

Vanguard Managed Solutions

Vanguard Applications Ware
Serial Feature Protocols

T3POS Protocol

Notice

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Part No. T0102-08, Rev F
Publication Code: DS
First Printing: November 1998

Manual is current for Release 6.1 of Vanguard Applications Ware.

To comment on this manual, please send e-mail to LGEN031@vanguardms.com

Overview

Introduction This manual describes the T3POS feature for Vanguard products. It supplements the *Vanguard Configuration Basics Manual* (Part No. T0113) and the individual Vanguard Installation Manuals.

About This Manual This manual assumes that you are familiar with your Vanguard product, and its interface via the Control Terminal Port (CTP), as well as TCP and POS protocols. If you need additional information, please refer to your Vanguard Installation Manuals or the Feature Protocols documentation supporting your authorized software license.

About T3POS T3POS is a transaction processing protocol for POS (Point of Service) devices. T3POS PADs allow terminal equipment to communicate with ISPs (Information Service Providers) via virtual circuits supported by an X.25-based PPSN (Public Packet Switched Network).

The PAD converts character-oriented frames arriving from a POS terminal to an X.25 packet switched format.

Related Documentation If you desire additional information concerning the T3POS protocol, or related areas of technology, please refer to these documents:

- *Vanguard Configuration Basics Manual* (Part No. T0113).
- *Generic Requirements for a Packet Assembler/Disassembler Supporting T3POS* (Part No. GR-2803-CORE, Issue 1, November 1993)

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T3POS PAD Support

Introduction

T3POS is a transaction processing protocol for Point of Service devices. T3POS PADs allow terminal equipment to communicate with ISPs (Information Service Providers) via virtual circuits supported by an X.25-based PPSN (Public Packet Switched Network).

The PAD converts character-oriented frames arriving from a POS terminal to an X.25 packet switched format.

Supported Devices

T3POS supports these devices:

- POS terminals
 - Hosts conforming to the standards defined in the *Generic Requirements for a Packet Assembler/Disassembler Supporting T3POS* (Part No. GR-2803-CORE, Issue 1, November 1993)
-

Modes of Operation

Introduction

T3POS PADs operate in three modes:

- Local
 - Transparent
 - Blind
-

Local Mode

In Local mode, T3POS transmits and receives characters in accordance with IA5 (International Alphabet No. 5) asynchronously. The transmission is 7 bits with even parity or 8 bits with no parity.

Information frames from the POS are transmitted and received in General and Control frame format only in Local mode. The General and Control frame format is unrecognized in Transparent and Blind modes.

Transparent Mode

In Transparent mode, the transmission is in 8 bits with no parity. The T3POS PAD clears the call if the characters DLE and EOT are received from the POS at any time.

Blind Mode

In Blind mode, the transmission is in 8 bits with no parity. The T3POS PAD transparently passes all characters received from the POS.

Physical Line Characteristics

The T3POS PADs have the following physical line characteristics:

- Clock speeds between 300 bps and 19.2 kbps
 - Full duplex physical line
 - Data bits 7/8
 - Stop bits 1
 - Parity Even/None
-

EIA Control Signals

All 6500 Series Port connectors are wired as Data Communications Equipment (DCE). A crossover cable is required when a 6500^{PLUS} physical port is connected to a modem or another DCE-wired device.

T3POS Generated EIA Control Signals

Based on the guidelines discussed above, the T3POS PAD generates these EIA control signals:

Data Carrier Detect	DCD	Pin 8
Data Set Ready	DSR	Pin 6
Clear to Send	CTS	Pin 5

PAD Port Monitored EIA Signals

The PAD port monitors these EIA signals.

Data Terminal Ready	DTR	Pin 20
Request to Send	RTS	Pin 4

■ **Note**

Flow control between the T3POS PAD port and the modem is done using CTS.

Connection Types

These are some connection type guideline:

SIMP (Simple)

Use the SIMP connection type when terminals are connected to a port with a cable that has minimal conductors. With this type of cable, most control signals are absent because of the lack of conductors, and consequently only ground, transmit, and receive data, as well as transmit and receive blocks are provided.

Control signal information for DCEs and DTEs (Data Terminal Equipment) is listed here:

DCE	Control signals DCD, DSR, and CTS remain high.
DTE	Control signals RTS, DTR, and DRO remain high.

DIMO

Use the DIMO connection type when a crossover cable is used to connect a dial modem DCE port. During Dial In, a connection is established only after a valid handshake between the port and the modem.

■ **Note**

The T3POS PAD port supports Dial In and Simple connection from the T3POS port to the POS.

Frame Procedures

The T3POS PAD performs numerous functions on behalf of the POS terminal:

- X.25 virtual call control
- X.28 call string for called address and facilities (i.e., RPOA)
- Packet assembly and disassembly
- PAD/host control information exchange
- Timeout prevention (using SYN characters)
- Opening frame validation and processing
- LRC and parity checking
- Frame header stripping
- Host poll handling
- Data content monitoring

Link Procedure

Introduction	This section describes the T3POS link procedure, including: call setup, call clearing, and data transfer.
Call Set Up	<p>The PAD supports default options for both terminal- and host-initiated calls.</p> <p>Irrespective of the T3POS operation mode (Local, Transparent, or Blind), a transaction can be initiated by the POS, the remote ISP, or the host. For terminal-initiated calls, the default mode is Local. For host-initiated calls, the default is Blind.</p> <p>You can change the T3POS operation mode via the Mode Selection Signal (MSS). This is done using either:</p> <ul style="list-style-type: none"> • The opening frame from the POS • The contents of the call user data field of the X.25 call request packet from the host <p>The T3POS sends a T3POS-ID PAD service signal (i.e., an ENQ character) when the physical link is established between the T3POS PAD and POS terminal. This is done only if the parameter Service Signal Control = 1 and the connection is Dial In. If the T3POS PAD does not receive a valid opening frame from the Dial-In POS terminal before the FAT (Frame Arrival Timer) timer expires, the T3POS PAD disconnects the physical link.</p>
Terminal-Initiated Calls	<p>A terminal-initiated call is established when a T3POS PAD receives a valid opening frame from a POS terminal. The called address is set in the following manner:</p> <ul style="list-style-type: none"> • If the parameter Override Direct Call Address = YES, and the opening frame is in control format, the T3POS PAD uses the called address from the control field of the opening frame. • If the opening frame is in general format or the parameter Override Direct Call Address parameter = NO, the called address is taken from the Direct Call Address entered at subscription time. <p>Upon receipt of the terminal-initiated call, the T3POS PAD sends a call request packet with the called address. When the T3POS PAD receives an X.25 call accept packet from the host, it sends an ACK (acknowledgment) to the POS and enters the Data Transfer phase.</p>
Host-Initiated Calls	<p>A host-initiated call is established when the host sends a call request packet to the T3POS PAD. The T3POS PAD then sends the DLE EOT, ENQ select sequence to the POS. When the T3POS PAD receives an ACK from the POS, it sends a Call accept to the host and transmits the Mode Switch Control Frame (MSCF) and waits for an ACK in return from the POS. The T3POS PAD enters the Data Transfer phase depending on the ENQ handling parameter.</p>
T3POS PAD-Initiated Calls	<p>If the POS opening frame is in the General Frame format, the call is initiated by the T3POS PAD, with the default parameters of MSS, PID, and X.21 called address in the X.25 call request packet to the host.</p> <p>In the call establishment state, the PAD issues SYN characters to POS when the SYN timer expires and a DLE, EOT, if an error condition occurs. Once the PAD receives the Call Accept from the host, it sends an ACK back to POS.</p>

Call Clearing Phase Call clearing can be initiated by the POS terminal, the remote host system, or the T3POS PAD. The PAD initiates the call clearing procedures and generates a report in the following situations:

- Expiration of timer (i.e., DLE_EOT Timer)
- Unsuccessful virtual call setup
- Invalid MSS from the POS
- Unexpected Frame from the POS during call establishment
- Retry limit exceeded
- Loss of physical connection
- DLE EOT from POS
- Clear request from host
- Invitation to clear from host (X.29 packet)
- Invalid mnemonic or X.21 address
- Mnemonic provided could not be resolved in the node's Mnemonic table
- Facilities provided with the called address were invalid
- Frame received from the POS or the host exceeded the configured maximum frame size
- Control frame received from host

Data Transfer Phase

The T3POS PAD remains in the Data Transfer phase until the virtual call is cleared by the T3POS PAD, the host, or the POS terminal. The T3POS mode of operation cannot be changed while in the Data Transfer phase.

The T3POS PAD uses an inactivity timer to monitor excessive inactivity during the Data Transfer phase and disconnects the virtual calls when the timer expires.

Typical Application

Introduction

Figure 1 illustrates ports on the Vanguard node configured as T3POS PADs which enable the POS terminal to interact with the host or an ISP, via an X.25-based PPSN. The POS terminals can be connected to the T3POS PAD of the 6500^{PLUS} on leased or switched lines while the host and ISP are connected to the 6500^{PLUS} via an X.25-based PPSN.

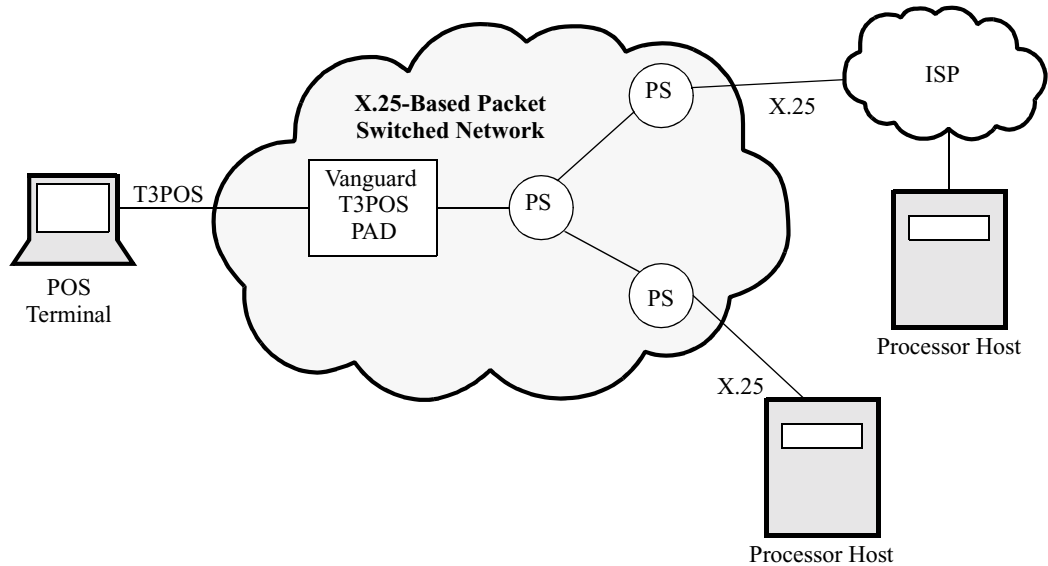


Figure 1. T3POS System Block Diagram

Configuring the T3POS PAD

T3POS Port Configuration

Figure 2 shows the location of the T3POS PAD Port Record under the Configure menu.

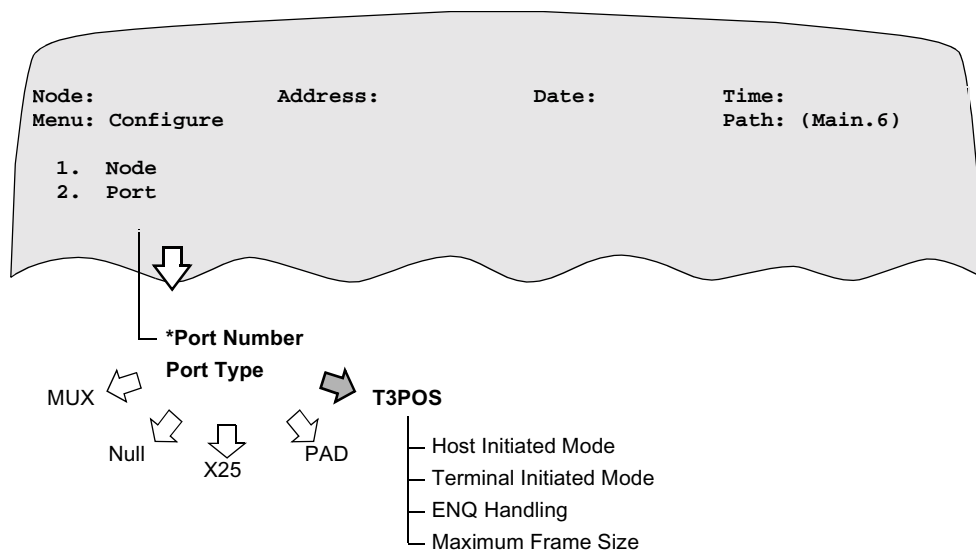


Figure 2. T3POS Port Configuration

T3POS Parameters These parameters are associated with configuring the T3POS option.

Port Number

Range:	1 to 54
Default:	1
Description:	This number corresponds to the physical port position at the rear of the unit and is the port record reference number.

Port Type

Range:	X25, PAD, MUX, T3POS, NULL
Default:	X25
Description:	This is the port type. Select T3POS.

Host Initiated Mode

Range:	Local, Transparent, Blind
Default:	Blind
Description:	Specifies the operating mode of the T3POS PAD for Host Initiated Calls.

Terminal Initiated Mode

Range:	Local, Transparent, Blind
Default:	Local
Description:	Specifies the operating mode of the T3POS PAD for Terminal Initiated Calls.

ENQ Handling

Range:	OFF, ON
Default:	OFF
Description:	<ul style="list-style-type: none"> • On: The T3POS PAD enters the data transfer state only after ENQ timeout. • Off: The T3POS PAD does not wait for ENQ timeout before entering data transfer state.

Maximum Frame Size

Range:	512 to 1024
Default:	512
Description:	Specifies the maximum frame size (in octets) transmitted and received from the POS.

T1

Range:	20 to 255
Default:	50
Description:	Specifies the Character-to-Character Timer value (in msec).

T2

Range:	1 to 10
Default:	4
Description:	Specifies the SYN-TO-SYN Timer value (in seconds).

T3

Range:	500 to 5000
Default:	1500
Description:	Specifies the ENQ Timer value (in msec).

T6

Range:	60 to 300
Default:	120
Description:	Specifies the Frame Arrival Timer value (in seconds).

Address Type

Range:	X121, Mnemonic
Default:	X121
Description:	Specifies the type of address for the Direct Call Address parameter.

Direct Call Address

Range:	NONE
Default:	NONE
Description:	Specifies the destination address used to set up a virtual circuit if the T3POS opening frame is in the general format.

Override Direct Call Address

Range:	YES, NO
Default:	YES
Description:	Specifies that the Direct Call Address not to be used if the T3POS opening frame is in the control format.

Host Notification

Range:	CUD, MSCF, NONE
Default:	NONE
Description:	Specifies how the host is informed of the MSS in case the call is terminal initiated.

ACK Generation

Range:	ON, OFF
Default:	OFF
Description:	Blind/Transparent mode setting of this parameter enables transmission of ACK to the POS on receipt of the opening frame.

PID Selection

Range:	T3POS, X.29
Default:	T3POS
Description:	This is PID for the CUD of the Call request packet.

Port Speed

Range:	300, 1200, 2400, 4800, 9600, 19200
Default:	2400
Description:	The port speed (in bps).

Data Format

Range:	7 bits, Even Parity; 8 bits, No Parity
Default:	7 bits, Even Parity
Description:	Specifies the parity in the Opening frame and Local mode.

Connection Type

Range:	SIMP, DIMO
Default:	SIMP
Description:	Specifies the type of connector between the PAD and POS.

Retry Limit

Range:	1 to 15
Default:	3
Description:	Specifies the number of retries for VC establishment and frame retransmission.

RTS/CTS Flow Control

Range:	ON, OFF
Default:	OFF
Description:	Hardware flow control is supported in Transparent/Blind modes, only if the Connection Type parameter is set to DIMO.

Service Signals Control

Range:	0, 1
Default:	0
Description:	The T3POS PAD sends the ENQ character to POS in the DIAL_IN connection Type, once the connection has been established between POS and the T3POS PAD.

Port Address

Range:	NONE
Default:	NONE
Description:	Specifies the address used in the Calling Address field of X.25 Call Request packet, if the Call Control option is set to REGO.

Call Control

Range:	REGO, NONE
Default:	NONE
Description:	Replaces the calling address of the call request packet with the configured Port Address.

Force Reverse Charging

Range:	YES, NO
Default:	NO
Description:	Specifies reverse charging for all calls.

T3POS Over TCP

Introduction

In addition to the original T3POS functionality described earlier in this manual, the T3POS protocol supports T3POS Virtual ports, as a TCP application. The T3POS Virtual port is one that is assigned a port number between 100 and 254.

TCP Interface

The T3POS Entity will be able to send/receive the T3POS frame over TCP session as shown in Figure 3.

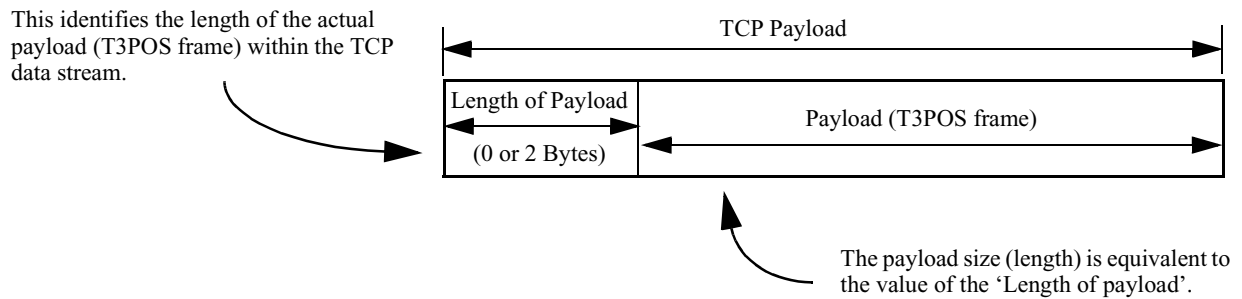


Figure 3. TCP Data Stream From/To the NT Server

A separate T3POS Entity instance, with a different TCP port number, must exist for each TCP session. This allows Vanguard devices running the T3POS protocol to listen, on its TCP port, and serve the requests from specific T3POS terminals.

Figure 4 illustrates the process flow of a typical transaction cycle.

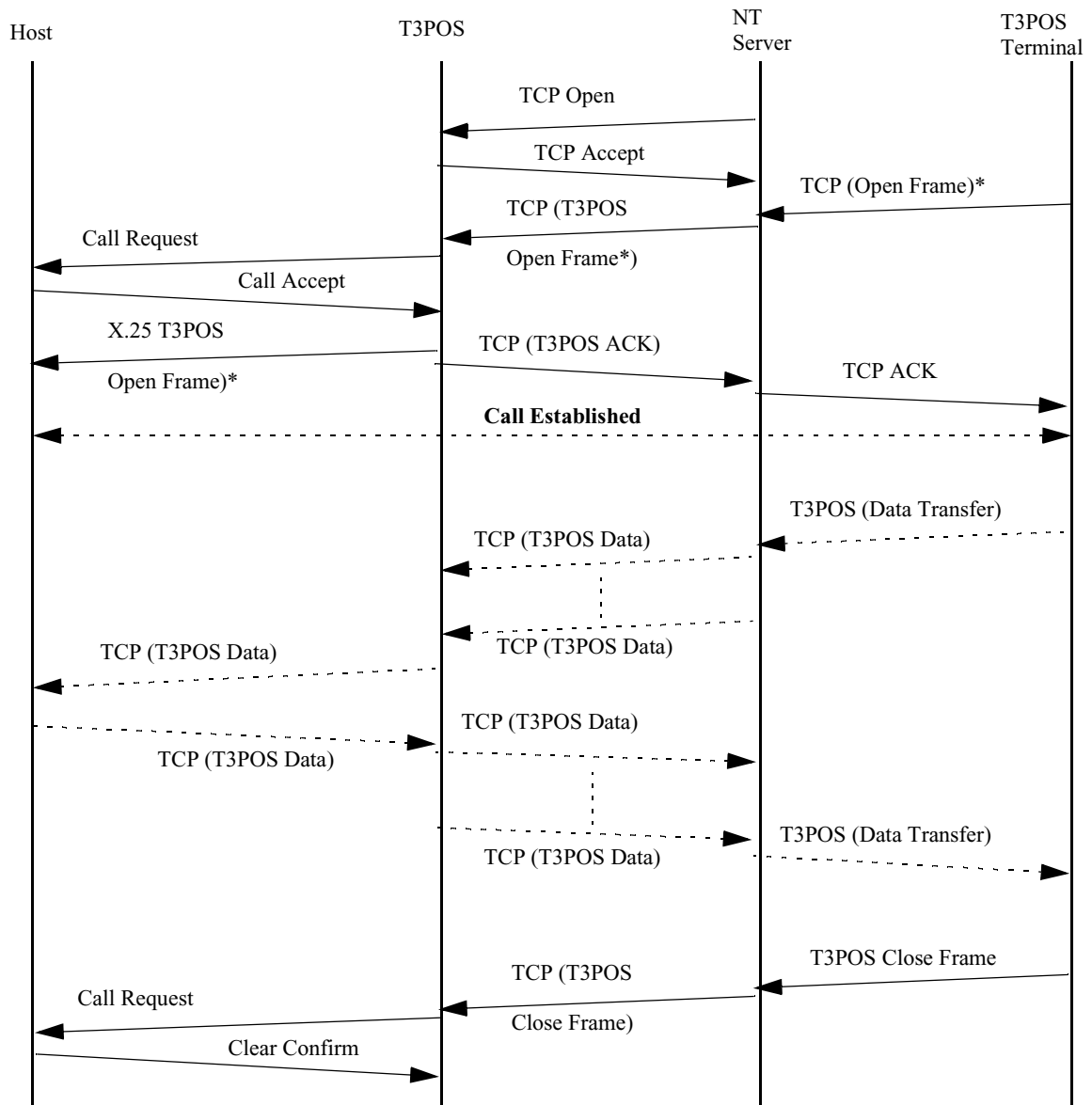


Figure 4. T3POS Over TCP Transaction Process

Note

In Opening Frames identified by an asterisk (*) may also include data.

Inserting T3POS Frames

The T3POS protocol prefixes data received from an X25 Host, with the Length field, provided that the 'Length of the Data Length Field' parameter is configured with a non-zero value. The Length field is set to the size of the T3POS frame received from the X25 Host.

Received data is written in to the TCP data stream while the TCP window is open, that is while there is space available to write. Flow control is required while sending the data through TCP. If T3POS frames are being received continuously, from the X25 Host, the T3POS Entity queues the packets to achieve flow control.

The same insertion activity takes place for the local T3POS frames (i.e., link control protocol elements) that are sent via TCP to the NT Server.

Extracting T3POS Frames

The TCP data stream prefixes the T3POS frame with the Length field, depending on what is configured in the 'Length of the Data Length field' parameter. The T3POS protocol reads the Length field (provided it is configured with a non-zero value) and reads the T3POS data frame for the length specified in the Length field. The T3POS protocol then creates an X25 packet and forwards it to the X25 Host.

When the Length field is configured as zero, the TCP data stream will include the T3POS frame without the Length field. The T3POS protocol reads 128 bytes (for a maximum period of character to character timeout) from TCP, and then creates an X25 packet with the received data. The X.25 packet is forwarded to the X25 Host according to T3POS protocol definition. This process continues while T3POS reads the TCP data stream.

Session Establishment

A TCP session, between the NT server and the Vanguard device running the T3POS protocol is always be initiated by the NT server. The X25 connection, between the Host and T3POS, is established according to the T3POS protocol definition.

Session Clear

T3POS clears the TCP session in these cases:

- Port Disable/Boot - When the T3POS port is booted or disabled via the CTP, T3POS will clear the TCP session.
- TCP Protocol Errors - When the TCP session is idle and the Keep Alive parameter is configured to ON, TCP will send Keep Alive packets to determine the state of the TCP session. If no response for 15 seconds, the TCP clears the session.

When the TCP session is cleared, T3POS re-initiates the 'Listen for the TCP Port' configured in the Port record, and the NT server will re-establish the TCP session.

Typical Application

Sample Network Topology

Figure 5, illustrates a sample network using T3POS over TCP.

An NT server initiates a TCP session with a Vanguard 320 while the T3POS terminal initiates a transaction with the Host. This is done by sending an opening frame, through the NT server to T3POS on the Vanguard 320. The T3POS frame is extracted from the TCP data stream and, after exchanging proper T3POS opening frames (between the Vanguard 320 and the T3POS Terminal), the Vanguard 320 establishes an X25 connection, over an ISDN 'D' channel, with the Credit Clearing House (Host).

Once the X25 call is established, T3POS data (including the opening frame) is forwarded to the X25 Host. The Vanguard 320 sends an acknowledgment to the T3POS terminal through NT Server.

The call can be terminated by either the T3POS Terminal (by sending a closing frame, i.e., DLE.EOT) or from the Host (by clearing the X25 call).

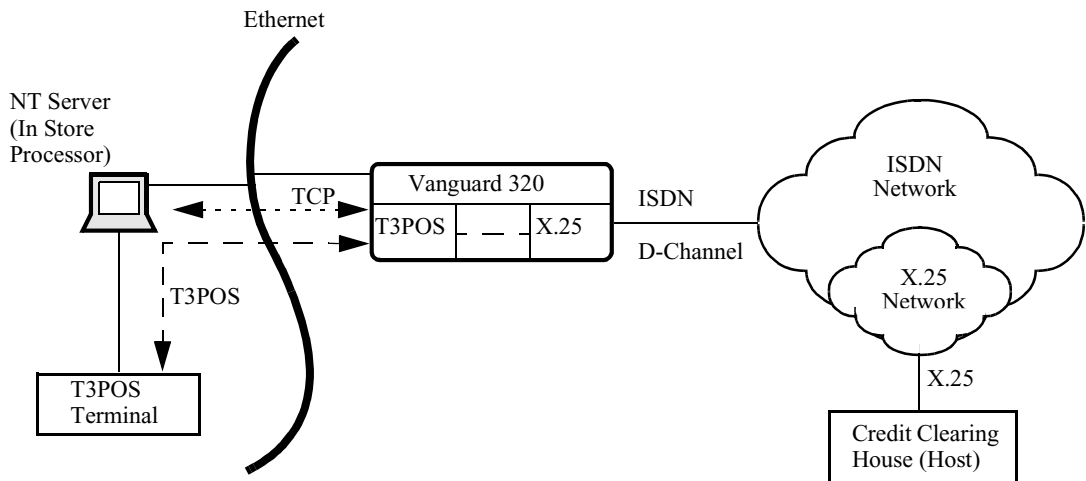


Figure 5. T3POS over TCP Application Connectivity

Configuring T3POS Over TCP

Introduction

There are three additional Port parameters that must be configured to send T3POS over TCP:

■Note

These parameters only appear if you have already configured the port as a virtual port.

■Note

After making changes to any of these parameters you must perform a Port boot for those changes to take affect.

Source Port

Range:	256 to 65535
Default:	256
Description:	Specifies the TCP port number on which T3POS watches for TCP data streams.

Length of Data Length Field

Range:	0, 2
Default:	0
Description:	Specifies the number of bytes needed to specify the data length field which is used to access data from TCP. A value of zero means no data length is given in the TCP data stream. The length should be set as per the value of MAX Frame size parameter

Keep Alive Timer

Range:	ON, OFF
Default:	ON
Description:	Specifies whether TCP Keep Alive is active. <ul style="list-style-type: none"> • ON enables the TCP Keep Alive • OFF disables the TCP Keep Alive

T3POS Statistics

Introduction

Statistics are displayed in the format shown in Figures 6 and 7.

```
Node:                Address:                Date:                Time:
Detailed T3POS Port Statistics: Port 101                Page 1 of 2

Port Number: 102     Port Type: T3POS     Port Utilization In: 0%
Port Status: Up      Port Speed: 0        Port Utilization Out: 0%
Port Mode: Local

Data Summary
          IN      OUT
Frames :    0      0          Frames/sec : 0      0

TCP Summary:
Session State      Up          TCP data bytes IN : 0
TCP Source port    256        TCP data bytes OUT : 0

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

Figure 6. T3POS Statistics - Page 1

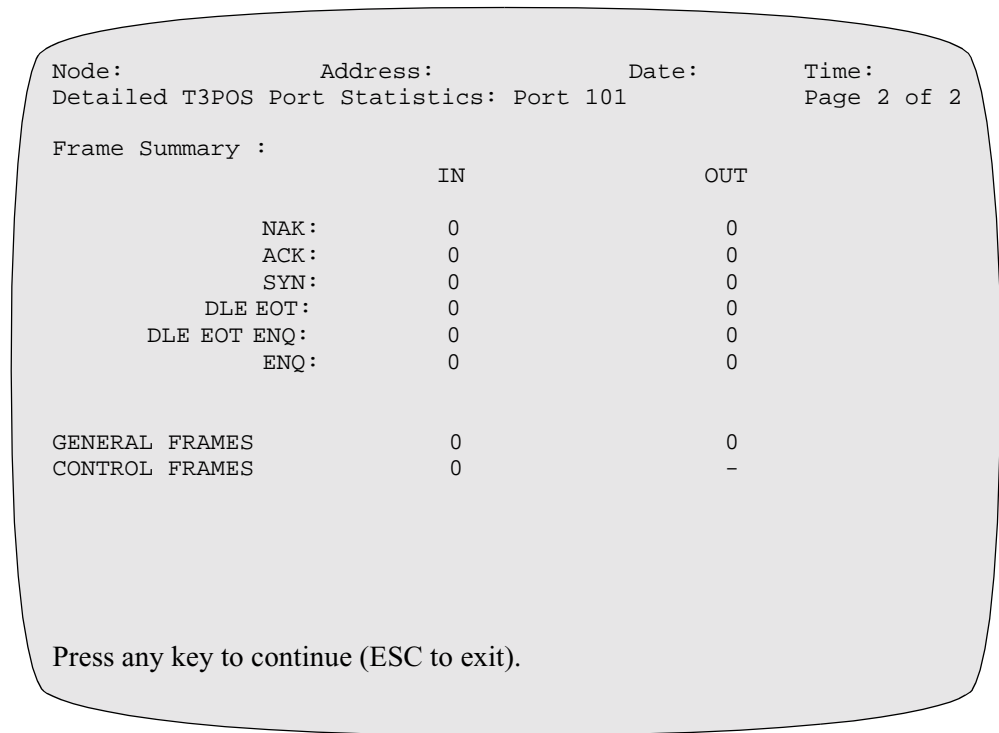


Figure 7. T3POS Statistics - Page 2

Definitions

This table defines the statistics shown in Figures 6 and 7.

Term	Definition
Port Number:	Number of the port
Port Type:	Identifies the type of port
Port Utilization IN/OUT:	Percentage of port bandwidth in use
Port Status:	Status of the port: <ul style="list-style-type: none"> • Up: Port is active. • Down: Port is inactive. • Disabled: Port has been disabled by the user.
Port Speed:	Speed of the port if Clock=Int Detected clock speed if Clock=Ext If the Port Speed is 0, and the Clock=Ext, but clocking is not being received from attached device.
Port Mode:	Identifies the mode that the T3POS port is operating in. Refer to the “Modes of Operation” section on page 3 for additional information.

Term	Definition (continued)
Data Summary	<ul style="list-style-type: none"> • Frames IN: Number of frames received by the port since the last node, port, or statistics reset. • Frames OUT: Number of frames sent by the port since the last node, port, or statistics reset. • Frames/sec IN: Summary of the frames received over the port. • Frames/sec OUT: Summary of the frames being sent over the port.
TCP Summary	<ul style="list-style-type: none"> • TCP data bytes IN: Identifies the number of data bytes received through TCP. • TCP data bytes OUT: Identifies the number of data bytes sent through TCP. • Session State: Identifies the current state of the session. • TCP Source port: Identifies the TCP Port number on which T3POS listens.
Frame Summary:	<ul style="list-style-type: none"> • NAK IN/OUT: Identifies the number of frames, containing a NAK character, received/transmitted as data. • ACK IN/OUT: Identifies the number of frames, containing a ACK character, received/transmitted as data. • SYN IN/OUT: Identifies the number of frames, containing a SYNC character, received/transmitted as data. • DLE EOT IN/OUT: Identifies the number of frames, containing a DLE EOT character, received/transmitted as data. • DLE EOT ENQ IN/OUT: Identifies the number of frames, containing a DLE EOT ENQ character, received/transmitted as data. • ENQ IN/OUT: Identifies the number of frames, containing a ENQ character, received/transmitted as data.
General Frames IN/OUT	Identifies the number of General Frames received or sent over the specified T3POS port.
Control Frames IN/OUT	Identifies the number of Control Frames received or sent over the specified T3POS port.