Vanguard Managed Solutions

Vanguard Applications Ware
Serial Feature Protocols

Telelocator Networking Paging Protocol

Notice

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TNPP

Overview

Introduction

This chapter describes the basic concepts of TNPP.

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About TNPP

Introduction

Telocator Network Paging Protocol (TNPP) is a protocol used for communications between paging terminals or other types of equipment that are part of a paging system network.

TNPP characteristics

TNPP is an asynchronous ASCII character-based protocol that is transmitted over an RS-232 port. The data rate varies from 300 bps to 19,200 bps. The character format over a full duplex physical line has these characteristics:

- Eight data bits
- No parity
- One stop bit

TNPP supports variable-length packets up to 1024 bytes and the grouping of different page and data blocks within the same data packet.

How TNPP support works

TNPP, configured on a PAD port, operates through X.25 Switched Virtual Circuit (SVC) connections. The X.25 SVC connection establishment uses the X.25 autocall feature to initiate the call request procedure. Autocalling is initiated when one of the following occurs:

- Node or port restart is completed
- EIA signal DTR becomes active
- Data arrives on a TNPP port

If the connection establishment is unsuccessful, additional attempts are made. If the number of autocall retries exceeds the maximum limit, a report indicating that the X.25 link is bad, is generated.

TNPP also provides link-level spoofing to the attached Paging terminals.

Connection types

TNPP uses two connection types:

- SIMP — used when the terminals are connected to a port with a cable that has minimal conductors.
- DTR — used when the device connected to the port provides the basic control signals to maintain the EIA connection.

Implementation of TNPP

Our implementation of TNPP supports the following:

- TNPP PAD - provides point-to-point connectivity between paging networks
- TNPP Routing - provides network connectivity between multiple paging terminal networks across X.25 or Frame Relay networks.

Figure 1-1 illustrates a typical paging network using Vanguard Products.

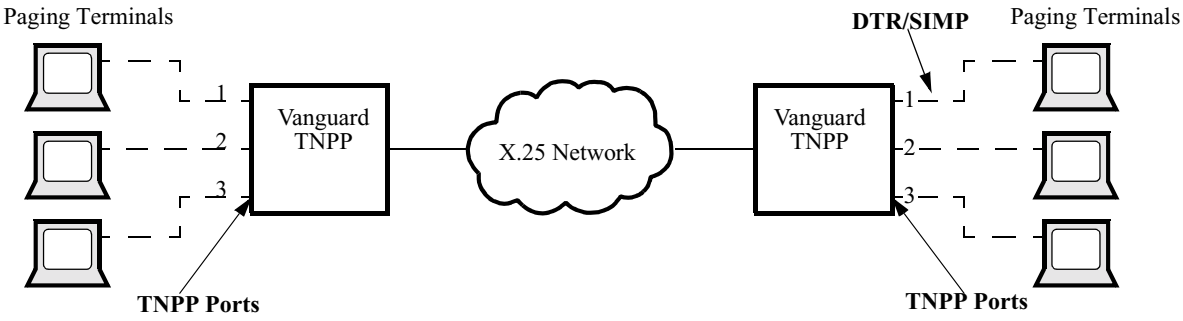


Figure 1-1. Paging Network

Product Support

The following Vanguard Products support TNPP:

- 6500*PLUS*
- Vanguard 6520

Features

TNPP supports:

- X.25 Virtual call control
- SVCs
- Data Connection Protection (DCP)
- Mnemonics for called address and facilities
- Packet assembly and disassembly
- Frame validation through CRC Check
- Sequence Number table of the last 64 sequence numbers received
- CRC Generation
- Flow Control using Request to Stop (RS)
- Link Reset
- Local Processing (ACK, NAK, CAN)
- Transparent Control Character (only ACK and NAK) embedded in the frame, which is a network throughput improved feature of the Paging Terminal.
- Maximum frame size of 1024 bytes
- Frame Relay Annex-G

Limitations

TNPP's limitations are:

- Does not support PVCs
- Releases the data frame in the remote TNPP PAD during data transfer if the remote Paging Terminal switches off or the Link Test fails
- Does not interact with an SNMP manager
- Is not supported by SNMP or the 9800 Network Management System
- Does not support voice paging using the TNPP PAD port
- Does not support XON/XOFF flow control

Data Connection Protection

Introduction

TNPP supports Data Connection Protection (DCP). DCP lets you:

- Reroute calls around failed network links with the Connection Protection component.
- Recover lost data packets with the Data Protection component.

Connection protection

Connection protection lets you re-establish a call when a network link or an intermediate node fails. If you enable only Connection Protection without Data Protection, you may lose some data.

Data protection

Data Protection ensures data delivery during link outages and rerouting. It can save data that has been lost for any number of causes including degraded lines.

You can enable Data Protection only with Connection Protection.

Configuring DCP

The following table describes the parameters found in the Port record that you need to configure to enable DCP.

Parameter	*Description*
Protection Level	• Sets protection for connection only • Sets connection for data and connection • Turns off the feature This parameter requires a node boot.
Reconnection Timeout	Specifies how long the originating node waits between reconnection attempts.
Reconnnection Tries Limit	Specifies the number of times that DCP attempts to reconnect a call before it clears the call.

Setting Up Calls

Introduction

Initiation of autocalling is controlled by the calling mode parameter. If the establishment of the X.25 connection is unsuccessful, the Maximum Number of Autocall Attempts parameter determines the number of attempts at call establishment.

Call Setups Conditions

The following table describes the conditions under which a call is set up and the associated calling mode parameters configured.

If a call is set up when....	*The calling mode parameter is...*
The DTR is up from the Paging Terminal	DTR
Data is transmitted from the Paging Terminal	DATDRV
The Vanguard is powered, a node boot occurs, or a port boot occurs	POWERON

DTR or DATDRV Call Setup

The following table describes call setup when the calling mode is either DTR or DATDRV.

Stage	*Description*
1	The Paging Terminal signals the TNPP PAD by DTR or data arrives from a remote TNPP PAD.
2	The TNPP PAD signals the Paging Terminal and performs the Link Restart procedure.
3	Call connection is established.

Power On Call Setup

The following table describes call setup when the calling mode is POWERON. Refer to the “Link Restart Procedure” section for additional information.

<table>
<tr><th>Stage</th><th colspan="2">Description</th></tr>
<tr><td>1</td><td colspan="2">A node is powered up or a node boot occurs.</td></tr>
<tr><td rowspan="3">2</td><td colspan="2">The TNPP PAD establishes an X.25 connection to the remote TNPP PAD.</td></tr>
<tr><td>If...</td><td>Then....</td></tr>
<tr><td>Data frames are received by the Paging Terminal before the link restart between the remote TNPP PAD and remote Paging Terminal is successful</td><td>The data frames are discarded.</td></tr>
</table>

Unlike calling modes

You can set up a call even if the calling mode parameter is different on each node, for example, the calling mode for the local node is POWERON and the calling mode for the remote node is DTR. The virtual link is set up only after the Link Restart procedure is successful.

Link Restart Procedure

Introduction

The Link Restart procedure is performed at the time of connection establishment. This section describes:

- Link Restart procedure
- Link Test procedure
- Typical timers and counters

Link Restart Procedure

The following table describes the Link Restart procedure performed by each node at the time of connection establishment.

Stage	Description
1	Each node clears the receiver serial number table.
2	Each node performs a Link Test procedure. Refer to the next section, "What happens during the Link Test."
3	Each node sends an empty packet with the serial number and destination address set to zero.

Verifying Proper Operation

The following table describes how the link test procedure verifies proper operation of the communications link when the link is idle for more than ^{T}idle.

Refer to the "Typical timers or counters" table for a description of the timers and counters.

<table>
<tr><th>Stage</th><th colspan="2">Description</th></tr>
<tr><td>1</td><td colspan="2">The sender transmits an ENQ flag and increments ^{C}enq.</td></tr>
<tr><td rowspan="4">2</td><td colspan="2">The sender waits for either an End of Transmission (EOT) response from the receiver or for ^{T}nre timer to expire.</td></tr>
<tr><td>When...</td><td>Then...</td></tr>
<tr><td>The timer ^{T}nre expires before an ENQ is received</td><td>Another ENQ is sent and ^{C}enq is incremented. This process continues until an EOT is received.</td></tr>
<tr><td>An EOT is received</td><td>Normal communication resumes.</td></tr>
<tr><td>The ^{C}enq limit is reach before an EOT is received</td><td>The sender should log a link failure error.</td></tr>
</table>

Typical Counters and Timers

The following table describes typical timers or counters.

Timer	Counter	Description	Time Interval (seconds)	Counter Value
T_{ict}		Inter-character time within the packet	2	
T_{nri}		Timeout on a response with idle receiver	10	
T_{nrb}		Timeout on a response with busy receiver	60	
T_{nre}		Timeout on a response to ENQ for Link Test	10	
T_{hold}		RS flag hold-off time	10	
T_{idle}		Timeout on an idle link for keep alive ENQ	60	
	C_{retry}	Retries by a sending station per packet		6
	C_{hold}	Retransmissions in response to RS holdbacks		6
	C_{enq}	ENQ retries before error logging		24

Flow diagram

Refer to Appendix A.

Data Transfer

Introduction

A TNPP PAD port remains in the data transfer phase until the virtual call is cleared by either the TNPP PAD or by the Paging Terminal.

Data Transfer Process

The following table describes the data transfer process.

<table>
<tr><th>Stage</th><th colspan="2">Description</th></tr>
<tr><td rowspan="5">1</td><td colspan="2">The local TNPP PAD waits for the complete frame before forwarding it in one or more X.25 packets to the remote TNPP PAD.</td></tr>
<tr><td>If the X.25 link is blocked and you configured...</td><td>Then...</td></tr>
<tr><td>RS support as Yes</td><td>• The TNPP PAD port responds to the Paging Terminal with RS.
• The data received from the Paging Terminal is not buffered</td></tr>
<tr><td>RS support as No</td><td>• The TNPP PAD port does not respond to the Paging Terminal.
• The data received from the Paging Terminal is not buffered.</td></tr>
<tr><td>If...</td><td>Then....</td></tr>
<tr><td>2</td><td colspan="2">A frame is received from the Paging Terminal before or after RS is sent</td><td>The frame is dropped.</td></tr>
<tr><td>3</td><td colspan="2">The remote TNPP PAD accumulates the X.25 data packet sequence and reconstructs the TNPP frame.</td></tr>
<tr><td>4</td><td colspan="2">The remote TNPP PAD assigns each frame a sequence number.</td></tr>
<tr><td></td><td colspan="2">The remote TNPP PAD forwards the frame to the attached Paging Terminal.</td></tr>
</table>

Stage	*Description*	
4 (Cont.)	***If ...***	***Then...***
	The retry count for retransmission towards the Paging Terminal reaches the maximum value or ^{T}nrb expires.	• The TNPP PAD loses the data frame. • The following error report is generated. FRAME RETRY EXHAUSTED, FRAME DISCARDED: SA-*, DA -** * - Source Address of the discarded frame is displayed. ** - Destination address of the discarded frame is displayed.
5	The remote TNPP PAD waits for an acknowledgment from the attached Paging Terminal before sending another frame.	

Flow diagram

Refer to Appendix A.

Flow Control and Error Control

Introduction

The flow control process uses Request to Stop (RS), an ASCII character. You can configure the MAX RS parameter to define when the TNPP PAD port stops transmission of any new frames to the Paging Terminal.

Flow Control Process

The following table shows the flow control process.

Stage	*Description*	
1	X.25 sends an event to indicate temporary outbound busy condition to the TNPP PAD port.	
2	The TNPP PAD port sends an RS frame to the attached Paging Terminal if RS support is set to Yes.	
3	The TNPP PAD receives RS from the Paging Terminal and holds the frame.	
	When the number of frames on hold...	***Then the TNPP PAD port ...***
	Remains at or above the MAX RS COUNT	• Stops the transmission of any new frame to the Paging Terminal. • Transmits control frames. • Retransmits the RS timed-out frames.
	Are at or above RS COUNT	Flow controls the X.25 SVC.

Error Control Process

The following table describes the error control process.

If ...	*Then...*
The arriving data packet has an SOH flag between the first SOH and the ETX flag	The receiver should abort the packet in process and assume that a new packet has been started.
A data packet has been received and the receiver generated BCC check is the same as the one received in the packet	The receiver should send a positive acknowledgment (ACK).
The BCC check is not the same as the one received in the packet	The receiver should send a negative acknowledgment (NAK).

If ...	Then... (continued)
The sender receives a NAK	The sender should: • Retransmit the data packet up to ^{C}retry times and then discard the packet. • Decrement the inertia.
Control frames such as ENQ, EOT, CAN, RS, and ACK, or NAK are received in a data frame and they are not supported by the TAN control parameter	The data frame is discarded.

The Transparent ACK/NAK (TAN) control parameter determines how the TNPP PAD port handles ACKs and NAKs as described in the following table.

When a port is ...	And the TAN control parameter is...	Then...
Configured for 2-byte or 4-byte transparent CRC	MPS200MODE	ACK and NAK are not supported.
Configured for 2-byte CRC Configured for 4-byte CRC	UNIPAGEMODE	ACK and NAK are recognized only between SOH and ETX. ACK and NAK are recognized anywhere in the data frame.
Disabled for the transparent ACK/NAK	UNIPAGEMODE	The recognized ACK or NAK is interpreted as unsupported control characters.

CAN control flag

The CAN control flag indicates a routing error. The TNPP PAD spoofs only the link layer and does not participate in the Paging Terminal's routing scheme.

The TNPP PAD generates reports for each received CAN if the CAN reports parameter is set to Yes. The CAN report generated by the TNPP PAD port is forwarded to the node reporting mechanism. The node reporting mechanism is responsible for remote printing, filtering and displaying on the CTP terminal.

Flow diagram

Refer to Appendix A.

Clearing Calls

Introduction

Calls are cleared when:

- The Paging Terminal initiates call clearing by dropping DTR if it is configured as DTR calling mode.
- The TNPP PAD initiates call clearing when the Link Test Procedure fails.

Call Clearing Process

The following table describes call clearing process.

Stage	*Description*	
1	Either the Paging Terminal or the PAD initiates call clearing.	
2	The TNPP PAD port transmits all the queued frames before clearing the call.	
3	The TNPP PAD does not accept new frames during call clearing.	
	If...	***Then...***
	Any data frame is received from the Paging Terminal during call clearing	A new call request is initiated for the remote TNPP PAD.
	There is link reset failure or DTR drop from the Paging Terminal	The PAD generates a report.
	The call is set up due to node boot, port boot, or power on condition	The call is cleared.
	The calling modes are different for the two nodes and one is configured as POWERON	The call does not get cleared.

TNPP Routing Components

Introduction

TNPP Routing is an extension of the TNPP PAD feature and provides network connectivity between multiple paging terminal networks across X.25 or Frame Relay networks. This section describes TNPP Routing options and feature.

TNPP Routing Functionality

The following components make up the TNPP routing option's functionality for the Vanguard:

- TNPP Data Link Control (TDLC) ports
- TNPP Frame Router Interface (TFRI)
- TNPP Frame Router (TFRI)

Figure 1-2 illustrates two Vanguards providing TNPP routing for a paging network.

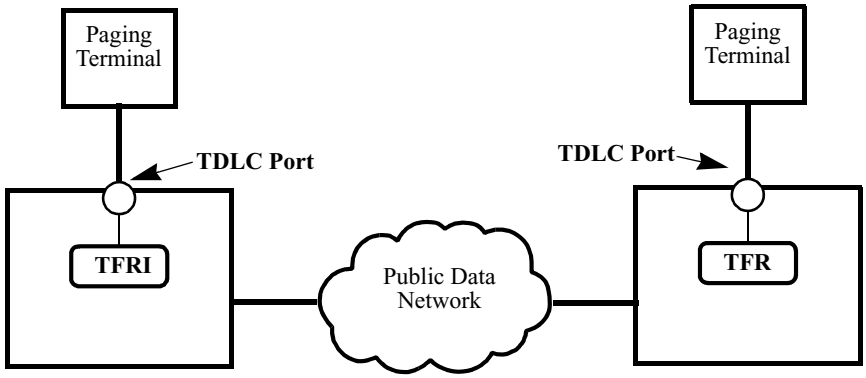


Figure 1-2. Paging Network

TNPP Data Link Control

TNPP Data Link Control (TDLC) provides a link level interface between paging terminals and a Vanguard. Configured on a port, TDLC connects paging terminals to the network. A modification of the TNPP PAD feature, TDLC, retains all the physical and link level capabilities of the existing TNPP PAD, including Transparency Insertion, Cancel Handling and Inertia Handling.

TNPP Frame Router

The TNPP Frame Router (TFR) provides routing functionality for TNPP. The TFR handles connection requests from TFRIs, sets up a connection with the other TFR, and routes TNPP data frames based on a configured Paging Destinations Table.

The TFR must be enabled with a CSK. You must have one TFR configured in your network to perform TNPP routing. You can enable only two TFRs, one per node, on a single network at the same time.

There are three types of TFR connections:

- Broadcast: Connections within a set of two or more TFRs that provide load sharing and redundancy
- Mesh: Connections within a set of two or more TFRs having full connectivity
- Hierarchy: Connections between TFRs belonging to different levels in a hierarchical network

TNPP Frame Router Interface

The TFRI component is enabled with a Customer Software Key and activates if you configure one or more TDLC ports on a Vanguard. The TFRI provides connectivity to the TNPP Frame Router (TFR) and interacts with the TDLC port in the node it resides in to route frames between the port and the TFR. The TFRI can reside in the same node as the TFR or it can reside in a node by itself, as long as there is a TFR configured in the network.

Paging Destination Table

The Paging Destination Table:

- Maps the destination codes to the paging terminals. The destination code is a hexadecimal code use to identify the destination paging terminals.This mapping specifies that the TNPP data frame carrying any of these destination codes has to be broadcast to the paging terminals indicated by the configured paging terminal identifiers.
- Supports up to 1000 destination code entries per table. For each destination code, you can configure up to 256 paging terminal identifiers. The TFR will support up to 10,000 paging terminals.

How TNPP Data Frame Routing Occurs

Routing Process

The table below describes the process for routing TNPP frames between paging terminals:

Step	Process
1	Paging terminal sends TNPP data frames to the TDLC ports.
2	The TDLC port passes the data frames to the TFRI which in turns forwards the frame to the TFR.
3	Based on Paging Destination Table mappings, the TFR routes the data frame to the appropriate TFR and/or TFRI.

Rules for TNPP Routing

The following rules governs the TNPP data frame routing:

- The TFR does not forward TNPP data frames back through the TFRI connection that sent it.
- If the TFR cannot find a destination code for an incoming TNPP data frame in the paging destination table, it discards the frame and generates a report.

TNPP Routing Sample Application

Example

Figure 1-3 shows a sample implementation of TNPP Routing functionality. This example shows how TNPP data frames are routed in a multipoint network application.

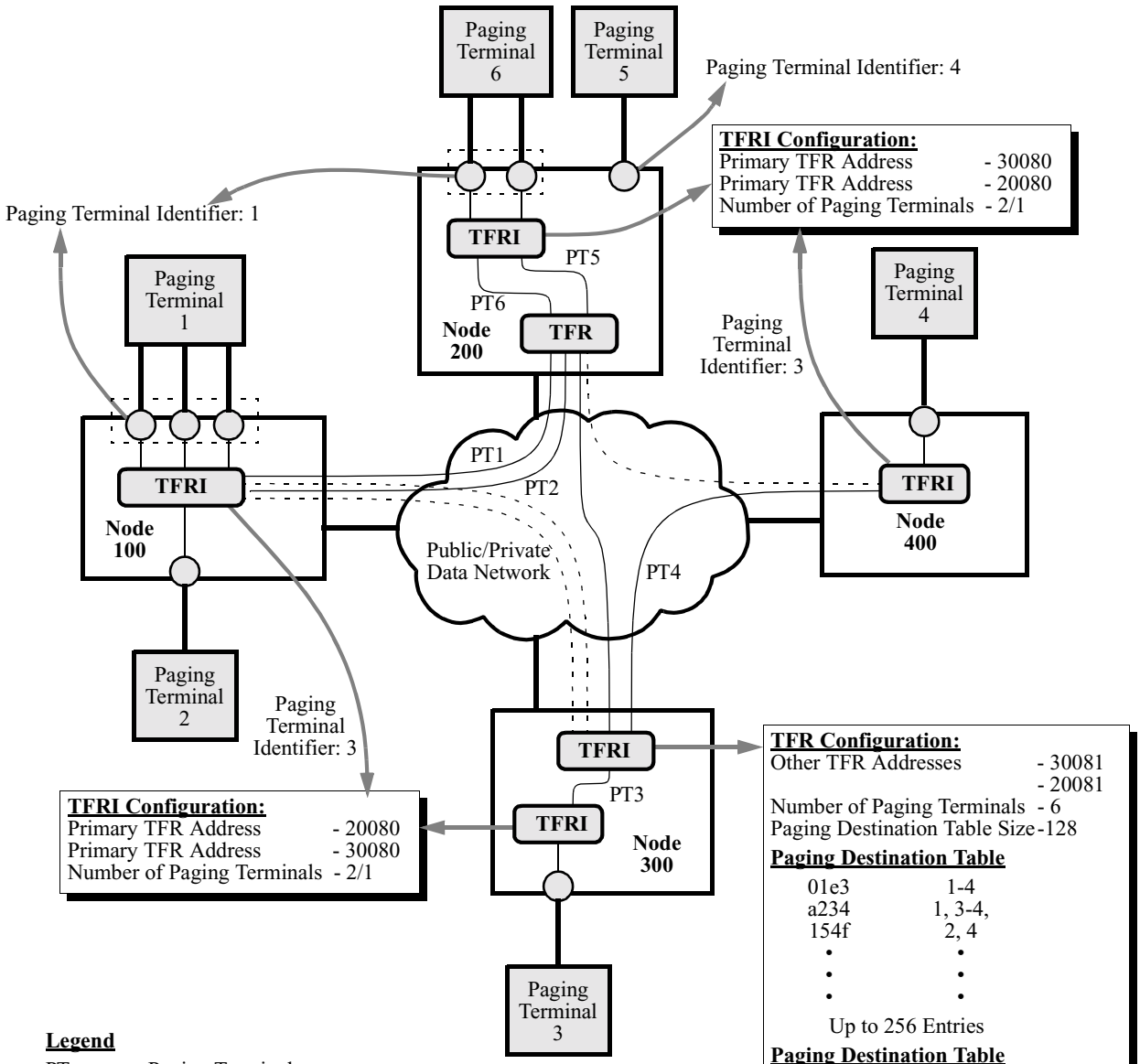


Figure 1-3. TNPP Routing in Multi-Terminal Network

How It Works

As shown in Figure 1-3, routing of TNPP data frames is achieved by providing routing capability through the TFR, TFRI, and TDLC components configured on Vanguard nodes.

The TDLC ports on the Vanguard connect to the paging terminals. The ports use paging terminal identifiers to uniquely identify the attached paging terminals. A single paging terminal can be attached to more than one TDLC port. For each group of TDLC ports (connected to the same paging terminal and identified by the same paging terminal identifier), the TFRI makes a connection with the primary TFR (if the primary TFR is down, it will connect to a secondary TFR, as shown by dotted lines in Figure 1-3). During the connection setup, the TFRI passes the paging terminal identifier for this group of ports on to the TFR.

Note

The TFRI sets up only one connection for each group (either with the primary TFR or with the secondary TFR). Furthermore, the primary TFR for one TFRI can be the secondary TFR for another TFRI, depending on how the TFRI is configured.

The TFR keeps track of registered paging terminal identifiers (passed by TFRIs during connection setup) by connections. For example, PT connects to PT as shown in Figure 1-3. The TFR uses them to route or broadcast TNPP data frames. The TFR also makes a connection with the other TFR in the network, to route TNPP data frames to remote TFRIs not directly connected to it.

The TFR routes the TNPP data frames to the destined paging terminals based on the configured Paging Destination Table (this means the TFR maps the destination codes to the paging terminals) and the registered paging terminal identifiers. The TFR always sends TNPP frames to the other TFR, if properly connected.

For each of the TNPP data frames received, the TFR scans the paging Destination Table for the destination code contained in the frame. If a frame is found, the TFR broadcasts the frame to the destined paging terminal through the corresponding TFRI connections, excluding the source paging terminal. If the TFR does not find a destination code, it discards the frame and generates a report.

Multiple paging terminals connected to different nodes can use the same paging terminal identifier. If more than one paging terminal uses the same identifier in the network, a TNPP data frame originated from one of these terminals can be sent to the other terminals as destinations. This means the same identifier can be configured as the destination for the corresponding destination code in the Paging Destination Table. The TFR broadcasts the frame to all paging terminals with the same identifier, except the one where the frame was originated.

More Examples of TNPP Routing

The following examples describe how TNPP data frames are routed from the various nodes shown in Figure 1-3, based on the destination codes configured in the Paging Destination Table.

TNPP data frame with destination code 01e3 from paging terminal PT6

The following example describes how TNPP frames are routed from node 200 to all other nodes in the network shown in Figure 1-3.

- After receiving the TNPP frame from one of the TDLC ports connected to PT6, the TFRI in node 200 forwards the frame to the local TFR in node 200 through connection PT
- The TFR learns from the Paging Destination Table that this frame should be broadcast to all the paging terminals with identifiers 1, 2, 3 and 4.
- The TFR broadcasts this frame:
  - to the local TFRI in node 100 through connection PT
  - to the TFRI through connections PT and PT, and
  - to the other TFR in node 300.
- The TFRI in node 200 forwards the frame received through PT5 to the TDLC port connected to PT5, which sends it to PT5.
- The TFRI in node 100 forwards the frame received through connection PT1 to the least congested of the three TDLC ports connected to PT1. The port then sends the frame to PT1. It also forwards the frame received through connection PT2 to the TDLC port connected to PT2, which sends it to PT2.
- After receiving the frame from the TFR in node 200, the TFR in node 300 broadcasts the frame to the local TFRI through connection PT3 and the TFRI in node 400 through connection PT4, based on its Paging Destination Table.
- The TFRIs in nodes 300 and 400 forward the frames received from PT3 and PT4 to their respective TDLC ports, which in turn send them to PT3 & PT4.

TNPP data frame with destination code 154f from paging terminal PT1

The following example describes how a TNPP frame received at node 100 is routed to the paging terminals connected to nodes 100 and 200.

- After receiving the frame from one of the TDLC ports connected to PT1, the TFRI in node 100 forwards the TNPP frame to the TFR in node 200 through connection PT1.
- The TFR learns from the Paging Destination Table that this frame must be broadcast to all the paging terminals identified by paging terminal identifiers 2 and 4.
- It broadcasts the frame to the local TFRI through connection PT5, the TFRI in node 100 through the connection PT2, and to the other the TFR in node 300.
- The local TFRI in node 200 forwards the frame through connection PT5 to the TDLC port connected to PT5, which sends it to PT5.
- The TFRI in node 100 forwards the frame received through the connection PT2 to the TDLC port connected to PT2, which sends it to PT2.
- The TFR in node 300, after receiving the frame from the TFR in node 200, discards the frame since it has no connections for the identifiers 2 & 4.

TNPP data frame with destination code 91ef from paging terminal PT4

The following example describes how a frame is discarded when the destination code is not found in the Paging Destination Table of either node where the TFRs reside.

- After receiving the frame from the TDLC port connected to PT4, the TFRI in node 400 forwards the frame to the TFR in node 300 through connection PT4.
- The TFR in node 300 forwards the frame received through PT4 only to the other TFR in node 200, since the destination code 91ef is not found in its Paging Destination Table.
- The TFR in node 200, after receiving the frame from the TFR in node 300, discards the frame and generates a report, since the destination code 91ef is not available in its Paging Destination Table either. When the TFRI receives a TNPP data frame, it forwards this frame to the least congested TDLC port in the group that corresponds to the connection that sent the frame. Load sharing is based on queue depth and packet/byte count. The TDLC port sends this frame to the attached paging terminal.

Chapter 2
Configuring TNPP

Overview

Introduction

This chapter describes how to configure the Vanguard for:

- TNPP PAD
- TNPP Routing

In This Chapter

Configuring TNPP PAD Ports

Introduction

This section describes the steps to configure a TNPP PAD port and provides an example. It also describes the TNPP PAD port parameters.

Configuration requirements

To configure the TNPP PAD port, you need to complete:

- Port record
- Mnemonic table record

Configuration Guidelines

This table describes the steps to configure a TNPP PAD port and provides an example.

Steps for configuring the TNPP PAD port

Step	*Action*	*Result/Description*
1	Select **Configure** from the CTP Main menu.	The Configure menu appears.
2	Select **Port** from the Configure menu.	The Port record appears.

Steps for configuring the TNPP PAD port *(continued)*

Step	Action		Result/Description
3	Enter a port number and complete the parameters as described below.		
	Prompt:	Enter:	
	Port speed	9600	Indicates the port speed in bits per second.
	Call control	POWERON	Indicates the type of call setup.
	CRC option	Normal	Indicates the CRC format.
	TAN control	Unipage	Indicates whether or not transparent ACK and NAK control characters are supported.
	CAN reports	Yes	Indicates whether or not CAN reports are generated.
	RS count	5	Indicates the number of Request to Stop (RS) frames on hold. When the value is equal to or above this number, the TNPP PAD port flow controls the X.25 channel.
	Max RS count	5	Indicates that the TNPP PAD port stops transmission of any new frame to the Paging Terminal when the number of frames on hold is equal to or greater than this value.
	RS support	Yes	Indicates whether or not the RS frames are transmitted to the local paging terminal under X.25 blocked condition.
	Autocall mnemonic	JAGI	Indicates the remote address called by the TNPP PAD port.
	Autocall timeout	30	Indicates the interval of time in seconds between the call attempts when autocalling.
	Maximum number of autocall attempts	3	Indicates the maximum number of attempts by the TNPP PAD port to autocall a remote destination.

Parameters

This section describes the TNPP parameters**.**

Note

Unless otherwise indicated, you must perform a Port boot for changes to these parameters to take affect.

Port speed:

Range:	300, 1200, 2400, 4800, 9600, 19,200
Default:	9600
Description:	Describes the port speed in bits per second.

Call control

Range:	DTR, DATADRV, POWERON
Default:	POWERON
Description:	• DTR — X.25 call is set up when DTR is up. Connection type is DTR. • DATADRV — X.25 call is up when there is incoming data from the Paging Terminal. Connection Type is SIMP. • POWERON — X.25 call is made when poweron, node boot, or port boot occurs. Connection type is SIMP.

CRC option:

Range:	Normal, Transp
Default:	Normal
Description:	• Normal — 2 bytes binary CRC • Transp — 4 bytes ASCII CRC

TAN control:

Range:	UNIPAGEMODE, MPS2000MODE
Default:	UNIPAGEMODE
Description:	• Transparent ACK and NAK are only supported in UNIPAGEMODE • Transparent ACK and NAK are not supported in MPS2000MODE

CAN reports:

Range:	NO, YES
Default:	NO
Description:	The CAN control flag indicates a routing error within the Paging Terminal's routing scheme. • NO — CAN reports are not generated by the TNPP PAD port • YES — CAN reports are generated by the TNPP PAD port.

Note

Remote printing, logging, filtering, and CTP display is controlled by the node parameters.

RS count:

Range:	1-10
Default:	5
Description:	Request to Stop (RS) count indicates that the TNPP PAD port flow controls the X.25 channel when the number of RS frames on hold remains at or above the configured value of this parameter.

Max RS count:

Range:	1-10
Default:	5
Description:	Specifies that the TNPP PAD port stops transmission of any new frames to the Paging Terminal when the number of frames on hold remains at or above the value of this parameter. Transmission of the control frames and retransmission of the RS timed-out frames continues.

RS support:

Range:	NO, YES
Default:	NO
Description:	• NO — Request to Stop (RS) frame is not transmitted to local paging terminal under X.25 SVC blocked condition • YES — RS frame is transmitted to local paging terminal under X.25 SVC blocked condition.

Autocall mnemonic

Range:	Null
Default:	Blank
Description:	Refers to the remote address that will be called by the TNPP PAD port.

Autocall timeout:

Range:	5-255
Default:	30
Description:	Specifies the time interval in seconds between call attempts when auto calling.

Maximum number of autocall attempts:

Range:	0-20
Default:	0
Description:	Specifies the number of times the TNPP PAD port attempts to autocall the remote destination. A value of zero specifies unlimited attempts.

Configuring TNPP Routing

Overview

This section describes how to configure a Vanguard to perform TNPP routing. This assumes your node is operational and properly connected to a network.

What You Need to Configure

You need to configure these records and tables in your Vanguard for TNPP Routing operation:

- TFRI Record
- TFR Record (if you are configuring the TFR routing node)
- TDLC port(s)
- Route Selection Table
- Paging Destination Table

Note

This assumes you are not running other protocols on the node. If you are running other protocols, refer to the user documentation on those protocols for more information.

Configuring the TDLC Port

Overview

This section describes how to configure the TDLC port for routing operation.

Follow These Steps....

Follow these steps to configure the TDLC port for TNPP routing.

Step	*Action*	*Result*
1	Select **Configure -> Port** from the CTP Main menu.	The entry for Port Number appears.
2	Enter a port number and press Return.	The entry for Port Type: appears.
3	Enter **TDLC** for port type and press Return.	The parameters for the TDLC port appear in sequence.
4	Configure the TDLC port parameters. See the "TDLC Port Parameters" section on page 2-8 for parameter values and descriptions.	
5	Type **;** and press Return.	This saves the record in CMEM.
6	Perform a Node boot.	Your changes are implemented.

TDLC Port Parameters

These parameters are available from the TDLC port record.

Port Speed

Range:	300, 1200, 2400, 4800, 9600, 19200
Default:	9600
Description:	Specify the port speed for the TDLC port.

Connection Type

Range:	SIMP, DTR
Default:	SIMP
Description:	Specify the control signal handshake and clocking required for a connection to be made to the TDLC port: • SIMP - simple, no control signals required. • DTR - dedicated, requires the Data Terminal Ready signal.

CRC Option

Range:	NORMAL, TRANSP
Default:	NORMAL
Description:	Specify CRC checking and generation for TNPP data frames: • NORMAL - two bytes Binary CRC • TRANSP - four bytes ASCII CRC

TAN Handling

Range:	NO, YES
Default:	NO
Description:	Specify whether or not to accept the control characters ACK, NAK, CAN, and RS in TNPP data frames: • NO - Not accepted • YES - Accepted

Paging Terminal Identifier

Range:	1 to 256
Default:	1
Description:	Specify the identifier for the connected paging terminal. **Note** You must perform a Node boot for changes to this parameter to take affect.

Response Control

Range:	NO, YES
Default:	NO
Description	Specify whether to respond to the paging terminal when the no connection exist between the TFRI and TFR. • NO - will respond regardless of whether a TFRI and TFR connection exists. • YES - will respond only if a TFRI and TFR connection exists.

Configuring TNPP Frame Router Interface

Overview

This section describes how to configure the TNPP Frame Router Interface for TNPP routing. You need to configure a TFRI in each node where a TDLC port is configured.

Follow These Steps....

Follow these steps to configure the TFRI.

Step	*Action*	*Result*
1	Select **Configure -> TFRI Record** From the CTP Main menu.	The parameters for the TFI record appear in sequence.
2	Fill out the parameters for the TFRI record. When you are finished, type **;** and press Return to save the record. Refer to the "TNPP Frame Router Interface Parameters" section on page 2-10 for details on parameter values and descriptions.	The TFRI record is configured and saved to CMEM.
3	Perform a Node boot.	Your changes are implemented.

TNPP Frame Router Interface Parameters

These parameters are available from the TFRI record.

Primary TFR Address

Range:	0 to 15 Binary Coded Decimal (BCD) digits
Default:	Blank
Description:	Specify the address of the primary TNPP Frame Router.

Secondary TFR Address

Range:	0 to 15 BCD digits
Default:	Blank
Description:	Specify the address of the secondary TNPP Frame Router. The Secondary TFR Address is used when the Primary TFR Address is unavailable. If there is only one TFR in the network, you do not need to configure this parameter.

Number of Paging Terminals

Range:	1 to 50
Default:	1
Description:	Specify the number of paging terminals connected or the number that will be connected to this node. The TFRI will set up these connections with the TFR. **Note** You must perform a Node boot for changes to this parameter to take affect.

Protection Level

Range:	NONE, CP_ONLY, FULL_DCP
Default:	NONE
Description:	Specify the level of data or connection protection applied to calls to or from the TFRI. The actual level for a call will be negotiated to the lower of the two levels (i.e., the local and remote ends of the call). • NONE - No protection • CP_ONLY - Connection protection only • FU:_DCP - Full data and connection protection **Note** You must perform a Node boot for changes to this parameter to take affect.

Reconnection Timeout

Range:	1 to 128
Default:	2
Description:	Specify the number of seconds that DCP on the originating side should wait between reconnection attempts. **Note** This parameter appears only when the DCP option is enabled.

Reconnection Tries Limit

Range:	0 to 127
Default:	4
Description:	Specify the number of times that DCP on the originating side should attempt to reconnect before clearing the call. If you enter 0, no attempt to reconnect is made. **Note** This parameter appears only when the DCP option is enabled.

Configuring the TNPP Frame Router

Overview

This section describes how to configure the TNPP Frame Router. You need to configure the TFR record in the node used to route TNPP between paging terminals. You must have at least one TFR node configured in your network to perform TNPP routing. Up to two TFR nodes are allowed within the same network.

Follow These Steps....

Follow these steps to configure the TFR for TNPP routing.

Step	*Action*	*Result*
1	From the CTP Main menu, select **Configure -> TFR Record**.	The parameters for the TFI record appear in sequence.
2	Fill out the parameters for the TFRI record. When you are finished, type **;** and press Return to save the record. Refer to the "TNPP Frame Router Parameters" section on page 2-13 for details on parameter values and descriptions.	The TFRI record is configured and saved to CMEM.
3	Perform a Node boot.	Your changes are implemented.

TNPP Frame Router Parameters

These parameters are available from the TFR record.

Paging Destination Table Size

Range:	1 to 1000
Default:	10
Description:	Specify the maximum permitted number of table entries for the paging destination table. **Note** You must perform a Node boot for changes to this parameter to take affect.

Number of Paging Terminals

Range:	1 to 1000
Default:	10
Description:	Specify the number of paging terminals serviced by this TFRI connection. **Note** You must perform a Node boot for changes to this parameter to take affect.

Other TFR Address

Range:	0 to 15 Binary Coded Decimal (BCD) digits
Default:	Blank
Description:	Specify the address of the other TNPP Frame Router (TFR) in the network. If there is only one TFR in the network, you do not have to configure this parameter.

Protection Level

Range:	NONE, CP_ONLY, FULL_DCP
Default:	NONE
Description:	Specify the level of data or connection protection applied to the calls to or from the TFR. The actual level for a call is negotiated to the lower of the two levels (i.e., the local and remote ends of the call). • NONE - No protection • CP_ONLY - Connection protection only • FU:_DCP - Full data and connection protection **Note** You must perform a Node boot for changes to this parameter to take affect.

Reconnection Timeout

Range:	1 to 128
Default:	2
Description:	Specify the number of seconds that DCP on the originating side should wait between reconnection attempts. **Note** This parameter appears only when the DCP option is enabled.

Reconnection Tries Limit

Range:	0 to 127
Default:	4
Description:	Specify the number of times that DCP on the originating side should attempt to reconnect before clearing the call. If you enter 0, no attempt to reconnect is made. **Note** This parameter appears only when the DCP option is enabled.

Configuring the Route Selection Table

Route Selection for TFR Nodes

TNPP Routing uses a specific character string to specify the routing path between TFR nodes or TFR and TFRI nodes. To do this, you must configure a Route Selection Table for each TFR node in your network, using the string TFR-TFR or TFR-TFRI, depending on whether you are routing between one TFR and another TFR, or a TFR and TFRI.

Route Selection for TFRI Nodes

To make a connection between a TFRI node and a TFR node, no special route selection string is required in the #1 Destination parameter. You configure the Route Selection Table for the TFRI node as you would any other port.

Example

For example, Node 100 is a TFRI node that needs to route information to Node 200, a TFR node. If the nodes are connected using X.25 on port 1 of both nodes, then the #1 Destination parameter in the Route Selection Table in Node 100 would be X25-1 with an address of 200 in the Address parameter in the Route Selection Table.

Follow These Steps

Follow these steps to configure the Route Selection Table.

Step	*Action*	*Result*
1	Select **Configure -> Network Services -> Route Selection Table** from the CTP Main menu	The Route Selection Table parameters appear in sequence.
2	At the Address parameter, type in the network address of the node for calls routed beyond this node. For example, if this is TFRI Node 100 and you want to connect to TFR Node 200 with a subaddress of 97, you would enter **20097**. This should match the Primary TFR Address as configured in the TFRI record for Node 100.	This sets up the connection between the TFRI and TFR.
3	At the #1 Destination parameter, type in the address of the node for calls routed beyond this node (this address should match the address in the Address parameter), followed by the special string (TFR-TFR or TFR-TFRI), and press Return. For example: **20097 TFR-TFRI**	Calls with a network address corresponding to this table entry route to this destination.
4	Perform a Table boot.	Your changes are implemented.

Configuring the Paging Destination Table

Introduction

You need to configure a Paging Destination Table in each TFR node. The Paging Destination Table contains a number of configured entries equal to the Paging Destination Table Size as configured in the TFR record.

Follow These Steps...

Follow these steps to configure the Paging Destination Table.

Step	*Action*	*Result*
1	Select **Configure -> Paging Destination Table** from the CTP Main menu.	The parameters for the Paging Destination Table appear in sequence.
2	Configure the Paging Destination Table parameters. See the "Paging Destination Table Parameters" section on page 2-16 for details on parameter values and descriptions.	The Paging Destination Table is configured.
3	Enter **;** and press Return at the last parameter.	The record is saved in CMEM.
4	Perform a Node boot.	This implements your configuration changes.

Paging Destination Table Parameters

These parameters are available from the Paging Destination Table record.

Entry Number

Range:	1 to whatever number is configured in the Table Destination Size.
Default:	1
Description:	Specifies the number used to reference this table record.

Destination Code

Range:	0 to ffff
0000	Specifies the hexadecimal code for the destination paging terminals. A TNPP data frame carrying this Destination Code is broadcast to all these paging terminals. A value of zero (0) means no Destination Code is specified.

Paging Terminal Identifiers

Range:	Up to 256 identifiers for each paging terminal.
Default:	Blank
Description:	Specifies the paging terminal identifiers for the destination paging terminals corresponding to the value configured in the Destination Code parameter. Use a comma to separate the identifiers, or use a dash (-) in a range. A range of paging terminal identifiers can be entered as: 1,6,8-12,250-256, 252,253,256. Use the Spacebar to blank this parameter.

Chapter 3
TNPP Monitoring and Statistics

Overview

Introduction

This chapter describes how to monitor TNPP statistics.

In This Chapter

Monitoring a TNPP PAD Port

Introduction

You can monitor the TNPP PAD port and view the statistics using the Control Terminal Port (CTP).

Accessing Statistics

The following table describes how to access the statistics.

Step	Action
1	Select **Status/Statistics** from the CTP main menu.
2	Select Detailed Port Stat.

Detailed Statistics screen #1

Figure 3-1 shows the first screen of the detailed statistics for the TNPP PAD port.

```
Node:              Address:             Date:          Time:
 Detailed TNNP Port Statistics: Port 2                  Page:  1 of 2

 Port Number: 2                                           Port Type: TNNP
Port Utilization IN: 0%
 Port Status: Up                                         Port Speed: 9600
Port Utilization Out:0%
Calling Mode: DATADRV

Physical Summary:
Overrun Errors: 0  Framing Errors: 0 CRC Errors: 15

Data Summary:
                                                      IN              OUT
IN        OUT
  Frames: 6120      6120Frames/sec:       100                        50
  Number of Packets Queued: 0

EIA Summary:                                  INPUT           OUTPUT
                                          DTR RTS MB P14  DSR DCD RI CTS
  State: Connected (SIMPLE)L               H  L   H   H   HL   H

Press any key to continue ( ESC to exit ) ...
```

Figure 3-1. **Detailed Statistics**

Detailed Statistics screen #2

Figure 3-2 shows the second screen of detailed statistics for the TNPP PAD port.

```
Node:              Address:             Date:          Time:
Detailed TNNP Port Statistics: Port 2                  Page: 2 of 2

Frame Summary:
                                                      IN         OUT
ACK:               14352000
NAK:               1000
  1500
RS:                65     100
CAN:               0       0
EOT:               10     10
ENQ:               10     10

DATA FRAMES        3600   2500
CONTROL FRAMES     2520              3620
(ACK+NAK+RS+CAN+ENQ+EOT)

DTE Summary -
Local DTE State: ACTIVE                  Remote DTE State: DOWN

Local Queue Summary:
Queue for Remote PAD: 0
Queue for Local Terminal: 4
Ready Queue:       3
```

Figure 3-2. **Detailed Statistics**

Detailed Statistics screen #3

Figure 3-3 shows the DTE summary.

```
Node:              Address:            Date:          Time:
Detailed TNNP Port Statistics: Port 2                  Page: 2 of 2

DTE Summary -
Local DTE State: ACTIVE                Remote DTE State: DOWN

Local Queue Summary:
Queue for Remote PAD: 0
Queue for Local Terminal: 4
Ready Queue:       3
Hold Queue:        0

Press any key to continue ( ESC to exit ) ...
```

Figure 3-3. **Detailed Statistics**

Statistic Descriptions

This table describes the statistics.

Statistic	*Description*
Port Number	Indicates the physical port number.
Port Status	Indicates the operational status of the port. • Up indicates the link between PAD and Paging Terminal is up. • Down indicates the link between PAD and Paging Terminal is disabled. • Disabled indicates the port is disabled by the user.
Port Type	Indicates the type of access protocol for this port.
Port Speed	Indicates the measured port speed in bits per second.
IN	Refers to data flow from the line to the port direction.
OUT	Refers to the data flow from the port to the line direction.
Port Utilization	Indicates the port utilization for both IN and OUT directions and is calculated by the following formula: number of bytes per second * 100/(speed/8) This statistic is calculated every 60 seconds.

Statistic	Description
Overrun Errors	Indicates the total number of overrun errors counted by the I/O driver.
Underrun Errors	Indicates the total number of framing errors counted by the I/O driver.
CRC Errors	Indicates the total number of CRC errors from the Paging Terminal counted by the TNPP PAD.
Frames	Indicates the total number of valid TNPP frames processed up to the current time.
EIA Summary	Indicates the current status of RS232 control leads, for example, H is for High and L is for Low.
State	Indicates the various state of the EIA connection type, for example, Idles, Connected, Disconnected, and so on.
Frame Summary	Indicates the total number of control frames received and transmitted.

TNPP PAD Port Reports

Introduction

TNPP event reports display informational text or error conditions.

Report format

The reports generated from the TNPP PAD port use the following format:

Node<#><Date><Port Type><port#><report text>[-cause code>]

The cause code is optional.

Report example

The following is an example of the report:

Node 100 10-NOV-1993 TNPP-2-PORT BOOT COMPLETE

High severity reports

These tables display the High severity reports generated by the TNPP PAD port.

PORT BOOT COMPLETE

Severity Level:	High
Description:	Indicates that the port boot is complete.
User Action:	None

PORT BOOT FAILURE- <cause string>

Severity Level:	High
Description:	Indicates that the port boot failed.
User Action:	The following is a list of the cause strings: • No configuration • Port type changed • Port disabled • DCP protection level changed to or from NULL. Node boot is required.

PORT DISABLED

Severity Level:	High
Description:	Indicates that the port is disabled by a CTP command.
User Action:	None

PORT DISABLE FAILURE - <cause string>

Severity Level:	High
Description:	Indicates that you have failed to disable the port.
User Action:	The following is a list of the cause strings: • No configuration • Port type changed • Port already disabled

PORT ENABLED

Severity Level:	High
Description:	The port has been enabled by a CTP command.
User Action:	None

PORT ENABLE FAILURE- <cause string>

Severity Level:	High
Description:	Indicates that you have failed to enable the port.
User Action:	The following is a list of the cause strings: • No configuration • Port type changed • Port already enabled

REMOTE PAD IS NOT TNPP PAD, CLEARING CALL

Severity Level:	High
Description:	Indicates that the remote PAD is not configured as a TNPP PAD.
User Action:	Check that the port type of the remote port is TNPP.

PORT STATUS WARNING - <cause string>

Severity Level:	High
Description:	Indicates that DCP is not initialized due to one of the cause strings.
User Action:	Refer to cause string for an explanation and take appropriate action: • NO MEMORY FOR D/CP • NO SAK FOR D/CP

DTR DROPPED, LINE DISCONNECTED

Severity Level:	High
Description:	Indicates that the call is disconnected.
User Action:	None

LOCAL DEVICE IS DOWN

Severity Level:	High
Description:	Indicates that the DTR signal is dropped or link test failed (unable to respond with EOT to the ENQ from the TNPP PAD).
User Action:	Check if the device is powered off, or cable connecting the terminal and TNPP PAD may be bad.

AUTOCALL RETRIES EXHAUSTED, REBOOT THE PORT

Severity Level:	High
Description:	Indicates that the value of autocall retries has been exceeded.
User Action:	None

REMOTE DEVICE IS DOWN

Severity Level:	High
Description:	Indicates that on the remote paging terminal DTR signal is dropped or the Link test failed.
User Action:	Check whether the device is powered off or cable connecting the remote TNPP PAD is bad.

CAN RECEIVED, FRAME DISCARDED: SA- <Source address>, DA - <Destination address>

Severity Level:	High
Description:	The ASCII character CAN has been received by the TNPP PAD port from the attached Paging Terminal. It indicates that a frame is received without any error, but it cannot be routed.
User Action:	Check routing information of the Paging Terminal.

Medium severity reports

These tables describe the Medium severity reports generated by the TNPP PAD port.

TNPP PROTOCOL VIOLATION, FRAME DISCARDED

Severity Level:	Medium
Description:	Indicates that the paging terminal has sent more than one data frame without waiting for the acknowledgment for the earlier frame. The data frames are discarded.
User Action:	None

QUEUE TO LOCAL DEVICE OVERRUNS

Severity Level:	Medium
Description:	Indicates that the number of frames received from the remote TNPP PAD is larger than the size of the queue holding the frames for the local paging terminal.
User Action:	None

QUEUE TO REMOTE TNPP PAD OVERRUNS

Severity Level:	Medium
Description:	Indicates that the number of frames received from the local paging terminal is larger than the size of the queue holding the frames for the remote TNPP PAD.
User Action:	None

CALL CLEARED BY REMOTE TNPP PAD - <cause code>

Severity Level:	Medium
Description:	Indicates that the call is cleared by the remote TNPP PAD. Cause codes are the standard X/25 cause codes, which will always be 0 in this case because it is cleared by the remote DTE.
User Action:	None

CALL REJECTED BY LEVEL #3 - <cause code>

Severity Level:	Medium
Description:	Indicates one of these cause codes: • 0 —þNo called address is specified. • 1 — Busy, connection is being established. • 2 — Timeout, waiting for connection to be established. • 3 — Call collision detected. • 4 — Call Accept is failed, call is cleared. • 5 — Cleared from level 3 due to internal error.
User Action:	None

INVALID CONTROL FIELD, FRAME DISCARDED

Severity Level:	Medium
Description:	Indicates that the length of the control field frame exceeds the standard length of 12 or 16.
User Action:	The Paging Terminal should follow the standard protocol as defined in the PCIA standard.

FRAME SIZE EXCEEDED, FRAME DISCARDED

Severity Level:	Medium
Description:	Indicates that the frame is discarded because of size.
User Action:	None

FRAME RETRY EXHAUSTED, FRAME DISCARDED: SA - <Source Address>, DA- <Destination Address>

Severity Level:	Medium
Description:	Indicates that the frame is discarded because the system exceeded the number of retries.
User Action:	Check that the CRC on the Paging Terminal is configured the same as the TNPP PAD, for example, either 2 bytes or 4 bytes.

HOLD RETRY EXHAUSTED, FRAME DISCARDED:SA - <Source Address>, DA- <Destination Address>

Severity Level:	Medium
Description:	Indicates that the frame is discarded because the system exceeded the number of holds.
User Action:	None

MNEMONIC IS EITHER BLANK OR NOT CONFIGURED - <cause code>

Severity Level:	Medium
Description:	Indicates that the mnemonic is not configured. The cause codes are: 1. X.25 string may not be mnemonic. 2. Facilities in mnemonic call 3. Undefined facility 4. Invalid facility value 5. Invalid NUI facility length 6. Called address too long 7. Invalid numeric address 8. Nested mnemonics 9. Mnemonic not found 10.Mnemonic name too long 11. Mnemonic only 12. Invalid fast select facility value 13. Invalid packet size facility value 14.Invalid window size facility value 15. User facility had non-hex digit 16. Facility field too long
User Action:	Configure a mnemonic for autocalling.

STATISTIC COUNTER OVERRUN <counter No>

Severity Level:	Medium
Description:	Indicates that there is an overflow in the statistics counter.
User Action:	None

REMOTE DEVICE IS UP

Severity Level:	Medium
Description:	Indicates that the remote device link is up.
User Action:	None

INVALID CRC, FRAME DISCARDED

Severity Level:	Medium
Description:	Indicates that the frame is discarded due to an invalid CRC.
User Action:	Check the CRC configurations of the TNPP PAD and the Paging Terminal.

LOCAL DEVICE IS UP

Severity Level:	Medium
Description:	Indicates that the local device is up.
User Action:	None

RECEIVER BUSY, FRAME DISCARDED: SA - <Source Address>, DA- <Destination Address>

Severity Level:	Medium
Description:	Indicates that the Paging Terminal is unable to acknowledge a frame received from the TNPP PAD port before the busy timer expires.
User Action:	None

X25 CONNECTION IS UP

Severity Level:	Medium
Description:	Indicates that the X.25 connection is up.
User Action:	None

<no of frame> DATA FRAME(s) LOST

Severity Level:	Medium
Description:	Indicates that the Link Restart procedure during data transfer failed.
User Action:	Check to see if the paging terminal is powered off.

INVALID FRAME IN MPS2000 MODE, FRAME DISCARDED

Severity Level:	Medium
Description:	Indicates that the control characters (ACK/NAK) are received as part of the data frame, which is not allowed in MPS2000 mode.
User Action:	Check if the parameter for the Paging Terminal is set to UNIPAGE. If so, change it to MPS2000.

CALL CLEARED BY NETWORK, CAUSE CODE - <cause code#>

Severity Level:	Medium
Description	Indicates that the call is cleared by the network for cause codes, which are standard X.25 cause codes.
User Action:	Refer to your Vanguard documentation for an explanation of the cause codes.

INVALID FRAME FROM REMOTE PAD, FRAME REJECTED

Severity Level:	Medium
Description:	Indicates that invalid frame (missing STX) is received from the TNPP PAD.
User Action:	None

Low severity reports

These tables display the Low severity reports generated by the TNPP PAD port.

CONNECTION TOWARDS REMOTE TNPP PAD IN PROGRESS

Severity Level:	Low
Description:	Indicates SVC setup is in progress.
User Action:	None

REJECTING X25 CALL, ALREADY CONNECTED

Severity Level:	Medium
Description:	Indicates that a call is already set up.
User Action:	None

TNPP Routing Statistics

Overview

The TNPP Routing feature provides the following statistics:

- TDLC Port Statistics
- TNPP Frame Router Interface Statistics
- TNPP Frame Router Statistics

Refer to the following sections for details on these statistics.

TDLC Port Statistics

Introduction

This section describes the TDLC statistics screens.

To Display TDLC Port Statistics

From the CTP Main menu, select **Statistics -> Ports** and press Return. The TDLC Statistics screen(s) appear, as shown in Figures 3-4 and 3-5.

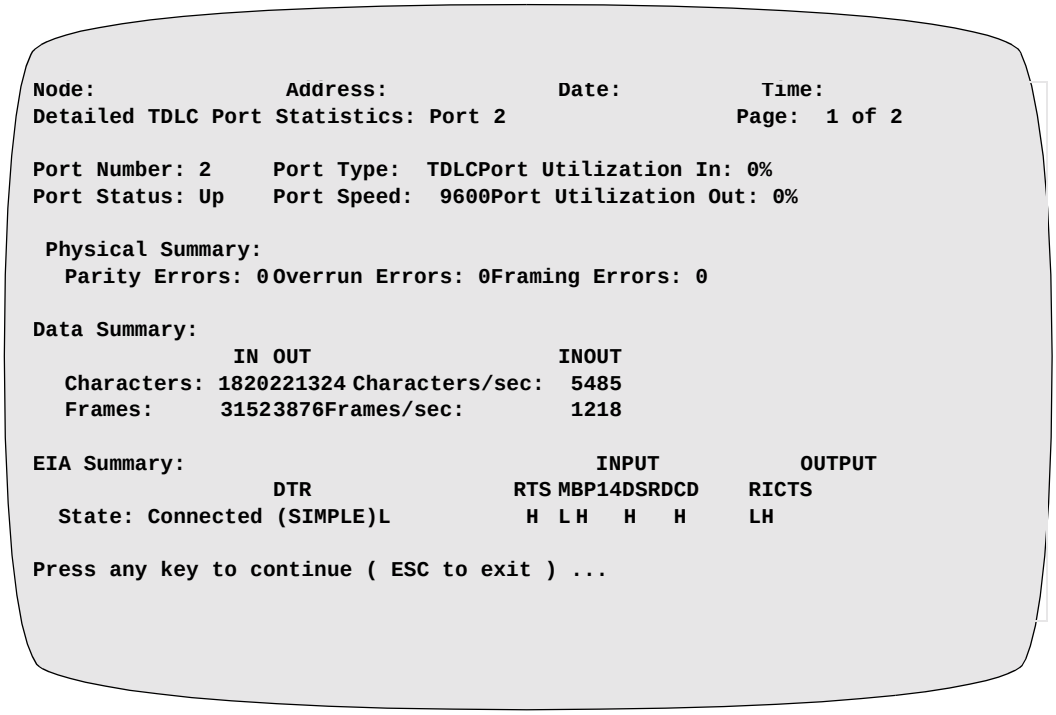


Figure 3-4. TDLC Port Statistics, Screen 1

```
Node:              Address:             Date:          Time:
Detailed TDLC Port Statistics: Port2Page 2 of  2
TNPP Link Summary :
Paging Terminal Identifier : 25Link State : 1
CRC Errors : 5     Framing Errors : 3Protocol Errors : 2
Frame Summary :
                   IN OUT
     Control Frames :
          ENQ:     10  10
          EOT :    10  10
          ACK:     14352000
          NAK:     10001500
          RS:      65 100
          CAN:     0   -
          ------------------------------------------
          TOTAL:   25203620

     Data Frames:
          Passed:  420539
          Discarded:12 1
          ------------------------------------------
          TOTAL:   432540
Press any key to continue (ESC to exit) . . . . .
```

Figure 3-5. TDLC Port Statistics, Screen 2

TDLC Port Screen Descriptions

The following table describes the screen terms in the TDLC Port Statistics screens shown in Figures 3-4 and 3-5.

Term	Description
Port Number	Physical port number of the TDLC port.
Port Status	Operational status of the TDLC port. The TDLC port can be UP, DOWN, or DISABLED.
Port Type	Indicates the type of access protocol configured for this port.
Port Speed	The port speed measured in seconds.
IN	Refers to the data flow from the port to the line direction.
OUT	Refers to the data flow from the port to the line direction.
Port Utilization	Indicates the port utilization for both IN and OUT directions.
Physical Summary	Gives the physical layer statistics summary: • Parity Errors - total number of parity errors counted by the I/O driver. • Overrun Errors - total number of overrun errors counted by the I/O driver. • Framing Errors - total number of character framing errors counted by the I/O driver.

Term	Description (continued)
Data Summary	Total number of characters and frames and their rates.
EIA Summary	Indicates the current status of RS232 control lead (for example, H for High or L for Low) and state of the EIA connection (for example, Idle, Connected, Disconnected).
TNPP Link Summary	The TNPP Link Level summary: • Paging Terminal Identifier - identifies the terminal connected to this port. • Link State - indicates the state of the TNPP link with Paging Terminal, as follows: - 0 Initialization state - 1 Await ENQ RESPONSE state - 2 READY to communicate state - 3 TRANSMIT state - 4 Await TRANSMIT RESPONSE state • Protocol Errors - the total number of protocol errors due to unexpected events. • CRC Errors - the total number of data frames received with CRC errors. • Framing Errors - the total number of TNPP Framing errors, for example, invalid header, Invalid Control character, Frame Size Exceeded, or Incomplete Frame.
Frame Summary	Lists the TNPP frames IN and OUT of this port, including: • Control Frames - TNPP Control characters. • Data Frames - TNPP data frames passed and discarded.

TNPP Frame Router Interface Statistics

Overview

This section describes the TNPP Frame Router Interface statistics screens.

To Display TFRI Statistics

From the CTP Main menu, select **Statistics -> Detailed TFRI Statistics** and press Return. The TFRI Statistics screen(s) appear, as shown in Figure 3-6.

```
Node:              Address:              Date:           Time:
Detailed TFRI Statistics               Page:  1 of  1

TDLC Ports Interface Summary
Number of TDLC ports - Active                    :            0
Number of TDLC ports - Blocked

Total Number of TDLC ports                       :            0
Total Number of frames received from TDLC ports  :            0
Total Number of frames transmitted to TDLC ports :            0

TFR Interface Summary
Total Number of frames received from TFR         :            0
Total Number of frames transmitted to TFR        :            0
Total Number of frames discarded                 :            0

Press any key to continue ( ESC to exit ) ...
```

Figure 3-6. TNPP Frame Router Interface Statistics

TFRI Statistics Screen Descriptions

This table describes the screen terms in the TDLC Port Statistics screens shown in Figure 3-6.

Term	*Description*
TDLC Ports Interface Summary:	• Number of TDLC port - Active • Number of TDLC ports - Blocked • Total Number of TDLC ports • Total number of frames received from TDLC ports • Total number of frames transmitted to TDLC ports
TFR Interface Summary:	• Total number of frames received from TFR • Total number of frames transmitted to TFR • Total number of frames discarded

TNPP Frame Router Statistics

Overview

This section describes the TNPP Frame Router statistics screens.

To Display TFRI Statistics

From the CTP Main menu, select **Statistics -> Detailed TFR Stats** and press Return. The TFR Statistics screen(s) appear, as shown in Figure 3-7.

```
Node:              Address:             Date:          Time:
Detailed TFR Statistics                                      Page:  1
of  1

 Paging Terminals Interface Summary
   Number of Paging Terminals - Active : 1
   Number of Paging Terminals - Blocked: 0
   Total Number of Paging Terminals    : 3

 Other TFR Interface Summary
   Other TFR Address: (blank)
   Channel State    : UNREACHABLE

 Routing Summary
   Total number of frames received from Paging Terminals : 0
   Total number of frames transmitted to Paging Terminals: 0
   Total number of frames received from other TFR        : 0
   Total number of frames transmitted to other TFR       : 0
   Total number of frames discarded                      : 0




 Press any key to continue ( ESC to exit ) ...
```

Figure 3-7. TNPP Frame Router Statistics

Description of Screen Terms

This table describes the screen terms shown in Figure 3-7.

Term	Description
Paging Terminals Interface Summary:	• Number of Paging Terminals - Active • Number of Paging Terminals - Blocked • Total Number of Paging Terminals
Other TFR Interface Summary:	• Other TFR Address • Channel State
Routing Summary:	• Total Number of Frames Received from Paging Terminals • Total Number of Frames Transmitted to Paging Terminals • Total Number of Frames Received from Other TFR • Total Number of Frames Transmitted to Other TFR • Total Number of Frames Discarded

TNPP Routing Alarms

Introduction TNPP routing generates these alarms.

Alarm	Priority	Description	Action
PORT BOOT COMPLETE	HIGH	Indicates port boot was successful.	No action required.
PORT BOOT FAILURE	HIGH	Port failed to boot up.	Check port configuration and reboot.
PORT DISABLED	HIGH	Indicates the TDLC port is disabled after Node boot.	Enable the port through the CTP and boot the port.
PORT DISABLE FAILURE	HIGH	Indicates attempt to disable port failed.	Check port configuration and repeat port disable procedure.
PORT ENABLED	HIGH	Indicates port was enabled successfully.	No action required.
PORT ENABLE FAILURE	HIGH	Indicates port failed.	Check port configuration and reboot.
PORT STAT OVERFLOW	MEDIUM	The Statistics counter indicated the counter type has overflowed and been reset to zero.	No action required.
PORT STATUS WARNING	HIGH	The <Cause String> is warning you about port status.	Reference the <Cause String> and corresponding user action for details.
FRAME DISCARDED	LOW	The TNPP data frame has been discarded for the reason given in the <Cause String>. This alarms shows the <Source Address> and <Destination Address> of the discarded frame.	No action required.
PROTOCOL ERROR	MED	Protocol error due to unexpected event.	Check whether the connected terminal supports TNPP. If not, configure it for TNPP operation.
LINK DOWN	MED	Link between TDLC port and paging terminal is down. The string <DATA FRAMES LOST> appears only if frames are discarded. A <CAUSE STRING> also appears.	• Make sure paging terminal is physically connected to port. • Make sure power is on. • Check for faulty cable.
LINK UP	LOW	Link test passed and link to paging terminal is active.	No action required.

Alarm	Priority	Description	Action
INSUFFICIENT MEMORY	HIGH	Sufficient memory is not available for the TFRI to come up.	Add more DRAM and boot the node.
BOOT FAILURE <parameter> CHANGED - NODE BOOT REQUIRED	HIGH	TFR boot failed because TFR parameter that requires a node boot has changed. This is likely to occur if changes are made to the number of paging terminals connected or to the DCP protection level, without booting the node.	Boot the node to implement the changes.
CONNECTION ESTABLISHED WITH TFR FOR THE PT	LOW	The TFRI established a connection with TFR for the paging terminal identified by <n>.	No action required.
CONNECTION FAILURE WITH TFR FOR PT	MED	TFRI is not able to make a connection with TFR for the paging terminal identified by <n>. A <CAUSE CODE> also appears.	Based on the <CAUSE CODE>, investigate the problem and restore the connection booting the node that generated the alarm.
CONNECTION ESTABLISHED WITH OTHER TFR	LOW	The local TFR established connection with other TFR.	No action required.
CONNECTION FAILURE WITH OTHER TFR	MED	The local TFR is not able to connect to other TFR.	Investigate the problem based on the <CAUSE CODE>, Restore the connection by booting the TFR in the node that generated the alarm.
UNKNOWN CALLER	MED	The TFR received a call from an unknown source. The source address of the call is shown.	This may be a configuration error, so check your configuration.

Appendix A
TNPP Frame Structure, Control Characters, and Data Transfer Flow

Overview

Introduction

This appendix provides information on TNPP frame structure, ASCII control characters, and data transfer flow.

In This Appendix

TNPP Frame Structure

Introduction

A TNPP frame consists of the following:

- Start of heard (SOH) flag
- Header
- Start of text (STX) flag
- Data blocks
- End (ETX) flag
- Block check code (CRC-16)

Example of TNPP frame structure

Figure A-1 shows the TNPP frame structure.

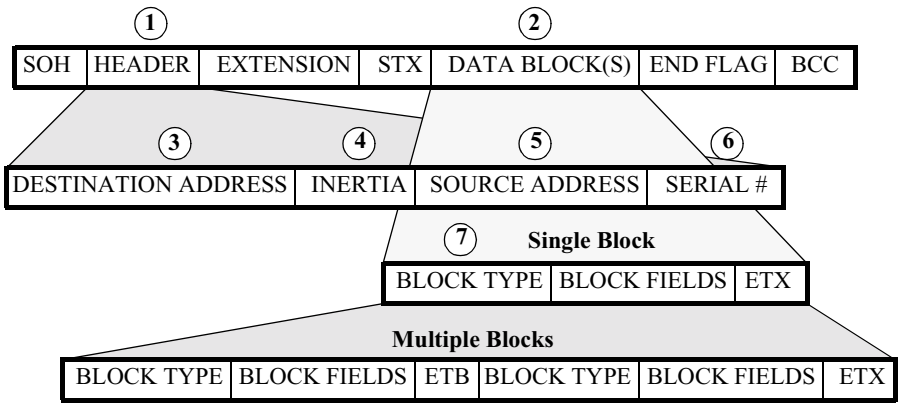


Figure A-1.

Frame Structure Fields

The following table describes the fields.

Description of key fields in the TNPP frame

Callout Number	*Label Name*	*Description*
1	Header	Includes: • Source and destination address of each data packet • Serial number • Inertia value
2	Data Blocks	Each data block is terminated with an ETB character. The last data block in a packet is terminated with the ETX character.

Description of key fields in the TNPP frame *(continued)*

Callout Number	Label Name	Description
③	Destination address	Four hexadecimal digit values that represent the 16-bit numeric address assigned to the message destination. A destination address of 0 is reserved for node to node control and is not permitted for general communications.
④	Inertia	A 2-hexadecimal digit value that represents the number of paging terminals that the current packet may pass through before being removed from the network. For more information, see the "Inertia" section that follows.
⑤	Source address	Four hexadecimal digits that represent the 16-bit numeric address assigned to the message originator. You cannot use a source address of 0.
⑥	Serial number	A 2-hexadecimal digit value that is assigned to the packet before it is transmitted from one node in the network to another. For more information, see the "Serial Number" section that follows.
⑦	Block type	Block types are: • Control Blocks • Paging Blocks • Command Blocks • Data Blocks • Status Blocks For more information, see the "Block type descriptions" section that follows.

Inertia

The value of inertia is decremented at each paging terminal that retransmits the packet. If the value reaches zero, the paging terminal must discard the packet and report the error. This field is used to prevent a packet from remaining in the network forever due to routing errors.

Serial Number

The serial number is used to distinguish an original packet from a duplicate transmission. The receiver must maintain a table of at least 64 serial numbers to recognize duplicate packets. The sender of the frame assigns a unique number to each packet.

If a packet is retransmitted, the same serial number is used. A serial number of 0 is reserved for startup synchronization. If a packet is received with a serial number of 0, the receiver serial number table is cleared. At initialization, each transmitter uses a serial number of 0 in the first packet to clear the receiver serial number table. The transmitter should use an empty packet (no data block) to pass the zero serial number.

Block type descriptions

The following list describes the block types:

- Control Block — provide control information
- Paging Blocks — two types are available:
  - Send paging information that is ready for encoding
  - Send a request for generation of a page to be sent to a customer
- Command Blocks — send configuration and control commands to a destination
- Data Blocks — send generic data to a destination
- Status Blocks — report error conditions of external equipment attached to a node in a network

ASCII Control Characters

ASCII Control Characters

The following table shows the ASCII control characters.

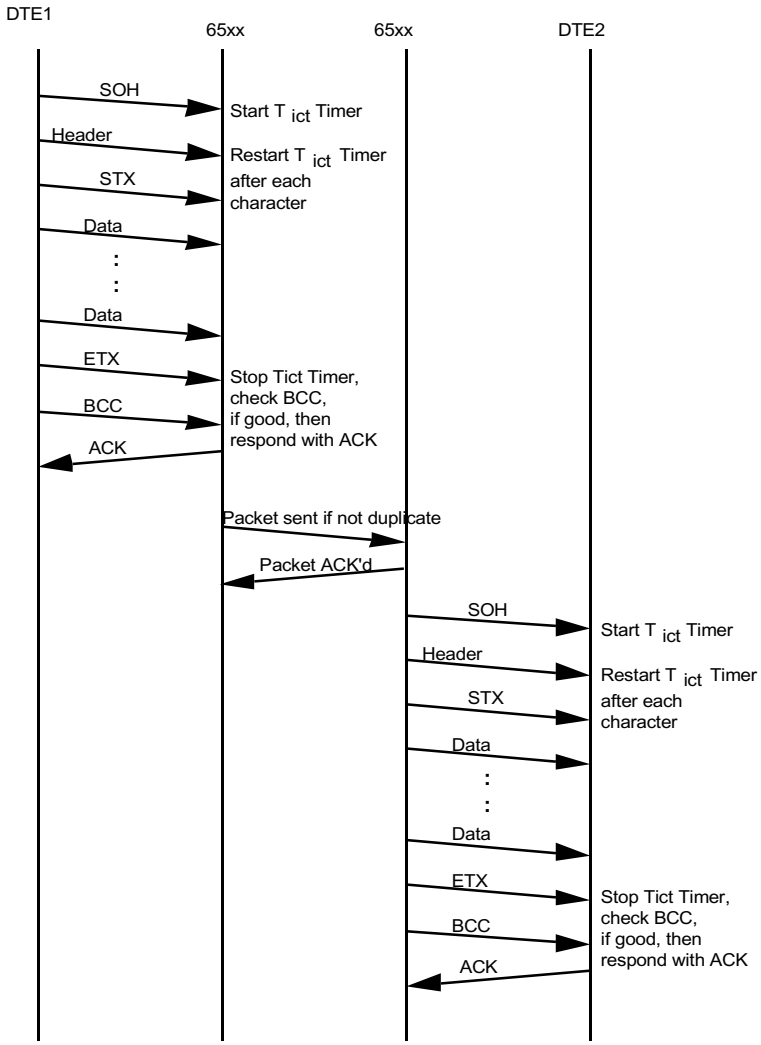
ASCII control characters

Control Character Name	*Description*	*ASCII Character*
ACK	Acknowledgment	06
CAN	Cancel	18
ENQ	Enquiry	05
EOT	End of transmission	04
ETX	End of text	03
NAK	Negative acknowledgment	15
RS	Request to Stop	1E
SOH	Start of header	01
STX	Start of text	02

Data Transfer Flow Diagram

Data Transfer Example

Figure A-2 shows data transfer flow diagram.



Data Transfer

Figure A-2. Data Transfer Flow

Error Control example

Figure A-3 shows error control.

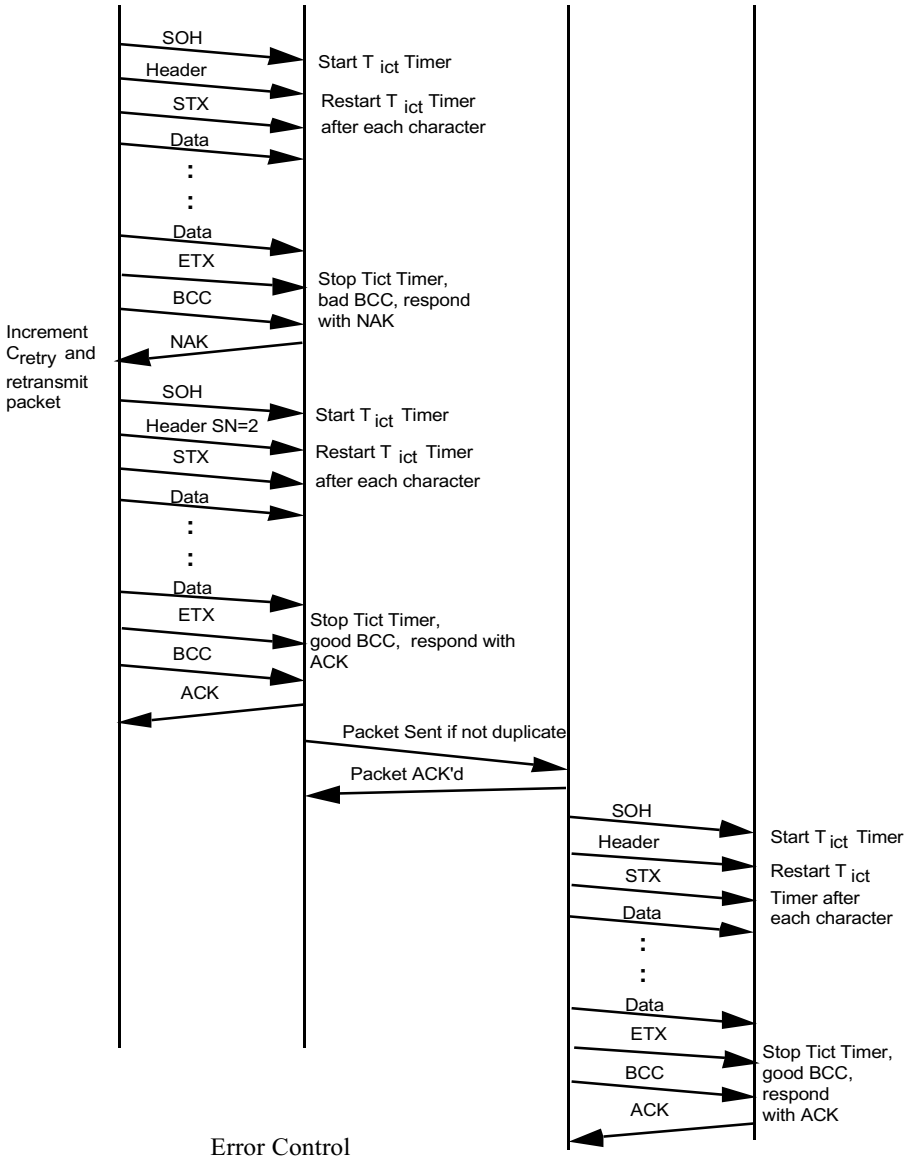
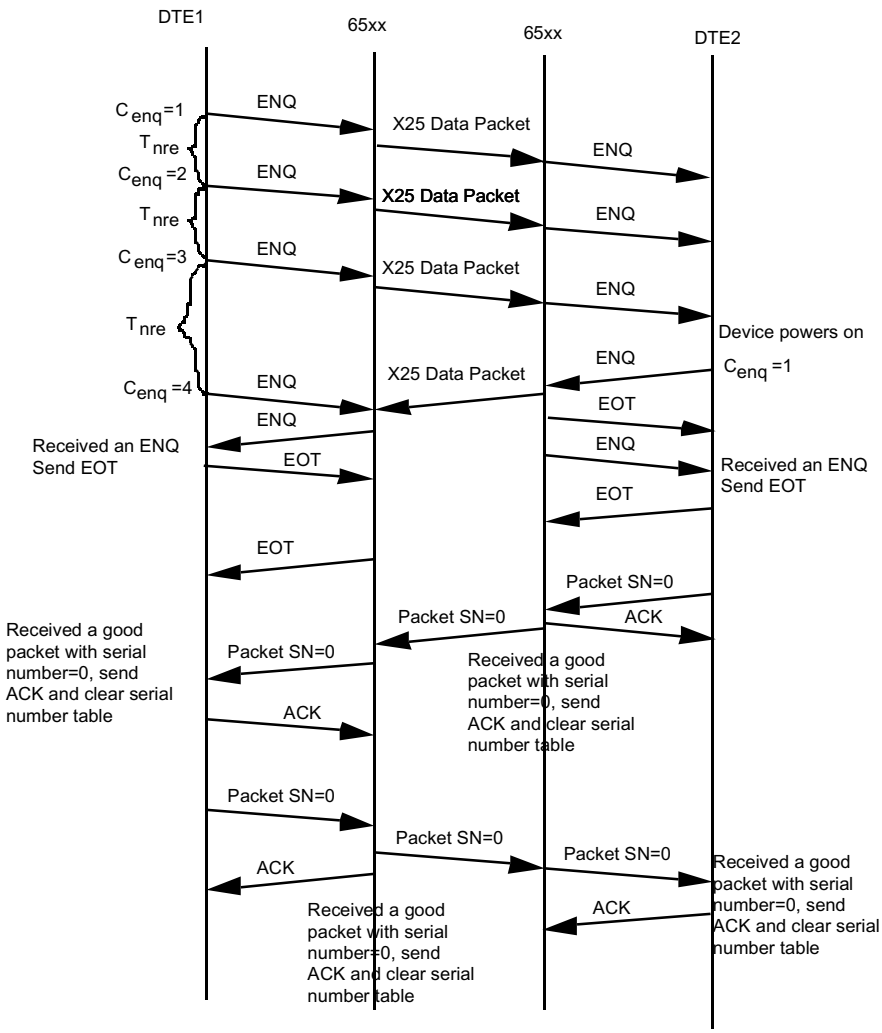


Figure A-3. Error Control Flow

Powerup or Restart example

Figure A-4 shows powerup or restart.



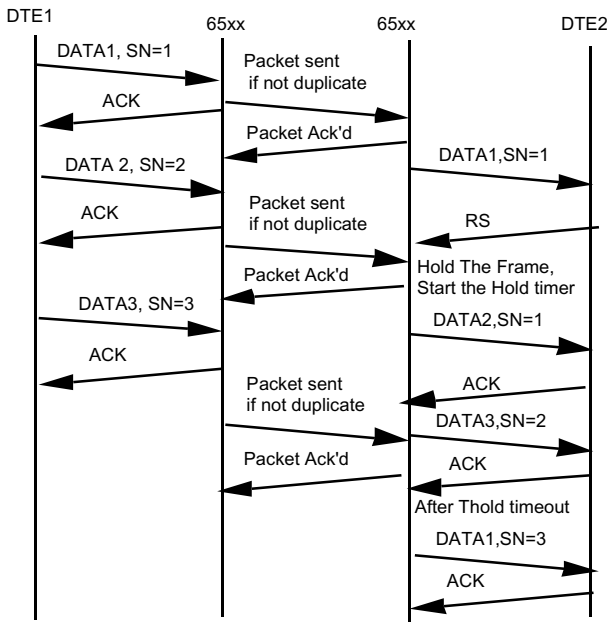
Power-Up/Restart

Note: X25 Data Packet is a Qbit Data Packet for either inquring the Remote DTE status or an indication for Remot DTE,ie REMOTE DTE UP etc

Figure A-4. Power Up/Restart Flow

Flow control with RS example

Figure A-5 shows flow control with RS.



Flow Control with RS

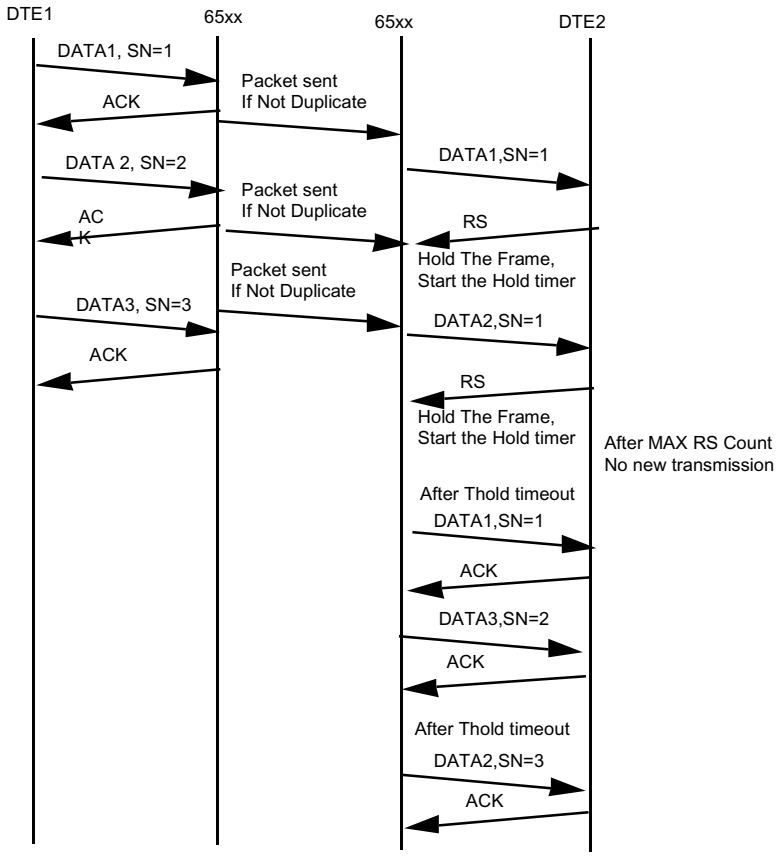
Note:

DATA1 = SOH+HEADER+Data + ETX + CRC
DATA2 = SOH+HEADER+Data + ETX + CRC

Figure A-5. Flow Control with RS

Flow control with MAX RS

Figure A-6 shows flow control with MAX RS.



Flow Control with MAX RS

Note:

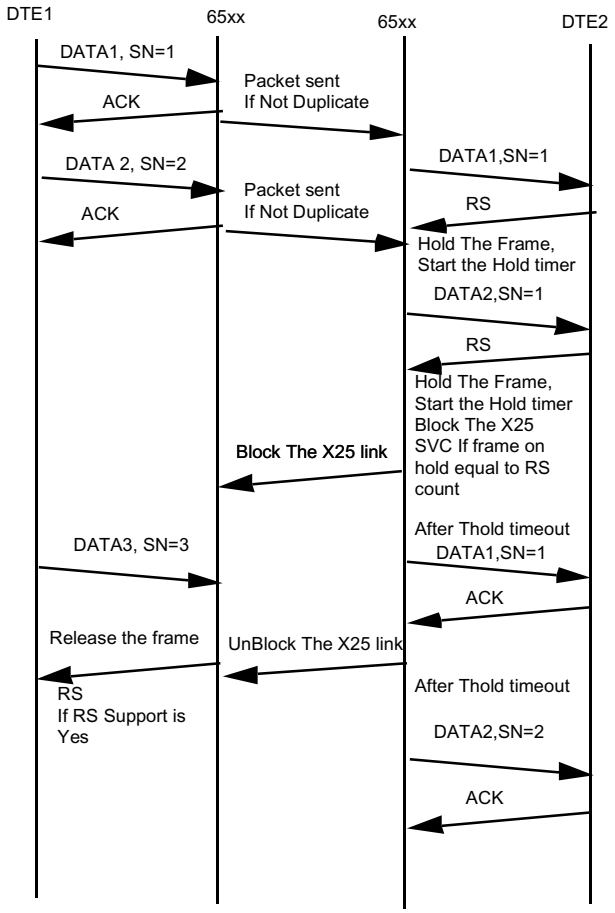
DATA1 = SOH+HEADER+Data + ETX + CRC
DATA2 = SOH+HEADER+Data + ETX + CRC
DATA3 = SOH+HEADER+Data + ETX + CRC

MAX RS = 2

Figure A-6. Flow Control with MAX RS

Flow Control with RS Count example

Figure A-7 shows flow control with RS count.



Flow Control with RS Count

Note:

DATA1 = SOH+HEADER+Data + ETX + CRC
DATA2 = SOH+HEADER+Data + ETX + CRC
DATA3 = SOH+HEADER+Data + ETX + CRC

RS Count = 2

Figure A-7. Flow Control with RS Count

Index

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