Vanguard Managed Solutions

Vanguard Applications Ware
Serial Feature Protocols

NCR BSC Protocol

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NCR Binary Synchronous Communications Protocol

Overview

Introduction

This manual describes the NCR Binary Synchronous Communications (NCR BSC) option for Vanguard products. Refer to the *Vanguard Basic Configuration Manual* (Part Number T0113) for additional configuration information.

Alarms

For information about alarms, refer to *Vanguard Applications Ware Alarms and Reports Manual* (Part Number T0005).

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About the NCR Binary Synchronous Communications Option

Introduction

This manual describes the NCR BSC protocol option for Vanguard products

Custom Software Key

You must enable the appropriate Custom Software Key (CSK). Once you enter the CSK, all of the protocol features and options are available in the menus.

Refer to the *Vanguard Basic Configuration Manual* (Part Number T0113) and the Installation Manual for your Vanguard for additional information.

Features

The NCR BSC option provides these capabilities:

- Proprietary end-to-end protocol
- Synchronous communication
- Multipoint, poll/select
- Full conversational mode
- Half-duplex and full-duplex support
- ASCII character set

NCR BSC PAD End-to-End Protocol

End-to-end data transfer between an NCR BSC HPAD port and an NCR BSC TPAD port is performed by the NCR BSC PAD End-to-End Protocol. This is a proprietary protocol designed specifically for this application.

The main tasks of the PAD End-to-End Protocol are to:

- Maintain the connections between devices connected to two NCR BSC PADs.
- Monitor the exchange of data messages.

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. NCR BSC does not have the hardware flow control auto-enable feature that is required by character-oriented protocols.

Devices Supported

The NCR BSC protocol supports the following NCR devices:

- 9150 front-end processor (FEP)
- 2155 Point of Sale (POS) controller

The protocol supported for these devices is the C751-600 NCR Interactive Terminal Concentrator protocol. This protocol operates on these devices in a multidrop configuration.

Network Example

Introduction

This section describes a typical network example which includes:

- NCR BSC Point-of-Sale (POS) operation.
- POS controller devices that connect to the port.

Typical Application

Figure 1 shows an NCR BSC configuration that uses a single Front-End Processor (FEP) with a collocated HPAD. Two TPADs at remote locations connect to the HPAD by an X.25 network.

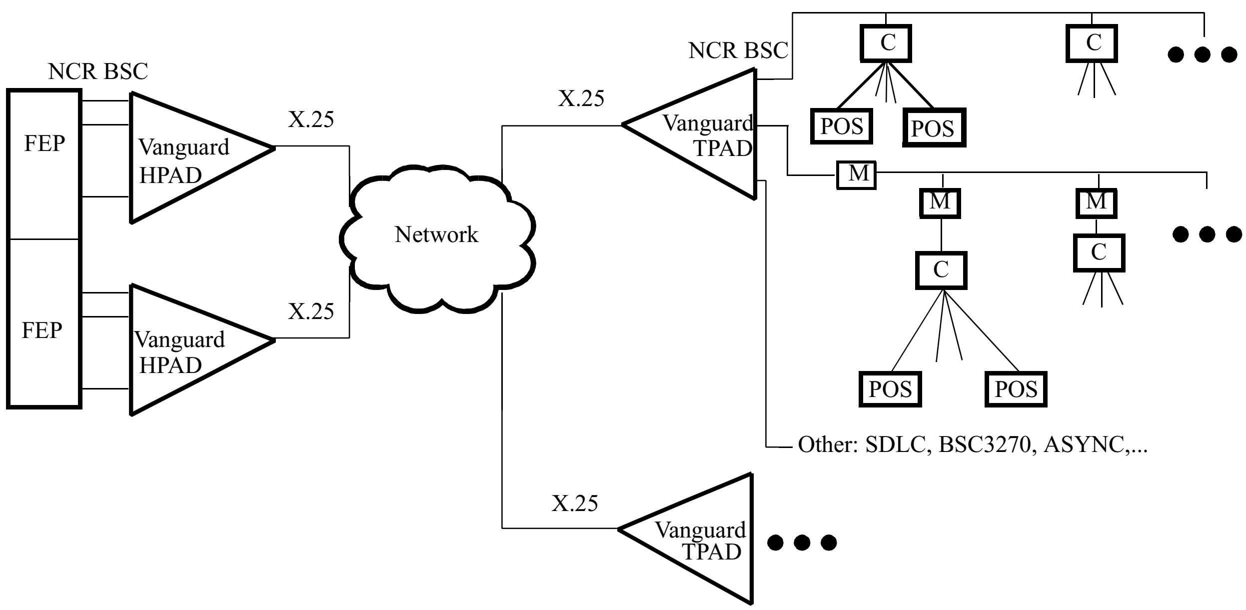

Figure 1. Typical NCR BSC Point-of-Sale Configuration

Network Description

Devices marked with a **C,** in Figure 1, are either standalone Point-of-Sale controller devices or they may have other non-NCR BSC devices (for example, the NCR 2154) attached to them. A number of these controller devices may be connected in a multi-dropped configuration to a single TPAD port.

HPAD

The term Host PAD (HPAD), connected to the FEP, refers to the NCR BSC POS protocol-related processes inside the Vanguard device. The HPAD interfaces the host device (FEP) to the rest of the network. Similarly, the term Terminal PAD (TPAD), connected to all of the controller devices, refers to the NCR BISYNC POS protocol-related processes inside the Vanguard device. The TPAD acts as an interface between the POS controller devices and the rest of the network.

The NCR BSC PAD Port lets you connect the POS devices to the FEP through an X.25 packet-switched network. The POS controller devices connect to an NCR BSC TPAD Port, while the FEP connects to one or more NCR BSC HPAD Ports.

An HPAD port connected to an FEP emulates NCR POS devices by:

- Responding locally to polling and selecting.
- Receiving data messages from and forwarding data messages to remote devices.

TPAD

A TPAD port emulates the host FEP by:

- Polling and selecting data messages to and from the POS devices connected to the ports.
- Forwarding data messages to and from the POS devices connected to the ports.

Call parameters are configured for each controller by using mnemonics that are entered into the PAD mnemonic table. NUI information, if required, may be specified in the mnemonic parameters.

The maximum number of controller devices that can be supported on a single NCR BSC port is 32. The maximum combined number of NCR BSC and (if any) BSC3270 devices that can be supported on a node is 256.

NCR 2155 Point of Sale Controller

The NCR 2155 Point of Sale (POS) controller operates in either Data Collect or Interactive mode.

- Data Collect Mode: When operating in Data Collect mode, the 2155 sends Data Collect messages continuously, while being polled by the device, until all messages in the buffer have been sent. While in the Data Collect mode, the 2155 controller does not receive any data messages from the host.
- Interactive Mode: When operating in Interactive mode, the 2155 generates interactive or inquiry data messages based on the activity of attached devices (normally cash registers). A device only waits for a response from the host for a limited amount of time (8 seconds for interactive messages and 16 seconds for inquiry messages).

Node Configuration

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:	• Vanguard 65xx and 64xx: 32 • Vanguard 100: 16 • Vanguard 200: 256 • Vanguard 300/305/320/34x: 32
Description:	Specifies the maximum configured number of SES 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. ■ **Note** You must perform a Node boot for changes to this parameter to take effect.

Port Configuration

Introduction

To configure for NCR BSC operation, you must configure the desired port to connect to NCR BSC devices.

Accessing the Port Record

To configure the port:

Step	***Action***
1	Select **Configure** from the Main menu.
2	Select **Port** from the Configure menu.

Port Parameters

These are the NCR Port parameters:

Port Number

Range:	1 to 48
Default:	1
Description:	Specifies the port that to be configured as an NCR BSC port. This number corresponds to the physical port position at the rear of the unit and is the Port Record reference number. When you configure an NCR BSC controller (after the configuration of the port is completed), the appropriate port number must be entered in order to reference this particular port configuration.

Port Type

Options:	NULL, PAD, MUX, X25, NCRBSC
Default:	X.25
Description:	Specifies the port type. Enter NCRBSC to configure this port for NCR Binary Synchronous operation.
Boot Type	A change to this parameter requires a node boot in order for the changes to take effect.

PAD Type

Options:	TPAD, HPAD
Default:	HPAD
Description:	Specifies the PAD Type: • HPAD: Host PAD refers to the NCR BSC POS process inside the device. • TPAD: Terminal PAD refers to the NCR BISYNC POS process inside the device.

Clock Source

Options:	INT, EXT
Default:	EXT
Description:	Specifies the clock source: • EXT: Select EXT (External) ff the NCR BSC port is connected directly to a modem (via a designated crossover cable), or other Data Communications Equipment (DCE). This allows the NCR BSC port to transmit only if Pin 14 of the EIA 232-D interface is at an active or high state. Pin 14 is cross connected to the Clear-to-Send (CTS) output from the modem. This ensures that the port starts to transmit only if the modem is ready, which is particularly important if using half-duplex modems. (Required for hardware flow control.) • INT: Select INT (internal) if the NCR BSC port is connected to a cluster controller or terminal (Data Terminal Equipment). (A DTE does not normally provide any kind of clocking.) Pin 14 has no effect. The attached device is assumed to be ready to receive as soon as the line is turned around (after sending EOT sequence).

Clock Speed

Range:	1200 to 19200
Default:	4800
Description:	Specifies clock speed in bits per second. When the parameter Clock Source is set to INT (internal), you must determine the speed of the port. When the parameter Clock source is set to EXT (external), the clock speed is determined by the modem.

Contention

Range:	FDX, HDX
Default:	FDX
Description:	Specifies the type of contention: • FDX: Full Duplex, specifies that the port can transmit data in either direction simultaneously. The device automatically sets CTS to follow the RTS setting of the device. • HDX: Half Duplex, specifies that the port can send or receive data at any time. ■ **Note** The NCR BSC protocol is half duplex and data is sent to the port or the terminal in one direction at a time regardless of the port configuration. When using modems with full-duplex capabilities, you should utilize the increased speed of full-duplex operation. Data transmission between the modems occurs at a far greater speed when the ports are configured for full duplex. If you are using half-duplex modems, set the contention parameter to half duplex.

Number of Controllers

Range:	1 to 32
Default:	1
Description:	The actual number of physical devices on this line. ■ **Note** You must configure each of the devices (as many as 32) after you have configured the port.
Boot Type	A change to this parameter requires a node boot for the changes to take effect.

Service Timer

Range:	5 to 60
Default:	30
Description:	Specifies the time (in seconds) between servicing. Servicing includes: • Intervals between the time the PAD attempts to re-poll devices that have failed to respond. • Intervals between attempts to establish a connection from a port configured to Originate calls. The TPAD keeps track of the consecutive number of times that a device fails to respond to polls. If the number of failures exceeds the configured Error Threshold Count, the device is considered down and is put onto a slow poll list. Devices that are put on the slow poll list are polled less frequently so they do not tie up the line. The Service Timer specifies the time between polling of devices that are on the slow poll list. A device remains on the slow poll list until it responds to a poll, at which time it returns to normal operation.

Error Threshold Count

Range:	1 to 255
Default:	5
Description:	Specifies the number of consecutive errors that can occur before a device is considered down. Errors include the failure to respond to polling from the host.

Retransmission Timeout

Range:	1 to 255
Default:	5
Description:	Specifies the time (in tenths of a second) that a device waits before sending a poll to a device that has been declared down. Polls are sent until the Error Threshold Count is reached after which polls are sent according to the value of the Service Timer parameter. The minimum value depends on the speed of the port: • 1200bps - 12 (1.2s) • 2400bps - 6 (0.6s) • 4800bps - 3 (0.3s) • 9600bps - 2 (0.2s) • 19200bps - 2 (0.2s)

Inter Buffer Timeout

Range:	1 to 255
Default:	15
Description:	The PAD Protocol Timeout specifies the maximum amount of time in seconds that the PAD port waits to receive the subsequent portions of a user data-block that spans more than one X.25 packet. If this timeout is exceeded (i.e., due to network congestion), the PAD initiates the clearing of the call.

Port Options

Range:	NONE, ORG, ACK
Default:	NONE
Description:	Specifies the frame transmission options for the port: • NONE: None of the port options effect the operation of this port. • ORG: This port originates 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 (ACK) messages.

Port Subaddress

Range:	0 to 3 (decimal digits)
Default:	The number of the port that you are currently configuring.
Description:	Calls addressed to this node and with this subaddress are routed to this port. The space bar blanks this field.

Restricted Connection

Range:	0 to 32 alphanumeric characters (the space bar may be used to blank this field)
Default:	(blank)
Description:	When using the Route Selection Table, this parameter allows you to specify an alternative destination. All calls that originate from this port are routed according to what you enter here. For example, to route calls to Port 1, enter **P1**. To route calls to Port 2, Station 4, enter **P2S4**. If you do not wish to use this function, disable it by pressing the space bar to blank the field.

Billing Records

Range:	ON, OFF
Default:	OFF
Description:	Determines if billing records are generated for this port.

Controller Configuration

Introduction

Once you have configured a port for NCR BSC operation, you must configure the controller devices that you want to connect to the port.

Accessing the Port Record

To configure the port:

Step	Action
1	Select **Configure** from the Main menu.
2	Select **NCR Device Table** from the Configure menu.

Application

Figure 2 shows how POS controllers on different TPADs connect to the same HPAD port. To do this, you need to assign the appropriate destination Control Unit Address (CUA) to the desired POS controller.

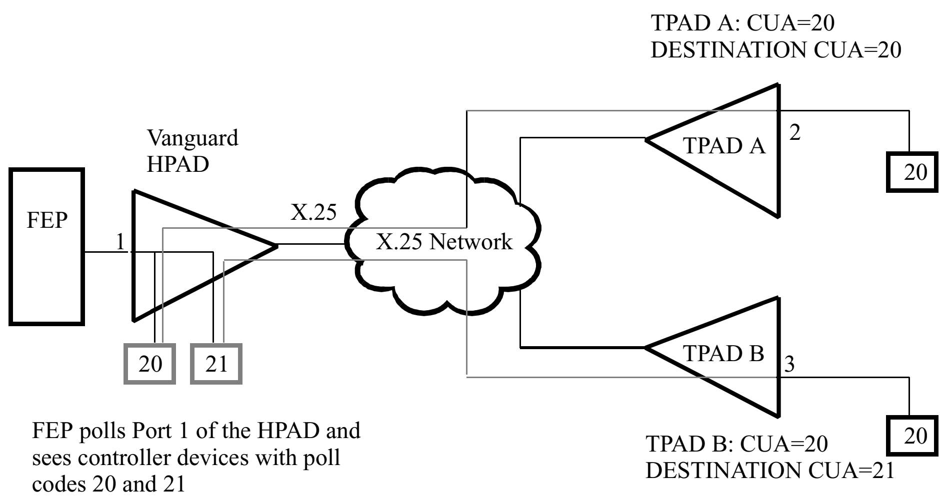

Figure 2. POS Controllers in a Multidrop Network

Controller Parameters

These tables describe the controller parameters in the NCR Device Table.

Port Number

Range:	1 to 48
Default:	1
Description	Each NCR BSC controller device must be connected or associated with a specific port that has been configured for NCR BSC operation. The Port Number refers to the physical port position on the back panel of the unit and is also the reference number for the Port Record. The Port Record contains all of the specific parameters that govern the operation of the port and any devices connected to that port.

Control Unit Address

Range:	20 to 2F, 40 to 4F, 60 to 6F (hex)
Default:	20
Description	Identifies the device being configured, This acts as the Device Record reference number. You can only configure the number of devices determined during port configuration. You do not have to configure the devices in consecutive order, but you may only enter a number that is within the given range.

Destination Control Unit Address

Range:	20 to 2F, 40 to 4F, 60 to 6F
Default:	20
Description	The Destination Control Unit Address parameter is significant only if the port is configured as an originator. This parameter is the poll code of the remote control unit to which the designated control unit connects.

Call Mnemonic

Range:	0 to 8 alphanumeric characters (space bar may be used to blank the field)
Default:	(blank)
Description	If the device is configured for AUTO or FAST Call Control, you need to determine the mnemonic name so that the device connects directly to the desired destination.

Device Enabled

Range:	YES, NO
Default:	YES
Description	YES: enables a device NO: disables a device

NCR BSC End-to-End Protocol Operation

Introduction

The NCR BSC PAD End-to-End Protocol defines the set of messages and procedures used to maintain connections and transfer data between the NCR BSC end user devices over the X.25 network. A user circuit carries all PAD protocol-related control messages and user data exchanged as it relates to a single FEP - controller connection between the HPAD and the TPAD. In this implementation, a single user circuit per X.25 Switched Virtual Circuit (SVC) is used. The PAD protocol procedures are executed independently for each active user circuit.

All messages exchanged between the two connected NCR BSC PADs use the user data field of the X.25 data packets. Data Messages (see below) are exchanged with Q=0, whereas all other control messages set Q=1. The second byte of all control messages conveys the Message identifier and is indicated in the message layout diagrams.

In the descriptions that follow, the local PAD is the PAD (HPAD or TPAD) that accepts the data from the device that originates the data (data-originating device) and forwards it to the network for delivery to the destination device (data-destination device) connected to the remote PAD (TPAD or HPAD, respectively).

Protocol Operation

End-to-end data transfer between an NCR BSC HPAD port and an NCR BSC TPAD port is performed by the NCR BSC PAD End-to-End Protocol. This is a proprietary protocol designed specifically for this application. The main task of the PAD End-to-End Protocol is the maintenance of connections between devices connected to two NCR BSC PADs and monitoring the exchange of data messages.

Connection between the FEP and an NCR BSC controller is established using a single X.25 SVC; for example, each active NCR BSC controller has an SVC between the HPAD and the TPAD. If the NCR BSC POS controller has one or more non-BSC devices connected to it, the TPAD treats these as single devices identified by a unique Controller Address (poll/select code). No checking is performed for any other lower-level, non-BSC, end-device subaddressing and all data messages from/to this controller device are passed without any modification.

Call Establishment

The PAD that is configured to originate calls is responsible for initiating call establishment.

TPAD as Originator

If the TPAD is the originator, it sends an X.25 Call Request packet when the line protocol module detects that the device is responding to polls. If the Call Request fails, the TPAD waits the configured Service Timeout period and attempts a Call Request again.

HPAD as Originator

If the HPAD is the originator, it sends an X.25 Call Request packet when the line protocol module detects that the device is being polled by the host. If the Call Request fails, the HPAD waits the configured Service Timeout period and attempts a Call Request again.

Connection is made after the PAD receives an X.25 Call Accept packet followed by a Circuit Enable Message.

The PAD considers a user circuit established when it receives an X.25 Call Accept packet followed by a Circuit Enable Message.

TPAD Example

Figure 3 shows call establishment by the TPAD.

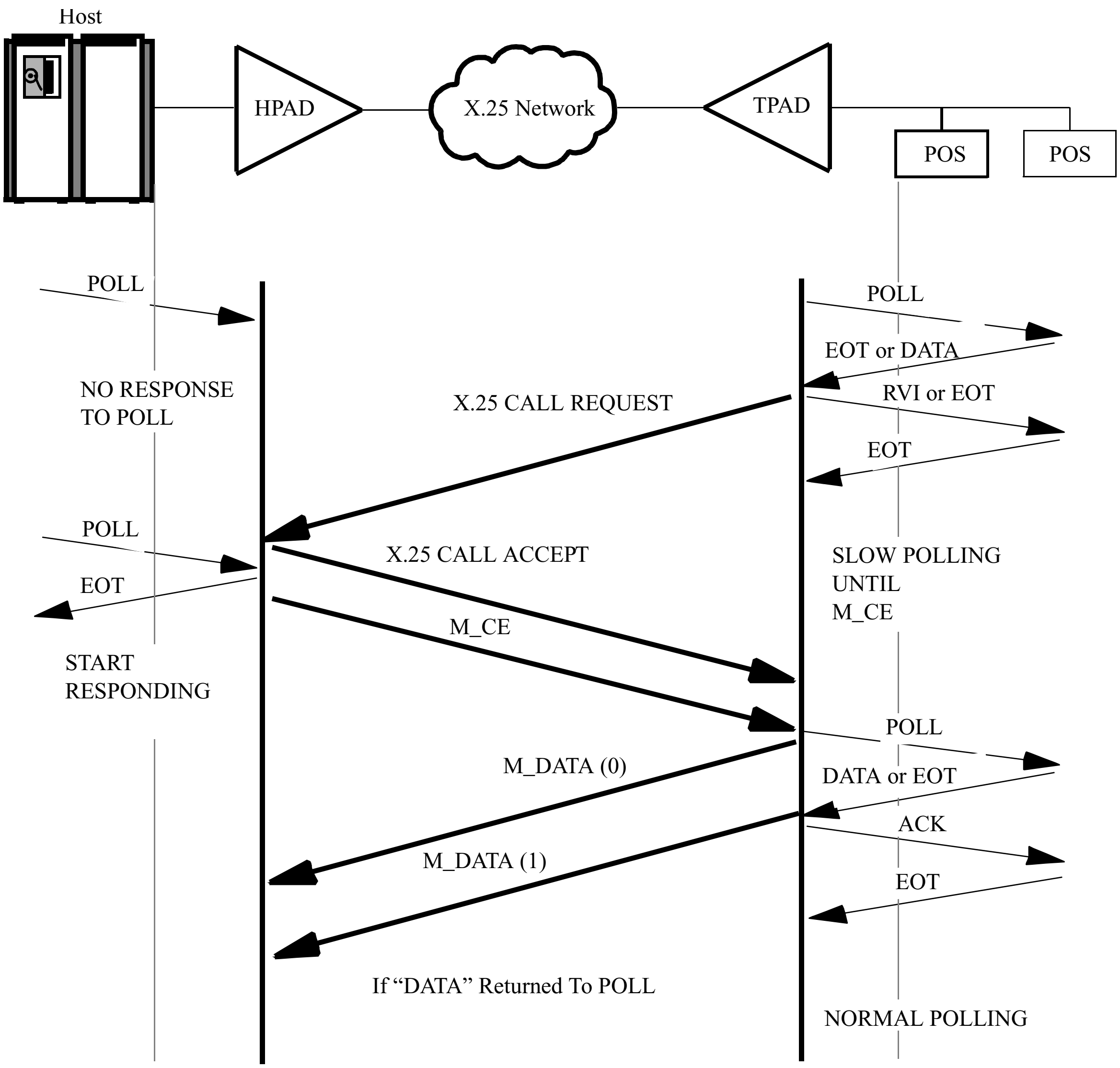

Figure 3. TPAD Originated User Circuit Establishment

HPAD Example

Figure 4 shows call establishment by the HPAD.

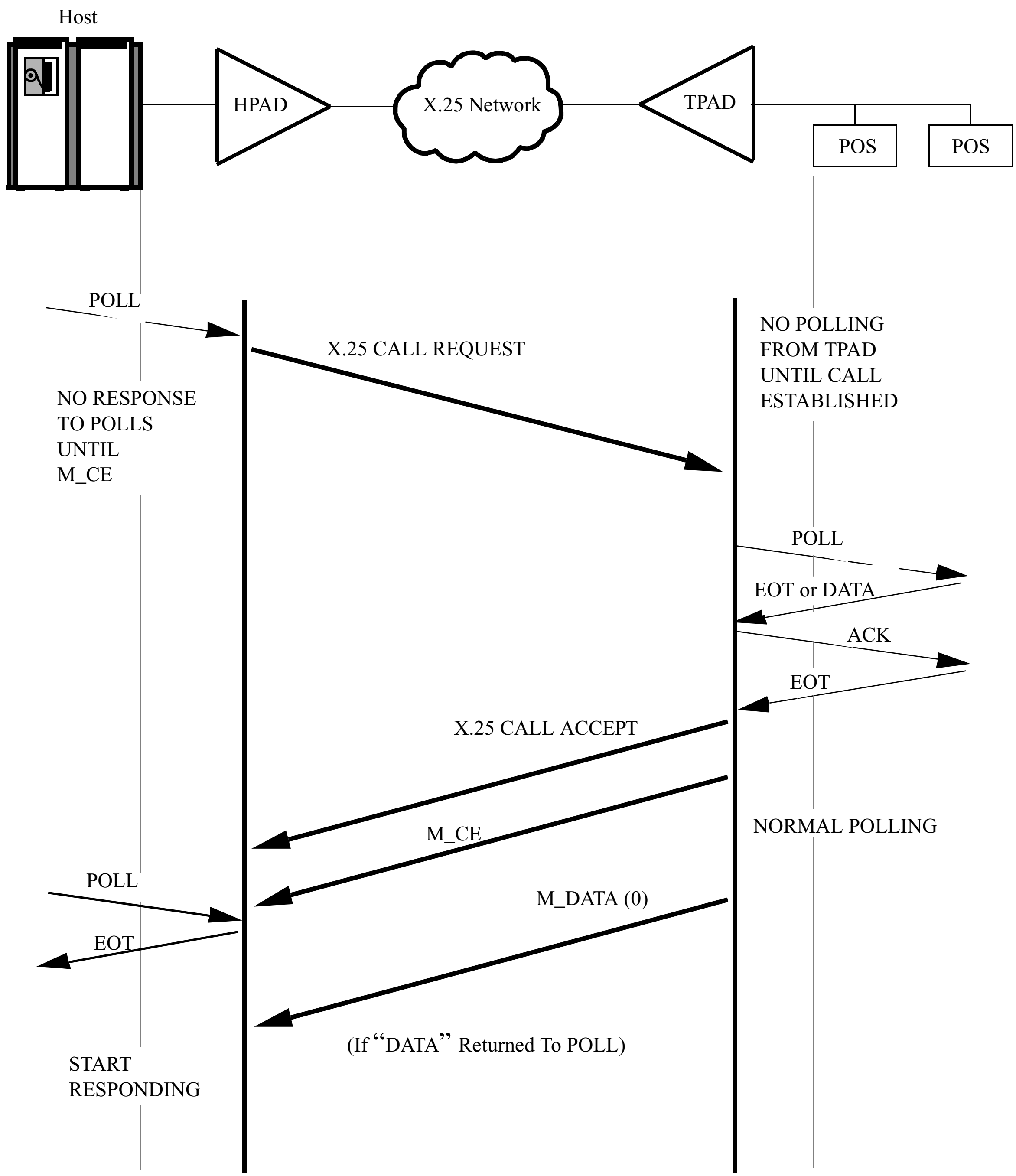

Figure 4. HPAD Initiated User Circuit Establishment

Data Transfer

Introduction

Data messages obtained through the line protocol are passed between the two PADs while the switched virtual circuit (SVC) is in place. The PAD protocol adds a header to the first packet of every block of user data. The M-bit in the third byte of the X.25 data packet header is set to 1 if the length of the user data exceeds the packet size used on X.25. Only the first such data packet contains the Data Message Header. The PAD protocol makes no distinction between user data ending in ETX and ETB.

The PAD waits until the entire data message is received by the line protocol before forwarding it to the network (remote PAD). Similarly, the PAD also waits until all packets of a data message are received from the network (remote PAD) before delivering it to the user device. This eliminates the possibility of forwarding a portion of the message that eventually may not be acknowledged by the local PAD and the necessity to abort such a partially forwarded message. Since the interactive transaction messages are shorter than the anticipated 256 byte packet size, no additional buffer delays are created.

Data Message Sequence Numbers

The PAD maintains these data message sequence numbers (SN) at both PADs to monitor the delivery of Data Messages:

Sender Related

- *SN (N_ACC) of the last DATA block accepted from the local device*. This SN is incremented after the line protocol successfully receives the next DATA block from the local device. This sequence number is stored in the SN field of the M_DATA that contains this DATA block.
- *SN (N_ACK) of the last data message acknowledged by an End-to-End ACK message from the remote PAD*. N_ACK is set to equal the SN field of the last received M_EEACK if this sequence number falls within the range defined by N_ACC and the previous value of the N_ACK. In effect, this acknowledges, to the local PAD, all outstanding M_DATA messages up to and including the one with SN=N_ACK.

Receiver Related

- *SN (N_RX) of the last received M_DATA from the remote PAD*. N_RX is incremented after the receipt of the next M_DATA and is checked for a match with the SN field of the received M_DATA. A mismatch indicates an M_DATA sequence error and the local PAD sends out a Circuit Request Message (CRM) to the remote PAD.
- *SN (N_DEL) of the last successfully delivered DATA message to the local device*. N_DEL is set to equal the SN of M_DATA when the DATA block contained in the M_DATA is successfully delivered to the local device. At the same time, the header of M_DATA indicates that an M_EEACK is sent to the remote PAD.

Data Transfer may be temporarily suspended due to congestion or an X.25 reset. An X.25 reset will be handled as described in the “Circuit Enable (Q=1)” section on page 26.

Call Clearing

If subsequent packets of the same Data Message do not arrive within the (configurable) PAD protocol timeout period, the entire message is dropped by the remote PAD and the PAD initiates the clearing of the user circuit.

If the delivery of data messages to the user device is abnormally terminated due to unrecoverable communication errors, or the device stops responding, the local PAD initiates the clearing of the user circuit.

If the PAD receives an X.25 Reset from the network and the Circuit Reset messages are not successfully exchanged within the (configurable) PAD Protocol timeout period, the PAD initiates the clearing of the user circuit.

The clearing of a user circuit that corresponds to one FEP - controller connection, does not effect in any way any other user circuits that may be active on the same PAD port. For example, if a controller is powered down on a TPAD port that has other controllers attached, the other controllers are able to continue normal operation. The same applies if the FEP stops polling a particular controller configured on an HPAD port.

The PAD enters the call establishment phase as soon as the condition that caused the circuit to be cleared is removed.

NCR BSC PAD End-to-End Protocol Messages

Introduction

This section describes the NCR BSC End-to-End Protocol messages. It also describes the format of the X.25 Call Request packet used by the NCR BSC PAD.

Message Type	Hex Code	Message Name
M_DATA	—	Data Message
M_ITC	01	Invitation to Clear Message
M_EEACK	14	End-to-End Acknowledgment Message
M_CR	21	Circuit Reset Message
M_CE	20	Circuit Enable Message

Data Message (Q=0)

The Data Message (M_DATA) is used to convey data from the data-originating device (host or POS device) to the data-destination device. Normally the data field starts with an SOH and ends with ETB/ETX.The ACK bit is set if end-to-end acknowledgment is required for this message. This bit should always be set (configured) if data loss detection is required.

The XPR bit is set if the user data contains transparent data that is enclosed with DLE-STX and DLE ETX/ETB sequences. The leading DLE characters of any two-character (DLE-x) sequences are not present in the Data Message. These are reinserted by the remote PAD before sending the User Data field to the remote NCR BSC device.

The Sequence Number (SN) allows the receiver to detect missing or out of order messages. This number is incremented modulo-256 by one for each data message transmitted. SNs are independent of each other for the two data transfer directions (host to POS and POS to host).

The Checksum field contains the modulo-256 sum of all user data bytes of the X.25 Data Packet(s) that this M_DATA may span. This field is used to detect dropped packets or erroneously concatenated packets.

Example

This table shows the data message.

	0	1	2	3	4	5	6	7
0	0	0	0	0	0	0	0	0
1	0	ACK	XPR	0	0	0	0	0
2	Sequence Number							
	SOH or STX							
3	User Data							
	ETB/ETX							
	Checksum							

Communication Example 1

Figure 5 shows communication examples that use M_DATA.

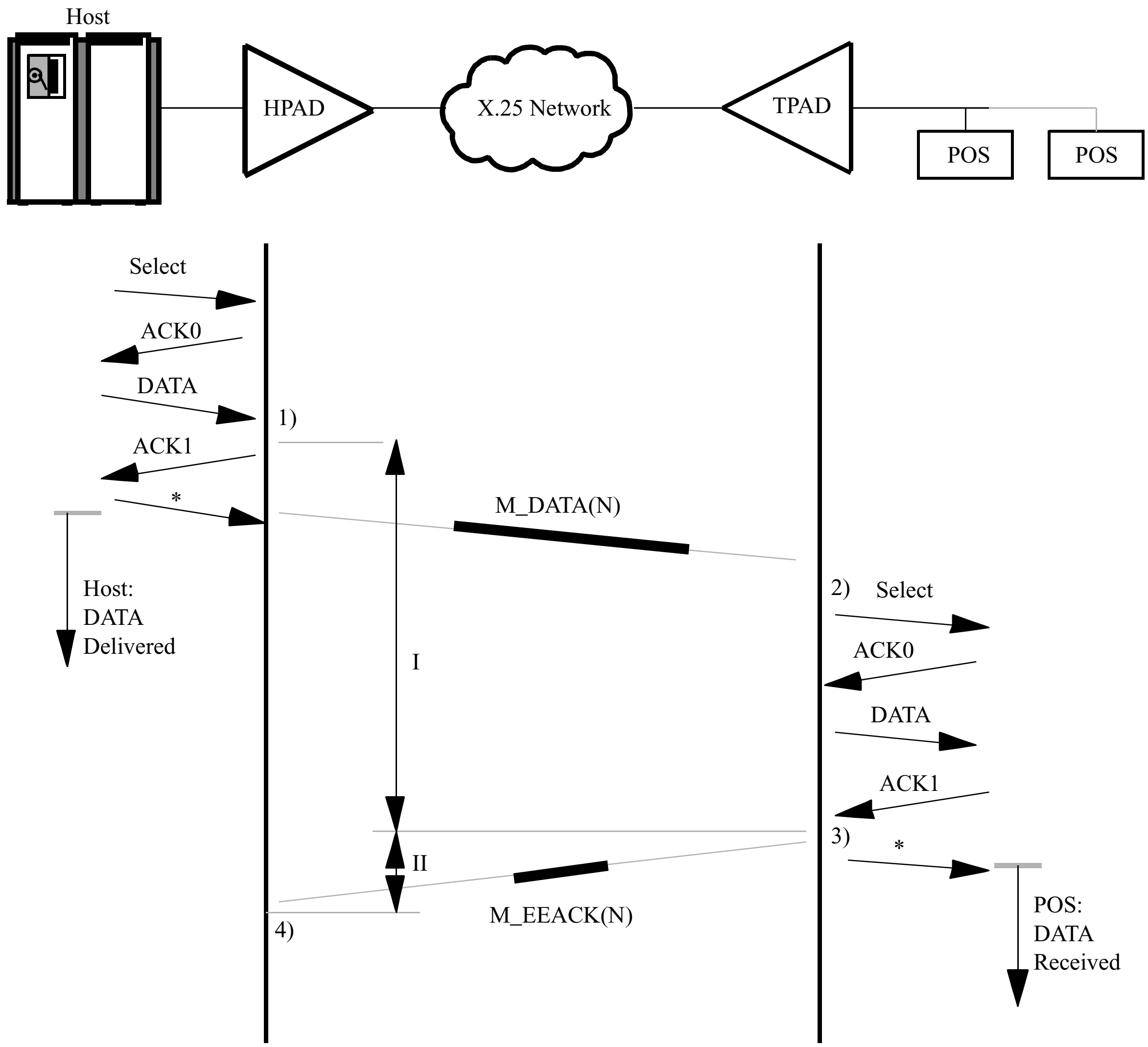

Figure 5. Delivery of a Data Block with SN = N

Communication Example 2

Figure 6 shows communication examples that use M_DATA.

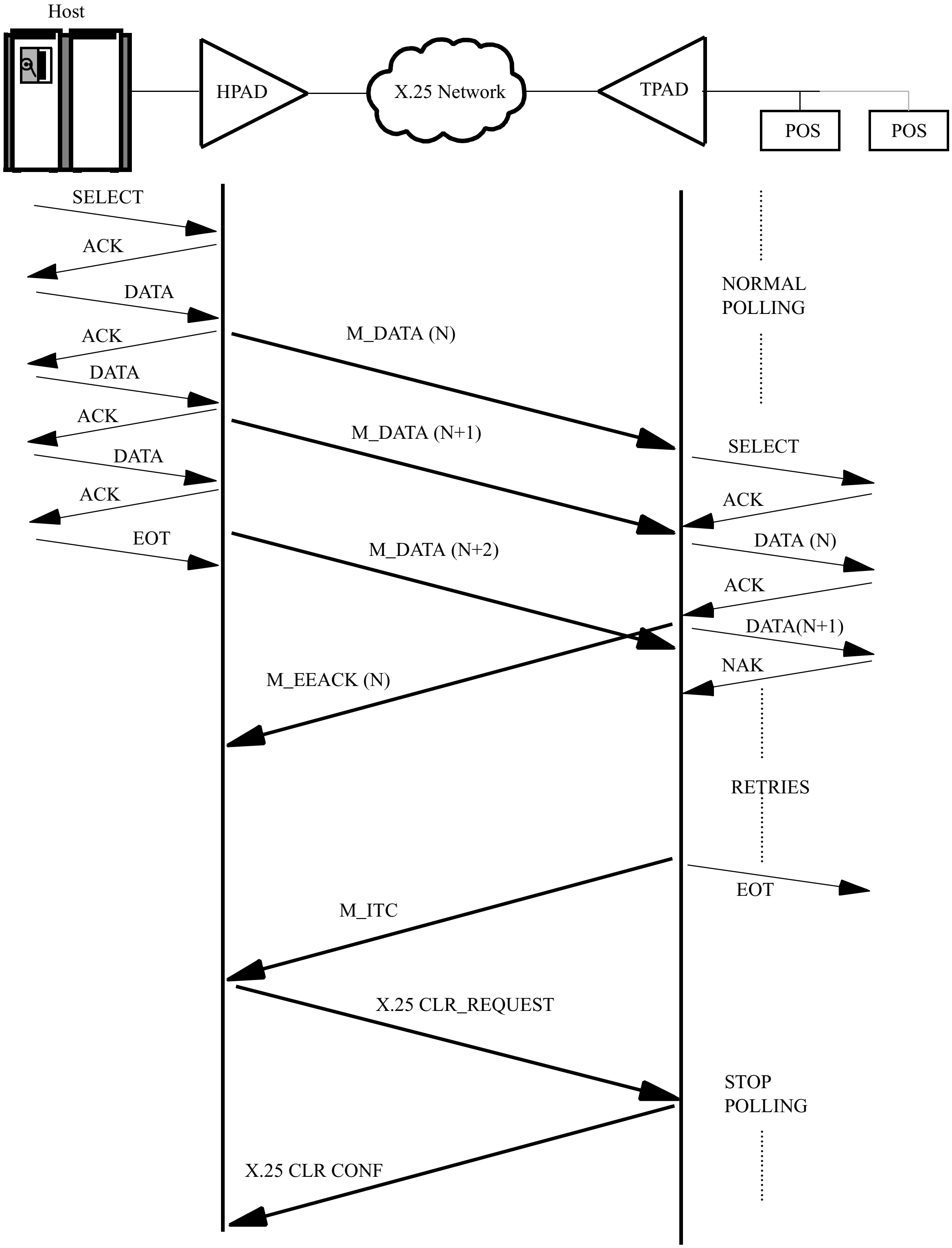

Figure 6. Unsuccessful Delivery of Data Block with SN=N+1

End-to-End Acknowledgment Message (Q=1)

The End-to-End Acknowledgment Message (M_EEACK) acknowledges, to the local PAD, the delivery of data messages to the remote device. This message acknowledges all outstanding data messages sent by the local PAD, including the one with Sequence Number (SN) equal to the SN field of the received M_EEACK. An M_EEACK message is sent from the remote PAD for each M_DATA that is successfully delivered to the remote user device if the M_DATA has its ACK bit set.

Figures 5 and 6 show the use of the M_EEACK.

Example

This table shows the End-to-End Acknowledgment message.

	0	1	2	3	4	5	6	7
0	0	0	0	0	0	0	0	0
1	Message Identifier X'14'							
2	Sequence Number							

Invitation to Clear (Q=1)

The Invitation to Clear Message (M_ITC) is sent by a PAD to indicate that it cannot continue the session. The M_ITC message is also a request to the PAD that receives the M_ITC to transmit an X.25 CLEAR REQUEST packet.

	0	1	2	3	4	5	6	7
0	0	0	0	0	0	0	0	0
1	Message Identifier X'01'							
3	Reason Code							

Reason Code	***Mnemonic***	***Description***
01	TIMEOUT	Indicates that the data-destination device is not responding, or that the error limits were exceeded while communicating with it.
10	INVALID DQ MESSAGE	Indicates that an X.25 Data packet with Q=1 was received and an error was detected trying to parse it.

The Reason Code field indicates the reason for issuing this M_ITC.

Figure 6 is an example of using the M_ITC.

Circuit Reset (Q=1)

The Circuit Reset Message (M_CR) is used to indicate that the PAD that originates the M_CR wants to exchange Sequence Numbers with the other PAD in order to check for consistency.

	0	1	2	3	4	5	6	7
0	0	0	0	0	0	0	0	0
1	Message Identifier X’21’							
2	POS Device Sequence Number							
2	Host Sequence Number							
3	Reason Code							

Reason Code	Mnemonic	Description
0	RESET	X.25 Reset or M_CR from Remote is received
11	DATA ERROR	The PAD protocol detected an error in a received M_DATA sequence number.

The Reason Code field indicates the reason for issuing this M_CR.

The M_CR is sent by the PAD if:

- An X.25 reset is received
- An M_DATA with an unexpected sequence number is received
- An M_CR message from the remote is received

The exchange of M_CRs between the HPAD and TPAD allows for the detection of lost Data Messages in the network. However, they DO NOT acknowledge any Data Messages still waiting for their M_EEACKs.

Either the TPAD or HPAD may initiate the M_CR. After the M_CR is sent, the PAD waits for acknowledgment from the receiving PAD. All messages coming from the network, other than M_CR or M_ITC and X.25 Clear Request, will be ignored while in this state.

If a response to a M_CR is not received within the PAD protocol timeout, the PAD initiates the clearing of the user circuit by sending an M_ITC.

M_CR Exchange

Figure 7 shows an example of using the M_CR exchange.

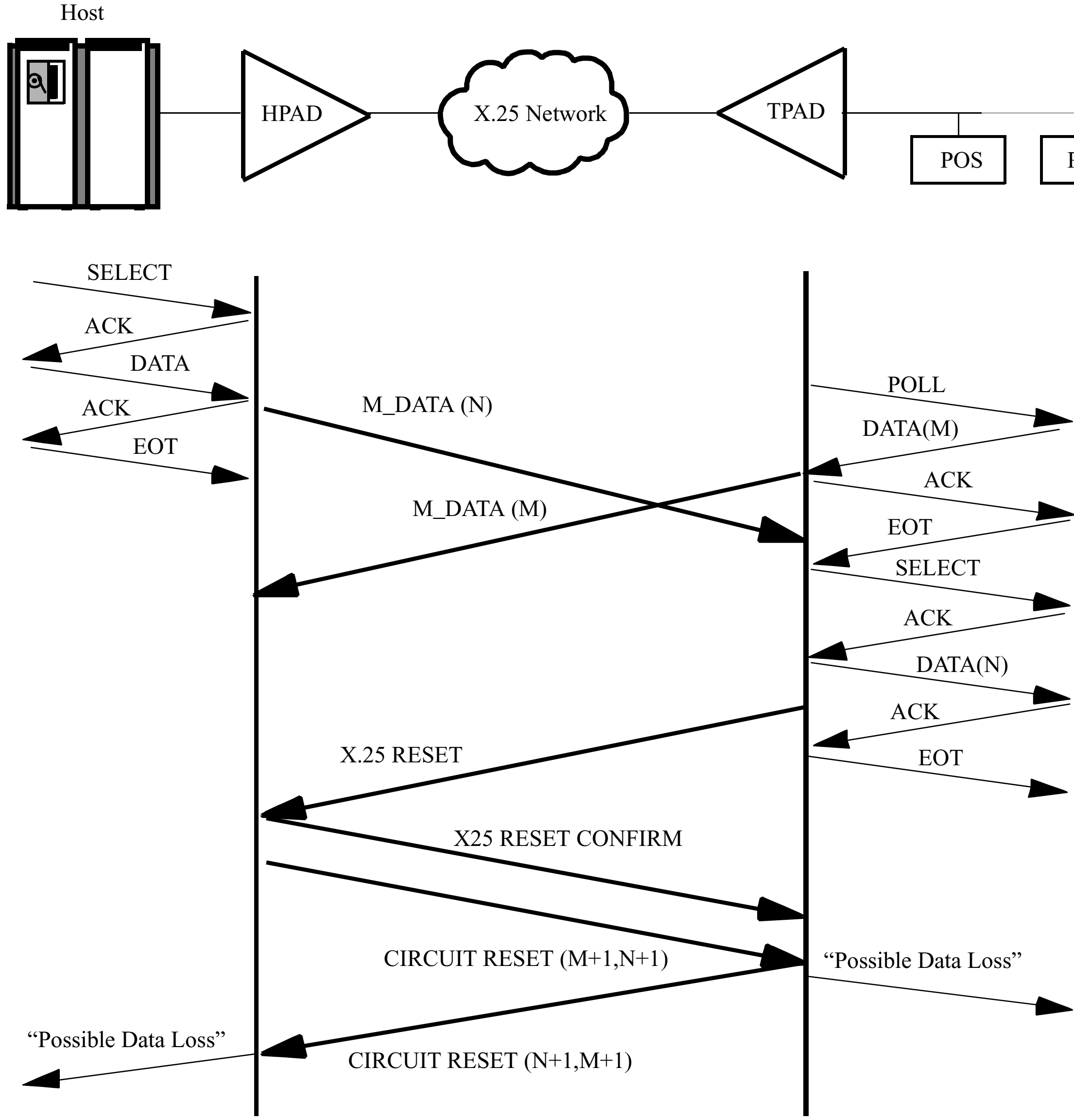

Figure 7. Exchange of Circuit Reset Messages

Circuit Enable (Q=1)

The Circuit Enable Message (M_CE) is sent (after an X.25 Call Accept packet) in response to an X.25 Call Request packet.

	0	1	2	3	4	5	6	7
0	0							
1	Message Identifier X'20'							
2	Source PC							
3	Source PC							
4	0	0	1	1	0 0 0			0
5	0	0	0	0	0	0		
6	2							
7	Application ID=1							
8	Destination PC							
9	Destination PC							

The Destination PC field contains the Poll Code of the device that has accepted the call.

The Source PC field contains the Poll Code of the device that is connected to the circuit enabled by this M_CE.

Circuit Enable Messages are shown in Figures 3 and 4.

Call Request Packet (X.25)

The Call Request packet (X.25) is sent by the PAD that originates the establishment of a session (see the Port Configuration).

The format of the User Data Field of the Call Request packet is:

	0	1	2	3	4	5	6	7
0	Protocol ID (HPAD=58, TPAD=59)							
1	Source PC							
2	Source PC							
3	0	0	1	1	0 0 0			0
4				0	0 0 0			0
5	2							
6	Destination PC							
7	Destination PC							

Description of the Call Request Packet

The Protocol ID field uniquely identifies this Call Request Packet within a private network, containing Vanguard products, as being originated by an NCR BSC PAD and destined to another NCR BSC PAD. The remote (destination) NCR BSC PAD rejects this call request if it does not recognize the value of the Protocol ID field.

The Source PC field contains the Poll Code of the NCR BSC device that is seeking connection.

The Destination PC field contains the Poll Code of the remote, target controller of this call request.

The remote (destination) PAD rejects this call request if:

- There is no corresponding (PC = Destination PC) NCR BSC device on the port addressed by the call request packet.
- The corresponding NCR BSC device is in the DOWN state.
- The corresponding NCR BSC device's link is not in the Active state. This happens as a result of a configuration error where the device on the remote PAD is configured as an originator and it itself is trying to establish a connection.

The Facility Field of the Call Request packet may contain the NUI facility and other facilities that may be appended by the originating PAD's X.25 Port. If present, the contents of the NUI facility is defined (configured) by the call mnemonic for each NCR BSC (controller) device (see the Controller Configuration).

An example of HPAD initiated and TPAD initiated call setup are shown in Figures 3 and 4, respectively.

Reports and Statistics

Introduction

Several possible scenarios can cause the delivery of DATA blocks to fail.

Failures

Examples of possible failures are:

- Local PAD goes down. All data buffers are irrecoverably lost. The remote PAD receives X.25 Clear Requests for any existing user circuit that is in a data transfer state. The connections are re-established when the remote PAD becomes operational.
- Remote PAD goes down. All data buffers are irrecoverably lost. The local PAD receives X.25 Clear Requests for any existing user circuit that is in a data transfer state. The connections are re-established when the remote PAD becomes operational.
- Remote controller stops responding. The NCR BSC line protocol in the remote PAD detects this and begins clearing the user circuit for that controller (no other controller on the same line is effected). The connection is re-established when the controller begins responding to polls.
- Unrecoverable line protocol communication errors with the controller. These errors include:
  - excessive NAKs/ENQs sent or received
  - TIMEOUTs
  - EOT received in response to a data message

Any of the above errors indicates a serious, possibly temporary, problem. The remote PAD initiates the clearing of the user circuit. The connection is re-established when the controller responds properly to polls.

- The Switched Virtual Circuit (SVC) between the local and remote PADs is cleared by the network. Reconnection attempts are made periodically as defined by the Service Timeout interval (see the Port Configuration).
- Invitation to Clear is received from the remote PAD. This represents an orderly clearing of the session. This is normally the result of failure 3 or 4. The connection is re-established when the controller begins responding to polls.
- An X.25 Reset occurs on the SVC, and is originated from either the PAD or the network. This failure is due to a network problem (for example, congestion, packet loss, etc.) One or both PADs attempt recovery. If this is successful within the PAD Protocol Timeout, the user circuit remains in operation. If it fails, one or both PADs may initiate the clearing of the circuit. The connection is re-established when the controller begins responding to polls.

In all cases, except the first, the local PAD generates a Probable Data Loss report if there are any unacknowledged messages on the input queue.

Port Worksheets

Introduction

Before you attempt online configuration of your network, we strongly recommend that you first plan it on paper. Properly completed worksheets are a useful configuration tool and provide a permanent record of the operating characteristics and configuration of your network.

Port Record

This is the port record.

Form 1. Port Record – Type NCR BSC Point of Sale

Port Number				
*Port Type				
PAD Type				
Clock Source				
Clock Speed				
Contention				
*Number of Controllers				
Service Timer (secs)				
Error Threshold Count				
Retransmission Timeout (secs)				
Inter Buffer Timeout				

NCR Device Table

The following table shows the parameters for the NCR Device Table.

NCR BSC Controller Configuration

Port Number				
Control Unit Address				
Destination Control Unit Address				
Call Mnemonic				
Device Enabled				

EIA Signals

Introduction

The NCR BSC Line Protocol uses serial, synchronous half-duplex or full-duplex transmission of data.

EIA Signals for NCR BSC Port Interface

This table displays the EIA signals that are used by the NCR BSC port interface.

Signal	Pin	Source	Description
TXD	2	DTE	Transmit Data
RXD	3	DCE	Receive Data
RTS	4	DTE	Request to Send. RTS must be raised while the DTE transmits data in half-duplex mode.
CTS	5	DCE	Clear to Send. Follows RTS if the port is configured for INTernal clocking (such as DCE).
DSR	6	DCE	Data Set Ready. Set high while the port device is enabled.
GND	7	--	Common Ground
DCD	8	DCE	Data Carrier Detect. High for full-duplex, toggles in half-duplex (high while DCE is transmitting).
EDR	14	DTE	External Data Restraint. The port will not transmit if configured for EXTernal clocking.
TXC	15	DCE	Transmit Clock. Provided by the port if configured for INTernal clocking.
RXC	17	DCE	Receive Clock. Provided by the port if configured for INTernal clocking.
ERXC	18	DTE	External Receive Clock. Required by the port if configured for EXTernal clocking.
DTR	20	DTE	Data Terminal Ready. Should be high at all times.
ETXC	24	DTE	External Transmit Clock. Required by the port if configured for EXTernal clocking.

Sample Network

Introduction

To illustrate the use of configurable parameters and some of the characteristics of the HPAD and TPAD, a sample network is shown in Figure 8. This network uses a single FEP with a co-located HPAD. The network involves two TPADs at remote locations, connected to the HPAD by an X.25 network. The arrangement of equipment is as follows:

HPAD	One NCR BSC line (port 1) is connected to the FEP.
TPAD A	TPAD A supports one controller with Poll Code (controller address) hex '20' on port 3. The X.25 line connects to the X.25 Network.
TPAD B	TPAD B supports one controller with Poll Code (controller address) hex '20' on port 3. The X.25 line connects to the X.25 Network.

The following sections include Port Records, Device Table Configurations, and the Mnemonic Call tables for the HPAD and two TPADs.

Typical Application

Figure 8 displays the sample configuration that is described in this section.

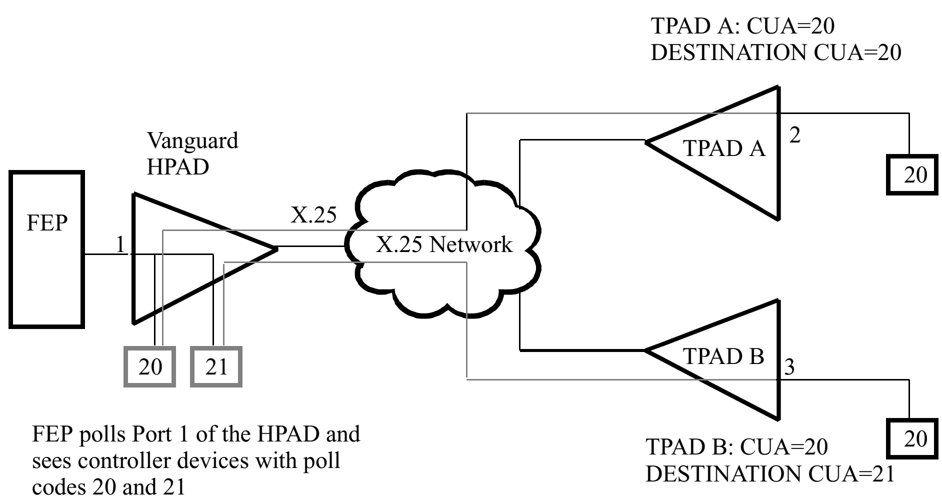

Figure 8. NCR BSC Point-of-Sale Configuration for Sample Network

NCR BSC Configuration of the HPAD

Introduction

The clocking for the HPAD of the NCR BSC port is Internal. This ensures the Host receives clocking. A straight-through cable must be used. The physical line characteristics of the cable are listed in the "EIA Signals" section on page 30.

Port Configuration

This table details HPAD port record configuration.

Port Number	1
* Port Type	NCRBSC
PAD Type	HPAD
Clock Source	INT
Clock Speed	9.6
Contention	FDX
* Number of Devices	2
Service Timer	30
Error Threshold	5
Retransmission Timeout	5
PAD Protocol Timeout	10
Port Subaddress	01
Port Options	ACK
Restricted Connection Destination	(blank)
Billing Records	NO

■ **Note**
When an asterisk appears beside a parameter, a Node Boot is needed for any changes to that particular parameter to take effect.

Controller Configuration

This table details controller configuration for an HPAD line.

NCR BSC Controller Configuration—HPAD Line

Port Number	1	1
Control Unit Address	20	21
Destination Control Unit Address	20	20
Call Mnemonic	(blank)	(blank)
Device Enabled	YES	YES

NCR BSC Configuration of TPAD A

Introduction

This section details how to configure port, controller, and mnemonic tables for TPAD A.

Port Configuration

This table details port record configuration for TPAD A.

Port Number	2
* Port Type	NCRBSC
PAD Type	TPAD
Clock Source	INT
Clock Speed	4.8
Contention	FDX
* Number of Devices	1
Service Timer	30
Error Threshold	5
Retransmission Timeout	5
PAD Protocol Timeout	10
Port Subaddress	02
Port Options	ACK+ORG
Restricted Connection Destination	(blank)
Billing Records	NO

■**Note**
When an asterisk appears beside a parameter, a Node Boot is needed for any changes to that particular parameter to take effect.

Controller Configuration

This table details controller table configuration for TPAD A.

Port Number	2
Control Unit Address	20
Destination Control Unit Address	20
Autocall Mnemonic	(blank)
Device Enabled	YES

Mnemonic Call Table

This table details entry number, mnemonic name, and call parameters for TPAD A.

Mnemonic Call Table—TPAD A

Entry Number	Mnemonic Name	Call Parameters
1	FEP1	30001

NCR BSC Configuration of TPAD B

Introduction

This section details how to configure port, controller, and mnemonic tables for TPAD B.

Port Configuration

This table details TPAD B port record configuration

Port Number	3
* Port Type	NCRBSC
PAD Type	TPAD
Clock Source	INT
Clock Speed	4.8
Contention	FDX
* Number of Devices	1
Service Timer	30
Error Threshold	5
Retransmission Timeout	5
PAD Protocol Timeout	10
Port Subaddress	03
Port Options	ACK+ORG
Billing Enabled	YES

■ **Note**
When an asterisk appears beside a parameter, a Node Boot is needed for any changes to that particular parameter to take effect.

Controller Configuration

This table details controller table configuration for TPAD B.

Port Number	3
Control Unit Address	20
Destination Control Unit Address	21
Call Mnemonic	FEP1
Device Enabled	YES

Mnemonic Call Table

This table details entry number, mnemonic name, and call parameters for TPAD B.

Mnemonic Call Table--TPAD B

Entry Number	*Mnemonic Name*	*Call Parameters*
1	FEP1	30001

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