

Vanguard Managed Solutions

Vanguard Applications Ware
Serial Feature Protocols

Burroughs Standard Poll/Select

Notice

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Overview

Introduction

This manual describes the Burroughs Standard (BSTD) Poll/Select protocol available with Vanguard Applications Ware.

BSTD support on Vanguard Products provides access to X.25 networks for hosts and terminals in a BSTD multipoint environment. BSTD support consists of BSTD TPADs emulating FEPs and BSTD HPADs emulating terminals. The BSTD TPADs and HPADs communicate through a standard X.25 link, which is implemented in Vanguard products. Use of an EIA 232-C interface provides a physical connection between a PAD port and the attached device.

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About the BSTD PAD Protocol

Introduction

The BSTD PAD Protocol defines the set of messages and procedures that are used to maintain connections and to transfer data between the FEP and the terminals over the X.25 network.

TPAD and HPAD Support

TPAD supports Specific Poll, Group Poll, Select, and Contention Mode (which can be enabled or disabled). HPAD supports Specific Poll, Group Poll, Select, Fast Select, and Contention Mode. See the “Operation and Administration” section on page 22 for more information about these procedures.

Typical Application Figure 1 is an example of a network with the BSTD protocol.

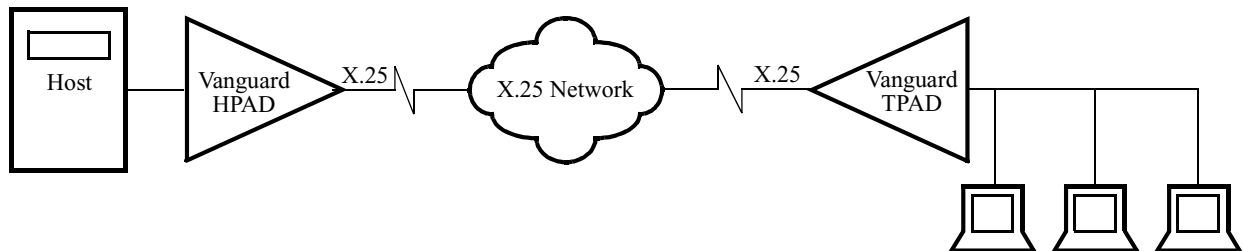


Figure 1. Example of HPAD and TPAD Connected Using an X.25 Network

How It Works

The BSTD PAD port allows the BSTD terminals to be connected to the FEP using a packet-switched network. Without a packet-switched network, the terminals are directly connected to the Host FEP using multi-dropped modem links.

HPAD

The HPAD port connected to the FEP emulates the BSTD terminals, by:

- Responding locally to polling and selection from the FEP.
- Forwarding data messages from or to remote terminals using the packet-switched network.

TPAD

The TPAD port emulates the host FEP by polling and selecting terminals and by forwarding data messages from or to the terminals connected to the port. A single node may have multiple BSTD PAD ports configured.

The BSTD PAD Protocol performs the end-to-end data transfer between the BSTD HPAD port and a BSTD TPAD port. For each active BSTD terminal, a Switched Virtual Circuit (SVC) is established between the HPAD and TPAD to provide a network connection. You can configure either the TPAD or the HPAD as the call originator, but not both at the same time.

-
- Feature Limitations** Current limitations of the BSTD Poll/Select HPAD and TPAD are:
- The total number of stations configured per node is 256.
 - If a node is configured with a combination of BSC 3270, NCR BSC, IBM 2260, and BSTD, the total number of devices/stations configured for these protocols cannot exceed 256.
 - When a PAD port is booted and a station is configured with a specific address that matches any group address configured on that port, that station is inhibited and a report is generated.
 - Broadcast Select and Group Select procedures are not supported.
 - RVI (Reverse Interrupt) is not supported.
 - Transmission number formats supported are Modulo 2, or no transmission numbering.

Hardware Flow Control To handle hardware flow control with character-oriented protocols on an EIA232 port, the port must have an external clocking source to control data transmission flow. BSTD does not have the hardware flow control auto-enable feature that is required by character-oriented protocols.

-
- Supported Hardware** The BSTD HPAD supports the following hardware:
- UNISYS CP-2000 Communications Processors (CPs) with UNISYS Interactive Communication Processors (ICPs) for host interface
 - UNISYS Network Support Processors (NSPs)
- The BSTD TPAD supports most BSTD terminals, specifically:
- UNISYS B28 File Server with workstations
 - UNISYS MT795 banking terminals
 - UNISYS T27 CRT terminals (successor to ET-1100 and TD830)
-

Port Record

Introduction

The BSTD Port Record provides information about the BSTD PAD port. To define a BSTD port, refer to Figure 2 and these instructions:

Step	Action
1	Select Configure from the Main menu.
2	Select Port from the Configure menu.
3	Enter the number of the port you want to configure at the prompt. For Port Type, enter BSTD .

BSTD Port

Figure 2 shows the BSTD menu.

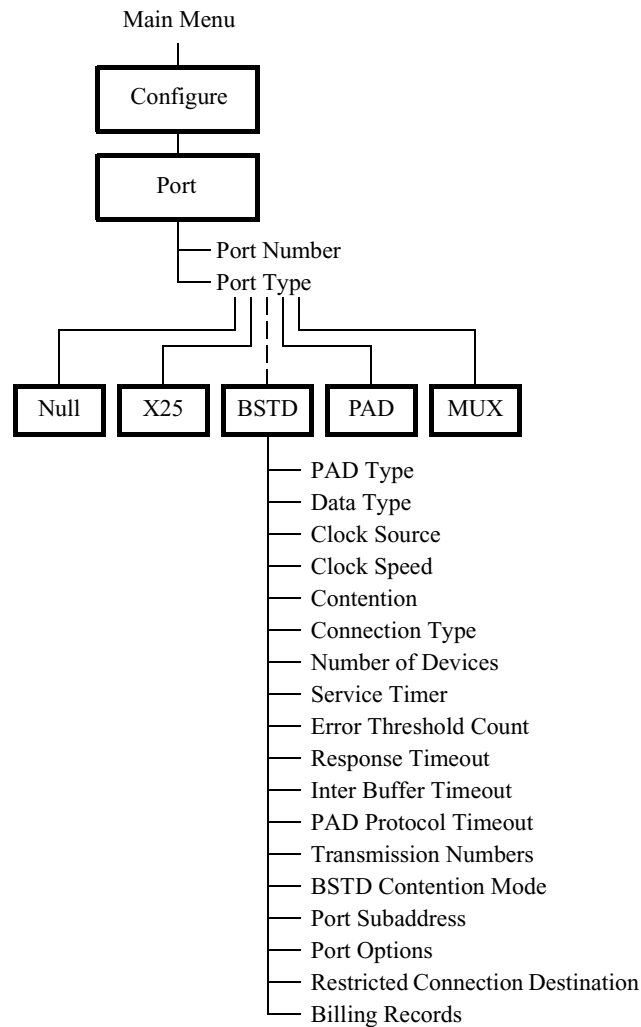


Figure 2. Configuring the Port

Port Parameters

Introduction

The BSTD Port parameters are described in the order in which they appear on the screen. When you configure a port for BSTD operation, the Port Configuration parameters differ from those used to configure any of the other port types.

Parameters

These tables describe the BSTD parameters.

Port Number

Range:	1 to 54
Default:	1
Description	Specifies the number of the BSTD port you are configuring. This number corresponds to the physical port position at the rear of the unit and is the Port Record reference number.

*Port Type

Range:	NULL, PAD, MUX, X.25, BSTD
Default:	PAD
Description	Specifies the port type. For this software option, enter BSTD. ■ Note You must perform a Node boot for changes to this parameter to take effect.

*PAD Type

Range:	TPAD, HPAD
Default:	TPAD
Description	Specifies the two choices of PAD type: HPAD and TPAD. <ul style="list-style-type: none"> • The HPAD, or Host PAD, is connected to the BSTD host. The TPAD, or Terminal PAD, is connected to the BSTD terminals. • The HPAD emulates the terminals and responds to polls from the host. A device on the HPAD does not respond to a poll until a call is established with a remote TPAD. ■ Note You must perform a Node boot for changes to this parameter to take effect.

***Data Type**

Range:	SYNC, ASYNC
Default:	SYNC
Description:	<p>Specifies the data line interface to be used:</p> <ul style="list-style-type: none"> • SYNC: Synchronous operation • ASYNC: Asynchronous operation <p>■ Note Half duplex transmission is supported for both SYNC and ASYNC operation.</p> <p>■ Note You must perform a Node boot for changes to this parameter to take effect.</p>

Clock Source

Range:	INT, EXT
Default:	INT
Description:	<p>Determines whether the device sets the synchronization (INT) interval or whether it takes the synchronization from another device (EXT). Select the appropriate clock source:</p> <ul style="list-style-type: none"> • INT: Internal clock source. The port supplies the receive and transmit clocks. • EXT: External clock source. The port receives clocks on pins 18 and 24. (Required for hardware flow control.)

Clock Speed

Range:	1200 to 19200
Default:	4800
Description:	<p>Specifies the clock speed in bps when Clock Type = INT (Internal).</p> <ul style="list-style-type: none"> • If Internal clocking is used, you must determine the speed of the port. The range is from 1200 to 19200 bits per second. • If External clocking is used, the speed of the port is determined by the modem.

Contention

Range:	HDX, FDX
Default:	FDX
Description:	<p>The Contention parameter controls the operation of EIA signals. It is applicable to synchronous operation only.</p> <ul style="list-style-type: none"> • HDX: CTS follows RTS, and the BSTD port raises DCD while transmitting. • FDX: CTS follows RTS, and the BSTD port raises DCD while the port is enabled. <p>■ Note This parameter only appears if the Data Form = SYNC.</p>

EIA Control

Range:	NONE, HDX, DCD
Default:	NONE
Description:	<p>Specifies the EIA Control signal handshake required for a connection to be made to this port.</p> <ul style="list-style-type: none"> • NONE: No EIA control signal handshake occurs for a connection to this port. • HDX: EIA control signals for half duplex are required. • DCD: Toggle the DCD when this port sends data. <p>■ Note This parameter only appears if the Data Type parameter is set to SYNC.</p>

Connection Type

Range:	SIMP, SIMPa
Default:	SIMPa
Description:	<p>Specifies the control signal handshakes required for a connection to be made to this port.</p> <ul style="list-style-type: none"> • SIMP: Simple, no control signals are required. • SIMPa: CTS follows RTS, but no control signals are required. <p>■ Note This parameter is only applicable to asynchronous operation and only appears if the Data Type parameter is set to SYNC.</p>

***Number of Devices**

Range:	1 to 128
Default:	1
Description:	<p>Specifies the number of BSTD stations on this BSTD line. You must also configure each of these stations once you are finished configuring the port.</p> <p>■ Note A change to this parameter requires a node boot in order for the changes to take effect.</p>

Service Timer

Range:	10 to 60 (seconds)
Default:	30
Description:	<p>Specifies the time interval in seconds between periodic servicing, for example, the frequency of attempts to establish connections for active stations that are disconnected.</p>

Error Threshold Count

Range:	1 to 255
Default:	3
Description:	<p>Indicates the number of consecutive line protocol error conditions before a terminal is considered nonoperational.</p>

Response Timeout

Range:	50 to 5000 milliseconds
Default:	1000
Description:	<p>Specifies the amount of time (in milliseconds) that the PAD allows a terminal, printer, or host to respond.</p> <ul style="list-style-type: none"> • The TPAD may retransmit the previous message or abort the current procedure. • The HPAD aborts the current procedure as though EOT was received. This allows the HPAD station to disconnect it's X.25 circuit if the host malfunctions. An HPAD with a response timeout shorter than the hosts ability to respond may result in "Inbound Errors".

Inter Buffer Timeout

Range:	1 to 60 (seconds)
Default:	60
Description:	Specifies the maximum amount of time in seconds that the PAD port waits for the end of a multi-packet message from the network. If this time limit is exceeded, the PAD aborts the message and initiates clearing of the circuit.

PAD Protocol Timeout

Range:	1 to 60 (seconds)
Default:	60
Description:	Specifies the maximum amount of time in seconds that the PAD port waits for the end of a multi-packet message from the network. If this time limit is exceeded, the PAD aborts the message and initiates clearing of the circuit.

Transmission Numbers

Range:	Disable, Modulo2, ModuloAuto
Default:	Disable
Description:	Specifies the transmission numbering scheme: <ul style="list-style-type: none"> • Disable: Disable transmission numbers. • Modulo2: Modulo2 transmission numbering is a scheme that uses ASCII “0” and “1” characters to synchronize BSTD text messages. • ModuloAuto: Modulo transmission numbering uses ASCII “0”, “1”, “2”, and “3” to synchronize BSTD text messages.

BSTD Contention Mode

Range:	Enable, Disable
Default:	Disable
Description:	Enables BSTD Contention. <ul style="list-style-type: none"> • Enable: Enable TPAD to use Contention mode. • Disable: Disable TPAD from using Contention mode.

Port Subaddress

Range:	0 to 3 decimal digits
Default:	XX, where XX is the number of the port that you are configuring.
Description:	Calls addressed to this node and with this subaddress are routed to this port. The space bar may be used to blank this field.

Port Options

Range:	NONE, ORG, ACK, FSL
Default:	NONE
Description:	<p>Specifies the port options.</p> <ul style="list-style-type: none"> • NONE: No Port options are specified. • ORG: Stations configured on this port originate calls when they enter their active state. • ACK: All data messages sent from this port to the remote PAD port require end-to-end acknowledgment messages. • FSL: The TPAD must send messages to this port using the Fast Select Procedure. This option applies only to a port which is a HPAD. <p>■ Note You can sum the four options using the plus sign. (For example, two options are summed with this syntax: ORG+ACK).</p>

Restricted Connection Destination

Range:	0 to 32 (alphanumeric characters)
Default:	(blank)
Description:	Specifies the destination for all calls originating from this port irrespective of the route selection table entries.

Billing Records

Range:	ON, OFF
Default:	OFF
Description:	<p>Enables Billing Record generation.</p> <ul style="list-style-type: none"> • ON: Billing for this BSTD port is enabled. • OFF: Billing is disabled.

Station Record

Introduction

To define a BSTD Station, refer to Figure 3 and these instructions:

Step	Action
1	Select Configure from the Main menu.
2	Select BSTD Station from the Configure menu.
3	At the prompt, enter the station number of the port you want to configure.

BSTD Station Menu Figure 3 shows the BSTD Station menu.

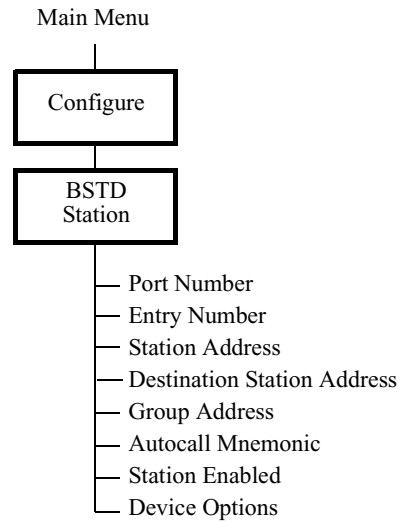


Figure 3. Configuring Stations

Station Parameters

Parameters

Descriptions of the parameters that make up the BSTD Station Record are listed below.

Port Range

Range:	1 to 5 and 100 to 254
Default:	1
Description:	Specifies the physical port number of the BSTD port to which this station belongs. The specified port must be configured as a BSTD HPAD/TPAD port.

Entry Number

Range:	1 to XX where XX represents the number of stations configured for the port, as determined when configuring the specified port.
Default:	1
Description:	<p>Specifies the entry number that is used to reference this record. Every station must be configured individually.</p> <p>■ Note The range allowed corresponds to the number of BSTD stations configured for this port. The maximum number of stations is 32, but you are only permitted to configure the number of stations as specified in the Port Configuration.</p>

Station Address (Hexadecimal)

Range:	(ADDR1): 20 to 7F (ADDR2): 20 to 7F
Default:	(ADDR1): 20 (ADDR2): 20
Description:	Specifies the poll address of the station. Addresses 1 and 2 combine to form two hexadecimal digits.

Destination Station Address

Range:	(ADDR1): 20 to 7F (ADDR2): 20 to 7F
Default:	(ADDR1): 20 (ADDR2): 20
Description:	Specifies the poll address of the remote station to which this station will connect. Addresses 1 and 2 combine to form two hexadecimal digits.

Group Address

Range:	(ADDR1): 20 to 7F (ADDR2): 20 to 7F
Default:	(ADDR1): 20 (ADDR2): 20
Description:	Specifies the Station's Group address. The combination of AD1 and AD2 address must be different from any other group or station address.

Autocall Mnemonic

Range:	0 to 8 (alphanumeric characters)
Default:	(blank)
Description:	Specifies the mnemonic name is used if this port is configured for originating connection requests. For information about the Mnemonic Table, refer to the <i>Vanguard Configuration Basics Manual</i> (T0113).

Station Enabled

Range:	YES, NO
Default:	YES
Description:	Disables/enables a station.

Device Options

Range:	NONE, TGRP
Default:	NONE
Description:	<p>Enables group polling for the specified device.</p> <ul style="list-style-type: none">• NONE - Specifies that the polling group is disabled.• TGRP - Specifies that TPAD will group poll this device. <p>When you select TGRP, TPAD Group Poll is enabled and the parameters Group Address (ADDR1) and Group Address (ADDR2) defines the device's poll group.</p> <p>Any combination of the above is specified by summing (for example, TGRP+...).</p> <p>■ Note TPAD Group Poll and Contention mode cannot be simultaneously enabled. If Contention is enabled, TPAD Group Poll is automatically disabled.</p>

Node Record

Introduction

You must configure one additional parameter in the Node Record. This parameter is identified in the table below:

*Quantity of DSP Devices

Range:	1 to 1024
Default:	<ul style="list-style-type: none"> • Vanguard 65xx and 64xx: 32 • Vanguard 100: 16 • Vanguard 200: 256 • Vanguard 300/305/320/34x: 32
Description:	<p>Specifies the maximum configured number of DSP type devices on this node. Set this value as close to the actual number of devices configured in the node, since each device allocated consumes a data buffer whether or not the node has an associated device.</p> <p>■ Note You must perform a Node boot for changes to this parameter to take effect.</p>

Pipelining of PAD-to-PAD Data

Introduction

The data pipelining feature is a method of reducing data packet delivery delay from link to link in an X.25 network.

What Is It?

Link-to-link transmission delay is a more significant contributor to total end-to-end system delay than, for example, queueing and polling delay, so reducing link-to-link transmission times has a more marked effect than reducing other forms of delay.

How It Works

The pipelining algorithm comes into play when a text message must cross two or more links to reach its destination. The algorithm makes use of concurrent-delivery efficiency by dividing the message into n packets for transmission. Rather than sending one at a time through the data “pipe,” and waiting for packet n to arrive at the next link before sending packet $n + 1$, pipelining “stuffs” packets $n + 1$, $n + 2$, and so on, into the pipe without waiting for notification of n ’s arrival.

This action, repeated at every intervening link from host to destination, efficiently transmits packets simultaneously and results in faster delivery.

Configuring PAD-to-PAD Pipelining

Introduction

This section describes the critical parameters needed to use pipelining.

Recommended Settings

In most configurations, a port's Transmit Character Delay parameter should be set to zero. Receive Character Delay should be set as follows:

<i>BSTD Link Speed (bps)</i>	<i>Receive Character Delay Setting</i>
1200	32
2400	32
4800	64
9600	128
19200	256

Sample Application Figure 4 shows a sample pipe lining application.

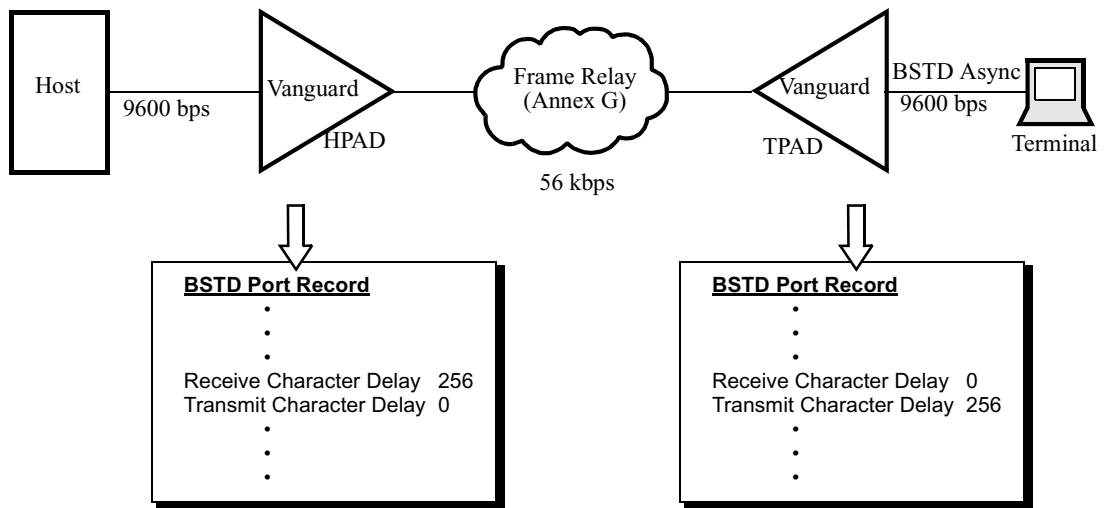


Figure 4. Pipelined Data Communications Application Example

Limitations

Since pipelining is a proprietary enhancement to Display System Protocol (DSP), it is not compatible with other DSP implementations.

Configuration Procedure

This table explains how to configure for data pipe lining; refer to Figure 4. All parameter settings for your network will vary.

Step	Action	Result/Description
1	Select Port from the Configure menu.	The Port Type prompt appears.
2	Select BSTD . Then configure these parameters: <ul style="list-style-type: none"> • Receive Character Delay — 256 • Transmit Character Delay — 0 	The BSTD Port record appears. <ul style="list-style-type: none"> • For messages received from the host or terminal, specifies message-segment size to forward to the network. • For messages received from the network, specifies delay to introduce before forwarding the first message-segment to the host or terminal. Subsequent segments are forwarded without delay. 0: disables pipelined operation.
3	Repeat Steps 1 and 2 for each node on your network.*	

Note

*You must set HPAD and TPAD pipelining parameters to the same values.

Segmentation Control Field in X.25 Data Packets

Data pipe lining inserts a new field, Segmentation Control, in X.25 data packets that it forwards to the network; pipe lining strips this field from packets received of the network. Figure 5 shows the X.25 packet format.

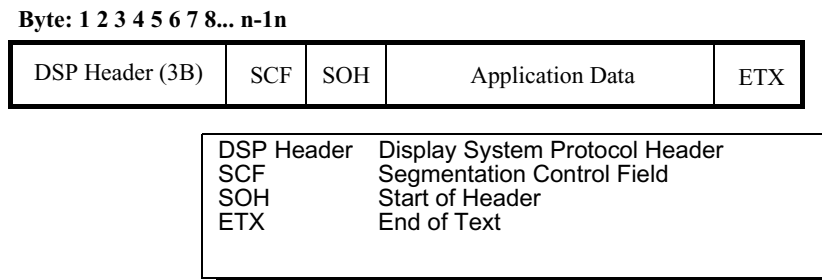
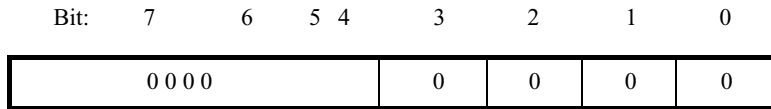


Figure 5. X.25 Data Packet Format With Segmentation Control Field

Segmentation Control Field Bits

The Segmentation Control field enables the reconstruction of pipelined frame segments at the remote PAD. It includes first-segment, last-segment, and frame-termination condition indication bits, as shown in Figure 6.

The Segmentation Control field has a proprietary format based on CCITT V.120.



Segmentation Control Field Bits			
Position	Type	Value	Meaning
4, 5, 6 and 7	-	-	(Reserved)
2 and 3	Error Control	00	No error detected
		01	(Reserved for future use)
		10	Error detected
		11	(Reserved for future use)
0 and 1	Segment Identification	00	Interior segment
		01	Packet final segment
		10	Packet initial segment
		11	Packet is single segment

Figure 6. Segmentation Control Field Bits

Alarms, Events, Reports, and Statistics

The pipe lining feature does not generate alarms, events, reports, or statistics.

Tuning a BSTD Configuration

Introduction

In order to better understand how to tune a BSTD configuration, first read the “Operation and Administration” section on page 22 to learn more about BSTD protocol.

Non-Operational Polling Stations

To minimize the TPAD from polling stations that are nonoperational:

Step	Action
1	Configure the TPAD’s port options to originator.
2	Disable BSTD contention mode.
3	Maximize the TPAD’s service timer (for example, set the service timer to 60 seconds).

This results in the TPAD polling one nonoperational station per service timer and improves throughput for BSTD ports with several stations configured, but with only a few stations operational.

■ Note

When the TPAD is booted, it polls each station once at the normal polling rate then proceeds to poll operational stations at the normal rate and “slow poll” nonoperational stations.

Establishing Connection Time

To minimize the time required to establish a connection for all stations on a BSTD port, do either of the following:

- Configure the HPAD as originator and minimize the HPAD’s service timer. The HPAD originates a call when accessed by the host, provided it has been at least the duration of the service timer since the last access. The rate of calls originated from the HPAD is increased as the host uses group poll and contention messages:
 - When the host does a group poll, all stations in the group will attempt to make a call.
 - When the host uses a contention message, all stations on the port will attempt to make a call.
- Configure the TPAD’s port option to originator and enable BSTD contention mode. The TPAD polls all enabled stations once per service timer, allowing all stations on the port to establish a connection in approximately the duration of the service timer.

■ **Note**

When the TPAD receives an incoming call, it polls the terminal to determine if it is operational. If few of the terminals are operational, and the rate of originating calls is maximized, the TPAD spends a significant amount of time polling stations that are nonoperational.

For a TPAD port where several stations are configured, but for one poll cycle there are few stations with text ready to transmit, the link utilization improves with TPAD Contention mode enabled.

Operation and Administration

Introduction

This section describes station status, error recovery, and other protocol procedures of TPAD and HPAD. Refer to your Burroughs documentation for more information about Burroughs Standard procedures.

BSTD Protocol Line Characteristics

The BSTD Line protocol is half-duplex. EIA 232-C half-duplex transmission is used for passing data. The BSTD Poll/Select protocol uses ASCII control characters for Data Link Control.

■Note

For asynchronous operation when used in place of a modem, the PAD is usually configured for Internal Clocking (DCE) and is connected directly to the user device (for example, terminal or FEP) with a serial cable. When the user device is at a remote location, the PAD port is configured for External Clocking (DTE) and is connected to a modem with a crossover cable. We do not recommend the use of any other connection configurations.

BSTD Procedures

This table indicates the procedures supported by the BSTD option.

<i>Procedure</i>	<i>TPAD</i>	<i>HPAD</i>
Specific Poll	S	S
Group Poll	S	S
Select	S	S
Fast Select	NS	S
Contention Mode	S	S
Broadcast Select	NS	NS
Group Select	NS	NS

■Note

S = Supported, NS = Not Supported

When FEP delivers text to the HPAD using Fast Select, the TPAD uses the Select procedure to deliver this same text to the terminals.

**BSTD Protocol
Message Formats**

This table describes the BSTD characters and hexadecimal values used to build BSTD messages.

Name	Hex Value	Description
ACK	06	Acknowledgment
AD1	20 – 7F	First character of station address
AD2	20 – 7F	Second character of station address
BCC	XX	Block Check Character
CON	07	Contention character
ENQ	05	Enquiry
EOT	04	End of Transmission
ETX	03	End of Text
FSL	73	Fast Select
NAK	15	Negative Acknowledgment
NUL	00	Zero
POL	70	Poll
SEL	71	Select
SOH	01	Start of Header
STX	02	Start of Text
XM	XX	Transmission number

BSTD Messages

These messages do not include the SYN characters used for synchronous operation.

POLL

EOT	AD1	AD2	POL	ENQ
-----	-----	-----	-----	-----

SELECT

EOT	AD1	AD2	SEL	ENQ
-----	-----	-----	-----	-----

Contention Message

EOT	NUL	NUL	CON
-----	-----	-----	-----

Contention Response

AD1	AD2	POL	ENQ
-----	-----	-----	-----

Text Message

SOH	AD1	AD2	XM	STX	...DATA...	ETX	BCC
-----	-----	-----	----	-----	------------	-----	-----

Fast SELECT

EOT	AD1	AD2	FSL	SOH	AD1	AD2	STX	...DATA...	ETX	BCC
-----	-----	-----	-----	-----	-----	-----	-----	------------	-----	-----

■ **Note**

XM is present only if the Transmission Numbering parameter is enabled.

TPAD

Station Status

The TPAD port continuously polls all configured stations that are enabled. Upon responding to a poll from the TPAD, the terminal is considered operational and the station is ready to establish its network connection. Only when a station does not respond to a poll, does the TPAD consider this station as nonoperational.

■ Note

The TPAD does not accept any data from the terminal until the terminal's network connection is established.

Polling Algorithm

The TPAD's polling scheme allows all terminals equal access to the line, but sets a higher priority for delivering text messages to the terminals. Therefore, whenever text messages are ready for transmission to a terminal, selection procedures are done before polling. Each operational station has its own network connection (an X.25 Switched Virtual Circuit). When a terminal's network connection is not established it is "slow polled," using the rate determined by the service timer. Once a network connection is established, the terminal is polled at the normal rate.

Group Poll

This feature, which is available for both synchronous and asynchronous operations, allows group polling for up to 90 devices. Each device can be a member of only one group (though each device does not need to be a member of a poll group). There is no set limit to the number of poll groups on one line. With Group Poll operation, BSTD TPAD maintains contact with all devices on the line, so that if a device is removed, it is detected within five minutes.

The TPAD Group Poll procedure allows a device to respond with a text message using an address which is not configured in a BSTD station record. If the text message is structurally correct, the TPAD will respond with an ACK and drop the text message, otherwise the TPAD responds with NAK. This capability is unique to TPAD Group Poll. None of the other TPAD procedures and none of the HPAD procedures acknowledge a text message from an unconfigured device.

Contention Mode

When the TPAD Contention mode of operation is enabled, the TPAD Polling cycle is:

- 1) Poll once all stations that are enabled and not flow controlled by X.25.
- 2) Send the Contention message and remain in Contention mode for the duration of the service timer. When the Contention cycle has exceeded the service timer, repeat (1).

During the Contention Cycle

When a terminal has a text message to send, it sends a contention response message to request service from the TPAD. The TPAD normally polls the terminal immediately. Once the poll procedure is completed, the TPAD sends the contention message to resume the contention cycle. The TPAD will not poll a terminal that responded with a contention response message if:

- This address is not configured for this port.
- The terminal does not have its SVC established.
- The TPAD station is disabled.
- The SVC window is closed (unable to accept more text messages).

A TPAD ignoring a contention response issues a contention message immediately to resume the contention cycle.

During the Poll Cycle or Contention Cycle

When a TPAD is configured as non-originator and an incoming call arrives, the TPAD polls the terminal to determine its status. If the contention cycle is in progress, the TPAD sends a contention message to resume the contention cycle, once the POLL procedure is completed.

When a text message arrives from the remote HPAD, the TPAD Selects the terminal to deliver the text message. If the contention cycle is in progress, the TPAD sends a contention message to resume the contention cycle, once the SELECT procedure is completed.

■ **Note**

Contention mode can be enabled or disabled only for the TPAD. Contention mode is a parameter of BSTD port configuration. It only appears when you select the value SYNC (to enable synchronous operation) in the Data Form parameter.

Error Recovery

The TPAD verifies these attributes of a BSTD message:

- The response timeout that detects the absence of terminals.
- BCC for corrupted text messages.
- Message length is within the maximum size allowed.
- Format errors (i.e., Fast Select, which consists of two address pairs that should always be identical).

During a BSTD procedure the TPAD tolerates any combination of the above errors up to the number specified by the Error Threshold Count parameter. Once the Error Threshold count is met, the procedure is terminated.

HPAD

Station Status

Once an HPAD station is accessed by the host, it is considered operational. The HPAD station is detected as nonoperational, however, if the station is not accessed by the host for the duration specified by the configured service timer. Access to the station includes:

- Poll
- Group Poll
- Select
- Fast Select
- Contention message

■Note

The HPAD does not respond to the host's Polls or Selects until the station's network connection is established.

Contention Mode

The HPAD enters Contention mode when the host transmits the contention message and ends Contention mode when the host transmits EOT.

During Contention mode, the HPAD sends contention responses to indicate that it has data ready for transmission to the host. A contention response may be sent immediately after the host's contention message, and at the rate of 1 per second while the host does not respond to contention responses. Each contention response message contains the station address of the station that has data available. If more than one station has data available, the HPAD uses a scheme that allows each station equal opportunity to send contention response messages.

Error Recovery

Response Timeout is used by the HPAD to avoid a line lock-up in the event a host becomes nonoperational during a BSTD procedure. If the HPAD's Response Timeout interval expires, the HPAD defaults the line to IDLE state. The service timer can detect the inactivity only of a station that is not currently accessing the line (IDLE state), hence the above recovery procedure.

■Note

There is no limit to the number of retransmissions by the HPAD.

Transmission Numbers

Transmission numbering allows detection and discarding of duplicate messages. The Modulo 2 option supports a numbering scheme using the ASCII characters "0" and "1" for synchronization. The ModuloAuto option supports using ASCII characters "0", "1", "2" and "3" for synchronization. Transmission numbering is enabled from the port configuration.

Network Connection

Each station communicates with its remote station via an X.25 Switched Virtual Circuit. Each station within a BSTD port operates independently from the others. Therefore, one SVC is used for each pair of connected stations. Only one of the two stations for a given pair can be configured as Call Originator. A station can originate a call once it is detected by the originating PAD (for example, TPAD or HPAD) as operational. Conversely, once a TPAD or HPAD station is detected as nonoperational, the Call is cleared.

Station Addressing

Station Address	You must configure each station on a BSTD port with a unique Station Address. The TPAD uses this address when it is polling and selecting a terminal. The HPAD also uses this address to recognize Polls and Selects emanating from the FEP to an HPAD station. Do not configure a port with two or more stations having the same Station Address. Upon a node boot, all but the first station are inhibited and a report (for example, BSTD - XX - STATION INHIBITED - YY,ZZ) is generated for each station that has a conflicting address.
Destination Station Address	Used by the remote station, the Destination Station Address allows a pair of connected stations to each use a different Station Address. The PADs (HPAD or TPAD) rely on the Destination Station Address to translate local and remote addresses. A PAD port (TPAD or HPAD) does not verify that the Destination Station Address is unique, because this check would be redundant to the remote port validating its Station Address.
Group Address	Stations configured on a BSTD port are also identified using a Group Address. This address is used to support group polling from the FEP and allows the FEP to address a number of stations with a single message. Grouping stations is achieved by configuring the desired stations to use the same Group Address. If a port is configured with a Station Address which has already been used as a Group Address, all stations with this conflicting address will generate a report upon a node boot (for example, BSTD - XX - STATION INHIBITED - YY,ZZ).

Statistics

Introduction

This section describes statistics used with BSTD. Other statistics are described in the *Vanguard Basic Configuration Manual* (T0113). You can use the information appearing in Figure 7 to monitor the operation of a BSTD port.

Detailed Port Statistics

Detailed Port Statistics provide status reports about various operations of a BSTD port. To view the Detailed BSTD Port Statistics:

Step	Action
1	Select Status/Statistics from the Main menu.
2	Select Detailed Port Statistics from the Status/Statistics menu.
3	At the prompt, enter the number of the selected port.

BSTD Port Statistics

The information displayed is similar to that shown in Figures 7 and 8.

```

Node:                Address:                Date:                Time:
Detailed BSTD Port Statistics: Port 2                Page: 1 of 3

Port Number: 2                Port Type: BSTD TPAD                Port Status: Up
Port Speed: 4810                Port State: IDLE                Port Utilization: 0 %

Transmission Numbers: Disabled                Data Type: SYNC

Physical:
Parity Errors : 0                Overrun Errors : 0
BCC Errors : 0

Data Summary:
                IN                OUT                IN                OUT
Characters: 0                0                Characters/sec: 0                0
Messages: 0                0                Messages/sec: 0                0
Interface Summary: EIA-232-D DCE                INPUT                OUTPUT
                DTR RTS MB P14                DSR DCD RI CTS
State: Connected (SIMPLE)                L L L L                H H L L

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

Figure 7. Detailed BSTD Port Statistics - Page 1

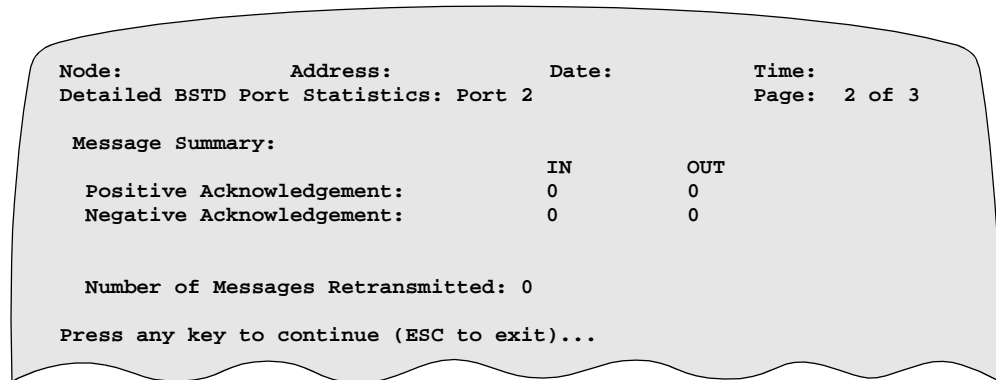


Figure 8. Detailed BSTD Port Statistics - Page 2

Description of Terms

This table describes the terms used in the Detailed BSTD Port Statistics screen.

Port Statistics	Description
Port Number	Specifies a particular port in the node.
Port Type	Indicates the type of port.
Port Status	Specifies the current port status. <ul style="list-style-type: none"> • Up: Port is operational. • Down: Port is not operational. • Disabled: Port is disabled and not operational. For information on disabling the port, refer to the <i>Vanguard Basic Configuration Manual</i> (Part Number T0113)

Port Statistics	Description (continued)
Port State	<p>These messages indicate the port state:</p> <ul style="list-style-type: none"> • IDLE: No line activity • W4EOT: Wait for EOT character • W4DR2D: Waiting for device layer's response to data received • W4DAP: Wait for Data after polling • HW4R2D: HPAD Waiting for Response to Data • TW4R2D:TPAD Waiting for Response to Data • HW4DAA: HPAD Waiting for Data after ACK • TW4DAA: TPAD Waiting for Data After ACK • W4AAS: Wait for ACK after Select • W4SOM: Wait for Start Of Message • HW4EOM: HPAD Wait for End Of Message • W4FEOM: Wait for Fast Select's End Of Message • W4FAAS: Wait for ACK from device layer after Fast Select • TW4EOM: TPAD Wait for End Of Message • W4R2N: Wait for Response to NAK • W4R2P: Wait for Response to Poll • W4R2S: Wait for Response to Select • H_CONT: HPAD's Contention mode • T_CONT: TPAD's Contention mode
Port Speed	Message transmission speed in bits per second.
Port Utilization	Indicates the amount of bandwidth in use, expressed as a percentage of the total bandwidth available on this port.

Port Statistics	Description (continued)
Transmission Numbers	<ul style="list-style-type: none"> • Disabled: Transmission numbers disabled. • Modulo2: Modulo2 transmission numbering is used.
Physical	<ul style="list-style-type: none"> • BCC Errors: Number of errors detected by Block Check Character since last node boot or reset of statistics.
Data Summary	<ul style="list-style-type: none"> • Characters: Number of characters received or transmitted since last boot or statistics reset. • Messages: Number of messages received or transmitted since last boot or statistics reset. • Characters/sec: The average number of characters received or transmitted per second. • Messages/sec: The average number of messages received or transmitted per second.
EIA Status	Summarizes the state of EIA (electrical) interface.
Message Summary	<ul style="list-style-type: none"> • Positive Acknowledgment: Number of ACKs received or transmitted since last boot or statistics reset. • Negative Acknowledgment: Number of NAKs received or transmitted since last boot or statistics reset. Excessive NAKs normally indicate problem with the communication equipment (modem or line drivers between the port and the device), or the clocking is incorrect.
Number of Messages Retransmitted	Indicates the number of messages that were retransmitted due to NAKs or response time-outs.
Parity Errors	Number of characters with an incorrect parity bit.
Overrun Error	Number of times the PAD was unable to process the incoming BSTD frames.
Framing Errors	Applicable for asynchronous operation only; number of times a character was not framed properly with 1 start and 1 stop bit.

Alarms and Reports

Refer to the *Vanguard Applications Ware Alarms and Reports Manual* (Part Number T0005) for the BSTD alarms.

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