Perle 594T

User and Reference Guide

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Taiwan

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這是甲類的資訊產品，在居住的環境中使用時間，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

HOW TO USE THIS GUIDE

Read this page if you don't read anything else!

The information in this manual has been presented in the recommended order in which to setup and configure the Perle 594T. More experienced users may wish to refer to chapters out of sequence, depending on their needs and level of expertise.

For those of you that only read manuals as a last resort, the next two pages tell you where to find information when you need it.

Quick Install	Read *Chapter 1: Quick Install*—for those in a rush for a checklist of steps to install, setup and configure the Perle 594T. Each step is cross-referenced with a page number where you can find detailed descriptions.
Perle 594T Overview	Read *Chapter 2: Introducing the Perle 594T* for an introduction to the Perle 594T, its features, use and environment.
Configuration Overview	Read *Chapter 3: Installing and Configuring the Perle 594T* for an overview of how to install, setup and configure the Perle 594T.
Installation	Read *Chapter 4: Installing the Perle 594T* for information on installation and setup of the Perle 594T.
594T Utility Program	Read *Chapter 5: Using the 594T Utility Program* for information on the functions and use of the 594T Utility Program.
AS/400 Communications	Read *Chapter 6: Communicating with the AS/400* for information on communication with the AS/400.
Concurrent Host	Read *Chapter 7: Concurrent Host* for information on using the 594T to communicate concurrently with up to four AS/400 systems over a single link.
Perle 594e Network Controller Feature	Read *Chapter 8: 594e Network Controller Feature Installation and Setup* for information on installing and setting up the 594T Network Controller Feature hardware and software.
PPP	Read *Chapter 9: Point to Point Protocol (PPP) Information* for configuring and using a PPP host.
VPN	Read *Chapter 10: Virtual Private Network (VPN)* for information on configuring and using this feature.
Configuration Examples	Read *Appendix A: Configuring the AS/400* for common examples on how to configure the AS/400.
Configuration Parameters	Read *Appendix B: Understanding Configuration Parameters* for an alphabetical list of parameters that require configuration on the AS/400.
Problems	Read *Appendix C: Solving Problems* for information on possible error conditions and how to resolve them.
Feature Card Installation	Read *Appendix D: Installing Perle 594T Feature Cards* for a step-by-step description of installation and setup of Feature Cards. If you are installing a new Perle 594T at your site, your Perle 594T is preconfigured and does NOT require onsite installation of Feature Cards.

Specifications	Read *Appendix E: Specifications* for specifications on the Perle 594T.
Memory Modules	Read *Appendix F: Adding Memory Modules* for instructions on adding additional memory modules (SIMMs).
Perle 594T Part Numbers	Read *Appendix G: Identifying Perle 594T Components* for a listing of the part numbers for Perle 594T components.
Ethernet Address Formats	Read *Appendix H: Specifying Ethernet Address Formats* for information on Ethernet addressing formats.
TCP/IP White Paper	Read *Appendix I: 594T and AS/400 TCP/IP Configuration* for information on configuration of TCP/IP controllers

About this guide

The *Perle 594T User and Reference Guide* provides you with setup, configuration, operational, diagnostic and reference information for the Perle 594T. More specifically, this manual tells you how to:

- configure the AS/400 to communicate with the Perle 594T
- setup the Perle 594T
- configure the Perle 594T
- connect the communication cable
- establish communication with the AS/400
- isolate and diagnose problems.

For further information about the Perle 594T, please refer to the following in the 594T documentation set:

Perle 594 Problem Determination Quick Reference	Provides information in a format that lets you quickly retrieve and diagnose problems. For your convenience, it is provided as a small booklet that easily fits into your shirt pocket or in the pocket on the front panel of the Perle 594T.
Perle 594 Planning Guide	Provides information for the AS/400 manager to assist in setup of your communications and controller network.
Perle 594 Diagnostic Guide	Contains information for diagnosis of error conditions. Also includes message code descriptions and System Reference Code (SRC) descriptions.

Conventions used in this guide

Information that you enter by typing on a workstation keyboard or on the Perle 594T key panel, is shown in **`bold Courier`** typeface characters.

Buttons that you press on a workstation keyboard or on the Perle 594T key panel, are shown in **bold** characters.

All titles are shown in italic characters; titles include: *book titles*, *chapter titles* and *section titles.*

Table of Contents

Chapter 5: Using the 594 Utility Program 35

Chapter 6: Communicating with the AS/400 59

List of Figures

Chapter 1: Quick Install—for those in a rush

This chapter provides a checklist of steps required to install, setup and configure the Perle 594T. Each step is cross-referenced with a page number where you can find detailed descriptions.

1. Prepare site for Perle 594T (refer to the *Perle 594 Planning Guide*).

2. Configure the AS/400.
   a) Define a Line Description (refer to page 11).
   b) Define the APPC (advanced program-to-program communication) Controller Description (refer to page 11)
   c) Define the RWS (remote workstation) Controller Description (refer to page 11)
   d) Define the Device Descriptions (refer to page 11)
   e) Define the Mode Description (refer to page 12)

3. Setup and Install Perle 594T hardware
   a) Unpack the Perle 594T (refer to page 16).
   b) If you have an Ethernet Feature Card, ensure that the UTP setting (media type) is correct (refer to page 23).
   c) Set up the Perle 594T.
      i. Set the voltage selector switch (refer to page 24).
      ii. Connect and plug in the power cord (refer to page 24).
      iii. Power on the Perle 594T (refer to page 25).
      iv. Set date and time (refer to page 25).
      v. If you have a LAN Feature Card, set the LAN speed (refer to page 27).
   d) Connect the Perle 594T.
      i. Connect workstations (see Connecting workstations on page 28).
      ii. Connect the communication cable (see Connecting the Communication Cable on page 32).

4. Configure the Perle 594T.
   - For an overview on configuring the Perle 594T refer to page 14.
   - For a description of configuring from a Twinaxial NWS, refer to page 40.
   - For a description of configuring with the Perle 594T Utility Program (the recommended method for ALL configurations), refer to page 37.

5. Establish communication with the AS/400 (refer to page 60).

For more information on the above procedures refer to Chapter 3: *Installing and Configuring the Perle 594T.*

Chapter 2: Introducing the Perle 594T

Welcome to the Perle 594T—the Network Controller that provides powerful solutions for both your AS/400 communication and thin client computing needs! The Perle 594T is an advanced workstation and communication remote controller for the IBM AS/400 environment that facilitates connection of display stations, personal computers (PCs) and printers to an AS/400. As well, the 594T's integrated IP routing capabilities supports the installation of thin clients and other IP devices at remote sites.

The Perle 594T offers all the features you've seen on the IBM 5494 at a fraction of IBM's cost plus the Perle 594T provides additional features and can emulate MULTIPLE controllers sharing a multipoint communication line.

Perle 594T Feature Cards

A Feature Card is a hardware component installed in the Perle 594T chassis. You can order additional Perle 594T Feature Cards to add functions and attach additional workstations to the AS/400. Furthermore, each Feature Card can be configured to emulate a separate controller. You can configure the Perle 594T to suit your requirements using the following Feature Cards:

Twinaxial — Supports attachment of up to 8 Nonprogrammable Workstations (NWS) or Twinaxial printers. The Perle 594T supports one Twinaxial card.

Ethernet — Supports attachment of up to 80 Ethernet workstations to the Perle 594T or can attach the Perle 594T using Ethernet to the AS/400. The Perle 594T supports one LAN card which can be either a Ethernet or Token-Ring card.

Token-Ring — Supports attachment of up to 80 Token-Ring workstations to the Perle 594T or can attach the Perle 594T using Token-Ring to the AS/400. The Perle 594T supports one LAN card which can be either a Ethernet or Token-Ring card.

For more information on Perle 594T Feature Cards, refer to *Appendix D: Installing Perle 594T Feature Cards*.

Features of the Perle 594T

Attachment of Remote Workstations

Normally, workstations that are locally attached to the AS/400 must be located near the AS/400. The Perle 594T allows workstations to be located any distance from the AS/400 because it communicates with the AS/400 over a communication network.

Nonprogrammable Workstation Support

Twinaxial displays and devices that emulate Twinaxial displays are called Nonprogrammable Workstations (NWS). With the Perle 594T you can remote attach Twinaxial devices to an AS/400.

Local NWS Editing Control

The Perle 594T handles field editing functions for each NWS.

Programmable Workstation Support

A programmable workstation (PWS) can process information independently of an AS/400 or controller, but can exchange information with these systems. An example of a PWS is a PC running IBM AS/400 PC Support or Client Access/400.

Automatic Configuration

The addition, removal or relocation of a NWS or a PWS is automatically detected by the Perle 594T. On the AS/400, a PWS can be automatically reconfigured, but the device description for a NWS may require modification when a change occurs.

Attachment of Twinaxial Workstations

The Perle 594T's Twinaxial Feature Card supports up to 28 workstations. A Twinaxial workstation can be an NWS or a PWS. Twinaxial workstations may be attached using twinaxial cabling or twisted pair cabling.

Attachment of SNA Token-Ring Workstations

The Perle 594T's Token-Ring Feature Card can be configured as a Token-Ring gateway. This configuration allows up to 80 Token-Ring workstation attachments to the Perle 594T. Each Token-Ring workstation operates as a PWS running IBM's AS/400 PCSupport or Client Access software. In this configuration, the Perle 594T communicates with the AS/400 over a synchronous communication network.

Attachment of SNA Ethernet Workstations

The Perle 594T's Ethernet Feature Card can be configured as an Ethernet gateway. This configuration allows up to 80 Ethernet workstation attachments, per card, to the Perle 594T. Each Ethernet workstation operates as a PWS running IBM's AS/400 PC Support or Client Access software. In this configuration, the Perle 594T communicates with the AS/400 over a synchronous communication network.

Synchronous Communication Interfaces

The Perle 594T supports the following physical interfaces to synchronous communication equipment:

- EIA 232D (V.24/V.28)
- V.35
- X.21.

Token-Ring AS/400 Attachment

The Perle 594T and the AS/400 can be configured to communicate over a Token-Ring network. Other devices may share the network with the AS/400 and the Perle 594T.

Ethernet AS/400 Attachment

The Perle 594T and the AS/400 can be configured to communicate over an Ethernet network. Other devices may share the network with the AS/400 and the Perle 594T.

SNA Subarea Network Support

The Perle 594T can access the AS/400 system over an SNA subarea network.

Access to Alternate AS/400 Systems

The Perle 594T can be preconfigured for up to four AS/400 systems. The Perle 594T stores information about all four AS/400 systems so that the operator can end a connection with one AS/400 and easily establish a link with a different AS/400.

Workstation Customization

The Perle 594T supports the AS/400 Workstation Customization feature.

594T Utility Program

The 594T Utility Program is used to enter configuration information, provide network link establishment and to access Concurrent Diagnostics.

Standalone PC Configuration

Configuration information can be entered from a PC. The PC runs the 594T Utility Program and the configuration is stored on a floppy diskette for distribution to remote Perle 594T systems.

Online PWS Configuration

Configuration information can be entered from a PWS that is attached to the Perle 594T. The PWS may be attached through a Twinaxial Feature Card or through either an Ethernet Feature Card or Token-Ring Feature Card using gateway configuration.

Internal Configuration Storage

Configuration information is saved in non-volatile storage on the Perle 594T whenever configuration is done from an attached PWS or NWS. When configuration is done on a standalone PC, the information can be copied to a floppy diskette and transferred to the Perle 594T for internal storage.

Using Backup Configuration from Diskette

The 594 Utility Program in Stand Alone mode can save your configuration as a Backup configuration. When this Backup configuration is placed on the 594 system diskette and the diskette is used to power on the controller, the Backup configuration is used instead of the configuration in permanent storage.

This enhancement is useful for occasions when your network becomes unavailable and you need to switch to a backup connection. You can now restart the 594 with your backup diskette that has the Backup configuration file on it and the Backup configuration will be used instead of the configuration in permanent storage. When the original network is restored, replace your backup diskette with your original system diskette and restart the 594. The configuration in permanent storage will again be used.

Diskette-Based Architecture

Each software upgrade is distributed through new diskette releases.

Concurrent Host Attachment

The 594 can be configured to communicate concurrently with up to four AS/400 systems over a single physical link. Concurrent host attachment enables NWSs that do not have the use of AS/400 display station or printer passthrough to communicate with different AS/400 systems in the communication network. Once concurrent host attachment is configured, printer sharing can be enabled or disabled.

Frame Relay Token-Ring Bridging

With the 594 configured for Frame Relay Token Ring Bridge, the 594 will support source route bridging of token ring traffic across the frame relay connection to an AS/400 or a bridge partner. Bridge partners must support RFC 1490 Frame Relay bridging. The 594 will operate as a bridge and forward non SNA traffic such as IP and IPX on the Token Ring LAN over the frame relay "Virtual LAN".

If the 594 is connected via frame relay to an AS/400, the bridged frame relay connection allows the AS/400 to communicate with a station on the 594's token ring gateway as if they were on a token ring locally attached to the AS/400.

Emulation of Multiple Controllers

The Perle 594T can be configured so that each Feature Card emulates a separate controller. All emulated controllers communicate with the AS/400 over the same communication line, thereby reducing line costs.

Access to Multiple AS/400 Systems (Multihost)

Each Feature Card acts as an independent controller. Each controller, while sharing the physical link, can communicate with different AS/400s on the network. Departments sharing a Perle 594T, but needing access to different hosts can each access their host directly without Display Station Passthrough. When combined with the Multisession feature, a single display can access more than one host at a time.

TCP/IP Host Connection

The Perle 594T supports a TCP/IP host connection that uses full AnyNet functionality to take in SNA traffic and convert it into TCP/IP. At the host, the AS/400 uses AnyNet/400 to convert the TCP/IP back to SNA. This means that any SNA 5250 workstation, printer or PC client connected to the Perle 594T can communicate with the AS/400 over a TCP/IP enabled network.

A TCP/IP connection can be made over either a Token Ring or Ethernet network.

Host Roaming Feature

When enabled, the controller will automatically switch, without user intervention and attempt to establish communication with the next configured host if communication with the currently active host is lost and cannot be reestablished. The controller will continue to try each configured host until an active host is found. If the last configured host is not active, the controller will continue with the first configured host. Up to four hosts can be configured.

Software Download Utilities

Software Download refers to the capability of downloading new controller software to a 594T Controller. The software will overwrite the existing software on the 594 Controller Software Diskette in the controller's floppy disk drive or the 594T Network Controller Software on the 594T hard drive. This is accomplished using the 594 Utility program on a PWS that is attached locally or remotely to a controller.

There are two methods of downloading the 594 Controller Software. Interactive mode uses the 594 Utility program menus to select download files and begin download operation. Status and progress will be displayed on screen. Batch mode uses the 594 Utility with the batch mode option. This allows the software to be downloaded to one or more controllers without user attendance. Status is saved in a log file.

Fast Ethernet Support

The Perle 594T supports one Fast Ethernet (10/100 Mbps) Feature card (Type 49). This card has a **LINK**, **ACT** and **100** Mbps indicator LEDs. The physical interfaces supported are:

- 10 BaseT (10 Mbps UTP category 3, 4 or 5 cable)
- 100BaseTX (100 Mbps UTP category 5 cable)

TCP/IP Host Connection over Frame Relay Protocol (with IP Routing Feature only)

The configuration of TCP/IP controllers over frame relay protocol will allow the 594T to natively connect to an AS/400 or connect to an AS/400 via an IP router, over a frame relay network, using TCP/IP protocol. Routers that the 594T will be communicating with must support Frame Relay RFC 1490 Routed IP format. This will eliminate the need of an IP router at every remote site that the user wishes to configure a 594T TCP/IP controller.

TCP/IP Host Connection over PPP

The Perle 594T supports a PPP host connection. This will allow the controller to connect to the AS/400 or connect to the AS/400 via an IP router or RAS (Remote Access Server), using the TCP/IP protocol running over a PPP connection. The physical connection is achieved by connecting a modem or Terminal Adapter to the 594T Sync card.

594T IP Routing Feature

The Perle 594T IP Routing Feature is an upgrade feature kit that allows you to utilize IP Routing features on the 594T.

With the 594T configured for IP Routing the 594T will provide basic IP routing, using either dynamic or customized static routes, to forward IP datagrams between the LAN interfaces (Token-Ring and Ethernet), the twinax interface, the frame relay interface and the PPP interface. IP routing allows devices such as AS/400s, Network Computers PC's running IP applications on the LAN, twinax and the frame relay, to send IP datagrams to the 594T with an IP destination address other than the 594T's IP address. The 594Ts at remote sites can now be connected to each other or other IP routers and route IP traffic to interconnect their IP devices. Routers that the 594T will be communicating with over Frame Relay must support Frame Relay RFC 1490 Routed IP format.

IP over Twinax Support

The support of IP devices on the 594's twinax interface allows customers with PCs or Network Computers attached to the 594 via their twinax cabling to gain access to any of their IP networks. One of the benefits of running IP over twinax is that it supports cable distances of up to 5,000 feet of twinax without any kind of repeater. This is longer that many LAN types that require additional hubs to obtain this distance.

With the support of IP over Twinax, it is now possible to have non-LAN PCs and Network Computers attached to the 594 Network Controller to access the worldwide web, share printers and files and use workgroup applications.

Dynamic Routing Support (RIP V1 and V2)

The support of Dynamic Routing allows the 594 to exchange route or link information from which the best paths to reach destinations in the internetwork are calculated. With Dynamic Routing enabled, you will no longer be required to configure static route entries in the 594 and adjacent IP routers, as long as the adjacent IP routers support RIP V1 or V2.

BOOTP Relay Agent (with IP Routing Feature only)

Bootstrap Protocol (BOOTP) is a TCP/IP protocol that provides a method for assigning client devices (such as Network Computers) an IP address and optionally a start-up file. When a client is powered on, a BOOTP request is sent out on the LAN. A BOOTP server will send back a reply that contains the IP address defined for that client and optionally the name of the start-up file to load.

Dynamic Host Control Protocol (DHCP) is also a TCP/IP protocol that provides IP addresses to clients devices. DHCP does not force a fixed link between a clients MAC address and an IP address and therefore it is more flexible than BOOTP.

The 594T BOOTP relay agent will relay a BOOTP or DHCP request from a client locally connected to a 594T LAN across the corporate WAN to specific BOOTP or DHCP Servers. Up to 4 BOOTP or DHCP servers can be configured for the 594T.

VPN Support [1]

The Perle 594 supports the establishment of VPN (Virtual Private Network) tunnels over any IP host connection. Up to 8 VPN tunnels can be defined on the controller. The 594 implementation of VPN is based on the IPSec (IP Security) protocol and IKE (Internet Key Exchange) protocol, both of which have gained widespread acceptance in the industry. The 594 conforms to RFC #2401 for IPSec and RFC #2409 for IKE.

1. For the 594T, this configuration requires that the Perle 594T IP Routing plus VPN feature be installed. For more information on the VPN feature see “Chapter 10: Virtual Private Network (VPN)” on page 83.

Chapter 3: Installing and Configuring the Perle 594T

Introduction

This chapter provides an overview of how to install, setup and configure the Perle 594T. These are the major steps:

- Prepare site for Perle 594T.
- Configure the AS/400—*Time to complete*: approximately 10—60 minutes, depending upon how you configure your Perle 594T.
- Set up and Install Perle 594T hardware—*Time to complete*: approximately 30 minutes.
- Configure the Perle 594T—*Time to complete*: approximately 10—60 minutes, depending upon how you configure your Perle 594T.
- Establish communication with the AS/400.
- Set up Concurrent Host.

Preparing the site for the Perle 594T

Prior to installation, prepare the site for the Perle 594T as described in the *Perle 594 Planning Guide*, including:

- All workstations, workstation cabling and communications lines are on hand and have been installed, where applicable.
- Any network facilities, modems and other equipment that may be required have been installed and are ready for use.
- The Perle 594T does not require special cooling, but sufficient clearances must be maintained in front of and behind the unit to allow proper airflow to internal fans.
- Locate the controller in an area where:
  - Power cords and cables are out of traffic areas.
  - The front panel display is easily visible.
  - Floppy diskettes can be inserted into and removed from the diskette drive.

Configuring the AS/400

The Perle 594T can emulate one or more controllers. Before the Perle 594T operates as a controller you need to configure the following items on the AS/400 so that each emulated controller can communicate with the Perle 594T:

- Network Interface Description (Frame Relay only)
- Line Description(s)
- APPC Controller Description(s)
- RWS Controller Description(s)
- Device Description(s)
- Mode Description(s)
- TCP/IP Interface (TCP/IP or IP Routing only)
- TCP/IP Host Table Entry (TCP/IP only)
- TCP/IP Routes (TCP/IP or IP Routing only)
- APPN Remote Configuration List (TCP/IP only)

Perle recommends you configure the AS/400 prior to setup and configuration of the Perle 594T. You will need to note certain parameters so that they match on both the AS/400 and the Perle 594T. In an APPN network, the host needs information about each network node to which it has a connection. This is done by providing an APPC controller description for each remote controller or emulated remote controller.

For more information on configuration of the AS/400 refer to *Appendix A: Configuring the AS/400, Appendix B: Understanding Configuration Parameters* and your AS/400 documentation.

The following table displays the descriptions to create and the commands to use, on the AS/400:

Parameter	AS/400 Command	Explanation
Network Interface Description (Frame Relay only)	CRTNWIFR	create a network interface description for Frame Relay
Line Description	CRTLINTRN	create line description for Token-Ring
	CRTLINETH	create line description for Ethernet
	CRTLINSDLC	create line description for SDLC and X.21
	CRTLINX25	create line description for X.25
	CRTLINFR	create line description for Frame Relay
APPC Controller Description	CRTCTLAPPC	create APPC controller description
RWS Controller Description	CRTCTLRWS	create RWS controller description required for NWS devices
Device Descriptions	CRTDEVDSP	create display device description
	CRTDEVPRT	create print device description
Mode Description	CRTMODD	create mode description
TCP/IP Interface	ADDTCPIFC	add a TCP/IP interface
TCP/IP Host Table Entry	ADDTCPHTE	add an entry to the TCP/IP host table
TCP/IP Routes	ADDTCPRTE	add a TCP/IP route
Add APPN Remote Configuration List Entry	ADDCFGLE	add an APPN remote configuration list entry

Note: *You will need to know the information entered in the descriptions above to configure the Perle 594T.*

Defining a Frame Relay Network Interface

The Frame Relay Network interface description defines the physical attributes of the Frame Relay port. The Frame Relay line descriptions define the logical or virtual connections. Each of these virtual connections is called a permanent virtual circuit (PVC) and is identified by a DLCI number.

In some cases, you need not define a Frame Relay network interface description because it might have already been created. To display the current configuration, type: **DSPNWIFR**

Ensure that the Network Interface Description (NWID) parameter matches the nonswitched NWI (NWI) parameter.

Defining the Line Description

The Line Description defines the communication protocol and related attributes with which the AS/400 communicates to the Perle 594T. This information needs definition in both the AS/400 and the Perle 594T. If you will be attaching the Perle 594T to an existing line, you will not need to create a Line Description. You may view the existing description using the DSPLIND command.

Defining the APPC Controller

The APPC Controller Description defines APPN connections for each emulated controller on a Perle 594T. On the AS/400 that is the adjacent link station to the Perle 594T, you must define an APPC controller description. This defines the network communication parameters on the AS/400 for the Perle 594T.

The AS/400 defines the APPC controller automatically if:

- The Perle 594T is attached to the host via Token-Ring or Ethernet and
- Autocreation is enabled on the host by setting the system value **`QAUTOCRTCTL = *YES`** in the Line Description.

You must define the APPC controller if using another host connection type.

Note: *For a Perle 594T running in Enhanced mode you need to create an APPC controller description for each emulated controller used for device attachment.*

Defining the RWS Controller Description

The RWS Controller Description defines the type of controller and the name of the controller to the AS/400. This description is defined on the host on which users sign on for a session. This may be, but is not necessarily, the adjacent link station to the Perle 594T.

The AS/400 defines the RWS controller automatically if:

- The AS/400 is running OS/400 Version 3.1 or higher and
- Autocreation is enabled on the host by setting the system value **`QAUTORMT = 1`**.

The APPC Controller Description and the RWS Controller Description must be associated with one another on the AS/400. This association takes place automatically when the Remote Control Point Name and the Remote Location Name are the same. When they are not the same, associate them by an entry in the Remote Configuration List.

Note: *For a Perle 594T running in Enhanced mode you need to create an RWS controller description for each emulated controller.*

Defining the Device Description

The Device Description defines the NWS devices for the RWS controller. The AS/400 defines the Device Descriptions automatically if:

- The AS/400 is running OS/400 Version 3.1 or higher and
- Autocreation is enabled on the host by setting the system value **`QAUTOCRTDEV = *ALL`** on the RWS Controller Description.

Defining the Mode Description

The Mode Description defines LU6.2 communication characteristics. An AS/400 predefined mode, named QRMTWSC, is supplied for use with remote controllers. Perle recommends that you use this mode.

Adding a TCP/IP Interface

A TCP/IP interface makes the logical connection between the AS/400 and the TCP/IP protocol stack.

Adding a Host Table Entry

The host table should contain an entry for each network controller that you want to communicate with. Each controller name and IP address must be unique within the network.

Adding a TCP/IP Route

A TCP/IP route entry must be configured if your 594T controller is on a different IP subnet than your AS/400.

Adding an APPN Remote Configuration List Entry

The AS/400 requires a configuration list entry for each 594T TCP/IP controller. The AS/400 uses the information in the remote location list to determine which controller description to use when it activates an NWS session.

Matching Network Attributes

Certain parameters from AS/400 Descriptions need to match parameters in the Perle 594T configuration. Appendix A provides examples of different Perle 594T attachments and shows the relationship between AS/400 parameters and Perle 594T parameters.

You should have the values of the related AS/400 parameters available for the configuration of the Perle 594T.

Setting Up and Installing Perle 594T hardware

Installation Overview

Refer to *Chapter 4: Installing the Perle 594T* for detailed instructions on installing the Perle 594T.

Note: *Feature Card Installation—If you are installing the Perle 594T for the first time, all Feature Cards have been installed for you. If you are upgrading the Perle 594T by installing an additional Feature Card, refer to Appendix D for details on Feature Card installation.*

Installing the Perle 594T is composed of the following major steps:

- Unpacking the Perle 594T (refer to page 16).
    - Open the shipping box.
    - Remove the cables.
    - Remove the documentation packet.
    - Lift the Perle 594T out of the box.
    - Remove packing material.
- If you have an Ethernet Feature Card, set the Ethernet jumpers (refer to page 187).
- Setting up the Perle 594T.
    - Set the voltage selector switch (refer to page 24).
    - Connect and plug in the power cord (refer to page 24).
    - Power on the Perle 594T (refer to page 25).
    - Set date and time (refer to page 25).
    - If you have a LAN Feature Card, set the LAN speed (refer to page 27)
- Connecting the Perle 594T.
    - Connect workstations (see *Connecting workstations* on page 28).
    - Connect the communication cable (see *Connecting the Communication Cable* on page 32).

Configuring the Perle 594T

Using the 594T Utility Program

Use the 594T Utility Program for ALL configurations of the Perle 594T. The 594T Utility Program provides easy-to-use menus that simplify configuration.

For more information refer to:

- *Chapter 5: Using the 594T Utility Program* for information on the functions and features of the 594T Utility Program
- *Chapter 6: Configuring from the 594T Utility Program* for information on configuration of the Perle 594T using the 594T Utility Program.

Establishing communication with the AS/400

Complete the following to establish communications between the Perle 594T and the AS/400:

- Place the Perle 594T in normal operating mode.
- Start TCP/IP on the AS/400, if configured.
- On the AS/400 system, vary on:
  - Network Interface (frame-relay only)
  - the Line
  - the PPP Profile (if dialing into or from AS/400)
  - the APPC Controller
  - the RWS Controller.

For more information, refer to *Chapter 8: Communicating with the AS/400*.

Setting Up Concurrent Host Attachment

Every NWS initially has the primary host as its default host, which is the host the 594T establishes a session with when the NWS is powered on. Concurrent host attachment will allow you to change the default host or switch between hosts. For more details, see chapter 9 "Concurrent Host."

Chapter 4: Installing the Perle 594T

Prerequisites

Complete the following before you install the Perle 594T:

- Prepare the site for the Perle 594T as directed in the *Perle 594 Planning Guide*.
- Configure the AS/400 as directed in this guide in *Chapter 3: Installing and Configuring the Perle 594T.*
- Install Feature Card upgrades as directed in *Appendix D: Installing Perle 594T Feature Cards*.

Note: *If you are installing the Perle 594T for the first time, all Feature Cards have been installed for you. If you are upgrading the Perle 594T by installing an additional Feature Card, install all Feature Card upgrades before proceeding.*

Once you complete the above you are ready to install the Perle 594T. For more information, refer to Chapter 3 for an overview of the installation and configuration of the Perle 594T or Chapter 1 for a brief checklist of the steps to install and configure the Perle 594T.

Installation Overview

Installing the Perle 594T is composed of the following major steps:

1. Unpacking the Perle 594T (refer to page 16).
2. If you have an Ethernet Feature Card, ensuring that the media type setting is correct (refer to page 23).
3. Setting up the Perle 594T (refer to page 24).
4. Connecting the Perle 594T (refer to page 28).

Once you install and setup the Perle 594T as described in this chapter, proceed to configuration of the Perle 594T on page 33 or page 37.

Unpacking the Perle 594T

Unpacking the Perle 594T is composed of five steps:

1. Open the shipping carton.

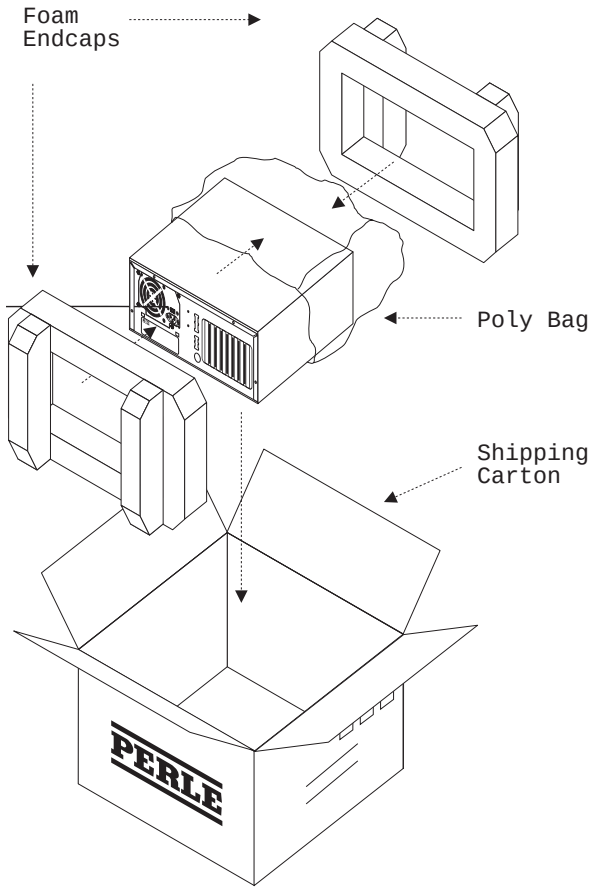


Fig. 1: Opening the Perle 594T shipping carton

2. Remove accessory tray containing cable(s) and power cord(s) from top.
3. Remove documentation packet from side cavity between unit and outer carton.
4. Lift the Perle 594T out of the shipping carton.
5. Remove packing material.

What's in the box?

The Perle 594T shipping carton contains the following:

- cables
- documentation packet
- diskette packet
- Perle 594T.

Cables

Part numbers are molded into the power cords and communications cables; refer to Appendix G if you are not sure which power cord or communication cable(s) is appropriate for your site.

The following cables are included in the shipping box:

- power cord
- communications cable
- workstation cables.

Power Cord

The appropriate power cord is supplied for your location.

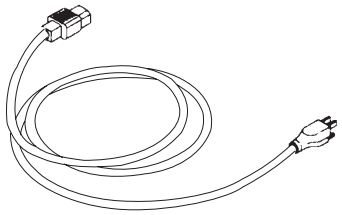


Fig. 2: Power Cord

Communications Cable

Use the appropriate communications cable to connect the Perle 594T to the communications equipment.

- EIA232 cable (V.24 /V.28) is identified by the DB 25-pin connector. It should be used when:
  - connecting to the host via SDLC, X.21, Frame relay or X.25 and the connection speed does not exceed 19,200 bps.
  - connecting to the host using asynchronous PPP.

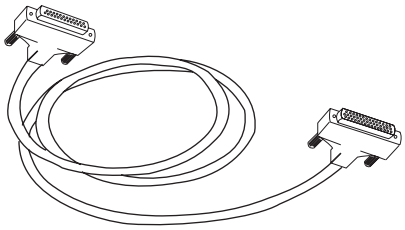


Fig. 3: EIA232 cable

- V.35 cable, recommended for speeds up to 128,000 bps, is identified by the box-type connector.

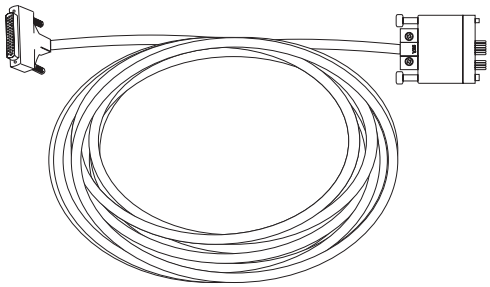


Fig. 4: V.35 cable

- X.21 cable, recommended for high speed communications (up to 128,000 bps), is identified by the DB 15-pin connector.

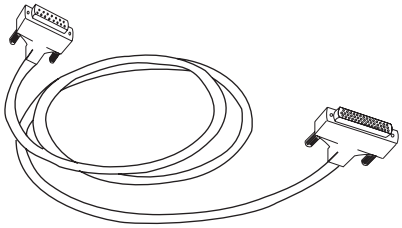


Fig. 5: X.21 cable

Workstation Cables

The appropriate workstation cable(s) is supplied for your Feature Cards.

- Perle supplies Twinaxial workstation cables, identified by the 4-port connector, for Twinaxial connections.

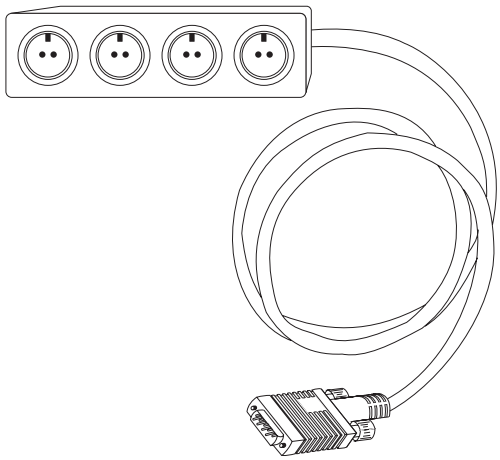


Fig. 6: Twinaxial workstation cable

- Perle supports all commonly used Token-Ring and Ethernet LAN connections.

Documentation packet

The documentation packet contains the following documents:

- 594T User and Reference Guide

- 594 Planning Guide
- 594 Diagnostic Guide
- 594 Problem Determination Quick Reference.

Note: *If your Perle 594T contains an Ethernet Feature Card, the documentation packet will contain a 10BaseT adapter.*

Diskette packets

594T Base Controller Diskette Packet. This Diskette Packet contains the following:

- 594 Controller Setup Diskette
- 594 Controller Setup Backup Diskette
- 594T Base Controller Software Diskette
- 594T Base Controller Software Backup Diskette
- 594 Utility Diskette for DOS
- 594 Utility Diskette for Windows 95/98/NT
- Loopback Adapter.

Optional 594T IP Routing Controller Diskette Packet

This diskette packet contains the following:

- 594T IP Routing Controller Software Diskette
- 594T IP Routing Controller Software Backup Diskette

Optional 594T IP Routing plus VPN Controller Diskette Packet

This diskette packet contains the following:

- 594T IP Routing plus VPN Controller Software Diskette
- 594T IP Routing plus VPN Controller Software Backup Diskette

Perle 594T Views

The diagrams below show the major hardware components of the Perle 594T.

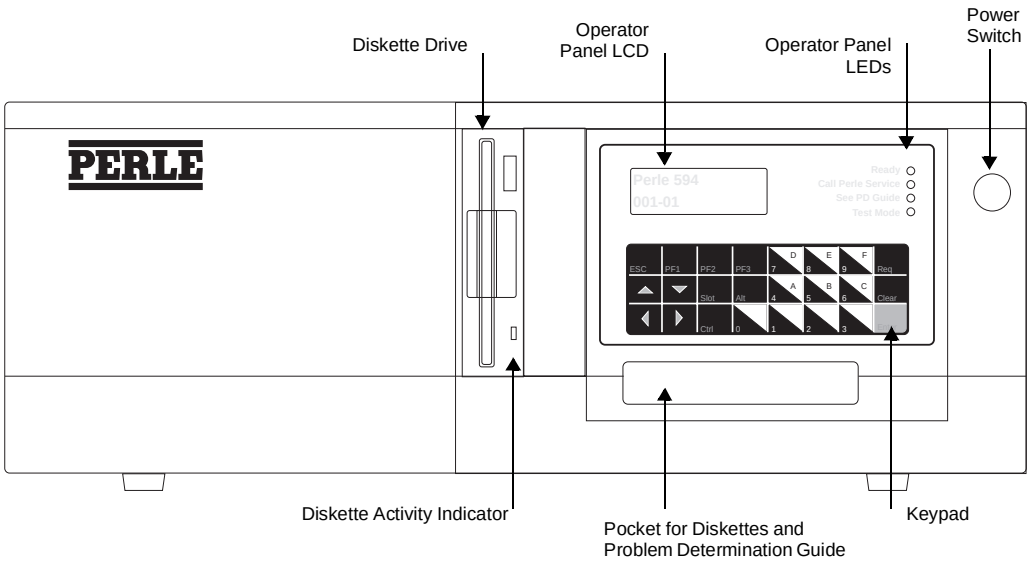


Fig. 7: Perle 594T Front View

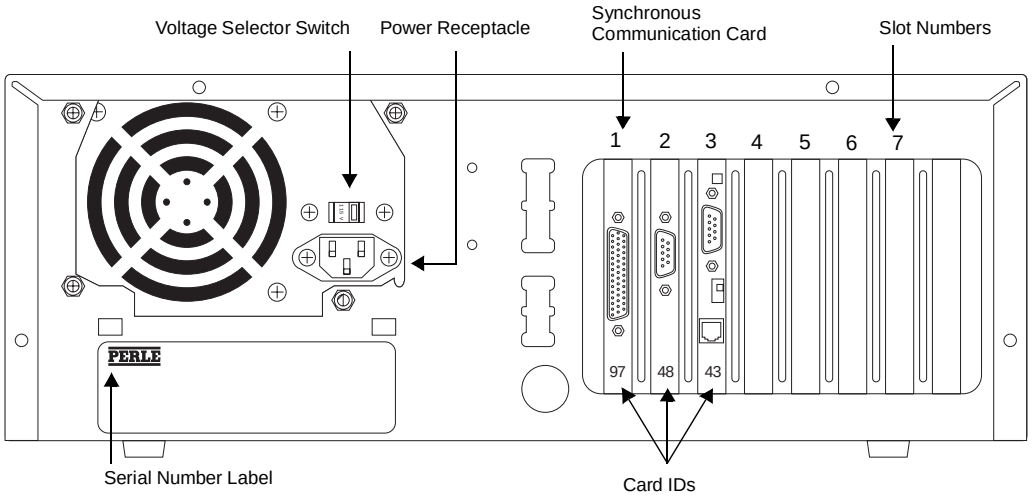


Fig. 8: Perle 594T Rear View

Note: *We've displayed slot numbers in this diagram to help you identify slot positions on your Perle 594T.*

Slot 3 on your Perle 594T will be occupied by the Feature Card you ordered and may be different than what is shown in this diagram.

Perle 594T Component Description

Serial Number

Examine the label on the back panel to locate your Perle 594T's serial number.

Operator Panel LCD

The operator panel has a 2-line by 16-character Liquid Crystal Display (LCD) that displays status messages for the Perle 594T.

Operator Panel LEDs

There are four operator panel Light Emitting Diodes (LEDs):

 (Ready)	When lit, this green LED indicates the Perle 594T is ready for operation.
 (Call Perle Service)	When lit, this yellow LED indicates detection of an error condition that requires you to contact your 594T service representative.
 (See PD Guide)	When lit, this yellow LED indicates the Perle 594T has detected a problem that requires diagnosis. Refer to *Appendix C: Solving Problems* or the *Perle 594 Problem Determination Quick Reference* for problem resolution instructions.
 (Test Mode)	This yellow LED is lit when the Perle 594T is in test mode, configuration mode or when the Concurrent Diagnostics feature is enabled.

Power Switch

Use this push-button switch to turn power for the Perle 594T on and off. When power is on, one or more of the operator panel LEDs will be on.

Keypad

Use the 24-key keypad to enter commands. The following table provides a description of the Perle 594T keypad functions:

Key		Description
Esc		Cancel request.
PF1		Special request.
PF2		Special request.
PF3		Special request.
0—9		Numeric entry.
		Pressing a number while holding the Alt key produces the following hexadecimal numbers:
Alt + 4		Hexadecimal A
Alt + 5		Hexadecimal B
Alt + 6		Hexadecimal C
Alt + 7		Hexadecimal D
Alt + 8		Hexadecimal E
Alt + 9		Hexadecimal F
	Req	Initiates a status or function request.
↑		Scroll **UP**.
↓		Scroll **DOWN**.
	Slot	Enter slot selection mode.
Alt		When held down, this key in combination with numeric keys or PF keys produces alternate values.
	Clear	Clear the value currently being entered. Cancel the current selection.
←		Scroll **LEFT**.
→		Scroll **RIGHT**.
	Ctrl	Enter controller selection mode.
	Enter	End input string or initiate selected function.

Diskette Drive

Use the diskette drive to load software and configuration data from the Controller Software Diskette and the Controller Setup Diskette. You can transfer configuration to and from 720Kb or 1.44Mb diskettes.

Diskette Activity Indicator

The diskette activity indicator is lit when the diskette drive is in use.

Warning: *Do not remove the diskette from the diskette drive or power off the Perle 594T when the diskette activity indicator LED is on.*

Pocket for Diskettes and Problem Determination Quick Reference

This pocket provides a convenient location for storage of the Perle 594T diskettes and the *Perle 594 Problem Determination Quick Reference.*

Voltage Selector Switch

Use the voltage selector switch to adjust the Perle 594T for the electrical service available at your site—the selected setting is visible on the switch. This switch has two positions:

- 115 for 100—125 VAC
- 230 for 200—240 VAC.

Synchronous Communication Card

The Synchronous Communication Card is always located in slot number **1**, identified by Card ID **97**. The Synchronous Communication Card supports SDLC, X.25, X.21 and Frame Relay host connections.

For controllers which have a serial number of 59-08000 or greater the synchronous communications card can be used to support a PPP host connection.

Note: *Even if you are not using the communication method listed above, this card is required for the operation of the Perle 594T.*

Setting the Ethernet media type setting

If you have an Ethernet Feature Card, ensure that the media type setting is correct. The Ethernet Feature Card supports three different media types. They are:

- UTP (10BaseT) using the RJ45 connection
- Thin Ethernet (10Base2) using the BNC port
- Thick Ethernet (10Base5) using the AUI port.

The default media type setting for the Ethernet Feature Card is UTP (10BaseT), using an RJ45 connection. Refer to page 187 in Appendix D if you need to change the Ethernet media type setting.

Setting up the Perle 594T

Complete the following major steps to set up the Perle 594T:

1. Set the voltage selector switch.
2. Connect and plug in the power cord.
3. Power on the Perle 594T.
4. Set the date and time.
5. Set the LAN speed (if required).

Setting the voltage selector switch

Warning: *If the voltage selector switch is set incorrectly, it may cause permanent damage to the unit and void any warranty. The 594T must always be powered off and its power cord disconnected before adjusting the voltage selector switch.*

Set the voltage selector switch on the back of the Perle 594T as follows:

1. Ensure that the Perle 594T's power is turned off (i.e. no operator panel LEDs are on).
2. Ensure that the power cord is disconnected from the electrical outlet.
3. Set the voltage selector switch to the correct voltage as follows:

- 115V for inputs of 100—125 VAC at 47—63 Hz
- 230V for inputs of 200—240 VAC at 47—63 Hz.

The following diagram shows the voltage selector switch in both the 115 V and 230 V positions.

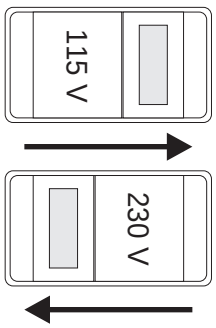


Fig. 9: Voltage Selector Switch

4. Proceed to *Connecting the power cord*.

Connecting the power cord

Using the supplied power cord:

1. Connect the power cord into the power receptacle on the rear of the Perle 594T.
2. Connect the power cord into a properly grounded electrical outlet.

3. Proceed to section *Powering on the Perle 594T.*

Powering on the Perle 594T

Throughout the following procedures, the Perle 594T displays status codes. If the code for a step in the procedure shown in this guide does not match the one shown on your display, refer to the *Appendix C: Solving Problems* and follow the directions given for the displayed code.

1. Ensure that the diskette drive is empty.

2. Press the power switch. All LEDs should come on momentarily. If the LEDs do not come on, check the power cord and the electrical outlet.

3. The following message code appears on the LCD, indicating that diagnostic tests are running:

   001-01

4. In a few moments, the following message code appears:

   003-02 1

5. Locate the Perle 594T Controller Setup Diskette and ensure that the diskette is not write-protected. Insert the Controller Setup Diskette into the diskette drive.

6. On the keypad, type **0** and press **Enter**. The 594T takes a couple of minutes to load the software from the diskette.

7. Once the software has been loaded from the Controller Setup Diskette, the Perle 594T displays date and time settings, followed by the extended diagnostics main menu:

   020-01 1

8. Proceed to *Setting the Date and Time*.

Setting the Date and Time

Proceed as follows to set the date and time:

1. Ensure that the extended diagnostics main menu is displayed:

   020-01 1

   If the above message code is not displayed, repeat the procedure *Powering on the Perle 594T* on page 25.

2. On the keypad, type **3** and press **Enter**.

3. The following appears:

   023-01 yy-mm-dd

4. Enter the current date using the numeric entry keys.

   Use the right and the left arrow keys to move the cursor to make required changes. The following

table lists valid ranges:

Date	Valid Range
yy (year)	91 to 50 (1991 2050)
mm (month)	01 to 12
dd (day)	01 to 31

5. Press **Enter**. At this point, the LCD displays one of the following message codes:

023-02	The date entered is valid. Proceed to the next step.
023-03	The date entered is not valid. Press **Enter**. The cursor is under the invalid field. Correct the invalid field and repeat step 4.

6. The following appears:

   023-02 hh:mm:ss

7. Enter the current time using the numeric entry keys. Use the right and the left arrow keys to move the cursor to make required changes. The following table lists valid ranges:

Time	Valid Range
hh (hours)	00 to 23
mm (minutes)	00 to 59
ss (seconds)	00 to 59

8. Press **Enter**. At this point, the LCD displays one of the following message codes:

020-01 1	The time entered is valid and the Perle 594T displays the extended diagnostic main menu.
023-04	The time entered is not valid. Press **Enter**. The cursor is under the invalid field. Correct the invalid field and repeat step 7.

9. Proceed to *Setting the LAN speed*, if required. If you do not need to set the LAN speed, proceed to *Connecting the Perle 594T*.

Setting the LAN Speed

Note: *You only need to set the LAN speed if the Perle 594T has an installed Token-Ring Feature Card (Card ID 43) or a Fast Ethernet Feature Card (Card ID 49)* **.**

Warning: *Ensure that you set the LAN speed before you connect the 594T to the LAN. Failure to do so may interfere with communications on the LAN.*

All devices on the same LAN segment must operate at the same *LAN speed*. Ensure that the LAN speed of the Perle 594T matches the line speed on the LAN.

1. Ensure that the following message code is displayed on the bottom line of the LCD:

   ```
   020-01      1
   ```

   If the above message code is not displayed, repeat the procedure for *Powering on the Perle 594T* on page 25.

2. On the keypad, type **4** and press **Enter**. The Perle 594T displays the following message:

   ```
               01 97
   P24-01      97
   ```

3. Press the **Slot** key, then press the arrow keys until the Card ID 43 for the Token-Ring Feature Card or Card ID 49 for the Fast Ethernet Feature Card appears. Press **Enter** and the following information is displayed.

   ```
               0y zz
   P24-01      zz
   ```

   where: **y** is the selected slot number.

   zz is either card ID 43 or 49.

4. Press **Enter**. The following information is displayed.

   ```
               0y zz
   P24-02      x MBPs
   ```

   where **x** is the current LAN speed (4 or 16 Mbps for Token-Ring and 10 or 100 for Ethernet). If necessary, use the arrow keys to change the setting. Press **Enter** to confirm the setting.

5. Press **Esc**.

6. Is the following message code displayed?

   ```
   024-02
   ```

   Yes LAN speed setup is complete. Press **Enter** to return to the extended diagnostics menu. Power off the Perle 594T and proceed to *Connecting the Perle 594T.*

   No Proceed to step 12.

7. An error has occurred or the Perle 594T is not configured for a Token-Ring or Fast Ethernet Feature Card. To check for errors, look up the message code in *Appendix C: Solving Problems*. If the Perle 594T is not configured for a Token-Ring or Fast Ethernet Feature Card, refer to *Appendix D: Installing Perle 594T Feature Cards*. Return to step 1 once the problem has been resolved.

Connecting the Perle 594T

To connect the Perle 594T you need to do the following:

- connect workstations (refer to *Connecting workstations* on page 28)
- connect the communication cable (refer to *Connecting the Communication Cable* on page 32).

Connecting workstations

Depending on your site configuration, you need to connect one or more, of the following workstation cable(s):

- Twinaxial (proceed to *Connecting Twinaxial Workstations* on page 29)
- Token-Ring (proceed to *Connecting the Token-Ring Cable* on page 31)
- Ethernet (proceed to *Connecting the Ethernet Cable* on page 32)

Once you have connected all workstation cables proceed to *Connecting the Communication Cable* on page 32.

Warning: *Always turn off the power switch before connecting or disconnecting cables.*

Connecting Twinaxial Workstations

1. Set up each Twinaxial workstation according to the vendor's instructions.
2. Ensure that the Perle 594T's power is turned off (i.e. no operator panel LEDs are on).
3. For each Twinaxial Feature Card, do the following:
   a) Connect a Twinaxial Workstation Attachment Cable to the Twinaxial Feature Card.

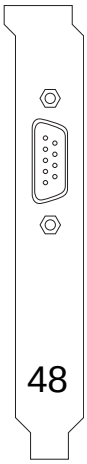


Fig. 10: Twinaxial Feature Card backplate

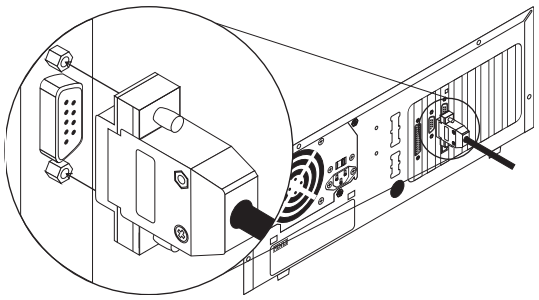


Fig. 11: Twinaxial Feature Card connection

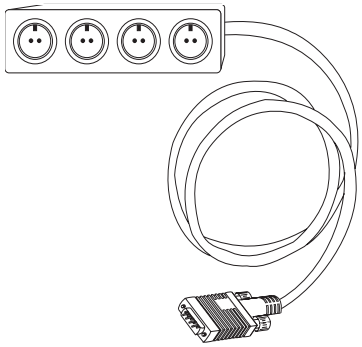


Fig. 12: Twinaxial workstation cable

b) Tighten the screws.

c) Connect the required Twinaxial cables to the appropriate ports.

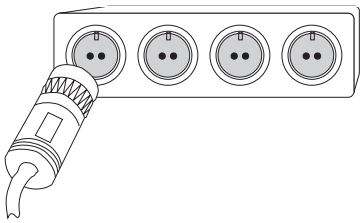


Fig. 13: Twinaxial port connection

Note: *Port numbers are molded into the Twinaxial cable to assist connection to the correct port.*

Connecting the Token-Ring Cable

1. Ensure that the Perle 594T's power is turned off (i.e. no operator panel LEDs are on).

2. For each Token-Ring Feature Card, do the following:
   a) Select the appropriate interface cable and connect it to the proper port on the Token-Ring card.

Warning: *Do not connect more than one cable to the Token-Ring Feature Card because it may damage the Token-Ring Feature Card.*

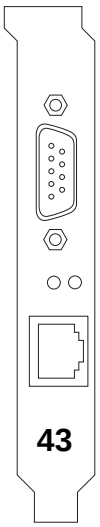


Fig. 14: Token-Ring backplate

   b) If your Token-Ring Feature Card is equipped with a switch marked STP/UTP, set this switch according to the Feature Card cable connection.
   c) Connect the Token-Ring Cable to the proper Media Access Unit (MAU).

Connecting the Ethernet Cable

1. Ensure that the Perle 594T's power is turned off (i.e. no operator panel LEDs are on).

2. For each Ethernet Feature Card, do the following:
   a) Select the appropriate media interface cable and connect it to the same media interface port on the Ethernet Feature Card.

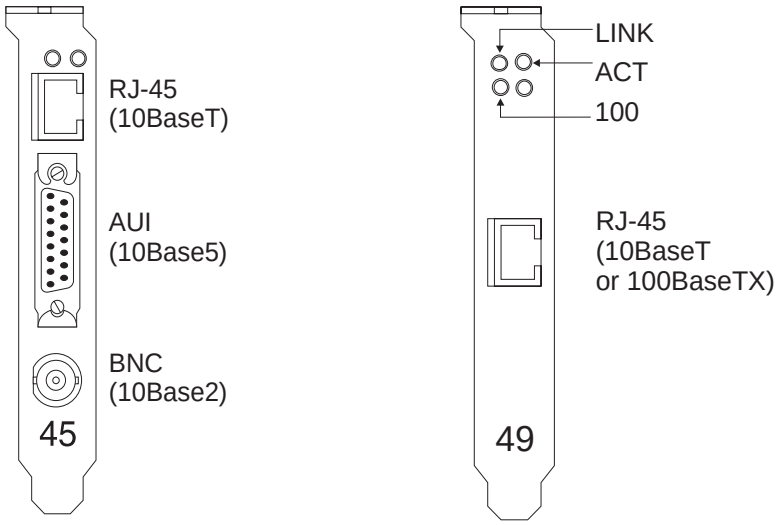


Fig. 15: Ethernet Feature and Fast Ethernet Card backplate

   b) Connect the Ethernet Cable to the proper Ethernet Hub, according to vendor instructions.

Connecting the Communication Cable

The communication cable is used by the Synchronous Communication Card for communication with the AS/400 system. If you are using a LAN Feature Card to communicate with the AS/400 system, the communication cable is not needed.

Connect the communication cable using the following procedure:

1. Ensure that the Perle 594T's power is turned off (i.e. no operator panel LEDs are on).

2. Connect the appropriate communication cable to the Perle 594T Synchronous Communication Card.

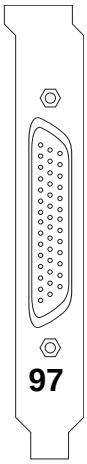


Fig. 16: Synchronous Communication card backplate

Note: *The communication cable is one of the following, depending on your communication mode:*

- EIA232 (V.24/V.28) cable
- V.35 cable
- X.21 cable.

3. Connect the communication cable to the communication equipment.

4. Connect the power cord of the communication equipment to a properly wired, grounded, electrical outlet.

5. The communication cable is now connected to the modem. Proceed to *Configuring the Perle 594T.*

6. If you are using a direct connection, complete the following:
   a) Connect the communication cable to the AS/400 communication cable.
   b) The communication cable is now directly connected. Proceed to *Configuring the Perle 594T.*

Configuring the Perle 594T

Once the Perle 594T is set up as directed you can proceed to configuring the Perle 594T. Perle recommends configuration of the AS/400 prior to configuration of the Perle 594T. You should note certain parameters so that they match on both the AS/400 and the Perle 594T.

- For an overview on configuring the Perle 594T refer to page 14.
- For a description of configuring with the 594T Utility Program refer to page 37.

Chapter 5: Using the 594 Utility Program

Introduction

The 594 Utility Program provides easy-to-use menus that simplify configuration of the Perle 594T. With the 594 Utility Program you can:

- configure the Perle 594T
- establish communication between the Perle 594T and an AS/400 system
- request communication and operational status about the Perle 594T (Concurrent Diagnostics feature—for more information refer to the *Perle 594T Diagnostic Guide*).

In addition, the 594 Utility Program provides the following features:

- A context-sensitive Help system.

  Depending on the current screen and field, the Help system displays topics relating to the parameter(s). Press F1 to display Help.

- Validation of parameter data.

  The 594 Utility Program ensures that you make valid entries for all required fields. When a required field is blank or contains invalid data, the 594 Utility Program displays an error message and places the cursor in the invalid field. Press F1 to display Help for the current field and then enter the appropriate data.

Remote Access from a DOS PC

You can use the Utility Program from a PC that is attached locally to the 594T or from a PC that is attached remotely to the 594T through an APPN network. The Utility Program performs the same functions on a remotely attached PC as it does on a locally attached PC. In order for the remote Utility Program to work, the 594T must be communicating with the host. For configuration procedures for remote access, see *Configuring the Remote Access Feature (DOS)* on page 39.

Note: *In order for the remote access feature to function, you must make sure that the 594T system level has been upgraded to a compatible level.*

Modes of operation

You can use the 594 Utility Program in one of two modes:

Standalone When you use the 594 Utility Program in standalone mode, you can create new or modify existing 594T configuration data. Configuration data is saved to a file and later transferred to the non-volatile memory of the Perle 594T. The reasons you may use this method are:

- You wish to leave your Perle 594T operational while you work on the configuration data.
- You wish to create configuration data for distribution.
- Your PC is not connected to the Perle 594T.
- You wish to create a Backup configuration. For more information on Backup

Configuration see "Saving Configuration Data" on page 47.

- Use the 594 Utility diskette to check your bridge filter file.

Note: *You will need to know which Feature Cards are located in which slots prior to use of standalone mode.*

Online When you use the 594 Utility Program online to the Perle 594T, you are working directly on the configuration file contained within the Perle 594T. You communicate with the Perle 594T from a PWS or IP enabled PC and the configuration file is automatically transferred to the non-volatile memory of the Perle 594T. Use this method if:

- Your PC is connected to the Perle 594T and you wish to work directly on the configuration file without moving files to diskettes.
- You wish to modify your 594T configuration during normal operation.
- You wish to perform a Network Link Establishment request.
- You wish to access 594T concurrent diagnostic information.
- You wish to access Frame Relay Token-Ring Bridge Status.
- You wish to access Frame Relay or PPP IP Routing Status
- You wish to reset the 594T controller (594T System Password required).
- You wish to download new system software to the 594T (594T system password required).

Prerequisites

Before you begin configuring with the 594 Utility Program, you need the following information from the AS/400:

- Network Interface Description (Frame Relay only)
- Line Description(s)
- APPC Controller Description(s)
- RWS Controller Description(s)
- Device Description(s)
- Mode Name(s)
- TCP/IP Interface (TCP/IP or IP Routing only)
- TCP/IP Host Table Entries (TCP/IP only).

For more details on configuration parameters:

- refer to *Appendix A: Configuring the AS/400* for configuration examples
- refer to *Appendix B: Understanding Configuration Parameters* for detailed descriptions of parameters for the Perle 594T.

Configuring with the 594 Utility Program

Configuring the Perle 594T with the 594 Utility Program is composed of the following major steps:

1. Installing the 594 Utility Program onto the PC. Proceed as follows:
   a) for a DOS workstation, proceed to *Installing the 594 Utility Program on a DOS workstation* on page 37.
   b) for a Windows 95, 98, 2000 or NT workstation, proceed to *Installing the 594 Utility Program on a Windows 95/98/2000/NT workstation* on page 39.

2. For remote PWSs: Configuring the Remote Access feature.
   a) for a LAN-attached remote PWS, proceed to *Configuring a LAN-Attached Remote PWS* on page 39.
   b) for a Twinaxial-attached remote PWS, proceed to *Configuring a Twinaxial-Attached Remote PWS* on page 40.

3. Starting the 594 Utility Program:
   a) for DOS workstations, proceed to *Starting the 594 Utility Program on a DOS workstation* on page 41.
   b) for Windows 95/98/2000/NT workstations, proceed to *Starting the 594 Utility Program on a Windows 95/98/2000/NT workstation* on page 41.

4. Saving configuration data (refer to page 47).

Installing the 594 Utility Program

Installing the 594 Utility Program on a DOS workstation

Prerequisites

- You can use the 594 Utility Program on a PC running DOS 3.3 or higher.
- The PC must have 475 Kb of memory available to operate the 594 Utility Program in standalone mode and 525 Kb of memory available to operate the 594 Utility Program in Interactive mode.
- To use the 594 Utility Program online to the Perle 594T the personal computer must have Client Access/400 for DOS with Ext. Memory.
- Reinstall the 594 Utility Program whenever you want to run it in a different environment than the one in which it was installed.

Installation

1. Insert the Utility Diskette for DOS into your workstation's diskette drive.

2. Select the drive containing the Utility Diskette for DOS (i.e. select **A:** if the diskette is in drive A:).

3. Enter:

```
INSTALL c n [address] [SAP]
```

where:

<table>
<tr><td>c</td><td colspan="2">Is the drive to which you will install the 594 Utility Program. All files are installed in the subdirectories c:\594UP and c:\594UP\MENUS.</td></tr>
<tr><td>n</td><td colspan="2">This optional parameter indicates the mode in which the 594 Utility Program is installed. Valid entries are 0-3.</td></tr>
<tr><td></td><td>0</td><td>The 594 Utility Program is installed for standalone mode.</td></tr>
<tr><td></td><td>1</td><td>The 594 Utility Program is installed on a twinaxial attached PC running PC Support/400 or Client Access/400.</td></tr>
<tr><td></td><td>2</td><td>The 594 Utility Program is installed on a LAN PC running PC Support/400 or Client Access/400.</td></tr>
<tr><td></td><td>3</td><td>The 594 Utility Program is installed on an Ethernet attached PC. The address will be automatically converted to the Token-Ring format. See Appendix H.</td></tr>
<tr><td>[address]</td><td colspan="2">If you are twinaxial attached, this is the optional station address of the PC.

The default address is 5.
Valid entries are 0-6.</td></tr>
<tr><td></td><td colspan="2">If you are LAN attached, this is the optional LAN address of the Perle 594T LAN Feature Card. The default address is 400059400003. A LAN address is 12 digits long. Valid entries are 0-9 and A-F. If the Perle 594T has never been configured and is on the same type of LAN as the LAN PC, use the default LAN address.

Note: If you are using an Ethernet attachment and your LAN uses Token-Ring address format, refer to Appendix H.</td></tr>
<tr><td>[SAP]</td><td colspan="2">The optional Service Access Point of the Perle 594T LAN Feature Card. The default SAP is 04. Valid entries are 04-FC (hexadecimal) in multiples of 04. If the Perle 594T has never been configured or the SAP has not been changed, use the default SAP.

Note: If a SAP value is being configured, then a LAN address must also be configured.</td></tr>
</table>

4. Proceed to *Starting the 594 Utility Program on a DOS* workstation on page 41.

Installing the 594 Utility Program on a Windows 95/98/2000/NT workstation

Prerequisites

- You can use the 594 Utility Program on a PC running Windows 95/98/2000/NT.
- To use the 594 Utility Program in online mode to the Perle 594T you need to ensure that the IP protocol is installed and configured on the workstation. You also need to be able to reach the 594T using the IP protocol. The Windows version of the 594 Utility Program does not use APPC to communicate with the 594T controller.

Installation

1. Insert the Utility Diskette for Windows 95/98/2000/NT into your workstation's diskette drive.
2. From the start menu, select "**Run...**".
3. Type **A:\setup.exe** and press "**OK**" (if your floppy drive is not drive "A:", substitute the correct drive letter).

Follow the instructions provided by the setup utility.

Configuring the Remote Access Feature (DOS)

If you do not want to configure the remote access feature, proceed to *Starting the 594 Utility Program* on page 41.

The remote access feature for the 594 Utility Program can be used to access one or more 594Ts from a remote PWS. A PWS is considered "remote" only if it communicates to the 594T via an APPN network. To use the DOS remote access feature, the PWS must be running Client Access/400 or PC Support/400 (version 2, release 3), which lets you specify LU names that are fully qualified. For each 594T you want to connect to by remote access, you must create a unique .PCS file and put it in the 594UP directory.

Configuring a LAN-Attached Remote PWS

To configure a DOS remote PWS with a LAN connection, perform the following steps:

1. Change to the 594UP sub-directory.
2. Copy the PUP594.PCS file to *new*.PCS, where *new* is the name of the new.PCS file.
3. The content of *new*.PCS is listed below.

```
RTLN APPN.PUP594T
RTYP ITRN
TRLI LOCL594,400059400003,04,PUP594T
```

Using a text editor program, make the following changes:

a) In the first line, change APPN.PUP594T to the network name and LU name of your PWS. Use the form: network_name.LU_name

b) In the third line:

- Replace **`LOCL594`** with the LU name of the 594T you want to connect with. The LU name of the 594T must be fully-qualified, use the alias support of Client Access/400.

- Replace **400059400003** with the LAN address of the ALS that the PC is using.
- Replace **04** with the SAP of the ALS that the PC is using.
- Replace **PUP594T** with the LU name of the PWS.

Example:

Suppose a PWS is attached to an AS/400 system through a Token Ring network. The 594T is attached to that AS/400 system via SDLC. The PWS network name is APPN; the LU name is PWS01. The 594T network name is ITSCNET; the LU name is RCH594T. The PWS uses Token Ring address 400000000149 and SAP 04 (on the AS/400) to access the AS/400. You could name the .PCS file for this 594T RCH594T.PCS. Its contents would be:

```
RTLN APPN.PWS01
RTYP ITRN
TRLI RAL594T=ITSCNET.RCH594T,400000000149,04,PWS01
```

where: **RAL594T=ITSCNET.RCH594T** defines **RAL594T** as the alias for **ITSCNET.RCH594T**

4. Save all changes.

5. To configure remote access for any additional 594Ts, repeat steps 2 to 4.

6. Go to *Starting the 594 Utility Program* on page 41.

Configuring a Twinaxial-Attached PWS

To configure a DOS remote PWS with a twinaxial connection, perform the following steps:

1. Change to the 594UP sub-directory.

2. Copy the PUP594.PCS file to *new*.PCS, where *new* is the name of the new .PCS file.

3. The contents of *new*.PCS is listed below.

```
RTLN APPN.PUP594T
RTYP 5250
EMLI LOCL594,5,PUP594T
```

Using a text editor program, make the following changes:

a) In the first line, change **APPN.PUP594T** to the fully qualified LU name of your PWS. Use the form: *network*.LU_*name*

b) In the third line:

- Replace **LOCL594** with the LU name of the 594T you want to connect with. The LU name of the 594T must be fully-qualified, use the alias support of Client Access/400.
- Replace **5** with the station address of the PWS.
- Replace **PUP594T** with the LU name of the PWS.

Example:

Suppose a PWS is attached to an AS/400 system through a twinaxial connection. The 594T is attached to that AS/400 system via Ethernet. The twinax station address of the PWS is 02. The PWS network name is APPN; the LU name is PWS02. The network name of the 594T is NET594T; the LU name is LU594T. You could name the .PCS file LU594T.PCS. It contents

would be:

```
RTLN APPN.PWS02
RTYP 5250
EMLI RLU594T=NET594T.LU594T,2,PWS02
```

where: **RLU594T=NET594T.LU594T** *defines* **RLU594T** *as the alias for* **NET594T.LU594T**

4. Save all changes.
5. To configure remote access for any additional 594T, repeat steps 2 to 4.
6. Go to *Starting the 594 Utility Program* on page 41.

Starting the 594 Utility Program

Starting the 594 Utility Program on a DOS workstation

1. Go to the directory in which the 594 Utility Program has been installed.
2. To start the 594 Utility Program in standalone mode, enter:

   ```
   594TUP /S
   ```

3. To start the 594 Utility Program in online mode:

   If the PWS is attached **locally** to the 594T, enter:

   ```
   594TUP
   ```

   If the PWS is attached **remotely** to the 594T, enter:

   ```
   594TUP new.PCS
   ```

   where: *new.PCS* is the file you created in *Configuring the Remote Access Feature.*

   Note: *This automatically starts the router.*

4. The 594 Utility Program startup screen appears.
5. Go to *594 Utility Program Startup Screens* on page 42.

Starting the 594 Utility Program on a Windows 95/98/2000/NT workstation

The installation procedure will have created the following three selection under the *"Perle Utility Program"* menu option:

- Perle 594 Utility Program Uninstall
- Standalone
- Interactive

To configure or control the 594T directly, select *"Interactive"*. If you wish to create a standalone configuration file select *"Standalone"*.

If *"Interactive"* is selected, you will be prompted to enter the IP address of the 594T controller you wish to manage. Once you enter the IP address, the 594 Utility Program will attempt to establish a link with the 594T. If it is able to reach the 594T, the 594 Utility Program Startup screen will appear.

594 Utility Program Startup Screens

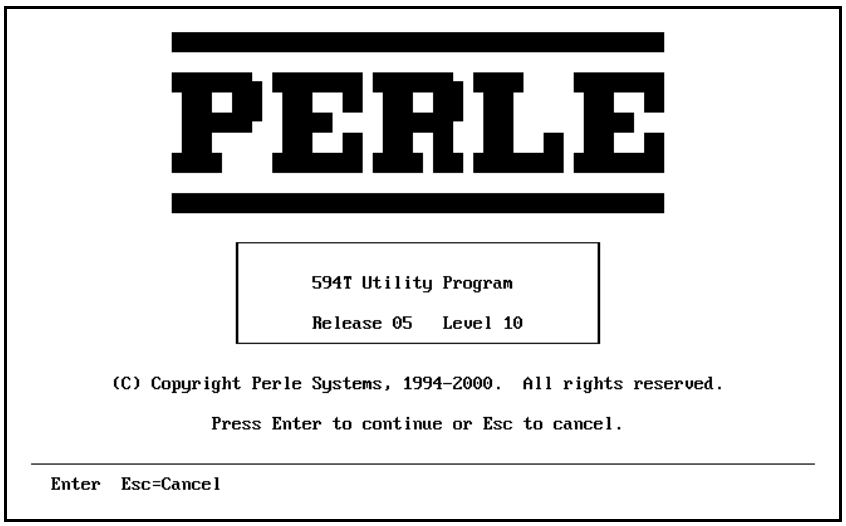


Fig. 17: 594 Utility Program startup

The following 594 Utility Program main screen is displayed

.

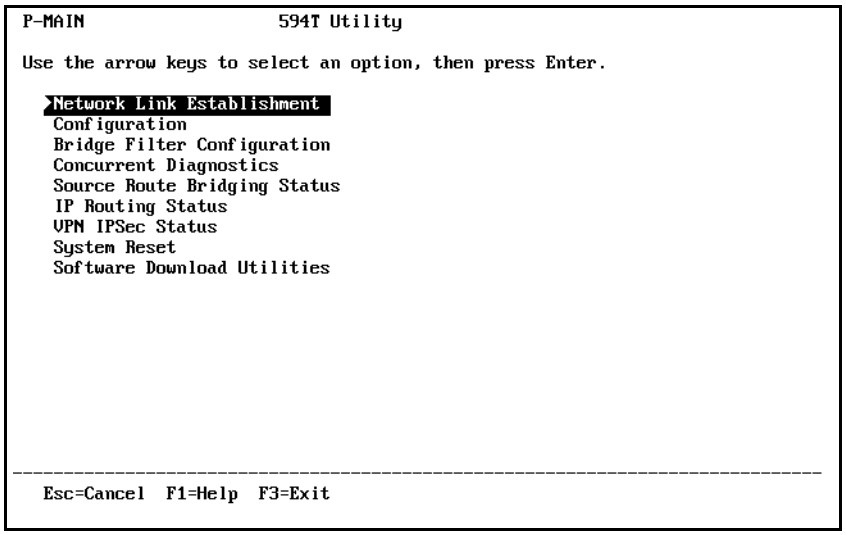


Fig. 18: 594 Utility Program main screen

Navigation

Use the following keys to navigate (move) throughout the 594 Utility Program:

Navigation Key	Description
←↑→↓	Use cursor keys to move from field to field.
Enter	Press Enter to select menu option or to verify data.
F3	Press F3 to exit the program.
F6	Press F6 to verify data and display the next screen.
F7	Press F7 to Page Up the current screen.
F8	Press F8 to Page Down the current screen.
Esc	Press Esc to return to the previous screen without saving data.

Network Link Establishment

The *Network Link Establishment* option lets you:

- establish a link between each emulated controller on the Perle 594T and the AS/400
- disconnect a communication link between the Perle 594T and the AS/400
- establish communication with an alternate AS/400.

Configuration Overview

Configuration of the Perle 594T contains the following major steps:

- If configuring off-line to the Perle 594T, configure hardware
- For each Feature Card:
  - Configure the AS/400 Connection
  - Configure SNA network information
  - Configure card-specific information
- Configure Global Parameters for Network Controller features if required.
- Save configuration data.

For detailed descriptions of configuration parameters refer to:

- Appendix A for configuration examples
- Appendix B for descriptions of configuration parameters
- 594 Utility Program on line help

Bridge Filter Configuration

The Bridge Filter Configuration menu option lets you upload and download an ASCII filter file to the 594T controller. The ASCII filter file is used for a Frame Relay Bridge configuration to control what frames can go through the 594T between the Token-Ring and your bridge partner (i.e. the AS/400) and vice-versa.

Use and Creation of Bridge Filter File

This section describes the importance of using bridge filters and a general overview of how they work and how to edit and save them. For more detail on how a bridge filter file is created and to see examples of bridge filter files, refer to the *594 Diagnostic Guide*. If you are not using a Frame Relay Token-Ring Bridge configuration then you do not need to read this section.

The Importance of Filtering

Although it is not essential to create a bridge filter, the token-ring speeds are much faster than the frame relay speeds supported on the 594T and a high volume of LAN traffic trying to cross the FR-TR bridge can cause some undesirable results, such as overflowing buffers, time-outs and lost connections. In addition, depending on how you are billed for your frame relay traffic, unnecessary traffic can cost you money. Similarly, you might want to insulate your LANs from the frame relay traffic coming across the FR-TR bridge.

The 594 bridge filter will allow you to limit traffic in either or both directions. You can specify precisely the kinds of frames that can cross the FR-TR bridge, by using such attributes as frame type, hop count, source and destination addresses and data within the frames themselves. You can create a bridge filter that will include those frames you want to cross, exempting those frames you do not want to cross or some combination of both.

Not everyone needs to filter. If your Frame Relay connection is capable of high speeds (greater than 64Kbps) then you might forgo the filtering until you detect a real need for it. The need for filtering is usually indicated by network congestion and poor response times. However, even low volume, low speed systems operate more efficiently with bridge filters.

Filter File Overview

The filter file you created is stored in a file called **594FILT.DAT** on the 594 system diskette. You can create the file yourself or you can modify the **594UP\594FILT.DAT** file that comes on the 594 Utility diskette and is installed when you install the 594 Utility program. For more information refer to Editing and Saving 594 Filter File on page 45.

The basic unit of the bridge filter is the **criterion**, in which you specify some attribute of a frame that makes it worthy of crossing or not crossing the bridge. Logically combining two or more criteria yields the next larger unit, called a **criteria list**. The final unit, the **filter** itself, names the criteria or criteria list that will be used for filtering. The Boolean logic used to combine criteria and criteria lists allows cumulative, yet very selective filtering.

When you specify a filtering criterion, you will state whether you are seeking a match (True) or mismatch (False) and when you combine criteria into criteria lists, you'll be using the logical operations AND, OR, NAND and NOR. Finally, when you use the criteria lists in your bridge filter, the relevant parts of the frames that are trying to cross the bridge will be logically compared to the criteria you have set. Those that meet your criteria will be filtered (discarded) and all others will be forwarded.

Editing and Saving 594 Filter File

The 594 uses the bridge filter from an ASCII file that is stored on the 594 system diskette. This file can be created using any ASCII editor or you can modify the null 594FILT.DAT file that comes on the 594 Utility diskette and is installed when you install the 594 Utility program. The maximum size this ASCII filter file can be is 10,000 bytes.

To create or change the file:

1. Use any ASCII editor on your PWS. Save the file as 594FILT.DAT.

2. You will also find the file CHKFILT.EXE on both your 594 Utility Program diskettes. This program checks your filter file and reports any errors it finds. CHKFILT is a DOS program and must be run in DOS mode. To execute the CHKFILT program go to the directory in which the 594 Utility program was installed and type:

   CHKFILT 594FILT.DAT

   These instructions assume you copied your 594FILT.DAT file to the 594 Utility program directory.
   When the CHKFILT program finishes executing and there were no error in your filter file, then you will see the message:

   570000 594FILT.DAT

   If you have any error in your filter file you will see error codes in the range 570010 to 570200. Refer to Frame Relay Token-Ring Bridge SRCs in the 594 Diagnostic Guide for descriptions of these message codes. If errors are found in the filter file the last message code displayed is:

   570001 594FILT.DAT

   If you get this message code look at the other message codes previous to this one and correct the errors and run CHKFILT again.

3. To use the bridge filter file it must be transferred to the 594 system diskette. You can transfer the filter file in one the following methods.
   - If your have been configuring with the Utility program in interactive mode (either Locally attached or through remote access), then continue to step 4
   - If you have been configuring with the Utility program in stand-alone mode or the NWS configuration then proceed to *Transferring Configuration Data* on page 48.

4. From the *594T - Utility program* main screen, select *Bridge Filter Configuration* and press **Enter**.

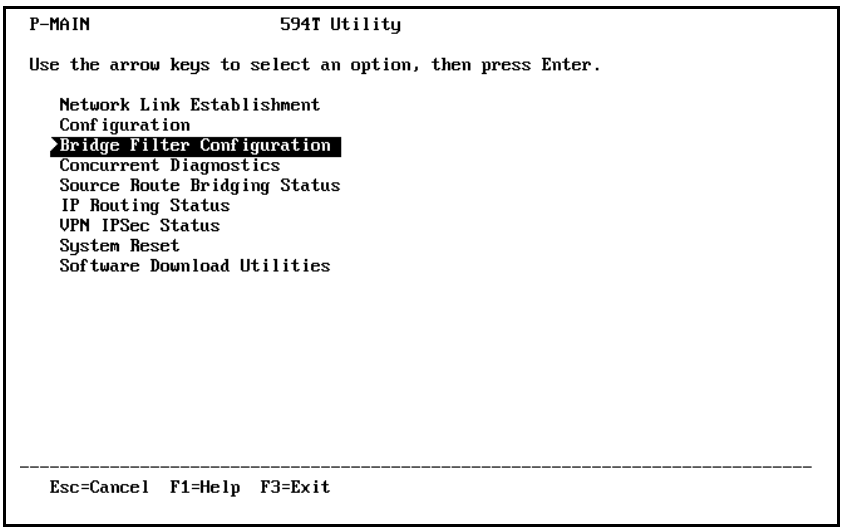


Fig. 19: 594T Utility Program main screen

5. The 594T - Bridge Filter Configuration screen appears. Select Upload PC Bridge filter file to 594T to transfer the filter file to the 594T. This Upload of the bridge filter file can be done while the 594T is in normal or configuration mode.

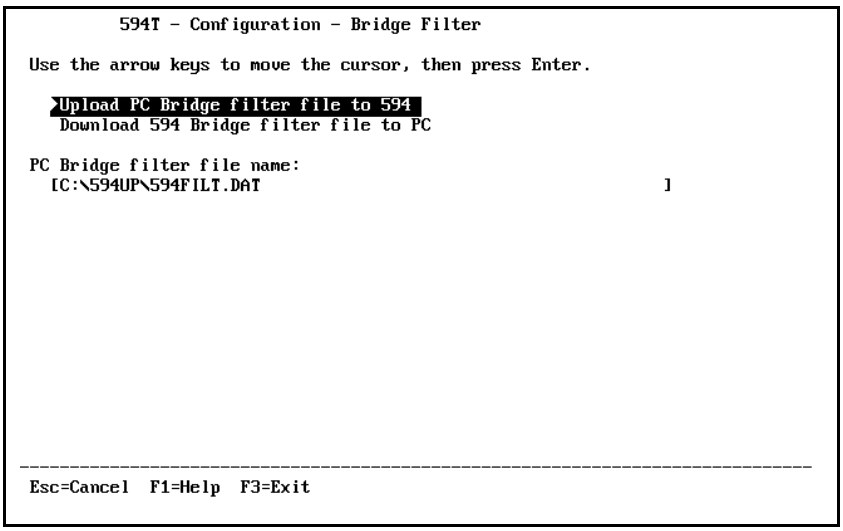


Fig. 20: 594T Bridge Filter Configuration screen

6. You can also use the Bridge Filter Configuration screen to download the file to the PC at a later time if you want to make any changes to the filter file.

Saving configuration data

1. Once you complete Configuration, save your configuration data before exiting. Select *Save Configuration* on the *594T - Configuration* screen and press **Enter**.

2. The *594T - Configuration - Save Configuration* screen appears:

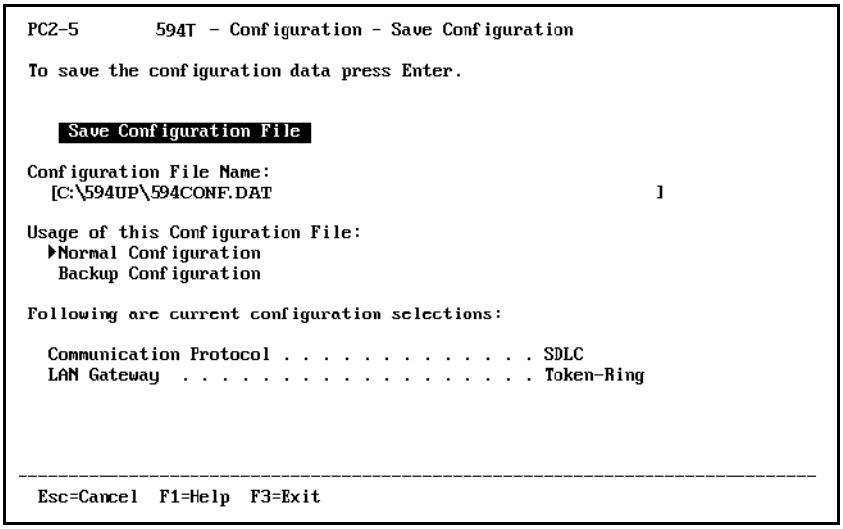


Fig. 21: 594T - Configuration - Save Configuration

Note: *Data in your screen may vary depending upon how you configure your Perle 594T.*

3. The screen displays the following parameters:

Parameter	Value
Configuration File Name	Directory path and file name to which configuration file is saved.
Usage of this Configuration File	Defines how the configuration file will be used (standalone mode only)
Communication Protocol	Displays current connection type.
LAN Gateway	Displays the type of Gateway Support that is configured.

Save the configuration file depending on the mode in which you use the 594 Utility Program,

a) In ***standalone*** mode, save the configuration files as follows:

- Press **Enter** to save the configuration data in the displayed path and file name. To transfer configuration data to the Perle 594T, proceed to *Transferring Configuration Data* on page 48.
- To save the configuration data as a Backup configuration, press **Tab** twice and select *Backup Configuration* and press **Enter**. Proceed to *Using a Backup Configuration* on page 48.
- To save the configuration data into a different path and file name, press **Tab**, type the desired directory path and filename and press **Enter**. To transfer configuration data to the Perle 594T, proceed to *Transferring 594T Configuration Data* on page 48.

b) In ***online*** mode, the 594 Utility Program automatically saves the configuration file to the non-volatile storage of the Perle 594T. In addition, the 594 Utility Program also saves the configuration file to the displayed directory path and file.

- Press **Enter** to save the configuration data in the displayed path file name.
- To save the configuration data into a different file, press **Tab**, type the desired directory path and filename and press **Enter**.

4. The 594 Utility Program MAY now display error messages indicating duplicates or parameters that require edits. Modify as required and repeat the above step.

5. Press **F3** to exit the program.

Using a Backup Configuration

A Backup configuration is useful for those occasions when your primary network becomes unavailable and you need to use a different configuration in order to switch to a backup connection.

After you have created a Backup configuration using the 594 Utility program in standalone mode, you must transfer the Backup configuration to a 594T system diskette. To transfer the configuration file to a 594 system diskette refer to *Transferring a Backup configuration to your System Diskette* on page 51. After you have transferred the file, label the 594 system diskette as a "Backup Configuration Disk". The configuration you copied will now be recognized by the 594T as a Backup configuration and will use this configuration rather than the configuration in permanent storage.

If your primary network fails, power **OFF** the 594T and insert the 594 system diskette you labeled "Backup Configuration Disk". Power **ON** the 594T and once the 594T becomes active, it will begin operation using the Backup configuration from the system diskette.

When your primary network recovers, merely reverse the procedure. Turn **OFF** the 594T, replace the "Backup Configuration Disk" with your regular 594 system diskette. Power **ON** the 594T and this time the 594T will use the configuration from permanent storage.

Transferring Configuration Data

Your Normal configuration data is stored within the Perle 594T's non-volatile memory. This memory is maintained even when the unit is not powered on.

To save a normal configuration file from any diskette to this non-volatile memory use the procedure described in *Saving a Normal Configuration to your 594T* on page 49.

To manually back up your configuration to diskette, use the procedure described in *Manually Backing Up Configuration Data* on page 50.

Whenever the Perle 594T starts up in normal mode and a Backup configuration file exist on the 594 system diskette, the 594T will use this Backup configuration from disk instead of the normal configuration from non-volatile memory. To transfer a Backup configuration from any diskette to a 594 system diskette use the procedure described in *Transferring a Backup Configuration to your System Diskette* on page 52.

If you are using a Frame Relay Token-Ring Bridge configuration the 594T uses a bridge filter file stored on the 594 system diskette. To transfer a bridge filter file from any diskette to a 594 system diskette use the procedure described in *Transferring a Bridge Filter File to your System Diskette* on page 52.

Note: *A table at the end of this section describes any error codes that may appear as you carry out any of these procedures.*

Saving a Normal Configuration to your 594T

To save a normal configuration file from any diskette to the Perle 594T non-volatile memory:

1. Ensure that the power is turned off at the Perle 594T (i.e. no operator panel LEDs are on).
2. Ensure that the diskette drive is empty.
3. Press the power switch. All LEDs should come on momentarily. If the LEDs do not come on, check the power cord and the electrical outlet.

   The following message code appears on the LCD, indicating that diagnostic tests are running:

   ```
   001-01
   ```

   If any other message code appears on the LCD write down the message code and any number on the right side of the LCD. Refer to *Appendix C: Solving Problems* and follow the directions given for this message code.

   In a few moments, the following message code appears:

   ```
   003-02      1
   ```

4. Insert the 594T Controller Setup Diskette into the diskette drive.
5. On the keypad, type **2** and press **Enter**. After about 2 minutes the Test Mode and the Ready LEDs come on.
6. Press **Req**, then type **300** and press **Enter**. The LCD displays:

   ```
   301||**********
   ```

7. Replace the 594T Controller Setup Diskette with the diskette containing your normal configuration file and press **Enter**. To indicate that configuration data is being copied from the diskette, the LCD displays:

   ```
   *******301******
   ```

   When all configuration data has been restored to the Perle 594T, the LCD displays:

   ```
   303||**********
   ```

8. Using the power switch, turn off power to the 594T. Before resuming normal operations, remove the diskette from the Perle 594T diskette drive and replace it with the Controller Software Diskette.

   Note: *When you restart the 594T, it automatically backs up the new configuration data to that diskette.*

Manually Backing Up Configuration Data

To backup a normal configuration to any diskette:

1. Ensure that the power is turned off the Perle 594T (i.e., no operator panel LEDs are on).
2. Ensure that the diskette drive is empty.
3. Press the power switch. All LEDs should come on momentarily. If the LEDs do not come on, check the power cord and the electrical outlet.

   The following message code appears on the LCD indicating that diagnostic tests are running:

   ```
   001-01
   ```

   If any other message code appears on the LCD, write down the message code and any number on the right side of the LCD. Refer to *Appendix C: Solving Problems* and follow the directions given for this message code.

   In a few moments, the following message code appears:

   ```
   003-02      1
   ```

4. Insert the 594T Setup Diskette into the diskette drive.
5. On the keypad, type **2** and press **Enter**. After about 2 minutes the Test Mode and the Ready LEDs come on.
6. Press **Req**, then type **302** and press **Enter**. The LCD displays:

   ```
   302||**********
   ```

7. Replace the 594T Controller Setup Diskette with a properly labeled configuration backup diskette and press **Enter**. To indicate that configuration data is being written to the diskette, the LCD displays:

   ```
   ******302******
   ```

   When all configuration data has been transferred to the backup diskette, the LCD displays:

   ```
   303||**********
   ```

8. Remove the configuration diskette from the Perle 594T diskette drive.
9. Press **Esc** to clear the LCD.

Transferring a Backup Configuration to your System Diskette

To transfer a Backup Configuration file from any diskette to your 594 system diskette:

1. Ensure that the power is turned off at the Perle 594T (i.e. no operator panel LEDs are on).
2. Ensure that the diskette drive is empty.
3. Press the power switch. All LEDs should come on momentarily. If the LEDs do not come on, check the power cord and the electrical outlet.

   The following message code appears on the LCD indicating that diagnostic tests are running:

   001-01

   If any other message code appears on the LCD, write down the message code and any number on the right side of the LCD. Refer to *Appendix C: Solving Problems* and follow the directions given for this message code.

   In a few moments, the following message code appears:

   003-02 1
4. Insert the 594T Controller Setup Diskette into the diskette drive.
5. On the keypad, type **2** and press **Enter**. After about 2 minutes the Test Mode and the Ready LEDs come on.
6. Press **Req**, then type **300** and press **Enter**. The LCD displays:

   301||********
7. Replace the 594T Controller Setup Diskette with the configuration backup diskette and press **Enter**. To indicate that configuration data is being copied from the diskette, the LCD displays:

   *********301********

   When all configuration data has been restored to the Perle 594T, the LCD displays:

   303||********1**
8. Press **Req**, then type **302** and press **Enter**. The LCD displays:

   302||********
9. Remove the diskette from the diskette drive. Insert your 594 system diskette into the 594T diskette drive and press **Enter**. The LCD displays:

   *********302********

   When all configuration data has been transferred to the 594 system diskette, the LCD displays

   303||********1**
10. Press **Esc** to clear the LCD.

Transferring a Bridge Filter File to your System Diskette

To transfer a bridge filter file from any diskette to your 594 system diskette:

1. To transfer a bridge filter file, your 594T can be in normal mode or configuration mode.
2. Press **Req**, then type **320** and press **Enter**. The LCD displays:

   ```
   301||**********
   ```

3. Remove the 594 system diskette or 594 setup diskette. Insert the diskette containing the bridge filter file into the diskette drive and press **Enter**. To indicate that the filter file is being copied from the diskette, the LCD displays:

   ```
   *******301******
   ```

   When the 594T has finished copying the bridge filter file from the diskette the LCD displays:

   ```
   302||**********
   ```

4. Replace the diskette from the diskette drive with your 594 system diskette and press **Enter**. To indicate that the filter file is being written to the diskette the LCD displays:

   ```
   *******302******
   ```

   When the filter file has finished being transferred to your 594 system diskette the LCD displays:

   ```
   303||**********2
   ```

5. Press Esc to clear the LCD

Configuration Data Transfer Error Codes

The following table lists error codes which may appear on the LCD during configuration data transfer:

Transfer Error Code	Description
304	The Perle 594T is in interactive configuration mode, configuration data cannot be transferred. Press **Esc** to exit this operation.
305	There is no configuration file, 594CONF.DAT or bridge filter file, 594FILT.DAT, on the inserted diskette. Press **Clear**, insert the correct disk and repeat the data transfer procedure.
306	The Perle 594T is not in configuration mode. Transferring configuration can only be done in configuration mode. Power off the Perle 594T, return to step 1 and complete the data transfer procedure.
307 500005	Your diskette is write protected. Remove the diskette and set the diskette to write enabled. Press **Clear**, return to step 4 and complete the data transfer procedure.
307 xxxxxx	A diskette problem has been detected. Use the 6-digit SRC on the LCD display to identify the problem. Appendix C provides a list of the SRCs.
309	There is no configuration data in CMOS.
310	The bridge filter file cannot be copied at this time. Try this operation again later when the 594T is not so busy.
311	The bridge filter file is larger than 10,000 bytes. Press **Clear**. Reduce bridge filter file size and try operation again.

Concurrent Diagnostics

The 594 Utility Program can provide detailed status and configuration data while the Perle 594T is online. You can request the following:

- Software release level
- Mother board RAM storage size
- 594T Serial number, cable types and Feature Card IDs
- Network and AS/400 Qualified LU and CP names
- Timeout and Retry limits
- Status of Perle 594T connections
- 594T Synchronous Communications and Statistical counters
- AS/400 link status
- AS/400 Logical Unit status
- 594T Dataset signal status
- Status of Twinaxial and LAN Gateway devices
- LAN error statistics
- System time-stamped error log.
- TCP/IP Status

Concurrent Diagnostics information is available for each emulated controller within the Perle 594T. For more information, refer to the *Perle 594 Diagnostic Guide*.

Source Route Bridging Status

The 594 Utility Program can provide you with Source Route Bridging Status. This status includes inbound and outbound frame summaries and counts of the different types of frames (such as Spanning Tree Explorer, All Routes Explorer and Specifically Routed frames) and normal and error frame discards. These counters can also be cleared and frame forwarding stopped or started through the use of the 594 Utility program. For more information, refer to the *Perle 594 Diagnostic Guide*.

IP Routing Status (with IP Routing Feature only)

The 594 Utility Program can provide you with IP Routing Statuses such as IP packets received, transmitted or discards due to no routes found or congestion. Counter for different types of frames forwarded such as IP, TCP, UDP and ICMP on each IP router port can also be displayed. These counters can also be cleared and frame forwarding stopped or started through the use of the 594 Utility program. The 594 Utility program can also be used to display the current Static IP Router table and the IP Router DLCI table.

System Reset

You can reset the 594T and cause it to restart in Normal mode. If you reset the 594T, you will have to restart the Utility Program on the PC. This option requires a recognized 594T System Password.

Software Download Utilities

Software Download refers to the capability of downloading new controller software to a 594T. The software will overwrite the existing software on the 594 Controller Software Diskette in the 594T floppy disk drive or the 594 Network Controller Software on the 594T hard drive. This is accomplished using the 594 Utility program that is attached locally or remotely to a 594T Controller. The steps for performing a software download are as follows:

1. Create Software Software Download File

   Select the type of Software you require. The options are;

   a) Base Controller software

   b) IP routing Controller software

   c) IP routing plus VPN Controller sofware

2. Download the Controller Software - There are two methods:

   a) Interactive Mode - Use the 594 Utility program menus to select download files and begin download operation. Status and progress will be displayed on screen.

   b) Batch mode - Use the 594 Utility with the batch mode option. This allows for software download operations to one or several 594T Controllers without user attendance. Status is saved in a log file.

   Both methods have a Quick Disconnect option. If enabled, this option will cause the 594 Utility program to disconnect from the controller as soon as the software has been downloaded but before the controller has written the software to the 594 Controller Software Diskette in the 594T floppy drive. This will speed up the download process especially in batch mode.

Note: *The download operation will reset the 594T System. Before beginning the download operation, it is recommended that the user terminate all sessions on the 594T and vary off the RWS Controller on the AS/400 System. Do* ***NOT*** *vary off the APPC Controller on the*

AS/400.

Creating a file for download

Note: *Download file creation can be performed in standalone or online mode*.

1. On the *594T - Utility* program main screen, select *Software Download Utilities* and press **Enter**.

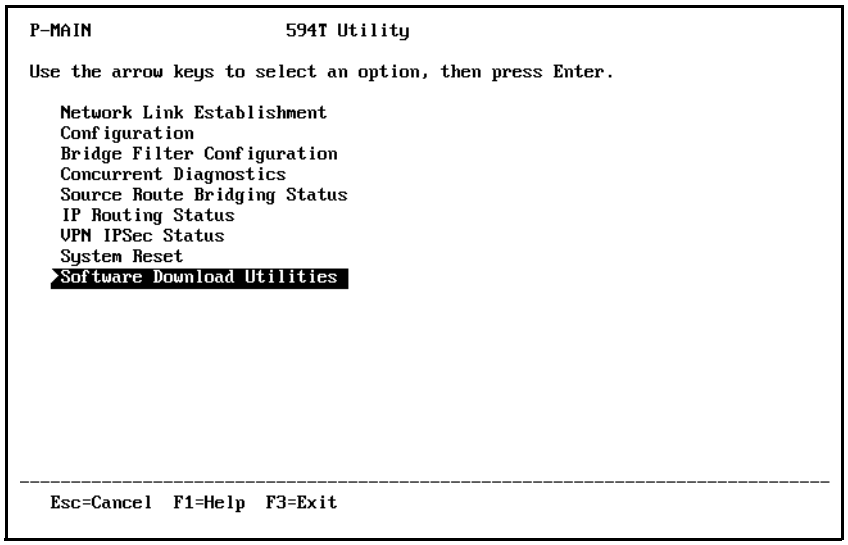


Fig. 22: 594 Utility Program main screen

2. The 594T - Software Download Utilities main screen appears.

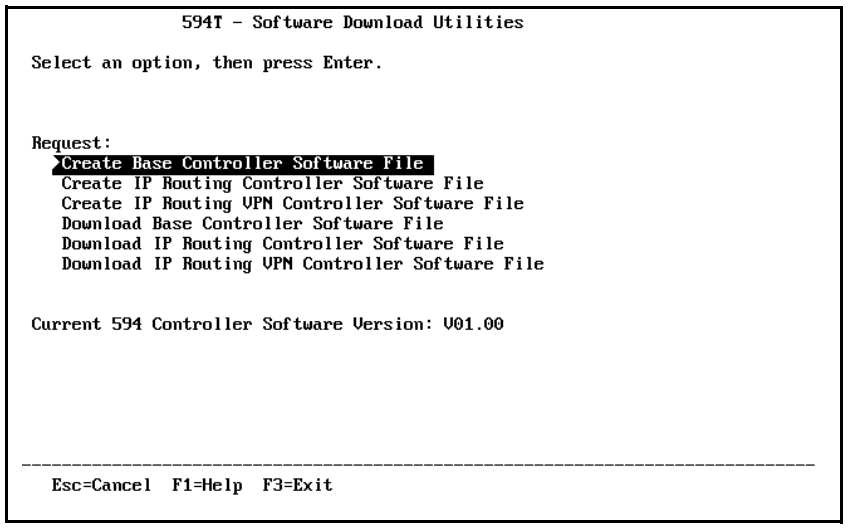


Fig. 23: Software Download Utilities main screen

3. Select the appropriate 594 controller software to be created, press **Enter** and follow the on screen prompts.

Downloading the Controller Software

1. On the *594T - Software Download Utilities* main screen, select the appropriate download menu, press **Enter** and follow the on screen prompts.

Batch download

A special batch facility has been developed to let you download the 594 Controller Software to many 594T controllers. Batch download, which relieves the operator of many repetitive and tedious tasks, is usually done after normal working hours. You can also use the batch facility for retrieving version levels of controller software currently running on 594T controllers.

The DOS version batch download command has the following format:

```
594TUP base.PCS /d=filename /l=luname /p=password [/q]
```

If using the Windows version of the 594 Utility Program, you can still use the batch mode by creating a batch file in a DOS window which has the following entry:

```
594TUP/d=filename/ip=ipaddress/p=password [/q]
```

where

base.PCS - is the name of a .PCS file that will be used as a base for connection parameters to the 594T Controller. This must be the first option on the command line. See the section *Configuring the Remote Access Feature (DOS)* for instructions on creating the file. Do not replace the **LOCL594** LU name. This will be done automatically by the batch utility.

filename - is the name of the file containing the 594 Controller Software to download.

luname - is the LU name of a controller in the 594T. If the LU name of the 594T controller must be fully qualified, use the alias support of Client Access/400.

ipaddress- IP address of the 594T controller (only used by Windows version of 594 Utility Program).

password - is the configured password.

/q - optional - enables Quick Disconnect.

The batch download command can be invoked from the DOS prompt for download to a single controller. As well, several commands can be placed in a DOS batch file. When the DOS batch file runs, downloads to several 594T Controllers will be performed.

The following is an example of a batch file which will download V02.00 of the 594 Controller Software to five controllers using an APPC connection.

```
download.bat
  call 594Tup local.pcs /d=c:\www\sys0200.img /l=LOCL594 /p=perle
  call 594Tup remote.pcs /d=c:\www\sys0200.img /l=RAL594T1=ITSCNET.CNTR001 /p=perle
  call 594Tup remote.pcs /d=c:\www\sys0200.img /l=RAL594T2=ITSCNET.CNTR002 /p=perle
  call 594Tup remote.pcs /d=c:\www\sys0300.kim /l=RAL594T3=ITSCNET.CNTR003 /p=perle /q
  call 594Tup remote.pcs /d=c:\www\sys0300.kim /l=RAL594T4=ITSCNET.CNTR004   /p=perle
```

The following is an example of a batch file which will download V02.00 of the 594 Controller Software to five controllers using an IP connection.

download.bat

```
call 594Tup /ip=172.16.1.1 /d=c:\www\sys0200.img /p=perle /q
call 594Tup /ip=172.16.1.2 /d=c:\www\sys0200.img /p=perle /q
call 594Tup /ip=172.16.1.3 /d=c:\www\sys0200.img /p=perle /q
call 594Tup /ip=172.16.1.4 /d=c:\www\sys0200.img /p=perle /q
call 594Tup /ip=172.16.1.5 /d=c:\www\sys0200.img /p=perle /q
```

The batch download command will log the status of each download into a file called **logfile.txt**. An entry of the log file will have the following format:

```
YYYY/MM/DD hh:mm - luname (or ip address if using ip)
Downloaded= Vxx.xx, Previous = Vyy.yy
File:
Status:
```

where

YYYY/MM/DD- is the date on which the 594 Controller File was downloaded. The date has the format:

year/month/day

hh:mm- is the time at which the 594 Controller Software file was downloaded. The time will use the 24 hour clock format.

luname- is the LU name of the 594T Controller specified in the batch download command.

IP address- is the ip address of the 594T Controller specified in the batch download command.

Vxx.xx- is the version of the 594 Controller Software in the download file.

Vyy.yy- is the version of the 594 Controller Software in the Controller before download.

File: is the full path and name of the 594 Controller Software file that was downloaded

Status: is a status message for the download operation. See section *594 Utility Program Run Time Messages* in *Appendix C* for a description of these message.

Following is an example of a log file produced by the DOS batch file shown above for an APPC connection:

logfile.txt

```
1999/11/13 10:10 - LOCL594
  Downloaded = V02.00, Previous = V01.00
  File:    C:\WWW\SYS0200.IMG
  Status:  Download successful

1999/11/13 10:15 - RAL594T1=ITSCNET.CNTRL001
  Downloaded = V02.00, Previous = V01.00
  File:    C:\WWW\SYS0200.IMG
  Status:  Download successful

1999/11/13 10:20 - RAL594T2=ITSCNET.CNTRL002
  Downloaded = V02.00, Previous = V01.10
  File:    C:\WWW\SYS0200.IMG
  Status:  File Writing Error
```

```
1999/11/13 10:25 - RAL594T3=ITSCNET.CNTRL003
  Downloaded = V03.00, Previous = V02.00
  File:    C:\WWW\SYS0300.IMG
  Status:  594 Controller Software successfully transferred to 594

1999/11/13 10:30 - RAL594T4=ITSCNET.CNTRL004
  Downloaded = V03.00, Previous = V02.00
  File:    C:\WWW\SYS0300.IMG
  Status:  Download successful
```

The command for retrieving version levels has the following format:

```
594TUP base.PCS /v /l=luname   (APPC)
594TUP /ip=172.16.1.1 /v       (IP)
```

where

base.PCS - is the name of a .PCS file that will be used as a base for connection parameter to the 594T Controller. This must be the first option on the command line. See the section *Configuring the Remote Access Feature (DOS)* for instructions on creating the file. Do not replace the **LOCL594** *LU name. This will be done automatically by the batch utility.*

ip address- is the ip address of the 594e controller.

/v indicates that the version level is being requested.

luname is the LU name of a controller in the 594T. The LU name of the 594T controller must be fully qualified, use the alias support of Client Access/400.

The following is an example of a batch file for retrieving the version levels of five controllers using an APPC connection. The content of the log file is also shown.

```
getver.bat
  call 594Tup /v /l=LOCL594
  call 594Tup /v /l=RAL594T1=ITSCNET.CNTRL001
  call 594Tup /v /l=RAL594T2=ITSCNET.CNTRL002
  call 594Tup /v /l=RAL594T3=ITSCNET.CNTRL003
  call 594Tup /v /l=RAL594T4=ITSCNET.CNTRL004

logfile.txt
  1999/11/13 10:10 - LOCL594 : Version = V01.00
  1999/11/13 10:15 - RAL594T1=ITSCNET.CNTRL001:Version = V01.00
  1999/11/13 10:20 - RAL594T2=ITSCNET.CNTRL002:Version = V01.10
  1999/11/13 10:25 - RAL594T3=ITSCNET.CNTRL003:Version = V02.00
  1999/11/13 10:30 - RAL594T4=ITSCNET.CNTRL004:Version = V02.00
```

Chapter 6: Communicating with the AS/400

Communication Checklist

Ensure that the following tasks have been completed before attempting to establish communications between the Perle 594T and the AS/400 system:

- Configuration of the following items on the AS/400 system:
  - Network Interface Descriptions (Frame Relay only)
  - The Line Description
  - The APPC Controller Description
  - The RWS Controller Description
  - The NWS Device Descriptions
  - TCP/IP Interfaces (TCP/IP only)
  - TCP/IP Host Table Entries (TCP/IP only)
  - TCP/IP Routes (TCP/IP only)
  - APPN Remote Configuration List (TCP/IP only)
  - PPP Profile (only if dialing into or from AS/400)
- Configuration of the Perle 594T.
- Start TCP/IP if configured.
- A vary-on by the AS/400 system operator of:
  - Network Interface (Frame Relay only)
  - the Line
  - the APPC Controller
  - the RWS Controller.

Note: *The Perle 594T may emulate more than one controller. Be sure that the above steps are completed for each emulated controller before attempting to establish communications.*

Placing the Perle 594T in Operating Mode

1. Ensure that the power is turned off at the Perle 594T (i.e., no operator panel LEDs are on).

2. Ensure that the Controller Software Diskette is inserted into the diskette drive.

3. Press the power switch. All LEDs should come on momentarily. If the LEDs do not come on, check the power cord and the electrical outlet.

4. The Ready LED should come on within 2 minutes. If the Ready LED does not come on within this time, refer to *Appendix C: Solving Problems*.

5. Proceed to *Establishing Communication*.

Establishing Communication

Use the following chart to locate the procedure for establishing communication between a controller and an AS/400 system. If your Perle 594T emulates more than one controller, you may need to repeat the procedure for each emulated controller.

Communication Method		Procedure
SDLC	Leased	None.
	Switched, Auto Answer	None.
	Switched, Manual Answer	Manual Calls (page 61).
	Switched, Manual Dial	Manual Calls (page 61).
	Switched/V.25 bis	Auto Dial from an NWS (page 61).
X.21	Leased	None.
	Switched, answer call	None.
	Switched, initiate call	PWS Communication Establishment (page 60) or Auto Dial from an NWS (page 61).
X.25	PVC, automatic connect	None.
	PVC, manual connect	PWS Communication Establishment (page 60) or PVC Open Command from an NWS (page 61).
	SVC, answer only	None.
	SVC, initiate call	PWS Communication Establishment (page 60) or SVC Call Command from an NWS (page 62).
Token-Ring		None.
Ethernet		None.
Frame Relay		None.
TCP/IP		None
PPP		See Establishing a PPP Connection (62)

When the above table indicates that the procedure is *None*, there are no special procedures required to establish communication. Once the Perle 594T is in operating mode and the AS/400 system operator activates the line, the APPC controller and the remote workstation controller, a sign-on screen should appear on all active workstations.

Note: *If you do not get a sign-on screen after a few minutes, repeat the procedure described in Placing the Perle 594T in Operating Mode on page 59, followed by the Establishing Communication procedure. If the problem continues, refer to Appendix C: Solving Problems.*

Communication Establishment using the 594 Utility Program

Chapter 5 contains instructions for installing and starting the 594T Utility Program on a PC. Under the 594T Utility Program main menu, select *Network Link Establishment* and press **Enter**. The proper network establishment menu is displayed for the type of communication you are using. Select the proper options for the type of communications you wish to establish.

Manual Calls

1. Complete any steps required to establish a modem connection (see your modem documentation).
2. After the connection is completed, a sign-on screen should appear on all active workstations.

Note: *If you do not get a sign-on screen after a few minutes, repeat the procedure described in Placing the Perle 594T in Operating Mode on page 59. If the problem continues, refer to Appendix C: Solving Problems.*

Auto dial from an NWS

The following procedure must be performed at an NWS which is attached to the controller for which you are attempting to establish communication.

1. Press the **System Request** key.
2. Type a comma (**,**) and the letter **C**.

   For example, to initiate a call with AS/400 system 1, enter:

   ```
   H1,C
   ```

3. Press **Enter** to establish communication.

Note: *If you do not get a sign-on screen after a few minutes, repeat the procedure described in Placing the Perle 594T in Operating Mode on page 59. If the problem continues, refer to Appendix C: Solving Problems.*

PVC Open Command from an NWS

The following procedure must be performed at an NWS which is attached to the controller for which you are attempting to establish communication.

1. Press the **System Request** key.
2. Type an *open* command on the system request line using the following syntax:

   ```
   Hx,O,Lxxx
   ```

   where: **x** is the selected host (1—4)

   xxx is a 3-character hexadecimal code to identify the logical channel ID to be used. It is comprised of the logical group number and the logical channel number. This value can range from 001 to FFF.

Note: *If you do not provide a logical channel ID, the controller defaults to the last value provided on an open command. If this is the first open command issued after a power-on or after a detach command, the controller defaults to the logical channel provided in the configuration procedure.*

3. Press **Enter** to establish communications.

Note: *If you do not get a sign-on screen after a few minutes, repeat the procedure described in Placing the Perle 594T in Operating Mode on page 59. If the problem continues, refer to Appendix C: Solving Problems.*

SVC Call Command from an NWS

The following procedure must be performed at an NWS which is attached to the controller for which you are attempting to establish communication.

1. Press the **System Request** key.

   To issue an outgoing call to the host, proceed to step 2. To answer an incoming call from the host, go to step 3.

2. To issue an outgoing call to the host, type a *call* command on the system request line using the following syntax:

   `Hx,C,Naaa,Xppp`

   where: **x** is the selected host (1—4)

   aaa is the host address (1 to 15 numeric characters)

   ppp is the connection password (1 to 8 alphanumeric characters).

   Note: *If you do not provide a host address or a connection password, the controller will default to the last value provided for the same command. If this is the first command issued after a power-on or after a detach command, the controller will default to values provided in the configuration procedure.*

   Press **Enter**. A sign-on screen should appear on all active workstations.

3. To answer an incoming call from the host, type an *answer* command on the system request line using the following syntax:

   `Hx,A,Naaa,Xppp`

   where: **x** is the selected host (1—4)

   aaa is the host address (1 to 15 numeric characters)

   ppp is the connection password (1 to 8 alphanumeric characters).

   Note: *If you do not provide a host address or a connection password, the controller will default to the last value provided for the same command. If this is the first command issued after a power-on or after a detach command, the controller will default to values provided in the configuration procedure.*

Establishing a PPP connection

594 Utility Program

Chapter 5 contains instructions for installing and starting the 594 Utility Program on a PC. Under the 594 Utility Program main menu, select *Network Link Establishment* and press **Enter**. The proper network establishment menu is displayed for the type of communication you are using. Select the proper options for the type of communications you wish to establish.

Automatic connection

If you would like the 594T to automatically connect to the host at power up;

When configuring the Async PPP host connection

1. Set "Automatic PPP Link Establishment" to "YES"

2. Configure "PPP Link 1" with the User ID, Password and phone number for the host (this may be an AS/400, Router or RAS) you wish to connect to.

3. Configure "H1 AS/400 System 1" with the IP address of the AS/400 you wish to connect to.

   When the 594T powers up, it will attempt to establish a physical connection to the device configured in Link 1. If the connection does not succeed, an SRC will be displayed on the front panel indicating the reason the connection attempt failed. Once the PPP link is established, a logical connection will be established to the AS/400 for each configured controller.

Manual connection from an NWS

If you would like to manually control the PPP link establishment;

When configuring the Async PPP host connection

1. Set "Automatic PPP Link Establishment" to "NO"

   The following can be performed on any NWS connected to the 594T.

   a) Press the **System Request** key.

   b) Type the command "Lx,C" where x = 1, 2 or 3 (x represents the PPP link to establish)

   c) Press **Enter** to Establish communication

If the connection does not succeed, an SRC will be displayed on the front panel indicating the reason the connection attempt failed.

Once the PPP link is established, a logical connection will be established to the AS/400 for each configured controller.

Ending Communication

Communication between an emulated controller and an AS/400 system can be ended using this procedure. This is usually done to clear an error condition or to access an alternate AS/400 system.

To stop communication between a controller and an AS/400 system, use the following procedure.

1. End all sessions between workstations and the AS/400 system.
2. Have the AS/400 system operator vary off the controller.
3. To disconnect using the 594 Utility Program, proceed to *Disconnecting Communication using the 594 Utility Program*.

   To disconnect using an NWS, go to *Disconnecting Communication from an NWS*.

Note: *To end a session using a PPP host connection go to "Disconnecting a PPP Link".*

Disconnecting Communication using the 594 Utility Program

Chapter 5 contains instructions for installing and starting the 594T Utility Program on a PC. Under the 594T Utility Program main menu, select *Network Link Establishment* and press **Enter**. The proper network establishment menu is displayed for the type of communication you are using. Select the proper options to disconnect communications.

Disconnecting Communication from an NWS

1. Go to one of the attached display stations and press the **System Request** key.
2. The host identifier (H1—H4) is displayed on the screen.
3. Type a comma (**,**) and the letter **D**.

   For example, to disconnect from AS/400 system 1, enter:

   ```
   H1,D
   ```

4. Press **Enter** to disconnect communication.

Disconnecting a PPP link

594 Utility Program

Chapter 5 contains instructions for installing and starting the 594 Utility Program on a PC. Under the 594 Utility Program main menu, select *Network Link Establishment* and press **Enter**. The proper network establishment menu is displayed for the type of communication you are using. Select the proper options to re-establish communications.

Before disconnecting any of the physical PPP host connections (L1 - L4) you should first ensure that all logical host connections have been terminated. This is done by selecting the "Disconnect ALL" option.

From an NWS

The following can be performed on any NWS connected to the 594T.

1. Press the **System Request** key.
2. Type the command "H*,D"
3. Press Enter to disconnect **ALL** active sessions. This will cause all active sessions on this physical link to drop. This includes all the controllers on the 594T which have an active link to the host. The NWS should now be in FREE KEY mode.
4. Press the **System Request** key.
5. Type the command "Lx,D". (x = 1,2 or 3 and indicates the currently active physical link to disconnect).

Disconnecting while the physical link is down but the logical link is still up (virtual connection)

If the controllers are still in a "varied on" state on the 594T and are not physically connected to the host, the controller is deemed to have a "virtual connection" with the host. This means that the physical connection has been dropped by the 594T due to a luck of activity on the line but logically,

the host believes that the session(s) is still up. If while the virtual connection exists, the controllers get varied off on the host (i.e. by operator intervention or an error condition), the 594T and the host will have a different status for the controllers. On the host the controllers will be varied off, on the 594T the controllers will be in a varied on state. To correct this situation, the following steps should be taken;

1. Ensure that the controllers are in a varied off state on the host.

2. Issue a "Disconnect ALL" command using the 594 Utility Program or the procedure outlined above for an NWS.

   This will put the 594T and the host in the same state. At this time, a new connection can be established to any of the links configured on the 594T.

Re-establishing Communication

If the logical link has been lost due to an AS/400action,but the physical link is still active, you may re-establish communication with the following procedures:

- To re-establish communication using the 594 Utility Program, proceed to *Re-establishing Communication from a PWS*.
- To re-establish communication using an NWS, go to *Re-establishing Communication from an NWS*.
- To re-establish a lost physical link, go to *Establishing Communicatio*n on page 60.

Re-establishing Communication using the 594 Utility Program

Chapter 5 contains instructions for installing and starting the 594T Utility Program on a PC. Under the 594T Utility Program main menu, select *Network Link Establishment* and press **Enter**. The proper network establishment menu is displayed for the type of communication you are using. Select the proper options to re-establish communications.

Re-establishing Communication from an NWS

1. Go to one of the attached display stations and press the **System Request** key.
2. The host identifier (H1—H4) is displayed on the screen.
3. Press **Enter** to establish communication.

   Note: *If you do not get a sign-on screen after a few minutes, repeat the procedure described in Placing the Perle 594T in Operating Mode on page 59. If the problem continues, refer to Appendix C: Solving Problems.*

Changing Your AS/400 System Attachment

1. End all sessions between workstations and the AS/400 system.
2. Have the AS/400 system operator vary off the current controller.
3. If an error has occurred or if you are using Token-Ring, Ethernet AS/400 or PPP Attachment, you must end communication with the AS/400 system using the procedure on page 63. Once this procedure is complete, continue with step 4.
4. Ensure that the AS/400 system operator has varied on the:
   - line
   - PPP Profile (if dialing into or from the AS/400)
   - APPC controller
   - RWS controller.
5. Use the following chart to locate the procedure for establishing communication with a new AS/400 system. If your Perle 594T emulates more than one controller, you need to repeat the procedure for each emulated controller.

Communication Method		**Procedure**
SDLC	Switched/V.25 bis	Auto Dial from an NWS (page 61).
	Other	Changing Your AS/400 System from an NWS (page 67).
X.21	Leased	Changing Your AS/400 System from an NWS (page 67).
	Switched, answer call	Changing Your AS/400 System from an NWS (page 67).
	Switched, initiate call	PWS Communication Establishment (page60) or Auto Dial from an NWS (page 61).
X.25	PVC, automatic connect	Changing Your AS/400 System from an NWS (page 67).
	PVC, manual connect	PWS Communication Establishment (page 60) or PVC Open Command from an NWS (page 61).
	SVC, answer only	Not applicable.
	SVC, initiate call	PWS Communication Establishment (page 60) or SVC Call Command from an NWS (page 62).
Token-Ring		Changing Your AS/400 System from an NWS (page 67).
Ethernet		Changing Your AS/400 System from an NWS (page 67).
Frame Relay		Changing Your AS/400 System from an NWS (page 67).
TCP/IP		Changing Your AS/400 System from an NWS (page 67).
PPP		See Establishing a PPP connection (page 62).

Changing Your AS/400 System from an NWS

Go to one of the attached display stations and press the **System Request** key.

1. Ensure that the proper host identifier (H1—H4) is displayed on the screen. If not, enter the host identifier you desire.
2. Press **Enter** to change the AS/400 system.

   Use the following chart to locate the procedure for establishing communication between a controller and the new AS/400 system. If your Perle 594T emulates more than one controller, you need to repeat the procedure for each emulated controller.

Communication Method		**Procedure**
SDLC	Leased	None.
	Switched, Auto Answer	None.
	Switched, Manual Answer	Manual Calls (page 61).
	Switched, Manual Dial	Manual Calls (page 61).
X.21	Leased	None.
	Switched, answer call	None.
X.25	PVC, automatic connect	None.
Token-Ring		None.
Ethernet		None.
Frame Relay		None.
TCP/IP		None

Registering Online Facilities (X.21 Switched)

PWS

1. Start the 594T Utility Program. See page 41.
2. Select Network Link Establishment and press **Enter**.
3. Select Change Subscription Parameters. Type in the facility code and parameters.
4. Press **F6**. When the subscription request completes. check the SRC. See *Appendix C* for a list of all SRCs.

NWS

1. Ask the AS/400 system operator to vary off the 594T.
2. Key in the System Request key sequence.
3. Key in a comma (,) and the letter **S**, followed by the X.21 switched facility code and parameters in the exact way your network expects them. Obtain these parameters from your network supplier.

   For example, to activate the redirection of call facility, enter:

   ```
   H1,S63/1-+
   ```

4. Press **Enter**.

   The network displays an acknowledgment of the request in the form of an SRC. See *Appendix C* for a list of all SRCs.

Chapter 7: Concurrent Host

Introduction

The Perle 594T controller can be configured to allow its nonprogrammable workstations (NWS) to communicate concurrently with up to four AS/400 hosts over a single physical link. This capability is referred to as Concurrent Host. Nonprogrammable workstation (NWS) and printers that do not have the use of AS/400 display station or printer passthrough, can now communicate with other AS/400s in the communication network. To reach multiple AS/400 systems in the network, concurrent host attachment uses the SNA session-level routing capabilities of an APPN network or an SNA subarea network.

AS/400 System Requirements

Once the configured AS/400 systems are interconnected with an appropriate communication network, whether it be an APPN network or an SNA subarea network, the 594T can provide concurrent host attachment. A route through the network must be established for the flow of LU6.2 session traffic between a 594T controller with which it is intended to communicate and each AS/400 system. Each controller in the 594T must be configured on each AS/400 system. This configuration will be the same with or without concurrent host attachment.

594T Configuration Requirements

Every AS/400 host that a 594T controller contacts must be configured in the 594T (H1-H4) and one of those hosts must be declared the primary host.

A 594T controller and the primary host interact in the following manner:

- Error log data is sent from a 594T controller to the primary host. A 594T controller does not send error log data to any other host.
- A 594T controller sends alerts to the primary host. However, if the controller session with the primary host becomes inactive, an active session with an alternate host will be used for sending alerts until the primary host controller session becomes active again.
- A 594T controller attempts to keep the controller session active as long as there is a device active for a particular host.
- A 594T controller attempts to keep the primary host controller session active whenever any alternate host controller session is active. This way alerts and error log information can be sent to the primary host.

Display Options

Concurrent Host capability affects NWS display options and introduces the concept of "default host."

Default host simply refers to the AS/400 that provides the NWS with its sign-on screen. Unless you change it, the default host is the primary host. The first time you use the 594 Controller Software, all NWS sign-on screens will be taken from the primary host.

However, you can enter a System Request command to change the default host for a particular NWS to any AS/400 that has been configured for that 594T controller. By doing this, you cause that NWS display to take its sign-on screen from a non-primary AS/400. You can also enter another System Request command to temporarily switch to a different host without changing the default host for that display.

Whenever a display session switches hosts, it will appear to the current host as a display power-off and to the new host as a display power-on.

Note: *Return to the sign-on screen for the current host before switching a display session to another host.*

Single, shared and multiple address displays have different capabilities when communicating with the host:

Single-address displays: able to communicate with only one host at a time.

Shared addressing displays: as long as the AS/400 system supports shared addressing displays (Version 3, Release 1 or later), the displays are able to communicate with a different host on each shared session. If the AS/400 system does not support shared address displays, only the base session of a shared address display will be able to communicate with the AS/400 system.

Multiple address displays: a display that uses multiple addresses for additional sessions can also communicate with a different host on each session. For each session on a shared or multiple address display, the default host can be set independently.

Switching to other AS/400 Systems

Your display session can be switched to any other AS/400 system that is configured in a 594T controller. To do this, follow the steps below:

1. Make sure you are signed off your AS/400 system.

2. Press the **System Request** key on the display that you wish to switch to another AS/400.

   If you are *not* currently in session with an AS/400, a line with the AS/400 system identifier (Hx) will appear at the top of the screen. This identifier indicates the host with which your display is currently set to communicate.

   If you are currently in session with an AS/400, a blank line will appear at the bottom of the screen.

3. To switch the display session to another host *without* changing the power-on default host, type the AS/400 system identifier of the new host in the first two characters of the line, as in the following example:

   ```
   H3
   ```

To switch the display session to another host *and also* change the power-on default host, type the AS/400 system identifier of the new host in the first two characters of the line, a comma and then a P, as in the following example:

```
H3,P
```

4. For the final step, simply press **Enter**.

   As long as the System Request command is a valid host switching command, the 594T will process the command. Otherwise, in the event that the System Request command is *not* valid, the 594T will forward the command to the AS/400 for processing or if a controller session with an AS/400 is not active, report an error.

   Whenever a controller session for the new AS/400 is not currently active, the controller session for the new AS/400 will be brought up before the display session.

AS/400 Application Considerations

The following considerations should be kept in mind when using these AS/400 applications:

Performance Tools/400:

- only one AS/400 at a time can run Performance Tools/400 for the 594T emulated controller.
- response time data will only be collected and reported for display sessions with the AS/400 running Performance Tools/400.

Workstation Customization:

- For each session of a single, multiple or shared address display, a 594T controller will accept the download of a keyboard translation table (KTT), to a maximum of five.
- For each single address display, a 594T controller will accept the download of a printer definition (PDT). For multiple and shared address displays, only the display base session will download a PDT. For all displays on a 594T controller, a maximum of five PDTs can be downloaded.

Printers and Concurrent Host Attachment

Once a 594T controller has been configured for concurrent host attachment, printer sharing can be enabled or disabled.

Printer Sharing Enabled

The following is a list of functions that apply once printer sharing is enabled.

- any printer attached to a 594T controller can be shared by up to four AS/400 systems.
- whenever a shared printer is powered on, the 594T controller will activate the controller session with the primary host and report to the primary host that the printer is available.
- if a controller session becomes active with any alternate hosts, the 594T controller will report to the alternate host that the printer is available.
- the 594T controller will not activate a controller session with an alternate host just for a shared printer.
- there are two ways a controller session with an alternate host can be activated:
  - by setting the **Controller Session Initiation** to "yes" for the alternate host.
  - if a display becomes active for this alternate host.

Printer Timeout

A printer can have only one AS/400 system printer writer active at a time. Therefore, once the writer for a particular AS/400 system has started, a 594T controller will report to the other AS/400 systems that the printer is unavailable. When the writer has ended for the printer, the 594T controller will start the printer sharing timeout. After the timeout expires, the 594T controller will report to the other AS/400 systems that the printer has powered on and that a writer on one of the other AS/400 systems can be started and can begin printing.

Printer Sharing Disabled

Printers can be dedicated to any AS/400 system if printer sharing is disabled. When the printer connected to a 594T controller is turned on, the 594T controller will activate the controller session with the appropriate primary or alternate host and report to that host that the printer is available.

By default, each printer is initially set to a 594T controller's primary host. To change the host, do the following steps:

1. Turn the printer on.

2. From any display that is attached to the same 594T controller as the printer, press the **System Request** key.

3. Select the new host system for the printer by typing on the System Request input line as follows:

   `Hx,P,ps,`

   where:

Hx	Host ID
P	Power-on default host
p	Printer port
s	Printer station address

4. Press **Enter**.

   The 594T controller will now change the power-on default host for the printer at the specified port and station address.

   If the System Request command is not valid, the 594T will, if a host session is active for this display, forward the System Request command to the AS/400 for processing. But if the host session is not active, the 594T will report an error.

5. To complete the change, turn the printer off and then back on.

The printer will then be ready to communicate with the new AS/400 system.

Chapter 8: 594T Controller Feature Kits Installation and Setup

IP Routing Controller Feature

The Perle 594T IP Routing Controller Feature is an upgrade feature kit (factory or customer installable), that allows you to utilize enhanced networking features on the 594T such as:

- TCP/IP Host Connection over Frame Relay Protocol
- IP Routing
  - Dynamic Routing using RIP
  - BOOTP Relay Agent
  - IP over Twinax

Note: *The 594T IP Routing Controller software does not support the configuration of Perle ASCII feature cards or an IBM compatible Mode configuration.*

This feature kit consists of both hardware and software components.

If you have ordered your 594T with the IP Routing Controller Feature factory installed then all the necessary 594T IP Routing Controller Feature hardware components are already installed. Proceed to *594T* IP Routing *Controller Software Setup and Use*.

If you have ordered the 594T IP Routing Controller Feature as a field installable feature then proceed with the following section to install the necessary 594T IP Routing Controller Feature hardware components.

Installing 594T IP Routing Controller Feature

IP Routing Controller Feature Components

The components that make up the 594T IP Routing Controller Features are the following:

- An additional 8 MB of memory over the Base 594T memory (minimum of 16 MB total in 594T) (refer to page 202 for installation of additional memory modules)

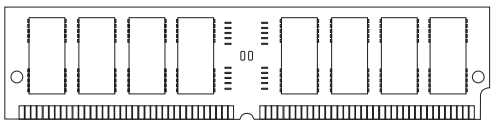


Fig. 24: Memory SIMMs

- 594T Network Controller Software Diskettes

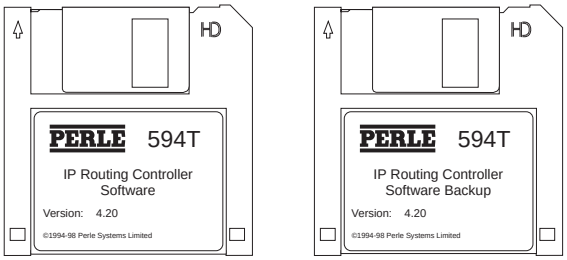


Fig. 25: 594T IP Routing Controller Software Diskettes

594T IP Routing Controller Software Setup and Use

All the software required for the 594T IP Routing Controller feature is on the *594T IP Routing Controller Software Diskette*. To use the Perle 594T IP Routing Controller software simply boot up the 594T with the *594T IP Routing Controller Software Diskette in the 594T diskette drive*.

IP Routing plus VPN Controller Feature

The Perle 594T IP Routing plus VPN Controller Feature is an upgrade feature kit. It comes in two versions.

Upgrade From Base Software

Allows you to utilize enhanced networking features on the 594T such as:

- VPN over an IP Host Connection
- TCP/IP Host Connection over Frame Relay or PPP Protocol
- IP Routing
  - Dynamic Routing using RIP
  - BOOTP Relay Agent
  - IP over Twinax

Upgrade From IP Routing Software

Allows you to utilize enhanced networking features on the 594T such as:

- VPN over an IP Host Connection

The Upgrade from Base Software includes an additional 8 MB of memory over the Base 594T memory (refer to page 202 for installation of additional memory modules).

The Upgrade from IP Routing does not require additional memory to be installed.

If you have ordered your 594T with the IP Routing plus VPN Controller Feature factory installed then all the necessary 594T IP Routing plus VPN Controller Feature hardware components are already installed. Proceed to *594T IP Routing plus VPN Controller Software Setup and Use.*

If you have ordered the 594T IP Routing Controller Feature as a field installable feature and have received additional memory as part of the upgrade, refer to page 202 for installation of additional memory modules. Once the memory has been installed, proceed to 594T IP Routing plus VPN Controller Software Setup and Use.

594T IP Routing plus VPN Controller Software Setup and Use

All the software required for the 594T IP Routing plus VPN Controller feature is on the *594T IP Routing plus VPN Controller Software Diskette.* To use the Perle 594T IP Routing plus VPN Controller software simply boot up the 594T with the *594T IP Routing plus VPN Controller Software Diskette in the 594T diskette drive*.

Please note that you will need to enter a “box security key” on the front panel in order to use the VPN feature. See section on “box security key” in “Chapter 10: Virtual Private Network (VPN)” on page 83.

Chapter 9: Point To Point Protocol (PPP) Information

This appendix will cover issues related to using a PPP host connection. The following topics will be covered;

- Setup
- Number of connections supported
- Virtual connections
- VPN
- Configuring the AS/400 for PPP
- Initiating connections
- Terminating connections

Setup

To use a PPP host connection the following components are required on the 594T

1. A synchronous communication card which is able to support PPP. Any chassis which has a serial number of 59-08000 or greater will contain a synchronous card which is PPP capable. If your unit has a lower serial number, you must obtain a hardware upgrade from you dealer.
2. An asynchronous modem capable of communicating at speeds of 14.4 Kbps or higher.
3. If the connection will be established via an ISP, you need to establish an account with a local ISP provider. If you wish to take advantage of the 594 ability to drop the call when no traffic is being exchanged, you need to ask your ISP to provide you with an account with a FIXED IP ADDRESS. This address will be assigned to you each time you connect to the ISP.

To use a PPP host connection the following components are required on the AS/400

1. OS/400 Release 4 Version 2 or later
2. Client Access (V3R2M0) or Client Access Express for Windows (V4R4M0) and Operations Navigator
3. A modem or ISDN terminal adapter
   The AS/400 has a limited set of supported modems. Please check the list of supported modems on the AS/400 before purchasing the modem.
4. The AS/400 must have a communications port and adapter which can support PPP. The following I/O adapters support PPP;

   2699 - Two-line WAN IOA

   2720 - PCI WAN/Twinaxial IOA

   2721 - PCI Two-line WAN IOA
5. If you plan to connect to the AS/400 via the Internet, you will need an account with an ISP (Internet Service Provider).

Number of connections supported

The 594T supports a single physical PPP connection at a time. Internally the 594T can be configured for three different PPP connections. Each connection can have a unique phone number, user name and password associated with it. All incoming calls will share a common userid and password.

Virtual connections

The 594T can be configured to drop the physical connection when there has been no traffic on the connection for a configured amount of time (inactivity time-out). The logical session is maintained. This is referred to as a "virtual connection". When the 594T has data to send to the host, it will automatically re-establish the connection and send the data. In order for the "virtual connection" to operate correctly, the following must be done;

1. When configuring the PPP connection, select the "On-Demand Connection" option.
2. Ensure that you enter a non-zero time for the "Inactivity Time-out".
3. Ensure that the "AnyNet keep-alive" timer has been turned off on the 594T and the AS/400. Failure to do so will cause the 594T or the AS/400 to periodically send out a message to ensure that the connection is up. This message will be treated as activity on the line and will prevent the inactivity timer from expiring thereby always keeping the connection up.
4. Turn off RIPs on this connection. Failure to do so will result in traffic being generated every 30 seconds thereby keeping the link up forever. When RIPs are not used, you need to enter static routes for each destination you wish to reach and/or set up the PPP port to be the default port if you wish any destination which is not in a static route to go out the PPP port.
5. If using an ISP service, ensure that you will be assigned a fixed IP address each time you connect to the ISP.

Special Considerations

Two Way PPP Authentication

When a router or host calls the 594 controller, the 594 will ask it to authenticate with it. Optionally, the router or host dialing in may also request the 594 to authenticate with it. If this is the case, the 594 will use the username and password associated with the last link which was in use. If this is the first connection after a boot, the username and password associated with Link 1 will be used.

Supernetting

Supernetting is NOT supported on the 594 controller. This is the situation where a user defines a subnet mask which is greater than the class of the IP address it is associated with. An example of this would be:

```
IP address:  172.12.1.1 (class B)
Subnet:       255.0.0.0 (class A)
```

Configuring the AS/400 for PPP

In order to use PPP on the AS/400, the following items are required;

1. OS/400 Release 4 Version 2 or later
2. Client Access (V3R2M0) or Client Access Express for Windows (V4R4M0) and Operations Navigator.
3. A modem or ISDN terminal adapter
4. The AS/400 must have a communications port and adapter which can support PPP. The following I/O adapters support PPP;

   2699 - Two-line WAN IOA

   2720 - PCI WAN/Twinaxial IOA

   2721 - PCI Two-line WAN IOA
5. If you plan to connect to the AS/400 via the Internet, you will need an account with an ISP (Internet Service Provider). If you plan to take advantage of the 594's ability to disconnect the call when there is not activity and then reconnect when there is data to send over the link, you will need to arrange for ISP to provide you with a fixed IP address. Each time the connection to the ISP is made, you will be given the same IP address.

To configure PPP on the AS/400 you need to install the IBM AS/400 Client Access or IBM AS/400 Client Access Express for Windows on a PC which is connected via IP to the AS/400 host. This sofware will allow you to create the objects required to establish a PPP connection to the host. Follow the instructions provided with the software to install it on a LAN PC. Once installed, the software can be used to create, modify and control the objects which make up the PPP connection.

The following objects will need to be configured on the AS/400;

1. A connection profile
   a)· Use the Operations Navigator program to create a PPP connection profile.
      i. Double click your AS/400 server in the main tree view of Operations Navigator to expand the tree.
      ii. Click on **Network**
      iii. Click on **Point-to-Point**
      iv. Click on **Connection Profiles**
      v. Select “New Profile”
      vi. Complete the profile by clicking on each tab and entering the required information in the fields.
2. Defining a line to use for your PPP connection.
   a) Use the Operations Navigator program to select an existing line description or to define a new line description.
      i. Double click your AS/400 server in the main tree view of Operations Navigator to expand the tree.
      ii. Click on **Network**
      iii. Click on **Point-to-Point**
      iv. Click on **Connection Profiles**
      v. Select “New Profile” or double click on an existing profile to edit it.
      vi. Under the "Connection" tab, in the "Link configuration" section, select an existing line or enter a new line name

vii. Click on "Open" to define/modify the line attributes.

3. Defining a modem or terminal adapter.
   a) Use the Operations Navigator program to select a modem or terminal adapter to associate with the PPP connection profile.
      i. Double click your AS/400 server in the main tree view of Operations Navigator to expand the tree.
      ii. Click on **Network**
      iii. Click on **Point-to-Point**
      iv. Click on **Connection Profiles**
      v. Select “New Profile” or double click on an existing profile to edit it.
      vi. Under the "Connection" tab, in the "Link configuration" section, select line and click on "Open"
      vii. Click on the "Modem" tab to select from a list of supported modems.
   b) To Add a new modem definition;
      i. Double click your AS/400 server in the main tree view of Operations Navigator to expand the tree.
      ii. Click on **Network**
      iii. Click on **Point-to-Point**
      iv. Click on **Modems**
      v. Under the File menu, select "New Modem"

Initiating connections

From the 594

The connection to the AS/400 can be made manually or automatically depending on configuration. If the PPP connection is configured to come up automatically, the 594T will attempt to establish a connection to the destination configured in "PPP Link 1". The attempt will be made once. No retires will be attempted. If unable to connect, an SRC will be posted on the front panel. If manual link initiation is used, the user can select between any of the three configured links. Failure will again be indicated via an SRC.

From the AS/400

To start the connection, you need to vary on the PPP connection. This can be done from the Operations Navigator by;

1. Double click your AS/400 server in the main tree view of Operations Navigator to expand the tree.
2. Click on **Network**
3. Click on **Point-to-Point**
4. Highlight the PPP connection you wish to start.
5. From the "File" menu, select "Start"

If the connection has been configured to initiate a call, this should cause the call to be made.

If the connection has been configured to answer a call, this will place the connection in a state where it is ready to accept an incoming call.

Terminating connections

From the 594

Before terminating a PPP physical link, all logical connections should be terminated. This can be done using the "H*,D" command on the System Request line or by using the "Disconnect All" option of the 594 Utility Program. Once the logical connections have been terminated, the physical link can be brought down. This is done by doing a "Lx,D" (x = link number) on the System Request line or by using the "Disconnect Link x" command from the 594 Utility Program. The Disconnect all command can also be used if a physical connection does not currently exist. This will put the current state of all configured controllers on the 594T in the varied off state.

From the AS/400

To end the connection, you need to vary off the PPP connection. This can be done from the Operations Navigator by;

1. Double click your AS/400 server in the main tree view of Operations Navigator to expand the tree.
2. Click on **Network**
3. Click on **Point-to-Point**
4. Highlight the PPP connection you wish to start.
5. From the "File" menu, select "Stop"

Chapter 10: Virtual Private Network (VPN)

This chapter will cover issues related to configuration and usage of VPN. The following topics will be covered;

- Overview
- Configuration
  - Setup
  - Controller
  - AS/400
- Status

Overview

VPN stands for Virtual Private Network. It is the ability to provide what appears to be a private IP connection even though the data is being carried via a public network. This is achieved by using a combination of encryption, packet authentication, compression and firewall functionality.

People use the Internet as a means of connecting devices at a reduced cost. The down side to this type of connectivity comes from two sources. One is the non-guaranteed rate of traffic delivery and the other is the non-secure nature of the data transfer. For the controller, the non-secure aspect of the transmission tends to be the more critical issue. The type of data being exchanged between the controller and the host tends to be of a sensitive nature. A VPN resolves this issue by ensuring the validity and security of the data which travels through the public network. The issue of the performance is being handled by some ISPs with SLAs (Service Level Agreements) which guarantee a maximum latency of 80 ms.

VPN functionality can be provided by:

- Customer owned hardware at both ends (i.e. 594 controller and AS/400)
- Network Service Provider
- Combination of both

The 594T implementation of VPN is based on the “IPSec” (IP Security) protocol and IKE (Internet Key Exchange) protocol, both of which have gained widespread acceptance in the industry. As the name implies, this protocol is used only with IP data. Making use of this open standard allows the 594T controller to be interoperable with a large number of routers, remote access servers and VPN gateways.

IPSec provides the IP network layer encryption and authentication functions. This is done by adding new headers to the packet. The types of headers supported are the AH (Authentication Header) and ESP (Encapsulating Security Payload) header. IPSec is fully defined by the IETF (Internet Engineering Task Force) RFC #2401.

IKE offers a standard way of establishing authentication and encryption services between the two VPN gateways. It allows for the negotiation of Security Associations (SAs). An SA is a policy or rule that that is associated with a specific peer. Each SA is identified with a unique SPI (Security Parameter Index). If IKE is used, the SPI is automatically negotiated. If IKE is not used, it must be configured by the user and must match the SPI configured on the peer. IKE is fully defined by the IETF RFC #2409.

Configuration

Setup

In order to implement VPN, you must first fully identify the following items;

1. Which nodes will be acting as VPN gateways in your network
2. Which nodes will need to talk to each other
3. The type of data that will be allowed to travel between any two nodes
4. The level of security which is required between any two nodes.
5. The VPN options available on the 594T controller

Once you have understood the requirements, you will need to configure each side of the VPN connection. It is critical that the configuration on both sides of the VPN tunnel match. If the definition of the tunnel is not correct, the two VPN gateways will not be able to communicate.

The 594T allows for the configuration of up to 8 VPN tunnels. Each tunnel can be configured to define the type of traffic it will allow, as well as the type of security associations it will be linked to. Each tunnel, supports the use of AH (Authentication Header), ESP (Encapsulating Security Payload) or AH with ESP. AH is used to provide integrity and authentication for IP data. ESP is used to provide security via the encryption of the IP data. This includes the original source and destination IP addresses of the data.

594T

Configuration

The configuration of the VPN feature involves the following steps;

1. Enable the VPN feature
2. Configure the “box key”
3. Configure the IPSec profiles

Enabling VPN

Before enabling the VPN feature you must ensure that you are running IP on the host connection and that you have configured the IP address for this interface.

VPN is only available in “enhanced” mode. To enable the VPN feature, go into configuration and select the option “Global Parameters”, followed by “VPN IPSec Profiles”. As soon as this option is selected, you will be asked to enter a “box security key”. This key is used to encrypt all VPN keys which you configure. This is done to ensure the security of the data when it is stored on a file as well as when it is transmitted to the 594T controller. The same key will be entered on the front panel of the controller to enable the 594T to decrypt the configured keys. This key must be 16 characters in length. The key entered on the front panel must match the key entered in the 594T Utility Program exactly. If this is not the case, VPN connections will not be successful. If you have configured the VPN feature but did not enter the box security key via the front panel, you will see an SRC (50001F) on the front panel. This indicates that the box security key is not present and therefore, the VPN feature can not function. Please use the Req. 274 (see the 594 Diagnostic Guide) to enter the key. You will need to re-start the 594 once the box security key has been set.

You will also be given the ability to define the action required for data which has been received or is about to be transmitted outside of a VPN tunnel. You can chose to allow or disallow such traffic. This choice affects only IP traffic destined to or from the host port.

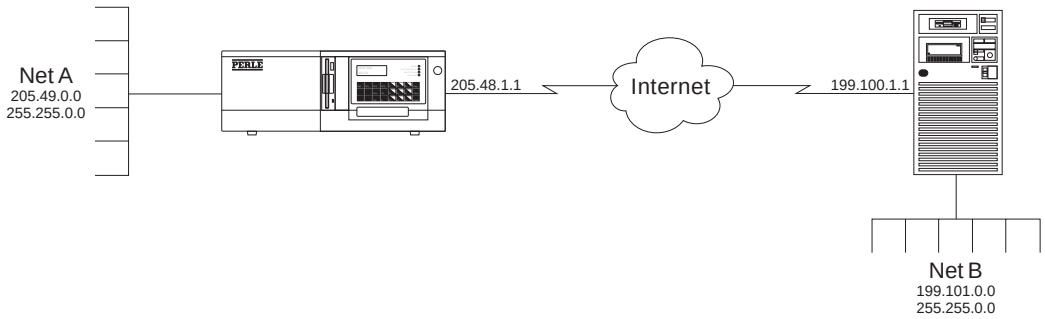
Once configured, the act of disabling VPN will delete all associated IPSec information.

If you enable VPN, you will need to configure at least one IPSec profile.

Each IPSec profile will require the configuration of the following;

- The IP address of the remote VPN gateway.
  - The address of the peer VPN gateway at the other side of the tunnel
- The IP address of the remote host or network
  - The host or network IP address (address and mask) of the actual destination of the IP traffic. The destination of IP packets which are about to be transmitted by the 594T controller will be compared against this address to determine these packets need to travel through the tunnel.
- The IP address of the local host or network
  - The host or network IP address (address and mask) of the actual source of the IP traffic. The source of IP packets which are about to be transmitted by the 594T controller will be compared against this address to determine these packets need to travel through the tunnel. It is the combination of a match on the source and destination IP address that defines a match with a tunnel.
- Manual key management or IKE parameters.
  - One of these must be selected and configured. IKE will define an automated negotiation of parameters to establish the SAs where as "Manual key management" requires the manual definition of the SA. The method selected here must match the method selected on the peer VPN gateway.

Example



The above example maps into the configuration of an IPSec profile as follows;

Remote VPN Gateway address:	199.100.1.1
Remote host IP address:	199.101.0.0
Remote host network mask:	255.255.0.0
Local host IP address:	205.49.0.0
Local host network mask:	255.255.0.0

Note: *The tunnel definition above will address traffic going from A to B as well as traffic traveling from B to A. When inbound traffic arrives at the controller, (i.e. source = 199.101.x.x and destination = 205.49.y.y), the code will automatically reverse the source and destination addressing before comparing it to the information configured for the tunnels on the controller. The source address will be matched against the "remote" address and the destination address will be matched against the "local" address information. Both addresses must match the configured tunnel for a successful match to be obtained.*

Using VPN over a PPP host connection

When using PPP, it is possible to have the IP address of the host port be dynamically assigned by the other end of the PPP connection. If VPN is used over this type of a PPP connection, the IP address which will be assigned to the port must be known and it must be constant. This address will need to be used when configuring the VPN tunnel on the remote peer and therefore it can not change.

AS/400

Software Requirements

- OS/400 V4R4 or later (5769 - SS1)
- Client Access Express for Windows (5769 - XE1)
- IBM Cryptographic Access Provider (5969-AC2 (56 Bit) or AC3 (128 Bit))

To configure VPN on the AS/400 you need to install the IBM AS/400 Client Access Express for Windows on a PC which is connected via IP to the AS/400 host. This software will allow you to create the objects required to configure VPN on the host.

Enabling VPN on the AS/400

Enabling VPN on the AS/400 requires the following four features to be enabled (using the AS/400 command line)

1. Enable VPN services

   ```
   STRTCPSVR server(*VPN)
   ```

2. Enable security data retention on the AS/400

   ```
   CHGSYSVAL SYSVAL(QRETSVRSEC) VALUE('1')
   ```

3. Configure the AH and ESP protocols. The **`WRKPCLTBLE`** command can be used to view the active protocols. Make sure the AH (protocol number 51) and ESP (protocol number 50) protocols have been added to the protocol table.
4. Configure the AS/400's services table to include the AH and ESP protocols. The command **`WRKSRVTBL`** can be used to view the services table. Make sure the AH (port 51, protocol ah) and ESP (port 50, protocol esp) services have been added to the table.

Configuring a VPN connection

Configuring a VPN connection on the AS/400 requires the use of Client Access Express. If you have not already installed this software on a PC, you will need to do so before proceeding.

The first step is to create a new connection. This is done by clicking on the “Network” option, followed by “IP Security”, followed by “Virtual Private Networking menu”. A new connection can either be a manual connection (manual) or a dynamic key connection (IKE). Items such as system role, end points, local and remote addresses services, keys, AH configuration and ESP configuration must all be setup correctly in order for a connection to be established.

The next step is to create a IP filter table which enables the correct processing of VPN and non-VPN traffic. Here are some important points about creating the IP filters.

- Be sure to include all interfaces on which you want VPN traffic or non-VPN traffic to flow on.
- The set name or set names on the interfaces should match those in the filters.
- When creating a filter and the action specified is IPSEC the direction of inbound and outbound is implicit and therefore is not available.

- All IKE permit rules must appear before the first IPSEC filter rule in the filter rules file.
- Rather then applying rules on top of rules, be sure to deactivate the current filter rules before applying the new rules.
- An incorrect filter or filters can deny all IP traffic on the AS/400 (including traffic to and from the Client Access Express program). To recover, the current filter must be removed using the command line command **`RMVTCPTBL TBL(*ALL)`**

Starting a VPN connection

Once a connection and a filter have been created, VPN should be enabled. For manual connection you must explicitly start the connection by right-clicking on the manual connection and selecting start. Active connection and failed connection can be viewed using the View -- Active Connections under the Virtual Private Networking section in Client Access Express.

Additional information is available in the AS/400 Redbook “AS/400 Internet Security: Implementing AS/400 VPNs (SG24-5404-00)

Appendix A: AS/400 Configuration Examples

This appendix provides configuration examples for the following connections:

- SDLC Leased
- X.21 Switched
- X.25 Switched
- X.25 Permanent
- AS/400 Token-Ring Attachment
- AS/400 Ethernet Attachment
- SDLC Leased through SNA SubArea Network
- SDLC Leased through APPN Network
- AS/400 Frame Relay Attachment and FR-TR Bridge
- AS/400 Frame Relay Attachment and IP Routing (with 594T IP Routing Feature only)
- AS/400 TCP/IP Token-Ring Attachment
- AS/400 TCP/IP Ethernet Attachment and Twinax IP Routing (with 594T IP Routing Feature only)
- AS/400 TCP/IP Frame Relay Attachment

These examples demonstrate how configuration parameters on the AS/400 relate to those on the Perle 594T. These parameters are listed under the title of the configuration screen on which they can be found (on the AS/400 or the Perle 594T).

Refer to *Appendix B* for more information on Perle 594T parameters or to the appropriate AS/400 documentation on AS/400 parameters.

SDLC Leased

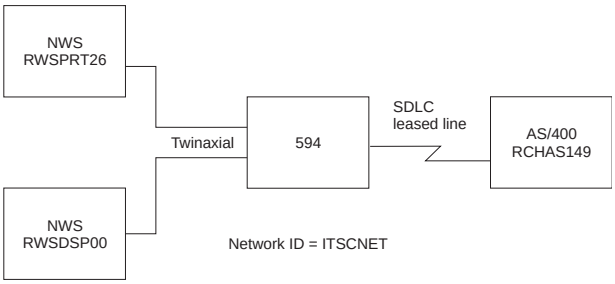


Fig. 26: SDLC Leased configuration

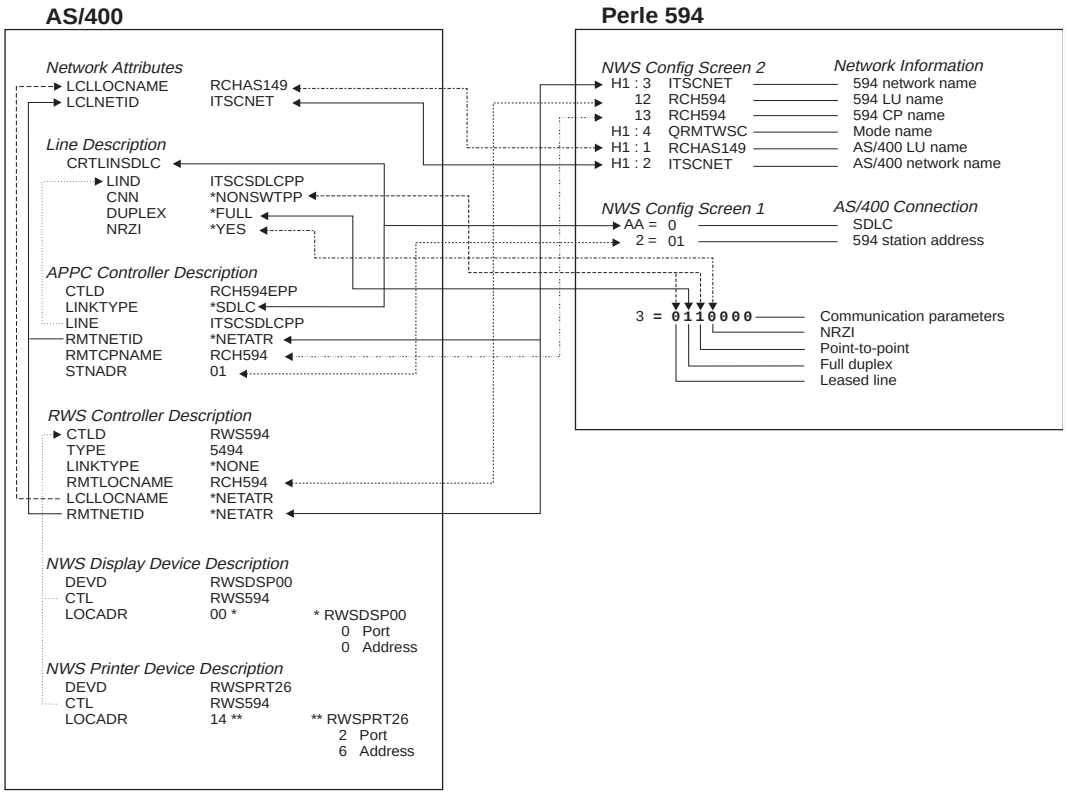


Fig. 27: SDLC Leased configuration cross-reference

X.21 Switched

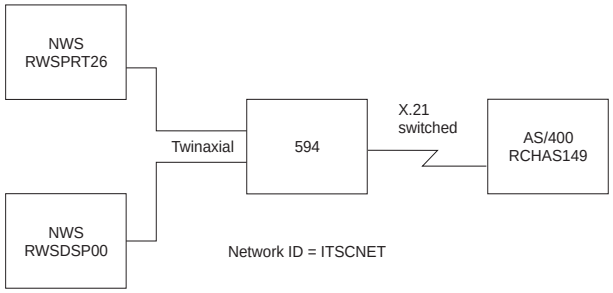


Fig. 28: X.21 Switched configuration

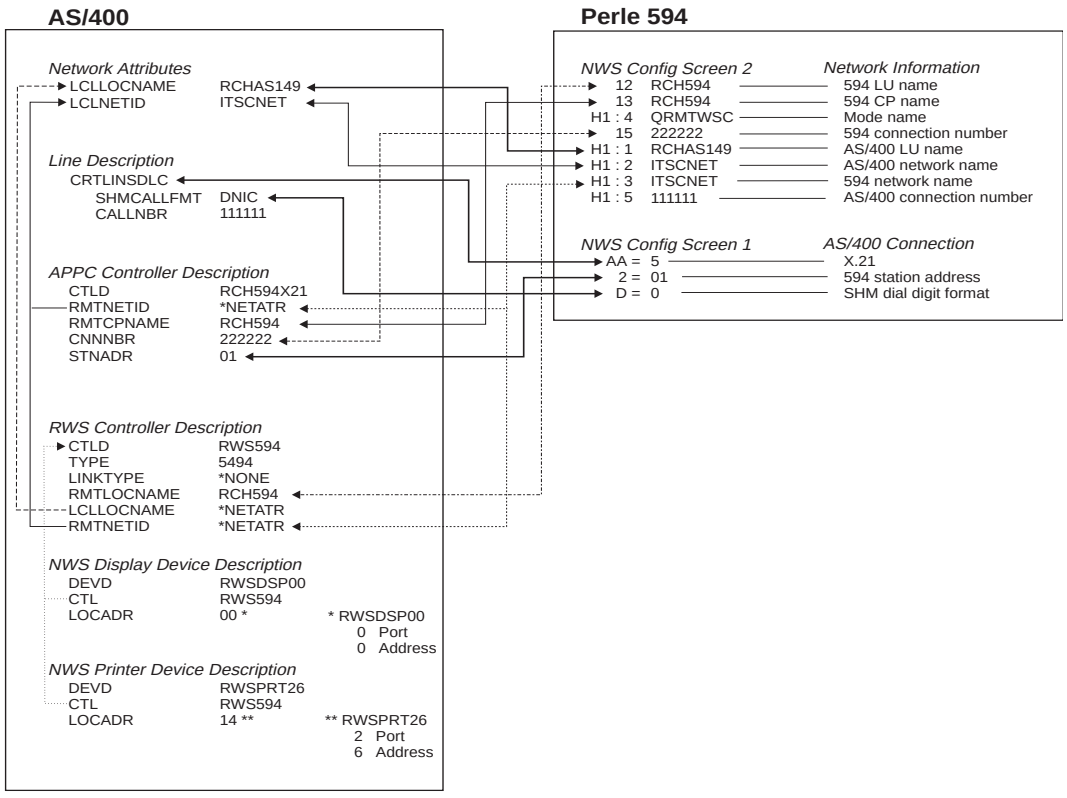


Fig. 29: X.21 Switched configuration cross-reference

X.25 Switched

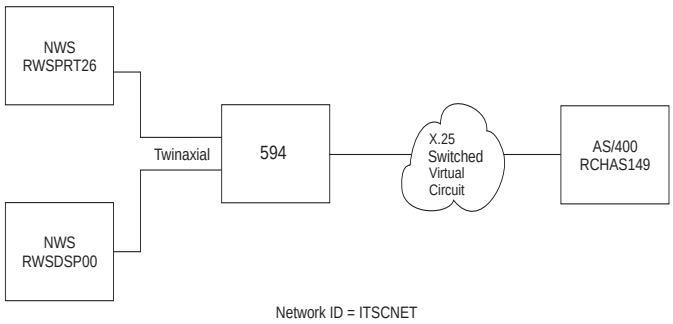


Fig. 30: X.25 Switched configuration

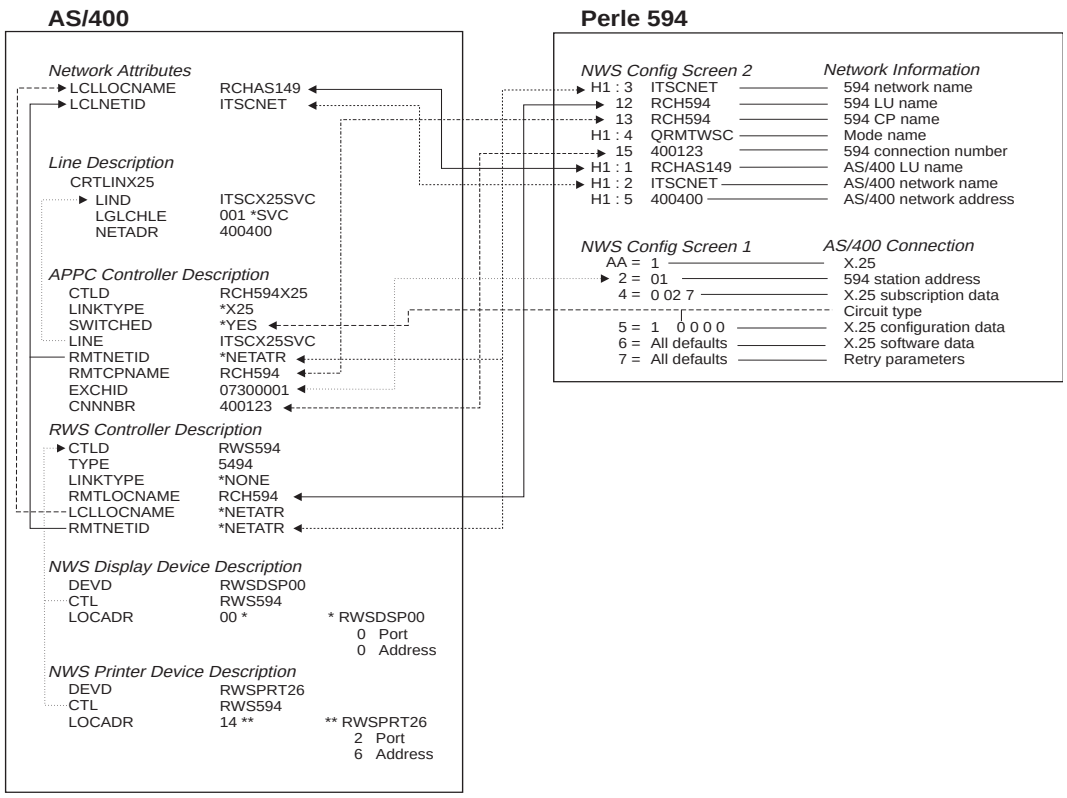


Fig. 31: X.25 Switched configuration cross-reference

X.25 Permanent

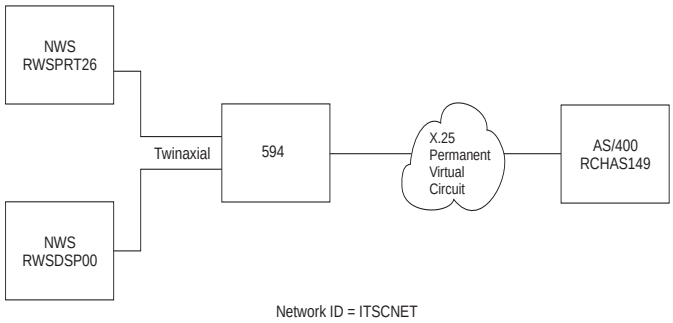


Fig. 32: X.25 Permanent configuration

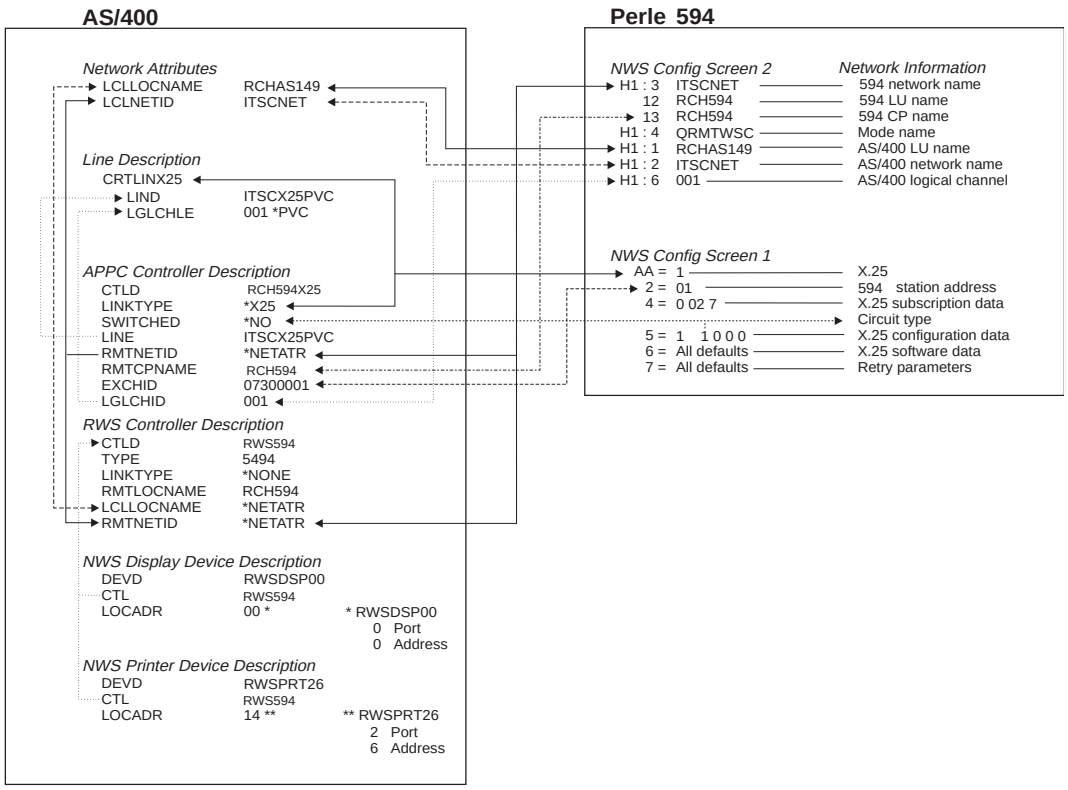


Fig. 33: X.25 Permanent configuration cross-reference

AS/400 Token-Ring Attachment

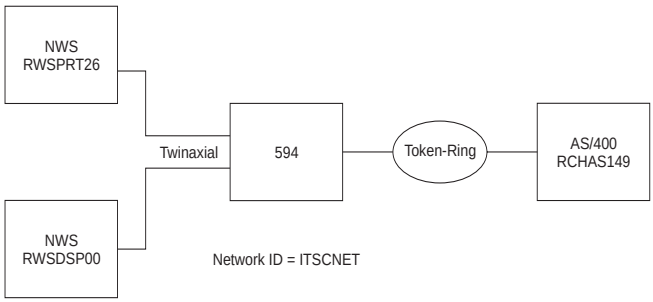


Fig. 34: AS/400 Token-Ring configuration

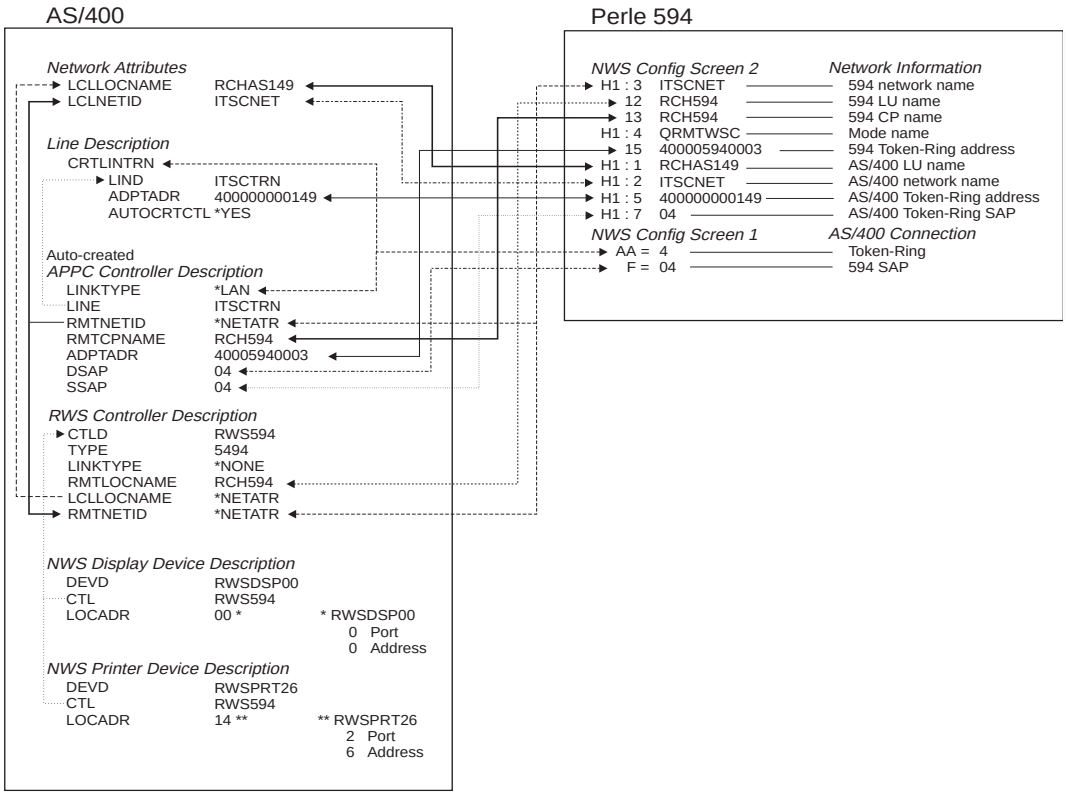


Fig. 35: AS/400 Token-Ring configuration cross-reference

AS/400 Ethernet Attachment

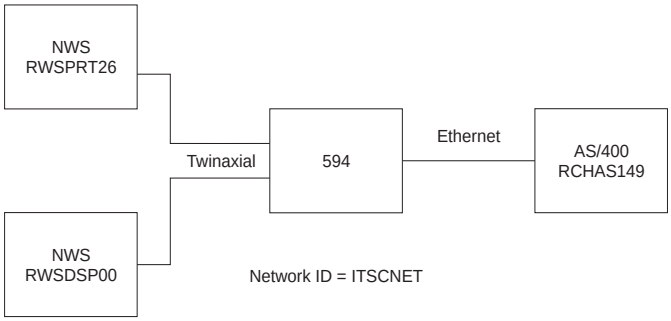


Fig. 36: AS/400 Ethernet configuration

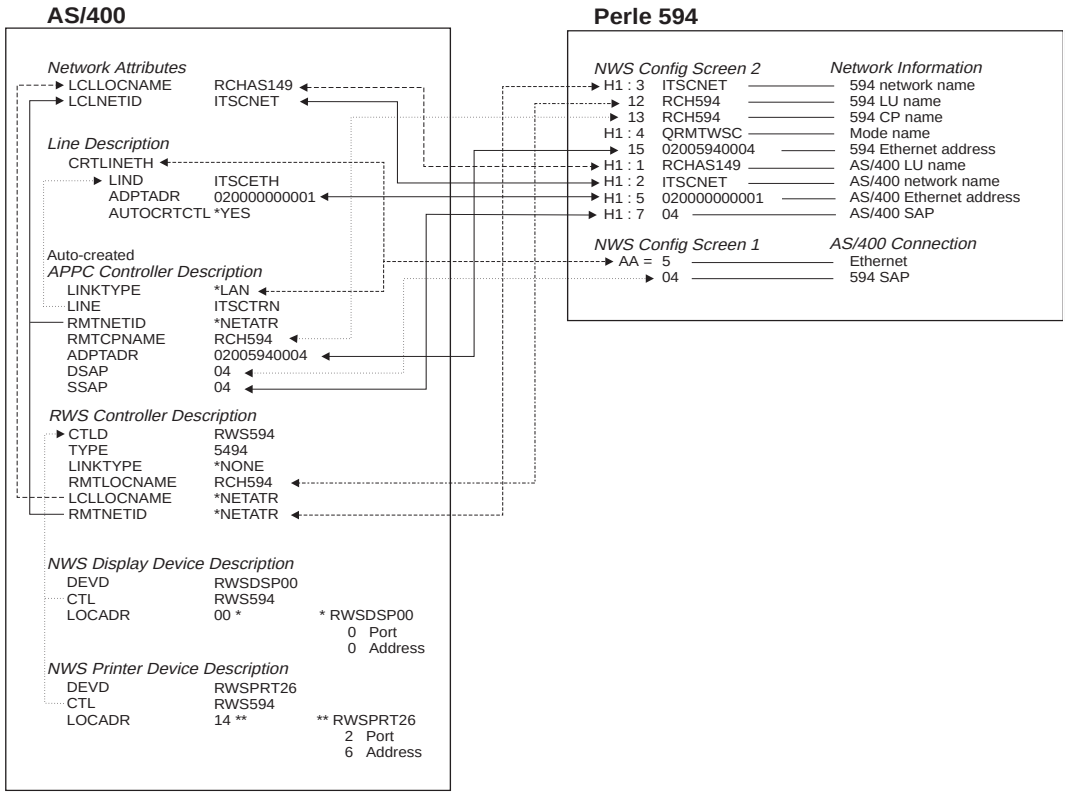


Fig. 37: AS/400 Ethernet configuration cross-reference

SDLC Leased through SNA SubArea Network

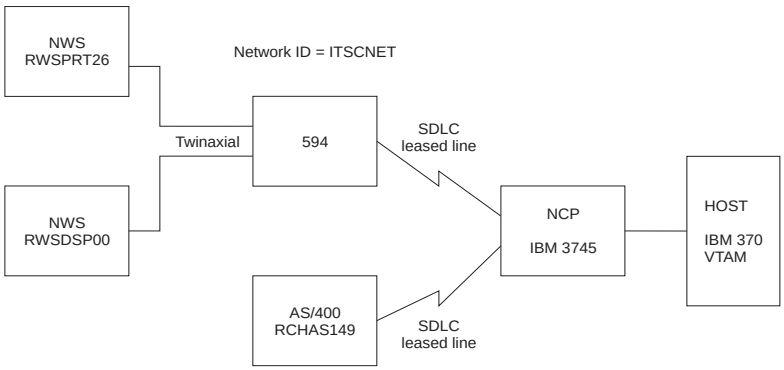


Fig. 38: SNA SubArea Network configuration

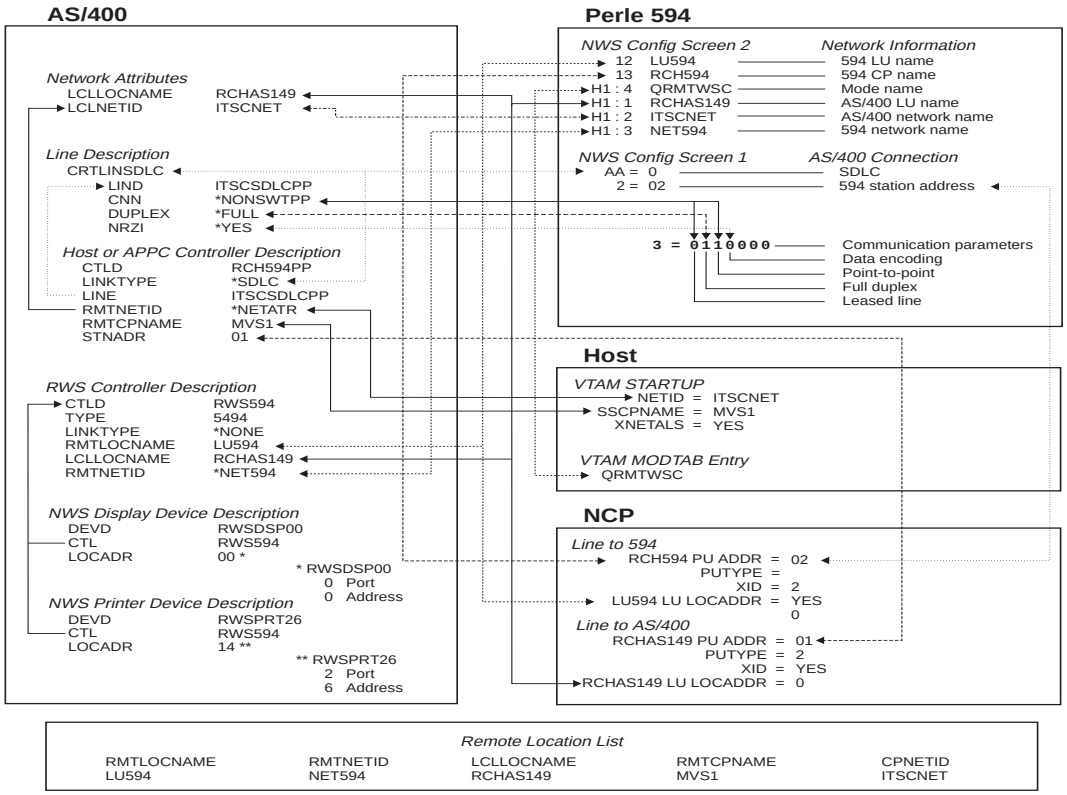


Fig. 39: SNA SubArea Network configuration cross-reference

SDLC Leased through APPN Network

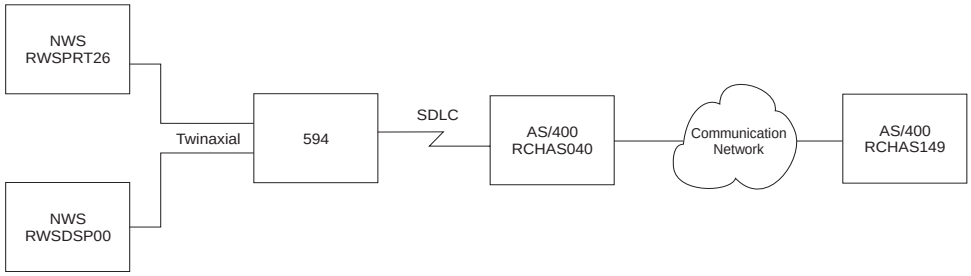


Fig. 40: APPN Network configuration

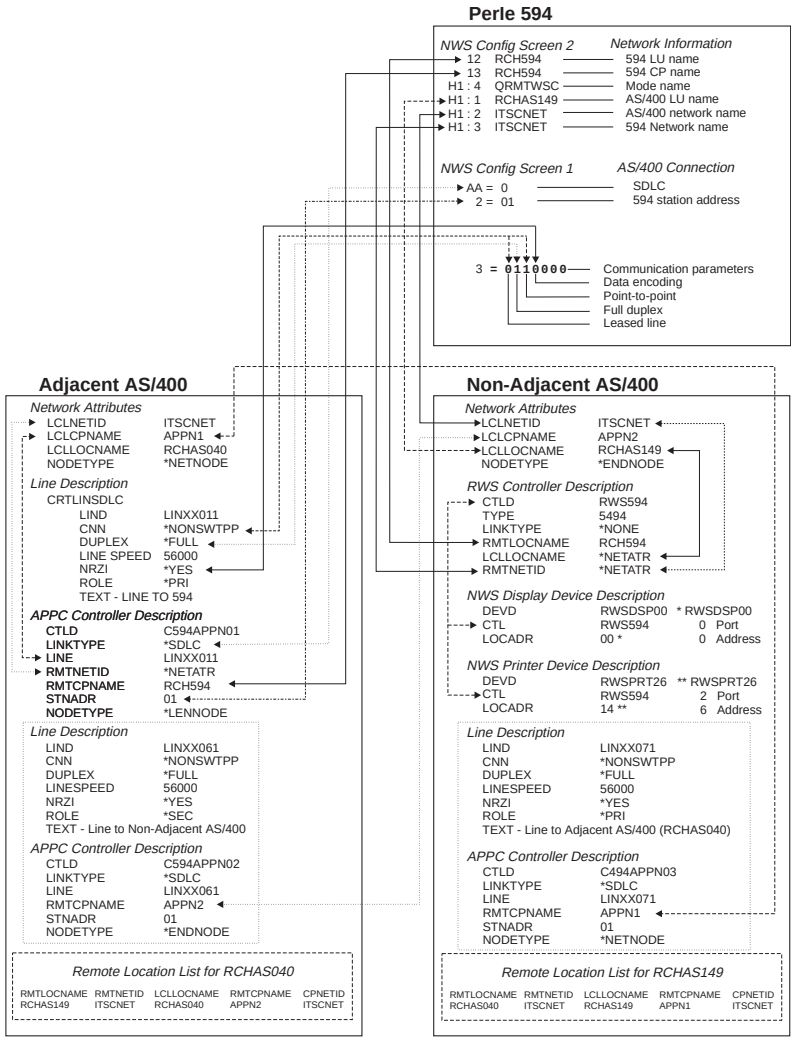


Fig. 41: APPN configuration cross-reference

AS/400 Frame Relay Attachment and FR-TR Bridge

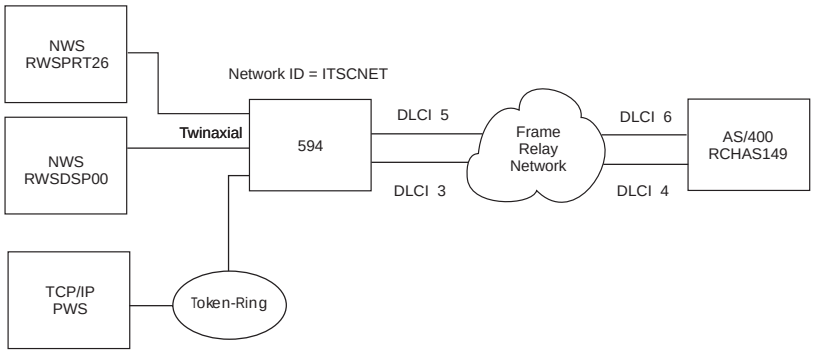


Fig. 42: AS/400 Frame Relay and IP Routing configuration

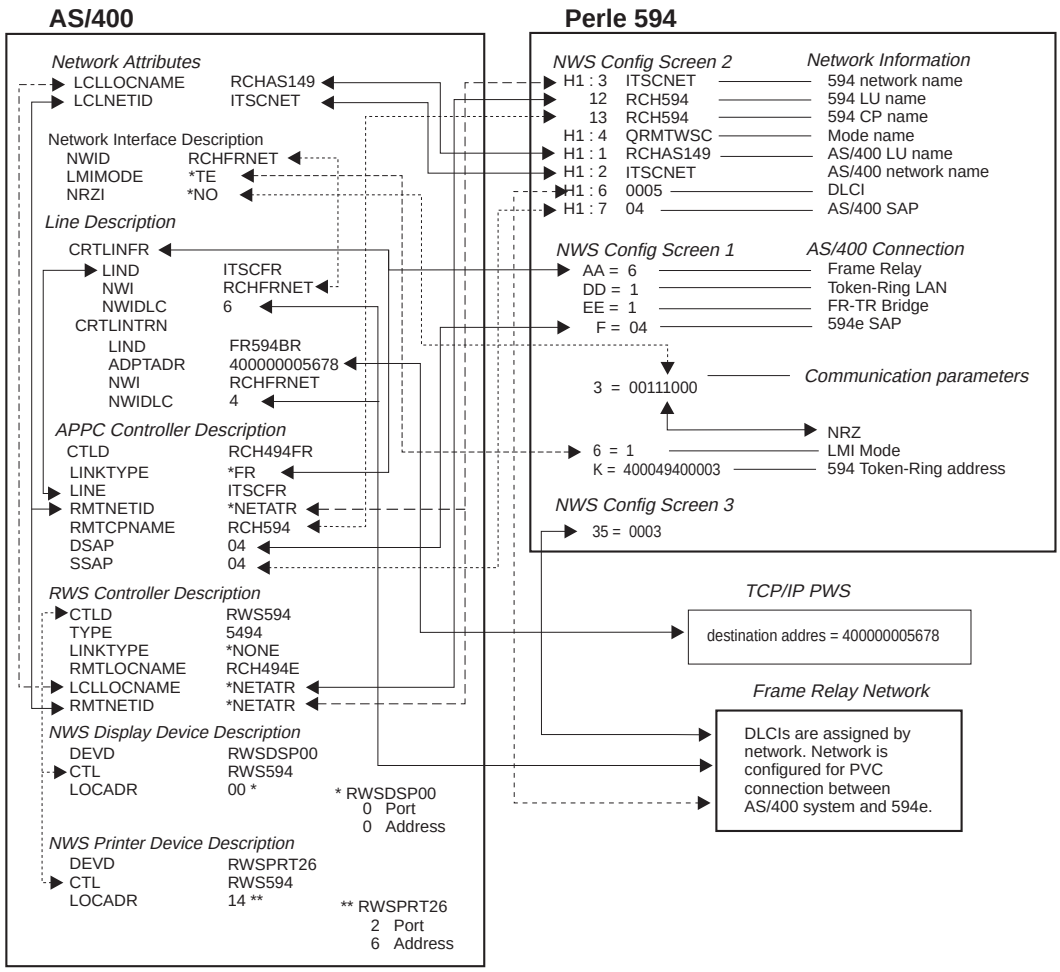


Fig. 43: AS/400 Frame Relay Configuration cross reference

AS/400 Frame Relay Attachment and IP Routing (with 594T IP Routing Feature only)

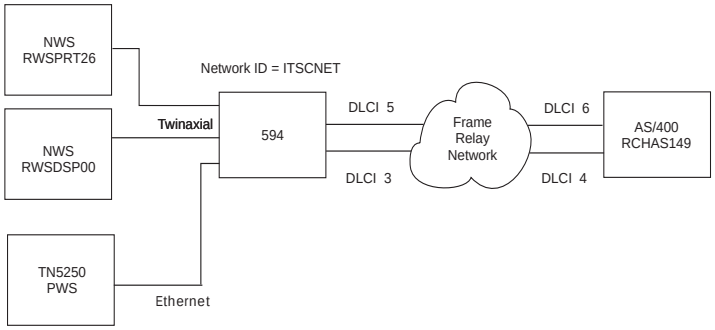


Fig. 44: AS/400 Frame Relay and IP Routing configuration

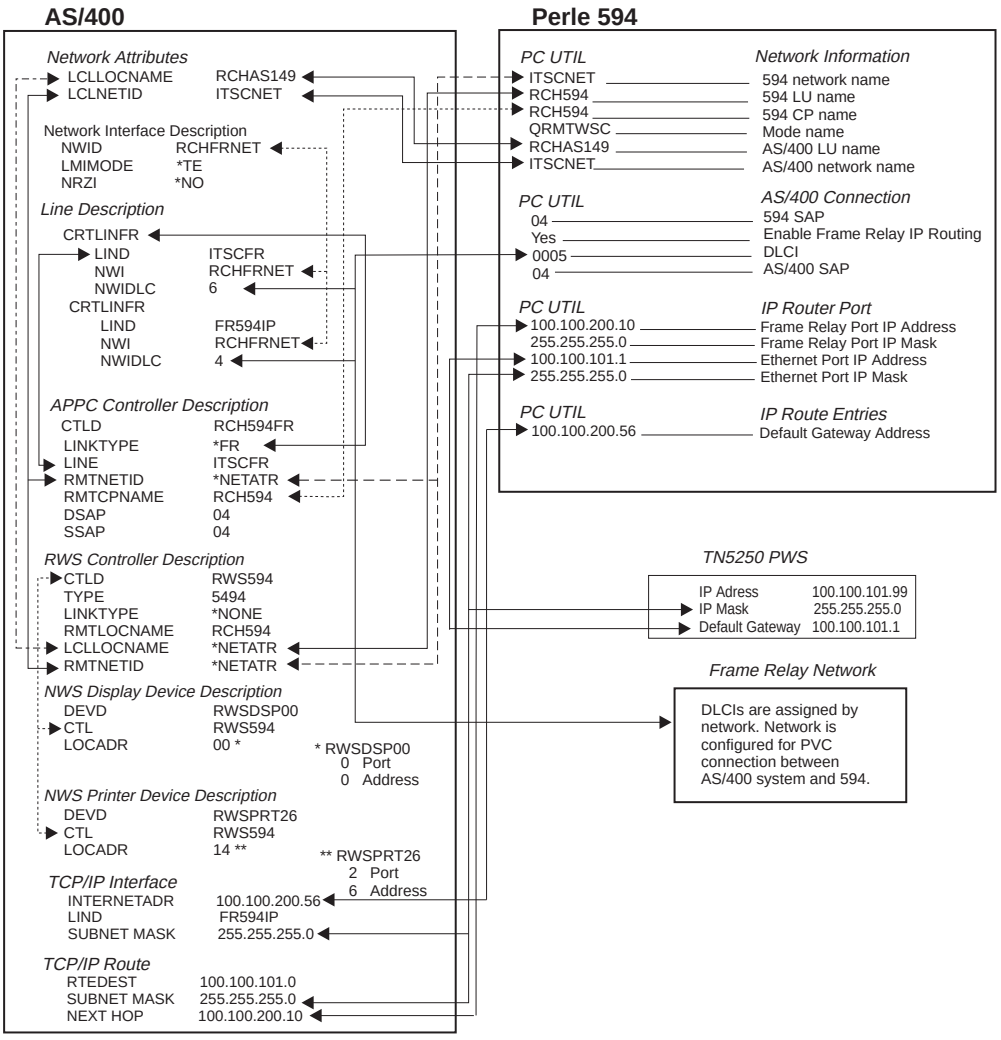


Fig. 45: AS/400 Frame Relay and IP Routing Config. cross reference

AS/400 TCP/IP Token Ring Attachment

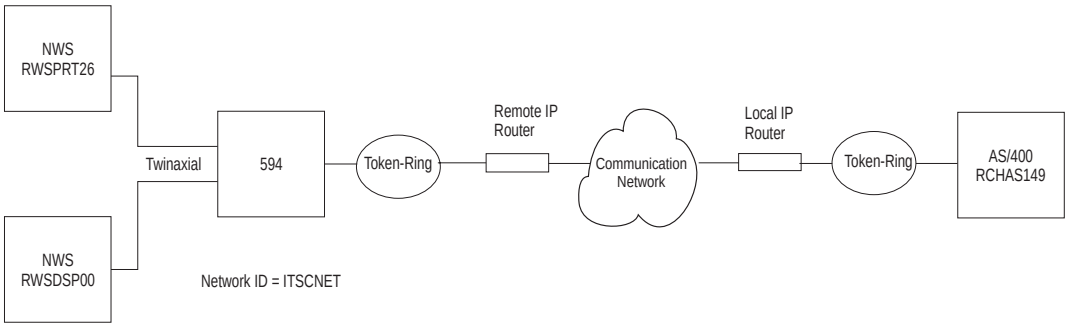


Fig. 46: AS/400 TCP/IP Token-Ring configuration

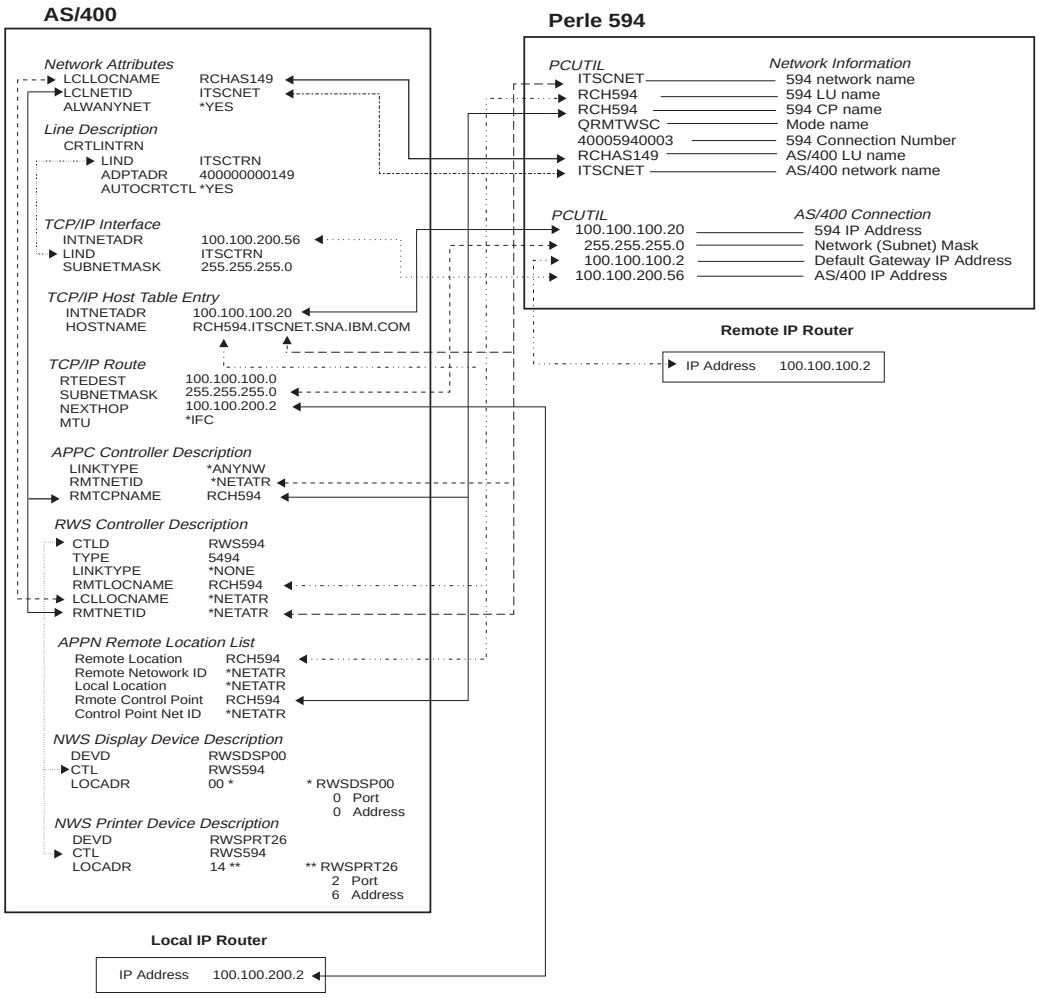


Fig. 47: AS/400 TCP/IP Token-Ring config. cross-reference

AS/400 TCP/IP Ethernet Attachment and Twinax IP Routing (with 594T IP Routing feature only)

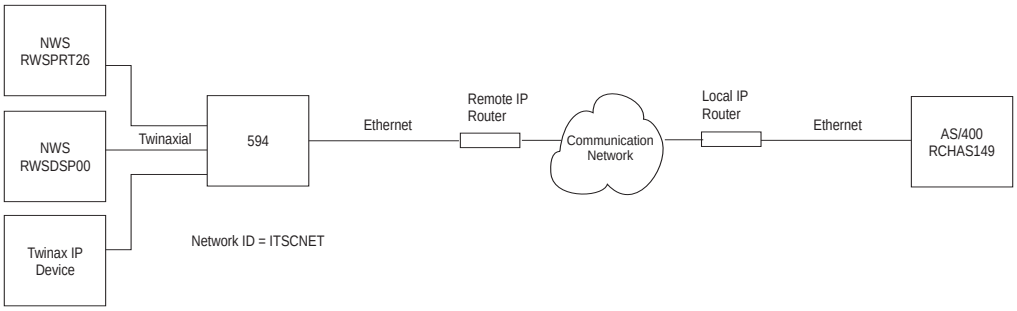


Fig. 48: AS/400 TCP/IP Ethernet configuration

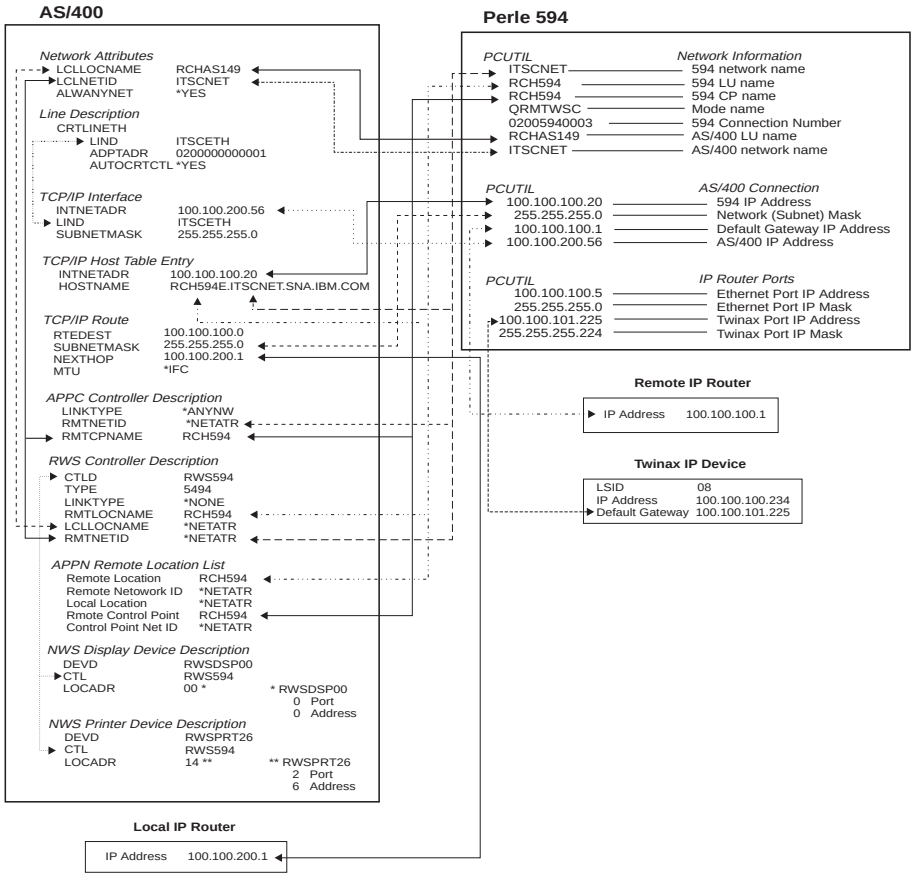


Fig. 49: AS/400 TCP/IP Ethernet and Twinax IP Routing config. cross-reference

AS/400 TCP/IP Frame Relay Attachment

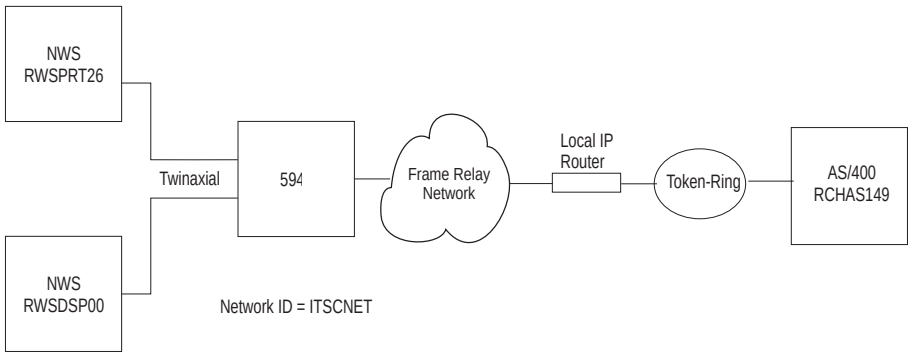


Fig. 50: AS/400 TCP/IP Frame Relay configuration

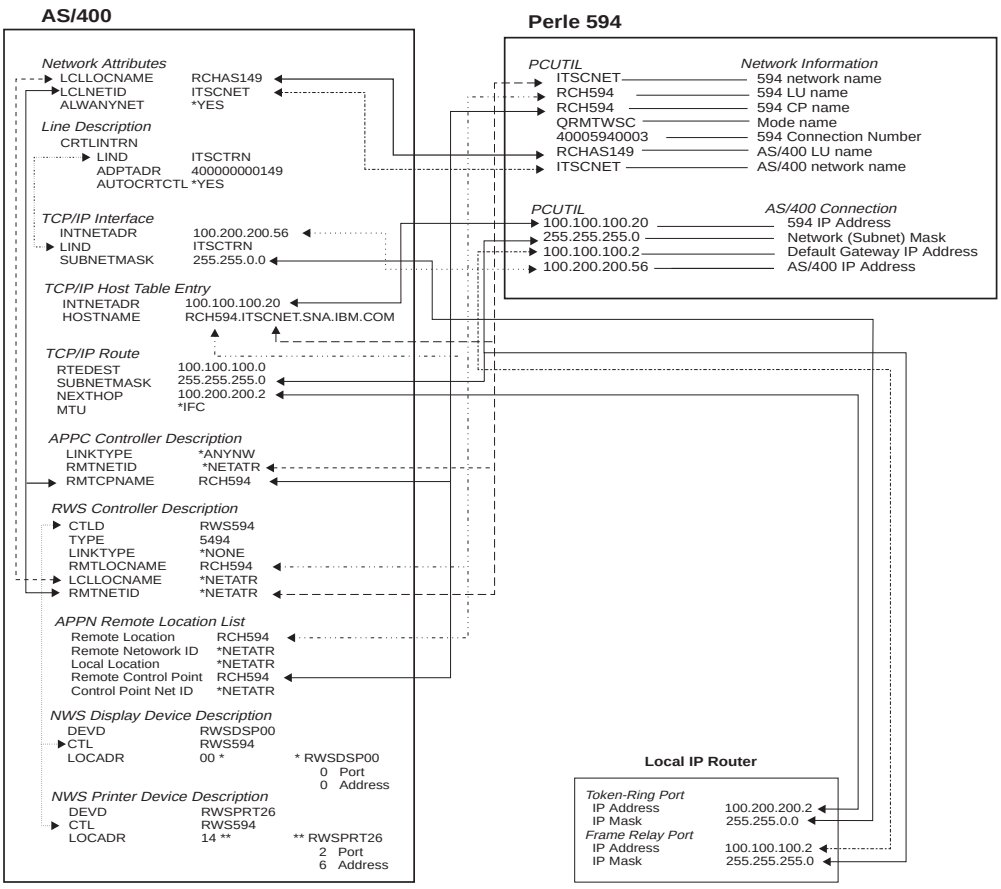


Fig. 51: AS/400 TCP/IP Frame Relay config. cross-reference

Appendix B: Understanding Configuration Parameters

This appendix contains an alphabetical list (by keyword) of configuration parameters for the Perle 594T.

594T address format

When connecting the Perle 594T to an Ethernet LAN you can use one of two formats:

- Use **Ethernet** format if the LAN connection between your controller and host is Ethernet only.
- Use **Token-Ring** format:
  - if your controller is attached to Ethernet and there are Token-Ring segments in your network
  - your network is designed to use the Token-Ring address format.

The order of the bits in each byte is reversed when you use the Token-Ring address format.

594T connection number

The 594T connection number is used as follows:

- for X.21 connections it specifies the telephone number of the Perle 594T
- for LAN connections it specifies the Perle 594T LAN address
- for X.25 connections it specifies the network address of the Perle 594T.

Set the 594T connection number as follows:

- SDLC Leased connections—The 594T connection number is not used.
- SDLC Switched/Manual Dial connections—The 594T connection number is not used.
- SDLC switched using V.25 bis
- X.25 connections—enter the network address of the Perle 594T. Field length is up to 15 numeric characters 0—9. Match to the CNNNBR parameter in the AS/400 APPC controller description.
- X.21 Switched connections—enter the network telephone number (calling number). Field length is four to fourteen numeric characters 0—9. The number must be the FULL international number, including the network ID (or country code), excluding any additional access codes. Match to the CNNNBR parameter in the AS/400 APPC controller description.
- Token-Ring AS/400 attachment—enter the Token-Ring address of the Perle 594T. Field length is twelve characters: 0—9, A—F. Match to the ADPTADR parameter in the AS/400 APPC controller description.
- Ethernet attachment—enter the 594T Ethernet address of the Perle 594T. Field length is twelve characters: 0—9, A—F. Match to the ADPTADR parameter in the AS/400 APPC controller description.
- X.21 Leased connections—The 594T connection number is not used.

594T CP Name

Specifies the control point name of the Perle 594T controller and identifies it to the AS/400 with which it communicates. This parameter MUST match the remote control point name (RMTCPNAME) in the AS/400 APPC controller description. When the Perle 594T emulates multiple controllers, each emulated controller requires a unique control point name. Field length is up to eight characters: 0—9, A—Z, $, # and @.

Note: *Perle recommends that the RMTLOCNAME and RMTCPNAME parameters use identical names to correlate the APPC controller with an RWS controller. If you do not use identical names, an entry in the Remote Configuration List is required.*

594T Ethernet address

Specifies the last 8 characters of the Ethernet feature card LAN address. The default is 0200494000XX, where XX=the slot number of the card and the first four characters are either **0200** (for Ethernet address format) or **4000** (for Token-Ring address format). Field length is twelve characters: 0—9, A—F. MUST match the ADPTADR parameter on the AS/400 APPC controller description.

594T IP Address

The IP address consists of 4 numbers each between 0-255 which are separated from each other by a period. One or more of the numbers identify the network, while the remaining numbers identify the controller (or host). If you do not plan on attaching your network to the internet, then you may choose any address you like. Otherwise, the network portion of your IP address must be assigned by InterNIC Registration Services.

594T LU Name

This parameter is the Logical Unit (LU) Name of the controller. It describes the location of the Perle 594T to a specific remote controller on the the AS/400. Field length is up to eight characters: 0—9, A—Z, $, # and @. This parameter must match the Remote Location Name in the RWS Controller Description on the AS/400 system. If there is an intermediate ALS, this parameter must also match the Remote Location Name in the ALS. When the Perle 594T emulates multiple controllers, each emulated controller requires a unique LU name.

594T Network Name

This parameter specifies the name of the network to which the Perle 594T is attached. If this parameter is left blank, the Default Local Network Name is used. The 594T Network Name contains up to 8 characters. Each character can be a number from 0 to 9 or a letter from A to Z. This parameter must match the Remote Network ID in the RWS Controller Description on the AS/400 system.

594T SAP

When using LAN connections, the 594T SAP (Service Access Point) uniquely identifies emulated controllers that share the same physical LAN address. The 594T SAP is a two-digit, hexadecimal number from 04 to FC, in multiples of hexadecimal 04. The default value is hexadecimal 04. The 594T SAP on the controller must match the LAN DSAP in the AS/400 APPC controller description.

594T SDLC Station Address

When using an SDLC connection, the Perle 594T controller's SDLC address identifies the Perle 594T to the AS/400. Valid entries are between 01 to FE (Hex). Each controller description on the same line requires a unique station address. This parameter must match the station address in the ALS. Unless the Perle 594T is communicating with an intermediate ALS, this parameter must match the station address in the APPC Controller Description on the AS/400 system.

594T Station Address

When using an X.25 or X.21 Switched communication line, the Station Address of the Perle 594T uniquely identifies this controller. The 594T Station Address contains a two-digit, hexadecimal number from hexadecimal 01 to hexadecimal FE. The default value is hexadecimal 01. This parameter must match the last two characters of the EXCHID keyword in the AS/400 APPC controller description and the station address for the X.21 Switched and the X.25 SVC.

594T System Password

Use this password with the 594T Utility Program to access the password-protected Concurrent Diagnostics feature. Valid entries include up to eight alphanumeric characters. If the password is not set, access to Concurrent Diagnostics must be enabled through the front panel.

Aborted Frames

If during a data frame, there is an occurrence of more than six logical 1s in a row, this counter is incremented by 1.

Access Code

For X.21 Switched communications, this parameter is the international access country code of the phone number. The access code is a number between 0 and 999. This parameter can be left blank (default) if no access code is required. Match this field to the SHMACC keyword on the AS/400 Line Description.

Address Format

When connecting the Perle 594T to an Ethernet LAN you can use one of two formats:

- Use **Ethernet** format if the LAN connection between your controller and PWS is Ethernet only.
- Use **Token-Ring** format:
  - if your controller is attached to Ethernet and there are Token-Ring segments in your network
  - your network is designed to use the Token-Ring address format.

The order of the bits in each byte is reversed when you use the Token-Ring address format.

Alternate Keyboard Translations

Enter a two-digit code in this parameter to enable use of a keyboard with a different language from the default keyboard type. If an Alternate Keyboard Translation is not specified, the NWSs for that controller use the Default Keyboard Translation. The Keyboard Translation is identified by a two-digit code, called a Keyboard Code. To use this feature the default and alternate keyboard translations must be multinational codes. These codes are listed in the following table:

Country Character Set	Keyboard Code
Albania	3E
Austria/Germany Multinational	21
Belgium Multinational	07
Canada/English Multinational	22
Canada/French Multinational	09
Denmark Multinational	0B
Finland Multinational	0D
France (AZERTY) Multinational	05
France (QWERTY) Multinational	1B
Icelandic Multinational	2C
International Multinational	15
Italy Multinational	11
Japanese/English Multinational	02
Japanese/Kandy Multinational	37
Japanese/Katahdin Multinational	01
Japanese Multinational	03
Latin America Multinational	0F

Country Character Set	Keyboard Code
Netherlands Multinational	2E
Norway Multinational	17
Portugal Multinational	19
Spain Multinational	1D
Sweden Multinational	1F
Swiss/French Multinational	28
Swiss/German Multinational	2A
United Kingdom Multinational	13
United States Multinational	22
Yugoslav Multinational	2F

Notes: *Up to three alternate keyboard translations can be used for each emulated controller. The Alternate Keyboard Translations parameter must match the keyboard translation for this NWS on the AS/400 system.*

AS/400 Connection Number

The AS/400 connection number is used as follows:

- for synchronous dial connections it specifies the telephone number of the network
- for LAN connections it specifies the host LAN address
- for X.25 connections it specifies the network address of the ALS.

Set the AS/400 connection number as follows:

SDLC Switched connections — Enter the network telephone number (calling number). Field length is up to 64 characters 0 - 9,:, <, =, >, P, T and &. Match to the CNNNBR parameter in the AS/400 Line Description. No entry is needed if the network does not require this parameter.

X.25 connections — Enter the network address of the ALS. Field length is up to 15 characters 0—9. Match to the NETADR parameter in the AS/400 Line Description

X.21 Switched connections — For an Address Call, enter the network telephone number (calling number). Field length is from four to fourteen numeric characters 0—9. The number must be the FULL international number, including the network ID (or country code), excluding any additional access codes. Match to the CNNNBR parameter in the Line Description. For Direct Call, use the value DC for this parameter.

Token-Ring AS/400 attachment — Enter the 594T Token-Ring address of the ALS. Field length is twelve characters: 0—9, A—F. Match to the ADPTADR parameter in the AS/400 Line Description.

Ethernet attachment — Enter the 594T Ethernet address of the ALS. Field length is twelve characters: 0—9, A—F. Match to the ADPTADR parameter in the AS/400 Line Description.

SDLC Leased connections — The AS/400 connection number is not used.

X.21 Leased connections The AS/400 connection number is not used.

AS/400 Data Link Connection Identifier (DLCI)

An identifier assigned to the link between the 594T and the network so the controller can communicate with the host using the Frame Relay protocol. If the 594T is attached directly to the host, the 594T's DLCI and the host's DLCI must match.

AS/400 Ethernet Address

Specifies the Ethernet address which is used for communicating with the AS/400. Field length is eight characters: 0—9, A—Z. This field must match the ADPTADR parameter in the AS/400 Line Description.

AS/400 IP Address

The IP address consists of 4 numbers each between 0-255 which are separated from each other by a period. One or more of the numbers identify the network, while the remaining numbers identify the controller (or host). If you do not plan on attaching your network to the internet, then you may choose any address you like. Otherwise, the network portion of your IP address must be assigned by InterNIC Registration Services.

AS/400 LU Name

This parameter is the Logical Unit (LU) Name of the host AS/400. Field length is up to eight characters: 0—9, A—Z, $, # and @. This parameter must match the Local Location Name on the AS/400. If there is an intermediate ALS, this parameter must also match the Local Location Name in the ALS.

AS/400 Network Name

This parameter is the name of the network to which the AS/400 system is attached when it is communicating with the Perle 594T. If this parameter is left blank, the Default Local Network Name is used. The AS/400 Network Name contains up to 8 characters. Each character can be a number from 0 to 9 or a letter from A to Z. This parameter must match the Local Network ID under Network Attributes on the AS/400 system.

AS/400 SAP

When using a LAN connection to the host, the AS/400 SAP (Service Access Point) uniquely identifies the host to the Perle 594T. The AS/400 SAP is a two-digit, hexadecimal number from 04 to FC, in multiples of hexadecimal 04. The default value is hexadecimal 04. The AS/400 SAP on the controller must match the LAN SSAP in the AS/400 APPC controller description.

Note: *There is no relation between the AS/400 SAP and 594T SAP, therefore, the values can be either identical or unique.*

Baud Rate

This parameter specifies the speed at which information is exchanged between this port and the modem to which it is attached.

Box Security Key

This key is used to encrypt/decrypt all keying material (keys) configured for the 594 controller. The key is entered on the 594 Utility Program prior to configuring the keying material and is also entered on the front panel at boot time. The key must be 16 digits long.

Circuit Type

This parameter specifies the type of X.25 circuit you will use to access the AS/400 system. The Circuit Type will be one of the following:

SVC A manual command is required from the Perle 594T to place outgoing call

or to answer incoming Switched Virtual Circuit (SVC) calls.

PVC — A manual command is required from the Perle 594T to establish a Permanent Virtual Circuit (PVC) link to the AS/400 system.

SVCIN — Incoming Switched Virtual Circuit calls are automatically answered by the Perle 594T.

PVC AUTO — When the Perle594T is powered on, the Permanent Virtual Circuit link to the AS/400 system is established automatically.

Connection Method

For synchronous host connections, this parameter specifies the way your modem controls auto-answer.

- In the DTR mode, the Perle 594T enables the DTR signal to indicate its readiness to accept a call.
- In the CDSTL mode, the Perle 594T waits for an enabled calling indicator that shows the presence of an incoming call.

DTR method is the most commonly used method by modems for controlling auto-answer. If you are unsure, refer to your modem documentation or contact your Network supplier.

Connection Type

This parameter specifies whether your SDLC or X.21 leased line is a point-to-point line or a multipoint line. This parameter must match the setting in the Line Description on the AS/400 system. The connection type correlates with the line facility.

A point-to-point line is a data link that connects a single remote controller with an AS/400 system. It can be a non-switched or switched connection. If your line is non-switched point-to-point, you must specify *NONSWTPP for the CNN parameter defined in the AS/400 line description. If your line is switched point-to-point, you must specify *SWTPP for the CNN parameter defined in the AS/400 line description.

A multipoint line is a data link that connects 2 or more remote controllers with an AS/400 system. It is considered a non-switched connection and is always leased. Specify multipoint (*MP) for the CNN parameter; the MAXCTL parameter must equal the total number of physical and emulated controllers on the line. You must specify multipoint if a single Perle 594T is emulating multiple remote controllers.

Continuous Retry

This parameter specifies whether the Perle 594T continuously attempts to re-establish a logical connection to the AS/400 if the logical connection is lost. When Continuous Retry is set to **Yes**, the controller will attempt every 10 minutes to re-establish the connection as long as the physical link is still active.

It is recommended that **Yes** be selected if your AS/400 is unavailable for extended periods or if a leased line is used.

Data Encoding

This parameter specifies the type of Data Encoding that your SDLC or X.21 leased line is using (i.e. NRZI or NRZ). This parameter must match the setting on the AS/400 Line Description.

NRZI specifies that non-return-to-zero inverted data encoding is used. NRZI can allow transmitters and receivers to better maintain synchronization and may be required by some modems that are sensitive to certain bit patterns in the data stream. Normally, analog connections (connections using modems) should specify NRZI data encoding. Specify *YES for the NRZI parameter defined in the AS/400 line description.

NRZ specifies that (non-return-to-zero) inverted data encoding is not used. NRZ is recommended for use with digital data circuit-terminating equipment and networks such as X.21. Specify *NO in the NRZI parameter defined in the AS/400 line description.

Note: *All equipment on the same line must specify the same data encoding method.*

Data Link Connection Identifier (DLCI)

An identifier assigned to the link between the 594T and the network so the controller can communicate with the host using the Frame Relay protocol. If the 594T is attached directly to the host, the 594T's DLCI and the host's DLCI must match.

Default Controller Address

When defining a multi-session controller, this parameter is the default controller address for each multi-session. For more information, see *Multi-session Assignment*.

Default Gateway IP Address

The value of the router while linking the controller to the remote host.

Default Keyboard Translation

For NWS attachment, this parameter defines the language and layout of the attached keyboards. The Keyboard Translation is identified by a two-digit code, called a Keyboard Code. All keyboards attached to this emulated controller will share this Keyboard Code unless defined as using an Alternate Keyboard Translation. These codes are listed in the following table:

Country Character Set	Keyboard Code	Country Character Set	Keyboard Code
Albania	3E	Korea	38
Austria/Germany	20	Latin 2	34
Austria/Germany Multinational	21	Latin America	0E
Belgium Multinational	07	Latin America Multinational	0F
Brazil	3C	Macedonia (Cyrillic)	42
Bulgaria (Cyrillic)	3F	Netherlands	2D
Canada/English	00	Netherlands Multinational	2E
Canada/English Multinational	22	Norway	16
Canada/French	08	Norway Multinational	17
Canada/French Multinational	09	Poland	43
Cyrillic	31	Portugal	18
Czech	40	Portugal Multinational	19
Denmark	0A	Romania	44
Denmark Multinational	0B	Russia (Cyrillic)	45
Finland	0C	Serbia (Cyrillic)	48
Finland Multinational	0D	Simplified Chinese	3A
France (AZERTY)	04	Slovakia	46
France (AZERTY) Multinational	05	Spain	1C
France (QWERTY)	1A	Spain Multinational	1D
France (QWERTY) Multinational	1B	Sweden	1E
Greek	32	Sweden Multinational	1F
Greek 2	3B	Swiss/French Multinational	28
Hungary	41	Swiss/German Multinational	2A
Icelandic	2B	Thai	35
Icelandic Multinational	2C	Traditional Chinese (Taiwan)	39
International	14	Turkish (83 or 122 key keyboard)	36
International Multinational	15	Turkish 2	47
Italy	10	United Kingdom	12
Italy Multinational	11	United Kingdom Multinational	13
Japanese/English Multinational	02	United States	00
Japanese/Kanji Multinational	37	United States Multinational	22
Japanese/Katakana Multinational	01	Yugoslav Multinational	2F
Japanese Multinational	03		

Default Local Network Name

This parameter is used if the 594T Network Name or the AS/400 Network name was not entered. Field length is 8 characters. Valid characters are: 0—9, A—Z, $, # and @. See *594T Network Name* for further details.

Default Mode Name (QRMTWSC)

This parameter is used if a Mode Name for the AS/400 system is not defined on the Perle 594T. Field length is 8 characters. Valid characters are: 0—9, A—Z, $, # and @. See *Mode Name* for further details.

Delay between Retries

When using an X.21 Switched host connection, this parameter sets the delay between Short Hold Mode retries. The Delay between Retries is entered in seconds, from 1 to 15. The default value is 6 seconds.

Diagnostic Code Format

Specifies the format of the diagnostic codes sent by the 594T in Call Clearing, Restart or Reset packets. The option represents the year the standard was written.

Dial Digit Format

When using an X.21 Switched host connection, this parameter specifies the format of the 594T and AS/400 Connection Numbers. Two Dial Digit Format are used: Data Network Identification Code (DNIC) or Data Country Code (DCC). DNIC format uses a four-digit network ID followed by a network terminal number. DCC format uses a three-digit country code followed by the national number. The default is DNIC.

Direct Call Support

When using an X.21 Switched host connection, this parameter specifies whether the controller uses Direct Call to re-establish a link to the AS/400 system. The default is that the controller will not use Direct Call.

DLCI

An identifier assigned to the link between the 594T and the network so the controller can communicate with the host using the Frame Relay protocol. If the 594T is attached directly to the host, the 594T's DLCI and the host's DLCI must match.

Enable Inactivity Time Limit

This option specifies whether the ASCII Feature Card automatically disconnects devices that have been inactive for a specified period of time. This can prevent unnecessary telephone charges if a user fails to properly disconnect their device or modem. The time limit is specified in the Inactivity Time Limit field. When the time limit is reached, the ASCII Feature Card notifies the AS/400 of the disconnection and ends the session.

Select **No** to disable the Inactivity Time Limit. The connection will never be dropped due to inactivity.

Ethernet address

This is the Ethernet address of the Perle 594T Ethernet Feature Card when used as a LAN gateway. The default address is 0200494000xx, where xx is the slot number of the Feature Card. The field length is twelve characters: 0—9, A—F. All PWSs on the same Ethernet gateway must use the same Ethernet address.

Ethernet Frame Format

This field is used to identify the Ethernet frame type or standard to be used on the Ethernet local area network. The Perle 594T supports the Ethernet IEEE 802.3 standard and the Ethernet version 2.0 standard by DEC, Intel, & Xerox (DIX) corporations. The advantages of specifying the IEEE 802.3

standard is that it supports frame sequencing, flow control and error recovery capabilities which the DIX version 2 standard does not support.

A third option supported by the Perle 594T is AUTO CONFIG. The Auto Configure option allows the Perle 594T to automatically adjust to the frame type being used by the AS/400. However, the initial connection to the AS/400 may be a little slower since the Perle 594T tries one frame type first and if no response is received, it tries the other frame type.

Unless AUTO CONFIG is specified, this field must match the ETHSTD parameter defined in the AS/400 Line Description.

FCS Error Count

If the FCS (Frame Check Sequence) is incorrect, this counter is incremented by 1.

Flow Control Negotiation Allowed

This feature lets you alter packet size and packet window size. If the network allows flow control negotiation, you can change the packet size and packet window size from call to call.

Frame Relay LMI Mode

Select which LMI (Link Management Interface) mode will be used for the 594T. LMI specifies the exchange of management-related information.

Note: *The mode you select must match the mode configured on the network or, if you attached directly to the host, the mode must match the mode configured on the AS/400.*

Full Inquiry Interval

On a regular basis, the 594T sends to the network a "full" Status Enquiry message that contains more information than is contained in a standard Status Enquiry. Full Inquiry Interval (FULLINQITV) is the number of Status Enquiry messages sent between full Status Enquiry messages plus 1 (so the full Status Enquiry message will be included in the count).

Inactive Timer (Ti)

When using a LAN connection, the Inactive Timer (Ti) is used to detect an inoperative condition on the LAN. If there has been no data received or transmitted during the Inactive Timer interval, a message will be sent to verify that the connection is still active. If there is no response to this message, the 594T will wait for the Inactive Timer to expire again, then retry. This will repeat for the number of times set by the Retry Count (N2) value. If there is no response after the Retry Count has expired, the 594T will disconnect the link and will then attempt to re-establish communications.

The inactive timer (Ti) value should be at least 5 to 10 times greater than the response timer (T1) value. Valid entries are from 1 to 99 seconds. The default is 30 seconds. If the response timer (T1) is specified as "*", then the default Ti value of 30 seconds is adequate. This field should match the LAN Inactivity Timer (LANINACTMR) parameter defined in the AS/400 APPC controller description.

Inactivity Time Limit

This parameter is the amount of time that the ASCII Feature Card allows the connection to remain idle before disconnecting the device from this port. When the time limit is reached, the ASCII Feature Card ends the session. This can prevent unnecessary telephone charges if a user fails to properly disconnect their device or modem. The time is entered in minutes, from 1 to 99. To use the Inactivity Time Limit, set the Enable Inactivity Time Limit field to Yes.

LAN Link Station Status (Gateway)

Displays status of 594T-to-workstation link station status.

LAN Link Station Status (Upstream)

Displays status of 594T-to-host link station status.

Line Facility

When using a synchronous host line connection, this parameter specifies whether the line operates in Half Duplex or Full Duplex mode. Half Duplex mode allows communication in only one direction at a time, but allows more than one physical controller to be attached to a line. Full Duplex allows communication in both directions simultaneously, but only allows one physical controller to be attached to the line. In cases where Full Duplex operation can be used, better performance may result.

Use Half Duplex if you have more than one physical controller sharing the line. Use Full Duplex if you have only one physical controller sharing the line. You may use Full Duplex if you have a single 594T on a line and it is emulating multiple controllers.

This field must match the DUPLEX parameter defined in the AS/400 line description. In addition, all communications equipment on the line should be set accordingly.

Line Speed (valid For Direct Cable Only)

When using a synchronous host line connection, this parameter specifies the speed at which data is transmitted on the communication line. The Line Speed is specified only if the Perle 594T is being directly connected to the AS/400 system. Otherwise, the line speed is established by the modems.

Valid line speed entries are from 1200 to 128000 bits per second. This field must match the LINESPEED parameter defined in the AS/400 line description.

Line Type

For an SDLC host connection, this parameter specifies the type of line you are using: leased or switched/manual dial. A leased line is permanently allocated to the Perle 594T and is always available for its use. A switched/manual dial line is a switched point-to-point line that requires dialing to establish a connection between the Perle 594T remote site and the AS/400 site. The default is a leased line.

Link Initiation

This parameter specifies by what means link initiation is accomplished. Either the network alone performs link initiation; or either the network or the 594T performs link initiation.

Link State/LLC State

Link State:

1 = Disconnected
2 = Define station sent
3 = Define station done
4 = Test sent
5 = Test done
6 = XID sent
7 = XID done
8 = Connected

LLC State:

1 = Reserved
2 = Reserved
3 = Reserved
4 = Closing
5 = Closed
6 = Reserved
7 = Open
8 = Connecting
9 = Connected
10 = Close station

Link Window Size

For an X.25 connection, this parameter specifies the maximum number of information frames (I-frames) which can be awaiting acknowledgment at any one time. The Link Window Size can be from 1 to 7, but must match the Link Window Size specified in your X.25 Network Subscription. In a network with large transmission delays, a larger Link Window Size may increase throughput.

LMI Protocol Error Count

If the 594T detects an error in the format of an LMI Status Enquiry response message, this counter is incremented by 1.

LMI Sequence Error Count

If the 594T detects an error in the sequence number of a response to an LMI Status Enquiry, this counter is incremented by 1.

LMI Timeout Count

If the network does not respond to a 594T LMI Status Enquiry within the Polling Interval time (Pollitv), this counter is incremented by 1

Local Loopback Supported

Local loopback is a test used to determine if the modem attached to the 594T is operating correctly.

Logical Channel

For an X.25 connection, this parameter is the logical channel number used for connection with the AS/400 system. This parameter is only required for SVC circuits and must match the logical channel assigned by your network.

The Logical Channel contains 3 characters. Each character can be a number from 0 to 9 or a letter from A to F. The first character specifies the Logical Group Number. The last two characters specify the Logical Channel Number. Each alternate AS/400 system can have a different Logical Channel.

Logical Link Control (LLC)

When using an X.25 host connection, this parameter specifies the type of LLC used between the Perle 594T and the AS/400. The LLC provides end-to-end link level functions to the SNA protocol. Two LLCs are supported: Qualified Logical Link Control (QLLC) and Enhanced Logical Link Control (ELLC). The default is QLLC. This parameter must match the LLC specified on the AS/400 system.

Manual Options

These options permit the operator to change call parameters from call to call.

Maximum In (N3)

When using a LAN connection, this parameter specifies the maximum number of information frames that the Perle 594T can receive before sending an acknowledgment. An acknowledgment indicates whether all frames since the previous acknowledgment were error free. If the acknowledgment indicates an error, all frames since the previous acknowledgment are retransmitted.

In an error free network, it is best to set Maximum In to a large value. This will improve throughput by reducing the number of acknowledgments.

In an error-prone network, it is best to set Maximum In to a small value. This will increase the probability that a successful acknowledgment will be returned and will reduce the number of frames that must be retransmitted.

The N3 parameter should be half of the Maximum Out (TW) value. Valid entries are from 1 through 4 frames. The default is 1 frame. This field should match the LAN Max Outstanding Frames (LANMAXOUT) parameter defined in the AS/400 APPC controller description.

Maximum Out (TW)

When using a LAN connection, this parameter specifies the maximum number of sequentially numbered frames which the controller can send before it must receive an acknowledgment. An acknowledgment indicates whether all frames since the previous acknowledgment were error free. If the acknowledgment indicates an error, all frames since the previous acknowledgment are retransmitted.

In an error free network, it is best to set Maximum Out to a large value. This will improve thoroughput by reducing the number of acknowledgments.

In an error-prone network, it is best to set Maximum Out to a small value. This will increase the probability that a successful acknowledgment will be returned and will reduce the number of frames that must be retransmitted.

The Maximum Out parameter can be from 2 to 8. The default value is 2. The Maximum Out parameter must be at least two times as large as the Maximum In (N3) parameter. If you are using a LAN AS/400 attachment and Alternate AS/400 systems, you must enter the Maximum Out value for each AS/400 system. This field should match the LAN Acknowledgment Frequency (LANACKFRQ) parameter defined in the AS/400 APPC controller description.

Misaddressed Frames

If the 594T receives a frame having an address that the 594T is not configured for, this counter is incremented by 1.

Mode Name

This Network parameter is the name of the Mode Description which will be used for communication with the AS/400. The Mode Name defines LU6.2 communications characteristics. A Mode Name contains up to 8 characters. Each character can be a number from 0 to 9, a letter from A to Z or one of the following symbols: $, # or @.

An AS/400 predefined mode is supplied for use with remote controllers named QRMTWSC. Perle recommends that you use this mode.

Network (subnet) Mask

This parameter is a bit mask that defines the portion of an IP address that identifies the network. The mask is logically added with the IP address to determine which network the host or controller is attached to.

Network Subscription

Specifies the level of the X.25 network used to access the controller. The parameter indicates the year the standard was issued.

No Receive buffers

If the 594T runs out of buffer space, this counter is incremented by 1.

Number of filtered frames

Number of times there was invalid data in the Frame Relay header.

Number of frames received in error

Number of FCS errors received.

Number of frames received with BECN

Number of times the BECN (Backward Explicit Congestion Notification) bit in the Frame Relay Core header was set.

Number of frames received with DE

Number of times the DE (Discard Eligibility) bit in the Frame Relay Core header was set.

Number of frames received with FECN

Number of times the FECN (Forward Explicit Congestion Notification) bit in the Frame Relay Core header was set.

Number of Retries

X.21 switched — When using Short Hold Mode, this parameter is the number of times that the controller will attempt to re-establish a link to the AS/400 after a Short Hold disconnect. The Number of Retries can be from 0 to 255. The default value is 5 retries.

X.25 — This parameter is the number of times that the controller will resend a transmitted frame that was not successfully received. The Number of Retries can be from 0 to 255. The default value is 10 retries.

Number of times T1 timer expired

Number of times the Response Timer expired.

Overruns

If the 594T cannot receive data fast enough to keep up with the data rate, this counter is incremented by 1.

Packet Level Sequence Numbering

Specifies the set of numbers used to identify packets. Modulo 8 specifies numbers 0-7; modulo 128 specifies numbers 0-127.

Packet Size

This parameter specifies the size of each packet, in bytes. The Packet Size can be 64, 128, 256 or 512 bytes. The default Packet Size is 128 bytes.

Packet Window Size

When using an X.25 host connection, this parameter specifies the maximum number of outstanding packets which can be sent before an acknowledgment must be received. The Packet Window Size can be from 2 to 7. The default value is 2.

Password

When using an X.25 host connection and there are multiple emulated controllers defined for the Perle 594T, this parameter is used to uniquely identify this controller to the X.25 network during link establishment. It is only required when Switched Virtual Circuits (SVC) are being used. A password is necessary with an SVC since the Logical Channel number is assigned dynamically and, therefore, cannot be used to identify a specific controller.

This parameter is not required if the Perle 594T is emulating a single controller.

PM CTS Error Count

If the CTS signal is dropped by the modem connecting the 594T to the network, this counter is incremented by 1.

PM DSR Error Count

If the DSR signal is dropped by the modem connecting the 594T to the network, this counter is incremented by 1.

Polling Interval

The 594T repeatedly sends a Status Enquiry message to the network. The Polling Interval (POLLITV) value is the number of seconds between Status Enquiry messages.

Printer Port and Station

When using the NWS Configurator, this field identifies the printer to which configuration screens will be sent during a Print Screen. This field specifies the following: port address and workstation address.

Receiver Acknowledgment Timer (T2)

When using a LAN connection, T2 specifies the maximum amount of time that the Perle 594T waits before sending acknowledgments to the sender. The Perle 594T will send an acknowledgment as soon as the T2 timer expires. Before the T2 timer expires, the Perle 594T determines whether it can send an acknowledgment along with an information frame. If an information frame is not available, the Perle 594T will only send an acknowledgment. Therefore, a larger T2 value could improve performance on the network by reducing the number of frames.

If the LAN connection is to the host, the T2 timer must be set to a value that is less than the AS/400 LAN Response Timer (LANRSPTMR) parameter defined in the AS/400 APPC controller description. This is to ensure that an acknowledgment is received before the AS/400 LAN response timer expires. If the AS/400 LAN Response Timer expires, the link will be lost and the Perle 594T must attempt to re-establish communications again.

Valid entries are from 1 to 255 milliseconds. The default is 30 milliseconds. This field should match the LAN Acknowledgment Timer (LANACKTMR) parameter defined in the AS/400 APPC controller description.

Reconnect Time Limit

This parameter is the amount of time during which the ASCII Feature Card will maintain the AS/400 session following an inadvertent disconnection. While this timer is active, the user can reconnect to the port and continue the AS/400 session. After the time limit is reached, the ASCII Feature Card will inform the AS/400 of the disconnection and end the session.

The time is entered in minutes, from 0 to 99. When zero is entered, the ASCII Feature Card will immediately notify the AS/400 system of the disconnection. For more information, see *Enable Reconnect Time Limit*.

Residue Errors

If the FCS (Frame Check Sequence) for a valid data frame contains any more data bits, this counter is incremented by 1.

Response Timer (T1)

For a LAN connection, T1 specifies the amount of time that the Perle 594T waits for an acknowledgment or a response from the network. The T1 timer should be set to a value that is equal or greater than the maximum delays accumulated in a network. This delay is dependent on the number of bridges between the Perle 594T and the AS/400 system, the queuing delay at those bridges, the buffer sizes at those bridges and the transmission delay across the link.

If the T1 setting is lower than the total delays in the network, the T1 timer will expire before a response to a frame is received. If attempts to resend the frame also fail, the Perle 594T will drop the link and will start the sequence to re-establish communications. All active sessions with the AS/400 will be brought down if this occurs.

If the T1 timer is set much higher than the total delays in the network, performance can be affected. For example, if an information frame is lost or damaged due to line errors, the Perle 594T needs to wait longer before detecting that there has been a line error.

Valid entries are from 1 to 20 seconds. The default is 1 second. A setting of 1 to 2 seconds is typical, however, this value is dependent on the number of bridges in the network. Also, since delay is affected by LAN congestion, the delay may vary throughout the day. For Token-Ring, enter an * for the Perle 594T to automatically calculate T1 based on the number of bridges in the path.

This field should match the LAN Frame Retry (LANFRMRTY) parameter defined in the AS/400 APPC controller description.

Retry Count (N2)

When using a LAN connection, this parameter specifies the number of times the Perle 594T attempts to resend an information frame following the expiration of the response timer (T1). If the specified retry count expires and no responses are received, the Perle 594T drops the link and attempts to re-establish communications.

Valid entries are from 1 to 99 retries. The default is 8 retries. If you have an error-prone network, you may need to increase this value. This field should match the LAN Frame Retry (LANFRMRTY) parameter defined in the AS/400 APPC controller description.

Retry Counter

The number of times that the Perle 594T attempts to re-establish a logical connection to the AS/400. The Retry Counter is from 0—255. The default value is 10.

Retry Interval

This parameter specifies the amount of time that the Perle 594T will wait between attempts to re-establish a logical connection to the AS/400 if the logical connection is lost. The Retry Interval is measured in 10-second increments from 1 to 60 (i.e., from 10 to 600 seconds). The default value is 6 (i.e., 1 minute).

Retry of Optional Call Progress Signals

When using an X.21 Switched host connection, a Call Process Signal (CPS) is returned if a Short Hold Mode link re-establishment fails. If a CPS from the table below is returned, the 594T will consider the link to have failed and not attempt to retry. However, in some X.21 networks, some of the codes may be returned when a retry should be attempted.

If you wish to have the 594T retry if any of the Call Process Signals below are received, specify them in the field. Up to eight call progress signals can be tried again. These signals are listed in the following table:

Code	Meaning
01	Terminal called
02	Redirected call
03	Connect when free
04	Private network reached
05	Public network reached
41	Access barred
42	Changed number
43	Not obtainable
44	Out of order
45	Controlled not ready
46	Uncontrolled not ready
47	DCE power off
48	Facility request not valid
49	Network fault in local loop
51	Call information service

52	Incompatible user class of service
71	Long-term network congestion
72	RPOA out of order

Consult your network representative before entering any codes. CPSs which start with 2 and 6 are automatically tried again during SHM link re-establishment and should not be entered here.

Reverse Charging Accepted

Reverse charging refers to a facility that allows virtual calls to be billed to the receiving DTE.

SAP

The Service Access Point (SAP) is used as the logical address for communicating with the PWS. When the Perle 594T emulates more than one LAN gateway, the SAP can be either unique or identical because LAN Feature Cards are distinguished from one another by their unique network address. Valid characters are from 04 to FC, in multiples of 04. The default is 04. All PWSs on the same LAN gateway must specify the same SAP.

Seconds Between Retries

When using an X.25 connection, this parameter is the amount of time that the controller will wait for a response to a transmitted frame. It is also used to determine the time that the controller will wait before sending a link initiation request. The Seconds Between Retries is from 1 to 60. The default value is 3 seconds.

Send Leading Pad

When using an SDLC host connection, a leading pad character will be added to all information frames if Send Leading Pad is set to Yes. Some modems require a leading pad for synchronization. If your modem requires a leading pad character, you must also select NRZI data encoding. Note that specifying an incorrect entry for this field may cause retransmission of frames and degrade line performance.

Serial Number

This parameter is a user-defined serial number for this controller. The Serial Number is sent to the AS/400 system in some messages for purposes of identification. The Serial Number contains 7 characters. Each character can be a number from 0 to 9 or a letter from A to Z.

Choose a Serial Number that uniquely identifies this controller to the AS/400 system. If no Serial Number is entered, then seven zeros are used. If network user verification is used, the first 2 characters of the Serial Number must be "XI".

Although you may wish to set this field to the 594T Hardware Serial Number, this relationship is not enforced. If the unit is emulating multiple controllers, the serial number for each of the emulated controllers should be unique.

Slot

On the 594T - Configuration - Hardware screen, this parameter displays the Card ID for each slot which is currently defined. Slots which are not yet defined display blanks. Card IDs can be changed to match the actual hardware configuration for slot 3 only. The following table lists valid Card IDs for slot 3:

Slot Number	Purpose
1	97 (Synchronous Communication Card)
2	48 (Twinaxial Feature Card)
3	43 (Token-Ring Feature Card) 45 (Ethernet Feature Card) 49 (Fast Ethernet Feature Card)

Telenet-Type Network Attachment

This parameter specifies whether or not the 594T is attached to a Telenet-type network. If not, the 594T responds with a DISCONNECT MODE (DM) to a DISC received after sending SABM. If the 594T is attached to a Telenet-type network, the network expects the 594T to respond with UNNUMBERED ACKNOWLEDGMENT (UA) to a DISC command after sending SABM.

Token-Ring Address

This is the Token-Ring address of the Perle 594T Token-Ring Feature Card when used as a LAN gateway. The default address is 4000594000XX, were XX is the slot number of the Feature Card. Each emulated controller must specify a unique Token-Ring address. Field length is twelve characters: 0—9, A—Z. All PWSs on the same Token-Ring gateway must use the same Token-Ring address.

Total number of bytes received

Total number of data bytes received from the host/network.

Total number of bytes transmitted

Total number of data bytes transmitted to the host/network.

Total number of frames received

Total number of data frames received from the host/network.

Total number of frames transmitted

Total number of data frames transmitted to the host/network.

Underruns

If the 594T cannot send data fast enough to keep up with the data rate, this counter is incremented by 1.

Appendix C: Solving Problems

This appendix contains a procedure to diagnose problems and resolve error conditions. Also included are the following topics:

- Operator Panel LEDs
- Power-On Options
- LCD Message Formats
- Making Status Requests
- Restarting Token-Ring Communication.

Problem Determination

To diagnose and resolve problems, do the following:

1. Is a system reference code (SRC) displayed on any workstation?

   Yes Look up the SRC in this appendix.

   No Proceed to step 2.

2. Is a 3-digit message code displayed on the operator panel LCD?

   Yes Write down all numbers displayed on the LCD. Look up the message code in this appendix.

   No Proceed to step 3.

3. Is the Ready LED on?

   Yes Go to step 11.

   No Proceed to step 4.

4. Do the following:
   a) Turn off the power on the Perle 594T.
   b) Ensure that the Controller Software Diskette is inserted into the Perle 594T diskette drive.
   c) Turn on the power on the Perle 594T.

5. Does a message code display within 2 minutes?

   No Go to step 7.

   Yes Proceed to step 6.

6. Is the Ready LED on?

   Yes The problem is resolved.

   No Call your 594T service representative.

7. Check for one or more of the following signs that electrical power is reaching the Perle 594T:
   a) The cooling fan is operating.
   b) One or more LEDs are on.
   c) A message is displayed on the LCD.
   d) The diskette activity indicator has come on.

8. Is electrical power reaching the Perle 594T?

   Yes Call your 594T service representative.

   No Go to step 9.

9. Is the Perle 594T properly connected to the electrical outlet?

   No Turn off the power on the Perle 594T and connect the power cord. The problem is resolved.

   Yes Go to step 10.

10. Test the outlet with another electrical device.

    Is electrical power available?

    No The problem has been located. Take the necessary steps to restore electrical power to the outlet.

    Yes Call your 594T service representative.

11. Are any twinaxial workstations not communicating?

    Yes Proceed to step 12.

    No Go to step 18.

12. Locate the Twinaxial Feature Card to which the nonfunctioning workstation(s) are attached. Are any workstations communicating with this Twinaxial Feature Card?

    No Go to step 16.

    Yes Proceed to step 13.

13. Are all noncommunicating twinaxial workstations attached to the same port?

    No Go to step 16

    Yes Proceed to step 14.

14. Do the following:

    a) Turn off the power on the Perle 594T.

    b) Remove the cable from the failing port. Replace it with the cable from a functioning port.

    c) Ensure that the Controller Software Diskette is inserted into the Perle 594T diskette drive.

    d) Turn on power on the Perle 594T.

15. Do the workstations communicate with the port?

    Yes The problem is with the twinaxial cable or the workstations attached to it. Take the necessary steps to correct the problem.

    No Call your 594T service representative.

16. Do the following:

    a) Ensure that the twinaxial workstation attachment cable is properly connected to the Twinaxial Feature Card

    b) Ensure that the twinaxial cables are properly connected to the twinaxial workstation attachment cable.

    c) Ensure that the twinaxial cables are properly connected to the workstations.

17. Do these steps correct the problem?

    Yes The problem is resolved.

    No Call your 594Tservice representative.

18. Are any Token-Ring workstations not communicating?

    No Go to step 21.

    Yes Proceed to step 19.

19. Locate the Token-Ring Feature Card to which the nonfunctioning workstation(s) are attached. Are any workstations communicating with this Token-Ring Feature Card?

    Yes The problem is with the Token-Ring network or the workstation attached to it. Take the necessary steps to correct the problem.

    No Proceed to step 20.

20. Ensure that the Token-Ring cable is properly connected to the Token-Ring Feature Card and to the MAU. Is the Token-Ring cable properly connected?

    No The problem is resolved.

    Yes Call your 594T service representative.

21. Are any Ethernet workstations not communicating?

    Yes Proceed to step 22.

    No Call your 594T service representative.

22. Locate the Ethernet Feature Card to which the nonfunctioning workstation(s) are attached. Are any workstations communicating with this Ethernet Feature Card?

    Yes The problem is with the Ethernet network or the workstation attached to it. Take the necessary steps to correct the problem.

    No Proceed to step 23.

23. Ensure that the Ethernet cable is properly connected to the Ethernet Feature Card and to the concentrator hub or the network trunk. Is the Ethernet cable properly connected?

    No The problem is resolved.

    Yes Call your 594T service representative.

Operator Panel LEDs

The operator panel has the following LEDs:

Ready	This green LED comes on when the power-on diagnostics have been successfully completed, indicating the Perle 594T is ready for operation.
Call Perle Service	This LED comes on when an error condition is detected which requires you to contact your 594T service representative. Write down all numbers displayed on the LCD and give these numbers to the service representative.
See PD Guide	This LED comes on when the Perle 594T detects a problem which must be diagnosed. Write down all numbers displayed on the LCD and look up these numbers in the *Problem Determination Quick Reference* or in this appendix in the section *Message Codes and SRCs.*
Test Mode	This LED comes on when the Perle 594T is in test mode or configuration

mode. When tests are running, the Ready LED is off. When the Perle 594T is in configuration mode or concurrent information is being displayed, the Ready LED is on.

Power-On Options

When the Perle 594T is powered on with the Base Controller Software Diskette or the Network Controller Software Diskette in the 594T diskette drive, the Perle 594T automatically enters operating mode. To enter either extended diagnostics or configuration mode, do the following:

1. Ensure that the diskette drive is empty.
2. Press the power switch. All LEDs come on momentarily. To indicate that diagnostic tests are running, the LCD displays:

   001-01

   In a few moments, the following message code will be displayed:

   003-02 1

3. Locate the 594T Controller Setup Diskette and ensure that the write-protect tab is closed (i.e., the diskette is not write-protected). Insert the Controller Setup Diskette into the diskette drive.
4. On the keypad, type one of the following to enter the desired mode:

0	Run extended diagnostics
1	Enter operating mode
2	Enter configuration mode

5. Press **Enter**.
6. When you are finished, remember to replace the Controller Setup Diskette with the 594T Controller Software Diskette.

LCD Message Formats

The operator panel LCD has two lines for messages. The top line may be blank or it may display messages in the following formats:

Top Line Format

The top line will either be blank or it will display additional information about an error condition. This information will be displayed in one of the following two formats:

CCCCCCCC

where the letters "CCCCCCCC" indicate the CP Name of the controller which is reporting an error. The actual error code will be displayed on the bottom line of the LCD.

or

0X ##

where the letter "X" indicates a slot number. This is the slot number of the card which is reporting an error. The actual error code will be displayed on the bottom line of the LCD. The slot number (X) will always be preceded by the number "0". "##" indicates the type of card which is reporting the error.

Bottom Line Format

The bottom line of the LCD has the following format:

```
xxxxx aaaaaa(a)
```

The letters "xxxxx" indicate a message code. Refer to the section, *Message Codes*, for a list of message codes.

The letters "aaa" indicate additional information which is relevant to the message code (xxxxx). This information may be a System Reference Code (SRC). Refer to the section, *System Reference Codes*, for a list of SRCs and their meaning.

NWS Workstation Display Format

When the NWS is first set to ON, the cursor will be displayed in the upper right-hand corner of the screen.

When the NWS makes connection with the 594T, the cursor moves to the upper left-hand corner of the screen and the System Available indicator, consisting of four digits, is displayed on the screen. The position of the System Indicator depends on the type of workstation you have. It could be displayed in either the upper right, upper left or lower left portions of your screen.

Verifying NWS or PWS Connection

This section will help you determine if your workstation is connected correctly.

1. Be sure the 594T is powered on and the Ready LED is on.
2. Turn on all workstations for which you want to verify connection.
3. If you want to verify NWS workstation connections, go to Twinaxial Connection.

   To verify PWS workstation connections, continue with step 4.
4. Establish connection with your host. For details, see Chapter 8.
5. If your PWS uses Client Access, start Client Access now. Wait until the following message is displayed on the screen:

   ```
   WAITING FOR ADAPTER TO OPEN
   ```

Verifying a LAN Connection

1. Press **Req** and type **211**. Press **Enter**.

   An LCD panel in the following format is displayed for each workstation using the LAN connection to communicate with the 594T:

   ```
   211||aaaaaaaaaaaa
   ```

   where **aaaaaaaaaaaa** is the Token-Ring or Ethernet address.

   Note: If the display consists of **211||**************, it indicates the end of the list**.**
2. To scroll between the next and previous entries, use the up and down arrow.
3. To display current information, press **Req**, type **211** and press **Enter**. To clear the panel, press **Esc**.

Verifying a Twinaxial Connection

1. Press **Req** and type **210**. Press **Enter**.

An LCD panel in the following format is displayed for each workstation using the Twinaxial connection to communicate with the 594T:

```
210-xs||wwww  mmm
```

where:

xs is the device identifier, where

x = port (0-3)

s = station (0-6).

wwww is the device type.

mmm is the device model.

Setting the Date and Time

To Set the Date

1. Press **Req** and type 213. Press **Enter**. The following panel appears:

```
213-01||  yy-mm-dd
```

2. The date appears in year-month-day format. Enter the current date. Use the right and the left arrow keys to move the cursor.

Date	Valid Range
yy (year)	91 - 50 (1991 - 2050)
mm (month)	01 - 12
dd (day)	01 - 31

To quit without changing the date, press **Esc.**

3. Press **Enter**. If the new date is valid, the panel is cleared. If the date is not valid, a beep sounds.

To Set the Time

1. Press **Req** and type **214**. Press **Enter**. The following panel appears:

```
214-01||  hh:mm:ss
```

2. Enter the current time. Use the right and the left arrow keys to move the cursor.

Time	Valid Range
hh (hours)	00 - 23
mm (minutes)	00 - 59
ss (seconds)	00 - 59

To quit without changing the time, press **Esc.**

3. Press **Enter**. If the new time is valid, the panel is cleared. If the time is not valid, a beep sounds.

Note: *If the 594T is configured for AS/400 date and time synchronization (see "Field 23 Synchronize Date and Time with Primary AS/400 System") the date and time will be set to be the same as that of the primary AS/400 system when the 594T establishes a session with that primary AS/*

400 system.

Making Status Requests

The operator panel LCD can be used to display status information. Use the keypad to request status information as follows:

1. Press **Req**, type **200** and press **Enter**.
2. The LCD will initially display the status for slots **1** through **4** in the following format:

   200-01|| 1↑2↑3↓4↑

   Press the down arrow key to display the 594T status information for slots **5** through **7**. This information is displayed in the following format:

   200-02|| 5↑6↑7↓

   where:

Status	Description
1-4 and 5-7↑	Identifies the Perle 594T slot.
↑	Indicates communication activity on the Feature Card.
↓	Indicates the slot is empty or there is no communication activity on the Feature Card.

   Press the down arrow key to display the 594T status information for controllers **8** and **9**. This information is displayed in the following format:

   200-03|| 8↑9↑

   where:

Status	Description
8↑	Indicates that the selected controller is communicating with the selected AS/400 system.
8↓	Indicates that the selected controller is not communicating with the selected AS/400 system.
9↑	Indicates that the selected controller has established a logical connection (LU 6.2 controller session) with the selected AS/400 system.
9↓	Indicates that the selected controller has not established a logical connection (LU 6.2 controller session) with the selected AS/400 system.

   Go to step 4.
3. Should the status change after the request was made, the LCD will not be automatically updated. To display updated information, press **Req**, type **200** and press **Enter** again.
4. When you have finished viewing the information on the LCD, press **Esc** to clear.

Making Status Requests for Alternate Hosts

As long as the 594T is configured to use concurrent host attachment, the operator panel LCD can be used to display status information for all configured hosts. If **215||************* is displayed, the 594T is not configured for concurrent host attachment.

Use the keypad to request status information as follows:

1. Press **Req**, type **215** and press **Enter**.

   The 594T status information will be displayed on the LCD in the following format:

   215-11||h 3↑4↑5↑

   where:

Status	Description
11	Indicates the first panel for the H1 host. Other panels will be displayed as follows: H2 = 21 H3 = 31 H4 = 41
h	Indicates the type of host, where: 0 = alternate host 1 = the configured primary host 2 = no active session with the primary host. Therefore, any alerts generated by the 594T will be sent to this host.
3↑	The adjacent link station has been contacted by the 594T.
3↓	The 594T was not successful while trying to contact an adjacent link station using this host.
4↑	The 594T has successfully established contact with this AS/400 system.
4↓	The 594T has not successfully established contact with this AS/400 system.
5↑	An APPC session has been established with this AS/400 system.
5↓	An APPC session has not been established with this AS/400 system.

2. To display the next panel, use the up arrow key.

   215-12|| uuuuuuuu

   where:

Status	Description
12	Indicates the second panel for the H1 host. Other panels will be displayed as follows: H2 = 22 H3 = 32 H4 = 42
uuuuuuuu	The AS/400 LU name.

3. To display the next panel, use the up arrow key.

   215-13|| nnnnnnnn

   where:

Status	Description
13	Indicates the third panel for the H1 host. Other panels will be displayed as follows: H2 = 23 H3 = 33 H4 = 43
nnnnnnnn	The AS/400 network name.

4. To display the next panel, use the up arrow key.

```
215-14|| kkkkkkkk
```

where:

Status	Description
14	Indicates the third panel for the H1 host. Other panels will be displayed as follows: H2 = 24 H3 = 34 H4 = 44
kkkkkkkk	The 594T network name.

5. To display the next panel, use the up arrow key.

```
215-15|| mmmmmmmm
```

where:

Status	Description
15	Indicates the third panel for the H1 host. Other panels will be displayed as follows: H2 = 25 H3 = 35 H4 = 45
mmmmmmmm	The mode name.

6. To display the next panel, use the up arrow key.

```
215-16|| i u
```

where:

Status	Description
16	Indicates the third panel for the H1 host. Other panels will be displayed as follows: H2 = 26 H3 = 36 H4 = 46
i	Indicates when the 594T controller session should start, where: 0 = the configuration is set up to start the 594T controller session when the first NWS or, if this is the primary host, PWS that is ready to communicate with this host powers on. 1 = the configuration is set to autostart the 594T controller session even if no NWS is ready to communicate.

u	If there are no workstations communicating with this host, this will indicate whether or not to end the 594T controller session, where: 0 = when this AS/400 system receives an indication that there is no NWS or PWS active with this host, the configuration is set to end the 594T controller session with this AS/400 system. 1 = even if there are no NWSs or PWSs communication with this host, the configuration is set to keep the 594T controller session active.

7. Use the up arrow to display these panels for alternate hosts.

Restarting Token-Ring Communication

Should the Perle 594T lose communication with the Token-Ring network, this command can be used to restart communication. To restart Token-Ring communication, do the following:

1. Press **Req** and type **230**. Press **Enter**.
   The following panel will appear:

```
>xx 43<

230-01||
```

   where **xx** indicates the slot number of the Token-Ring Feature Card which will be restarted.
2. Press **Enter**. Token-Ring communication will now be restarted.

Displaying Error Log Entries

Using the 594T operator panel, you can display up to 13 of the most recent 594T Error Log entries. Each entry includes the System Reference Code (SRC), the date-and-time stamp and sense data, which includes the number of times an error occurred consecutively and any applicable Link Station identifier. The most recent entry at the time of the request appears first.

Note: *To display the entire 594T Error Log and send it to an ASCII file, use the 594T Utility from a PWS.*

- The system time-stamped error log is structured in a series of panels that are grouped into different error log entries. In general:
- Use the Up arrow key to display the first panel of the next most recent error entry. When you are already at the top of the list, pressing the Up arrow key displays the End of List indicator.
- Use the Down arrow key to display the first panel of the next older error entry. When you are displaying the End of List indicator, pressing the Down arrow key displays the first panel of the first error log entry.
- Use the Right arrow key to display the next panel of information for an error log entry. When you are displaying the last panel of sense data for an error log entry, no Right arrow key appears on the panel.
- Use the Left arrow key to display the previous panel of information for an error log entry. When you are displaying the first panel for an error log entry, no Left arrow key appears on the panel.

Because the list of errors is displayed in a continuous loop, you can always use the Up and Down Arrow keys.

```
203||ss eeeeee>
```

The first panel of an error log entry displays both the source of the error and the System Reference

Code (SRC), where:

ss	=	Workstation identifier
eeeeee	=	System Reference Code (SRC) **Note:** Three-byte and four-byte SRCs have leading zeroes to fill in the six-byte field. For example, an SRC of *124* appears as *000124*.
>	=	Pressing the right arrow key displays the date and time that the error was logged.

203|| <mmdd hhmm>

The second panel displays the date/time that the error was logged:

<	=	Pressing the left arrow key displays the workstation ID and SRC.
mmdd	=	Month and day that the error was logged.
hhmm	=	Hour and minute that the error was logged.
>	=	Pressing the right arrow key displays the first panel of sense data.

203|| <00

When the third panel displays 00, there is no sense data. Otherwise, the third panel appears as shown on the next panel.

203||<sssssssss>

Each Perle 594T error log entry contains up to 19 bytes of sense data. The next one through four panels (depending on how much data has been entered for the error) display sense data, where:

<	=	Pressing the left arrow key displays the previous panel in the group of panels that describes the error log entry.
sssssssss	=	Sense data
>	=	Pressing the right arrow key displays an additional panel of sense data.

203||********

The last error log entry panel in the series indicates the end of the error list.

Note *When there are additions to the error log after the request was made, scrolling to the top of the list will not display the new data. To update the display, again press **Req**, type **203** and press **Enter.***

Extended Diagnostics

When the Perle 594T is powered-on with the Base Controller Software diskette or IP Routing Controller Software diskette in the Perle 594T diskette drive, the Perle 594T will automatically enter operating mode. During power-on, the Perle 594T can also enter extended diagnostics mode. To run diagnostics, do the following:

1. Ensure that the Perle 594T diskette drive is empty.
2. Press the power switch. All LEDs will come on momentarily.
3. The LCD displays the following message code, indicating that diagnostic tests are running:

   001-01

4. In a few moments, the following message code will appear:

   003-02 1

5. Locate the 594 Controller Setup diskette and ensure that the write-protect tab is closed (i.e., the diskette is *not* write-protected):
6. On the keypad, type **0**
7. Press **Enter**.

Message Codes and SRCs

This section describes message codes and System Reference Codes (SRCs). Message codes are three digits long. They appear on the LCD, on the left side of the bottom line. SRCs may appear on workstation screens and on the LCD, on the right side of the bottom line.

Message Codes

The bottom line of the LCD has the following format:

```
xxxxx aaaaaa(a)
```

The letters "xxxxx" indicate a message code.

The letters "aaaaaa(a)" indicate a System Reference Code (SRC). All SRCs are listed in the next section.

The top line of the LCD may display one of the following messages:

- The CP Name of the controller reporting the error.
- The slot number and card type of the card reporting the error.
- Blanks.

Message Code	Description
000	Request command selected. To enter a request, type a request number, then press **Enter**. To clear the request command, press **ESC**.
001 to 099	Diagnostic testing in progress.
199	Perle 594T hardware error. Use the SRC on the LCD display to identify the error.
200 to 220	Request codes for Perle 594T status information.
230	Restart LAN communications request. To activate the request, press **Enter** or press **ESC** to clear.
240	Stop/Start FR-TR Bridge frame forwarding. To activate the request, press **Enter** or press **ESC** to clear.
241	Start/Stop IP Routing frame forwarding. To activate the request, press **Enter**.
250 to 257	Request codes for IP Routing status information.
280	Indicates that software is being downloaded to the 594T.
290	Enter concurrent diagnostic mode request. To activate the request, press **Enter** or press **ESC** to clear.
291	Exit concurrent diagnostic mode request. To activate the request, press **Enter** or press **ESC** to clear.
300 to 350	Copy configuration data, bridge filter file or 594 Network Controller Software messages. Press **ESC** to cancel this operation. See section "*Transferring Configuration Data*" on page 48.
351	System file cannot be read from 594 diskette or 594 Hard Drive. Use the SRC on the LCD display to identify the problem.
352	A configuration problem was detected. Use the SRC on the LCD display to identify the problem.
359	Incorrect configuration data was detected. Use the SRC on the LCD display to identify the problem.
361	A configuration problem was found. Use the SRC on the LCD display to identify the problem.

Message Code	Description
363	AS/400 connection error. Use the SRC on the LCD display to identify the problem.
364	A problem was detected with either the Token-Ring or the Ethernet adapter. Use the SRC on the LCD display to identify the problem.
410	Physical link error. Use the SRC on the LCD display to identify the error.
420	X.25 network error. Use the SRC on the LCD display to identify the error.
430	X.21 network error. Use the SRC on the LCD display to identify the error.
440	A V.25 bis error was detected. Use the SRC on the LCD display to identify the error.
450	SNA communication error. Use the SRC on the LCD display to identify the error.
460	LAN error. Use the SRC on the LCD display to identify the error.
470	Frame-relay error. Use the SRC on the LCD display to identify the error.
480	A Frame Relay Token-Ring Bridge or IP Routing error has been detected. Use the SRC displayed on the operator panel LCD to identify the problem.
490	A PPP error has been detected. Use the SRC displayed on the operator panel LCD to identify the problem.
491	A VPN error has been detected. Use the SRC displayed on the operator panel LCD to identify the problem.
500	TCP/IP error. Use the SRC on the LCD display to identify the error.
720	A Perle 594T system failure has been detected. Note any SRC on the LCD display and contact your 594T service representative.
999	Invalid key pressed following a Req key. Press **ESC** to clear the error and retry the operation.
P01-01	Select Perle 594T enhanced mode. On the keypad use the arrow keys to select one of the following: 0 and press the **Enter** key to continue in compatible mode. 1 and press the **Enter** key to select Perle 594T enhanced mode.
P02-01	Delete Perle 594T configuration data. On the keypad use the arrow keys to select one of the following: 0 and press the **Enter** key to return without deleting. 1 and press the **Enter** key to delete Perle 594T configuration data.
P22-01	The loopback diagnostic test is in progress.
P22-02	The loopback diagnostic test has passed successfully.
P22-03	The loopback adapter has not been detected. Press **Esc** to return to the extended diagnostic menu or attach the loopback adapter to the connector on the back of the Synchronous Communication card and press **Enter** to continue loopback diagnostics.
P22-04	The loopback diagnostics test has failed.
P24-01	The Card ID of the feature card is displayed on the right side of the bottom line of the LCD display. The slot number of the feature card is displayed on the top line of the LCD display. Use the up and down arrows to select the feature card to configure.
P24-02	The current Token-Ring or Ethernet speed of the selected LAN Feature Card is displayed on the LCD display. The slot number of the card is displayed on the top line of the LCD display. Use the up and down arrow keys on the keypad to select a new LAN speed and press the **Enter** key.

SRC	Description
P24-03	The configuration data does not match the Perle 594T hardware. Use the 3-digit SRC on the LCD to identify the problem. Press **Enter** to correct the configuration data or press **Esc** to leave the configuration data unchanged.

System Reference Codes

System Reference Codes (SRCs) may appear on workstation screens and on the LCD, on the right side of the bottom line.

The bottom line of the LCD has the following format:

```
xxx-xx aaaaaa(a)
```

The letters "aaaaaa(a)" indicate an SRC.

The top line of the LCD may display one of the following messages:

- The CP Name of the controller reporting the error.
- The slot number and card type of the card reporting the error.
- Blanks.

SRCs may be from 3 to 6 digits long. SRCs are listed in this section in numerical order.

594 System Hardware and Configuration SRC's (100-199)

The following SRCs indicate hardware problems with the Perle 594T:

SRC	Description
100 - 123	A problem has been detected during diagnostic testing. See the *594 Diagnostic Guide* for more information.
124	Perle 594 System Diskette problem detected, restart the Perle 594T with the backup diskette. If the problem continues contact your 594T service representative.
126	No configuration data found for this card. Press the right arrow key on the keypad to display the slot number of the card generating the error.
127	A Perle 594T card failed the self test procedure. Press the right arrow key on the keypad to display the slot number of the card generating the error and the self test error code. Power the Perle 594T off and on. If the problem continues contact your 594T service representative.
128	Motherboard memory error detected during power on diagnostics. Power the Perle 594T off and on. If the problem continues contact your 594T service representative.
129	This card has failed loopback diagnostics test. Power the Perle 594T off and on. If the problem continues contact your 594T service representative.
130	The card ID assigned during configuration does not match the card installed in the slot. Press the right arrow key on the keypad to display the slot number of the card generating the error.
131	The card ID assigned during hardware setup does not match the card installed in the slot. Press the right arrow key on the keypad to display the slot number of the card generating the error.
132	None of the card IDs have been assigned for Feature Card slots 2 through 7. The card IDs are assigned using the keypad during the hardware setup procedure. Refer to Appendix D.

SRC	Description
133	None of the card IDs have been assigned for the Feature Cards used to communicate with the workstations. The card IDs are assigned using the keypad during the hardware setup procedure. Refer to Appendix D.
134	All of the configured Feature Cards used to communicate with the workstations have failed the POST procedure. Power the Perle 594T off and on. If the problem continues contact your 594T service representative.
135	None of the card IDs have been assigned for the Feature Cards used to communicate with the Host systems. The card IDs are assigned using the keypad during the hardware setup procedure. Refer to Appendix D.
136	All of the configured Feature Cards used to communicate with the Host systems have failed the POST procedure. Power the Perle 594T off and on. If the problem continues contact your 594T service representative.
137	No Twinax card has been installed. Therefore, the 594T cannot operate in compatible mode. Use the 594T Utility program to configure the 594T in enhanced mode, which can operate with a LAN gateway only.
138	The wrong diskette is in the diskette drive. Use the Base Controller Software or Networking Controller Software Diskette to start up in normal operating mode.
139	There is no configuration file in CMOS or on the Controller Software Diskette. Use Req 300 to restore the configuration file from your backup diskette to CMOS. For information about backing up and restoring the configuration file, refer to Chapter 6, *594T Utility Configuration Method*.
140	The 594T Controller Setup Diskette was not in the diskette drive when initiation of configuration mode was attempted. Insert the correct diskette in the drive and try again.
141	The 594T Controller Setup Diskette was not in the diskette drive when initiation of extended diagnostics mode was attempted. Insert the correct diskette in the drive and try again.
142	The Timestamped Error Log is invalid. Contact your Perle Systems representative.
143	Insufficient memory for the number of controllers you have assigned. Contact your 594T service representative.
145	An enhanced hardware setup is being used with a configuration file that is configured for compatible mode.
146	More than 2 LAN cards are installed in the Perle 594T. Enter Extended Diagnostics to configure the additional cards.
147	A Perle feature card has been configured with the same slot number as an existing LAN card.
148	The primary Token-Ring card has not been installed in slot 3.
149	The 594T contains a secondary LAN card, but no primary.
150	The synchronous communication card has failed the self test procedure. Power the 594T off and on. If the problem continues, contact your 594T service representative.
151	An invalid twinax card was detected in slot 2 of the 594T.
152	Two (2) unconfigured Token-Ring cards have been installed in the 594T at the same time. See the section *Setting the Token-Ring Feature Card Position* in Appendix D for instructions.
153	More than 2 Ethernet LAN cards are installed in the Perle 594T.
168(n)	Configuration data does not match Perle 594T hardware; (n) indicates the slot number of the card generating this error.

SRC	Description
169(n)	The Feature Card is not been placed in the correct slot; (n) indicates the slot number of the card generating this error.
170	Insufficient memory for current configuration.
171	No 594T Hard Drive was found. The 594T was started with a Network Controller Software disk but no hard drive was found in the unit.
172	No 594 Networking Controller Software was found on the 594T Hard Drive. Use **REQ 340** to load system software onto your 594T hard drive. For more information on installing 594 Networking Controller Software on to the 594T, refer to "Installation of Networking Controller Software", *594e User and Reference Guide*.
173	The 594 controller software in the disk drive is not compatible with the 594 hardware.
174	You have configured the 594T to use the PPP protocol but your current hardware does not support PPP. Check the serial number of the controller, if it is lower than 59-08000, it indicates that you need to upgrade the Synchronous Communication Card in order to run PPP.
199	The test code corresponding to the testing error is not found in the test code table.

NWS Operational SRC's (0000-0177)

The following SRCs indicate keyboard errors. To recover from the error, press the **Error Reset** key, correct any problems and continue.

SRC	Description
0000	Help key is not valid.
0001	Keyboard overrun.
0002	Invalid scan code.
0003	Invalid key followed CMD or ALT key.
0004	Only data from a magnetic stripe reader or a light pen is allowed.
0005	Cursor in protected area of display.
0006	Invalid key followed System Request key.
0007	Mandatory entry field not filled in.
0008	Only alphabetical data is allowed.
0009	Only numeric data allowed.
000G	Secondary session not available at this time, session power down in progress. Retry this request when the power down is completed.
000H	Hot key to secondary session failed, either the session has not been configured or the session could not be allocated during power up.
0010	Only characters 0 through 9 allowed.
0011	Key not allowed in last position of signed numeric field.
0012	No room to insert data in the field.
0013	Terminal still in insert mode, only data keys allowed.
0014	Mandatory fill field, must be filled or empty.
0015	Self-check field error.
0016	Field not valid for this field.

SRC	Description
0017	Mandatory field must be filled or empty.
0018	You pressed a data key to exit a nondata field. To exit this field, use Field Exit.
0019	Dup or Field Mark key not permitted.
0020	You pressed a function key that is not valid in a right-adjust field. To exit this field press Field -, Field + or Field Exit.
0021	Data must be entered in mandatory enter field.
0022	System error.
0023	Hexadecimal mode error.
0024	Invalid key, only 0 through 9 and Dup key allowed.
0026	Field entry not allowed, last position must be 0 through 9.
0027	Key not valid on this display station.
0028	Key not valid on this display station.
0029	Diacritic character not valid.
0031	Data buffer overflow.
0032	Magnetic stripe reader, invalid data.
0033	Magnetic stripe reader, data not authorized.
0034	Magnetic stripe reader, data exceeds field length.
0035	Magnetic stripe reader, card cannot be read.
0036	Cursor select not allowed in field exit mode.
0037	Cursor select not allowed in a nonselectable field.
0038	Magnetic stripe reader or light pen not allowed for this field.
0040	Modem or DCE Not Ready. Data Set Ready (DSR) Line Inactive for V.24 or V.35 or DCE Not Ready for X.21. This error indicates that the modem or DCE was not ready during required intervals of normal operation. The operating state of the modem or DCE is checked at different times, depending on the specific link-level protocol in use.
0041	The receive line was idle for at least 15 bit times. Verify all cable and line connections. If the problem persists, contact the network administrator.
0042	The receive clock signal from the modem or DCE is not being received. Verify all cable and line connections. If the problem persists, contact the network administrator.
0043	The data set ready (DSR) signal was not deactivated by the modem or DCE even though the 594T tried to disconnect from the line. Verify all cable and line connections. If the problem persists, contact the network administrator.
0044	30-Second Timeout. For a synchronous connection this error indicates that no valid data has been received for 30 seconds. For a LAN connection this error indicates the Ti timer has expired before a valid frame was received by the Perle 594T.
0045	During link setup, either a disconnect mode (DM) or disconnect (DISC) command was received; the DCE will not active. Verify all cable and line connections. If the problem persists, contact the network administrator.
0046	Frame reject received. The Perle 594T received a FRMB from the network. Verify all cable and line connections. If the problem persists, contact the network administrator.
0047	The Perle 594T received an unexpected disconnect mode or disconnect command. Verify all cable and line connections. If the problem persists, contact the network administrator.

SRC	Description
0048	An unexpected Unnumbered Acknowledgment (UA) frame was received. Verify all cable and line connections. If the problem persists, contact the network administrator.
0049	The Perle 594T received an unexpected SABME. Restart communication, if the problem persists, contact the network administrator.
0050	An error was detected in the Ready For Sending (RFS) or Clear To Send (CTS) signal. Verify all cable and line connections. If the problem persists, contact the network administrator.
0051	The transmit clock failed during a transmit operation. If the problem persists, contact the network administrator.
0052	No transmit clock, modem or DCE signal was detected even though the link adapter did not complete a transmit operation within the allotted time period. Verify all cable and line connections. If the problem persists, contact the network administrator.
0053	Expiration of Retry Counter (X.25 only). No acknowledgment of a transmission was received within the allowed timeout. (Timeout retry counter (N2) and retry interval (T1) are specified in Field 7 of the NWS configurator.)
0054	Frame reject sent. The Perle 594T has sent a FRMR response to the AS/400 system after receiving an invalid DLC or LAPB command.
0055	The Perle 594T has determined that the communication cable is not attached to the 594T. Attach a cable to the 594T or replace the one currently attached.
0056	Link was broken between the Perle 594T and the host. Ensure that delays and timer values are sufficiently long. If the problem persists, contact the network administrator.
0060	Alphanumeric character entered into double-byte data characters or a key that is invalid within an embedded segment was pressed.
0061	Double-byte character entered into an alpha numeric field or a key that is invalid outside an embedded segment was pressed.
0062	Change data type not allowed, the cursor must be in an open field or in the first position ideographic field.
0063	Invalid ideographic character entered while in alternate entry mode.
0064	Invalid key pressed for the current keyboard mode.
0065	Invalid cursor position, column reserved for shift-out or shift-in characters.
0066	Repeat key not valid at current position.
0067	Workstation extension character RAM is full. Therefore, additional extension characters will be displayed as default characters.
0068	Perle 594T output data stream is not valid for extension characters. Therefore, any additional extension characters will be displayed as default characters.
0069	Perle 594T output data stream contains invalid or undefined extension characters. Additional extension characters will be displayed as default characters.
006G	Invalid terminal type. A double byte character terminal is attached to a Twinaxial Feature Card with Card ID 41. A card with Card ID 44 must be used.
0070	Word spill or carrier return error.
0071	Invalid start copy, move or delete text operation while a previous operation is still in progress.
0072	Invalid key pressed for the current cursor position.
0073	Invalid instruction attempted while the general prompt function was not active.
0074	Invalid key pressed while the general prompt function is active.

SRC	Description
0075	Keyed characters not found.
0076	Insert function failed, the AS/400 has not processed the text on the screen.
0077	Invalid function key pressed or a 3270 keyboard function was entered while in word processing mode.
0078	Application error, the required scale line is not defined for your workstation.
0081	Configuration error, there are too many devices attached.
0082	Invalid keyboard function.
0083	Invalid selection.
0084	Selection field unavailable.
0087	Flow control error. Be sure X.25 communication settings on the Perle 594T match X.25 communication worksheet.
0089	One or more required fields not complete.
008A	One or more fields contain an invalid embedded blank.
008B	Too many keyboard country codes defined; four is the maximum.
008C	Duplicate values configured error. One of the following duplicate values have been configured: • Two or more hosts have been given the same fully qualified name (Hx:1 joined together with Hx:2). If concurrent host is enabled, each host must have a unique, fully qualified name. • A FR-TR Bridge DLCI is the same as another FR-TR bridge DLCI or the same as a Host DLCI. • The frame relay ring number and LAN ring number are the same on a FR-TR bridge configuration. • The frame relay MAC address and the 594T token-ring LAN address are the same on a FR-TR bridge configuration
008D	The printer port and/or station address values are invalid.
008E	One or more fields contain an insufficient number of characters.
008F	One or more fields contain a value outside the valid range.
008G	NWS configuration can only be accessed on slot 2.
008H	Perle 594T hardware setup for enhanced mode only. You must use the PWS configuration to modify your configuration data.
008J	Perle 594T configuration file valid for enhanced mode only. You must use the PWS configuration to modify your configuration data.
0091	The Reverse and Close keys are not valid for this field.
0092	The Reverse key is not valid on this display because it is configured for shared addressing.

SRC	Description
0097	Test request not supported by the host system.
0098	Hardware error.
0099	In operating mode, the requested function is not supported or there is no session with AS/400 system established. In configuration mode, only one device can be in configuration mode at any time. Another device is currently active in the configuration program.
009A	Three invalid passwords have been entered on this PWS.
009G	The default word processing message table is currently active for this session. All word processing functions are available.
009H	The 594T requires additional system memory to operate with the current configuration. Only the primary session(s) will be active, multi-session(s) will not be available.
0170	An attached workstation failed to detect a valid end of printer definition table (PDT).
0172	An attached workstation detected invalid data in a host-originated printer definition table (PDT).
0173	An attached workstation received a printer definition table (PDT) that exceeded the maximum size.
0176	An attached workstation detected an error in a host-originated microcode correction file.
0177	An attached workstation detected an error in a host-originated font file.

X.25 Communication SRC's (100000-1BFF00)

If you are using X.25 communication and an error occurs during the keyboard entry of a command, option or parameter, a 6-digit SRC between 100000 and 10FFFF is displayed.

If the controller accepts the keyboard-entered options but the network operation with the AS/400 system fails, an SRC between 110000-1BFF00 is displayed on all display stations attached to that controller. These SRCs indicate a communication network problem at the packet level.

SRC	Description
100000	Previous X.25 command still being executed.
100100	A virtual circuit has already been established. The Perle 594T can only communicate over one virtual circuit per controller at a time.
100200	An answer command was entered for a PVC circuit. A PVC circuit requires an open command.
100300	A call command was entered for a PVC circuit. A PVC circuit requires an open command.
100400	The logical channel ID is not valid because it is not three characters long.
100500	The logical channel ID option is not valid because it is not a hexadecimal value between 001 and FFF.
100600	The password option is not valid because it is longer than eight characters or contains nonalphanumeric characters.
100700	The host network address is not valid because it is longer than 15 decimal digits or contains nonnumeric characters.
100A00	The operator attempted to enter option fields not supported by that connection type.

SRC	Description
100B00	The X.25 facility entered contains invalid characters.
100C00	The X.25 packet window size entered is invalid because it is less than 02.
100D00	The X.25 packet window size entered is invalid because modulo 8 is specified and the packet size is greater than 07.
100E00	The X.25 packet window size entered is invalid because modulo 128 is specified and the packet size is greater than 15.
100F00	The X.25 packet size is not equal to 64, 128, 256 or 512.
101000	The X.25 closed user group option does not contain 2 decimal digits.
101100	An invalid control character was entered.
101300	For X.25: Either a) the first control character entered was not one of A, O, C or D or b) the first control character has already been entered.
101500	The password option was entered for a PVC.
101600	The X.25 password is invalid because it contains characters that are not alphanumeric.
101800	The X.25 closed user group option was entered for a command that was not a CALL command issued on an SVC.
101900	The option Q (QLLC) or E (ELLC) is not valid with an answer command. Use these options with an SVC call or PVC open command.
101A00	The X.25 F or R option was entered for a command that was not initiating a CALL command on an SVC.
101B00	The recovery value for the E (ELLC) option must be from 100 to 199.
101C00	A CALL command was entered for an answer-only SVC. The 594T configuration may be incorrect.
101D00	An open command was entered for a manual connect SVC controller.

SRCs 110000—1100FF

The controller issued a clear request packet after detecting an error.

SRC	Description
110000	No additional information. Report the problem to your AS/400 system operator.
110014	The Perle 594T received an X.25 packet type that is invalid for state p1 and issued a Clear Request.
110015	The Perle 594T detected an X.25 packet type that is invalid for state p2 and issued a Clear Request.
110017	The Perle 594T detected an X.25 packet type that is invalid for state p4 and issued a Clear Request.
110018	The Perle 594T detected an X.25 packet type that is invalid for state p5 and issued a Clear Request.
110031	The Perle 594T issued an X.25 Clear Request because a Call Connected was not received within 200 seconds. Contact the X.25 network service provider.
110032	The Perle 594T issued an X.25 Clear Request because a Clear Confirmation was not received within 200 seconds. Contact the X.25 network service provider.

SRC	Description
110046	Call from unexpected DTE. Verify the network address and retry. If the problem continues, report the problem to your AS/400 system operator.
110050	A general ELLC/QLLC error has occurred. Report the problem to the AS/400 system operator.
110051	An undefined ELLC C field was detected. Report the problem to the AS/400 system operator.
110054	An undefined ELLC I field was detected. Report the problem to the AS/400 system operator.
110055	An I field that was longer than the allowed 521 bytes was detected. Report the problem to the AS/400 system operator.
110056	An error occurred and an ELLC frame reject was received. Report the problem to the AS/400 system operator.
110057	An invalid ELLC header was detected. Report the problem to the AS/400 system operator.
110059	An ELLC timeout condition was detected. Report the problem to the AS/400 system operator.
11005A	An invalid ELLC receive sequence count was detected. Report the problem to the AS/400 system operator.
11005B	An ELLC recovery was rejected or terminated.
1100A1	The Perle 594T detected an invalid X.25 M-bit packet sequence and, therefore, issued a Clear Request. Be sure the packet size entered matches the packet size specified in the network subscription.
1100A6	The Perle 594T detected an X.25 packet that was too short and, therefore, issued a Clear Request. Be sure the packet size entered matches the packet size specified in the network subscription.
1100A7	The Perle 594T detected an X.25 packet that was too long and, therefore, issued a Clear Request. Be sure the packet size entered matches the packet size specified in the network subscription.
1100AA	The Perle 594T detected an unsupported, X.25 interrupt packet and, therefore, issued a Clear Request. Contact the X.25 network service provider.
1100AB	The Perle 594T detected an invalid X.25 packet send sequence number (Ps) and, therefore, issued a Clear Request. Contact the X.25 network service provider.
1100AC	The Perle 594T detected an invalid X.25 packet receive sequence number (Pr) and, therefore, issued a Clear Request. Contact the X.25 network service provider.
1100AD	The Perle 594T received an invalid X.25 D-bit and, therefore, issued a Clear Request. Report the problem to the AS/400 system operator.
1100D0	The Perle 594T received an X.25 general resources error and, therefore, issued a Clear Request. Report the problem to the AS/400 system operator.
1100D2	The Perle 594T received an X.25 path information (PIU) that was too long and, therefore, issued a Clear Request. Report the problem to the AS/400 system operator.
1100E0	An invalid facility length was detected. Report the problem to the AS/400 system operator.
1100E6	Unsupported facility parameters were detected. Report the problem to the AS/400 system operator.

SRC	Description
1100E7	An unsupported facility was detected. Report the problem to the AS/400 system operator.
1100E8	A call from an unexpected DTE was detected. Retry the operation.
1100E9	The Perle 594T detected an invalid X.25 D-bit and, therefore, issued a Clear Request. Report the problem to the AS/400 system operator.
1100EA	An error was detected and there was a reset indication on an SVC.
1100EB	An invalid protocol identifier was detected. Retry the operation.
1100EC	A password mismatch was detected. Retry the password.
1100F4	Connection rejection, reason unspecified (transient condition). Retry the operation. Report the problem to your AS/400 system operator.
1100F5	Connection rejection, reason unspecified (permanent condition). Retry the operation. You should report the problem to your AS/400 system operator.
1100F6	Connection rejection, requested quality of service not available (transient condition). Verify your configuration. If the problem continues, report the problem to your network representative.
1100F8	Connection rejection, incompatible information in user data. Verify your configuration. If the problem continues, report the problem to your network representative.

SRCs 120000—1200FF

The controller issued a reset request packet after detecting an error.

SRC	Description
120000	No additional information. Report the problem to your AS/400 system operator.
120001	Invalid packet sent sequence number (Ps). Report the error to your network representative.
120002	Invalid packet received sequence number (Pr). Report the error to your network representative.
12001B	Invalid packet type for state d1. Retry the operation. You may be allowed temporary operation. However, you should report the error to your network representative.
120020	Packet not allowed. Report the problem to your AS/400 system operator.
120026	Packet too short. Make sure that the packet size entered in the configuration or entered manually matches your network subscription.
120027	Packet too long. Make sure that the packet size entered in the configuration or entered manually matches your network subscription.
120033	Reset confirmation not received within 200 seconds. Report the problem to the AS/400 system operator.
120050	A general ELLC/QLLC error has occurred. Report the problem to the AS/400 system operator.

SRC	Description
120051	An undefined ELLC C field was detected. Report the problem to the AS/400 system operator.
120054	An undefined ELLC I field was detected. Report the problem to the AS/400 system operator.
120055	An Ifield that was longer than the allowed 521 bytes was detected. Report the problem to the AS/400 system operator.
120056	An error occurred and an ELLC frame reject was received. Report the problem to the AS/400 system operator.
120057	An invalid ELLC header was detected. Report the problem to the AS/400 system operator.
120059	An ELLC timeout condition was detected. Report the problem to the AS/400 system operator.
12005A	An invalid ELLC receive sequence count was detected. Report the problem to the AS/400 system operator.
12005B	An ELLC recovery was rejected or terminated.
1200A1	The Perle 594T detected an invalid X.25 M-bit packet and, therefore, issued a Reset Request. Ensure packet size entered matches packet size in network subscription.
1200A6	The Perle 594T detected an X.25 packet that was too short and, therefore, issued a Reset Request. Ensure packet size entered matches packet size in network subscription.
1200A7	The Perle 594T detected an X.25 packet that was too long and, therefore, issued a Reset Request. Ensure packet size entered matches packet size in network subscription.
1200AA	The Perle 594T detected an X.25 unsupported interrupt packet and, therefore, issued a Reset Request. Contact the network service provider.
1200AB	The Perle 594T detected an invalid X.25 packet send sequence number (Ps) and, therefore, issued a Reset Request. Contact the network service provider.
1200AC	The Perle 594T detected an invalid X.25 packet receive sequence number (Pr) and, therefore, issued a Reset Request. Contact the network service provider.
1200AD	The Perle 594T detected an invalid X.25 D-bit and, therefore, issued a Reset Request. Report the problem to the AS/400 system operator.
1200D0	The Perle 594T detected an X.25 general resources error and, therefore, issued a Reset Request. Report the problem to the AS/400 system operator.
1200D2	The Perle 594T detected anX.25 path information unit (PIU) that was too long and, therefore, issued a Reset Request. Report the problem to the AS/400 system operator.
1200F4	General resources. Retry the operation. Other applications may operate normally. However, you should report the error to your AS/400 system operator.
1200F5	PIU too long. Retry the operation. Other applications may operate normally. However, you should report the error to your AS/400 system operator.

SRCs 1800zz -18FFzz

The DCE issued a clear indication packet after detecting an error.

Note: *Most diagnostic codes (zz) are issued by the network and may vary from network to network. The diagnostic codes (zz) are defined later in this section.*

SRC	Description
1800zz	Call clearing originated at AS/400 system. Report the problem to the AS/400 system operator.
1801zz	AS/400 system busy. Wait, then retry the operation.
1803zz	Invalid facility request. Verify the request. Report the problem to your network representative.
1805zz	Network congestion. Retry the operation. If the problem continues, report the problem to your network representative.
1809zz	Out of order. AS/400 system not ready. Wait, then retry the operation. If the problem continues, report the problem to your network representative.
180Bzz	Access to the AS/400 system not allowed. Verify the request. Report the problem to your AS/400 system operator.
180Dzz	Unrecognized AS/400 system network address. Verify the request. Report the problem to your AS/400 system operator.
1811zz	Error at the AS/400 system. Report the problem to your AS/400 system operator.
1813zz	Error at the Perle 594T controller. Verify the request. Report the problem to your network representative.
1815zz	Recognized private operating agency (RPOA) out of order. Verify the request. Report the problem to your network representative.
1819zz	Reverse charging not subscribed. Verify the request. Report the problem to your network representative.
1821zz	Incompatible destination. Verify the request. Report the problem to your network representative.
1829zz	Fast select not supported. Verify the request.
1841zz	Gateway-detected procedure error. Repeat the operation. Report the problem to the network representative.
1843zz	Gateway congestion error. Repeat the operation. Report the problem to the network representative.
1880xx	Call clearing originated at target X.25 DTE. Report the problem to the system operator.
1881zz	Target X.25 DTE is busy. Verify the call. Report the problem to the system operator.
1883zz	Invalid facility request. Verify the facility. Report the problem to the network representative.
1885zz	Network is congested. Repeat the operation. Report the problem to the network representative.
1889zz	Target X.25 DTE is not ready. Verify the call. Report the problem to the system operator.

SRC	Description
188Bzz	Access to selected target X.25 DTE denied. Verify the link and configuration. Report the problem to the system operator.
188Dzz	Target X.25 DTE network address is not recognized. Verify the address. Report the problem to the system operator.
1891zz	Error at target X.25 DTE. Report the problem to the system operator.
1893zz	Error at the Perle 594T.
1895zz	Recognized private operating agency (RPOA) is out of order. Verify the RPOA. Report the problem to the network representative.
1899zz	Reverse charging not subscribed to. Report problem to the network representative.
18A1zz	Incompatible destination. Verify the link and address. Report the problem to the network representative.
18A9zz	Fast select not subscribed to. Verify the link.
18C1zz	Gateway-detected procedure error. Wait and retry the operation. Report the problem to the network representative and the system operator.
18C3zz	Gateway congestion error. Wait and retry the operation. Report the problem to the network representative and the system operator.

SRCs 1900zz—19FFzz

The DCE issued a reset indication packet after detecting an error.

Note: *Most diagnostic codes (zz) are issued by the network and may vary from network to network. The diagnostic codes (zz) are defined later in this section.*

SRC	Description
1900zz	Reset originated at AS/400 system.
1901zz	Out of order-disconnected AS/400 system.
1903zz	Error at the AS/400 system.
1905zz	Error at the controller.
1907zz	Network congestion.
1909zz	Remote DTE operational. This is not an error, it is a normal condition at startup.
190Fzz	Network operational. This is not an error, it is a normal condition at startup.
1911zz	Incompatible destination.
191Dzz	Network out of order.
1980zz	Call clearing from the target X.25 DTE.
1981zz	Disconnected target X.25 caused an out of order.
1983zz	Error at the target X.25.
1985zz	Error at the Perle 594T.
1987zz	Network congestion.
1989zz	Remote DTE is operational. This is not an error; it is a normal condition at startup.
198Fzz	The network is operational. This is not an error; it is a normal startup condition.
1991zz	Incompatible destination.
199Dzz	Network is out of order.

SRCs 1A00zz—1AFFzz

The DCE issued a restart.

Note: *Most diagnostic codes (zz) are issued by the network and may vary from network to network. The diagnostic codes (zz) are defined later in this section.*

SRC	Description
1A00zz	No additional information.
1A01zz	Local procedure error.
1A03zz	Network congestion.
1A07zz	Network is operational. This is not an error, this is a normal condition at startup.
1A7Fzz	Registration or cancellation confirmed. This is not an error.

18yyzz—1Ayyzz (zz) Diagnostic Codes

The following are the diagnostic codes (zz) for 18yyzz, 19yyzz and 1Ayyzz:

Diagnostic Code (zz)	Description
00	No additional information.
01	Send sequence P (s) not valid.
02	Received sequence P (r) not valid.
10	Packet type not valid.
11	State r1.
12	State r2.
13	State r3.
14	State p1.
15	State p2.
16	State p3.
17	State p4.
18	State p5.
19	State p6.
1A	State p7.
1B	State d1.
1C	State d2.
1D	State d3.
20	Packet not allowed.
21	Unidentifiable packet.
22	Call on oneway logical channel.
23	Invalid packet type on a permanent virtual circuit.
24	Packet on unassigned logical circuit.
25	Reject not subscribed to.
26	Packet too short.

Diagnostic Code (zz)	Description
27	Packet too long.
28	Invalid general format identifier.
29	Restart with LCID not equal to hexadecimal 000.
2A	Packet type not compatible with facility.
2B	Unauthorized interrupt confirmation.
2C	Unauthorized interrupt.
2D	Unauthorized reject.
30	Timer expired, general.
31	Timer expired for incoming call.
32	Timer expired for clear indication packet.
33	Timer expired for reset indication packet.
34	Timer expired for restart indication packet.
40	Call setup or call clearing problem.
41	Facility code not allowed.
42	Facility parameter not allowed.
43	Invalid called address.
44	Invalid calling address.
45	Invalid facility/registration length.
46	Incoming call barred.
47	No logical channel available.
48	Call collision.
49	Duplicate facility requested.
4A	Nonzero facility address.
4B	Nonzero facility length.
4C	Facility not provided when expected.
4D	Invalid CCITTspecified DTE facility.
50	Miscellaneous problems.
51	Improper cause code from DTE.
52	Octet not aligned.
53	Inconsistent Q bit setting.
70	International problem.
71	Remote network problem.
72	International protocol problem.
73	International link out of order.
74	International link busy.
75	Transit network facility problem.
76	Remote network facility problem.
77	International routing problem.

Diagnostic Code (zz)	Description
78	Temporary routing problem.
79	Unknown called DNIC.
7A	Maintenance action.
80-FF	Network-specific diagnostic information.

SRCs 1B0000—1BFF00

The controller issued a restart request packet after detecting an error.

Note: *Most diagnostic codes (zz) are issued by the network and may vary from network to network. The diagnostic codes (zz) are defined earlier in this section.*

SRC	Description
1B1100	Unsolicited restart confirmation received.
1B2400	LCID=0 nonrestart/diagnostic packet.
1B2800	Invalid GFI (restart indication/confirmation only).
1B2900	LCID is not equal to 0 on restart indication/confirmation.
1B3400	Restart confirmation packet not received within 200 seconds.
1BA5yy	Diagnostic packet was received.
1BA500	Diagnostic packet received.
1BA600	Packet is too short.
1BA700	Packet is too long.
1BA800	General format identifier (GFI), restart indication or confirmation not valid.
1BE200	Restart indication/confirmation packet logical channel identifier (LCID) is not equal to 0.
1BE500	Non-restart/diagnostic packet logical channel identifier (LCID) is equal to 0.

Point To Point Protocol SRCs (1C0000 - 1C00FF)

When using the PPP protocol to communicate with the host, the following conditions will be reported:

SRC	Description
1C0000	No Data Set Ready (DSR) detected from the modem.
1C0001	Busy signal detected, the connection could not be established.
1C0002	No dial tone detected, the connection could not be established.
1C0004	Unable to initialize the modem.
1C0010	Carrier has been lost unexpectedly during connect state
1C0011	Unable to process the link disconnect request because the link is already in the process of being disconnected

Virtual Private Network SRCs (1D0000 – 1D00FF)

When VPN is enabled, the following SRC may be reported:

1D00xx yy

xx = diagnostic code

yy = The tunnel number this SRC is associated with

Diagnostic Code	Description
01	Tunnel connection is in progress.
02	Tunnel connection is being re-negotiated.
03	No Communication to Remote gateway. Check Remote gateway IP address.
04	Could not negotiate a tunnel connection. Check that the configuration on the 594 controller matches that of the remote tunnel gateway.

X.21 Switched Communication SRCs (200000-250300)

If the controller accepts the keyboard entered options but the network operation with the AS/400 system fails, an SRC indicating the type of communication problem code is displayed on all the display stations attached to that controller.

The 200000 through 25FFFF SRCs occur when a call progress signal is received from the network.

Contact your network supplier to determine the time period you must wait between recovery attempts and the maximum number of retries allowed by your network.

SRC	Description
200000	A call command is already in progress. Wait until call is completed or a different SRC is displayed.
200100	Detach command accepted, call clearing in progress.
200200	Detach command attempted while a call command in progress or no circuit established.
210100	The incoming call was received by the AS/400 system. Communication should be established shortly. Wait 1 minute or until a different SRC is displayed. This status is temporary.
210200	The call is being redirected to a number other than the one entered. Wait 1 minute or until a different SRC is displayed. This status is temporary.
210300	The call was queued and communication will be established when the AS/400 system is not busy. Wait 1 minute or until a different SRC is displayed. This status is temporary.
210400	A private network was reached. Wait 1 minute or until a different SRC is displayed. This status is temporary.
210500	A public network was reached. Wait 1 minute or until a different SRC is displayed. This status is temporary.
212000	There is no connection. Make sure that the number called is correct and try the operation again. This is a DCE or a network error.

SRC	Description
212100	The number is busy. Make sure that the number called is correct and try the operation again. If the number is busy for longer than normal, call the AS/400 system operator to see if the system port for the number dialed is actually busy. If the number is correct and the port is not busy, this is a network problem.
212200	There is a procedure error in the selection signals sent to the network. Make sure that the operating procedures are correct and try the operation again. If the same failure occurs, the problem is caused by the DCE or the network.
212300	The network detected a transmission error in the selection signals. Make sure that the number called is correct and try the operation again. This is a DCE or a network error.
214100	Access is barred. Make sure that the number called is correct and that the operating procedures and configuration are compatible with the network subscription for the controller and the AS/400 system location. If the number, the procedures and configuration are correct and compatible, the failure is a network problem.
214200	The number you are calling has changed. Make sure that the number called is correct and that the operating procedures and configuration are compatible with the network subscription for the controller and the AS/400 system location. If the number, the procedures and configuration are correct and compatible, the failure is a network problem.
214300	The called DTE address is not valid or not assigned to any DTE or the user class of service is not compatible. Make sure that the number called is correct and that the operating procedures and configuration are compatible with the network subscription for the controller and the AS/400 system location. If the number, the procedures and configuration are correct and compatible, the failure is a network problem.
214400	The number you called is out of order. Make sure that the number called is correct, that the AS/400 system you called as well as the DCE are on and ready and that the controller is brought online by the AS/400 system operator. If the AS/400 system and DCE are on and ready and the controller is online, the failure is a network problem.
214500	The called DTE is signaling controlled-not-ready. Make sure that the number called is correct, that the AS/400 system you called as well as the DCE are on and ready and that the controller is brought online by the AS/400 system operator. If the AS/400 system and DCE are on and ready and the controller is online, the failure is a network problem.
214600	The called DTE is signaling uncontrolled-not-ready. Make sure that the number called is correct, that the AS/400 system you called as well as the DCE are on and ready and that the controller is brought online by the AS/400 system operator. If the AS/400 system and DCE are on and ready and the controller is online, the failure is a network problem.
214700	The called DCE is powered off. Make sure that the number called is correct, that the AS/400 system you called as well as the DCE are on and ready and that the controller is brought online by the AS/400 system operator. If the AS/400 system and DCE are on and ready and the controller is online, the failure is a network problem.

SRC	Description
214800	The facility request code is not valid. Make sure that the facility request code is correct and that the operating procedures and configuration are compatible with the network subscription for the controller and the AS/400 system location. If the code, the procedures and configuration are correct and compatible, the failure is a network problem.
214900	There is a network problem in the local loop at the DCE you called. Make sure that the number called is correct and that the operating procedures and configuration are compatible with the network subscription for the controller and the AS/400 system location. If the number, the procedures and configuration are correct and compatible, the failure is a network problem.
215100	The number called cannot be obtained. Make sure that the number called is correct and that the operating procedures and configuration are compatible with the network subscription for the controller and the AS/400 system location. If the number, the procedures and configuration are correct and compatible, the failure is a network problem. Call your network supplier to find out why the number is unobtainable.
215200	The user class of service is not compatible. Make sure that the number called is correct and that the operating procedures and configuration are compatible with the network subscription for the controller and the AS/400 system location. If the number, the procedures and configuration are correct and compatible, the failure is a network problem.
216100	The network is congested. Make sure that the number is called is correct and try the operation again. This is a network error.
217100	There is long-term network congestion. Make sure that the number is called is correct and try the operation again. This is a network error.
217200	The recognized private operating agency (RPOA) is out of order. The failure is caused by an RPOA problem or a network problem.
218100	The registration or cancellation is confirmed. This is a confirmation, not an error.
218200	Redirection of the call facility is activated. This is a response to a status inquiry, not an error.
218300	Redirection of the call facility is deactivated. This is a response to a status inquiry, not an error.
219x00	Codes reserved for national purposes. Your network supplier can provide you with the meaning of the call progress signal 9*x*.
220000	An invalid XID was received (invalid short hold indicators). Make sure that the number called was correct. There may be an AS/400 system programming error or a configuration problem.
220100	An invalid XID was received (more than 27 digits were received or the number of digits received does not equal the number of digits specified for short hold mode). Make sure that the number called was correct. There may be an AS/400 system programming error or a configuration problem.
220200	The wrong XID was received. Make sure that the number called was correct. There may be an AS/400 system programming error or a configuration problem.
220300	An XID was required and was not received first. Make sure that the number called was correct. There may be an AS/400 system programming error or a configuration problem.

SRC	Description
220400	A DCE clear was received during call selection. The failure is caused by a network or DCE problem. Report the problem to a network service representative.
220500	Invalid transition to data transfer state while message was received. Report problem to network representative.
220600	Message was too long for buffer. Report problem to network representative.
220700	Attempt was made to send an X.21 message to the network in SDLC state. Contact your Perle 594T representative.
220800	Attempt was made to send an SDLC frame to the network in X.21 state. Contact your Perle 594T representative.
220900	Message was received in the not-ready queue. Contact your Perle 594T representative.
221101	A timeout (T1) for call-request response occurred. The failure is caused by a network or DCE problem. This error can occur if the AS/400 system configuration does not match the Perle 594T configuration. Make sure that the controller is in operating mode. Report the problem to a network service representative.
221102	A timeout (T2) for selection-signal response occurred. The failure is caused by a network or DCE problem. Report the problem to a network service representative.
221103	A timeout (T3A or T3B) for call-progress-signal response occurred. The failure is caused by a network or DCE problem. Report the problem to a network service representative.
221104	A timeout (T4B) for call-accepted response occurred. The failure is caused by a network or DCE problem. Report the problem to a network service representative.
221105	A timeout (T5) for DTE-clear-request occurred. The failure is caused by a network or DCE problem. Report the problem to a network service representative.
221106	A timeout (T6) for DTE-clear-confirmation occurred. The failure is caused by a network or DCE problem. Report the problem to a network service representative.
221300	A call-collision error occurred. Try the operation again. If the error occurs again, report the problem to a network service representative.
221400	A DCE clear was received during X.21 data-transfer state. Connection to the AS/400 system was lost. Make sure that the number called is correct. If the number called is correct, there is an AS/400 system or network problem.
221500	Received Exchange Station Identifier (XID) indicated the AS/400 system was busy.
23xx00	A call progress signal (xx) was received from the network, but a call was not placed. The failure was caused by a network or DCE problem. Report the problem to a network service representative.
240000	The DTE received an invalid call progress signal. The failure is caused by a network or DCE problem. Report the problem to a network service representative.
250100	Invalid XID3 command received, no network name control vector. Contact the AS/400 system operator, there is an AS/400 configuration error.

SRC	Description
250200	Invalid XID3 command received, no short hold mode control vector. Contact the AS/400 system operator, there is an AS/400 configuration error.
250300	Invalid XID3 command received, no short hold connection ID. Contact the AS/400 system operator, there is an AS/400 configuration error.

Vi25 bis SRC's (300000-323400)

SRC	Description
300000	Call request not allowed. Wait 30 seconds and retry the call or wait until a different SRC is displayed.
300100	Disconnect command accepted.
300200	Call clearing not allowed. Do not try to clear the call.
3101ET	Number is busy. Verify the call then try the call again. Contact the system operator.
3102xx	Delayed Call Indication received. Wait the length of time in minutes indicated by xx. Then recall.
310300	Invalid Call Indication was received. Try call again. If needed, contact the network representative.
320100	Error occurred in message transmission. Try call again. If needed, contact Perle 594T service.
320600	Message was too long to fit in buffer. Contact Perle 594T service.
320900	Message was received in the not-ready queue. Contact Perle 594T service.
321000	Ready for Sending (RFS) timeout occurred while the link was being established. Verify the link is correct. If needed, contact the network representative.
321100	Call-connected timeout occurred for an outgoing call. Verify the link is correct. If needed, contact the network representative.
321200	Call-connected timeout occurred for an incoming call. Verify the link is correct. If needed, contact the network representative.
322000	Call-collision error occurred. Try call again. If needed, contact the network service representative.
322100	Incoming call was rejected because state of the call was invalid. Try call again. If needed, contact the network service representative.
323100	Message containing fewer than 3 characters was received. Contact service representative for the modem or the network.
323300	Invalid call-failure-indication parameter was received. Contact service representative for the modem or the network.
323400	No time was indicated for the delayed call failure indication that was received. Contact service representative for the modem or the network.

SNA Communication SRC's (400000-470200)

400000	Connection attempt is already in progress.
400100	Connect request was rejected. Retry call in one minute. If needed, contact service representative for the modem, DCE or network.
400200	Data entered in the wrong format, correct the request and retry.
400300	Disconnect attempt from an unconnected AS/400, correct the request and retry.

SRC	Description
400400	Request rejected, LU name is not configured for the selected AS/400 system. Correct the request and retry.
400500	Request rejected, command not allowed for this communication configuration. Correct the request and retry.
400600	Invalid request format, correct the request and retry.
400700	Request rejected, connection number is not configured for the selected AS/400 system. Correct the request and retry.
400800	Request rejected, the link to the AS/400 already exists.
400900	Request rejected, the Perle 594T is already establishing a link to the AS/400.
400A00	Request was rejected because: a) the 594T controller is not configured for concurrent hosts. b) an attempt was made to perform a host switch from an NWS to which multi-sessions were assigned. Concurrent host switches are only allowed from NWSs to which no multi-sessions have been assigned.
400B00	Request was rejected because link to the host is already active. Wait for a different SRC to be displayed or for a sign-on screen.
400C00	Disconnect command was rejected. Wait two minutes for a sign-on screen. Then try the operation again.
400D00	Request was rejected because no printer is powered on at the address you specified or is not being recognized by the 594T.
410000	Exchange protocol error occurred for an Exchange Station Identifier (XID). Verify the configuration. If needed, contact the system operator or the network service representative.
410100	XID command length error, contact the AS/400 system operator.
410200	XID contains an unsupported I field format, contact the AS/400 system operator.
410300	XID command exchange state indicators are set to "not supported", contact AS/400 system operator.
410400	XID3 command did not specify SDLC, contact the AS/400 system operator.
410500	XID3 command specified ABM support, contact the AS/400 system operator.
410600	XID3 command specified ALS as secondary, contact the AS/400 system operator.
410700	XID3 command specified a maximum BTU length less than 256 bytes, contact the AS/400 system operator.
410800	XID3 command specified an SDLC profile that is not valid, contact the AS/400 system operator.
410900	XID3 command specified a maximum I frame outstanding value that is not valid, contact the AS/400 system operator.
411200	The AS/400 reported an error in the XID response. This may be an invalid configuration on the AS/400 of the Perle 594T. Sense data contains the 3-byte error offset received in the control vector. Verify the AS/400 and the Perle 594T configuration (note CP names).
420000	There was a timeout on completion of a change number of sessions (CNOS). Try communicating with the AS/400 system again. If needed, contact the AS/400 system operator. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.

SRC	Description
420100	A CNOS reply contains unacceptable values, contact the AS/400 system operator. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.
420200	A CNOS reply contains a format error, contact the AS/400 system operator. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.
4203xx	Abnormal CNOS reply, if xx=02 the Perle 594T mode name is not defined on the AS/400. Contact the AS/400 system operator. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.
420400	There was a timeout on completion of a change number of sessions (CNOS). Contact the AS/400 system operator. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.
421000	There was a negative response to the change number of sessions (CNOS) BIND. Try communicating with the AS/400 system again. If needed, contact the AS/400 system operator. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.
4211xx	The Perle 594T received an unbind (type xx), try to re-establish communication, if unsuccessful contact the AS/400 system operator. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.
421200	Error detected in the LU6.2 CNOS session. The Perle 594T received a function management header indicating session termination. Verify configuration, if problem persists contact the AS/400 system operator. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.
421300	An error occurred while the change number of sessions (CNOS) between the 594T and the AS/400 system was being established or was in progress. Verify the configuration. Then try to reconnect. If needed, contact the AS/400 system operator. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.
4221xx	The Perle 594T sent an xx type unbind to the AS/400. Verify configuration, if problem persists contact the AS/400 system operator. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.
430000	An error occurred while the LU 6.2 session between the 594T and the AS/400 system was being established or was in progress. Try to reconnect. If needed, contact the AS/400 system operator. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.

SRC	Description
430001	An error occurred while the LU 6.2 session between the 594T and the AS/400 system was being established or was in progress. Contact the AS/400 system operator. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.
431000	The Perle 594T received a negative response to a bind command. Verify configuration, if problem persists contact the AS/400 system operator. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.
4311xx	Error detected in the LU6.2 session. The Perle 594T received an UNBIND type xx. Verify configuration, if problem persists contact the AS/400 system operator. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.
431200	Error detected in the LU6.2 session. The Perle 594T received a function management header indicating session termination. Verify configuration, if problem persists contact the AS/400 system operator. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.
431300	An error occurred while the LU 6.2 session between the 594T and the AS/400 system was being established or was in progress. Verify the configuration, if the AS/400 is operating. If not, wait for the connection to be established again or for a different SRC to be displayed. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.
4321xx	Error detected in the LU6.2 session. The Perle 594T sent an UNBIND type xx. Verify configuration, if problem persists contact the AS/400 system operator. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.
438904	The AS/400 did not accept the Perle 594T connection request, no controller description was found. Verify the AS/400 and the Perle 594T configuration (note CP names). By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.
438905	The AS/400 did not accept the 594T connection request because this 594T description was already active. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.
438908	The AS/400 did not accept the 594T connection request because this 594T description has been varied offline. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.
438909	The AS/400 did not accept the 594T connection request because the 594T recovery is pending. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.

SRC	Description
438910	The AS/400 did not accept the 594T connection request because the recovery of this 594T has been canceled. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.
438911	The AS/400 did not accept the 594T connection request because this 594T description is in a fail state. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.
438912	The AS/400 did not accept the 594T connection request because the AS/400 has an internal error. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.
439900	Invalid data was received from the AS/400 while the 594T was waiting for a response to its connection request. Contact the AS/400 system operator. By examining the content of the first sense byte, you can tell which AS/400 host the 594T controller was trying to contact when the error occurred: 00 = H1; 40 = H2; 80 = H3; C0 = H4.
4411xx	LU6.2 session error for an NWS. The Perle 594T received an unbind type xx, contact the AS/400 system operator. By examining the content of the first sense byte, you can find the LSID of the NWS in the low 6 bits. The identity of the AS/400 host the 594T controller was trying to contact when the error occurred is in the high 2 bits. B'00' = H1; B'01' = H2; B'10' = H3; B'11' = H4.
441200	LU6.2 session error for an NWS. The Perle 594T received an FMH7 indicating abnormal termination, contact the AS/400 system operator. By examining the content of the first sense byte, you can find the LSID of the NWS in the low 6 bits. The identity of the AS/400 host the 594T controller was trying to contact when the error occurred is in the high 2 bits. B'00' = H1; B'01' = H2; B'10' = H3; B'11' = H4.
4421xx	LU6.2 session error for an NWS. The Perle 594T sent an unbind type xx, contact the AS/400 system operator. By examining the content of the first sense byte, you can find the LSID of the NWS in the low 6 bits. The identity of the AS/400 host the 594T controller was trying to contact when the error occurred is in the high 2 bits. B'00' = H1; B'01' = H2; B'10' = H3; B'11' = H4.
4500xx	PWS error detected during link initialization, verify PWS configuration. xx=01 indicates bad initiate link reply (incorrect length). xx=02 indicates bad initiate link reply (nonzero return code).
4501xx	PWS error detected during communication, an invalid frame was received from a PWS, verify PWS configuration, xx is the first byte of the control field.
4510xx	PWS error detected during XID exchange, verify PWS configuration. xx=80 frame length too long. xx=40 not a format 3 XID. xx=20 length inconsistency between XID and I/O block length. xx=10 XID exchange state not 01 or 00. xx=08 link station role was not 00. xx=04 maximum BTU acceptable to PWS was less than 109. xx=02 PWS responded to XID with neither an XID nor a disconnect. xx=01 XID frame length is too short.

SRC	Description
4511xx	PWS error detected during communication, an invalid twinaxial data link control frame was received from a PWS, verify PWS configuration, xx is the first byte of the control field.
4520xx	PWS error detected during communication, the link was ended because of a severe session state conflict, verify PWS configuration.
4521xx	LAN link with a PWS error detected during communication, the link was ended because of a severe session state conflict, verify PWS configuration.
4522xx	PWS error detected during communication, an invalid twinaxial data link control frame was received from a PWS, verify PWS configuration, xx is the twinaxial workstation ID.
4523xx	LAN link with a PWS error detected during communication, an invalid frame was received from a PWS, verify PWS configuration, xx is the LAN workstation ID.
4524xx	Twinaxial data link control (TDLC) link with the PWS terminated. Turn power to the PWS off and on. Verify the PWS communication is installed and configured correctly.
4525xx	LAN link with the PWS terminated. Turn power to the PWS off and on. Verify the PWS communication is installed and configured correctly.
460000	A frame was received with an invalid session address. If problem persists, contact the AS/400 system operator.
460100	A frame was received with an invalid format identification (FID) type. If problem persists contact the AS/400 system operator.
460200	A frame was received that did not contain a full transmission header (TH). If problem persists, contact the AS/400 system operator.
460300	A frame was received that did not contain a full transmission header (TH) and request header (RH). If problem persists contact the AS/400 system operator.
460400	A frame was received that did not contain a session control request code. If problem persists, contact the AS/400 system operator.
460500	The Perle 594T received an unsupported segmented frame. If problem persists contact the AS/400 system operator.
470100	An invalid BIND request was received (incorrect ODAI), contact the AS/400 system operator.
470200	An invalid BIND request was received (incorrect SIDH/SIDL), contact the AS/400 system operator.

594 System Operations SRC's (500000-520003)

500001	Error trying to read information from the 594T floppy diskette or 594T hard drive.
500002	Hardware cannot support parameters specified by the current configuration. Verify configuration and communication cable are correct.
500003	Perle 594T hardware is not compatible with system diskette. Replace diskette.
500004	Diskette is not a Perle 594T Controller Software Diskette.
500005	Perle 594T system diskette is write-protected.
500006	Error trying to write information to the 594T floppy diskette or 594T hard drive.
500007	Perle 594T system diskette has been superseded by a later release.
500009	Invalid value was detected in the Perle 594T configuration file. Reconfigure the 594T.
50000A	The attempt to download a configuration file has failed. The previous configuration file has been restored.

SRC	Description
50000G	The configuration file contains features not supported by the current version of Controller Software. Upgrade to the newest version of Controller Software or use the appropriate version of 594T Utility Program.
500011	Perle 594T is not operating in configuration mode and could not find a valid configuration file.
500013	This error indicated one of the following problems: - no AS/400 connection cable attached - faulty AS/400 connection cable attached - the communication mode configuration does not match the cable attached.
500014	The Token-Ring or Ethernet adapter is not recognized even though the 594T is configured for a LAN Gateway or a LAN AS/400 connection.
500015	Diskette error, the KTT or PDT files on the diskette are not valid. These files will be downloaded from theAS/400.
500016	A microcode error occurred. Report the SRC that appears on the front panel to your 594T service representative.
500018	Indicates the date and time the Perle 594T was restarted. This is not an error.
500019	You can only use either the Token-Ring adapter or the Ethernet adapter, depending on the configuration. If no configuration exists, the 594T will use the adapter in the lowest slot number.
50001A	Indicates the configuration file was changed and the 594T will use the changed configuration file for the next installation. This is not an error.
50001C	The 594 has been started with a 594 controller software diskette that does not support one of the features currently configured in the 594 configuration file. Refer to *Features of the Perle 594T* in Chapter 2 for a list of 594T features and their requirements.
50001E	A SNA twinax device (NWS or PWS) has been connected to a twinax controller which has been configured as an IP Router Port with the SNA controller disabled. The SNA twinax device will not be able to communicate with the AS/400.
50001F	VPN has been configured on the controller but a “Box Security Key” has not been entered (see Req. 274 in the 594 Diagnostic Guide).
500040	The 594T has detected a low buffer pool condition while running a TCP/IP, FR-TR Bridge or IP Routing configuration. This SRC is informational only.
500041	The 594T has recovered from a low buffer pool shortage. This SRC is informational only.
520000	No printer found for local copy to print function, verify printer is powered on and online.
520001	Device specified for local copy to print function is not a printer, verify configuration.
520002	Printer is busy, powered off or in error state, correct printer condition.
520003	The Perle 594T has lost communication with the printer, correct printer condition.

LAN SRC’s (540000-540425)

540010	The LAN Feature Card did not initialize correctly. Power the Perle 594T OFF and ON, if problem continues contact service.
540011	Token-Ring restart in progress.
540021	The network is recovering from a beaconing condition.
540105	Command to the Ethernet or Token-Ring adapter has failed. Press the right arrow key on the Perle 594T keypad to obtain sense data. Run extended diagnostics to test all hardware.

SRC	Description
540106	Token-Ring Gateway adapter open error. Verify the Perle 594T Token-Ring speed setting matches the LAN speed. If the problem persists, contact the Token-Ring administrator. Press the right arrow key on the Perle 594T keypad to display the sense data for this SRC: 1100 lobe media function failure. 2400 physical insertion ring failure, wrong speed 2600 physical insertion ring failure. 2700 physical insertion ring failure, ring beaconing. 2A00 physical insertion error, timeout. 2D00 no monitor detected. 3200 address verification, signal loss. 3300 unable to transmit 3500 address verification, timeout. 3600 address verification, ring failure. 3700 address verification, ring beaconing. 3800 address verification, duplicate node address. 3A00 address verification, remove received. 4200 ring poll, signal loss. 4500 ring poll, timeout. 4600 ring poll, ring failure. 4700 ring poll, ring beaconing. 4A00 ring poll, remove received. 5500 request parameter, timeout. 5600 request parameter, ring failure. 5700 request parameter, ring beaconing. 5900 request parameter, request. 5A00 request parameter, remove received.
540107	LAN Gateway frame error. Verify configuration, if problem persists, contact the LAN administrator. Press the right arrow key on the Perle 594T keypad to display the sense data for this SRC. The first byte of sense data is a cause code, the final six bytes are the AS/400 LAN address. Token-Ring cause codes: 22 error in frame transmission. 23 error in frame transmitted readback checking. 24 unauthorized MAC frame. Ethernet cause codes: 22 too many collisions
540108	Command to the Ethernet or Token-Ring adapter has failed. Press the right arrow key on the Perle 594T keypad to obtain sense data. Run extended diagnostics to test all hardware.
540109	Token-Ring Gateway XID error. Verify PWS configuration, if problem persists contact the AS/400 system operator.
540122	Token-Ring Gateway wire fault. The Perle 594T has detected a Token-Ring wire fault between the Perle 594T and the multistation access unit (MSAU). Contact the Token-Ring administrator and report that a wire fault has been detected.
540123	Token-Ring Gateway. The Perle 594T has removed itself from the network. Contact the Token-Ring administrator and report that an auto-removal command was received.
540124	Token-Ring Gateway. The Perle 594T received a remove command from the Token-Ring network. Contact the Token-Ring administrator and report that a remove command was received.
540125	Token-Ring network error, the network is beaconing due to a permanent error on the Token-Ring. Contact the Token-Ring administrator and report the condition.

SRC	Description
5402wd	There was an error during device driver initialization. The value for w indicates the error type. The value for d indicates the device driver. Press the right arrow key on the Perle 594T keypad to obtain sense data. Run extended diagnostics to test all hardware.
540404	The AS/400 did not respond to a TEST command sent from the Perle 594T, contact the AS/400 system operator.
540405	The AS/400 did not respond to the XID3 command sent from the Perle 594T, contact the AS/400 system operator.
540406	Token-Ring adapter open error. Verify the Perle 594T Token-Ring speed setting matches the LAN speed. If the problem persists, contact the Token-Ring administrator. Press the right arrow key on the Perle 594T keypad to display the sense data for this SRC: 1100 lobe media function failure 2400 physical insertion ring failure, wrong speed. 2600 physical insertion ring failure. 2700 physical insertion ring failure, ring beaconing. 2A00 physical insertion error, timeout. 2D00 no monitor detected. 3200 address verification, signal loss. 3500 address verification, timeout. 3600 address verification, ring failure. 3700 address verification, ring beaconing. 3800 address verification, duplicate node address. 3A00 address verification, remove received. 4200 ring poll, signal loss. 4500 ring poll, timeout. 4600 ring poll, ring failure. 4700 ring poll, ring beaconing. 4A00 ring poll, remove received. 5500 request parameter, timeout. 5600 request parameter, ring failure. 5700 request parameter, ring beaconing. 5900 request parameter, request. 5A00 request parameter, remove receive.
540407	LAN frame error. Verify configuration, if problem persists contact the LAN administrator. Press the right arrow key on the Perle 594T keypad to display the sense data for this SRC. The first byte of sense data is a cause code, the final six bytes are the LAN address. Token-Ring cause codes: 22 error in frame transmission. 23 error in frame transmitted readback checking. 24 unauthorized MAC frame. Ethernet cause codes: 22 too may collisions
540422	The Perle 594T has detected a Token-Ring wire fault between the Perle 594T and the multistation access unit (MSAU). Contact the Token-Ring administrator and report that a wire fault has been detected.
540423	The Perle 594T has removed itself from the network. Contact the Token-Ring administrator and report that an auto-removal command was received.
540424	The Perle 594T received a remove command from the Token-Ring network. Contact the Token-Ring administrator and report that a remove command was received.
540425	Token-Ring network error, the network is beaconing due to a permanent error on the Token-Ring. Contact the Token-Ring administrator and report the condition.

Frame Relay Communication SRCs (560000-560410)

SRC	Description
560010	There was an initialization error with the Perle 594T host-twinaxial adapter. Run extended diagnostics to test all hardware.
560011	There is a response problem with the network's LMI. Make sure the 594T's LMI matches the host/network's LMI.
560404	The ALS is not responding to the 594T's TEST command. Ask the host operator to ensure the ALS is operating and is configured for the 594T and to ensure the line is varied on at the host.
560405	The ALS is not responding to the 594T's XIDS command. Ask the host operator to ensure the ALS is operating and to ensure the host system's APPC controller description and RWS controller description for your 594T are varied on.
560406	An error occurred when the Perle 594T tried to attach to the frame relay network. Run extended diagnostics to test all hardware.
560407	An error occurred when the Perle 594T tried to transmit a frame. Press the right arrow key on the Perle 594T keypad to obtain sense data. The sense data cause code is one of: 22 (frame transmission error); 23 (frame transmitted read-back checking error); 24 (medium access control frame is unauthorized). The last three digits of the sense data frame relay address are the data link connection identifier. Run extended diagnostics to test all hardware.
560408	There was a problem with a command to the Perle 594T host-twinaxial adapter. Press the right arrow key on the Perle 594T keypad to obtain sense data. Run extended diagnostics to test all hardware.
560409	The network is not reporting a configured DLCI. If the DLCI indicated in the sense data is for the correct host, make sure the configuration contains the correct DLCI for your 594T. Also, this may be due to a temporary problem in the network.
560410	The network is reporting a configured DLCI as not active. If the DLCI indicated in the sense data is for the correct host, report the problem to the network service provider. *Note: This can be a temporary condition caused when the network is first started up.*

Frame Relay Token-Ring Bridge SRC's (570000-57FFFF)

SRC	Description
570000	The filter file has been verified by the CHKFILT program and contains no errors.
570001	The filter file contains one or more errors. The 594 bridge will not activate with an invalid filter file.
570030	The 594 FR-TR bridge initialized with no filter file or a null filter file. No bridge filtering will be performed.
570041	The filter file contains an illegal character.
570042	The filter file contains a line with numeric characters but no keyword.
570049	The 594 FR-TR bridge partner's ring number and the frame relay ring number configured on the 594 does not match. The 594 will discard frames from this bridge partner. Press the right arrow key on the Perle 594 keypad to display the sense data for this SRC: bytes 1 and 2 = DLCI of bridge partner bytes 3 and 4 = ring number of bridge partner
570063	The 594 FR-TR bridge port for the token-ring or frame relay has failed. Press the right arrow key on the Perle 594 keypad to display the sense data for this SRC: 00 indicates the token-ring port 01 indicates the frame relay port
570066	The 594 encountered a problem when changing operational states. Press the right arrow key on the Perle 594 keypad to display the sense data for this SRC: byte 1 = current state byte 2 = return code
570092	The 594 FR-TR bridge could not start operations.
570112	The FR-TR bridge detected a SAP failure on the adapter and has closed the SAP. Press the right arrow key on the Perle 594 keypad to display the sense data for this SRC: 00 indicates the token-ring port 01 indicates the frame relay port
570114	The 594 FR-TR bridge operation has failed on a specific port. Press the right arrow key on the Perle 594 keypad to display the sense data for this SRC: 00 indicates the token-ring port 01 indicates the frame relay port
570119	The 594 FR-TR bridge was unable to initialize. Press the right arrow key on the Perle 594 keypad to display the sense data for this SRC.
570143	The 594 FR-TR bridge was unable to initialize.
570149	The FR-TR bridge has detected the presence of another bridge between the 594T token-ring gateway LAN and the frame relay virtual LAN with the same bridge number.

SRC	Description
570151	The FR-TR bridge has experienced an adapter failure. Press the right arrow key on the Perle 594 keypad to display the sense data for this SRC: 00 indicates the token-ring port 01 indicates the frame relay port
570152	The FR-TR bridge did not successfully open the adapter on a specified port. Press the right arrow key on the Perle 594 keypad to display the sense data for this SRC: Sense byte 1 indicates the port: 00 indicates the token-ring port 01 indicates the frame relay port Sense bytes 2-3 indicate the sense data. Values for the token ring port are: 1100 lobe media function failure 2400 physical insertion ring failure, wrong speed. 2600 physical insertion ring failure. 2700 physical insertion ring failure, ring beaconing. 2A00 physical insertion error, timeout. 2D00 no monitor detected. 3200 address verification, signal loss. 3500 address verification, timeout. 3600 address verification, ring failure. 3700 address verification, ring beaconing. 3800 address verification, duplicate node address. 3A00 address verification, remove received. 4200 ring poll, signal loss. 4500 ring poll, timeout. 4600 ring poll, ring failure. 4700 ring poll, ring beaconing. 4A00 ring poll, remove received. 5500 request parameter, timeout. 5600 request parameter, ring failure. 5700 request parameter, ring beaconing. 5900 request parameter, request. 5A00 request parameter, remove receive. Values for the frame relay port are: 3300 Unable to transmit
570153	The FR-TR bridge has sent out an 802.5 TEST frame from one port to the other and has not received a response.
570155	The FR-TR bridge experienced a SAP failure on a specified port. Press the right arrow key on the Perle 594 keypad to display the sense data for this SRC: 00 indicates the token-ring port 01 indicates the frame relay port
570156	The FR-TR bridge has experienced congestion where the required resources were not available. The 594 will retry the operation.

SRC	Description
570161	The FR-TR bridge did not receive a BPDU before the message age timer expired. Press the right arrow key on the Perle 594 keypad to display the sense data for this SRC: 00 indicates the token-ring port 01 indicates the frame relay port
570176	The 594 was unable to initialize the FR-TR bridge.
570186	The 594 detected a FR-TR bridge configuration problem. Verify the 594 configuration matches your network.
570410	The network is reporting a configured FR-TR bridge DLCI as not active. *Note: This can be a temporary condition caused when the network is first started up.*

TCP/IP Error SRCs (5A000-5AFFFF)

SRC	Description
5A00xx	The ALS TCP/IP connection attempt to establish an SNA session has failed because an invalid parameter was detected in the TCP/IP connection request at the offset indicated by xx.
5A01xx	The 594T TCP/IP connection attempt to establish an SNA session with the ALS has failed because an invalid parameter was detected in the connection response or because a connection reject/negative response was sent from the ALS. If an invalid parameter was detected, xx indicates the offset of the invalid parameter. If a reject/negative response was sent, xx is 0.
5A0200	The ALS TCP/IP connection attempt to establish an SNA session has failed because an invalid parameter was detected in the SNA BIND data in the TCP/IP connection request.
5A03xx	A TCP/IP record was either rejected or discarded because an invalid command was detected in the MPTN header. xx is the value of the invalid command.
5A04xx	The ALS rejected an TCP/IP record sent by the 594T. If xx = 00, the TCP/IP response was discarded. If xx = 01, the connection was abnormally reset.
5A05xx	The 594T received an unrecognized TCP/IP record that was discarded. xx indicates an unsupported TCP/IP command or compensation detected in the record.
5A0600	There are no accessible TCP ports for establishing a connection to the ALS because all ports have been stranded by the ALS. To remove the strand status from a port so that it will become available, speak to your ALS operator.
5A0601	The 594T is waiting for the ALS to terminate previously established TCP/IP sessions. This process may take up to 10 minutes. This process resulted if the 594T was powered off and on or if the 594T was disconnected from the host for more than the 594T configured AnyNet Keep Alive duration.
5A0602	The 594T attempted to start a new TCP/IP session with the AS/400 but the AS/400 rejected the connection request or did not respond.
5A07xx	A TCP/IP out-of-band record was either rejected or discarded because an invalid parameter was detected in the record at the offset indicated by xx.
5A1000	A TCP/IP protocol error was detected in the TCP/IP record sent from the ALS. The record length did not match the overall length minus the headers and administration data.
5A1001	A TCP/IP protocol error was detected in the TCP/IP record sent from the ALS. The TCP/IP record was out of sequence.

Frame Relay IP Routing SRCs (5B000-5BFFFF)

SRC	Description
5B0010	A 594T IP Routing port has failed. Press the right arrow key on the Perle 594 keypad to display the sense data for this SRC: 01 indicates the Frame Relay Port 02-07 indicates the LAN port number (which equals the configured LAN slot number), of the router port that has failed.
5B0020	An Inverse-ARP reply has been received that reported an IP address that has already been pre-configured on a different DLCI. The new DLCI information will be ignored and the configured DLCI will be used for this IP address. Press the right arrow key on the Perle 594 keypad to display the sense data for this SRC: sense byte 1-2: xxxx indicates the DLCI number that the Inverse-ARP reply was received on sense byte 3-6: aabbccdd indicates the IP address, in hex (aa.bb.cc.dd) that was reported in the Inverse-ARP reply. Sense byte 7-8: yy indicates the DLCI number that was already configured with the reported IP address.
5B0021	An Inverse-ARP reply has been received that reported an IP address that has already been reported by an Inverse-ARP on a different DLCI. The new DLCI information will be used and the previously reported DLCI information will be ignored. Press the right arrow key on the Perle 594 keypad to display the sense data for this SRC: sense byte 1-2: xxxx indicates the DLCI number that the Inverse-ARP reply was received on sense byte 3-6: aabbccdd indicates the IP address, in hex (aa.bb.cc.dd) that was reported in the Inverse-ARP reply. Sense byte 7-8: yyyy indicates the DLCI number that had previously reported the IP address.
5B0022	An Inverse-ARP reply has been received that reported an IP address that is not on the same IP network that was configured for the Frame Relay port. The new DLCI information will be ignored. Press the right arrow key on the Perle 594 keypad to display the sense data for this SRC: sense byte 1-2: xxxx indicates the DLCI number that the Inverse-ARP reply was received on sense byte 3-6: aabbccdd indicates the IP address, in hex (aa.bb.cc.dd) that was reported in the Inverse-ARP reply.

SRC	Description
5B0030	The network is reporting a IP Routing DLCI as not active, that was previously active. Note: This can be a temporary condition caused when the network is first started up Press the right arrow key on the Perle 594 keypad to display the sense data for this SRC: xxxx indicates the DLCI number
5B0040	A newly discovered DLCI has been reported by the LMI, but the maximum number of DLCIs (40 Maximum), is already active. Press the right arrow key on the Perle 594 keypad to display the sense data for this SRC: xxxx indicates the DLCI number
5B00120	The Perle's 594T pre-defined IP address assigned to a twinax IP device conflicts with an IP address already assigned (via BOOTP or DHCP), to another twinax IP device. This may be a temporary condition, until the new twinax IP device is assigned an IP address from a BOOTP or DHCP server. Press the right arrow key on the Perle 594 keypad to display the sense data for this SRC. Sense byte 1: xx indicates the LSID of the newly connected twinax IP device Sense byte 2-5: aabbccdd indicates the IP address, in hex (aa.bb.cc.dd) that was attempted to be assigned to the new twinax IP device. Sense byte 6: xx indicates the LSID of the twinax device that is already assigned this IP address via BOOTP or DHCP.
5B00121	An IP address was assigned to a twinax IP device via BOOTP or DHCP that conflicts with an IP address that was pre-defined by the Perle 594 to another twinax IP device. This may be a temporary condition, until the other twinax IP device is assigned an IP address from a BOOTP or DHCP server. Press the right arrow key on the Perle 594 keypad to display the sense data for this SRC. Sense byte 1: xx indicates the LSID of the twinax IP device assigned a new IP address by a BOOTP or DHCP server Sense byte 2-5: aabbccdd indicates the IP address, in hex (aa.bb.cc.dd) that was assigned to the new twinax IP device via BOOTP or DHCP. Sense byte 6: xx indicates the LSID of the other twinax device that is already assigned this IP address by the Perle 594.

SRC	Description
5B00122	An IP address was assigned to a twinax IP device via BOOTP or DHCP that is not on the same IP network that was configured for the 594 twinax port. The new IP address information will be ignored. Press the right arrow key on the Perle 594 keypad to display the sense data for this SRC. Sense byte 1: xx indicates the LSID of the twinax IP device that the new IP address was received for via a BOOTP or DHCP server Sense byte 2-5: aabbccdd indicates the IP address, in hex (aa.bb.cc.dd) that was attempted to be assigned to a twinax IP device.
5B0150	Invalid BOOTP request received from a twinax IP device. The BOOTP request had no hardware address associated with the twinax IP device.

PPP SRCs (5C00xx - 5C33xx)

General negotiation failure SRCs:

xx = PPP phase of negotiation when failure occurred

00 = LCP negotiation

01 = Authentication

02 = IPCP negotiation

SRC	Description
5C01xx	Negotiation timer expired before successful negotiation was achieved.
5C02xx	The PPP layer issued a close port command. This could be caused by the expiration of a negotiation counter or timer.
5C03xx	The line disconnected. The peer may have dropped the connection.
5C04xx	The user requested a disconnect via SysReq. or the on-demand timeout expired during the PPP negotiation.

Authentication failure SRCs

SRC	Description
5C1001	PAP authentication by the 594 failed.
5C1002	CHAP authentication by the 594 failed.
5C1801	PAP authentication by the remote peer failed.
5C1801	CHAP authentication by the remote peer failed.

LCP negotiation failure SRCs:

zz = The specific LCP option number which failed.

SRC	Description
5C20zz	An option that the 594 requires to be negotiated was rejected by the peer.
5C21zz	The remote peer has Negative Acknowledged (NAK'ed) an option who's value is non-negotiable or has a limited number of acceptable values.
5C22zz	The 594 sent a Negative Acknowledge (NAK) to an option that was requested by the remote peer.

IPCP negotiation failure SRCs:

zz = The specific NCP option number which failed.

SRC	Description
5C30zz	An option that the 594 requires to be negotiated was rejected by the remote peer.
5C31zz	The remote peer has NAK'ed an option who's value is non-negotiable or has a limited number of acceptable values.
5C32zz	The 594 sent a NAK to an option that was requested by the remote peer.
5C3303	The 594 requested an IP address from the remote peer. The remote peer acknowledged the request but did not provide an IP address.

Hardware Error SRCs (E00XXX)

SRC	Description
E00xxx	Indicates the hardware failure. xxx is the 3-digit SRC. Report the SRC to the 594T service representative.

Software Error SRCs (FXXXX)

SRC	Description
Fxxxxx	Perle 594T code error detected, contact your 594T service representative.

Utility Program Messages and SRCs

This section describes message and System Reference Codes (SRCs) which are used by the 594T Utility Program.

594T Utility Program Installation Codes

The following SRC codes are displayed during the installation of the 594T Utility Program:

SRC	Description
0000	Installation complete
1010	Invalid destination drive. Restart the install program with a valid drive selection.
1020	Invalid mode parameter. Restart the install program with a valid selection (0,1,2 and blank).
1031	Invalid 5250 workstation address. Restart the install program with a valid drive selection (06).
1032	Invalid Token-Ring Address. Restart the install program with a valid Token-Ring Address.
1040	Invalid Token-Ring SAP. Restart the install program with a valid Token-Ring SAP.
1100	Invalid number of parameters. Restart the install program with valid parameters.
2000	Insufficient memory available to run the installation program. Free up at least 100 kb of memory and restart the installation program.
3000	Error reading the 594T Utility disk. Retry the 594T Utility installation, if the problem continues contact a service representative.
4000	Cannot create the destination directory. Restart the install program with a valid destination directory.
4001	Cannot write to destination drive. Verify drive and retry.
4002	Not enough disk space on destination drive. Restart the install program with a valid destination drive.
4005	Installation error. Retry the install program.
4007	Invalid run time parameters or options. Verify and restart the install program.

594T Utility Program Run Time Messages

The following messages are displayed when running the 594T Utility program:

Message	Description
594 Controller Software diskette build started... please wait	The controller is creating the 594 Base Controller Software diskette. This might take about 2 minutes.
594 Controller Software diskette file error	There is a problem with the 594 Base Controller Software diskette. Restart the 594T and use the backup diskette. If the problem persists, contact your service representative.
594 Controller Software diskette invalid	The diskette in the 594T diskette drive is not a valid 594 Base Controller Software diskette. Replace the diskette with the appropriate diskette and try again.
594 Controller Software diskette write protected	Remove the write protect and try again.
594 Controller Software diskette write protected or damaged	Remove the write protect and try again. If the diskette is damaged, use the backup diskette.
594 Controller Software file names must end in ".IMG"	The File name has the wrong extension.
594 Controller Software successfully transferred to 594T memory	This message appears only if the Quick Disconnect option was invoked and indicates that the first stage of the download was completed successfully.
594 Controller Software transfer started	The first stage of the download process has begun.
594 Network Controller Software file names must end in ".KIM"	The file name has the wrong extension.
594 out of memory	Insufficient memory available to run the download option. Contact your service representative.
594T file shared error	A file used by the 594T is currently owned by another program. Do not lock out the 594T files.
594T Hardware error	A hardware error has occurred on the 594T. Use any SRC or message displayed on the 594T LCD display to determine the cause of the error. Power the 594T off and on. If the problem continues contact your Perle 594T service representative.
594T is not in Network Controller mode	The 594T must have the 594T Network Controller Feature installed and must be running the Networking Controller Software in order to perform this operation
594T Local session cannot be started	The AS/400 PC Support router could not allocate a local session. Verify the configuration and restart the 594T Utility program.
594T Local Session connection ended	The local session physical connection has been terminated. Verify the 594T power and all cable connections. Correct any problem and restart the 594T Utility program.
594T Local Session deallocated	The 594T Utility program received a deallocate from the 594T. Reinstall and restart the 594T Utility program. If the problem continues, contact a service representative.

Message	Description
594T Local Session ended	The 594T local session ended prematurely because of a failure. Start the 594T Utility program again. If the problem continues contact a service representative.
594T Network Controller Feature not enabled	"Enable Network Controller Features" must be set to Yes in order to configure this option.
594T Network Controller Software diskette invalid	The diskette in the 594T diskette drive is not a valid 594 Network Controller Software diskette. Replace the diskette with the appropriate diskette and try again.
594T Utility Program Error	Contact your service representative.
594T Utility program version mismatch with 594T controller	The configuration file includes features not yet supported by this version of controller.
594T version does not support this function	The configuration file includes features not yet supported by this version of controller.
Added Ethernet card must be in higher slot than first	The second Ethernet card must be installed in a higher numbered slot than the first (primary) Ethernet card.
AS/400 connection has not been configured	To complete your configuration you must complete the AS/400 connection parameters.
AS/400 connection must be Frame Relay, Token Ring or Ethernet	The AS/400 Connection must be configured for either Frame Relay, Token Ring or Ethernet before you can select Global Paramaters.
AS/400 Connection not Frame Relay	The AS/400 connection must be configured for frame relay before you can select Frame Relay Bridging.
ASCII interactive session with 594T not supported	PC Utility does not support interactive sessions through the ASCII feature card.
At least one DLCI must be configured	If LMI mode is set to No LMI and "Use Dynamically discovered DLCIs" is set to No then at least one DLCI must be configured
Bridge Filtering file exceeds 10000 bytes	The size of the FR-TR bridge filter file is greater than 10000 bytes in length.
Cannot disable Network Controller Features while configured	Remove all Network Controller feature configurations before attempting to disable the Network Controller Features.
Cannot find modem name for configured modem code	Select another modem code or enter your own Initialization String.
Cannot select more than 1 controller for switched line	A switched AS/400 Attachment will only support one controller. Change the configuration to one controller only.
Card has not been defined for any slot	At least one Feature Card must be defined.
Configuration contains features not supported	The configuration file has been created by a newer version of software. Upgrade to the newest version of the 594T Utility Program.
Configuration file is being saved	Wait while the configuration file is being saved.
Controller IP address in same subnet as twinax IP address	An IP controller has been configured for a network that is a subnet of one of the twinax IP router ports
Controller IP Address is not in same network as IP Ports	All TCP/IP Controller IP addresses must be in one of the configured local IP networks.

Message	Description
Controller IP Address is same as Destination IP Address	All configured IP addresses must be unique.
Controller IP Address is same as Host IP Address	All configured IP addresses must be unique.
Controller IP Address same as IP Router Port IP Address	All configured IP addresses must be unique.
Controller IP Addresses are not in same network	All TCP/IP Controllers must be configured on the same IP network.
Controller is inactive	The controller cannot be selected because it is inactive.
Controller Software not compatible with Utility	The software on the Controller Software Diskette does not support all features of the 594T Utility in use. Either use a Controller Software Diskette that supports the 594T Utility in use or install the version of 594T Utility Program that is compatible with the Controller Software Diskette.
Controller wrong type	The type of controller does not match the type of data requested.
Corresponding IP DLCI must be configured	A configured IP address in the IP DLCI table requires a DLCI number to be configured.
Could not reset LAN error counters	There is a communication problem between the controller and the PC Utility program.
Create software file operation was successful	The process of creating the 594 software file was completed successfully.
Data verified	The data and selections on the current menu have been verified and are correct.
Date Time Synchronization already configured	The Synchronize Date and Time with Primary AS/400 System can only be configured on one emulated controller.
Default Gateway Address is not in same network as Controller	Default Gateway IP addresses must be in one of the configured local IP networks.
Default Gateway Address is not in same network as Ports	Default Gateway IP addresses must be in one of the configured local IP networks.
Default Gateway Address same as controller IP address	All configured IP addresses must be unique.
Default Gateway Address same as port IP address	All configured IP addresses must be unique.
Destination IP Address in same network as Controller	The Destination IP address in a IP Static Route Entry must not be in the same network of any of the configured local IP networks
Destination IP Address in same network as IP Router Ports	The Destination IP address in a IP Static Route Entry must not be in the same network of any of the configured local IP networks
DLCI IP Address must be configured	An IP address must be configured in the IP DLCI table.
Download was successful	The complete process of transferring to the 594T controller and creating the 594 Software Diskette was completed successfully.
Duplicate controller addresses are configured	Two controllers have been configured with the same station address. Change the configuration so each controller has a unique address.

Message	Description
Duplicate controller TCP/IP addresses are configured	The same TCP/IP address has been configured for more than one controller in the 594T.
Duplicate CP names are configured	All CP names configured for an AS/400 system must be unique. Change the configuration so that no CP name is duplicated on an AS/400 system.
Duplicate DLCI IP Addresses configured	All configured DLCI IP address must be unique
Duplicate DLCI Table Entries configured	All configured DLCI Table Entries must be unique
Duplicate Ethernet Gateway addresses configured	Two Ethernet cards have been configured with the same high order address.
Duplicate Logical Channels Configured	All logical channels configured for an AS/400 system must be unique. Change the configuration so that no logical channel is duplicated on an AS/400 system.
Duplicate LU names are configured	All LU names configured for an AS/400 system must be unique. Change the configuration so that no LU name is duplicated on an AS/400 system.
Duplicate Passwords configured	All passwords configured for an AS/400 system must be unique. Change the configuration so that no password is duplicated on an AS/400 system.
Duplicate Router Port IP Addresses are configured	Two IP Router Ports have been configured with the same IP address
Duplicate Token-Ring Gateway addresses configured	Each Token-Ring Gateway requires a unique Token-Ring address.
Duplicated Destination exists	A duplicate destination IP address exist in the Static IP Router Entries
Embedded Zeros found in IP Mask	IP Mask is in an invalid format. Leading high bits of IP Mask must be consecutive ones followed by consecutive zeros. See PC Util help for detail
Error in creating Software File	An error has occurred while trying to create a Software File for downloading to the 594T
Error in downloading Software File	An error occurred while downloading the software file to the 594T, try the operation again
Error in getting concurrent diagnostic data	There is a communication problem between the controller and the PC Utility program.
Ethernet card not defined for any slot	No Ethernet card has been installed. Therefore, Ethernet cannot be used for high order communication.
First Ethernet card must be in lowest available slot	The first (primary) Ethernet card must be installed in the lowest numbered available slot.
First Token-Ring card must be in slot 3	The 594T requires the first Token-Ring Feature card be installed in slot 3 of the 594T. Verify and correct the configuration information before proceeding.
Frame Relay Bridging DLCI not unique	A FR-TR Bridge DLCI is the same as another FR-TR Bridge DLCI.
Frame Relay Bridging DLCIs must not match DLCIs for host(s)	A FR-TR Bridge DLCI is the same as a host DLCI.
Frame Relay Bridging not configured	"Frame Relay Bridging to Token-Ring" must set to Yes before you can select Frame Relay Bridging.

Message	Description
Frame Relay IP Routing not enabled	"Enable Network Controller Features" must be set to Yes in order to configure this option.
Frame Relay MAC Address same as Token Ring Gateway Address	The frame relay MAC address and the 594 token-ring LAN address are the same on a FR-TR bridge configuration.
Frame Relay Ring Number must be different from LAN Ring Number	The frame relay ring number and LAN ring number are the same on a FR-TR bridge configuration.
Function not available	The function you have selected is not available because the menu choice is inappropriate or there is a mismatch with the current setup.
Group data does not match	The emulated port parameters for all members of this group must be identical.
Hardware does not match User configuration	The 594T hardware configuration does not match the 594T user configuration data. Verify and correct the configuration information before proceeding.
Host Network names and LU names must be unique for all hosts	Two or more configured hosts were assigned the same name as the host network name and the LU name.
Insert the 594 Network Controller Software disk and hit Enter	Insert the 594 Network Controller Software Diskette into the selected floppy drive and press enter.
Invalid data	The value entered is not valid.
Invalid data format	The value entered is not in the right format
Invalid length	The value entered is not valid.
Invalid number of Multinational Countries	Too many keyboard codes have been entered. The maximum number of unique keyboard codes allowed is four.
Invalid password	The password entered does not match the configured password.
Invalid range	The value entered is not valid.
IP Address in DLCI IP Table not in same network as Controller	A DLCI IP address must be in the same network as the Frame Relay TCP/IP Controllers network
IP Address in DLCI IP Table not in same network as Frame Relay Port	A DLCI IP address must be in the same network as the Frame Relay IP port network
IP Address in DLCI IP Table same as Controller address	All configured IP addresses must be unique.
IP Address in DLCI IP Table same as Port address	All configured IP addresses must be unique.
IP Mask allows insufficient number of IP addresses for Twinax	The IP mask configured for the twinax IP router port does not allow for the minum 32 IP addresses. Select a different IP Mask.
Keyboard country codes do not match within group	Change the Keyboard country code to match the other ports in this group or assign this port to another group.
LAN Gateway not Token-Ring	The LAN Gateway must be configured for token-ring before you can select Frame Relay Bridging
Maximum controllers would be exceeded	Too many controllers have been configured. The number of multi-sessions controller defined in the configuration data has been exceeded. Either delete existing controllers or update the configuration parameter.

Message	Description
Maximum of 2 Ethernet cards are allowed	No more than two Ethernet feature cards are valid for the 594T.
Maximum of 2 Token-Ring cards are allowed	No more than two Token-Ring feature cards are valid for the 594T.
Maximum of 2 type-48 Twinaxial cards exceeded	The 594T can accept no more than 2 type-48 Twinaxial Feature cards.
May not be able to display all Concurrent Diagnostic data	The concurrent diagnostic data includes features not yet supported by this version of controller.
Must enable passthrough printer for PerleTALK for Windows	A passthrough printer field has not yet been enabled.
Must have IP Routing enabled or TCP/IP configured	"Frame Relay IP Routing Ports and Tables" can not be selected unless IP routing has been enabled or Frame Relay TCP/IP has been configured.
Network Mask is not compatible with Destination IP Address	Network portion of Destination IP address, (based on Network Mask), must be specified only
Next hop IP address is not in same network as controller	All Next hop IP addresses must be in one of the configured local IP networks.
Next hop IP Address is not in same network as IP Ports or IP Controllers	All Next hop IP addresses must be in one of the configured local IP networks.
Next hop IP address same as controller IP address	All configured IP addresses must be unique.
Next hop IP address same as port IP address	All configured IP addresses must be unique.
No .IMG files found	Only files with an extension of ".IMG" can be selected for download.
No .KIM files found	Only file with an extension of ".KIM" can be selected for Network Software download
No diskette or diskette is not a 594 Controller Software diskette	Either there is no diskette in the floppy drive or the diskette is not a 594 Controller Software diskette.
Not a 594 Controller Software diskette	The diskette currently in the floppy drive is not a 594 Controller Software diskette.
Not a 594 Network Controller Software diskette	The diskette currently in the floppy drive is not a 594 Network Controller Software diskette.
Not a physical NWS controller	A physical NWS controller must be defined.
Not available: Ethernet AS/400 connection is configured	The Ethernet card cannot be used for LAN communication because it is already being used for host communication.
Not available: LAN Gateway is configured	The AS/400 connection cannot be Token-Ring or Ethernet if a LAN Gateway is configured. Verify and correct the configuration information before proceeding.
Not available: Token-Ring AS/400 connection is configured	A Token-Ring Gateway cannot be configured if the AS/400 connection is configured for Token-Ring. Verify and correct the configuration information before proceeding.
Operation complete	The operation you selected has completed successfully.
Operation in progress	The operation you selected is in progress.
Passthrough printer not valid for AS/400 PC Support	If you wish to use a Passthrough printer, select a different ASCII Display Type.

Message	Description
Physical NWS controller not configured	A Feature Card definition is required.
PWS disk error	An error occurred writing to the 594T Controller Software Diskette. Replace or correct the disk and retry.
PWS disk is full	There is not enough room on the PWS diskette to write the configuration file. Correct the diskette and retry.
PWS diskette is write protected	Remove the write protect and retry.
PWS drive Not Ready	The drive specified in the configuration file name is not ready. Insert the 594T diskette into the specified drive and retry.
PWS file access denied	A file used by the 594T Utility program is access-protected. Assign the 594T Utility program access to this file.
PWS file error	One of the text files in the "Menus" directory is invalid. Reinstall and then restart the 594T Utility program.
PWS file not found	A file used by the 594T Utility program could not be found. Assign the 594T Utility program access to this file. Reinstall the 594T Utility program and retry.
PWS file open failure	A file used by the 594T Utility program could not be opened. Assign the 594T Utility program access to this file. Reinstall the 594T Utility program and retry.
PWS file shared error	A file used by the 594T Utility program is currently owned by another program. Do not lock out the 594T Utility program files. Reinstall the 594T Utility program and retry.
PWS incorrect diskette type or no diskette	Either there is no diskette in the PWS floppy drive or the diskette is not a 594 Controller Software diskette.
PWS invalid drive	The drive specified in the configuration file name is not valid. Specify a valid drive.
PWS out of memory	Insufficient memory available to run the program. Refer to Chapter 7 for system requirements.
PWS path not found	A path used by the 594T Utility program could not be found. Assign the 594T Utility program access to this file. Reinstall the 594T Utility program and retry.
PWS router is not installed	The AS/400 PC Support router has not been installed and is required by the 594T Utility program. Install the AS/400 PC Support program and then reinstall the 594T Utility program and retry.
PWS too many open files	The operating system has too many files open. Verify that other programs are not accessing the 594T Utility program files. Reinstall the 594T Utility program and retry.
Rebooting 594T. Wait 5 min. before restarting Utility	The 594T is being rebooted. This takes about 5 minutes.
Required field	A value must be entered in the current field.
Required field - AS/400 TCP/IP Address	A host TCP/IP address has not yet been defined.
Required field - Controller TCP/IP Address	A controller TCP/IP address has not yet been defined.
Required field - Frame Relay Bridging	Frame Relay Bridging information must be configured if "Frame Relay Bridging to Token-Ring" has been set to Yes.

Message	Description
Required field - Frame Relay IP Routing	Frame Relay IP Routing information must be configured if "Enable Frame Relay IP routing" has been set to Yes.
Required field - Logical Channel	An logical channel number has not been entered for a configured AS/400 system.
Required Field - Network Information	The Network Information has not been completed for all controllers selected.
Required field - Station Address	A station address has not been entered for all the controllers selected.
Router port IP address in same subnet as twinax IP address	An IP router port has been configured with a network that is a subnet of one of the twinax IP router ports
Router Port IP Address is same as Host IP Address	All configured IP addresses must be unique.
Save completed	The configuration data has been saved.
Selected file is not a 594 Controller Software file	Be sure you select a 594 Controller Software file.
This entry is incomplete	All the required field in a table entry have not been configured
To use dynamically discovered DLCIs, LMI must not be set to NO	Either set LMI mode to ANSI Annex D or CCITT or set "Use dynamically discovered DLCIs" to No
Token-Ring card not defined for slot 3	To configure the AS/400 connection as Token-Ring, a Token-Ring card must be installed in slot 3 of the 594T.
Version mismatch between Network and Base diskettes	The software version of the Base and Network Controller Software diskettes must be the same

Appendix D: Installing Perle 594T Feature Cards

If you are installing the Perle 594T for the first time, your Perle 594T is preconfigured and does NOT require onsite installation of Feature Cards. You do not need to install feature cards, therefore, proceed to Chapter 6: Configuring from the Perle 594T Utility Program.

Installation Overview

To install Perle 594T Feature Cards, you need to:

- select and set the Feature Card Slot Position
- define primary and alternate Feature Cards
- identify the Ethernet Card type, if required
- select and set the Ethernet media type, if required
- install the Feature Cards in the Perle 594T chassis
- set the Token-Ring speed, if required
- enter Card IDs if using more than two LAN cards.

Depending on your needs, you can configure the Perle 594T using combinations of the following feature cards:

Twinaxial	Refer to page 186 if you are installing a Twinaxial Feature Card.
Token-Ring	Refer to page 187 if you are installing a Token-Ring Feature Card.
Ethernet	Refer to page 190 to install an Ethernet Feature Card.
Fast Ethernet	Refer to page 193 to install a Fast Ethernet Feature Card.

For more details on the Twinaxial, Token-Ring and Ethernet feature cards, refer to Feature Card Specifications in Appendix E. Feature Cards are automatically detected during power-up.

Prerequisites

If you have not already prepared the Perle 594T site, refer to the Perle *594 Planning Guide.*

Before you install Perle 594T Feature Cards, ensure the following:

- All workstations, workstation cabling and communication lines have been installed.
- Any network facilities, modems and other equipment that may be required have been installed and are ready for use.

Perle 594T Card Labels

All cards placed in a slot into the Perle 594T have a numeric label on the backplate as follows:

Card Type	Label
Synchronous Communication Card	97
Token-Ring Feature Card	43
Ethernet Feature Card	45
Twinaxial Feature Card	48
Fast Ethernet Feature Card	49

Perle 594T Feature Card capacity

The following table illustrates how many of each type of Feature Card may be installed in a Perle 594T:

Card Type	Description
Twinaxial Feature Card	One card
LAN Feature Card • Token-Ring • Ethernet • Fast Ethernet	One LAN card

Feature Card Slot Position

Before installing a Feature Card into the Perle 594T chassis you must first determine in which slot to install the card and then set the slot number on the Feature Card. Slots are numbered from 1 to 7, with slot 1 closest to the power supply.

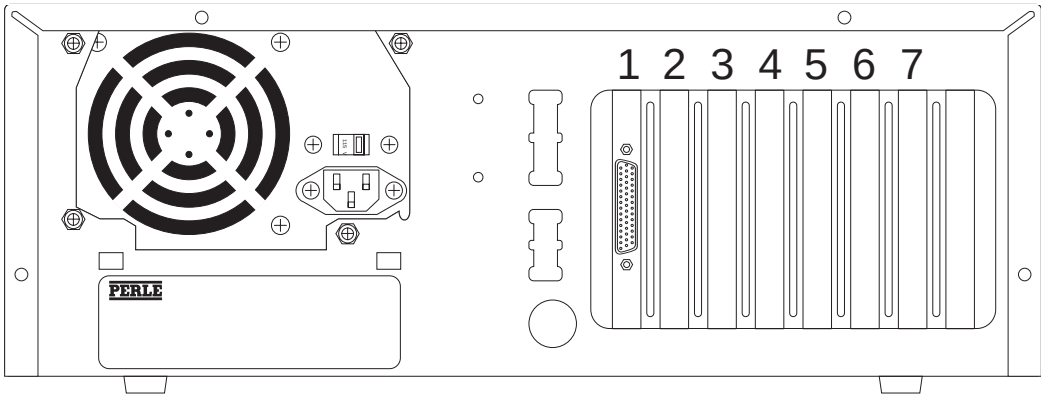


Fig. 52: Feature Card Slot Position

Note: *Slot numbers are NOT shown on the rear of the Perle 594T.*

Selecting a Feature Card Slot Position

The Perle 594T supports one LAN Feature Card (Token-Ring, Ethernet or Fast Ethernet).

Install Perle 594T Feature Cards in the following order:

1. Install Twinaxial Feature Cards.
2. Install Token-Ring, Ethernet or Fast Ethernet Cards.

Use the following table to determine the slot position for each Feature Card. Install Feature Cards in the first available slot for that card type:

Feature Card Type	Slot Number
Token-Ring	3
Twinaxial	2
Ethernet or Fast Ethernet	3

Setting the Feature Card Slot Position

Setting the Twinaxial Feature Card Slot Position

On the Twinaxial Feature Card, use the four DIP switches on the Feature Card to set the slot number.

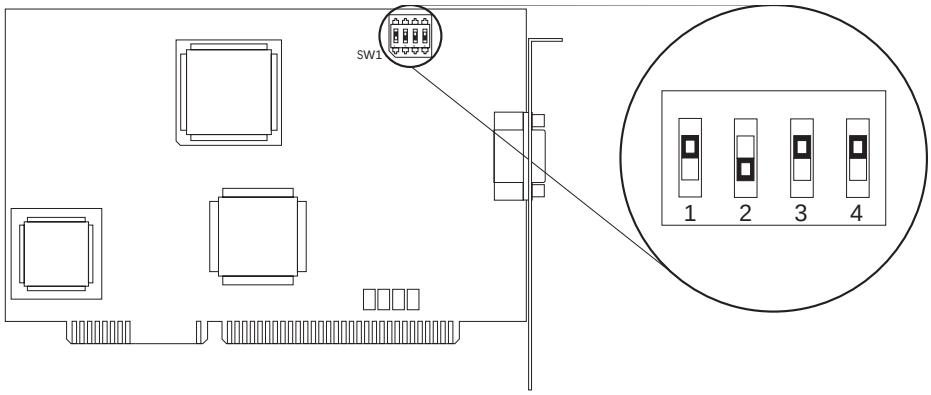


Fig. 53: DIP Switches

Note: *The above diagram illustrates the DIP switch setting for a Twinaxial Feature Card installed in slot number 2 of the Perle 594T.*

Slot Number	**SW1 DIP Switch Settings**			
	1	2	3	4
2	up	down	up	up

Setting the Token-Ring Feature Card Slot Position

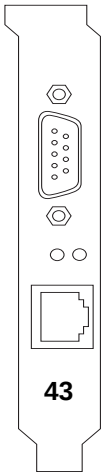


Fig. 54: Token-Ring Card

The Token-Ring card will be setup automatically by the 594 Controller software on power-up.

Identifying the Ethernet Card Type

There are two types of Ethernet Feature Cards for the Perle 494E:

- Type A and
- Type B.

If your Ethernet Card contains DIP switches, you have Type A. Please refer to “Ethernet DIP Switches” on page 188 to verify that the DIP switch areas match those on your Type A Ethernet Card.

If your Ethernet Card contains jumpers only, you have Type B. Please refer to “Ethernet Jumper Areas” on page 190 to verify that the jumper areas match those on your Type B Ethernet Card.

Setting the Ethernet Feature Card Slot Position - Type A

The Ethernet Feature Card has three DIP switch settings as shown below:

- SW1
- JP3
- JP2.

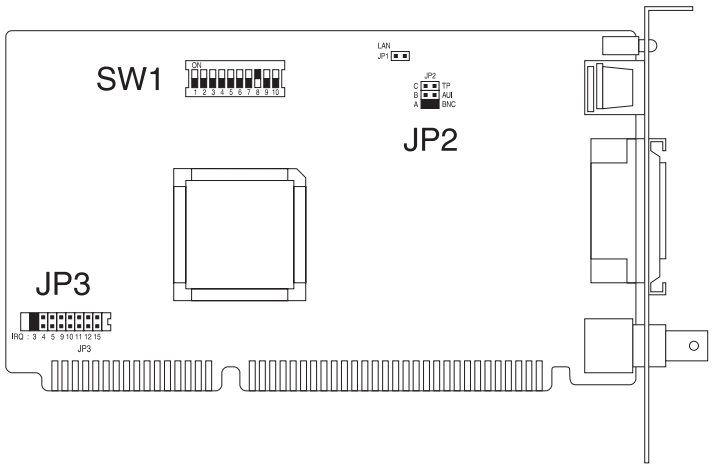


Fig. 55: Ethernet DIP Switches

On the Ethernet Feature Card, set the DIP switches as follows:

Set SW1 and short JP3 for the Primary Ethernet Feature Card, as shown below. Shaded areas indicate switch position and shorted jumpers:

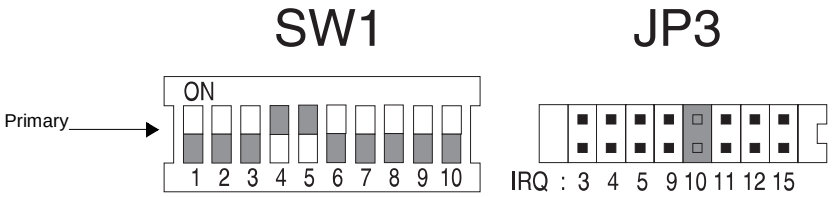


Fig. 56: SWI and JP3 DIP Switches

Setting the Ethernet media type - Type A

The Ethernet Feature Card supports three different media types. They are:

- UTP (10BaseT) using the RJ45 connection (default)
- Thin Ethernet (10Base2) using the BNC port
- Thick Ethernet (10Base5) using the AUI port

Select the Ethernet media type being used to connect to the LAN by shorting the correct jumpers on JP2.

- For a UTP (10BaseT) connection, short JP2-C.
- For an AUI (10Base5) connection, short JP2-B.
- For a BNC (10Base2) connection, short JP2-A.

Shaded areas indicate the jumper is shorted.

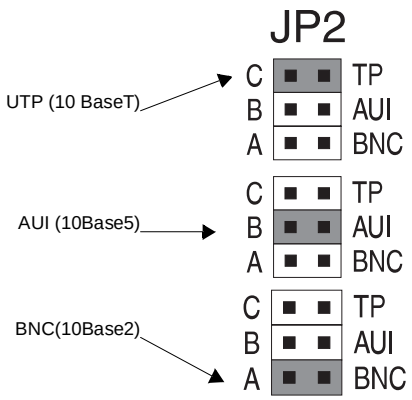


Fig. 57: Media Type DIP Switches

Setting the Ethernet Feature Card Slot Position - Type B

The Ethernet Feature Card has three jumper areas as shown below:

- JPA (jumpers 1-10)
- JPB (jumpers 11-13, 18)
- JPC (jumpers 14-17).

Shaded areas indicate shorted jumpers and are the default factory settings.

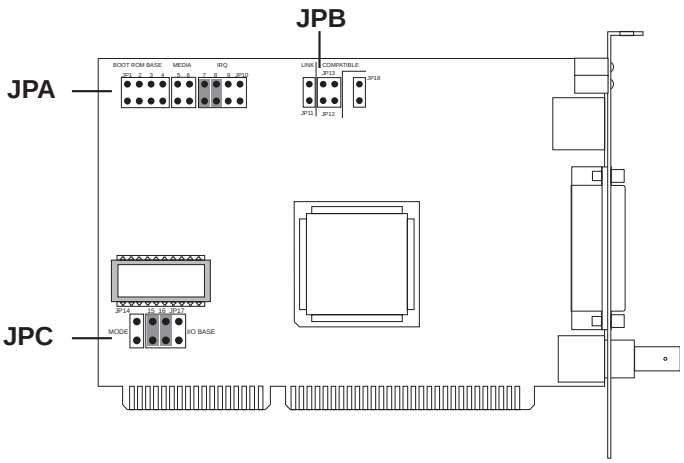


Fig. 58: Ethernet Jumper Areas

On the Ethernet Feature Card, set the jumpers as follows:

Short JPA and JPC for the Primary Ethernet Feature Card, as shown below. Shaded areas indicate shorted jumpers:

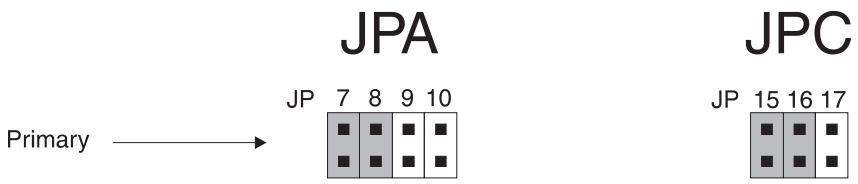


Fig. 59: JPA and JPC Shorted Jumpers

Setting the Ethernet media type - Type B

The Ethernet Feature Card supports three different media types. They are:

- UTP (10BaseT) using the RJ45 connection (default)
- Thin Ethernet (10Base2) using the BNC port
- Thick Ethernet (10Base5) using the AUI port

Select the Ethernet media type being used to connect to the LAN by shorting the correct jumpers on JPB.

- For a UTP (10BaseT) connection, do not short any jumper.
- For an AUI (10Base5) connection, short JP5.
- For a BNC (10Base2) connection, short JP6.

Shaded areas indicate the jumper is shorted.

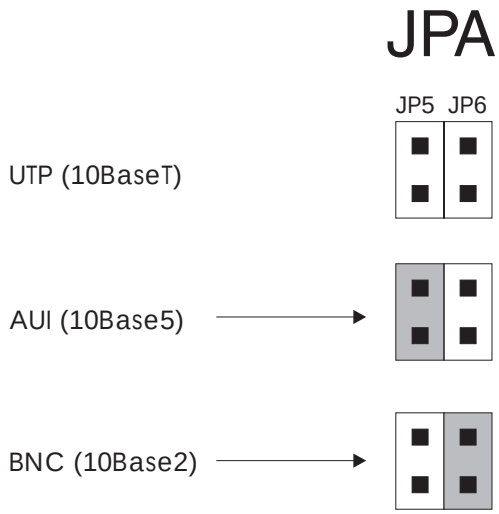


Fig. 60: Media Type Jumpers

Setting the Fast Ethernet Feature Card Slot Position

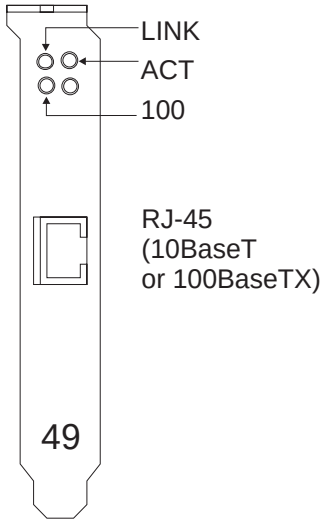


Fig. 61: Fast Ethernet Card

The Fast Ethernet card will be setup automatically by the 594 Controller software on power-up.

Installing the Feature Card in the Chassis

Warning: *Always power off the Perle 594T and disconnect the power cord BEFORE removing the cover.*

1. Powering off the 594T.
   a) Turn the Perle 594T's power off.
   b) Disconnect the Perle 594T's power cord from the power outlet.

2. Remove the Perle 594T's cover.
   a) Remove the four cover mounting screws on the rear of the Perle 594T.
   b) Push the cover back about 15mm (1/2 inch).
   c) Lift the cover up and away.

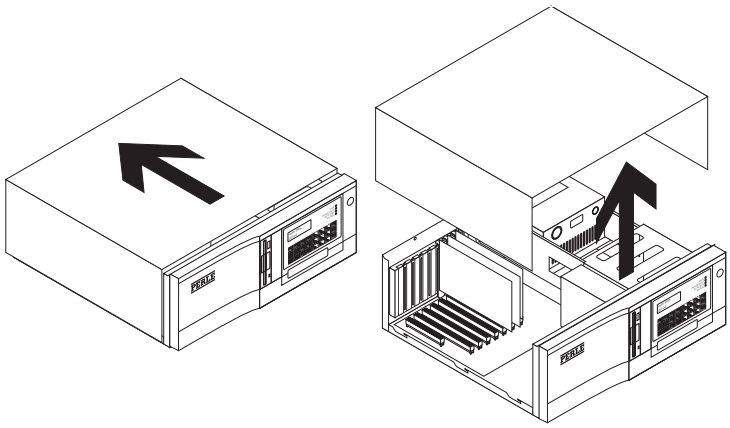


Fig. 62: Removing the Perle 594T cover

3. Remove the cover of the slot by removing the mounting screw.

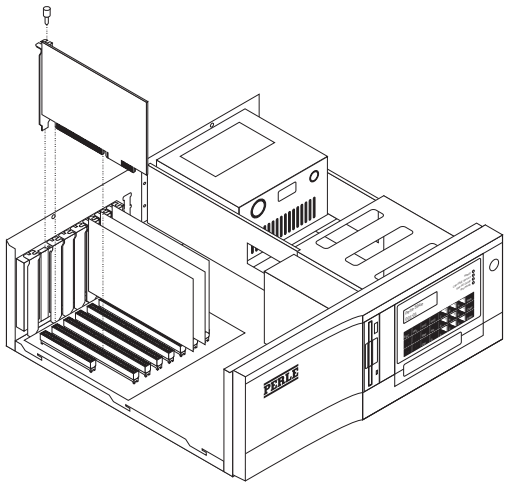


Fig. 63: Installing a Feature Card in the Perle 594T

4. Insert the Feature Card into the slot. Secure the card in place with the mounting screw removed in step 2. Repeat this step for each feature card you install.
5. Replace the Perle 594T's cover using the mounting screws removed in step 1c.

Setting the Token-Ring or Fast Ethernet Feature Card Speed

1. Connect the power cord to the power receptacle on the back of the Perle 594T and to a properly grounded electrical outlet.
2. Ensure that the diskette drive is empty.
3. Press the power switch. All LEDs should come on momentarily. If the LEDs do not come on, check the power cord and the electrical outlet.
4. The following message code is displayed on the LCD, indicating that diagnostic tests are running:

   001-01

   Whenever the displayed code does not match the above, note the message code and any number displayed on the right side of the LCD. Refer to the 594T Problem Determination Quick Reference and follow the directions given for this message code.
5. In a few moments, the following message code displays:

   003-02 1

6. Locate the Perle 594T Controller Setup Diskette and ensure that the diskette is not write-protected. Insert the Controller Setup Diskette into the diskette drive.
7. On the keypad, type **0** and press **Enter**. The 594T takes a couple of minutes to load the software from the diskette.
8. Once the software has been loaded from the Controller Setup Diskette, the Perle 594T displays date and time settings, followed by the extended diagnostics main menu as follows:

```
020-01     1
```

   If the above message code is not displayed, repeat steps 1 to 8.
9. On the keypad, type **4** and press **Enter**. The Perle 594T displays the following message:

```
           01 97
P24-01     97
```

10. Press the **Slot** key, then press the arrow keys until the Card ID (43) for the Token-Ring Feature Card or the Card ID (49) for the Fast Ethernet Feature Card appears. Press **Enter** and the following information is displayed.

```
           0y zz
P24-01     zz
```

   where: **y** is the selected slot number.

   zz is the Card ID of the selected card (43 for Token-Ring and 49 for Fast Ethernet)

11. Press **Enter**. The following information is displayed.

```
            0y zz
P24-02     x MBPs
```

   where **x** is the current Token-Ring speed (4 or 16 Mbps) or Ethernet speed (10 or 100 Mbps). If necessary, use the arrow keys to change the setting. Press **Enter** to verify the setting.
12. Repeat steps 15 and 16 to set the speed for each Token-Ring or Fast Ethernet Feature Card.
13. Press **Esc** to exit LAN speed setup and return to the main menu.

```
024-02
```

14. Press **Esc** to verify the configuration data.
15. Is the following message code displayed?

```
024-02
```

   Yes LAN speed setup is complete. Press **Enter** to return to the extended diagnostics menu. Power off the Perle 594T.

   No Proceed to step 21.
16. An error has occurred or the Perle 594T is not configured for a Token-Ring or Fast Ethernet Feature Card. To check for errors, look up the message code in *Appendix C: Solving Problems*. Return to step 1 once the problem has been resolved.
17. Setup is complete. Press **Enter** to return to the extended diagnostics menu.
18. Power off the Perle 594T.

Appendix E: Specifications

This appendix provides specifications on the Perle 594T and its feature cards.

Perle 594T Specifications

Table E-1

Dimensions	Height x Width x Depth	159 x 435 x 425 mm 6.25 x 17.25 x 16.75 inches
	Weight	11 kg / 25 lbs maximum
Physical/Electric Specifications	Ambient Temperature	10°—30° C (50°—85°F)
	Relative humidity	20—80%, non-condensing
	Power	100—125VAC, 50—60Hz, 1.5A 200—240VAC, 50—60Hz,.75A
	Btu output	400 Btu/hour maximum
	MTTR	30 minutes
	MTBF	100,000 hours (11.4 years)
Configuration Utilities	Languages	594T Controller Software and 594T Utility Programs are available in the following languages: English, French, German, Italian, Spanish and Japanese.

Table E-2

Feature Cards	The following feature Cards can be added to the unit: - Token-Ring - Ethernet
Memory	Sixteen megabytes (Mb) of internal memory.
Approvals	FCC, UL listed, CSA, DOC, TUV, BZT and CNS Fully compliant for IBM Information Network (IIN) and Advantis networks
Communications Speeds	• Up to 128 Kbps using V.35 (digital circuits) or X.21 host interface • Up to 128 Kbps with local attach to the host using the built-in modem eliminator. • Up to 19.2 Kbps supported with synchronous modems and analog lines • Up to 16 Mbps using Token-Ring • Up to 100 Mbps using Ethernet. • Up to 115.2 Kbps using PPP
Host Interface	• V.35, EIA 232D (V.24/V.28), X.21 standard • Uses a PU Type 2.1 connection for AS/400 communication • RU size up to 1033 bytes • IP or Bridge Frame size up to 1500 bytes
Disk Drive	3.5-inch floppy disk drive.
LCD panel	2 rows x 16 characters backlit status display.
Keypad	24-key keypad for system setup and status inquiry.
Status LEDs	• Ready • Call Perle Service • See PD Guide • Test Mode
Communications Protocols	• SDLC • X.25 • Token-Ring • Ethernet • circuit switched X.21 (SHM) • PPP
Network Interface	• SDLC • SNA subarea network (SDLC) • X.25 • X.21 circuit switched • Multihost support uses Token-Ring, Ethernet, X.25 or SDLC links
Software Supported	• OS/400 V2R1.1 or higher • PC Support/400 V2R.1 or higher • Client Access/400 • PC Support-compatible software, such as Rumba, ShowCase VISTA, etc. • DOS V3.3 or higher

Feature Card Specifications

The following table provides specifications for the Perle 594T feature cards.

Card	Interface	Workstations	Sessions
Twinaxial	*Cable length* 1235 m (5000') per port maximum. Compatibility Most baluns/patch panels are supported, with maximum distances dependent on equipment used.	All Twinaxial workstations, IBM PCs and compatibles supported by the IBM 5494. IP Twinax devices	The Twinaxial Feature supports up to 8 physical terminal sessions.
Token-Ring	*LAN Interface* Token-Ring LAN wiring supported. Shield twisted pair (Types 1, 2, 6, 9) Unshielded twisted pair (Type 3) Unshielded untwisted pair (Type 8) *LAN Speeds* User-selectable: 4 or 16 Mbps Compatibility Compatible with all IBM Token-Ring products, including MAC-layer bridges.	All IBM PCs and compatibles supported by the IBM 5494. Non-SNA Token-Ring devices.	The Token-Ring Feature Card in gateway mode supports 80 Token-Ring users with AS/400 sessions.
Ethernet	Ethernet LAN wiring supported 10BaseT Unshielded Twisted Pair 10Base2 Thin Ethernet cable 10Base5 Thick Ethernet cable LAN speed 10 Mbps Compatibility Compatible with all Ethernet products	All IBM PCs and compatibles supported by the IBM 5494. IP Ethernet devices	The Ethernet Feature Card in gateway mode supports 80 Ethernet users with AS/400 sessions.
Fast Ethernet	Ethernet LAN wiring supported 10BaseT UTP Category 3, 4 or 5 10Base2 UTP Category 4 or 5 100 BaseTX UTP Category 5 LAN speed 10 Mbps 100 Mbps Compatibility Compatible with all Fast Ethernet products	All IBM PCs and compatibles that support Fast Ethernet cards. IP Ethernet devices	The Ethernet Feature Card in gateway mode supports 80 Ethernet users with AS/400 sessions.

Appendix F: Adding Memory Modules

Motherboard

Memory modules, also referred to as SIMMs (Single In-Line Memory Modules), are located on the 594T motherboard.

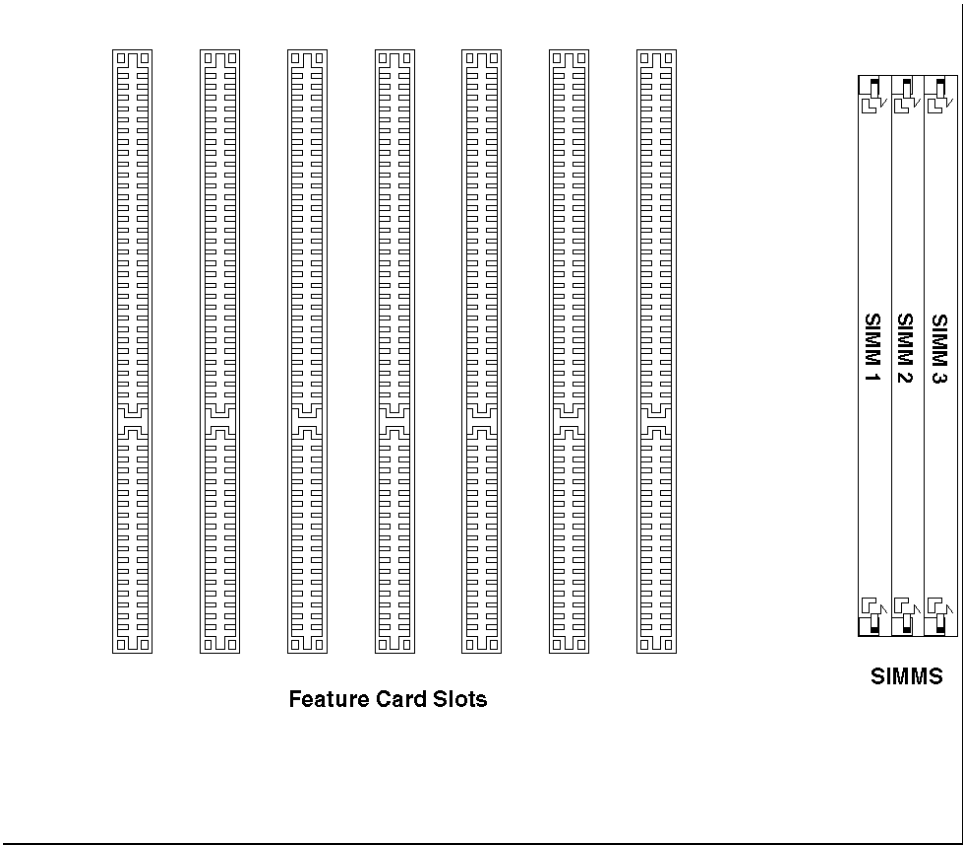


Fig. 64: Motherboard

Installing Additional Memory Modules

Use the following procedure to install additional SIMMs:

1. Turn off the power to the Perle 594T and disconnect the power cord.

Warning: Always power off the Perle 594T and disconnect the power cord before removing the cover.

2. Remove the Perle 594T's cover, as follows:
   a) Remove the four cover mounting screws on the rear of the Perle 594T.
   b) Push the cover back about 15mm (1/2 inch).
   c) Lift the cover up and away.

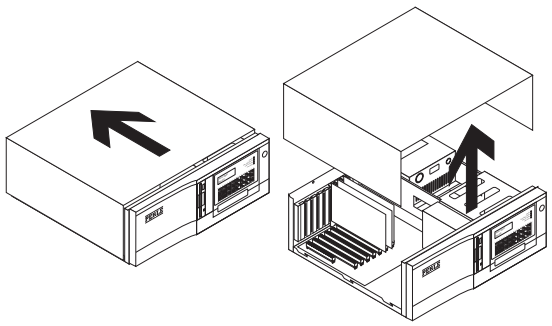


Fig. 65: Removing the Perle 594T cover

3. For each SIMM, do the following:
   a) Touch the surface of the antistatic package before removing the SIMM.

Warning: Avoid touching the components on the SIMM at any time. Avoid flexing the SIMM.

   b) Hold the SIMM at an angle and push it into the slot as shown below. Be sure that the metal contacts on the SIMM touch the bottom of the slot.

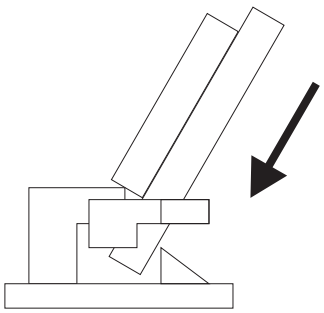


Fig. 66: Putting the SIMM into the slot

   c) Push the SIMM into the vertical position. The SIMM should snap into place.

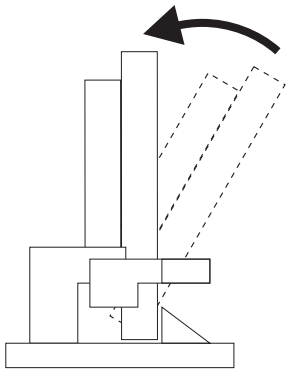


Fig. 67: Moving the SIMM into a vertical position

d) Repeat steps **a)** through **c)** for each SIMM you wish to install.

4. Replace the Perle 594T's cover using the mounting screws removed in step 2.

5. The Perle 594T can now be returned to operating mode. Additional NWS sessions can be accessed.

Removing Memory Modules

1. Locate the metal clips holding the SIMM in place.

2. Apply enough outward pressure to both clips so that they release the SIMM.

3. While holding the clips away from the SIMM, tilt the SIMM towards the power supply.

4. Release the clips and pull the SIMM out of the slot.

5. Repeat steps 1 through 5, until all desired SIMMs have been removed.

Verifying System Memory Size

1. Ensure that the diskette drive is empty.

2. Press the power switch. All LEDs will come on momentarily.

3. The following message code is displayed on the LCD, indicating that diagnostics are running.

   001-01

4. In a few moments, the following message code will be displayed:

   003-02

5. Locate the Controller Setup Diskette and ensure that the write-protect tab is closed (i.e., the diskette is not write-protected). Insert the Controller Setup Diskette into the diskette drive.

6. On the keypad, type **0** and press **Enter**. Once the software has been loaded from the system diskette, the extended diagnostics main menu will be displayed, as follows:

   020-01 1

7. On the keypad type **1** and press **Enter**. The systems features will be displayed for slot 1 as follows:

   021-01 97

8. Press the up or down arrow key until the following message is displayed:

   021-08 XX Mb

   Where **XX** is the amount of system memory in megabytes.

9. Power off the Perle 594T.

Appendix G: Identifying Perle 594T Components

This appendix provides identification for Perle 594T Components.

Part #	Component
Communications cables	
59-1516	Twinaxial Workstation Adapter (TWA) Cable
59-1541	Token-Ring Cable
59-1908	EIA-232D (V.24/V.28) Communication Cable, 4—40 UNC
59-1909	EIA-232D (V.24/V.28) Communication Cable, M3
59-1910	EIA-232D (V.24/V.28) Communication Cable, M2.6
59-1911	EIA-232D (V.24/V.28) Direct Attach Adapter, 4—40 UNC
59-1914	X.21 Communication Cable, 4—40 UNC
59-1915	X.21 Direct Attach Adapter, 4—40 UNC
59-1916	V.35 Communication Cable, 1.6mm Pins, Thumbscrews
59-1917	V.35 Communication Cable, 1.0mm Pins, Thumbscrews
59-1918	V.35 Communication Cable, 1.0mm Pins, Clips
59-1919	V.35 Direct Attach Adapter, 1.6mm Sockets, Thumbscrews
59-1920	V.35 Direct Attach Adapter, 1.0mm Sockets, Thumbscrews
59-1921	V.35 Direct Attach Adapter, 1.0mm Sockets, Clips
59-2100	EIA-232D (V.24/V.28) Direct Attach Adapter, M3
59-2101	EIA-232D (V.24/V.28) Direct Attach Adapter, M2.6
59-2104	X.21 Communications Cable, M3
59-2105	X.21 Direct Attach Adapter, M3
Power cables	
60-0578	North American / Japan
60-0743	United Kingdom
60-0744	European
60-0745	Australian
60-1031	Switzerland

Appendix H: Specifying Ethernet Address Formats

When configuring an Ethernet host or gateway attachment you need to specify the Ethernet Address option in one of two formats:

- Ethernet address format
- Token-Ring address format.

Using Ethernet address format

Use Ethernet address format if the LAN connection between your controller and host is Ethernet only.

Using Token-Ring address format

Use Token-Ring address format when:

- your controller is attached to Ethernet and there are Token-Ring segments in your network or
- your network is designed to use the Token-Ring address format.

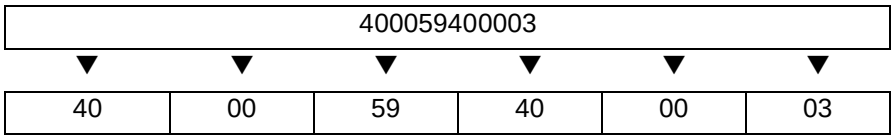
Every LAN device on the network has a unique physical address, known as the Media Access Control (MAC) address. The format for this address is different for Token-Ring and Ethernet. In particular, the bit order with each byte of the address is reversed.

Refer to the procedure on the following page when using Token-Ring address format.

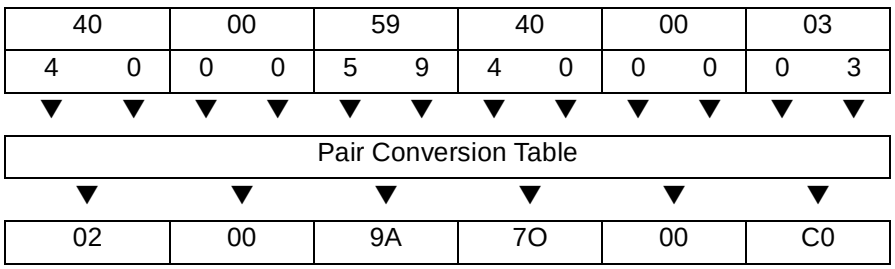
Converting Token-Ring address formats

Use the following procedure to convert the LAN address before entry into configuration when specifying Token-Ring address format:

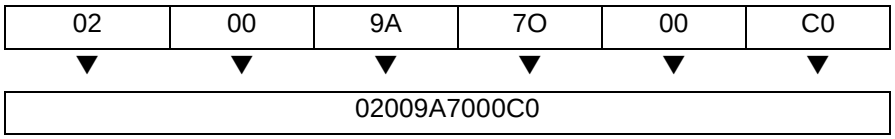
1. Write out the 12-digit Perle 594T LAN address separating it into 6 pairs. For example, the default 594T LAN address is written as:



2. Use the Pair Conversion Table on the following page to locate the conversion pair by using the first digit of each pair as a row coordinate and the second digit as a column coordinate. For example:



3. Combine the 6 converted pairs into a 12-digit LAN address. For example:



Pair Conversion Table

2nd Char →(Column) 1st Char ↓ (Row)	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	00	80	40	C0	20	A0	60	E0	10	90	50	D0	30	B0	70	F0
1	08	88	48	C8	28	A8	68	E8	18	98	58	D8	38	B8	78	F8
2	04	84	44	C4	24	A4	64	E4	14	94	54	D4	34	B4	74	F4
3	0C	8C	4C	CC	2C	AC	6C	EC	1C	9C	5C	DC	3C	BC	7C	FC
4	02	82	42	C2	22	A2	62	E2	12	92	52	D2	32	B2	72	F2
5	0A	8A	4A	CA	2A	AA	6A	EA	1A	9A	5A	DA	3A	BA	7A	FA
6	06	86	46	C6	26	A6	66	E6	16	96	56	D6	36	B6	76	F6
7	0E	8E	4E	CE	2E	AE	6E	EE	1E	9E	5E	DE	3E	BE	7E	FE
8	01	81	41	C1	21	A1	61	E1	11	91	51	D1	31	B1	71	F1
9	09	89	49	C9	29	A9	69	E9	19	99	59	D9	39	B9	79	F9
A	05	85	45	C5	25	A5	65	E5	15	95	55	D5	35	B5	75	F5
B	0D	8D	4D	CD	2D	AD	6D	ED	1D	9D	5D	DD	3D	BD	7D	FD
C	03	83	43	C3	23	A3	63	E3	13	93	53	D3	33	B3	73	F3
D	0B	8B	4B	CB	2B	AB	6B	EB	1B	9B	5B	DB	3B	BB	7B	FB
E	07	87	47	C7	27	A7	67	E7	17	97	57	D7	37	B7	77	F7
F	0F	8F	4F	CF	2F	AF	6F	EF	1F	9F	5F	DF	3F	BF	7F	FF

Enter the converted address into the related field in configuration data.

Appendix I: TCP/IP White Paper

This appendix contains a copy of the Perle White Paper
594T and AS/400 TCP/IP Configuration

594 and AS/400

TCP/IP Configuration

PERLE

95-2435-02

Overview

Using the Perle's enhanced 5494 compatible controller, it is now possible to support native SNA applications and devices over your TCP/IP network. The Perle 594 looks like a 5494 compatible workstation controller to native 5250 devices and LAN attached workstations but is able to take the SNA traffic and convert it into TCP/IP for delivery over the network. The 594 accomplishes this by integrating IBM's implementation of MPTN architecture into the 594 controller. This means that the 594 provides 5250 devices and LAN attached workstations with the equivalent of the AnyNet router that runs inside client applications on intelligent workstations.
The information in this white paper is intended for customers and Perle technical professionals who are in the process of or planning to connect Perle 594 TCP/IP controllers to their AS/400 via Anynet (APPC over TCP/IP). This white paper will discuss the following major topics:

- AS/400 System Requirements
- AS/400 and AnyNet (APPC over TCP/IP) Configuration
- 594 Configuration
- Verification of the APPC over TCP/IP Configuration
- Performance and Operation Considerations

AS/400 System Requirements:

The AnyNet/400 APPC over TCP/IP code is part of the base OS/400 V3R1 code. There are no special installation requirements. You must be running AS/400 with V3R1 or a later OS/400 version in order to configure and establish communication with the 594 TCP/IP controller. IBM has made several fixes to the TCP/IP and AnyNet code on the AS/400, so it is **strongly** recommended that your AS/400 be at the latest PTF level.
If you do not wish to load the latest AS/400 Cumulative PTF package in it's entirety then you should at least load any PTF's related to TCP/IP, AnyNet and APPN/APPC. To find out more information on what is contained in these PTF packages you can look at the IBM AS/400's Preventive Service Planning (PSP) Information web site at the following URL:

`http:/www.as400service.ibm.com/as4sde/sline003.nsf/sline003home`

AS/400 and AnyNet (APPC over TCP/IP) Configuration

The following OS/400 configuration steps are required to successfully bring up a 594 TCP/IP controller:

1. Establish a TCP/IP Configuration between the AS/400 System and the 594
2. Change the Network Attribute ALWANYNET to *YES
3. Create APPC Controller with LINKTYPE (*ANYNW)
4. Create RWS Controller and NWS Devices Descriptions
5. Add Entries to the APPN Remote Location List
6. Map 594 LU name to an Internet Address
7. Start TCP/IP

The user ID under which the APPC over TCP/IP configurations are created, must have sufficient authority to access the relevant commands. Some of the commands require the user ID to have the IOSYSCFG authority. The following examples shown here were created using a profile with QSECOFR authority.
In the following sections we will create the necessary OS/400 configurations for the "PERLE" AS/400 system in Figure 1. They will illustrate the configuration steps required for this 594 TCP/IP configuration example.

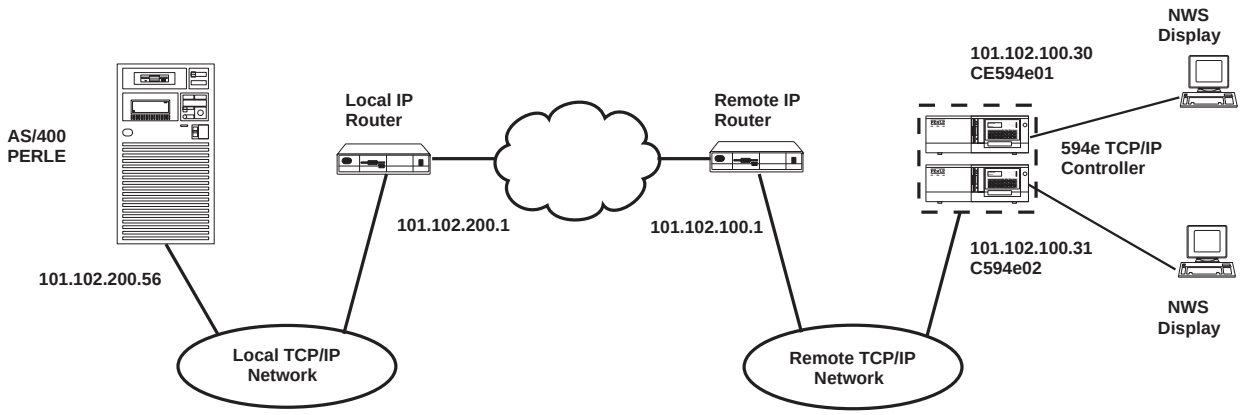


Figure 1. 594 Configured for Two Controllers Connected via APPC over TCP/IP

Note: In this White Paper we use a 594 TCP/IP over Token-Ring configuration for our sample configuration. If you wish to view other sample 594 configurations using TCP/IP over Ethernet or Frame Relay refer to "AS/400 Configuration Examples" section in the *Perle User and Reference Guide*.

In our example configuration we used a Perle 594e controller. The configuration for a Perle 594T controller would be the same except for the limitations in the number of controllers that can be configured.

1. Establish a TCP/IP configuration between the AS/400 system and the 594

In this section we show the basic steps to establish a TCP/IP configuration between your AS/400 and the remote network where your 594 is situated. If your system already has a TCP/IP configuration to the remote network with which you want to communicate with your 594 via APPC over TCP/IP, then you can skip this step and proceed to step 2 in this section. The basic steps to establish a TCP/IP configuration between your AS/400 and the remote network are:

- Create an AS/400 Line Description.
- Add a TCP/IP Interface
- Add a TCP/IP Route

Create an AS/400 Line Description

The AS/400 line description defines the physical interface to the network. If an appropriate line description does not already exist (they can be shared), you will need to create one. Here we use the **CRTLINTRN** command to create a token-ring line description.

```
                    Create Line Desc (Token-Ring) (CRTLINTRN)

Type choices, press Enter.

Line description . . . . . .>  TCPTKRN       Name
Resource name  . . . . . . .>  LIN061        Name, *NWID, *NWSD
Online at IPL  . . . . . . .   *YES          *YES, *NO
Vary on wait . . . . . . . .   *NOWAIT       *NOWAIT, 15-180 (1 second)
Maximum controllers  . . . . .  40           1-256
Line speed . . . . . . . . . .>  16M         4M, 16M, *NWI
Maximum frame size . . . . . .  1994         265-16393, 265, 521, 1033...
Local adapter address  . . . .  *ADPT        400000000000-7FFFFFFFFFFF...
Exchange identifier  . . . . .  *SYSGEN      05600000-056FFFFF, *SYSGEN
SSAP list:
  Source service access point  .  *SYSGEN    02-FE, *SYSGEN
  SSAP maximum frame . . . . .               *MAXFRAME, 265-16393
  SSAP type  . . . . . . . . .               *CALC, *NONSNA, *SNA, *HPR
            + for more values
Text 'description' . . . . . .  *BLANK

                                                                    Bottom
F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
F13=How to use this display       F24=More keys
```

Figure 2. Creating a Token-Ring Line Description

Add a TCP/IP Interface

The TCP/IP interface defines the AS/400 on the TCP/IP network. The interface defines the association of an IP address with a line description on your AS/400.
Each line description that is associated with a physical communications line can have several interfaces. Each interface must have a unique IP address. These IP addresses are the IP addresses that you are assigning to each interface on this AS/400. They are **not** the IP addresses for any other systems in the network. In most cases, you only need one IP interface address on your AS/400
Enter **CFGTCP** command to access the Configure TCP/IP panel and select option 1 to work with TCP/IP interfaces.

```
                        Work with TCP/IP Interfaces
                                                            System:   PERLE
Type options, press Enter.
  1=Add   2=Change   4=Remove   5=Display   9=Start   10=End

     Internet         Subnet            Line       Line
Opt  Address          Mask            Description  Type
1    _______________
__   127.0.0.1        255.0.0.0        *LOOPBACK    *NONE

                                                                      Bottom
F3=Exit      F5=Refresh   F6=Print list   F11=Display interface status
F12=Cancel   F17=Top      F18=Bottom
```

Figure 3. Work with TCP/IP Interfaces display

Besides allowing you to add, change and remove TCP/IP interfaces, this screen also allows you to start and end these interfaces
If a TCP/IP interface does not already exist, add an entry using the internet address allocated to your system and the mask of the subnet in which your communication line is connected to, by entering a 1 under the Opt field.

```
                    Add TCP/IP Interface (ADDTCPIFC)
Type choices, press Enter.

Internet address . . . . . > '101.102.200.56'
Line description . . . . . .   TCPTKRN       Name, *LOOPBACK
Subnet mask  . . . . . . . .   255.255.255.0
Type of service  . . . . . .   *NORMAL       *MINDELAY, *MAXTHRPUT...
Maximum transmission unit  . .  *LIND        576-16388, *LIND
Autostart  . . . . . . . . .   *YES          *YES, *NO
PVC logical channel identifier                001-FFF
            + for more values
X.25 idle circuit timeout  . . .  60         1-600
X.25 maximum virtual circuits  .  64         0-64
X.25 DDN interface . . . . . .   *NO          *YES, *NO
TRLAN bit sequencing . . . . . .  MSB         *MSB, *LSB

                                                                    Bottom
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Figure 4. Add TCP/IP Interface display

If TCP/IP is already started on your AS/400 system then you will need to start the interface by typing 9 in the Opt field beside the TCP/IP interface you have just added.

Add a TCP/IP Route

A route entry provides the connection between your AS/400 system and an external network. If your 594 resides in a different network or subnetwork to your AS/400 via an IP router, it will be necessary to configure at least one route entry. This route entry can be a default route or an explicit route entry. If just one TCP/IP interface is defined on your AS/400 system then a default route entry will do. If, however, you have defined multiple TCP/IP interfaces, it is recommended that you to add an explicit route entry for every subnetwork that your 594 controller resides on. It is possible to have multiple default routes, but it is not recommended.

The default route tells the AS/400 system to route any traffic for locations that are not on the local subnetwork to the IP router. An explicit route entry prompts the AS/400 to route frames destined for a specific subnetwork to the IP router. The router handles delivering the packets to their destination IP address whether a default or explicit route entry is used.

To define a default route, return to the Configure TCP/IP menu and select Option 2, Work with TCP/IP routes. If an appropriate route entry does not already exist, add a route entry by entering a 1 under the Opt field. *Figure 5* and *Figure 6* below show the required parameters for a default route entry and an explicit route entry for the example configuration in *Figure 1*.

```
                          Work with TCP/IP Routes
                                                  System:   PERLE
Type options, press Enter.
  1=Add   2=Change   4=Remove   5=Display

                                          Type
       Route              Subnet          of             Next
Opt     Destination        Mask            Service        Hop
__   _______________   _______________   __________   _______________
__    *DFTROUTE          *NONE          *NORMAL    101.102.200.1





                                                                 Bottom
F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 5. Work with TCP/IP Routes display - Default Route Entry

```
                          Work with TCP/IP Routes
                                                  System:   PERLE
Type options, press Enter.
  1=Add   2=Change   4=Remove   5=Display

                                          Type
         Route              Subnet          of             Next
Opt       Destination        Mask            Service        Hop
__      _______________   _______________   __________   _______________
__      101.102.100.0     255.255.255.0     *NORMAL      101.102.200.1





                                                                 Bottom
F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Top   F18=Bottom
```

Figure 6. Work with TCP/IP Routes display - Explicit Route Entry

It is recommended that the *IFC option be selected for the Maximum Transmission Unit (MTU) parameter instead of the default value of 576 (refer to "Performance and Operation Considerations" later in this document).

Note: If you are removing any TCP/IP Interfaces it is strongly recommended that you stop TCP/IP (ENDTCP) and start TCP/IP (STRTCP) again in order to make sure the AS/400 has properly removed residual information about that TCP/IP interface's IP address.

2. Change the Network Attribute ALWANYNET to *YES

Changing this network attribute will allow APPC over TCP/IP to run on your system. If you are not sure what the parameter is set to, enter DSPNETA at the AS/400 command prompt. Page down to the last page and find "Allow AnyNet Support".

If the value is *NO, then enter the following command:

```
CHGNETA ALWANYNET (*YES)
```

After changing this attribute, you can verify the change by entering the DSPNETA command again to display the parameter.

3. Create APPC controller with LINKTYPE (*ANYNW)

A new LINKTYPE has been added to the APPC controller description for APPC over TCP. With APPC over TCP/IP, the APPC controller is no longer directly attached to a line description but rather can be thought of as being defined as an AS/400 AnyNet class of service. Because of this fact, when a PWS or a 594 controller tries to connect to the AS/400 via APPC over TCP/IP, the AS/400 seems to couple that APPC over TCP device with the first active APPC controller defined as *ANYNW. As a result, if you have multiple AnyNet APPC controllers defined and active on your AS/400, the same 594 or PWS will randomly come up under any of these defined APPC controllers every time they connect via APPC over TCP/IP. Because of this behavior on the AS/400, Perle recommends that you use one of the following two methods for configuring your AnyNet APPC controllers on your AS/400.

Method 1: Define an AnyNet APPC Controller for Each 594 TCP/IP Controller

Using this method an APPC controller with LINKTYPE (*ANYNW) is defined for each 594 TCP/IP controller. Note that **no other AnyNet APPC controllers** should be defined on the AS/400. If other AnyNet APPC controller are created then you run the risk that your 594 controller APPC device will autocreate under the additional APPC controllers and will NOT allow NWS devices to find a path back to the controller. These AnyNet APPC controllers you define for the 594 TCP/IP controllers will be used by any PWSs connected via APPC over TCP/IP. The RMTCPNAME for each of these AnyNet APPC controllers should match your CP and LU names configured for each 594 TCP/IP controller. Use the CRTCTLAPPC (create APPC Controller Description) command to create the AnyNet APPC for each controller. For our example configuration in *Figure 1*. you would enter the following two commands on the AS/400 command prompt:

```
CRTCTLAPPC CTLD(c594e01) LINKTYPE(*ANYNW)
           RMTCPNAME(c594E01)RMTNETID(*NETATR)
CRTCTLAPPC CTLD(c594E02) LINKTYPE(*ANYNW)
           RMTCPNAME(c594e02)RMTNETID(*NETATR)
```

Benefits:

- More traditional way of configuring 5494 type controllers and easier conceptually to understand
- Each AnyNet controller allows a combination of 254 594s and PWSs connected via AnyNet.

Disadvantages:

- AnyNet PWSs will randomly come up under the different 594 APPC controllers. This is sometimes confusing and makes it hard to find the APPC device descriptions for individual PWSs.
- 594 controller APPC device descriptions may randomly come under different AnyNet APPC controllers, which can be confusing but does NOT affect operation.

Method 2: Define a Single AnyNet APPC Controller

Using this method, **only one** AnyNet APPC controller is defined on your AS/400 system and it will be used for all PWSs and 594s connected via APPC over TCP/IP. The RMTCPNAME for this AnyNet APPC controller should not match the CP and LU names configured on any of your 594 TCP/IP controllers. Use the CRTCTLAPPC (create APPC Controller Description) command to create this AnyNet APPC controller. For our example configuration in *Figure 1.* you would enter the following command on the AS/400 command prompt:

```
CRTCTLAPPCCTLD(anynetappc)LINKTYPE(*ANYNW)
          RMTCPNAME(anyntctl)RMTNETID(*NETATR)
```

Benefits:

- Easy to locate all AnyNet APPC devices
- No need to configure APPC AnyNet controllers for each 594 TCP/IP controller added, you just need to add a remote location list entry

Disadvantages

- Limited to no more than a combination of 254 PWSs and 594s connected via AnyNet. An AnyNet APPC controller can only have up to 254 APPC devices associated with it and each PWS and 594 connected via AnyNet requires an APPC device to be auto/manually created under the AnyNet APPC controller.

4. Create RWS Controller and NWS Devices Descriptions

For every 594 TCP/IP controller a remote workstation controller needs to be created. With OS/400 V3R1 or later the RWS controller device description can be automatically created by the AS/400 system. Enable this support by setting the system value autoconfigure remote controller (QAUTORMT) to ON (1). If you wish to manually create the RWS controller, then for the configuration example shown in *Figure 1.* you would enter the following commands on the AS/400 command prompt:

```
CRTCTLRWS CTLD(c594e01r) TYPE(5494) MODEL(2) LINKTYPE (*NONE)
          RMTLOCNAME(c594e01) AUTOCRTDEV (*ALL)

CRTCTLRWS CTLD(c594e02r) TYPE(5494) MODEL(2) LINKTYPE (*NONE)
          RMTLOCNAME(c594e02) AUTOCRTDEV (*ALL)
```

The 594 attached NWS device descriptions are automatically created by the host by setting autocreate device (AUTOCRTDEV) to *ALL in the RWS controller description as shown above.

5. Add Entries to the APPN Remote Location List.

To Communicate using APPC over TCP/IP support, the AS/400 system requires a configuration list entry for each 594 TCP/IP controller. The APPC over TCP/IP communications uses the information in the APPN remote location list to determine which controller description to use when it activates an NWS session. To update the APPN remote configuration list, use the following command:

```
CHGCFGL *APPNRMT
```

The following two figures show what entries you would add depending on the method you used in step 3 to create your AnyNet APPC controller(s).

```
                  Change Configuration List                PERLE
                                                       07/21/97  18:21:03
Configuration list  . . :   QAPPNRMT
Configuration list type :   *APPNRMT
Text  . . . . . . . . . :

Type changes, press Enter.

---------------------------APPN Remote Locations-----------------------------
          Remote              Remote    Control
Remote    Network    Local    Control   Point     Location          Secure
Location  ID         Location  Point     Net ID    Password          Loc
C594E01   *NETATR    *NETATR   C594E01   *NETATR   ________________  *NO
C594E02   *NETATR    *NETATR   C594E02   *NETATR   ________________  *NO
________  *NETATR    *NETATR   ________  *NETATR   ________________  *NO
________  *NETATR    *NETATR   ________  *NETATR   ________________  *NO
________  *NETATR    *NETATR   ________  *NETATR   ________________  *NO
________  *NETATR    *NETATR   ________  *NETATR   ________________  *NO
________  *NETATR    *NETATR   ________  *NETATR   ________________  *NO
________  *NETATR    *NETATR   ________  *NETATR   ________________  *NO
                                                                  More...
F3=Exit   F11=Display session information   F12=Cancel   F17=Top   F18=Bottom
```

Figure 7. AS/400 APPN Remote Location List Panel (Method 1)

```
                  Change Configuration List                PERLE
                                                       07/21/97  18:35:03
Configuration list  . . :   QAPPNRMT
Configuration list type :   *APPNRMT
Text  . . . . . . . . . :

Type changes, press Enter.

---------------------------APPN Remote Locations-----------------------------
          Remote              Remote    Control
Remote    Network    Local    Control   Point     Location          Secure
Location  ID         Location  Point     Net ID    Password          Loc
C594E01   *NETATR    *NETATR   ANYNTCTL  *NETATR   ________________  *NO
C594E02   *NETATR    *NETATR   ANYNTCTL  *NETATR   ________________  *NO
________  *NETATR    *NETATR   ________  *NETATR   ________________  *NO
________  *NETATR    *NETATR   ________  *NETATR   ________________  *NO
________  *NETATR    *NETATR   ________  *NETATR   ________________  *NO
________  *NETATR    *NETATR   ________  *NETATR   ________________  *NO
________  *NETATR    *NETATR   ________  *NETATR   ________________  *NO
________  *NETATR    *NETATR   ________  *NETATR   ________________  *NO
                                                                  More...
F3=Exit   F11=Display session information   F12=Cancel   F17=Top   F18=Bottom
```

Figure 8. AS/400 APPN Remote Location List Panel (Method 2)

The remote location names must match the RMTLOCNAME names entered in the RWS controllers while the remote control point name must match the RMTCPNAME name(s) entered in the AnyNet APPC controller(s).

6. Map 594 LU names to an Internet address

The AS/400 TCP/IP host table provides the mapping between the SNA remote location name/remote network ID of the 594 TCP/IP controller and a remote internet address. Enter the CFGTCP command to access the Configure TCP/IP panel and select option 10 to work with the TCP/IP host table.

```
                  Work with TCP/IP Host Table Entries
                                                        System:   PERLE
Type options, press Enter.
  1=Add   2=Change   4=Remove   5=Display   7=Rename

     Internet           Host
Opt  Address            Name
__   _______________
__   101.102.100.30     C594E01.PLSNET.SNA.IBM.COM
__   101.102.100.31     C594E02.PLSNET.SNA.IBM.COM
__   127.0.0.1          LOOPBACK









                                                                    Bottom
F3=Exit   F5=Refresh   F6=Print list   F12=Cancel   F17=Position to
```

Figure 9. AS/400 TCP/IP Host Table Entries

The IP address entered must match the remote IP address of your 594 TCP/IP controller. The host name entered must be in the form **rmtlocname.appn.sna.ibm.com**, where:

rmtlocname- is the RMTLOCNAME entered in the RWS controller

appn- is the remote network ID of the 594 TCP/IP controller

sna.ibm.com- is the SNA domain suffix.

The SNA domain suffix is needed for AnyNet (APPC over TCP/IP) communications in SNA networks. The AnyNet standard for SNA domain suffix is **sna.ibm.com** and you should not change it unless absolutely necessary.

7. Start TCP/IP

Before any TCP/IP services are available, the TCP/IP servers must be started. To start all TCP/IP servers, select option 3 from the TCP/IP Administration menu (GO TCPADM). Option 3 starts TCP/IP processing, starts the TCP/IP interfaces and starts the TCP/IP server jobs. Note that the APPC over TCP/IP servers cannot be started individually. Allow a few moments for TCP/IP to start, then select Option 20, Work with TCP/IP jobs in the QSYSWRK subsystem from the TCP/IP Administration menu. The job QTCPIP should be in the list (along with jobs for FTP, POP, TELNET, LPD and SMTP). To check for the successful start of TCP/IP, enter the following Display Message command at the AS/400 prompt:

```
DSPMSG QTCP
```

Note:
You must start TCP/IP whenever all subsystems are ended or you IPL the AS/400 system. To have TCP/IP start automatically after an IPL, you need to change the IPL start-up program.

594 Configuration

In order to create a 594 TCP/IP configuration you must use Perle's 594 Utility Program in enhanced mode. Refer to Perle's *594 User and Reference Guide* for details on installing and navigating through the 594 Utility configuration screens.

From the *594 - Configuration* screen of every controller card you are configuring for TCP/IP, select *the AS/400 Connection* menu, TCP/IP and then Token-Ring, Ethernet or Frame Relay. For our example configuration in *Figure 1.* you would select Token-Ring.

```
PC2E-C-1-5A 594e - Configuration - AS/400 Connection - TCP/IP Token-Ring
                                                                  More   ↓
Fill in the fields, then press F6.
Press Enter to verify the data.

594e IP Address  . . . . . .  [101].[102].[100].[30 ]

Global Parameters (Required)

  Network (Subnet) Mask  . . . . . .  [255].[255].[255].[0  ]
  Default Gateway IP Address . . . . . .  [101].[102].[100].[1  ]
  AnyNet Keep Alive Duration . . . . . . . . . . . . . . . . . [3 ]

H1 AS/400 System 1
  AS/400 IP Address  . . . . . .  [101].[102].[200].[56 ]

H2 AS/400 System 2
  AS/400 IP Address  . . . . . .  [   ].[   ].[   ].[   ]

H3 AS/400 System 3
  AS/400 IP Address  . . . . . .  [   ].[   ].[   ].[   ]

------------------------------------------------------------------------------
  Esc=Cancel  F1=Help  F3=Exit  F6=Return  F7=Page Up  F8=Page Down
```

Figure 10. 594 Utility: AS/400 Connection - TCP/IP Token-Ring Panel

Note that the Default Gateway IP Address entered should be the IP address of the remote router, (local to the 594). The AnyNet Keep Alive Duration field is used to set the duration in minutes that the 594 will send out AnyNet Keep Alive messages, at 30 second intervals for each configured controller, to verify that the connection to the AS/400 is still established. If the 594 gets no responses to the Keep Alive messages for the duration specified, then the 594 will bring down all TCP/IP connection for that controller. If this value is set to zero then the AnyNet Keep Alive timer is turned off and the 594 also informs the AS/400 not to send AnyNet Keep Alive messages. This is a useful setting if you are communicating over a network, (like ISDN), where you are charged for network connection time.

Then select the *Network Information* menu from the *594 - configuration* screen. It is recommended that you configure the *Continuous Retry* field to YES so that the 594 will continuously try to reconnect with your AS/400 if you loose communication. This is useful in the case were your AS/400 is IPLed and you want your 594s to come back up without any user intervention.

```
PC2-1   594e - Configuration - Network Information - TCP/IP Token-Ring
                                                                More   ↓
Fill in the fields, then press F6.
Press Enter to verify the data.

Default Local Network Name . . . . . . . . . . . . . . . . . [PLSNET  ]
594e LU Name . . . . . . . . . . . . . . . . . . . . . . . . [C594E01 ]
594e CP Name . . . . . . . . . . . . . . . . . . . . . . . . [C594E01 ]
Default Mode Name  . . . . . . . . . . . . . . . . . . . . . [QRMTWSC ]
594e Connection Number . . . . . . . . . . . . . . . .[400059400003   ]
Logical Connection:
  Retry Counter  . . . . . . . . . . . . . . . . . . . . . . .[10 ]
  Retry Interval . . . . . . . . . . . . . . . . . . . . . . . [6 ]
  Continuous Retry . . . . . . . . . . . . . . . . . . . . . .▶No
                                                               Yes

Serial Number  . . . . . . . . . . . . . . . . . . . . . . [00]-[00000]
594e System Password . . . . . . . . . . . . . . . . . . . [C594E01 ]
594e ID Number . . . . . . . . . . . . . . . . . . . . . . . . [*    ]

594e Primary host  . . . . . . . . . . . . . . . . . . . . . [1]
-------------------------------------------------------------------------------
  Esc=Cancel  F1=Help  F3=Exit  F6=Return  F7=Page Up  F8=Page Down  F9=Copy
```

Figure 11. 594 Utility: Network Information - Screen 1

```
PC2-1   594e - Configuration - Network Information - TCP/IP Token-Ring
                                                              More ↑ ↓
Fill in the fields, then press F6.
Press Enter to verify the data.

594e Primary host  . . . . . . . . . . . . . . . . . . . . . [1]
Concurrent Host Attachment . . . . . . . . . . . . . . . . . ▶NO
                                                              YES

Printer Inactivity Timeout . . . . . . . . . . . . . . . . . [000]

H1 AS/400 System 1
  AS/400 LU Name . . . . . . . . . . . . . . . . . . . . . [CHICAGO ]
  AS/400 Network Name. . . . . . . . . . . . . . . . . . . [PLSNET  ]
  594e Network Name  . . . . . . . . . . . . . . . . . . . [PLSNET  ]
  Mode Name  . . . . . . . . . . . . . . . . . . . . . . . [QRMTWSC ]
  Controller Session Initiation  . . . . . . . . . . . . . ▶NO
                                                              YES

  Controller Session Not Terminated  . . . . . . . . . . . ▶NO
                                                             YES
-------------------------------------------------------------------------------
  Esc=Cancel  F1=Help  F3=Exit  F6=Return  F7=Page Up  F8=Page Down  F9=Copy
```

Figure 12. 594 Utility: Network Information - Screen 2

Verification of the APPC over TCP/IP Configuration

The verification of the APPC over TCP/IP should be carried out in the following stages:

- **Verify the TCP/IP Configuration Between the AS/400 and the 594**
- **Verify the APPC over TCP/IP Configuration Between the AS/400 and the 594**

Verify the TCP/IP Configuration Between the AS/400 and the 594

Before you verify the APPC over TCP/IP configuration, you should verify the native TCP/IP configuration. This can be done in such a way that it also verifies part of the APPC over TCP/IP configuration. From our example configuration in *Figure 1*, entering the following command will verify the TCP/IP connection between the AS/400 (PERLE) and the 594 via the APPC over TCP/IP host table entry:

```
ping c594e01.plsnet.sna.ibm.com
```

If the PING operation is successful, the job log should contain messages that are similar to the ones in the following figure. To view the messages, use the Display Job Log (DSPJOBLOG) command, press F10 to display detailed message and then Page Up.

```
ping c594e01.plsnet.sna.ibm.com
    Verifying connection to host system C594E01.PLSNET.SNA.IBM.C at address
      101.102.100.31.
    Connection verification 1 took .033 seconds.  1 successful connection
      verifications.
    Connection verification 2 took .014 seconds.  2 successful connection
      verifications.
    Connection verification 3 took .017 seconds.  3 successful connection
      verifications.
    Connection verification 4 took .015 seconds.  4 successful connection
      verifications.
    Connection verification 5 took .036 seconds.  5 successful connection
      verifications.
    Round-trip (in milliseconds) min/avg/max = 14/23/36
```

Figure 13. AS/400 PING Command Job Log information

Repeat this ping command for every 594 controller you have configured. Once you are satisfied that the TCP/IP configuration is working correctly then you can move on to verify the APPC over TCP/IP configuration.

Verify the APPC over TCP/IP Configuration Between the AS/400 and the 594

First you should check that the APPC over TCP/IP job is running. The command WRKACTJOB SBS(QSYSWRK) will display the active jobs in the QSYSWRK subsystem. The APPC over TCP/IP job QAPPCTCP should be active as shown in the following figure.

```
                    Work with Active Jobs                    PERLE
                                                        07/21/97  19:08:32
CPU %:     .0     Elapsed time:   00:00:00     Active jobs:   57

Type options, press Enter.
  2=Change   3=Hold   4=End   5=Work with   6=Release   7=Display message
  8=Work with spooled files   13=Disconnect ...

Opt  Subsystem/Job  User      Type    CPU %  Function      Status
__   QSYSWRK       QSYS      SBS      .0                  DEQW
 5     QAPPCTCP    QSYS      BCH      .0    PGM-QZPAIJOBTIMW
__     QMSF          QMSF      BCH      .0                  DEQW
__     QTCPIP      QTCP      BCH      .0                  DEQW
__     QTFTP02615  QTCP      BCH      .0                  DEQW
__     QTFTP02862  QTCP      BCH      .0                  DEQW
__     QTFTP05452  QTCP      BCH      .0                  TIMW
__     QTGTELNETS  QTCP      BCH      .0                  DEQW
__     QTLPD12982  QTCP      BCH      .0                  TIMW
                                                                More...
Parameters or command
===> _____________________________________________________________________
F3=Exit      F5=Refresh   F10=Restart statistics   F11=Display elapsed data
F12=Cancel   F23=More options   F24=More keys
```

Figure 14. Work with Active Jobs Panel

If you look at the job log associated with QAPPCTCP, you should see the following:

```
                            Display Job Log
                                                      System:   PERLE
Job . . :   QAPPCTCP     User . . :   QSYS         Number . . . :   345195

 >> CALL QSYS/QZPAIJOB
    APPC over TCP/IP job started.









                                                                    Bottom
Press Enter to continue.

F3=Exit   F5=Refresh   F10=Display detailed messages   F12=Cancel
F16=Job menu          F24=More keys
```

Figure 15. Display Job Log (QAPPCTCP) Panel

Note:
The APPC over TCP/IP job (QAPPCTCP) is initially started when the Allow AnyNet support (ALWANYNET) network attribute is changed to *YES. If the job fails for any reason, it is necessary to stop TCP/IP (ENDTCP) and start TCP/IP (STRTCP) again to re-start the job.

To verify the APPC over TCP/IP configuration you must Vary on the APPC controller description(s) you created for the APPC over TCP/IP connection. For our example in Figure 1 (using method 2), enter the following command at the AS/400 prompt:

```
VRYCFG CFGOBJ(anynetappc) CFGTYPE(*CTL) STATUS(*ON)
```

When the first controller with link type *ANYNW is varied on, two APPC over TCP/IP servers will be started; one is a TCP server that goes to LISTEN state to allow the AS/400 system to accept incoming APPC over TCP/IP connection requests; while the other is a UDP server to handle out-of-band data for all APPC over TCP/IP activity. The command NETSTAT option 3 can be used to display all TCP/IP sessions (native TCP/IP and APPC over TCP/IP). The following figure shows the TCP/IP connection status before any APPC over TCP/IP sessions have been established.

```
                  Work with TCP/IP Connection Status
                                                      System:         PERLE
Local internet address  . . . . . . . . . . . :   *ALL

Type options, press Enter.
  4=End   5=Display details

     Remote         Remote      Local
Opt  Address        Port        Port             Idle Time  State
     *               *          ftp-con >        012:13:07  Listen
     *               *          telnet           001:24:36  Listen
     *               *          pop3             012:09:27  Listen
     *               *          APPCove >        001:24:06  Listen
     *               *          APPCove >        000:00:10  *UDP
     *               *          lpd              012:11:19  Listen
     *               *          as-file          004:17:11  Listen


                                                                    Bottom
F5=Refresh   F11=Display byte counts   F13=Sort by column
F14=Display port numbers   F22=Display entire field   F24=More keys
```

Figure 16. TCP/IP Connection Status - No APPC over TCP/IP Connections Established

If you manually created your RWS controllers you should now vary them on using the VFYCFG command.

Use the WRKCFGSTS command to show the status of your AnyNet APPC controller(s).

```
                  Work with Configuration Status             PERLE
                                                        07/21/97  19:42:59
Position to  . . . . .   __________   Starting characters

Type options, press Enter.
  1=Vary on   2=Vary off   5=Work with job   8=Work with description
  9=Display mode status ...

Opt  Description     Status              -------------Job--------------
__   C594E01         ACTIVE
__     C594E01       ACTIVE
__       QRMTWSC     ACTIVE/TARGET        C594E01    QUSER      345261
__       QRMTWSC     ACTIVE/SOURCE        C594E01    QUSER      345261
__   C594E02         ACTIVE
__     C594E02       ACTIVE
__       QRMTWSC     ACTIVE/TARGET        C594E02    QUSER      345262
__       QRMTWSC     ACTIVE/SOURCE        C594E02    QUSER      345262

                                                                  Bottom
Parameters or command
===> ____________________________________________________________________
F3=Exit   F4=Prompt   F12=Cancel   F23=More options   F24=More keys
```

Figure 17. WRKCFGSTS of AnyNet APPC Controllers (Method 1)

```
                  Work with Configuration Status            PERLE
                                                        07/21/97  19:42:59
Position to  . . . . .  __________   Starting characters

Type options, press Enter.
  1=Vary on   2=Vary off   5=Work with job   8=Work with description
  9=Display mode status ...

Opt  Description      Status              -------------Job-------------
__   ANYNTCTL         ACTIVE
__     C594E01        ACTIVE
__       QRMTWSC      ACTIVE/TARGET       C594E01     QUSER       345261
__       QRMTWSC      ACTIVE/SOURCE       C594E01     QUSER       345261
__     C594E02        ACTIVE
__       QRMTWSC      ACTIVE/TARGET       C594E02     QUSER       345262
__       QRMTWSC      ACTIVE/SOURCE       C594E02     QUSER       345262


                                                                    Bottom
Parameters or command
===> ____________________________________________________________________
F3=Exit   F4=Prompt   F12=Cancel   F23=More options   F24=More keys
```

Figure 18. WRKCFGSTS of AnyNet APPC Controller (Method 2)

The NETSTAT option 3 displayed in the following figure shows the associated TCP/IP connections after they have been established with the 594.

```
                      Work with TCP/IP Connection Status
                                                          System:   PERLE
 Local internet address  . . . . . . . . . . . :   *ALL

 Type options, press Enter.
   4=End   5=Display details

     Remote        Remote        Local
 Opt  Address          Port          Port          Idle Time  State
      *                *             ftp-con >     012:13:07  Listen
      *                *             telnet        001:24:36  Listen
      *                *             pop3          012:09:27  Listen
      *                *             APPCove >     001:24:06  Listen
      *                *             APPCove >     000:00:10  *UDP
      *                *             lpd           012:11:19  Listen
      *                *             as-file       004:17:11  Listen
      101.102.100.30  APPCove >      1024          000:17:52  Established
      101.102.100.30  1025           APPCove >     000:19:22  Established
      101.102.100.31  APPCove >      1025          000:19:22  Established
      101.102.100.31  1025           APPCove >     001:48:37  Established
                                                                Bottom
 F5=Refresh   F11=Display byte counts   F13=Sort by column
 F14=Display port numbers   F22=Display entire field   F24=More keys
```

Figure 19. TCP/IP Connection Status - 594 TCP/IP Connections Established

Use the WRKCFGSTS to show the status of the remote workstation controllers.

```
                  Work with Configuration Status           PERLE
                                                        07/21/97  19:42:59
Position to  . . . . .  __________  Starting characters

Type options, press Enter.
  1=Vary on   2=Vary off   5=Work with job   8=Work with description
  9=Display mode status ...

Opt  Description              Status        -------------Job--------------
__   C594E01R                ACTIVE
__     C594EDSP01            SIGNON DISPLAY
__   C594E02R                ACTIVE
__     C594EDSP02            SIGNON DISPLAY




                                                                    Bottom
Parameters or command
===> ____________________________________________________________________________
F3=Exit   F4=Prompt   F12=Cancel   F23=More options   F24=More keys
```

Figure 20. WRKCFGSTS of Remote Work Station Controllers

Performance and Operation Considerations

You may be able to improve your performance with a few simple changes to the AS/400 TCP/IP Interface and router configuration. Currently the AS/400 system defaults to a Maximum Transmission Unit (MTU) of 576 when a new route is added. This default value is used to ensure packets are not dropped over the route since all TCP/IP implementations have to support at least a 576-byte transmission unit. However, in many cases this value is unnecessarily small since there are no intermediate hops that only support a 576-byte packet. If this is the case, you should change the MTU from 576 to *IFC. The MTU now defaults to the line description frame size. This is approximately 2000 for token-ring and 1500 for Ethernet.

If for any reason you wish to bring down one of your 594 TCP/IP controllers, the following procedure is recommended:

- Vary off the RWS controller associated with the 594 you wish to bring down. Be sure to wait until the controller goes completely to a VARY OFF state. Note, it is not recommended that you vary off the AnyNet APPC controller since there might be other 594 CP sessions or AnyNet PWS sessions that are active under the AnyNet APPC controller. It is also not recommended that you vary off the APPC device description associated with the 594 controller unless you are going to immediately delete the APPC device description. If this is done then the AS/400 may autocreate another APPC device description that will conflict with the current APPC device description that the 594 is currently using.
- Use the NETSTAT Opt 3 command to display the TCP/IP connections and end (using Opt 4) all TCP/IP connections with the IP address of the controller you just varied off. Refresh the TCP/IP connection status screen by pressing F5 a couple of times to verify that all these connections have ended.
- If you want to bring the 594 controller back up, then Vary on the RWS controller again.

The APPC controllers defined with LINKTYPE *ANYNW are no longer directly attached to a line description. This means you will not see the statuses of your AnyNet APPC controllers when you display the status of your line description. You will however see the status of a TCP/IP network controller and device (category *NET), that the AS/400 automatically creates when a TCP/IP interface that is associated with the line description is started. To display the status of your AnyNet APPC controllers you must use the WRKCFGSTS command specifying *CTL as the type of description.

It is recommended that your AS/400 IPL shut-down and start-up programs be changed to end and start the TCP/IP services respectively. This will ensure that all TCP/IP servers have been properly ended before the AS/400 IPL is performed and will make sure the TCP/IP servers are started before the 594 AnyNet controllers are brought back up.

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Glossary

594T Connection Number
A parameter used to identify the Perle 594T on the communication network.

594T CP Name
The Control Point (CP) Name of the 594T.

594T LU Name
The Logical Unit (LU) Name of the 594T.

594T Network Name
The Network Name of the 594T.

594T SAP
The Service Access Point (SAP) of the 594T.

594T SDLC Station Address
The SDLC Station Address of the controller used to uniquely identify the controller on an SDLC communication line.

594T Station Address
The Station Address of the controller used to uniquely identify the controller on an X.25 communication line.

594T Utility Program
A program which runs on a PC and is used to enter configuration data for the Perle 594T. The configuration data is saved in a configuration file. When the PC is online to the Perle 594T, the 594T Utility can also be used to establish and end network links. You can use the 594T Utility Program in either standalone or online mode.

Access Code
The international access code of the 594T optionally used for X.21 communications.

Address Call
The full telephone number which the Perle 594T must dial to access AS/400 system. This number contains from 4 to 14 characters. Each character can be a number from 0 to 9. Include the network ID or the country code, but do not include access codes.

Adjacent Link Station (ALS)
A node in the communication network with which a device communicates. In an SNA subarea network, there are one or more, intermediate ALSs.

Advanced Program-to-program Communication (APPC)
A data communications process that lets AS/400 programs communicate with programs on another system that has a compatible communications process.

ALS
See Adjacent Link Station.

Alternate Keyboard Translations
If an Alternate Keyboard Translation is not specified, then the DWS will use the Default Keyboard Translation. To use an Alternate Keyboard Translation, the Default Keyboard Translation must be a multinational code.

ANSI
American National Standards Institute

APPC
See Advanced Program-to-program Communication.

APPC Controller Description
The AS/400 system has an APPC Controller Description for each APPN connection to another system. This includes connections to a controller emulated by a Perle 594T and other AS/400 systems.

APPN
Advanced Peer-to-Peer Network.

APPN network
A network of computers using APPC.

AS/400
Application System 400. A computer in the IBM midrange product line.

Automatic Answer
A feature that allows a station to answer a call on a switched line without operator action.

Automatic Call
A feature that allows a station to call another station on a switched line without operator action.

Beacon Message
A repeating message that an adapter sends to indicate a serious network problem.

BIND Command
A type of command in an SNA environment used to start and define the session.

Box Security Key
This key is used to encrypt/decrypt all keying material (keys) configured for the 594 controller. The key is entered on the 594 Utility Program prior to configuring the keying material and is also entered on the front panel at boot time. The key must be 16 digits long.

BPS
Bits per second.

Bridge
A mechanism that connects a network to other networks.

Cable-thru
A type of cabling system that allows multiple workstation to be connected to a single cable path.

Call Command
A command entered at an NWS to place the 594T in Call mode.

Call Progress Signals (CPS)
X.21 signals sent during link establishment that provide status information.

CDSTL
Connect Data Set To Line.

CMOS
Type of integrated circuit technology used for the internal memory of the 594T.

Communication Interface
The physical connection to the Synchronous Communication Card which allows communication with an AS/400 system.

Communication Line
A physical link that allows data transmission between workstations and controllers.

Communication Network
Hardware and software which allow data transmission between two locations.

Communication Protocol
A set of rules which define the orderly transfer of data across a network.

Concurrent Host Attachment
A function that allows the 594T to communicate with up to four AS/400s over a single physical link.

Configuration
An arrangement of devices in a network. Also, the activity of defining parameters and options for a particular arrangement of devices.

Configuration Data
The list of parameters and options that have been entered during the process of configuration.

Configuration File
A computer file in which configuration data is stored.

Configuration Mode
The mode of the Perle 594T during which it can be reconfigured. Use Operating mode to establish sessions with the AS/400.

Controller
A device that allows workstations to communicate with an AS/400.

Controller Address
An address which uniquely identifies the controller on the communication line.

Controller Setup Diskette
Use the Perle 594T Controller Setup Diskette during setup and installation of the Perle 594T .

Controller Slot
The slot in which to install Multi-session Controllers, The Synchronous Communication Card or 594T Feature Cards.

Controller Software Diskette
Use the Perle 594T Controller Software Diskette for normal system operation.

CPS
See Call Progress Signals

CPU
Central Processing Unit—the main processing unit of a computer.

DBCS
See Double-Byte Character Set.

DC
Direct Call.

DCC
Data Country Code.

DCE
See Data Circuit Terminating Equipment.

Data Circuit-terminating Equipment (DCE)
The equipment that provides the signal conversion and coding between the data terminal equipment (DTE) and the line.

Data Link
The mechanism (hardware and software) used for sending and receiving data.

Data Terminal Equipment (DTE)
A device, like the 594T or the host, that is connected to a network.

Delimiter
A character used to indicate the beginning and end of a character string.

Device
In this guide, *device* refers to equipment that connects to either the Perle 594T, the AS/400 or the communications network. For example, workstations and printers are individually known to the AS/400 as a device.

Device Description
On the AS/400, the Device Description defines the devices (i.e., display device, print device, etc.) that receive or transmit data through the Perle 594T.

Display Screen
The part of an NWS or PWS that displays information.

DLCI
Data link connection identifier

DNIC
Data Network Identification Code.

Double Byte Character Set (DBCS)
A character set that requires two bytes to represent each character.

DSR
Data set ready.

DSU
Data Service Unit.

DTE
Data Terminal Equipment.

DTR
Data Terminal Ready.

DWS
Display-only workstation. Currently referred to as an NWS (nonprogrammable workstation).

EBCDIC
Extended Binary Coded Decimal Interchange Code.

EIA232
A standard for serial interfaces between computers and communication equipment. Formerly known as RS232, this standard is officially recognized as EIA232.

ELLC
See Enhanced Logical Link Control.

Enhanced Logical Link Control
In X.25 communication, a type of logical link control.

Enhanced Mode
A mode of operation in which the Perle 594T provides additional features and can operate as MULTIPLE controllers sharing a multipoint communication line. See Chapter 2 for more details.

Ethernet
A local area, packet-switched data network mechanism for communication between computers.

Facility Request Code
A number comprised of one or two digits that represents a subscription parameter.

Feature Card
A 594T optional hardware component that adds functions to the 594T.

Field
A location on a workstation screen where data is displayed or entered.

Frame
A transmission of a minimum of 32-bits that is used by SDLC over a communication network.

Frame Relay
An interface standard that provides fast packet-switching by leaving some of the checking and monitoring to higher level protocols.

Full Duplex
The exchange of data in two directions simultaneously.

Gateway
A functional unit that connects networks that have different architecture or use different communication protocols.

Half Duplex (HDX)
The transmission of data in only one direction at a time.

HDX
See Half-duplex

Hexadecimal
The base 16 numbering system using characters 0 through 9 and A through F to represent 0 to 9 and 10 to 15.

Hot Key
A sequence of keys which allow the user of an NWS to access Multi-sessions.

Hz
Hertz.

IEEE
Institute of Electrical and Electronics Engineers

IKE
Internet Key Exchange. This is a standard protocol defined by RFC #2409 which dictates the manner in which two VPN peers will negotiate the parameters associated with a VPN tunnel.

Interface Card
A computer card that may be installed in the Perle 594T and which provides connectors for the attachment of communication cables.

Internal Storage
The internal memory or CMOS of the Perle 594T.

Kb
Kilobyte.

Keyboard Code
A two-digit code which identifies the keyboard translation being used.

Keyboard Translation
The set of symbols used on a keyboard. Each keyboard translation is designed for use in a particular country.

LAN
See Local Area Network.

LAN Card
In the Perle 594T, the LAN card refers to either a Token-Ring Feature Card or an Ethernet Feature Card used for LAN connections.

LAN Gateway
Using the Perle 594T, the LAN Gateway is the functional unit that connects (via Token-Ring or Ethernet) a local area network (LAN) with another network that uses a different architecture or communication protocol.

LCD
Liquid Crystal Display.

Leading Pad
A single byte which is sent to the modem in order to synchronize it.

Leased Line
A communication line which is dedicated to a particular device. This line is always available and no circuit setup procedures are required.

LED
Light Emitting Diode.

Line Description
On the AS/400, the Line Description defines the communication protocol by which the AS/400 communicates with the Perle 594T.

Link Management Interface (LMI)
For frame-relay networks, the interface that carries status messages between two points.

LLC
See Logical Link Control.

LMI
See Link Management Interface

Local Area Network (LAN)
Two or more computers that are located on a user's premises within a limited distance of each other and that are connected to each other directly or indirectly.

Logical Channel Identifier
A number used to identify a logical channel, consisting of a logical channel group number (4 bits) and a logical channel number (8 bits).

Logical Channel
The method by which data on an X.25 virtual circuit is routed between two devices. More than one logical channel can be used to maintain separate data streams between the same two devices.

Logical Link Control (LLC)
For X.25, the information included in data packets that provides end-to-end link functions to the SNA layers in the 594T and AS/400 systems.

LU
Logical Unit.

Manual Answer
A feature that allows a station to answer a call on a switched line but which requires operator action.

Manual Call
A feature that allows a station to call another station on a switched line but which requires operator action.

MAU
Media Access Unit.

Message Codes
A three-digit number which appears on the operator panel display and indicates a specific condition or error of the Perle 594T.

Mode Description
The Mode Description on the AS/400 controls communications

Modem (Modulator-Demodulator)
A device that converts data from a workstation into a signal that can be transmitted over a communications line and converts the transmitted signal to data for the receiving device.

Multi-Point Line
A communication line which can support communication with more than one device at a time.

Multinational Keyboard Code
The code number for a keyboard translation which uses the multinational EBCDIC character set on the AS/400 system.

Network Attribute
An individual parameter or option used by the Perle 594T to establish a network link with the AS/400.

Network Information
Parameters and options used by the controller to establish a network link with one of the four alternate AS/400 systems.

Network Link Establishment
The steps which must be performed in order to establish a communication link between the Perle 594T and the AS/400 system.

Non Return to Zero (NRZ)
A type of data encoding.

Non Return to Zero Inverted (NRZI)
A type of data encoding.

NRZ
See Non Return to Zero.

NRZI
See Non Return to Zero Inverted.

Non-programmable Workstation (NWS)
Previously known as a DWS (display-only workstation). An NWS is a workstation attached to your AS/400 that only displays information from the host. It does not have its own CPU and cannot be programmed.

Null
The EBCDIC character that represents the hexadecimal value of 00.

NWS
See Nonprogrammable Workstation

Offline
The condition that exists when the 594T is not communicating with the host.

Online
The condition that exists when the 594T is in communication with the host.

Online Mode
When you use the 594T Utility Program online to the Perle 594T, you are working directly on the configuration file contained within the Perle 594T.

Operating Mode
The mode of the Perle 594T during which it can establish sessions with AS/400 systems. Use Configuration mode to reconfigure the Perle 594T.

Packet
A well-defined sequence of bytes, including data and control signals, that is transmitted and switched as one unit.

Packet Size
The maximum number of bytes the user data area of a data packet can contain.

Packet Switched
The transference of data by means of address packets.

Passthrough Printer
An ASCII printer that receives data through a port on a PC or terminal. The data is passed, unchanged, through the PC or terminal.

Permanent Virtual Circuit (PVC)
A type of X.25 virtual circuit which is always available for use between the Perle 594T and the AS/400 systems. No call establishment is required.

Physical Interface
The physical connector which is used to attach the Perle 594T to the communication network or directly to the AS/400 system.

Point-to-Point Line
A communication line which supports communication between one two devices.

Polling
On a multipoint connection or a point-to-point connection, the process whereby data stations are allowed one at a time to transmit.

Port
The hardware mechanism that attaches workstations or a network to the 594T.

PPP (Point to Point Protocol)
A protocol used to transmit information between two points. The connection can be either synchronous or asynchronous.

Programmable Workstation (PWS)
A workstation that can communicate with a host but that can also operate independently of the host.

Protocol
A set of governing instructions, requests and responses that constitute a way of controlling data transfer.

PVC
See Permanent Virtual Circuit.

PWS
Programmable workstation.

QLLC
See Qualified Logical Link Control.

Qualified Logical LInk Control
For X.25 communication, a type of logical link control.

Remote Workstation
A workstation that is attached to the host through a network.

RS232
A standard for serial interfaces between computers and communication equipment. Formerly known as RS232, this standard is officially recognized as EIA232.

RWS
See Remote workstation.

RWS Controller Description
The RWS Controller Description on the AS/400 contains parameters for nonprogrammable workstations.

SABM
See Set Asynchronous Balanced Mode.

SAP
See Service Access Point.

SBCS
See Single-Byte Character Set.

SDLC
See Synchronous Data Link Control.

Service Access Point (SAP)
An address used in a system that allows data to be directed to the correct remote device.

Set Asynchronous Balanced Mode (SABM)
A data link control command used for establishing a data link connection in asynchronous balanced mode.

SHM
Short Hold Mode.

Short Hold Mode (SHM)
For X.25, an option that allows a link to remain established only when there is data to transfer.

SIMM
Single In-Line Memory Modules.

Single-Byte Character Set (SBCS)
A character set which one requires one byte to represent each character.

Slot
A physical location in the chassis of the Perle 594T where an Interface Card may be installed.

Slot Number
The number assigned to a slot in the Perle 594T. The slots are numbered from left to right.

SNA
Systems Network Architecture.

SNA SubArea Network
A network which allows the Perle 594T to communicate with an AS/400 system to which the Perle 594T has no direct communication line.

SRC
System Reference Code.

SVC
Switched Virtual Circuit.

Switched Virtual Circuit
A type of X.25 virtual circuit which requires a link to be established before each use.

Synchronous Data Link Control
A method of managing data transfer across a synchronous communication line.

System Reference Code
A code which may appear on the operator panel display or on a workstation screen. The code will identify a specific condition or error with the Perle 594T.

Terminal
Equipment through which data enters or leaves a communication network.

Twinaxial Adapter Cable
A short cable which allows up to four twinaxial communication lines to a Twinaxial Feature Card.

V.35 cable
Used for low-speed communications, this communication cable conforms to the V.35 standard recommended by CCITT.

V
Volts.

VAC
Volts Alternating Current.

Vary Off
To cause a device or line to be unavailable for its normal use.

Vary Off
To cause a device or line to be available for its normal use.

VPN IPSec Profile
A VPN profile defines the attributes of a secure tunnel which is formed between the 594 controller and the remote VPN gateway. The parameters configured for this tunnel must match the configuration of the tunnel on the remote VPN gateway.

Workstation
Input/output equipment connected to a mainframe or computer network, at which an individual displays, enters or manipulates data. There are two basic types of workstations:

- a nonprogrammable workstation (NWS)
- a programmable workstation (PWS).

A Twinaxial NWS or a PC connected to the AS/400 are each known as a workstation.

X.21
A recommendation by CCITT that defines the interface between a DTE and public data networks. Recommendation X.21 also defines procedures for establishing links on switched or leased communication lines.

X.21 switched
A procedure for establishing communications links over circuit-switched communication lines.

X.25
A recommendation by CCITT that defines the interface between a DTE and a packet-switched data network.

X.25 Network Address
The address which uniquely defines this DTE to the X.25 network.

Index

Numerics

A

B

C

D

E

F

G

H

I

K

L

M

N

O

P

Q

R

S

T

U

V

W

X