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CONTROL DATA CORPORATION

COMMUNICATIONS CONTROL PROGRAM VERSION 1 DIAGNOSTIC HANDBOOK

CONTROL DATA®
CYBER 170 SERIES
CYBER 70 SERIES MODELS 72, 73, 74
6000 SERIES COMPUTER SYSTEMS
CYBER 18 COMPUTER SYSTEMS
255X HOST COMMUNICATIONS PROCESSORS

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PREFACE

This handbook describes messages associated with Version 1 of the Communications Control Program (CCP 1), that is used with the CONTROL DATA© 2550 Series Host Communications Processor (HCP). The CCP is the operating software for the HCP, which provides front-end functions for a CDC 6000 or CYBER 70/170 host computer system. The CYBER host system operates under control of the NOS/BE operating system.

The purpose of these descriptions is to assist system operators and customer engineers (CEs) in the isolation of system faults. Any codes appearing within these messages are also described and defined, and brief instructions on dump interpretation are also provided.

Only two types of messages useful in trouble isolation are reported by the CCP. These are halt-code messages and on-line diagnostic response messages. Additionally, upline memory dumps of the contents of the 2550 main memory, micromemory, and file registers are also useful for fault isolation. Section 1 of this handbook describes the halt-code messages, section 2 describes the on-line diagnostic response messages, section 3 provides instructions for dump interpretation, section 4 provides diagnostic service messages and section 5 describes procedures to be taken to isolate problems relating to communications lines.

Within sections 1 and 2, the messages are arranged in alphanumeric order by halt code or diagnostic response code.

Further information related to the 2550 Series HCP software, as well as hardware, is contained in the publications listed below. These publications are available through the Control Data Literature Distribution Services, Minneapolis, Minnesota.

Publication	Publication Number
Communications Control Program, Version 1 Software Operator's Guide	60470100
NOS/BE Installation Handbook	60494300
Communications Control Program, Version 1 Software Reference Manual	60470000
2550-2 Host Communications Processor Hardware Reference Manual	74375500
Communications Handbook	60405100
MSMP Diagnostic Reference Manual	96700000

Order the following publications from American Telephone & Telegraph, Supervisor, Information Distribution Center, 195 Broadway, Room 208, New York, New York 10007.

Bell System Data Communications Technical Reference - Data Communications Using Voiceband Private Line Channels, October 1973	41004
Bell System Technical Reference - Data Set 208A Interface Specification, November 1973	41209

This product is intended for use only as described in this document. Control Data cannot be responsible for the proper functioning of undescribed features or undefined parameters.

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HALT CODE MESSAGES 1

INTRODUCTION

When the CCP 1 system detects an unrecoverable condition caused by either a hardware or software malfunction, an appropriate halt-code message is printed. When such a halt occurs, the host processor normally executes an upline dump of the 2550 main memory, micromemory, and file registers. Thereafter, the host attempts to reload the 2550 memory. If the halt condition persists, the 2550 operator is requested to switch the 2550 coupler off-line (to prevent the host from continuing its reloading attempts) and to attempt to correct the fault causing the persistent halts. The following halt-code descriptions are provided in correcting these faults.

HALT CODES

Halt codes can be divided into three categories: 1) those primarily resulting from incorrect switch settings, 2) those caused by hardware malfunctions, and 3) those that can be either hardware or software problems.

In the first category is detection of a duplicate CLA address (halt code 12). This condition is usually caused by two CLA switches being set to the same address. Such a fault can normally be corrected by the operator correctly setting the switches.

In the second category, the halt codes are the following:

- Power failures (code 001)
- Memory parity error (code 002)
- Memory protect bit error (code 003)
- Bad MLIA initialization status (code 011)
- Real-time clock lost count (code 018)
- Bad coupler initialization status (code 00E)
- MLIA failure (code 01F)
- Coupler detection of memory parity or program protect errors (code 028)

Such conditions are usually caused by some type of hardware failure and normally must be repaired by a CE.

The third category of halt codes (all those not already specified) may be caused either by a hardware failure or by a software error. For the first three months following installation, these halts are more likely to result from software problems. After three months of service, most software problems will have been found and corrected and, thereafter, most such halts will be caused by hardware malfunctions. To correct this category of problems, the CE should normally first be called to check the hardware. If the hardware is functioning properly, a system analyst should be called.

NOTE

Make available all upline dumps taken by the host to the CE and system analyst.

Table 1-1 lists all the halt codes, their meanings, and the suggested action to be taken when they occur.

TABLE 1-1. SYSTEM HALT CODES

Halt Code	Meaning	Suggested Action
000	Not a valid halt code	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
001	Power failure	Hardware problem. Call CE to check power problem.
002	Memory parity error detected by 2550	Hardware problem. Call CE to check memory parity.
003	Program protect bit error detected by 2550	Hardware problem. Call CE to check memory program protect bit logic.
004	Interrupt count less than zero (PASCAL tried to enable interrupts more times than it inhibited them)	May be either hardware or software problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
005	TIMAL (base system timing services) worklist error	May be either hardware or software problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
006	Active line control block list error	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
007	No buffer left	May be either hardware or software problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
008	Size error in stamp	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
009	Duplicate GET buffer	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
00A	Duplicate RELEASE buffer	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
00B	Buffer CHAIN error	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.

TABLE 1-1. SYSTEM HALT CODES (Contd)

Halt Code	Meaning	Suggested Action
00C	Buffer out-of-range	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
00D	BAD command, not type 1 or type 2	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
00E	Bad coupler initialization status	Hardware problem. Call CE to run coupler diagnostics.
00F	Attempted to clear an enabled line	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
010	Not a valid halt code	Hardware problem. Call CE to run 2550 diagnostics.
011	Bad multiplex loop interface adapter (MLIA) initialization status	Hardware problem. Call CE to run multiplexer subsystem diagnostics on MLIA and loop.
012	Duplicated CLA address detected	Either two CLAs are set to the same address (check CLA address switches on handles of CLA circuit cards) or a CLA circuit card is bad (hardware problem). To check duplicate CLA address, access first entry in NPINTAB table in ADDRESS table (fixed memory location). The first entry in NPINTAB table contains duplicate CLA address. If two CLAs are not set to that address, call CE to run off-line CLA diagnostics. Provide upline dumps to CE.
013	Attempt to redefine an existing destination node (DN) directory entry	May be either hardware or software problem or host software error. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
014	Attempt to redefine an existing connection number (CN) directory entry	Hardware problem. Call CE to run 2550 diagnostics.
015	Attempt to remove a non-existing DN directory entry	May be either hardware or software problem or host software error. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.

TABLE 1-1. SYSTEM HALT CODES (Contd)

Halt Code	Meaning	Suggested Action
016	Attempt to remove a non-existing source node (SN) directory entry	May be either hardware or software problem or host software error. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
017	Attempt to remove a non-existing CN directory entry	May be either hardware or software problem or host software error. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
018	Real-time clock lost count	Hardware problem. Call CE to run real-time clock and firmware diagnostics.
019	Illegal point-of-interface (POI) key	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
01A	Attempt to add a zero CN to the directories	May be either hardware or software problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
01B	Program selected to run is not in memory	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
01C	Monitor did not run for B2TIME/2 seconds	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
01D	Service module called with worklist empty	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
01E	Service module workcode out-of-range	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
01F	MLIA failure	Hardware problem. Call CE to run MLIA and loop diagnostics.

TABLE 1-1. SYSTEM HALT CODES (Contd)

Halt Code	Meaning	Suggested Action
020	Pointer to read next loop cell from circular input buffer (CIB) exceeded present line frame pointer	Probably a hardware problem. Call CE to run multiplexer subsystem diagnostics. If hardware checks good, call system analyst and provide upline dumps.
021 022 023 024 025 026 027	Reserved for firmware use (not valid halt codes)	May be either hardware or software problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
028	Coupler Alarm Condition (coupler detected memory-parity error or program-protect-bit error during data transfer)	Hardware problem. Call CE to run memory diagnostics.
029	No queue control block available for terminal control block build (implemented but not called by CCP 1)	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
02A	Bad line number from TIP (invalid line number passed from TIP to service module as worklist entry; out-of-range line number)	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
02B	Unknown task number (TASKNR) selected. Nonexistent task number for Mode 4 TIP	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
02C	Unknown block/command received (no command, block, message, or service message in TIP output queue; part of Mode 4 TIP)	May be either hardware or software problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
02D	Improper multiplex subsystem operation (non-reject, non-ack, non-error, non-read E1, non-read E2, or non-read E3 worklist entry made following input)	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.

TABLE 1-1. SYSTEM HALT CODES (Contd)

Halt Code	Meaning	Suggested Action
02E	Improper Mode 4 TIP operation (unacceptable task)	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
02F	Control for disabled line (Mode 4 TIP attempted to run on disabled line)	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
030	Reserved for Mode 4 TIP (not a valid halt code)	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
031	Error in header builder (PNHDRBLD)	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
032	Not a valid halt code	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
033	Illegal line status software condition detected by PTCLAS (CLA status)	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
034	Not a valid halt code	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
035	Attempt to queue message to NPU console when console not configured into system	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
036	Directory function attempted with DN out-of-range (DN C3MAXDN)	May be either hardware or software problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.
037 and up	Not valid halt codes	Probably a hardware problem. Call CE to run 2550 diagnostics. If hardware checks good, call system analyst and provide upline dumps.

DIAGNOSTIC TEST RESPONSES 2

INTRODUCTION

The CCP 1 programs include an on-line diagnostic test that can be invoked from the 2550 console to perform data and status tests on one or more communications lines. Performance of these tests does not impact services to other lines in the system.

The on-line diagnostic test programs can test a communications line in any of three different modes: 1) CLA internal loopback mode (tests all CLA logic except modem drivers and receivers), 2) external data loopback mode (isolates modem and transmission line problems), or 3) CLA external loopback mode (drivers and receivers). Directions for operating these programs are found in the CCP 1 Operator's Guide. (Refer to Preface.)

MESSAGE CATEGORIES

While running the on-line diagnostic test programs, various diagnostic test responses may be received at the 2550 console. These messages fall into four categories: 1) responses to commands to the diagnostic TIP, 2) CLA command errors detected, 3) CLA data turnaround errors detected, or 4) either a CLA command or data turnaround error.

DIAGNOSTIC TIP COMMAND

Responses to commands to the diagnostic TIP are informational in nature. They concern the state of a line (line-in-service or line-out-of-service), state of the diagnostic test (test started or completed), or indicate improper command information has been given (such as an invalid CLA type or invalid test mode). Responses in this category do not indicate the source of any problems for the line or lines being tested, but rather indicate the status of the test or some improper operation of the test.

Included in this category are diagnostic test responses A0 through AA and CE.

CLA COMMAND ERROR

Diagnostic test responses indicating CLA command errors generally imply that an expected status response from the CLA has not been received. Such errors are usually detected while running the status and command portion of either the CLA internal or external loopback tests, and normally indicate a faulty CLA. Included in this category of diagnostic test responses are B5, BA through C4, and CF.

CLA DATA TURNAROUND ERROR

Responses indicating CLA data turnaround errors are caused either by receipt of status information from the CLA that indicates a data error, or by a faulty data comparison upon loopback. Again, this type of error is normally detected during the CLA internal or external loopback tests, and indicates a faulty CLA. If the errors are detected only in the external loopback test, a faulty modem or transmission line is indicated. Included in this category are diagnostic test responses AF through B2 and C5 through DB.

CLA COMMAND OR DATA TURNAROUND ERROR

The fourth category of diagnostic test responses, indicating either a

CLA command error or a data turn-around error, could occur during any portion of the tests. If detected during the CLA internal or external loopback tests, it normally indicates a faulty CLA. If the errors are detected only during the external data loopback mode, it normally indicates either a bad modem or transmission line. Included in this category are diagnostic test responses AB through AE, B3 and B4, and B6 through B9.

DIAGNOSTIC TEST RESPONSE CODES

Table 2-1 lists all of the on-line diagnostic test responses, gives their meanings, and suggest actions to be taken when the error message occurs.

NOTE

Even though good, a CLA may fail the diagnostic test the first time that the test is run after the CLA is installed in the system. Therefore, disregard the results of the first run and rerun the diagnostic test a second time.

The message format is as follows:

0	1	2	3	4	5	6	7	8	9
DN	SN	00	0 BSN	00	04	00	RC	P	SP

where:
- DN - Destination node
- SN - Source node
- BSN - Block serial number
- RC - Response code
- P - Port (CLA address)
- SP - Subport (not applicable = 00)

TABLE 2-1. DIAGNOSTIC TEST RESPONSE CODES

Response Code	Meaning	Suggested Action
A0	Line is out of service; normal response to place-line-out-of-service command	None
A1	Command rejected; system temporarily low on buffers	Reissue command.
A2	Line in service; normal response to place-line-in-service command	None
A3	Diagnostics in process; response to place-line-in-service command if diagnostic tests are in process	Wait for response at completion of diagnostic tests before placing line back into service.
A4	Diagnostic started; normal response to start-CLA-loop-internal-test, start-CLA-loop-external-test, or start-external-data-loopback test	None
A5	Invalid line number or bad command; invalid line number or byte 5 in command	Check for proper line number or proper command and reissue.
A6	Invalid CLA type issued in command	Check for proper CLA type and reissue command.
A7	Invalid test mode issued in command (byte 6)	Check for proper test mode and reissue command.
A8	Line not out of service; response to start of diagnostic mode if line is not out of service	Check for proper line number and, if correct, issue line-out-of-service command and restart diagnostic.
A9	Test already in process; response to start of diagnostic mode if line specified is already running a diagnostic	Check for proper line number and, if incorrect, reissue command with correct line number. If correct, wait for previous diagnostic test to complete and reissue command.
AA	Invalid modem class	Check for proper modem class and reissue commands.
DD	Test completed - no errors; normal response upon completion of diagnostic test	None

TABLE 2-1. DIAGNOSTIC TEST RESPONSE CODES (Contd)

Response Code	Meaning	Suggested Action
AB	Unsolicited input detected; in either CLA loop internal or external test, indicates bad CLA; if only occurs in data loopback test mode, indicates bad modem or transmission line	If bad CLA indicated, call CE to replace CLA. If bad modem or transmission line indicated, follow directions under line problem solving section, appendix D.
AC	Unsolicited output data demand detected	Same action as for code AB
AD	Input loop error (ILE status detected)	Same action as for code AB
AE	Output loop error (OLE status detected)	Same action as for code AB
AF	Parity error (PES status detected)	Same action as for code AB
B0	Framing error (FES status detected)	Same action as for code AB
B1	Data transfer overrun (DTO status detected)	Same action as for code AB
B2	Next character not available (NCNA status detected)	Same action as for code AB
B3	No CLA status after CLA status was requested; input status request (ISR) command did not cause status to be reported	Bad CLA, call CE to replace CLA.
B4	Unsolicited CLA status	Same action as for code AB
B5	CLA status not cleared after input supervision on (ISON) sent	Bad CLA, call CE to replace CLA.
B6	No status after request to send (RTS) or ISR sent	Same action as for code AB
B7	CTS status not responding correctly to RTS-on/off commands	Same action as for code AB
B8	No status after data terminal ready (DTR); DTR command did not cause DSR status	Same action as for code AB

TABLE 2-1. DIAGNOSTIC TEST RESPONSE CODES (Contd)

Response Codes	Meaning	Suggested Action
B9	DSR status not responding correctly to DTR-on/off commands, or other status received rather than DSR	Same action as for code AB
BA	Signal quality detector (SQD) status not responding correctly to DTR-on/off commands	Bad CLA, type 2560-1. Call CE to replace CLA.
BB	No ring after cycling DTR command on and off	Bad CLA, type 2560-1. Call CE to replace CLA.
BC	No status after secondary request to send (SRTS); SRTS command did not cause secondary received signal detector (SRLSD) status.	Bad CLA, type 2561-1. Call CE to replace CLA.
BD	SRLSD status not responding correctly to SRTS on/off commands, or other status received rather than SRLSD	Bad CLA, type 2561-1. Call CE to replace the CLA.
BE	No CLA status after commanding on local mode (LM). Expected received signal detector (RLSD) status	Bad CLA, type 2561-1. Call CE to replace CLA.
BF	RLSD status not responding correctly to LM-on/off commands	Bad CLA, type 2561-1. Call CE to replace CLA.
C0	Unsolicited CLA status after originate mode (OM) on command	Bad CLA, type 2561-1. Call CE to replace CLA.
C1	No CLA status or improper ring indicator (RI) status after toggling terminal busy (TB) command	Bad CLA, type 2561-1. Call CE to replace CLA.
C2	No CLA status after turning on new sync (NSYN) command	Bad CLA, type 2560-1, 2, or 3. Call CE to replace CLA.
C3	Improper RLSD or RI or quality monitor (QM) status when commanding NSYN on/off.	Bad CLA, type 2560-1, 2, or 3. Call CE to replace CLA.
C4	Unwanted RI status; RTS command just turned on	Bad CLA. Call CE to replace CLA.
C5	Input data timeout during data verification test	Same action as for code AB.

TABLE 2-1. DIAGNOSTIC REST RESPONSE CODES (Contd)

Response Code	Meaning	Suggested Action
C6	Data compare error, sync CLA, even parity	Same action as for code AB
C7	Data compare error, sync CLA, odd parity	Same action as for code AB
C8	Data compare error, sync CLA, no parity	Same action as for code AB
C9	Data compare error, async CLA, even parity 40 baud, 1 stop bit	Same action as for code AB
CA	Data compare error, async CLA, odd parity, 85.4 baud, 2 stop bits	Same action as for code AB
CB	Data compare error, async CLA, no parity, 100 baud, 1 stop bit	Same action as for code AB
CC	Data compare error, async CLA, even parity, 110 baud, 2 stop bits	Same action as for code AB
CD	Data compare error, async CLA, odd parity, 120 baud, 1 stop bit	Same action as for code AB
CE	Data compare error, async CLA, no parity, 133.3 baud, 2 stop bits	Same action as for code AB
CF	Data compare error, async CLA, even parity, 150 baud, 1 stop bit	Same action as for code AB
C0	Data compare error, async CLA, odd parity, 300 baud, 2 stop bits	Same action as for code AB
D1	Data compare error, async CLA, no parity, 600 baud, 1 stop bit	Same action as for code AB
D2	Data compare error, async CLA, even parity, 800 baud, 2 stop bits	Same action as for code AB
D3	Data compare error, async CLA, odd parity, 1050 baud, 1 stop bit	Same action as for code AB

TABLE 2-1. DIAGNOSTIC TEST RESPONSE CODES (Contd)

Response Code	Meaning	Suggested Action
D4	Data compare error, async CLA, no parity, 1200 baud, 2 stop bits	Same action as code AB
D5	Data compare error, async CLA, even parity, 1600 baud, 1 stop bit	Same action as code AB
D6	Data compare error, async CLA, odd parity 1600 baud, 2 stop bits	Same action as code AB
D7	Data compare error, async CLA, no parity, 2400 baud, 1 stop bit	Same action as code AB
D8	Data compare error, async CLA, even parity, 2400 baud, 2 stop bits	Same action as code AB
D9	Data compare error, async CLA, odd parity, 4800 baud, 1 stop bit	Same action as code AB
DA	Data compare error, async CLA, no parity, 9600 baud, 2 stop bits	Same action as code AB
DB	Data compare error, async CLA, even parity, 9600 baud, 1 stop bit	Same action as code AB
DF	Unsolicited status after LM command to CLA	Bad CLA, type 2561-1. Call CE to replace CLA.

DUMP INTERPRETATION 3

INTRODUCTION

At most times when a halt occurs and at all times when using the on-line diagnostic programs, halt codes and diagnostic test responses are printed at the 2550 console and dump interpretation is not needed. However, 1) if a halt occurs after loading but before completion of initialization, or 2) if the system becomes trapped in a looping condition during initialization (before the CCP 1 header prints), dump interpretation may be necessary to determine which halt has occurred, or in which subroutine of the initiation section the program is looping.

INTERPRETATION INSTRUCTIONS

When interpreting the upline dump printout to determine the cause of a halt or looping condition, first examine the contents of memory location 30_{16} as reflected in the dump printout. If nonzero, a halt has occurred and the halt code value is contained in that location. Refer to that value in table 1-1 and perform the suggested action for that halt.

If memory location 30_{16} equals zero, examine the contents of the NPINTAB entry in the address table which begins at fixed memory address 150_{16}. Table 3-1 lists the contents of the address table. Entry NPINTAB gives the starting address for the NPINTAB table, the format of which is illustrated in figure 3-1. The NPISFL entry in the NPINTAB table contains the flags of the initialization subroutines that have completed running when the looping condition occurred. This information should be given to the system analyst along with the dump printouts.

TABLE 3-1. ADDRESS TABLE CONTENTS

Entry	Meaning
BYWLCB	Worklist control block
JSWLADDR	Worklist entry addresses by LEVELNO
BlTCB	Internal processing terminal control block (TCB)
BlBUFF	Internal processing block pointer
JKMASK	Interrupt masks
JKTMASK	PBAMask save area
CBTIMTBL	Timer table
JACT	PD controller table
BECTLBK	Buffer control block
BEBSA	Buffer stamp area
CLBFSPACE	Total buffer space in number of small buffers
BKPIKT	Point-of-interface (POI) table
JlUERRSTAT	Upline error statistics message routing
JlUSVM	Upline service message routing
JlDSVM	Downline service message routing
NAPORT	Port table
BQCIB	Circular input buffer
NFCCST	CLA command status table
MLSTABLE	CLA current status table
CGLCBS	Line control blocks (LCBs)
CHSUBLCB	Subline control blocks
BJTIPTYPT	Terminal interface program (TIP) type table
NJTECT	Terminal characteristics table
NPINTAB	Initialization sequences completed and errors table

NOTE

Fixed core address table starts at location 150_{16}

Bits	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
WORD 0 (NPSODD)	0	0	0	0	0	0	0	0	X	X	X	X	X	X	X	X
WORD 1 (NPISFL)	B15	0	0	0	0	0	0	0	B7	B6	B5	B4	B3	B2	B1	B0
WORD 2 (NPBMLS)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
WORD 3 (NPBCOS)	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z

NPSODD - Duplicate CLA address, where XX...XX is the duplicated CLA address between 01_{16} and FE_{16}. 00_{16} indicates preset value (no duplicates), and FF_{16} indicates no response.

NPISFL - Initialization completion sequence flags, where B15 and B7 through B0 indicate completion of various tasks as follows:

- B15 - All buffers initialized, system initialization completed
- B7 - Initialize lines completed
- B6 - Initialize MLIA completed
- B5 - Miscellaneous console initialization completed
- B4 - Initialize monitor tables completed
- B3 - Initialize worklist control blocks completed
- B2 - Initialize buffers completed
- B1 - Set up program protect bits completed
- B0 - Initialize multiplexer firmware completed

NPBMLS - Bad MLIA initialization status, where any value for YY...YY other than 0009_{16} indicates bad status. Call CE to run MLIA diagnostics.

NPBCOS - Bad coupler initialization status, where any value for ZZ...ZZ other than 0000_{16} indicates bad status. Call CE to run coupler diagnostics.

Figure 3-1. NPINTAB Table Starting Address Format

DIAGNOSTIC SERVICE MESSAGES TO HOST COMPUTER 4

INTRODUCTION

There are two different types of diagnostic service messages sent to the host computer that are of interest to the CE. These are the CE error messages and the statistics service messages. The host computer operator can supply these messages to the CE. Message interpretation and suggested actions by the CE are described in this section.

CE ERROR MESSAGES

The format for CE error messages is as follows:

0	1	2	3	4	5	6	7	8	9	10	11
DN	SN	00	4	BSN	00	04	00	EC	TEXT		TEXT

where: DN - Destination node (2 hex characters)

SN - Source node (2 hex characters)

BSN - Block sequence number (1 hex character)

EC - CE error code (2 hex characters)

TEXT - Error-code-dependent text (see table 4-1)

Such CE error messages can be divided into seven categories as follows:

1. Modem signal messages (error codes 01, 03, and 0B)
2. CLA messages (error codes 04 thru 0A and 0D thru 10)
3. MLIA messages (error code 11)
4. Coupler messages (error codes 20 thru 2A)
5. Mode 4 TIP messages (error code 12)
6. Real-time clock messages (error codes 7 and 18)
7. Unused codes (error codes 06, 13 thru 17, and 19 thru 1F)

Table 4-2 lists the CE error messages and gives their meaning and the suggested action to be taken by the CE when the message occurs.

NOTE

In table 4-2, all references to the off-line diagnostic refer to diagnostics listed and described in the MSMP Reference Manual. Procedures for running those diagnostics and hints on using them to isolate equipment malfunctions are provided in that manual.

TABLE 4-1. CE ERROR MESSAGE TEXT DEFINITIONS

<table>
<tr><th>Error Codes</th><th>Text Definition</th></tr>
<tr><td>01 thru 10</td><td>
<table><tr><td>P</td><td>SP</td><td>S1</td><td>S2</td></tr></table>
where: P - Port number (CLA address)
SP - Subport number (not used = 00)
S1 - CLA status byte 1 (logical format)
S2 - CLA status byte 2 (logical format)

CLA status byte 1
<table><tr><td>CTS</td><td>DSR</td><td>DCD</td><td>SCDC</td><td>QM</td><td>SQD</td><td>RI</td><td>Spare</td></tr></table>
CLA status byte 2
<table><tr><td>Spare</td><td>Spare</td><td>ILE</td><td>OLE</td><td>DTO</td><td>NCNA</td><td>PES</td><td>FES</td></tr></table>
where: CTS - Clear to send
DSR - Data Set ready
DCD - Data carrier detect
SDCD - Secondary data carrier detect
QM - Quality monitor
SQD - Signal quality detector
RI - Ring indicator
ILE - Input loop error
OLE - Output loop error
DTO - Data transfer overrun
NCNA - Next character not available
PES - Parity error status
FES - Framing error status
</td></tr>
<tr><td>11</td><td>
<table><tr><td>ET</td><td>LE</td><td>LD</td><td>AL</td></tr></table>
where: ET - Error type (01 = Error counts given
02 = MLIA failure)
LE - Input loop error count
LD - Lost data count
AL - Alarm count
} only listed if ET = 01
</td></tr>
<tr><td>12</td><td>
<table><tr><td>P</td><td>SP</td><td>00</td><td>RB</td><td>CA</td><td>TA</td></tr></table>
where: P - Port number
SP - Subport number
} Line number
RB - Reason for break as follows:
01 = No response from terminal, counter overflowed
02 = Bad response from terminal, counter overflowed
03 = Error response from terminal, counter overflowed
CA - Cluster address
TA - Terminal address
</td></tr>
</table>

TABLE 4-1. CE ERROR MESSAGE TEXT DEFINITIONS (Contd)

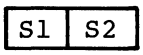
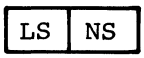
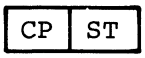
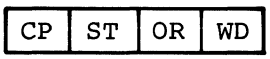
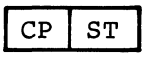
Error Codes	Text Definition
18	 where: S1 and S2 - Real-time clock status as follows: Bit 15 14 0  Bit 14 = Count limit interrupt Bit 15 = Lost count interrupt
20	 where: LS - Last state NS - Next state
21 thru 24	 where: CP and ST - Coupler status word
25	 where: CP and ST - Coupler status word OR and WD - Orderword received
27 thru 2A	 where: CP and ST - Coupler status word

TABLE 4-2. CE ERROR MESSAGE CODES

Error Code	Generated by	Description	Suggested Action
01	CLA Status Handler	Disconnect of switched line	Not actually an error message. Occurs during normal traffic handling when dial-up connection is terminated. Provides printed record of dial-up activity on line.
02	CLA Status Handler	Abnormal operation of data set ready (DSR) or clear to send (CTS)	Use on-line diagnostic to isolate problem on the line, as described in section 5.
03	CLA Status Handler	Abnormal operation of data carrier detect (DCD) caused by 10-second timeout of DCD or DCD going off in middle of input	Indicates noise on transmission line. If too frequent, run on-line diagnostics and isolate problem on the line, as described in section 5.
04	Worklist Processor	Unsolicited output data demand (ODD) detected caused by duplicate CLA address or bad CLA	Check for duplicate CLA addresses. If none, run off-line multiplexer subsystem diagnostics. If no errors, run off-line memory, firmware, and coupler diagnostics. If hardware checks good, call system analyst.
05	Worklist Processor	CLA address out of range	Check for CLA address greater than maximum configured. If none beyond limit, check for CLA with bad address switch, or switch set between two numbers (causes F_{16}).
06	Worklist Processor	Illegal loop cell format; caused by MLIA or loop mux problems	If error occurs more than three times in half-hour, run off-line multiplexer subsystem diagnostics to isolate cause of problem.
07	Worklist Processor	Unsolicited input; caused by duplicated CLA addresses or bad CLA	Same action as for error code 04
08	CLA Status Handler	Input loop error, caused by noise on multiplexer loop	If error occurs more than three times in half-hour on the same line number, run on-line diagnostics on CLA specified by line number. If message occurs on more than one line number, run off-line diagnostics on mux subsystem.

TABLE 4-2. CE ERROR MESSAGE CODES (Contd)

Error Code	Generated by	Description	Suggested Action
09	CLA Status Handler	Output loop error, caused by noise on multiplexer loop	Same action as for error code 08
0A	PTTER (TIP event receiver)	Output data demand (ODD) timeout during output message transmission; can be caused by bad CLA or drop of CTS status	If error occurs more than three times in half-hour, run on-line diagnostics on CLA specified by line number in message, and isolate problem as described in section 5.
0B	PTTER (TIP event receiver)	Modem timeout, caused by DCD missing for too long	Same action as for error code 0A
0C	---	Not a valid error code	Call system analyst.
0D	CLA Status Handler	CLA status overflow; caused by more than 128 status messages received from CLA within half-second	Run on-line diagnostics on CLA specified by line number in message.
0E	CLA Status Handler	Framing error, caused by asynchronous CLA (type 2561-1) detecting missing stop bit on character	Same action as for error code 0A
0F	CLA Status Handler	Next character not available, caused by synchronous CLA (type 2560-1, 2, or 3) not having next character for output in time to keep output data stream in sync; could also be result of lost ODD or CLA plugged into low priority card slot	If error occurs more than three times in half-hour, run on-line diagnostics on CLA specified by line number in message. If CLA checks good, call system analyst and check CLA priority placement. Each loop multiplexer (LM) card cage is organized so leftmost card slot has highest priority, and each succeeding slot to right has lower priority than neighbor to left. On CLA card, CLA1 has higher priority than CLA2. If system has more than one LM, LM with highest priority has its upper cable connected to MLIA. LMs are connected serially; i.e., lower cable on LM with highest priority is connected to LM with next lower priority, etc.

TABLE 4-2. CE ERROR MESSAGE CODES (Contd)

Error Code	Generated by	Description	Suggested Action
10	CLA Status Handler	Data transfer overrun, caused by CLA receiving second character before loop mux has taken first character; may be either overloaded system or bad CLA	Same action as for error code 0F
11	MLIA Interrupt Handler	MLIA error status; may be caused by faulty MLIA, loop cables, or loop multiplexers	If error occurs more than three times in half-hour, run off-line diagnostics on multiplexer subsystem.
12	Mode 4 TIP	Upline break from overflowed error counter, caused by overflow of no response, bad response, or error response counter for terminal	If error occurs more than three times in half-hour for same terminal, probably indicates bad terminal or remote modem; call terminal customer and request repair at that end; or if most terminals on line show problem, isolate problem as described in section 5.
13 thru 17	---	Not valid error codes	Call system analyst.
18	Clock Interrupt Handler	Real-time clock has lost count, caused either by bad real-time clock or multiplex system firmware required more than 3.3 milliseconds to run	Hardware problem. Run quick-look section of off-line diagnostics and firmware diagnostic. If firmware checks good but quick-look shows problem, real-time clock hardware on TTY I/O card is bad. If firmware checks bad, replace card containing firmware ROMs and retest.
19 thru 1F	---	Not valid error codes	Call system analyst.
20	Host Interface Package (HIP)	Deadman timeout, caused by host not responding to activity in 2550 for approx. 20 seconds; indicates host is down or not responding due to lack of available PPU	None

TABLE 4-2. CE ERROR MESSAGE CODES (Contd)

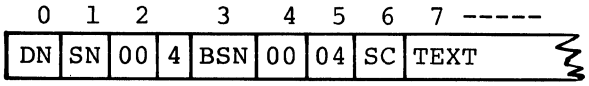
Error Code	Generated by	Description	Suggested Action
21	Host Interface Package (HIP)	Spurious interrupt, caused by unexpected coupler status	If error occurs more than three times in half-hour, run off-line diagnostics on coupler.
22	Host Interface Package (HIP)	Chain address zero, caused by 2550 buffer chaining addressing error	Same action as for error code 21
23	Host Interface Package (HIP)	Hardware timeout on input, caused when transmission-complete interrupt does not occur within reasonable time	Same action as for error code 21
24	Host Interface Package (HIP)	Input data transfer terminated by PPU; host terminated transfer for reasons known only to host	Same action as for error code 21
25	Host Interface Package (HIP)	Illegal orderword, caused by coupler protocol error	Same action as for error code 21
26	---	Not a valid error code	Call system analyst.
27	Host Interface Package (HIP)	Output data transfer terminated by PPU; host terminated transfer for reasons known only to host	Same action as for error code 21
28	Host Interface Package (HIP)	Hardware timeout on output, caused by transmission complete not occurring within reasonable time	Same action as for error code 21
29	Host Interface Package (HIP)	End-of-operation (EOP) missing, usually caused by timing problem	Same action as for error code 21

TABLE 4-2. CE ERROR MESSAGE CODES (Contd)

Error Code	Generated by	Description	Suggested Action
2A	Host Interface Package (HIP)	Unexpected coupler status	Same action as for error code 21
2B and up	---	Not valid error codes	Call system analyst.

STATISTICS SERVICE MESSAGES

Three types of statistics service messages are supplied by the 2550 to the host. They include those that provide network processing unit (NPU) statistics, line statistics, and Mode 4 terminal statistics. The format for the statistics service message is as follows:



where:
- DN - Destination node (2 hex characters)
- SN - Source node (2 hex characters)
- BSN - Block sequence number (1 hex character)
- SC - Service code (2 hex characters) as follows:
  - 01 - NPU statistics
  - 02 - Line statistics
  - 03 - Mode 4 terminal statistics
- TEXT - Service-code-dependent text (see table 4-3)

TABLE 4-3. SERVICE CODE MESSAGE TEXT DEFINITIONS

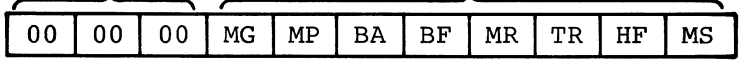
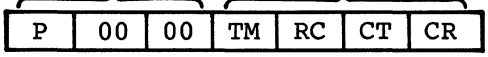
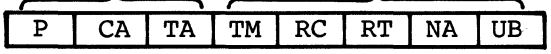
Service Code	Text Definition
01	NPU service message format as follows:  where: MG - Count of upline service messages generated MP - Count of downline service messages processed BA - Count of blocks discarded due to bad network addresses BF - Count of blocks discarded due to bad format MR - Count of times Mode 4 input regulation started; increased first time any Mode 4 terminal finds low threshold of buffers TR - Count of times teletype input regulation started; incremented when teletype TIP finds low threshold of buffers HF - Count of host failures; incremented when HIP detects host not responding MS - Count of service messages received out of sequence; indicates illogical operation such as trying to enable line already enabled, or disable line already disabled

TABLE 4-3. SERVICE CODE MESSAGE TEXT DEFINITIONS (Contd)

Service Code	Text Definition
02	Line statistics service message format as follows: 1 byte each — 2 bytes each  where: P - Port number TM - Count of blocks transmitted from terminal to host RC - Count of blocks received from host to terminal CT - Count of characters transmitted (good blocks only) CR - Count of characters received (good blocks only)
03	Mode 4 terminal statistics service message format as follows: 1 byte each — 2 bytes each  where: P - Port number CA - Controller address } Mode 4 terminal address TA - Terminal address } TM - Count of blocks transmitted from terminal to host (not including blocks retransmitted); count updated upon reception of ACK RC - Count of blocks received from host to terminal (not including blocks with errors) RT - Count of blocks retransmitted; updated on each retransmission try NA - Count of blocks received but not accepted because of errors; updated on each entry UB - Upline break because of errors, without batch interrupt; customer parameter, presently set for 10

COMMUNICATIONS LINE FAULT ISOLATION 5

INTRODUCTION

The on-line diagnostic test programs can be used to isolate suspected faulty communications line problems to a particular piece of equipment. Three basic program modes are available within the on-line diagnostic terminal interface program (TIP) to accomplish this testing.

Two of the available test modes (CLA internal-loopback mode and CLA external-data-loopback mode), used after CLA operation is verified by the CLA modes, test the local and remote modems and the transmission line facilities. The external-data-loopback mode includes analog and digital loopback tests, remote tests, self-tests, and transceiver analog loopback tests.

CLA INTERNAL AND EXTERNAL LOOPBACK TEST MODES

In the CLA-internal loopback test mode, all CLA logic, except the modem signal drivers and receivers, are tested.

The CLA external loopback mode can be used only with CLA types 2560-1 and 2561-1. CLA type 2560-1 uses external test connector type 74715000 and CLA type 2561-1 uses external connector type 74715600. These connectors are installed at the CLA in place of the normal connector to the local modem.

EXTERNAL DATA LOOPBACK MODE

The external-data-loopback mode is used after CLA operation is verified by running the CLA internal and external-loopback mode tests.

INFORMATION REQUIRED

Before running the external-data loopback tests, the following information must be known:

1. The type of modem or Data Set (Bell 208A, Bell 207C, CDC 358-2, etc.) used on the line or lines to be tested.

2. The test modes (analog loopback, digital loopback, self-test, etc.) available for use with the modem or modems to be tested. See the applicable modem manual or Bell Telephone Data Set specifications for this information and/or step-by-step instructions for testing. Table 5-1 also lists some of the more common modems and the test modes available for each.

3. The type of service (dial-up or dedicated). Dedicated lines have more loopback points than do dial-dial-up lines.

4. The type of line operation used (simplex, half-duplex, or full-duplex). Simplex lines cannot be looped back past the analog loopback of the local modem. Half-duplex lines echo back transmitted data to the received data line at the modem interface. Full-duplex lines handle all types of loopback points.

After obtaining the foregoing information, use figure 5-1 to select a loopback test from the available loopback points illustrated. The suggested sequence of the tests is described in subsequent paragraphs. This sequence should be adapted for the particular configuration to be tested.

TABLE 5-1. COMMON MODEMS AND LOOPBACK TESTS AVAILABLE

Modem Type	Loopback Tests Available
Bell 103-non A	Remote test
Bell 103A	Analog test, remote test
Bell 113A	Remote test
Bell 201A	Remote test
Bell 201B	Remote test
Bell 201C	Analog test, digital test, self-test
Bell 202-non S,T	Remote test
Bell 202S	Analog test, remote test
Bell 202T	Analog test, remote test
Bell 208A	Analog test, digital test, self-test
Bell 208B	Analog test, self-test
CDC 358-2	Transceiver analog loopback test

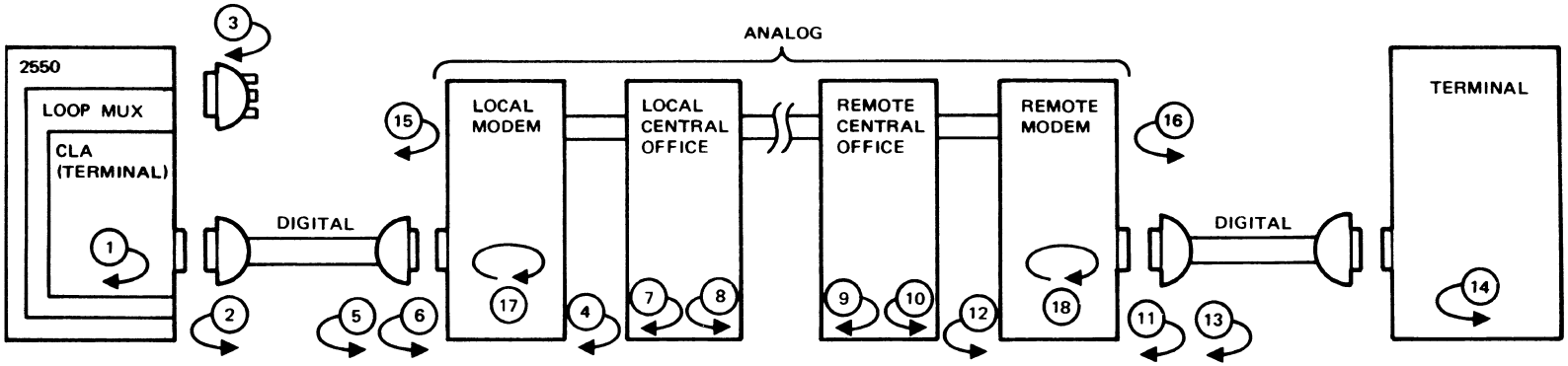
Analog Test -- Local Modem looped back toward local terminal (the CLA is considered to be a terminal to the modem).

Remote Test - Modem looped back toward telephone lines for testing of the modem and telephone lines by the telephone company (only used when requested by telephone company maintenance personnel).

Digital Test - Depressed on remote modem for digital looping back a remote modem toward telephone lines to test telephone lines and remote modem locally.

Self-Test - Built-in test generator and comparator.

Transceiver Analog Loopback - Analog loopback toward local terminal by connecting transmit data back to receive data on the analog terminal block with a jumper wire.



(1) WITH CLA IN INTERNAL LOOPBACK TEST MODE (LIT ON).

(2) FOR CLA TYPE 2561-1, CAN SET ECHOPLEX MODE (ECHO ON) AND RECEIVE DATA IS LOOPED BACK TO TRANSMIT DATA SO THAT DATA RECEIVED FROM TERMINAL IS SENT BACK TO TERMINAL (WHERE APPLICABLE).

(3) USING EXTERNAL LOOPBACK CONNECTOR TYPE 74715000 AT RS-232 CONNECTOR ON CLA.

(4) & (12) ANALOG LOOPBACK TEST MODE SWITCH ON MODEM CAUSES ANALOG LOOPBACK TOWARD TERMINAL (CLA ACTS AS TERMINAL).

(5) & (11) DIGITAL LOOPBACK TEST MODE SWITCH ON MODEM CAUSES DIGITAL LOOPBACK TOWARD TELEPHONE LINES.

(6) & (13) REMOTE TEST MODE SWITCH ON TELEPHONE DATA SETS (MODEMS) CAUSES SPECIAL LOOPBACK TOWARD TELEPHONE LINES FOR TELEPHONE COMPANY TESTING ONLY.

(7) THRU (10) ANALOG LOOPBACK ON TELEPHONE TEST PANEL TOWARD EITHER TERMINAL (BY SPECIAL ARRANGEMENT WITH TELEPHONE COMPANY).

(14) LOCAL MODE SWITCH ON TERMINAL CAUSES LOCAL TESTING OF THE TERMINAL.

(15) & (16) HALF-DUPLEX LINE LOOPS TRANSMIT DATA BACK TO RECEIVE DATA AT MODEM INTERFACE.

(17) & (18) SELF-TEST MODE SWITCH ON MODEM CAUSES WORD GENERATOR AND WORD COMPARATOR BUILT INTO MODEM TO TEST MODEM LOGIC. REFER TO REFERENCE MANUAL FOR MODEM OR DATA SET TYPE.

Figure 5-1. Loopback Points for Test Selection

EXTERNAL DATA LOOPBACK TESTS

The external data loopback mode includes analog and digital loopback tests, remote tests, self-tests, and transceiver analog loopback tests. Refer to table 5-1 for the test mode or modes that apply to each of the common types of modems or data sets.

In the analog loopback test, activated by the analog loopback test mode switch on the modem, either the local or remote modem can be caused to loop analog data back toward the terminal (with the CLA acting as a terminal). The digital loopback test is activated by the digital loopback test switch on the modem, and loops digital data from the modem back toward the communications lines (local or remote central office).

The remote test mode is used only when requested by the telephone company maintenance personnel for telephone company testing of the modem and telephone lines.

If the modem being tested includes word generator and word comparator facilities, activating the self-test mode switch at the modem enables the modem to test its own logic. Additionally, for the CDC type 358-2 modem, the transceiver analog loopback test mode connects transmit data by jumper wire back to the receive data side of the modem.

SUGGESTED LOOPBACK TEST SEQUENCE

When a communications line failure is suspected, run the following tests in the sequence indicated to isolate the problem to a particular piece of equipment or section of the transmission line or system cabling. If any test fails, report the test indications to a Customer Engineer (CE) so that the trouble may be corrected.

1. Execute the CLA internal loopback test to test all CLA logic except the modem signal drivers and receivers.

   a. If the test fails, it indicates that the CLA is faulty. Have CE replace CLA.

   b. If the test does not fail, proceed to the next step.

2. If the CLA is type 2560-1, install external test connector type 74715000; and if type 2561-1, install external test connector type 74715600. Execute the CLA external loopback test to test all logic of the CLA, including the modem signal drivers and receivers.

   a. If the test fails, it indicates that the CLA modem signal drivers or receivers are faulty. Have CE replace CLA.

   b. If the test does not fail, proceed to the next step.

3. With the analog test button on the local modem depressed, execute the external data loopback test. This tests the data transmission capability to the local modem and the CLA-to-local modem cable.

   a. If the test fails, either the local modem or the CLA-to-local modem cable is faulty. Proceed to step 6.

   b. If the test does not fail, proceed to the next step.

4. Release the analog test button on the local modem, and arrange to have the digital test button on the remote modem depressed (by telephoning remote terminal end of line, i.e., the customer). Again run the external data loopback test. This tests the transmission line and remote modem.

a. If the test fails, either the transmission line or remote modem is faulty. Proceed to step 8.

b. If the test does not fail, proceed to the next step.

5. Arrange to have the digital test button on the remote modem released. If no errors were detected in steps 1 through 4, the CLA, modems, and transmission line may be assumed to be working properly. Test the remote terminal and the remote terminal-to-remote modem cable using any available diagnostics. See steps 10 through 12.

6. Enter this step from step 4. Release the analog test button on the local modem. If the local modem has an analog loopback self-test mode (such as Bell 208A modem), run that test as described in the modem manual.

   a. If the test fails, the local modem is bad. Call CE to replace the local modem.

   b. If the test does not fail, or if the modem does not have a self-test mode, proceed to the next step.

7. Have CE replace the CLA-to-local modem cable, and, with the analog test button on the local modem depressed, execute the external data loopback test.

   a. If the test fails and the modem is a telephone company modem without the self-test mode, read appendixes B, C, and D before calling the telephone company repair service and requesting assistance to test the modem and telephone line. Follow telephone company directions to test the modem and line.

   b. If the test does not fail, the trouble was in the CLA-to-local modem cable and has been corrected.

8. Enter this step from step 4 or step 5. If the remote modem has an analog loopback self-test mode, run that test as described in the modem manual.

   a. If the test fails, the remote modem is bad. Call CE to replace the remote modem.

   b. If the test does not fail or if the modem does not have a self-test mode, proceed to the next step.

9. If the modem is a telephone company modem without self-test mode, read appendixes B, C, and D before calling the telephone company repair service and requesting assistance to test the modem and telephone line. Follow the telephone company directions to test the modem and line.

   a. If the test fails, call CE to replace the indicated faulty equipment.

   b. If the test does not fail or the modem is not a telephone company modem, proceed to the next step.

10. If the local and remote modems both tested good, but step 4 continues to fail, a transmission line problem is indicated. Request the telephone company to loop back the telephone line at the voice frequency test panel (in the local central office), which returns the signal toward the CLA. Execute the external data loopback test to verify that the telephone line is working properly to the local central office.

a. If this test fails, the telephone line between local modem and local central office is bad. Have telephone company check that line.

b. If this test does not fail, proceed to next step.

11. Request the telephone company to loop back the telephone line at the voice frequency test panel in the remote central office and again run the external data loopback test.

a. If this test fails, have the telephone company check the telephone line.

b. If this test does not fail, proceed to next step.

12. If the remote terminal is capable of self-test, or, if the remote terminal can send messages that the terminal can copy on a looped-back line, have the user perform that test. This test indicates a fault in the remote terminal. Request user's maintenance personnel to replace or repair the terminal.

APPENDIX A
SYSTEM MESSAGES

Message	Significance
NO PRINTED MESSAGE	System did not complete load and initialization. Indicates either: a. Initialization halt. Check location 30_{16} and, if non-zero, interpret halt code according to table 1-1 of this manual. If zero, program did not halt. b. Program is looping in an initialization routine. Look up NPINTAB entry in address table (see Interpretation Instructions paragraph, section 3) to obtain address of NPINTAB table. Examine second entry of NPINTAB table to determine where program is looping.
C C P 1.0 HOST ID: 00 NPU ID: 01	Message indicating load and initialization has ended.
*HALT XXXX YYYY	An irrecoverable error has caused 2550 to halt. XXXX will be the return address of the program requesting the halt. YYYY will be the halt code specifying the type of error causing halt (see table 1-1 of this manual).

APPENDIX B
TELEPHONE COMPANY ASSISTANCE

If Bell System Data Sets (modems) are used, the telephone company assumes responsibility for finding and clearing trouble conditions for the overall data service between the interfaces of the data sets.

If customer-owned and maintained data sets are used, the telephone company will test the transmission characteristics of the channel. However, they will not provide guidance or assume responsibility for locating the overall system difficulty. The telephone company will not demodulate a customer signal or provide a compatible Data Set to test with customer-owned equipment. The telephone company does not guarantee the recommendations of an outside supplier of data modems, or advise whether the modems can perform satisfactorily over the channel, or if the data transmission system is compatible.

If customer-owned and maintained Data Sets are used and a trouble report is given to the telephone company indicating problems in the telephone line, the telephone company action is limited to testing and restoring the telephone line to prescribed parameters. If no problem is found in the telephone lines, the customer is billed for the service call.

By telephoning either the local or remote central office of the telephone company, a private dedicated telephone line can be arranged to be looped-back in either direction (toward the 2550 or toward the remote terminal). On voice-grade, interfaced lines, this is done on the voice-frequency AC test board. On loop current interfaced lines, this is done on the local loop DC test board. In this case, the customer should be advised that the telephone company may require more than 30 minutes to complete such a loopback connection.

APPENDIX C
EVERYTHING YOU'VE ALWAYS WANTED TO KNOW ABOUT THE TELEPHONE COMPANY

"Telephone Company" is a general term used when discussing communications common carriers. The business of a telephone company is to supply communications facilities to the general public. Since these companies serve the public, they must comply with regulations set up by the Federal Communications Commission (FCC) at the Federal level and many state regulatory agencies. These agencies regulate the companies by setting rates which may be charged and generally regulating all phases of their business.

There are many telephone companies in the United States. By far the largest is the Bell System companies operated by American Telephone and Telegraph Company (AT&T) and its subsidiaries. The Bell System is a system of local companies (Northwestern Bell, Mountain Bell, etc.) which serves the various geographic areas. The U.S. is also broken into geographic areas known as "Long Lines" areas. "Long Lines" is a division of AT&T which provides interstate service between territories of the various associated companies and the many independent companies in the U.S. Therefore, if your line goes interstate or connects to an independent company, long-lines has responsibility for that line in the Bell System.

The independent phone companies noted above consist of some 2550 companies owned and operated outside of the Bell System. These companies all connect to the Bell System giving the capability to communicate with anyone on the Bell System or with other independents. It might be noted here that Bell has more experience with data lines than many of the independents. Therefore, problem solving with the independents will require patience and perseverance.

APPENDIX D
DATA LINE PROBLEM SOLVING

CIRCUIT NUMBER

This number identifies the line to the telephone company and should be kept at some location (besides the site log) where it is readily accessible. A good place is the demarcation strip.† Placement of the number on the modem is not recommended because it would be removed if the data set is replaced.

STRAPPING OPTIONS

If your data set becomes inoperable and has to be replaced, the replacement may not have the correct strapping options. Therefore, you should keep a list of strapping options for future reference. This list should be kept in the site log and a copy in the terminal cabinet if convenient.

When a problem develops on your data line, there is certain information that is necessary to help isolate the problem. Therefore, you should take time to find and record this information so that it is readily available when a problem arises.

Information required when requesting help from the telephone company:

LINE TYPE

a. Dedicated (sometimes called "private" or "leased line")

b. Dial-up

EMERGENCY SERVICE PHONE NUMBER

An "emergency service" phone number should be available on your modem or near the demarcation strip.† If a number is not posted there, it will have to be obtained from your local sales representative. This number should be obtained and kept handy. This number will put you in contact with the "Private Line Service Board." For "Long Lines," this board is manned 24 hours a day, 7 days a week.

Now that you have all the necessary information, you can start checking your phone line problem.

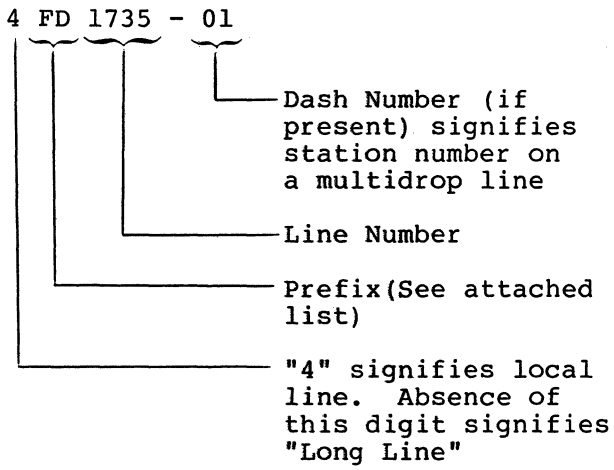
If your phone line is a dial-up line, you can try hanging up and dialing again. This may give you a different line of better quality. If re-dialing does not solve your problem, or if re-dialing is necessary too often, your customer may have to work with his account representative to resolve the problem.

Dedicated lines present unique problems which may prove difficult to define and correct. After you are reasonably sure that the problem is in the phone line, you should proceed as follows:

1. Call the "emergency service" number.

2. Identify yourself and your line number. A typical line number would be:

† A demarcation strip is the point at which the telephone line terminates. This point is then connected to the modem.



The test board man will then check your line to see if it is properly terminated. If the problem cannot be resolved by talking to the test board man, it is advisable to call Regional Tech Support. They will have the test equipment and experience necessary to check further into the problem.

APPENDIX E
GLOSSARY

Term	Meaning
BSN	Block Serial Number
CCP	Communications Control Program
CE	Customer Engineer - system maintenance and repairman
CLA	Communications Line Adapter
CN	Connection Number
Data Set	Telephone company equivalent of modem
DN	Destination Node
Dump	Printout of 2550 HCP main memory, micro-memory, and file register contents
HCP	2550 Host Communications Processor
Hex	Hexadecimal (base 16) notation
HIP	Host Interface Program
Host	CDC 6000/CYBER 70/170 Computer for which the 2550 HCP acts as a front-end
MLIA	Multiplex Loop Interface Adapter
Modem	Modulator-demodulator equipment used to send digital information over telephone lines
Mux	Multiplexer
POI	Point of Interface
P	Port - Physical CLA Slot
RC	Response Code
SN	Source Node
SP	Subport (N/A on this system)
TIP	Terminal Interface Program

COMMENT SHEET

MANUAL TITLE Communications Control Program Version 1
— Software Diagnostic Handbook

PUBLICATION NO. 60470200 REVISION B

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BUSINESS ADDRESS: _____

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