IBM

G226-3548-0

Field Engineering Handbook

Systems Network Architecture

Part 1 - General Information

Part 2 - Maintenance Aids

PREFACE

This handbook was prepared by CETO La Gaude ANS NSSPO (Network System Service Project Office) and is organized in two parts.

Part 1 - General Information
Part 2 - Maintenance Aids

First Edition (March 1979)

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PART 1

GENERAL INFORMATION

SECTION 1: SNA GENERALITIES

SECTION 2: TYPES OF INFORMATION

SECTION 3: S D L C

SECTION 4: SENSE DATA

SECTION 5: NETWORK COMMANDS

SECTION 6: PROCEDURES

SECTION 7: APPENDIX

SECTION 8: ABBREVIATIONS

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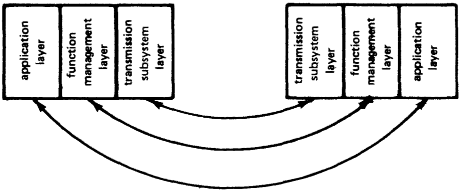
SECTION 1: SNA GENERALITIES

SEPARATION OF FUNCTIONS

SNA is structured in three layers

- application layer
- function management layer
- transmission management layer



Application layer - perform the user's application processing

Function management layer - is concerned with the presentation of information from one application to another application layer.

Transmission subsystem layer - is concerned with the routing and movement of data units between origins and destinations.

SNA STRUCTURE

TRANSMISSION SUBSYSTEM
Provides information exchange between NAU's.

DATA LINK CONTROL (DLC)

Manages the link between nodes

PATH CONTROL (PC)

Provides routing of data units over the path between network addresses.

TRANSMISSION CONTROL (TC)

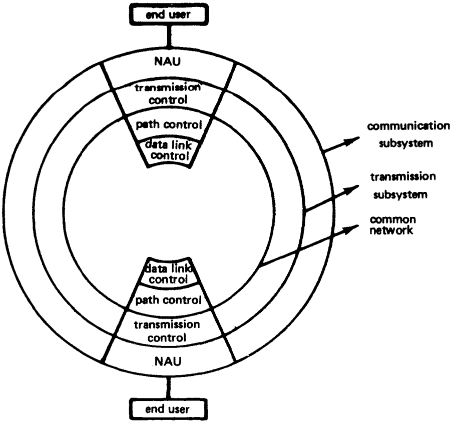
Controls sessions and manages the flow of data into and out of the common network (DLC + PC).

Transmission control consists of three components :

1) Session control (SC) - provides the NAU function for controlling the operation of its sessions.

2) Network control (NC) - provides transmission control and path control with administrative functions.

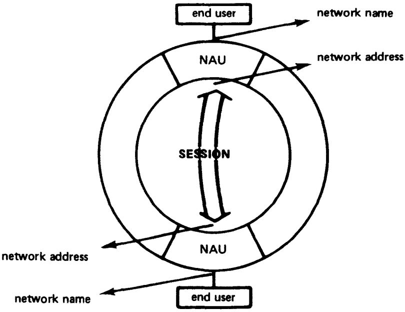
3) Connection Point Manager (CPM) - controls the transmission of requests and responses during the session, including those generated by SC and NC.



END USER
ultimate sources and destinations of information. They include programs, operators and devices media (cards, tapes,...)

NETWORK ADDRESSABLE UNIT (NAU)

It is a resource managed by the communication system. It provides a port for end-user access to the communication system. NAU's are the origin and destination of information units flowing in the communication system.



A session must be established between two NAU's before their end-user can communicate.

TYPES OF NAU'S

- System service control point (SSCP)
- Logical Unit (LU)
- Physical Unit (PU)

SSCP - Provides a set of commands processors like network services. It is responsible for the general management of the network.

LU - It is the port through which an end-user accesses the SSCP or another end-user.

PU - Each unit in the network (whose existence has been defined to the SSCP) has a PU. A session is used to control the physical configuration or resources associated with the unit, and to collect maintenance and operational statistics.

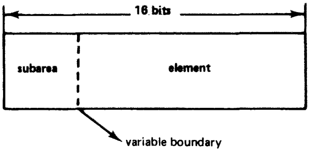
Three kinds of sessions are defined in SNA
1) LU to LU
2) SSCP to LU
3) SSCP to PU

NETWORK NAMES AND ADDRESSES

A network name is associated with each PU, link, and LU in the configuration. The SSCP maintains a directory of network names and transforms network names of PU's and LU's into network addresses. Network names are used by terminal operators, application programs, and network administrators. Network addresses are used within the transmission subsystem. They identify the origin and destination of information units flowing in the communication system.

The full network address is 16 bits long and consists of two parts:

1) Subarea
2) Element within the subarea



The boundary between subarea and element is variable and must be selected at system generation. It must remain constant for all addressable entities in the configuration.

TYPES OF NETWORK NODES

A node is characterized by the type of PU it contains.
Four are defined: PU type 1 (PU-T1)
PU type 2 (PU-T2)
PU type 4 (PU-T4)
PU type 5 (PU-T5)

Informal usage also associates the terms HOST NODE (HN) with a PU-T5 node, COMMUNICATION CONTROLLER NODE (INN for intermediate or BNN for boundary) with a PU-T4 node, CLUSTER CONTROLLER NODE (CCN) with a PU-T2 node, and TERMINAL NODE (TN) with a PU-T1 node.
A node also includes logical units (LUs), through which end-users attach to the node, and to SNA.

HOST NODE - They are CPU's in which application programs and access method (VTAM or TCAM) resides. Each Host Node has a SSCP, and the resources controlled by it are the DOMAIN of this host.
Host nodes can be connected to local communication controllers and some types of local cluster or terminal nodes.

COMMUNICATION CONTROLLER NODE - They are programmable transmission control units designed to assume many of the line control and processing functions for the data communication network.
A communication controller can be locally attached (it is a local communication controller) or remotely attached (it is a remote communication controller).
A communication controller node may provide two types of facilities: intermediate functions (INN) or boundary functions (BNN).

CLUSTER CONTROLLER NODE - Supports up to 255 LU (address 0 is reserved for the PU). It allows the end-user attached through the LU in the cluster to share the function management and transmission services components required to interact with other LU/EU in the network.
Example of cluster controller node is 3601 or 3791.

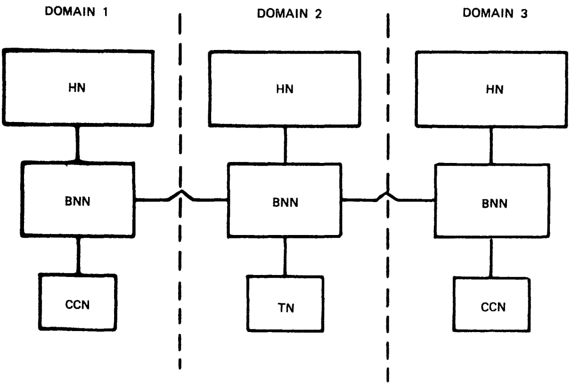
TERMINAL NODE - The existing terminal nodes support only a single LU. It implies a limited subset of transmission services supported, the absence of PU services in the node and additional support required of the BNN to allow valid terminal node interaction with the remainder of the network.
Example of terminal node is the 3767.

DOMAIN

The combination of the acces method, the terminals, communication controllers, and the interconnecting communication lines are also referred as a single domain network or DOMAIN. The essential characteristics of a domain is the existence of the SSCP which is located in the access method.

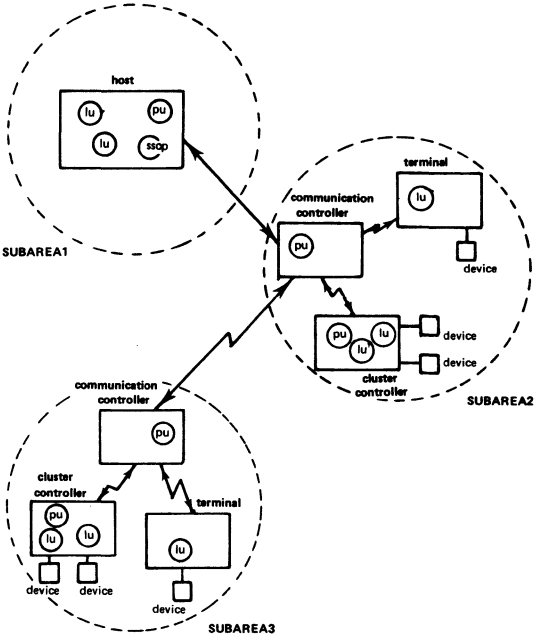
NETWORKING

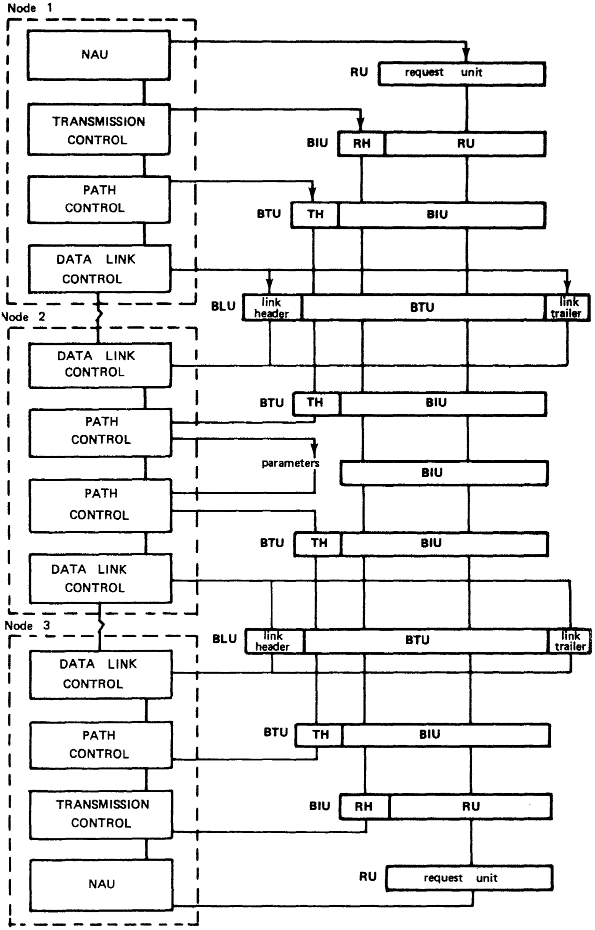
The interconnection of two or more domains into one consolidated network is çalled multi-domain network or NETWORKING.
An application program in one domain can communicate with either another application or terminal in some other domain without involving application programs in intervening domains.



MULTIDOMAIN NETWORK

PHYSICAL CONFIGURATION OF SUBAREAS




Node 1
NAU
TRANSMISSION CONTROL
PATH CONTROL
DATA LINK CONTROL
Node 2
DATA LINK CONTROL
PATH CONTROL
PATH CONTROL
DATA LINK CONTROL
Node 3
DATA LINK CONTROL
PATH CONTROL
TRANSMISSION CONTROL
NAU
RU
request unit
BIU
RH
RU
BTU
TH
BIU
BLU
link header
BTU
link trailer
BTU
TH
BIU
parameters
BIU
BTU
TH
BIU
BLU
link header
BTU
link trailer
BTU
TH
BIU
BIU
RH
RU
RU
request unit

SECTION 2: TYPES OF INFORMATION

SNA conveys information concerning the network via three basic mechanisms:

1) Request - Response unit (RU)
2) Request - Response Header (RH)
3) Transmission Header (TH)

RU - Normally contains user data but may contain control information to assist in the routing of the particular types of messages through the network

RH - Contains control information to assist in the routing of RU's (see RH format)

TH - Contains control information required by path control for manipulating BIU (see TH format)

BIU - It is the fundamental unit handled by path control (BIU = Basic Information Unit). A BIU consists of RH + RU.

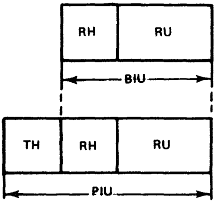
PIU - Path control affixes a TH to each BIU or BIU segment to form a PIU (Path Information Unit).

BTU - It is the fundamental unit passed between path control and data link control (BTU = Basic Transmission Unit). A BTU consists of one or more PIU's depending on blocking or not.

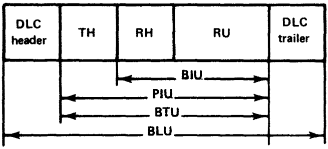
BLU - The Basic unit of transmission at the data link level is the BLU (Basic Link Unit). For example, in SDLC the BLU is one frame.
BLU = frame = F, A, C, (BTU), FCS, F (see SDLC chapter).

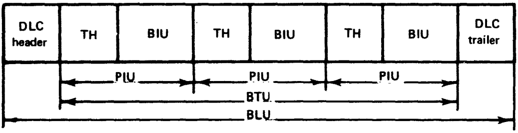
Information relationship

INTEGRAL BIU
(not segmented)

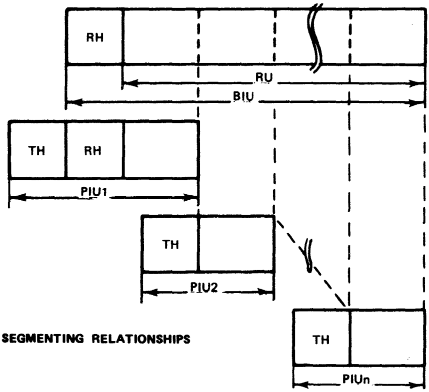


SINGLE PIU





BLOCKED PIU's



PIU's SEGMENTING RELATIONSHIPS

2

A transmission header is attached to each BIU or BIU segment that is handled by the path control. The TH is composed of a byte which contains the format identification field (FID), the mapping field (MPF) and the expedited flow indicator (EFI), followed by a series of fields defining other attributes of the associated BIU or BIU segment.

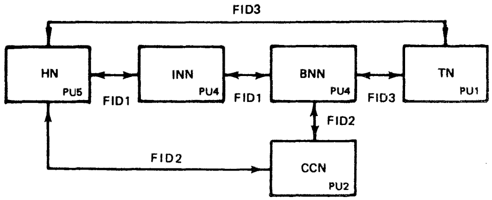
The format of the TH is depending on the type of FID.

TH FORMAT WITH FID1 -Used between a PU.T5 and an adjacent PU.T4 (or between adjacent PU.T4's) nodes.

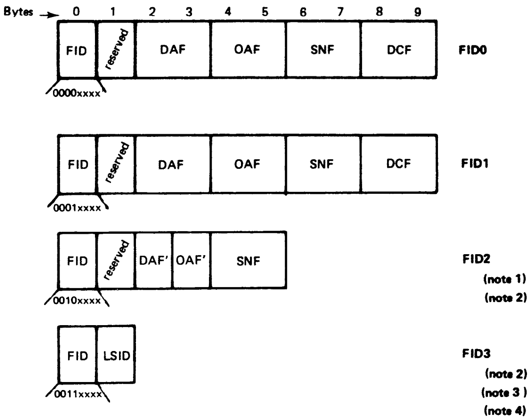
TH FORMAT WITH FID2 -Used between a PU.T5 or PU.T4 and an adjacent PU.T2 node.

TH FORMAT WITH FID3 -Used between a PU.T5 or PU.T4 and an adjacent PU.T1 node.

TH FORMAT WITH FID0 -Used between a PU.T5 and an adjacent PU.T4 (or between adjacent PU.T4's) in handling traffic for pre-SNA devices.



TH FORMAT



Note 1 - The physical unit services of a cluster control node (CCN) is always assigned to the local address value of 0.

Note 2 - Blocking of PIU's cannot be done (no DCF in the TH).

Note 3 - Segmenting is not allowed (no SNF in the TH).

Note 4 - DAF and OAF are replaced by a single byte, the LSID

Bits 0-1 =	00	SSCP to PU
	01	SSCP to LU
	11	LU to LU
	10	**Invalid**

Bits 2-7 = Select one of 64 possible LU's in the NAU (must be 0 for SSCP to PU)

Note 5 - The SNF has the same value in each segment of the associated BIU.

2

BYTE 0

XXXX	Format identification field
.... XX..	Mapping field 00 = Middle segment 01 = Last segment 10 = First segment 11 = Only segment
.... ..X.	Reserved
....X	Expedited flow 0 = Normal flow 1 = Expedited flow

BYTE 1 (FID 3 ONLY)

X...	1 = To/From application 0 = To/From SSCP
.X..	1 = To/From Logical Unit 0 = To/From Physical Unit
..XX XXXX	Local address of station

BYTES 2-3 : DAF (Destination Address Field) Address of the destination NAU

BYTES 4-5 : OAF (Origin Address Field) Address of the originating NAU

BYTES 6-7 : SNF (Sequence Number Field) Provide numerical identity for the associated BIU

BYTES 8-9 : DCF (Data Count Field) Binary count of bytes in the BIU or BIU segment associated with the header. The count does not include TH, only RH + RU

The RH is three bytes long and is attached to each RU

RH BYTES EXPANSION

BYTE 0

X...	0 = Request 1 = Response
.XX.	Type of network command in process 00 = FM Data (FMD) 01 = Network Control (NC) 10 = Data Flow Control (DFC) 11 = Session Control (SC)
...X	Reserved
.... X...	1 = FM Header present or field-formatted 0 = No FM Header or character-coded
.... .X..	1 = Sense data included (see page 4-1) 0 = No sense data
.... ..XX	Chaining control : 00 = Middle element 01 = Last element 10 = First element 11 = Only element

For FM Header format see FM Header chapter

BYTE 1

X...	Definite Response 1 (DR1)
.X.. XX..	Reserved
..X.	Definite Response 2 (DR2)
...X	Exception Response (ERI)
.... ..X.	Queued Response Indicator (QRI)
....X	Pacing (PI)

BYTE 2

X...	Begin bracket
.X..	End bracket
..X.	Change direction
...X .XXX	Reserved
.... X...	Code selection indicator

2

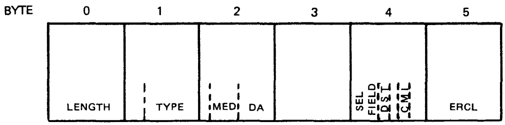
FORM OF RESPONSE REQUESTED

DR1	DR2	ERI	FORM OF RESPONSE REQUESTED
0	0	0	no response
1 0 1	0 1 1	0 0 0	definite response
1 0 1	0 1 1	1 1 1	exception response
0	0	1	reserved

FORM OF RESPONSE SENT

DR1	DR2	ERI	FORM OF RESPONSE SENT
copied from request		0	positive response
		1	negative response

When the RH format indicator = 1, the first six bytes of the RU are interpreted as an FM Header with the following format :



Byte 0

xxxx xxxx	Length = X'06'

Byte 1

xx..	Reserved
..xx xxxx	Type = 000001

Byte 2

x...	Reserved
.xxx	Medium (MED) (output class) 000 = console 001 = exchange (e.g, customer-removable diskette) 002 = card punch 003 = printer
.... xxxx	Device address (DA)

MED and DA fields identify the desired LU component.

Byte 3

xxxx xxxx	Reserved

2

Byte 4

xxx.	Selection Field 000 Resume suspended LU component selection 001 END (normal) of LU component selection 010 Begin LU component selection 011 Begin then end LU component selection 100 Suspend LU component selection 101 END (abortive) LU component selection 110 Reserved 111 Reserved
...x	Data Stream Type (DST) (used in conjunction with ERCL field) 0 = Basic-exchange format not used ;ERCL field is reserved 1 = Basic exchange format follows FM Header ERCL field defines the record length (see details in IBM diskette general information GA21-9132)
.... x.xx	Reserved
.... .x..	Compression indicator (CMI) 1 = Presence of string control bytes (SCB's) 0 = Absence of string control bytes (SCB's are used to compress data)

Byte 5

xxxx xxxx	Exchange Record Length (ERCL)

Used when DST = 1 to indicate the record length used in the basic exchange format. When DST = 0, this field is reserved.

Note :For 3790 machines specific FMH's are used (FMH1 and FMH2). Refer to 3790 communication system host system programmer's guide F/N GC22-9033.

SECTION 3: S D L C

FRAME FORMAT

F	A	C	I	FCS	F
0111 1110					0111 1110
1byte	1byte	1byte	variable length	2bytes	1byte
FLAG	ADDRESS	CONTROL	INFORMATION	CHECK FIELD	FLAG

F = FLAG (1 byte = 01111110 = X'7E')

A = ADDRESS (of secondary station) (1 byte)

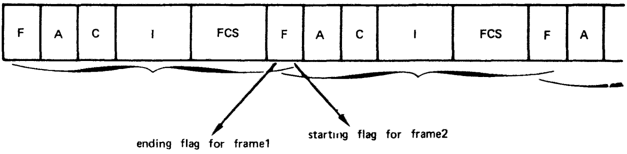
C = CONTROL FIELD (1 byte)

I = INFORMATION FIELD (variable length - present or not depending on C field)

FCS = FRAME CHECK SEQUENCE FIELD (2 bytes)
Fields A - C - I (if present) are included.
Inserted zeros are not included.

The transmitting station complements the FCS before transmission and the receiving station combines the received FCS with its own FCS. The result must be F0B8 in the CRC register.

The frames may be contiguous as follows :



FRAME TYPE

Three types of frames
- Information frame I
- Supervisory frame S
- Non-sequenced frame N/S

C FIELD

	0	1	2	3	4	5	6	7
I		Nr		P/F		Ns		0
S		Nr		P/F	S	S	0	1
NS	M	M	M	P/F	M	M	1	1

I for data transfer

S for flow control

N/S for link control

S Supervisory function bits

M Modifier function bits

P/F Poll bit for primary station
Final bit for secondary station

Format (*)	Binary configuration 0 1 2 3 4 5 6 7	Acronym	Command	Response	I Frame prohibited	Reset Nr/Ns	Definition
NS	0 0 0 P/F 0 0 1 1	NSI	X	X			Non sequenced information
	0 1 0 P 0 0 1 1	DISC	X		X		Disconnect
	1 0 0 P 0 0 1 1	SNRM	X		X	X	Set normal response mode
	0 0 1 P/F 0 0 1 1	NSP **	X	X			Non sequence poll
	1 1 1 P/F 0 0 1 1	TEST	X	X			Test
	0 0 0 P 0 1 1 1	SIM	X		X	X	Set initialization mode
	0 0 0 F 0 1 1 1	RQI		X	X		Request initialization
	0 1 1 F 0 0 1 1	NSA		X			Non sequenced acknowledge
	1 0 0 F 0 1 1 1	CMDR		X			Command reject
	0 0 0 F 1 1 1 1	ROL		X	X		Request on line
	1 0 1 P/F 1 1 1 1	XID	X	X			Exchange station identification
S	-Nr— P/F 0 0 0 1	RR	X	X	X		Receive ready
	-Nr— P/F 0 1 0 1	RNR	X	X	X		Receive not ready
	-Nr— P/F 1 0 0 1	REJ	X	X	X		Reject
			X	X	X		
I	-Nr— P/F —Ns- 0	I	X	X			Information

* - NS = Non sequenced
- S = supervisory
- I = information

** also referenced as ORP (Optional Response Poll)

* NSI (Nonsequenced Information) : As a command, an NSI frame is the vehicle for nonsequenced information. An NSI frame is also a vehicle for nonsequenced information sent to the primary station. NSI is not acknowledged.

* SNRM (Set Normal Response Mode) : This command subordinates the receiving secondary station to the transmitting primary station. No unsolicited transmissions are allowed from a secondary station that is in normal response mode. NSA is the expected response. The primary and secondary station Nr and Ns counts are reset to 0. The secondary station remains in normal response mode until it receives a DISC or SIM command.

* DISC (Disconnect) : This command terminates other modes and places the receiving secondary station effectively offline. The expected response is NSA. (A switched data link station then disconnects, or goes 'on hook'). A disconnected secondary under station cannot receive or transmit information frames ; it remains disconnected until it receives an SNRM or SIM command.

* NSA (Nonsequenced Acknowledgement) : This is the affirmative response to an SNRM, DISC or SIM command. Further transmissions are at the option of the primary station.

* RQI (Request for Initialization) : An RQI frame is transmitted by a secondary station, to notify the primary station of the need for an SIM command. Any command other than SIM causes repetition of RQI by the secondary station.

* SIM (Set Initialization Mode) : This command initiates system specified procedures at the receiving secondary station, for the purpose of initializing link-level functions. NSA is the expected response. The primary and secondary station Nr and Ns counts are reset to 0.

* ROL (Request Online) : This response is transmitted by a secondary station, to indicate that it is disconnected. A secondary station in NDM transmits this response if the received command is not implemented or not valid.

* CMDR (Command Reject) : This response is transmitted by a secondary station in NRM, when it receives a non-valid command. A received command may be non-valid for several reasons :

  1. It is not implemented at the receiving station. This category includes unassigned commands.
  2. The I field is too long to fit into the receiving station buffers. This use is optional.
  3. The command received does not allow the I field that was also received.
  4. The Nr that was received from the primary station is incongruous with the Ns that was sent to it.

  The secondary station cannot release itself from the CMDR condition, nor does it act upon the command that caused the condition. It repeats CMDR whenever it responds, except to an acceptable mode-setting command : SNRM, DISC, or SIM.

The secondary station sends an I field containing status information as part of the CMDR response frame (see figure). This I field provides the secondary station status data that the primary station needs to select appropriate recovery action.

* TEST (Test) : As a command, a TEST frame may be sent to a secondary station in any mode to solicit a TEST response. If an I field is included in the command, it is returned in the response (unless the I field cannot be stored in the secondary station buffer).

* XID (Exchange Station Identification) : As a command, this C field solicits the identification of the receiving secondary station. An I field may be included in the frame to convey the system identification of the transmitting primary station. (A common secondary station address may be used in the A field of the command frame : An XID response is required from the secondary station. An I field in the response is a system option : It is the vehicle for the system identification of the responding secondary station.

  XID is not restricted to a switched data link.

* NSP (Nonsequenced Poll) : This command, with no P-bit, invites transmission from the addressed secondary station(s) ; with the P-bit, it demands transmission from the addressed secondary stations(s). An I field is not permitted. The response to an NSP command requires an F-bit only if the command had the P-bit on.

  NSP is not restricted to a loop data link.

* RR (Receive Ready) : Sent by either a primary or a secondary station, RR confirms sequenced frames through Nr-1 and indicates that the originating station is ready to receive.

* RNR (Receive Not Ready) : Sent by either a primary or a secondary station, RNR indicates a temporarily busy condition in which no frames that require buffer space can be accepted.

  As a command or response, RNR confirms sequenced frames through Nr-1 and indicates that frame Nr is expected next.

* REJ (Reject) : This command/response may be transmitted to request transmission or retransmission of sequenced information. REJ confirms frames through Nr-1 and requests Nr and following frames.

  An REJ command may be interspersed in the sequence of transmitted frames ; an REJ response may also be interspersed. The REJ condition clears when the Nr and succeeding frames have been correctly received.

  If a final frame (with the F-bit on) is not accepted by a primary station, or if a poll frame (with the P-bit on) is not accepted by a secondary station, the primary station times out, waiting for a response to its P-bit, and polls the secondary station again.

Checking for missing or duplicated frames.

- sending count = Ns
- Receiving count = Nr
- Counting capacity = 8 (3 bits) with wrap-around (7 is sequentially followed by 0)
- Up to 7 frames may be sent before Nr count will be transmitted

Ns	Nr			Ns	Nr	
0	0			0	0	
		I,Nr=0,Ns=0,P=0 →				
1	0			0	1	
		I,Nr=0,Ns=1,P=0 →	Error			no change
2	0			0	1	
		I,Nr=0,Ns=2,P=1 →				
3	0			0	1	
		← I,Nr=1,Ns=0,F=1				
3	1			1	1	
		I,Nr=1,Ns=1,P=0 →				
2	1			1	2	
		I,Nr=1,Ns=2,P=0 →				
3	1			1	3	
		I,Nr=1,Ns=3,P=1 →				
4	1			1	4	
		← I,Nr=4,Ns=1,F=1				
4	2			2	4	
		I,Nr=2,Ns=4,P=0 →				
5	2			2	5	

ZERO INSERTION

- Any bit pattern can be sent
- Only the flag may have more than 5 contiguous ones (And Abort pattern)
- The line can never be all ones

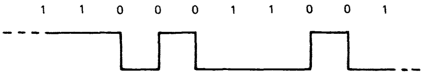
```
                 01111110  11111111  11000000  11111000   Bit stream station trans.

                 01111110  1111101111110000000  111110000  Bit stream on the line.
inserted zeroes                ↑      ↑           ↑
                 01111110  11111111  11000000  11111000   Bit stream station receiv.
```

NRZI

(nonreturn to zero inverted)

- Change the level of the send data for each zero

- Maintain the existing level for each one



- NRZI is used for non-synchronous type modems , no scrambler modems, pattern sensitive modems, to prevent the occurance of extended periods of transitionless data due to contiguous zero bit sequence.

- The following modems are synchronous and do not need NRZI :
  3874 - 3875 - 3978 (all models) - 5979.

- Other modems use NRZI.

- For World Trade, WT Signal Converter Handbook ZZ19-6066 provides information related to the coding to be used with mandatory modems of every country (facility notes).

ACTIVE STATE

Condition when a station is transmitting or receiving data link control or data signals.

IDLE STATE

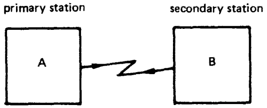
Condition when the link is operational but no transmission is in progress, and after a station is receiving a succession of 15 or more consecutive binary 1s.

HDX	- No signal
FDX/PP	- All ones
FDX/MP PRI	- All ones
FDX/MP SEC	- No signal

Do not confuse with IDLE STATION, where a serie of contiguous flags may be transmitted by a primary station or by a duplex secondary station to maintain bit synchronism and to maintain data link in an ACTIVE STATE.

TRANSIENT STATE

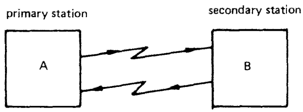
Condition when the carrier is turned on in order to transmit. This is the delay between request-to-send on and clear-to-send on (turnaround).



negative response to poll	B,SNRM-P →		A sets B's response mode. Nr and Ns counts are reset to 0.
		← B,NSA-F	B acknowledges.
	B,RR-P(0) →		A polls B for transmission
		← B,RR-F(0)	B has nothing to transmit. (B remains in NRM).
affirmative response to poll / secondary station sends sequenced frames	B,RR-P(0) →		A polls B for transmission.
		← B,I(0)F(0)	B sends final I-frame
	B,RR-P(1) →		A confirms frame 0 and polls B for transmission
		← B,I(1)$\overline{F}$(0)	B sends sequenced I-frames.
		← B,I(2)$\overline{F}$(0)	
		← B,I(3)F(0)	B sends final I-frame, RR is implied
	B,I(0)$\overline{P}$(4) →		A confirms frames 1-3 and starts sending sequence I-frames.
	B,I(1)$\overline{P}$(4) →		
	B,I(2)P(4)		A sends poll I-frame, B must respond.
		← B,RR-F(3)	B confirms frame 0-2.
online and offline status changes	B,DISC-P →		A sets B offline.
		← B,NSA-F	B acknowledges (B assumes NDM).
	B,RR-P(0) →		A polls B
		← B,ROL-F	B requests online status.
	B,SNRM-P →		A sets B online. Nr and Ns counts are reset to 0.
		← B,NSA-F	B acknowledges. (B remains in NRM).

primary and secondary station exchange sequenced frames

B,I(0)$\overline{P}$(0) →		A sends frame 0.
B,I(1)P(0) →		A sends poll I-frame, B must respond.
	← B,I(0)F(2)	B confirms frames 0-1 and sends frame 0.
B,RR-P(1) →		A confirms frame 0 and polls B for transmission.
	← B,I(1)$\overline{F}$(2)	B sends sequenced I-frames.
(CRC error)	← B,I(2)$\overline{F}$(2)	A discards frame 2 because of a CRC error.
	← B,I(3)$\overline{F}$(2)	
	← B,I(4)F(2)	B sends final I-frame.
B,RR-P(2) →		A confirms frame 1 and requests frame 2.
	← B,I(2)$\overline{F}$(2)	B sends frames 2-4 again.
	← B,I(3)$\overline{F}$(2)	
	← B,I(4)F(2)	B sends final I-frame
B,RR-$\overline{P}$(5) →		A confirms frames 2-4 (B remains in NRM).



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secondary station comes online, primary and secondary exchange sequenced frames

B,RR-P(0) →		A polls B.
	← B,RQI-F	B requests initialization
B,SIM-P →		A sets B to initialization mode.
	← B,NSA-F	B acknowledges.
		B is brought online through system procedures when initialization is complete.
B,SNRM-P →		A sets B's response mode. Nr and Ns counts are reset to 0.
	← B,NSA-F	B acknowledges.
B,RR-P(0) →		A polls B for transmission.
B,I(0)$\overline{\text{P}}$(0) ⇄	B,I(0)$\overline{\text{F}}$(0)	Duplex exchange of sequenced I-frames (B uses longer frames than A).
B,I(1)$\overline{\text{P}}$(0) →		A sends frame 1.
B,I(2)$\overline{\text{P}}$(0) ⇄	B,I(1)$\overline{\text{F}}$(2)	A sends frame 2. B confirms frames 0-1 and sends frame 1.
B,I(3)$\overline{\text{P}}$(1) →		A confirms frame 0 and send frame 3.
	← B,I(2)F(4)	B confirms frames 2-3 and sends frame 2.
B,RR-P(3) →		A confirms frames 1-2
	← B,RR-F(4)	B relinquishes transmission. (B remains in NRM).

sy secondary statio

B,I(4)$\overline{\text{P}}$(3) →		A sends sequenced I-frames.
B,I(5)$\overline{\text{P}}$(3) →		
B,I(6)$\overline{\text{P}}$(3) →		
B,I(7)$\overline{\text{P}}$(3) →		
B,I(0)P(3) →		A polls B for confirmation.
	← B,RNR-F(0)	B becomes busy, but confirms frames 4-7.
B,RR-P(3) →		A asks if B is still busy.

←— B,RR-F(0)	B can receive again and expects frame 0.
B,I(0)$\overline{\mathrm{P}}$(3) —→	A sends frame 0 again.
B,I(1)$\overline{\mathrm{P}}$(3) —→	A continues with frame 1.
B,I(2)P(3) —→	A sends poll I-frame.
←— B,RR-F(3)	B confirms frames 0-2. (B remains in NRM).

busy primary station

B,SNRM-P —→	A sets B's response mode to reset The Nr and Ns counts to 0.
←— B,SNA-F	B acknowledges.
B,RR-P(0) —→	A polls B.
←— B,I(0)$\overline{\mathrm{F}}$(0)	B sends sequenced I-frames.
←— B,I(1)$\overline{\mathrm{F}}$(0)	
←— B,I(2)$\overline{\mathrm{F}}$(0)	
B,RNR-$\overline{\mathrm{P}}$(3) ⇄ B,I(3)$\overline{\mathrm{F}}$(0)	A becomes busy, but confirms frames 0-2.
←— B,RR-F(0)	B stops sending.
B,RR-P(3) —→	A polls B for frame 3.
←— B,I(3)$\overline{\mathrm{F}}$(0)	B retransmits frame 3.
(CRC error) ←— B,I(4)F(0)	B sends frame 4.
B,RR-P(4) —→	A polls B, confirms frame 3, and requests frame 4.
←— B,I(4)F(0)	B sends frame 4 again.
B,RR-$\overline{\mathrm{P}}$(5) —→	A confirms frame 4. (B remains in NRM).

invalid command

B,XXX-P —→	A sends frame with an undefined C field.
←— B,CMDR-F	B rejects the command.
	Higher level at A processes the status reported by B in the CMDR response.
B,SNRM-P —→	A resets B's error condition. Nr and Ns counts are reset to 0.
←— B,NSA-F	B acknowledges. (B remains in NRM).

B,RR-P(0) —→	A polls B for transmission.
←— B,I(0)$\overline{\mathrm{F}}$(0)	B sends sequenced I-frames.

sequence error in duplex exchange

A	B	
$B,I(0)\overline{P}(0)$ ⇄	$B,I(1)\overline{F}(0)$	Duplex exchange of sequenced I-frames. (A uses longer frames than B).
	← $B,I(2)\overline{F}(0)$	
	(CRC error)	B receives frame 0 with a CRC error,
$B,I(1)\overline{P}(2)$ →		
	← $B,I(3)\overline{F}(0)$	
	← $B,REJ\text{-}\overline{F}(0)$	A's frame 1 is out of sequence. B expects frame 0.
$B,I(0)\overline{P}(4)$ ⇄	$B,I(4)\overline{F}(0)$	B continues sending. A sends frame 0 again and confirms frame 0-3.
	← $B,I(5)F(0)$	B sends final I-frame.
$B,I(1)P(6)$ →		A retransmits frame 1, confirms frames 0-5, and polls B for confirmation.
	← $B,RR\text{-}F(2)$	B confirms. (B remains in NRM).

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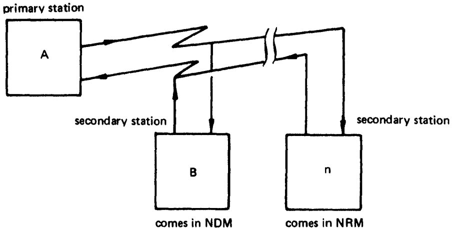
MULTIPOINT DUPLEX EXCHANGES



secondary stations come online;

B,RR-P →		A polls B for status.
	← B,RQI-F	B asks for initialization mode.
B,SIM-P →		A sets B to initialization mode.
	← B,NSA-F	B acknowledges.
		B is brought online through system procedures when initialization is complete.
B,SNRM-P		A sets B online. Nr and Ns counts are reset.

primary station sends to one and receives from the other

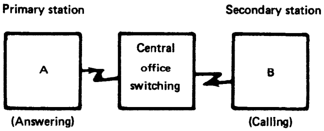
←— B,NSA-F		B acknowledges.
n,RR-P(0) —→		A polls n for transmission.
B,I(0)-$\overline{\text{P}}$(0)—→	←— n,I(0)$\overline{\text{F}}$(0)	n sends sequenced frames to A while A sends to B.
B,I(1)$\overline{\text{P}}$(0)—→	←— n,I(1)$\overline{\text{F}}$(0)	
	←— n,I(2)$\overline{\text{F}}$(0)	
	←— n,I(3)F(0)	n completes its sequence.
B,RR-P(0) —→		A polls B for confirmation.
←— B,RR-F(2)		B confirms frames 0-1.
n,RR-$\overline{\text{P}}$(4) —→		A confirms frames 0-3. (B and n remain in NRM).

interleaved primary station transmission

n,I(0)$\overline{\text{P}}$(4)—→		A sends sequenced frames to n.
B,I(2)$\overline{\text{P}}$(0)—→		A sends sequenced frames to B.
n,I(1)P(4)—→		A concludes sending to n and requests confirmation.
B,I(3)$\overline{\text{P}}$(0)—→	←— n,RR-F(2)*	A continues sending to B and n confirms frames 0-1.
B,I(4)P(0)—→		A concludes sending to B and requests confirmation.
←— B,RR-F(5)*		B confirms (B and n remain in NRM).

* If a secondary station has information to send this confirmation may be in the I format

POINT-TO-POINT SWITCHED EXCHANGES (HALF DUPLEX)



'Handshaking' and mode-setting

A → B	B → A	
Common Address, XID-P →		A requests B's ID.
	← B,XID-F	B identifies itself to A.
B,RR=P(0) →		A alerts B for status change.
	← B,ROL-F	B requests online status.
B.SNRM-P →		A sets B's response mode. Nr and Ns counts are reset.
	← B,NSA-F	B acknowledges (B remains in NRM).

Inquiry-response exchange

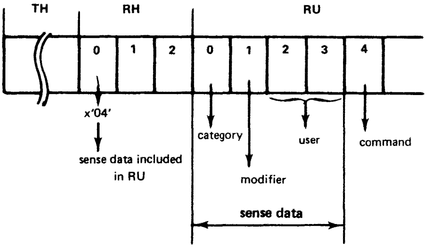
A → B	B → A	
B,RR-P(0) →		Primary always initiates switched communication. A polls B for transmission.
	← B,I(0)$\overline{F}$(0)	B sends sequenced frames
	← B,I(1)$\overline{F}$(0)	
	← B,I(2)$\overline{F}$(0)	
	← B,I(3)F(0)	B concludes its sequence
B,RR-$\overline{P}$(4) →		A confirms B's frames 0-3.
		(inactivity timeout at A)
B,RR-P(4) → (CRC error)		A polls B for response. B dis the frame because of CRC erro
		(idle receive timeout at A)
B,RR-P(4) →		A polls B again
	← B,RR=F(0)	B responds.
B,I(0)$\overline{P}$(4) →		A sends sequenced frames
B,I(1)P(4) →		A concludes its sequence
	← B,RR-F(2)	B confirms frames 0-1
B,DISC-P →		A commands disconnect.
	← B,NSA-F	B acknowledges
		A and B disconnect.

SECTION 4 - CONTENTS

ECTION 4: SENSE DATA

4

SNA provides for four bytes of sense data to be returned on all negative responses or exception responses (EXR). The sense data defines the specific condition preventing successful processing of the request. Sense data always comprises the first four bytes in the RU when the Sense data Included is set in the RH. In a few cases, user-defined data is not included in the sense data ; in its place is a binary count that indexes the first byte found to be in error in the received request, and possibly the indexed byte. The format of the sense data field is described below.



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CATEGORY

It is the first byte of the sense data. It reflects the nature of the exception.

Byte 0	Category
X'80'	Path Error
X'40'	RH usage error
X'20'	State Error
X'10'	Request Error
X'08'	Request Reject
X'00'	User Sense Data Only

The Category 'User Sense Data Only' (X'00') allows the End-Users to exchange data in bytes 2-3 for conditions not defined by SNA within the other categories (and perhaps unique to the End-Users involved). The modifier value is also X'00'.

The sense codes for the other categories are discussed below. For these categories, a modifier value of X'00' can be used (as an implementation option) when no definition of the exception condition beyond the major category is to be identified.

Path Error (Category Code = X'80')

Indicates that the request could not be delivered to the intended receiver, due to a path outage or an invalid sequence of activation requests or one of the listed transmission header errors. (Some TH errors, i.e., SQN errors, are category X'20').

Modifier

01 Intermediate Node Failure in an intermediate node ; request discarded. A response may or may not be possible. : Machine or Program Check

02 Link Failure : Data link failure.

03 LU Inoperative : The LU is unable to process requests.

04 Unrecognized DAF : An intermediate or boundary node has no routing information for the DAF, or an end mode has no LU with indicated DAF (FID1), DAF' (FID2), or local address (FID3).

05 No Session : (Note 2) No session is bound in the receiver for the indicated OAF, or no active CP manager. Exists for the OAF-DAF pair in a communication controller node providing a Boundary Function. This exception does not apply to BIND, ACTCDRM, ACTPU or ACTLU (Note 2).

06 FID : Invalid FID for the receiving node (Note 1)

07 Segmenting error : First BIU segment had less than 10 bytes ; or mapping field sequencing error, such as first, last, middle ; or segmenting not supported and MPF not set to 11 (Note 3).

08 PU Not Active : The PU in the receiving node has not been activated and the request was not ACTPU for this half-session, or the request was ACTLU from an SSCP that does not have an active SSCP-PU session with the PU associated with the addressed LU (note 2).

09 LU Not Active : The LU indicated by the DAF has not been activated and the request is not ACTLU. (Note 2)

0A Too long PIU : Transmission was troncaded by the receiving link station because sufficient buffering was not available.

0B Incomplete TH : Transmission received shorter than TH. (Note 1)

0C DCF : Data Count Field inconsistent with transmission length.

0D Lost Contact : Contact with the link station for which the transmission was intended has been lost, but the link has not failed. If the difference between link failure and loss of contact is not detectable, link failure (X'8002') is sent.

OE Unrecognized OAF : The OAF (FID1) was not recognized.

OF Invalid address combination : The DAF' - OAF' (FID2) combination or the LSID (FID3) specified an invalid type of session, e.g., a PU-LU combination.

Note 1 : It will generally not be possible to send a response for these exception conditions, since information (FIP, Addresses) required to generate a response is not available. They are logged as errors along with the error codes if this capability exists in the receiver.

Note 2 : These errors are listed as path errors since the request could not be delivered to the intended TC element.

Note 3 : If segmenting is not supported, a negative response will be returned for the first segment only, since this contains the RH. Subsequent segments are discarded.

RH Error (Category code = X'40')

Indicate that the value of a field or combination of fields in the RH violates architectural rules or BIND options previously selected. These errors are independent of the current states of the session or data flows. They result from the failure of the sender to enforce session rules. It is not required that the receiver check for these conditions.

Modifier

01 Invalid SC or NC RH : The RH of a SC or NC request was invalid.

02 Used for Crypto

03 BB not allowed : Begin Bracket (BB) was indicated with no Begin Chain (BC).

04 EB not allowed : End Bracket (EB) is indicated with no BC, or by the Primary when only the Secondary may send EB, or by the Secondary when only the Primary may send EB.

05 Incomplete RH : Transmission shorter than full TH-RH.

06 Exception Not Allowed : Exception response was requested when not permitted.

07 Definite Response Not Allowed : A definite response was requested when not permitted.

08 Pacing Not Supported : The Pacing bit was set on a request, but the receiving CPM does not support pacing for this session.

09 CD Not allowed : Change Direction (CD) was indicated with no End Chain (EC).

0A No Response Not Allowed : No response was specified on a request when not permitted. (Used only on EXR)

0B Chaining Not Supported : Chaining bits indicated other than BC, EC, but multi-request chains are not supported on the session.

0C Brackets Not Supported : A Bracket bit was set, but brackets are not used on the session.

0D CD Not Supported : Change Direction bit was set, but is not supported.

0E Reserved

0F Format Indicator Not allowed : The format indicator was set when not supported for the session, or when BC was not set.

10 Alternate Code not supported : The Code Selection Indicator was set when not supported on the session.

State Error (Category code = X'20')

Indicates a sequence number error, or an RH field or RU which is not allowed in the current session control or data flow control state of the receiver. These errors prevent delivery of the request to the intended half-session protocol machine.

Modifier

01 Sequence Number : Sequence number received on normal flow request was not one greater than the last.

02 Chaining : Error in the sequence of the chain indicator settings, such as first, middle, first.

03 Bracket : Error resulting from failure of sender to enforce Bracket rules for session. This error does not apply to contention or race conditions.

04 Direction : Error resulting from a normal-flow request received while HDX-FF transmit state. (Contrast this sense code with X'081B' which signals a race condition.)

05 Data Traffic Reset : An FMD or normal-flow DFC request received by a half-session whose session was active, but whose Data Traffic was not in the active state.

06 Data Traffic Quiesced : FM Data or DFC request received from an LU which has previously sent Quiesce Complete or Shutdown Complete and has not responded to Release Quiesce.

07 Data Traffic Not Reset : A Session Control request allowed only in the Data Traffic Reset state (e.g., STSN) was received while Data Traffic was not reset.

08 No Begin-Bracket : A BID or an FMD request specifying BB was received while SBI was in the NOBB state.

4

Request Error (Category Code = X'10')

Indicates that the RU was delivered to the intended half-session, but could not be interpreted or processed. This condition represents a mismatch in half-session capabilities.

Modifier

01 RU Data Error : Data in the request RU is not acceptable to the receiving FM ; for example a character code not in the set supported, or a formatted data field not acceptable to Presentation Services.

02 RU Length Error : The request RU was too long or too short.

03 Function Not Supported : The function requested is not supported. The function may have been specified by a formatted request code, a field in an RU, or a control character.

04 Reserved

05 Parameter Error : A parameter modifying a control function is invalid, or outside the range allowed by the receiver.

06 Reserved

07 Category Not Supported : DFC, SC, NC or FMD request received by a half-session not supporting any request in the Category, or Network Services request with byte 0 not set to 01, or byte 1 not set to a NS Category supported by the receiver.

08 Invalid FM Header : The FM Header was not understood or translatable by the receiver, or an header was expected but not present.

Request Reject : (Category Code = X'08')

Indicates that the request was delivered to the intended half-session and was understood and supported, but not executed.

Modifier

01 Resource Not Available : The requested resource (LU, PU, link) specified in an RU is not available.

02 Intervention Required : Forms or cards are required at an output device, device is temporarily in local mode, or other conditions requiring intervention.

03 Missing Password : The required password was not supplied.

04 Invalid Password : Password was not valid

05 Session Limit Exceeded : The requested session cannot be activated as one of the NAUs is at its session limit. Applies to ACTCDRM, INIT, BIND and CINIT commands.

06 Resource Unknown : The resource (LU, PU or Link) name or address in an RU is not recognized by the receiver.

07 Resource not available - LUSTAT forthcoming : A subsidiary device will be unavailable for an indeterminate period of time. LUSTAT will be sent when the device becomes available.

08 Invalid Contents ID : The contents ID contained on the ACTCDRM request was found to be invalid.

09 Mode Inconsistency : The requested function cannot be performed in the present state of the receiver.

0A Permission Rejected : The receiver has denied an implicit or explicit request of the sender ; when sent in response to BIND, it implies that the secondary half sessions's LU will not notify the SSCP when a BIND can be accepted. (See the X'0845' sense code for a contrasting response).

0B Bracket Race Error : Loss of contention within the bracket protocol. Arises when Bracket Initiation/termination is allowed by both NAUs in a session.

0C Procedure Not Supported : A named procedure (Test, Measurement, Trace,) specified in an RU is not supported by the receiver.

0D NAU Contention : A request to activate a session was received while the receiving half-session was awaiting a response to a previously sent activation request for the same session.

0E NAU Not Authorized : The requesting NAU does not have access to the requested resource.

4

0F End-User Not Authorized : The requesting NAU does not have access to the requested resource.

10 Missing Requestor ID : Required Requestor ID was missing.

11 Break : Asks the receiver of this sense code to terminate the present chain with CANCEL or with an FMD request carrying EC. The sender enters PURGE state when Break is sent.

12 Insufficient Resource : Receiver cannot act on request because of a temporary lack of resources.

13 Bracket Bid Reject - No RTR : BID (or BB) is received while INB or while BETB and the FM denied permission. RTR will not be sent.

14 Bracket Bid reject - RTR : BID (or BB) is received while INB or while BETB and the FM denied permission. RTR will be sent.

15 Function Active : A request to activate a network element or procedure was received, but the element or procedure was already active.

16 Function Inactive : A request to terminate a procedure or deactivate a network element was received but the element or procedure was not active.

17 Link Inactive : A request requires the use of a link, but the link is inactive.

18 Link Procedure in Process : CONTACT, DISCONTACT, IPL or other link procedure in progress when a conflicting request was received.

19 RTR Not Required : Receiver of READY TO RECEIVE has nothing to send.

1A Request Sequence Error : Invalid sequence of requests.

1B Receiver in Transmit Mode : A race condition normal-flow request received while the HDX-CONT state was in send mode or the resources were unavailable (Contrast this sense code with X'2004', which signals a protocol violation).

1C Request not executable : The requested function can not be executed due to a permanent error condition in the receiver.

1D Invalid Station/SSCP ID : The station ID or SSCP ID in the request was found to be invalid .

1E Session Reference Error : A request contained a reference to a half-session that was neither active nor in the process of being activated (generally applies to network services commands).

1F Reserved

20 Control Vector Error : Data is invalid for the Control Vector specified by the target network address and key. Applies to SET CONTROL VECTOR and

SENSE CONTROL VECTOR.

21 Invalid Session Parameters : Session Parameters were not valid or not supported by the half-session whose activation was requested.

22 Link Procedure Failure : A link-level procedure has failed due to link hardware failure, loss of contact with a link station or an invalid response to a link command (This is not a path error since the request being rejected was delivered to its destination).

23 Unknown Control Vector : The Control Vector specified by a Network Address and key is not known to the receiver.

24 Component Aborted : The LU component (device indicated by an FM header) which had been selected has been aborted due to an error condition or resource depletion.

25 Component Not Available : The LU component (device indicated by an FM header) is not available.

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26 FM Function Not Supported : A function requested in an FM data RU is not supported by the receiver.

27 Intermittent Error-Retry Requested : An error at the receiver caused an RU to be lost. The error is not permanent and retry of the RU (or chain) is requested.

28 Reply Not Allowed : A request requires a normal-flow reply, but the outbound data flow is Quiesced or Shutdown, and there is no delayed reply capability for this half-session.

29 Change Direction Required : A request requires a normal-flow reply, but the data flow is in HDX-FF receive state; CD was not set on the request and there is no delay reply capability

2A Presentation Space Alteration : Presentation space altered by end user while data flow is in HDX receive state.

2B Presentation Space Integrity Lost : Presentation space error due to other than end user action, e.g., transient error in regeneration buffer.

2C Resource-Sharing Limit Reached : The request received from an SSCP was to activate a half-session, a link, or a procedure, when that resource was at its sharing limit.

2D LU Busy : The LU resources needed to process the request are being used ; for example, the LU resources needed to process the request received from the SSCP are being used for the (LU,LU) session.

2E Intervention Required at Subsidiary Device : A condition requiring intervention, such as out of paper, or power-off, or cover interlock open, exists at a subsidiary device.

2F Request Not Executable, Subsidiary Device : The requested function cannot be executed, due to a permanent error condition in one or more of the receiver's subsidiary devices.

30 Reserved.

31 Reserved.

32 Invalid Count Field : A count field contained in the request indicates a value too long or too short to be interpreted by the receiver, or the count field is inconsistent with the length or the remaining fields. Bytes 2 and 3 following the sense code are not used for user-defined datea; they contain a binary count that indexes (zero-origin) the first byte of the invalid count field.

33 Invalid Parameter in Fixed-Length Field : One or more parameters contained in fixed-length fields of the request are invalid or not supported by the NAU that received the request. Bytes 2 and 3 following the sense code are not used for user-defined data. Byte 2 contains a binary value that indexes (zero-origin) the first byte that contained an invalid parameter. Byte 3 contains a transform of the first byte that contained an invalid parameter : the bits that constitute the invalid parameter(s) are complemented and all other bits are copied.

34 RPO Not Initiated : A power-off procedure for the specified SPU node was not initiated because one or more other SSCPs have contacted the SPU node, or because a CONTACT, DUMP, IPL, or DISCONTACT procedure is in progress for that SPU node.

35 Invalid Parameter in Fixed or Variable-Length Field

The request contained a fixed or variable-length field whose contents are invalid or not supported by the NAU that received the request. Bytes 2 and 3 following the sense code are not used for user-defined date; they contain a binary count that indexes (zero-origin) the first byte of the fixed or variable length field having invalid contents.

36 PLU/SLU Specification Mismatch : For a specified (LU,LU) session, both the OLU and DLU have only the primary capability or have only the secondary capability.

37 Queuing Limit Exceeded : For an (LU,LU) session initiation request (INIT, CDINIT, or INIT-OTHER-CD) specifying (1) Initiate or Queue (if Initiate not possible) or (2) Queue Only, the queuing limit of either the OLU or the DLU, or both, was exceeded.

38 Queuing not supported : For an (LU,LU) session initiation request specifying (1) Initiate or Queue (if initiate not possible) or (2) Queue Only, either an SSCP (ILU) cannot support initiate-queuing, or an SSCP (OLU) or an SSPC (DLU) cannot support set up-queuing.

39 (LU,LU) Session being taken down : At the time an (LU,LU) session initiation or termination request is received, the SSCP of at least one of the LUs (OLU or DLU) is processing a CDTAKED request.

3A LU not enabled : At the time an (LU,LU) session initiation request is received at the SSCP, at least one of the two LUs, although having an active session with its SSCP, is not ready to accept CINIT or BIND requests.

3B Invalid PCID : An invalid PCID, one containing invalid network address of the SSCP (ILU or TLU), has been received in CDNINIT, INIT-OTHER-CD, CDTERM, or TERM-OTHER-CD ; or a PCID that does not identify a previously queued request has been received in CDINIT (Dequeue) or INIT-OTHER-CD (Dequeue) ; or, a PCID that cannot be associated with the PCID of any previously processed CDINIT has been received on CDCINIT.

3C Domain Takedown Contention : While waiting for a response to a CDTAKED ; a CDTAKED request is received by the SSCP (primary). Contention is resolved by giving preference to the CDTAKED sent by the SSCP (primary).

3D Dequeue Retry Unsuccessful-Removed from Queue : The SSCP cannot successfully honor a CDINIT (Dequeue) request, which specifies 'leave on queue if dequeue-retry is unsuccessful', to dequeue and process a previously queued CDINIT request (e.g., the LU in its domain is still not available for the specified session), and removes the queued CDINIT request from its queue.

3E Network Name resolution problem : An SSCP receiving a CDTERM request (with Session key X'06') does not have the capability to resolve the OLU network name to a network address ; it requires session key X'08', which carries the network address of the OLU.

3F Terminate Contention : While waiting for a response to CDTERM, a CDTERM is received by the SSCP (SLU). Contention is resolved by giving preference to the CDTERM sent by the SSCP (SLU).

40 Reserved.

41 Duplicate Network Address : In a cross-domain (LU,LU) session initiation request to the SSCP (DLU) determines that the OLU network address specified in the CDINIT request is a duplicate of an LU network address in the domain of the SSCP (DLU).

42 (SSCP, SSCP) Session not active : At the time an (LU, LU) session initiation or termination request is received, at least one of the following conditions exists :

* The SSCP (ILU) and SSCP (OLU) do not have an active session with each other, and therefore INIT-OTHER-CD cannot flow.

* The SSCP (TLU) and SSCP (OLU) do not have an active session with each other, and therefore TERM-OTHER-CD cannot flow.

* The SSCP (OLU) and SSCP (DLU) do not have an active session with each other, and therefore CDINIT or CDTERM cannot flow.

43 Reserved.

44 Initiation Dequeue Contention : While waiting for a response to a CDINIT (Dequeue), a CDINIT (Dequeue) is received by the SSCP (SLU). Contention is resolved by giving preference to the CDINIT (Dequeue) sent by the SSCP (SLU).

45 Permission Rejected-SSCP will be notified : The receiver has denied an implicit or explicit request of the sender ; when sent in response to BIND, it implies that the secondary half-session's LU will notify the SSCP (via LUSTAT) when a BIND can be accepted. (See the X'080A' sense code for a contrasting response).

46 ERP message forthcoming : The received request was rejected for a reason to be specified in a forthcoming request.

47 Resynchronizing restart required : The secondary half-session is awaiting resynchronization via STSN and cannot successfully process the received request, such as SDT or BIND (specifying a TS profile not allowing STSN).

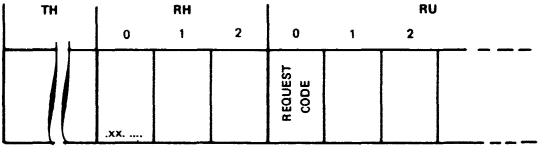
48 Reserved.

49 Invalid request procedure : The procedure requested is invalid for the resource named in the request.

SECTION 5: NETWORK COMMANDS

5

NETWORK COMMAND FORMAT



- RH Byte 0 Bits 1-2 indicate the type of network command in process:

Bits 1-2	= 00	Function management data
	= 01	Network control
	= 10	Data flow control
	= 11	Session control

- RU Byte 0 indicates the request code except for Function Management Data (request code in Byte 2), and for Customer Data (see Network Services commands)

REQUEST CODE	COMMAND	TYPE OF COMMAND
01/81	NETWORK SERVICES	
04	LUSTAT	DFC
05	RTR	DFC
05	LSA	NC
07	ANSC	NC
0D	ACTLU	SC
0E	DACTLU	SC
11	ACTPU	SC
12	DACTPU	SC
14	ACTCDRM	SC
15	DACTCDRM	SC
31	BIND	SC
32	UNBIND	SC
70	BIS	DFC
71	SBI	DFC
80	QEC	DFC
81	QC	DFC
82	RELQ	DFC
83	CANCEL	DFC
84	CHASE	DFC
A0	SDT	SC
A1	CLEAR	SC
A2	STSN	SC
A3	RQR	SC
C0	SHUTD	DFC
C1	SHUTC	DFC
C2	RSHUTD	DFC
C8	BID	DFC
C9	SIG	DFC

COMMAND	REQUEST CODE	TYPE OF COMMAND
ACTCDRM	14	SC
ACTLU	0D	SC
ACTPU	11	SC
ANSC	07	NC
BID	C8	DFC
BIND	31	SC
BIS	70	DFC
CANCEL	83	DFC
CHASE	84	DFC
CLEAR	A1	SC
DACTCDRM	15	SC
DACTLU	0E	SC
DACTPU	12	SC
LSA	05	NC
LUSTAT	04	DFC
QC	81	DFC
QEC	80	DFC
RELQ	82	DFC
RQR	A3	SC
RSHUTD	C2	DFC
RTR	05	DFC
SBI	71	DFC
SDT	A0	SC
SHUTC	C1	DFC
SHUTD	C0	DFC
SIG	C9	DFC
STSN	A2	SC
UNBIND	32	SC

5

NETWORK CONTROL COMMANDS

REQUEST CODE	COMMAND	COMMAND NAME	SESSION
05	LSA	Lost SubArea	PU-PU
07	ANSC	Auto Network Shutdown Complete	PU.T4-SSCP
06	ANS	Auto Network Shutdown	PU-SSCP
50	INITC	Initialization Complete	PU-SSCP

These two commands are only NCP commands

Flow is Expedited for all these commands

SESSION CONTROL COMMANDS

REQUEST	COMMAND	COMMAND NAME	SESSION
0D	ACTLU	Activate Logical Unit	SSCP-LU
0E	DACTLU	Deactivate Logical Unit	SSCP-LU
11	ACTPU	Activate Physical Unit	SSCP-PU
12	DACTPU	Deactivate Physical Unit	SSCP-PU
14	ACTCDRM	Activate Cross-Domain Resource Manager	SSCP-SSCP
15	DACTCDRM	Deactivate Cross-Domain Resource Manager	SSCP-SSCP
31	BIND	Bind Session	PLU-SLU
32	UNBIND	Unbind Session	PLU-SLU
A0	SDT	Start Data Traffic	PLU-SLU SSCP-SSCP
A1	CLEAR	Clear	PLU-SLU SSCP-SSCP
A2	STSN	Set and Test Sequence Numbers	PLU-SLU
A3	RQR	Request Recovery	SLU-PLU SSCP-SSCP

Flow is Expedited for all these commands

DATA FLOW CONTROL COMMANDS

REQUEST CODE	COMMAND	COMMAND NAME	SESSION	FLOW
04	LUSTAT	Logical Unit Status	LU-LU LU-SSCP	N
05	RTR	Ready to Receive	LU-LU	N
70	BIS	Bracket Initiation Stopped	LU-LU	N
71	SBI	Stop Bracket Initiation	LU-LU	E
80	QEC	Quiesce at End of Chain	LU-LU	E
81	QC	Quiesce Complete	LU-LU	N
82	RELQ	Release Quiesce	LU-LU	E
83	CANCEL	Cancel	LU-LU	N
84	CHASE	Chase	LU-LU	N
C0	SHUTD	Shutdown	PLU-SLU	E
C1	SHUTC	Shutdown Complete	SLU-PLU	E
C2	RSHUTD	Request shutdown	SLU-PLU	E
C8	BID	Bid	LU-LU	N
C9	SIG	Signal	LU-LU	E

AUTO NETWORK SHUTDOWN COMPLETE (ANSC) - PU-SSCP

RU format bytes

0	X'07' request code
1	reason code :
	X'01' operator initiated
	X'02' unrecoverable timeout
	X'03' ACTPU (ERP) received while session active
	X'04' DISC received while session active
	X'05' SNRM received while session active
	X'06' unrecoverable link error

Sent by a PU to notify the SSCP that the network shutdown procedure signalled by AUTO NETWORK SHUTDOWN has been completed.

Note - ANSC is always sent with no-response indicated.

LOST SUBAREA (LSA) - PU-PU

RU format bytes

0	X'05' request code
1-2	Reserved
3	Reason code, X'01' unexpected routing interruption X'02' controlled routing interruption
4	Format : X'01' (only value defined)
5-6	Reserved
7-8	Network address of the PU that originated the LSA
9-10	Reserved
11	Subarea address (left-justified) for a lost subarea
12	Reserved
13-n	Additional 4-byte fields in the form of bytes 9-12, corresponding to additional lost subareas

ACTIVATE CROSS-DOMAIN RESOURCE MANAGER (ACTCDRM) - SSCP-SSCP

RU format bytes

0	X'14' request code
1	bits 0-3, format : X'0' (only value defined) bits 4-7, type activation requested : X'1' cold (only value defined)
2	FM profile (see Appendix B)
3	TS profile (see Appendix C)
4-11	Contents ID : eight-character EBCDIC symbolic name that represents implementation and installation dependent information about the SSCP issuing the ACTCDRM ; eight blanks is the value used if no information is to be conveyed (this field could be used to provide a check for a functional and configurational match between the SSCPs.)
12-17	SSCP ID : a six-byte field that includes the ID of the SSCP issuing the ACTCDRM. The first four bits specify the format for the remaining bits : bits 0-3, 0000 bits 4-7, physical unit type (see Appendix D) of the node containing the SSCP bits 8-47, implementation and installation dependent binary identification
18	TS Usage bits 0-1, reserved bits 2-7, primary CPMGR receiving pacing count (zero means no pacing of requests flowing to the primary)

5

ACTIVATE LOGICAL UNIT (ACTLU) - SSCP-LU

RU format bytes

0	X'0D' request code
1	Type activation requested : X'01' cold
2	Bits 0-3 FM profile
2	Bits 4-7 TS profile

FM profile = see appendix B
TS profile = see appendix C

ACTLU (COLD) is requested when SSCP cannot recover the SSCP - LU session or has lost track of session and data flow state for the LU.

ACTIVATE PHYSICAL UNIT (ACTPU) - SSCP-PU

RU format bytes (request)

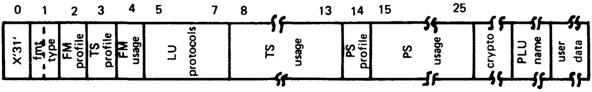
0	X'11'	request code
1		type activation requested
2		Bits 0-3 FM profile
2		Bits 4-7 TS profile
3-8		SSCP ID

type activation X'01' = cold
X'02' = ERP
FM profile = see appendix B
TS profile = see appendix C
SSCP ID = six bytes field specifying the ID of SSCP issuing the ACTPU.
The first four bits specify the format for the remaining bits :
Bits 0-3 : 0000 format
Bits 4-7 : PU type of the node containing the SSCP (see Appendix D)
Bits 8-47 : implementation and installation dependent binary identification,

ACTPU (COLD) is specified on the initial session, and for reactivation where the SSCP has not retained enough information to recover the session.

ACTPU (ERP) is requested when the SSCP has enough information to recover the session.

BIND SESSION (BIND) - PLU-SLU



Is sent from the PLU to the SLU to establish a session between the LUs.

The BIND format which has been defined is : Format 0

Location	Field	Values
Byte 0	BIND RU Code	X'31'
Byte 1, bits 0-3	Format	X'0'
Byte 1, Bits 4-7	Type	X'1' = Cold, Other values reserved
Byte 2	FM Profile	(See Appendix B)
Byte 3	TS Profile	(See Appendix C)

FM Usage

Primary LU Protocols for FM Data

Byte 4, bit 0	Chaining Use	1 = Multiple RU chains are allowed from the Primary LU 0 = Only single RU chains are allowed from the Primary LU
Byte 4, bit 1	Request mode Selection	0 = Immediate Request mode 1 = Delayed Request Mode
Byte 4, bit 2-3	Chain Responses Protocol used by Primary LU half session for FMD requests	Chains from Primary will ask for : '00' - no response '01' - Exception Response '10' - Definite Response '11' - Definite or Exception Response
Byte 4, bit 4	Chain Responses Protocol used by primary half-session for DFC requests	Chains from Primary will ask for : 0 = Definite Response 1 = Definite or Exception Response
Byte 4, bit 5	Reserved	
Byte 4, bit 6	Compression Indicator	1 = Compression may be used 0 = Compression will not be used on requests from primary
Byte 4, bit 7	Send EB Indicator	1 = Primary may send EB 0 = Primary will not send EB

5

Secondary LU Protocols for FM Data

Byte 5, bit 0	Chaining Use	1 = Multiple RU chains are allowed from the Secondary LU 0 = Only single RU chains are allowed from the Secondary LU
Byte 5, bit 1	Request Mode Selection	0 = Immediate Request mode 1 = Delayed Request mode
Byte 5, bit 2-3	Chain Response used by the Secondary LU half-session for FMD requests	(See encoding in Primary LU Protocol field)
Byte 5, bit 4	Chain Response used by the secondary LU half-session for DFC requests	(See encoding in Primary LU protocol field)
Byte 5, bit 5	Reserved	
Byte 5, bit 6	Compression Indicator	1 = Compression may be used 0 = compression must not be used on requests from Secondary
Byte 5, bit 7	Send EB Indicator	1 = Secondary may send EB 0 = Secondary will not send EB

Common LU Protocols

Byte 6, bit 0	Reserved	
Byte 6, bit 1	FM Header Usage	0 = FM Headers not allowed 1 = FM Headers allowed
Byte 6, bit 2	Brackets	1 = Brackets will be used during this session,

		0 = Brackets will not be used
Byte 6, bit 3	Bracket Termination Rules	0 = Rule 2 (unconditional termination) will be used during the session 1 = Rule 1 (conditional termination) will be used during the session
Byte 6, bit 4	Alternate Code Set Allowed Indicator	1 = Alternate Code set may be used 0 = Alternate Code set will not be used
Byte 6, bit 5-7	Reserved	
Byte 7, bit 0-1	FM Transaction Mode	00 = Full duplex 01 = HDX Contention 10 = HDX Flip Flop 11 = Reserved
Byte 7, bit 2	Recovery Responsibility	0 = Primary LU responsible 1 = Symmetrical responsibility
Byte 7, bit 3	Brackets First Speaker	0 = Secondary is 1st Spkr 1 = Primary is 1st Spkr
Byte 7, bit 4-5	Reserved	
Byte 7, bit 6	Reserved	
Byte 7, bit 7	Contention Resolution	0 = Secondary sends first if HDX-FF and brackets are not used 1 = Primary sends first if HDX-FF and brackets are used

5

TS Usage

```
Byte 8,  bits 0-1 Reserved
         bits 2-7 secondary  CPMGR's send pacing count
                  0 means no pacing

Byte 9,  bits 0-1 Reserved
         bits 2-7 secondary CPMGR's receive pacing
                  count

Byte 10, Maximum RU size sent on the normal flow
         by secondary half-session

Byte 11, Maximum RU size sent on the normal flow by
         primary half-session

Byte 12, Bits 0-1 Reserved
         Bits 2-7 Primary CPMGR's send pacing count

Byte 13, Bits 0-1 Reserved
         Bits 2-7 Primary CPMGR's receive pacing count
         0 means no pacing
```

PS Profile

```
Byte 14, Bit 0 PS usage field format :
               0 Basic format
               1 Reserved
         Bits 1-7 LU Type
```

PS Usage

```
Bytes 15-25 PS characteristics
```

End of PS Usage field

```
Byte 26    Bits 0-3 Reserved
           Bits 4-7 crypto options field length

Bytes 27-k   Crypto options

Bytes k+1    Length of Primary LU name

Bytes k+2-m Primary LU name

Bytes m+1    Length of user data (X'00' = no user data)

Bytes m+2-n User data
```

Note : The length of the BIND RU cannot exceed 256 bytes

CLEAR (CLEAR) - PLU-SLU

RU format bytes
0 X'A1' Request Code

Is sent by the primary session control to reset the data traffic subtrees in the primary, secondary and boundary function.

DEACTIVATE CROSS-DOMAIN RESOURCE MANAGER (DACTCDRM) SSCP-SSCP

RU format bytes

0 X'15' request code

1 bits 0-3, format : X'0' (only value defined)

bits 4-7, type deactivation requested : X'1' normal end of session

X'2' invalid activation parameter, sent by the primary half-session to deactivate the session and to indicate to the secondary that the response to ACTCDRM contained in invalid parameter

2-3 Reason code (included only if type deactivation requested is invalid activation parameter, i.e., byte 1, bits 4-7 = 2)

X'0808' invalid contents ID
X'081D' invalid SSCP ID
X'0821' invalid session paremeters

4-5 Reserved if bytes 2-3 present; not included if bytes 2-3 not included

5

DEACTIVATE LOGICAL UNIT (DACTLU) - SSCP-LU

RU format bytes

0 X'0E'

Is sent from an SSCP to a LU to end the session between the SSCP and the LU. All SSCP - LU and LU - LU state information maintained by the LU is reset.

DEACTIVATE PHYSICAL UNIT (DACTPU) - SSCP-PU

RU format bytes

0 X'12' request code

1 type :

X'01' final use
X'02' not final use

Final use : indicates that the physical connection may be broken

DACTPU is sent to end the session between SSCP and PU. All SSCP - PU, SSCP - LU, and LU - LU state information is reset.

REQUEST RECOVERY (RQR) - SLU-PLU

RU format bytes

0 X'A3' Request code

Is sent by the secondary session control to request the Primary session control to initiate data traffic recovery procedures as defined by the primary.

START DATA TRAFFIC (SDT) - PLU-SLU

RU format bytes
0 X'A0' Request Code

Is sent by Primary session control to complete a data traffic recovery or initialization sequence. The FMs and associated Session Control of both sender and receiver are removed from Data Traffic Reset state and so may begin an exchange of traffic between the NAU's.

SET AND TEST SEQUENCE NUMBERS (STSN) - PLU-SLU

RU format bytes
0 X'A2' Request Code
1 bits 0-3 Action Code
2-5 Values depending on Action Code

Is sent by the primary CPM session control during a data traffic recovery or initialization sequence to resynchronize the sequence numbers for one or both of the normal flow.

Action code : Byte 1 Bits 0-1 : Action Code for S-P flow ; related data are in bytes 2-3

Byte 1 Bits 2-3 : Action code for P-S flow ; related data are in bytes 4-5

Action Code :

00 = IGNORE : Flow not affected by this STSN

01 = SET : CPM value must be set to the value in the RU

10 = SENSE : Secondary end-user must return its sequence number for this flow in the RU

11 = SET AND TEST : CPM value must be set to the RU value and the secondary end-user must compare that value against its own value and respond accordingly

(Byte 1 Bits 4-7 are reserved)

UNBIND SESSION (UNBIND) - PLU-SLU

RU format bytes
0 X'32' Request Code
1 Type Unbind : X'01' = normal end of session
X'02' = BIND forthcoming retain the node resources allocated to this session, if possible.

Is sent from the Primary LU's to the secondary LU's to end a session between the two associated LU's.

BID (BID) - LU-LU

RU format byte
0 X'C8' request code

Requests permission to begin a bracket BID is issued by the Bidder and is used only when using the Bracket protocol.

BRACKET INITIATION STOPPED (BIS) - LU-LU

RU format byte
0 X'70' request code

CANCEL (CANCEL) - LU-LU

RU format byte
0 X'83' request code

Sent by an FM to terminate a partially sent chain of FM data requests.

CHASE (CHASE) - LU-LU

RU format byte
0 X'84' request code

Sent by an FM to request the receiving FM to return all outstanding normal flow responses for requests previously received from the issuer of CHASE.

LOGICAL UNIT STATUS (LUSTAT) - LU-LU

RU format bytes

0	X'04' request code	
1-4	Status value + status extension field (two bytes each) :	
	X'0000'+'uuuu'	no-op (no system-defined status) + user-defined field
	X'00001'+'cc00'	component now available + component identification (see note)
	X'0002'+'rrrr'	no FMD requests to transmit + reserved field
	X'0003'+'cc00'	component entering attended mode of operation + component identification (see note)
	X'0004'+'cc00'	component entering unattended mode of operation + component identification (see note)

5

X'0005'+'iiii'	prepare to commit all resources required for atomic unit of work + information field '0000' reserved '0001' request end bracket be sent on next chain All others reserved
X'0801'+'cc00'	component not available (e.g., not configured) + component identification (see note)
X'0802'+'cc00'	component failure (intervention required) + component identification (see note)
X'081C'+'cc00'	component failure (permanent error + component identification (see note)
X'0824'+'rrrr'	function cancelled + reserved field
X'082B'+'cc00'	component available, but presentation space integrity lost + component identification (see note)
X'400A'+'ssss'	'no-response mode' not allowed + sequence number of the request specifying no-response

Note : Values for 'cc' byte are :
X'00' = LU itself rather than a specific LU component. Otherwise :
bit 0 : set to 1
bits 1-3 : LU component medium class :
- 000 console
- 001 exchange (e.g., customer-removable diskette)
- 010 card punch
- 011 printer
- 101 display

bits 4-7 : LU component device address

QUIESCE COMPLETE (QC) - LU-LU

RU format byte
0 X'81' request code

Sent by either the Secondary or Primary FM after receiving a QEC to indicate to the other FM that it has placed itself in Quiesce state.

QUIESCE AT END OF CHAIN (QEC) - LU-LU

RU format byte
0 X'80' request code

Sent by an FM which may be either the Primary or Secondary FM to request the other FM to enter QUIESCE state at the end of the Data Chain it is currently sending.

RELEASE QUIESCE (RELQ) - LU-LU

RU format byte
0 X'82' request code

Sent by either Primary or Secondary FM to remove the other FM from Quiesce state.

REQUEST SHUTDOWN (RSHUTD) - SLU-PLU

RU format byte
0 X'C2' request code

Sent from secondary FM to Primary FM to indicate that the secondary FM is at an 'End of Job' condition and would like the session terminated.

READY TO RECEIVE (RTR) - LU-LU

RU format byte
0 X'05' request code

Indicates that the Bidder is now allowed to initiate a bracket.

STOP BRACKET INITIATION (SBI) - LU-LU

RU format byte

0 X'71' request code

SHUTDOWN COMPLETE (SHUTC) - SLU-PLU

RU format byte
0 X'C1' request code

Sent by the secondary FM to indicate that it has completed session processing and has placed itself in Quiesce state.

SHUTDOWN (SHUTD) - PLU-SLU

RU format byte
0 X'C0' request code

Sent from Primary FM to the secondary FM to request that the secondary FM enter the Quiesce state when the secondary 'End of session' processing has been completed.

5

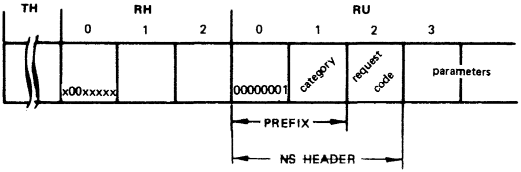
SIGNAL (SIG) - LU-LU

RU format byte

0	X'C9' request code
1-4	signal code

Permits an expedited signal to be sent through the network, regardless of the status of the normal flows. It carries a four bytes signal code set by the sending FM.

Signal code :	X'0000' + 'uuuu' :	no op (no system-defined code) + user-defined field
	X'0001' + 'rrrr' :	request-to-send + reserved field



NS HEADER

The first three bytes of the RU represent the Ns header when Byte 0 Bit 7 is set to 1 (see details below)

5

BYTE 0

XX..	Type of service 00 = Not specified 01 = Physical 10 = Logical 11 = Reserved
..XX XXXX	000001 = Network Services

BYTE 1

X...	Type of request 0 = Same domain 1 = Cross-domain
.X..	Reserved
..XX XXXX	Ns category 000010 = Configuration Services 000011 = Maintenance Services 000100 = Measurement Services 000110 = Session Services

BYTE 2

XXXX XXXX	Request code (see next pages)

COMMAND	NS HEADER		
	Byte 0	Byte 1	Byte 2
ABCONN	01	02	0F
ABCONNOUT	01	02	18
ACTCONNIN	01	02	16
ACTLINK	01	02	0A
ACTTRACE	01	03	02
ANA	01	02	19
BINDF	81	06	85
CDCINIT	81	86	4B
CDINIT	81	86	41
CDSESSEND	81	86	48
CDSESSSF	81	86	45
CDSESSST	81	86	46
CDSESSTF	81	86	47
CDTAKED	81	86	49
CDTAKEDC	81	86	4A
CDTERM	81	86	43
CESLOW	01	02	0C
CEXSLOW	01	02	0D
CINIT	81	06	01
CLEANUP	81	06	29
CONNOUT	01	02	0E
CONTACT	01	02	01
CONTACTED	01	02	80
CTERM	81	06	02
DACTCONNIN	01	02	17
DACTLINK	01	02	0B
DACTTRACE	01	03	03
DISCONTACT	01	02	02
DSRLST	81	86	27
DUMPFINAL	01	02	08
DUMPINIT	01	02	06
DUMPTEXT	01	02	07
ESLOW	01	02	14
EXECTEST	01	03	01
EXSLOW	01	02	15
FNA	01	02	1A
INIT-OTHER	81	06	80
INIT-OTHER-CD	81	86	40
INIT-SELF	01/81	06	81
INOP	01	02	81
IPLFINAL	01	02	05
IPLINIT	01	02	03
IPLTEXT	01	02	04
ISETCV	41	02	22
NOTIFY	81	06/86	20
NSLSA	41	02	85
NSPE	01	06	04
RECMD	01	04	80
RECMS	01	03	81
RECTD	01	03	82
RECTDR	01	03	83
REQCONT	01	02	84
REQDISCONT	01	02	1B
REQTEST	01	03	80
RNAA	41	02	10
RPO	01	02	09
SESSEND	81	06	88
SESSST	81	06	86
SETCV	01	02	11
STARTMEAS	01	04	01
STOPMEAS	01	04	02
TERM-OTHER	81	86	82
TERM-OTHER-CD	81	86	42
TERM-SELF	01/81	06	83
UNBINDF	81	06	87

REQUEST CODE	COMMAND	COMMAND NAME	SESSION
01	CONTACT	Contact	SSCP-PU
02	DISCONTACT	Discontact	SSCP-PPU
03	IPLINIT	IPL Initial	SSCP-PPU
04	IPLTEXT	IPL Text	SSCP-PPU
05	IPLFINAL	IPL Final	SSCP-PPU
06	DUMPINIT	Dump Initial	SSCP-PPU
07	DUMPTEXT	Dump Text	SSCP-PPU
08	DUMPFINAL	Dump Final	SSCP-PPU
09	RPO	Remote Power Off	SSCP-PPU
0A	ACTLINK	Activate Link	SSCP-PPU
0B	DACTLINK	Deactivate Link	SSCP-PPU
0C	CESLOW	Control Entering Slowdown	SSCP-PU
0D	CEXSLOW	Control Exiting Slowdown	SSCP-PU
0E	CONNOUT	Connect Out	SSCP-PPU
0F	ABCONN	Abandon Connection	SSCP-PPU
10	RNAA	Request Network Address Assignment	SSCP-PPU
11	SETCV	Set Control Vector	SSCP-PU
14	ESLOW	Entering Slowdown	PU-SSCP
15	EXSLOW	Exiting Slowdown	PU-SSCP
16	ACTCONNIN	Activate Connect In	SSCP-PPU
17	DACTCONNIN	Deactivate Connect In	SSCP-PPU
18	ABCONNOUT	Abandon Connect Out	SSCP-PPU
19	ANA	Assign Network Addresses	SSCP-PPU
1A	FNA	Free Network Addresses	SSCP-PPU
1B	REQDISCONT	Request discontact	SPU-SSCP
22	ISETCV	Indirect Set Control Vector	SSCP-PU
80	CONTACTED	Contacted	PPU-SSCP
81	INOP	Inoperative	PPU-SSCP
84	REQCONT	Request Contact	PPU-SSCP
85	NSLSA	Network Services lost Subarea	PU.T4-SSCP

Ns header is X'0102'

* Ns header is X'4102'

MAINTENANCE SERVICES COMMANDS

REQUEST CODE	COMMAND	COMMAND NAME	SESSION
01	EXECTEST	Execute Test	SSCP-PU
02	ACTTRACE	Activate Trace	SSCP-PU
03	DACTTRACE	Deactivate Trace	SSCP-PU
80	REQTEST	Request Test Procedure	LU-SSCP PU-SSCP
81	RECMS	Record Maintenance Statistics	PU-SSCP
82	RECTD	Record Test Data	PU-SSCP
83	RECTRD	Record Trace Data	PU-SSCP

Ns header is X'0103'

MEASUREMENT SERVICES COMMANDS

REQUEST CODE	COMMAND	COMMAND NAME	SESSION
01	STARTMEAS	Start Measurement	SSCP-LU
02	STOPMEAS	Stop Measurement	SSCP-LU SSCP-PU
80	RECMD	Record Measurement Data	LU-SSCP PU-SSCP

Ns header is X'0104'

REQUEST CODE	COMMAND	COMMAND NAME	SESSION	Ns header
01	CINIT	Control Initiate	SSCP-PLU	8106
02	CTERM	Control Terminate	SSCP-PLU	8106
04	NSPE	NS Procedure Error	SSCP-ILU SSCP-TLU	0106 0106
20	NOTIFY	Notify	SSCP-LU SSCP-SSCP	8106 8186
27	DSRLST	Direct Search List	SSCP-SSCP	8186
29	CLEANUP	Cleanup Session	SSCP-SLU	8106
40	INIT-OTHER -CD	Initiate-Other Cross-Domain	SSCP-SSCP	8186
41	CDINIT	Cross-Domain Initiate	SSCP-SSCP	8186
42	TERM-OTHER -CD	Terminate-Other Cross-Domain	SSCP(TLU)-SSCP(OLU)	8186
43	CDTERM	Cross-Domain Terminate	SSCP(OLU)-SSCP(DLU)	8186
45	CDSESSSF	Cross-Domain Session Set-Up failure	SSCP(PLU)-SSCP(SLU)	8186
46	CDSESSST	Cross-domain Session Started	SSCP(PLU)-SSCP(SLU)	8186
47	CDSESSTF	Cross-Domain Session Takedown Failure	SSCP(PLU)-SSCP(SLU)	8186
48	CDSESSEND	Cross-Domain Session Ended	SSCP(PLU)-SSCP(SLU)	8186
49	CDTAKED	Cross-Domain Takedown	SSCP-SSCP	8186
4A	CDTAKEDC	Cross-Domain Takedown Complete	SSCP-SSCP	8186
4B	CDCINIT	Cross-Domain Control Initiate	SSCP-SSCP	8186
80	INIT-OTHER	Initiate-Other	ILU-SSCP	8106
81	INIT-SELF	Initiate-Self	ILU-SSCP ILU-SSCP	0106 8106
82	TERM-OTHER	Terminate-Other	TLU-SSCP	8106
83	TERM-SELF	Terminate-Self	TLU-SSCP TLU-SSCP	0106 8106
85	BINDF	Bind Failure	PLU-SSCP	8106
86	SESSST	Session Started	PLU-SSCP	8106
87	UNBINDF	Unbind Failure	PLU-SSCP	8106
88	SESSEND	Session Ended	PLU-SSCP	8106

5

ABANDON CONNECTION (ABCONN) - SSCP-PPU

RU format bytes
0-2 X'01020F' Ns header
3-4 Link Network address

Requests the PU to terminate all connections on the indicated link.

ABANDON CONNECT OUT (ABCONNOUT) - SSCP-PPU

RU format bytes
0-2 X'010218' Ns header
3-4 Link Network address

Requests the PU to terminate an outbound connection procedure at the specified link station.

ACTIVATE CONNECT IN (ACTCONNIN) - SSCP-PPU

RU format bytes
0-2 X'010216' Ns header
3-4 Link network address
5 Type

Type : Bit 0 = 0, only value defined
Bit 1-7 Reserved

Requests the PU to enable the indicated link station to accept an incoming connection.

ACTIVATE LINK (ACTLINK) - SSCP-PPU

RU Format bytes
0-2 X'01020A' Ns header
3-4 Network address of link

Initiates a procedure to place the addressed link in the active state.

ASSIGN NETWORK ADDRESSES (ANA) - SSCP-PPU

RU format bytes
0-2 X'010219' Ns header
3-4 Network address of PU associated with the node to which addresses are to be designed
5 Number of network addresses to be assigned
6 Type (X'80' = noncontiguous)
7-8 First network addresses
9-n Additional network addresses (if any)

Updates the Path Control routing table in the receiver such that PIUs with the indicated network addresses will be routed to the adjacent node whose PU network addresses appears in bytes 3 and 4. Several network addresses maybe assigned with one request.

CONTROL ENTERING SLOWDOWN (CESLOW) - SSCP-PU

```
RU format bytes
                0-2 X'01020C' Ns header
                3-4 Network address of PU that has
                    has entered slowdown
```

CONTROL EXITING SLOWDOWN (CEXSLOW) - SSCP-PU

```
RU format bytes
                0-2 X'01020D' Ns header
                3-4 Network address of PU that has
                    exited slowdown
```

CONNECT OUT (CONNOUT) - SSCP-PPU

```
RU format bytes
                0-2 X'01020E' Ns header
                3-4 Link network address
                5   Link station address
                6   Type
                7   Retry limit
                8   Number of dial digits
                9-n Dial digits

Type : Byte 6 Bit 0 = 0 (only value defined)
              Bit 1 = 0 automatic connect out
                    = 1 manual connect out
              Bits 2-7 : Reserved
Retry limit : number of times the CONNECT OUT
              procedure is to be retried.
```

Requests the PU to initiate a connection procedure with the indicated link stations.

CONTACT (CONTACT) - SSCP-PU

```
RU format bytes
                0-2 X'010201' Ns header
                3-4 Network address of the PU in node to
                    be contacted (the SPU)
```

Initiates a procedure to establish link level contact with the link station associated with the PU addressed in the request.

CONTACTED (CONTACTED) - PPU-SSCP

```
RU format bytes
                0-2 X'010280' Ns header
                3-4 Network address of PU in node being
                    contacted (the SPU)
                5   Status

Status - X'01' = loaded
         X'02' = load required
         X'03' = error on contact
```

Informs SSCP of completion of a procedure to contact the station associated with an adjacent PU

5

DEACTIVATE CONNECT IN (DACTCONNIN) - SSCP-PPU

RU format bytes
0-2 X'010217' Ns header
3-4 Link Network address

Requests the PU to reset the CONNECT IN state for the specified link

DEACTIVATE LINK (DACTLINK) - SSCP-PPU

RU format bytes
0-2 X'01020B' Ns header
3-4 Network address of link

Initiates a procedure to deactivate an active link specified by the network address parameter of the request. It is used after all stations on the link have been discontacted.

DISCONTACT (DISCONT) - SSCP-PU

RU format bytes
0-2 X'010202' Ns header
3-4 Network address of PU in node to be discontacted (the SPU)

Initiates a procedure to terminate link level contact with the station associated with the PU.

DUMP FINAL (DUMPFINAL) - SSCP-PPU

RU format bytes
0-2 X'010208' Ns header
3-4 Network address of PU in node to be dumped (the SPU)

Terminates a dump sequence at the node specified by the network address. CONTACT is required after DUMPFINAL if the station is to be contacted.

DUMP INITIAL (DUMPINIT) - SSCP-PPU

RU format bytes
0-2 X'010206' Ns header
3-4 Network address of PU in node to be dumped (the SPU).

Initiates a dump of the node specified by the network address. Basic dump data such as register, key and indicator values may be returned on the response to this request. If further dump data is required, DUMPINIT is followed by DUMPTEXT. The dump sequence should be terminated with DUMPFINAL.

DUMP TEXT (DUMPTEXT) - SSCP-PPU

RU format bytes
0-2 X'010207' Ns header
3-4 Network address of PU in node to be dumped (the SPU).
5-8 Starting location (address)
9-10 Length of text (binary count of the number of bytes)

Causes the dump data specified by the starting parameter to be returned as data on the response.

ENTERING SLOWDOWN (ESLOW) - PU-SSCP

RU format bytes

0-2	X'010214' Ns header
3-4	PU network address

Informs the SSCP that the sender has entered a state called SLOWDOWN. This state is generally associated with buffer depletion, and may require traffic through the unit to be reduced or suspended until the state is exited.

EXITING SLOWDOWN (EXSLOW) - PU-SSCP

RU format bytes

0-2	X'010215' Ns header
3-4	PU Network address

Informs the SSCP that the PU has exited the SLOWDOWN state.

FREE NETWORK ADDRESSES (FNA) - SSCP-PPU

RU format bytes

0-2	X'01021A' Ns header
3-4	Network address of target link or SPU
5	Number of SPU or LU network addresses to be freed (X'00' = all, and bytes 7-n not present)
6	Type (X'80' = non contiguous)
7-8	First network address to be freed
9-n	Additional network addresses (if any)

Updates the Path Control routing table in the receiver such as PIUs received containing a freed network address in the DAF will no longer be routed to the node containing the PU whose network address appears in bytes 3-4.

INOPERATIVE (INOP) - PPU-SSCP

RU format bytes

0-2	X'010281' Ns header
3-4	Network address of inoperative link or PU (when the PU is inoperative)
5	Element type

Element type : Bits 0-3 = 0000 (only value defined)
Bits 4-7 reason =
00001 : station inoperative
0010 : link inoperative
0011 : station (discontact-loss of synchronization)
0100 : station (incomplete discontact - loss of synchronization)
0101 : station (request resynchronization - unexpected request for resynchronization)

Reports a loss of contact with a link station, the failure of a link, or the failure to establish a connection on a switched link.

5

IPL FINAL (IPLFINAL) - SSCP-PPU

RU format bytes
```
0-2 X'010205' Ns header
3-4 Network address of PU in node being
    loaded (SPU)
5-8 Entry point location within load
    module
```

This request completes the load sequence and supplies the load module entry point to the node being loaded (a CONTACT is required after IPLFINAL)

IPL INITIAL (IPLINIT) - SSCP-PPU

RU format bytes
```
0-2 X'010203' Ns header
3-4 Network address of PU in node to be
    loaded (the SPU)
```

Initiates a link level load of the node containing the PU specified by the network address parameter of the request.

IPL TEXT (IPLTEXT) - SSCP-PPU

RU format bytes
```
0-2 X'010204' Ns header
3-4 Network address of PU in node to be
    loaded (the SPU)
5-n Text
    Text = variable length in the form
    required by the destination node
```

This request transfers load module text to the PU providing primary station link support for the node being loaded.

INDIRECT SET CONTROL VECTOR (ISETCV) - SSCP-PU

RU format bytes
```
0-2 X'010222' Ns header
3-4 Network address of resource to which
    control vector applies (see note)
5-n Control vector (see note and
    appendix A)
```

Note : the following combinations are used in ISETCV

Vector key (byte 5)	Resource (bytes 3-4)
X'01'	PU
X'02'	Link to be used for routing to the subarea specified in byte 6
X'03'	SPU
X'04'	LU
X'05'	Link (S/370 channel)

NETWORK SERVICES LOST SUBAREA (NSLSA) - PU.T4 or T5-SSCP

Ru format bytes

0-2 X'010285' Ns header
3 Reason code specifying why LSA was originated
X'01' :unexpected routing interruption
X'02' :controlled routing interruption
4 Format : X'01' (only value defined)
5-6 Reserved
7-8 Network address of the PU that originated the LSA
9-10 Reserved
11 Subarea address (left-justified) for a lost subarea
12 Reserved
13-n Additional 4-bytes fields in the form of bytes 9-12, corresponding to additional lost subareas.

REQUEST CONTACT (REQCONT) - PPU-SSCP

RU format bytes

0-2 X'010284' Ns header
3-4 Link Network address
5-10 Station ID

Byte 5 Bits 0-3 : reserved
Bits 4-7 : a binary value corresponding to the PU type of the SPU with which the PPU has established a physical connection.

Byte 6 Reserved

Byte 7-10 Block number (12 bits) : see the individual product specifications for the specific values used.
ID number (20 bits) : a binary value identifying a specific station uniquely within a customer installation. The ID number can be assigned in various ways, depending on the product. See individual product specifications for details.

Notifies the SSCP that a physical connection with a station has been established on the indicated link and requests CONTACT of that station.

REQUEST DISCONTACT (REQDISCONT) - SPU-SSCP

RU format bytes

0-2 X'01021B' Ns header
3 Type = X'00' = normal
X'80' = immediate

Requests the SSCP to start a procedure to discontact the station.

5

REQUEST NETWORK ADDRESSES ASSIGNMENT (RNAA) - SSCP-PPU

RU format bytes

0-2	X'410210' Ns header
3	Network address of link or SPU
5	Assignment type : X'00' request of PU(s) associated with link X'01' request of LU(s) associated with SPU
6	Number of network addresses to be assigned
7	Reserved
8	Secondary link station address
9-n	Any additional two-bytes entries (in the same format as bytes 7-8)

REMOTE POWER OFF (RPO) - SSCP-PPU

RU format bytes

0-2	X'010209' Ns header
3-4	Network address of PU in node to be powered off (the SPU).

Causes a link level power off sequence to be initiated to the node specified by the network address. It is not necessary that the node being powered off have an active PU or even be contacted.

SET CONTROL VECTOR (SETCV) - SSCP-PU

RU format bytes

0-2	X'010211' Ns header
3-4	Network address of resource to which control vector applies, as described in the note below.
5	Control vector data (see appendix A)

Control Vectors are named sets of parameters providing control information for network components such as NAUs, links and link stations. This request loads the information in the Control Vector data field into the Control Vector for the specified network address. The DAF of the request indicates the PU maintaining the Control Vector ; the netwwork address in the RU indicates the element for which the Control Vector is maintained ; the key in the RU specifies the particular type of Control Vector to be set.

Control Vector formats are defined in Appendix A.

ACTIVATE TRACE (ACTTRACE) - SSCP-PU

RU format bytes

- 0-2 X'010302' Ns header
- 3-4 Network address of the resource to be traced
- 5 Selected trace
- 6-n Data to support trace

Requests activation of a trace of the resource specified by the network address in the RU.

DEACTIVATE TRACE (DACTTRACE) - SSCP-PU

RU format bytes

- 0-2 X'010303' Ns header
- 3-4 Network address of resource to be traced
- 5 Selected trace
- 6-n Data to support deactivation

Requests deactivation of the specified resource trace.

EXECUTE TEST (EXECTEST) - SSCP-PU

RU format bytes

- 0-2 X'010301' Ns header
- 3-4 Network address of resource to be tested
- 5-8 Binary code selecting the test
- 9-n Data to support test

Instructs the PU or the LU to execute a test on the network address designated.

RECORD MAINTENANCE STATISTICS (RECMS) - PU-SSCP

RU format bytes

- 0-2 X'010381' Ns header
- 3-4 Network address of resource
- 5-n Maintenance Statistics

Permits the passing of maintenance statistic from a LU or PU to a centralized recording facility at the control point.

RECORD TEST DATA (RECTD) - PU-SSCP

RU format bytes

- 0-2 X'010382' Ns header
- 3-4 Network address of resource under test
- 5-8 Binary code selecting the test
- 9-n Test status and results

Returns the status and results of a test to maintenance services.

RECORD TRACE DATA (RECTRD) - PU-SSCP

RU format bytes

```
0-2 X'010383' Ns header
3-4 Network address of resource under
    trace
5   Selected trace
6-n Trace data
```

Returns data collected during a trace of the indicated resource.

REQUEST TEST (REQTEST) - LU-SSCP or PU-SSCP

RU format bytes

```
0-2 X'010380' Ns header
3   Type : X'F3' logical unit
4   Length : binary number of bytes in
    symbolic name (X'00' = no symbolic
    name present)
5-m Symbolic name of LU controlling the
    test, in EBCDIC characters
m+1 Type :X'F1' physical unit
          X'F2' logical unit
          X'F9' link
m+2 Length : binary number of bytes in
    symbolic name (X'00' ; no symbolic
    name present)
m+3-n Symbolic name of resource to be
    tested, in EBCDIC characters
n+1 Type : X'F5' test procedure name
n+2 Length : binary number of bytes in
    symbolic name (X'00' = no symbolic
    name present)
n+3-p Symbolic name of test procedure to
    be executed, in EBCDIC characters
p+1 Length : binary number of bytes in
    requester ID (X'00' = no requester
    ID present)
p+2-q Requester ID, in EBCDIC
    characters, of the end user
    initiating the request (may be used
    to verify end user's authority to
    access a particular resource).
q+1 Length : binary number of bytes in
    password (X'00' = no password
    present)
q+2-r Password, field used to verify the
    identity of an end user
r+1 Length : binary number of bytes of
    user data (X'00' = no user present)
r+1-s User data
```

RECORD MEASUREMENT DATA (RECMD) - LU-SSCP or PU-SSCP

RU format bytes
- 0-2 X'010480' Ns header
- 3-4 Network address of resource being measured
- 5 Selected measurement type (no values yet defined)
- 6-n Measurement data (not defined)

START MEASUREMENT (STARTMEAS) - SSCP-LU or SSCP-PU

RU format bytes
- 0-2 X'010401' Ns header
- 3-4 Network address of resource measured
- 5 Selected measurement type (no values defined yet)
- 6-n Measurement parameters (none yet defined)

STOP MEASUREMENT (SOTPMEAS) - SSCP-LU or SSCP-PU

RU format bytes
- 0-2 X'010402' Ns header
- 3-4 Network address of resource being measured
- 5 Selected measurement type (no values defined yet)

5

BIND FAILURE (BINDF) - PLU-SSCP

RU format bytes
0-2 X'810685' Ns header
3-6 Sense data
7 Reason
bit 0, reserved
bit 1, 1 BIND error in reaching SLU
bit 2, 1 setup reject at PLU
bit 3, 1 setup reject at SLU
bits 4-7, reserved
8 Session key :
X'06' uninterpreted name pair
X'07' network address pair
For session key X'06' :
9 Type : X'F3' logical unit
10 Length, in binary, of symbolic name of PLU
11-k Symbolic name in EBCDIC characters
k+1 Type : X'F3' logical unit
k+2 Length, in binary, of symbolic name of SLU
k+3-m Symbolic name, in EBCDIC characters.
For session key X'07' :
9-10 Network address of PLU
11-12 Network address of SLU

CROSS-DOMAIN CONTROL INITIATE (CDCINIT) - SSCP-SSCP

RU format bytes
0-2 X'81864B' Ns header
3 Format
bits 0-3, 0000 format 0 (only value defined)
bits 4-7, reserved
4 Reserved
5-12 PCID
5-6 The network address of SSCP (ILU)
7-12 A unique 6-byte value, generated by the SSCP (ILU), which is retained and used in all cross-domain requests dealing with the same procedure until it is completed. The SSCP (ILU) maintains correlation between PCID and the URC, if one has been provided by the INIT-SELF or INIT-OTHER request.
13-14 Network address of PLU
15-16 Network address of SLU
17-18 Length, in binary, of BIND image
19-n BIND image : the BIND RU (see BIND format description), excluding the request code field.
n+1-n+2 Length, in binary, of LU or non-SNA device characteristics field and format. (X'00' = no characteristics/format field)
n+3 LU or non-SNA device characteristics format
X'01' format 1 : access method unique device characteristics (only value defined)

```
n+4-p Lu or non SNA device
    characteristics (see CINIT for the
    specification of this field)
p+1 Length, in binary, of crypto key
    (Note : X'00' = no crypto key field
    is present)
p+2-q Crypto key
```

CROSS-DOMAIN INITIATE (CDINIT) - SSCP-SSCP

```
RU format bytes
            0-2 X'818641' Ns header

            Format 0
            3   bits 0-3, 0000 Format 0, specifies
                    the full set of parameters; it
                    is used when type = I, I/Q, or
                    Q; bytes 17-18 are zero for
                    format 0
                bits 4-7, reserved
            4   Type
                bits 0-1, 00 reserved
                          01 initiate only (I)
                          10 queue only (Q)
                          11 initiate or queue (I/Q)
                bits 2-4, reserved
                bits 5-6, 00 DLU is PLU
                          01 DLU is SLU
                          10 SSCP determines PLU/SLU
                          11 reserved
                bit 7, reserved

            5   Queuing Conditions for DLU
                bit 0, 0 do not queue if session
                         count exceeded
                       1 queue if session count
                         exceeded
                bit 1, 0 do not queue if DLU not
                         enabled
                       1 queue if DLU not enabled
                bit 2, 0 do not queue if CDINIT
                         loses contention
                       1 queue if CDINIT loses
                         contention
                bit 3, 0 do not queue if no SSCP
                         (DLU)-DLU path
                       1 queue if no SSCP (DLU)-DLU
                         path
                bit 4, reserved
                bit 5-6, queuing position/service
                       00 put this request on the
                          bottom of the queue (this
                          request is dequeued only
                          when the queue is
                          otherwise empty)
                       01 enqueue this
                          request FIFO
                       10 enqueue this
                          request LIFO
                       11 reserved
                bit 7, 0 do not queue for recovery
                          retry
```

5

```
            1 queue for recovery retry
              (The element will be
              maintained on the recovery
              retry queue even after the
              activation of the session
              so that the session can be
              retried in the event of a
              session failure).
          Note : Queuing will not be
          done if the DLU is unknown, or
          the domain or the DLU is in
          takedown status.
6   OLU status
    bit 0, reserved
    bit 1, 0 LU is not available
           1 LU is available
    bits 2-3 (if LU is not available)
           00 LU session count exceeded
           01 reserved
           10 LU is not enabled (not
              accepting new sessions)
           11 reserved
    bit 4, 0 existing SSCP to LU path
           1 no existing SSCP to LU path
             (connectivity is lost)
    bit 5, reserved
    bits 6-7, 00 reserved
           01 OLU is PLU
           10 OLU is SLU
           11 OLU may be either
              (SSCP(DLU) decides)
7-14 PCID
7-8 The network address of SSCP (ILU)
9-14 A unique 6-byte value, generated by
      the SSCP (ILU), which is retained
      and used in allcross-domain
      requests dealing with the same
      procedure until it is completed
15-16 Network address of OLU
17-18 Reserved
19 INITIATE origin :
    bit 0, 0 INIT-SELF is origin
           1 INIT-OTHER is origin
    bits 1-2, reserved
    bit 3, 0 network user is the
             initiator
           1 network manager is the
             initiator
    bit 4-7, reserved
20  NOTIFY specification
    bits 0-1, 00 do not send NOTIFY to
                 LUs in session with DLU
              01 send NOTIFY to all LUs
                 in session with DLU
              10 send NOTIFY to all LUs
                 in session with DLU
                 only if the CINIT
                 request is queued
              11 reserved
    bits 2-7, reserved
21-28 Mode : an eight-character symbolic
    name (implementation and
```

installation dependent) that
identifies the set of rules and
protocols to be used for the
session; used by the SSCP (SLU) to
select the BIND image that will be
used by the SSCP (PLU) to build the
CINIT request.

29-m Network Name of DLU
29 Type : X'F3' logical unit
30 Length, in binary, of symbolic name
31-m Symbolic name, in EBCDIC characters
m+2-n Requester ID : the ID, in EBCDIC characters, of the end user initiating the request (May be used to establish the authority of the end user to access a particular resource).
n+1-p Password
n+1 Length, in binary, of user data (Note : X'00' = no user data is present)
p+2-q User data : user -specific data that is not processed by network services protocol machines but is passed to the primary LU on the CINIT request
q+1-r Network Name of OLU
q+1 Type X'F3' logical unit
q+2 Length, in binary, of symbolic name
q+3-r Symbolic name in EBCDIC characters
r+1-s Uninterpreted Name of DLU
r+1 Type : X'F3' logical unit
r+2 Length, in binary, of symbolic name (Note : X'00' = no uninterpreted name ; the network name in bytes 29-m is used as the uninterpreted name).
r+3-s Symbolic name in EBCDIC characters

Format 1

3 Format
bits 0-3, 0001 Format 1, specifies a subset of the parameters; only bytes 0-18 are used in Format 1 ; Format 1 is used when type = DQ
bits 4-7, reserved

4 Type
bits 0-1, 00 dequeue (DQ)
bits 2-3, 00 leave on queue if dequeue retry is unsuccessful
01 remove from queue if dequeue retry is unsuccessful
10 do not retry-remove from queue
11 reserved
bits 5-6, 00 LU2 is PLU
01 LU2 is SLU
10 reserved
11 reserved
bit 7, reserved

5

5 Queuing status (For LU associated with SSCP sending CDINIT (DQ))
bits 0-3, reserved
bit 4, reserved
bits 5-6, 00 request on bottom of queue
01 enqueued request FIFO
10 enqueued request LIFO
11 reserved
bit 7, reserved

6 LU Status (For LU associated with SSCP sending CDINIT (DQ))
bit 0, reserved
bit 1, 0 LU is unavailable
1 LU is available
bits 2-3 (if LU is unavailable)
00 LU session count exceeded
01 reserved
10 LU is not enabled (not accepting new sessions)
11 reserved
bit 4, 0 existing SSCP to LU path
1 no existing SSCP to LU path
bit 5, reserved
bits 6-7, 00 reserved
01 LU is PLU
10 LU is SLU
11 reserved

7-14 PCID
7-8 The network address of SSCP (ILU)
9-14 A unique 6-byte value, generated by the SSCP (ILU), which is retained and used in all cross-domain requests dealing with the same procedure until it is completed. (This PCID must be the same as in the original CDINIT request).
15-16 Network address of LU1
17-18 Network address of LU2

CROSS-DOMAIN SESSION ENDED (CDSESSEND) - SSCP(PLU)-SSCP(SLU)

RU bytes format
0-2 X'818648' Ns header
3-10 PCID
3-4 Network address if SSCP (TLU) (Note : a network address value of zero indicates that no PCID is present in bytes 5 through 10 ; bytes 5-10 are reserved when bytes 3-4 are zero).
5-10 A unique 6-byte value, generated by the SSCP (TLU), which is retained and used in all cross-domain requests dealing with the same procedure until it is completed.
11 Reserved
12 Session key
X'06' network name pair
13-n Session Key Content
For session key X'06' : network name pair
13 Type : X'F3' logical unit

14 Length, in binary, of symbolic name
of PLU
15-m Symbolic name in EBCDIC characters
m+1 Type : X'F3' logical unit
m+2 Length, in binary of symbolic name
of SLU
m+3-n Symbolic name in EBCDIC characters

CROSS-DOMAIN SESSION SETUP FAILURE (CDSESSSF) - SSCP(PLU)-SSCP(SLU)

RU format bytes

0-2 X'818645' Ns header
3-10 PCID
3-4 The network address of SSCP (ILU)
5-10 A unique 6-byte value, generated by the SSCP (ILU), which is retained and used in all cross-domain requests dealing with the same procedure until it is completed
11-14 Sense data
0801,0803,0804,0805,080A,080C,080E,080F, 0810,0812,0815,081C,0821,1003,1005, and path, RH, and State error sense codes (see Appendix G for a description of sense codes.)
15 Reason :
bit 0, 1 CINIT error in reaching PLU
bit 1, 1 BIND error in reaching SLU
bit 2, 1 setup reject at PLU
bit 3, 1 setup reject at SLU
bits 4-7, reserved
16 Session key X'06' network name pair
17 Type : X'F3' logical unit
18 Length, in binary, of symbolic name of PLU
19-m Symbolic name in EBCDIC characters
m+1 Type : X'F3' logical unit
m+2 Length, in binary, of symbolic name of SLU

5

CROSS-DOMAIN SESSION STARTED (CDSESSST) - SSCP(PLU)-SSCP(SLU)

RU format bytes

0-2 X'818646' Ns header
3-10 PCID
3-4 The network address of SSCP (ILU)
5-10 A unique 6-byte value, generated by the SSCP (ILU), which is retained and used in all cross-domain requests dealing with the same procedure until it is completed
11 Reserved
12 Session key
X'06' network name pair
13 Type X'F3' logical unit
14 Length, in binary of symbolic name of PLU
15-m Symbolic name in EBCDIC characters
m+1 Type X'F3' logical unit
m+2 Length, in binary, of symbolic name of SLU
m+3-n Symbolic name in EBCDIC characters

CROSS-DOMAIN SESSION TAKEDOWN FAILURE (CDSSTF) - SSCP(PLU)-SSCP(SLU)

RU format bytes

0-2 X'818647' Ns header
3-10 PCID
3-4 The network address of SSCP(TLU) (Note : a network address value of zero indicates that no PCID is present ; bytes 5-10 are reserved when bytes 3-4 are zero).
5-10 A unique 6-byte value, generated by the SSCP (TLU), which is retained and used in all cross-domain requests dealing with the same procedure until it is completed).
11-14 Sense data 0801,0803,0804,080A,080E,080F,0810, and path, RH, and state error sense codes (See Appendix G for a description of sense codes).
15 Reason :
bit 0, 1 CTERM error in reaching PLU
bit 1, 1 UNBIND error in reaching SLU
bit 2, 1 takedown reject at PLU
bits 3-7, reserved
16 Session key :
X'06' network name pair
17 Type : X'F3' logical unit
18 Length, in binary, of symbolic name of PLU
19-m Symbolic name in EBCDIC characters
m+1 Type X'F3' logical unit
m+2 Length, in binary, of symbolic name of SLU
m+3-n Symbolic name in EBCDIC characters

CROSS-DOMAIN TAKEDOWN (CDTAKED) - SSCP-SSCP

RU format bytes

0-2 X'818649' Ns header
3-10 PCID
3-4 The network address of the SSCP sending the request
5-10 A unique 6-byte value generated by the sending SSCP and retained and used in all cross-domain requests dealing with the same procedure until it is completed
11 Type :
bits 0-1, 00 active and pending-active sessions
01 active, pending active, and queued sessions
10 queued only sessions
11 reserved
bits 2-3, 00 quiesce
01 orderly
10 forced
11 cleanup (mutual procedure)

```
            bits 4-7, reserved
        12  Reason :
            bit 0, 0 network user
                   1 network manager
            bit 1, 0 normal
                   1 abnormal
            bits 2-7, detailed reason (dependent
                      upon bits 0-1)
            For bits 0-1, 00 user and normal :
            bits 2-7, 000000 general category
                             (only value
                             defined)
            For bits 0-1, 01 user and abnormal :
            bits 2-7, 000000 general category
            For bits 0-1, 10 manager and normal:
            bits 2-7, 000000 general category
                      000011 operator command
                             domain is going
                             away
            For bits 0-1, 11 manager and
                             abnormal :
            bits 2-7, 000000 general category
                      000001 operator command
                      000010 restart procedure
```

5

CROSS-DOMAIN TAKEDOWN COMPLETE (CDTAKEDC) - SSCP-SSCP

```
RU Format bytes
        0-2 X'81864A' Ns header
        3-10 PCID
        3-4 The network address of the SSCP that
            initiated the takedown procedure
        5-10 A unique 6-byte value generated by
            the SSCP initiating the takedown
            procedure ; which is retained and
            used in all cross-domain requests
            dealing with the same procedure
            until it is completed
        11  Type
            X'01' summary (only value defined)
        12  Status :
            For type X'01' : summary
            X'01' all sessions successfully
                  taken down
            X'02' takedown failures occured
```

CROSS-DOMAIN TERMINATE (CDTERM) - SSCP(OLU)-SSCP(DLU)

```
RU format bytes
        0-2 X'818643' Ns header
        3   bits 0-3, 0000 Format 0 (only value
                           defined)
            bits 4-7, reserved
        4   Type :
            bits 0-1, 00 request applies to
                         active and pending-
                         active sessions
                      01 request applies to
                         active, pending-active
                         and queued sessions
                      10 request applies to
                         queued sessions only
                      11 reserved
```

```
bits 2, 0 forced termination,
          session to be deactivated
          immediately and
          unconditionally
        1 orderly termination,
          permitting an
          end-of-session procedure
          to be executed at the PLU
          before the session is
          deactivated
bit 3, 0 not last session for DLU
       1 last session for DLU
    (Note : the 'last session' is
    relative to the information that
    SSCP(OLU) has concerning its LUs
    and the DLU).
bit 4, reserved
bits 5-6, 00 DLU is PLU
          01 DLU is SLU
          10 SSCP determines
             PLU/SLU
          11 reserved
bit 7, 0 not cleanup
       1 cleanup (not allowed when
         bit 2 = 1)
```

```
5-12 PCID
5-6 The network address of the SSCP
    (TLU)
7-12 A unique 6-byte value, generated by
    the SSCP (TLU), which is retained
    and used in all cross-domain
    requests dealing with the same
    procedure until it is completed
13  Reason
    bit 0, 0 network user
           1 network manager
    bit 1, 0 normal
           1 abnormal
    bits 2-7 detailed reason (dependent
             upon bits 0-1) :
    For bits 0-1, 00 user and normal
    bits 2-7, 000000 general category
              000001 self , OLU = PLU
              000010 self, OLU = SLU
              000011 other
    For bits 0-1, 01 user and abnormal:
    bits 2-7, 000000 general category
    For bits 0-1, 10 manager and normal:
    bits 2-7, 000000 general category
              000001 operator
                     command-session
              000010 operator command-LU
              000011 operator
                     command-domain
    For bits 0-1, 11 manager and
                     abnormal :
    bits 2-7, 000000 general category
              000001 operator command
              000010 restart procedure
              000011 preempt procedure
              000100 unrecoverable
                     path error
```

000101 unrecoverable destination error

14-15 Reserved

16 Session key :
X'06' network name pair
X'08' network address-network name

17-n Session key content
For session key X'06' : network name pair

17 Type : X'F3' logical unit

18 Length, in binary, of symbolic name of OLU

19-m Symbolic name in EBCDIC characters

m+1 Type : X'F3' logical unit

m+2 Length, in binary, of symbolic name of DLU

m+3-n Symbolic name in EBCDIC characters
For session key X'08' : network address-network name

17-18 Network address of OLU

19 Type : X'F3' logical unit

20 Length, in binary, of symbolic name of DLU

21-n Symbolic name in EBCDIC characters

n+1-p Requester ID

n+1 Length, in binary, of requester ID (Note : X'00' = no requester ID)

n+2-p Requester ID : the ID, in EBCDIC characters, of the end user initiating the request

p+1-q Password

p+1 Length, in binary, of password (Note : X'00' = no password is present)

p+2-q Password used to verify the identity of the end user

CONTROL INITIATE (CINIT) - SSCP-PLU

Ru format bytes

0-2 X'810601' Ns header

3 Format
bits 0-3, 0000 Format 0 (only value defined)
bits 4-7, reserved

4 INITIATE Origin :
bit 0, 0 INIT-SELF is origin
1 INIT-OTHER is origin
bit 1, reserved
bit 2, 0 PLU is DLU
1 PLU is OLU
bit 3, 0 network user is the initiator
1 network manager is the initiator
bits 4-5, reserved
bit 6, 0 no recovery retry
1 recovery retry to be used
bit 7, reserved

5-6 Network address of secondary LU

7-8 Length of BIND image field

5

9-m BIND image : the BIND RU, excluding
    the request code field (see BIND
    format description)
m+1-n Name of SLU
m+1 Type : X'F3' logical unit
m+2 Length, in binary, of symbolic name
m+3-n Symbolic name, in EBCDIC
    characters
    Note : the SLU name is the
    * uninterpreted name if the INITIATE
    origin was INIT-SELF issued by the
    PLU
    * network name if the INITIATE
    origin was INIT-SELF issued by the
    SLU, or was INIT-OTHER
n+1-p Requester ID
n+1 Length, in binary, of requester ID
    (Note : X'00' = no requester ID)
n+2-p Requester ID : the ID, in EBCDIC
    characters, of the end user
    initiating the session activation
    request (May be used to establish
    the authority of the end user to
    access a particular resource.)
p+1-q Password
p+1 Length, in binary, of password
    (Note : X'00' = no password is
    present)
p+2-q Password used to verify the
    identity of the end user
q+1-r User field (from INITIATE RU)
q+1 Length, in binary, of user date
    (Note : X'00' = no user data is
    present)
q+2-r User data : user-specific data
    that is not processed by FI.FMD
    network services protocol machines
    but is passed to the SVC.MGR.PLU.
r+1-s LU or Non-SNA Device
    characteristics
r+1-r+2 Length of characteristics field,
    including both format and
    characteristics fields. (Note :
    X'0000' = no format and no
    characteristics fields are present).
r+3 Characteristics format
    X'01' device characteristics (only
    value defined)
r+4-s LU or Non-SNA Device
    characteristics
    Format X'01' :
    (This format represents an
    access-method-unique LU/device
    characteristics definition. For more
    specific information refer to access
    method implementation
    documentation.)
r+4 Scheduling information :
    X'80' input device
    X'40' output device
    X'20' conversational mode
    X'10' reserved
    X'08' start print sensitive

```
    X'04' reserved
    X'02' additional information
          provided (always on)
    X'01' specific poll=on
          general poll=off
r+5 Device type :
    X'00' undefined device type
    X'04' 2741
    X'08' WTTY
    X'10' 115A
    X'20' TWX (33-35)
    X'30' 83B3
    X'40' 2740
    X'80' 1050
    X'90' 2780
    X'19' 3277
    X'1A' 3284
    X'1B' 3286/3288
    X'1C' 3275
    X'6D' SNA logical unit
r+6 Model Information :
    X'00' Model 1
    X'01' Model 2
r+7 Feature information :
    bits 0-1, 00 SLDC
              01 start/stop
              10 BSC
              11 reserved
    bits 2-7, X'20' XMIT interrupt
                    feature
              X'10' SWITCHED LINE = ON
                    LEASED LINE = OFF
              X'08' attention
              X'04' checking
              X'02' station control
              X'01' selector pen
r+8 Physical Device Address
r+9 Miscellaneous Flags :
    X'80' SNA compatible application
           program interface (always on)
    X'40' non-SNA application program
           interface (always off)
    X'20' buffered
    X'10' continue mode
    X'08' contention mode
    X'04' inhibit mode (Text Timeout)
    X'02' end-to-end control
    X'01' reserved
r+10 Reserved
r+11 Reserved
r+12-r+16 Screen size (see BIND RU for
    format)
r+17-s Work area format :
       X'00' unformatted
       X'01' TCAM format
r+18-s Work area excluding format
s+1 Length of Crypto Key field
s+2-t Crypto Key field
```

5

CLEANUP SESSION (CLEANUP) - SSCP-SLU

```
Ru format bytes
            0-2 X'810629' Ns header
            3   bits 0-3, 0000 format 0 (only value
                               defined)
                bits 4-7, reserved
            4   Reserved
            5   Reason :
                bit 0, 0 network user
                       1 network manager
                bit 1, 0 normal
                       1 abnormal
                bits 2-7 detailed reason (dependent
                         upon bits 0-1)
                For bits 0-1, 00 user and normal
                bits 2-7, 000000 general category
                          000001 self, OLU=PLU
                          000010 self, OLU=SLU
                          000011 other
                For bits 0-1, 01 user and abnormal
                bits 2-7, 000000 general category
                                 (only value
                                 defined)
                For bits 0-1, 10 manager and normal
                bits 2-7, 000000 general category
                          000001 operator command-
                                 clean up session
                          000010 operator command-
                                 clean up all
                                 sessions for LU
                          000011 operator command-
                                 clean up all LU-LU
                                 sessions for LUs in
                                 the domain
                For bits 0-1, 11 manager and
                abnormal
                bits 2-7, 000000 general category
                          000001 Operator Command
                          000010 Restart procedure
                          000011 Preempt procedure
                          000100 Unrecoverable path
                                 error
                          000101 Unrecoverable
                                 destination error
            6   Session key
                X'06' uninterpreted name pair
                X'07' network address pair
            7-n Session Key Content
                For session key X'06' :
                uninterpreted name pair
            7   Type : X'F3' logical unit
            8   Length, in binary, of symbolic name
                of PLU
            9-m Symbolic name in EBCDIC characters
            m+1 Type : X'F3' logical unit
            m+2 Length, in binary, of symbolic name
                of SLU
            m+3-n Symbolic name in EBCDIC characters
                For session key X'07' : network
                address pair
            7-8 Network address of PLU
            9-10 Network address of SLU
```

CONTROL TERMINATE (CTERM) - SSCP-PLU

```
RU format bytes
            0-2 X'810602' Ns header
            3   bits 0-3, 0000 Format 0 (only value
                               defined)
                bits 4-7, reserved
            4   Type :
                bits 0-1, reserved
                bits 2-3, 00 reserved
                          01 orderly
                          10 forced
                          11 cleanup
                bits 4-7, reserved
            5-6 Network address of SLU
            7   Reason :
                bit 0, 0 network user
                       1 network manager
                bit 1, 0 normal
                       1 abnormal
                bits 2-7, detailed reason (dependent
                          upon bits 0-1)
                For bits 0-1, 00 user and normal
                bits 2-7, 000000 general category
                          000001 self, OLU=PLU
                          000010 self, OLU=SLU
                          000011 other
                For bits 0-1, 01 user and abnormal
                bits 2-7, 000000 general category
                                 (only value
                                 defined)
                For bits 0-1, 10 manager and normal
                bits 2-7, 000000 general category
                          000001 operator command-
                                 session
                          000010 operator command-LU
                          000011 operator command-
                                 domain
                For bits 0-1, 11 manager and
                                 abnormal
                bits 2-7, 000000 general category
                          000001 operator command
                          000010 restart procedure
                          000011 preempt procedure
                          000100 unrecoverable path
                                 error
                          000101 unrecoverable
                                 destination error
            8-n Requester ID
            8   Length, in binary, of requester ID
                (Note : X'00' = no requester ID)
            9-n Requester ID : the ID, in EBCDIC
                characters, of the end user
                initiating the session deactivation
                request (may be used to establish
                the authority of the end user to
                access a particular resource or
                service).
            n+1-p Password
            n+1 Length, in binary, of password
                (Note : X'00' = no password is
                present)
            n+2-p Password used to verify the
                identity of the end user
```

5

DIRECT SEARCH LIST (DSRLST) - SSCP-SSCP

RU format bytes

```
0-2  X'818627' Ns header
3    Control list type : X'01' (only
     value defined)
4    Type : X'F3' logical unit
5    Length, in binary, of symbolic name
6-m  Symbolic name in EBCDIC characters
```

INITIATE-OTHER (INIT-OTHER) - ILU-SSCP

RU format bytes

```
0-2  X'810680' Ns header
3    Format :
     bits 0-3, 0001 Format 1 (only value
                    defined)
     bits 4-7, reserved
4    Type :
     bits 0-1, 00 dequeue (DQ) a
                  previously enqueued
                  initiate request (see
                  bits 2-3 for further
                  specification of
                  dequeue actions).
               01 initiate only (I) ; do
                  not enqueue
               10 enqueue only (Q) (See
                  bytes 5-6 for further
                  specification of
                  queueing conditions).
               11 initiate/enqueue (I/Q)
                  : enqueue the request
                  if it can not be
                  satisfied immediately
     bits 2-3, (used for DQ ; otherwise,
               reserved)
               00 leave on queue if
                  dequeuing attempt is
                  unsuccessful
               01 remove from queue if
                  dequeuing attempt is
                  unsuccessful
               10 remove from queue ; do
                  not attempt initiation
               11 reserved
     bit 4, reserved
     bits 5-6, PLU/SLU specification
         (when type = DQ, bits 5 and 6
         must be the same as on the
         original INIT-OTHER request) :
         00 LU1 is PLU
         01 LU2 is PLU
         10 SSCP determines PLU/SLU
            specification
         11 reserved
     bit 7, reserved
5    Queuing conditions for LU1 (when
     Type = DQ, bits 0,1,2,3 are reserved
     and bits 5,6 and 7 must be the same
     as on the original INIT-OTHER
     request) :
     bit 0, 0 do not enqueue if session
              count will be exceeded
            1 enqueue if session count
              will be exceeded
```

```
bit 1, 0 do not enqueue if the LU is
         not enabled
       1 enqueue even though the LU
         might not be enabled
bit 2, 0 do not enqueue if CDINIT
         loses contention
       1 enqueue if CDINIT loses
         contention
bit 3, 0 do not enqueue if there are
         no SSCP-LU paths
       1 enqueue if there are no
         SSCP-LU paths
bit 4, reserved
bits 5-6, Queuing position/service
          00 enqueue this request at
             the bottom of the queue
             (The request is at the
             bottom of the queue and
             gets dequeued only when
             the queue is otherwise
             empty ; at any given
             time there may be at
             most one bottom element
             on a queue).
          01 enqueue this request
             FIFO
          10 enqueue this request
             LIFO
          11 reserved
bit 7, 0 do not enqueue for recovery
         retry
       1 enqueue for recovery retry
         (This is a queue that is
         used for
         recovery-reactivating an
         LU-LU when the session,
         though it had been
         successfully activated,
         fails for some reason.
         Elements on this queue are
         not dequeued when a session
         activation is successfully
         completed. Explicit session
         deactivation requests are
         needed to dequeue elements
         from this queue).
```

6   Queuing conditions for LU2 (When type = DQ, bits 0,1,2,3 are reserved and bits 5,6 and 7 must be the same as in the original INIT-OTHER request) :

```
bit 0, 0 do not enqueue if session
         count will be exceeded
       1 enqueue if session count
         will be exceeded
bit 1, 0 do not enqueue if the LU is
         not enabled
       1 enqueue though the LU might
         not be enabled
bit 2, 0 do not enqueue if CDINIT
         loses contention
       1 enqueue if CDINIT loses
         contention
```

5

bit 3, 0 do not enqueue if there are no SSCP-LU paths
1 enqueue if there are no SSCP-LU paths
bit 4, reserved
bits 5-6, Queuing position/service
00 enqueue this request at the bottom of the queue (the request is at the bottom of the queue and gets dequeued only when the queue is otherwise empty ; at any given time there may be at most one bottom element on a queue).
01 enqueue this request FIFO
10 enqueue this request LIFO
11 reserved
bit 7, 0 do not queue for recovery retry
1 enqueue for recovery retry (This is a queue that is used for recovery-reactivating an LU-LU session when the session, though it had been successfully activated, fails for some reason. Elements on this queue are not dequeued when a session activation is successfully completed ; explicit session deactivation requests are needed to dequeue elements from this queue).

* If enqueuing for recovery is desired then it must be indicated in both LU1 and LU2 Enqueuing Conditions bytes (bit 7 = '1').
* Bit 2 (CDINIT contention) must have the same setting for both LU1 and LU2. (Contention occurs when both SSCPs try to setup a session between the same LUs at the same time).
* Enqueuing is not performed if the DLU is unknown, or if the domain of either LU is in takedown status.

7 INITIATE origin :
bits 0-2, reserved
bit 3, (when Type = DQ, bit 3 is reserved) 0 network user is the initiator
1 network manager is the initiator
bits 4-7, reserved

8 NOTIFY
bits 0-1, (when Type = DQ, bits 0 and 1 are reserved)
00 do not send NOTIFY to LUs in session with LU1
01 send NOTIFY to all LUs in session with LU1
10 send NOTIFY to all LUs in session with LU1 only if the request is queued
11 reserved
bits 2-3, (when Type = DQ, bits 2 and 3 are reserved)
00 do not send NOTIFY to LUs in session with LU2
01 send NOTIFY to all LUs in session with LU2
10 send NOTIFY to all LUs in session with lu2 only if the request is enqueued
11 reserved
bit 4, 0 do not send NOTIFY to the ILU when INIT is dequeued
1 send NOTIFY to the ILU when INIT is dequeued
bit 5, 0 do not send NOTIFY to the ILU when the requested session is set up
1 Send NOTIFY to the ILU when the requested session is set up
bits 6-7, reserved

9-16 Mode : an eight-character symbolic name (implementation and installation dependent) that identifies the set of rules and protocols to be used for the session ; used by the SSCP (SLU) to select the BIND image that will be used by the SSCP(PLU) to build the CINIT request (when Type = DQ, the Mode field must have the same value as in the original INIT-OTHER request).

17-m Uninterpreted name of SLU
17 X'F3' type : logical unit
18 Length, in binary, of symbolic name
19-m Symbolic name, in EBCDIC characters

m+1-n Uninterpreted name of LU2
m+1 X'F3' type : logical unit
m+2 Length, in binary, of symbolic name
m+3-n Symbolic name, in EBCDIC ccharacters

n+1-p Requester ID
n+1 Length, in binary, of requester ID (X'00' = no requester ID)
n+2-p Requester ID : the ID, in EBCDIC characters, of the end user initiating the request (May be used to establish the authority of the end user to access a particular resource).

5

p+1-q Password

p+1 Length, in binary, of password (Note : X'00' = no password is present)

p+2-q Password used to verify the identity of the end user

q+1-r User Field (When Type = DQ, user field is reserved)

q+1 Length, in binary, of user data (Note : X'00' = no user data is present)

q+2-r User data : user-specific data that is not processed by network services protocol machines, but is passed to the primary LU on the CINIT request

r+1-s User Request Correlation (URC) field (when Type = DQ, the URC must be the same as on the original INIT-OTHER request).

r+1 Length, in binary, of URC (Note : X'00' = no URC)

r+2-s URC : end-user defined identifier ; this value can be returned by the SSCP in a subsequent NOTIFY or NSPE to correlate a given session to the initiating request

INITIATE-OTHER CROSS-DOMAIN (INIT-OTHER-CE) - SSCP-SSCP

RU Format Bytes

0-2 X'818640' Ns header

3 Format :
bits 0-3, 0000 Format 0 (only value defined)
bits 4-7, reserved

4 Type :
bits 0-1, 00 dequeue (DQ) a previously enqueued initiate request. (See bits 2-3 for further specification of dequeue actions.)
01 initiate only (I) : do not enqueue
10 enqueue only (Q) : (See bytes 5-6 for further specification of queuing conditions.)
11 initiate/enqueue (I/Q) : enqueue the request if it cannot be satisfied immediately
bits 2-3, (used for DQ; otherwise, reserved)
00 leave on queue if dequeing attempt is unsuccessful
01 remove from queue if dequeuing attempt is unsuccessful

10 remove from queue, do not attempt initiation
11 reserved

bit 4, reserved

bits 5-6, PLU/SLU specification (When type = DQ, bits 5-6 must be the same as on the original INIT-OTHER-CD request).
00 LU1 is PLU
01 LU2 is PLU
10 SSCP determines PLU/SLU specification
11 reserved

bit 7, reserved

5 Queuing conditions for LU1 (When type = DQ, bits 0-3 are reserved and bits 5-7 must be the same as on the original INIT-OTHER -CD request)

bit 0, 0 do not enqueue if session count will be exceeded
1 enqueue if session count will be exceeded

bit 1, 0 do not enqueue if the LU is not enabled
1 enqueue if the LU is not enabled

bit 2, 0 do not enqueue if CDINIT loses contention
1 enqueue if CDINIT loses contention

bit 3, 0 do not enqueue if there are no SSCP-LU paths

bit 4, reserved

bits 5-6, 00 enqueue this request at the bottom of the queue ; the request at the bottom of the queue gets dequeued only when the queue is otherwise empty (At any given time there may be at most one bottom element on a queue).
01 enqueue this request FIFO
10 enqueue this request LIFO
11 reserved

bit 7, 0 do not enqueue for recovery retry
1 enqueue for recovery retry (This is a queue that is used for recovery reactivating an LU-LU session when the session, though it had been successfully activated, fails for some reason. Elements on this queue are not dequeued when a session activation is successfully completed. Explicit session deactivation requests are needed to dequeue elements from this queue).

6 Queuing conditions for LU2 (When type = DQ, bits 0-3 are reserved and bits 5-7 must be the same as on the original INIT-OTHER-CD request).

```
bit 0, 0 do not enqueue if session
         count will be exceeded,
       1 enqueue if session count
         will be exceeded
bit 1, 0 do not enqueue if the LU is
         not enabled
       1 enqueue even though the LU
         might not be enabled
bit 2, 0 do not enqueue if CDINIT
         loses contention
       1 enqueue if CDINIT loses
         contention
bit 3, 0 do not enqueue if there are
         no SSCP-LU paths
bit 4, reserved
bits 5-6, Queuing position/service
       00 enqueue this request at
          the bottom of the queue ;
          the request at the bottom
          of the queue gets dequeued
          only when the queue is
          otherwise empty (At any
          given time there may be at
          most one bottom element on
          a queue.)
       01 enqueue this request FIFO
       10 enqueue this request LIFO
       11 reserved
bit 7, 0 do not enqueue for recovery
         retry
       1 enqueue for recovery retry
         (This is a queue that is
         used for
         recovery-reactivating an
         LU-LU session when the
         session, though it had been
         successfully activated,
         fails for some reason.
         Elements on this queue are
         not dequeued when a session
         activation is successfully
         completed ; explicit
         session deactivation
         requests are needed to
         dequeue elements from this
         queue.)
```

Note :
* If enqueuing for recovery is desired, then it must be indicated in both LU1 and LU2 Queuing Conditions bytes (bit 7 = '1').
* Bit 2 (CDINIT contention) must have the same setting for both LU1 and LU2. (Contention occurs when both SSCPs try to set up a session between the same LUs at the same time). * Enqueuing is not performed if the DLU is unknown, or if the domain of either LU is in takedown status.

7-14 PCID (When type = DQ, the PCID must be the same as in the original INIT-OTHER-CD request).

7-8 The network address of SSCP (ILU)

9-14 A unique 6-byte value, generated by the SSCP (ILU), which is retained and used in all cross-domain requests dealing with the same procedure until it is completed ; an SSCP maintains correlation between PCID and the URC, if a URC has been provided by the INIT-OTHER request

15 INITIATE origin
bits 0-2, reserved
bit 3, (reserved when type = DQ)
0 network user is the initiator
1 network manager is the initiator
bits 4-7, reserved

16 NOTIFY
bits 0-1, (when type = DQ, bits 0-1 are reserved).
00 do not send NOTIFY to LUs in session with LU1
01 send NOTIFY to all LUs in session with LU1
10 send NOTIFY to all LUs in session with LU1 only if the request is enqueued
11 reserved
bits 2-3, (when type = DQ, bits 2-3 are reserved)
00 do not send NOTIFY to LUs in session with LU1
01 send NOTIFY to all LUs in session with LU1
10 send NOTIFY to all LUs in session with LU1 only if the request is enqueued
11 reserved
bits 2-3, (when type = DQ, bits 2-3 are reserved).
00 do not send NOTIFY to LUs in session with LU2
01 send NOTIFY to all LUs in session with LU2
10 send NOTIFY to all LUs in session with LU2 only if the request is enqueued.
11 reserved
bit 4, 0 do not send NOTIFY to the SSCP (ILU) when INIT is dequeued
1 send NOTIFY to the SSCP (ILU) when INIT is dequeued
bits 5-7, reserved

17-24 Mode : an eight-character symbolic name (implementation and installation dependent) that identifies the set of rules and protocols to be used for the session ; used by the SSCP (SLU) to select the BIND image that will be used by the SSCP (PLU) to build the CINIT

5

request (when type = DQ, the Mode field must have the same value as in the original INIT-OTHER-CD request).

25-m Network name of LU1

25 X'F3' type : logical unit

26 Length, in binary, of symbolic name

27-m Symbolic name, in EBCDIC characters

m+1-n Network name of LU2

m+1 X'F3' type : logical unit

m+2 Length, in binary, of symbolic name

m+3-n Symbolic name, in EBCDIC characters

n+1-p Requester ID

Length, in binary, of requester ID (Note : X'00' = no requester ID is present)

n+2-p Requester ID ; the ID, in EBCDIC characters, of the end user initiating the request (May be used to establish the authority of the end user to access a particular resource).

p+1-q Password

p+1 Length, in binary, of password (Note : X'00' = no password is present)

p+2-q Password used to verify the identity of the end user

q+1-r User Field (When type = DQ, this field is reserved).

q+1 Length, in binary, of user data (Note : X'00' = no user data is present)

q+2-r User data : user-specific data that is not processed by network services protocol machines but is passed to the primary LU on the CINIT request

Note : With the exception of NS header and PCID, all the fields in the INIT-OTHER-CD RU are derived from its corresponding INIT-OTHER RU.

INITIATE-SELF (INIT-SELF) - ILU-SSCP

RU Format bytes

0-2 X'010681' Ns header

3 bits 0-3, format :
0000 Format 0 : specifies a subset of the parameters shown in Format 1 of INIT-SELF (described separately, because the NS header differs in the first byte), with the receiver supplying default values
bit 4-7, type
bit 4, reserved
bits 5-6, 00 DLU is PLU
01 DLU is SLU
10 SSCP determines PLU and SLU
11 reserved

bit 7, 1 initiate/enqueue (I/Q) : enqueue the request if it cannot be satisfied immediately
0 Initiate only (I) ; do not enqueue

4-11 Mode : an eight-character symbolic name (implementation and installation dependent) that identifies the set of rules and protocols to be used for the session ; used by the SSCP(SLU) to select the BIND image that will be used by the SSCP(PLU) to build the CINIT request

12-m Uninterpreted Name of DLU

12 X'F3' type : logical unit

13 Length, in binary, of symbolic name

14-m Symbolic name, in EBCDIC characters

m+1-p Requester ID

m+1 Length, in binary, of requester ID (Note : X'00' = no requester ID)

m+2-p Requester ID : the ID, in EBCDIC characters, of the end user initiating the request (may be used to establish the authority of the end user to access a particular resource).

p+1-q Password

p+1 Length, in binary, of password (Note : X'00' = no password is present)

p+2-q Password used to verify the identity of the end user

q+1-r User Field

q+1 User data : user-specific data that is not processed by network services protocol machines but is passed to the primary LU on the CINIT request

Note : The following default values are supplied by the SSCP(ILU) receiving the format 0 INIT-SELF request :

* Queuing conditions (if queuing is specified) :
- enqueue if session count exceeded
- enqueue this request FIFO

* Initiate origin : network user is the initiator.

* NOTIFY : do not notify

INITIATE-SELF (INIT-SELF) - ILU-SSCP

RU format bytes

0-2 X'810681' Ns header

3 bits 0-3, format : 0001 Format 1 : specifies the full set of parameters
bits 4-7, reserved

4 bits 0-1, 00 dequeue (DQ) a previously enqueued initiate request. (See bits 2-3 for further specification of setup actions).

5

01 initiate only (I) ; do not enqueue
10 enqueue only (Q) (See byte 5 for further specification of queuing conditions.)
11 initiate/enqueue (I/Q) : enqueue the request if it cannot be satisfied immediately

bits 2-3, (used for DQ ; otherwise, reserved)
00 leave on queue if setup attempt is unsuccessful
01 remove from queue if setup attempt is unsuccessful
10 remove from queue ; do not attempt setup
11 reserved

bit 4, reserved

bits 5,6, PLU/SLU specification (When type = DQ, bits 5 and 6 must be the same as on the original INIT-SELF request.)
00 DLU is PLU
01 DLU is SLU
10 SSCP determines PLU/SLU specification
11 reserved

bit 7, reserved

5 Queuing conditions for DLU (when type = DQ, bits 0-3 are reserved, and bits 5-7 must be the same as in the original INIT-SELF request).

bit 0, 0 do not enqueue if session count exceeded
1 enqueue if session count exceeded

bit 1, 0 do not enqueue if DLU not enabled
1 enqueue if DLU not enabled

bit 2, 0 do not enqueue if CDINIT loses contention
1 enqueue if CDINIT loses contention

bit 3, 0 do not enqueue if no SSCP (DLU)-DLU path
1 enqueue if no SSCP(DLU)-DLU path

bit 4, reserved

bits 5-6, Queuing position/service
00 put this request at the bottom of the queue (this request is dequeued only when the queue is otherwise empty)
01 enqueue this request FIFO

10 enqueue this request LIFO
11 reserved

bit 7, 0 do not enqueue for recovery retry
1 enqueue for recovery retry (The element is maintained on the recovery retry queue even after the activation of the session, so that the session can be retried in the event of a session failure).

Note : since queueing conditions are specified for the DLU only, the following default values are used by SSCP (OLU) for the OLU :
* Enqueue if session count exceeded
* Enqueue this request at the foot of the queue (FIFO)
* For 'CDINIT contention' and 'recovery retry' the default values are the same as those specified for the DLU (see bits 2 and 7 above)

6 INITIATE origin :
bits 0-2, reserved
bit 3, 0 network user is the initiator (bit 3 is reserved when type = DQ)
1 network manager is the initiator
bits 4-7, reserved

7 NOTIFY specifications :
bits 0-1, (bits 0 and 1 are reserved when type = DQ)
00 do not notify LUs in session with DLU
01 notify all LUs in session with DLU that the ILU/OLU has requested a session with the DLU
10 notify LUs in session with DLU only if request is queued
11 reserved
bits 2-3, reserved
bit 4, 0 do not notify the ILU when the request is dequeued
1 notify the ILU when the request is dequeued
bits 5-7, reserved

8-15 Mode : an eight-character symbolic name (implementation and installation dependent) that identifies the set of rules and protocols to be used for the session : used by the SSCP(SLU) to select the BIND image that will be used by the SSCP(PLU) to build the CINIT request (when type = DQ, the Mode field must have the same value as in the original INIT-SELF request).

5

16-n Uninterpreted Name of DLU
16 X'F3' type : logical unit
17 Length, in binary, of symbolic name
18-n Symbolic name, in EBCDIC characters
n+1-p Requester ID
n+1 Length, in binary, of requester ID
(Note : X'00' = no requester ID)
n+2-p Requester ID : the ID, in EBCDIC characters, of the end user initiating the request (may be used to establish the authority of the end user to access a particular resource.)
p+1-q Password
p+1 Length, in binary, of password
(Note : X'00' = no user data is present)
p+2-q Password used to verify the identity of the end user
q+1-r User Field (When type = DQ, User field is reserved).
q+1 Length, in binary, of user data
(Note : X'00' = no user data is present)
q+2-r User data : user-specific data that is not processed by network services protocol machines but is passed to the primary LU on the CINIT request
r+1-s User Request Correlation (URC) Field (when type = DQ, the URC must be the same as in the original INIT-SELF request).
r+1 Length, in binary, of URC
(Note : X'00' = no URC)
r+2-s URC : end-user defined identifier ; this value can be returned by the SSCP in a subsequent NOTIFY or NSPE to correlate a given session to this initiating request

NOTIFY (NOTIFY) - SSCP-SSCP or SSCP-LU

RU Format bytes
0-2 X'810620' Ns header (for SSCP-LU)
0-2 X'818620' Ns header (for SSCP-SSCP)

3 NOTIFY Vector key :
X'01' resource requested : used to send NOTIFY to the current users (LUs) of a resource (LU) to inform them that another LU wishes to use the resource
X'02' ILU/TLU notification : used to send NOTIFY to the issuer of an INIT or TERM request to give the status of the session
X'03' third party SSCP notification : used to send NOTIFY to a third party SSCP (the SSCP whose LU issued an INIT-OTHER or TERM-OTHER request) to give the status of the setup/takedown procedure

4-n <u>NOTIFY Vector Data</u>

* For NOTIFY Vector Key X'01' :
4-m <u>Network name of requested LU</u>
4 Type : X'F3' logical unit
5 Length, in binary, of symbolic name of LU
6-m Symbolic name in EBCDIC characters
m+1-n <u>Network name of requesting LU</u>
m+1 Type : X'F3' logical unit
m+2 Length, in binary, of symbolic name
m+3-n Symbolic name in EBCDIC characters

* For NOTIFY Vector Key X'02' :
4 Session key :
X'06' uninterpreted name pair
5-n <u>Session Key Content</u>
5 Type : X'F3' logical unit
6 Length, in binary, of symbolic name of PLU (or OLU or LU1)
7-m Symbolic name in EBCDIC characters
m+1 Type : X'F3' logical unit
m+2 Length, in binary, of symbolic name of SLU (or DLU or LU2)
m+3-n Symbolic name in EBCDIC characters
n+1 Status :
X'01' session terminated
X'02' setup process started
n+2-p <u>User Request Correlation Field</u>
n+2 Length, in binary, of the URC
n+3-p URC : end-user defined identifier, specified in an INIT or TERM request ; used to correlate the given session to the initiating or terminating requests

* For NOTIFY Vector Key X'03' :
4 Status :
X'01' session terminated
X'02' session initiated
X'03' procedure error
X'04' setup process started
5-12 <u>PCID</u>
5-6 Network address of the SSCP(ILU) or SSCP(TLU)
7-12 A unique 6-byte value, generated by the SSCP (ILU) or SSCP(TLU), which is used in all cross-domain requests dealing with the same setup or takedown procedure until it is completed
13 Reason (defined for Status value of X'03' only)
<u>Note</u> : There are two encodings of the Reason byte :
if bit 4 = '0', then the reason byte is encoded for a setup procedure error.
If bit 4 = '1', then the Reason byte is encoded for a takedown procedure error.

5

Setup Procedure Error
bit 0, 1 CINIT error in reaching the PLU
bit 1, 1 BIND error in reaching the SLU
bit 2, 1 setup reject at the PLU
bit 3, 1 setup reject at the SLU
bit 4, 0 setup procedure error
bit 5, reserved
bit 6, 1 setup reject at SSCP
bit 7, reserved

Takedown Procedure Error
bit 0, 1 CTERM error in reaching the PLU
bit 1, 1 UNBIND error in reaching the SLU
bit 2, 1 takedown reject at the PLU
bit 3, 1 takedown reject at the SLU
bit 4, 1 takedown procedure error
bit 5, 1 takedown reject at the SSCP
bit 6, 0 see following note
bit 7, reserved

Note : The bit combination of 11 for bits 4 and 6 is set aside for implementation internal use and will not be otherwise defined.

14-17 Sense data (defined for Status value of X'03' only)

NS PROCEDURE ERROR (NSPE) - SSCP-ILU or SSCP-TLU

RU Format bytes
0-2 X'010604' Ns header

Note : The remainder of this RU has two formats : a comprehensive form and a condensed form, based upon the setting of bit 7 of the Reason byte (byte 3) : the choice is implementation-dependent

Comprehensive Format
3 Reason
Note : There are two encodings of the Reason byte in the comprehensive format :
- if bit 4 = '0', then the Reason byte is encoded for a setup procedure error
- if bit 4 = '1', then the Reason byte is encoded for a takedown procedure error

Setup Procedure Error
bit 0, 1 CINIT error in reaching the PLU
bit 1, 1 BIND error in reaching the SLU
bit 2, 1 setup reject at the PLU
bit 3, 1 setup reject at the SLU
bit 4, 0 setup procedure error
bit 5, reserved
bit 6, 1 setup reject at SSCP
bit 7, 1 comprehensive format of Reason byte

Takedown Procedure Error
bit 0, 1 CTERM error in reaching the PLU
bit 1, 1 UNBIND error in reaching the SLU
bit 2, 1 takedown reject at the PLU
bit 3, 1 takedown reject at the SLU
bit 4, 1 takedown procedure error
bit 5, 1 takedown reject at SSCP
bit 6, 0 see following note
bit 7, 1 comprehensive format of Reason byte

Note : The bit combination of 11 for bits 4 and 6 is set aside for implementation internal use and will not be otherwise defined.

4-7 Sense Data
8 Session key :
X'06' uninterpreted name pair
X'0A' session correlation
9-n Session Key content
For session key X'06' : uninterpreted name pair
9 Type : X'F3' logical unit
10 Length, in binary, of the symbolic name of the PLU
11-m Symbolic name in EBCDIC characters
m+1 Type : X'F3' logical unit
m+2 Length, in binary, of the symbolic name of the SLU
m+3-n Symbolic name in EBCDIC characters
For session key X'0A' : session correlation
9 Length, in binary, of the URC
10-n URC : end-user defined identifier, specified in an INIT or TERM request, used to correlate the given session to the initiating request.

Condensed Format :
3 Reason :
bit 0, 1 CINIT error in reaching the PLU
bit 1, 1 BIND error in reaching the SLU
bit 2, 1 setup reject at the PLU
bit 3, 1 setup reject at the SLU
bit 4, 1 takedown failure
bit 5, 1 takedown reject at SSCP
bit 6, 1 setup reject at SSCP
bit 7, 0 condensed format
4-m Uninterpreted name of PLU
4 Type : X'F3' logical unit
5 Length, in binary, of symbolic name
6-m Symbolic name in EBCDIC characters
m+1-n Uninterpreted name of SLU
m+1 Type : X'F3' logical unit
m+2 Length, in binary, of symbolic name of SLU
m+3-n Symbolic name in EBCDIC characters

SESSION ENDED (SESSEND) - PLU-SSCP

RU Format bytes
0-2 X'810688' Ns header
3 Reserved

4 Session key :
X'06' uninterpreted name pair
X'07' network address pair
5-n <u>Session Key Content</u>
For session key X'06' :
Uninterpreted name pair
5 Type : X'F3' logical unit
6 Length, in binary, of symbolic name of PLU
7-m Symbolic name in EBCDIC characters
m+1 Type : X'F3' logical unit
m+2 Length, in binary, of symbolic name of SLU
m+3-n Symbolic name in EBCDIC characters
For session key X'07' : network address pair
5-6 Network address of PLU
7-8 Network address of SLU

<u>SESSION STARTED</u> (<u>SESST</u>) - PLU-SSCP

RU Format bytes
0-2 X'810686' Ns header
3 Reserved
4 Session key :
X'06' uninterpreted name pair
X'07' network address pair
5-n <u>Session Key content</u>
For session key X'06' :
uninterpreted name pair
5 Type : X'F3' logical unit
6 Length, in binary, of symbolic name of PLU
7-m Symbolic name in EBCDIC characters
m+1 Type : X'F3' logical unit
m+2 Length, in binary, of symbolic name of SLU
m+3-n Symbolic name in EBCDIC characters
For session key X'07' : network address pair
5-6 Network address of PLU
7-8 Network address of SLU

<u>TERMINATE-OTHER</u> (<u>TERM-OTHER</u>) - TLU-SSCP

RU Format bytes
0-2 X'810682' Ns header
3 bits 0-3, 0001 Format 1 (only value defined)
bits 4-7, reserved
4 Type
bits 0-1, 00 the request applies to active and pending-active sessions
01 the request applies to active, pending-active, and queued sessions
10 the request applies to queued sessions only
11 reserved
bit 2, 0 forced termination-session to be deactivated immediately and unconditionally

```
                1 orderly
                  termination-permitting an
                  end-of-session procedure to
                  be executed at the PLU
                  before the session is
                  deactivated
         bit 3, 0 not last session for LU1
                1 last session for LU1
         bit 4, 0 not last session for LU2
                1 last session for LU2
            Note : The term 'last session' is
            relative to the TLU's knowledge
            of the sessions that LU1 and LU2
            have active.
         bits 5-6, 00 LU1 is PLU
                   01 LU2 is PLU
                   10 SSCP determines PLU/SLU
                   11 reserved
         bit 7, 0 not cleanup
                1 cleanup
     5   Reason
         bits 0-2, reserved
         bit 3, 0 network user requested the
                  termination
                1 network manager requested
                  the termination
         bit 4, reserved
         bit 5, 0 normal termination
                1 abnormal termination
         bits 6-7, reserved
     6   NOTIFY specifications :
         bits 0-5, reserved
         bit 6, 0 do not notify TLU when the
                    session takedown procedure
                    is complete
                1 notify the TLU when the
                  session takedown procedure
                  is complete.  (not allowed
                  with Type = cleanup)
         bit 7, reserved
     7   Reserved
     8   Session key :
         X'06' uninterpreted name pair (the
         only permissible session key)
     9-n Session key Content-Uninterpreted
         name of LU1/LU2
         For session key X'06' :
         uninterpreted name pair
     9   Type : X'F3' logical unit
     10  Length, in binary, of symbolic name
         of LU1
     11-m Symbolic name in ECBDIC characters
     m+1 Type : X'F3' logical unit
     m+2 Length, in binary, of symbolic name
         of LU2
     m+3-n Symbolic name in EBCDIC characters
         Note : If the length of one of the
         uninterpreted names (LU1 or LU2, but
         not both) is zero then all sessions
         for the named LU, as specified by
         the Type byte, are terminated as a
         result of this TERM-OTHER request.
```

5

n+1-p Requester ID
n+1 Length, in binary, of requester ID
(Note : X'00' = no requester ID)
n+2-p Requester ID : the ID, in EBCDIC characters, of the end user initiating the request
p+1-q Password
p+1 Length, in binary, of password
(Note : X'00' = no password is present)
p+2-q Password userd to verify the identity of the end use
q+1-r User Request Correlation (URC) Field
q+1 Length, in binary, of the URC
(Note : X'00' = no URC)
q+2-r URC : end-user defined identifier : this value can be returned by the SSCP in a subsequent NOTIFY or NSPE to correlate a given session to this terminating request.

TERMINATE-OTHER CROSS-DOMAIN (TERM-OTHER-CD) - SSCP(TLU)-SSCP(OLU)

RU Format Bytes

0-2 X'818642' Ns header

3 bits 0-3, 0000 Format 0 (only value defined)
bits 4-7, reserved

4 Type :
bits 0-1, 00 the request applies to active and pending-active sessions
01 the request applies to active, pending-active, and queued sessions
10 the request applies to queued sessions only
11 reserved
bit 2, 0 forced termination-session to be deactivated immediately and unconditionally
1 orderly termination-permitting end-of-session procedure to be executed at the PLU before the session is deactivated
bit 3, 0 not last session for LU1
1 last session for LU1
bit 4, 0 not last session for LU2
1 last session for LU2
Note : the term 'last session' is relative to the TLU's knowledge of the sessions that LU1 and LU2 have active.
bits 5-6, 00 LU1 is PLU
01 LU2 is PLU
10 SSCP determines PLU/SLU
11 reserved
bit 7, 0 not cleanup
1 cleanup

5-12 PCID
5-6 Network address of the SSCP (TLU)
7-12 A unique 6-byte value, generated by the SSCP(TLU), which is retained and used in all cross-domain requests dealing with the same procedure until it is completed
13 Reason :
bits 0-2, reserved
bit 3, 0 network user requested the termination
1 network manager requested the termination
bit 4, reserved
bit 5, 0 normal termination
1 abnormal termination
bits 6-7, reserved
14-15 Reserved
16 Session key :
X'06' network name pair
17-n Session Key Content
For session key X'06' : Network name pair
17 Type : X'F3' logical unit
18 Length, in binary, of symbolic name of LU1
19-m Symbolic name in EBCDIC characters
m+1 Type : X'F3' logical unit
m+2 Length, in binary, of symbolic name of LU2
m+3-n Symbolic name in EBCDIC characters
Note : If the length of one of the network names, but not both, is zero then all sessions specified by the Type byte are terminated as a result of this TERM-OTHER-CP request.
n+1-p Requester ID
n+1 Length, in binary, of requester ID (Note : X'00' = no requester ID)
n+2-p Requester ID : the ID, in EBCDIC characters, of the end-user initiating the request
p+1-q Password
p+1 Length, in binary, of password (Note : X'00' = no password is present)
p+2-q Password used to verify the identity of the end-user.

TERMINATE-SELF (TERM-SELF) - TLU-SSCP

Ru format bytes
0-2 X'010683' Ns header

3 Type :
bits 0-1, 00 the request applies to active and pending-active sessions
01 the request applies to active, pending-active and queued sessions
10 the request applies to queued only sessions

5

```
                11 reserved
   bit 2, 0 forced termination-session
            to be deactivated
            immediately and
            unconditionally
          1 orderly
            termination-permitting an
            end-of-session procedure to
            be executed at the PLU
            before the session is
            deactivated
   bit 3, 0 not last session for OLU
          1 last session for OLU
   bit 4, 0 do not clean up
          1 clean up
   bits 5-6, 00 DLU is PLU
             01 DLU is SLU
             10 SSCP determines PLU and
                SLU
             11 reserved
   bit 7, 0 indicates that the format
            of the RU is Format 0 and
            that byte 3 is the Type
            byte.
```

4-m Uninterpreted Name of DLU

4 Type : X'F3' logical unit

5 Length, in binary, of symbolic name
Note : if the length value of the DLU name is zero, then the TERM-SELF applies to all sessions, as specified in the Type byte, where the TLU is a partner.

6-m Symbolic name, in EBCDIC characters
Note : Bits 2 and 4 of the Type byte (byte 3) together provide the following combinations :

* Forced-not cleanup : requires the PLU to initiate session deactivation procedures immediately and unconditionally. The PLU user is notified.
* Orderly-not cleanup : permits an end-of-session procedure to be executed at the PLU before the session is deactivated.
* Cleanup-Orderly : requests the SSCP to initiate cleanup procedures for the PLU, Boundary function, and SLU. The request notifies the SSCP (OLU) to clean up its LU-LU session related information and send CDTERM (Cleanu-up orderly).
* Cleanup-Forced : has the same meaning as Cleanup-Orderly for the TLU (OLU) and the SSCP (OLU) except wthat CDTERM is not sent.

Note 2 The following defaults are supplied by the SSCP receiving a Format 0 TERM-SELF:

* Type : do not cleanup
* Reason : network user, normal

* Notify : do not notify
* Requester ID, URC, and password are not used in mapping to subsequent requests.

TERMINATE-SELF (TERM-SELF) - TLU-SSCP

RU format bytes

```
0-2 X'810683' Ns header

3   bits 0-3, format : 0001 Format 1
                (only value defined)
    bits 4-6, reserved
    bit 7, 1 indicates that byte 3, bits
             0-3, contain the format
             value
4   Type :
    bits 0-1, 00 the request applies to
                 active and
                 pending-active sessions
              01 the reauest applies to
                 active, pending-active,
                 and queued sessions
              10 the request applies to
                 queued sessions only
              11 reserved
    bit 2, 0 forced termination-session
             to be deactivated
             immediately and
             unconditionally
           1 orderly
             termination-permitting an
             end-of-session procedure to
             be executed at the PLU
             before the session is
             deacrivated
    bit 3, 0 not last session for OLU
           1 last session for OLU
    bit 4, reserved
    bits 5-6, 00 DLU is PLU
              01 DLU is SLU
              10 SSCP determines PLU and
                 SLU
              11 reserved
    bit 7, 0 do not clean up
           1 clean up
5   Reason :
    bits 0-2, reserved
    bit 3, 0 network user requested the
             termination
           1 network manager requested
             the termination
    bit 4, reserved
    bit 5, 0 normal termination
           1 abnormal termination
    bits 6-7, reserved
6   NOTIFY specifications :
    bits 0-5, reserved
    bit 6, 0 do not notify TLU when the
             session takedown procedure
             is complete
           1 notify the TLU when the
             session takedown procedure
```

5

is complete (not allowed
with Type = Cleanup)

bit 7, reserved

7 Reserved

8 Session key :
X'01' uninterpreted name (the only permissible session key)

9-n Session Key content

9 Type : X'F3' logical unit

10 Length, in binary, of symbolic name

11-n Symbolic name in EBCDIC characters
Note : If the length value is zero, them the TERM-SELF applies to all sessions specified in the Type byte where the TLU is a partner.

n+1-p Requester ID

n+1 Length, in binary, of requester ID
(Note : X'00' = no requester ID)
n+2-p Requester ID : the ID, in EBCDIC characters, of the end user initiating the request

p+1-q Password

p+1 Length, in binary, of password
(Note : X'00' = no password is present)

p+2-q Password used to verify the identity of the end user

q+1-r User Request Correlation (URC) Field

q+1 Length, in binary, of URC Field
(Note : X'00' = no URC)

q+2-r URC : end-user defined identifier ; this value can be returned by the SSCP in a subsequent NOTIFY or NSPE to correlate a given session to this termination request

UNBIND FAILURE (UNBINDF) - PLU-SSCP

Ru format bytes

0-2 X'810687' Ns header

3-6 Sense data :
0801,0803,0804,080A,080E,080F,0810, and path, RH, and state error sense codes (See Appendix G for a description of sense codes).

7 Reason :
bit 0, reserved
bit 1, 1 UNBIND error in reaching SLU
bit 2, 1 takedown reject at PLU
bit 3-7, reserved

8 Session key :
X'06' uninterpreted name pair
X'07' network address pair

9-n Session Key Content
For session key X'06' :
uninterpreted name pair

9 Type : X'F3' logical unit

10 Length, in binary, of symbolic name of PLU

11-m Symbolic name in EBCDIC characters

m+1 Type : X'F3' logical unit

m+2 Length, in binary, of symbolic name
    of SLU
m+3-n Symbolic name, in EBCDIC
    characters
    For session key X'07' : network
    address pair
9-10 Network address of PLU
11-12 Network address of SLU

5

		POSITIVE RESPONSES	NEGATIVE RESPONSES
NC		Only the Request Code is returned	4 Sense Data bytes and the Request Code are returned
DFC		Only the Request Code is returned	4 Sense Data bytes and the Request Code are returned
SC		Only the Request Code is returned, except for : ACTCDRM, ACTLU, ACTPU, and STSN (see note)	4 Sense Data bytes and the Request Code are returned
NS	Maintenance Services	Only the 3-byte request prefix and code is returned	4 Sense Data bytes and the 3-byte request prefix and code are returned if RH Byte 0 Bit 4 = 1 . Otherwise only the 4 sense data bytes are returned
	Session Services	Only the 3-byte request prefix and code is returned except for : CDINIT, CDTERM, DSRLST, and INIT-OTHER-CD (see note)	
	Configuration Services	Only the 3-byte request prefix and code is returned except for : DUMPINIT, DUMPTEXT and RNAA (see note)	

Note : These request RU's require response RU's that, if positive, contain data in addition to the Request code. See details below :

ACTCDRM

RU Format bytes

0 X'14' request code

1 bits 0-3, format : X'0' (only value defined)
bits 4-7, type activation performed : X'1' cold (only value defined)

2 FM profile (see Appendix F)

3 TS profile (See Appendix F)

4-11 Contents ID : eight-character EBCDIC symbolic name that represents implementation and installation dependent information about the SSCP issuing the response to ACTCDRM; eight blanks is the value used if no information is to be conveyed (This field could be used to provide a check for a functional and configurational match between the SSCPs).

12-17 SSCP ID ; a six-byte field that includes the ID of the SSCP issuing the ACTCDRM response ; the first four bits specify the format for the remaining bits :
bits 0-3, 0000
bits 4-7, physical unit type (see Appendix F) of the node containing the SSCP
bits 8-47, implementation and installation dependent binary identification

18 TS Usage
bits 0-1, reserved
bits 2-7, secondary CPMGR receive pacing count (zero means no pacing of requests flowing to the secondary)

5

ACTLU

RU Format bytes

0 X'0D' request code

1 Type activation selected :
X'01' = cold

2 bits 0-3, FM profile : same as the corresponding request
bits 4-7, TS profile : same as the corresponding request

3 Reserved

4 Maximum RU size sent on the normal flow by either half-session : if bit 0 is set to zero, then no maximum is specified and the remaining bits 1-7 are ignored; if bit 0 is set to one, then the byte is interpreted as

X'ab' = a *2**b (Notice that, by definition, a 8 and therefore X'ab' is a normalized floating point representation).

5-6 LU Capabilities

5 bit 0, character-coded capability :
- 0 the SSCP may not send unsolicited character-coded requests; a solicited request is a reply request or a request that carries additional error information to supplement a previously send negative response
- 1 the SSCP may send unsolicited character-coded requests

bit 1, field-formatted capability :
- 0 the SSCP may not send unsolicited field-formatted requests
- 1 the SSCP may send unsolicited field-formatted requests

bit 2, LU readiness :
- 0 BIND can be received
- 1 BIND and other requests cannot yet be processed ; LUSTAT will be sent to signal LU readiness

5-6 bits 3-15, reserved

7 Reserved

Note : A two-byte response can be sent ; it means maximum RU size = 256 bytes and bytes 5-7 = X'000000'.

ACTPU

RU Format bytes

0 X'11' request code

1 bits 0-1, reserved

bits 2-3, format of response :
- 00 format 0
- 01 format 1 (defined only for PU.T1s and PU.T2s)

bits 4-7, type activation selected :
- X'1' cold
- X'2' ERP

2-9 Contents ID : eight-character EBCDIC symbolic name of the load module currently operating in the node ; eight blanks is the default value (Note : END of Format 0; Format 1 continues below).

10-11 Reserved

12 Control vector as described in the Appendix A

Note : The following vector key is used in RSP(ACTPU) : X'07'

CDINIT

```
RU Format bytes
               0-2 X'818641' NS header
               3   Format
                   bits 0-3, 0000 Format 0 : used when
                                  type is I, I/Q, or Q
                             0001 Format 1 : used when
                                  Type is DQ
                   bits 4-7, reserved
               4   Procedure Status:
                   bits 0-3, reserved
                   bits 4-7, Status at SSCP receiving
                             CDINIT
                             0000 reserved
                             0001 initiate successful-
                                  proceed
                             0010 initiate successful-
                                  queued
                             0011 dequeued- successful
                             0100 dequeued-
                                  unsuccessful
               5-6 Network address of DIU for CDINIT;
                   for CDINIT(DQ), it is the network
                   address of the LU associated with
                   the SSCP receiving the CDINIT (DQ)
                   request
               7   LU status for LU associated with the
                   SSCP receiving the CDINIT request :
                   bit 0, reserved
                   bit 1, 0 LU is unavailable
                          1 LU is available
                   bits 2-3, (reserved if LU is
                               available)
                             00 LU session count
                                exceeded
                             01 reserved
                             10 LU is not enabled (not
                                accepting new sessions)
                             11 reserved
                   bit 4, 0 existing SSCP to LU path
                          1 no existing SSCP to LU path
                   bit 5, reserved
                   bits 6-7, 00 reserved
                             01 LU is PLU
                             10 LU is SLU
                             11 reserved
```

CDTERM

```
RU Format bytes
               0-2 X'818643' Ns header
               3   bits 0-3, 0000 Format 0 (only value
                                  defined)
                   bits 4-7, reserved
               4   DLU status
                   bits 0-5, reserved
                   bits 6-7, 00 not applicable (queue
                                purge)
                             01 DLU is PLU
                             10 DLU is SLU
                             11 reserved
               5-6 Network address of DLU
```

5

DSRLST

```
RU Format bytes
          0-2 X'818627' Ns header
          3-n Control list entry data for list
              type :
              X'01' (only value defined) (see
              Appendix A for Control list format)
```

DUMPINIT

```
RU Format bytes
          0-2 X'010206' Ns header
          3-n Dump data
```

DUMPTEXT

```
RU Format bytes
          0-2 X'010207' Ns header
          3-n Dump data
```

INIT-OTHER-CD

```
RU Format bytes
          0-2 X'818640' Ns header
          3   Format
              bits 0-3, 0000 format 0 (only value
                             defined)
              bits 4-7, reserved
          4   Procedure status
              bits 0-3, Status for SSCP (LU1)
                        0000 reserved
                        0001 initiate successful-
                             proceed
                        0010 initiate successful-
                             queued
                        0011 dequeued- successful
                        0100 dequeued-
                             unsuccessful
              bits 4-7, Status for SSCP (LU2)
                        0000 reserved
                        0001 initiate successful-
                             proceed
                        0010 initiate successful-
                             queued
                        0011 dequeued- successful
                        0100 dequeued-
                             unsuccessful
          5   LU1 status
              bit 0, reserved
              bit 1, 0 LU1 is unavailable
                     1 LU1 is available
              bits 2-3 (reserved if LU1 is
                       available)
                       00 LU1 session count
                          exceeded
                       01 reserved
                       10 LU1 is not enabled (not
                          accepting new sessions)
                       11 reserved
              bit 4, 0 existing SSCP to LU path
                     1 no existing SSVP to LU path
              bit 5, reserved
```

```
            bits 6-7, 00 reserved
                      01 LU1 is PLU
                      10 LU1 is SLU
                      11 reserved
        6   LU2 Status :
            bit 0, reserved
            bit 1, 0 LU2 is unavailable
                   1 LU2 is available
            bits 2-3, (reserved if LU2 is
                      available)
                      00 LU2 session count
                         exceeded
                      01 reserved
                      10 LU2 is not enabled (not
                         accepting new sessions)
                      11 reserved
            bit 4, 0 existing SSCP to LU path
                   1 no existing SSCP to LU path
            bit 5, reserved
            bits 6-7, 00 reserved
                      01 LU2 is PLU
                      10 LU2 is SLU
                      11 reserved
```

<u>RNAA</u>

```
RU Format bytes

        0-2 X'410210' Ns header
        3-5 Reserved
        6   Number of network addresses returned
        7-8 Network address : SPU address
            assigned (if bytes 3-4 of the RNAA
            request contained a link network
            address), or an LU network address
            assigned (if bytes 3-4 of the RNAA
            request contained an SPU network
            address)
        9-n Additional network addresses
            assigned (two-byte multiples) in the
            same format as bytes 7-8 ; the order
            of the network addresses returned
            corresponds to the order of the
            entries (bytes 7-n) in the RNAA
            request
```

<u>STSN</u>

```
RU Format bytes
        0   X'A2' request code
        1   bits 0-1, result code for S-P action
                      code in the request
                      (related data in bytes
                      2-3)
            bits 2-3, result code for P-S action
                      code in the request
                      (related data in bytes
                      4-5)
                Note 1 : Values for either
                result code are :
              * For set or ignore action code :
                 01 ignore (other values
                    reserved) ; appropriate
                    bytes 2-3 or 4-5 reserved
```

5

* For sense action code :
  - 00 for LU type 0 : user-defined meaning ; for all other LU types : reserved (appropriate bytes 2-3 or 4-5 reserved)
  - 01 reserved
  - 10 secondary end user (or NAU services manager) does not maintain user sequence numbers or cannot return a valid user sequence number (appropriate bytes 2-3 or 4-5 reserved)
  - 11 user sequence number, as known at the secondary, in bytes 2-3 or 4-5, as appropriate
* For set and test action code :
  - 00 for LU type 0 : user-defined meaning ; for all other LU types : reserved (appropriate bytes 2-3 or 4-5 reserved)
  - 01 value received in STSN request equals the user sequence number value as known at the secondary (appropriate bytes 2-3 or 4-5 return the secondary's value for the user sequence number)
  - 10 secondary end user (or NAU services manager) does not maintain user sequence numbers or cannot perform the requested test on the user sequence number (appropriate bytes 2-3 or 4-5 reserved)
  - 11 value received in STSN request does not equal the user sequence number value as known at the secondary (appropriate bytes 2-3 or 4-5 return the secondary's value for the user sequence number)

bits 4-7, reserved

2-3 Secondary-to-primary normal-flow sequence number data to support S-P result code, or reserved (see Note 1 above)

4-5 Primary-to-secondary normal flow sequence number data to support P-S result code or reserved (see Note 1 above)

<u>Note 2</u> : Where the STSN request specified as action codes two 'sets', two 'ignores', or a combination or 'set' and 'ignore' the positive response

RU consists of one byte X'A2'
(the STSN request code).

2 bits 0-3, FM profile : same as the corresponding request
bits 4-7, TS profile : same as the corresponding request

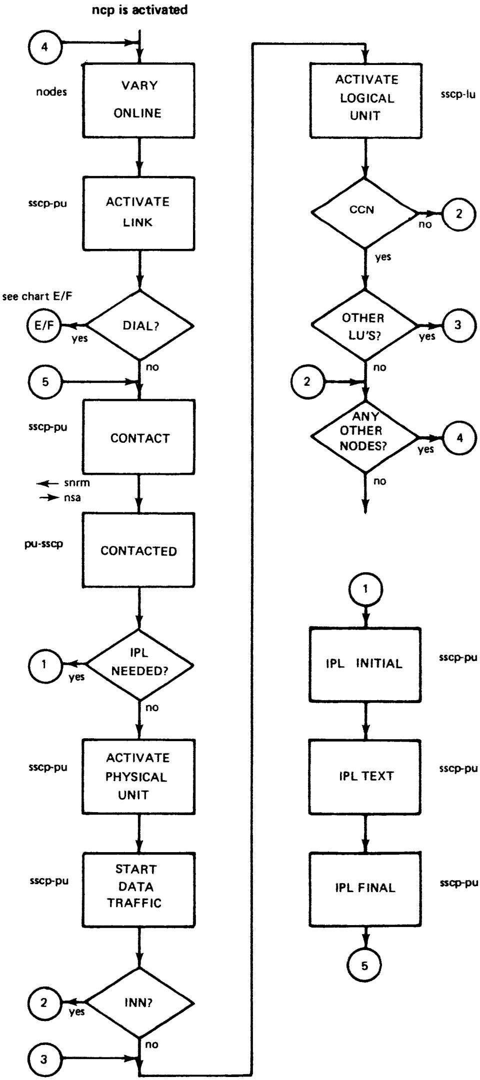
3 Reserved

4 Maximum RU size sent on the normal flow by the secondary half-session : if bit 0 is set to zero, then no maximum is specified and the remaining bits 1-7 are ignored ; if bit 0 is set to one, then the byte is interpreted as X'ab' = a*2**b (Notice that, by definition, a±8 and therefore X'ab' is a normalized floating point representation).

5

SECTION 6: PROCEDURES

VARY ONLINE



6

VARY OFFLINE

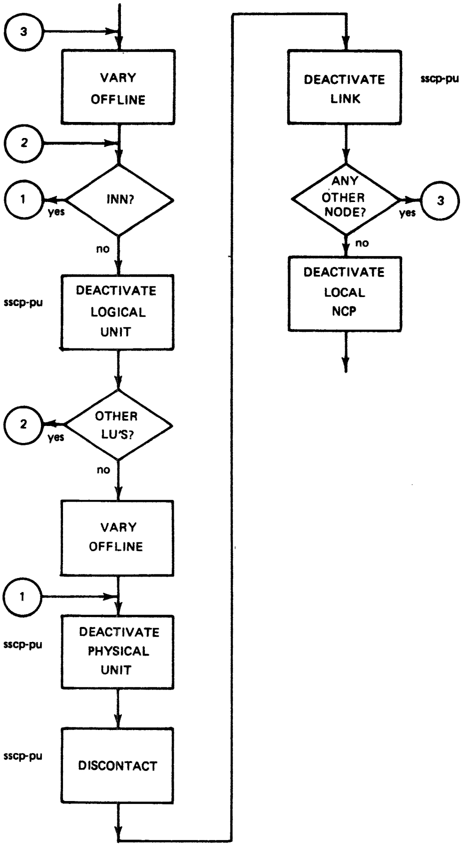


chart B

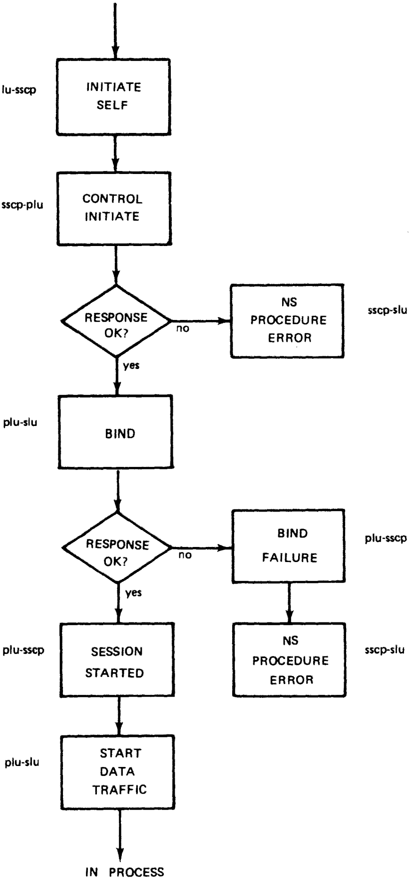

lu-sscp
INITIATE SELF
sscp-plu
CONTROL INITIATE
RESPONSE OK?
no
NS PROCEDURE ERROR
sscp-slu
yes
plu-slu
BIND
RESPONSE OK?
no
BIND FAILURE
plu-sscp
yes
plu-sscp
SESSION STARTED
NS PROCEDURE ERROR
sscp-slu
plu-slu
START DATA TRAFFIC
IN PROCESS

chart C

SESSION TERMINATION

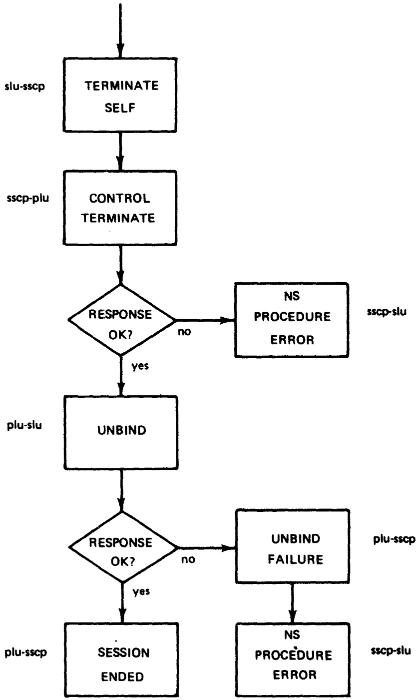


chart D

DIALING IN

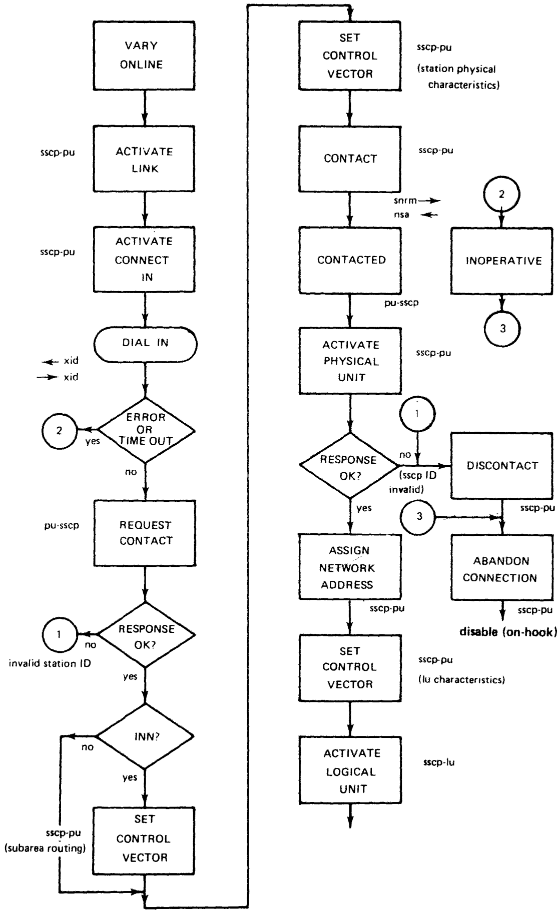


chart E

6

DIALING OUT

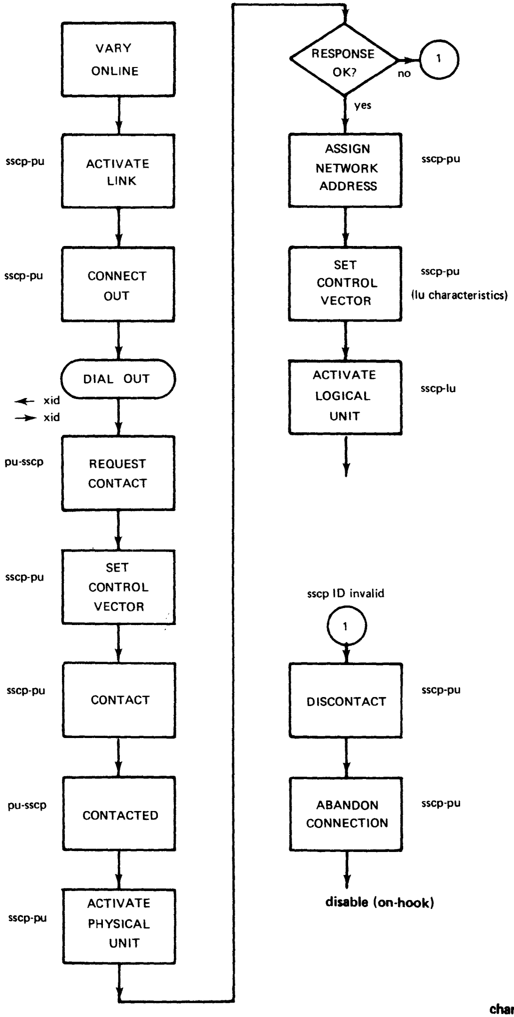


chart F

FINAL ON-HOOK SEQUENCE

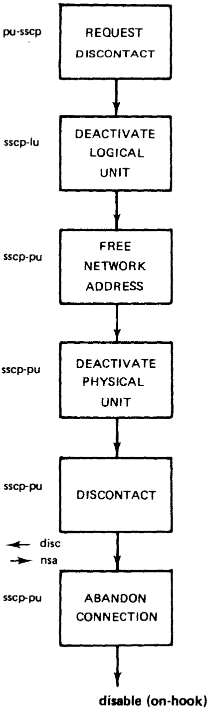


chart G

SECTION 7: APPENDIX

CONTROL VECTOR FORMATS

When sent on SET CONTROL VECTOR, or the response to SENSE CONTROL VECTOR, the formats below are preceeded by a two-byte prefix and a one-byte request code.

1. DATE-TIME

Key = X'01'

Bytes	Description
3-4	PU network address
5	Key = X'01'
6-17	MM/DD/YY.ddd (date)
18-25	HH.MM.SS. (time)

date and time fields are EBCDIC characters.

2. SUBAREA ROUTING

Key = X'02'

Bytes	Description
3-4	Network address of the link to be used for routing to the Subarea specified in Byte 6
5	Key = X'02'
6	Subarea address (left justified)

Note : This control vector supports subarea addresses no greater than 8 bits, and links which only attach single remote subareas. When additional requirements are established, new control vectors will be defined.

3. SDLC SECONDARY STATION

Key = X'03'

Bytes	Description
3-4	Network address of PU at station
5	Key = X'03
6	Reserved
7	PU type identifier for SPU : bit 0-4 : reserved bit 5-6 : 01 : PU.T2 10 : PU.T1 bit 7 : reserved
8	Type modifier
9	SDLC BTU send limit
10	Maximum contiguous BTUs
11	Error retry indicator
12-13	Link error recovery control information
14-15	Max segment length (bytes)

7

4. LU

Key = X'04'

Bytes	Description
3-4	LU network address
5	Key = X'04'
6	Local address form of LU network address
7	secondary CPMGR's receive pacing count
8	Reserved, set to a value of 1
9	Priority : X'01' : low priority (batch) X'02' : high priority (interactive)

5. CHANNEL

Key = X'05'

Bytes	Description
3-4	Link network address of the channel
5	Key = X'05'
6-7	Channel delay : minimum interval between successive inbound transmissions. (Binary in tenths of second.)

6. NS RU USAGE

Key = X'07'

Bytes	Description
3-4	Network address
5	Key = X'07'
6	Maintenance services profile : X'00' : Profile 0 : no maintenance services RUs are supported by the PU on the SSCP-to-PU flow. X'01' : Profile 1 : the following maintenance services RU is supported by the PU on the SSCP-to-PU flow : REQMS.

FUNCTION MANAGEMENT PROFILES

FM profiles 0, 2 through 5, and 18 (referred to in ACTPU, ACTLU and BIND) and 16 (used for PU-PU sessions, but not referred to in any RU), and 17 (referred to in ACTCDRM) are described here. All other profile numbers are reserved.

Note :If the FM usage field specifies a value for a parameter, that value is used unless it conflicts with a value specified by the FM profile. The FM profile overrides the FM Usage field.

FM PROFILE 0

Profile 0 specifies the following session rules :

Primary and secondary half-sessions use immediate control mode and immediate response mode.
Only single-RU chains allowed
No compression
Primary half-session sends no DFC RUs
Secondary half-session may send LUSTAT
NS headers are allowed.
No FM headers
No brackets
No alternate code
Normal flow send/receive mode is HDX-CONT.
Secondary half-session wins contention
Primary half-session is responsible for recovery

FM PROFILE 1

Profile 1 is reserved.

7

FM PROFILE 2

Profile 2 specifies the following session rules :

Primary LU half-session uses delayed control mode
Secondary LU half-session uses delayed request mode
Secondary LU half-session uses immediate response mode
Only single-RU chains allowed
Secondary LU half-session requests indicate no-response
No compression
No DFC RUs
No NS or FM headers
Secondary LU half-session is first speaker if brackets are used
Bracket termination rule 2 is used if brackets are used
Primary LU half-session will send EB
Secondary LU half-session will not send EB
Normal-flow send/receive mode is FDX
Primary LU half-session is responsible for recovery

The FM usage fields defining the options for Profile 2 are :

Primary request mode selection
Primary chain response protocol (no-response may not be used)
Brackets
Alternate code

FM PROFILE 3

Profile 3 specifies the following session rules :

Primary LU half-session and secondary LU half-session use delayed control mode and immediate response mode.
No NS headers
Primary LU half-session and secondary LU half-session support the following DFC function :

- CANCEL
- SIGNAL
- LUSTAT (allowed secondary-to-primary only)
- CHASE
- SHUTD
- SHUTC
- RSHUTD
- BID and RTR (allowed only if brackets are used)

The FM usage fields defining the options for Profile 3 are :

Chaining use (primary and secondary)
Request mode selection (primary and secondary)
Chain response protocol (Primary and secondary)
Compression indicator (primary and secondary)
Send EB indicator (Primary and secondary)
FM header usage
Brackets
Bracket termination rule
Alternate Code Set Allowed indicator
Normal-flow send/receive mode
Recovery responsibility
First speaker (for bracket protocol)
Contention resolution

FM PROFILE 4

Profile 4 specifies the following session rules :

Primary LU half-session and secondary LU half-session use delayed control mode and immediate response mode.
No NS Headers.
Primary LU half-session and secondary LU half-session support the following DFC functions :

- CANCEL
- SIGNAL
- LUSTAT
- QEC
- QC
- RELQ
- SHUTD
- SHUTC
- RSHUTD
- CHASE
- BID and RTR (allowed only if brackets are used)

The FM usage fields defining the options for Profile 4 are :

Chaining use (primary and secondary)
Request mode selection (primary and secondary)
Chain response protocol (primary and secondary)
Compression indicator (primary and secondary)
Send EB indicator (primary and secondary)
FM header usage
Brackets
Bracket termination rule
Alternate Code Set Allowed indicator
Normal-flow send/receive mode
Recovery responsibility
First speaker (for bracket protocol)
Contention resolution

FM PROFILE 5

Profile 5 specifies the following session rules :

Only single-RU chains allowed
Primary half-session uses delayed request mode.
Secondary half-session uses delayed request mode and delayed response mode
Primary half-session chains indicate definite response.
Secondary half-session chains indicate no-response.
No compression
No DFC RUs
NS headers are allowed
No FM headers
No brackets
No alternate code
Normal-flow send/receive mode is FDX
Primary half-session is responsible for recovery

FM PROFILE 16

Profile 16 specifies the following session rules :

No DFC RUs
No FMD RUs

FM PROFILE 17

Profile 17 specifies the following session rules :

Only single-RU chains allowed
Primary and secondary half-sessions use delayed request mode and delayed response mode
Primary and secondary half-session chains indicate definite response
No DFC RUs
All FMD RUs include NS headers
No FM headers
No compression
No brackets
No alternate code
Normal-flow send/receive mode is FDX
Sender of request is responsible for recovery.

FM PROFILE 18

Profile 18 specifies the following session rules :

Primary LU half-session and secondary LU half-session use delayed control mode and immediate response mode.
No NS headers.
Primary LU half-session and secondary LU half-session support the following DFC functions :

- CANCEL
- SIGNAL
- LUSTAT
- BIS and SBI (allowed only if brackets are used)
- RSHUTD
- CHASE
- BID and RTR (allowed only if brackets are used)

The FM usage fields defining the options for Profile 18 are :

Chaining use (primary and secondary)
Request mode selection (primary and secondary)
Chain response protocol (primary and secondary) Compression indicator (primary and secondary)
Send EB indicator (primary and secondary)
FM header usage
Brackets
Bracket termination rule
Alternate Code Set Allowed indicator
Normal-flow send/receive mode
Recovery responsibility
First speaker (for bracket protocol)
Contention resolution

The following table specifies which FM profiles may be used with each type of session.

FM PROFILE	SESSION TYPE				
	(SSCP, PU)	(SSCP, LU)	(LU,LU)	(PU,PU)	(SSCP, SSCP)
0	yes	yes	no	no	no
2	no	no	yes	no	no
3	no	no	yes	no	no
4	no	no	yes	no	no
5	yes	no	no	no	no
16	no	no	no	yes	no
17	no	no	no	no	yes
18	no	no	yes	no	no

TS profiles 1 through 5 (referred to in ACTPU, ACTLU, and BIND) 16 (used for PU-PU sessions, but not referred to in any RU), and 17 (referred to in ACTDRM) are described here. All other profile numbers are reserved.

TS PROFILE 0

Profile 0 is reserved.

TS PROFILE 1

Profile 1 specifies the following session rules :

No pacing.
Identifiers rather than sequence numbers are used on the normal flow.
SDT, CLEAR, RQR, and STSN are not supported.
No maximum RU sizes for the normal flow are specified.

This profile does not require the use of the TS Usage field.

TS PROFILE 2

Profile 2 specifies the following session rules :

Primary-to-secondary and secondary-to-primary normal flows are paced.
Sequence numbers are used on the normal flows.
CLEAR is supported.
SDT, RQR, and STSN are not supported.

The TS Usage subfields defining the options for this profil are :

Pacing counts
Maximum RU sizes on the normal flows

TS PROFILE 3

Profile 3 specifies the following session rules :

Primary-to-secondary and secondary-to-primary normal flows are paced.
Sequence numbers are used on the normal flows.
CLEAR and SDT are supported.
RQR and STSN are not supported.

The TS Usage subfields defining the options for this profile are :

Pacing counts
Maximum RU sizes on the normal flows

TS PROFILE 4

Profile 4 specifies the following session rules :

Primary-to-secondary and secondary-to-primary normal flows are paced.
Sequence numbers are used on the normal flows.
SDT, CLEAR, RQR, and STSN are supported.

The TS Usage subfields defining the options for this profile are :

Pacing counts
Maximum RU sizes on the normal flows.

TS PROFILE 5

Profile 5 specifies the following session rules :

No pacing.
Sequence numbers are used on normal flows
SDT is supported
CLEAR, RQR, and STSN are not supported.
No maximum RU sizes for the normal flows are specified.

TS PROFILE 16

Profile 16 specifies the following session rule :

Only NC RUs are supported.

The following table specifies which TS profile may be used with each type of session.

TS PROFILE 17

Profile 17 specifies the following session rules :

Primary-to-secondary and secondary-to-primary normal flows are paced.
Identifiers rather than sequence numbers are used in the normal flows.
SDT, CLEAR and RQR are supported.
STSN is not supported.
No maximum RU sizes for the normal flow are specified.

The TS Usage subfields defining the options for this profile are :

Pacing counts

TS PROFILE	SESSION TYPE				
	(SSCP, SSCP)	(SSCP, PU)	(SSCP, LU)	(LU,LU)	(PU,PU)
1	no	yes	yes	no	no
2	no	no	no	yes	no
3	no	no	no	yes	no
4	no	no	no	yes	no
5	no	yes	no	no	no
16	no	no	no	no	yes
17	yes	no	no	no	no

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PHYSICAL UNIT TYPES

The following PU types are defined (all others are reserved) :

PU Type 1 (PU.T1)

For all PIUs sent and received, the transmission header (TH) format is FID3.

PU type 2 (PU.T2)

For all PIUs sent and received, the transmission header (TH) format is FID2.

PU Type 3

This type is reserved.

PU type 4 (PU,T4)

A PU.T4 is at a node that has intermediate and/or boundary function.

The TH format is either :
* FID0 or FID1 for all PIUs transmitted between the PU.T4 and adjacent PU.T4/5s.
* FID2 for all PIUs transmitted between the PU.T4 and adjacent PU.T2s.
* FID3 for all PIUs transmitted between the PU.T4 and adjacent PU.T1s.

PU Type 5 (PU.T5)

A PU.T5 is at a node that has intermediate and/or boundary function and also contains the SSCP.

The TH format is either :
* FID0 or FID1 for all PIUs transmitted between the PU.T5 and adjacent PU.T4s.
* FID2 for all PIUs transmitted between the PU.T5 and adjacent PU.T2s.
* FID3 for all PIUs transmitted between the PU.T5 and adjacent PU.T1s.

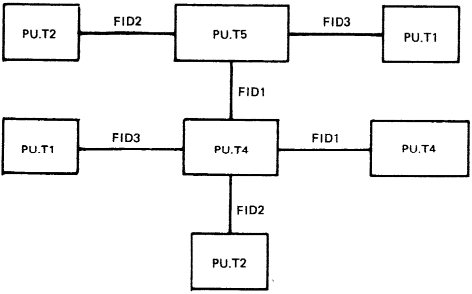

Figure 1: Nodes interconnections within a Single-SSCP network

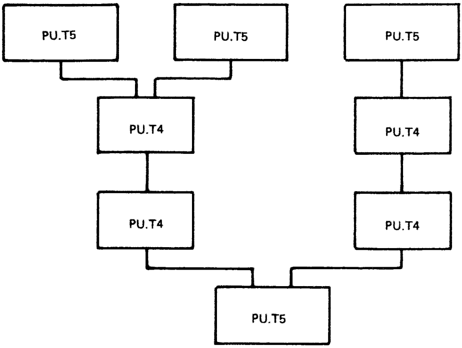

Figure 2: Nodes interconnections within a Multiple-SSCP network (PU.T1 and PU.T2 nodes are not shown. They may be connected to any PU.T5 or PU.T4)

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LOGICAL UNIT TYPES

A LU type is the architectural view of an LU that one obtains by simultaneously observing the sequences of commands, requests and replies that flow between the LU and the transmission subsystem, in one side, and the LU and the End-User in the other side.

LU types provide a firm functional definition so that PLUs and SLUs may be assured matching support.

The following LU types are defined now :

LU type 0

- For LUs created before the Bind structure based on LU type was invented.
There is no architecture structure. Each implementation of LU type 0 defines its own structure to meet its own needs.

LU type 1

- For operator oriented presentation services.

LU type 2

- For LUs structure oriented to the support of a single keyboard display device (3270)

LU type 3

- For LUs structure oriented to the support of a single printer device (328x)

LU type 6

- Interface for use between two application subsystems (e.g. IMS to CICS)

The control lists are defined, by type, as follows (with zero-origin indexing of the list bytes ; see the individual RU description for the actual displacement within the RU) :

Type X'01' : LU Status Control List Entry

```
Bytes

 0    Lu status

      bit 0 : reserved
      bit 1 : 0 LU is unavailable
              1 LU is available
      bits 2-3 : (if LU is unavailable)
                   00 LU session count exceeded
                   01 LU is being taken down
                      (not accepting new sessions)
                   10 LU is not enabled
                      (not accepting new sessions)
                   11 reserved
      bit 4 : 0 existing SSCP to LU path
              1 no existing SSCP to LU path
      bits 5-7 : reserved

 1    LU information

      bit 0 : 0 LU does not reside in a PU.T5 node
              1 LU resides in a PU.T5 node
      bits 1-6 : reserved
      bit 7 : 0 LU is accepting INITIATEs/logons
              1 LU is temporarily not accepting
                INITIATEs/logons

2-3   Session count (range : 0-65535)
```

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SECTION 8 - CONTENTS

SECTION 8: ABBREVIATIONS

BB	-	BEGIN BRACKET
BETB	-	BETWEEN BRACKET STATE
BIU	-	BASIC INFORMATION UNIT
BLU	-	BASIC LINK UNIT
BNN	-	BOUNDARY NETWORK NODE
BTU	-	BASIC TRANSMISSION UNIT
CCN	-	CLUSTER CONTROL NODE
CD	-	CHANGE DIRECTION
CPM	-	CONNECTION POINT MANAGER
DAF	-	DESTINATION ADDRESS FIELD
DCF	-	DATA COUNT FIELD
DFC	-	DATA FIELD CONTROL
DLC	-	DATA LINK CONTROL
DR	-	DEFINITE RESPONSE
EB	-	END BRACKET
EFI	-	EXPEDITED FLOW INDICATOR
ERI	-	EXCEPTION RESPONSE INDICATOR
EU	-	END-USER
FCS	-	FRAME CHECK SEQUENCE
FDX/MP PRI	-	FULL DUPLEX/MULTIPOINT PRIMARY
FDX/MP SEC	-	FULL DUPLEX/MULTIPOINT SECONDARY
FDX/PP	-	FULL DUPLEX/POINT-TO-POINT
FID	-	FORMAT IDENTIFICATION FIELD
FM	-	FUNCTION MANAGEMENT
HDX	-	HALF-DUPLEX
HN	-	HOST NODE
INB	-	IN BRACKET
INN	-	INTERMEDIATE NETWORK NODE
LSDI	-	LOCAL SESSION IDENTIFIER
LU	-	LOGICAL UNIT
MPF	-	MAPPING FIELD
NAU	-	NETWORK ADDRESSABLE UNIT
NC	-	NETWORK CONTROL
NRZI	-	NON RETURN TO ZERO INVERTED
OAF	-	ORIGIN ADDRESS FIELD
PC	-	PATH CONTROL
PCID	-	PROCEDURE CORRELATION IDENTIFICATION
PI	-	PACING INDICATOR
PIU	-	PATH INFORMATION UNIT
PU	-	PHYSICAL UNIT
QRI	-	QUEUED RESPONSE INDICATOR
RH	-	REQUEST/RESPONSE HEADER
RTR	-	READY TO RECEIVE
RU	-	REQUEST/RESPONSE UNIT
SC	-	SESSION CONTROL
SDLC	-	SYNCHRONOUS DATA LINK CONTROL
SNA	-	SYSTEMS NETWORK ARCHITECTURE
SNF	-	SEQUENCE NUMBER FIELD
SSCP	-	SYSTEM SERVICES CONTROL POINT
STSN	-	SET AND TEST SEQUENCE NUMBER
TC	-	TRANSMISSION CONTROL
TH	-	TRANSMISSION HEADER
TN	-	TERMINAL NODE
TS	-	TRANSMISSION SUBSYSTEMS
URC	-	USER REQUEST CORRELATION

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PART 2

MAINTENANCE AIDS

SECTION 9: SNA NETWORKS

SECTION 10: VTAM TRACES SNA 2 AND SNA 3 - ACF/TAP

SECTION 11: NCP LINE TRACE

SECTION 12: T O L T E P

SECTION 13: 370X ON-LINE TESTS

SECTION 14: SDLC LINK TEST1 (LTE)

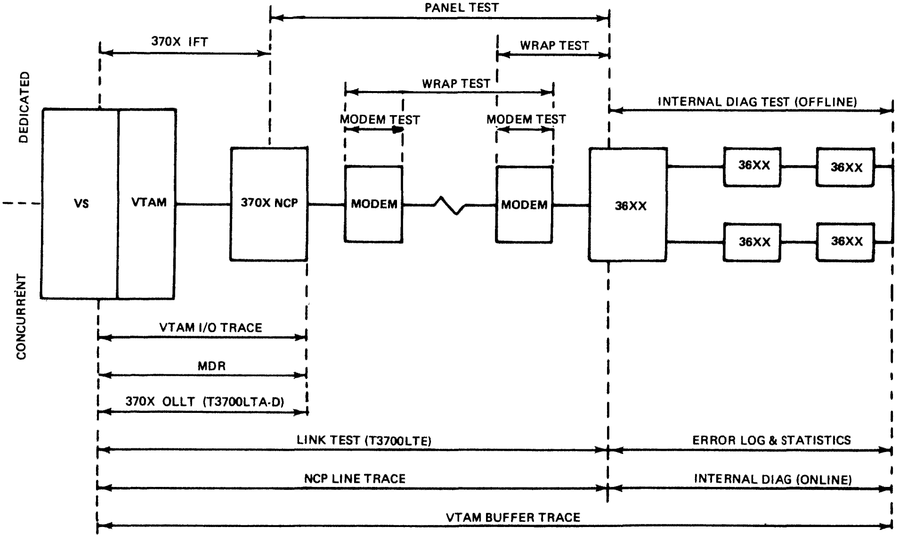
SECTION 15: MISCELLANEOUS DATA RECORDER (MDR)

SECTION 21: 3791 DIAGNOSTICS - SIRF

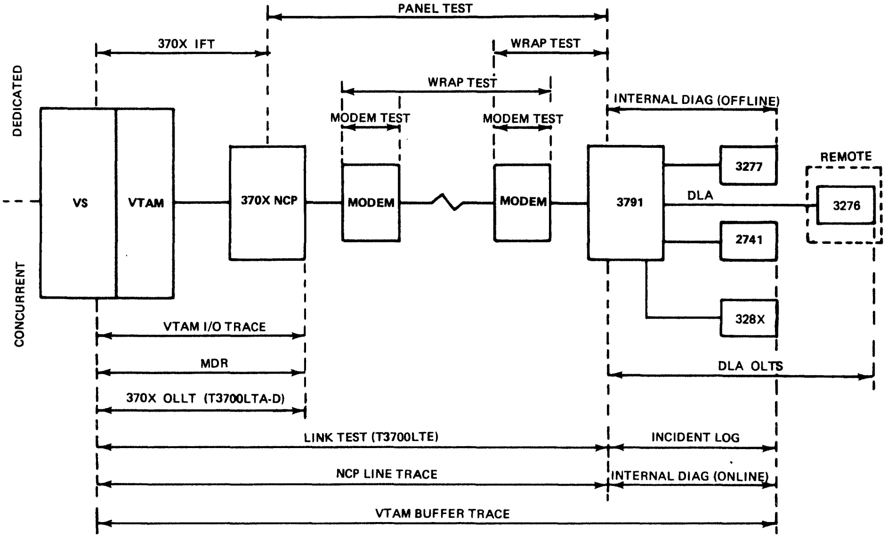
SECTION 23: 3274/6/8 DIAGNOSTICS

SECTION 22: 3271/5 DIAGNOSTICS

SECTION 9: SNA NETWORKS

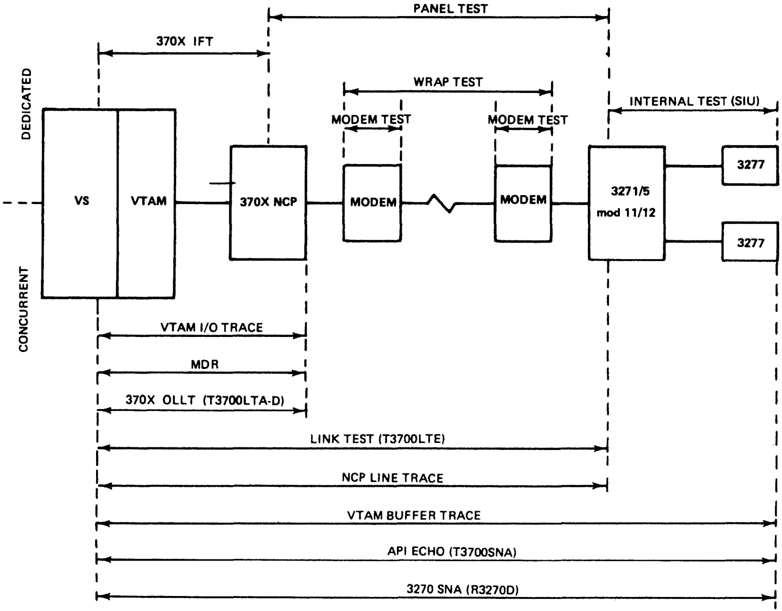


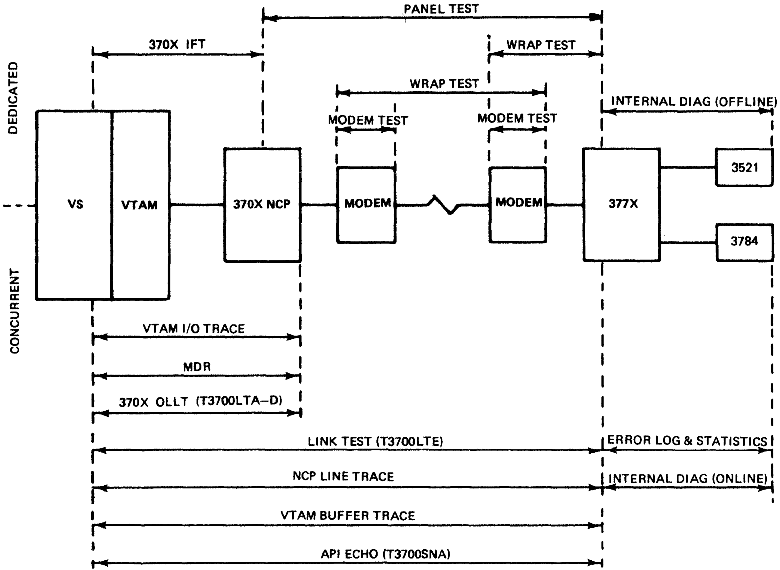
SNA NETWORK WITH 3651 AND 3601 / 3602



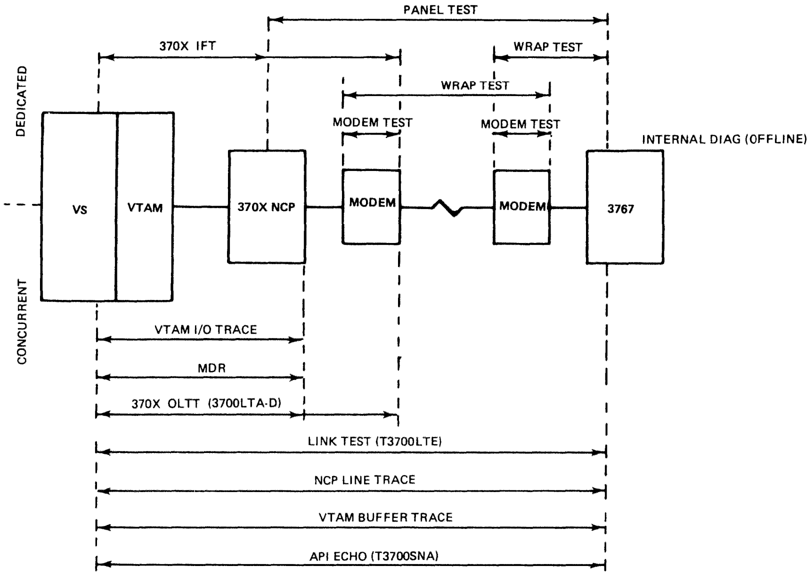
SNA NETWORK WITH 3791

SNA NETWORK WITH 3271/5

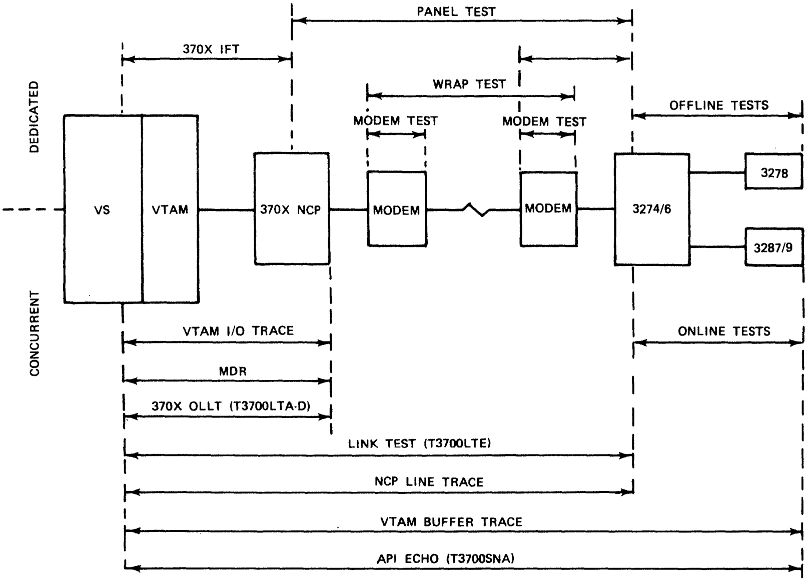




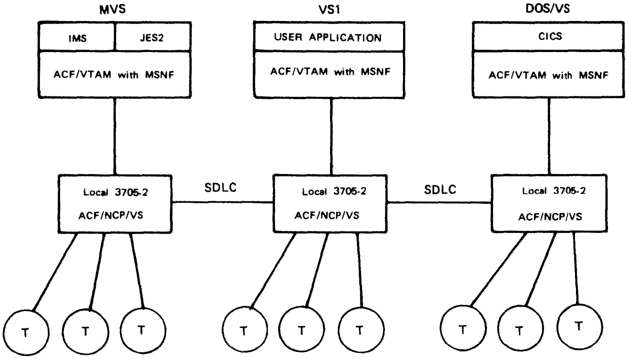
SNA NETWORK WITH 377X


PANEL TEST
370X IFT
WRAP TEST
WRAP TEST
MODEM TEST
MODEM TEST
INTERNAL DIAG (OFFLINE)
DEDICATED
VS
VTAM
370X NCP
MODEM
MODEM
3767
CONCURRENT
VTAM I/O TRACE
MDR
370X OLTT (3700LTA-D)
LINK TEST (T3700LTE)
NCP LINE TRACE
VTAM BUFFER TRACE
API ECHO (T3700SNA)

SNA NETWORK WITH 3274/6



SNA-3 NETWORK



MSNF — MultiSystem Networking Facility

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SECTION 10: VTAM TRACES SNA 2 AND SNA 3 - ACF/TAP

VTAM will supply the following traces :

1) NCP line trace
2) Buffer trace
3) I/O trace
4) Internal trace (DOS only)

These VTAM facilities are always included in VTAM and do not require to be specified during VTAM or System generation.

The OS GTF and the DOS PDAID (PDAID=VT) may be used to trace the above events.

For OS, the three VTAM traces can be traced by use of GTF. The VTAM trace facility requires the following GTF options :

- RNIO
- IO or IOP
- USR

TIME=YES should be specified in the GTF start command.

1) LINE TRACE

The line trace facility of VTAM allows a user to activate or deactivate the NCP trace of a particular line and to record the NCP trace records on the VTAM trace data set.

For further information, refer to NCP Line Trace section in this handbook.

Activating/Deactivating Line Trace (OS/VS) (see figure 3)

```
{MODIFY} PROCNAME, {TRACE   },TYPE=LINE,ID=name
{F     }           {NOTRACE }
```

Activating/Deactivating Line Trace (DOS/VS)

```
{MODIFY} NET, {TRACE   },TYPE=LINE,ID=name
{F     }      {NOTRACE }
```

2) BUFFER TRACE

The buffer trace provides a trace of buffer contents for any of these types of addressable nodes : component, terminal (which may be a logical unit), cluster control unit, or NCP. A buffer trace is a means of identifying all changes to data caused by VTAM. As a message originating from or destined to an application program enters VTAM control, it is placed in a trace record and written to auxiliary storage. Included in the record are : node name of the application program, resource ID of the terminal, and message data.

Buffer Trace Record - OS/VS (see fig 1)

USRFD	FLAG	COMPONENT	DIRECTION	ANODE	DATA
5	3	5	3	14	80

REMOTE	DNODE	DATA
6	14	80

USRFD
identifies the trace record as a GTF USR trace record.

FLAG
Is X'FEF' for a TPIOS trace record, or X'FF1' for a control layer trace record.

COMPONENT
Is either TPIOS, or C/L for control layer, indicating where the data was traced.

DIRECTION
Is either IN or OUT, indicating the traced information was inbound or outbound at the indicated component.

ANODE
Is the name of the application node.

DATA
Is an FDB, FSB, TH/RH, or buffer text. If the data is hexadecimal buffer text, the EBCDIC translation appears at the end of the line. There may be more than one line of data in a single trace record.

REMOTE/LOCAL
Appears on TPIOS trace records, indicating the traced data was for a remote or local service.

DNODE
Is the name of the destination node.

Activating/Deactivating Buffer Trace (OS/VS) (see figure 3)

```
{MODIFY} PROCNAME, { TRACE   } ,TYPE=BUF,ID=name
{F     }           { NOTRACE }
```

Buffer trace record DOS/VS (see figure 2)

TYPE = BUF	DEST	DATE	TIME	LOST RCDS	APPLICATION NAME	DIRECTION
9	26	11	13	16	22	13

TYPE
Specifies the type of trace record in the form TYPE=BUF.

DEST
Is the node name or device CID (communication identifier) of the destination in the form DEST.NODENAME=cccccccc or DEST.CID=hhhhhhhh. The node name is used if it can be resolved, otherwise the CID is given. The CID is described in the VTAM Macro Language Reference.

DATE
Is the date of the trace, in the form DATE=yy.ddd. where yy represents the year and ddd represents the day (using January first as day 1).

TIME
Is the time of the trace in the form TIME=hh.mm.ss, where hh represents the hours, mm represents minutes, and ss represents second.

LOST RCDS
Is the number of records lost since the previous first I/O record because of the inability of the trace facility to obtain a VTAM buffer. The count is in the form LOST RCD CNT=ccc.

APPLICATION NAME
Is the name of the application program in the form APL.NODENAME=cccccccc.

DIRECTION
Is the direction of the record : INBOUND or OUTBOUND.

The second and subsequent parts of the buffer trace record show the contents of the buffer. Each line contains 32 bytes of user data in standard dump format: that is, eight groups of eight hexadecimal digits followed by the equivalent 32 EBCDIC characters.

Buffer Trace Record

Second part

BUFFER	BUFFER DATA IN HEX	BUFFER DATA IN EBCDIC
8	82	32

BUFFER=
Is a label in the form BUFFER=.

BUFFER DATA IN HEX
Is 32 or fewer bytes of the user's data in hexadecimal form. Each subsequent line contains following 32-byte segments of the user's data. Confidential data is not recorded. When the trace facility detects confidential data (CONFTXT option of the application program's NIB macro instruction), the second record of the buffer trace contains ***CONFIDENTIAL DATA***.

BUFFER DATA IN ECBDIC
Is 32 or fewer EBCDIC characters equivalent to the 64 hexadecimal digits contained at the left of this same trace record.

Trace Print Utility

When the trace print utility is activated, all tracing is suspended until the printout is completed. While the print utility is running, all trace records are discarded : upon completion, all active traces start again.

Activating/Deactivating Buffer Trace (DOS/VS)

```
{MODIFY} NET, { TRACE   },TYPE=BUF,ID=name
{F     }      { NOTRACE }
```

3) I/O TRACE

The I/O trace collects information for a local or remote NCP or for remote devices attached to an NCP.

The data collected is variable, it depends on the type of node being traced.

I/O Trace Record (OS/VS) (see fig.1)

RNIO	TCB	JOBN	RO	DIRECTION	PIU
4	12	13	12	3	44

RNIO
Indicates the trace record was created by the GTF RNIO trace.

TCB
Is the address of the TCB of the partition running the application program.

JOBN
Is the contents of register 0, which indicates the length of the PIU.

DIRECTION
Is the direction of the trace record : IN for inbound or OUT for outbound.

PIU
Is the path information unit. It consists of a transmission header (TH) a request/response header (RH), and a request/response unit (RU).

Activating/Deactivating I/O Trace (OS/VS)

```
{MODIFY} PROCNAME, { TRACE   },TYPE=I/O,ID=name
{F     }           { NOTRACE }
```

I/O Trace Record (DOS/VS) (see fig.2)

First Part

TYPE = IO	DEST	DATE	TIME	LOST RCDS	LOCAL REMOTE	MPX	DIRECTION
9	28	11	13	16	9	13	13

TYPE
Specifies the type of trace in the form TYPE=IO.

DEST
DATE
TIME
LOST RCDS
Are the same as 'Buffer Trace Record - First Part'.

LOCAL or REMOTE
Indicates whether the record is from a local or remote communications controller, by the word LOCAL or REMOTE.

MPX
Indicates that the record is for either a communications controller by INT.MPX or a 3270 by NON-INT or MPX.

DIRECTION
Is the direction of the record : INBOUND or OUTBOUND.

I/O Trace Record

Second part

TH	RH	BDU/SENSE
23	9	7/4

TH=
Is the transmission header in the form TH= followed by the transmission header in the form of 20 hexadecimal characters.

RH
Is the request/response header in the form RH= followed by the request/response header in the form of six hexadecimal characters.

BDU or SENSE
Is either the 7-byte BDU (if the I/O being traced is for a BSC or start-stop device) or contains seven bytes of sense information (if the I/O being traced is for an SNA device and the sense indicator in the RH indicates that sense information is present).

Activating/Deactivating I/O Trace (DOS/VS)

```
{ MODIFY }  NET, { TRACE   } ,TYPE=I/O,ID=name
{ F      }       { NOTRACE }
```

4) VTAM INTERNAL TRACE (DOS/VS ONLY)

VTAM internal trace can trace the following internal VTAM functions :

* Application program interface (API)
* Process scheduling service (PSS)
* Executing sequence control (ESC)
* Locking and unlocking
* Storage management service (SMS)

Tracing these functions permits the reconstruction of sequences of VTAM events and can be used in debugging new applications.

Activating/Deactivating Internal Trace (DOS/VS)

```
{MODIFY}{TRACE   },TYPE=VTAM
{F     }{NOTRACE }
```

```
    TIME    44192.142741
FF2  LINE      DNODE NCP52AF                 TIME 23
                         LCD 9  PCF 9  TIME 22  SCE 45  PDF 7E      LCD 9  PCF 9  TIME 22  SCF 40  PDF C1
                         LCD 9  PCF 9  TIME 22  SCF 40  PCF 91      LCD 9  PCF 9  TIME 22  SCF 40  PDF 35
                         LCD 9  PCF 9  TIME 22  SCF 40  PDF 59      LCD 9  PCF 9  TIME 22  SCF 45  PDF 7E
                         LCD 9  PCF 9  TIME 22  SCF 45  PDF FF      LCD 9  PCF 5  TIME 22  SCF 45  PDF FF
    TIME    44192.147431
FEF  TPIOS IN  ANODE ISTOLTEP   FDB  00000000 001C03E9 00010000   RSVD 081C   LNG2 00E0
       REMOTE  DNODE A3767LU    FSB  022C0001 00000000 0201C218 00030000 00000000 00000000 00000000 00040000
                                THRH 1F000201 02180003 0004EB80 00
                                TEXT A1                                               *.                     *
    TIME    44192.228461
FEF  TPIOS OUT ANODE ISTOLTEP   FDB  00000000 001C03C8 000 0000   RSVD 0000   LNG2 00C4   RSVD  00000000 00000000
       REMOTE  DNODE A3767LU    THRH 1C00C218 02010000 00006B80 00
                                TEXT A0                                               *.                     *
    TIME   44192.234144
FEF  TPIOS IN  ANODE ISTOLTEP   FDB  00000000 001006A1 00010000   RSVD 0810   LNG2 00E0
       REMOTE  DNODE A3767LU    FSB  022C0001 00000000 0201C218 00010000 00000000 00000000 00000000 00040000
                                THRH 1F000201 C21B0001 0004EB80 00
                                TEXT A0                                               *.                     *
    TIME   44192.753558
FF1  C/L  OUT  ANODE ISTOLTEP   TEXT C1C2C3C4 C5C6C7C8 C9D1D2D3 D4D5D6D7 D8D9E2E3  *ABCDEFGHIJKLMNOPQRST*
               DNODE A3767LU         E4E5E6E7 E8E9                                *UVWXYZ               *
    TIME    44192.757421
FEF  TPIOS OUT ANODE ISTOLTEP   FDB  00000000 001C0680 00270000   RSVD 0000   LNG2 00C4   RSVD  00000000 00000000
       REMOTE  DNODE A3767LU    THRH 1C00C218 02010000 00000380 80
                                TEXT C1C2C3C4 C5C6C7C8 C9D1D2D3 D4D5D6D7 D8D9E2E3  *ABCDEFGHIJKLMNOPQRST*
                                     E4E5E6E7 E8E9                                *UVWXYZ               *
    TIME    44192.771054
FF2  LINE      DNODE NCP52AF                 TIME 2E
                         LCD 9  PCF 6  TIME 23  SCF 0D  PDF FF     LCD 9  PCF 7  TIME 33  SCF 49  PCF C1
                         LCD 9  PCF 7  TIME 23  SCF 49  PDF B8     LCD 9  pCF 7  TIME 23  SCF 49  PDF 3F
                         LCD 9  PCF 7  TIME 23  SCF 49  PDF C0     LCD 9  PCF 7  TIME 23  SCF 49  PDF EB
                         LCD 9  PCF 7  TIME 23  SCF 49  PDF 80     LCD 9  PCF 7  TIME 23  SCF 49  PDF 00
                         LCD 9  PCF 7  TIME 23  SCF 49  PDF A1     LCD 9  PCF 7  TIME 23  SCF 49  PDF BA
                         LCD 9  PCF 7  TIME 23  SCF 49  PDF 5F     LCD 9  PCF 6  TIME 24  SCE 0D  PDF 5F
                         LCD 9  PCF 9  TIME 24  SCF 45  PDF 00     LCD 9  PCF 9  TIME 24  SCF 45  PDF 7E
                         LCD 9  PCF 9  TIME 24  SCF 40  PDF C1     LCD 9  PCF 9  TIME 24  SCF 40  PDF B1
                         LCD 9  P[illegible]  TIME 24  SCF 40  PDF 37     LCD 9  PCF 9  [illegible]ME 24  SCF 40  [illegible] 78
```

VTAM TRACE OUTPUT OS/VS (continued)

```
LCD 9   PCF 9   TIME 24   SCF 45   PDF 7E      LCD 9   PCF 9   TIME 24   SCF 45   PDF FF
LCD 9   PCF 5   TIME 25   SCF 45   PDF FF      LCD 9   PCF 6   TIME 25   SCF 0D   PDF FF
LCD 9   PCF 7   TIME 25   SCF 49   PDF C1      LCD 9   PCF 7   TIME 25   SCF 49   PDF B1
LCD 9   PCF 7   TIME 25   SCF 49   PDF 37      LCD 9   PCF 7   TIME 25   SCF 49   PDF 78
LCD 9   PCF 6   TIME 26   SCF 0D   PDF 78      LCD 9   PCF 9   TIME 26   SCF 45   PDF 00
LCD 9   PCF 9   TIME 26   SCF 45   PDF 7E      LCD 9   PCF 9   TIME 26   SCF 40   PDF C1
```

```
*** DATE   DAY 162     YEAR 1975          TIME 04 35 47 974462

RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      OUT     1E00D600 02000040 00080B80 00
RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      IN      1E000200 D6000040 00068B80 00
RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      OUT     1E00D600 02000041 00080B80 00
RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      IN      1E000200 D6000041 00068B80 00
RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      OUT     1E00D600 02000042 00080B80 00
RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      IN      1E000200 D6000042 00068B80 00
RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      OUT     1E00D600 02000043 00080B80 00
RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      IN      1E000200 D6000043 00068B80 00
RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      OUT     1E00D600 02000044 00080B80 00
RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      IN      1E000200 D6000044 00068B80 00
RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      OUT     1E00D600 02000045 00080B80 00
RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      IN      1E000200 D6000045 00068B80 00
RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      OUT     1E00D600 02000046 00080B80 00
RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      IN      1E000200 D6000046 00068B80 00
RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      OUT     1E00D600 02000047 00080B80 00
RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      IN      1E000200 D6000047 00068B80 00
RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      OUT     1E00D600 02000048 00080B80 00
RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      IN      1E000200 D6000048 00068B80 00
RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      OUT     1E00D600 02000049 00080B80 00
RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      IN      1E000200 D6000049 00068B80 00
RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      OUT     1E00D600 0200004A 00080B80 00
RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      IN      1E000200 D600004A 00068B80 00
RNIO    TCB 0002F220    JOBN N/A      R0  0000000D      OUT     1E00D600 0200004B 00080B80 00
```

FIGURE 1

VTAM TRACE OUTPUT DOS/VS

```
TYPE=BUF   DEST.NODENAME=T27410A     DATE=74.206  TIME=14.54.53   LOST RCD CNT=000   APPL.NODENAME=APPL1     OUTBOUND
  BUFFER= 7A4040C5  D5E3C5D9  4040C4C1  E3C140E8  D6E440D3  C9D2C540  C1D5C440  C5D6E315       :  ENTER  DATA YOU LIKE AND EOT.
          25                                                                                   .

TYPE-BUF   DEST.NODENAME=T27410A     DATE=74.206  TIME=14.54.57   LOST RCD CNT=000   APPL.NODENAME=APPL1     OUTBOUND
  BUFFER= 089AD602  000803                                                                     ..0....

TYPE=BUF   DEST.NODENAME=T27410A     DATE=74.206  TIME=14.54.57   LOST RCD CNT=000   APPL.NODENAME=APPL1     OUTBOUND
  BUFFER= 7A4040C5  D5E3C5D9  4040C4C1  E3C140E8  D6E440D3  C9D2C540  C1D5C440  C5D6E315       :  ENTER  DATA YOU LIKE AND EOT.
          25                                                                                   .

TYPE= IO   DEST.NODENAME=T27410A     DATE=74.206  TIME=14.54.57   LOST RCD CNT=000   REMOTE   NON-INT.MPX    OUTBOUND
          TH=0E00D60202014100000D    RH=039000    00089A00000000

TYPE= IO   DEST.NODENAME=T27410A     DATE=74.206  TIME=14.54.57   LOST RCD CNT=000   REMOTE   NON-INT.MPX    OUTBOUND
          TH=0E00D60202011101002B    RH=039000    00020A00000000

TYPE= IO   DEST.NODENAME=T27410A     DATE=74.206  TIME=14.56.12   LOST RCD CNT=000   REMOTE   NON-INT.MPX    INBOUND
          TH=0E000201D6024101000A    RH=039000    00089A00006000

TYPE= IO   DEST.NODENAME=T27410A     DATE=74.206  TIME=14.56.12   LOST RCD CNT=000   REMOTE   NON-INT.MPX    INBOUND
          TH=0E000201D6021101000A    RH=039000    00020A00006000

TYPE= IO   DEST.NODENAME=T27410A     DATE=74.206  TIME=14.56.16   LOST RCD CNT=000   REMOTE   NON INT.MPX    OUTBOUND
          TH=0E00D60202011102000A    RH=039000    00010300000000

TYPE= IO   DEST.NODENAME=T27410A     DATE=74.206  TIME=14.56.28   LOST RCD CNT=000   REMOTE   NON=INT.MPX    INBOUND
          TH=0E000201D60211020017    RH=039000    00010310006038
```

```
TYPE=BUF   DEST.NODENAME=T27410A      DATE=74.206  TIME=14.56.32   LOST RCD CNT=000   APPL.NODENAME=APPL1     INBOUND
  BUFFER= C6C9D9E2  E340D4C5  E2E2C1C7  C5                                                   FIRST MESSAGE

TYPE=BUF   DEST.NODENAME=T27410A      DATE=74.206  TIME=14.56.32   LOST RCD CNT=000   APPL.NODENAME=APPL1     OUTBOUND
  BUFFER= 7AE2E3C1  D5C4C1D9  C440D9C5  E2D7D6D5  E2C540D4  C5E2E2C1  C7C56040  D7D3C5C1      :STANDARD RESPONSE MESSAGE- PLEA
          E2C540C5  D5E3C5D9  40D4D6D9  C540C4C1  E3C11525                                   SE ENTER MORE DATA..

TYPE=BUF   DEST.NODENAME=T27410A      DATE=74.206  TIME=14.56.34   LOST RCD CNT=000   APPL.NODENAME=APPL1     OUTBOUND
  BUFFER= 7AE2E3C1  D5C4C1D9  C440D9C5  E2D7D6D5  E2C540D4  C5E2E2C1  C7C56040  D7D3C5C1      :STANDARD RESPONSE MESSAGE-PLEA
          E2C540C5  D5E3C5D9  40D4D6D9  C540C4C1  E3C11525                                   SE ENTER MORE DATA..

TYPE= IO   DEST.NODENAME=T27410A      DATE=74.206  TIME=14.56.34   LOST RCD CNT=000   REMOTE   NON=INT.MPX     OUTBOUND
          TH=0E00D60202011103003E     RH=039000    00020200000000

TYPE= IO   DEST.NODENAME=T27410A      DATE=74.206  TIME=14.57.13   LOST RCD CNT=000   REMOTE   NON-INT.MPX     INBOUND
          TH=0E000201D6021103000A     RH=039000    00020200006000

TYPE= IO   DEST.NODENAME=T27410A      DATE=74.206  TIME=14.57.16   LOST RCD CNT=000   REMOTE   NON-INT.MPX     OUTBOUND
          TH=0E00D60202011104000A     RH=039000    00010300000000
  NO LINE RECORDS FOUND IN TRACE FILE
END OF TRACE PRINT UTILITY
```

FIGURE 2

```
 IEF005I PARTITION WAITING FOR WORK P01
S NET.P1,,,(LIST=00,CONFIG=5A)
 IEF403I NET      STARTED TIME=12.06.12 P01
S VGTF.P0
 IEF403I VGTF     STARTED TIME=12.06.58 P00
*01 HHL100A  SPECIFY TRACE OPTIONS P00
 IST197I  SAVED CONFIGURATION APPCON0A READ FROM VTAMOBJ P01
 IST093I  APPCON0A ACTIVE P01
 IST197I  SAVED CONFIGURATION NCP52AF  READ FROM VTAMOBJ P01
 IST020I  VTAM INITIALIZATION COMPLETE P01
1,TRACE=USR,RNIO
 HHL103I  TRACE OPTIONS SELECTED --USR,RNIO P00
*02 HHL125A  RESPECIFY TRACE OPTIONS OR REPLY U P00
2,U
 HHL031I GTF INITIALIZATION COMPLETE P00
 IST270I  370X NCP52AF  NOW LOADED WITH LOADMOD NCP52AF  P01
 IST093I  NCP52AF  ACTIVE P01
V NET,ACT,ID=A023
 IST097I  VARY     ACCEPTED P01
 IST067I  VARY FAILED- A023     NODE ALREADY ACTIVE P01
V NET,ACT,ID=A3767PU
 IST097I  VARY     ACCEPTED P01
 IST093I  A3767PU  ACTIVE P01
V NET,ACT,ID=A3767LU
 IST097I  VARY     ACCEPTED P01
 IST093I  A3767PU  ACTIVE P01
F NET.P1,TRACE,TYPE=LINE,ID=A023
 IST097I  MODIFY   ACCEPTED P01
 IST513I  TRACE INITIATED FOR NODE A023     P01
F NET.P1,TRACE,TYPE=BUF,ID=A3767LU
 IST097I  MODIFIED ACCEPTED P01
 IST513I  TRACE INITIATED FOR NODE A3767LU  P01
F NET.P1,TEST
 IST097I  MODIFY   ACCEPTED P01
 ITA102I ISTOLTEP REL.2.0 INITIALIZATION IN PROGRESS P01
 ITA107I OPTIONS ARE NTL,NEL,NPP, FE,NMI, EP, CP, PR,NTR,NAP P01
*03 ITA105D ENTER DEV/TEST/OPT/ P01
3,A3767LU/T3700SNA/NFE/
 ITA158I  S T3700SNA UNIT 00AF A3767LU P01
 ITA158I  T T3700SNA UNIT 00AF A3767LU P01
 ITA107I OPTIONS ARE NTL,NEL,NPP,NFE,NMI, EP, CP, PR,NTR,NAP P01
*04 ITA105D ENTER DEV/TEST/OPT/ P01
R 04,A3767LU/T3700SNA/EXT=12ABCDEFGHIJKLMNOPQRSTUVWXYZ/
 ITA548I ISTOLTEP NO LONGER REQUIRES A3767LU P01
 ITA158I  S T3700SNA UNIT 00AF A3767LU P01
 ITA158I  T T3700SNA UNIT 00AF A3767LU P01
 ITA107I OPTIONS ARE NTL,NEL,NPP,NFE,NMI, EP, CP, PR,NTR,NAP P01
 ITA327I EXT=12ABCDEFGHIJKLMNOPQRSTUVWXYZ P01
*05 ITA105D ENTER DEV/TEST/OPT/ P01
5,CANCEL
 ITA548I ISTOLTEP NO LONGER REQUIRES A3767LU P01
F NET.P1,NOTRACE,TYPE=LINE,ID=A023
 IST097I  MODIFY   ACCEPTED P01
 IST512I  TRACE TERMINATED FOR NODE= A023    P01
F NET.P1,NOTRACE,TYPE=BUF,ID=A3767LU
 IST097I  MODIFY   ACCEPTED P01
 IST512I  TRACE TERMINATED FOR NODE= A3767LU P01
P P0
 HHL006I GTF ACKNOWLEDGES STOP COMMAND P00
 IEF404I VGTF     ENDED   TIME=12.18.41 P00
 IEF049I VGTF    ON DEVICE
 IEF005I PARTITION WAITING FOR WORK P00
 IEF868I      WTR WAITING FOR WORK
S PRINTGTF.P2
 IEF403I PRINTGTF STARTED TIME=12.19.19 P02
 IEF0741 SPOOL CRITICAL. READER SUSPENDED. QUEUE HELD. P02
 IEE332I          QUEUE HELD
*IEF075A  SPOOL  75 PER CENT ALLOCATED P02
*IEF075A  SPOOL  80 PER CENT ALLOCATED P02
 IEF404I PRINTGTG ENDED   TIME=12.20.30 P02
 IEF049I PRINTGTF ON DEVICE
 IEF049I PRINTGTF ON DEVICE 00E
 IEF868I      WTR WAITING FOR WORK
 IEF005I PARTITION WAITING FOR WORK  P02
Z NET
 IST097I  HALT     ACCEPTED P01
 IST133I  VTAM TERMINATION IN PROGRESS P01
 IST617I  DEACTIVATE IN PROGRESS FOR A3767PU  P01
 IST141I  NODE A3767PU NOW DORMANT P01
 IST105I  A3767PU  NODE NOW INACTIVE P01
PRT FILE 0715  FOR VS1TPA   COPY 01 NOHOLD
 IEF077A SPOOL NO LONGER CRITICAL. RELEASE QUEUE. START RDR.
 IEF868I 00E WTR WAITING FOR WORK
```

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OS/VS SYSTEM CONSOLE OUTPUT (continued)

Initializing Virtual GTF
and specifying options :
USR, RNIO

Activating Line,
Physical Unit,
and Logical Unit

Activating Line
and Buffer Trace

Initializing TOLTEP
Running API Echo to
3767 (results at 3767)

Repeating API Echo,
generating echo data
from console

Cancelling TOLTEP

Deactivating Line
and Buffer Trace

Stopping VGTF and
printing output

Terminating VTAM

FIGURE 3

DESCRIPTION

The following trace enhancements in SNA-3 are additional to the existing traces in SNA-2 and consist of the following :

1) application to application
2) CDRM to CDRM (Cross Domain Resource Manager)
3) application to Cross Domain Resource trace

I/O trace will be limited to the concurrent tracing of 36 SNA nodes per domain. If a command is entered to start I/O trace on a SNA node when trace is already active for 36 SNA nodes per domain, the request will be rejected. For SNA3, with the availability of an I/O trace for applications, all resources connected to that application can be traced.

Note that for SNA3 extensions to trace, there is no support for consolidation of data; i.e., no one host can be designated as a collection point.

Note also that trace and the formats on the records produced/logged are not common across operating systems.

Buffer trace

1) ID = APPL name

   Function - Trace all buffers to and from this APPL in this host for SNA sessions

2) ID=CDRSC

   Function - Trace all buffers originating or terminating in this host for session with teh CDRSC.
   CDRSC can be a CD-Application or CD-LU.

3) ID=SSCP for this host

   Function - Trace all buffers to and from this SSCP.
   Note :
   Only TPIOS buffer trace and no control layer buffer trace.

4) ID=CDRM in another host

   Function - Trace all buffers for the session between the CDRM in this host and the CDRM in another host.

   Note :
   * TPIOS trace only, no control layer trace
   * CD PU name, not supported

I/O Trace

1) ID=APPL name

   Function - Trace all I/O to and from this application for SNA session (includes APPL-APPL session in same domain)

2) ID=CDRSC

   Function - Trace all I/O originating and terminating in this host to and from the CDRSC (CDRSC can be APPL or LU in another domain)

3) ID=SSCP in same domain

   Function - Trace all I/O originating and terminating in this host for the SSCP

4) ID=CDRM in another domain

   Function - Trace all I/O originating and terminating in this host for the CDRM (CD PU name not supported)

Line Trace

1) ID=Line name

   Function - Trace up to a maximum of 8 lines per single 370X simultaneously, if the 370X is N-tailed, then the maximum of 8 is distributed between the hosts.

The following section provides an overview and summary of ACF/TAP. For more detailed information, refer to 'ACF/TAP User's guide' SC 30-3115.

Description

The Advanced Communications Function/Trace Analysis Program (ACF/TAP) is an IBM service aid that assists in analyzing trace data produced by ACF/VTAM, ACF/TCAM, and ACF/NCP. ACF/TAP provides a common trace analysis facility for different types of trace input data. It produces output reports showing SNA and SDLC trace data formatted into merged, easy-to-use, and easy-to-read formats. Unusual conditions occuring in the trace data that may indicate error situations are highlighted for the user.

ACF/TAP functions as an application program under OS/VS1, OS/VS2 (MVS), OS/VS2 (SVS) and DOS/VS. It operates independently of the VTAM or TCAM access methods, but uses the external trace files produced by VTAM and TCAM as input data.

ACF/TAP processes :

* NCP line traces from communication scanner types 1, 2 and 3 (LINE, LIN3)
* OS/VS VTAM I/O traces (RNIO)
* DOS/OS I/O traces (IO)
* OS/VS VTAM buffer traces (now BUF, formerly TPIOS)
* OS/VS TCAM PIU trace (PIUT)

An ACF/TAP processed trace record is defined as a record that is read from a trace file and analyzed. Then some type of printed output is produced.

The primary ACF/TAP output report is SYSPRINT (OS/VS version) or SYSLST (DOS/VS version). SYSPRINT or SYSLST has up to four different formats and shows the following :

* Input control parameters and error messages
* Summary of the GTF, VTAM, TCAM or NCP line trace header information that precedes the trace data
* The input records in standard hexadecimal and alphanumeric dump format
* The ACF/TAP processed trace data and, in abbreviated form, the ACF/TAP interpretation of the SNA and SDLC header information from the trace data.

  In addition to the SYSPRINT or SYSLT reports, ACF/TAP can produce up to six other output reports describing the contents of the input trace data files. They are :

  * Line Trace Detail Report
  * Line Trace Summary Report
  * SNA Detail Report
  * SNA Summary Report
  * Network Data Traffic Report
  * Network Error Report

Line Trace Detail Report

This report shows NCP line trace records in one of two formats depending on whether the trace data is from a type 1 or 2 scanner or from a type 3 scanner.

For the type 1 or 2 scanners, trace records are four bytes in length and are shown in hexadecimal format, one entry per print line with a description of the entry.

For the type 3 scanner, trace records are either eight-byte status records or variable-length text records. Status trace entries are shown in hexadecimal format, one entry per print line with a description of the entry. Text traces are shown on a variable number of print lines, depending on their length, in hexadecimal and character format.

Line Trace Summary Report

This report shows the NCP line trace in one of two condensed formats depending on whether the trace data is from a type 1 or 2 scanner or from a type 3 scanner. For the type 1 or 2 scanners, 35 trace records are shown per group of six print lines for SDLC line control. For SDLC, the report indicates the start and end of messages and flags certain error and exception conditions.

For the type 3 scanner, up to four status and text entries are shown in hexadecimal format per print line. Complete SDLC messages are indicated by a message number.

SNA Detail Report

This report is produced from all types of trace records processed by ACF/TAP, and has a group of print lines for each complete message. Each print entry shows a complete analysis of the SNA and SDLC protocols used in the message. SDLC data is not produced for line trace data from the type 3 scanner.

SNA Summary Report

This report is produced from all types of trace records processed by ACF/TAP, and shows the SNA and SDLC protocols in a compact one-print-line-per-message format. The summary information is shown in a vertical format that permits you to rapidly scan a column in a particular bit setting.

Network Data Traffic Report

This report provides a hexadecimal and character printout of request/response units (RU) that have data associated with them. Any data that remains after the analysis of the transmission header (TH), request/response header (RH), and RU command bytes is printed. In the case of network commands, a description of the command is provided.

Network Error Report

This report indicates messages that show unusual characteristics.

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Creating Trace Files

ACF/TAP proces ses the following traces :

VTAM
* NCP Line Trace (LINE)
* OS/VS VTAM Buffer trace (BUF)
* OS/VS VTAM I/O trace (RNIO)
* DOS/OS VTAM I/O trace (IO)

TCAM
* NCP Line trace (LINE and LIN3)
* PIU trace (PIUT)

Before running ACF/TAP, you need to create trace files to use as input data.

Starting ACF/TAP

For OS and DOS JCL, refer to 'User's Guide' chapter 4.

When ACF/TAP begins execution, you get these messages on the operator's console.

```
DSJ001I ACFTAP EXECUTION BEGINS
  F601I
DSJ021I PARAMETERS ARE RESET TO DEFAULT STATUS
  F621I
DSJ020A ENTER ACFTAP PARAMETERS OR READ,QUIT,LIST,GO,RESET
  F620A
```

Note : The messages are shown in their OS/VS format. For the DOS version of ACF/TAP, console messages have a different message ID than the OS message ID. The message text is the same for either, and is hsown only with the OS ID. Messages in the output reports always appear in the OS/VS format, even for the DOS version of ACF/TAP.

You must reply to these messages with either an ACF/TAP command or control parameter(s). The commands and parameters are entered from the operator's console. Or, if you enter a READ command, ACF/TAP then begins reading the commands and parameters from the SYSIN (OS/VS version) or SYSIPT (OS/DOS version) data set.

ACF/TAP commands

ACF/TAP commands direct the overall operation of ACF/TAP The format to enter an ACF/TAP command is :

```
REPLY xx,GO
         LIST
         PROMPT
         QUIT
         READ
         RESET
```

Note : The format shown is for OS/VS. xx is the OS/VS system reply ID. For DOS/VS, omit 'REPLY xx'.

GO ACF/TAP begins processing trace files and producing output reports. All changes to the control parameters must be made before this command is entered.

LIST This list shows the current parameters.

PROMPT ACF/TAP stops reading paramters from the SYSIN (OS/VS version) or SYSIPT (DOS/VS version) data set, and promtps the user to enter the parameters from the operator's console.

QUIT ACf/TAP terminates execution

READ ACF/TAP stops reading parameters from the operator's console and begins reading them from the SYSIN (OS/VS version) or SYSIPT (DOS/VS version) data set.

RESET ACF/TAP resets all control parameterrs to their default state.

ACF/TAP Control parameters

The six major categories of ACF/TAP control parameters are used to select :

* Type of input trace records
* Origin of the input trace file
* Type of output reports
* Selective processing of input trace records
* Network definition
* Miscellaneous control parameters

Enter ACF/TAP control parameters in this format :

```
REPLY xx,parameter=value
```

Note : The format shown is for OS/VS, xx is the OS/VS system reply ID. For DOS/VS omit, 'REPLY xx'.

You enter the parameters from the operator's console (or from the SYSIN or SYSIPT data set if a READ command was previously entered). Blanks and commas are delimiters. At least one delimiter must appear between parameters. The maximum length of an input line is 72 characters. Multiple lines may be entered ; however, no parameter may be continued from one line to another. Parameters may be re-entered if you make a mistake. The parameters used is the last value entered.

The parameter value default is shown underscored.

After each entry from the operator's console, ACF/TAP responds with these messages :

```
DSJ02A ENTER ACFTAP PARAMETERS OR READ,QUIT,LIST,GO,RESET
```

F620A
DSJ029I message text shows the entry from the console.
F629I

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<u>How to select the type of Trace Records for Proce ssing</u>

You use this parameter to specify what type of trace records to select from the input trace file for processing

The parameters are :

```
INPUT=ALL
BUFFER!PIU
LINE
RNIO!IO
SCAN
```

ALL — ACF/TAP processes BUFFER and RNIO trace records at the same time. When ALL is specified, ACF/TAP always sets LSPRT=NO and LDPRT=NO

BUFFER — ACF/TAP processes only VTAM buffer trace records or TCAM PIU trace records. PIU can be entered instead of BUFFER.

LINE — ACF/TAP processes only NCP line trace records. ACF/TAP can process line trace data for only one line at a time. If no line is specified, the first line in the trace file is the line processed. LINE is the default value.

RNIO — ACF/TAP processes only OS/VTAM RNIO traces, DOS/VTAM I/O traces, or OS/TCAM I/O traces. IO can be entered instead of RNIO. If INPUT=RNIO!Io and SOURCE=COMWRITE are specified, ACF/TAP ignores INPUT=RNIO!IO and instead processes INPUT=BUFFER!PIU.

SCAN — ACF/TAP summarizes all the trace records on the input file. No analysis is performed on the trace records.

<u>How to specify the origin of the Trace files</u>

You use this parameter to specify the origin of the trace file. The parameters are :

```
SOURCE=(COMWRITE)
       (GTF)
       (DOS)
```

COMWRITE — The input trace file is the TCAM COMWRITE data set.

GTF — The input trace file is the GTF SYS1.TRACE data set. For the OS/VS version of ACF/TAP, GTF is the default value.

DOS — The input trace file is the DOS VTAM trace file data set. For the DOS/VS version of ACF/TAP, DOS is the default and is the only valid keyword that can be specified for SOURCE.

How to select the types of output reports

You use these parameters to specify the kind of output reports you want. You can request up to seven different types of reports. YES causes the report to be produced ; NO omits the report. LDPRT and SUMMARY have addtional parameters that are explained below.

NCP Line Trace Summary Report

```
LSPRT=(NO)
      (YES)
```

If INPUT=ALL is specified, than ACF/TAP always sets LSPRT=NO.

NCP Line Trace Detail Report

```
LDPRT=(ERROR)
      (NO)
      (YES)
```

ERROR specifies the detail report show only ACF/TAP defined error or exception conditions

If INPUT=ALL is specified, than ACF/TAP always sets LDPRT=NO

SNA Analysis Detail Report

```
SDPRT=(NO)
      (YES)
```

SNA Analysis Summary Report

```
SSPRT=(NO)
      (YES)
```

Network Data Traffic Report

```
DTPRT=(NO)
      (YES)
```

Network Error Report

```
NEPRT=(NO)
      (YES)
```

SYSPRINT or SYSLST Reports

Message Numbers SYSPRINT or SYSLST Report : This report provides a summary of the parameters that ACF/TAP used to process the input file and a summary of input records.

```
SUMMARY=(ALL)
        (EVERY)
        (NO)
        (YES)
```

ALL   Specifies a SYSPRINT or SYSLST report showing all input trace records specified by INPUT=.

EVERY Specifies a SYSPRINT or SYSLST report showing every input trace record on the input data set including types that ACF/TAP does not process.

YES Specifies a SYSPRINT or SYSLST report showing input trace records that ACF/TAP processed.

NO Is the default except if INPUT=SCAN is specified. In this case, SUMMARY=ALL overrides the default.

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Hexadecimal Snapshot SYSPRINT or SYSLST Report : This parameter specifies that every input trace file record be printed in standard dump format.

```
DUMP=(NO)
     (YES)
```

Trace summary SYSPRINT or SYSLST Report : This parameter specifies that the contents of the TH, RH and RU be printed.

```
PRINT=(NO)
      (YES)
```

How to selectively process trace records

You use these parameters to select records for processing based on time, count, and device name.

Select Records by time

```
STIME=hh.mm.ss ETIME=hh.mm.ss.
```

These parameters specify records for processing based on the trace record timestamp.

Select records by count (Range)

```
START=count END=count
```

These parameters specify records for processing based on ACF/TAP assigned message counts. Records with message counts between START= and END= are processed.

Selecting by Device Name

```
NODE=nodename
```

This parameter specifies the records to be processed based on the name of a device.

For NCP line trace, if you do not specify a nodename, the first identifiable name is used as a selection limit for the remainder of the file.

How to define the network

You use these parameters to select records for processing based on the network definition

Number of Major Active Network Nodes

```
MAXSUBA=(nnn)
        (15)
```

MAXSUBA specifies the highest value assigned to a major node ID in the network configuration. ACF/TAP must know the MAXSUBA of the network to form the SSCP and CDRM network addresses. Specify n=3, 7, 15, 31, 63, 127, or 255. No other values are allowed.

Address of CDRM (Cross Domain Resource Manager)

```
CDRM=(subarea,element)
     (1,1)
```

CDRM specifies the subarea and element address of each CDRM in the network. A maximum of 255 CDRM addresses can be specified.

Address of SSCP (System Services Control Point)

```
SSCP=(subarea,element)
      (1,0)
```

SSCP specifies the subarea and element address of an SSCP. A maximum of 255 SSCP addresses can be specified.

Miscellaneous Control Parameters

You use these parameters to change the format or data in certain output reports or, for DOS, top specify the device type that the DOS/VS trace file resides on.

Selecting the Number of Print Lines per page

```
LINECNT=(nn)
        (60)
```

Specify the LINECNT=parameter to change the number of print lines per page on the output reports. The minimum line count is 25 and the maximum line count is 99999999.

Suppressing Receive Ready (RR) Frames

```
RRSUP=(NO)
      (PAIR)
       (YES)
```

NO — Speciofies no SDLC receive ready (RR) frames are suppressed on the output reports.

PAIR — Specifies RR sequence pairs (command and response) occuring after the first pair are suppressed from the output reports, except the NCP line trace detail report (LDPRT) for the type 3 scanner, the SNA summary report (SSPRT) for the type 1 or 2 scanner, and the SNA detail report (SDPRT) for the type 1 or 2 scanner.

YES — Specifies SDLC receive ready (RR) frames are suppressed from the SNA summary report (SSPRT), SNA detailed report (SDPRT), and NCP line trace detail report (LDPRT) for the type 3 scanner. YES is the default valued.

Selecting Timeout Limit for NCP Line Trace Timer Field

```
TIMEOUT=(nnn)
        (010)
```

TIMEOUT=specifies the time duration of the NCP timer field that ACF/TAP flags as an exception in the line trace summary report (LSPRT) and line trace detail report (LDPRT). nnn is in tenths of a second, 000 is the minimum allowed value and 255 is the maximum allowed value.

Selecting Type of Device the Trace File resides on (DOS/VS only)

```
UNIT=(TAPE)
     (2311)
     (2314)
     (3330)
     (3340)
```

This parameter is used by the DOS/VS version of ACF/TAP to specify the type of device that the input data set resides on.

ADVANCED COMMUNICATIONS FUNCTION
TRACE ANALYSIS PROGRAM
DATE: 05:04:77 LINE TRACE DETAIL

ELEMENT NUMBER	*TRACE ENTRY FIELDS* LCD	PCF	SCF	PDF	TIME	S T A T I O N / A C T I O N		DESCRIPTIVE ANALYSIS	PROGRAM RESULT
0000105	9	5	45	7E	04	SCAN FOR FLAG	(PDF NOT RELEVANT)	SCF (01000101)	RESET INPUT
0000106	9	6	0D	7E	04	RECEIVE FLAG	(PDF NOT RELEVANT)	SCF (00001101)	START INPUT
0000107	9	7	49	C1	01	RECEIVE DATA		SCF (01001001)	CHAR STORED
0000108	9	7	49	71	04	RECEIVE DATA		SCF (01001001)	CHAR STORED
0000109	9	7	49	3B	04	RECEIVE DATA		SCF (01001001)	CHAR STORED
0000110	9	7	49	BE	04	RECEIVE DATA		SCF (01001001)	CHAR STORED
0000111	9	6	0D	BE	04	RECEIVE FLAG	(PDF NOT RELEVANT)	SCF (00001101)	END I0000017
0000112	9	9	45	7E	04	TRANSMIT FLAG		SCF (01000101)	CHAR IGNORED
0000113	9	9	40	C1	04	TRANSMIT DATA		SCF (01000000)	CHAR STORED
0000114	9	9	40	D1	04	TRANSMIT DATA		SCF (01000000)	CHAR STORED
0000115	9	9	40	31	04	TRANSMIT DATA		SCF (01000000)	CHAR STORED
0000116	9	9	40	1B	04	TRANSMIT DATA		SCF (01000000)	CHAR STORED
0000117	9	9	45	7E	04	TRANSMIT FLAG		SCF (01000101)	END 00000018
0000118	9	5	45	7E	04	SCAN FOR FLAG	(PDF NOT RELEVANT)	SCF (01000101)	RESET INPUT
0000119	9	6	0D	7E	05	RECEIVE FLAG	(PDF NOT RELEVANT)	SCF (00001101)	START INPUT
0000120	9	7	49	C1	05	RECEIVE DATA		SCF (01001001)	CHAR STORED

LINE TRACE DETAIL EXAMPLE (SCANNER 1/2)

```
                                   ADVANCED COMMUNICATIONS FUNCTION
                                       TRACE ANALYSIS PROGRAM
              DATE: 06:01:77               LINE TRACE DETAIL

ELEMENT  ************TRACE ENTRY FIELDS*************   LINK *CONTROL FIELDS*    CURRENT                     RECORD
NUMBER  LCD PCF EPCF SCF TIME STAT1 STAT2 ADDR CNTL  STATE      CMND P/F RCV SND  SCANNER STATE            NUMBER

0002125   9   7   05   47  E0    80    00   03   1E   I I        S     0   7   RECEIVE FLAG                0000532

0002126 *3CC08381   0A8B1                                                                 *..CA.Y.

          0000006 RR  0000000 RNR  0000004 TEXT  ELEMENTS SUPPRESSED

0002137   9   9   04   43  E3    00    04   03   00   0 I              0   0   TRANSMIT DATA               0000532
0002138   9   9   02   47  E5    00    04   03   00   0 I              0   0   TRANSMIT FLAG               0000532

0002142 *3CC00381  C04015D4  E2C7F140  40406040  E2D5C1F3  C1D7D7D3  40C9D540  C1E4E3D6*...A. .MSG1   - SNA3APPL in A
        *40C5C3C8  D640D4D6  C4C54B40  F0F0F415  40404040  40404040  40404040* ECHO MODE. 004.
        *40404040  40404040  40404040  40404040  40404040  40343B           *                          ..

         0000013 RR  0000024 RNR   0000025 TEXT  ELEMENTS SUPPRESSED

0002205   9   6   03   43  C1    80    00   03   30   I I          S   1   0   RECEIVE CNTL                0000543
0002206   9   7   05   47  C1    80    00   03   30   I I          S   1   0   RECEIVE FLAG                0000543

0002207 *3CC08381  006A0D                                                                 *..CA...

         0000006 RR  0000000 RNR  0000004 TEXT  ELEMENTS SUPPRESSED
```

```
                                 ADVANCED COMMUNICATIONS FUNCTION
                                      TRACE ANALYSIS PROGRAM
        DATE: 01:18:77                LINE TRACE SUMMARY          PAGE: 00001

ELEMENT  TRACE                                                                             PROGRAM
REC/MSG FIELDS              V              V              V              V              V  RESULT

0000035 LCDPCF  95 96 97 97 97 97 96 99 99 99 99 99 99 99 99 99 95 96 97 97 97 97 96 99 99 I-IGNOR CHR
        TIME    00 00 00 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 01 02 02 02 02 R-RESET BFR
0000005 SCF     45 0D 49 49 49 49 0D 45 40 40 40 40 45 40 40 45 45 0D 49 49 49 49 0D 45 40 S-START MSG
        PDF     7E 7E C1 71 3B BE BE 7E C1 D1 31 1B 7E 31 1B 7E 7E 7E C1 71 3E BE BE 7E C1 E-END MSG
0000005         R  S              E  S              E        E  R  S              E  I     X-EXCEPTION

0000070 LCDPCF  99 99 99 99 95 96 97 97 97 97 96 99 99 96 99 99 99 99 99 99 95 96 97 97 97 I-IGNOR CHR
        TIME    02 02 02 02 02 02 02 02 02 02 02 02 02 02 02 03 03 03 03 03 03 03 03 03 03 R-RESET BFR
0000007 SCF     40 40 40 45 45 0D 49 49 49 49 0D 45 40 0D 45 40 40 40 40 45 45 0D 49 49 49 S-START MSG
        PDF     D1 31 1B 7E 7E 7E C1 71 3B BE BE 7E C1 BE 7E C1 D1 31 1B 7E 7E 7E C1 71 3B E-END MSG
0000010                  E  R  S              E  I        I              E  R  S           X-EXCEPTION

0000105 LCDPCF  97 96 99 99 99 99 99 99 95 96 97 97 97 97 97 97 97 96 99 99 99 99 99 99 95 I-IGNOR CHR
        TIME    03 03 03 03 03 03 03 03 03 03 03 03 03 04 04 04 04 04 04 04 04 04 04 04 04 R-RESET BFR
0000010 SCF     49 0D 45 40 40 40 40 45 45 0D 49 49 49 49 49 49 49 0D 45 40 40 40 40 45 45 S-START MSG
        PDF     BE BE 7E C1 D1 31 1B 7E 7E 7E C1 71 3B C1 71 3B BE BE 7E C1 D1 31 1B 7E 7E E-END MSG
0000016            E  I              E  R  S                       E  I              E  R  X-EXCEPTION

0000140 LCDPC F 96 97 97 97 97 96 99 99 99 99 99 99 95 99 99 95 96 97 97 97 97 96 99 99 99 I-IGNOR CHR
        TIME    04 04 04 04 04 04 04 04 04 04 04 04 04 05 05 05 05 05 05 05 05 05 05 05 05 R-RESET BFR
0000012 SCF     0D 49 49 49 49 0D 45 40 40 40 40 45 45 40 45 45 0D 49 49 49 49 0D 45 40 40 S-START MSG
        PDF     7E C1 71 3B BE BE 7E C1 D1 31 1B 7E 7E 1B 7E 7E 7E C1 71 3B BE BE 7E C1 D1 E-END MSG
0000021         S              E  I              E  R     E  R  S              E  I        X-EXCEPTION
```

LINE TRACE SUMMARY EXAMPLE (SCANNER 1/2)

DATE: 04:21:77 PAGE: 00013

RECORD NUMBER	ELEMENT NUMBER	*********************************** T R A C E D A T A ***********************************	MESSAGE NUMBER
0000446	0001625	STATUS: 47950000014503 31 TEXT: 86D2 STATUS: 4396038000450331 STATUS: 4797058000450331 TEXT: 2505	
0000447	0001630	STATUS: 4795000001470331 TEXT: 86D2 STATUS: 4396038000470331 4797058000470331 TEXT: 2505	
0000447	0001635	STATUS: 4795000001470331 TEXT: 96D2 STATUS: 4396038000480331 4797058000048331 TEXT: 2505	
0000447	0001640	STATUS: 4795000001480331 TEXT: 86D2 STATUS: 4396038000490331 4797058000490331 TEXT: 2505	
0000447	0001645	STATUS: 4795000001490331 TEXT: 86D2 STATUS: 4396038000490331 4797058000490331 TEXT: 2505	
0000448	0001850	STATUS: 47950000014B0331 TEXT: 86D2 STATUS: 43960380004B0331 47970580004B0331 TEXT: 2505	
0000451	0001655	STATUS: 47950000014B0331 TEXT: 86D2 STATUS: 43960380004C0331 4797058000400331 TEXT: 2505	
0000451		STATUS: 43960380004D0331 47970580004D0331 TEXT: 2505	
0000453		STATUS: 43960380004D0331 STATUS: 47970580004D0331 TEXT: 2505	
0000453		STATUS: 43960380004F0331 47970580004F0331 TEXT: 2505	
0000453	0001675	STATUS: 47950000014F0331 TEXT: 86D2 STATUS: 4396038000500331 4797058000500331 TEXT: 2505	
0000456	0001680	STATUS: 4795000001500331 TEXT: 86D2 STATUS: 4396038000510331 4797058000510331 TEXT: 2505	
0000456	0001685	STATUS: 4795000001510331 TEXT: 86D2 STATUS: 4396038000510331 STATUS: 4797058000510331 TEXT: 2505	
0000457	0001687	STATUS: 4799020004530322 TEXT: 3DC06B800031010303B1A030400001000004000 TEXT: 0000000000000000000000000501	
0000457	0001693	TEXT: D7D7D3F3006ABE STATUS:4795000001540331 TEXT: 86D2 STATUS: 4396038000540352 4797058000[illegible]	0000001

SCF ICW 0	L P C C D F ICW2	EPCF ICW 16	STAT 1 ICW 14	STAT 2 ICW 15	NCP TIMER	SDLC 'A'	SDLC 'C'

LINE TRACE SUMMARY EXAMPLE (SCANNER 3)

10

```
                                        ADVANCED COMMUNICATIONS FUNCTION
                                           TRACE ANALYSIS PROGRAM
          DATE: 12:23:77                SYSTEMS NETWORK ARCHITECTURE DETAIL

MESSAGE   GROUP
 NUMBER   SUMMARY                                 D E S C R I P T I V E   A N A L Y S I S

0000081   DATA FLOW  1D 00 30 00 50 00 00 11 00 08 AF 90 00 08 15 00 00 51 00 00 00 00 00 00 00 00 00 00

          TH   00-00  FORMAT ID (FID): 1 * SEGMENT (MPF): ENTIRE *                         * FLOW (EFI) : EXPEDITED
          TH   02-09  SOURCE (OAF) : 5000 DESTINATION (DAF): 3000* SEQUENCE NUMBER (SNF):00017 * COUNT (DCF) : 00008

          RH   00-02  RU TYPE: NETWORK CONTROL   RESPONSE * RESPONSE/REQUEST: DR1     EXCEPTION* CHAIN: ONLY ELEMENT
                      RU FORMAT:   FORMATTED              * PACING INDICATOR: OFF              * SENSE DATA INCLUDED

          RU   00-03  SENSE: 08150000  08 REQUEST REJECT  15 FUNCTION ALREADY ACTIVE       USER DATA: 0000000000000000

          RU 04-      COMMAND:  NCP LINE-SWITCH LINE TO NCP MODE CMD DATA: 00 00 00 00 00 00 00 00 00 00

0000081   USER DATA  *..........

0000082   DATA FLOW  00 00 50 33 30 00 10 01 00 0A 0B 80 00 00 08 18 40 00 00 00 00 00 00 00 00 00 00 00 00 00

          TH   00-00  FORMAT ID (FID): 0 * SEGMENT (MPF): ENTIRE *                          * FLOW (EFI): NORMAL
          TH   02-09  SOURCE (OAF): 3000 DESTINATION (DAF) :5033 * SEQUENCE NUMBER (SNF):04097  * COUNT (DCF): 00010

          RH   00-02  RU TYPE: FM DATA FLOW      REQUEST   * RESPONSE/REQUEST: DR1              * CHAIN: ONLY ELEMENT
                      RU FORMAT:   FORMATTED               * PACING INDICATOR: OFF              *
                      BRACKET:                             * CHANGE DIRECTION INDICATOR: OFF    *

          RU   00-06  COMMAND: 08  CONTROL             MODIFIER: 18-COPY DESTINTTION CODE          FLSGS; 40 00
                      FUNCTION FLAGS: 01000000                           BTU FLAGS: 00000000
                                         --------HEADER PREFIX

0000082   USER DATA  *.........
```

```
                                   ADVANCED COMMUNICATIONS FUNCTION
                                       TRACE ANALYSIS PROGRAM
                                 SYSTEMS NETWORK ARCHITECTURE SUMMARY

            *******SDLC******   **********TRANSMISSION HEADER*********   *********************REQUEST HEADER*********

            ..-SDLC ADDRESS    .-FORMAT IDENTIFIER (FID)             .-REQUEST(Q) OR RESPONSE(S)      .-PACING INDICA
              .-CMND/RESP       .-F/M/L(=ENTIRE) SEGMENT               .-SC/DFC/NC/(=FMDATA) RU         .-BEGIN BRACK
                .-POLL.FINAL     .-EXPEDITED                             .-FORMATTED                      .-END BRACK
DIRECTION-.       .-RECEIVE                                                .-F/M/L(=ONLY) CHAIN             .-CHANGE
   TYPE-.           .-SEND                FROM/RO SSCP(FID3)---.                                             .-ALT C
-------               .-TYPE              FROM/TO PU(FID3)---.    FID3                                       *****
MESSAGE                CMND            OAF  DAF  SEGNO COUNT      LSID          REQUEST/RESPONSES             COMM
NUMBER


0000185 L I C1    S 3 6 I         2       06   01   00022                  Q         DR1
0000190 L O C1      7 3 I         2       01   06   00022                  S         DR1
0000193 L O C1      7 4 I         2       01   06   00022                  Q         DR1     EXCEPTION
0000195 L I C1    S 5 7 I         2       01   01   00023                  Q         DR1
0000200 L O C1      0 5 I         2       01   01   00023                  S         DR1
0000203 L O C1      0 6 I         2       01   01   00023                  Q         DR1     EXCEPTION
0000566 L I C1    S 7 0 I         2       03   01   00024                  Q         DR1
0000571 L O C1      1 7 I         2       01   03   00024                  S         DR1
0000574 L O C1      1 0 I         2       01   03   00024                  Q         DR1     EXCEPTION
0000576 L I C1    S 1 1 I         2       02   01   00031                  Q         DR1
0000581 L O C1      2 1 I         2       01   02   00031                  S         DR1
0000584 L O C1      2 2 I         2       01   02   00031                  Q         DR1     EXCEPTION
0000612 L I C1    S 3 2 I         2       03   01   00025                  Q         DR1
```

```
                                    ADVANCED COMMUNICATIONS FUNCTION
                                       TRACE ANALYSIS PROGRAM
       DATE: 01:18:77                  NETWORK DATA TRAFFIC                                PAGE: 00002

MESSAGE   GROUP
 NUMBER   SUMMARY                              M E S S A G E   D A T A

0000031  USER DATA *4015D4E2 C7F14040 406040E2 D5C1F3C1 D7D7D340 C9D540C1 E4E3D640* .MSG1    - SNA3APPL IN AUTO *
                   *C5C3C8D6 40D4D6D4 C54B40F0 F1F21540 40404040 40404040 40404040*ECHO MODE. 012               *
                   *40404040 40404040 40404040 40404040 40404040 40404040 *        *

0000033  USER DATA *4015D4E2 C7F14040 406040E2 D5C1F3C1 D7D7D340 C9D540C1 E4E3D640* .MSG1    - SNA3APPL IN AUTO *
                   *C5C3C8D6 40D4D6C4 C54B40F0 F1F31540 40404040 40404040*ECHO MODE. 013.                    *
                   *40404040 40404040 40404040 40404040 40404040 40404040 *        *

0000035  USER DATA *4015D4E2 C7F14040 406040E2 D5C1F3C1 D7D7D340 C9D540C1 E4E3D640* .MSG     - SNA3APPL IN AUTO *
                   *C5C3C8D6 40D4D6C4 C54B4FF0 F1F41540 40404040 40404040 40404040*ECHO MODE. 014.*
                   *40404040 40404040 40404040 40404040 40404040 40404040 *        *

0000037  USER DATA *4015D4E2 C7F14040 406040E2 D5C1F3C1 D7D7D340 C9D540C1 E4E3D640* .MSG1    - SNA3APPL IN AUTO *
                   *C5C3C8D6 40D4D6C4 C54B40F0 F1F51540 40404040 40404040 40404040*ECHO MODE. 015.              *
                   *40404040 40404040 40404040 40404040 40404040 40404040 *        *

0000041  USER DATA *4015D4E2 C7F14040 406040E2 D5C1F3C1 D7D7D340 C9D540C1 E4E3D640* .MSG1    - SNA3APPL IN AUTO *
                   *C5C3C8D6 40D4D6C4 C54B40F0 F1F71540 40404040 40404040 40404040*ECHO MODE. 017               *
                   *40404040 40404040 40404040 40404040 40404040 40404040 *        *

0000042  USER DATA *0101                                                          *..                           *

0000043  USER DATA *01                                                            *.                            *
```

DATE: 05:44:77 NETWORK ERROR ANALYSYS PAGE: 00002

ERROR MESSAGE NUMBER	E R R O R C O N D I T I O N	ADDITIONAL INFORMATION	SUMMARY
DSJ123I MESSAGE 0000112	INCOMPLETE NETWORK SERVICES RU		INCOMPLETE
DSJ123I MESSAGE 0000114	INCOMPLETE NETWORK SERVICES RU		INCOMPLETE
DSJ123I MESSAGE 0000116	INCOMPLETE NETWORK SERVICES RU		INCOMPLETE
DSJ126I MESSAGE 0000118	SENSE DATA FIELD PRESENT	80020000	SENSE DATA
DSJ123I MESSAGE 0000119	INCOMPLETE NETWORK SERVICES RU		INCOMPLETE
DSJ126I MESSAGE 0000121	SENSE DATA FIELD PRESENT	80020000	SENSE DATA
DSJ123I MESSAGE 0000122	INCOMPLETE NETWORK SERVICES RU		INCOMPLETE
DSJ126I MESSAGE 0000124	SENSE DATA FIELD PRESENT	80020000	SENSE DATA
DSJ123I MESSAGE 0000125	INCOMPLETE NETWORK SERVICES RU		INCOMPLETE
DSJ126I MESSAGE 0000127	SENSE DATA FIELD PRESENT	80020000	SENSE DATA
DSJ123I MESSAGE 0000128	INCOMPLETE NETWORK SERVICES RU		INCOMPLETE
DSJ126I MESSAGE 0000130	SENSE DATA FIELD PRESENT	80020000	SENSE DATA
DSJ123I MESSAGE 0000131	INCOMPLETE NETWORK SERVICES RU		INCOMPLETE
DSJ126I MESSAGE 0000133	SENSE DATA FIELD PRESENT	80020000	SENSE DATA
DSJ123I MESSAGE 0000134	INCOMPLETE NETWORK SERVICES RU		INCOMPLETE
DSJ126I MESSAGE 0000136	SENSE DATA FIELD PRESENT	80020000	SENSE DATA
DSJ123I MESSAGE 0000137	INCOMPLETE NETWORK SERVICES RU		INCOMPLETE
DSJ126I MESSAGE 0000139	SENSE DATA FIELD PRESENT	80020000	SENSE DATA
DSJ123I MESSAGE 0000140	INCOMPLETE NETWORK SERVICES RU		INCOMPLETE
DSJ123I MESSAGE 0000145	INCOMPLETE NETWORK SERVICES RU		INCOMPLETE
DSJ123I MESSAGE 0000150	INCOMPLETE NETWORK SERVICES RU		INCOMPLETE
DSJ123I MESSAGE 0000155	INCOMPLETE NETWORK SERVICES RU		INCOMPLETE
DSJ123I MESSAGE 0000160	INCOMPLETE NETWORK SERVICES RU		INCOMPLETE
DSJ123I MESSAGE 0000165	INCOMPLETE NETWORK SERVICES RU		INCOMPLETE
DSJ123I MESSAGE 0000170	INCOMPLETE NETWORK SERVICES RU		INCOMPLETE
DSJ123I MESSAGE 0000175	INCOMPLETE NETWORK SERVICES RU		INCOMPLETE
DSJ123I MESSAGE 0000180	INCOMPLETE NETWORK SERVICES RU		INCOMPLETE

SECTION 11: NCP LINE TRACE

NCP LINE TRACE

DESCRIPTION

The line trace facility of VTAM allows a user to activate or deactivate the NCP trace of a particular line and to record the NCP trace records on the VTAM trace data set.

LINE TRACE (TYPE 1/2 SCANNER)

The Line Trace function is an optional diagnostic and debugging aid that stores certain fields from the interface control word (ICW) each time a level 2 interrupt occurs on a designated communication line. The line trace is activated and deactivated by network commands from the host. Only one line at a time may be traced. If a duplex line is being traced, there is an LTCB and buffer or buffer chain for both the receive leg and transmit leg. The NCP always transfers both the receive and transmit buffers to the host together (the transmit buffers follow the receive buffers).

The following ICW fields are stored as a unit at each level 2 interrupt on the designated line :

* Line Control Definer (LCD)
* Primary Control Field (PCF)
* Secondary Control Field (SCF)
* Parallel Data Field (PDF)

If a type 1 communication scanner is installed, the fields are obtained from the bit control block (BCB) rather than the ICW.

Also stored with each unit is a one-byte timer field. It contains a hexadecimal value indicating in tenths of a second the time that elapsed between the activiation of the line trace and the level 2 interrupt represented by this unit. The value in this field wraps around to zero after 25.5 seconds have elapsed.

The diagnostic unit stored for each level 2 interrupt is four bytes long. It has the following format :

LCD | PCF	TIMER FIELD	SCF	PDF
0	1	2	3

The units are stored in NCP buffers, allocated dynamically as the line trace progresses. These buffers are transferred to the host whenever one of two conditions is met : (1) the maximum number of buffers for the line trace (determined at NCP generation) is filled, or (2) a time interval specified by the host expires. In both cases, the trace continues, using a new chain of buffers, until the host issues a command to terminate the trace.

Illustration of an SDLC line trace of the transfer of a Bind command from the NCP to a terminal, the NCP's poll for a response, and the terminal's response.

	LCD	PCF	SCF	PDF	
	9	9	45	7E	Flag
	9	9	40	C1	Address
	9	9	40	AA	Control 101 0 101 0
	9	9	40	2F	
	9	9	40	00	
	9	9	40	02	TH DAF
	9	9	40	01	OAF
Transfer	9	9	40	00	Sequence number
of Bind	9	9	40	01	
	9	9	40	6B	
	9	9	40	80	RH RME requested
	9	9	40	00	
	9	9	40	31	RU Bind
	9	9	40	01	
	9	9	45	7E	Flag
	9	9	40	C1	Address
Poll for	9	9	40	B1	Control 101 1 00 01
response	9	9	40	37	FCS Count
	9	9	40	78	Poll
	9	9	45	7E	Receive Ready
	9	6	0D	FF	Supervisory
	9	7	49	C1	Address
Response	9	7	49	D1	Control
to poll	9	7	49	31	FCS
	9	7	49	1B	
	9	6	0D	1B	

FIGURE 1

In the previous example the timer field has been deleted

SDLC Line Trace

Figure 1 illustrates an SDLC line trace of a polling sequence from the NCP to a programmable controller. Under the primary polling sequence and secondary response to polling are the trace fields. The sample has been formatted for illustration which is not the format of the normal trace entries.

LCD of 9 indicates an SDLC 8 bit byte length line. All of the illustrations show a value of 9 for the LCD. An LCD value of 8 indicates the monitor for flag which does not appear on the trace. A level 2 interrupt only occurs after a flag is received and the LCD value is now 9 indicating a flag was received.

The PCF value of 9, transmit normal, is used for sending the flag, address, polling, etc. In the polling response the PCF value is changed from 5 (Monitor flag) to 6 (Receive information - inhibit data interrupt). The data is inhibited because the flag character is not needed, only the recognition of the flag condition. From flag recognition the PCF state is set to 7 (Receive Information - allow data interrupts) until the next flag is received (PCF 6).

The SCF field is initially 45. The 4 indicates a service request interlock. If another character arrives before the interlock is cleared by character service the character overrun/underrun bit will also be set. The 5 indicates flag detection with zero insertion disabled to transmit a flag. The subsequent text transfers of the polling sequence do not have any bits set except the service request interlock (40). The end of the polling sequence requires a flag and the value is again 45.

The SCF field on the response to polling is 45 to indicate a service request interlock and flag detection. The second entry indicates the flag was received, and the 49 values during the transfer of the frame specify a receive signal detector and disable zero/insert control. The ending flag condition of the SCF is indicated by the 0D.

The PDF field value illustrates a 7E or FF on output, FF or the residual of 78 on input. The polling sequence of C1 (address), B1 (control) and 3778 (check characters) illustrate the text between frames. The response characters are C1 (address), B1 (control), 3778 (check characters) and the second 78 is residual PDF on the ending flag received (PCF 6).

LINE TRACE (TYPE 3 SCANNER)

Line trace for a type 3 scanner requires a host access method change to format the line trace data. Since the type 3 and type 2 scanner may reside together, the NCP notifies host access method via the Request/Response Unit (RU) whether character or buffer line trace data is contained in the PIU.

The NCP sets a flag in the ICW to inform the scanner that the line is a trace mode. On transmit operations for SDLC, the NCP inputs the BCC from the ICW on the interrupt following the line turnaround. In the case of SDLC receive operations, the normal procedure is for the scanner to store the BCC accumulation in the data buffer for 'I' format frames. When in trace mode the scanner treats all frames as 'I' format type so the BCC is stored in a buffer.

The status information consists of the following eight bytes of information :

* SCF	ICW byte 0
* LCD/PCF	ICW byte 2
* Extended PCF	ICW byte 16
* Status byte 1	ICW byte 14
* Status byte 2	ICW byte 15
* Timer field	
* SDLC address character (BSC=0)	
* SDLC control character (BSC=0)	

Status information does not cross buffer boundaries. The data length is variable but data that crosses buffer boundaries gets a new count field in the next buffer.

STATUS	SCF	LCD	PCF	EPCF	STAT1	STAT2	TIME	ADDR	CNTL
	47	9	7	05	80	00	78	C1	91
	TEXT 3559								
STATUS	SCF	LCD	PCF	EPCF	STAT1	STAT2	TIME	ADDR	CNTL
	47	9	5	00	00	01	78	C1	51
	TEXT 0000								
STATUS	SCF	LCD	PCF	EPCF	STAT1	STAT2	TIME	ADDR	CNTL
	43	9	6	03	80	00	79	C1	91
	47	9	7	05	80	00	79	C1	91
	TEXT 3559								
STATUS	SCF	LCD	PCF	EPCF	STAT1	STAT2	TIME	ADDR	CNTL
	47	9	5	00	00	01	79	C1	51
	TEXT								

LCD (LINE CONTROL DEFINER)

The scanner uses the LCD field during transmit and receive operations to determine the position of the character within the parallel data and serial data fields. This field is also used during transmit operations to set up the proper PDF to SDF transfer and the proper SDF to PDF during receive operations.

SCANNER TYPE 2

LCD State X'8' (SDLC Monitor Flag) : This LCD state along with PCF State X'5' is set by the control program to monitor the received information for an SDLC flag sequence. For a description of what happens when a flag is detected, see PCF State X'5' in this section.

LCD State X'9' (SDLC 8 Bit Byte) : This LCD state is used for transferring SDLC 8-bit characters. This state must be set by the control program for transmitting on SDLC lines. When a character to be transmitted is sent to the PDF, the eight data bits must be placed into bits 0-7 of the PDF as shown below.

PDF bit positions	0	1	2	3	4	5	6	7
Character bits	X1	X2	X3	X4	X5	X6	X7	X8

Characters received from the interface are in the same format when the scanner requests a character service interrupt. All address, control, and flag characters are 8-bit bytes.

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This field is set by scanner hardware when a flag is detected in the received information while LCD state X'8' is set.

This is the only LCD state that can be set by the scanner. It is set by the scanner when a flag is received while LCD state X'8' is set.

SCANNER TYPE 3

LCD State X'9' : this state causes the Type 3 Scanner to block all characters into eight-bit bytes and to search for SDLC control characters (Flag, Abort, Idle).

PCF (PRIMARY CONTROL FIELD)

This field identifies the status of the communications line this ICW is controlling.

SCANNER TYPE 2

PCF State X'0' (No-Op) : This PCF state causes the type 2 Scanner to take no action (active or passive) upon subsequent scans. The scanner hardware can request a Type 2 Scanner L.2 interrupt and set this PCF state for an interface if it determines that new control information is required from the control program. This PCF state can be set by the control program ; however, no interrupt are generated by the interface.

PCF State X'1' (Set Mode) : This PCF state causes scanner to set and reset certain mode latches in the line interface hardware. These latches are specified the SDF field. When setting this PCF state, the control program must ensure the integrity of the entire ICW. This may be done by first setting the PCF to state X'0' (no-op) so that the ICW will not be modified by a possible interrupt. The SDF can than be set to the proper value. Finally, state X'1' (set mode) can be set into the PCF field. Execution of a set mode does not require a bit service request from the addressed interface. However, a bit service request must occur to allow the scanner to request a Type 2 Scanner L2 interrupt to end the set mode operation. The set mode operation ends when the scanner hardware sets the PCF state to X'0' (no-op).

A set mode can be executed to change the state of the data rate selector bit and the oscillator select bits without requiring a disable. However, data terminal ready must remain on.

PCF State X'2' (Monitor Data Set Ready) : This PCF state places the interface in a wait-for-incoming-call condition. For switched lines, this state should normally be set by the control program following a PCF State X'F' (disable) and PCF state X'1' (Set mode with data terminal ready bit = 1). When an interface is in this state, the Type 2 Scanner tests the 'data set ready' lead from the common carrier or IBM line adapter for an active condition when the ICW is fetched. When data set ready is on, indicating that a call is established, the Type 2 Scanner sets PCF state X'0' (No-Op) for start-stop or PCF state X'4' (monitor phase - data set ready check off) for binary synchronous transmission and requests an L2 interrupt.

Though not necessary, this state can also be used for leased lines. Data set ready should be on at the first bit service request when the interface is scanned.

PCF State X'3' (Monitor Ring Indicator or Data Set Ready) : This PCF state, when set by the control program, places the line interface in a wait-for-incoming call (ring indicator on) or wait-for-manual-call-out connection condition (data set ready on). This state must be preceded by setting PCF state X'F' (disable), or a set mode that resets data terminal ready. When the PCF state is set to X'3', the Type 2 Scanner tests the 'ring indicator' and 'data set ready' leads from the common carrier equipment for an active condition of either lead. When 'ring indicator' is active, a call is coming in and a pending connection is to be established. When either of these conditions occurs, the Type 2 Scanner sets PCF state X'0' (no-op) and places the line in a L2 interrupt pending state. This PCF state must be followed by PCF state X'1' (set mode) from the control program to set the 'data terminal ready' latch. After the Type 2 Scanner executes the set mode, it sets PCF X'0' (no-op) and places the line in a L2 interrupt pending state. The interrupt handling program must then place the line in PCF state X'2' (monitor data set ready on), after which the operation proceeds as described in PCF state X'2' - Monitor Data Set Ready.

PCF State X'4' (Monitor Flag - Block Data Set Ready Error) : This PCF state is identical to PCF state X'5' (monitor flag - allow data set ready error) except that the inactive condition of 'data set ready' does not signal a check condition.

PCF State X'5' (Monitor Flag - Allow Data Set Ready Error) : This PCF state is used in conjunction with LCD state X'8' to monitor for an SDLC flag after a half-duplex turnaround or after an inactive period on the communication channel. Each bit interval time, the SDF is shifted one bit and the counter located in ICW bits 34-36 is updated. The counter is used to detect the flag character. When a flag character is detected, the following actions are taken by the scanner :

* The contents of the SDF are zeroed out and a tag bit is inserted in the ICW
* The flag detection bit (ICW bit 5) is set on in the SCF
* The PCF state is set to X'6'
* The LCD state is set to X'9'
* A level 2 interrupt is requested.

The flag character is not transferred to the PDF and the service request bit (ICW bit 1) is not turned on.

PCF State X'6' (Receive Information - Inhibit Interrupts) : This state is entered when a flag is detected while in state X'4', X'5' or X'7'. During this state scanner monitors the receive data stream. Inserted zeros are deleted and 8-bit characters are assembled. If contiguous flags are received :

* Flag detection (ICW bit 5) is set in the SCF every character time
* Transfer from SDF to PDF is inhibited
* Service request (ICW bit 1) is not set
* No interrupt is requested.

When a non-flag character is assembled

* The PCF state is set to X'7'
* The character is transferred from SDF to PDF
* Service request (ICW bit 1) is set to initiate data transfer between the control program and the PDF.

PCF State X'7' (Receive Information - Allow Data interrupts) : This state can be entered from PCF state X'6' when a non-flag character is detected. This state is used in conjunction with LCD state X'9' to assembble consecutive bits into 8-bit SDLC characters. The scanner remains in this state until a flag sequence is detected, or until the state is changed by the control program. When a flag sequence is detected, the scanner changes to PCF state X'6' and requests a level 2 interrupt.

PCF State X'8' (Transmit Initial) : PCF state X'8' is used to initiate a transmit operation on an SDLC interface when the LCD is set to X'9'. This state disables the NRZI mode and forces to send data lead to a mark state as long as 'clear to send' is not active. When 'clear to send' becomes active, the NRZI mode and the 'send data' lead are allowed to operate normally.

If business machine clocking is used, the first characters transmitted must be X'00' (if using NRZI mode) or X'AA' (if not using NRZI mode) so that the remote clock can get in synchronization. If modem clocking is used, the two leading characters (X'00' or X'AA') are not required, and the first two characters and the tag bit should be set in the SDF and PDF.
When a flag is placed in the PDF for transmission, the disable zero insert control bit (ICW bit 7) must be turned on by the control program. When the type 2 Scanner begins transmission ('clear to send' on), the scanner hardware changes the PCF state to X'9' (transmit data).

Note : When operating on a half-duplex line, the control program should not set the PCF state to X'8' until ICW bit 4 (receive line signal detector) is turned off.

PCF State X'9' (Transmit Normal) : This PCF state is set by the Type 2 Scanner after completion of PCF state X'8'. Data is transmitted in this state until one of the transmit turnaround states (PCF X'C' or X'D') is set by the control program.
During transmission of characters over the SDLC line, the control program must maintain the proper state of the LCD. For example, when a flag character is placed into the PDF, the LCD must be set to X'9' and ICW bit 7 (disable zero

insert control) must be set to 1. This allows transmission of more than five consecutive 1 bits for control purposes. For non-flag characters the disable zero insert control bit must be off.

PCF State X'A' (Transmit Data with New Sync) : This state is identical to PCF state X'9' (transmit data) except that the 'new sync' line to the modem equipment is active. It must be used only with 4-wire duplex, multipoint leased-line modem equipment where the associated interface is designated as the master station. The control program must change PCF state X'A' to PCF state X'9' (transmit data) in the character service routine that places the last character to be transmitted into the PDF.

PCF State X'C' (Transmit Turnaround - Request to Send Off) : This PCF state is set by the control program on the interrupt following the interrupt that placed the last flag character to be transmitted into the PDF. While bits are being transmitted, this state is the same as PCF state X'9'. When the character is completely transmitted, request to send is reset along with the transmit mode talch in the interface hardware.

PCF State X'D' (Transmit Turnaround - Request to Send On) : This PCF state is set by the control program when the ending flag character for a message is placed in the PDF and the disable zero-insert control bit (7) is set on. In this state, the scanner transfers the flag character from the PDF to the SDF and sets the flag detection/disable zero insert remembrance bit (5) to the current state of the disable zero-insert control bit (7) every flag character transfer. Continuous flag characters will be serialized to the LIB without further interrupts until PCF state X'D' is ended by the control program.

The control program normally ends this state by setting PCF state X'9'. When changing from PCF state X'D' to PCF state X'9', the first character to be transmitted in the X'9' state is loaded into the PDF and the disable zero-insert control bit (7) is reset if that character is not a flag. Subsequent characters are supplied by normal data servicing requests.

Programming note : When changing from state X'D' to state X'9', the program should check that the zero insert remembrance bit (5) is 1 to ensure that at least one flag character has been sent since X'D' was set.

PCF State X'F' (Disable) : This state is set by the control program and causes the Type 2 Scanner to turn off data terminal ready. A disable resets all control information in the line that was provided by the last set mode (PCF State X'1'). The scanner hardware then causes the interface to be placed in an interrupt pending state when the 'data set ready' lead and the 'receive line signal detector' lead are deactivated. For auto-dial applications, other conditions on the automatic calling unit must be satisfied before another dial operation can be attempted. Before the interrupt is requested, PCF State X'0' (no-op) is set by the scanner. Because all control information in the line set is reset, the control program must set up the proper control information again by a set mode (PCF state X'1') in the interrupt after the disable.

SCANNER TYPE 3

The type 3 scanner has an extended PCF which is used in conjunction with the normal PCF.

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PCF State X'0' (no-Op). This PCF state causes the Type 3 Scanner to take no action (active or passive) upon subsequent scans. The scanner hardware can request a Type 3 Scanner L2 interrupt and set this PCF state for an interface if it determines that new control information is required from the control program. This PCF state can be set by the control program; however, no interrupts are generated by the interface.

PCF State X'1' (Set Mode) : This PCF state causes the scanner to set and reset certain mode latches in the line interface hardware. These latches are specified by the SDF field. When setting this PCF state, the control program must ensure the integrity of the entire ICW. This may be done by first setting the PCF to state X'0' (no-op) so that the ICW will not be modified by a possible interrupt. The SDF can then be set to the proper via Output X'46'. Finally, state X'1' (set mode) can be set into the PCF field. Execution of a set mode does not require a bit service request from the addressed interface. However, a bit service request must occur to allow the scanner to request a Type 3 Scanner L2 interrupt to end the set mode operation. The set mode operation ends when the scanner hardware sets the PCF state to X'0' (no-op).

A set mode can be executed to change the state of the data rate selector bit and the oscillator select bits without requiring a disable. However, 'data terminal ready' must remain on.

PCF State X'2' (Monitor Data Set Ready) : This PCF state places the interface in a wait-for-incoming-call condition. For switched lines, this state should normally be set by the control program following a PCF state X'F' (disable) and a PCF State X'1' (set mode with data terminal ready bit = 1). When an interface is in this state, the Type 3 Scanner tests the 'data set ready' lead from the common carrier or IBM line adapter for an active condition when the ICW is fetched. When data set ready is on, indicating that a call is established, the Type 3 Scanner sets PCF state X'4' (monitor phase data set ready check off) and requests an L2 interrupt.
Though not necessary, this state can also be used for leased lines. Data set ready should be at the first bit service request when the interface is scanned.

PCF State X'3' (Monitor Ring Indicator or Data Set Ready) : This PCF state, when set by the control program, places the line interface in a wait-for-incoming-call (ring indicator on) or wait-for-manual-call-out connection condition (data set ready on). This state must be preceded by setting PCF state X'F' (disable), or a set mode that resets data terminal ready. When the PCF state is set to X'3', the Type 3 scanner tests the 'ring indicator' and 'data set ready' leads from the common carrier equipment for an active condition of either lead. When 'ring indicator' is active, a call is coming in and a pending connection is to be established. When either of these conditions occurs, the

Type 3 Scanner sets PCF state X'0' (no-op) and places the line in a L2 interrupt pending state. This PCF state must be followed by PCF state X'1' (set mode) from the control program to set the 'data terminal ready' latch. After the Type 3 Scanner executes the set mode, it sets PCF state X'0' (no-op) and places the line in a L2 interrupt pending state. The interrupt handling program must then place the line in PCF state X'2' (monitor data set ready on), after which the operation proceeds as described in PCF state X'2' - Monitor Data Set Ready.

PCF State X'4/PECF State X'0' (Monitor Phase - Data Set Ready (check off) : This PCF state is identical to PCF state X'5' except that the inactive condition of 'data set ready' does not signal a check condition. PCF X'4' is intended to initialize the first receive operation after a switched network call connection has been established.

PCF/EPCF State X'5'/'0' (Monitor Flag - Allow Data Set Ready Check) : This state is used in conjunction with LCD state X'9' to monitor received data for an SDLC flag character. To do so, the scanner uses the three low-order bits of the ones counter (ICW bits 4.2.4.4.). Upon detecting a flag character, the scanner sets a tag bit in the SDF to block the next character into eight bits and enters PCF/EPCF state X'6'/'1'. If diagnostic bit 1 is set, the PCF/EPCF state is instead changed to X'7'/'C'.

PCF State X'6' (Receive Initiated) : The Type 3 Scanner sets this state upon receiving a flag. In this state the scanner receives the address (A) control (C), and first two data characters. The scanner examines the control character to determine whether the frame is information or supervisory. If the frame is information, the scanner stores the data. (Normally, the control program has a two-byte area set up to receive the A and C characters; when these are stored, the scanner makes a level 2 interrupt to obtain a data buffer). If the scanner does not receive four characters, the length check (ICW bit 14.7) and the OEM (ICW bit 0.5) or Abort Detect (ICW bit 0.0) bit is set and a level 2 interrupt is made.

If the frame is supervisory, on the other hand, the scanner waits for the two BCC characters and the flag that follow the control character before storing the A and C characters. If the Flag or Abort occurs before the fifth character is received in the PDF array, the scanner returns to monitoring for the flag character and does not set any error bits in the ICW. If the fifth character (not including the initial flag) is not a flag, the scanner sets the Control exception bit (ICW bit 15.0) and continues to receive data as if the frame being received were an information frame. If ICW bit 14.5 is off, the scanner adjusts the number of bytes expected to accomodate two control (C) characters.

PCF/EPCF State X'6'/'1' (Receiving flags) : In this state, the scanner has received one or more consecutive flag characters. If the character assembled in the SDF is a flag, the scanner remains in this state. The first non-flag character it receives causes the scanner to changethe state. Unless an abort condition is detected, the state becomes X'6'/'2' (Receive address) the character in the SDF is transferred to the PCF and the BCC is accumulated.

PCF/EPCF State X'6'/'2' (Received Address) : In this state, the scanner has received the address character and the control character is currently being received into the SDF. When the character is assembled in the SDF, the scanner changes to PCF/EPCF state X'6'/'3' (Receive Control), transfers the contents of the SDF to the PDF and accumulates the BCC. The scanner interrogates the control byte and if an information (I) frame is indicated, sets sequence bit 1 (ICW bit 13.1) and increments the cycle steal message counter (ICW bits 13.6-13.7), allowing cycle steal operation to be activated. If a supervisory (S) frame is indicated, the scanner waits for an ending flag character before allowing cycle steal operation to begin. If a flag character or an abort condition is detected, the scanner does not set sequence bit 1 or increment the message counter.

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The scanner decrements the PDF pointer by one, erasing the A character, and sets the PCF/EPCF state to X'6'/'1' (if a flag character was received) or X'5'/'0' (if an abort condition was detected).

PCF/EPCF State X'6'/'3' (received Control) : The scanner enters this state from state X'6'/'2'. In this state the scanner has received the control character and the next character expected is either data or the first BCC character. (If ICW bit 14.5 is on, indicating that two control characters are expected, sequence bit 0 is set upon entering this state and the second control character is received before the PCF/EPCF changes to a new state). After the character is assembled in the SDF, the scanner changes to state X'6'/'4' (receive data/BCC) with sequence bit 0 on unless a flag character or an abort condition is detected. The scanner transfers the contents of the SDF to the PDF and accumulates the BCC characters.
Upon detecting a flag character, the scanner sets PCF/EPCF state X'6'/'1'. If sequence bit 1 is off (indicating a supervisory frame), the PDF array pointer is decremented to erase the 'AC' characters from the PDF array. If sequence bit 1 is on, the scanner sets end-of-message and length check indicators (ICW bits 0.5 and 14.7) into a control byte in the PDF array for a level 2 EOM interrupt request.
Upon detecting an abort condition, the scanner sets PCF/EPCF state X'7'/'3' (if sequence bit 1 is on) or X'5'/'0' (if sequence 1 is off) and adjusts the PDF array pointer to erase the 'AC' characters.

PCF/EPCF State X'6'/'4' (Received Data 1 and 2) : the scanner enters this state from state X'6'/'3'. In this state, when sequence bit 0 is on, the scanner has received the first data or BCC character and expects as the next character the second data or BCC character. Upon receiving that character, sequence bit 0 is reset, the received character is written in the PDF array, and BCC is accumulated. Following this, the next character expected is a flag (for a supervisory frame) or data (for an information frame).
Receipt of a flag character if ICW bit 13.1 is off because the PDF pointer to be decremented by two (this erases the BCC characters from the PDF array) and sets sequence bit 2 (ICW bit 13.3). This bit causes checking of the BCC accumulation at the next bit service time, writes an EOM control byte with the BCC result into the PDF array, increments the message counter, sets sequence bit 1, and changes the PCF/EPCF state to X'7'/'4'.
Receipt of a data character causes the scanner to write the character into the PDF array, accumulate BCC, and change to state X'7'/'4'.

Upon detecting an abort condition, the scanner enters PCF/EPCF state X'7'/'3' if sequence bit 1 is on. If sequence bit 1 is off, the scanner enters state X'5'/'0' and decrements the PDF pointer to erase the characters received, beginning with the 'A' character.

PCF State X'7' (Received Data) : In this state, the Type 3 Scanner is receiving information (I) frames. Data is stored under cycle steal control. If the cycle steal byte count reaches zero or the scanner detects a flag character in the received data, the scanner generates a level 2 interrupt. The scanner must receive an ending flag or detect a line idle condition to leave this PCF state.
PCF/EPCF State X'7'/'3' (Received Abort) : In this state, the scanner has received an Abort character between the starting and ending flag character or a line idle condition. If the scanner detects a flag character, the PCF/EPCF state changes to X'7'/'5' (received ending flag) ; if it detects an idle condition, the PCF/EPCF state changes to X'5'/'0' (monitor flag). In either case the scanner also sets end-of-message (ICW bit 0-5) and makes a level 2 interrupt. The abort bit (ICW bit 0.0) is also set and in the case of an idle condition -ICW bit 14.1 is set.

PCF/EPCF State X'7'/'4' (Received Data) : In this state, the scanner is receiving message data (other than flag or abort characters). The data is transferred from the SDF to the PDF array and the BCC is accumulated. The PCF/EPCF state does not change while consecutive data characters are being received. If the scanner detects a flag character, the state changes to X'7'/'5' (received ending flags0 or X'6'/'1' (received flag). If either case the scanner sets the OEM bit (ICW bit 0.5) and makes a level 2 interrupt request. If the scanner receives an abort character, the PCF/EPCF state changes to X'7'/'3' (received abort).

PCF/EPCF State X'7'/'5' (Receive ending flag) : In this state, the scanner has received an ending flag character. When the character is assembled in the SDF, the scanner changes state to X'6'/'1' (received flag) if a flag has been received or to X'7'/'7' if an abort character has been received. If the received character is neither a flag nor an abort character, the state changes to X'6'/'2' (received address) ; in this case, the contents of the SDF are transferred to the PDF and the BCC is accumulated.

PCF/EPCF State X'7'/'7' (Receive Idle) : This state is entered by the scanner either when the scanner detects an abort character following a good message or when the control program places the scanner in this state. The program uses this state to monitor received data for flag or idle characters. Upon detecting a flag, the state changes to X'6'/'1' (received flag). Upon detecting an idle character (when ICW bit 15.3 is on), the scanner changes state to X'5'/'0' (monitor flag) and requests a level 2 interrupt.

PCF/e2EPCF State X'8'/'0' (Transmit Initial) : This state is set by the control program to initiate text transmission. The program must initialize the following ICW fields :

* Transmit control (ICW byte 15)
* LCD (ICW byte 2)
* PCF/EPCF (ICW bytes 2 and 16)
* The low order cycle steal address (ICW byte 9)

* The cycle steal control (ICW byte 6) and cycle steal byte count (ICW byte 7). The cycle steal valid bit (ICW bit 6.5) must be set in order for the scanner to initiate a text transmission.

This state may also be used in transmitting a supervisory frame by writing the 'AC' characters into the PDF array with an Output X'4D' instruction ; the cycle steal address (ICW byte 9) and cycle steal control (byte 6) need to be set.

PCF State X'9' (Transmit Data) : This PCF state is used to transmit message data and control characters, the specific kinds of characters being specified by the EPCF states. The scanner enters this state from PCF state X'8'/'0' when the 'clear to send' line of modem becomes active.

PCF/EPCF State X'9'/'0' (Transmit Pad) : In this state the scanner serializes the leading Pad character from the serial data field (SDF) to the line adapter. The address and control bytes are in the PDF array awaiting transmission. Any data to be transmitted is also in the PDF array. At the time the next character is transferred the scanner takes places a clock sync or flag character in the SDF and changes the PCF/EPCF state.

PCF/EPCF State X'9'/'1' (Transmit Clock Sync) : In this state the scanner serializes the clock sync character from the SDF to the line adapter. After the sync characters are transmitted, the scanner places a flag character in the SDF and changes the PCF/EPCF state.

PCF/EPCF State X'9'/'2' (Transmit Flags) : In this state the scanner serializes the clock sync characters from the SDF to the line adapter. After the sync characters are transmitted, the scanner places a flag character in the SDF and changes the PCF/EPCF state.

PCF/EPCF State X'9'/'2' (Transmite Flags) : In this state the scanner serializes consecutive flag characters until a data character is available in the PDF for transmission. The scanner then places that character in the SDF, resets the BCC accumulation, accumulates a new BCC for that character, and changes the PCF/EPCF state. Zero bit insertion is inhibited in this state.

PCF/EPCF State X'9'/'3' (Transmit Abort) : This state is entered if the scanner is to transmit an abort sequence. After transmitting the abort sequence the scanner places a flag character in the SDF, aborts transmission of the current message, sets appropriate error flags in the ICW, changes the PCF/EPCF state to X'9'/'2' to send consecutive flags characters, and makes a level 2 interrupt request.

The scanner transmits an Abort sequence if the ICW control bits indicate that more data is to be transmitted but the PDF array is empty. This condition also sets the underrun bit (ICW bit 0.2). Zero bit insertion is inhibited in this state.

PCF/EPCF State X'9'/'4' (Transmit Data) : In this state the scanner transmits message text. The scanner transfers each character from the PDF array to the SDF, from which it is serialized to the line adapter. When the cycle steal byte count reaches zero and the data chain flag (ICW bit 6.6) is on, the scanner makes a level 2 interrupt request to obtain the next buffer. If the data chain flag is not on (indicating that no more data blocks are to be sent), the scanner continues to transfer characters from the PDF array to the SDF until the PDF array is empty. At the next character transfer time the scanner places the first BCC character in the SDF and changes the PCF/EPCF state. Zero bit insertion is active in this state.

PCF/EPCF State X'9'/'5' (Transmit Ending Flag) : This flag is entered after the BCC characters are serialized, the ending flag has been placed in the SDF, and the need for a line turaround is indicated by ICW bit 15.7. When leaving this state, the scanner places a two-or aight-bit pad of 1 bits in the SDF, as indicated by ICW bit 15.6. Zero bit insertion is inhibited in this state.

PCF/EPCF State X'9'/'6' (Transmit BCC) : In this state the scanner serializes the two BCC characters from the SDF to the line adapter. After this is completed, an ending flag character is placed in the SDF and the PCF/EPCF state is changed. Zero bit insertion is active in this state.

PCF/EPCF State X'9'/'7' (Transmit Idle) : In this state the scanner transmits continuous line idle characters (all one bits) if line turnarounc is not specified by ICW bit 15.7 (line turnaround after transmission). If ICW bit 15.7 does specify line turnaround, the scanner transmits two or eight consecutive one bits before changing its state to X'5'/'0'. The two bits serialized from the SDF to the line set ensure that the modem has transmitted an ending flag bit before a line turaround occurs. Zero bit insertion is inhibited in this state.

PCF State X'A' (Transmit Initial with New Sync) : This state is identical to PCF state X'8' (transmit initial) except that the new sync interface lead to the modem will be controlled according to the setting of ICW bit 16.0. (The scanner sets and resets this bit). This state must be used only with four wire, duplex multipoint leased-line modems where the associated interface is the master station. All of the EPCF states described for PCF state X'8' are valid for PCF state X'A'.

PCF State X'B' (Transmit Data with New Sync) : This state is identical to PCF state X'9' (transmit data) except that the new sync interface lead to the modem is activated when the address (A) character is transmitted and deactivated when the second BCC character is transmitted. ICW bit 16.0 (set and reset by the scanner) controls the activation of the new sync lead. This state must be used only with four-wire, duplex, multipoint leased-line modems where the associated interface is the master station. All of the EPCF states described for PCF state X'9' are valid for PCF state X'B'.

PCF State X'C' (reserved)

PCF State X'D' (reserved)

PCF State X'E' (Transmit Continuous) : The control program can use this state to transmit the same character continuously. Before setting this state, the program must set the SDF via an Output X'46' instruction and the PDF via an Output X'44' instruction (bit 0.4 must be on to allow writing in the PDF). The scanner activates the 'request to writing in the PDF). The scanner activates the 'request to send' (RTS) lead to the modem. When the modem signals 'clear to send' (CTS), the scanner sets sequence bit 0 and transfers the SDF content serially by bit to the line set. At each character transfer time, the character in the PDF is transferred to the SDF to be serialized. The PDF pointer is not incremented. The control program must change this state to end the continuous transmission.

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PCF State X'F' (Disable) : The control program sets this state to cause the Type 3 scanner to turn off the 'data terminal ready' lead to the modem. A disable command resets all control information that was provided by the last Set Mode Instruction (PCF state X'1'). The scanner then causes the interface to be placed in an interrupt pending state when the 'data set ready' lead and the 'receive line signal detect' lead are deactivated. For Auto Call applications, other conditions on the automatic calling unit must be satisfied before another dial operation can be attempted following the Disable. The Scanner sets PCF state X'0' (no-op) before requesting the interrupt. Because all control information in the line set is reset, the control program must set the proper control information in the line set via a Set Mode instruction (PCF state X'1') issued after the Disable command.

STATUS BYTE 1

Bit 14.0 (Receive Line Signal Detected) : The type 3 scanner sets this bit to 1 at bit service time when the CD (carrier detect) lead from the modem is active and is reset when the CD lead becomes active.

Bit 14.1 (SDLC Idle Detect) : For SDLC receive operations the Type 3 Scanner sets this bit upon detecting an idle-line condition while receiving a frame. ICW bit 0.0 (Abort Detect) is also set in this case. Bit 14.1 is also set if the scanner is in PCF/EPCF state X'7'/'7', ICW bit 15.3 is on, and an line-idle condition is detected. A level 2 interrupt request is also generated,
This bit is unused for SDLC transmit operations.

Bit 14.3 (Data Check) : This bit is set on by the Type 3 Scanner upon detecting a bad BCC character in the received data stream. If this bit is on, ICW bit 0.1 is reset.

Bit 14.4 (Flag Off Boundary) : For SDLC, this bit is set when a flag byte detected in received data is not on a character boundary. If this bit is on, ICW bit.0 is reset.

Bit 14.5 (2 control characters) : For SDLC, the control program sets this bit to indicate to the Type 3 Scanner to expect multiple control (C) bytes. When this bit is on, the scanner expects two control bytes to follow the address (A) byte.

Bit 14.7 (Length Check) : For SDLC, the Type 3 Scanner sets this bit upon detecting an ending flag after the address and control (AC) characters are received but before two more characters have been received.

STATUS BYTE 2

The Type 3 Scanner uses the status indicators in byte 15 of the ICW to determine the appropriate control sequences to send during a transmit operation. During a receive operation, the scanner uses these indicators to inform the control program what control characters were received.

Transmit

The format of the status byte for SDLC transmit operation is :

```
Bit:  0 1 2 3 4 5 6 7
      (reserved)      Line turnaround
                      Line  Pad/idle
                      Flag/idle
```

Bit 5 : When set (1), this bit causes the scanner to transmit continuous flag characters at the end of the frame if bit 7 is not set to cause the line to turn around. When reset (0), this bit causes the scanner to assume a line idle state after sending the ending flag after a frame.

Bit 6 : When set (1), this bit causes the scanner to send an all-1s character (8 consecutive 1's) before turning the line around if bit 7 is set to cause line turnaround.

Bit 7 : When set (1) this bit causes the scanner to turn the line around (that is, change from a transmit to a receive state) after it transmits the ending flag character.

Receive

The format of the status byte for SDLC receive operations is :

```
Bit: 0 1 2 3 4 5 6 7
                  (reserved)
            Request L2 interrupt on line
            idle or flag detect
          (reserved)
        (reserved)
     Control exception - received data in
     control frame
```

Bit 0 : The scanner sets this bit when a control (C) frame was indicated by the C byte but the flag character was not received three bytes afterward.

Bits 1 and 2 : (reserved)

Bit 3 : The control program sets this bit to request that the scanner make a level 2 interrupt request if the receive line assumes an idle state or a flag character is detected.

SCF (SECONDARY CONTROL FIELD)

The secondary control field is used as a sense, status, and operation modifier field between the control program and the communication scanner, it is an eight bit field.

SCANNER 2 TYPE 2

SCF bit 0 - Abort : The type 2 scanner sets this bit to 1 when it detects seven consecutive 1 bits in the received data stream while the PCF state is X'6' or X'7'. If this bit is 1, the service request interlock (ICW bit 1) is forced to 0. Bit 0 must be reset by the control program using an Output X'44' instruction.
This bit has no significance during a transmit operation.

Note : A transmitted abort sequence consists of eight contiguous 1 bits. However, if the scanner detects seven contiguous 1 bits while receiving data, it will set the abort bit (ICW bit 0) to 1.

SCF bit 1 - Service Request Interlock : This bit is set when the type 2 scanner detects that data transfer or control servicing is required between the control program and the 'parallel data field'. The control program must reset this bit after the interrupt is honored and all bits or bytes of the ICW have been modified. If this bit is already set when the scanner is prepared to set it on, and the PCF state is X'7' through X'A', a character overrun/underrun flag is set (ICW bit 2).

The scanner is prevented from setting this bit if an SDLC flag or SDLC abort is detected. This bit is reset by detection of SDLC abort. If this bit is 1, the abort 1 character overrun/underrun, and modem check bits are 0.

SCF bit 2 - Character overrun/underrun : this bit is set when the type 2 scanner attempts to set the service request interlock (ICW bit 1) and finds it already set. This error is normally caused by an instantaneous peak overload situation. Errors of this type should not occur in the average installation and should not occur only infrequently in high throughput installations.
If a character overrun occurs, the next character received is placed into the PDF field overlaying the character that was to have been serviced. Thus, if an overrun occurs, a character is lost.
In the event of an overrun, the same character is transmitted until the program changes the PDF field to another character or the primary control field to another character or the primary control field is changed from the transmit state.
If this bit is 1, the service request interlock (ICW bit ±0 is 0.
If the PCF state is X'7' and the flag is detected at other than the predicted position, this bit is set to one.

SCF Bit 3 - Modem Check : During each bit interval (bit service time), the type 2 scanner checks the line interface for the proper modem conditions. This bit is set to 1 to indicate the following conditions :

1. The 'data set ready' line is inactive when the PCF field of the ICW is in states X'5', X'7', X'8', X'9', X'A', X'B' or X'D'.
2. The 'clear to send' line is inactive when the PCF field of the ICW is in states X'9', X'A', X'B', or X'D'.

SCF bit 4 - Received line signal detector : This bit is sent when the line interface indicates that the data communication equipment is receiving a carrier signal that meets its requirements for receiving data. The program has no control over this bit.

SCF Bit 5 - Flag Detection/Disable Zero Insert Remembrance : During a receive operation (LCD X'8' or X'9'), this bit is set to 1 when the scanner detects a flag character in the received data. An interrupt request may be set by a change of the PCF state due to detection of the flag. This bit must be reset to 0 by the control program when the scanner is in a receive operation.

During a transmit operation, this bit is set to 1 as a character is being transferred from the PDF to the SDF, provided ICW bit 7 is set to 1. ICW bit 5 set to 1 prevents insertion of a zero after five contiguous 1 bits are transmitted. If ICW bit 7 is 0, ICW bit 5 is set to 0 as a character is transferred from the PDF to the SDF. With ICW bit 5 set to 0, a 0 bit is inserted into the data stream after five contiguous 1 bits are transmitted.

SCF bit 6 - Program Flag : This bit provides a flag in the ICW that can be used by the program.

SCF bit 7 - Disable Zero Insert Control : For a transmit operation, this bit should be turned on by the control program at the same time a flag or an abort character is set into the PDF. When this bit is 0, the scanner inserts a 0 bit into a transmitted character after five 1 bits, and the sixth bit transmitted is not changed.
As a character is transferred from the PDF to the SDF for transmission, the state of ICW bit 7 is transferred to ICW bit 5. This bit has no significance during a receive operation.

SCANNER TYPE 3

SCF bit 0.0 - Abort Detected : The Type 3 Scanner sets this bit to 1 when it detects seven consecutive 1 bits in the received data stream while the PCF state is X'6' or X'7'. If this bit is 1, the service request interlock (ICW bit 0.1) is forced to 0. Bit 0 must be reset by the control program using an Output X'44' instruction.
This bit has no significance during a transmit operation.

Note : A transmitted sequence consists of eight consecutive 1 bits. However, if the scanner detects seven consecutive 1 bits while receiving data, it will set the abort bit (ICW bit 0.0) to 1.
SCF bit 0.1 - Normal Service Request interlock : This bit is set when the type 3 scanner detects that buffer servicing or control servicing is required between the control program and the addressed ICW. The control program must reset this bit after the interrupt is honored and all bits or bytes of the ICW have been modified. If this bit is already set when

the scanner is prepared to set it on, and the scanner is in a transmit or receive state, a character overrun/underrun flag is set (ICW bit 0.2).
If this bit is 1, ICW bits 0.0, 0.2, 0.3, 14.1, 14.4, 14.6 and 14.7 are 0. Programming notes :

1. The control program should reset the normal service request interlock before setting the PCF state to monitor modem or autocall unit control lines.
2. For level 2 interrupt routines that change the cycle steal address and count, the cycle steal valid bit should be set before the normal service request interlock is reset.
3. An Output X'44' instruction that resets the normal service request interlock and/or EOM bits should be the last Output instruction executed for the scanner in program level 2.

SCF bit 0.2 - Character Overrun/Underrun : This bit is set when the Type 3 scanner attempts to set the service request interlock (ICW bit 0.1) and finds it already set. This error is normally caused by an instantaneous peak overload situation. Errors of this type should not occur in the average installation and should occur only infrequently in high-throughput installations.

If a character overrun occurs, the next character received overlays the previously received character in the PDF array. Thus, one or more characters are lost. When this occurs, the flush bit (ICW bit 14.2) is set, the PDF array is reset, and all subsequent data received is discarded until an ending sequence is received. At that point, the EOM bit (0.5) and the character overrun/underrun bit (0.2) are set.
If an underrun occurs (possible only on an SDLC transmit line), an Abort character is transmitted and the EOM and overrun/underrun bits are set.
An underrun conddition cannot occur on a BSC line because the scanner automatically transmits SYN characters (non-transparent text) or DLE SYN sequences (transparent text) until the control program sets up another cycle steal operation.
If this bit is 1, the service request interlock (ICW bit 0.1) is 0.

SCF bit 0.3 - Modem Check : During each bit interval (bit service time), the type 3 scanner checks the line interface for the proper modem conditions. This bit is set to 1 to indicate the following conditions :

1. The 'data set ready' line is inactive when the PCF field of the ICW is in states X'5', X'6', X'7', X'8', X'9', X'A', or X'B'.
2. The 'clear to send' line is inactive when the PCF field of the ICW is in states X'9' or X'B'.
   If this bit is 1, the service request interlock (ICW bit 0.1) is 0.

SCF bit 0.4 - Not Level 2 bid : This bit is set whenever an Output X'44' instruction is executed, regardless of the contents of the register specified by R. It is reset by the type 3 scanner when a level 2 bid is accepted by the interrupt priority register of the type 2 Attachment Base. When reset, this bit prevents the type 3 scanner from making another level 2 interrupt request for the line.

SCF bit 0.5 - End-of-Message interrupt : This bit is set to 1 byt the type 3 scanner to indicate the end of a received or transmitted message. If both this bit and bit 0.1 are 1, the receive or transmit operation ended normally. The operation ended abnormally if both this bit and bit 0.0, 0.2, 0.3, 14.1 14.3, 14.4 , 14.6 or 14.7 are 1.

During an SDLC receive operation, the scanner sets this bit after storing the received data and checking the block check characters (BCC). During an SDLC transmit operation, the scanner sets this bit after sending an ending control character.

SCF Bit 0.6 - Program Flag : This bit provides a flag in the ICW that can be used by the control program for any desired purpose. It is not used by the scanner.

SCF Bit 0.7 - Line Trace Active : The control program sets this bit to indicate to the scanner that the line represented by the ICW is to be traced.

PDF (PARALLEL DATA FIELD)

This eight bit character buffers the data between the control program and the serial data field.

ACTIVATING/DEACTIVATING NCP LINE TRACES

DOS/VS

```
{MODIFY} NET, {TRACE   },TYPE=LINE, ID=Line name
{F     }      {NOTRACE }
```

OS/VS

```
{MODIFY} PROCNAME, {TRACE   } ,TYPE=LINE,ID=Line name
{F     }           {NOTRACE }
```

ADDRESS TRACE

Address trace is a service aid by which the contents of selected areas of communications controller storage and selected external registers can be recorded at each successive interrupt. Certain types of interrupts, or all successive interrupt. Certain types of interrupts, or all interrupts can be designated. The Network Control Program records the trace data in a trace table within control storage. When the desired data has been recorded, the contents of the trace table can be displayed on the control panel 1 of the controller. The contents of controller storage can be transferred to the host processor via the Dump program and the contents of the trace table examined in the listing of the dump.

The TRACE operand of the BUILD macro specifies whether the address trace option is to be included in the network control program, and specifies the size of the trace table.

The address trace function is performed only for lines operating in network control mode.

Address trace is activated or deactivated by the 3704/3705 control panel for the user specified storage address or external register. The instructions for operating address trace can be found in the IBM 3704 Communications Controller Control Panel (GA27-3086) or the IBM 3705 Communications Controller Control Panel (GA27-3087).

The Trace table can be displayed via the control panel, dynamic dump, or storage dump. To locate the trace table, see the Address Trace Block (ATB) in the IBM 3704 and 3705 Program Reference Handbook (GY30-3012). The sequence to locate the trace table is as follows :

a. Storage address X'7D8' is the fullword address of the Extended Halfword Direct Addressables (HWE).

b. At HWE plus 8 is a halfword address of the Address Trace Block (ATB).

c. at ATB plus X'14' is the shifted address of the last entry of the trace table.

e. At ATB plus X'12' is the shifted address of the current (last used) entry in the trace table.

The trace entries can be analyzed by starting at the current entry plus one, the oldest entry. From the oldest entry the events are consecutive with a wrap from the last table entry to the first table entry.

The address trace facility allows the user to select any combination of up to four external registers, general registers, and storage halfwords whose contents are to be recorded each time data is loaded from or sorted into a specified storage address at a specified program level.

Figure 2 illustrates the Address Trace Block (See next page)

ADDRESS TRACE BLOCK

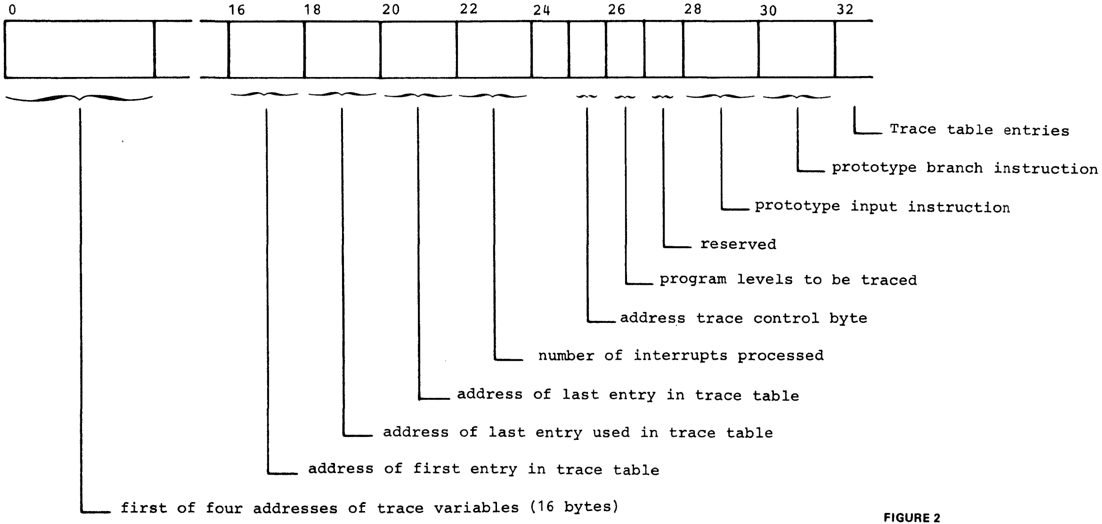


FIGURE 2

CHANNEL ADAPTER TRACE

The channel adapter trace is an optional diagnostic and debugging aid that stores certain fields from the Channel Control Block (CHB)of a type 2/3 channel adapter or the Channel Operation Block (COB) of a type 1 channel adapter into a trace table. The trace is included in the system by reassembling SYSCG006 of stage 2 generation specifying the TRACE operand. The TRACE operand specifies the number of trace entries desired in the Channel Adapter Trace table (maximum of 256). An entry is placed into the table for each level 1 and level 3 interrupt relating to the channel. After the last entry in the table is used, succeeding entries overlay the previous entries, beginning with the first. The trace table can be examined in a storage dump by locating CXCAIO53 (type 1 channel adapter) or CXCA1054 (type 2/3 channel adapter) in the dump listing. The trace table prefix is 24 bytes. Each entry is 32 bytes. The format of the trace is illustrated below with the detail of the each trace entry in the IBM 3704 and 3705 Program Reference Handbook (GY30-3012) under Channel Adapter Trace Table.

The trace table should not be included in the regular production system. If the trace is included, it is automatically active and cannot be turned off. This would take machine cycles required for production in a heavily loaded system. It should only be added to diagnose suspected or known channel problems.

The values in the trace table entries must be analyzed based upon the external register values for a specific channel adapter type. Information on the values recorded can be found in the IBM 3704 and 3705 Communications Controller Principles of Operation, GC-30-3004.

CHANNEL ADAPTER TRACE

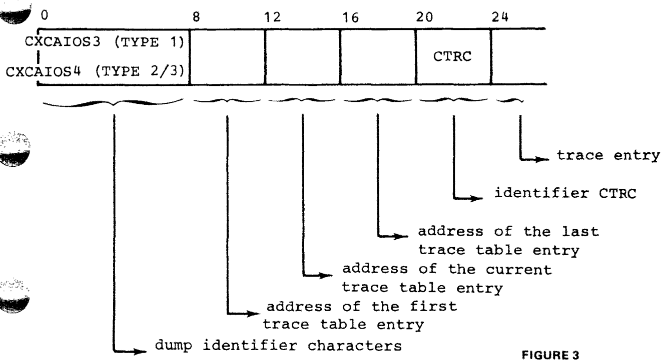


FIGURE 3

PANEL TESTS

Panel Support Routines

These routines process requests from the control panel. They are the panel display control update/refresh routine, the panel test routine, the panel display routine, and the panel monitor.

Dynamic Panel Displays

The network control program allows the user to display the following types of information on the control panel :

* Communication scanner interface control word (ICW)
* Contents of an external register
* Contents of a halfword of controller storage.

The user selects a function by setting the DISPLAY/FUNCTION SELECT and STORAGE ADDRESS/REGISTER DATA switches on the panel. When he presses the INTERRUPT push button, a level 3 interrupt to the NCP occurs.

The NCP uses a group of routines common to all the displays to process interrupts from the panel. One of these routines is the panel reader, which receives control from the level 3 router as a results of the interrupt. The panel reader reads the switch settings from the panel and ensures that it is in NCP mode. If it is, the panel reader triggers the panel service module. This routine determines which function was requested and passes control to an appropriate subroutine to set up for the display.

The remaining panel support routines get control once every 100 milliseconds as a result of a level 3 interval timer interrupt. The routines check the panel control block (PCB) the common data area for all panel routines. If the panel service module has completed its processing of a panel request, an indication is set in the PCB, notifying the panel support routines that they have work to do. First, the panel display control update/refresh routine determines whether an appendage routine is required to finish servicing the panel request. If so, it branches to the appendage routine.

One appendage routine is the communication scanner interface control word display routine. This routine moves the ICW fields into display register 2 to satisfy a dynamic ICW display request. This routine returns control to the panel monitor.

If no appendage routine is necessary, the panel display routine determines whether something is to be displayed or whether a display is to be updated. If so, it gathers the requested data and places it into display registers 1 and 2, which are gated to the panel display lights.

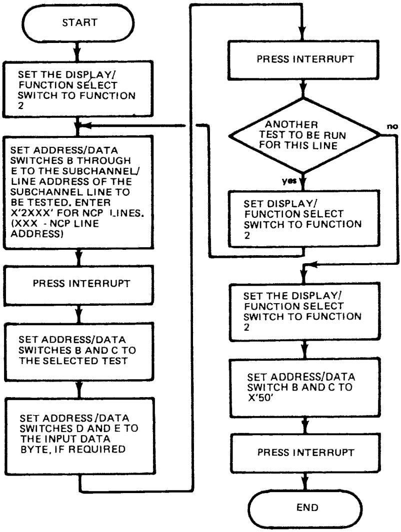
Finally, the panel monitor determines whether a panel function is currently in progress. If so, it determines whether the panel switches have been changed. If it detects a change, it triggers the panel service module to terminate the display.

Line Test

The line test feature allows the user to address, poll, dial, and transmit or receive from a terminal. The test function consists of an initialization subroutine, a series of test subroutines and an end-test subroutine. The test can be used to analyze the operation of a line by observing the ICW (displayed in DISPLAY A and DISPLAY B) during any part of the test executed in level 2 or level 3.

Note : If a line is in use by the test function, it is not available to the system. If a line is in use by the system, it is not available to the test function. Always use X'50' to end all test functions to ensure the availability of the line.

To run the NCP line trace and the NCP line test (panel test) procedures together, start the line test procedure first then start the line trace.



Test Settings for the NCP Line Test Function

The following test settings are the relevant tests for SDLC

FUNCTIONS	ADDRESS/ DATA SWITCHES B AND C	ADDRESS/DATA SWITCHES D AND E INPUT DATA BYTE	DESCRIPTIONS
Set Mode (set by NCP generation)	40	None	Retrieves set mode byte from the ACB and loads it into the line's SDF. Sets the PCF to the set mode state and returns the line to the NO-OP state.
Set Mode (variable)	41	Set Mode Character entered and used instead of the CCB set mode byte.	Loads the byte from ADDRESS/DATA switches D and E into the line's SDF. Sets the PCF to the set mode state and returns the line to the NO-OP state.
Transmit Test Character Repeat	44	Test Character	Reads the test character from ADDRESS/DATA switches D and E and places it in the line's PCF. The line must be in transmit mode already (PDF state X'9') The test character is transmitted repeatedly. If the line being tested is attached to a type 3 scanner, this function is equivalent to the Transmit Initial function (function 42), except the test character is placed in both the SDF and PDF. The line does not have to be in transmit mode initially.
Data Rate Select	49	FF=high rate 00=low rate	Selects the high or data rate for a line previously defined in the test.
Receive Mode	4A	None	Places the line in receive mode and places the first character received in the first position of the data buffer. If more than 16 characters are received, subsequent characters overlap into the last byte position of the data buffer. If the line being tested is attached to a type 3 scanner the PCF/EPCF state is set to X'5'/X'0' (SDLC monitor flag). A receive count of 40 is set up to be compared with the receive compare characters. If a match is found, the line is turned around to the transmit state. If more than 40 characters are received only the first 40 are compared.

Change PCF turn character	4B	Turn	Changes the PCF turn character to the value set in ADDRESS/DATA switch E. DISPLAY D should be set to zero.
Display LTS	4C	Displacement into LTS	Displays two half words of the line test control block (LTS) beginning at the displacement specified in ADDRESS/DATA switches D and E.
Transmit Test and Repeat (SCF bit 7 set)	4E	Test Character	Same as transmit test character and repeat except SCF bit 7 is set. This test can be used to trasnmit a character on an SDLC (Synchronous Data Link Control) line with inhibit 0 bit insert set. If the line being tested is attached to a type 3 scanner the PCF/EPCF state (X'9'/X'C' Transmit Diagnostic Mode) is set to transmit the test character continuously. The PCF/EPCF state allows only transmission of data and thus inhibits 0 bit insertion. (Enter function 42 before performing this function).
Transmit Buffer 0 or 1	4F	0(X) digit	The line is set to trasnmit mode (PCF state X'8'). When PCF state X'8' goes to PCF state X'9' buffer 0 is transmitted if byte 1, bit 7 is zero. If bit 7 is one, buffer 1 is transmitted. If the line being tested is attached to a type 3 communication scanner, the transmit is done on count rather than with a transmit end compare character. (The transmit on count operation is applicable for all scanner types used with NCP 4.1 and later releases).
End Test	50	0(X) digit	If byte 1, bit 7 is 0, the test is ended, the line test control block (LTS) is cleared, and the line is placed in a NO-OP state (drops DTR and resets options selected by set-mode). If bit 7 is 1, the line remains enabled (DTR active).

Load Buffer 0 (see Note 1)	51	(XX) digit	The character in switches D and E is stored in a 40 character buffer.
Load Buffer 1 (See Note 1)	52	(XX) digit	Same as 'Load Buffer 0' except the character is stored in buffer 1.
Load Receive Compare Character 1 (See Note 3)	53	(XX) digit	The character in switches D and E is stored as the first receive compare character.
Load Receive Compare Character 2 (see Note 3)	54	(XX) digit	Same as Load Receive Compare Character 1 except the character is stored as the second receive compare character.
Load Receive Compare Character 3 (see Note 3)	55	(XX) digit	Same as Load Receive Compare Character 1 except the character is stored as the third receive compare character.
Load Swap Transmit Buffer 0 Compare Character (See Note 3)	56	(XX) digit	The character in switches D and E (XX) is stored as the swap transmit buffer 0 compare character.
Load Swap Transmit Buffer 1 Compare Character (See Note 3)	57	(XX) digit	Same as Load Swap Transmit Buffer 0 Compare Character except the character is stored as the swap transmit buffer 1 compare character.
Initialize Buffer 0 Offset	58	XX	Sets in the LTS the displacement (normally X'00') into the appropriate buffer at which the storing of data entered through the panel is to begin. As the data is subsequently entered, a count of the data characters will be accrued and this count will then be used by the transmit routine to determine when the line should be placed into receive mode.
Initialize Buffer 1 Offset	59	XX	Same as function 58 except the displacement is for buffer 1.

SDLC CRC Accumulation Buffer 0/1	5B (invalid for Type 3 Scanner)	00 (for buffer 0) 01 (for buffer 1)	Accumulates the BCC for SDLC data (to be transmitted) as it is entered into either buffer 0 or 1. If the line being tested is attached to a type 3 communication scanner DISPLAY A and DISPLAY B will display all zeros.
Set Receive Mode Byte	5C	setting dependent on option selected (see description	Allows the selection of certain options by setting a control byte in the LTS (line test control block). Bit 3 will indicate that the option of checking for two special characters (set by subfunctions 53 and 54) in sequence in a received data stream is to be used by the panel line test function to determine when the line being tested should be placed into transmit mode. Bit 7 will give the same indication for SDLC data. (For type 3 communication scanner only). Bit 5 (modem test in progress) is set whenever a modem test is performed. Bits 6 and 7 indicate that the line is to be turned around from receive mode to transmit mode when good block check characters are received.

Note 1: For NCP 4.1 and later releases, the transmit operation is done on a count accumulated as data is stored in the desired transmit buffer.

Note 2: Before doing a Load Dial Digits operation (function 47) or Load Buffers 0 or 1 (function 51 or 52), ensure that the LTSDCNT field in the LTS is zero by entering X'5899' then X'4F99' in the ADDRESS/DATA switches and pressing INTERRUPT.

Note 3: Each received character is compared with the five compare characters in the following order : receive compare character 1, 2, 3, swap transmit buffer 0 compare character, swap buffer 1 compare character. If the received character compares with one of the receive compare character, the line is set to transmit mode and the previously specified buffer is transmitted. If the received character cq pares with the swap buffer 0 character, buffer 0 is transmitted ; if it compares with the swap buffer 1 character, buffer 1 is transmitted.

For more detailed information on panel routines, refer to 'Guide to Using the IBM 3705 Communications Controller Control Panel' form number GA27-3087.

The following are additional facilities available in NCP 6.0 (ACF)

1) Panel Dynamic Store function

NCP provides a new 3705 panel function to store data or instructions from the panel into storage without stopping instruction processing to use the hardware store function. (Additionally, any on-line channels have to be taken off-line before stopping instruction processing).

To initiate the Dynamic Store Function, the operator should enter X'00003', X'00004', or X'00005' in the HEX switches to store a byte, half word, or 18-bit word, respectively select Function 1 with the Function Select Switch, and press the Interrupt key. Display Register 1 (top row of lights) will now indicate the value from the HEX switches and Display Register 2 (bottom row of lights) will indicate X'00000'.

Next, the location to be changed must first be displayed. Select Function 2, enter the storage address in the HEX switches and press the Interrupt key. Display Register (DR1) will now indicate the storage addres and Display Register 2 (DR2) will indicate the byte, halfword, or 18 bit word at that location. (The byte and halfword displays will be right-justified in DR2, with the high order bits set to zero).

Data can now be stored from the panel by entering the byte (use Hex switches D, E), halfword (use HEX switches B, C, D, F) or 18-bit word (use HEX switches A, B, C, D, E), selecting function B and pressing the Interrupt key. DR1 contents will be incremented by 1 for a byte store, by 2 for a halfword store, and by 4 for an 18-bit store. DR2 will display the contents (byte, halfword, or 18 bit word) of that next location.

To store successive bytes, halfwords, or 18 bit words from this point on, simply enter the byte, halfword, or 18-bit word in the HEX switches and press the Interrupt key. Each time this is done, DR1 contents are incremented and DR2 displays the contents of the storage location indicated by DR1. To change another non-consecutive location in storage, that location must first be displayed as described above. To change the mode (byte, halfword, or 18-bit word) the Dynamic Store Function must be re-initiated as described above.

If the address entered via the HEX switches, or the incremented address is too large and would cause an address exception if used, an address error is indicated by displaying X'3FFFF' in both DR1 and DR2. If a store operation is attempted (Function 3) before doing a display (Function 2), an improper sequence error is indicated by displaying X'3FFFE' in both DR1 and DR2.

To terminate the Dynamic Store Function, select Function 6 and press the Interrupt key. DR1 and DR2 will now be all zeros, indicating that the function has been terminated.

2) Panel Controls of Channel Adapter trace

NCP 6 provides a new maintenance/debug tool to allow tracing channel adapter level 3 interrupts. The channel adapter trace can be optionally included by specifying CATRACF=YES operand on the BUILD macro. If included the channel adapter trace is activated/ deactivated using the 3705 operator panel.

To activate and/or deactivate the channel trace, the operator should enter 'activate/deactivate channel adapter trace mode' by selecting X'00006' in the HEX switches, selecting Function 1 on the Function Select Switch and pressing the Interrupt key. Display Register 1 (the top row of lights) will now indicate X'00004' and Display Register 2 (the bottom row of lights) will indicate X'00000'.

To activate the channel adapter trace, select Function 2 ; select the first, second, third, or fourth channel adapter by selecting 1, 2, 3, or 4 on HEX switch E; and press the Interrupt key. The Hex switch value will appear in Display Register 1 (DR1) and X'00000' will appear in Display Register 2 (DR2).

To activate the channel trace, select Function 3; select the first, second, third or fourth channel adapter by selecting 1, 2, 3 or 4 on HEX switch E; and press the interrupt key. The HEX switch value will appear in Display Register 1 (DR1) and X'00000' will appear in Display Register 2 (DR2).

To deactivate the channel trace, selection Function 3; select the first, second, third or fourth channel adapter by selecting 1, 2, 3 or 4 on HEX switch E; and press the Interrupt key. The HEX switch value will appear in DR1 and X'00000' will appear in DR2.

If any value other than 1, 2, 3, or 4 is entered in HEX switch E, or if any function other than 2, 3, or 6 is selected, or if a non-installed channel adapter is selected when Interrupt is pressed, DR1 and DR2 will be set to X'3FFFF'.

To terminate 'activate/deactivate channel adapter trace mode', select Function 6 and press the Interrupt key. DR1 and DR2 will now be all zeros indicating the function has been terminated.

The channel adapter trace table can then be inspected by dumping the 3705.

3) Cross Domain Link Test

NCP 6 provides a new maintenance capability for testing back-up links. The new capability provides for returning (transmitting back) received SDLC test commands (X'F3') to the primary SDLC station when NCP 6 is providing secondary SDLC station support (PU type 4 to PU type 4 link).

An activate link must be issued to the back-up link (the back-up links will be made addressable) in order to enable the link test capability. Once the link has been activated, SDLC test commands and their associated data will be returned to the primary station only while the link is in Disconnect Response Mode. For proper operation, the poll bit in the command field of the received test command must be on. There is no limit imposed on the number of data bytes that may be sent with the test command other than limitations which already exist for the link such as cut-off limit or current buffer availability. If anything is wrong with the received test command (bad CRC, poll bit OFF, enough data to cause cutoff to be reached, etc.). The test command will not be transmitted back to the primary station. There is no link test capability in Load Program 2 (the program that provides loading across a link capability).

4) Multiple Line Trace

NCP 6 will provide the ability to trace multiple lines simultaneously. The specific number of lines capable of being traced will be specified in System Generation (maximum of eight half or full duplex data lines in any combination). In addition, SSCP failure will result in ANS procedures which terminate all active line traces which were activated by the failing SSCP.

The user of multi-line trace must understand that the use of this function degrades the overall performance of the 3705. The degradation of performance is directly proportional to the number of lines traced simultaneously. In other words, the more lines traced simultaneously, the greater the performance degradation.

SECTION 12: T O L T E P

12

DESCRIPTION

The Teleprocessing Online Test Executive Program (TOLTEP) operates with the online test (OLT) programs and the Virtual Telecommunications Access Method (VTAM). TOLTEP controls the selection and execution of the OLT's used for testing the teleprocessing terminals supported by VTAM. You can use the OLT programs to :

* Perform preventive maintenance
* Perform problem determination
* Diagnose I/O errors
* Verify device repairs and engineering changes

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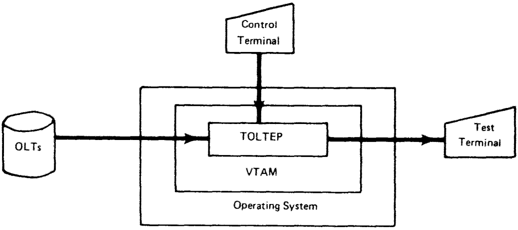

TOLTEP RELATIONSHIP WITH ONLINE TESTS (OLTs)

TOLTEP supports online testing for :

* Local and remote 3270 Information Display Systems

* Remote terminals attached to local or remote 3704 and 3705 Communication Controllers
  1. 3270
  2. 3767
  3. 3770

* Teleprocessing line hardware.

TOLTEP does not support online testing for 3704 and 3705 Communications Controllers (e.g. IFT's).

TOLTEP REQUIREMENTS

To include and run TOLTEP in your system :

* VTAM must be specified as an access method during system generation.

* For a device (terminal, control unit, or teleprocessing line) to be tested, TOLTEP requires that the device is allocated to VTAM, and that an online test (OLT)and configuration data set (CDS) are available for the device.

* For OS/VS, the appropriate DD statements must be included in the START VTAM procedure so that TOLTEP can refer to the proper data sets. The OS/VS1 VTAM System Programmer's Guide, GC27-6996, and OS/VS2 System Programming Library : VTAM GC28-0688 include this information in the START VTAM procedure.

* OLT=YES should be specified during NCP (network control program) generation. Some OLT's require this for execution.

* Symbolic names specified in the CDSs must agree with the names assigned during NCP (network control program) generation and VTAM system definition. TOLTEP associates the terminal to be tested with the CDS.

* TOLTEP does not support duplicate symbolic names. OLT test results from terminals with duplicate names can be misleading, especially if such terminals have different characteristics.

* TOLTEP consists of two load modules that are brought into virtual storage with VTAM. TOLTEP requires 79K bytes of virtual storage for DOS/VS and 85K bytes of virtual storage for OS/VS. (For OS/VS planning purposes, TOLTEP with SNA devices requires 89K bytes of virtual storage). For each user that invokes TOLTEP, including the first user, an additional 34K bytes of virtual storage are required for the OLT and a work area.

* TOLTEP requires CDSs for all test terminals and for SNA control terminals and alternate printers.

HOW TO START TOLTEP

To start TOLTEP from the network operator's console, enter one of the following operator commands.

* MODIFY NET,TEST (for DOS/VS only)
* MODIFY procname,TEST (for OS/VS only)

Where 'procname' is the name of the VTAM start cataloged procedure and 'termname' is the name of the terminal to be logged on to TOLTEP as the control terminal.

To start TOLTEP from a terminal other than the network operator's console, use the logon procedure defined at your installation. Note that the system name for TOLTEP is ISTOLTEP. TOLTEP requires CDSs for all test terminals and for SNA control terminals and alternate printers.

e.g. LOGON APPLID (ISTOLTEP)
Logging on remote terminal from system console

VARY NET,ID=termname,LOGON=ISTOLTEP

If you cannot start TOLTEP, it may be because the network operator denied the request, the device is not supported as a TOLTEP control terminal, VTAM cannot honor the request, or there is not a CDS for an SNA device.

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Acquiring Devices

You can acquire terminals for TOLTEP use only when the terminals are not connected to an application program. When the desired terminals are not connected, TOLTEP obtains use of the terminals in the same manner as other application programs.

You can disconnect terminals from an application program by :

* Using the logoff procedure defined at your installation.
* Pressing the RFT (Request for text) key on terminals that have this key (include the selection characters on a 3270 cluster).

* Issuing a VARY inactivate immediate command from the network operator's console.

TOLTEP Message prefixes for DOS/VS and OS/VS

The prefix 'ITA' is used for identification of OS/VS and 'F' for DOS/VS.

e.g. ITA105D ENTER-DEV/TEST/OPT/ (OS/VS)

F105D ENTER-DEV/TEST/OPT/ (DOS/VS)

The message serial number (identification) and message text are identical for both the DOS/VS and OS/VS systems.

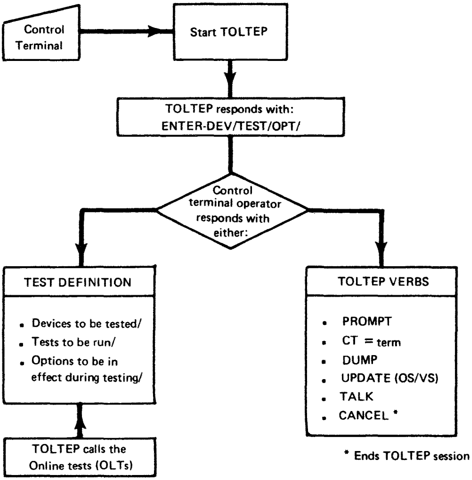
HOW TO DEFINE AND RUN TESTS

When TOLTEP is started, the control terminal operator is prompted with the message :

ENTER - DEV/TEST/OPT

The operator responds to this message as for other OLT requests (OLTEP). He also may enter any of the following TOLTEP verbs :

PROMPT	asking for help.
CT=term	switching the TOLTEP control terminal
DUMP	causing a dump
CANCEL	terminating a TOLTEP session
TALK	communicate with the OLT.



- See example of console printout (page 12-5)

CONSOLE PRINTOUT EXAMPLE

```
F net,test

 IST097I MODIFY ACCEPTED P00
 ITA102I ISTOLTEP R.2.0 INITIALIZATION IN PROGRESS P00
 ITA107I OPTIONS ARE NTL,NEL,NPP, FE,NMI, EP, CP, PR,NTR,NAP P00
*01 ITA105D ENTER DEV/TEST/OPT/ P00
r 01,t3767z/3700sna/nfe/
 IEE600I REPLY TO 01 IS 'T3767Z/3700SNA/NFE/'
 ITA158I  S T3700SNA UNIT 0033 T3767Z P00
 ITA158I  T T3700SNA UNIT 0033 T3767Z P00
 ITA107I OPTIONS ARE NTL,NEL,NPP,NFE,NMI, EP, CP, PR,NTR,NAP P00

*02 ITA105D ENTER DEV/TEST/OPT/ P00
r 2,cancel
 IEE600I REPLY TO 02 IS 'CANCEL'
 ITA548I ISTOLTEP NO LONGER REQUIRES T3767Z P00
v net,id=t3767z,logon=istoltep
 IST097I  VARY     ACCEPTED P00
 IST120I  LOGON COMPLETE FOR NODE T3767Z P00
*03 ITA920D MAY T3767Z   BE USED FOR TESTING-REPLY Y/N P00
r 3,y
 IEE600I REPLY TO 03 IS 'Y'
```

Initializing TOLTEP

Running 3700SNA (API Echo) OLLT to test 3767

Cancelling TOLTEP

Logging on a terminal from system console for terminal to have control of running test

TERMINAL PRINTOUT EXAMPLE

```
logon applid (istoltep)
ITA102I ISTOLTEP REL.2.0 INITIALIZATION IN PROGRESS
ITA107I OPTIONS ARE NTL,NEL,NPP, FE,NMI, EP, CP, PR,NTR,NAP
ITA105D ENTER DEV/TEST/OPT
```

Logging on from remote terminal to TOLTEP

SECTION 13: 370X ON-LINE TESTS

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DESCRIPTION OF TESTS

The 3704/3705 Communications Scanner On-Line Tests (OLLT's) were designed to functionally test the per-line hardware (line sets, line adapters, integrated modems, and automatic call originate features) of the 3704/3705 Communications Controller, and SDLC links attached to the 3704/3705.

The OLLT's reside in the host CPU. The individual OLLT modules build 'interpretive command chains' which are passed to the On-Line Line Test Control Program (OLLTCP). The OLLTCP, in turn puts the command chains into a Path Information Unit, or PIU. The PIU is given to the OLT executive, TOLTEP, which sends the PIU, through VTAM, to the NCP residing in the 3704/3705. The NCP decodes the individual interpretive commands and performs the indicated operation.

Some of the interpretive commands initiate certain hardware manipulations or buffering operation, e.g., set LCD/PCF, send data, etc. Other commands are used to check the results of such operations and control such things as error branching and looping.

When execution of a command chain is complete, the NCP returns certain information relating to the results of the command chain (the OLLTCB) and any received data back to the OLLT in the host. The OLLT analyzes the results and sends over the next command chain or issues an error print, as appropriate.

All of the foregoing takes place while normal VTAM and NCP operations continue on all other lines not being tested.

The OLLT's may be divided into two categories :

1) Those primarily designed for customer problem identification, and
2) Those primarily designed for use by the CE.

The tests in the first category were designed to be simple to run and to verify proper operation in the normal environment, i.e., use the same line control values as used by the NCP, etc. The tests are T3700LTA through T3700LTF.

Only one test falls into the second category, T3700 LT. This section tests all the same functions as those in the first category, provides for an external data wrap, and also allows for the optional selection of such things as the data to be wrapped, the LCD, etc.

The following sections describe the individual tests. Refer to the 3704/3705 FETMM for details on the data paths and hardware operation of the individual diagnostic wraps.

T3700LTA

T3700LTA - provides for an internal data wrap. Utilizing the hardware diagnostic wrap facilities of the 3704/3705 communications scanner, this section tests the data path of a line set, up to (but not through) the line drivers and terminators. This section has only one routine.

The following illustrations show samples of the 'DEV' field to the test request message and are used to illustrate the T3700LTA test sequence.

Since full duplex lines have only one symbolic name but are made up of two 3704/3705 addresses, the internal wrap will be run twice for each full duplex line to be tested. The 'TX' and 'RX' symbols, used below, indicate the respective transmit and receive lines of a full duplex pair.

The symbols 'Wn' and 'Tn' indicate the respective wrap and test lines, where 'n' indicates the sequence of the test. Examine the following examples and the descriptions that follow.

a)

	LONDON,	MANCHESTER, (TX)	(RX)	GLASGOW
PASS 1:	W1	T1		
PASS 2:	W2		T2	
PASS 3;	W3			T3
PASS 4:	T4			W4

b)

	MANCHESTER,	(TX)	LONDON (RX)
PASS 1:	W1	T1	
PASS 2:	W2		T2
PASS 3:	T3		W3

In example a), 'LONDON' is used as the wrap line, throughout the test, since it is the first line entered in the test request message. Each line, in turn, is then selected as the test line. (Both transmit and receive sides of full duplex lines are tested). When the last line entered has been tested, it is then used as the wrap line, and the firts line (which has not yet been tested) is used as the test line.

The sequence is the same in example b). Note that the transmit line side of 'MANCHESTER' is used throughout as the wrap line, just as 'LONDON' was in example a).

Up to sixteen symbolic names may be entered in the 'DEV' field of the test request message.

This test section can be utilized to test the per-line hardware of the 3704/3705 up to the line drivers. It tests the ability of the receive (test) line to strobe in data and present it to the Communications Scanner.

If a problem is suspected on only one line of the 3704/3705, this section should be run first, with the failing line used as the receive (test) line. If the test indicates a failure, the problem is probably in the associated line interface cards (the problem may also possibly be in the associated Line Interface Base cards).

If several lines are failing, examine their addresses. If they are all on the same Line Interface Base (LIB), then suspect a problem in that LIB. If they are not on the same LIB, suspect a problem in the Communications Scanner itself.

Remember that the actual line drivers are not tested. Therefore, if a single line is failing, but the test section runs and the trouble still seems to lie in the 3704/3705, suspect the line drivers.

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T3700LTB

T3700LTB - provides for a modem data wrap. This section was designed to test the 1200 BPS half and full duplex integrated modems and the 2400 BPS full duplex integrated modem. This section may also be used to test external 3872, 3874, and 3875 modems attached to 3704/3705 full duplex lines. The test section looks at the external clock bit in the set-mode SDF to determine the type of modem. If internally clocked, the section assumes an integrated 1200 BPS modem. If externally clocked, it assumes an integrated 2400 BPS modem or external 3872/3874/3875.

This test section has three routines. All three routines perform the same function. The only difference is in the selection of data rate select.

Routine 1 - 1200 BPS integrated modems only. (No data rate select)

Routine 2 - 2400 BPS integrated modems or 3872, 3874, 3875. This routine runs with the higher modem speed selected. (Data rate select on).

Routine 3 - 2400 BPS integrated modems or 3872, 3874, 3875. This routine runs with the lower modem speed selected. (Data rate select off).

Note : if running with an external 3872/3874/3875 modem whose mode switch is not in the 'external' position, both routines 2 and 3 will be run; however, the modem will actually be tested only at the speed selected by the mode switch.

The following illustrations show examples of the 'DEV' field of the test request message and are used to illustrate the T3700LTB test sequence.

The sequence of testing is similar to that of T3700LTA. Since T3700LTB tests modems, however, there is a difference. When a full duplex line is encountered by T3700LTB, the transmit side is always used as the wrap line and the receive side is always used as the test line. Examine the following examples and the descriptions that follow.

```
a)             BIRMINGHAM, LONDON, LIVERPOOL
   PASS 1:        W1       T1
   PASS 2:        W2            T2
   PASS 3:        T3            W3

b)             MANCHESTER, LEEDS, LIVERPOOL
               (TX)    (RX) (TX)    (RX)
   PASS 1:      W1      T1
   PASS 2:                   W2      T2
   PASS 3:      W3                         T3
```

In example a), 'BIRMINGHAM' is used as the wrap line, throughout the test, since it was the first line entered. Each line in turn is then selected as the test line.

Example b) illustrates, however, that whenever a full duplex line is encountered, its transmit side is used as the wrap line.

Up to sixteen symbolic line names may be entered in the test request message.

This section should be run only after successful completion of T3700LTA (to insure that the - set itself is operative). If T3700LTA runs successfully and this section does not, suspect a definite problem in the 1200 BPS integrated modem. Refer to the 3704/3705 FETMM for addition service aids and information.

T3700LTC

T3700LTC - provides for execution of a modem self-test. This section was designed to test the 2400 BPS half duplex integrated modem and external 3872, 3874, and 3875 modems attached to 3704/3705 half duplex lines.

This section has two routines. Both provide the same function. The only difference is the state of data rate select. Routine 1 runs with the data rate select interface lead on (the high modem speed) and routine 2 runs with it off (the lower modem speed).

Note : If running with an external 3872/3874/3875 modem whose mode switch is not 'external' position, both routines 1 and 2 will be run ; however, the modem will actually be tested only at the speed selected by the mode switch.

Since this section requires only one line at a time to run, illustrations are unnecessary. Enter the name of each line to be tested. Each line, in the order entered, will be tested. Up to sixteen line names may be entered.

This section should be run only after successful completion of T3700LTA (to insure that the line set itself is operative). If T3700LTA runs successfully and this section does not, suspect a problem in the modem. (For externally attached modems, T3700LTA may be run first to check the 3704/3705 interface and the 'test 1' position of the modem may be used to check the modem).

Refer to the 3704/3705 FETMM for additional service aids and information.

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T3700LTD

T3700LTD - provides for a test of the Autocall originate (ACO) feature of the integrated modem. It may also be used to exercise externally attached autocall units. Basically, the test is performed by dialing numbers selected by the operator.

There are two routines in this section, also. The first routine dials a valid telephone number and tests for successful connection. The second dials an invalid number, no answer or busy, and tests for no connection.

The numbers to be dialed may be entered by the operator at either of two times. The first is at the time the test is requested, by supplying the numbers in the EXT=field of the test request message. None, one, or both of the numbers may be entered at that time. The second is at the beginning of each of the routines. If the dial number for the individual routine was not entered in the EXT=field, a request will be made for the operator to enter it.

This section, also, requires only one line at a time. Enter the name of each line to be tested up to a maximum of sixteen names. Each line will be tested, in the order entered.

The telephone numbers to be dialed by this section may be entered at the same time the lines are selected. This is done by providing them in the EXT=option of the 'OPT' field of the test request message. If this is desired, enter the numbers in the EXT=option, as follows :

a) The telephone number for routine 1, routine 2, or both may be entered. If both are entered, they must be separated by a comma. If only the number for routine 2 is entered, it must be preceeded by a comma to indicate the absence of the number for routine 1. (Example : EXT=,4451). If only the number for routine 1 is entered, no comma is necessary.

b) Total length of the EXT=field may not exceed 54 characters. The total length of either telephone number may not exceed 34 characters. (If the total length of both numbers exceeds 54 characters, omit one of the numbers. When the routine requiring that number is executed, it will ask for it).

c) Only the characters 0-9, '?', '%' or '_' may be entered.

If this section detects any failures in the ACO feature of the integrated modems, refer to the 3704/3705 FETMM for diagnostic flowcharts, service aids, and additional information.

T3700LTE (see section SDLC link 1 test)

T3700LTE - provides for execution of the SDLC link test. This test is designed to aid in isolating failures on an SDLC link.

This section automatically sends the SDLC test frame 10 times and does not allow optional data to be sent in the test frame.

Since this section requires only one line at a time to run, illustrations are unnecessary. Enter the name of each line to be tested. Each line, in the order entered, will be tested. Up to sixteen line names may be entered.

This section should be run only after successful completion of T3700LTA, and T3700LTA, and T3700LTB or T3700LTC if integrated modems or 3872/3874/3875 modems are being used. This section is used to help isolate failures on an SDLC link. Analyzation of the statistics accumulated at the primary and secondary stations is helpful.

On full duplex links, the use of wrap blocks or other methods of wrapping the transmit and receive interfaces, may be helpful. The lines should be wrapped in such fashion that all normal interface signals are present and send data of the transmit interface is tied to receive data of the receive interface. The lines may be wrapped anywhere, even down-line. Half duplex links may not be wrapped.

Note - The LU, PU and Line must be deactivated in order to run this test.

T3700LTF

T3700LTF - provides for a test of the break circuitry of the integrated 1200 bps modem with break feature.

This section has two routines. The first tests the ability of the break circuitry to detect a mark frequency and the second routine tests its ability to detect a space frequency.

Note : It is recommended that section T3700LTB be successfully run before attempting to run this routine.

Since this section requires only one line at a time to run, illustrations are unnecessary. Enter the name of each line to be tested. Each line, in the order entered, will be tested. Up to sixteen line names may be entered.

This section should be run only after successful completion of T3700LTA and T3700LTB. If both of these sections run okay and T3700LTF fails, the problem is most likely to be in the modem's break feature circuitry.

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T3700LT

T3700LT - CE utility and external data wrap. This section provides for testing any of the same functions tested by T3700LTA through T3700LTE. It also provides for an external data wrap. In any of these cases, the operator may optionally specify :

a) The data to be sent.

b) The LCD to be utilized. (If SDLC, the operator may also specify if NRZI mode is to be used).

c) The set-mode SDF to be utilized.

d) In test 6, the number of frames to be sent.

When T3700LT begins execution, a request is made to determine the test to be run. The operator may select from one of the following :

Test 1 - internal data wrap. Same function as T3700LTA.

Test 2 - modem data wrap. Same function as T3700LTB. (If full duplex and external clocking and operator has specified the LCD or set-mode SDF, only routine 1 will be run. Data rate select will be set as selected by operator).

Test 3 - modem self-test. Same function as T3700LTC. (If operator has specified the LCD or set-mode SDF, only one routine is run. Data rate select is set as selected by operator.)

Test 4 - ACO dial. Same function as T3700LTD. (Numbers to be dialed may not be entered in the test request message.)

Test 5 - External data wrap. Provides a means of externally wrapping any two lines, thus verifying a data path outside of the 3704/3705. Although the method of wrapping would normally be the use of an external wrap block on the 3704/3705 line interface connectors, wrapping may be done 'downline' at any convenient point. However, for external wrapping, the transmit side of a full duplex line may be wrapped only to its associated receive side. (i.e., the transmit side of one full duplex line may not be wrapped to the receive side of another full duplex line.)

Test 6 - SDLC Link Test. Same function as T3700LTE.

Test 7 - Break test. Same function as T3700LTF.

The device entry for this section differs from that of the other test sections. For this section, only one or two symbolic line names may be entered in the test request message. The second line name entered, if there is one, will be used as the wrap line. (Some tests under T3700LT do not require a wrap line. In addition, if either of the lines whose names are entered are full duplex lines, message ITB502 will occur. This message is a request to select the side of the line to be utilized, i.e., transmit or receive.

If no wrap line is entered (only one line name entered), and the test line is full duplex, the side not selected in response to message ITB502 will be used as the wrap line.

This section when used in conjunction with T3700LTA can help isolate a problem to the 3704/3705 line drivers. First, run T3700LTA to verify the operation of the line set. Then attach external wrap blocks on the 3704/3705 line drivers or receivers.

The above description does not fully cover the facilities available under this section. The reader should therefore refer to 3704/5 Communications Scanner On-Line Tests form D99-3700C for a more comprehensive description.

T3700 SNA (API ECHO)

Description

The API Echo Test is designed to verify the integrity of the link between the terminal and the central site. This is done by sending to the terminal the data that was requested the number of times specified.

The above takes place while normal VTAM and NCP operations continue on all terminals not being tested, including other Terminals on a multidropped T.P. line.

T3700SNA - provides for echoing the data to the terminal. The test will repeat the requested data the number of times specified. In addition, if no data is requested, the test will send default test data to the test terminal.

Products supported :

3270 SNA
3767
3770
3274/3276

Test Request Message Entry

1 - Device Field

This section will test only one terminal at a time. Enter the symbolic name of the terminal to be tested.

2 - Test Field

T3700SNA is the test section name.

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3 - Option Field

Data to be echoed by this section may be entered at the same time the terminal is selected. This is done by providing it in the EXT= option of the 'OPT' field of the test request message. (See note). If this is desired, enter the request in the EXT= option, as follows :

a. 2 digit number for the times to receive the data followed by the data. (Example :EXT=99ABC..Z). (This will send ABC...Z to the test terminal 99 times).

   Note :Only Alpha-numeric characters will be echoed. Caution :Over-printing will result on Test devices that require a carriage return character in its data stream.

b. 2 digit number for the times to receive the standard message. (Example :EXT=99). (This will send A-Z, 0-9 to the test terminal 99 times).

c. 2 digit number for the times to receive the data followed by X' then data. (Example :EXT=99X'FFFF). (This will send the Hex text (FFFF) to the terminal 99 times).

   Note :If the test terminal cannot request data, the EXT=Option must be used to request YYDATA.

d. The word BIND to display the bind parameters for the symbolic unit in the Test field.

Selecting the Echo Options

T3700SNA provides for selection of three different options in addition to allowing the operator to specify the data to be echoed.

This message 'ENTER YYDATA, PROMPT, or END' will occur, providing an opportunity to select any of the following options :

a. 'YYDATA' - YY is number of times to repeat the data. Data is the information to be echoed.

b. 'PROMPT' - This will prompt the user of the YYDATA format.

c. 'END'   - Terminates the Echo Test.

NOTE :If no options are selected, the test will repeat the last requested option (YYDATA).

Selecting the Echo Data

The 'DATA' option allows specification of the data to be transmitted during the selected test. Up to 100 bytes of data may be specified.

The data can be one of two formats :

(1) Normal keyboard data :ie. ABC...Z

(2) Hex data :ie. X'F1F2

Hex data must be preceded by X' and consist of an even number of characters.

<u>Reference documentation</u> :

API echo D99-3700D

<u>Examples of running tests</u>

1 - NAME/T3700SNA//

Where :NAME is the symbolic name of the terminal to be tested.
T3700SNA is API Echo Test.

This example will select the terminal called 'NAME' and send a message to it requesting what data to echo.

2 - */T3700SNA//

This example is used when the test terminal and control terminal are the same. Only the * is required for the symbolic name.

3 - NAME/T3700SNA/EXT=YYDATA/

EXT=YYDATA is requesting the Echo Test to send 'DATA' to the terminal YY times.

4 - NAME/T3700SNA/EXT=YY/

EXT=YY is requesting the Echo Test to send Default Test Data (A-Z, 0-9) to the terminal YY times.

5 - NAME/3700SNA/OPT,EXT=YYX'DATA/

EXT=YYX'DATA is requesting the Echo Test to send the data in Hex to the terminal YY times.

R3270D (SNA)

The diagnostic programs detailed in this section are designed to test and provide functional exercisors for :

* 3271 Remote Multiplexor Control Unit with SNA Feature

* 3275 Remote Standalone Display Station with SNA Feature

with attached
* 3277 Display station
* 3284 Printer
* 3286 Printer
* 3288 Printer

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TEST INITIATION

Test execution is initiated through the normal executive operator requests. The test ID shall be R3270D. The variations for inclusion in the request message are :

...SYM NAME/R3270D/OPTIONS/ will cause a default to EXT=CHK.

NAME/R3270D/(OPTIONS),EXT=xxx/'-where xxx entries are explained below and a specific set of OLTs can be selected.

EXT option

Specific portions of the OLT package can be selected by the use of an EXT= entry in the options field of the operators request message. The permitted entries for EXT= are:

ENTRY	TESTS SELECTED
CHK	Check tests (Functional Exercisors)
MAN*	Manual tests (includes both KEY and MAG).
KEY*	Keyboard tests.
MAG*	Magnetic Card Reader.
PAT*	Patterns for Display Station or Buffered Printer.
PAT,DPRT*	Patterns for dedicated printer (Non-Buffered).
RPQ	RPQ Tests (For Future Use).

* These entries should be proceded by option MI, e.g.,...
(SYM NAME)/R3270D/NFE,MI,EXT=MAN/'

Routine Selection

Functional Exercisors (CHK)

ROUTINE NUMBER DECIMAL	TEST DESCRIPTION (CHK)
1	Write and Read all Graphic Characters
2	Start Field Order with all valid attributes
3	Insert Cursor with all WCCs
4	Erase all unprotected command
5	Erase Unprotected to Address Order
6	Repeat to Address order
7	Program Tap Order
8	Copy command
9	Start Printer
10	APL Graphic character test

Keyboard (key)

ROUTINE NUMBER DECIMAL	TEST DESCRIPTION (KEY)
31	Manual Interrupt AID check
32	Uppercase Keyboard Check
34	APL Keyboard Check

Magnetic Card Reader (MAG)

ROUTINE NUMBER DECIMAL	TEST DESCRIPTION (MAG)
61	Test Magnetic Card Reader and Cards Reader and Cards

Patterns (PAT)

ROUTINE NUMBER DECIMAL	TEST DESCRIPTION (PAT)
91	RFT's Menu Pattern
92	Copying all characters and symbols
93	Test Patterns for 480 buffer alignment
94	Test Pattern for 1920 buffer alignment
95	Check Program Tab and Erase unprotected
96	Universal pattern display
97	New Line function test

Reference Documentation

Remote 3270 Display system D99-3270D

Example of running test

R 01, 3277D/R3270D,91,92/NFE,MI,EXT=PAT/

where :
- 3277D is the symbolic name of the terminal
- R3270D is the test
- 91,92 are the routine numbers to be run
- NFE,MI,EXT=PAT is the pattern test with options specified.

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SECTION 14: SDLC LINK TEST1 (LTE)

DESCRIPTION

The SDLC Link Test, provided within the SNA architecture, is basically an echo test. The primary SDLC station sends an SDLC 'TEST' frame down the link to the secondary station. If the secondary station receives the 'TEST' frame without errors, it resends the frame to the primary station.

The SDLC Link Test is implemented in all SDLC devices. In the 3704/3705 it is implemented in two vehicles. The first is in the the Internal Functional Tests (IFT's), and is commonly referred to as Link level 0. The IFT's provide support for the 3704/3705 to act as either a primary or secondary station and require that the entire 3704/3705 be dedicated to the test. (Refer to the descriptions of routines X6F0 and 15F0 in D99-3700A for further detail).

The second is in the ON-Line Line Tests (OLLT's), and is commonly referred to as Link Level 1. This Level of the Link Test provides support for the 3704/3705 to act as a primary station only, and requires only the line to be tested be dedicated to the test. This level of the Link Test is described in the following paragraphs. The 'test' frame that is sent is the same, regardless of the level of the test. Operating procedures and requirements, and statistics accumulated may be different.

All SDLC frames are of structure as shown in figure 1. The command field, for a 'TEST' frame indicates 'TEST'. The optional data field may or may not be present. (T3700LTE does not allow the optional data field, while test 6, under T3700LT, does).

SDLC Test Frame

Pad Pad F A C dd BC BC F ee

where,

Pad = alternate data transition characters for clock correction : X'00' if NRZI mode, 'XAA' if not

F = SDLC flag characters : X'7E'

A = SDLC station address byte

C = SDLC command byte : X'F3' for 'TEST'

dd = optional data field.

BC = block check (CRC) characters.

ee = ending transmission of idle character : X'FF'

Note : All characters between the two flags are defined as a frame. If NRZI is in use, the actual bit pattern on the line will be different due to NRZI mode. Also, SDLC zero bit insertion/deletion apply to all characters within the frame.

OPERATION

The Link Test OLLT sends a 'TEST' frame down the line. The secondary station (SDLC device or remote 3704/3705) acts as follows :

a) Buffer the received frame.
b) Check the block check characters.
c) Check for valid address and command bytes.
d) Maintain statistics
e) If no errors in receiving the frame, return the frame to the primary. (If more optional data is received that can be buffered, the basic 'test' frame is returned without the optional data).

(Note that some SDLC devices may respond differently. These differences are beyond the scope of this document. Information relating to the responses of an individual device should be obtained from the documentation for the specific device).

The Link Test OLLT checks the frames received from the secondary station in a fashion similar to the secondary station. In addition the optional data field received is compared to the optional data sent. Statistics are gathered and printed prior to test termination.

T3700LTE

Since this section requires only one line at a time to run, illustrations are unnecessary. Enter the name of each line to be tested. Each line, in the order entered, will be tested. Up to sixteen line names may be entered.

e.g. SYM NAME/T3700LTE//

- See console printout example (page 14-5)

RESULTS

Link Test Statistics Table

The following describes the Link Test statistics table. This table is immediately printed following the transmission of the requested number of SDLC 'TEST' frames. Any hardware errors occuring while transmitting the frames will be printed first. Note that this table will always be printed whether or not errors occurred ; however, if no errors occurred there will be no '*' on the TOLTEP test terminate message.

Example of table :

```
T3700LT - 00 RTN 001 - DEV/LN 00B SLBSCAD ECA 0 RETNUM 00000

        LINK TEST STATISTICS (IN HEX)

FRMS REQUEST-000A  FRMS TX       -000A  TOT RCVD FRM-0000
BCC ERRORS  -0000  HRDWARE ERR   -0000  TIME OUT ERR-000A
INV A/C  FLD-0000  DATA NT RCVD  -0000  INCORRECT DAT-0000
'CMDR' RESP -0000  'NSA' RESP    -0000  RCVD W/O ERR-0000

ACCUMULATED SCF    -01
ACCUMULATED RCVD DATA BITS IN ERROR
      0000
```

a) FRMS REQUEST - The number of frames requested to be sent. (if T3700LTE, this will always be X'0A').

b) FRMS TX - The actual number of frames transmitted successfully. (Transmission of frames halts if any error is detected while transmitting).

c) TOT RCVD FRM - The total number of frames received. This count includes all frames received, including frames in error.

d) BCC ERRORS - The number of frames received in which block check errors occurred.

e) HRDWARE ERR - The number of receive operations that ended because of one or more bits in error in the SCF. As each level two interrupt occurs, bits 0, 2 and 3 of the SCF should be off.

f) TIME OUT ERR - The number of receive operations that ended in a timeout, i.e. nothing received within three seconds.

g) INV A/C FLD - The number of frames received whose station address was not equal to the station address sent, or whose command field did not contain X/'F3'.

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h) DATA NT RCVD - The number of frames received that contained no optional data when optional data was included in the frames sent.

i) INCORRECT DAT - The number of frames received whose optional data fields did not compare with the optional data sent. This also includes the number of frames that included data when no data was sent.

j) 'CMDR' RESP - The number of frames received whose command field contained 'CMDR' (command rejects) :

k) 'NSA' RESP - The number of frames received whose command field contained 'NSA', (non-sequenced acknowledgement) : X'73'.

l) RCVD W/O ERR - The total number of frames received without error, i.e., all frames whose receipt was not included in any of the fields described in d-k above.

m) ACCUMULATED SCF - The accumulated SCF. As each frame is received the ending SCD is or'ed into this field.

n) ACCUMULATED RCVD DATA BITS IN ERROR - As each frame is received, the frame is compared with the frame sent. Each bit in error is or'ed into this field.

EXAMPLE OF RUN LINK TEST

```
 ITA107I OPTIONS ARE NTL,NEL,,NPP,NFE,NMI, EP, CP, PR,NTR,NAP P01
*32 ITA105D ENTER DEV/TEST/OPT/ P01
R 32,A023/T3700LTE/NFE/
 ITA548I ISTOLTEP NO LONGER REQUIRES A023 P01
 ITA158I  S T3700LTE UNIT 0000 A023 P01
*33 ITB531D  - ENTER THE ONE BYTE STATION ADDRESS IN HEX P01
R 33,C1
  T3700LTE-00  RTN 001   DEV/LN 0000 A023      ECA 0    REFNUM 00000 P01
   P01
          LINK TEST STATISTICS (IN HEX) P01
   P01
   FRMS REQUEST-000A   FRMS TX     -000A   TOT RCVD FRM-000A P01
   BCC ERRORS  -0000   HRDWARE ERR -0000   TIME OUT ERR-0000 P01
   INV A/C FLD -0000   DATA NT RCVD-0000   INCORRCT DAT-0000 P01
   'CMDR' RESP -0000   'NSA' RESP  -0000   RCVD W/O ERR-000A P01
   P01
   ACCUMULATED SCF    -0D P01
   ACCUMULATED RCVD DATA BITS IN ERROR P01
      00000000 P01
   P01
   P01
ITB533I  - TEST 6 ENDED ON A023      (0846/NONE). P01
ITA158I  T T3700LTE UNIT 0000 A023 P01
```

SECTION 15: MISCELLANEOUS DATA RECORDER (MDR)

DESCRIPTION

The 3705 Network Control Program (NCP) and VTAM provide records as input to the Miscellaneous Data Recorder (MDR). VTAM recognizes these records by the system response (X'0A') set by the NCP in the BTU. The text portion of the MDR record consists of a field of up to 25 bytes. The third byte of the field is the recording mode byte, which is used to differentiate between the types of NCP MDR records. The fourth byte, the record ID byte, is always set to X'05' indicating to VTAM that this is a 370X MDR record.

The recording mode byte (third byte). is broken down as follows :

High-order Hex digit indicates the error category

0000 .... - 3705 TP Line Errors
0001 .... - 3705 Temporary Errors

The two Hex digits together indicate :

0000 0000 - Permanent SDLC Line Errors
0000 0001 - Statistical Data on Line Errors
0001 0000 - Channel Adapter Temporary Error
0001 0001 - Communications Scanner Temporary Error
0001 0010 - Program Checks Temporary Error
0001 0011 - Miscellaneous Program Level 1/Level 3 Temporary Error

The Temporary errors are further defined by the fifth (+X'04') byte of the MDR record.

If the recording mode byte (+X'02') is a X'10' (Channel Adapter Temporary Error) then :

Error Record Byte (+X'04')	Applies to
X'02'	Type 2 Channel Adapter Position 2
X'04'	Type 2 Channel Adapter Position 1
X'84'	Type 1 Channel Adapter Position 1

If the recording mode byte (+X'02') is a X'11' (Communication Scanner Temporary Error) then :

Error Record Byte (+X'04')	Applies to
X'08'	Type 2 Communications Scanner Position 4
X'10'	Type 2 Communications Scanner Position 3
X'20'	Type 2 Communications Scanner Position 2
X'40'	Type 2 Communications Scanner Position 1
X'C0'	Type 1 Communications Scanner Position 1

The OS utility IFCEREP0 and DOS EREP prints a formatted dump at these error records from the data set (SYS1.LOGREC).

Figure 1 shows an example of a Permanent SDLC Line Error MDR.

```
                        --- I/O DEVICE EDITING ---
RECORD ENTRY TYPE - VTAM MDR    SOURCE - OUTBOARD
CPU MODEL 0145    SERIAL 750109
DOS RELEASE LEVEL 32
DEVICE TYPE          3705
CHANNEL UNIT ADDRESS 0050
RESOURCE ID          201F       RESOURCE NAME LINE2A
 RECORD TYPE - PERMANENT SDLC LINE ERROR
LIB ADDR             002A
  LINK INFORMATION
   CCB TYPE CONNECTION FLAGS   00     LXB COMMAND         8D       LXB LAST ERROR STATUS             06F4
   CCB TYPE FLAGS              21     LXB MODIFIERS       0000     LXB LAST ERROR EXTENDED STATUS  00
                                      LXB IMMED CTRL CMD 00        LXB FIRST ERROR STATUS           0000
                                                                   LXB FIRST ERROR EXTENDED STATUS  00
   LAST ERROR, BIT DECODE      LAST ERROR EXT STAT
   EXTENDED ERR STAT FLG 0     OVERRUN/UNDERRUN FLAG 0
   FORMAT EXCEPTION FLAG 0     BLOCK OVERRUN         0
   CHARACTER SYNC CHECK  0     ABORT BLOCK           0
   DATA CHECK            0     MONITOR COUNT OVERFLO 0
   SDLC POLL FINAL BIT   0
  LOCAL (PRI) STATION INFORMATION
   SCB DEVICE TYPE            00
   SCB LINK SCHEDULING FLAGS  0000
   SCB OUTPUT CONTROL FLAGS   00
   LXB XMTD BLU CMD FIELD     00
   LXB RCVD BLU CMD FIELD     00
   SCB SEQUENCE   N(R)        0
   SCB SEQUENCE   N(S)        0
   SCB BLKS OUTSTANDING COUNT 000
   SCB PASS COUNT             000
   SCB I-FORMATS TRANSMIT CNT 000000
   SCB TEMP XMIT ERROR COUNT  000
```

FIGURE 1

The following pages contain a breakdown of the most important fields contained in the MDR for 'Permanent SDLC Line Errors'.

LXBCMODS

Byte 0	Command modifiers :
x...	1=Suppress ending a new command due to outstanding status 0=Immediate end to new command when status is outstanding
.x..	1=No retry 0=retry
...x	1=Immediate retry if errors while normal polling 0=if errors, retry at next normal poll cycle
....x	1=Do not release transmitted buffers after ACK
Byte 1	
x...	1=Perform command reset step first 0=Normal command execution

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LXBIMCTL

	Immediate control command flags :
X'80'	Reset immediate issued
	Set Mode Commands (for idle or busy lines)
X'04'	Read line type
X'06'	Set text error retry limit
X'10'	Set receive buffer cutoff factor
X'12'	Start line trace
X'14'	Stop line trace
X'18'	Set operation link
X'1A'	Reset operational link
	Set Mode Commands (idle lines only) :
X'05'	Set line adapter interface parameters
X'07'	Set line control procedure
	LXB line type :
X'8C'	Primary SDLC station mask
X'8E'	Secondary SDLC station mask

LXBCMAND

	LXB command
X'00'	No I/O occured
X'83'	Disable
X'8D'	Enable
X'8F'	Dial
X'30'	Run SDLC link
X'32'	Run initial (remote NCP)

LXBEXTST

	Extended error status
1...	1 = overrun if LXBSTAT Bit 4 = 0 1. Lost character, PDF overlayed 2. Flag received off boundary 1 = Underrun if LXBSTAT Bit 4 = 1 Character in PDF transmitted more than one (Limit 127 retries LSBRTYCT)
.... 1...	Block overrun occured Level 3 block processing in progress when another block available from L2
.... ..1.	Abort received Eight consecutive 1 bits received
....1	Monitor count overflow 64 temporary I format receive errors have occured 1. I format receive data check 2. I format receive format checks 3. I format receive aborts

SCBTYPE

	Station type
X...	1=Duplex station 0=Half-duplex station
.1..	Continue polling in ANS
..1.	Switched SDLC station
.... X...	0=Link is primary 1=Link is secondary
.... .1..	Terminal node (type 1 PU)
.... ..1.	Cluster controller (type 1 PU)
....X	1=Intermediate node (INN) 0=Boundary node (BNN)

LXBSTAT (BYTE 0)

Byte 0	Status equates :
1...	Extended error status see LXBEXTST
.1..	Format exception invalid SDLC format 1. Frame contained Data (NSA, SNRM) 2. Not a complete frame 3. The following is a list of LXBSTATC values and the reason for the format exception : 0E Rec REJ, line is not duplex 1C Rec RR or in NS Phase 1E Rec XID in RR or RNR phase A2 Rec Invalid SDLC Command A8 Rec SDLC Disc AC Rec RQI B2 Rec SDLC SNRM B6 Rec SDLC ROL BC Rec NSA in RR or RNR Phase BD Sent SNRM did not rec NSA
...1	FCS error (data check)
	Run command error/exception phase field :
.... 000.	No Command Active
.... 001.	SDLC I-format sent or SDLC RR sent
.... 010	SDLC RNR sent
.... 011.	SDLC NS command sent
.... 100.	Transmit
.... 101.	Error while sending text I-format
.... 110.	Error while sending normal polling or response S-format
.... 111.	Error while sending NS control sequence

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Byte 1	Completion code status byte :
000.	Normal Final Status : control information received in S-format
0 000.	Timeout received RR, RNR or REJ
0 101.	Test frame received
0 110.	Partial acknowledgement sequence number change (OR) Negative acknowledgement sequence number does not change
0 111.	SDLC REJ received
1 110.	SDLC RR received positive acknowledgement (NS = NR)
1 111.	SDLC NRN received
001.	Normal Final Status : Data received in I-format
0 000.	Timeout received address and control fields
0 010.	Buffer Cutoff Exceeded buffer limit
0 101.	Test frame received
0 110.	Partial acknowledgement sequence number change (OR) Negative acknowledgement sequence number does not change
1 010.	End of Block I-format received
011.	Normal final status : Data received in NS format
0 000.	Timeout flag received
0 001.	SDLC CMDR received (no retry) MDR has reason for CMDR
0 010.	Buffer Cutoff Exceeded buffer limit
0 101.	Test frame received
1 010.	SDLC NSI received
100.	Special 0 Final Status : Special Status or control information received in NS-format
0 000.	Timeout Nothing received
0 010.	Buffer Pool Depleted No more buffers available
0 110.	Reset end run command
0 111.	Invalid Address Received from Secondary
1 011.	Poll stop
1 100.	SDLC Frame sent
1 110.	Disabled
1 111.	Enabled

101.	Special 1 SDLC Final Status control information received in NS format
0 000.	Timeout received flag
0 001.	Received Invalid SDLC Command (no retry)
0 010.	Received Invalid (incongruous) N(R) in I or S-format
0 011.	Link Activity Timeout (Secondary only)
0 100	Received SDLC DISC
0 110.	Received SDLC RQI or SIM (No retry)
1 000.	Record statistics total retry count overflowed or transmission count overflowed
1 001.	Received SDLC SNRM
1 011.	Received SDLC ROL (no retry)
1 110.	Received SDLC SNA
1 111.	Received SDLC XID
111.	Hardware final status :
... 0 100.	Adapter Check - 1. Timer has detected no level 2 interrupt when at least one was expected. 2. Modem self-test failed to get level 2 interrupt after placing the PCF in turnaround 3. Enable or dial failed to get a level 2 interrupt after setting the PCF to set mode
...0 101.	Adapter Feedback Check - 1. Timer detects an LCD of X'F' which results from a hardware-detected error within the adapter 2. Improper SYSGEN about the adapter in use.
...1 000.	Modem error - Set when the SCF modem error bit is on. 1. Occurs when DSR drops during a transmit or receive operation 2. Can be set by the timer 3. Set if CTS drops while transmitting
...1 001.	Transmit Clock or CTS failure 1. During enable or write control operation, a Level 2 interrupt failed to follow turnaround 2. During enable on a full duplex line, CTS failed to come up 3. Time-out occurs with PCF of transmit initial (8)
...1 010.	DSR Turn On Check - DSR fails to come up during an enable or dial operation
...1 100.	DSR Turn Off Check - DSR fails to drop during a disable operation

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...1 110.	Auto call check 1. Initial dial PCF 'F' sees ACR, DLO, COS, or PND up 2. Dial PCF '4' sees ACR, COS, or PND up
1111 1111	Program failure 1. Line I/O code completed in an impossible status, (e.g. ENQ on SDLC line). 2. A negative data length was computed
....x	Poll final bit

SECTION 16: MODEM TEST

DESCRIPTION

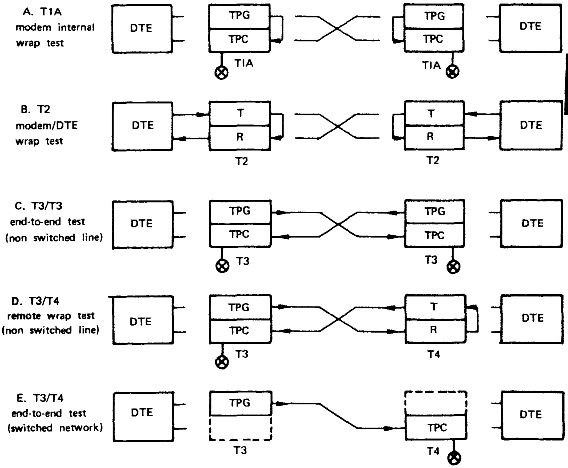
The tests referred to in this section apply to IBM modems 3872, 3874 and 3875 and integrated modems.

Tests A, B, C, and D may be carried out for a centralized multipoint configuration. In this configuration, end-to-end testing is always carried out between the control modem and one of the tributary modems.

Tests A, B, and E may be carried out for public switched network operation.

Tests C through E require the cooperation of the other-end operator (remote or tributary); for tests C and D conversation may take place over the leased line via the handset (if the 'Alternate Voice' feature is installed) or may take place over the public telephone system. When test E is being performed the conversation must take place via the data coupler or the data access arrangement.

In each of the tests, with the exception of test B, a fault is indicated by the operate lamp on the receiving modem going out.



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SECTION 17: 3601/3602 DIAGNOSTICS

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DESCRIPTION

The maintenance package for the 3600 controller consists of :

1) Problem Determination Procedures (PDP)
2) Maintenance Analysis Procedures (MAP)
3) 3601 controller Log
4) Errors Statistics Counters
5) Debug mode
6) Starter diskette - controller terminal exercisers

1) PROBLEM DETERMINATION PROCEDURES (PDP)

PDP's are available to the customer and are located in the Operating Guide for the IBM 3600 Finance Communication System, GA27-2776. Use of the PDP's will enable the customer to direct the CE to the problem area.

2) MAINTENANCE ANALYSIS PROCEDURES (MAP)

MAP's are used by the CE to analyse problems with the 3601 controller and the connected terminals and are included in the Maintenance Information Manual.

3) 3601 CONTROLLER LOG

The 3601 controller Log is a file located on the diskette. The system monitor places messages in this log that relate to maintenance and engineering data. The user's programs also have the ability to place messages in this log. The first two digits of any log messages are significant. The meaning of these digits are as follows :

First digit = 1 : System written log message.
First digit = Not 1: User-written log message. User should not begin the message with a 1.
Second digit = 1: The log message requires immediate attention. To alert the CE to the presence of such a message, the 3601 controller turns on the CHECK, 1, 2 or 3 indicator light of the control operator's 3604. (The configuration process at generation time determines which light will be used for this purpose. Usually, it is the CHECK light). If the control operator's 3604 is not operating, the 3601 controller turns on the corresponding light of the first available 3604 that is operating.
Second digit = Not 1 : This message does not require immediate attention and does not turn on the CHECK light at a 3604.

NOTE : The 3601 controller log is lost through a cold start. It is not lost through a warm start.

The CE can examine a display or a printout of the 3601 controller log by logging on at any operating 3604, and then giving a 001, 002 or 046 command.

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TYPES OF LOG MESSAGES 3601

* 10 002 AA BBBBBB CCCCCCCC DDDDDDDD EE F GGGG, where:

A = Control Code supplemental version ID.
B = Diskette identification (Volume D).
C = Configuration identification (GEN ID).
D = The EC level of the controller data.
E = Control Unit (controller) address (CUA).
F = Relocate count. A count of the number of the diskette records moved to the error track because of disk surface defects.
G = Session identification (ID). A session is one or more periods of time that the customer thinks of as one continuous period of time for the purpose of record keeping.

NOTE : On a cold start, message 10 002 is placed in the log and the session identification is incremented. On a warm start, message 10 002 is placed in the log but the session identification is not incremented.

* 10 030 DATA where :

DATA is any text, up to 176 characters, keyed in by the CE for diskette test.

* 11 003 NNNNNNNN SS PP AAAACCCC IIII, where :

N = Application program name.
S = Work station identification in hexadecimal.
P = Program check code in hexadecimal.
A = Program check address in hexadecimal.
C = Loop count in hexadecimal (a count to indicate whether the application program is in an endless loop).
I = First two bytes of instruction. If PP = 0B (user's instruction counter invalid), IIII is not valid data.

NOTE : The above information is connected with the customer's application program and should be supplied to the customer.

* 11 004 EEMM CCLL PPII WWWW WWWW TTTT ZZZZ ....

This message contains design support information. The CE may be called upon to provide this information when aid is required to correct a problem.

* 11 005 LOOP X ERROR,CODE = Y-Z, where :

X = Loop number.
Y = Loop Status.
- 0 = The 3601 loop control card and the modem (if a remote loop) passed the wrap test.
- 1 = Modem failed wrap test.
- 2 = 3601 loop control card failed wrap test.
- 4 = Machine check.
- 6 = Combination of 2 and 4.
- 8 = User requested stop loop.

Z = Modem status :
- 0 = Transmit and receive not ready.
- 1 = Receive ready (carrier detect).
- 2 = Transmit ready (clear to send).
- 3 = Combination of 1 and 2.

* 11 006 (host link error message) has three formats :

  Format 1 : 11 006 A
  Format 2 : 11 006 AXXXBXXXXXXXXXXX
  Format 3 : 11 006 A (followed by 28 hexadecimal characters).

  Format 1 :
  A = 0. An error condition has caused the 3601 to run wrap tests, and they were successful, The 3601 automatically wrap-tests the SDLC card and the modem if it is an integrated modem. The 3601 may or may not automaticcally wrap-test an external modem. This is determined by the customer's configuration image and the external modem capability.
  A = 2. A stop link command has been given the 3601.

  Format 2
  A = 1. Either the SDLC card or the modem failed the wrap test.
  B = 9. The SDLC card failed the wrap test.
  B = D. The modem failed the wrap test.

  The remaining characters contain design support information.

  Format 3
  A = 3. A message was received in error.

  NOTE : The 28 characters that follow '3' are for programming information.

* 11 008 (alternative Line Attachment) Message has 3 formats :

  Where :
  Format 1 - 11 008 AXX
  Format 2 - 11 008 AXXZZNNNN
  Format 3 - 11 008 AYYYYDD..DD

  Where :
  A = 1 (Format 1) Stop line command issued.
  A = 2 (Format 2) Wrap test results.
  A = 4 (Format 3) Unknown device to system (Gen Error).
  A = 5 (Format 3) Device released with I/P pending.
  A = 6 (Format 3) Network entity not acquired or owned.
  XX = Adapter address
  ZZ = Wrap test status
  00 - Wrap performed successfully
  09 - Adapter wrap failed
  0D - Modem wrap failed
  NNNN = Failing diagnostic subroutine number
  YYYY = Network ID of associated entity
  DD..DD = First 12 bytes of dumped MSG.

* 11 010X (Host Access), where :

  X = Error return code
  1 - Link adapter type unknown
  2 - Link module requested cannot be found
  3 - Default taken but no link module matches adapter.

Log usage Notes.

1. When displaying and paging down the log by repeatedly pressing the enter (EM) key after entering the 001 command, the 3601 will cause message 90001 to be displayed if the enter key is pressed after message number one has been displayed.

2. If an attempt is made to write a log message while you are logged on and the log area is full, the 3601 will cause message 90012 40000 to be displayed.

TYPES OF LOG MESSAGES 3602

* 10 002 AA BBBBBB CCCCCCCC DDDDDDDD EE F GGGG, where:

  A = Control code supplemental version ID.
  B = Diskette identification (volume ID).
  C = Configuration identification (GEN ID).
  D = The EC level of the controller data.
  E = Control unit (controller) address (CUA).
  F = Relocate count. A count of the number of the diskette records moved to the error track because of diskette surface defects.
  G = Session identification (ID). A session is one or more periods of time that the customer thinks of as one continuous period of time for the purpose of record keeping.

  Note : On a cold start, message 10 002 is placed in the log and the session identification is incremented. On a warm start, message 10 002 is placed in the log but the session identification is not incremented.

* 10 030 DATA, where :

  DATA is any text, up to 176 characters, keyed in by the CE for diskette test.

* 11 001 **900XX XXXX**

  This is a record of 90027, 28, or 29 messages.

* 11 003 NNNNNNNN SS PP AAAA CCCC IIII, where :

  N = Application program name
  S = Work station identification is hexadecimal.
  P = Program check code in hexadecimal.
  A = Program check address in hexadecimal.
  C = Loop count in hexadecimal (a count to indicate whether the application program is is an endless loop).
  I = First two bytes of instruction. If PP = 0B (user's instruction counter invalid), IIII is not valid data.
  Note : The above information is connected with the customer's application program and should be supplied to the customer.

* 11 004 EEMM CCLL PPII FFFF WWWW WWWW TTTT ZZZZ....

  This message contains design support information. The CE may be called upon to provide this information when aid is required to correct a problem.

* 11 005 LOOP X ERROR,code = Y-Z, where :

  X = Loop number
  Y = Loop status
  - 0 = The controller loop control card and the modem (if a remote loop) passed the wrap test.
  - 1 = Wrap test failure, external modem interface or integrated modem
  - 2 = Controller loop control card failed wrap test
  - 4 = Machine check
  - 6 = Combination of 2 and 4
  - 8 = User requested stop loop

  Z = Modem status : (FDX 6,600 BPS modem only).

  - 0 = Transmit and receive not ready
  - 1 = Receive ready (carrier detect)
  - 2 = Transmit ready (clear to send)
  - 3 = Combination of 1 and 2.

* 11 006 (host link error mesage) has three formats :

  Format 1 : 11 006 A
  Format 2 : 11 006 AXXXBXXXXXXXXXXX
  Format 3 : 11 006 A (followed by 28 hexadecimal characters)

  Format 1
  A = 0. An error condition has caused the controller to run wrap tests, and they were successful. The controller automatically wrap-tests the CA card and the modem if it is an integrated modem. The controller may or may not automatically wrap-test an external modem. This is determined by the customer's configuration image and the external modem capability.
  A = 2. A stop link command has been given by the controller.

  Format 2
  A = 1. Either the CA card or the modem failed the wrap test.
  B = D. The modem failed the wrap test.

  The remaining characters contain design support information.

  Format 3
  A = 3. A message was received in error.

  Note : The 28 characters that follow '3' are for programming information.

* 11 007 CCFFIIAALLLLSSSSBBBBXXXXYYYY, where :

  11 identifies this as a system-written message that lights the system message indicator.

  007 identifies this as a disk error message.

  CC is a code identifying the type of error
  - X'01' = Initialize failure
  - X'02' = Fixed Head Refresh failure
  - X'03' = Label Read error.
  - X'05' = Result of disk facilities procedure error
  - X'11' = DSCB I/O error

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```
FF is the logical adapter function requested
  X'00' = Initialize disk
  X'06' = Write sector
  X'07' = Read sector
  X'40' = Assign Alternate sector
  X'42' = Write ID
  X'43'= Read ID
  X'46' = Write Displaced ID
  X'47' = Read Displaced ID

II is the Data Set ID being referenced, if any.
AA is the physical adapter address

LLLL is the physical disk location in error.
  Bits 0-9 = track number
  Bits 10-15 = sector number

SSSS is the status reported by the CAC

BBBB is the basic status reported by the adapter

XXXX is a routing code, identifying the routine that
     is to process this I/O completion.

YYYY is a routing code, identifying the routine that
     is to receive control next. It may be 0000.
```

* 11 008 (alternative Line Attachment) message has three formats, where :

```
Format 1 - 11 008 AXX
Format 2 - 11 008 AAXXZZNNNN
Format 3 - 11 008 AYYYYDD..DD, where :

   A = 1 (Format 1) Stop line command issued
   A = 2 (Format 2) Wrap test results
   A = 4 (Format 3) Unknown device to system (Gen
           error)
   A = 5 (Format 3) Device released with I/P pending
   A = 6 (Format 3) Network entity not acquired or
           owned.
   XX = Adapter address
   ZZ = Wrap test status
        00 - Wrap performed successfully
        09 - Adapter wrap failed
        0D - Modem wrap failed
   NNNN = Failing diagnostic subroutine number
   YYYY = Network ID of associated entity
   DD..DD = First 12 bytes of dumped MSG
```

* 11 010 X (Host Access), where :

```
   X = Error return code
       1 - Link adapter type unknown
       2 - Link module requested cannot be found
       3 - Default taken but no link module matches
           adapter
```

4) ERROR STATISTIC COUNTERS

In addition to recording errors in the log, the 3601 controller maintains error statistic counters for each of the following components of the system :

3601 Diskette
3601 Loop control (for each loop)
3601 Host communication link
3604 keyboard
3604 Display
3604 Encoder
3606 Keyboard/Display
3608 Keyboard/Display
3608 Printer
3610 Document Printer
3612 Document printer
3612 Passbook Printer
3614 Consumer Transaction Facility
3618 Administrative Line Printer

Keyboards commands are available to display or print the contents of error statistic counters.

NOTE : Error statistic counts are located in functional storage and are lost each time there is a startup (warm or cold). In contrast, the 3601 log is located on the diskette. Thus, this log is lost only on a cold start.

After logging on at a 3604, the CE can key in either of two commands to obtain error statistics.

1. 010 LSSD is keyed to display the error statistics of a specified component.

2. 012 X is keyed to print error statistic counters for all components on the assigned output printer. X is the number of loops attached to the 3601.

Refer to 'Commands given at keyboard' in 3601 Maintenance Information form number SY27-2360 for details on the 010 and 012 commands and on the format of the printed/displayed error statistic messages.

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Concerning the displayed or printed error counts, note that :

1. Each three-digit count represents the decimal count in one counter. The counters are designated as counter 1, counter 2, etc. from left to right.

2. If a count reaches 256, additional errors of that type will cause the count to return to 128 and continue from there. Thus, counts of 128 or over, are not definitive.

3. Error counts represent the number of operation failures, not the number of retries per operation,

The following tables explain the error counts for the 3601 components ; that is, the diskette loop control, the host communication link and the counters that record terminal component errors.

HOST LINK ERRORS STATISTICS COUNTER

9010 01 XXX XXX XXX	
Counter	Stepped by :
1	Receipt of a valid set response mode command from host
2	Receipt of a test message from host
3	Write retry. When the controller sends a message as the results of a poll from the 370X, it waits for confirmation that the complete message was received. If this confirmation is not found, the controller resends the entire message and increments this counter. If a part of the message was received, the parts not received are resent, but the counter is not incremented (This is a Soft error).
4	Timeout. The line has been inactive for a period of time specified by the user in the CTG parameter in the COMLINK macro, then the adapter is reset, an automatic wrap is performed, and this counter is incremented. If the wrap test is not successful, a message is recorded in the controller log and the adapter is disabled. If the wrap test is successful, a message is also recorded in the controller log and the controller waits for traffic on the line : any subsequent timeouts are ignored until communication is restored. This is a Hard error.
5	Overrun
6	Underrun
7	Connection problem. In association with counter 3, if a complete message is resent more than a preset number of times (20), this counter is incremented. This is a Soft error on the line. Counter 3 steps 20 times, counter 7 steps 1 time. Note : a Soft error means there is no interruption in the session. A Hard error interrupts the session and the adapter is wrap tested.

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Counter	Stepped by :
8	Invalid controller data. Indicates a failure in 3601.
9	Block check count (BCC). The CRC check failed for last message received. Indicates a probable communication line problem.
10	The 3601 detecting a not-normal termination of a message by the host. Indicate a network problem.
11	Data communication equipment (DCE) error. Indicates a probable modem problem.
12	3601 busy because of no available receive buffers. Indicates a probable 3601 configuration procedure problem.
13	A command reject condition that resulted from messages received out of sequence. Frame has good BCC.
14	Machine check
15	A command reject condition that resulted from receipt of a data field with an otherwise valid write command for which no data field is defined. Frame has good BCC.
16	A command reject condition that resulted from receipt of an invalid command in a frame which has good BCC.

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Terminal Component	Counter	Stepped by :
3604 keyboard	1 2 3 4 5	Common loop error * Common loop error * Keyboard or magnetic stripe reader error. Translate error. Application program block (APB) segment overrun.
3604 display	1 2	Common loop error * Common loop error *
3604 encoder	1 2 3	Common loop error * Common loop error * Bad write, bad LRC, or bad buffer format
3606 Keyboard-Display 3608 Keyboard/ Display	1 2 3 4-9 10-11 12-13 14-15 16	Common loop error * Common loop error * Read timeout Not used Total transactions Total transactions unserviced until another completes. Total transactions received while the station was busy Highest number of transactions waiting (Counter values are for total devices at loop address used).
3608 Printer	1 2 3 4 5 6	Common loop error * Common loop error * Printer error incorrect length Intervention requied Timeout (Counter values are for total devices at loop address used).
3610 3611 and 3612	1 2 3 4 5 6 7 8	Common loop error * Common loop error * Intervention required Emitter check End of forms ** Platen open Timeout (no response) from 3610, 3611 or 3612. Missing left margin indication after carriage return.

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Terminal Component	Counter	Stepped by
3614	1 2	Common loop error * Common loop error *
3618	1 2 3 4 5 6 7 8 9 10 11 12	Common loop error * Common loop error * Hammer fire check, printer sync check, illegal order or initialization check Hammer fire check Forms motion check Timeout Printer sync check End-of-forms, left or right, or both Retry count for initializations Belt not up to speed Printer overheated Cover/throat open
* Common terminal statistical counters (counters 1 and 2). Counter 1 (Loop Related) - Status 0200. Stepped if : a. The entire loop goes down during an I/O operation. b. An I/O Operation is attempted and the loop is not is not yet started. Counter 2 (Terminal Loop Adapter Related) - Status 0201.		
** 3610 or 3612 models 3 and 13 only.		

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DISKETTE ERROR STATISTIC COUNTER

9020 02 XXX XXX XXX	
Counter	Stepped by :
1	Intervention required. The diskette is not rotating or the speed is not within limits. The count can include normal operations of changing the diskette.
2	Command reject
3	Record not found
4	Incorrect cyclic redundancy check (CRC)
5	Incorrect format
6	Machine check
7	Seek failure
8	Overrun
9	A diskette surface defect encountered when attempting to write a record in the customer's temporary data file. Record is then written in the next sector.

LOOP ERROR STATISTIC COUNTER

X000 80 XXX XXX XXX XXX XXX	
Counter	Stepped by
1	Sync check. The counter is stepped if the loop goes out of sync and sync cannot be recovered within 64 tries.
2	Noise errors in loop return to 3601.
3	Machine check during wrap test of loop control card
4	Error during wrap test of loop control card
5	Error during wrap test of modem

ERROR STATISTIC COUNTERS 3602

In addition to recording errors in the system log, the controller maintains statistic counters for each of the following components of the system :

3602 diskette
3602 Loop control (for each loop)
3602 Host communication link
3602 Disk storage
3604 Keyboard
3604 Display
3604 Encoder
3606 Keyboard/display
3608 Keyboard/Display
3608 Printer
3610 Document Printer
3612 Document Printer
3612 Passbook Printer
3614 Consumer Transaction Facility
3618 Administrative Line Printer

Note : Statistic counts are located in functional storage and are lost each time there is a startup (warm or cold). In contrast, the controller log is located on the diskette. Thus, this log is lost only on a cold start.

After logging on at a 3604, the CE can key in either of two commands to obtain statistic counts.

1. 010 LSSD is keyed to display the statistic counters of a specified document.
2. 012 X is keyed to print statistic counters for all components on the assigned output printer. X is the number of loops attached to the controller.

Concerning the displayed or printed counts, note that :

1. Each three-digit count represents the decimal count in one counter. The counters are designated as counter 1, counter 2, etc., from left to right.
2. If a count reaches 256, additional counts of that type will cause the count to return to 128 and continue from there. Thus, counts of 128 or over, are not definitive.
3. Counts represent the number of operation failures, not the number of retries per operation.

The following chart shows the Disk storage statistics only, all the other counters as indicated above are identical to the 3601 shown in the previous pages.

DISK STORAGE STATISTIC COUNTERS

9100 XX XXX XXX	
Counter	Stepped by
1	I/O parity error
2	Command reject
3	Seek failure
4	Data invalid
5	Read sync error
6	No sector found with specified ID
7	Write protect
8	A read/write to a bad sector
9	Echo check
10	Cycle-steal timeout
11	Incorrect cycle redundancy check (CRC)
12	A not-ready condition for one of the following reasons : disk not up to speed, I/O reset activated, brake failure, data unsafe.
13	Disk busy
14	Machine check
15	Not used.
16	Not used.

5 - DEBUG MODE

The debug mode can be used by customer personnel or by the CE and the host PSR (program service representative) to further define an application program problem. Use of the debug mode requires an application program listing.

After logging on, the CE/control operator can key and enter 123XX to place the controller in debug mode. This mode allows the operator to perform online debugging of the logical work station identified by XX (one or two characters that can be obtained from the customer's configuration documentation). The logical work station consists of : (1) the application program that runs a group of terminal components that form a physical work station, and (2) the storage area connected to the work station. This storage area may consist of as many as 16 segments (0-15).

For debug commands, error messages and displayed messages refer to relevent MLM. (3601: SY27-2452 and 3602: SY27-2453).

6 - STARTER DISKETTE 3601/2

An IBM controlled starter diskette is shipped with each controller. All the exerciser tests that can be performed with an operating diskette are available on the starter diskette.
Also the starter diskette includes the create diskette function (capability) that is not available on the operating diskette. This function is used by the customer to create (generate) operating diskettes.

Preparing to use the starter diskette

The starter diskette supplied to the customer has been configured for one terminal of each type on each of two loops, loops 1 and 2. (Loop 1 contains the control operator's 3604 at address 1.) After startup is complete, loops 1 and 2 are both running. Keyboard commands are available to stop loop 2, specify another loop to take loop 2's place, and start for other loop.

For all loops, the starter diskette is configured as shown in Table 1. Thus, if a terminal is being used in the testing, its address switches must be set as shown in Table 1. For terminals that are on the loop being tested but are not being used in the testing, configuration requirements may be set by turning off their power switches rather than changing the normal setting of their address switches.

There is no need to change the address switches or the power switches of terminals on loops not being tested.

Startup

With the starter diskette, the starter is the same as with the operating diskette. Note that the control operator's 3604 is the 3604 at address 1 on loop 1.

Logon/Logoff Procedure

As soon as the CE completes the startup by responding to the 00001 message, the gas panel on the operator's 3604 (address 1 on loop 1) goes blank and the message 92222 appears. This message indicates that the CE is automatically logged on that 3604 and may run exerciser tests by using its keyboard. The CE can log off that 3604 by keying 000 and the enter (EM) key; he can then manually log on at another 3604 in the same way as with an operating diskette.

Testing a Component

After being logged on, the CE can test a component by using the commands described in Table 3-6 of the MLM (3601: SY27-2452, 3602: SY27-2453).
If the component to be tested is on loop 1, it is assigned as the test component with command code 007, just as with an operating diskette.

With the starter diskette, loop 2 is named as having a wrappable modem. If loop 2 actually has a wrappable modem, it is only necessary to use the 007 command to assign the component to be tested, just as with an operating diskette. If loop 2 has no modem or has a modem that is not wrappable, the following commands should be given before giving the 007 command :

```
040 0 02 00 02
040 0
```

If the component to be tested is on a loop other than 1 or 2, it is necessary to enter the following commands, before using the 007 command :

```
040 0 0X 00 0Y
040 0
```

- X is set to 2 if there is no wrappable modem on the loop (local loop or World Trade 600-bps remote loop).
- X is set to 3 if there is a wrappable modem (1200-bps remote loop).

- Y is set to the loop number of the loop to be tested. This same number is also used to specify the loop when using the 007 command to assign the component to be tested.

The first of the above commands (040 0 0X 00 0Y) stops all loops except loop1 and specifies the loop to be tested. The 040 0 command starts the loop to be tested.

TABLE 1 - STARTER DISKETTE CONFIGURATION

Terminal	Address	Slots Used	Components
3604	01	1,9	Keyboard (magnetic stripe reader), and display
3618	02	2,10	132 print positions, dual forms feed
3604	03	3,11	Keyboard (magnetic stripe reader), display, and magnetic stripe encoder.
3610	04	4,12	Continuous form/cut form
3611, 3612	05	5,13	Document : continuous form/cut form. Passbook : 28 lines, centerfold starts on line 14, and ends on line 17.
3614	08	8,16	Cash issuer.

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Command (Function: Display the statistics counters for the specified component)
010 LSSD L = Loop number SS = Terminal address (01 through 16) D = Component address, as follows : 1 = keyboard 2 = display 3 = encoder 4 = 3610, 3612 document printer, or 3618 printer 5 = 3611, 3612 passbook printer 6 = 3606/3608 keyboard/display 7 = 3608 printer 8 = 3614 consumer transaction facility LSSD = 9001 for host link LSSD = 9002 for diskette LSSD = 9010 for disk storage * LSSD = 903X for ALA line LSSD = X000 for loop control, where X is the number of the loop. Output format is : LSDM TT SS XXX XXX XXX... ... ... L = Loop number S = Terminal address in hexadecimal. D = Component address, same as input above M = Modulus value for a terminal component TT = Component type ** SS = Work station identification. (Not applicable to diskette, loop control, or host communication link.) XXX = Error count is decimal LSDM = 9010 = Host link LSDM = 9020 = diskette LSDM = 9100 = disk storage * LSDM = X0YY for loop control where X is the number of the loop If YY = loop speed, values are as follows : 01 = 4800 bps 02 = 2400 bps 04 = 1200 bps 08 = 600 bps 8X = clocking loop

* Available only on an operational diskette that was written for a disk storage application.

** Component types (TT) are as follows :

80 = loops
81 = keyboard
82 = display
83 = 3610, 3611, or 3612 printer
85 = 3618 printer
86 = magnetic stripe encoder
87 = 3614 consumer transaction facility
88 = 3606/3608 keyboard/display
89 = 3608 printer
01 = host link
02 = disk
03 = ALA line

Keyed input Commands 3601/2

After logging on the system at a 3604, the CE can use the keyboard at that 3604 to issue commands to the system. These commands enable the CE to perform the following functions :

1. Examine the controller log. For example, see command code 001.
2. Examine the statistic counters. For example, see command code 010.
3. Exercise a controller or terminal component. For example, see command code 020.

EXAMPLE OF COMMANDS GIVEN AT KEYBOARD

Command	Function
000	Log off Note : If the CE has logged on during a service call, the CE must log off before returning system to customer.
001	Display the first portion of each of the last five messages (or the number specified in the 049 command) in the log. Each time the enter (EM) key is pressed, earlier messages are displayed. That is, the log is paged backward.
002 XXXX	Display full text of log message XXXX (maximum 240 characters).
002 0000 (002 0)	Display current diskette status (two status bytes XXXX).
002 9999	Display the last X1 XXX type of message in the log. .(Display full test of the message;maximum of 240 characters
020 ZZZ YYY AAA BBB ZZZ = Number of times to run the test. (If 000 (0) is entered, printing/display is continuous until the RE (reset) key is pressed twice. YYY = length of line to be printed/displayed (255 maximum). AAA = Decimal number that gives physical position on print wheel or belt, or logical position in display	Do a ripple print or display on the assigned test component. Assume, for example, that that AAA = 010, BBB = 019, YYY = 020, and ZZZ = 005. In this case, the specified character group would be printed/displayed twice on each of five lines. The first line would begin with the character from print/display position 010, the second line would begin with the character from print/display position 010 the second line would begin with the char-

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SECTION 18: 3650 DIAGNOSTICS

18

DESCRIPTION

The maintenance package for the 3650 consists of :

1. Problem Determination Procedures (PDP)
2. Maintenance Analysis Procedures (MAP).
3. Diagnostic Tests.
4. Error Log.

Problem Determination Procedures

Problem Determination Procedures are included in the IBM 3650 Retail System Administrative Operations Guide, GA27-3088. These procedures tell the user how to determine fault responsibility between IBM and other equipment manufacturers, but the user will never perform trouble diagnosis or make repairs to IBM equipment.

In some cases, the CE may have to use these procedures during trouble analysis ; they are included in the MAP's for CE use.

Maintenance Analysis Procedures

Maintenance Analysis Procedures (MAPs) are used by the CE to analyse problems with the 3650 Retail Store System. The MAPs are arranged in frames, with each frame representing one item of information or a task to be performed. The CE should begin a service action by starting at the first frame in the MAPs (for example, frame 10-001 in the 3651 MAPs) and proceeding, frame by frame, as directed by the MAPs. Unless he is directed otherwise by the text in a frame the CE should perform each frame in sequence.

Diagnostic Tests

Diagnostic Tests are to be used only as directed by the MAPs and/or problem determination procedure. When the MAPs or problem determination procedure require a diagnostic test, they will give the instructions for executing the test.

Diagnostic tests are used, in conjunction with the MAP's and/or a problem determination procedure, to identify the trouble area, and then to isolate the cause of the trouble to the failing field replaceable unit (FRU).

Diagnostic tests are to be used only as directed by the MAP's and/or a problem determination procedure. When the MAPs or a problem determination procedure requires a diagnostic test,it will give the instructions for executing the test.

There are two groups of diagnostic tests : offline and online. When offline diagnostic tests are operating, the system is not available for normal store support operations. When online diagnostic tests are operating, store support operations are normal, except for the device being tested. The MAPs or the problem determination procedure dictates system requirements.

Only one online test can be run at a time. If a request is made while an online test is in progress, the message 'T134 OLT ALREADY ACTIVE' is displayed or printed at the requesting terminal.

The 3653 power should not be turned off while diagnostics are running. If power is turned off and then on again, the terminal will not be in data entry mode. If the 3653 accidently loses power while the diagnostics are running, it may be necessary to reinitialize the store controller to become operational again. If it is necessary to turn the 3653 power off, exit diagnostic mode first by keying in 0900 and pressing ENTER.

Store Controller Diagnostic Tests

The store controller diagnostic test are in three basic parts, as follows :

1. Initial Machine Load (IML) Tests
   The IML tests run automatically each time the 3651 (or 7480) Power switch is turned on. The purpose of these tests is to check the store controller's logic, storage, and disk control and the disk read function.
2. Extended IML tests
   The extended IML tests are stored on the 3651 (or 7480) disk and are loaded by the IML tests. The purpose of these tests is to perform more extensive tests on the store controller logic, storage, disk, realtime clock, and the CE/operator panel.
3. Offline Tests
   The offline tests are controlled by the Controller Diagnostic Support Microcode (CDSM). The CDSM is stand-alone diagnostic support microcode which controls the selection, loading, an execution of the 3651 (or 7480) offline diagnostic tests. While the offline diagnostic tests are running, the 3650 system cannot be used to support normal store operations.

All information and error codes from the 3651-50 (or 7480) diagnostic tests are represented in four characters that are displayed at the 3651 (or 7480) CE operator panel.

The TEST indicator is turned on when the CDSM is loaded. The TEST indicator blinks while the diagnostic tests are running. When a code is displayed which requires a CE response at the 3651-50 (or 7480) CE/operator panel, the TEST indicator comes on solid.

For detailed description to run above tests, refer to 3650 Maintenance Information SY27-0151.

Online Diagnostic Tests

The online diagnostic tests are disk resident and are loaded into controller storage for execution. The online test for any device or terminal may be requested from the 3651 (or 7480).

The online tests for a 3653 or 3275-3 may be requested from the 3651 (or 7480), the terminal the test is to run on, or any other terminal connected to the 3651 (or 7480).

Only one online test operates at a time. If a request is made while an online test is in progress, the message 'T134 OLT ALREADY ACTIVE' is displayed or printed at the requesting terminal. If the request was made from the 3651 (or 7480) the code E023 is displayed.

While the online diagnostic tests are executing, store support operations are normal except for the device being tested.

Requesting tests

The following procedures use Keywords (in italics)

At the 3651 (or 7480) CE/operator panel:

request2(PPRR XTTT)

where :

PP = Program number

RR = Routine Number : entering 00 will cause all routines of this program to run. A hexadecimal routine number of 01 to FF may be entered as directed by the MAPs or PDPs. The routine number (RR) from an error code display may also be used.

X = Option

TTT = Terminal Address : enter the address of the terminal to be tested. If this is not a terminal test, enter 000.

PP = Program Number : enter one of the following :

PP	Area Tested
12	3653 Display
22	3653 Printer
32	3653 Keyboard
42	3653 Wand
13	3275-3 Function Test
23	3284-3 Printer
03	Run Test 13 and 23
50	Local Store Loop 1
54	Local Store Loop 2
58	Local Store Loop 3

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62 Host
64 Host
60 Run Test 62 and 64
68 RFT Host
69 RFT Host
(Tests 68 and 69 require operation of OLT Responder Test at the host)
70 Remote Store Loop 2
74 Remote Store Loop 3
80 3872 for Remote Store Loop 2
84 3872 for Remote Store Loop 3
90 Remote Store Loop 2 exerciser
94 Remote Store Loop 3 Exerciser
98 3874 Line Printer exerciser

For detailed running procedure, refer to 3650 MI SY27-0151.

ERROR LOG

General

The error log is a reserved area on the disk, used for storing error information. When an error is detected by the system, information about the error is entered in the error log file. The entry is made even if the system recovers from the error. The error log entry contains information such as time and date, unit, device, type of error, status, etc. When the file for a unit is full, a new entry will replace the oldest entry in that file.

An extension to the error log was added by RSS Release 3.1 and is referred to as the 'console log'. The console log is made up of two sections. Entries are made in the first section for 3651 panel messages and 3651 panel input. Entries are made in the second section by most system functions when they are forced to terminate abnormally. Console log entries at time and date stamped the same as error log entries. Once a file section is full, any new entry replaces the oldest entry in that file section.

Error log scan is a system function that selects, formats, and prints error log and console log data.

A printout of the error log file can be requested from, and printed at, a 3653 terminal; or if Release 2 or a later release is being used, it can also be requested from, and displayed at, a 3275-3 terminal. This error log description uses the terms printout and print, but if the 3275-3 is being used, the term display is usually inferred. The MAP's use the error log printouts as a diagnostic aid, especially for intermittent failures.

(Release 1 only). The error log scan will not run while the controller is communicating with the host processor. If a scan is attempted under this condition, the terminal remains in a wait state until the controller completes its communications with the host processor.

Error Log Scan Types

The customer personnel should be encouraged to maintain accurate error reports on system malfunctions. These reports can assist in making error scan information more useful to confirm reported problems.

There are six types of error scan logout available :

1. SYSTEM SCAN : Lists of the major system units with applicable error counts. Provides a general overview of system performance.
2. UNIT SCAN : Provides specific individual unit listing with each device of that unit and the error count logged.
3. DEVICE SCAN : Lists of errors by type for a specific device showing error count for each device or terminal.
4. DETAILED ERROR LOG SCAN : Provides thirty-two bytes of hexadecimal data printout for each error logged for a specific device. Special care must be exercised when interpreting data requested with this scan, so use it only if requested by system MAP's.
5. CONSOLE LOG SCAN : (Panel Input/Output) (RSS Release 3.2 and later). Provides a printout of the messages that were displayed and the data that was entered from the 3651 panel. The intended use of this scan is to provide data for analysis by support personnel. However, it may be helpful in verifying what messages appeared and what input was entered.
6. CONSOLE LOG SCAN : (System Error Records) (RSS Release 3.2 and Later) Provides a printout of the system error records. These error records are also recorded in the transaction log.

Search Argument Format

In order to request an error scan, the user must perform a 'sign-on' followed by the error scan request. This request has four search argument field as follows :

1. Scan type - 1 decimal digit
2. Unit type - 2 decimal digits
3. Device ID - 3 decimal digits
4. Adapter ID - 3 decimal digits

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The following combinations of search argument fields are valid :

1. Scan type
2. Scan type, Unit type
3. Scan type, unit type, Device ID
4. Scan type, Unit type, Device ID, Adapter ID

Use the procedure on the following pages to request an error log printout. The operator ID and security code, where required, must be obtained from the store operations personnel.

Note : The 3653 must be in Inquiry (non-sales) Mode.

Error Log Display

The following pages contain examples of the different types of error logs available. Since the procedure for displaying these logs vary depending upon the release level of the 3650, it is not possible to include all this information. However, this is available in the 3650 Maintenance Information Manual SY27-0152.

```
               LOG SCAN

AAAA   HH.MM    MM.DD.Y    BB     CCC
HHHH   HHHH   HHHH   HHHH   HHHH   HHHH
HHHH   HHHH   HHHH   HHHH   HHHH   HHHH
```

These three lines will be repeated for each error.

In the above format example

```
   AAA      = the sequence number of this entry in the error
              log (hexadecimal).
   HH.MM    = time (hour and minute) when this entry was made
              in the error log
   MM.DD.Y = date (month, day, and year) this entry was made
              in the error log
   BB       = device type (decimal)
   CCC      = device address (decimal)
   HHHH     = error data (hexadecimal)
```

```
      UNIT SCAN - 3651

FROM          TO        PRESENT
HH.MM         HH.MM     HH.MM
MM.DD.Y       MM.DD.Y   MM.DD.Y

                        NO OF
     DEVICE             ERRORS

DISK                    NNNN
CONTROLLER              NNNN
CE/OP PANEL             NNNN
CLOCK                   NNNN
```

In this format (example) :

HH.MM = hours and minutes
MM.DD.Y = month, day, and year
NNNN = number of errors

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SYSTEM SCAN		
FROM HH.MM MM.DD.Y	TO HH.MM MM.DD.Y	PRESENT HH.MM MM.DD.Y
UNIT		NO OF ERRORS
3651		NNNN
STORE LOOP		
POSITION 1		NNNN
POSITION 2		NNNN
POSITION 3		NNNN
TERMINALS		NNNN
HOST		NNNN

In this format (example)

HH.MM = hours and minutes
MM.DD.Y = month, day, and year
NNNN = number of errors (decimal)

DRIVER = Those types of errors that can be associated with the store controller hardware for that store loop.

LINK = Those types of errors, detected by the line control, that can be associated with the store loop (noise injection, poor connector wiring in terminal plugs, opening the loop and turning on or turning off the terminal power).

DEVICE SCAN-DISK		
FROM HH.MM MM.DD.Y	TO HH.MM MM.DD.Y	PRESENT HH.MM MM.DD.Y
ERROR TYPE		NO OF ERRORS
MC/PC		
EXTERNAL CHECK		NNNN
I/O PARITY		NNNN
CYCLE STEAL		
EXTERNAL CHECK		NNNN
I/O PARITY CHECK		NNNN
READ DISK		NNNN
WRITE DISK		NNNN
SEEK		
1 to 7 TRACKS		NNNN
8 OR MORE TRACKS		NNNN
FILE NOT READY		NNNN
BAD SECTOR		NNNN

```
             UNIT SCAN

   STORE LOOP POSITION ####

FROM      TO        PRESENT
HH.MM     HH.MM     HH.MM
MM.DD.Y   MM.DD.Y   MM.DD.Y

DEVICE              NO OF
ID                  ERRORS

DRIVER              NNNN
LINK                NNNN
---------------------------
ERROR RATE FOR ALL
LINK ERRORS
FROM      TO         00.00
HH.MM     HH.MM      PER
MM.DD.Y   MM.DD.Y    CENT
```

Note : The average figure for
       remote loop is 6%

```
DEVICE SCAN - LINK
STORE LOOP POSITION ####

   FROM      TO          PRESENT
   HH.MM     HH.MM       HH.MM
   MM.DD.Y   MM.DD.Y     MM.DD.Y

   ERROR                 NO OF
   TYPE                  ERRORS

END-OF-POLL TIME-OUTS    NNNN

CRC WITH INV TERM ADR    NNNN

TERMINAL AAA

   CRC ERRORS            NNNN
   SEQUENCE ERRORS       NNNN
   RETRANSMISSIONS       NNNN

TERMINAL AAA

   CRC ERRORS            NNNN
   SEQUENCE ERRORS       NNNN
   RETRANSMISSIONS       NNNN
```

In this format (example)

can be 0001, 0002, or 0003
AAA is the terminal address
NNNN is the number of errors

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Examples of Console Log Scan Printouts

```
        Console Log Scan (Type 5)

Search Argument: 5/enter
Range : Total

A017     11.23   9.25.7   DISP-1  11
0001     11.13   1.11.1   EXF-F   11
```

A017 = The message that was displayed or the characters that were entered. Characters are left justified as they are entered. Therefore, entering '1' or '1000' will each show as '1000'. Entering nothing, 0, 00, 000, or 0000 will each show as '0000'. (See note 2).

11.23 = Time as HH.MM (See note 3).
9.25.7 = Date as MM.DD.Y (See note 3).

DISP-1 = This field indicates the mode of the
EX-F = display DISP-1 or the execute value (EX-F) of the characters that were entered. The modes of display are :
1=Display.
3=Display, response required.
(See note 1).
5=Display with alarm.
7=Display with alarm, response required.
(see note 1).

11 = The IML that the controller was in when the message was displayed or when the data was entered.

Note 1: Messages that require a response cannot be reset with an enter, execute 7. In the case of setting the time and date (display AAA), a response is required even though this mode of display is not used.

Note 2 : Logging of messages and panel input data takes place only after the system is completely loaded. Therefore, messages that are put out by 'Bring-up diagnostics' or the IML process will not be logged.

Note 3 : If the message is displayed or the data entered before the time and date have been set, the date will be 0.00.0 and the time will be 12.00.

```
        Console Log Scan (Type 6)

Search Argument: 6/enter
Range: Total

0213   14.18   12.11.1                          008
31D8   00A0    6C01           8858    0000    0450
310F   4008    0000           0000    0000    0000
```

0213   = Sequence number.
            This number has no special significance.
            Each record in the log has a sequence
            number.
14.18   = Time as HH.MM.
12.11.1   = Date as MM.DD.Y.
008   = Length of the message in decimal
31D8,etc = Message text. Refer to 'Error Message
            Records' in chapter 8 of the RSS Programmers
            Guide, GC30-3035. These records are written
            in the transaction log and the console log
            and will usually be used when requested by
            your support personnel

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Definitions :

END-OF-POLL TIMEOUTS = The store controller is sending out a Poll message on the loop requesting terminals to send their messages to the store controller and the store controller is not receiving its End-of-Poll byte back.

CRC WITH INV TERM ADDR = The store controller has calculated a CRC error on a message that contains a terminal address that is illegal for that store loop. (For example a CRC error with the terminal address of 095 on Store Loop 1 is illegal, since terminal 095 is a Store Loop 2 terminal address). This can happen if the address byte of the message is changed (by noise, etc.) as it goes around the store loop or if eight bits are not a legal address byte.

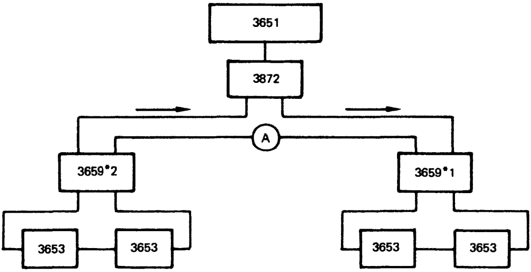
TERMINAL AAA = Identifies the terminal against which errors have been recognized by the store controller. (It is possible for the address byte to be changed by noise, etc. in such a way that an error is logged against the wrong terminal. However, for this to happen, the address must still be valid for that store loop. For example, address 040 may be changed to 041). This failure may be identified by a scattering of CRC errors around the entire store loop, with no significant pattern.

CRC ERRORS = The store controller has calculated a CRC error on a message that contains the terminal's address. Since the address byte is only eight bits of the entire message, the probability that it is the byte affected is small. But this is possible, and it must be considered when the total log output is analyzed.

SEQUENCE ERRORS = Information messages have send and receive counts so that the store controller and the terminal can make certain they are in step with each other when the receipt of a message is acknowledged. If the store controller receives messages with counts that do not match, a SEQUENCE ERROR is logged against that terminal.

RETRANSMISSIONS = This is looged when the store controller recognizes the need to retransmit to a given terminal. This may be a reaction to a CRC error.

Remote Loop Problem Determination Example



The 3653's on 3659# 1 have CRC errors in the 3651, i.e. the data transmitted from the 3653 has to go through the degradation and therefore gets corrupted.

The 3653's on 3659# 2 should have only those CRC errors expected during normal operation.

The 3653's on 3659# 2 should have retransmission errors in the 3651, i.e. the data received by the 3653 from the 3651 has gone through the degradation and been corrupted.

The 3653's on 3659# 1 should have only those retransmissions expected during normal operation.

After using the previous technique, the problem should be diagnosed to a specific link.
This will include the communication line and the associated Transmit and Receive parts of the attached modems.
It should be possible to use the wrap test to test the local 3659 and then use the equalise position of 3659 to set up and monitor the quality of the line as shown in the 3650 system Maintenance Information book.

It must be remembered that with line degradation it is possible that :
1) The address could be corrupted and logged against a wrong device.
2) The address could be corrupted in such a way that the address is not valid for that loop to which is attached, The indication is then 'CRC with invalid terminal address'.

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SECTION 19: 3767 DIAGNOSTICS

ESCRIPTION

The maintenance package for the 3767 consists of :

A. Problem Determination Procedures (PDP)
B. Maintenance Analysis Procedures (MAP)
C. Offline Diagnostics
D. Online Diagnostics

_. PROBLEM DETERMINATION PROCEDURES

PDP's are available to the customer and are located in the '3767 Communication Terminal Operators Guide', GA18-2000, Chapter 6.
Use of the PDP's will enable the customer to direct the CE to the problem area.

B. MAINTENANCE ANALYSIS PROCEDURES

MAP's are used by the CE to analyse problems with the 3767 and are located in the 3767 MLM, SY18-2000.

C. OFFLINE DIAGNOSTICS

The 3767 diagnostic tests reside in a ROS module on the planer card and consist of the following :

1. THE BASIC ASSURANCE TEST is initiated by the following :

   * Power on
   * Test switch and numeric 0 key
     (This method is used for terminating the tests).
   * Automatic entries from CE jumper Register Printout, Section V Line Buffer Printout, and Terminal Indepth Test.

   The BAT includes the following tests :
   * Indicator test
   * Controller test
   * Ross Scan test
   * Register space test
   * Printer test

2. THE TEST SECTION TESTS are initiated by pressing and holding the Test switch while the numeric key corresponding to the test section described is pressed (except that, with the Katakana keyboard, numeric '1' is pressed for test section VI and numeric '6' for test section 1); the test switch is then released. If no key, or a key other than 0 through 7, is pressed while holding the Test switch, the test section is bypassed and Terminal Indepth Tests are run, followed by the Basic Assurance Test.

3. TEST SECTION

   I - BAT
   II - Terminal indepth loop test including :
     * Controller test
     * Ros scan test
     * Communication wrap test
     * Printer test

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III - Keyboard test
IV - Printer indepth test
V - CR display
VI - Line buffer printout
VII - Modem transmit level adjustment
VIII - Communication wrap loop test

All above tests automatically invoke the terminal indepth test consisting of ;
* Register printout
* Controller test
* Ros can test
* Communication wrap test
* Printer test

4. TEST DESCRIPTION

ROS Scan Test checks on a byte basis, whether the ROS readout of each address is valid. A cyclic redundancy check (CRC) count is made for each module and compared with the expected results.

Register Space Test verifies that 0's and 1's can be written into and read out of each position of each register.

Communication Wrap test tests the transmit and receive hardware. It checks all data combinations. Some unique signal lines are time-out counted.

Printer test consists of one or two tests:
1. The 'timer Test' checks that the time-out counter is operating properly.
2. The 'Print Test' checks the printer functions. All characters are printed twice.

Keyboard Test (Test Section II selected) checks the scan code of each key pressed for correct parity, and that the key code is valid. The pressed key scan code bits are displayed in the indicator lights. Key scan codes are also displayed in the indicator lights whenever a key is pressed while holding the Test switch.

Printer Indepth Test (Test Section III selected) is a print line test. A detected error will stop the printer with an error indication with the Auto switch off. A variable length line of data (up to the maximum of the print line buffer) may be entered and repeated until stopped. This test is useful to exercise printer functions to isolate a problem.

Common Register Display (Test Section IV selected) is used to display the contents of inbound common registers (CR). This may be used to display switch settings, terminal jumpers and print and carriage emitters by manually moving the print head or platen and observing the indicator lights.

Line Buffer Printout (Test Section V selected) prints, in hexadecimal format, the contents of the communication line buffer. This is useful in diagnosing line-related problems. The register printout is performed after the line buffer printout is completed.

Modem Transmit Level Adjustment (Test Section VI selected) permits the continuous sending of known data on the line. It may be used to adjust the modem transmit level.

Communication Wrap Loop Test (Test Section VII selected) is used to loop the communication wrap test and diagnose an intermittent line-related problem. See preceding description of Communication Wrap Test.

Indicator Test turns on eight indicator lights and all ANR segments. They remain on until the Test switch is released or a keyboard key is pressed.

Register Printout prints the contents of the registers (64 lines with 16 registers per line) in hexadecimal format of two characters per register and one space between registers.

Controller Test checks, with predetermined data, the functions and associated hardware of most of the controller circuits. Successful completion of the test ensures, to a high degree, that the controller is operating correctly.

D. ON LINE DIAGNOSTICS

The following tests can support the 3767 in SDLC mode:

LINK TEST (T3700LTE). The SDLC link test is basically an echo test initiated by the host. The primary station sends a SDLC 'TEST' frame down the link to secondary station. If the secondary station (3767) receives the 'TEST' frame without errors it resends the frame to the primary. (see Link Test, section 14).

API ECHO TEST (T3700SNA). The API echo test is designed to verify the integrity of the link between the terminal (3767) and the central site (370X). This is done by sending to the terminal the data that was requested the number of times specified. This test can be initiated from either host or terminal (see section 13).

EXAMPLE OF RUNNING API ECHO TEST FROM 3767

```
Logon applid (istoltep)                                      Logging on terminal
F102I ISTOLTEP REL 2.0 INITIALIZATION IN PROGRESS            to TOLTEP
F107I OPTIONS ARE NTL,NEL,NPP,FE,NMI,EP,CP,PR,NTR,NAP
F105D ENTER DEV/TEST/OPT/
*/3700sna//
F158I S T3700SNA UNIT 00CF RT2LU1
901 ENTER YYDATA,PROMPT,OR END
4 test data
test data
test data                                                    Running Echo test
test data
test data
901 ENTER YYDATA,PROMPT,OR END
end
905 END OF ECHO TESTING
F158I T3700SNA UNIT 00CF RTS2LU1
F107I OPTIONS ARE NTL,NEL,NPP,FE,NMI,EP,CP,PR,NTR,NAP        Cancelling TOLTEP
F105D ENTER DEV/TEST/OPT/
cancel
```

SECTION 20: 3770 DIAGNOSTICS

DESCRIPTION

The maintenance package for the 3770 system consists of :

1. Problem Recovery Procedures (PRP)
2. Maintenance Analysis Procedures (MAP)
3. Offline tests
4. Online tests
5. Error log

Problem Recovery Procedures

The customer is supplied with an Operator Guide containing PRP's. These charts will enable the customer to isolate the problem to the IBM, OEM, or common-carrier equipment (GA27-3114).

Maintenance Analysis Procedures

MAP's are used by the CE to analyse problems with the 3770 system and are located in MLM SY27-0129.

Offline tests

a) Bring-up Diagnostic test

This test runs following any Power On Reset or System Reset. The following areas are tested: Controller, ROS, RAM, System Card or Keyboard Adapter and Operator Panel. Successful completion or an error condition will be indicated by the operator panel lights and NPR (LED's).

b) Communication Tests

This series of tests assists in determining whether the 3770, local modem, line, or remote modem is causing the problem.

Test 0 (Terminal Communication Test)

Enter communication test mode :
Hold the CODE key down and enter the number '0' from the keyboard.
Release the CODE key.
Enter the number '6' from the keyboard.

Note : The number '6' displays in the readout indicators ; this indicates that you have selected the communication test mode function. The terminal will enter communication test mode when you press the OEM key.

Press the EOM key to enter communication test mode, and run test 0 (terminal communication test).

Test 0 (terminal communication test) runs automatically. The operator panel readout indicator (NPR) displays one of these indications of the status of the test.

NPR = 01 : the test is running ; has not completed.
NPR = 00 : the test ended without error ; no problem was detected in the terminal communication test.

NPR displays an 800-series number, and the operator panel SYSTEM CHECK indicator turns on : An error was detected during the test ; these 800-series numbers (for example 801 = a clear to send error) identify the error. These numbers are listed in the error code section of the MLM and also in the Operators Guide. If the test ended without error, you have identified that the problem is not in the terminal's controller (including the communication driver).

__Test 2 (Modem Wrap Test)__

After test 0 ends (without error), enter the number '2' from the keyboard to start test 2 (Modem Wrap Test). Test 2 (Modem Wrap Test) runs. The operator panel readout indicators (NPR) display indications of the status of the test.

If an error was detected during the test :
Check that the modem's cables (power cord cable from the terminal to the modem, and cable from the modem to the communication line jack) are plugged in ; run the communication tests again after re-connecting any plugs that were plugged in.

__Test 3 (Modem Transmit Test)__

Contact the operator at the central processor ; inform the operator that you will run test 3 (Modem Transmit Test) ; request that the processor operator run test 4 (Modem Receive Test), and record the error count while the test runs.

Start test 3 (Modem Transmit Test) by entering a numeric '3' from the keyboard. The operator panel STANDBY indicator turns on when the test starts.

If using a switched communication (dial) network, dial the central processor's modem and establish the communication link.

Contact the operator at the processor to obtain the test results ; one of these conditions could occur :

The processor did not receive the test transmission ; if this happens :
(1) When using a switched communication line, re-dial the connection and run the test again
(2) When using a leased communication line, request that the common-carrier company test the communication facilities, and correct any problems.

The processor received the test transmission, but the error count was excessive when compared to the 'Error Count During Normal Transmission' chart that follows : if this happens :
(1) If using a switched communication line, re-dial the connection and try the test again.
(2) If using a leased communication line, and the terminal's auxiliary operator panel has a TRANSMIT

EQUALIZER control knob, or the terminal's modem is an IBM 3872 modem, check the equalization as described in the 'Modem Transmit Equalization' section in the Operator's Guide : then, return to this point in the test procedure. If performing transmit equalization does not correct the problem, request that the common-carrier company test the communication facilities and correct any problems.

(3) If using a leased line and the terminal's auxiliary operator panel does not have a TRANSMIT EQUALIZER control, request the common-carrier company test the communication facilities and correct any problems.

If no problems were noted when running test 3, you have identified that the terminal can transmit to the central processor. The next step : Run test 4 (Modem Receive Test), is to identify that the terminal can receive from the central processor.

Test 4 (Modem Receive Test)

Contact the operator at the central processor ; request that the processor operator run test 3 (Modem Transmit Test) : inform thm the operator that you will run test 4 (Modem Receive Test), and check the error count for the test message received. Start test 4 by entering a numeric '4' from the keyboard.

The operator panel PROCEED indicator turns on when the test starts : this indicates that you are receiving a signal from the processor's modem.

When test 4 starts, a count of the number of errors received displays in the operator panel readout indicators. Compare this error count to the 'Error Count During Normal Transmission' Chart that follows.

Note : You can reset the error count, and start counting the errors again, by entering a numeric '4' from the keyboard (this restart test 4). Do this to re-check the number of errors received for any given period of time.

One of these problems can occur when the test starts :

A. The terminal did not receive the test transmission : if this happens :
   (1) When using a switched communication line, re-dial the connection and try the test again
   (2) When using a leased communication line, request that the common-carrier company test the communication facilities and correct any problems.
B. The terminal received the test transmission, but the error count was excessive when compared to the 'Error Count During Normal Transmission' chart that follows ; if this happens :
   (1) If using a switched communication line, re-dial the connection and try the test again
   (2) If using a leased communication line, and the terminal's auxiliary operate panel has a RECEIVE EQUALIZER control knob, or the terminal's modem is an IBM 3872 Modem, check the equalization as described in the 'Modem Receive Equalization' section in the Operator's Guide. Then, return to

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this point in the test procedure. If performing receive equalization does not correct the problem request that the common-carrier company test the communication facilities and correct any problems.

(3) If using a leased line and the terminal's auxiliary operator panel does not have a RECEIVE EQUALIZER control, request that the common-carrier company test the communication facilities and correct any problems.

The above tests should be performed in order sequence and can be used by either customer or CE.

CE Diagnostics Tests

Located on the CE cassette tape supplied with the terminal, these tests are read into the terminal RAM using the cassette tape player (CE tool). If an error is detected during a selected test, an error code is displayed in the keyboard NPR's (LED) or the operator panel lights if no keyboard. This error code acts as a key entry point into the MAP's.

The following functions are checked in tests :

Line Printer
Wire Matric Printer
Keyboard
Operator Panel
ID Badge Reader
Communication Adapter/Modem
Multipoint Feature
Cycle Steal Adapters
Disc Unit
Buffers
2502 Card Reader
3501 Card Reader
3521 Card Reader/Punch

For detailed information on running the above test, refer to MLM SY27-0129.

Cable End Wrap Test

This test enables the CE to loop the communication cable, using a socket attached, back into the terminal. This will enable the CE to completely check his terminal to the cable end.

Online test (API Echo Test - T3700SNA)

This test is designed to verify the integrity of the link between the terminal (3770) and the central site (370X). This is done by sending to the terminal the data that was requested the number of times specified. This test can be initiated from either the host or terminal (see section 12 and 13).

EXAMPLE OF RUNNING API ECHO TEST FROM 3770

```
Logon applid (istoltep)
F102I ISTOLTEP REL.2.0 INITIALIZATION IN PROGRESS
F107I OPTIONS ARE NTL,NEL,NPP,FE,NMI,EP,CP,PR,NTR,NAP
F105D ENTER DEV/TEST/OPT/
*/3700sna/
F158I S T3700SNA UNIT 00CF RT2LU1
901 ENTER YYDATA, PROMPT, OR END
4 test data
test data
test data
test data
test data
901 ENTER YYDATA, PROMPT, OR END
end
905 END OF ECHO TESTING
F158I T3700SNA UNIT 00CF RTSLU1
F107I OPTIONS ARE NTL,NEL,NPP,FE,NMI,EP,CP,PR,NTR,NAP
F105D ENTER DEV/TEST/OPT
cancel
```

Error Log

The 3770 has an Error Log which contains detailed hardware, software and machine check information. To print this Error Log, hold the 'code' key down and press the numeric 2 key. This information is destroyed with Power-On-Reset.

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SECTION 21: 3791 DIAGNOSTICS - SIRF

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DESCRIPTION

The maintenance package for the 3790 system consists of :

1. Problem Recovery Procedures (PRP)
2. Maintenance Analysis Procedures (MAP)
3. Offline tests
4. Online tests

1. PROBLEM RECOVERY PROCEDURES

The customer is provided with an Operations Guide, GA27-2786 for version 1-5, GA27-2822 for version 6. These charts will enable the customer to perform Problem Recovery.

2. MAINTENANCE ANALYSIS PROCEDURES

MAP's are used by the CE to analyse problems with the 3790 system and are located in the 'Maintenance Information' manuals, these are located with the machine (volume 1/2/3)

3. OFFLINE TESTS

a -- BU Test Invocation (Bring Up)

Test type	When used	How to invoke	Comments
BRING UP (from a power-off condition)	*First time offline tests are run *Test unit controller and control storage	*Diagnostic diskette inserted *Set the Data/Function select switch to 0 *Turn 3791 power on	Progressive displays (1XXX, 2XXX, 3XXX, 5XXX indicate steps through the initialization and the Bring-Up tests BC80 display indicates test completed successfully. A steady display (not BC80) is a failure indication. Refer to the AA MAP, General Failure Index (GFI)
BRING-UP (power already on	*Test Unit controller and control storage	*Diagnostic diskette inserted *Set the Data/Function select switch to F *Press Reset *FF00 display *Enter Function F	FF00 display indicates that a special initialization test option may be entered. Progressive displays (1XXX, 2XXX, 3XXX, 5XXX) indicate steps through the initialization and the Bring-Up tests. BC80 display indicates test completed successfully A steady display (not BC80) is a failure indication. Refer to the AA MAP, General Failure Index (GFI)
BRING-UP (loop option) (power off or power on condition)	*Test Unit controller and control storage for intermittents	*Diagnostic diskette inserted *Set the Data/Function Select switch to F *Trun 3791 power on or press Reset *FF00 display *Enter Data A *Enter Function B	FF00 display indicates that a special initialization test option may be entered. Progressive displays (1XXX, 2XXX, 3DXX) indicate steps through the initialization and the Bring-Up tests. A steady display (not BC80) is a failure indication. Refer to the AA MAP, General Failure Index (GFI)
BRING-UP (Bypass option) (power off or power on condition)	*Test only adapter/devices *Bring-up tests not required	*Diagnostic diskette inserted *Set the Data/Function Select switch to 8 *Turn 3791 on or press Reset	Progressive displays (1XXX, 5XXX) indicates the step through initialization(bypassing the Bring-Up tests) BC80 display indicate the bypass completion A steady display (not BC80) is a failure indication. Refer to the AA MAP, General Failure Index (GFI)

b. Adapter/Device tests

How to Invoke	Comments
* At the 3791 Operator Panel * After initialization using the Diagnostic Diskette or at the completion of an offline test or routine. * At a BC80 or an LA00 display * Enter Data LASLRR (See Notes 1 and 4). Where : LA = Logical Address of adapter or device to be tested S = Test Selection Option S = 0 = Test Adapter (not Device) 1 = Test Adapter and Device 2 = Test Adapter and Device with manual intervention L = Loop Option L = 0 = No looping 1 = Loop, stop on failure 2 = Loop, no stop on failure RR = Routine Number for a specific routine; otherwise no entry is required. * Enter Function B.	LAF0 displays while tests run. LA00 displays when a test completes successfully. BC80 displays when a test or routine is terminated with Enter Function F. LAXX (XX = 01 through 7F) display indicates a Manual Intervention stop. Refer to the appropriate MAP for the required action. LAEE or LAYY (YY = 80 through 9F) display indicates a failure has occured during a test. Use the Error Data Recovery procedure to display and record the Error Data. (Refer to section 3.4.3.) See Notes 2 and 3. BCZZ (ZZ = 81 or greater) display indicates a procedure error while invoking or running the tests. Refer to the AA MAP General Failure Index (GFI). To terminate, Enter Function F.

c. Maintenance Function

The Maintenance Function consists of six routines which enable the CE to service the 3790 system offline :

Routine 1. Display/Patch Diagnostic Diskette : Routine 1 is used (only after aid is requested) to display or change a data field in a test residing on the Diagnostic Diskette.

Routine 2. Configure Diagnostic Diskette : Routine 2 is used after an EC installation to transfer configuration data from the installation Diskette to a new unpersonalized Diagnostic Diskette

Routine 3. Disk Map Generation : Routine 3 is used by the DS MAP to record sector ID status of the disk storage unit(s) on the Diagnostic Diskette.

Routine 4. Format Disk : Routine 4 is used (only after aid is requested or by EC installation instructions) to format disk sector ID or Data fields; action is dependent on run option.

Routine 5. Disk Surface Analysis : Routine 5 is used by the DS MAP to determine the condition of disk sector IDs and data fields.

Routine 6. Configuration and MAP File Save : Routine 6 is used to transfer Configuration data and disk MAPs from a personalized Diagnostic Diskette to an unpersonalized backup Diagnostic Diskette.

d. Diskette Surface Analysis

This test identifies bad tracks on a formatted diskette capable of being used by a 3791. It may be invoked from any Diagnostic Diskette because the test is not dependent on system configuration. It may be run on any range of tracks (o to 76) with the option to loop or not to loop the test. A failure, after one or more tracks have been read successfully, indicates a diskette surface or head alignment problem. Go and perform the Head Alginment Check. If the Head Alignment is correct and the diskette has more than two bad tracks, replace the diskette.

e. Remote Adapter Tests

The RA Offline Tests are invoked using the invocation procedures that are described in Chapter 3, Offline Adapter/Device Test Invocation (SY27-2477).

Routines 1 through 15 - Adapter Test.
These routines test the RA adapter. They do not require or test the attached EIA card, integrated modem, or external modem. A failure in any of these routines is probably caused by a defective RA adapter.

Routine 16 - Integrated or External Modem Wrap Test. This test puts either the integrated or external modem into wrap mode by raising the Local Test Line and running various data patterns through the modem. A failure in this test is probably an integrated modem or external modem problem. The external modem must have wrap capability.

Routine 17 - Wrap Plug Test (adapter with clock)
This test requires a wrap plug, PN 2605944, to be installed at the end of the EIA interface cable. The test then checks for open or short circuits on the EIA interface by activating Driver Lines and Checking for proper responses through the wrap plug. This routine is selected manually.

Routine 18 - Wrap Cable Test (adapter without clock)
This routine requires a wrap cable, PN 2605949, to be installed between the end of the EIA cable and the external modem. This routine is similar in operation to Routine 17, and also must be selected manually.

Routine 19 - Wrap Cable Test (JAPAN)
This test requires a wrap cable, PN 2722052, to be installed at the end of the EIA cable. This routine is similar to Routine 17, and it also must be selected manually.

Online Test (RADOLT 1)

This test is used to provide testing of the RA Adapter and Modem during concurrent customer operation. The customer must not have the Host link active at this time.

Online test consists of three routines, a description of which follows :

Adapter Prewrap test - routine 14 tests the RA adapter with limited wrap testing. It checks for invalid commands, control and status registers, timer, interrupt enable/disable, input and output requests, overrun and underrun, invalid sequence, 15 ones recognition, and continuous frame insertion.

Adapter Data Wrap Test - Routine 15 wraps four different data patterns through the adapter. The data is transmitted in EBCDIC, ASCII, SDLC 8-bit, and SDLC 8-bit NRZI modes. For each data pattern, the adapter is placed in wrap mode, receive and transmit modes are turned on, and the adapter is enabled for interrupts. A check is made of all interrupts, and all data is checked for correctness.

Modem Data Wrap Test - Routine 16 tests the ability of the modem to wrap a data pattern. The attached modem must be capable of supporting this type of test. The data consists of seven different data characters, each transmitted 32 times. The 'Test' line is activated to cause the modem to go into wrap mode. The adapter is placed in transmit and receive mode, and enabled for interrupts. After the last data character has been received 32 times, the adapter is reset, and the test is complete.

DUMP FUNCTION

Dump Diskette Description

Dump Diskette is used to :

1. Record a dump of 3791 control storage
2. Copy a 3792 control storage dump from disk storage
3. Copy the 3791 condition/incident log
4. Transmit a dump or a condition/incident log to the Product Support Center
5. Locate intermittent 3791 control storage failures

* Contents are used by the Product Support Center to troubleshoot an Operational code problem

* May be mailed or transmitted to the Product Support Center.

* May have only one 3791 dump or condition incident log recorded on it

* May have one 3792 dump and the condition incident log recorded on it.

  Note : Routine 1 must be used to transmit.

Dump diskette functions are :

* 3791 dump (control storage)

* Routine 1, transmit 3791 dump

* Routine 2, transmit 3792 dump

* Routine 3, transmit condition/incident log

* Routine 4, copy 3792 dump and the condition incident log

* Routine 5, copy 3792 dump

* Routine 6, copy condition incident log

3791 Dump (Control Storage)

3791 Dump :

* is used by tha AA MAP to locate intermittent control storage failures

* is used by the Product Support Center to troubleshoot operational code problems

* is invoked when one of the following occurs :
  1. A 3791 abend message (FXXX indicated by the 3791 digit display)
  2. A 3791 hang condition when no message is indicated, and the 3791 was using the operational code.

3791 dump procedure

CAUTION : if local channel feature is installed, the local channel switch must be in LOCAL/INTF disable position and the disable indicator ON.

1. at a 3791 abend message or hang condition :

a. record the condition of the 3791 (abend message number, hang condition, functions or programs running at the time of the failure, etc.)
b. insert the dump diskette
c. set the data/function select switch to 7 ; press Reset

2. displays of 1XXX and DXXX indicate initialization tests are running

3. when the digit display indicates all blanks, the 3791 control storage dump to the diskette has started. Go to step 4.

4. if a failure is detected, one of the following failure conditions (a or b) occurs ; if a failure does not occur, go to step 5.

   a. Test indicator flashing. Condition indicator on, and a message on the Digit display.

      * a recoverable control storage failure has been detected.

      * record the entire digit display failure pattern

      * enter function B to continue.
        If the failure occurs more than three times, terminate the dump by setting the Data/Function select switch to F, and pressing Reset. Then, use the dump failure pattern table on MAP page AA02 to identify the failing control storage card(s). Exchange the failing card(s) with new card(s).

   b. Test indicator flashing. Condition indicator off, and a message on the Digit Display.

      * an unrecoverable controller failure has been detected.

      * insert a new dump diskette, return to step 1c, and retry the dump.

      * if the failure does not recur, the original diskette is defective.

      * if the failure recurs, use the dump failure pattern table on MAP page AA02 to identify the failing control storage card(s). Exchange the failing card(s) with new card(s).

5. D000 is displayed when the dump is complete. The Product Support Center determines what steps should be taken with the Dump Diskette. If the Dump Diskette is not needed, the diskette should be retained and used again.

__Dump Copy Functions__ (__Routines 5 and 6__)

__Copy function__ :

* copies on the dump diskette a selected 3792 dump that has been recorded on disk storage.

* copies on the dump diskette the 3791 condition/incident log.

* is used under the supervision of the Product Support Center. The recorded information may be sent to the Product Support Center.

Copy procedure

1. if a 3792 dump is to be copied, record the condition of the 3792 at the time of the failure (abend message, hang condition, functions, or programs running at the time of the failure, etc.).

2. to copy a 3792 dump or the 3791 condition/incident log :
   a. insert the dump diskette
   b. set the data/function select switch to 8 ; press Reset.

3. displays of 1XXX and DXXX indicate initialization tests are running.

4. when the prompt message D001 occurs, select option a or b, then go to step 5.
   a. to copy the 3791 condition/incident log, enter data 6, enter function B.
   b. to copy the 3792 dump and condition incident log, enter data 4, enter function B.
   c. to copy a 3792 dump, enter data 5, enter function B. When the prompt message D051 occurs, select one of the following :
      * for 3792 #1 (LA=88), enter data 1, enter function B.
      * for 3792 #2 (LA=98), enter data 2, enter function B.
      * for 3792 #3 (LA=A8) enter data 3, enter function B.

5. D000 is displayed when the dump is complete.

(f) Dump display diskette (B.O. tool)

Set up

1. insert diskette

2. depress 'reset' to IPL program

3. LED will display 'ABCD with CONDITION' light on.

4. to execute :
   (a) print on SELECTRIC - Set 'FUNCTION SEL' switch to '1' and depress 'Enter Data'.
   (b) print on LYNX/OPS panel - Set 'FUNCTION SEL' switch to '2' and depress 'Enter data'.
   (c) display on ANR - set 'FUNCTION SEL' switch to '3' and depress 'Enter data'.

Procedure

1. Following input of the option desired the selected device outputs 'FC00' with LED blank and no indicator lights on.

2. insert previously 'Dumped to' to dump diskette.

3a. Dump diskette header data will be outputted at the device ie., **3791 dump data**.

. if only inc log data is present on the dump diskette, it will automatically be outputted. Following output of the data the program will return to step 1 LED = 'FC00'.

3c. if Inc log and 3792 data are both present on the dump diskette, 'FC11' will be outputted. If the Inc log is to be displayed set the 'Function select' to '1' and depress 'Enter data'. The Inc log will be outputted followed by 'FCAA'. Proceed as in step 4. To display 3792 data set 'Function select' to any position except '1' and depress 'Enter data'. 'FCaA' will be outputted. Proceed as in step 4.

Note : for Inc log dumps the entire Incident log will be outputted following the header data described in step 3.

4. 'FCAA' will be outputted on the device.

   Enter the beginning address (for 3791/3792 dumps) - 5 Hex digits as follows : (obtainable from SNAIS/PTSC)

   a. Option 1 (Sel) type all digits (upper or lower case) then depress 'ENTER'.
   b. Option 2 (Lynx) enter each digit by setting 'Function sel' switch to correct digit and depressing 'Enter data' button. Then set 'Function sel' to 'B' and depress 'Set function' button.
   c. Option 3 (ANR) type all digits and depress 'Enter'

   Note : if the device is higher than the maximum RAM size, the beginning address will not be accepted, ie, 'FCAA' will again be outputted.

6. 'FCBB' will be outputted at the device.

7. Enter the Ending address (5 Hex digits) in the same manner as step 5. The ending address will not be accepted if it crossed volumn boundaries or if it is higher than maximum RAM size. ie, 'FCBB' will again be outputted.

8a. PRINT/DISPLAY of data will commence.

8b. Following output of data, 'FCAA' will again be outputted to the device. Continue at Step 5.

   TERMINATE output of data as follows :
   a. Option 1 (Sel) - Depress any function button (except reset), enter a 'pound( )' sign followed by an 'F' character. Output will terminate, 'FCAA' will be printed, enter a starting address and continue as from item 5.
   b. Option 2 (Lynx) - Set 'FUNCTION SEL' switch to 'F' and depress 'SET FUNCTION' button. Output will terminate, FCAA will be displayed in the LED's enter a starting address and continue as from item 5.
   c. Option 3 (ANR) - Key in a pound " " sign followed by and 'F' character and depress the 'ENTER' key and the 'PA1' key. Output will terminate, 'FCAA' will be displayed, enter a starting address and continue as in step 5.

   ABNORMAL OPERATION MEESAGES - sent to the outplant device or to LEDS.
   a. 'EEE4' and 'condition' light on - probable hardware problem - CAC process was not completely successful retry IPL.

b. 'EE01' and condition light on - 'Set Function' butto depressed in error - depress 'Enter Data' button to continue.
c. 'EE02' and condition light on - the 'Function Sel' switch is set to an unused position - change it and depress 'Enter Data' to continue.
*d. 'FCEE92XX' invalid dump diskette mounted, xx characters are not significant.
*e. FCEEE 91XXXX - Lynx printer error detected, xxxx is Lynx CAC status (R2, R3)
*f. FCEE90XX - Invalid function request detected, xx characters are not significant.
*g. FCEE 9AXX - IGAR adapter error detected, xx is IGAR CAC program status (R3)

*NOTE : OP PANEL OPERATION - messages d, e, f, g, LED will display 'FCEE' ; to display the rest of th message, set the 'function select' switch to 'E' a depress the 'Set Function' button.
To re-display the entire message, set the 'Function Sel' switch to 'C' and depress 'Set Function'.

11. ERROR MESSAGES - outputted to ops panel LED only, non recovery.
These messages are in the same formate as errors in Section 10 but both the 'condition' and blinking 'Test' lights will be on. The LED will display 'FCEE'. By setting the 'Function Select' switch to 'E' and depressing the 'Set function' button the rest of the message will be displayed. The message will consist of a two digit code followed by a digit level number. These error codes are described in the listings of the utility routines.

12. ANR OPERATIONS
a. The 'clear' key can be used at any time to reposition the next output to line 3. The first two lines are reserved for input and special usage.

b. Once the screen has been filled, a prompting message will be received to roll the screen. By depressing the 'PA1' key the next line of data will be displayed starting on line 3.

4. ONLINE TESTS

Warning :
the following tests are relevent for E/C 74204x and above, for lower level E/C 3791's refer to previous level handbook 3791 section.

Online condition allows normal 3790 system customer data processing operations. Online service operations, run by the CE, share the 3790 system with customer operations.

Online functions provide the CE with additional system support. The CE can select these functions :

- * SYSLDEV (898) List Device Status
- * SYSREQ (908) System Messages
- * SYSTRACE (911) Trace System Operation
- * SYSLPROG (914) List Functions
- * SYSPAT* (915) Emergency Patches
- * SYSIMOD (934) Installation Parameters/modification
- * SYSLERR (978) List Condition/Incident Records
- * SYSTCM (999) Online Tests
- * SYSTCM (999) Free Task Option
- * SYSLIST (974) List Controller Configuration
- * SYSECHO (987) Checks Data Transmission to/From Host
- * SYSRIS (998) Allows CE to display System Data or Code
- * SYSREA (862) Allows CE to update Code using REA's

The following chart shows which CE functions can be selected by 3790 terminals.

Function Name/Number	Valid Terminals			
	2741 or TP Term.	3277	3793	Other
SYSREADI 856	Yes	Yes	Yes	
SYSLDEV 898	Yes	Yes	Yes	
SYSREQ 908	No	Yes	Yes	
SYSTRACE 911	Yes	Yes	Yes	
SYSLPROG 914	No	Yes	Yes	
SYSPAT 915	No	Yes	Yes	
SYSIMOD 934	No	Yes	Yes	
SYSLIST 974	Yes	Yes	Yes	
SYSLERR 978	Yes	Yes	Yes	
SYSECHO 987	No	Yes	Yes	
SYSRIS** 998	No	Yes	Yes	
SYSTCM 999	Yes	Yes	Yes	3791 * Operator panel

*Go to SYSTCM (999) online procedures for the 3791 Operator Panel invocation

**To be used only under the direction of the Product Support Center.

The following sections describe terminal and function procedures. When the function is successfully selected at the terminal, go to the function description located in the section listed in the chart above.

REMEMBER : the 3791 must be online to log on a terminal. If the terminal is connected to a 3792, the 3792 must also be online.

a. SYSLDEV (898) List Device Status

The SYSLDEV Function

* is used by the Control Operator or a CE
* can be invoked from a terminal
* is used only when the 3791 is online
* has five options :
  option 1 - list devices
  option 2 - display all tasks
  option 3 - display tasks by task number
  option 4 - display tasks by OPID
  option 5 - device by Device Address

b. SYSREQ (908) System Messages

Caution : This function should be used by the CE only at Site Installation time for recovering Control Operator messages. When these messages are required at other times, the 3790 Control Operator must perform message recovery.

After Site Installation, the CE does not have access to the Control Operator password. For security reasons this password is normally changed by the customer when the 3790 system is turned over to the customer.

Description

The SYSREQ function is invoked from a Control Operator's terminal (3276/7/8 or 3793). The SYSREQ Function prints or displays control messages from the 3790 Control Operator's queue. These control messages describe a 3790 system condition or status and may prompt a 3790 Control Operator or CE for additional system action.

A single control message is printed or displayed when the SYSREQ function is invoked. To obtain another message, the SYSREQ function must be re-invoked.

c. SYSTRACE (911) Trace System Operation

The SYSTRACE Function

* is used to trace selected Operating Code events while troubleshooting an Operating Code problem.

* Is used only after contact with the Product Support Center.

* Trace Data is obtained by taking a Dump of Control Storage

* May be terminated by logoff or by initializing the 3791

* Contain four options :
  Option 1 - Common code trace
  Option 2 - Terminal Code Trace
  Option 3 - Host Code Trace
  Option 4 - Host Communication Error Trace

d. SYSLPROG (914) List Functions

The SYSLPROG Function

* Used by the Control Operator or a CE

* Lists the name, number, primary device, access information, and transaction data set use of functions stored in 3790 Data Sets.

Function Range

* The Control Operator may list the information related to programs (numbers 1 through 8191)

* The CE may list ONLY information related to functions (numbers 897 through 1023)

e. SYSPAT (915) Emergency Patches

CAUTION : Customer Operations must be terminated before SYSPAT is used.

The SYSPAT Function

* Allows the CE to patch any block of data in the System Data Sets.

* Is used only after contact with the Product Support Center or Retain.

Note : This function is included in SYSREA (862) when available

f. SYSIMOD(934) Installation Parameters

The SYSIMOD Function

* Is used to customize the Operational Code to a particular installation.

* Consists of nine Parameter Option Groups :
  Group 1 - Host Communication table
    a. For a remote teleprocessing 3790 system (no Local Channel Feature), contains host communication link parameters.
    b. For a S/370 attached 3790 system (Local Channel feature) contains the S/370 Control Unit address of the 3791 Controller.

  Group 2 - Print Group Table, contains parameters to customize the Print Data Set.
  Group 3 - Transaction Data Set Group Table, contains parameters to customize the Transaction Data Set (TDS).

Group 4 - System IOCB Table, contains parameters that indicate the Enable/Disable condition of terminals attached to the 3790 system.
Group 5 - 2741 (or other T.P. terminals) IOCB Table, contains 2741 communication link parameters.
Group 6 - LU/LA table contains parameters to customise the bulk printing data set
Group 7 - RJE parameters for remote job entry optional feature
Group 8 - System Option - parameters for SYSABEND dump function and the WT only function - data stream compatibility mode
Group 9 - Data link option contains the parameters for the DLA control unit and attached devices.

* Information for all groups except 4 is provided by the customer using the 3790 SYSIMOD Worksheets,

* Information for Group 4 is generated by the CE using MAP pages AA04 and AA05.

The SYSIMOD Function is used :

* At Initial Site Installation

* After an Operational Code EC installation
* After an Operational Code Full Installation

* To change 3790 parameters after an Initial Site Installation

* To enable or disable a selected terminal.

g. SYSLERR (978) Condition/Incident Log

The SYSLERR Function :

* Is provided to search, display, and print the contents of the Condition/Incident Log

* Is used only when the 3791 is On Line.

* Is invoked from a terminal

  Note : The Log may also be output on a Line Printer after being invoked from a terminal.

Some of the SYSLERR Options Are :

* Search by Incident Type (1, 2, 3 or 4)

* Search by PA (Physical Address)

* Search by LA (Logical Address)

* Search by sequence range

* Search by 3276 Control Unit

* Clear Log

* Print on a Line Printer

SYSTCM (999) Online Tests

The SYSTCM Function

* INvoked from a 2741, 3277, 3793, or 3791 Op Panel.

* Allows the user to request an execute tests in a 3790 online condition.

These devices can invoke tests to other devices as shown in the table below :

Invoking Device	Device to be tested: 3793	3277	2741	Line Printer
3793	Yes	Yes	No	Yes
3277	Yes	Yes	No	Yes
3791 PANEL	Yes	Yes	No	Yes
2741 or other TP terminal	Yes	Yes	Yes (same terminal)	Yes
3278	Yes	Yes	No	Yes
3287	Yes	Yes	No	Yes

DLA OLTs

The Data Link OLTS consist of the following types :

1. RADOLT 1
2. RADOLT 2
3. RASOLT

ιdolt 1

RADOLT 1 performs adapter (HPCA) and device (modem or EIA) tests utilizing a special segmented diagnostic CAC. Routines 14 and 15 provide HPCA prewrap and adapter wrap tests, while routine 16 runs a modem or EIA wrap. Multiple Data patterns are used and routines can be looped. Our completion of testing RADOLT 1 will pass ›ntrol to RADOLT 2. All RADOLT 1 routines can be invoked ⅰther manually or automatically.

RADOLT 2

RADOLT 2 performs additional testing of the hardware attached to the HPCA using the operational CAC.

›utine 53, which is both auto or manually invoked, tests ιat it can communicate with at least one 3276 subsystem on a Data Link line. If manually invoked, Routine 53 will stop on the first error detected. If auto invoked TP

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errors will be retried 'twice' before indicating a hard failure, and if successful will continue to the next operation. At completion of the auto invoked option a message indicating 'success with retry' or 'successful completion with no errors' will be provided.

Routine 55 is a manually invoked test only and performs remote subsystem 'Data link analysis'. The routine sends a Link Test with 254 bytes of data to each station (subsystem controller) on the data link. The number of times the data is to be sent to each station is selected by the invoker, a default of 100 times is available. The data to be sent can be entered manually or a 'test pattern' defaulted to. If an error is returned by the station or the data does not compare the appropriate error count is incremented. This sequence continues until all stations have received the total number of test messages. When the test is completed 'statistics' for each station are displayed as follows :

```
SA        = station address
MSG COUNT = messages sent count
T/O       = Time out error count
BCC       = BCC error count
DATA      = DDDD if data compare error received
          = 0000 if no data compare errors
```

RASOLT

This test requires dedication of the station to be tested, normal operation is maintained to other stations on the same data link. This OLT tests the link to the station using the SDLC architectured 'Link test' command.

The test consists of 4 manually invoked routines.

Routine 1 - SDLC Test Command A link test with no data is sent to the station. Results of this test are outputted to the invoker.

Routine 2 - SDLC Test Command with data response A link test with data (test pattern) is sent to the station. The data is returned and compared at the 3791. Results are outputted to the invoker.

Routine 3 - SDLC Test Command with data provided by invoker This test is similar to routine 2 but ahs the data field supplied by the invoker to assist in a diagnosis of 'data sensitive' problems. A count field is available to the invoker, enabling the test to be automatically repeated.

Routine 4 - Line Analysis A link test with data (supplied by invoker) is sent to the station a predetermined number of times. Errors are logged in a counter until the test is completed, at which time statistical results are outputted. The format is as follows :

```
AA   = adapter address
EEEE = number of failures
TTTT = number of test msgs sent
SADA = station and device address
```

j. SYSLIST (974) - List controller configuration

* used by control operator or CE
* lists configuration stored on the installation diskette number 1 (new list) or in the 3791 data sets (current lists).
* invoked from a terminal

k. SYSECHO (987) 3790 to Host Wrap Test

* used by control operator or CE
* requires host system program support
* checks data transmission to and from host system
* used only when the 3791 is on-line

SYSECHO requires a companion program at the Host System, either 'Host PGM1' or an equivalent program. Verify through Host System personnel that 'Host program' is running and communication with the 3790 is enabled.

l. SYSRIS (998) Remote Interrogation System

Caution :
customer operations must be terminated before SYSRIS is used.

* is used only by CE
* allows the CE to display System Data or code
* Data or code may be in storage, disk, diskette, or data sets
* allows the CE to patch data on direction of PSC (Product Support Centers)

m. SYSREA (862) System REA

Caution :
All customer operations must be terminated before invoking options 1 and 2 or loading REA's from the REA diskette.

* is used only by the CE
* allows the CE to update the system code using REA's
* updates the REA log for any REA's added or deleted
* has the following options:

1. install REA
2. remove REA
3. list REA status
4. test TEA status
5. copy REA to REA DS
6. verify/update REA
7. create REA
8. enable/disable REA
9. terminate

n. Condition/Incident Log -
(valid for E/C 74204x and above)

The 3791 records selected system events in a Condition/ Incident Log. This log resides on Disk Storage LA=21. Each event is identified by an incident type and a sequence number. Sequence numbers are assigned in order of occurence, sequentially from 1 to 4095. The Log will wrap around at 4095, starting over at 1, and any previous recordings will be over-written.
Note : Some Condition/Incident Log records may be lost after a 3791 power-off sequence if : 1) 1) the Control Operator did not perform a normal termination of system operations prior to power-off or 2) the CE did not initialize the 3791 prior to power off.

The four types of Condition/Incident records are :
1. Type 1 records, associated with Adapter or Device failures.
2. Type 2 records, associated with Machine Check failures
3. Type 3 records, associated with Adapter/Device failures with variable format records
4. Type 4 records, associated with various system events such as System Start, System Abend, System Shutdown, etc.

Typical usage of the Log by the CE is for intermittent failure resolution when the various tests do not detect a failure. The MAPs request the usage of the log when necessary.

Type 1 Record

```
  1              2           3     4     5
1-TYPE    I-REC  SEQ-XXXX   NA-XX PA-XX LA-XX

  6                  7               8
C-CODE-XX          B-STAT-XX       C-FR-XX
  9                10              11
X-STAT1-XX         X-STAT2-XX      S-FR-XX
12                     13
IOCB   -XXXX XXXX     RC-XX
15       16       17          18
D1-XXXX  D2-XXXX  D3-XXXX     D4-XXXX
```

Type 1 Log Record Description

Field 1	Type 1	Indicates a Type 1 record, 3791 Feature failure.
Field 2	SEQ	A 4 digit decimal sequence number ranging from 0001 to 4095. Number indicates the relative order at which the record occured.
Field 3	NA	The number of functions and programs which were active at the time of the failure.
Field 4	PA	The Physical Address of the Adapter for which the recording was made.
Field 5	LA	The logical address for which the recording was made.
Field 6	C-CODE	A completion Code which identifies the amount of retries performed and if they were successful. Each MAP describes its C-Codes.
Field 7	B-STAT	A Basic Status byte presented by the adapter and used by the MAPs to identify the problem.
Field 8	C-FR	The adapter operation active at the time of the failure.
Field 9 10	X-STATX	X-STATX STatus X = 1 or 2 information presented by the adapter (used by MAPs).
Field 11	S-FR	The System Operation in process at the time of the failure.
Field 12 13 15 16 17 18		Feature dependent, MAPs identify usable fields.

Type 2 Record

```
 1                2          3     4     5
2-TYPE   I-REC  SEQ-XXXX  NA-XX PA-XX LA-XX
 19                 20           8
D21-XXXX XXXX       LVL-XX       C-FR-XX
21                  22           11
D22-XXXX XXXX       MC-XX        S-FR-XX
23         24         25
D23-XXXX   D24-XXXX   D25-XXXX
```

Type 2 Log Record Description

Field 1 Type 2	Indicates a Type 2 record, 3791 Machine Check
Field 2 3 4 5 8 11	Same as for Type 1 record.
Field 19 20 21 23 24 25	Reserved
Field 22 MC	Two hex digits that indicate the type of Machine Check that occured. Bits 0 and 1 indicate an adapter failure. Bits 2 and 3 indicate a Unit Controller Logic or Control Storage failure.

Type 3 Record

```
  1                  2                5
3-TYPE    I-REC   SEQ-XXXX          LA-XX
   32         33          34          35
D1-XX       D2-XX       D3-XX       D4-XX
 36         37       38       39     40
D5-XX      D6-XX   D7-XX    D8-XX D9-XX
    41                   42
D10-XXXX               D11-XXXX
    43                   44
D12-XXXX               D13-XXXX
    45                    46
D14-XXXX               D15-XXXX
```

Type 3 Log Record Description

Field 1	Type 3	Indicates a Type 3 record, RA variable data incident record
Field 2 5 Field 32	D1	Same as Type 1 System operation at the time of the error
Field 33	D2	Adapter operation at the time of the error
Field 34	D3	Completion Code
Field 35	D4	Reserved
Field 36	D5	Machine Check Code (MCMC) Valid only if field 6 bit 5 = 1
Field 37	D6	Status flags *
Field 38	D7	Extended error data *
Field 39	D8	Set to 0
Field 40	D9	Reserved
Field 41	D10	Sense and Status information *
Field 42	D11	Sense and Status information *
Field 43	D12	Sense and Status information *
Field 44	D13	Sense and Status information *
Field 45	D14	Reserved
Field 46	D15	Reserved

Type 4 Record

```
1                  2            26
4-TYPE   I-REC SEQ-XXXX     SYS-COND-XX
27       28       29       30       31
D01-XX   D02-XX   D03-XX   D04-XX   D05-XX
```

Type 4 Log Record

Field 1	Type 4	System Condition record
Field 2		Same as Type 1
Field 26	SYS COND *	A System Condition Code that identifies the system event being recorded
Field 27	28 29 30 31 D-fields	Variable information associated with the System Condition being recorded

Type 4 Cond XX Record Types -

System Condition Code	Description	D-Fields
01	System Date Log record Recorded each time Date Set	D01 = Year D02 = month D03 = Day
02	3791 initialization record Recorded each time 3791	D01 = XY X=8=Power-on initialization X=0=Reset initialization Y=OP Panel Setting
03	3791 initialization record Recorded each time 3791 is initialized	D01-D05=Code EC number
04	3791 Abend record Recorded each time the 3791 Abends with a FXXX Digit display	D01=Number of active functions D02, D03 contain FXXX Abend number
05	3791 Shutdown record Recorded each time an automatic Power Down occurs	D01-D05=Code EC number
06	Time date stamp	D01 Hours D02 Minutes D03 Seconds
07-0D	Not used	
0E-15	Not used	
16	Over 50 (5M) or 100 (10M) alternate sectors have been used This record is generated for every alternate used over the threshold	D01=Number of active programs or functions D02,D03=Number of storage blocks available D04=Count of remaining alternates D05=LA of disk that exceeded the threshold
17	Up to 32 tracks of available Disk Space have been lost due to a Disk failure (LA=21) Lost tracks may not be on (LA=21)	D01=Number of active programs or functions D02,D03=Number of storage blocks available D04=Block ID Number
18	The Print or Transaction Data Set has been lost due to a disk failure	D01=LA of failing disk D02=Data set number that was lost
19	Not used	
20	Remote Adapter or Local Channel Attachment failure	D01-D05 contain maintenance information
21	Control command received from Host is unknown	D01-D05=01010A0F00

(Continued next page)

21

Type 4 Cond XX Record Types -

System Condition Code	Description	D-Fields
22	Control command received from Host is incorrect length	D01-D05=01010A0F00
23	Host connect parameters rejected	
24-83	Not used	
84	3792 Abend record Recorded when the 3792 Abends with a FXXX Digit Display	D01=88=Port 1-3792 98=Port 2-3792 A8=Port 3-3792 D02,D03=FXXX number Abend code

(Continued)

For further information on incident logs, refer to RA300-320 SY27-2477

Hard Copy Procedure

This procedure enables the CE to obtain all available RA incident records from the 3791 Condition/Incident Log. The RA records may be printed on the 3791 Line Printer or the 3793.

To obtain the RA records, perform the following :

1. Log on the 3793 with CE ID = 48CE3791. Refer fo Chapter 3, 3790 Basic Procedures.
2. Select the SYSLERR Function :
   type 978, press Return Key.
3. Obtain Type 4 RA records :
   ENTER FIELD3
   type 3 ; press Return Key.
   ENTER FIELD2
   type 2420 ; press Return key.
   ENTER FIELD 1

* To print on 3793
  type 11 ; Press Return Key.
* To print on 3791 Line Printer (if present)
  type 12 ; press Return Key.
  Then, at message ENTER PRINTER ID,
  type 14, press Return Key.

The most recent Type 4 record is outputted, if present.

4. Obtain Type 2 RA records :
   ENTER FIELD 3
   type 3 ; press Return Key.
   ENTER FIELD 2
   type 22 ; press Return Key

ENTER FIELD 1
* To print on 3793 :
  type 11 ; press Return Key.
* To print on 3791 Line Printer (if present),
  type 12 ; press Return Key.
  Then, at message, ENTER PRINTER ID
  type 14 ; press Return Key.

The most recent Type 2 record is outputted, if present. Review and identify Type 2 records with LA and/or PA=24. These are the RA Type 2 records.

P. Link Test

The Host 3704/3705 Communications Controller provides an SDLC Link Test that may be used for Host data link problem determination and repair verification.

The SDLC link test is basically an Echo Test with the 370X sending an SDLC test frame to a 3791. The 3791 will echo the test sequence back to the 370X, if it is received without error.

The receiving of SDLC Test Frames and the echoing back to the 370X is handled by the SYSHOST function of the Operating Code. With the SYSHOST function selected, the 3791 will receive and check all test frames. Test frames that are received good and have 9 or less data bytes will be transmitted back to the 370X exactly as received. Test frames that are received good but have more than 9 data bytes will cause a CMDREJ sequence to be transmitted back to the 370X. The 3791 will not send a response to any frame received bad. The results of the Link Test are recorded in the 3791 Condition/Incident Log as Type 4 COND-20 records.

For further information concerning Link Test operation procedure refer to RA172-174, SY27-2392 (see also Link Test section 14 in this handbook).

DESCRIPTION

The 3790 subsystem information retrieval facility, SIRF, is a VTAM application program which is designed to retrieve selected data from a 3790. Via specific operator commands the following data can be retrieved :

1. Condition Incident Log (CIL) records
2. Request for engineering action (REA) log
3. List configuration data
4. FP abend dump data
5. Transaction data blocks
6. Print data blocks
7. Operator message data blocks

The program will display and/or print all the data which has been retrieved. The display/print options are under operator control.

Additionally, the application provides a convenient wrap test which can be initiated from either the host application or one or more 3790 logical units. The 3790 initiated wrap test is provided in a separately startable routine, SIRFW. This separates the host initiated batch functions in SIRF from the interactive function of SIRFW.

This application has been designed to execute on all virtual operating systems - OS/VS1, OS/VS2, and DOS/VS. The application requires VTAM as its access method. Release independence has been maintained through the use of the VTAM manipulative macros.

The appropriate 3790 configuration support is required as follows :

Configuration support	EC Level
9431*	742035
9165	742042
9169	742050

* 9431 supports only items 1-4 as described above.

The following devices are supported in the batch retrieval routine SIRF :

1. 3791 - SNA (local or remote)
2. 3277 - SNA/BSC/3790 compatibility mode (3277 CM) - large or small screen - locally attached or remotely attached. This device can be used for input/output.
3. 3284, 3286, 3288 printers - large or small buffer - local or remote or 3790 bulk print. These devices are used for output or copy
4. The system printer (log) as output or copy device
5. The system card reader for offline input

The batch retrieval routine, SIRF, supports one 3277/3790 pair at a time in online mode. Once data is retrieved from one 3790, another 3790 may be specified and data retrieved from it. The separately startable routine, SIRFW, concurrently supports multiple LU's in multiple 3790's for 3790 initiated wrap test.

Program description

The 3790 subsystem information retrieval facility consists of two separately startable routines. SIRF supports all the batch retrieval capabilities of the application. In addition, it provides host initiated wrap tests with the type 1 batch FP. SIRFW supports the 3790 initiated wrap tests. SIRF is a VTAM application program. It communicates with one 3790 at a time. The program runs in either offline or online mode. At startup time, the program reads a card from the system card reader. If this control card specifies that a 3277 be acquired, (ACQ3277 LUNAME), the program will acquire the specified 3277 and enter online mode. In online mode the program will write all prompting messages to the 3277 specified. All operator input will be read from this 3277. If the first card does not specify ACQ3277, the program will enter offline mode and will continue to read input from the system card reader. In offline mode, all output is logged to the system printer. In online mode, output will be to the device or devices specified by the 3277 operator - 3277, 3284, or the system printer. (Note, the 3284, as referred to in this document, also includes the 3284, 3286, 3288, or 3790 bulk printer). The 3277 is the default output device. Additionally, in online mode, the 3277 operator is given the facility to optionally copy the currently viewed screen to hardcopy. The 3284 and system printer are valid copy devices. If logging is active, all input, as well as the output, will be logged to hardcopy.

The CIL records, the REA log, and the list configuration data will be displayed sequentially on the 3277, (assuming that the program is executing in online mode and the 3277 has been specified as an output device). Page forward (enter), copy (PA1), and cancel (clear key) functions are provided with this support.

The print, transaction, or operator message block will be displayed on the 3277 if the application is running in online mode and the 3277 is an output device. A block is 256 bytes of data. Since a block will span four screens, the character key '+' or the 'enter' key can be used to page ahead to view the next portion (page) of the block. A page is 64 bytes of a block. The character key '-' can be depressed to view the previous portion of the block. To obtain the next clock of a record from the 3790, the character key 'F' can be depressed. To obtain the previous block of a record from the 3790, the character key 'B' can be depressed. To end the command, the 'clear' key must be depressed. In offline mode, or if the 3277 is not being used for output, a range of blocks in a given record can be retrieved from the 3790. This range of blocks can be specified on the appropriate card input command.

The FP abend dump data will be logged to the system printer in all cases. This data cannot be displayed.

Wrap test

The host initiated wrap test provides the capability to wrap data with the type 1 batch FP in the 3790. The application provides data flexibility by allowing the user to specify test patterns dynamically. Each user buffer must be 256 bytes or less in length. The buffer must be assembled and link edited int the SYS1.LINKLIB (OS/VS) or Core Image Library (DOS/VS) prior to three 256 byte default buffers : SIRFX (all 00), SIRFY (all FF), and SIRFZ (00-FF). Additionally, the application allows the user to control the RU length and the chain length. If an error is encountered in running the test, the failing data, as well as the expected data, is reported.

The 3790 initiated wrap test is supported in a separately startable routine, SIRFW. This routine wraps all data received. It supports multiple LU's in multiple 3790's simultaneously. It opens an ACB name as specified on the job (DOS) or Exec (OS) card in the execute JCL. To wrap data with the IBM supplied 3790 FP, the name specified in the execute JCL must be HOSTPGM1 (see section 4).

In summary then, SIRF is the mainline application. SIRFX, SIRFY and SIRFZ are the IBM supplied test patterns used for host wrap test in SIRF. SIRFW is the separately startable 3790 initiated wrap test routine.

Installation

SIRF must be ordered through (DPD) Emergency Parts Centers, and will be shipped on 9 track 1600 BPI tape. Installation/Usage documentation, as well as configuration/ EC and service support information is included with the tape

	Part Number
SIRF OS/VS - VTAM/TCAM	360A - 020 - 9 - 1000
SIRF DOS/VS - EXTM	360A - 020 - 9 - 3000
SIRF DOS/VS VTAM	360A - 020 - 9 - 5000

Operation

This application consists of two separately startable routines samed SIRF and SIRFW. SIRFW supports the 3790 initiated wrap tests. SIRFW requires no operator commands at startup time. SIRFW will end when the system operator replies stopwrap to the prompting message SIRFW001 at the system console.

SIRF is the mainline data retrieval application. The following commands and explanations apply to SIRF.

Once the application SIRF has been started, it will read a card from the system card reader. If the program is to be run in online mode, the following card must be read first :

ACQ3277 LUNAME (480) (LU3790)

This command indicates that the program is to execute in online mode and the program will acquire the 3277 indicated by LUNAME. No other control cards will be read from the system card reader. If the screen size on the indicated 3277 is 480, then the parameter 480 must also be specified. The default is a screen size of 1920. If the device is a 3277 in compatibility mode (a 3277 attached to a 3790 for example), the parameter LU3790 must be specified. This will insure that the proper bind parameters are used. This 3277 will become the default output device for all future interaction unless this is overidden by an output command. Regardless of the output device, all error messages and prompting messages will be displayed on the 3277. If the first card is not an ACQ3277 command, the program will execute in offline mode. In this mode, all input will read from the card reader. All output will be printed on the system printer.

For online mode, once the 3277 has been acquired, the following prompt message will be displayed on it :

```
SIRF06A - options are :
3277 LU connected is : LUNAME
3790 LU is not connected
3284 LU is not connected
Output : 3277
Copy :
Enter request :
```

The following are valid input commands

1. ACQ3790 LUNAME

This command specifies the Luname of the type 1 batch FP in the 3790 from which data records are to be retrieved. This command must be entered before any request for data. If a subsequent ACQ3790 command is entered, the currently connected 3790 will be disconnected, and the newly specified 3790 will be connected. This allows data to be sollicited from a number of 3790's sequentially.

2. ACQ3284 LUNAME (LU3790)

This command specifies the 3284, 3286, or 3288 printer which the program will acquire. This command must be specified on either the output or copy commands. If another ACQ3284 command is entered, the current device will be disconnected and the specified 3284 will be acquired. The output and copy options are not changed by this command. If the device is a 3284 in bulk print mode (a 3284 attached to a 3790, for example), the parameter LU3790 must be specified. The buffer size of the printer does not affect the operation of the program. This command is not valid if the program is running in offline mode. The operands are positional in this command. The parentheses are shown to indicate that LU3790 is optional. The parentheses should not be specified by the user.

3. Output 3277 3284 Log

This command is used to specify the desired output devices. Valid output devices are :

a) the 3277 specified on the ACQ3277 command
b) the 3284, 3286, or 3288 specified on the ACQ3284 command
c. the system printer indicated by the previous output command.

If any error is encountered in the processing of the command, the entire command is rejected.
If 3284 is specified, a 3284 must have been previously acquired via an ACQ3284 command. Any combination of any of the three options may be specified on the command. Since all output is to the system printer (log) in offline mode, this command is not a valid command for offline mode. Note, the output options cannot be changed during any data retrieval

command processing. Therefore, be sure that the output devices required are assigned before entering a retrieval command. Of course, the output options may be changed between retrieval commands.

4. Copy 3284 log

This command specifies the valid copy devices. The command must be entered before any data retrieval commands. For example, if you intend to copy CIL records. The copy options must be set prior to entering a CILREQ command. The copy options cannot be changed during any data retrieval commands. If they are not changed between retrieval commands, the previous options will apply. If the PA1 key on the 3277 is depressed, the program will copy the currently displayed data to the indicated copy device or devices. Either 3284, log or both may be specified. If 3284 is specified, a previous ACQ3284 command must have been entered. The log device is the system printer. If any error is encountered in the processing of the command, the total command is ignored. This command totally supercedes any previous copy command. Copy can only be activated by the PA1 key when the 3277 is defined as an output device.

5. Logoff

This command will terminate the application. All devices will be disconnected and the application will run to end of job.

Example after options have been specified.

```
SIRF06A - options are
3277 LU connected is : CON3277
3790 LU connected is  TEST3790
3284 LU is not connected
Output : log
Copy :
Enter request :

    e.g. DUMPREQ
```

Requesting data

6a. CILREQ data

This command specifies that CIL processing is to occur. This command is valid only after an ACQ3790 has been specified. The 'data' will be sent to the acquired 3790 for processing. The data should be specified in the same numeric format as the input to the SYSLERR program. The valid commands are documented in the Operation's guide for the IBM 3790 communication system (GA27-2822). The format and the subsequent operator interaction will be similar to that of the SYSLERR program. The 3790 will transmit to SIRF messages and actual CIL data. These messages and data will be written by SIRF to the appropriate output devices. Note, CILREQ 9 should be used to end a sequence of CILREQ requests. This will reset the scan values at the 3790. Nevertheless, if a sequence of CILREQ requests if followed by another SIRF request command (e.g. REAREQ), the SIRF application will automatically transmit a CILREQ request to the 3790.

    e.g. CILREQ 1

6b. DUMPREQ

This command specifies that FP abend dump processing is to occur. The program will retrieve all the FP abend dumps from the 3790 which has been acquired. The FP abend dump data will be formatted and printed on the system printer. This type of data will not be displayed since it is bulk in nature. Therefore the output and copy options are ignored for this command. Note, as the FP abend dumps are transmitted from the 3790, the 3790 deletes these dumps from its dump data set.

e.g. DUMPREQ

6c. REAREQ

Qhis command specifies that the REA log is to be retrieved from the 3790. The 3790 will trasnmit the REA log to SIRF application. The data will be formatted by SIRF and sent to the active output device(s). This data consists of a header containing : the 3790 machine serial number, the factory order number, and the EC number of the 3790. This header is followed by a list of REA numbers and dates.

e.g. REAREQ

6d. INSTALLREQ

This command specifies that the configuration data stored in the 3790 controller is to be retrieved from the 3790. The 3790 will transmit the configuration data stored in the controller to the SIRF application. The data will be formatted by the application and sent to the active output device(s). This data consists of a header containing : 3790 machine serial number, factory order number, and the EC number. This header is followed by a list consisting of : feature, specify, or RPQ number; bill of material number ; quantity ; and comments.

e.g. INSTALLREQ

6e. HOSTWRAP NNN BUFNAME XXX (BUFNAME2 YYY)

This command specifies that a host initiated wrap test is to be run. The test will be run to the type 1 batch LU in the 3790 specified by the ACQ3790 command. The data to be wrapped can be user defined or the defaults supplied by the application. The data buffers are specified by BUFNAME1 and BUFNAME2. Each data buffer must be 256 bytes or less in length. The default data buffers are : SIRFX, SIRFY, and SIRFZ. SIRFX contains 256 bytes of all 00. SIRFY contains 256 bytes of FF. SIRFZ contains 256 bytes of 00-FF. If user defined buffers are used, they must be assembled and link edited prior to issuing the hostwrap command. The application will load these user defined buffers from SYS1.LINKLIB in OS systems or from the core image library in DOS systems using the names specified by BUFNAME1 and BUFNAME2. The application builds either one or two variable length RU's from the data buffer(s) to send to the 3790. If BUFNAME2 is omitted, only one RU will be sent. The length of RU one is specified by XXX where XXX can be 1-256. The length of RU two is specified by YYY where YYY can be 1-256. If XXX or YYY is smaller than the actual size of buffer BUFNAME1 or BUFNAME2, the appropriate buffer RU will be

truncated to size XXX or YYY. If XXX or YYY is larger than the actual size of buffer BUFNAME1 or BUFNAME2, the appropriate buffer RU will be padded on the end with hexadecimal zeros. The value NNN indicates how many times the 3790 should send the RU(s) back to the host application repeated as elements of a single chain. For example, if NNN is 10 and two data buffers have been specified, the 3790 will send a chain of 20 RU's to the host application. The chain will consist of repeated RU one and RU two data elements of length XXX and YYY. Valid values for NNN are 0-255. If 0 is specified, the application will request repeated 255 element chains of data from the 3790. This provides an 'infinite wrap capability'. however, if zero is specified for NNN you should insure that the VTAM buffers are capable of handling the amount of data to be received. To terminate this 'infinite wrap test' , issue a :
V INACT.I,ID=3790 LUNAME (VTAM command) from the TP operator's console. To continue to process other application commands, remember to reactivate the 3790 LU and issue another ACQ3790 command. In offline mode the infinite wrap should be run as the only command in the job since the deactivation of the LU will cause all subsequent commands to fail. The operands are positional for this command. The parentheses are shown to indicate that BUFNAME2 YYY is optional. The parentheses should not be specified by the user.

e.g. HOSTWRAP 255 SIRFY 256 SIRFZ 255

6f - Printed RSN (RNB1) (RNB2)

This command specifies that a print block is to be retrieved from the 3790. RSN is the record sequence number of the record which contains the block(s) being requested. RBN1 is the relative block number of the block being requested. If RBN1 is higher than the largest block number at the 3790, the 3790 will return the highest relative block. In offline mode, or if 3277 is not used for output, a range of blocks can be specified by RBN1 and RBN2. The block(s) retrieved will be written with a descriptive header including the type of data (print, transaction, or operator message), the record number, the block number, and the following descriptive flags :

```
LAST:Y - indicates the block is the last block of the
         record
LAST:N - indicates the block is not the last block
CNCL:Y - The cancel flag is ON
CNCL:N - The cancel flag is OFF
PKPT:Y - The record was packed if it is a transaction
         record
         The record was printed if it is a print record
PKPT:N - the record was not packed or printed
SAVE:Y - The save flag is ON
SAVE:N - The save flag is OFF
HOLD:Y - The hold flag is ON
HOLD:N - The hold flag is OFF
```

The flags are followed by two lines of 32 EBCDIC data bytes, preceded by offsets. The EBCDIC is followed by four lines of the same data in hexadecimal, preceded by offsets. Since a 256 byte block spans four display screens, the application provides a page ahead function via the '+' or 'enter' keys.

A page back function is supported via the '-' key. Refer to message SIRF43A for a detailed description of these paging functions. To complete the command process in online mode, depress the 'clear' key. In offline mode, or if the 3277 is not used for output, the application will retrieve and print the blocks in the range specified by RBN1 and RBN2. If either the RBN1 or RBN2 value exceeds the value of the last block at the 3790, the 3790 will return the last block in the record specified. If RBN1 if greater than RBN2, the application will output the blocks in descending numerical order. If RBN2 is greater than RBN1, the application will output the blocks in ascending numerical order. If only the RSN value is specified, the application will retrieve the last clock from the record requested. The operands are positional for this command. The parentheses are shown to indicate that RBN1 and RBN2 are optional. The parentheses should not be specified by the user.

e.g. PRINTREQ 30 I O

6g - TRANSREQ RSN (RBN1) (RBN2)

This command specifies that a transaction block is to be retrieved from the 3790. The command is processed as described in the PRINTREQ command. The operands are positional for this command. The parentheses are shown to indicate that RBN1 and RBN2 are optional. The parentheses should not be specified by the user.

e.g. TRANSREQ 40

6h - MSGREQ OP (RBN1) (RBN2)

This command specifies that an operator message block is to be retrieved. OP is the number of the operator. The command is processed as described in the PRINTREQ command. The operands are positional for this command. The parentheses are shown to indicate that RBN1 and RBN2 are optional. The parentheses should not be specified by the user.

e.g. MSGREQ 18

7 - PA1

If this key is depressed on the 3277, the program will copy the data on the screen to the valid copy devices. If valid copy devices do not exist, an error message (SIRF21E) will be displayed. This key is only active for 3790 data, and does not support the copy of the optional menu.

8 - CLEAR

If this key is depressed on the 3277, the current operation (e.g. display of all data) will be cancelled immediately. The next input command can be entered when the option menu appears.

<u>Miscellaneous operations</u>

While displaying data, the depression of the PA2, enter, or PF keys on the 3277 will result in the display of the next portion of the data retrieved. For example, to page to the next CIL record, the PA2 or enter keys can be depressed.

NOTE : commands 1, 5, 6a, 6b, 6c, 6d, 6e, 6f, 6g and 6h are the only valid input commands for offline mode. The card format of these commands are indentical to the 3277 online format. The program does not depend on the data being in any specific column. However, commands should be entered in columns 1-72. Comments may not be included. The sequence field columns 73-80 are ignored. A command must be contained completely on one card. Continuation cards are not supported.

The system printer output (Log) will contain a page header for each page of output. This header will contain a page number as well as a time and date stamp. The header has the following format :

SIRF191 - HARDCOPY OUTPUT DATE-XX/XX/XX TIME-XX:XX:XX PAGE XXXXX (for DOS)

SIRF191 - HARDCOPY OUTPUT DATE-YY.DDD TIME-XX:XX:XX PAGE XXXXX (for OS)

The actual data, either copied or logged will be printed following this header. FP abend dump data will be printed sequentially, with each dump separated by a page eject. Please refer to chapter 8 for examples of SIRF output. When an error message or the completion message SIRF23A is displayed, the enter key should be depressed to continue program operation. The operator will then be prompted with a display of the option menu.

The 3790 initiated wrap test, SIRFW is started as a separate routine. It will open the ACB with the name specified on the JOB (DOS) or EXEC (OS) card of the JCL. To communicate with the IBM supplied 3790 FP, this name must be HOSTPGM1. Therefore, this name must be a valid, active name in the VTAMLST. The application will wait for Logon requests from the 3790 LU's. Each data message received by the application will be returned to the sending LU. Multiple wraps from many 3790 LU's may be run simultaneously. All data validity checking is done at the 3790. Once the wrap tests have been completed, reply STOPWRAP to the prompt message SIRFW001 at the system console. This will end the application.

3791 CONDITION INCIDENT LOG (CIL)

Purpose :

Provides a means of preserving a history of selected system events occuring in the 3790 system at a result of certain detectable conditions. It also provides the capability of displaying the data associated with these incidents.

General description

The Condition Incident Log resides on the Disk storage File (LA=21). It can be used as a key 3790 tool solid and intermittent hardware failures and, to some extent, system failures.

The Condition Incident Log can contain records of the following types :

Type 1 records for 3790 system equipment failures requiring a fixed format

Type 2 records, for 3790 system control logic failures

Type 3 records, for 3790 system equipment errors requiring a variable format

Type 4 records, for incidents that are not failures in the 3790 system (such as the setting of the system's date). Type 4 records are also associated with 3790 system failures (equipment and control logic) that cause abnormal termination of the system's operation or a 3792's operation.

Recoverable and unrecoverable errors are recorded in the Condition Incident Log. Records are entered sequentially in the Condition Incident Log, and each record is assigned a sequence number (from 1-4095). Before the log is full, the record with the highest number - that is the newest record - is listed first. After it becomes full, the oldest records are replaced with new incident records. Therefore, the record with the highest number is no longer the newest record after the log is filled. Prior to replacing any old incident records, the message A000 - CONDITION INCIDENT LOG FULL - is stored to alert the control operator at the 3791 that the log is full and should be listed so that no incident records are lost.

Unless all records in the log are to be listed, the normal procedure is using the CIL Retrieval Facility is to use one or both of the set options (range and incident type described below) to define the criteria to be used when selecting which incident records are to be listed.

Whenever incidents are presented on the 3277, a STOP is issued so that the operator can set the record and acknowledge the stop before the next record is listed.

Condition/Incident Log retrieval

Description of Facility :

* Is provided to search, display and print the contents of the Condition/Incident log

* Is used only when the 3791 is online.

Some of the Search Options are :

* Search by Incident Type (1, 2, 3 or 4)
* Search by PA (physical address)
* Search by LA (Logical Address)
* Search by sequence range

The log output is always in reverse chronological order. The most recent records for the range selected are output first.

Option fields

The CIL Retrieval facility prompts the user to enter Field Entries. The Field Entries are :

* Field 9 - End SYSLERR
* Field 5 - Determines the PA (Physical Address) to be scanned Type 1 or Type 2 records.
* Field 3 - Determines if all log records, a range of Log records, or a single Log record is to be scanned.
* Field 2 - Determines what type of record (Adapter/Device failure, Machine check failure, or System Events) is to be searched for in the record(s) specified by Field 3.
* Field 1 - Determines how the desired records are to be output.

For CIL examples, refer to CIL record types shown earlier in this section, or refer to RAMAP SY27-2477.

Option Fields	Response	Action
1	SCAN	
	1	List the most recent incident record (on your terminal) that matches the last set incident types and last set range. If neither type nor range has been set, the latest entry is listed. Entering this option again causes the next-to-last entry that matches the set range and incident type to be listed, and so on.
	11	List all incident records (on your terminal) that match the last set incident type and last set range. (All incidents are listed if neither range nor type has been specified).
		WARNING - VTAM Buffer size must be large enough to handle the CIL data you have requested, otherwise, VTAM may abend.
	13	Present count of all incidents at your terminal that match the last set type and range. (The count of all incidents is presented when neither range nor type has been specified.
2	SET INCIDENT TYPE	
	2	Set incident type to all incidents.
	21	Set incident type to all equipment failures. (Type 1 errors).
	21nn	Set incident type only to incidents recorded for device with logical address nn.
	22	Set incident type only to machine check (Control Logic) incidents. (Type 2 errors).
	22nn	Set incident type to machine check incidents for device with logical address nn.
	23	Set incident type to equipment failures requiring variable -- format record (Type 3 errors).
	23nn	Set incident type to equipment failures requiring variable -- format record for device with logical address nn.
	24	Set incident type only to system incidents. (Type 4 errors).
	24nn	Set incident type to specific system incidents where nn is a system condition (SYS-COND) code .

3	SET RANGE	
	3	Set range to all sequence numbers.
	3nnnn	Set range to specific sequence number nnnn.
	3xxxxyyyy	Set range values so that records from xxxx to yyyy are scanned, where: xxxx is the most recent record number with which to start. Enter the number as four digits, using leading 0's if needed. yyyy is the oldest record number with which to end. Enter the number as four digits, using leading 0's if needed. Example : to have records 0600 to 0300 scanned, enter 306000300.
	3yyyyxxxx	Set range values so that all records except those between yyyy and xxx are scanned, where : yyyy is the oldest record number with which to start. Enter the number as four digits, using leading 0's if needed. xxxx is the most recent record with which to end. Enter the number as four digits, using leading 0's if needed. Example : to have all records scanned except 0600 to 0300, enter 303000600.
5	SET PA AND INCIDENT TYPE	Where : PA = Physical address T = Record type = 1 - Adapter/Device failures = 2 - Machine check failures
	5pa(t)	* If the T number is not entered, all Type 1 and Type 2 records are output for the selected PA.
9	END SYSLERR	
	9	End SYSLERR

Glossary of SIRF commands - Quick reference

ACQ3277 LUNAME (480) (LU3790)	Acquire a 3277
ACQ3284 LUNAME (LU3790)	Acquire a 3284
ACQ3790 LUNAME	Acquire a 3790
CILREQ DATA	Retrieve CIL data
COPY 3284 LOG	Set up copy device
DUMPREQ	Retrieve/format FP dumps
HOSTWRAP NNN BUFNAME1 XXX (BUFNAME2 YYY)	Host initiated wrap test
INSTALLREQ	Retrieve configuration data
LOGOFF	End SIRF
MSGREQ OP (RBN1) (RBN2)	Retrieve message block
OUTPUT 3277 3284 LOG	Set up output device(s)
PRINTREQ RSN (RBN1) (RBN2)	Retrieve print block
REAREQ	Retrieve the REA log
TRANSREQ RSN (RBN1) (RBN2)	Retrieve transaction blocks

3277 keys - general

CLEAR	Cancel the request
ENTER	Continue
PA1	Copy and continue
PA2	Continue
PF1-PF12	Continue

3277 keys - MSGREQ, PRINTREQ, TRANSREQ

B	Back one block
F	Forward to next block
+	Forward one page
-	Back one page
PA1	Copy (no page ahead)
CLEAR	End the request
Any other key	Same as +

SECTION 22: 3271/5 DIAGNOSTICS

DESCRIPTION

The maintenance Package for the 3271/5 system consists of :

1. Problem Determination Procedures
2. Maintenance Analysis Procedures
3. Offline Test
4. Online Test

1. Problem Determination Procedures

The customer is supplied with an Operator Guide, GA27-2750 containing PRP's. These charts will enable the customer to perform Problem Determination.

2. Maintenance Analysis Procedures

MAP's are used by the CE to analyse problems with the 3271/5 system and these are located with the machine.

3. Offline Tests

Off-line testing is provided through the use of the following :

A) Switch Indicator (SIU): Four hexadecimal LED indicators and a 16 bit block checker has been added to the SIU. The modified SIU is compatible with the existing 3270 BSC CU maintenance procedures.

B) Pre-recorded cassette tape: One common pre-recorded tape will be available for both 3270 SDLC CU machine types. Diagnostic Read and Write commands have been added to the tape routines for additional fault isolation.

C) Cassette Record Adapter Unit (CRAU): The CRAU provides the capability of operating pre-recorded tapes.

D) SDLC Test Tape Procedure : When the original version of the SIU was used with 3270 BSC CU's, many bit switch manipulations were required to exercise the control units. The SDLC Test Tape procedure does not require manual bit switch operation ; thus reducing the possibility of switch operation errors. The following is a brief description of the SDLC test tape procedures :

1. Test tape routine exercises the 3270 SDLC CU
2. The SIU block checks the transmitted 3270 SDLC CU response.
3. The Tape Routine Completion Code (TRCC) is indicated in the SIU Hexadecimal LEDS. This TRCC value is used along with the MLTG to determine the Failing Tape Routine.

4. The repeatable tape routines are used for logic probing and with the SIU indicators, help in isolating the faulty card.

4. Online Tests

A. 3270 SNA (R3270D) : The OLT programs and patterns can be invoked from the host CPU or via a test request message from a remote keyboard. The OLTs operate concurrently with the customer program. Card calling fault locating tests (FLT) have been removed from the OLTs and inserted in the off-line maintenance procedures (see section 13).

B. API Echo (T3700SNA) : Test data in the form of characters or patterns are entered via the remote keyboard. The operator (customer or CE) specifies the number of times the test data will be repeated. The host system sends the test data to the remote display or printer specified, the number of times as indicated in the Echo Test message. The Echo Test is invoked from any remote keyboard and requires the dedication of the remote control unit under test (see section 13).

C. SDLC Link Test (T3700LTE) : The SDLC Link Test is provided for installation verification and for definition and isolation of link problems. The link test is invokable from the host CPU (See section 14).

SECTION 23: 3274/6/8 DIAGNOSTICS

DESCRIPTION

The maintenance package for the 3274/6/8 consists of :

1) Problem determination procedures
2) Maintenance Analysis Procedures (MAP's)
3) Display station tests (3276/8)
4) Subsystem tests (3274)
5) Subsystem error logs and test (3274)
6) Subsystem tests and logs (3276)
7) Control unit to station tests (3276)
8) 3277 path test

1 - PROBLEM DETERMINATION PROCEDURES (PDP)

The customer is supplied with PDP guides and these are located with the machine in local language.

2 - MAINTENANCE ANALYSIS PROCEDURES (MAP)

MAP's are used by the CE to analyse problems within the subsystem, these are located with the machine, 3274 SY27-2511, 3276 SY18-2004, 3278 SY27-2510.

3 - DISPLAY STATION TEST (3276/8)

Set the Normal/test switch to test

Test Mode 1 - Pattern display (loaded automatically)

Fills display with pattern shown in MLM. Compare the test pattern lines shown in the MLM with the corresponding lines on the screen. Verify that the characters are in correct sequence.
This is a test of the character generator (01 A/A1G2), storage (01A/A1F2) and control (01A/A1G2). Character generator failure causes wrong or defective characters to be displayed at any point or points on the screen, and control failure affects all characters.

Test Mode 2 - Key to CRT test

Characters keyed in replace characters displayed in Test Mode 1, beginning at top left of display. This is a test of keyboard scan codes.

Test Mode 3 - Test logic area

Provides two paths from keyboard to logic :
logic area test path and data path.
Press reset to enter test, then press :

C key - rewrites test 1, initial power-on status is loaded into status register

B key - 2 appears in first position of operator information area (correct response for power-on status). Press B two more times to clear status.

J key - A character dependent upon the display model and keyboard type appears in the first position of the operator information area (see below)

Keyboard Types	Character			
	Models 1,11	2,12	3,13	4.14
Typewriter-like	Š	Ć	Ś	Ł
Data Entry with Numeric Lock	s	u	m	;̄
Data Entry without Numeric Lock	A	B	◗	?
Data Entry, Keypunch-Like, with Numeric Lock	c	e	g	o
Data Entry, Keypunch-Like, without Numeric Lock	š	ć	ś	χ

N Key - A character dependent upon security key and monocase switches appears in first position of operator information area (see below).

Security Keylock	Monocase Switch : A	A,a
No Security keylock	0	A
Security Keylock ON (vertical position)	&	Q
Security keylock OFF	1	B

D Key - First position of operator area is loaded with character (same, but lower case) that is at cursor position when D is pressed. Cursor then advances one character position.

V Key - Same as D key except upper case character.

F Key - First position of operator information area is loaded with a character from 0 to 7 (representing the one of eight 256-character blocks in which the cursor is positioned).

M Key - Characters keyed in replace characters displayed in Test Mode 1.

U Key - Cursor move with each key depression, but stays within a 256-character position area.
(If cursor is within unchanged Test Mode 1 pattern, it will move under same character as on key that is pressed (except for uppercase characters on keyboard top row).

E Key - Cursor moves with each key depression-off screen, with most keys. Shortest move is made with 1 key (which moves cursor within same line, or to next).

K Key - Press one of the following keys according to the function desired :

,	Reverse and blink cursor,
C	Reverse cursor
B	Blink cursor,
A	Normal cursor,
F	Inhibit cursor,
Z	Inhibit display,

O Key - Insert attribute followed by :

Press 1 - All characters on screen display high intensity
Press Q - All normal intensity from cursor to end of display.

For a complete description and set routines, refer to Display tests in MIM 3276 SY18-2004 and 3278 SY27-2510.

4 - 3274 SUBSYSTEM TESTS (OFFLINE TEST)

Subsystem tests consists of the Bus and Lamp Test, and the IML Tests. External tests consists of OLTs for the Model 1C.

Initial Machine Load (IML) Tests

Initiating a Normal IML (ALT switch not depressed and System diskette installed) invokes a sequence of hardware prior to operational code being loaded. When the IML pushbutton is depressed, a hardware Bus and Lamp test is performed. When the IML pushbutton is released, the diagnostic sequence begins.

IML Tests

Note : At least one complete IML test sequence is required to initialize Control Storage. Bypassing IML by using either ALT 1 or ALT 2 mode does not perform this initialization function, therefore it is possible that bad parity may exist after initial power on if NORMAL IML has been bypassed.

ALT1 IML Mode

Depressing the IML pushbutton while holding the ALT switch in the ALT 1 position bypasses the Normal IML test sequences and causes the unit code to be directly loaded. This will enable the user to bypass a test sequence known to be failing (for example, the Type B adapter) that does not prevent use of the rest of the control unit. (Unit code will load and the Type A devices are available for use). The Bus and Lamp Test functions the same as during a normal IML. See below for an ALT 1 IML sequence.

Step	Code	Meaning
1. ALT1 & IML Depressed	1111	Bus & Lamp Test OK
2. ALT1 & IML Released	0000	Initiate Unit Code loading
3. Wait	1111	Unit Code loading has completed
4. Begin normal Operation	0000	Unit code execution begins

A hang condition at either step 3 or step 4 usually indicates a defective system diskette or a configuration error.

ALT 2 IML Mode - Mode IC with wrapable modem (Test/Operate switch in operate position).

Depressing the IML pushbutton while holding the ALT switch in the ALT 2 position invokes an extended modem wrap test. Some types of modems require manual intervention to set up for wrap testing. The test checks the transmission path (transmit and receive data lines) to and from the modem. Modem clocking is required to sucessfully run this test and a missing or defective modem clock will result in a failure indication. (Flashing 0111). The intent of this test not to test the modem. The Bus and Lamp test functions the same as during a normal IML. See below for this ALT 2 sequence :

Step	Code	Meaning
1. ALT2 & IML Depressed	1111	Bus & Lamp Test OK
2. ALT2 & IML Released	0000	Begin Modem Wrap Test
3. Wait	0111	Pre-wrap, adapter wrap, & modem wrap tests are running
4. End Test - A Normal IML required to begin normal operation	1000	Successful test - Carrier not present after test completed.
	1111	Successful test - Carrier is present after test completed.
	0111	FLASHING - Modem wrap test has failed.

When running this test in ALT 2 mode, the 3278 does not display the 8 4 2 1 indications.

ALT 2 Mode - Model 1C without wrapable modem (Test/Operate switch in the test position)

Depressing the IML pushbutton while holding the ALT switch in the ALT 2 positin invokes an extended modem wrap test. When a non wrappable modem is being used the EIA test cable Test/Operate switch should be in the TEST position. This test checks the transmission path (Transmit and Receive Data lines) to and from the Test/Operate switch at the end of the cable. The test cable must be attached to the and the modem must provide clocking or a failure indication of 0111 (Flashing) will result. The Bus and lamp Test functions the same as during a normal IML. See below for this ALT 2 sequence.

Step	Code	Meaning
1. ALT 2 & IML Pressed	1111	Bus & Lamp Test OK
2. ALT 2 & IML Released	0000	Begin Modem Wrap Test
3. Wait	0111	Pre-wrap, Adapter wrap, & Modem wrap tests are running.
4. End Test	0111 1000	FLASHING - Modem wrap test has failed Successful test
5. Return TEST/ OPERATE Switch to the Operate position	1000 1111	Carrier not present. Carrier is present

A normal IML is required to begin normal operation. When running this test in ALT 2 mode, there is no 3278 display of failing indications (0111 013, etc.)

3274 Monitoring of EIA Interface Lines (Model 1C)
The 8421 Indicators can be used as CE indicators during troubleshooting to monitor certain communications lines. Any one lines. Anyone of the EIA interface lines listed below may be monitored by using an SLT jumper wire to connect that line to one of the 8421 Indicator lines. Using this technique enables the CE to monitor a maximum of four lines at any one time.

CAUTION : Do not IML with any of these jumpers installed and Do not jumper any line not listed.

8421 Indicators

Ind 1 on AS12S12
Ind 2 on A1S2U13
Ind 4 on A1S2U05
Ind 8 on A1SU06

EIA Interface Lines

Carrier Detect	A1Q2S04
Req to send	A1Q2S10
Clr to send	A1Q2S12
Data Set Rdy	A1Q2S13
Transmit Data	A1Q2U04
Receive Clock	A1Q2U10
Transmit Clock	A1QU11
Data Trmnl Rdy	A1QU12
Receive Data	A1QU13

Note : Operational code also uses these indicators. They may not be available due to an error condition being displayed.

5 - 3274 SUBSYSTEM ERROR LOGS AND TEST FORMATS (O NLINE TEST)

There are six basic formats for entry into the subsystem lc and test facility. This concurrent test facility provides path tests between the control unit and attached devices, device error statistics, device adapter error statistics, host adapter error logs and statistics, configuration and EC data, display of the status of all configured devices, reset capability of statistical error counters, register display, and device control block displays for all configured devices. The use of the ALT key and the TEST key is necessary to enter TEST MODE. The concurrent test facility is available only after entering TEST MODE.

Test 0 - Communication path test and 3278 display test.

Test 0 will perform the following functions :

* Transmit a test pattern from the control unit to the display from which you requested Test 0.

* Transmit a test pattern from the control unit to another 3278 as specified by you when you entered the Test 0 format message.

* Functionally test the following using the test pattern transmitted by the control unit to the 3278 display specified by you : 1) High intensity function, 2) Non display function, 3) Various key functions, 4) Selector pen function, 5) MSR function, and the 6) Audible alarm function

A request for Test 0 will be executed to any Type A display (3278) except under the following conditions :

* If the device requested is in a SNA session, the test pattern function is not performed. Do not enter minus function indications is returned.

* If the device has the Wait indicator on and is attached to a model 1B or is busy executing a command that requires asynchronous ending status (Op complete), Do Not Enter minus function indication is returned.

This test, if requested for a Type B display (3277) or typε A or B printer, only checks the continuity of the coax communication path. Success or failure of this test is displayed on the requesting 3278 display as follows :

* The test message you entered followed by a : +, -, or 0.
  + = Test successful or path OK.
  - = Test failed, device disabled due to error
  0 = Test not run, device powered off

Test 1 - Display error statistics

Test 1 is a variety or device and adapter error log and statistical counter information that can be displayed on any working 3278 while that 3278 is in TEST MODE. By using a two digit prefix to the entry SLASH (/)1, specific device log or adapter log information can be retrieved. The formats for entering a Test 1 request are as follows :

* 00 to 31/1 - Displays log of any device from 00 to 31.

* A0/1 - Displays five (5) Hopst adapter/attachment log formats : CCA BSC, CCA SDLC, HPCA, LCA attachment and LHA attachment. Only the format for the Host adapter installed in your machine is displayed in response to this request.

* A1/1 - Displays log of the Type A adapters.

* A2/1 - Displays log of the Type B adapters.

* A3/1 - Displays log of the configured terminal and summary counters.

The error information contained in the above logs is resident in the 3274 storage. The general fomat of all logs reflect two things; 1) The most recent error event information, 2) Statistical counters reflecting the type of errors occuring. The event log may be a combination of significant information that will differ in content from adapter to adapter as well as format. The statistical counters record errors using hexadecimal values. The maximum value for any counter is hex 'ff.

Test 2 - Display configuration Information.

Test 2 displays the configuration table residing on the system diskette. The configuration table data is the result of the user customizing the feature diskette and writing the configuration data from storage to the system diskette. Test 2 is displayed by entering TEST MODE using the ALT, and TEST keys and then keying in SLASH (/), two (2), enter.

Test 3 - Display the status of all configured terminals and display the control unit summary counters. Test 3 is invoked after using the ALT and TEST keys to enter TEST MODE. An entry of /3 from any functioning 3278 display and then an ENTER, will display the following format on the screen : (the actual format may vary depending on how many devices have been configured)

* Line 1 - 01234567890123456 7890
* Line 2 - 1111111111111111 110-

* Line 3 - 0000 0000 0000 0000 0000

Line 1 displays all of the Type A devices starting from the leftmost position. The digits correspond to the low order digit of the coax port address. Therefore port A0 = position number 0 and port A16 = position number 16 (the second 6 from the left); The type B devices are separated from the Type A devices by a space. Therefore port B0 = position number 17 (device 17) in the log and port B03 = position number 20 (device 20).

Line 2 displays the status, 1 = on, 0 = off, and - = disabled, of each configured device.

Line 3 displays statistical counter information in summary form of control unit detected machine checks, program checks , communication checks, program checks and SDLC test commands. The values are displayed in hexadecimal. The counters are two byte counters numbered from left to right starting at counter number 01. See example below fc counter meanings :

Counter	Meaning
0102	Summary of all machine checks
0304	Summary of all communications checks
0506	Summary of all program checks
0708	SDLC test commands received
0910	SDLC test commands sent

(Maximum counter values are FFFF)

<u>Test 4 -</u> Reset any test 1 Log

Test 4 provides the capability of reseting any device adapter, device, host adapter, or control logig log. By using the ALT and TEST keys you may enter TEST MODE. Test 4 may now be used as shown below :

* 00 to 31/4 - resets the device log for the device specified to all zeros (0)

* A0/4 - Resets the Host adapter log to all zeros (0)

* A1/4 - Resets tge Type B adapter log to all zeros (0)

* A2/4 - Resets the Type B adapter log to all zeros (0)

* A3/4 - Resets the control logic log to its initial values.

Test 4 may be used if it is desired to track intermittent failures without re-IML or powering off the machine to clea- the error logs.

<u>Test 6 -</u> Device control block display.

he device control block (DCB) contains common subsystem information pertaining to all terminals ; contains device and host adapter information, and also contains limited device feature information. The test 6 display represents the most current information regarding a specific device. The DCB should be checked when it is necessary to determin specific device parameters such as : 1) Is the device configured as a display or printer ? 2) Is the display screen size correctly specified ? 3) Is a MDT bit set ? 4) The status of keyboard for this device, etc.

To invoke test 6 you must first enter TEST MODE by using the ALT and TEST key. The DCB for any device from 00 to 31 may be displayed by keying the device number followed by a slash (/), the number 6, followed by an ENTER key. Each DCB consists of four displays of 64 bytes each. The individual bytes are not labeled. There are six lines to each display. The first line is always returned the same as input 00-31/6 for each display. The second line of each display will indicate the beginning byte ID of that display. See the Test 6 Byte ID Chart for details. You may page from one display to the next by depressing the ENTER key. Paging beyond display 0C will result in a locked keyboard and X-f displayed on the status line.

Refer to the DCB Bit definition chart for DCB interpretation.

6 - 3276 SUBSYSTEM TESTS (OFFLINE TEST)

Test C0

Basic Assurance Test (BAT), basic tool for checking functional integrity of 3276.

Test C1

Common Register Display, displays contents of common register in system logic card.

Test C2

Register /R/WS Display, displays contents of registers and R/WS - except for line buffer.

Test C3

CCA/Modem Wrap Test Loop, performs wrap test on CCA and modem

Test C4

Register /R/WS (3 second wait, loop), after writing data in all registers and R/WS. This test then waits 3 seconds, then reads data to check that is was retained.

Test C5

Modem Transmit level adjustment, permits adjustment of modem transmit-level through continuous transmission to communication facility.

Test C6

ROS Chip Part Number Read out, displays ROSS chip part numbers (reach module has two part numbers, one for each chip

Test C9

Test Exit, executes four BAT routines (register, R/WS, TA and 3276 display link test) before passing control to POR routine

Activating tests

Hold Test Subsystem, and depress test number desired.

7 - 3276 CONTROL UNIT IS STATION TESTS (ONLINE TE ST)

The above test performs the following function :

Test 0 - Device functional test

Routine 1 ; TA test, checks basic functions - register, serdes, command decoder, etc.

Routine 2 ; Link test, checks link by issuing reset and receiving a POR response

Routine 3 ; Interactive test, permits operator testing of selector pen and keyboard functions, display test pattern and sound audible alarm.

Test 1 - Error log display

Displays the terminal and common error logs.

Test 3 - Display status summary 'xxxxxxxx'

1 = Power on, 0 = Power off or no TA

Test 4 - Error log erase

This test resets all error logs

Test 5 - Register /R/WS display

Displays contents of register and R/WS - except for line buffer.

Activating tests

Press an hold Alt ; strike Test Req and then release Alt.

```
Key in : /
Press :  Enter
Key in : AA/     (where AA is TA address
Press    Enter    of display to be tested)

Key in : B/       (Where B is number of test
Pr Ess : Enter     to be run, e.g. number 1
                   of test L1)
```

8 - 3277 PATH TEST/TEST REQUEST KEY

SNA attached.

On 3277's attached to a SNA configured 3274, the coax path from the device to the Control Unit can be verified by the use of the Test Request key twice. The first depression of the key will cause the Control Unit to attempt to turn off the Do Not Enter indicator. The second depression of the Test Request key will cause the Control Unit to attempt to turn on the System Available indicator. Operationally, this sequence is used to enter and exit two key sequence mode. Test Request followed by Clear is functionally equivalent to the Systems Request key on 3278's in SNA mode. Test Reques followed by PA1 is the equivalent in function to the ATTN key on 3278's in SNA mode. Test Request followed by Rest Request returns the 3277 to normal operation.

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