

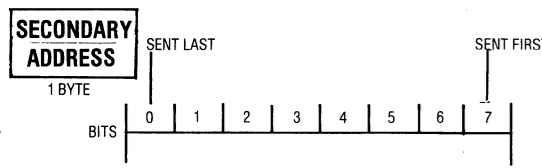
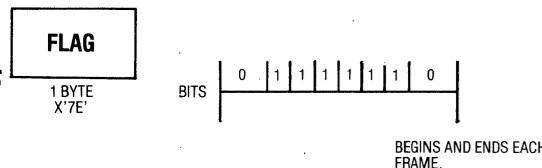
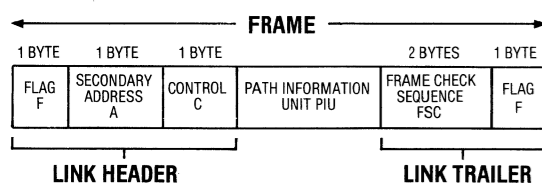
SDLC

SYNCHRONOUS DATA LINK CONTROL

QUESTRONICS INC.

Monitors for Data Processing
3565 South West Temple
Salt Lake City, Utah 84115
(801) 262-9923
TWX: 910-925-4000

Copyright © 1981 By Questronics, Inc.



THE SECONDARY ADDRESS IS USED IN BOTH RECEIVING FROM AND TRANSMITTING TO THE PRIMARY STATION.

CONTROL TABLE

FORMAT (NOTE 1)	SENT LAST	SENT FIRST	ACRONYM	COMMAND	RESPONSE	FIELD PROHIBITED	RESETS Nr AND NS THROUGH Nr-1	CONFIRMS FRAMS THROUGH Nr-1	DEFINING CHARACTERISTICS
NS	000 P/F 0011	0011	NSI	X	X				Command or response that requires nonsequenced information
	000 F 0111	0111	ROI		X	X			Initialization needed; expect SIM
	000 P 0111	0111	SIM	X			X		Set initialization mode; the using system prescribes the procedures.
	100 P 0011	0011	SNRM	X	X	X			Set normal response mode; on command
Non-sequenced	000 F 1111	1111	ROL	X	X	X			This station is offline.
	010 P 0011	0011	DISC	X	X	X			Do not transmit or receive information
	011 F 0011	0011	NSA	X	X	X			Acknowledge NS commands
	100 F 0111	0111	CMDR		X				Non-valid command received; Must receive SNRM, DISC, or SIM
	101 P/F 1111	1111	XID	X	X				System identification in I field
	001 P/F 0011	0011	NSP	X	X	X			Response optional if no P-bit
	111 P/F 0011	0011	TEST	X	X				Check pattern in I field.
S	Nr P/F 0001	RR	X	X	X		X		Ready to receive
Supervisory	Nr P/F 0101	RNR	X	X	X		X		Not ready to receive
	Nr P/F 1001	REJ	X	X	X		X		Transmit or retransmit, starting with frame Nr
I Information	Nr P/F Ns 01		X	X			X		Sequenced I-frame

C

P

PATH INFORMATION UNIT
Variable Length.
SEE REVERSE SIDE OF CARD FOR SNA INFORMATION.

F

FRAME CHECK SEQUENCE
The SDLC implementation of cyclic redundancy checking utilizes a generator polynomial (division) = $x^{16} + x^{12} + x^5 + 1$.
The result of a transmission correctly received including the FCS bytes is a constant:
2 BYTES (X0 through X15) 1111000010111000

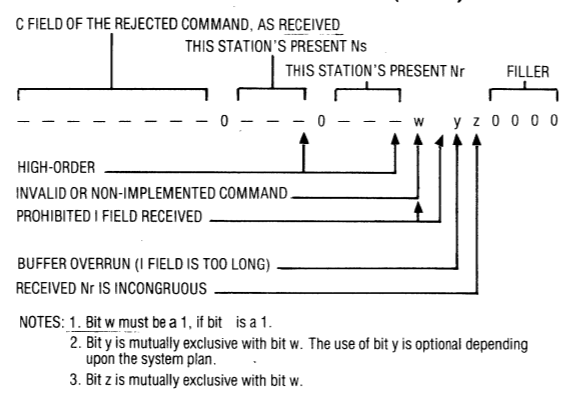
F

FLAG
1 BYTE
The flag in the link trailer may act as the link header flag in back to back transmissions.

ZERO INSERTION: All frames begin and end with a flag (F) and must contain only non-F bit patterns. In order to not restrict the frame contents, the SDLC procedure requires that a binary 0 must be inserted after any five contiguous 1's within the frame. Therefore the pattern 0111110 (F) is never transmitted by chance.

SIGNALING MODES: Both non-return-to-zero (NRZ) synchronous transmission and zero-complementing non-return-to-zero-inverted (NRZI) transmissions are used with SDLC. NRZI transmissions may or may not also use data clocking.

COMMAND REJECT RESPONSE (CMDR)



HIGH-ORDER
INVALID OR NON-IMPLEMENTED COMMAND
PROHIBITED I FIELD RECEIVED
BUFFER OVERRUN (I FIELD IS TOO LONG)
RECEIVED Nr IS INCONGRUOUS

NOTES: 1. Bit w must be a 1, if bit y is a 1.
2. Bit y is mutually exclusive with bit w. The use of bit y is optional depending upon the system plan.
3. Bit z is mutually exclusive with bit w.

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. The 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. This I field provides the secondary station status data that the primary station needs to select appropriate recovery action.

EXCHANGE STATION IDENTIFICATION (XID)

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 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.)

3274, 3276 XID

The XID command and response contains additional data beyond the C byte. The 3274 or 3276 responds to the XID command in NRM or NDM, except when an FRMR condition exists, in which case the FRMR response takes precedence over XID. The request/response unit (RU) of the XID response consists of 48 bits, defined as follows:

BITS	M	MORY
0 - 3		ID format B'0000'
4 - 7		PU type B'0010'
8 - 15		Self description X'00'
16 - 27		X'017' (3274) and X'019' (3276)
28 - 47		Terminal ID

3770 XID

Function Level	(8 bits) = X'02' (cluster)
Reserved Bits	(8 bits) = X'00'
Block Number	(12 bits) = X'0MM'
ID Number	(20 bits) = X'00ISS'

Where SS = SDLC address (from jumpers)
J = Jumper bits (from jumpers)
MM = 0F for 3773
10 for 3774-1, 2/3775-1
11 for 3774P/3775P
12 for 3771
13 for 3776/3777

The ID number is assigned and plugged during the installation process.

EIA RS-232C INTERFACE CONNECTOR PIN ASSIGNMENTS

Pin Number	CCITT Equivalent	Description
1	101	Protective ground
2	103	Transmitted data
3	104	Received data
4	105	Request to send
5	106	Clear to send
6	107	Data set ready
7	102	Signal ground (common return)
8	109	Received line signal detector (Reserved for data set testing)
9		(Reserved for data set testing)
10		Unassigned
11		Unassigned
12	122	Secondary received line signal detector
13	121	Secondary clear to send
14	118	Secondary transmitted data
15	114	Transmission signal element timing (DCE source)
16	119	Secondary received data
17	115	Receiver signal element timing (DCE source)
18		Unassigned
19	120	Secondary request to send
20	108.2	Data terminal ready
21	110	Signal quality detector
22	125	Ring indicator
23	111/112	Data signal rate selector (DTE source)
24	113	Transmit signal element timing (DTE source)
25		Unassigned

INTERCHANGE LOGIC STATES

Notation	Interchange Voltage (3 to 25 Volts)	
	Negative	Positive
Binary state	1	0
Signal condition	Marking	Spacing
Function	OFF	ON

EIA RS-449 PIN ASSIGNMENTS

- Shield
- Send Timing
- Spare
- Send Data
- Send Timing
- Receive Data
- Request to Send
- Receive Timing
- Clear to Send
- Local Loopback
- Data Mode
- Terminal Ready
- Receiver Ready
- Remote Loopback
- Incoming Call
- Select Frequency/Signal Rate Selector
- Terminal Timing
- Test Mode
- Signal Ground
- Receive Common
- Spare
- Send Data
- Send Timing
- Receive Data
- Request to Send
- Receive Timing
- Clear to Send
- Terminal in Service
- Data Mode
- Terminal Ready
- Receiver Ready
- Select Standby
- Signal Quality
- New Signal
- Terminal Timing
- Standby Indicator
- Send Common

GENERAL PARAMETERS

PARAMETERS	NONPROGRAM. 3770	3270 (3271,3275)	3270 (3271,3276)
FIX	NO	YES	NO
FLIP-FLOP	NO	NO	NO
CONTENTION	INTERACTIVE	NO	NO
BRACKET	ONLY BRACKET	OPTIONAL	ONLY BRACKET
FIRST SPKR	3770	3271,3275	3271,3276
QUIESCE	NO	NO	NO
PRIMARY REQ. MODE	IMMEDIATE	DELAYED REQ.	IMMEDIATE
PRIMARY RESP. MODE	IMMEDIATE	NO RESP. REQ.	IMMEDIATE
SECONDARY REQ. MODE	IMMEDIATE	DELAYED REQ.	IMMEDIATE
SECONDARY RESP. MODE	IMMEDIATE	IMMEDIATE	IMMEDIATE
MAXOUT	1	8	8
PASSIM	1	1	1
MAXDATA	265 OR 521	261	265
PACING	1, 1	1, 1	1, 1
VPACING	2, 1	2, 1	2, 1
CHANNELING	MULTIPLE ELEMENTS (IN & OUT)	SINGLE ELEMENTS (IN & OUT)	MULTIPLE ELEMENTS (IN & OUT)
LOGON	USS	USS	USS
LOGOFF	USS OR BSHUTO	USS	USS
FN PROFILE	3	2	3
IS PROFILE	3	2	3
LU TYPE	1	1	1, 2, 3

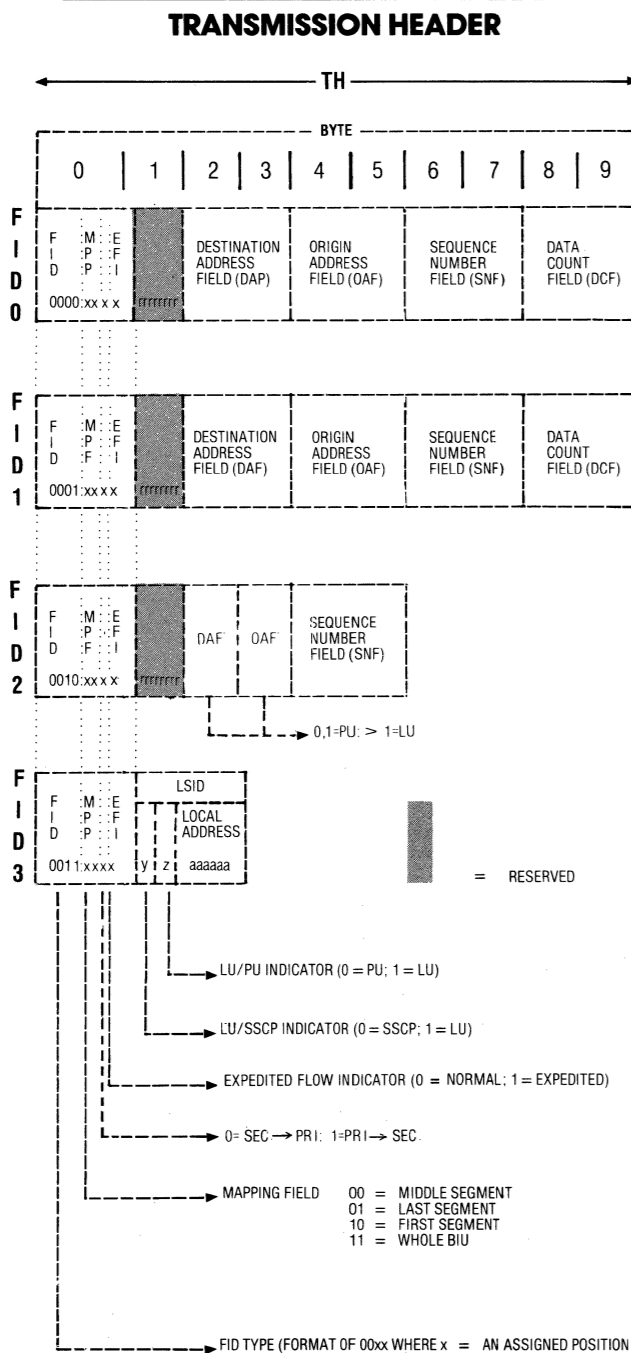
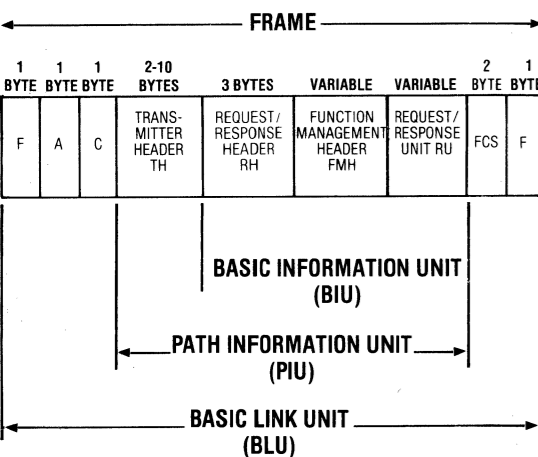
SNA

SYSTEMS NETWORK ARCHITECTURE

QUESTRONICS INC.

Monitors for Data Processing
3565 South West Temple
Salt Lake City, Utah 84115
(801) 262-9923
TWX: 910-925-4000

Copyright © 1981 By Questronics, Inc.



REQUEST/RESPONSE HEADER

FIELD	DESCRIPTION	EXPLANATION / USAGE
RRI	Request-Response indicator	0 = request (RQ); 1 = response (RSP)
RU Category	Request-Response Unit Category	00 = FM Data (FMD) 01 = Network Control (NC) 10 = Data Flow Control (DFC) 11 = Session Control (SC)
FI	Format indicator	0 = No FM header, for LU-LU sessions; or character-coded without an MS header for network services; 1 = FM header (FMH) follows, for LU-LU sessions; or field-formatted with an MS header (MSH), for network services
SDI	Sense Data Included indicator	0 = not included (SD); 1 = included (SD)
BCI	Begin Chain indicator	0 = not first in chain (BC); 1 = first in chain (BC)
ECI	End Chain indicator	0 = not last in chain (EC); 1 = last in chain (EC)
DR11	Definite Response 1 indicator	0 = DR1 1 = DR1
DR21	Definite Response 2 indicator	0 = DR2 1 = DR2
ERI	Exception Response indicator	Used in conjunction with DR11 and DR21 to indicate, in a request, the form of response requested: DR11, DR21, ERI = 000 means no-response request = 100/010/110 means definite-response requested = 101/011/111 means exception-response requested (001 is reserved)
RTI	Response Type indicator	0 = positive (+); 1 = negative (-)
QRI	Queued Response indicator	0 = response bypasses TC queues 1 = enqueue response in TC queues
PI	Pacing indicator	0 = PAC; 1 = PAC
BB1	Begin Bracket indicator	0 = BB 1 = BB
EB1	End Bracket indicator	0 = EB 1 = EB
CDI	Change Direction indicator	0 = do not change direction (CD); 1 = change direction
CSI	Code Selection indicator	0 = code 0; 1 = code 1
EDI	Enciphered Data indicator	0 = RU is not enciphered (ED); 1 = RU is enciphered (ED)
PDI	Padded Data indicator	0 = RU is not padded (PD); 1 = RU is padded (PD)

BIND REQUEST UNIT FORMAT

BYTE:

0	1	2	3	4	5
X'31'	FORMAT/TYPE	FM PROFILE	TS PROFILE	FM DATA USAGE (PLU)	FM DATA USAGE (SLU)

BYTE:

6	7	8	9	10	11	12	13
FM USAGE COMMON LU PROFILES	PACING SLU TO PLU	PACING NCP TO SLU	MAX RU FROM SLU	MAX RU FROM PLU	PACING PLU SEND COUNT	PACING PLU RECEIVE COUNT	

BYTE:

14	15-25	26	27	28-256 MAX.
LU TYPE	PS VALVE CHARACTERISTICS	CRYPTO OPTIONS	CRYPTO ENCRIPH. MODE	CRYPTO KEY

LU-LU SESSION ERRORS

BYTE 0	BYTE 1	BYTE 2	BYTE 3
SYSTEM MAJOR CODE	SENSE MODIFIER	USER SENSE	

4 BYTE SENSE DATA RU FORMAT

MAJOR CODE X'80' PATH ERROR MODIFIER

- INTERMEDIATE NODE FAILURE
- LINK FAILURE
- L. U. INOPERATIVE
- UNRECOGNIZED DAF
- NO SESSION
- INVALID FID
- SEGMENTING ERROR
- P. U. NOT ACTIVE
- L. U. NOT ACTIVE
- RESERVED
- INCOMPLETE TH
- DCF ERROR
- LOST CONTACT

MAJOR CODE X'40' RH USAGE ERROR MODIFIER

- INVALID SC OR NC RH
- RESERVED
- BB NOT ALLOWED
- EB NOT ALLOWED
- INCOMPLETE RH
- EXCEPTION NOT ALLOWED
- DR NOT ALLOWED
- PACING NOT SUPPORTED
- CD NOT ALLOWED
- NO-RESPONSE NOT ALLOWED
- CHAINING NOT SUPPORTED
- BRACKETS NOT SUPPORTED
- CD NOT SUPPORTED
- SENSE DATA INCLUDED NOT ALLOWED
- FORMAT INDICATOR NOT ALLOWED
- ALTERNATE CODE NOT SUPPORTED

LU-LU SESSION ERRORS (CON'T.)

MAJOR CODE X'20' STATE ERROR MODIFIER

- SEQUENCE NUMBER ERROR
- CHAINING ERROR
- BRACKET ERROR
- DIRECTION
- DATA TRAFFIC RESET
- DATA TRAFFIC QUIESCED
- DATA TRAFFIC NOT RESET

MAJOR CODE X'10' REQUEST ERROR MODIFIER

- RU DATA ERROR
- RU LENGTH ERROR
- FUNCTION NOT SUPPORTED
- RESERVED
- PARAMETER ERROR
- RESERVED
- CATEGORY NOT SUPPORTED
- INVALID FM HEADER

MAJOR CODE X'08' REQUEST REJECT MODIFIER

- RESOURCE NOT AVAILABLE
- INTERVENTION REQUIRED
- MISSING PASSWORD
- INVALID PASSWORD
- SESSION LIMIT EXCEEDED
- RESOURCE UNKNOWN
- RESERVED
- RESERVED
- MODE INCONSISTENCY
- PERMISSION REJECT
- BRACKET RACE ERROR
- PROCEDURE NOT SUPPORTED
- RESERVED
- LU NOT AUTHORIZED
- END USER NOT AUTHORIZED
- MISSING REQUEST ID
- BREAK
- INSUFFICIENT RESOURCE
- BRACKET BID REJECT-NO RTR
- BRACKET BID REJECT-RTR
- FUNCTION ACTIVE
- FUNCTION INACTIVE
- LINK INACTIVE
- LINK PROCEDURE IN PROCESS
- RTR NOT REQUIRED
- REQUEST SEQUENCE ERROR
- RECEIVER IN TRANSMIT MODE
- REQUEST NOT EXECUTABLE
- INVALID STATION/SSCPIID
- SESSION REFERENCE ERROR
- RESERVED
- CONTROL VECTOR ERROR
- INVALID SESSION PARAMETERS
- LINK PROCEDURE FAILURE
- UNKNOWN CONTROL VECTOR
- COMPONENT ABORTED
- COMPONENT NOT AVAILABLE
- FM FUNCTION NOT SUPPORTED
- INTERMITTENT ERROR
- REPLY NOT ALLOWED
- CHANGE DIRECTION REQUIRED

RESPONSE UNIT BYTE 0 REQUEST CODES

OP Codes	Name	Normal Expedited	Destination Origin
X'04'	LUSTAT	N	DFC
X'05'	RTR	N	DFC
X'05'	LSA	E	NC
X'07'	ANSC	E	NC
X'0D'	ACTLU	E	SC
X'0E'	DACTLU	E	SC
X'11'	ACTPU	E	SC
X'12'	DACTPU	E	SC
X'14'	ACTCDRM	E	SC
X'15'	DACTCDRM	E	SC
X'31'	BIND	E	SC
X'32'	UNBIND	E	SC
X'70'	BIS	N	DFC
X'71'	SBI	E	DFC
X'80'	QEC	E	DFC
X'81'	QC	N	DFC
X'82'	RELO	E	DFC
X'83'	CANCEL	N	DFC
X'84'	CHASE	N	DFC
X'A0'	SDT	E	SC
X'A1'	CLEAR	E	SC
X'A2'	STSN	E	SC
X'A3'	RQR	E	SC
X'CO'	CRV	E	SC
X'CO'	SHUTD	E	DFC
X'C1'	SHUTC	E	DFC
X'C2'	RSHUTD	E	DFC
X'C8'	BID	N	DFC
X'C9'	SIG	E	DFC

DFC = Data Flow Control
SC = Session Control
NC = Network Control

FUNCTION MANAGEMENT DATA HEADER 3 BYTES

OP CODES	NAME	NORMAL EXPEDITED	DESTINATION ORIGIN
X'010201'	CONTACT	N	FMD NS (c)
X'010202'	DISCONTACT	N	FMD NS (c)
X'010203'	IPLIMIT	N	FMD NS (c)
X'010204'	IPLTEXT	N	FMD NS (c)
X'010205'	IPFINAL	N	FMD NS (c)
X'010206'	DUMPFINAL	N	FMD NS (c)
X'010207'	DUMPTXT	N	FMD NS (c)
X'010208'	DUMPFINAL	N	FMD NS (c)
X'010209'	RPO	N	FMD NS (c)
X'01020A'	ACTLINK	N	FMD NS (c)
X'01020B'	DACTLINK	N	FMD NS (c)
X'01020C'	CESLOW	N	FMD NS (c)
X'01020D'	CESXLOW	N	FMD NS (c)
X'01020E'	CONNOUT	N	FMD NS (c)
X'01020F'	ABCONN	N	FMD NS (c)
X'010211'	SETCV	N	FMD NS (c)
X'010214'	ESLOW	N	NS (c)
X'010215'	EXSLOW	N	FMD NS (c)
X'010216'	ACTCONNIN	N	FMD NS (c)
X'010217'	DACTONNIN	N	FMD NS (c)
X'010218'	ABCONNOUT	N	FMD NS (c)
X'010219'	ANA	N	FMD NS (c)
X'01021A'	FNA	N	FMD NS (c)
X'01021B'	REQDISCONT	N	FMD NS (c)
X'010280'	CONTACTED	N	FMD NS (c)
X'010281'	INOP	N	FMD NS (c)
X'010284'	REQCONT	N	FMD NS (c)
X'010301'	EXECTEST	N	FMD NS (ma)
X'010302'	ACTTRACE	N	FMD NS (ma)
X'010303'	DACTTRACE	N	FMD NS (ma)
X'010331'	DISPSTOR	N	FMD NS (ma)
X'010334'	RECTOR	N	FMD NS (ma)
X'010380'	REOTEST	N	FMD NS (ma)
X'010381'	RECMS	N	FMD NS (ma)
X'010382'	RECTD	N	FMD NS (ma)
X'010383'	RECTRD	N	FMD NS (ma)
X'010401'	STARTMEAS	N	FMD NS (me)
X'010402'	STOPMEAS	N	FMD NS (me)
X'010480'	RECMD	N	FMD NS (me)
X'010604'	NSPE	N	FMD NS (s)
X'010681'	INIT-SELF (FORMAT 0)	N	FMD NS (s)
X'010683'	TERM-SELF (FORMAT 0)	N	FMD NS (s)
X'410210'	RNAA	E	FMD NS (c)
X'410222'	ISETCV	N	FMD NS (c)
X'410285'	NLSLA	E	FMD NS (c)
X'410304'	REQMS	N	FMD NS (ma)
X'410384'	RECFMS	N	FMD NS (ma)
X'410601'	CINIT	N	FMD NS (s)
X'810602'	CTERM	N	FMD NS (s)
X'810620'	NOTH-Y (SSCP - LU)	N	FMD NS (s)
X'810629'	CLEANUP	N	FMD NS (s)
X'810680'	INIT-OTHER	N	FMD NS (s)
X'810681'	INIT-SELF (FORMAT 1)	N	FMD NS (s)
X'810682'	TERM-OTHER	N	FMD NS (s)
X'810683'	TERM-SELF (FORMAT 1)	N	FMD NS (s)
X'810685'	BINDF	N	FMD NS (s)
X'810686'	SESSST	N	FMD NS (s)
X'810687'	UNBINDF	N	FMD NS (s)
X'810688'	SESSND	N	FMD NS (s)
X'818620'	NOTIFY (SSCP - SSCP)	N	FMD NS (s)
X'818627'	DSRLST	N	FMD NS (s)
X'818640'	INIT-OTHER-CD	N	FMD NS (s)
X'818641'	CDINIT	N	MFD NS (s)
X'818642'	TERM-OTHER-CD	N	FMD NS (s)
X'818643'	CDTERM	N	FMD NS (s)
X'818645'	CDSESSSF	N	FMD NS (s)
X'818646'	CDSESSST	N	FMD NS (s)
X'818647'	CDSESSTF	N	FMD NS (s)
X'818648'	CDSESSND	N	FMD NS (s)
X'818649'	CDTAKED	N	FMD NS (s)
X'81864A'	CDTAKEDC	N	FMD NS (s)
X'81864B'	CDINIT	N	FMD NS (s)

FMD NS (c) = Function management data, network services, configuration services.
FMD NS (ma) = Function management data, network services, maintenance services.
FMD NS (me) = Function management data, network services, measurement services.
FMD NS (s) = Function management data, network services, session services.