

Program Product

**X.25 NCP Packet Switching Interface
Program Description and Operation**

Program Number 5668-981



First Edition (September 1981)

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PREFACE

This publication provides the information necessary to define and generate the X.25 NCP Packet Switching Interface (X25NPSI) Release 1, which runs with the same operating systems as the prerequisite NCP on which it is installed—that is, DOS/VSE, OS/VS1, OS/VS2 (MVS), or MVSE.

X25NPSI is built on ACF/NCP/VS Version 1 Release 2.1 and, as such, operates with ACF/VTAM Version 1 Releases 2 and 3 and with ACF/TCAM Version 2 Release 3 access methods.

X25NPSI runs on both IBM 3705-II and 3705-80 Communications Controllers. It is a Program Product that enables the users of IBM's ACF/NCP Program Products to attach IBM 3705-II or 3705-80 Communications Controllers to data transmission services which support interfaces that comply with CCITT X.25 recommendations.

This publication is directed so system analysts and system programmers responsible for preparing an ACF/NCP/VS and X25NPSI system to be used in communicating with an IBM System/370 in which one or more of the following access methods are being executed: ACF/TCAM, ACF/VTAM, TCAM, and VTAM.

Note: In this publication, generic terms are used for brevity, as follows. Network Control Program (or NCP) refers to ACF/NCP/VS. Access Method refers to whichever access method is communicating with ACF/NCP/VS, when there is no need to distinguish between TCAM and VTAM or between their ACF and non-ACF versions.

The term network has at least two meanings. A public network is a network established and operated by common carriers or telecommunication administrations for the specific purpose of providing circuit-switched, packet-switched, and leased-circuit services to the public. A user application network is a configuration of data processing products—such as processors, controllers, and terminals—established and operated by users for the purpose of data processing or information exchange, which may use transport services offered by common carriers or telecommunication administrations.

Prerequisites and Related Manuals

Prerequisite to use of this publication is a basic understanding of data communications and related access methods. You should also have a general knowledge of the purposes of the IBM 3705 Communications

Controllers. This knowledge may be obtained from the publications: Introduction to the IBM 3704 and 3705 Communications Controllers, GA27-3057; and IBM 3704 and 3705 Communications Controllers Principles of Operation, GC30-3004.

See the ACF/VTAM Installation and ACF/TCAM Installation manuals for VTAM and TCAM information. Also see ACF/NCP/VS NCP System Support Programs Installation, SC30-3142.

Within this publication, mention is made of the following publications:

- IBM 5973-L02 Product Description Manual, GA11-8642 (SC 7042)
- ACF/NCP/VS Customization Manual, ZC30-3146
- ACF/NCP/VS Installation Release 2.1, SC30-3142
- IBM 5973-L02 Product Description Manual, GA11-8643 (SC 7043)
- IBM Virtual Machine Facility/370: OLTSEP and Error Recording Guide, GC20-1809
- OS/VS Environmental Recording Editing and Printing (EREP) Program Manual, GC28-0772
- ACF/NCP/VS, Network Control Program, System Support Programs, Utilities Manual, SC30-3143

Program Reference Handbooks refer to:

- IBM 3704 and 3705 Program Reference Handbook, GY30-3012
- X25NPSI Handbook, SC30-3079

The NCP Program Logic Manual refers to:

- IBM 3705 Advanced Communications Function for Network Control Program/VS Program Logic Manual, SY30-3013

The Program Logic Manual for this X25NPSI Program Product is:

- X25NPSI Program Logic Manual, LY30-3053

The VTAM System Programmer's Guide refers to any of these publications as appropriate:

- DOS/VS ACF/VTAM System Programmer's Guide, SC38-0268
- OS/VS ACF/VTAM System Programmer's Guide, SC38-0258
- DOS/VS VTAM System Programmer's Guide, GC27-6957
- OS/VS1 VTAM System Programmer's Guide, GC27-6996
- OS/VS2 MVS System Programmer's Library: VTAM, GC20-0688
- OS/VS SVS System Programmer's Guide, GC27-0049

The TCAM Programmer's Guide refers to any of the following publications as necessary:

- OS/VS1 TCAM Programmer's Guide, GC30-2054
- OS/VS2 TCAM Programmer's Guide, GC30-2041
- OS/VS TCAM System Programmer's Guide, GC30-2051

Consult your IBM representative for the titles and order numbers of related ACF/TCAM/VTAM publications you may need. The Teleprocessing Preinstallation Guide for IBM 3704 and 3705 Communications Controllers, GC30-3020, may also provide aids to defining your Network Control Program. You may also, for the same purpose, use the Teleprocessing Installation Record for IBM 3704 and 3705 Communications Controllers, GC30-3021. The Preinstallation Guide provides the appropriate values for many of the network configuration parameters that must be specified in the control program, and gives the value(s) appropriate to each type of station and line set accommodated by the program. The Installation Record contains a set of formatted sheets representing the communications controller and the attached lines, with labeled spaces suitable for recording the parameter value appropriate for the network being documented. This record should be filled out as soon as the equipment configuration of the network is known, and should subsequently be updated each time any changes are made to the configuration.

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CONTENTS

GENERAL DESCRIPTION	1-1
Programming Systems Supported.....	1-1
Operating Systems.....	1-1
TP Programming Systems.....	1-1
Products Supported.....	1-1
Communication Controllers.....	1-1
X.25 Networks Supported.....	1-1
Terminal Products Supported.....	1-1
Limitations on X.25 Functions Supported.....	1-2
Introduction to the X.25 Network.....	1-2
The Public Packet Switching Networks (PPSN).....	1-2
Network Protocol.....	1-4
X.25 NETWORK CONNECTION DESCRIPTION.....	2-1
Configuration Description.....	2-1
Support of X.25 User Facilities.....	2-2
Support of Type 1 Networks.....	2-2
Multiline Protocol.....	2-3
Flow Control Parameters.....	2-3
Reject Option.....	2-5
Acceptance of Reverse Charging Calls.....	2-5
Closed User Group.....	2-5
Support of Type 2 Networks.....	2-6
High-Priority Class of Traffic.....	2-6
The One-Way Logical Channel Facility.....	2-6
Special Considerations for Nord Rhein Westfalen Facilities.....	2-6
X25NPSI DESCRIPTION.....	3-1
X25NPSI Modules.....	3-3
Initialization Routine.....	3-3
Network Action Scheduler (NAS).....	3-3
NAS Entered by Timer Tick (Every 100 milliseconds).....	3-3
X10 or Line Timer.....	3-4
Level 2 and Level 3 Interrupts.....	3-4
Logical Link Control (LLC) Routine.....	3-4
Protocol Converter for Non-SNA Equipment (PCNE).....	3-7
Physical Services Header (PSH) Module.....	3-7
Virtual Circuit Manager (VCM).....	3-8
VCM-IN Task.....	3-8
Virtual Circuit Manager-Out (VCM-OUT).....	3-8
Virtual Circuit Manager-In (VCM-IN).....	3-9
Packet Level Procedure (PLP).....	3-9
Packet Level Processor-Out (PLP-OUT).....	3-9
Packet Level Processor-In (PLP-IN).....	3-10
Line Access Control (LAC).....	3-10
Link Level 2 Test for Virtual Circuits (LL2T/VC).....	3-11

Control Blocks.....	3-11
Blocks Initialized by the Customization Facility.....	3-12
NCP Control Blocks (LNVT/ULVT/UACB).....	3-12
X25NPSI Blocks.....	3-13
Blocks Initialized by the X25BUILD Macro Processor.....	3-13
Blocks Initialized by the X25NET Macro Processor.....	3-13
Blocks Initialized by the X25VCCPT Macro Processor.....	3-13
Blocks Initialized by the X25OUFT Macro Processor.....	3-13
Blocks Initialized by the X25MCH Macro Processor.....	3-13
Blocks Initialized by the X25LCG Macro.....	3-14
Blocks Initialized by the X25VC Macro Processor.....	3-14
Record Formats.....	3-17
Frame Format.....	3-17
Table of Supported Frames.....	3-19
Packet P/Format.....	3-21
The Diagnostic Field in the Clear Request Packet for Type 1 Networks.....	3-22
The Diagnostic Field in the Reset Request Packet.....	3-23
Logical Link Unit Format.....	3-23
COMMUNICATING WITH NON-SNA X.25 DTEs.....	4-1
Limitations.....	4-1
Action on Physical Services Requests.....	4-2
Identification Exchange.....	4-2
Call-Out.....	4-2
Call-In.....	4-3
Contact/Discontact.....	4-3
Action on Session Control RUs.....	4-3
ACTLU.....	4-3
BIND.....	4-3
SDT.....	4-4
CLEAR.....	4-4
UNBIND.....	4-4
DACTLU.....	4-4
Action on Data Flow Control RUs.....	4-6
CANCEL.....	4-6
SIGNAL.....	4-6
BID (In "Between Brackets" Status).....	4-6
CHASE.....	4-6
SHUTD/SHUTC.....	4-6
Action on Function Management (FM) Data RUs.....	4-7
Outbound Flow.....	4-7
Inbound Flow.....	4-9
Pacing.....	4-10
Flow Direction Control.....	4-10
Code Selection.....	4-10
Sequencing.....	4-10
Method of Operation.....	4-11
Logon Procedure.....	4-11
Logoff Procedure.....	4-11

Bracket Management.....	4-11
When the SLU (PCNE) Cannot Send EB.....	4-11
When the SLU (PCNE) Can Send EB.....	4-14
Remarks Concerning a Host-to-Host Connection through the PCNE.....	4-14
Connection Through Switched Virtual Circuits.....	4-15
Connection Through Permanent Virtual Circuits.....	4-19
Communicating With the X.25 Network Services.....	4-19
X25NPSI INSTALLATION.....	5-1
Distribution Package.....	5-1
OS/VS X25NPSI Libraries.....	5-1
Job Card Modification.....	5-1
DOS/VS X25NPSI Libraries.....	5-2
User Generation Processing.....	5-2
X25NPSI Generation.....	5-2
X25NPSI Network Description.....	5-2
X25NPSI Stage 1.....	5-3
X25NPSI Stage 2.....	5-3
NCP Generation.....	5-4
NCP Description.....	5-4
NCP Stage 1.....	5-4
NCP Stage 2.....	5-5
X25NPSI Stage 1 Generation Macro Description	5-7
X25BUILD Macro Instruction.....	5-7
X25NET Macro Instruction.....	5-10
X25VCCPT Macro Instruction.....	5-11
X25OUFT Macro Instruction.....	5-12
X25MCH Macro Instruction.....	5-14
X25LCG Macro Instruction.....	5-17
X25VC Macro Instruction.....	5-18
X25LINE Macro Instruction.....	5-20
X25PU Macro Instruction.....	5-21
X25LU Macro Instruction.....	5-22
X25END Macro Instruction.....	5-22
The Optional GENEND Macro Instruction.....	5-24
Summary of Operands for X.25 Macros That Describe the Network.....	5-25
X25NPSI Stage 1 Sample Generation.....	5-26
X25NPSI Stage 1 Sample Output for OS/VS.....	5-29
NCP Stage 1 System Generation.....	5-35
Resource Naming Conventions.....	5-35
BUILD Macro Instruction.....	5-36
GROUP Macro Instruction.....	5-36
LUDRPOOL Macro Instruction.....	5-37
LINE Macro Instruction.....	5-37
PU Macro Instructions.....	5-37
PU Macro Instruction Associated with a Multichannel Link.....	5-37
PU Macro Instruction Associated with a Permanent Virtual Circuit.....	5-38

PU Macro Instruction Associated with a Switched Virtual Circuit.....	5-38
LU Macro Instruction.....	5-38
LU Macro Instruction Associated with a Multichannel Link...	5-38
LU Macro Instruction Associated with a Permanent Virtual Circuit.....	5-39
LU Macro instruction Associated with a Switched Virtual Circuit.....	5-39
NCP Stage 1 Sample Generation.....	5-40
Access Method Considerations.....	5-42
ACF/VTAM Considerations.....	5-42
VBUILD Macro Instruction.....	5-42
PU Macro Instruction.....	5-42
PATH Macro Instruction.....	5-43
LU Macro Instruction.....	5-46
ACF/TCAM Considerations.....	5-46
INTRO Macro Instruction.....	5-46
TERMINAL (TERM=LINE) Macro Instruction.....	5-46
TERMINAL (TERM=PUNT) Macro Instruction.....	5-46
INVLIST Macro Instruction.....	5-47
NETWORK OPERATOR CONSIDERATIONS.....	6-1
Activation/Deactivation.....	6-1
Multichannel (MCH) Command.....	6-2
MCH Recovery.....	6-3
The Permanent Virtual Circuit (PVC) - LLC Level 2 (LLC=PSH).....	6-4
PVC Recovery.....	6-5
The Switched Virtual Circuit (SVC) - LLC Level 2 (LLC=PSH).....	6-5
Outgoing Call (for TCAM).....	6-5
Incoming Call (for VTAM).....	6-6
Special DATAPAC Considerations.....	6-6
SLOWDOWN AND AUTO NETWORK SHUTDOWN.....	7-1
X25NPSI Slowdown Procedure.....	7-1
Entering Slowdown.....	7-1
Exiting from Slowdown.....	7-1
The Auto Network Shutdown (ANS) Procedure.....	7-4
COMPATIBILITY/INCOMPATIBILITY CONSIDERATIONS.....	8-1
Supported and Non-Supported ACF Functions.....	8-1
Host Network Control Aids Considerations.....	8-1
PROBLEM DETERMINATION AIDS.....	9-1
Tools to Check the Hardware.....	9-1
OLLT.....	9-3
NIA Wrap.....	9-3
Using ECHO With an Application.....	9-3
Link Level 2 Test for a VC.....	9-4
Generalized Trace Facility (GTF).....	9-6

Line Trace Facility.....	9-7
Error Reports.....	9-7
Exception Responses.....	9-8
Inoperative Message.....	9-9
INOPs for an MCH.....	9-9
INOPs for a VC.....	9-9
Record Maintenance Statistics Messages.....	9-13
Description of the Internal X25NPSI Error Bytes.....	9-14
Internal X25NPSI Error Bytes for an MCH.....	9-14
Internal X25NPSI Error Bytes for a VC.....	9-16
RECMS for SNA Link Errors.....	9-22
MCH's RECMS for SNA Link Errors.....	9-22
VC's RECMS for SNA Link Errors.....	9-22
RECMS for SNA Station Errors.....	9-23
MCH's RECMS for SNA Station Errors.....	9-23
VC's RECMS for SNA Station Errors.....	9-23
RECMS for SNA Statistics.....	9-24
MCH's RECMS for SNA Statistics.....	9-25
VC's RECMS for SNA Statistics.....	9-26
RECMS Retrieval Without Network Communications Control	
Facility (NCCF).....	9-26
RECMS Retrieval Under a VM System.....	9-26
RECMS Retrieval Under an OS/VS System.....	9-27
RECMS Retrieval Under a DOS/VS System.....	9-27
RECMS Retrieval with the Network Communications Control	
Facility (NCCF).....	9-28
Dump Utilities.....	9-28
Obtaining Dumps Under an OS/VS System.....	9-28
Obtaining Dumps Under a DOS/VS System.....	9-29
X25SNAP Facility.....	9-29
Including the X25SNAP Facility Under OS/VS.....	9-30
Including the X25SNAP Facility Under DOS/VSE.....	9-30
Editing and Interpreting the X25SNAP Trace.....	9-31
Abend Codes.....	9-36
X25NPSI Modules.....	9-37
Example of Assembly for X25NPSI Modules Under OS/VS.....	9-38
Example of Assembly for X25NPSI Modules Under DOS/VSE.....	9-39
STORAGE AND PERFORMANCE.....	10-1
Storage.....	10-1
Performance.....	10-2
LIST OF ACRONYMS.....	Abbr-1

FIGURES

1-1. Network Configuration.....1-3
1-2. Packet Format.....1-5
2-1. Actual Physical Configuration (Part 1 of 2).....2-2
2-1. Configuration as seen by SNA Components(Part 2 of 2).....2-2
3-1. X25NPSI Release 1 Data Flow.....3-2
3-2. The Logical Link Control (LLC).....3-6
3-3. Format of the LLU.....3-6
3-4. NCP Control Block Relationship.....3-12
3-5. X25NPSI Control Block Relationship.....3-15
3-6. NCP and X25NPSI Control Block Relationship.....3-16
4-1. The BIND Parameter List.....4-5
4-2. Function Management Data Flow (Part 1 of 2).....4-8
4-2. Function Management Data Flow (Part 2 of 2).....4-9
4-3. Bracket Protocol When the SLU Cannot Send EB.....4-13
4-4. Bracket Protocol When the SLU Can Send EB.....4-14
4-5. Session Setup/Shutdown Through an SVC
 (APPL-to-APPL Connection).....4-18
5-1. Summary of Generation Processing.....5-6
7-1. X25NPSI Slowdown Procedure.....7-3
9-1. Hardware Configuration.....9-2

PROGRAMMING SYSTEMS SUPPORTED

OPERATING SYSTEMS

The X.25 NCP Packet Switching Interface (X25NPSI) program product operates with the same operating systems as the prerequisite NCP on which it is installed, that is, DOS/VSE, OS/VS1, OS/VS2 (MVS), and MVSE.

TP PROGRAMMING SYSTEMS

X25NPSI is built on ACF/NCP/VS Version 1 Release 2.1 and, as such, operates with ACF/VTAM Version 1 Releases 2 and 3 and ACF/TCAM Version 2 Release 3.

PRODUCTS SUPPORTED

COMMUNICATION CONTROLLERS

X25NPSI runs on both 3705-2 and 3705-80 multiplexors. Attachment to the X.25 network requires a full-duplex synchronous adapter (non-switched line), and at least one CS2 or CS3 (CS1 is not supported). Only the V24 (X21bis) or V35 adapters are supported.

X.25 NETWORKS SUPPORTED

The following networks are supported by the X25NPSI:

- Type 1 Networks

EURONET	E.E.C.
TRANSPAC	France

- Type 2 Networks

DATAPAC	Canada
DATEX-P	Germany
NRW	Germany

TERMINAL PRODUCTS SUPPORTED

- All SNA terminal products connectable to the X.25 networks through the IBM 5973-L02 Network Interface Adapter (NIA), specify code 7043.

- Non-SNA X.25 DTEs that can be connected to the networks directly through the X.25 procedure without using qualified data packets or interrupt packets.

LIMITATIONS ON X.25 FUNCTIONS SUPPORTED

Access to Datagram services is not allowed.

Only the X21bis physical interface is supported (X21 leased is not supported).

INTRODUCTION TO THE X.25 NETWORK

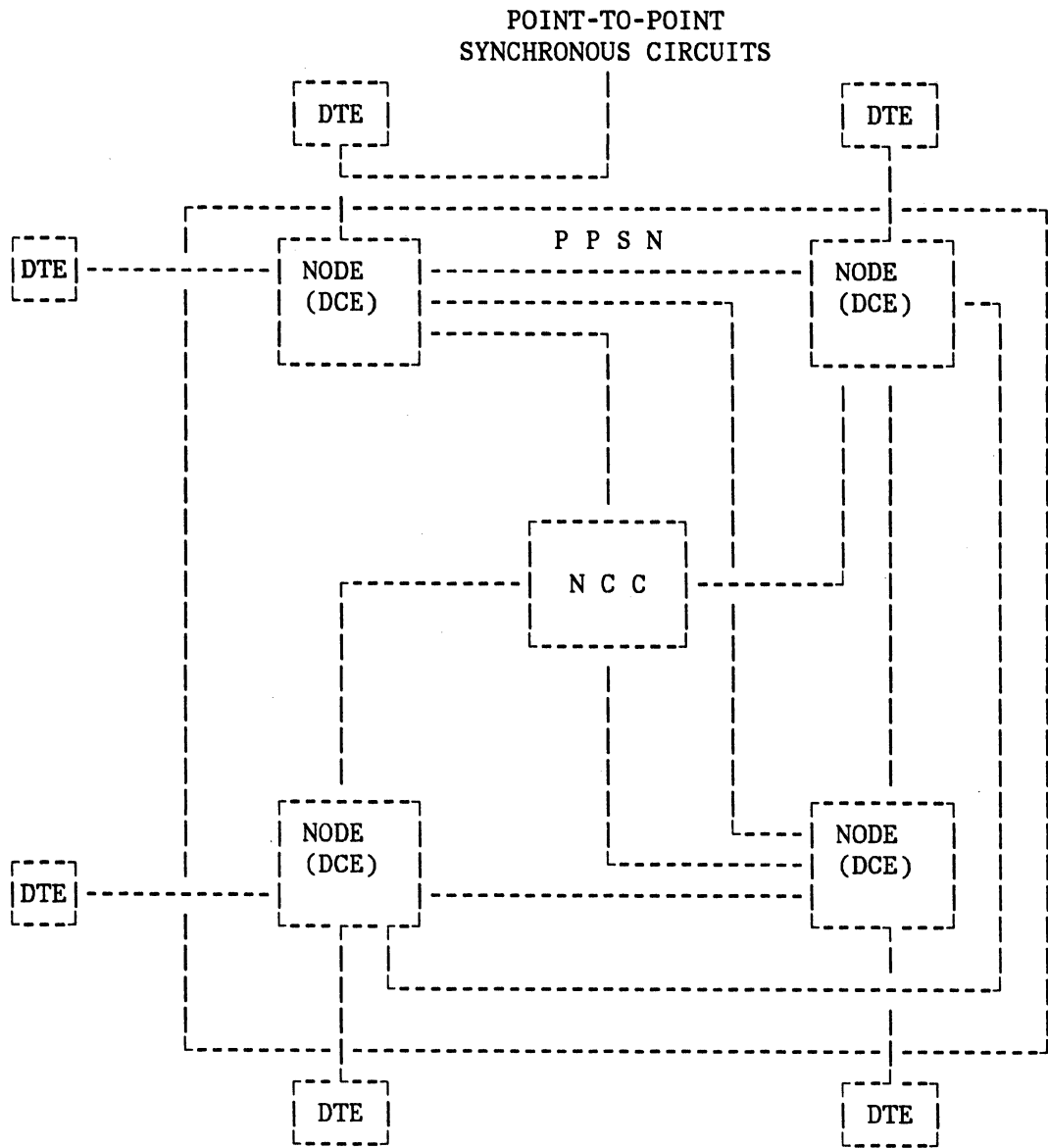
This and the following section summarize the X.25 Public Packet Switching Network (PPSN) interface characteristics. This information should allow you to better understand the functions performed by X25NPSI as extensions to ACF/NCP/VS and the SNA access methods (ACF/VTAM and ACF/TCAM).

Note that this section is not intended to describe all the functions performed by the PPSN. Readers desiring more comprehensive descriptions should refer to the appropriate documentation.

THE PUBLIC PACKET SWITCHING NETWORKS (PPSN)

Public Packet Switching Networks consist of switching nodes and internodal high-speed digital communication trunks. Data Terminal Equipment (DTE) such as computers, programmable terminal controllers, and intelligent terminals may be connected directly to these networks, using point-to-point synchronous links and a protocol briefly described in this section (see Figure 1-1).

The fundamental data transport technique used in these networks is packet switching. Non-packet switching data services are based upon providing a physical data channel as an increment of the dedicated bandwidth. This bandwidth may be permanently leased as a non-switched line or periodically accessed as a switched offering. Inefficient utilization of facilities often occurs because the bandwidth is reserved whether data is actually being transmitted. In packet switching, all users' data is formed into discrete variable-length entities called packets. In addition to the data being transmitted, each packet includes a header. The header specifies control functions and addressing information to make sure that the data is delivered to the appropriate destinations. Packets of data from many users are dynamically interleaved over shared network transmission facilities, and routed to their destinations.



DTE = DTEs such as computers, communications controllers and intelligent clustered terminals.

NODE
(DCE) = Switching node (Data Circuit Terminating Equipment).

NCC = Network Control Central

Figure 1-1. Network Configuration

NETWORK PROTOCOL

A protocol is a formal set of conventions governing the format and control of data in input and output. It gives the data user access to a communications network.

The CCITT X.25 protocol is designed for interface on a network providing packet switching services.

It consists of three distinct levels of control procedures:

- The physical interface
 - The frame-level logical interface
 - The packet-level logical interface
1. The physical interface protocol is concerned with the control of each link (four-wire, point-to-point, synchronous) during its physical operation. It specifies the use of the physical interface between the DTEs and the network.
 2. The Frame-Level Logical Interface protocol deals with the logical data exchange over each link (format of data, first level of recovery procedures).

It is specified as a subset of the High Level Data Link Control (HDLC) procedures being standardized by the International Organization for Standardization (ISO). The X.25 protocol is symmetrical because each side of the link is equipped with a primary and a secondary function. Command frames flow from the primary to the secondary function. Response frames flow from the secondary to the primary function.

The frame format includes flags at each end of the frame, and header and trailer fields for the identification and checking of commands and responses.

The Frame-Level Protocol ensures that data is accurately exchanged between a DTE and the network.

One frame does not contain more than one packet as defined below.

3. The Packet Level Logical Interface (PLLI) protocol specifies the manner in which calls are made, maintained, and cleared, and how user data and control information are structured into packets for presentation to the network.

The PLLI protocol accommodates both permanent and switched virtual circuits. A virtual circuit is a bidirectional association between a pair of DTEs over which all data is transferred in the form of packets.

A permanent virtual circuit is a permanent association between two DTEs, and is similar to a point-to-point non-switched line.

A switched virtual circuit is a temporary association between two DTEs.

A single physical link can support many communications at the same time by using an interleaved packet multiplexing scheme. Each packet (see Figure 1-2) contains a logical channel number that associates the packet with a switched or permanent virtual circuit, thus identifying the communication.

Many functions and facilities are or are not supported, according to the type of the virtual circuit. This type is defined, when the Program Product is installed, as the Logical Link Control Level by a specific parameter: LLC=0 or 2.

LLC level 0 specifies a virtual circuit that communicates with an X.25 DTE. LLC level 2 specifies a virtual circuit that communicates with an SNA terminal via a 5973-L02 network interface adapter.

Some of the tasks performed by the X.25 network include:

- Identifying the destination of each packet;
- Routing each packet accordingly;
- Checking the accuracy of the packet as it moves along the network;
- Delivering the packet to its destination in the required format.

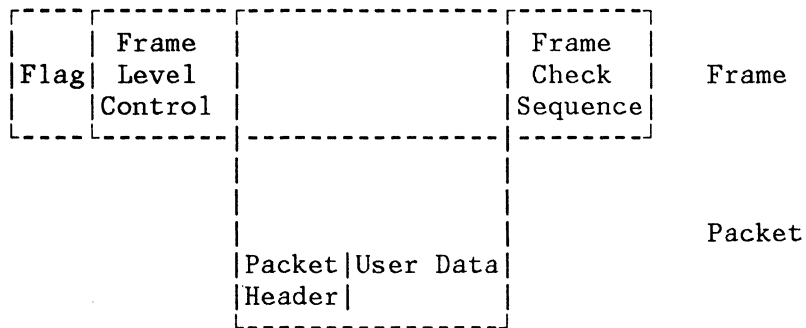


Figure 1-2. Packet Format

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CONFIGURATION DESCRIPTION

The SNA components see the PPSN as a telephone line network, each virtual circuit being seen as a switched or non-switched line (see Figure 2-1). The description of a TP configuration using PPSN is, therefore, similar to that of a TP configuration using telephone lines. The same macro instructions are to be coded in the same order, but several new parameters are included in the NCP generation deck.

Figure 2-1 (Parts 1 and 2) show how the standard SNA components see a connection to the PPSN.

Figure 2-1 (Part 1) shows the actual configuration:

- A full-duplex multichannel link is used to communicate with the PPSN
- A switched virtual circuit (VC1) is established between the 3705 and the SNA TER1 terminal
- A permanent virtual circuit (VC2) is established between the 3705 and the SNA TER2 terminal.

Figure 2-1 (Part 2) shows how the SNA components see the above configuration:

- The multichannel link is seen as a non-switched SDLC full-duplex link.
- The switched virtual circuit (VC1) to the TER1 terminal is seen as a switched SDLC link
- The permanent virtual circuit (VC2) to the TER2 terminal is seen as a non-switched SDLC link.

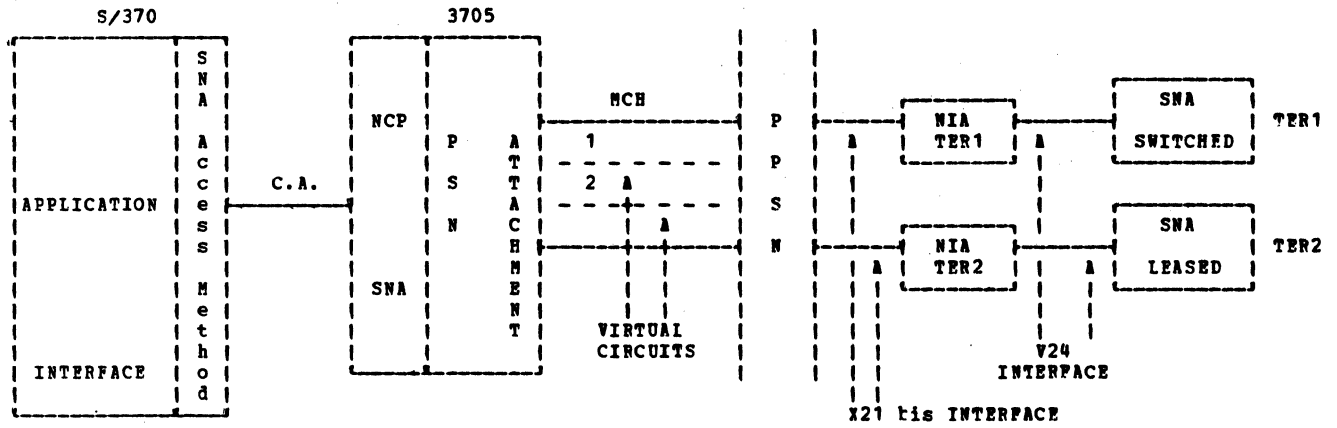


Figure 2-1 (1 of 2). Actual Physical Configuration

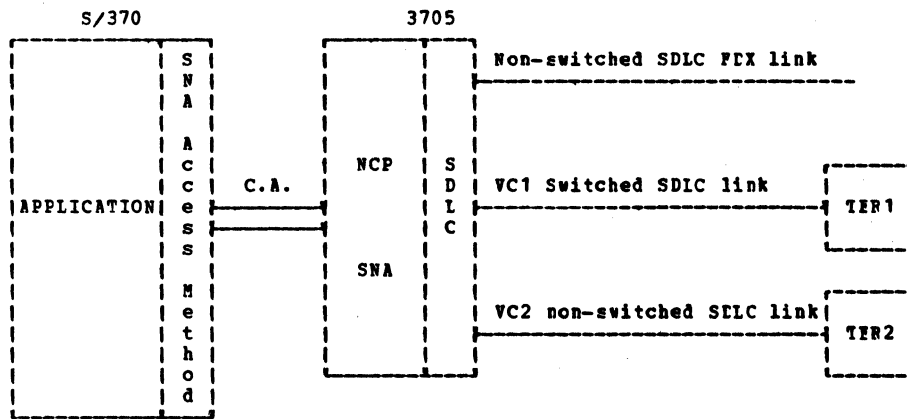


Figure 2-1 (2 of 2). Configuration as Seen by SNA Components

Multiline Protocol

The X25NPSI does not support the multiline protocol.

Flow Control Parameters

PACKET AND WINDOW SIZE: The X25NPSI supports the optional "Packet and Window Size Selection per Virtual Circuit" mechanism.

Therefore, for each Virtual Circuit, you have to associate an entry in the Virtual Circuit Parameter Table (VCCPT), where are defined a packet length and a window size, that will apply to the virtual circuit (the MAXPKTL and VWINDOW parameters of the X25VCCPT macro instruction). The association between a VC and an entry in the VCCPT is done at generation time for a permanent VC and a switched VC (CALL-IN), and at connection establishment for a switched VC (CALL-OUT only).

For a connection to an SNA terminal via the 5973-L02 NIA, the SNA segmentation is transparent to the X25NPSI. The "more data bit" mechanism -- that is, the X.25 segmenting, is not supported. Segmentation is performed using the Segment Indication of the FID-FOX, which is the LLC Header for LLC level 2, to adapt a PIU to the packet length used for the X.25 connection. Type 1 networks allow different packet lengths, and you can choose one of them with the MAXPKTL operand of the X25VCCPT macro instruction.

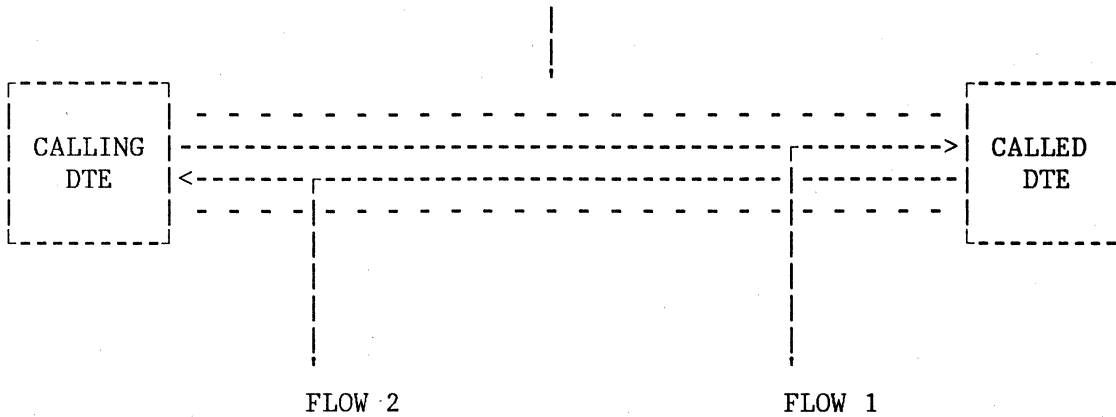
Note: What is sent from the 3705 must be able to enter the 5973-L02 without the "more data bit" mechanism, and vice versa. Thus, the 5973-L02 must be defined with a packet length equal to that of the current connection in the 3705.

For a connection to an X.25 product, since the Protocol Converter for Non-SNA Equipment (PCNE) uses the "more data bit" mechanism, you may specify any valid "MAXPKTL=" value corresponding to your subscription. For the VWINDOW parameter, it is recommended that you use 2, but you may specify any value within the limits imposed by the network to which the 3705 is being connected.

If you have a multichannel link containing some virtual circuits that communicate with 5973-L02 adapters and other circuits that communicate with non-SNA X.25 DTEs, you may choose any combination of "MAXPKTL=" and "VWINDOW=" values corresponding to your subscription.

THE THROUGHPUT CLASS: With respect to the throughput class, a virtual circuit is characterized by two types of data flow for which the receiving capacity of one end must equal the sending capacity of the other end. A particular capacity does not imply particular packet length and window values. The throughput class is a pricing parameter.

VIRTUAL CIRCUIT



Flow 1 is defined by the throughput class for transmission from the calling DTE.

Flow 2 is defined by the throughput class for transmission from the called DTE.

For switched virtual circuits, if there is a conflict between the throughput classes for the transmission indicated in the CALL REQUEST packet and the default throughput classes for the reception of the corresponding DTEs, the lowest throughput class value is forced by the network for each flow.

The throughput class mechanism is proper to the network, and the X25NPSI or the 5973-L02 are not involved in this mechanism except in the case of switched virtual circuits, as far as the "Selection by the calling DTE of the Throughput Classes per Communication" is concerned, as shown in the following table.

FACILITY	X25NPSI	5973-L02
Choice of the default throughput classes of the link for each virtual circuit.	NOT INVOLVED	NOT INVOLVED
Selection by the calling DTE of the throughput classes per communication.	Note 1	Note 2
Throughput class indication to the called DTE.	NOT INVOLVED	NOT INVOLVED
Choice of the throughput classes per permanent virtual circuit.	NOT INVOLVED	NOT INVOLVED

Note 1:

This facility is supported by the X25NPSI via the "OPTFACL=" operand of the X25OUFT macro instruction, as described below in the X.25 Stage 1 Generation Macro Description.

The coding for the facility code and parameter fields for the throughput classes in the CALL REQUEST packet is:

Facility Code Field = X'02'
Facility Parameter Field = bits: 0123 4567

The throughput class for transmission from the calling DTE is indicated in bits 4, 5, 6, and 7. The throughput class for transmission from the called DTE is indicated in bits 0, 1, 2, and 3. Bits 3 and 7 are the low order bits of each throughput class indicator.

Note 2: For more information, refer to the 5973-L02 Product Description Manual, GA11-8632.

Reject Option

This option, which allows a DTE to request the retransmission of one or several consecutive DATA packets from the DCE by using the REJ packet, is not supported either by the X25NPSI or by the 5973-L02.

Acceptance of Reverse Charging Calls

This option is not checked either by the X25NPSI or by the 5973-L02 when receiving an INCOMING CALL packet. However, you may ask for this option. In this case, the caller's decision is always accepted as far as charging is concerned.

The reverse charging request is provided by the X25NPSI via the "OPTFACL=" operand of the X25OUFT macro instruction.

The coding for the facility code and parameter fields for reverse charging in the CALL REQUEST packet is:

Facility Code Field = X'01'
Facility Parameter Field = X'00' (Reverse charging not requested)
X'01' (Reverse charging requested)

Closed User Group

This option, which allows a specific group of users to communicate with each other but not with any user outside the group, may be used but is not checked by the X25NPSI; see the "OPTFACL=" operand of the X25OUFT macro.

SUPPORT OF TYPE 2 NETWORKS

What has been explained above for Type 1 Networks also applies to Type 2 Networks. Moreover, for Type 2 Networks, you have to consider the following options.

High-Priority Class of Traffic

This option is granted for a period of time to a given permanent virtual circuit, or requested by a DTE for a given switched virtual circuit.

It is supported for outgoing and incoming calls and must use packets 128 bytes long. For incoming calls, the X25NPSI checks for high-priority service requests in the facility fields and internally updates the maximum packet size for the duration of the call. For outgoing calls, the X25NPSI supports this facility by using the "OPTFACL=" operand of the X25OUFT macro instruction associated with a VCCPT entry containing a "MAXPKTL=" parameter coded with a value of 128. Refer to the "X.25 Stage 1 Generation Macro Description" section of this manual.

This support has no impact on the internal scheduling of the NCP.

Facility Code = X'01'

Facility Parameter Field = X'00' (Facility not requested)
X'02' (Facility requested)

Note: The 5973-L02 NIA also supports this facility. Even if it is configured with a maximum packet length of 256, the 5973-L02 dynamically changes this value to 128 when this facility is specified in a CALL REQUEST or INCOMING CALL packet.

The One-Way Logical Channel Facility

This user facility limits the use of a logical channel to either incoming or outgoing calls. The switched logical channels are seen by the SNA access method and the NCP as switched SDLC lines. By means of the "CALL=" parameter of the:

- VTAM "LINE" macro instruction, and of the
- TCAM "TERMINAL TERM=LINE" macro instruction.

the use of a switched logical channel can be reserved for a one-way call only.

Special Considerations for Nord Rhein Westfalen Facilities

Only X.25 DTEs working in LLC level 0 can be connected to this network.

The X.25 NCP Packet Switching Interface is included in ACF/NCP/VS using the Customization facility described in the ACF/NCP/VS Customization manual, ZC30-3146. It contains specific control blocks (SSP extension), and seven main modules (NCP extension):

1. The Initialization Routine, running at level 1, to initialize the X25NPSI control blocks.
2. The Network Action Scheduler (NAS), which provides the interface between the NCP and the X25NPSI by giving control to the appropriate X25NPSI module.
3. The Logical Link Control (LLC) routine, which deals with the end-to-end transmission control over a permanent or switched virtual circuit.

Two types of LLC are included in the X25NPSI:

- LLC level 0, as implemented by the SNA/X.25 Protocol Converter (PCNE). LLC level 0 deals with the transmission of data between SNA applications and non-SNA X.25 DTEs (terminal, cluster, host) over a virtual circuit.
 - LLC level 2, as implemented by the Physical Services Header (PSH) routine. LLC level 2 deals with the transmission of data between the X25NPSI and the NIA to which SNA devices are attached.
4. The Virtual Circuit Manager (VCM), which deals with the activation and deactivation of virtual circuits.
 5. The Packet Level Procedure (PLP), which controls packet transmission over the virtual circuits.
 6. The Line Access Control (LAC), which manages the physical link(s) between the 3705 and the X.25 DCE node. The prime function of the LAC is to control the actual transmission of data between the 3705 and the X.25 DCE to which it is attached. The LAC supports both communication scanners type 2 and type 3.
 7. The Link Level 2 Test for virtual circuits (LL2T/VC).

Figure 3-1 shows the X25NPSI data flow.

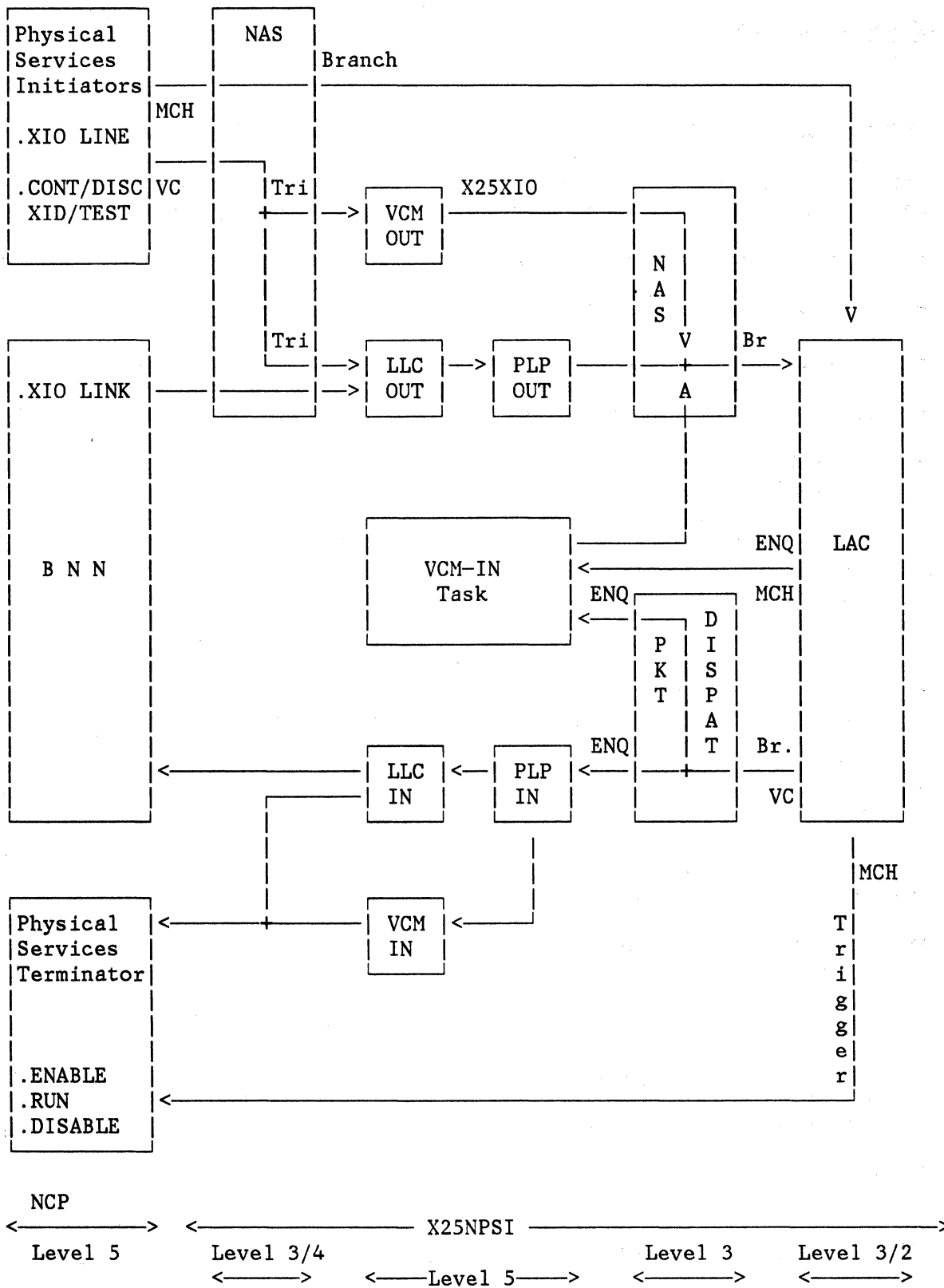


Figure 3-1. X25NPSI Release 1 Data Flow

X25NPSI MODULES

INITIALIZATION ROUTINE

After loading the NCP into the controller, the loader program passes control to the system initialization procedure, which:

- Initializes the communication lines
- Initializes the channel adapters
- Formats the buffer pool
- Initializes the storage protection mechanisms
- Initializes the NCP control blocks that require dynamic initialization.

After this standard system initialization, the X25NPSI adds processing in order to:

- Initialize pointers from the X25NPSI blocks to the standard NCP blocks
- Initialize values in the X25NPSI blocks that cannot be set during NCP generation -- mainly input data offset, slowdown thresholds, and cutoff values.
- Check the compatibility between the NCP network definition and the X25NPSI network definition.

NETWORK ACTION SCHEDULER (NAS)

The NAS gets control from the NCP via the Customization facility in the following cases:

- Each 100 milliseconds to scan the SCBs for Contact, Discontact, or XID
- Each time an XIO is performed by the BNN or the Physical Services and each time a line timer elapses for an X.25 resource
- Each time a level 2 or level 3 Interrupt occurs for an X.25 line.

NAS Entered by Timer Tick (Every 100 milliseconds)

The SCBs are scanned periodically for Contact, Discontact, or XID:

- For an MCH, control is given to the LAP by a branch.
- For a VC, the LLC-OUT is triggered.

XIO or Line Timer

In the case of an MCH:

- For XIO LINE, control is given to the LAP.
- For XIO IMMEDIATE, control is given to the LAP.
- For XIO SETMODE, the NAS itself handles the command and processes it if OK.
- For XIO LINK, the NAS sends a negative response to the host.
- For Line Timeout, the NAS gives control to the LAP.

In the case of a VC:

- For XIO LINE, the VCM-OUT is triggered.
- For XIO IMMEDIATE, branch to a VCM routine for action.
- The XIO SETMODE is handled in the NAS, this XIO SETMODE is mainly used to perform operations at level 3 from level 5.
- For XIO LINK, the NAS enqueues the PIU to the LLC-OUT QCB and triggers this QCB.
- Line Timeout is not used.

Level 2 and Level 3 Interrupts

These interrupts cannot occur for a VC.

In the case of an MCH:

- For a level 2 interrupt, locate the UACB and branch to an entry of the LAP according to the status:
 - No error: The LAP entry address is in MUAL2.
 - Error: The LAP entry address is contained in MUAL2 minus 2.
 - Modem check: Predefined LAP entry.
- For a level 3 interrupt, branch to the address contained in MUAL3 in the UACB of the line.

LOGICAL LINK CONTROL (LLC) ROUTINE

Over a virtual circuit, the LLC plays the same part as the Synchronous Data Link Control for an SDLC line (see Figure 3-2). The LLC performs two functions:

1. Controls the virtual circuit SNA status, and
2. Performs the data transmission integrity check.

For a virtual circuit communicating with a non-SNA X.25 DTE (LLC level 0), the LLC gives control to the PCNE module.

For a virtual circuit communicating with a 5973-L02 NIA (LLC level 2), the LLC gives control to the PSH module.

The unit of data transferred over a virtual circuit by the LLC is called a Logical Link Unit (LLU). Its format is illustrated in Figure 3-3. For LLC level 0, the format of the LLU is the same as that of the RU. For LLC level 2, the LLU consists of a PIU preceded by a 2-byte header.

From a coding point of view, the LLC is divided in two parts:

1. LLC-OUT for outbound LLU processing is invoked by the NAS (in the case of XIO LINK), or by the BNN-PC-OUT (in the case of TEST, XID, SNRM or DISC).
2. LLC-IN for inbound LLU processing is a level 5 routine that is always invoked by the PLP-IN.

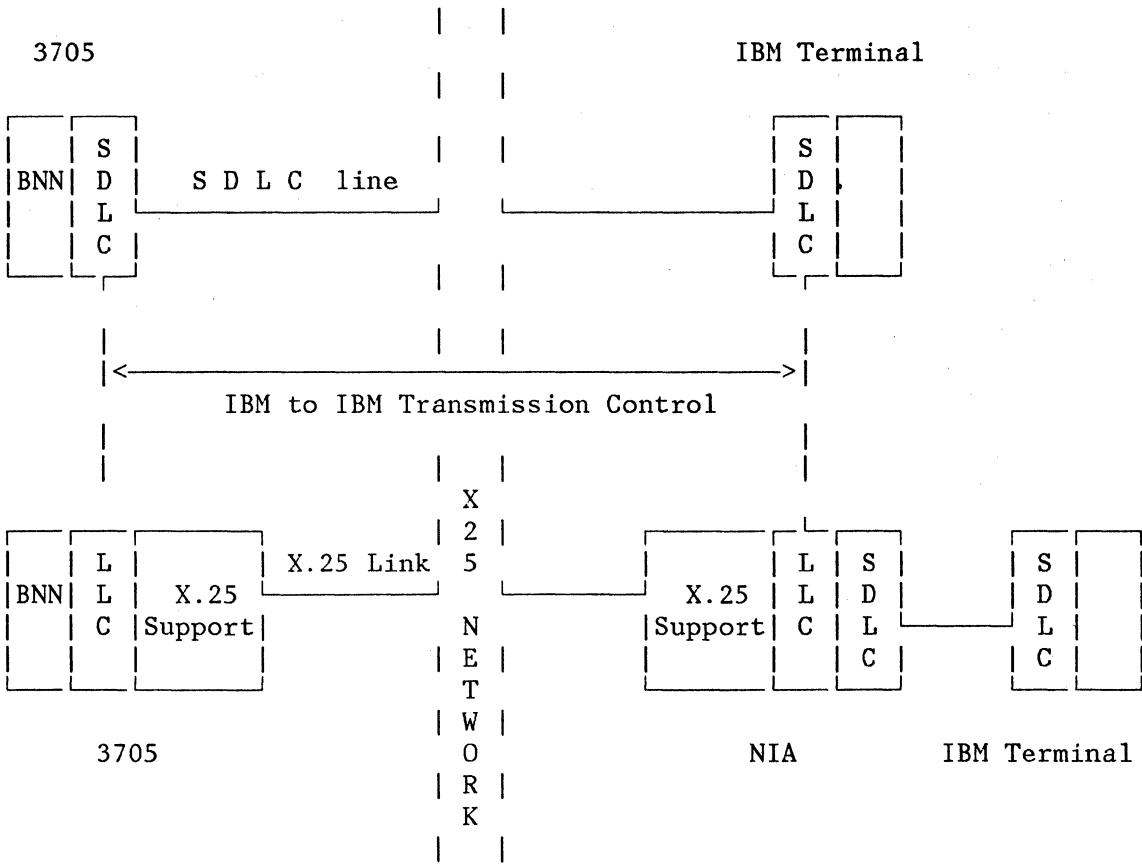


Figure 3-2. The Logical Link Control (LLC)

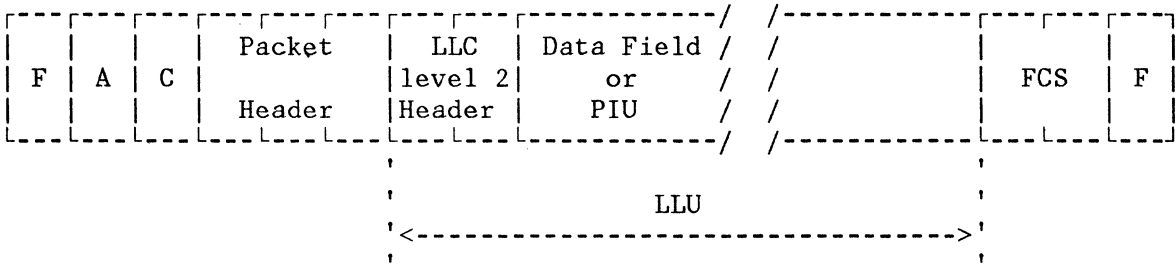


Figure 3-3. Format of the LLU

The LLC level 2 header is the FID-FOX.

Protocol Converter for Non-SNA Equipment (PCNE)

The PCNE is a subroutine called by the LLC dispatcher when processing virtual circuits working in LLC level 0.

The PCNE allows communications between an application using an SNA access method and non-SNA X.25 DTEs (terminal, cluster, or host).

The protocol conversion is performed only between the X.25 packet header (or some X.25 control packets) and the transmission/request header of the SNA PIUs. The data contained in the SNA FM request units, or in the data packets, is not processed by the PCNE and is transferred end-to-end without any conversion.

The handling of the TH and RH by the PCNE is similar to that of the 3767 secondary LU. Only one LU can be associated with a PU -- that is, on the X.25 side, only one PU/LU pair appearance can be associated with one virtual circuit either permanent or switched.

In order to write an SNA application working with the PCNE, you need to know much more about the internal processing of this module. To obtain the required information, please refer to the section of this manual titled "Communicating with non-SNA X.25 DTEs."

Physical Services Header (PSH) Module

The PSH is a routine invoked by the LLC Dispatcher when processing virtual circuits working in LLC level 2. The PSH allows communications between an application using an SNA access method and an SNA terminal connected to the X.25 network via a 5973-L02 NIA.

The PSH performs the following functions:

1. Control of the Virtual Circuit's SNA Status:

The PSH works in asynchronous response mode.

Because there are supervisory (S) frames in the SDLC procedure, the PSH supports the following supervisory LLUs:

```
SNRM = PSCONT
XID = PSXID
DISC = PSDISC
TEST = PSTEST
```

NSA is not used, the answer to a command being the command itself.

2. Control and integrity verification of data by sequencing each output I-LLU:

If a sequencing error occurs during reception, the virtual circuit is cleared. The segmenting of a PIU into several I-LLUs (adapted to packet size) is provided by the segmenting function of the PSH-OUT. The control of the outbound and inbound I-LLU flow is provided by the pacing function. However, before calling the

PLP-OUT to transmit an LLU, the LLC must make sure that the PLP-OUT can transmit this LLU. This means that the packet window is not closed, and that the PLP has not received an RNR packet. In other words, the queuing of data is performed at LLC level.

VIRTUAL CIRCUIT MANAGER (VCM)

The Virtual Circuit Manager is that part of the X25NPSI that supervises the virtual circuits. The VCM controls the enabling and disabling of permanent and switched virtual circuits. It makes and breaks connections with remote data terminals over switched virtual circuits.

The virtual circuits are supervised via commands from the System Services Control Point (SSCP), or via control packets received from the packet network.

The Virtual Circuit Manager code is divided into three parts:

1. The VCM-IN Task, for functions common to all VCs.
2. The Virtual Circuit Manager Out (VCM-OUT), which receives SSCP commands. If the command can be performed, it is sent to the packet network in a control packet.
3. The Virtual Circuit Manager In (VCM-IN), which receives and processes the control packets coming from the packet network.

VCM-IN Task

The VCM-IN task sends or receives RESTART packets after SABM exchange. It breaks the connection for all VCs after DISC exchange, on request from the host's operator or from the X.25 network, and in case of MCH failure.

Virtual Circuit Manager-Out (VCM-OUT)

The VCM-OUT deals with the following SSCP commands:

```
ACTIVATE LINK      }  
DEACTIVATE LINK   } Permanent Virtual Circuit  
  
CONNECT-OUT       }  
ABANDON CONNECT-OUT }  
CONNECT-IN        } Switched Virtual Circuit  
ABANDON CONNECT-IN }  
ABANDON CONNECTION }
```

The VCM-OUT replies with a +RSP/-RSP to the SSCP when it does not send the command to the packet network (ACTIVATE LINK, CONNECT-IN, ABANDON CONNECT-OUT, ABANDON CONNECT-IN). When the SSCP command is sent to the packet network in a control packet (DEACTIVATE LINK, CONNECT-OUT, ABANDON CONNECTION), the +RSP/-RSP to the SSCP will be sent by VCM-IN at

packet network response time. The SSCP command is forwarded to the network in a control packet. The result is that:

- The CONNECT-OUT command produces a call request control packet
- The DEACTIVATE LINK command produces a reset request control packet
- The ABANDON CONNECTION command produces a clear request control packet.

Virtual Circuit Manager-In (VCM-IN)

The VCM-IN receives commands (Control Packet Indications) or responses (Control Packet Confirmations) from the packet network. These network commands/responses are forwarded to the SSCP in request/response PIU format by VCM-IN. The commands processed by VCM-IN are:

- CONNECTION/DISCONNECTION of a switched virtual circuit
- DEACTIVATION of a permanent virtual circuit
- DEACTIVATION of all permanent virtual circuits and DISCONNECTION of all switched virtual circuits.

PACKET LEVEL PROCEDURE (PLP)

The PLP controls the inbound and outbound packet flow. In order to perform these functions, the PLP is divided into:

- The PLP-OUT to handle the flow of outbound packets
- The PLP-IN to handle the flow of inbound packets.

Packet Level Processor-Out (PLP-OUT)

PLP-OUT is a routine running at level 5. It is called by LLC-OUT in order to edit and queue, in packet format, data to be transmitted by the LAC over the multichannel link. PLP-OUT activates the LAC via an X25XIO macro instruction.

PLP-OUT receives an LLU from the LLC-OUT. It adds an information (I) packet header consisting of a packet type, virtual circuit number, and inbound/outbound sequencing. PLP-OUT regulates this outbound flow in accordance to the DTE packet window controlled by the P(R) from the DCE. A received RNR stops this outbound flow until RR packets are received from the DCE.

PLP-OUT computes statistic counters for the number of RNR and data packets. A statistics PIU is sent to the NCP in case of counter overflow.

If the VCM detects an inoperative condition for a given virtual circuit, PLP-OUT is called to snap the packet traffic situation when the problem is detected.

Packet Level Processor-In (PLP-IN)

PLP-IN is made up of two modules: The Packet Dispatcher and the PLP-IN delayed.

The packet dispatcher runs at interrupt level 3. This is a routine performed by the LAC to route received packets to their proper destinations:

Restart packets to the VCM-IN task, and information (I) and other S packets to PLP-IN delayed.

The processing of RR or RNR packets, and more generally the control of the inbound packet flow, is performed in the PLP itself.

PLP-IN computes statistic counters for the number of RR, RNR, and I packets received from the DCE. If a counter overflows, a statistic record is sent to the SSCP.

PLP-IN delayed is activated by the reception of I packets. The LAC splits the received packet in two parts within the input buffers. Therefore, PLP-IN delayed reformats the I packet in a standard PIU before enqueueing it to LLC-IN for later processing.

LINE ACCESS CONTROL (LAC)

The purpose of the LAC is to control the status of the multichannel link(s), and the transmission of data between the 3705 and the PPSN node on the full-duplex link. The functions performed by the LAC can be sorted into three major groups:

1. The common processing related to link status control.
 2. The primary processing in charge of controlling the 3705's primary function.
 3. The secondary processing in charge of controlling the 3705's secondary function.
- The common functions are performed when the link is activated, when an ACTIVATE LINK command is received by the physical services of the NCP, and when the link is deactivated after the physical services have received a DEACTIVATE LINK command; or when a permanent abnormal situation is detected on the link. Once the common function responses are completed, RECMS are generated and sent to the host SSCP.

- The primary functions control the status of the primary leg of the full-duplex link, and the transmission of I frames to the PPSN node. If a permanent abnormal situation is detected on the primary leg, the common functions are scheduled for the deactivation of the link.
- The secondary functions control the status of the secondary leg of the full-duplex link, and the reception of I frames from the PPSN node. If a permanent abnormal situation is detected on the secondary leg, the common functions are scheduled for the deactivation of the link.

The LAC interfaces with the packet dispatcher. The LAC delivers the received packets and returns transmitted packets to the packet dispatcher.

The LAC operates mainly at machine levels 2 and 3:

- Actions requiring a direct interface with the scanners are executed at level 2.
- Transmission initialization and all logical operations are executed at level 3.

The LAC records the activity of the lines by counting the number of bytes, I frames, RRs, RNRs, and REJs exchanged. The counters are delivered to the access method via statistical RECMS, or via station error RECMS, each time a pertinent event occurs for a line (enable, disable, MCH failure, counter overflow).

- The LAP and LAPB protocols are supported.

LINK LEVEL 2 TEST FOR VIRTUAL CIRCUITS (LL2T/VC)

This routine causes the same functions to be performed for virtual circuits as are performed by the Link Level 2 Test for SDLC links.

The test is independent of the LLC level. It operates both for SNA terminals through NIA, and for non-SNA X.25 DTEs able to echo received data.

In order to avoid packet segmenting, test data received from the host is truncated to the maximum packet length.

Please refer to the ACF/VTAM documentation for details concerning the Link Level 2 Test mode of operation.

CONTROL BLOCKS

This section presents the new control blocks prepared by the X.25 generation and created at NCP generation time, and shows the relationship between them and NCP blocks.

Note 3: The BAR-VECTOR field (CCBBAR) of the VC's UACBs contain X'0000'. This serves to identify them.

X25NPSI BLOCKS

Figure 3-5 shows the relationship between these control blocks, and Figure 3-6 shows the relationship between these and NCP control blocks.

Blocks Initialized by the X25BUILD Macro Processor

Two types of block are initialized by the X25BUILD macro processor.

1. The Address Vector Table (AVT) is 28 bytes long. It contains a pointer to the Multi Channel Address Table (MKBAT).
2. The MCH Address Table (MKBAT) consists of twelve-byte entries that contain a pointer to each Multichannel Block (MKB) and counters for the NAS scanning routine. An entry is reserved for each subsequent X25MCH macro.

Blocks Initialized by the X25NET Macro Processor

The X25NET macro reserves space for the Virtual Circuit Parameter Index Table (VCCPTIT) and the User's Facility and Data Index Table (OUFTIT).

Blocks Initialized by the X25VCCPT Macro Processor

The X25VCCPT macro initializes one Virtual Circuit Parameter Table (VCCPT) and the corresponding entry in the VCCPTIT.

Blocks Initialized by the X25OUFT Macro Processor

The X25OUFT macro initializes the User's Facility and Data Table (OUFT) and the corresponding entry in the OUFTIT.

Blocks Initialized by the X25MCH Macro Processor

The X25MCH processor for a multichannel link initializes four types of blocks: The User Adapter Control Blocks (UACBs), the Multichannel Block (MKB), the Virtual Circuit Group Address Table (VCGAT), the Virtual Circuit Block Address Table (VCBAT).

- The Receive and Transmit UACB contains mainly the interface with the NCP and plays the same part as the ACBs do for a standard SDLC line.
- The Multichannel Block (MKB) contains all the characteristics of the multichannel links given by the X25MCH macro parameters, and pointers to the NCP and related X25NPSI blocks.

- The Virtual Circuit Group Address Table (VCGAT) contains pointers for all defined Logical Channel Groups to the entry in the VCBAT corresponding to Logical Channel Number zero, even if it is not defined. Each entry in the VCGAT is eight bytes.
- The Virtual Circuit Block Address Table (VCBAT) contains pointers for all defined Logical channel Numbers to the corresponding Virtual Circuit Block (VCB) and CUB. Each entry in the VCBAT is twelve bytes.

Block Initialized by the X25LCG macro

The X25LCG macro initializes an entry in the VCGAT.

Blocks Initialized by the X25VC Macro Processor

A Virtual Circuit Block (VCB) is created for each permanent or switched virtual circuit by the X25VC macro. The VCB is initialized with the following information:

- Type of virtual circuit
- Number of the virtual circuit
- Pointer to the MKB.

A User Adapter Control Block (UACB) is created for each virtual circuit.

A Secondary Logical Unit Block (SLUB) is created when the line has been defined with LLC=PCNE0 (LLC level 0).

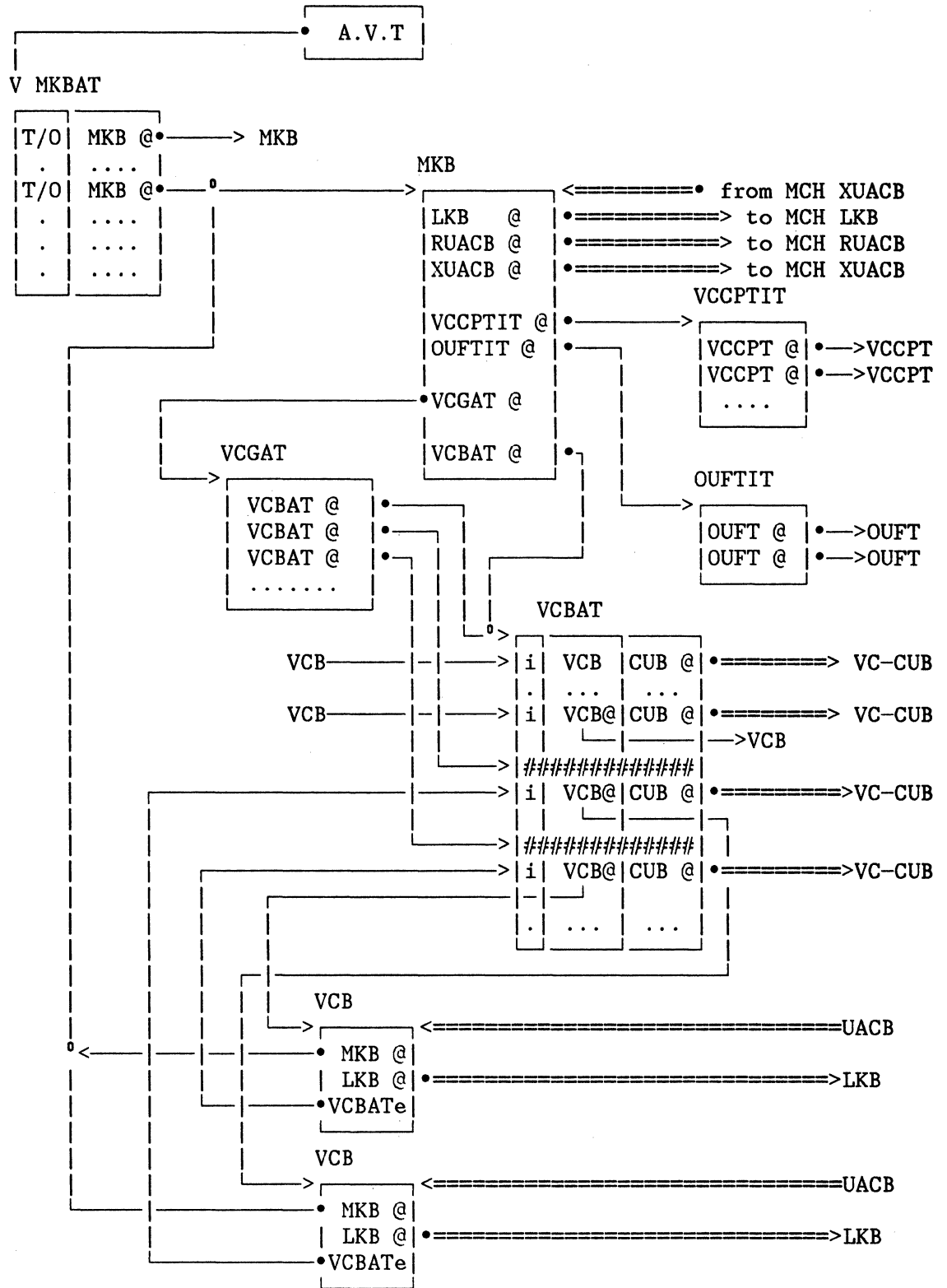


Figure 3-5. X25NPSI Control Block Relationship

Note: The ==> between the X.25 and NCP control blocks are established at INITIALIZATION time; the others are established at sysgen time.

RECORD FORMATS

FRAME FORMAT

All transmissions over a multichannel link are in frame format. The frame format is:

FLAG	ADDRESS	CONTROL	INFORMATION	FRAME CHECKING SEQUENCE		FLAG
F	A	C	I	FCS1	FCS2	F

0--7 0-----7 0-----7 8 x N bits 0-----7 0-----7 0--7

1. Flag: The (F) flag is equal to X'7E'
2. Address field:

Commands from the DCE to the DTE contain X'03'
Responses from the DTE to the DCE contain X'03'
Commands from the DTE to the DCE contain X'01'
Responses from the DCE to the DTE contain X'01'

In other words:

The address of the X.25 LAC's secondary is X'03, and
The address of the DCE's secondary is X'01'.

3. Control field

This byte contains commands and responses described in the following table:

FORMAT	COMMANDS	RESPONSES	ENCODING									
			0	1	2	3	4	5	6	7		
Information transfer	I Information		N(R)	P	N(S)	0						
Supervisory	RR Receive ready	RR Receive ready	N(R)	P/F	0	0	0	1				
	RNR Receive not ready	RNR Receive not ready	N(R)	P/F	0	1	0	1				
	REJ Reject	REJ Reject	N(R)	P/F	1	0	0	1				
	SARM Set synchronous response mode		0	0	0	P	1	1	1	1		
		DM Disconnect mode	0	0	0	F	1	1	1	1		
Non Sequenced	SABM Set asynchronous balanced mode		0	0	1	P	1	1	1	1		
			0	1	0	P	0	0	1	1		
	DISC Disconnect	UA Unnumbered acknowledge	0	1	1	F	0	0	1	1		
		FRMR Frame reject	1	0	0	F	0	1	1	1		

where:

N(S) is the Send sequence number

N(R) is the Receive sequence number

P/F is the Poll/Final bit

The use of the above commands/responses is in full conformity with CCITT/X.25 recommendations.

The first bit of each byte sent over the line is bit 7.

4. Frame Checking Sequence

The FCS is a 16-bit sequence. It is calculated by using the generator polynomial:

$$X^{16} + X^{12} + X^5 + 1.$$

Table of Supported Frames

1. PSNSTAT = LAP

FRAMES	SENT BY 3705		RECOGNIZED BY 3705	
	Command	Response	Command	Response
I (\pm P)	*		*	
SARM (+ P) (- P)	*		*	
DISC (+ P) (- P)	*		*	
UA (+ F) (- F)		*		*
FRMR (\pm F)		*		*
RR (\pm F)		*		*
RNR (\pm F)		*		*
REJ (\pm F)		*		*

The + character means "with", that is, +P means with poll bit.

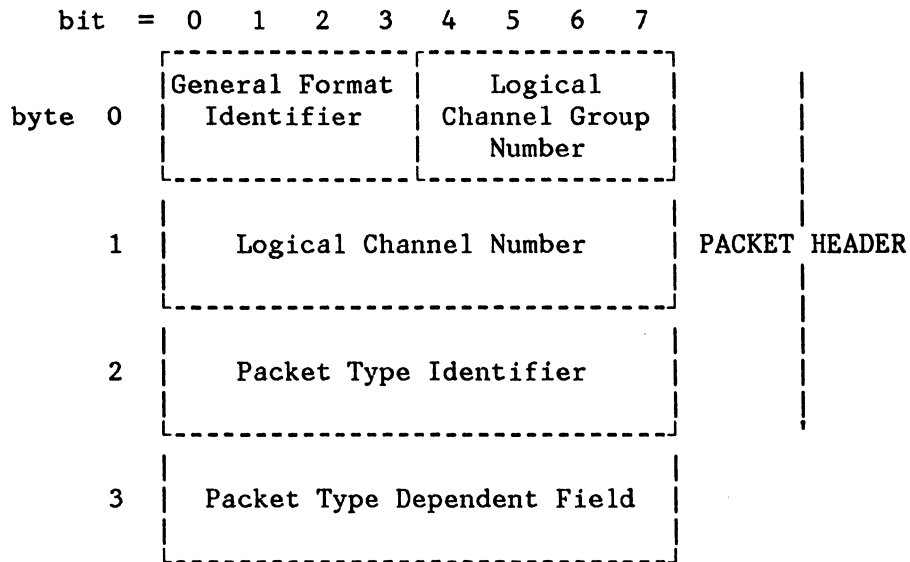
The - character means "without", that is, -F means without final bit.

2. PSNSTAT = LAPB

FRAMES	SENT BY 3705		RECOGNIZED BY 3705	
	Command	Response	Command	Response
I (+ P) (- P)	*		*	
SABM (+ P) (- P)	*		*	
DISC (+ P) (- P)	*		*	
UA (+ F) (- F)		*		*
DM (+ F) (- F)				*
FRMR (+ F) (- F)		*		*
RR (+ P/F) (- P/F)	*	*	*	*
RNR (+ P/F) (- P/F)	*	*	*	*
REJ (+ P/F) (- P/F)		*		*

PACKET P/FORMAT

The following diagram shows the packet format:



Each packet is identified by the General Format Identifier (byte 0, bits 0 to 3) and by the Packet Type Identifier (byte 2).

The Virtual Circuit Number is made up of the Logical Channel Group Number (byte 0, bits 4 to 7) and the Logical Channel Number (byte 1).

The meaning of the fields starting from byte 3 depends on the type of the packet.

The following table shows all the possible packet formats supported by this X25NPSI.

P A C K E T T Y P E		Byte 0 bits				Byte 2 bits							
FROM DCE TO DTE	FROM DTE TO DCE	0	1	2	3	0	1	2	3	4	5	6	7
CALL SET UP AND CLEARING													
Incoming Call	Call Request	0	0	0	1	0	0	0	0	1	0	1	1
Call Connected	Call Accepted	0	0	0	1	0	0	0	0	1	1	1	1
Clear Indication	Clear Request	0	0	0	1	0	0	0	1	0	0	1	1
DCE Clear Confirmation	DTE Clear Confirmation	0	0	0	1	0	0	0	1	0	1	1	1
DATA													
DCE Data	DTE Data	Q	0	0	1	R	R	R	M	S	S	S	0
FLOW CONTROL AND RESET													
DCE RR	DTE RR	0	0	0	1	R	R	R	0	0	0	0	1
DCE RNR	DTE RNR	0	0	0	1	R	R	R	0	0	1	0	1
Reset Indication	Reset Request	0	0	0	1	0	0	0	1	1	0	1	1
DCE Reset Confirmation	DTE Reset Confirmation	0	0	0	1	0	0	0	1	1	1	1	1
DCE Interrupt	DTE Interrupt	0	0	0	1	0	0	1	0	0	0	1	1
DCE Interrupt Confirm	DTE Interrupt Confirm	0	0	0	1	0	0	1	0	0	1	1	1
RESTART													
Restart Indication	Restart Request	0	0	0	1	1	1	1	1	1	0	1	1
DCE Restart Confirmation	DTE Restart Confirmation	0	0	0	1	1	1	1	1	1	1	1	1

Where:

- Q = Data Qualifier bit (not supported by Release 1 of the X25NPSI)
- M = More Data indication
- RRR = P(R) Packet Receive Sequence Number
- SSS = P(S) Packet Send Sequence Number

An I packet is a packet which contains a P(S) and P(R) field.

An S packet is a packet which contains a P(R) field only.

An NS Packet is a packet which contains neither P(S) nor P(R) fields.

Note: In a CLEAR REQUEST or a RESET REQUEST packet, byte 3 is called the CAUSE byte and is set to X'00', and byte 4 is called the DIAGNOSTIC byte and is coded as explained below. DATAPAC does not support the diagnostic field in the CLEAR REQUEST packet. This means that, in the case of DATAPAC, the X25NPSI sends 4-byte CLEAR REQUEST packets.

The Diagnostic Field in the Clear Request Packet for Type 1 Networks

When the X25NPSI sends a CLEAR REQUEST packet, the "Clearing Cause" byte is set to X'00' and the diagnostic field byte is set to the following values:

HEXADECIMAL VALUE	EXPLANATION
00	Disconnection upon request from the host, or if an ANS situation occurs
45	Incoming call received and link not owned by SSCP
84	PLP or LLC error
A2	Invalid or unexpected control packet received
E0	Reset indication received while in VCM inoperative status
E3	Incoming call received and VC not in answer mode
E5	Incoming call received and LLC type invalid
E6	Incoming call received and LLC type not supported
E8	Timeout on call request
E9	Incoming call received for a callout only VC
EA	Incoming call received during NCP slowdown
EB	Reset indication while in VCM data transfer status
EC	Incoming call received and Switched Connection Terminator (CXDDSCT) not present

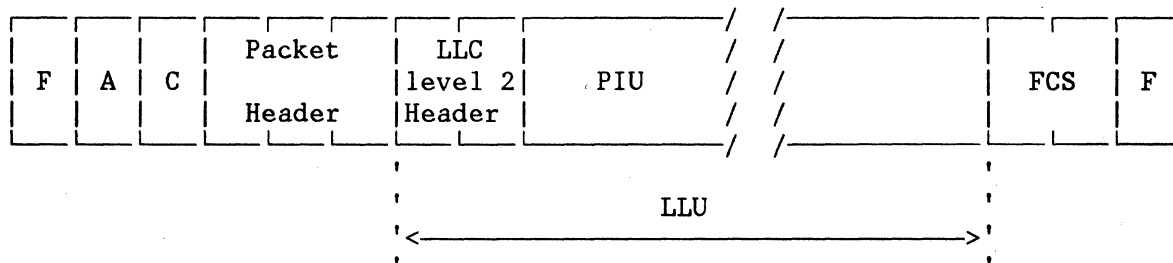
The Diagnostic Field in the Reset Request Packet

When the X25NPSI sends a RESET REQUEST packet, the "Resetting Cause" byte is set to X'00' and the diagnostic byte is set to the following values:

HEXADECIMAL VALUE	EXPLANATION
00	Value required for type 2 networks
82	Invalid or unexpected control packet received
83	Disconnection upon request from the SSCP, or because an ANS situation has occurred
84	PLP or LLC error

LOGICAL LINK UNIT FORMAT

An LLU is inserted in a frame in the following manner:



The LLC header in LLC level 2 is made up of 2 bytes.

The following table shows the different types of LLU:

LLU TYPE		Byte 0 bits								Byte 1 bits							
From 3705 to NIA From NIA to 3705		0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
DATA-LLU																	
Data LLU	Data LLU	1	1	1	1	0	X	1	0	S	S	S	S	S	S	S	S
CONTROL LLU																	
PSCONT	PSCONT	1	1	1	1	0	0	0	1	0	0	0	0	1	0	0	0
PSDISC	PSDISC	1	1	1	1	0	0	0	1	0	0	0	0	0	0	1	0
PSXID	PSXID	1	1	1	1	0	0	0	1	0	0	0	0	0	1	0	0
PSTEST	PSTEST	1	1	1	1	0	0	0	1	0	0	0	0	0	1	1	0

Where SSSSSSSS = N(S) = LLC Send Sequence Number

Where X is the Segment Indicator:

X=1 the LLU is not the last of a chain

X=0 the LLU is the last of a chain or a unique segment.

COMMUNICATING WITH NON-SNA X.25 DTES

The PCNE allows communications between a Host application using an SNA access method and a non-SNA X.25 DTE (terminal, cluster, or host). An SNA host connected to a 3705 running X25NPSI may itself be considered as a non-SNA X.25 DTE by another host; that is, PCNE-to-PCNE connection is allowed. The conversion is performed with some restrictions, both on the X.25 and on the SNA protocols. The limitations are described later in this section.

Protocol conversion is performed only between the X.25 packet header (or some X.25 control/interrupt packets) and the transmission/request header of the SNA PIUs. Data contained in SNA FM request units or in data packets is not processed by the PCNE and is transferred end-to-end without any conversion.

The PCNE simulates an SNA LU type 1, working in half-duplex mode (contention or flip-flop) with one local host application program. Only one LU can be associated with a PU; that is, on the X.25 side, only one PU/LU pair can be associated with one virtual circuit (either permanent or switched).

LIMITATIONS

- There can be only one PU/LU pair per virtual circuit. As a result, there is only one APPL/SLU SNA session per virtual circuit.
- Either half-duplex contention or half-duplex flip-flop mode is supported.
- PCNE-to-PCNE communications are allowed in half-duplex contention mode. Because the X25NPSI provides for both inbound and outbound data queueing, a contention problem cannot cause any loss of data and the end-to-end data flow may be independent from the simulated SNA data flow.
- | • To perform a full-duplex end-to-end data flow, either on PCNE-to-PCNE or PCNE-to-X.25 DTE Communications, you must use an SNA session defined with the "Exception Response Mode" and "Single RU chain" for both flows: PLU/SLU and SLU/PLU.
- Outgoing RUs (from the host) are converted into independent X.25 packets, whatever the setting of the chaining bits.
- An incoming set of packets, linked by the "more data bit", is sent to the host as one RU OIC within a single segment.
- The data part of the FMD RU in the PLU-SLU session is not processed by the PCNE; that is, the application must understand the data format of the X.25 equipment with which it communicates. The PCNE does not perform character stream mapping.

- Only the EBCDIC character code is supported.
- The PCNE allows the connection of non-SNA X.25 DTEs only; that is, the "PAD" is not supported.
- When calling a host over a switched virtual circuit, a non-SNA X.25 DTE must insert the following in the Call User Data field of the CALL REQUEST packet: X'CO', followed by the five digits (two and one half bytes) of either
 - The "IDNUM=" parameter contained in the PU of the macro describing this equipment to VTAM, or
 - The identification number contained in the INVLIST macro instruction describing this equipment to TCAM.

Remember that an SNA station identification is made up of four bytes: X'BBBNNNN', where X'BBB' represents the identification block, and X'NNNN' represents the identification number.

ACTION ON PHYSICAL SERVICES REQUESTS

IDENTIFICATION EXCHANGE

Call-Out

When the VCM receives a CONNECT-OUT with LLC=PCNEO, the last five digits representing the "SSCP identification number" as specified in the DIALNO keyword are stored in the SLUB.

Then, the VCM builds a CALL REQUEST packet, with the following information in the 1st byte of the Call User Data field:

X'CO' if LLC=PCNEO was specified

followed by a "remote identification number". This remote identification number is necessary, when the X.25 equipment is also a PCNE, to identify the remote PU of the remote SNA access method. The "remote identification number" is equal to the "SSCP identification number" value plus one, or to the "default identification number". Refer to the PU macro instruction in the "ACF/VTAM Considerations" section of this manual.

After receiving the CALL CONNECTED packet, the PCNE gets the local ID from the SLUB and passes it to the physical services for insertion in the REQUEST CONTACT command sent to the host.

Refer to the PATH macro instruction in the "ACF/VTAM Considerations" section of this manual for the format of these CALL packets.

Call-In

When an INCOMING CALL packet is received with LLC=PCNE0, the next two and one half bytes (representing the identification number parameter) are stored in the SLUB extension. The VCM sends the CALL CONNECTED packet, triggering the PCNE, which gets the ID from the SLUB and passes it to the physical services for insertion in the REQUEST CONTACT command sent to the host.

CONTACT/DISCONTACT

1. When CONTACT is requested by the physical services, the PCNE triggers the physical services for a positive response if the multichannel link is in the ACTIVE status.
2. When DISCONTACT is requested, the PCNE triggers the physical services for a positive response. All the packets received over the associated virtual circuits are discarded after the DISCONTACT processing.

ACTION ON SESSION CONTROL RUS

The PCNE supports the following session control RUs when they are issued by the host:

ACTLU (Activate Logical Unit)
BIND
SDT
CLEAR
UNBIND
DACTLU (Deactivate Logical Unit)

A response is returned locally.

ACTLU

All pending conditions are cleared and the ACTLU IN PROGRESS status is entered.

The positive response is immediately sent to the host, and the ONLINE status is entered.

Note: The type of activation (ERP, WARM, COLD) is not checked by the LU simulator.

BIND

The BIND parameters are checked against the values listed in Figure 4-1. If valid, the BIND parameters are stored in the SLUB and a positive response is sent to the host.

Note: As for the ACTLU command, the type of activation (ERP, WARM, COLD) is not checked by the LU simulator.

SDT

The DATA TRAFFIC status is entered and a positive response is sent to the host.

CLEAR

All pending conditions are cleared locally, and a positive response is sent to the host.

UNBIND

The session condition is reset and a positive response is sent to the host. The ONLINE status waiting for DACTLU is entered.

DACTLU

All pending conditions are cleared, a positive response is sent to the host, and the OFFLINE status is entered.

BYTES	BITS	VALUE	MEANING
0	0-7	X'31'	BIND code
1	0-3	B'0000'	BIND format = 0
	4-7	B'0001'	BIND type =1
2	0-7	X'03'	FM profile = 3
3	0-7	X'03'	TS profile = 3
DEFINITION OF PRIMARY PROTOCOL:			
4	0	B'1'	Multiple request chains
	1	B'0'	Mandatory value, immediate request
	2-3	B'01'	Exception response
		B'10'	Definite response
		B'11'	Exception and definite response
	4-5	---	Not used
	6	B'0'	Compression not used
	7	B'1'	Primary may send EB
	B'0'	Primary will not send EB	
DEFINITION OF SECONDARY PROTOCOL:			
5	0	B'1'	Multiple request chains (the PCNE always sends OIC RU to the host)
	1	B'0'	Mandatory value, immediate request
	2-3	B'01'	Exception response
		B'10'	Definite response
		B'11'	Exception and definite response
	4-5	---	Not used
	6	B'0'	Compression not used
	7	B'1'	Primary may send EB
	B'0'	Primary will not send EB	
COMMON PROTOCOL:			
6	0	---	Not used
	1	B'0'	FM header not used
	2	B'1'	Bracket used
		B'0'	Bracket not used
	3	B'1'	Bracket termination rule 1
	4	B'0'	EBCDIC
	5-6-7	---	Not used
COMMON PROTOCOL:			
7	0-1	B'01'	HDX Contention
		B'10'	HDX Flip-Flop
	2	B'0'	Primary LU recovery responsibility
	3	B'0'	First speaker is secondary
	4-7	---	Not used

Figure 4-1. The BIND Parameter List

ACTION ON DATA FLOW CONTROL RUS

The PCNE supports the following DFC RUs when they are issued by the host:

CANCEL
SIGNAL
BID
CHASE
SHUTD (Shutdown)

The PCNE sends the SHUTC DFC RU to the host.

CANCEL

CANCEL is never sent by the PCNE. When CANCEL is received from the host, a positive response is sent back to the host without any other action. As a matter of fact, since the "chaining" concept in the PCNE is only local, the host application program needs a higher level end-to-end protocol to cancel such a chain of RUs.

SIGNAL

The user's data signals are not processed.

The SIGNAL command is never generated by the PCNE. When the SIGNAL command is received from the host, a positive response is sent back to the host without further action.

BID (IN "BETWEEN BRACKETS" STATUS)

The BID command is accepted if the HDX bracket status permits processing an RU request from the host with "Begin Bracket". In this case, the "Begin Bracket Pending" status is entered, and all data packets received from the network are held in buffers until the "Begin Bracket" RU is received. For more details, refer to the "Bracket Management" section of this manual.

CHASE

A positive response is sent to the host without further action.

SHUTD/SHUTC

As soon as the bracket status changes to BETB, after a SHUTD request is received from the host, the LU simulator sends a SHUTC request to the host, and all incoming data packets are discarded.

Note: If the SLU can close the brackets, SHUTC can be sent after reception of the first packet without the "more data" bit.

ACTION ON FUNCTION MANAGEMENT (FM) DATA RUS

Figure 4-2 illustrates the inbound and outbound flow of FM data RUs.

OUTBOUND FLOW

The PCNE does not support outbound SNA segmenting. For this reason, the MAXDATA parameter of the VTAM "PU" macro instruction, and of the TCAM "TERMINAL TERM=PUNT" macro instruction, must be coded with a value higher than the maximum RU size sent by the application.

Each outgoing RU is sent as an independent set of packets. In each set, all packets except the last have the "more data" bit ON in their packet headers. The last packet has its "more data" bit OFF. Adapting the data length to the characteristics of the connection is done by the PCNE in such a manner that all the packets with the "more data" bit ON contain a number of data bytes equal to the maximum packet length ("MAXPKTL=" keyword) acceptable by the DTE interface.

The chaining concept is not translated end-to-end. It is supported for compatibility purposes only.

The outbound response protocol is defined in the BIND parameters by byte 4, bits 2-3 (see Figure 4-1). Because the LU simulator works with a pacing equal to 1, the PCNE sends a response (IPR, +RSP, or -RSP) to each RU received from the host. If requested in the RH, the response is sent as soon as the first packet built from the RU is scheduled on the outbound queue.

When received from the host, IPR and Definite Response mean only that the beginning of the RU is scheduled on the outbound queue. They do not mean that it has been correctly sent. An Exception Response means that the RU cannot be sent and has been discarded.

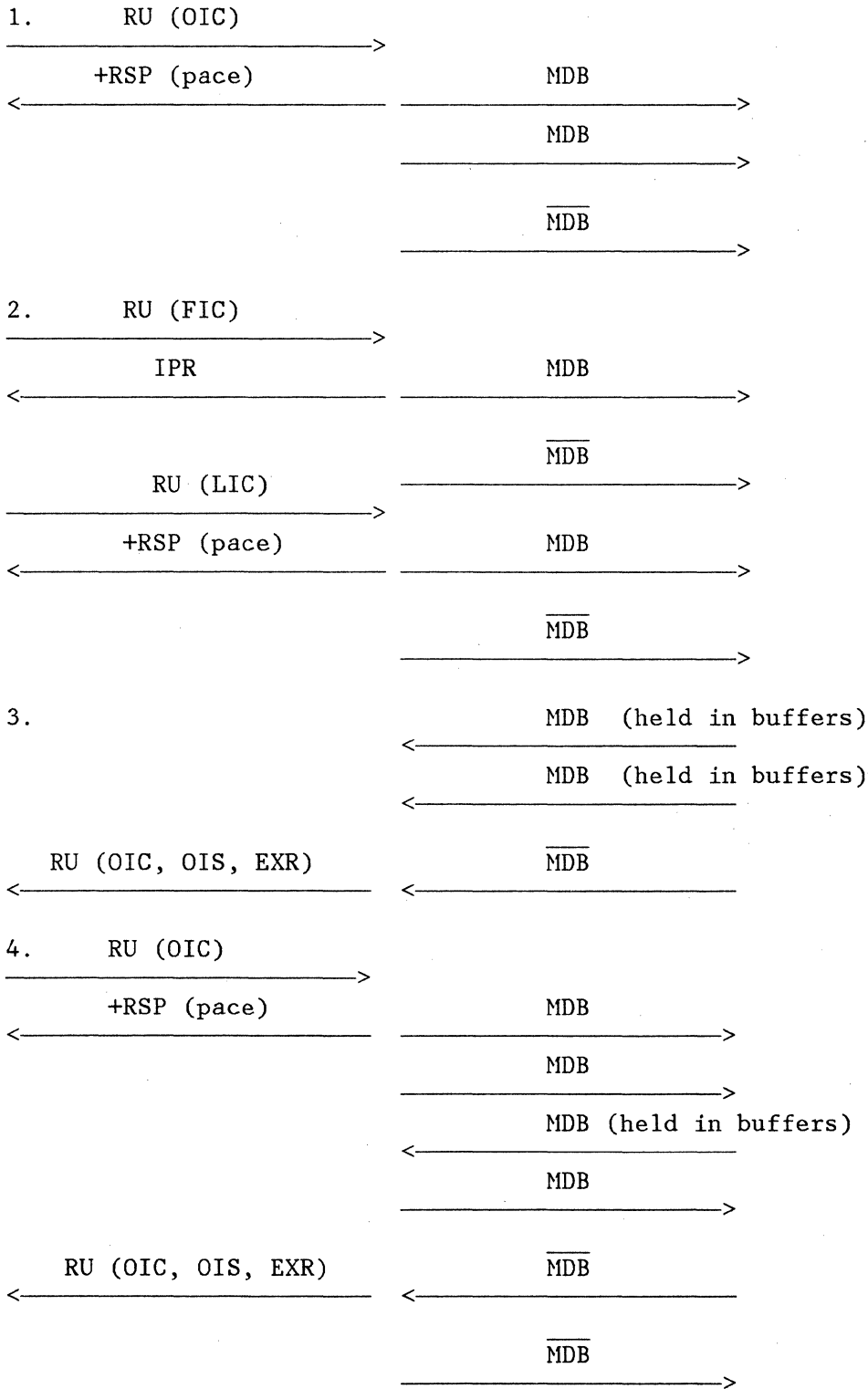


Figure 4-2 (1 of 2). Function Management Data Flow

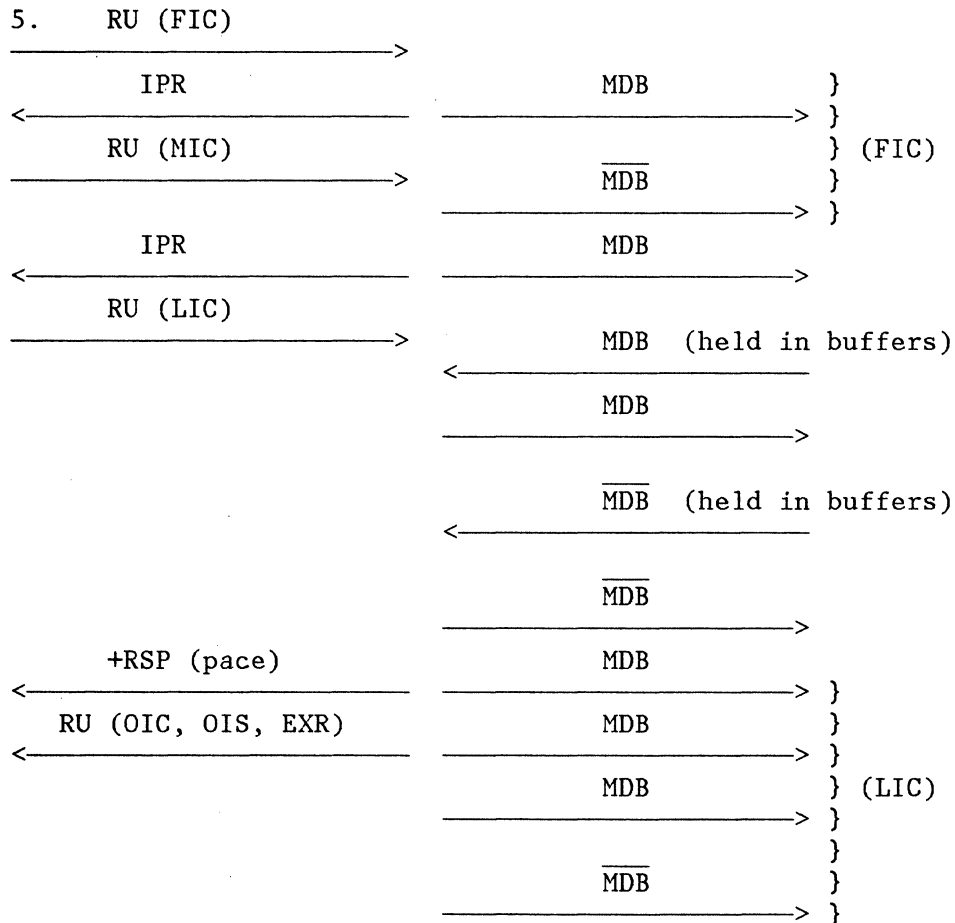


Figure 4-2 (2 of 2). Function Management Data Flow

INBOUND FLOW

A set of packets with the "more data" bit ON in their packet headers (up to the first packet with the "more data" bit OFF) is sent to the host as an only-in-chain and single-segment RU. All data packets received during the transmission of a CHAIN by the host are held in buffers until the PCNE can deliver this data to the host (that is, until the PCNE processes the last-in-chain RU).

Since each RU request sent to the host is sent as only-in-chain, the PCNE sets the response bits in the RH of each request based upon the value of the BIND parameters (byte 5, bits 2-3) for the secondary-to-primary protocol. The PCNE concerns itself with the response coming from the host (whether it is positive or negative) only when the request RU specifies a Definite Response. Otherwise, in Exception Response mode, the LU Simulator (LUSIM) internal status changes directly to standby as soon as the RU request is sent to the host. Use of the Exception Response mode for the secondary protocol facilitates inbound traffic flow, since in this case the PCNE does not have to wait for a response for each PIU from the host.

PACING

The PCNE supports only outbound pacing, and sends a pacing response each time a request is received with the PACE bit ON.

Specifying PACING=(1,1) is mandatory for a PU working under LLC level 0. VPACING is independent of the X25NPSI. VPACING should be chosen with regards to the host application and to the buffers available in the 3705.

Note: The PACING fields of the "BIND=" parameter should be coded according to this value.

Though the pacing information placed by the PCNE in a response does not result in the release of the buffers containing the corresponding RU request, the PACING and VPACING concepts allow regulating the data flow between the host and the NCP. When determining pacing parameters, you should take into account the packet window processing. In fact, an RU request from the host entering the NCP is processed by the PCNE only when the packet window is open -- that is, when the previous RUs have been sent to the network.

FLOW DIRECTION CONTROL

- In half-duplex contention mode, contention is resolved at the X25NPSI level by the PCNE, which uses outbound and inbound data queueing.
- In half-duplex flip-flop mode, the PCNE changes its internal status when it receives a data packet from the network with the MDB turned OFF. Receipt of a data packet from the network with the MDB turned OFF causes the PCNE to send a request RU to the host with the "Change Direction" bit turned ON.

CODE SELECTION

The PCNE does not check the data contained in the data packets; however, the data contained in the LOGON message must be coded exactly as it is defined in the access method (VTAM/TCAM) USS conversion table, in order for the SSCP to establish a successful LU-LU session between a primary LU located in the host and the secondary LU associated with the virtual circuit. For more information, see the "Logon Procedure" in the following "Method of Operation" section.

SEQUENCING

Since the PCNE supports the FID3 TH only, the sequence numbers are managed by the BNN function of the NCP.

METHOD OF OPERATION

LOGON PROCEDURE

A LOGON message is a PIU sent by an SLU during the SSCP-SLU session to request an APPL-SLU session. It takes place between the ACTLU and the BIND SNA commands. Therefore, any data packet received from an X.25 equipment after transmission to the host of the +RSP to ACTLU, and before reception of a BIND command, is considered to be a LOGON message, and the PCNE delivers this packet to the host over the SSCP-SLU session.

The LOGON information which may be contained is several data packets, is transferred to the host without being modified by the PCNE. The data format must be compatible with the USS definition table.

- If you select the ACF/VTAM-supplied default USS conversion table, the LOGON message must be entered in the following format:

```
LOGON [APPLID (name)] [LOGMODE (name)] [DATA (user data)]
```

- If you select the ACF/TCAM-supplied default USS conversion table, the LOGON message must be entered in one of the following two formats:

```
INITS luname,modename  
LOGON luname,modename
```

LOGOFF PROCEDURE

The X.25 DTE has no means to request the SSCP to end the APPL-SLU session. You need a higher protocol at application level: the X.25 DTE can send special data information recognized by the application that will cause the application to request the SSCP to end the APPL-SLU session.

BRACKET MANAGEMENT

The PCNE is always the first speaker.

WHEN THE SLU (PCNE) CANNOT SEND EB

1. The first data packet without MDB received from the X.25 DTE (see Figure 4-3) when the PCNE is in the BETB state causes the bracket state manager to enter the INB state, and an FMD RU with BB ON to be sent to the host. The PCNE remains in the INB state until it receives EB from the host.
2. Bracket initialized by a BID sequence: If the PCNE is in the BETB state and receives a BID from the host, a positive response is sent to the host and the BBP state is entered. All data packets

received while in this state are held in buffers until the BRACKET and HDX states permit their processing. The INB state is entered when the first RU with BB set ON is received from the host. The INB state is left when an RU with EB set ON is received.

3. Bracket initialized by a data RU (implicit BID): If while in the BETB state the PCNE receives from the host an FMD RU with BB set ON, the PCNE sends the data packet(s) to the X.25 DTE and enters the INB state.
4. If the PCNE receives a BID while in the INB state, an error response is returned.
5. If the PCNE receives an FMD RU with BB set ON while in the INB state, an error response is returned to the host and the PCNE remains in the same state.

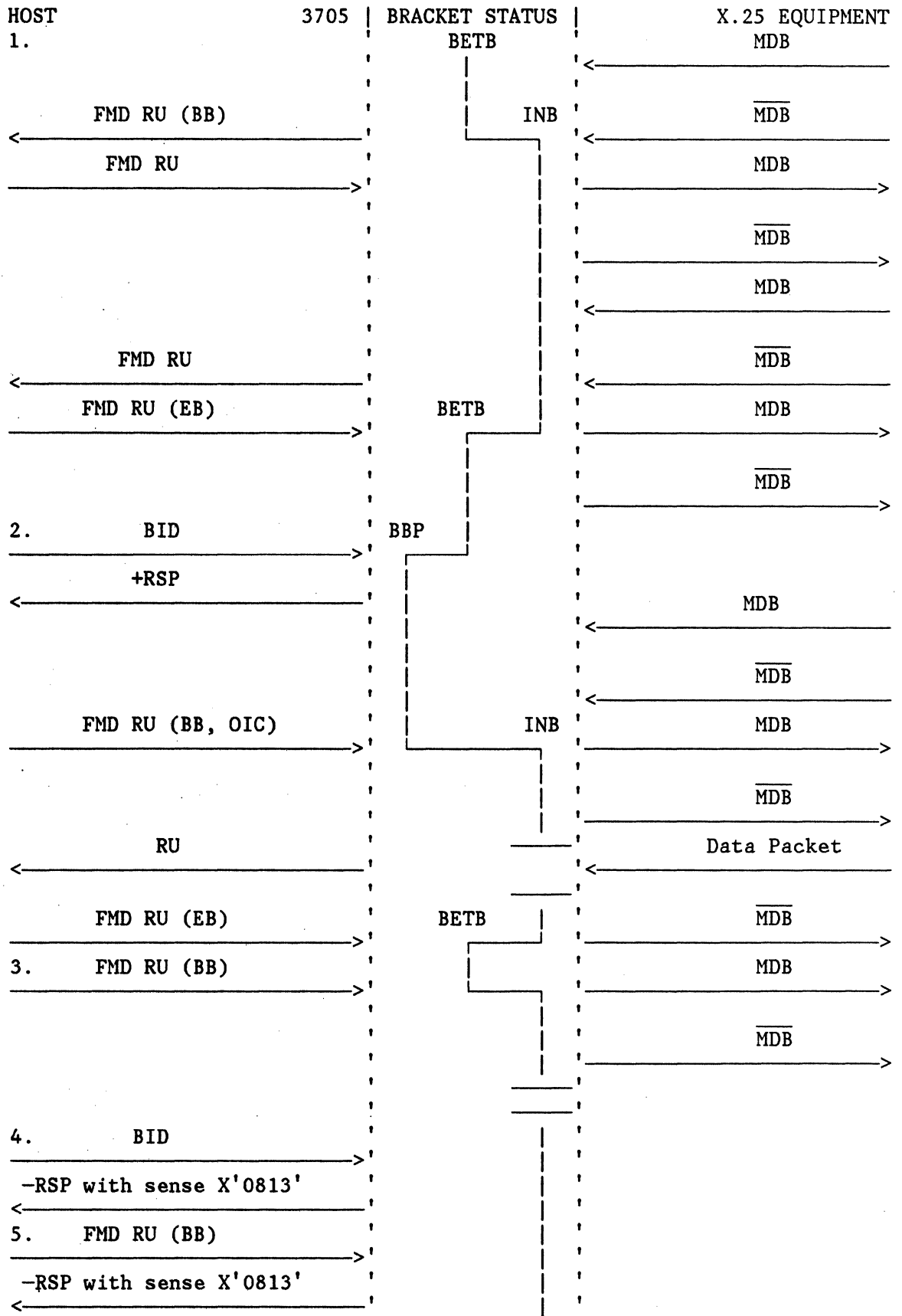


Figure 4-3. Bracket Protocol When the SLU Cannot Send EB

WHEN THE SLU (PCNE) CAN SEND EB

1. If the PCNE is in the BETB state and receives a set of data packets with MDB set ON (up to the first packet with MDB set OFF), it sends one FMD RU with BB and EB set ON (see Figure 4-4). The PCNE remains in the BETB state.
2. If the PCNE is in the INB state and receives a set of data packets with MDB set ON (up to the first packet with MDB set OFF), it sends the host one FMD RU with EB set ON. The PCNE then enters the BETB state.

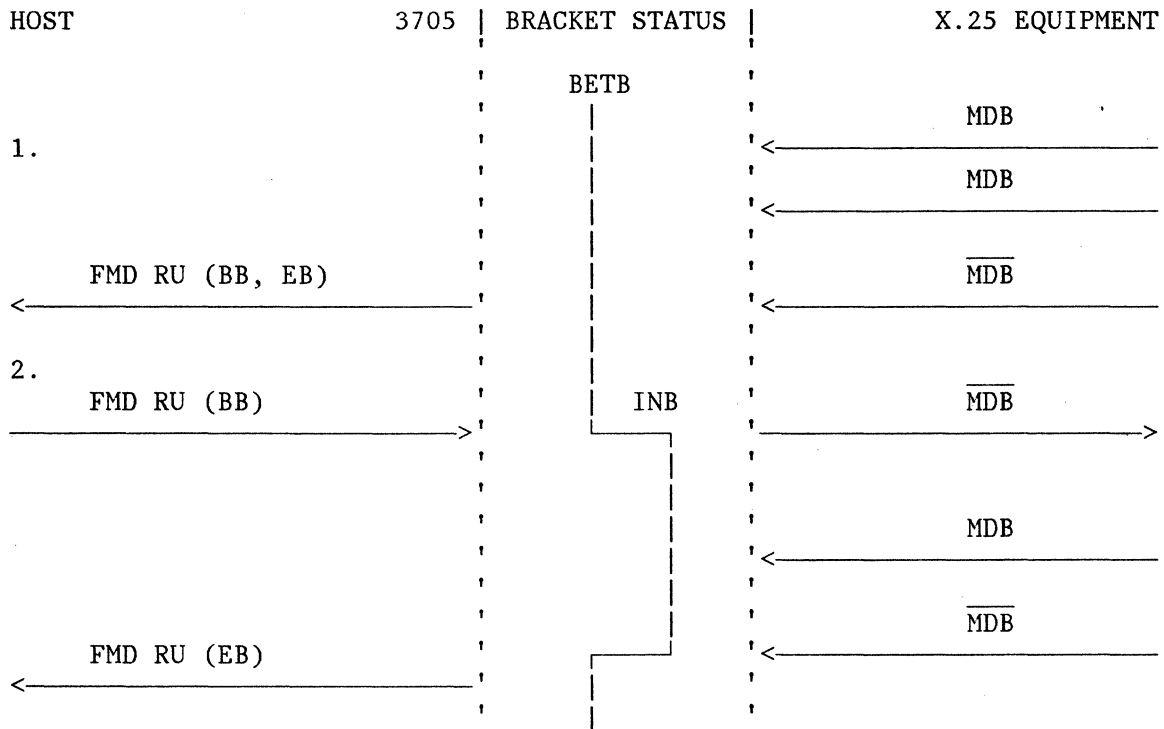


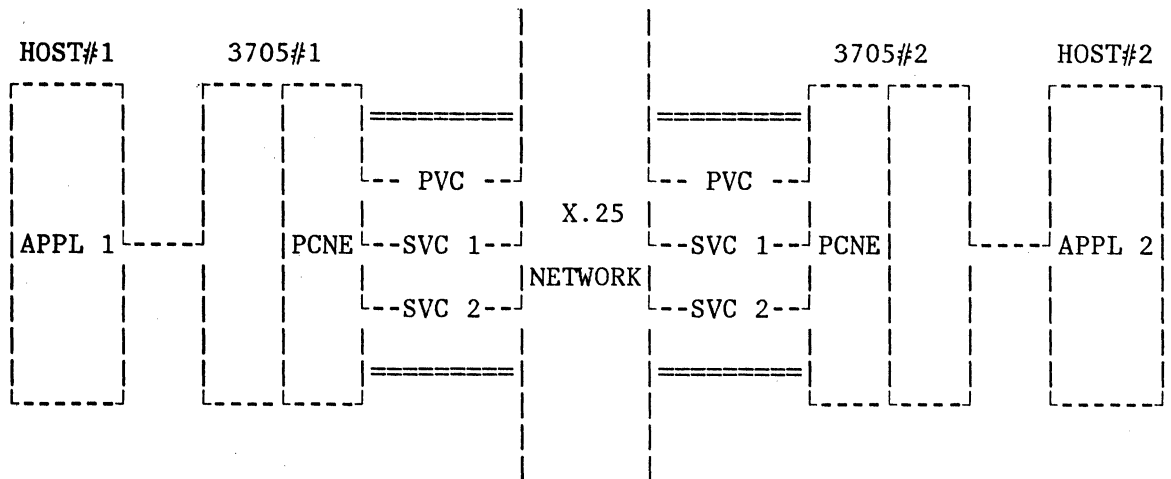
Figure 4-4. Bracket Protocol When the SLU Can Send EB

REMARKS CONCERNING A HOST-TO-HOST CONNECTION THROUGH THE PCNE

The following considerations apply to a VTAM environment. Similar considerations would apply to a TCAM environment.

Let the following configuration be considered: To each 3705 is connected a multichannel link on which are defined:

- One permanent virtual circuit
- Two switched virtual circuits



Data has to be transferred from the APPL 1 application to the APPL 2 application and vice versa, with either application being able to initialize the connection.

CONNECTION THROUGH SWITCHED VIRTUAL CIRCUITS

1. Definition of the "Switched Major Nodes":

The configuration shows two distinct SNA domains:

SNA domain 1 consisting of Host#1 and 3705#1.

SNA domain 2 consisting of Host#2 and 3705#2.

The only relationship between the two SNA domains is made by the Remote Identification number specified in the CALL REQUEST and INCOMING CALL packets. This identification number is used by the called SNA domain to identify the corresponding PU and LU in its own domain.

In the VTAM environment, the "Remote Identification number" is equal to the "SSCP Identification number" of the calling SNA domain +1; therefore, you have to choose the values of the "IDNUM=" parameter in both domains carefully.

You are advised to use the following table:

SNA Domain 1			SNA Domain 2		
PU11	PU	... IDBLK= 003 IDNUM= 00001 ...	PU21	PU	... IDBLK= 003 IDNUM= 00001 ...
PATH11	PATH	... DIALNO= ...00001 ...	PATH21	PATH	... DIALNO= ...00001 ...
LU11	LU	...	LU21	LU	...
PU12	PU	... IDBLK= 003 IDNUM= 00002 ...	PU22	PU	... IDBLK= 003 IDNUM= 00002 ...
LU12	LU	...	LU22	LU	...
PU13	PU	... IDBLK= 003 IDNUM= 00003 ...	PU23	PU	... IDBLK= 003 IDNUM= 00003 ...
PATH13	PATH	... DIALNO= ...00003 ...	PATH23	PATH	... DIALNO= ...00003 ...
LU13	LU	...	LU23	LU	...
PU14	PU	... IDBLK= 003 IDNUM= 00004 ...	PU24	PU	... IDBLK= 003 IDNUM= 00004 ...
LU14	LU	...	LU24	LU	...

The first digit in PUxx, PATHxx, and LUxx indicates the SNA domain.
The second digit in PUxx, PATHxx, and LUxx indicates the LU number.

You have to define a number of LUs equal to twice the number of switched virtual circuits. The odd-numbered LUs are used for the outgoing calls. The even-numbered LUs are used for the incoming calls. No PATH macro instruction is defined in such an entry.

For example, a connection from APPL1 to APPL2 will use:

Either LU11 connected to LU22, or

LU13 connected to LU24.

Note: The first digit, which indicates the SNA domain, can be suppressed, because the two SNA domains are completely distinct. It was specified for explanation purposes only.

2. Session Setup and Session Shutdown (refer to Figure 4-5):

Assume that the APPL1 application initializes session setup. It executes an OPENDST (ACQUIRE) macro instruction which results in the establishment of the required sessions:

a. In SNA domain 1:

SSCP1-PU (ACTPU)

SSCP1-LU (ACTLU)

APPL1-LU (BIND)

b. In SNA domain 2:

SSCP2-PU (ACTPU)

SSCP2-LU (ACTLU)

To request the establishment of the APPL2-LU session in SNA domain 2, the APPL1 application must send a LOGON message as standard data. In SNA domain 2, this LOGON message can be forwarded to SSCP2 only if the SSCP2-LU session is already established. This is the reason why the PCNE retains any data packet up to the ACTLU command.

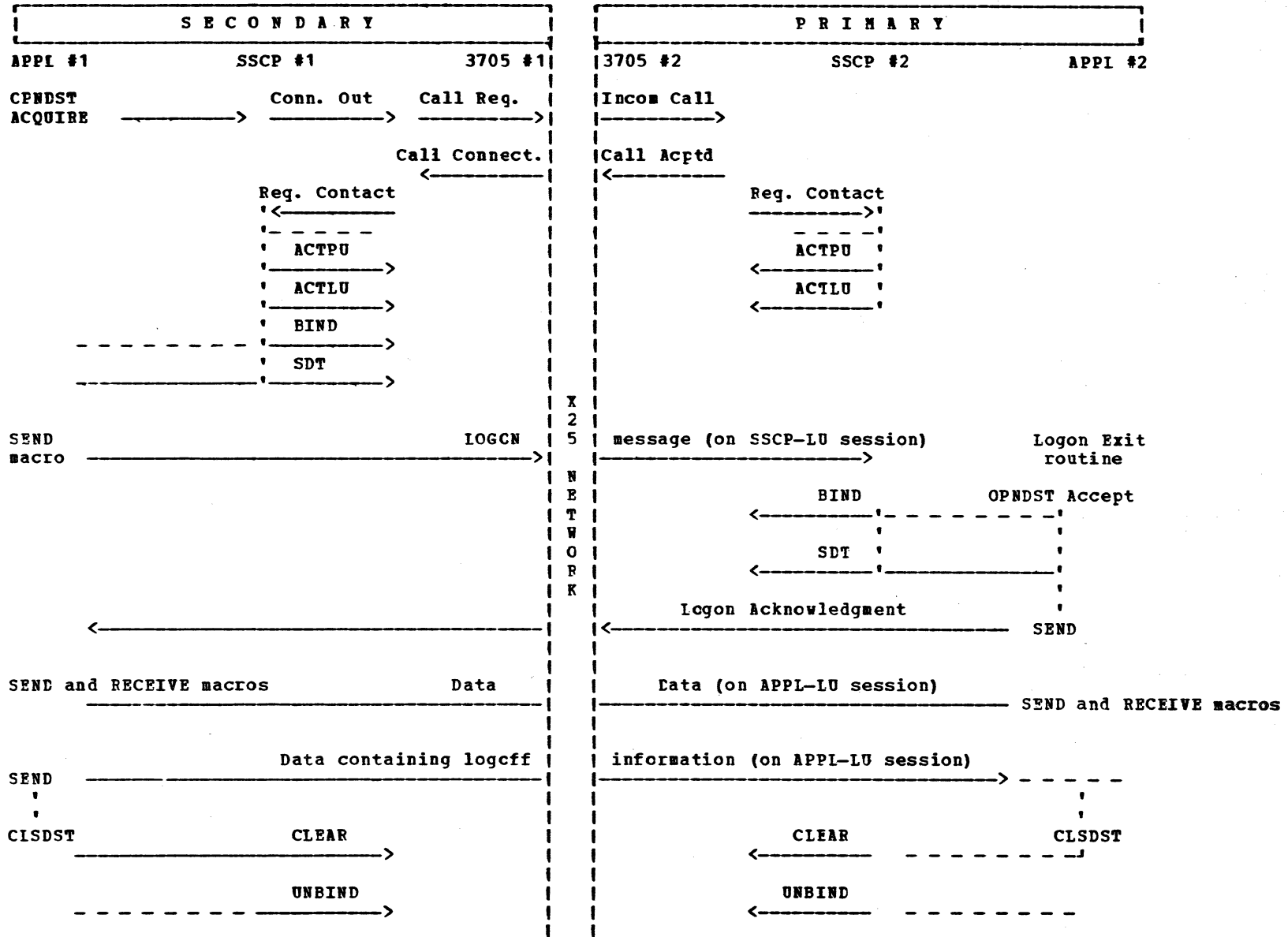


Figure 4-5. Session Setup/Shutdown Through an SVC (APPL-toAPPL Connection)

Upon receipt of the LOGON message, SSCP2 schedules the LOGON exit routine of APPL2 which performs an OPENDST (ACCEPT). Thus, the APPL2-LU session is established. Receipt of the SDT message allows the PCNE to forward the data packets coming from the network to APPL2 and no longer to SSCP2. Thus, APPL1 must wait for a "Logon Acknowledgment" sent by the APPL2 logon exit routine before sending data to APPL2. You may have to utilize a timer in APPL1 to cover the cases of non-response to a LOGON message.

Before performing a CLOSEDST macro instruction to end an APPL1 to APPL2 connection, an application must send as normal data LOGOFF information requesting the application in the other domain to end its APPL-LU session.

CONNECTION THROUGH PERMANENT VIRTUAL CIRCUITS

The above discussion of connection to SVCs applies in general to PVCs as well. However, unlike an application working with an SVC, a called application working with a PVC does not necessarily need a LOGON message. It can be in a state allowing itself to receive data from the other side's application directly. In fact, an application may issue an OPENDST (ACQUIRE) macro instruction resulting in the establishment of the APPL-LU session without any impact on the X.25 network.

COMMUNICATING WITH THE X.25 NETWORK SERVICES

The X25NPSI allows communications with the ECHO service of the network, if any. The X25NPSI sees the ECHO service as an X.25 non-SNA DTE working in LLC level 0. The PCNE allows these communications by simulating an SNA secondary LU associated with a type 1 PU. Communications with the ECHO service are allowed through switched virtual circuits only. Thus, the pseudo-type 1 PU used for the communications must be switched and, for VTAM, defined as such in the switched sub-area's major node.

In an X.25 generation deck, the PCNE support is included when you specify LLC=PCNE0 anywhere in the deck.

Once the communication has been established with the ECHO service of the network, using network specifications, link test level 2 or an application program can be used to perform the echo.

Refer to the host access method's Operator's Guide to learn how to perform link test level 2 for leased circuits.

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DISTRIBUTION PACKAGE

After you have installed your basic NCP library with the Standard ACF/NCP/VS package, you must install X25NPSI using SMP for OS/VS and MSHP for DOS/VS.

You should carefully refer to the instructions given in the "PROGRAM DIRECTORY FOR USE" of the X25NPSI in order to select the correct files on the tape.

OS/VS X25NPSI LIBRARIES

The following library is restored from the X25NPSI tape: SYS1.GEN3705X, which is used for X.25 stage 1, concatenated to the NCP SYS1.GEN3705.

JOB CARD MODIFICATION

You can supply your own JOB card by replacing the JOBXCARD member of the SYS1.GEN3705X library. An example of JCL you could use to effect this replacement follows:

```
//S1 EXEC PGM=IEBUPDTE,PARM=NEW
//SYSPRINT DD SYSOUT=A
//SYSUT1 DD DSN=SYS1.GEN3705X,DISP=SHR
//SYSUT2 DD DSN=SYS1.GEN3705X,DISP=SHR
//SYSIN DD DATA,DLM=ZZ
./ ADD NAME=JOBXCARD,LIST=ALL
//&JOBNAMC JOB (xxx,yyy),
// progname,MSGLEVEL=(1,1),CLASS=A
ZZ
```

The JOB name (variable &JOBNAMC) is prepared by the generation processor. You can code a user name instead but, in this case, if you code JOBCARD=MULTI in the X25BUILD macro, all the X25NPSI's stage 2 jobs will have the same name, unless you affix &SNDA to the name (for example when coding the jobcard as follows):

```
//USER&SNDA JOB (xxx,yyy),
```

The jobnames will be USER1, USER2, USER3. &SNDA is incremented by 1 for each job.

- The SYS1.MAC3705X library contains X25NPSI macros to assemble the code produced by X.25 Stage 1 during the first assembly of the NCP's stage 2. It must be defined as one of the MACLIB suboperands of the

NCP BUILD macro.

- The SYS1.OBJ3705X library contains the X25NPSI load modules and corresponds to the library specified by the "QUALIFY=" and "USERLIB=" operands of the NCP BUILD macro.

When several programs use the Customization Facility (for instance X25NPSI and Network Terminal Option), the object modules of the different programs have to be in the file corresponding to the USERLIB operand of the NCP BUILD macro instruction.

If you want to use different files for the object modules, you have to modify the link-edit job by concatenating these files in the ULIB DD statement.

The following working libraries are required for stage 2 of the NCP generation:

- A library defined in the first MACLIB suboperand of the NCP BUILD macro. Optionally, it can be the same as the SYS1.MAC3705X described above, but this is not recommended. This library will contain the result of the X.25 generation and will be used as input for stage 2 of the NCP generation.
- The library defined in the OBJLIB operand of the NCP BUILD macro.
- The library defined in the LOADLIB operand of the NCP BUILD macro.

DOS/VS X25NPSI LIBRARIES

The following libraries are restored from the X25NPSI tape:

- The source library (F sublibrary) for the X.25 stage 1 run and for the ACF/NCP stage 2 assembly run.
- The relocatable library containing the X25NPSI object modules.

These libraries are the same as (or must be concatenated to) the libraries used by ACF/NCP.

USER GENERATION PROCESSING

After you install the libraries described above from the X25NPSI tape, as explained in the Program Directory that is shipped on the tape, proceed as follows.

X25NPSI GENERATION

X25NPSI Network Description

Using the X.25 macros described later in this chapter, you must define your attachment to the Packet Switching Network.

X25BUILD

```
...  
X25VC      for an automatic naming of resources
```

or

```
linename X25LINE  
puname   X25PU      to choose your own resources names  
[luname X25LU]  
...  
X25END
```

These macros will produce all the input required for the X.25 part of the NCP generation. In particular, they will prepare descriptions of X25NPSI control blocks that will be assembled in the first assembly of stage 2 of the NCP generation, together with the NCP control blocks.

X25NPSI Stage 1

X25NPSI stage 1 is an assembly step and produces job control language for the X.25 stage 2: See box 1 in Figure 5-1. The OS/VSE or DOS/VSE Assembler must be used.

Use the following JCL:

OS/VSE

```
//STEP1 EXEC PGM=IFOX00,....  
  
//SYSLIB DD DSN=SYS1.GEN3705X,DISP=SHR  
//      DD DSN=SYS1.GEN3705,DISP=SHR
```

At least a 1536K partition is required.

Note:

You can also use the Assembler H.

```
//STEP1 EXEC PGM=IEV90,....
```

DOS/VSE

```
// OPTION DECK,NOEDECK,SUBLIB=DF  
// EXEC ASSEMBLY
```

At least a 1224K partition is required.

X25NPSI Stage 2

X25NPSI stage 2 consists of eight update steps (box 2 in Figure 5-1) that prepare the input for the X25NPSI part of the NCP generation:

1. Your source members that are copied by the first assembly of the NCP generation's stage 2 to create the X25NPSI control blocks in 2 CSECTs:
 - a. \$SRCL0, which contains the UACBs.
 - b. \$SRCHI, which contains all other X25NPSI blocks.
2. The linkedit control statements to include the adequate pre-assembled X25NPSI modules.
3. A member containing the NCP stage 1 macros for the X25NPSI attachment: GROUP, LINE, PU, LU, and GENEND macros. The name of this member is specified by the "NCPSTG1=" operand of the X25END macro instruction. The names of the resources are assigned by X25NPSI and you can change them if they do not fit your requirements.

In OS/VS only, X25NPSI stage 1 output is placed by the X25NPSI stage 2 in the user library defined in the first or only suboperand of the "MACLIB=" operand of the NCP BUILD macro. In DOS/VS, X25NPSI stage 1 output is placed by X25NPSI stage 2 in the source library.

NCP GENERATION

NCP Description

Get the source code contained in the last member prepared by X25NPSI stage 1 and insert it in your NCP deck as if you were defining SDLC lines.

This member contains the GROUP, LINE, PU, LU, and GENEND macros for X25NPSI. The name of this member is specified by the "NCPSTG1=" operand of the X25END macro. You may modify this code to fit your special requirements.

NCP Stage 1

Stage 1 of the NCP is an assembly (box 3 in Figure 5-1). It is done with the standard library and with the IBM 3705 assembler.

Use the JCL described in Chapter 4 of ACF/NCP/VS Installation Release 2.1, SC30-3142, that is:

OS/VS

```
//STEP1 EXEC PGM=CWAX00,...
```

```
//SYSLIB DD DSN=SYS1.GEN3705,DISP=SHR
```

```
//SYSIN DD *  
BUILD
```

(definition of resources other than X.25 ones)
(source code punched in the member of the MACLIB defined
in the NCPSTG1 operand of the X25END macro)

```
END
```

DOS/VSE

```
// EXEC IFZASM
```

NCP Stage 2

Then perform stage 2 of the NCP's assembly (see box 4 in Figure 5-1),
and the final linkedit (see box 5 in Figure 5-1).

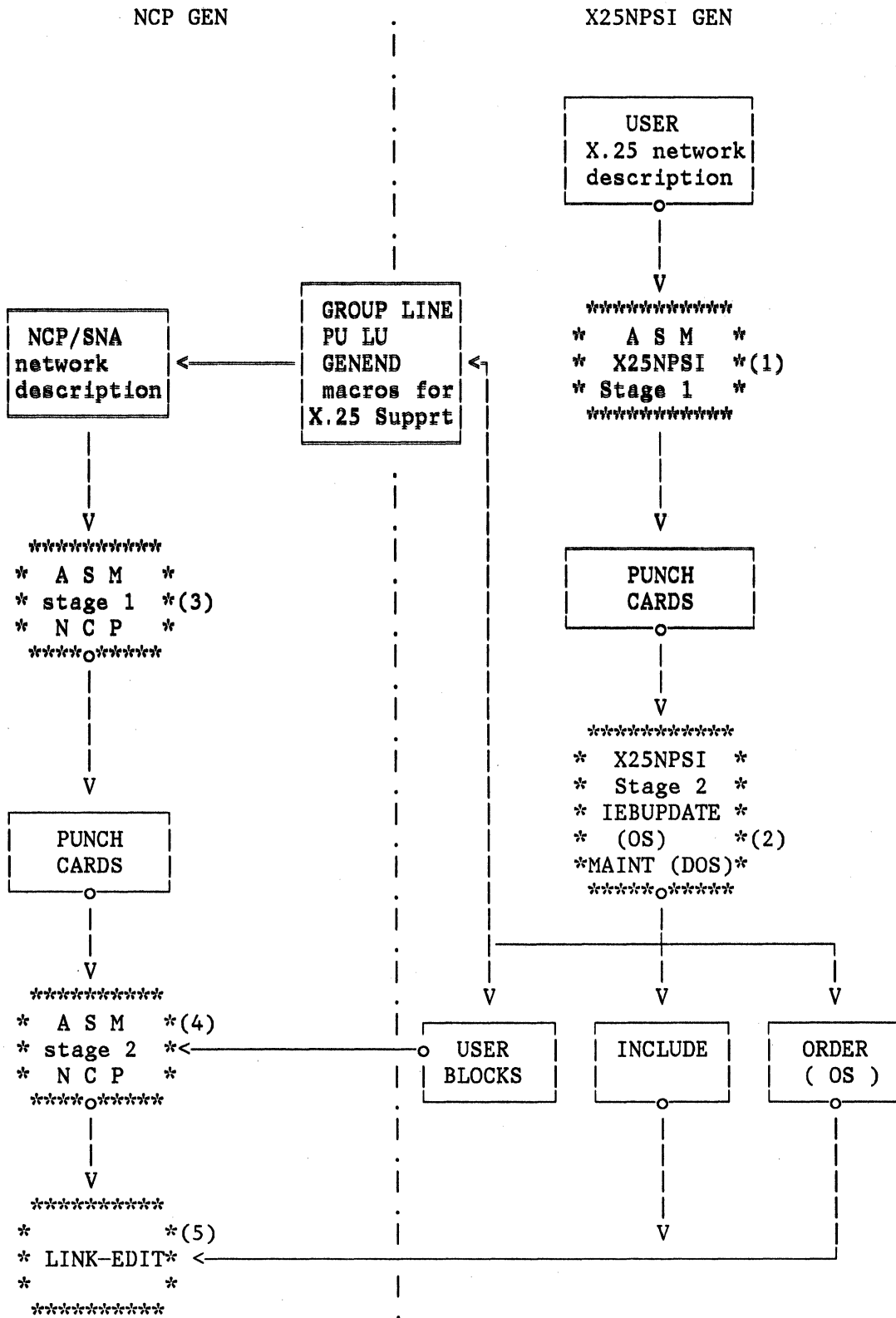


Figure 5-1. Summary of Generation Processing

X25NPSI STAGE 1 GENERATION MACRO DESCRIPTION

The stage 1 user macros describe the X25NPSI network. They are:

X25BUILD

```

X25NET      One for each network.
X25VCCPT    One for each filled VCCPTIT entry.
X25OUFT     One for each filled OUFTIT entry
            (one VCCPTIT and one OUFTIT per network).
X25MCH      One per MCH and at least one per network
X25LCG      One per logical channel group, and
            at least one per MCH.
X25VC       At least one per logical channel group.
            or
{X25LINE}   One per virtual circuit.
{X25PU }    One per virtual circuit.
{X25LU }    At least one per permanent VC.
    
```

X25END

These macros generate input for the NCP generation.

X25BUILD MACRO INSTRUCTION

This macro starts the generation process for the X25NPSI control blocks. Among its operands, five are the same as those of the NCP BUILD macro: JOBCARD, MACLIB, OUTPUT, QUALIFY, TYPYSYS.

Name	Operation	Operands
Symbol	X25BUILD	[MCHCNT={count}] {1 }] [JOBCARD={NO }] {MULTI} {YES }] [,MACLIB=dsname] (OS only) [,OUTPUT=iebupdte] (OS only) [,QUALIFY={NONE }] (OS only) {symbol} {SYS1 }] [,SRCPRFX={prefix}] {X25 }] [,SRCLO={name }] {X25TBL}]

Name	Operation	Operands
		[,SRCHI={name }] {X25BLK}] [,TYP SYS={DOS}] {OS }] [,SNAP={YES}] { <u>NO</u> }]

MCHCNT=count

Specifies the number of MCHs defined in this X25NPSI generation.
 The default value is 1.

JOB CARD=YES/NO/MULTI

Specifies whether the program generation procedure is to provide a job card for the stage 2 input stream, and whether the input stream will consist of more than one job.

If you specify JOB CARD=YES or omit the operand, a single job card is provided and the stage 2 input stream will consist of a single job.

If you specify JOB CARD=MULTI, a job card is provided for each step and the stage 2 input stream will consist of multiple jobs:

- 2 for the SRCLO and SRCHI members
- 3 for the INCL2LO, INCL2HI, and INCINIT members in OS/VS and DOS/VS
- 3 for the ORDL2LO, ORDL2HI, and ORDINIT members in OS/VS only.
- 1 for the NCP stage 1 layout.

See the earlier section of this chapter titled "JOB Card Modification" to find out how to supply a JOB card different from the default JOB card used in OS/VS.

MACLIB=dsname

Is the name (OS/VS only) of the output library for the X25NPSI stage 2. This operand is required if the OUTPUT operand is not coded. It is ignored if the "OUTPUT=" operand is coded. The data set may or may not be qualified depending on the "QUALIFY=" operand of this macro. This data set must be cataloged and must be the first suboperand in the "MACLIB=" operand of the NCP BUILD macro. The dsname can be MAC3705X.

OUTPUT=(iebupdte)

Specifies the name (OS/VS only) of a cataloged procedure used in lieu of the normally generated JCL when performing an X25NPSI generation.

QUALIFY=symbol/NONE/SYS1

For OS/VS only (same as for the NCP), this parameter indicates the first level qualifier for OS/VS data sets specified by the "MACLIB=" operand of this macro and of the corresponding NCP BUILD macro. SYS1 is the default value. This operand is ignored when the "OUTPUT=" operand is coded.

SRCPRFX=prefix/X.25

Specifies the 1 to 5 characters used as prefixes to give names to the members containing SRCLO and SRCHI created by this assembly in the MACLIB. The default value is X25. The first character must be alphabetic, except for \$.

SRCLO=X25TBL/name

Specifies the name of the member to be used in the MACLIB to store the X25NPSI tables. The default name is X25TBL.

SRCHI=X25BLK/name

Specifies the name of the member to be used in the MACLIB to store the X25NPSI control blocks. The default name is X25BLK.

TYPYSYS=OS/DOS

Specifies whether stage 2 of the X25NPSI generation procedure is to be run under OS/VS or DOS/VS. The default value is OS.

SNAP=YES/NO

Specifies whether the SNAP facility is active in the actual generation. The default value is NO and means that the internal SNAP facility is not active.

- Programming Note (OS/VS only)
 - In both the BUILD (ACF/NCP) and X25BUILD macros, the operand "QUALIFY=" must be coded the same or omitted (the default value is then SYS1). If the qualifier is not SYS1 (if it is X25 for example), the two libraries SYS1.MAC3705x and SYS1.OBJ3705X must be renamed X25.MAC3705X and X25.OBJ3705X respectively, and cataloged.

- The "MACLIB=" operand of the X25BUILD macro accepts only one dsname (such as USERX25).
- The "MACLIB=" operand of the BUILD macro (ACF/NCP) accepts up to five dsnames. The first of these dsnames defines the library in which the members prepared by stage 1 of the X25NPSI generation process are stored. The other dsnames can be used to define the libraries in which the user macros required for the first assembly step of stage 2 of the NCP are stored.

These dsnames will be concatenated in the MACLIB DD card for the first assembly of stage 2 of the NCP. In the final linkedit, only the first dsname will also be used to search for the INCLUDE and ORDER control cards.

X25NET MACRO INSTRUCTION

This macro is used to specify and start the description of an X.25 network.

Name	Operation	Operands
symbol	X25NET	NETTYPE=ID [,CPHINDX={index}] { <u>1</u> } [,OUHINDX={index}] { <u>1</u> }

symbol

This is an optional label.

NETTYPE=ID

Specifies the ID number given to this network. The following ID numbers are defined:

ID = 1	TRANSPAC, EURONET
ID = 2	DATAPAC, DATEX-P, NRW
ID = 3	Reserved
ID = 4	Reserved
ID = 5	Reserved
ID = 6	Reserved

The other networks will have an associated ID number after the completion of their attachment tests.

| From the point of view of the X.25 NPSI Internal Processing, the
| differences between a Network Type 1 and 2 are the following:

- | 1. Clear Request/Indication Packets for Network Type 2 are only
| 4-bytes long. No diagnostic byte is accepted/provided by a
| Network Type 2 in these packets so that no end-to-end information
| is propagated between DTE's.
- | 2. Reset Request Packet: There is no end-to-end DTE information
| forwarded by a network Type 2 for this packet. As a matter of
| fact, the diagnostic byte in a Reset Request Packet, accepted by
| a Network Type 2, must be equal to X'00'.
- | 3. The meaning of the cause byte in a Reset Indication Packet is not
| always the same:

- | • For Type 1 networks:

| 'Remote DTE Operational' condition is specified by a cause byte
| equal to X'09'.

| 'Network Operational' condition is specified by a cause byte
| equal to X'0F'.

- | • For Type 2 networks:

| The two previous conditions are identified by a single cause
| byte equal to X'00', which is called 'End of out-of-order'
| condition.

TNL SN30-3213 (26 Feb 82) to SC30-3078-0

CPHINDX=index/1

Specifies the highest index used in a dependent X25VCCPT macro for this network. The default value is 1.

OUHINDX=index/1

Specifies the highest index used in a dependent X25OUFT macro for this network. The default value is 1.

X25VCCPT MACRO INSTRUCTION

This macro instruction describes the VC's connection parameters. At least one X25VCCPT macro is required, and up to 19 X25VCCPT macros can be coded per network. One macro is required for each filled entry of the VCCPTIT. Consecutive entries need not be used. The length of the table is specified by the "CPHINDX=" operand of the X25NET macro.

An entry in the VCCPTIT will be used for each VC defined in this network. Please refer to the "VCCINDX=" operand of the X25VC macro for more details on how to use this table.

Name	Operation	Operands
	X25VCCPT	INDEX=index, MAXPKTL=size [,VWINDOW={value}] { 2 } [,INSLOW={(percent1,percent2)}] {(25,0) }]

INDEX=index

Specifies the index into the VCCPTIT for the entry being initialized by this X25VCCPT macro. For example, if INDEX=3, this X25VCCPT macro initializes the third entry in the VCCPTIT. The valid values for this index range from 01 to 19.

MAXPKTL=size

Specifies (in bytes) the maximum length of the packets to be sent or received over the VCs using this entry in the VCCPTIT. The valid range is from 32 to 4096. There is no default size. This length is the maximum length of data in a packet, excluding the length of the packet header.

Note: Make sure that the number of inbound packets accumulated via the More Data Bit (MDB) for LLC level 0, and by the Segment Indication (SI) of the LLC level 2 header, is such that the length of the accumulated PIU does not exceed the maximum length that can be transferred to the host during a READ operation -- that is, it must be less than: MAXBFRU multiplied by UNITSZ.

VWINDOW=value

Specifies the value of the transmit/receive window used by the packet protocol for the VCs using this entry. This value must be less than the modulo value used by this protocol, which is 8 for most of the networks.

INSLOW=(percent1,percent2)

Specifies the percentage of free buffers that must be reached before entering:

- The UNSAFE situation (percent1), or
- The DANGER situation (percent2)

for the VCs using this entry. The valid values are 0, 6, 12, 25, 50, or 100. When this operand is coded, both values must be specified and "percent1" must be greater than or equal to "percent2". The default values are (25,0).

Note: The "percent1" and "percent2" values are defined in terms of the NCP's "SLOWDOWN=" parameter of the BUILD macro. The default values of "percent1" and "percent2" (25,0) mean that the UNSAFE limit is 25% higher than the NCP SLOWDOWN value, and that the DANGER limit (0%) is equal to the NCP's slowdown value.

X25OUFT MACRO INSTRUCTION

This macro is used to specify which user facilities and Call User Data field will be copied in the OUTGOING CALL packet as is. Refer to the discussion of the ACF/VTAM PATH Macro Instruction later in this chapter for more details on how to use this macro.

From 1 to 19 X25OUFT macros may be coded for each network. One macro is required for each filled entry of the OUFTIT. Consecutive entries need not be used, but the length of the table is specified by the "OUHINDX=" operand of the X25NET macro. At least one X25OUFT macro is required for each network that has switched virtual circuits. No X25OUFT macro is required when only permanent virtual circuits are in the network.

Name	Operation	Operands
	X25OUFT	INDEX=index [OPTFACL=a1a2a3a4b1b2b3b4....z1z2z3z4] [,USRFILD=hexavalue]

INDEX=index

Specifies which index value of the OUFTIT allows gaining access to this OUFT. The valid values for this index range from 01 to 19.

OPTFACL=a1a2a3a4b1b2b3b4....z1z2z3z4

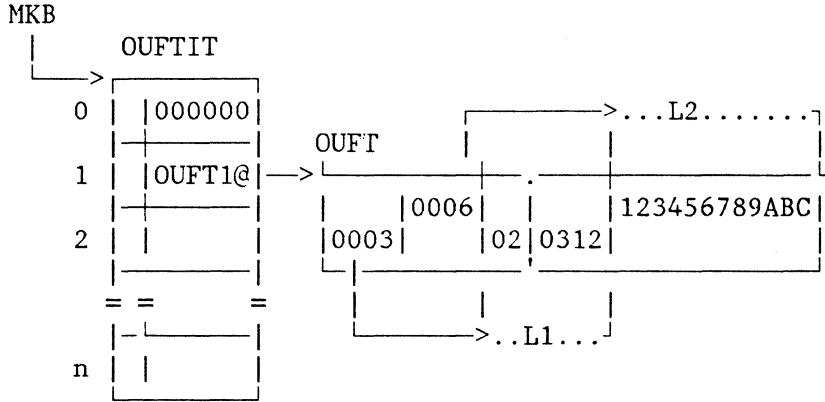
Specifies the hexadecimal configuration to be copied in the optional facility field of a Call Request packet. The number of hexadecimal characters must be a multiple of 4 (less than or equal to 16). The description of an optional facility is made by four hexadecimal characters. The first two give the facility code, and the last two describe the facility parameter field.

USRFILD=hexavalue

Specifies the correct bit configuration to be copied, as is, in the User Data field of the call requested packet. "hexavalue" must contain an even number of digits (less than or equal to 16). This value does not include the LLC type because it is used for outgoing calls only.

Note: The following is an example of X25OUFT macro instruction:

Name	Operation	Operands
	X25OUFT	INDEX=1, X
		OPTFACL=0312, X
		USRFILD=123456789ABC



X25MCH MACRO INSTRUCTION

This macro instruction is used to describe a multichannel link. When invoked, it creates one BAK2MCH macro.

Name	Operation	Operands
[symbol]	X25MCH	CSBTYPE={2}, {3} ADDRESS=(xxx,rrr), LCGDEF=[(]l _{cg} (l _{cnhi})[,l _{cg} (l _{cnhi}),...)], FRMLGTH=length, MWINDOW=window [,STATION={DCE}] {DTE}] [,PROTOCOL={LAPB}] {LAP }] [,RETRYCT={count}] {7 }] [,RETRYTO={timeout}] {1 }] [,NRZI={NO }] {YES}] [,NCPGRP={label}] {NEW }] [,MACB=(labelx,labelr)]

Name	Operation	Operands
		[,SPEED={value}] {4800 } [,PUNAME=label] [,LUNAME=label]

symbol

This is an optional Label. When coded, it overrides the automatic resource name generation for the corresponding NCP line. See the earlier "NCP Stage 1 System Generation" section of this manual for more details.

CSBTYPE=2/3

Is coded 2 if this interface is on a CSB-2. Is coded 3 if this interface is on a CSB-3.

ADDRESS=(xxx,rrr)

specifies the TRANSMIT and RECEIVE line interface addresses in 3 hexadecimal digits each.

LCGDEF=lcg(lcnhi)

For each Logical Channel Group (LCG), this operand specifies the highest logical channel number (lcnhi). At least one pair of values lcg(lcnhi) must be defined. A maximum of sixteen pairs of values can be coded in any order, between parentheses and separated by commas. Only defined LCGs should be mentioned.

FRMLGTH=length

Specifies (in bytes) the maximum length of the frames that may flow over the MCH (X.25 N1 parameter divided by 8). The valid range of values is from 35 to 4099. This length is equal to the data packet length plus that of the packet header -- that is, the length of the data frame.

MWINDOW=window

Specifies the size of the window to be used by the Link Access protocol. The valid range of values is from 1 to 7.

Note: This value is used to compute the number of entries (NOE) in the Line Input Queue (LIQ). NOE = 2 X window.

STATION=DTE/DCE

Specifies whether this link station (NCP) will operate as a DTE or a DCE. DTE is the default value and must be used for a normal connection to a network node (usually a DCE).

The only effect of this parameter is to change the primary link address of the interface (it has no impact on packet level protocol).

PROTOCOL=LAPB/LAP

Specifies the link access protocol to be used. The default value is LAPB.

RETRYCT=count

Specifies the number of retries on the MCH (X.25 N2 parameter). The valid range is from 3 to 31. The default value is 7.

RETRYTO=timeout

Specifies the value of the timeout used between retransmissions (X.25 T1 retry parameter). The value is 1, 2, or 3 seconds. The default value is 1.

NRZI=YES/NO

Specifies whether or not the DTE must operate in NRZI mode. The default value is NO. This parameter is reserved for future use.

NCPGRP=label/NEW

Optionally, "label" specifies the label of the new NCP GROUP macro where the actual MCH is defined in the NCP's stage 1 deck. You usually do not have to specify this value, in which case the name is chosen by the X25NPSI stage 1 generation. You may code this operand when you modify an existing generation and do not want to modify the NCP labels.

If this operand is omitted, the built-in label is XNETn1 where "n" is the position of the previous X25NET macro within the X25NPSI generation.

If you specify NEW, a new NCP GROUP is created. The name of this new NCP GROUP is built using the automatic naming convention.

If you specify a label, a new NCP GROUP is created with this label as the name of the GROUP macro.

MACB=(labelx,labelr)

This parameter is optional and specifies the labels of the user's ACBs. These labels are normally chosen by the actual X25NPSI stage 1 generation. You may code this operand to prevent label duplication with other resource names in the same generation.

If you do not code this operand, the UACB labels will be XMCHxxxX and XMCHxxxR, where xxx is the first suboperand of the "ADDRESS=" operand.

SPEED=value

Specifies the speed of the MCH. This value is used to code NCP macros only (GROUP and/or LINE). The valid range of values is from 1200 to 56000 bps.

PUNAME=label

This parameter is optional and specifies the label of the PU associated with an MCH line, as chosen by the user to prevent label duplication either inside the same generation, or inside VTAM during node activation. See the section of this chapter titled "NCP Stage 1 System Generation" for more details on automatic name generation.

LUNAME=label

This parameter is optional and specifies the label of the LU associated with an MCH line, as chosen by the user to prevent label duplication either inside the same generation, or inside VTAM during node activation. See the section of this chapter titled "NCP Stage 1 System Generation" for more details on automatic name generation.

X25LCG MACRO INSTRUCTION

This macro instruction begins the description of one LCG. One such macro must be coded for each LCG defined on this multichannel.

Name	Operation	Operand
	X25LCG	LCGN=number

LCGN=number

Specifies the Logical Channel Group Number (LCGN) for all the virtual circuits specified by the subsequent X25VC macros. The valid range of values is from 0 to 15.

Note: If more than one LCG is to be used, the X25LCG macros must be coded with the LCG numbers in ascending order. However, a starting LCGN ≠ 0, or discontinuities in the ascending sequence, are allowed.

X25VC MACRO INSTRUCTION

This macro instruction describes the characteristics of the VCs pertaining to the MCH and to the LCG previously defined.

One X25VC macro may describe one or several virtual circuits that have the same characteristics. On output, one BAK2VC macro is punched for each virtual circuit and is coded as follows:

Name	Operation	Operands
[symbol]	X25VC	LCN=(number1,number2), VCCINDX=index, LLC=llcn [,TYPE={SWITCHED,OUFINDX=index,LLCLIST=(llc0,llc2,...)} {PERMANENT} [,CALL={OUT }] {IN } {INOUT} [,NCPGRP={label}] {NEW } [,VACB=LABEL]

symbol

This is an optional label.

LCN=(number1,number2)

Specifies that the virtual circuits which have as LCNs number1 to number2 are defined sequentially. number1 and number2 are in decimal notation. The valid range of values is from 0 to 255. Some networks do not use the value 0.

VCCINDX=index

When TYPE=PERMANENT is coded, this parameter specifies the value of the index to be used in the VCCPTIT to find the operational characteristics of the VC.

When TYPE=SWITCHED is coded, this parameter specifies:

- For an incoming call, the value of the index to be used in the VCCPTIT to find the operational characteristics of the VC.
- For a call request, the default value of the index to be used in the VCCPTIT to find the operational characteristics of the VC. The default value is used when the XX field of the "DIALNO=" operand of the PATH macro instruction is equal to 00.

The valid range of values is from 1 to 19. The specified index must have been defined in a previous X25VCCPT macro.

LLC=llcn

When TYPE=PERMANENT is coded, this parameter specifies the type of LLC used on this VC. No default value is given in this macro. The llcn suboperand can be PCNEO or PSH.

- PCNEO means that the permanent virtual circuits are connected to non-SNA X.25 DTEs that do not support the interrupt packets.
- PSH means that the permanent virtual circuits are connected to the 5973-L02 NIA. A two-byte LLC header is added to each packet.

When TYPE=SWITCHED is coded, this parameter specifies a default value to be used if the "LLCLIST=" operand of the "TYPE=" keyword is not coded.

TYPE=PERMANENT/SWITCHED

Indicates the type of virtual circuit used. PERMANENT is the default value. This parameter can be abbreviated with P or S.

"OUFINDX=index" specifies the default value of the index to be used in the OUFTIT to build the FACILITY and USER fields for a Call Request packet used on this VC. The specified index must have been defined in a previous X25OUFT macro. This operand is required only when TYPE=SWITCHED is coded.

LLCLIST=(llc0,llc2,...) specifies a maximum of two LLCs that can be used on this switched virtual circuit. The llcn value can be PCNEO or PSH. This operand is valid only when TYPE=SWITCHED is coded. The default value is the LLC specified in the mandatory LLC operand.

CALL=IN/OUT/INOUT

Specifies the type of call to be used on this VC. The default value is IN.

This keyword is valid only with TYPE=SWITCHED and must be consistent with the "CALL=" parameters of the NCP's LINE macro instruction that refers to the corresponding UACB.

NCPGRP=label/NEW

This parameter is optional and specifies the label of the NCP GROUP macro where the actual VC is defined in the NCP stage 1 deck. You usually do not have to specify this value, in which case the name is chosen by the X25NPSI stage 1 generation. You may code this operand when you want to modify an existing generation without modifying the NCP labels.

If a label is specified, a new NCP GROUP is created with this label as the name of the GROUP macro.

If NEW is specified, a new NCP group is created. The name of this group is automatically built by the X25NPSI stage 1 generation.

Note: One group for PVCs and one group for SVCs is opened at a time. If this parameter is omitted, the VC being defined will belong to the previously opened, leased, or switched group, whichever group has chosen the name.

VACB=label

This parameter is optional and specifies the label of the user's ACB normally chosen by the actual X25NPSI stage 1 generation. You may code this operand to prevent label duplication with other resource names in the same generation.

X25LINE MACRO INSTRUCTION

This macro instruction can be used instead of the X25VC macro instruction. It has the same operands, except for the "LCN=" operand, which can have one value only.

As is the case for the X25VC macro instruction, the X25LINE macro instructions must be coded in ascending order with reference to the value of the LCN operand.

The label of this macro instruction is mandatory, and is used as the resource name for the corresponding NCP line.

This macro instruction must be followed by one X25PU macro instruction which can be followed by X25LU macro instructions. The labels of the X25PU/X25LU macro instructions are mandatory and are the symbolic names of the corresponding SNA resources.

Name	Operation	Operands
Symbol	X25LINE	LCN=number, VCCINDX=index, LLC=llcn [,TYPE={SWITCHED,OUFINDX=index,LLCLIST=(llc0,llc2,...)}] {PERMANENT} [,CALL={OUT }] {IN } {INOUT} [,NCPGRP={label}] {NEW } [,VACB=LABEL]

Symbol

This is mandatory and will be the label of the corresponding LINE macro instruction in the NCP deck and, therefore, the symbolic name of this SNA resource.

LCN=number

This parameter specifies the logical channel number of the virtual circuit being defined. This value is coded in decimal notation, and its valid range is from 0 to 255. For the remaining parameters, please refer to the preceding X25VC macro instruction.

X25PU MACRO INSTRUCTION

This macro instruction defines the PU attached to the line defined in the previous X25LINE macro instruction. The keyword operands are the same as in the NCP PU macro instruction.

Name	Operation	Operands
symbol	X25PU	Same as in the NCP PU macro (*) See note below

A maximum of 500 such macros can be coded in an X.25 stage 1 deck. A SERVICE macro instruction is generated if necessary.

| For both this and the following X25LU macro instruction, refer to the
 | ACF/NCP/VS Release 2.1 Installation, SC30-3142.

X25LU MACRO INSTRUCTION

This macro instruction defines one of the LUs attached to the PU defined in the previous X25PU macro instruction. The keyword operands are the same as those of the NCP LU macro instruction.

Name	Operation	Operands
symbol	X25LU	Same as in the NCP LU macro (*) See note below

A maximum of 4095 such macros can be coded in an X.25 stage 1 deck.

| Note: (DOS restriction): Only the first 8 characters of the keyword operand are transmitted to the NCP's system generation. The following message

IFZ089 SETC OPERAND TOO LONG

will appear each time a keyword value exceeds 8 characters.

X25END MACRO INSTRUCTION

This macro instruction ends the user's system generation.

Name	Operation	Operands
symbol	X25END	[INCPREFIX={prefix}] {X25 }] [,NCPSTG1={name }] {NONE } {X25NCP}

Name	Operation	Operands
		[,LSTUACB={NO }] {YES}]
		[,X25VTAM={NO }] {YES}]
		[,SCANCTL=....]
		[,HSPDSEL=....]
		[,INCL2HI={name }] {X25HII}]
		[,INCL2LO={name }] {X25LOI}]
		[,INCINIT={name }] {X25INI}]
		[,ORDL2LO={name }] {X25LOO}] (OS/VS only)
		[,ORDL2HI={name }] {X25HIO}] (OS/VS only)
		[,ORDINIT={name }] {X25INO}] (OS/VS only)

INCPREFIX=prefix/X.25

Specifies the 1 to 5 characters used as prefix to give names to the member created by this assembly in the MACLIB. The default value is X25. The first character must be alphabetic, with the exception of \$.

NCPSTG1=name/NONE/X25NCP

Specifies the name of the member stored in the MACLIB that will contain the frame of the NCP macros corresponding to the X25NPSI generation. The GROUP, LINE, PU, LU, and GENEND macros are punched in this member file. Even when you do not plan to use this facility, it is recommended that you code this operand to get a list of the NCP macros with the appropriate names, mainly the label of the GROUP macros and the value to code in the UACB operand of the LINE macros. When NONE is coded, no skeleton of the NCP macros is created. Therefore, you should provide these macros yourself.

LSTUACB=NO/YES

Specifies whether the X25NPSI UACBs inserted in the NCP by COPY SRCLO during the first assembly of the NCP's stage 2 will be ended

by the LASTUACB macro punched by this assembly. When NO is coded, a user other than an X25NPSI user must supply the LASTUACB macro, in which case this other user must insert his UACBs after those of X25NPSI. The default value is YES and must be used when no other user code is included in the NCP, through the user-written DLC, Customization Facility. Otherwise, only one user must supply the LASTUACB macro instruction.

| X25VTAM=NO/YES

| Specifies whether VTAM has been modified to accept the LINEADD=NONE
| and LINEAUT=YES operands of the GROUP macro. If not, the
| ADDRESS=NONE and AUTO=YES operands are generated in all the LINE
| macros describing virtual circuits.

SCANCTL= HSPDSEL=

These operands are optionally coded. Their contents are reproduced without checking in the GENEND statement of the member coded in the NCPSTG1 operand of the X25END macro.

All the other operands are the same as in the GENEND macro in the corresponding NCP stage 1 generation. The default names are indicated in capital letters when INCPRFX is not coded. When INCPRFX is coded, the default names are prefixed by the user-supplied prefix.

This macro closes the X25NPSI generation, prepares the JCL to set all the defined members in this macro in the MACLIB, and displays the information to be used for the NCP definition:

- Group names, such as labels of the NCP GROUP macros for X25NPSI.
- UACB names to be used in the UACB operands of the NCP LINE macros for X.25 lines.
- Values to code in the keyword parameters of the NCP macros (BUILD, GROUP, GENEND).

THE OPTIONAL GENEND MACRO INSTRUCTION

Skip this section if you have no other product inserted in your NCP with the Customization facility, such as the Network Terminal Option (NTO), or an Airlines Control Program.

This macro instruction belongs to the SYS1.GEN3705X library. Its purpose is to punch a GENEND statement for NCP stage 1, during X25NPSI stage 1. The resulting GENEND statement will contain (in a concatenated format) the parameters you have specified in the GENEND macro instruction for the NTO or the Airlines Control Program, plus those parameters particular to X25NPSI.

Note 1: When coded, the optional GENEND macro must be placed before X25END.

| Note 2: Moreover, the first statement of the X.25 stage 1 input deck must be:

COPY XGENEND

TNL SN30-3213 (26 Feb 82) to SC30-3078-0

Example:

If another product, using the Customization facility, must be inserted in the X25NPSI stage 1 generation sample and requires the following GENEND macro:

```
GENEND    INIT=USRINIT,INCINIT=USRINI,-----
```

This macro must be inserted in the X.25 stage 1 deck after the last X25VC macro and before the X25END macro:

```
-----
X25VC    -----
GENEND    INIT=USRINIT,INCINIT=USRINI,
X25END    -----
```

Then the resulting GENEND macro will be prepared by the X.25 generation as follows and must be inserted in the NCP deck:

```
GENEND    INIT=(USRINIT,BALINIMD),INCINIT=(USRINI,D01INI),---
```

| THE IFQALIGN MACRO INSTRUCTION (DOS ONLY)

| The purpose of this macro is to make easier the process of the three
| steps of the NCP Generation Stage 3, which consists of 3 successive link
| edits. The operator is prompted after the first and second link edit to
| enter the "HICORE" value given by the previous link edit. This process
| is used to align the X.25 NPSI code on a 2K boundary.

| To use this facility, code this macro without any operand after the
| GENEND macro and before the END Statement in the NCP Stage 1 deck.

SUMMARY OF OPERANDS FOR X.25 MACROS THAT DESCRIBE THE NETWORK

OPERANDS	STAGE 1 MACRO INSTRUCTIONS				MACRO INSTRUCTIONS
	X25BUILD	X25NET	X25MCH	X25VC	Used in stage 2
ADDRESS			*		BAK2MCH
CALL				*	BAK2VC
CSBTYPE	0	0	*		BAK2MCH
FRMLGTH		0	*		BAK2MCH
LCN				*	BAK2VC
LCGDEF			*		BAK2MCH
LLC		0	0	*	BAK2VC
MACB			*		BAK2MCH
MWINDOW	0	0	*		BAK2MCH
NCPGRP			*	*	BAK2MCH, BAK2VC
NETTYPE		*			BAK2NET
NRZI		0	*		BAK2MCH
OUFINDX			0	*	BAK2VC
PROTCOL		0	*		BAK2MCH
RETRYCT		0	*		BAK2MCH
RETRYTO		0	*		BAK2MCH
RETVCT				*	BAK2VC
RETVCTO				*	BAK2VC
SPEED	0	0	*		NCP MACROS
STATION		0	*		BAK2MCH
TYPE				*	BAK2VC
VACB				*	BAK2VC
VCCINDX			0	*	BAK2VC

* Indicates macros in which the operand is described.

0 Indicates macros in which the operand can be coded.

X25NPSI STAGE 1 SAMPLE GENERATION

```

*****
*
*          GENERATION OF THE X.25 BLOCKS WITHIN NCP
*
*          -1 NETWORK
*          -2 MCHS
*          -1 PVC AND 7 SVC'S FOR EACH MCH
*
*****
*
***    STAGE 1 INPUT
*
NEOGENE X25BUILD MACLIB=MAC71, X.25 STAGE 2 OUTPUT
        JOBCARD=MULTI,
        QUALIFY=VTAM,
        SRCPRFX=DO1,      PREFIX FOR BLOCK MEMBERS IN VTAM.MAC71
        TYP SYS=OS,
        MCHCNT=2
TRANSPAC X25NET NETTYPE=1,CPHINDX=3,OUHINDX=3
        X25VCCPT INDEX=1,
        MAXPKTL=128,
        VWINDOW=3
        X25VCCPT INDEX=3,
        MAXPKTL=128,
        VWINDOW=2
        X25OUFT INDEX=1,
        USRFILD=12141618
        X25OUFT INDEX=2,
        OPTFACL=0302
        X25OUFT INDEX=3,
        OPTFACL=03021202,
        USRFILD=123456
***** FIRST MCH
        X25MCH CSBTYPE=3,
        ADDRESS=(024,025),
        LCGDEF=0(7),
        FRMLGTH=131,
        MWINDOW=5,
        STATION=DTE,
        SPEED=9600
        X25LCG LCGN=0
XL024000  X25LINE LCN=0,
        VCCINDX=1,
        LLC=PCNEO,
        TYPE=P
XP024000  X25PU PUTYPE=1,ADDR=01,MAXDATA=261,VPACING=(2,1),
        PACING=(1,1)
XU024000  X25LU LOCADDR=0
        X25VC LCN=(1,7),
        VCCINDX=1,
        OUFINDX=1,
        LLC=PCNEO,
        CALL=INOUT,
        LLCLIST=(PCNEO,PSH),

```

TNL SN30-3213 (26 Feb 82) to SC30-3078-0

```

                                TYPE=SWITCHED
***** SECOND MCH
      X25MCH CSBTYPE=2,
                                ADDRESS=(0A8,0A9),
                                LCGDEF=0(7),
                                FRMLGTH=131,
                                STATION=DTE,
                                SPEED=9600,
                                MWINDOW=3
      X25LCG LCGN=0
      X25VC LCN=0,
                                VCCINDX=1,
                                TYPE=PERMANENT,
                                LLC=PCNE0
      X25VC LCN=(1,2),
                                VCCINDX=1,
                                OUFINDX=1,
                                LLCLIST=(PCNE0,PSH),
                                LLC=PCNE0,
                                TYPE=SWITCHED
      X25VC LCN=3,
                                VCCINDX=1,
                                CALL=INOUT,
                                OUFINDX=1,
                                LLC=PCNE0,
                                LLCLIST=(PCNE0),
                                TYPE=SWITCHED
      X25VC LCN=4,
                                VCCINDX=1,
                                CALL=INOUT,
                                OUFINDX=1,
                                LLC=PSH,
                                LLCLIST=(PCNE0,PSH),
                                TYPE=SWITCHED
      X25VC LCN=5,
                                VCCINDX=3,
                                CALL=OUT,
                                OUFINDX=3,
                                LLC=PSH,
                                LLCLIST=(PCNE0,PSH),
                                TYPE=SWITCHED
      X25VC LCN=6,
                                VCCINDX=1,
                                CALL=OUT,
                                OUFINDX=2,
                                LLC=PCNE0,
                                LLCLIST=(PCNE0,PSH),
                                TYPE=SWITCHED
      X25VC LCN=7,
                                VCCINDX=1,
                                CALL=OUT,
                                OUFINDX=1,
                                LLC=PCNE0,
                                LLCLIST=(PCNE0,PSH),
                                TYPE=SWITCHED
      X25END INCPRFX=D01,

```

NCPSTG1=D01INX25,
X25VTAM=NO

X

END

X25NPSI Stage 1 Sample Output for OS/VS

```
//D01TBL JOB (LGDE,  
// 370Y),FERR,TYPRUN=HOLD,CLASS=L  
//S1 EXEC PGM=IEBUPDTE,PARM=NEW  
//SYSPRINT DD SYSOUT=A  
//SYSUT2 DD DSN=VTAM.MAC71,DISP=SHR  
//SYSIN DD DATA  
./ ADD NAME=D01TBL  
./ NUMBER NEW1=10000,INCR=1000  
X25$MKB BAK2INIT AVTN=BAL$AVT,LLCTN=BAL$LLC,XPARENT=1,SARL=1,MCHCNT=2  
TRANSPAC BAK2NET NETTYPE=1,CPTITN=X25N1C,CPTITL=4,OUFTITN=X25N1O,OUFTIT*  
L=4  
X25N1C1 BAK2VCPT DATAPTY=LOW,INDEX=1,MAXPKTL=128,PKTSEQ=0,VWINDOW=3,OU*  
TSLOW=0,INSLOWY=2,INSLOWX=16  
X25N1C3 BAK2VCPT DATAPTY=LOW,INDEX=3,MAXPKTL=128,PKTSEQ=0,VWINDOW=2,OU*  
TSLOW=0,INSLOWY=2,INSLOWX=16  
X25N1O1 BAK2OUFT INDEX=1,FACL=0,DATL=4,VALUE=12141618  
X25N1O2 BAK2OUFT INDEX=2,FACL=2,DATL=0,VALUE=0302  
X25N1O3 BAK2OUFT INDEX=3,FACL=4,DATL=3,VALUE=12020302123456  
X25KM024 BAK2MCH NRZI=NO,STATION=DTE,PROTCOL=LAP,MWINDOW=5,FRMLGTH=131*  
,RETRYCT=7,RETRYTO=1,ACBXN=X25A024X,ACBRN=X25A024R,LIQN=*  
X25Q024,MCHNO=1,CSBTYPE=3,VCGATL=1,VCGATN=X25KG024,VCBAT*  
N=X25KV024,VCBATL=8,PLPOUEP=BALPLPO,VCMINEP=BALVCIE1,GCB*  
N=XNET11,RLINADD=025,XLINADD=024,VCSCNB=30,XPRTIEP=BALPC*  
A2,XPRTOEP=BALPCA3,XSLUBN=X25KS024,STATSEP=BALNASTA  
X25K0240 BAK2LCG LCGN=0,LCCNT=8  
XB024000 BAK2VC TYPE=P,DSTNODE=BNN,VCCINAM=X25N1C1,RETVCTO=40,RETVCTCCT=0*  
,LLC=0,LCN=0,VCCINDX=1,OUFINDX=0,VCMOUEP=BALVCOF1,LLCOUT*  
K=BALLCOUT,PLPINAC=BALPLPI1,SLUBN=XS024000,PLPINEP=BALPL*  
PI,VACBN=XA024000,GCBN=X25P024A,PKTMODL=8  
XB024001 BAK2VC TYPE=S,DSTNODE=BNN,VCCINAM=X25N1C1,OUFINAM=X25N1O1,CALL*  
=INOUT,RETVCTO=40,RETVCTCCT=0,LLC=0,LLCLIST=(0,2),LCN=1,*  
VCCINDX=1,OUFINDX=1,VCMOUEP=BALVCOF1,LLCOUTK=BALLCOUT,PL*  
PINAC=BALPLPI1,SLUBN=XS024001,PLPINEP=BALPLPI,VACBN=XA02*  
4001,GCBN=X25S024B,PKTMODL=8  
XB024002 BAK2VC TYPE=S,DSTNODE=BNN,VCCINAM=X25N1C1,OUFINAM=X25N1O1,CALL*  
=INOUT,RETVCTO=40,RETVCTCCT=0,LLC=0,LLCLIST=(0,2),LCN=2,*  
VCCINDX=1,OUFINDX=1,VCMOUEP=BALVCOF1,LLCOUTK=BALLCOUT,PL*  
PINAC=BALPLPI1,SLUBN=XS024002,PLPINEP=BALPLPI,VACBN=XA02*  
4002,GCBN=X25S024B,PKTMODL=8  
XB024003 BAK2VC TYPE=S,DSTNODE=BNN,VCCINAM=X25N1C1,OUFINAM=X25N1O1,CALL*  
=INOUT,RETVCTO=40,RETVCTCCT=0,LLC=0,LLCLIST=(0,2),LCN=3,*  
VCCINDX=1,OUFINDX=1,VCMOUEP=BALVCOF1,LLCOUTK=BALLCOUT,PL*  
PINAC=BALPLPI1,SLUBN=XS024003,PLPINEP=BALPLPI,VACBN=XA02*  
4003,GCBN=X25S024B,PKTMODL=8  
XB024004 BAK2VC TYPE=S,DSTNODE=BNN,VCCINAM=X25N1C1,OUFINAM=X25N1O1,CALL*  
=INOUT,RETVCTO=40,RETVCTCCT=0,LLC=0,LLCLIST=(0,2),LCN=4,*  
VCCINDX=1,OUFINDX=1,VCMOUEP=BALVCOF1,LLCOUTK=BALLCOUT,PL*  
PINAC=BALPLPI1,SLUBN=XS024004,PLPINEP=BALPLPI,VACBN=XA02*  
4004,GCBN=X25S024B,PKTMODL=8  
XB024005 BAK2VC TYPE=S,DSTNODE=BNN,VCCINAM=X25N1C1,OUFINAM=X25N1O1,CALL*  
=INOUT,RETVCTO=40,RETVCTCCT=0,LLC=0,LLGLIST=(0,2),LCN=5,*  
VCCINDX=1,OUFINDX=1,VCMOUEP=BALVCOF1,LLCOUTK=BALLCOUT,PL*  
PINAC=BALPLPI1,SLUBN=XS024005,PLPINEP=BALPLPI,VACBN=XA02*
```

4005 ,GCBN=X25S024B ,PKTMODL=8.

- XB024006 BAK2VC TYPE=S,DSTNODE=BNN,VCCINAM=X25N1C1,OUFINAM=X25N1O1,CALL*
=INOUT,RETVCTO=40,RETVCCT=0,LLC=0,LLCLIST=(0,2),LCN=6,*
VCCINDX=1,OUFINDX=1,VCMOUEP=BALVCOF1,LLCOUTK=BALLCOUT,PL*
PINAC=BALPLPI1,SLUBN=XS024006,PLPINEP=BALPLPI,VACBN=XA02*
4006,GCBN=X25S024B,PKTMODL=8
- XB024007 BAK2VC TYPE=S,DSTNODE=BNN,VCCINAM=X25N1C1,OUFINAM=X25N1O1,CALL*
=INOUT,RETVCTO=40,RETVCCT=0,LLC=0,LLCLIST=(0,2),LCN=7,*
VCCINDX=1,OUFINDX=1,VCMOUEP=BALVCOF1,LLCOUTK=BALLCOUT,PL*
PINAC=BALPLPI1,SLUBN=XS024007,PLPINEP=BALPLPI,VACBN=XA02*
4007,GCBN=X25S024B,PKTMODL=8
- X25KM0A8 BAK2MCH NRZI=NO,STATION=DTE,PROTCOL=LAP,MWINDOW=3,FRMLGTH=131*
,RETRYCT=7,RETRYTO=1,ACBXN=X25A0A8X,ACBRN=X25A0A8R,LIQN=*
X25Q0A8,MCHNO=2,CSBTYPE=2,VCGATL=1,VCGATN=X25KGOA8,VCBAT*
N=X25KV0A8,VCBATL=8,PLPOUEP=BALPLPO,VCMINEP=BALVCIE1,GCB*
N=XNET11,RLINADD=0A9,XLINADD=0A8,VCSCNB=30,XPRTIEP=BALPC*
A2,XPRTOEP=BALPCA3,XSLUBN=X25KSOA8,STATSEP=BALNASTA
- X25K0A80 BAK2LCG LCGN=0,LCCNT=8
- XB0A8000 BAK2VC TYPE=P,DSTNODE=BNN,VCCINAM=X25N1C1,RETVCTO=40,RETVCCT=0*
,LLC=0,LCN=0,VCCINDX=1,OUFINDX=0,VCMOUEP=BALVCOF1,LLCOUT*
K=BALLCOUT,PLPINAC=BALPLPI1,SLUBN=XSOA8000,PLPINEP=BALPL*
PI,VACBN=XA0A8000,GCBN=X25P0A8A,PKTMODL=8
- XB0A8001 BAK2VC TYPE=S,DSTNODE=BNN,VCCINAM=X25N1C1,OUFINAM=X25N1O1,CALL*
=IN,RETVCTO=40,RETVCCT=0,LLC=0,LLCLIST=(0,2),LCN=1,*
VCCINDX=1,OUFINDX=1,VCMOUEP=BALVCOF1,LLCOUTK=BALLCOUT,*
PLPINAC=BALPLPI1,SLUBN=XSOA8001,PLPINEP=BALPLPI,*
VACBN=XA0A8001,GCBN=X25SOA8B,PKTMODL=8
- XB0A8002 BAK2VC TYPE=S,DSTNODE=BNN,VCCINAM=X25N1C1,OUFINAM=X25N1O1,CALL*
=IN,RETVCTO=40,RETVCCT=0,LLC=0,LLCLIST=(0,2),LCN=2,*
VCCINDX=1,OUFINDX=1,VCMOUEP=BALVCOF1,LLCOUTK=BALLCOUT,*
PLPINAC=BALPLPI1,SLUBN=XSOA8002,PLPINEP=BALPLPI,*
VACBN=XA0A8002,GCBN=X25SOA8B,PKTMODL=8
- XB0A8003 BAK2VC TYPE=S,DSTNODE=BNN,VCCINAM=X25N1C1,OUFINAM=X25N1O1,CALL*
=INOUT,RETVCTO=40,RETVCCT=0,LLC=0,LLCLIST=(0),LCN=3,*
VCCINDX=1,OUFINDX=1,VCMOUEP=BALVCOF1,LLCOUTK=BALLCOUT,*
PLPINAC=BALPLPI1,SLUBN=XSOA8003,PLPINEP=BALPLPI,*
VACBN=XA0A8003,GCBN=X25SOA8B,PKTMODL=8
- XB0A8004 BAK2VC TYPE=S,DSTNODE=BNN,VCCINAM=X25N1C1,OUFINAM=X25N1O1,CALL*
=INOUT,RETVCTO=40,RETVCCT=0,LLC=2,LLCLIST=(0,2),LCN=4,VC*
CINDX=1,OUFINDX=1,VCMOUEP=BALVCOF1,LLCOUTK=BALLCOUT,PLPI*
NAC=BALPLPI1,SLUBN=XSOA8004,PLPINEP=BALPLPI,VACBN=XA0A80*
04,GCBN=X25SOA8B,PKTMODL=8
- XB0A8005 BAK2VC TYPE=S,DSTNODE=BNN,VCCINAM=X25N1C3,OUFINAM=X25N1O3,CALL*
=OUT,RETVCTO=40,RETVCCT=0,LLC=2,LLCLIST=(0,2),LCN=5,VCCI*
NDX=3,OUFINDX=3,VCMOUEP=BALVCOF1,LLCOUTK=BALLCOUT,PLPINA*
C=BALPLPI1,SLUBN=XSOA8005,PLPINEP=BALPLPI,VACBN=XA0A8005*
,GCBN=X25SOA8B,PKTMODL=8
- XB0A8006 BAK2VC TYPE=S,DSTNODE=BNN,VCCINAM=X25N1C1,OUFINAM=X25N1O2,CALL*
=OUT,RETVCTO=40,RETVCCT=0,LLC=0,LLCLIST=(0,2),LCN=6,VCCI*
NDX=1,OUFINDX=2,VCMOUEP=BALVCOF1,LLCOUTK=BALLCOUT,PLPINA*
C=BALPLPI1,SLUBN=XSOA8006,PLPINEP=BALPLPI,VACBN=XA0A8006*
,GCBN=X25SOA8B,PKTMODL=8
- XB0A8007 BAK2VC TYPE=S,DSTNODE=BNN,VCCINAM=X25N1C1,OUFINAM=X25N1O1,CALL*
=OUT,RETVCTO=40,RETVCCT=0,LLC=0,LLCLIST=(0,2),LCN=7,*
VCCINDX=1,OUFINDX=1,VCMOUEP=BALVCOF1,LLCOUTK=BALLCOUT,*
PLPINAC=BALPLPI1,SLUBN=XSOA8007,PLPINEP=BALPLPI,*

VACBN=XAOA8007,GCBN=X25S0A8B,PKTMODL=8

```
$SRCL0 CSECT
/*
//D01BLK JOB (LGDE,
// 370Y),FERR,TYPRUN=HOLD,CLASS=L
//S2 EXEC PGM=IEBUPDTE,PARM=NEW
//SYSPRINT DD SYSOUT=A
//SYSUT2 DD DSN=VTAM.MAC71,DISP=SHR
//SYSIN DD DATA
./ ADD NAME=D01BLK
./ NUMBER NEW1=10000,INCR=1000
BAK2END LSTUACB=YES,LLCOEP=(BALPCAO,BALPCA1),LLC1EP=(BALPCAO,B*
ALPCA1),LLC2EP=(BALPSHO,BALPSHI)
$SRCHI CSECT
/*
//D01LOI JOB (LGDE,
// 370Y),FERR,TYPRUN=HOLD,CLASS=L
//S3 EXEC PGM=IEBUPDTE,PARM=NEW
//SYSPRINT DD SYSOUT=A
//SYSUT2 DD DSN=VTAM.MAC71,DISP=SHR
//SYSIN DD DATA
./ ADD NAME=D01LOI
./ NUMBER NEW1=10000,INCR=1000
INCLUDE ULIB(BALNASME)
/*
//D01HII JOB (LGDE,
// 370Y),FERR,TYPRUN=HOLD,CLASS=L
//S4 EXEC PGM=IEBUPDTE,PARM=NEW
//SYSPRINT DD SYSOUT=A
//SYSUT2 DD DSN=VTAM.MAC71,DISP=SHR
//SYSIN DD DATA
./ ADD NAME=D01HII
./ NUMBER NEW1=10000,INCR=1000
INCLUDE ULIB(BALNASM4)
INCLUDE ULIB(BALL2TMB)
INCLUDE ULIB(BALSTAM8)
INCLUDE ULIB(BALPLPM5)
INCLUDE ULIB(BALVCIM6)
INCLUDE ULIB(BALVCIMC)
INCLUDE ULIB(BALVCOMA)
INCLUDE ULIB(BALPCNM9)
INCLUDE ULIB(BALUSIMF)
INCLUDE ULIB(BALPSHM7)
INCLUDE ULIB(BALLAPM1)
INCLUDE ULIB(BALLAPN1)
/*
//D01INI JOB (LGDE,
// 370Y),FERR,TYPRUN=HOLD,CLASS=L
//S5 EXEC PGM=IEBUPDTE,PARM=NEW
//SYSPRINT DD SYSOUT=A
//SYSUT2 DD DSN=VTAM.MAC71,DISP=SHR
//SYSIN DD DATA
./ ADD NAME=D01INI
./ NUMBER NEW1=10000,INCR=1000
INCLUDE ULIB(BALINIMD)
/*
```

```

//D01LOO JOB (LGDE,
// 370Y),FERR,TYPRUN=HOLD,CLASS=L
//S6 EXEC PGM=IEBUPDTE,PARM=NEW
//SYSPRINT DD SYSOUT=A
//SYSUT2 DD DSN=VTAM.MAC71,DISP=SHR
//SYSIN DD DATA
./ ADD NAME=D01LOO
./ NUMBER NEW1=10000,INCR=1000
ORDER BALNASME

```

```

/*
//D01HIO JOB (LGDE,
// 370Y),FERR,TYPRUN=HOLD,CLASS=L
//S7 EXEC PGM=IEBUPDTE,PARM=NEW
//SYSPRINT DD SYSOUT=A
//SYSUT2 DD DSN=VTAM.MAC71,DISP=SHR
//SYSIN DD DATA
./ ADD NAME=D01HIO
./ NUMBER NEW1=10000,INCR=1000
ORDER BALTICK
ORDER BALNASM4
ORDER BALSTAM8
ORDER BALLCIN
ORDER BALL2TMB
ORDER BALPLPM5
ORDER BALVCIM6
ORDER BALVCIMC
ORDER BALVCOMA
ORDER BALPCNM9
ORDER BALUS9
ORDER BALUSA
ORDER BALUSB
ORDER BALPSHM7
ORDER BALLAPZ2
ORDER BALLAPZ3

```

```

/*
//D01INO JOB (LGDE,
// 370Y),FERR,TYPRUN=HOLD,CLASS=L
//S8 EXEC PGM=IEBUPDTE,PARM=NEW
//SYSPRINT DD SYSOUT=A
//SYSUT2 DD DSN=VTAM.MAC71,DISP=SHR
//SYSIN DD DATA
./ ADD NAME=D01INO
./ NUMBER NEW1=10000,INCR=1000
ORDER BALINIMD

```

```

/*
//D01INX.25 JOB (LGDE,
// 370Y),FERR,TYPRUN=HOLD,CLASS=L
//S9 EXEC PGM=IEBUPDTE,PARM=NEW
//SYSPRINT DD SYSOUT=A
//SYSUT2 DD DSN=VTAM.MAC71,DISP=SHR
//SYSIN DD DATA
./ ADD NAME=D01INX.25
./ NUMBER NEW1=10000,INCR=1000

```

```

XNET11 GROUP LNCTL=SDLC,LEVEL2=BALNAML2,LEVEL3=BALNAML3,USERID=(56689*
81,BALMBDT),LEVEL5=NCP,TIMER=(BALLAP4,BALLAP4,BALLAP4,BA*

```

```

                LLAP4),XIO=(BALNAMXL,BALNAMXS,BALNAMXI,BALNAMXK),DIAL=NO
XL024  LINE  UACB=(X25A024X,X25A024R),ADDRESS=(024,025),SPEED=9600
        SERVICE ORDER=XPO24
XPO24  PU    ADDR=01,MAXDATA=261,PUTYPE=1
XU024  LU    LOCADDR=0
XLOA8  LINE  UACB=(X25A0A8X,X25A0A8R),ADDRESS=(0A8,0A9),SPEED=9600
        SERVICE ORDER=XPOA8
XPOA8  PU    ADDR=01,MAXDATA=261,PUTYPE=1
XU0A8  LU    LOCADDR=0
X25P024A GROUP LNCTL=SDLC,LEVEL2=BALNAVL2,LEVEL3=BALNAVL3,LEVEL5=NCP,US*
        ERID=(5668981,BALPBDT),TIMER=(BALNATER,BALNATRA,          *
        BALNATST,BALNATLS),XIO=(BALNAVXL,BALNAVXS,BALNAVXI,BALNA*
        VXK),DIAL=NO
XL024000 LINE  ADDRESS=NONE,UACB=XA024000
        SERVICE ORDER=XPO24000
XPO24000 PU  ADDR=01,MAXDATA=261,PACING=(1,1),VPACING=(2,1),PUTYPE=1
XU024000 LU  LOCADDR=0
X25P0A8A GROUP LNCTL=SDLC,LEVEL2=BALNAVL2,LEVEL3=BALNAVL3,LEVEL5=NCP,US*
        ERID=(5668981,BALPBDT),TIMER=(BALNATER,BALNATRA,          *
        BALNATST,BALNATLS),XIO=(BALNAVXL,BALNAVXS,BALNAVXI,BALNA*
        VXK),DIAL=NO
XLOA8000 LINE  ADDRESS=NONE,UACB=XA0A8000
        SERVICE ORDER=XPOA8000
XPOA8000 PU  PUTYPE=1,ADDR=01,MAXDATA=261,VPACING=(2,1),PACING=(1,1)
XU0A8000 LU  LOCADDR=0
X25S0A8B GROUP LNCTL=SDLC,LEVEL2=BALNAVL2,LEVEL3=BALNAVL3,LEVEL5=NCP,US*
        ERID=(5668981,BALSBDT),TIMER=(BALNATER,BALNATRA,          *
        BALNATST,BALNATLS),XIO=(BALNAVXL,BALNAVXS,BALNAVXI,BALNA*
        VXK),DIAL=YES
XLOA8007 LINE  CALL=OUT,ADDRESS=NONE,AUTO=YES,UACB=XA0A8007
XPOA8007 PU  MAXLU=3,PUTYPE=(1,2)
XLOA8006 LINE  CALL=OUT,ADDRESS=NONE,AUTO=YES,UACB=XA0A8006
XPOA8006 PU  MAXLU=3,PUTYPE=(1,2)
XLOA8005 LINE  CALL=OUT,ADDRESS=NONE,AUTO=YES,UACB=XA0A8005
XPOA8005 PU  MAXLU=3,PUTYPE=(1,2)
XLOA8004 LINE  CALL=INOUT,ADDRESS=NONE,AUTO=YES,UACB=XA0A8004
XPOA8004 PU  MAXLU=3,PUTYPE=(1,2)
XLOA8003 LINE  CALL=INOUT,ADDRESS=NONE,AUTO=YES,UACB=XA0A8003
XPOA8003 PU  MAXLU=3,PUTYPE=(1,2)
XLOA8002 LINE  CALL=IN,ADDRESS=NONE,AUTO=YES,UACB=XA0A8002
XPOA8002 PU  MAXLU=3,PUTYPE=(1,2)
XLOA8001 LINE  CALL=IN,ADDRESS=NONE,AUTO=YES,UACB=XA0A8001
XPOA8001 PU  MAXLU=3,PUTYPE=(1,2)
X25S024B GROUP LNCTL=SDLC,LEVEL2=BALNAVL2,LEVEL3=BALNAVL3,LEVEL5=NCP,US*
        ERID=(5668981,BALSBDT),TIMER=(BALNATER,BALNATRA,          *
        BALNATST,BALNATLS),XIO=(BALNAVXL,BALNAVXS,BALNAVXI,BALNA*
        VXK),DIAL=YES
XL024007 LINE  CALL=INOUT,ADDRESS=NONE,AUTO=YES,UACB=XA024007
XPO24007 PU  MAXLU=3,PUTYPE=(1,2)
XL024006 LINE  CALL=INOUT,ADDRESS=NONE,AUTO=YES,UACB=XA024006
XPO24006 PU  MAXLU=3,PUTYPE=(1,2)
XL024005 LINE  CALL=INOUT,ADDRESS=NONE,AUTO=YES,UACB=XA024005
XPO24005 PU  MAXLU=3,PUTYPE=(1,2)
XL024004 LINE  CALL=INOUT,ADDRESS=NONE,AUTO=YES,UACB=XA024004
XPO24004 PU  MAXLU=3,PUTYPE=(1,2)
XL024003 LINE  CALL=INOUT,ADDRESS=NONE,AUTO=YES,UACB=XA024003

```

```
XP024003 PU    MAXLU=3,PUTYPE=(1,2)
XL024002 LINE  CALL=INOUT,ADDRESS=NONE,AUTO=YES,UACB=XA024002
XP024002 PU    MAXLU=3,PUTYPE=(1,2)
XL024001 LINE  CALL=INOUT,ADDRESS=NONE,AUTO=YES,UACB=XA024001
XP024001 PU    MAXLU=3,PUTYPE=(1,2)
                GENEND INIT=BALINIMD,INCINIT=D01INI,INCL2HI=D01HII,INCL2LO=D01*
                LOI,SRCHI=D01BLK,SRCLO=D01TBL,ORDL2LO=D01LOO,ORDL2HI=D01*
                HIO,ORDINIT=D01INO,TMRTICK=BALTICK
```

```
./ ENDUP
/*
```

NCP STAGE 1 SYSTEM GENERATION

X25NPSI stage 1 will produce in the output an IEBUPDTE step containing the GROUP, LINE, PU, SERVICE, and LU macros that describe the X.25 configuration in the NCP's stage 1 generation.

RESOURCE NAMING CONVENTIONS

The SNA resource names can be allocated by the X25NPSI system generation, or by the user through the X25LINE, X25PU, and X25LU macro instructions.

All resource names built by X25NPSI stage 1 begin with the letter X. You should not use this letter for resources other than X.25 resources.

More precisely, the prefixes used for the block names are:

XA...	For the UACBs of the VC (VUA)
XB...	For the VCBs
XL...	For the LKBs (LINE macro)
XP...	For the PUs (PU macro)
XS...	For the SLUBs
XU...	For the LUs (LU macro)
X25...	For all other blocks

The names allocated to the SNA resources by the X25NPSI stage 1 are built as follows:

1. For the MCH:

XLxxx	for the label of the LINE macro
XPxxx	for the label of the PU macro
XUxxx	for the label of the LU macro

Where xxx is the line set address of the transmit leg.

2. For the VC:

XLxxxlcn	for the label of the LINE macro
XPxxxlcn	for the label of the PU macro
XUxxxlcn	for the label of the LU macro

Where xxx is the line set address of the transmit leg of the related MCH, and lcn the Logical channel number of the current VC in hexadecimal.

Note: You should use the generated names, because they will simplify the identification of the X.25 resources in the host.

X25NPSI uses macros to describe its control blocks during the first NCP stage 2 assembly. All these macros are prefixed with BAK2. As a consequence, no other user can utilize this prefix for the same purpose.

All the entry points within the X25NPSI code in the load module begin with the prefix BAL. Therefore, no other user can utilize these three letters for the same purpose.

BUILD MACRO INSTRUCTION

Name	Operation	Operands
	BUILD
		[,MACLIB=dsname] (OS only)
		[,QUALIFY={NONE }] {symbol} { <u>SYS1</u> } (OS only)
		[,USERLIB=] (OS only)
	

These operands should agree with the same operands coded in the X25BUILD macro described previously in the "X25NPSI Stage 1 Generation Macro Description". Please refer to the description of the X25BUILD macro for more information.

GROUP MACRO INSTRUCTION

A new operand has been added to this macro instruction to identify the user and the entry of the Block Dump Table used to format the user's blocks. This operand is prepared by X25NPSI stage 1 with the appropriate value and should be used as is.

USERID=(User Identification,Entry Label)

User Identification

Specifies the user's identification, and consists of from 1 to 7 alphanumeric characters. For IBM users, using the product number is recommended. For this X25NPSI, the identification used is 5668-981. This identification is used by the system generation as a character constant to identify all the GCBs pertaining to the user.

Entry Label

Specifies the label of the Block Dump Table used by the modified formatted dump to edit and format the user's blocks. For X25NPSI, the following names are used:

BALMBDT Block Dump Table for MCHs
 BALPBDT Block Dump Table for PVCs
 BALSBDT Block Dump Table for SVCs

Note: This operand will temporarily cause a WARNING message to be issued when VTAM loads the 3705 for the first time.

LUDRPOOL MACRO INSTRUCTION

This macro instruction must be included when the access method is ACF/VTAM, release 2 or higher, if there are switched virtual circuits defined in the system generation.

LINE MACRO INSTRUCTION

All the operands are correctly prepared by X25NPSI stage 1.

PU MACRO INSTRUCTIONS

| The SRT operand is not supported by X25NPSI. Default values for SRT are
 | fixed and equal to 32768 for counters contained in two bytes, and 256
 | for counters contained in one byte. (See the sections titled "MCH's
 | RECMS for SNA Statistics" and "VC's RECMS for SNA Statistics" in Chapter
 | 9).

PU Macro Instruction Associated with a Multichannel Link

Name	Operation	Operands
[symbol]	PU	ADDR=01, MAXDATA=261, PUTYPE=1, PUDR=NO

ADDR=

Specifies the hexadecimal representation of the eight-bit address of the physical unit represented by this PU Macro. It must be coded 01.

MAXDATA=261

Specifies the maximum length of a PIU sent to a type 1 PU.

PUTYPE=

Specifies the type of physical unit constituting the SDLC station represented by this PU macro instruction. It must be coded 1.

PUDR=NO

Specifies that dynamic reconfiguration is not allowed for this PU.

PU Macro Instruction Associated with a Permanent Virtual Circuit

Refer to the instructions in the ACF/NCP/VS Installation, SC30-3142, for coding a PU macro instruction for a PU on a non-switched line. More information concerning certain parameters follows:

- ANS=CONTINUE is significant only if it has been coded with the same value in the PU of the MCH.

For LLC=PCNEO:

- PUTYPE must be equal to 1. The PCNE simulates an LU associated with a type 1 PU.
- MAXDATA must be equal to or greater than the maximum size of the RUs sent by the application to the pseudo-LU in the NCP.

For LLC=PSH:

The MAXDATA parameter must reflect the PU characteristics of the SNA terminal attached to this PVC.

PU Macro Instruction Associated with a Switched Virtual Circuit

Refer to the ACF/NCP/VS Installation, SC30-3142, for a dummy PU definition on a switched line. To define the actual PU to the access method, refer to the appropriate documentation.

The ANS=STOP operand is required.

LU MACRO INSTRUCTIONS

LU Macro Instruction Associated with a Multichannel Link

The LU associated with a multichannel link must never be activated.

Name	Operation	Operands
[symbol]	LU	LOCADDR=0, ISTATUS=INACTIVE, LUDR=NO

LOCADDR=

Specifies the local address of the logical unit in decimal notation, and without leading zeros. It must be coded 0.

ISTATUS=INACTIVE

Specifies to VTAM that this LU should not be activated after IPL.

LUDR=NO

Specifies that dynamic reconfiguration is not allowed on this LU.

LU Macro Instruction Associated with a Permanent Virtual Circuit

Refer to the instructions in the NCP Generation Manual for coding an LU on a non-switched line. For LLC=PCNE0, the "PACING=" keyword must be coded PACING=(1,1). This is the default value. For LLC=PCNE0, the "LOCADDR=" parameter must be coded 0.

LU Macro Instruction Associated with a Switched Virtual Circuit

This macro must be defined in accordance with the specific host access method documentation.

NCP STAGE 1 SAMPLE GENERATION

The following is an NCP generation sample, corresponding to the previously presented X25NPSI stage 1 sample output where two multichannel links are defined. Six permanent virtual circuits are defined on the first multichannel link. One permanent virtual circuit and seven switched virtual circuits are defined on the second one. The terminals may be accessed through the two different multichannel links.

```

BAKLOCAL PCCU CUADDR=0D0 ,DUMPDS=DUMDSET ,SUBAREA=2
BAKBUILD BUILD JOBCARD=MULTI ,ASMREF=SHORT, X
                QUALIFY=VTAM, X
                OBJQUAL=D1, REPLACE CG X
                MACLIB=(MAC71 ,MAC3705X) , X.25 SYSGEN OUT/X.25 MACROS X
                USERLIB=OBJ71, X.25 OBJECT MODULES X
                OBJLIB=D01OBJ, NCP STAGE2 OUTPUT X
                LOADLIB=LNCP71, NCP LOAD MODULE X
                UNIT=SYSDA, X
                UT1=NCP7OUT1, X
                UT2=NCP7OUT2, X
                UT3=NCP7OUT3, X
                TYPGEN=NCP, X
                CA=TYPE4 ,CHANTYP=(TYPE4) , X
                MODEL=3705-2, X
                MAXSUBA=7, X
                SUBAREA=5, NCP SUBAREA = X'A000' X
                MEMSIZE=256, X
                BFRS=92, X
                ANS=YES, X
                ABEND=YES, X
                TRACE=(YES ,100) , X
                NEWNAME=D01GEN
BAKSYSC SYSCNTRL OPTIONS=(STORDSP)
BAKHOST HOST INBFRS=15 ,MAXBFRU=15 ,UNITSZ=196 ,BFRPAD=0, X
                SUBAREA=2, HOST SUBAREA = X'6000' X
                DELAY=0.1 ,STATMOD=YES ,TIMEOUT=30
CSB3 CSB TYPE=TYPE3 ,MOD=0 ,SPEED=(150 ,600 ,1200 ,2400)
CSB2 CSB TYPE=TYPE2 ,MOD=1 ,SPEED=(134 ,600 ,1200)
BAKLUP LUPOOL NUMBER=10 ACCESS M. COMPATIBILITY
                LUDRPOOL NUMTYP1=5 ,NUMTYP2=6
***** INSERT HERE X25STAGE1 OUTPUT
XNET11 GROUP LNCTL=SDLC ,LEVEL2=BALNAML2 ,LEVEL3=BALNAML3 ,USERID=(56689*
                81 ,BALMBDT) ,LEVEL5=NCP ,TIMER=(BALLAP4 ,BALLAP4 ,BALLAP4 ,BA*
                LLAP4) ,XIO=(BALNAMXL ,BALNAMXS ,BALNAMXI ,BALNAMXK) ,DIAL=NO*
                ,ISTATUS=INACTIVE
XL024 LINE UACB=(X25A024X ,X25A024R) ,ADDRESS=(024 ,025) ,SPEED=9600
                SERVICE ORDER=XP024
XP024 PU ADDR=01 ,MAXDATA=261 ,PUTYPE=1
XU024 LU LOCADDR=0
XLOA8 LINE UACB=(X25A0A8X ,X25A0A8R) ,ADDRESS=(0A8 ,0A9) ,SPEED=9600
                SERVICE ORDER=XPOA8
XPOA8 PU ADDR=01 ,MAXDATA=261 ,PUTYPE=1
XU0A8 LU LOCADDR=0
X25P024A GROUP LNCTL=SDLC ,LEVEL2=BALNAVL2 ,LEVEL3=BALNAVL3 ,LEVEL5=NCP ,US*
                ERID=(5668981 ,BALPBDT) ,TIMER=(BALNATER ,BALNATRA, *
```

```

                BALNATST ,BALNATLS ) ,XIO=(BALNAVXL ,BALNAVXS ,BALNAVXI ,BALNA*
                VXK) ,DIAL=NO ,ISTATUS=INACTIVE
XLO24000 LINE ADDRESS=NONE ,UACB=XAO24000
            SERVICE ORDER=XPO24000
XPO24000 PU ADDR=01 ,MAXDATA=261 ,PACING=(1 ,1) ,VPACING=(2 ,1) ,PUTYPE=1
XUO24000 LU LOCADDR=0
X25POA8A GROUP LNCTL=SDLC ,LEVEL2=BALNAVL2 ,LEVEL3=BALNAVL3 ,LEVEL5=NCP ,US*
            ERID=(5668981 ,BALPBDT) ,TIMER=(BALNATER ,BALNATRA ,
            *
            BALNATST ,BALNATLS) ,XIO=(BALNAVXL ,BALNAVXS ,BALNAVXI ,BALNA*
            VXK) ,DIAL=NO ,ISTATUS=INACTIVE
XLOA8000 LINE ADDRESS=NONE ,UACB=XAOA8000
            SERVICE ORDER=XPOA8000
XPOA8000 PU PUTYPE=1 ,ADDR=01 ,MAXDATA=261 ,VPACING=(2 ,1) ,PACING=(1 ,1)
XUOA8000 LU LOCADDR=0
X25SOA8B GROUP LNCTL=SDLC ,LEVEL2=BALNAVL2 ,LEVEL3=BALNAVL3 ,LEVEL5=NCP ,US*
            ERID=(5668981 ,BALSBDT) ,TIMER=(BALNATER ,BALNATRA ,
            *
            BALNATST ,BALNATLS) ,XIO=(BALNAVXL ,BALNAVXS ,BALNAVXI ,BALNA*
            VXK) ,DIAL=YES ,ISTATUS=INACTIVE
XLOA8007 LINE CALL=OUT ,ADDRESS=NONE ,AUTO=YES ,UACB=XAOA8007
XPOA8007 PU MAXLU=3 ,PUTYPE=(1 ,2)
XLOA8006 LINE CALL=OUT ,ADDRESS=NONE ,AUTO=YES ,UACB=XAOA8006
XPOA8006 PU MAXLU=3 ,PUTYPE=(1 ,2)
XLOA8005 LINE CALL=OUT ,ADDRESS=NONE ,AUTO=YES ,UACB=XAOA8005
XPOA8005 PU MAXLU=3 ,PUTYPE=(1 ,2)
XLOA8004 LINE CALL=INOUT ,ADDRESS=NONE ,AUTO=YES ,UACB=XAOA8004
XPOA8004 PU MAXLU=3 ,PUTYPE=(1 ,2)
XLOA8003 LINE CALL=INOUT ,ADDRESS=NONE ,AUTO=YES ,UACB=XAOA8003
XPOA8003 PU MAXLU=3 ,PUTYPE=(1 ,2)
XLOA8002 LINE CALL=IN ,ADDRESS=NONE ,AUTO=YES ,UACB=XAOA8002
XPOA8002 PU MAXLU=3 ,PUTYPE=(1 ,2)
XLOA8001 LINE CALL=IN ,ADDRESS=NONE ,AUTO=YES ,UACB=XAOA8001
XPOA8001 PU MAXLU=3 ,PUTYPE=(1 ,2)
X25S024B GROUP LNCTL=SDLC ,LEVEL2=BALNAVL2 ,LEVEL3=BALNAVL3 ,LEVEL5=NCP ,US*
            ERID=(5668981 ,BALSBDT) ,TIMER=(BALNATER ,BALNATRA ,
            *
            BALNATST ,BALNATLS) ,XIO=(BALNAVXL ,BALNAVXS ,BALNAVXI ,BALNA*
            VXK) ,DIAL=YES ,ISTATUS=INACTIVE
XLO24007 LINE CALL=INOUT ,ADDRESS=NONE ,AUTO=YES ,UACB=XAO24007
XPO24007 PU MAXLU=3 ,PUTYPE=(1 ,2)
XLO24006 LINE CALL=INOUT ,ADDRESS=NONE ,AUTO=YES ,UACB=XAO24006
XPO24006 PU MAXLU=3 ,PUTYPE=(1 ,2)
XLO24005 LINE CALL=INOUT ,ADDRESS=NONE ,AUTO=YES ,UACB=XAO24005
XPO24005 PU MAXLU=3 ,PUTYPE=(1 ,2)
XLO24004 LINE CALL=INOUT ,ADDRESS=NONE ,AUTO=YES ,UACB=XAO24004
XPO24004 PU MAXLU=3 ,PUTYPE=(1 ,2)
XLO24003 LINE CALL=INOUT ,ADDRESS=NONE ,AUTO=YES ,UACB=XAO24003
XPO24003 PU MAXLU=3 ,PUTYPE=(1 ,2)
XLO24002 LINE CALL=INOUT ,ADDRESS=NONE ,AUTO=YES ,UACB=XAO24002
XPO24002 PU MAXLU=3 ,PUTYPE=(1 ,2)
XLO24001 LINE CALL=INOUT ,ADDRESS=NONE ,AUTO=YES ,UACB=XAO24001
XPO24001 PU MAXLU=3 ,PUTYPE=(1 ,2)
**** INSERT HERE X.25 GENEND MACRO
            GENEND INIT=BALINIMD ,INCINIT=D01INI ,INCL2HI=D01HII ,INCL2LO=D01*
            LOI ,SRCHI=D01BLK ,SRCLO=D01TBL ,ORDL2LO=D01LOO ,ORDL2HI=D01*
            HIO ,ORDINIT=D01INO ,TMRTICK=BALTICK
END

```

ACCESS METHOD CONSIDERATIONS

ACF/VTAM CONSIDERATIONS

VTAM macros are not changed to define a configuration using a PPSN. However, some rules have to be followed when coding the parameters required to define a major SNA switched node.

VBUILD Macro Instruction

There are no special considerations for this macro instruction.

PU Macro Instruction

- The "ADDR=" operand must be coded even though it has no meaning for the X25NPSI environment. Any value below 255 can be specified.
- For LLC level 2, the "MAXDATA=" operand must reflect the characteristics of the PU.

For LLC level 0, the "MAXDATA=" operand must be coded with a value greater than or equal to at least the maximum size of the RUs sent by the application to the pseudo-LUs in the 3705.

- For LLC level 2, the "IDBLK=" operand is coded in a standard manner. For LLC level 0, this operand must be coded 003.
- For LLC level 2, the "IDNUM=" operand is coded in a standard manner. For LLC level 0, you should remember that the "remote identification number" generated in the CALL REQUEST packet, and therefore received in an INCOMING CALL packet, is equal to:
 - Either the "IDNUM=" operand (SSCP identification number) plus one, if this SSCP identification number (ZZZZZ field) is specified in the "DIALNO=" operand of the PATH macro instruction.
 - Or to the "Default Identification Number", if the ZZZZZ field is not specified in the "DIALNO=" operand of the PATH macro instruction. The default identification numbers are generated for each SVC at initialization time. They are generated in the order in which the SVCs appear in the RVT -- that is, in the order in which the SVCs appear in the generation deck. The default identification number is a value beginning at 2 with an increment of 2.

In the above generation sample, the following values are assigned for the default identification number:

```
For XLOA8007 : The default identification number = X'0002'  
XLOA8006 : " " " " = X'0004'  
XLOA8005 : " " " " = X'0006'  
XLOA8004 : " " " " = X'0008'
```

```

XLOA8003 : " " " " = X'000A'
XLOA8002 : " " " " = X'000C'
XLOA8001 : " " " " = X'000E'
XLO24007 : " " " " = X'0010'

```

The default identification number value is stored in the VCBXIDDF half word (displacement of 2).

- The "PUTYPE=" operand is coded in a standard manner for LLC level 2. For LLC level 0, this operand must be coded 1.

PATH Macro Instruction

- The "DIALNO=" operand of the PATH macro must be coded as follows:

```
DIALNO=NNN...N [*MMM...M] L XX YY *ZZZZZ
```

The maximum length of the "DIALNO=" parameter is 32 characters, including asterisks.

[*MMM...M] is an optional field that is required only when the calling DTE's network address must be specified.

1. NNN...N

Is the called DTE's network address. The number of N characters is such that: $1 \leq \text{number} \leq 15$.

2. MMM...M

Is the calling DTE's network address. If this field is specified, the number of M characters is such that: $1 \leq \text{number} \leq 15$.

3. L specifies (in one byte) the level of LLC that will be used by the current connection. The accepted values are 0 or 2.

L=0 LLC level 0 (Connection with X.25 non-SNA equipment not supporting interrupt packets, or with the X.25 ECHO service).

L=2 LLC level 2 (Connection with a 5973-L02).

4. XX

Is the two-byte VCCPT index whose value ranges from 00 to 19.

XX=00 means that the packet procedure will work using the values defined in the entry of the VCCPT specified in the "VCCINDX=" operand of the X25VC macro instruction.

XX=xx means that the packet procedure will work using the values defined in the "xx" entry of the VCCPT. This entry must have been defined during X25NPSI generation.

5. YY

Is the two-byte OUFT index whose value ranges from 00 to 19.

YY=00 means that the CALL REQUEST packet is built with the facility field and the user data specified in the "OUFINDX=" operand of the X25VC macro instruction.

YY=yy means that the CALL REQUEST packet is built with the facility field and the user data defined in the yy entry of the OUFT. This entry must have been defined during X25NPSI generation.

6. ZZZZZ is the five-byte ID number of the PU ("IDNUM=" keyword). Each Z has a value from 0 to 9 in decimal notation. This field (including the asterisk) is required and valid only when LLC level 0 is specified.

Examples:

Take a typical connection with LLC level 2 under TRANSPAC. Assuming that the called DTE's network address is 175000233 and the default VCCPT and OUFT entries are used, you should code:

```
DIALNO= 175000233 2 00 00
```

Assuming that the called DTE's network address is 175000235, the VCCPT and OUFT entries 1 are used, the LLC level is 0, and the ID number of the PU is 66666, you should code:

```
DIALNO= 175000235 0 01 01 *66666
```

Assuming that the calling DTE's network address is necessary and is equal to 4444, the called DTE's network address is 333, entry 19 of the VCCPT is used, the OUFT default entry is used, the LLC level is 0, and the ID number of the PU is 66666, you should code:

```
DIALNO= 333 *4444 0 19 00 *66666
```

And the format of the corresponding CALL REQUEST packet would be (assuming that, in the OUFT default entry, a 4800 bps throughput class in transmission and a 2400 bps throughput class in reception are defined):

← 1 byte →

CALL REQ Packet Header	{	Gen. Format Identifier	Logic. Chann. Grp Numb.	
	{	0 0 0 1		
	{	Logical Channel Number		
	{	Packet Type Identifier		
	{	0 0 0 0	1 0 1 1	
	{	Calling DTE Addr Length	Called DTE Addr Length	
		0 1 0 0	0 0 1 1	
		Called DTE Address		
		0 0 1 1	0 0 1 1	
		Calling DTE Address		
		0 0 1 1	0 1 0 0	
		0 1 0 0	0 1 0 0	
		0 1 0 0	0 0 0 0	
			Facility Length	
		0	0 0	0 0 1 0
	Facility Code			
	0 0 0 0	0 0 1 0		
	Facility Parameter			
	1 0 0 0	1 0 0 1		
	Call User Data Field			
	1 1 0 0	0 0 0 0		
	Remote IDNUM= SSCP IDNUM + 1 or default IDNUM			
	0 1 1 0	0 1 1 0		
	0 1 1 0	0 1 1 0		
	0 1 1 1	0 0 0 0		

- The "REDIAL=" operand of the PATH macro is no longer significant. Even if you specify REDIAL=n, no dialing retry will be performed by the X25NPSI before returning a dialing error to VTAM.

LU Macro Instruction

For LLC level 0, the "PACING=" operand must be coded PACING=(1,1). This is the default value. For LLC level 0, the "LOCADDR=" operand must be coded 0.

ACF/TCAM CONSIDERATIONS

TCAM macros used to define a message control program are not changed when specifying a configuration using a PPSN. However, some rules have to be followed when coding these macros.

INTRO Macro Instruction

This macro should be used carefully as far as TCAM buffers are concerned. A long inbound RU message may be split into many PIU segments to be adapted to the characteristics of the network. TCAM accumulates the PIU segments before delivering the complete RU to the application. This means that many TCAM buffers may be utilized at certain times to accommodate inbound messages.

TERMINAL (TERM=LINE) Macro Instruction

- The "CALL=" operand specifies whether stations, the host, or both can initialize calls via the virtual circuits represented by the TERMINAL (TERM=LINE) macro instruction. This operand allows reserving a switched virtual circuit for a one-way call.

In order to perform a call, the X.25 network chooses the first virtual circuit available with the lowest logical channel number. Therefore, in order to minimize the possibilities of call collisions, the TERMINAL (TERM=LINE) macro instructions associated with the highest virtual line addresses should be used for outgoing calls (CALL=OUT or INOUT).

TERMINAL (TERM=PUNT) Macro Instruction

- The "DIALNO=" operand should be coded as follows:

DIALNO= X'FnFnFn...Fn [FC FmFmFm...Fm] F1 FxFx FyFy [FC FzFzFzFzFzFz]

The differences between VTAM and TCAM are:

- The maximum length of the "DIALNO=" operand in TCAM is twenty dial digits for 'F.' configurations only.

DIALNO=DIRECT is not valid.

- In TCAM, the equivalent of * is the 'FC' configuration. This is why hexadecimal notation is used when a delimiter configuration is needed. When you do not need to specify the MMM.M and ZZZZZ fields, you may use the decimal dial digit notation.
- In TCAM, the ZZZZZ field is optional. TCAM can be generated so as not to be concerned with the XID specified in the REQUEST CONTACT command resulting from an outgoing call. This is why the ZZZZZ field is between parentheses.

Otherwise, for a detailed description, refer to the previous discussion of the VTAM PATH Macro Instruction in the preceding "ACF/VTAM Considerations" section of this manual.

As far as the ZZZZZ field is concerned, you must remember that an SNA station identification is made up of four bytes:

X'BBBZZZZ'

where X'BBB' represents the identification block, and X'ZZZZ' represents the identification number.

- The "DISCNT=" operand should be coded YES for the switched virtual PUs. It specifies that TCAM is to end the SSCP-PU session when all the PLU-SLU sessions are terminated. "YES" means TCAM will wait for a "REQUEST DISCONTACT" from the PU.
- The "MAXDATA=" operand specifies the maximum length (in bytes) of a data segment for an SNA-switched PU.
 - For LLC level 2, this operand must reflect the PU's characteristics.
 - For LLC level 0, this operand must be coded with a value equal to at least the maximum size of the RUs sent by the application to the pseudo-LUs in the 3705.

INVLIST Macro Instruction

The "ORDER=" operand specifies the invitation list entries for the line.

If TCAM has to perform an ID verification for NCP-attached stations, you have to remember that:

- For LLC level 2, the identification block is coded in a standard manner. For LLC level 0, this operand must be coded 003.
- For LLC level 2, the identification number is coded in a standard manner. For LLC level 0, you should remember that the remote identification number is generated in the CALL REQUEST packet and therefore received in an INCOMING CALL packet. It is equal to:
 - zzzzz plus one, if this field is specified in the "DIALNO=" operand

- The default identification number, if the 'FzFzFzFzFz' field is not specified in the "DIALNO=" operand. Refer to the discussion of the VTAM PU macro instruction for more details concerning the default identification number.

NETWORK OPERATOR CONSIDERATIONS

ACTIVATION/DEACTIVATION

All the SNA resources should be activated, except for the LU of the MCH (which is not used).

Activation of the SNA resources may be performed in any order. X25NPSI will synchronize the SNA activation commands with network action and handle both in the appropriate sequence. For example, the CONTACT/XID of the VCs will be accepted only when the connection is established with the network.

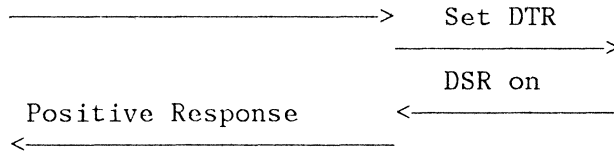
Note that deactivating the MCH's PU will involve the deactivation of all the virtual circuits defined on this MCH.

The remainder of this section describes the actions performed by X25NPSI for operator commands.

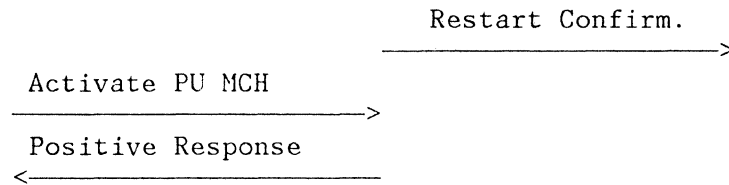
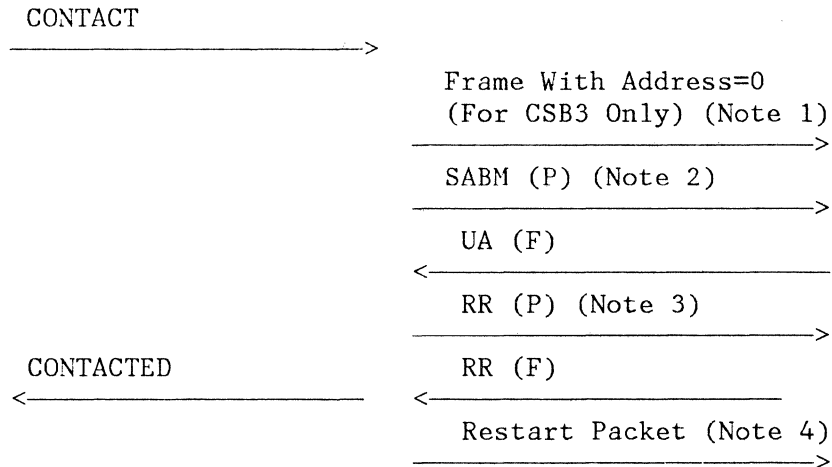
MULTICHANNEL (MCH) COMMANDS

OPERATOR SSCP 3705 X.25 Node

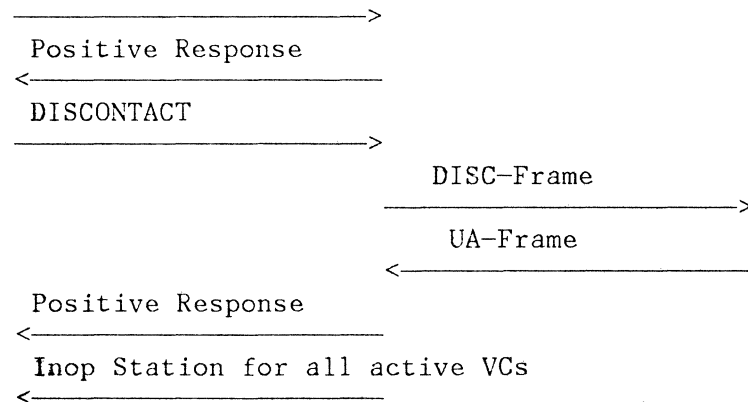
VTAM: V NET,ACT,ID=linename
TCAM: F Procname,ACTIV=linename
Act Link MCH



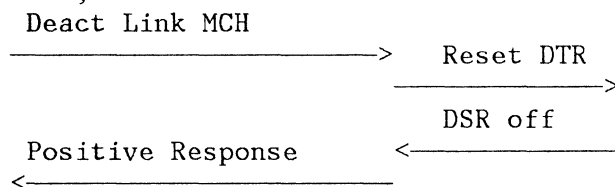
VTAM: V NET,ACT,ID=puname
TCAM: F Procname,ACTIV=puname



VTAM: V NET,INACT,ID=puname
TCAM: F Procname,DEACT=puname
Deactivate PU MCH



VTAM: V NET,INACT,ID=linename
 TCAM: F Procname,DEACT=linename



- | NOTE 1: In case of the scanner CSB3 only, the X.25 NPSI sends this invalid frame (Address=X'00') for initialization of the scanner itself. The DCE should not be disturbed by this frame because the CCITT recommendation specifies that a frame with an invalid address must be discarded.
- | NOTE 2: In case of no answer to this SABM after the retries, the X.25 NPSI does not send a DISC command because the link set-up has not been completed.
- | NOTE 3: In case of no answer to this RR command after the retries, the X.25 NPSI does not send a DISC command because the link set-up is not considered complete.
- | NOTE 4: It is only after the exchange of the RR Command/Response that the X.25 NPSI sends the restart request packet.

TNL SN30-3213 (26 Feb 82) to SC30-3078-0

MCH Recovery

For Inoperative Station, the PU must be reactivated.

For Inoperative Link, the link and the PU must be reactivated.

If you issue a deactivation command for the MCH's PU, all the VCs defined on this MCH will be deactivated immediately.

A smooth deactivation consists of the following:

- Deactivation of the LUs, PUs, and links of the PVCs.
- Deactivation of the LUs, PUs, and links of the SVCs.
- Deactivation of the MCH's PU and link.

| NOTE: The X.25 NPSI Program Product sends a DISC
| command after receiving an FRMR frame.

THE PERMANENT VIRTUAL CIRCUIT (PVC) - LLC LEVEL 2 (LLC=PSH)

OPERATOR SSCP 3705 X.25 Node

VTAM: V NET,ACT,ID=linename
 TCAM: F Procname,ACTIV=linename
 Act Link PVC
 _____>
 Positive Response
 <_____

VTAM: V NET,ACT,ID=puname
 TCAM: F Procname,ACTIV=puname
 CONTACT
 _____>
 Positive Response PSCONT
 <_____+_____>
 PSCONT
 <_____

CONTACTED
 <_____>
 Activate PU Type 1 PVC
 _____>
 Positive Response
 <_____>
 or
 Activate PU Type 2
 _____>
 Positive Response
 <_____>

VTAM: V NET,ACT,ID=luname
 TCAM: F Procname,ACTIV=luname
 Activate LU
 _____>
 Positive Response
 <_____>

VTAM: V NET,INACT,ID=puname
 TCAM: F Procname,DEACT=puname
 Deactivate PU PVC
 _____>
 Positive Response
 <_____>
 DISCONTACT
 _____>
 PSDISC
 _____>
 PSDISC
 <_____>
 Positive Response
 <_____>

VTAM: V NET,INACT,ID=linename
 TCAM: F Procname,DEACT=linename
 Deact Link PVC
 _____>
 Positive Response
 <_____>

COMPATIBILITY/INCOMPATIBILITY CONSIDERATIONS

X25NPSI provides the X.25 interface control for ACF/NCP Version 1 Release 2.1 and up, without adding any incompatibility with the NCP support for the resources not connected through X25NPSI. However, some limitations are listed below. They are related to the ACF functions available for the X25NPSI-controlled resources, and to the use of host network control facilities.

SUPPORTED AND NON-SUPPORTED ACF FUNCTIONS

The following table shows whether the ACF functions are supported according to the X25NPSI links: MCH, PVC, or SVC.

ACF Functions	X25NPSI LINKS		
	MCH	PVC	SVC
Link level 2 Test	NO Negative Resp. Sense X'081C'	YES	
Line trace	YES as for SDLC line	Not applicable because no physical connection	
OLLT	T3700LTA/B only See section "Tools to check the Hardware"	Not applicable because no physical connection	
Backup SSCP for Netw. Resources	Allowed	Allowed	Not allowed
Dynamic Reconfig.	NO	Allowed only for LUs. Not for PUs	
Negotiable bind	Not applicable	For SNA resources only, that is, for LLC2 only	
Intensive Mode Recording	NO, negative response Sense X'1003'		
Link Problem Determination Aid	NO		

HOST NETWORK CONTROL AIDS CONSIDERATIONS

NPA cannot be used to collect data from the pseudo-SDLC links representing the physical connection to the X.25 network (MCH) and the virtual circuits. For these pseudo-links, the related LINE macro should be coded with NPA=NO (ACF/NCP Version 1 Release 4).

ACF/TAP cannot be used to format the trace records generated by the X25NPSI for the X.25 multichannel links.

NPDA cannot be used to format the RECMSs generated by the X25NPSI for the resources connected to the 3705 through the X.25 network. However, the user can develop his own formatting routine for X.25 RECMSs on the CNM EXIT provided by NCCF. If requested by the NPDA operator, NPDA displays the X.25 RECMSs in hexadecimal notation.

X25NPSI SLOWDOWN PROCEDURE

The NCP slowdown procedure is a means of partially restricting the NCP's activity if the number of available buffers reaches a predefined lower system threshold (LST). The NCP exits from SLOWDOWN when a predefined upper system threshold (UST) is reached. The UST is 150% of the LST.

X25NPSI also has its own slowdown procedure:

- Two thresholds are defined (see the description of the X25VCCPT macro in the "X25NPSI Installation" section of this manual):
 - The SAFE/UNSAFE threshold is, by default, equal to 125% of the LST.
 - The UNSAFE/DANGER threshold is, by default, equal to the LST.
- After the NCP's initialization, all the VCs are in the SAFE situation.

ENTERING SLOWDOWN

When the number of available buffers reaches the SAFE/UNSAFE threshold for a VC (equal to 125% LST by default), the activity on this VC enters the UNSAFE state and the virtual circuit window size is restricted to a value of one as long as the DCE timer does not elapse. Each time the DCE timer elapses, the window size is increased by one.

When the number of available buffers reaches the UNSAFE/DANGER threshold for a VC (equal to the LST by default), the X25NPSI enters the DANGER state for this VC.

- RNR packet is sent when the window is closed, and when the More Data Bit is OFF.
- The window is decreased to 1 as long as the packets received carry the MDB, but, each time the DCE timer elapses, an RR is sent.

If the number of available buffers is equal to eight, no more buffers can be leased and the LAC sends an RNR frame over all the multichannel links.

EXITING FROM SLOWDOWN

As soon as the number of available buffers exceeds sixteen, the LAC resumes line activity by sending an RR frame over all the multichannel links.

In the DANGER situation, exiting is always performed from DANGER to SAFE:

- At the highest of UST or SAFE/UNSAFE thresholds when in QUIESCE mode.
- At the SAFE/UNSAFE threshold when in DANGER but not in system QUIESCE mode.

The X25NPSI exits from the UNSAFE state and enters the SAFE state when the SAFE/UNSAFE threshold is reached. All the virtual circuit windows are set to their normal size (set at generation time for PVCs, or established at CALL time for SVCs).

The host is not aware that the X25NPSI has entered the slowdown procedure except when the NCP is also in QUIESCE mode, in which case all the virtual circuits are, all the more, in DANGER state.

Figure 7-1 shows how the X25NPSI slowdown procedure works.

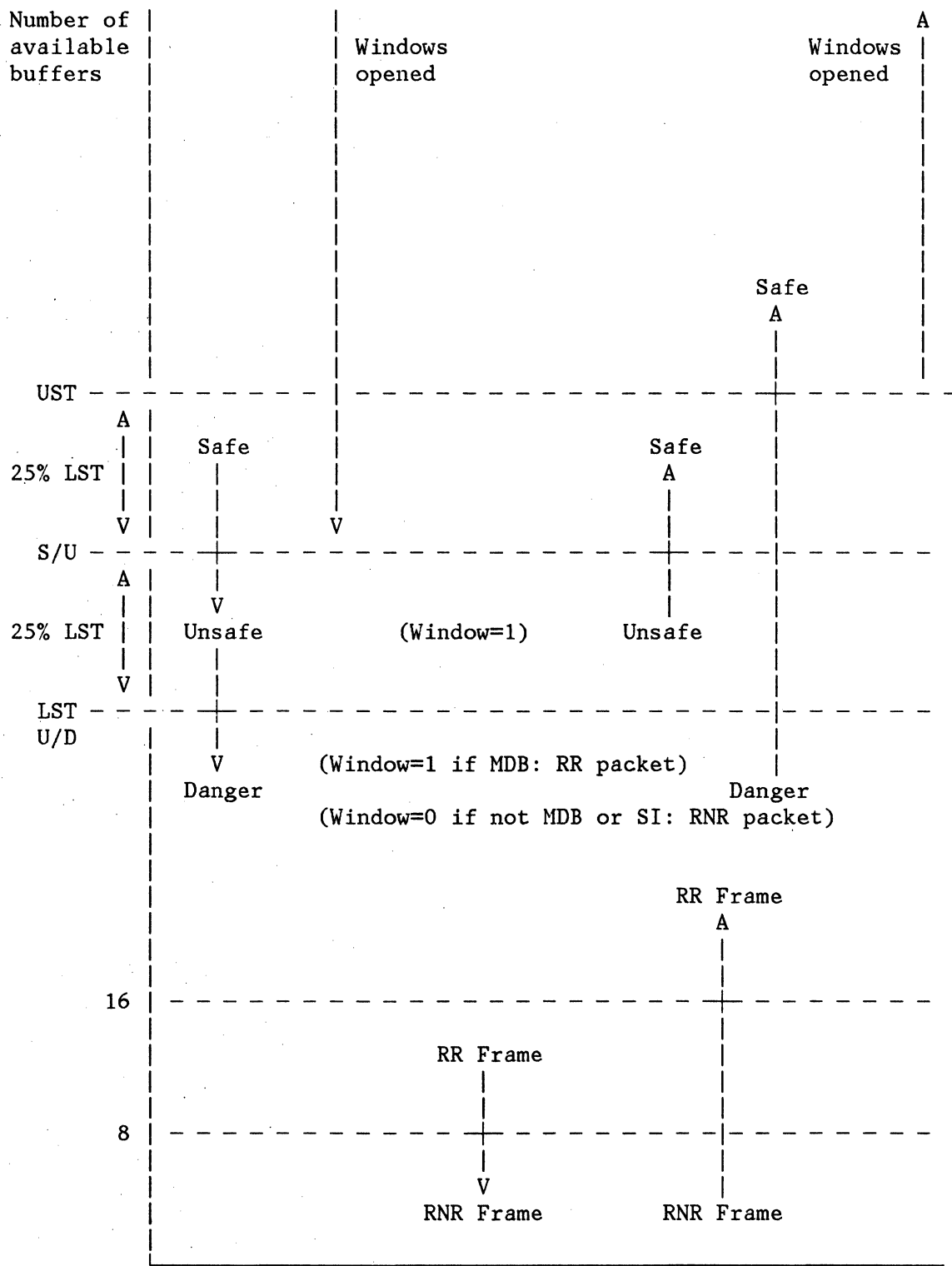


Figure 7-1. X25NPSI Slowdown Procedure

THE AUTO NETWORK SHUTDOWN (ANS) PROCEDURE

The NCP enters ANS when no more paths are available between the host and the 3705.

The NCP performs the Auto Network Shutdown (ANS) for SNA links owned by the SSCP undergoing ANS by:

- Clearing the SSCP undergoing ANS as link owner
- Exiting from the ANSWER mode on switched links
- Taking any link with LINE TRACE ACTIVE, activated by the SSCP undergoing ANS, out of LINE TRACE mode
- Quiescing links in OLLT mode
- Quiescing links with link Test, level 2 active
- Resetting intensive mode recording
- Breaking switched connections

The NCP performs ANS for SNA devices for which ANS=STOP is specified, by:

- Sending a DISC command and stopping polling operations
- Breaking the switched connections
- Clearing the SSCP undergoing ANS as the station owner
- Resetting all session states

Then, the X25NPSI reacts to the NCP's actions by:

- Sending a DISC frame over the MCHs which are found active if ANS=STOP is coded in the corresponding PU
- Sending a DISC-LLU over all the permanent virtual circuits that have been found active if ANS=STOP is coded in the PU macro
- Sending a DISC-LLU over all the switched virtual circuits which have been found active, and then breaking the connection by sending a CLEAR REQUEST packet
- Exiting from the ANSWER mode on all the other switched virtual circuits

COMPATIBILITY/INCOMPATIBILITY CONSIDERATIONS

X25NPSI provides the X.25 interface control for ACF/NCP Version 1 Release 2.1 and up, without adding any incompatibility with the NCP support for the resources not connected through X25NPSI. However, some limitations are listed below. They are related to the ACF functions available for the X25NPSI-controlled resources, and to the use of host network control facilities.

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The following table shows whether the ACF functions are supported according to the X25NPSI links: MCH, PVC, or SVC.

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Backup SSCP for Netw. Resources	Allowed	Allowed	Not allowed
Dynamic Reconfig.	NO	Allowed only for LUs. Not for PUs	
Negotiable bind	Not applicable	For SNA resources only, that is, for LLC2 only	
Intensive Mode Recording	NO, negative response Sense X'1003'		

HOST NETWORK CONTROL AIDS CONSIDERATIONS

NPA cannot be used to collect data from the pseudo-SDLC links representing the physical connection to the X.25 network (MCH) and the

virtual circuits. For these pseudo-links, the related LINE macro should be coded with NPA=NO (ACF/NCP Version 1 Release 4).

ACF/TAP cannot be used to format the trace records generated by the X25NPSI for the X.25 multichannel links.

NPDA cannot be used to format the RECMSs generated by the X25NPSI for the resources connected to the 3705 through the X.25 network. However, the user can develop his own formatting routine for X.25 RECMSs on the CNM EXIT provided by NCCF. If requested by the NPDA operator, NPDA displays the X.25 RECMSs in hexadecimal notation.

Different tools are at your disposal for problem determination. Although the use of these different tools is often simultaneous, they can be divided into four classes:

1. Tools to check the hardware
2. Trace
3. Reports
4. Dump/Snap

TOOLS TO CHECK THE HARDWARE

Figure 9-1 shows a typical hardware configuration.

- The numbers identify the various tests.
- The letters identify the possible traces.

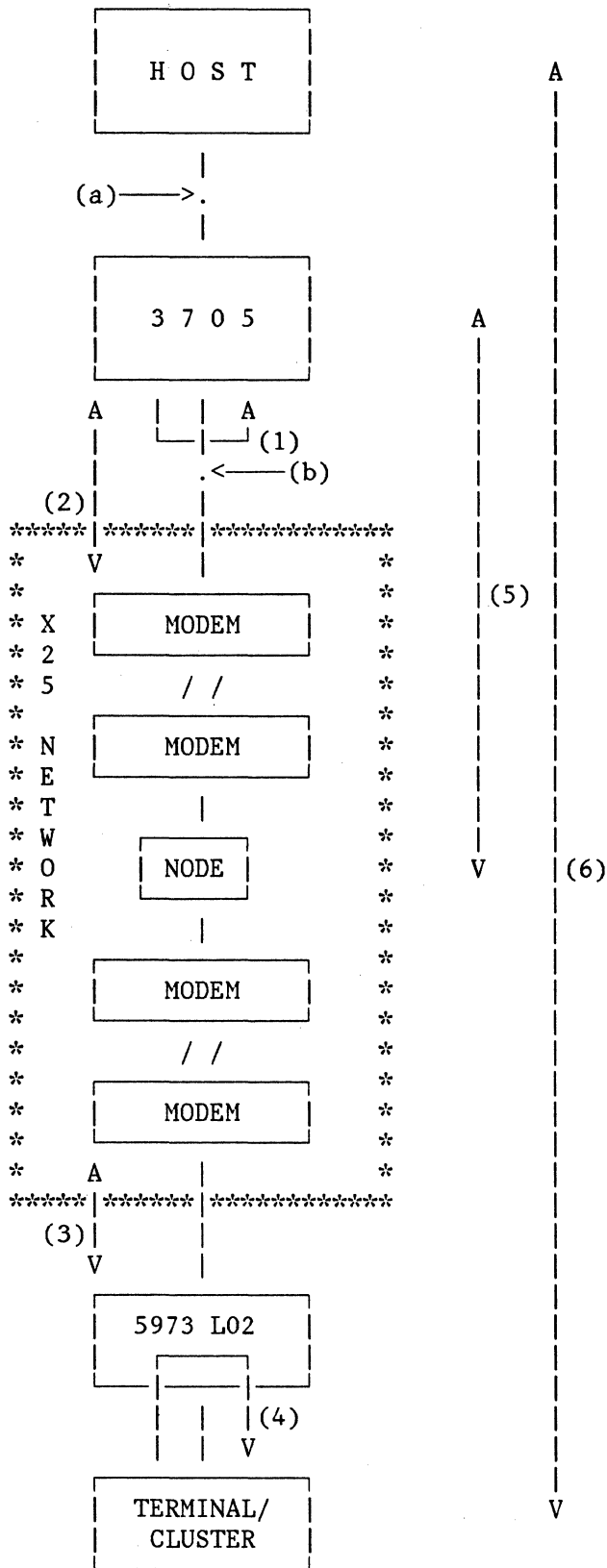


Figure 9-1. Hardware Configuration

The tests corresponding to arrows 1 to 6 can be performed in the following manner:

OLLT

If the OLT=YES operand is specified in the BUILD macro instruction of an NCP generation, the Online Line Tests (OLLT) can be performed on the multichannel links. Processing the OLLT on a PVC or SVC would, of course, lead to a "resource not available" report, because a PVC or SVC does not correspond to a real physical connection. The OLLT consists in sending PIUs consisting of interpretative chain commands to the OLLT NCP processor by means of VTAM's TOLTEP program.

- Arrow 1:

The test corresponding to arrow 1 may be performed by means of the T3700LTA test. It consists in a wraparound at line set level, excluding the interface drivers.

- Arrow 2:

The test corresponding to arrow 2 may be performed by means of the T3700LTB test, provided the modem has a wrap switch at the entry.

NIA WRAP

- Arrow 3:

The 5973-L02 NIA may perform the test corresponding to arrow 3, provided the modem has a wrap switch at the entry.

Please refer to the 5973-L02 Product Description Manual, GA11-8643, for more details and operation guidelines.

- Arrow 4:

The 5973-L02 NIA is equipped with a wrap switch at SDLC procedure level, and thus can be seen as a modem by an SNA terminal.

USING ECHO WITH AN APPLICATION

- Arrow 5:

This test corresponds to a communication with the "Echo service" of the PPSN. Please refer to the "Communicating with the Network Services" section of the chapter titled "Communications with non-SNA X.25 DTEs". This test invokes software as well as hardware. It needs an application program and can be seen as a tool to debug an application program.

LINK LEVEL 2 TEST FOR A VC

- Arrow 6:

This test invokes an end-to-end communication. This test can be performed by:

1. Using the IBM SSCP test from the SNA terminal.
2. Using link level 2 test from the host:
 - a. For a PVC, only the link should be activated before issuing the command that performs the test.
 - b. For an SVC, the connection should be established. This means that XIDs should have been exchanged.

This test can be performed with IBM terminals connected to the X.25 network via the NIA, supported with LLC level 2 (PSH). It may also be performed with non-SNA X.25 DTEs (LLC level 0) if they support the ECHO packet.

In any case, the data length must not exceed the packet length minus two. If this length is exceeded, the link level 2 test request is rejected by the X25NPSI.

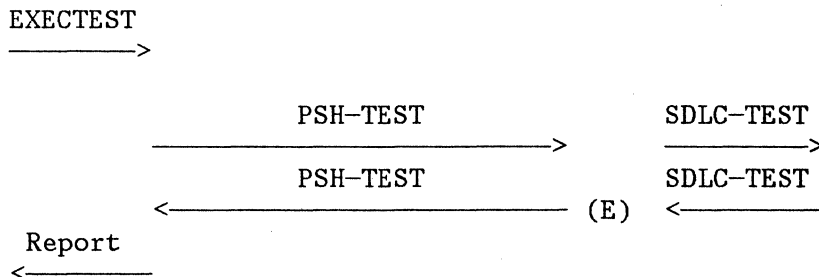
This test is performed without using a host application program. Thus, the operation guidelines for permanent virtual circuits differ from those for switched virtual circuits.

1) Permanent virtual circuit

OPERATOR SSCP 3705 Node 5973-L02 Terminal

Line Set up Line Set up (E)
 <-----> <----->

VTAM: F NET,LL2,ID=puname,NTRANS=1
 TCAM: F procname,ACTIV=puname,.....



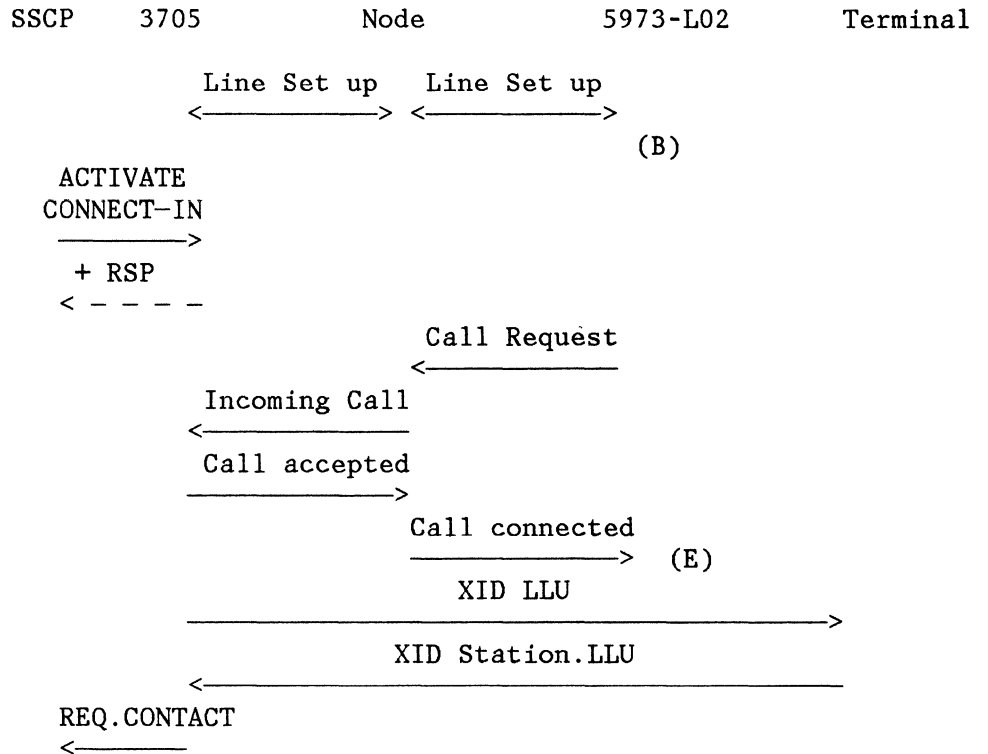
Once the X.25 line setup has been performed, first between the 3705 and the PPSN node, and second between the NIA and the PPSN node, the operator may key a command to activate

the link level 2 test. The EXECTEST command sent by the SSCP results in a PSH-TEST LLU being transmitted to the 5973-L02. Then, the PSH-TEST LLU is changed into an SDLC-TEST over the SDLC line and, when the answer is received, the 5973-L02 sends the PSH-TEST back to the 3705. The X25NPSI makes a report to the SSCP to tell it whether the test was successful. The 5973-L02 remains in the E state.

In this manner, it becomes possible to follow the transmission of a message along the entire path.

2) Switched Virtual Circuit Under VTAM:

In this case, the problem is somewhat different. Because an operator cannot send a CONNECT OUT command directly without an application program, it is better to initiate the call from the 5973-L02 NIA.

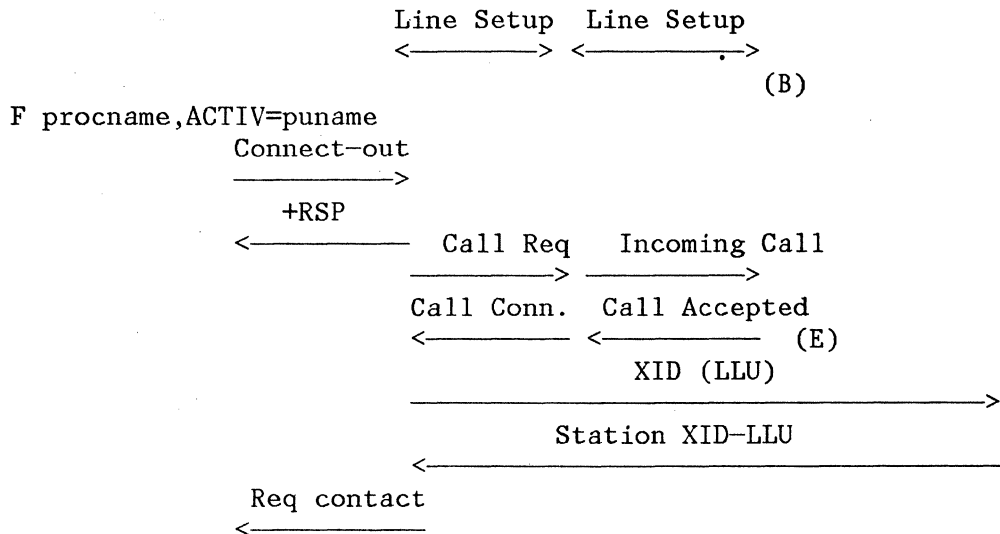


Once the line setup and the ANSWER command have been performed, a 5973-L02 operator may key dial digits to call the 3705 over the wanted line.

The 5973-L02 state goes from B to E when the CALL CONNECTED packet is received.

3) Switched Virtual Circuit Under TCAM:

Operator SSCP 3705 Node 5973-L02 Terminal



Once the X.25 line setup has been performed, first between the 3705 and the PPSN node, and second between the NIA and the PPSN node (Status B of the NIA), the operator may enter a command to acquire a terminal (F procname, ACTIVE=puname). When the call is accepted, the state of the NIA changes to E.

GENERALIZED TRACE FACILITY (GTF)

The Generalized Trace Facility (GTF) is a service aid program available under OS/VS to trace selected system events. The trace output, when formatted and printed by the EDIT function of PRDMP, is useful in determining and diagnosing problems that may arise while using OS/VS1. As far as the X25NPSI is concerned, you may use this facility:

1. To trace the exchange of PIUs with a particular destination between the host and the 3705: (a) in Figure 9-1.
2. To trace the line activity between the 3705 and the network node: (b) in Figure 9-1.

To obtain more detailed information concerning the use and operation guidelines for the GTF and PRDMP facilities, use the appropriate operating-system and access-method documentation.

In order to use GTF, you should perform the following operations:

1. First, start the GTF program:

```

//S1      EXEC      PGM=HHLGTF,
//                    PARM='MODE=EXT,DEBUG=NO,TIME=YES'
//SYSPRINT DD      SYSOUT=A,DCB=BLKSIZE=1089
//IEFRDER   DD      DSN=SYS1.TRACE,UNIT=3400-4,DISP=OLD,
  
```



```
VOL=SER=NLTAPE
//SYSLIB DD DSN=SYS1.PARMLIB(VTGTFTRA),DISP=SHR
/*
```

where the VTGTFTRA member in the SYS1.PARMLIB is defined by:

```
TRACE=RNIO,USR
```

2. Then, specify to VTAM what you want to trace:

```
MODIFY PROCNAME,TRACE,TYPE=BUF,ID=resource name(LINK, PU, LU)
MODIFY PROCNAME,TRACE,TYPE=LINE,ID=line name
```

3. At the end, stop GTF and process the following job to get output editing:

```
//PRINT EXEC PGM=HMDPRDMP
//SYSPRINT DD SYSOUT=A
//PRINTER DD SYSOUT=A,DCB=BLKSIZE=1089
//TAPE DD DSN=SYS1.TRACE,UNIT=3400-4,
// DISP=OLD,VOL=SER=NLTAPE
//SYSIN DD DSN=SYS1.PARMLIB(GTFTPIOA),DISP=SHR
```

where the GTFTPIOA member in SYS1.PARMLIB is defined by:

```
EDIT DD=TAPE,USR=(TPIO).
```

LINE TRACE FACILITY

The standard ACTIVATE and DEACTIVATE LINE TRACE commands are available for a multichannel link working with a Communications Scanner type 2 or 3. They allow tracing all the bytes on the line.

Because no physical connection is associated to a PVC or SVC, the ACTIVATE and DEACTIVATE LINE TRACE commands are not used and are rejected by X25NPSI with a negative response.

ERROR REPORTS

When an invalid request is encountered, or when an abnormal condition occurs without provoking a hard stop, the NCP reports this event to the access method by means of the following messages:

- Exception Response
- Inoperative
- Record Maintenance Statistics

When an invalid SSCP request is detected by an NCP initializer, the NCP generates an SNA exception response.

If the SSCP request is valid, but if an NCP terminator detects an abnormal condition, the NCP generates an SNA exception response followed by an RECMS. The purpose of this RECMS is to explain the circumstances of this abnormal condition.

When the NCP detects an abnormal condition not caused by a request message, the NCP generates an inoperative message followed by an RECMS:

- If this is an RECMS for SNA Station Error, the SSCP may again try to contact the physical unit and, for VTAM, will schedule the LOSTERM exit routine of the application program after "n" unsuccessful retries.
- If this is an RECMS for SNA Link Error, the SSCP considers it as a hardware error and sends an ABANDON CONNECTION command.
- The RECMS for SNA statistics are generally used for statistics. They are sent when a counter becomes exhausted, or after an INOPERATIVE link, for all the dependent stations.

The Exception Response and Inoperative messages are a means of keeping the host console operator informed of what goes on. The Record Maintenance Statistics messages, which contain more detailed information, are recorded on:

- SYSERR under a VM System
- SYS1.LOGREC, and possibly the NCCF file under an OS/VS System
- SYSREC under a DOS/VS System.

EXCEPTION RESPONSES

Exception Responses are identified in the RH by RH1B0 bit 5 being ON. In this case, the RU is displaced four bytes to the left to make room for sense data. The first two bytes (bytes 0 and 1) of this sense data contain the exception response code.

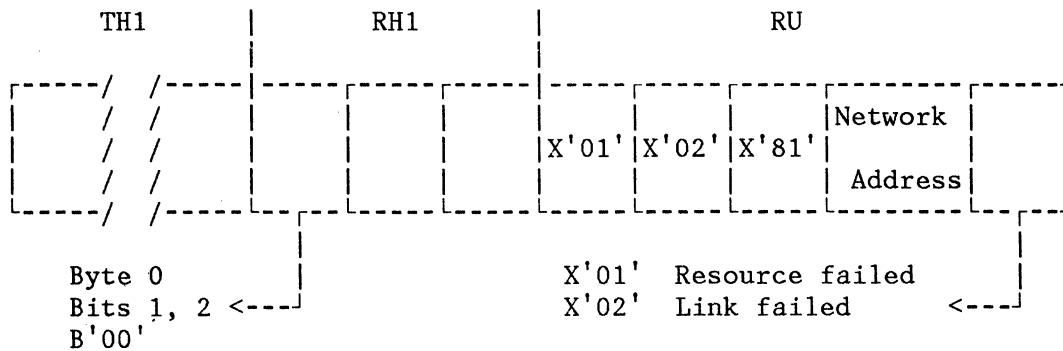
Bytes 2 and 3 contain user-specified sense information. The exception response code information (used by this X25NPSI) is set by the PCNE or the NAS and is as follows:

EXCEPTION RESPONSE CODE	MEANING
X'0001'	Component not available
X'080C'	Activate line trace on rejected VC
X'0813'	Bracket rejected, or BB request received from the host on an OIC or LIC request with exception response
X'081B'	Receiver in transmit
X'081C'	Link test level 2 rejected on an MCH
X'081C'	ACTLU rejected on an MCH
X'0821'	Invalid session operand
X'0850'	Load/dump failed

X'08F3'	Invalid SC/DFC requests
X'08F4'	PCNE error
X'08F5'	Segmenting not supported
X'08F6'	Interrupt confirmation not received
X'08F7'	Interrupt request contention
X'08F8'	DFC request not supported
X'08F9'	SHUTD request not currently allowed
X'1003'	Function not supported
X'2002'	Chaining error
X'2003'	FMD without Begin Bracket or Exception Response requested on OIC during conditional bracket initialization
X'400C'	Bracket not supported
X'8007'	Segment error

INOPERATIVE MESSAGES

Inoperative messages are "Function Management Data" messages. More precisely, they belong to the "Physical Configuration Services". The format of an INOPERATIVE message is the following:



INOPs for an MCH

X25NPSI generates INOP LINK or STATION messages. Before sending An INOP STATION message, LAPB sends a DISC command to the network. At this point, X25NPSI is waiting for an ACTIVATE PU. Before sending an INOP LINK message, X25NPSI disables the modem and waits for an ACTIVATE LINK followed by an ACTIVATE PU.

INOPs for a VC

There are four categories of failure for a VC:

1. Failure at MCH level
2. Failure at VCM level

3. Failure at PLP level

4. Failure at LLC level

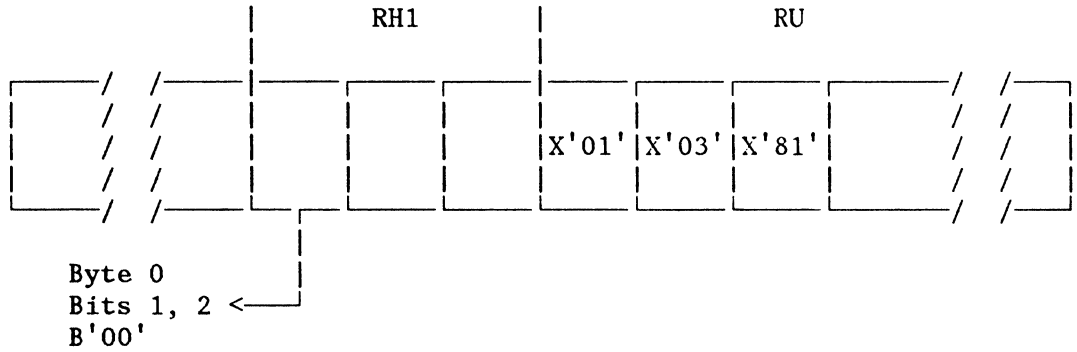
The following table indicates the actions to be taken in case of various types of failure in each of these categories.

Failure Level	Category of failure	Event	Action
MCH		MCH down	INOP station
VCM	Timeout	Timeout on CALL REQUEST (Connect-out)	INOP station
		Timeout on CLEAR REQUEST	INOP station
	Outgoing call refused by the X25NPSI	LLC type invalid	INOP station
		LLC type not supported	INOP station
		Invalid VCCPT index	INOP station
		Invalid OUFT index	INOP station
		Slowdown during Connect-out	INOP station
		Command refused due to MCH failure	INOP station
Command refused because VC not defined for CALLOUT	INOP station		
Incoming call refused	LLC type invalid	RECMS link	
	LLC type not supported	RECMS link	
Clear Indication received	VC not in answer mode	RECMS link	
	VC defined with CALL=OUT only	RECMS link	
Reset Indication received	Contention	RECMS link	
Clear Indication received		INOP station	
Reset Indication received		INOP station	
Restart Indication received	VC inactive	No action	
	VC active	INOP station	
Invalid or not supported control packet received	Before XID exchange	No action	
	After XID exchange	INOP station	

Failure Level	Category of failure	Event	Action	
PLP		Invalid P(S) received	INOP station	
LLC	LLC-OUT Dispatcher	LLU to be sent on X.25 LVL3 Status different from Information Transfer (P4)	INOP station	
		PSH	Invalid PU type in XID XID-LLU to be sent on: *a PVC *or state different from XMIT-XID Timeout and retries exhausted Invalid/Unexpected NS-LLU recvd CMDR received	INOP station INOP station INOP station INOP station INOP station
		Invalid N(S) rcvd in an I-LLU	INOP station	
		I-LLU to be sent on state different from "PSH Data Transfer"	INOP station	
		I-LLU received on state different from "PSH Data Transfer"	INOP station	
		Contact/Discontact request out of valid PSH state	INOP station	
	PCNE		Discontact processing on a PVC due to an ANS condition	INOP station
			Error in inbound detected by LUSREQ: No SSCP-SLU session	INOP station
			Error in inbound detected by LUSREQ: No PLU-SLU session	INOP station
			Error in inbound detected by LUSREQ: SLU in RCV or FME-WAIT state	INOP station
		Error in inbound detected by LUSREQ: SHUTC state entered	INOP station	
		Error in inbound detected by LUSREQ: Wait for DFC response	INOP station	
		Error in inbound detected by LUSREQ: No DFC request pending	INOP station	
	Error in inbound detected by LUSREQ: Begin bracket pending	INOP station		

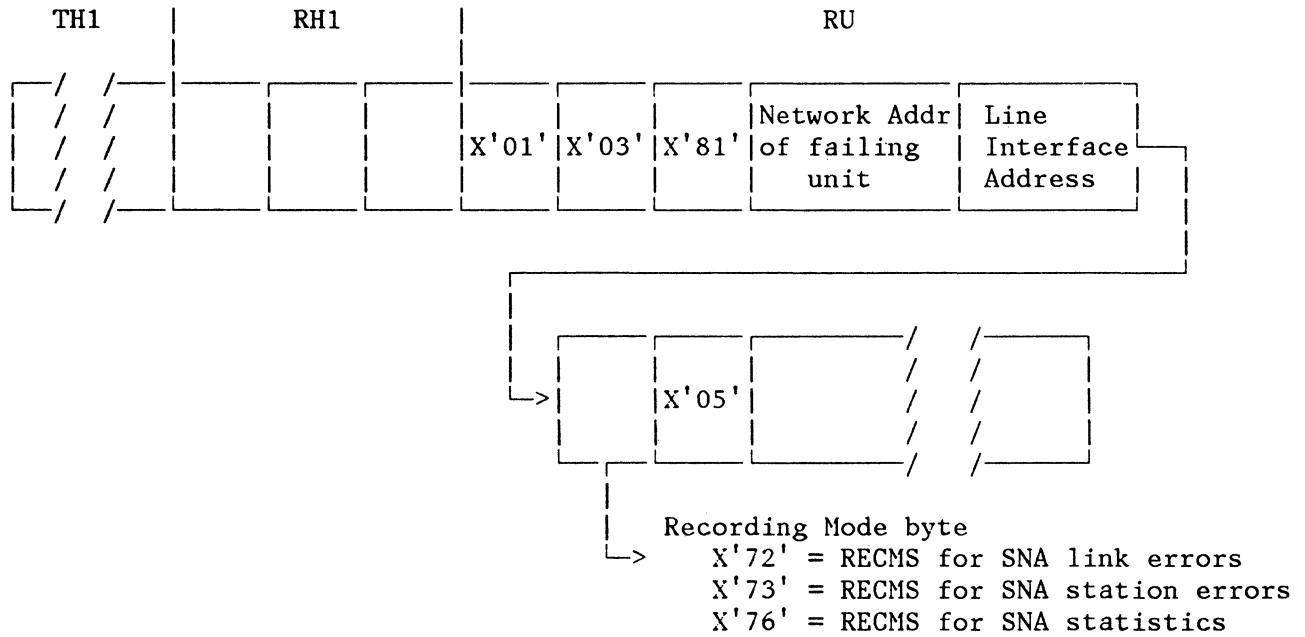
RECORD MAINTENANCE STATISTICS MESSAGES

RECMS messages are "Function Management Data" messages. More precisely, they belong to the "Physical Maintenance Services" and are identified by:



As far as X25NPSI is concerned, there are three types of Record Maintenance Statistics message:

1. The RECMS for SNA link errors: Recording mode = X'72'
2. The RECMS for SNA station errors: Recording mode = X'73'
3. The RECMS for SNA statistics: Recording mode = X'76'



DESCRIPTION OF THE INTERNAL X25NPSI ERROR BYTES

Internal X25NPSI Error Bytes for an MCH

Should a failure occur on a MCH, X25NPSI maintains one byte in the MKB to explain this failure. When an MCH's RECMS for SNA link error has to be sent to the host, this byte is copied in place of LXBHSTAT.

The format of this byte is:

MKBMDBEC	FAILURE EXPLANATION	ACTION
X'02'	No completion of XMIT action at level 2 (Modem power OFF or level 2 masked)	INOP link
X'04'	Permanent Synchro lost on receive leg	INOP link
X'05'	N2 counter exhausted	INOP link
X'06'	Scanner check: Error on final flag xmission (CSB2 only)	INOP link
X'07'	Modem check: * DSR OFF due to permanent modem failure or due to LOOP test initialized by local network node. * CTS OFF in xmit.	INOP link
X'08'	Carrier detector check	INOP link
X'09'	Line permanently at mark	INOP link
X'0A'	Disconnect requested by DCE or DM received	INOP station or link
X'0B'	SABM received after setup (re-initialization not supported)	INOP station
X'0C'	Unsolicited UA received	INOP station
X'0D'	Unexpected "final bit" in a response	INOP station
X'0E'	Frame overrun (no LIQ available)	INOP link
X'10'	CMDR sent for invalid length	INOP station
X'11'	CMDR sent for invalid N(R)	INOP station
X'13'	Character underrun	INOP link
X'14'	CMDR received (Invalid N(S))	INOP station
X'15'	CMDR received (W bit ON)	INOP station
X'16'	CMDR received (X bit ON)	INOP station
X'17'	CMDR received (Y bit ON)	INOP station
X'18'	CMDR received (Z bit ON)	INOP station
X'19'	CMDR sent for invalid 'C' field	INOP station
X'1A'	Maximum output queueing limit reached	INOP station
ERROR CODES FOR UNSUCCESSFUL ENABLE/CONTACT (CSE 2)		
X'80'	Set mode X leg (CSB error)	INOP link
X'82'	Set mode R leg (CSB error)	INOP link
X'84'	DSR OFF on X leg (line set error)	INOP link
X'86'	DSR OFF on R leg (modem power off)	INOP link
X'8A'	Clock check (modem error)	INOP link
X'8C'	DCE does not send flags	INOP link
ERROR CODES FOR UNSUCCESSFUL ENABLE/CONTACT (CSE 3)		
X'92'	Set mode X leg (CSB error)	INOP link
X'94'	Set mode R leg (CSB error)	INOP link
X'96'	DSR OFF on X leg (line set error)	INOP link
X'98'	DSR OFF on R leg (modem power cff)	INOP link
X'9A'	RTS check (modem error)	INOP link
X'9E'	Clock check (modem error)	INOP link
X'A0'	DCE does not send flags	INOP link
X'FF'	Timeout on Restart Request	INOP link

Internal X25NPSI Error Bytes for a VC

Should an abnormal condition occur on a VC, X25NPSI maintains six bytes in the VCB to explain this condition. When a VC's RECMS for SNA link/station error or statistics is built, these six bytes are in the RECMS in place of the unused SDLC fields:

VCBRECBO ----> LXBERST
 VCBRECB1 ----> LXBHSTAT
 VCBRECB2 ----> LXBEREST
 VCBRECB3 ----> SCBPCNT (Only in RECMS for SNA station error)
 VCBRECB4 ----> SCBNR (Only in RECMS for SNA station error)
 VCBRECB5 ----> SCBNS (Only in RECMS for SNA station error)

The format of these six bytes is:

VCBRECBO	
	bit 0 = 0 Indicates that the RECMS applies to a VC
	bit 1 = 1 Indicates that the RECMS is generated by the X25NPSI
	bits 2,3:
VCBROMCH	00 MCH failure
VCBROVCM	01 VCM failure
VCBROPLP	10 PLP failure
VCBROLLC	11 LLC failure
	bits 4-7: indicate the category of the failure. Valid in case of VCM or LLC failure:
	In the case of VCM failure:
VCBROTO	0001 Timeout
VCBROOCR	0010 Outgoing call refused
VCBROCLE	0011 Clear indication received
VCBRORET	0100 Reset indication received
VCBORAT	0101 Restart indication received
VCBROICP	0110 Invalid or unexpected control packet received
VCBROICR	0111 Incoming call refused
	In the case of LLC failure:
VCBROPSH	0001 PSH failure
VCBROPCO	0010 PCNE 0 failure
VCBROLLD	0100 LLC-OUT dispatcher failure
VCBROLLI	0101 LLC-IN dispatcher failure

VCBREC B1	
VCBR1MC0	In case of MCH failure (VCBREC B0 bits 2,3=00): = X'00'
VCBR1A01	In case of VCM failure (VCBREC B0 bits 2-3=01) *For the "Type of failure": Timeout X'01' Timeout on CALL REQUEST
VCBR1B01	*For the "Type of failure": Outgoing call refused X'01' LLC type invalid
VCBR1B02	X'02' LLC type not supported
VCBR1B03	X'03' Invalid VCCPT index
VCBR1B04	X'04' Invalid OUFT index
VCBR1B05	X'05' Slowdown during Connect-out
VCBR1B06	X'06' Command refused due to MCH failure
VCBR1B07	X'07' SVC not defined for CALL=OUT
VCBR1B08	X'08' Calling or Called DTE address length invalid
VCBR1B09	X'09' Invalid Dial Digits length
	*For the "Type of failure": Clear indication received The value of this byte is equal to the CAUSE byte received in the CLEAR indication packet (1)
	*For the "Type of failure": Reset indication received The value of this byte is equal to the CAUSE byte received in the RESET indication packet (2)
	*For the "Type of failure": Restart indication rcvd The value of this byte is equal to the CAUSE byte received in the RESTART indication packet (3)
	*For the "Type of failure": Invalid or unexpected control packet received The value of this byte is equal to byte 0 of the packet header received
VCBR1C01	*For the "Type of failure": Incoming call refused X'01' LLC type invalid
VCBR1C02	X'02' LLC type not supported
VCBR1C03	X'03' VC not in answer mode
VCBR1C04	X'04' VC defined with CALL=OUT only
VCBR1C05	X'05' Contention with an outgoing call
VCBR1PL1	In case of PLP failure (VCBREC B0 bits 2,3=10) X'01' Invalid P(S) received
VCBR1PL2	X'02' Q bit received, not supported

<p>VCBR1LL1</p> <p>VCBR1LL2</p>	<p>In case of LLC failure (VCBRECBO bits 2,3=11)</p> <p>*For an LLC-OUT dispatcher failure: X'01' LLU to be sent on an X.25 LVL3 state different from "Information Transfer" (P4)</p> <p>*For an LLC-IN dispatcher failure: X'02' Invalid input from End-User</p>
<p>VCBR1PS2</p> <p>VCBR1PS3</p> <p>VCBR1PS4</p> <p>VCBR1PS5</p> <p>VCBR1PS7</p> <p>VCBR1PS8</p> <p>VCBR1PS9</p> <p>VCBR1PSA</p> <p>VCBR1PSB</p> <p>VCBR1PC1</p> <p>VCBR1PC2</p> <p>VCBR1PC3</p> <p>VCBR1PC4</p> <p>VCBR1PC5</p> <p>VCBR1PC6</p> <p>VCBR1PC7</p> <p>VCBR1PC8</p>	<p>*For a PSH failure:</p> <p>X'02' Invalid PU type in XID</p> <p>X'03' XID-LLU to sent on a PVC or on a state different from XMIT-XID</p> <p>X'04' Timeout and retries exhausted</p> <p>X'05' Invalid NS-LLU received</p> <p>X'07' Invalid N(S) received in an I-LLU</p> <p>X'08' I-LLU to be sent on state different from PSH Data Transfer</p> <p>X'09' I-LLU received on state different from PSH Data Transfer</p> <p>X'0A' Contact request out of valid PSH state</p> <p>X'0B' Discontact request out of valid PSH state</p> <p>*For a PCNE failure:</p> <p>X'01' Error in inbound detected by LUSREQ: no SSCP-SLU session</p> <p>X'02' Error in inbound detected by LUSREQ: no PLU-SLU session</p> <p>X'03' Error in inbound detected by LUSREQ: SLU in RCV or FME-WAIT state</p> <p>X'04' Error in inbound detected by LUSREQ: SHUTC state entered</p> <p>X'05' Error in inbound detected by LUSREQ: Wait for DFC response</p> <p>X'06' Error in inbound detected by LUSREQ: no DFC request pending</p> <p>X'07' Error in inbound detected by LUSREQ: Begin bracket pending</p> <p>X'08' Discontact processing on a PVC due to an ANS condition</p>

| (1) Cause byte in Clear:

	X'00'	DTE clearing
	X'01'	Number busy (or CALL COLLISION)
	X'03'	Invalid facility request
	X'03'	Invalid call (Network type 1)
	X'05'	Network congestion
	X'05'	Incidents on the network (Network type 1)
	X'09'	Out-of-order
	X'0B'	Access barred
	X'0D'	Unknown number, not obtainable
	X'11'	Remote procedure error
	X'13'	Local procedure error
	X'15'	RPOA out of order
	X'19'	Remote DTE refuses reverse charging
	X'21'	Incompatible destination
	X'21'	End of out-of-order condition (Network type 1)

| (2) Cause byte in Reset:

	X'00'	DTE resetting (Network type 1)
	X'00'	End of out-of-order (Network type 2)
	X'01'	Out-of-order
	X'03'	Remote procedure error
	X'05'	Local procedure error
	X'07'	Network congestion
	X'09'	Remote DTE operational
	X'0F'	Network operational
	X'11'	Incompatible destination

| (3) Cause byte in Restart:

	X'00'	DTE restart
	X'01'	Local procedure error
	X'03'	Network congestion
	X'05'	End of out-of-order condition (Network type 1)
	X'07'	End of incidents on the network

| Network Type 1 is specified by coding NETTYPE=1 in the X25NET macro.

| Network Type 2 is specified by coding NETTYPE=2 in the X25NET macro.

| When no network type is specified above, the cause is as defined
| in the CCITT-1980 X25 recommendations.

VCBREC B2	
VCBR2MCO	In case of MCH failure (VCBRECBO bits 2,3=00) = X'00'
VCBR2VCO	In case of VCM failure (VCBRECBO bits 2,3=01) *For the "Type of failures": Timeout Outgoing call refused Incoming call refused = X'00' *For the "Type of failure": Clear indication received the value of this byte is equal to the DIAGNOSTIC byte received in the Clear indication packet (Note 1) *For the "Type of failure": Reset indication received the value of this byte is equal to the DIAGNOSTIC byte received in the Reset indication packet (Note 1) *For the "Type of failure": Restart indication rcvd the value of this byte is equal to the DIAGNOSTIC byte received in the Restart indication packet *For the "Type of failure": Invalid or not supported control packet received, the value of this byte is equal to byte 2 of the packet header received
VCBR2PLO	In case of PLP failure (VCBRECBO bits 2,3=10) = X'00'
VCBR2LLO	In case of LLC failure, (VCBRECBO bits 2,3=11) =X'00'

Note 1:

When the CAUSE byte means DTE clearing/resetting operation, the associated diagnostic byte should be read in accordance with the type of the remote DTE:

1. If the remote DTE is a IBM 5973-L02 remote, you have to refer to IBM 5973-L02 Product Program Manual, GA11-8643 (SC7043) Section: Problem Determination - Aid 3.
2. If the remote DTE is the X.25 NPSI program product itself, you have to refer to sections:

Diagnostic field in the clear request packet for Type 1 networks

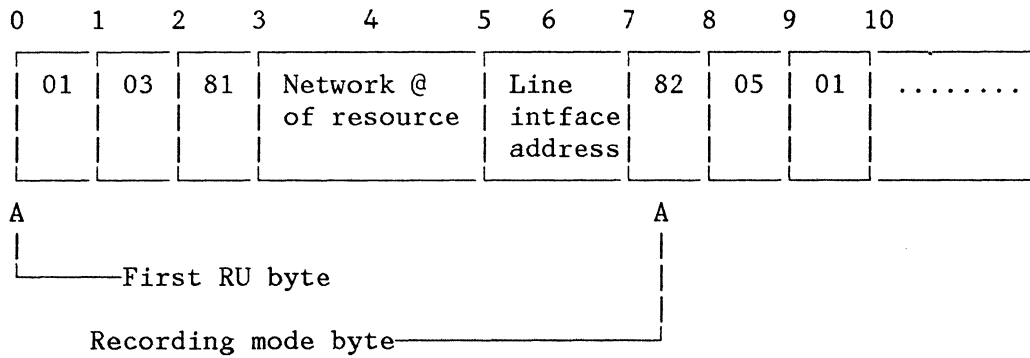
Diagnostic field in the reset request packet.

For CAUSE values other than DTE clearing/resetting, see the X.25 network specifications corresponding to the PPSN you are using.

	<p>VCBRECB3 This byte contains a copy of the VCM state at the time of the failure: VCBVCM0</p> <p> X'40' Inhibit transmit SARM</p> <p> X'08' P6 - DTE CLEAR REQUEST in progress</p> <p> X'04' P4 - Data transfer</p> <p> X'02' P2 - CALL REQUEST in progress</p> <p> X'01' D2 - DTE RESET REQUEST in progress</p>
	<p>VCBRECB4 This byte contains a copy of the PLP state at the time of the failure: VCBEPST</p> <p> X'80' DTE window closed</p> <p> X'40' RNR received</p> <p> X'20' Inbound packet accumulation in progress</p> <p> X'10' PLP-IN locked for PCNE</p>
	<p>VCBRECB5 This byte contains a copy of the end user state taken at the time of the failure</p> <p> *LLC dispatcher state = VCBEEST</p> <p> X'80' LLC timer running</p> <p> X'40' LLC-OUT waits for triggering</p> <p> X'20' LLC-IN timer elapsed</p> <p> *PSH state = VCBPSS1</p> <p> X'80' Information transfer</p> <p> X'40' Waiting XID</p> <p> X'20' Waiting PSCONT</p> <p> X'10' Waiting PSDISC</p> <p> X'08' Outbound segmenting</p> <p> X'04' Inbound segmenting</p> <p> *PCNE state = VCBEUS1</p> <p> X'80' Interrupt in progress</p> <p> X'40' SHUTC pending</p> <p> X'08' Inbound purge mode</p>

RECMS FOR SNA LINK ERRORS

The general format of RECMS for an SNA link error is:



The purpose of an RECMS for SNA LINK error is to explain in detail the cause of a failure.

MCH's RECMS for SNA Link Errors

The MKBMDREC X25NPSI error byte explaining the failure is located in this RECMS.

X'CO' ———> LXBERST
 MKBMDREC ———> LXBHSTAT

VC's RECMS for SNA Link Errors

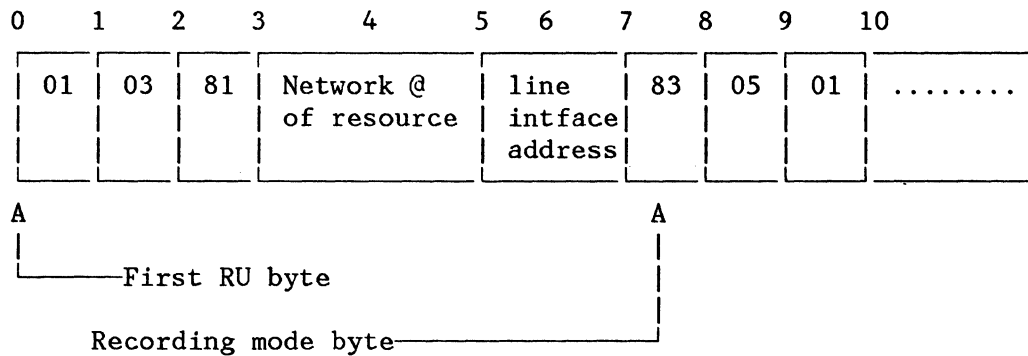
For a VC, the Line Interface Address is equal to X'FC00'.

The VCBRECB0-2 X25NPSI error bytes explaining the abnormal condition, are located in this RECMS.

VCBRECB0 ———> LXBERST
 VCBRECB1 ———> LXBHSTAT
 VCBRECB2 ———> LXBEREST

RECMS FOR SNA STATION ERRORS

The general format of an RECMS for an SNA station error is:



The purpose of an RECMS for SNA station errors is:

- To explain in detail the cause of the failure, and
- To send to the CPU information concerning the activity of the corresponding station.

An RECMS for SNA station errors must contain the information provided in:

- An RECMS for SNA link errors, and
- An RECMS for SNA statistics.

MCH's RECMS for SNA Station Errors

An MCH's RECMS for SNA station errors contains the following bytes:

X'CO' ———>LXBERST
 MKBMDREC ———>LXBHSTAT

and the eight standard statistics counters.

VC's RECMS for SNA Station Errors

For a VC, the Line Interface Address is equal to X'FC00'.

A VC's RECMS for SNA station errors contains the following bytes:

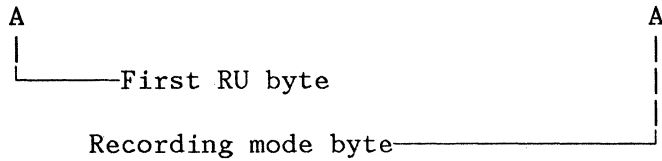
VCBRECB0 ———>LXBERST
 VCBRECB1 ———>LXBHSTAT
 VCBRECB2 ———>LXBEREST
 VCBRECB3 ———>SCBPCNT
 VCBRECB4 ———>SCBNR
 VCBRECB5 ———>SCBNS

And the 8 standard statistic counters.

RECMS FOR SNA STATISTICS

The general format of an RECMS for SNA statistics is:

0	1	2	3	4	5	6	7	8	9	10
01	03	81	Network @ of resource		line intface address		86	05	01



The purpose of an RECMS for SNA statistics is to send to the CPU information concerning the activity of the corresponding station. Note that in the case of an INOP LINK message, an RECMS for SNA statistics is generated for each station depending on this line.

The standard NCP maintains 8 counters to give information about the traffic concerning this station.

X25NPSI uses the same fields located in the SCB to maintain its own statistics.

MCH's RECMS for SNA Statistics

In the case of an MCH, the standard fields for statistics are used by X25NPSI as follows:

location	length in bytes	Meaning
SCBTCNT	2	Number of I Frames transmitted
SCBTRTCT	2	Number of I Frames received
SCBRECNT	2	Number of RRs transmitted
SCBTPCNT	2	Number of RRs received
SCBRCNT	2	1st byte: Number of RNRs transmitted 2nd byte: Number of RNRs received
SCBRPCNT	2	1st byte: Number of REJs transmitted 2nd byte: Number of REJs received
SCBTIACT	2	1st byte: Total number of retries on XMIT leg 2nd byte: Number of frames received with FCS error
SCBTINCT	2	Total number of errors on receive leg

VC's RECMS for SNA Statistics

For a VC, the Line Interface Address is equal to X'FC00'.

In the case of a VC, the standard fields for statistics are used by X25NPSI as follows:

Location	Length in bytes	Meaning
SCBTCNT	2	Number of I packets transmitted
SCBTRTCT	2	Number of I packets received
SCBRECNT	2	Number of RR packets transmitted
SCBTPCNT	2	Number of RR packets received
SCBRCNT	2	1st byte: Number of RNR packets transmitted 2nd byte: Number of RNR packets received
SCBRPCNT	2	Number of interrupt packets transmitted
SCBTIACT	2	Total number of connection requests (call request and incoming call)
SCBTINCT	2	Total number of connections (call connected/accepted)

RECMS RETRIEVAL WITHOUT NETWORK COMMUNICATIONS CONTROL FACILITY (NCCF)

The RECMS messages are recorded on the:

- SYSERR file under a VM system
- SYS1.LOGREC, and possibly on NCCF file under an OS/VS system
- SYSREC file under a DOS/VS system.

The purpose of this section is to indicate how to retrieve these records from these different files when not using the NCCF.

RECMS Retrieval Under a VM System

Refer to the IBM Virtual Machine Facility/370: OLTSEP and Error Recording Guide, GC20-1809, and particularly to the section "Using the CPEREP Command".

Example:

Enter first

```
DEF STOR 1M
I CMS
CPEREP
```

Once you have keyed the CPEREP command you may enter the following operands, via the prompting technique:

```
ACC=N
CUA=(addr)
DATE=(yrday)
HIST=N
PRINT=PS
```

When you get the printout of the RECMS, it will contain formatted explanations concerning the nature of the failure. As far as X25NPSI is concerned, you do not have to take into consideration the edited information because the contents of the fields do not have the same meaning any more. Only the hexadecimal printing of the record is useful.

RECMS Retrieval Under an OS/VS System

Refer to the OS/VS Environmental Recording Editing and Printing (EREP) Program Manual, GC28-0772.

Example:

```
//STEP1 EXEC PGM=IFCEREP1,
// PARM = ('ACC=N,TYPE=T,CUA=(addr),DATE=(yrday),PRINT=PS')
//SERLOG DD DSN=SYS1.LOGREC,DISP=OLD
//TOURIST DD SYSOUT=A,DCB=BLKSIZE=133
//EREPPPT DD SYSOUT=A,DCB=BLKSIZE=133
//SYSIN DD DUMMY,DCB=BLKSIZE=80
```

When you get the printout of the MDRs and SDRs, it will contain formatted explanations concerning the nature of the failure. As far as X25NPSI is concerned, you should ignore the edited information because the contents of the fields are no longer meaningful. Only the hexadecimal printing of the record is useful.

RECMS Retrieval Under a DOS/VS System

```
// JOB EREP
// EXEC EREP
OPTION CLEAR
/*
/&
```

Note: During the execution of this job, you may reply C to the following prompting:

3E11D ENTER OPTION SOURCE, C=CARD, S=CONSOLE, N=NONE.

RECMS RETRIEVAL WITH THE NETWORK COMMUNICATIONS CONTROL FACILITY (NCCF)

The NCCF program product can be modified to edit the X25NPSI RECMS using the line interface address to identify them. The processing of such an RECMS by NPDA results in the printing of the hexadecimal configuration only. This is due to the fact that the RECMS is meaningless to NPDA.

X25SNAP FACILITY

The X25SNAP facility need not normally be used in an operational environment.

In order to follow X25NPSI processing inside a 3705, a new macro instruction called X25SNAP has been developed. This X25SNAP macro has been coded at key points of X25NPSI in level 3 and level 5 codes. It allows recording the following information in a wraparound storage area:

- Identifier: Label of the X25SNAP macro (4 bytes)
- Registers 1 to 7 of the level (4 bytes):
 - The level is indicated in the first byte of register 1
 - The register identification is in the first half-byte of the second byte.
 - The register itself is in the 20 rightmost bits of these 4 bytes.
- 32 bytes of 3705 storage (optional).

This information can be read when a dump of 3705 storage is made.

This macro instruction can be very useful, but its use can be dangerous because the processing is very time-consuming. The possibility of overrun is rather high and depends on the number and speed of the lines connected to the 3705.

When it is issued, the X25SNAP handler tests whether the SNAP area is included. If yes, it is executed. If not, the processing is bypassed.

| One of the following operations should be performed in order to activate the X25SNAP facility:

- | 1. Perform a system generation with SNAP=YES coded in the X25BUILD macro.
- | 2. Change the member coded in the "INCL2HI=" operand of the X25END macro of the MACLIB library, by including BALSTAS8 instead of BALSTAM8, and run the linkedit job.

Including the X25SNAP Facility Under OS/VS

Process an IEBUPDTE utility on your MACLIB. The following JCL may be used for this update on the sysgen example given above:

```
//S1      EXEC PGM=IEBUPDTE
//SYSPRINT DD SYSOUT=A
//SYSUT1  DD DSN=SYS1.MAC71,DISP=SHR
//SYSUT2  DD DSN=SYS1.MAC71,DISP=SHR
//SYSIN   DD *
./ CHANGE NAME=D01HII
    INCLUDE ULIB(BALSTAS8)
./ ENDUP
```

00012000

Including the X25SNAP Facility Under DOS/VSE

With the Sysgen example given above:

- Number the D01HII book in the RL
- List this book
- Use MAINT utility to replace BALSTAM8 by BALSTAS8.

To deactivate the SNAP facility, proceed with the reverse operations.

TNL SN30-3213 (26 Feb 82) to SC30-3078-0

Editing and Interpreting the X25SNAP Trace

To edit the trace produced by the X25SNAP macros, use the formatted dump. The trace area is dumped at each MCH occurrence in the formatted blocks.

The last entry filled is immediately followed by an entry flagged with FFFF as SNAP label. Going backwards, you may reconstitute the last events.

Note: The entry at the end of the SNAP area flagged to FFFF is meaningful only when unique in the whole SNAP area.

The structure of one entry in the SNAP area filled with registers is shown below:

XXXXXXXX 0L1RRRRR 002RRRRR 003RRRRR 004RRRRR 005RRRRR 006RRRRR 007RRRRR

XXXXXXXX Is the SNAP identifier label of the X25SNAP macro in hexa.
In the edited part of the dump it is the SNAP label in Char.
L Is the level at which the X25SNAP has occurred (3 or 5).
1 to 7 Is the identification of the register.
RRRRR Is the value of the register at SNAP time.

This entry is optionally followed by 32 bytes of storage taken at the same time.

The description of the significant register contents and of the optional 32 bytes can be found in the assembly printouts using the following reference table:

IN THE LLC DISPATCHERS (BALSTAM8 MODULE, BALLCIN CSECT):

LCIO LLC-IN entry: R2=VCB address, R3=Buffer address,
R7=PLP-IN return address
LCIE LLC-IN after PCNE or PSH processing: R2=VCB address,
Snap area=Buffer begin
LCID LLC-IN exit: R2=VCB address
LCIQ LLC-IN after ENQ on BNN: R2=VCB address, R3=Buffer address,
R5=CUB address, Snap area=Buffer begin
LCIR LLC-IN inop: R2=VCB address, R3=Buffer address, snap area=Buffer begin
LC00 LLC-OUT entry: R2=VCBQCB3

IN LAP LEVEL 3: BALLAPZ3 CSECT:

LP00 Enable: R1HI=MKBLNKST, R2=Xmit UACB address, R5=MKB address
LP01 Disable: R1HI=MKBLNKST, R2=Rcv UACB address, R5=MKB address
LP10 XIO LINK: R3=Buffer address, R5=MKB address
LP60 Contact: R1HI=MKBLNKST, R2=Xmit UACB address, R5=MKB address
LP70 Discontact: R1HI=MKBLNKST, R2=Rcv UACB address, R5=MKB address

IN THE LU SIMULATOR (BALUSIMF):

LRP1 LURSP Entry: R3=SLUB address, Snap area=SLUB

LRP2 LURSP Exit with error: R1=SLUB address, R2=PIU address
LRP3 LURSP normal Exit: R1=SLUB address, R2=CUB address, R3=PIU address
LRP5 LURSP normal Exit: R1=SLUB address, R2=CUB address, R3=PIU address
LRQ1 LUREQ Entry: R2=PIU address, R3=SLUB address, Snap area=SLUB
LRQ2 LUREQ Exit with error: R2=PIU address, R3=SLUB address, Area=SLUB
LRQ3 LUREQ normal Exit: R1=SLUB address, R2=CUB address, R3=PIU address
Snap area=SLUB
LRQ4 LUREQ normal Exit: R1=SLUB address, R2=CUB address, R3=PIU address
Snap area=PIU
LRV1 LUSRCV Entry: R2=PIU address, R3=SLUB address, Snap area=SLUB
LRV2 LUSRCV Exit with error: R2=PIU address, R1=SLUB address, Area=SLUB
LRV3 LUSRCV normal exit: R2=PIU address, R3=SLUB address, Area=SLUB

IN THE LINK LEVEL 2 TEST (BALL2TMB MODULE AND CSECT):

L2I1 Inbound frame checking: R2=VCB address, R3=Received buffer address,
R5=Packet type byte, R7=PH address
L2I2 Test frame reformatting: R2=VCB address, R3=Received buffer address,
R4=New buffer address
L2I3 Frame received, error free: R2=VCB address, R5=TCB address
L2I4 No data received: R2=VCB address, R3=Data count,
R4=Received buffer address, R5=TCB address
L2I5 Less data received: R2=VCB address, R4=Received buffer address,
R5=TCB address
L2I6 Data length discrepancy: R2=VCB address, R4=Received buffer address,
R5=TCB address
L2I7 More data received: R2=VCB address, R4=Received buffer address,
R5=TCB address
L2I8 Data character invalid: R2=VCB address, R4=Received character address,
R5=Sent character address
L2O1 Timer elapsed entry: R2=VCB address, R3=LLC-OUT ECB address
L2O2 LL2T activation: R2=VCB address, R4=TCB address, R5=VCBAT entry
L2O3 Data length error: R1=Maximum packet length, R2=VCB address,
R3=First buffer data count
L2O4 Data length checking: R1=Last TCB buffer length, R2=VCB address,
R4=Last TCB buffer address
L2O5 LL2 test end: R2=VCB address, R3=Frame request count, R4=TCB address,
R5=Test ending state, R7=Sent frame count
L2O6 COPYPIU unsuccessful: R1=Return code, R2=VCB address,
R7=Transmitted test frame count
L2O7 Test frame building: R2=VCB address, R3=Test buffer address,
R4=TCB address, R7=PH address
L2O8 SARM inhibited state: R2=VCB address, R3=Test buffer address,
R4=TCB address, R5=LLC-OUT QCB address
L2O9 Release unused buffers: R2=VCB address,
R3=Address of buffer to be released,
R4=Previous buffer address

IN THE NAS (BALNASM4 MODULE):

NMI1 XIO IMMED to MCH: R1HI=LXBIMCTL, R2=UACB address, R3=LKB address
NMK1 XIO LINK to MCH (XPARENT): R1HI=AVTSMK, R2=UACB add., R3=Buf add.
R4=MKB address, R3=Xparent-out QCB, Area=Buffer
NMK2 XIO LINK to MCH (from NCP Link L2 act.): R1=CUBSTATS, R2=UACB add.
R3=Buf add., R4=CUB address, Snap Area=Buffer
NMK3 XIO LINK to MCH (from NCP not 1st. segment): R1=CUBSTATS, R2=UACB addr.

R3=Buf address, R4=CUB address, Snap Area=Buffer

NMK4 XIO LINK to MCH (from NCP, 1st. segment): R1=CUBSTATS, R2=UACB address.
R3=Buf address, R4=CUB address, Snap Area=Buf (-RESP)

NML1 XIO LINE to MCH (Exit): R2=UACB address

NMR1 MCH unrecoverable error: R2=UACB address, R3=MKBATGFG, R4=MKBAT address

NVI1 XIO IMMED to VC: R2=UACB address (VUA)

NVL1 XIO LINE to VC: R2=UACB address, R3=LXBCMAND, R4=MKBAT address,
R5=QCB address

NVL2 DISCONTACT VC, R2=CUB address, R4=AVT address, R7=MKBAT address
MCH not running: R3=VCB address

IN THE PCNE (BALPCNM9 MODULE AND CSECT):

PAOC X25XIO rej. for int. pkt: R1=Return code, R2=VCB address, R4=Buf address
R7=SLUB address

PAOE FMD procedure entry: R2=VCB address, R4=PIU address

PAOM DFC procedure entry: R2=VCB address, R4=PIU address

PAOP Int. conf. not rcvd: R1=return code, R2=VCB addr, R4=buf addr,
R7=SLUB address

PAO4 Out. proc. exit: R1=ret. code, R2=VCB addr, R4=PIU add, R7=SLUB addr

PAO5 Poll proc. exit: R2=VCB address, R7=LXBSTAT value

PAO6 SHUTC Req. to Host: R2=VCB addr, R4=SHUTC PIU addr, R7=SLUB addr

PAO7 Session Control Procedure entry: R2=VCB address, R4=PIU address

PA13 Data Pkt Proc. exit: R2=VCB address, R3=SLUB address, R4=Buff address

PA15 X25XIO rej. for int. conf.: R2=VCB addr, R3=SLUB addr, R4=Pkt addr
R5=PH in buffer

PA17 Int. req. collision: R2=VCB address, R3=SLUB address

PA22 XPARENT-IN: R3=MKB address, R4=PIU address, R5=CUB address

PA32 XPARENT-OUT: R3=MKB address, R4=PIU address, R7=SLUB address

IN THE PLP (BALPLPM5 MODULE AND CSECT):

1. In the Packet Dispatcher

PN3A Inv. VCN Rcv: R1=1st. VCBAT addr, R2=1rst VCB addr, R5=MCH addr

PN4A Inv. VCN Xmit: R2=VCB address, R5=Pkt VCN, R7=VCB VCN

PN4B Pseudo-Buffer release: R2=VCB addr, R5=PLP/IN QCB,
R7=Pseudo-Buffer address

PN4C VCN validity check: R1=VCBAT entry, R2=VCB address

2. In the PLP-IN

PPI1 Not Data Xfer state: R1=MKBATGFG, R2=VCB addr, R3=PH addr, R4=Buf addr
R5=VCBATUID/VCBVCM0, R7=MKBAT address

PPI2 RNR Received: R1=RNR pkt type, R2=VCB address, R4=VCBAT entry

PPI3 LLC-OUT wait trigger: R1=VCBEEST, R2=VCB address, R7=LLC-OUT QCB addr

PPI4 Inop from PLP: R2=VCB address, R7=VCBAT entry

PPI5 Inop from other layer: R2=VCB address

PPI6 Timer routine safe: R2=VCB address, R5=PLP-IN QCB address,
R7=PLP-IN ECB address

PPI7 Complete packet Received: R2=VCB address, R3=Buffer address,
R7=PLP-IN ECB address

3. In the PLP-OUT

PP01 XIO LINK not executed: R2=VCB address, R3=Pkt address, Snap area=Pkt
 PP02 XIO LINK not executed (RR/RNR): R2=VCB addr, R3=Pkt addr, Snap area=Pkt

IN THE PSH (BALPSHM7 MODULE):

PSOR PSH-OUT exit w/o action: R1 byte 0=LLC state, R2=VCB address,
 R5=Active QCB address, R7 byte 1=PSH state,
 R1 byte 1=CUBSSCP

PSOX PSH-OUT exit after process: R1=Return code to LLC-OUT, R2=VCB address,
 R3=Edited out buffer address,
 R5=Active QCB address

PS03 Delayed contact wait issuance: R1=Return code to LLC-OUT,
 R2=VCB address,
 R5=Active QCB address

PSOI PSH-OUT inop completed: R1=Return code to LLC-OUT, R2=VCB address,
 R7 byte 1=Failure code, Snap area=VCB VCBVCMO

PSOT PSH-OUT timeout handler completed: R1 byte 0=VCB state,
 R2=VCB address, R5=QCB address,
 R1 byte 1=PSH state

PSOY Delayed contact wait re-issuance: R1=Return code to LLC-OUT,
 R2=VCB address

PSOG PSH data segmentation: R2=VCB address, R3=Copy buffer address,
 R5=Extra byte count,
 R7=Extra bytes origin address

PSOS Data editor with segmentation: {R2=VCB addr, R3=PSH header buffer address
 {Snap area=PSH header buffer

PSOV Data editor w/o segmentation: {R2=VCB addr, R3=PSH header buffer address
 {Snap area=PSH header buffer

PS05 Discontact retry: Registers contents as for PSOX,
 Snap Area=Edited out buffer

PS06 Discontact immediate end: Registers contents same as for PS03

PS08 Retry XID: Registers contents, dump area, same as for PS05

PS09 Retry contact: Registers contents, dump area, same as for PS05

PSOE Packet filled up: R1=PSH data length, R2=VCB address, R3=chain header
 R4=work chain tail, R5=chain count, R7=chain tail
 Snap area=chain header buffer

PSOQ Segmentation at buffer boundary: R2=VCB address, R3=PSH header buffer
 address

PSIA PSH abandon connection completed: R2=VCB address,
 Snap area=VCB starting from VCBVCMO

PSIL Terminal command dispatcher entry: R1 byte 1=Received PSH command,
 R3=Received buffer address,
 R5=PSH header address

PSIX XID terminator completed: R1=Return code to LLC-IN, R2=VCB address,
 R3=Received buffer address,
 R5=PSH header address

PSIC Contact terminator completed: R1=Return code to LLC-IN, R2=VCB address,
 R3=Received buffer address,
 R5=PSH header address

PSID Discontact terminator completed: R1=Return code to LLC-IN,
 R2=VCB address,
 R3=Received buffer address,

R5=PSH header address

PSII PSH-IN inoperative entry: R1=Return code to LLC-IN,
R2=VCB address, R7 byte 1=Failure code,
Snap area=VCB starting from VCBVCM0

PSI4 Terminal data unit validation entry: R1 byte 1=PSH state,
R2=VCB address,
R3=Received buffer address,
Snap area=Received buffer

PSIP Terminal data handler completed: R1=Return code to LLC-IN,
R3=Buffer address (chain) ready to be
sent to the host (if any),
Snap area=VCB starting from VCBVCM0

IN THE VCM-IN ROUTINE (BALVCIMC MODULE AND CSECT):

VIMC VCM-IN routine entry:

R1HI=MKBATGFG,R1LO=VCBATGFG,R2=VCB address,
R3=Buffer address,R4=MKB address,R5=PKT2/PKT3,
R7HI=PKT4,R7LO=VCBVCM0

IN THE VCM-IN TASK (BALVCIM6 MODULE AND CSECT):

VIM6 VCM-IN task entry: R1H1=MKBATGFG,R1LO=LKBSTATC,R2=MKBQCB1 address,
R3=Element address, R4=MKB address

IN THE VCM-OUT TASK (BALVCOMA MODULE AND CSECT):

VOF1 VCM-OUT entry: R1LO=LXBCMAND,R2=VCB address,R3=Element address,
R4=MKB address,R5=VCBAT address,R7HI=VCBATGFG,
R7LO=VCBVCM0

VOF2 XIO immediate: R1="Switched ANS terminator" address,R2=UACB address,
R3=VCB address,R4=LKB address,RSHI=Request code,
R7=NCP terminator address in the LKB

VOF3 Inoperative routine:

R2=VCB address,R4=VCBAT address,R5LO=VCBRECBO,
R7HI=VCBATGFG,R7LO=VCBVCM0

VOF4 Dial command: R1HI=MKBATGFG,R1LO=LXBCMAND,R2=VCB address,
R4=Dial digit address,R7LO=VCBTYPE

ABEND CODES

Several abend codes have been programmed:

ABEND CODE	COMMENTS
0A00	No ECB on timeout (BALVCOMA)
0A01	Invalid VCM state on an Activate link for a PVC (BALVCOMA)
0A02	Wrong Interface at BALMAR1 Entry (BALVCOMA)
0A03	Invalid VCM state on a timeout for an SVC (BALVCOMA)
0A10	DISCREPANCY BETWEEN THE NCP AND X.25 SYSGEN (BALINIMD) NUMBER OF ERRORS SAVED IN THE MODULE AFTER THE LABELS ER1= MORE THAN ONE UACB FOR ONE LKB ER2= UACB NOT IDENTIFIED AS X.25 (MU OR VU) ER3= NCP/X.25 DISCREPANCY ABOUT SWITCHED/PERMANENT ER4= PU TYPE INVALID FOR LLC0, LLC1 (PU TYPE 1 ONLY)
0A20	INVALID VALUE IN MKBSTATC (BALVCIM6)
0A21	NO ELEMENT ON QCB DURING RESTART PHASE (BALVCIM6)
0A22	NO ELEMENT ON QCB WHEN MCH OPERATIONAL (BALVCIM6)
0A23	INVALID VALUE IN LXBSTATC (BALVCIM6)
0A24	INVALID VALUE IN CUBSSCP (BALVCIM6)
0A30	INVALID COMMAND ON XIO LINE (LAP-LVL3)
0A31	ENABLE ON A BUSY LINE (LAP-LVL3)
0A32	CONTACT ON A LINE NOT ENABLED (LAP-LVL3)
0A33	OVERRUN ON OPEN PHASES (OUT OF TABLE) (LAP-LVL3)
0A34	DISCONT. ON A LINE ENABLE/DISABLE/IDLE (LAP-LVL3)
0A35	XIO SETMODE (LAP-LVL3)
0A36	NO MORE A AND C FIELDS AT XMIT END (LAP-LVL3)
0A37	INVALID NS RESPONSE FRAME AT XMIT END (LAP-LVL3)
0A38	INVALID S FRAME AT XMIT END (LAP-LVL3)
0A39	INVALID NS COMMAND FRAME AT XMIT END (LAP-LVL3)
0A3A	NSA NOT ALLOWED IN ACTUAL GROWING PHASE (LAP-LVL3)
0A3B	TIMEOUT ON R-LEG NOT IN GROWING/DECREASING (LAP-LVL3) OR NOT WHEN PRIMARY AND SECONDARY IN ARM
0A3C	TIMEOUT ON R-LEG: INVALID AUX PRIMARY ON (LAP-LVL3) DECREASING
0A3D	TIMEOUT ON R-LEG: INV. AUX PRIMARY GROW. (LAP-LVL3)
0A3E	XMISSION SCHED: REQ. WHILE OUTQ COUNT=0 (LAP-LVL3)
0A3F	XMISSION SCHED: INVALID REQUEST (LAP-LVL3)
0A40	FRAME ROUTER: FRAME PRES. LIQ NOT BUSY (LAP-LVL3)
0A41	UNEXPECTED SARM RECEIVED (LAP-LVL3)
0A42	UNEXPECTED DISC RECEIVED (LAP) (LAP-LVL3)
0A43	RCVD I FRAME: ERROR IN BUFFER CHAIN-CSB2 (LAP-LVL3)
0A44	RCVD I FRAME: TOO SHORT (LAP-LVL3)
0A45	NS RESP. RCVD IN A WRONG DECREAS. PHASE (LAP-LVL3)
0A46	NSA RCVD WHILE NOT IN DECREASING/GROWIN (LAP-LVL3)
0A47	NSA RCVD IN A WRONG GROWING PHASE (LAP-LVL3)

ABEND CODE	COMMENTS	
0A48	REJ RECEIVED: WRONG N(R) CALCULATION	(LAP-LVL3)
0A49	WACK COUNT=0 WHILE PROCESSING N(R)	(LAP-LVL3)
0A4A	CSB2 RCVD: NO MORE LIQ AVAILABLE	(LAP-LVL2)
	LEVEL 3 NOT WORKING	
0A4B	CBS2 RCVD: ERROR DETECTED - RGICW1 NO ERROR	(LAP-LVL2)
0A4C	CSB3-XMIT INTERRUPT: NOT XMIT END AND	(LAP-LVL2)
	NOT BUFFER SERVICE	
0A4D	CSB3 XMIT ERROR	(LAP-LVL2)
0A4E	CSB3 RECEIVED: NO MORE LIQ AVAILABLE	(LAP-LVL3)
0A4F	LEVEL 3 NOT WORKING	(LAP-LVL3)
0A50	MODULO OTHER THAN 8 (NOT SUPPORTED)	(BALPLPM5)
0A70	INVALID BUFFER OR PSEUDO-BUFFER ON X25XIO	(BALNASM4)
0A71	INVALID PACKET LENGTH: LT.3 OR GT.FRMLGTH	(BALNASM4)
0A72	LINE TIMER LEVEL 3 FOR A VC	(BALNASM4)
0A73	DEQUEUE INVALID DURING RESET SYSTEM TIMER	(BALNASM4)
0A74	X25XIO INTERFACE ERROR	(BALNASM4)
0A75	THE X25NPSI ISSUED XIO LINK INSTEAD OF X25XIO	(BALNASM4)
0A77	X25EXTRA INTERFACE ERROR	(BALNASM4)
0A81	LEVEL 3 INTERRUPT FOR A VC	(BALNASME)
0A82	LEVEL 2 INTERRUPT FOR A VC	(BALNASME)
0A90	ERROR IN LUSRCV	(BALUSIMF)
0A91	ERROR IN LUSRSP	(BALUSIMF)
0A92	ERROR IN LUSREQ	(BALUSIMF)
0AA1	DISPATCH-OUT FUNCTION NOT RECOGNIZED	(BALPCNM9)
0AA2	PHYSICAL SERVICES ERROR	(BALPCNM9)
0AA3	UNKNOWN SESSION CONTROL COMMAND	(BALPCNM9)
0AA4	INVALID ENTRY IN THE TIMER ROUTINE	(BALPCNM9)
0AA5	DISPATCH-IN FUNCTION NOT RECOGNIZED	(BALPCNM9)
0AA6	NO PIU QUEUED IN TRANSPARENT MODE	(BALPCNM9)
0AB0	VC NUMBER DISCREPANCY IN VCB AND PKT	(BALVCIMC)
0AB2	OTHER THAN CONTROL PACKET RECEIVED	(BALVCIMC)
0AB3	INVALID PVC STATUS, PROGRAMMING ERROR	(BALVCIMC)
0AB4	INVALID SVC STATUS, PROGRAMMING ERROR	(BALVCIMC)

X25NPSI MODULES

The X25NPSI modules are:

BALLAPN1 LVL2 LAP for CSB2 and CSB3
 BALLAPN2 LVL2 LAP for CSB2
 BALLAPN3 LVL2 LAP for CSB3

BALLAPM1 LVL3 LAP for CSB2 and CSB3
 BALLAPM2 LVL3 LAP for CSB2
 BALLAPM3 LVL3 LAP for CSB3
 BALNASM4 NAS Level 3/4/5
 BALPLPM5 PLP
 BALVCIM6 VCM-IN Task
 BALPSHM7 PSH
 BALSTAM8 Common Routines:

- Block Dump Tables
- LLC-OUT Task Dispatcher
- LLC-IN Routine Dispatcher

BALSTAS8 Common Routines, same as BALSTAM8 plus:

- Snap Area

BALPCNM9 PCNE & Transparent
 BALVCOMA VCM-OUT
 BALL2TMB Link Level 2 Test
 BALVCIMC VCM-IN Routine
 BALINIMD Initialization Routine
 BALNASME NAS Level 2/3 in low core
 BALUSIMF Logical Unit Simulator

EXAMPLE OF ASSEMBLY FOR X25NPSI MODULES UNDER OS/V5

```
//S1      EXEC    PGM=CWAX00,PARM='DECK,XREF(SHORT),NOALOGIC,SYSPARM(OS)'  
//STEPLIB DD      DSN=SYS1.SSPLIB,DISP=SHR  
//SYSPRINT DD     SYSOUT=A  
| //SYSUT1 DD     UNIT=SYSDA,SPACE=(1700,(800,800)),DCB=(OPTCD=C)  
| //SYSUT2 DD     UNIT=SYSDA,SPACE=(1700,(800,800)),DCB=(OPTCD=C)  
| //SYSUT3 DD     UNIT=SYSDA,SPACE=(1700,(800,800)),DCB=(OPTCD=C)  
//SYSLIB  DD     DSN=SYS1.RPQSRC,DISP=SHR  
//        DD     DSN=SYS1.MAC3705X,DISP=SHR  
//        DD     DSN=SYS1.MAC3705,DISP=SHR  
//SYSPUNCH DD     DSN=&&OBJSET,UNIT=SYSSQ,SPACE=(80,(600)),DISP=(,PASS)  
//SYSIN   DD     DSN=SYS1.RPQSRC(BALxxxxx),DISP=SHR  
//LKED    EXEC    PGM=IEWL,PARM=(XREF,LET,LIST,NCAL)  
//SYSPRINT DD     SYSOUT=A  
//SYSLIN  DD     DSN=&&OBJSET,DISP=(OLD,DELETE)  
//SYSLMOD DD     DSN=SYS1.OBJ3705X(BALXXXXX),DISP=OLD  
//SYSUT1  DD     UNIT=SYSDA,SPACE=(1700,(800,800)),DCB=(OPTCD=C),DISP=OLD
```

Where BALxxxxx stands for the names specified above.

Note: When assembling the "BALDSECT" member, remove the linkedit step.

EXAMPLE OF ASSEMBLY FOR X25NPSI MODULES UNDER DOS/VSE

```
// JOB ASM BALxxxxx
// ASSGN SYSPCH,280
// MTC REW,280
// OPTION DECK
// EXEC IFZASM
  PUNCH '// JOB CATALR BALxxxxx '
  PUNCH '// EXEC MAINT '
  END

/*
// OPTION DECK,NOXREF
// EXEC IFZASM
  COPY BALxxxxx
  END

/*
// MTC WTM,SYSPCH
// CLOSE SYSPCH,UA
/&
```

Where BALxxxxx stands for the names specified above.

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STORAGE

The basic X25NPSI code requires a minimum of 25 Kbytes and a maximum of 35 Kbytes of storage in addition to that for the prerequisite ACF/NCP, distributed as follows:

Init routine	(BALINIMD)	= 850 (overridden by buffers)
NAS Low Core	(BALNASME)	= 100
NAS High Core	(BALNASM4)	= 2600
VCM-OUT	(BALVCOMA)	= 2900
VCM-IN	(BALVCIMC)	= 3100
VCM-Common	(BALVCIM6)	= 1600
PLP	(BALPLPM5)	= 2500
PSH	(BALPSHM7)	= 2100
LLC/BDT or	(BALSTAM8)	= 1000
LLC/BDT/SNAP	(BALSTAS8)	= 3900
LAC with CS2 Lv12	(BALLAPN2)	= 1300
LAC with CS2 Lv13	(BALLAPM2)	= 5600
LAC with CS3 Lv12	(BALLAPN3)	= 1300
LAC with CS3 Lv13	(BALLAPM3)	= 5600
LAC with CS2/CS3 Lv12	(BALLAPN1)	= 2200
LAC with CS2/CS3 Lv13	(BALLAPM1)	= 5900
PCNE	(BALPCNM9)	= 4000
LUSIM	(BALUSIMF)	= 2250
LL2T/VC	(BALL2TMB)	= 1600

The X25NPSI uses several new control blocks:

AVT	28 bytes	1 per 3705
MKBAT	$8 + 12 * 1$	1 = number of multichannel links
MKB	176	1 per multichannel link
MUA	116	2 per multichannel link
VCGAT	$8 + 12 * m$	m = number of logical channel groups
VCBAT	$8 + 12 * n$	n = number of virtual circuits
VCB	204	1 per virtual circuit
VUA	108	1 per virtual circuit
SLUB	38	1 per virtual circuit, LLC=0
VCCPTIT	$8 + 4 * (p+1)$	1 per network, p = higher VCCPT index
OUFFIT	$8 + 4 * (q+1)$	1 per network, q = higher OUFFT index
VCCPT	$14 * (p+1)$	1 per network
OUFFT	$8 + q * (4 * f + u)$	1 per network, f = number of facilities u = user data length

PERFORMANCE

The environment assumptions for the values given in this section are:

- On outgoing PIUs, the only performance consideration is the additional cycles between (1) the XIO link from BNN Path Control-Out and (2) the scheduling of the frames for transmission.
- The actual sending and receiving of data has similar 3705 cycle use as the SDLC procedure, without non-productive polling.
- On incoming PIUs, the only performance consideration is the additional cycles between (1) the end-of-frame received and (2) the scheduling of the BNN Path Control-In delayed. Consider the following:

1. First Case, using SNA to SNA communications:

Suppose the PIU (segment) to be transmitted or received can be contained in only one packet. The PIU must be 2 bytes less than the packet size because the LLC header is 2 bytes long.

Additional cycles include 2000 cycles for each PIU OUT plus 900 cycles for each "Receive Ready " received, and 3100 cycles for each PIU IN plus 1300 cycles for each "Receive Ready" sent to the network.

2. Second Case, using SNA to SNA communications:

Suppose the PIU (segment) contains 256 bytes of data, with a maximum packet length of 128 and a buffer size of 100 bytes. This PIU (segment) must be sent or received in three packets.

Additional cycles include 6800 cycles to transform the outgoing PIU (segment) into three packets, plus 900 cycles for each "Receive Ready" packet received from the network.

7300 cycles are used, on the receiving side, to receive the three packets and combine them into one PIU (segment) plus 3900 cycles to build and send three "Receive Ready" packets.

3. Third case, using SNA to non-SNA communications with the PCNE (SNA/X.25 Protocol Converter):

Suppose the data unit is contained in one packet. On the SNA side, the RU length would equal the packet length.

Additional cycles include 2800 cycles for each data unit OUT plus 900 cycles for each "Receive Ready" packet received, and 3600 cycles for each data unit IN plus 1300 cycles for each "Receive Ready" sent.

4. Fourth case, using SNA to non-SNA communications with the PCNE (SNA/X.25 Protocol Converter):

Suppose the data unit contains 384 bytes, with a maximum packet length of 128. The data unit must be contained in three packets.

Additional cycles include 7600 cycles to transform the outgoing PIU into three packets, plus 900 cycles for each "Receive Ready " packet received from the network.

7800 cycles are used, on the receiving side, to combine the three packets into one PIU plus 3900 cycles to send three "Receive Ready" packets.

TNL SN30-3213 (26 Feb 82) to SC30-3078-0

LIST OF ACRONYMS

A

ACF Advanced Communications Facility
ACTLU Activate Logical Unit

B

BB Begin Bracket
BBP Begin Bracket Pending
BETB Between Brackets
BNN Boundary Network Node

C

CCITT International Telegraph and Telephone Consultative Committee
CMDTE Character Mode DTE
CUD Call User Data field

D

DACTLU De-activate Logical Unit
DATE Dedicated Access to X.25 Transport Extension
DCE Data Circuit Equipment
DFC Data Flow Control
DTE Data Terminal Equipment
DTR Data Terminal Ready

F

FCS Frame Checking Sequence
FID Format Identifier
FIC First In Chain
FMD Function Management Data

G

GATE General Access to X.25 Transport Extension
GTF Generalized Trace Facility

H

HDLC High Level Data Link Control

I

INB In Bracket
INN Inter Network Node
ISO International Organization for Standardization
I-LLU Information Logical Link Unit

L

LAC Line Access Control (X.25 Level 2 in X.25 NCP Packet Switching Interface)
LAP Line Access Protocol
LAPB Line Access Protocol Balanced
LCGN Logical Channel Group Number
LCN Logical Channel Number
LIC Last In Chain
LIQ Link Input Queue
LLC Logical Link Control
LLU Logical Link Unit
LNVT Line Vector Table
LUSIM Logical Unit Simulator

M

MCH Multi Channel Link
MDB More Data Bit
MIC Middle In Chain
MSHP Maintain System History Program

N

NAS Network Action Scheduler (X.25 Packet Switching Interface Layer)
NCP Network Control Program
NEO Network Extension Option
NIA Network Interface Adapter
NPA Network Performance Analyzer

O

OIC Only In Chain
OIS Single Segment
OLLT Online Line Test
OUFT Optional User Facility Table

P

PAD Packet Assembly De-assembly
PCNE Protocol Converter for Non-SNA Equipment
PIU Path Information Unit
PLLI Packet Level Logical Interface
PLP Packet Level Procedure (X.25 Packet Switching Interface Layer)

PLU Primary Logical Unit
PMDTE Packet Mode Data Terminal Equipment
PPSN Public Packet Switching Network
PSH Physical Services Header (X.25 Level 4 for SNA Terminals)
PSN Packet Switching Network
PVC Permanent Virtual Circuit
PU Physical Unit

R

RECMS Record Maintenance Statistic
REJ Rejected Message (Packet or Frame)
RNR Receive Not Ready
RR Receive Ready
RU Request Unit

S

SABM Set Asynchronous Balanced Mode
SDT Start Data Traffic
SHUTC Shutdown Complete
SHUTD Shutdown
SLU Secondary Logical Unit
SMP System Maintenance Program
SNA Systems Network Architecture
SVC Switched Virtual Circuit

T

TH Transmission Header

U

UACB User Adapter Control Block
ULVT User Line Vector Table

V

VCB Virtual Circuit Block
VCBAT Virtual Circuit Block Address Table
VCCPTIT Virtual Circuit Connection Parameter Table Index Table
VCGAT Virtual Circuit Group Address Table
VCM Virtual Circuit Manager (X.25 Packet Switching Interface Layer)
VCN Virtual Circuit Number
VPACING VTAM Pacing

X

X25PSI X.25 Packet Switching Interface

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Index

- A**
Abend Codes 9-36
ACF functions, non-supported 8-1
ACF functions, supported 8-1
ACF functions chart 8-1
ACF/NCP (*see* NCP) 1-1, 1-2, 2-6, 5-38
ACF/NCP libraries 5-2
ACF/TAP 8-2
ACF/TCAM 1-1, 1-2, 5-46
 Considerations 5-46
 INTRO macro 5-46
 INVLIST macro 5-46
 TERMINAL=LINE macro 5-46
 TERMINAL=PUNT macro 5-46
ACF/TCAM (*see* TCAM) 1-1, 1-2, 2-6, 5-46
ACF/VTAM 1-1, 1-2, 5-42
 considerations 5-42
 LU macro 5-46
 PATH macro 5-43
 PU macro 5-42
 VBUILD macro 5-42
ACF/VTAM (*see* VTAM) 1-1, 1-2, 5-38, 5-39
Activate Line Trace 9-7
ACTIVATE LINK 3-10
Activation 6-1
Address Field 3-17
Address Vector Table 3-13
ANS (*see* Auto Network Shutdown) 7-4
asynchronous response mode 3-7
Auto Network Shutdown 7-4
 procedure 7-4
- B**
BIND parameter list (table) 4-5
bracket protocols (figures) 4-13, 4-14
brackets 4-11, 4-12
breaking connections 3-8
buffer pool 3-3
- C**
Call-In 4-3
Call-Out 4-2
CALL CONNECTED 4-3
CALL REQUEST packet 2-5, 2-6
chaining 4-6, 4-7
channel adapters 3-3
CLEAR REQUEST 3-22
communication between applications 3-7
communication controllers 1-1
communication lines 3-3
compatibility 8-1
Compatibility 8-1
 ACF (Advanced Communication Facility) 8-1
 Chart 8-1
 Host Network Control Aids 8-1
configuration 2-1
CONTACT 4-3
Control Block Relationship (figures) 3-15, 3-16
Control Blocks 10-1
control blocks 2-7, 3-3
Control Blocks Initialized by: 3-11
 X25BUILD macro 3-13
 X25LCG macro 3-14
 X25MCH macro 3-13
 X25NET macro 3-13
 X25OUFT macro 3-13
 X25VC macro 3-14
 Record Formats 3-17
 X25VCCPT macro 3-13
Control Field 3-17
counter overflow 3-10
- D**
data flow (figure) 3-2
data length 9-4
data transmission integrity check 3-5
Datagram 1-2
DATAPAC 1-1, 5-10
DATEX-P 1-1, 5-10
Deactivate Line Trace 9-7
DEACTIVATE LINK 3-10
Deactivation 6-1
deactivation, steps in 6-3
destinations 1-5
DISC 3-7
DISCONTACT 4-3
DOS/VS, RECMS retrieval under 9-27
DOS/VS libraries 5-2
dump utilities 9-28
Dumps 9-28
 DOS/VS 9-29
 JCL 9-29
 OS/VS 9-28
 JCL 9-28
- E**
ECHO 4-19
Entering Slowdown 7-1
Error Reports 9-7
 Exception Responses 9-8
 Exception Responses (table) 9-8
 Inoperative Messages 9-9
 for Multichannel Links 9-9
 for Virtual Circuits 9-9
 Format 9-9
 table 9-11, 9-12
EURONET 1-1, 5-10
Exchange, Identification 4-2
Exiting Slowdown 7-1
- F**
Facility Parameter Field 2-6
flags 1-4
flow control 2-3
FMD Flow (figure) 4-8, 4-9
Frame 3-17
frame-level protocol 1-4
Frame
 Address 3-17
 Control 3-17
 Flag 3-17
 Frame Check Sequence 3-18
frame format 1-4
Frame level logical interface 1-4
Frames, Supported (table) 3-19, 3-20
full-duplex link 3-11
full-duplex links 3-10
- G**
GENEND (optional generation macro) 5-24
Generalized Trace Facility 9-6
Generation Processing (figure) 5-6
GTF (*see* Generalized Trace Facility) 9-6, 9-7
 Line Trace Facility 9-7
- H**
hardware configuration (figure) 9-2
Hardware testing tools (figure) 9-1, 9-2
 Online Line Tests 9-3
HDLC (*see* High Level Data Link Control) 1-4
High Level Data Link Control 1-4
host-to-host connection 4-14
Host-to-Host Connection 4-14
host-to-host connection, (figure) 4-15
- I**
Identification Exchange 4-2
INCOMING CALL packet 2-5, 2-6
incompatibility 8-1

initialization values 3-3
INOP 9-9
 table 9-11, 9-12
inoperative messages 9-7, 9-9
 format 9-9
Inoperative station recovery 6-3, 6-5
Installation of X25NPSI 5-1
interface 1-4
interrupts 3-4
INTRO Macro, in TCAM 5-46
INVLIST Macro, in TCAM 5-47

J

Job Card, use in installation 5-1

L

LAP protocol support 3-11
LAPB protocol support 3-11
Libraries, in installation 5-1, 5-2
 DOS/VS 5-1, 5-2
 OS/VS 5-1
Limitations on non-SNA communication 4-1, 4-2
Line Access Control 3-10
Line Timeout 3-4
Line Timer 3-4
Line Trace Facility 9-7
link-level control 1-5
Link Level Test 2 (sequence) 9-4, 9-5, 9-6
link status control 3-10
LLC-IN 3-5
LLC-OUT 3-5
LLC Send Sequence Number 3-24
LLU format (figure) 3-6
logical interface 1-4
Logical Link Control (figure) 3-6
Logical Link Unit 3-5
Logical Link Unit Format 3-23
logon 4-10, 4-11
LU Macro, in VTAM 5-46

M

macro operand summary (table) 5-25
making connections 3-8
MAXPKTL 2-3
MCH (*see* Multichannel
 Link) 6-1, 6-2, 6-3
MCH Address Table 3-13
Multichannel Commands (figure) 6-2
Multichannel Commands (sequence) 6-2
Multichannel Link, LU 5-38
Multichannel Link, PU 5-37
multiplexors 1-1

N

NCCF, RECMS retrieval under 9-28
NCCF (*see* Network Communications
 Control Facility) 9-28
NCP 1-1, 2-7
NCP Control Blocks (figure) 3-12
NCP Customization 2-7
NCP description 5-4
NCP generation 3-3, 3-11, 5-4
NCP Generation 5-4
 NCP Description 5-4
 NCP Stage 1 5-4
 JCL 5-4, 5-5
 NCP Stage 2 5-5
NCP libraries 5-2
NCP Stage 1 Macros 5-36
 BUILD 5-36
 GROUP 5-36
 LINE 5-37
 LU 5-38, 5-39
 LUDRPOOL 5-37
 PU 5-37
NCP Stage 1 Sample Generation 5-40
NCP Stage 1 System Generation 5-35
network commands/responses 3-9
Network Communications Control Facility 9-28
network description 5-2
Network Interface Adapter (NIA) 2-3

Network Operator 6-1
 Considerations 6-1
Network protocols 1-4
 definition 1-4
 CCITT X.25 protocol 1-4
NIA WRAP (*see* Network Interface
 Adapter WRAP) 9-3
 ECHO 9-3
 Link Level Test 2 9-4
Non-packet switching 1-2
Non-SNA communication 4-1
Non-SNA DTE communication 4-1
 Bracket Management 4-11
 Bracket Protocols 4-13, 4-14
 Brackets 4-11
 Code Selection 4-10
 Flow Direction Control 4-10
 Limitations 4-1
 Logoff 4-11
 Logon 4-11
 Pacing 4-10
 RUs 4-3, 4-6, 4-7
 ACTLU 4-3
 BID 4-6
 BIND 4-3
 CANCEL 4-6
 CHASE 4-6
 CLEAR 4-3
 CONTACT 4-3
 DACTLU 4-3
 data RUs 4-7
 DISCONTACT 4-3
 SDT 4-3
 SHUTC 4-6
 SHUTD 4-6
 SIGNAL 4-6
 UNBIND 4-3
 Sequencing 4-10
NRW 1-1, 5-10

O

OLLT (*see* Online Line Test) 9-3
 Network Interface Adapter WRAP 9-3
one-way calling 2-6
operand summary (table) 5-25
Operating Systems 1-1
OPTFACL 2-5
OS/VS, RECMS retrieval under 9-27
OS/VS libraries 5-1

P

pacing 4-7, 4-10
pacing parameters 2-3
Packet 3-21
packet dispatcher 3-10
Packet Format 3-21
packet length 2-6, 9-4
Packet Level Logical Interface 1-4
Packet level logical interface 1-4
packet size 2-3
PATH Macro, in VTAM 5-43
PCNE 3-7
Performance Assumptions 10-2
permanent virtual circuit 2-4
Permanent Virtual Circuit
 recovery 6-5
 sequences 6-4
Permanent Virtual Circuit (sequence) 6-4, 6-5
permanent virtual circuits 4-19
Permanent Virtual Circuits 4-19
physical interface 1-4
Physical interface 1-4
Physical interface protocol 1-4
physical link 1-5
Physical Services Header 3-1, 3-7
PLLI (*see* Packet Level Logical
 Interface) 1-4
PLP-IN 3-5, 3-9
PLP-OUT 3-9
PPSN (*see* Public Packet Switching
 Networks) 1-2, 2-1
primary station 3-11

- problem determination 9-1
- problem determination tools hardware (chart) 9-2
- Protocol Conversion 4-1
- PU definition, dummy 5-38
- PU Macro, in VTAM 5-42
- Public Packet Switching Networks 1-2
- PVC (*see* Permanent Virtual Circuit) 4-19

R

- RECMS 3-10
- RECMS (*see* Record Maintenance Statistics) 9-13
- RECMS Retrieval 9-26, 9-27, 9-28
- Record Maintenance Statistics 9-7, 9-13
 - format 9-13
- Remote Identification Number 4-15
- RESET REQUEST 3-22
- resource naming conventions 5-35
- RH 3-7
- routing 1-5

S

- scanners 3-11
- SDLC 2-1, 2-6, 3-4, 3-11
- secondary station 3-11
- segmenting 3-7
- Session Setup 4-17
- Session Setup/Shutdown (figure) 4-18
- Session Shutdown 4-17
- shared transmission facilities 1-2
- Slowdown 7-1
 - Entering 7-1
- Slowdown, Entering/Exiting Slowdown 7-1
 - Exiting 7-1
 - Procedure (figure) 7-3
- Slowdown Procedure (figure) 7-3
- SNA, simulation of LU types 4-1
- SNA components 2-1
- SNA resources, activation of 6-1
- SNRM 3-7
- SSCP (*see* Systems Services Control Point) 3-8
- SSCP Identification Number 4-15
- stage 1 generation 5-3
- Stage 1 Generation Macro Description 5-7, 5-25
- stage 2 generation 5-3, 5-4
- Storage Requirements 10-1
- Summary 1-2
- SVC (*see* Switched Virtual Circuit) 4-15, 4-19
- switched logical channel 2-6
- Switched Major Nodes 4-15
- Switched Virtual Circuit 2-4
- switched virtual circuit 3-9
- Switched Virtual Circuit 6-5
 - Incoming Call (figure) 6-6
 - Outgoing Call (figure) 6-5
- Switched Virtual Circuit (sequence) 6-5
 - Incoming Call - VTAM (sequence) 6-6
 - Outgoing Call - TCAM (sequence) 6-5
- Switched Virtual Circuits 4-15
- Systems Services Control Point 3-8
- Systems Supported 1-1
 - Hardware 1-1
 - 3705-2 1-1
 - 3705-80 1-1
 - Networks 1-1
 - Software 1-1
 - NCP 1-1
 - TCAM 1-1, 1-2
 - VTAM 1-1, 1-2
 - Terminals 1-1
 - Non-SNA 1-2
 - SNA 1-1

T

- TCAM 1-1, 2-6
- TERMINAL Macro, in TCAM 5-46
- TEST 3-7
- TH 3-7

- throughput class 2-3, 2-4
- timer tick 3-3
- timing 3-3
- trace, (GTF) 9-6
- TRANSPAC 1-1, 5-10
- Type 1 networks 2-3
 - Acceptance of Reverse Charging Calls 2-5
 - Closed User Group 2-5
 - Flow Control Parameters 2-3
 - Packet Size 2-3
 - Throughput Class 2-3, 2-4, 2-5
 - Window Size 2-3
 - Multiline Protocol 2-3
 - Reject Option 2-5
- Type 2 networks 2-6
- Type 2 Networks 2-6
 - High-Priority Class of Traffic Facility 2-6
 - One-Way Logical Channel Facility 2-6
 - TCAM TERM=LINE macro 2-6
 - VTAM LINE macro 2-6

U

- User's Facility and Data Table 3-13
- User Identification 5-36

V

- VCM-IN 3-8, 3-9
- VCM-OUT 3-8
- Virtual Circuit Block Address Table 3-13
- Virtual Circuit Group Address Table 3-13
- Virtual Circuit Parameter Table 3-13
- virtual circuits 1-4, 1-5
- VTAM 2-6, 3-11, 4-10
- VTAM Considerations 5-42
- VWINDOW 2-3

W

- window size 2-3

X

- X.25 connection 2-1
 - configuration description 2-1
 - description 2-1
- X.25 Description 3-1
 - Initialization Routine 3-1
 - LAC (*see* Line Access Control) 3-10, 3-11
 - Line Access Control 3-10
 - Link Level 2 Test for Virtual Circuits 3-1, 3-10, 9-4 thru 9-6
 - LLC (*see* Logical Link Control) 3-4, 3-5, 3-6
 - Logical Link Control 3-1
 - NAS (*see* Network Action Scheduler) 3-3, 3-4
 - Network Action Scheduler 3-1
 - Packet Level Procedure 3-1, 3-9
 - PCNE 3-7
 - PLP (*see* Packet Level Procedure) 3-9, 3-10
 - PSH 3-7
 - VCM (*see* Virtual Circuit Manager) 3-8, 3-9
 - Virtual Circuit Manager 3-1, 3-8
- XID 3-7
- XIO 3-4
- X25 Gen macro operand summary (table) 5-25
- X25NPSI Error Bytes 9-14
 - for Multichannel Links 9-14
 - format 9-14
 - table 9-15
 - for SNA Link Errors 9-22
 - format 9-22
 - table 9-22
 - for SNA Station Errors 9-23
 - format 9-23
 - table 9-23
 - for SNA Statistics 9-24
 - format 9-24
 - table 9-25, 9-26
 - for Virtual Circuits 9-16

format 9-16
table 9-16, 9-21
X25NPSI Generation 5-2
X25NPSI Network Description 5-2
X25NPSI Stage 1 5-3
JCL 5-3
X25NPSI Stage 2 5-3
X25NPSI Modules 9-37
assembly examples 9-38
DOS/VSE 9-39
OS/VS 9-38
table 9-37
X25NPSI Stage 1 Macros 5-7
X25BUILD 5-7
X25END 5-22
X25LCG 5-17
X25LINE 5-20
X25LU 5-22
X25MCH 5-14
X25NET 5-10

X25OUFT 5-12
X25PU 5-21
X25VC 5-18
X25VCCPT 5-11
X25NPSI Stage 1 Sample Generation 5-26
X25NPSI Stage 1 Sample Output for OS/VS 5-29
X25OUFT 2-5
X25SNAP Facility 9-29
DOS/VSE 9-30
OS/VS 9-30
JCL 9-30
X25SNAP Trace 9-31
editing 9-31
interpreting 9-31
X25XIO 3-9

3
3705 2-3, 3-10

X.25 NCP Packet Switching Interface
Program Description and Operation

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1-1, 1-2	6-1, 6-2
4-1, 4-2	6-2.1, 6-2.2 (added)
4-5, 4-6	6-3, 6-4
5-1, 5-2	8-1, 8-2
5-7 through 5-10	9-13, 9-14
5-10.1, 5-10.2 (added)	9-17 through 9-22
5-11 through 5-18	9-27 through 9-30
5-21 through 5-24	9-33, 9-34
5-24.1, 5-24.2 (added)	9-37, 9-38
5-25, 5-26	10-1, 10-2
5-26.1, 5-26.2 (added)	10-2.1, 10-2.2 (added)
5-37, 5-38	

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