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3272 Control Unit Models 1 and 2 Troubleshooting Guide

SY27-2312-2

Preface

The IBM 3270 Information Display System consists of control units, display stations, printers, and optional feature devices. This manual contains all the information required to maintain the IBM 3272 Control Unit. The purpose of this manual is to present maintenance and repair information rather than theory of operation information.

This manual is organized into seven sections and an appendix. Section 1 contains maintenance approach material. Section 2 contains manual test operating procedures. Section 3 contains Switch Indicator Unit (SIU) diagrams that provide procedures to exercise the control unit offline; these procedures also reference diagrams in Section 4. Section 4 contains troubleshooting diagrams. Section 5 contains all power supply maintenance information.

Sections 2, 3, 4, and 5 contain all diagnostic procedures and repair information necessary to correct a control unit malfunction. Instructions for installing the control unit are presented in Section 6. Miscellaneous reference data is included in Section 7. Appendix A contains SIU troubleshooting procedures.

Due to the nature of this manual, no index is necessary. The Contents table will serve the same purpose.

To successfully use this manual to repair IBM 3272 control units, maintenance personnel should have a level of training equivalent to basic System I/O schooling. Because the control unit attaches to IBM 3277 display stations and IBM 3284, 3286, and 3288 printers, an understanding of all devices is also helpful.

The titles and form numbers of the device Troubleshooting Guides are listed below under "Companion Manuals". These Troubleshooting Guides contain a glossary of terms that are applicable to display stations and printers.

Companion Manuals:

3277 Display Station, Models 1 and 2	SY27-2314
3284 Printer, Models 1 and 2; 3286 Printer, Models 1 and 2	SY27-2315
3288 Line Printer, Model 2	SY27-2401

The following publications may also prove useful:

IBM 3270 Component Description	GA27-2749
Operators Guide for IBM 3270 Information Display Systems	GA27-2742

Third Edition (May 1976)

This is a major revision of and obsoletes SY27-2312-1. The Katakana feature has been added to this manual, obsoleting SY27-2338. Because of the many minor technical and editorial changes, revision bars have not been used. This manual supports units up to EC level 741779.

Information in this manual is subject to change from time to time. Any such change will be reported in subsequent Technical Newsletters.

Text for this manual has been prepared with the IBM SELECTRIC ® Composer.

A form is provided at the back of this publication for reader's comments. If the form has been removed, comments may be addressed to: IBM System Communications Division, Product Publications, Dept. 52L, Neighborhood Road, Kingston, N.Y., 12401

Abbreviations

ADR	address
ADR I	address in
ADR OUT	address out
AFT	after
AID	attention identifier
ALD	automated logic diagrams
APL	A Programming Language
ASM	assembly
ATTN	attention
BAC	buffer address counter
BFR	buffer
BFR ADR VAL	buffer address valid
BFR VAL	buffer valid
BO	bus out
BOC	bus out check
BSC	binary synchronous communications
BTAM	Basic Telecommunication Access Method
C	capacitor
CE	channel end
CE REM	channel end remember
CH	channel
CH REQ	channel request
CHAR	character
CHG	change
CHG SEQ	change sequence
CHK	check
CMD	command
CMD OUT	command out
CMD REJ	command reject
CMD ST	command stored
CONN	connector
CPU	central processing system
CSR	cursor
CTL CHK	control check
CTR	counter
CTRL	control
CU	control unit
CUE	control unit end
DC	device control
DCD	diagnostic control data
DE	device end
DEV	device
DOS	disk operating system
DS	indicator (or lamp)
DSBL	disable
DUP	duplicate
DVC	device
E	edge connector
EAU	erase all unprotected
EBCDIC	extended binary-coded-decimal interchange code
EC	engineering change
EM	end of message
ENBL	enable
EPO	emergency power-off
EQ CHK	equipment check
ERLY	early
EUA	erase unprotected to address
E/Wrt	erase/write
F	fuse
FET	field effect transistor
FL	line filter
FM	field mark
FTCH	fetch
GND	ground
Hex	hexadecimal
HI	high
HT	horizontal tab
IC	insert cursor
IF	interface
IFS	interchange field separator
IGS	interchange group separator
IND	indicator
INHT	inhibit
INTF	interface
INV	intervention
INV RQD	intervention required
I/O	input/output
IO REG LDD	input/output register loaded
IRS	interchange record separator
ITB	end of intermediate transmission block
IUS	interchange unit separator
J	jack
K	contactor
KB	keyboard
LDD	loaded
LO	low
LOC	local
MDT	modified data tag
MOD	modified
MLPXR	multiplexer
NL	new line
NO OP	no operation
NUL	null
O	out
OP	operation, operational
OP CHK	operation check
OP I	operational in
OP OUT	operational out
OP/XFR FINISH	operation transfer finished
OS	operating system
PC	printed circuit
PF	program function
POR	power on reset
PRI	priority
PRI CTR LDD	priority counter loaded
PT	program tab
RA	repeat to address
RD	read
RD BFR	read buffer
RD MOD	read modify
REF	reference
REG	register
REJ	reject
REM	remember, remote
REQ	request
REQ I	request in
RFT	request for test
RQD	required
RST	reset
SA	sound alarm
SBA	set buffer address
SDR	statistical data recording
SEL	select
SEL O	select out
SEQ	sequence
SERV	service
SERV I	service in
SERV OUT	service out
SERV SEQ	service sequence
SF	start field
SIU	switch indicator unit
SLT	solid logic technology
SM	status modifier
SOH	start of heading
SP	start printer
SPY	specify
SR	shift register
STA	status
STA ERLY	status early
STA I	status in
STA REQ	status request
STD	stored
STX	start of text
SUPR	suppress
SUPR OUT	suppress out
SW	switch
T	transformer
TB	terminal board
TI/O	test input/output
UC	unit check
UEX	unit exception
UNIT SPY	unit specify
VAL	valid
WCC	write control character
WR, WRT	write
XFR	transfer

Contents

Contents (Cont)

Section 1. Maintenance Approach

1.1 INTRODUCTION

This manual contains maintenance and installation information for the 3272 Model 1 and Model 2 Control Units used in the 3270 Information Display System. Model 1 has 480-character capacity and Model 2 has 1920-character capacity. The manual guides the Customer Engineer in isolating and replacing faulty control unit (CU) circuit cards and power supply subassemblies (called field replaceable units, FRU). The FRU maintenance approach is feasible because functionally packaged logic and densely packed components are used throughout the CU.

Maintenance begins when the customer gathers as much information as possible about a problem and reports the problem to the Customer Engineer. This information is evaluated to determine the best maintenance approach. Other symptoms that the Customer Engineer observes are considered when determining the best approach to the problem.

The first consideration is to determine that the trouble is in the CU rather than in another unit of the display system. The failure is isolated to the control unit or the controlling CPU system when several devices exhibit similar failure symptoms. If only one device fails, the trouble is likely in that device.

1.2 CONTROL UNIT TROUBLE ANALYSIS AIDS

CU maintenance and testing can be performed online using Online Test (OLT) diagnostic programs and offline using the Switch/Indicator Unit (SIU) to simulate attachment of the CU to a channel.

Aids provided in this manual to isolate or correct the cause of CU failure are: maintenance approach flowchart; reference data; SIU diagrams; troubleshooting diagrams; and check and adjustment procedures. Maintenance Program documentation is also provided in the program package.

1.2.1 Maintenance Approach Flowchart

Diagram 1-100 describes the procedure to be followed when analyzing a control unit problem.

1.2.2 Symptom Index

Diagram 1-101 provides a list of trouble symptoms and a specific procedure for each symptom.

1.2.3 Diagnostic Programs

Diagnostic programs perform the following functions:
1. Identify suspected failing logic FRUs.
2. Functionally test all units of the 3270 system.
3. Provide test patterns for adjusting display units.

Diagrams 7-128 and 7-129 describe the diagnostic program routines.

1.2.4 Manual Test Operating Procedures

Section 2 provides manual test procedures which may be used to check for improper operation of the control unit or attached devices.

1.2.5 Switch/Indicator Unit (SIU) Diagrams

The SIU is a portable testing device attached by cables to a CU in offline mode. It should be checked for proper operation prior to its use in troubleshooting (refer to paragraph 7.7.3). The SIU allows the Customer Engineer to manually exercise the CU circuitry. Indicators display normal operational and error conditions at each step of a command operation. The SIU diagrams (Section 3) list sequentially the manual switch settings required to perform each command and show corresponding indicator status associated with each switch setting. SIU diagrams are used as directed by the Maintenance Approach Flowchart (Diagram 1-100) to produce a failure. While performing a command, if the correct indicators are not displayed, the diagram refers the Customer Engineer to one or more troubleshooting diagrams (Section 4). All references (provided in two columns) must be considered for failure analysis.

1.2.6 Troubleshooting Flowcharts

The Customer Engineer may be referenced to troubleshooting flowcharts (Section 4) from the Maintenance Approach Flowchart (Diagram 1-100) or from the SIU diagrams (Section 3) to locate a failing logic card.

1.2.7 Power Supply Maintenance

Section 5 provides information to aid in diagnosis and repair of power supply problems.

1.2.8 Reference Information

Component location drawings, coding charts, and miscellaneous reference information are provided in Section 7.

1.3 INSTALLATION PROCEDURE

The CU installation procedure is given in Section 6. If a CU is moved to a new location, the information in Section 6 will aid in packaging and relocation.

1.4 SPECIAL TOOLS

In addition to the Customer Engineer tool kit, the following equipment is required:
1. Logic Probe, PN 453652. (See Section 7 for a description of the probe.)
2. Switch/Indicator Unit, PN 2570250. (See Section 7 for description, use, and checkout procedure for the SIU.)
3. Coax cable, 6 ft, PN 2621412.
4. Switch/Indicator Unit overlays, PN 2621301, 2621408.

- SIU overlay "3272 MLPXR CTRLS/ LOCAL INTERFACE BUS & TAG" provides indication necessary while performing command test procedures. Status and sense information (connector A1Y3) needs to be observed only if an error is detected in manual test procedures. "3272 MLPXR CTRLS/IO REG & SHIFT REG" overlay is used as directed.
- Initial selection is the same for all commands up to rise of command out.
- Observe indicators very closely the first time a command is executed. Following times do not require close observation of indicators except when a different operation is introduced or an error occurs.
- Always troubleshoot the first indication of an error to prevent following the effect rather than the cause.

Note: Press the reset button once for every device attached if the 3272 or a device has gone from power off to power on.

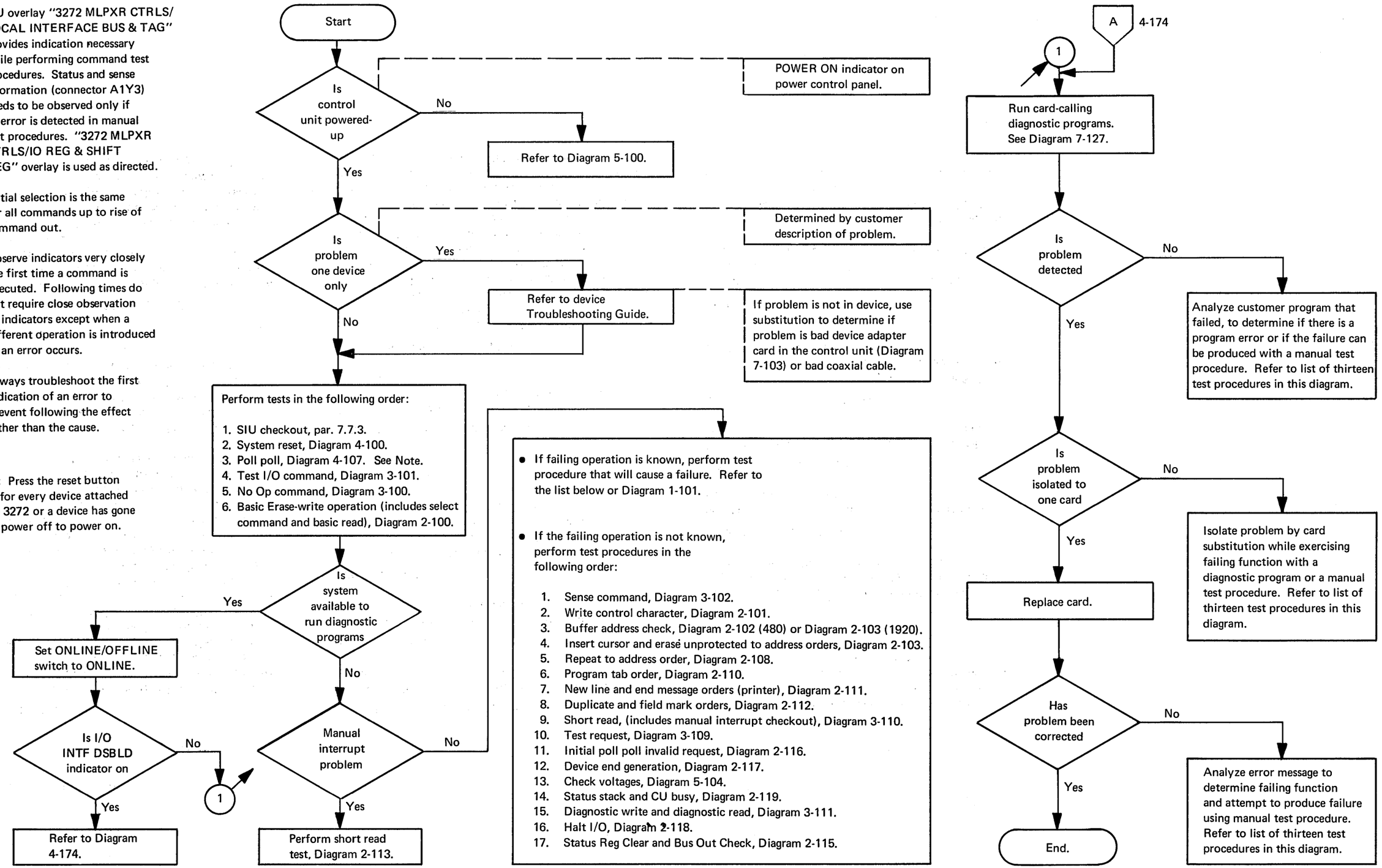


Diagram 1-100. Maintenance Approach Flowchart

Description of Problem	Action
• Status/Sense errors, analyze Diagrams 7-108 through 7-112.	Refer to Diagrams 4-108 through 4-115.
• Not able to select CU (condition code 3).	Perform initial selection on SIU diagram for appropriate channel, any command (Section 3).
• CU always busy.	Perform initial selection on SIU diagram for appropriate channel, any command (Section 3).
• Device always busy.	Perform initial selection on SIU diagram for appropriate channel, any command (Section 3).
• CU "hangs" channel - causes red light, "hard" error condition. (Machine Check).	Perform SIU procedure for failing command (Section 3).
• Manual interrupts fail (keyboard, light pen, ID card reader).	Activate manual input and refer to Diagram 4-166.
• No data written to device (Write or Erase/Write command).	Perform SIU procedure for failing command (Section 3).
• Incorrect data written to device (Write or Erase/Write Command).	Perform SIU procedure for failing command (Section 3).
• No data read from device (Read or Read Modified command).	Perform SIU procedure for failing command (Section 3).
• Incorrect data read from device (Read or Read Modified command).	Perform SIU procedure for failing command (Section 3).
• Audible alarm failure - all displays (WCC).	Perform Erase/Write command with audible alarm bit in WCC. Refer to Diagram 4-147.
• Keyboard fails to restore even though "Restore Keyboard" bit set in WCC.	Perform Erase/Write command with restore keyboard bit in WCC. Refer to Diagram 4-147.
• Printer fails to print, all printers (WCC).	Perform Erase/Write command with start print bit in WCC. Refer to Diagram 4-147.
• Printer format not executed properly (WCC).	Perform Erase/Write command with printer format bits in WCC. Refer to Diagram 4-147.
• Reset Modified Data Tag not executed (WCC).	Perform Erase/Write command with MDT bit in WCC. Refer to Diagram 4-147.
• Keyboard fails to lock during command execution, all displays.	Replace A1P2 2222 Pri Ctr.
• REQ I failed to rise (Write or Erase/Write command).	Replace *A1V2, A1Q2, A1U2, A1R2.
• Command fails online but operates correctly from SIU.	Possible failing cards: *A1S2, *A1T2, A1U2, *A1V2, A1Q2, A1R2.

*Jumpered card. See old card or Diagram 6-101 for jumpering.

Diagram 1-101. Symptom Index

Section 2. Manual Test Operating Procedures

The following procedures (Diagrams 2-100 through 2-118) check out CU functions. Use the SIU to simulate channel operation and to indicate CU functions. When loading data (Erase/Write and Write commands), use the data streams specified for WCC and data.

Begin troubleshooting at the first indication of a problem; the SIU diagram indicates the flowchart to follow. If the command is executed correctly but an error occurs in the data stream, begin troubleshooting on Diagram 4-169.

If possible, verify the results on a display screen or a printer. (For these tests, the printout should look like the display except that no cursor is printed.) When neither device is accessible, the contents of the CU buffer may be determined as follows: (1) Perform a Select command (Diagram 3-103) and, if correct, (2) perform a Read Buffer command (Diagram 3-105).

Notes:

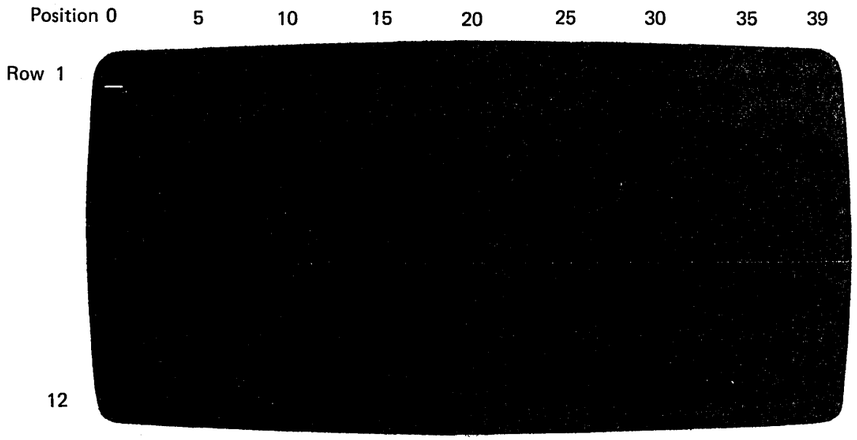
1. Unless otherwise instructed, the Select command need be performed only before the first Read Buffer command.
2. The letter P preceding a character (such as C6) that is loaded in an Erase or Erase/Write command indicates that the BUS OUT P switch must be set to maintain odd parity. The P is also shown in messages read by a Read Buffer or Read Modified command to indicate correct parity generated by the Control Unit.

- **Purpose:** Check CU ability to erase the entire buffer contents and transfer the cleared buffer to a device.

- **Instructions:** Perform an Erase/Write command (Diagram 3-104) to load the following data:

P	5C	WCC (sound alarm; start printer)

Terminate command with channel-stop sequence.* The display screen should appear as shown:



If a device is not accessible, a Read Buffer command may be performed to check that the message was written correctly. The following message should be read:

P	60	Display AID (P E8 for printer)
	40 }	Cursor Address 00
	40 }	
P	00	Null
P	00	Null
P	00	Null

Note: It is not necessary to read out any more nulls to verify accuracy of remaining buffer contents.

Terminate command with channel-stop sequence.*

o **Purpose:** 1. Check ability to set and transfer all data bits in the CU buffer. a. EBCDIC - The quotation mark character (") is used for this purpose because it comprises all data bits. b. Katakana Feature - The equal sign (=) and Kana character (ｱ) are used because they provide testing of all data bits.
2. Select command checks device-to-CU buffer transfer.
3. Read Buffer command checks read capability.
4. Read Modified command checks correct transfer (to the channel) of an unformatted (no attribute characters) buffer. (All null characters are suppressed.)

o **Instructions:** Perform an Erase/Write command (Diagram 3-104) to load the following data:

EBCDIC

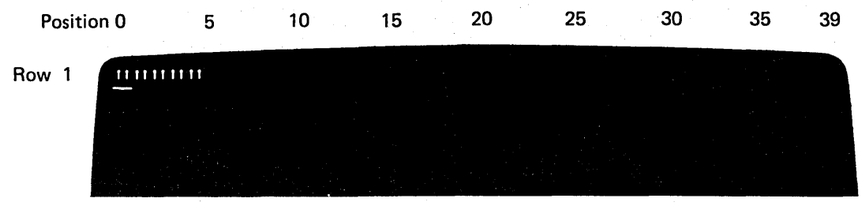
P	7E	WCC (sound alarm; start printer; 80-char line; restore keyboard)
	(5) 7F's	(5)

Katakana Feature

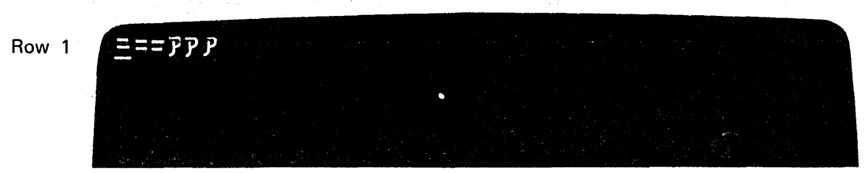
P	7E	WCC (sound alarm; start printer; 80-char line; restore keyboard)
	(3) (P) 7E	(3) =
	(3) (P) 81	(3) ｱ

Terminate command with channel-stop sequence.* The display screen should appear as shown:

EBCDIC



Katakana Feature



Perform a Select command (Diagram 3-103) if not previously done.

Perform a Read Buffer command (Diagram 3-105). The following message should be read:

EBCDIC

P	60	Display AID (P E8 for Printer)
	40 }	Cursor address 00
	40 }	
	(5) 7F's	(5) " (quotation mark)
P	00	null
P	00	null

Katakana Feature

P	60	Display AID (P E8 for printer)
	40 }	Cursor address 00
	40 }	
	(3) (P) 7E	(3) = (equal sign)
	(3) (P) 81	(3) ｱ
	00	null
	00	null

Terminate command with channel-stop sequence.*

Perform a Read Modified command (Diagram 3-107). The following message should be read:

EBCDIC

P	60	Display AID (P E8 for printer)
	40 }	Cursor address 00
	40 }	
	(5) 7F's	(5) " (quotation mark)

Katakana Feature

P	60	Display AID (P E8 for printer)
	40 }	Cursor address 00
	40 }	
	(3) (P) 7E	(3) = (equal sign)
	(3) (P) 81	(3) ｱ

Terminate command with CU=stop sequence.**

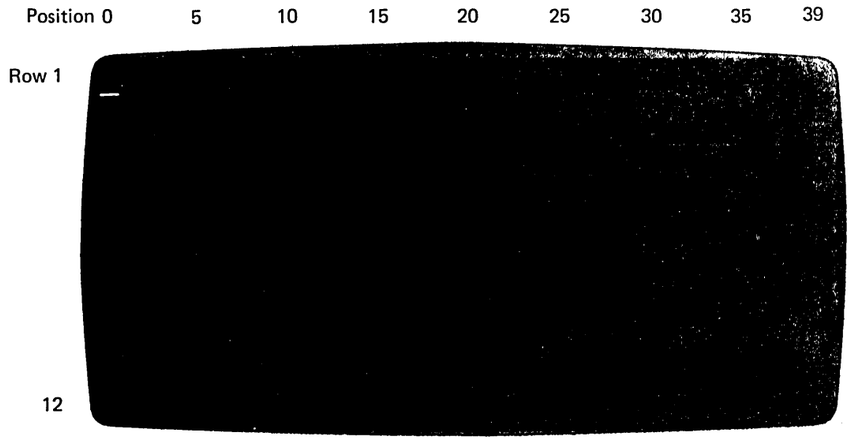
- **Purpose:** 1. Erase/Write command checks ability of CU to transfer all-zero characters (nulls) to device buffer.
2. Read Modified command checks CU ability to suppress nulls in an unformatted buffer.

- **Instructions:** Perform an Erase/Write command (Diagram 3-104) to load the following data:

P	5C	WCC (sound alarm; start printer)
	(5) P 00's	(5) Nulls

Diagram 2-100. Basic Erase/Write Operations (Includes Select Command and Basic Read) Test Procedure (Sheet 1 of 2)

Terminate command with channel-stop sequence.* The display screen should appear as shown:



Perform a Read Modified command (Diagram 3-107). The following message should be read:

P	Display AID (P E8 for printer)
60 40 40	Cursor address 00

Terminate command with CU-stop sequence.**

*Channel-stop sequence:
1. Raise and drop CMD OUT.
2. Drop SEL OUT.
3. Raise and drop SERV OUT.

**CU-stop sequence
1. Raise SERV OUT (last character).
2. Drop SERV OUT.
3. Drop SEL OUT.
4. Raise SERV OUT.
5. Drop SERV OUT.

Diagram 2-100. Basic Erase/Write Operations (Includes Select Command and Basic Read) Test Procedure (Sheet 2 of 2)

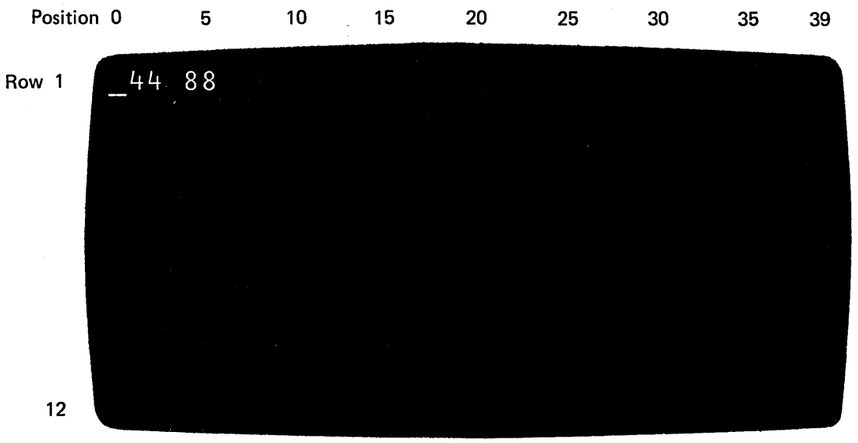
- **Purpose:** 1. WCC checkout for a display station: sound alarm, reset keyboard, and reset MDT bit.
  2. WCC checkout for a printer: start printer, and 40-character line format.
  3. Check SF (start field) order.
  4. Check Read Modified and EAU commands.
  5. Set up fields by means of attribute characters (both with and without MDT bit set).

- **Instructions:** Perform an Erase/Write command (Diagram 3-104) to load the following data:

Note: Watch multiplexer indicators carefully as order and attribute are entered.

P	5C	WCC (sound alarm, start printer)
P	1D	SF order
	C1	Attribute (unprotected; MDT)
	F4	4
	F4	4
P	1D	SF order
P	60	Attribute (protected)
	F8	8
	F8	8

Terminate command with channel-stop sequence.* The display screen should appear as follows:



If no device is accessible, verify the CU buffer contents by performing a Read Buffer command. The following message should be read:

P	60	Display AID (P E8 for printer)
	40	Cursor address 00
	40	
P	1D	SF
	C1	Attribute†
	F4	4
	F4	4
P	1D	SF
P	60	Attribute†
	F8	8
	F8	8

Terminate command with channel-stop sequence.*

Diagram 2-101. Write Control Character, Read Modified, Erase Unprotected to Address, Erase/Write, and Write Operation Test Procedure (Sheet 1 of 2)

Perform a Read Modified command (Diagram 3-107). The following message should be read:

P	60	Display AID (P E8 for printer)
	40	Cursor address 00
	40	
P	11	SBA
	40	Address 01
	C1	
	F4	4
	F4	4

Note: Only this field, with MDT bit set, is read back.

Terminate command with CU-stop sequence.**

Perform a Write command (Diagram 3-106) to reset the MDT bit. Load the following:

P	43	WCC (reset MDT; restore keyboard)

Terminate command with channel-stop sequence.*

Perform a Read Buffer command (Diagram 3-105) at this time only if observation of a device is not possible or if there is a problem with the Read Modified command. (If there is a Read Modified command problem, make certain that the Read Buffer command is O.K. before troubleshooting Read Modified. If there is also a problem with Read Buffer, troubleshoot Read Buffer first.

If a Read Buffer command must be performed, the following message should be read:

P	60	Display AID (P E8 for printer)
	40	Cursor address 00
	40	
P	1D	SF
	40	Attribute (unprotected)
	F4	4
	F4	4
P	1D	SF
P	60	Attribute (protected)
	F8	8
	F8	8

Terminate command with channel-stop sequence.*

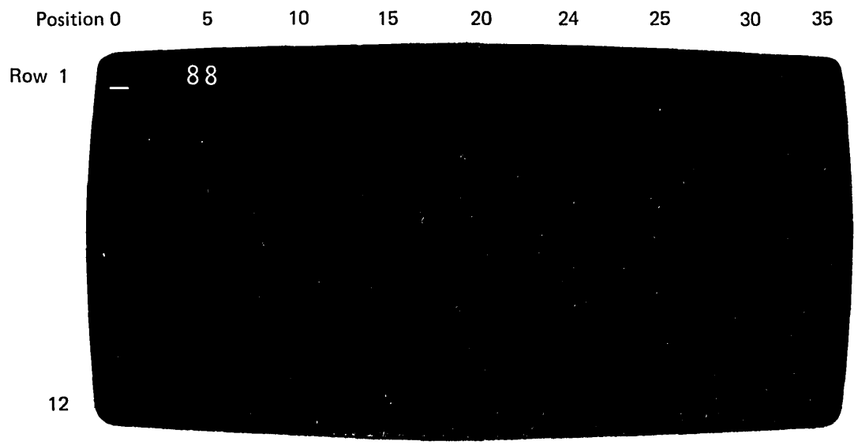
Perform a Read Modified command. The following message should be read:

P	60	Display AID (P E8 for printer)
	40	Cursor address 00
	40	

Terminate command with CU-stop sequence.**

Note: No data is read because no MDT bit is set.

Perform an EAU (Erase All Unprotected) command (Diagram 3-108) to clear unprotected fields. The display screen should appear as follows:



Perform a Read Buffer command only if a device is not accessible for inspection. The message should be as follows:

P	60	Display AID (P E8 for printer)
	40 }	Cursor address 00
	40 }	
P	1D	SF
	40	Attribute (unprotected)
	00	Null
	00	Null
P	1D	SF
P	60	Attribute (protected)
	F8	8
	F8	8

Terminate command with channel-stop sequence.*

*Channel-stop sequence:
1. Raise and drop CMD OUT.
2. Drop SEL OUT.
3. Raise and drop SERV OUT.

**CU-stop sequence:
1. Raise SERV OUT (last character).
2. Drop SERV OUT.
3. Drop SEL OUT.
4. Raise SERV OUT.
5. Drop SERV OUT.

† If MDT bit (bit 7 of attribute character) is lost or is in the wrong location and no noticeable failures are found in command execution, replace A1H2 (2220, Seq 2, 3, 7 card).

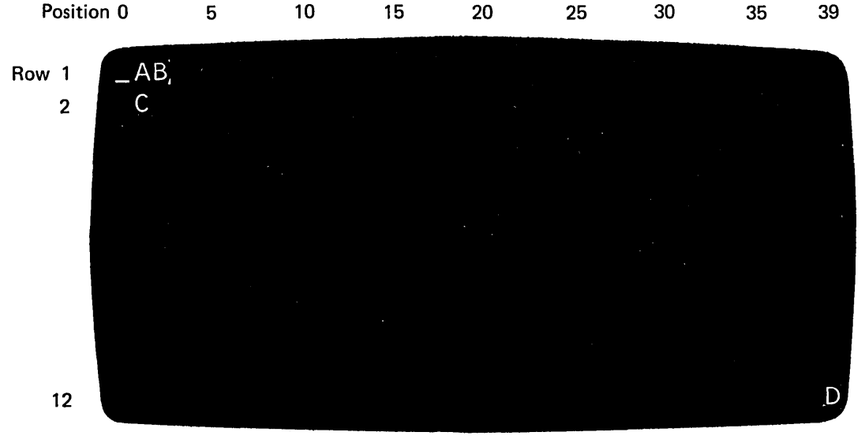
Diagram 2-101. Write Control Character, Read Modified, Erase Unprotected to Address, Erase/Write, and Write Operation Test Procedure (Sheet 2 of 2)

- **Purpose:** Check out all address bits of a 480-character CU.

- **Instructions:** Perform an Erase/Write command (Diagram 3-104) to enter data at specific addresses. Load in the following:

P	5C	WCC (sound alarm; start printer, 40-character line)
P	1D	SF order
	C1	Attribute (unprotected; MDT)
	C1	A
	C2	B
P	11	SBA order
	40	Address 40
P	E8	
P	1D	SF order
	C1	Attribute (unprotected; MDT)
	C3	C
P	11	SBA order
	C7	Address 478
	5E	
P	1D	SF order
	C1	Attribute (unprotected; MDT)
	C4	D

Terminate command with channel-stop sequence.* The display screen should appear as follows:



Attribute character locations:

Address	Row	Position
0	1	0
40	2	0
478	12	38

If the display station has a keyboard, the addresses may be quickly verified as follows:
1. Press BSKP once. Cursor moves under "D".
2. Press ADVANCE key twice. Cursor moves under "A".
3. Press DOWN key once. Cursor moves under "C".

Diagram 2-102. Buffer Address Check, Model 1 (480-Character Device) Test Procedure

If a display station with a keyboard is not accessible, perform a Read Modified command (Diagram 3-107). The following message should be read:

P	60	Display AID (P E8 for printer)
	40	Cursor address 00
	40	
P	11	SBA
	40	Address 01
	C1	
	C1	A
	C2	B
P	11	SBA
	40	Address 41
	E9	
P	C3	C
P	11	SBA
	C7	Address 479
P	5F	
	C4	D

Addresses of first character of altered fields.

Terminate command with CU-stop sequence.**

*Channel-stop sequence:
1. Raise and drop CMD OUT.
2. Drop SEL OUT.
3. Raise and drop SERV OUT.

**CU-stop sequence:
1. Raise SERV OUT (last character).
2. Drop SERV OUT.
3. Drop SEL OUT.
4. Raise SERV OUT.
5. Drop SERV OUT.

Troubleshooting Hints:

1. A problem that occurs during SBA order execution should cause a branch from Diagram 3-104 to Diagram 4-150 or 4-151 for troubleshooting.
2. If SBA appears to function correctly at SIU, but data is stored in the wrong locations, begin troubleshooting with Diagram 4-152.
3. If error occurs on SBA data stream above and SBA data stream in Diagram 2-105 is correct, replace A1D2. (9034; BFR CTRLS)

Note: Observe MLPXR CTRL indicators very closely during SBA order execution.

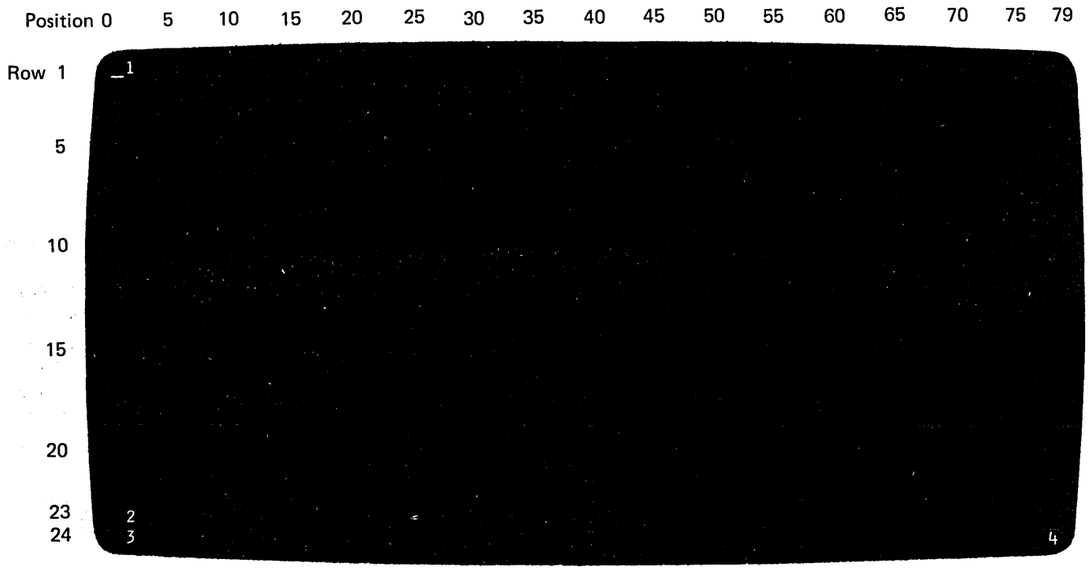
- **Purpose:** Check out all address bits of a 1920-character CU.

  Note: If this operation is tried on a 480-device, OP CHK sense bit will be set.

- **Instructions:** Perform an Erase/Write command (Diagram 3-104) to enter data at specific addresses. Load in the following:

P	7E	WCC (sound alarm; restore keyboard; start printer; 80-character line)
P	11	SBA order
	40 }	Address 00
	40 }	
P	1D	SF order
	C1	Attribute (unprotected; MDT)
	F1	1
P	11	SBA order
	5B }	Address 1760
	60 }	
	1D	SF order
	C1	Attribute (unprotected; MDT)
	F2	2
P	11	SBA order
P	5C }	Address 1840
P	F0 }	
P	1D	SF order
	C1	Attribute (unprotected; MDT)
	F3	3
P	11	SBA order
	5D }	Address 1918
P	7E }	
P	1D	SF order
	C1	Attribute (unprotected; MDT)
	F4	4

Terminate command with channel-stop sequence.* The display screen should appear as follows:



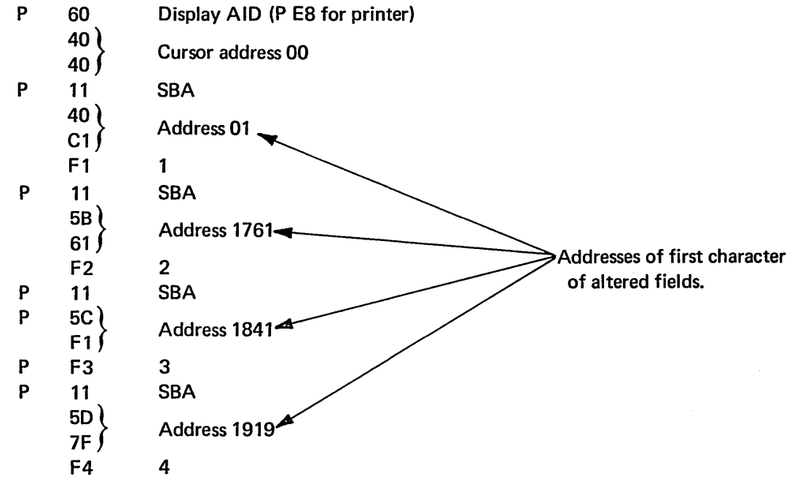
Attribute character locations:

Address	Row	Position
0	1	0
1760	23	0
1840	24	0
1918	24	79

Diagram 2-103. Buffer Address Check, Model 2 (1920-Character Device) Test Procedure (Sheet 1 of 2)

If the display station has a keyboard, the addresses may be quickly verified as follows:
1. Press BKSP key once. Cursor moves under "4".
2. Press ADVANCE key twice. Cursor moves under "1".
3. Press UP key once. Cursor moves under "3".
4. Press UP key once again. Cursor moves under "2".

If a display station with a keyboard is not accessible, perform a Read Modified command (Diagram 3-107). The following message should be read:



Terminate command with CU-stop sequence.**

Diagram 2-103. Buffer Address Check, Model 2 (1920-Character Device) Test Procedure (Sheet 2 of 2)

*Channel-stop sequence:
1. Raise and drop CMD OUT.
2. Drop SEL OUT.
3. Raise and drop SERV OUT.

**CU-stop sequence:
1. Raise SERV OUT (last character).
2. Drop SERV OUT.
3. Drop SEL OUT.
4. Raise SERV OUT.
5. Drop SERV OUT.

Troubleshooting Hints:

1. A problem that occurs during SBA order execution should cause a branch from Diagram 3-104 to Diagram 4-150 or 4-151 for troubleshooting.
2. If SBA appears to function correctly at SIU, but data is stored in wrong locations, begin troubleshooting with Diagram 4-133.
3. If error occurs on SBA data stream above and SBA data stream in Diagram 2-105 is correct, replace A1D2.

Note: Observe MLPXR CTRL indicators very closely during SBA order execution.

- **Purpose:** Check IC (Insert Cursor) and EUA (Erase Unprotected to Address) orders.

- **Instructions:** If this test is performed with a 480-character device, set up the display by performing the test in Diagram 2-102. Do not reset the CU once the display is set up correctly.

  If this test is performed with a 1920-character display, set up the display by performing the test in Diagram 2-103. Do not reset the CU once the display is set up correctly.

  Perform a Write command to enter the following:

  Note: If you have a problem with data, refer to Diagram 4-169. If you have a problem with an order, refer to Diagram 4-151 or 4-152.

	P	5C	WCC
	P	11	SBA order
	P	40 50	Address 16
	P	1D	SF order
		61	Attribute (protected; MDT)
	P	D7	P
	P	D7	P
		13	IC order
	P	D7	P
	P	D7	P
	P	12	EUA order
480-character device →	P	C7 F5	Address 479
		or	
1920-character device →		5D 7F	Address 1919

  Terminate command with channel-stop sequence.*

  The display should be as follows:

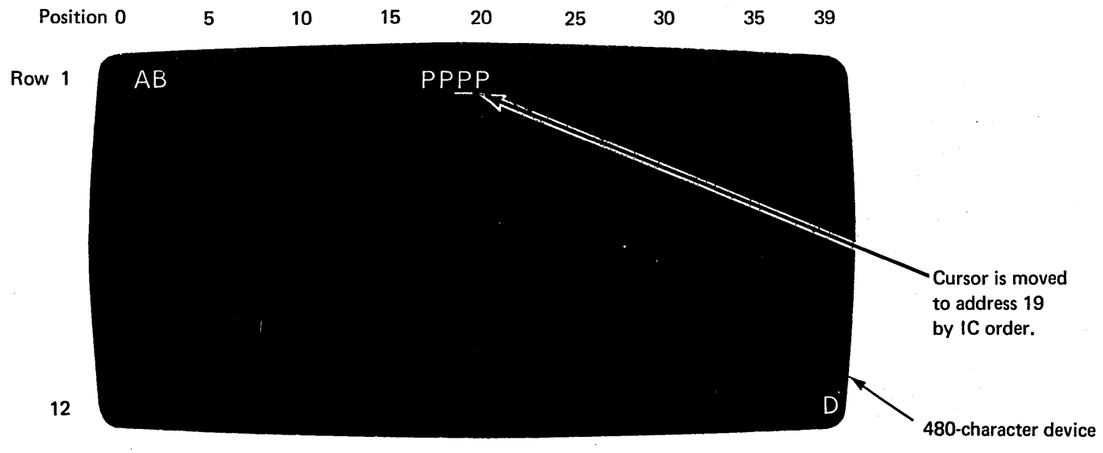
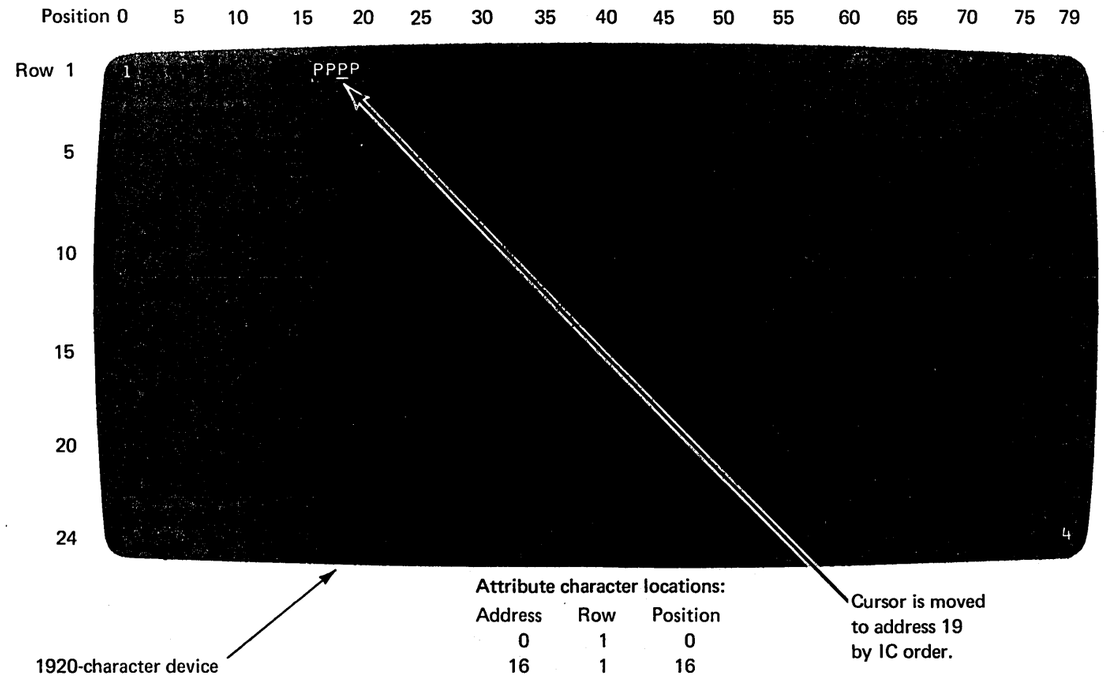


Diagram 2-104. Insert Cursor and Erase Unprotected to Address Order Test Procedure

Attribute character locations:

Address	Row	Position
0	1	0
16	1	16
40	2	0
478	12	38



Attribute character locations:

Address	Row	Position
0	1	0
16	1	16
1760	23	0
1840	24	0
1918	24	78

*Channel-stop sequence:
1. Raise and drop CMD OUT.
2. Drop SEL OUT.
3. Raise and drop SERV OUT.

- **Purpose:** To load data starting at address immediately following the SBA character.

Perform a Write command (Diagram 3-106) to load the following data:

P	C0	WCC	P	11	SBA order
P	11	SBA order		C1 }	Address 80
	40 }	Address 07	P	50 }	
	C7 }			(2) P 50's	&
	(5) C7's	(5) G's			

Terminate command with channel-stop sequence.* If address 06 is loaded, the display screen should appear as shown:

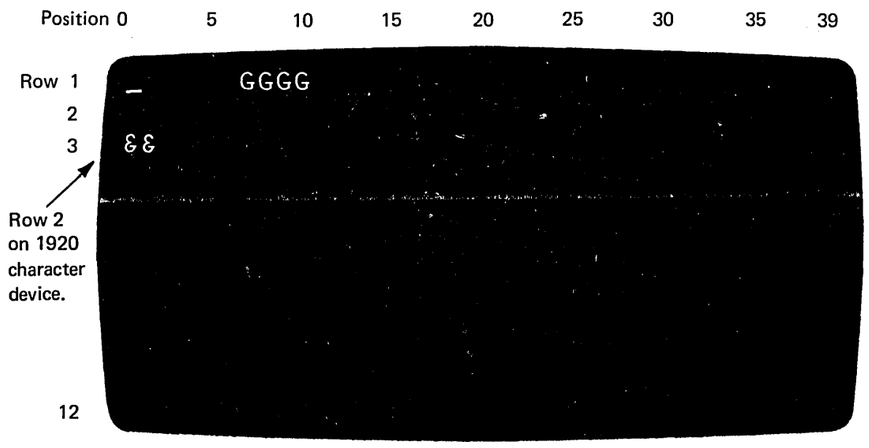


Diagram 2-105. Set Buffer Address (SBA) Test Procedure

If a display is not accessible, a Read Buffer command (Diagram 3-105) may be performed to read the CU buffer contents. The following message should be read.

P	60	Display AID (P E8 for printer)	(68) 00's	(68) Nulls
	40 }		(2) 50's	(2) &
	40 }	Cursor Address 00		
	(6) 00	(6) Null		
	(5) C7's	(5) G's		

Terminate command with channel-stop sequence* or simply drop OP OUT to issue a system reset. If the order fails, refer to Diagram 4-151 or 4-152.

*Channel-stop sequence:
1. Raise and drop CMD OUT.
2. Drop SEL OUT.
3. Raise and drop SERV OUT.

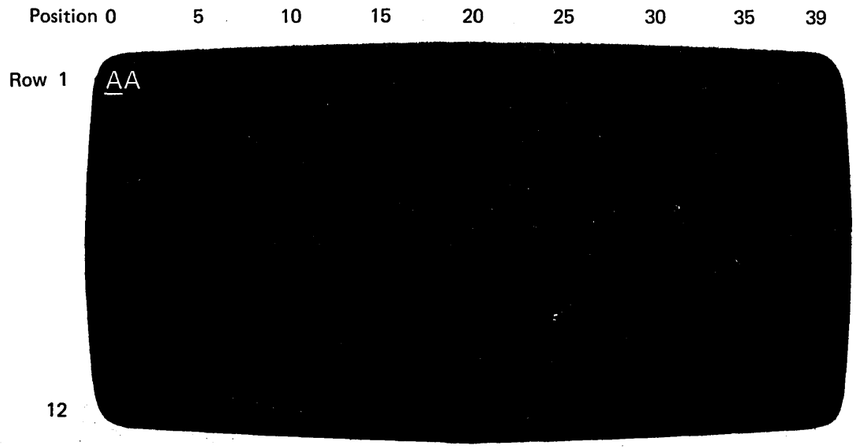
Notes:
1. All orders should be addressed to a display station unless otherwise specified.
2. The letter "P" preceding a message character (such as C0) is shown to remind you to flip up the BUS OUT P switch to generate odd parity when entering these characters. Parity is also indicated in like manner on the Read Buffer command. However, in this case, it is generated by the CU.
3. Observe MPLXR CTRLS indicators very closely during SBA order execution.

- **Purpose:** Specifies the next character as an attribute character.

- **Instruction:** Perform an Erase/Write command (Diagram 3-104) to load the following data:

P	C0	WCC
	C1	A
	C1	A
P	1D	SF order
	40	Attribute (defines an unprotected field)

Terminate command with channel-stop sequence.* The display screen should appear as shown:



Depress TAB key on display keyboard. Cursor should move to address 03 (position immediately following attribute character) as shown below:

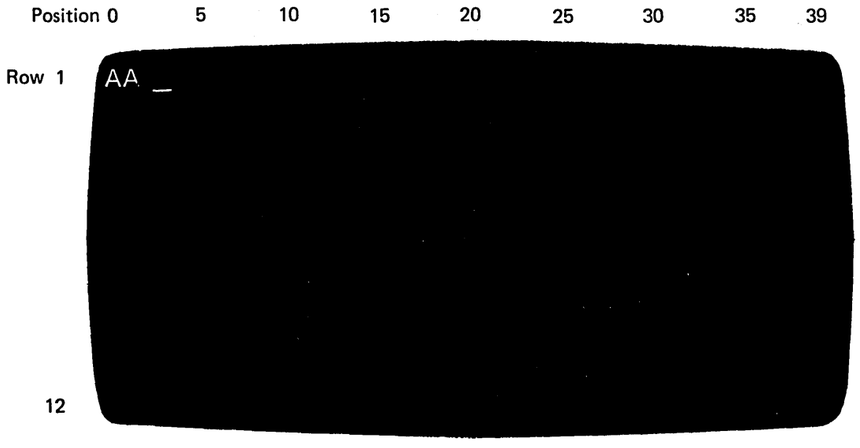


Diagram 2-106. Start Field (SF) Test Procedure

If a display is not accessible, a Read Buffer command (Diagram 3-105) may be performed following the setup procedure. The following message should be read:

P	60	Display AID (P E8 for printer)
	40 }	Cursor Address 00
	40 }	
	C1	A
	C1	A
P	1D	SF order
	40	Attribute

Terminate command with channel-stop sequence* or simply drop OP OUT to issue a system reset.

If order fails, refer to Diagram 4-151.

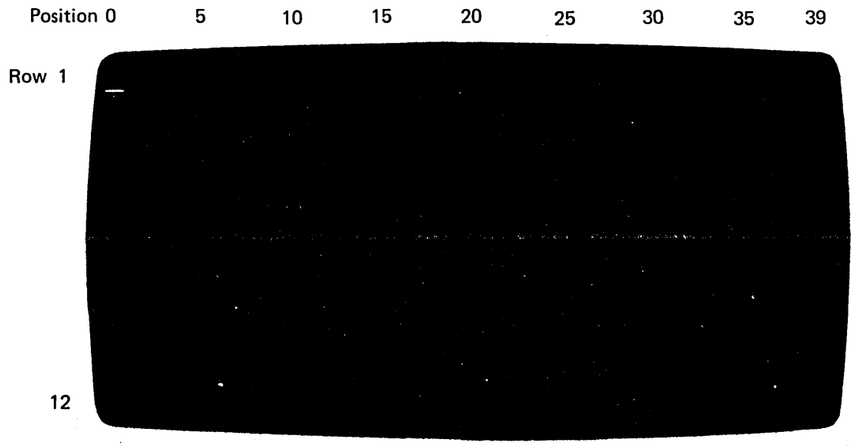
*Channel-stop sequence:
1. Raise and drop CMD OUT.
2. Drop SEL OUT.
3. Raise and drop SERV OUT.

- **Purpose:** To change the cursor address, and thus to re-position the cursor on the display screen. Because the CU buffer address is not advanced when the IC order is loaded, the next byte is stored at the cursor address.

- **Instructions:** At keyboard—Move cursor to address 00 (Top leftmost position of display screen).

  or

  At switch/indicator unit — Perform an Erase/Write command (Diagram 3-104) and load a WCC (C0) only. Use channel-stop sequence* to end Erase/Write command. This procedure clears CU buffer (and display screen) and positions cursor at address 00.



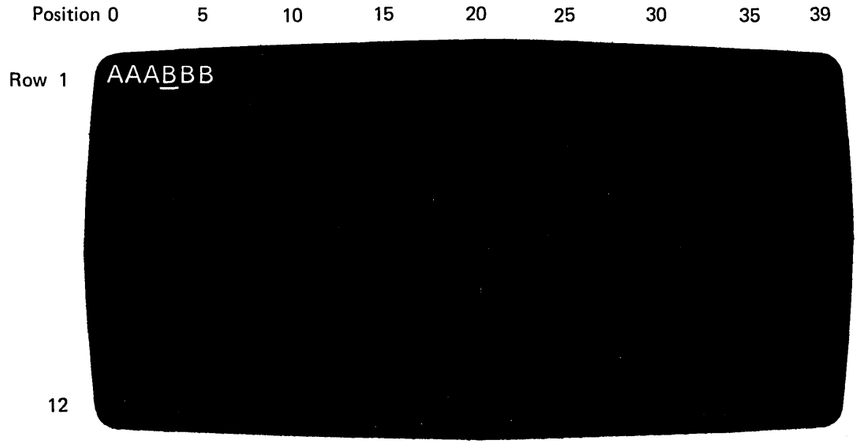
Perform an Erase/Write command (Diagram 3-104) to load the following data:

P	C0	WCC
	C1	A
	13	IC order
	C1	A
	13	IC order
	C1	A
	13	IC order
	(3) C2's	(3) B's

Notes:
1. This procedure also checks that only one cursor can remain stored.
2. If data check (DC) is set when IC order is entered, replace A1F2.

Diagram 2-107. Insert Cursor (IC) Test Procedure

Terminate command with channel-stop sequence. * Display screen should appear as shown.



If a display is not accessible, a Read Buffer command (Diagram 3-105) may be performed to read the CU buffer contents. The following message should be read:

P	60	Display AID (P E8 for printer)
P	40 C3	Cursor Address 03
	(3) C1's	(3) A's
	(3) C2's	(3) B's

If the order fails, refer to Diagram 4-151.

Note: If a Write command is performed at this time, the starting address will be address 03. That is, the first data character will be stored at address 03 of the CU buffer.

*Channel-stop sequence:
1. Raise and drop CMD OUT.
2. Drop SEL OUT.
3. Raise and drop SERV OUT.

Diag 2-108

- **Purpose:** To load a single character repeatedly, starting at the current CU buffer address and continuing to, but not including, the address specified in the order sequence. The cursor is not affected.

- **Instructions:** Perform an Erase/Write command (Diagram 3-104) to load the following data:

P	C0	WCC
P	3C	RA order
	40 4A	Address 10
	C1	A

Terminate command with channel-stop sequence.* A's should be displayed in the first 10 positions of the screen as shown:

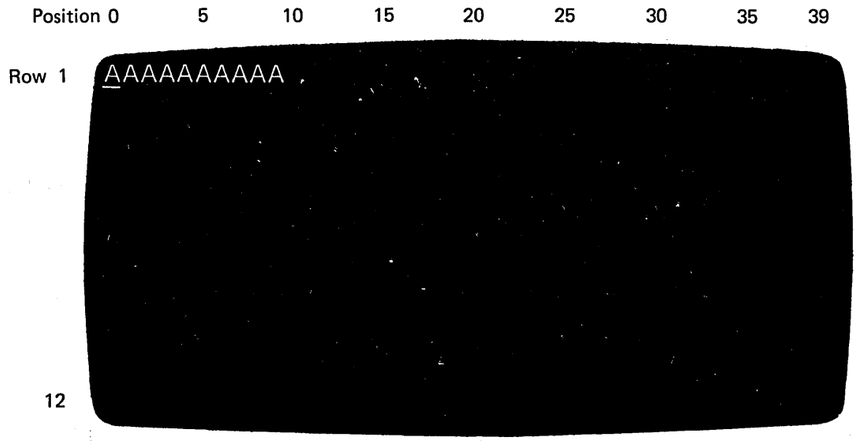


Diagram 2-108. Repeat to Address (RA) Test Procedure

If a display is not accessible, a Read Buffer command (Diagram 3-105) may be performed to read the CU buffer contents. The following message should be read:

P	60	Display AID (P E8 for printer)
	40 40	Cursor Address 00
	(10) C1's	(10) A's

Terminate command with channel-stop sequence* or simply drop OP OUT to issue a system reset.

If order fails, refer to Diagram 4-151.

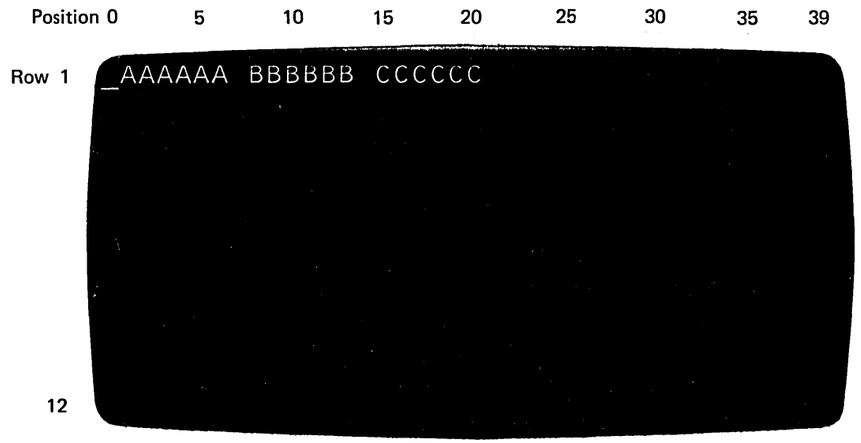
*Channel-stop sequence:
1. Raise and drop CMD OUT.
2. Drop SEL OUT.
3. Raise and drop SERV OUT.

- **Purpose:** To delete all unprotected-field characters beginning with the character at the current address to, but not including, the character at the address specified in the order sequence. If the address specified in the order sequence equals the current address, wraparound occurs, and all unprotected characters are deleted. The attribute characters defining the unprotected fields are not deleted.

- **Instructions:** Perform an Erase/Write command (Diagram 3-104) and load the following data:

P	C0	WCC
P	1D	SF order
	40	Attribute (defines an unprotected field)
	(6) C1's	(6) A's
P	1D	SF order
P	60	Attribute (defines an protected field)
	(6) C2's	(6) B's
P	1D	SF order
	40	Attribute (defines an unprotected field)
	(6) P C3's	(6) C's

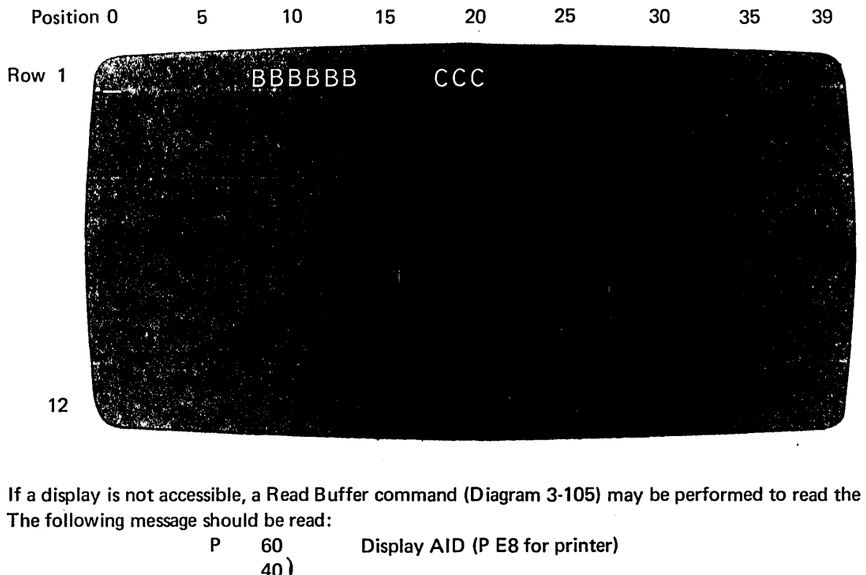
Terminate command with channel-stop sequence.* The display screen should appear as shown:



Perform a Write command (Diagram 3-106) to load the following data:

P	C0	WCC
P	12	EUA order
P	40 D2	Address 18

Terminate command with channel-stop sequence.* The display should appear as shown:



If a display is not accessible, a Read Buffer command (Diagram 3-105) may be performed to read the CU buffer contents. The following message should be read:

P	60	Display AID (P E8 for printer)
	40 40	Cursor Address 0
P	1D	SF
	40	Attribute
	00	(6) Nulls
P	1D	SF
P	60	Attribute
	(6) C2's	(6) B's
P	1D	SF
	40	Attribute
	00	(3) Nulls
	(3) P C3's	(3) C's

Terminate command with channel-stop sequence* or simply drop OP OUT to issue a system reset. If order fails, refer to Diagram 4-151.

*Channel-stop sequence:
1. Raise and drop CMD OUT.
2. Drop SEL OUT.
3. Raise and drop SERV OUT.

Diagram 2-109. Erase Unprotected to Address (EUA) Test Procedure

- **Purpose:** To advance the CU buffer address to that of the character position immediately following the next attribute character that defines an unprotected field. The cursor is not affected and no wraparound occurs. The search begins at the current buffer address. The final result depends on one of three conditions:
  1. When PT immediately follows a data character within an unprotected field, all remaining characters within that field are replaced by nulls.
  2. When PT immediately follows a WCC or an order sequence, no nulls are inserted.
  3. When the current buffer address contains an attribute character that defines an unprotected field, the CU buffer address 1 simply advanced one character location.

- **Instructions:** Perform an Erase/Write command (Diagram 3-104) to load the following data:

P	C0	WCC
P	1D	SF order
	40	Attribute (defines an unprotected field)
P	3C	RA order
P	40 4B	Address 11
	C1	A
P	1D	SF order
P	60	Attribute (defines a protected field)
P	3C	RA order
	40 D6	Address 22
	C2	B
P	1D	SF order
	40	Attribute (defines an unprotected field)
P	3C	RA order
	40 61	Address 33
P	C3	C

Terminate command with channel-stop sequence.* The display screen should appear as shown:

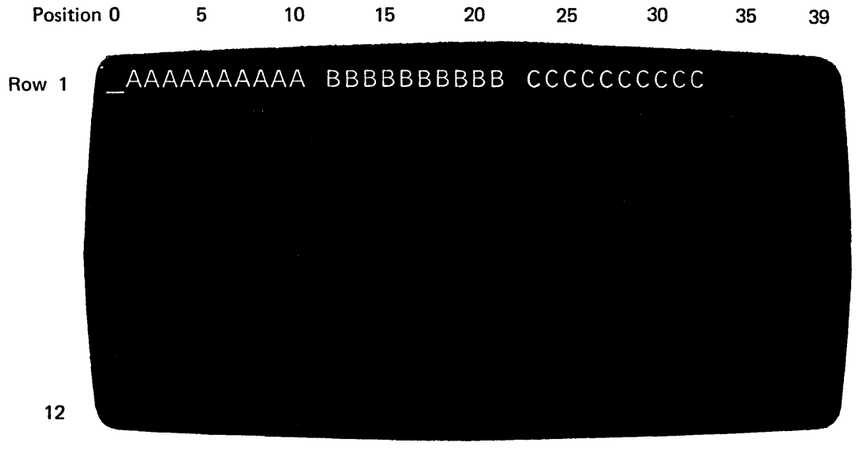


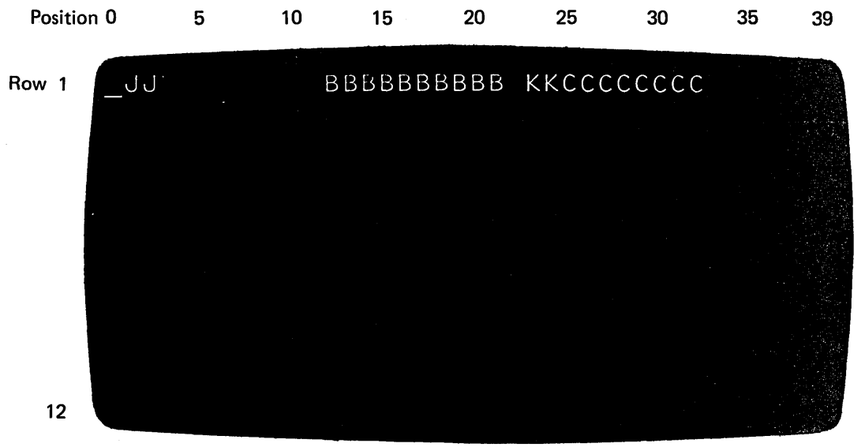
Diagram 2-110. Program Tab (PT) Test Procedure (Sheet 1 of 3)

If there is no apparent failure during command execution but display is not correct, replace A1F2.

Perform a Write command (Diagram 3-106) to load the following data:

P	C0	WCC
P	05	PT order
P	D1	J
P	D1	J
P	05	PT order
P	D2	K
P	D2	K

Terminate command with channel-stop sequence.* The display screen should appear as shown:



Note: First PT stops at address 01 because unprotected attribute is at starting address (condition 3). Second PT stops at address 23 after inserting nulls after data characters JJ in unprotected field.

If there is no apparent failure during command execution but display is not correct, replace A1F2.

If a display is not accessible, a Read Buffer command (Diagram 3-105) may be performed to read the CU buffer contents. The following message should be read:

P	60	Display AID (P E8 for printer)
	40 40	Cursor Address 00
P	1D	SF
	40	Attribute
P	D1	J
P	D1	J
	(8) 00's	(8) Nulls
P	1D	SF
P	60	Attribute
	(10) C2's	(10) B's
P	1D	SF
	40	Attribute
P	D2	K
P	D2	K
	(8) P C3's	(8) C's

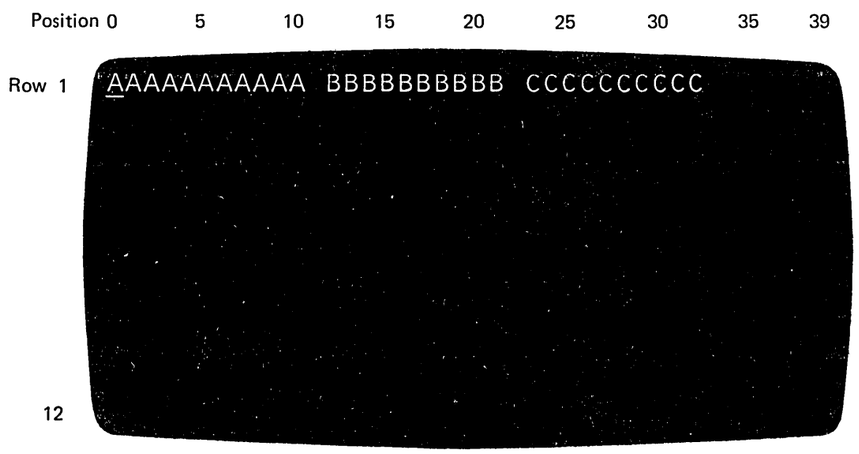
Terminate command with channel-stop sequence* or simply drop SEL OUT to issue a system reset.

If order fails, refer to Diagram 4-151.

Perform an Erase/Write command (Diagram 3-104) to load the following data:

P	C0	WCC
P	3C	RA order
P	40 4B	Address 11
	C1	A
P	1D	SF order
	40	Attribute (defines an unprotected field)
P	3C	RA order
	40 D6	Address 22
	C2	B
P	1D	SF order
	40	Attribute (defines an unprotected field)
P	3C	RA order
	40 61	Address 33
P	C3	C

Terminate command with channel-stop sequence.* The display screen should appear as shown:



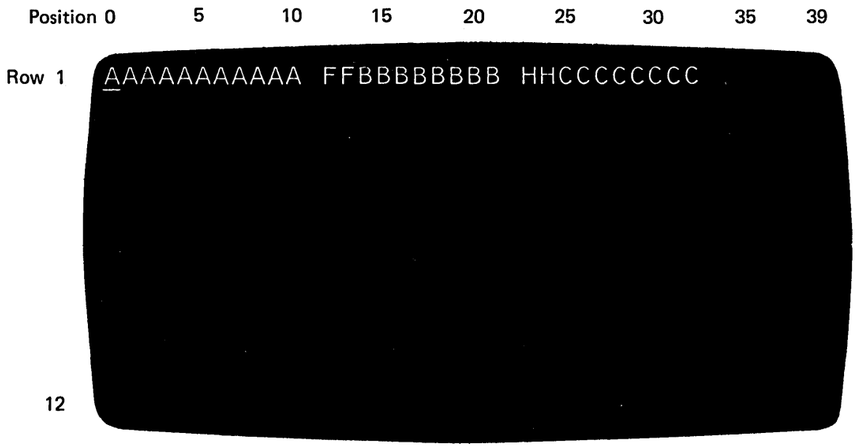
If there is no apparent failure during command execution but display is not correct, replace A1F2.

Perform a Write command (Diagram 3-106) to load the following data:

P	C0	WCC
P	05	PT order
P	C6	F
P	11	SBA order
	40 P 50	Address 16
P	05	PT order
	C8	H
	C8	H

Diagram 2-110. Program Tab (PT) Test Procedure (Sheet 2 of 3)

Terminate command with channel-stop sequence.* The display screen should appear as shown:



Note: First PT immediately follows WCC so no nulls are inserted in place of A's. Second PT immediately follows SBA order sequence so no nulls are inserted in place of B's (address 16 through 21).

If there is no apparent failure during command execution but display is not correct, replace A1F2.

If a display is not accessible, a Read Buffer command (Diagram 3-105) may be performed to read the CU buffer contents. The following message should be read:

P	60	Display AID (P E8 for printer)
	40 }	Cursor Address 00
	40 }	
	(11) P C1's	(11) A's
P	1D	SF
	40	Attribute
P	C6	F
P	C6	F
	(8) C2's	(8) B's
P	1D	SF
	40	Attribute
	C8	H
	C8	H
	(8) P C3's	(8) C's

Terminate command with channel-stop sequence* or simply drop SEL OUT to issue a system reset.

If order fails, refer to Diagram 4-151.

*Channel-stop sequence:
1. Raise and drop CMD OUT.
2. Drop SEL OUT.
3. Raise and drop SERV OUT.

Diagram 2-110. Program Tab (PT) Test Procedure (Sheet 3 of 3)

- **Purpose of NL Order:** When included in the data stream addressed to a printer, the NL order initiates a carrier return/line feed (CR/LF) operation by the printer. That is, the platen is advanced one line and the print mechanism is returned to the first print position of the new line. If this order is included in the data stream addressed to a display, the NL order is displayed as the number 5 (blank, 5 for Katakana Feature), but does not cause any action within the CU or the display; it is stored in the CU buffer as the number 5 (blank, 5 for Katakana Feature).
- **Purpose of EM Order:** This order must be included at the end of a message addressed to a printer to notify the printer when to stop printing. If the EM order is not included at the end of the printer message, the printer will print out the contents of the complete printer buffer (either 480 or 1920 characters). If this order is included in the data stream addressed to a display, the EM order is displayed as the number 9 (blank, 9 for Katakana Feature), but does not cause any action in the CU or display; it is stored in the CU buffer as the number 9 (blank, 9 for Katakana Feature).

  The following procedure tests both orders simultaneously.

- **Instructions:** Perform an Erase/Write command (Diagram 3-104) to load the following data:

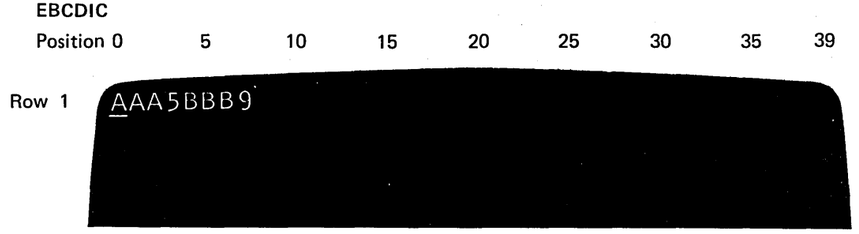
P	48	WCC (Start print)
	(3) C1's	(3) A's
	15	NL order
	(3) C2's	(3) B's
	19	EM order

Terminate command with channel-stop sequence.*
If the command is addressed to a printer, the message will be printed as shown:

AAA
BBB

If the command is addressed to a display, the message will be displayed as shown:

EBCDIC



Katakana Feature

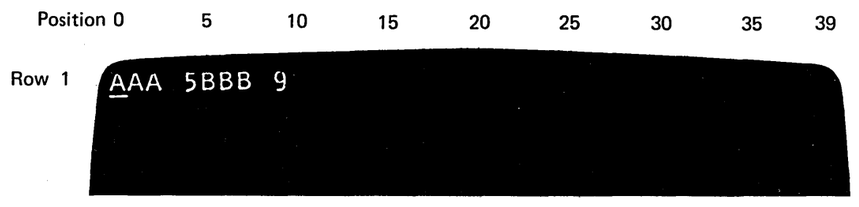


Diagram 2-111. New Line (NL) and End of Message (EM) Test Procedure

If neither a printer nor a display is accessible, a Read Buffer Command (Diagram 3-105) may be performed to read the CU buffer contents. The following message should be read:

P	60	Display AID (P E8 for printer)
	40 40	Cursor Address 00
	(3) C1's	(3) A's
	15	NL
	(3) C2's	(3) B's
	19	EM

If orders fail, refer to Printer Troubleshooting Guide.

Terminate command with channel-stop sequence* or simply drop OP OUT to issue a system reset.

*Channel-stop sequence:
1. Raise and drop CMD OUT.
2. Drop SEL OUT.
3. Raise and drop SERV OUT.

- **Purpose of DUP order:** To inform the program that the DUP key was depressed by the display operator. Its actual function is determined by the program. The DUP order is displayed as an asterisk. It is stored in the CU buffer. It does not cause any action in the CU, but it does cause the cursor in the display buffer to tab to the following field.
- **Purpose of FM order:** To inform the program that the FM key was depressed by the display operator. It indicates the end of a field to the program. The FM order is displayed as a semi-colon (;). It is stored in the CU buffer, but does not cause any action in the CU.

The following procedure tests both orders simultaneously.

- **Instructions:** At keyboard –
  Key in (3) A's.
  Depress DUP key. This causes the cursor to tab to the following field. If the buffer is unformatted, the cursor will stop in address 00.
  Key in (3) B's.
  Depress FM key.

The display screen should appear as shown:

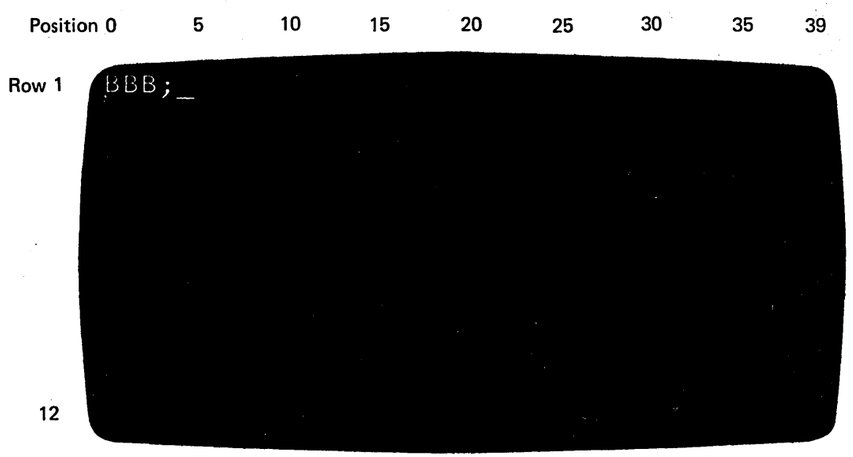


Diagram 2-112. Duplicate (DUP) and Field Mark (FM) Test Procedure

Perform a Read Buffer command (Diagram 3-105) to read the CU buffer contents. The following message should be read:

P	60	Display AID (P E8 for printer)
	40 C8	Cursor Address 08
	(3) C2's	(3) B's
P	1E	;

Terminate command with channel-stop sequence* or simply drop OP OUT to issue a system reset.

If orders fail, refer to Display Troubleshooting Guide.

*Channel-stop sequence:
1. Raise and drop CMD OUT.
2. Drop SEL OUT.
3. Raise and drop SERV OUT.

- **Purpose:** To permit the display operator to communicate with the program without sending modified data characters. This action is initiated when the display operator depresses one of the following keys: PA 1, PA 2, PA 3, CLEAR, or CANCEL. If the program responds with the Read Modified command, only the unique AID character, to identify the key, is sent to the program. No cursor address characters nor modified data characters are sent.

- **Instructions:** Depress PA 1 key on display keyboard. Using switch/indicator unit, address the display and perform a Read Modified command (Diagram 3-107). The AID character defining the PA 1 key is the only character in the message. Repeat a separate test for PA 2, PA 3, CLEAR, and CANCEL keys. Note that all keys listed may not be present on keyboard.

  Terminate command with channel-stop sequence.*

Key Depressed At Display	AID Character (Hex)
PA 1	6C
PA 2	6E
PA 3	6B
CANCEL	6E
CLEAR	6D

  If failure occurs, execute a Short Read command (Diagram 3-110).

*Channel-stop sequence:
1. Raise CMD OUT.
2. Drop SEL OUT.
3. Raise and drop SERV OUT.

Diagram 2-113. Short Read Test Procedure

- **Purpose:** To provide the display operator with a means of initiating a test message to, or requesting a test message from, the CPU. After keying in data, the operator depresses the test request key. (The data may be a test message to be sent to the CPU. Or, it may be some pre-arranged codes that, when interpreted by the program, result in a specific on-line test message being sent to the display.)

  If the program responds with a Read Buffer command, the display buffer contents are sent preceded by the normal heading sequence; that is, AID (in this case, F0), cursor address, cursor address. However, if the program responds with a Read Modified command, the display buffer contents are preceded by a different heading sequence generated by the CU. This sequence is: SOH % / STX. The normal heading sequence is omitted.

- **Instructions:** Key in (5) A's at keyboard and depress TEST REQUEST key. Using switch/indicator unit, address the display and perform a Read Modified command (Diagram 3-109). The following message should be read:

	01	SOH
P	6C	%
	61	/
	02	STX
	(5) C1's	(5) A's

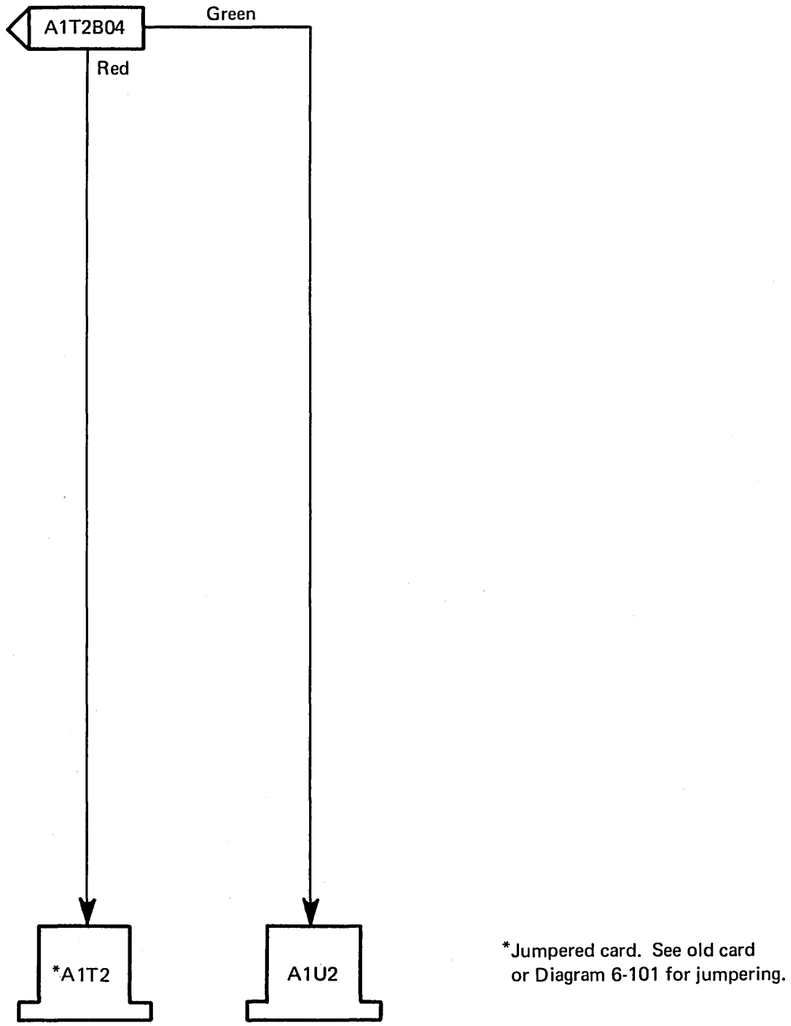
  Terminate command with channel-stop sequence.*

  If failure occurs, refer to Diagram 4-144.

*Channel-stop sequence:
1. Raise CMD OUT.
2. Drop SEL OUT.
3. Raise and drop SERV OUT.

Diagram 2-114. Test Request Test Procedure

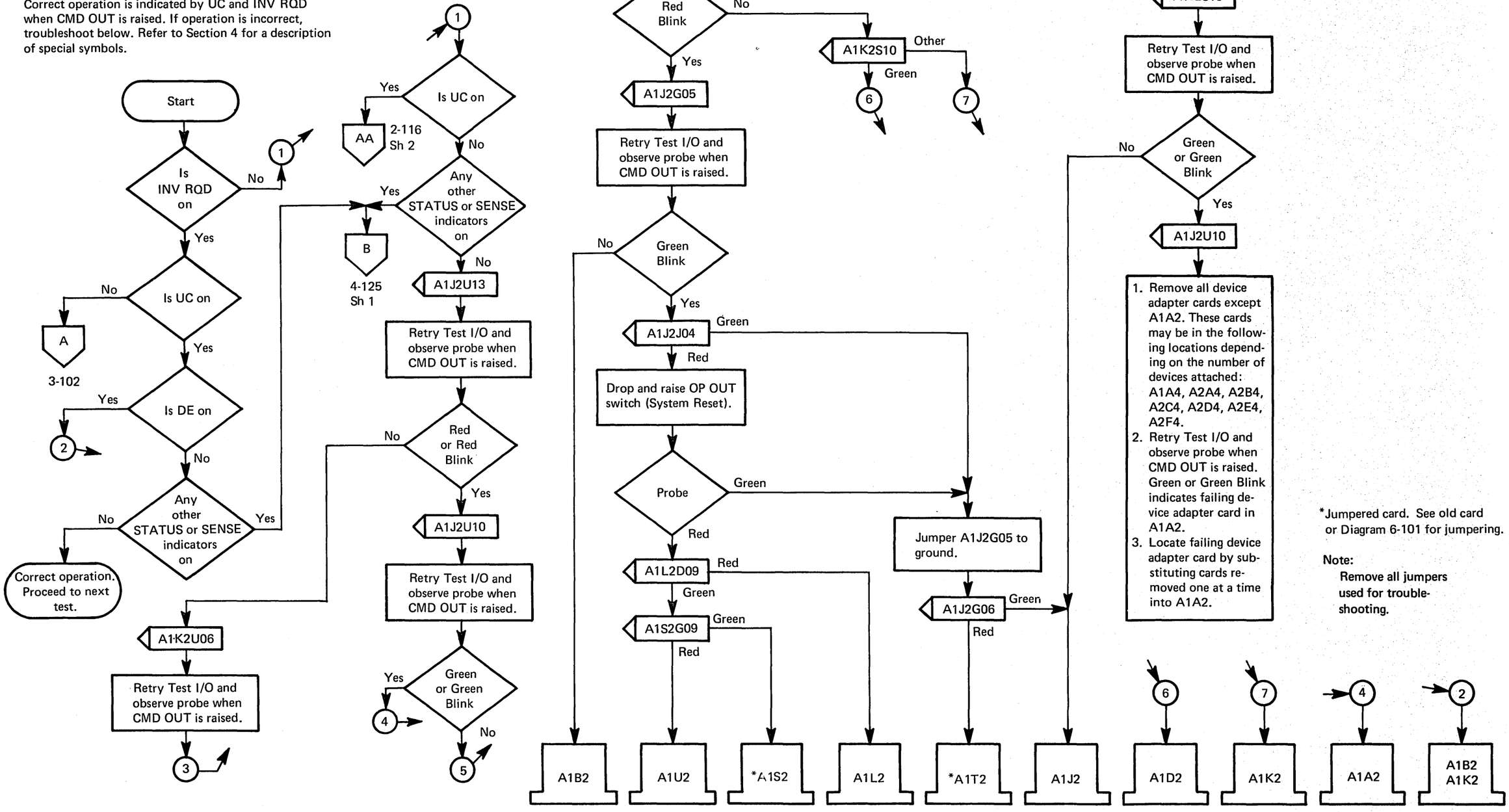
- Purpose: Check Status Reg Clear condition and ability to set Bus Out check.
- Instructions: Perform a Write command (Diagram 3—106 with one byte of data set to even parity. Unit Check status and Bus Out Check sense bits are set when Service Out is raised. Status In is set when Service Out is dropped. If Service In and Status In are set when Service Out is dropped, troubleshoot as shown below. Refer to Section 4 for a description of special symbols.



*Jumpered card. See old card or Diagram 6-101 for jumpering.

Diagram 2-115. Status Reg Clear and Bus Out Check

- Purpose: Check for correct setting of unit check and intervention required.
- Instructions: Execute Test I/O command using an address of a non-existent device. Refer to Diagram 3–101. Correct operation is indicated by UC and INV RQD when CMD OUT is raised. If operation is incorrect, troubleshoot below. Refer to Section 4 for a description of special symbols.



*Jumpered card. See old card or Diagram 6-101 for jumpering.

Note:
Remove all jumpers used for trouble-shooting.

Diagram 2-116. Initial Poll and Intervention Required Check (Sheet 1 of 2)

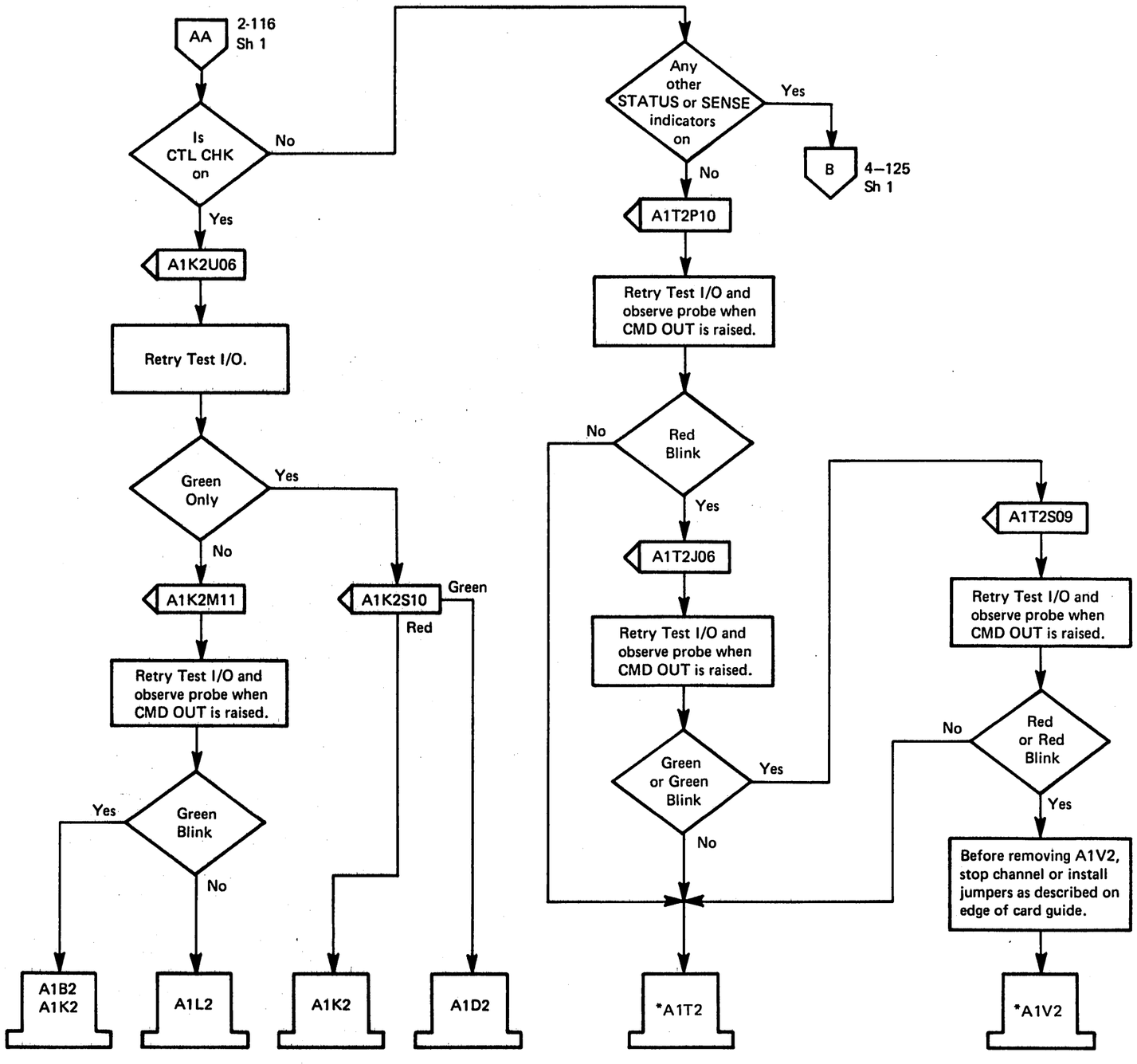


Diagram 2-116. Initial Poll and Intervention Required Check (Sheet 2 of 2)

Note:
Remove all jumpers used for trouble-shooting.

*Jumpered card. See old card or Diagram 6-101 for jumpering.

- Purpose: Check for Device End generation.
- Instructions: Disconnect and reconnect coaxial cable to a device that has power-on. The following indicators should light: DE, SEQUENCE 6, and PRIORITY CTR-LDD. If they do not, troubleshoot below. Refer to Section 4 for a description of special symbols.

  CAUTION: Power-down before removing or inserting device adapter cards.

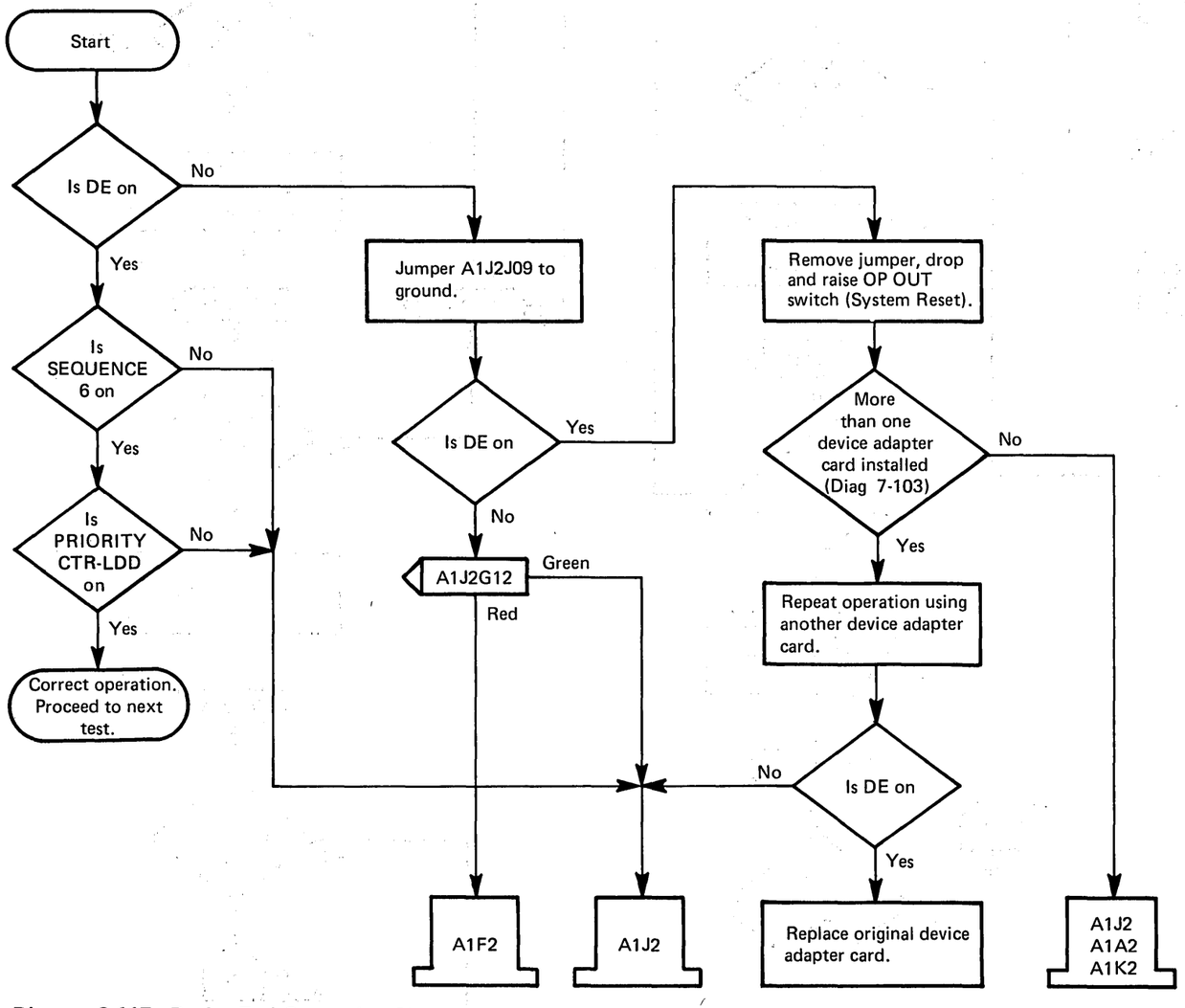


Diagram 2-117. Device End Generation Check

Device Adapter Cards	
Card	Devices
A1A2	0–3
A1A4	4–7
A2A4	8–11
A2B4	12–15
A2C4	16–19
A2D4	20–23
A2E4	24–27
A2F4	28–31

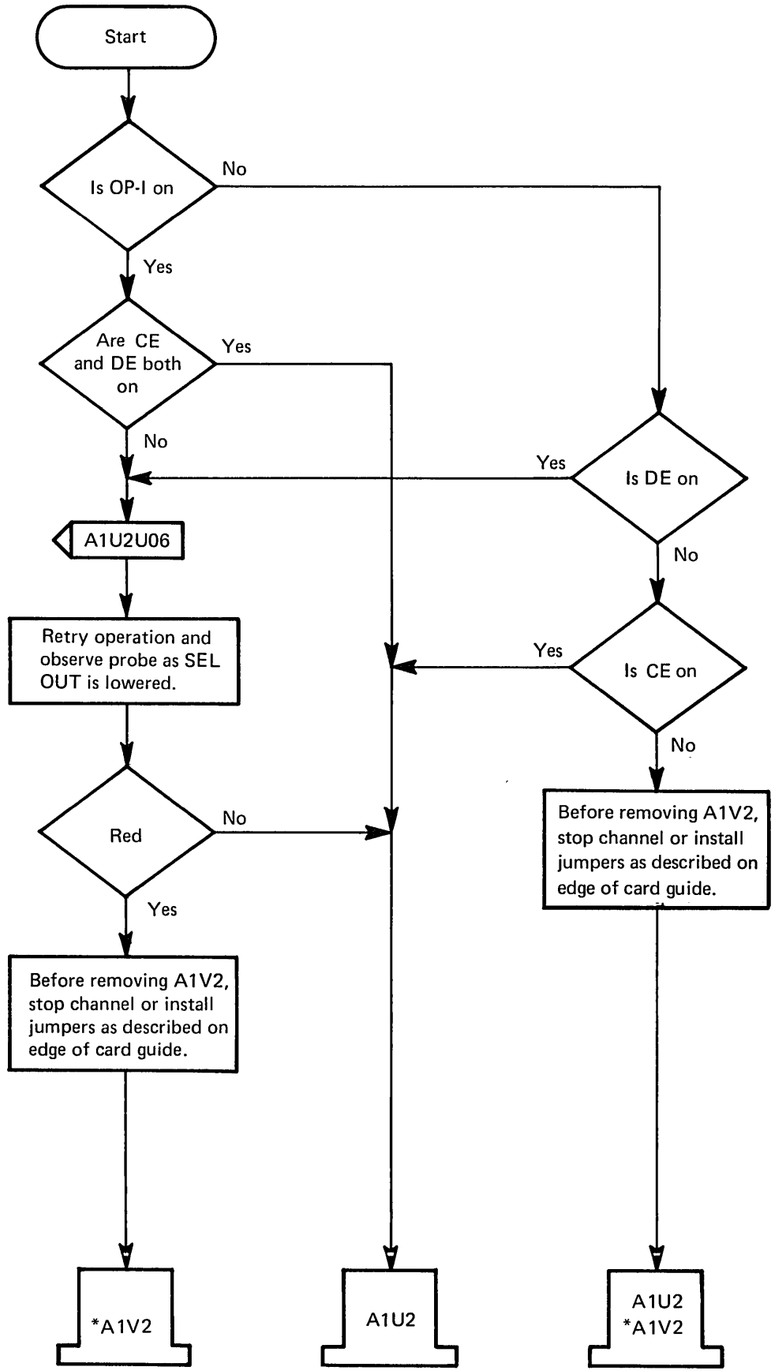
Note:
Remove all jumpers used for trouble-shooting.

- Purpose: Check for correct operation of Halt I/O during initial selection.

- Instructions: Install SIU using 3272 MLPXR CTRLS/ LOCAL INTERFACE BUS & TAG overlay.
  Set all switches down.
  Raise OP OUT.
  Set BUS OUT switches to CU/device address (Diagram 7-106).
  Raise ADR OUT.
  Raise SEL OUT.
  Lower ADR OUT.
  Verify that only the following indicators are on: CH-REQ, OP-I, ADR-I, SEL OUT, BYTE COUNT 0, PRIORITY CTR LDD, and SEQUENCE 6. If this is not true, refer to Diagram 3-101.
  Raise ADR OUT.
  Lower SEL OUT.
  Verify that all indicators are out except SEQUENCE 2, SEQUENCE 4, and BYTE COUNT (stepping). If this is not true, stop channel and replace A1V2.

- Purpose: Check for correct operation of Halt I/O during data transfer.

- Instructions: Install SIU using 3272 LOCAL INTERFACE: BUS & TAG/STATUS & SENSE overlay.
  Perform Erase Write command through two data bytes. Refer to Diagram 3-104.
  Raise ADR OUT.
  Lower SEL OUT.
  Lower ADR OUT.
  Verify that only the following indicators are on: CE, DE, REQ-I, and CE-REM.
  If this is not true, proceed below. Refer to Section 4 for a description of special symbols.



*Jumpered card. See old card or Diagram 6-101 for jumpering.

Note: Remove all jumpers used for troubleshooting.

Diagram 2-118. Halt I/O Check

Section 3. Switch/Indicator Unit (SIU) Diagrams

The SIU Diagrams 3-100 through 3-112 provide a guide for testing all command functions manually with the SIU. The SIU should be checked for proper operation prior to its use in troubleshooting (refer to paragraph 7.7.3). Should you encounter an SIU failure, use the SIU Troubleshooting Procedure in Appendix A.

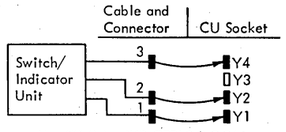
Before starting command operation, perform the following procedure (if not previously done):
Switch Indicator Unit checkout (paragraph 7.7.3).

IMPORTANT

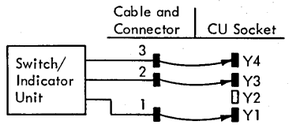
When an error is detected, swap Cable 2. Retry command using other overlay. If an error is detected both ways, troubleshoot error that occurs earliest.

All references in the Troubleshooting Diagram Ref columns should be considered in the order listed for problem analysis.

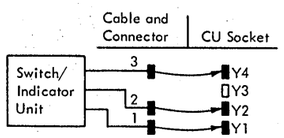
Legend:
- ✳ Any sense bit on
- ● Continuously Lighted Indicator
- ⊙◉ Pulsing Indicator – Size of dot is relative to pulse length and repetition rate. That is, the smaller the dot, the shorter the pulse and/or the lower the repetition rate.



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.



Use 3272 MLPXR/LOCAL INTERFACE STATUS & SENSE overlay.



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.

Switches (Out Tags)	IND switch down: BUS IN 0-7	BUS IN P	SERV SEQ	REQ I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST	UC ✳	Trouble-shooting Diagram Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL/ AFT FTCH	BFR ADD VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN	Trouble-shooting Diagram Ref	NOTES
Start below if chained from previous command. 1. Place CU off line by flipping ON LINE/OFF LINE switch (located on logic gate A1) to OFF LINE. 2. Place LOC/REM switch (on main power panel) in LOC. 3. Turn MAIN LINE switch ON. 4. Flip LOCAL MODE ON switch up.																																							
Drop OP OUT																			4-100	●									●									4-100	System reset.
All Switches Down																				●									●										
Raise OP OUT																				◉	⊙	⊙	⊙						◉		◉					⊙			4-107	CU begins polling each device (poll poll). Polling involves byte counts 0, 1, 2, and 3. Sequences alternate between 2 and 4.
Load CU-device address with BUS OUT switches. (See Chart 1.)																																							
Raise ADR OUT																				◉	⊙	⊙	⊙						◉		◉					⊙				
Raise SEL OUT	CU-Device Address			●	●	●													4-116 4-117 4-118	●					●								●						4-117 4-119	
To terminate command-chaining, drop SUPR OUT here.																																							
Drop ADR OUT	CU-Device Address			●	●	●	●												4-118 4-120	●					●								●							

Diagram 3-100. No-Op Command (Sheet 1 of 2)

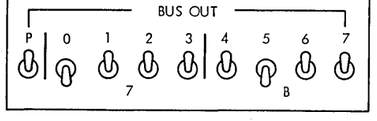
Switches (Out Tags)	IND switch down: BUS IN 0-7	BUS IN P	SERV SEQ	REQ I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST	UC / *	Trouble-shooting Diagram Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL / AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN		Trouble-shooting Diagram Ref	NOTES
Load No Op command - BUS OUT switches P, 6, and 7 (Hex 03).																																									CU polls device (initial poll).
Raise CMD OUT					●	●	●					●						●		4-121, 4-122 4-125	●					●									●						4-132 4-122	
Drop CMD OUT	OC	●			●	●	●			●	●		●	●	●			●		4-133 4-125	●					●									●							Bus In Bit 4 (CE) } Ending Bus In Bit 5 (DE) } Status
If chaining to next command, raise SUPR OUT here.																																									
Drop SEL OUT	OC	●				●	●			●	●		●	●	●			●		4-133 4-162	●					●									●							Channel accepts initial status. If SUPR OUT is up (chaining), the following indicators are lit: BYTE COUNT 0, PRI CTR LDD, and SEQUENCE 6. If there is a failure in chaining, refer to Diagram 4-170.
Raise SERV OUT																				4-135	◉	⊙	⊙	⊙							◉		◉					⊙			4-135	
Drop SERV OUT																					◉	⊙	⊙	⊙							◉		◉					⊙				

CHART 1. CU - DEVICE ADDRESSING

Hex	Binary Equivalent
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

Note: Flip BUS OUT P switch up, as required to generate odd parity.

Example: CU/device address is hex 7B.
Flip BUS OUT switches as shown.



Legend:

* Any sense bit on

Diagram 3-100. No-Op Command (Sheet 2 of 2)

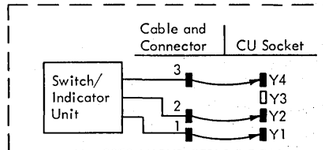
Before starting command operation, perform the following procedure (if not previously done):
Switch Indicator Unit checkout (paragraph 7.7.3).

IMPORTANT

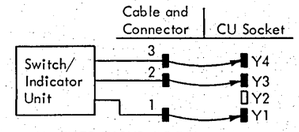
When an error is detected, swap Cable 2. Retry command using other overlay. If an error is detected both ways, troubleshoot error that occurs earliest.

All references in the Troubleshooting Diagram Ref columns should be considered in the order listed for problem analysis.

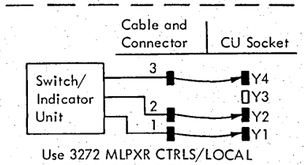
Legend:
- ✳ Any sense bit on
- ● Continuously Lighted Indicator
- ⊙⊙ Pulsing Indicator – Size of dot is relative to pulse length and repetition rate. That is, the smaller the dot, the shorter the pulse and/or the lower the repetition rate.



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.



Use 3272 MLPXR/LOCAL INTERFACE STATUS & SENSE overlay.



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.

Switches (Out Tags)	IND switch down: BUS IN 0-7	BUS IN P	SERV SEQ	REQ I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST	UC / ✳	Trouble-shooting Diagram Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL/ AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN		Trouble-shooting Diagram Ref	NOTES
Start below if chained from previous command. 1. Place CU off line by flipping ON LINE/OFF LINE switch (located on logic gate A1) to OFF LINE. 2. Place LOC/REM switch (on main power panel) in LOC. 3. Turn MAIN LINE switch ON. 4. Flip LOCAL MODE ON switch up.																																									
Drop OP OUT																				4-100	●																			4-100	System reset.
All Switches Down																					●																				
Raise OP OUT																					◉	◉	◉	⊙						◉		◉				⊙			4-107	CU begins polling each device (poll poll). Polling involves byte counts 0, 1, 2, and 3. Sequences alternate between 2 and 4.
Load CU-device address with BUS OUT switches. (See Chart 1.)																																									
Raise ADR OUT																					◉	◉	◉	⊙						◉		◉				⊙					
Raise SEL OUT	CU-Device Address				●	●	●													4-116 4-117 4-118	●					●								●					4-117 4-119	
To terminate command-chaining, drop SUPR OUT here.																																									
Drop ADR OUT	CU-Device Address				●	●	●	●												4-118 4-120	●					●								●						

Diagram 3-101. Test I/O Command (Sheet 1 of 2)

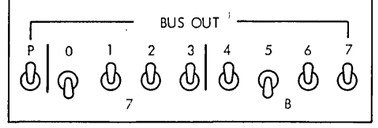
Switches (Out Tags)	IND switch down: BUS IN 0-7	BUS IN P	SERV SEQ	REQ I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST	UC / *	Trouble-shooting Diagram Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL/ AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN		Trouble-shooting Diagram Ref	NOTES
Load Test I/O command - BUS OUT switch P only (Hex 00).																																									
Raise CMD OUT					●	●	●					●								4-121 4-122 4-125	●					●								●						4-132 4-122	CU polls device (initial poll).
Drop CMD OUT	See NOTES Column				●	●	●			●	●									4-125 4-133	●					●								●							
If chaining to next command, raise SUPR OUT here.																																								If any status bits are set, they appear in Bus In indicators. At this time status is normally all-zeros.
Drop SEL OUT	See NOTES Column					●	●			●	●									4-133 4-162	●					●								●							
Raise SERV OUT																				4-135	◉	◉	◉	◉						◉		◉					⊙			4-135.	Channel accepts pending status. CU resumes polling unless SUPR OUT is up (chaining). If so, the following indicators are lit: BYTE COUNT 0 PRI CTR LDD, and SEQUENCE 6. If there is a failure in chaining, refer to Diagram 4-170.
Drop SERV OUT																					◉	◉	◉	◉						◉		◉					⊙			4-107	

CHART 1. CU - DEVICE ADDRESSING

Hex	Binary Equivalent
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

Note: Flip BUS OUT P switch up, as required to generate odd parity.

Example: CU/device address is hex 7B.
Flip BUS OUT switches as shown.



Legend:

* Any sense bit on

Diagram 3-101. Test I/O Command (Sheet 2 of 2)

Before starting command operation, perform the following procedure (if not previously done):
Switch Indicator Unit checkout (paragraph 7.7.3).

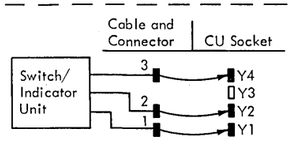
IMPORTANT

When an error is detected, swap Cable 2. Retry command using other overlay. If an error is detected both ways, troubleshoot error that occurs earliest.

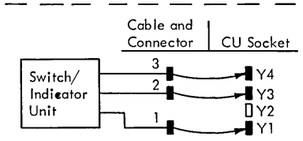
All references in the Troubleshooting Diagram Ref columns should be considered in the order listed for problem analysis.

Legend:

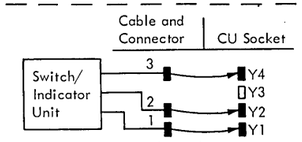
- ● Continuously Lighted Indicator
- ⊙◉ Pulsing Indicator – Size of dot is relative to pulse length and repetition rate. That is, the smaller the dot, the shorter the pulse and/or the lower the repetition rate.



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.



Use 3272 MLPXR/LOCAL INTERFACE STATUS & SENSE overlay.



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.

Switches (Out Tags)	IND switch down: BUS IN 0-7	BUS IN P	SERV SEQ	REQ I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST	UC / * CR	Trouble-shooting Diagram Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL/ AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN		Trouble-shooting Diagram Ref	NOTES
Start below if chained from previous command. 1. Place CU off line by flipping ON LINE/OFF LINE switch (located on logic gate A1) to OFF LINE. 2. Place LOC/REM switch (on main power panel) in LOC. 3. Turn MAIN LINE switch ON. 4. Flip LOCAL MODE ON switch up.																																									
Drop OP OUT																				4-100	●									●										4-100	System reset.
All Switches Down																					●									●											
Raise OP OUT																					◉	◉	⊙	⊙						◉		◉				⊙				4-107	CU begins polling each device (poll poll). Polling involves byte counts 0, 1, 2, and 3. Sequences alternate between 2 and 4.
Load CU-device address with BUS OUT switches. (See Chart 1.)																																									
Raise ADR OUT																					◉	◉	⊙	⊙						◉		◉				⊙					
Raise SEL OUT	CU-Device Address			●	●	●														4-116 4-117 4-118	●					●								●					4-117 4-119	
To terminate command-chaining, drop SUPR OUT here.																																									
Drop ADR OUT	CU-Device Address			●	●	●	●													4-118 4-120	●					●								●						
To force a sense condition: • Load an invalid command – All BUS OUT switches up. This will set the Cmd Rej (command reject) sense bit.																																									
Raise CMD OUT				●	●	●					●							●	●/	4-121,4-122 4-125,4-167	●					●								●					4-132	
Drop CMD OUT	02			●	●	●			●	●								●	●/	4-133	●					●								●						Bus In Bit 6 – UC (unit check) Initial Status.
Drop SEL OUT	02				●	●			●	●								●	●/	4-162	●					●								●						
Raise SERV OUT																			/		◉	◉	⊙	⊙						◉		◉				⊙					
Drop SERV OUT																			●		◉	◉	⊙	⊙						◉		◉				⊙					

*CR = Cmd Rej

Diagram 3-102. Sense Command (Sheet 1 of 2)

Switches (Out Tags)	IND switch down: BUS IN 0-7	BUS IN P	SERV SEQ	REQ I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST	UC / * CR	Trouble-shooting Diagram Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL/ AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN		Trouble-shooting Diagram Ref	NOTES
Start of actual Sense command: Load CU-device address with BUS OUT switches. (See Chart 1.)																																									
Raise ADR OUT																			●		◉	◉	◉	⊙							◉		◉				⊙				
Raise SEL OUT	CU-Device Address				●	●	●												●	4-116 4-117 4-118	●					●									●							4-117 4-119
Drop ADR OUT	CU-Device Address				●	●	●	●											●	4-120	●					●									●						
Load Sense command - BUS OUT switch 5 (Hex 04).																																									
Raise CMD OUT					●	●	●					●						●	●	4-121 4-122 4-125	●					●									●						
Drop CMD OUT					●	●	●			●	●							●	●	4-133 4-125	●					●									●						
Raise SERV OUT					●		●											●	●	4-134	●					●									●						
Drop SERV OUT	Sense Byte		●		●		●		●			●	●	●	●			●	●	4-168	●					●									●						Contents of sense register are on Bus In (in this case, bit 0 Cmd Rej).
Raise SERV OUT			●		●		●					●	●	●	●			●	●	4-146	●					●									●						
Drop SERV OUT	OC				●		●			●	●		●	●	●			●	●	4-156	●					●									●						
If chaining to next command, raise SUPR OUT here.																																									Bus In Bit 4 (CE) Ending Bus In Bit 5 (DE) Status
Drop SEL OUT	OC						●			●	●		●	●	●			●	●	4-162	●					●									●						
Raise SERV OUT																				4-134 4-162	◉	◉	◉	⊙							◉		◉				⊙			4-162	Channel accepts ending status. CU resumes polling unless SUPR OUT is up (chaining). If so, the following indicators are lit: BYTE COUNT 0, PRI CTR LDD, and SEQUENCE 6.
Drop SERV OUT																					◉	◉	◉	⊙							◉		◉				⊙				

*CR = Cmd Rej

CHART 1. CU-DEVICE ADDRESSING

Hex	Binary Equivalent
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

Note: Flip BUS OUT P switch up, as required to generate odd parity.

Example: CU/device address is hex 7B.
Flip BUS OUT switches as shown.

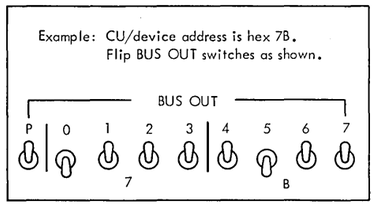


Diagram 3-102. Sense Command (Sheet 2 of 2)

Before starting command operation, perform the following procedure (if not previously done):
Switch Indicator Unit checkout (paragraph 7.7.3).

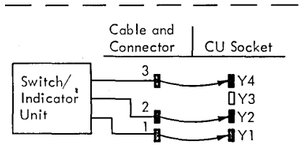
IMPORTANT

When an error is detected, swap Cable 2. Retry command using other overlay. If an error is detected both ways, troubleshoot error that occurs earliest.

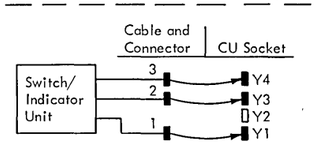
All references in the Troubleshooting Diagram Ref columns should be considered in the order listed for problem analysis.

Legend:

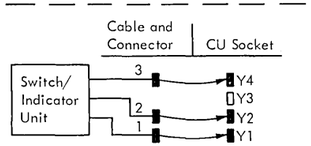
- ● Continuously Lighted Indicator
- ⊙◉ Pulsing Indicator – Size of dot is relative to pulse length and repetition rate. That is, the smaller the dot, the shorter the pulse and/or the lower the repetition rate.



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.



Use 3272 MLPXR/LOCAL INTERFACE STATUS & SENSE overlay.



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.

Switches (Out Tags)	IND switch down: BUS IN 0-7	BUS IN P	SERV SEQ	REQ I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST	Trouble-shooting Diagram Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL / AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN	Trouble-shooting Diagram Ref	NOTES
Start below if chained from previous command. 1. Place CU off line by flipping ON LINE/OFF LINE switch (located on logic gate A1) to OFF LINE. 2. Place LOC/REM switch (on main power panel) in LOC. 3. Turn MAIN LINE switch ON. 4. Flip LOCAL MODE ON switch up.																																						
Drop OP OUT																			4-100	●									●									4-100	System reset.
All Switches Down																				●									●										
Raise OP OUT																				◉	⊙	⊙	⊙						◉		◉					⊙			4-107	CU begins polling each device (poll poll). Polling involves byte counts 0, 1, 2, and 3. Sequences alternate between 2 and 4.
Load CU-device address with BUS OUT switches. (See Chart 1.)																																						
Raise ADR OUT																				◉	⊙	⊙	⊙						◉		◉					⊙			
Raise SEL OUT	CU-Device Address			●	●	●													4-116 4-117 4-118	●					●								●					4-117 4-119	
To terminate command-chaining, drop SUPR OUT here.																																						
Drop ADR OUT	CU-Device Address			●	●	●	●												4-118 4-120	●					●								●						

Diagram 3-103. Select Command (Sheet 1 of 2)

Switches (Out Tags)	IND switch down: BUS IN 0-7	BUS IN P	SERV SEQ	REQ I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST	Trouble-shooting Diagram Ref	IND switch up: BYTE COUNT 0	BYTE COUNT 1	BYTE COUNT 2	BYTE COUNT 3	IO REG LDD	PRI CTR LDD	BFR VAL/ AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	SEQUENCE 3	SEQUENCE 4	SEQUENCE 5	SEQUENCE 6	SEQUENCE 7	SEQUENCE 8	CHG SEQ	OP/ XFR FIN	Trouble-shooting Diagram Ref	NOTES
Load Select command - BUS OUT switches 4, 6, and 7 (Hex 0B).																																							
Raise CMD OUT					●	●	●					●				●		●	4-121 4-122 4-125	◉					●	●					☼		●						4-129 4-132	☼ Flashes when device buffer transfers to CU buffer.
Drop CMD OUT	OC	●			●	●	●			●	●		●	◉	◉			●	4-133	◉					◉	◉							●							Bus In Bit 4 (CE) } Ending Bus In Bit 5 (CE) } Status
If chaining to next command, raise SUPR OUT here.																																						
Drop SEL OUT	OC	●				●	●			●	●		●	◉	◉			●	4-162	◉					◉	●							●							
Raise SERV OUT																			4-135	◎	◎	◎	◎						◉		◉				⊙			4-135	Channel accepts initial status. If SUPR OUT is up (chaining), the following indicators are lit: BYTE COUNT 0, PRI CTR LDD, BFR VAL AFT FTCH, and SEQUENCE 6.
Drop SERV OUT																				◎	◎	◉	◉						◉		◉				⊙				

CHART 1. CU - DEVICE ADDRESSING

Hex	Binary Equivalent
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

Note: Flip BUS OUT P switch up, as required to generate odd parity.

Example: CU/device address is hex 7B.
Flip BUS OUT switches as shown.

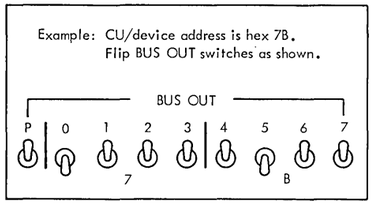


Diagram 3-103. Select Command (Sheet 2 of 2)

Before starting command operation, perform the following procedure (if not previously done):
Switch Indicator Unit checkout (paragraph 7.7.3).

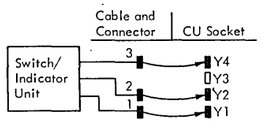
IMPORTANT

When an error is detected, swap Cable 2. Retry command using other overlay. If an error is detected both ways, troubleshoot error that occurs earliest.

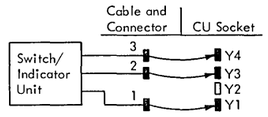
All references in the Troubleshooting Diagram Ref columns should be considered in the order listed for problem analysis.

Legend:

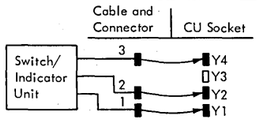
- ● Continuously Lighted Indicator
- ⊙◉ Pulsing Indicator - Size of dot is relative to pulse length and repetition rate. That is, the smaller the dot, the shorter the pulse and/or the lower the repetition rate.



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.



Use 3272 MLPXR/LOCAL INTERFACE STATUS & SENSE overlay.



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.

Switches (Out Tags)	IND switch down: BUS IN 0-7	BUS IN P	SERV SEQ	REQ I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST	Trouble-shooting Diagram Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL/ AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN	Trouble-shooting Diagram Ref	NOTES
Start below if chained from previous command. 1. Place CU off line by flipping ON LINE/OFF LINE switch (located on logic gate A1) to OFF LINE. 2. Place LOC/REM switch (on main power panel) in LOC. 3. Turn MAIN LINE switch ON. 4. Flip LOCAL MODE ON switch up.																																						
Drop OP OUT																			4-100	●									●									4-100	System reset.
All Switches Down																				●									●										
Raise OP OUT																				◉	⊙	⊙	⊙						◉		◉					⊙			4-107	CU begins polling each device (poll poll). Polling involves byte counts 0, 1, 2, and 3. Sequences alternate between 2 and 4.
Load CU-device address with BUS OUT switches. (See Chart 1)																																							
Raise ADR OUT																				◉	⊙	⊙	⊙						◉		◉					⊙				
Raise SEL OUT	CU-Device Address				●	●	●												4-116 4-117 4-118	●					●								●					4-117 4-119	
To terminate command-chaining, drop SUPR OUT here.																																							
Drop ADR OUT	CU-Device Address				●	●	●	●											4-118 4-120	●					●								●						
Load Erase/Write command - BUS OUT switches P, 5, and 7 (Hex 05).																																							
Raise CMD OUT					●	●	●					◉					●		4-121 4-122 4-125	●					●								●					4-128 4-132	
Drop CMD OUT		●			●	●	●			◉	◉						●		4-133 4-125	●					●								●						Initial status is all zeros.
Raise SERV OUT					●		●										●		4-134	●					●								●						Channel accepts initial status.
Drop SERV OUT			●		●		●		◉								●		4-136	●					●								●						CU waits for WCC.
Load WCC. (See Chart 2.)																																							
Raise SERV OUT			●		●		●										●		4-145 4-146 4-148	●	☼				●	●	●	●					●					4-136 4-145 4-149	☼ Flashes when CU buffer is erased. WCC on bus out.
Drop SERV OUT			●		●		●		◉								●		4-136	●					●	●	●	●					●						

Diagram 3-104. Erase/Write Command (Sheet 1 of 3)

Switches (Out Tags)	IND switch down: BUS IN 0-7	BUS IN P	SERV SEQ	REQ I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST		Trouble-shooting Flowchart Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN		Trouble-shooting Flowchart Ref	NOTES
Load character.																					Note that byte count is shown for an alphameric character and the following orders: IC, PT, NL, EM, FM, and DUP. For RA, SBA, EUA, and SF orders, see Chart 3. See Chart 3 also for abbreviations and hex codes.																							
Raise SERV OUT			●		●		●											●		4-146,4-148 4-136,4-126	●			☼	●	●	●	●							●				4-150 4-136 4-151	☼ Flashes when character transfers from bus out to CU buffer. May or may not be visible depending on position of buffer address counter.
Drop SERV OUT			●		●		●		●									●		4-126 4-136	●				●	●	●	●							●				4-150 4-151	
Repeat two previous steps for each character including SF, attribute, orders, and addresses.																																								
Raise CMD OUT			◒		◒		◒					◒	◒	◒			◒	◒		4-153	◒					●	●	●							●			◒		4-153	Channel stop.
Drop CMD OUT	08				●		●			●	●		●	●			●	●		4-156	●					●	●	●							●			●			④ Bus in bit 4 (CE) ending status
Drop SEL OUT	08						●			●	●		●	●			●	●		4-162	●					●	●	●							●			●			
Raise SERV OUT													●		●	●		●		4-158	●	☼	☼	☼		●	●	●			☼				●			●		4-158	☼ Flashes when CU buffer transfers to device buffer.
Drop SERV OUT				●									●		●	●		●		4-157	●					●	●	●							●			●		4-157	
Raise SEL OUT	CU-Device Address				●		●	●					●		●	●		●		4-159	●					●	●	●							●			●			Channel poll.
Raise CMD OUT					●		●					●	●		●	●		●		4-121	●					●	●	●							●			●		4-121	Proceed.
Drop CMD OUT	04				●		●			●	●		●		●			●		4-160	●					●	●	●							●			●			⑤ Bus in bit 5 (DE) pending status.
If chaining to next command, raise SUPR OUT here.																																								
Drop SEL OUT	04						◒			●	●		●		●			●		4-162	◒					●	●	●							◒			◒			Channel accepts pending status. CU resumes polling unless SUPR OUT is up (chaining). If so, the following indicators are lit: BYTE COUNT 0, PRI CTR LDD, BFR VAL AFT FTCH, BFR ADR VAL and SEQUENCE 6.
Raise SERV OUT																				4-162	◉	◉	◉	◉							●		●			⊙			4-162	
Drop SERV OUT																					◉	◉	◉	◉							●		●			⊙				

Notes:
1. If incorrect data is displayed (or printed) at device, begin troubleshooting on Diagram 4-169.
2. If WCC is not properly executed at device, begin troubleshooting on Diagram 4-147.
3. If order is not executed properly, begin troubleshooting on Diagram 4-151.
4. If data following SBA order is not displayed in proper location, begin troubleshooting on Diagram 4-152.

Diagram 3-104. Erase/Write Command (Sheet 2 of 3)

CHART 1. CU-DEVICE ADDRESSING

Hex	Binary Equivalent
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

Note: Flip BUS OUT P switch up, as required to generate odd parity.

Example: CU/device address is hex 7B.
Flip BUS OUT switches as shown.

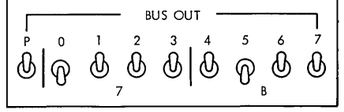


CHART 2. WCC CODES

Write Control Character (WCC)

Bit	0	1	2	3	4	5	6	7
Bit Function	0	1	Printer Format		SP	SA	KB RST	RST MDT

Bit	Action	Set BUS OUT Switch To:
0		0
1		1
2	See Note	
3	See Note	
4	Start Printer	1
5	Sound alarm	1
6	Restore keyboard	1
7	Reset modified Data tags	1

Note: Bits 2 and 3 settings

	2	3
Honor NL (Printer Start New Line) and EM (End of Message Stop Printing) Orders. =	0	0
Print 40-character line =	0	1
Print 64-character line =	1	0
Print 80-character line =	1	1

Example:
WCC bit-configuration (in a message addressed to a display station) to (1) cause audible alarm to sound and (2) to restore keyboard, looks like this:

Bits	P	0	1	2	3	4	5	6	7
Bit Value	0	0	1	0	0	0	1	1	0

Hex = 46

Sound alarm bit

Restore keyboard bit

CHART 3. RA, SBA, EUA, AND SF ORDER SEQUENCES SHOWING BYTE COUNT STEPPING.

How to Use This Chart:
If you load in the RA order, for example, you must follow Chart 3A before loading in the next data character. The byte count should step as shown.
* If not correct, troubleshoot with Diagram 4-150 or 4-151.

A.

	BYTE COUNT 0	1	2	3
Load RA Order				
*Raise SERV OUT		●		
Drop SERV OUT		●		
Load Hi-Order Adr				
*Raise SERV OUT			●	
Drop SERV OUT			●	
Load Lo-Order Adr				
*Raise SERV OUT				●
Drop SERV OUT				●
Load Alphameric Char				
*Raise SERV OUT	●			
Drop SERV OUT	●			

B.

	BYTE COUNT 0	1	2	3
Load SBA or EUA Order				
*Raise SERV OUT		●		
Drop SERV OUT		●		
Load Hi-Order Adr				
*Raise SERV OUT			●	
Drop SERV OUT			●	
Load Lo-Order Adr				
*Raise SERV OUT	●			
Drop SERV OUT	●			

C.

	BYTE COUNT 0	1	2	3
Load SF Order				
*Raise SERV OUT		●		
Drop SERV OUT		●		
Load Attribute Char				
*Raise SERV OUT	●			
Drop SERV OUT	●			

Abbreviations of Orders

		Hex
DUP	Duplicate	1C
EM	End of Message	19
EUA	Erase Unprotected to Address	12
FM	Field Mark	1E
IC	Insert Cursor	13
NL	New Line	15
PT	Program Tab	05
RA	Repeat to Address	3C
SBA	Set Buffer Address	11
SF	Start Field	1D

Diagram 3-104. Erase/Write Command (Sheet 3 of 3)

Before starting command operation, perform the following procedure (if not previously done):
Switch Indicator Unit checkout (paragraph 7.7.3).

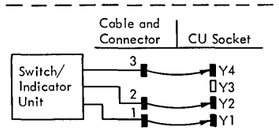
IMPORTANT

When an error is detected, swap Cable 2. Retry command using other overlay. If an error is detected both ways, troubleshoot error that occurs earliest.

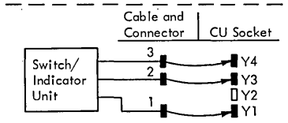
All references in the Troubleshooting Diagram Ref columns should be considered in the order listed for problem analysis.

Legend:

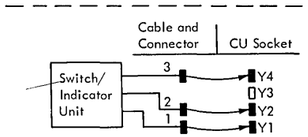
- ● Continuously Lighted Indicator
- ⊙◉ Pulsing Indicator - Size of dot is relative to pulse length and repetition rate. That is, the smaller the dot, the shorter the pulse and/or the lower the repetition rate.



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.



Use 3272 MLPXR/LOCAL INTERFACE STATUS & SENSE overlay.



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.

Switches (Out Tags)	IND switch down: BUS IN 0-7	BUS IN P	SERV SEQ	REQ I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST	Trouble-shooting Diagram Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL/ AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN	Trouble-shooting Diagram Ref	NOTES
Start below if chained from previous command. 1. Place CU off line by flipping ON LINE/OFF LINE switch (located on logic gate A1) to OFF LINE. 2. Place LOC/REM switch (on main power panel) in LOC. 3. Turn MAIN LINE switch ON. 4. Flip LOCAL MODE ON switch up.																																							
Drop OP OUT																			4-100	●									●									4-100	System reset.
All Switches Down																				●									●										
Raise OP OUT																				◉	⊙	⊙	⊙						◉		◉					⊙		4-107	CU begins polling each device (poll poll). Polling involves byte counts 0, 1, 2, and 3. Sequences alternate between 2 and 4.
Load CU-device address with BUS OUT switches. (See Chart 1.)																																							
Raise ADR OUT																				◉	⊙	⊙	⊙						◉		◉					⊙			
Raise SEL OUT	CU-Device Address				●	●	●												4-116 4-117 4-118	●					●								●					4-117 4-119	
To terminate command-chaining, drop SUPR OUT here.																																							
Drop ADR OUT	CU-Device Address				●	●	●	●											4-118 4-120	●					●								●						
Load Read Buffer command - BUS OUT switch 6 (Hex 02).																																							
Raise CMD OUT					●	●	●					●						●	4-121, 4-122 4-125, 4-130		●			●	●	●				☼				●					4-130 4-131 4-132	☼ Flashes when device buffer transfers to CU buffer.
Drop CMD OUT		●			●	●	●			●	●							●	4-125 4-130 4-133		●			●	●	●								●					4-130	Initial status is all zeros.
Raise SERV OUT					●		●											●	4-134		●			●	●	●								●						Channel accepts initial status.
Drop SERV OUT	Aid Char (Chart 2)		●		●		●		●									●	4-136 4-137 4-138		●			●	●	●								●					4-138	Attention identifier (AID) is on Bus In.
Raise SERV OUT			●		●		●											●	4-146		●			●	●	●								●					4-146	
Drop SERV OUT	Hi Order Crsr Adr		●		●		●		●									●	4-136 4-139			●		●	●	●								●					4-139	To determine cursor address, combine high and low order addresses (in hex) and look up address in Diagram 7-114.
Raise SERV OUT			●		●		●											●	4-146			●		●	●	●								●					4-146	
Drop SERV OUT	Lo Order Crsr Adr		●		●		●		●									●	4-136 4-139	●				●	●	●	●		●					●					4-139	
Raise SERV OUT			●		●		●											●	4-137 4-146	●				●	●	●	●		●					●					4-146	
Drop SERV OUT	See NOTES Column		●		●		●		●									●	4-136 4-140	●				●	●	●	●		●					●					4-140 4-141 4-142	Indicators are shown when a data byte or attribute character is on Bus In. Indicators are same for start field (SF) order except BYTE COUNT 1 is lit instead of BYTE COUNT 0.
Repeat two previous steps to read each byte desired. If address 478 (or 1918) is reached before channel-stop is performed, that is, CMD OUT is raised, skip channel-stop sequence and go to CU-stop sequence.																																							

Diagram 3-105. Read Buffer Command (Sheet 1 of 2)

Switches (Out Tags)	IND switch down: BUS IN 0-7	BUS IN P	SERV SEQ	REQ I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST		Trouble-shooting Diagram Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL/ AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN		Trouble-shooting Diagram Ref	NOTES
CHANNEL–STOP SEQUENCE																																									
Raise CMD OUT			●		●		●					●	●	●	●			●		4-146 4-154	●				●	●	●	●							●				●		4-154 4-141	Channel-stop.
Drop CMD OUT	OC	●			●		●			●	●		●	●	●			●		4-156 4-157	●					●	●	●							●				●			Bus In Bit 4 (CE) } Ending Bus In Bit 5 (DE) } Status
If chaining to next command, raise SUPR OUT here.																																								
Drop SEL OUT	OC	●					●			●	●		●	●	●			●		4-162	●					●	●	●							●			⊙	●			Channel accepts ending status. CU resumes polling unless SUPR OUT is up (chaining). If so, the following indicators are lit: BYTE COUNT 0, PRI CTR LDD, BFR VAL AFT FTCH, and SEQUENCE 6.
Raise SERV OUT																				4-162	◉	⊙	⊙	⊙							◉		◉					⊙				
Drop SERV OUT																					◉	⊙	⊙	⊙							◉		◉					⊙			4-107	
CU–STOP SEQUENCE																																								
Raise SERV OUT			●		●		●											●		4-145	●				●	●	●	●		●							●				
Drop SERV OUT	See NOTES Column		●		●		●		●									●		4-137 4-138 4-140	●				●	●	●	●		●							●		●		4-141	Next-to-last character is on Bus In.
Raise SERV OUT			●		●		●											●		4-146	●				●	●	●	●		●							●		●		4-146	
Drop SERV OUT	See NOTES Column		●		●		●		●									●		4-137 4-138 4-140	●				●	●	●	●							●			●			4-142	Last character (adr 479, or adr 1919) is on Bus In.
Raise SERV OUT			●		●		●					●	●	●	●			●		4-146 4-155	●				●	●	●	●							●			●			4-146	
Drop SERV OUT	OC	●			●		●			●	●		●	●	●			●		4-156	●					●	●	●							●				●			Bus In Bit 4 (CE) } Ending Bus In Bit 5 (DE) } Status
If chaining to next command, raise SUPR OUT here.																																								
Drop SEL OUT	OC	●					●			●	●		●	●	●			●		4-162	●					●	●	●							●			⊙	●			CU resumes polling unless SUPR OUT is up (chaining). If so, the following indicators are lit: BYTE COUNT 0, PRI CTR LDD, BFR VAL AFT FTCH, BFR ADR VAL and SEQUENCE 6.
Raise SERV OUT																				4-162	◉	⊙	⊙	⊙							◉		◉					⊙			4-162	
Drop SERV OUT																					◉	⊙	⊙	⊙							◉		◉					⊙			4-107	

CHART 1. CU - DEVICE ADDRESSING

Hex	Binary Equivalent
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

Note: Flip BUS OUT P switch up, as required to generate odd parity.

Example: CU/device address is hex 7B.
Flip BUS OUT switches as shown.

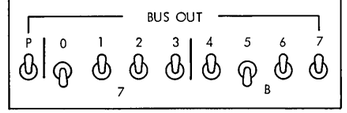


CHART 2. ATTENTION IDENTIFIER (AID) CODES

AID	Hex Char	Graphic Char
No AID generated (Display Station)	60	-
No AID generated (Printer)	E8	Y
ENTER key	7D	'
CLEAR key	6D	_
TEST REQ key	F0*	0
PF 1 key	F1	1
PF 2 key	F2	2
PF 3 key	F3	3
PF 4 key	F4	4
PF 5 key	F5	5
PF 6 key	F6	6
PF 7 key	F7	7
PF 8 key	F8	8
PF 9 key	F9	9

AID	Hex Char	Graphic Char
PF 10 key	7A	:
PF 11 key	7B	#
PF 12 key	7C	@
PA 1 key	6C	%
PA 2 (CANCEL) key	6E	>
PA 3 key	6B	,
Selector Pen	7E	=
Operator Identification Card Reader - Enter	E6	W
Reserved	6F	?
Reserved	E9	Z
Reserved	6A	¦

* Transferred on Read Buffer command only.

Note: If incorrect AID character is on Bus In, begin troubleshooting on Diagram 4-138.

Diagram 3-105. Read Buffer Command (Sheet 2 of 2)

Before starting command operation, perform the following procedure (if not previously done):
Switch Indicator Unit checkout (paragraph 7.7.3).

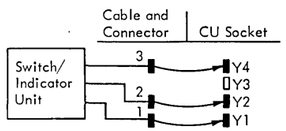
IMPORTANT

When an error is detected, swap Cable 2. Retry command using other overlay. If an error is detected both ways, troubleshoot error that occurs earliest.

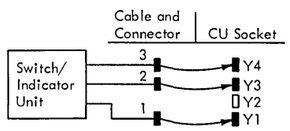
All references in the Troubleshooting Diagram Ref columns should be considered in the order listed for problem analysis.

Legend:

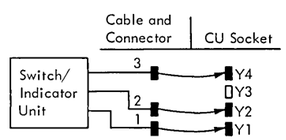
- ● Continuously Lighted Indicator
- ⊙⊙ Pulsing Indicator – Size of dot is relative to pulse length and repetition rate. That is, the smaller the dot, the shorter the pulse and/or the lower the repetition rate.



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.



Use 3272 MLPXR/LOCAL INTERFACE STATUS & SENSE overlay.



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.

Switches (Out Tags)	IND switch down: BUS IN 0-7	BUS IN P	SERV SEQ	REQ I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST	Trouble-shooting Diagram Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL/ AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN	Trouble-shooting Diagram Ref	NOTES
Start below if chained from previous command. 1. Place CU off line by flipping ON LINE/OFF LINE switch (located on logic gate A1) to OFF LINE. 2. Place LOC/REM switch (on main power panel) in LOC. 3. Turn MAIN LINE switch ON. 4. Flip LOCAL MODE ON switch up.																																						
Drop OP OUT																			4-100	●									●									4-100	System reset.
All Switches Down																				●									●										
Raise OP OUT																				◉	◉	◉	◉						◉		◉					⊙			4-107	CU begins polling each device (poll poll). Polling involves byte counts 0, 1, 2, and 3. Sequences alternate between 2 and 4.
Load CU-device address with BUS OUT switches. (See Chart 1.)																																						
Raise ADR OUT																				◉	◉	◉	◉						◉		◉					⊙				
Raise SEL OUT	CU-Device Address				●	●	●												4-116 4-117 4-118	●				●														4-117 4-119	
To terminate command-chaining, drop SUPR OUT here.																																						
Drop ADR OUT	CU-Device Address				●	●	●	●											4-118 4-120	●				●															
Load Write command – BUS OUT switch 7 (Hex 01).																																						
Raise CMD OUT					●	●	●				●							●	4-121 4-122 4-125	●				●														4-128 4-132	CU polls device (initial poll).
Drop CMD OUT		●			●	●	●			●	●							●	4-133 4-125	●				●															Initial status is all zeros.
Raise SERV OUT					●		●											●	4-134	●				●															Channel accepts initial status.
Drop SERV OUT			●		●		●		●									●	4-136	●				●															CU waits for WCC.
Load WCC. (See Chart 2.)																																						
Raise SERV OUT			●		●		●											●	4-145 4-148		●			●														4-145	WCC on Bus Out.
Drop SERV OUT			●		●		●		●									●	4-136		●			●															

Diagram 3-106. Write Command (Sheet 1 of 3)

Switches (Out Tags)	IND switch down: BUS IN 0-7	BUS IN P	SERV SEQ	REQ I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST		Trouble-shooting Diagram Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL/ AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN		Trouble-shooting Diagram Ref	NOTES
Load first character. Note that byte count is shown for an alphameric character and the following orders: IC, PT, NL, EM, FM, and DUP. For RA, SBA, EUA, and SF orders, see Chart 3. See Chart 3 also for abbreviations and hex codes.																																									
Raise SERV OUT			●		●		●										●			4-130, 4-136 4-126	●				②	●	●	●	●			①				●				4-136 4-150 4-130 4-148	First character on Bus Out.
Drop SERV OUT			●		●		●		●								●			4-136, 4-150 4-126	●					●	●	●	●							●				4-150	① Flashes when device buffer transfers to CU buffer.
Load next character.																																									② Flashes when character transfers from Bus Out to CU buffer. May or may not be visible depending on position of buffer address counter.
Raise SERV OUT			●		●		●										●			4-148, 4-136 4-126	●				②	●	●	●	●							●				4-136 4-150	
Drop SERV OUT			●		●		●		●								●			4-136 4-126	●					●	●	●	●							●				4-150 4-151	
Repeat two previous steps for each character including SF, attribute, orders, and addresses.																																									
Raise CMD OUT			●		●		●					●	●	●			●	●		4-153	●					●	●	●						●				●		4-153	Channel stop.
Drop CMD OUT	08				●		●			●	●		●	●			●	●		4-156	●					●	●	●						●				●			Bus In Bit 4 (CE) Ending Status
Drop SEL OUT	08						●			●	●		●	●			●	●			●					●	●	●						●				●			
Raise SERV OUT													●		●	●		●		4-158	●	☼	☼	☼		●	●	●				☼			●			●			4-158	☼ Flash occurs when CU buffer transfers to device buffer.
Drop SERV OUT				●									●		●	●		●		4-157	●					●	●	●						●				●				
Raise SEL OUT	CU-Device Address				●		●	●					●		●	●		●		4-159	●					●	●	●						●				●			Channel poll.
Raise CMD OUT					●		●					●	●		●	●		●		4-121	●					●	●	●						●				●		4-121	Proceed.
Drop CMD OUT	04				●		●			●	●		●		●			●		4-160	●					●	●	●						●				●			Bus In Bit 5 (DE) Pending Status
If chaining to next command, raise SUPR OUT here.																																									
Drop SEL OUT	04						●			●	●		●		●			●		4-162	●					●	●	●						●				●			Channel accepts pending status. CU resumes polling unless SUPR OUT is up (chaining). If so, the following indicators are lit: BYTE COUNT 0, PRI CTR LDD, BFR VAL AFT FTCH, BFR ADR VAL and SEQUENCE 6.
Raise SERV OUT																				4-162	◉	⊙	⊙	⊙							◉		◉				⊙			4-162	
Drop SERV OUT																					◉	⊙	⊙	⊙							◉		◉				⊙			4-107	

Notes:
1. If incorrect data is displayed (or printed) at device, begin troubleshooting on Diagram 4-169.
2. If WCC is not properly executed at device, begin troubleshooting on Diagram 4-147.
3. If order is not executed properly, begin troubleshooting on Diagram 4-151.
4. If data following SBA order is not displayed in proper location, begin troubleshooting on Diagram 4-152.

Diagram 3-106. Write Command (Sheet 2 of 3)

CHART 1. CU-DEVICE ADDRESSING

Hex	Binary Equivalent
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

Note: Flip BUS OUT P switch up, as required to generate odd parity.

Example: CU/device address is hex 7B.
Flip BUS OUT switches as shown.

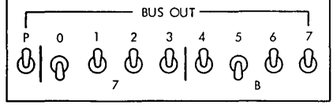


CHART 2. WCC CODES

Write Control Character (WCC)

0	1	2	3	4	5	6	7
0	1	Printer Format		SP	SA	KB RST	RST MDT

Bit	Action	Set BUS OUT Switch To:
0		0
1		1
2	See Note.	
3	See Note.	
4	Start Printer	1
5	Sound Alarm	1
6	Restore Keyboard	1
7	Reset Modified Data Tags	1

Note: Bits 2 and 3 settings → 2 | 3

Honor NL (Printer Start New Line) and EM (End of Message Stop Printing) orders.	=	0	0
Print 40-character line	=	0	1
Print 64-character line	=	1	0
Print 80-character line	=	1	1

Example:
WCC bit-configuration (in a message addressed to a printer) to (1) print 40-character, lines and (2) start the printer printing, looks like this:

	P	0		2	3	4	5	6	7
Bits									
Bit Value	0	0	1	0	1	1	0	0	0

Print 40-character line

Start printer

Hex = 58

CHART 3. RA, SBA, EUA, AND SF ORDER SEQUENCES SHOWING BYTE COUNT STEPPING.

How to use this chart:
If you load in the RA order, for example, you must follow chart 3A before loading in the next data character. The byte count should step as shown.
* If not correct, troubleshoot with Diagram 4-150 or 4-151.

A.

	BYTE COUNT 0	1	2	3
Load RA Order				
*Raise SERV OUT		●		
Drop SERV OUT		●		
Load Hi-Order Adr				
*Raise SERV OUT			●	
Drop SERV OUT			◒	
Load Lo-Order Adr				
*Raise SERV OUT				●
Drop SERV OUT				●
Load Alphameric Char				
*Raise SERV OUT	◔			
Drop SERV OUT	◔			

B.

	BYTE COUNT 0	1	2	3
Load SBA or EUA Order				
*Raise SERV OUT		●		
Drop SERV OUT		●		
Load Hi-Order Adr				
*Raise SERV OUT			●	
Drop SERV OUT			◒	
Load Lo-Order Adr				
*Raise SERV OUT	●			
Drop SERV OUT	●			

C.

	BYTE COUNT 0	1	2	3
Load SF Order				
*Raise SERV OUT		◔		
Drop SERV OUT		◔		
Load Attribute Char				
*Raise SERV OUT	◔			
Drop SERV OUT	◔			

Abbreviations of Orders

		Hex Code
DUP	Duplicate	1C
EM	End of Message	19
EUA	Erase Unprotected to Address	12
FM	Field Mark	1E
IC	Insert Cursor	13
NL	New Line	15
PT	Program Tab	05
RA	Repeat to Address	3C
SBA	Set Buffer Address	11
SF	Start Field	1D

Diagram 3-106. Write Command (Sheet 3 of 3)

IMPORTANT

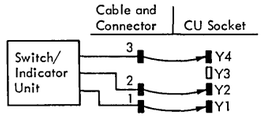
When an error is detected, swap Cable 2. Retry command using other overlay. If an error is detected both ways, troubleshoot error that occurs earliest.

All references in the Troubleshooting Diagram Ref columns should be considered in the order listed for problem analysis.

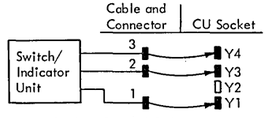
Legend:

- ● Continuously Lighted Indicator
- ⊙ Pulsing Indicator - Size of dot is relative to pulse length and repetition rate. That is, the smaller the dot, the shorter the pulse and/or the lower the repetition rate.

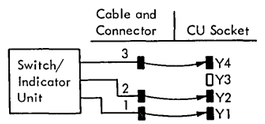
Before starting command operation, perform the following procedure (if not previously done):
Switch Indicator Unit checkout (paragraph 7.7.3).



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.



Use 3272 MLPXR/LOCAL INTERFACE STATUS & SENSE overlay.



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.

Switches (Out Tags)	IND switch down: BUS IN 0-7	BUS IN P	SERV SEQ	REG I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST	Trouble-shooting Diagram Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL/ AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN	Trouble-shooting Diagram Ref	NOTES
Start below if chained from previous command. 1. Place CU off line by flipping ON LINE/OFF LINE switch (located on logic gate A1) to OFF LINE. 2. Place LOC/REM switch (on main power panel) in LOC. 3. Turn MAIN LINE switch ON. 4. Flip LOCAL MODE ON switch up.																																							
Drop OP OUT																			4-100	⊙									●									4-100	System reset.
All Switches Down																				⊙									●										
Raise OP OUT																				⊙	⊙	⊙	⊙						⊙		⊙					⊙			4-107	CU begins polling each device (poll poll). Polling involves byte counts 0, 1, 2, and 3. Sequences alternate between 2 and 4.
Load CU-device address with BUS OUT switches. (See Chart 1)																																							
Raise ADR OUT																				⊙	⊙	⊙	⊙						⊙		⊙					⊙			
Raise SEL OUT	CU-Device Address				●	●	●												4-116 4-117 4-118	⊙					●							●						4-117 4-119	
To terminate command-chaining, DROP SUPR out here.																																							
Drop ADR OUT	CU-Device Address				●	●	●	●											4-118 4-120	⊙					●							●							
Load Read Modified command - BUS OUT switches P, 5, and 6 (Hex 06).																																						4-130	
Raise CMD OUT					●	●	●					●						●	4-121 4-122 4-130		⊙			●	●	●					☼				●				4-130 4-131 4-132	☼ Flashes when device buffer transfers to CU buffer.
Drop CMD OUT		●			●	●	●			●	●							●	4-125 4-130 4-133		⊙			●	●	●									●				4-130	Initial status is all zeros.
Raise SERV OUT					●		●											●	4-134		⊙			●	●	●									●					Channel accepts initial status.
Drop SERV OUT	AID Char (Chart 2)		●		●		●		●									●	4-136 4-137 4-138		⊙			●	●	●									●					Attention identifier is on bus in.
Raise SERV OUT			●		●		●											●	4-146		⊙			●	●	●									●				4-146	
Drop SERV OUT	Hi Order CRSR ADR		●		●		●		●									●	4-136 4-139			⊙		●	●	●									●				4-139	To determine cursor address, combine high and low order addresses (in hex) and look up cursor address in Diagram 7-114.
Raise SERV OUT			●		●		●											●	4-146			⊙		●	●	●									●				4-146	
Drop SERV OUT	Lo Order CRSR ADR		●		●		●		●									●	4-136 4-139	⊙				●	●	●	●		●						●				4-139	
Raise SERV OUT			●		●		●											●	4-146	⊙				●	●	●	●		●						●				4-146	SBA (set buffer address) code on bus in if MDT (modified data tag) bit of attribute character is found. If no MDT bit is found, CU sets CE and DE. Conclude operation at CU-stop sequence (next page).
Drop SERV OUT	SBA 1T	●	●		●		●		●									●	4-136 4-143		⊙			●	●	●	●		●						●				4-141	

Diagram 3-107. Read Modified Command (Sheet 1 of 2)

Switches (Out Tags)	IND switch down: BUS IN 0-7	BUS IN P	SERV SEQ	REG I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST		Trouble-shooting Diagram Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL/ AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN		Trouble-shooting Diagram Ref	NOTES
Raise SERV OUT			○		◉		◉											●		4-146		●			◉	●	●	●		◉						◉				4-146	
Drop SERV OUT	Hi Order ADR		○		◉		◉		●									●		4-136 4-143			●		◉	●	●	●		◉						◉				4-141	To determine address of first character position of modified data field, combine high and low order addresses (in hex) and look up address in Diagram 7-114.
Raise SERV OUT			◉		◉		◉											●		4-146			●		◉	●	●	●		◉						◉				4-146	
Drop SERV OUT	Lo Order ADR		○		◉		◉		●									●		4-136 4-143	●				◉	●	●	●		◉						◉				4-141	
Raise SERV OUT			◉		◉		◉											●		4-146	●				◉	●	●	●		◉						◉				4-146	
Drop SERV OUT	Data Char		○		◉		◉		●									●		4-136 4-140 4-143	●				◉	●	●	●		◉						◉				4-141 4-142	

Repeat two previous steps to read each byte desired. If last character position of last modified data field is reached before channel-stop is performed; that is, CMD OUT is raised, skip channel-stop sequence and go to CU-stop sequence.

CHANNEL–STOP SEQUENCE

Raise CMD OUT			◉		◉		●					●	●	●	●			●		4-146 4-154	●				◉	●	●	●							◉				●		4-154	Channel stop.
Drop CMD OUT	OC	○			◉		●			●	●		●	●	●			●		4-156	●					●	●	●							◉				●			Bus In Bit 4 (CE) Bus In Bit 5 (DE) } Ending Status
If chaining to next command, raise SUPR OUT here.																																									
Drop SEL OUT	OC	○					◒			◒	◒		◒	◒	◒			◒		4-162	◒					◒	◒	◒							◉				◒			Channel accepts ending status. CU resumes polling unless SUPR OUT is up (chaining). If so, the following indicators are lit: BYTE COUNT 0, PRI CTR LDD, BFR VAL AFT FTCH, BFR ADR VAL and SEQUENCE 6.
Raise SERV OUT		○																		4-162	◉	◉	◉	◉							◉		◉				⊙			4-162 4-107	
Drop SERV OUT		○																			◉	◉	◉	◉							◉		◉				⊙			4-107	

CU–STOP SEQUENCE

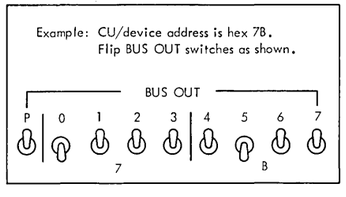
SRV OUT Down	See NOTES Column		○		◉		◉		●									●		4-141	●				◉	●	●	●		◉						◉				4-141	Last character of last modified field is on bus in.
Raise SERV OUT			○		◉		◉											●		4-146	●				◉	●	●	●		◉						◉					
Drop SERV OUT	OC	○			◉		◉		●			●	●	●				●		4-155 4-156	●					●	●	●							◉				●		4-141 4-142 4-155	Bus In Bit 4 (CE) Bus In Bit 5 (DE) } Ending Status
If chaining to next command, raise SUPR OUT here.																																									
Drop SEL OUT	OC	○					◒			●	●		●	●	●			●		4-162	●					●	●	●							◉				●			Channel accepts ending status. CU resumes polling unless SUPR OUT is up (chaining). If so, the following indicators are lit: BYTE COUNT 0, PRI CTR LDD, BFR VAL AFT FTCH, BFR ADR VAL and SEQUENCE 6.
Raise SERV OUT		○																		4-162	◉	◉	◉	◉							◉		◉				⊙			4-162 4-107	
Drop SERV OUT		◒																			◉	◉	◉	◉							◉		◉				⊙			4-107	

CHART 1. CU-DEVICE ADDRESSING

Hex	Binary Equivalent
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

Note: Flip BUS OUT P switch up, as required to generate odd parity.

Example: CU/device address is hex 7B.
Flip BUS OUT switches as shown.



Note: If wrong AID is on Bus In, start troubleshooting on Diagram 4-138.

CHART 2. ATTENTION IDENTIFIER (AID) CODES

AID	Hex Char	Graphic Char
No AID generated (Display Station)	60	-
No AID generated (Printer)	E8	Y
ENTER key	7D	'
CLEAR key	6D	_
TEST REQ key	F0*	0
PF 1 key	F1	1
PF 2 key	F2	2
PF 3 key	F3	3
PF 4 key	F4	4
PF 5 key	F5	5
PF 6 key	F6	6
PF 7 key	F7	7
PF 8 key	F8	8
PF 9 key	F9	9

AID	Hex Char	Graphic Char
PF 10 key	7A	:
PF 11 key	7B	#
PF 12 key	7C	@
PA 1 key	6C	%
PA 2 (CANCEL) key	6E	>
PA 3 key	6B	,
Selector Pen	7E	=
Operator Identification Card Reader - Enter	E6	W
Reserved	6F	?
Reserved	E9	Z
Reserved	6A	|

* Transferred on Read Buffer command only.

Diagram 3-107. Read Modified Command (Sheet 2 of 2)

Before starting command operation, perform the following procedure (if not previously done):
Switch Indicator Unit checkout (paragraph 7.7.3).

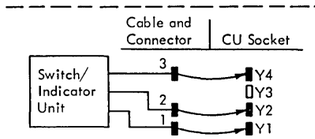
IMPORTANT

When an error is detected, swap Cable 2. Retry command using other overlay. If an error is detected both ways, troubleshoot error that occurs earliest.

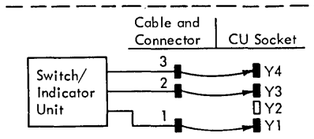
All references in the Troubleshooting Diagram Ref columns should be considered in the order listed for problem analysis.

Legend:

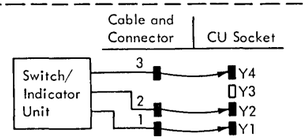
- ● Continuously Lighted Indicator
- ⊙◉ Pulsing Indicator – Size of dot is relative to pulse length and repetition rate. That is, the smaller the dot, the shorter the pulse and/or the lower the repetition rate.



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.



Use 3272 MLPXR/LOCAL INTERFACE STATUS & SENSE overlay.



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.

Switches (Out Tags)	IND switch down: BUS IN 0–7	BUS IN P	SERV SEQ	REQ I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST	Trouble-shooting Diagram Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL/ AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN	Trouble-shooting Diagram Ref	NOTES
1. Place CU off line by flipping ON LINE/OFF LINE switch (located on logic gate A1) to OFF LINE. 2. Place LOC/REM switch (on main power panel) in LOC. 3. Turn MAIN LINE switch ON. 4. Flip LOCAL MODE ON switch up.																																						
Drop OP OUT																			4-100	●									●								4-100	System reset.
All Switches Down																				●									●										
Raise OP OUT																				◉	◉	◉	◉						◉		◉				◉			4-107	CU begins polling each device (poll poll). Polling involves byte counts 0, 1, 2, and 3. Sequences alternate between 2 and 4.
Load CU-device address with BUS OUT switches. (See Chart 1).																																						
Raise ADR OUT																				◉	◉	◉	◉						◉		◉				◉				
Raise SEL OUT	CU-Device Address			●	●	●													4-116 4-117 4-118	●					●								●					4-117 4-119	
Drop ADR OUT	CU-Device Address			●	●	●	●												4-118 4-120	●					●								●						

Diagram 3-108. Erase All Unprotected (EAU) Command (Sheet 1 of 2)

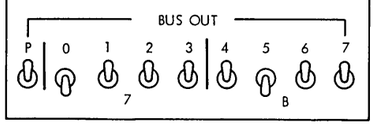
Switches (Out Tags)	IND switch down: BUS IN 0-7	BUS IN P	SERV SEQ	REQ I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST		Trouble-shooting Flowchart Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL/ AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN		Trouble-shooting Flowchart Ref	NOTES
Load Erase All Unprotected command - BUS OUT switches P, 4, 5, 6, and 7 (Hex 0F).																																								
Raise CMD OUT					●	●	●					●				●		●		4-121 4-122 4-125	●					●												●		4-132 4-164 4-165	CE and DE indicators light simultaneously in manual operation. However, in normal channel operation, DE is set after CE and results in a request-in sequence.
Drop CMD OUT	OC	●			●	●	●			●	●		●	●	●			●		4-125 4-133	●					●												●			
Drop SEL OUT	OC	●				●	●			●	●		●	●	●			●		4-133 4-162	●					●												●			Bus In Bit 4 (CE) Ending Bus In Bit 5 (DE) Status
Raise SERV OUT																				4-135	◉	◉	◉	◉						◉		◉				◉			4-135	Channel accepts initial status. If SUPR OUT is up (chaining) the following indicators are lit: BYTE COUNT 0, PRI CTR LDD, and SEQUENCE 6.
Drop SERV OUT																					◉	◉	◉	◉						◉		◉				◉			4-107	

CHART 1. CU - DEVICE ADDRESSING

Hex	Binary Equivalent
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

Note: Flip BUS OUT P switch up, as required to generate odd parity.

Example: CU/device address is hex 7B.
Flip BUS OUT switches as shown.



Note: Troubleshoot Diagram 4-165 if EAU command appears O.K., but all unprotected fields are not erased at display.

Diagram 3-108. Erase All Unprotected (EAU) Command (Sheet 2 of 2)

Before starting command operation, perform the following procedure (if not previously done):
Switch Indicator Unit checkout (paragraph 7.7.3).

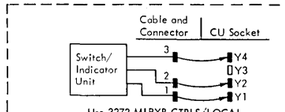
IMPORTANT

When an error is detected, swap Cable 2. Retry command using other overlay. If an error is detected both ways, troubleshoot error that occurs earliest.

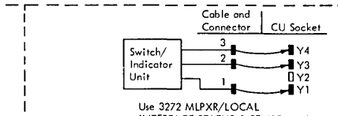
All references in the Troubleshooting Diagram Ref columns should be considered in the order listed for problem analysis.

Legend:

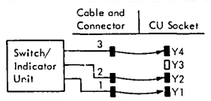
- ● Continuously Lighted Indicator
- ⊙◉ Pulsing Indicator – Size of dot is relative to pulse length and repetition rate. That is, the smaller the dot, the shorter the pulse and/or the lower the repetition rate.



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.



Use 3272 MLPXR/LOCAL INTERFACE STATUS & SENSE overlay.



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.

Switches (Out Tags)	IND switch down: BUS IN 0–7	BUS IN P	SERV SEQ	REQ I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST	Trouble-shooting Diagram Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL/ AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN	Trouble-shooting Diagram Ref	NOTES
1. Place CU off line by flipping ON LINE/OFF LINE switch (located on logic gate A1) to OFF LINE. 2. Place LOC/REM switch (on main power panel) in LOC. 3. Turn MAIN LINE switch ON. 4. Flip LOCAL MODE ON switch up.																																						
Drop OP OUT																			4-100	●									●									4-100	System reset.
All Switches Down																				●									●										
Raise OP OUT																				◉	◉	◉	⊙						◉		◉					⊙			4-107	CU begins polling each device (poll poll).
At display station keyboard: Key in three or four characters. Depress TEST REQ key. The CU should stop polling and the following indicators should light: REQ I, ATTN, BYTE COUNT 0, PRI CTR LDD, and SEQ 6. (Diagram 4-166.)																																						
Raise SEL OUT	CU-Device Address				◉		●	●												●					●							●							CU initiated selection during channel poll.
Raise CMD OUT					◉		●					●								●					●							●							Proceed
Drop CMD OUT	80				◉		●			●	●									●					●							●							Attention status (bit 0) on BUS IN.
Drop SEL OUT	80						●			●	●									●					●							●							
Raise SVC OUT																				◉	◉	◉	⊙						◉		◉					⊙				Channel accepts attention (ATTN) status. CU resumes polling.
Drop SVC OUT																				◉	◉	◉	⊙						◉		◉					⊙				
Load CU-device address with BUS OUT switches. (See Chart 1.)																																						
Raise ADR OUT																				◉	◉	◉	⊙						◉		◉					⊙				
Raise SEL OUT	CU-Device Address				◉	●	●												4-116 4-117 4-118	●					●								●					4-117 4-119	
Drop ADR OUT	CU-Device Address				◉	●	●	●											4-118 4-120	●					●								●						
Load Read Modified command – BUS OUT switches P, 5, and 6 (Hex 06).																																						
Raise CMD OUT					◉	●	●					●						●	4-121 4-122 4-130		●			●	●	●								☼				●			4-130 4-131 4-132	☼ Flashes when device buffer transfers to CU buffer.
Drop CMD OUT		●			◉	●	●			●	●							●	4-125 4-130 4-133		●			●	●	●											●				Initial Status is all zeros.
Raise SERV OUT					◉		●											●	4-134		●			●	●	●											●				Channel accepts initial status.
Drop SERV OUT	01		◉		◉		●		●									●	4-136 4-144		●			●	●	●											●			4-144	SOH (Hex 01)
Raise SERV OUT			◉		◉		●											●	4-146		●			●	●	●											●				
Drop SERV OUT	5C	●	◉		◉		●		●									●	4-136 4-144			●		●	●	●											●			4-144	% (Hex 6C)
Raise SERV OUT			◉		◉		●											●	4-146			●		●	●	●											●				
Drop SERV OUT	51		◉		◉		●		●									●	4-136 4-144				●	●	●	●											●			4-144	/ (Hex 61)
Raise SERV OUT			◉		◉		●											●	4-146				●	●	●	●											●				
Drop SERV OUT	02		◉		◉		●		●									●	4-136 4-144	●				●	●	◉	●		●								●			4-144	STX (Hex 02)

Special Heading Generated by CU. Note: AID character is not transferred.

Diagram 3-109. Test Request (Read Modified CMD in Response to Test Request from Display) (Sheet 1 of 2)

Switches (Out Tags)	IND switch down: BUS IN 0-7	BUS IN P	SERV SEQ	REQ I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST		Trouble-shooting Diagram Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL/ AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN		Trouble-shooting Diagram Ref	NOTES
Raise SERV OUT			●		●		●											●		4-146	●				●	●	●	●		●						●					
Drop SERV OUT	Data Char		●		●		●		●									●		4-136 4-140 4-143	●				●	●	●	●		●						●					
Repeat two previous steps to read each byte desired. If last character position is reached before channel-stop is performed, that is, CMD OUT is raised, skip channel-stop sequence and go to CU-stop sequence.																																									
CHANNEL-STOP SEQUENCE																																									
Raise CMD OUT			●		●		●					●	●	●	●			●		4-146 4-154	●				●	●	●	●							●					4-141 4-142 4-154	Channel stop.
Drop CMD OUT	OC	●			●		●			●	●		●	●	●			●		4-156	●					●	●	●							●						Bus In Bit 4 (CE) Bus In Bit 5 (DE) } Ending Status
If chaining to next command, raise SUPR OUT here.																																									
Drop SEL OUT	OC	●					●			●	●		●	●	●			●		4-162	●					●	●	●							●						Channel accepts ending status. CU resumes polling unless SUPR OUT is up (chaining). If so, the following indicators are lit: BYTE COUNT 0, PRI CTR LDD, BFR VAL AFT FETCH, BFR ADR VAL and SEQUENCE 6.
Raise SERV OUT																				4-162	◉	◉	⊙	⊙							◉		◉				⊙			4-162 4-107	
Drop SERV OUT																					◉	◉	⊙	⊙							◉		◉				⊙			4-107	
CU-STOP SEQUENCE																																									
SERV OUT Down	See NOTES Column		●		●		●		●									●		4-141	●				●	●	●	●		●						●					4-141	Last character of last modified field is on Bus In.
Raise SERV OUT			●		●		●					●						●		4-146	●				●	●	●	●		●						●						
Drop SERV OUT	OC	●			●		●			●	●		●	●	●			●		4-155 4-156	●					●	●	●							●					4-141 4-142 4-155	Bus In Bit 4 (CE) Bus In Bit 5 (DE) } Ending Status
If chaining to next command, raise SUPR OUT here.																																									
Drop SEL OUT	OC	●					●			●	●		●	●	●			●		4-162	●					●	●	●							●						Channel accepts ending status. CU resumes polling unless SUPR OUT is up (chaining). If so, the following indicators are lit: BYTE COUNT 0, PRI CTR LDD, BFR VAL AFT FETCH, BFR ADR VAL and SEQUENCE 6.
Raise SERV OUT																				4-162	◉	◉	⊙	⊙							◉		◉				⊙			4-162 4-107	
Drop SERV OUT																					◉	◉	⊙	⊙							◉		◉				⊙			4-107	

CHART 1. CU-DEVICE ADDRESSING

Hex	Binary Equivalent
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

Note: Flip BUS OUT P switch up, as required to generate odd parity.

Example: CU/device address is hex 7B.
Flip BUS OUT switches as shown.

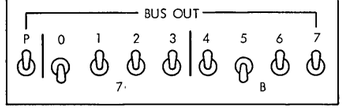


Diagram 3-109. Test Request (Read Modified CMD in Response to Test Request from Display) (Sheet 2 of 2)

IMPORTANT

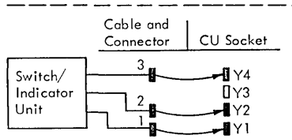
Before starting command operation, perform the following procedure (if not previously done):
Switch Indicator Unit checkout (paragraph 7.7.3).

When an error is detected, swap Cable 2. Retry command using other overlay. If an error is detected both ways, troubleshoot error that occurs earliest.

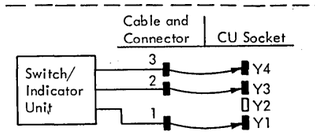
All references in the Troubleshooting Diagram Ref columns should be considered in the order listed for problem analysis.

Legend:

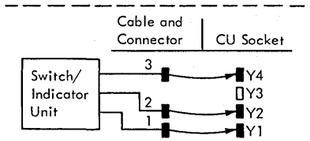
- ● Continuously Lighted Indicator
- ⊙⊙ Pulsing Indicator - Size of dot is relative to pulse length and repetition rate. That is, the smaller the dot, the shorter the pulse and/or the lower the repetition rate.



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.



Use 3272 MLPXR/LOCAL INTERFACE STATUS & SENSE overlay.



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.

Switches (Out Tags)	IND switch down: BUS IN 0-7	BUS IN P	SERV SEQ	REQ I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST		Trouble-shooting Diagram Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL/ AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN		Trouble-shooting Diagram Ref	NOTES
1. Place CU off line by flipping ON LINE/OFF LINE switch (located on logic gate A1) to OFF LINE. 2. Place LOC/REM switch (on main power panel) in LOC. 3. Turn MAIN LINE switch ON. 4. Flip LOCAL MODE ON switch up.																																							
Drop OP OUT																				4-100	●													●							4-100	System reset.
All Switches Down																					●													●								
Raise OP OUT																					⊙	⊙	⊙	⊙										⊙			⊙				4-107	CU begins polling each device (poll poll).
At display station keyboard: Depress one of the keys shown in Chart 2. The CU should stop polling, and the following indicators should light: REQ I, ATTN, BYTE COUNT 0, PRI CTR LDD, and SEQ 6 (Diagram 4-166).																																								
Raise SEL OUT	CU-Device Address				●		●	●												4-159	●					●									●							
Raise CMD OUT					●		●					●								4-121	●					●									●							Proceed
Drop CMD OUT	80				●		●			●	●									4-133	●					●									●							Attention status (bit 0) on BUS IN.
Drop SEL OUT	80						●			●	●									4-162	●					●									●							
Raise SVC OUT																				4-135	⊙	⊙	⊙	⊙										⊙			⊙					Channel accepts attention (ATTN) status. CU resumes polling.
Drop SVC OUT																					⊙	⊙	⊙	⊙										⊙			⊙					
Load CU-device address with BUS OUT switches. (See Chart 1.)																																								
Raise ADR OUT																					⊙	⊙	⊙	⊙										⊙			⊙					
Raise SEL OUT	CU-Device Address				●	●	●													4-116 4-117 4-118	●					●									●							4-117 4-119	
Drop ADR OUT	CU-Device Address				●	●	●	●												4-118 4-120	●					●									●								

Diagram 3-110. Short Read (Sheet 1 of 2)

Switches (Out Tags)	IND switch down													IND switch down						Trouble-shooting Diagram Ref	IND switch up																										Trouble-shooting Diagram Ref	NOTES
	BUS IN		SERV SEQ	REQ I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	CE	DE	END	STOP	CMD ST			BYTE COUNT				IO REG LDD	PRI CTR LDD	BFR VAL/ AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE							CHG SEQ	OP/ XFR FIN							
	0-7	P																			0	1	2	3							2	3	4	5	6	7	8								
Load Read Modified command - BUS OUT switches P, 5, and 6 (Hex 06).																																														
Raise CMD OUT					●	●	●					●						●		4-121 4-122 4-125	●				●	●												●				●			4-131 4-132	
Drop CMD OUT		●			●	●	●			●	●							●		4-125 4-133	●				●	●												●				●				Initial status is all zeros.
Raise SERV OUT					●		●											●		4-134	●				●	●												●				●				Channel accepts initial status.
Drop SERV OUT	AID Char (Chart 2)		●		●		●		●									●		4-136 4-137 4-138	●				●	●												●				●			4-138	Attention identifier (AID) is on Bus In.
Raise CMD OUT			●		●		●					●	●	●	●			●		4-146 4-154	●				●	●												●				●			4-154	
Drop CMD OUT	OC	●			●		●			●	●		●	●	●			●		4-156	●					●												●				●				Bus In Bit 4 (CE) } Ending Status Bus In Bit 5 (DE) }
If chaining to next command, raise SUPR OUT here.																																													
Drop SEL OUT	OC	●					●			●	●		●	●	●			●		4-162	●					●												●				●				
Raise SERV OUT																				4-162	◉	◉	◉	◉							◉		◉				⊙						4-162 4-107	Channel accepts ending status. CU resumes polling unless SUPR OUT is up (chaining). If so, the following indicators are lit: BYTE COUNT 0, PRI CTR LDD, and SEQUENCE 6.
Drop SERV OUT																					◉	◉	◉	◉							◉		◉				⊙						4-107	

CHART 1. CU-DEVICE ADDRESSING

Hex	Binary Equivalent
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

Note: Flip BUS OUT P switch up, as required to generate odd parity.

Example: CU/device address is hex 7B.
Flip BUS OUT switches as shown.

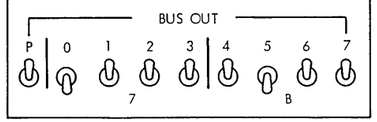


CHART 2. AID CHARACTERS GENERATED BY DISPLAY ASSOCIATED WITH SHORT READ

Key Depressed at Display*	AID Character on Bus In	
	Bus In Bits	Hex
PA1	1 2 4 5	6C
PA2	1 2 4 5 6	6E
PA3	1 2 4 6 7	6B
CANCEL	1 2 4 5 6	6E
CLEAR	1 2 5 7	6D

* All keys listed may not be present on keyboard.

Diagram 3-110. Short Read (Sheet 2 of 2)

Before starting command operation, perform the following procedure (if not previously done):
Switch Indicator Unit checkout (paragraph 7.7.3).

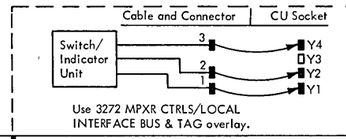
IMPORTANT

When an error is detected, swap Cable 2. Retry command using other overlay. If an error is detected both ways, troubleshoot error that occurs earliest.

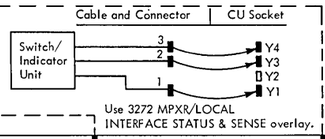
All references in the Troubleshooting Diagram Ref columns should be considered in the order listed for problem analysis.

Legend:

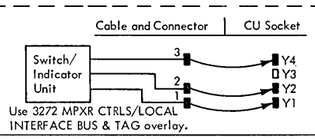
- ● Continuously Lighted Indicator
- ⊙⊙ Pulsing Indicator – Size of dot is relative to pulse length and repetition rate. That is, the smaller the dot, the shorter the pulse and/or the lower the repetition rate.



Use 3272 MPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.



Use 3272 MPXR/LOCAL INTERFACE STATUS & SENSE overlay.



Use 3272 MPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.

Switches (Out Tags)	IND switch down: BUS IN 0-7	BUS IN P	SERV SEQ	REG I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST	Trouble-shooting Diagram Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL/ AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN	Trouble-shooting Diagram Ref	NOTES
Start below if chained from previous command. 1. Place CU off line by flipping ON LINE/OFF LINE switch (located on logic gate A1) to OFF LINE. 2. Place LOC/REM switch (on main power panel) in LOC. 3. Turn MAIN LINE switch ON. 4. Flip LOCAL MODE ON switch up.																																							
Drop OP OUT																			4-100	●									●									4-100	System reset.
All Switches Down																				●									●										
Raise OP OUT																				⊙	⊙	⊙	⊙						⊙		⊙					⊙			4-107	CU begins polling each device (poll poll). Polling involves byte counts 0, 1, 2, and 3. Sequences alternate between 2 and 4.
Load CU-device address with BUS OUT switches. (See Chart 1)																																							
Raise ADR OUT																				⊙	⊙	⊙	⊙						⊙		⊙					⊙				
Raise SEL OUT	CU-Device Address				●	●	●													4-116 4-117 4-118	●					●							●						4-117 4-119	
To terminate command-chaining, drop SUPR OUT here.																																							
Drop ADR OUT	CU-Device Address				●	●	●	●												4-118 4-120	●					●							●							
Load diagnostic write command – BUS OUT switches P, 4, and 7 (Hex 09).																																							
Raise CMD OUT					●	●	●					●						●		4-121 4-122 4-125	●					●							●							
Drop CMD OUT		●			●	●	●			●	●							●		4-133 4-125	●					●							●							Initial status is all zeros.
Raise SERV OUT					●		●											●		4-134	●					●							●							Channel accepts initial status.
Drop SERV OUT			●		●		●		●									●		4-136	●					●							●							CU waits for DC D.
Load DCD (may be any valid character – not used).																																							
Probe A1B2P02. Green should be lit and should remain lit as SERV OUT is raised. If this is not true, replace A1B2.																																							
Raise SERV OUT			●		●		●					●	●	●	●	●		●		4-172	●					●							●		●			4-172	Diagnostic Write must be chained to another Diagnostic Write to be effective.
Drop SERV OUT	OC	●			●		●			●	●		●	●	●			●			●					●							●		●				
Raise SUPR OUT	OC	●			●		●			●	●		●	●	●			●			●					●							●		●				Causes command chaining.
Drop SEL OUT	OC	●					●			●	●		●	●	●			●			●					●							●		●				
Raise SERV OUT																				4-170	●					●							●					4-170	
Drop SERV OUT																					●					●							●						

Note: These commands are not used by customer programs but are used by diagnostic programs.

Diagram 3-111. Diagnostic Write and Diagnostic Read Commands (Sheet 1 of 3)

Switches (Out Tags)	IND switch down: BUS IN 0-7	BUS IN P	SERV SEQ	REQ I	SEL O	CH REQ	OP I	ADR I	SERV I	STA I	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST		Trouble-shooting Flowchart Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN		Trouble-shooting Flowchart Ref	NOTES
Load CU-device address with BUS OUT switches. (See Chart 1.)																																								
Raise ADR OUT																					●					●							●								
Raise SEL OUT	CU-Device Address				●	●	●													4-116 4-117 4-118	●					●							●								
Drop SUPR OUT	CU-Device Address				●	●	●														●					●							●								
Drop ADR OUT	CU-Device Address				●	●	●	●												4-118 4-120	●					●							●								
Load diagnostic write command - BUS OUT switches P, 4, and 7 (Hex 09).																																								
Raise CMD OUT					●	●	●					●						●		4-121 4-122 4-125	●					●							●								
Drop CMD OUT		●			●	●	●			●	●							●		4-133 4-125	●					●							●								
Raise SERV OUT					●		●											●		4-134	●					●							●								
Drop SERV OUT			●		●		●		●									●		4-136	●					●							●								
Load DCD - BUS OUT switch 6 (Hex 02). Bit 6 sets Deactivate latch to prevent priority counter stepping. See Chart 2.																																								
Raise SERV OUT			●		●		●					●	●	●	●	●		●		4-172	●					●							●				●			4-172	DCD byte transfers to MPXR.
Drop SERV OUT	OC	●			●		●			●	●		●	●	●			●			●					●							●				●				
Raise SUPR OUT	OC	●			●		●			●	●		●	●	●			●			●					●							●				●				Causes command chaining.
Drop SEL OUT	OC	●					●			●	●		●	●	●			●			●					●							●				●				
Raise SERV OUT																					●					●							●								
Drop SERV OUT																					●					●							●								
Probe A1P2S07. Green should be lit. If Red is lit, go to Diagram 4-172.																																							

Diagram 3-111. Diagnostic Write and Diagnostic Read Commands (Sheet 2 of 3)

Switches (Out Tags)	IND switch down: BUS IN 0-7	IND switch down: BUS IN P	IND switch down: SERV SEQ	IND switch down: REQ I	IND switch down: SEL O	IND switch down: CH REQ	IND switch down: OP I	IND switch down: ADR I	IND switch down: SERV I	IND switch down: STA I	IND switch down: STA ERLY	IND switch down: STA REQ	IND switch down: CE REM	IND switch down: CE	IND switch down: DE	IND switch down: END	IND switch down: STOP	IND switch down: CMD ST	Trouble-shooting Flowchart Ref	IND switch up: BYTE COUNT 0	BYTE COUNT 1	BYTE COUNT 2	BYTE COUNT 3	IO REG LDD	PRI CTR LDD	BFR VAL AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE 2	SEQUENCE 3	SEQUENCE 4	SEQUENCE 5	SEQUENCE 6	SEQUENCE 7	SEQUENCE 8	CHG SEQ	OP/ XFR FIN	Trouble-shooting Flowchart Ref	NOTES
Load CU-device address with BUS OUT switches. (See Chart 1.)																																					
Raise ADR OUT																			4-116 4-117 4-118	●					●									●						
Raise SEL OUT	CU-Device Address				●	●	●													●					●									●						
Drop SUPR OUT	CU-Device Address				●	●	●													●					●									●						
Drop ADR OUT	CU-Device Address				●	●	●	●												4-118 4-120	●					●									●						
Load diagnostic read command - BUS OUT switches P, 4, and 6 (Hex 0A).																																					
Raise CMD OUT					●	●	●					●						●		4-121 4-122 4-125		●			●	●									●					4-173	
Drop CMD OUT		●			●	●	●			●	●							●		4-125 4-133		●			●	●									●						
Raise SERV OUT					●		●											●		4-134		●			●	●									●						
Drop SERV OUT	40		●		●		●		●									●		4-136 4-173		●			●	●									●					4-173	BUS IN bit 1 indicates no sequence or monitored control latch changed.
Raise SERV OUT			●		●		●											●				●			●	●									●						
Drop SERV OUT	40		●		●		●		●									●		4-173	●				●	●									●				●	4-173	
Raise SERV OUT			●		●		●											●			●				●	●									●				●		
Drop SERV OUT	OC	●			●		●			●	●		●	●	●			●		4-173	●				●	●									●				●		
Drop SEL OUT	OC	●					●			●	●		●	●	●			●			●				●									●				●		
Raise SERV OUT																				4-162	◉	◉	◉	◉						◉		◉				⊙			4-162	
Drop SERV OUT																					◉	◉	◉	◉						◉		◉				⊙				

CHART 1. CU-DEVICE ADDRESSING

Hex	Binary Equivalent
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

Note: Flip BUS OUT P switch up, as required to generate odd parity.

Example: CU/device address is hex 7B.
Flip BUS OUT switches as shown.

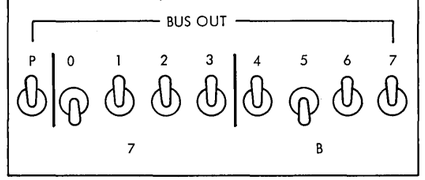


CHART 2. DIAGNOSTIC CONTROL DATA

Bit	Function
0, 1	See Diagram 7-112.
2	Inhibit initial poll.
3	Inhibit buffer transfer.
4	Force buffer parity.
5	Force AID byte of 60.
6	Set Deactivate latch.
7	Inhibit buffer fetch.

CHART 3. DIAGNOSTIC READ DATA, TRACE LATCHES

Byte 1		Byte 2	
Bit	Description	Bit	Description
0, 1	See Diagram 7-112.	0, 1	See Diagram 7-112.
2-7	Sequence latches 2-7.	2	Memory cycle was taken.
		3	WCC has one or more bits set.
		4	Order has been decoded.
		5	Modified Data Tag in CU buffer.
		6	Cursor check.
		7	Sequence latch 8.

Diagram 3-111. Diagnostic Write and Diagnostic Read Commands (Sheet 3 of 3)

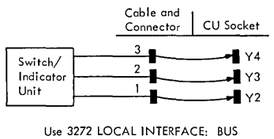
Before starting command operation, perform the following procedure (if not previously done):
Switch Indicator Unit checkout (paragraph 7.7.3).

IMPORTANT

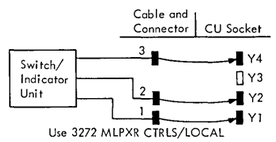
When an error is detected, swap Cable 2. Retry command using other overlay. If an error is detected both ways, troubleshoot error that occurs earliest.

All references in the Troubleshooting Diagram Ref columns should be considered in the order listed for problem analysis.

Legend:
- ● Continuously Lighted Indicator
- ⊙⊙ Pulsing Indicator – Size of dot is relative to pulse length and repetition rate. That is, the smaller the dot, the shorter the pulse and/or the lower the repetition rate.



Use 3272 LOCAL INTERFACE: BUS & TAG/STATUS & SENSE overlay.



Use 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlay.

Switches (Out Tags)	BUS IN 0-7	BUS IN P	IND switch up: SERV SEQ	REQ 1	SEL O	CH REQ	OP 1	ADR 1	SERV 1	STA 1	STA ERLY	STA REQ	CE REM	IND switch down: CE	DE	END	STOP	CMD ST	STACK	Trouble-shooting Diagram Ref	IND switch up: BYTE COUNT 0	1	2	3	IO REG LDD	PRI CTR LDD	BFR VAL/ AFT FTCH	BFR ADD VAL	WRT MODE	RD MODE	SEQUENCE 2	3	4	5	6	7	8	CHG SEQ	OP/ XFR FIN		Trouble-shooting Diagram Ref	NOTES
Start below if chained from previous command. 1. Place CU off line by flipping ON LINE/OFF LINE switch (located on logic gate A1) to OFF LINE. 2. Place LOC/REM switch (on main power panel) in LOC. 3. Turn MAIN LINE switch ON. 4. Flip LOCAL MODE ON switch up.																																									
Drop OP OUT																				4-100	●										●									4-100	System reset.
All Switches Down																					●										●										
Raise OP OUT																					⊙	⊙	⊙	⊙							⊙		⊙				⊙			4-107	CU begins polling each device (poll poll). Polling involves byte counts 0, 1, 2, and 3. Sequences alternate between 2 and 4.
Load CU-device address with BUS OUT switches. (See Chart 1.)																																									
Raise ADR OUT																					⊙	⊙	⊙	⊙							⊙		⊙				⊙				
Raise SEL OUT	CU-Device Address				●	●	●													4-116 4-117 4-118	●					●									●					4-117 4-119	
To terminate command-chaining, drop SUPR OUT here.																																									
Drop ADR OUT	CU-Device Address				●	●	●	●												4-118 4-120	●					●									●						
Load No Op command - BUS OUT switches P, 6, and 7 (Hex 03).																																									
Raise CMD OUT					●	●	●					●						●		4-121 4-122 4-125	●					●									●					4-125 4-122	
Drop CMD OUT	OC	●			●		●			●	●		●	●	●			●		4-133	●					●									●						
If chaining to next command, raise SUPR OUT here.																																								Bus In Bit 4 (CE) ⎫ Ending Bus In Bit 5 (DE) ⎭ Status
Drop SEL OUT	OC	●					●			●	●		●	●	●			●		4-133 4-162	●					●									●						
Raise CMD OUT													●	●	●			●	●	4-175	●					●									●						Channel stacks status.
Drop CMD OUT				●									●	●	●			●	●	4-157	●					●									●						CU raises REQ 1 because of stacked status.

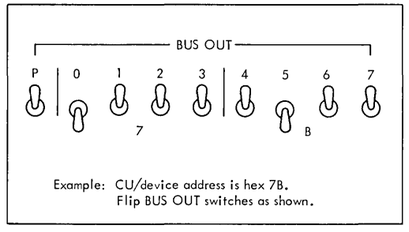
Diagram 3-112. No Op Command with Status Stacking and Control Unit Busy (Sheet 1 of 2)

Switches (Out Tags)	IND switch up													IND switch down						Trouble-shooting Diagram Ref	IND switch up																									Trouble-shooting Diagram Ref	NOTES
	BUS IN		SERV SEQ	REQ 1	SEL O	CH REQ	OP 1	ADR 1	SERV 1	STA 1	STA ERLY	STA REQ	CE REM	CE	DE	END	STOP	CMD ST	STACK		BYTE COUNT				IO REG LDD	PRI CTR LDD	BFR VAL AFT FTCH	BFR ADR VAL	WRT MODE	RD MODE	SEQUENCE							CHG SEQ	OP/ XFR FIN			
	0-7	P																			0	1	2	3							2	3	4	5	6	7	8					
Load CU-device address, different than address used on Sheet 1, with BUS OUT switches. (See Chart 1.)																																										
Raise ADR OUT				●									●	●	●			●	●	4-175	●					●											●						
Raise SEL OUT	50	P		●	●					●			●	●	●			●	●	4-162	●					●											●						Note that Op I and ADR I do not turn on. STA 1, SM, and Busy indicators on identifies CU busy sequence.
Drop SEL OUT				●									●	●	●			●	◐		●					●											●						
Drop ADR OUT				●									●	●	●			●	●		●					●											●						
Raise SEL OUT	CU-Device Address				●		●	●					●	●	●			●	●	4-159	●					●											●						Channel Poll, CU initiated selection.
Raise CMD OUT					●		●					◐	●	◐	●			●	●	4-121	◐					●											●						Proceed.
Drop CMD OUT	OC	●			●		●			●	●		●	●	●			◐		4-175	◐					●											●						Stacked status presented.
Drop SEL OUT	OC	●					●			●	●		●	◐	●			◐		4-162	◐					●											◐						
Raise SERV OUT																				4-175	⬬					⬬											⬬						Channel accepts status and CU sets CUE status bit.
Drop SERV OUT				●																4-175	◐					●											◐						CU raises REQ I to asynchronously present CUE.
Raise SEL OUT	CU-Device Address				●		◐	●												4-159	◐					●											●						Channel Poll, CU initiated selection.
Raise CMD OUT					●		●					◐								4-121	◐					●											●						Proceed.
Drop CMD OUT	20				●		●			●	●									4-175	◐					●											●						CUE in status byte.
Drop SEL OUT	20						●			●	●										◐					●											◐						
Raise SERV OUT																				4-162	◉	◉	⊙	⊙					◉		◉					⊙			4-162		
Drop SERV OUT																				4-107	◉	⊙	⊙	⊙					◉		◉					⊙			4-107		

CHART 1. CU-DEVICE ADDRESSING

Hex	Binary Equivalent
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

Note: Flip BUS OUT P switch up, as required to generate odd parity.



Example: CU/device address is hex 7B.
Flip BUS OUT switches as shown.

Diagram 3-112. No Op Command with Status Stacking and Control Unit Busy (Sheet 2 of 2)

Section 4. Troubleshooting

This section provides troubleshooting diagrams to aid in locating a failing logic card. These diagrams are referenced in Diagrams 1-100 and 1-101, in test procedures of Section 2, and in SIU diagrams of Section 3. They are also cross-referenced. Diagram titles are descriptive and may be used to determine which diagram to refer to when more than one is referenced.

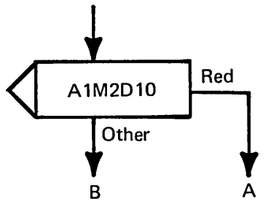
The logic probe, described in paragraph 7.6, is used to determine line levels and to detect pulses by observing the red and green indicators. Be sure to use the Probe Checkout Procedure, paragraph 7.6.3, before troubleshooting the control unit. Red indicates connection to a plus level or not connected; green indicates connection to ground. To use the probe, connect the two wires, one to ground (any D08 pin) and one to +6 (any D03 pin), as they are labeled, and connect the probe lead to the pin to be observed. A length of insulated wire approximately 3 inches long may be used to connect the pins that are difficult to reach.

The following terms are used to describe indicator conditions seen using the older logic probe PN 453652:

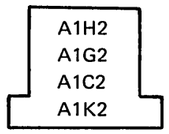
1. Red – Red only.
2. Green – Green only.
3. Red and Green – May be of equal brilliance, one may be more brilliant than the other, or one may be bright and the other blinking.
4. Red Blink – Red indicator blinks one time as a result of the preceding action or an earlier action.
   Green Blink – Green indicator blinks one time as a result of the preceding action or an earlier action.
   Other – Any one of the above conditions other than the one describing the opposite flow line.

The same conditions can be observed using the new General Logic Probe (GLP) PN 453212. The basic difference from the older logic probe is that the GLP uses UP in place of RED to indicate a plus level and DOWN in place of GREEN to indicate a minus level. This difference must be kept in mind when troubleshooting with the GLP, as the MAPS in this manual were designed for use with the older probe.

The following are examples of special symbols used in the diagrams.



The probe is to be attached to the specified pin. A decision is then to be made. In this example, if only the red indicator is lit, flow line A is taken. If any other condition exists, flow line B is taken.



The logic card in the specified location has been isolated as faulty, and must be replaced. If more than one card location is specified (as shown in this example), isolate to the faulty logic card by substituting one card at a time with a new card. The cards are listed, with the most probable faulty card first.

CAUTION
Loose cards and connecting cables can cause solid or intermittent failures. To avoid these failures, check card and cable seating before and after troubleshooting. Pay particular attention to those areas in which the SIU is used.

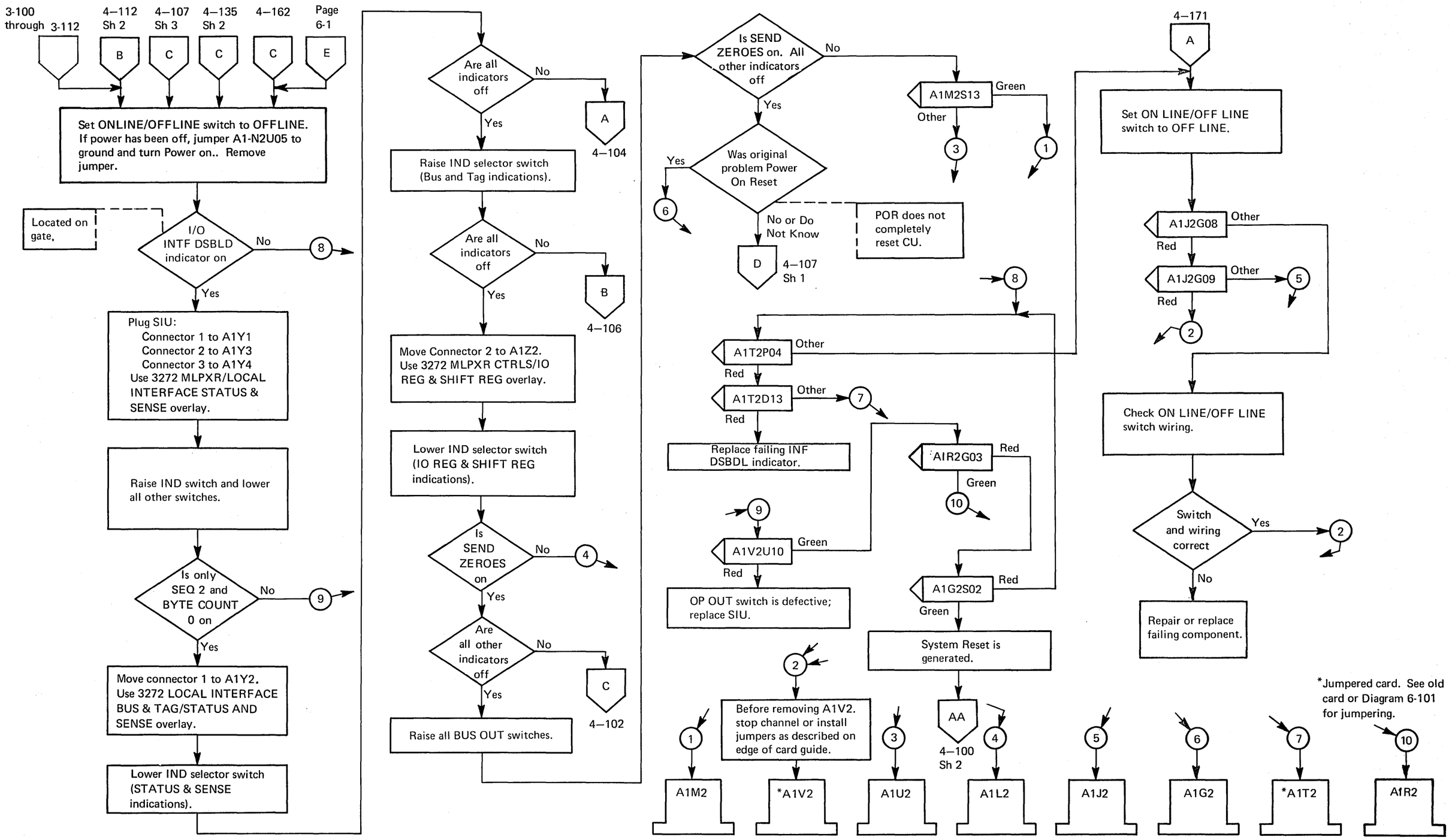


Diagram 4-100. System Reset Checkout, Power-On Reset Failure (Sheet 1 of 2)

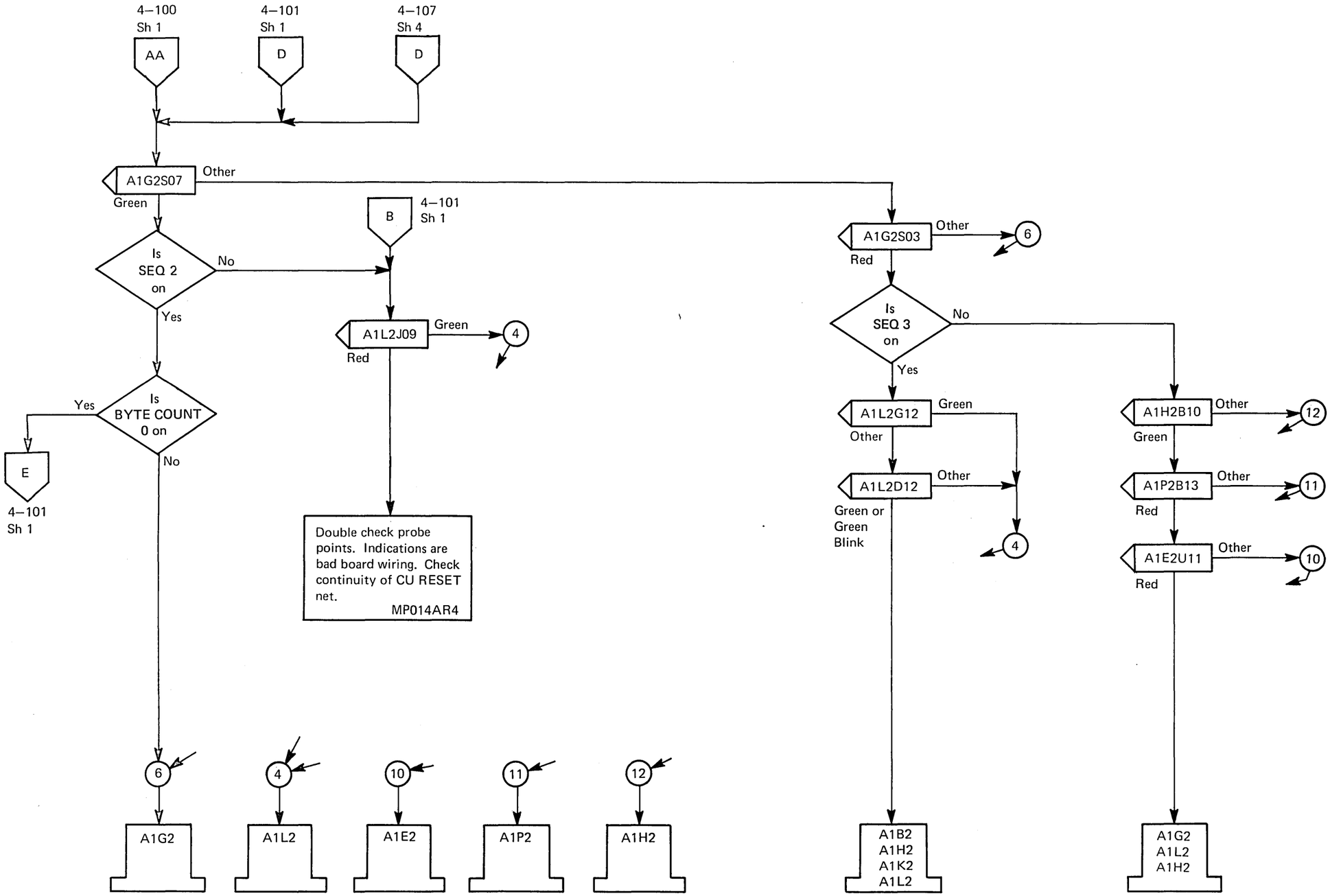


Diagram 4-100. System Reset Checkout, Power-On Reset Failure (Sheet 2 of 2)

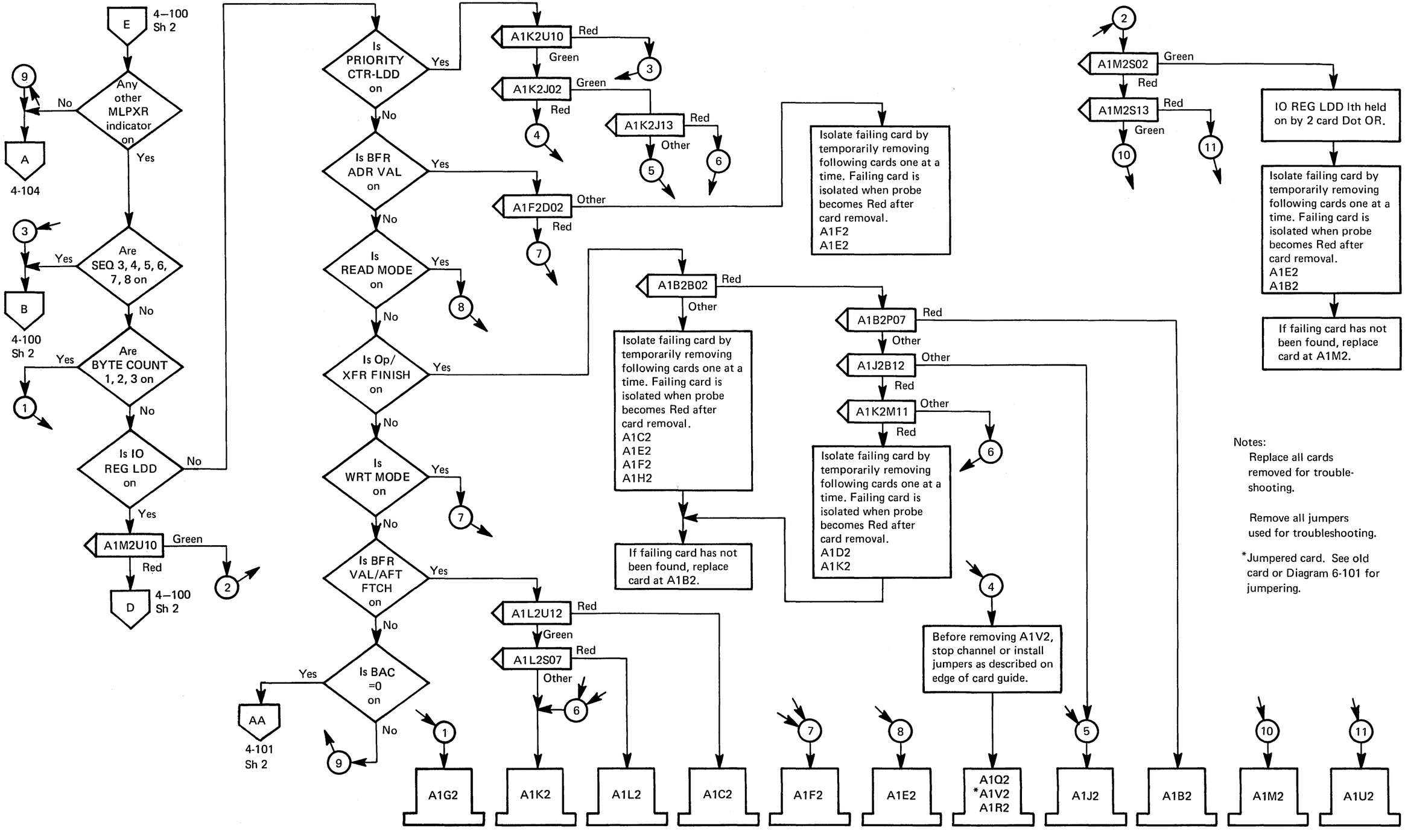
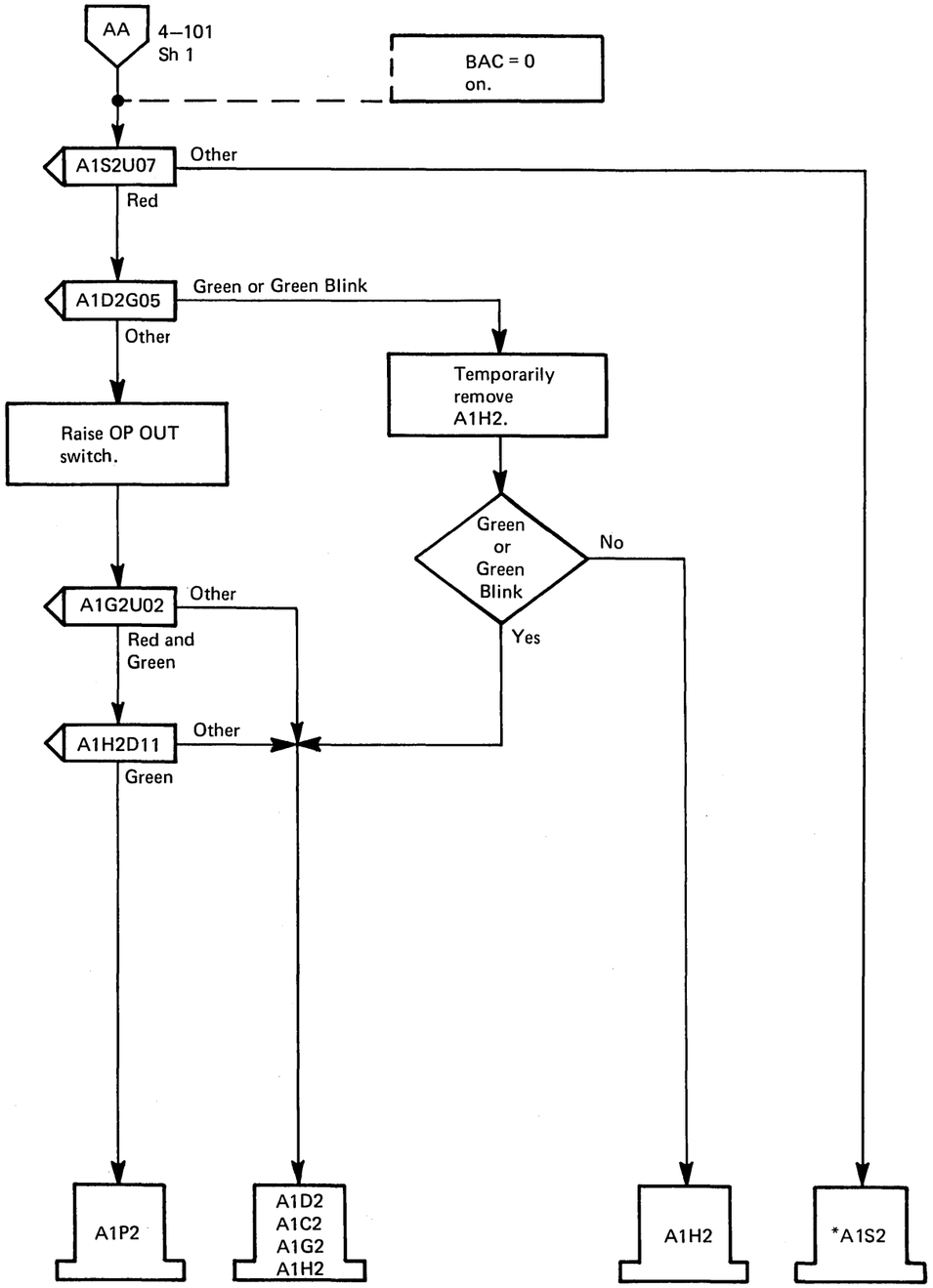


Diagram 4-101. System Reset Checkout, Mlpxr (Sheet 1 of 2)



Note: Replace all cards removed for troubleshooting.

*Jumpered card. See old card or Diagram 6-101 for jumpering.

Diagram 4-101. System Reset Checkout, MIpxr (Sheet 2 of 2)

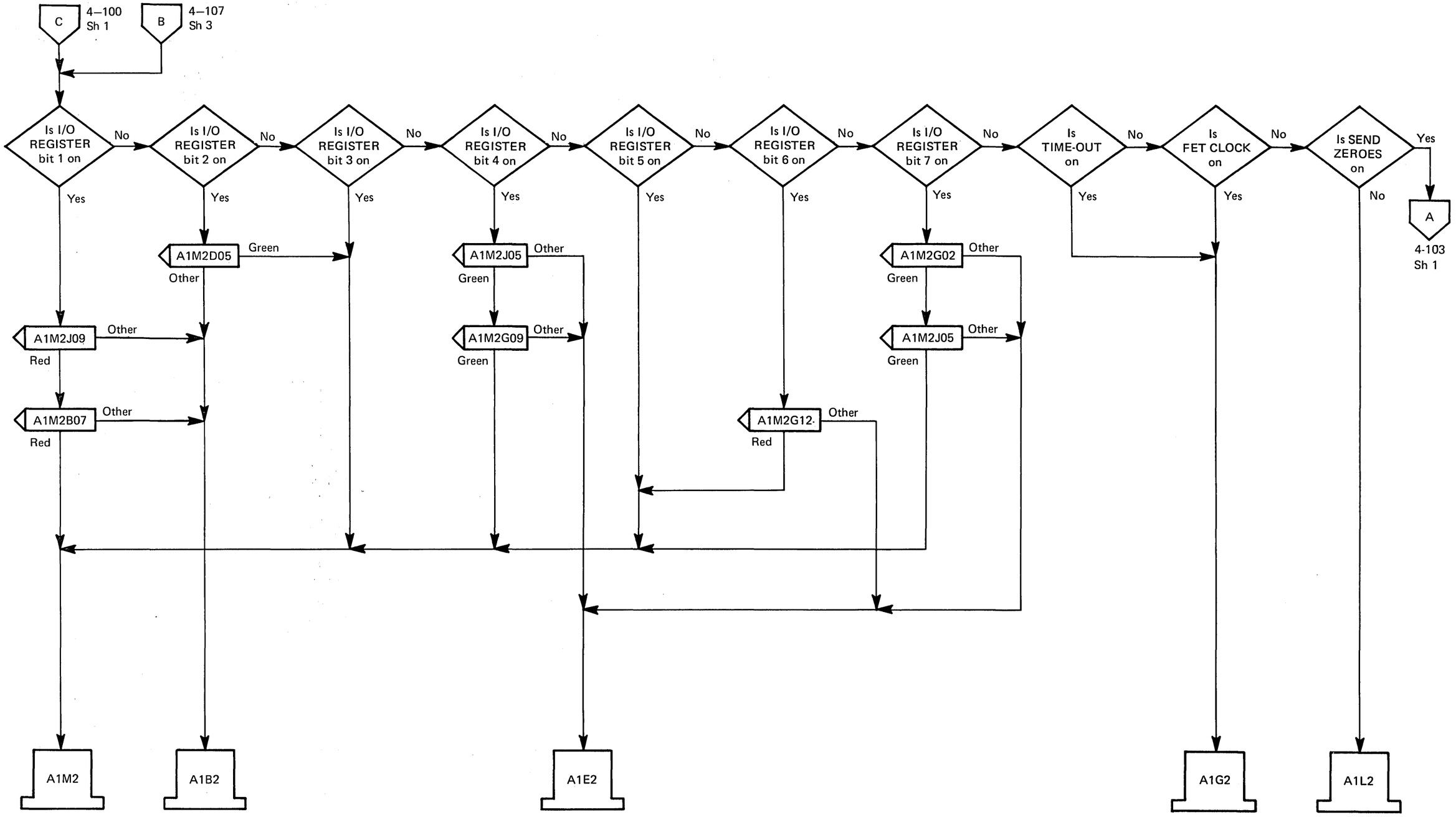
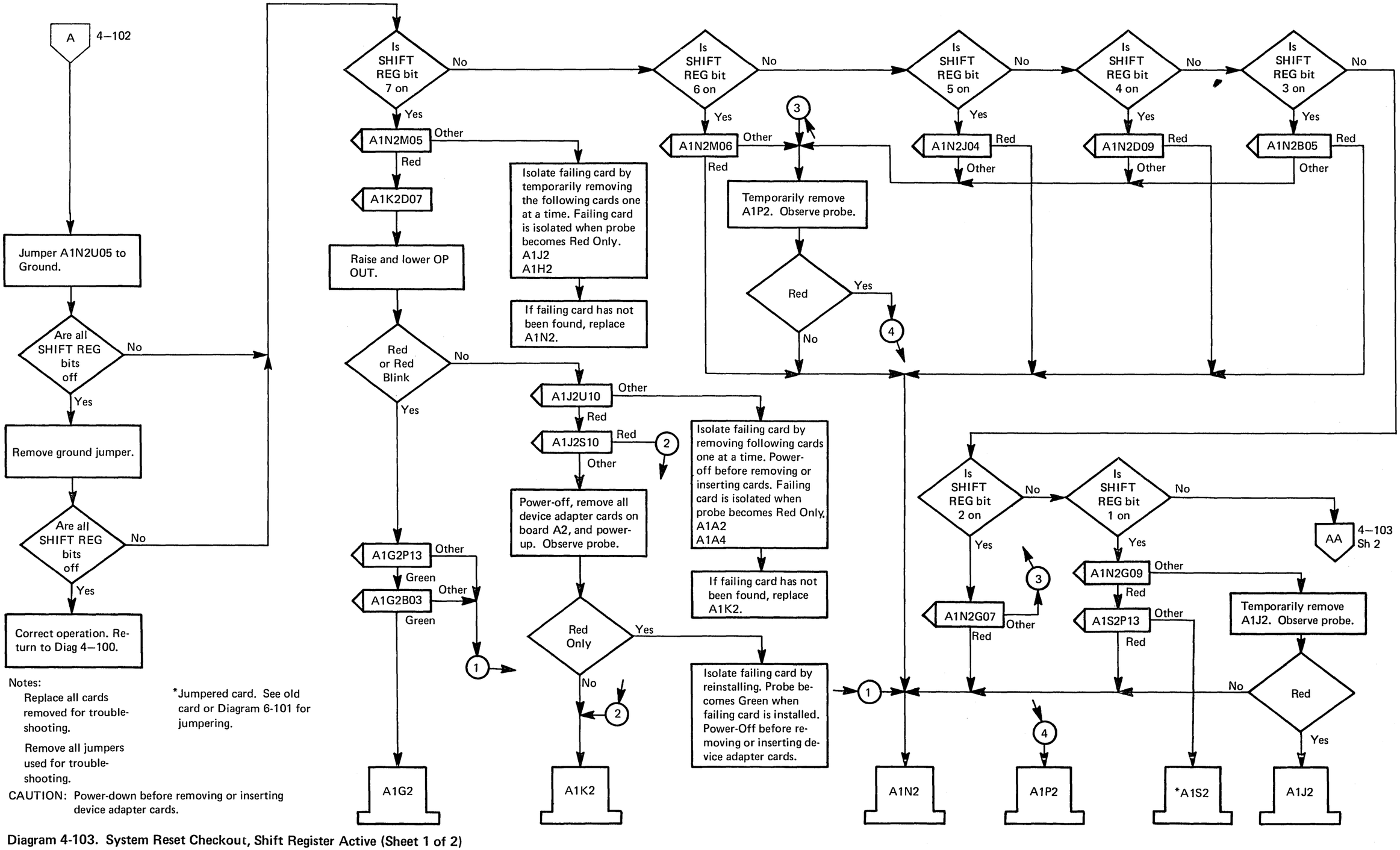


Diagram 4-102. System Reset Checkout, I/O Reg Active



Notes:

Replace all cards removed for trouble-shooting.

Remove all jumpers used for trouble-shooting.

*Jumpered card. See old card or Diagram 6-101 for jumpering.

CAUTION: Power-down before removing or inserting device adapter cards.

Diagram 4-103. System Reset Checkout, Shift Register Active (Sheet 1 of 2)

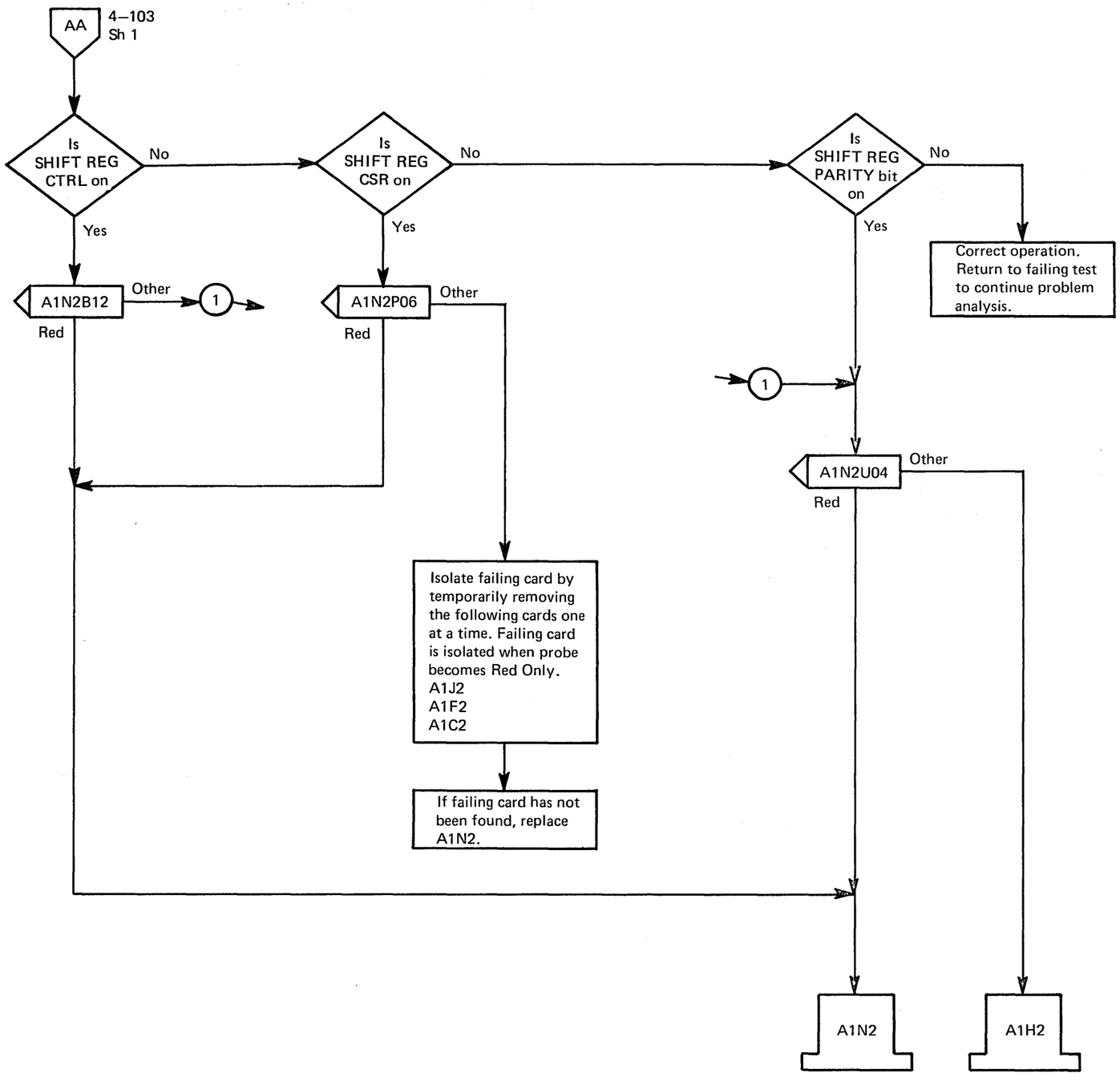


Diagram 4-103. System Reset Checkout, Shift Register Active (Sheet 2 of 2)

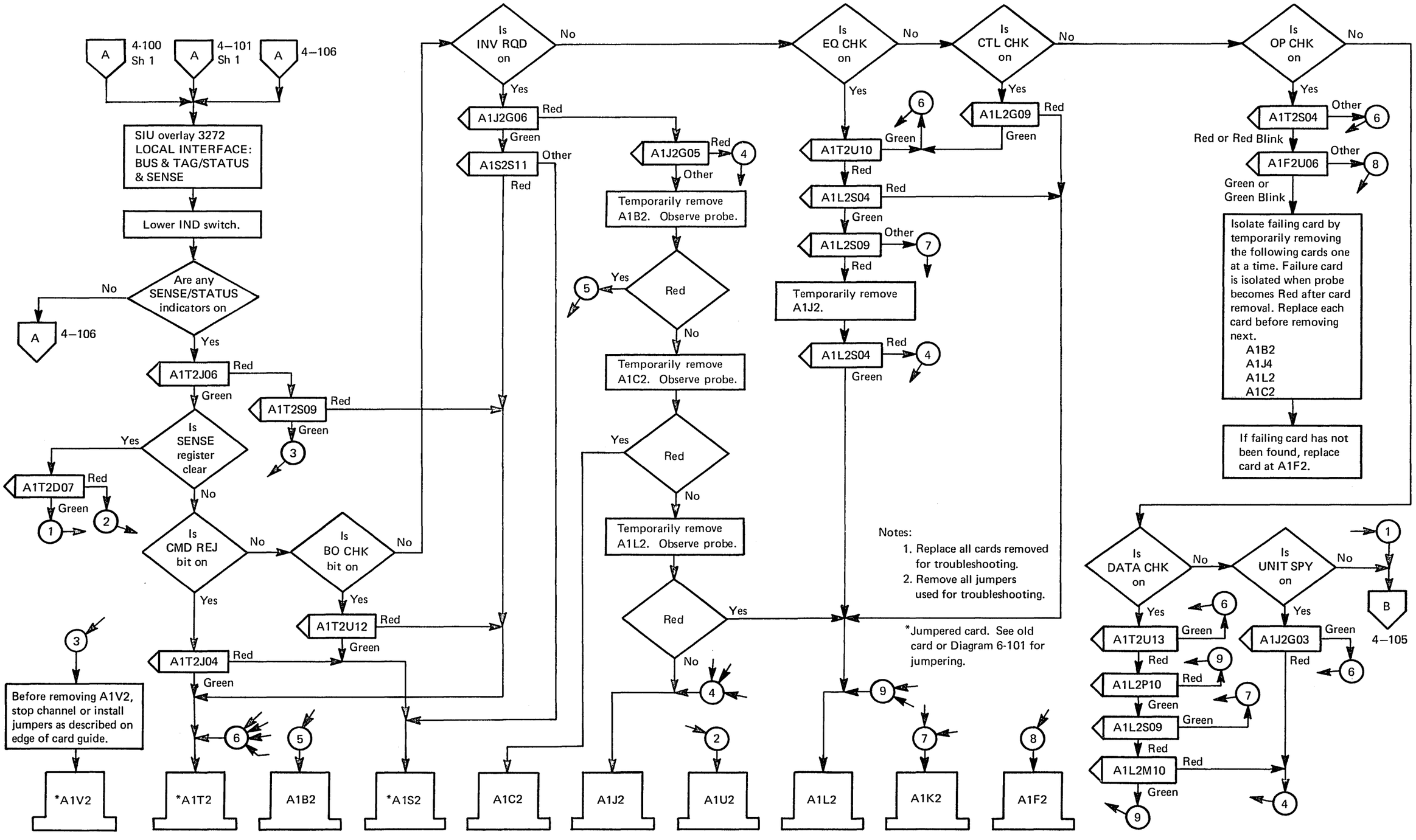


Diagram 4-104. System Reset Checkout, Sense Register

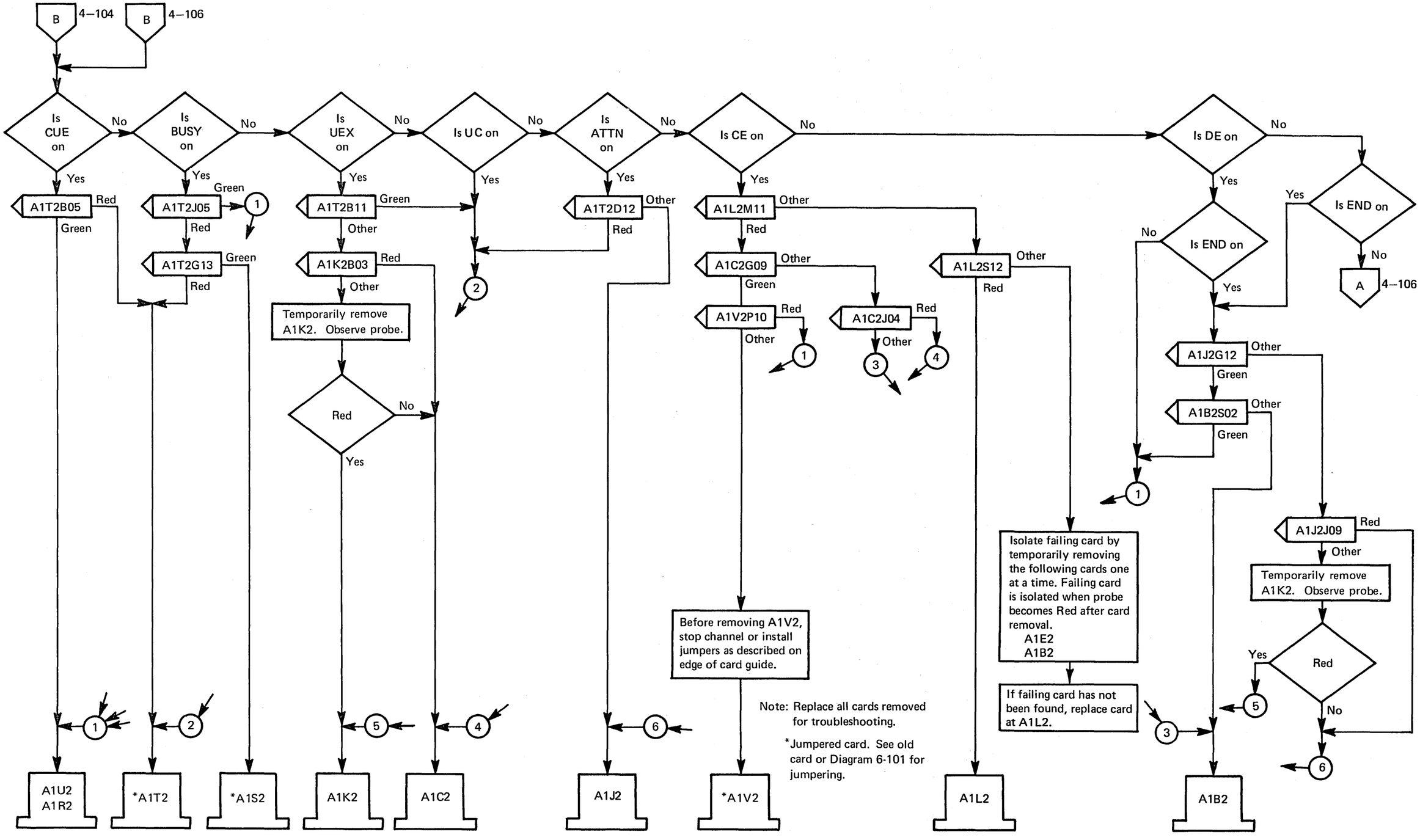
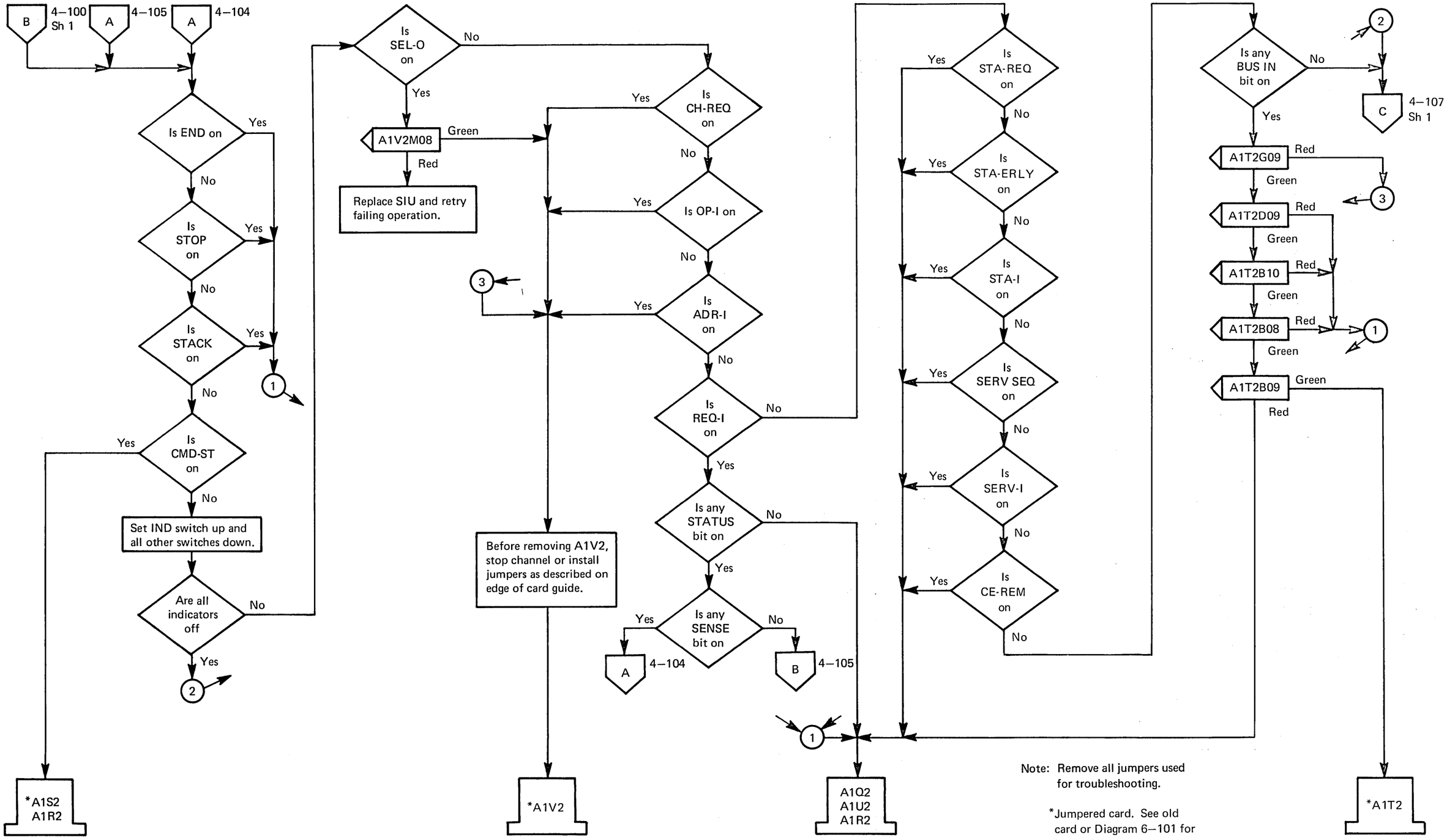


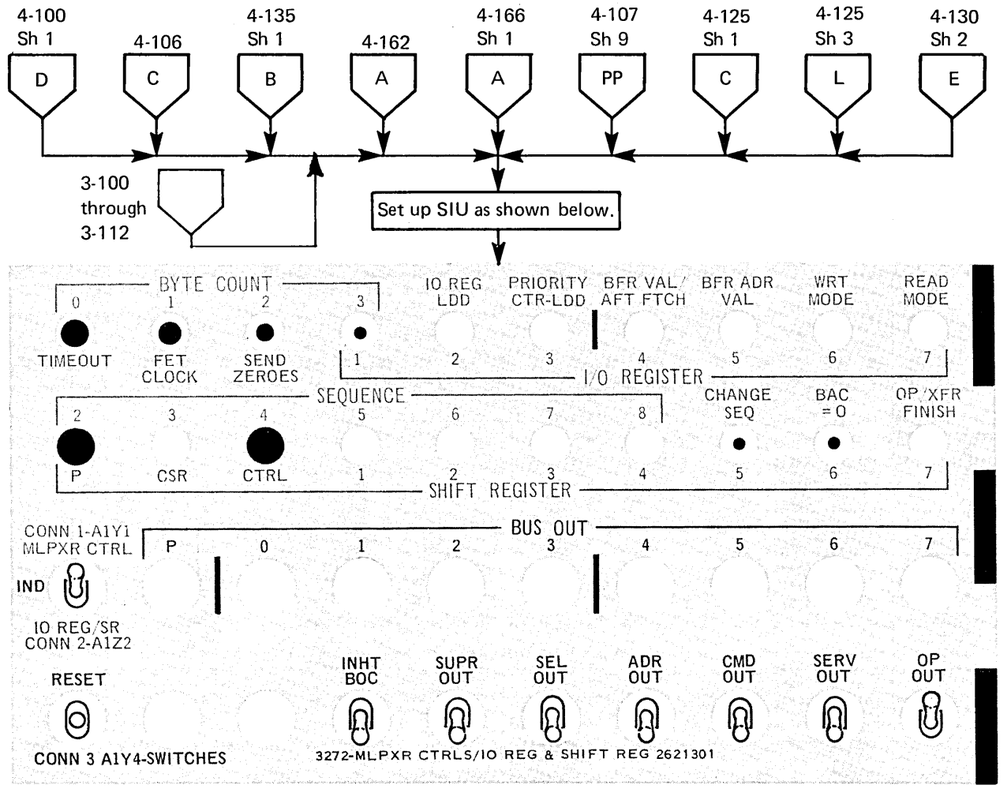
Diagram 4-105. System Reset Checkout, Status Register



Note: Remove all jumpers used for troubleshooting.

*Jumpered card. See old card or Diagram 6–101 for jumpering.

Diagram 4-106. System Reset Checkout, IF Control

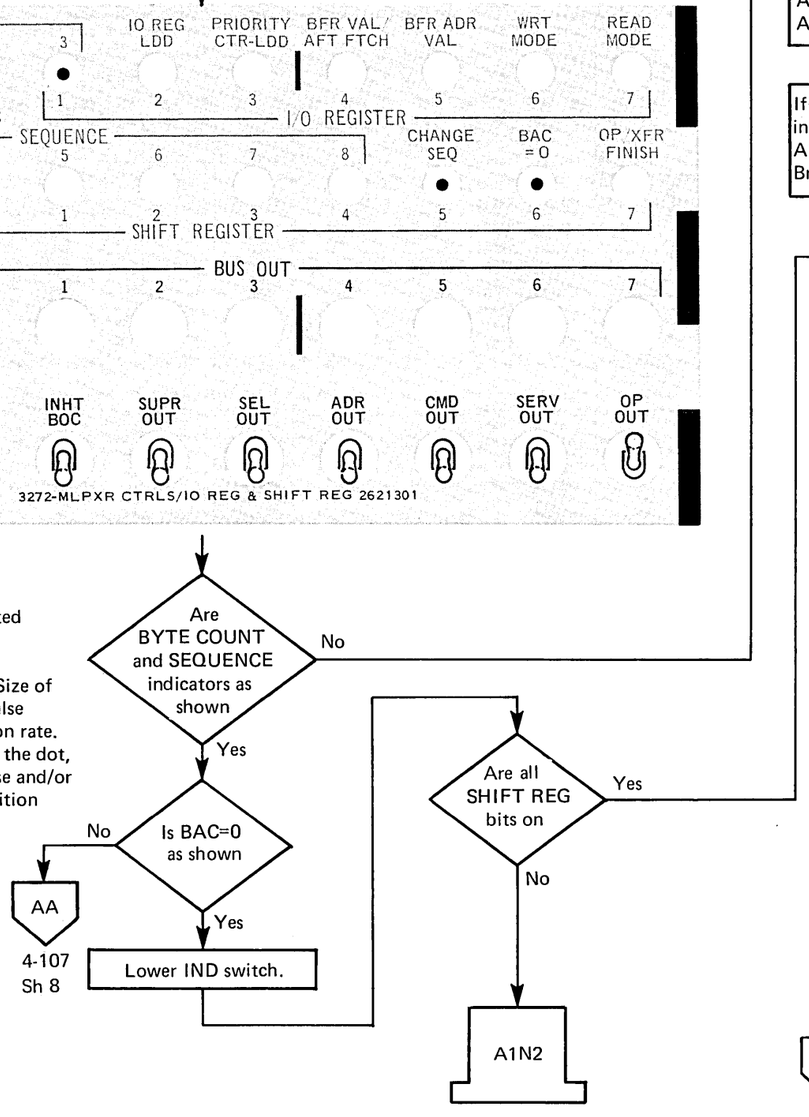


Legend:

Continuously Lighted Indicator

Pulsing Indicator—Size of dot is relative to pulse length and repetition rate. That is, the smaller the dot, the shorter the pulse and/or the lower the repetition rate.

WARNING: Pulsing indicators may be difficult to see. Shade the external light from the indicators for better viewing.



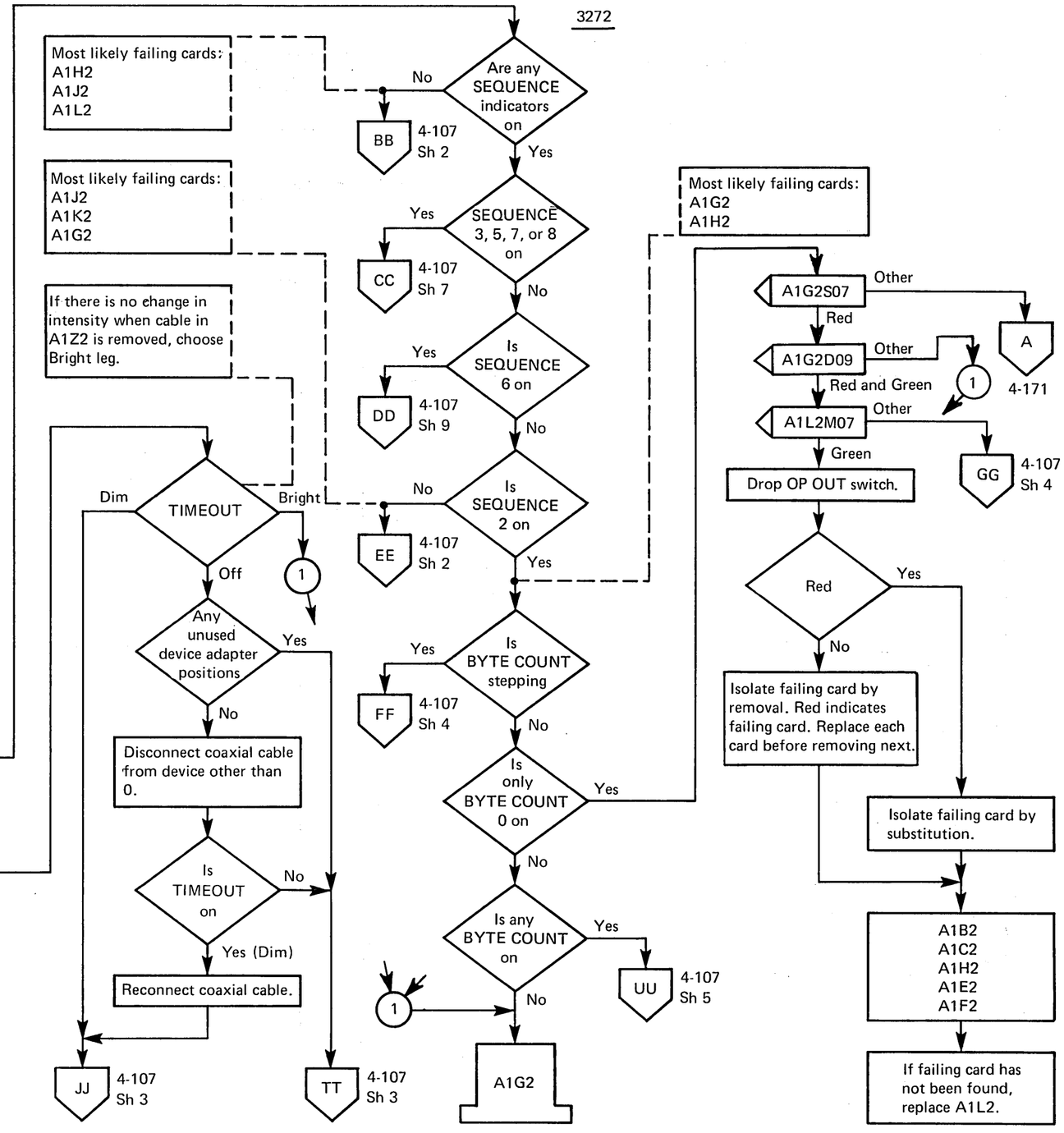


Diagram 4-107. Poll Poll Checkout (Sheet 1 of 10)

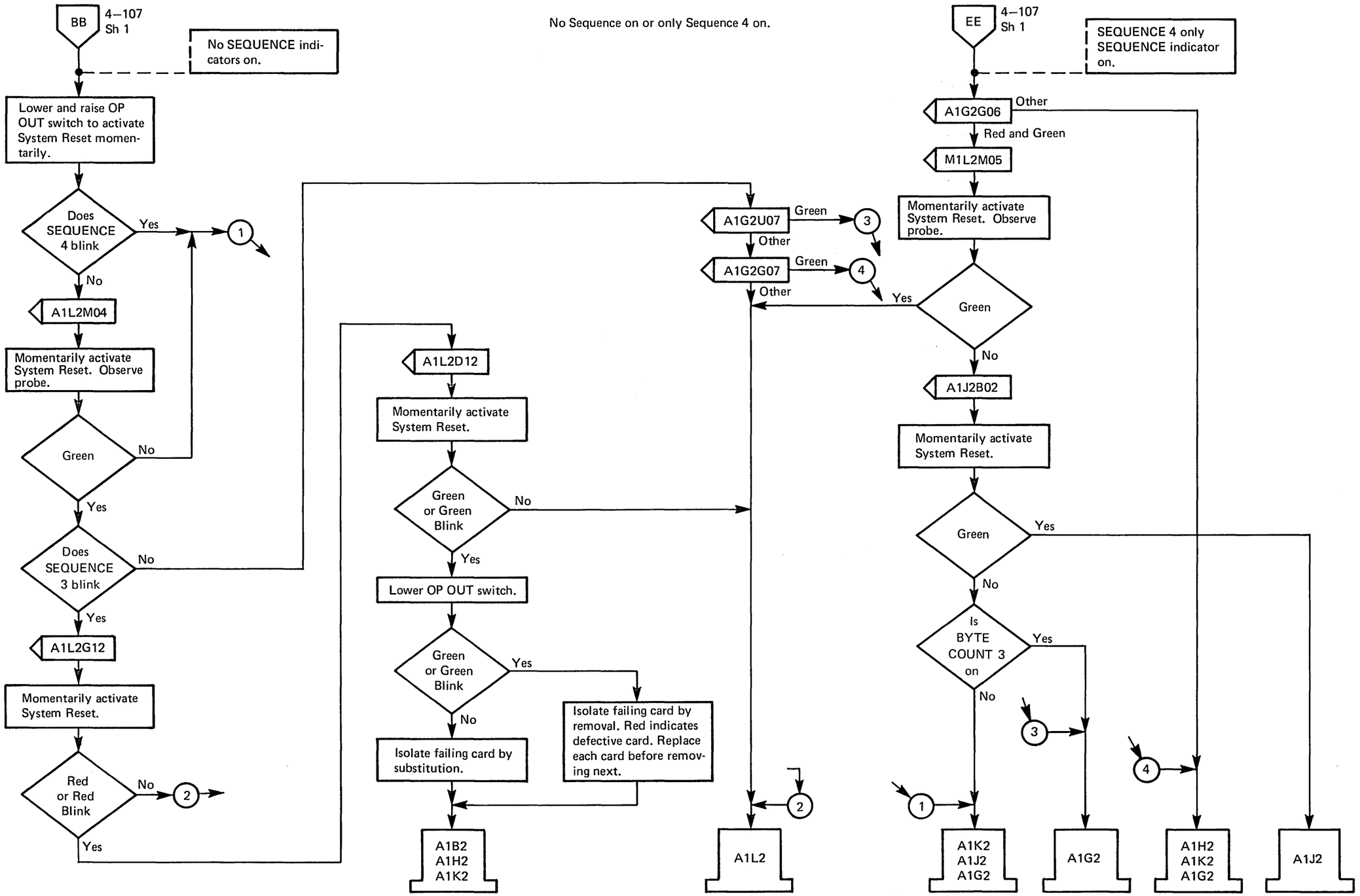
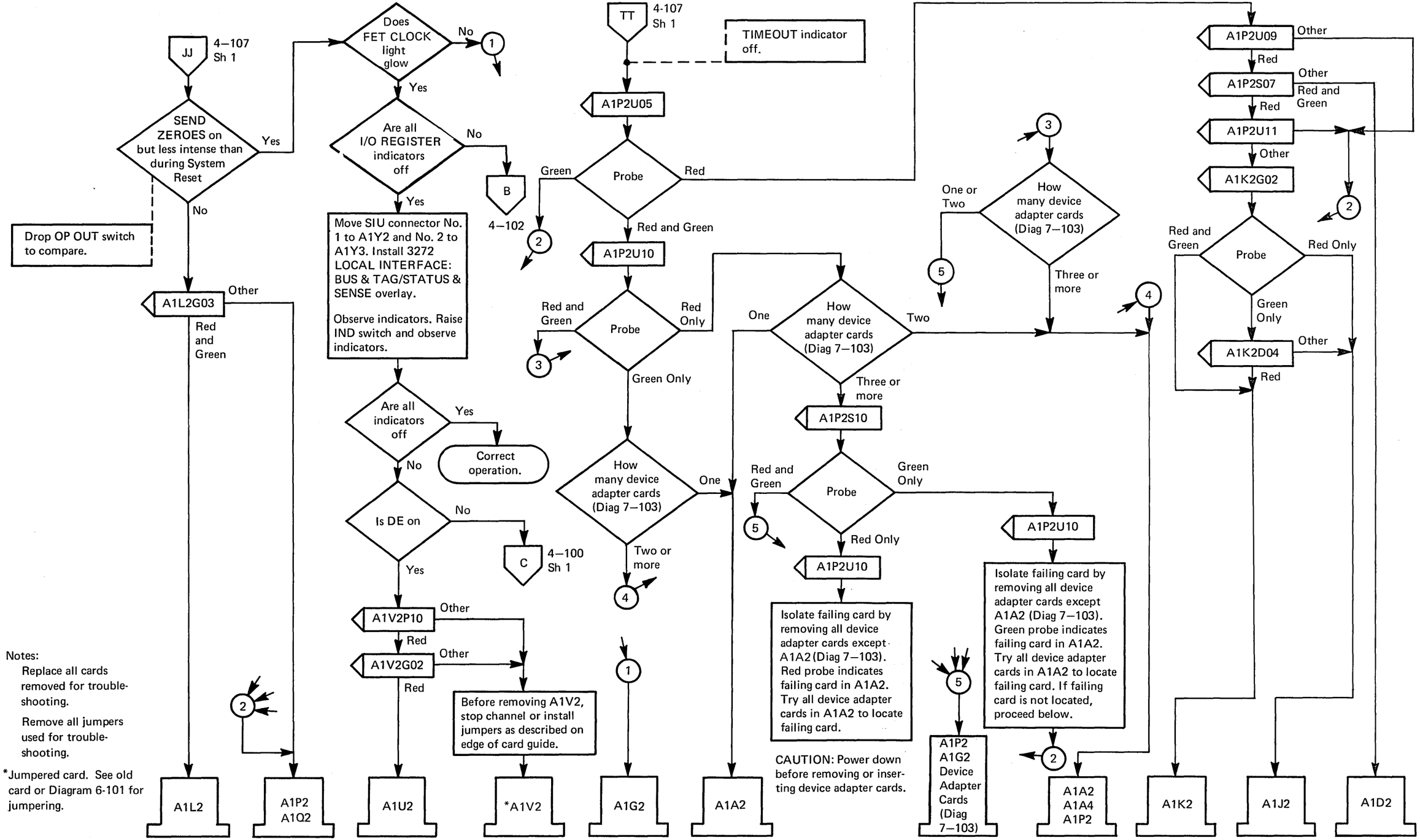


Diagram 4-107. Poll Poll Checkout (Sheet 2 of 10)



Notes:

Replace all cards removed for trouble-shooting.

Remove all jumpers used for trouble-shooting.

*Jumpered card. See old card or Diagram 6-101 for jumpering.

Diagram 4-107. Poll Poll Checkout (Sheet 3 of 10)

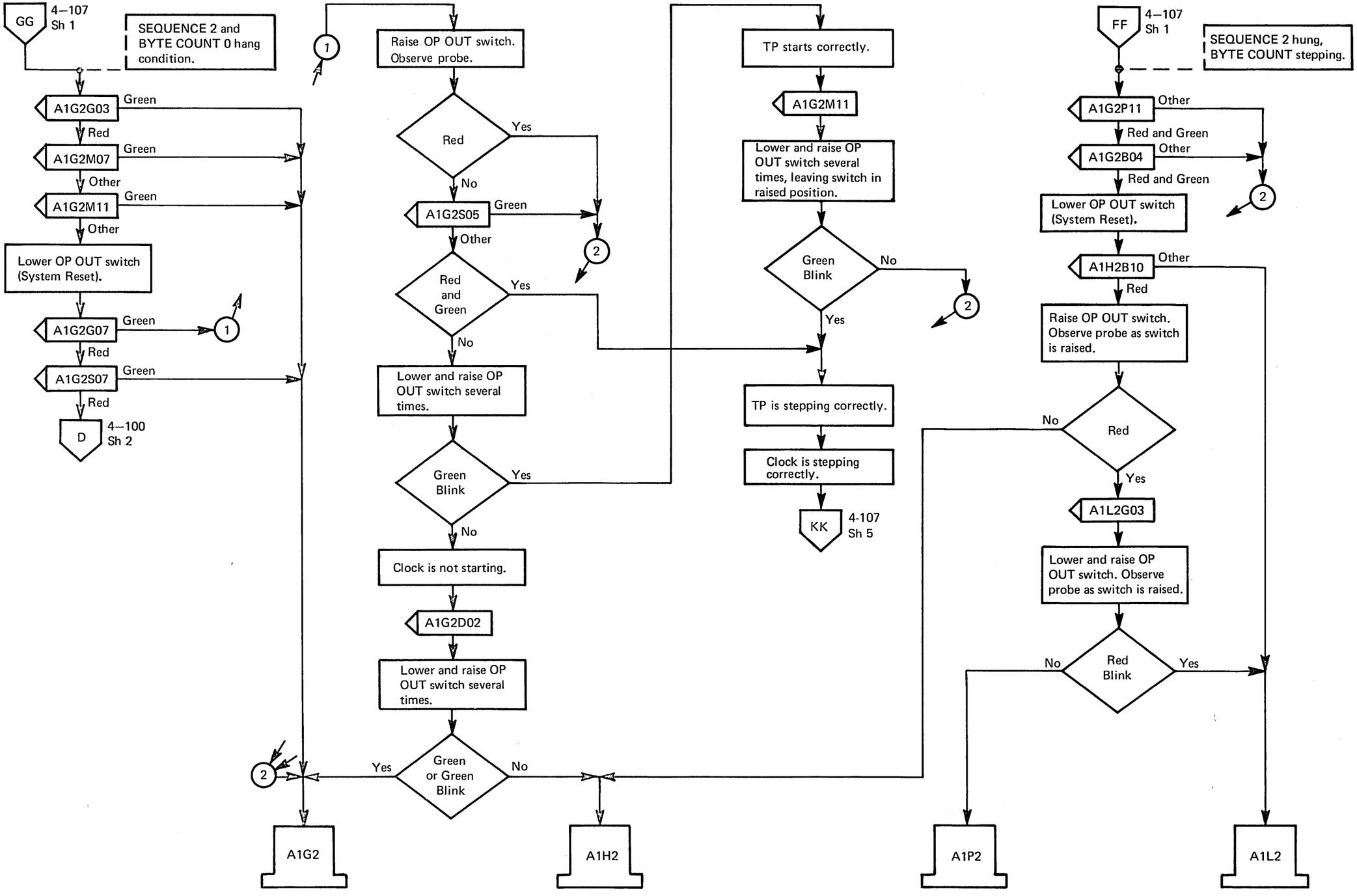
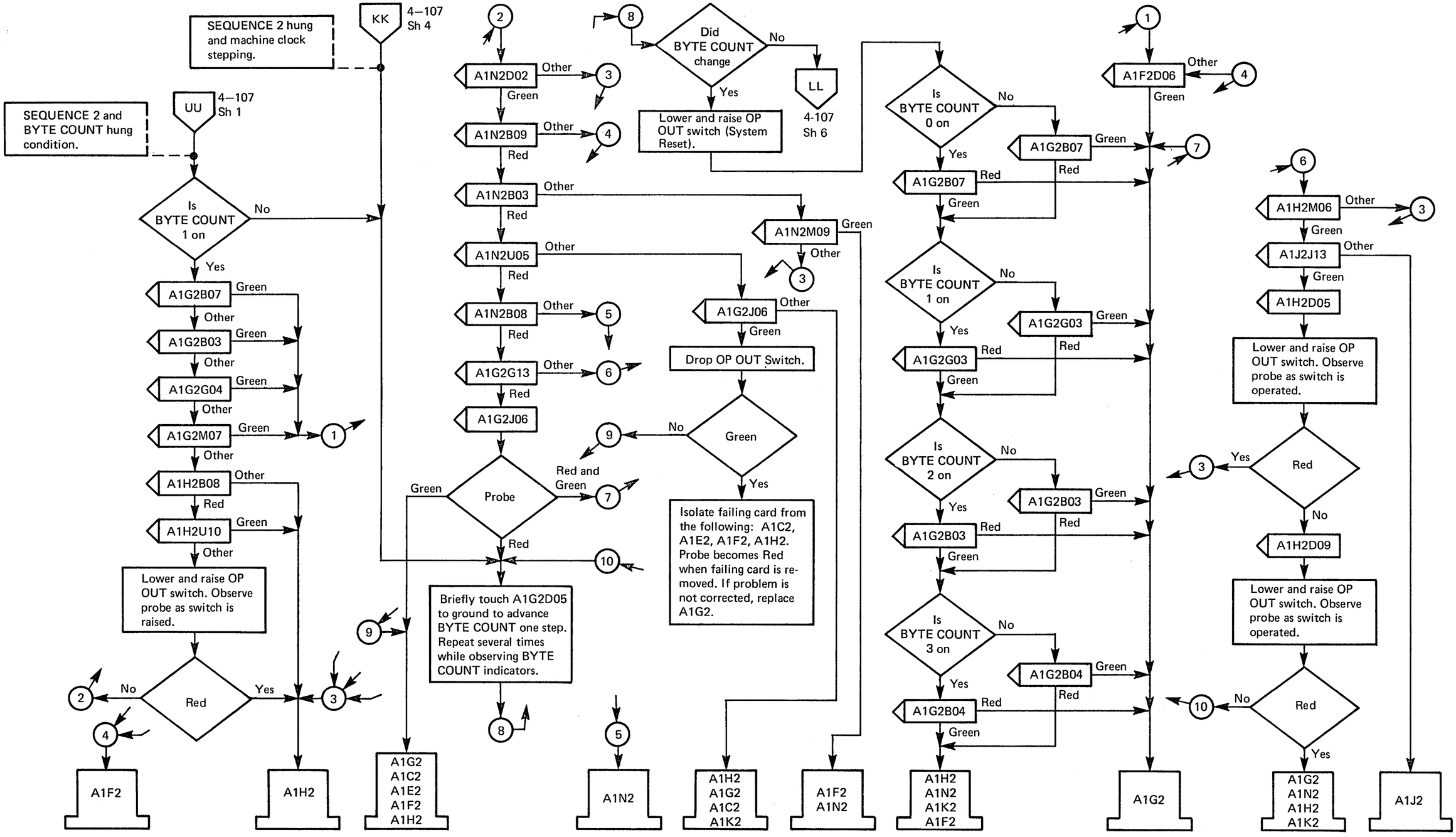


Diagram 4-107. Poll Poll Checkout (Sheet 4 of 10)



Note: If indicators change when probe is moved, reset and retry operation.

Diagram 4-107. Poll Poll Checkout (Sheet 5 of 10)

Sequence 2 Hang Condition

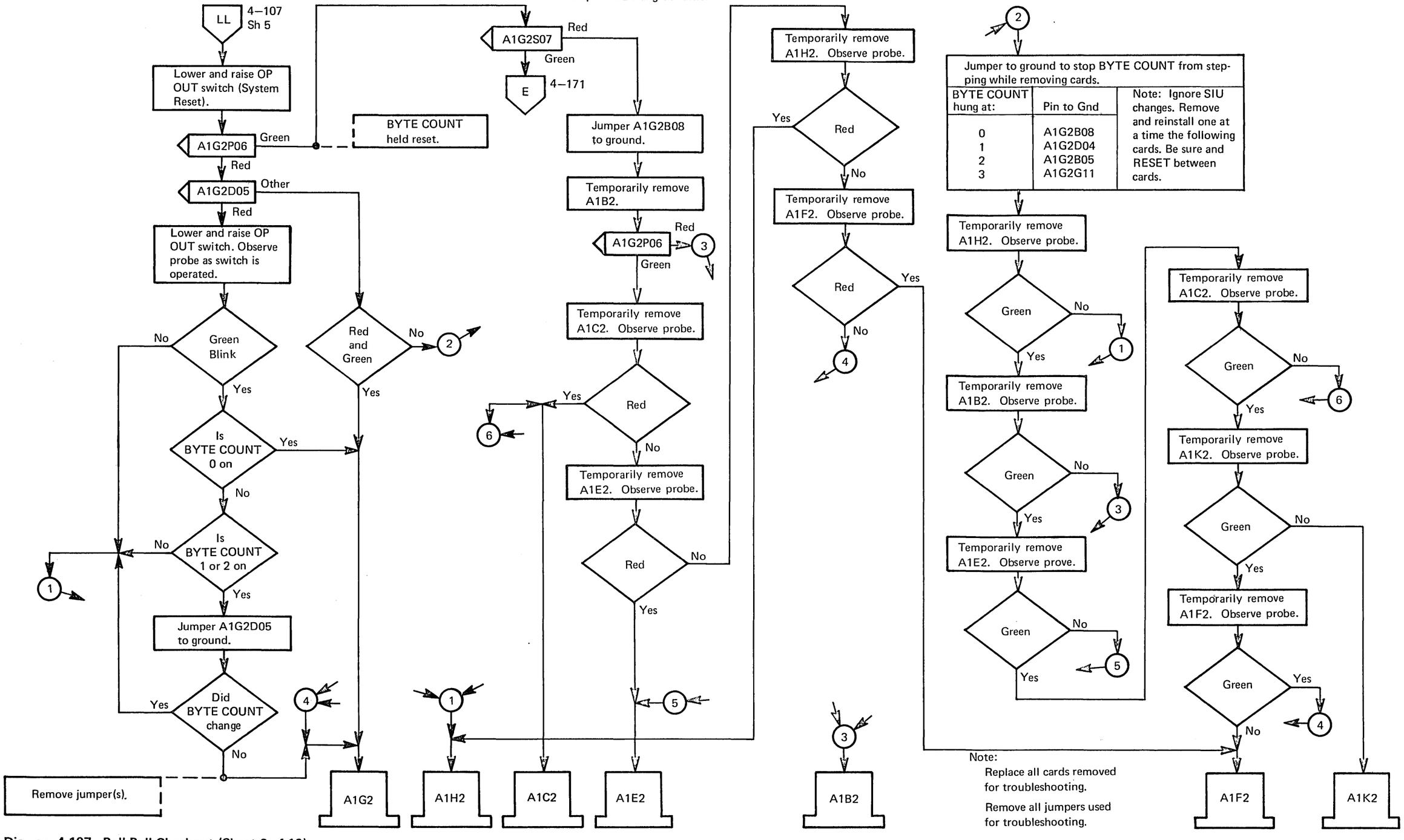


Diagram 4-107. Poll Poll Checkout (Sheet 6 of 10)

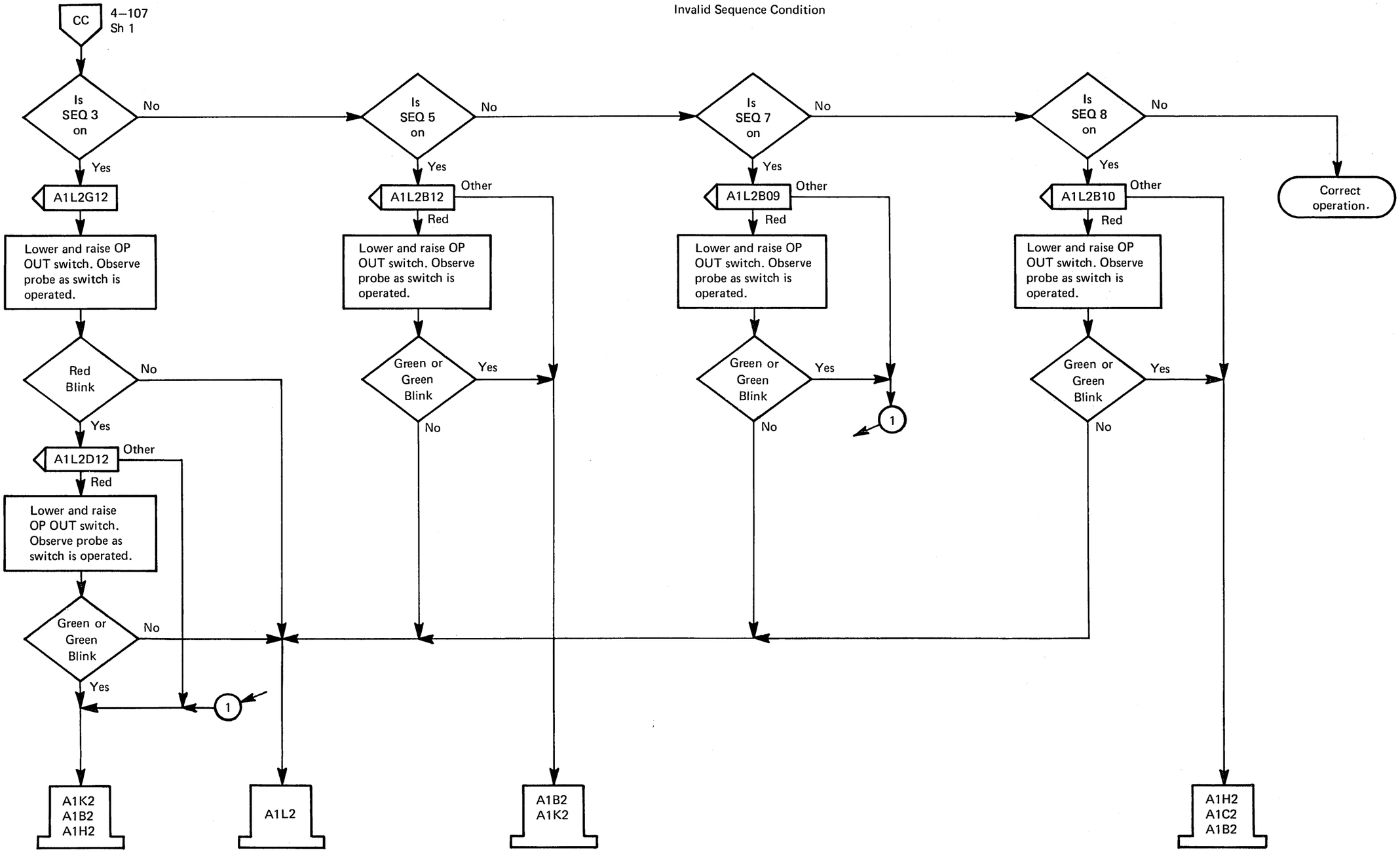
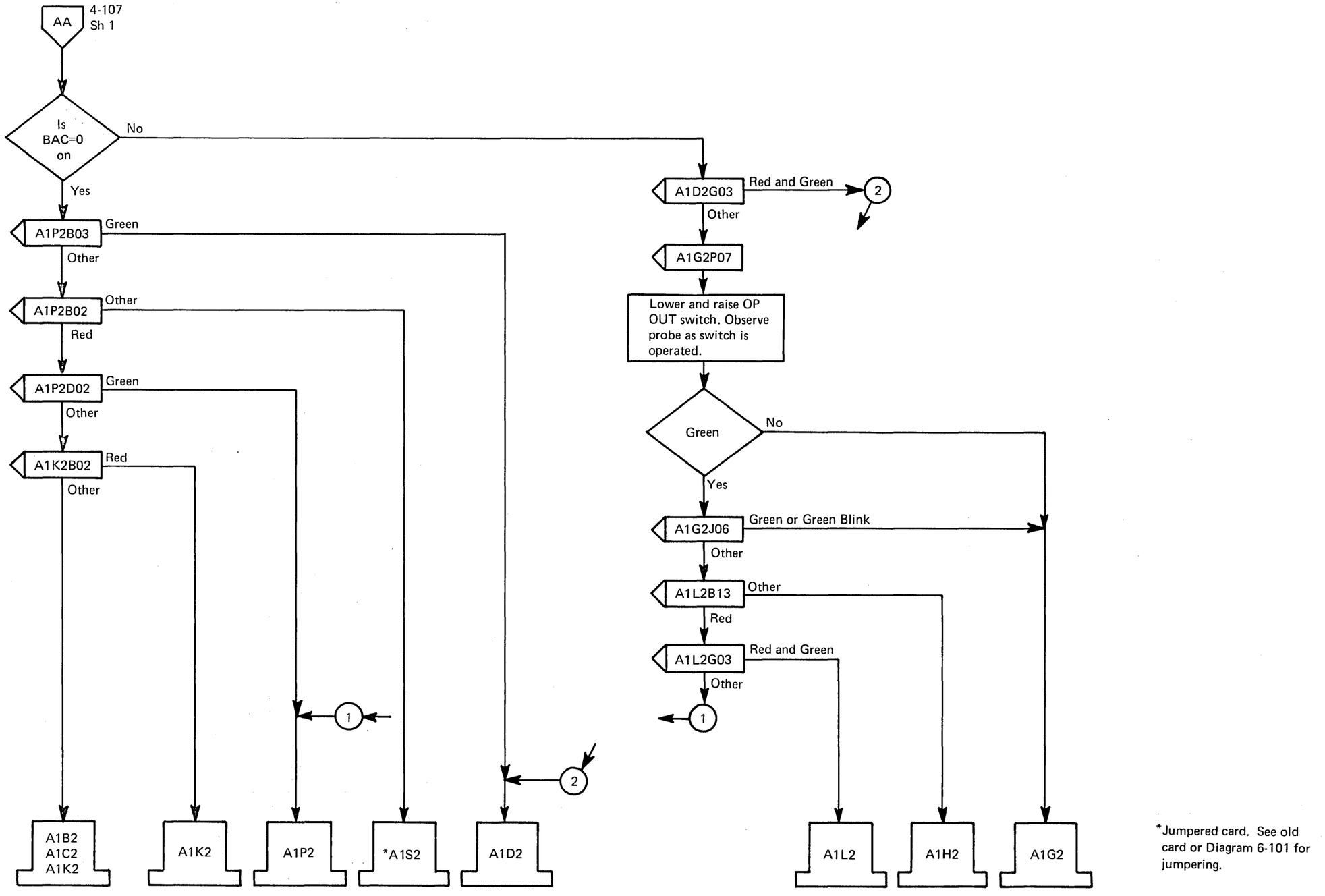


Diagram 4-107. Poll Poll Checkout (Sheet 7 of 10)



*Jumpered card. See old card or Diagram 6-101 for jumpering.

Diagram 4-107. Poll Poll Checkout (Sheet 8 of 10)

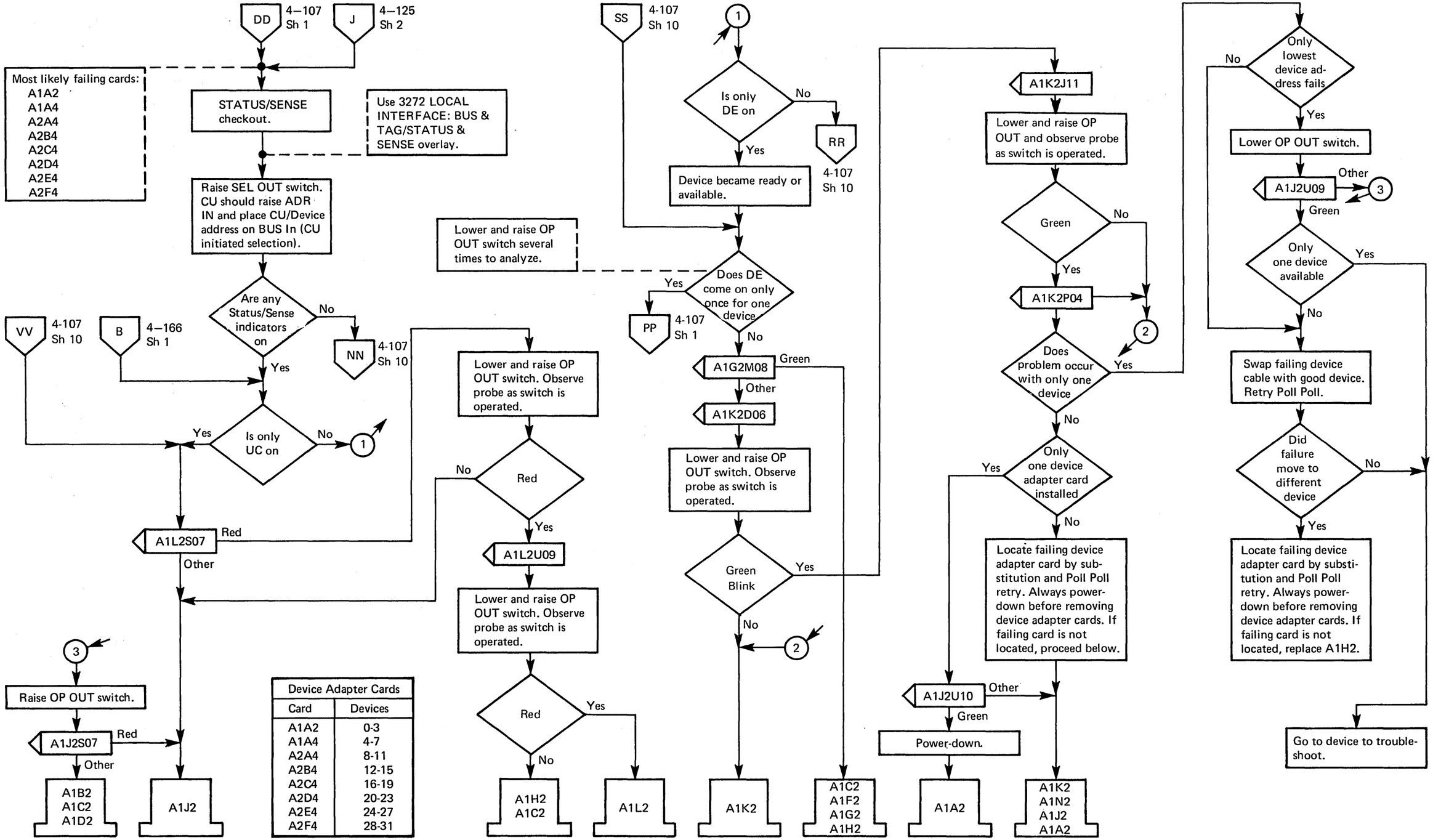


Diagram 4-107. Poll Poll Checkout (Sheet 9 of 10)

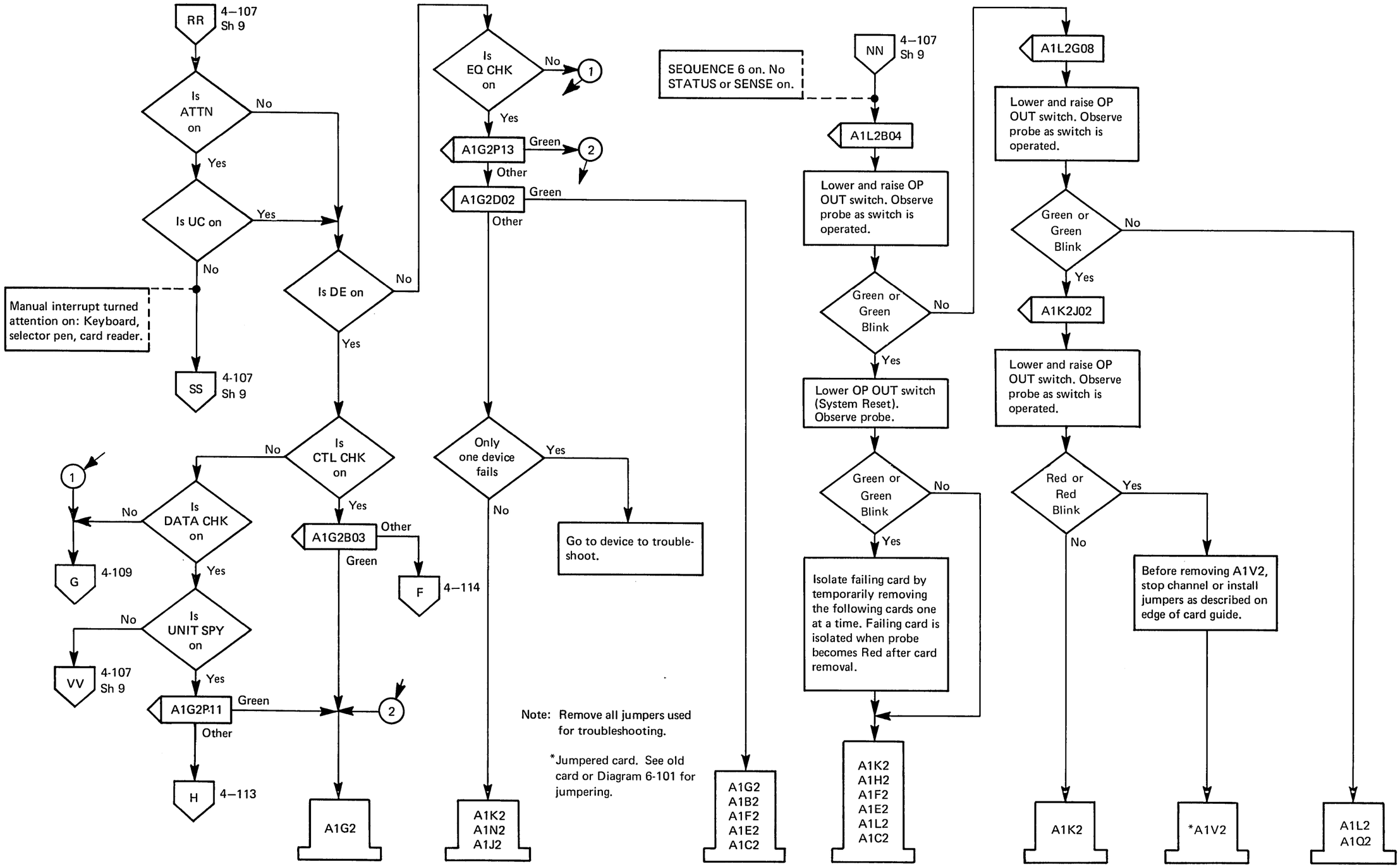


Diagram 4-107. Poll Poll Checkout (Sheet 10 of 10)

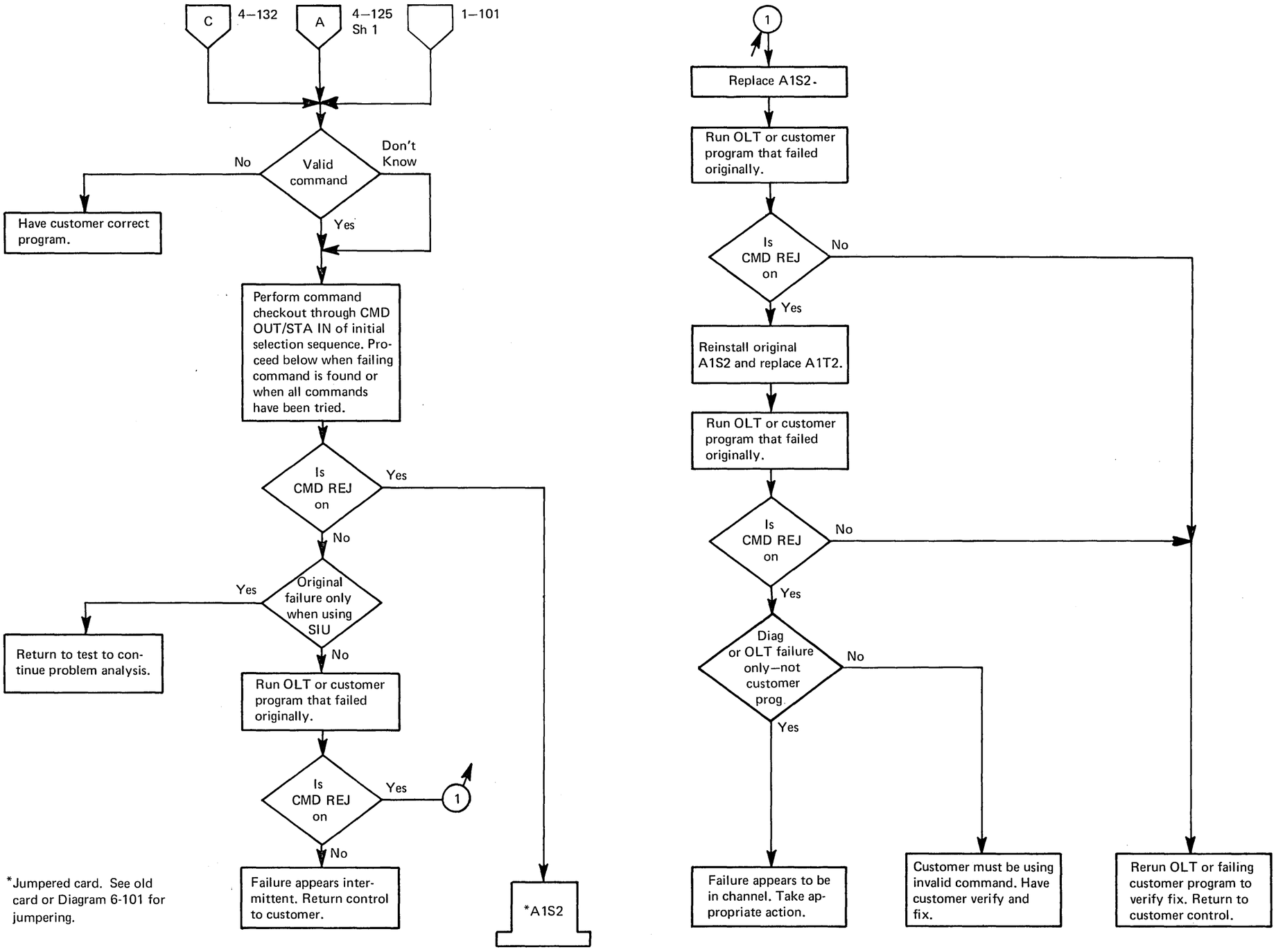
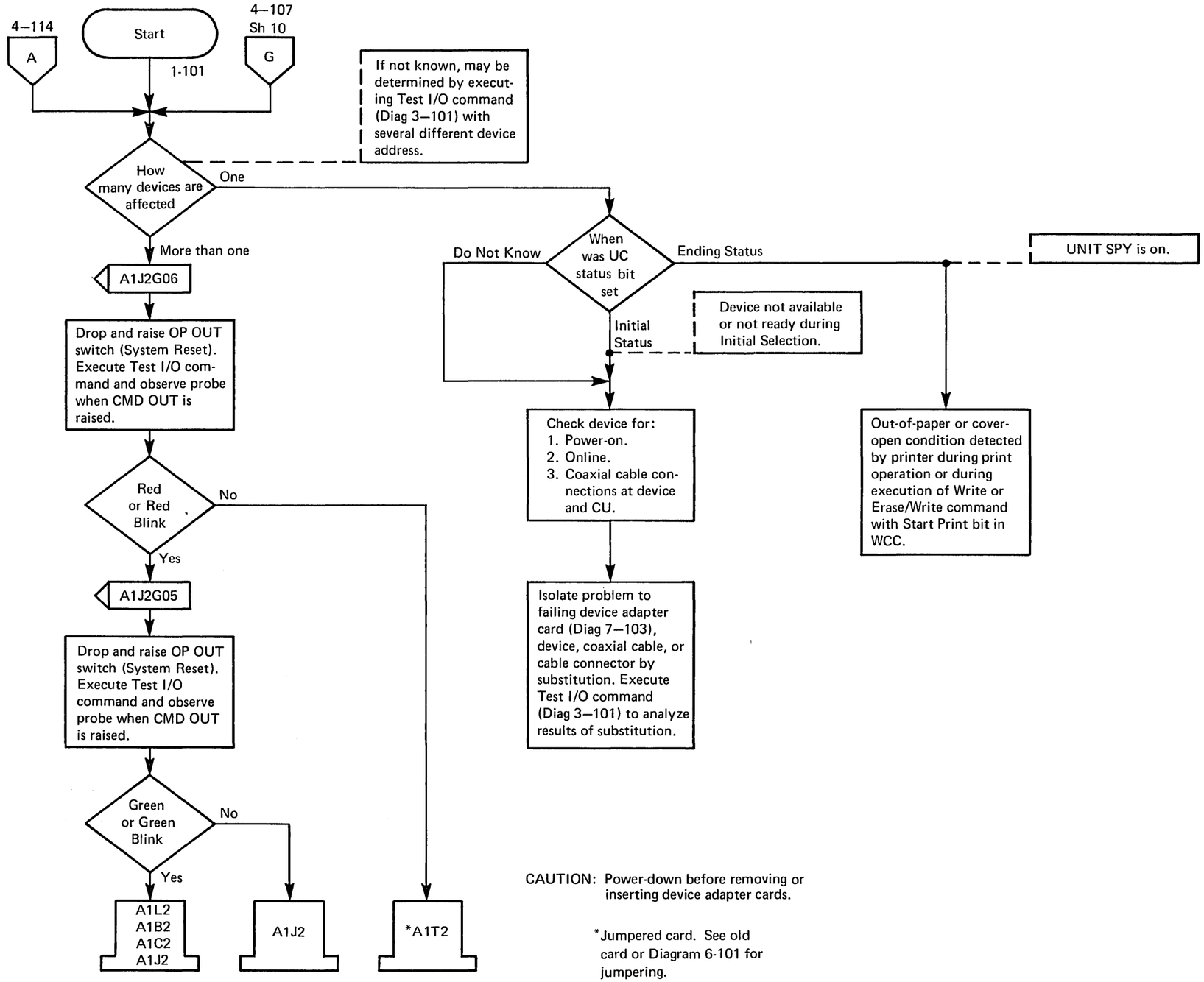


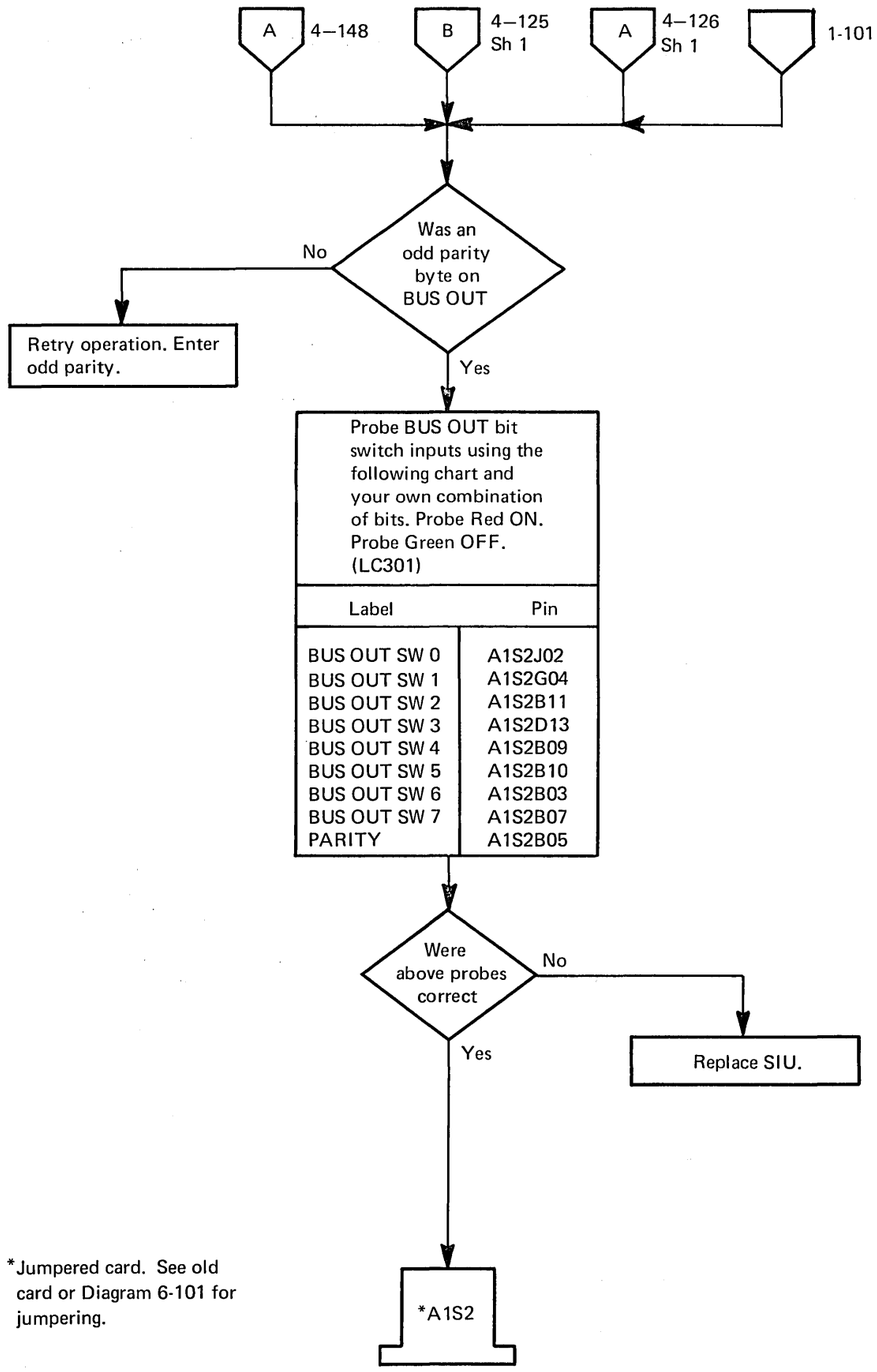
Diagram 4-108. Sense Bit 0 (Command Reject)



CAUTION: Power-down before removing or inserting device adapter cards.

*Jumpered card. See old card or Diagram 6-101 for jumpering.

Diagram 4-109. Sense Bit 1 (Intervention Required)



*Jumpered card. See old card or Diagram 6-101 for jumpering.

Diagram 4-110. Sense Bit 2 (Bus Out Check)

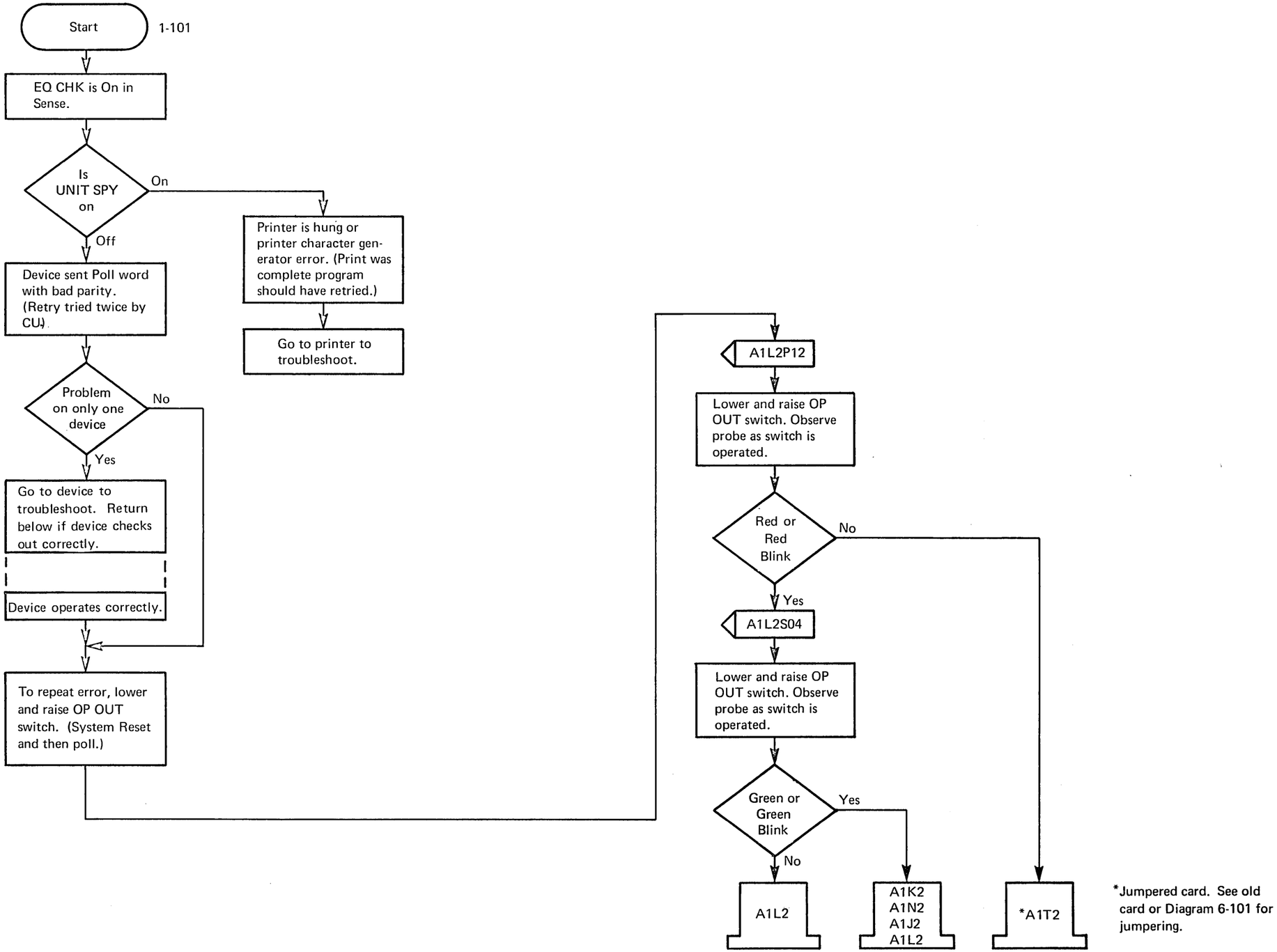
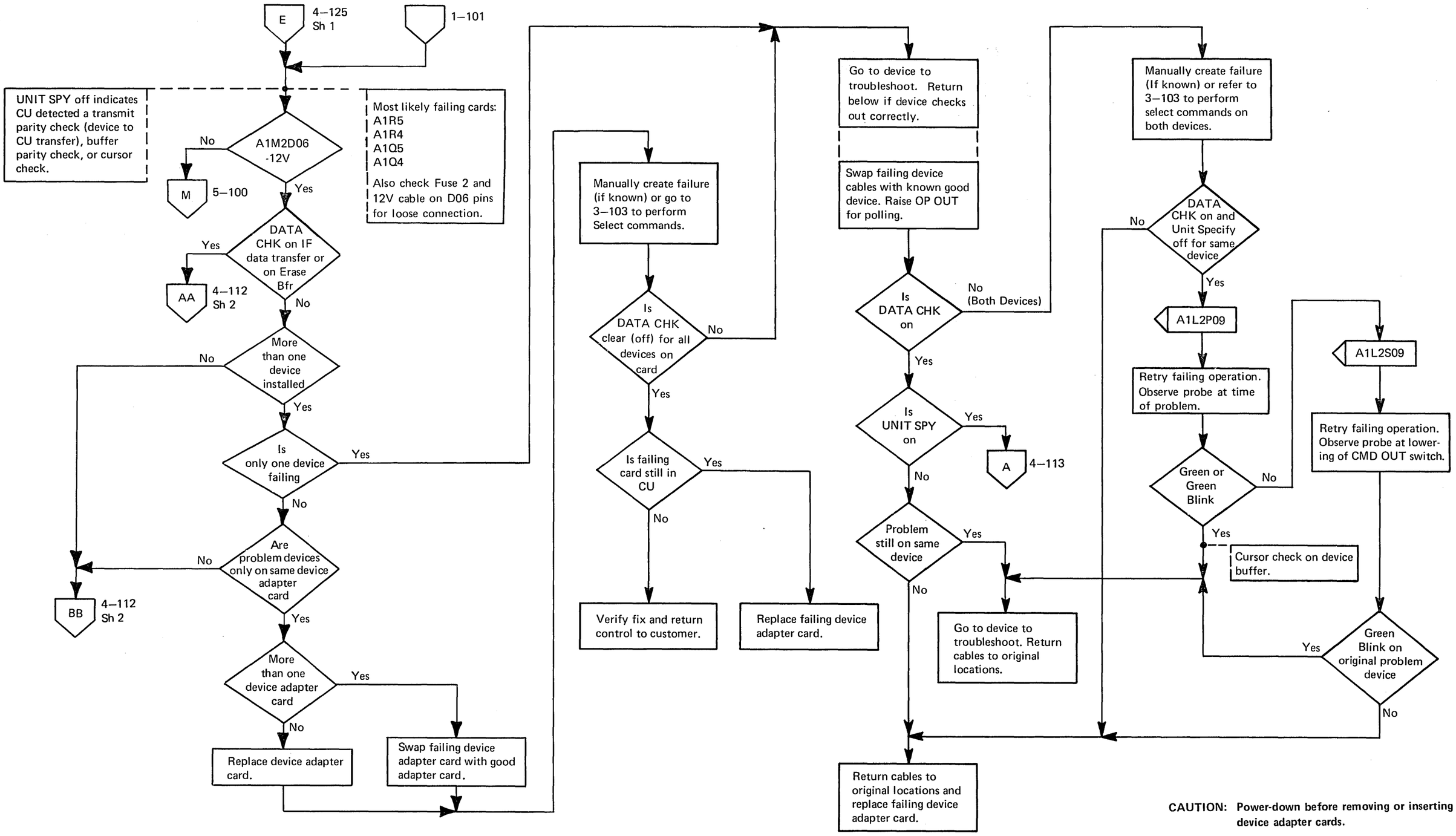


Diagram 4-111. Sense Bit 3 (Equipment Check)



CAUTION: **Power-down before removing or inserting device adapter cards.**

Diagram 4-112. Sense Bit 4 (Data Check) CU-Detected (Sheet 1 of 5)

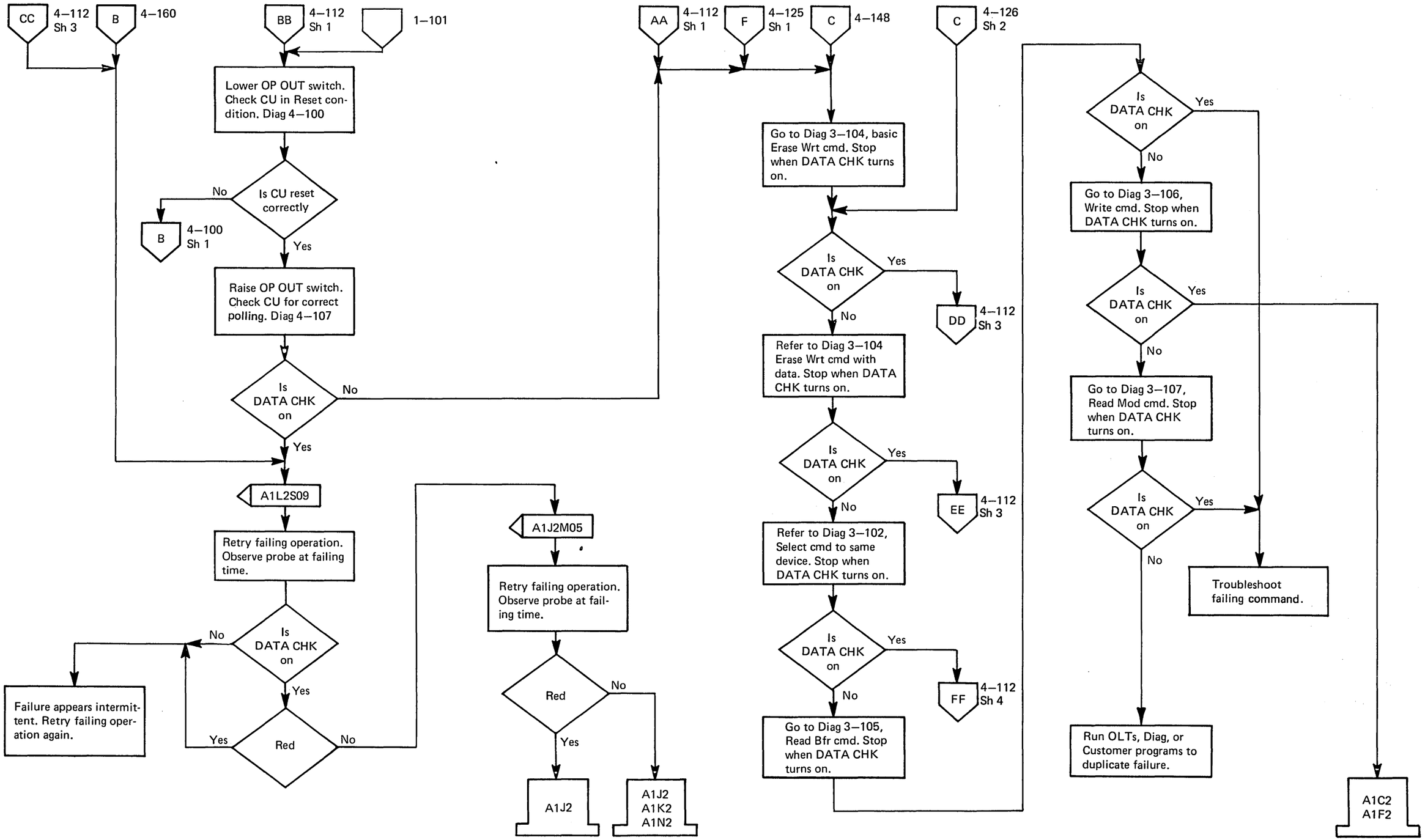


Diagram 4-112. Sense Bit 4 (Data Check) CU-Detected (Sheet 2 of 5)

CAUTION: Power-down before removing or inserting device adapter cards.

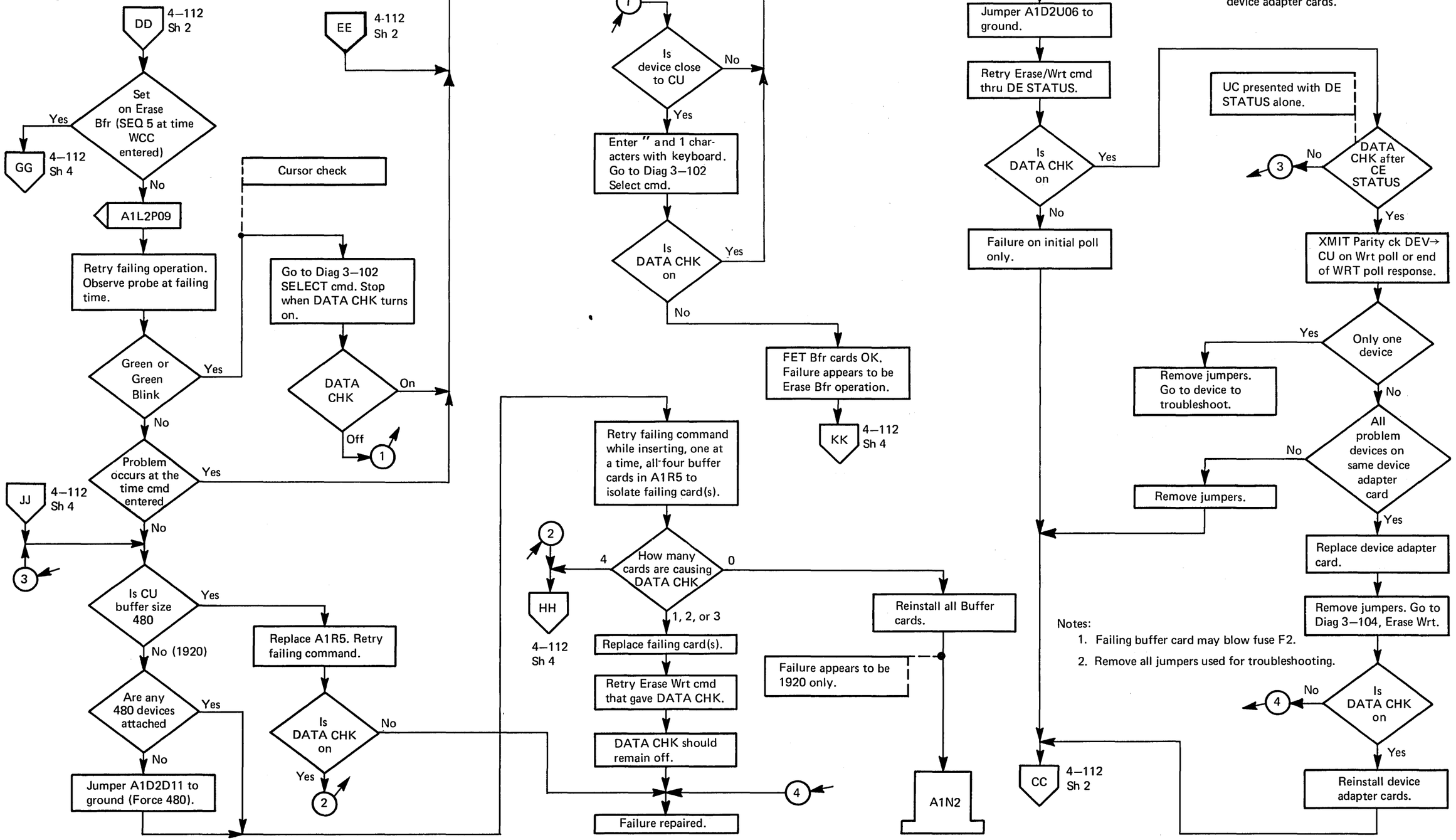


Diagram 4-112. Sense Bit 4 (Data Check) CU-Detected (Sheet 3 of 5)

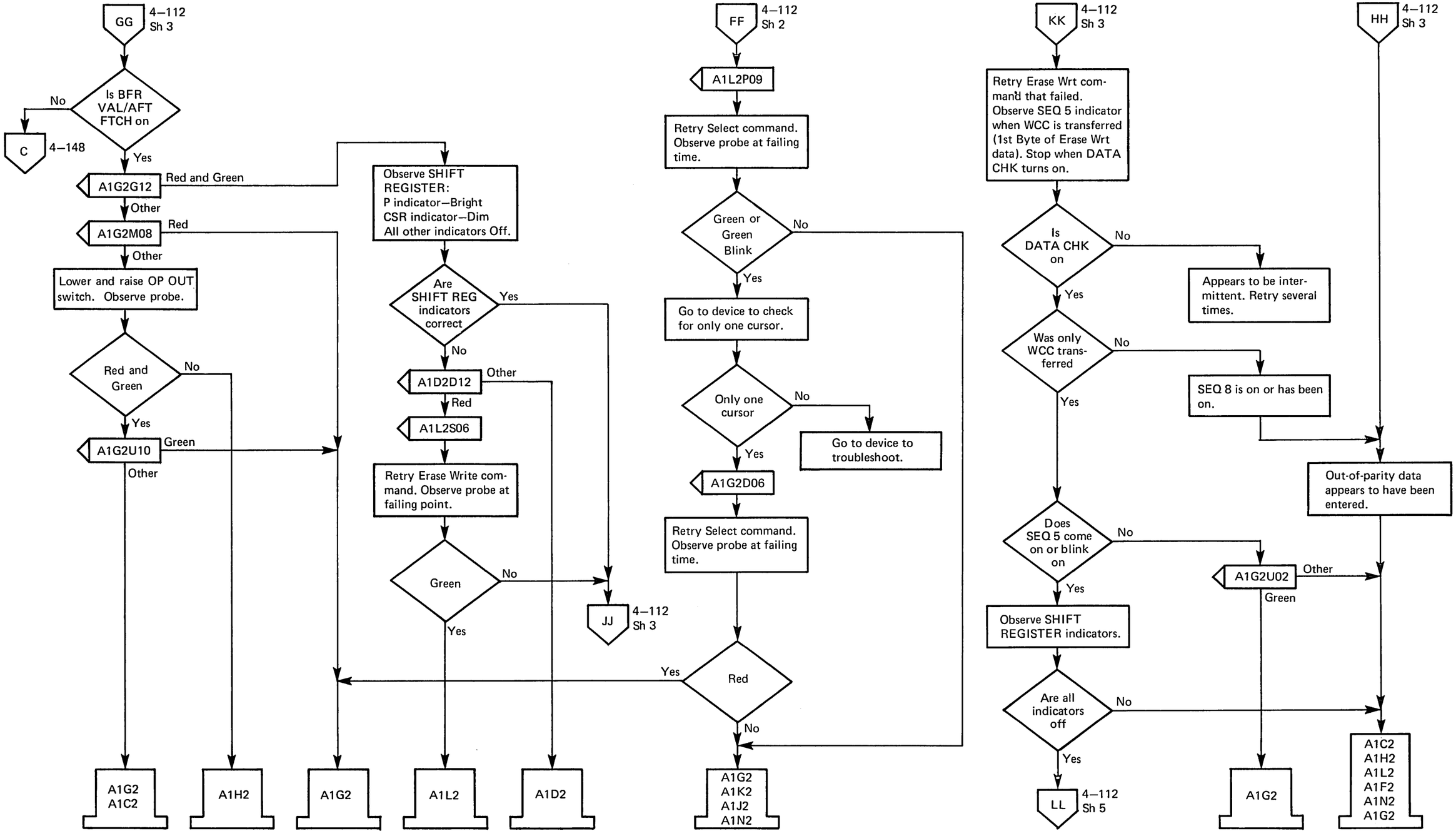


Diagram 4-112. Sense Bit (Data Check) CU-Detected (Sheet 4 of 5)

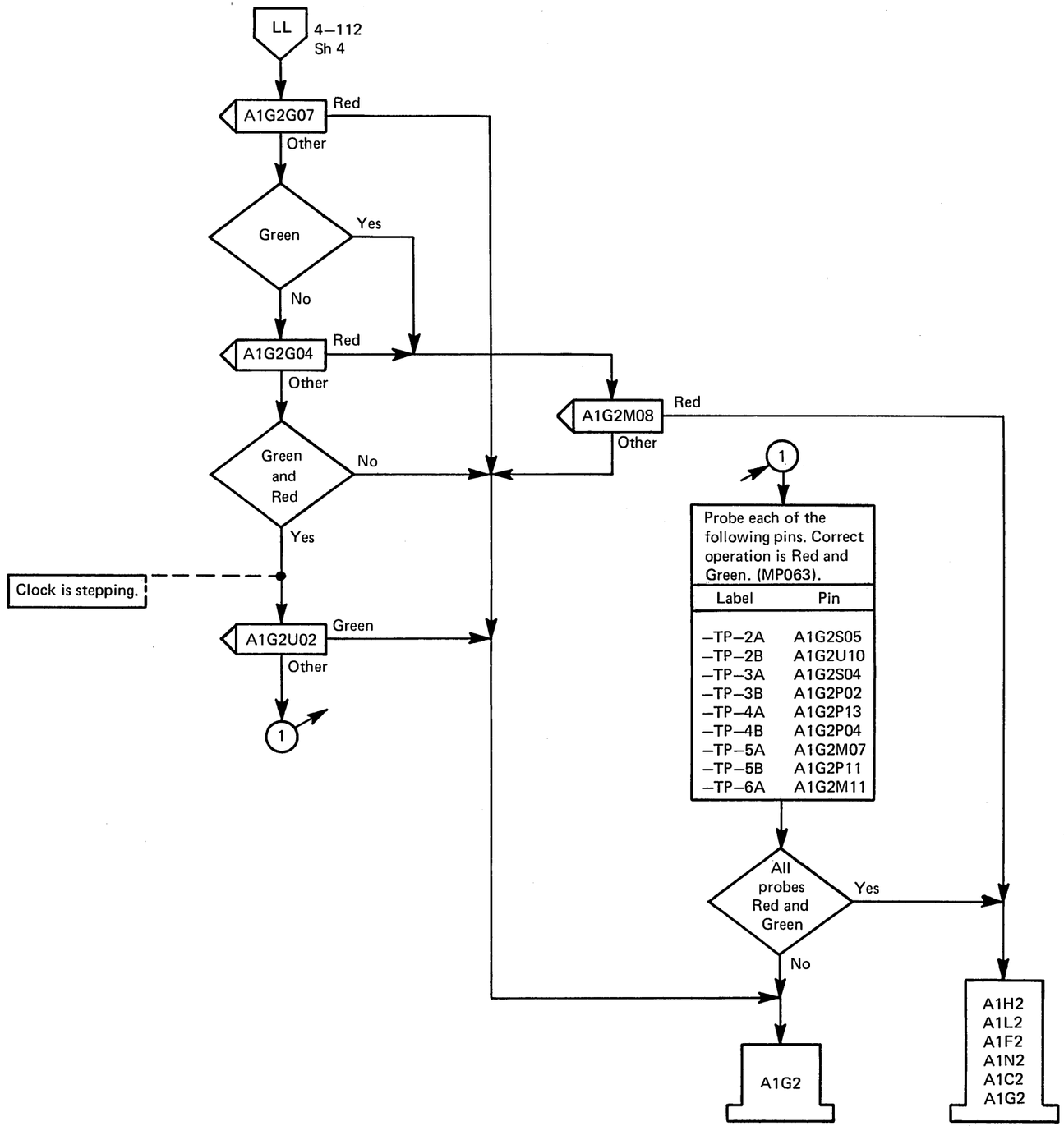


Diagram 4-112. Sense Bit 4 (Data Check) CU-Detected (Sheet 5 of 5)

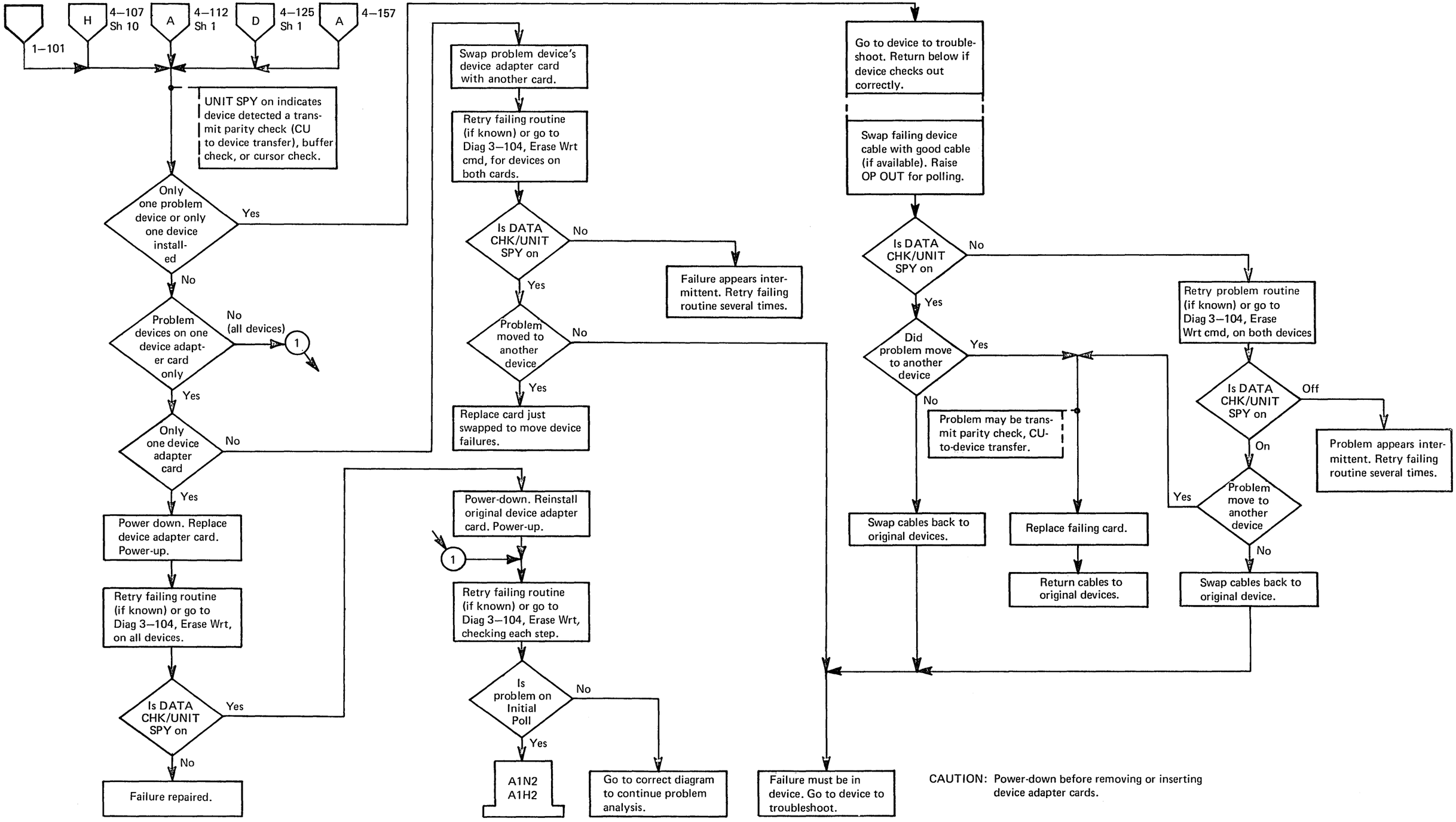


Diagram 4-113. Sense Bit 4 (Data Check) and Bit 5 (Unit Specify) Device-Detected

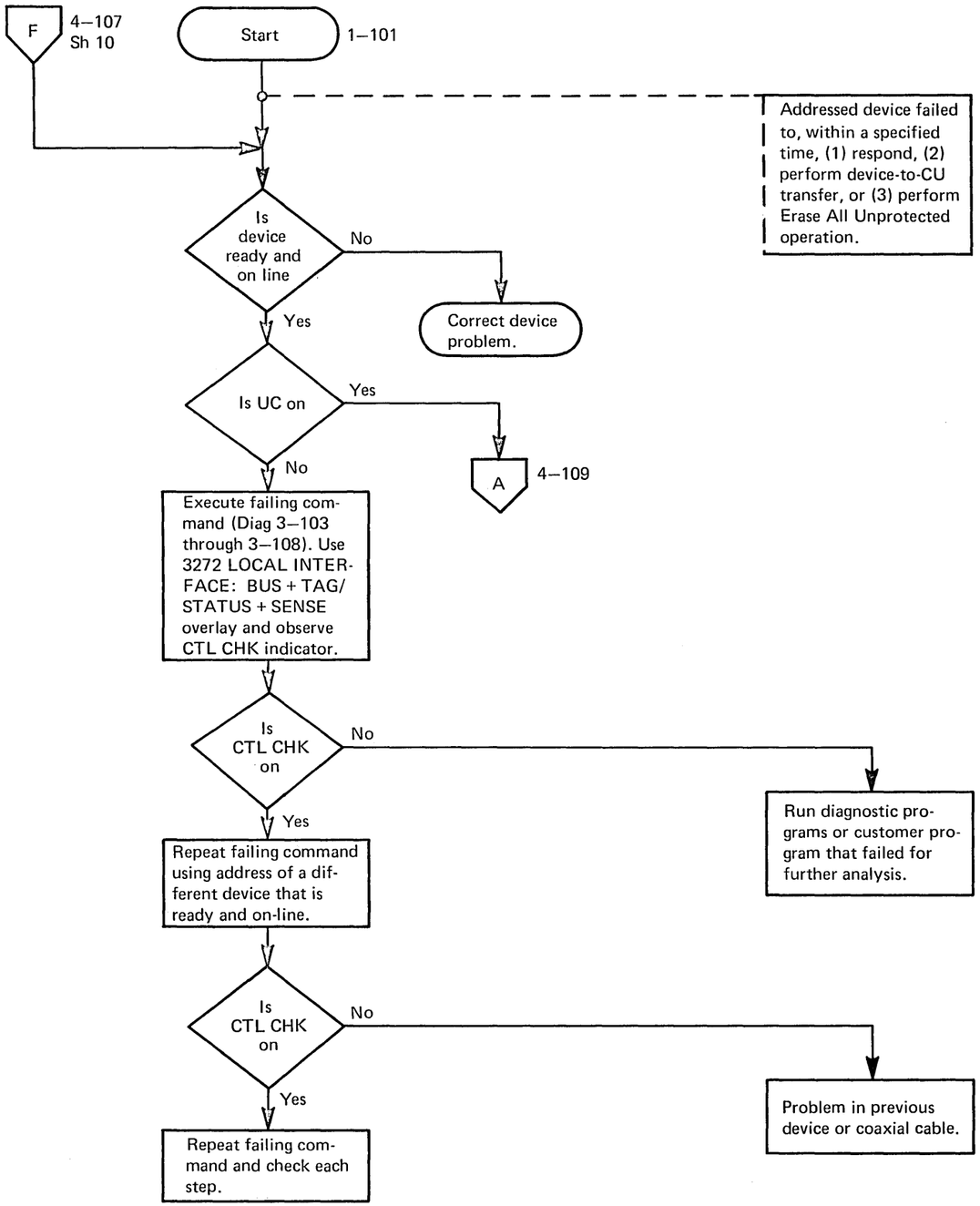


Diagram 4-114. Sense Bit 6 (Control Check)

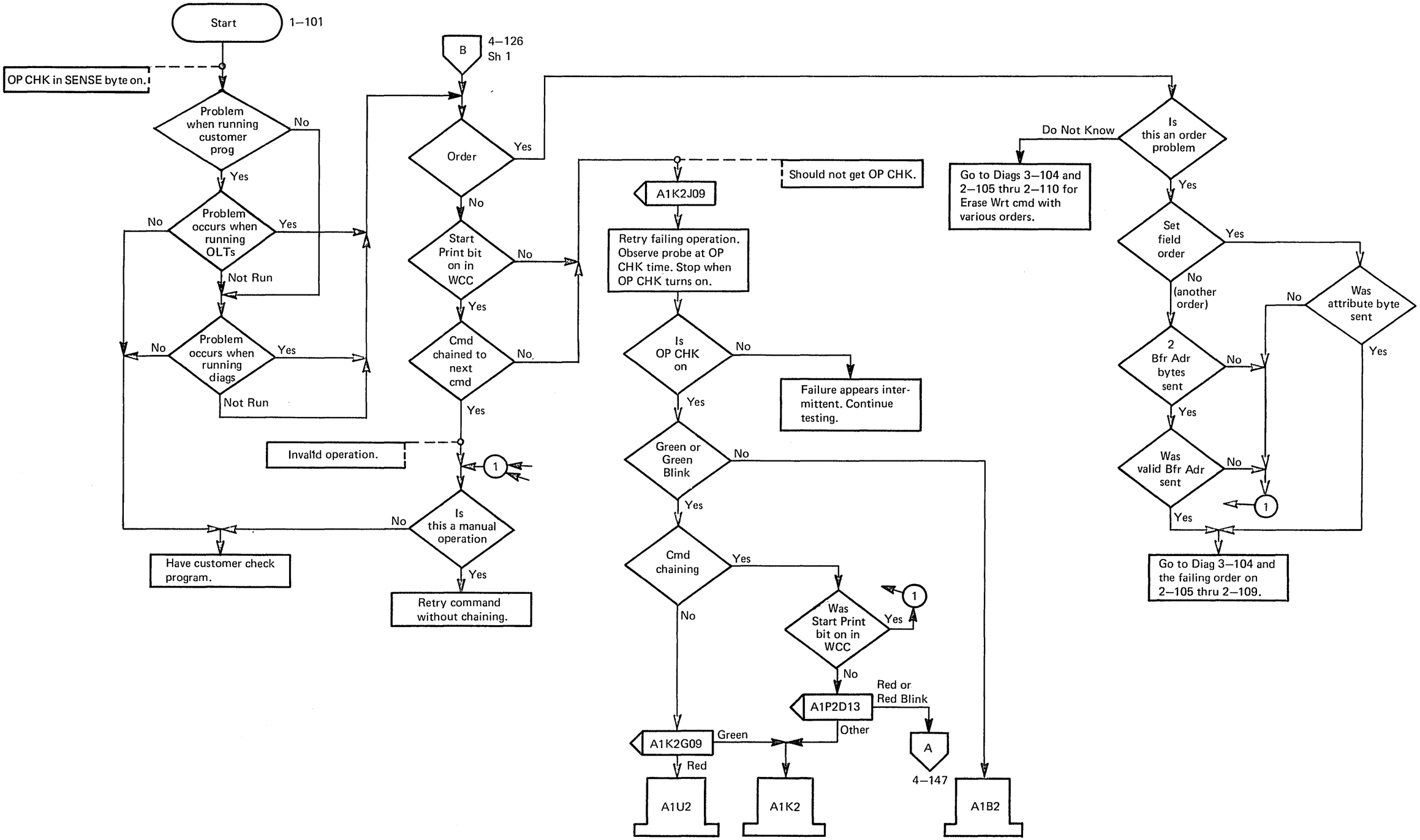
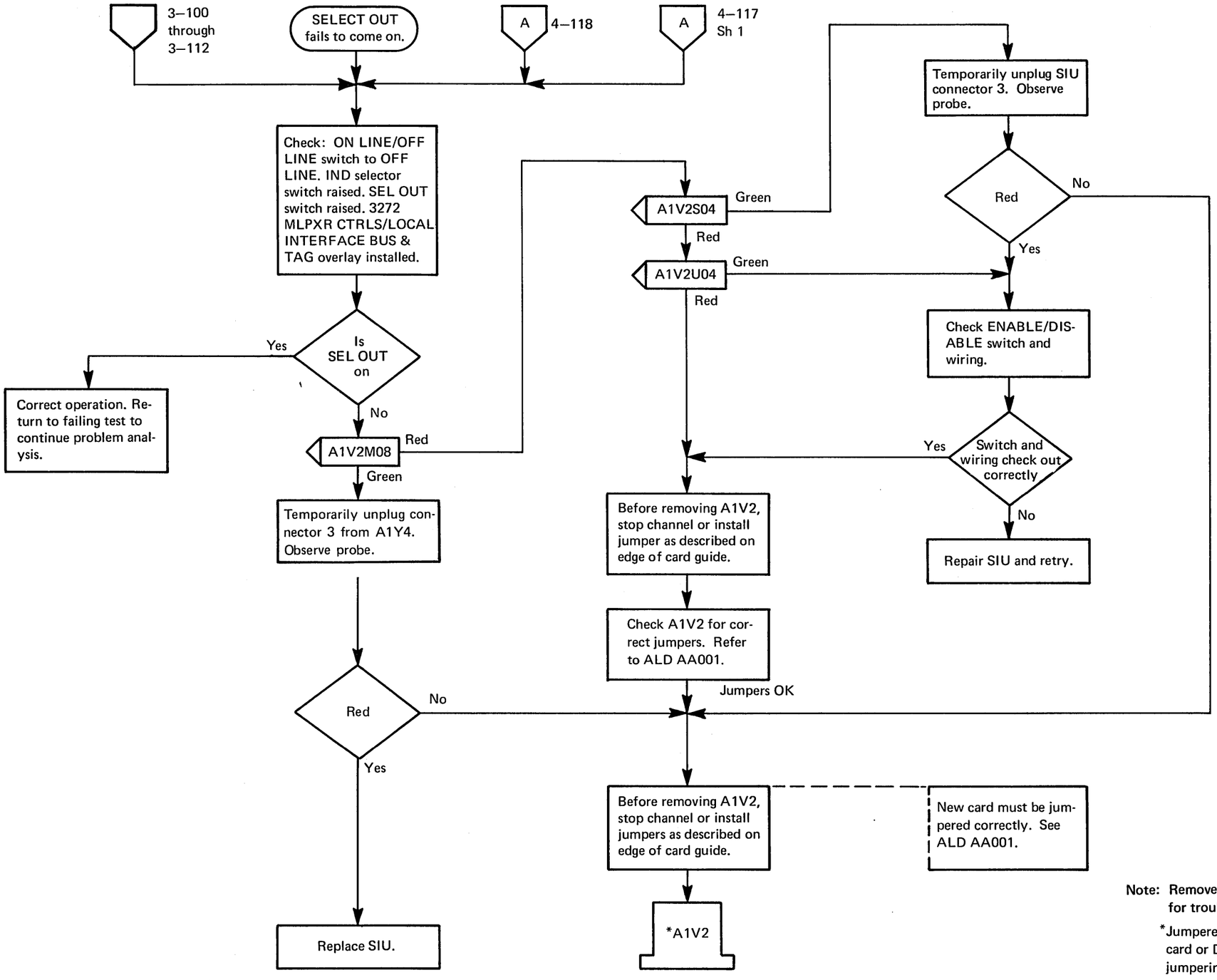


Diagram 4-115. Sense Bit 7 (Operational Check)



Note: Remove all jumpers used for troubleshooting.

*Jumpered card. See old card or Diagram 6-101 for jumpering.

Diagram 4-116. Select Out Failure

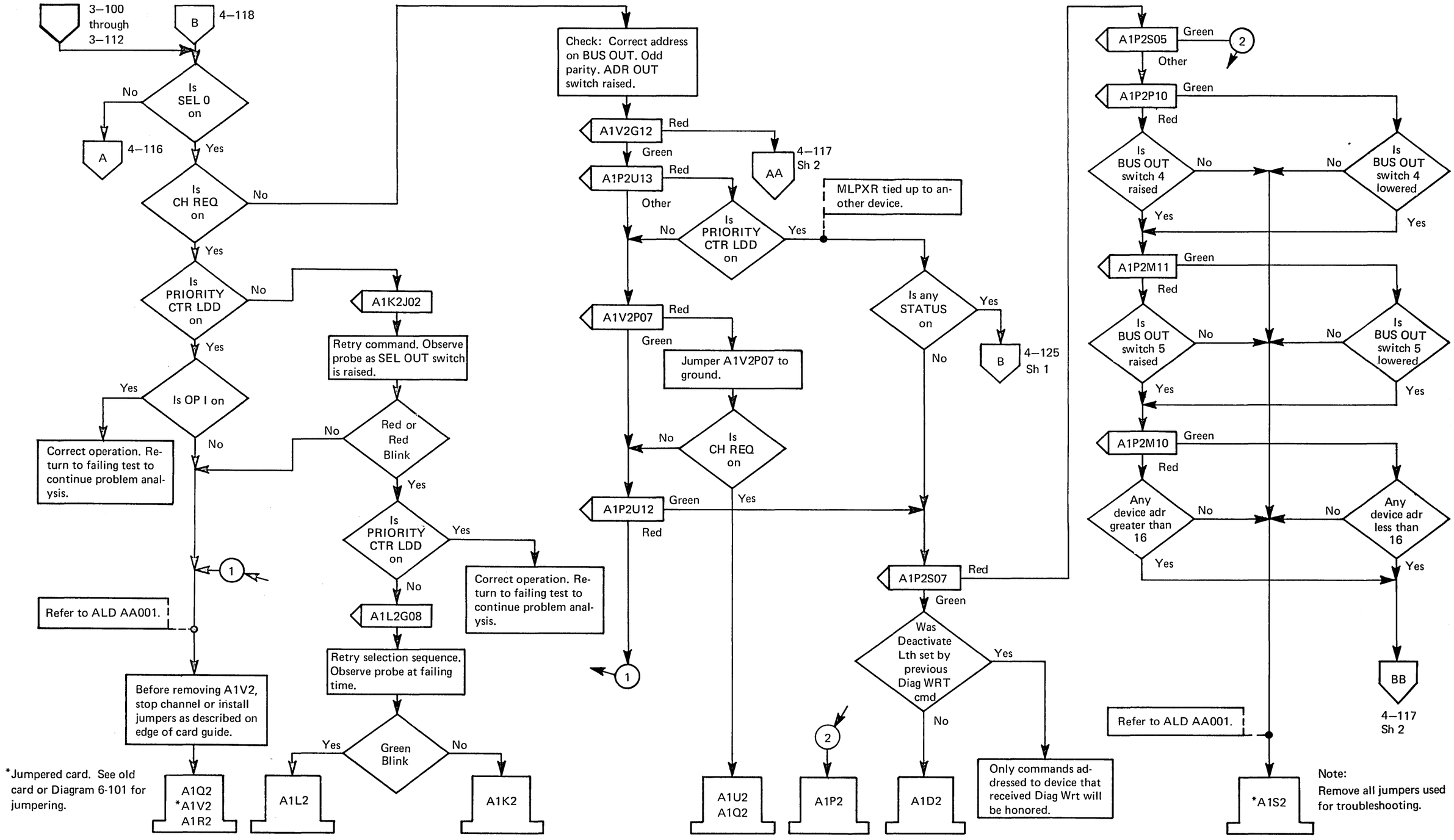
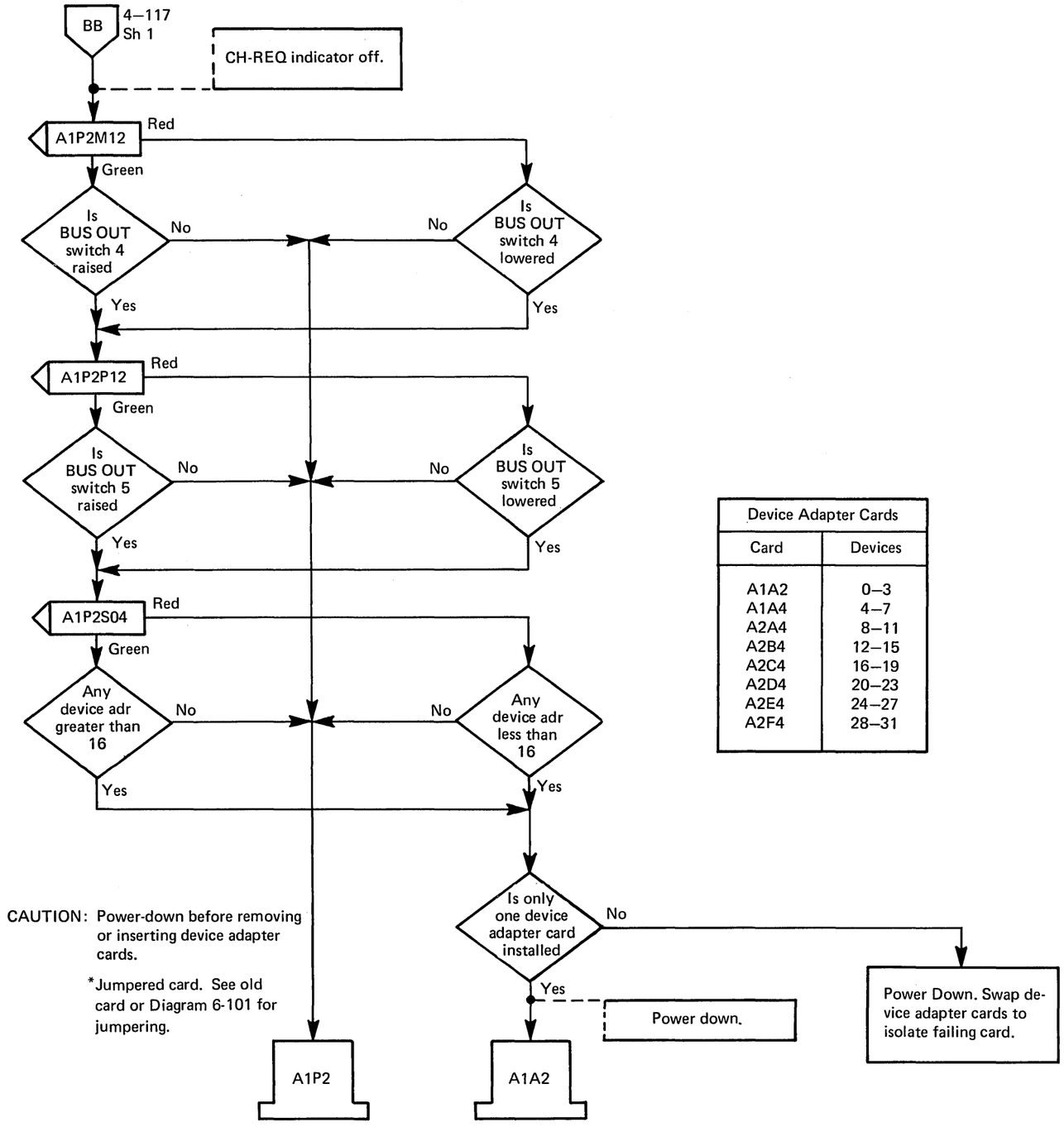


Diagram 4-117. Channel Request, Priority Counter, or Op-In Failure (Sheet 1 of 2)



Device Adapter Cards	
Card	Devices
A1A2	0–3
A1A4	4–7
A2A4	8–11
A2B4	12–15
A2C4	16–19
A2D4	20–23
A2E4	24–27
A2F4	28–31

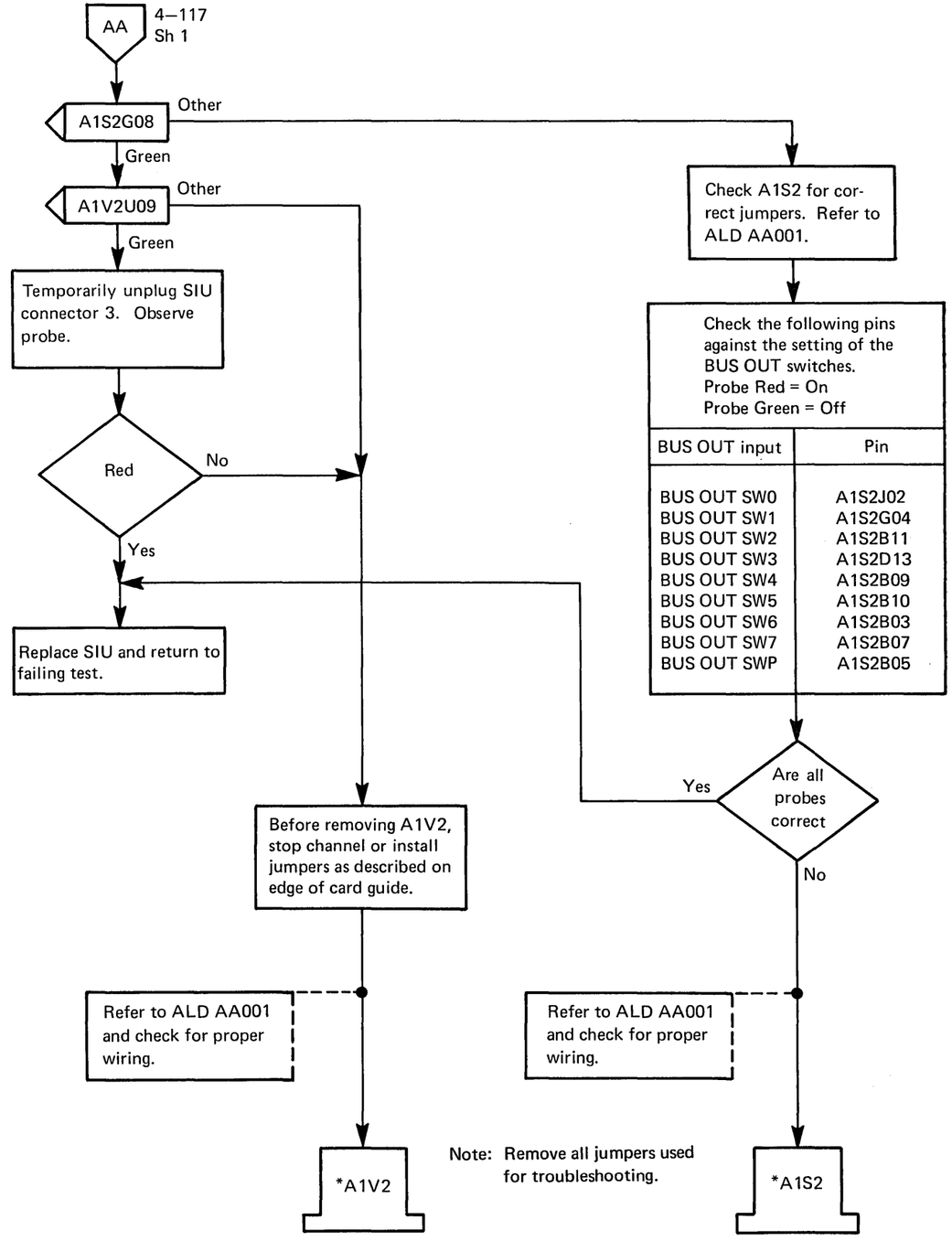
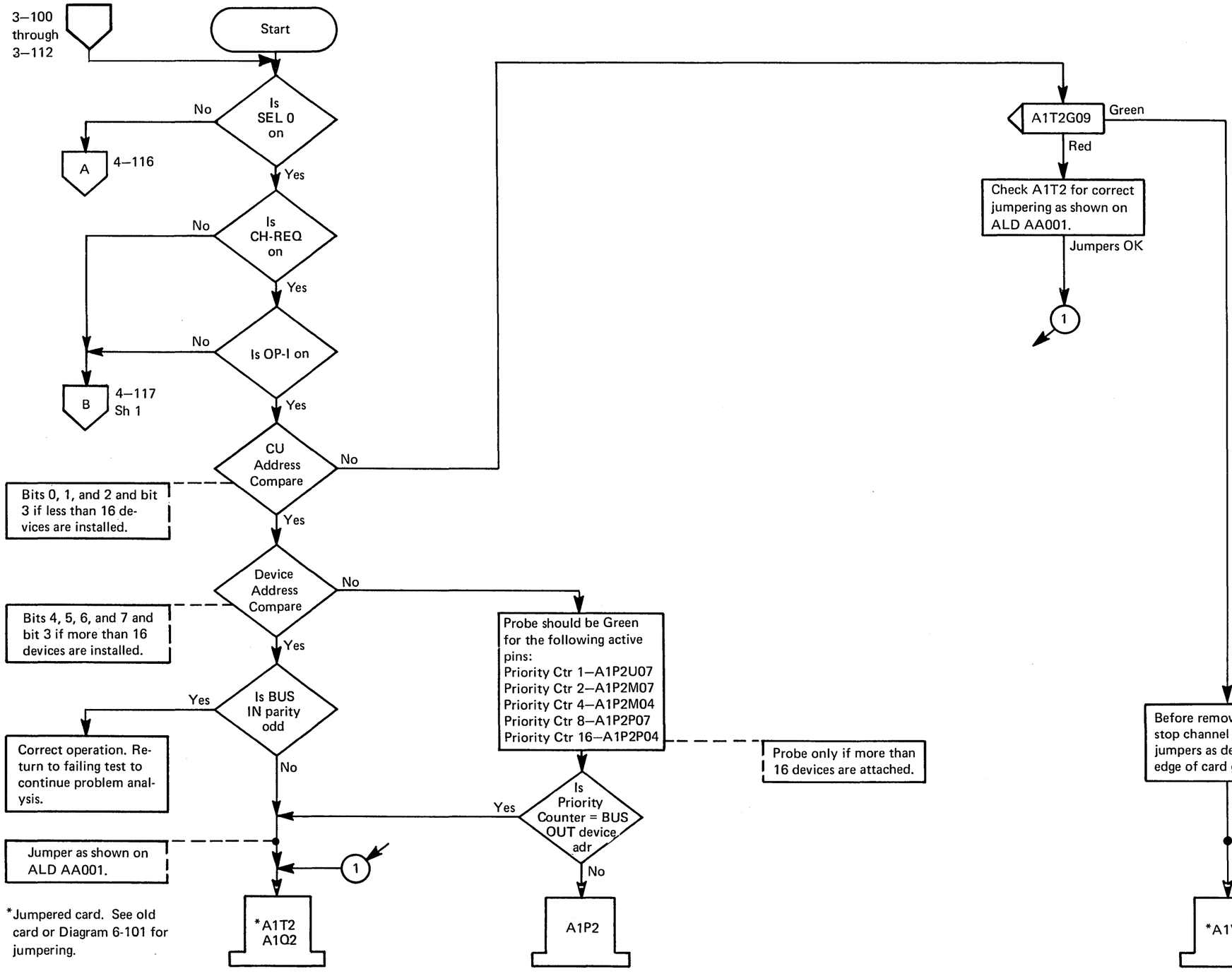


Diagram 4-117. Channel Request, Priority Counter, or Op-In Failure (Sheet 2 of 2)



*Jumpered card. See old card or Diagram 6-101 for jumpering.

Diagram 4-118. Address Compare Failure

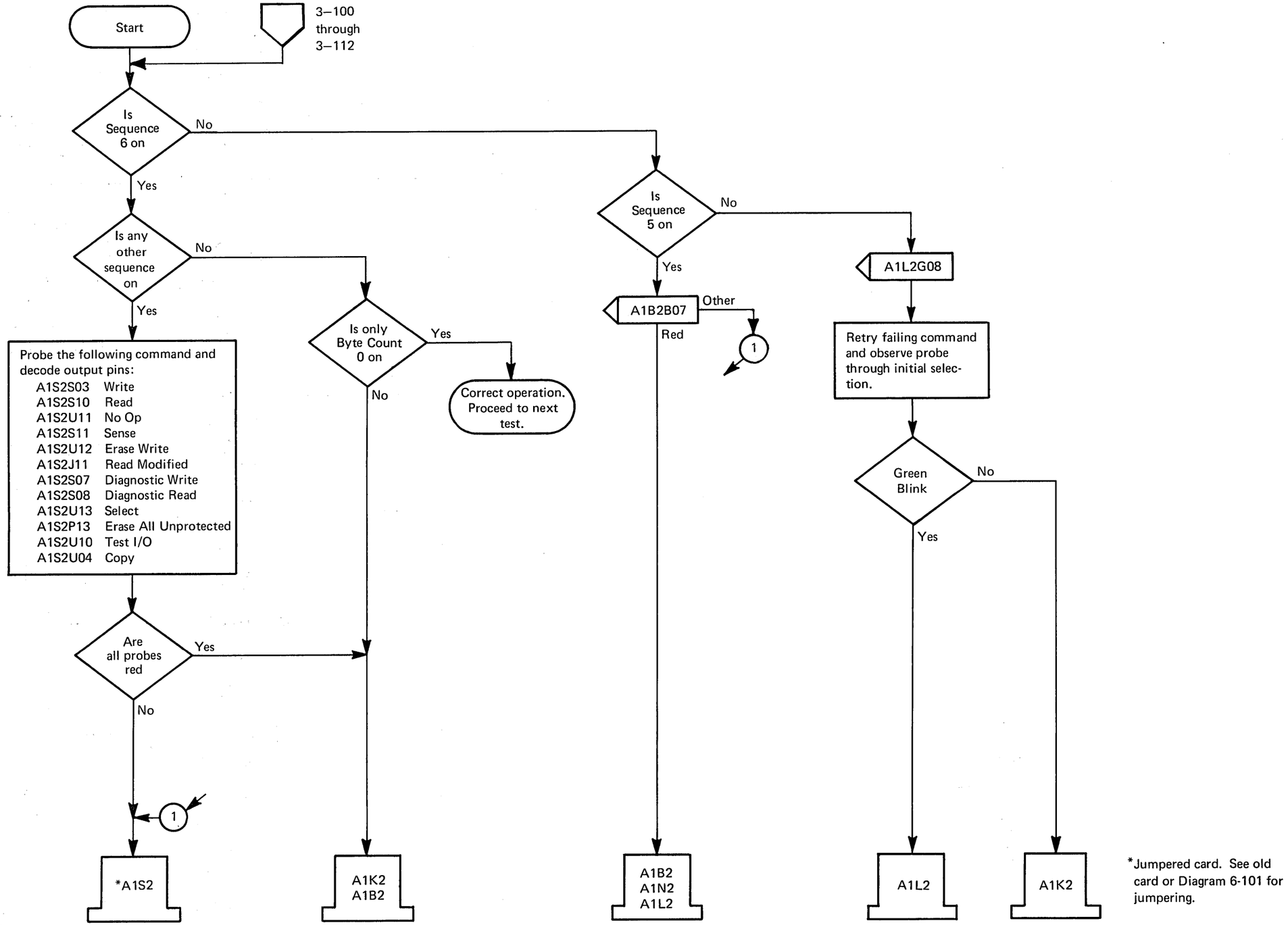
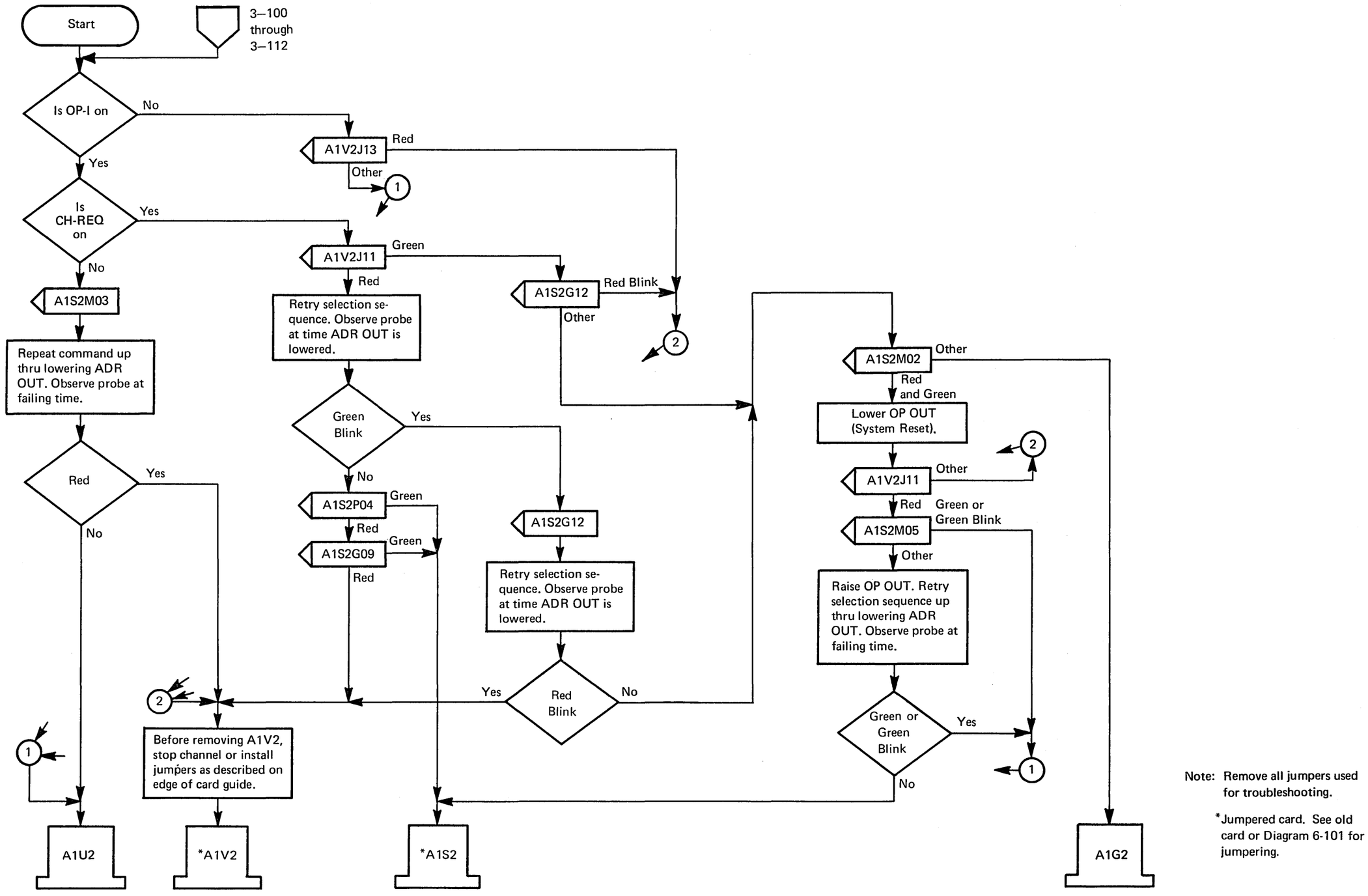


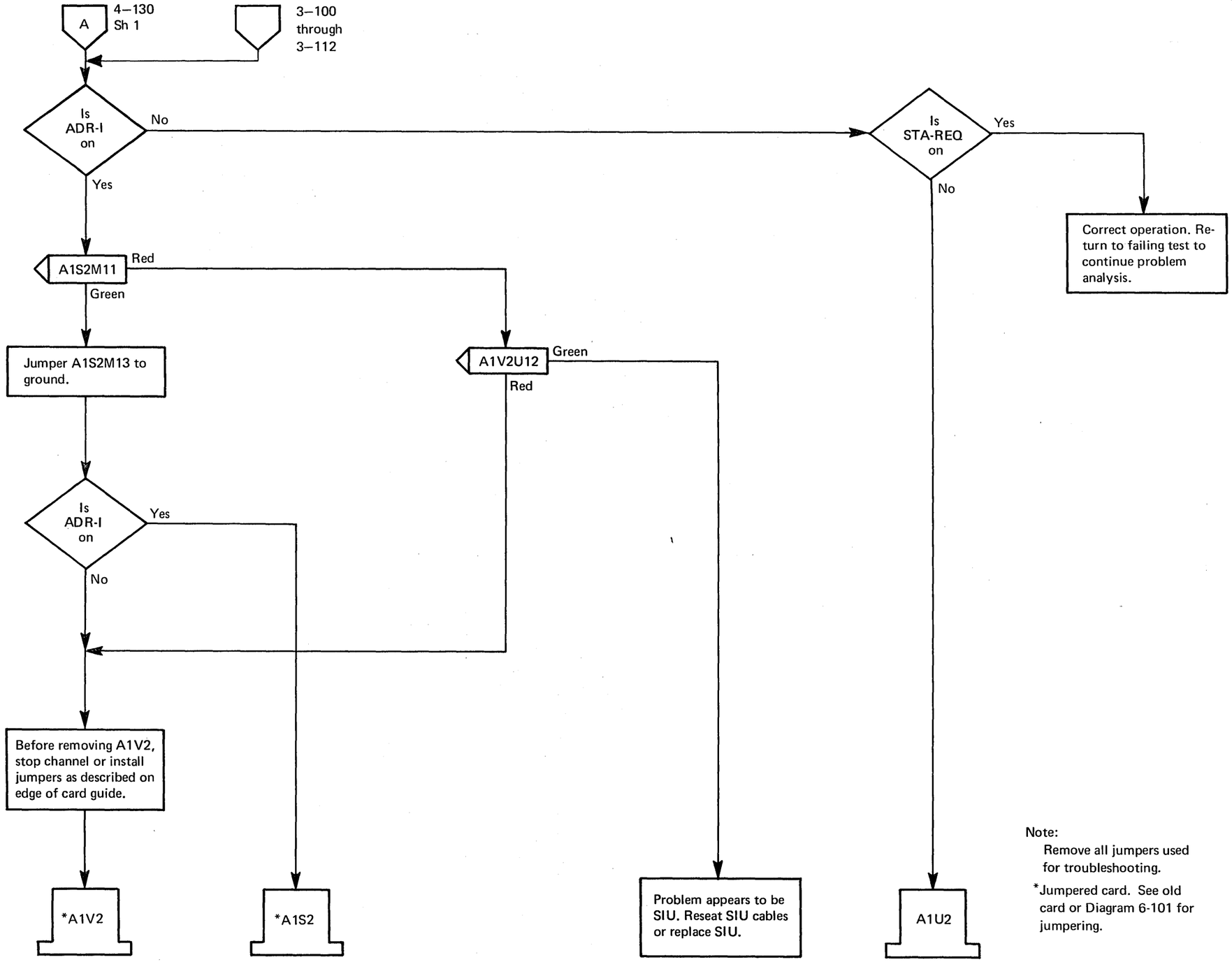
Diagram 4-119. Sequence or Byte Count Error during Initial Selection



Note: Remove all jumpers used for troubleshooting.

*Jumpered card. See old card or Diagram 6-101 for jumpering.

Diagram 4-120. Address-In Failure



Note:
Remove all jumpers used for troubleshooting.

*Jumpered card. See old card or Diagram 6-101 for jumpering.

Diagram 4-121. Address-In or Status-In Fails to Reset on Rise of Command Out

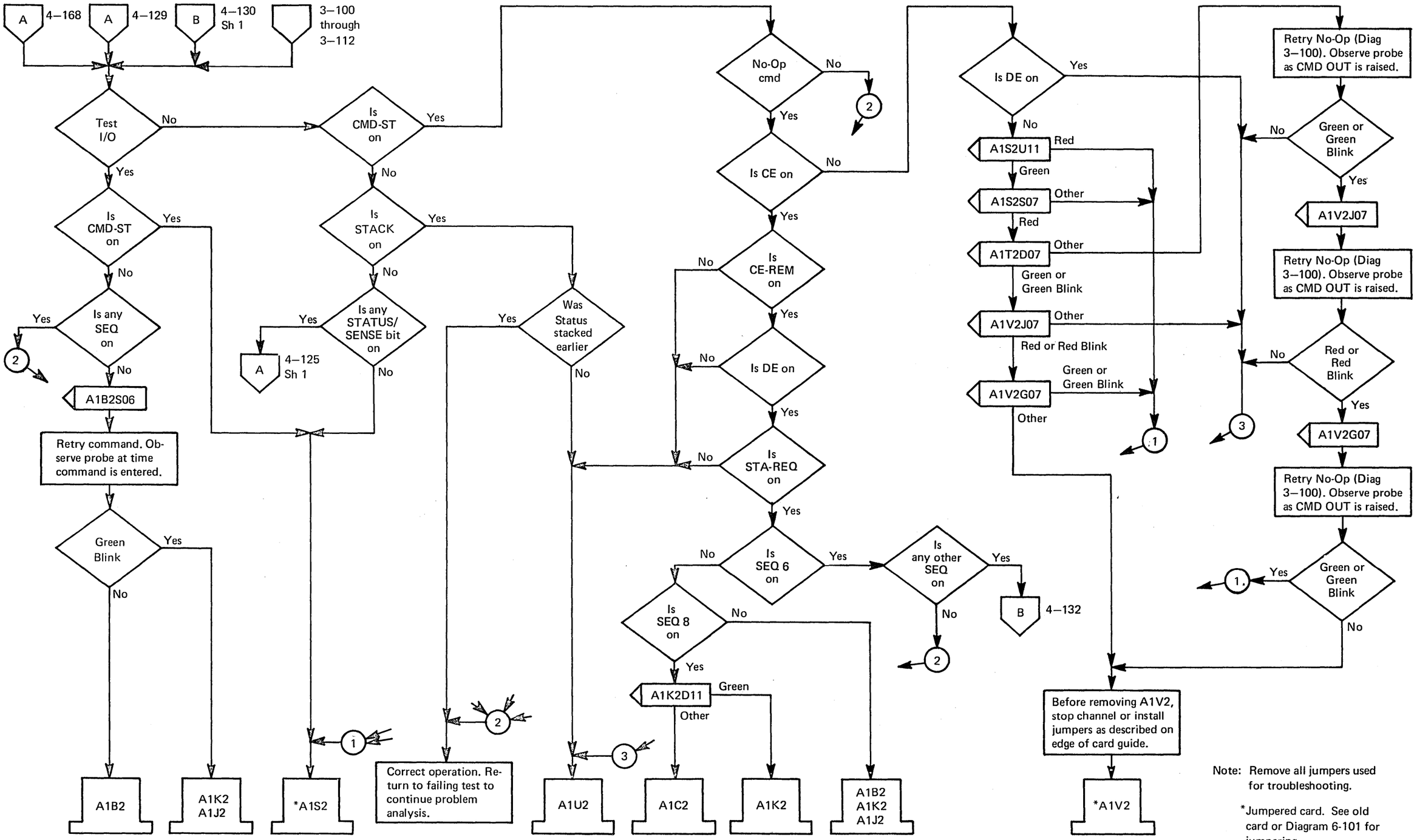


Diagram 4-122. Command Store, CE Remember/Status Request, or Sequence Failure during Channel End or Device End

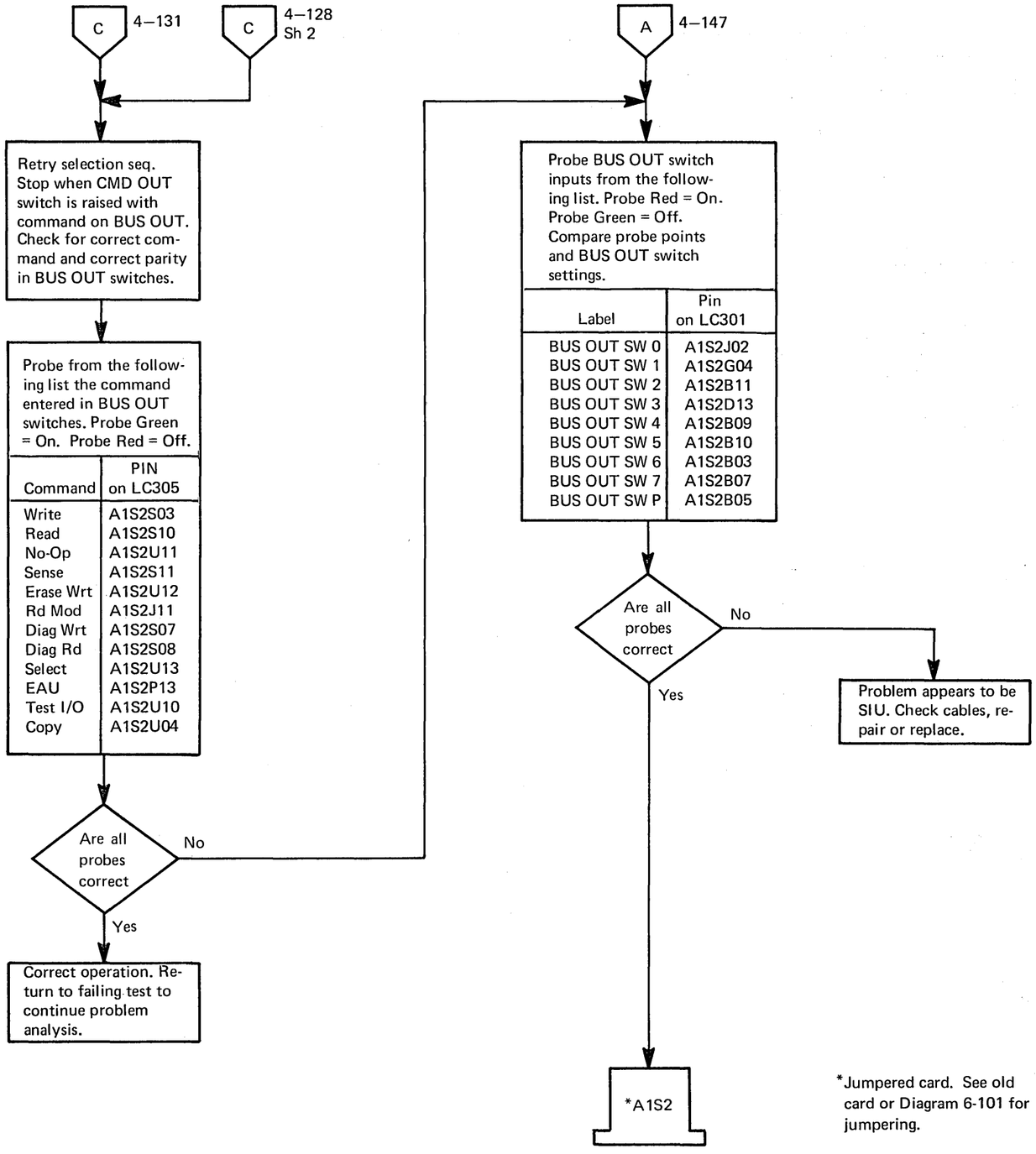
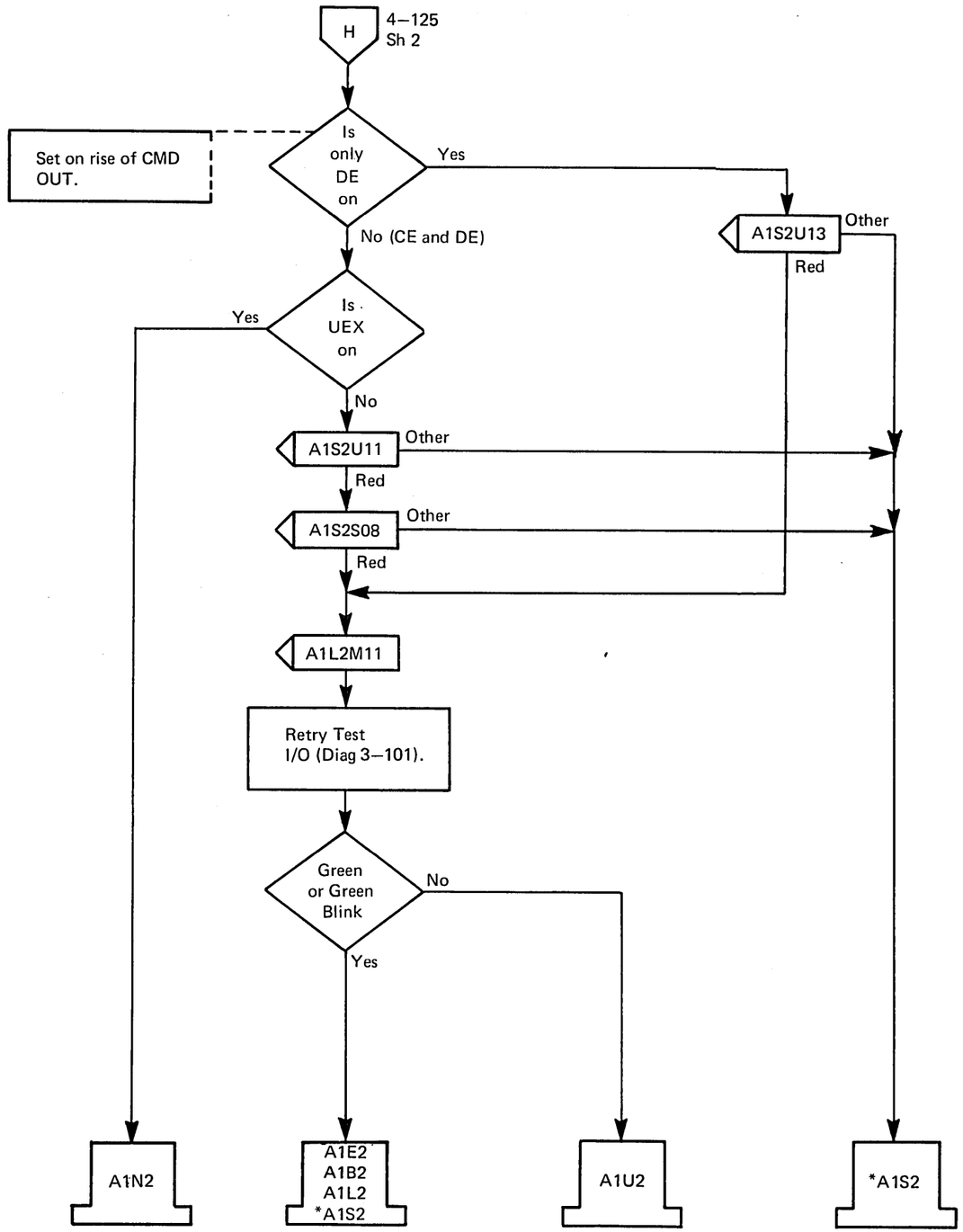


Diagram 4-123. Command Decode Failure



*Jumpered card. See old card or Diagram 6-101 for jumpering.

Diagram 4-124. Unexpected Channel End and/or Device End during Initial Selection

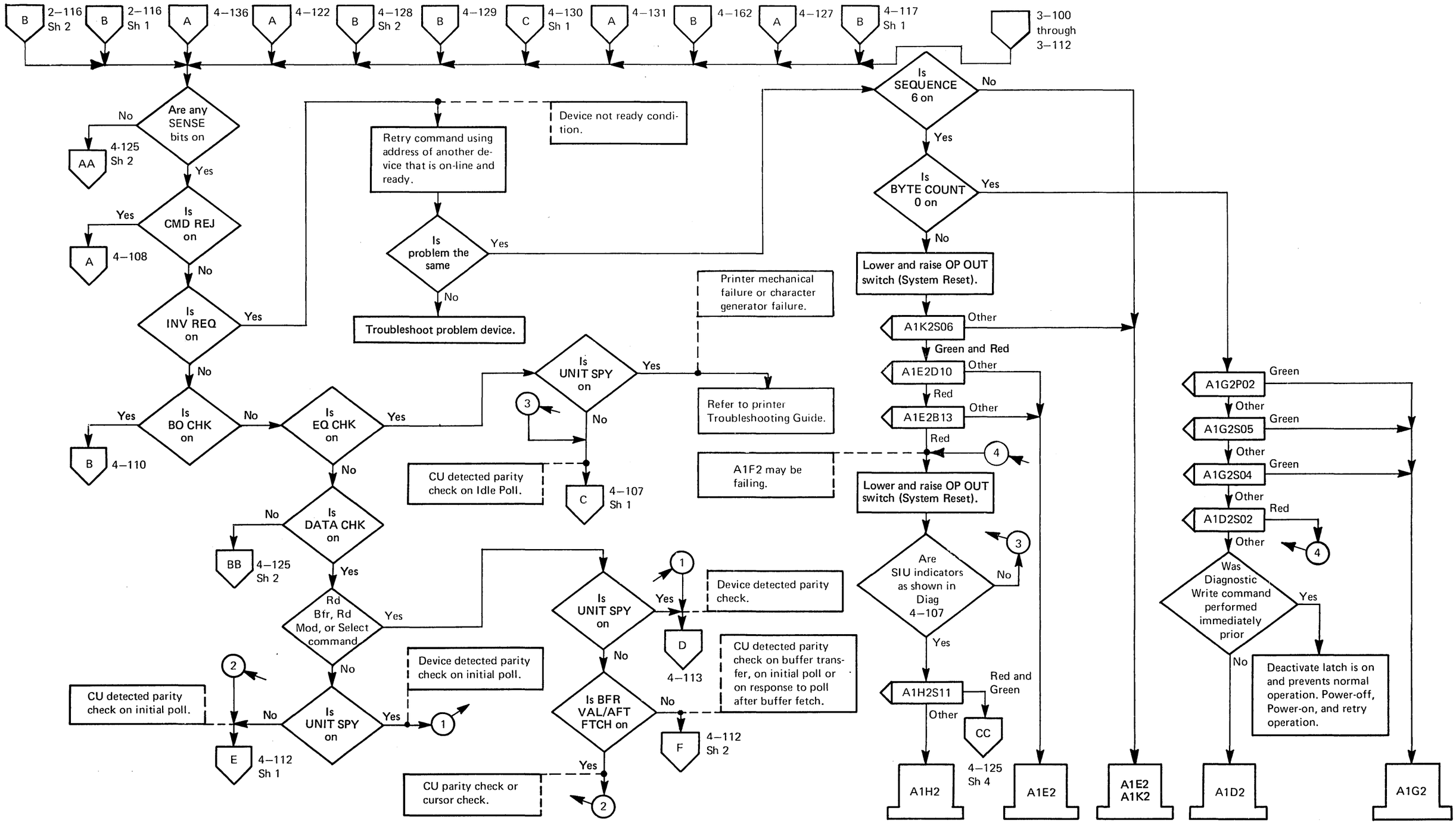


Diagram 4-125. Unexpected Status or Sense during Initial Selection (All Commands) (Sheet 1 of 5)

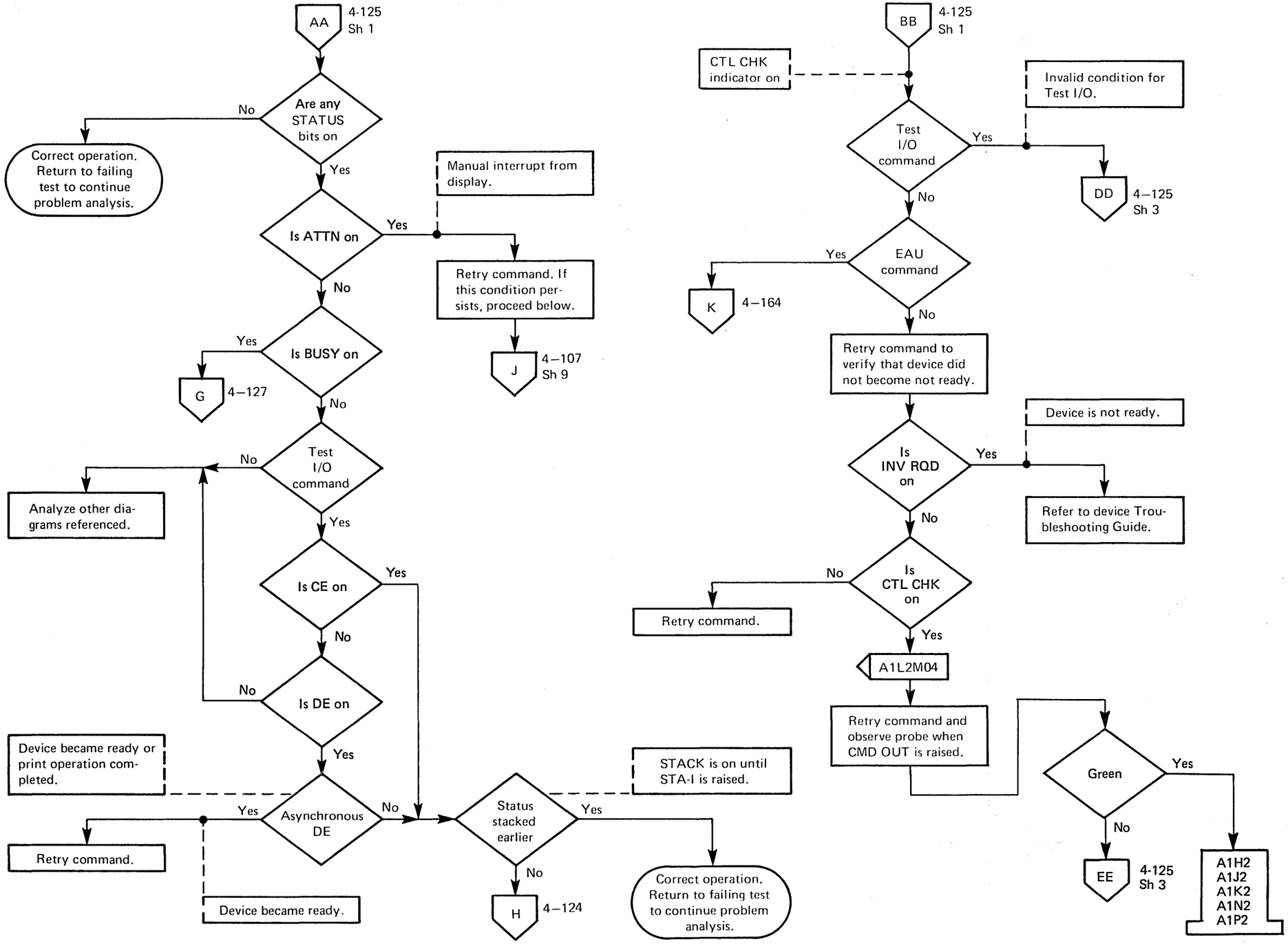


Diagram 4-125. Unexpected Status or Sense during Initial Selection (All Commands) (Sheet 2 of 5)

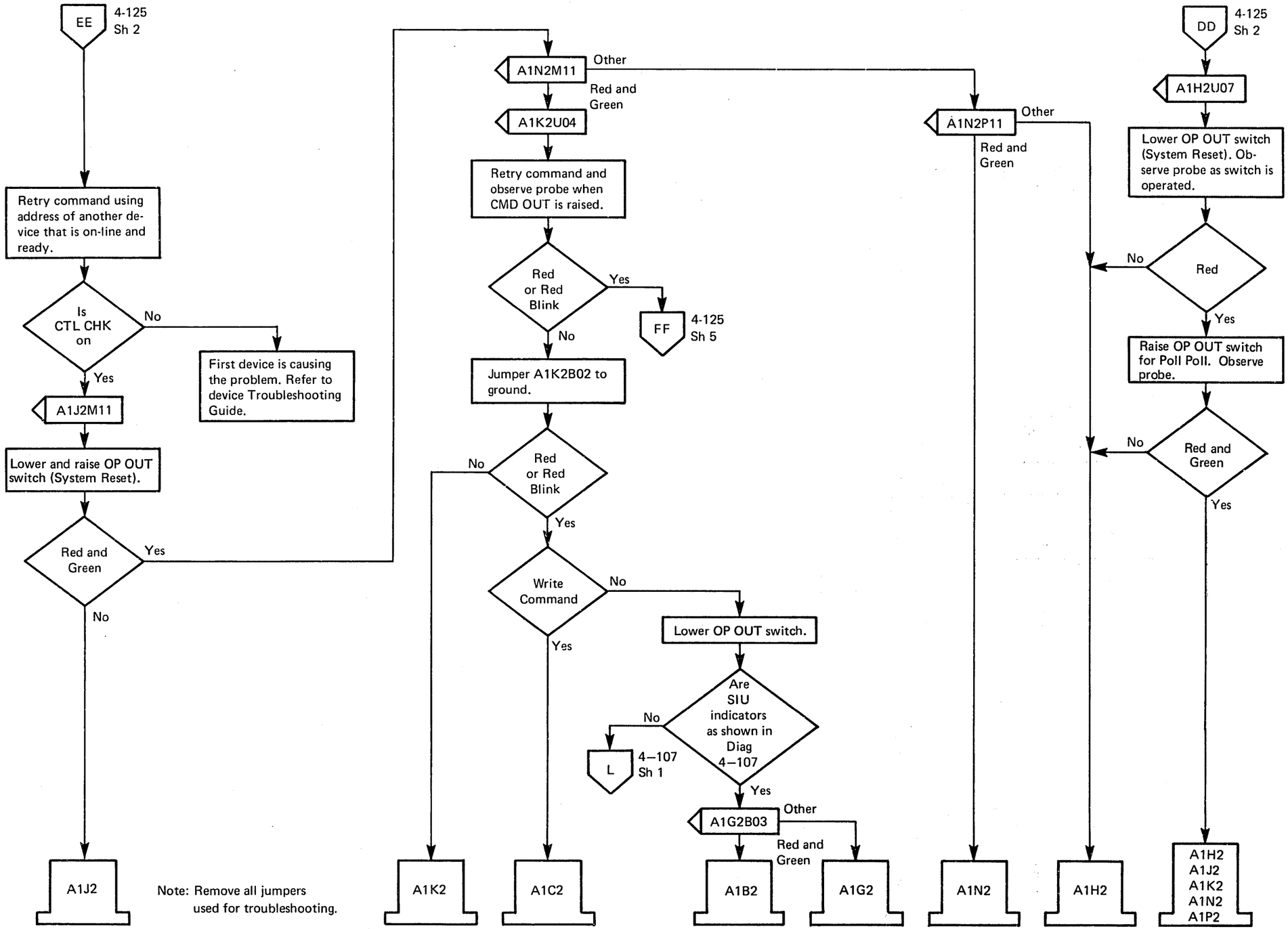


Diagram 4-125. Unexpected Status or Sense during Initial Selection (All Commands) (Sheet 3 of 5)

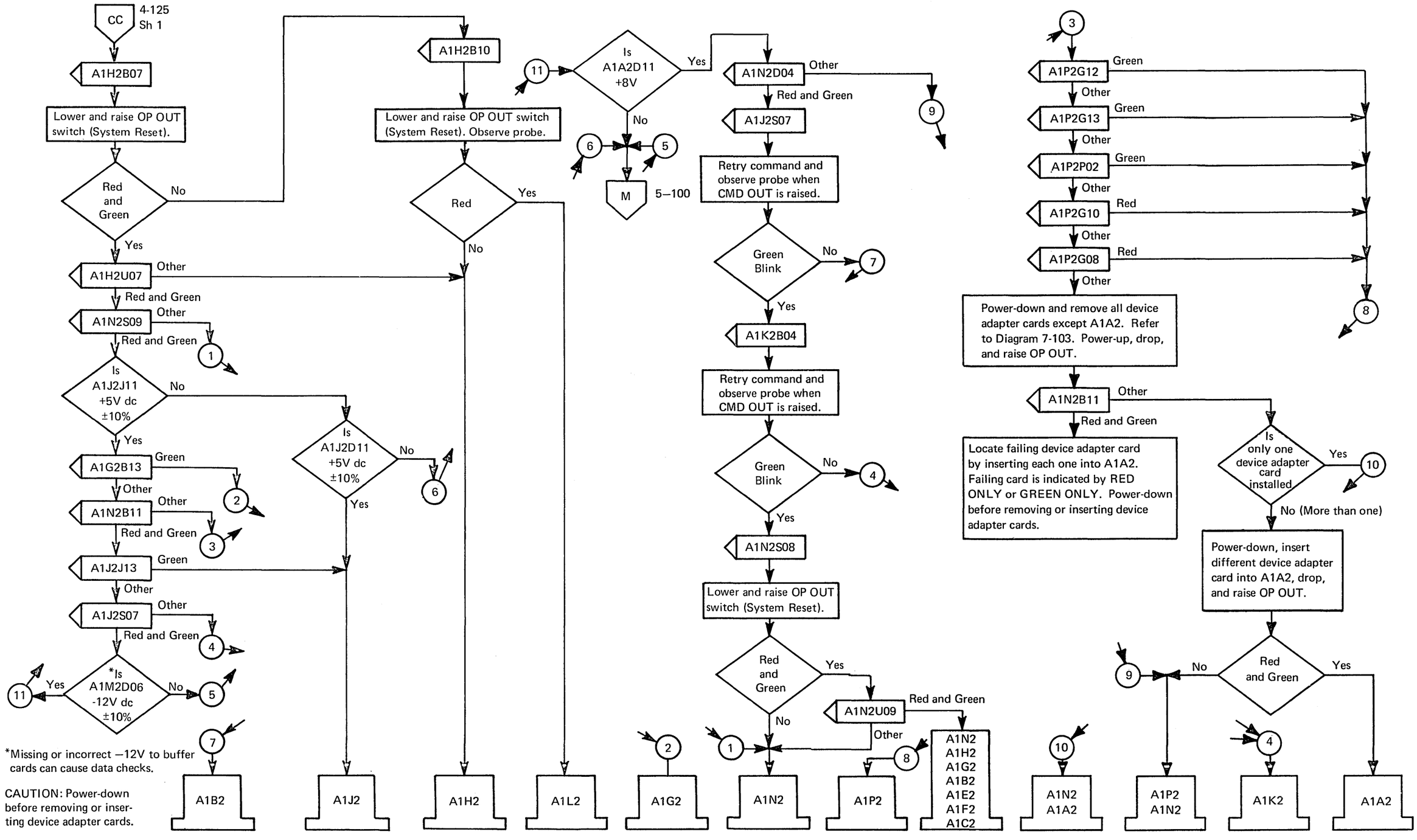


Diagram 4-125. Unexpected Status or Sense during Initial Selection (All Commands) (Sheet 4 of 5)

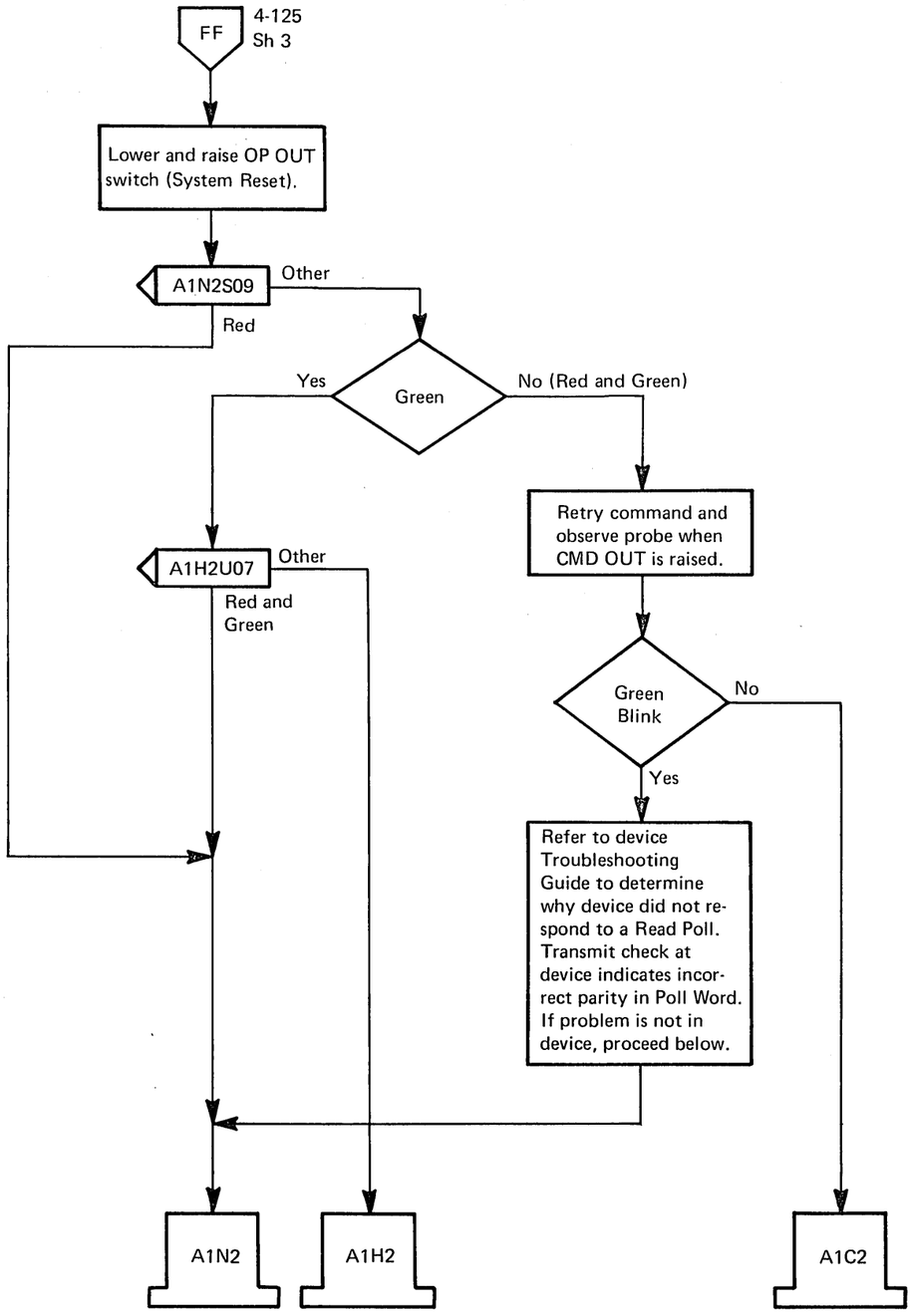


Diagram 4-125. Unexpected Status or Sense during Initial Selection (All Commands) (Sheet 5 of 5)

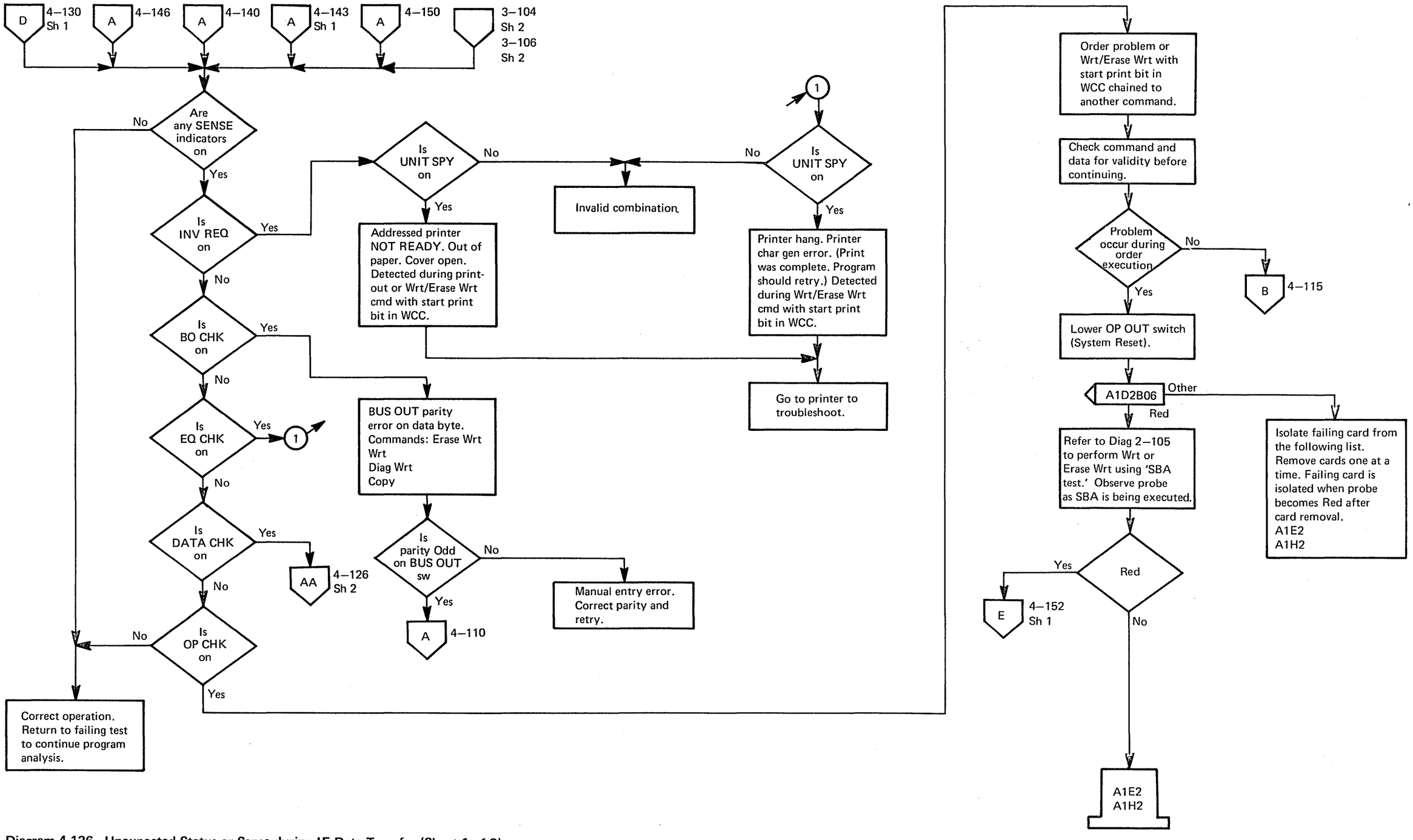


Diagram 4-126. Unexpected Status or Sense during IF Data Transfer (Sheet 1 of 2)

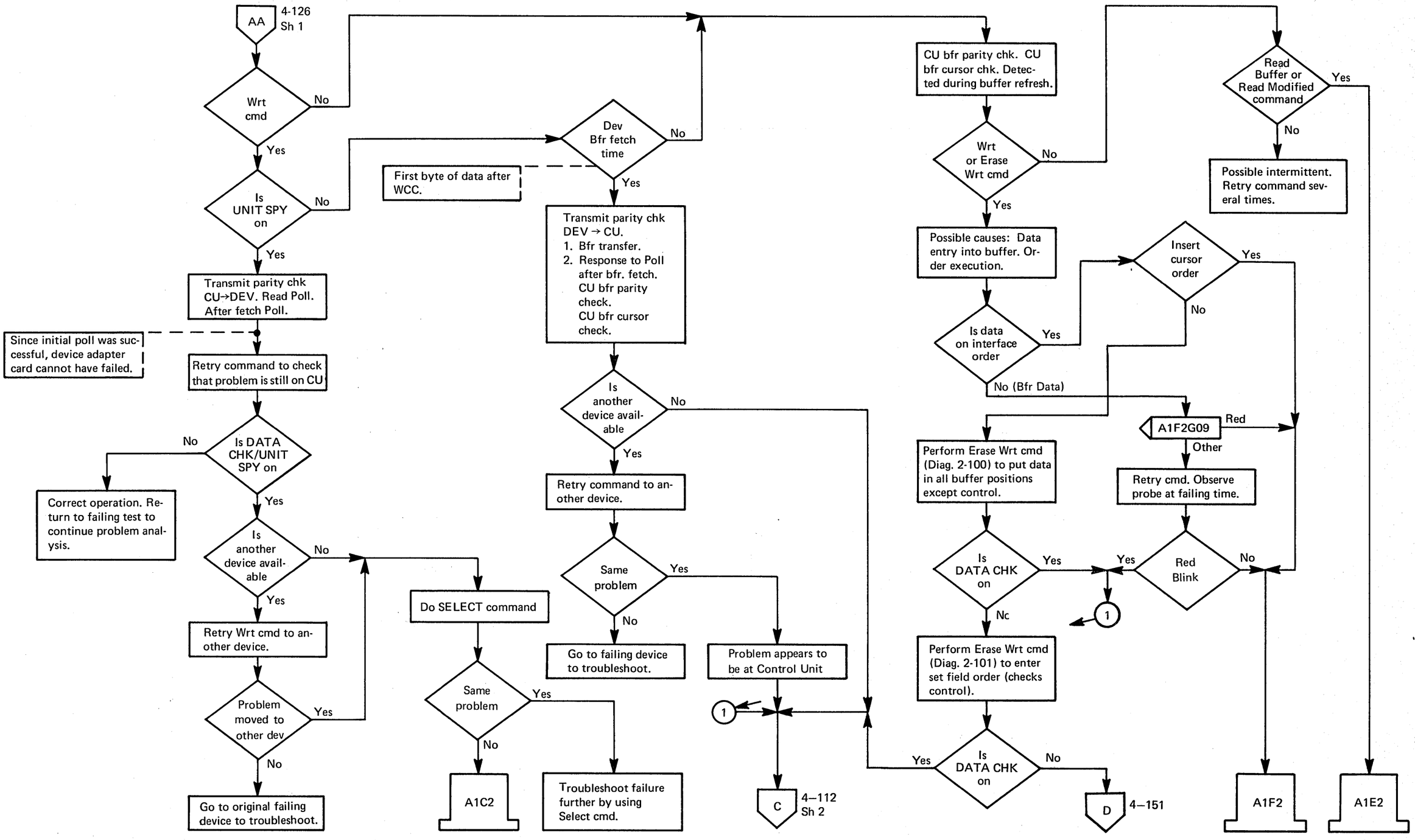


Diagram 4-126. Unexpected Status or Sense during IF Data Transfer (Sheet 2 of 2)

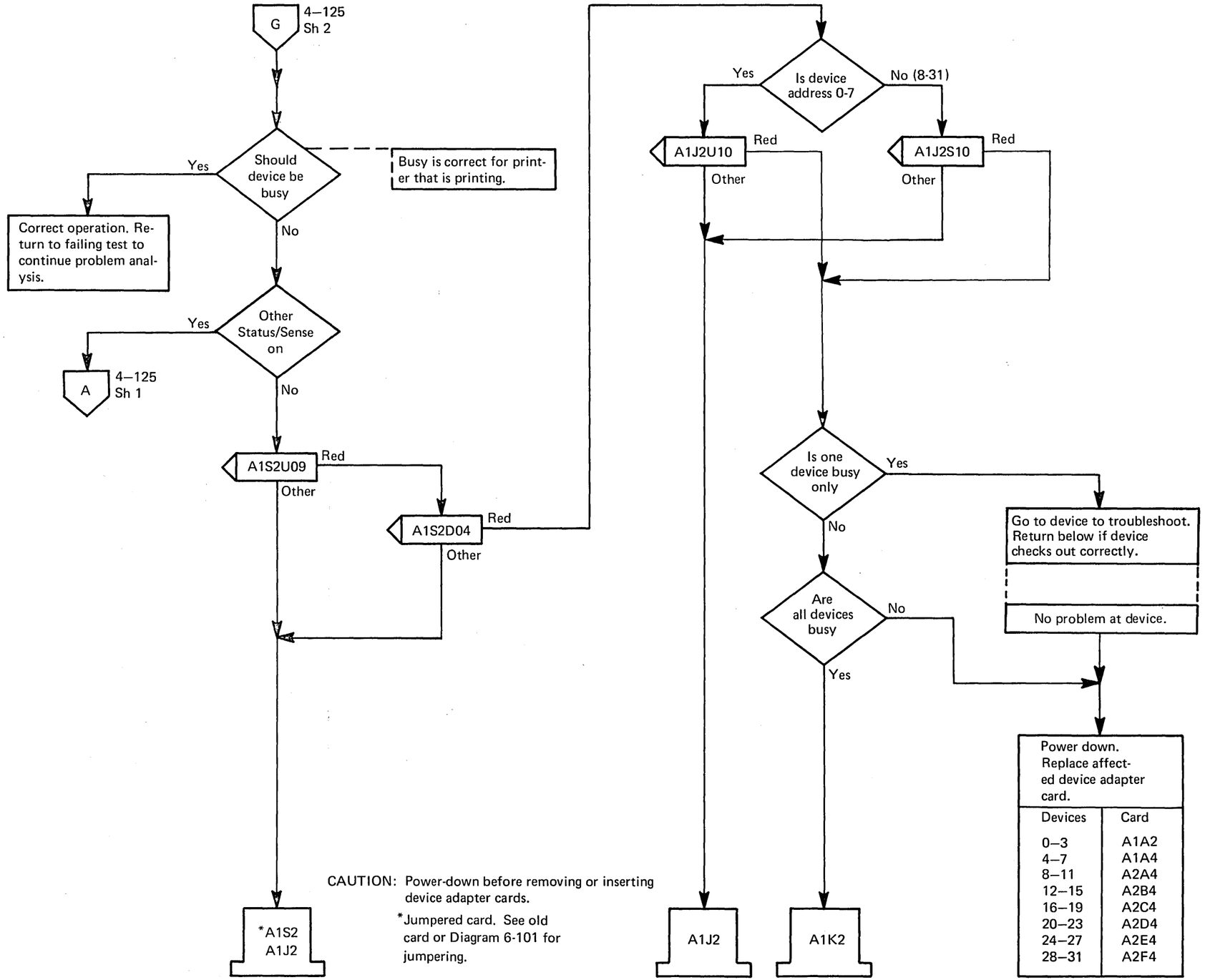
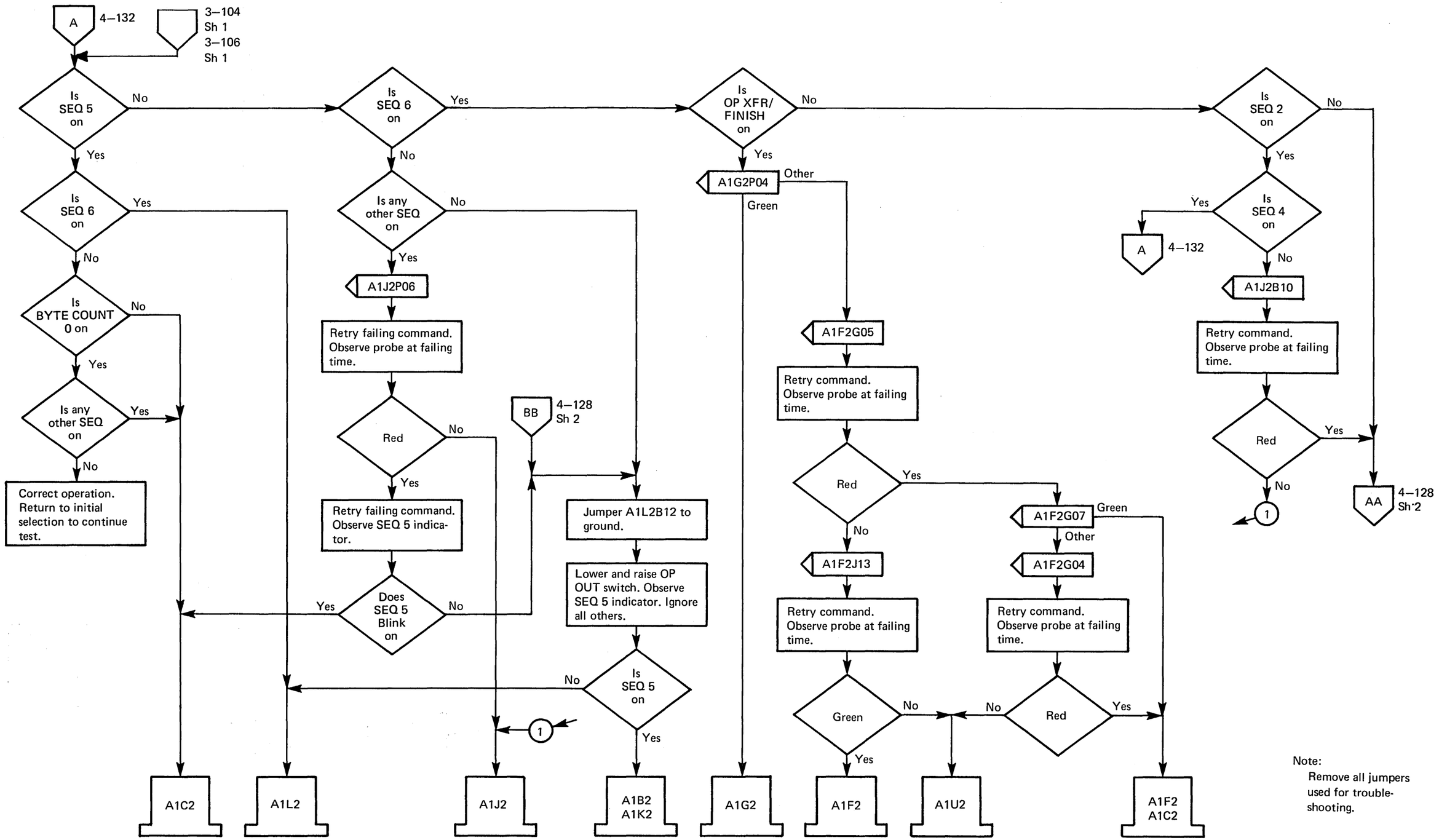
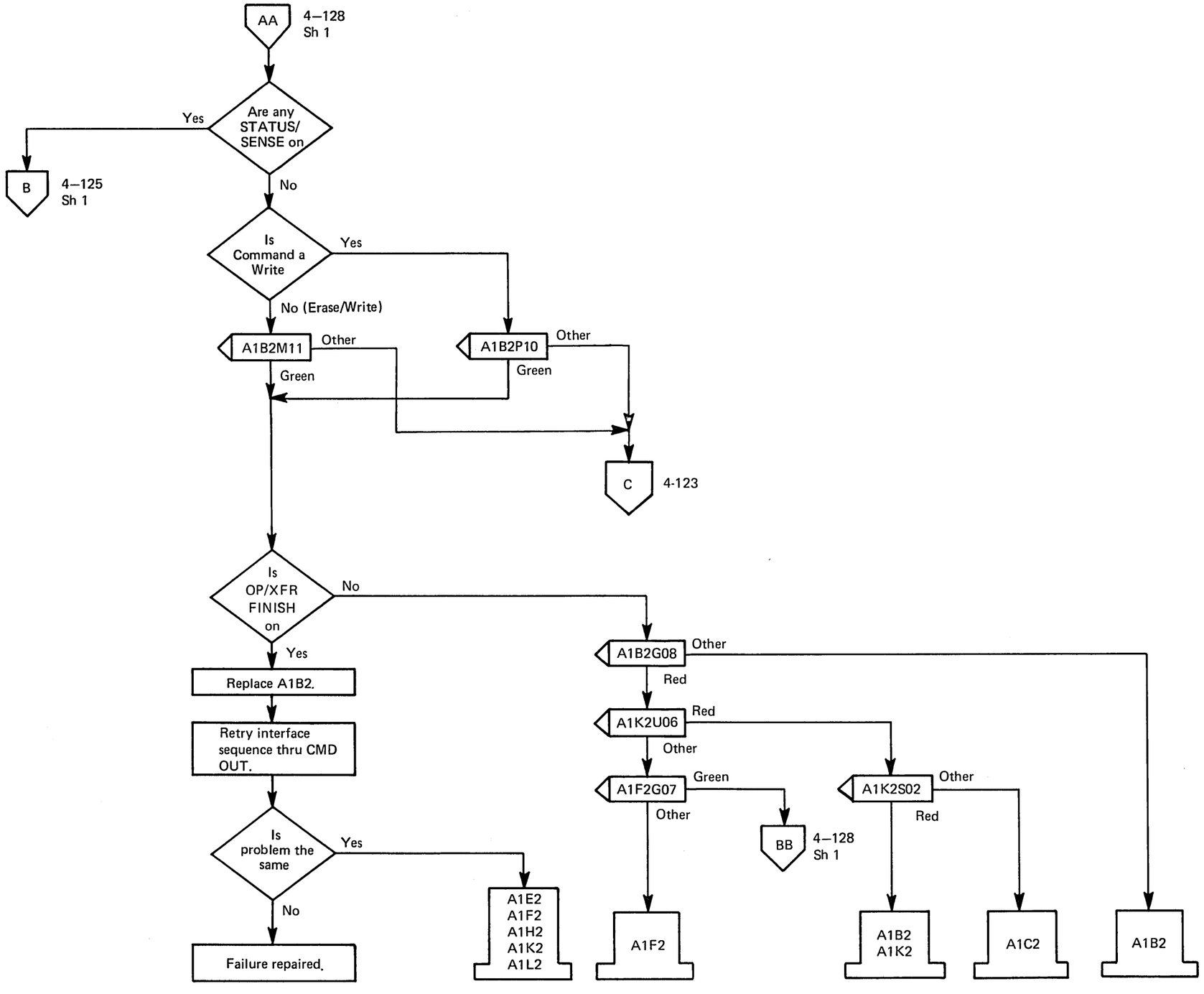


Diagram 4-127. Device Busy during Initial Selection



Note:
Remove all jumpers used for trouble-shooting.

Diagram 4-128. Sequence 5 or Byte Count 0 Failure (Sheet 1 of 2)



Note: Remove all jumpers used for troubleshooting.

Diagram 4-128. Sequence 5 or Byte Count 0 Failure (Sheet 2 of 2)

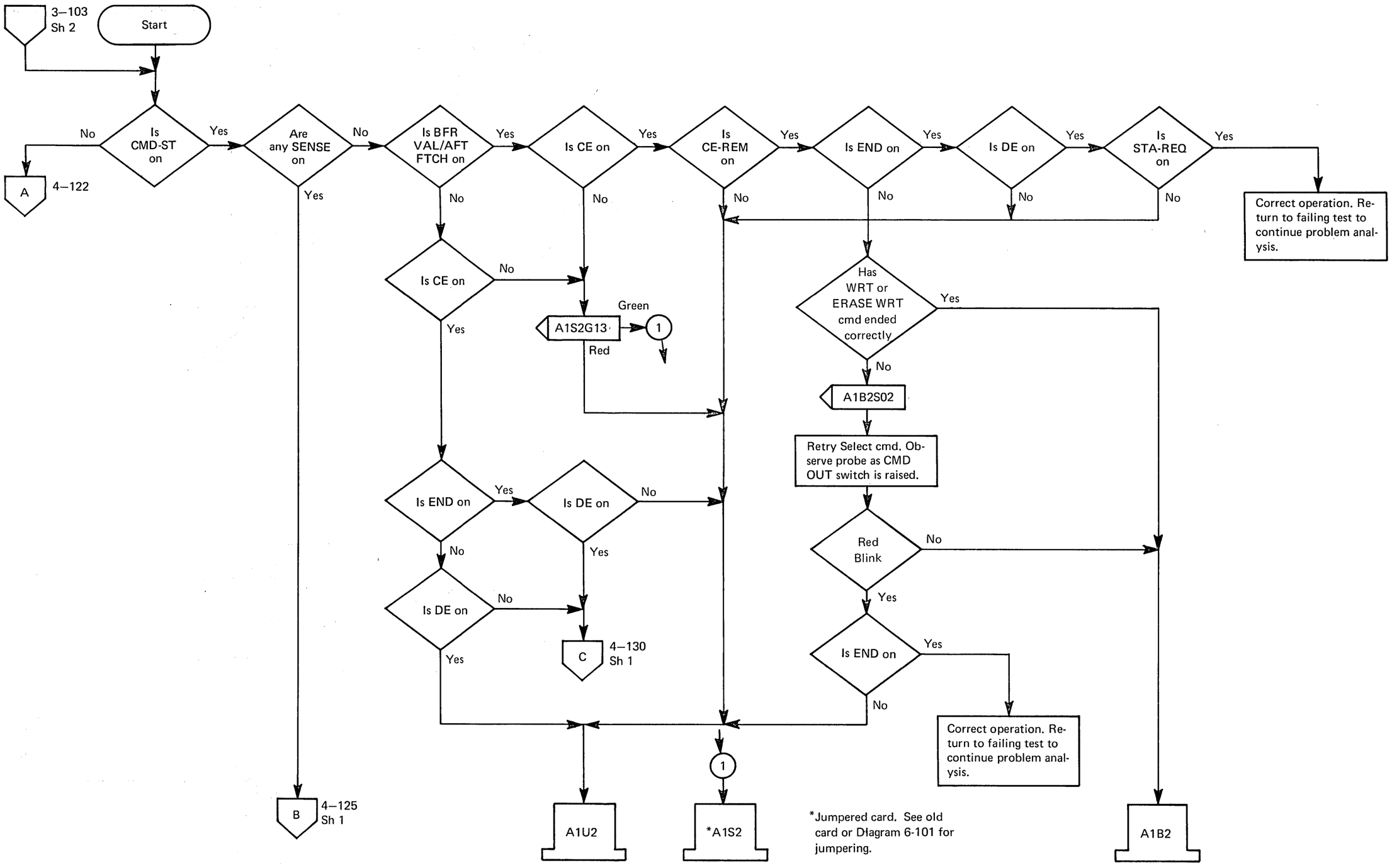


Diagram 4-129. Select Command Failure on Rise of Command Out

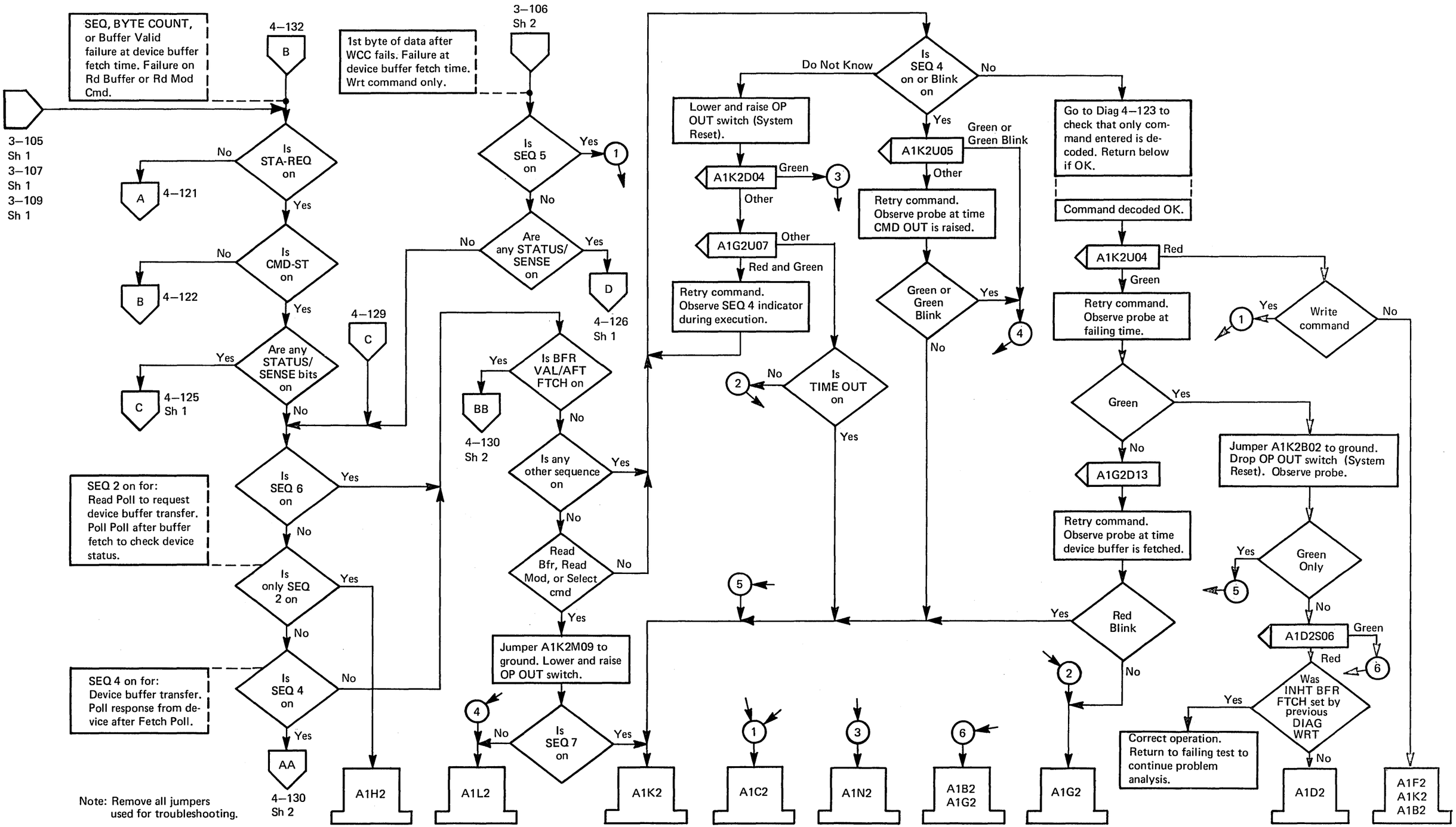
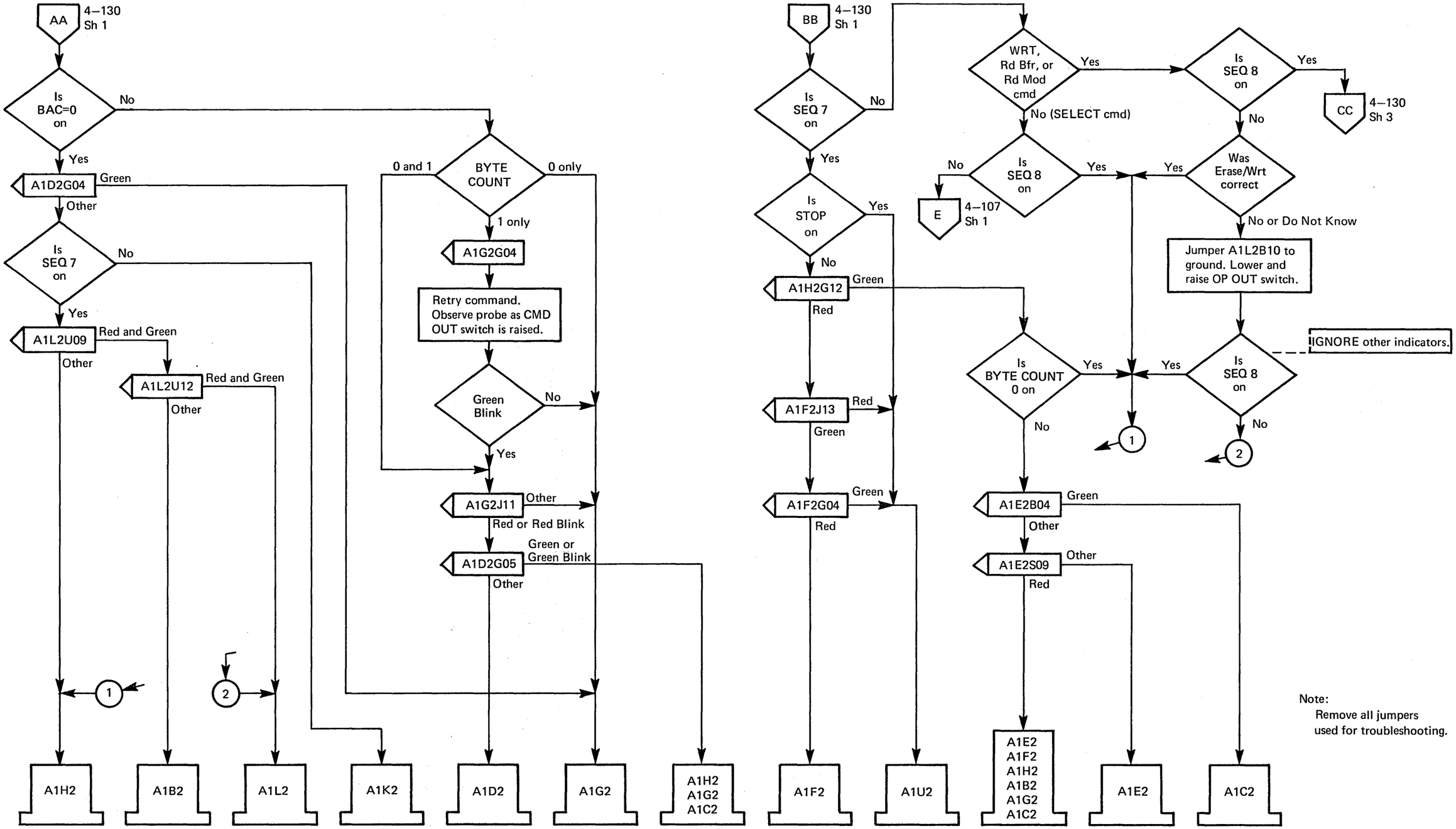
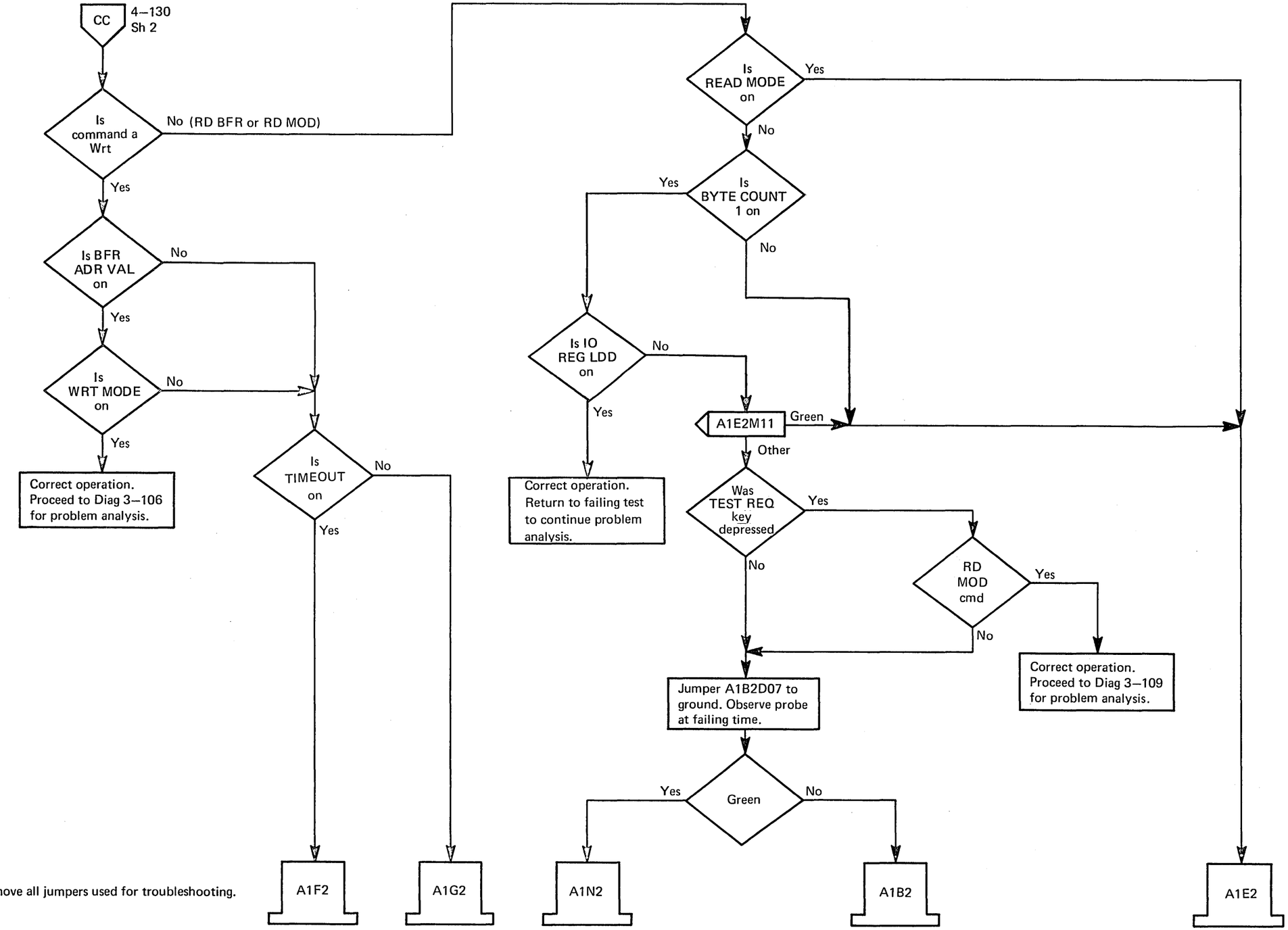


Diagram 4-130. Device Buffer Fetch Failure (Sheet 1 of 3)



Note:
Remove all jumpers used for troubleshooting.

Diagram 4-130. Device Buffer Fetch Failure (Sheet 2 of 3)



Note: Remove all jumpers used for troubleshooting.

Diagram 4-130. Device Buffer Fetch Failure (Sheet 3 of 3)

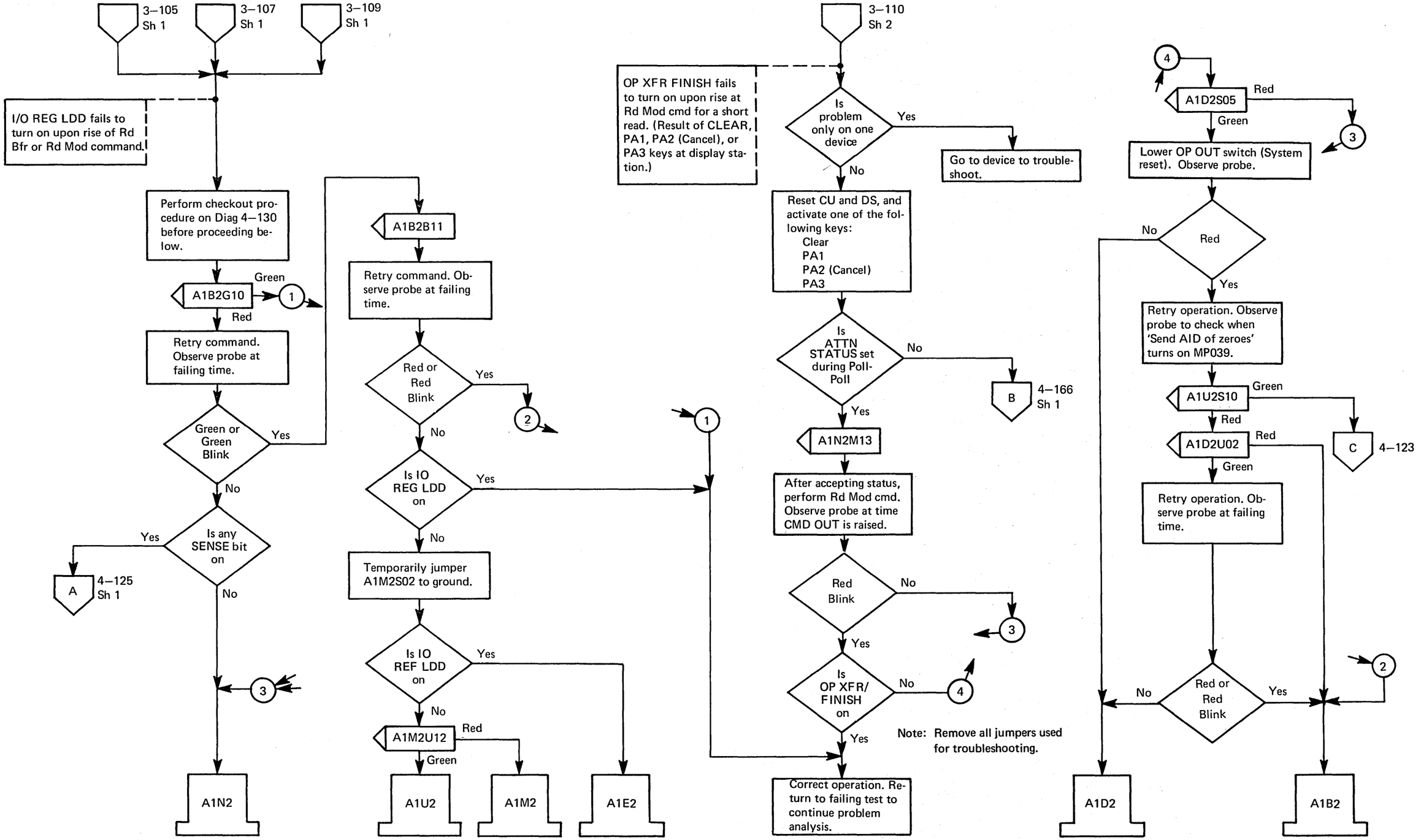


Diagram 4-131. I/O Reg LDD or OP1/XFR FINISH Fails to Turn On

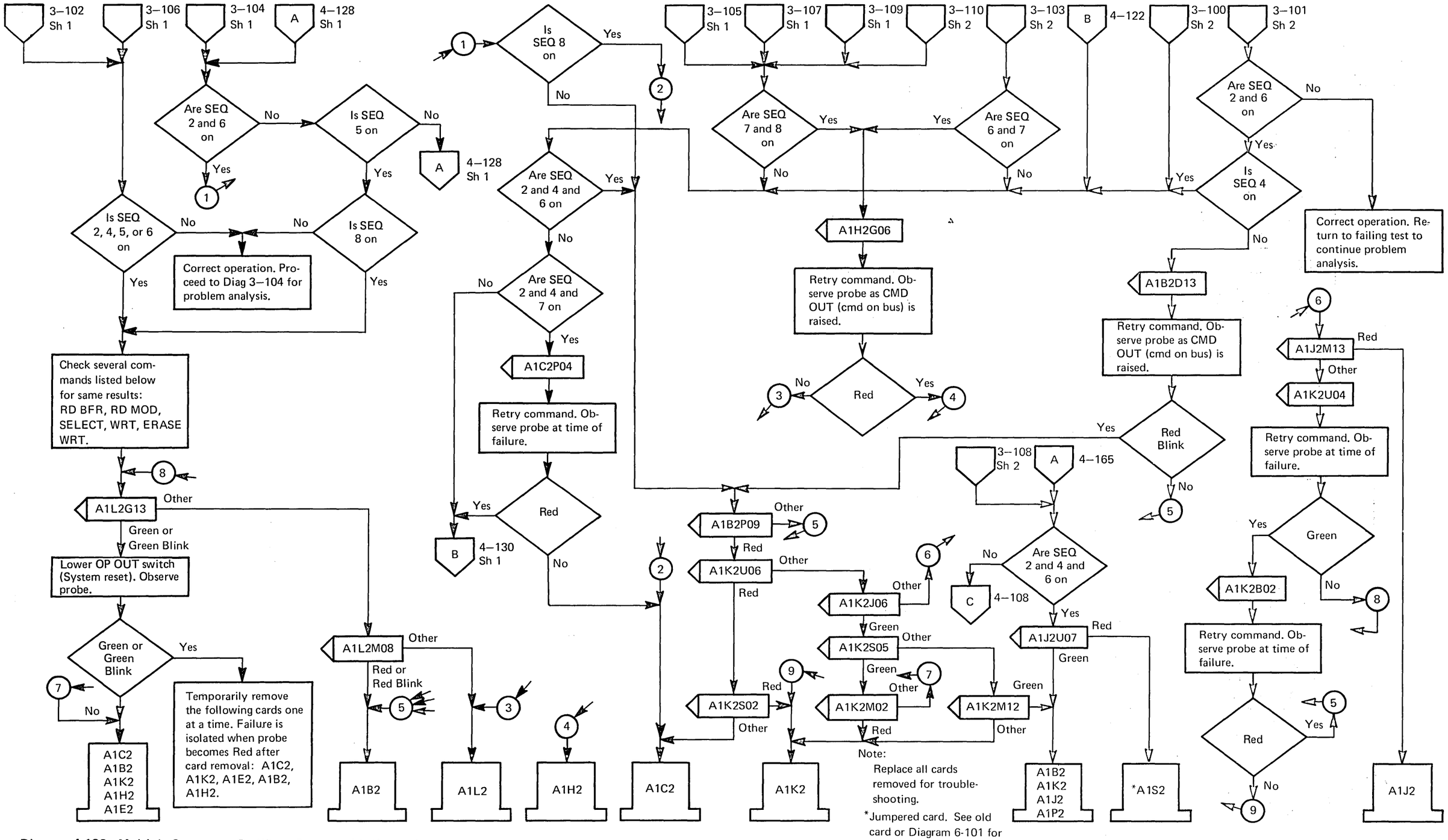


Diagram 4-132. Multiple Sequences On When Command Is Entered

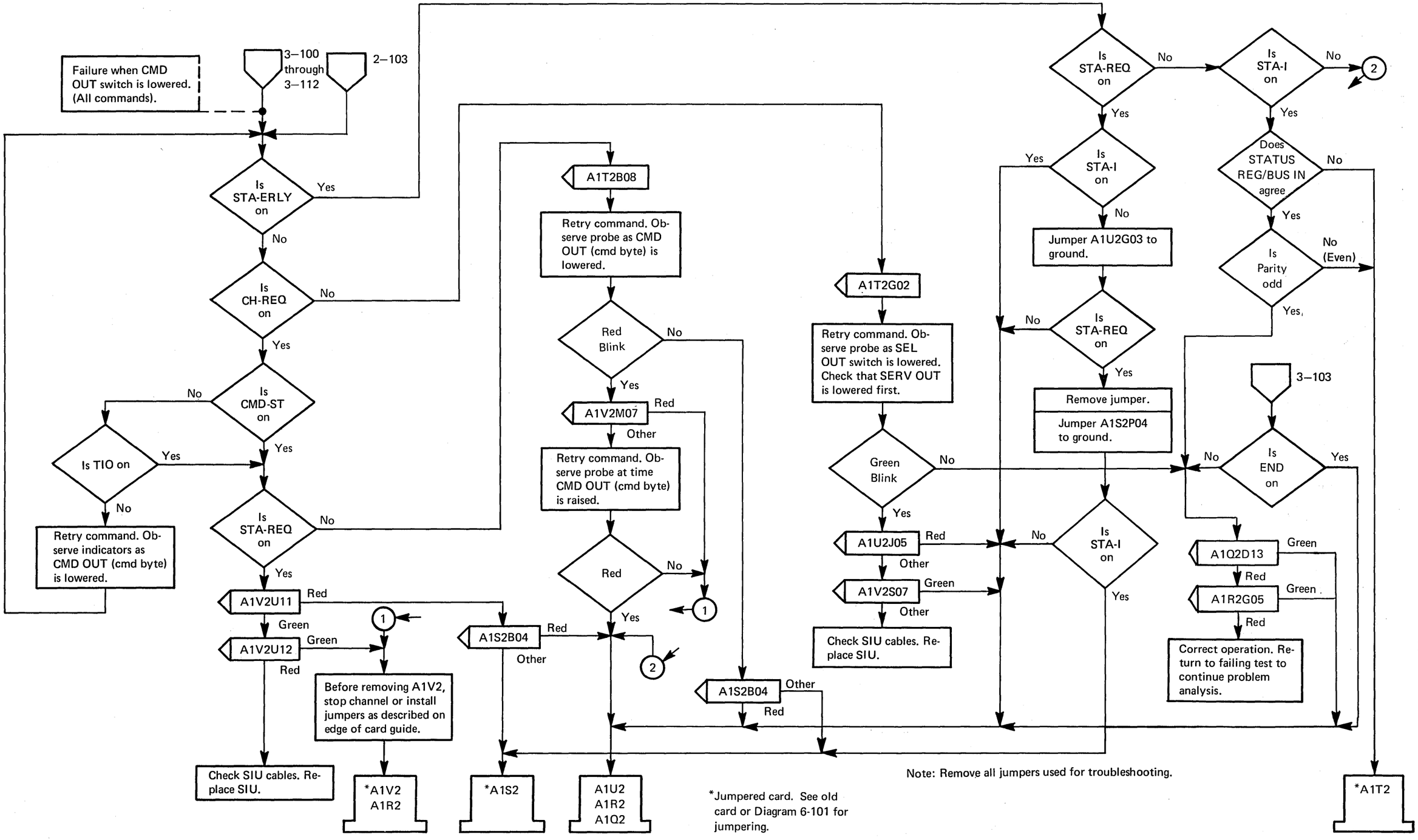
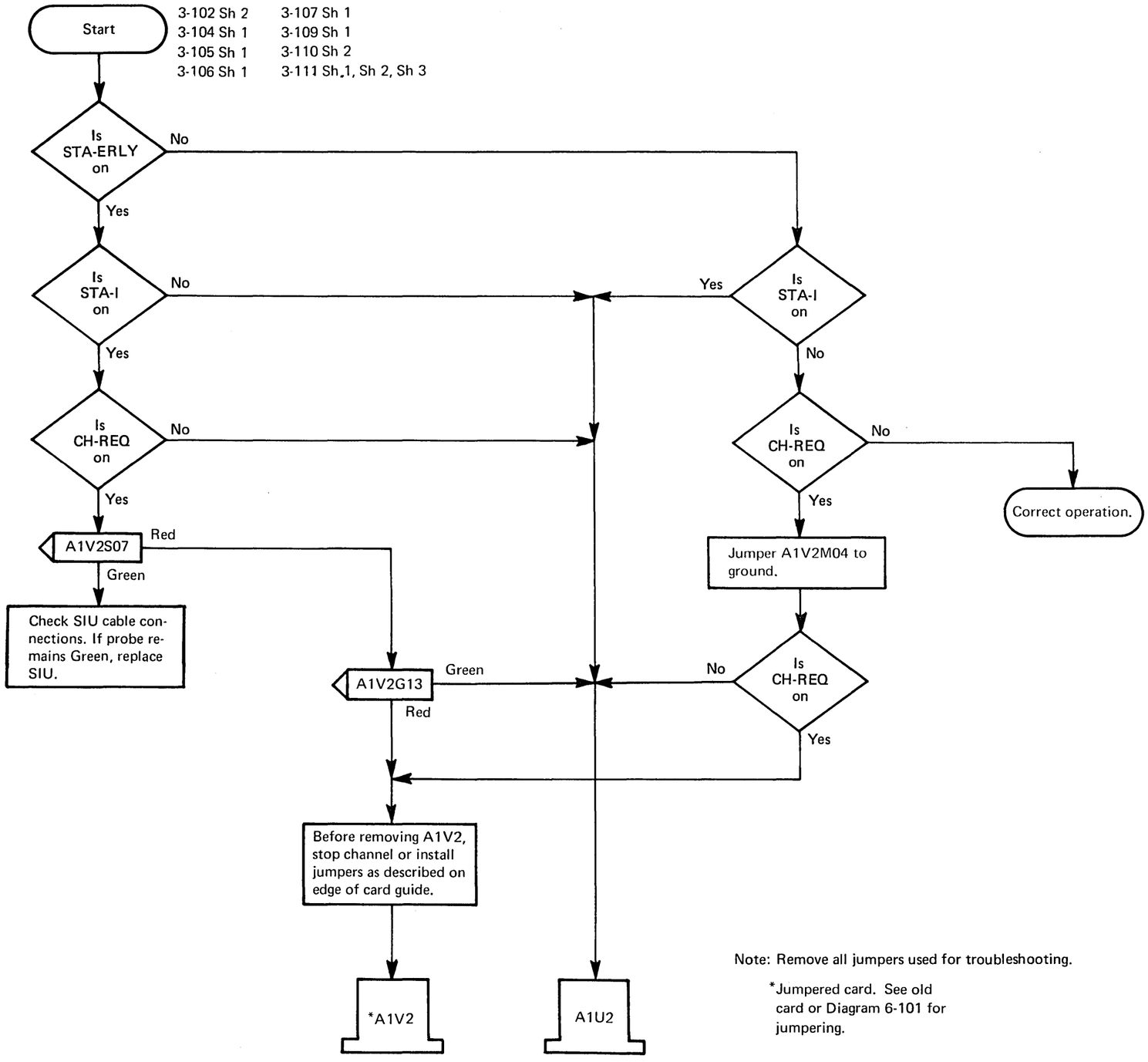


Diagram 4-133. Status-In or Status Byte Failure



Note: Remove all jumpers used for troubleshooting.

*Jumpered card. See old card or Diagram 6-101 for jumpering.

Diagram 4-134. Channel Request, Status-In or Status-In Early Fails to Go Off

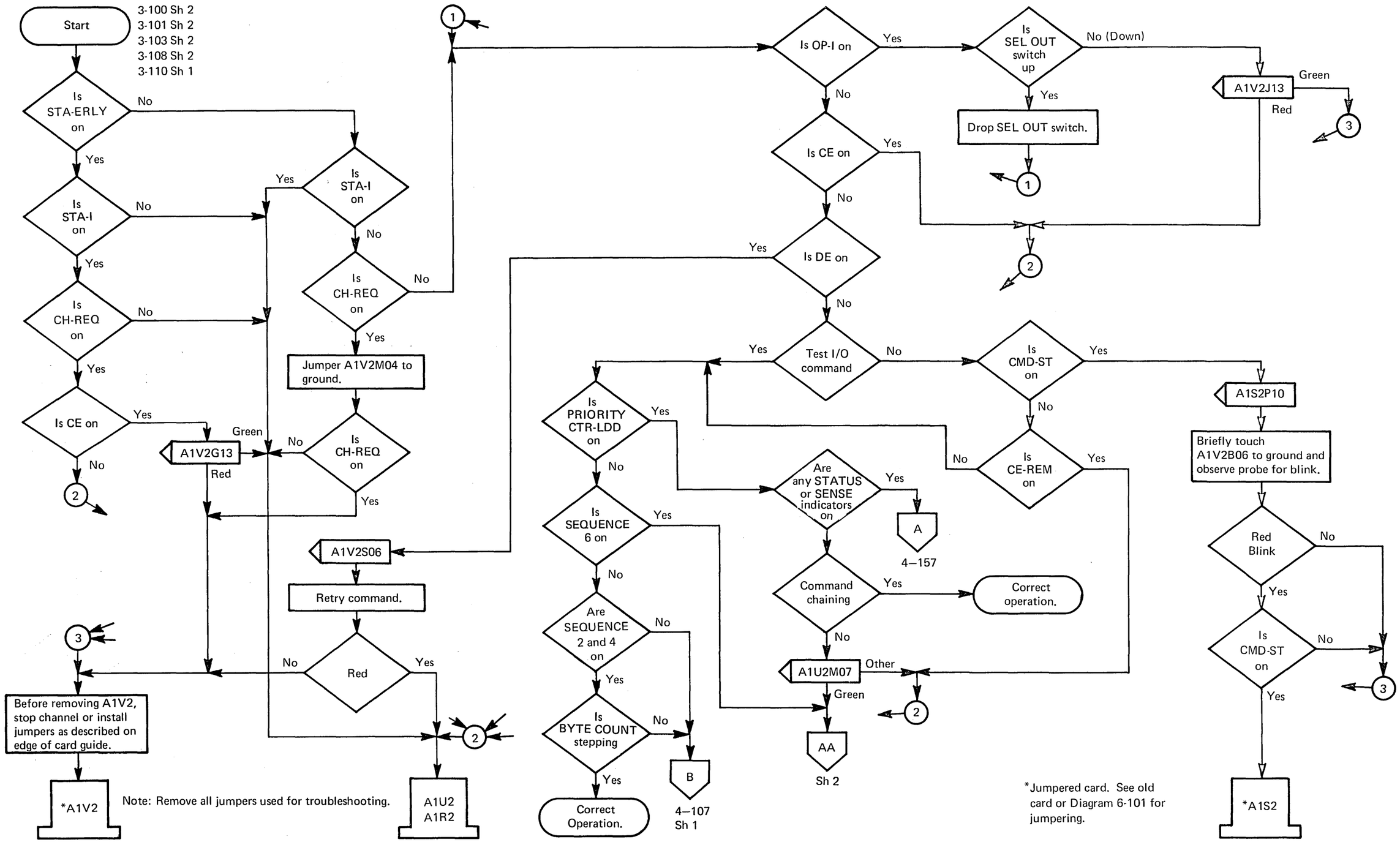
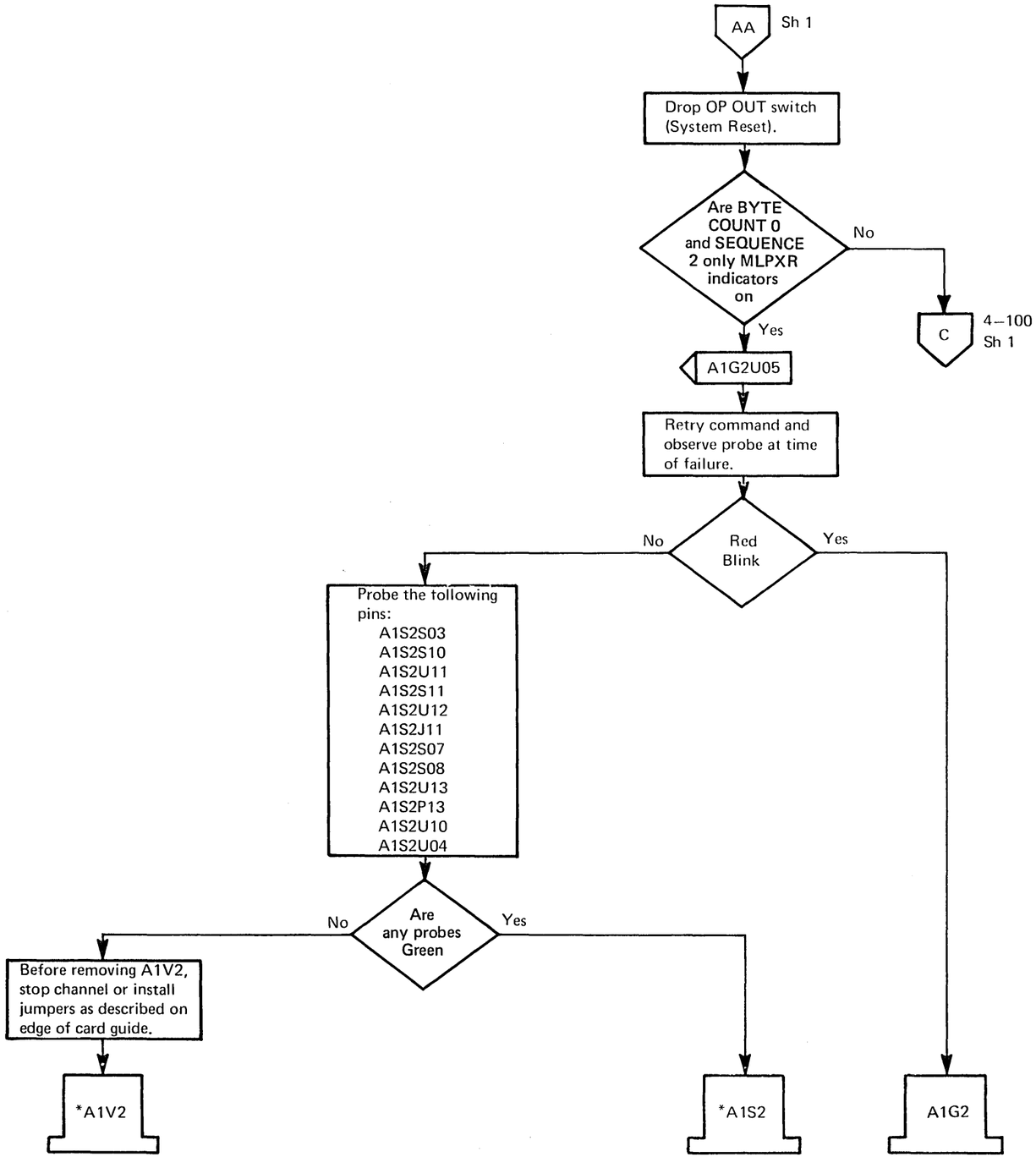


Diagram 4-135. Command Immediate Ending Failure (Select, Test I/O, No Op, or EAU) (Sheet 1 of 2)



Note: Remove all jumpers used for troubleshooting.

*Jumpered card. See old card or Diagram 6-101 for jumpering.

Diagram 4-135. Command Immediate Ending Failure (Select, Test I/O, No Op, or EAU) (Sheet 2 of 2)

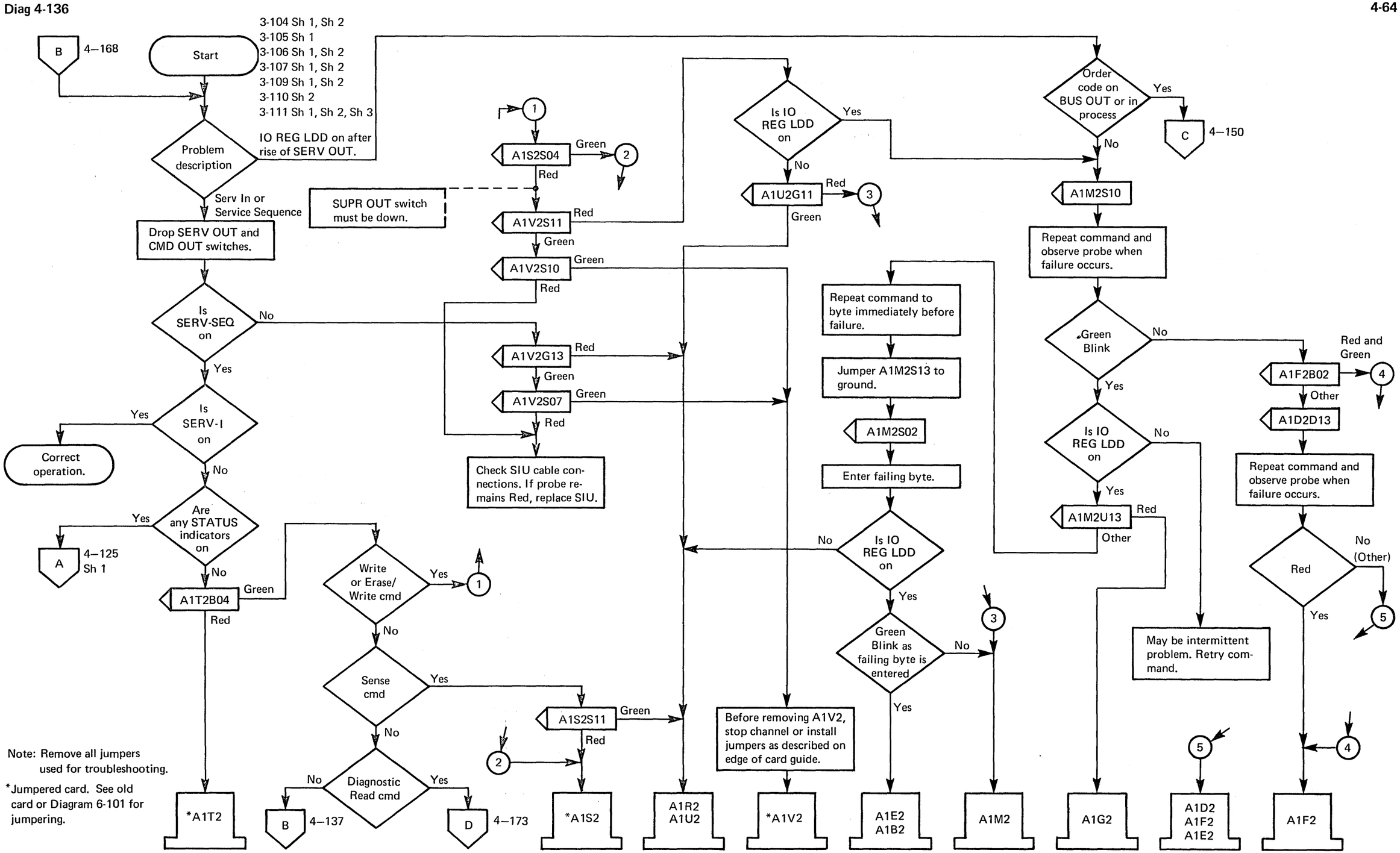


Diagram 4-136. Service Sequence, Service In, or I/O Reg Loaded Failure

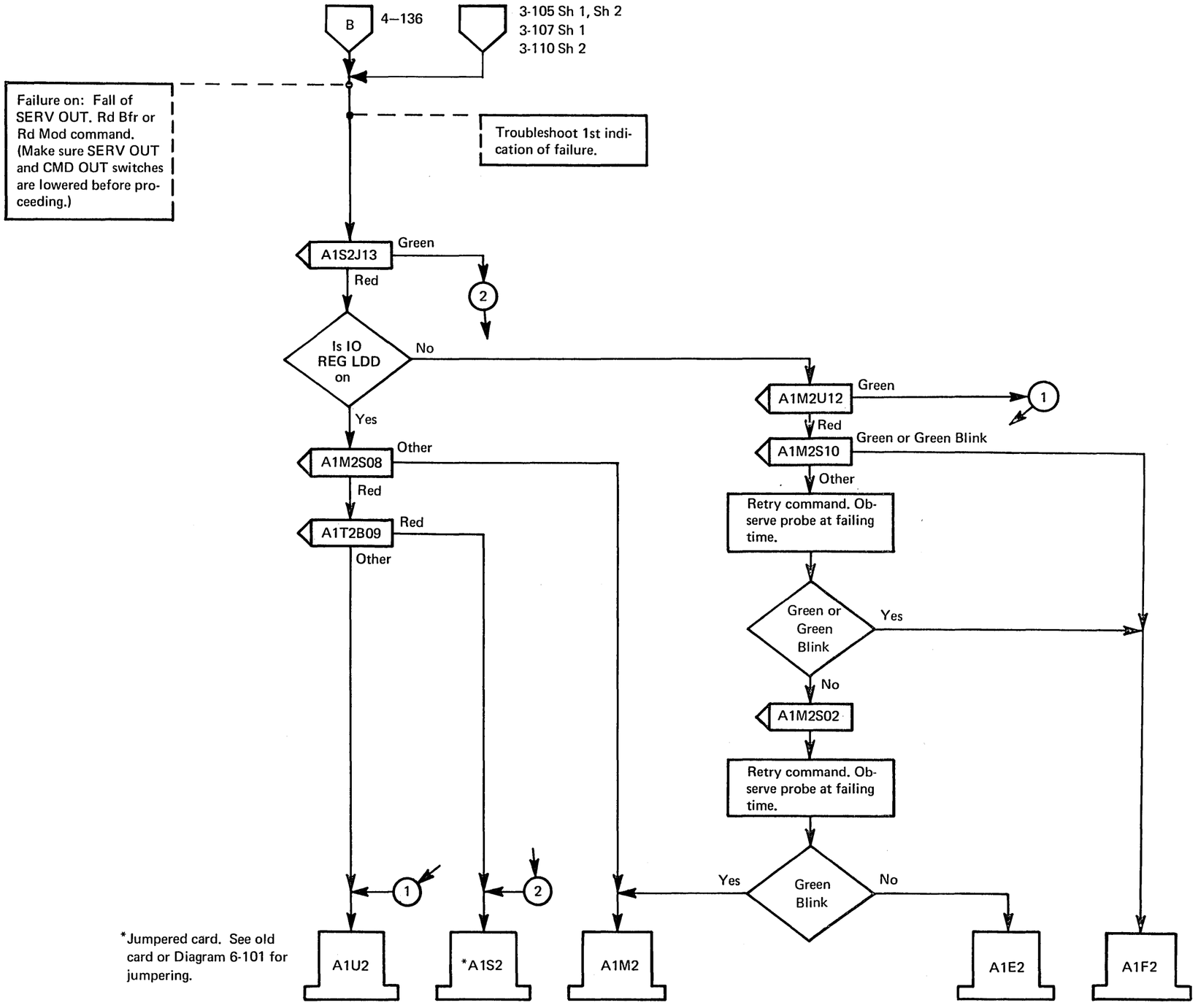


Diagram 4-137. Service-In Failure

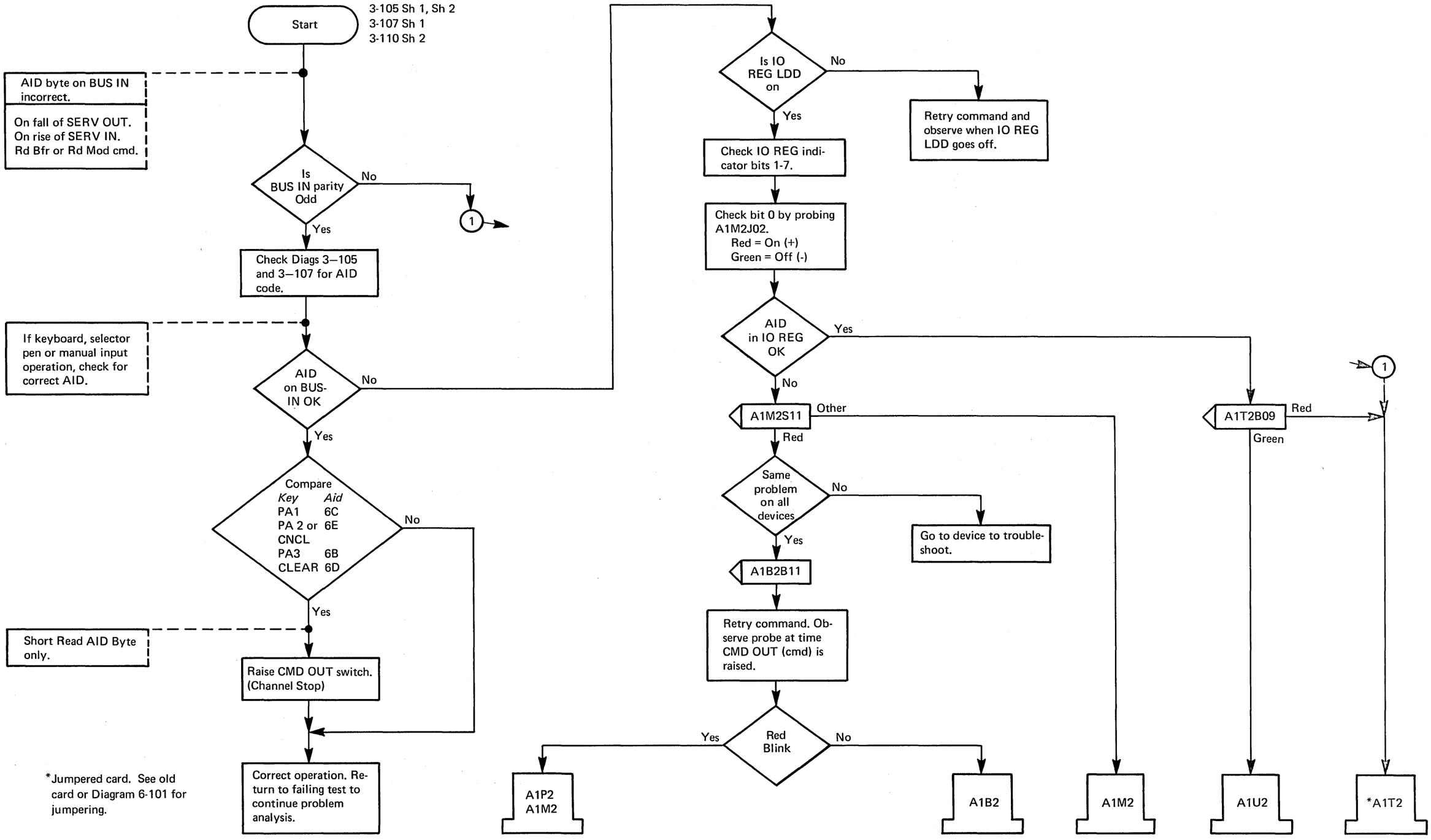


Diagram 4-138. AID Byte Failure

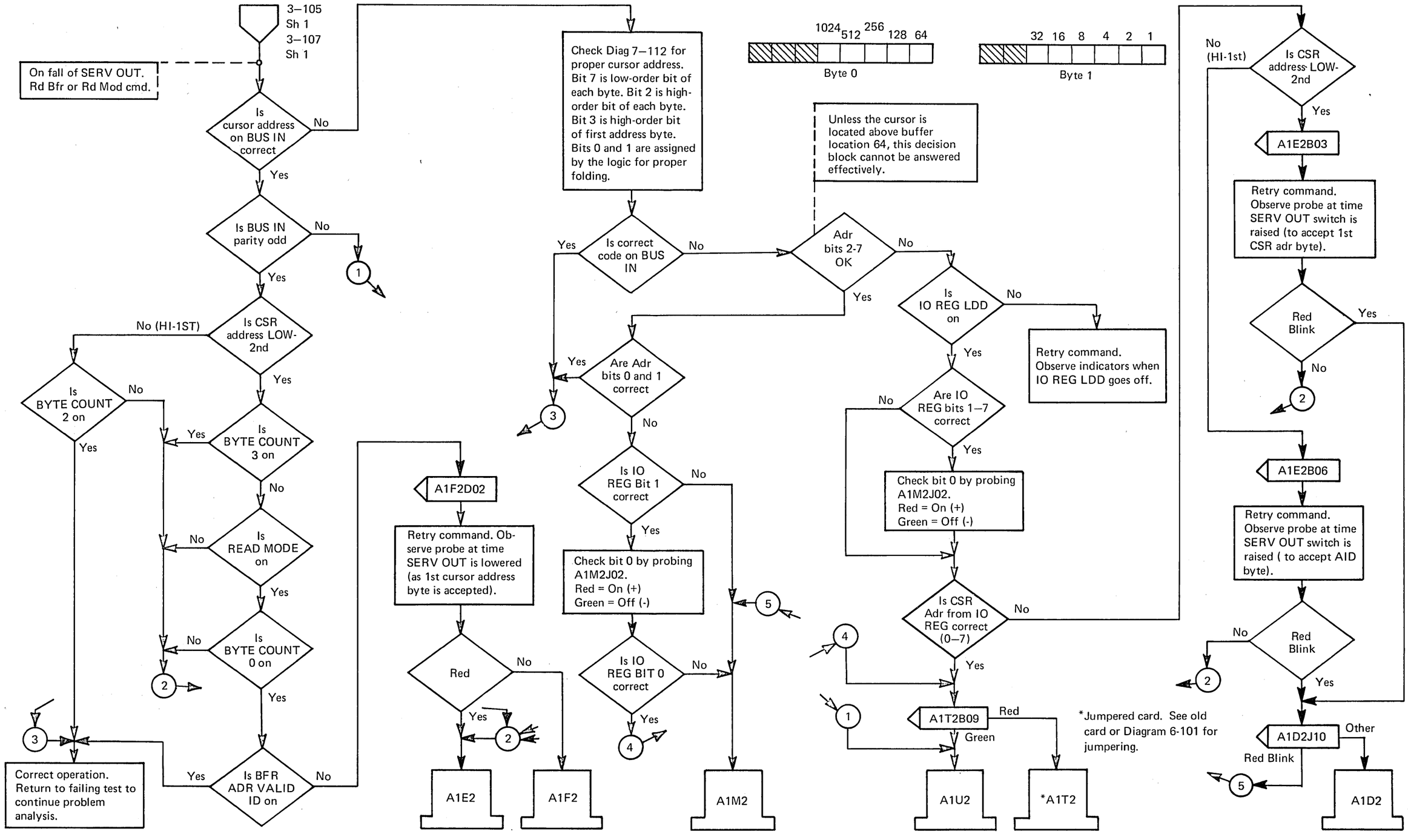


Diagram 4-139. Cursor Address on Bus In, Byte Count, Read Mode or Buffer Address Valid Failure

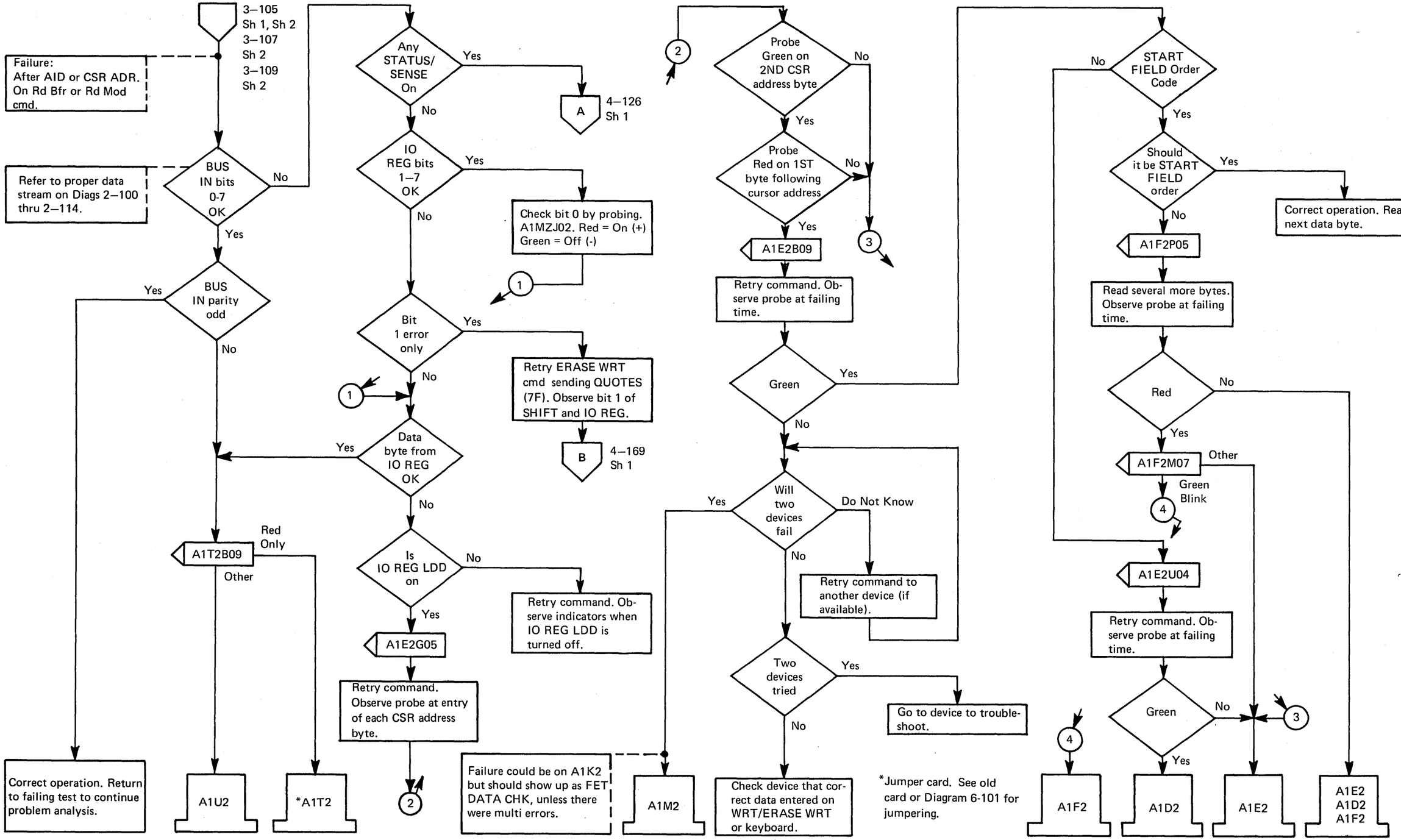
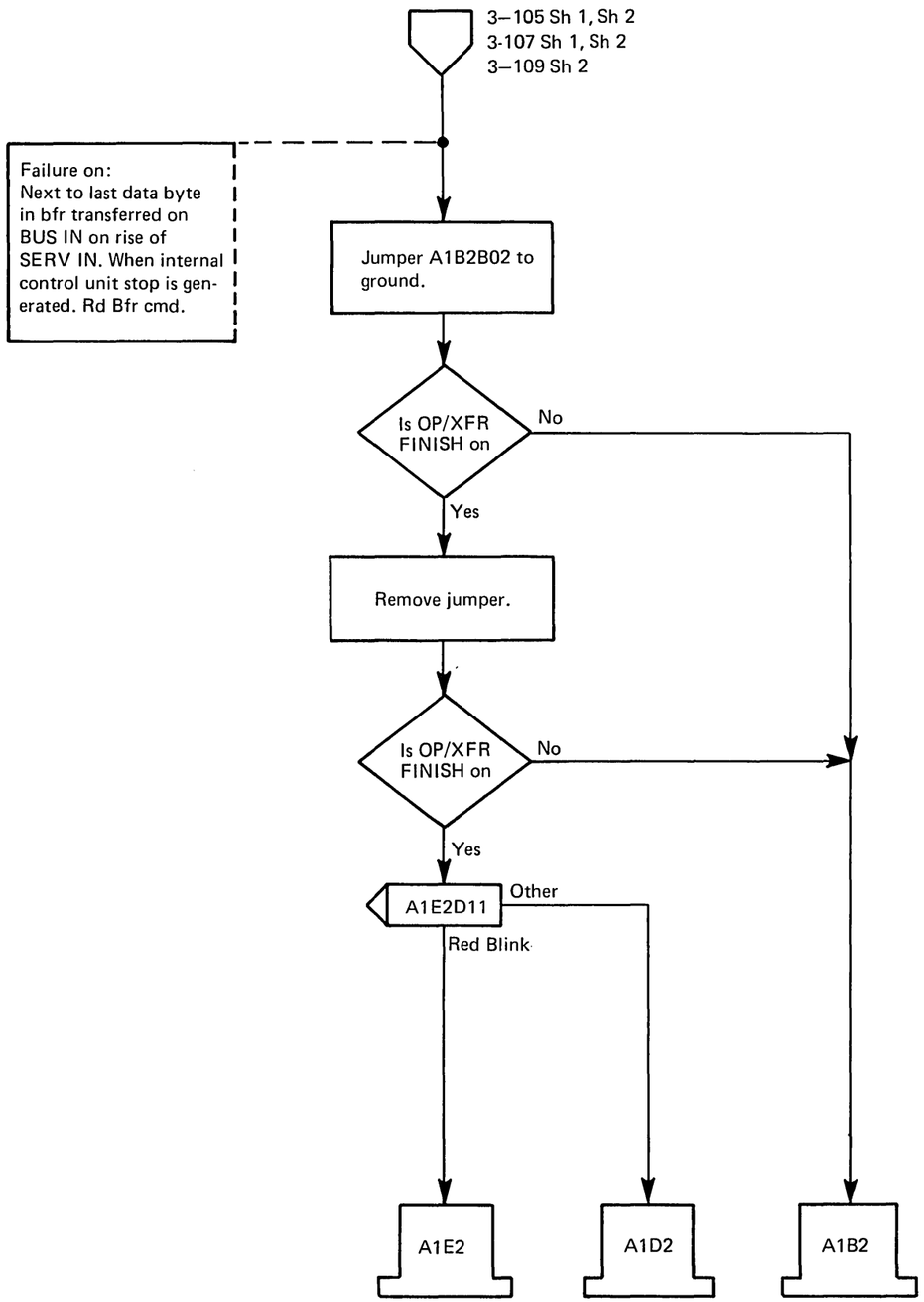


Diagram 4-140. Buffer Data Byte on Bus-In Failure



Note: Remove all jumpers used for troubleshooting.

Diagram 4-141. OP/XFR FINISH Fails to Turn On

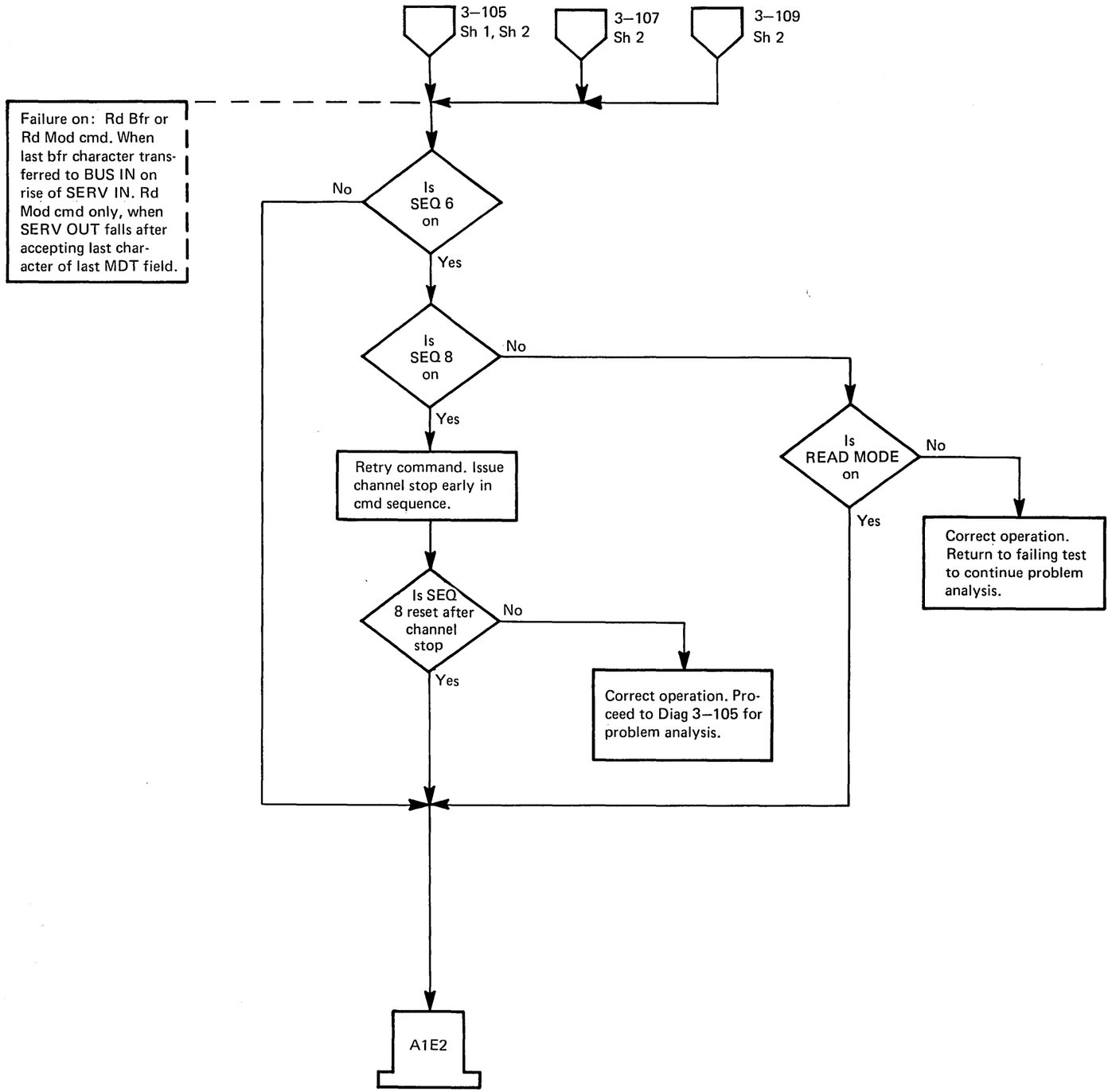


Diagram 4-142. Sequence 6 Fails to Turn On

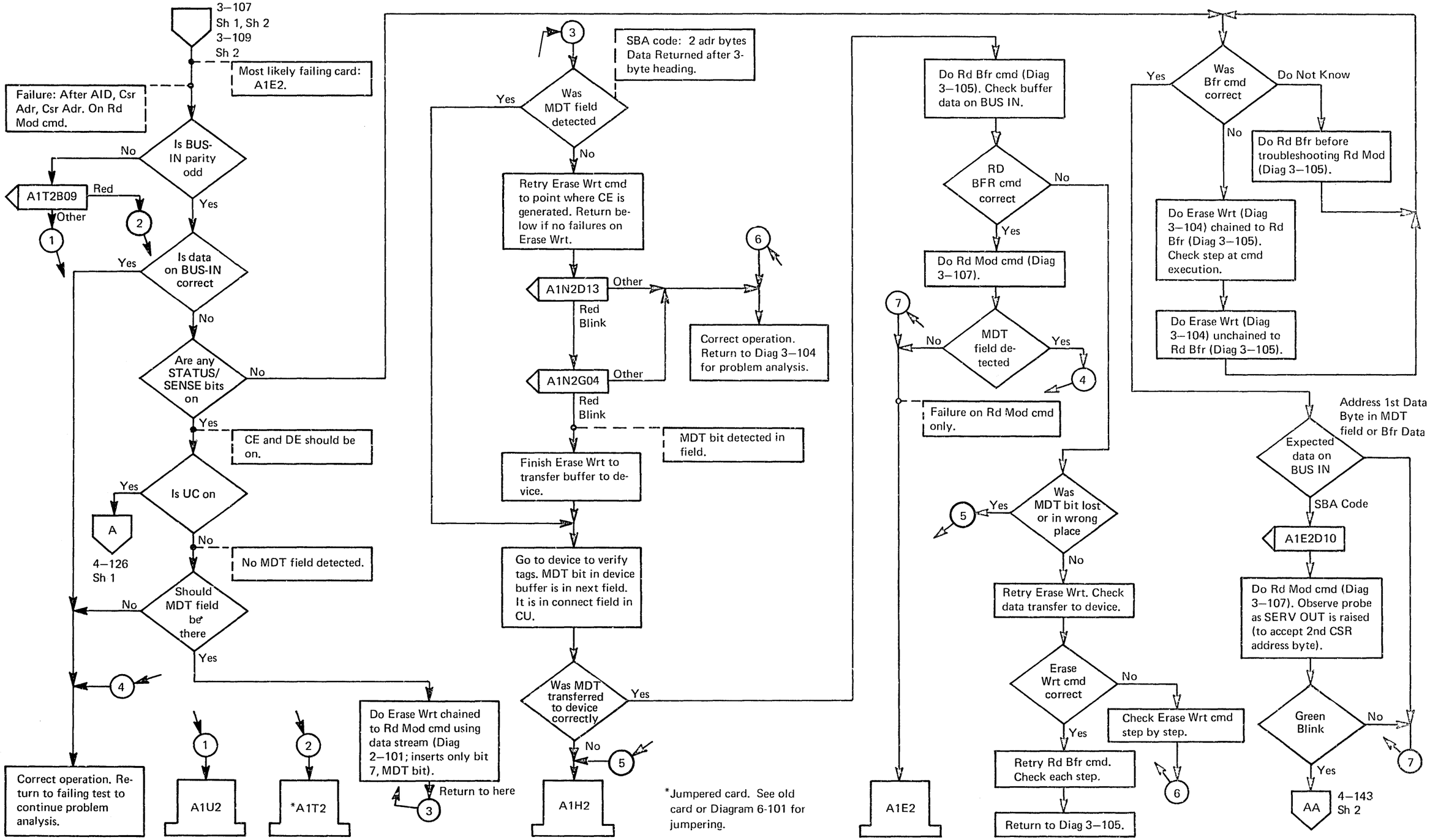
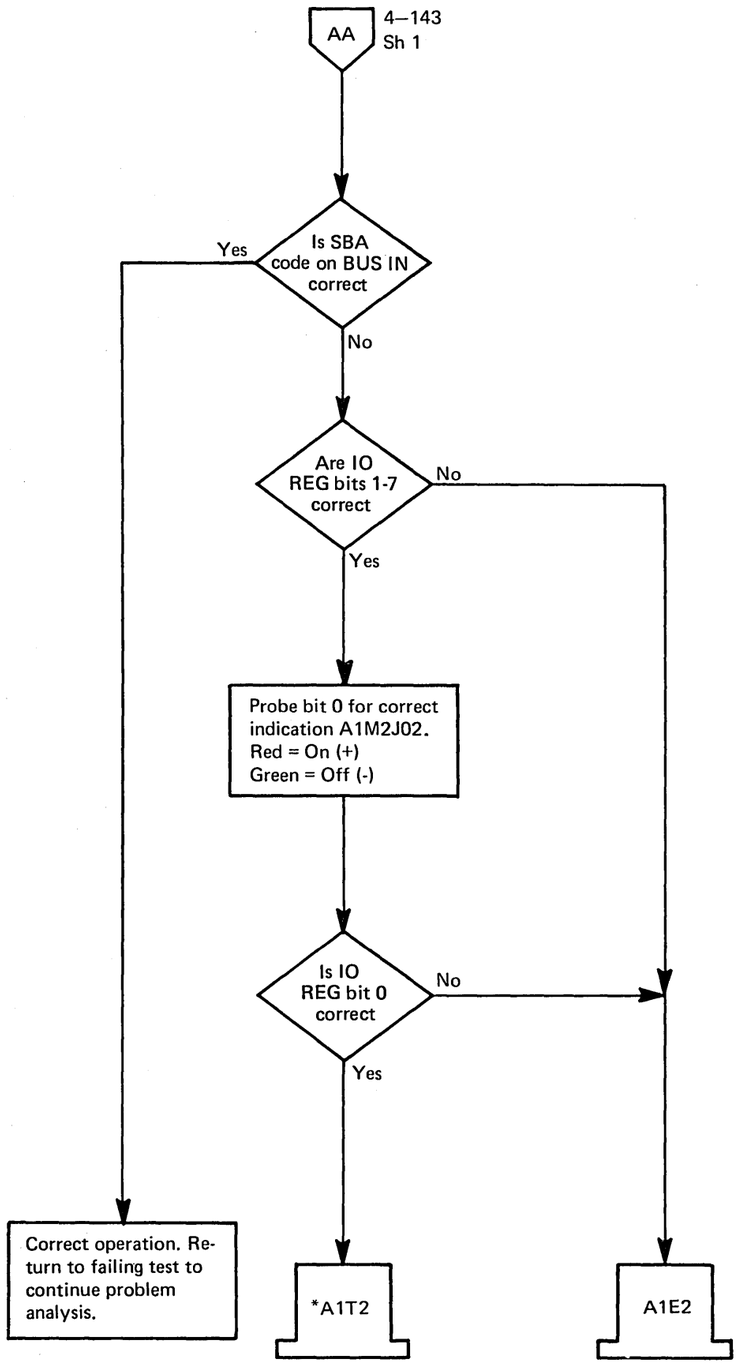


Diagram 4-143. Data on Bus-in Failure (Sheet 1 of 2)



*Jumpered card. See old card or Diagram 6-101 for jumpering.

Diagram 4-143. Data on Bus-In Failure (Sheet 2 of 2)

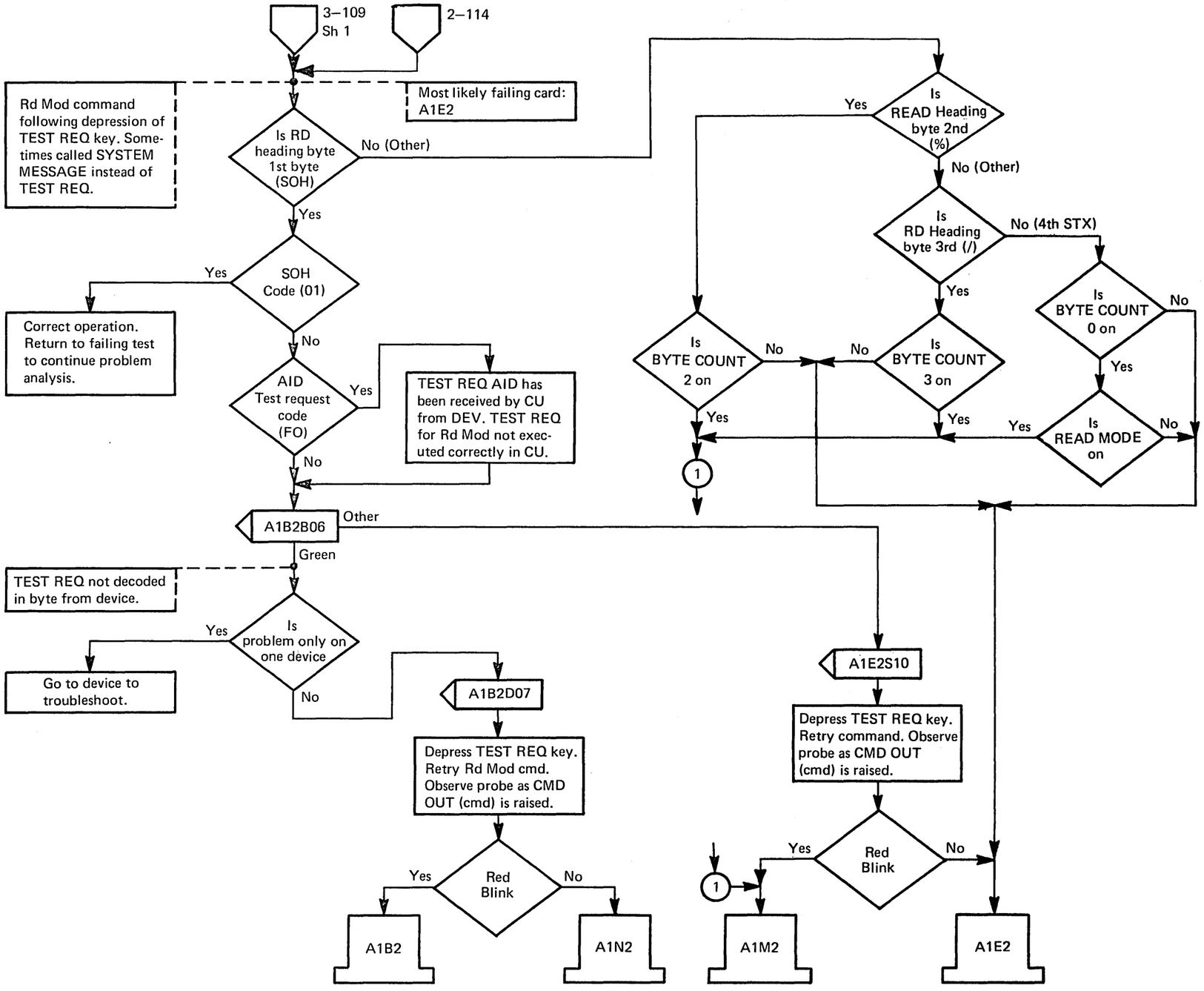


Diagram 4-144. Test Request Heading Failure on Bus-In

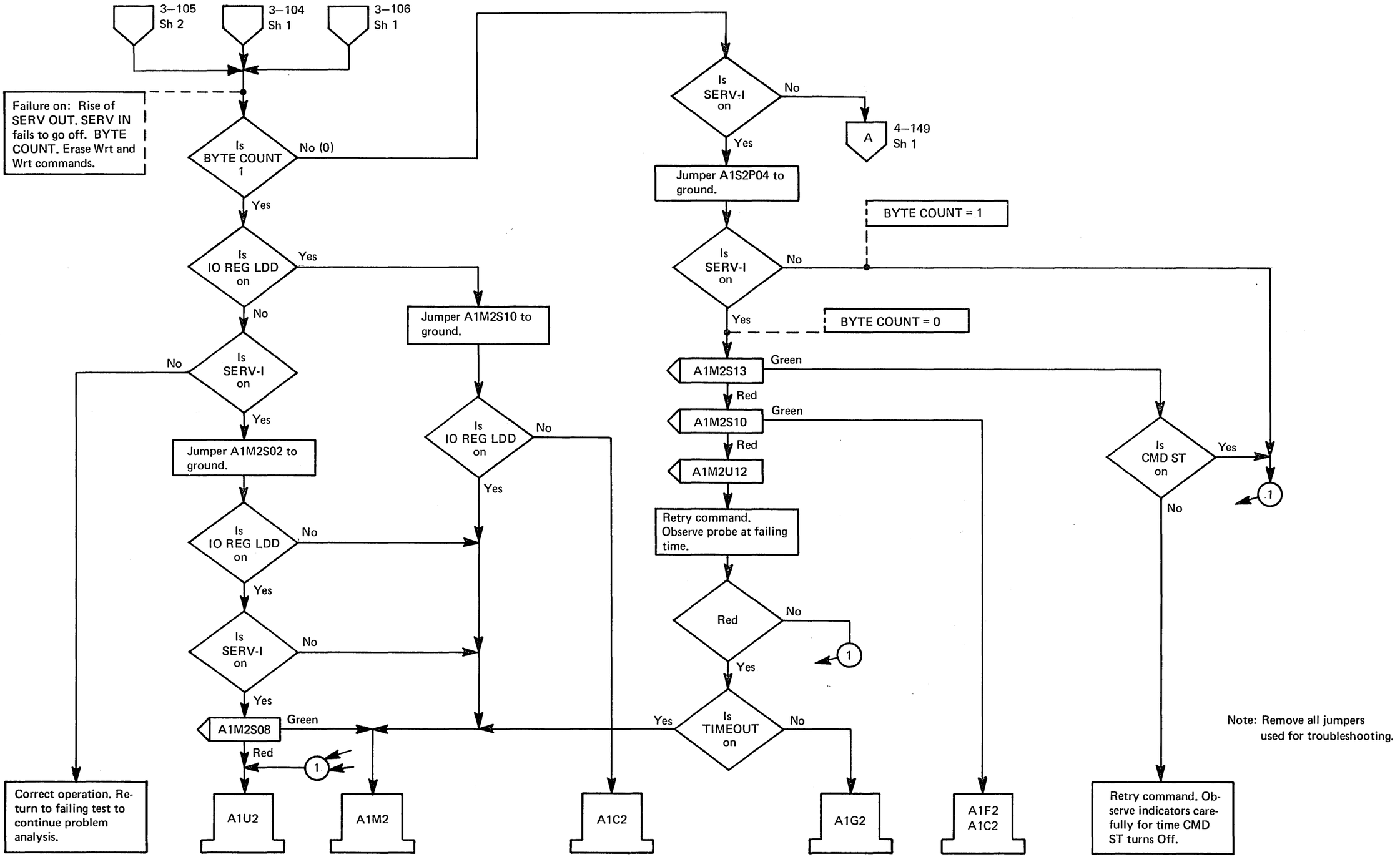


Diagram 4-145. WCC Transfer, Byte Count, or Service-In Failure

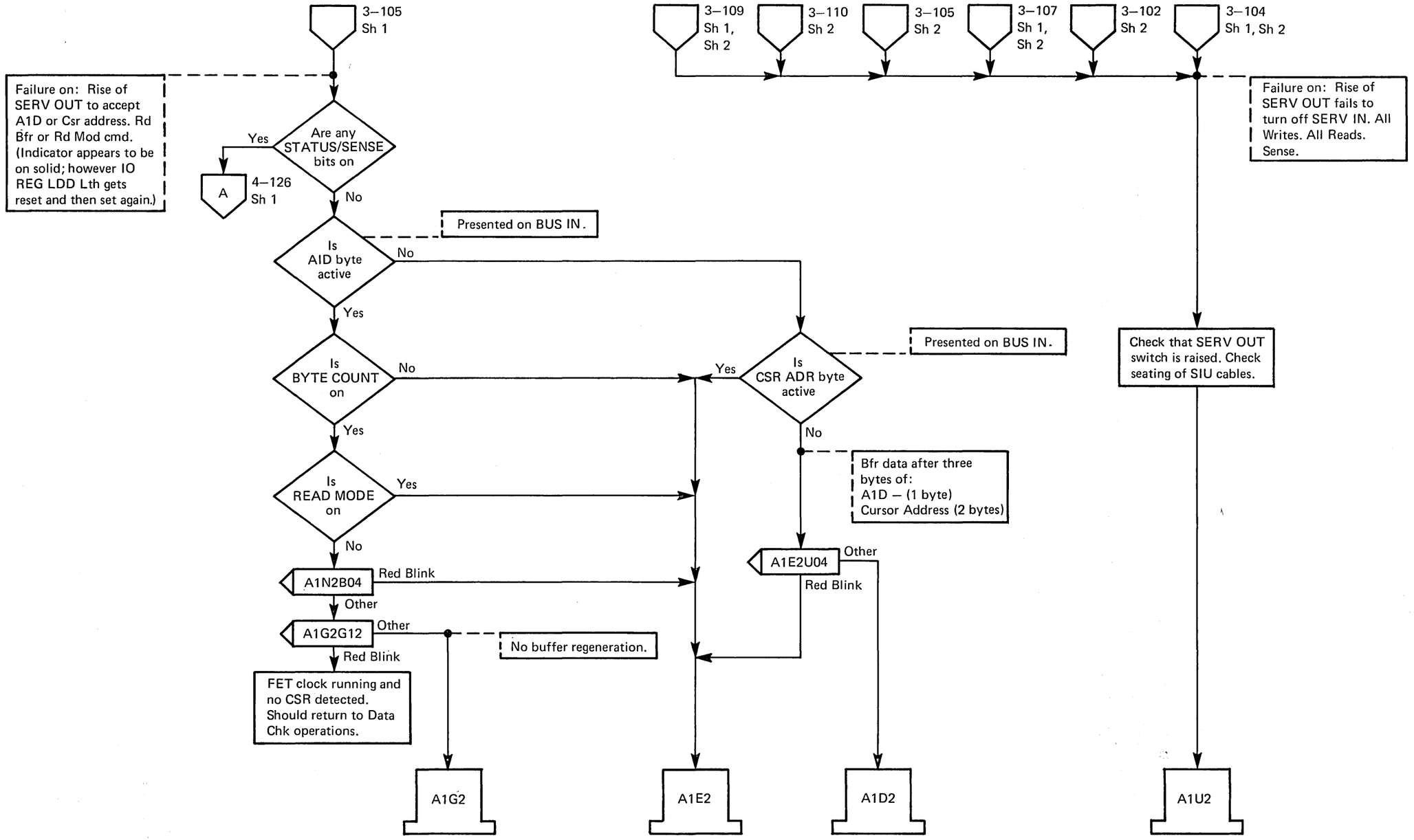


Diagram 4-146. I/O Reg Loaded Fails to Turn On or Service-In Fails to Turn Off

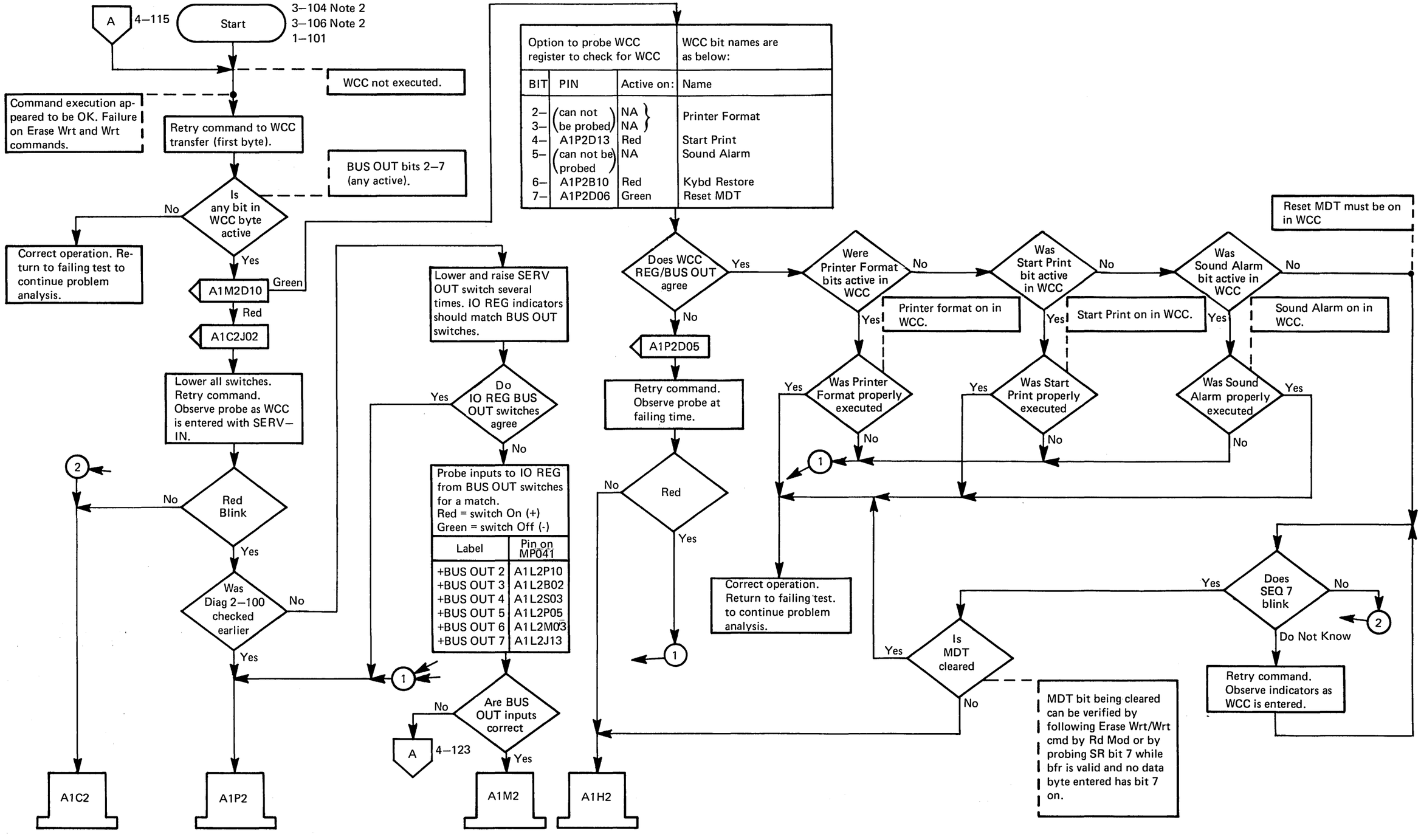


Diagram 4-147. WCC Transfer Failure

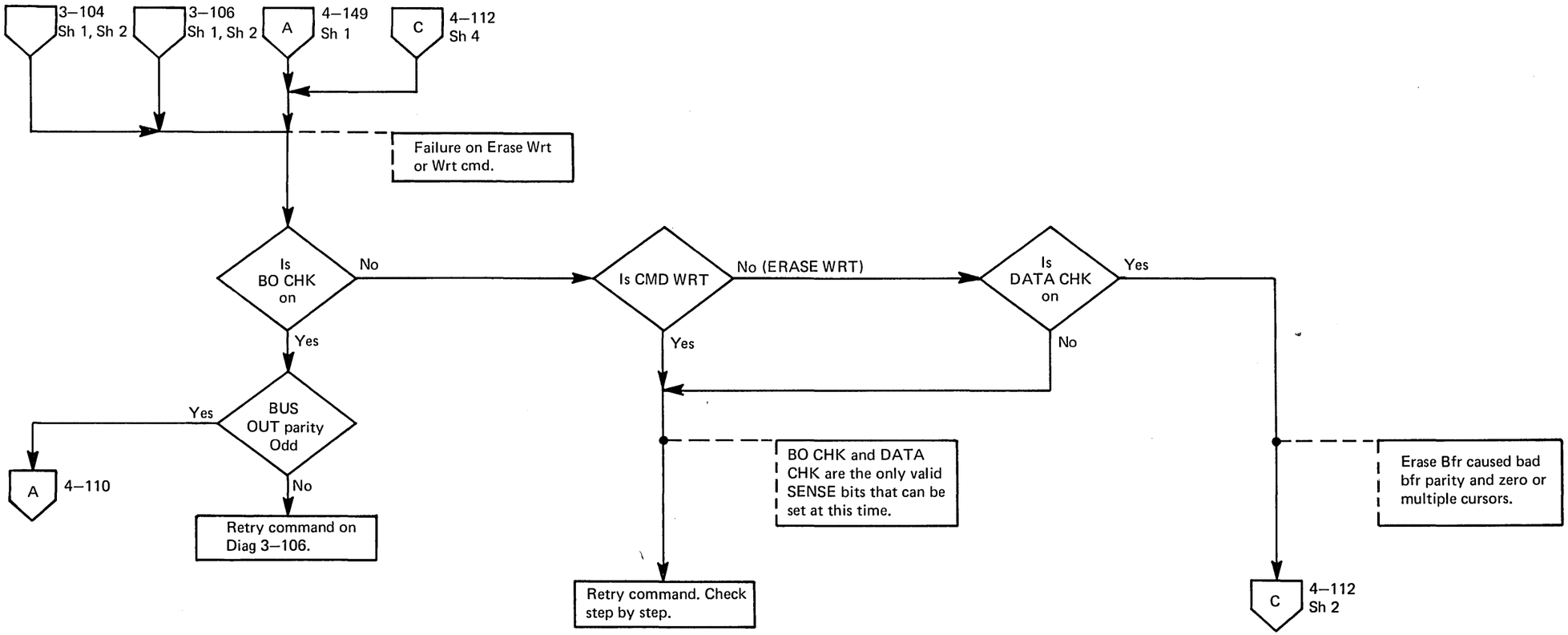
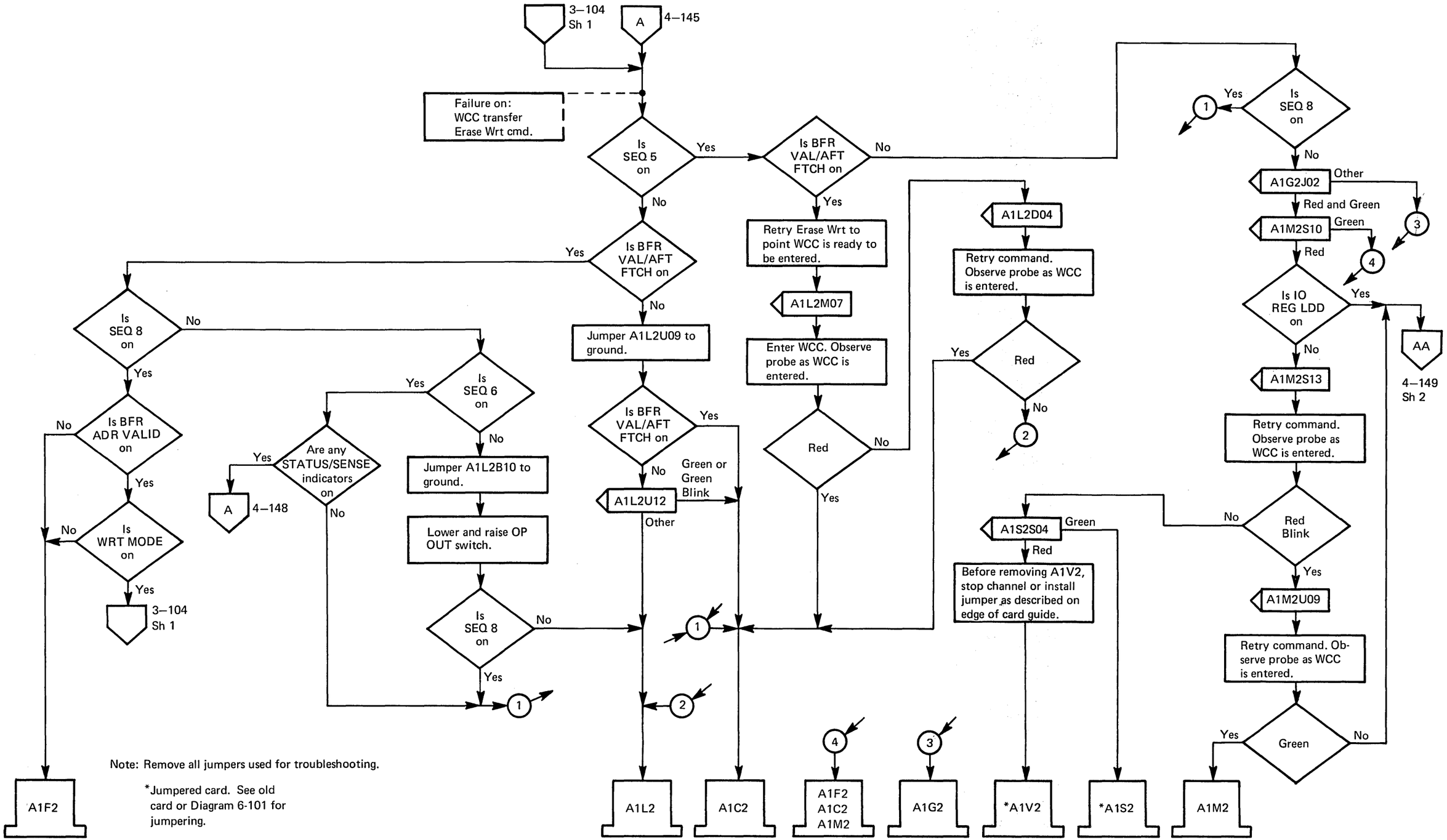


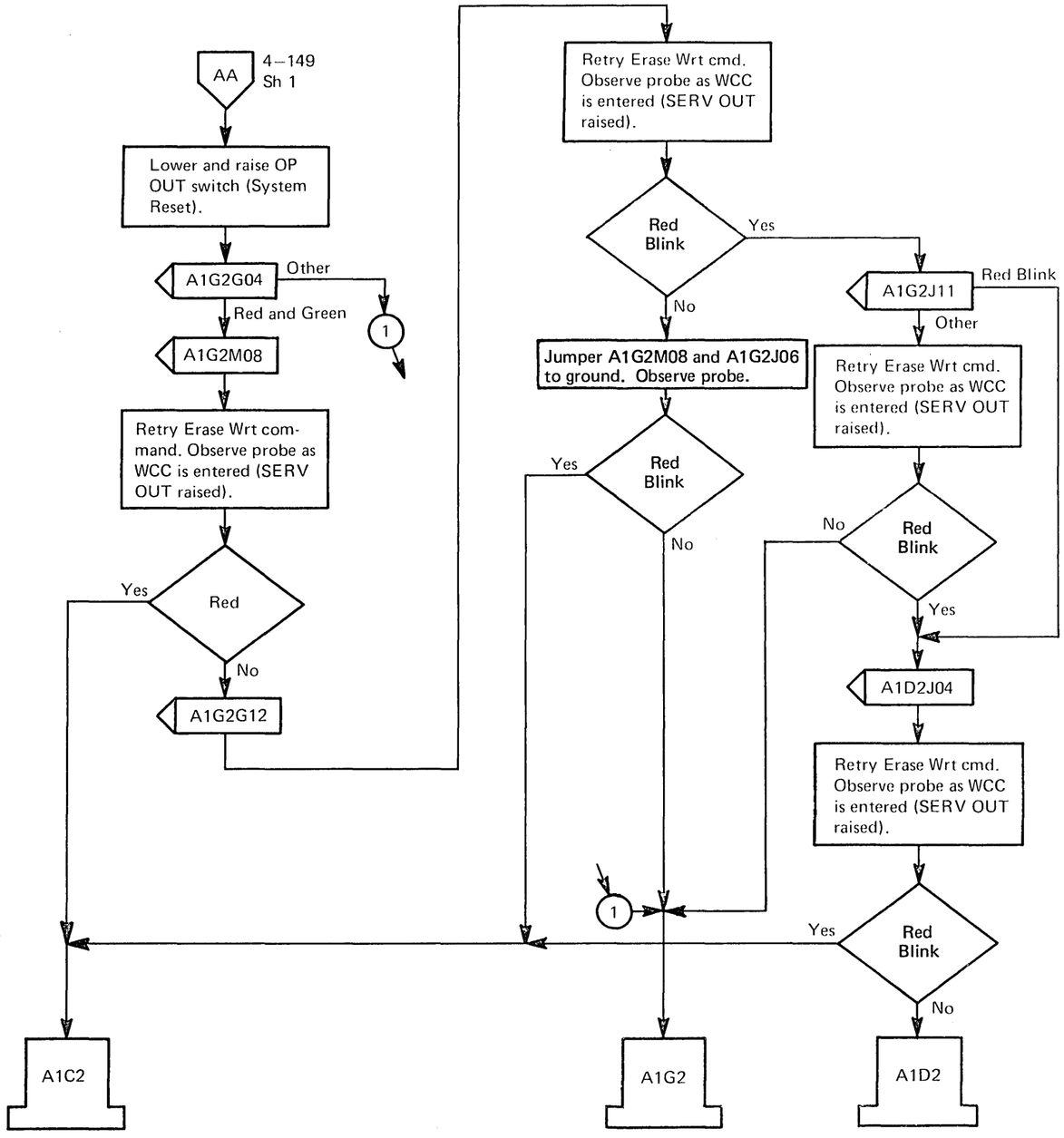
Diagram 4-148. Status or Sense Active after WCC Transfer



Note: Remove all jumpers used for troubleshooting.

*Jumpered card. See old card or Diagram 6-101 for jumpering.

Diagram 4-149. Erase Buffer, Sequence 5, Sequence 8, or Buffer Valid after Fetch Failure (Sheet 1 of 2)



Note: Remove all jumpers used for troubleshooting.

Diagram 4-149. Erase Buffer, Sequence 5, Sequence 8, or Buffer Valid after Fetch Failure (Sheet 2 of 2)

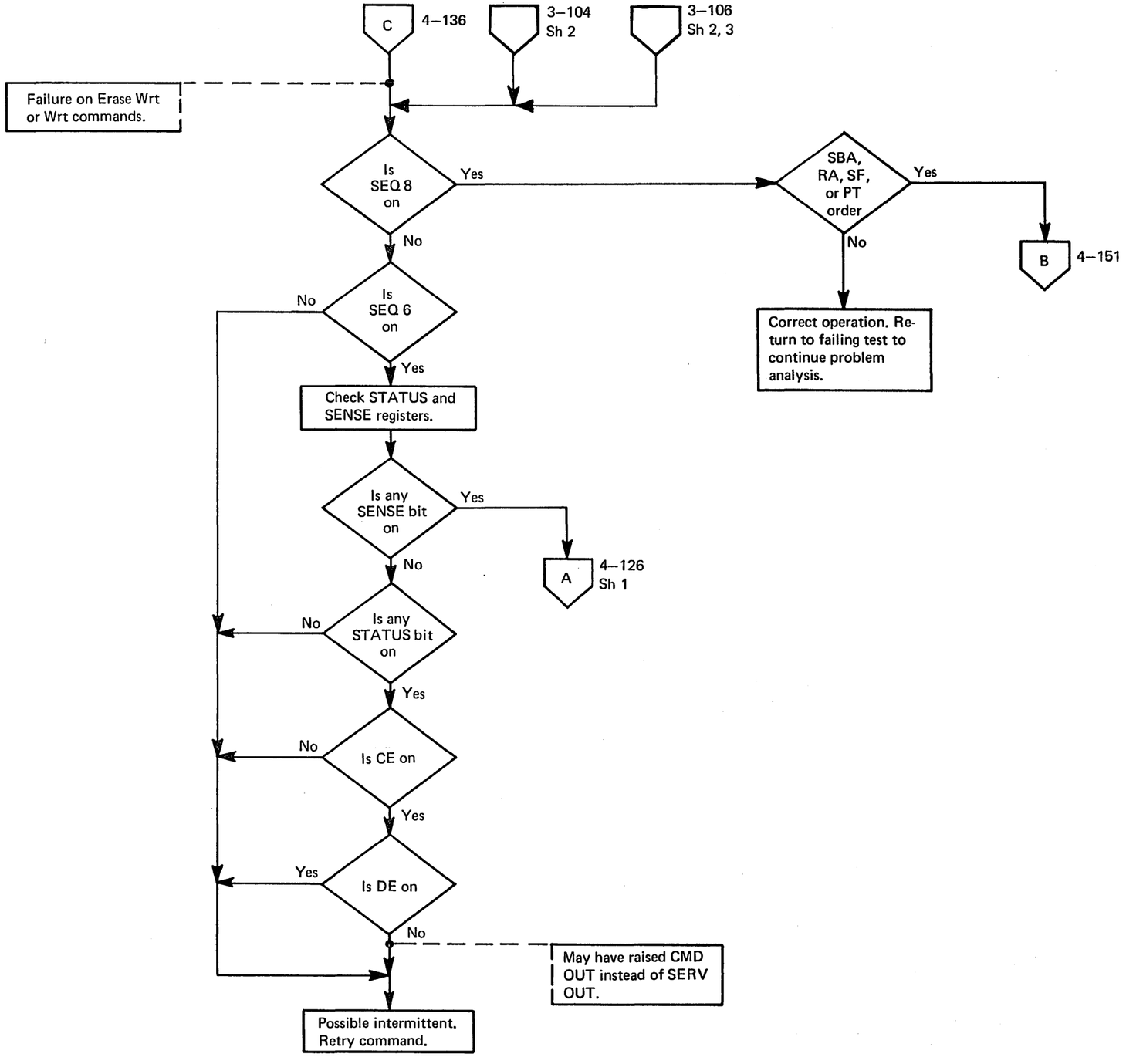


Diagram 4-150. Data Transfer Failure

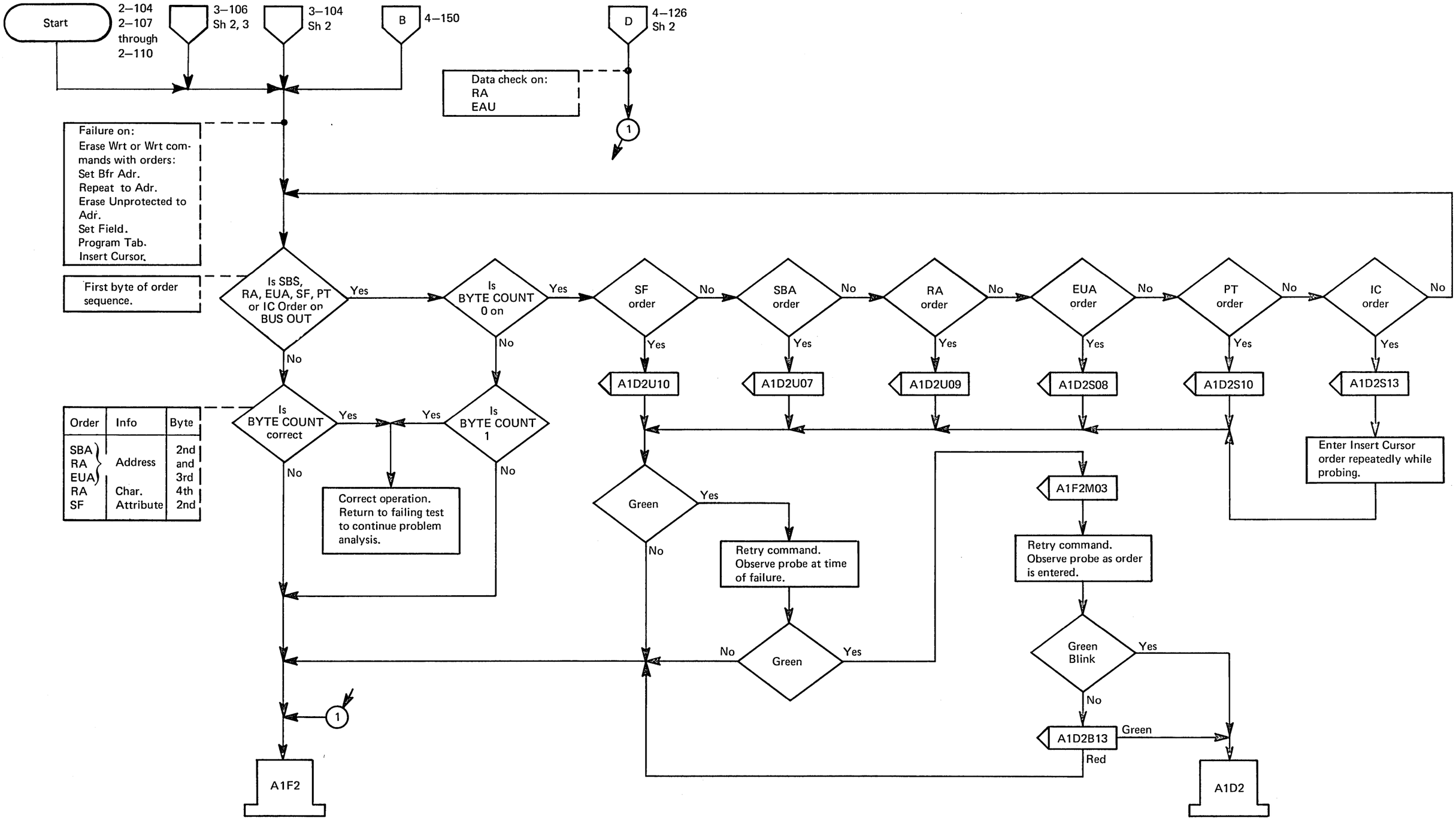


Diagram 4-151. Order Sequence Failure

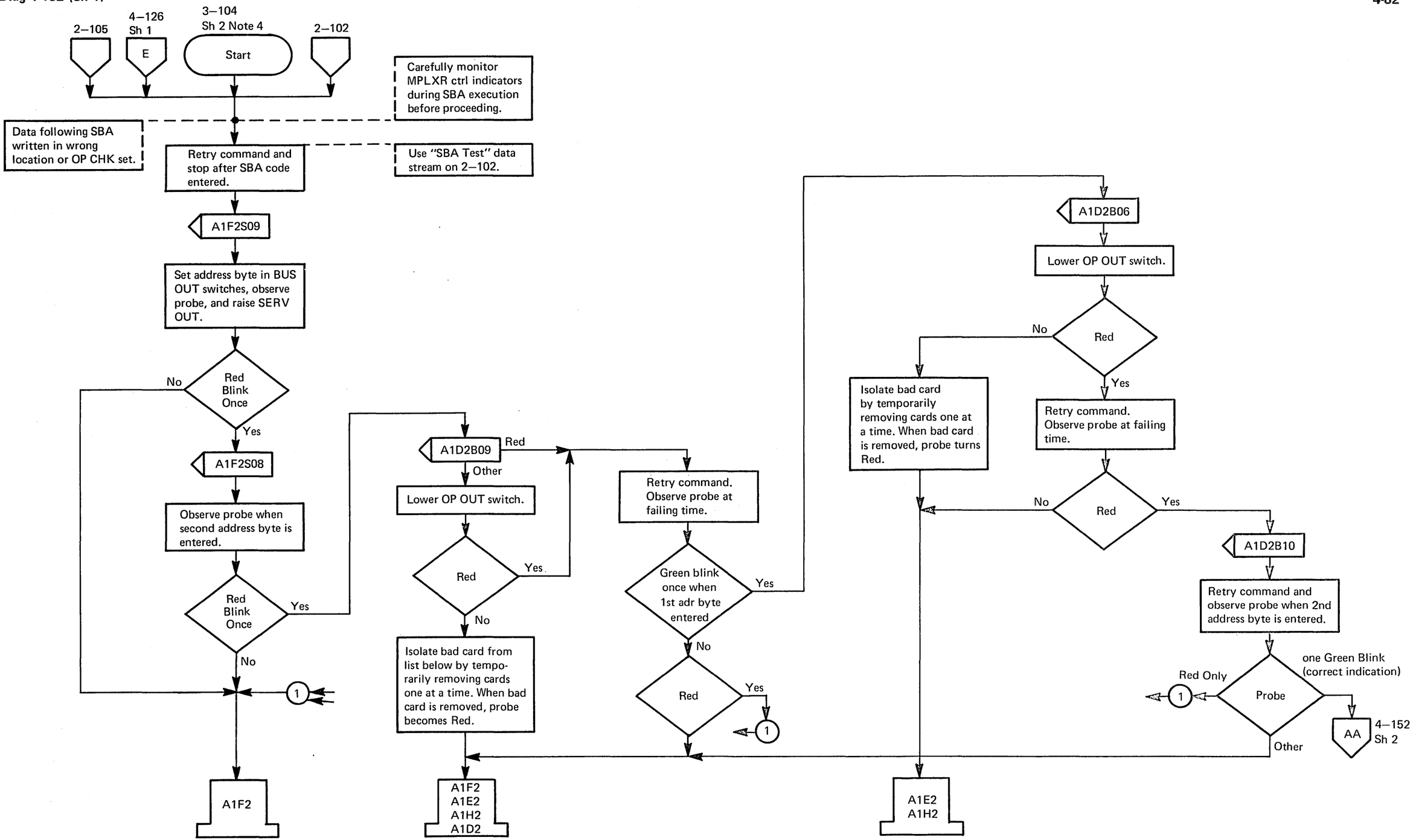


Diagram 4-152. SBA Order Failure (Sheet 1 of 2)

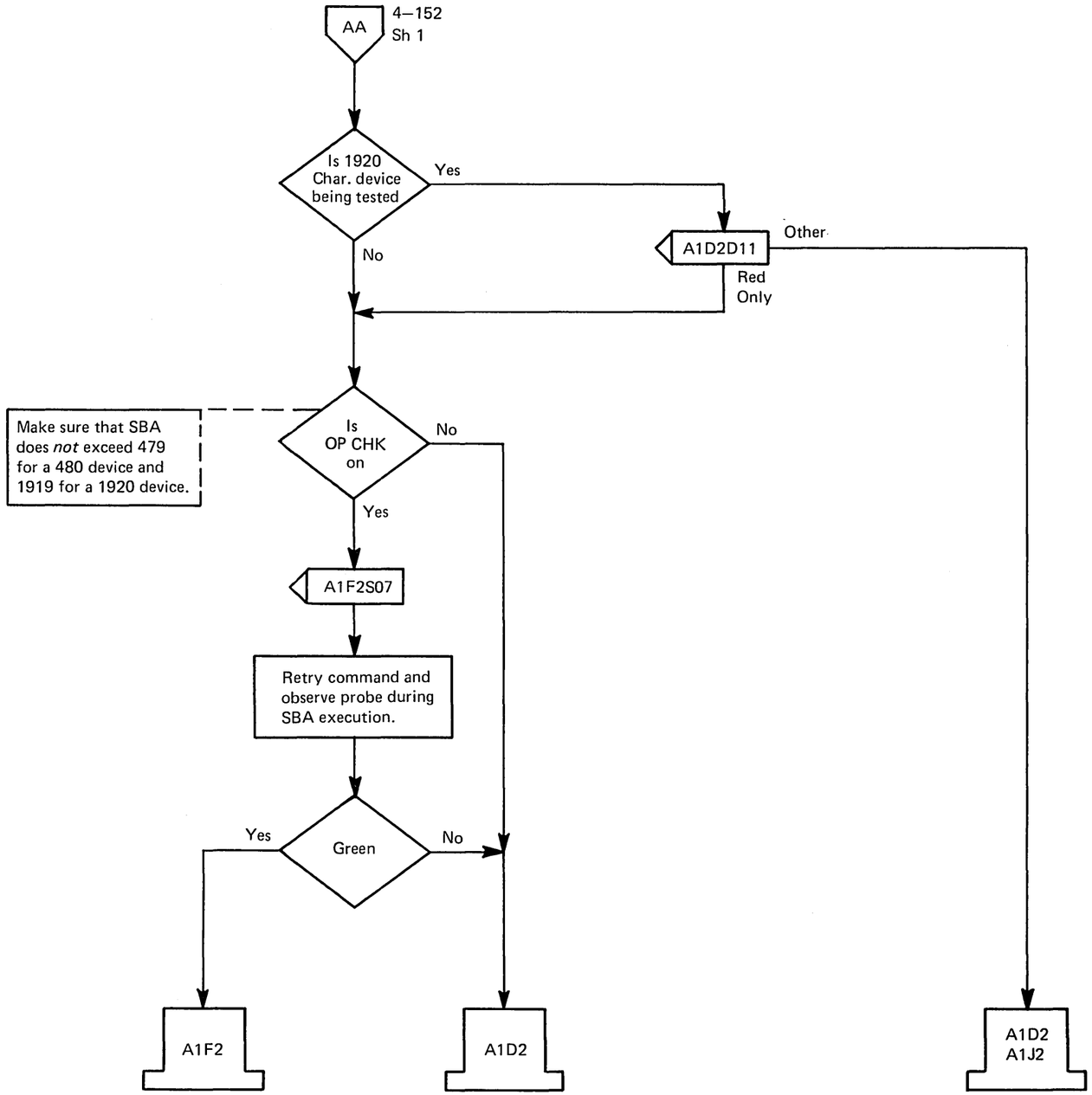


Diagram 4-152. SBA Order Failure (Sheet 2 of 2)

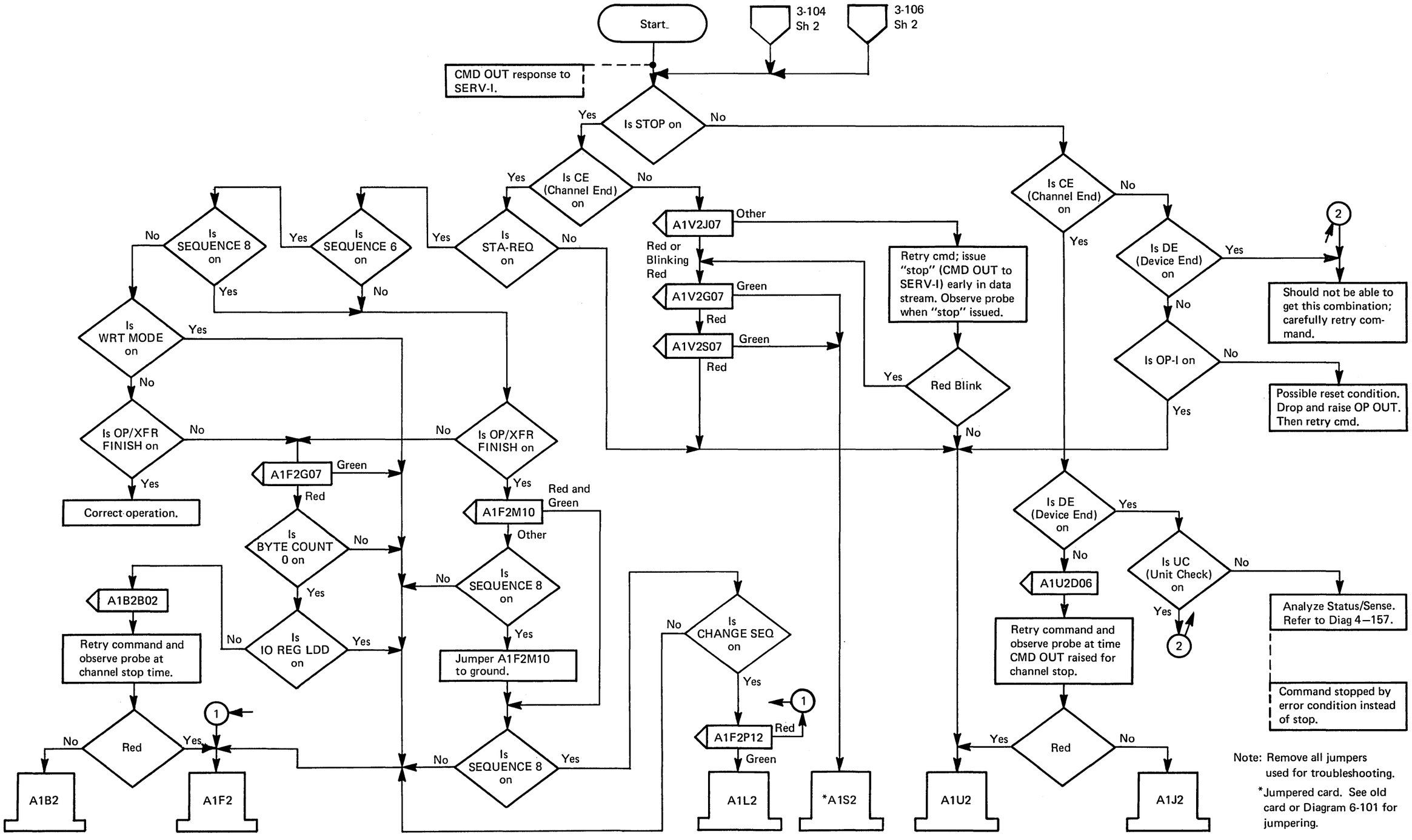
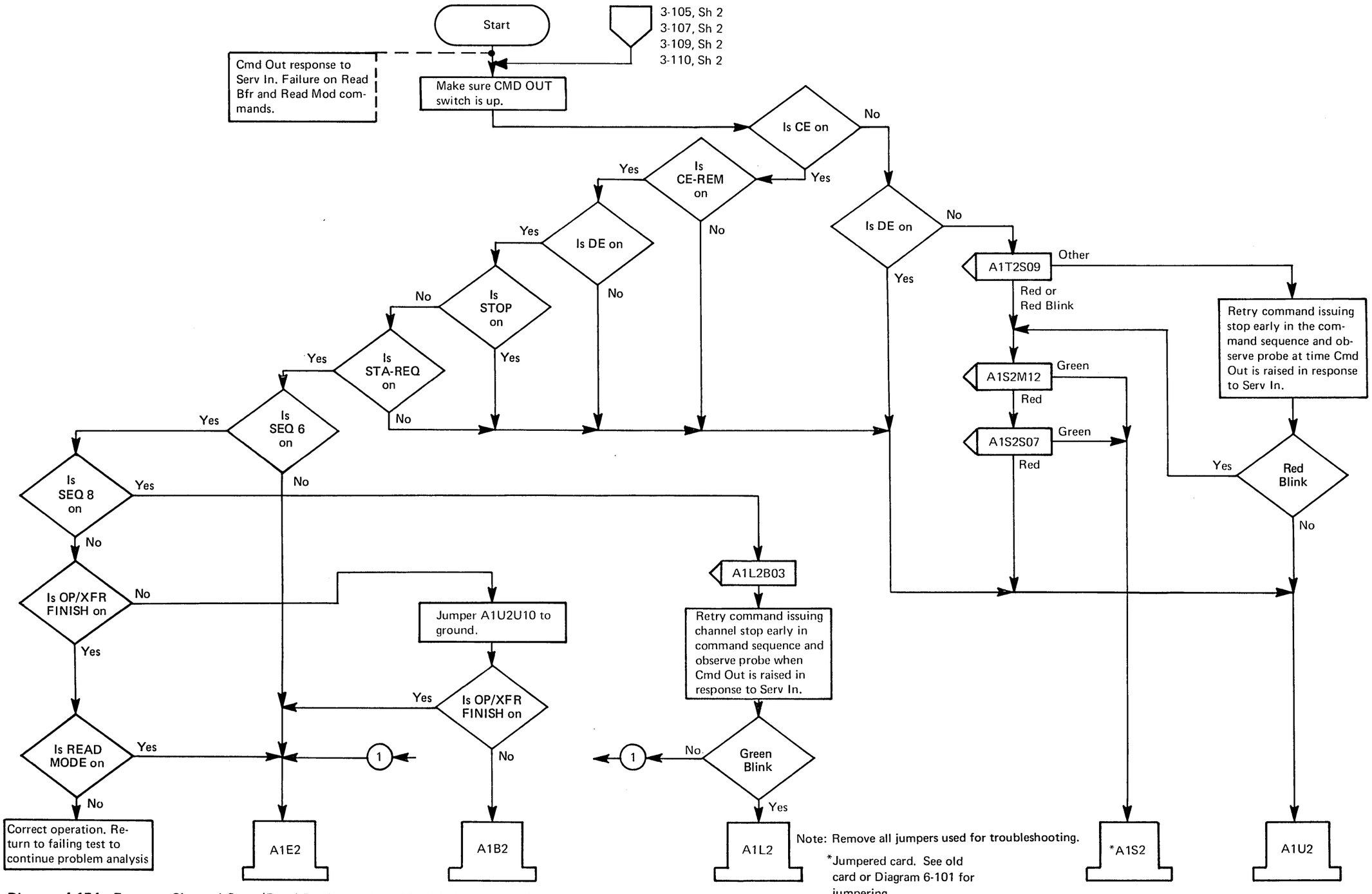


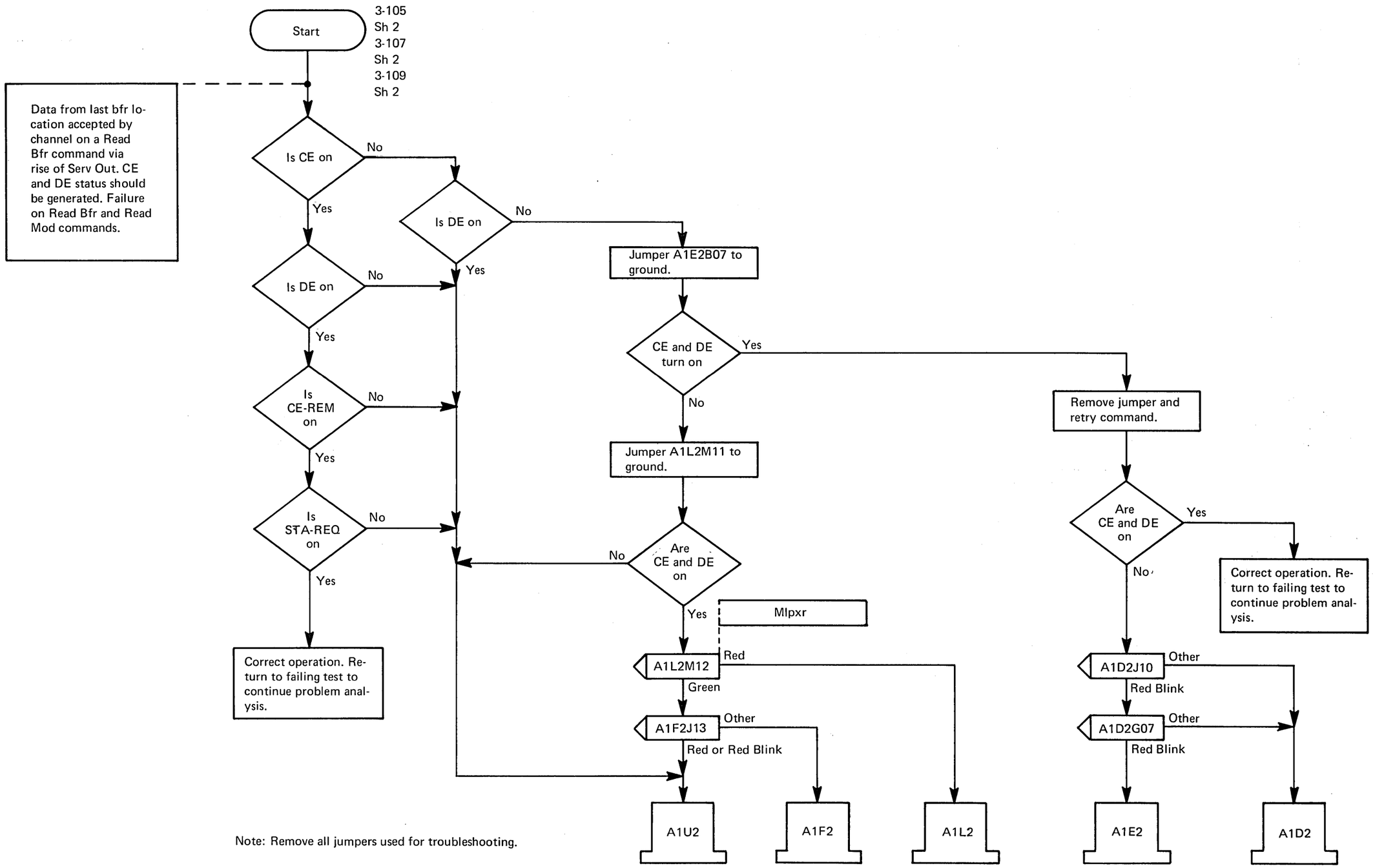
Diagram 4-153. Error on Channel Stop (Write or Erase/Wrt Cmd)



Note: Remove all jumpers used for troubleshooting.

*Jumpered card. See old card or Diagram 6-101 for jumpering.

Diagram 4-154. Error on Channel Stop (Read Buffer or Read Modified Command)



Note: Remove all jumpers used for troubleshooting.

Diagram 4-155. Error on Control Unit Stop

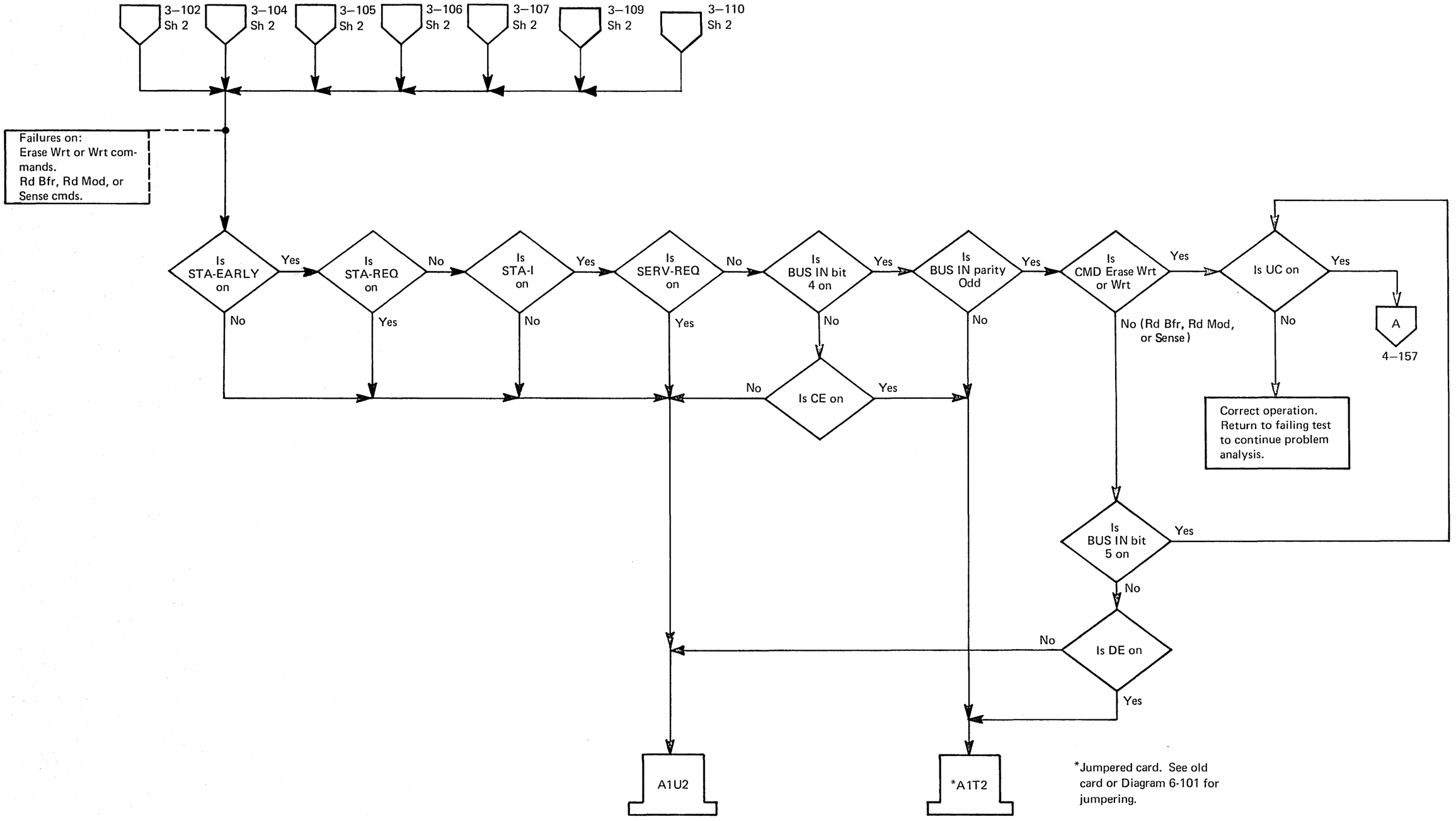


Diagram 4-156. Channel End and Device End Status Failures

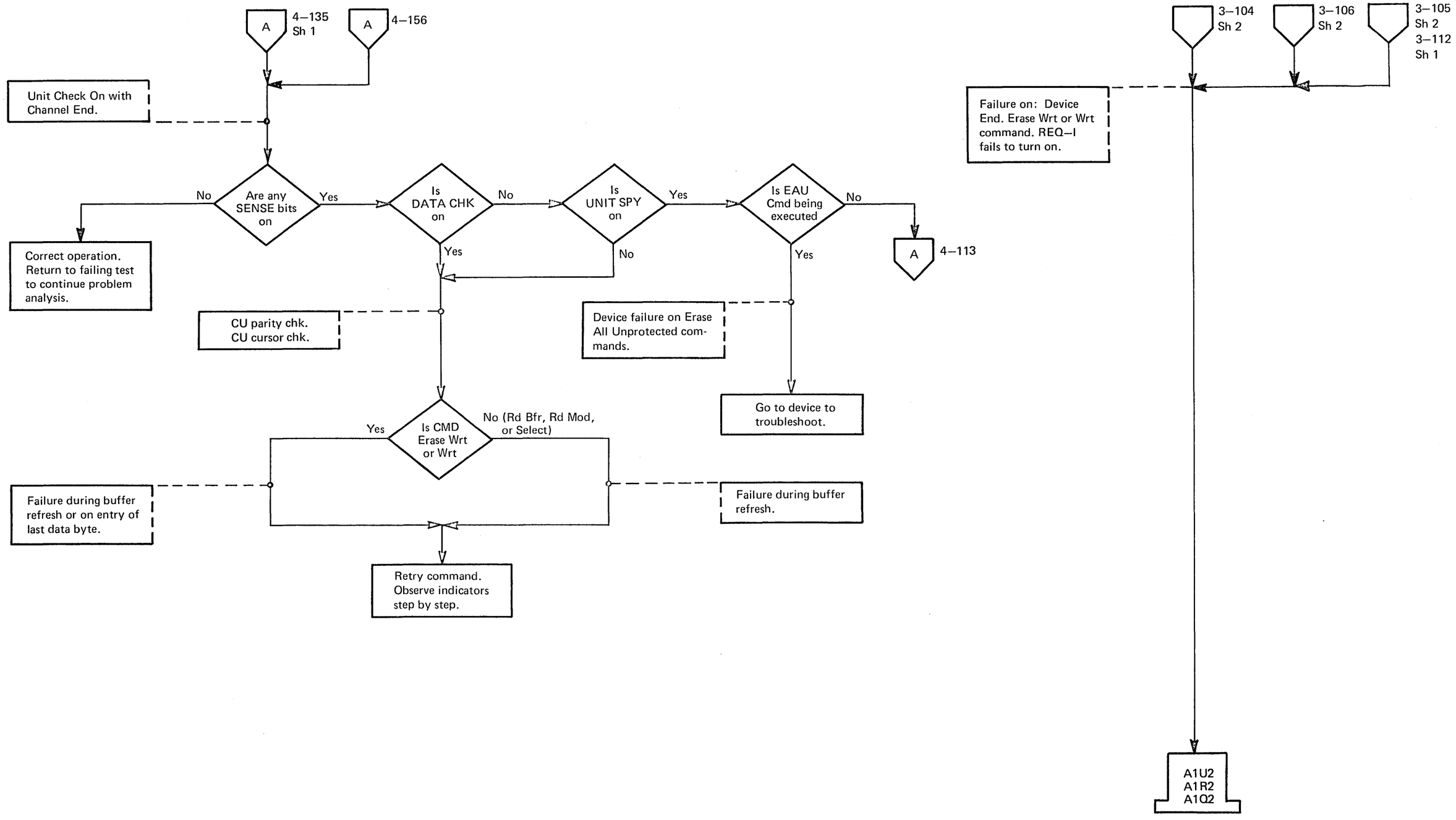


Diagram 4-157. Status/Sense, Ending Status, or Request-In Failure

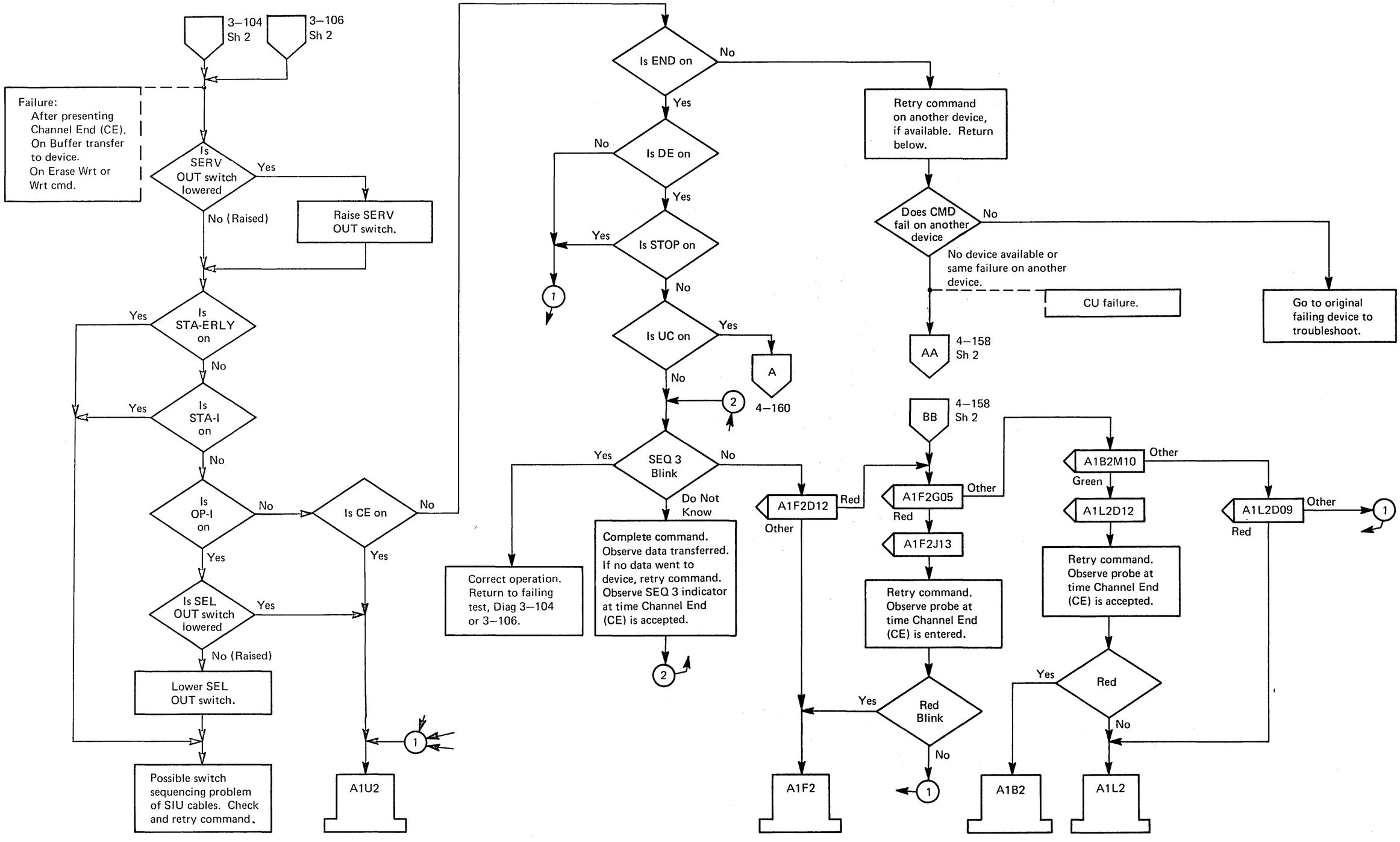


Diagram 4-158. Channel End or Buffer Transfer Failure (Sheet 1 of 2)

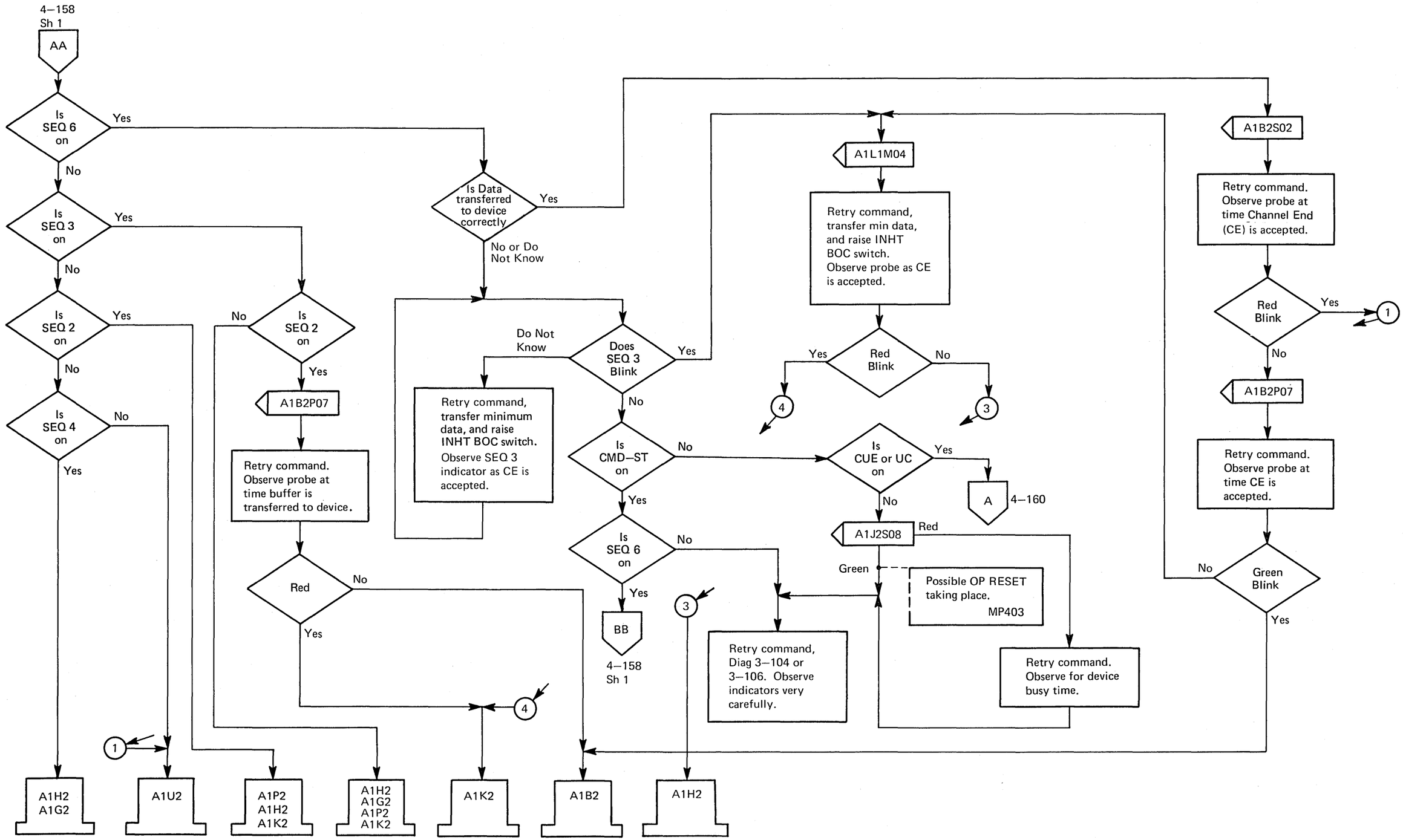


Diagram 4-158. Channel End or Buffer Transfer Failure (Sheet 2 of 2)

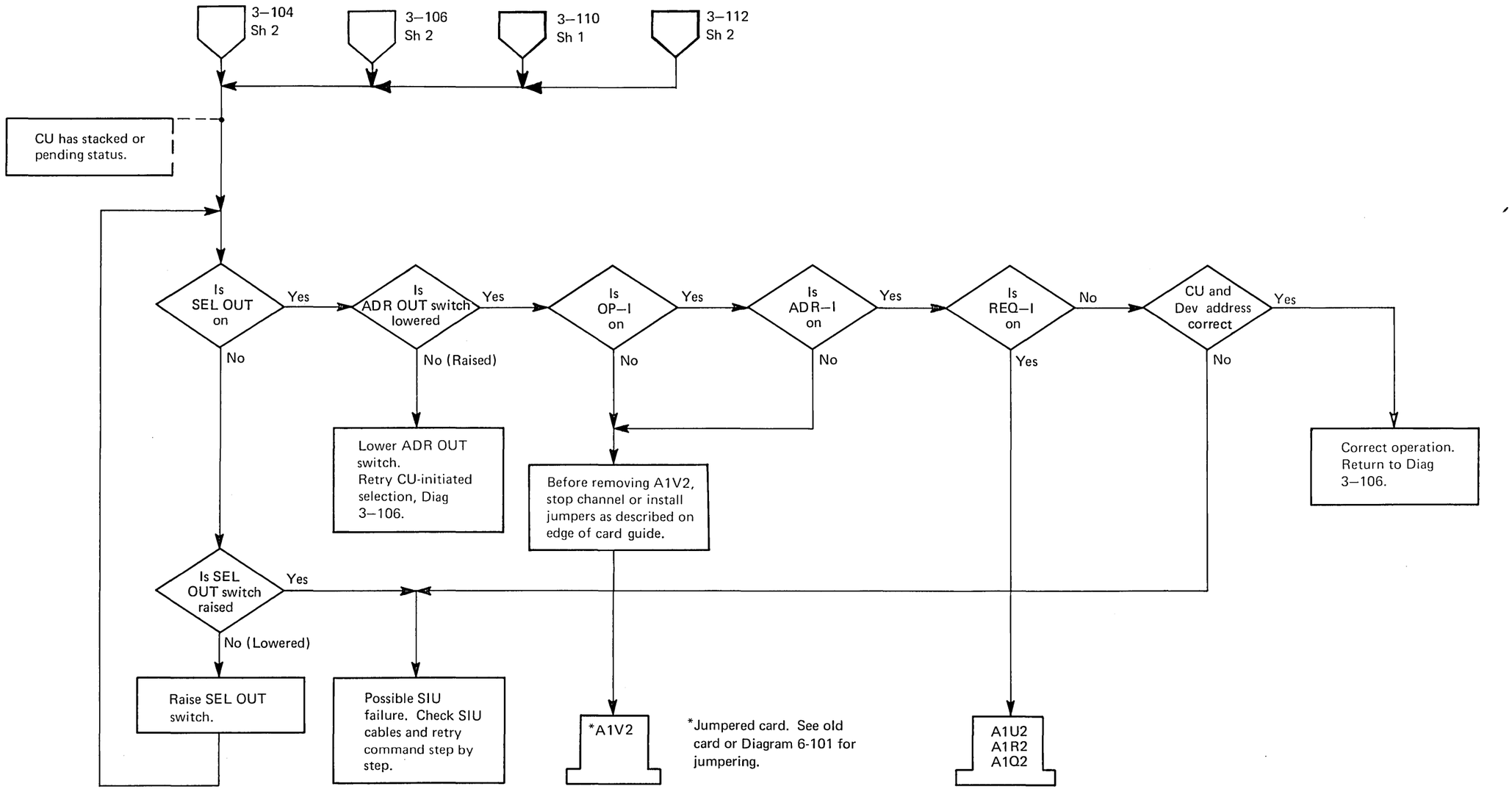
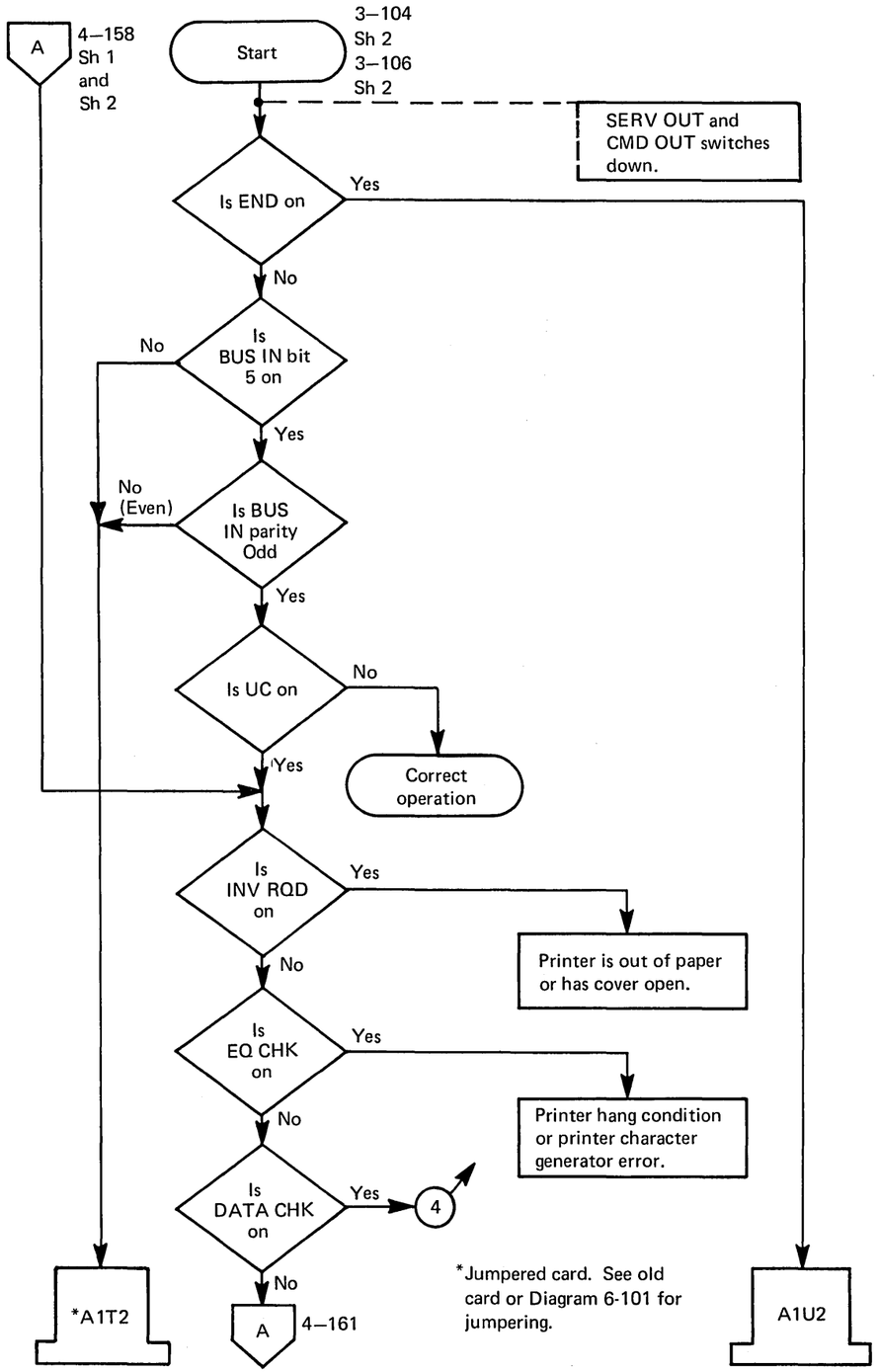


Diagram 4-159. CU-Initiated Selection Failure



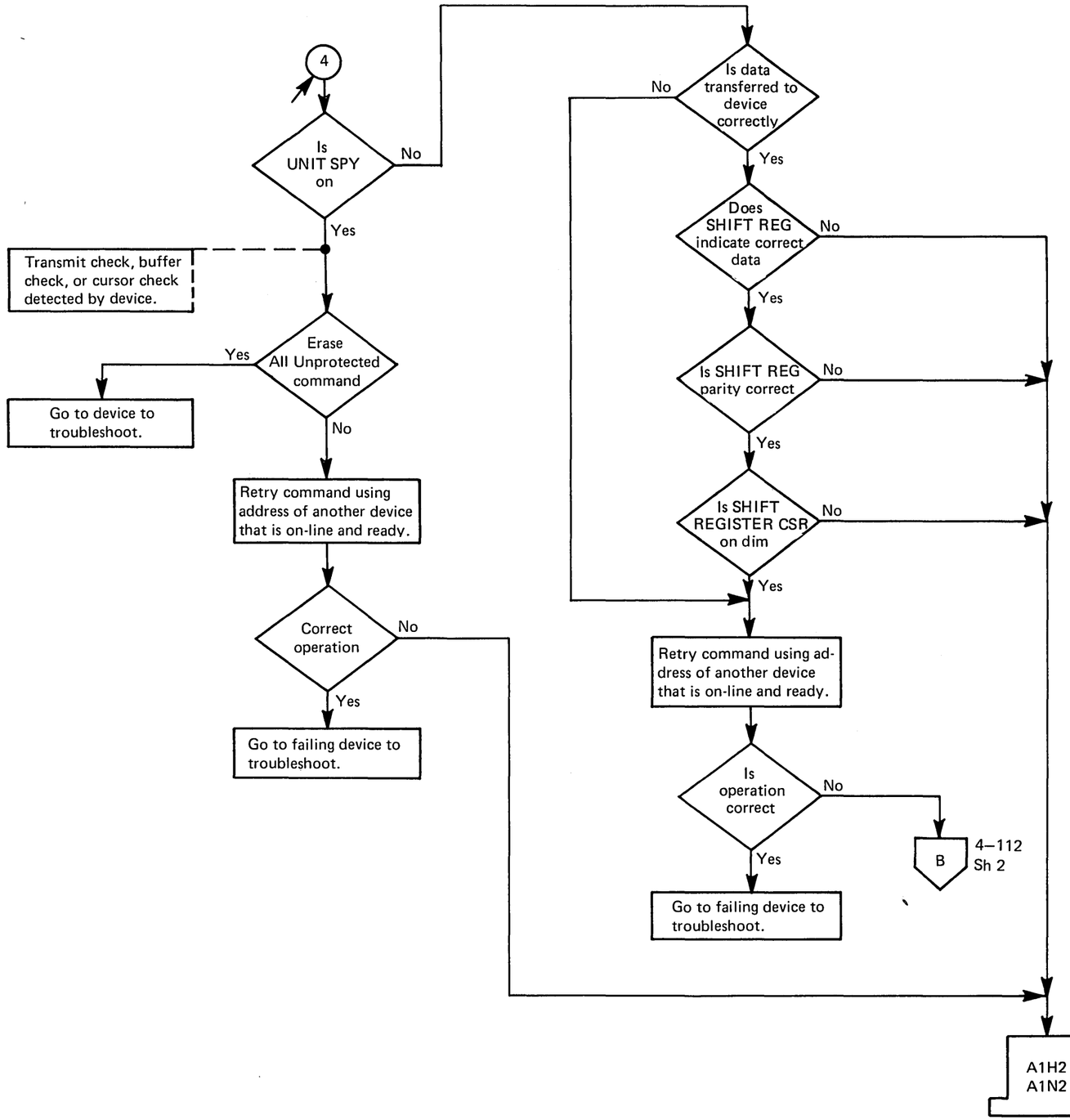


Diagram 4-160. Device End Status Analysis

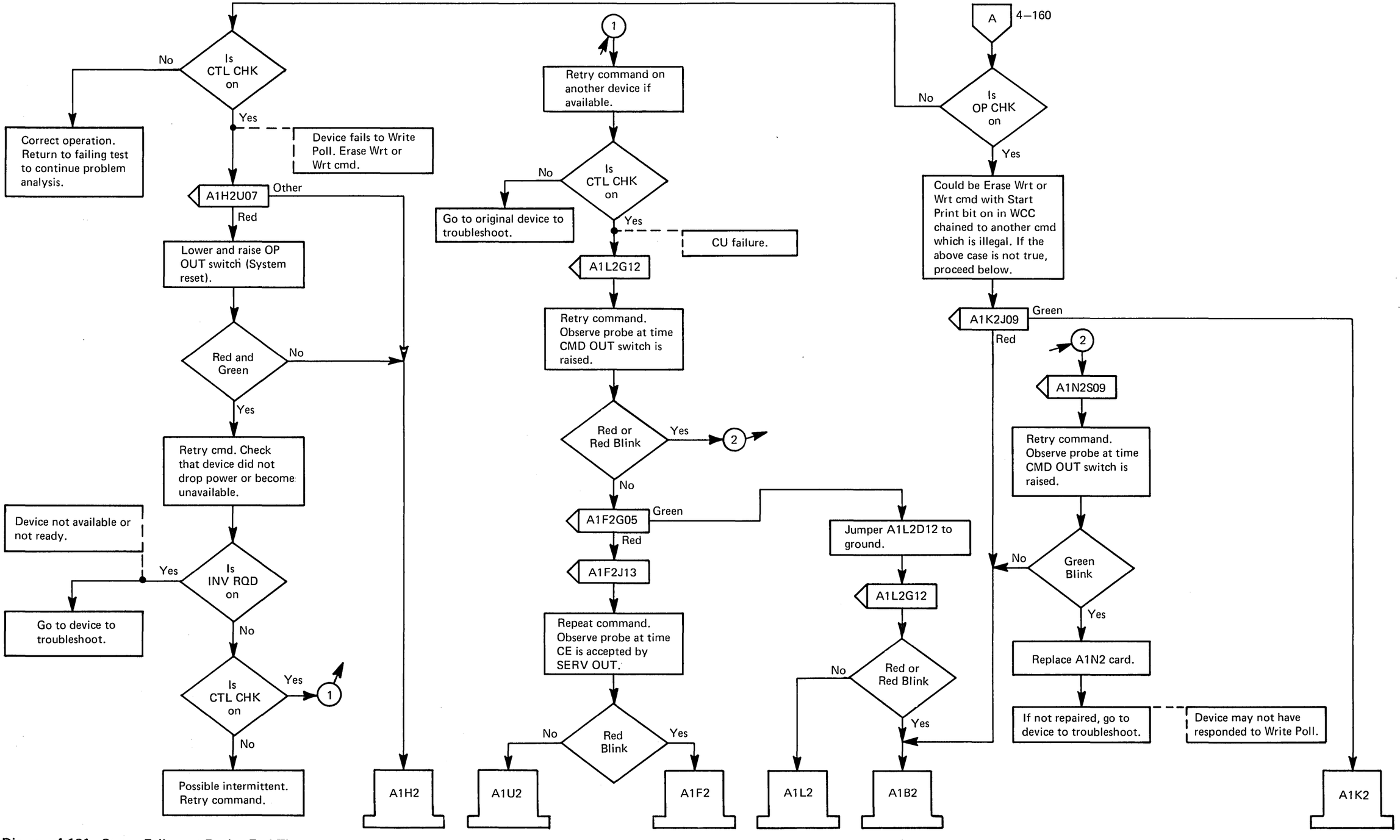


Diagram 4-161. Status Failure at Device End Time

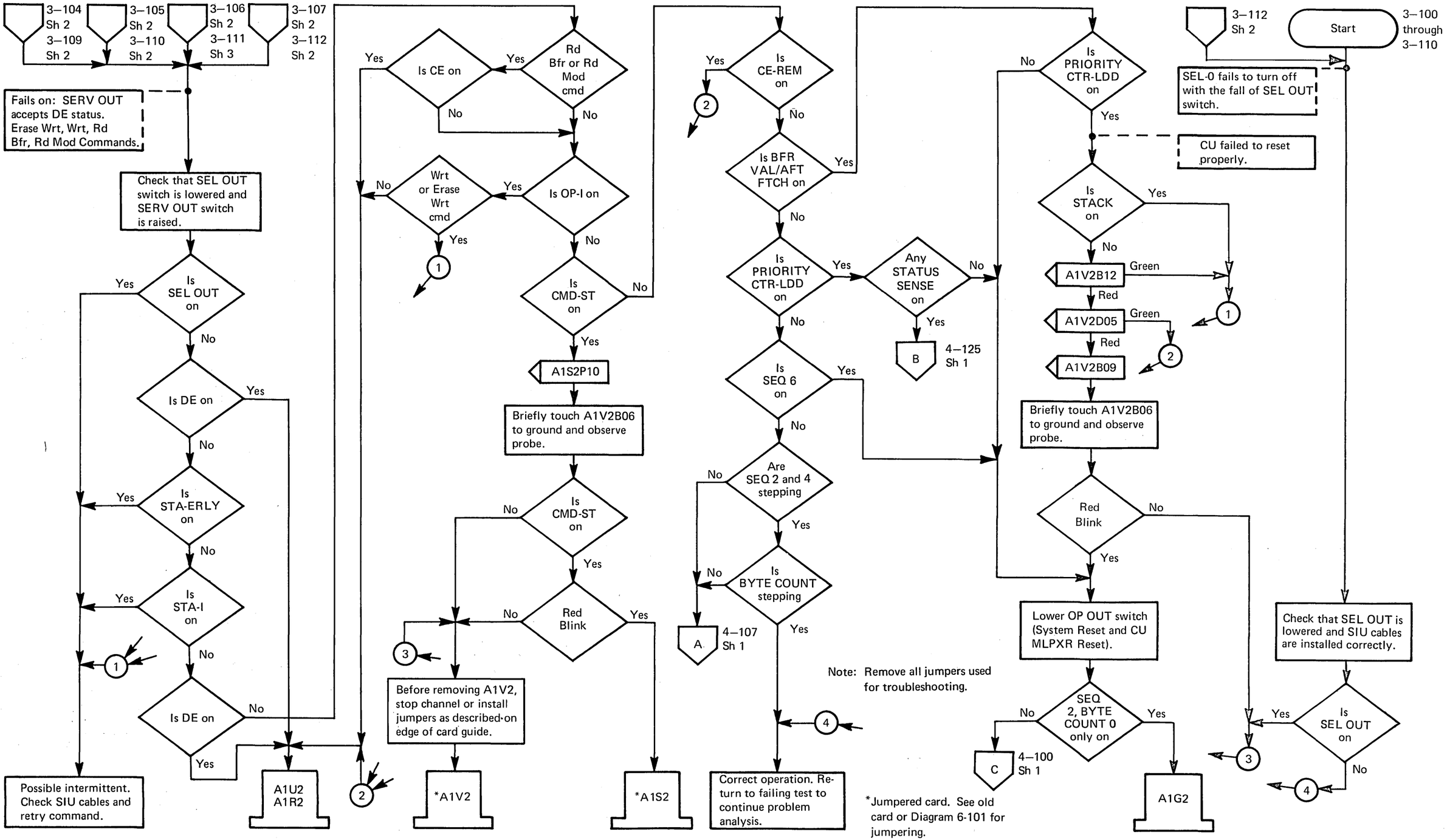


Diagram 4-162. Failure at End of Command

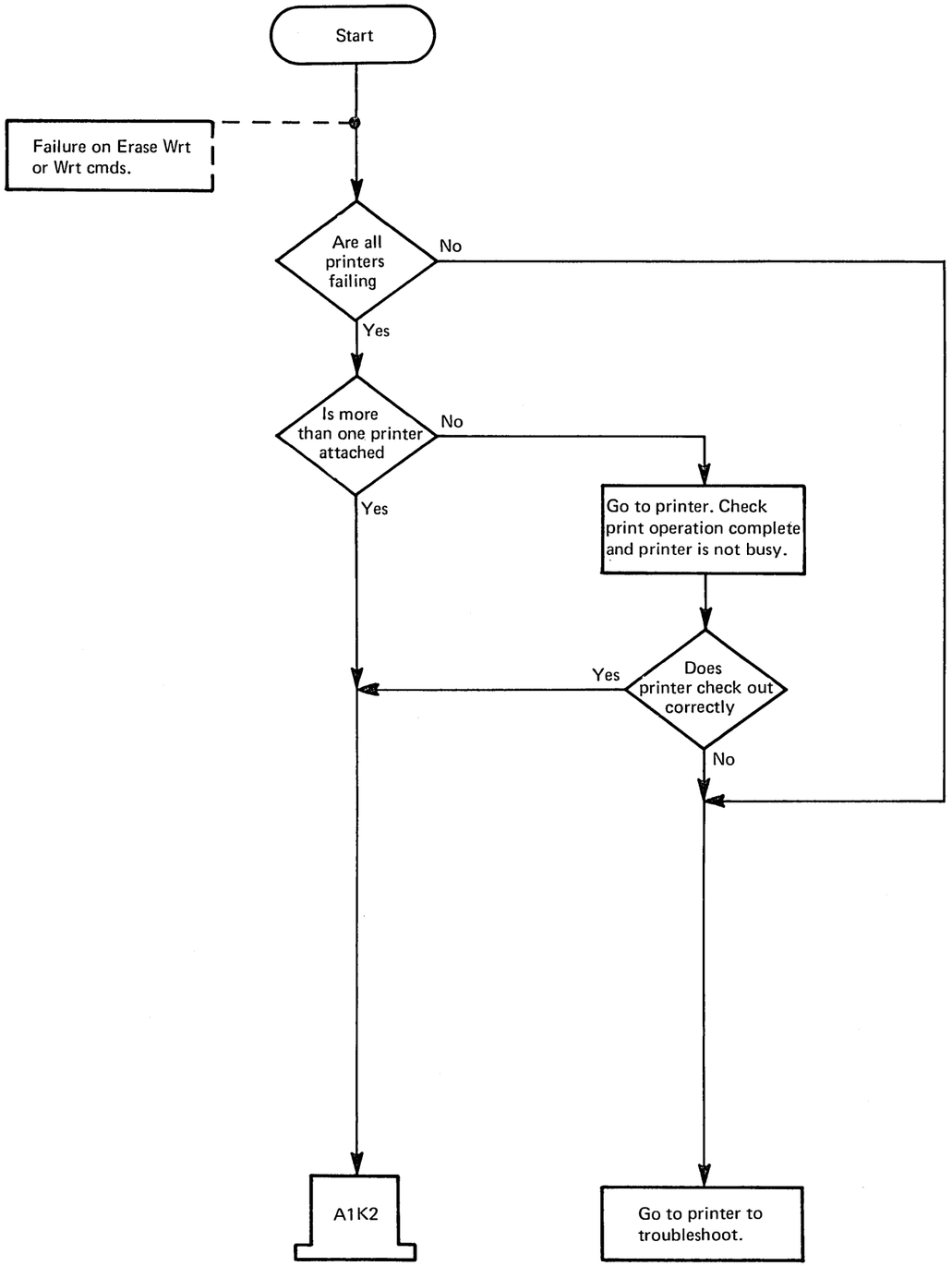


Diagram 4-163. Device End Failure at End of Print Operation

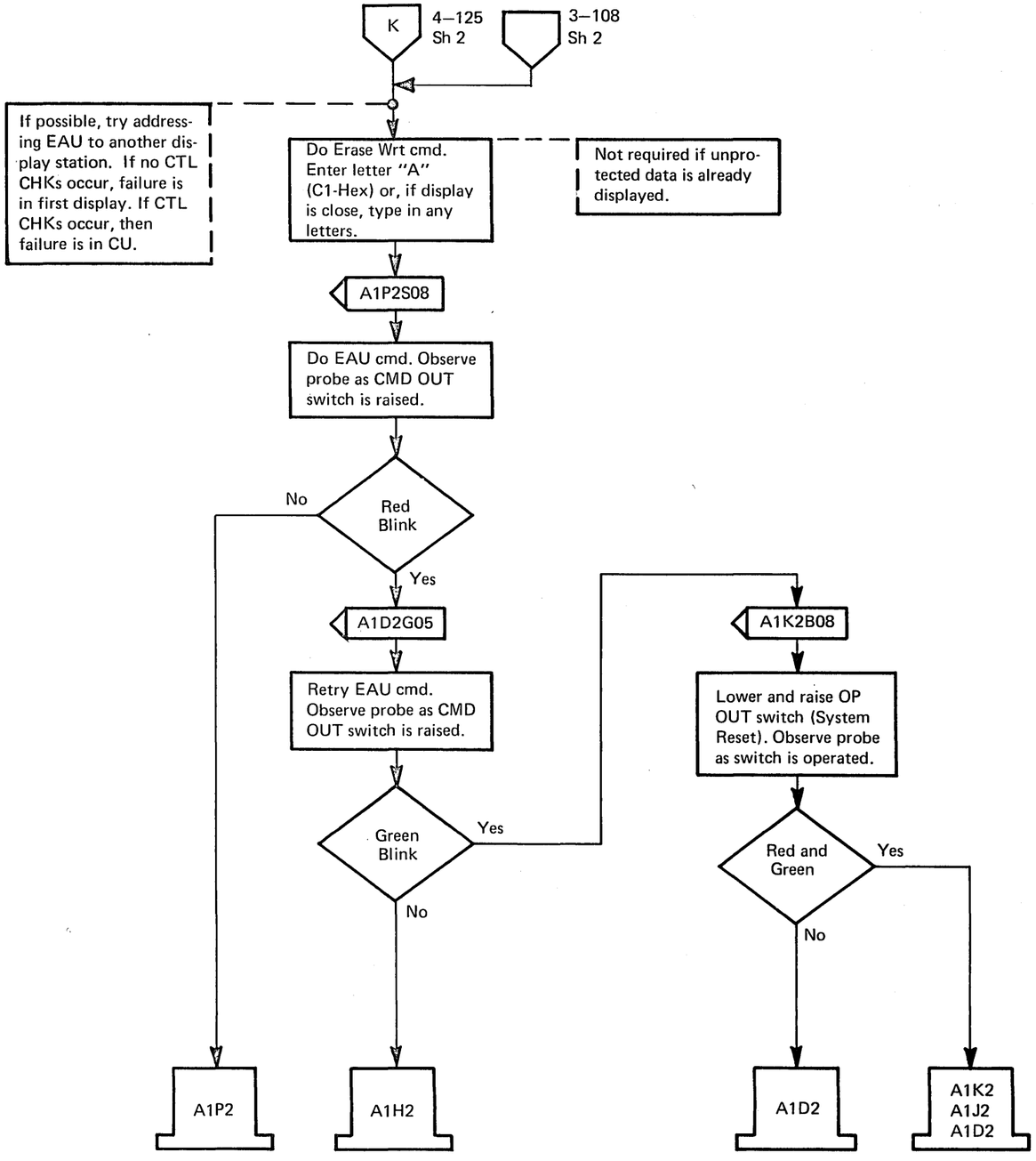
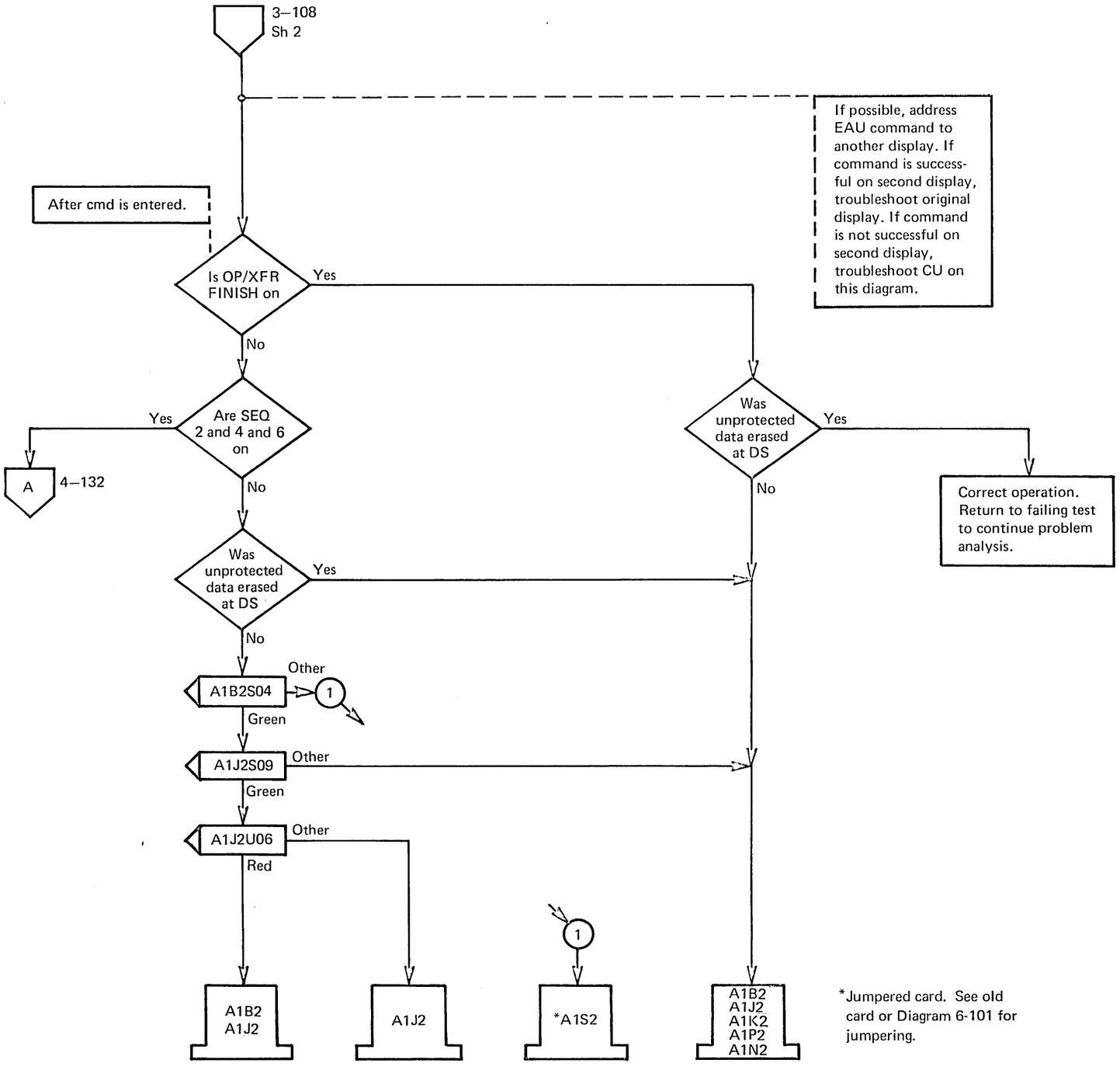
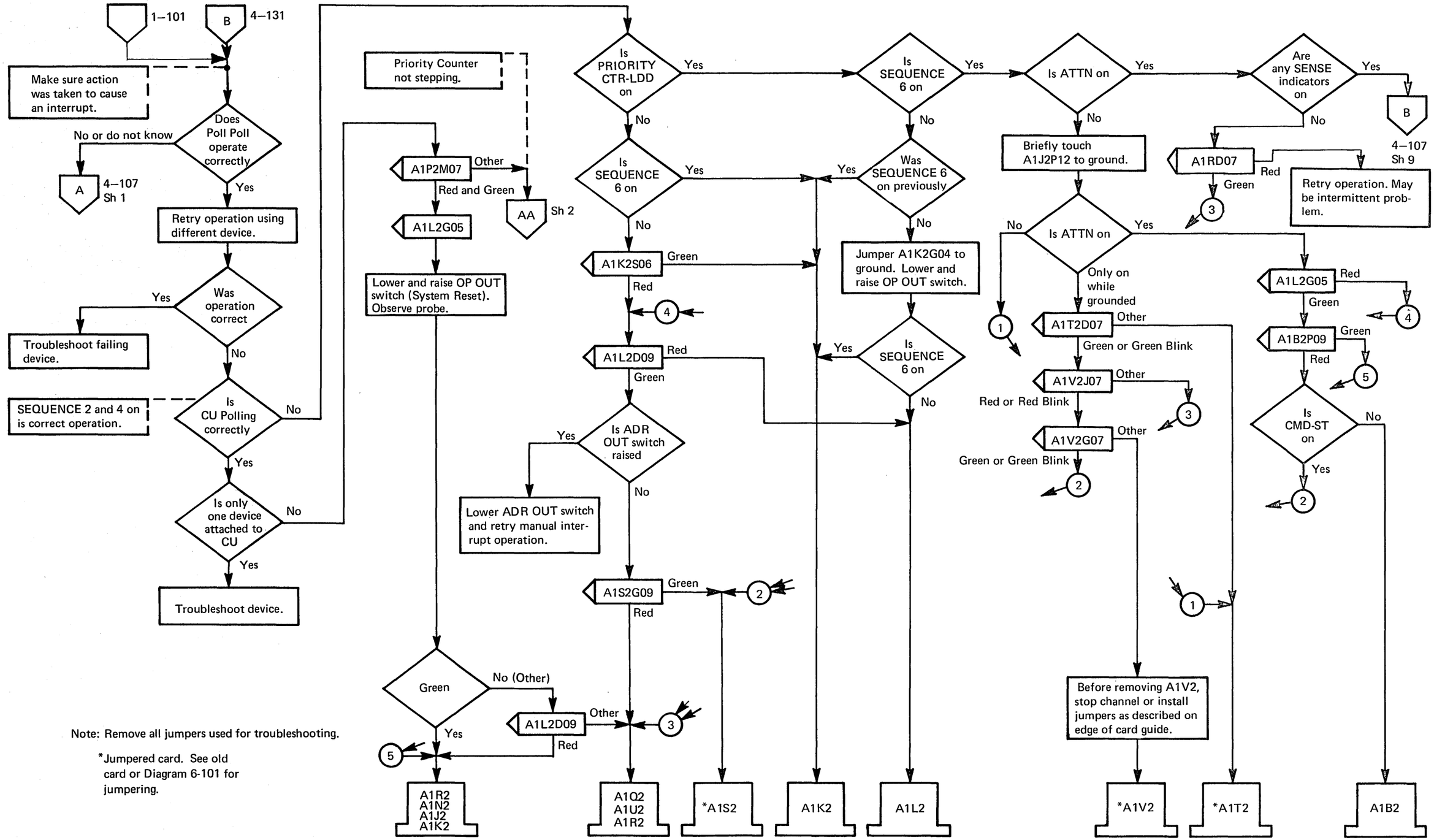


Diagram 4-164. Control Check on EAU Command



*Jumpered card. See old card or Diagram 6-101 for jumpering.

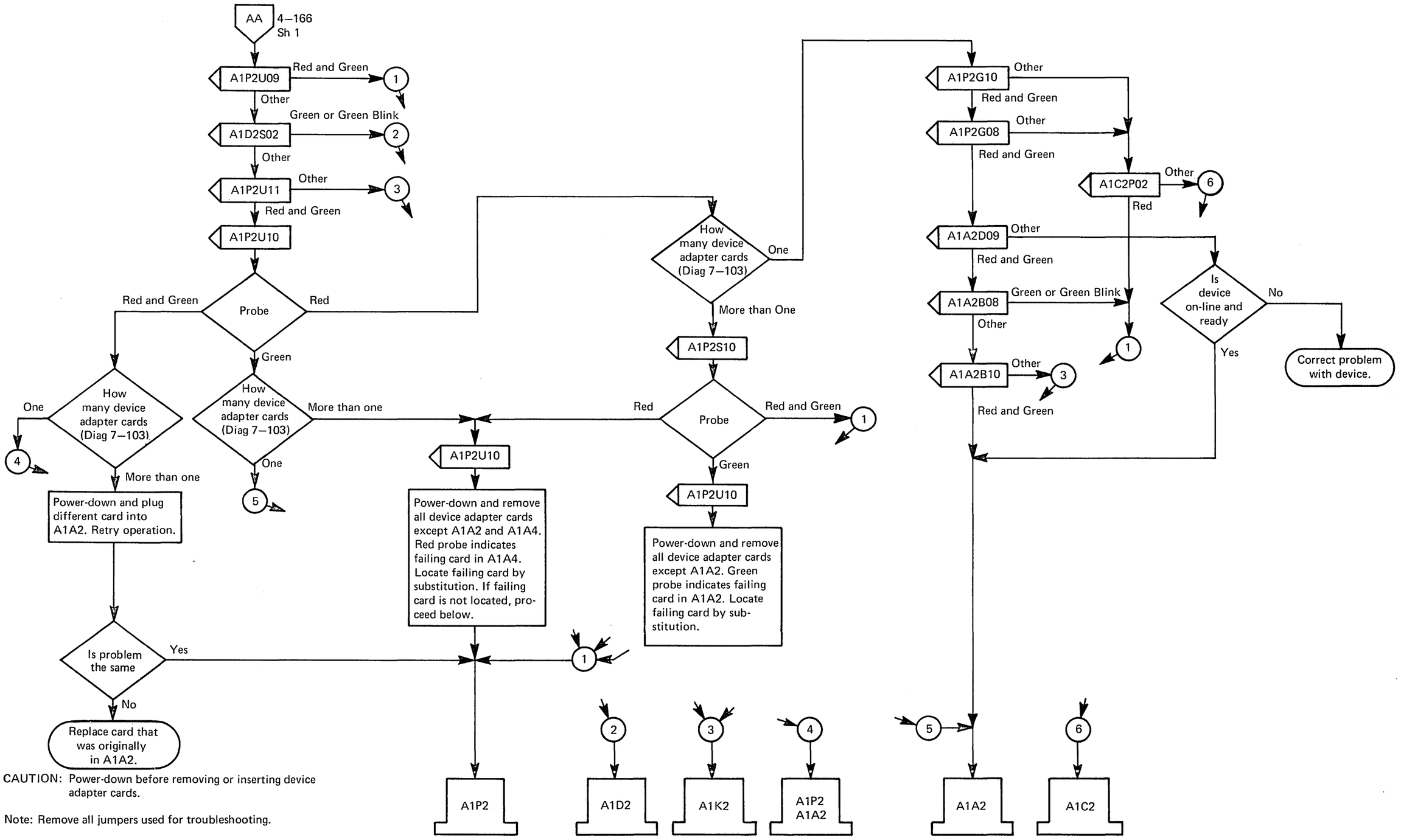
Diagram 4-165. EAU Command Fails to Erase All Unprotected Fields



Note: Remove all jumpers used for troubleshooting.

*Jumpered card. See old card or Diagram 6-101 for jumpering.

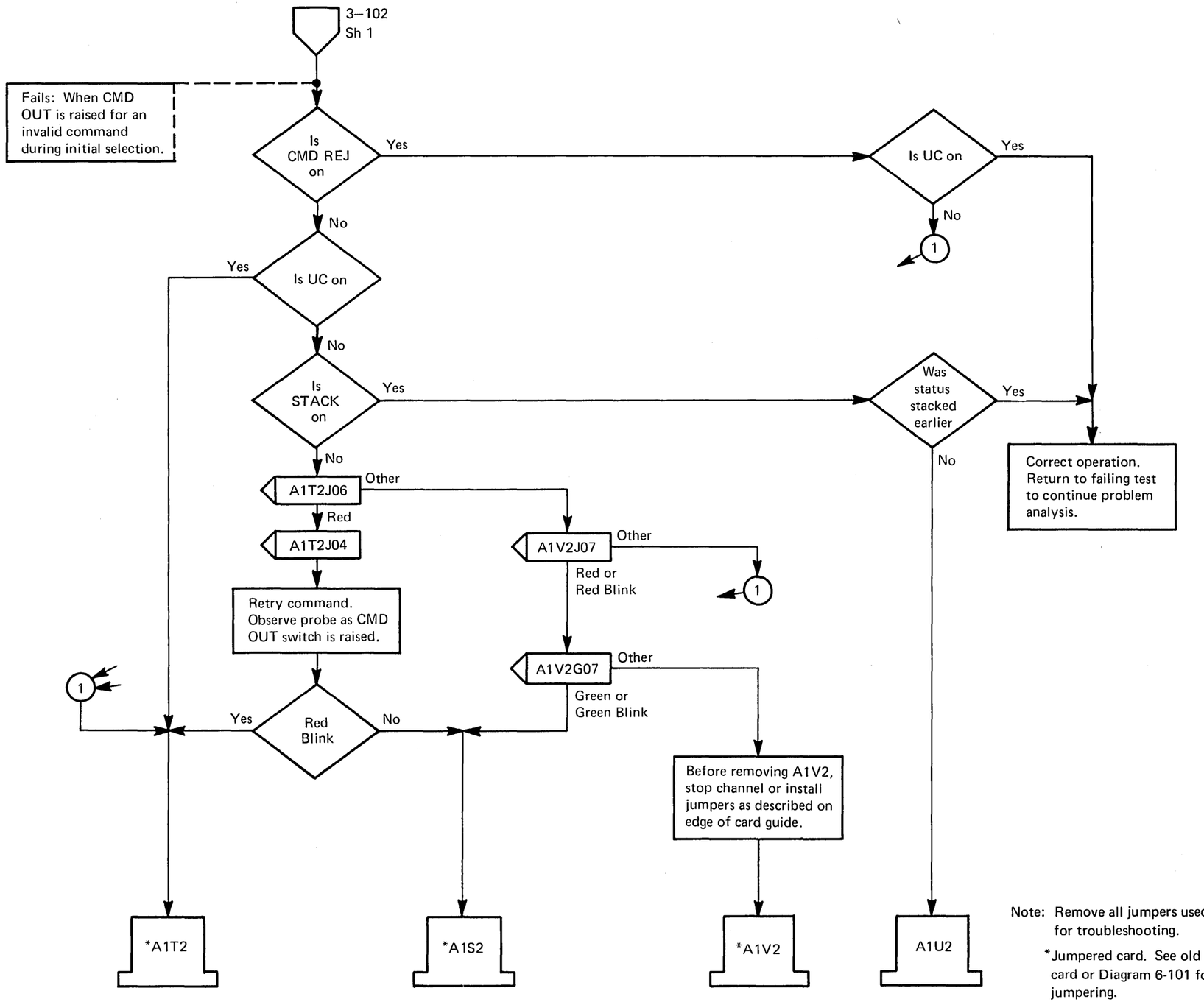
Diagram 4-166. Failure to Set Attention for Manual Interrupt (Sheet 1 of 2)



CAUTION: Power-down before removing or inserting device adapter cards.

Note: Remove all jumpers used for troubleshooting.

Diagram 4-166. Failure to Set Attention for Manual Interrupt (Sheet 2 of 2)



Note: Remove all jumpers used for troubleshooting.

*Jumpered card. See old card or Diagram 6-101 for jumpering.

Diagram 4-167. Unit Check or Command Reject Fails to Turn On

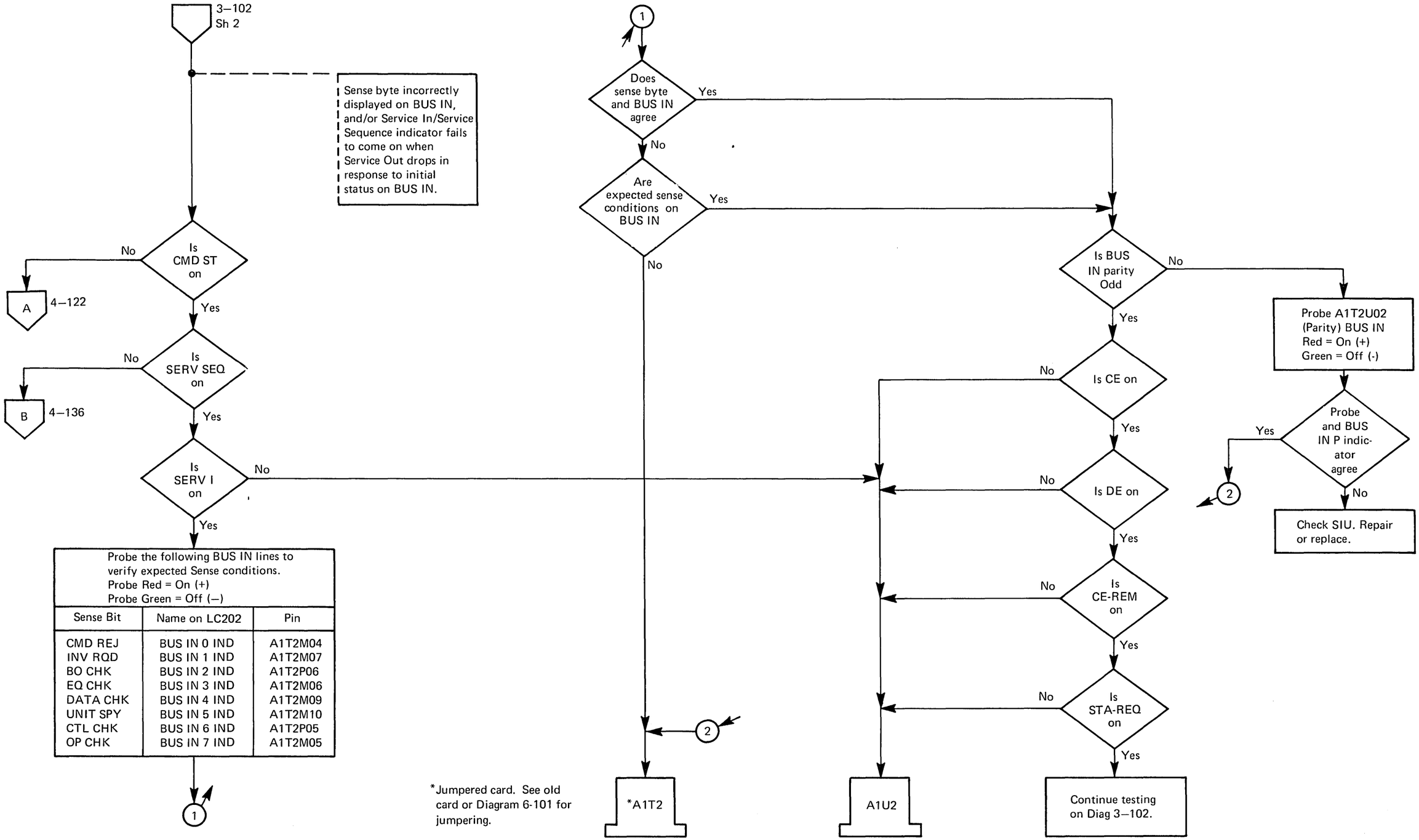


Diagram 4-168. Service In, Service Sequence, or Bus-In Data Failure with Sense Command

Data Path Probe Points Chart						
Probe Red = On (+), Probe Green = Off (-)						
Data→	BUS OUT switch inputs	BUS OUT	I/O REG	SHIFT REG	480 FET Buffer Output	1920 FET Buffer Output
Logic→ Pages	LC301	LC301	MP041 thru MP043	MP131	MP181	MP161
Bit 0	A1S2J02	A1S2J07	———	———	———	———
Bit 1	A1S2G04	A1S2G06	A1M2B11	A1N2J02	A1R5B08	A1Q5B08
Bit 2	A1S2B11	A1S2G07	A1M2M11	A1N2D05	A1R5B11	A1Q5B11
Bit 3	A1S2D13	A1S2G03	A1M2P13	A1N2B06	A1R5D11	A1Q5D11
Bit 4	A1S2B09	A1S2G02	A1M2P11	A1N2D07	A1R5D13	A1Q5D13
Bit 5	A1S2B10	A1S2J04	A1M2M13	A1N2B07	A1R5B13	A1Q5B13
Bit 6	A1S2B03	A1S2G05	A1M2G03	A1N2D06	A1R5D07	A1Q5D07
Bit 7	A1S2B07	A1S2J06	A1M2J07	A1N2G04	A1R5B05	A1Q5B05
Cursor	———	———	———	A1N2B04	A1R5B07	A1Q5B07
Control	———	———	———	A1N2D13	A1R5B09	A1Q5B09
Parity	———	———	———	A1N2B13	A1R5B06	A1Q5B06

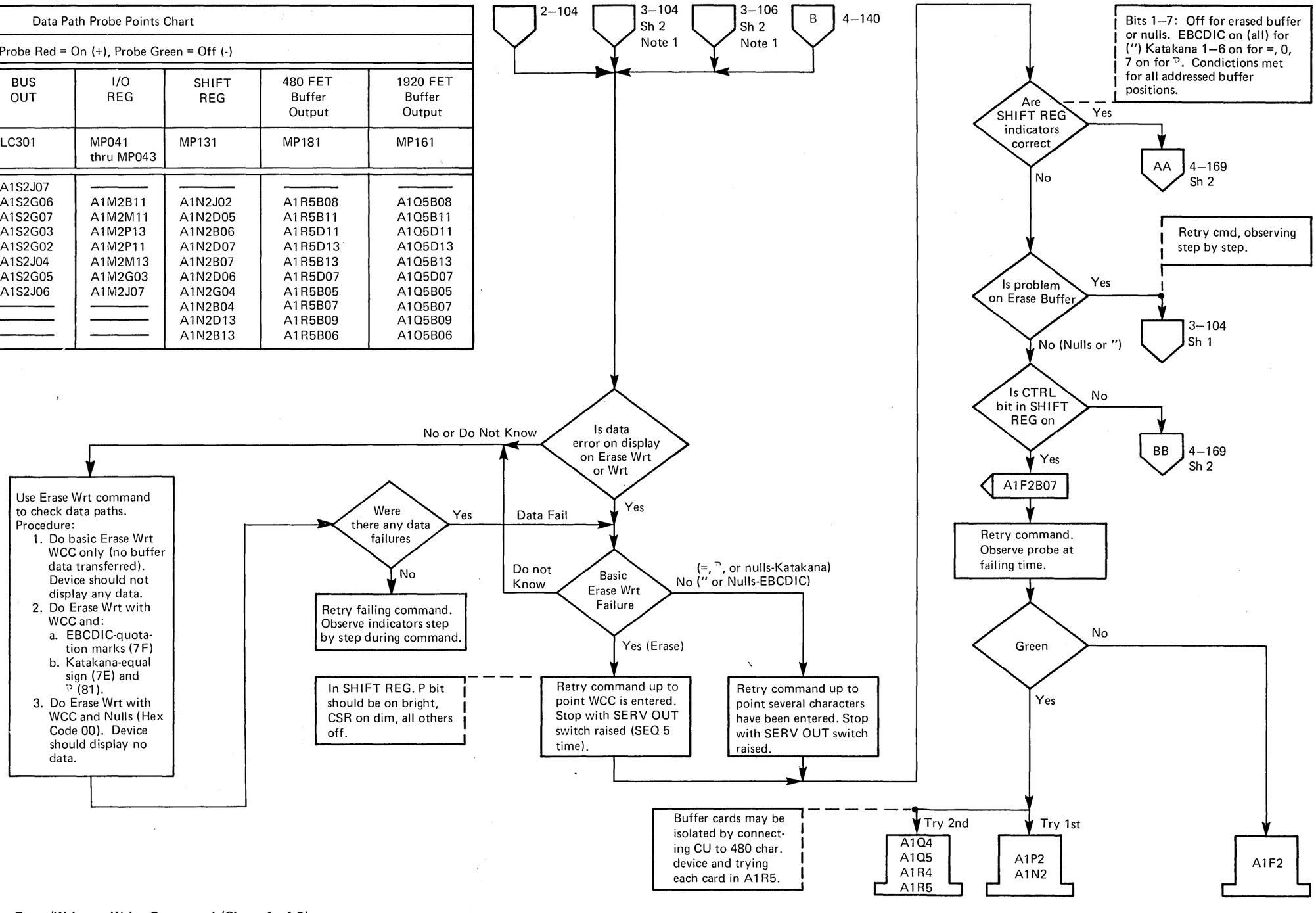


Diagram 4-169. Data Failure on Erase/Write or Write Command (Sheet 1 of 6)

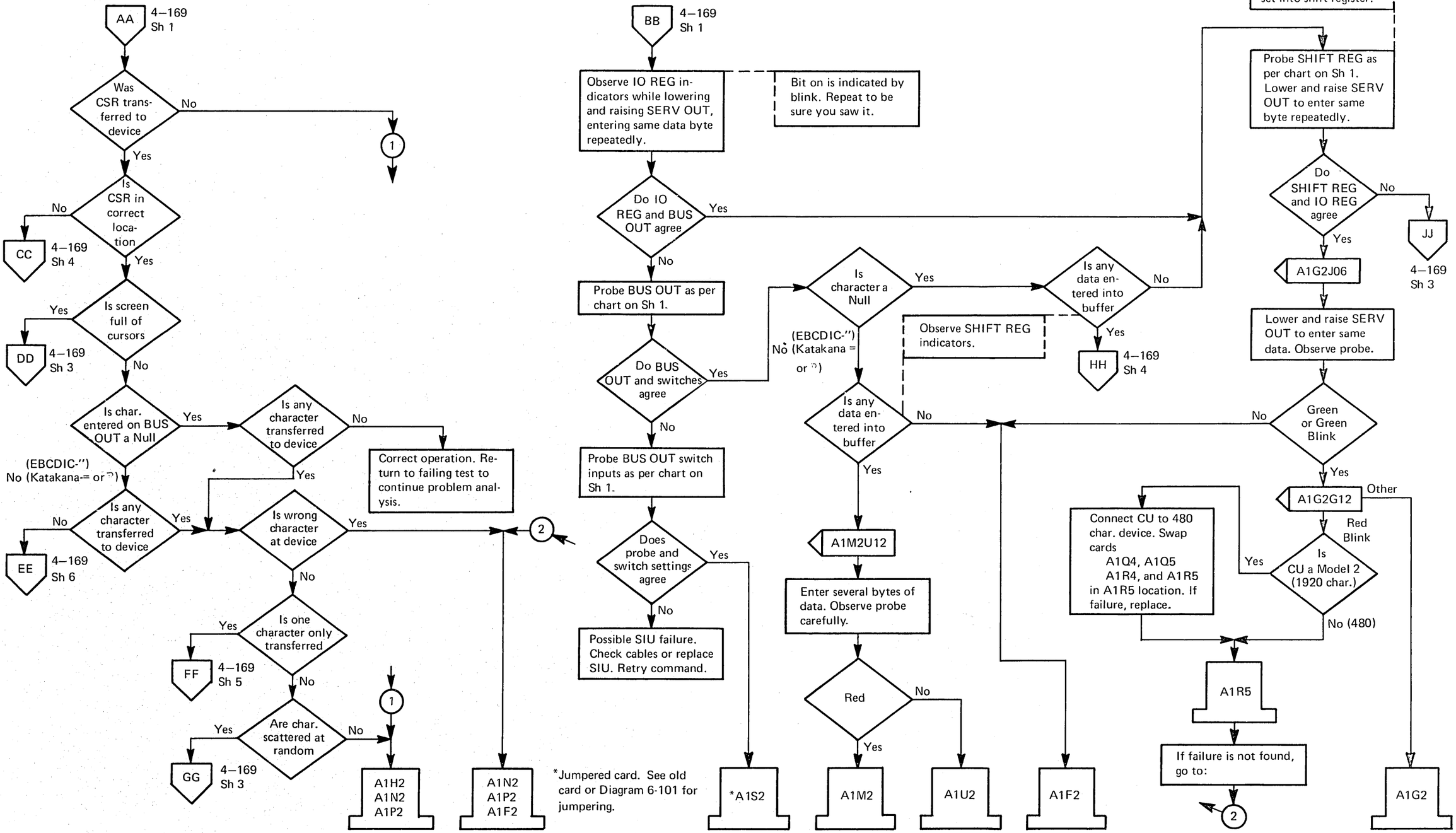


Diagram 4-169. Data Failure on Erase/Write or Write Command (Sheet 2 of 6)

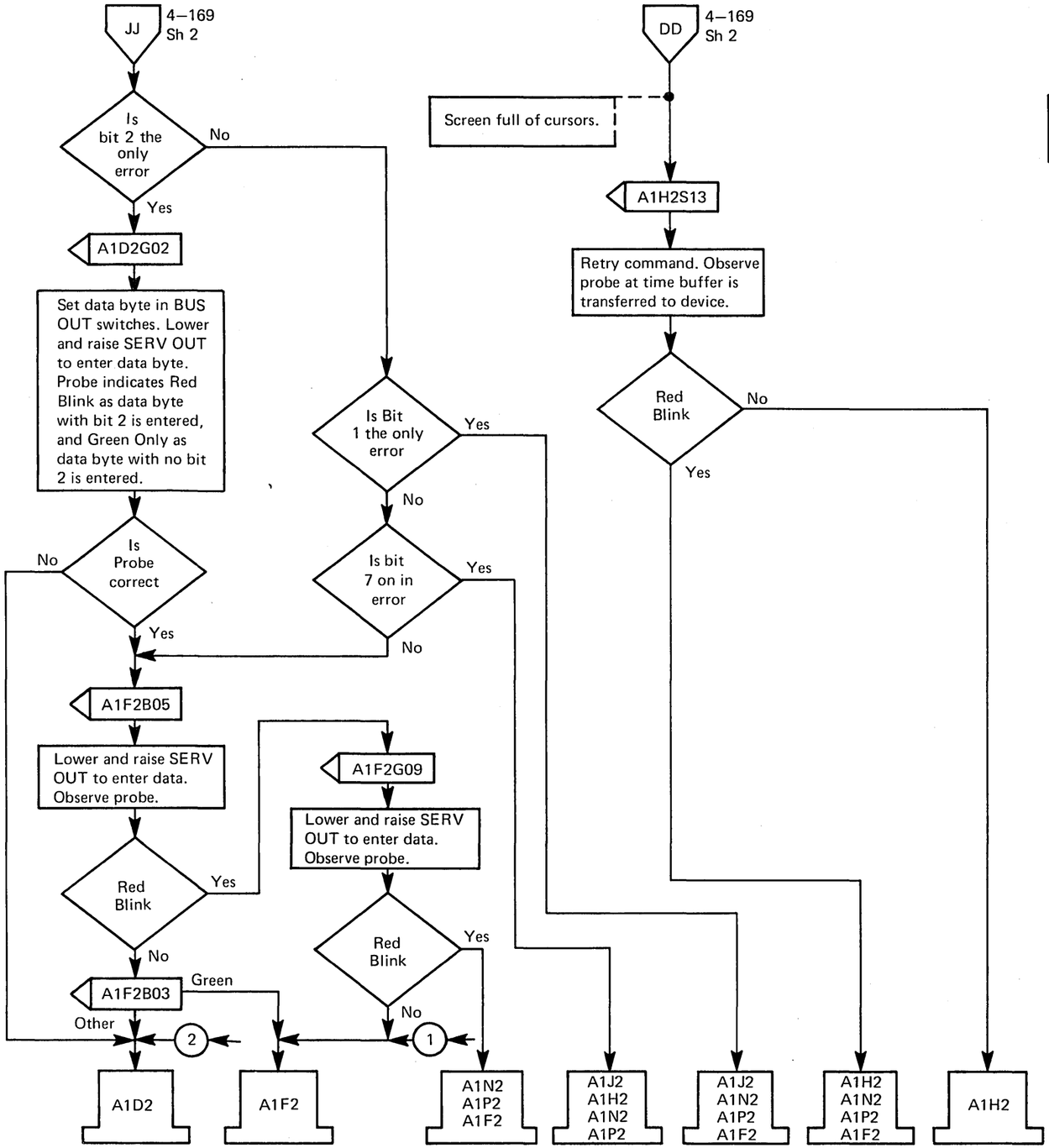


Diagram 4-169. Data Failure on Erase/Write or Write Command (Sheet 3 of 6)

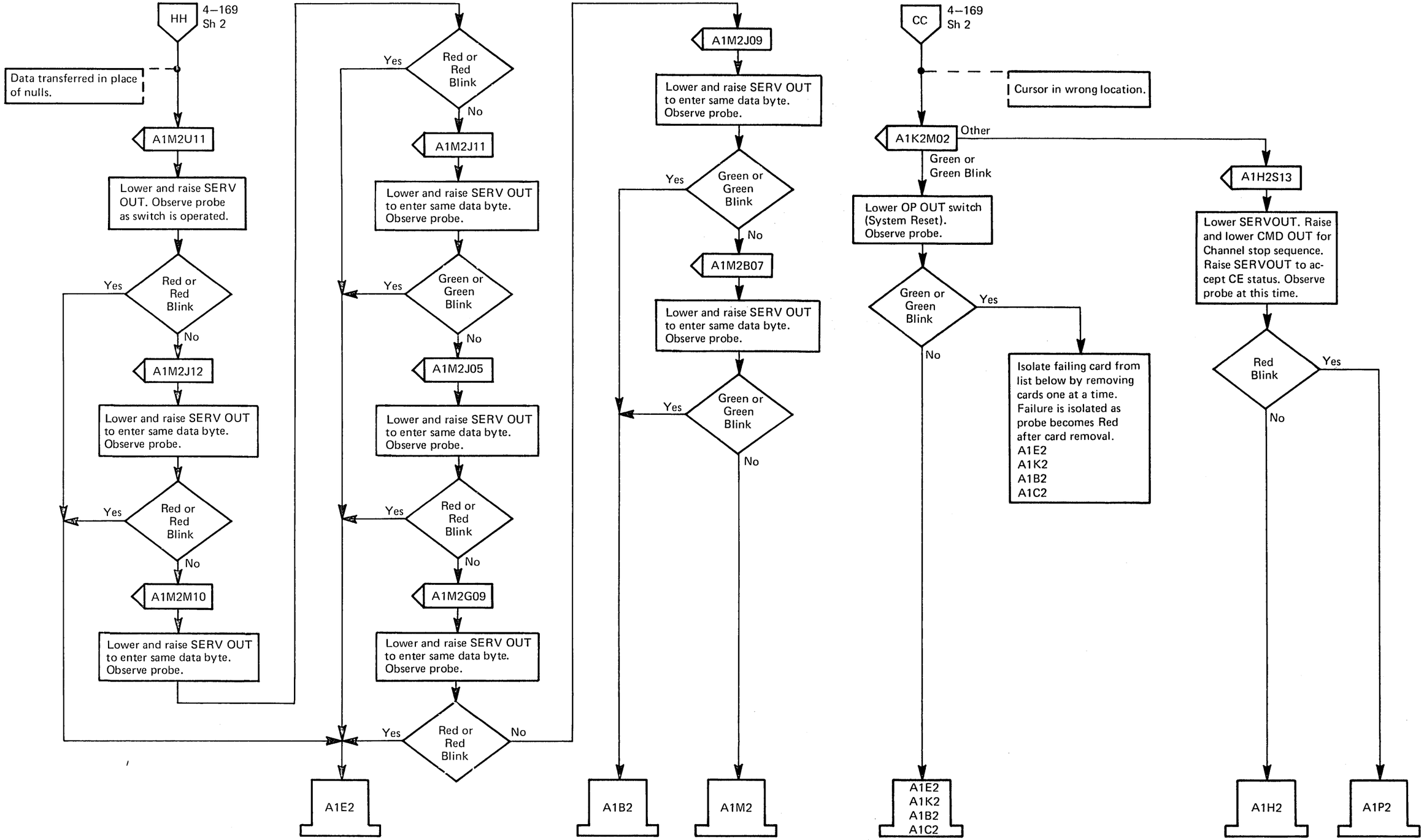


Diagram 4-169. Data Failure on Erase/Write or Write Command (Sheet 4 of 6)

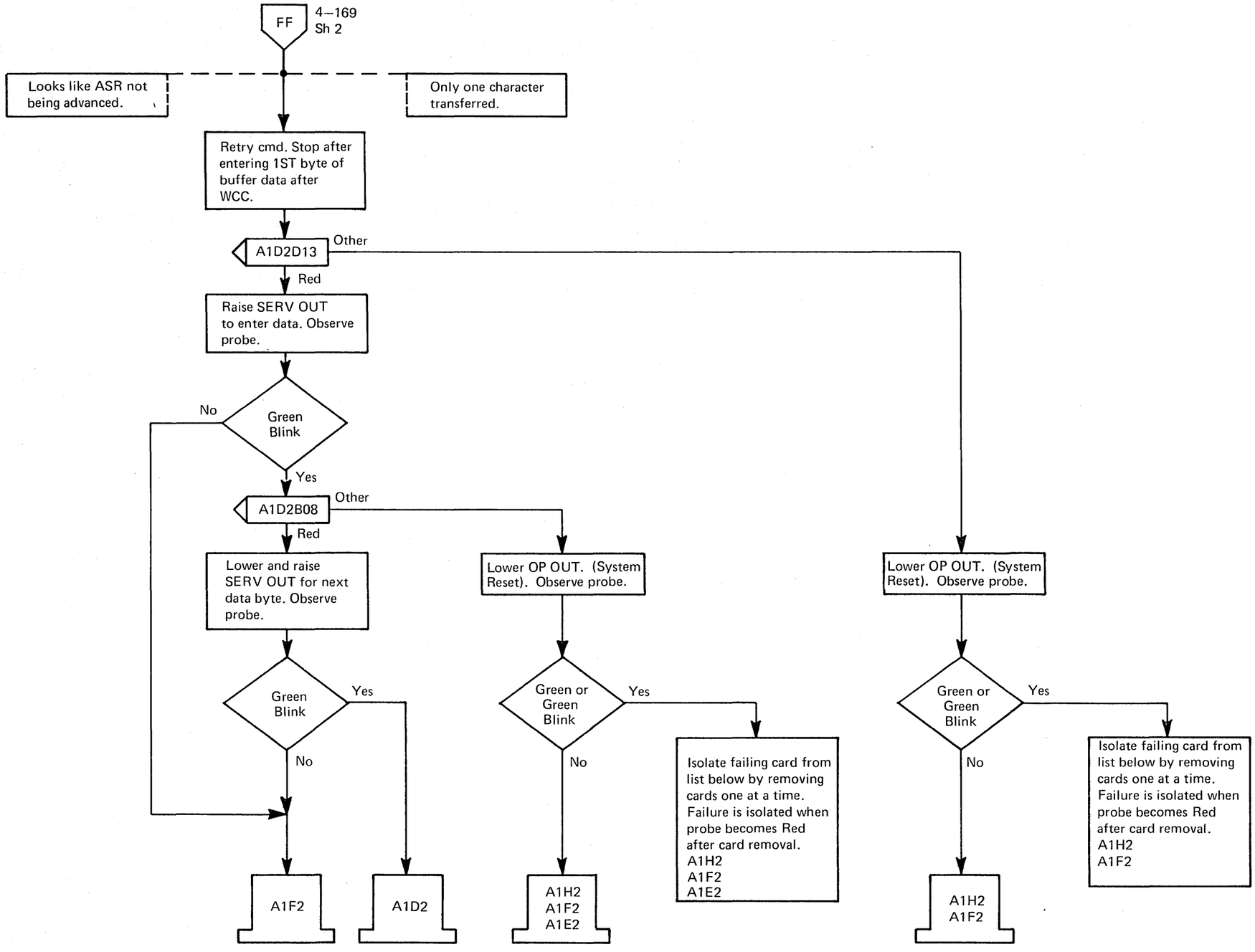


Diagram 4-169. Data Failure on Erase/Write or Write Command (Sheet 5 of 6)

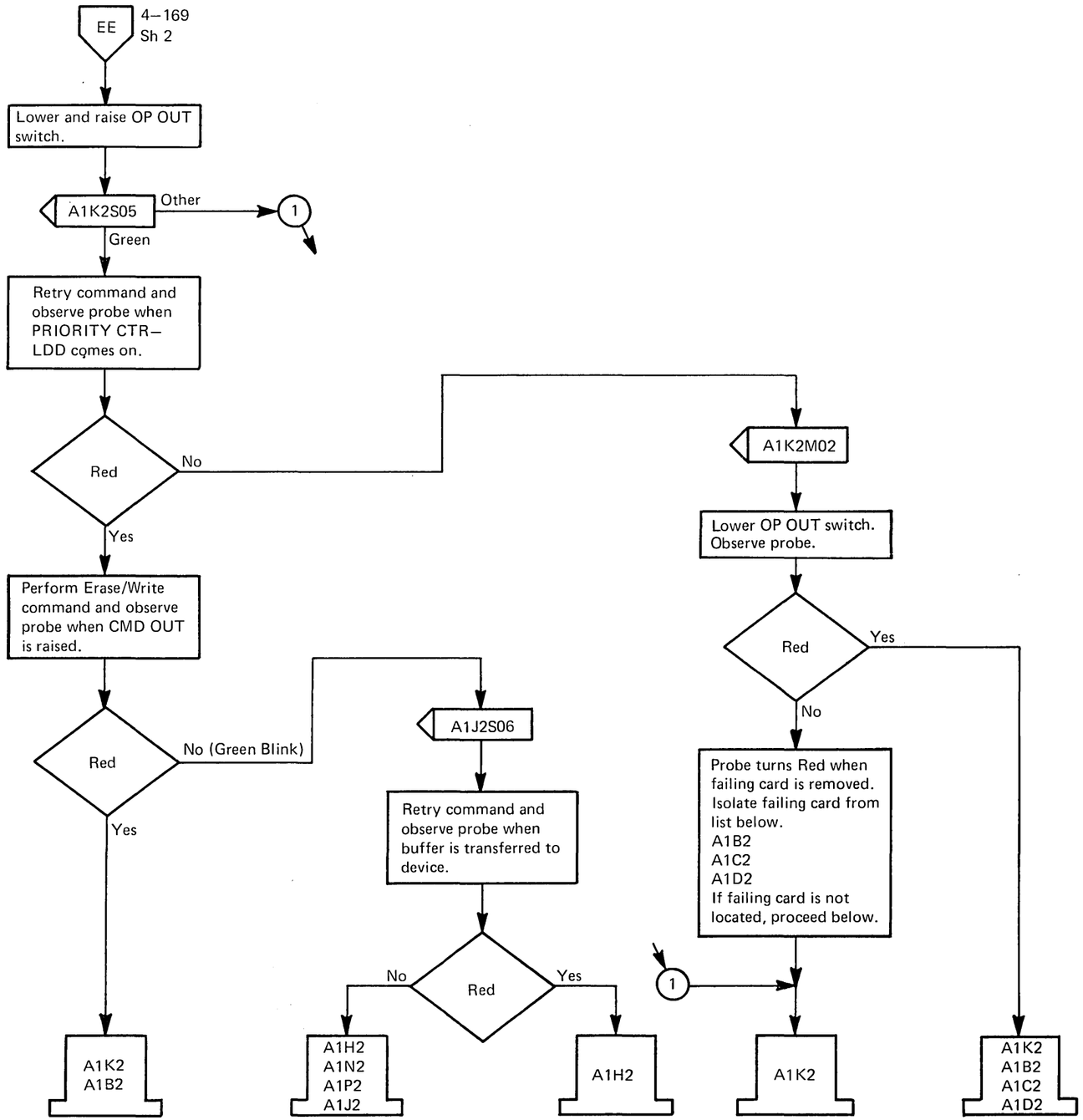


Diagram 4-169. Data Failure on Erase/Write or Write Command (Sheet 6 of 6)

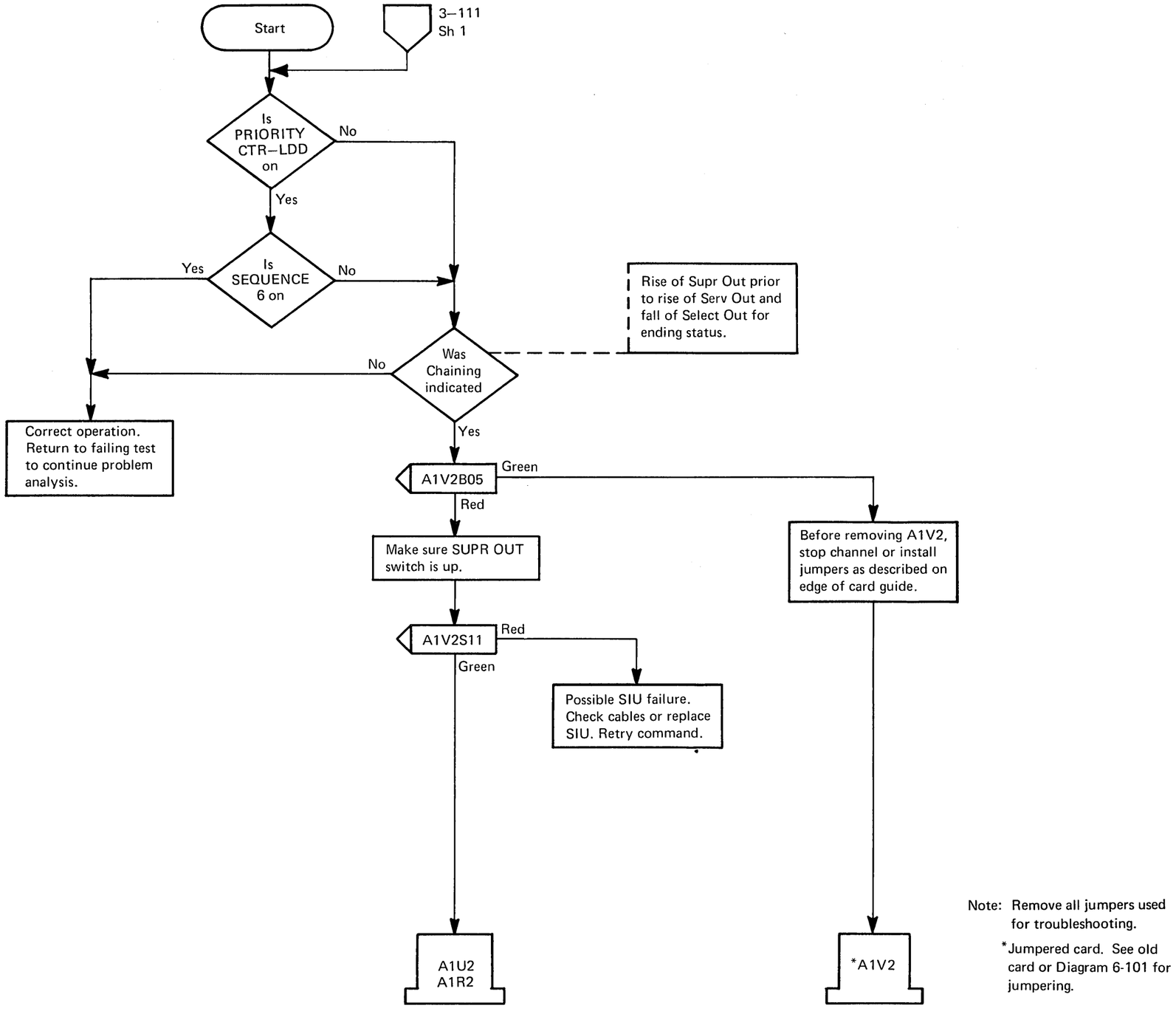
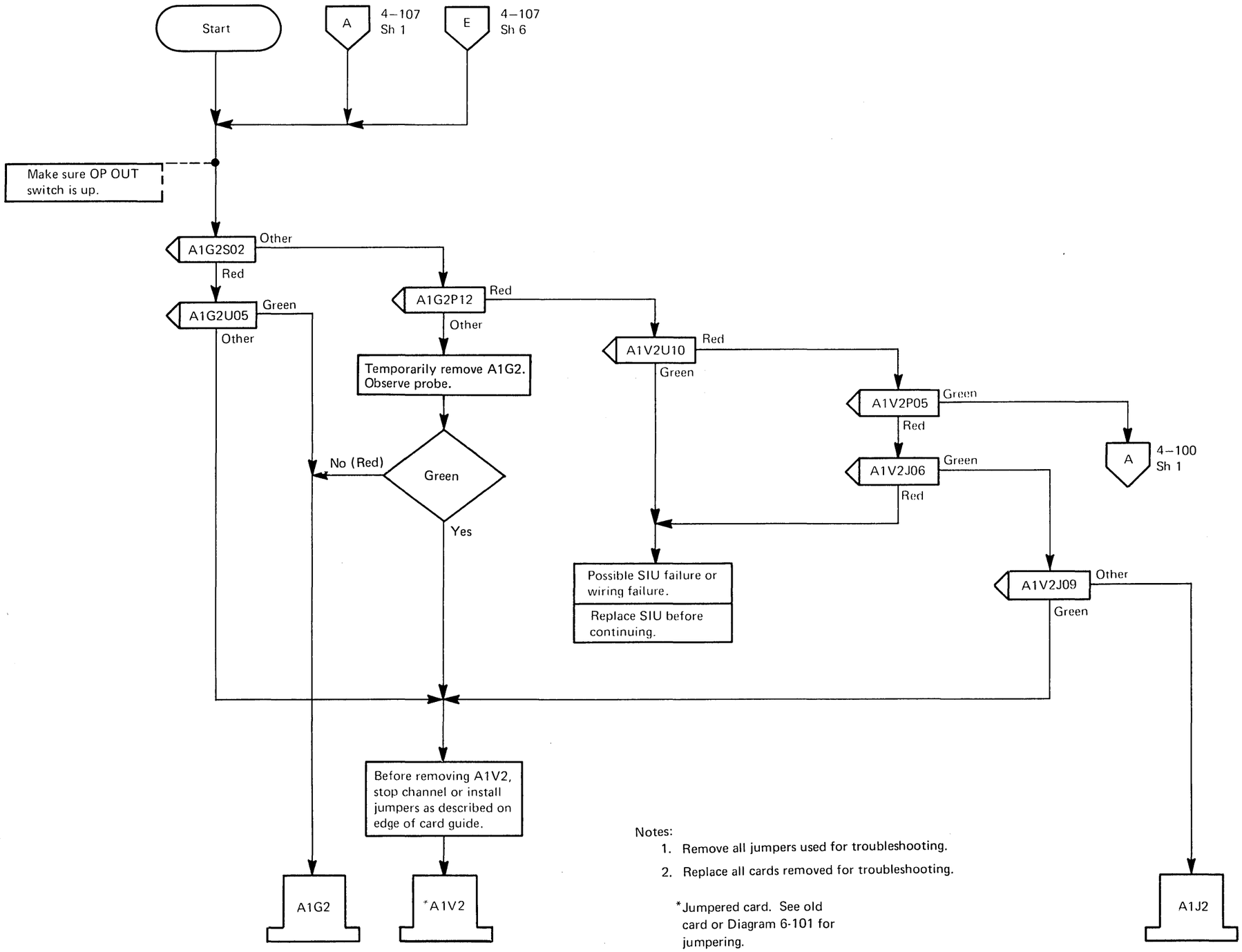


Diagram 4-170. Chaining Failure



Notes:

1. Remove all jumpers used for troubleshooting.
2. Replace all cards removed for troubleshooting.

*Jumpered card. See old card or Diagram 6-101 for jumpering.

Diagram 4-171. Incorrect CU Reset

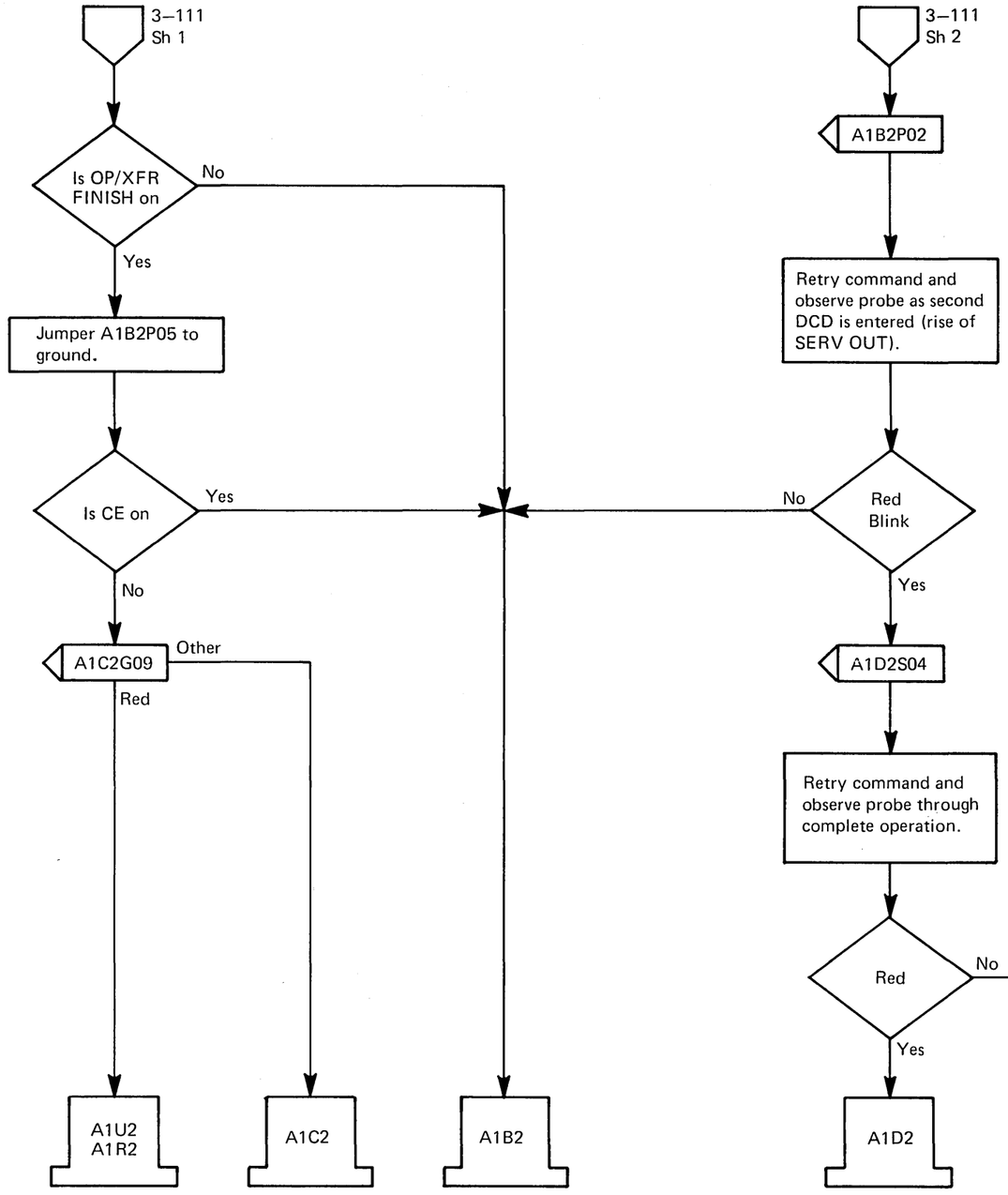
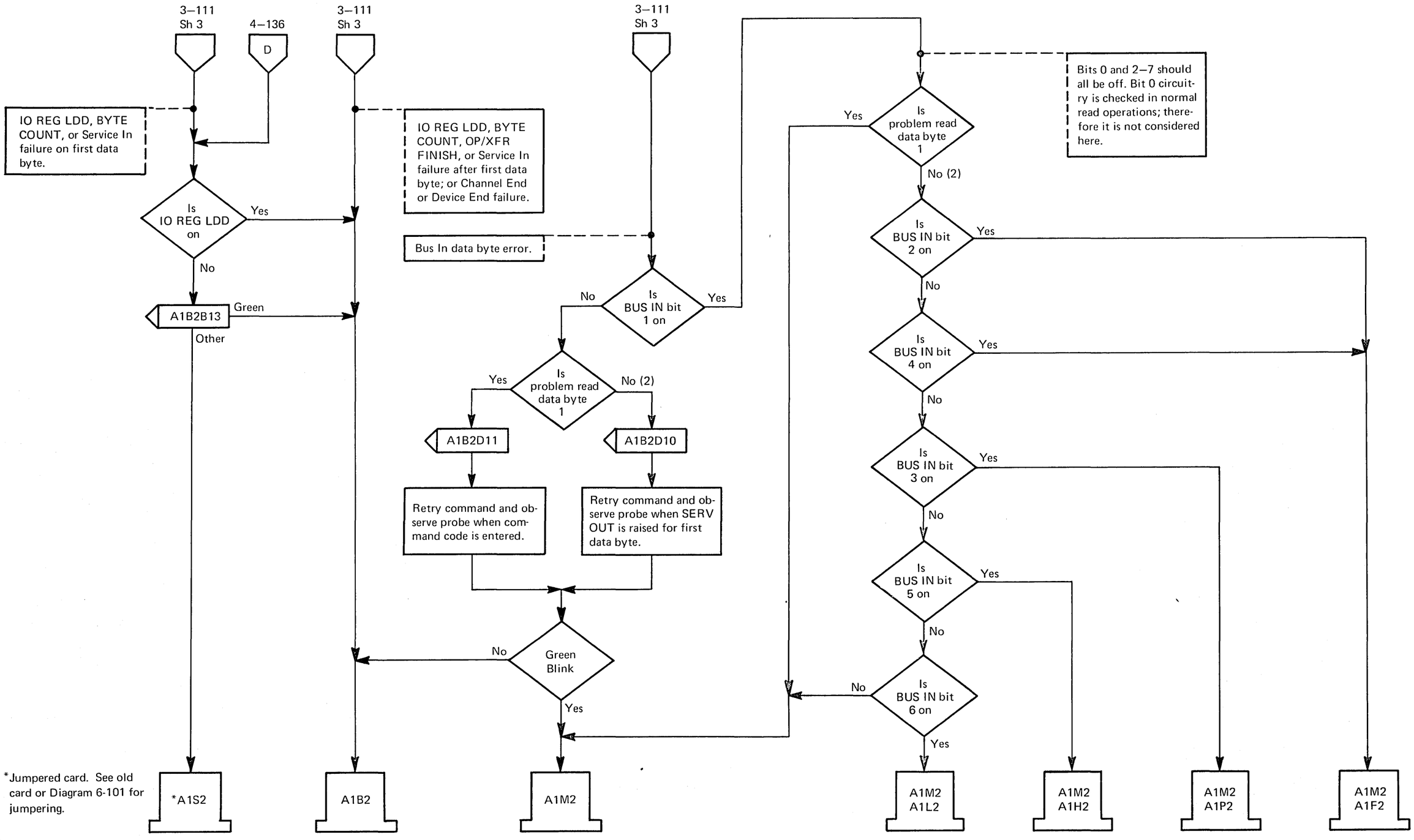


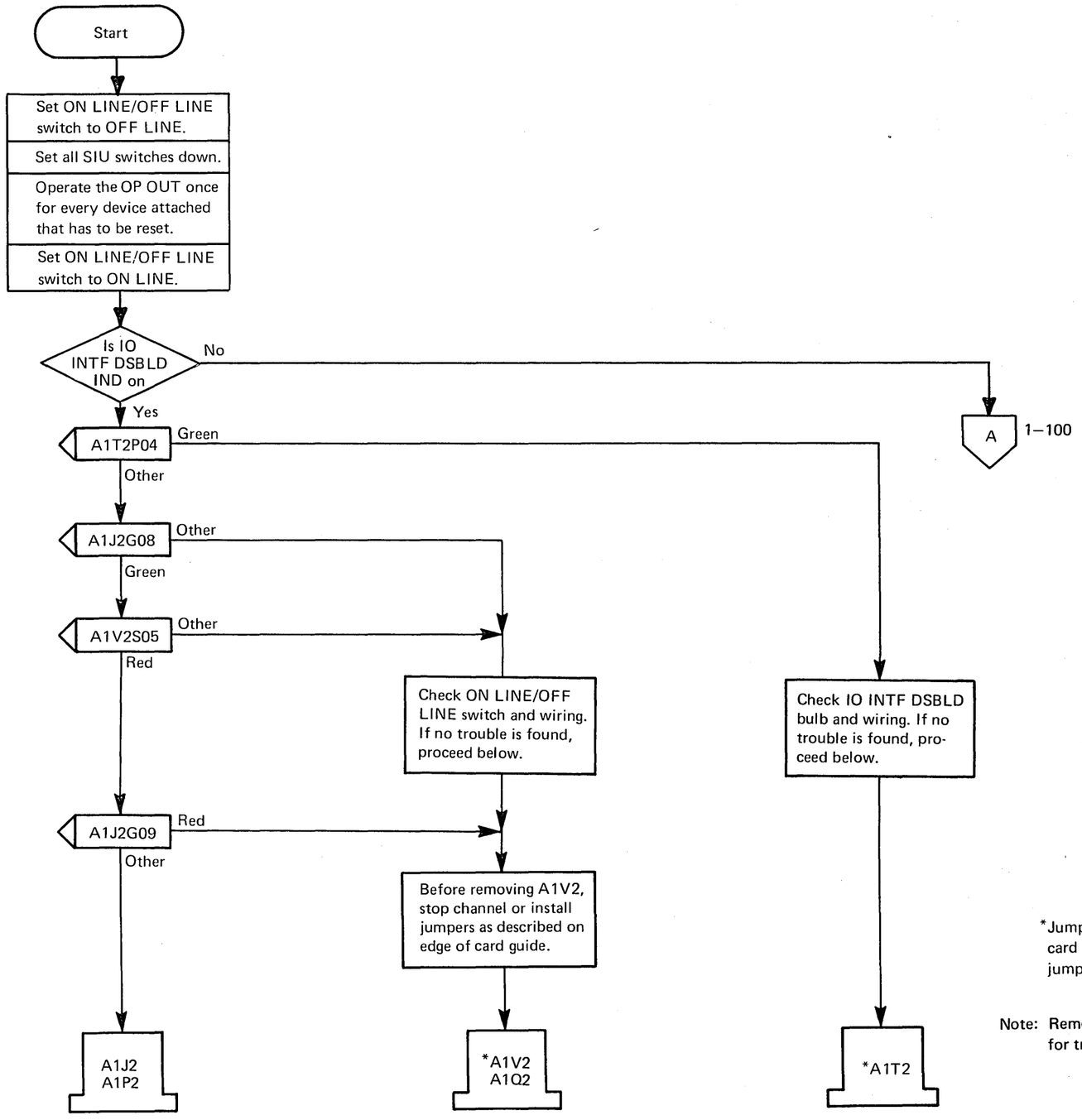
Diagram 4-172. Diagnostic Write Failure

Note: Remove all jumpers used for troubleshooting.



*Jumpered card. See old card or Diagram 6-101 for jumpering.

Diagram 4-173. Diagnostic Read Failure



*Jumpered card. See old card or Diagram 6-101 for jumpering.

Note: Remove all jumpers used for troubleshooting.

Diagram 4-174. IO INTF DSBLD Indicator Fails to Turn OFF

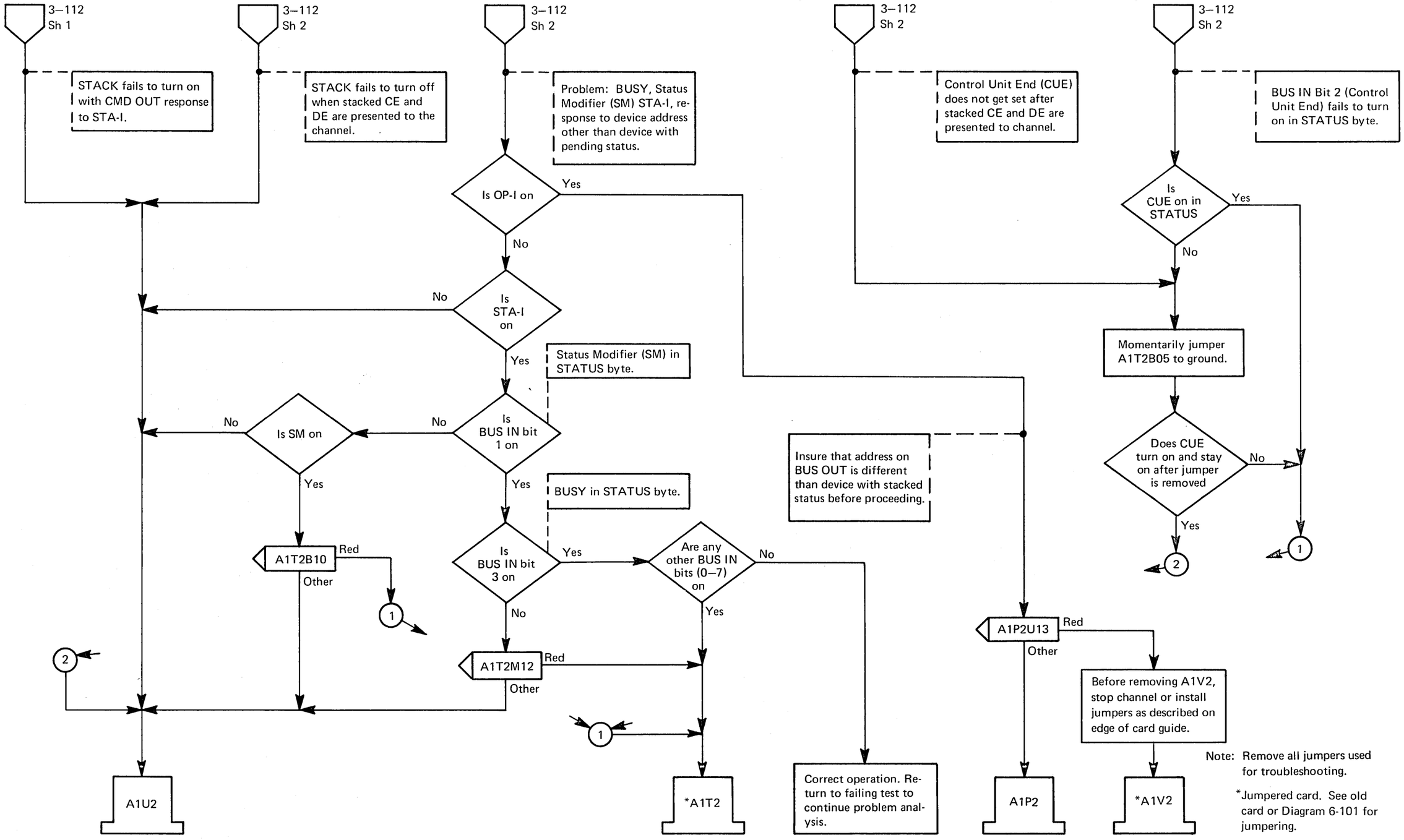
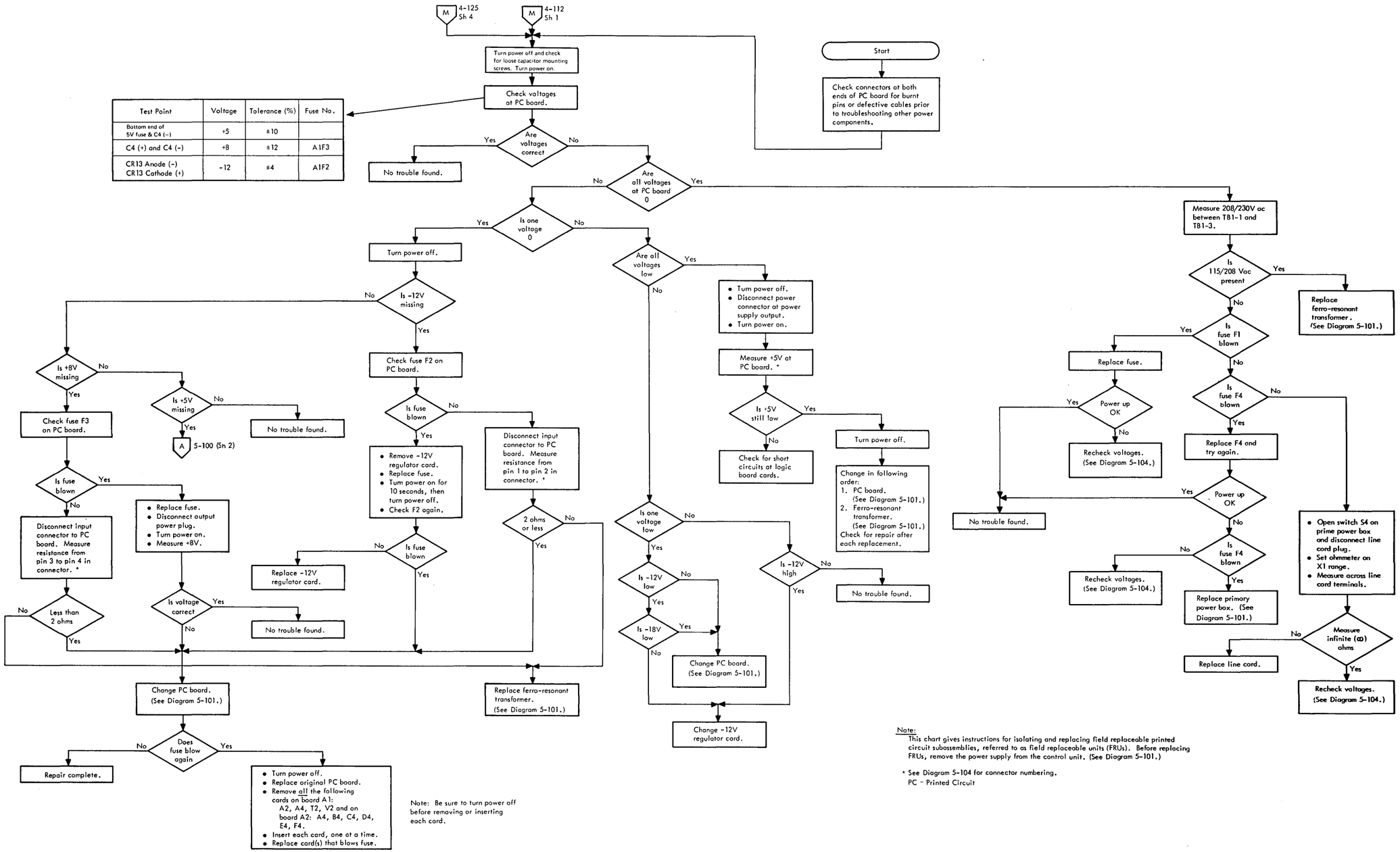


Diagram 4-175. Stack Status or CU Busy Failure

Section 5. Power Supply Maintenance

For ease of reference, all power supply maintenance is consolidated in this Section. Diagram 5-100 is a trouble-shooting flowchart for power supply problems. Diagram 5-101 describes removal, replacement, and check procedures. Diagrams 5-102 and 5-103 show component locations. Diagram 5-104 describes the printed circuit board.



Note: Be sure to turn power off before removing or inserting each card.

Note:
This chart gives instructions for isolating and replacing field replaceable printed circuit subassemblies, referred to as field replaceable units (FRUs). Before replacing FRUs, remove the power supply from the control unit. (See Diagram 5-101.)

* See Diagram 5-104 for connector numbering.
PC - Printed Circuit

Diagram 5-100. Power Supply Troubleshooting Flowchart (Sheet 1 of 2)

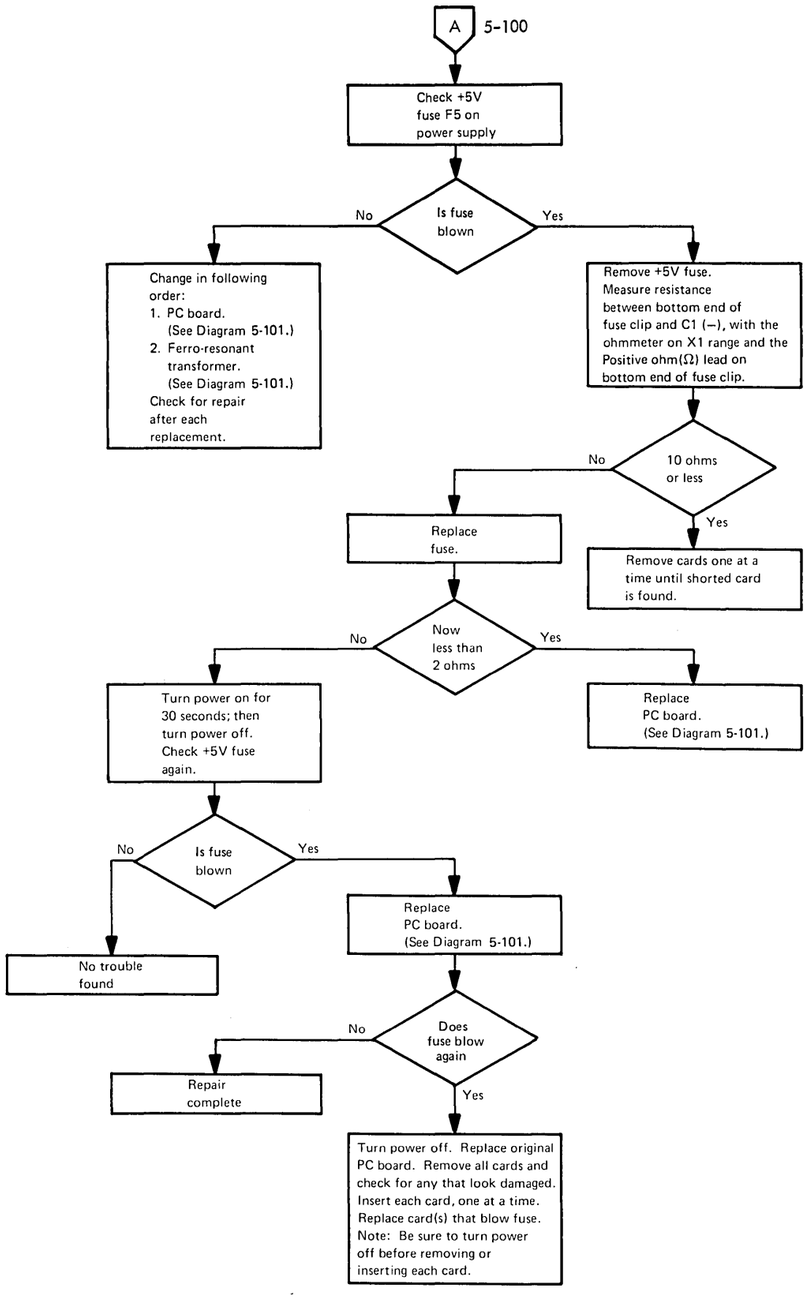


Diagram 5-100. Power Supply Troubleshooting Flowchart (Sheet 2 of 2)

DANGER
All power component removal and replacement procedures must be performed with the power turned off and the power cord removed from the wall socket.

The entire power supply can be removed from the machine by taking out two screws, unplugging the dc output connector from the supply, removing the wire nuts connecting fuse F5, and then unplugging the remote power control cable.

CAUTION
To prevent accidental dislodging of the power supply from its fixed vertical position, be sure to reinsert and tighten the three mounting screws when replacing or returning the power supply to its fixed position.

The total weight of the power supply does not exceed 20 pounds. Within the power supply, the prime power box, ferroresonant transformer assembly, PC board assembly, -12V regulator card, and fuses are individual field-replaceable units (FRUs). The power supply can be rotated to a horizontal position without unplugging it or removing it from the unit for access to fuses and regulator card adjustment. Removal of FRUs is most easily accomplished if the power supply is removed from the machine.

Fuses (FRUs)

The primary fuses are removed from the front of the prime power box assembly (A3). The secondary fuses are removed from either side of the printed circuit board (A1).

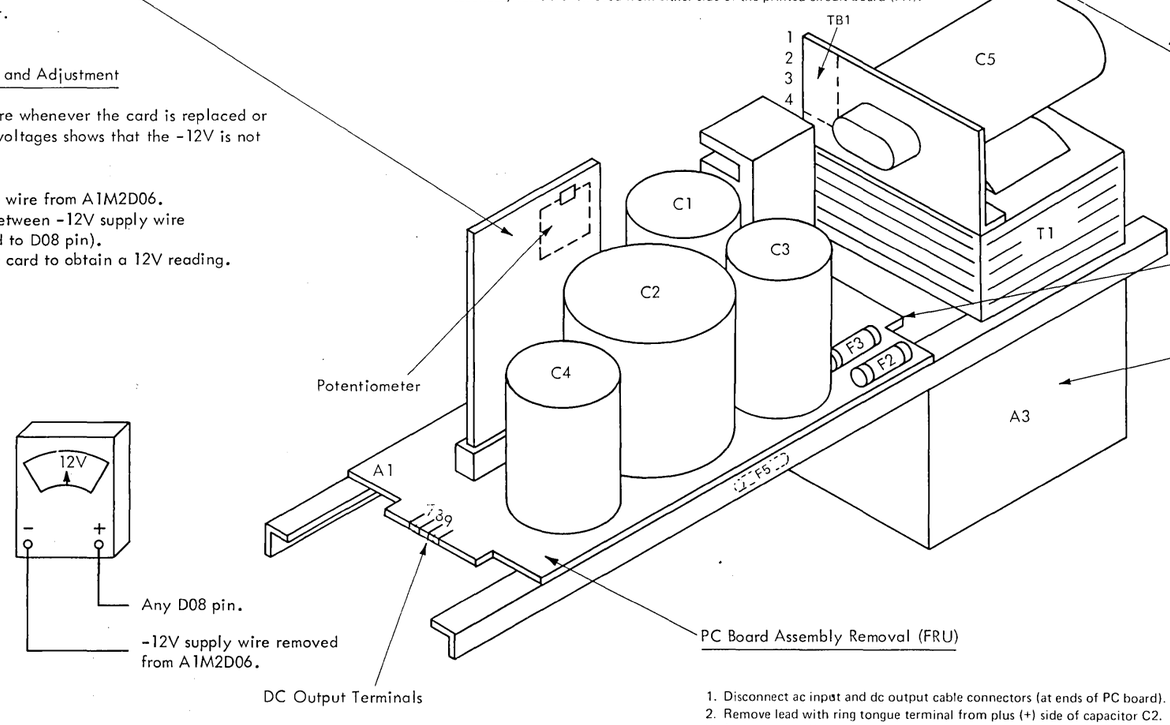
-12V Regulator Card Removal (FRU)

1. Move card-retaining clip aside (not shown).
2. Pull card from socket.
3. Replace in reverse order.
4. Check and adjust.

-12V Regulator Card Check and Adjustment

Note: Perform this procedure whenever the card is replaced or when a check of operating voltages shows that the -12V is not at its nominal value.

1. Disconnect -12V supply wire from A1M2D06.
2. Connect dc voltmeter between -12V supply wire and any D08 pin (+ lead to D08 pin).
3. Adjust potentiometer on card to obtain a 12V reading.



Ferroresonant Transformer Assembly Removal (FRU)

1. Disconnect primary wires from TB1. (Record their connections.)
2. Disconnect ac input cable connector.
3. Remove four 8-32 mounting nuts.
4. Replace in reverse order.

Ferroresonant Transfer Assembly (C5, T1, TB1)

AC Input Terminals

Prime Power Box Removal (FRU)

1. Disconnect ac input cable connector.
2. Disconnect primary wires from TB1. (Record their connections.)
3. Remove wire No. 3 from terminal B of fuse F5.
4. Remove four self-tapping screws.
5. Replace in reverse order.

PC Board Assembly Removal (FRU)

1. Disconnect ac input and dc output cable connectors (at ends of PC board).
2. Remove lead with ring tongue terminal from plus (+) side of capacitor C2.
3. Remove ten self-tapping screws.
4. Replace in reverse order.

Legend:

A = Assembly
C = Capacitor
F = Fuse
FL = Line Filter
PC = Printed Circuit
S = Switch
T = Transformer
TB = Terminal Board

Diagram 5-101. Power Supply Removal, Replacement, and Adjustment Procedures

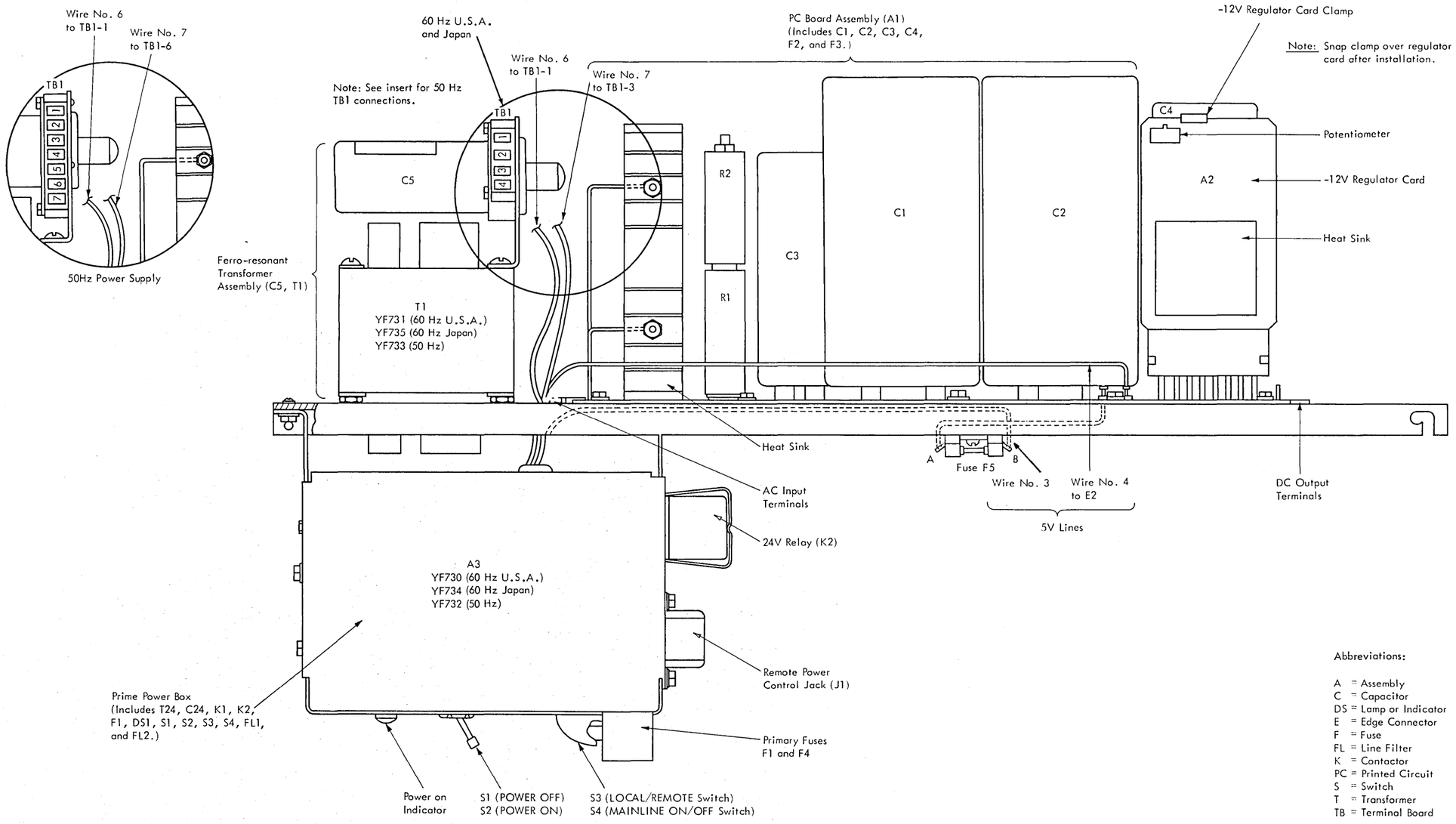
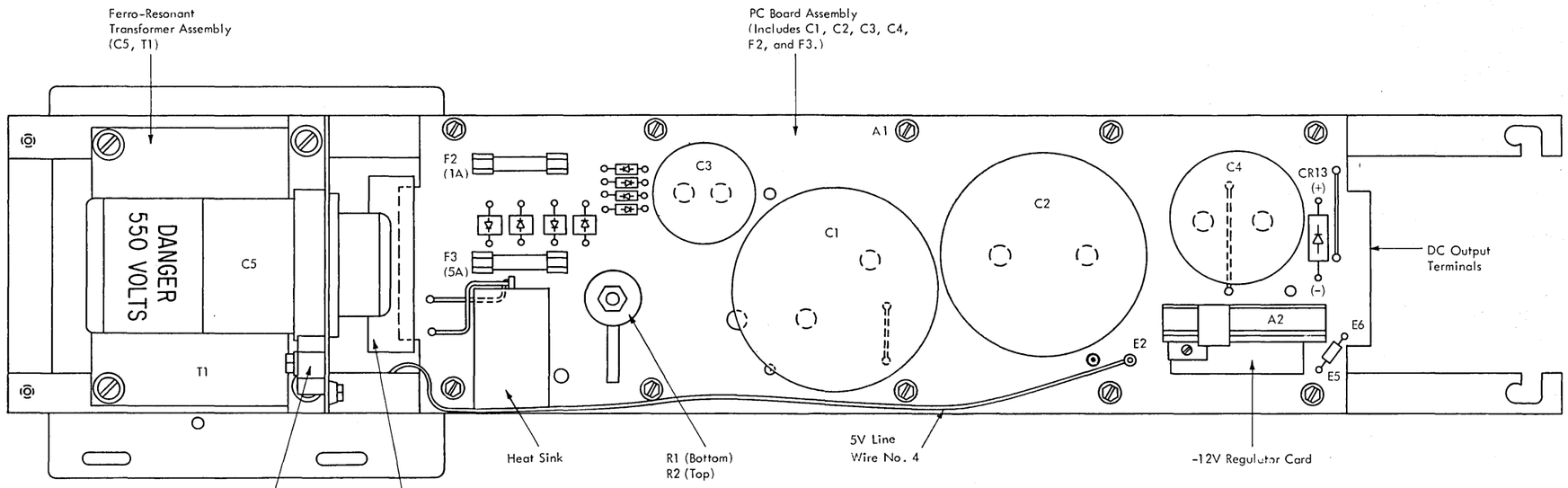


Diagram 5-102. Power Supply Component Locations (Side View)

Abbreviations:

A = Assembly
C = Capacitor
DS = Lamp or Indicator
E = Edge Connector
F = Fuse
FL = Line Filter
K = Contactor
PC = Printed Circuit
S = Switch
T = Transformer
TB = Terminal Board

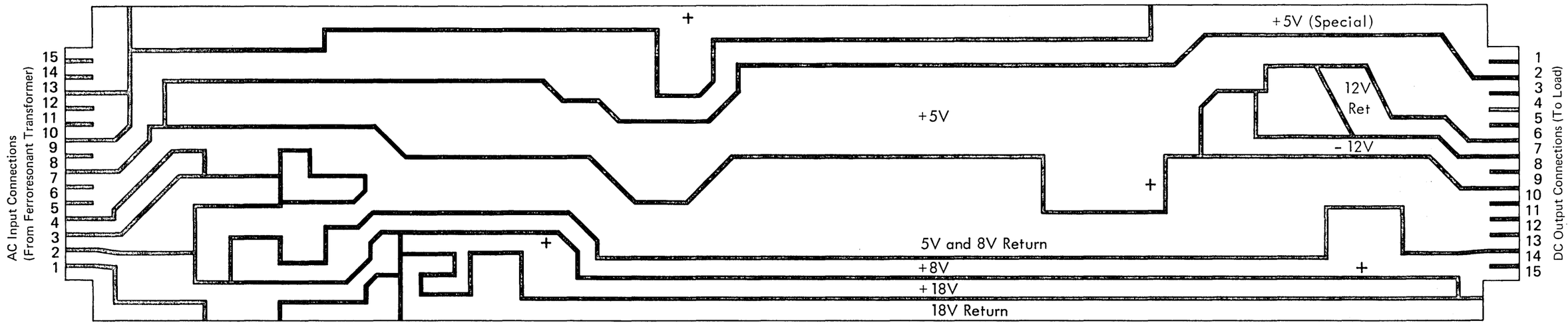


TB1	Transformer Secondary Connector (AC Input Connector)

Abbreviations:

A = Assembly
C = Capacitor
E = Edge Connector
F = Fuse
PC = Printed Circuit
T = Transformer
TB = Terminal Board

Diagram 5-103. Power Supply Component Locations (Top View)



Land Pattern Side

Voltage	Output Connections	Wire No.
+5 (Special)	1	1
	2	Not Used
+5	3	3
	4	4
	5	5
	6	6
12 Return	7	7
-12	8	8
	9	9
5 and 8 Return	10	10
	11	11
	12	12
	13	13
+8	14	14
	15	15

Diagram 5-104. Low-Voltage Printed Circuit Board Layout

Section 6. Installation Procedure

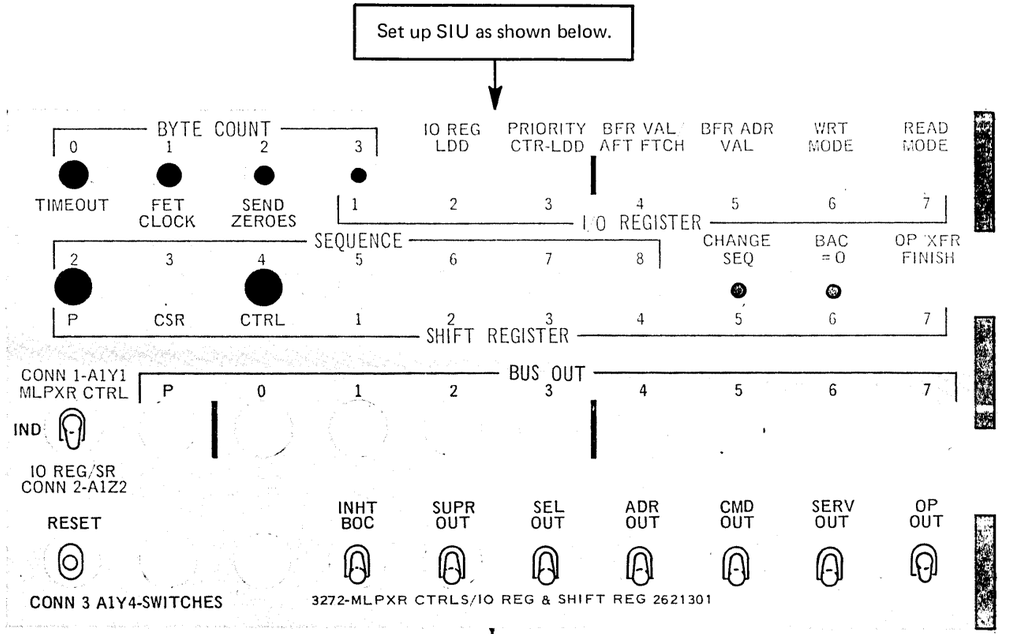
PREREQUISITES

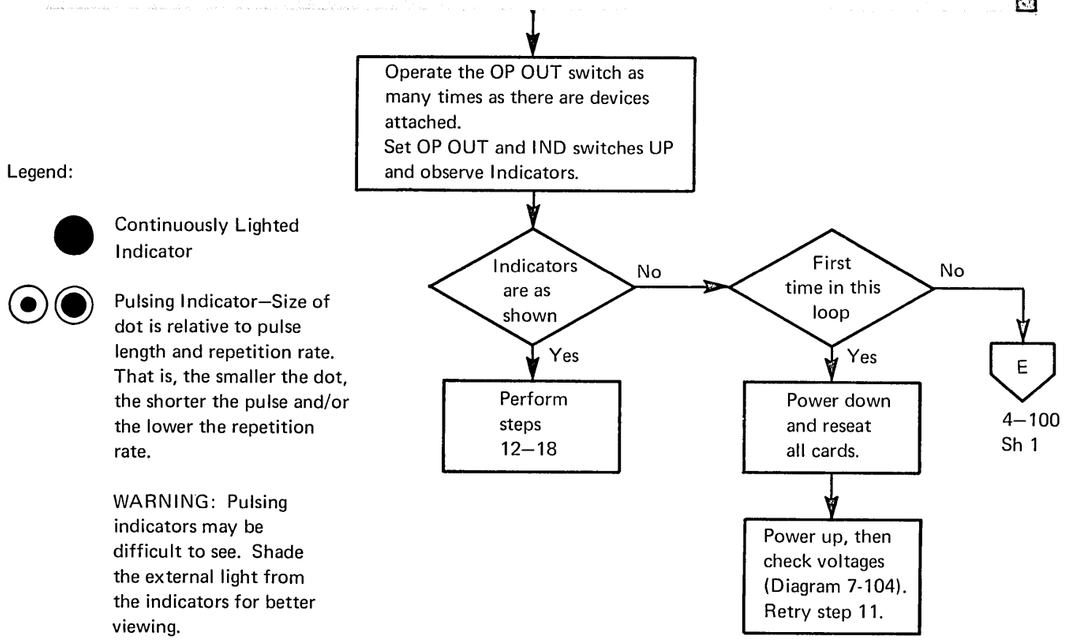
1. Insure that latest technical bulletins have been reviewed before starting installation.
2. Insure that Switch Indicator Unit (SIU) and Logic Probe are available on installation site.
3. Verify that 3270 OLTs have been properly included in the System OLT library.
4. Check Address Priority Mode.
5. Check CPU Channel Unit Control Word (UCW). Plug card for proper jumpering.

PROCEDURE

1. Check Machine History documentation with the customer so that the 3272 features and power match what the customer has ordered.
2. Carefully move CU to assigned floor location and remove packing material.
3. Lift and remove front cover. Check for loose cards.
4. Set ON LINE/OFF LINE switch to OFF LINE and REMOTE/LOCAL switch to LOCAL (Diagram 7-102).
5. Open logic gate.
6. Connect the address, priority, and operational mode jumpers required for system attachment. Refer to Diagram 6-101 for plugging reference and Diagram 7-106 for address assignment reference.
7. Check that transformer connections are correct for line voltage that is to be used. Refer to ALD YF730, 731 (USA 60 Hz); YF822, 823 (WTC 50 Hz); or YF734, 735 (Japan 60 Hz).

   CAUTION
   3272 CUs may appear to operate correctly for a time with transformer connections not matching line voltage.
8. Connect ac power cable and EPO cable. If EPO cable is not connected, the EPO plug in the 3272 must be jumpered before power can be brought up.
9. Set LOCAL MODE ON switch to ON. If unit does not power up, refer to Diagram 5-100.
10. Perform switch/indicator unit checkout (paragraph 7.7.3).
11. Connect one device cable and perform system reset:
12. Perform Test I/O command (Diagram 3-101).
13. Perform No Op command (Diagram 3-100).
14. Perform basic erase-write operation (Diagram 2-100).
15. Check plugging of address jumpers by performing an initial selection to the lowest and highest address available. Use only Sheet 1 of Diagram 3-100 for this check. Observe the BUS OUT indicators to assure that the correct device address appears.
16. Connect the bus and tag cables at the I/O panel (Diagram 6-100).
17. Connect all device cables and run CHK and KEY OLTs. OLT writeups can be found in the 3270 Display System On Line Tests (LOCAL) Form No. D99-3270A.
18. If CHK and KEY OLTs run error-free, the 3272 installation is complete. Fill out all appropriate forms and notify the Branch Office.

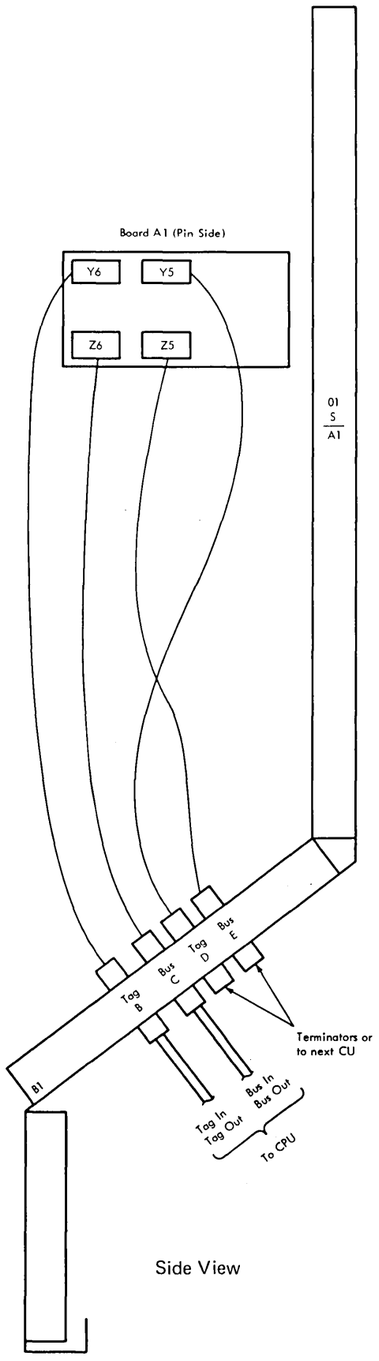




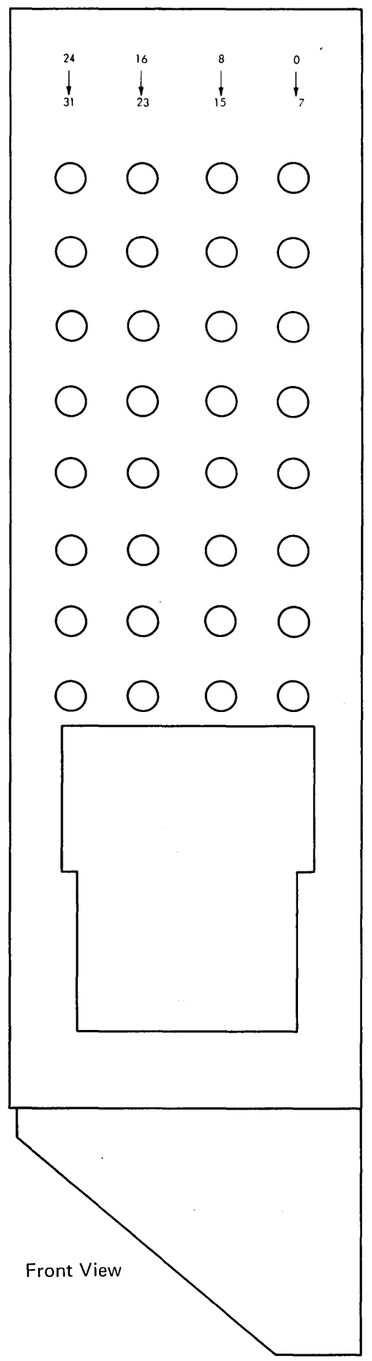
Legend:

- Continuously Lighted Indicator
- Pulsing Indicator—Size of dot is relative to pulse length and repetition rate. That is, the smaller the dot, the shorter the pulse and/or the lower the repetition rate.

WARNING: Pulsing indicators may be difficult to see. Shade the external light from the indicators for better viewing.

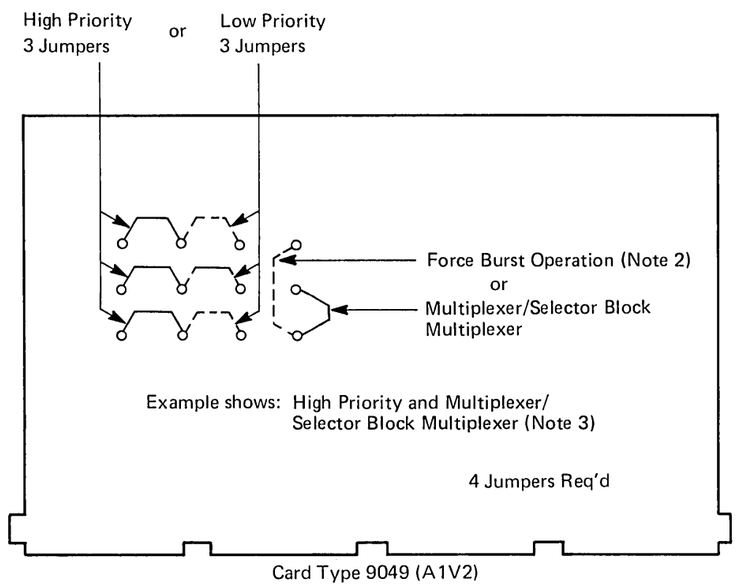


Side View

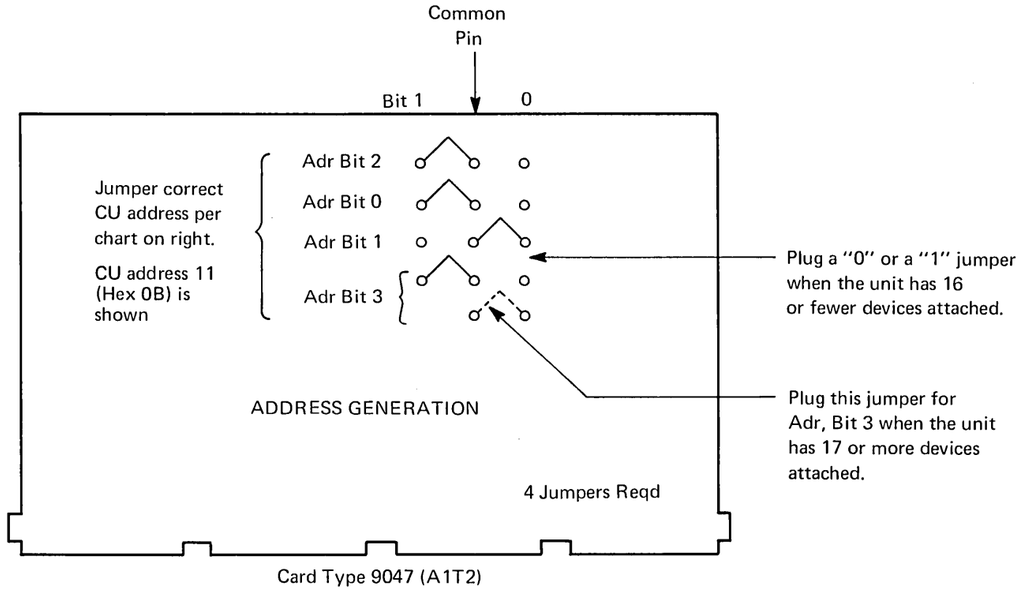


Front View

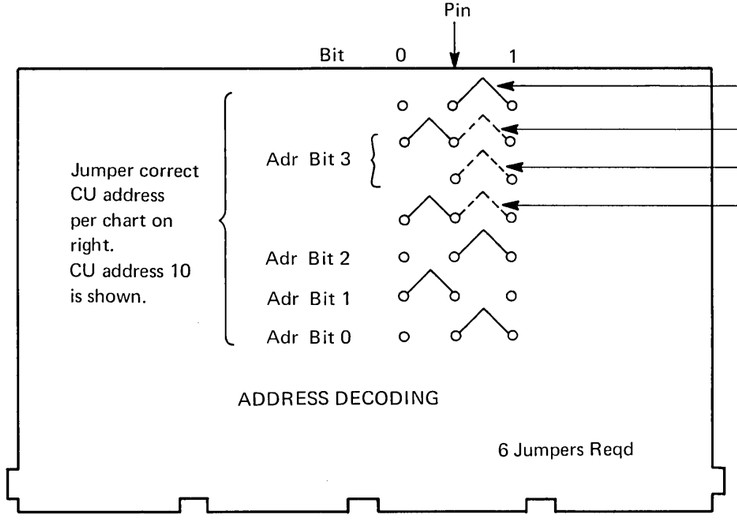
Diagram 6-100. I/O Connector Panel



Card Type 9049 (A1V2)



Card Type 9047 (A1T2)



Card Type 9048 (A1S2)

16 or Fewer Devices per CU

CU Address		8-Bit Local Adr Byte	
		CU	Device
Hex	Decimal	0 1 2 3	4 5 6 7
0	0	0 0 0 0	X X X X
1	1	0 0 0 1	X X X X
2	2	0 0 1 0	X X X X
3	3	0 0 1 1	X X X X
4	4	0 1 0 0	X X X X
5	5	0 1 0 1	X X X X
6	6	0 1 1 0	X X X X
7	7	0 1 1 1	X X X X
8	8	1 0 0 0	X X X X
9	9	1 0 0 1	X X X X
0A	10	1 0 1 0	X X X X
0B	11	1 0 1 1	X X X X
0C	12	1 1 0 0	X X X X
0D	13	1 1 0 1	X X X X
0E	14	1 1 1 0	X X X X
0F	15	1 1 1 1	X X X X

17 or More Devices per CU (Note 1)

CU Address		8-Bit Local Adr Byte	
		CU	Device
Hex	Decimal	0 1 2	3 4 5 6 7
0	*0	0 0 0	X X X X X
2	2	0 0 1	X X X X X
4	4	0 1 0	X X X X X
6	6	0 1 1	X X X X X
8	8	1 0 0	X X X X X
0A	10	1 0 1	X X X X X
0C	12	1 1 0	X X X X X
0E	14	1 1 1	X X X X X

*Even CU No's show no low-order bit as it is always 0. This allows Adr Bit 3 to be used as the high-order bit position for the device address as shown in Diagram 7-106.

Note 1: CU No's 1, 3, 5, 7, 9, 11, 13, and 15 cannot be assigned to Control Units when attached devices are assigned device No. 16 or greater.

Note 2: This mode restricts the channel to operate in Burst only, even if this is not desired.

Note 3: This is the most common mode of operation. It allows the 3272 to operate in the manner desired by the channel.

Diagram 6-101. CU Card Jumpering 3272 Control Unit Models 1 and 2

Section 7. Reference Information

This section contains reference information which will aid in control unit maintenance.

7.1 FUNCTIONS AND CONTROLS

Diagram 7-100 describes the main functional units and controls of the control unit. Diagram 7-101 describes in more detail the buffer storage and controls associated with it.

7.2 COMPONENT LOCATIONS AND DESCRIPTIONS

Diagram 7-102 shows the location of the power supply, power control panel, logic gate, logic boards, switches, and indicators. Following is a description of the switches and indicators.

MAIN LINE ON/OFF switch: ON position connects ac power to the power supply; OFF position disconnects ac power from the power supply.

LOC/REM switch: LOC position gives control of power supply activation to LOCAL MODE ON and OFF switches; REM position gives control of power supply activation to the CPU to which the control unit is connected. Emergency Power Off (EPO) from the CPU is effective in both positions.

POWER ON indicator: Lit when power supply is active and LOC/REM switch is in LOC position. (When the ac power cord is not connected, the POWER ON indicator can blink on and then off when the MAIN LINE switch is put in the ON position because of capacitance in the power supply.)

LOCAL MODE ON switch: UP position activates the power supply when LOC/REM switch is in LOC position.

LOCAL MODE OFF switch: UP position deactivates the power supply when LOC/REM switch is in LOC position.

ON LINE/OFF LINE switch: ON LINE position (operating position) connects the control unit to the channel interface; OFF LINE position (service position) disconnects the control unit from the channel interface.

I/O INTF DSBLD indicator: Lit when ON LINE/OFF LINE switch is in OFF LINE position (down).

7.3 LOGIC BOARD LAYOUT

Diagrams 7-103 through 7-105 describe the logic board layouts including voltage connections.

7.4 CHANNEL INTERFACE OPERATION

7.4.1 Selection

The channel attempts to select the 3272 and an attached device by sending a unique address byte to the 3272 (and to all other control units attached to the same channel or subchannel). When a 3272 has 16 or fewer devices attached, the first four bits of the address byte specify the 3272 address, and the last four bits of the address byte specify the device address (Diagram 7-106). Up to 32 devices can attach to 3272's that have even-numbered addresses. Note that no more than 16 devices can be attached to a 3272 that has an odd-numbered address. Device address must always be assigned sequentially, starting with address 0. However, no priority is given to any particular device address.

When a 3272 recognizes both addresses, it logically connects to the channel and responds to the selection by returning the address byte to the channel.

7.4.2 Command Operations

Command operations by the 3272 start when the 3272 and a device are successfully selected. When a command is to be executed by the 3272 (not by the channel alone), the channel sends the command code (CCW bits 0-7) to the 3272.

When execution of the command involves a transfer of data (such as Write or Read Modified), the 3272 responds to the command with a status byte (called "initial" status) indicating whether it can execute the command. If the command can be executed, the channel is set up to respond automatically to service requests from the 3272, and the 3272 assumes further control of the operation. Command operation can be terminated by the control unit or when the channel byte count reaches 0. At this time, the 3272 sends the channel a second status byte (called "ending" status) which indicates whether the command operation was successfully performed.

When the function of the 3270 command does not involve the transfer of data (such as EAU), it is called an "immediate" command. The resulting 3272 operation depends on the particular command, as follows. If the command is No Operation, ending status and initial status are combined to indicate to the channel that the 3272 has completed execution of the command. If the command is Select or Erase All Unprotected, which initiate certain 3272 and device operations, the initial status from the 3272 is such that block and byte multiplexer channels are released to perform other operations (selector channels remain logically connected to the 3272). When command execution is completed by the 3272 and selected device (and regains selection if attached to a multiplexer channel), the 3272 sends ending status to the channel, indicating whether the command was successfully performed.

7.4.2.1 Command Description

Five basic types of commands are executed by the 3272:

1. Write commands transfer data from main storage to a device.
2. Read commands transfer data from a device to main storage.
3. Sense command transfers one byte of data from the CU to main storage that reflects certain conditions existing in the device or CU.
4. Control commands do not transfer data to or from main storage but perform various control functions.
5. Diagnostic commands are used by diagnostic programs as an aid in locating failing cards.

Write Commands

Write

1. Transfers contents of the addressed device buffer to the CU storage buffer.
2. Performs operation specified by the write control character (WCC).
3. Enters data in any portion of the CU storage buffer (without erasing or modifying portions of the buffer in which a change is not required).
4. Allows execution of various order sequences within the data stream.
5. Transfers updated CU buffer to device buffer.

Erase/Write

1. Clears CU storage buffer to nulls.
2. Performs operations specified by WCC.
3. Stores any new data characters provided by program.
4. Allows execution of various order sequences within the data stream.
5. Transfers updated CU buffer to device buffer.

Read Commands

Read Modified

1. Transfers contents of addressed device buffer to CU storage buffer.
2. All fields in which the MDT bit has been set are transferred to the CPU.
3. Command is issued by the program as a result of an ENTER or PF key operation, Selector Pen attention operation, or Operator Identification Card read-in operation.

Read Buffer

1. Transfers contents of addressed device buffer to CU storage buffer.
2. Transfers contents of all CU buffer locations (protected and unprotected), attribute characters and alphameric characters, including nulls, starting at a specific location and continuing to the end of the buffer unless the channel byte count goes to zero before the last location is reached.

Sense Command

Sense

1. Issued by the program in response to Unit Check status.
2. Interface operation only.
3. Transfers one byte of sense data from the CU to main storage.

Control Commands

Erase All Unprotected

1. Clears all unprotected alphameric characters to nulls, resets modified data tag (MDT) bits of all unprotected fields to 0, restores keyboard, resets the attention identifier (AID), and repositions the cursor to the first character location in the first unprotected field in the buffer.
2. Command is performed at the device and has no data stream.

Select

Transfers contents of the addressed device buffer to the CU storage buffer.

Short Read

1. Permits the display operator to communicate with the program without sending modified data characters. This action is initiated when the display operator depresses one of the following keys: PA 1, PA 2, PA 3, CLEAR, or CANCEL or following card extract from an Operator Identification Card Reader.
2. If the program responds with the Read Modified command, only the unique AID character, to identify the key, is sent to the program.
3. No cursor address characters nor modified data characters are sent.

Test Request

1. Provides the display operator with a means of initiating a test message to, or requesting a test message from, the CPU. After keying in data, the operator depresses the test request key. (The data may be a test message to be sent to the CPU. Or, it may be some prearranged codes that, when interpreted by the program, result in a specific online test message being sent to the display.)
2. If the program responds with a Read Buffer command, the display buffer contents are sent preceded by the normal heading sequence; that is, AID (in this case, F0),

cursor address, cursor address. However, if the program responds with a Read Modified command, the display buffer contents are preceded by a different heading sequence generated by the CU. This sequence is: SOH%/ STX. The normal heading sequence is omitted.

Test I/O

1. Used to obtain pending or stacked status or to test for device busy condition.
2. Interface operation only.

No Operation

1. Performs no functional operation at the CU.
2. Interface operation only.

Diagnostic Commands

Diagnostic Write

Used by diagnostic programs to force various control functions in the CU. See Diagram 3-111, Sheet 3.

Diagnostic Read

Used by diagnostic programs to read two bytes of data which reflect various conditions in the CU. See Diagram 3-111, Sheet 3.

7.4.2.2 Order Description

Orders can be included in Write or Erase/Write command data streams, either alone or intermixed with display or print data. Two types of orders are available: printout format orders and buffer control orders. Printout format orders are initially stored in the buffer as data and are subsequently executed only during a print operation. Buffer control orders are not stored in the buffer and are executed as they are received in the write data stream.

Set Buffer Address (SBA)

Loads data starting at address immediately following SBA character.

Format: SBA, address, address

Start Field (SF)

1. With the 3270 Data Analysis - APL Feature installed, specifies that the next character received is to be stored with the control bit ON. Characters stored in this manner are decoded as attribute or data by the following definition. An attribute has: (1) the control bit 8 ON, (2) data bit 1 ON, and (3) data bit 6 OFF. Other combinations of these bits are considered data.

   On Read operations, the control unit inserts a Start Field for each character that has the control bit ON. The chart on Diagram 7-112.1 lists all the characters that are preceded by the SF code.

   Format: SF, attribute or data.

2. Specifies the next character as an attribute character.

   Format: SF, attribute character.

Insert Cursor (IC)

Changes the address in the CU buffer and thus repositions the cursor on the display screen. Because the CU buffer address is not advanced when the IC order is loaded in the CU buffer, the next byte is stored at the cursor address.

Format: IC

Repeat to Address (RA)

Loads a single character repeatedly, starting at the current CU buffer address and continuing to, *but not including,* the address specified in the order sequence. The cursor is not affected.

Format: RA, address, address, character

Erase Unprotected to Address (EUA)

Deletes all unprotected-field characters beginning with the character at the current address to, *but not including*, the character at the address specified in the order sequence. If the address specified in the order sequence equals the current address, wraparound occurs, and all unprotected characters are deleted. The attribute characters defining the unprotected fields are not deleted.

Format: EUA, address, address

Program Tab (PT)

Advances the CU buffer address to that of the character position immediately following the next attribute character that defines an unprotected field. The cursor is not affected and no wraparound occurs. The search begins at the current buffer address. The final result depends on one of three conditions:

1. When PT immediately follows a data character within an unprotected field, all remaining characters within that field are replaced by nulls.
2. When PT immediately follows a WCC or an order sequence, no nulls are inserted.
3. When the current buffer address contains an attribute character that defines an unprotected field, the CU buffer address is simply advanced one character location.

   Format: PT

New Line (NL)

When included in the data stream addressed to a printer, the NL order initiates a carrier return/line feed (CR/LF) operation by the printer. That is, the platen is advanced one line and the print mechanism is returned to the first print position of the new line. If this order is included in the data stream addressed to a display, the NL order is displayed as the number 5,blank,5 for Katakana feature, but does not cause any action within the CU or the display. In any case, it is stored in the CU buffer as the number 5,blank, 5 for Katakana feature.

Format: NL

End of Message (EM)

This order must be included at the end of a message addressed to a printer to notify the printer when to stop printing. If the EM order is not included at the end of the printer message, the printer will print out the contents of the complete printer buffer (either 480 or 1920 characters). If this order is included in the data stream addressed to a display, the EM order is displayed as the number 9,blank,9 for Katakana feature, but does not cause any action in the CU or display. In any case, it is stored in the CU buffer as the number 9,blank,9 for Katakana feature.

Format: EM

Duplicate (DUP)

Informs the program that the DUP key was depressed by the display station operator. Its actual function is determined by the CPU program. The DUP order is displayed as an asterisk. It is stored in the CU buffer but does not cause any action in the CU.

Format: Dup

Field Mark (FM)

Informs the CPU program that the FM key was depressed by the display operator. It indicates the end of a field to the program. The FM order is displayed as a semi-colon (;). It is stored in the CU buffer, but does not cause any action in the CU.

Format: FM

7.4.3 Chaining

When the channel has completed the operations specified by a CCW, it can continue the activity initiated by the previous Start I/O by fetching a new CCW, thereby restarting the cycle. The fetching of this new CCW is called "command chaining", and the CCWs belonging to such a sequence are said to be chained. All CCWs in a chain apply to the control unit (3272) and device specified by the original Start I/O instruction.

Either of two bytes of chaining can be specified by the current CCW (bits 32 and 33): data-byte chaining or command chaining. During data chaining (current CCW bits 32=1), the new CCW fetched by the channel defines a new main storage area (data address) for the current command. During command chaining (current CCW bits 33=1), the new CCW specifies a new command and a data address for that new command.

Thus, when command chaining is used, the 3272 is selected following the Start I/O instruction when the channel receives the first CCW in the chain that involves operations with the 3272. The 3272 is totally dedicated to one CCW string until final Channel End time or until operations are abnormally terminated.

7.4.4 Status

The 3272 generates a status byte to inform the channel of certain 3272 and device conditions. This status byte can be generated synchronously (while the 3272 is selected and performing a command operation with the channel) or asynchronously (while the 3272 is not selected).

Synchronous status is passed to the channel as both "initial" and "ending" status to a command. Initial status reflects the condition of the selected device and/or 3272 upon receipt of a command, and indicates to the channel whether the command can be executed. Ending status reflects the condition of the 3272 and selected device after all channel/3270 interface operations of a non-immediate command are completed. Asynchronous status reflects: (1) ending status for an immediate command other than No Operation; (2) a second ending status for a Write or Erase/ Write command, indicating that the 3272-to-device buffer transfer is completed; or (3) an equipment condition or operator action not associated with command execution (an attention).

Diagram 7-107 describes each bit of the status byte. Status is reset by the 3272 once it has been accepted by the channel.

7.4.5 Sense

When the CU detects an error, it sets a sense bit to record the condition that caused the error. Diagram 7-108 describes each bit of the sense byte. When a Sense command is executed, the sense byte is sent to channel and is then reset.

7.4.6 Initial Status and Sense Conditions

Initial status is generated by the CU in response to initial selection. During the initial selection sequence, the status byte is sent to the channel after the CU receives a command. Diagram 7-109 shows the possible initial status and sense bit configurations. An all-zero status byte is sent when a non-immediate command is accepted for execution by the CU; it is also sent in response to Test I/O if other status is not pending. The Unit Check bit is set if the command is not accepted by the CU because of a program or equipment error.

Initial status to immediate commands is as follows. For No Operation, Channel End and Device End are both set to indicate completion of the command. For Select and Erase All Unprotected, which do not involve data transfer between the channel and the CU, Channel End is set. This frees a multiplexer channel for other operations while the command is being executed. When command execution

is completed, ending status is presented asynchronously.

When status is pending (a previous status byte is awaiting transfer to the channel), the waiting status byte, with the Busy bit set, is sent to the channel in response to any command (not to a Test I/O instruction), and that command is not accepted by the 3272. For Test I/O, the waiting status byte is presented without the Busy bit set. If the waiting status is for a device other than the one selected during the initial command sequence, the Status Modifier bit is also set.

7.4.7 Ending Status and Sense Conditions

When the 3272 completes channel operations for a non-immediate command, it sends an ending status byte to the channel, freeing the channel for other operations. This status byte always relates to the command operation that has been executed. The normal ending status byte for a Read Buffer, Read Modified, or Sense command will have only the Channel End and Device End bits set, indicating that the command has been executed. Normal ending status for a Write, Erase/Write, or a Copy command is Channel End alone. When the 3272-to-device buffer transfer is completed, ending the command operation, Device End status is sent to the channel as asynchronous status. Any error condition associated with the operation just executed will cause additional status bits to be set. Diagram 7-110 shows the possible ending status and sense bit configurations.

When the 3272 has pending status, it attempts to gain selection of the channel asynchronously to pass this status. It is passed to the channel either when selection is accomplished or as initial status for the next command (with the Busy bit set), whichever occurs first.

7.4.8 Asynchronous Status and Sense Conditions

Asynchronous status reflects: (1) the ending status of a Copy command or an "immediate" command other than No Operation; (2) the second ending status for a Write, Erase/Write, or Copy command, indicating that all command-initiated operations are completed; (3) an action by the device operator that requires program intervention (attention status); or (4) a 3272 or attached device equipment malfunction. Diagram 7-111 shows the possible synchronous status and sense bit configurations.

When an asynchronous status condition occurs, the 3272 attempts to gain selection by the channel (this is a hardware function), and passes this status to the channel when selection is accomplished. This status is called "pending" status until selection is accomplished. If the channel issues a command before retrieving this pending status, the pending status is returned, with the Busy bit set, in place of initial status for the command; in this case, the command is not executed.

When an asynchronous condition occurs at a device while the 3272 is performing command operations with another device, the asynchronous status remains pending until the 3272 completes the current command operation, returns ending status to the channel, and becomes not busy. The 3272 then retrieves the pending status from the device and attempts to present it to the channel in the same manner as other asynchronous statuses.

7.5 REFERENCE DATA

Diagrams 7-112 through 7-121 contain reference data pertaining to codes, formats, addresses, and probe points used in diagnosing problems in the 3272.

7.6 LOGIC PROBES

Either of two different logic probes can be used to probe signal levels while troubleshooting the 3272 Control Unit. Both probes allow the Customer Engineer to distinguish between three signal states - a solid up level, a solid down level, or the presence of pulses. The older style probe (PN 453652), shown in Diagram 7-122, is described fully in the following paragraphs. The newer General Logic Probe (GLP) (PN 453212), shown in Diagram 7-122, is ordered as a complete kit containing the GLP, standard accessories, and the *General Logic Probe Manual,* SY27-0113. The manual describes the features of the GLP, and provides a checkout procedure. This information is not duplicated here; therefore, the user is referred to the manual. These probes are available from Mechanicsburg spare parts center and can be ordered through normal tool-ordering procedures.

7.6.1 Probe Description

The older logic probe is a completely self-contained device consisting of a anodized aluminum tube with a red and a green indicator near the tip. Two leads with SLT-type push-on terminals come out of the sealed top of the probe. A plastic head with a threaded stud is at the tip end of the device. The red and green indicators tell the state of the net being probed. The two leads with SLT-type push-on connectors are attached to pins on the back of the logic board being probed. The pins provide the operating voltage (+5V dc and ground) for the device. An oscilloscope probe tip is screwed on the threaded stud at the tip of the probe. This provides the input signals to the device.

7.6.2 General Logic Probe (PN 453212) Usage

To use the General Logic Probe (GLP) on 3270 units, do the following:

1. Attach the black power lead to 0 volts (or the most negative voltage). Use any D08 pin.
2. Attach the red power lead to a voltage that is +4 to +12 V dc positive in relation to the black power lead. Use any D03 pin (+5v).
3. Connect signal probe lead to signal source. The maximum length for this lead is 3 inches.
4. Connect the signal ground lead to any D08 pin. The maximum length for this lead is 4 inches.
5. Set the TECHNOLOGY switch to the MULTI position.
6. Set the LATCH switch to the NONE position (unless used as a "babysitter").
7. Set the GATE REFERENCE switch to the GND position.

The level indications for the probe are as follows:

Both lights on	Oscillating signal
UP light on	+2.0 to +60.0 volts
DOWN light on	0.0 to +1.0 volts
No lights on	+1.0 to +2.0 volts

Note: A voltage of greater than +60V dc on the MULTI setting or +14.0V dc on the MST 1, 2, or 4 setting will damage the probe.

7.6.3 Logic Probe Usage (PN 453652)

To use the logic probe it is first necessary to attach a probe tip to the threaded stud at the end of the device. An SLT probe tip (PN 453163) should be used for this application. The two leads coming out of the top end of the probe should then be attached to the back of the logic board being probed. The leads are clearly labeled ground (GND) and +6V. Connect the GND lead to any D08 pin on the board and connect the +6V lead to any D03 pin. Connection to the board is made by pushing the connector at the end of each lead on the designated pin. As soon as the last wire is connected, the red indicator should light.

Attach the oscilloscope probe tip to the pin designated in the Troubleshooting Diagrams or as determined in logic. To attach the probe, grasp it at the portion of the body nearest the tip and press the tip straight onto the desired pin. Remove the tip by grasping the probe body in the same manner as when it was installed and pulling so that the tip is withdrawn parallel to the pin.

The following conditions can be observed by using the logic probe:

1. Red indication
   a. Probe not attached to a pin (a floating condition), or
   b. Plus signal on the net being probed.
2. Green indication - Ground (negative) signal on the net being probed.
3. Red and Green Indication - A pulsing signal (alternately plus and ground) is present on the net being probed. This condition can appear as the red and the green indicator pulsing on and off or as both indicators seemingly on at the same time, depending on the frequency of the pulsing signal on the net being probed.

7.6.4 Probe Checkout Procedure

Logic probe PN 453652 should be checked for correct operation each time before troubleshooting the 3272 Control Unit. The check can be made on either logic board A1 or A2 of the 3272 Control Unit using the following procedure:

1. Attach an SLT probe tip to the probe.
2. Apply power to the 3272 Control Unit.
3. Connect the probe GND lead wire to any D08 pin.
4. Connect the probe +6V lead wire to any D03 pin. The probe's RED indicator should light as soon as this wire is attached.
5. Touch the probe tip to any D03 pin and the RED indicator should remain lit.
6. Touch the probe tip to any D08 pin and the RED indicator will turn off while the GREEN indicator should light and remain lit as long as the probe is on the D08 pin.
7. Remove the probe tip from the D08 pin. The GREEN indicator should turn off and the RED indicator should light again.

7.6.5 Probe Repair

The logic probe *is not* field-repairable. If trouble is experienced during the probe checkout procedure, verify the following:

1. Power is applied to the 3272 Control Unit.
2. Probe lead wires are connected on the proper source pins.
3. Proper pins are being probed.

If the above conditions are met, and the probe fails, obtain a new probe before troubleshooting the control unit.

7.7 SWITCH/INDICATOR UNIT (SIU)

The switch/indicator unit (PN 2570250), shown in Diagram 7-122, is a portable maintenance aid used to test the Control Unit. The 20 switches on the SIU are used to exercise the CU circuitry while observing the 20 indicators.

7.7.1 Description

The switch/indicator unit is contained in a small plastic box that is approximately 8" x 4-1/4" x 1-1/2" in size. The box has a magnet attached to the bottom side so that it can be placed on any horizontal or vertical metal surface and remain stationary while testing the CU. The SIU consists of 20 light-emitting diodes, 20 switches, and three connecting cables.

Because the SIU is used to service devices other than the 3272, plastic overlays with the unique device nomenclature are provided and are placed over the switches and indicators. Two overlays printed on both sides are provided, corresponding to the four options of plugging the SCI cables. Overlays are identified by printing in the lower margin and are illustrated in Diagram 7-123.

Three cables carry the signals and power to and from the

SIU. The cables are permanently attached to the SIU and are coiled and stored in the plastic box when the SIU is not being used. The cables are held in the box by a self-locking nylon strap. Diagrams 7-124 and 7-125 provide SIU switch and indicator cable connection reference.

7.7.2 Use

The SIU is attached to the CU by plugging the three cables into the card side of the logic board on gate A1. Two cables can carry up to 40 signal levels generated in the CU to light the SIU indicators. The third cable carries the SIU switch levels from the SIU to the CU. Each cable also carries +5V dc and dc return from the CU necessary to power the indicators.

Twenty SIU indicators display up to 40 signals generated by 3272 logic circuitry. Twenty signals enter the SIU on cable 1, and 20 signals enter on cable 2. The IND switch selects the group of 20 signals that are displayed by the SIU indicators. Nomenclature on the IND switch top position is printed in blue lettering and identifies the nomenclature on top of the two rows of indicators which is also printed in blue lettering. The bottom position of the IND switch is printed in green and identifies the nomenclature (also printed in green) that appears under the two rows of indicators.

7.7.3 Checkout

The following check of proper SIU operation should be made before using it to service the unit under test.

1. Set MAIN LINE switch ON.
2. Set ON LINE/OFF LINE switch to OFF LINE.
3. Set LOC/REM switch to LOC.
4. Set LOCAL MODE ON switch to upper position.
5. Install 3272 MLPXR CTRLS/LOCAL INTERFACE BUS & TAG overlays on the SIU panel (PN 2621408 and PN 2621301).
6. Insert connector 3 into A1Y4. All indicators should light.

   Note: +5 volts must be available to light the SIU indicators. If no indicators light, proceed to Diagram 5-100.

7. Transfer IND switch. All indicators should light.
8. Check correct operation of switches using logic probe* and probe pin reference in Diagram 7-125. Probe should be red when switch is on (up) and green when switch is off.

*Check out logic probe (par. 7.6.4) before using.

7.8 DIAGNOSTIC PROGRAMS

Diagram 7-126 describes each counter used by the Disk Operating System to record abnormal conditions. Diagram 7-127 describes Request For Test (RFT) and Online Test (OLT) procedures. Diagrams 7-128 and 7-129 describe diagnostic program routines provided for the 3272.

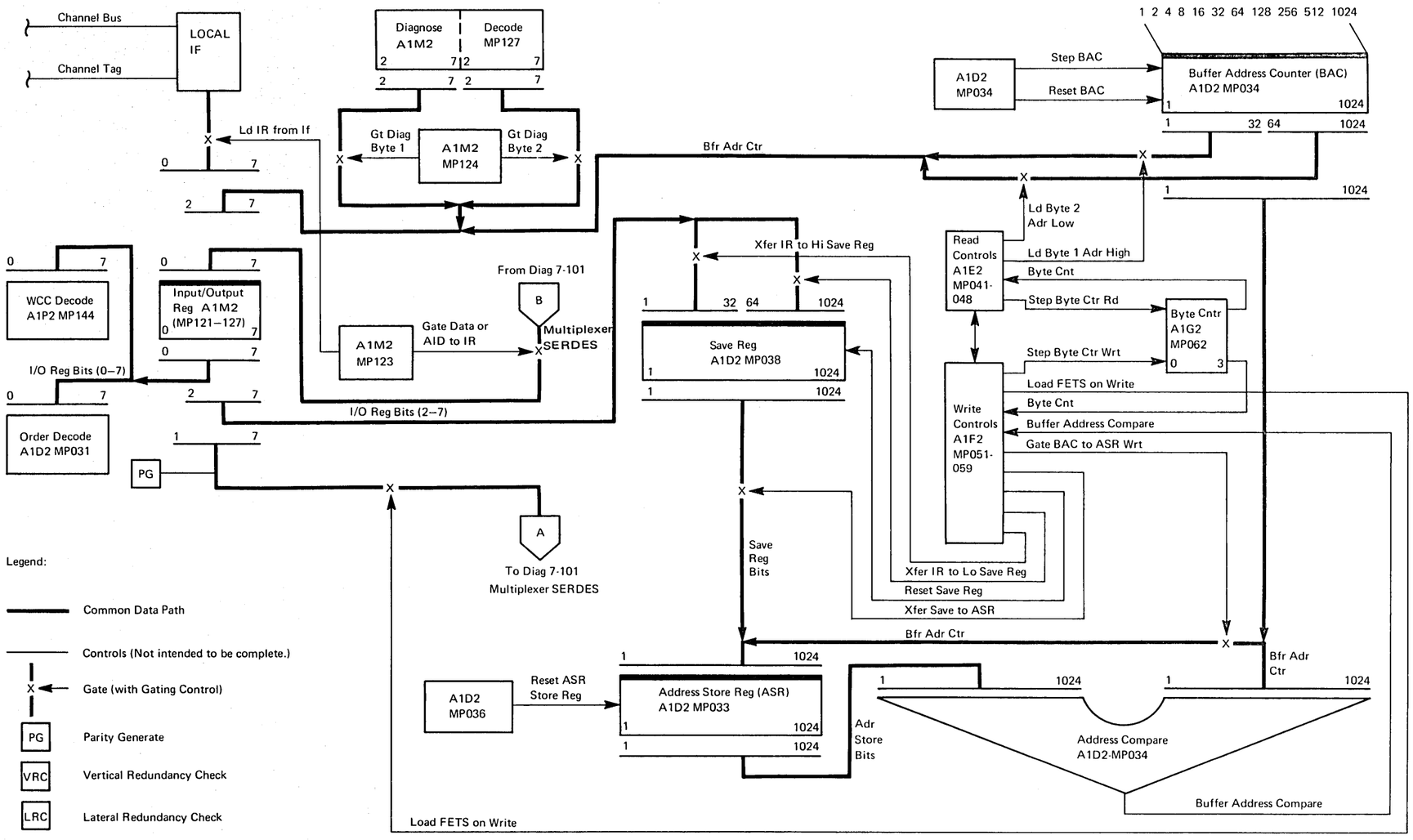


Diagram 7-100. 3272 Control Unit Data Flow

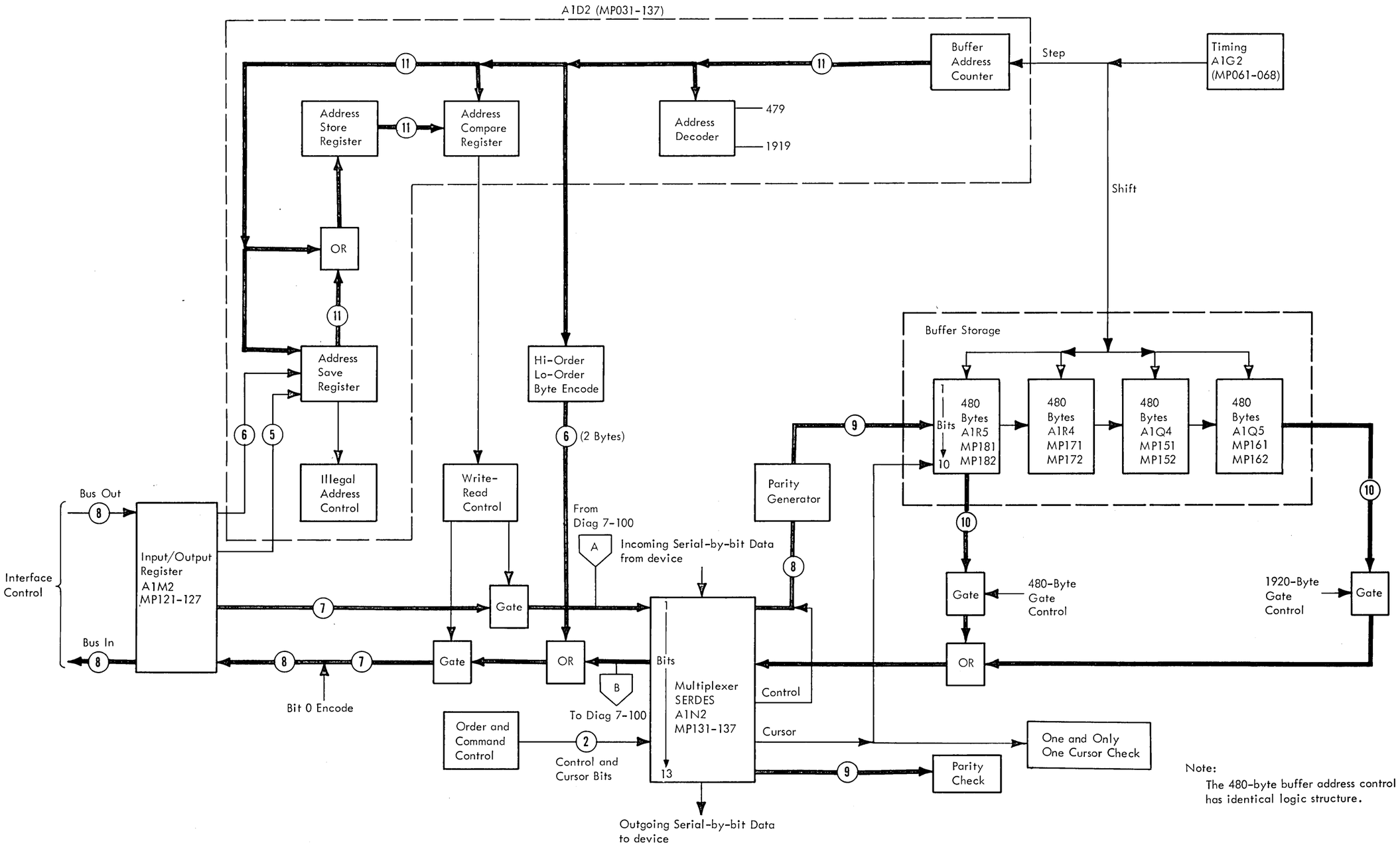
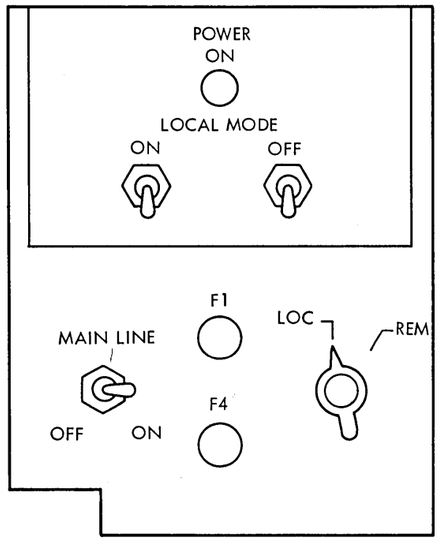


Diagram 7-101. Buffer Storage Address Control



United States	French	German	Italian	Spanish
POWER ON	SOUS TENSION	NETZ EIN	ACCESO	ENERGIA CONECTDA
LOCAL MODE	CONTROLE AUTONOME	LOKAL-BETRIEB	LOCALE	MODALIDAD LOCAL
ON	SOUS	EIN	ACCESO	ON
OFF	HORS	AUS	SPENTO	OFF

Indicators/Switches Located on Gate A	ALD Location	Source Pin (Board A1)
I/O INTF DISABLED indicator	LC206	T2D13 (Wire No. 1) T2D03 (Wire No. 2)
		Probe Pin (Board A1)
ON LINE/OFF LINE switch ON LINE position	LC401	V2S04 (Wire No. 3)
ON LINE/OFF LINE switch OFF LINE position	LC401	V2U04 (Wire No. 4)
ON LINE/OFF LINE switch common position	LC401	V2U08 (Wire No. 5)

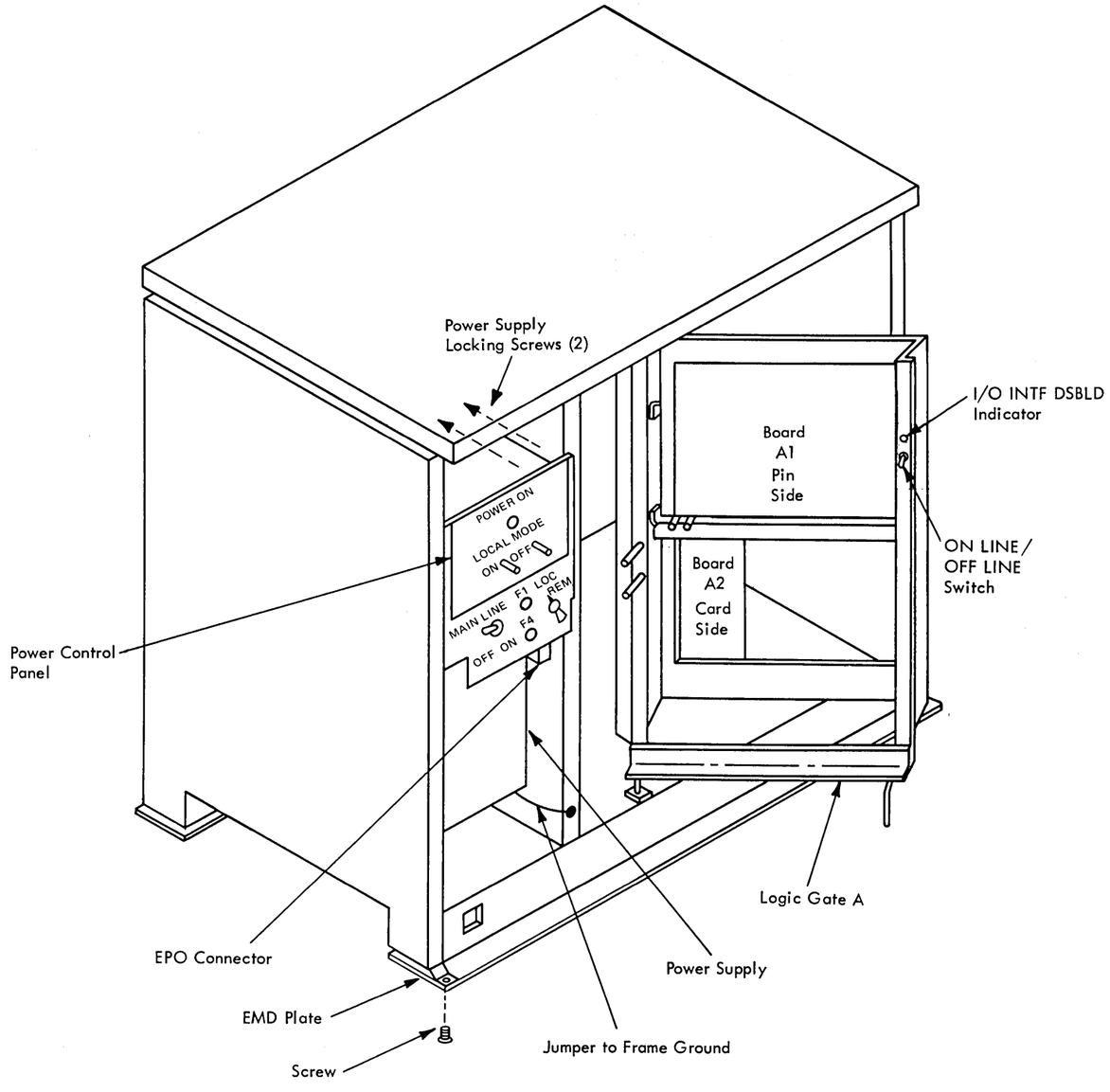


Diagram 7-102. Component Locations

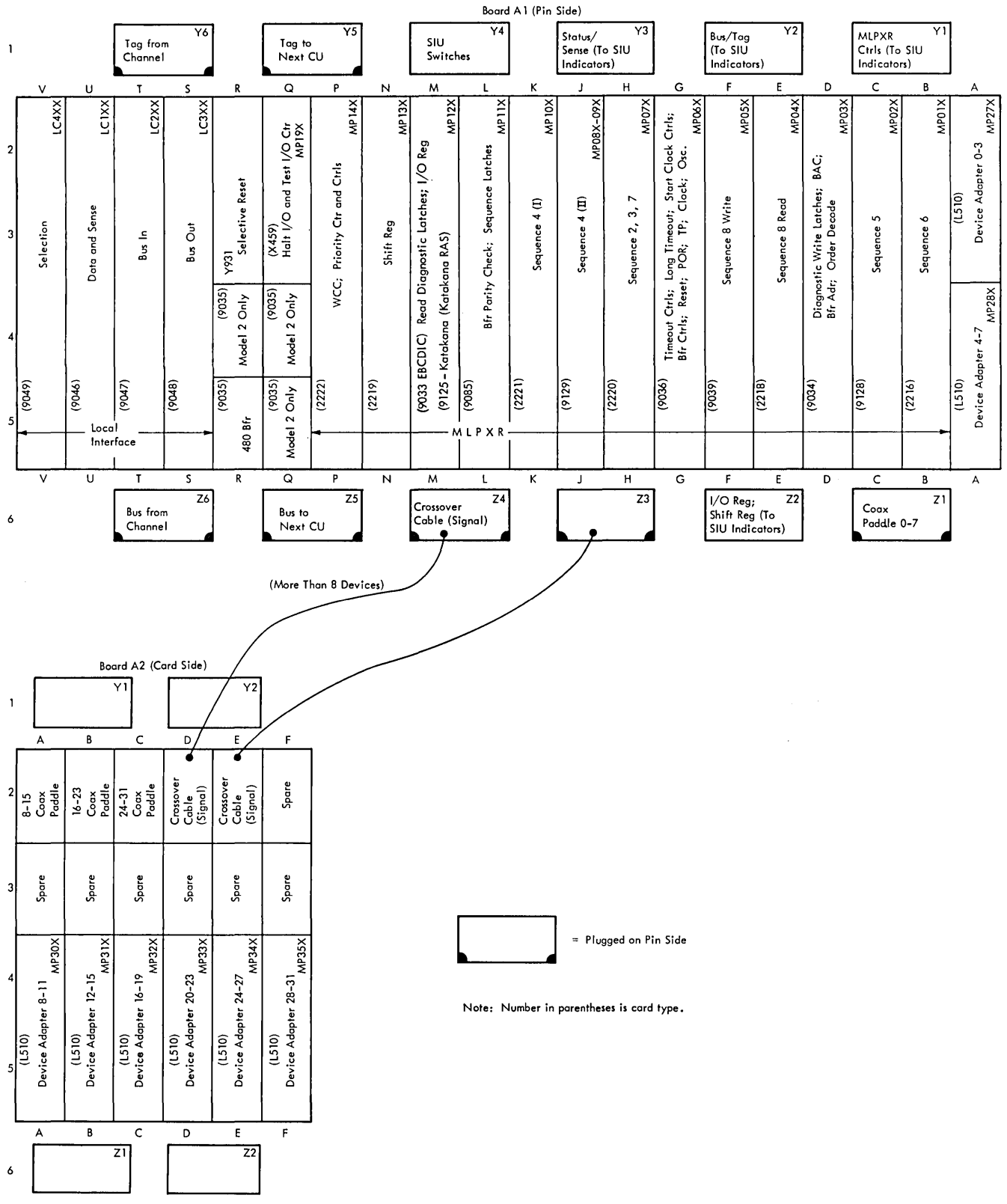
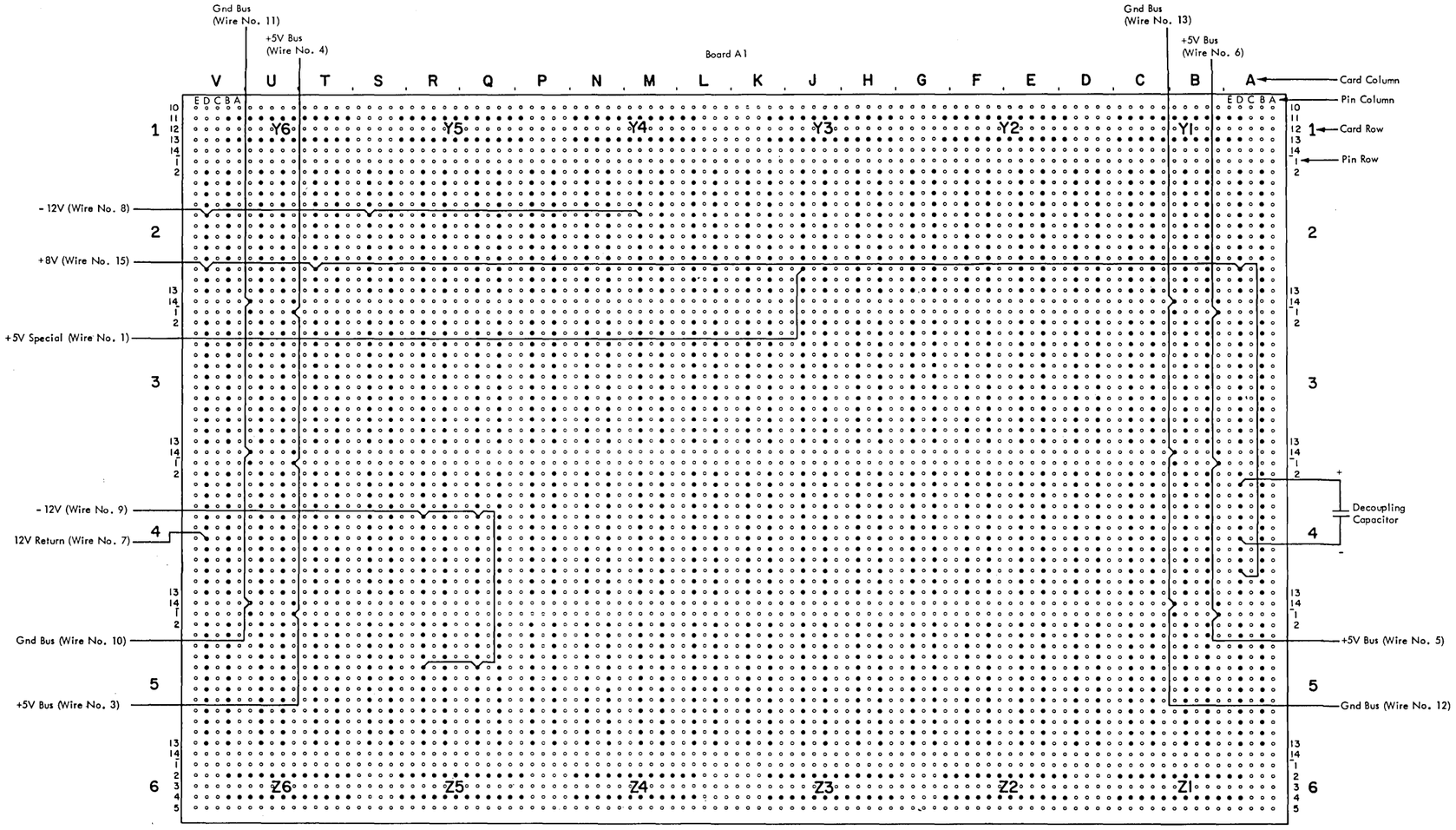
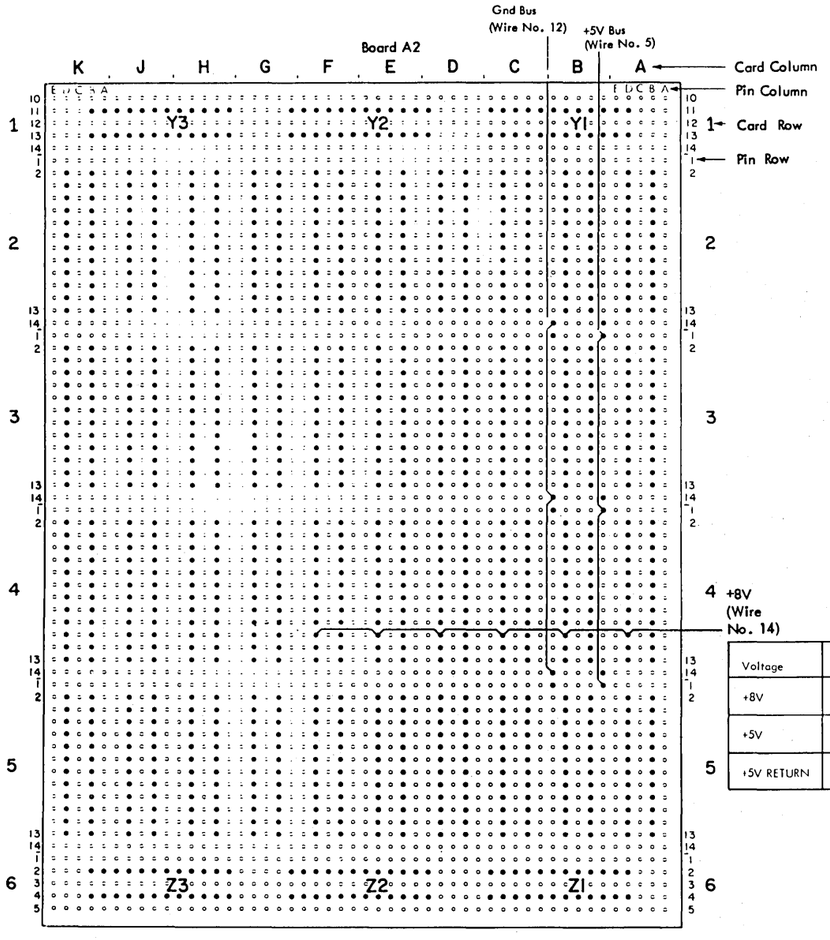


Diagram 7-103. Circuit Card Locations



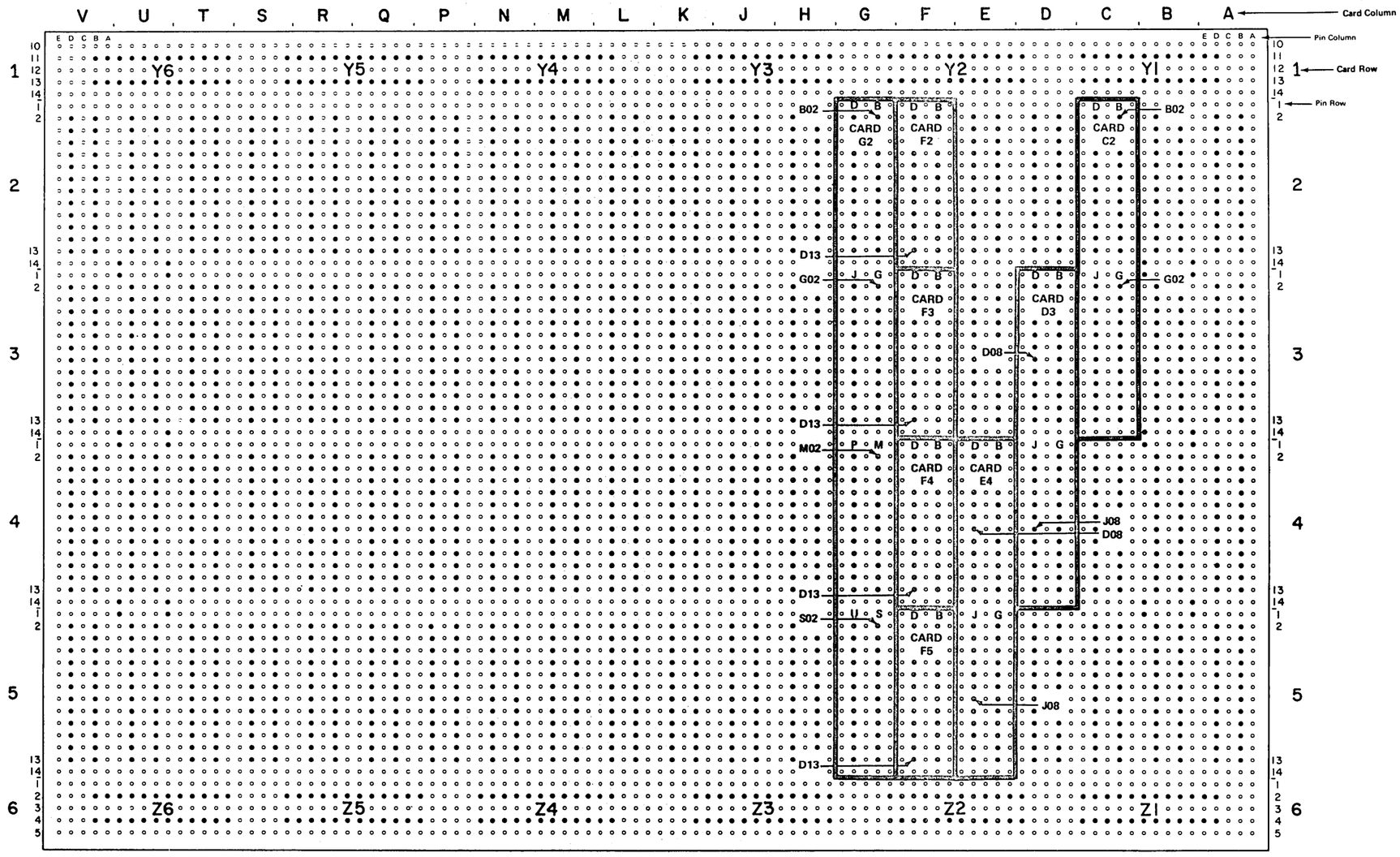
Voltage	Wire Number	Power Supply PC Board Connector Number	Card and Pin Numbers
+5V Special	1	1	J2D11
	2		Not Used
+5V	3, 4	3, 4	Voltage Bus: U3A01, U4A01, U5A01
+5V	5, 6	5, 6	Voltage Bus: B3A01, B4A01, B5A01
12V Return	7	7	V4D08
- 12V	8	8	V2D06, S2D06, M2D06
- 12V	9	9	R4D06, Q4D06, Q5D06, R5D06
5V and 8V Return	10, 11	10, 11	Ground Bus: U2E14, U3E14, U4E14
5V and 8V Return	12, 13	12, 13	Ground Bus: B2E14, B3E14, B4E14
+8V	15	15	V2D11, T2D11, A2D11, A4D11

Diagram 7-104. Logic Board Voltage Connections, Pin Side (Sheet 1 of 2)



Voltage	Wire Number	Power Supply PC Board Connector Number	Card and Pin Number
+8V	14	14	A4D11, B4D11, C4D11, D4D11, E4D11 F4D11, (Used only for more than 8 devices.)
+5V	5	5	VOLTAGE BUS: B3A01, B4A01, B5A01
+5V RETURN	12	12	GROUND BUS: B2E14, B3E14, B4E14

Diagram 7-104. Logic Board Voltage Connections, Pin Side (Sheet 2 of 2)



Legend:
- Probe Pin

Notes:
1. For multiple-socket cards (such as cards G2, E4, D3, and C2 in illustration), card location designation is specified by the uppermost row. Example: The location of card G2 (which actually occupies four sockets) is specified by the uppermost row, G2. If this card is located in gate A1, its location is identified as A1G2.
2. Pin-column letter designations are signified by card size (rather than vertical position of card on board), beginning with DB in the first pin row used. Subsequent designations are JG, PM, and US, which, when required, specify pin columns in the second, third, and fourth card rows, respectively. See examples in the illustration.
3. Ground = Any D08, J08, P08, or U08 pin; identified by a square surrounding each ground pin. (The square is not shown.) +5V = Any D03, J03, P03, or U03 pin.
4. Cards are shown for identification purposes only. See Diagram 7-103 for actual card locations.

Pin Location Code

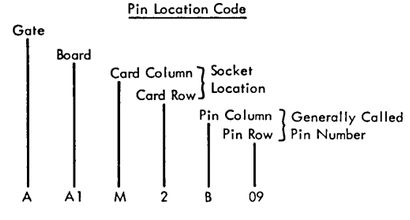


Diagram 7-105. Circuit Board, Card and Pin Locations

16 or Fewer Devices per CU

CU No.	8-Bit Local Adr Byte	
	CU	Device
	0 1 2 3	4 5 6 7
0	0 0 0 0	XXXX
1	0 0 0 1	XXXX
2	0 0 1 0	XXXX
3	0 0 1 1	XXXX
4	0 1 0 0	XXXX
5	0 1 0 1	XXXX
6	0 1 1 0	XXXX
7	0 1 1 1	XXXX
8	1 0 0 0	XXXX
9	1 0 0 1	XXXX
10	1 0 1 0	XXXX
11	1 0 1 1	XXXX
12	1 1 0 0	XXXX
13	1 1 0 1	XXXX
14	1 1 1 0	XXXX
15	1 1 1 1	XXXX

Device No.	4 5 6 7 (XXXX)
0	0 0 0 0
1	0 0 0 1
2	0 0 1 0
3	0 0 1 1
4	0 1 0 0
5	0 1 0 1
6	0 1 1 0
7	0 1 1 1
8	1 0 0 0
9	1 0 0 1
10	1 0 1 0
11	1 0 1 1
12	1 1 0 0
13	1 1 0 1
14	1 1 1 0
15	1 1 1 1

17 or More Devices per CU

CU No.	8-Bit Local Adr Byte	
	CU	Device
	0 1 2	3 4 5 6 7
0	0 0 0	XXXXX
2	0 0 1	XXXXX
4	0 1 0	XXXXX
6	0 1 1	XXXXX
8	1 0 0	XXXXX
10	1 0 1	XXXXX
12	1 1 0	XXXXX
14	1 1 1	XXXXX

Device No.	3 4 5 6 7 (XXXXX)
0	0 0 0 0 0
1	0 0 0 0 1
2	0 0 0 1 0
3	0 0 0 1 1
4	0 0 1 0 0
5	0 0 1 0 1
6	0 0 1 1 0
7	0 0 1 1 1
8	0 1 0 0 0
9	0 1 0 0 1
10	0 1 0 1 0
11	0 1 0 1 1
12	0 1 1 0 0
13	0 1 1 0 1
14	0 1 1 1 0
15	0 1 1 1 1

Device No.	3 4 5 6 7 (XXXXX)
16	1 0 0 0 0
17	1 0 0 0 1
18	1 0 0 1 0
19	1 0 0 1 1
20	1 0 1 0 0
21	1 0 1 0 1
22	1 0 1 1 0
23	1 0 1 1 1
24	1 1 0 0 0
25	1 1 0 0 1
26	1 1 0 1 0
27	1 1 0 1 1
28	1 1 1 0 0
29	1 1 1 0 1
30	1 1 1 1 0
31	1 1 1 1 1

NOTE: CU No's 1, 3, 5, 7, 9, 11, 13, and 15 cannot be assigned to control units when attached devices are assigned Device No. 16 or greater.

Diagram 7-106. CU and Device Addressing

Bit	Name	Condition
0	Attention (A)	Indicates a request for service from a 3277 attached to 3272. Set as result of certain keyboard, selector pen, or card reader activity at 3277. Program should respond by issuing a Read Modified command (chained to a Select command if multiplexer channel) to the 3277 requesting attention. Attention bit is also set with Unit Check bit as result of asynchronously detected equipment malfunction; in this case, program should respond by issuing a Sense command.
1	Status Modifier (SM)	Is set, with Busy bit, in initial status byte to indicate that there is pending status for a device other than the one selected.
2	Control Unit End (CUE)	Is set following a busy condition, after pending status is cleared or when control unit is no longer busy, to indicate that 3272 is now not busy and is free to accept a new command.
3	Busy (B)	Is set alone in initial status byte when addressed device is busy because it is performing a print operation or an Erase All Unprotected command. Set with SM when addressed 3272 is busy. When the channel addresses a device other than the one that is busy and control unit is not busy, addressed device becomes selected and the command is honored. Busy bit is also set with pending status if addressed device has such status; if pending status is for a device other than the one addressed, Status Modifier bit is also set.
4	Channel End (CE)	Indicates 3272/channel data transfer operations are completed. Is set alone (1) in initial status for Select or Erase All Unprotected command, or (2) as ending status for Write or Erase/Write command; in both cases, Device End status is sent asynchronously when device operations (command execution or 3272-to-device buffer transfer) are completed. Is set with Device End, to indicate that 3272 and device operations (except printing) are completed (1) in initial status for No Operation command, (2) in ending status for Read Buffer, Read Modified, or Sense command, or (3) asynchronously if only Channel End status was pending and the device operation is completed before the channel accepts status. Is set with Device End and Unit Exception in initial status for Read or Write command if addressed device is busy executing another command.
5	Device End (DE)	Indicates that 3272 and device have completed all command operations and are free to execute another command. Is set (1) in initial status for No Operation command, (2) in ending status for Read Buffer, Read Modified, or Sense command, and (3) in asynchronous status for Write, Erase/Write, Select, or Erase All Unprotected command.
6	Unit Check (UC)	Is set when an irregular program or equipment condition is detected by 3272 or the device. Program should always respond to Unit Check status by issuing a Sense command for further definition of condition.
7	Unit Exception (UE)	Is set in ending status (synchronous or asynchronous) when 3272 has attempted to execute a command but has found, after initial status was returned, that addressed device was busy.

Diagram 7-107. Status Byte Bit Assignment

Bit	Name	Condition
0	Command Reject (CR)	CU received an invalid command or incorrectly decoded a valid command.
1	Intervention Required (IR)	(1) A command other than Sense, Diagnostic Write, or Diagnostic Read was issued to a device that was not available or not ready. (2) A printer became not ready during a print operation. Unit Specify sense bit is also set.
2	Bus Out Check (BOC)	CU detected a parity error on a command byte or on a data byte from channel.
3	Equipment Check (EC)	CU polled a device and detected a transmit parity check in the device reply. Poll is tried twice before EC sense bit is set. Equipment Check is also set with Unit Specify when (1) CU detects a printer malfunction or (2) a printer character generator readout error is detected.
4	Data Check (DC)	(1) CU detected a transmit parity error on data or control words received from a device. (2) CU detected an internal parity error. (3) CU detected a cursor check. (4) Device detected a transmit parity error on data or control words. (5) Device detected a buffer parity error. (6) Device detected a cursor check. (7) Printer detected a buffer parity error during a print operation. Unit Specify sense bit is also set with conditions 4, 5, 6, and 7.
5	Unit Specify (US)	Device detected a Data Check error condition.
6	Control Check (CC)	(1) Device failed to respond to CU within a specified time. (2) Device failed to perform a device-to-CU buffer transfer within a specified time. (3) Device failed to perform an erase-all-unprotected operation within a specified time.
7	Operation Check (OC)	(1) CU detected an invalid buffer address with a set buffer address, repeat to address, or erase all unprotected to address order of a Write or Erase/Write command. (2) Channel terminates the data stream before sending all the characters required in a set buffer address, repeat to address, erase all unprotected to address, or start field order sequence. (3) CU received a Write or Erase/Write command with write control character start printer bit set and chained to a subsequent command. Print operation is suppressed.

Diagram 7-108. Sense Byte Bit Assignment

Status Byte	Sense Byte	Display Station	Printer	Condition
All Zeros (Hex 00)		X	X	Normal status for any command other than No Operation, Select, Erase All Unprotected, or Test I/O with stacked or pending status.
CE (Hex 08)		X	X	Normal status for a Select or Erase All Unprotected command.
CE, DE (Hex 0C)		X	X	Normal status for a No Operation command.
UC (Hex 02)	BOC (Hex 20)	X	X	A parity check was detected on the command byte.
UC (Hex 02)	IR (Hex 40)	X	X	A command other than Sense, Diagnostic Write, or Diagnostic Read was addressed to a device that the CU has recorded as "unavailable" or "not ready".
UC (Hex 02)	CR (Hex 80)	X	X	The command did not decode as a valid 3272 command.
B (Hex 10)		X	X	Response to a command addressed to a device which is being serviced by the CU or which is completing a previously issued command.
B, SM (Hex 50)		X	X	Response to a command to a device other than the device whose status is pending or the device which is being serviced by the CU.

Diagram 7-109. Initial Status and Sense Conditions

Status Byte	Sense Byte	Display Station	Printer	Condition
CE (Hex 08)		X	X	Sent at the end of the data stream on a Write or Erase/Write command.
CE, DE (Hex 0C)		X	X	Sent at the end of the data stream on a Read Buffer, Read Modified, Sense, Diagnostic Read, or Diagnostic Write command. Also, when the channel byte count goes to zero on a Read Modified or Read Buffer command.
CE, DE, UC (1) (Hex 0E)	BOC (Hex 20)	X	X	The CU detected a parity error on a character in the data stream of a Write, Erase/Write, or Diagnostic Write command.
CE, DE, UC (1) (Hex 0E)	DC, US (Hex 0C)	X	X	The addressed device detected a parity or cursor check during a Write, Read Buffer, or Read Modified command.
CE, DE, UC (1) (Hex 0E)	DC (Hex 08)	X	X	The CU detected a cursor or parity check during receipt of the data stream on a Write or Erase/Write command, or during transmission of the data stream on a Read Buffer or Read Modified command.
CE, DE, UC (1) (Hex 0E)	CC (Hex 02)	X	X	The addressed device failed to respond in a specified period of time to an Erase/Write command or an unchained Read Buffer, Read Modified, or Write command.
CE, DE, UC (1) (Hex 0E)	OC (Hex 01)	X	X	The CU received an illegal buffer address in the data stream of a Write or Erase/Write command. Also, during a Write or Erase/Write command, the data stream ended before providing all of the characters required for an SBA, RA, SF, or EUA order sequence.
CE, DE, UE (1) (Hex 0D)		X	X	The CU attempted to perform a Read Buffer, Read Modified, Write, or Erase/Write command but found the addressed device "busy" performing another operation.

Note:
(1) If this asynchronous status is stacked by the channel, an asynchronous CUE could be generated and combined with the status before the stack is removed.

Diagram 7-110. Ending Status and Sense Conditions

Status Byte	Sense Byte	Display Station	Printer	Condition
A (1) (Hex 80)		X		An attention-generating action (e.g., PA key depressed) was performed by the operator.
A, UC (1) (Hex 82)	EC (Hex 10)	X	X	An idle CU polled a device twice and detected a "transmit" parity check each time on the data in the device reply.
A, UC (1) (Hex 82)	DC, US (Hex 0C)	X	X	An idle device detected a parity check or cursor check in its buffer.
DE (1, 2) (Hex 04)		X	X	1. The CU-to-device buffer transfer is completed on a Write or Erase/Write command which did not start a Printer. 2. The device becomes "not busy" after completing an Erase All Unprotected command or the Printer becomes "not busy" after completing a printout. 3. The device-to-CU buffer transfer is completed on a Select command. 4. A device changes from "not available" to "available" or from "not ready" to "ready". 5. A device becomes "not busy" after having previously sent unit exception. (Unit exception was sent because the CU attempted to execute a command with the device when it was "busy".) 6. The control unit ON LINE/OFF LINE switch is thrown from ON LINE to OFF LINE. This causes each "available" device to present a device end to the channel.
A, DE, UC (1) (Hex 86)	IR (Hex 40)		X	The addressed Printer became NOT READY (out of paper or cover open) before completion of a printout operation.
DE UC (1, 2) (Hex 86)	IR (Hex 40)		X	A command attempting to start a Printer found it NOT READY.
A, DE, UC (1) (Hex 86)	IR, EC, US (Hex 54)		X	A Printer mechanical "hang" was detected during a printout and an automatic recovery was not successful.
DE, UC, (1, 2) (Hex 06)	IR, EC, US (Hex 54)			A command attempted to "start" a printout when ac power at the Printer was OFF.
A, DE, UC (1) (Hex 86)	EC, US (Hex 14)		X	A Printer character-generator "read-out" error or a Printer mechanical "hang" occurred while the printout operation was being completed.
DE, UC (1, 2) (Hex 06)	DC (Hex 08)	X	X	1. The CU detected a parity or cursor error during a Select, Write, or Erase/Write command. 2. The CU detected a "transmit" parity check on data received from the addressed device in response to a "poll" during a command.
DE, UC (1, 2) (Hex 06)	DC, US (Hex 0C)	X	X	The addressed device detected a parity or cursor check while executing a Select, Write, Erase/Write, or Erase All Unprotected command.
DE, UC (1, 2) (Hex 06)	OC (Hex 01)	X	X	A Write or Erase/Write command, containing a WCC with a "start print" bit, was chained to a subsequent command.
DE, UC (1, 2) (Hex 06)	CC (Hex 02)	X	X	The addressed device failed to respond in a specified period of time to a Select, Write, Erase/Write, or Erase All Unprotected command.
DE, UE (1, 2) (Hex 05)		X		An attempt was made by the CU to perform an Erase All Unprotected command with a "busy" device.
CUE (Hex 20)		X	X	The control unit had been addressed while busy, but is now not busy and is free to accept a new command.
DE, CE (Hex 0C)		X	X	This status is sent if Channel End was stacked by the channel and the operation was completed before the channel could accept status.

NOTES:

(1) If this asynchronous status is stacked by the channel, an asynchronous CUE could be generated and combined with it before the stack is removed.

(2) If CE status is stacked by the channel, this asynchronous status condition could be generated and combined with CE before the stack is removed. If this combination of stacked CE status and asynchronous status is in turn stacked, an asynchronous CUE status could be generated and combined with it before the stack is removed.

(3) If this asynchronous status is stacked by the channel, an asynchronous CUE could be generated and combined with the status before the stack is removed.

Diagram 7-111. Asynchronous Status and Sense Conditions

A. EBCDIC

Bits 4567	Hex 1	00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11
		00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0000	0	NUL				SP	&	-									0
0001	1	SOH	SBA / DC1					/		a	j			A	J		1
0010	2	STX	EUA / DC2							b	k	s		B	K	S	2
0011	3		IC / DC3							c	l	t		C	L	T	3
0100	4									d	m	u		D	M	U	4
0101	5	PT / HT	NL							e	n	v		E	N	V	5
0110	6									f	o	w		F	O	W	6
0111	7									g	p	x		G	P	X	7
1000	8									h	q	y		H	Q	Y	8
1001	9		EM							i	r	z		I	R	Z	9
1010	A					¢	!	¦	:								
1011	B					.	$	,	#								
1100	C		DUP IFS		RA	<	*	%	@								
1101	D		SF / IGS			(	)	_	'								
1110	E		FM / IRS			+	;	>	=								
1111	F		IUS			|	¬	?	"								

First Hex Char

Second Hex Char

Bits 0,1 ← 00 01 10 11

Bits 2,3 ← 00 01 10 11 00 01 10 11 00 01 10 11 00 01 10 11

Hex 0 ← 0 1 2 3 4 5 6 7 8 9 A B C D E F

Extended Binary-Coded-Decimal Interchange Code (EBCDIC)

Only those data characters shown within bold outline can be displayed and printed. Lowercase alphabetic characters are converted to uppercase by the Display Station or Printer, and are displayed or printed as uppercase characters.

NL, EM, DUP, and FM order characters (uniquely stored in the buffer) are displayed or printed as 5, 9, * and ; characters, respectively; except by the Printer under Format Control, in which case NL and EM do not result in a character being printed.

The data characters stored, displayed, printed and read back, for all remaining codes, are not defined.

IUS is interpreted under BSC standards as ITB.

Control Characters not shown are not recognized by the 3270.

The following characters are internally handled as 6-bit structured data: graphic, write control, AID, attribute, CU and device address, buffer address, and status and sense. When any of these characters is received, only the low-order 6 bits are used, and the rest are ignored. When any of these characters is transmitted, the appropriate EBCDIC code is assigned, so that the 6-bit code can be represented by a graphic character. Note that this table is an overlay of EBCDIC columns 4-7 hex on EBCDIC columns C-F hex.

Bits 2–7	Graphic	EBCDIC	Bits 2–7	Graphic	EBCDIC
00 0000	SP	40	10 0000	-	60
00 0001	A	C1	10 0001	/	61
00 0010	B	C2	10 0010	S	E2
00 0011	C	C3	10 0011	T	E3
00 0100	D	C4	10 0100	U	E4
00 0101	E	C5	10 0101	V	E5
00 0110	F	C6	10 0110	W	E6
00 0111	G	C7	10 0111	X	E7
00 1000	H	C8	10 1000	Y	E8
00 1001	I	C9	10 1001	Z	E9
00 1010	¢	4A	10 1010	¦	6A
00 1011	.	4B	10 1011	,	6B
00 1100	<	4C	10 1100	%	6C
00 1101	(	4D	10 1101	_	6D
00 1110	+	4E	10 1110	>	6E
00 1111	|	4F	10 1111	?	6F
01 0000	&	50	11 0000	0	F0
01 0001	J	D1	11 0001	1	F1
01 0010	K	D2	11 0010	2	F2
01 0011	L	D3	11 0011	3	F3
01 0100	M	D4	11 0100	4	F4
01 0101	N	D5	11 0101	5	F5
01 0110	O	D6	11 0110	6	F6
01 0111	P	D7	11 0111	7	F7
01 1000	Q	D8	11 1000	8	F8
01 1001	R	D9	11 1001	9	F9
01 1010	!	5A	11 1010	:	7A
01 1011	$	5B	11 1011	#	7B
01 1100	*	5C	11 1100	@	7C
01 1101	)	5D	11 1101	'	7D
01 1110	;	5E	11 1110	=	7E
01 1111	¬	5F	11 1111	"	7F

|	logical OR (4F)	¬	logical NOT (5F)
¦	vertical line (6A) (is not displayed)	>	greater than (6E)
		<	less than (4C)

Diagram 7-112. I/O Interface Codes (Sheet 1 of 4)

B. Katakana I/O Code

Second Hex Char. / Bits 4567	Hex 1	First Hex Char. 00	01	10	11
		00 01 10 11	00 01 10 11	00 01 10 11	00 01 10 11
		0 1 2 3	4 5 6 7	8 9 A B	C D E F
0000	0	NUL DLE	SP & -	ソ	$ 0
0001	1	SOH SBA	｡ エ /	ア タ	A J 1
0010	2	STX EUA SYN	「 オ	イ チ ｢	B K S 2
0011	3	ETX IC	」 ャ	ウ ツ ホ	C L T 3
0100	4		、 ュ	エ テ マ	D M U 4
0101	5	PT NL	・ ョ	オ ト ミ	E N V 5
0110	6	ETB	ヲ ッ	カ ナ ム	F O W 6
0111	7	ESC EOT	ァ	キ ニ メ	G P X 7
1000	8		ィ -	ク ヌ モ	H Q Y 8
1001	9	EM	ゥ	ケ ネ ヤ	I R Z 9
1010	A			コ ノ ユ レ	
1011	B		. ¥ , #		ロ
1001	C	DUP RA	< * % @	サ ヨ	ワ
1101	D	SF ENQ NAK	( ) — '	シ ハ ラ	ン
1110	E	FM	+ ; > =	ス ヒ リ	゛
1111	F	IUS SUB	| ¬ ?	セ フ ル	°

Character code assignments other than those shown within the heavily outlined portions of this chart are undefined. If an undefined character code is programmed, the character that will be displayed is not specified. The character displayed by the 3277 or 3275 for a given undefined character code may be different for other devices. IBM reserves the right to change at any time the character displayed for an undefined character code.

Hex codes 4A, 5A, 6A, and 7F are used for CU addressing, device addressing, buffer addressing, and control purposes (e.g., WCC, CCC, etc.) but have no associated graphic characters.

NL displays or prints as Blank 5
EM displays or prints as Blank 9
DUP displays or prints as * (asterisk)
FM displays or prints as ; (semi-colon)
Exceptions: A printer not operating under Format Control does not print a character when NL or EM is decoded, but performs the specified function.

NL and EM are stored in the buffer in two buffer locations. The Katakana hardware expands the NL and EM character received from the program to the required two-byte sequence. It also contracts the two-byte buffer sequence to the EBCDIC NL or EM code to transfer back to the program.

Bits 0 and 1 are assigned by the 3270 to the following characters prior to transmission to the CPU: graphic, AID, attribute, write control (WCC), copy control (CCC), CU and device address, buffer address, sense and status.

Diagram 7-112. I/O Interface Codes (Sheet 2 of 4)

C. Data Analysis - APL Feature Data Characters Preceded by SF Code

Second Hex Char. / Bits 4567	Hex 1	First Hex Char. CONTROL = 1															
		00				01				10				11			
		00 01 10 11				00 01 10 11				00 01 10 11				00 01 10 11			
		0 1 2 3				4 5 6 7				8 9 A B				C D E F			
0000	0										( )	0					
0001	1									A J	◦	1					
0010	2									B K S		2	↓	I	⊖		
0011	3									C L T		3	¨	!	⍞	Δ	
0100	4									D M U		4					
0101	5									E N V		5					
0110	6									F O W		6	~ ∇	∀	⍫		
0111	7									G P X		7	⊛	⍋	⍒		
1000	8									H Q Y		8					
1001	9									I R Z		9					
1010	A					~ ∧	⍞	∧		1 2 3		n					
1011	B					~ ∨	⍝	∨	~		⍞	⌊ ⌋					
1100	C									−		⌈ ⌉					
1101	D									( )		⊢ ⊤					
1110	E					⍘	⍀			+	±	⊣ ⊥					
1111	F					⍉	⍁			+	■	● —					

D. Data Analysis - APL Feature Interface Codes

Second Hex Char.		CONTROL = 0																CONTROL = 1															
		00				01				10				11				00				01				10				11			
Bits 4567	Hex 1	00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0000	0	NUL	DLE			SP	&	-			⍸	⍤	α				⍬										{	}	0				
0001	1	SOH	SBA					/		a	j		⍵	A	J		1									A	J	°	1				
0010	2	STX	EUA		SYN					b	k	s	ι	B	K	S	2									B	K	S	2	↓	⌶	⊖	
0011	3	ETX	IC							c	l	t	p	C	L	T	3									C	L	T	3	⋆⋆	!	⍞	⍙
0100	4									d	m	u	ω	D	M	U	4									D	M	U	4				
0101	5	PT	NL							e	n	v		E	N	V	5									E	N	V	5				
0110	6			ETB						f	o	w	X	F	O	W	6									F	O	W	6	⍨⍱	⍱	⍢	
0111	7			ESC	EOT					g	p	x	\	G	P	X	7									G	P	X	7	⍟	⍋	⍒	
1000	8									h	q	y	÷	H	Q	Y	8									H	Q	Y	8				
1001	9		EM							i	r	z		I	R	Z	9									I	R	Z	9				
1010	A					¢	!		:	↑	⊃	∩	∇									⍨∧	⍞	∧		1	2	3	n				
1011	B					.	$	.	#		⊂	∪	Δ									⍨∨	⍰	∨	~		⍞	⌊	⌋				
1100	C		DUP		RA	<	*	%	@	≤		⊥	⊤													⁻		⌐	¬				
1101	D		SF	ENQ	NAK	(	)	_	'	⌈	○	⌊	⌋													(	)	⊢	⊤				
1110	E		FM			+	;	>	=	⌊		≥	≠									⍞	⍲			+	±	⊣	⊥				
1111	F		ITB		SUB	|	¬	?	"	→	←	∘	|								⍀	⍱			+	⍞	o	—				

First Hex Char.

Bits 0.1

2.3

Hex 0

Diagram 7-112. I/O Interface Codes (Sheet 3 of 4)

E. Data Analysis - APL Feature Interface Codes

The following characters are internally handled as 8-bit structured data: graphic, write control, AID, attribute, CU and device address, buffer address, and status and sense. When any of these characters is received, bit 0 is dropped, and the remaining 7 bits (1-7) are stored. If the character is preceded by a START FIELD character (1D), the control bit will be turned on for that character. When any of these characters is transmitted, the appropriate EBCDIC code is assigned. In the case of data characters with the control bit on, the START FIELD (1D) will be generated with the EBCDIC code.

Control Bit =0				Control Bit =0			
Bits 1-7		Graphic	EBCDIC	Bits 1-7		Graphic	EBCDIC
000 0001	0	a	81	011 1011	0	Δ	BB
000 0010	0	b	82	011 1100	0	⊤	BC
000 0011	0	c	83	011 1101	0	⌋	BD
000 0100	0	d	84	011 1110	0	≠	BE
000 0101	0	e	85	011 1111	0	|	BF
000 0110	0	f	86	100 0000	0	SP	40
000 0111	0	g	87	100 0001	0	A	C1
000 1000	0	h	88	100 0010	0	B	C2
000 1001	0	i	89	100 0011	0	C	C3
000 1010	0	↑	8A	100 0100	0	D	C4
000 1100	0	≤	8C	100 0101	0	E	C5
000 1101	0	⌈	8D	100 0110	0	F	C6
000 1110	0	⌊	8E	100 0111	0	G	C7
000 1111	0	→	8F	100 1000	0	H	C8
001 0000	0	∘	90	100 1001	0	I	C9
001 0001	0	j	91	100 1010	0	¢	4A
001 0010	0	k	92	100 1011	0	.	4B
001 0011	0	l	93	100 1100	0	<	4C
001 0100	0	m	94	100 1101	0	(	4D
001 0101	0	n	95	100 1110	0	+	4E
001 0110	0	o	96	100 1111	0	|	4F
001 0111	0	p	97	101 0000	0	&	50
001 1000	0	q	98	101 0001	0	J	D1
001 1001	0	r	99	101 0010	0	K	D2
001 1010	0	ↄ	9A	101 0011	0	L	D3
001 1011	0	⊂	9B	101 0100	0	M	D4
001 1101	0	○	9D	101 0101	0	N	D5
001 1111	0	←	9F	101 0110	0	O	D6
010 0000	0	⁻	A0	101 0111	0	P	D7
010 0010	0	s	A2	101 1000	0	Q	D8
010 0011	0	t	A3	101 1001	0	R	D9
010 0100	0	u	A4	101 1010	0	!	5A
010 0101	0	v	A5	101 1011	0	$	5B
010 0110	0	w	A6	101 1100	0	*	5C
010 0111	0	x	A7	101 1101	0	)	5D
010 1000	0	y	A8	101 1110	0	;	5E
010 1001	0	z	A9	101 1111	0	¬	5F
010 1010	0	∩	AA	110 0000	0	‾	60
010 1011	0	∪	AB	110 0001	0	/	61
010 1100	0	⊥	AC	110 0010	0	S	E2
010 1101	0	⌊	AD	110 0011	0	T	E3
010 1110	0	≥	AE	110 0100	0	U	E4
010 1111	0	●	AF	110 0101	0	V	E5
011 0000	0	⍺	B0	110 0110	0	W	E6
011 0001	0	∈	B1	110 0111	0	X	E7
011 0010	0	⍳	B2	110 1000	0	Y	E8
011 0011	0	⍴	B3	110 1001	0	Z	E9
011 0100	0	⍵	B4	110 1011	0	,	6B
011 0110	0	x	B6	110 1100	0	%	6C
011 0111	0	\	B7	110 1101	0	_	6D
011 1000	0	÷	B8	110 1110	0	>	6E
011 1010	0	∇	BA	110 1111	0	?	6F

Control Bit =0			
Bits 1-7		Graphic	EBCDIC
111 0000	0	0	F0
111 0001	0	1	F1
111 0010	0	2	F2
111 0011	0	3	F3
111 0100	0	4	F4
111 0101	0	5	F5
111 0110	0	6	F6
111 0111	0	7	F7
111 1000	0	8	F8
111 1001	0	9	F9
111 1010	0	:	7A
111 1011	0	#	7B
111 1100	0	@	7C
111 1101	0	'	7D
111 1110	0	=	7E
111 1111	0	"	7F

Control Bit =1			
Bits 1-7		Graphic	EBCDIC
000 0001	1	A	1D 81
000 0010	1	B	1D 82
000 0011	1	C	1D 83
000 0100	1	D	1D 84
000 0101	1	E	1D 85
000 0110	1	F	1D 86
000 0111	1	G	1D 87
000 1000	1	H	1D 88
000 1001	1	I	1D 89
000 1010	1	⁻	1D 8A
000 1100	1	(	1D 8C
000 1101	1	+	1D 8D
000 1110	1	+	1D 8E
000 1111	1	(	1D 8F
001 0000	1	J	1D 90
001 0001	1	K	1D 91
001 0010	1	L	1D 92
001 0011	1	M	1D 93
001 0100	1	N	1D 94
001 0101	1	O	1D 95
001 0110	1	P	1D 96
001 0111	1	Q	1D 97
001 1000	1	R	1D 98
001 1001	1	2	1D 99
001 1010	1	□	1D 9A
001 1011	1	)	1D 9B
001 1101	1	±	1D 9D
000 1110	1	■	1D 9E
000 1111	1	}	1D 9F
010 0000	1	S	1D A0
010 0010	1	T	1D A2
010 0011	1	U	1D A3

Control Bit =1			
Bits 1-7		Graphic	EBCDIC
010 0100	1	U	1D A4
010 0101	1	V	1D A5
010 0110	1	W	1D A6
010 0111	1	X	1D A7
010 1000	1	Y	1D A8
010 1001	1	Z	1D A9
010 1010	1	3	1D AA
010 1011	1	⌊	1D AB
010 1100	1	⌈	1D AC
010 1101	1	⊢	1D AD
010 1110	1	⊣	1D AE
010 1111	1	●	1D AF
011 0000	1	0	1D B0
011 0001	1	1	1D B1
011 0010	1	2	1D B2
011 0011	1	3	1D B3
011 0100	1	4	1D B4
011 0101	1	5	1D B5
011 0110	1	6	1D B6
011 0111	1	7	1D B7
011 1000	1	8	1D B8
011 1001	1	9	1D B9
011 1010	1	ⁿ	1D BA
011 1011	1	⌋	1D BB
011 1100	1	⌐	1D BC
011 1101	1	⊤	1D BD
011 1110	1	⊥	1D BE
011 1111	1	—	1D BF
100 0010	1	⍋	1D C2
100 0011	1	⍒	1D C3
100 0110	1	⍫	1D C6
100 0111	1	⍟	1D C7
100 1010	1	⍲	1D 4A
100 1011	1	⍱	1D 4B
100 1110	1	⍬	1D 4E
100 1111	1	⍉	1D 4F
101 0010	1	I	1D D2
101 0011	1	!	1D D3
101 0110	1	⍱	1D D6
101 0111	1	⍋	1D D7
101 1010	1	⍞	1D 5A
101 1011	1	⍵	1D 5B
101 1110	1	⍲	1D 5E
101 1111	1	⍀	1D 5F
110 0010	1	⍜	1D E2
110 0011	1	⍈	1D E3
110 0110	1	⍫	1D E6
110 0111	1	⍢	1D E7
110 1010	1	∧	1D 6A
110 1011	1	∨	1D 6B
111 0011	1	⍋	1D F3
111 1011	1	~	1D 7B

Diagram 7-112. I/O Interface Codes (Sheet 4 of 4)

Command	WCC / CCC	Erase Bfr	Fetch Device Bfr	Write in CU Bfr	Orders	Xfr CU Bfr to Device Bfr	AID	Cursor Address	Encode SBA and Adr of 1st char of MDF	(1) Xfr all CU Bfr to Chan	Suppress Nulls	Xfr MDF Data Only	Initial Status (Normal)	Ending Status	Async Status	Local								
																Hex	Binary (8 4 2 1)							
																	0	1	2	3	4	5	6	7
																	0	0	0	0	0	1	0	1
Erase/Write	X	X		X	X	X							00	CE	DE	05					0	1	0	1
Write	X		*	X	X	X							00	CE	DE	01					0	0	0	1
Read Buffer			*				X	X (2 bytes)		X			00	CE,DE		02					0	0	1	0
Read Modified			*				X	X (2 bytes)	X		X	X	00	CE,DE		06					0	1	1	0
Select			*										CE		DE	0B					1	0	1	1
Erase All Unprotected													CE (2)		DE	0F					1	1	1	1
No-Op													CE,DE			03					0	0	1	1
Test I/O													(3)			00					0	0	0	0
Sense													00	CE,DE		04					0	1	0	0
Diagnostic Write													00	CE,DE		09					1	0	0	1
Diagnostic Read													00	CE,DE		0A					1	0	1	0

* Only if command is unchained or buffer is "not valid".

(1) Unless ended by channel.

(2) Note: Manually, CE and DE together

(3) Stacked or pending status, otherwise 0 0.

Diagram 7-113. Command Code Summary

Mod 1 R C	Mod 2 R C	Position Dec	Position Hex	Buffer Address (Hex) EBCDIC	
01 01	01 01	0000	0000	40	40
01 02	01 02	0001	0001	40	C1
01 03	01 03	0002	0002	40	C2
01 04	01 04	0003	0003	40	C3
01 05	01 05	0004	0004	40	C4
01 06	01 06	0005	0005	40	C5
01 07	01 07	0006	0006	40	C6
01 08	01 08	0007	0007	40	C7
01 09	01 09	0008	0008	40	C8
01 10	01 10	0009	0009	40	C9
01 11	01 11	0010	000A	40	4A
01 12	01 12	0011	000B	40	4B
01 13	01 13	0012	000C	40	4C
01 14	01 14	0013	000D	40	4D
01 15	01 15	0014	000E	40	4E
01 16	01 16	0015	000F	40	4F
01 17	01 17	0016	0010	40	50
01 18	01 18	0017	0011	40	D1
01 19	01 19	0018	0012	40	D2
01 20	01 20	0019	0013	40	D3
01 21	01 21	0020	0014	40	D4
01 22	01 22	0021	0015	40	D5
01 23	01 23	0022	0016	40	D6
01 24	01 24	0023	0017	40	D7
01 25	01 25	0024	0018	40	D8
01 26	01 26	0025	0019	40	D9
01 27	01 27	0026	001A	40	5A
01 28	01 28	0027	001B	40	5B
01 29	01 29	0028	001C	40	5C
01 30	01 30	0029	001D	40	5D
01 31	01 31	0030	001E	40	5E
01 32	01 32	0031	001F	40	5F
01 33	01 33	0032	0020	40	60
01 34	01 34	0033	0021	40	61
01 35	01 35	0034	0022	40	E2
01 36	01 36	0035	0023	40	E3
01 37	01 37	0036	0024	40	E4
01 38	01 38	0037	0025	40	E5
01 39	01 39	0038	0026	40	E6
01 40	01 40	0039	0027	40	E7
02 01	01 41	0040	0028	40	E8
02 02	01 42	0041	0029	40	E9
02 03	01 43	0042	002A	40	6A
02 04	01 44	0043	002B	40	6B
02 05	01 45	0044	002C	40	6C
02 06	01 46	0045	002D	40	6D
02 07	01 47	0046	002E	40	6E
02 08	01 48	0047	002F	40	6F
02 09	01 49	0048	0030	40	F0
02 10	01 50	0049	0031	40	F1
02 11	01 51	0050	0032	40	F2
02 12	01 52	0051	0033	40	F3
02 13	01 53	0052	0034	40	F4
02 14	01 54	0053	0035	40	F5
02 15	01 55	0054	0036	40	F6
02 16	01 56	0055	0037	40	F7
02 17	01 57	0056	0038	40	F8
02 18	01 58	0057	0039	40	F9
02 19	01 59	0058	003A	40	7A
02 20	01 60	0059	003B	40	7B
02 21	01 61	0060	003C	40	7C
02 22	01 62	0061	003D	40	7D
02 23	01 63	0062	003E	40	7E
02 24	01 64	0063	003F	40	7F
02 25	01 65	0064	0040	C1	40
02 26	01 66	0065	0041	C1	C1
02 27	01 67	0066	0042	C1	C2
02 28	01 68	0067	0043	C1	C3
02 29	01 69	0068	0044	C1	C4
02 30	01 70	0069	0045	C1	C5
02 31	01 71	0070	0046	C1	C6
02 32	01 72	0071	0047	C1	C7
02 33	01 73	0072	0048	C1	C8
02 34	01 74	0073	0049	C1	C9
02 35	01 75	0074	004A	C1	4A
02 36	01 76	0075	004B	C1	4B
02 37	01 77	0076	004C	C1	4C
02 38	01 78	0077	004D	C1	4D
02 39	01 79	0078	004E	C1	4E
02 40	01 80	0079	004F	C1	4F
03 01	02 01	0080	0050	C1	50
03 02	02 02	0081	0051	C1	D1
03 03	02 03	0082	0052	C1	D2
03 04	02 04	0083	0053	C1	D3
03 05	02 05	0084	0054	C1	D4
03 06	02 06	0085	0055	C1	D5
03 07	02 07	0086	0056	C1	D6
03 08	02 08	0087	0057	C1	D7
03 09	02 09	0088	0058	C1	D8
03 10	02 10	0089	0059	C1	D9
03 11	02 11	0090	005A	C1	5A
03 12	02 12	0091	005B	C1	5B
03 13	02 13	0092	005C	C1	5C
03 14	02 14	0093	005D	C1	5D
03 15	02 15	0094	005E	C1	5E
03 16	02 16	0095	005F	C1	5F
03 17	02 17	0096	0060	C1	60
03 18	02 18	0097	0061	C1	61
03 19	02 19	0098	0062	C1	E2
03 20	02 20	0099	0063	C1	E3
03 21	02 21	0100	0064	C1	E4
03 22	02 22	0101	0065	C1	E5
03 23	02 23	0102	0066	C1	E6
03 24	02 24	0103	0067	C1	E7
03 25	02 25	0104	0068	C1	E8
03 26	02 26	0105	0069	C1	E9
03 27	02 27	0106	006A	C1	6A
03 28	02 28	0107	006B	C1	6B
03 29	02 29	0108	006C	C1	6C
03 30	02 30	0109	006D	C1	6D
03 31	02 31	0110	006E	C1	6E
03 32	02 32	0111	006F	C1	6F
03 33	02 33	0112	0070	C1	F0
03 34	02 34	0113	0071	C1	F1
03 35	02 35	0114	0072	C1	F2
03 36	02 36	0115	0073	C1	F3
03 37	02 37	0116	0074	C1	F4
03 38	02 38	0117	0075	C1	F5
03 39	02 39	0118	0076	C1	F6
03 40	02 40	0119	0077	C1	F7
04 01	02 41	0120	0078	C1	F8
04 02	02 42	0121	0079	C1	F9
04 03	02 43	0122	007A	C1	7A
04 04	02 44	0123	007B	C1	7B
04 05	02 45	0124	007C	C1	7C
04 06	02 46	0125	007D	C1	7D
04 07	02 47	0126	007E	C1	7E
04 08	02 48	0127	007F	C1	7F
04 09	02 49	0128	0080	C2	40
04 10	02 50	0129	0081	C2	C1
04 11	02 51	0130	0082	C2	C2
04 12	02 52	0131	0083	C2	C3
04 13	02 53	0132	0084	C2	C4
04 14	02 54	0133	0085	C2	C5
04 15	02 55	0134	0086	C2	C6
04 16	02 56	0135	0087	C2	C7
04 17	02 57	0136	0088	C2	C8
04 18	02 58	0137	0089	C2	C9
04 19	02 59	0138	008A	C2	4A
04 20	02 60	0139	008B	C2	4B
04 21	02 61	0140	008C	C2	4C
04 22	02 62	0141	008D	C2	4D
04 23	02 63	0142	008E	C2	4E
04 24	02 64	0143	008F	C2	4F
04 25	02 65	0144	0090	C2	50
04 26	02 66	0145	0091	C2	D1
04 27	02 67	0146	0092	C2	D2
04 28	02 68	0147	0093	C2	D3
04 29	02 69	0148	0094	C2	D4
04 30	02 70	0149	0095	C2	D5
04 31	02 71	0150	0096	C2	D6
04 32	02 72	0151	0097	C2	D7
04 33	02 73	0152	0098	C2	D8
04 34	02 74	0153	0099	C2	D9
04 35	02 75	0154	009A	C2	5A
04 36	02 76	0155	009B	C2	5B
04 37	02 77	0156	009C	C2	5C
04 38	02 78	0157	009D	C2	5D
04 39	02 79	0158	009E	C2	5E
04 40	02 80	0159	009F	C2	5F
05 01	03 01	0160	00A0	C2	60
05 02	03 02	0161	00A1	C2	61
05 03	03 03	0162	00A2	C2	E2
05 04	03 04	0163	00A3	C2	E3
05 05	03 05	0164	00A4	C2	E4
50 06	03 06	0165	00A5	C2	E5
05 07	03 07	0166	00A6	C2	E6
05 08	03 08	0167	00A7	C2	E7
05 09	03 09	0168	00A8	C2	E8
05 10	03 10	0169	00A9	C2	E9
05 11	03 11	0170	00AA	C2	6A
05 12	03 12	0171	00AB	C2	6B
05 13	03 13	0172	00AC	C2	6C
05 14	03 14	0173	00AD	C2	6D
05 15	03 15	0174	00AE	C2	6E
05 16	03 16	0175	00AF	C2	6F
05 17	03 17	0176	00B0	C2	F0
05 18	03 18	0177	00B1	C2	F1
05 19	03 19	0178	00B2	C2	F2
05 20	03 20	0179	00B3	C2	F3
05 21	03 21	0180	00B4	C2	F4
05 22	03 22	0181	00B5	C2	F5
05 23	03 23	0182	00B6	C2	F6
05 24	03 24	0183	00B7	C2	F7
05 25	03 25	0184	00B8	C2	F8
05 26	03 26	0185	00B9	C2	F9
05 27	03 27	0186	00BA	C2	7A
05 28	03 28	0187	00BB	C2	7B
05 29	03 29	0188	00BC	C2	7C
05 30	03 30	0189	00BD	C2	7D
05 31	03 31	0190	00BE	C2	7E
05 32	03 32	0191	00BF	C2	7F
05 33	03 33	0192	00C0	C3	40
05 34	03 34	0193	00C1	C3	C1
05 35	03 35	0194	00C2	C3	C2
05 36	03 36	0195	00C3	C3	C3
05 37	03 37	0196	00C4	C3	C4
05 38	03 38	0197	00C5	C3	C5
05 39	03 39	0198	00C6	C3	C6
05 40	03 40	0199	00C7	C3	C7
06 01	03 41	0200	00C8	C3	C8
06 02	03 42	0201	00C9	C3	C9
06 03	03 43	0202	00CA	C3	4A
06 04	03 44	0203	00CB	C3	4B
06 05	03 45	0204	00CC	C3	4C
06 06	03 46	0205	00CD	C3	4D
06 07	03 47	0206	00CE	C3	4E
06 08	03 48	0207	00CF	C3	4F
06 09	03 49	0208	00D0	C3	50
06 10	03 50	0209	00D1	C3	D1
06 11	03 51	0210	00D2	C3	D2
06 12	03 52	0211	00D3	C3	D3
06 13	03 53	0212	00D4	C3	D4
06 14	03 54	0213	00D5	C3	D5
06 15	03 55	0214	00D6	C3	D6
06 16	03 56	0215	00D7	C3	D7
06 17	03 57	0216	00D8	C3	D8
06 18	03 58	0217	00D9	C3	D9
06 19	03 59	0218	00DA	C3	5A
06 20	03 60	0219	00DB	C3	5B
06 21	03 61	0220	00DC	C3	5C
06 22	03 62	0221	00DD	C3	5D
06 23	03 63	0222	00DE	C3	5E
06 24	03 64	0223	00DF	C3	5F
06 25	03 65	0224	00E0	C3	60
06 26	03 66	0225	00E1	C3	61
06 27	03 67	0226	00E2	C3	E2
06 28	03 68	0227	00E3	C3	E3
06 29	03 69	0228	00E4	C3	E4
06 30	03 70	0229	00E5	C3	E5
06 31	03 71	0230	00E6	C3	E6
06 32	03 72	0231	00E7	C3	E7
06 33	03 73	0232	00E8	C3	E8
06 34	03 74	0233	00E9	C3	E9
06 35	03 75	0234	00EA	C3	6A
06 36	03 76	0235	00EB	C3	6B
06 37	03 77	0236	00EC	C3	6C
06 38	03 78	0237	00ED	C3	6D
06 39	03 79	0238	00EE	C3	6E
06 40	03 80	0239	00EF	C3	6F
07 01	04 01	0240	00F0	C3	F0
07 02	04 02	0241	00F1	C3	F1
07 03	04 03	0242	00F2	C3	F2
07 04	04 04	0243	00F3	C3	F3
07 05	04 05	0244	00F4	C3	F4
07 06	04 06	0245	00F5	C3	F5
07 07	04 07	0246	00F6	C3	F6
07 08	04 08	0247	00F7	C3	F7

Diagram 7-114. Buffer Addresses – EBCDIC Hex I/O Interface Code (Sheet 1 of 8)

Mod 1 R C	Mod 2 R C	Position Dec	Hex	Buffer Address (Hex) EBCDIC	
07 09	04 09	0248	00F8	C3	F8
07 10	04 10	0249	00F9	C3	F9
07 11	04 11	0250	00FA	C3	7A
07 12	04 12	0251	00FB	C3	7B
07 13	04 13	0252	00FC	C3	7C
07 14	04 14	0253	00FD	C3	7D
07 15	04 15	0254	00FE	C3	7E
07 16	04 16	0255	00FF	C3	7F
07 17	04 17	0256	0100	C4	40
07 18	04 18	0257	0101	C4	C1
07 19	04 19	0258	0102	C4	C2
07 20	04 20	0259	0103	C4	C3
07 21	04 21	0260	0104	C4	C4
07 22	04 22	0261	0105	C4	C5
07 23	04 23	0262	0106	C4	C6
07 24	04 24	0263	0107	C4	C7
07 25	04 25	0264	0108	C4	C8
07 26	04 26	0265	0109	C4	C9
07 27	04 27	0266	010A	C4	4A
07 28	04 28	0267	010B	C4	4B
07 29	04 29	0268	010C	C4	4C
07 30	04 30	0269	010D	C4	4D
07 31	04 31	0270	010E	C4	4E
07 32	04 32	0271	010F	C4	4F
07 33	04 33	0272	0110	C4	50
07 34	04 34	0273	0111	C4	D1
07 35	04 35	0274	0112	C4	D2
07 36	04 36	0275	0113	C4	D3
07 37	04 37	0276	0114	C4	D4
07 38	04 38	0277	0115	C4	D5
07 39	04 39	0278	0116	C4	D6
07 40	04 40	0279	0117	C4	D7
08 01	04 41	0280	0118	C4	D8
08 02	04 42	0281	0119	C4	D9
08 03	04 43	0282	011A	C4	5A
08 04	04 44	0283	011B	C4	5B
08 05	04 45	0284	011C	C4	5C
08 06	04 46	0285	011D	C4	5D
08 07	04 47	0286	011E	C4	5E
08 08	04 48	0287	011F	C4	5F
08 09	04 49	0288	0120	C4	60
08 10	04 50	0289	0121	C4	61
08 11	04 51	0290	0122	C4	E2
08 12	04 52	0291	0123	C4	E3
08 13	04 53	0292	0124	C4	E4
08 14	04 54	0293	0125	C4	E5
08 15	04 55	0294	0126	C4	E6
08 16	04 56	0295	0127	C4	E7
08 17	04 57	0296	0128	C4	E8
08 18	04 58	0297	0129	C4	E9
08 19	04 59	0298	012A	C4	6A
08 20	04 60	0299	012B	C4	6B
08 21	04 61	0300	012C	C4	6C
08 22	04 62	0301	012D	C4	6D
08 23	04 63	0302	012E	C4	6E
08 24	04 64	0303	012F	C4	6F
08 25	04 65	0304	0130	C4	F0
08 26	04 66	0305	0131	C4	F1
08 27	04 67	0306	0132	C4	F2
08 28	04 68	0307	0133	C4	F3
08 29	04 69	0308	0134	C4	F4
08 30	04 70	0309	0135	C4	F5
08 31	04 71	0310	0136	C4	F6
08 32	04 72	0311	0137	C4	F7
08 33	04 73	0312	0138	C4	F8
08 34	04 74	0313	0139	C4	F9
08 35	04 75	0314	013A	C4	7A
08 36	04 76	0315	013B	C4	7B
08 37	04 77	0316	013C	C4	7C
08 38	04 78	0317	013D	C4	7D
08 39	04 79	0318	013E	C4	7E
08 40	04 80	0319	013F	C4	7F
09 01	05 01	0320	0140	C5	40
09 02	05 02	0321	0141	C5	C1
09 03	05 03	0322	0142	C5	C2
09 04	05 04	0323	0143	C5	C3
09 05	05 05	0324	0144	C5	C4
09 06	05 06	0325	0145	C5	C5
09 07	05 07	0326	0146	C5	C6
09 08	05 08	0327	0147	C5	C7
09 09	05 09	0328	0148	C5	C8
09 10	05 10	0329	0149	C5	C9
09 11	05 11	0330	014A	C5	4A
09 12	05 12	0331	014B	C5	4B
09 13	05 13	0332	014C	C5	4C
09 14	05 14	0333	014D	C5	4D
09 15	05 15	0334	014E	C5	4E
09 16	05 16	0335	014F	C5	4F
09 17	05 17	0336	0150	C5	50
09 18	05 18	0337	0151	C5	D1
09 19	05 19	0338	0152	C5	D2
09 20	05 20	0339	0153	C5	D3
09 21	05 21	0340	0154	C5	D4
09 22	05 22	0341	0155	C5	D5
09 23	05 23	0342	0156	C5	D6
09 24	05 24	0343	0157	C5	D7
09 25	05 25	0344	0158	C5	D8
09 26	05 26	0345	0159	C5	D9
09 27	05 27	0346	015A	C5	5A
09 28	05 28	0347	015B	C5	5B
09 29	05 29	0348	015C	C5	5C
09 30	05 30	0349	015D	C5	5D
09 31	05 31	0350	015E	C5	5E
09 32	05 32	0351	015F	C5	5F
09 33	05 33	0352	0160	C5	60
09 34	05 34	0353	0161	C5	61
09 35	05 35	0354	0162	C5	E2
09 36	05 36	0355	0163	C5	E3
09 37	05 37	0356	0164	C5	E4
09 38	05 38	0357	0165	C5	E5
09 39	05 39	0358	0166	C5	E6
09 40	05 40	0359	0167	C5	E7
10 01	05 41	0360	0168	C5	E8
10 02	05 42	0361	0169	C5	E9
10 03	05 43	0362	016A	C5	6A
10 04	05 44	0363	016B	C5	6B
10 05	05 45	0364	016C	C5	6C
10 06	05 46	0365	016D	C5	6D
10 07	05 47	0366	016E	C5	6E
10 08	05 48	0367	016F	C5	6F
10 09	05 49	0368	0170	C5	F0
10 10	05 50	0369	0171	C5	F1
10 11	05 51	0370	0172	C5	F2
10 12	05 52	0371	0173	C5	F3
10 13	05 53	0372	0174	C5	F4
10 14	05 54	0373	0175	C5	F5
10 15	05 55	0374	0176	C5	F6
10 16	05 56	0375	0177	C5	F7
10 17	05 57	0376	0178	C5	F8
10 18	05 58	0377	0179	C5	F9
10 19	05 59	0378	017A	C5	7A
10 20	05 60	0379	017B	C5	7B
10 21	05 61	0380	017C	C5	7C
10 22	05 62	0381	017D	C5	7D
10 23	05 63	0382	017E	C5	7E
10 24	05 64	0383	017F	C5	7F
10 25	05 65	0384	0180	C6	40
10 26	05 66	0385	0181	C6	C1
10 27	05 67	0386	0182	C6	C2
10 28	05 68	0387	0183	C6	C3
10 29	05 69	0388	0184	C6	C4
10 30	05 70	0389	0185	C6	C5
10 31	05 71	0390	0186	C6	C6
10 32	05 72	0391	0187	C6	C7
10 33	05 73	0392	0188	C6	C8
10 34	05 74	0393	0189	C6	C9
10 35	05 75	0394	018A	C6	4A
10 36	05 76	0395	018B	C6	4B
10 37	05 77	0396	018C	C6	4C
10 38	05 78	0397	018D	C6	4D
10 39	05 79	0398	018E	C6	4E
10 40	05 80	0399	018F	C6	4F
11 01	06 01	0400	0190	C6	50
11 02	06 02	0401	0191	C6	D1
11 03	06 03	0402	0192	C6	D2
11 04	06 04	0403	0193	C6	D3
11 05	06 05	0404	0194	C6	D4
11 06	06 06	0405	0195	C6	D5
11 07	06 07	0406	0196	C6	D6
11 08	06 08	0407	0197	C6	D7
11 09	06 09	0408	0198	C6	D8
11 10	06 10	0409	0199	C6	D9
11 11	06 11	0410	019A	C6	5A
11 12	06 12	0411	019B	C6	5B
11 13	06 13	0412	019C	C6	5C
11 14	06 14	0413	019D	C6	5D
11 15	06 15	0414	019E	C6	5E
11 16	06 16	0415	019F	C6	5F
11 17	06 17	0416	01A0	C6	60
11 18	06 18	0417	01A1	C6	61
11 19	06 19	0418	01A2	C6	E2
11 20	06 20	0419	01A3	C6	E3
11 21	06 21	0420	01A4	C6	E4
11 22	06 22	0421	01A5	C6	E5
11 23	06 23	0422	01A6	C6	E6
11 24	06 24	0423	01A7	C6	E7
11 25	06 25	0424	01A8	C6	E8
11 26	06 26	0425	01A9	C6	E9
11 27	06 27	0426	01AA	C6	6A
11 28	06 28	0427	01AB	C6	6B
11 29	06 29	0428	01AC	C6	6C
11 30	06 30	0429	01AD	C6	6D
11 31	06 31	0430	01AE	C6	6E
11 32	06 32	0431	01AF	C6	6F
11 33	06 33	0432	01B0	C6	F0
11 34	06 34	0433	01B1	C6	F1
11 35	06 35	0434	01B2	C6	F2
11 36	06 36	0435	01B3	C6	F3
11 37	06 37	0436	01B4	C6	F4
11 38	06 38	0437	01B5	C6	F5
11 39	06 39	0438	01B6	C6	F6
11 40	06 40	0439	01B7	C6	F7
12 01	06 41	0440	01B8	C6	F8
12 02	06 42	0441	01B9	C6	F9
12 03	06 43	0442	01BA	C6	7A
12 04	06 44	0443	01BB	C6	7B
12 05	06 45	0444	01BC	C6	7C
12 06	06 46	0445	01BD	C6	7D
12 07	06 47	0446	01BE	C6	7E
12 08	06 48	0447	01BF	C6	7F
12 09	06 49	0448	01C0	C7	40
12 10	06 50	0449	01C1	C7	C1
12 11	06 51	0450	01C2	C7	C2
12 12	06 52	0451	01C3	C7	C3
12 13	06 53	0452	01C4	C7	C4
12 14	06 54	0453	01C5	C7	C5
12 15	06 55	0454	01C6	C7	C6
12 16	06 56	0455	01C7	C7	C7
12 17	06 57	0456	01C8	C7	C8
12 18	06 58	0457	01C9	C7	C9
12 19	06 59	0458	01CA	C7	4A
12 20	06 60	0459	01CB	C7	4B
12 21	06 61	0460	01CC	C7	4C
12 22	06 62	0461	01CD	C7	4D
12 23	06 63	0462	01CE	C7	4E
12 24	06 64	0463	01CF	C7	4F
12 25	06 65	0464	01D0	C7	50
12 26	06 66	0465	01D1	C7	D1
12 27	06 67	0466	01D2	C7	D2
12 28	06 68	0467	01D3	C7	D3
12 29	06 69	0468	01D4	C7	D4
12 30	06 70	0469	01D5	C7	D5
12 31	06 71	0470	01D6	C7	D6
12 32	06 72	0471	01D7	C7	D7
12 33	06 73	0472	01D8	C7	D8
12 34	06 74	0473	01D9	C7	D9
12 35	06 75	0474	01DA	C7	5A
12 36	06 76	0475	01DB	C7	5B
12 37	06 77	0476	01DC	C7	5C
12 38	06 78	0477	01DD	C7	5D
12 39	06 79	0478	01DE	C7	5E
12 40	06 80	0479	01DF	C7	5F
	07 01	0480	01E0	C7	60
	07 02	0481	01E1	C7	61
	07 03	0482	01E2	C7	E2
	07 04	0483	01E3	C7	E3
	07 05	0484	01E4	C7	E4
	07 06	0485	01E5	C7	E5
	07 07	0486	01E6	C7	E6
	07 08	0487	01E7	C7	E7
	07 09	0488	01E8	C7	E8
	07 10	0489	01E9	C7	E9
	07 11	0490	01EA	C7	6A
	07 12	0491	01EB	C7	6B
	07 13	0492	01EC	C7	6C
	07 14	0493	01ED	C7	6D
	07 15	0494	01EE	C7	6E
	07 16	0495	01EF	C7	6F

Diagram 7-114. Buffer Addresses – EBCDIC Hex I/O Interface Code (Sheet 2 of 8)

Mod 1 R	Mod 1 C	Mod 2 R	Mod 2 C	Position Dec	Position Hex	Buffer Address (Hex) EBCDIC	
		07	17	0496	01F0	C7	F0
		07	18	0497	01F1	C7	F1
		07	19	0498	01F2	C7	F2
		07	20	0499	01F3	C7	F3
		07	21	0500	01F4	C7	F4
		07	22	0501	01F5	C7	F5
		07	23	0502	01F6	C7	F6
		07	24	0503	01F7	C7	F7
		07	25	0504	01F8	C7	F8
		07	26	0505	01F9	C7	F9
		07	27	0506	01FA	C7	7A
		07	28	0507	01FB	C7	7B
		07	29	0508	01FC	C7	7C
		07	30	0509	01FD	C7	7D
		07	31	0510	01FE	C7	7E
		07	32	0511	01FF	C7	7F
		07	33	0512	0200	C8	40
		07	34	0513	0201	C8	C1
		07	35	0514	0202	C8	C2
		07	36	0515	0203	C8	C3
		07	37	0516	0204	C8	C4
		07	38	0517	0205	C8	C5
		07	39	0518	0206	C8	C6
		07	40	0519	0207	C8	C7
		07	41	0520	0208	C8	C8
		07	42	0521	0209	C8	C9
		07	43	0522	020A	C8	4A
		07	44	0523	020B	C8	4B
		07	45	0524	020C	C8	4C
		07	46	0525	020D	C8	4D
		07	47	0526	020E	C8	4E
		07	48	0527	020F	C8	4F
		07	49	0528	0210	C8	50
		07	50	0529	0211	C8	D1
		07	51	0530	0212	C8	D2
		07	52	0531	0213	C8	D3
		07	53	0532	0214	C8	D4
		07	54	0533	0215	C8	D5
		07	55	0534	0216	C8	D6
		07	56	0535	0217	C8	D7
		07	57	0536	0218	C8	D8
		07	58	0537	0219	C8	D9
		07	59	0538	021A	C8	5A
		07	60	0539	021B	C8	5B
		07	61	0540	021C	C8	5C
		07	62	0541	021D	C8	5D
		07	63	0542	021E	C8	5E
		07	64	0543	021F	C8	5F
		07	65	0544	0220	C8	60
		07	66	0545	0221	C8	61
		07	67	0546	0222	C8	E2
		07	68	0547	0223	C8	E3
		07	69	0548	0224	C8	E4
		07	70	0549	0225	C8	E5
		07	71	0550	0226	C8	E6
		07	72	0551	0227	C8	E7
		07	73	0552	0228	C8	E8
		07	74	0553	0229	C8	E9
		07	75	0554	022A	C8	6A
		07	76	0555	022B	C8	6B
		07	77	0556	022C	C8	6C
		07	78	0557	022D	C8	6D
		07	79	0558	022E	C8	6E
		07	80	0559	022F	C8	6F
		08	01	0560	0230	C8	F0
		08	02	0561	0231	C8	F1
		08	03	0562	0232	C8	F2
		08	04	0563	0233	C8	F3
		08	05	0564	0234	C8	F4
		08	06	0565	0235	C8	F5
		08	07	0566	0236	C8	F6
		08	08	0567	0237	C8	F7
		08	09	0568	0238	C8	F8
		08	10	0569	0239	C8	F9
		08	11	0570	023A	C8	7A
		08	12	0571	023B	C8	7B
		08	13	0572	023C	C8	7C
		08	14	0573	023D	C8	7D
		08	15	0574	023E	C8	7E
		08	16	0575	023F	C8	7F
		08	17	0576	0240	C9	40
		08	18	0577	0241	C9	C1
		08	19	0578	0242	C9	C2
		08	20	0579	0243	C9	C3
		08	21	0580	0244	C9	C4
		08	22	0581	0245	C9	C5
		08	23	0582	0246	C9	C6
		08	24	0583	0247	C9	C7
		08	25	0584	0248	C9	C8
		08	26	0585	0249	C9	C9
		08	27	0586	024A	C9	4A
		08	28	0587	024B	C9	4B
		08	29	0588	024C	C9	4C
		08	30	0589	024D	C9	4D
		08	31	0590	024E	C9	4E
		08	32	0591	024F	C9	4F
		08	33	0592	0250	C9	50
		08	34	0593	0251	C9	D1
		08	35	0594	0252	C9	D2
		08	36	0595	0253	C9	D3
		08	37	0596	0254	C9	D4
		08	38	0597	0255	C9	D5
		08	39	0598	0256	C9	D6
		08	40	0599	0257	C9	D7
		08	41	0600	0258	C9	D8
		08	42	0601	0259	C9	D9
		08	43	0602	025A	C9	5A
		08	44	0603	025B	C9	5B
		08	45	0604	025C	C9	5C
		08	46	0605	025D	C9	5D
		08	47	0606	025E	C9	5E
		08	48	0607	025F	C9	5F
		08	49	0608	0260	C9	60
		08	50	0609	0261	C9	61
		08	51	0610	0262	C9	E2
		08	52	0611	0263	C9	E3
		08	53	0612	0264	C9	E4
		08	54	0613	0265	C9	E5
		08	55	0614	0266	C9	E6
		08	56	0615	0267	C9	E7
		08	57	0616	0268	C9	E8
		08	58	0617	0269	C9	E9
		08	59	0618	026A	C9	6A
		08	60	0619	026B	C9	6B
		08	61	0620	026C	C9	6C
		08	62	0621	026D	C9	6D
		08	63	0622	026E	C9	6E
		08	64	0623	026F	C9	6F
		08	65	0624	0270	C9	F0
		08	66	0625	0271	C9	F1
		08	67	0626	0272	C9	F2
		08	68	0627	0273	C9	F3
		08	69	0628	0274	C9	F4
		08	70	0629	0275	C9	F5
		08	71	0630	0276	C9	F6
		08	72	0631	0277	C9	F7
		08	73	0632	0278	C9	F8
		08	74	0633	0279	C9	F9
		08	75	0634	027A	C9	7A
		08	76	0635	027B	C9	7B
		08	77	0636	027C	C9	7C
		08	78	0637	027D	C9	7D
		08	79	0638	027E	C9	7E
		08	80	0639	027F	C9	7F
		09	01	0640	0280	4A	40
		09	02	0641	0281	4A	C1
		09	03	0642	0282	4A	C2
		09	04	0643	0283	4A	C3
		09	05	0644	0284	4A	C4
		09	06	0645	0285	4A	C5
		09	07	0646	0286	4A	C6
		09	08	0647	0287	4A	C7
		09	09	0648	0288	4A	C8
		09	10	0649	0289	4A	C9
		09	11	0650	028A	4A	4A
		09	12	0651	028B	4A	4B
		09	13	0652	028C	4A	4C
		09	14	0653	028D	4A	4D
		09	15	0654	028E	4A	4E
		09	16	0655	028F	4A	4F
		09	17	0656	0290	4A	50
		09	18	0657	0291	4A	D1
		09	19	0658	0292	4A	D2
		09	20	0659	0293	4A	D3
		09	21	0660	0294	4A	D4
		09	22	0661	0295	4A	D5
		09	23	0662	0296	4A	D6
		09	24	0663	0297	4A	D7
		09	25	0664	0298	4A	D8
		09	26	0665	0299	4A	D9
		09	27	0666	029A	4A	5A
		09	28	0667	029B	4A	5B
		09	29	0668	029C	4A	5C
		09	30	0669	029D	4A	5D
		09	31	0670	029E	4A	5E
		09	32	0671	029F	4A	5F
		09	33	0672	02A0	4A	60
		09	34	0673	02A1	4A	61
		09	35	0674	02A2	4A	E2
		09	36	0675	02A3	4A	E3
		09	37	0676	02A4	4A	E4
		09	38	0677	02A5	4A	E5
		09	39	0678	02A6	4A	E6
		09	40	0679	02A7	4A	E7
		09	41	0680	02A8	4A	E8
		09	42	0681	02A9	4A	E9
		09	43	0682	02AA	4A	6A
		09	44	0683	02AB	4A	6B
		09	45	0684	02AC	4A	6C
		09	46	0685	02AD	4A	6D
		09	47	0686	02AE	4A	6E
		09	48	0687	02AF	4A	6F
		09	49	0688	02B0	4A	F0
		09	50	0689	02B1	4A	F1
		09	51	0690	02B2	4A	F2
		09	52	0691	02B3	4A	F3
		09	53	0692	02B4	4A	F4
		09	54	0693	02B5	4A	F5
		09	55	0694	02B6	4A	F6
		09	56	0695	02B7	4A	F7
		09	57	0696	02B8	4A	F8
		09	58	0697	02B9	4A	F9
		09	59	0698	02BA	4A	7A
		09	60	0699	02BB	4A	7B
		09	61	0700	02BC	4A	7C
		09	62	0701	02BD	4A	7D
		09	63	0702	02BE	4A	7E
		09	64	0703	02BF	4A	7F
		09	65	0704	02C0	4B	40
		09	66	0705	02C1	4B	C1
		09	67	0706	02C2	4B	C2
		09	68	0707	02C3	4B	C3
		09	69	0708	02C4	4B	C4
		09	70	0709	02C5	4B	C5
		09	71	0710	02C6	4B	C6
		09	72	0711	02C7	4B	C7
		09	73	0712	02C8	4B	C8
		09	74	0713	02C9	4B	C9
		09	75	0714	02CA	4B	4A
		09	76	0715	02CB	4B	4B
		09	77	0716	02CC	4B	4C
		09	78	0717	02CD	4B	4D
		09	79	0718	02CE	4B	4E
		09	80	0719	02CF	4B	4F
		10	01	0720	02D0	4B	50
		10	02	0721	02D1	4B	D1
		10	03	0722	02D2	4B	D2
		10	04	0723	02D3	4B	D3
		10	05	0724	02D4	4B	D4
		10	06	0725	02D5	4B	D5
		10	07	0726	02D6	4B	D6
		10	08	0727	02D7	4B	D7
		10	09	0728	02D8	4B	D8
		10	10	0729	02D9	4B	D9
		10	11	0730	02DA	4B	5A
		10	12	0731	02DB	4B	5B
		10	13	0732	02DC	4B	5C
		10	14	0733	02DD	4B	5D
		10	15	0734	02DE	4B	5E
		10	16	0735	02DF	4B	5F
		10	17	0736	02E0	4B	60
		10	18	0737	02E1	4B	61
		10	19	0738	02E2	4B	E2
		10	20	0739	02E3	4B	E3
		10	21	0740	02E4	4B	E4
		10	22	0741	02E5	4B	E5
		10	23	0742	02E6	4B	E6
		10	24	0743	02E7	4B	E7

Diagram 7-114. Buffer Addresses — EBCDIC Hex I/O Interface Code (Sheet 3 of 8)

Mod 1 R C	Mod 2 R C	Position Dec	Position Hex	Buffer Address (Hex) EBCDIC	
	10 25	0744	02E8	4B	E8
	10 26	0745	02E9	4B	E9
	10 27	0746	02EA	4B	6A
	10 28	0747	02EB	4B	6B
	10 29	0748	02EC	4B	6C
	10 30	0749	02ED	4B	6D
	10 31	0750	02EE	4B	6E
	10 32	0751	02EF	4B	6F
	10 33	0752	02F0	4B	F0
	10 34	0753	02F1	4B	F1
	10 35	0754	02F2	4B	F2
	10 36	0755	02F3	4B	F3
	10 37	0756	02F4	4B	F4
	10 38	0757	02F5	4B	F5
	10 39	0758	02F6	4B	F6
	10 40	0759	02F7	4B	F7
	10 41	0760	02F8	4B	F8
	10 42	0761	02F9	4B	F9
	10 43	0762	02FA	4B	7A
	10 44	0763	02FB	4B	7B
	10 45	0764	02FC	4B	7C
	10 46	0765	02FD	4B	7D
	10 47	0766	02FE	4B	7E
	10 48	0767	02FF	4B	7F
	10 49	0768	0300	4C	40
	10 50	0769	0301	4C	C1
	10 51	0770	0302	4C	C2
	10 52	0771	0303	4C	C3
	10 53	0772	0304	4C	C4
	10 54	0773	0305	4C	C5
	10 55	0774	0306	4C	C6
	10 56	0775	0307	4C	C7
	10 57	0776	0308	4C	C8
	10 58	0777	0309	4C	C9
	10 59	0778	030A	4C	4A
	10 60	0779	030B	4C	4B
	10 61	0780	030C	4C	4C
	10 62	0781	030D	4C	4D
	10 63	0782	030E	4C	4E
	10 64	0783	030F	4C	4F
	10 65	0784	0310	4C	50
	10 66	0785	0311	4C	D1
	10 67	0786	0312	4C	D2
	10 68	0787	0313	4C	D3
	10 69	0788	0314	4C	D4
	10 70	0789	0315	4C	D5
	10 71	0790	0316	4C	D6
	10 72	0791	0317	4C	D7
	10 73	0792	0318	4C	D8
	10 74	0793	0319	4C	D9
	10 75	0794	031A	4C	5A
	10 76	0795	031B	4C	5B
	10 77	0796	031C	4C	5C
	10 78	0797	031D	4C	5D
	10 79	0798	031E	4C	5E
	10 80	0799	031F	4C	5F
	11 01	0800	0320	4C	60
	11 02	0801	0321	4C	61
	11 03	0802	0322	4C	E2
	11 04	0803	0323	4C	E3
	11 05	0804	0324	4C	E4
	11 06	0805	0325	4C	E5
	11 07	0806	0326	4C	E6
	11 08	0807	0327	4C	E7
	11 09	0808	0328	4C	E8
	11 10	0809	0329	4C	E9
	11 11	0810	032A	4C	6A
	11 12	0811	032B	4C	6B
	11 13	0812	032C	4C	6C
	11 14	0813	032D	4C	6D
	11 15	0814	032E	4C	6E
	11 16	0815	032F	4C	6F
	11 17	0816	0330	4C	F0
	11 18	0817	0331	4C	F1
	11 19	0818	0332	4C	F2
	11 20	0819	0333	4C	F3
	11 21	0820	0334	4C	F4
	11 22	0821	0335	4C	F5
	11 23	0822	0336	4C	F6
	11 24	0823	0337	4C	F7
	11 25	0824	0338	4C	F8
	11 26	0825	0339	4C	F9
	11 27	0826	033A	4C	7A
	11 28	0827	033B	4C	7B
	11 29	0828	033C	4C	7C
	11 30	0829	033D	4C	7D
	11 31	0830	033E	4C	7E
	11 32	0831	033F	4C	7F
	11 33	0832	0340	4D	40
	11 34	0833	0341	4D	C1
	11 35	0834	0342	4D	C2
	11 36	0835	0343	4D	C3
	11 37	0836	0344	4D	C4
	11 38	0837	0345	4D	C5
	11 39	0838	0346	4D	C6
	11 40	0839	0347	4D	C7
	11 41	0840	0348	4D	C8
	11 42	0841	0349	4D	C9
	11 43	0842	034A	4D	4A
	11 44	0843	034B	4D	4B
	11 45	0844	034C	4D	4C
	11 46	0845	034D	4D	4D
	11 47	0846	034E	4D	4E
	11 48	0847	034F	4D	4F
	11 49	0848	0350	4D	50
	11 50	0849	0351	4D	D1
	11 51	0850	0352	4D	D2
	11 52	0851	0353	4D	D3
	11 53	0852	0354	4D	D4
	11 54	0853	0355	4D	D5
	11 55	0854	0356	4D	D6
	11 56	0855	0357	4D	D7
	11 57	0856	0358	4D	D8
	11 58	0857	0359	4D	D9
	11 59	0858	035A	4D	5A
	11 60	0859	035B	4D	5B
	11 61	0860	035C	4D	5C
	11 62	0861	035D	4D	5D
	11 63	0862	035E	4D	5E
	11 64	0863	035F	4D	5F
	11 65	0864	0360	4D	60
	11 66	0865	0361	4D	61
	11 67	0866	0362	4D	E2
	11 68	0867	0363	4D	E3
	11 69	0868	0364	4D	E4
	11 70	0869	0365	4D	E5
	11 71	0870	0366	4D	E6
	11 72	0871	0367	4D	E7
	11 73	0872	0368	4D	E8
	11 74	0873	0369	4D	E9
	11 75	0874	036A	4D	6A
	11 76	0875	036B	4D	6B
	11 77	0876	036C	4D	6C
	11 78	0877	036D	4D	6D
	11 79	0878	036E	4D	6E
	11 80	0879	036F	4D	6F
	12 01	0880	0370	4D	F0
	12 02	0881	0371	4D	F1
	12 03	0882	0372	4D	F2
	12 04	0883	0373	4D	F3
	12 05	0884	0374	4D	F4
	12 06	0885	0375	4D	F5
	12 07	0886	0376	4D	F6
	12 08	0887	0377	4D	F7
	12 09	0888	0378	4D	F8
	12 10	0889	0379	4D	F9
	12 11	0890	037A	4D	7A
	12 12	0891	037B	4D	7B
	12 13	0892	037C	4D	7C
	12 14	0893	037D	4D	7D
	12 15	0894	037E	4D	7E
	12 16	0895	037F	4D	7F
	12 17	0896	0380	4E	40
	12 18	0897	0381	4E	C1
	12 19	0898	0382	4E	C2
	12 20	0899	0383	4E	C3
	12 21	0900	0384	4E	C4
	12 22	0901	0385	4E	C5
	12 23	0902	0386	4E	C6
	12 24	0903	0387	4E	C7
	12 25	0904	0388	4E	C8
	12 26	0905	0389	4E	C9
	12 27	0906	038A	4E	4A
	12 28	0907	038B	4E	4B
	12 29	0908	038C	4E	4C
	12 30	0909	038D	4E	4D
	12 31	0910	038E	4E	4E
	12 32	0911	038F	4E	4F
	12 33	0912	0390	4E	50
	12 34	0913	0391	4E	D1
	12 35	0914	0392	4E	D2
	12 36	0915	0393	4E	D3
	12 37	0916	0394	4E	D4
	12 38	0917	0395	4E	D5
	12 39	0918	0396	4E	D6
	12 40	0919	0397	4E	D7
	12 41	0920	0398	4E	D8
	12 42	0921	0399	4E	D9
	12 43	0922	039A	4E	5A
	12 44	0923	039B	4E	5B
	12 45	0924	039C	4E	5C
	12 46	0925	039D	4E	5D
	12 47	0926	039E	4E	5E
	12 48	0927	039F	4E	5F
	12 49	0928	03A0	4E	60
	12 50	0929	03A1	4E	61
	12 51	0930	03A2	4E	E2
	12 52	0931	03A3	4E	E3
	12 53	0932	03A4	4E	E4
	12 54	0933	03A5	4E	E5
	12 55	0934	03A6	4E	E6
	12 56	0935	03A7	4E	E7
	12 57	0936	03A8	4E	E8
	12 58	0937	03A9	4E	E9
	12 59	0938	03AA	4E	6A
	12 60	0939	03AB	4E	6B
	12 61	0940	03AC	4E	6C
	12 62	0941	03AD	4E	6D
	12 63	0942	03AE	4E	6E
	12 64	0943	03AF	4E	6F
	12 65	0944	03B0	4E	F0
	12 66	0945	03B1	4E	F1
	12 67	0946	03B2	4E	F2
	12 68	0947	03B3	4E	F3
	12 69	0948	03B4	4E	F4
	12 70	0949	03B5	4E	F5
	12 71	0950	03B6	4E	F6
	12 72	0951	03B7	4E	F7
	12 73	0952	03B8	4E	F8
	12 74	0953	03B9	4E	F9
	12 75	0954	03BA	4E	7A
	12 76	0955	03BB	4E	7B
	12 77	0956	03BC	4E	7C
	12 78	0957	03BD	4E	7D
	12 79	0958	03BE	4E	7E
	12 80	0959	03BF	4E	7F
	13 01	0960	03C0	4F	40
	13 02	0961	03C1	4F	C1
	13 03	0962	03C2	4F	C2
	13 04	0963	03C3	4F	C3
	13 05	0964	03C4	4F	C4
	13 06	0965	03C5	4F	C5
	13 07	0966	03C6	4F	C6
	13 08	0967	03C7	4F	C7
	13 09	0968	03C8	4F	C8
	13 10	0969	03C9	4F	C9
	13 11	0970	03CA	4F	4A
	13 12	0971	03CB	4F	4B
	13 13	0972	03CC	4F	4C
	13 14	0973	03CD	4F	4D
	13 15	0974	03CE	4F	4E
	13 16	0975	03CF	4F	4F
	13 17	0976	03D0	4F	50
	13 18	0977	03D1	4F	D1
	13 19	0978	03D2	4F	D2
	13 20	0979	03D3	4F	D3
	13 21	0980	03D4	4F	D4
	13 22	0981	03D5	4F	D5
	13 23	0982	03D6	4F	D6
	13 24	0983	03D7	4F	D7
	13 25	0984	03D8	4F	D8
	13 26	0985	03D9	4F	D9
	13 27	0986	03DA	4F	5A
	13 28	0987	03DB	4F	5B
	13 29	0988	03DC	4F	5C
	13 30	0989	03DD	4F	5D
	13 31	0990	03DE	4F	5E
	13 32	0991	03DF	4F	5F

Diagram 7-114. Buffer Addresses — EBCDIC Hex I/O Interface Code (Sheet 4 of 8)

Mod 1 R C	Mod 2 R C	Position Dec	Hex	Buffer Address (Hex) EBCDIC	
	13 33	0992	03E0	4F	60
	13 34	0993	03E1	4F	61
	13 35	0994	03E2	4F	E2
	13 36	0995	03E3	4F	E3
	13 37	0996	03E4	4F	E4
	13 38	0997	03E5	4F	E5
	13 39	0998	03E6	4F	E6
	13 40	0999	03E7	4F	E7
	13 41	1000	03E8	4F	E8
	13 42	1001	03E9	4F	E9
	13 43	1002	03EA	4F	6A
	13 44	1003	03EB	4F	6B
	13 45	1004	03EC	4F	6C
	13 46	1005	03ED	4F	6D
	13 47	1006	03EE	4F	6E
	13 48	1007	03EF	4F	6F
	13 49	1008	03F0	4F	F0
	13 50	1009	03F1	4F	F1
	13 51	1010	03F2	4F	F2
	13 52	1011	03F3	4F	F3
	13 53	1012	03F4	4F	F4
	13 54	1013	03F5	4F	F5
	13 55	1014	03F6	4F	F6
	13 56	1015	03F7	4F	F7
	13 57	1016	03F8	4F	F8
	13 58	1017	03F9	4F	F9
	13 59	1018	03FA	4F	7A
	13 60	1019	03FB	4F	7B
	13 61	1020	03FC	4F	7C
	13 62	1021	03FD	4F	7D
	13 63	1022	03FE	4F	7E
	13 64	1023	03FF	4F	7F
	13 65	1024	0400	50	40
	13 66	1025	0401	50	C1
	13 67	1026	0402	50	C2
	13 68	1027	0403	50	C3
	13 69	1028	0404	50	C4
	13 70	1029	0405	50	C5
	13 71	1030	0406	50	C6
	13 72	1031	0407	50	C7
	13 73	1032	0408	50	C8
	13 74	1033	0409	50	C9
	13 75	1034	040A	50	4A
	13 76	1035	040B	50	4B
	13 77	1036	040C	50	4C
	13 78	1037	040D	50	4D
	13 79	1038	040E	50	4E
	13 80	1039	040F	50	4F
	14 01	1040	0410	50	50
	14 02	1041	0411	50	D1
	14 03	1042	0412	50	D2
	14 04	1043	0413	50	D3
	14 05	1044	0414	50	D4
	14 06	1045	0415	50	D5
	14 07	1046	0416	50	D6
	14 08	1047	0417	50	D7
	14 09	1048	0418	50	D8
	14 10	1049	0419	50	D9
	14 11	1050	041A	50	5A
	14 12	1051	041B	50	5B
	14 13	1052	041C	50	5C
	14 14	1053	041D	50	5D
	14 15	1054	041E	50	5E
	14 16	1055	041F	50	5F
	14 17	1056	0420	50	60
	14 18	1057	0421	50	61
	14 19	1058	0422	50	E2
	14 20	1059	0423	50	E3
	14 21	1060	0424	50	E4
	14 22	1061	0425	50	E5
	14 23	1062	0426	50	E6
	14 24	1063	0427	50	E7
	14 25	1064	0428	50	E8
	14 26	1065	0429	50	E9
	14 27	1066	042A	50	6A
	14 28	1067	042B	50	6B
	14 29	1068	042C	50	6C
	14 30	1069	042D	50	6D
	14 31	1070	042E	50	6E
	14 32	1071	042F	50	6F
	14 33	1072	0430	50	F0
	14 34	1073	0431	50	F1
	14 35	1074	0432	50	F2
	14 36	1075	0433	50	F3
	14 37	1076	0434	50	F4
	14 38	1077	0435	50	F5
	14 39	1078	0436	50	F6
	14 40	1079	0437	50	F7
	14 41	1080	0438	50	F8
	14 42	1081	0439	50	F9
	14 43	1082	043A	50	7A
	14 44	1083	043B	50	7B
	14 45	1084	043C	50	7C
	14 46	1085	043D	50	7D
	14 47	1086	043E	50	7E
	14 48	1087	043F	50	7F
	14 49	1088	0440	D1	40
	14 50	1089	0441	D1	C1
	14 51	1090	0442	D1	C2
	14 52	1091	0443	D1	C3
	14 53	1092	0444	D1	C4
	14 54	1093	0445	D1	C5
	14 55	1094	0446	D1	C6
	14 56	1095	0447	D1	C7
	14 57	1096	0448	D1	C8
	14 58	1097	0449	D1	C9
	14 59	1098	044A	D1	4A
	14 60	1099	044B	D1	4B
	14 61	1100	044C	D1	4C
	14 62	1101	044D	D1	4D
	14 63	1102	044E	D1	4E
	14 64	1103	044F	D1	4F
	14 65	1104	0450	D1	50
	14 66	1105	0451	D1	D1
	14 67	1106	0452	D1	D2
	14 68	1107	0453	D1	D3
	14 69	1108	0454	D1	D4
	14 70	1109	0455	D1	D5
	14 71	1110	0456	D1	D6
	14 72	1111	0457	D1	D7
	14 73	1112	0458	D1	D8
	14 74	1113	0459	D1	D9
	14 75	1114	045A	D1	5A
	14 76	1115	045B	D1	5B
	14 77	1116	045C	D1	5C
	14 78	1117	045D	D1	5D
	14 79	1118	045E	D1	5E
	14 80	1119	045F	D1	5F
	15 01	1120	0460	D1	60
	15 02	1121	0461	D1	61
	15 03	1122	0462	D1	E2
	15 04	1123	0463	D1	E3
	15 05	1124	0464	D1	E4
	15 06	1125	0465	D1	E5
	15 07	1126	0466	D1	E6
	15 08	1127	0467	D1	E7
	15 09	1128	0468	D1	E8
	15 10	1129	0469	D1	E9
	15 11	1130	046A	D1	6A
	15 12	1131	046B	D1	6B
	15 13	1132	046C	D1	6C
	15 14	1133	046D	D1	6D
	15 15	1134	046E	D1	6E
	15 16	1135	046F	D1	6F
	15 17	1136	0470	D1	F0
	15 18	1137	0471	D1	F1
	15 19	1138	0472	D1	F2
	15 20	1139	0473	D1	F3
	15 21	1140	0474	D1	F4
	15 22	1141	0475	D1	F5
	15 23	1142	0476	D1	F6
	15 24	1143	0477	D1	F7
	15 25	1144	0478	D1	F8
	15 26	1145	0479	D1	F9
	15 27	1146	047A	D1	7A
	15 28	1147	047B	D1	7B
	15 29	1148	047C	D1	7C
	15 30	1149	047D	D1	7D
	15 31	1150	047E	D1	7E
	15 32	1151	047F	D1	7F
	15 33	1152	0480	D2	40
	15 34	1153	0481	D2	C1
	15 35	1154	0482	D2	C2
	15 36	1155	0483	D2	C3
	15 37	1156	0484	D2	C4
	15 38	1157	0485	D2	C5
	15 39	1158	0486	D2	C6
	15 40	1159	0487	D2	C7
	15 41	1160	0488	D2	C8
	15 42	1161	0489	D2	C9
	15 43	1162	048A	D2	4A
	15 44	1163	048B	D2	4B
	15 45	1164	048C	D2	4C
	15 46	1165	048D	D2	4D
	15 47	1166	048E	D2	4E
	15 48	1167	048F	D2	4F
	15 49	1168	0490	D2	50
	15 50	1169	0491	D2	D1
	15 51	1170	0492	D2	D2
	15 52	1171	0493	D2	D3
	15 53	1172	0494	D2	D4
	15 54	1173	0495	D2	D5
	15 55	1174	0496	D2	D6
	15 56	1175	0497	D2	D7
	15 57	1176	0498	D2	D8
	15 58	1177	0499	D2	D9
	15 59	1178	049A	D2	5A
	15 60	1179	049B	D2	5B
	15 61	1180	049C	D2	5C
	15 62	1181	049D	D2	5D
	15 63	1182	049E	D2	5E
	15 64	1183	049F	D2	5F
	15 65	1184	04A0	D2	60
	15 66	1185	04A1	D2	61
	15 67	1186	04A2	D2	E2
	15 68	1187	04A3	D2	E3
	15 69	1188	04A4	D2	E4
	15 70	1189	04A5	D2	E5
	15 71	1190	04A6	D2	E6
	15 72	1191	04A7	D2	E7
	15 73	1192	04A8	D2	E8
	15 74	1193	04A9	D2	E9
	15 75	1194	04AA	D2	6A
	15 76	1195	04AB	D2	6B
	15 77	1196	04AC	D2	6C
	15 78	1197	04AD	D2	6D
	15 79	1198	04AE	D2	6E
	15 80	1199	04AF	D2	6F
	16 01	1200	04B0	D2	F0
	16 02	1201	04B1	D2	F1
	16 03	1202	04B2	D2	F2
	16 04	1203	04B3	D2	F3
	16 05	1204	04B4	D2	F4
	16 06	1205	04B5	D2	F5
	16 07	1206	04B6	D2	F6
	16 08	1207	04B7	D2	F7
	16 09	1208	04B8	D2	F8
	16 10	1209	04B9	D2	F9
	16 11	1210	04BA	D2	7A
	16 12	1211	04BB	D2	7B
	16 13	1212	04BC	D2	7C
	16 14	1213	04BD	D2	7D
	16 15	1214	04BE	D2	7E
	16 16	1215	04BF	D2	7F
	16 17	1216	04C0	D3	40
	16 18	1217	04C1	D3	C1
	16 19	1218	04C2	D3	C2
	16 20	1219	04C3	D3	C3
	16 21	1220	04C4	D3	C4
	16 22	1221	04C5	D3	C5
	16 23	1222	04C6	D3	C6
	16 24	1223	04C7	D3	C7
	16 25	1224	04C8	D3	C8
	16 26	1225	04C9	D3	C9
	16 27	1226	04CA	D3	4A
	16 28	1227	04CB	D3	4B
	16 29	1228	04CC	D3	4C
	16 30	1229	04CD	D3	4D
	16 31	1230	04CE	D3	4E
	16 32	1231	04CF	D3	4F
	16 33	1232	04D0	D3	50
	16 34	1233	04D1	D3	D1
	16 35	1234	04D2	D3	D2
	16 36	1235	04D3	D3	D3
	16 37	1236	04D4	D3	D4
	16 38	1237	04D5	D3	D5
	16 39	1238	04D6	D3	D6
	16 40	1239	04D7	D3	D7

Diagram 7-114. Buffer Addresses — EBCDIC Hex I/O Interface Code (Sheet 5 of 8)

Mod 1 R C	Mod 2 R C	Position Dec	Position Hex	Buffer Address (Hex) EBCDIC
	16 41	1240	04D8	D3 D8
	16 42	1241	04D9	D3 D9
	16 43	1242	04DA	D3 5A
	16 44	1243	04DB	D3 5B
	16 45	1244	04DC	D3 5C
	16 46	1245	04DD	D3 5D
	16 47	1246	04DE	D3 5E
	16 48	1247	04DF	D3 5F
	16 49	1248	04E0	D3 60
	16 50	1249	04E1	D3 61
	16 51	1250	04E2	D3 E2
	16 52	1251	04E3	D3 E3
	16 53	1252	04E4	D3 E4
	16 54	1253	04E5	D3 E5
	16 55	1254	04E6	D3 E6
	16 56	1255	04E7	D3 E7
	16 57	1256	04E8	D3 E8
	16 58	1257	04E9	D3 E9
	16 59	1258	04EA	D3 6A
	16 60	1259	04EB	D3 6B
	16 61	1260	04EC	D3 6C
	16 62	1261	04ED	D3 6D
	16 63	1262	04EE	D3 6E
	16 64	1263	04EF	D3 6F
	16 65	1264	04F0	D3 F0
	16 66	1265	04F1	D3 F1
	16 67	1266	04F2	D3 F2
	16 68	1267	04F3	D3 F3
	16 69	1268	04F4	D3 F4
	16 70	1269	04F5	D3 F5
	16 71	1270	04F6	D3 F6
	16 72	1271	04F7	D3 F7
	16 73	1272	04F8	D3 F8
	16 74	1273	04F9	D3 F9
	16 75	1274	04FA	D3 7A
	16 76	1275	04FB	D3 7B
	16 77	1276	04FC	D3 7C
	16 78	1277	04FD	D3 7D
	16 79	1278	04FE	D3 7E
	16 80	1279	04FF	D3 7F
	17 01	1280	0500	D4 40
	17 02	1281	0501	D4 C1
	17 03	1282	0502	D4 C2
	17 04	1283	0503	D4 C3
	17 05	1284	0504	D4 C4
	17 06	1285	0505	D4 C5
	17 07	1286	0506	D4 C6
	17 08	1287	0507	D4 C7
	17 09	1288	0908	D4 C8
	17 10	1289	0509	D4 C9
	17 11	1290	050A	D4 4A
	17 12	1291	050B	D4 4B
	17 13	1292	050C	D4 4C
	17 14	1293	050D	D4 4D
	17 15	1294	050E	D4 4E
	17 16	1295	050F	D4 4F
	17 17	1296	0510	D4 50
	17 18	1297	0511	D4 D1
	17 19	1298	0512	D4 D2
	17 20	1299	0513	D4 D3
	17 21	1300	0514	D4 D4
	17 22	1301	0515	D4 D5
	17 23	1302	0516	D4 D6
	17 24	1303	0517	D4 D7
	17 25	1304	0518	D4 D8
	17 26	1305	0519	D4 D9
	17 27	1306	051A	D4 5A
	17 28	1307	051B	D4 5B
	17 29	1308	051C	D4 5C
	17 30	1309	051D	D4 5D
	17 31	1310	051E	D4 5E
	17 32	1311	051F	D4 5F
	17 33	1312	0520	D4 60
	17 34	1313	0521	D4 61
	17 35	1314	0522	D4 E2
	17 36	1315	0523	D4 E3
	17 37	1316	0524	D4 E4
	17 38	1317	0525	D4 E5
	17 39	1318	0526	D4 E6
	17 40	1319	0527	D4 E7
	17 41	1320	0528	D4 E8
	17 42	1321	0529	D4 E9
	17 43	1322	052A	D4 6A
	17 44	1323	052B	D4 6B
	17 45	1324	052C	D4 6C
	17 46	1325	052D	D4 6D
	17 47	1326	052E	D4 6E
	17 48	1327	052F	D4 6F
	17 49	1328	0530	D4 F0
	17 50	1329	0531	D4 F1
	17 51	1330	0532	D4 F2
	17 52	1331	0533	D4 F3
	17 53	1332	0534	D4 F4
	17 54	1333	0535	D4 F5
	17 55	1334	0536	D4 F6
	17 56	1335	0537	D4 F7
	17 57	1336	0538	D4 F8
	17 58	1337	0539	D4 F9
	17 59	1338	053A	D4 7A
	17 60	1339	053B	D4 7B
	17 61	1340	053C	D4 7C
	17 62	1341	053D	D4 7D
	17 63	1342	053E	D4 7E
	17 64	1343	053F	D4 7F
	17 65	1344	0540	D5 40
	17 66	1345	0541	D5 C1
	17 67	1346	0542	D5 C2
	17 68	1347	0543	D5 C3
	17 69	1348	0544	D5 C4
	17 70	1349	0545	D5 C5
	17 71	1350	0546	D5 C6
	17 72	1351	0547	D5 C7
	17 73	1352	0548	D5 C8
	17 74	1353	0549	D5 C9
	17 75	1354	054A	D5 4A
	17 76	1355	054B	D5 4B
	17 77	1356	054C	D5 4C
	17 78	1357	054D	D5 4D
	17 79	1358	054E	D5 4E
	17 80	1359	054F	D5 4F
	18 01	1360	0550	D5 50
	18 02	1361	0551	D5 D1
	18 03	1362	0552	D5 D2
	18 04	1363	0553	D5 D3
	18 05	1364	0554	D5 D4
	18 06	1365	0555	D5 D5
	18 07	1366	0556	D5 D6
	18 08	1367	0557	D5 D7
	18 09	1368	0558	D5 D8
	18 10	1369	0559	D5 D9
	18 11	1370	055A	D5 5A
	18 12	1371	055B	D5 5B
	18 13	1372	055C	D5 5C
	18 14	1373	055D	D5 5D
	18 15	1374	055E	D5 5E
	18 16	1375	055F	D5 5F
	18 17	1376	0560	D5 60
	18 18	1377	0561	D5 61
	18 19	1378	0562	D5 E2
	18 20	1379	0563	D5 E3
	18 21	1380	0564	D5 E4
	18 22	1381	0565	D5 E5
	18 23	1382	0566	D5 E6
	18 24	1383	0567	D5 E7
	18 25	1384	0568	D5 E8
	18 26	1385	0569	D5 E9
	18 27	1386	056A	D5 6A
	18 28	1387	056B	D5 6B
	18 29	1388	056C	D5 6C
	18 30	1389	056D	D5 6D
	18 31	1390	056E	D5 6E
	18 32	1391	056F	D5 6F
	18 33	1392	0570	D5 F0
	18 34	1393	0571	D5 F1
	18 35	1394	0572	D5 F2
	18 36	1395	0573	D5 F3
	18 37	1396	0574	D5 F4
	18 38	1397	0575	D5 F5
	18 39	1398	0576	D5 F6
	18 40	1399	0577	D5 F7
	18 41	1400	0578	D5 F8
	18 42	1401	0579	D5 F9
	18 43	1402	057A	D5 7A
	18 44	1403	057B	D5 7B
	18 45	1404	057C	D5 7C
	18 46	1405	057D	D5 7D
	18 47	1406	057E	D5 7E
	18 48	1407	057F	D5 7F
	18 49	1408	0580	D6 40
	18 50	1409	0581	D6 C1
	18 51	1410	0582	D6 C2
	18 52	1411	0583	D6 C3
	18 53	1412	0584	D6 C4
	18 54	1413	0585	D6 C5
	18 55	1414	0586	D6 C6
	18 56	1415	0587	D6 C7
	18 57	1416	0588	D6 C8
	18 58	1417	0589	D6 C9
	18 59	1418	058A	D6 4A
	18 60	1419	058B	D6 4B
	18 61	1420	058C	D6 4C
	18 62	1421	058D	D6 4D
	18 63	1422	058E	D6 4E
	18 64	1423	058F	D6 4F
	18 65	1424	0590	D6 50
	18 66	1425	0591	D6 D1
	18 67	1426	0592	D6 D2
	18 68	1427	0593	D6 D3
	18 69	1428	0594	D6 D4
	18 70	1429	0595	D6 D5
	18 71	1430	0596	D6 D6
	18 72	1431	0597	D6 D7
	18 73	1432	0598	D6 D8
	18 74	1433	0599	D6 D9
	18 75	1434	059A	D6 5A
	18 76	1435	059B	D6 5B
	18 77	1436	059C	D6 5C
	18 78	1437	059D	D6 5D
	18 79	1438	059E	D6 5E
	18 80	1439	059F	D6 5F
	19 01	1440	05A0	D6 60
	19 02	1441	05A1	D6 61
	19 03	1442	05A2	D6 E2
	19 04	1443	05A3	D6 E3
	19 05	1444	05A4	D6 E4
	19 06	1445	05A5	D6 E5
	19 07	1446	05A6	D6 E6
	19 08	1447	05A7	D6 E7
	19 09	1448	05A8	D6 E8
	19 10	1449	05A9	D6 E9
	19 11	1450	05AA	D6 6A
	19 12	1451	05AB	D6 6B
	19 13	1452	05AC	D6 6C
	19 14	1453	05AD	D6 6D
	19 15	1454	05AE	D6 6E
	19 16	1455	05AF	D6 6F
	19 17	1456	05B0	D6 F0
	19 18	1457	05B1	D6 F1
	19 19	1458	05B2	D6 F2
	19 20	1459	05B3	D6 F3
	19 21	1460	05B4	D6 F4
	19 22	1461	05B5	D6 F5
	19 23	1462	05B6	D6 F6
	19 24	1463	05B7	D6 F7
	19 25	1464	05B8	D6 F8
	19 26	1465	05B9	D6 F9
	19 27	1466	05BA	D6 7A
	19 28	1467	05BB	D6 7B
	19 29	1468	05BC	D6 7C
	19 30	1469	05BD	D6 7D
	19 31	1470	05BE	D6 7E
	19 32	1471	05BF	D6 7F
	19 33	1472	05C0	D7 40
	19 34	1473	05C1	D7 C1
	19 35	1474	05C2	D7 C2
	19 36	1475	05C3	D7 C3
	19 37	1476	05C4	D7 C4
	19 38	1477	05C5	D7 C5
	19 39	1478	05C6	D7 C6
	19 40	1479	05C7	D7 C7
	19 41	1480	05C8	D7 C8
	19 42	1481	05C9	D7 C9
	19 43	1482	05CA	D7 4A
	19 44	1483	05CB	D7 4B
	19 45	1484	05CC	D7 4C
	19 46	1485	05CD	D7 4D
	19 47	1486	05CE	D7 4E
	19 48	1487	05CF	D7 4F

Diagram 7-114. Buffer Addresses — EBCDIC Hex I/O Interface Code (Sheet 6 of 8)

Mod 1 R C	Mod 2 R C	Position Dec	Position Hex	Buffer Address (Hex) EBCDIC	
	19 49	1488	05D0	D7	50
	19 50	1489	05D1	D7	D1
	19 51	1490	05D2	D7	D2
	19 52	1491	05D3	D7	D3
	19 53	1492	05D4	D7	D4
	19 54	1493	05D5	D7	D5
	19 55	1494	05D6	D7	D6
	19 56	1495	05D7	D7	D7
	19 57	1496	05D8	D7	D8
	19 58	1497	05D9	D7	D9
	19 59	1498	05DA	D7	5A
	19 60	1499	05DB	D7	5B
	19 61	1500	05DC	D7	5C
	19 62	1501	05DD	D7	5D
	19 63	1502	05DE	D7	5E
	19 64	1503	05DF	D7	5F
	19 65	1504	05E0	D7	60
	19 66	1505	05E1	D7	61
	19 67	1506	05E2	D7	E2
	19 68	1507	05E3	D7	E3
	19 69	1508	05E4	D7	E4
	19 70	1509	05E5	D7	E5
	19 71	1510	05E6	D7	E6
	19 72	1511	05E7	D7	E7
	19 73	1512	05E8	D7	E8
	19 74	1513	05E9	D7	E9
	19 75	1514	05EA	D7	6A
	19 76	1515	05EB	D7	6B
	19 77	1516	05EC	D7	6C
	19 78	1517	05ED	D7	6D
	19 79	1518	05EE	D7	6E
	19 80	1519	05EF	D7	6F
	20 01	1520	05F0	D7	F0
	20 02	1521	05F1	D7	F1
	20 03	1522	05F2	D7	F2
	20 04	1523	05F3	D7	F3
	20 05	1524	05F4	D7	F4
	20 06	1525	05F5	D7	F5
	20 07	1526	05F6	D7	F6
	20 08	1527	05F7	D7	F7
	20 09	1528	05F8	D7	F8
	20 10	1529	05F9	D7	F9
	20 11	1530	05FA	D7	7A
	20 12	1531	05FB	D7	7B
	20 13	1532	05FC	D7	7C
	20 14	1533	05FD	D7	7D
	20 15	1534	05FE	D7	7E
	20 16	1535	05FF	D7	7F
	20 17	1536	0600	D8	40
	20 18	1537	0601	D8	C1
	20 19	1538	0602	D8	C2
	20 20	1539	0603	D8	C3
	20 21	1540	0604	D8	C4
	20 22	1541	0605	D8	C5
	20 23	1542	0606	D8	C6
	20 24	1543	0607	D8	C7
	20 25	1544	0608	D8	C8
	20 26	1545	0609	D8	C9
	20 27	1546	060A	D8	4A
	20 28	1547	060B	D8	4B
	20 29	1548	060C	D8	4C
	20 30	1549	060D	D8	4D
	20 31	1550	060E	D8	4E
	20 32	1551	060F	D8	4F
	20 33	1552	0610	D8	50
	20 34	1553	0611	D8	D1
	20 35	1554	0612	D8	D2
	20 36	1555	0613	D8	D3
	20 37	1556	0614	D8	D4
	20 38	1557	0615	D8	D5
	20 39	1558	0616	D8	D6
	20 40	1559	0617	D8	D7
	20 41	1560	0618	D8	D8
	20 42	1561	0619	D8	D9
	20 43	1562	061A	D8	5A
	20 44	1563	061B	D8	5B
	20 45	1564	061C	D8	5C
	20 46	1565	061D	D8	5D
	20 47	1566	061E	D8	5E
	20 48	1567	061F	D8	5F
	20 49	1568	0620	D8	60
	20 50	1569	0621	D8	61
	20 51	1570	0622	D8	E2
	20 52	1571	0623	D8	E3
	20 53	1572	0624	D8	E4
	20 54	1573	0625	D8	E5
	20 55	1574	0626	D8	E6
	20 56	1575	0627	D8	E7
	20 57	1576	0628	D8	E8
	20 58	1577	0629	D8	E9
	20 59	1578	062A	D8	6A
	20 60	1579	062B	D8	6B
	20 61	1580	062C	D8	6C
	20 62	1581	062D	D8	6D
	20 63	1582	062E	D8	6E
	20 64	1583	062F	D8	6F
	20 65	1584	0630	D8	F0
	20 66	1585	0631	D8	F1
	20 67	1586	0632	D8	F2
	20 68	1587	0633	D8	F3
	20 69	1588	0634	D8	F4
	20 70	1589	0635	D8	F5
	20 71	1590	0636	D8	F6
	20 72	1591	0637	D8	F7
	20 73	1592	0638	D8	F8
	20 74	1593	0639	D8	F9
	20 75	1594	063A	D8	7A
	20 76	1595	063B	D8	7B
	20 77	1596	063C	D8	7C
	20 78	1597	063D	D8	7D
	20 79	1598	063E	D8	7E
	20 80	1599	063F	D8	7F
	21 01	1600	0640	D9	40
	21 02	1601	0641	D9	C1
	21 03	1602	0642	D9	C2
	21 04	1603	0643	D9	C3
	21 05	1604	0644	D9	C4
	21 06	1605	0645	D9	C5
	21 07	1606	0646	D9	C6
	21 08	1607	0647	D9	C7
	21 09	1608	0648	D9	C8
	21 10	1609	0649	D9	C9
	21 11	1610	064A	D9	4A
	21 12	1611	064B	D9	4B
	21 13	1612	064C	D9	4C
	21 14	1613	064D	D9	4D
	21 15	1614	064E	D9	4E
	21 16	1615	064F	D9	4F
	21 17	1616	0650	D9	50
	21 18	1617	0651	D9	D1
	21 19	1618	0652	D9	D2
	21 20	1619	0653	D9	D3
	21 21	1620	0654	D9	D4
	21 22	1621	0655	D9	D5
	21 23	1622	0656	D9	D6
	21 24	1623	0657	D9	D7
	21 25	1624	0658	D9	D8
	21 26	1625	0659	D9	D9
	21 27	1626	065A	D9	5A
	21 28	1627	065B	D9	5B
	21 29	1628	065C	D9	5C
	21 30	1629	065D	D9	5D
	21 31	1630	065E	D9	5E
	21 32	1631	065F	D9	5F
	21 33	1632	0660	D9	60
	21 34	1633	0661	D9	61
	21 35	1634	0662	D9	E2
	21 36	1635	0663	D9	E3
	21 37	1636	0664	D9	E4
	21 38	1637	0665	D9	E5
	21 39	1638	0666	D9	E6
	21 40	1639	0667	D9	E7
	21 41	1640	0668	D9	E8
	21 42	1641	0669	D9	E9
	21 43	1642	066A	D9	6A
	21 44	1643	066B	D9	6B
	21 45	1644	066C	D9	6C
	21 46	1645	066D	D9	6D
	21 47	1646	066E	D9	6E
	21 48	1647	066F	D9	6F
	21 49	1648	0670	D9	F0
	21 50	1649	0671	D9	F1
	21 51	1650	0672	D9	F2
	21 52	1651	0673	D9	F3
	21 53	1652	0674	D9	F4
	21 54	1653	0675	D9	F5
	21 55	1654	0676	D9	F6
	21 56	1655	0677	D9	F7
	21 57	1656	0678	D9	F8
	21 58	1657	0679	D9	F9
	21 59	1658	067A	D9	7A
	21 60	1659	067B	D9	7B
	21 61	1660	067C	D9	7C
	21 62	1661	067D	D9	7D
	21 63	1662	067E	D9	7E
	21 64	1663	067F	D9	7F
	21 65	1664	0680	5A	40
	21 66	1665	0681	5A	C1
	21 67	1666	0682	5A	C2
	21 68	1667	0683	5A	C3
	21 69	1668	0684	5A	C4
	21 70	1669	0685	5A	C5
	21 71	1670	0686	5A	C6
	21 72	1671	0687	5A	C7
	21 73	1672	0688	5A	C8
	21 74	1673	0689	5A	C9
	21 75	1674	068A	5A	4A
	21 76	1675	068B	5A	4B
	21 77	1676	068C	5A	4C
	21 78	1677	068D	5A	4D
	21 79	1678	068E	5A	4E
	21 80	1679	068F	5A	4F
	22 01	1680	0690	5A	50
	22 02	1681	0691	5A	D1
	22 03	1682	0692	5A	D2
	22 04	1683	0693	5A	D3
	22 05	1684	0694	5A	D4
	22 06	1685	0695	5A	D5
	22 07	1686	0696	5A	D6
	22 08	1687	0697	5A	D7
	22 09	1688	0698	5A	D8
	22 10	1689	0699	5A	D9
	22 11	1690	069A	5A	5A
	22 12	1691	069B	5A	5B
	22 13	1692	069C	5A	5C
	22 14	1693	069D	5A	5D
	22 15	1694	069E	5A	5E
	22 16	1695	069F	5A	5F
	22 17	1696	06A0	5A	60
	22 18	1697	06A1	5A	61
	22 19	1698	06A2	5A	E2
	22 20	1699	06A3	5A	E3
	22 21	1700	06A4	5A	E4
	22 22	1701	06A5	5A	E5
	22 23	1702	06A6	5A	E6
	22 24	1703	06A7	5A	E7
	22 25	1704	06A8	5A	E8
	22 26	1705	06A9	5A	E9
	22 27	1706	06AA	5A	6A
	22 28	1707	06AB	5A	6B
	22 29	1708	06AC	5A	6C
	22 30	1709	06AD	5A	6D
	22 31	1710	06AE	5A	6E
	22 32	1711	06AF	5A	6F
	22 33	1712	06B0	5A	F0
	22 34	1713	06B1	5A	F1
	22 35	1714	06B2	5A	F2
	22 36	1715	06B3	5A	F3
	22 37	1716	06B4	5A	F4
	22 38	1717	06B5	5A	F5
	22 39	1718	06B6	5A	F6
	22 40	1719	06B7	5A	F7
	22 41	1720	06B8	5A	F8
	22 42	1721	06B9	5A	F9
	22 43	1722	06BA	5A	7A
	22 44	1723	06BB	5A	7B
	22 45	1724	06BC	5A	7C
	22 46	1725	06BD	5A	7D
	22 47	1726	06BE	5A	7E
	22 48	1727	06BF	5A	7F
	22 49	1728	06C0	5B	40
	22 50	1729	06C1	5B	C1
	22 51	1730	06C2	5B	C2
	22 52	1731	06C3	5B	C3
	22 53	1732	06C4	5B	C4
	22 54	1733	06C5	5B	C5
	22 55	1734	06C6	5B	C6
	22 56	1735	06C7	5B	C7

Diagram 7-114. Buffer Addresses — EBCDIC Hex I/O Interface Code (Sheet 7 of 8)

Mod 1 R	C	Mod 2 R	C	Position Dec	Hex	Buffer Address (Hex) EBCDIC	
		22	57	1736	06C8	5B	C8
		22	58	1737	06C9	5B	C9
		22	59	1738	06CA	5B	4A
		22	60	1739	06CB	5B	4B
		22	61	1740	06CC	5B	4C
		22	62	1741	06CD	5B	4D
		22	63	1742	06CE	5B	4E
		22	64	1743	06CF	5B	4F
		22	65	1744	06D0	5B	50
		22	66	1745	06D1	5B	D1
		22	67	1746	06D2	5B	D2
		22	68	1747	06D3	5B	D3
		22	69	1748	06D4	5B	D4
		22	70	1749	06D5	5B	D5
		22	71	1750	06D6	5B	D6
		22	72	1751	06D7	5B	D7
		22	73	1752	06D8	5B	D8
		22	74	1753	06D9	5B	D9
		22	75	1754	06DA	5B	5A
		22	67	1755	06DB	5B	5B
		22	77	1756	06DC	5B	5C
		22	78	1757	06DD	5B	5D
		22	79	1758	06DE	5B	5E
		22	80	1759	06DF	5B	5F
		23	01	1760	06E0	5B	60
		23	02	1761	06E1	5B	61
		23	03	1762	06E2	5B	E2
		23	04	1763	06E3	5B	E3
		23	05	1764	06E4	5B	E4
		23	06	1765	06E5	5B	E5
		23	07	1766	06E6	5B	E6
		23	08	1767	06E7	5B	E7
		23	09	1768	06E8	5B	E8
		23	10	1769	06E9	5B	E9
		23	11	1770	06EA	5B	6A
		23	12	1771	06EB	5B	6B
		23	13	1772	06EC	5B	6C
		23	14	1773	06ED	5B	6D
		23	15	1774	06EE	5B	6E
		23	16	1775	06EF	5B	6F
		23	17	1776	06F0	5B	F0
		23	18	1777	06F1	5B	F1
		23	19	1778	06F2	5B	F2
		23	20	1779	06F3	5B	F3
		23	21	1780	06F4	5B	F4
		23	22	1781	06F5	5B	F5
		23	23	1782	06F6	5B	F6
		23	24	1783	06F7	5B	F7
		23	25	1784	06F8	5B	F8
		23	26	1785	06F9	5B	F9
		23	27	1786	06FA	5B	7A
		23	28	1787	06FB	5B	7B
		23	29	1788	06FC	5B	7C
		23	30	1789	06FD	5B	7D
		23	31	1790	06FE	5B	7E
		23	32	1791	06FF	5B	7F
		23	33	1792	0700	5C	40
		23	34	1793	0701	5C	C1
		23	35	1794	0702	5C	C2
		23	36	1795	0703	5C	C3
		23	37	1796	0704	5C	C4
		23	38	1797	0705	5C	C5
		23	39	1798	0706	5C	C6
		23	40	1799	0707	5C	C7
		23	41	1800	0708	5C	C8
		23	42	1801	0709	5C	C9
		23	43	1802	070A	5C	4A
		23	44	1803	070B	5C	4B
		23	45	1804	070C	5C	4C
		23	46	1805	070D	5C	4D
		23	47	1806	070E	5C	4E
		23	48	1807	070F	5C	4F
		23	49	1808	0710	5C	50
		23	50	1809	0711	5C	D1
		23	51	1810	0712	5C	D2
		23	52	1811	0713	5C	D3
		23	53	1812	0714	5C	D4
		23	54	1813	0715	5C	D5
		23	55	1814	0716	5C	D6
		23	56	1815	0717	5C	D7
		23	57	1816	0718	5C	D8
		23	58	1817	0719	5C	D9
		23	59	1818	071A	5C	5A
		23	60	1819	071B	5C	5B
		23	61	1820	071C	5C	5C
		23	62	1821	071D	5C	5D
		23	63	1822	071E	5C	5E
		23	64	1823	071F	5C	5F
		23	65	1824	0720	5C	60
		23	66	1825	0721	5C	61
		23	67	1826	0722	5C	E2
		23	68	1827	0723	5C	E3
		23	69	1828	0724	5C	E4
		23	70	1829	0725	5C	E5
		23	71	1830	0726	5C	E6
		23	72	1831	0727	5C	E7
		23	73	1832	0728	5C	E8
		23	74	1833	0729	5C	E9
		23	75	1834	072A	5C	6A
		23	76	1835	072B	5C	6B
		23	77	1836	072C	5C	6C
		23	78	1837	072D	5C	6D
		23	79	1838	072E	5C	6E
		23	80	1839	072F	5C	6F
		24	01	1840	0730	5C	F0
		24	02	1841	0731	5C	F1
		24	03	1842	0732	5C	F2
		24	04	1843	0733	5C	F3
		24	05	1844	0734	5C	F4
		24	06	1845	0735	5C	F5
		24	07	1846	0736	5C	F6
		24	08	1847	0737	5C	F7
		24	09	1848	0738	5C	F8
		24	10	1849	0739	5C	F9
		24	11	1850	073A	5C	7A
		24	12	1851	073B	5C	7B
		24	13	1852	073C	5C	7C
		24	14	1853	073D	5C	7D
		24	15	1854	073E	5C	7E
		24	16	1855	073F	5C	7F
		24	17	1856	0740	5D	40
		24	18	1857	0741	5D	C1
		24	19	1858	0742	5D	C2
		24	20	1859	0743	5D	C3
		24	21	1860	0744	5D	C4
		24	22	1861	0745	5D	C5
		24	23	1862	0746	5D	C6
		24	24	1863	0747	5D	C7
		24	25	1864	0748	5D	C8
		24	26	1865	0749	5D	C9
		24	27	1866	074A	5D	4A
		24	28	1867	074B	5D	4B
		24	29	1868	074C	5D	4C
		24	30	1869	074D	5D	4D
		24	31	1870	074E	5D	4E
		24	32	1871	074F	5D	4F
		24	33	1872	0750	5D	50
		24	34	1873	0751	5D	D1
		24	35	1874	0752	5D	D2
		24	36	1875	0753	5D	D3
		24	37	1876	0754	5D	D4
		24	38	1877	0755	5D	D5
		24	39	1878	0756	5D	D6
		24	40	1879	0757	5D	D7
		24	41	1880	0758	5D	D8
		24	42	1881	0759	5D	D9
		24	43	1882	075A	5D	5A
		24	44	1883	075B	5D	5B
		24	45	1884	075C	5D	5C
		24	46	1885	075D	5D	5D
		24	47	1886	075E	5D	5E
		24	48	1887	075F	5D	5F
		24	49	1888	0760	5D	60
		24	50	1889	0761	5D	61
		24	51	1890	0762	5D	E2
		24	52	1891	0763	5D	E3
		24	53	1892	0764	5D	E4
		24	54	1893	0765	5D	E5
		24	55	1894	0766	5D	E6
		24	56	1895	0767	5D	E7
		24	57	1896	0768	5D	E8
		24	58	1897	0769	5D	E9
		24	59	1898	076A	5D	6A
		24	60	1899	076B	5D	6B
		24	61	1900	076C	5D	6C
		24	62	1901	076D	5D	6D
		24	63	1902	076E	5D	6E
		24	64	1903	076F	5D	6F
		24	65	1904	0770	5D	F0
		24	66	1905	0771	5D	F1
		24	67	1906	0772	5D	F2
		24	68	1907	0773	5D	F3
		24	69	1908	0774	5D	F4
		24	70	1909	0775	5D	F5
		24	71	1910	0776	5D	F6
		24	72	1911	0777	5D	F7
		24	73	1912	0778	5D	F8
		24	74	1913	0779	5D	F9
		24	75	1914	077A	5D	7A
		24	76	1915	077B	5D	7B
		24	77	1916	077C	5D	7C
		24	78	1917	077D	5D	7D
		24	79	1918	077E	5D	7E
		24	80	1919	077F	5D	7F

Legend:
R = Row
C = Column

Diagram 7-114. Buffer Addresses — EBCDIC Hex I/O Interface Code (Sheet 8 of 8)

Order / Order Sequence	Character 1 (Order Code) EBCDIC Hex	Character 1 (Order Code) EBCDIC Cntl*	Char. 2	Char. 3	Char. 4
Start Field	1D	IGS	Attribute		
Set Buffer Address	11	DC1	Address	Address	
Insert Cursor	13	DC3			
Program Tab	05	HT			
Repeat to Address	3C	DC4	Address	Address	Char.
Erase Unprotected to address	12	DC2	Address	Address	
New Line	15	NL			
End of Message	19	EM			
Duplicate	1C	IFS			'
Field Mark	1E	IRS			

*Example: The standard EBCDIC control character, IGS, is interpreted by the 3272 as the Start Field order. The hex code for IGS is 1D.

LEGEND:

IGS – Interchange Group Separator
IFS – Interchange Field Separator
IRS – Interchange Record Separator
DC – Device Control
HT – Horizontal Tab

Diagram 7-115. Order Description

Explanation of AID Character	Hex Char	Graphic Char	Read Mod Cmd Operation
No AID generated (Display Station)	60	–	Rd Mod**
No AID generated (Printer)	E8	Y	Rd Mod**
ENTER key	7D	'	Rd Mod
CLEAR key	6D	_	Short Rd
TEST REQ key	F0*	0	Tst Req Rd
PF 1 key	F1	1	Rd Mod
PF 2 key	F2	2	Rd Mod
PF 3 key	F3	3	Rd Mod
PF 4 key	F4	4	Rd Mod
PF 5 key	F5	5	Rd Mod
PF 6 key	F6	6	Rd Mod
PF 7 key	F7	7	Rd Mod
PF 8 key	F8	8	Rd Mod
PF 9 key	F9	9	Rd Mod
PF 10 key	7A	:	Rd Mod
PF 11 key	7B	#	Rd Mod
PF 12 key	7C	@	Rd Mod
PA 1 key	6C	%	Short Rd
PA 2 (CANCEL) key	6E	>	Short Rd
PA 3 key	6B	,	Short Rd
Selector Pen Attention	7E	=	Rd Mod***
Operator Identification Card Reader – Enter	E6	W	Rd Mod
Reserved	6F	?	None
Reserved	E9	Z	None
Reserved	6A	¦	None

*AID transferred on Read Buffer only.

**If remote polling operation, no read operation is performed.

***Only field addresses read, not data.

Diagram 7-116. Attention Identifier (AID) Character Description

CU Data Words

Identical format for transfer to Display Station or Printer.

a. Character Format

Busy Bit	0	Csr	Data Bits								P	0
1	2	3	4	5	6	7	8	9	10	11	12	13

Bit 2 = 0 Identifies data
Bit 4 = 0 Identifies character data

b. Attribute Format:

Busy Bit	0	Csr	1		Unprot Prot	A/N	I/SPD		Esc	MDT	P	0
1	2	3	4	5	6	7	8	9	10	11	12	13

Bit 2 = 0 Identifies data
Bit 4 = 1 Identifies attribute data
Bit 5 = Unused
Bit 6 = 0 Unprotected data
= 1 Protected data
Bit 7 = 0 Alphameric data
= 1 Numeric only data
Bits 8,9 = 0, 0 Normal intensity/nondetectable data
= 0, 1 Normal intensity/selector pen detectable
= 1, 0 High intensity/selector pen detectable
= 1, 1 Nondisplay/nonprint/non-detectable
Bit 10 (Escape) = This bit is not decoded.
Bit 11 (Modified Data Tag) = 0 Field data not modified
= 1 Field data modified

Bits 5-11 all zeros - Default option
= Unprotected, A/N, normal intensity/ nondetectable data.

Diagram 7-117. Data Word Formats

CU Control Words

	Busy Bit	1	0	Poll	Rd	Wrt	Sys Rdy	Unlk Kbd	Erase Unprot	End	Ack	P	0
Control Word 1	1	2	3	4	5	6	7	8	9	10	11	12	13

	Busy Bit	1	1	Poll	Spare	Format		Start Print	Sound Alarm	End	Spare	P	0
Control Word 2	1	2	3	4	5	6	7	8	9	10	11	12	13

Bit 2 = 1 Identifies a control word
Bit 3 = 0 Identifies control word 1
= 1 Identifies control word 2

Bits 6 and 7 = 0,0 Variable line-length format, up to 132 char/line.
= 0,1 40 char/line format
= 1,0 64 char/line format
= 1,1 80 char/line format

Note: Either or both control words may be transmitted to a selected Display Station or Buffered Printer.

Display Station or Printer Data Word

Busy Bit	0	Csr	Ctl	Data Bits							P	*
1	2	3	4	5	6	7	8	9	10	11	12	13

Bit 2 = 0 Identifies data word
Bit 3-11 = These 9 bits are fetched from the device buffer.
Bit 12 = Parity bit assigned by device
Bit 13 = 0 Identifies 480-byte device
= 1 Identifies 1920-byte device

Display Station Status Word

(Response to CU Poll)

Busy Bit	0	Busy	Dev Chk	Xmit Chk	Info Pend	Five Low-Order Bits of AID					P	*
1	2	3	4	5	6	7	8	9	10	11	12	13

* Bit 13 = 0 Identifies 480-byte device
= 1 Identifies 1920-byte device

Printer Status Word

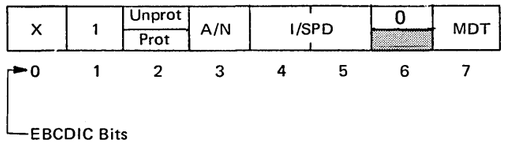
(Response to CU Poll)

Busy Bit	1	Busy	Dev Chk	Xmit Chk	Info Pend	Not Rdy	Spare	Equip Chk	Printer Hang	Spare	P	*
1	2	3	4	5	6	7	8	9	10	11	12	13

* Bit 13 = 0 Identifies 480-byte device
= 1 Identifies 1920-byte device

Diagram 7-118. Control Word Formats

Attribute Character



Bit 0 Determined by contents of bits 2 through 7. Refer to Diagram 7-112.

Bit 1 Always a 1 bit.

Bit 2 = 0 Unprotected data
Bit 2 = 1 Protected data - Autolock

Bit 3 = 0 Alphameric data
Bit 3 = 1 Numeric data - Autoshift

Bits 2,3 = 1,1 Autoskip

Bits 4,5 = 0,0 Normal intensity/nondetectable
Bits 4,5 = 0,1 Normal intensity/selector pen detectable
Bits 4,5 = 1,0 High intensity/selector pen detectable
Bits 4,5 = 1,1 Nondisplay/nonprint/nondetectable

Bit 6 { Reserved - For standard
Always a zero - For 3270 Data Analysis - APL Feature

Bit 7 = 0 Field data not tagged as modified.
Bit 7 = 1 Field data tagged as modified.

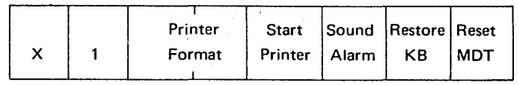
NOTE:

Bits 0 and 1 of the attribute character are not decoded when received by the CU. Regardless of their values as received, the CU always transfers them to the CPU with values specified in Diagram 7-112.

The default option (bits 2 through 7 all set to 0) results in an Unprotected, Alphameric, Normal Intensity/Nondetectable field.

Diagram 7-119. Attribute Character Format

WCC (Write Control Character)



Bit 0 Determined by the contents of bits 2 through 7. Refer to Diagram 7-112.

Bit 1 Always a 1 bit.

Bits 2, 3 = 0,0 Printer honors NL and EM codes.
Bits 2, 3 = 0,1 Printer prints 40 – character line.
Bits 2, 3 = 1,0 Printer prints 64 – character line.
Bits 2, 3 = 1,1 Printer prints 80 – character line.

Bit 4 = 1 Start printer.

Bit 5 = 1 Sound audible alarm.

Bit 6 = 1 WCC – Restore keyboard.

Bit 7 = 1 WCC – Reset modified data tags.

Diagram 7-120. Write Control Character (WCC) Format

Card	Pin	ALD	Signal Name
A1A2	B08	MP271	-Device Avail or Busy 0, 1, 2, 3
	B10	MP103	-Strobe Dev Avail or Busy
	D09	MP271	-Data to Mlpx 0, 1, 2, 3
	B02	MP012	-Mplx Op Finished
	B06	MP015	+Test Request Latch Set
	B11	MP015	+Allow Ld AID
	B13	MP014	-Diag Rd Cmd
A1B2	D07	MP135	+Decode Sys Msg
	D10	MP014	-Ld Rd Diag Byte 2
	D11	MP014	-Ld Rd Diag Byte 1
	G08	MP014	+Most Cmds
	G10	MP089	-Aid Avail
	P09	MP014	-Rst Mplx Lths Any Cmd
	M10	MP116	+Inhib Irpt Lth Set
	P02	MP013	+Set Wrt Diag Lths
	P05	MP013	-General Channel End for Diag Write
	S02	MP012	+Op Cmplt To IF
	S04	LC305	-Erase Unprotected Cmd
A1C2	G09	MP025	+Generate Channel End
	J02	MP024	+Ld WCC or CCC
	J04	MP013	-Gen Channel End For Diag Wrt
	P02	MP025	+Copy Add
	P04	MP025	-Rst Bfr Vld - EAU or Copy Seq 5
A1D2	B06	MP036	-Gt BAC to Save Req
	B08	MP036	-Rst Adr Store Req
	B09	MP036	-Rst Save Req
	B10	MP036	-Gt Save Req to Adr Store Req
	B13	MP031	+Decode Orders
	D11	MP036	+1920 Char DE
	D12	MP039	-Inhib Bfr Parity
	D13	MP034	-Gt BAC to ASR
	G02	MP031	+Bit 2 to SR
	G03	MP035	+Step BAC
	G05	MP035	-Rst Bfr Adr Ctr
	G07	MP035	+Bfr Adr Compare - BAC and ASR
	J04	MP035	+BAC Decode 0
	J10	MP035	+BAC Decode End
	S02	MP039	-Deactivate Lth
	S05	MP039	-Send AID of Zeros
	S06	MP039	+Inhib Bfr Fetch
	S08	MP031	+Erase Unpro to Adr
	S10	MP031	+Program Tab
	S11	MP012	-Set Xfr Finished
	S13	MP031	+Insert Crsr
	U02	MP013	+Set Wrt Diag Lths
	U07	MP031	+Set Buffer Adr
	U09	MP031	+Repeat to Address
	U10	MP031	+Start Field
A1E2	B03	MP047	+Gt Adr Byte 2 to IR
	B04	MP021	-Field Formatted
	B06	MP047	+Gt Adr Byte 1 to IR
	B09	MP045	+Gt Data to IR

Card	Pin	ALD	Signal Name
A1E2	B13	MP047	-Encode SF
	D10	MP047	-Encode SBA
	D11	MP035	+BAC Decode End
	D12	MP047	+SR Attribute (3270 Data Analysis - APL Feature)
	G02	MP044	+SR Bit Ctrl (3270 Data Analysis - APL Feature)
	G05	MP042	-First Byte Lth Set
	J13	MP045	-Gated Rst Seq 8
	M11	MP015	+Test Request Latch Set
	S07	LC401	+CE Serv Out Sw On
	S09	MP043	-Set Update Adr Lth
	S10	MP041	+Ld SOH - Test Req Byte 1
	U04	MP035	+Bfr Adr Compare BAC and ASR
	U11	MP034	-Early Restart Read
A1F2	B02	MP035	+Bfr Adr Compare BAC and ASR
	B03	MP031	+Decode Orders
	B05	MP054	+Xfr to FETs Lth Set
	B07	MP058	+Intf Cntl
	D02	MP056	-Set Buffer Address Valid
	D06	MP057	+Early Restart
	D12	MP056	+Bfr Modified Lth Set
	G04	LC104	-Stop
	G05	MP051	-Xfr Bfr to Dev Lth
	G07	MP051	+Stop Lth Set
	G09	MP054	+Gt Input Reg to SR Seq 8 Wrt
	J05	MP051	-Clr Adr Store Req - Seq 8 Wrt
	J13	LC105	+Xfer Bfr to Dev
	M03	MP052	-Gate Orders to Order Reg
	M07	MP054	-Set Update Adr Lth
	M10	MP054	-Start Clock at 2-Seq 8 Wrt
	P05	MP054	-Update Adr Lth Set
	P12	MP057	-Gated Rst Seq 8 Wrt
	S06	MP058	+Set Op Chk Sense
	S08	MP059	+Gt Byte 2 to Adr Save Reg
	S09	MP059	+Gt Byte 1 to Adr Save Reg
	U06	MP058	-Set Op Check Sense
A1G2	B03	MP062	-Byte Cnt 2
	B04	MP062	-Byte Cnt 3
	B07	MP062	-Byte Cnt 0
	B13	MP062	-Short Timeout
	D02	MP065	-Start Clock at 2
	D05	MP062	-Step Byte Ctr
	D06	MP068	-Rst Bfr Adr Ctr
	D13	MP067	+Long Timeout Lth Set
	G03	MP062	-Byte Cnt 1
	G04	MP063	-TP 1A
	G06	MP068	-4.75 MHz Osc to Logic
	G07	MP063	-TP 6B
	G08	LC401	-On Line Cntl
	G09	MP068	-4.75 MHz Osc to IF
	G12	MP065	+FET Clock
	G13	MP065	-Restart
	J02	MP068	-Gt Clr IO Reg Ldd

Diagram 7-121. Probe Point ALD Reference Chart (Sheet 1 of 4)

Card	Pin	ALD	Signal Name
A1G2	J06	MP067	-Set Mem Cycle Lth
	J11	MP067	+Step BAC
	M07	MP063	-TP5A
	M08	MP065	-Start Clock at 1
	M11	MP063	-TP6A
	P02	MP063	-TP3B
	P04	MP063	-TP4B
	P06	MP062	-Reset Byte Ctr
	P07	MP065	+Mem Cycle Lth Set
	P11	MP063	-TP5B
	P12	MP064	-POR
	P13	MP063	-TP4A
	S02	MP064	-System Reset 1
	S03	MP071	+Seq 2 or 3 Not Send 0s
	S04	MP063	-TP3A
	S05	MP063	-TP2A
	S07	MP064	-CU Reset
	U02	MP065	-Gt Rst Bfr Adr Ctr
	U05	LC403	+Clr Pri Ctr Ldd
	U07	MP066	-Start Clock at 3
	U10	MP063	-TP2B
A1H2	B07	MP071	-Ld Poll Msg
	B08	MP071	+Seq 2 or 3
	B10	MP116	+Send Zeroes Trig Set
	B11	MP071	-Rst CCC Copy Lths
	D05	MP071	-Start Clock at 3
	D09	MP071	-Decode End of Shifting in SE
	D10	MP072	+Copy Rst SR
	D11	MP147	+Gt Rst BAC
	G06	MP073	-Gated Rst Seq 7
	G12	MP051	+Stop Lth Set
	M06	MP073	+Clr Tags
	S11	MP076	-Ld Line Lth
	S13	MP076	+Rst SR Parity Bit
	U07	MP076	-Set P Chk Trig - Send Zeroes
A1J2	B02	MP091	-Retry Trig Set
	B04	MP087	-SR Attribute (3270 Data Analysis - APL Feature)
	B10	MP091	-Set Seq 2 Retry
	B12	MP090	-Set Seq 6 Illegal Copy
	D13	MP089	-Printer Started Printing
	G03	MP089	+Set Unit Specify
	G05	MP089	-Set Intervention Required
	G06	MP089	+Set Intervention Required
	G08	MP088	-On Line Control
	G09	MP089	+On Line to IF
	G12	MP089	+Set Dev End
	J04	MP116	+Inht Irpt Lth Set
	J09	MP089	-Set Dev End
	J13	MP088	+Rev Mode Sq 4 Not Tmount
	M05	MP091	-Mplx Pri Cntr Ldd Bad Parity
	M08	MP271	-Dev Avail or Busy 0, 1, 2, 3

Card	Pin	ALD	Signal Name
A1J2	M11	MP086	+Not Bad Parity Not Timeout
	M13	MP089	-AID Avail
	P06	MP087	-Copy Erase Lth Set
	P12	MP081	-Set Attention
	S06	MP071	-Ld Poll Msg
	S07	MP081	-Gt Dev Avail to Mplx
	S08	MP081	+Dev Busy to Intf
	S09	MP081	-Inhib Send EAU
	S10	MP081	-Dev Avail or Busy 8 thru 31
	U06	MP107	+Initial Poll Trig Set
	U07	LC305	-Erase Unprotected Card
	U09	MP081	+Gt Dev Avail to Mplx
	U10	MP081	-Dev Avail or Busy 0–7
	U13	MP081	+Dev Avail or Busy
A1K2	B02	MP107	-Set Read Poll
	B03	MP101	-Set Unit Excpt
	B04	MP101	-Start Clock 3
	B08	MP035	+BAC Decode End
	D04	MP134	+Gt Start Clock at 3
	D06	MP103	-Strobe Dev Avail or Busy
	D07	MP103	+Gate Rst Pri Ctr
	D11	MP025	+Copy Adr Lth Set
	G09	LC105	+Chaining
	J02	LC402	+Load Priority Ctr
	J06	MP106	-Poll Poll
	J09	MP103	-Chaining Start Print
	J11	MP103	+Set Busy Lth 0 thru 15
	J13	MP091	-Mplx Pri Ctr Ldd Bad Parity
	M02	MP107	-Set Poll Tgr
	M11	MP105	-Set Cntl Chk
	P04	MP104	-Gt Dev Avail to Mplx
	S02	MP029	-Set Initial Poll Trig
	S05	MP107	-Poll Tgr Set
	S06	MP103	-Strobe Dev Avail or Busy
	S10	MP039	-Inhib Initial Poll
	U04	MP107	+Rd Poll Lth Set
	U05	MP107	-After Fetch Lth Set
	U06	MP107	+Initial Poll Trig Set
	U10	MP064	-CU Reset
A1L2	B04	MP114	-Set Seq 6
	B09	MP114	-Set Seq 7
	B10	MP114	-Set Seq 8
	B12	MP114	-Set Seq 5
	B13	MP116	+Send Zeroes Trig Set
	D04	MP114	-Rst Seq 5
	D09	LC103	-Inhibit Interrupts
	D12	MP116	-Set Wrt Poll
	G03	MP146	+Comp Send 0's Tgr
	G05	MP116	+Inhib Irpt Lth Set
	G08	MP101	-Rst Seq 4 Alone
	G09	MP116	+Set Cntl Chk

Diagram 7-121. Probe Point ALD Reference Chart (Sheet 2 of 4)

Card	Pin	ALD	Signal Name
A1L2	G12	MP116	+Wrt Poll Trig Set
	G13	MP113	-Set Seq 2
	M04	MP113	+Set 4 Lth Set
	M05	MP113	+Change Seq Lth Set
	M07	MP113	-Set Change Seq Lth
	M08	MP012	+Set Seq 2 Don't Set Zeros
	M10	MP086	+Set Data Chk 1
	M11	MP115	-Rd Term to IF
	M12	MP051	+Stop Lth Set
	P09	MP112	-Set Rd Dg B2 Bit 6 Csr Chk
	P10	MP112	-Set Data Chk
	P12	MP115	+Set Equip Chk
	S04	MP115	-Set Equip Chk
	S06	MP111	+Parity to FETs
	S07	MP107	-After Fetch Lth Set
	S09	MP104	-Parity Response Chk
	S12	MP115	-Rd Terminate 2
	U09	MP075	-Set Bfr Valid - Seq 7
A1M2	B07	MP016	-Ld Rd Diag Byte 2
	B11	MP121	+Bit 1 to Intf
	D05	MP015	+Allow Ld AID
	D10	MP145	-Set Rd Dg B2 WCC Set
	G09	MP041	+Ld Percent - Test Req Byte 4
	G12	MP041	-Ld STX - Test Req Byte 4
	J05	MP041	+Ld Slash - Test Req Byte 3
	J09	MP016	-Ld Rd Diag Byte 1
	J12	MP047	+Gt Adr Byte 2 to IR
	M10	MP045	+Gate Data to IR
	S02	MP125	-Set IO Reg Ldd
	S08	MP125	+IO Reg Ldd to IF
	S10	MP125	-Clr IO Reg Ldd
	S11	MP125	+IO Reg Ldd or Stop
	S13	LC101	+Load CU Bfr
	U09	MP125	+IO Reg Ldd Set
	U10	MP064	-CU Rst
	U12	LC101	-Clr CU Bfr Ldd Lth
	U13	MP068	-Gt Ctr IO Reg Ldd
A1N2	B03	MP131	-Rst Rest of SR
	B04	MP131	+SR Bit Crsr
	B05	MP132	-Set SR Bit 3
	B08	MP131	-Rst AID Avail
	B09	MP054	-Clr Csr in SR-Seq 8 Wrt
	B11	MP134	-Data to Mplx
	B12	MP133	-Set SR Bit Cntl
	D02	MP076	+Rst SR Parity Bit
	D04	MP134	+Gt Start Clock at 3
	D07	MP131	+SR Bit 4
	D13	MP131	+SR Bit Ctrl Powered (Standard Machine)
	D13	MP131	+SR Attribute (3270 Data Analysis - APL Feature)
	G04	MP131	+SR Bit 7
	G07	MP132	-Set SR Bit 2
	G09	MP132	-Set SR Bit 1

Card	Pin	ALD	Signal Name
A1N2	G12	MP131	-SR Attribute (3270 Data Analysis - APL Feature)
	J04	MP132	-Set SR Bit 5
	M05	MP133	-Set SR Byte 7
	M06	MP133	-Set SR Bit 6
	M11	MP134	+Xmit Bad Parity
	M13	MP135	+Decode Short Rd
	P06	MP133	-Set SR Bit Crsr
	P11	MP076	-Set P Chk Trig - Send Zeroes
	S08	MP137	-Null Decode
	S09	MP135	-Data to Device
	S12	MP131	+SR Bit Ctrl (3270 Data Analysis - APL Feature)
	U04	MP071	-Ld Poll Msg
	U05	MP131	-Clr All SR
	U09	MP137	-Decode End of Shifting in SE
A1P2	B02	LC305	-Erase Unprotected Cmd
	B03	MP147	+Gt Rst BAC
	B13	MP146	-Word 1 Not End Wrt Poll
	D02	MP107	+Rd Poll Lth Set
	D13	MP145	+Start Print
	G08	MP142	+Gt DA Bit 2
	G10	MP142	+Gt DA Bit 1
	G12	MP142	-Gt DA Bit 4
	G13	MP142	-Gt DA Bit 8
	M07	MP141	+Pri Ctr 2
	M10	LC302	+Poll Adr Bit 16
	M11	LC301	+Data Out 5
	M12	MP143	-Data Out 4
	P02	MP142	-Gt DA Bit 16
	P12	MP143	-Data Out 5
	S04	MP143	-Poll Adr Bit 16
	S05	MP143	+Bypass Select Out
	S07	MP039	-Deactivate Lth
	S08	MP147	+Gt Rst BAC
	S10	MP291	-Reset Pri Ctr
	U05	MP142	-Rst Pri Cntr
	U09	MP143	-Step Pri Ctr
	U10	MP143	-Rst Pri Ctr
	U11	MP103	+Gate Rst Pri Ctr
	U12	MP143	-Deactivate Mode
	U13	MP143	-Address Compare
A1Q5	B05	MP161	+1920 Bit 7
	B06	MP161	+1920 Bit Parity
	B07	MP161	+1920 Bit Crsr
	B08	MP161	+1920 Bit 1
	B09	MP161	+1920 Bit Cntl
	B11	MP161	+1920 Bit 2
	B13	MP161	+1920 Bit 5
	D07	MP161	+1920 Bit 6
	D11	MP161	+1920 Bit 3
	D13	MP161	+1920 Bit 4

Diagram 7-121. Probe Point ALD Reference Chart (Sheet 3 of 4)

Card	Pin	ALD	Signal Name
A1R5	B05	MP181	+480 Bit 7
	B06	MP181	+480 Bit Parity
	B07	MP181	+480 Bit Crsr
	B08	MP181	+480 Bit 1
	B09	MP181	+480 Bit Cntl
	B11	MP181	+480 Bit 2
	B13	MP181	+480 Bit 5
	D07	MP181	+480 Bit 6
	D11	MP181	+480 Bit 3
	D13	MP181	+480 Bit 4
A1S2	B03	LC301	+CE BO 6 Sw
	B04	LC304	+Cmd Stored or TIO
	B05	LC301	+CE BO Parity Sw
	B07	LC301	+CE BO 7 Sw
	B09	LC301	+CE BO 4 Sw
	B10	LC301	+CE BO 5 Sw
	B11	LC301	+CE BO 2 Sw
	D04	LC304	-Bsy to Cmd
	D13	LC301	+CE BO 3 Sw
	G02	LC301	+Data Out 4
	G03	LC301	+Data Out 3
	G04	LC301	+CE BO 1 Sw
	G05	LC301	+Data Out 6
	G06	LC301	+Data Out 1
	G07	LC301	+Data Out 2
	G08	LC403	+Adr Out
	G09	LC301	-CU Adr Decoded
	G12	LC303	+TP 1
	G13	LC305	+Cmd Immediate
	J02	LC301	+CE BO 0 Sw
	J06	LC301	+Data Out 7
	J07	LC301	+Data Out 0
	J11	LC305	-Rd Mod Cmd
	J13	LC305	+Any Rd Cmd
	M03	LC304	-Status In TP-1
	M05	LC101	-Data or Status Start TPD
	M11	LC401	-Cmd Out
	M12	LC305	-Diag Cmd Cycle TP-2

Card	Pin	ALD	Signal Name
A1S2	P04	LC303	-TP2
	P10	LC403	+Op Reset
	P13	LC305	-Erase Unprotected Cmd
	S04	LC305	+Any Wrt
	S07	LC305	-Diag Cntl Cmd
	S08	LC305	-Diag Rd Cmd
	S11	LC305	-Sense Cmd
	U04	LC302	-Copy Cmd
	U07	LC301	+Tie Up
	U09	LC305	-Busy During Cmd Seq
	U11	LC305	-No-Op Cmd
	U12	LC305	-Erase Wrt Cmd
	U13	LC305	-IO Select Cmd
A1T2	B04	LC203	-Status Reg Clr
	B05	LC105	-Set CUE
	B09	LC101	+Gate Data to Bus In
	B10	LC103	+Gate Busy SM to Bus In
	B11	MP024	+Set Unit Exception
	D07	LC105	-Status Reg Reset
	D09	LC101	+Gate Sense to Bus In
	D13	LC206	Int Disabled Ind
	G02	LC102	-Status In Serv Out
	G09	LC402	+Gate Adr to Bus In
	G13	LC304	-Bsy to Cmd
	J04	LC305	+Set Cmd Reject
	J05	LC104	-Set Busy Latch
	J06	LC205	-Sns Reg Reset
	M04	LC202	+Bus In 0 Ind
	M05	LC202	+Bus In 7 Ind
	M06	LC202	+Bus In 3 Ind
	M07	LC202	+Bus In 1 Ind
	M09	LC202	+Bus In 4 Ind
	M10	LC202	+Bus In 5 Ind
	P04	LC201	-On Line
	P05	LC202	+Bus In 6 Ind
	P06	LC202	+Bus In 2 Ind
	P10	LC204	+Int Rqd Set

Card	Pin	ALD	Signal Name
A1T2	S09	LC403	+Sns Stat Rst
	U02	LC203	+Bus In Parity Ind
	U10	MP115	+Set Equip Chk
	U12	LC301	-Set Bus Out Chk
	U13	MP112	+Set Data Chk
A1U2	J05	LC401	-Serv Out
	M07	LC105	+Chaining
	S07	LC102	+Gt Stat to Bus In
	U05	LC104	-Halt IO Set
A1V2	B05	LC105	-Chaining
	B09	LC403	+Clr Pri Ctr Ldd Lth
	D05	LC105	-CUE Req Set
	G02	LC403	-HIO CE Rem
	G07	LC305	-Diag Cmd Cycle IP2
	G12	LC303	-CU Adr Decoded
	G13	LC401	-Serv Out
	J06	LC401	+CE Reset Sw
	J07	LC403	+SNS Status Rst
	J11	LC402	-Adr In Start IPD
	J13	LC101	-Mpx Reset Op In
	M07	LC403	-Op Rst Clr SS
	M08	LC401	+CE Sel Out Sw On
	P05	LC401	-On Line
	P07	LC103	+Busy Cntl
	P10	LC403	-Set Halt IO
	S04	LC401	-On Line Ctrl
	S05	LC401	-On Line Sw Off
	S06	LC403	-Any Halt IO
	S07	LC401	+CE Serv Out Sw On
	S10	LC405	+CE Supr Out Sev On
	S11	LC405	-Supp Out
	U04	LC401	+Enable
	U09	LC401	+CE Adr Out Sw
	U10	LC401	+CE Op Out Sw On
	U11	LC401	-Cmd Out
	U12	LC401	+CE Cmd Out Sw On

Diagram 7-121. Probe Point ALD Reference Chart (Sheet 4 of 4)

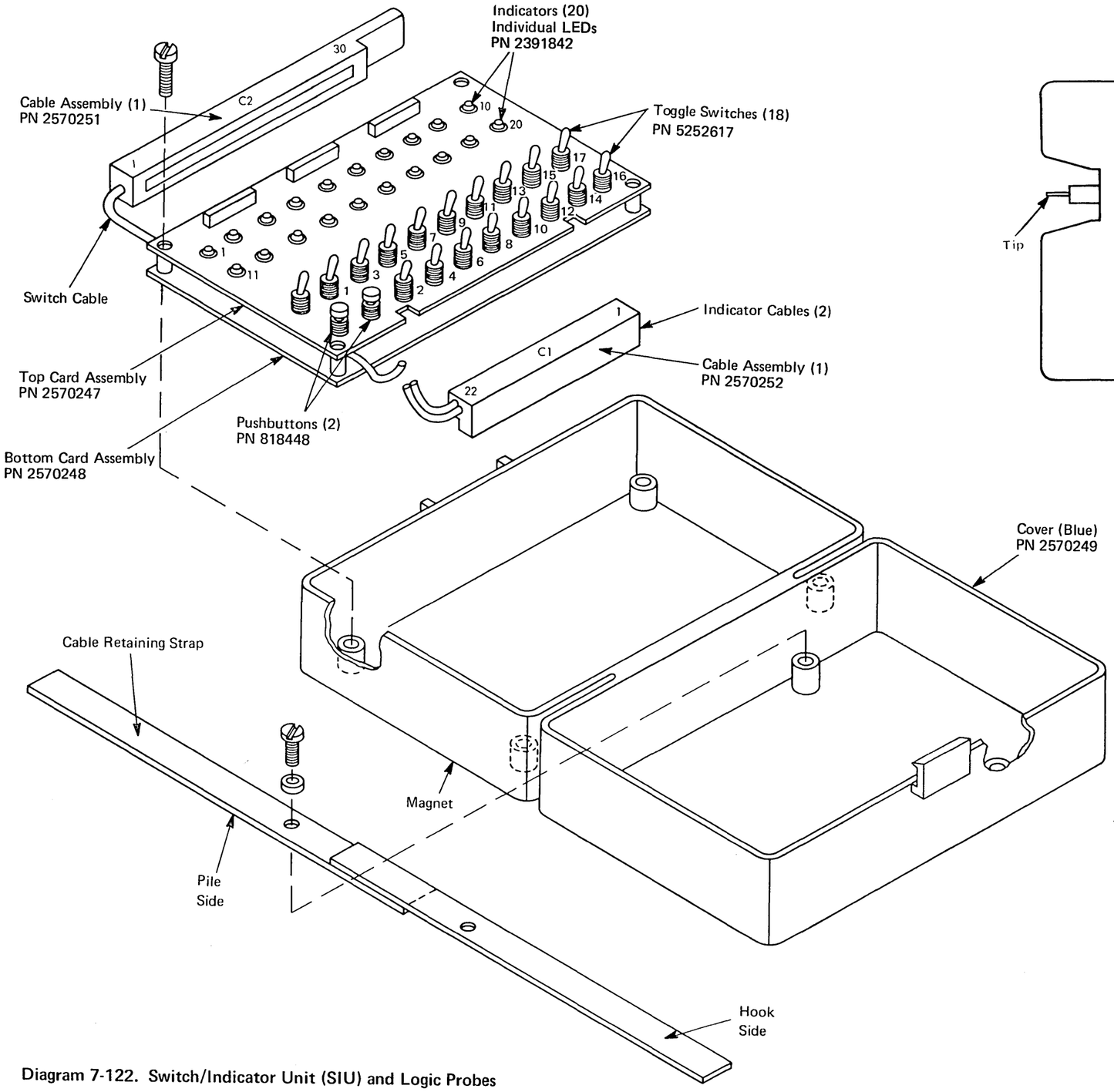
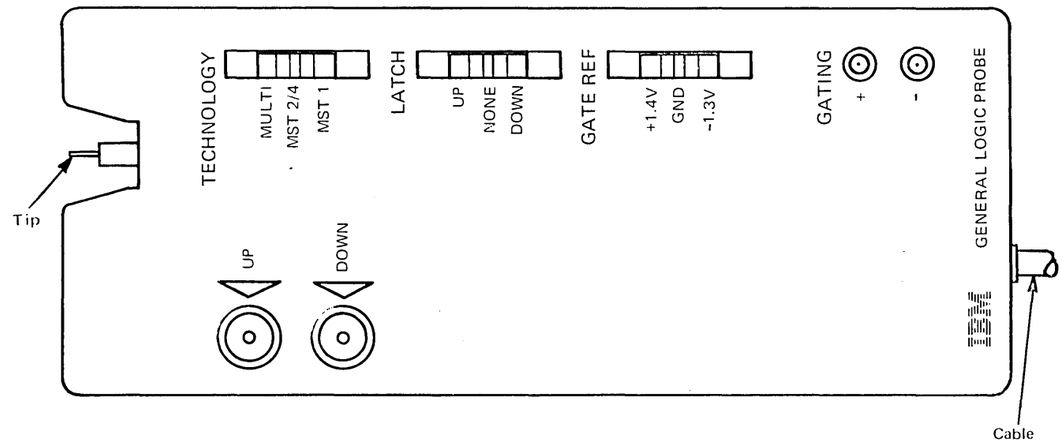


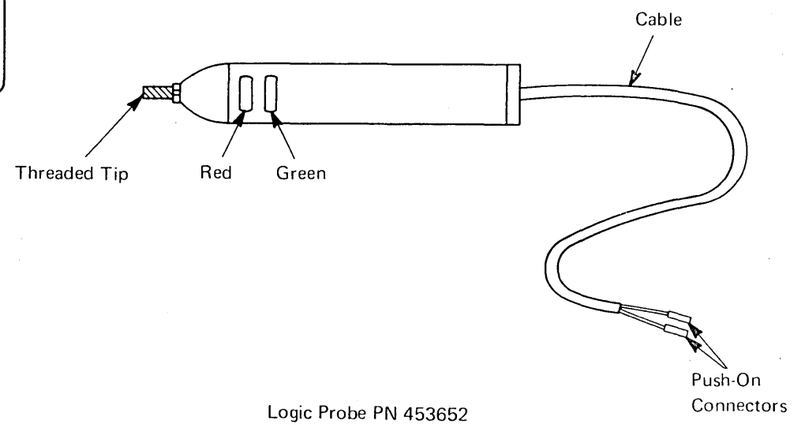
Diagram 7-122. Switch/Indicator Unit (SIU) and Logic Probes

Diag 7-122



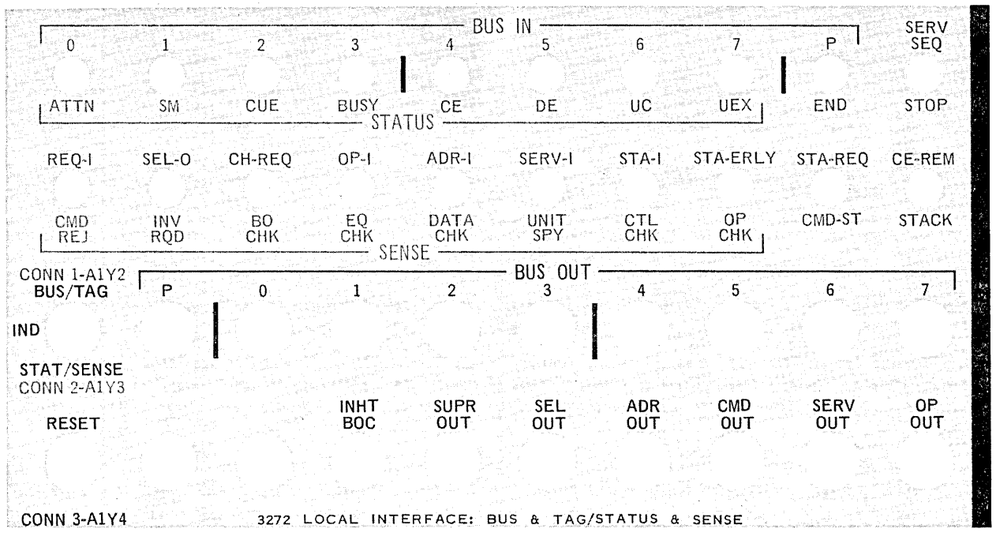
General Logic Probe (GLP) PN 453212

Note: SIU part numbers shown are for the Model 1 SIU. For the Model 2 SIU (red cover) refer to 3271 Models 11 and 12 MLTG, SY27-2409, or 3275 Models 11 and 12 MLTG, SY27-2410.

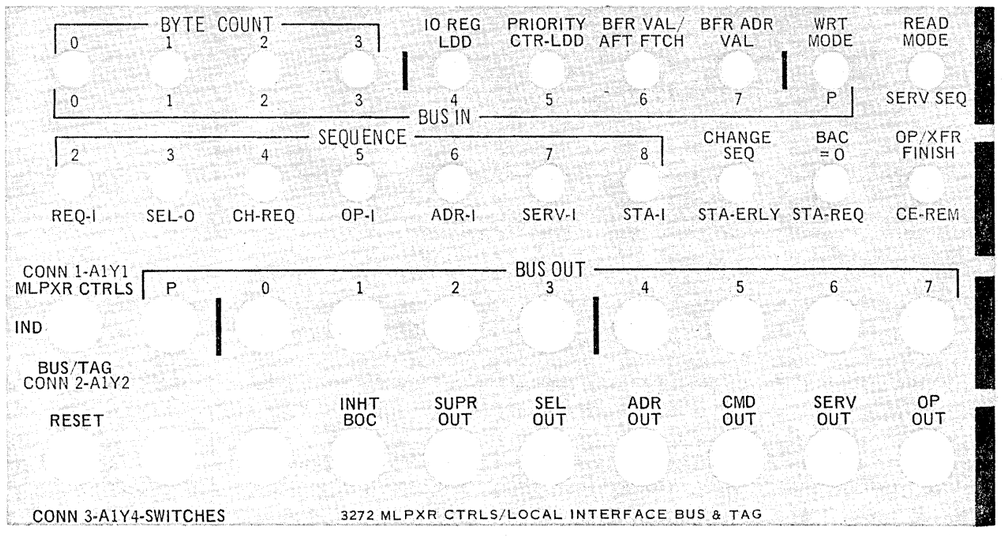


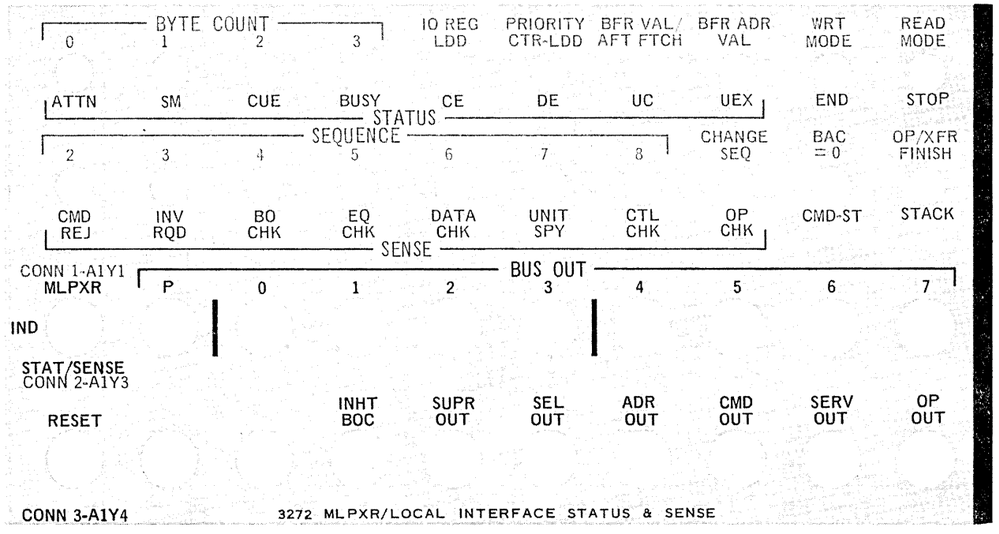
Logic Probe PN 453652

Overlay PN 2621408



Overlay PN 2621301





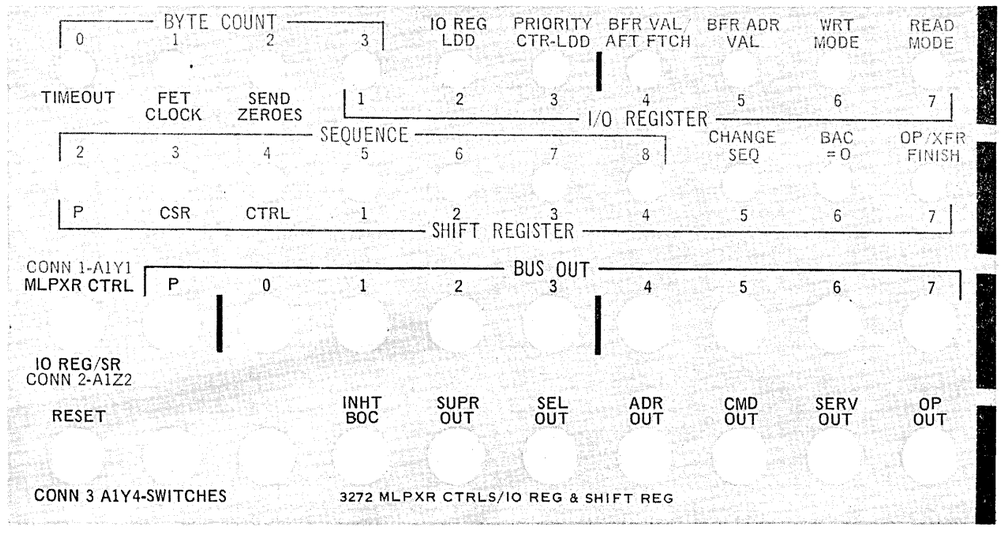


Diagram 7-123. Switch/Indicator Unit Overlays

Indicator No.	Indicator Name	Y-Conn Pin Location (Board A1)	Net No.	Source Pin (Board A1)
1	BUS IN 0	F1E13	LC202AJ4	T2M04
	ATTN	K1A13	LC203AF4	T2J13
	BYTE COUNT 0	C1D13	MP062AF2	G2G11
	TIMEOUT	F6E04	MP067AV4	G2S12
2	BUS IN 1	F1C13	LC202AK4	T2M07
	SM	J1D13	LC103AJ4	U2P06
	BYTE COUNT 1	C1B13	MP062AL2	G2B08
	FET CLOCK	F6C04	MP065BG4	G2G12
3	BUS IN 2	F1E11	LC202AL4	T2P06
	CUE	K1A11	LC203AL4	T2G08
	BYTE COUNT 2	C1D11	MP062AR2	G2D04
	SEND ZEROS	F6E06	MP116AL6	L2B13
4	BUS IN 3	G1A11	LC202AM4	T2M06
	BUSY	K1B11	LC203BA4	T2G11
	BYTE COUNT 3	C1E11	MP062AU2	G2B05
	IO REG 1	G6A02	MP121BL4	M2B11
5	BUS IN 4	F1C11	LC202AN4	T2M09
	CE	J1D11	LC104AR4	U2S03
	IO REG LDD	C1B11	MP125AF4	M2U09
	IO REG 2	F6C02	MP121BN4	M2M11
6	BUS IN 5	F1B13	LC202AP4	T2M10
	DE	J1C13	LC104BF4	U2B03
	PRIORITY CTR LDD	C1A13	MP101CC4	K2G05
	IO REG 3	F6B04	MP122AS4	M2P13
7	BUS IN 6	F1D11	LC202AQ4	T2P05
	UC	J1E11	LC203AQ4	T2D06
	BFR VAL/AFT FTCH	C1C11	MP111AM4	L2U07
	IO REG 4	F6D02	MP122BE4	M2P11
8	BUS IN 7	F1B11	LC202AR4	T2M05
	UEX	J1C11	LC203AT4	T2B07
	BFR ADR VAL	C1A11	MP056AL4	F2D05
	IO REG 5	F6B02	MP122BH4	M2M13
9	BUS IN P	E1E13	LC203AW4	T2U02
	END	J1A13	LC104AJ4	U2U11
	WRT MODE	B1D13	MP053AA4	F2D10
	IO REG 6	E6E04	MP123AS4	M2G03
10	SERV SEQ	E1E11	LC101BC4	U2B10
	STOP	J1A11	LC104BD4	U2D02
	READ MODE	B1D11	MP042AZ4	E2B10
	IO REG 7	E6E02	MP123AU4	M2J07
11	REQ I	E1B11	LC103AU4	U2U10
	CMD REJ	H1C11	LC204AJ4	T2U07
	SEQUENCE 2	B1A11	MP113CN4	L2G11
	SHIFT REGISTER P	E6B02	MP131BD2	N2B13
12	SEL 0	D1E13	LC401BZ4	V2U06
	INV RQD	H1A13	LC204AN4	T2P10
	SEQUENCE 3	A1D13	MP113AY2	L2P06
	SHIFT REGISTER CSR	D6E04	MP131AY2	N2B04
13	CH REQ	E1A13	LC402AL4	V2G02
	BO CHK	H1B13	LC204AS4	T2S12
	SEQUENCE 4	A1E13	MP113CK4	L2M04
	SHIFT REGISTER CTL	E6A04	MP131BG4	N2D13
14	OP I	D1E11	LC402AR4	V2G05
	EQ CHK	H1A11	LC204AW4	T2S11
	SEQUENCE 5	A1D11	MP114BA2	L2B05
	SHIFT REGISTER 1	D6E02	MP131AK2	N2J02
15	ADR I	G1A13	LC402AT4	V2M10
	DATA CHK	K1B13	LC204AL4	T2U04
	SEQUENCE 6	C1E13	MP114BB2	L2D05
	SHIFT REGISTER 2	G6A04	MP131BE2	N2D05
16	SERV I	E1B13	LC101BA4	U2D12
	UNIT SPY	H1C13	LC204AQ4	T2S07
	SEQUENCE 7	B1A13	MP114BC2	L2B08
	SHIFT REGISTER 3	E6B04	MP131BC2	N2B06
17	STA I	E1C13	LC102BP4	U2M03
	CTL CHK	H1D13	LC204AU4	T2S08
	SEQUENCE 8	B1B13	MP114BJ4	L2P02
	SHIFT REGISTER 4	E6C04	MP131AZ2	N2D07
18	STA ERLY	E1C11	LC102AQ4	U2S07
	OP CHK	H1D11	LC204AY4	T2U06
	CHANGE SEQ	B1B11	MP113AS4	L2M05
	SHIFT REGISTER 5	E6B02	MP131AQ2	N2B07
19	STA REQ	F1A13	LC102AN4	U2D13
	CMD ST	J1B13	LC304AL4	S2U06
	BAC=0	B1E13	MP035BS4	D2J04
	SHIFT REGISTER 6	F6A04	MP131AJ2	N2D06
20	CE REM	E1D11	LC104AX4	U2B11
	STACK	H1E11	LC102AJ4	U2M02
	OP/XFR FINISH	B1C11	MP012AW4	B2M08
	SHIFT REGISTER 7	E6D02	MP131AC2	N2G04

Note: A +5V line is included in each SIU connector cable. The +5V pins are at:

Conn Y1—A1E11
Conn Y2—E1A11
Conn Y3—H1B11
Conn Y4—L1E11
Conn Z2—E6A02

Diagram 7-124. Switch/Indicator Unit Indicator Connections

Switch No. See App A	Switch Name	Y-Conn Pin Location (Board A1)	ALD Location	Probe Pin (Board A1)
	IND (TOP/BOTTOM)	NA	NA	NA
1	BUS OUT P	N1E11	LC301	S2B05
3	BUS OUT 0	N1D11	LC301	S2J02
5	BUS OUT 1	N1C11	LC301	S2G04
7	BUS OUT 2	N1B11	LC301	S2B11
9	BUS OUT 3	N1A11	LC301	S2D13
11	BUS OUT 4	M1D11	LC301	S2B09
13	BUS OUT 5	M1C11	LC301	S2B10
15	BUS OUT 6	M1B11	LC301	S2B03
17	BUS OUT 7	L1D13	LC301	S2B07
PB 1	RESET	M1A11	LC401	V2J06
PB 2	Not Used			
2	Not Used			
4	INHT BOC	N1B13	LC301	S2D11
6	SUPR OUT	N2A13	LC405	V2S10
8	SEL OUT	M1E13	LC401	V2M08
10	ADR OUT	M1D13	LC401	V2U09
12	CMD OUT	M1B13	LC401	V2U12
14	SRV OUT	M1A13	LC401	V2S07
16	OP OUT	L1E13	LC401	V2U10

NA = Not Applicable

Diagram 7-125. Switch/Indicator Unit Switch Connections

Counter	Condition
1,2	Transmission counter; number of buffer transfers since last counter printout.
3	Bus out check.
4	Equipment check.
5	Not used.
6	Intervention required.
7	Not used.
8	Intervention required, equipment check, and unit specify.
9	Data check.
10	Data check and unit specify.
11	Control check.
12	Command reject.
13	Operation check.
14	Equipment check and unit specify.
15,16	Not used.

Diagram 7-126. Disk-Operating System Statistical Data Recording Counters

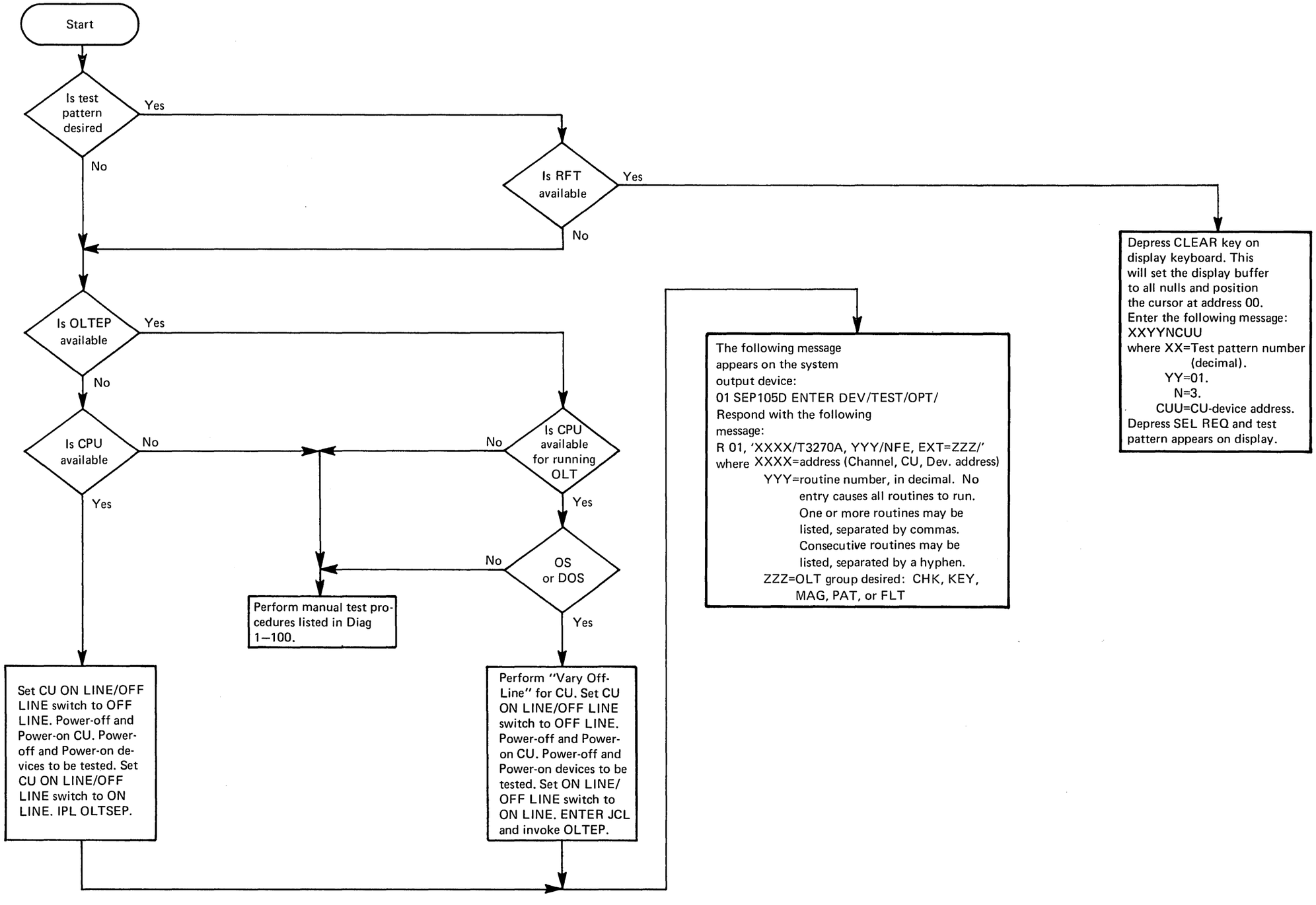


Diagram 7-127. RFT and OLT Operation Procedures

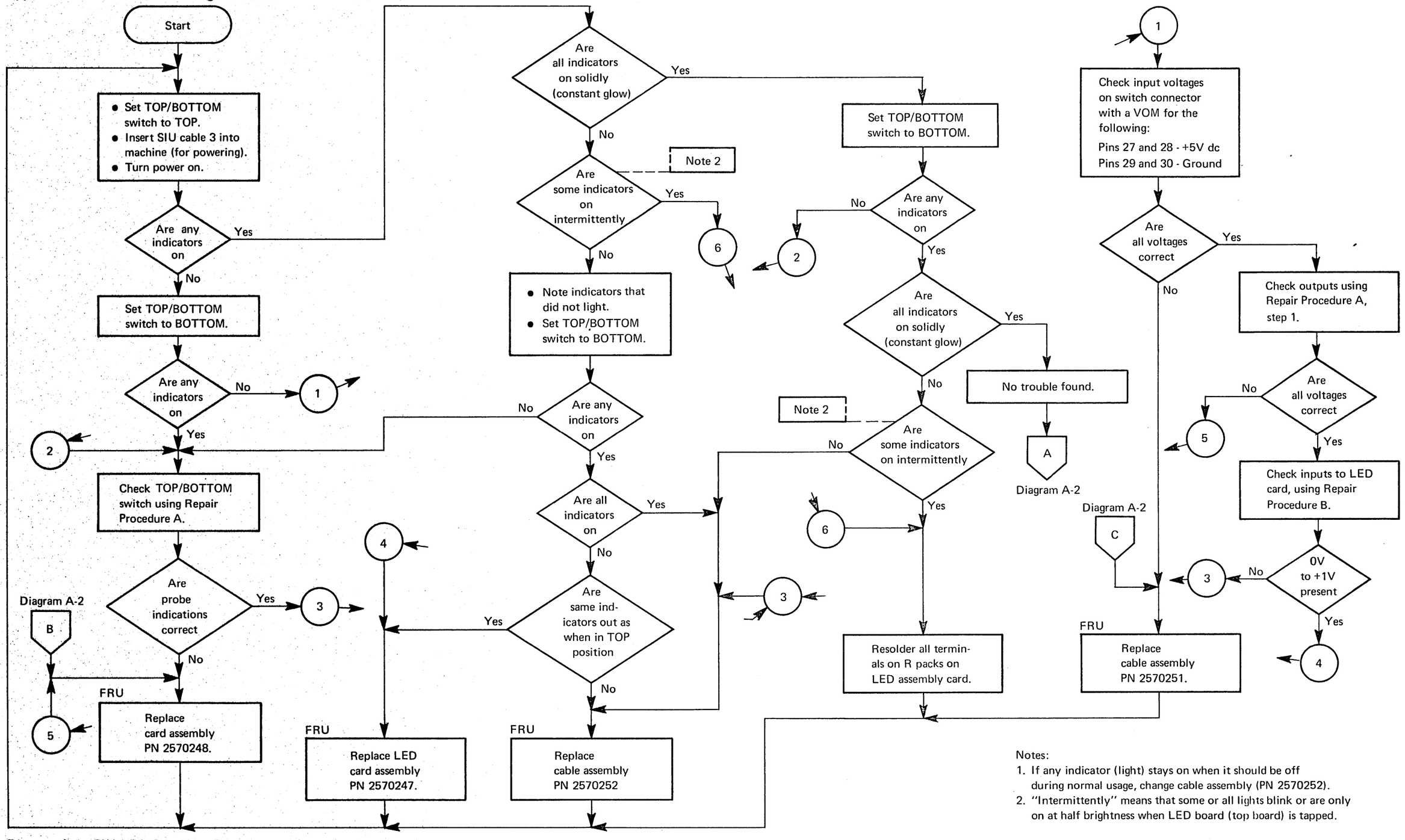
Card-Calling Diagnostic Programs (FLT)	
Decimal Routine No.	Description
001	NO-OP COMMAND
003	SENSE COMMAND
005	ILLEGAL COMMANDS
007	DIAGNOSTIC WRITE COMMAND
009	DIAGNOSTIC READ COMMAND
011	DIAG WRT/DIAG READ
013	DIAG WRT/DIAG WRT/DIAG RD
016	SELECT WITH DEACTIVATE
017	SELECT WITH DCD'S
019	SELECT W/O DCD'S
021	EWRT W/DCD'S WCC 40 NO DATA
023	EWRT W/O DCD'S WCC 40 NO DATA
025	ERASE WRT WCC = SA NO DATA
026	ERASE WRT WCC = SP NO DATA
027	ERASE WRT WCC = UK NO DATA
029	EWRT WCC = UC+SA+SP NO DATA
031	EWRT WCC = 40 1 DATA W/FBP
033	EWRT WCC = 40 1 DATA BYTE
035	WRT WCC = 40 NO DATA W/DCD'S
036	WRT WCC = 40 NO DATA W/O DCD
037	WRT WCC = SA NO DATA
038	WRT WCC = 40 1 BYTE W/FBP
039	WRT WCC = SA+UK NO DATA
041	WRT WCC = RMDT 1 BYTE DATA
043	RBFR 3 BYTES W/DCD'S
044	RBFR 3 BYTES W/O DCD'S
045	RMOD 3 BYTES W/O DCD'S
047	EAU CMD
050	CHAIN SEL-WRT WCC = 40
051	CHAIN SEL-WRT WCC = SA + UK
052	CHAIN SEL-RBFR 3 BYTES
054	CHAIN SEL-RMOD 3 BYTES
057	EWRT WCC = RMDT W/SF ORDER
058	EWRT WCC = UK W/SBA ORDER
060	EWRT WCC = SA W/IC ORDER
062	EWRT WCC = 40 W/PT ORDER
064	EWRT WCC = 40 W/RA ORDER
066	EWRT WCC = 40 W/EUA ORDER
067	EWRT WCC = 40 W/NL, EM, DUP, FM
069	WRT W/SBA TO ILLEGAL ADDRS
070	WRT W/SBA NO ADDRESS BYTES
071	WRT W/SBA 1 ADDRESS BYTE
073	WRT W/SF AND NO ATTR BYTE
074	WRT W/EUA - NO ADDRESS BYTES
075	WRT W/EUA - 1 ADDRESS BYTE
077	WRT W/RA AND NO ADDRESS
078	WRT W/RA AND 1 ADDRESS BYTE
080	WRT W/RA AND NO CHARACTER
081	WRT/RD ALL VALID CHARACTERS
082	EWRT W/SF MDT IN ATTRIBUTE
083	RBFR TO UNFORMATTED BUFFR
084	RMOD TO UNFORMATTED BUFFR
086	RBFR FORMATTED BUFFR W/MDT
087	RMOD FORMATTED BUFFER W/MDT
089	RMOD FORMAT'D BUFFR W/O MD
092	TEST EWRT ERASES COMP. BUF
093	TEST EWRT ERASES ATTRIBUTE
097	WRT FULL BUFFER, RD FULL BUFFER
098	BUFFER ADDRESSING TESTS
099	BUF ADDRESSING W/CMD CHAIN
103	CHARACTER FOLD TEST
104	IC ORD - AT ADDRS 3
105	IC ORD - LAST BUFFR LOCATION
106	IC ORD FROM LAST TO ZERO
109	IC ORD - FROM 250 TO 249
110	WRT-RD ALL POSSIBLE ATTR'S
112	RMOD WRAP FIELD OF NULLS
113	RMOD WRAP FIELD OF DATA
115	RBFR WRAP FIELD W/O MDT'S
116	RBFR WRAP FIELD W/MDT'S
119	RA ORD VALID CHAR ADD = LAST
121	EWRT TO FORMAT BUF-EUA ORD
123	EWRT W/PT CHK PT ERASES
125	EWRT SBA TO ATTR-THEN PT
129	UNCHAINED RBFR, RMOD + EWRT
130	UNCHAN'D EAU + RBFR W/MIX BF
132	UNCHAN'D EAU + RBFR UNPR BUF
133	UNCHAN'D EAU + RBFR PROT BUF
136	UNCHN'D RMOD + WRT + RMOD W/MD

Diagram 7-128. U3270 Card-Calling Diagnostic Program Routine Description

Decimal Routine No.	Description
Functional Tests (CHK)	
001	WRT AND RD ALL GRAPHICS
002	SF ORD W/ALL VALID ATTR
003	IC ORD W/ALL VALID WCC'S
004	ERASE ALL UNPROTECTED CMD
005	ERASE UNPROTECTED ORDER
006	REPEAT TO ADDRESS ORDER
007	PROGRAM TAB ORDER
009	WRT AND RD APL GRAPHICS
Keyboard Tests (KEY)	
031	MANUAL INTERRUPT AID CHECK
032	LOWER CASE KEYBOARD CHECK
034	APL KYBD CHAR CHECK
Magnetic Card Reader Test (MAG)	
061	MAG CARD READER AND CARDS
Display and Printer Patterns (PAT)	
091	PATTERN INSTRUCTIONS
093	480 BUFFER ALIGNMENT
094	1920 BUFFER ALIGNMENT
095	PROG TAB/ERASE UNPROTECTD
096	UNIVERSAL PATTERN DISPLAY
097	NEW LINE FUNCTION CHECK

Diagram 7-129. X3270 Diagnostic Program Routine Description

Appendix A - SIU Troubleshooting Procedure



Notes:
1. If any indicator (light) stays on when it should be off during normal usage, change cable assembly (PN 2570252).
2. "Intermittently" means that some or all lights blink or are only on at half brightness when LED board (top board) is tapped.

Diagram A-1. SIU-LED Checkout Flowchart

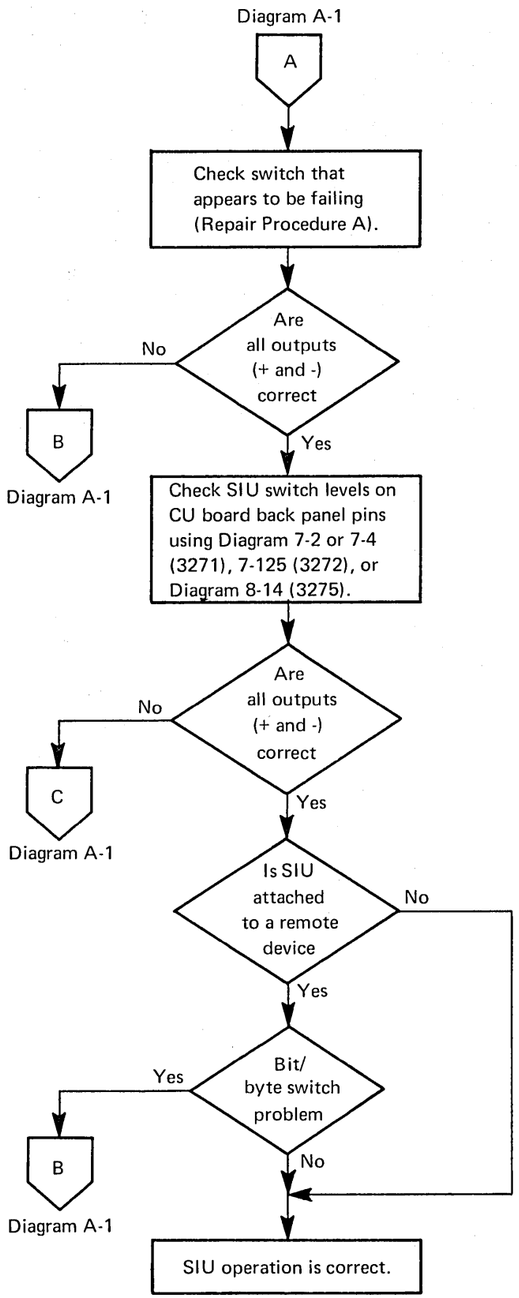


Diagram A-2. SIU-Switch Checkout Flowchart

REPAIR PROCEDURE A (Switch Repair)

Use logic probe to check levels. See Diagram A-3, Table 2, for probe points and Diagram A-4 for physical locations.

1. TOP/BOTTOM switch - probe levels are opposite.
   a. TOP position - Pin 1 is GREEN.
      Pin 2 is RED.
   b. BOTTOM position - Pin 1 is RED.
      Pin 2 is GREEN.
2. PB 1 - probe levels are opposite.
   a. Pin 4 - PB 1 not depressed, probe is RED.
      PB 1 depressed, probe is GREEN.
   b. Pin 5 - PB 1 not depressed, probe is GREEN.
      PB 1 depressed, probe is RED.
3. PB 2 - probe levels depend upon the setting of Switch 2 (pin 6 only).
   a. Pin 7 - PB 2 not depressed, probe is GREEN.
      PB 2 depressed, probe is RED.
   b. Pin 6 (Switch 2 up) - PB 2 not depressed, probe is RED.
      PB 2 depressed, probe is GREEN.
   c. Pin 6 (Switch 2 down) - Probe is always RED.
4. Pin 9 is approximately +1.5 to +2.0V dc measured with a VOM. The logic probe will be RED and GREEN on remote devices (3271 and 3275).
5. Switches 1 through 17 (as listed in Table 2) should be RED (+) when up and GREEN (-) when down as checked by the logic probe.

REPAIR PROCEDURE B (LED Repair)

Use VOM for diagnosis of failure. See Diagram A-3, Table 1, for metering points and Diagram A-4 for physical locations. Check failing LED indicator connector (as listed in Table 1) for the following conditions:

1. If LED is not lighted, 0 to +1V dc indicates LED is open. Replace indicator.
2. If LED is not lighted, +3 to +4V dc indicates cable assembly (PN 2570252) is open. Replace cable.

Table 1

LED Indicator Connector Pins	Function
1	+5V dc (RED)
2	LED 20
3	LED 10
4	LED 19
5	LED 9
6	LED 18
7	LED 8
8	LED 17
9	LED 7
10	LED 16
11	LED 6
12	LED 15
13	LED 5
14	LED 14
15	LED 4
16	LED 13
17	LED 3
18	LED 12
19	LED 2
20	LED 11
21	LED 1
22	Not Used

Table 2

Switch Connector Pins	Function
1 }	TOP/BOTTOM
2 }	Switch
3	Not Used
4	PB 1
5	PB 1
6	PB 2
7	PB 2
8	Not Used
9	1.5 to 2.0V dc (VOM)
10	Switch 1
11	Switch 2
12	Switch 3
13	Switch 4
14	Switch 5
15	Switch 6
16	Switch 7
17	Switch 8
18	Switch 9
19	Switch 10
20	Switch 11
21	Switch 12
22	Switch 13
23	Switch 14
24	Switch 15
25	Switch 16
26	Switch 17
27	+5V dc (RED)
28	+5V dc (RED)
29	GND (GREEN)
30	GND (GREEN)

Diagram A-3. SIU Connector Pin Listings

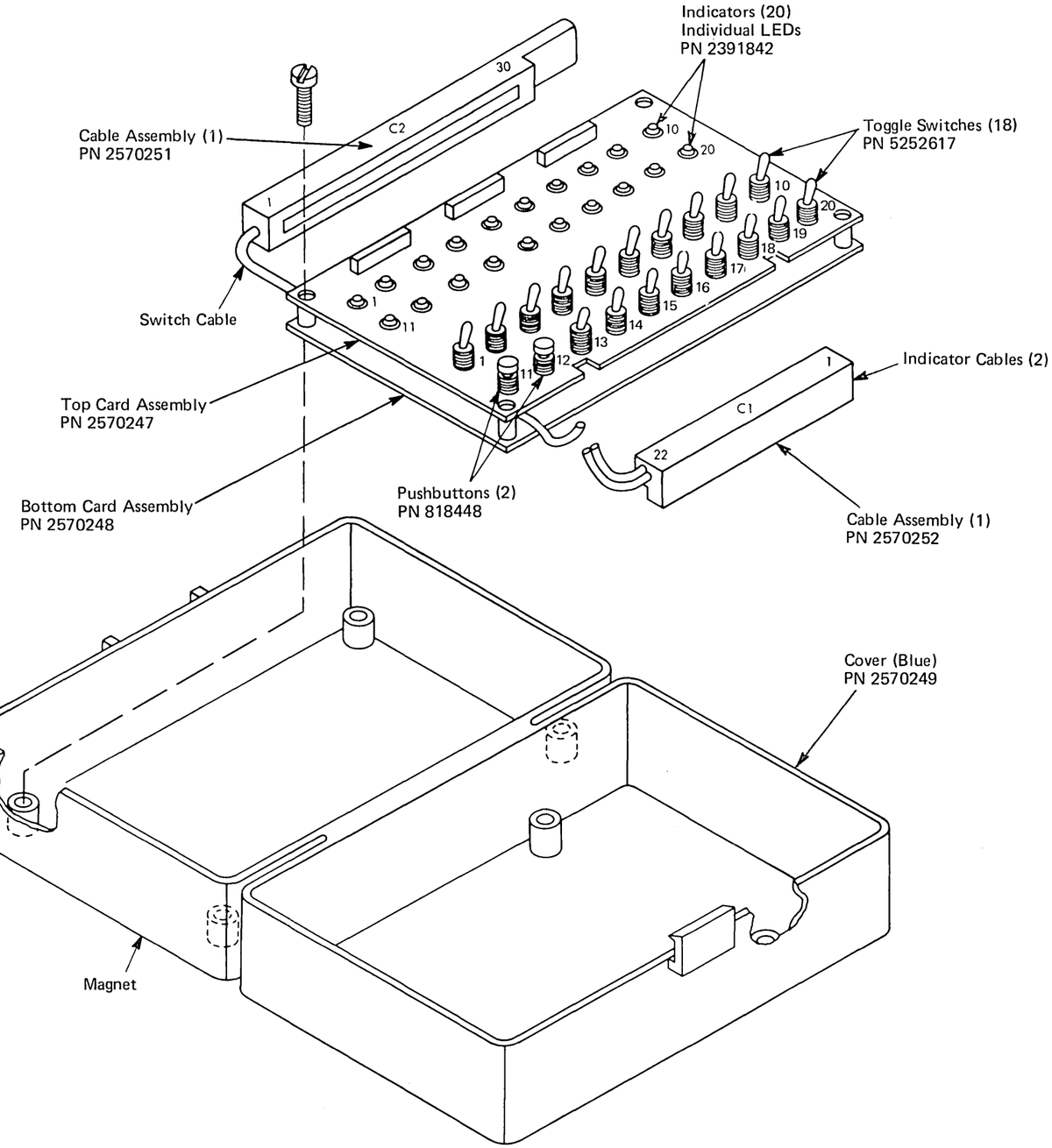


Diagram A-4. SIU Physical Locations and Part Numbers

Glossary

alphameric keyboard: A typewriter-like keyboard used to enter letters, numbers, and special characters into a device and also used to perform special functions (such as backspacing) and to produce special control signals.

attention: An I/O interruption generated asynchronously by an I/O device, usually as the result of an action taken by the operator of the device.

attention identification (AID) character: A code that is set in the display station when the display station operator takes an action that produces an I/O-pending condition. The character identifies the action or key that caused the condition to be generated. The AID is set when the display station operator presses a program access key, when a selector-pen attention occurs, or when a successful operator identification card read-in occurs.

attribute: Characteristic of a display field. The attributes are defined as protection (protected or unprotected against manual input and/or copy operations), input control (numeric only or alphameric), display intensity (normal, high, nondisplay), selector-pen detectability (can or cannot be detected), and modification (field has been modified or not modified).

attribute character: A single character code that defines the attributes (characteristics) of the display field that follows. An attribute character is the first character in a display field.

audible alarm: (1) For a display device, a short audible tone is sounded under program control. (2) For the display station, the audible alarm is also sounded automatically when a character is entered from the keyboard into the next-to-last character position on the screen.

available/unavailable: A device is available for CU-channel operation if (1) it is online, (2) it is physically attached to the CU, (3) its security lock is turned on and (4) it is supplied with ac power. The device is unavailable if any one of these conditions does not exist.

buffer: A hardware portion of the device or control unit in which information required to generate an image is stored. Also called *buffer storage* or *storage buffer.*

buffer address: The address of a location in the buffer of the device or control unit at which one character can be stored. Synonymous with *character address.*

buffer storage: Same as *buffer.*

busy/not busy: The CU detects a device busy condition if (1) the device is performing an operation that was initiated by the CU (namely, an erase-all-unprotected operation or a printing operation) or (2) the device is performing a manually initiated operation. A manual operation can be initiated at the keyboard, operator identification card reader, or selector pen.

cathode-ray tube (CRT): A vacuum tube in which a slender beam of electrons is projected upon a fluorescent screen to produce a luminous glow corresponding to the beam's path.

character address: Same as definition 2 under *buffer address.*

character addressing: In an alphameric display device, the ability to gain access to any character position in the buffer by using an address.

character generator: A hardware unit contained in a CRT display device that automatically converts the digital code for a character into signals that cause the electron beam to create the character on the screen.

character position: (1) For a display device, a location on the screen at which one character can be displayed; (2) Also, an addressed location in the buffer at which one character can be stored.

character row: Same as display line.

cursor check: There should be only one cursor bit stored in the entire storage buffer. If no cursor, or more than one cursor, is detected following a complete cycle of data through the buffer (address 0 to 479 or 1919), the data check bit is set in the sense register.

data-entry keyboard: For the display station, a keyboard on which the numeric keys are grouped in a format similar to the numeric keys on a card punch keyboard, thus facilitating entry of numeric data. Other features include (1) automatic upshift when the cursor enters a numeric-only display field, and (2) automatic prevention of entry of non-numeric characters into a numeric-only display field, when the Numeric Lock feature is installed.

data stream: (1) In general, all data transmitted through a channel in a single read or write operation. (2) Those control characters, order sequences, and attribute and alphameric characters transmitted to, or from, the 3270 Information Display System.

designator character: A character that immediately follows the attribute character in a selector-pen detectable field. The designator character controls whether a detect on the field will or will not cause an attention. For a non-attention-producing field, the designator character also determines whether the modified data tag for the field is to be set or reset as the result of a selector-pen detect.

detect: See *light pen detect* and *selector-pen detect.*

detectable: A characteristic of a display field (defined by its attribute and designator characters) that determines whether the field can be sensed by the selector pen.

display (used as a noun): Same as *screen image.*

display area: The portion of a CRT screen on which images can be displayed (that is, the portion on which the electron beam can be projected).

display buffer: Same as *buffer.*

display cycle: Same as definition 2 under *frame.*

display device: An I/O device or terminal, such as the 3277 Display Station, on which images are produced on a viewing screen.

display field: A group of consecutive characters (in the buffer) that starts with an attribute character (defining the characteristics of the field) and contains one or more alphameric characters. The field continues to, but does not include, the next attribute character.

display line: The series of character positions that constitute one horizontal line on the screen of an alphameric display device. Synonymous with *character row.*

display operator: A person who uses the keyboard or selector pen to perform operations at a display station.

display station: Same as *display device.*

display station user: Same as *display operator.*

end of message (EM) symbol: In a data stream transmitted to an IBM 3284 or 3286 Printer, a character that marks the end of the data to be printed.

field: See *display field:*

formatted display: A screen display in which a display field (or fields) have been defined as a result of storing an attribute character (or characters) in the display buffer. Contrast with *unformatted display.*

frame: (1) One complete presentation of a display image on the screen of a display device. (2) In discussing hardware generation of an image, the entire sequence of movements of an electron beam needed to create all points, lines, and characters *once* in a display image. In this sense, sometimes called display cycle.

frame rate: The number of times per second that a screen image is regenerated on a CRT. Sometimes called *regeneration rate* or *refresh rate.*

intensity: (1) In general, the brightness at which an image or portion of an image is displayed on a CRT screen. (2) For the 3270, an attribute character determines whether a field will be displayed and, if it is to be displayed, the brightness at which it will be displayed.

internal parity check: Each address location in the CU storage buffer contains the character data bits as well as a bit position for a cursor bit. Each character is assigned a parity bit to maintain odd parity. (The cursor bit is not included.) As each character is shifted out of the storage buffer, parity is checked. If bad (even) parity is detected in a character, the character is returned to the buffer and the data check sense bit is set in the sense register.

I/O pending condition: The condition that results in (1) generation of the attention status in a locally attached display station and (2) in an affirmative response to a polling operation in a remotely attached display station.

light pen: See selector pen.

manual input: In connection with a display device, the entry of information at the device by using a keyboard, a selector pen, or another input mechanism attached to the device.

modified data tag: A bit in the attribute character (of a display field) that results in that field being transferred during execution of a Read Modified command. The modified data tag may be set by: (1) a keyboard input to the field, (2) a selector-pen detection in the field, (3) an operation identification card read-in operation, or (4) program control. The modified data tag may be reset by: (1) a selector-pen detection in the field, or (2) program control.

nondestructive cursor: A cursor that can be moved within a CRT display area without changing or destroying the data displayed on the screen. This is the type of cursor that is used in the 3270.

nondisplay/nonprint field: A display field in which data cannot be displayed or printed.

new line (NL) symbol: For an IBM 3284 or 3286 Printer, a code that causes the printer to move to the beginning of the next line to print the next character.

null character: A nondata character. A null character occupies a position in the storage buffer and is displayed as a blank.

null suppression: In reading the contents of a buffer, the bypassing of all null characters in order to reduce the amount of data to be transmitted. Also called *data compaction.*

order code: A code that is included in the data stream transmitted to the device and that causes the device to perform a particular control operation.

order sequence: A sequence in the data stream that starts with an order code and includes any character address (or addresses) and/or data characters related to the order code.

printer hang: This condition exists when the print mechanism is unable to advance successfully. It can occur anytime during a printout through to, and including, the carriage return and new line advance. The printer will try to recover; i.e., mechanically restore its print mechanism to the starting position. This hang condition may be caused by a mechanical malfunction or loss of ac power at the carriage motor.

program access key: Any key on the display-station keyboard that solicits program action by setting an I/O-pending condition. The keys are CLEAR, ENTER, TEST REQUEST, CANCEL, program function keys, and program attention keys. Each program access key is associated with a unique attention identification (AID) character.

program attention (PA) key: A program access key intended to solicit program action that does not require data to be read from the buffer of the display station. If a Read Modified command is issued in response to the program attention key interruption, only the attention identification (AID) character is transferred to the program; no data from the buffer is transferred.

program function (PF) key: A program access key intended to solicit program action that usually requires data to be read from the buffer of the display station. If a Read Modified command is issued in response to the program function key interruption, the attention identification (AID) character *and* all display fields in which the modified data tags are set are transferred to the program.

protected field: A display field in which the display station operator cannot enter, modify, or erase data.

read-modified operation: An operation in which only those display fields in which the modified data tag is set are read.

ready/not ready: The only devices that can be "not ready" are the attached printers. Thus, a printer is not ready to operate with the CU when (1) the Printer's cover is open, (2) it is out of paper, or (3) a "hang" condition exists in the printer. (See "Printer Hang".)

regeneration: (1) The process of redisplaying an image on a CRT screen, or (2) the process of periodically reading out and writing back in the entire contents of a buffer.

screen: The viewing surface of a display device.

screen display: Same as *screen image.*

screen image: The pattern characters displayed on the viewing surface of a display device. Also called *image, display image, screen display,* or *display.*

selector pen: A pen-like instrument attached to the display station. When pointed at a detectable portion of an image and activated, the selector pen senses the presence of light at a display field and generates a selector-pen-detect signal.

selector-pen attention: An interruption generated when a selector-pen detect occurs on a display field that has the detectable attribute.

selector-pen detect: The sensing by the selector pen of the presence of light in a display field that has the detectable attribute. Data associated with the detection identifies the display field at which the light was detected. Depending on the status of that display field, the detection and location information may be stored in the device and may produce an interruption that is transmitted to the CPU.

storage buffer: Same as *buffer.*

timeout check: A timeout check occurs when a device fails to respond to the CU within a specific time period. The CU retries once. If a timeout check occurs a second time, the control check sense bit is set.

transmit check: A parity check is performed on each transfer of characters (between the CU and device) by the receiving unit. When a transmit check is detected, the transfer is retried once. If a transmit check is again detected, the appropriate sense bit(s) is set. That is, data check is set when the CU detects a transmit check on the second try of a device-to-CU transfer; data check and unit specify are set when the device detects a transmit check on the second try of a CU-to-device transfer.

unformatted display: A display buffer that contains no attribute character.

unprotected field: A display field in which the display station operator can enter, modify, or erase data.

wraparound: In an alphameric display device, the continuation of an operation (for example, a read operation or a cursor movement operation) from the last character position in a buffer to the first character position in the buffer.

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Due to the nature of this manual, no index is necessary. The Contents table at the front of the manual should serve the same purpose.

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