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NCR 2261/2262

SYSTEM INFORMATION

NCR 2261
COMMUNICATION PROCEDURES

COMMUNICATION PROCEDURES

CONTENTS

LINE INTERFACE 1

STANDARD MESSAGE FORMATS 1

ERROR CONTROL 1
System Status 1
Error Detection 1
Error Correction 2
Code Set 2

COMMUNICATION DISCIPLINE 2
Character Structure 2

ADDRESS ASSIGNMENTS 2
Poll/Select Codes 3
TA1 and TA2 Characters 3

INPUT COMMUNICATIONS 3
Input Message Format 3
Special Input Messages 5

OUTPUT MESSAGES 8
Output Message Format 8
Response Requirements To Input Messages 9
Special Output Messages 10
Terminal Processing Of Transaction Mask 12
Field Codes For Output Messages 12

COMMUNICATION PROCEDURES

The NCR 2261 terminal can operate online to a central computer through a Microprocessor Computer System (MCS), a digital concentrator, or an external modem. This publication provides the input and output message formats associated with this terminal so the central system programmer can design compatible software.

LINE INTERFACE

The terminal can be interfaced to the telephone line using either of these adapters.

- An ISO/ASYNC communication adapter (RS-232-C and CCITT V.24 compatible) to an external modem which can have a communication rate up to 1800 baud (bits per second) over either two- or four-wire private telephone lines.
- An M11-PILA adapter through either an MCS (NCR 2200 or 32XX) or an NCR 751-150 Digital Concentrator over either a two- or four-wire private telephone line. The terminal must be within 609.6 m (2000 ft) of the MCS or concentrator.

STANDARD MESSAGE FORMATS

The formats of the messages described in this publication apply to message transfer between an NCR application processor, communication processor, concentrator, or controller and this terminal. Non-NCR system interfaces are not included.

The message is made up of two parts, a message header and a message text. The elements that make up the message header and text are shown in Figure 1. Communication control characters are not included in this figure. This is the standard message format (SMF) for the NCR Financial System Family (FSF) for an input message. The SMF header for an output message header contains only the VLI, RLTC, FRMT, and MDC.

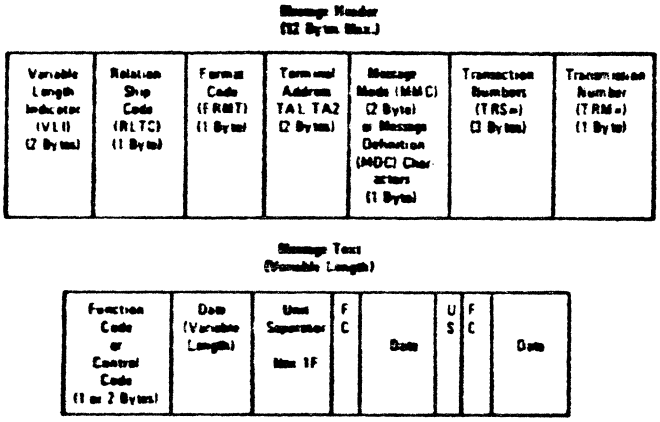

Figure 1 Standard message format

ERROR CONTROL

The error control techniques provided in the terminal system fall within the classification of system status, error detection, and error correction.

SYSTEM STATUS

System status provides for line verification and station verification. Line verification is performed by checking the modem or external data set and the line carrier signal for proper condition. Station assurance is provided in the system by sending terminal identification characters in the messages that are transferred between the terminal and central.

ERROR DETECTION

The types of error detection provided in the system are message delivery checking, message format checking, and redundancy checking.

Message Delivery Checking

Message delivery checking is accomplished by the use of a reply after receiving the message. If the message is received correctly, the correct reply is the control character ACK (affirmative acknowledgment); but if an error is detected in the message, the control

character NAK (negative acknowledgment) is the reply.

Message Format Checking

Format checking is performed by checking the message for properly positioned start-of-text (STX) and end-of-text (ETX) control characters. The STX character must always be the first character in the message and the ETX must always be the last character in the message.

Redundancy Checking

There are 2 methods of providing redundancy checking within the terminal: character parity and block checking (BCC).

Character Parity — A character parity check is performed on characters transmitted by the terminal to central. The terminal adds the bit to the character to be checked at central and checks the parity of the characters received from central. The parity of the characters for the NCR 2261 is programmable; but when used on an NCR system with the Retail/Financial OCD, the parity is even.

Block Check Character — The block check character (BCC) is a redundant 7-bit character added to the end of the transmitted text. It can be any character in the ASCII code character set. On input messages to central, the terminal generates the BCC; and on output messages to the terminal, the terminal checks the BCC.

Block checking is also referred to as longitudinal bit checking. Each bit of every character in a message block is added to the corresponding bit of all other characters without a carry to provide the BCC. All bit ones are added together, all bit twos are added together, and so on with the resulting character being the last character in the message block.

The accumulation of the BCC is started when the STX is detected. The STX is not included in the BCC accumulation, but all characters sent after the STX including the ETX are included in the accumulation.

The receiving unit longitudinally adds all bit positions of all characters following the STX including the BCC, and if the sum is zero, all data was transmitted correctly.

ERROR CORRECTION

When an error is detected in a message, the entire message is sent again. On an input message, the terminal repeats the message if a negative acknowledgment (NAK) is received from central. On an output message, the terminal starts the correction process by sending a NAK to central when an error is detected in an output message.

CODE SET

The terminal sends and receives data in the standard ASCII code format. Characters in the range from 30 through 39 (hex) are used for data; STX, ETX, NAK, ACK, EOT, and ENQ are used for communication control; and US (unit separator) is used as a data control character. Codes 41 through 5A are sent and received as alpha characters. Other characters in the range of 40 through 7D are used as miscellaneous control or identification characters and are described as they occur. The character is defined by bits 1 through 7 with bit 8 being the parity bit.

COMMUNICATION DISCIPLINE

The transmission mode is serial by bit and character, with the bits being synchronous and the characters being asynchronous. Transmission of data and control characters takes place in a half-duplex operation over either two- or four-wire dedicated telephone lines.

The transmission rate can be 300, 600, 1200, or 1800 baud and is specified in the terminal program.

For a complete description of the NCR asynchronous communications for financial systems, refer to the publication titled *Asynchronous Communication Discipline* (ST-9114-09) in reference manual RM-0263.

CHARACTER STRUCTURE

The character structure is made up of 10 signal elements per character with each character having equal time intervals. An 11th bit, an extra STOP bit, may be added by programming. The asynchronous character contains a START (logic zero) or space bit, 7 ASCII information bits, a parity bit, and one or two STOP (logic one) or mark bit(s). START and STOP bits frame each character since the characters are not synchronized.

The sequential order of transmission of the character bits is from the least significant bit to the most significant bit (START bit, bit 1 through bit 7, parity bit, and STOP bit).

ADDRESS ASSIGNMENTS

Each addressable unit within an NCR financial system has a 2-character terminal address (TA1, TA2). The low order 6-bits of each of these characters form a 12-bit address, bit 7 is always a 1 bit, and bit 8 is the parity bit.

In addition to TA1, TA2, each addressable unit (terminal or controller) is assigned a poll/select code. When assigning the terminal address and the poll/select code to the units, the requirements for these codes depend upon the central processor and the communications driver being used. If an NCR computer and the NCR Retail/Financial Online Communications Driver (OCD) is being used as central, the restrictions specified in the following paragraphs apply; but if central is other than an NCR computer or the NCR OCD is not being used, the restrictions may not apply.

POLL AND SELECT CODES

The poll and select codes are 8-bit characters with 7 code bits and a parity bit. Both characters have a direct relationship in that bits 7, 6, 4, 3, 2, and 1 must be the same. Bit 5 determines if the code is a poll code or select code. If bit 5 is zero, the character represents a poll code; but if bit 5 is a one, the character represents a select code. Bit 8 is the parity bit.

Poll codes are selected from columns 2, 4, and 6 of the ASCII code chart, and the select codes are from columns 3, 5, and 7 (Figure 2).

TA1 AND TA2 CHARACTERS

The TA1 and TA2 characters are the terminal address codes sent to central to identify the sending terminal. These two 8-bit characters form a 16 bit constant which is the terminal address. Bit 8 of each character is the parity bit and bit 7 of each character is always 1 so they can not be mistaken for a control character.

NCR Century software requires that TA1 be representative of the poll/select code. When the select code is hex 30 to 3F (ignoring parity), TA1 value is hex 60 to 6F; and when the select code is hex 50 to 5F and 70 to 7D (ignoring parity), TA1 is the same value. TA2 identifies the port on which the NCR 2261 is located when interfaced to central through a digital concentrator or an MCS controller. TA2 bit 1 and bit 6 are always zero and bits 2 through 5 represent the port number of the 2261 when using NCR software. Bits 1 through 4 may be used to represent the port number when using a different central software. Ports 0, 1, 2, and 15 on the digital concentrator are dedicated and can not be assigned to the terminal. There is no demand placed on TA2 when the terminal is a freestanding unit. Refer to Figure 2 for codes used by the terminal.

Poll Code			Select Code			TA1 Code			TA2 Code	
ASCII	DEC	HEX	ASCII	DEC	HEX	ASCII	DEC	HEX	NCR Software Port	NCR Software HEX
␣	32	20	0	48	30	`	96	60		
!	33	21	1	49	31	a	97	61		
"	34	22	2	50	32	b	98	62		
#	35	23	3	51	33	c	99	63		
$	36	24	4	52	34	d	100	64		
%	37	25	5	53	35	e	101	65		
&	38	26	6	54	36	f	102	66	0	
'	39	27	7	55	37	g	103	67	1	
(	40	28	8	56	38	h	104	68	2	
)	41	29	9	57	39	i	105	69	3	46
*	42	2A	:	58	3A	j	106	6A	4	48
+	43	2B	;	59	3B	k	107	6B	5	4A
,	44	2C	<	60	3C	l	108	6C	6	4C
-	45	2D	=	61	3D	m	109	6D	7	4E
.	46	2E	>	62	3E	n	110	6E	8	50
/	47	2F	?	63	3F	o	111	6F	9	52
@	64	40	P	80	50	p	80	50	10	54
A	65	41	Q	81	51	Q	81	51	11	56
B	66	42	R	82	52	R	82	52	12	58
C	67	43	S	83	53	S	83	53	13	5A
D	68	44	T	84	54	T	84	54	14	5C
E	69	45	U	85	55	U	85	56	15	
F	70	46	V	86	56	V	86	56		
G	71	47	W	87	57	W	87	57		
H	72	48	X	88	58	X	88	58		
I	73	49	Y	89	59	Y	89	59		
J	74	4A	Z	90	5A	Z	90	5A		
K	75	4B	[	91	5B	[	91	5B		
L	76	4C	\	92	5C	\	92	5C		
M	77	4D	]	93	5D	]	93	5D		
N	78	4E	^	94	5E	^	94	5E	0	
O	79	4F	_	95	5F	_	95	5F	1	
`	96	60	p	112	70	p	112	70	2	
a	97	61	q	113	71	q	113	71	3	43
b	98	62	r	114	72	r	114	72	4	44
c	99	63	s	115	73	s	115	73	5	45
d	100	64	t	116	74	t	116	74	6	46
e	101	65	u	117	75	u	117	75	7	47
f	102	66	v	118	76	v	118	76	8	48
g	103	67	w	119	77	w	119	77	9	49
h	104	68	x	120	78	x	120	78	10	4A
i	105	69	y	121	79	y	121	79	11	4B
j	106	6A	z	122	7A	z	122	7A	12	4C
k	107	6B	{	123	7B	{	123	7B	13	4D
l	108	6C	|	124	7C	|	124	7C	14	4E
m	109	6D	}	125	7D	}	125	7D	15	

TA2 Non-NCR Software

Port	HEX

Figure 2 Poll/select codes

INPUT COMMUNICATIONS

INPUT MESSAGE FORMAT

The message formats defined for the NCR 2261 in this publication are those that appear on the high-order line. The terminal has multiple message capability for all transactions and the input message transmission can be initiated using one of the following procedures: by filling the input/output buffer (IOB), transmit IOB bit in key parameter table set to 1 for the function key used, or by terminating the transaction. The input message, shown in Figure 3, may have a maximum of 256 characters excluding the STX, ETX, and BCC characters.

Communication Control Characters

The input message always starts with a communications control character (STX) and terminates with another communications control character (ETX).

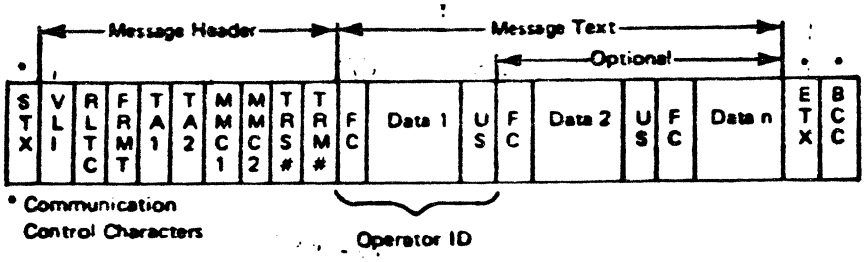

Figure 3 Input message format

Message Header

The message header contains the information required for the existing ISO/ASYNC communication convention as well as allowing for information that will be required in other communication conventions. The following paragraphs contain a description of the fields in the message header.

- VLI — VARIABLE LENGTH INDICATOR

  The VLI field is 2 bytes, and for the present, hex 7E7E is to be the value for this field. It is not being used at the present time except to identify the message as ISO/ASYNC format.
- RLTC — RELATIONSHIP CODE

  The RLTC field is a single byte which indicates the relationship of the format to its system or application. It is being provided to permit some modifications to the standard message formats. The value to be used with the FSF standard message format is hex 24.
- FRMT — FORMAT CODE

  This is a single byte field being used to distinguish between input and output message formats. Hex 31 is the FRMT code to identify an input message.
- MMC — MESSAGE CODE CHARACTERS

  The MMC1 and MMC2 characters define the mode of the message by the bit configuration of the characters. The 8 bits of each of the characters are defined as shown in Figure 4. In MMC2, only bit 3 is used and when bit 3 is a 1, an override condition exists.

TRS# — Transaction Number

The 3 least significant digits of the machine transaction number form the transaction number sent to central in an input message.

TRM# — Transmission Number

The transmission number is a single digit number sent with each input message and is incremented by one with each successful transmission.

Bit	MMC1 Description	MMC2 Description
8	Parity	Parity
7	Always 1	Always 1
6	1 = Auto Reentry Mode	0 — Reserved for future use
5	1 = Clear Text Warning	0 — Reserved for future use
4	1 = Manual Reentry Mode	0 — Reserved for future use
3	1 = Diagnostic Mode	1 = Override Condition
2	1 = Void	0 — Reserved for future use
1	1 = Last Segment of Message	0 — Reserved for future use

Figure 4 Message mode characters

Operator ID

The operator ID field defines the operator performing the operation. The operator ID field contains a field code (FC) and a mandatory data field. The field code identifies the operator and the data field contains the public identification number assigned to the operator. Figure 5 shows a list of the operator types taken from the list of field codes.

Field Codes (Hex)	Type of Operator
71	Primary Teller
72	Secondary Teller
73	Supervisor

Figure 5 Operator field codes

Text (Data Fields)

The data field follows the field code and uses the following format when it appears in the middle of a segment: US FC DATA US. If a field code does not require a data field, then the field code will be followed by a unit separator (hex 1F) using the following format, US FC US, again if the field code appears in the middle of a segment. This is referred to as a null data field. The unit separator character (US) indicates the end of a data field when the message contains more than one field code. The data fields are variable in length, containing a maximum of 40 characters and the number of data fields in the text portion of the message or segment are limited only by the IOB size.

Figure 5a shows the ASCII code set used in the NCR 2261 Terminal but the ASCII communication control characters are not shown. All terminals can print and process the special characters in columns A and B (bit 8 = 1) but presently only those terminals sold in the countries which use those characters can display them.

If a character or string of characters whose eighth bit is a 1 are included in an input message, an SO control character (hex 0E) precedes the string and an SI character (hex 0F) follows to indicate the beginning and ending of the special character string. The SO and SI control characters are not used if the data fields contain only those characters whose eighth bit is a 0 (columns 2 through 5). A data field will not contain any of the 10 Communication Control Characters (SOH, STX, ETX, EOT, ENQ, ACK, NAK, DLE, SYN, or ETB).

The terminal will not create a data field such that it will be resident in two message segments. For example, any data field which will cause an IOB overflow will not be input until the next segment.

For additional information, refer to the text describing alpha messages in this publication under "SPECIAL INPUT MESSAGES".

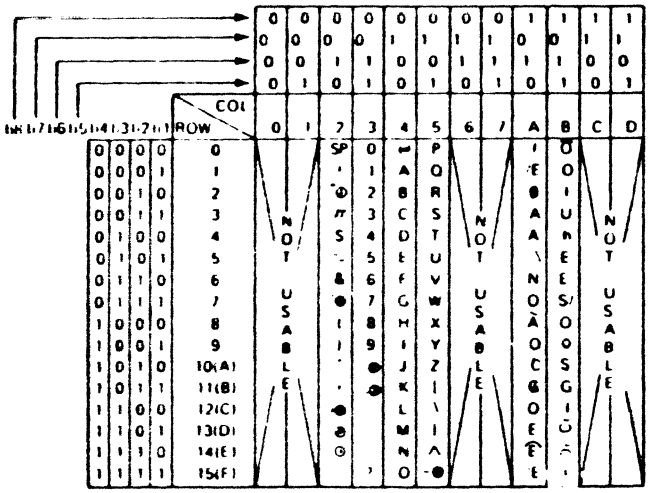

Figure 5a ASCII Code Set

Field Codes

The field codes (FC) are assigned to the programmable keys including the simulated keys in table 2 in the key parameter tables and to some of the fixed function keys in terminal table 68. The field codes available for customer programming are from hex 20 through hex 5F.

Field codes between hex 60 and hex 7A are reserved to identify functions performed by fixed function keys or by the terminal operating program and are shown in the following list.

60 — TELLER (OPERATOR) TOTALS
61 — BATCH TOTALS
62 — FUNCTION (MACHINE) TOTALS
63 — TRANSACTION TOTAL
64 — OVERRIDE
65 — SCREEN REQUEST
67 — PROGRAM LOAD REQUEST
68 — CASSETTE LABEL
69 — CASSETTE INPUT
6C — TRACK II CARD
71 — PRIMARY TELLER (TELLER A)
72 — SECONDARY TELLER (TELLER B)
73 — SUPERVISOR
76 — PING PONG TEST
77 — REPEATED OUTPUT TEST
78 — REPEATED INPUT TEST

The following reserved codes 66, 6A, 6B, 6D, 6E, 6F, 70, 74, and 79 either have no function assigned to them or the function has no meaning for this terminal. Refer to FIELD CODES FOR OUTPUT MESSAGES in this publication for additional information.

BCC Character

A BCC character is generated for each message by the sending unit so the receiving unit can verify that it received the complete message.

SPECIAL INPUT MESSAGES

The special input messages include void, override, totals, cassette reentry, manual reentry, program load, diagnostics, cassette label, and screen request messages.

Void

The void message consists of the standard message format (SMF) header and the operator ID with bit 2 of the MMC1 character set to 1 for identifying a void message. The text of the message always contains the operator ID with its field code but the data contents in the remaining text depends on when the VOID key is pressed.

When the VOID key is pressed during the inputting of a transaction, the transaction data already entered is still contained in the message for input followed by the field code programmed for the void message in terminal table #68. The format for this type of void message is shown in Figure 6, inset A.

Figure 6, inset B shows the format of the void message when the VOID key is pressed while the terminal is in output mode and is waiting for an output message.

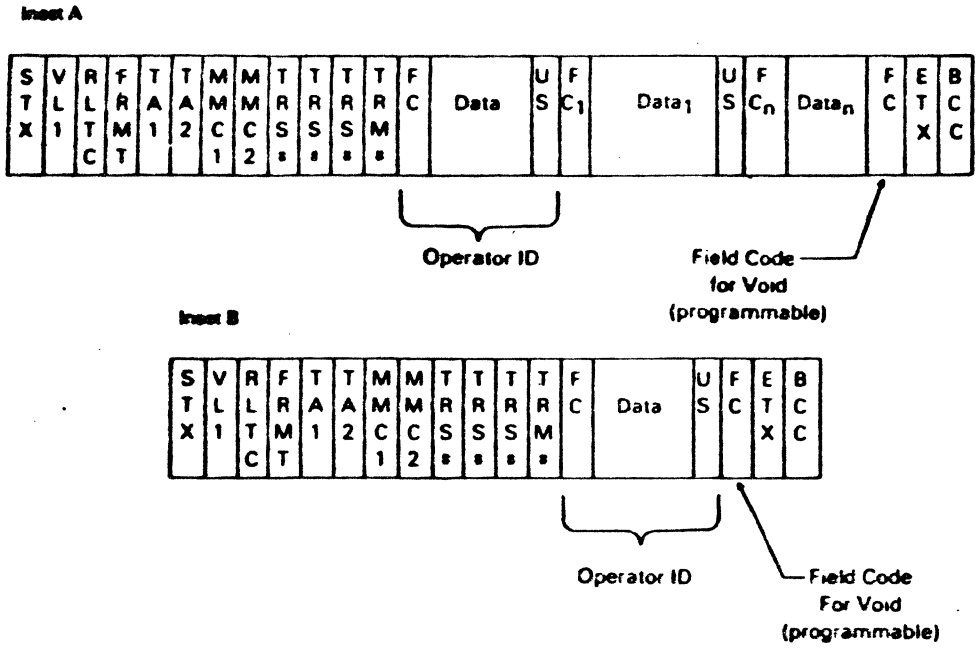

Figure 6 Void message format

Override

The override message consists of the SMF header, operator FC and public ID number, and the override FC. The preauthorized supervisor override may have an optional data field because the supervisor is permitted to enter an alphanumeric message to further identify the override. The override bit in MMC2 is set to 1 and the override message format is shown in Figure 7.

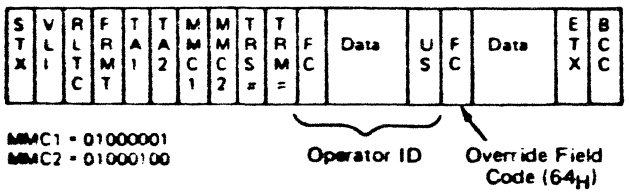

Figure 7 Override message format

Totals

The format for sending totals to central is shown in Figure 8. The field code for the group of totals are Teller Totals — 60 hex, Batch Totals — 61 hex, Function (Machine) Totals — 62 hex, and Distribution Totals — 63. The field codes for Total 1 ..... Total n are those of the corresponding function whose totals are being sent to central. If teller totals are being sent, all of the field codes are 60 hex, if batch totals, the field codes are 61. The Data 1.....Data n are the amounts in Total 1.....Total n. Leading zeros in the totals are not transmitted and any total containing a value of zero is transmitted as a single digit of 0 with a positive sign (hex 20).

Each transmitted total includes a sign character following the last character in the data field; hex 20 for a positive amount and hex 2D for a negative amount.

Manual Reentry

The messages transmitted to central have the same format as the standard input message shown in Figure 3 except that bit 4 of MMC1 is set to 1 to indicate manual reentry mode.

Cassette Reentry

Data that is recorded on a cassette tape for later transmission to central is recorded in the format shown in Figure 9. The recorded data contains all of the characters that are required for an input message except for the communication control characters (STX and ETX) and the BCC character.

When the recorded data is sent to central, the input message has the format shown in Figure 10. Bit 6 of MMC1 is set to 1 to indicate an auto reentry message. The cassette data field (in Figure 10) is shown in Figure 9.

The NCR 2261 can be placed in online data capture or offline data capture mode: when placed in offline data capture mode, bit 6 of the MMC1 character is set to 1 for recording on the cassette in the message header. When the terminal is online, the input message uses the message format shown in Figure 9 with the message framed by the STX and ETX control characters and

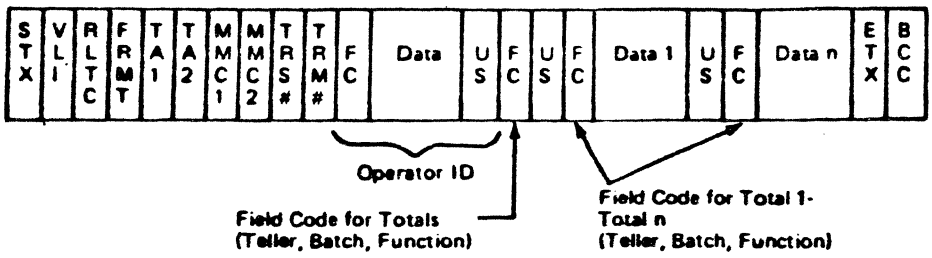

Figure 8 Totals message format

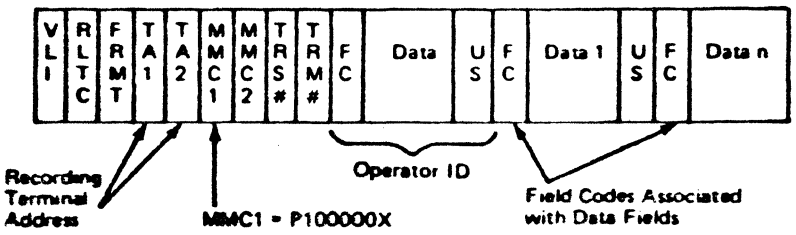

Figure 9 Cassette data capture format

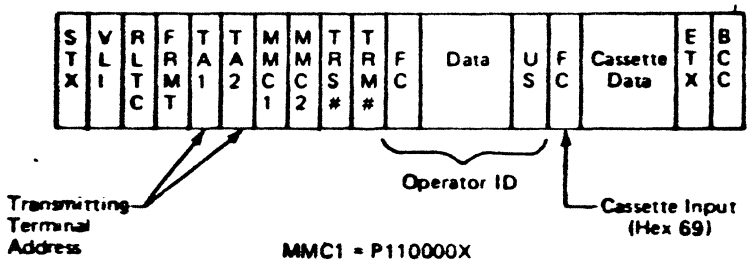

Figure 10 Cassette reentry message format

followed by a BCC. When the terminal is offline, the input message for sending the cassette tape to central uses the message format shown in Figure 10. Central can determine if the tape being sent was an online or offline data capture tape by examining bit 6 in MMC1 of the cassette data field. If the bit is 1, it is an offline data capture tape; but if it is 0, the tape is an online data capture tape and the data has already been used to update the accounts. The cassette data field is defined by a function code of 69.

Cassette Label

The cassette label message, when sent to central, has the same format as does the message in Figure 10 except that the field code following the Operator ID data field is hex 68 which defines the cassette data as the cassette label.

Program Load Request

The program load request message to central contains the operator ID, the field code for program load (hex 67) and an optional data field which can be used to indicate the program to be sent to the terminal. The program load request input message is shown in Figure 11.

Alpha Message

When the terminal sends a message to central containing alpha data, the alpha field code (field code assigned to the RETURN/ENTER key in Terminal Table #68) defines the field as alpha characters. The maximum length of an alpha data field is 40 characters. Figure 12 shows the format for the alpha input message. The message may contain more than one alpha field and each field will be identified by the field code assigned to the RETURN/ENTER key.

Diagnostic Message

The terminal can input 3 diagnostic related messages to central. To identify an input message as a diagnostic message, bit 3 of MMC1 is set to 1. The field codes for the diagnostic tests are: hex 76 for the Ping Pong test, hex 77 for the Repeated Output test, and hex 78 for the Repeated Input test. The format for the diagnostic message is shown in Figure 13.

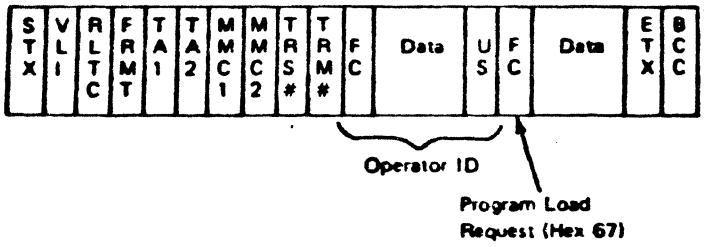

Figure 11 Program load request format

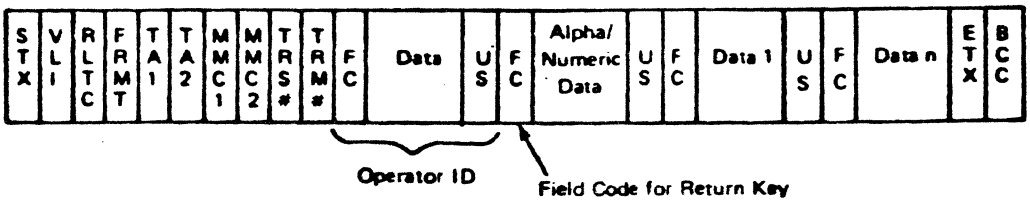

Figure 12 Input message containing alpha

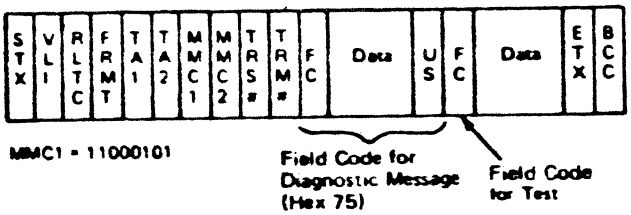

Figure 13 Diagnostic input message format

The contents of the diagnostic messages are described in the next publication (Pubn No. 2 of ST-9277-04).

Screen Request Message

The screen request message may be for a specific transaction mask by name (or number), or it may be for the list of transaction masks from which to select the desired mask. The screen request can be made only when the terminal is idle (between transactions). The format of this input message is shown in Figure 14. Input messages containing the data requested in a transaction mask are covered in output messages.

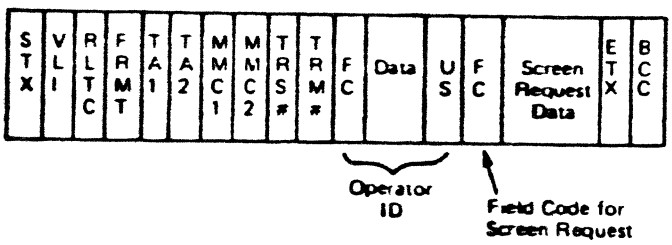

Figure 14 Screen request message format

Start-Of-Day Message

The start-of-day data is transmitted in the format as that shown in Figure 14a. The message contains the operator ID, the start-of-day field code (assigned in Terminal Table #67) followed by the data field.

The start-of-day data field is a 37 character fixed length field and does not contain any unit separator characters for separating the data. The first 7 characters (alphanumeric) are the date, followed by 10 digits for the supervisor public ID, 10 digits for the Teller A public ID, and finally 10 digits for the Teller B public ID.

OUTPUT MESSAGES

OUTPUT MESSAGE FORMAT

The format for the output message is shown in Figure 15. The output message is defined as being a message sent from a central computer (a high order device) to the terminal (a low order device). The output message may be either a response to an input message, such as an account or file inquiry, or the output message may be an unsolicited message such as a message to the operator. The terminal will accept and process any unsolicited output message regardless of the operating mode such as offline, online and so on as long as it is between transactions and is in the idle mode.

The maximum length of the output message is 256 characters (length of the IOB). That includes the header characters and the communications control character ETX but not the STX and the BCC (block control character).

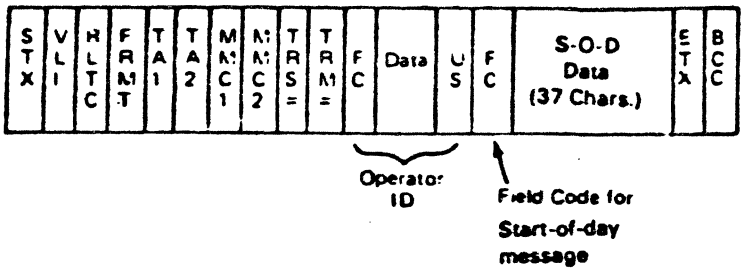

Figure 14a Start-of-day input message

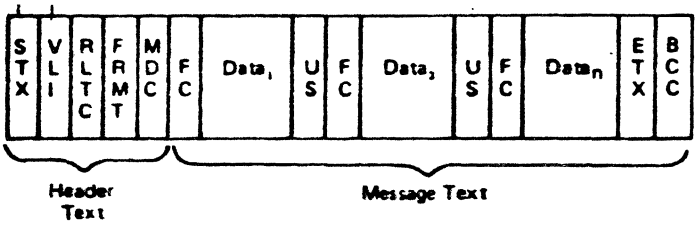

Figure 15 Output message format

Communication Control Characters

The output message, like the input message, is framed by the STX and ETX communication control characters with the BCC character following the ETX.

Message Header Characters

The message header characters; the variable length indicator (VLI), relationship code (RLTC), and format code (FRMT) characters, perform the same function in the output message as they do in the input message. The hex characters for the VLI and RLTC characters are the same as those in the input message, but the FRMT character is changed to hex 30 to indicate an output message.

The message definition character (MDC) in the output message replaces the MMC character in the input message to define the type of message being sent. The definition of the bits in the MDC are as follows:

- Bit 8 — Parity
- Bit 7 — Always 1
- Bits 6, 5, 4 = 0
- Bit 3 — 1 = Diagnostic message
- Bit 2 — 1 = Unsolicited message
- Bit 1 — 1 = Last segment of the output message

Message Text

The message text contains the field code (FC) character used by the terminal to process the data field that follows it. The field code character and its associated data field are separated from the next field code and data field by a unit separator. The unit separator is a hex 1F.

Field Code Characters

Each data field in an output message must have a field code before it. The terminal processes each field in sequence as it appears in the output message starting with the first one after the header and performs the same functions whether the message is solicited or unsolicited.

Text (Data Fields)

The data fields following the field codes in the output message may be variable in length (a maximum of 40 characters), or it may be a null data field (field code followed by a unit separator). However, the length of the data field for a screen display message is limited only by the display capability of the CRT (14 CRT lines, 40 characters per line).

A shift-out (SO) character (hex 0E) must precede any character or string of characters whose eighth bit is a 1 (columns A or B, Figure 5a) and a shift-in (SI) character (0F) must follow the string to indicate the beginning and ending. The SO and SI characters are not included in the 40 character maximum restriction and are not to be used if the data field contains only those characters whose eighth bit is a 0 (columns 2 through 5, Figure 5a).

The terminal can process and print the ASCII characters (columns A or B) but presently only those terminals used in the countries which use those characters have the capability to display them.

The data fields must not contain any of the communication control characters (ACK, SOH, STX, ETX, ENQ, EOT, NAK, DLE, SYN, or ETB).

RESPONSE REQUIREMENTS TO INPUT MESSAGES

The terminal requires an output message in response to any input message when the MMC1 character (Figure 4) is a 1 except for the following two types of input messages.

- A void input message.
- A message input to an NCR 751 Digital Concentrator and the data is to be recorded by an NCR 761 Digital Cassette Recorder.

When the contents of the IOB are input to central by a function key programmed to input the contents of the buffer but is not programmed to end the transaction, an output response message is expected and processed. This type of input does not terminate the transaction therefore, more data can be input. If such an operation was just performed but the operator decided to end the transaction by pressing the END key instead of entering more data, no transmission will occur because of the IOB is empty and no output response is expected. The END key causes an input to central only when the IOB contains data and again, an output response is expected and processed.

The output response message may or may not contain data to be processed or be multi-segmented but it must contain at least the SMF header.

SPECIAL OUTPUT MESSAGES

Program Load Messages

The format of the program load message to the terminal is shown in Figure 16. The program load field code (hex 70) identifies the data field in the message as a program load data field. The data field contains a table identifier and the table data characters. For example the data field for Terminal Table Number 1 would have this format: FC (70) T (54) 01 (30 31) semicolon (3B) Table Data Characters in ASCII followed by a unit separator (1F). The key tables for the programmable keys on the keyboard each require 6 tables as do the simulated keys used in online terminal programming. The data for the programmable keys is identified with a "K", and the data for the simulated keys is identified with a "P". The format for the key tables is as follows: FC (70) K (4B) or P (50) Key Number (3X 3X) Comma (2C) Table Number X (3X) semi-colon (3B) Table Data Characters in ASCII followed by a unit separator (1F). The key number can be 20 through 35 for the programmable keys on the keyboard and for the simulated online keys also. The table number can be from 1 through 6.

Unsolicited Output Messages

The terminal can accept an unsolicited output message only when it is between transactions as an unsolicited message is not normally transaction related. The format for this message is the same as in Figure 15 except the MDC character has bit 2 set to 1.

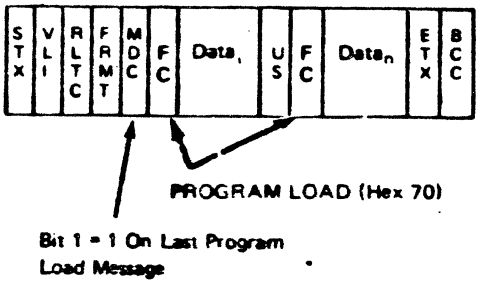

Figure 16 Program load message format

Diagnostic Messages

The format of the diagnostic output message is shown in Figure 17. There are 3 diagnostic test messages that can be sent to the terminal; they are: Ping Pong test, Repeated Output test, and Repeated Input test. The data field characters in the diagnostic message are not predefined, but the length of the field is predefined.

The Ping Pong diagnostic message is identified by the field code 76 (hex), the Repeated Output diagnostic message by the field code 77 (hex), and the Repeated Input diagnostic message by the field code 78 (hex). A field code of 79 (hex) identifies the tally table entries. The tally table message is sent upon completion of the Repeated Input and Repeated Output tests.

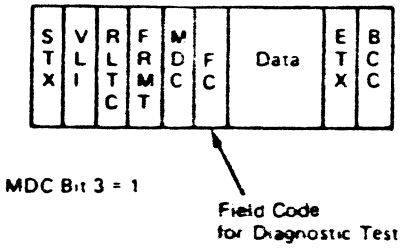

Figure 17 Diagnostic message format

Refer to publication number 2 of this publication for a complete description of the online diagnostic routines.

Void Required Message

The void required message can contain other field codes and data fields as shown in Figure 17a but the void field code 71 must be the last field code in the message. The terminal will not process any fields that follow the 71 code.

Override Request Message

The override request message (Figure 17b) may contain other field codes and data fields in the message but the field code 72 or 73 (teller or supervisor override request) must be the last field code in the message. The terminal does not process any field codes following.

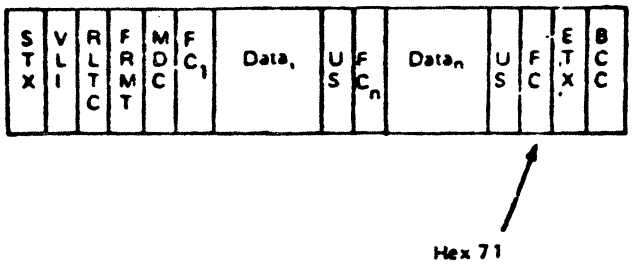

Figure 17a Void required message

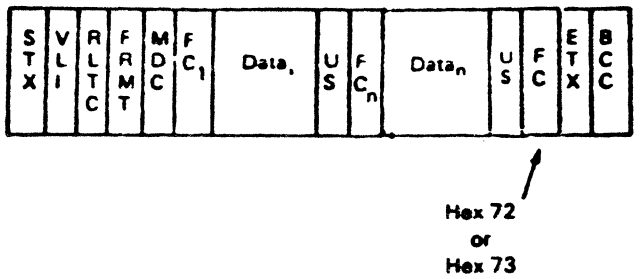

Figure 17b Override request message

Screen Output Message

The screen output message, sent in response to a screen input request, includes all the data fields to be displayed, the field characters required to specify the location on the screen for each data field (horizontal and vertical format control characters), and any control characters needed for special operations such as clearing the screen. The message must also contain a field code for each entry that the terminal operator must enter when processing the mask (Figure 18).

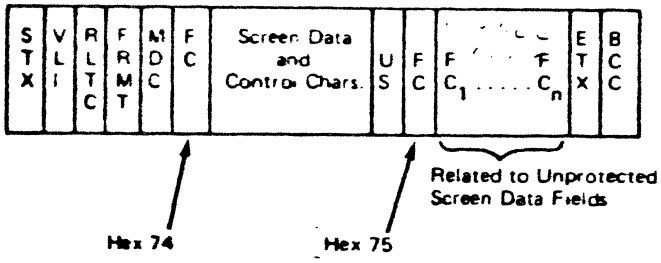

Figure 18 Screen output message

CRT Screen Control Functions

The following screen control functions are recognized and accepted by the terminal with all parameters in these functions being entered using the ASCII code characters. The display contains 40 display positions and position 1 is the left most position. There are 14 lines available for display with line 1 being the top most of the transaction data display area. The ASCII code chart name for the function is in parenthesis following the function name.

CLEAR CRT SCREEN (FF)

If the clear CRT screen code (hex 0C) is detected, the transaction data area of the screen is cleared and the pointer is returned to the first display position on first line of the transaction data area.

LINE FEED (LF)

When the line feed code (hex 0A) is detected, the pointer is advanced to the first display position of the next line.

CARRIAGE RETURN (CR)

The carriage return code (hex 0D) operates the same as described for the line feed. If the carriage return code and line feed code are used in the same command, the pointer still moves only to the first display position on the next line.

HORIZONTAL POSITION ABSOLUTE (HPA)

The format for the HPA is 1B 5B PARAMETER 60 with the parameter being from 0 through 40. To move the pointer to any specific display position on the active line, enter the desired position number in the parameter in ASCII. A value of 1 or 0 moves the pointer to the first position of the line. The maximum display position is 40 (34 30).

HORIZONTAL POSITION RELATIVE (HPR)

The format for the HPR is 1B 5B PARAMETER 61 with the parameter being from 0 through 40. The ASCII number in the parameter specifies the number of positions to move the pointer to the right of its present location. A value of 0 or 1 indicates a single position move with the maximum move being 40 (34 30). If the HPR control would cause the pointer to move past column 40, it then acts as a carriage return.

VERTICAL POSITION ABSOLUTE (VPA)

The format for the VPA is 1B 5B PARAMETER 64 with the parameter being from 0 through 14. The vertical position absolute parameter specifies the line on which the data field is to be displayed with a 0 or 1 as the parameter specifying the first line in the transaction display area.

VERTICAL POSITION RELATIVE (VPR)

The format for the VPR is 1B 5B PARAMETER 65 with the parameter being from 0 through 14. The vertical position relative parameter specifies the number of lines to move the display position down without changing the horizontal position. A 0 or 1 as the parameter moves the display position down 1 line.

START OF PROTECTED AREA (SPA)

The SPA control function specifies the beginning of a consecutive string of characters which the terminal operator can not change and is not sent to central with the entries for the requested mask. The character string is displayed in the positions

specified by the HPx and VPx characters. The format for the SPA within the mask is 1B 56 STRING but because the terminal accepts the beginning segment of the mask as a protected field, the SPA character is not included in that beginning segment. For example, the message format would be as follows: SMF header Field Code (74) STRING SMF header Field Code (74) STRING 1B 57

The HPx or VPx characters are not shown in this example. The EPA control function (1B 57) terminates the SPA function in this example.

END OF PROTECTED AREA (EPA)

The format for the EPA function within the mask is STRING 1B 57 with the STRING being the ASCII characters in the SPA function. As described for the SPA control function, the terminal accepts the beginning segment of the mask as a protected field, therefore, if the first position of the mask is not to be protected, the beginning segment must contain the EPA character. For example, the message format would be as follows: SMF header Field Code (74) 1B 57 STRING

The HPx and VPx characters are not shown in the example. In this case the STRING represents the character positions for the unprotected field and the SPA function must terminate the STRING for the EPA function.

SELECT GRAPHIC RENDITION (SGR)

The format for the SGR control function is 1B 5B PARAMETER 6D with the parameter being from hex 30 through 37. If the parameter is hex 35, the characters following the function coding flashes 125 times per minute. To indicate the end of the flashing character field, the parameter should be hex 30. The terminal performs the same slow flashing function for the hex parameters 31, 32, 33, 34, 36, and 37. If no SGR function is specified with a data field, the field does not flash.

REPEAT (REP)

The format for the REP control function is 1B 5B PARAMETER 62. The parameter defines the number of times the single display character or control function immediately before the REP control function is to be repeated. For example, a parameter value of 9 causes a character to be displayed 10 times.

TERMINAL PROCESSING OF TRANSACTION MASK

When the terminal receives the message containing the mask, it stores the screen data, the field codes, and clears the IOB. If it requires more than one message to output the mask, the terminal is ready to receive it. The messages sent for a mask can not exceed more than 14 lines of data characters with a maximum of 40 character positions per line.

The terminal automatically accepts the start of the display mask to be protected data unless it is specified to be unprotected with the use of an EPA function (refer to CRT SCREEN CONTROL FUNCTIONS). A transaction mask can have a maximum of 32 unprotected fields and an unprotected field can not be specified to have more than 40 display positions — the length of one CRT line. An unprotected field must start and end on the same CRT line which means that it can not be resident on more than one line.

If a protected field is ended with an EPA function but an SPA function immediately starts another protected field at the next display position, the total area is considered to be protected. However, if the SPA function starts the protected field one display position later instead of immediately following, then an unprotected field one display position in length exists.

The terminal processes the unprotected fields in the same sequence as they appear in the output transaction mask message. Therefore, a screen may be created in which the data field entry may be made right to left or bottom to top. But, as previously stated, there must be a field code sent for each unprotected data field in the mask into which the operator may insert data. These field codes must be in the same sequence as the unprotected fields. As each unprotected field is processed, the field code is stored in the IOB followed by the data entered for the field. When the IOB is full or the last entry for the mask is entered, the message is sent to central. The format of this input message is shown in Figure 3.

FIELD CODES FOR OUTPUT MESSAGES

All communication field codes that may be assigned in the terminal tables and key tables by a programmer/user should be selected from the range hex 20 through hex 5F. Any field codes in the range hex 60 through hex 7E that is not permanently assigned as either input or output may also be used. When any field code is output and matches any of the field codes for the following items, the terminal will process that function.

- Programmable and simulated keys as specified in each key table #2 for each key programmed. When a key is selected during output, the terminal will or will not process the following function specified in the key tables.
  - Will check whether the key is defined; if not, the terminal automatically voids.

- Performs all validation options with data following the FC processed as an amount.
- Adds to or subtracts from batch, teller, or machine totals depending on the sign of the data. The distribution (transaction code) totals are processed separately by outputting their specific FC in Terminal Table #68.
- Checks for the data length specified for the key. The terminal automatically voids if the length is greater than specified.
- Will change the accumulator according to parameters specified but will not set LIST mode.
- Will not store data in the ISB or IOB even though specified in key tables.
- Will not perform CDV on data following a FC.
- Will not perform any selection of input data source specified in key table #1.
- Will not test for the parameter specifying "key used more than once per transaction".

- Journal print function which also is the same field code as for the RETURN key during input specified in Terminal Table #68, field N.

  - When a field code matching the RETURN key field code is output, the terminal will print the data in the message which follows the FC starting in the left-justified position. There is no limit to the number of lines that can be printed on the journal as long as the RETURN key field code precedes each line of 40 characters in the output message.

- Free form output validation (NCR 2261-03XX model)

  - When the terminal receives a FC that matches the one stored in Terminal Table #67, field M, the terminal will print the data which follows the FC on a form. If the FC received is one hex digit higher, duplicate receipt printing will be permitted.

- Distribution totals as specified by the FCs in Terminal Table #68.

  - The amount data following the FC will be added to or subtracted from the distribution (transaction code) total according to the sign. If a key is selected during output to update totals, the distribution totals will not be changed or processed even though that key may be programmed to process distribution totals. Only a matching FC for a distribution total will be processed.

The FCs between hex 70 through hex 79 are permanently assigned to the following output functions.

70 — PROGRAM DATA
71 — VOID REQUIRED
72 — TELLER OVERRIDE REQUESTED
73 — SUPERVISOR OVERRIDE REQUESTED
74 — SCREEN DATA AND CONTROL
This field code identifies all data to be displayed as well as all other screen control characters such as clearing the screen, character placement on the screen and flashing them.
75 — TRANSACTION MASK FIELD CODES
76 — PING PONG TEST
77 — REPEATED OUTPUT
78 — REPEATED INPUT
79 — TALLY TABLES

ONLINE DIAGNOSTIC TESTS

In an online system, the NCR 2261 Terminal is capable of starting online diagnostic tests which permit online testing of the communications link to detect possible problem area. The primary purpose of this publication is to inform the central programmer of the online diagnostic tests available with this terminal. These tests include the Ping Pong, Repeated Output, and Repeated Input tests.

The online testing procedures described in this publication should be considered when the central programmer designs online diagnostic routines for the central processor for use with the NCR 2261. The test data sent to central and the test data expected from central is described in this publication. Each test description includes the communication procedures and the input and output messages formats for transferring the test data between the terminal and central.

ONLINE TESTS

When the terminal starts an online diagnostic test, the input message sent by the terminal indicates that the terminal is performing a test in the diagnostic mode. The diagnostic mode is specified in the MMC1 character (bit 3 = 1) and the test being performed is indicated by the second field code (FC). The first FC identifies the operator ID.

Upon detecting an input diagnostic test message, central should branch to the proper diagnostic routine to conduct the test.

When any of the online tests are performed, central should maintain a tally table for each terminal using online diagnostics. The tally table provides an efficient means of determining the performance of the communication link between central and the terminal. The items in the tally table, as expected by the terminal, are shown in the following list.

1. Input Attempts
2. Output Attempts
3. Selection Attempts
4. No Response To Poll Sequence
5. No Response To Select Sequence
6. No Response To Output Text
7. Time Outs After Transmitting ACK
8. NAKs Received
9. BCC And/Or Parity Errors Detected
10. Incomplete Input Messages
11. Incomplete Output Messages
12. Local Detected Errors
13. ENQ Time Outs or Invalid Responses To ENQ

The tally table is sent to the terminal as a data field containing 52 ASCII numeric characters defined by the field code 79 (this may apply only to a system using the NCR Retail/Financial O.C.D.). The terminal prints these characters as 13 fields of 4 characters each.

Upon completion of either the Repeated Input or Repeated Output test, the tally table is to be sent to terminal to aid the Field Engineer in locating problems associated with the communication link. The tally table represents the communication line conditions as seen by central.

Tally Tables

A definition of the items in the tally table is described in the list that follows.

- Input Attempts
  This is a tally of the total number of input attempts from the terminal. The count indicates that central received at least an STX from the terminal.
- Output Attempts
  This number indicates the total number of output attempts made by central.
- Selection Attempts
  This tally is the total number of selection attempts made by central to select the terminal.
- No Response To Poll Sequence
  This tally is incremented when the terminal fails to respond to a poll within the required time (no response timeouts).
- No Response To Select Sequence
  This tally indicates the times no response was received to a select sequence within the required time (no response timer timed out).

- No Response To Output Text
  This tally is incremented each time the terminal sends an ENQ as a response to an output message.
- Timeouts After Transmitting ACK
  This tally represents the total number of ACK timeouts after responding to an input message.
- NAKs Received
  This tally is incremented each time the terminal sends a NAK response to an output message.
- BCC And/Or Parity Errors
  This tally represents the number of NAKs sent to the terminal as a result of a bad BCC or bad parity detected in an input message.
- Incomplete Input Messages
  The number of input messages that were not completed after having received a start bit is indicated by the count in this tally. The incomplete input message is normally caused by a line drop.
- Incomplete Output Messages
  The incomplete output message tally is equal to 3 failures to each incomplete output message and may be caused by line drops or errors detected in an output message by the receiving terminal.
- Local Detected Errors
  The local detected errors tally indicates the total number of locally detected errors such as an EOT or ENQ with a data field.
- ENQ Timeouts Or Garbled Response To ENQs
  This tally is incremented when central receives a garbled response (response other than an ACK or NAK) to an ENQ or receives no response before an ENQ timeout occurs.

DIAGNOSTIC TESTS

REPEATED INPUT TEST

The repeated input test verifies the terminal's capability to transmit messages to central. An input message consisting of one or more characters that can be entered through the keyboard. This message is repeated and sent the number of times specified by a counter in central.

The terminal is polled, the message shown in Figure 1 is sent to central, and the input sequence is terminated. This sequence is repeated until the number of input messages received equals the previously determined counter. After receiving this last message, central sends the terminal's select sequence. The terminal responds with a NAK since it expects to be polled again, but this select sequence (EOT SELECT CODE ENQ) terminates the input portion of the test by the terminal.

The terminal's select sequence is sent by central again, but this time the terminal responds with TA1, TA2, ACK and central sends the Tally Table message shown in Figure 2. The Tally Tables are sent as a single 52 ASCII numeric field with each entry in the Tally Table having a 4-digit total.

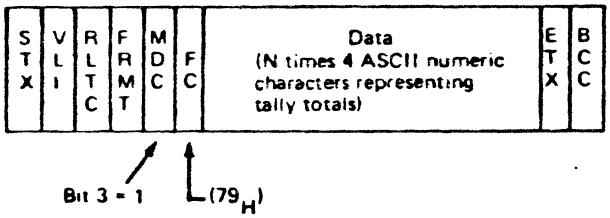

Figure 2 Tally table message

REPEATED OUTPUT TEST

The Repeated Output Test checks the capability of the terminal to receive messages from central and to display their contents on the CRT. After being polled, the terminal sends the input message shown in Figure 3 to start the Repeated Output Test. Inputs for this test are created by entries on the terminal keyboard of up to 40 characters and terminated by pressing the ENTER key. The END key must be pressed to transmit the message. The data characters in the input message are sent back to the terminal by central as many times as the counter for this test specifies, and after the last test message is sent, central sends the Tally Table message (Figure 2) to terminate the Repeated Output Test.

PING PONG TEST

The Ping Pong Test checks the capability of the terminal to send a message to central, which first must be entered through the keyboard, and have the same message returned. The test repeats only as often as the

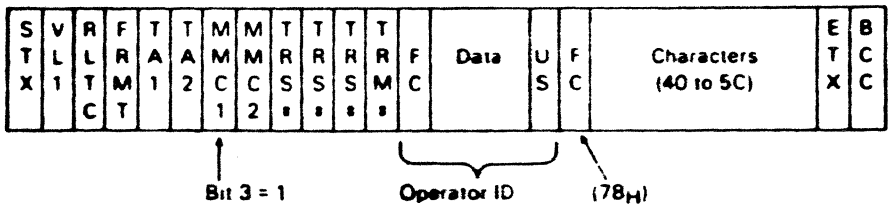

Figure 1 Repeated input test message

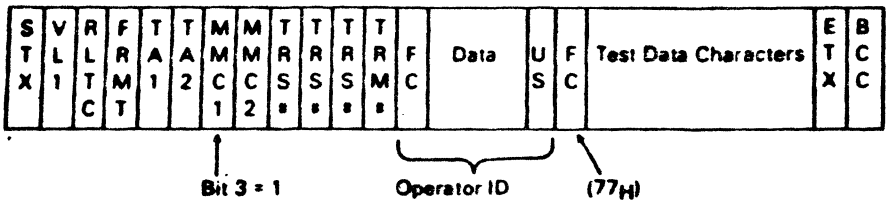

Figure 3 Input message for repeated output test

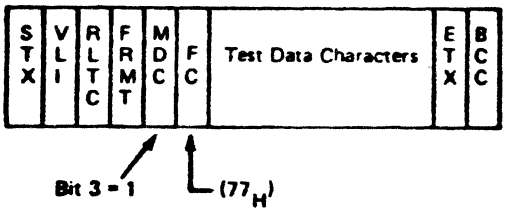

Figure 4 Output message for repeated output test

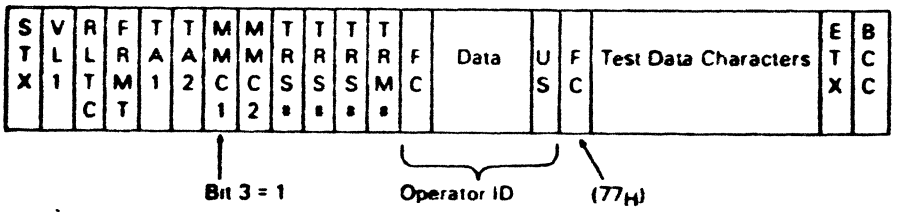

Figure 5 Input message for ping pong test

operator enters another message through the keyboard and inputs it to central. The test is terminated by pressing the CLEAR key (key #41) on the terminal keyboard. The message data consists of all characters on the ASCII code chart starting with the SPACE (hex 20) and ending with the "^" (hex 5E).

The terminal compares the message data field received from central with the message data field sent to central and indicates an error if the comparison fails. The test continues until an error is detected or the test is terminated. The format for the input message is shown in Figure 5 and the output message is shown in Figure 6.

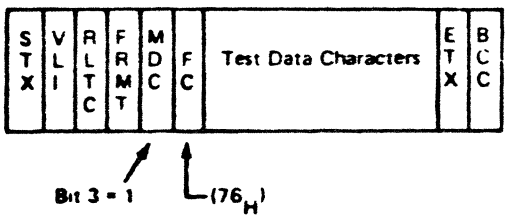

Figure 6 Output message for ping pong test

ONLINE DIAGNOSTIC TESTS USING FOS II SOFTWARE

When the NCR 2261 terminal is used online with an NCR 32XX series system using FOS II software, the format of the tally tables are different than those used by the NCR Retail/Financial O.C.D. The online diagnostic test routines and message formats as described in this publication remain the same.

TALLY TABLES

The terminal receives 8 four digit tallies from central. These tallies are not cleared to zero each time the diagnostic test is performed.

XXXX — Tally 1
XXXX — Tally 2
XXXX — Tally 3
XXXX — Tally 4
XXXX — Tally 5
XXXX — Tally 6
XXXX — Tally 7
XXXX — Tally 8

Tally 1

Tally 1 is the number of input message tries from the terminal. An STX — ENQ is not considered to be an input try; however, an STX and no other data in the message is considered to be an input try.

Tally 2

Tally 2 is the number of output message tries from central.

Tally 3

Tally 3 is the number of input message terminations such as loss of communications and so on.

Tally 4

Tally 4 is the number of output message terminations such as loss of communications and so on.

Tally 5

Tally 5 is the number of NAK responses transmitted by central following an input message try.

Tally 6

Tally 6 is the number of NAK responses received by central following an output message try.

Tally 7

Tally 7 is the number of 'no responses' to a poll request.

Tally 8

Tally 8 is the number of 'no responses' to a select request.