Task Oriented Practice
(TOP)

4ESS™ SWITCH
SWITCHING NETWORK

NETWORK CLOCK FRAME
(NETWORK CLOCK AND SYSTEM CLOCK)

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AT&T Network Systems Customer Education & Training Organization

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Acceptance	NTP-002
All Pending TLP Searches Inhibited — Diagnostic Failure — Clear	TAP-114
Automatic Power Monitor Test Failure — Clear	TAP-126
Blown Fuse — **A1**—**A9** or **B1**—**B8** — Clear	TAP-123
Blown Fuse — Not **A1**—**A9** or **B1**—**B8** (+9 and +24 Volt Distribution) — Clear	TAP-118
Blown Fuse — Not **A1**—**A9** or **B1**—**B8** (+24, +48 and +140 Volt Distribution) — Clear	TAP-122
Circuit Pack — Except **FB211** — Replace	DLP-500
Circuit Pack — **FB211** — Replace	DLP-511
Converter LED Lighted Condition — Clear	TAP-124
DC-DC Converter — Replace	NTP-009
Diagnostic Failure — Clear by Analyzing Raw Data	TAP-105
Diagnostic Failure — NCSU — Clear Using TLP Suspect Pack List	TAP-104
Diagnostic Failure — SCLK — Clear Using TLP Suspect Pack List	TAP-103
DS1 Sync Reference Signal — Check	DLP-550
Excessive Slips — In Your Office — Clear	TAP-139
FB152 Pack LED Lighted Condition — Clear	TAP-125
Lamps — Power Switch — Test	DLP-522

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Suspect Clock Chain — Diagnostic Failure — Isolate	TAP-136
Switches — Phase Lock Control Panel — Replace	NTP-005
Sync Reference Signal — DS1 — Check	DLP-550
System Clock Time of Day — Check	NTP-006
System Clock Time of Day — Daylight Saving Time Change — Update	NTP-007
TLP Abort — Diagnostic Failure — Clear	TAP-110
TLP Disk Queue Full — Diagnostic Failure — Clear	TAP-107
TLP Inhibit — Diagnostic Failure — Clear	TAP-109
TLP Queue Blockage — Diagnostic Failure — Clear	TAP-108
TLP Tape Acquisition Error — Diagnostic Failure — Clear	TAP-112
TLP Tape Not Mounted — Diagnostic Failure — Clear	TAP-113
TLP Tape Version x Does Not Match Version y — Diagnostic Failure — Clear	TAP-111
TTY Printout — DGN:NCLK 0,CHAIN a PH b STF ANALY:TLPFILE:NCLK 0,CHAIN a SUSPECTED FAULTY EQUIPMENT CLEAR DGN FAILURE USING TLP SUSPECT PACK LIST - NCLK Phase 3 First Failing Test and Any Phase Lock Temperature Meter Deflected Fully	TAP-129
TTY Printout — DGN:NCLK 0,CHAIN a PH b STF ANALY:TLPFILE:NCLK 0,CHAIN a SUSPECTED FAULTY EQUIPMENT CLEAR DGN FAILURE USING TLP SUSPECT PACK LIST - NCLK Phase 4 First Failing Test and Any Phase Meter 2 or More Divisions From Zero	TAP-135
TTY Printout — DGN:NCLK 0,CHAIN a PH b STF ANALY:TLPFILE:NCLK 0,CHAIN a SUSPECTED FAULTY EQUIPMENT CLEAR DGN FAILURE USING TLP SUSPECT PACK LIST - NCLK TLP Pack List Indicates Only One Clock Chain Faulty	TAP-102
TTY Printout — DGN:NCLK 0,CHAIN a PH b STF ANALY:TLPFILE:NCLK 0,CHAIN a SUSPECTED FAULTY EQUIPMENT CLEAR DGN FAILURE USING TLP SUSPECT PACK LIST - NCLK TLP Pack List Indicates More Than One Clock Chain Faulty	TAP-136

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

No acceptance test procedures are required for this frame. The readiness of this frame to become a part of the working system was established by the successful completion of Installation Handbook test procedures.

ACCEPTANCE

DO THE ITEMS BELOW IN THE ORDER LISTED . . . . . FOR DETAILS, GO TO

1	Check for Open Diodes in **FB211** Circuit Pack	DLP-534
2	Check for Shorted Diodes in **FB211** Circuit Pack	DLP-535

CHECK POWER-ORING DIODES, FB211 CIRCUIT PACK

DO THE ITEMS BELOW IN THE ORDER LISTED		FOR DETAILS, GO TO
1	On Power Switch, Rotate **ROS**/**OFF** Switch to **ROS** *Response:* **OS** and **OFF NORM** Lamps Light, **ACK** Lamp Lights Momentarily	—
2	Depress **ROS/OFF** Switch *Response:* **OFF NORM** and **PWR OFF** Lamps Light	—
3	Replace **PHASE** Meter or **PHASE LOCK OVEN TEMP** Meter	DLP-516
4	On Power Switch, Rotate **ROS**/**OFF** Switch Fully Counterclockwise *Response:* **OFF NORM** and **OS** Lamps Extinguish	—

DO THE ITEMS BELOW IN THE ORDER LISTED		FOR DETAILS, GO TO
1	On Power Switch, Rotate **ROS**/**OFF** Switch to **ROS** *Response:* **OS** and **OFF NORM** Lamps Light, **ACK** Lamp Lights Momentarily	—
2	Replace Meter Solenoid Operate (**MSO**) Switch, Phase Lock Shunt (**PLS**) Switch, or **OSC OS** Lamp Assembly	DLP-515
3	On Power Switch, Rotate **ROS**/**OFF** Switch Fully Counterclockwise *Response:* **OFF NORM** and **OS** Lamps Extinguish	—

DO THE ITEMS BELOW IN THE ORDER LISTED		FOR DETAILS, GO TO
1	Call U.S. Bureau of Standards Time Announcement, 303-499-7111, and Listen for Time Announcements Which Occur Every Minute on the Minute (Ignore Hours Announced; They Are in Greenwich Mean Time)	–
2	Type in Local Mode (but Do Not Send) **OP:CLK!**	–
3	Return Cursor To Start of Message	–
4	At Next Time Announcement, Remember the Minute Announced, and the Instant the Tone Is Heard, Depress Send Key	–
5	If System Clock Time Printed Is Greater Than Plus or Minus One Second From Minute Announced, Correct System Clock Time of Day Between 2:02 AM and 2:12 AM	DLP-518
6	Hang Up U.S. Bureau of Standards Call	–
7	If System Clock Time Was Corrected, Notify Network Management of Time Change	–
8	If Time Is Changed in AMA Supported Office, Record Time Change on AMA Transmittal Form, E-5233	

DO THE ITEMS BELOW IN THE ORDER LISTED . . . . . FOR DETAILS, GO TO		
	CAUTION: System Clock Update Must Be Accomplished Between 2:02 AM and 2:12 AM. Review Procedure and Notify Network Management of Impendent Time Change	—
1	Call U. S. Bureau of Standards Time Announcement, 303-499-7111, and Listen for Time Announcements Which Occur Every Minute on the Minute (Ignore Hours Announced; They Are in Greenwich Mean Time)	—
2	Enter Local Mode Partial Message **SET:CLK:TIME** aa	—
	aa = Hour of Night + 1 When Going to Daylight Saving Time	—
	aa = Hour of Night — 1 When Returning From Daylight Saving Time	—
3	At Next Time Announcement, Complete Message (but Do Not Send) By Adding Minute Announced Plus One and 00 Seconds. Example: **SET:CLK:TIME** aa bb **00**! Where bb = Minute Announced Plus One	—
4	Return Cursor to Start of Message	—
5	At Next Time Announcement, Instant Tone Is Heard; Depress Send Key	—
6	If System Clock Time Printed Is Greater Than Plus or Minus One Second From Time Announced, Correct System Clock Time of Day	DLP-518
7	Hang Up Bureau of Standards Call	
8	If AMA Supported Office, Record Time Change on AMA Transmittal Form, E-5233	

DO THE ITEMS BELOW IN THE ORDER LISTED		FOR DETAILS, GO TO
1	On Clock Chain Power Switch, Rotate **ROS**/**OFF** Switch to **ROS** *Response:* **OS** and **OFF NORM** Lamps Light, **ACK** Lamp Lights Momentarily	–
2	Remove 39B Oscillator	DLP-537
3	Install 39B Oscillator	DLP-519
	CAUTION: Clock Chain of Oscillator Being Checked Must be Removed From Service And Then Powered Down	
4	Connect Oscillator Manual Adjustment Unit (OMAU) to Oscillator	DLP-532
5	Check Full Frequency Range of Oscillator	DLP-520
6	Disconnect Oscillator Manual Adjustment Unit From Oscillator	DLP-531
7	Stabilize 39B Oscillator	DLP-525
8	Calibrate Scope	DLP-529
9	Check 39B Oscillator	DLP-538
10	If Manual Update Is Required, Align 39B Oscillator Using Open Loop Method	DLP-527
11	On Power Switch, Rotate **ROS**/**OFF** Switch Fully Counterclockwise *Response:* **OFF NORM** and **OS** Lamps Extinguish	–

DO THE ITEMS BELOW IN THE ORDER LISTED		FOR DETAILS, GO TO
1	Replace Converter	DLP-509
2	If Replaced Converter Is Type J87389, Adjust Associated 39B Oscillator Frequency	DLP-512
3	Rotate **ROS/OFF** Switch to Normal Position *Response:* **OFF NORM** and **OS** Lamps Extinguish	–

DO THE ITEMS BELOW IN THE ORDER LISTED . . . . . FOR DETAILS, GO TO		
	CAUTION: Clock Chain Having Oscillator Checked Must Be Powered Down	
1	Connect Oscillator Manual Adjustment Unit to **J20** Connector of 39B Oscillator	DLP-532
2	Check Full Frequency Range of Oscillator	DLP-520
3	Disconnect Oscillator Manual Adjustment Unit From Oscillator	DLP-531
4	Calibrate Scope	DLP-529
5	Check 39B Oscillator	DLP-538
6	If Manual Update is Required, Align 39B Oscillator Using Open Loop Method	DLP-527
7	On Power Switch, Rotate **ROS/OFF** Switch Fully Counterclockwise *Response:* **OFF NORM** and **OS** Lamps Extinguish	–

DO THE ITEMS BELOW IN THE ORDER LISTED		FOR DETAILS, GO TO
1	On Clock Chain Power Switch, Rotate **ROS**/**OFF** Switch to **ROS** *Response:* **OS** and **OFF NORM** Lamps Light, **ACK** Lamp Lights Momentarily	–
2	Remove DRO Oscillator	DLP-545
3	Install DRO Oscillator	DLP-541
	CAUTION: Clock Chain of Oscillator Being Checked Must be Removed From Service And Then Powered Down	
4	Connect Oscillator Manual Adjustment Unit (OMAU) to Oscillator	DLP-532
5	Check Full Frequency Range and Alarm Bits of DRO Oscillator	DLP-542
6	Disconnect Oscillator Manual Adjustment Unit From Oscillator	DLP-531
7	Calibrate Scope	DLP-529
8	Check DRO Oscillator	DLP-546
9	Check DRO Oscillator Status Indicators	DLP-548
10	If Manual Update Is Required, Align DRO Oscillator Using Open Loop Method	DLP-543
11	On Power Switch, Rotate **ROS**/**OFF** Switch Fully Counterclockwise *Response:* **OFF NORM** and **OS** Lamps Extinguish	–

DO THE ITEMS BELOW IN THE ORDER LISTED		FOR DETAILS, GO TO
	CAUTION: Clock Chain Having Oscillator Checked Must Be Powered Down	
1	Connect Oscillator Manual Adjustment Unit to **J20** Connector of DRO Oscillator	DLP-532
2	Check Full Frequency Range and Alarm Bits of DRO Oscillator	DLP-542
3	Disconnect Oscillator Manual Adjustment Unit From Oscillator	DLP-531
4	Calibrate Scope	DLP-529
5	Check DRO Oscillator	DLP-546
6	Check DRO Oscillator Status Indicators	DLP-548
7	If Manual Update is Required, Align DRO Oscillator Using Open Loop Method	DLP-543
8	On Power Switch, Rotate **ROS/OFF** Switch Fully Counterclockwise *Response:* **OFF NORM** and **OS** Lamps Extinguish	–

GENERAL

The maintenance philosophy contained in this volume is based upon the design of equipment (hardware), diagnostic software, and test equipment employed. Procedures are intended to aid personnel in performing trouble-clearing tasks. The degree to which these procedures accomplish this depends upon input and feedback from the user. Additions, corrections, and improvements to the data are encouraged. Manufacturer, engineering and software documentation such as input/output (I/O) manuals, SDs, PKs, PRs, etc., are referred to where applicable rather than duplicating that information in TOP. Some portions of those documents may be utilized in procedures, but only as examples for purposes of explanation. Test equipment (oscilloscopes, voltmeters, etc.) and parameters involved in circuits being tested, adjusted, or checked are usually prescribed. Setup and method of use is not described; unless, it is unusual or unique in some manner.

TASK INDEX LIST (IXL) PHILOSOPHY

The Task Index List is structured to provide fast access to those procedures pertinent to the symptoms identified. Procedures unique to a particular modification of frame are identified by that frame's SD number. If not so identified, the procedure applies to all modifications.

Power problems are sensed by scan points which generate a major or minor alarm. It is assumed that the user can locate the frame which was automatically powered down (1A power switch with **PWR OFF** lamp lighted and **OFF NORM** lamp off) due to the power fault. The user can follow the aisle pilot lights or read the REPT:PA printout which identifies the frame with power fault. The precise structure of the message is given in the I/O message manuals. Symptoms described in IXL reflect the previous assumptions and indicate other conditions, observable at the frame, that would enable the user to access the proper trouble-clearing procedure. These conditions are fuse blown, lighted LEDs on converters, or lighted LEDs on power function circuit packs.

In general, most logic circuit failures cause the fault recovery program to request a diagnostic program. This method of requesting the diagnostic program includes the trouble-locating program (TLP) option. The IXL reflects this in the TTY printouts listed. Other than the ANALY:TLPFILE supplementary messages which include the phrases "SUSPECTED FAULTY EQUIPMENT" or "NULL PACK TEST GENERATED," all ANALY:TLPFILE supplementary messages pertain to problems in generating a suspected faulty equipment list and refer to procedures (TAPs) which attempt to correct the problem. If successful in generating a suspected faulty equipment list, these procedures refer to the appropriate procedure [TAP-103, TAP-102, or TAP-104] which tells the user what to do with this list. If a suspected faulty equipment list is not successfully generated, the TTY messages refer to the next level of trouble-clearing, raw data analysis [TAP-105], which is an alternative to the first and most common trouble-clearing approach.

TAP PHILOSOPHY

When documenting a procedural approach to trouble-clearing, certain assumptions are made. It is assumed that one fault is being cleared at a time. When directing the user to perform an action, it is assumed that the user performs that action correctly. Similarly, when the user is directed to make replacements, the replacement

part is always assumed to be good and equipment used for testing both built-in and commercial hardware and software is assumed to be good.

The trouble-clearing TAPs provided for diagnostic failures are provided on three levels. The first level TAP-102, TAP-103, or TAP-104 addresses what to do with a software generated (TLP) suspected faulty equipment list and provides a step-by-step procedure for replacing circuit packs one at a time and analyzing the results. This level is straightforward and requires some familiarity with equipment (descriptive and theory practices), TTY techniques, and diagnostic printouts.

The second level of trouble clearing is accessed from the first level TAP when TLP-generated suspected faulty equipment list has been exhausted without clearing the problem, or it can be accessed directly from the IXL or any of the **ANALY: TLPFILE** TAPs which produce a **NULL PACK TEST GENERATED** response. This level [TAP-105] is known as raw data analysis and describes what to do with the summary and supplemental data printed either with or instead of the suspected faulty equipment list. It is expected that this leads to an identification of faulty circuits and possibly additional suspect circuit packs not previously identified. This level of trouble clearing is more complex and requires knowledge of equipment, TTY techniques and printouts, and SDs, PKs, PRs, etc.

The third level of trouble clearing is signal tracing using interactive diagnostics [TAP-106]. This procedure is accessible only from previous level [TAP-105] and uses information derived in the performance of that procedure. This level of trouble clearing requires an increase in the capabilities cited in the first two levels with additional knowledge and skill in the setup and use of test equipment (oscilloscopes, voltmeters, etc.).

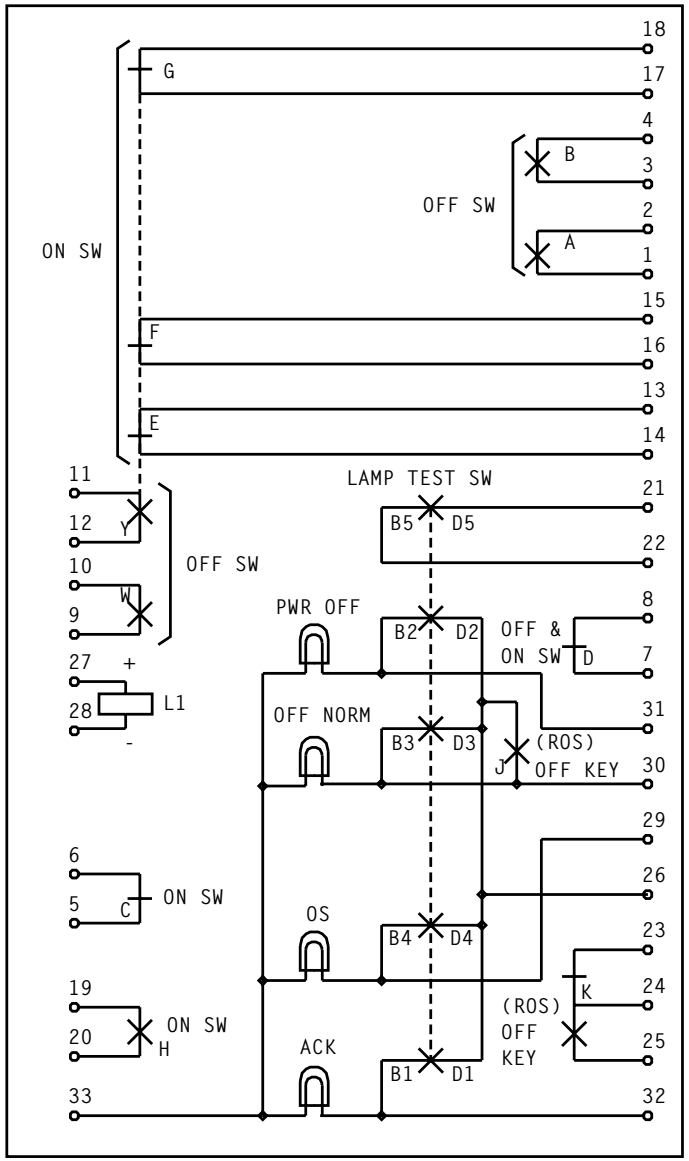
ALTERNATE METHODS

The more knowledgeable and experienced personnel may access TOP documents at a point in trouble clearing where analyzation is completed (faulty component determined) and only repair or replacement is required. In many instances, access to these procedures may be obtained by locating procedural data provided in Task Index List. Most DLPs are built to support TAPs and non-trouble analysis procedures (NTPs) with preconditioning and system restoration steps covered in those level procedures (TAPs, NTPs). Therefore, access to data (DLPs) on a hunt-and-find basis is a threat to equipment operation and may compound trouble-clearing problems.

Another method of trouble clearing that may be utilized is interrupt analysis. Interrupt analysis contained in TAP-141, TAP-142, TAP-143, or TAP-149 may produce a list of circuit packs that could cause a particular interrupt. Prior to changing the circuit packs, diagnostics should be run with ATP expected. If diagnostics produce:

(1) ATP - First circuit pack found in interrupt analysis should be changed. Should this be the wrong circuit pack, probability is high that interrupt occurs again with the same symptom. Next identified pack should be changed at this time.

(2) STF - Most suspect circuit pack is the pack that appears on both TLP pack list and list generated from interrupt analysis.



POWER SWITCH

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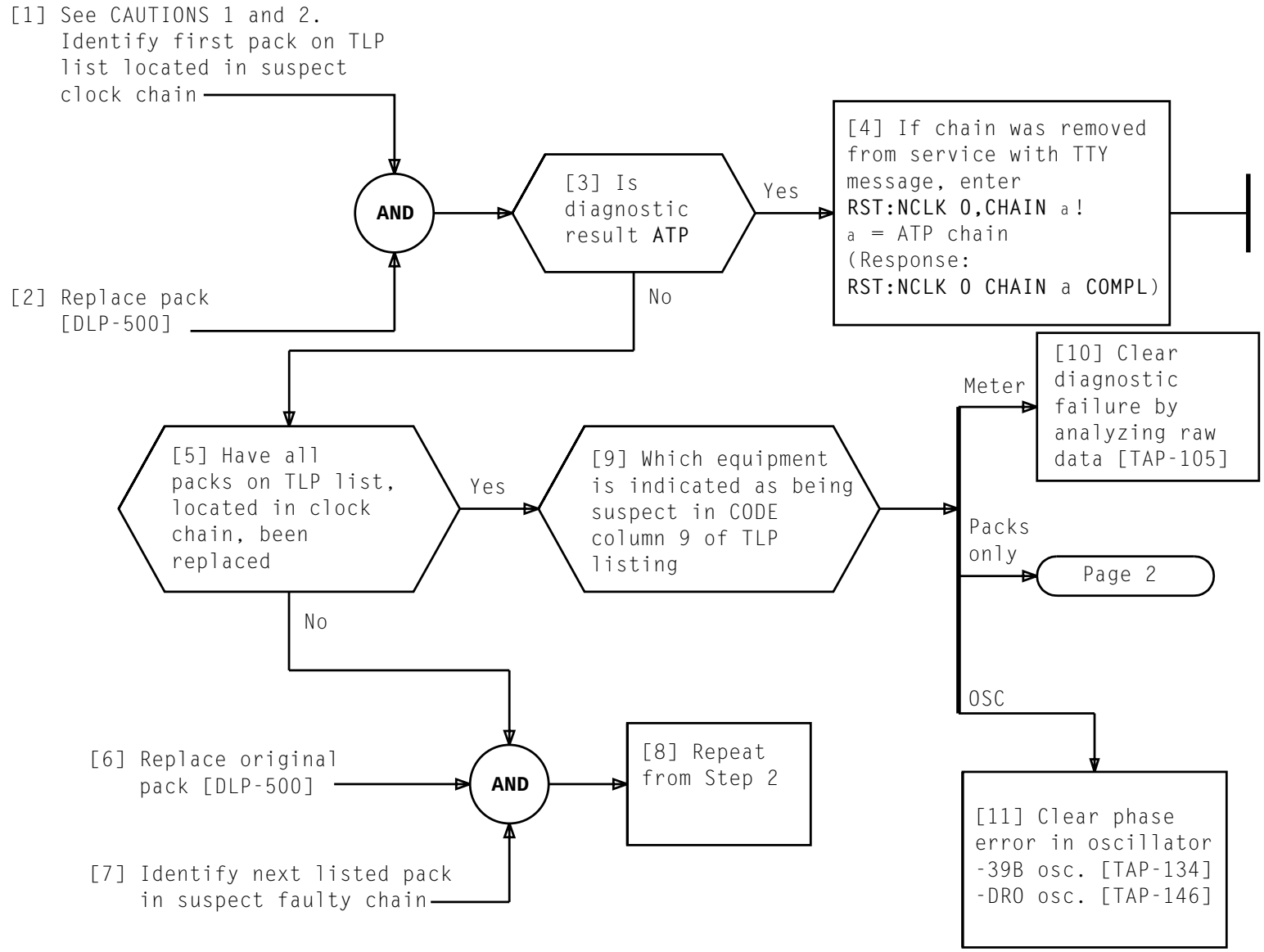
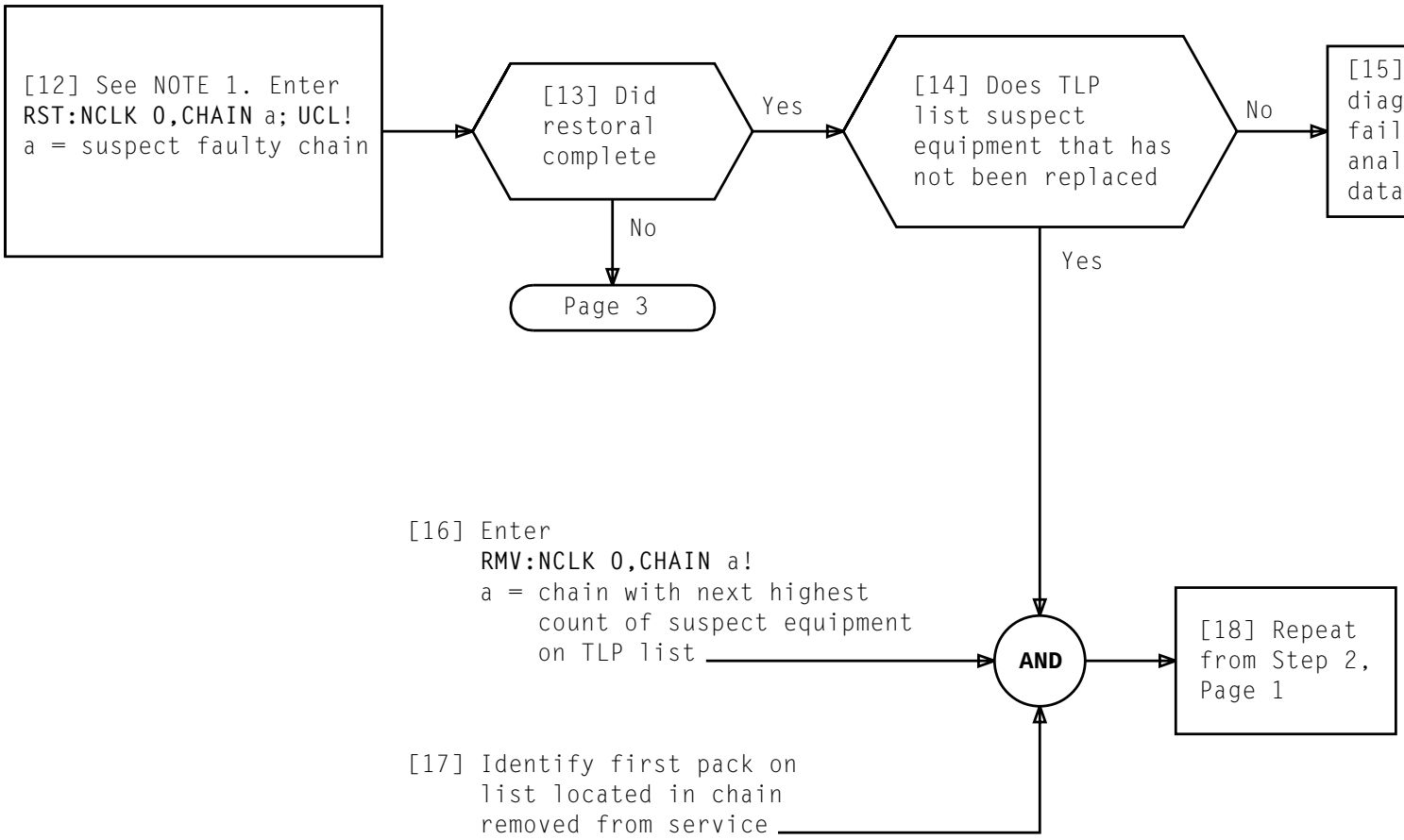


CAUTIONS

1. *Always remove NCSU from service and disable all oscillators (using* **ENABLE/ DISABLE** *switch) before working on any network clock problem*
2. *TLP list helper ID field lists clock chain for each listed suspect equipment. Usually list contains suspect equipment for chains other than diagnosed chain*

CLEAR DIAGNOSTIC FAILURE USING TLP SUSPECT PACK LIST, ONLY ONE CLOCK CHAIN OUT OF SERVICE



CLEAR DIAGNOSTIC FAILURE USING TLP SUSPECT PACK LIST, ONLY ONE CLOCK CHAIN OUT OF SERVICE

NOTE 1
Ensure chain is powered up before restoring chain unconditionally

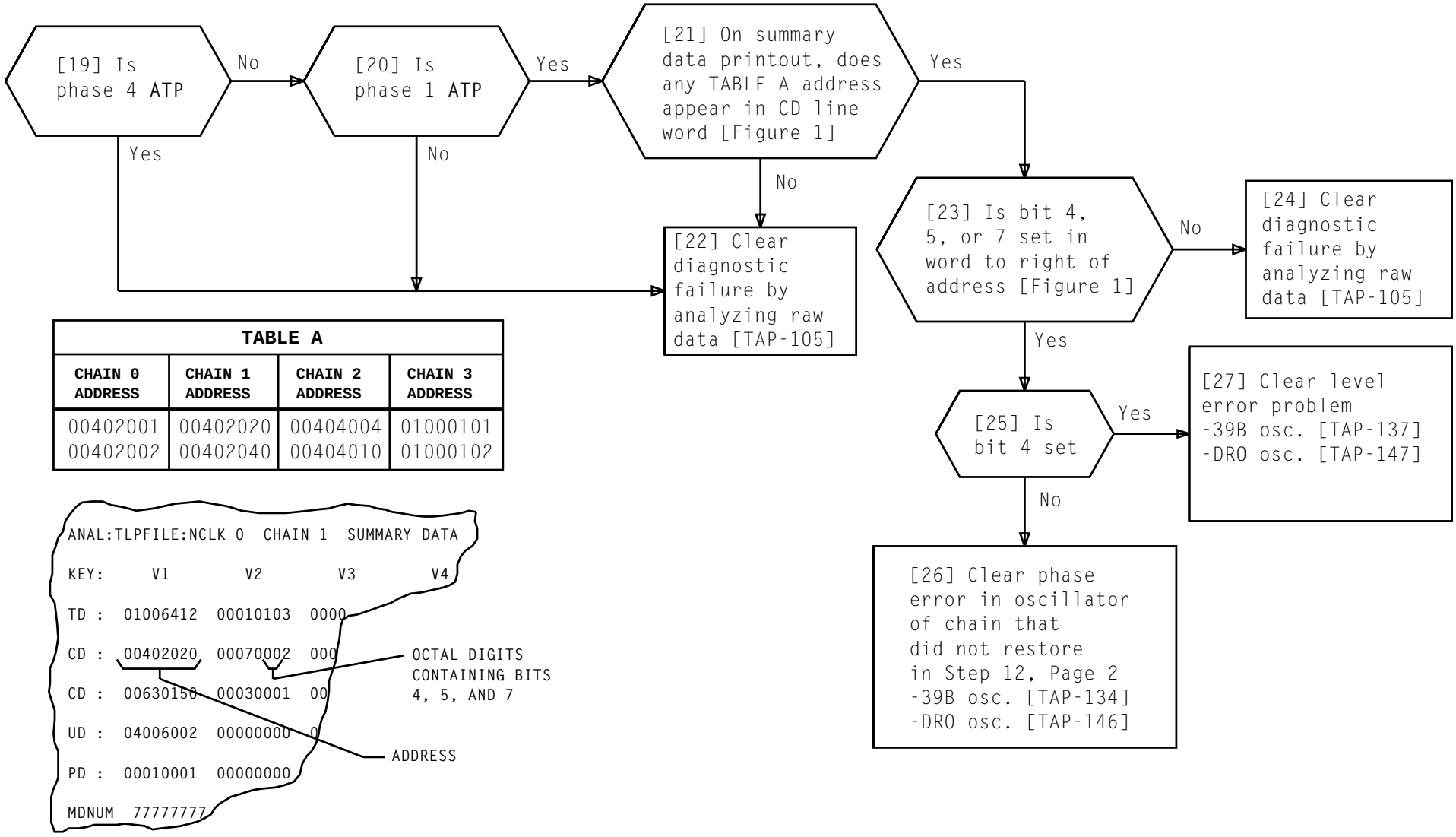


TABLE A

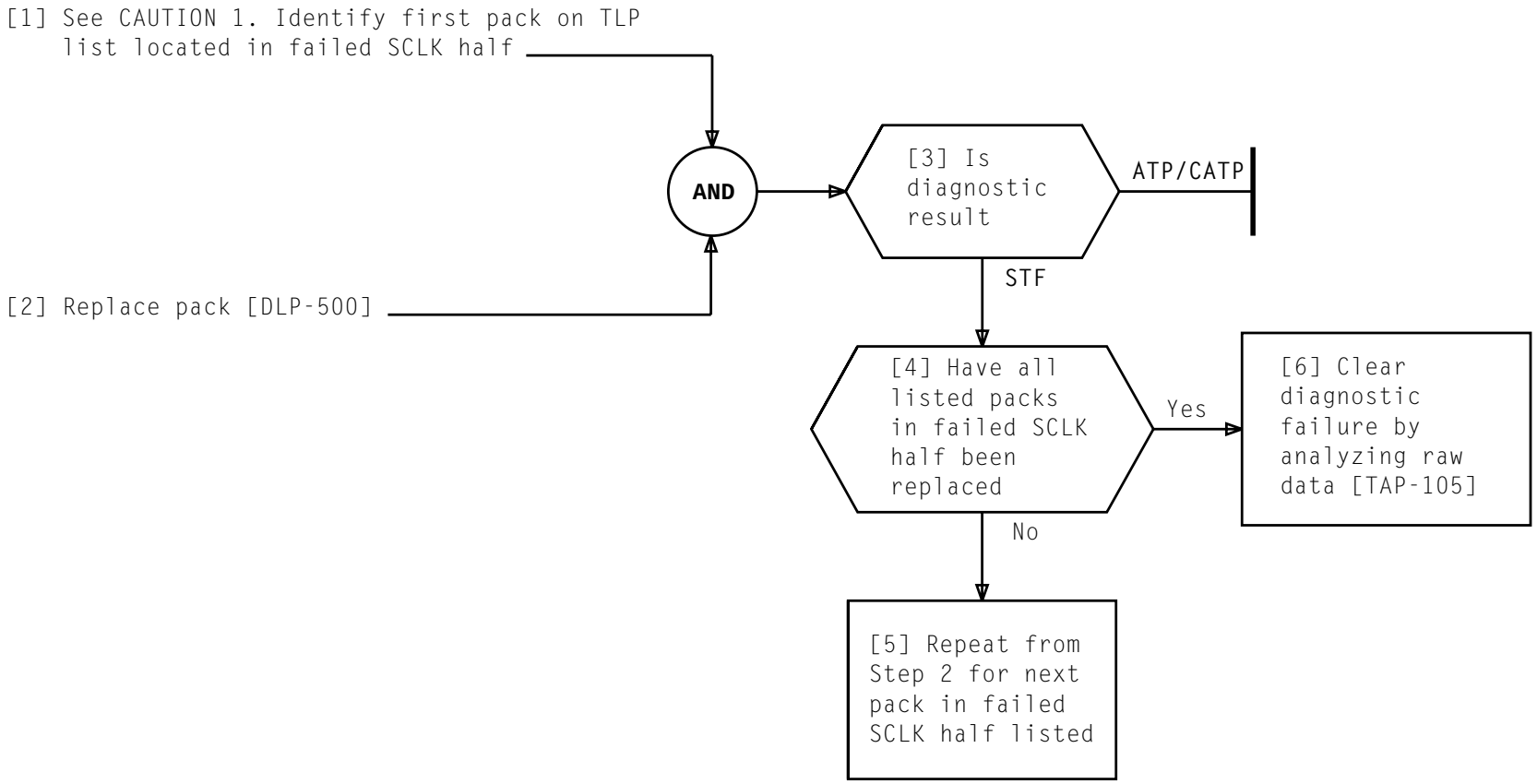
CHAIN 0 ADDRESS	CHAIN 1 ADDRESS	CHAIN 2 ADDRESS	CHAIN 3 ADDRESS
00402001	00402020	00404004	01000101
00402002	00402040	00404010	01000102

```
ANAL:TLPFILE:NCLK 0  CHAIN 1  SUMMARY DATA

KEY:     V1        V2        V3        V4

TD :  01006412  00010103  0000

CD :  00402020  00070002  000          OCTAL DIGITS
                                       CONTAINING BITS
CD :  00630150  00030001  00           4, 5, AND 7

UD :  04006002  00000000  0

PD :  00010001  00000000

MDNUM  77777777
```

ADDRESS

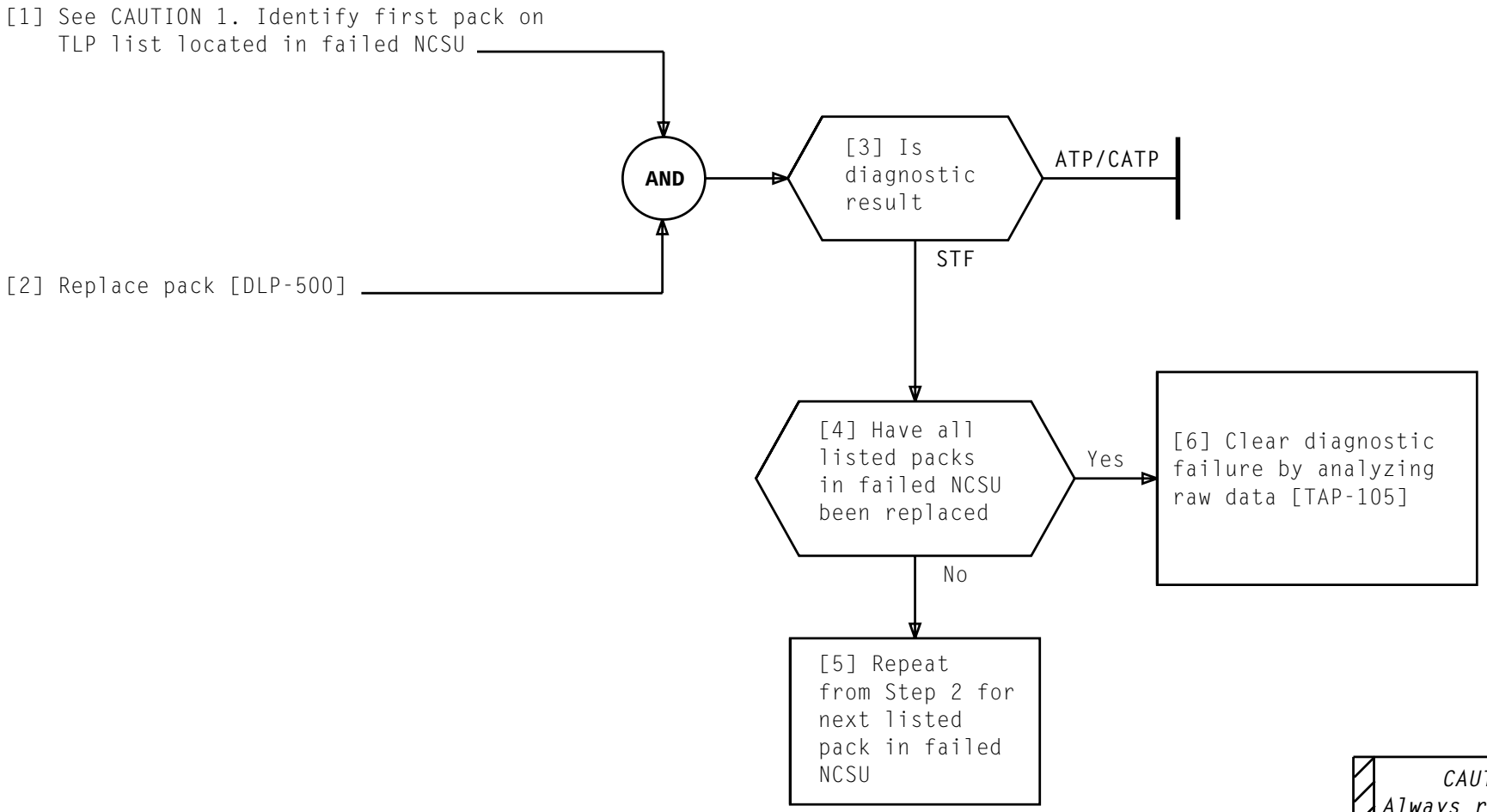
Figure 1 — Summary Data

CLEAR DIAGNOSTIC FAILURE USING TLP SUSPECT PACK LIST, ONLY ONE CLOCK CHAIN OUT OF SERVICE



CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

CLEAR DIAGNOSTIC FAILURE USING TLP SUSPECT PACK LIST, SCLK



CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

CLEAR DIAGNOSTIC FAILURE USING TLP SUSPECT PACK LIST, NCSU

SUMMARY

Read first failing phase prologue. Determine if subroutines were used and identify their location and function. Locate first failing test and determine test function. Determine if doloops were used and identify their location and function. Use knowledge of first failing test function to identify and replace any suspect packs other than those previously replaced

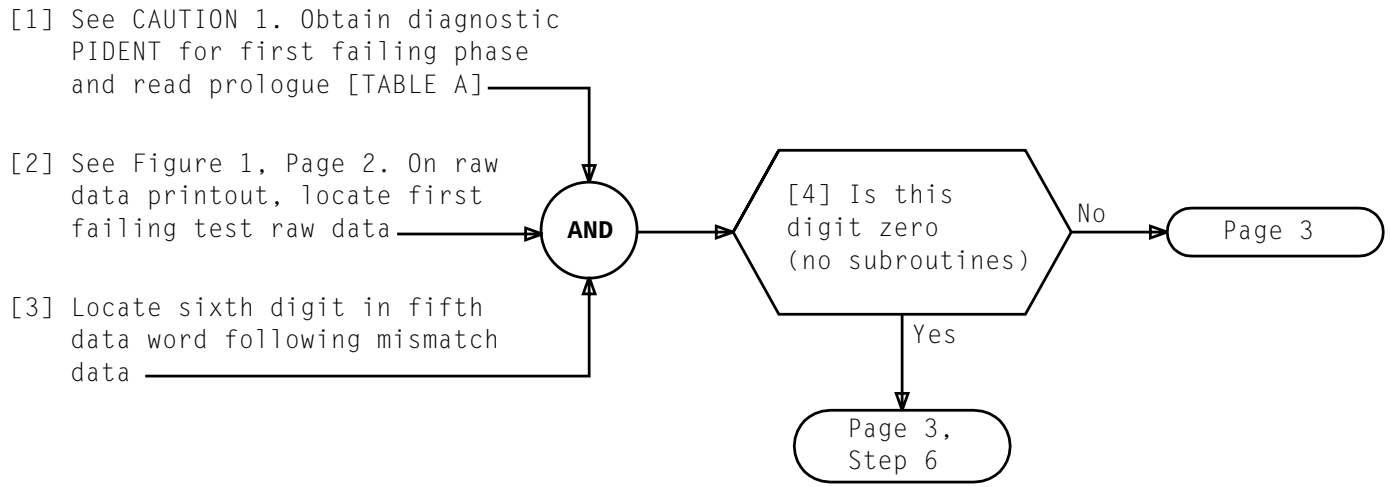


TABLE A
DIAGNOSTIC DOCUMENTATION

NETWORK CLOCK	NCLK SYNCHRONIZATION UNIT
PR number=4A504 + phase number PIDENT is PUDGNCXX (XX = phase number) Subroutines in PUDGNCHI (4A504)	PR numbers – phase number 4A420 – 1 4A419 – 2 4A418 – 3 4A417 – 4 4A421 – 5 4A465 – 6 4A466 – 7 4A452 – 8 PIDENT is PUDGSUXX (XX = phase number) Subroutines in PUDGSUCR (4A416)
SYSTEM CLOCK	
PR number=4A517 + phase number except IPUB (PH 99) is PR4A697. PIDENT is PUDGSCXX (XX = phase number) Subroutines in PUDGSCGR (4A517)	

CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

CLEAR DIAGNOSTIC FAILURE BY ANALYZING RAW DATA

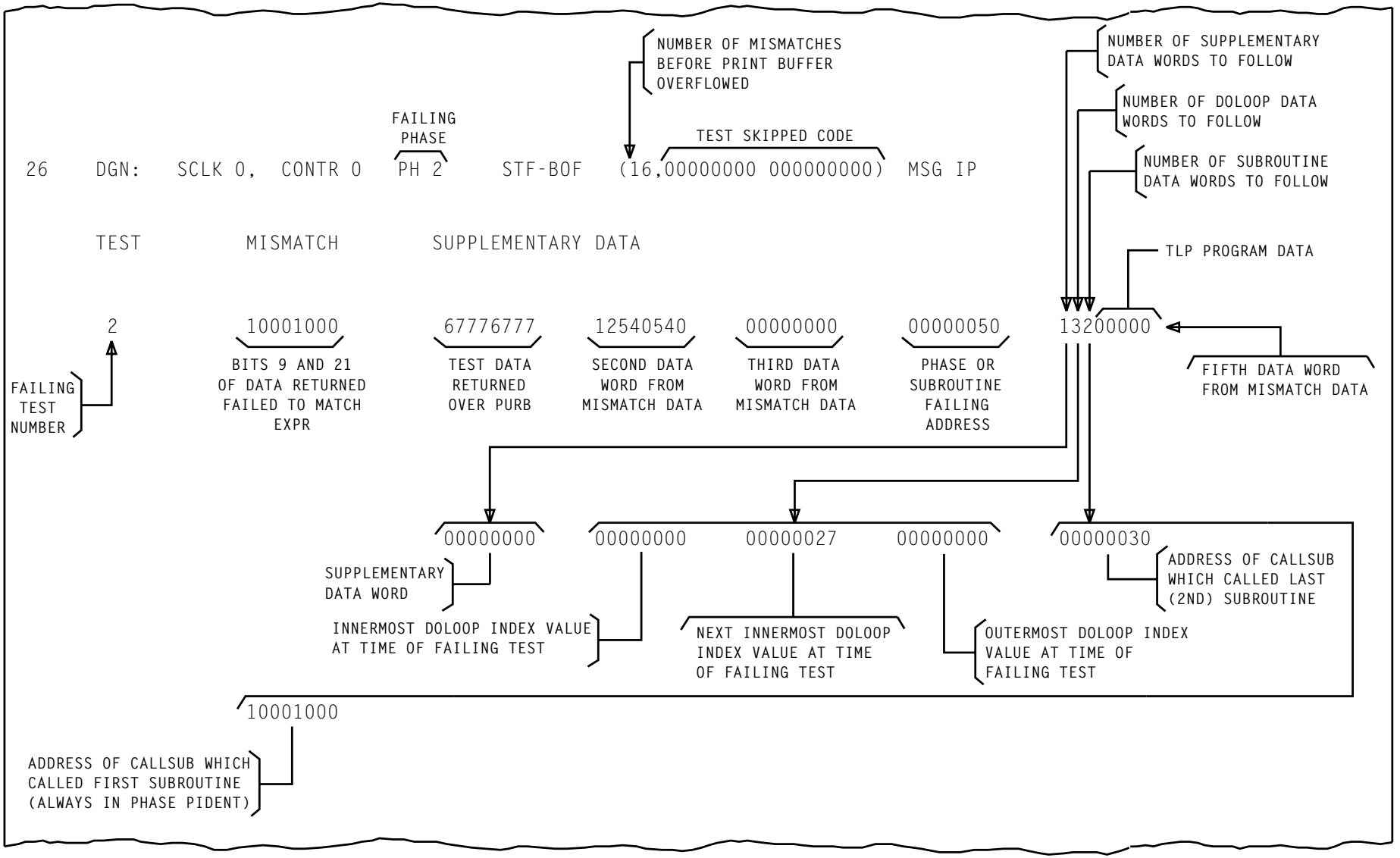
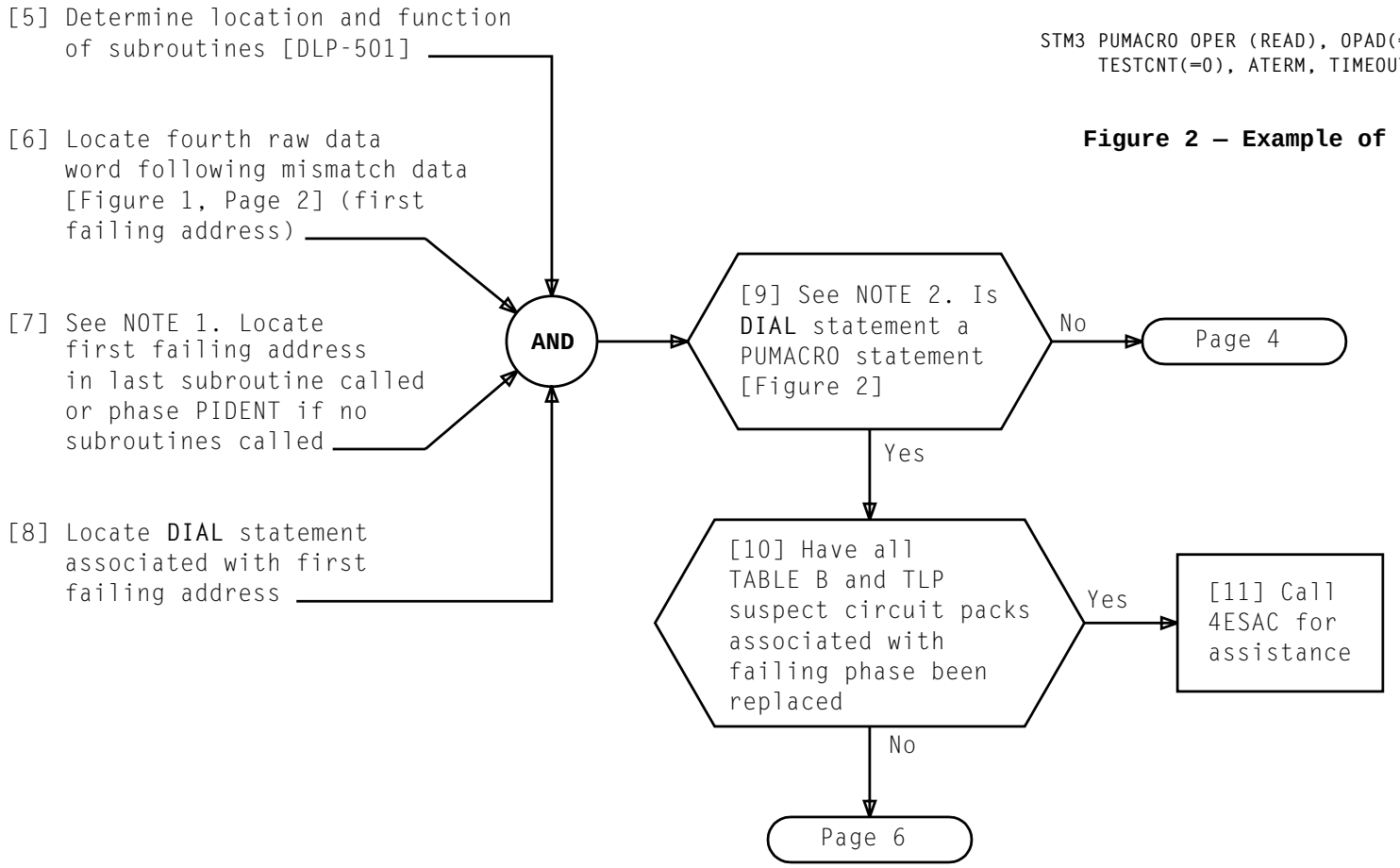


Figure 1 – Example of SCLK Raw Data Printout

CLEAR DIAGNOSTIC FAILURE BY ANALYZING RAW DATA




```
STM3 PUMACRO OPER (READ), OPAD(=4DZWMPMACRO), DATA (4DZDATA),
     TESTCNT(=0), ATERM, TIMEOUT(=30000)
```

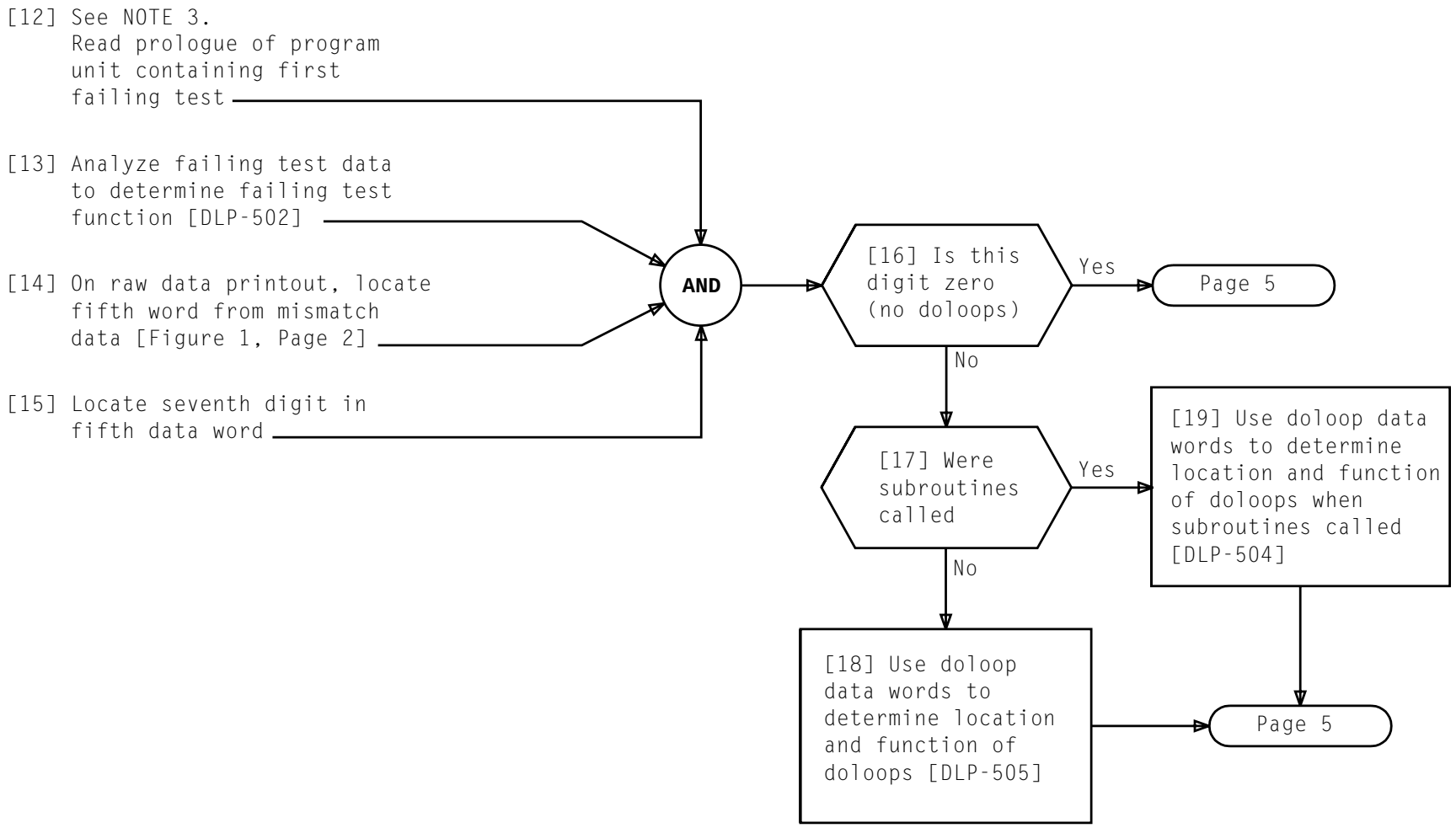
Figure 2 – Example of PUMACRO DIAL Statement

TABLE B
NCSU DIAGNOSTIC PHASES CONTAINING A PUMACRO DIAL STATEMENT

FAILING PHASE	CIRCUIT PACK ASSOCIATED WITH FAILING PHASE	CIRCUIT PACK LOCATION
6	**FG55, 57, 61, 62, 63, 73**	048-40, 42, 63, 59, 52, 49
7	**FG61, 62, 64, 65**	048-63, 59, 65, 67
8	**FG60, 63, 64, 75**	048-55, 52, 65, 57

NOTES
1. Phase PIDENT may consist of more than one strip with this address appearing in more than one strip. Be sure address located has EXPR data for your test
2. Diagnostic failure at index address of PUMACRO DIAL statement implies that fault was detected by microprocessor firmware

CLEAR DIAGNOSTIC FAILURE BY ANALYZING RAW DATA



NOTE 3
Program unit name is indicated in upper left of each listing page

CLEAR DIAGNOSTIC FAILURE BY ANALYZING RAW DATA

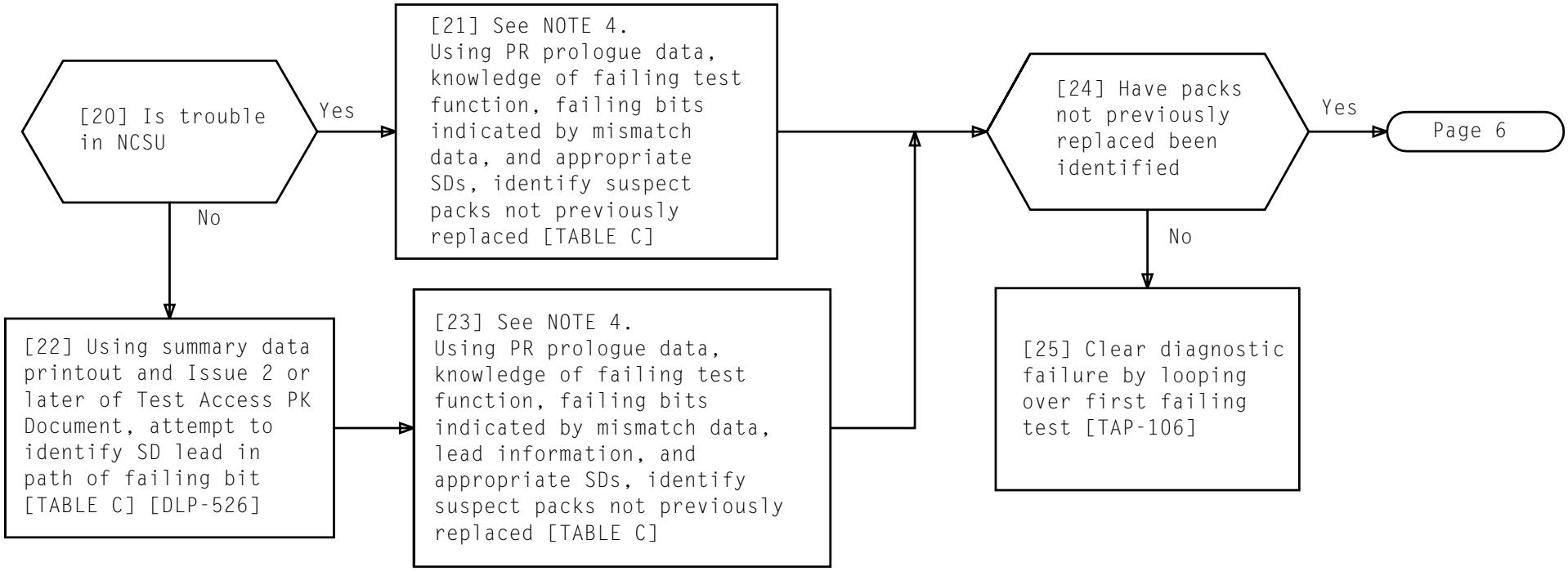


TABLE C
UNIT DOCUMENTATION

UNIT	SD/CD	PK
NCLK	4A014-02	4A014-01
SCLK	4A037-02	4A037-02
NCSU	4A105-01	—

NOTE 4
Tests often fail as result of register read. Fault could be in path of read or in path of write that set up read

CLEAR DIAGNOSTIC FAILURE BY ANALYZING RAW DATA

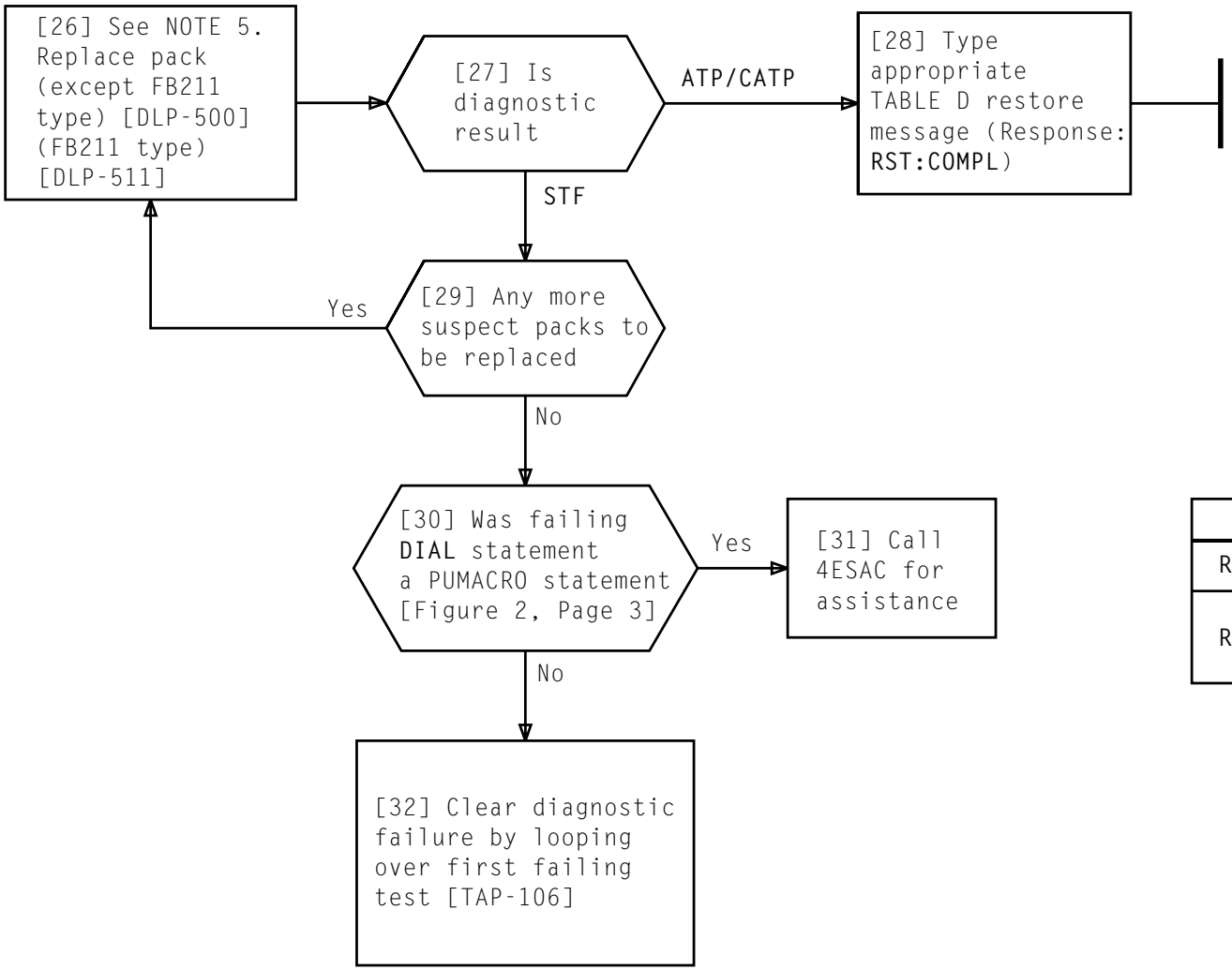


TABLE D
RST:NCLK 0,CHAIN a!
RST:SCLK 0, {IPUB b|CONTR c|NCSU 0}!

NOTE 5
Red designation marker at pack indicates fuse removal required to replace packs

CLEAR DIAGNOSTIC FAILURE BY ANALYZING RAW DATA

SUMMARY

Enter TABLE A messages. Verify first failing test raw data printed twice. Resend last TABLE A message with RPT option deleted for infinite loop. Set up scope. If SYNC option is used, attach external sweep trigger to 0/1-60-36 terminal 104. Using raw data analysis information obtained in TAP-105, SDs/CDs, and circuit pack SDs, trace signal path of failing bits to isolate and clear fault

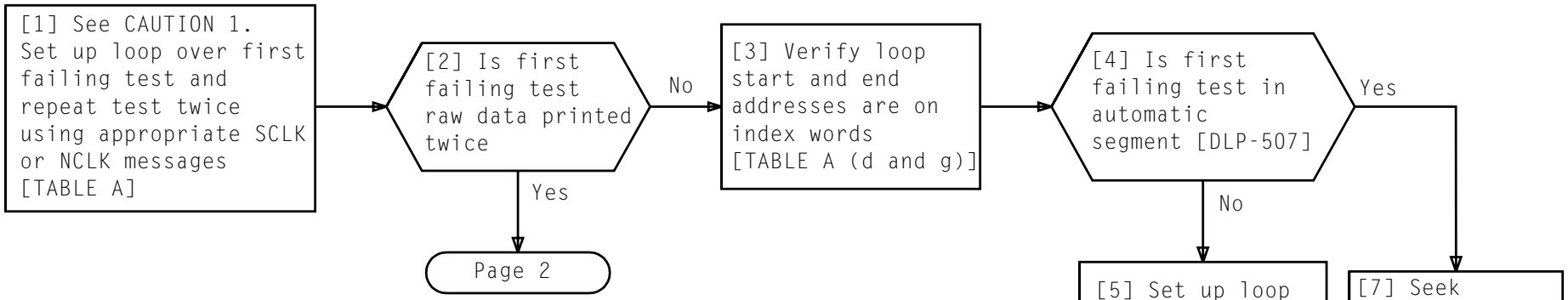


TABLE A — MESSAGES TO ESTABLISH LOOP

Enter a or b messages: 1a. **EX:SCLK 0, {CONTR a|IPUB b|NCSU 0};START!** 1b. **EX:NCLK 0,CHAIN c; START!**	Response:**SUSPENDED**
2a. **EX:SCLK 0:[SYNC d],ENABLE e!** 2b. **EX:NCLK 0:[SYNC d],ENABLE e!**	Response:**SUSPENDED**
3a. **EX:SCLK 0;RPT 2:PH f,ADR d-g!** 3b. **EX:NCLK 0;RPT 2:PH f,ADR d-g!**	Response:(raw data)

a = failing controller member number
b = failing IPUB member number
c = failing chain
d = address of first failing test statement index word
e = first failing test number
f = first failing phase number
g = address of next index word following first failing test index word

CAUTION 1

Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

CLEAR DIAGNOSTIC FAILURE BY LOOPING OVER FIRST FAILING TEST

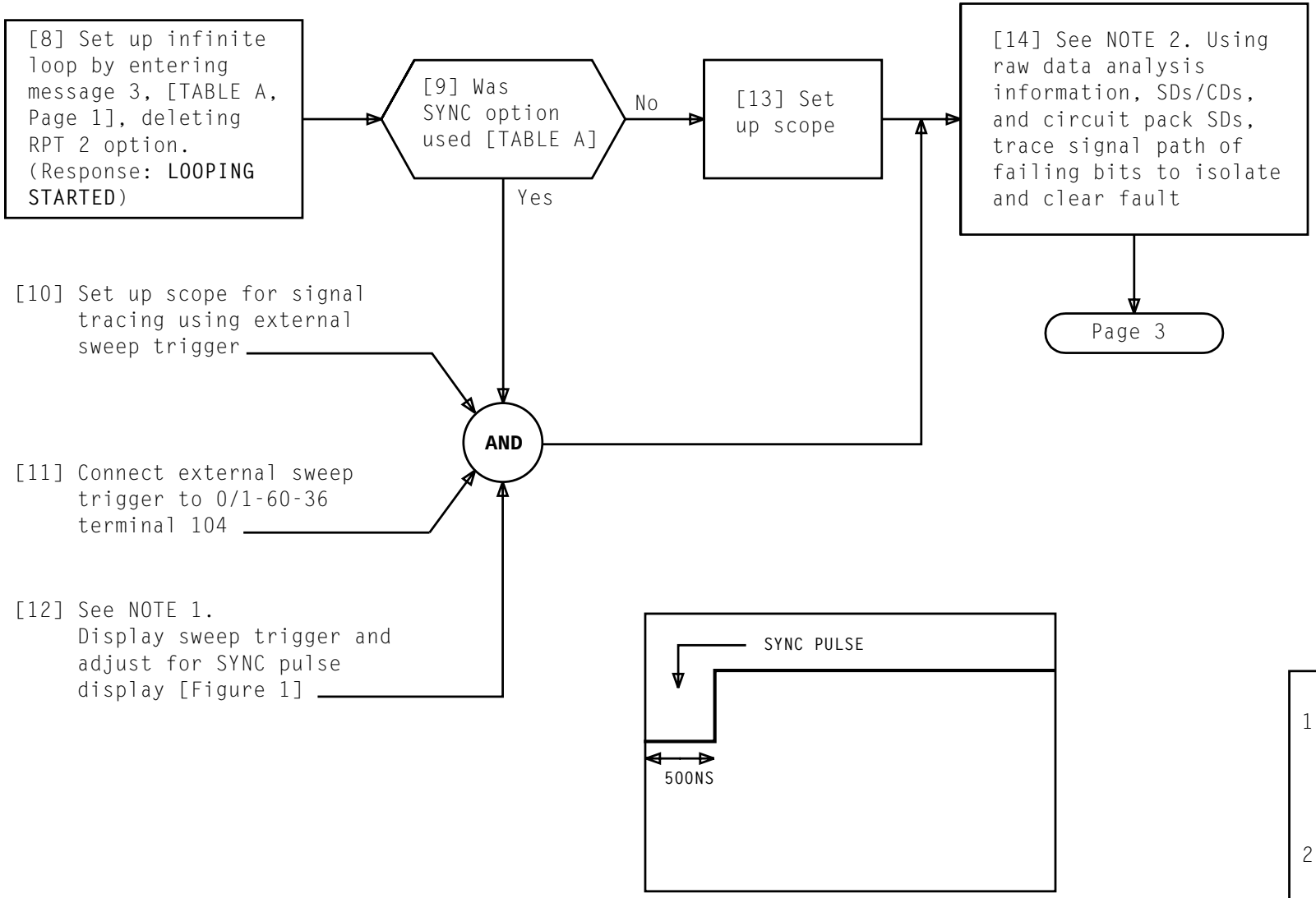


Figure 1 – SYNC Pulse Display

NOTES

1. SYNC pulse arrives over PUWB bit 36 which is not tested by diagnostic
2. Analysis of F-level interrupt associated with diagnostic failure may also be helpful

CLEAR DIAGNOSTIC FAILURE BY LOOPING OVER FIRST FAILING TEST

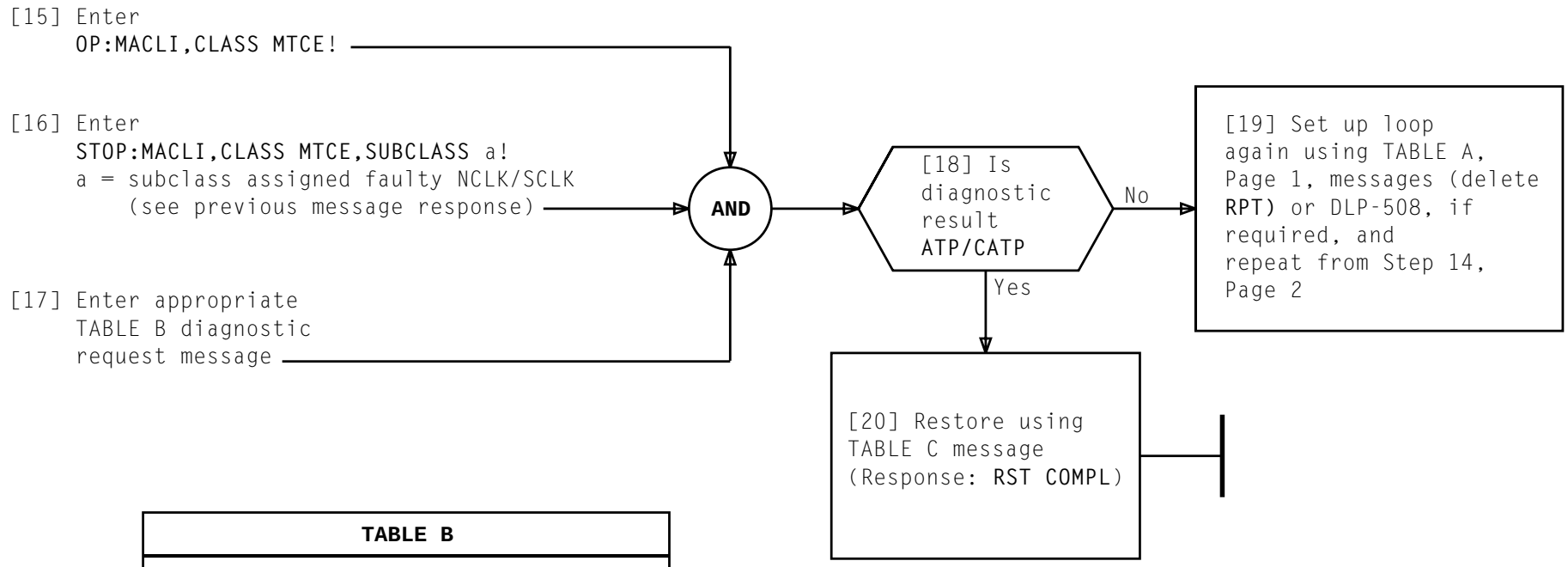
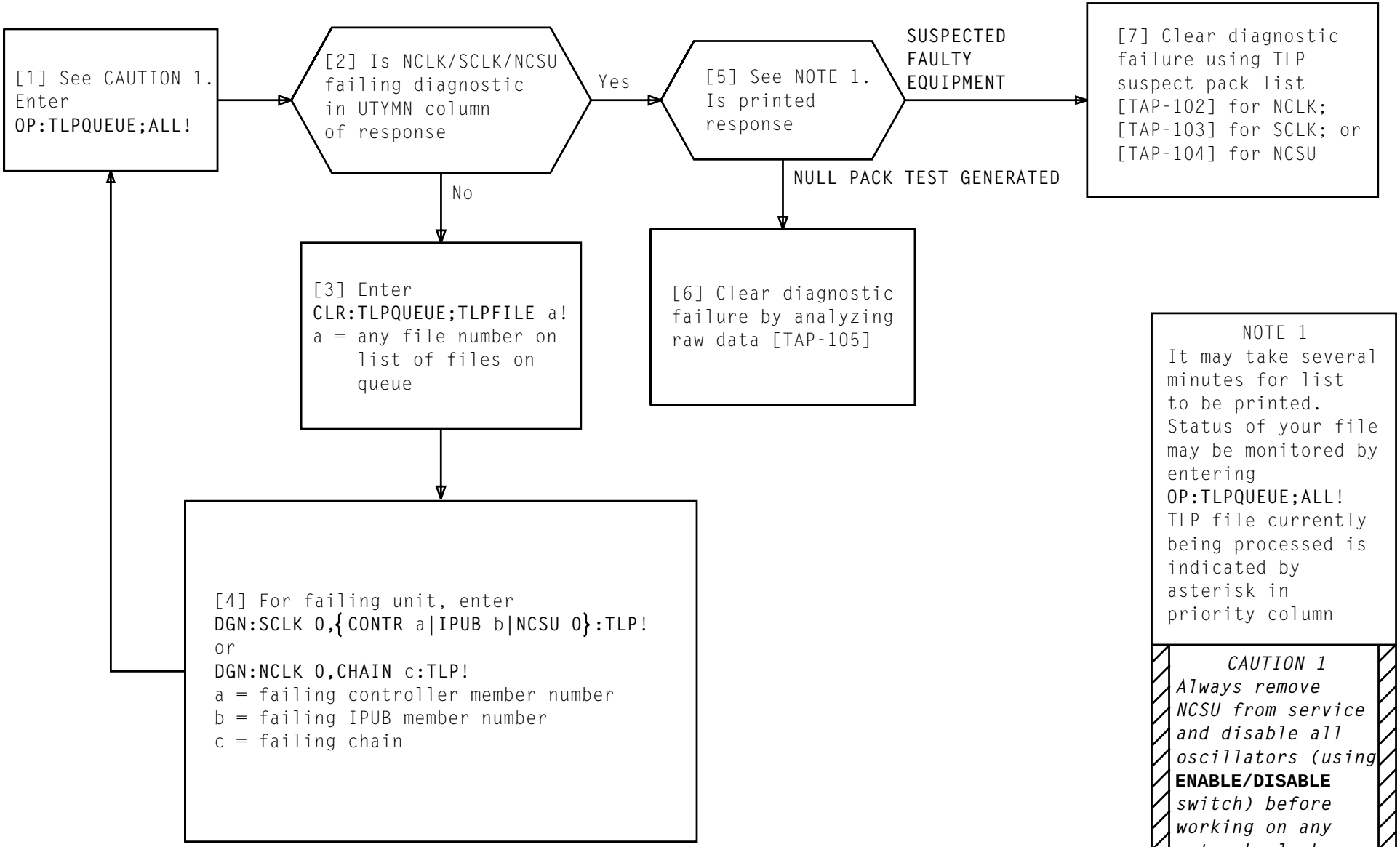


TABLE B
DGN:NCLK 0,CHAIN a!
DGN:SCLK 0, {CONTR b|IPUB c|NCSU 0}!

TABLE C
RST:NCLK 0,CHAIN a!
RST:SCLK 0, {CONTR b|IPUB c|NCSU 0}!

CLEAR DIAGNOSTIC FAILURE BY LOOPING OVER FIRST FAILING TEST



NOTE 1

It may take several minutes for list to be printed. Status of your file may be monitored by entering
OP:TLPQUEUE;ALL!
TLP file currently being processed is indicated by asterisk in priority column

CAUTION 1

Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

CLEAR DIAGNOSTIC FAILURE, TLP DISK QUEUE FULL

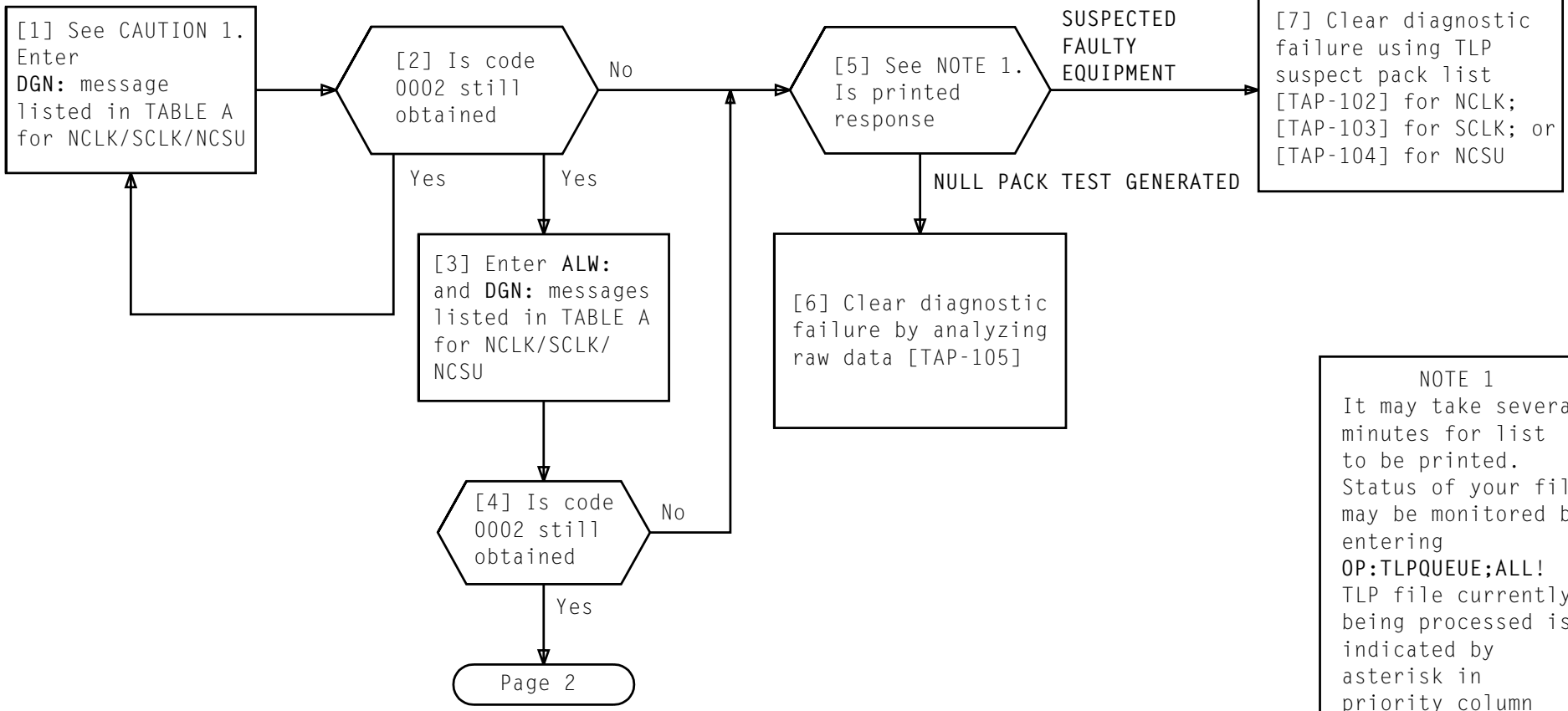


TABLE A
ALW:TLP:SRCH!
DGN:SCLK 0,{CONTR a|IPUB b|NCSU 0}:TLP! or DGN:NCLK 0,CHAIN c:TLP!
a = failing controller member number b = failing IPUB member number c = failing chain

NOTE 1
It may take several minutes for list to be printed. Status of your file may be monitored by entering **OP:TLPQUEUE;ALL!** TLP file currently being processed is indicated by asterisk in priority column

CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

CLEAR DIAGNOSTIC FAILURE, TLP QUEUE BLOCKAGE

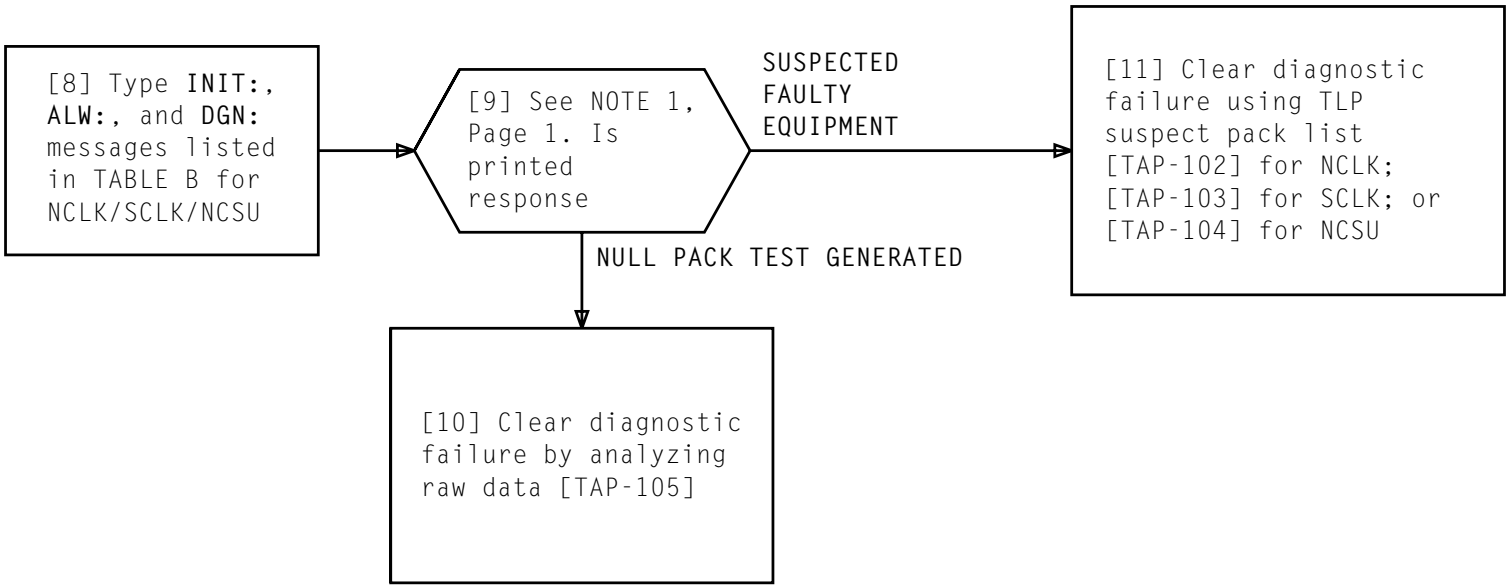


TABLE B

INIT:TLP!
ALW:TLP:SCLK! or ALW:TLP:NCLK!
DGN:SCLK 0, {CONTR a|IPUB b|NCSU 0}! or DGN:NCLK 0,CHAIN c:TLP!
a = failing controller b = failing IPUB c = failing chain

CLEAR DIAGNOSTIC FAILURE, TLP QUEUE BLOCKAGE

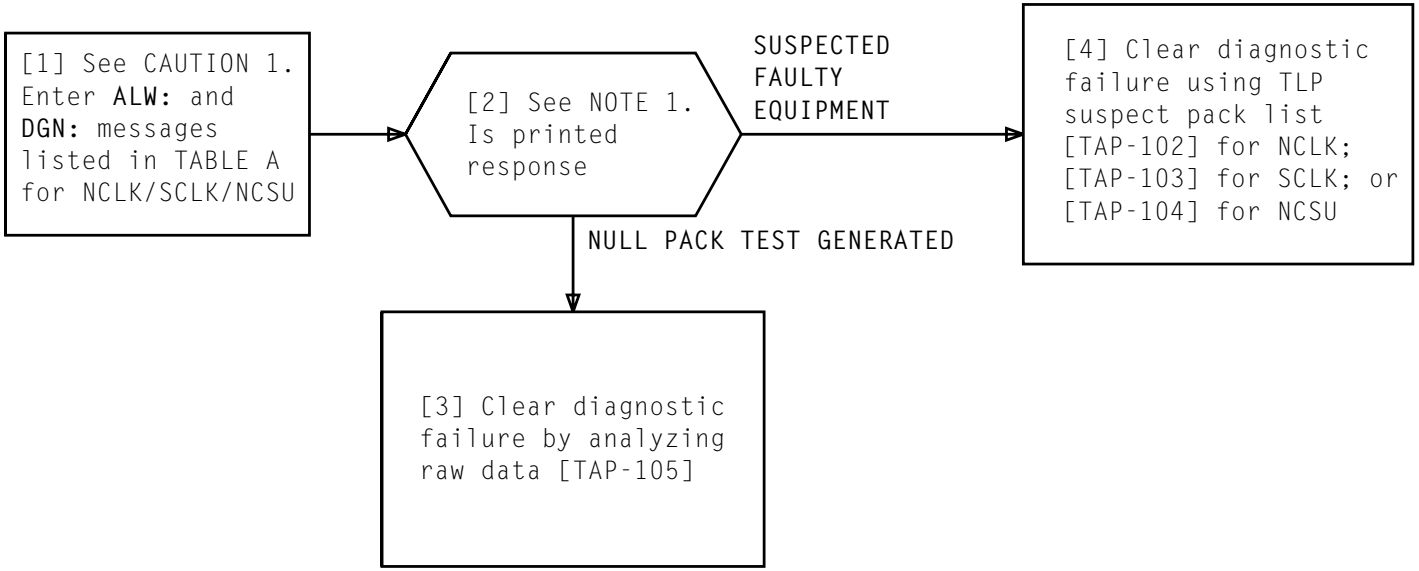


TABLE A
ALW:TLP:SCLK!
DGN:SCLK 0,{CONTR a|IPUB b|NCSU 0}:TLP! or DGN:NCLK 0,CHAIN c:TLP!
a = failing controller member number b = failing IPUB member number c = failing chain

NOTE 1
It may take several minutes for list to be printed. Status of your file may be monitored by entering
OP:TLPQUEUE;ALL!
TLP file currently being processed is indicated by asterisk in priority column

CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

CLEAR DIAGNOSTIC FAILURE, TLP INHIBIT

CLEAR DIAGNOSTIC FAILURE, TLP ABORT

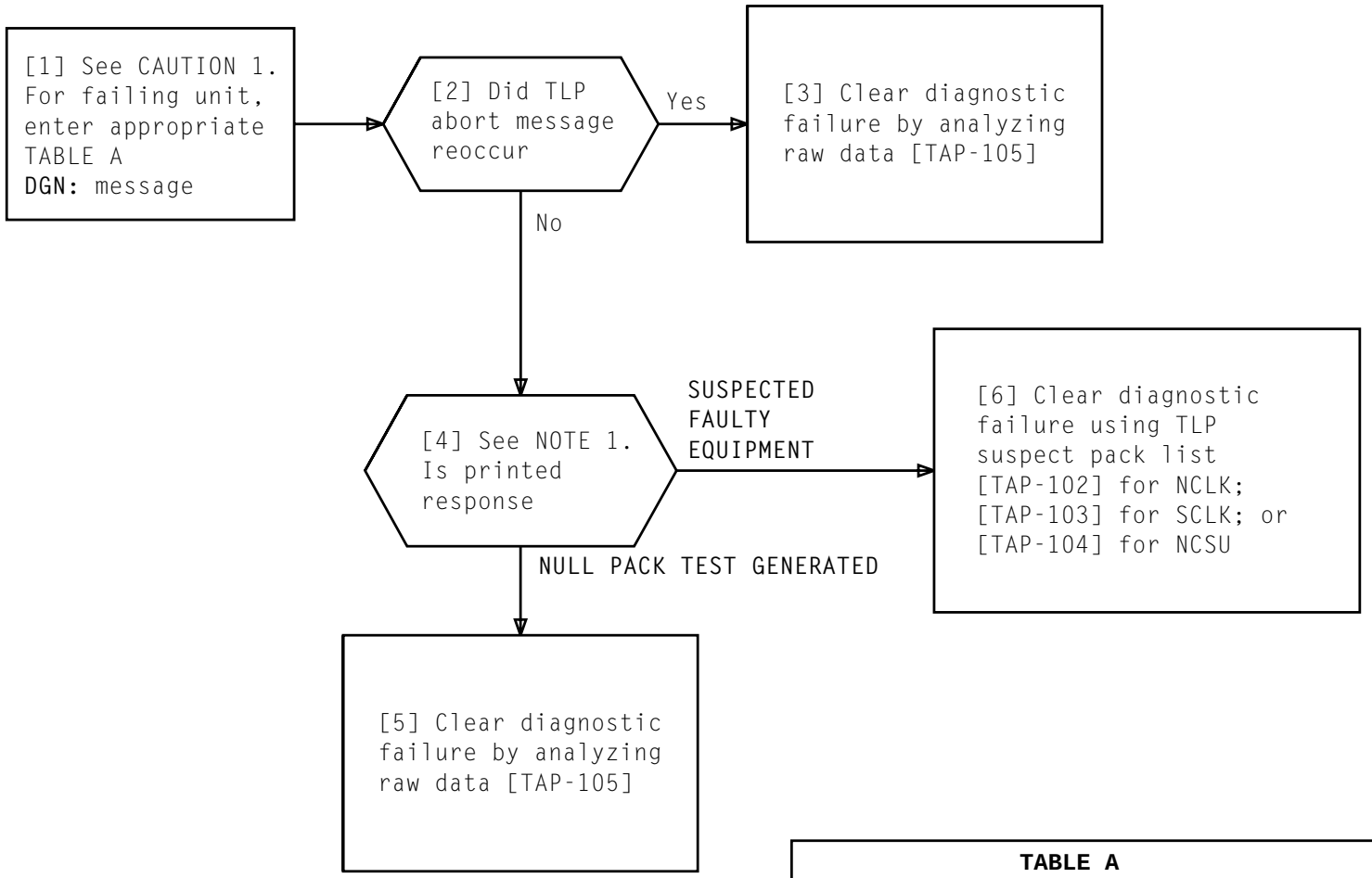


TABLE A
DGN:SCLK 0,{CONTR a|IPUB b|NCSU 0}:TLP!
DGN:NCLK 0,CHAIN c:TLP!
a = failing controller member number b = failing IPUB member number c = failing chain

NOTE 1
It may take several minutes for list to be printed. Status of your file may be monitored by entering
OP:TLPQUEUE;ALL!
TLP file currently being processed is indicated by asterisk in priority column

CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

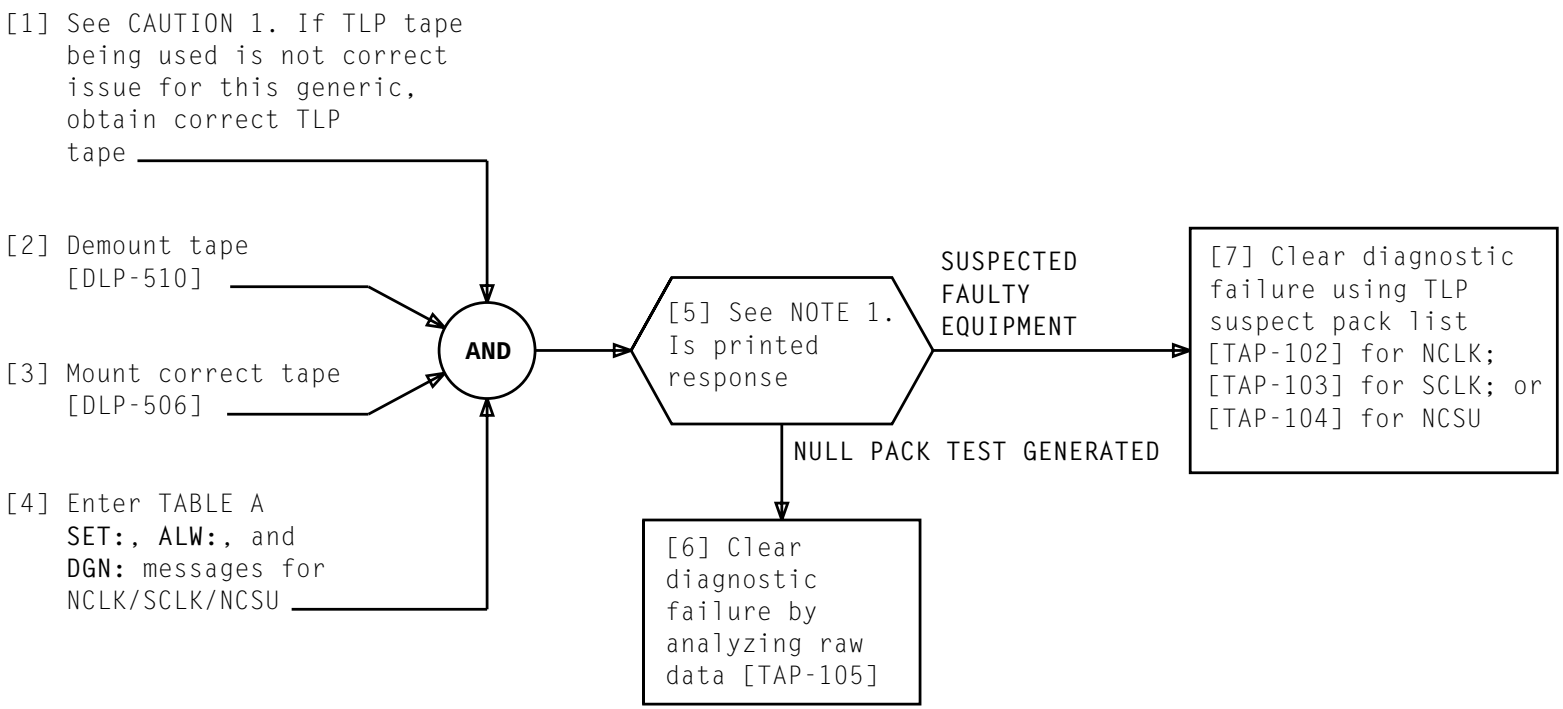


TABLE A
SET:TUC a;FUNCTION TLP!
ALW:TUC a:RO!
ALW:TLP:SRCH,SCLK! or ALW:TLP:SRCH,NCLK!
DGN:SCLK 0,{CONTR b|IPUB c|NCSU 0}:TLP! or DGN:NCLK 0,CHAIN d:TLP!
a = member number of TUC with TLP tape mounted b = failing controller member number c = failing IPUB member number d = failing chain

NOTE 1
It may take several minutes for list to be printed. Status of your file may be monitored by entering OP:TLPQUEUE;ALL! TLP file currently being processed is indicated by asterisk in priority column

CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

CLEAR DIAGNOSTIC FAILURE, TLP TAPE VERSION X DOES NOT MATCH VERSION Y

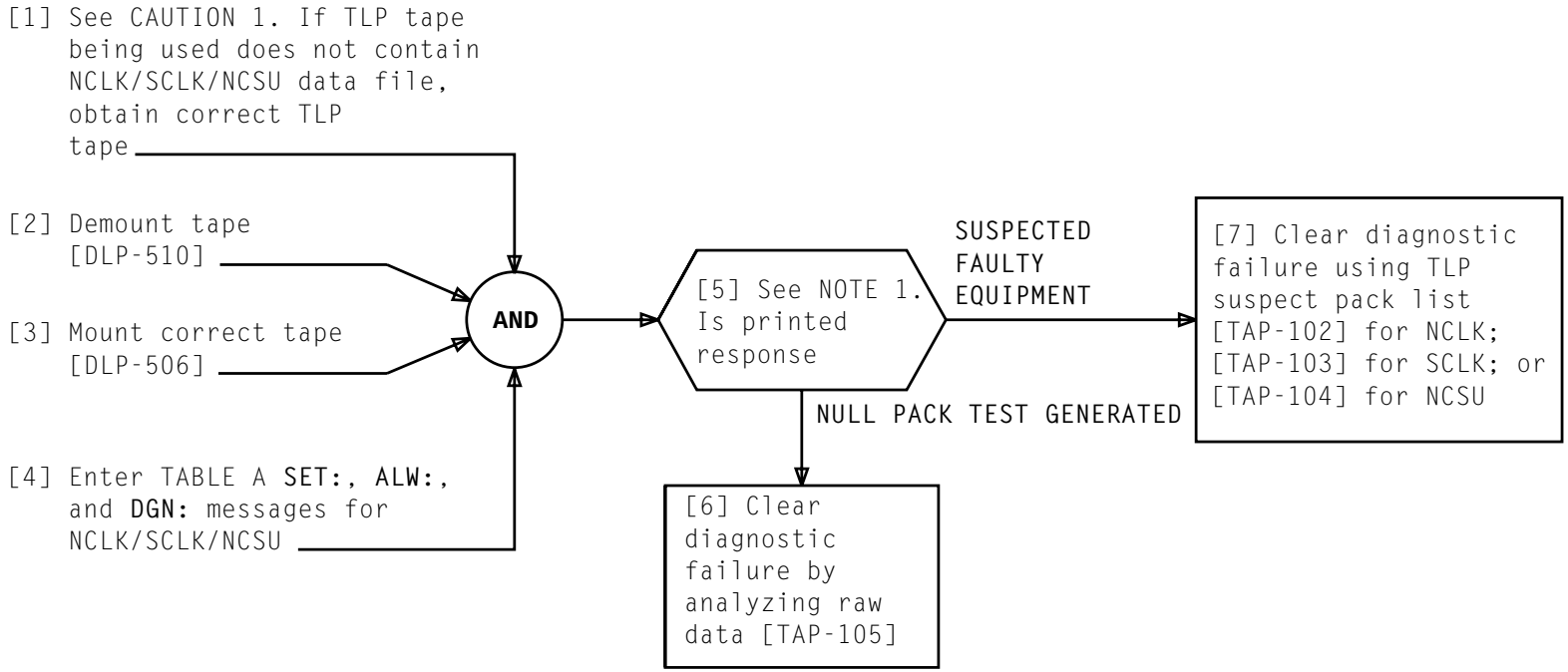


TABLE A
SET:TUC a;FUNCTION TLP!
ALW:TUC a:RO!
ALW:TLP:SRCH,SCLK! or ALW:TLP:SRCH,NCLK!
DGN:SCLK 0,{CONTR b|IPUB c|NCSU 0}:TLP! or DGN:NCLK 0,CHAIN d:TLP!
a = member number of TUC with TLP tape mounted b = failing controller member number c = failing IPUB member number d = failing chain

NOTE 1
It may take several minutes for list to be printed. Status of your file may be monitored by entering **OP:TLPQUEUE;ALL!** TLP file currently being processed is indicated by asterisk in priority column

CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

CLEAR DIAGNOSTIC FAILURE, TLP TAPE ACQUISITION ERROR

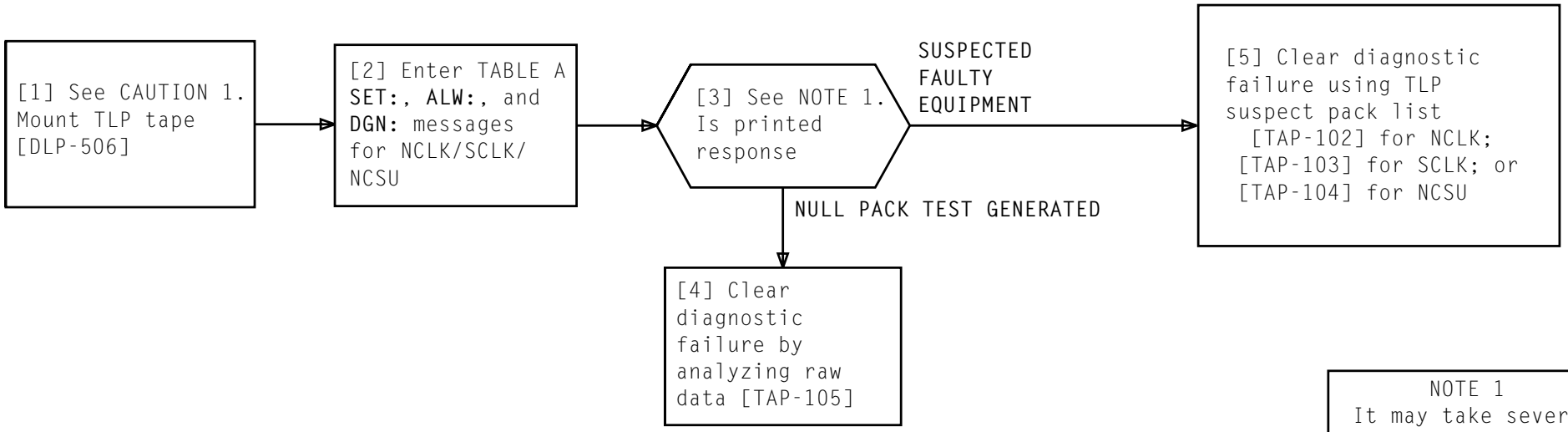


TABLE A
SET:TUC a;FUNCTION TLP!
ALW:TUC a:RO!
ALW:TLP:SRCH,SCLK! or ALW:TLP:SRCH,NCLK!
DGN:SCLK 0,{CONTR b|IPUB c|NCSU 0}:TLP! or DGN:NCLK 0,CHAIN d:TLP!
a = member number of TUC with TLP tape mounted b = failing controller member number c = failing IPUB member number d = failing chain

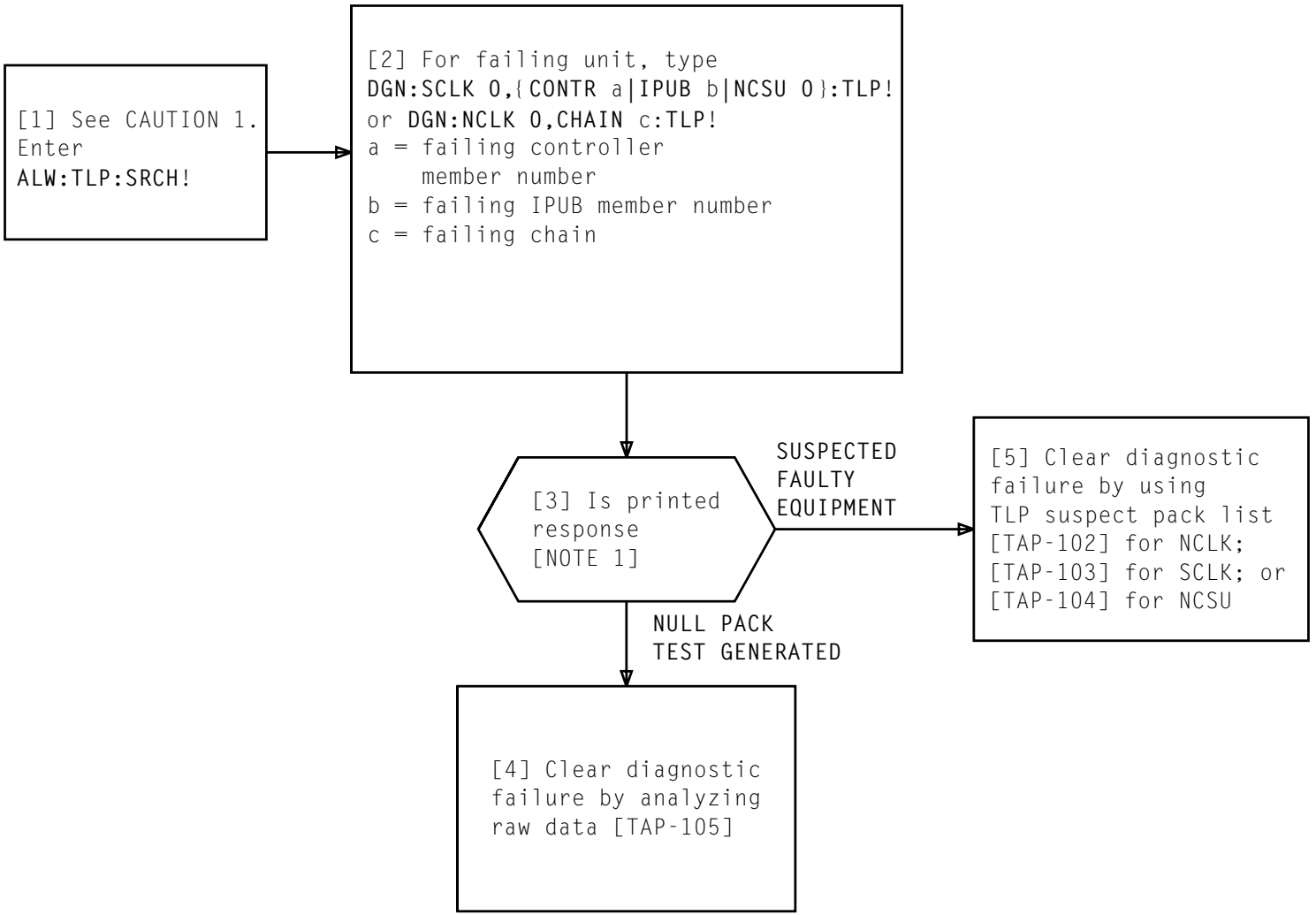
NOTE 1

It may take several minutes for list to be printed. Status of your file may be monitored by entering **OP:TLPQUEUE;ALL!** TLP file currently being processed is indicated by asterisk in priority column

CAUTION 1

Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

CLEAR DIAGNOSTIC FAILURE, TLP TAPE NOT MOUNTED



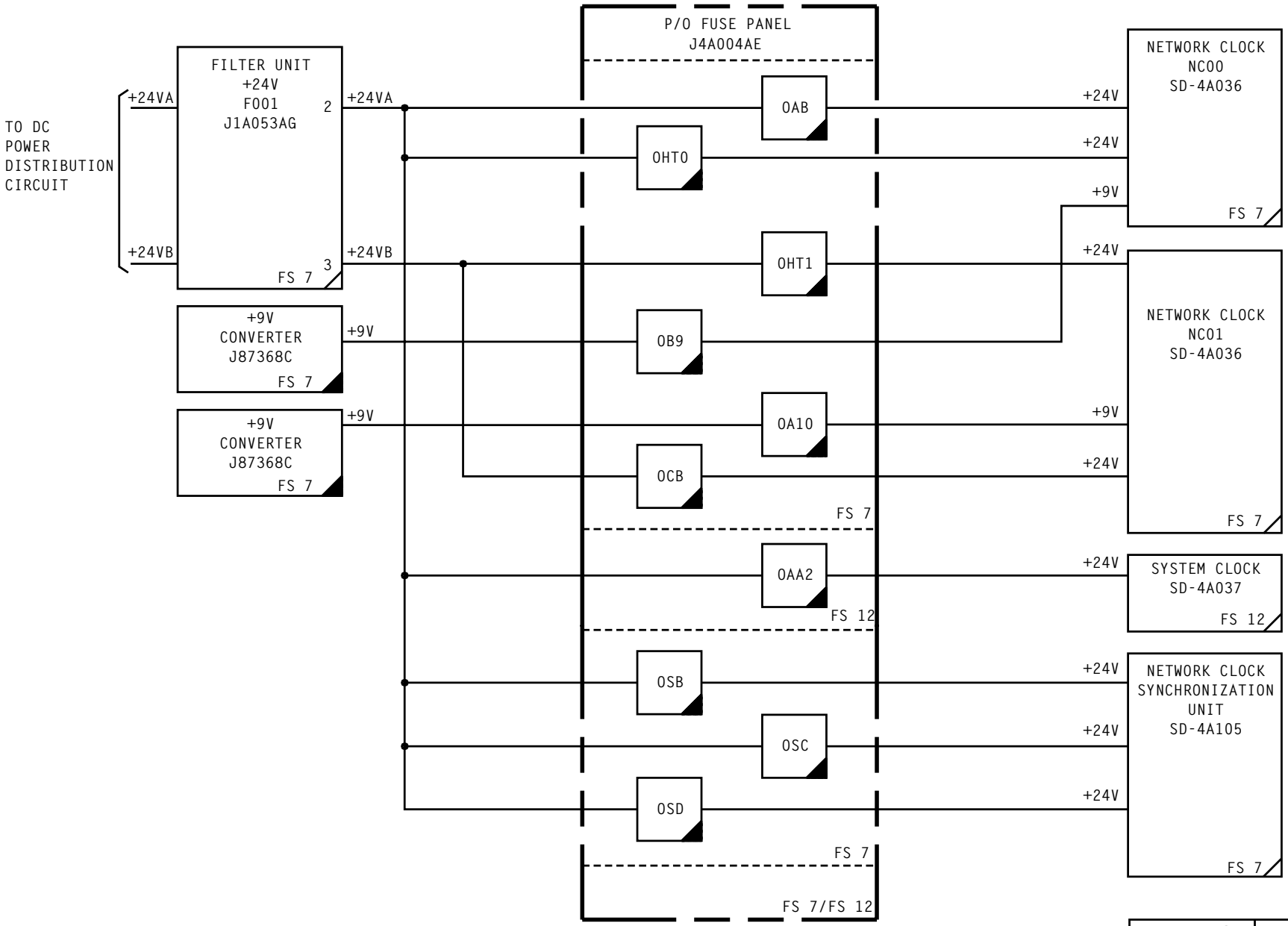
NOTE 1

It may take several minutes for list to be printed. Status of your file may be monitored by entering
OP:TLPQUEUE;ALL!
TLP file currently being processed is indicated by asterisk in priority column

CAUTION 1

Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

CLEAR DIAGNOSTIC FAILURE, ALL PENDING TLP SEARCHES INHIBITED



9 AND 24 VOLT FRAME DISTRIBUTION SD-4A014-02, BAY 0

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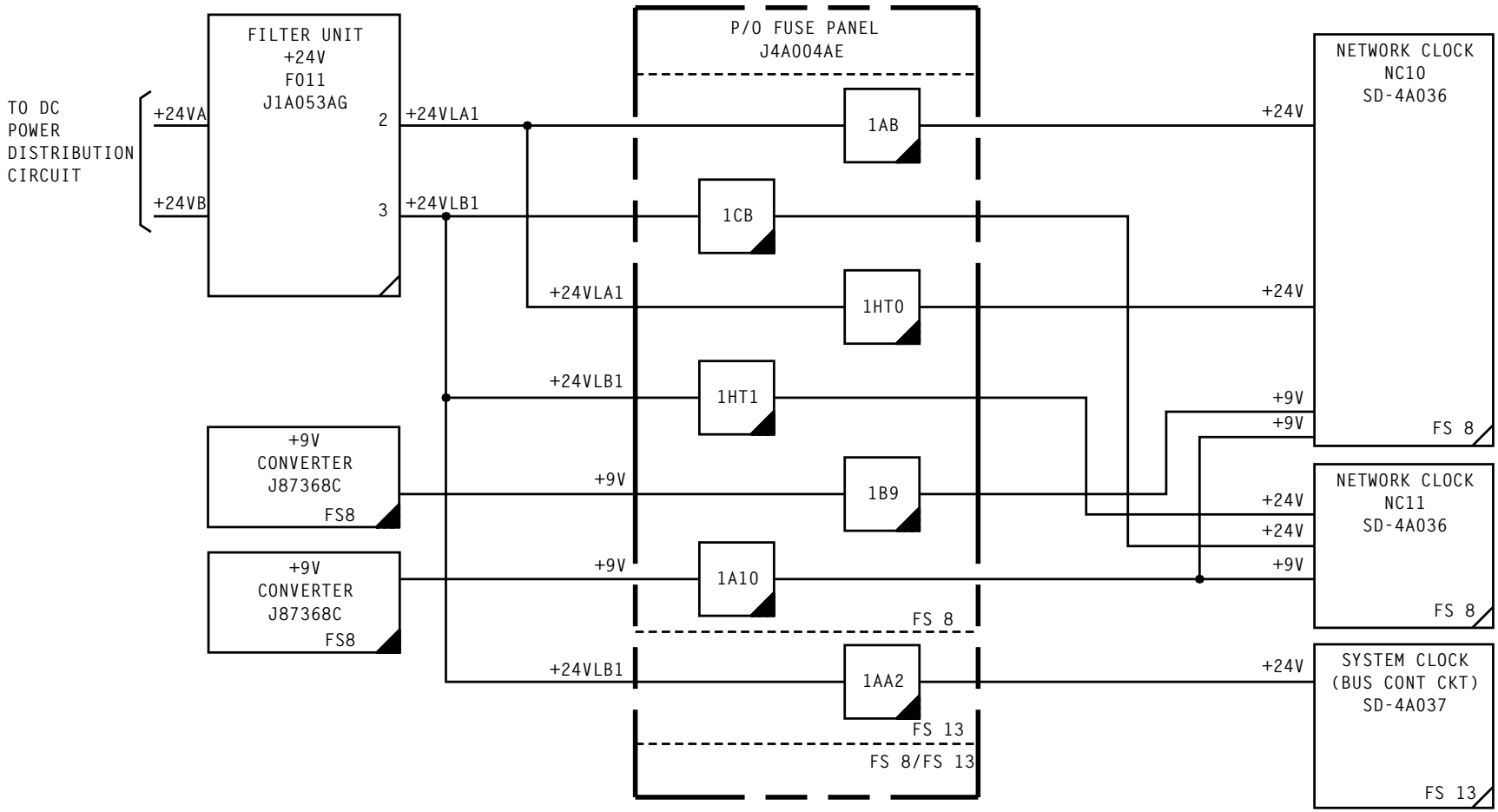
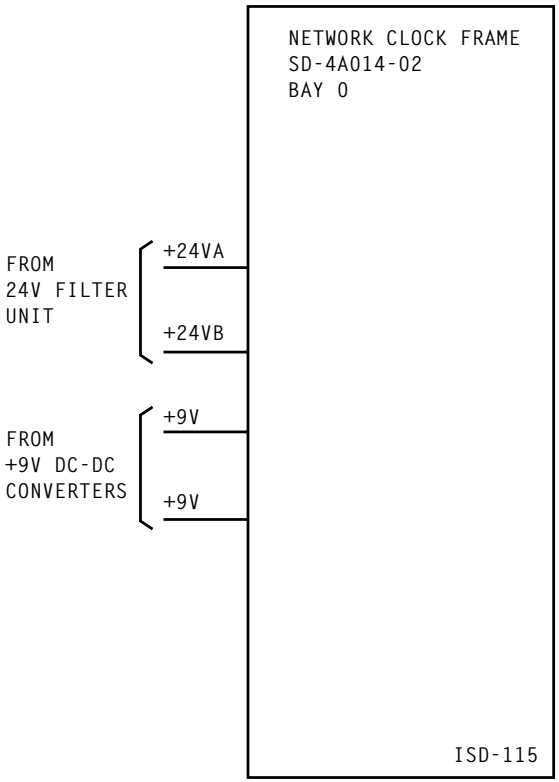
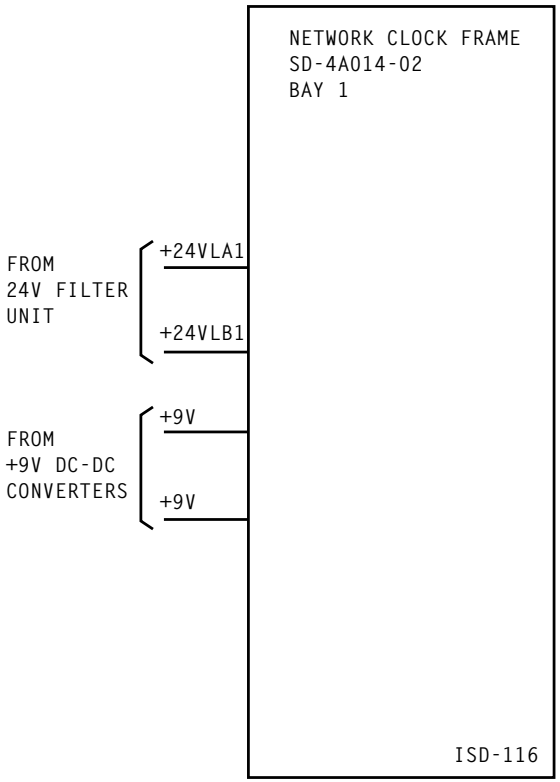


9 AND 24 VOLT FRAME DISTRIBUTION SD-4A014-02, BAY 1





9 AND 24 VOLT FRAME DISTRIBUTION

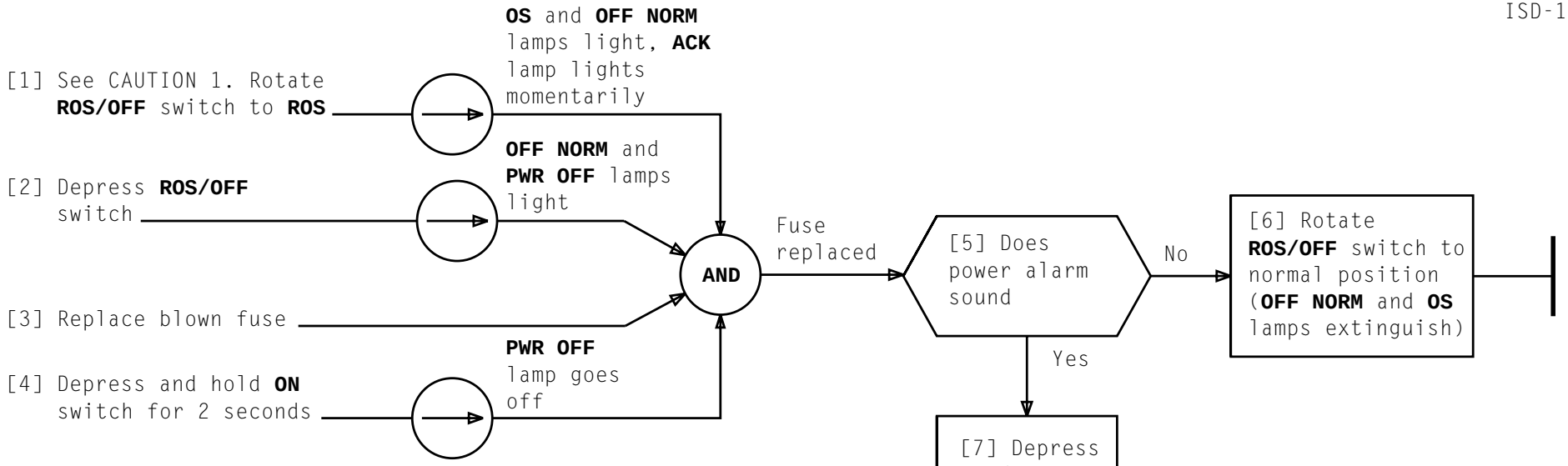
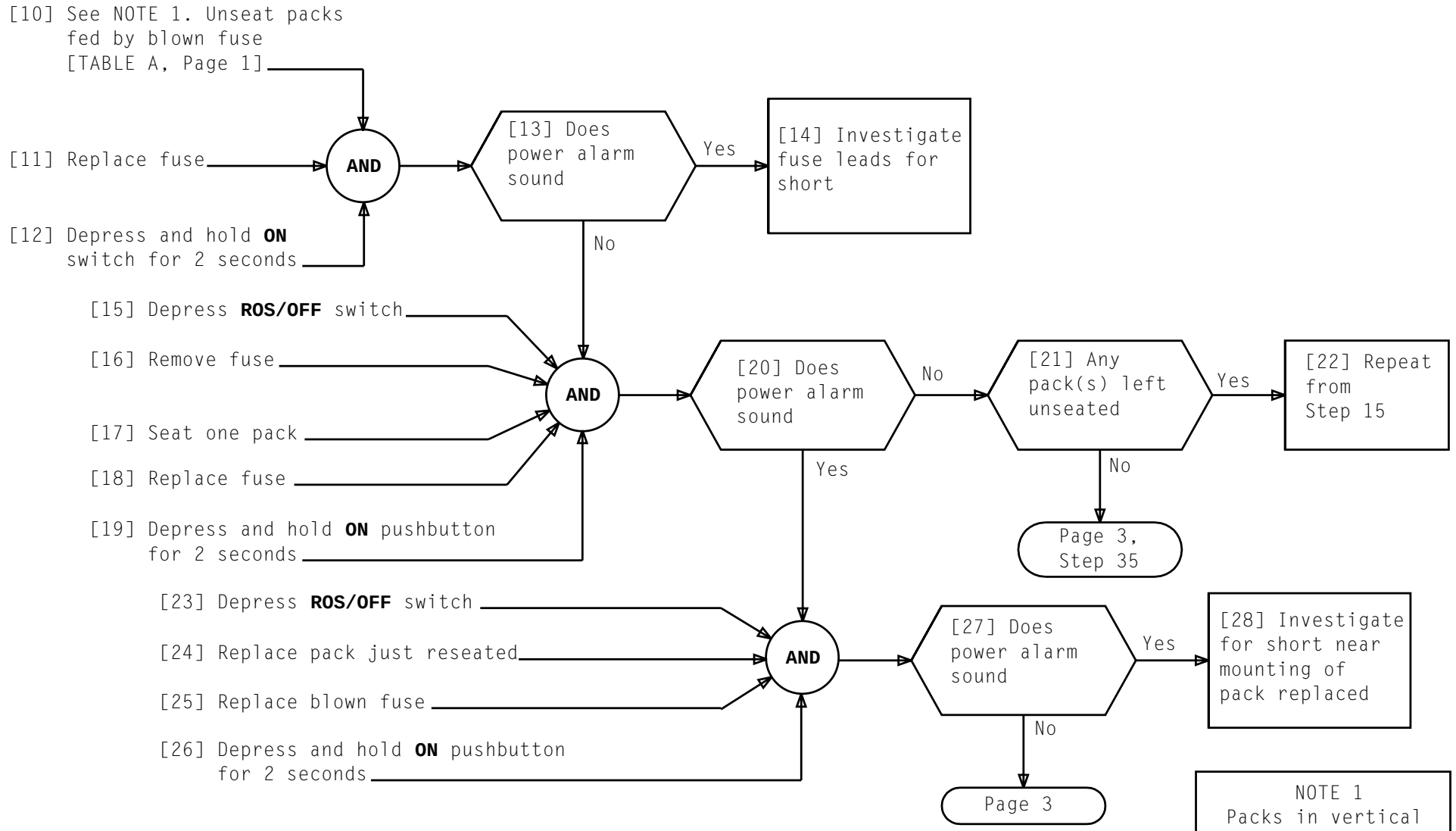


TABLE A			
FUSE BAY 0	**PACKS FED AT LOCATION**	**FUSE BAY 1**	**PACKS FED AT LOCATION**
0AB	0-78-03	**1AB**	1-78-03
0HT0*	0-78-20 0-66-31 0-66-34	**1HT0***	1-78-20 1-66-31 1-66-34
0HT1*	0-78-52 0-66-37 0-66-40	**1HT1***	1-78-52 1-66-37 1-66-40
0B9*	0-66-33	**1B9***	1-66-33
0A10*	0-66-39	**1A10***	1-66-39
0CB	0-78-68	**1CB**	1-78-68
0AA2	0-56-52	**1AA2**	1-56-52
0SB	0-50-25 0-50-27	—	—
0SC	0-50-25	—	—
0SD	0-50-25 0-50-27	—	—

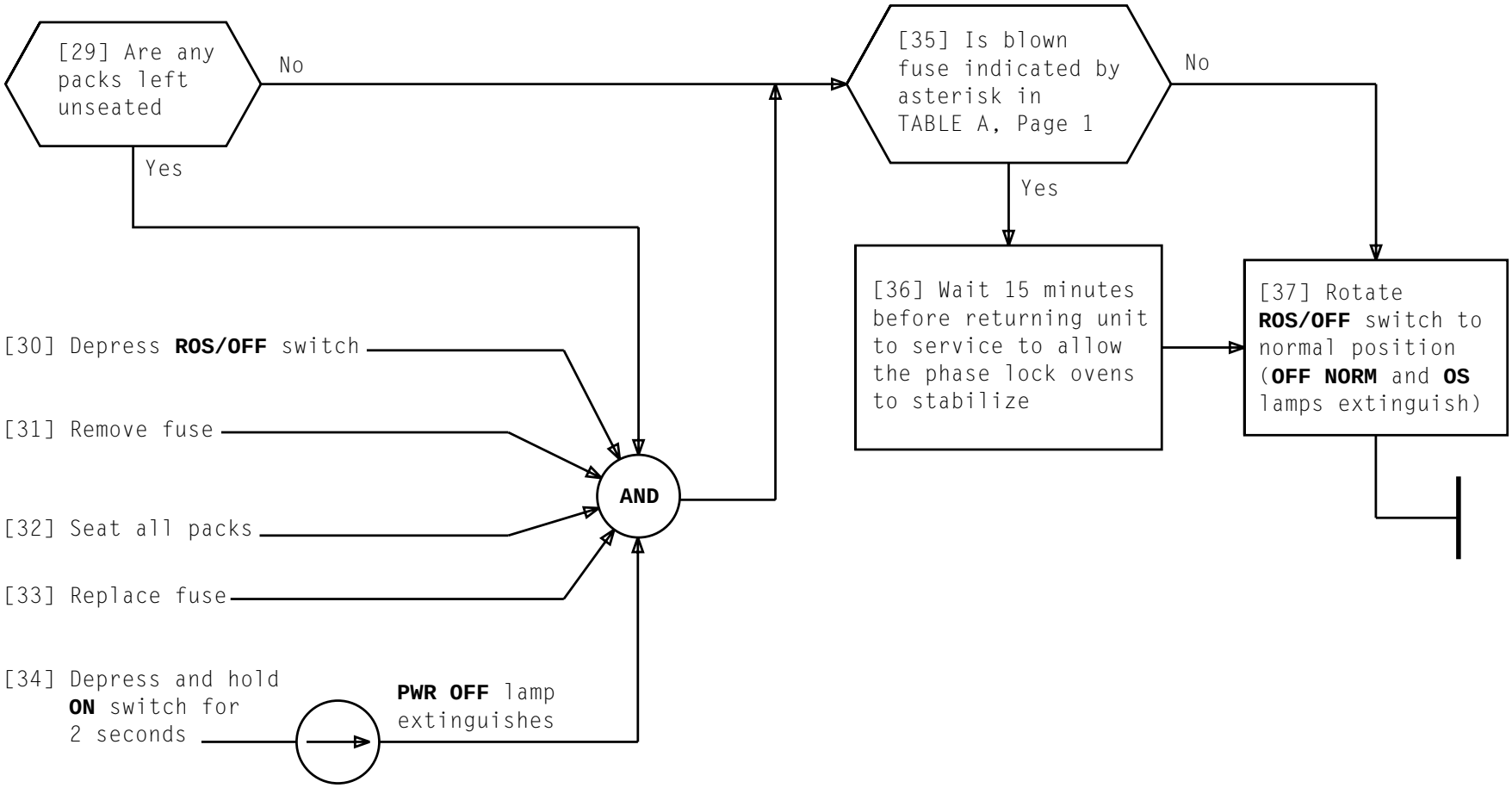
CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

CLEAR BLOWN FUSE, NOT A1-A9 OR B1-B8 (9 AND 24 VOLT DISTRIBUTION)

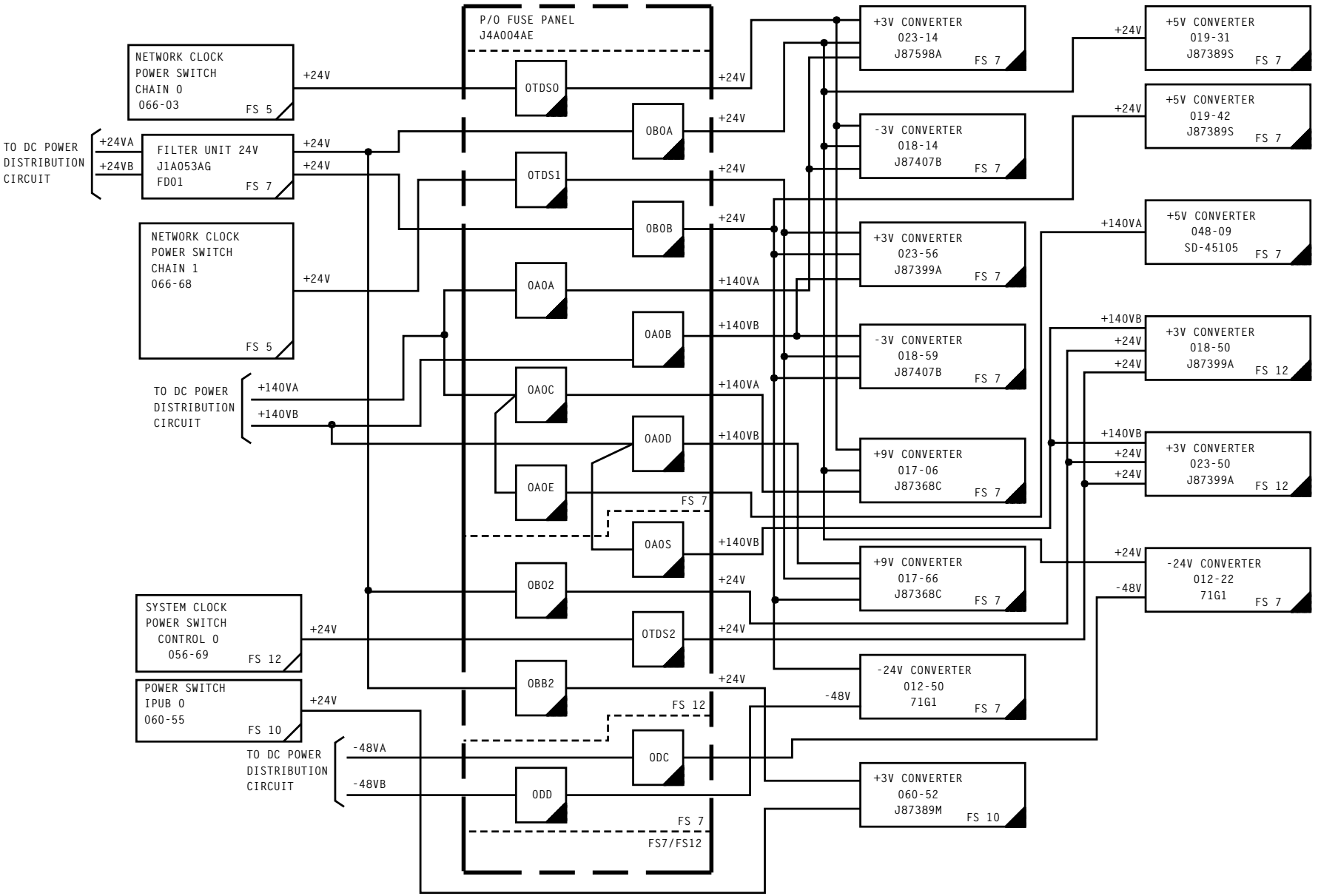


NOTE 1
Packs in vertical position 66 are behind screw-held covers of phase lock ovens

CLEAR BLOWN FUSE, NOT A1-A9 OR B1-B8 (9 AND 24 VOLT DISTRIBUTION)



CLEAR BLOWN FUSE, NOT A1-A9 OR B1-B8 (9 AND 24 VOLT DISTRIBUTION)



24, 48 AND 140 VOLT FRAME DISTRIBUTION, BAY 0 — 39B OSCILLATOR

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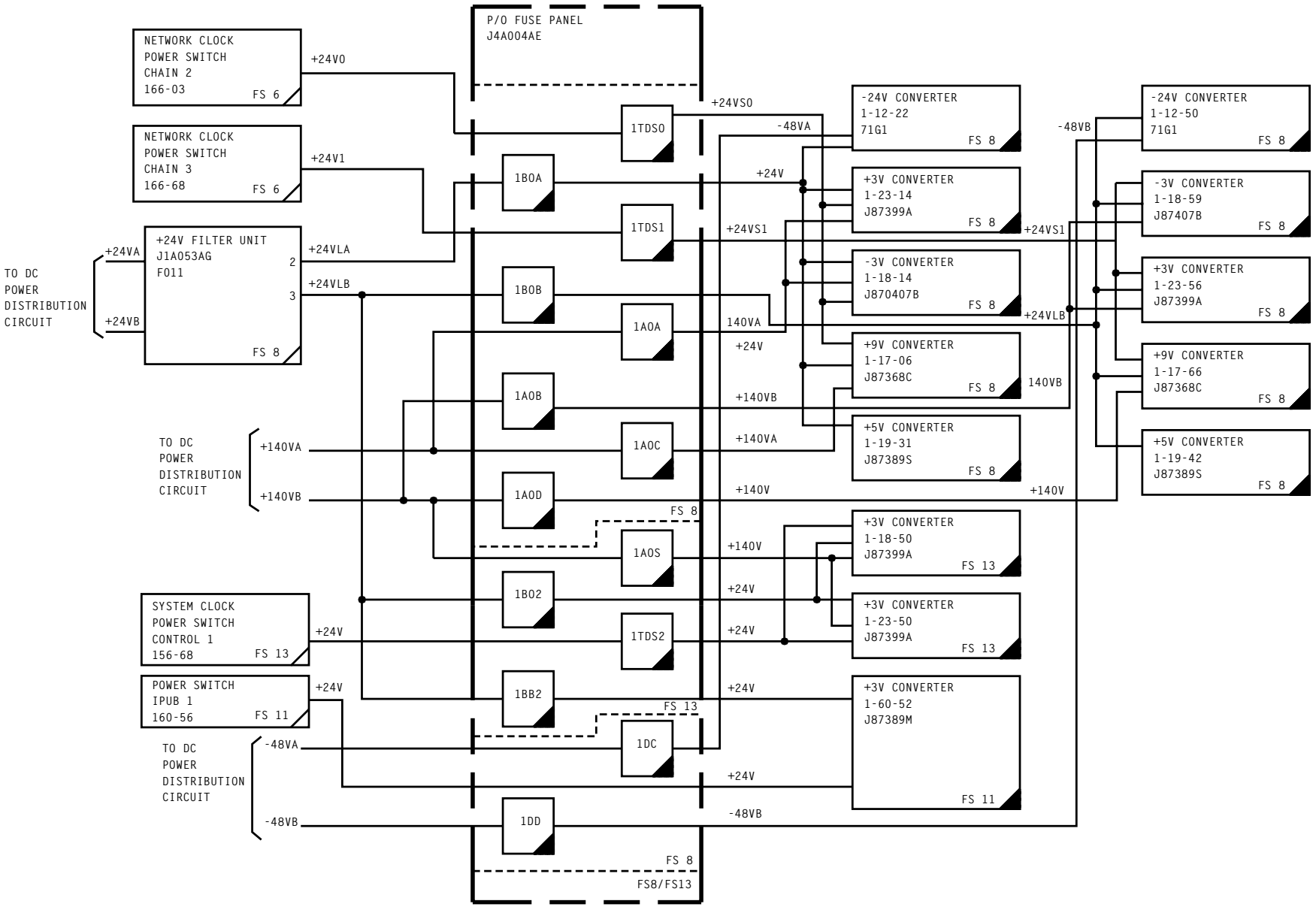

24, 48 AND 140 VOLT FRAME DISTRIBUTION, BAY 1 — 39B OSCILLATOR

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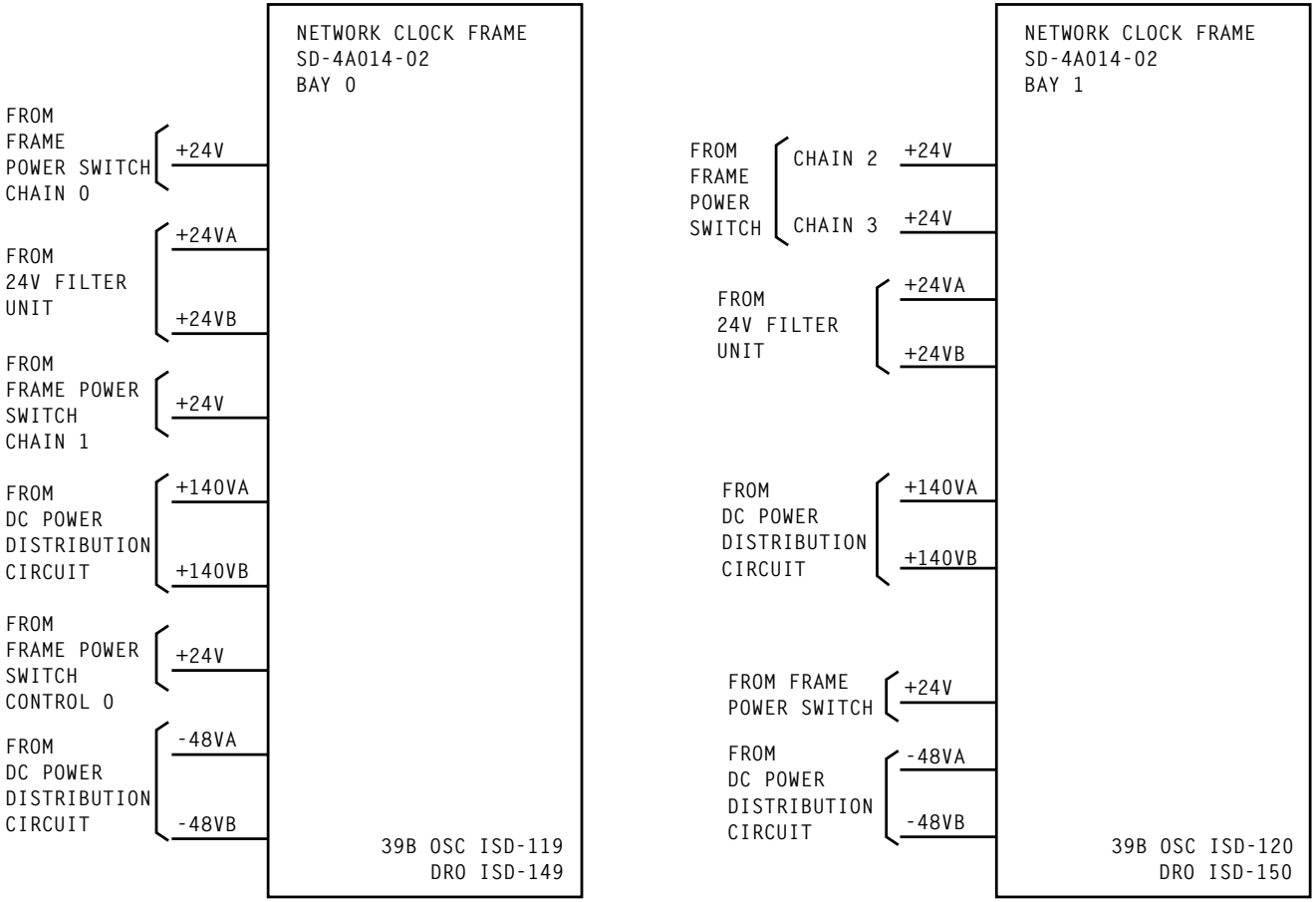
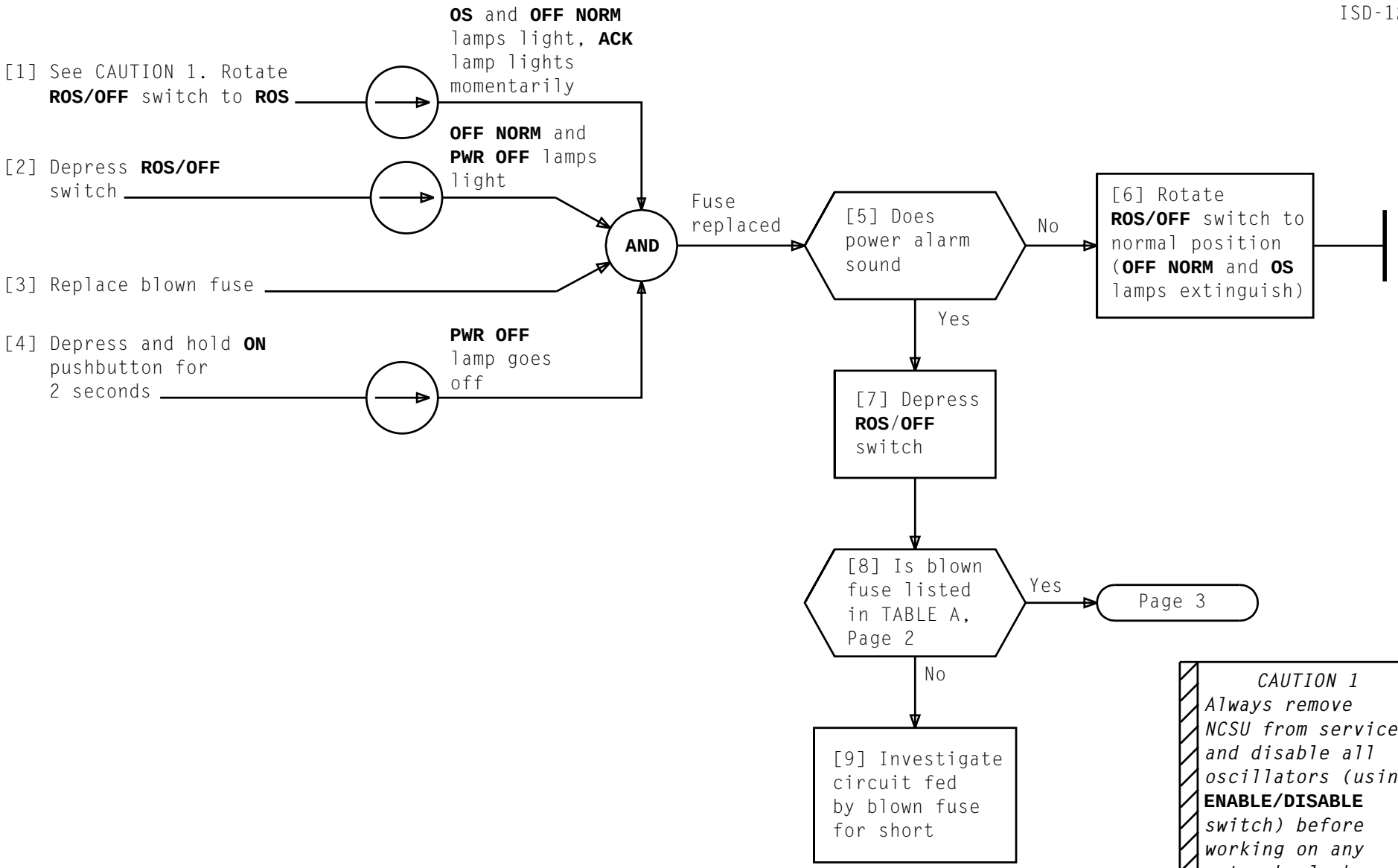


24, 48 AND 140 VOLT FRAME DISTRIBUTION

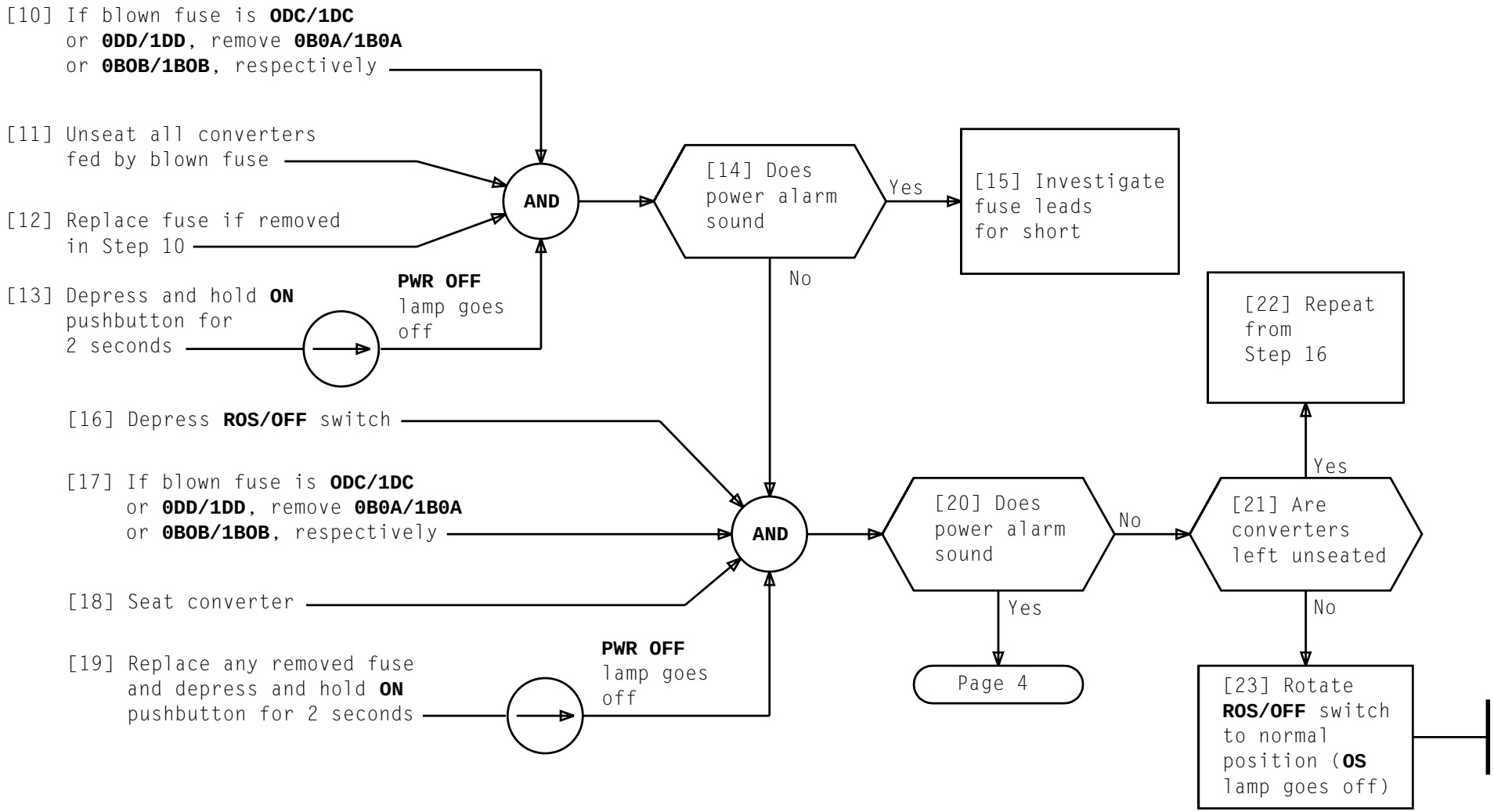


CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

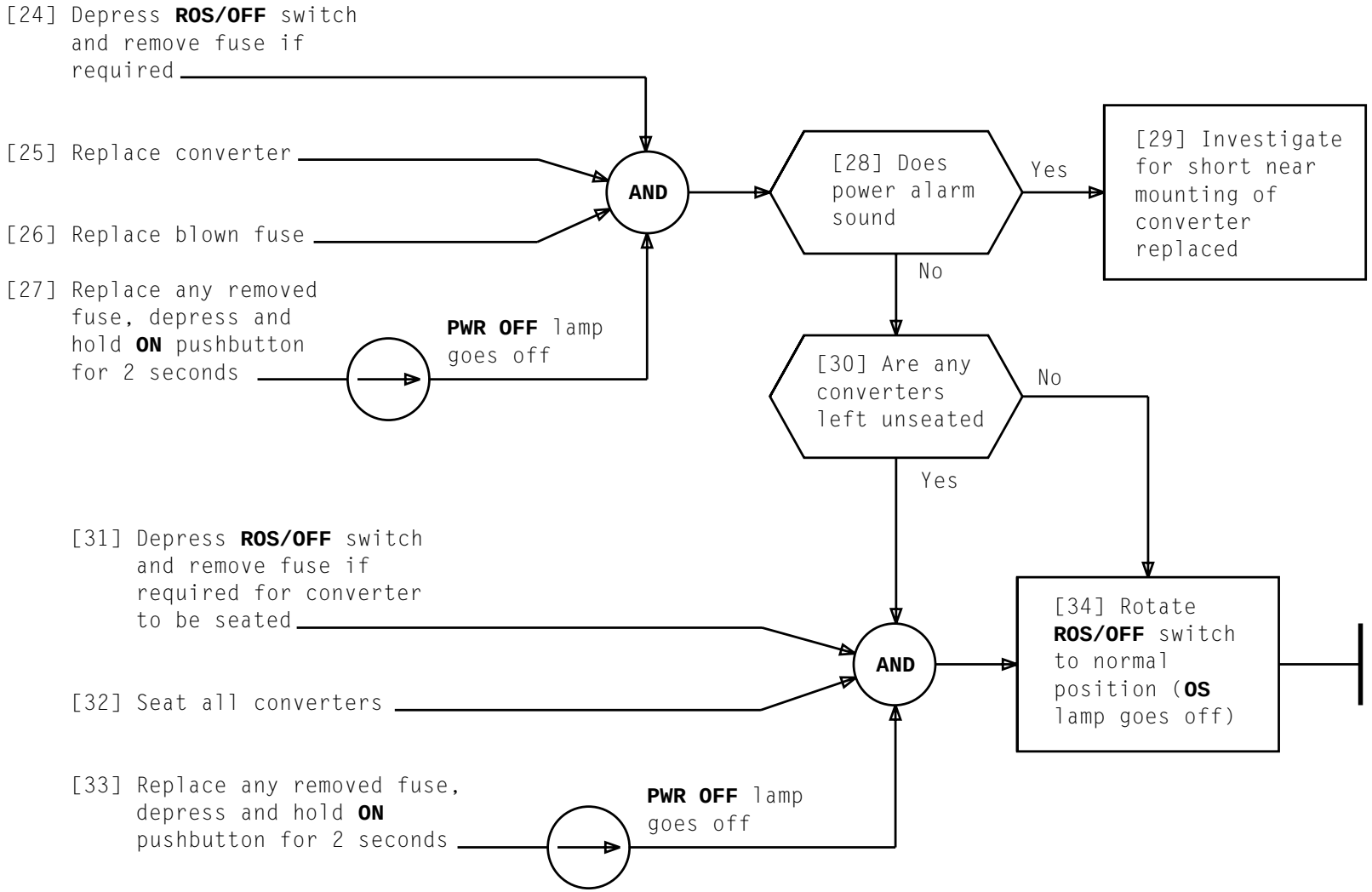
CLEAR BLOWN FUSE, NOT A1-A9 OR B1-B8 (24, 48 AND 140 VOLT DISTRIBUTION)

TABLE A			
FUSE BAY 0	CONVERTERS FED AT LOCATION	FUSE BAY 1	CONVERTERS FED AT LOCATION
0TDS0	0-23-14 0-18-14 0-17-06	**1TDS0**	1-23-14 1-18-14 1-17-06
0B0A	0-23-14 0-18-14 0-17-06 0-12-22 0-19-31	**1B0A**	1-23-14 1-18-14 1-17-06 1-12-22 1-19-31
0TDS1	0-23-56 0-18-59 0-17-66	**1TDS1**	1-23-56 1-18-59 1-17-66
0B0B	0-23-56 0-18-59 0-17-66 0-12-50 0-19-42	**1B0B**	1-23-56 1-18-59 1-17-66 1-12-50 1-19-42
0A0A	0-23-14 0-18-14	**1A0A**	1-23-14 1-18-14
0A0B	0-23-56 0-18-59	**1A0B**	1-23-56 1-18-59
0A0C	0-17-06	**1A0C**	1-17-06
0A0D	0-17-66	**1A0D**	1-17-66
0A0E	0-48-09	—	—
0A0S **0B02** **0TDS2**	0-18-50 0-23-50	**1A0S** **1B02** **1TDS2**	1-18-50 1-23-50
0BB2	0-60-52	**1BB2**	1-60-52
0DC	0-12-22	**1DC**	1-12-22
0DD	0-12-50	**1DD**	1-12-50

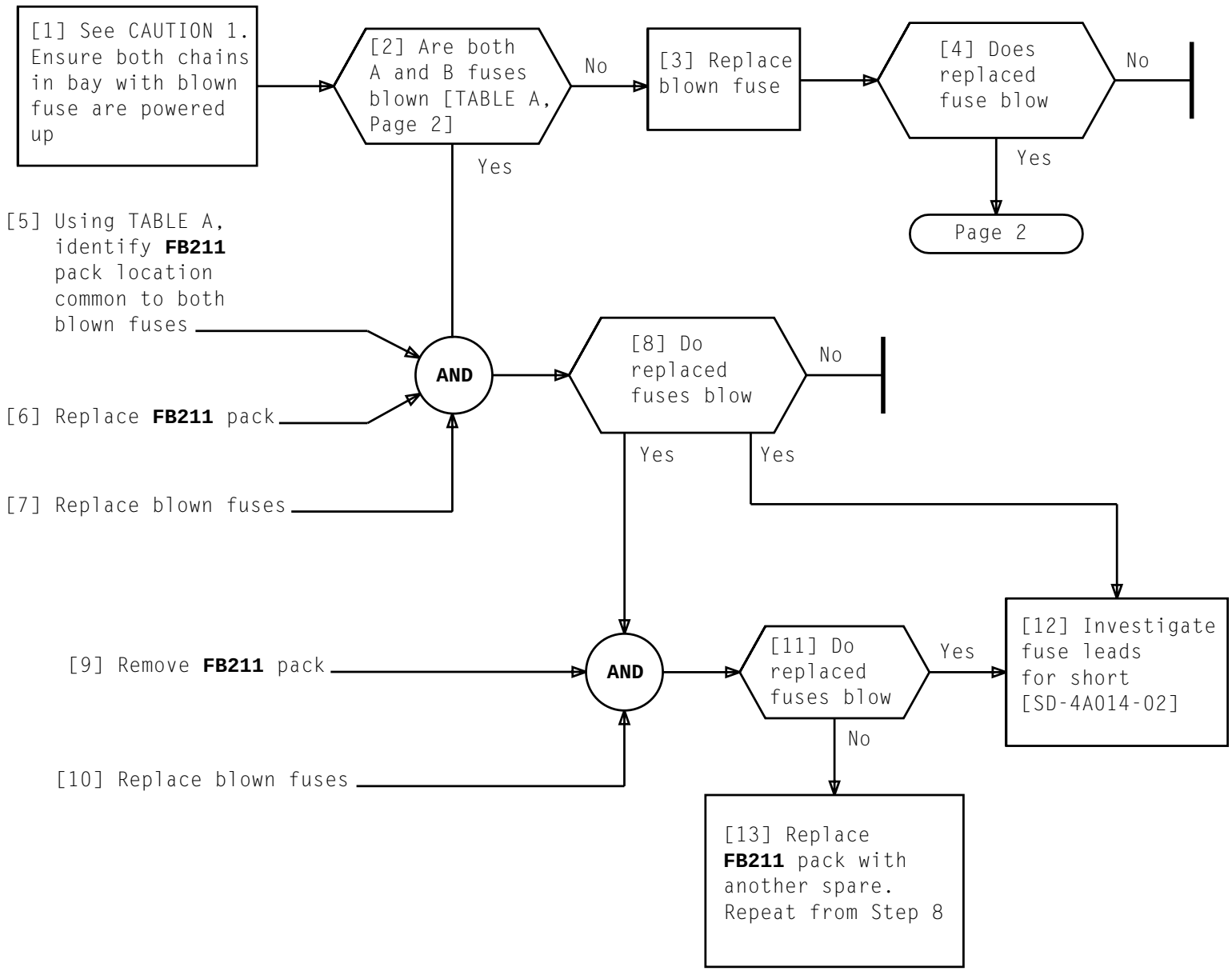
CLEAR BLOWN FUSE NOT A1-A9 OR B1-B8 (24, 48 AND 140 VOLT DISTRIBUTION)



CLEAR BLOWN FUSE NOT A1-A9 OR B1-B8 (24, 48, AND 140 VOLT DISTRIBUTION)



CLEAR BLOWN FUSE NOT A1-A9 OR B1-B8 (24, 48 AND 140 VOLT DISTRIBUTION)



CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

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CLEAR BLOWN FUSE A1-A9 OR B1-B8

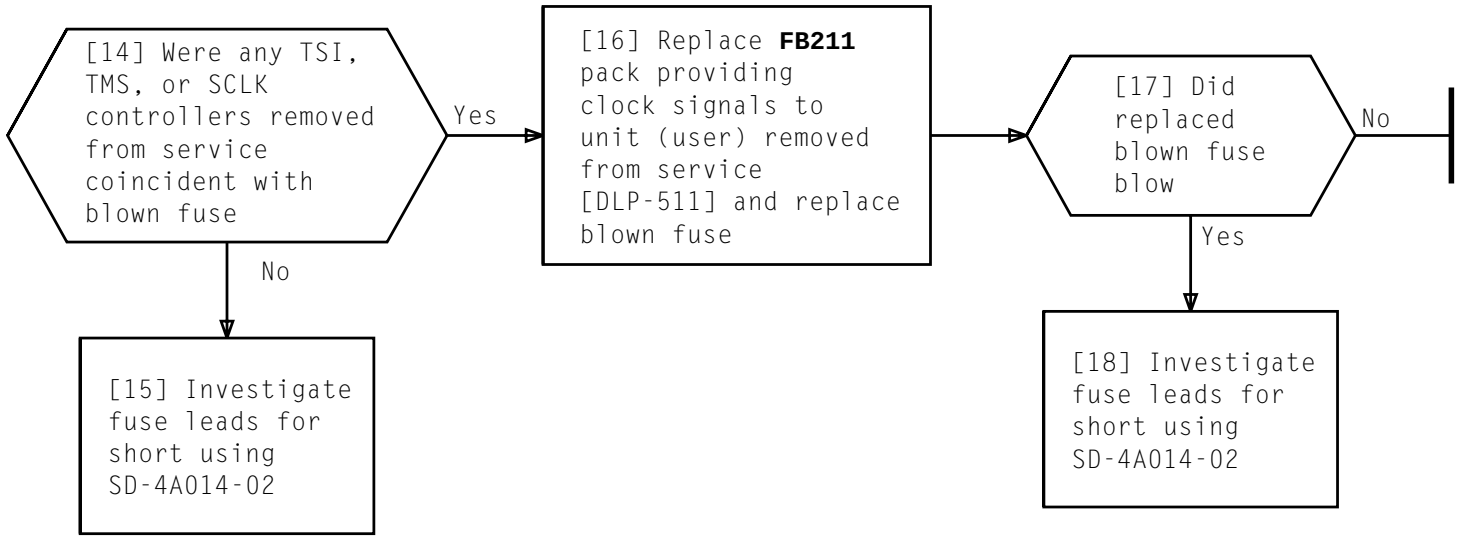
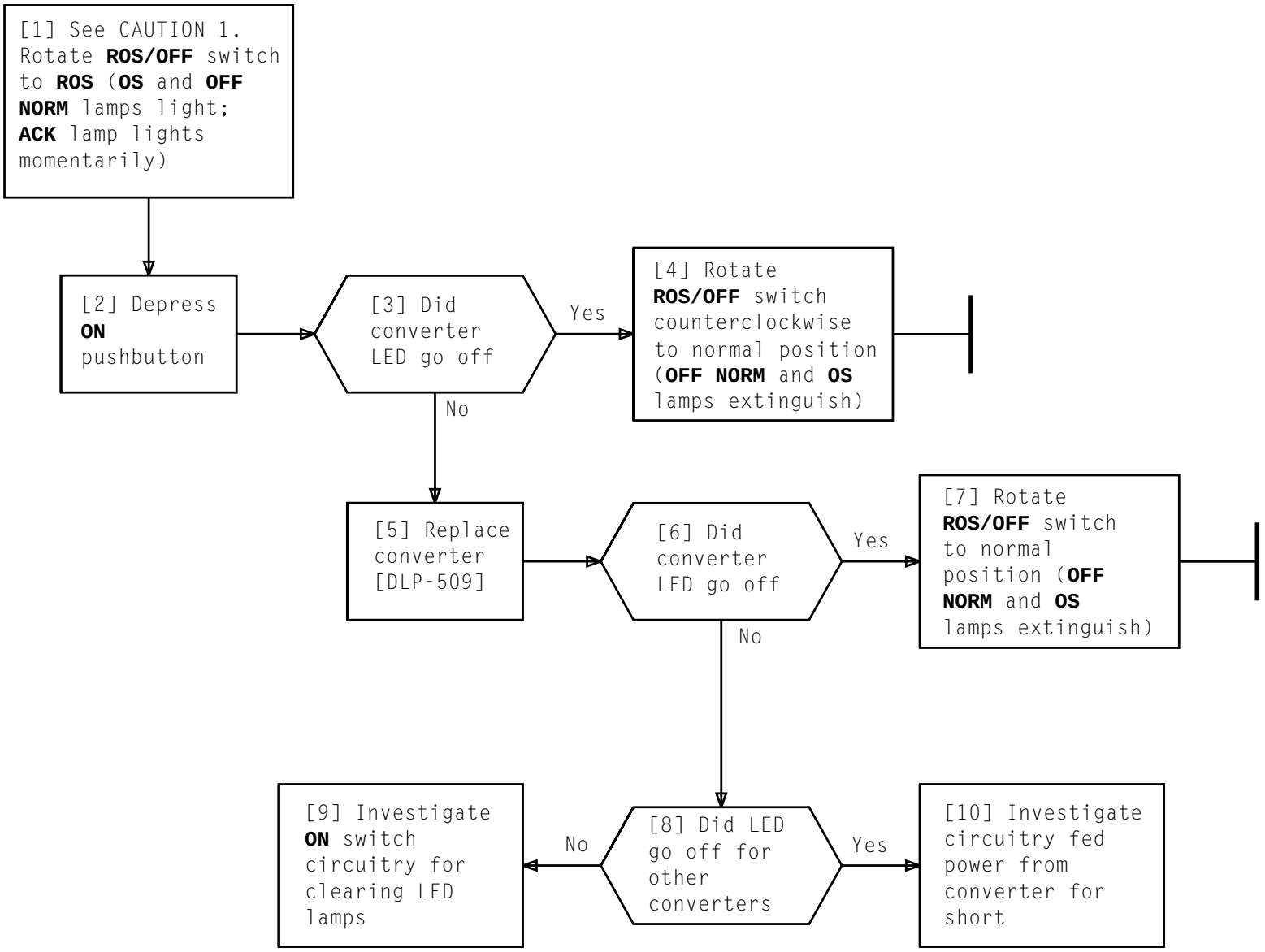


TABLE A
FB211 PACK LOCATION TO FUSE ASSIGNMENT

FUSE DESIG → / ↓	A1	A2	A3	A4	A5	A6	A7	A8	A9
B1	78-46	78-42	78-48	78-44	78-40	78-50	78-38	74-49	74-47
B2	78-45	78-41	78-47	78-43	78-39	78-49	78-37	74-48	74-46
B3	—	74-56	74-66	74-62	74-58	74-64	74-60	74-51	74-54
B4	74-67	74-55	74-65	74-61	74-57	74-63	74-59	74-50	74-52
B5	—	74-15	74-05	74-09	74-13	74-07	74-11	74-20	74-17
B6	74-04	74-16	74-06	74-10	74-14	74-08	74-12	74-21	74-19
B7	78-25	78-29	78-23	78-27	78-31	78-21	78-33	74-22	74-24
B8	78-26	78-30	78-24	78-28	78-32	78-22	78-34	74-23	74-25

CLEAR BLOWN FUSE A1-A9 OR B1-B8



CAUTION 1
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CLEAR CONVERTER LED LIGHTED CONDITION

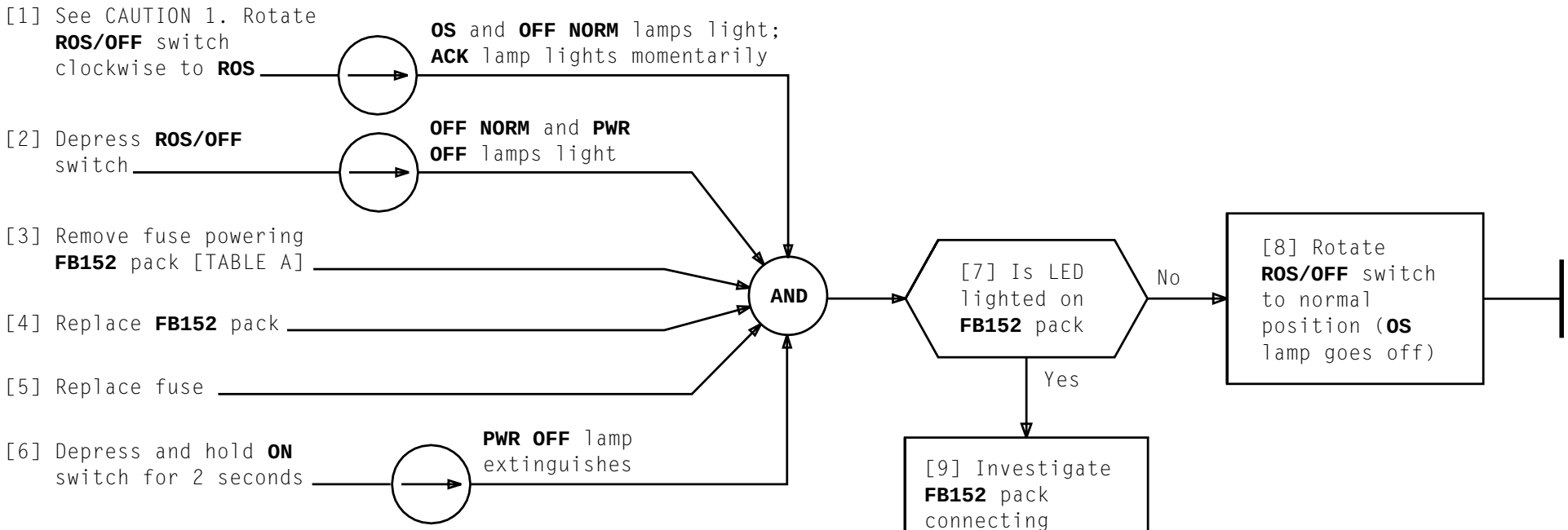


TABLE A

UNIT	FB152 LOCATION	FUSE DESIGNATION	FUSE LOCATION
NCLK CHAIN 0	0-78-03	**0AB**	0-07-20
NCLK CHAIN 2	1-78-03	**1AB**	1-07-20
NCLK CHAIN 1	0-78-68	**0CB**	0-07-51
NCLK CHAIN 3	1-78-68	**1CB**	1-07-51
SCLK CONTR 0	0-56-52	**0AA2**	0-09-51
SCLK CONTR 1	1-56-52	**1AA2**	1-09-51

CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

CLEAR FB152 PACK LED LIGHTED CONDITION

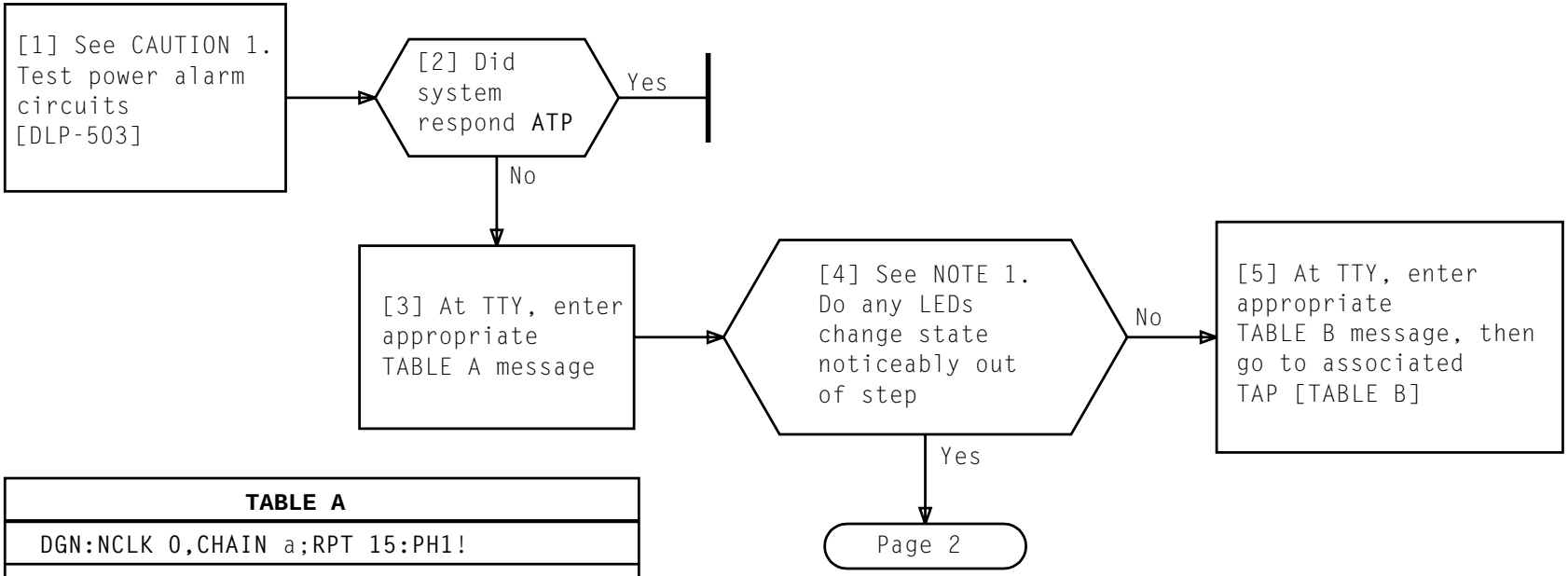


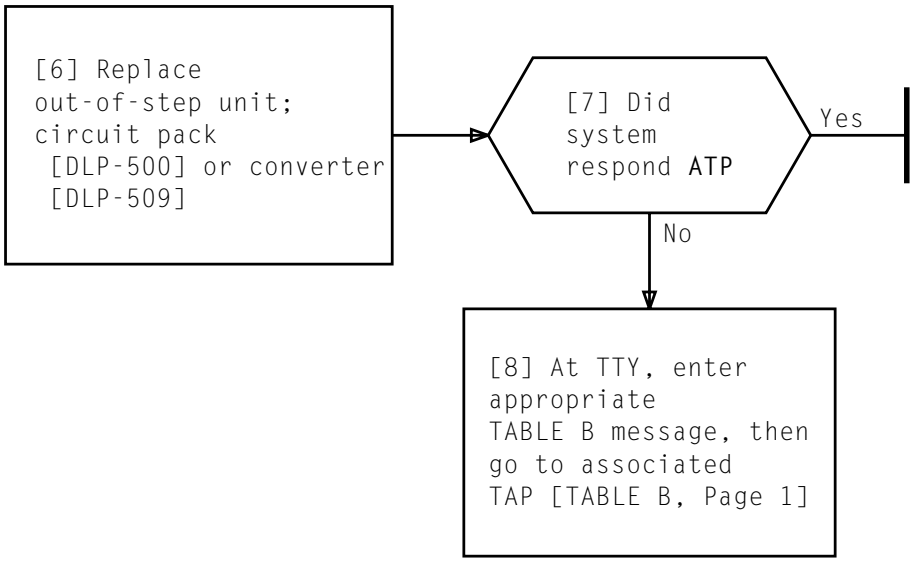
TABLE A
DGN:NCLK 0,CHAIN a;RPT 15:PH1!
DGN:SCLK 0,{CONTR b|NCSU 0};RPT 15:PH1!
a = NCLK chain 0-3 b = controller number (IPUBs are diagnosed with controller)

TABLE B	
DIAGNOSTIC MESSAGE	**ASSOCIATED TAP**
DGN:NCLK 0,CHAIN a:TLP!	[TAP-102]
DGN:SCLK 0,{CONTR b|IPUB c}:TLP!	[TAP-103]
DGN:SCLK 0,NCSU 0:TLP!	[TAP-104]
a = NCLK chain 0-3 b = controller number c = IPUB number	

NOTE 1
Normally, except for NCSU, LEDs do not all change state simultaneously

CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

CLEAR AUTOMATIC POWER MONITOR TEST FAILURE



CLEAR AUTOMATIC POWER MONITOR TEST FAILURE

[1] See CAUTION 1. Obtain volt/ohmmeter (KS-14510)

[2] At appropriate power switch, rotate **ROS/OFF** switch to **ROS**

OS and **OFF NORM** lamps light; **ACK** lamp lights momentarily

[3] Depress **ROS/OFF** switch to remove power from clock chain

OFF NORM and **PWR OFF** lamps are lighted

[4] At rear of frame, remove six panhead screws holding rear of network clock chain control cover [Figure 1]

[5] At front of frame, remove four flathead screws and network clock chain control cover

[6] Depress and hold **ON** pushbutton for 2 seconds to restore power to network clock chain

PWR OFF lamp extinguishes

AND

[7] Is trouble in

Meter circuit (**PHASE** or **PHASE LOCK OVEN TEMP**)

Page 3

MSO lamp circuit

[8] Connect voltmeter between pin 3 and ground of faulty switch; depress switch to operated position [Figure 2]

Page 2

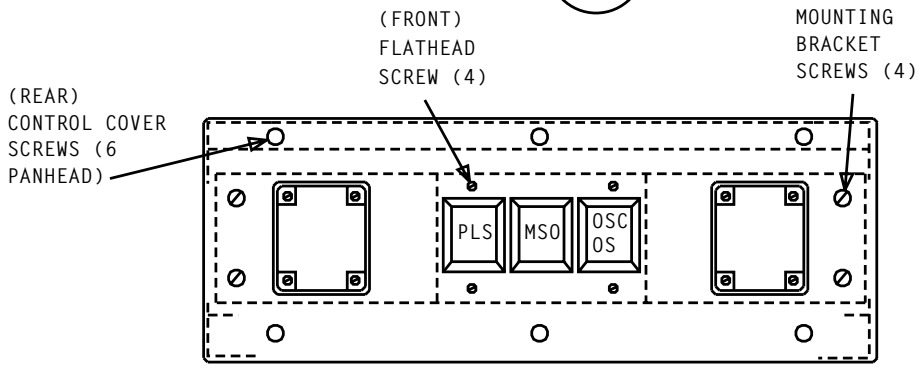


Figure 1 — Network Clock Control

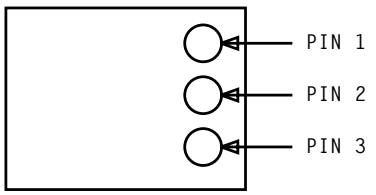
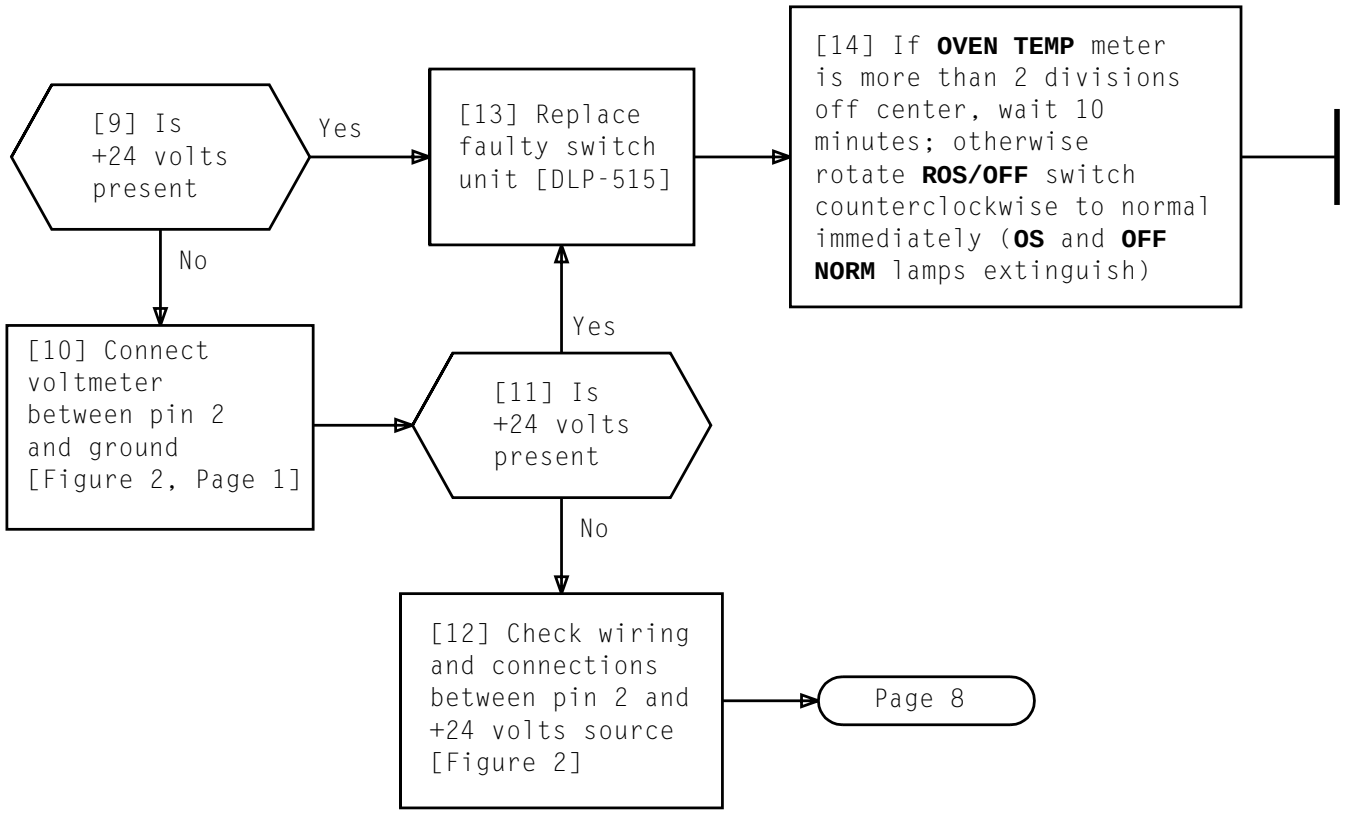


Figure 2 — Lamp Circuit (Front View)

CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

CLEAR METER SOLENOID OPERATE (MSO) LAMP AND PHASE OR PHASE LOCK OVEN TEMP METER RESET FAULT



CLEAR METER SOLENOID OPERATE (MSO) LAMP AND PHASE OR PHASE LOCK OVEN TEMP METER RESET FAULT

[15] Connect voltmeter between **R2** of meter and frame ground [Figure 3]

[16] Is +24 volts present

Yes

[18] Move voltmeter lead to **R1** of meter [Figure 3]

[19] Is +24 volts present

Yes

[24] Depress **MSO** switch

Page 4

No

[17] Use SD-4A014 and SD-4A036 to check +24 volts power and bay wiring

Page 8

No

[20] Are meters locked in reset position

Yes

Page 5

No

[21] At clock chain power switch, depress **ROS/OFF** switch

[22] Replace defective meter [DLP-516]

[23] If **OVEN TEMP** meter is more than 2 divisions off center, wait 10 minutes; otherwise, rotate **ROS/OFF** switch counterclockwise to normal position immediately (**OS** and **OFF NORM** lamps extinguish)

AND

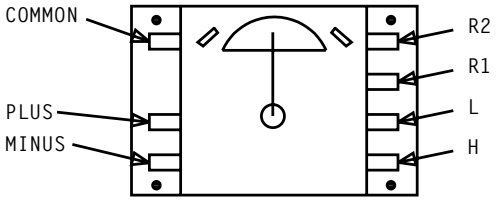
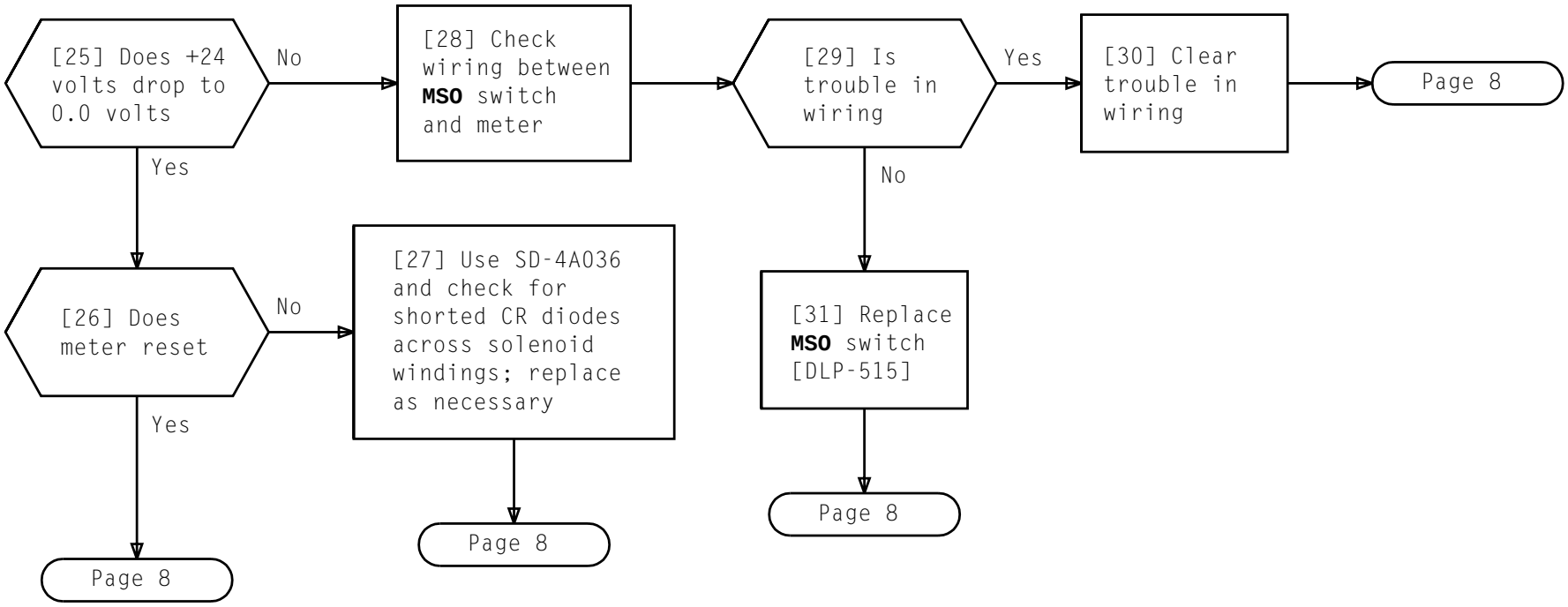


Figure 3 – Meter Circuit

CLEAR METER SOLENOID OPERATE (MSO) LAMP AND PHASE OR PHASE LOCK OVEN TEMP METER RESET FAULT



CLEAR METER SOLENOID OPERATE (MSO) LAMP AND PHASE OR PHASE LOCK OVEN TEMP METER RESET FAULT

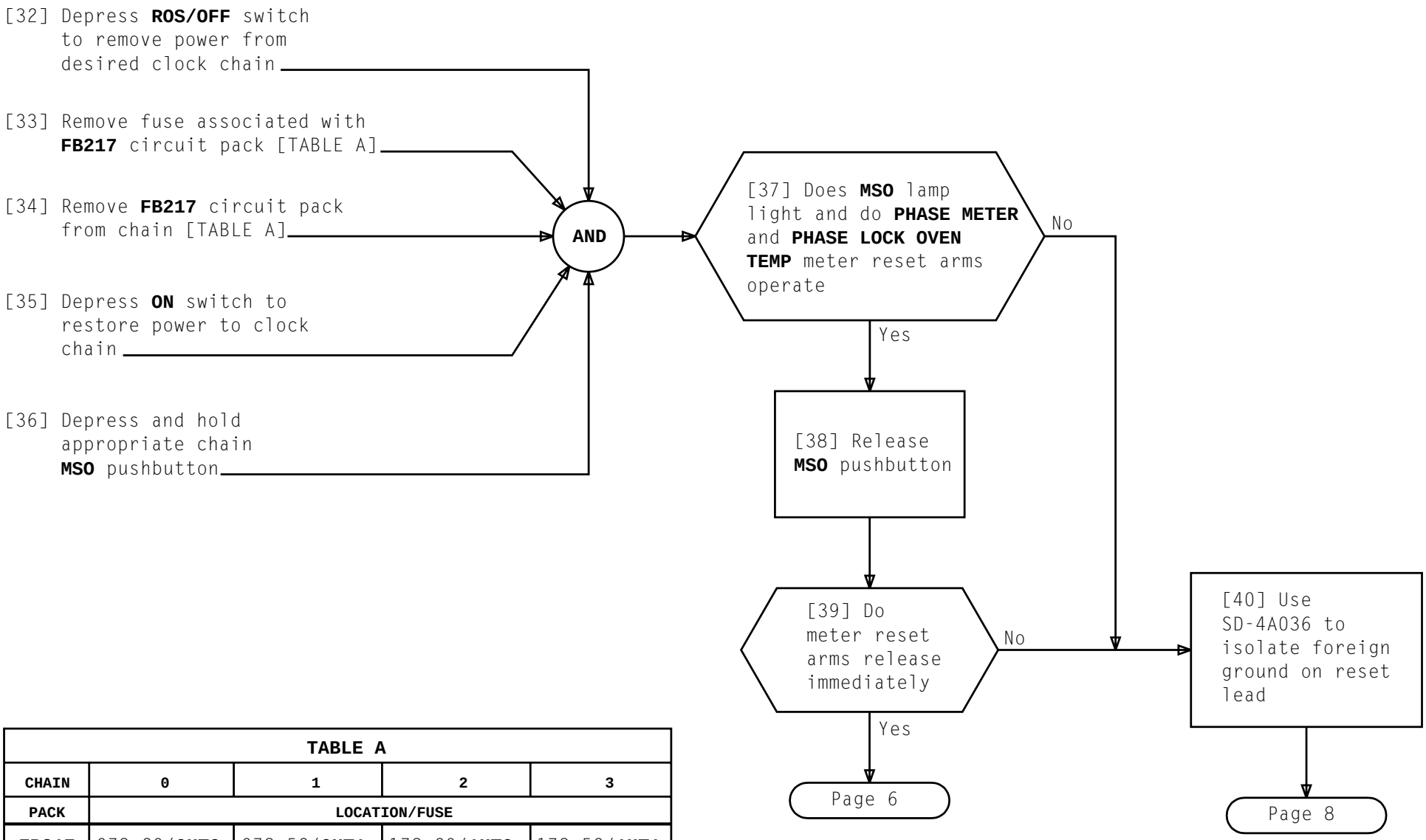
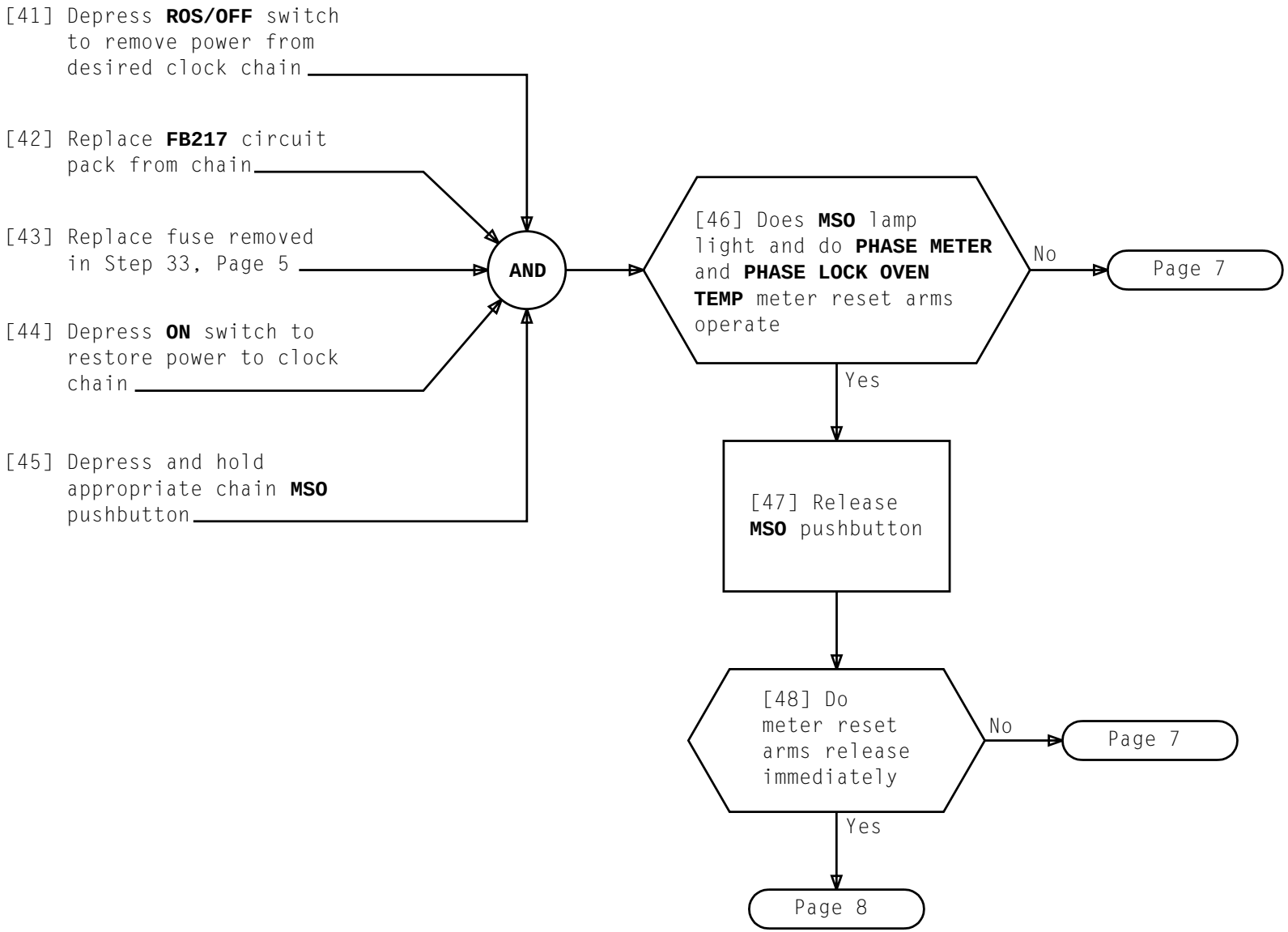


TABLE A				
CHAIN	**0**	**1**	**2**	**3**
PACK	**LOCATION/FUSE**			
FB217	078-20/**0HT0**	078-52/**0HT1**	178-20/**1HT0**	178-52/**1HT1**

CLEAR METER SOLENOID OPERATE (MSO) LAMP AND PHASE OR PHASE LOCK OVEN TEMP METER RESET FAULT



CLEAR METER SOLENOID OPERATE (MSO) LAMP AND PHASE OR PHASE LOCK OVEN TEMP METER RESET FAULT

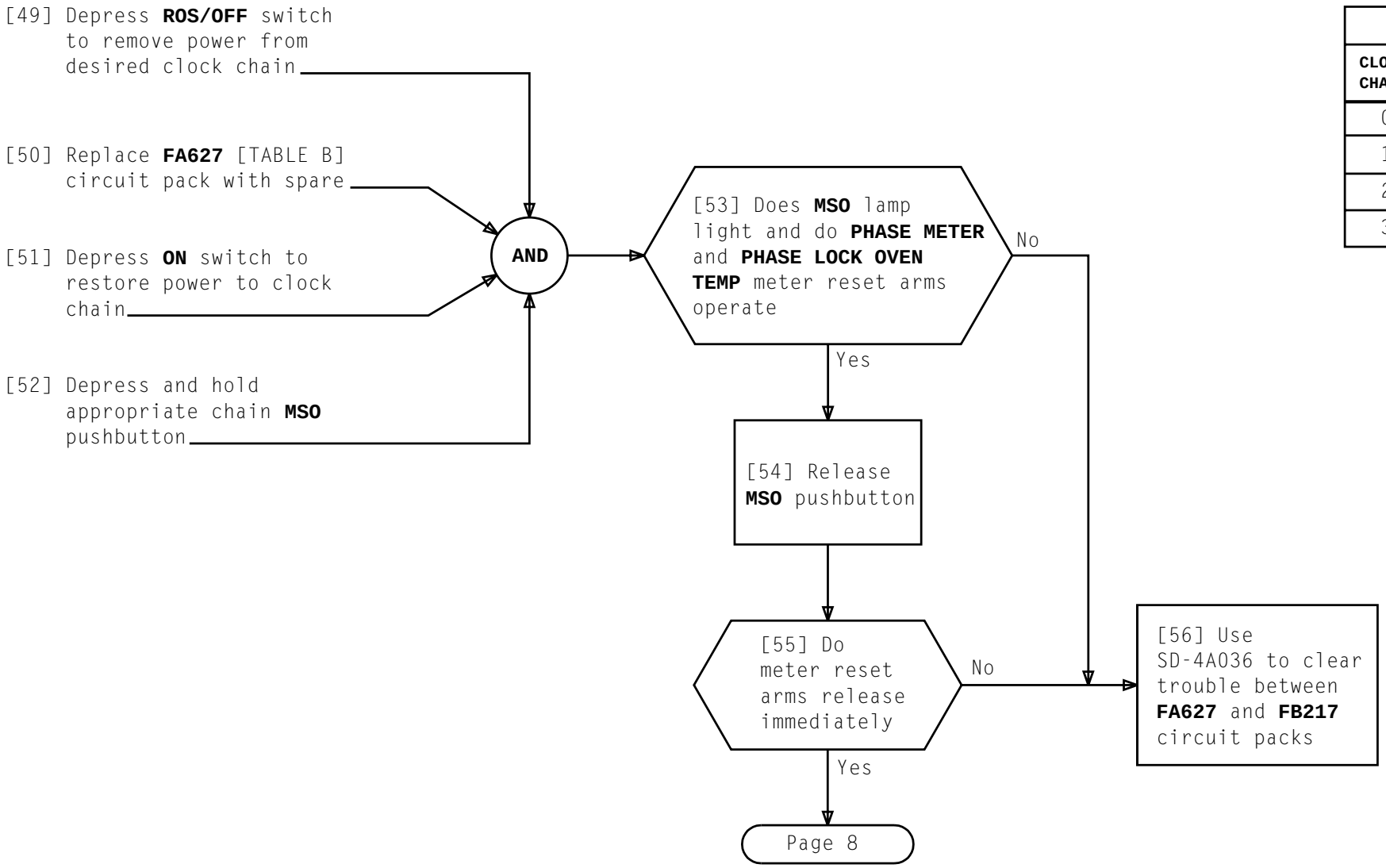
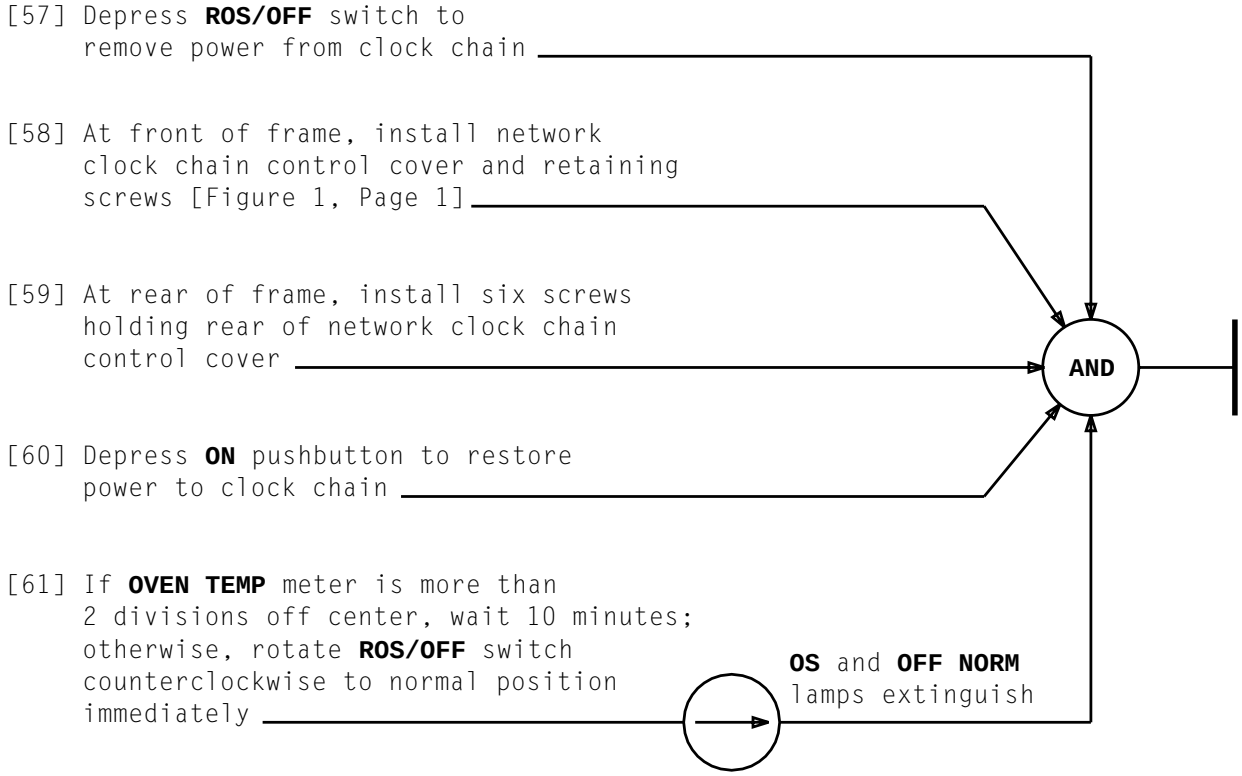


TABLE B	
CLOCK CHAIN	**FA627 LOCATION**
0	070-23
1	070-48
2	170-23
3	170-48

CLEAR METER SOLENOID OPERATE (MSO) LAMP AND PHASE OR PHASE LOCK OVEN TEMP METER RESET FAULT



CLEAR METER SOLENOID OPERATE (MSO) LAMP AND PHASE OR PHASE LOCK OVEN TEMP METER RESET FAULT

[1] See CAUTION 1. Obtain volt/ohmmeter (KS-14510)

[2] At appropriate power switch, ensure **ROS/OFF** switch is rotated to **ROS** (**OS** and **OFF NORM** lamps lighted)

[3] Depress **ROS/OFF** switch to remove power from clock chain (**OFF NORM** and **PWR OFF** lamps lighted)

[5] At rear of frame, remove six panhead screws holding rear of network clock chain control cover [Figure 1]

[6] At front of frame, remove four flathead screws and network clock chain control cover

AND

AND

[4] Is clock chain cover removed

Yes

No

[7] Using ohmmeter, measure resistance between pin 3 of **PLS** switch [Figure 2] and positive (+) terminal of coil [Figure 3]

[8] Is resistance between 66 ohms and 70 ohms

Yes

Page 2

No

[9] Replace **R1**

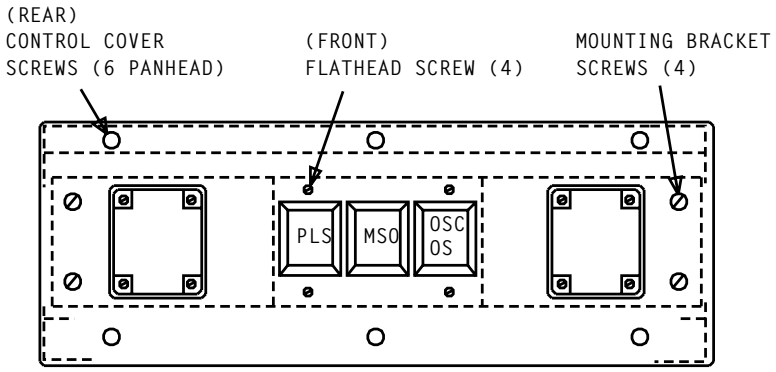


Figure 1 - Network Clock Control

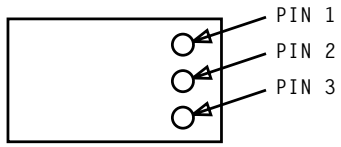


Figure 2 – PLS Circuit (Front View)

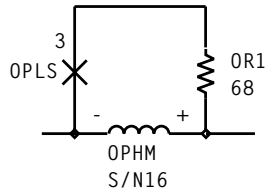


Figure 3 – R1/PLS Circuit Schematic

CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

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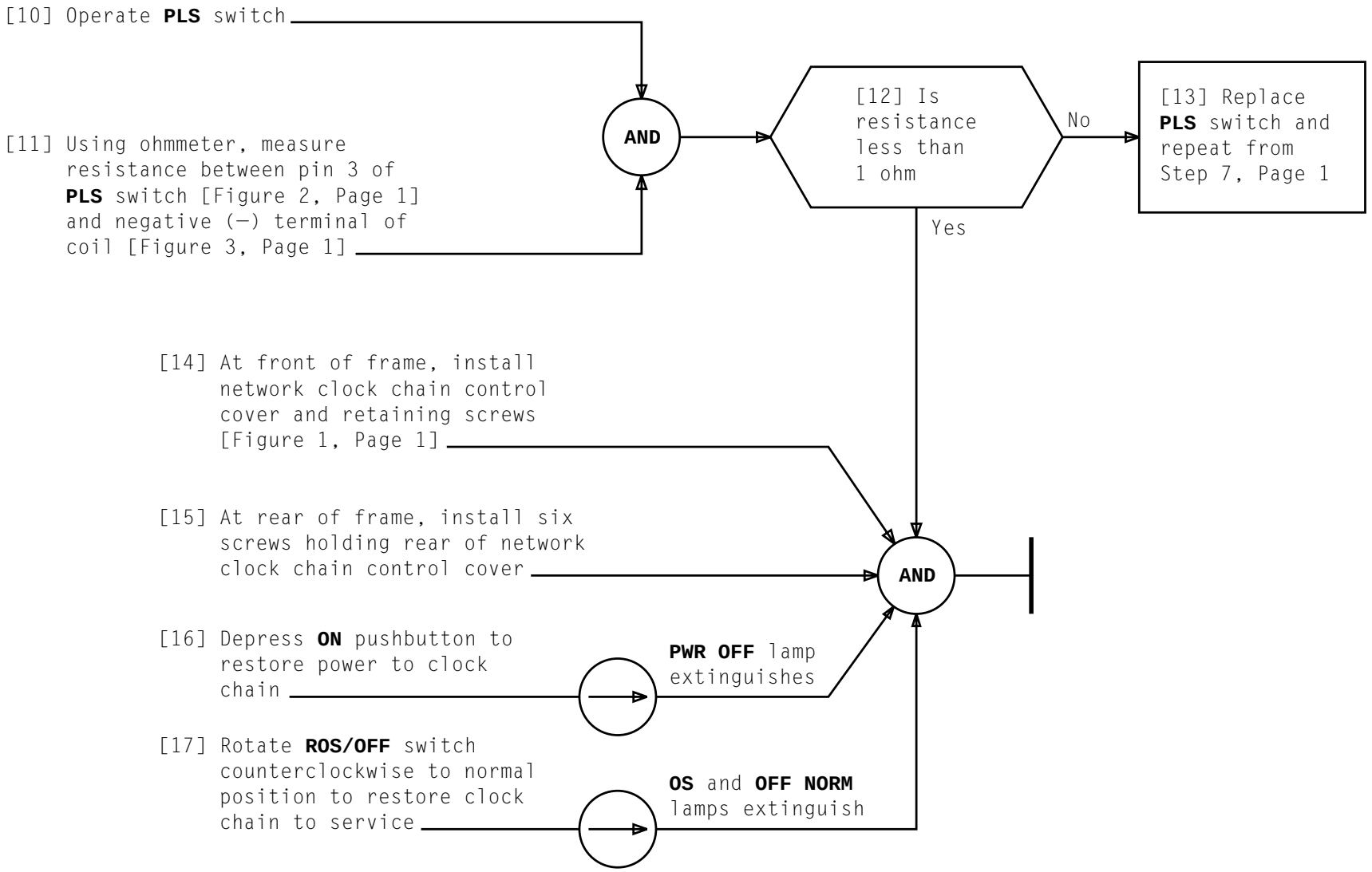
CLEAR R1 OR PLS FAULT – 39B OSCILLATOR



CLEAR R1 OR PLS FAULT — 39B OSCILLATOR

CLEAR PHASE LOCK OVEN TEMPERATURE FAULT

[1] See CAUTION 1. At TTY, enter **RMV:NCLK 0,CHAIN** a!
a = clock chain 0-3

TTY output message
RMV:NCLK 0 CHAIN a
COMPL

[2] Replace **FB217** circuit pack [DLP-500] associated with clock chain being tested [TABLE A]

[3] See NOTE 1.
Depress **MSO** switch

MSO lamp lights;
PHASE LOCK OVEN TEMP reset arms operate

AND

[4] Does **PHASE LOCK OVEN TEMP** meter indicate 2 divisions or more in either direction

No

[5] At TTY, enter **RST:NCLK 0,CHAIN** a!
a = clock chain 0-3
(system responds **RST:NCLK 0 CHAIN** a
COMPL)

Yes

[6] Restore original **FB217** circuit pack and remove (but do not replace) **FB214** circuit pack [TABLE A] and fuse associated with clock chain [DLP-500]

[7] See NOTE 1.
Depress **MSO** switch

AND

[8] Does **PHASE LOCK OVEN TEMP** meter indicate less than 1/2 division from zero

No

Page 2

Yes

[9] Install new **FB214** circuit pack and fuse removed in Step 6 [DLP-500]

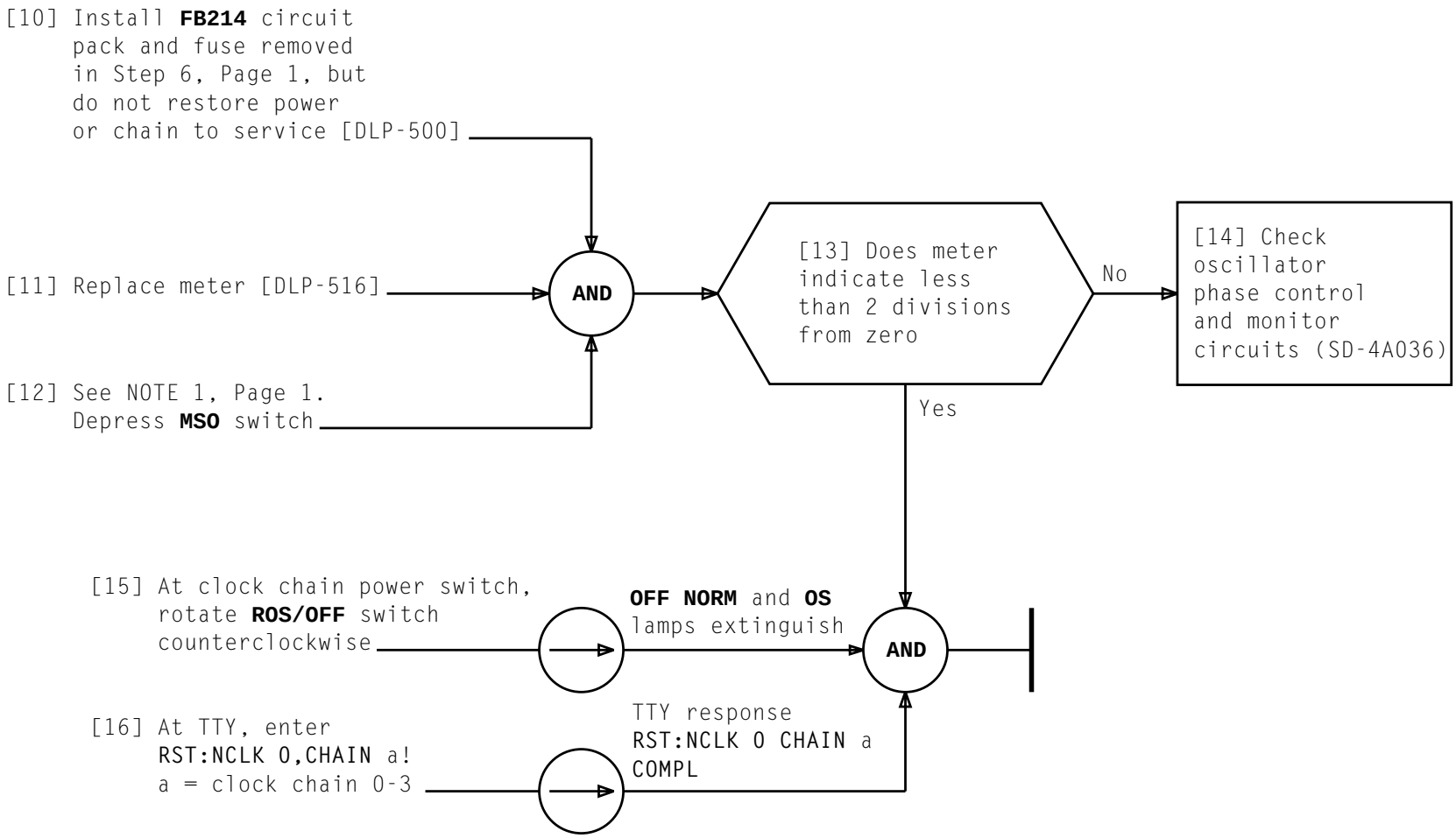
Page 2, Step 12

TABLE A
CIRCUIT PACK LOCATION

CHAIN	0	1	2	3
FB214	066-33	066-39	166-33	166-39
FB217	078-20	078-52	178-20	178-52

NOTE 1
Fifteen-minute delay is required before continuing to allow temperature stabilization

CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*



CLEAR PHASE LOCK OVEN TEMPERATURE FAULT

[1] See CAUTION 1. Replace **FB211** circuit pack [DLP-511] in first location listed under (A fuse) or across (B fuse) from fuse that failed voltage test [TABLE A]

[2] Remove fuse that failed voltage test

[3] Measure fuse socket voltage

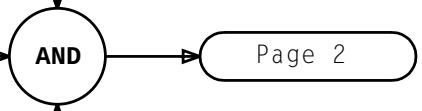
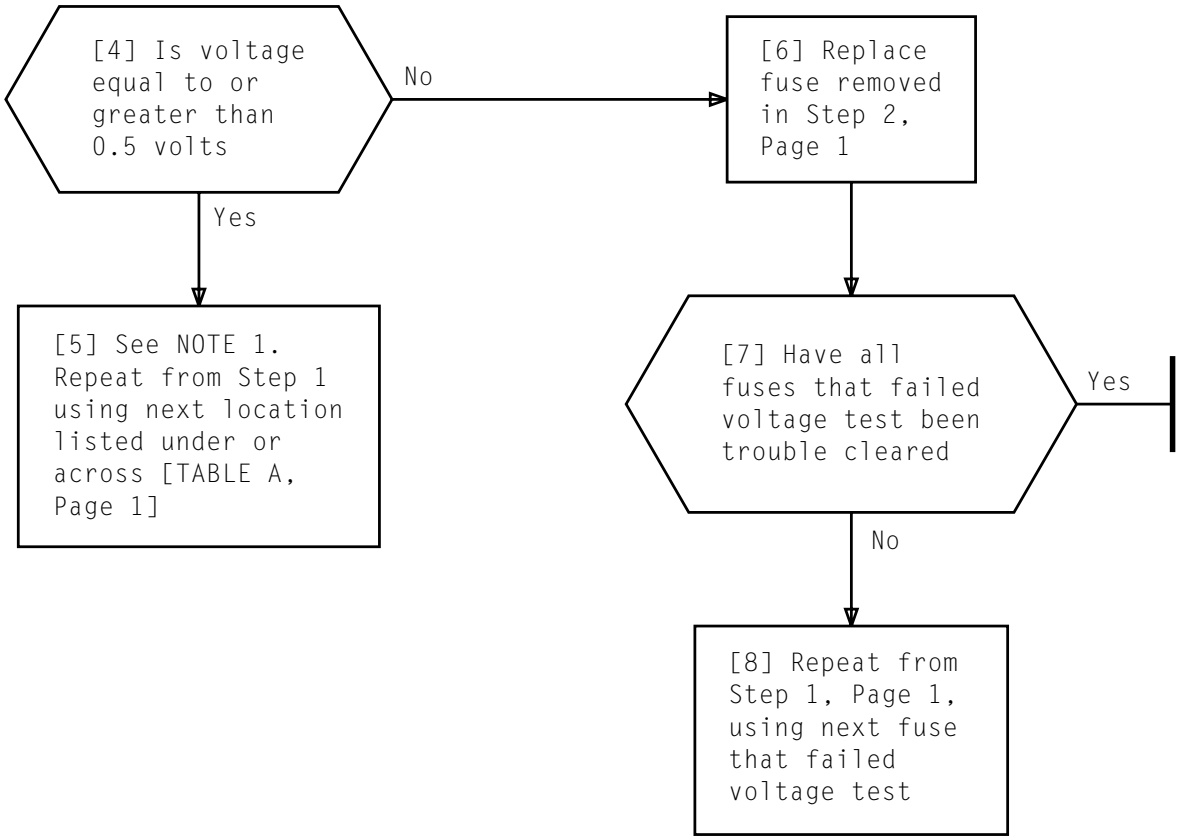


TABLE A
FB211 PACK LOCATION TO FUSE ASSIGNMENT

FUSE DESIG →	A1	A2	A3	A4	A5	A6	A7	A8	A9
B1	78-46	78-42	78-48	78-44	78-40	78-50	78-38	74-49	74-47
B2	78-45	78-41	78-47	78-43	78-39	78-49	78-37	74-48	74-46
B3	—	74-56	74-66	74-62	74-58	74-64	74-60	74-51	74-54
B4	74-67	74-55	74-65	74-61	74-57	74-63	74-59	74-50	74-52
B5	—	74-15	74-05	74-09	74-13	74-07	74-11	74-20	74-17
B6	74-04	74-16	74-06	74-10	74-14	74-08	74-12	74-21	74-19
B7	78-25	78-29	78-23	78-27	78-31	78-21	78-33	74-22	74-24
B8	78-26	78-30	78-24	78-28	78-32	78-22	78-34	74-23	74-25

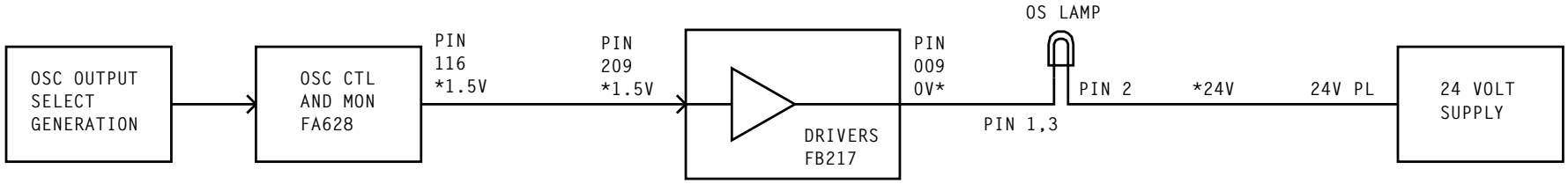
CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

CLEAR SHORTED POWER-ORING DIODE IN FB211 CIRCUIT PACK



NOTE 1
FB211 pack removed will be used as spare

CLEAR SHORTED POWER-ORING DIODE IN FB211 CIRCUIT PACK



*APPROXIMATE VOLTAGE TO LIGHT LAMP

OSCILLATOR OUT-OF-SERVICE LAMP CIRCUIT

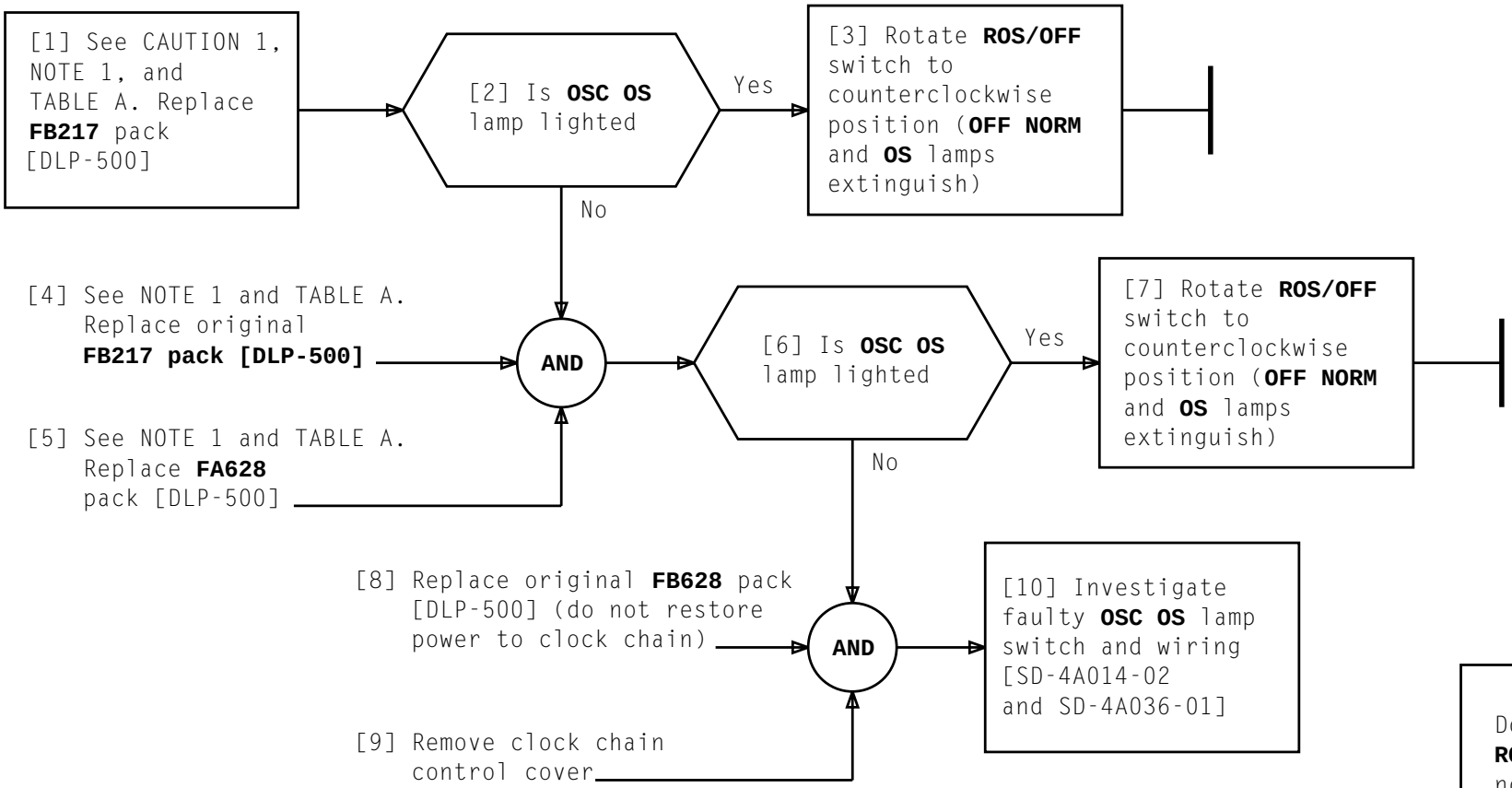


TABLE A				
CLOCK CHAIN	**0**	**1**	**2**	**3**
CIRCUIT PACK	**LOCATION**			
FB217	078-20	078-52	178-20	178-52
FA628	070-29	070-42	170-29	170-42

NOTE 1
Do not rotate **ROS/OFF** switch to normal position

CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

CLEAR OSCILLATOR OUT-OF-SERVICE (OSC OS) LAMP FAULT

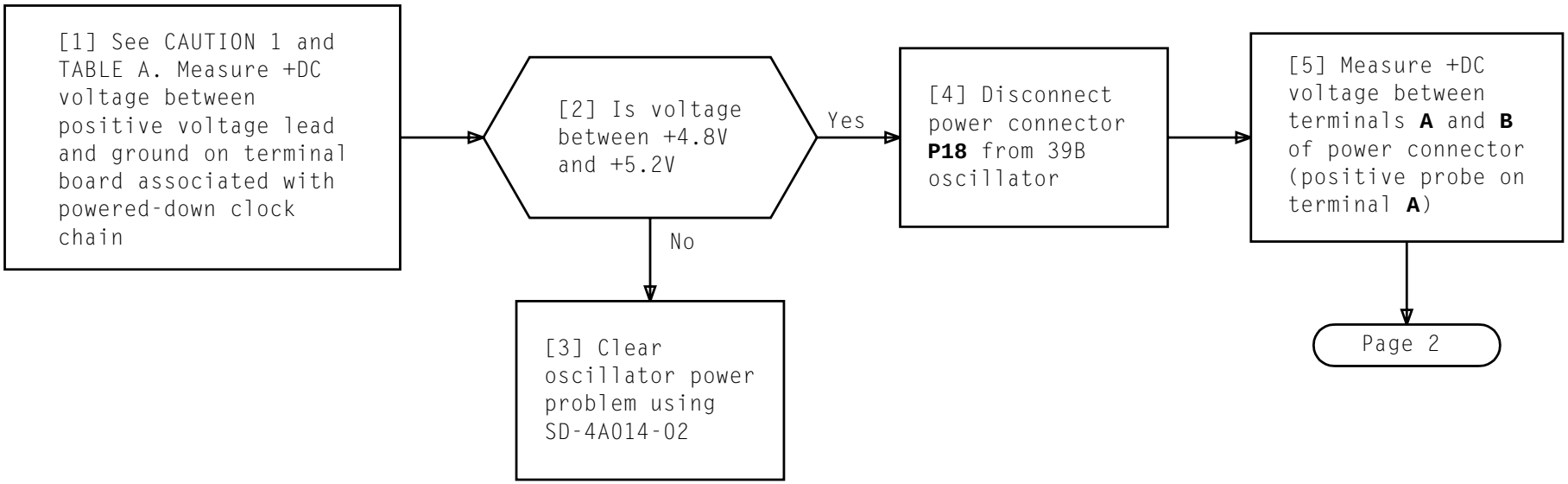


TABLE A

CLOCK CHAIN	CONVERTER LOCATION	POSITIVE VOLTAGE LEAD	PIN	GROUND LEAD	PIN
0	019-31	0+5V00	1	0+5T00	2
1	019-42	0+5V01	1	0+5T01	2
2	119-31	1+5V00	1	1+5T00	2
3	119-42	1+5V01	1	1+5T01	2

CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

CLEAR 39B OSCILLATOR FULL FREQUENCY RANGE PROBLEM

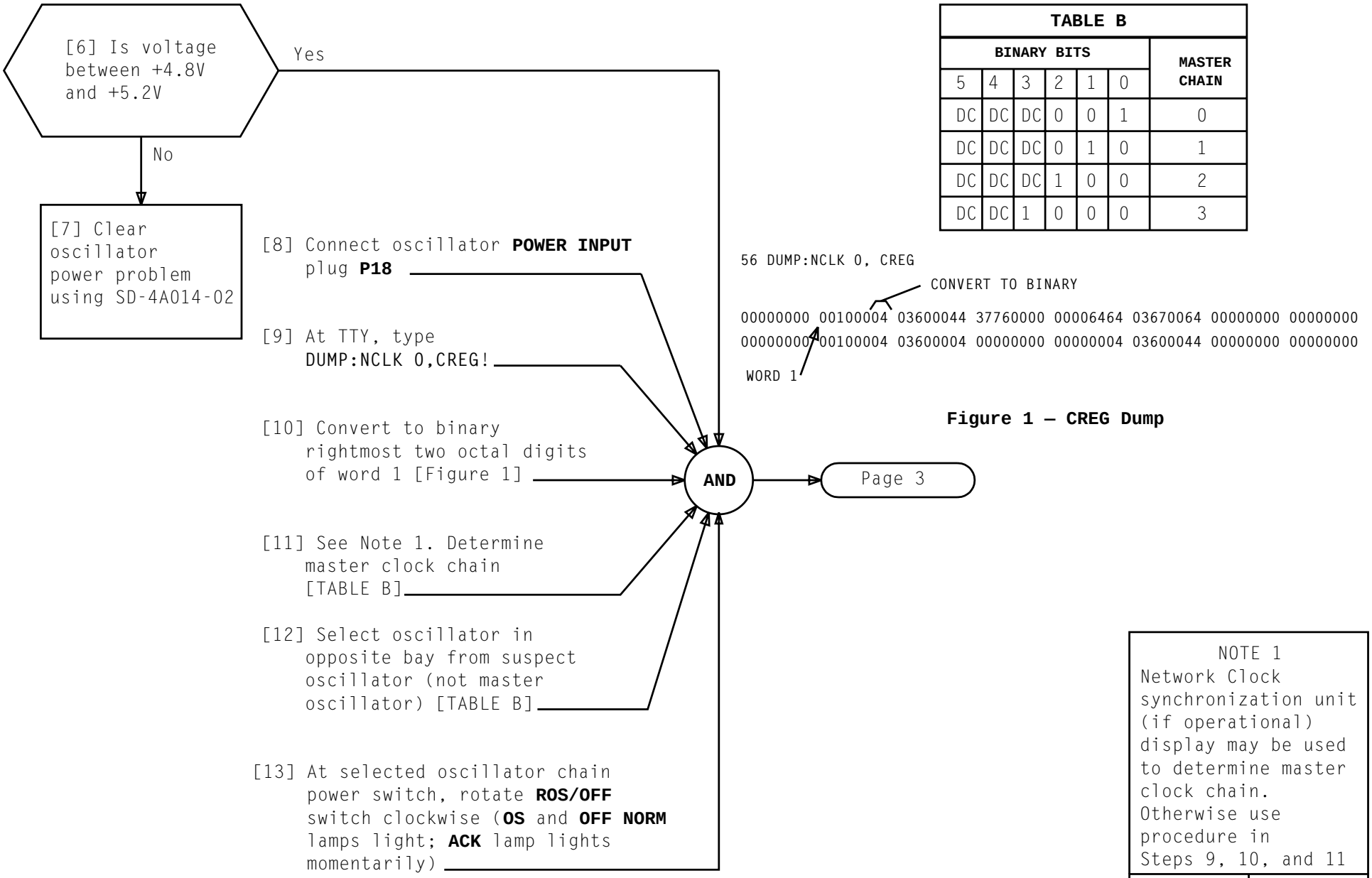


TABLE B

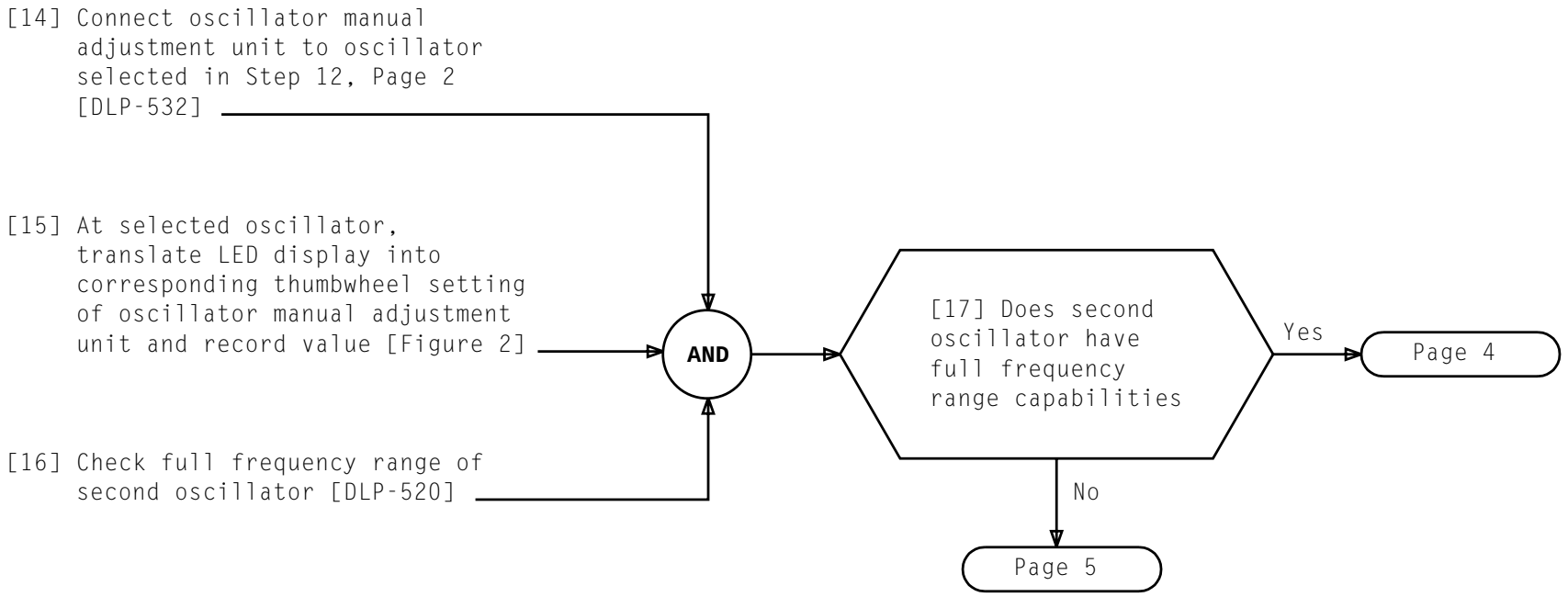
BINARY BITS						MASTER CHAIN
5	4	3	2	1	0	
DC	DC	DC	0	0	1	0
DC	DC	DC	0	1	0	1
DC	DC	DC	1	0	0	2
DC	DC	1	0	0	0	3

```
56 DUMP:NCLK 0, CREG
                    CONVERT TO BINARY
00000000 00100004 03600044 37760000 00006464 03670064 00000000 00000000
00000000 00100004 03600004 00000000 00000004 03600044 00000000 00000000
WORD 1
```

Figure 1 – CREG Dump

NOTE 1
Network Clock synchronization unit (if operational) display may be used to determine master clock chain. Otherwise use procedure in Steps 9, 10, and 11

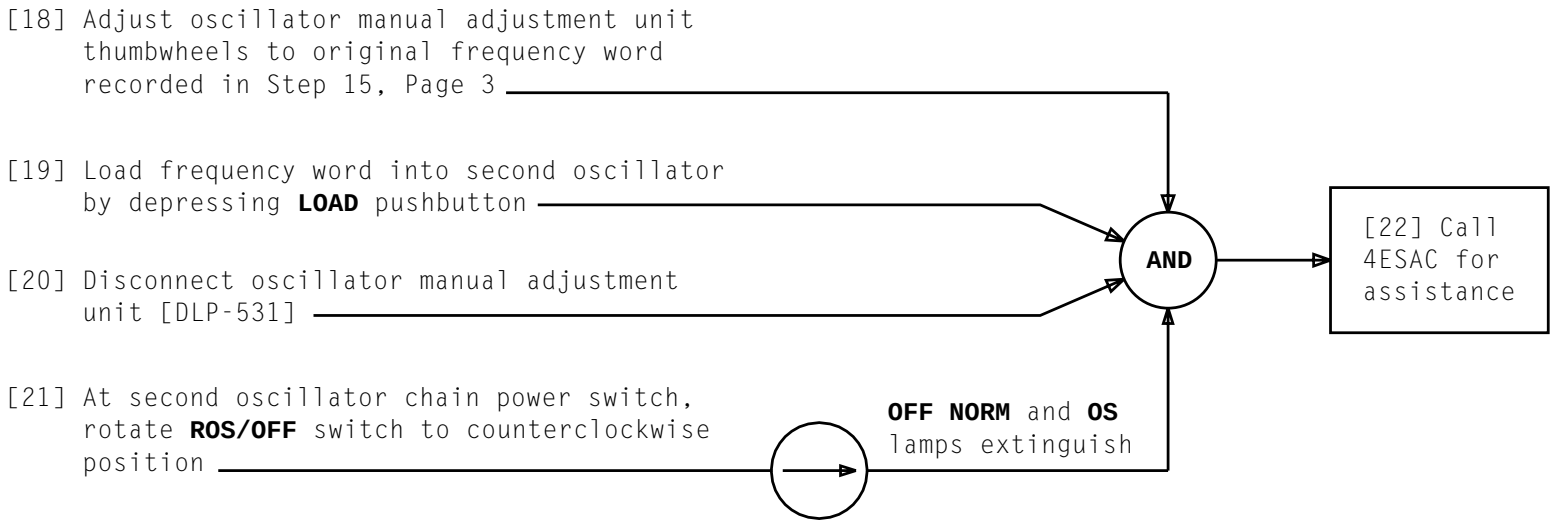
CLEAR 39B OSCILLATOR FULL FREQUENCY RANGE PROBLEM



	LED POSITION (TOP → BOTTOM)													
	14	13	12	11	10	9	8	7	6	5	4	3	2	1
LED BINARY NUMBER	1	0	1	0	1	0	1	0	0	1	1	1	1	1
THUMBWHEEL HEX NUMBER	2		A				9				F			

Figure 2 – Example of Binary to Hexadecimal Conversion of Oscillator LED Display for Oscillator Manual Adjustment Unit Thumbwheel Setting

CLEAR 39B OSCILLATOR FULL FREQUENCY RANGE PROBLEM



CLEAR 39B OSCILLATOR FULL FREQUENCY RANGE PROBLEM

[23] Disconnect oscillator manual adjustment unit [DLP-531]

[24] At TTY, type
RST:NCLK 0;OSC a!
a = second oscillator removed from service
c = chain of requested oscillator

Response:
RST:NCLK 0
CHAIN c **COMPL**

[25] At TTY, type
RST:NCLK 0;OSC b!
b = first oscillator removed from service
c = chain of requested oscillator

Response:
RST:NCLK 0
CHAIN c **COMPL**

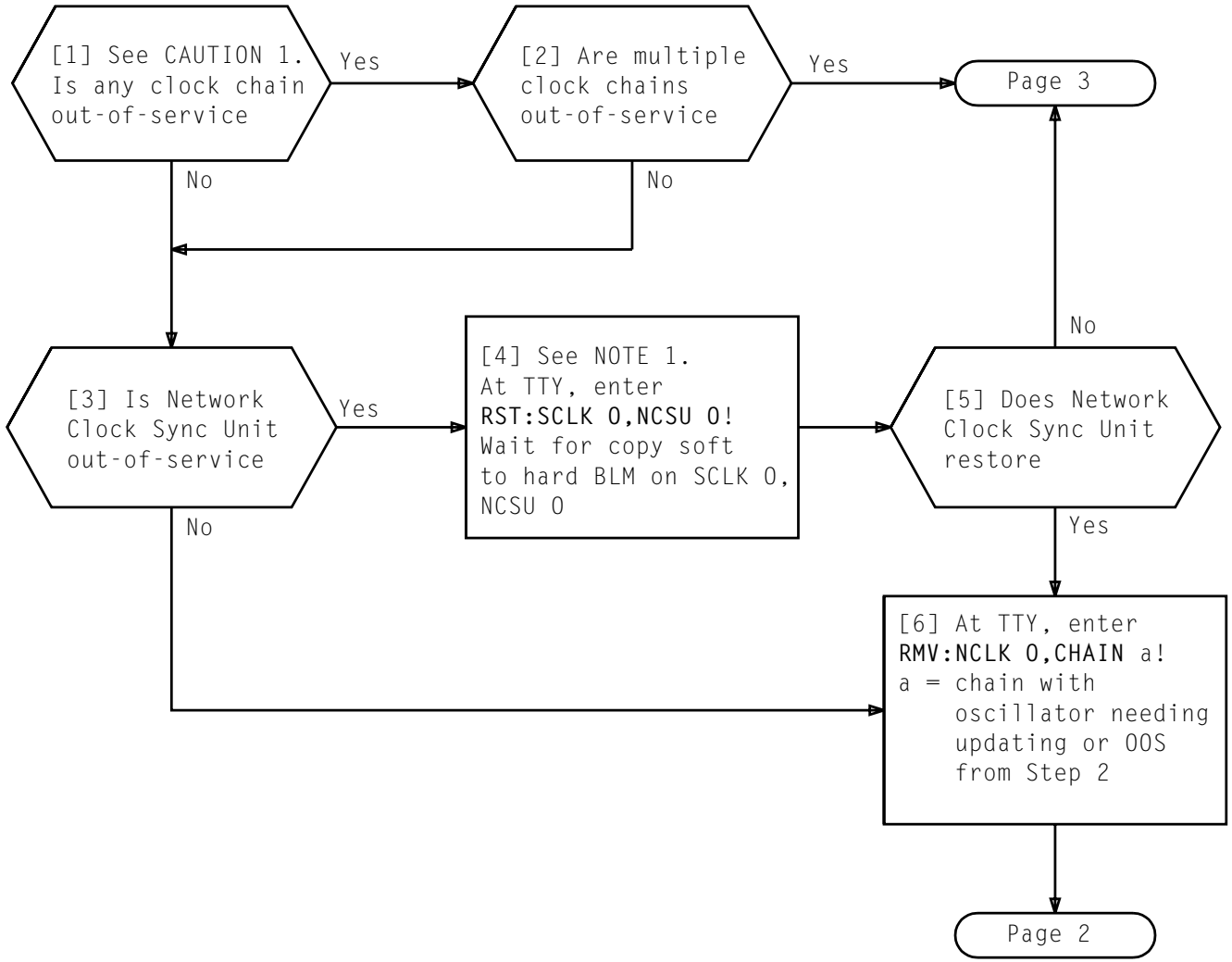
[26] At power switch, rotate **ROS** switch to normal position

OS and **OFF NORM** lamps extinguish

AND

[27] Repair suspect faulty cabling between oscillator manual adjustment unit and 39B oscillator

CLEAR 39B OSCILLATOR FULL FREQUENCY RANGE PROBLEM



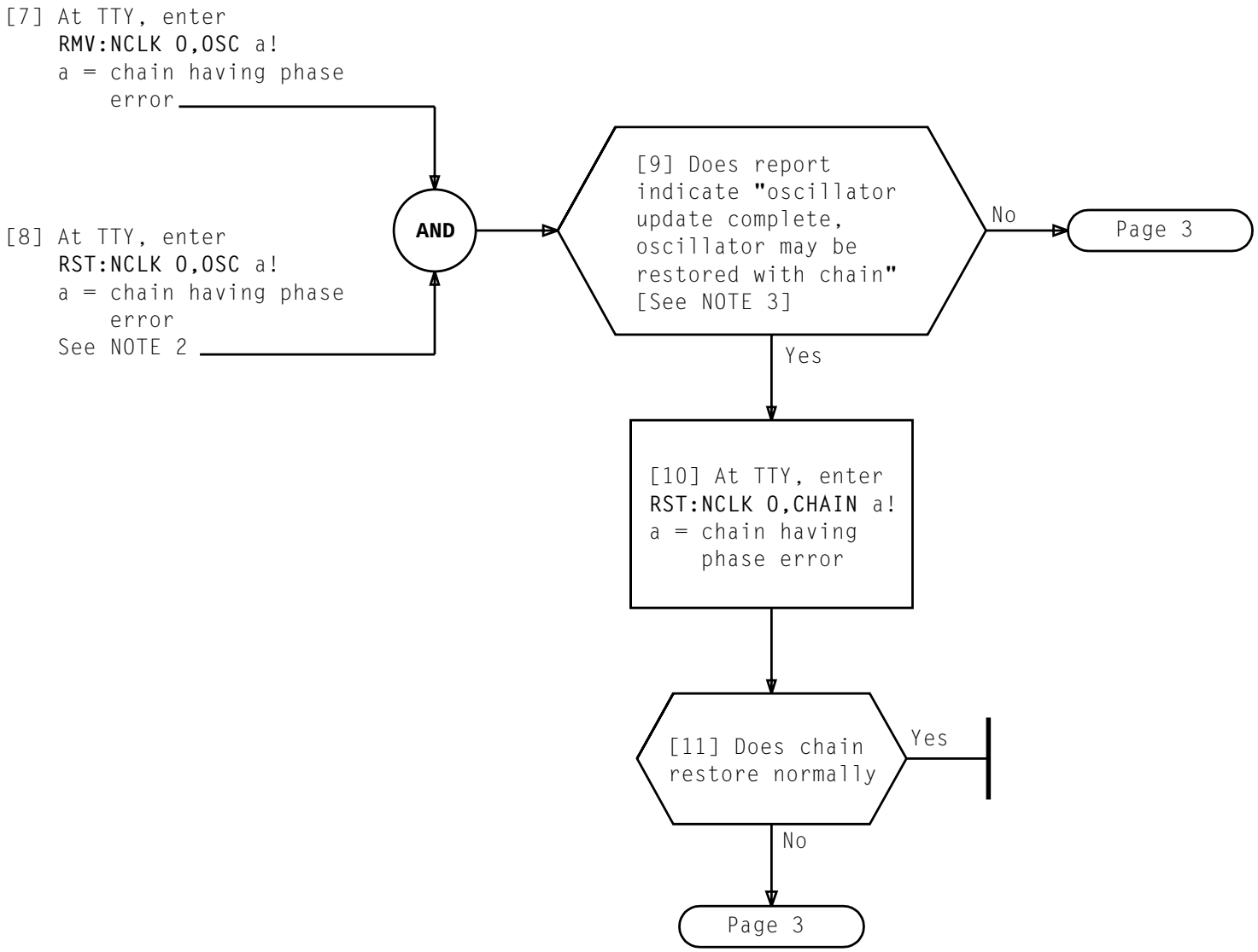
NOTE 1

STROBE switches on all 39B oscillators should be in the up or **ENABLE** position

CAUTION 1

This procedure calls for UCL restores of out-of-service chains. Contact next level of technical support for assistance

CLEAR PHASE ERROR — 39B OSCILLATORS



NOTES

2. Oscillator restore is reported immediately, but wait for report of result of NCSU update. May take up to 5 minutes
3. Other variations of the update report indicate "manual update required"

CLEAR PHASE ERROR — 39B OSCILLATORS

[12] At TTY, enter **RMV:SCLK 0,NCSU 0!**

[13] Disable all 39B oscillators using the **STROBE** switch on each oscillator

[14] See NOTE 4. Ensure chain with phase error is out-of-service

[15] See CAUTION 2. Calibrate scope [DLP-529]

[16] Connect channel 1 scope probe to terminal 218 of **FB214** pack [TABLE A] for chain having phase error cleared

AND

[17] Is waveform between 1.7 and 2.1 volts peak-to-peak

Yes → Page 9

No

No → [22] Clear phase error [SD-4A036-01]

[18] Enter **DUMP:NCLK 0,CREG!**

[19] Convert rightmost two octal digits of word 2 in response message to binary [Figure 1, Page 4]

[20] Use binary results to determine master clock chain [TABLE B]

AND

[21] Remove channel 1 scope probe from terminal 218 of **FB214** pack and connect probe to master oscillator input terminal of **FB213** pack [TABLES A and C]

Page 4

TABLE A

CLOCK CHAIN	0	1	2	3
CIRCUIT PACK	LOCATION			
FB213	070-32	070-39	170-32	170-39
FB214	066-33	066-39	166-33	166-39
FB687	070-34	070-37	170-34	170-37

TABLE B

BINARY BITS						MASTER CHAIN
5	4	3	2	1	0	
DC	DC	DC	0	0	1	0
DC	DC	DC	0	1	0	1
DC	DC	DC	1	0	0	2
DC	DC	1	0	0	0	3

TABLE C

MASTER CLOCK CHAIN	0	1	2	3
FB213 master oscillator input terminal	003	002	201	001

NOTE 4

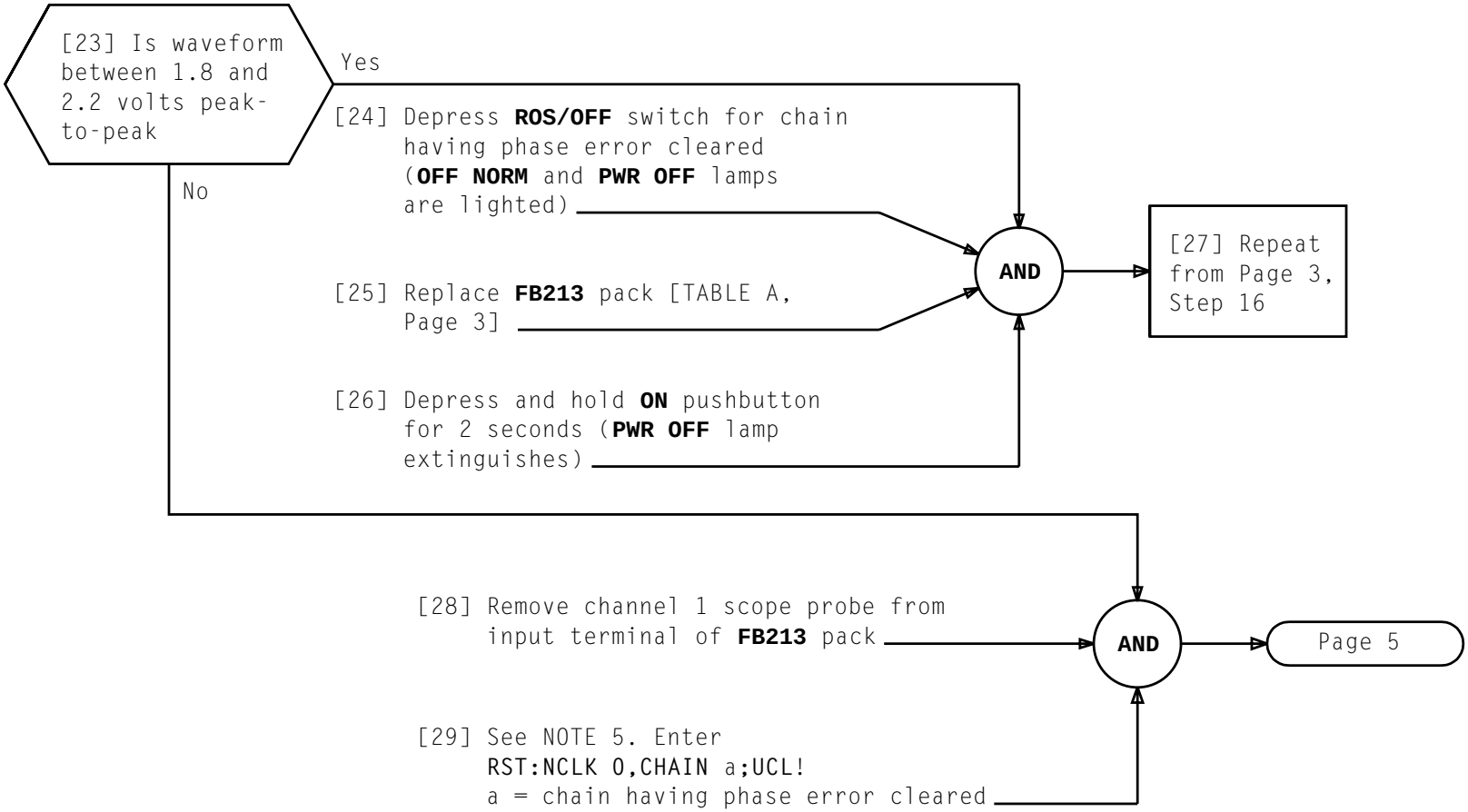
If clearing phase errors in all four clock chains, follow this sequence:

Chains 2, 0 followed by 1, 3 or 3, 1 unless chain other than 2 is out-of-service with diagnostic failure, then clear out-of-service chain first

CAUTION 2

Improper scope calibration may affect service

CLEAR PHASE ERROR — 39B OSCILLATORS




```
                CONVERT TO BINARY
56 DUMP:NCLK 0,CREG
   00000000 00100004 03600044 37760000 00006464 03670064 00000000 00000000
   00000000 00100004 03600004 00000000 00000004 03600044 00000000 00000000
   WORD 1
```

Figure 1 – CREG Dump

NOTE 5
Ensure chain is powered up before restoring unconditionally

CLEAR PHASE ERROR – 39B OSCILLATORS

[30] Enter
RMV:NCLK 0,CHAIN a!
a = master clock chain determined in Step 20, Page 3

[31] Connect channel 1 scope probe to terminal 018 of **FB214** pack [TABLE A, Page 3] (master clock chain)

AND

[32] Is waveform between 1.8 and and 2.0 volts peak-to-peak

Yes

[33] Remove scope probe from pack

No

[34] See NOTE 5, Page 4. Enter
RST:NCLK 0,CHAIN a;**UCL**!
a = master clock chain

AND

[35] Enter
RMV:NCLK 0,CHAIN a!
a = chain having phase error cleared

[36] Repeat from Step 16, Page 3

[37] Is waveform between 1.4 and and 2.4 volts peak-to-peak

No

Page 7

Yes

[38] Remove level adjustment cover from 39B oscillator [Figure 2] of master clock chain and adjust potentiometer to measure 1.9 volts peak-to-peak

[39] Replace level adjustment cover

Page 6

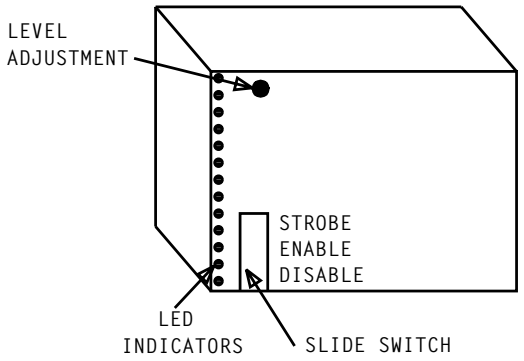
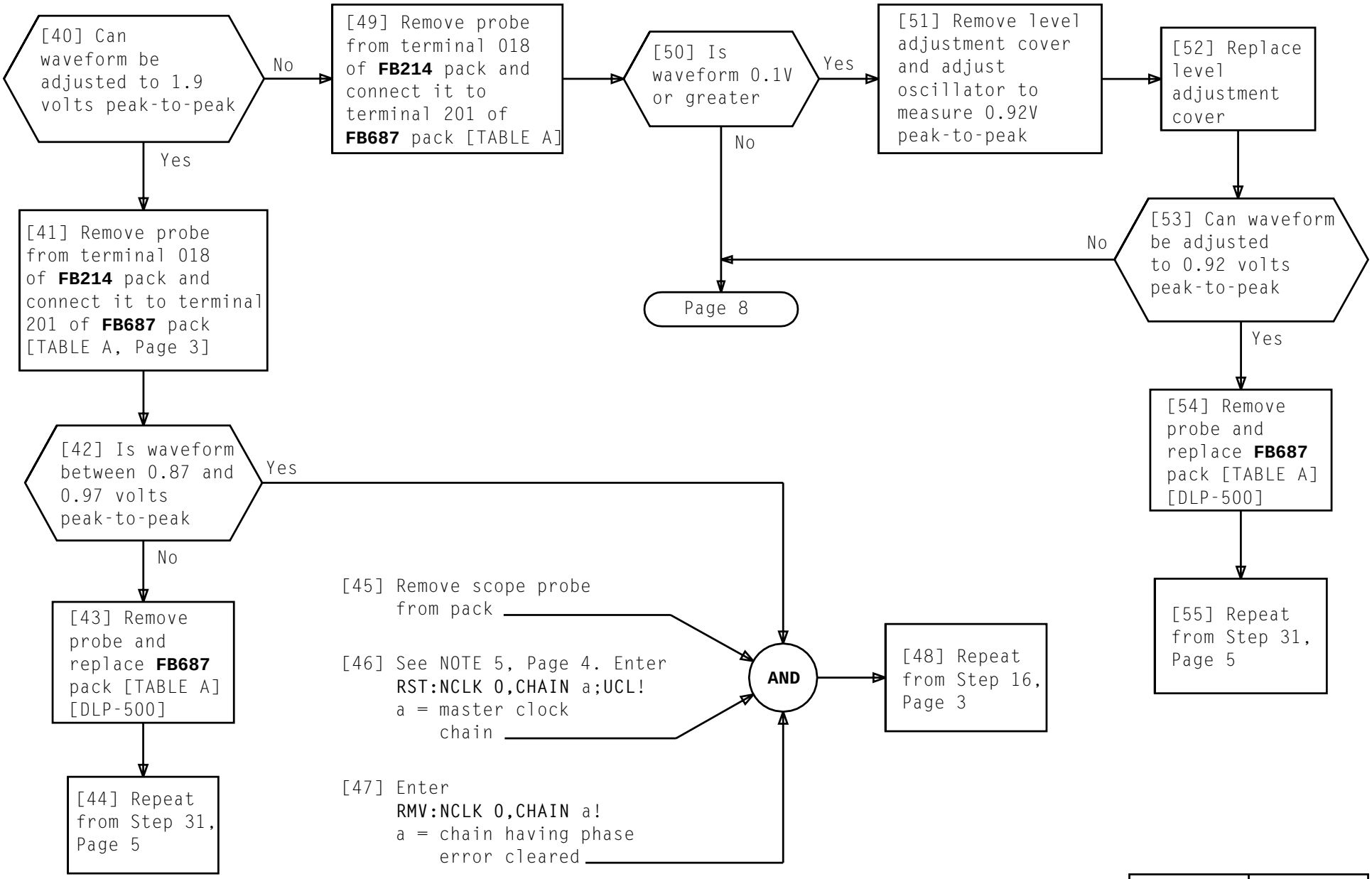
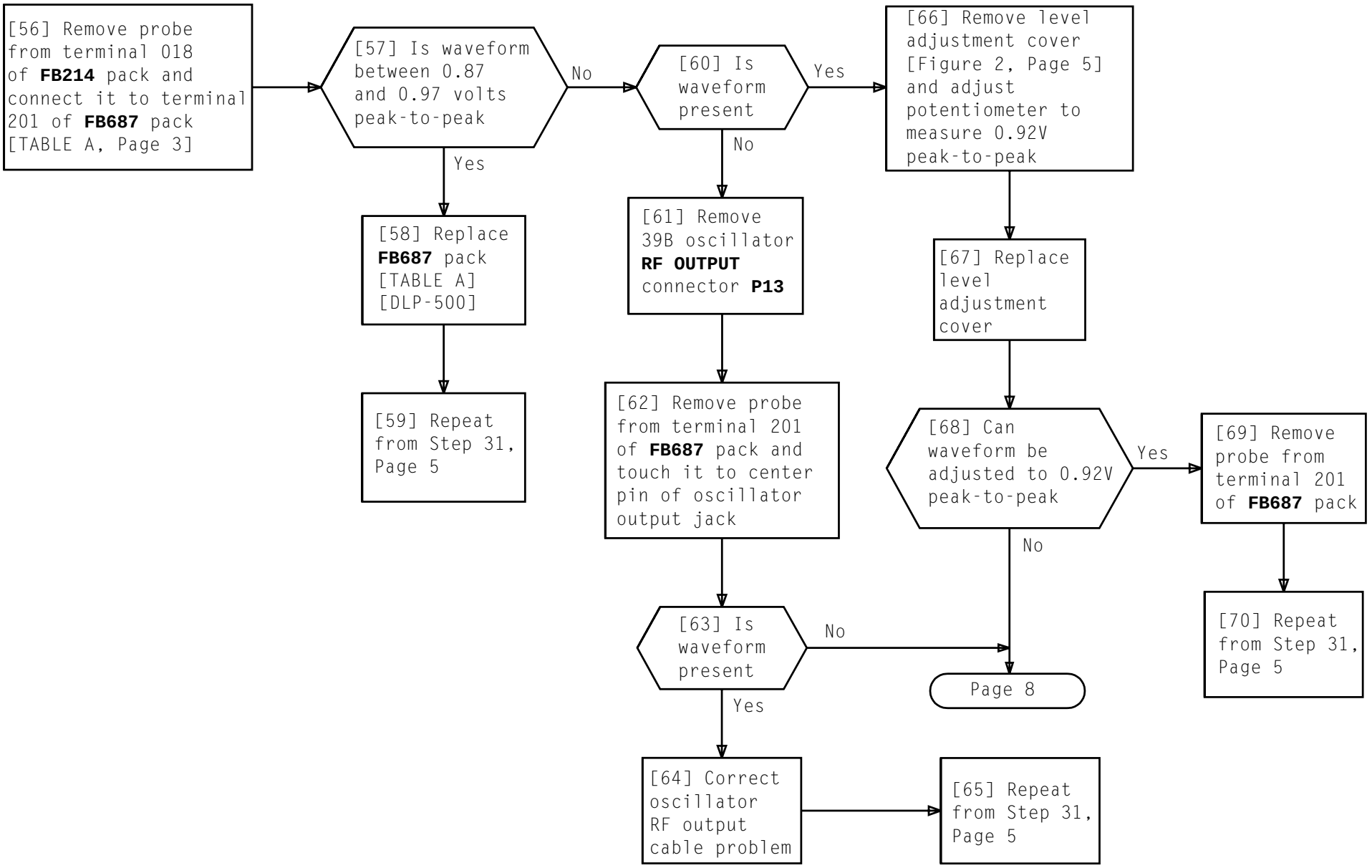


Figure 2 – 39B Oscillator

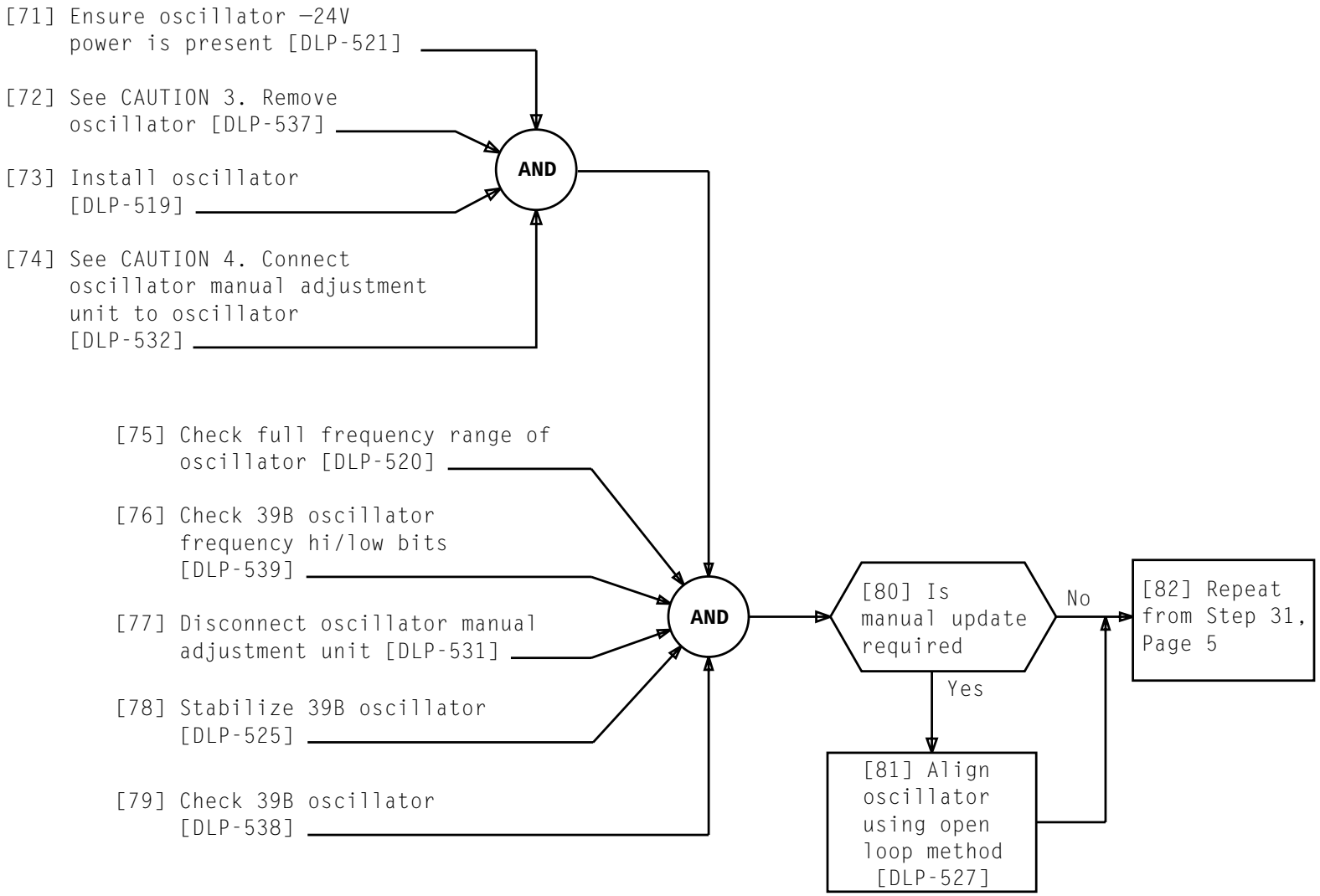
CLEAR PHASE ERROR – 39B OSCILLATORS



CLEAR PHASE ERROR — 39B OSCILLATORS



CLEAR PHASE ERROR — 39B OSCILLATORS



CAUTIONS

3. *Remove RF OUTPUT cable (**P13**) immediately even if oscillator is not physically removed immediately*
4. *Clock chain of oscillator being checked must be powered down*

CLEAR PHASE ERROR — 39B OSCILLATORS

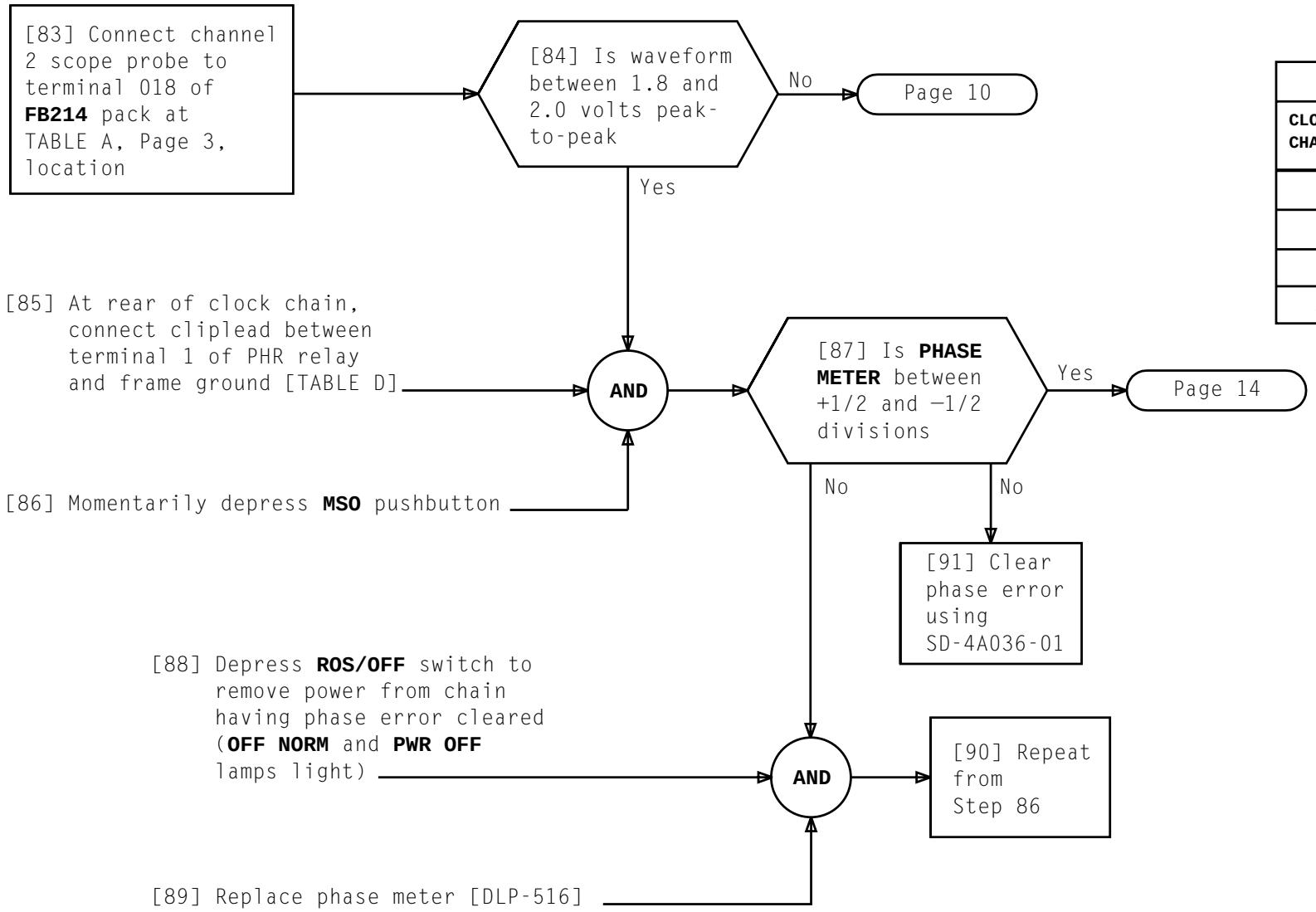
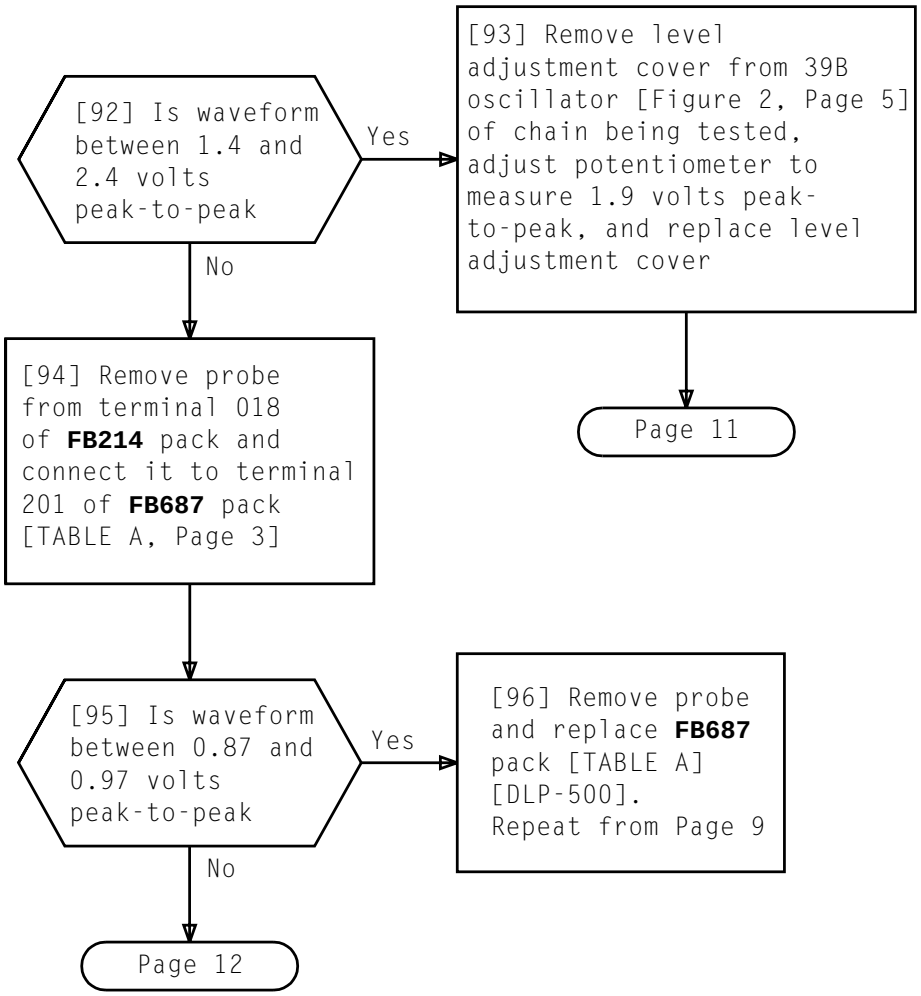
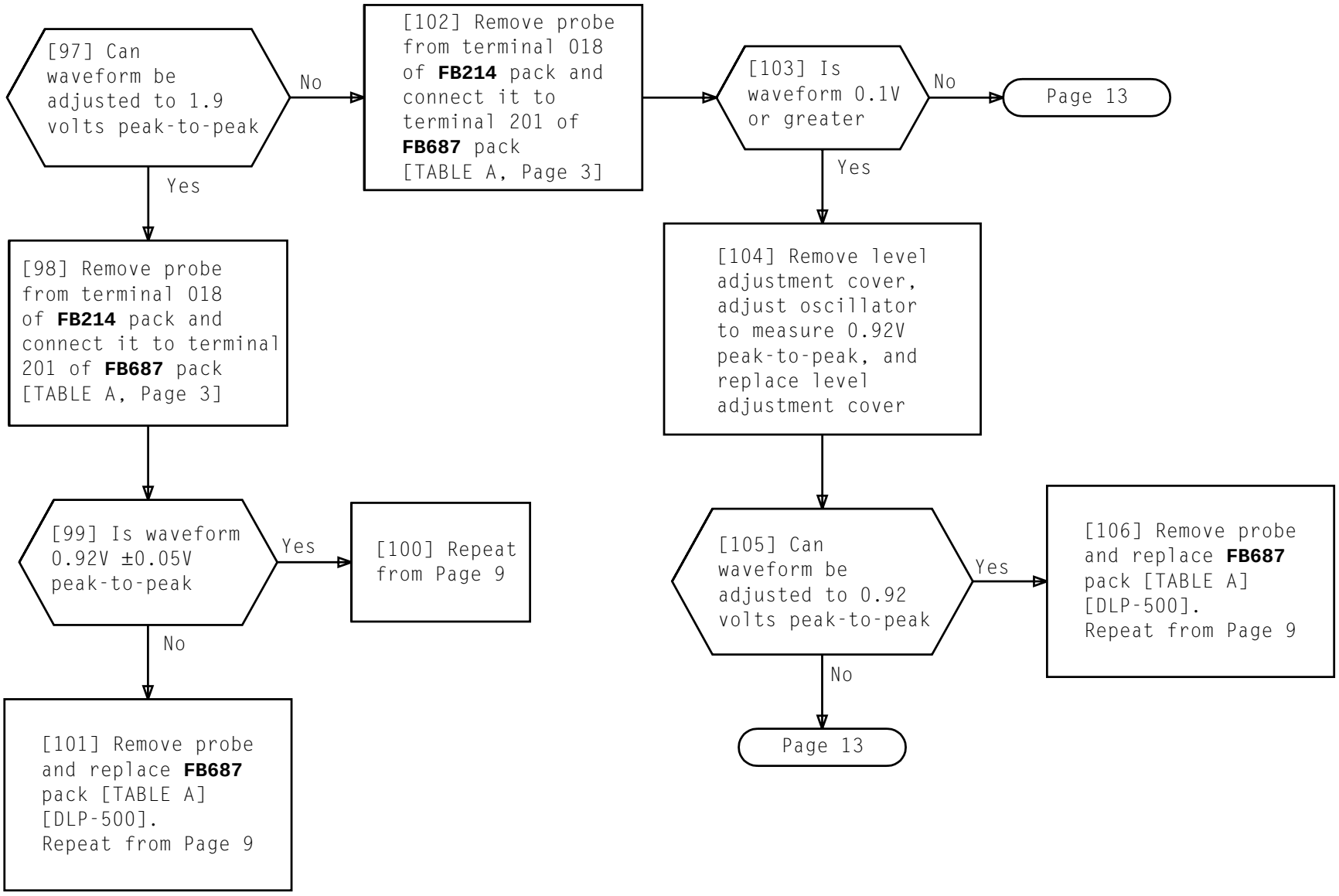


TABLE D		
CLOCK CHAIN	**RELAY**	**RELAY LOCATION**
0	**0PHR**	066-24
1	**1PHR**	066-47
2	**0PHR**	166-24
3	**1PHR**	166-47

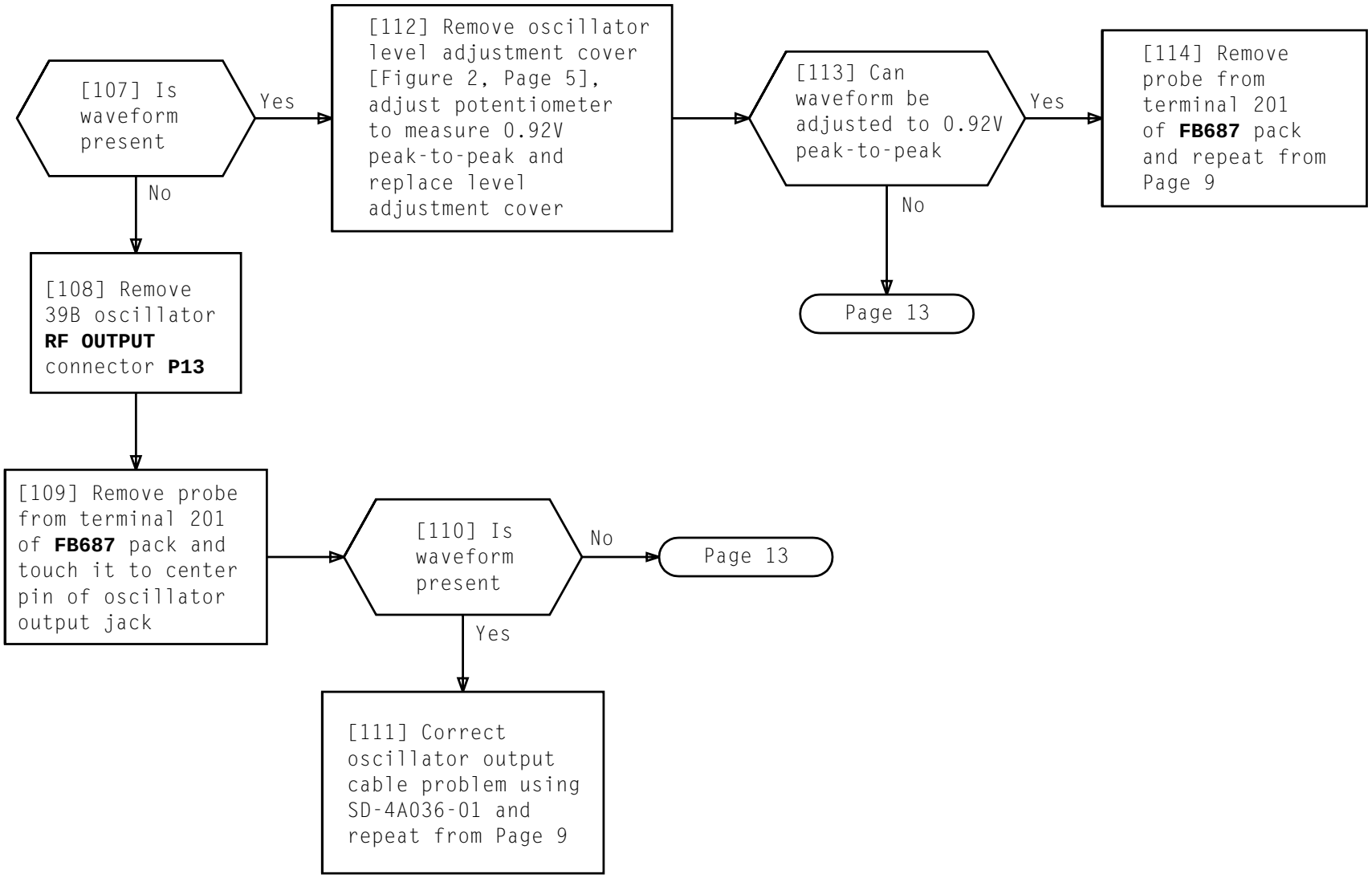
CLEAR PHASE ERROR — 39B OSCILLATORS



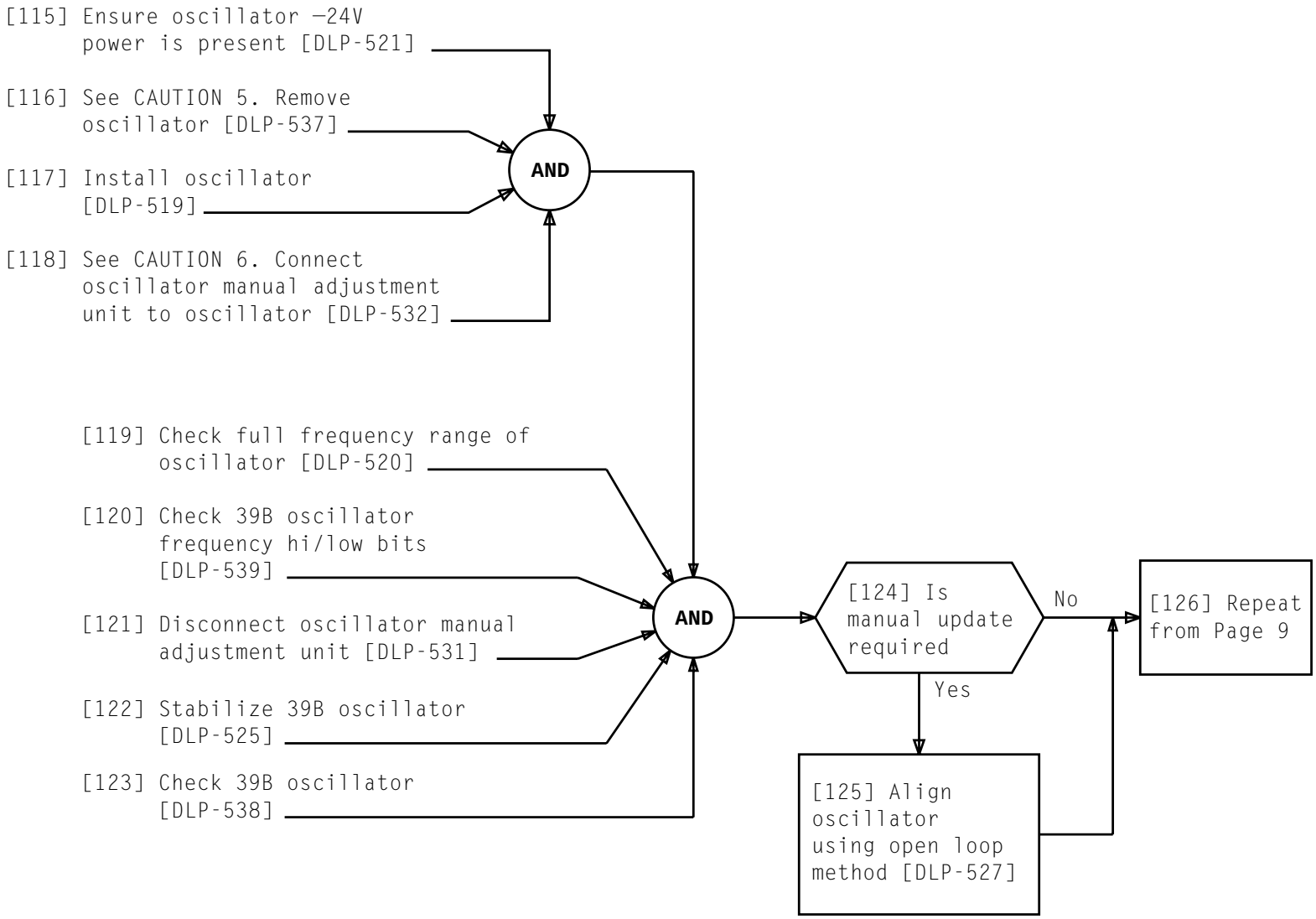
CLEAR PHASE ERROR — 39B OSCILLATORS



CLEAR PHASE ERROR — 39B OSCILLATORS



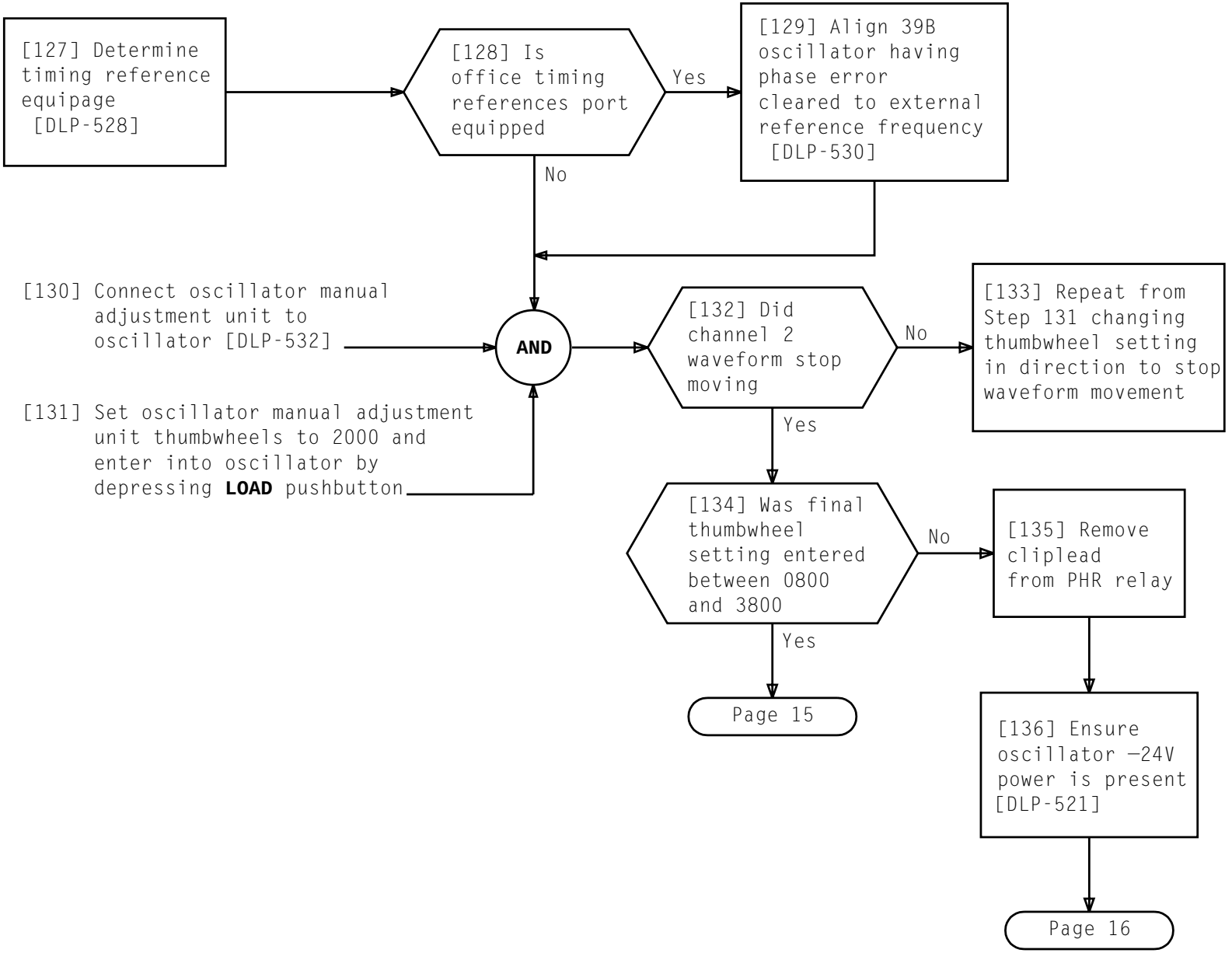
CLEAR PHASE ERROR — 39B OSCILLATORS



CAUTIONS

5. *Remove RF OUTPUT cable (**P13**) immediately even if oscillator is not physically removed immediately*
6. *Clock chain of oscillator being checked must be powered down*

CLEAR PHASE ERROR — 39B OSCILLATORS



CLEAR PHASE ERROR — 39B OSCILLATORS

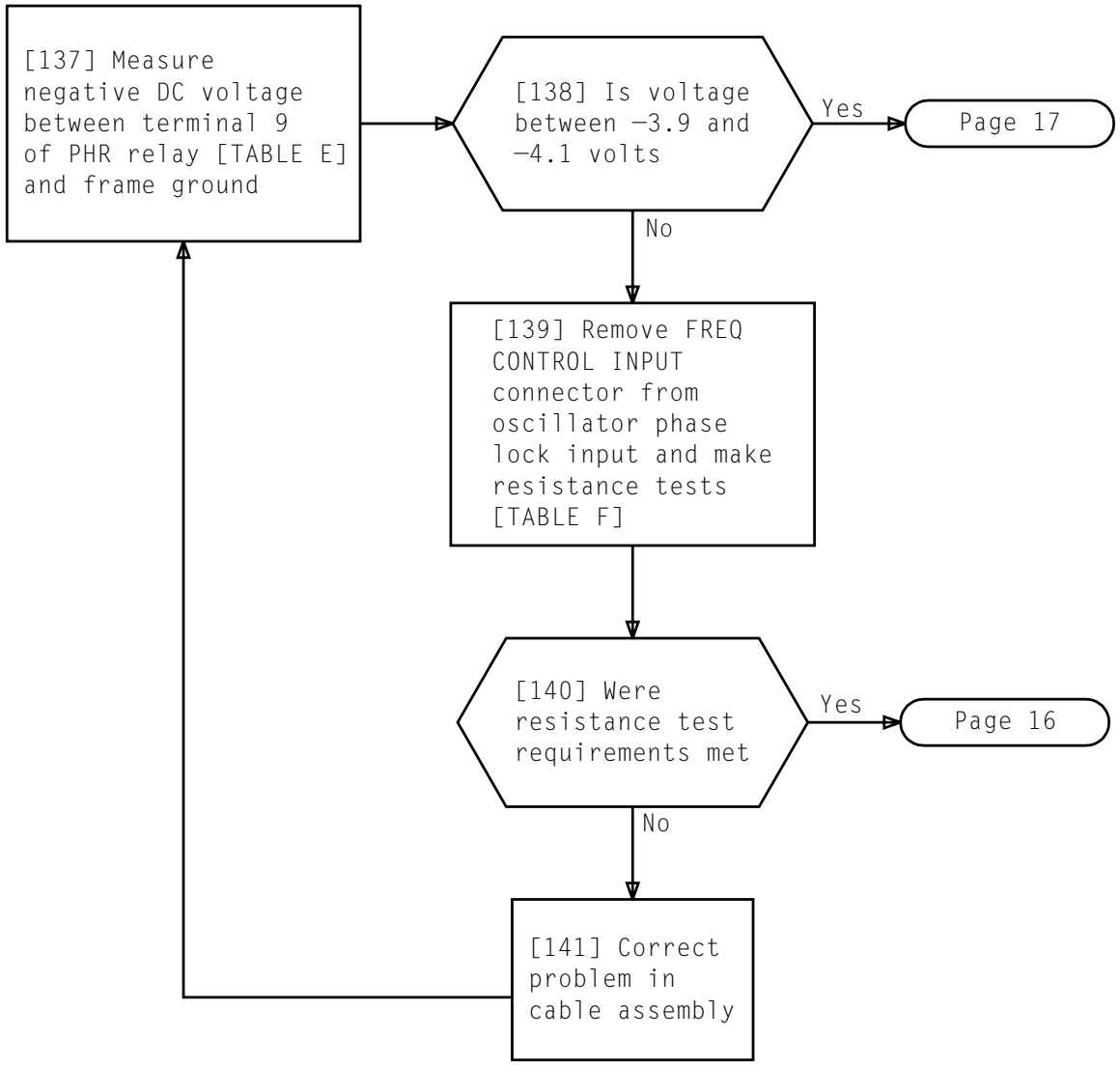


TABLE E

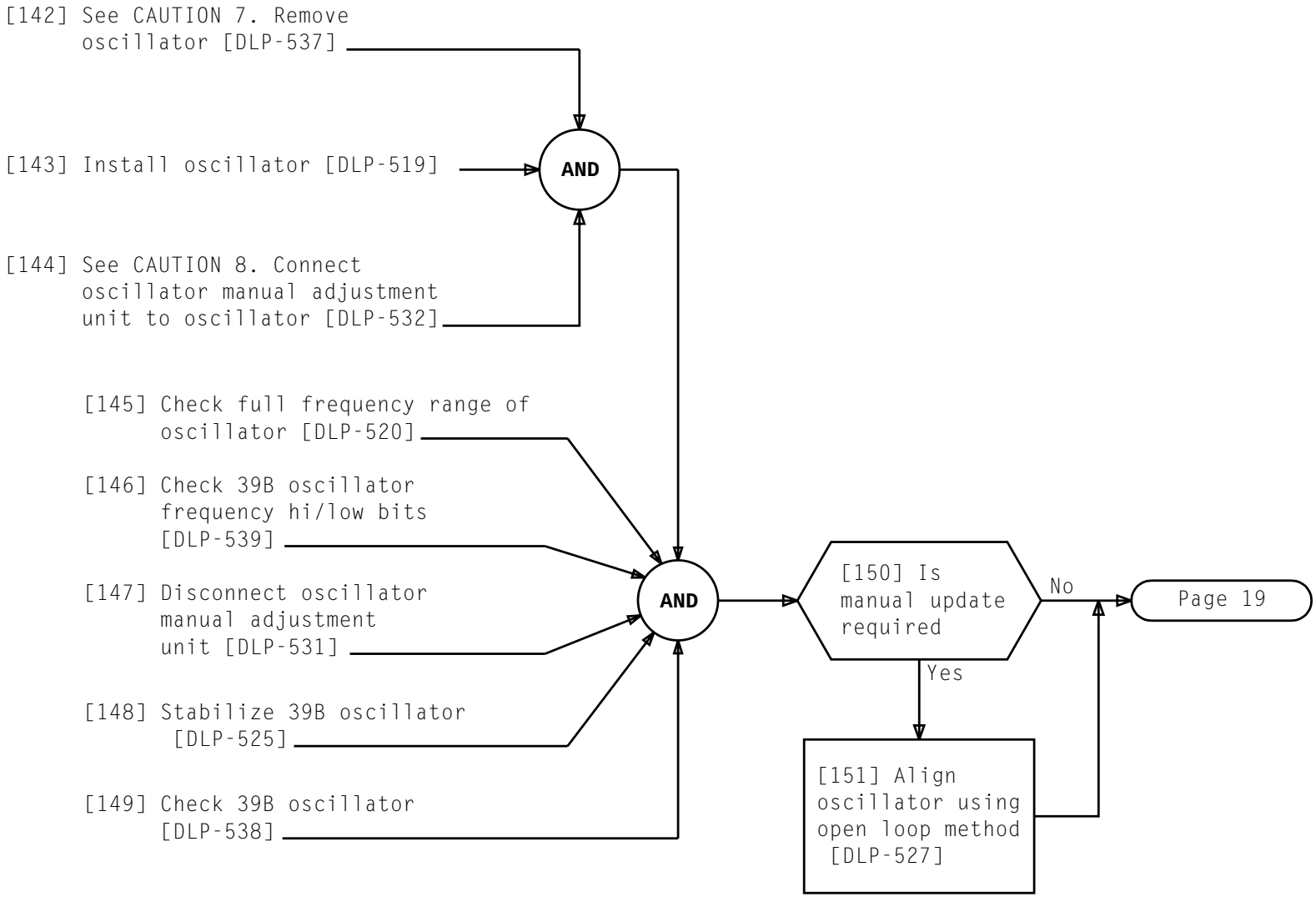
CLOCK CHAIN	RELAY	RELAY LOCATION
0	**0PHR**	066-24
1	**1PHR**	066-47
2	**0PHR**	166-24
3	**1PHR**	166-47

TABLE F

MEASURE BETWEEN		OHMS
OSC PLI CONN TERM	PHR RELAY	
B	Ground	0
D	Ground	0
E	Terminal 9	0
F	Terminal 9	⇒*

* Infinity reading

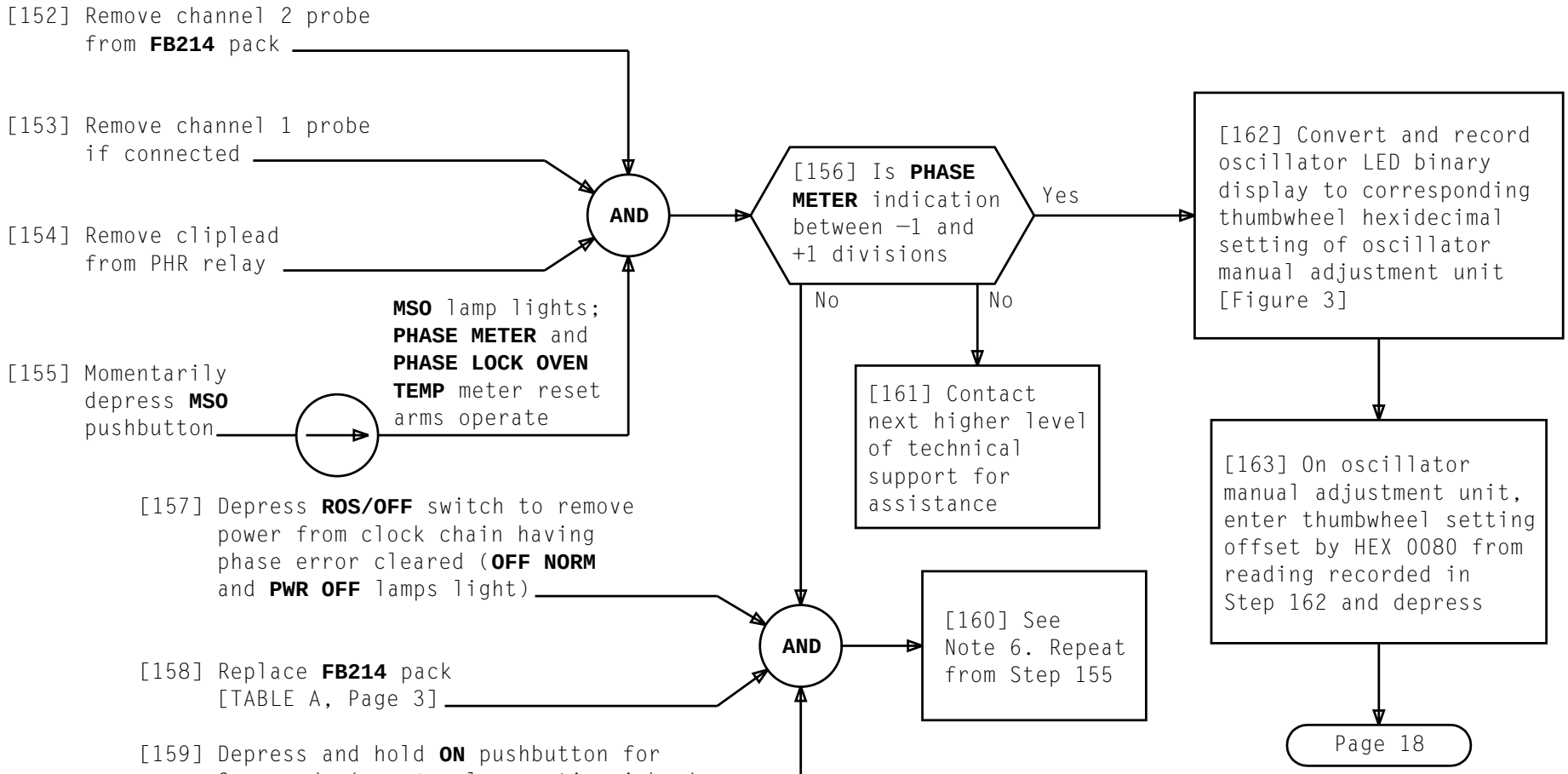
CLEAR PHASE ERROR — 39B OSCILLATORS



CAUTIONS

7. *Remove RF OUTPUT cable (**P13**) immediately even if oscillator is not physically removed immediately*
8. *Clock chain of oscillator being checked must be powered down*

CLEAR PHASE ERROR — 39B OSCILLATORS

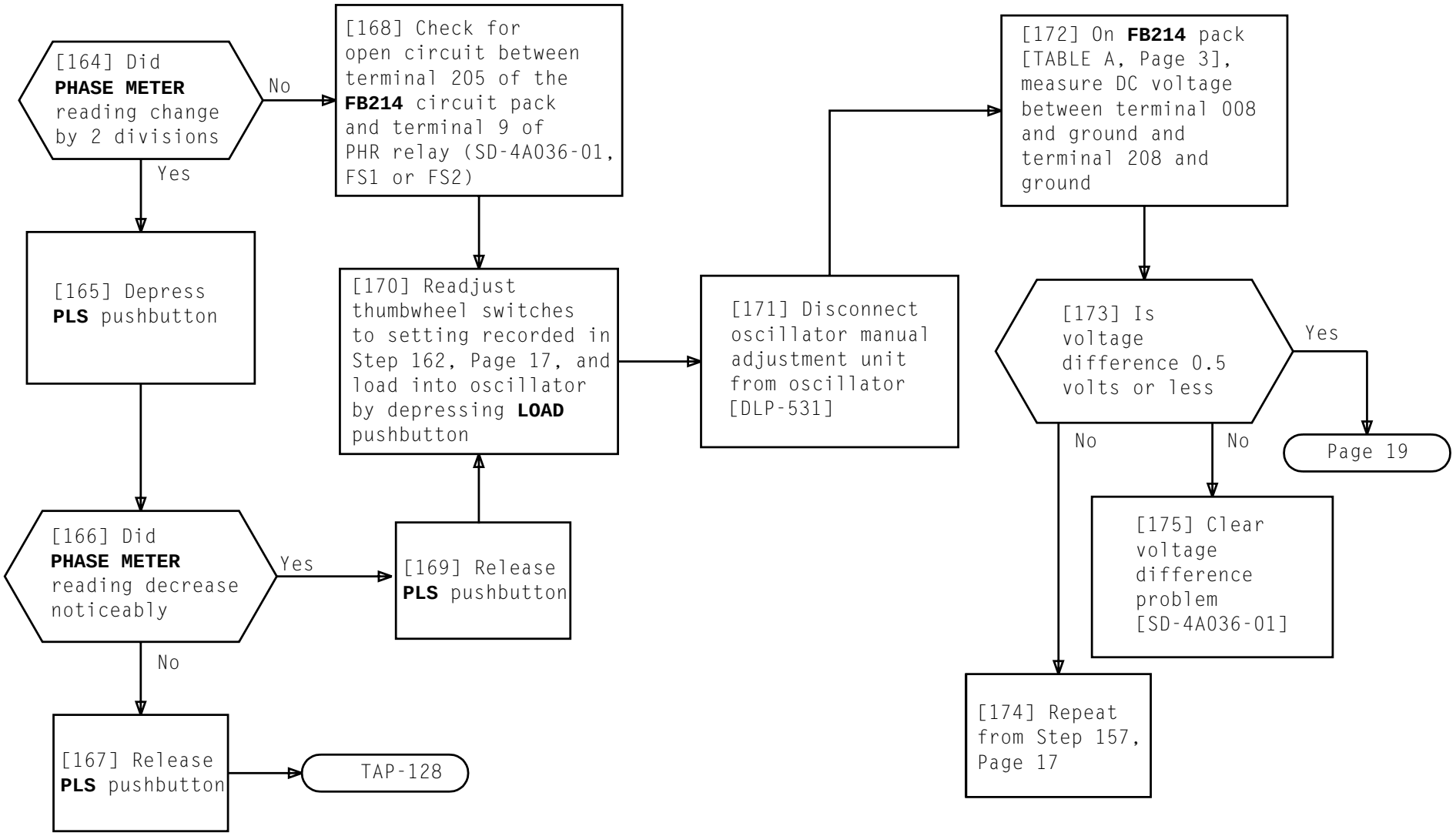


LED POSITION (TOP → BOTTOM)														
	14	13	12	11	10	9	8	7	6	5	4	3	2	1
LED BINARY NUMBER	1	0	1	0	1	0	1	0	0	1	1	1	1	1
THUMBWHEEL HEX NUMBER	2		A				9				F			

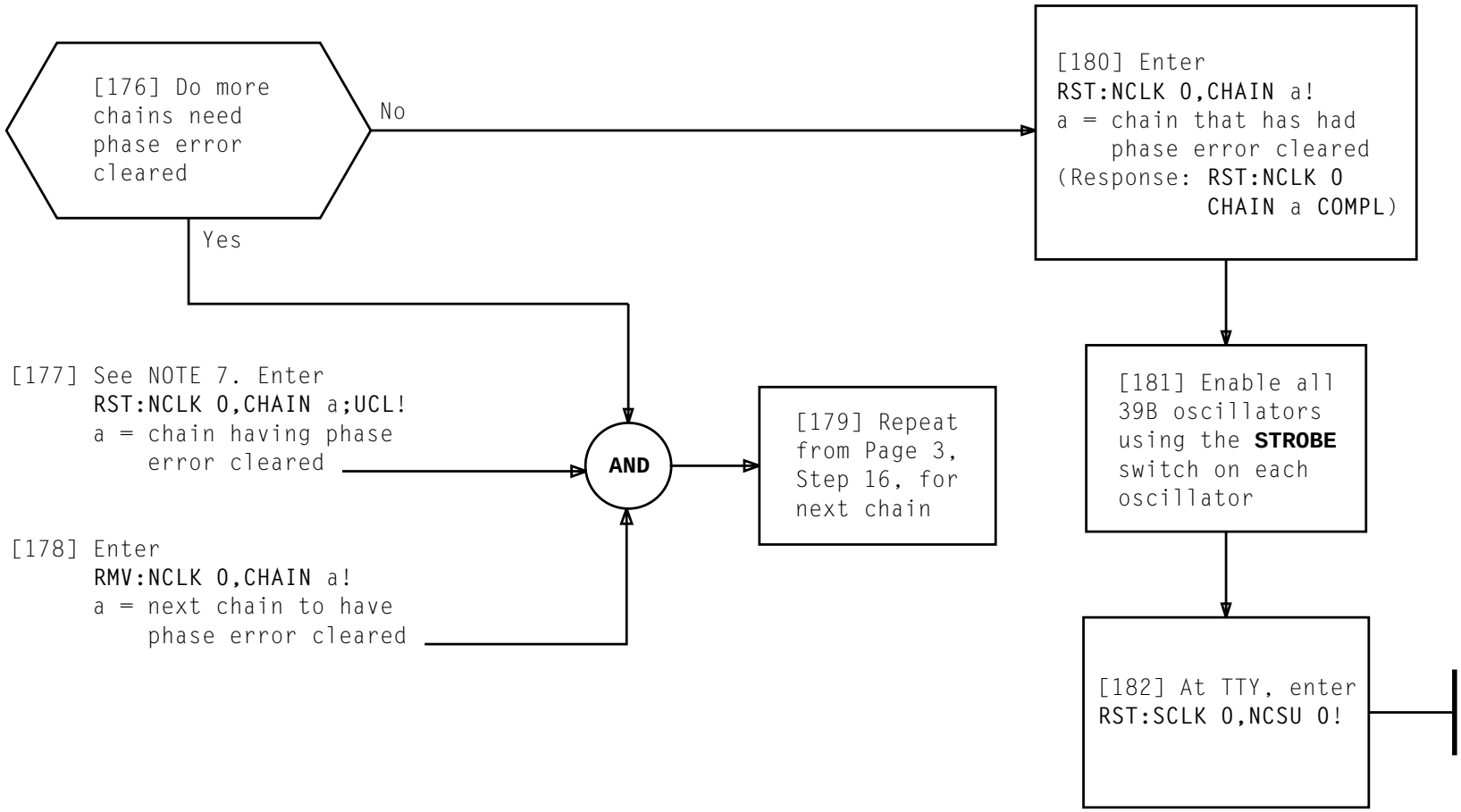
Figure 3 — Example of LED Binary Display and Corresponding Thumbwheel Hexidecimal Setting

NOTE 6
FB214 pack contains oven control and thermistor monitoring bridges that require 15 minutes to stabilize

CLEAR PHASE ERROR — 39B OSCILLATORS

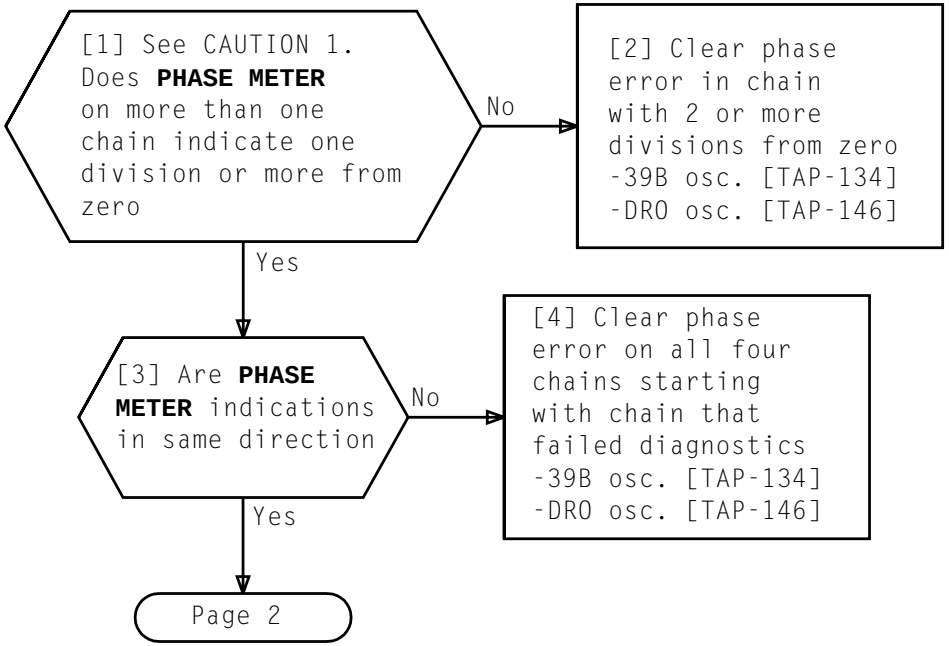


CLEAR PHASE ERROR — 39B OSCILLATORS



NOTE 7
Ensure chain is powered up before restoring unconditionally

CLEAR PHASE ERROR — 39B OSCILLATORS



CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

CLEAR NCLK CHAIN PHASE METER ERROR

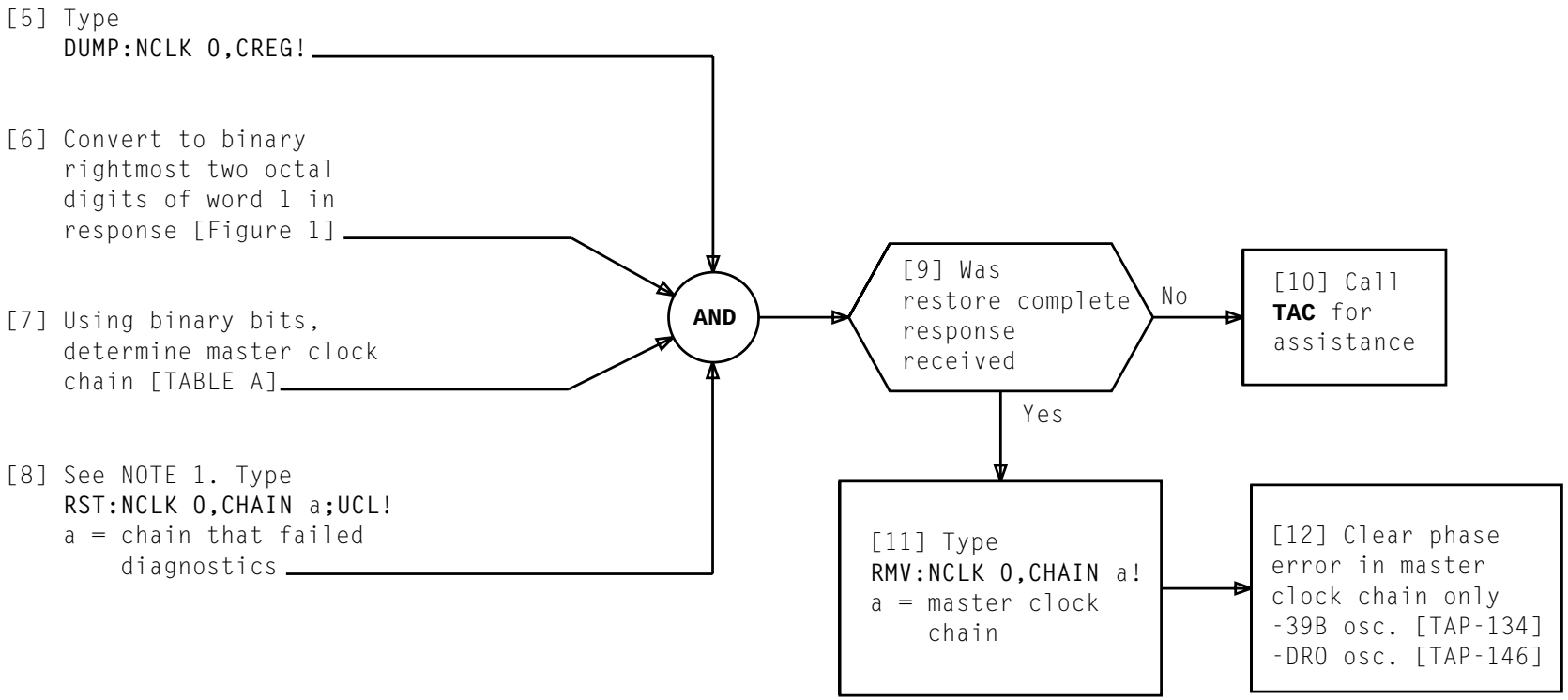


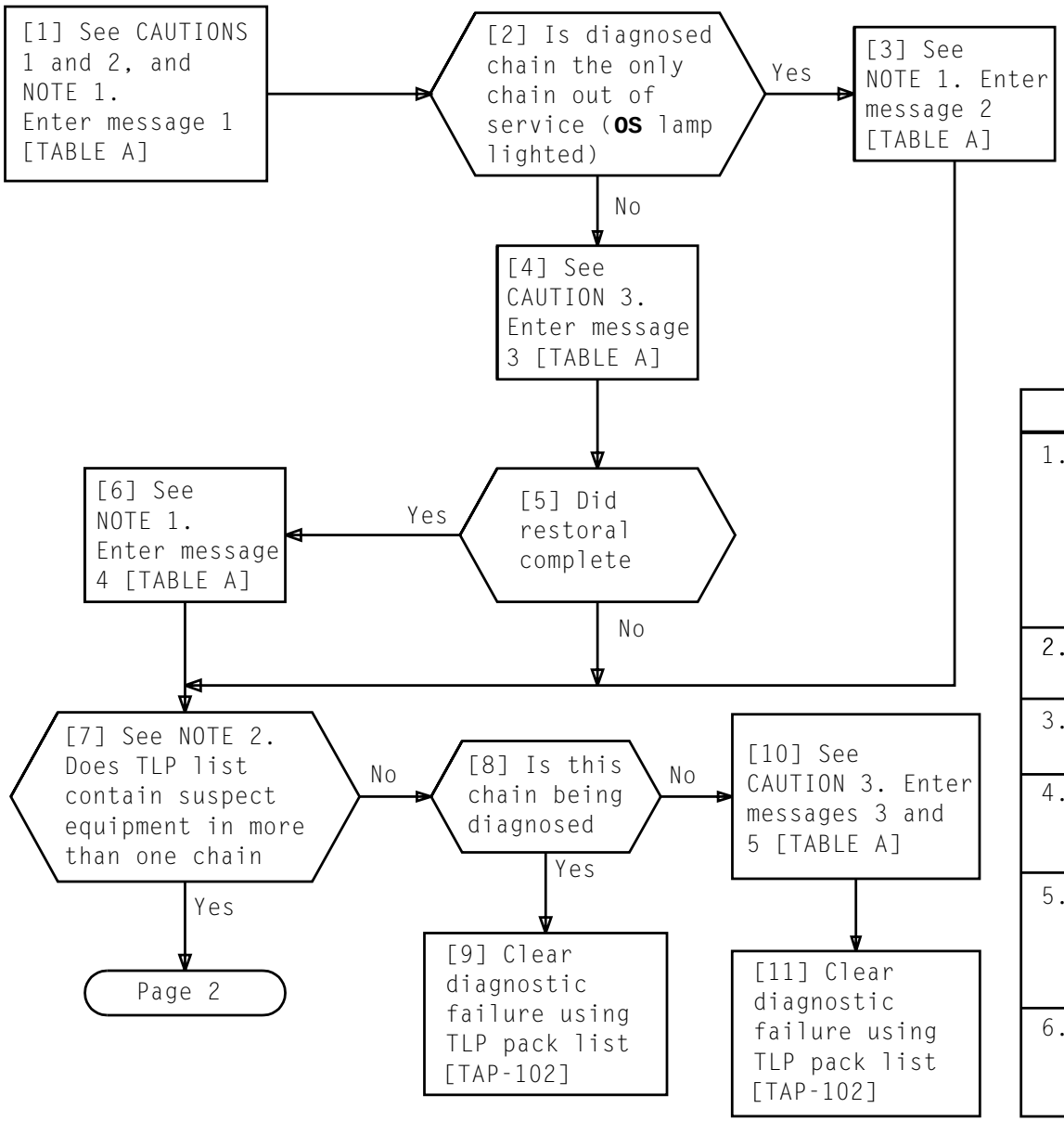
TABLE A						
BINARY BITS						MASTER CHAIN
5	4	3	2	1	0	
DC	DC	DC	0	0	1	0
DC	DC	DC	0	1	0	1
DC	DC	DC	1	0	0	2
DC	DC	1	0	0	0	3

```
56 DUMP:NCLK 0,CREG
                    CONVERT TO BINARY
   00000000 00100004 03600044 37760000 00006464 03670064 00000000 00000000
   00000000 00100004 03600004 00000000 00000004 03600044 00000000 00000000
        WORD 1
```

Figure 1 – CREG Dump

NOTE 1
Ensure chain is powered up before restoring unconditionally

CLEAR NCLK CHAIN PHASE METER ERROR



NOTES

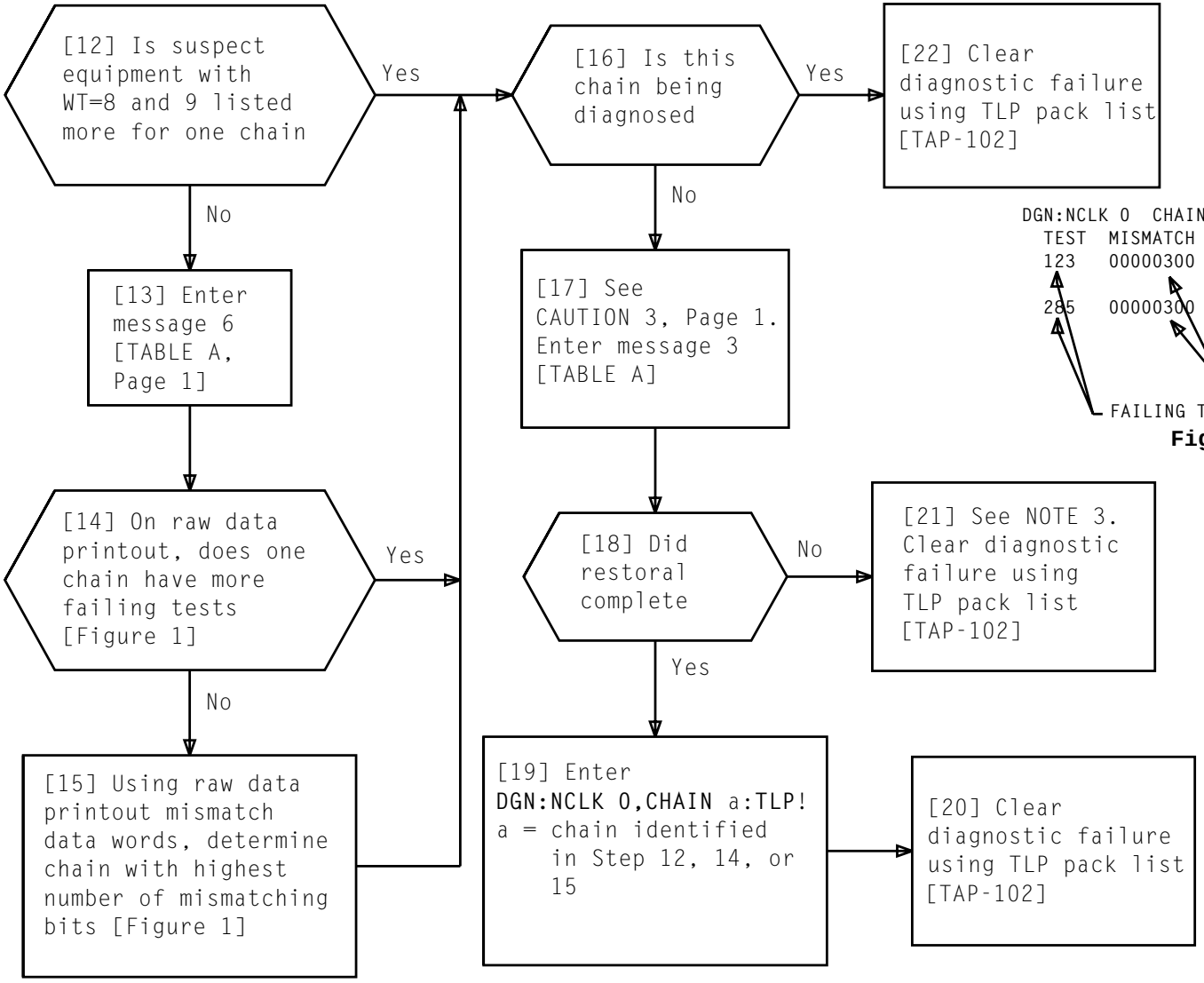
1. It may be several minutes before TLP list is printed
2. TLP list **HELPER ID** field lists clock chain for each listed suspect equipment. Usually, list contains suspect equipment for other chains in addition to chain diagnosed

TABLE A
1. RST:NCLK 0,CHAIN a;UCL! a = out-of-service (**OS**) chain numbers other than chain diagnosed (repeat message as required)
2. DGN:NCLK 0,CHAIN a:TLP! a = diagnosed chain number
3. RST:NCLK 0,CHAIN a;UCL! a = diagnosed chain number
4. DGN:NCLK 0,CHAIN a:TLP! a = out-of-service (**OS**) chain number
5. DGN:NCLK 0,CHAIN a:TLP! a = number of chain with equipment listed on TLP list
6. DGN:NCLK 0,CHAIN a;RAW! a = diagnosed chain number

CAUTIONS

1. *Always remove NCSU from service and disable all oscillators (using ENABLE/DISABLE switch) before working on any network clock problem*
2. *Procedure calls for UCL restores of out-of-service chains. Contact next level of technical support for assistance*
3. *Ensure chain is powered up before restoring chain unconditionally*

ISOLATE SUSPECT CLOCK CHAIN, DIAGNOSTIC FAILURE




```
DGN:NCLK 0  CHAIN 0  PH 4  STF  (2,00000000 00000002)
  TEST  MISMATCH   SUPPLEMENTARY DATA
  123   00000300   00106550 00010000 00402020 00001663 01000002
                   00000001
  285   00000300   00106650 00010000 00402020 00001663 01000002
```

FAILING TESTS — MISMATCH BITS — FAILING CHAIN

Figure 1 – Raw Data Printout

NOTE 3
Multiple faults likely to exist. Suspect chain has most suspect equipment on TLP list

ISOLATE SUSPECT CLOCK CHAIN, DIAGNOSTIC FAILURE

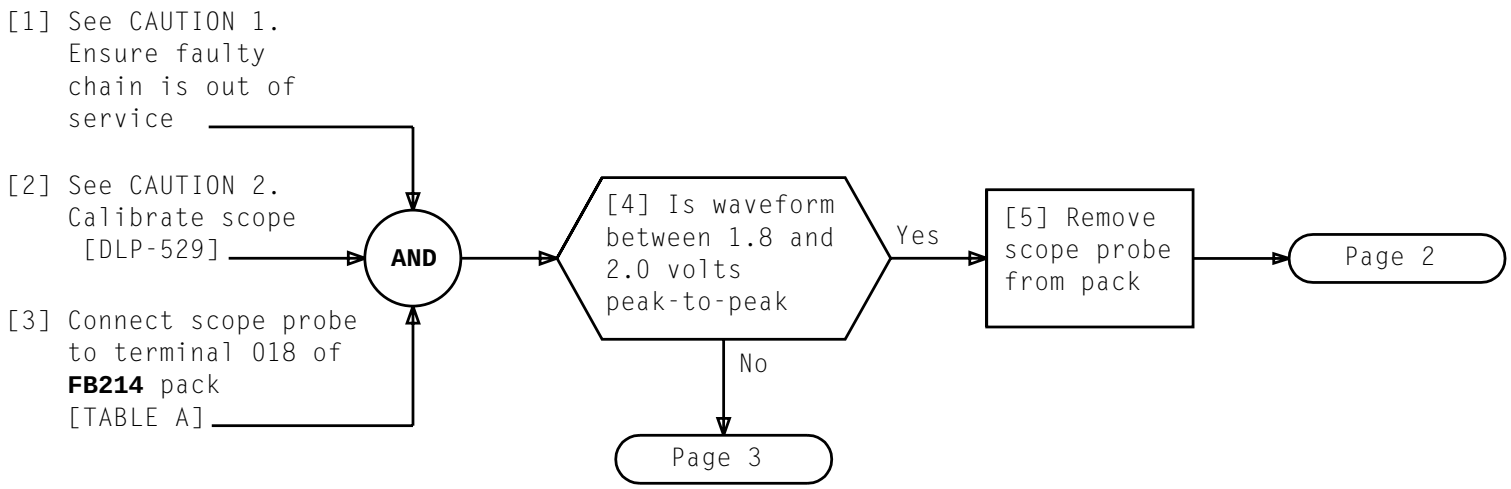


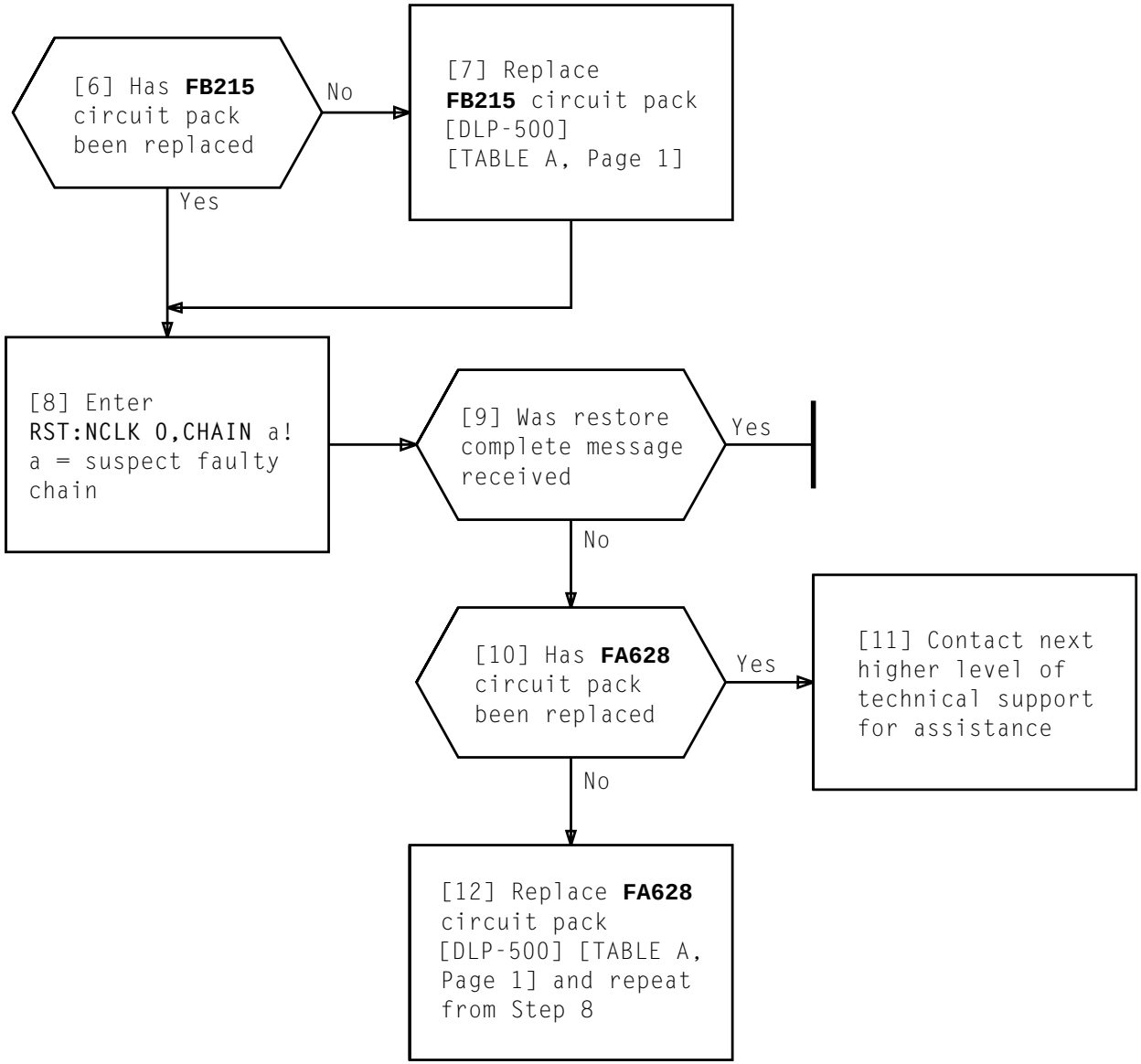
TABLE A

CHAIN	0	1	2	3
PACK	LOCATION			
FB214	066-33	066-39	166-33	166-39
FB687	070-34	070-37	170-34	170-37
FB215	070-31	070-40	170-31	170-40
FA628	070-29	070-42	170-29	170-42

CAUTIONS

1. *Always remove NCSU from service and disable all oscillators (using* **ENABLE/ DISABLE** *switch) before working on any network problem*
2. *Improper scope calibration can affect service*

CLEAR 39B OSCILLATOR LEVEL ERROR PROBLEM



CLEAR 39B OSCILLATOR LEVEL ERROR PROBLEM

[13] Is waveform between 1.4 and 2.4 volts peak-to-peak

Yes

[19] Remove level adjustment cover from front left side of 39B oscillator [Figure 1] of chain being tested and adjust potentiometer to measure 1.9 volts peak-to-peak

[20] Replace level adjustment cover

Page 4

No

[14] Remove probe from terminal 018 of **FB214** and connect it to terminal 201 of **FB687** pack [TABLE A, Page 1]

[15] Is waveform between 0.87 and 0.97 volts peak-to-peak

Yes

[17] Remove probe and replace **FB687** pack [DLP-500] [TABLE A]

[18] Repeat from Step 3, Page 1

No

Page 5

No

[16] Clear level error SD-4A036-01

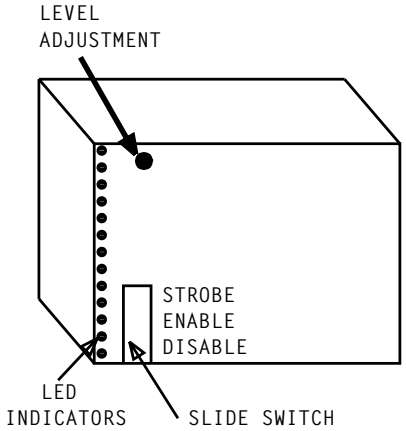
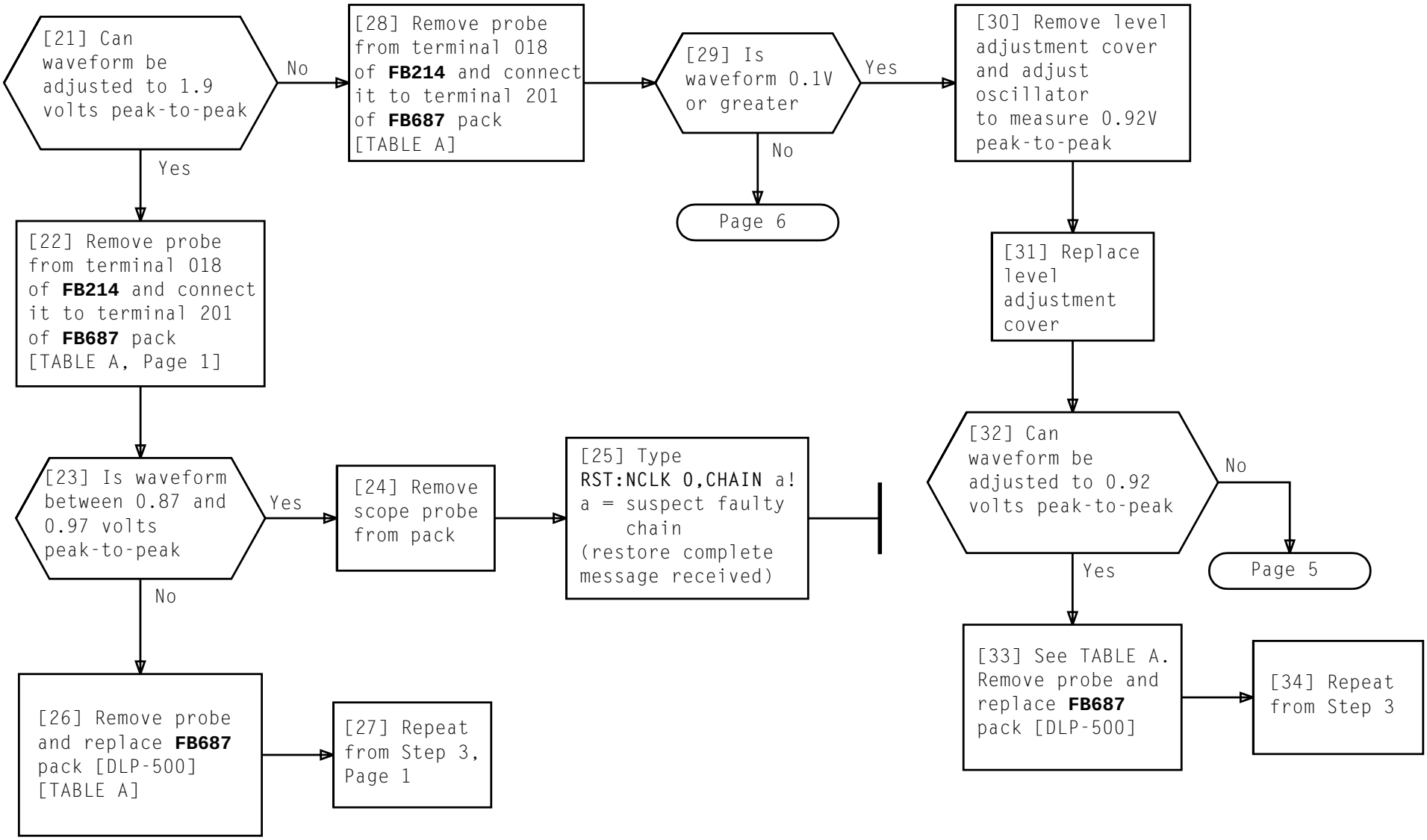
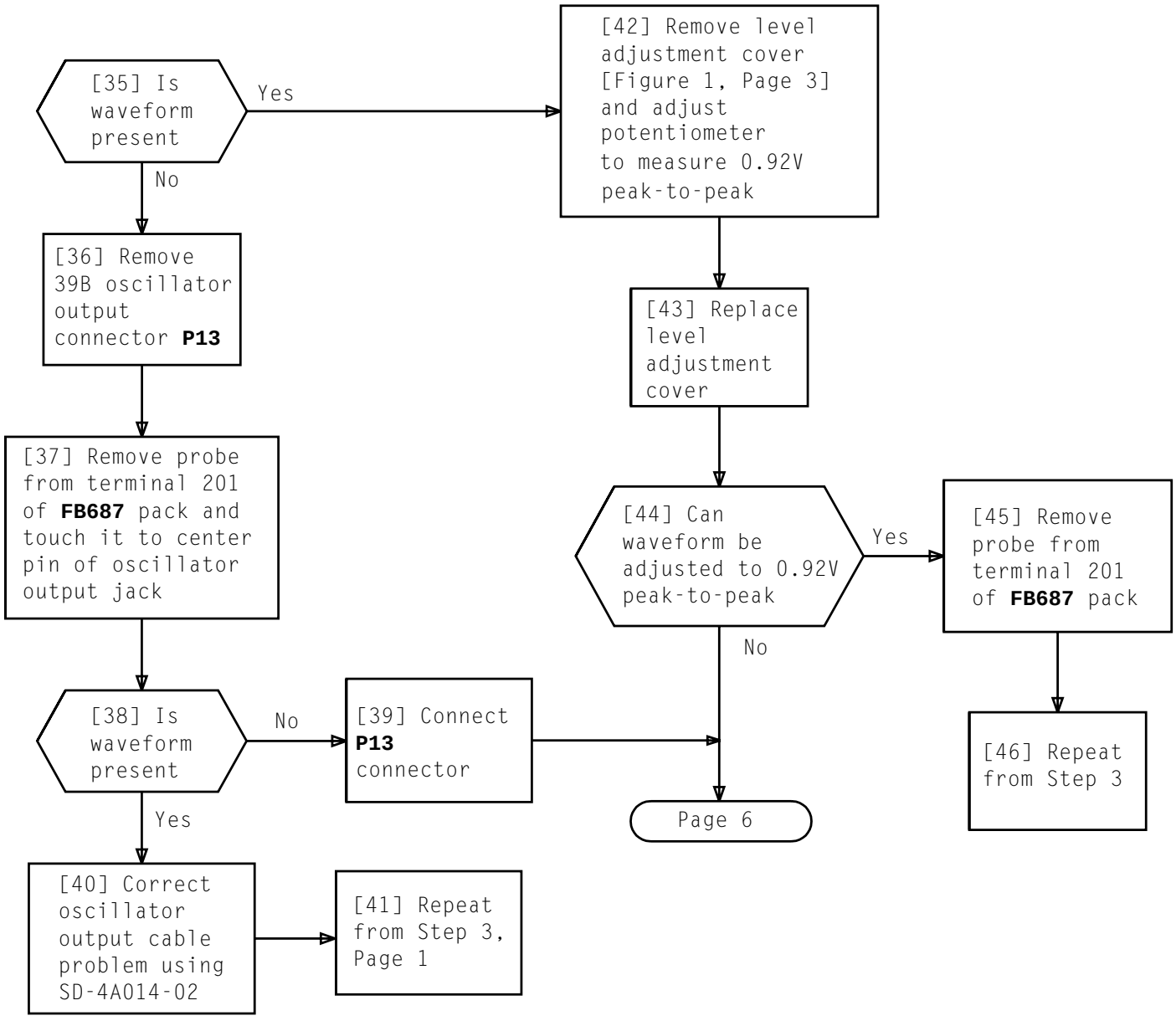


Figure 1 – 39B Oscillator

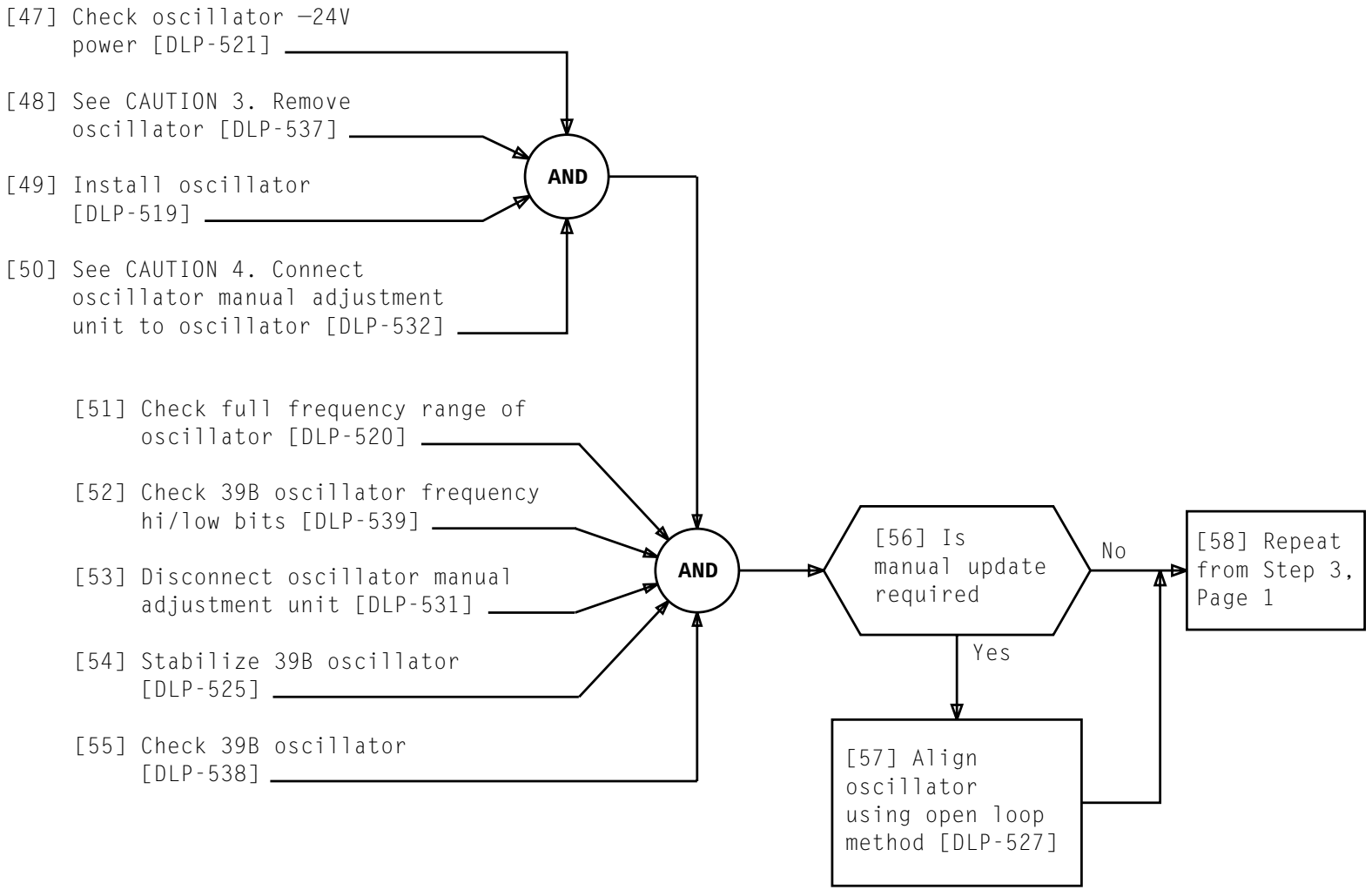
CLEAR 39B OSCILLATOR LEVEL ERROR PROBLEM



CLEAR 39B OSCILLATOR LEVEL ERROR PROBLEM



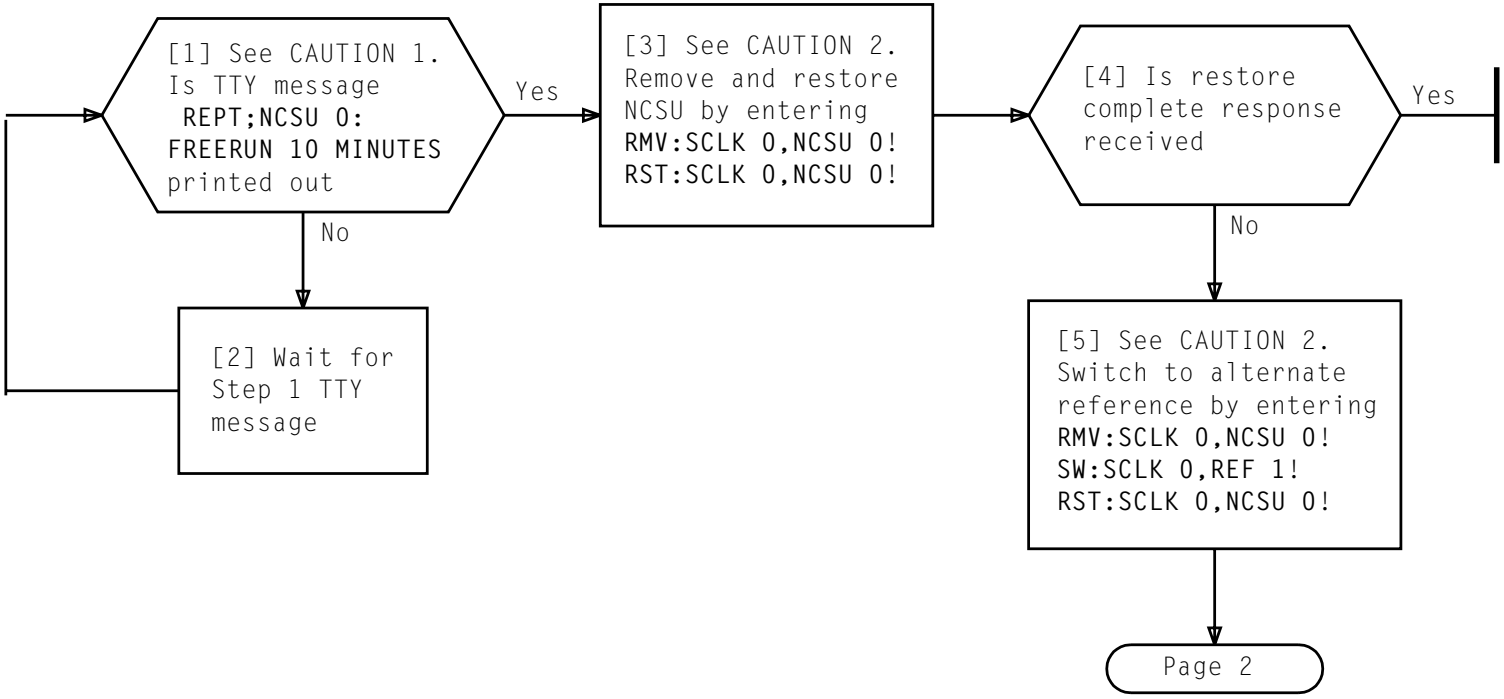
CLEAR 39B OSCILLATOR LEVEL ERROR PROBLEM



CAUTIONS

3. *Remove RF output cable* **(P13)** *immediately even if oscillator is not physically removed immediately*
4. *Clock chain of oscillator being checked must be powered down*

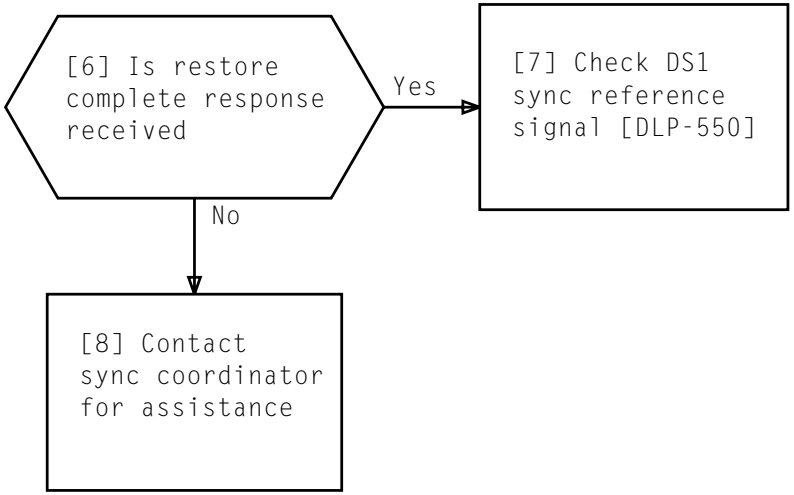
CLEAR 39B OSCILLATOR LEVEL ERROR PROBLEM



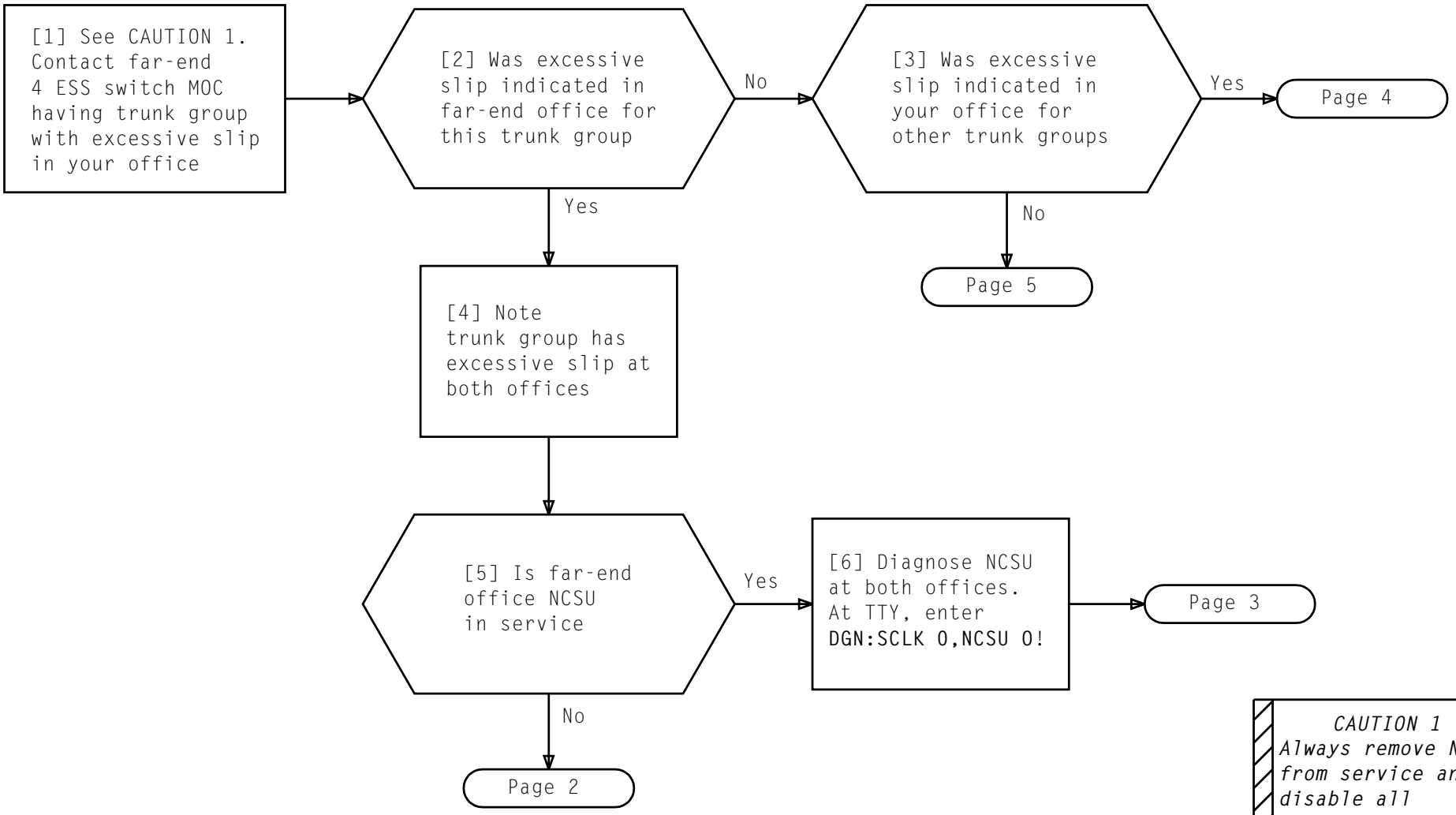
CAUTIONS

1. *Always remove NCSU from service and disable all oscillators (using* **ENABLE/ DISABLE** *switch) before working on any network clock problem*
2. *UCL restores of NCSU should not be performed under any circumstances. Adverse clock reactions may occur*

CLEAR REF STAT/FREE RUN LAMP LIGHTED, MCC SYSTEM ALARMS PANEL

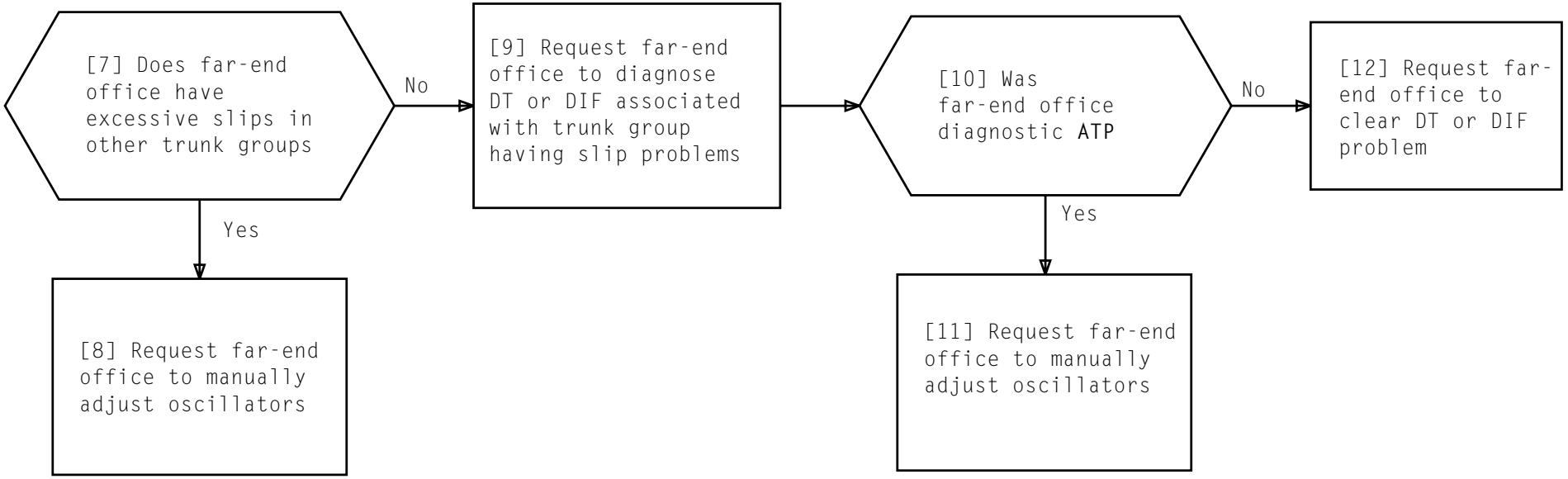


CLEAR REF STAT/FREE RUN LAMP LIGHTED, MCC SYSTEM ALARMS PANEL



CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

CLEAR EXCESSIVE SLIPS IN YOUR OFFICE



CLEAR EXCESSIVE SLIPS IN YOUR OFFICE

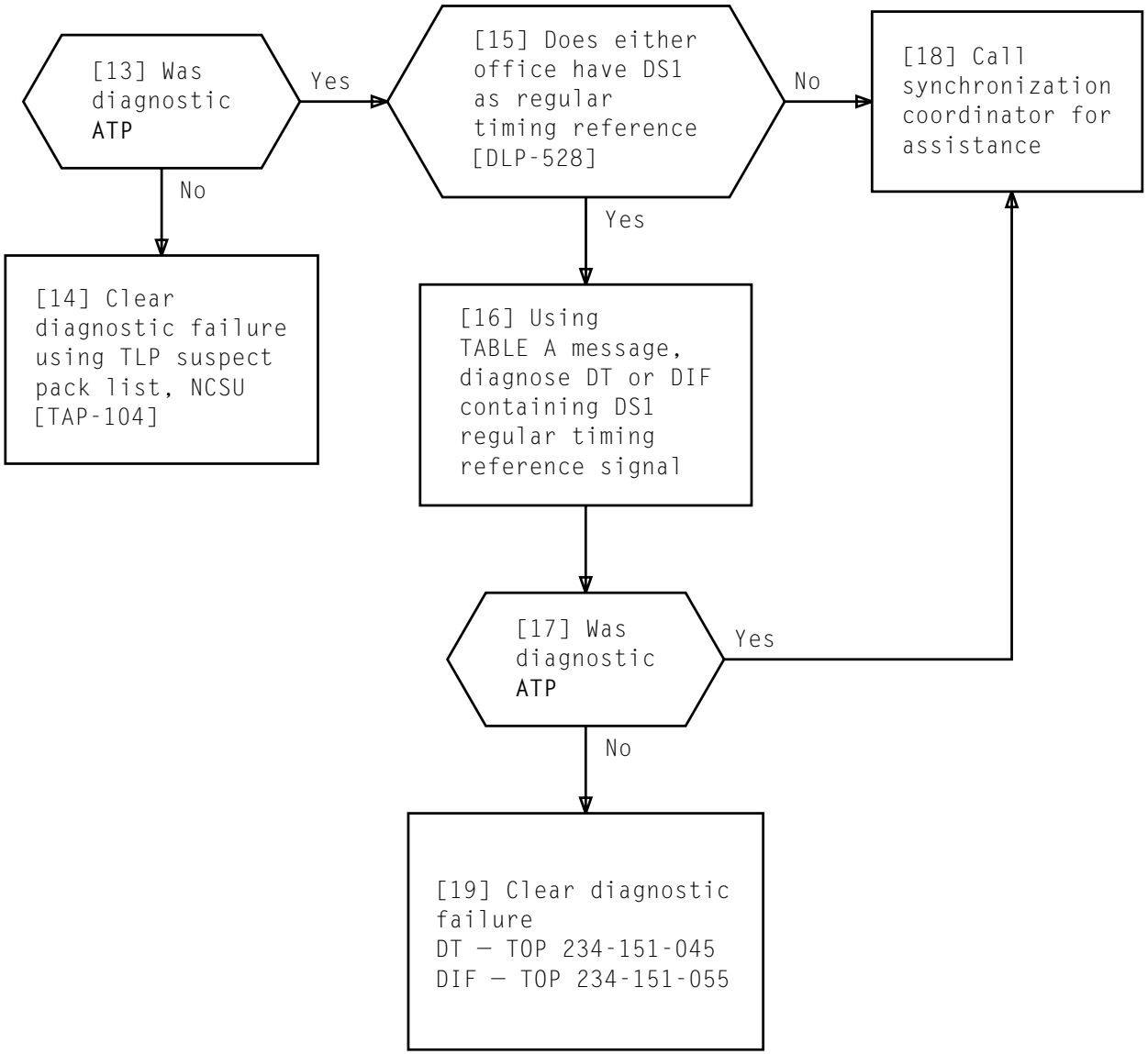
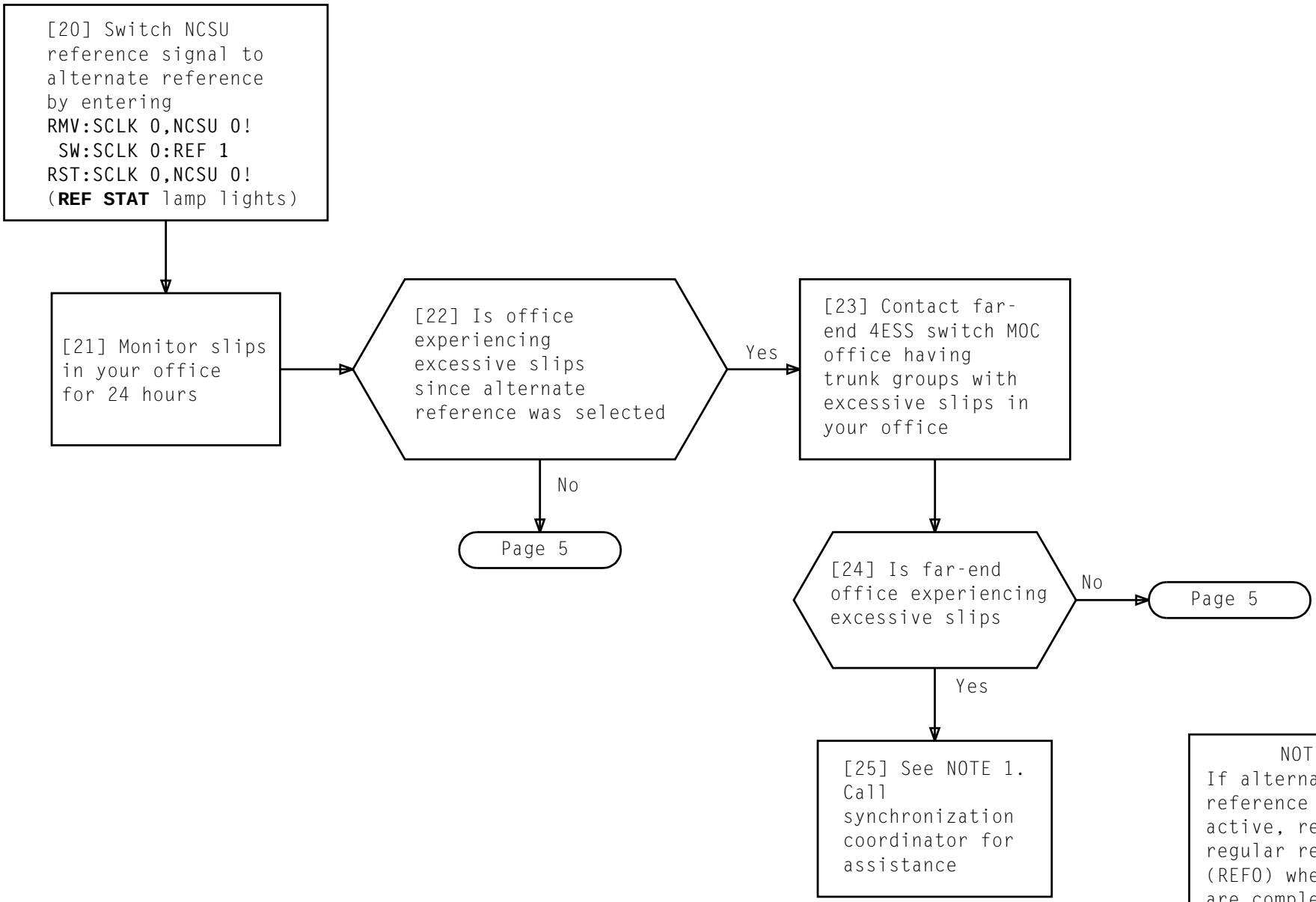


TABLE A
DGN:DT a,DIU b!
DGN:DIF a,DIU b!
a = member number containing DSI reference
b = submember number

CLEAR EXCESSIVE SLIPS IN YOUR OFFICE



NOTE 1
If alternate reference (REF1) is active, return to regular reference (REF0) when repairs are completed

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CLEAR EXCESSIVE SLIPS IN YOUR OFFICE

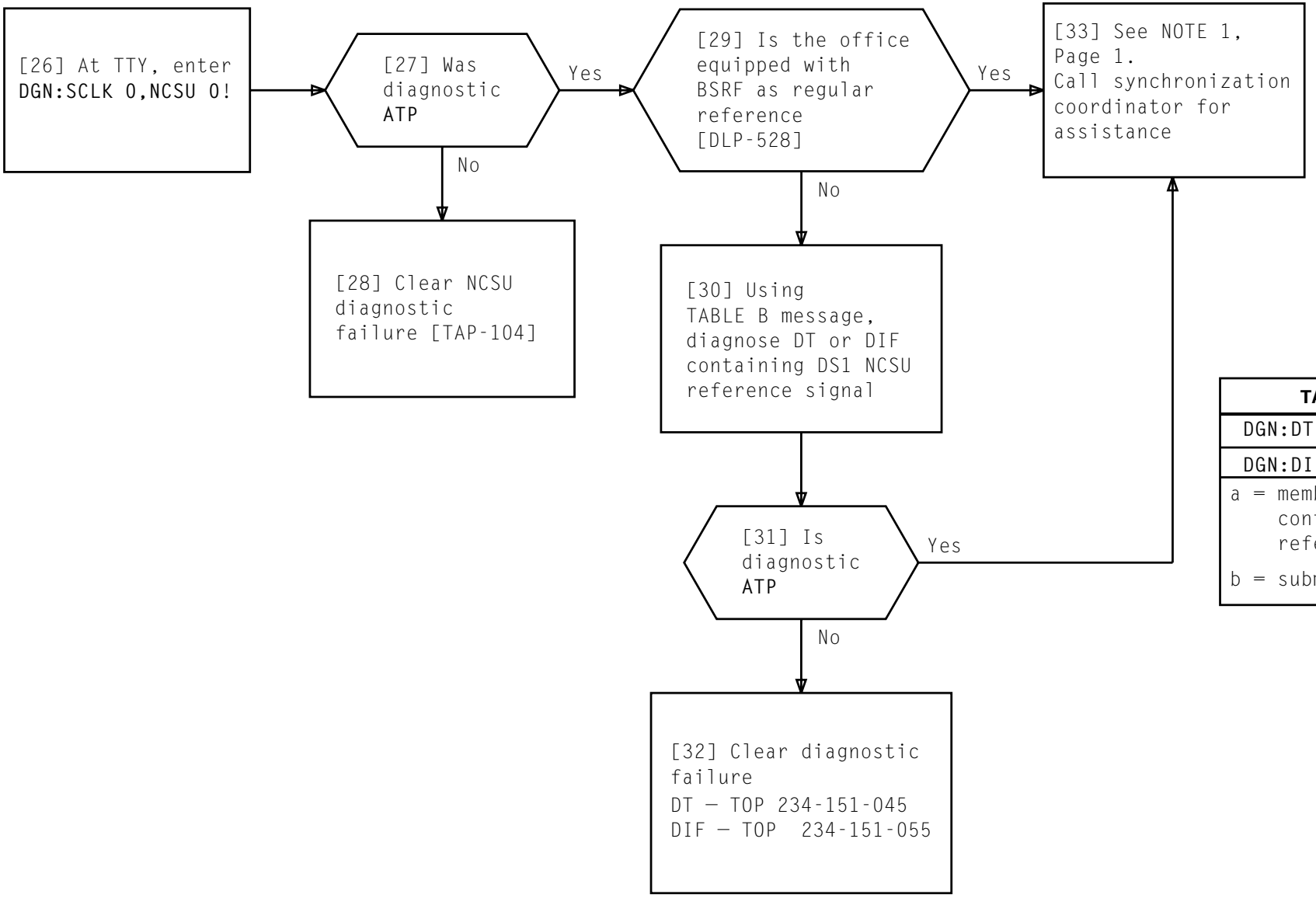
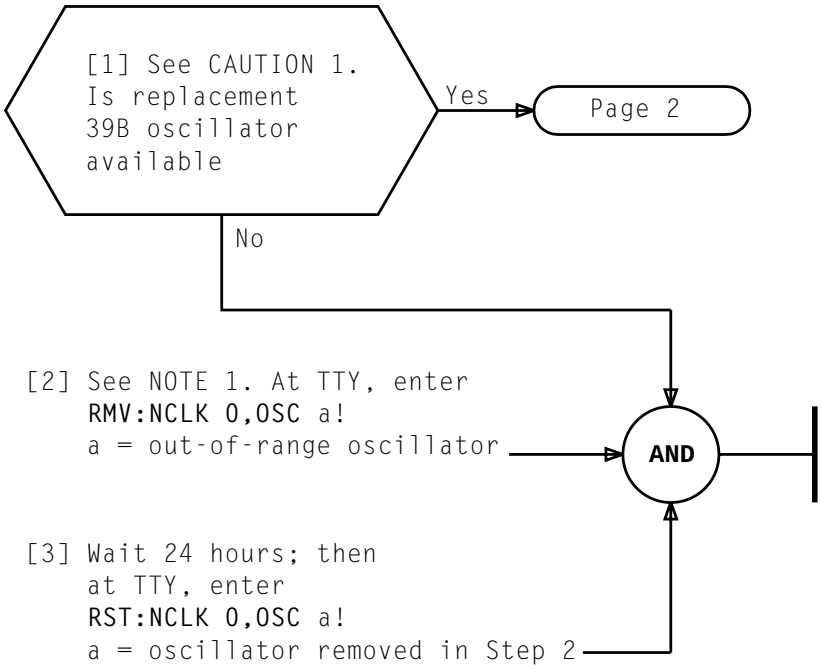


TABLE B
DGN:DT a,DIU b!
DGN:DIF a,DIU b!
a = member number containing DSI reference
b = submember number

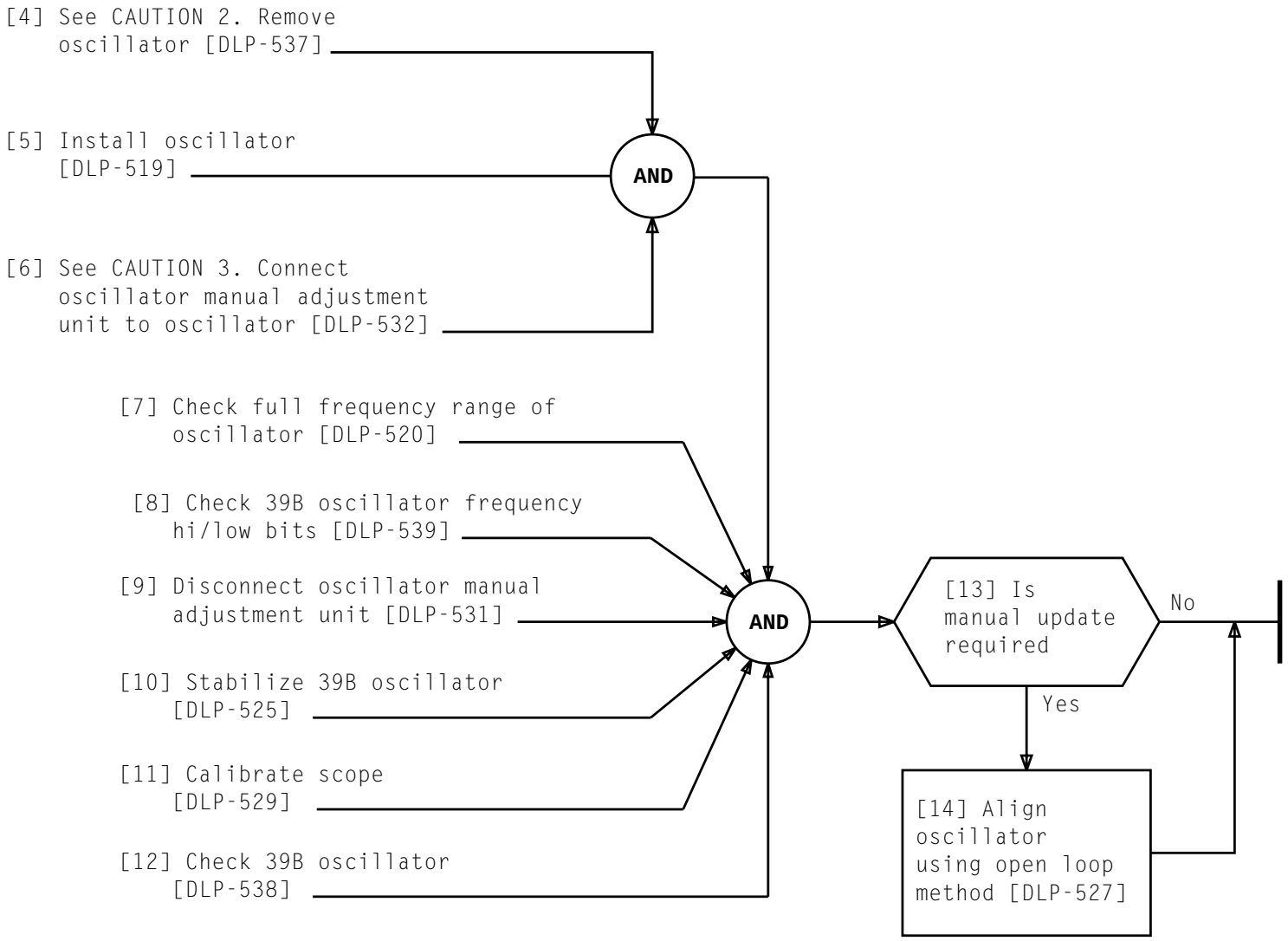
CLEAR EXCESSIVE SLIPS IN YOUR OFFICE



NOTE 1
Order should be placed for replacement 39B oscillator

CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

CLEAR REPETITIVE 39B OSCILLATOR RANGE EXCEEDED MESSAGE, NCSU



CAUTIONS

2. *Remove RF OUTPUT cable* **(P13)** *immediately even if oscillator is not physically removed immediately*
3. *Clock chain of oscillator being checked must be powered down*

CLEAR REPETITIVE 39B OSCILLATOR RANGE EXCEEDED MESSAGE, NCSU

CLEAR DISCIPLINED RUBIDIUM OSCILLATOR FULL FREQUENCY RANGE PROBLEM

[1] At TTY, enter
DUMP:NCLK 0,CREG!

[2] Convert to binary rightmost two octal digits of word 1 [Figure 1]

[3] See NOTE 1. Determine master clock chain [TABLE B]

[4] Select oscillator in opposite bay from suspect oscillator (not master oscillator) [TABLE B]

[5] At selected oscillator chain power switch, rotate **ROS/OFF** switch clockwise to **ROS** (**OFF NORM** and **OS** lamps light; **ACK** lamp lights momentarily)

AND

Page 2

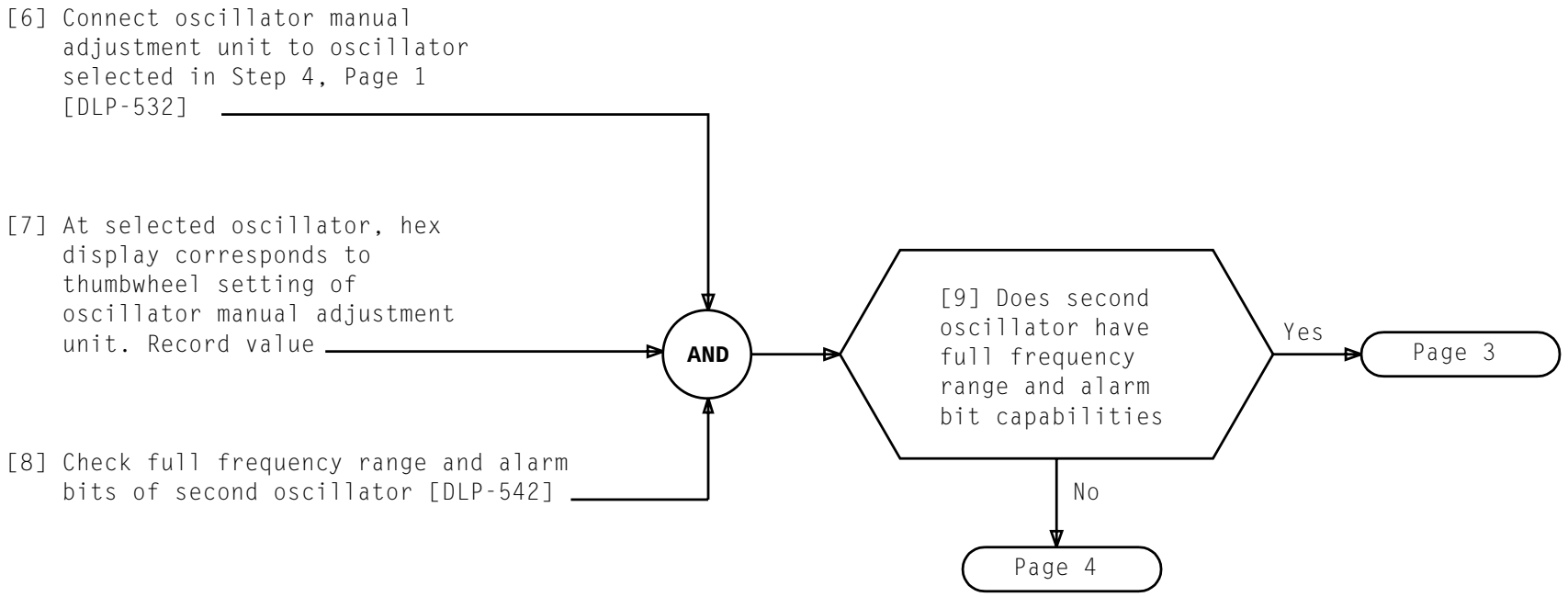
TABLE B

BINARY BITS						MASTER CHAIN
5	4	3	2	1	0	
DC	DC	DC	0	0	1	0
DC	DC	DC	0	1	0	1
DC	DC	DC	1	0	0	2
DC	DC	1	0	0	0	3

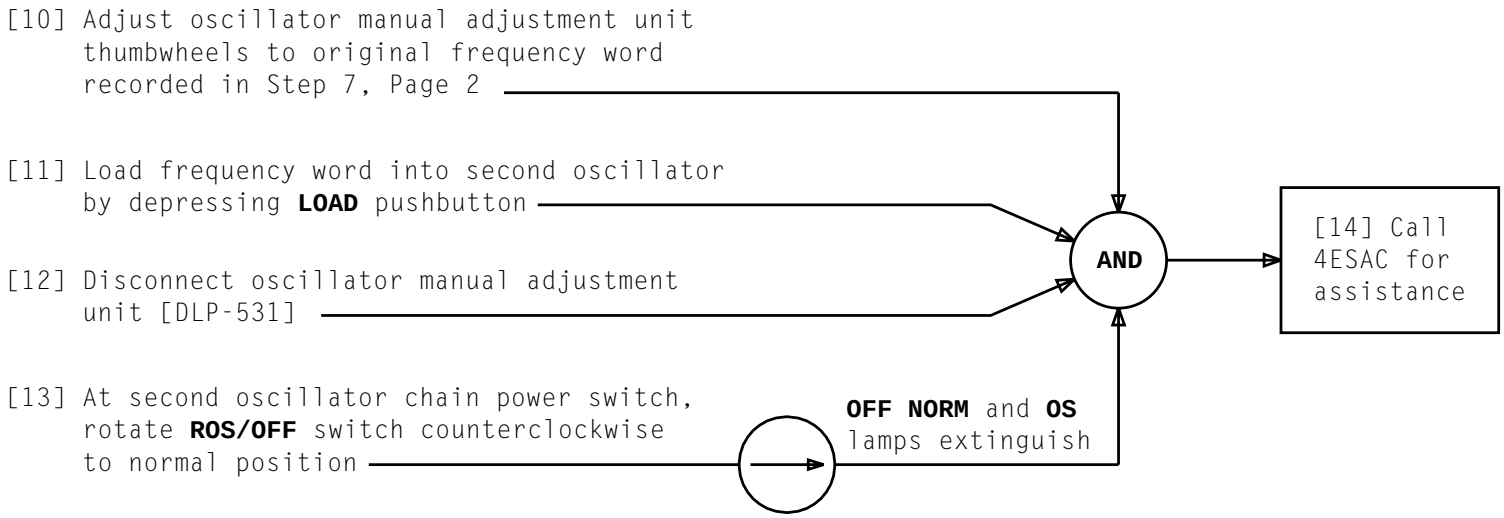
```
56 DUMP:NCLK 0, CREG
                    CONVERT TO BINARY
00000000 00100004 03600044 37760000 00006464 03670064 00000000 00000000
00000000 00100004 03600004 00000000 00000004 03600044 00000000 00000000
WORD 1
```

Figure 1 – CREG Dump

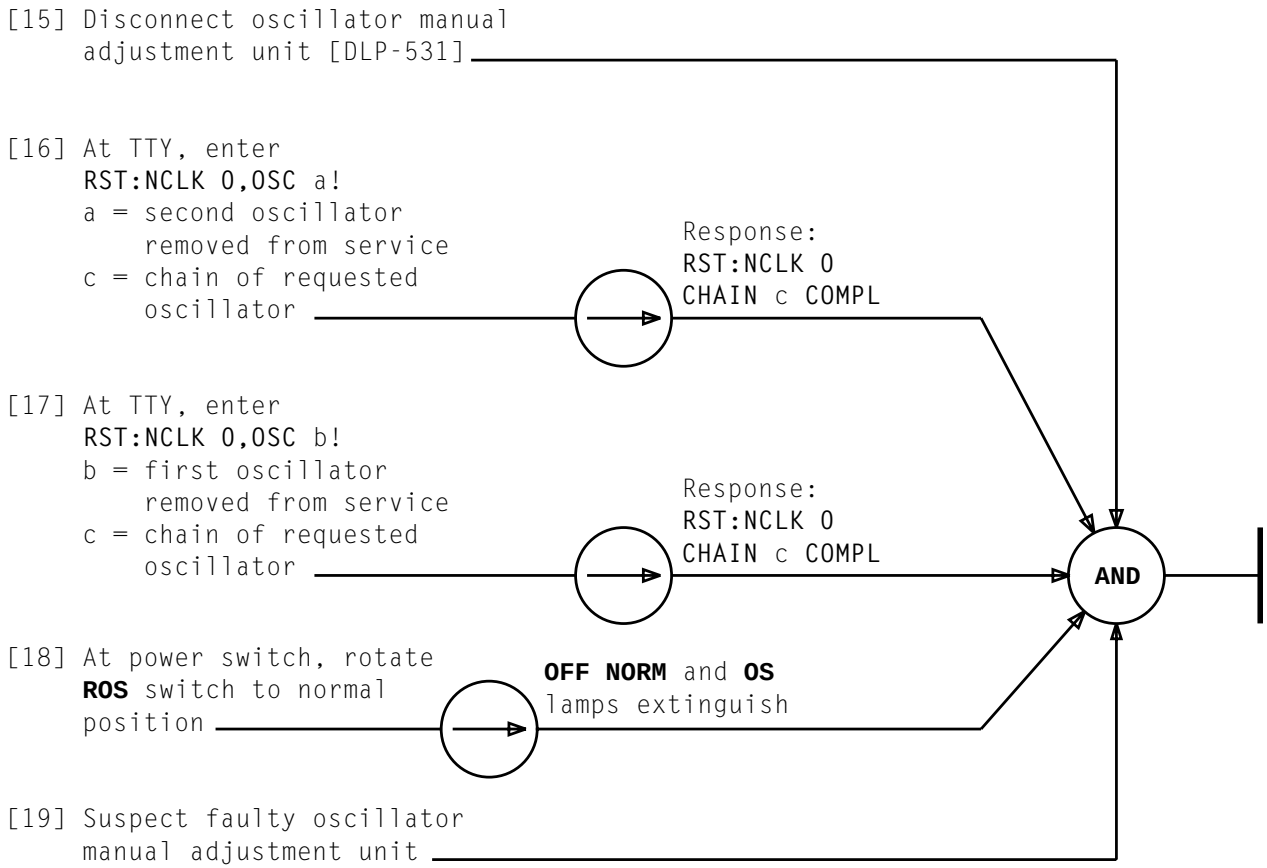
NOTE 1
Network Clock synchronization unit (if operational) display may be used to determine master clock chain. Otherwise, use procedure in Steps 1, 2, and 3



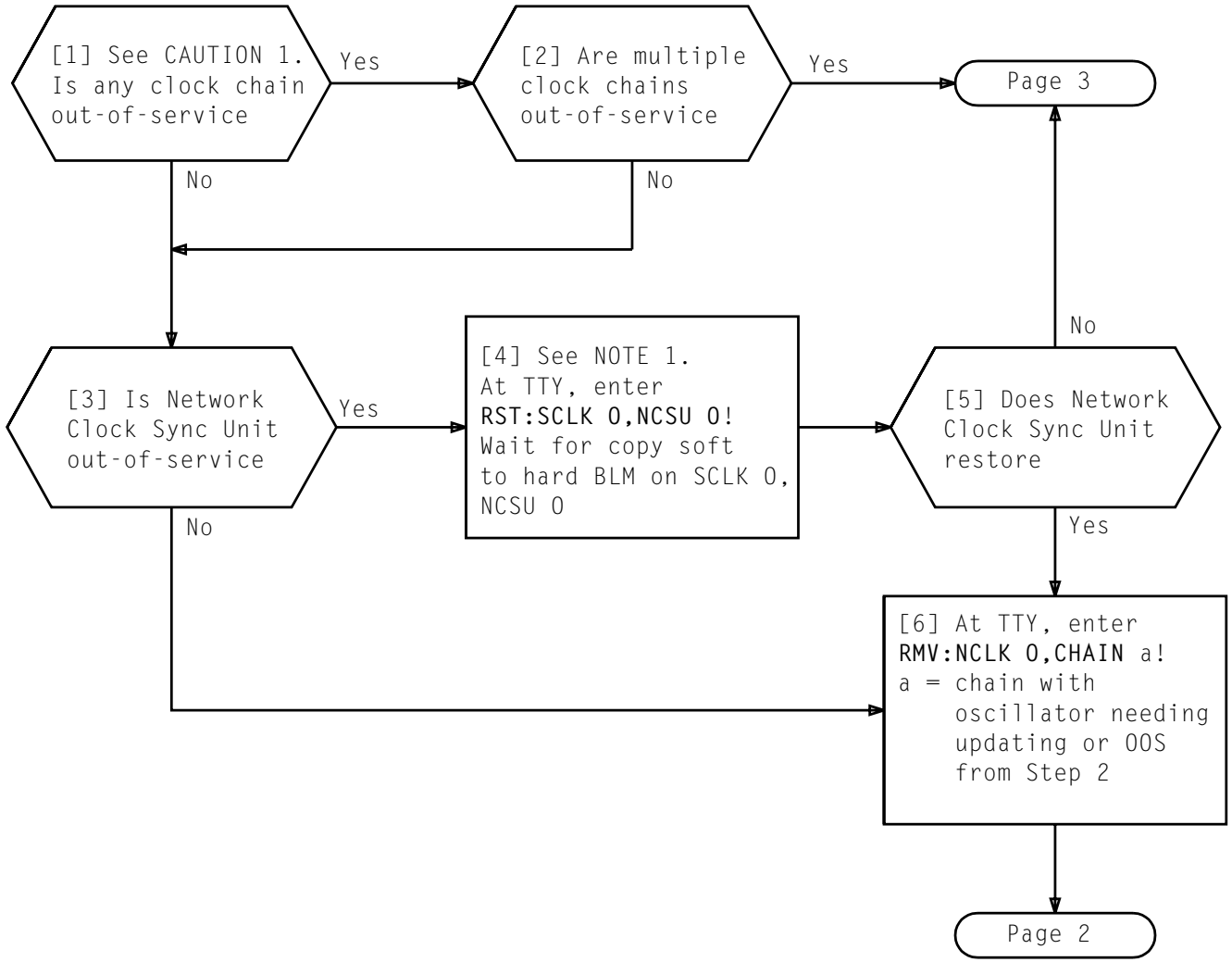
CLEAR DISCIPLINED RUBIDIUM OSCILLATOR FULL FREQUENCY RANGE PROBLEM



CLEAR DISCIPLINED RUBIDIUM OSCILLATOR FULL FREQUENCY RANGE PROBLEM



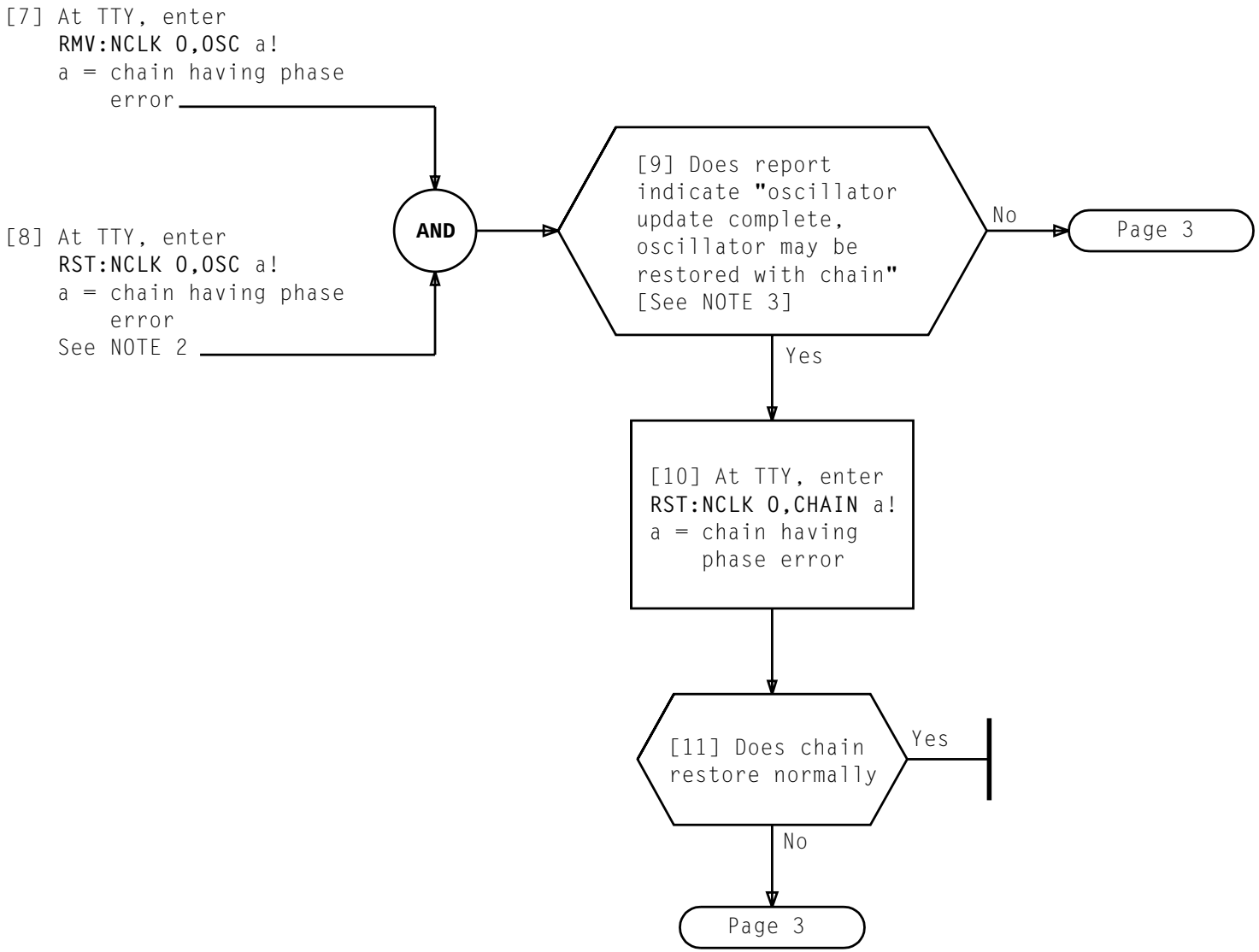
CLEAR DISCIPLINED RUBIDIUM OSCILLATOR FULL FREQUENCY RANGE PROBLEM



CLEAR PHASE ERROR — DISCIPLINED RUBIDIUM OSCILLATORS

NOTE 1
ENABLE/**DISABLE** switches on all DRO oscillators should be in the up or **ENABLE** position

CAUTION 1
This procedure calls for UCL restores of out-of-service chains. Contact next level of technical support for assistance



NOTES

2. Oscillator restore is reported immediately, but wait for report of result of NCSU update. May take up to 5 minutes
3. Other variations of the update report indicate "manual update required"

CLEAR PHASE ERROR — DISCIPLINED RUBIDIUM OSCILLATORS

CLEAR PHASE ERROR — DISCIPLINED RUBIDIUM OSCILLATORS

[12] At TTY, enter **RMV:SCLK 0,NCSU 0!**

[13] Disable all DRO oscillators using the **ENABLE**/**DISABLE** switch on each oscillator

[14] See NOTE 4. Ensure chain with phase error is out-of-service

[15] See CAUTION 2. Calibrate scope [DLP-529]

[16] Connect channel 1 scope probe to terminal 218 of **FB214** pack [TABLE A] for chain having phase error cleared

AND

[17] Is waveform between 1.7 and 2.1 volts peak-to-peak

Yes → Page 9

No → [22] Clear phase error [SD-4A036-01]

No

[18] Enter **DUMP:NCLK 0,CREG!**

[19] Convert rightmost two octal digits of word 2 in response message to binary [Figure 1, Page 4]

[20] Use binary results to determine master clock chain [TABLE B]

AND

[21] Remove channel 1 scope probe from terminal 218 of **FB214** pack and connect probe to master oscillator input terminal of **FB213** pack [TABLES A and C]

Page 4

TABLE B

BINARY BITS						MASTER CHAIN
5	4	3	2	1	0	
DC	DC	DC	0	0	1	0
DC	DC	DC	0	1	0	1
DC	DC	DC	1	0	0	2
DC	DC	1	0	0	0	3

TABLE A

CLOCK CHAIN	0	1	2	3
CIRCUIT PACK	LOCATION			
FB213	070-32	070-39	170-32	170-39
FB214	066-33	066-39	166-33	166-39
FB687	070-34	070-37	170-34	170-37

TABLE C

MASTER CLOCK CHAIN	0	1	2	3
FB213 master oscillator input terminal	003	002	201	001

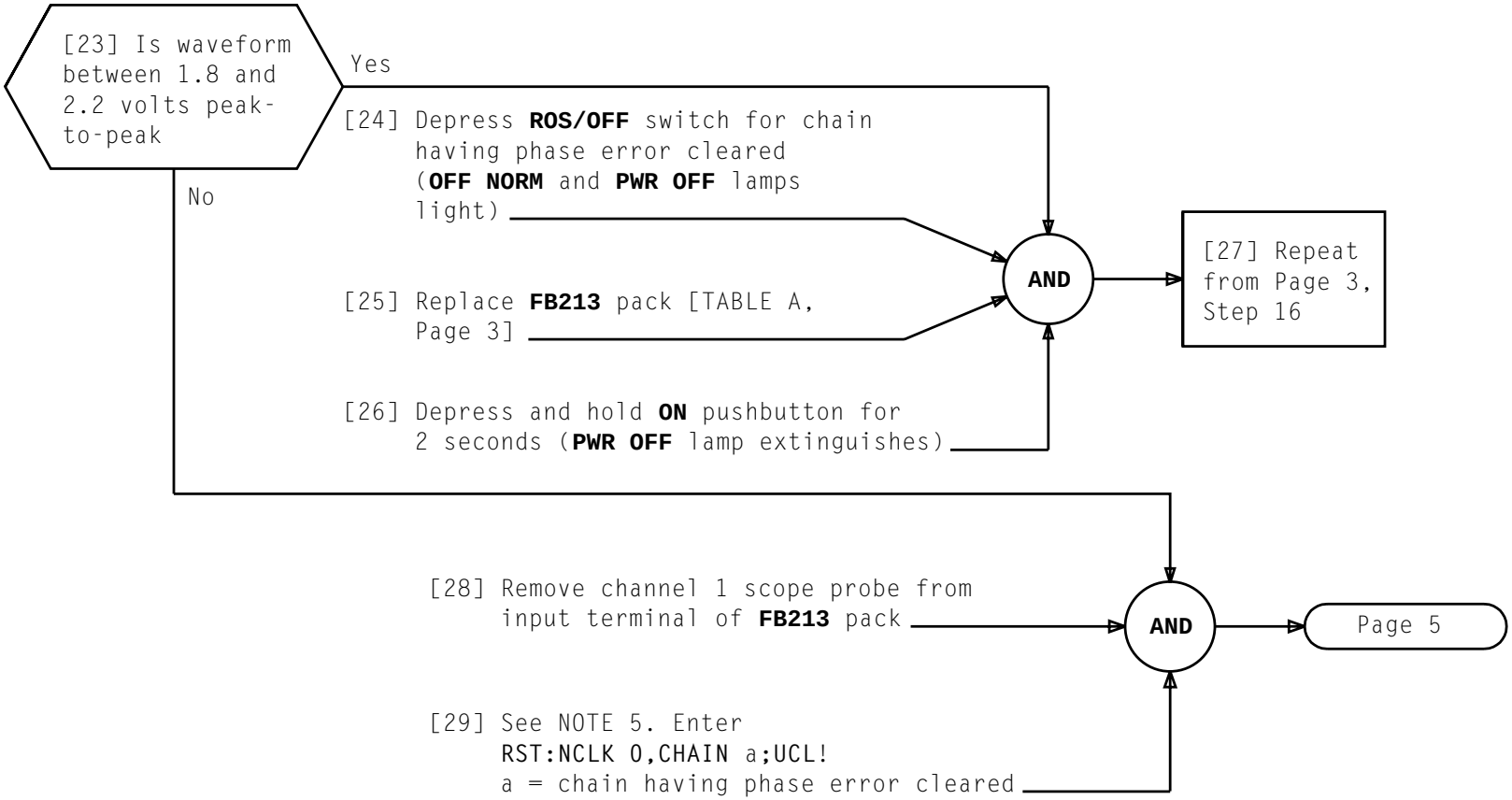
NOTE 4

If clearing phase errors in all four clock chains, follow this sequence:

Chains 2, 0 followed by 1, 3 or 3, 1 unless chain other than 2 is out-of-service with diagnostic failure, then clear out-of-service chain first

CAUTION 2

Improper scope calibration may affect service




```
                CONVERT TO BINARY
56 DUMP:NCLK 0,CREG
   00000000 00100004 03600044 37760000 00006464 03670064 00000000 00000000
   00000000 00100004 03600004 00000000 00000004 03600044 00000000 00000000
   WORD 1
```

Figure 1 – CREG Dump

NOTE 5
Ensure chain is powered up before restoring unconditionally

CLEAR PHASE ERROR – DISCIPLINED RUBIDIUM OSCILLATORS

[30] Enter
RMV:NCLK 0,CHAIN a!
a = master clock chain determined in Step 20, Page 3

[31] Connect channel 1 scope probe to terminal 018 of **FB214** pack [TABLE A, Page 3] (master clock chain)

AND

[32] Is waveform between 1.8 and and 2.0 volts peak-to-peak

Yes

[33] Remove scope probe from pack

No

[34] See NOTE 5, Page 4. Enter **RST:NCLK 0,CHAIN** a;UCL!
a = master clock chain

AND

[35] Enter **RMV:NCLK 0,CHAIN** a!
a = chain having phase error cleared

[36] Repeat from Step 16, Page 3

[37] Is waveform between 1.4 and and 2.4 volts peak-to-peak

No

Page 7

Yes

[38] Remove level adjustment cover from DRO oscillator [Figure 2] of master clock chain and adjust potentiometer to measure 1.9 volts peak-to-peak

[39] Replace level adjustment cover

Page 6

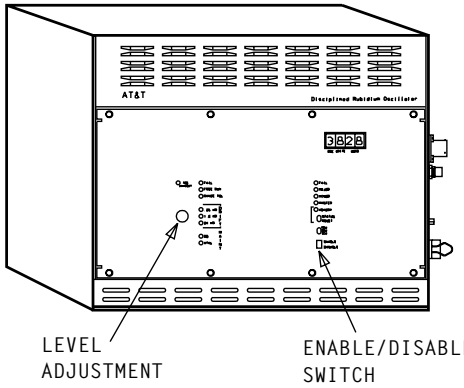
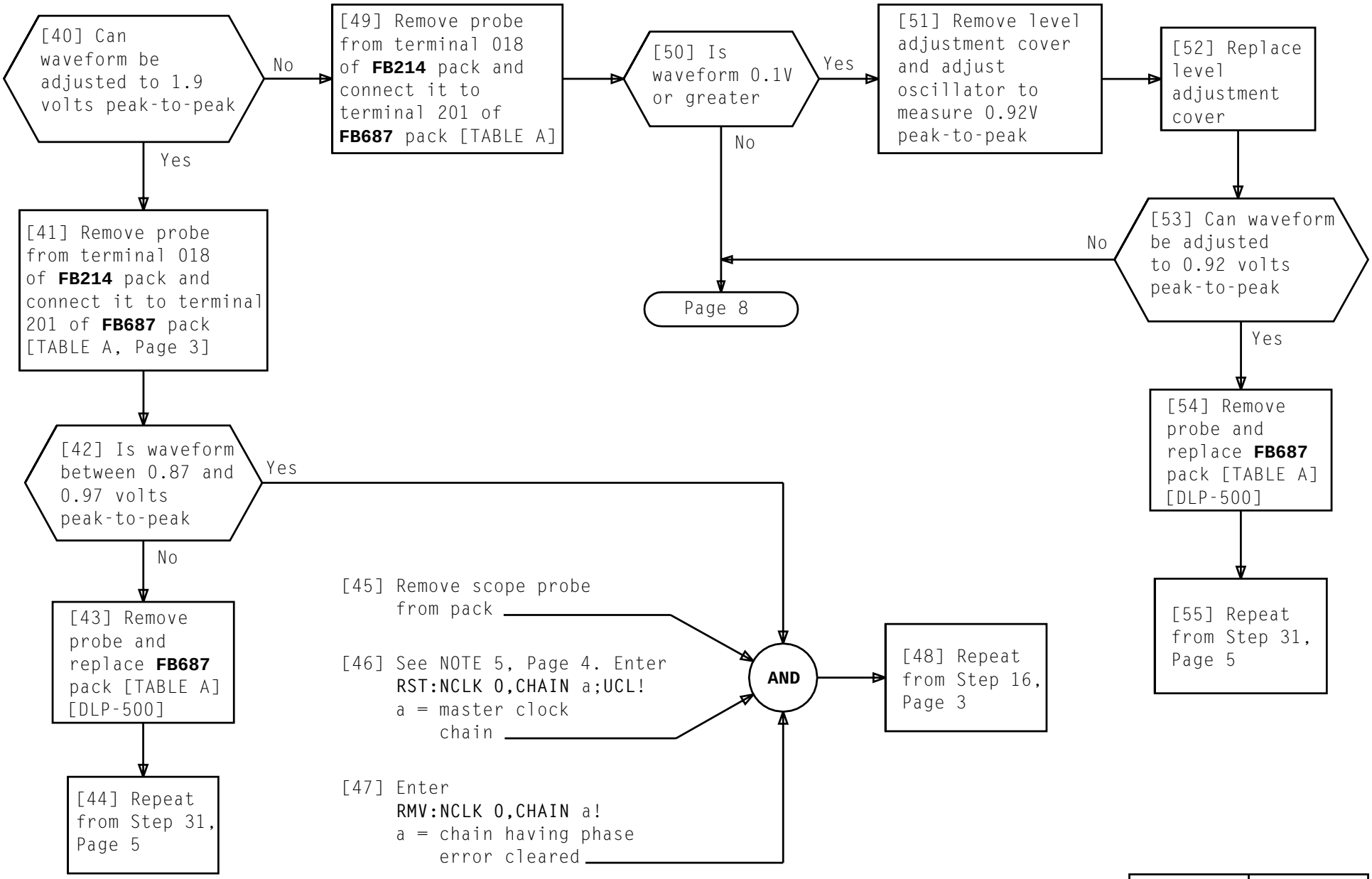
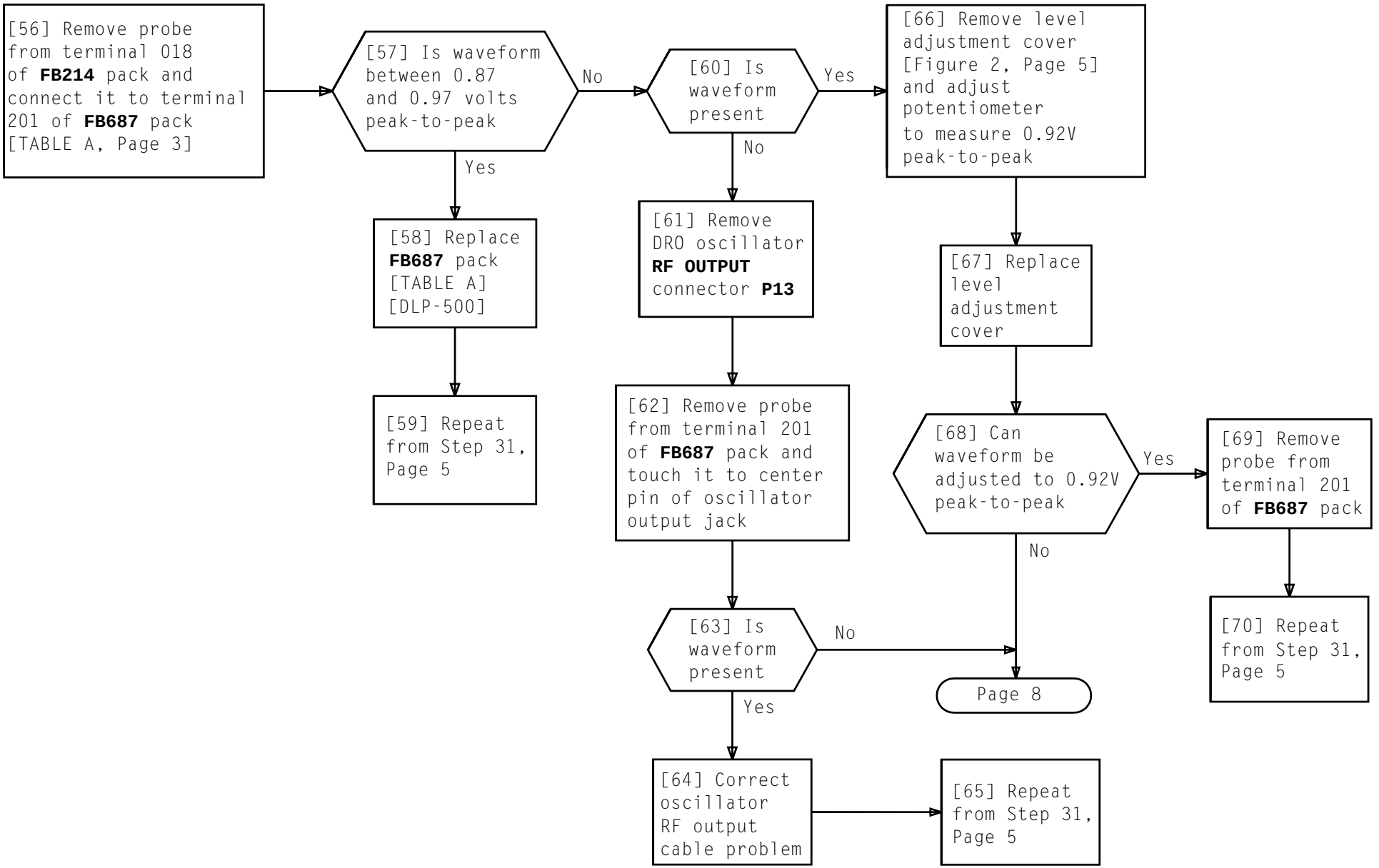


Figure 2 — DISCIPLINED RUBIDIUM OSCILLATOR

CLEAR PHASE ERROR — DISCIPLINED RUBIDIUM OSCILLATORS



CLEAR PHASE ERROR — DISCIPLINED RUBIDIUM OSCILLATORS



CLEAR PHASE ERROR — DISCIPLINED RUBIDIUM OSCILLATORS

[71] Ensure oscillator −48V power is present [DLP-549]

[72] See CAUTION 3. Remove DRO oscillator [DLP-545]

[73] Install DRO oscillator [DLP-541]

[74] See CAUTION 4. Connect oscillator manual adjustment unit to oscillator [DLP-532]

AND

[75] Allow DRO oscillator to initialize. During initialization:

- **FREE RUN** LED flashes
- **MAJOR** alarm LED is lighted
- Hex display indicates INIT
- **RF OUTPUT** is disabled

When initialization is complete (approximately 20 min):

- **FREE RUN** LED is out
- **MAJOR** alarm LED is out
- Hex display indicates 2000
- **RF OUTPUT** is enabled

[76] Check full frequency range and alarm bits of oscillator [DLP-542]

[77] Disconnect oscillator manual adjustment unit [DLP-531]

[78] Check DRO oscillator [DLP-546]

AND

[79] Is manual update required

No

[81] Repeat from Step 31, Page 5

Yes

[80] Align oscillator using open loop method [DLP-543]

CAUTIONS

3. *Remove RF OUTPUT cable (**P13**) immediately even if oscillator is not physically removed immediately*
4. *Clock chain of oscillator being checked must be powered down*

CLEAR PHASE ERROR — DISCIPLINED RUBIDIUM OSCILLATORS

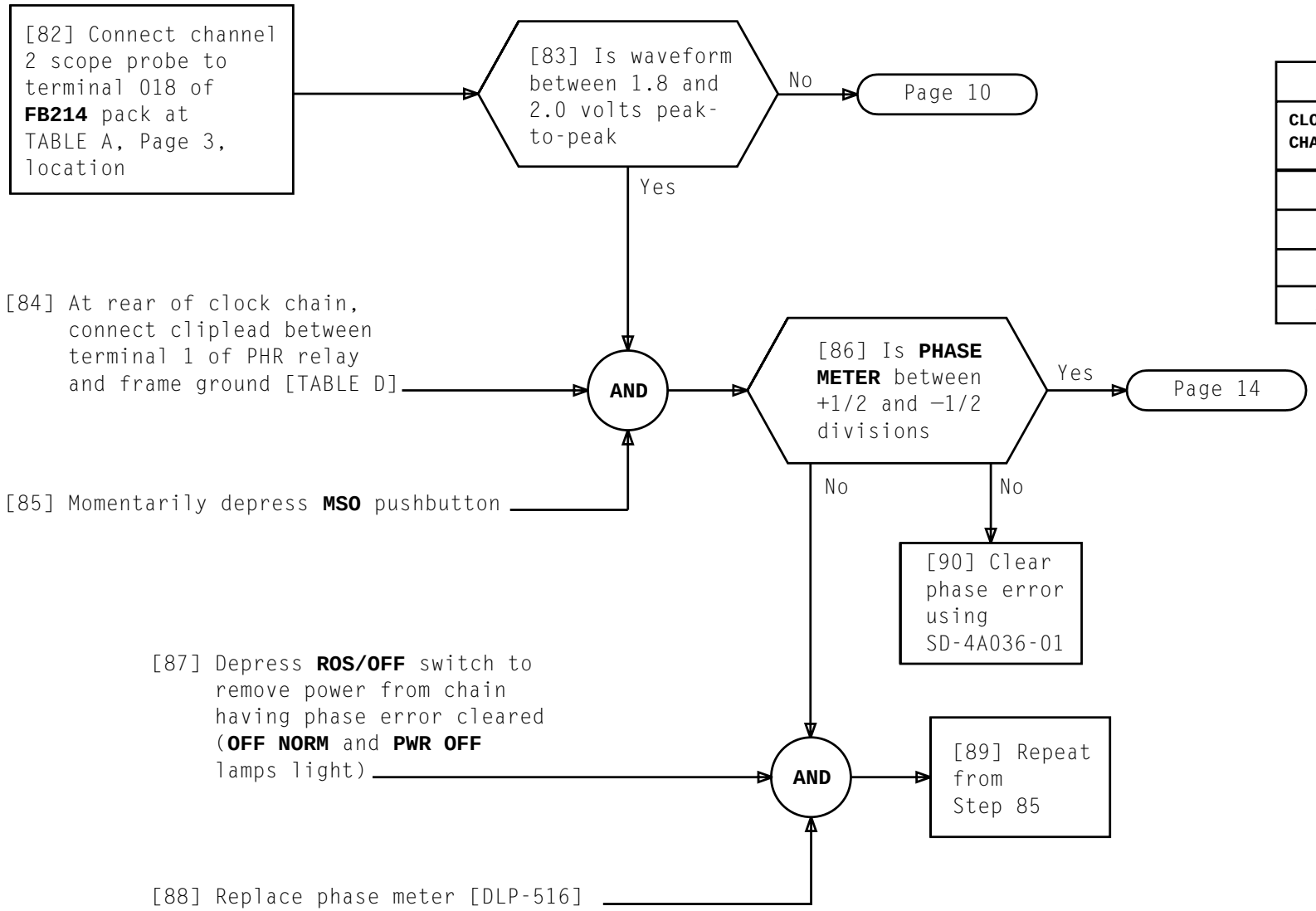
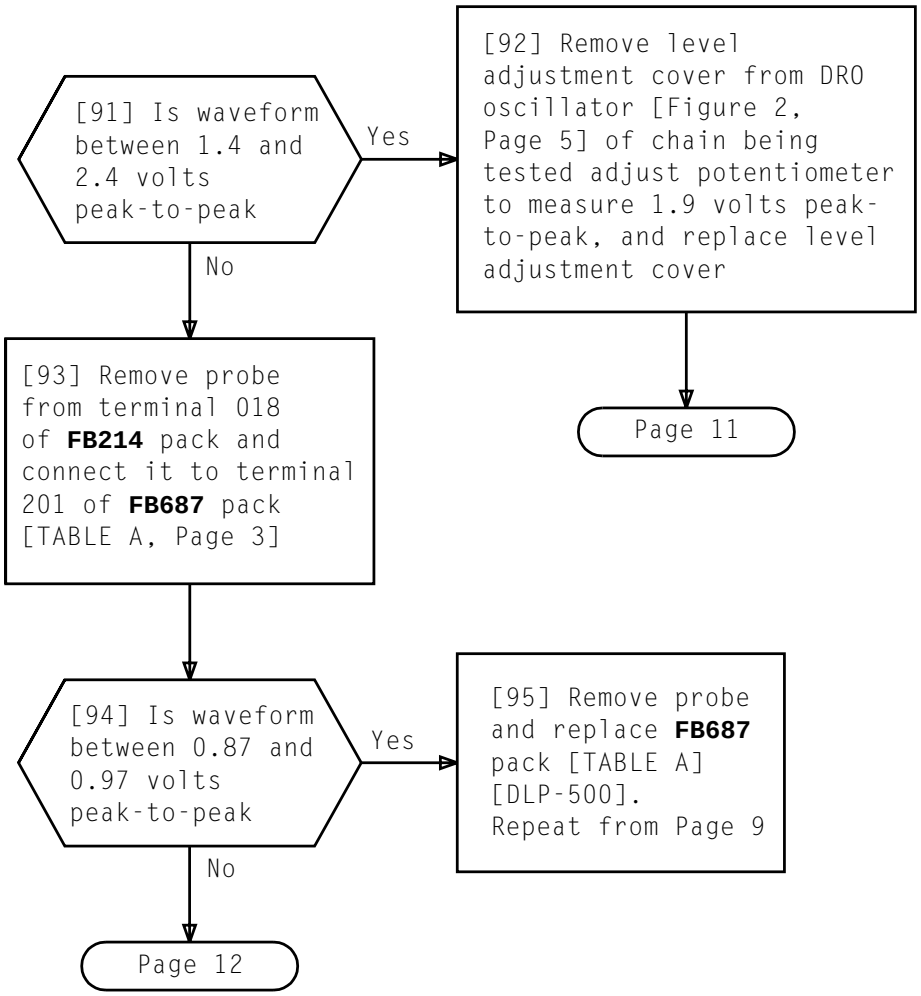


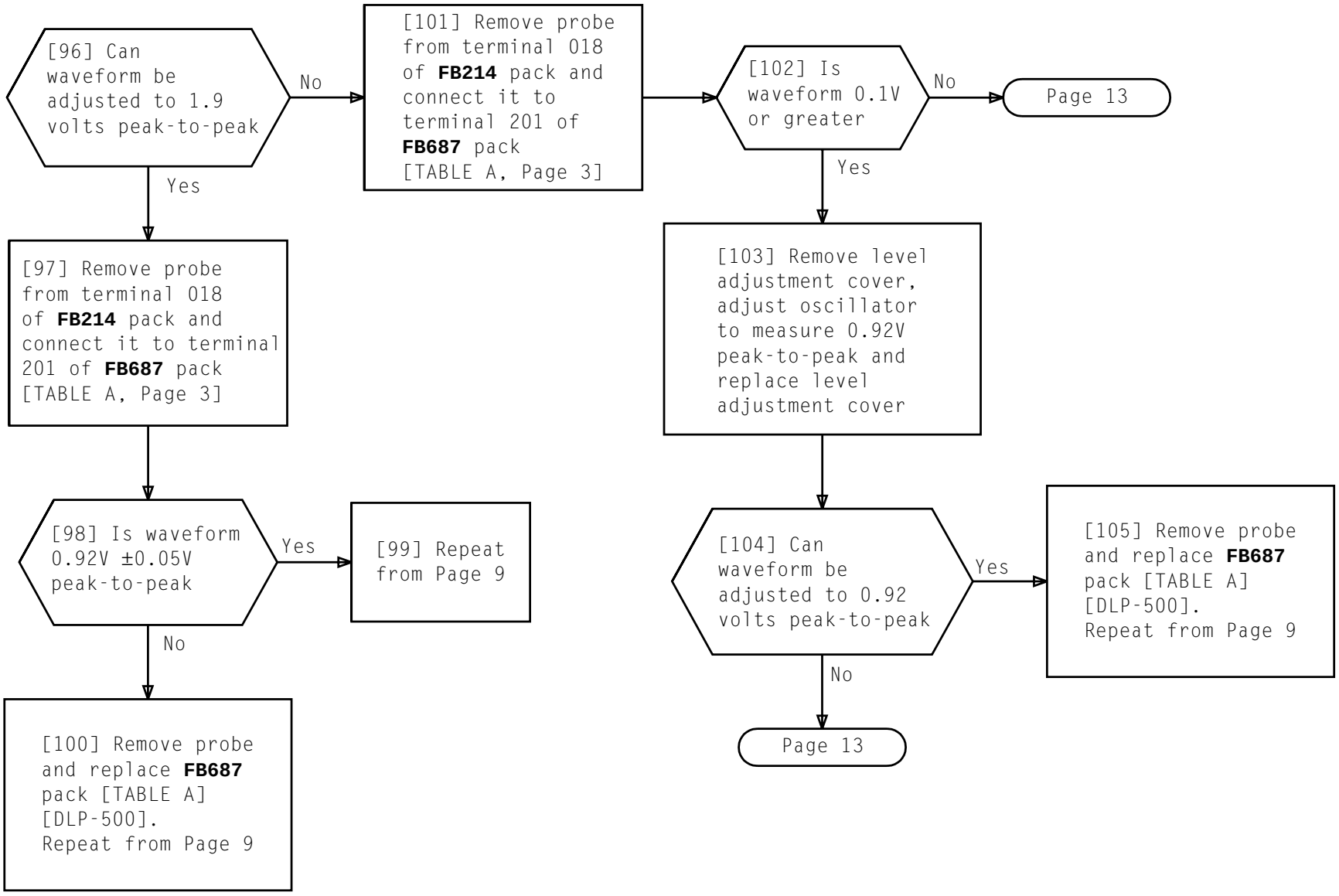
TABLE D

CLOCK CHAIN	RELAY	RELAY LOCATION
0	**0PHR**	066-24
1	**1PHR**	066-47
2	**0PHR**	166-24
3	**1PHR**	166-47

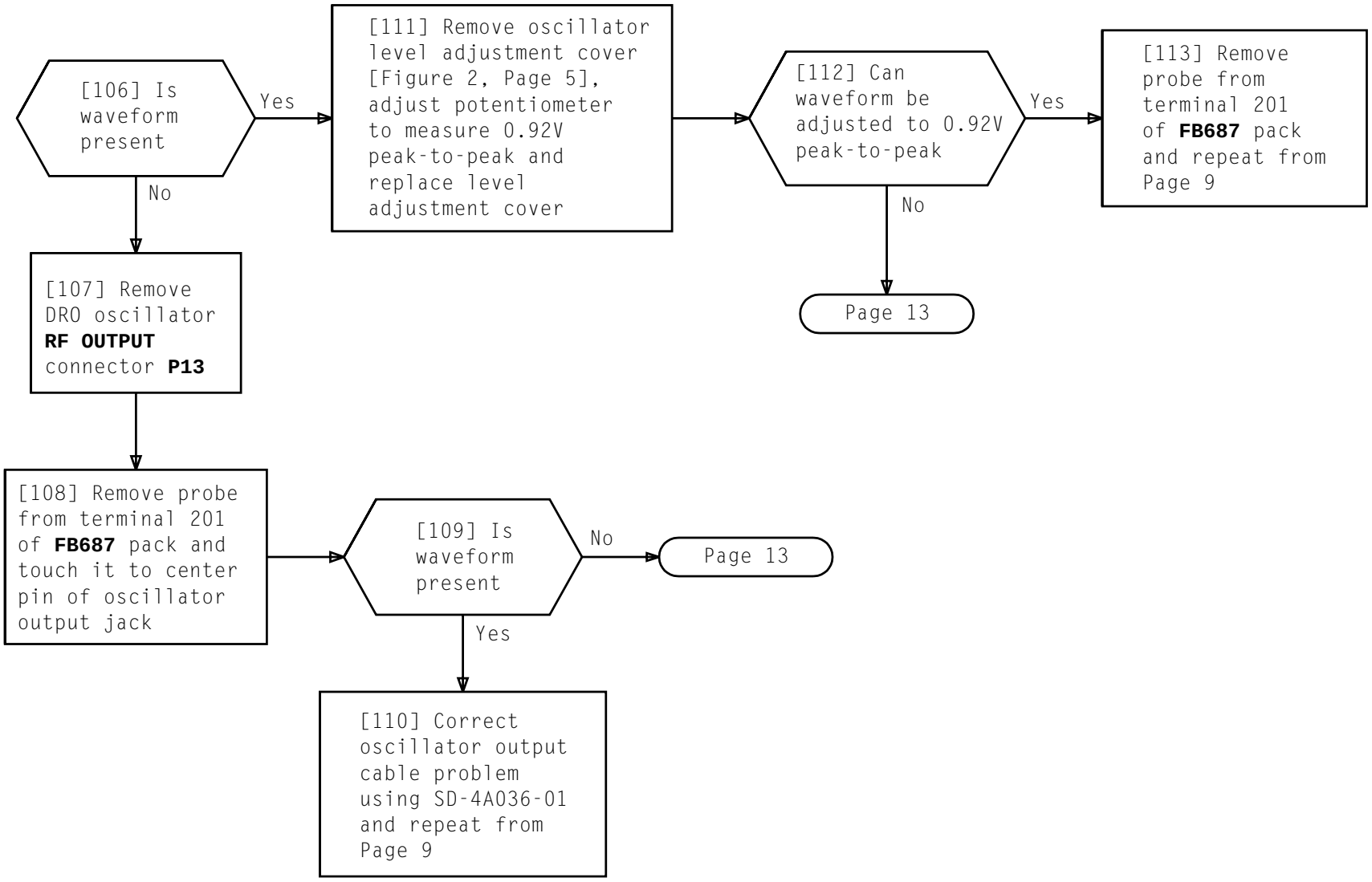
CLEAR PHASE ERROR — DISCIPLINED RUBIDIUM OSCILLATORS



CLEAR PHASE ERROR — DISCIPLINED RUBIDIUM OSCILLATORS



CLEAR PHASE ERROR – DISCIPLINED RUBIDIUM OSCILLATORS



CLEAR PHASE ERROR — DISCIPLINED RUBIDIUM OSCILLATORS

[114] Ensure oscillator −48V power is present [DLP-549]

[115] See CAUTION 5. Remove DRO oscillator [DLP-545]

[116] Install DRO oscillator [DLP-541]

[117] See CAUTION 6. Connect oscillator manual adjustment unit to oscillator [DLP-532]

AND

[118] Allow DRO oscillator to initialize. During initialization:

- **FREE RUN** LED flashes
- **MAJOR** alarm LED is lighted
- Hex display indicates INIT
- **RF OUTPUT** is disabled

When initialization is complete (approximately 20 min):

- **FREE RUN** LED is out
- **MAJOR** alarm LED is out
- Hex display indicates 2000
- **RF OUTPUT** is enabled

[119] Check full frequency range and alarm bits of oscillator [DLP-542]

[120] Disconnect oscillator manual adjustment unit [DLP-531]

[121] Check DRO oscillator [DLP-546]

AND

[122] Is manual update required

No

[124] Repeat from Page 9

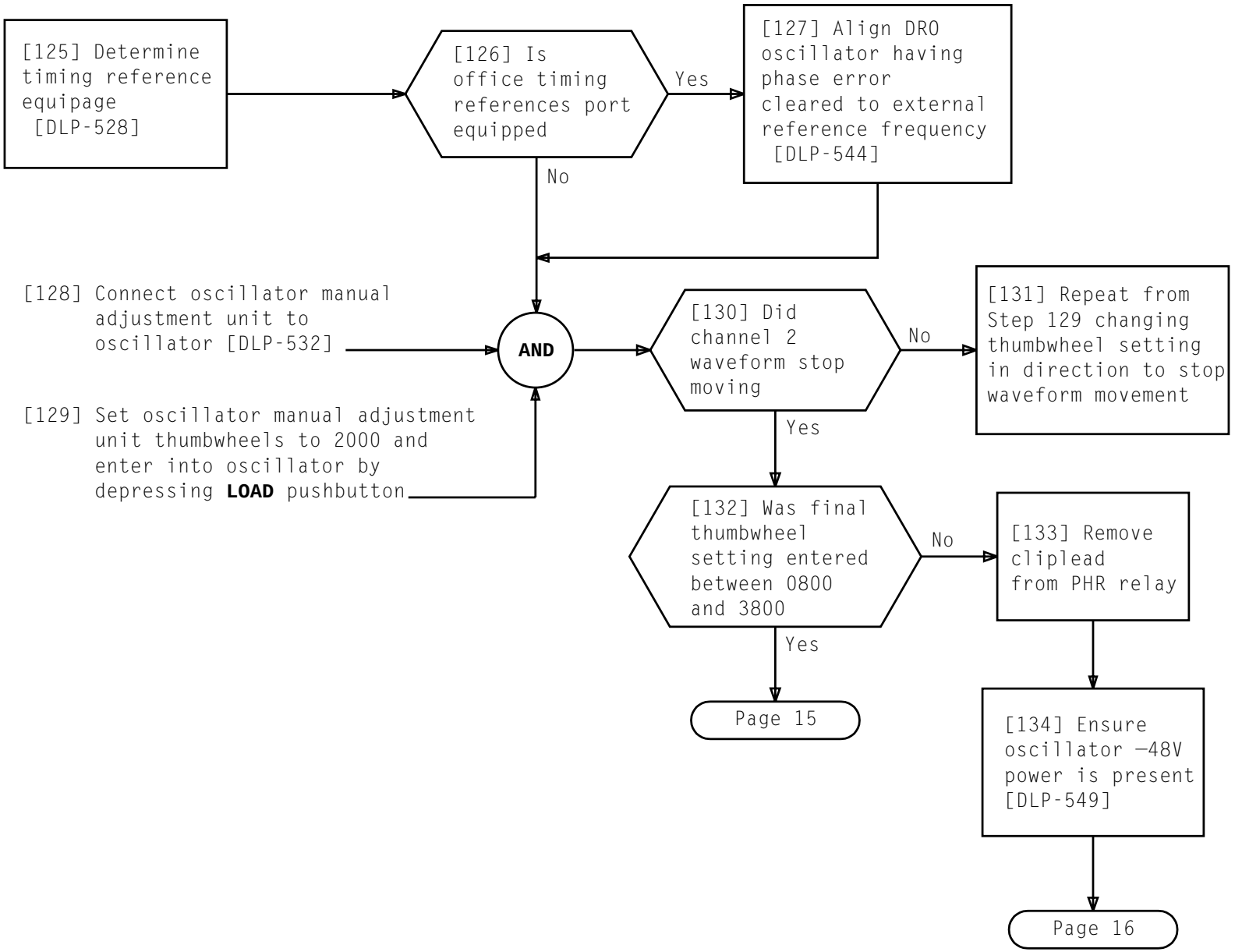
Yes

[123] Align oscillator using open loop method [DLP-543]

CAUTIONS

5. *Remove RF OUTPUT cable (**P13**) immediately even if oscillator is not physically removed immediately*
6. *Clock chain of oscillator being checked must be powered down*

CLEAR PHASE ERROR — DISCIPLINED RUBIDIUM OSCILLATORS



CLEAR PHASE ERROR — DISCIPLINED RUBIDIUM OSCILLATORS

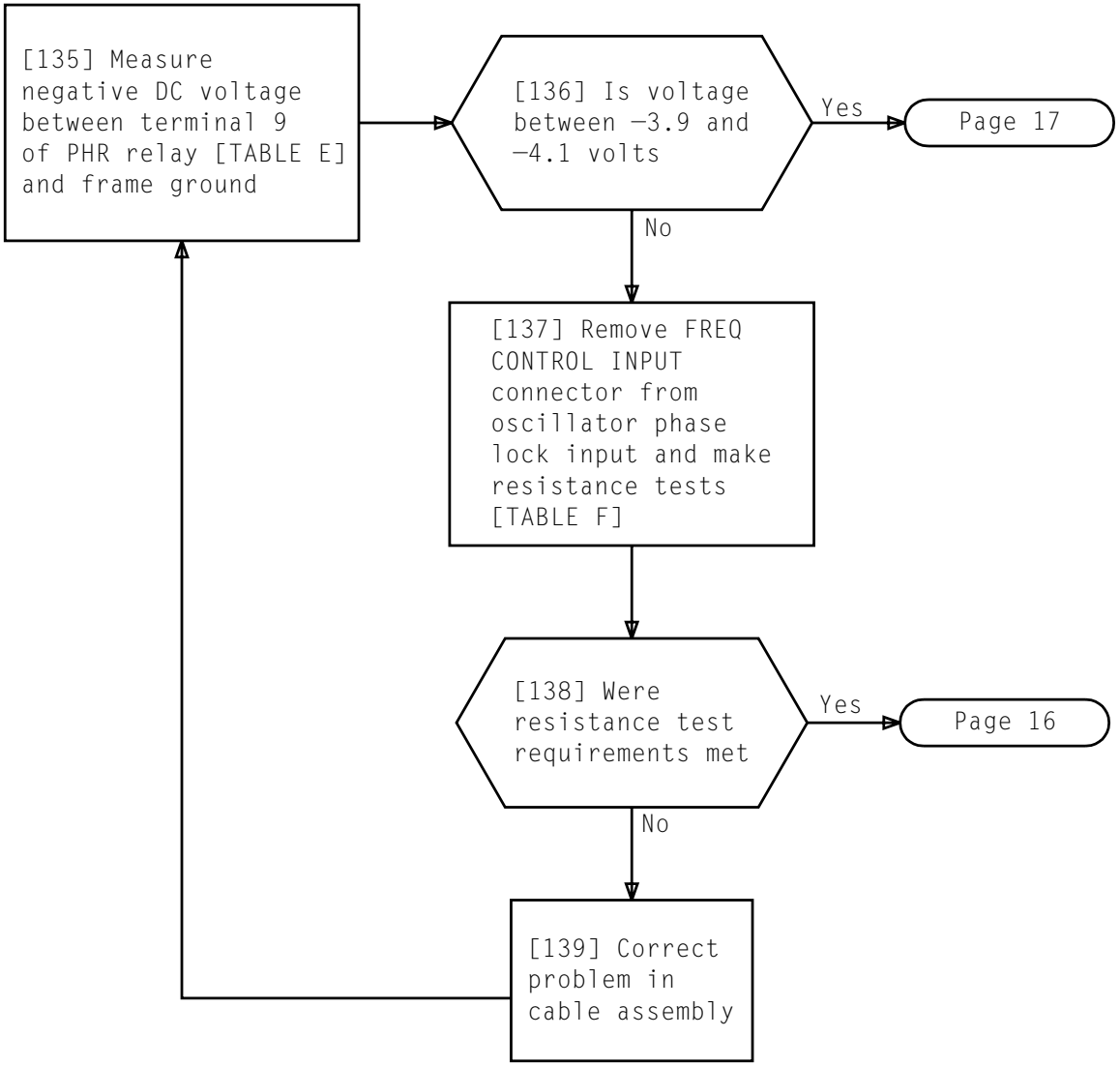
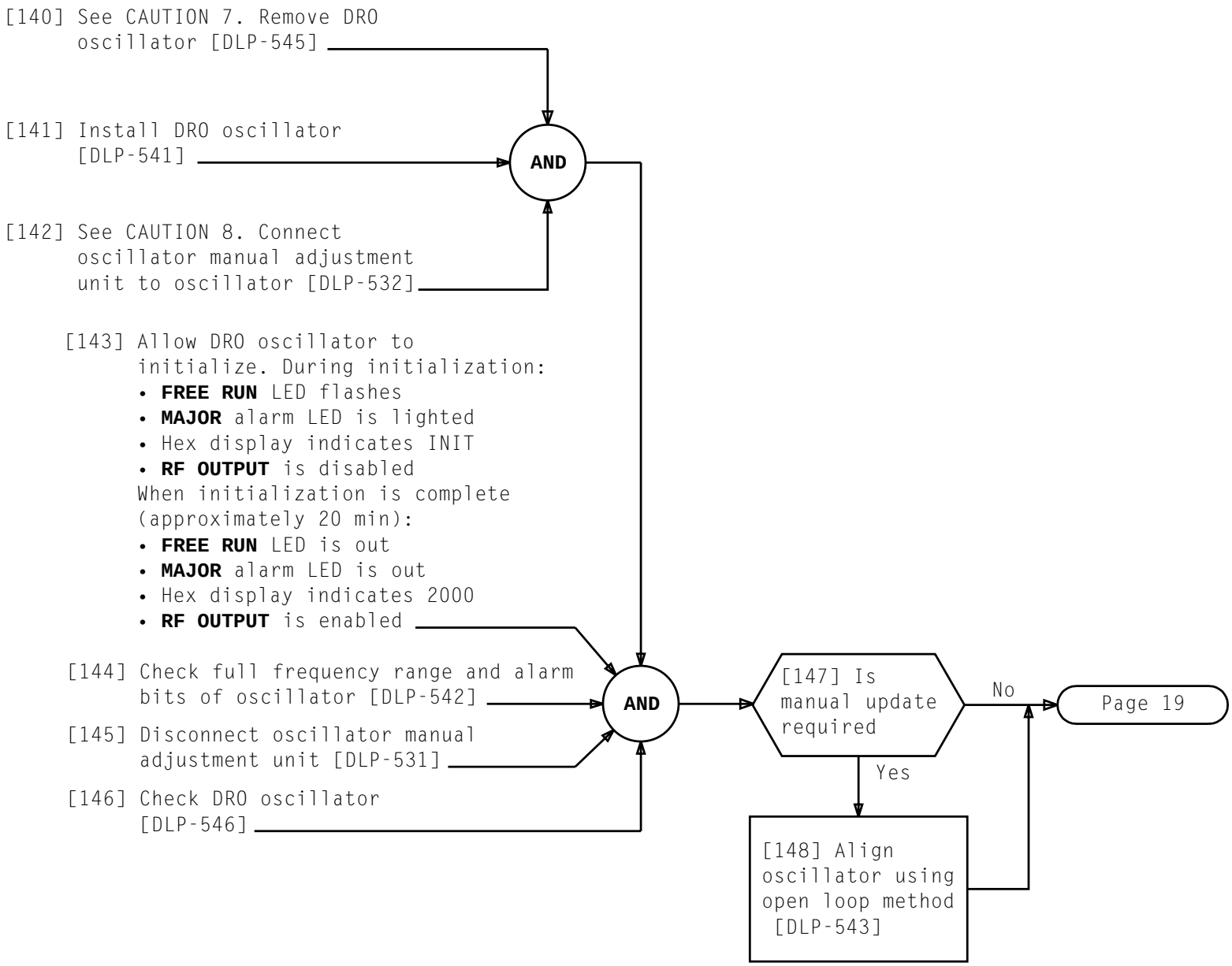


TABLE E		
CLOCK CHAIN	**RELAY**	**RELAY LOCATION**
0	**0PHR**	066-24
1	**1PHR**	066-47
2	**0PHR**	166-24
3	**1PHR**	166-47

TABLE F		
MEASURE BETWEEN		**OHMS**
OSC PLI CONN TERM	**PHR RELAY**	
B	Ground	0
D	Ground	0
E	Terminal 9	0
F	Terminal 9	⇒*
* Infinity reading		

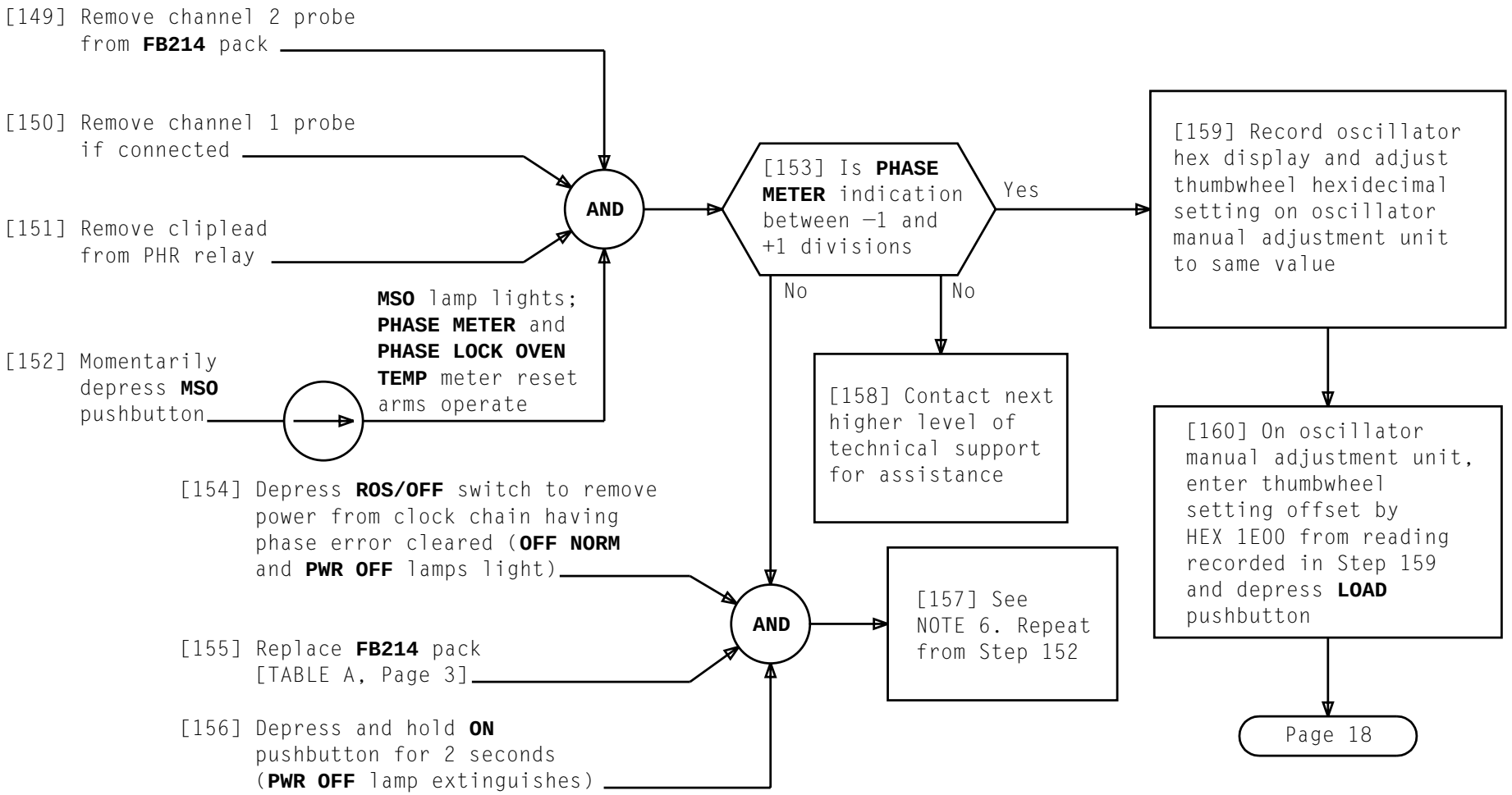
CLEAR PHASE ERROR — DISCIPLINED RUBIDIUM OSCILLATORS



CAUTIONS

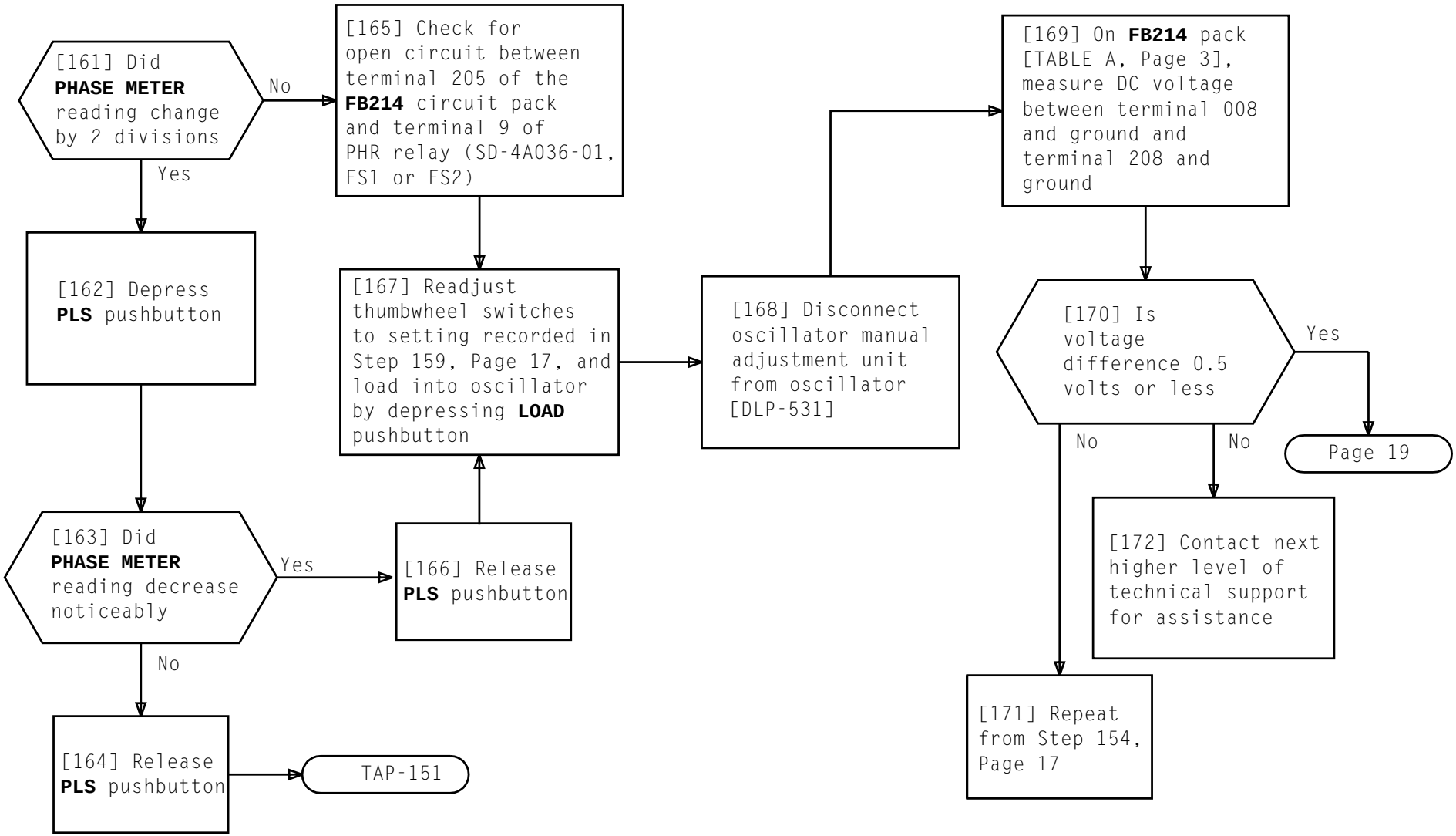
7. *Remove RF OUTPUT cable (**P13**) immediately even if oscillator is not physically removed immediately*
8. *Clock chain of oscillator being checked must be powered down*

CLEAR PHASE ERROR — DISCIPLINED RUBIDIUM OSCILLATORS

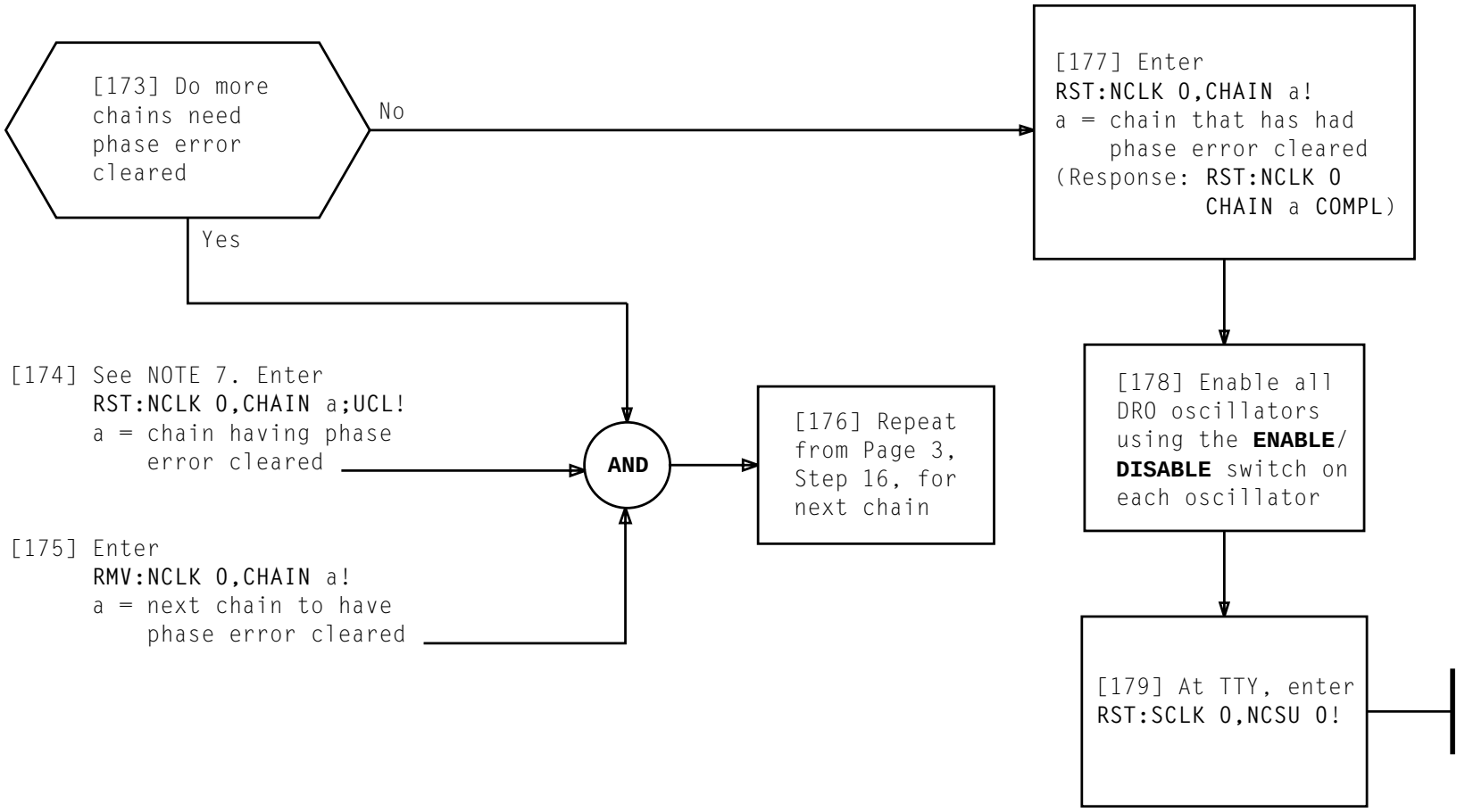


NOTE 6
FB214 pack contains oven control and thermistor monitoring bridges that require 15 minutes to stabilize

CLEAR PHASE ERROR — DISCIPLINED RUBIDIUM OSCILLATORS



CLEAR PHASE ERROR — DISCIPLINED RUBIDIUM OSCILLATORS



CLEAR PHASE ERROR — DISCIPLINED RUBIDIUM OSCILLATORS

NOTE 7
Ensure chain is powered up before restoring unconditionally

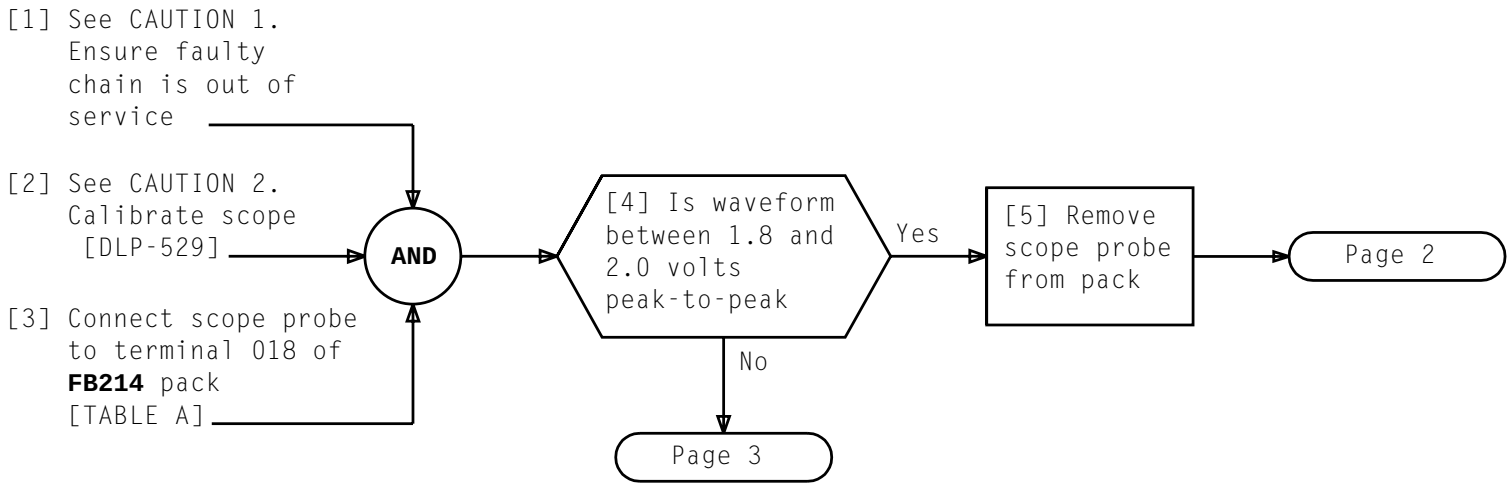


TABLE A

CHAIN	0	1	2	3
PACK	LOCATION			
FB214	066-33	066-39	166-33	166-39
FB687	070-34	070-37	170-34	170-37
FB215	070-31	070-40	170-31	170-40
FA628	070-29	070-42	170-29	170-42

CAUTIONS

1. *Always remove NCSU from service and disable all oscillators (using* **ENABLE/ DISABLE** *switch) before working on any network problem*
2. *Improper scope calibration can affect service*

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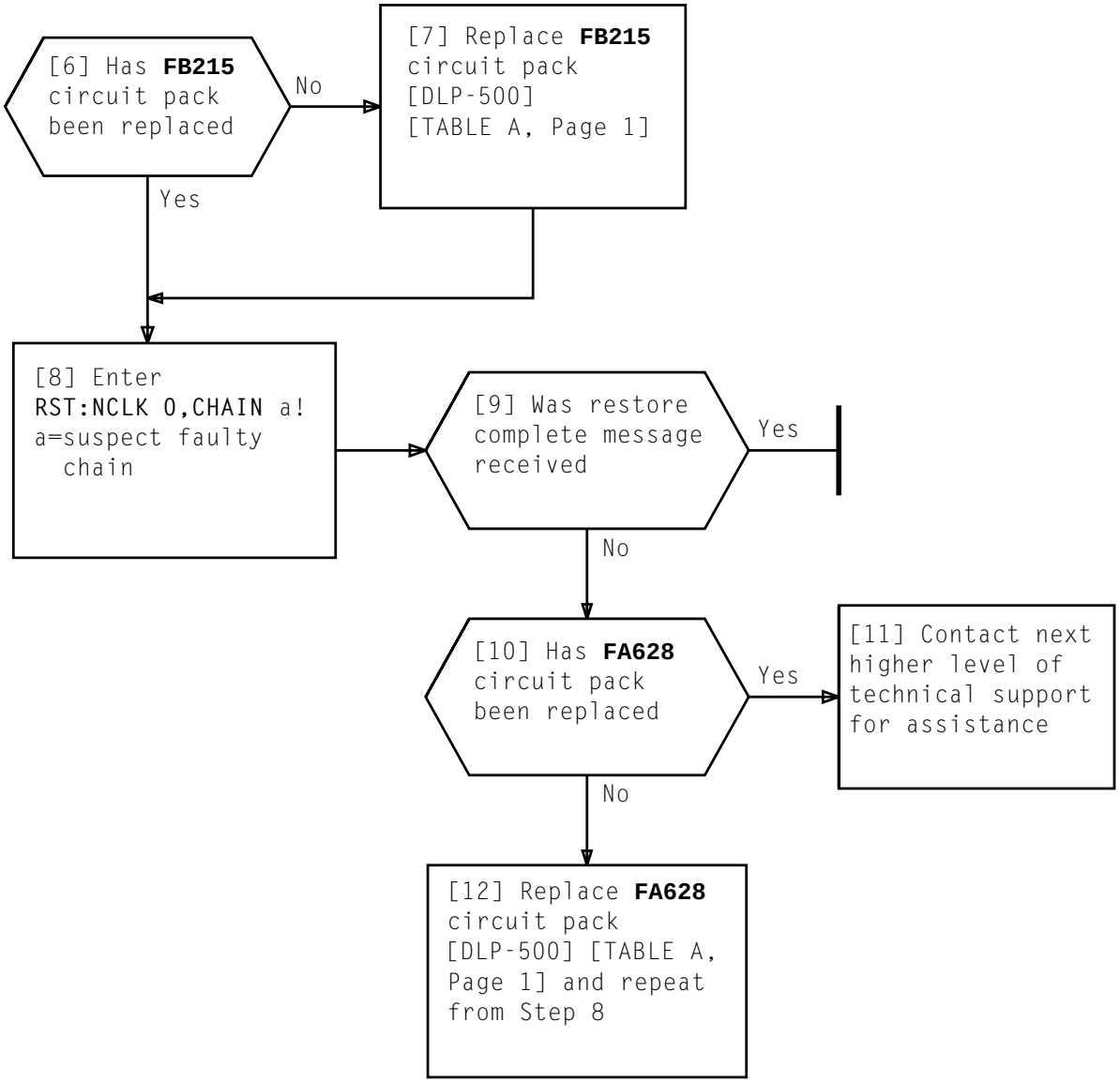
CLEAR DISCIPLINED RUBIDIUM OSCILLATOR LEVEL ERROR PROBLEM



CLEAR DISCIPLINED RUBIDIUM OSCILLATOR LEVEL ERROR PROBLEM

[13] Is waveform between 1.4 and 2.4 volts peak-to-peak

Yes

[19] Remove level adjustment cover from front side of DRO oscillator [Figure 1] of chain being tested and adjust potentiometer to measure 1.9 volts peak-to-peak

[20] Replace level adjustment cover

Page 4

No

[14] Remove probe from terminal 018 of **FB214** and connect it to terminal 201 of **FB687** pack [TABLE A, Page 1]

[15] Is waveform between 0.87 and 0.97 volts peak-to-peak

Yes

[17] Remove probe and replace **FB687** pack [DLP-500] [TABLE A]

[18] Repeat from Step 3, Page 1

No

Page 5

No

[16] Clear level error SD-4A036-01

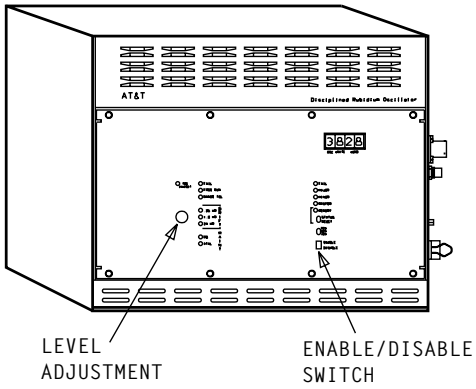
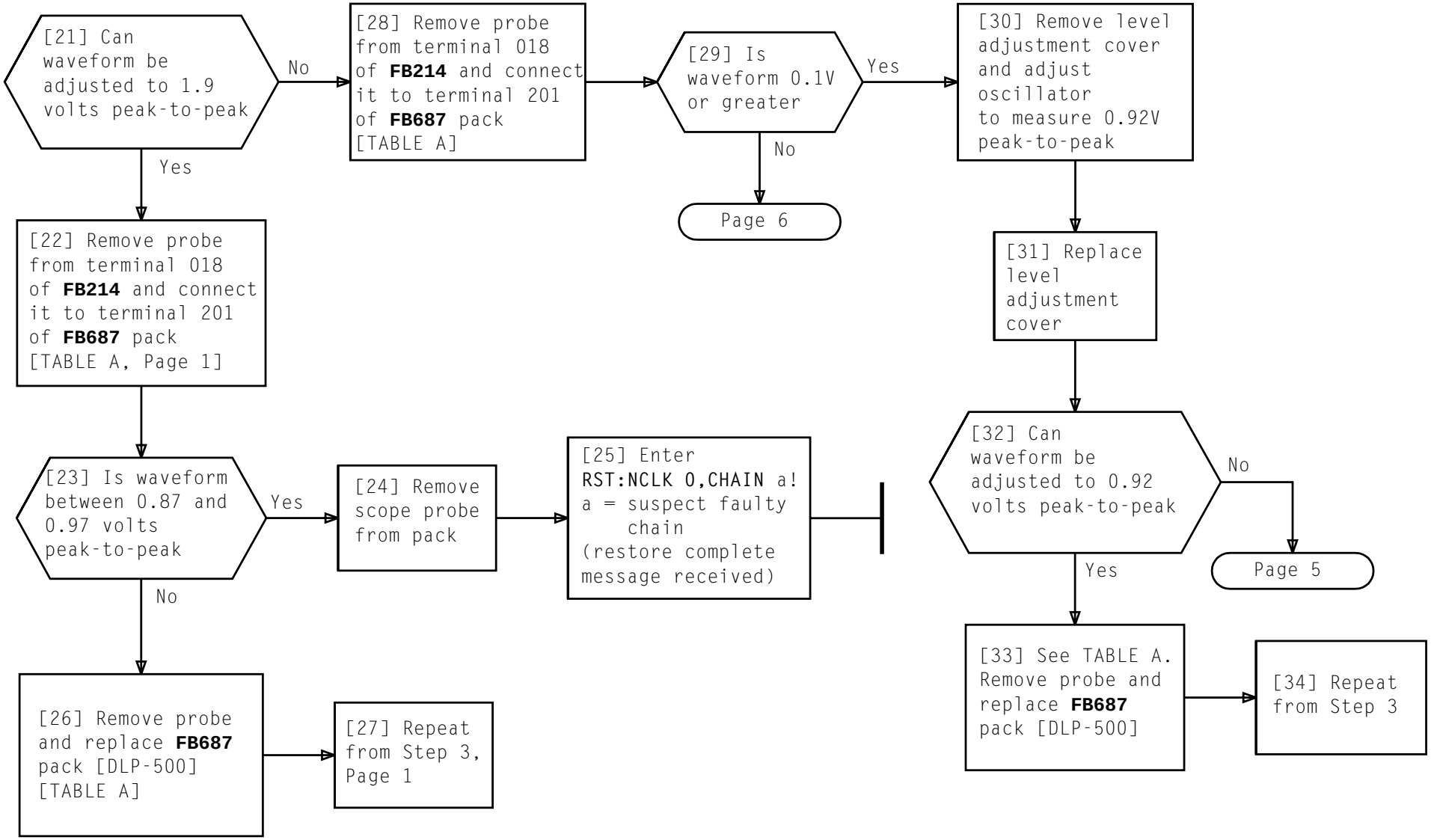
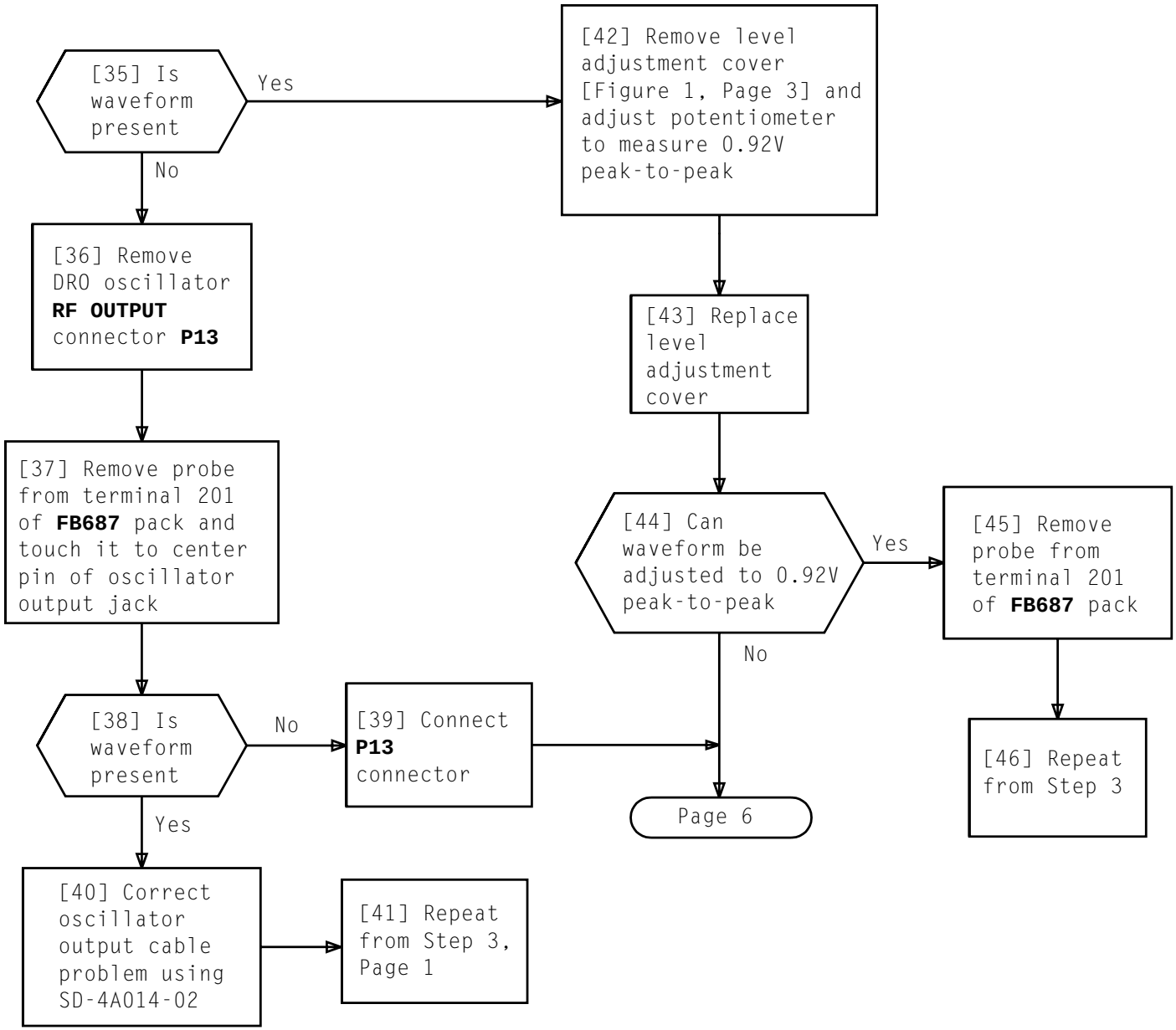


Figure 1 – Disciplined Rubidium Oscillator

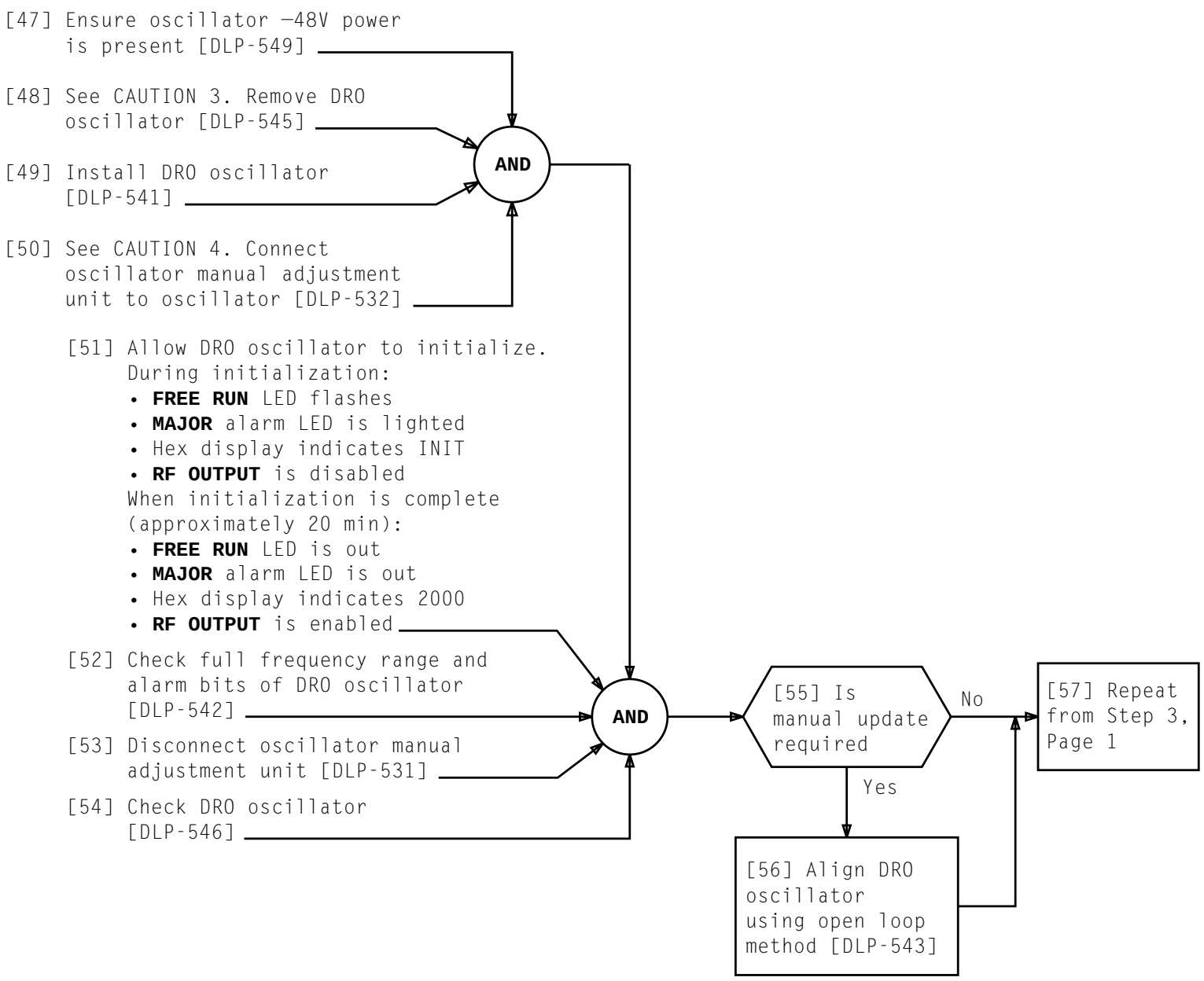
CLEAR DISCIPLINED RUBIDIUM OSCILLATOR LEVEL ERROR PROBLEM



CLEAR DISCIPLINED RUBIDIUM OSCILLATOR LEVEL ERROR PROBLEM



CLEAR DISCIPLINED RUBIDIUM OSCILLATOR LEVEL ERROR PROBLEM



CAUTIONS

3. *Remove RF OUTPUT cable* **(P13)** *immediately even if oscillator is not physically removed immediately*
4. *Clock chain of oscillator being checked; must be powered down*

CLEAR DISCIPLINED RUBIDIUM OSCILLATOR LEVEL ERROR PROBLEM

CLEAR REPETITIVE DISCIPLINED RUBIDIUM OSCILLATOR RANGE EXCEEDED MESSAGE, NCSU

[1] See CAUTION 1.
At TTY, enter
RMV:NCLK 0,OSC a!
a = out-of-range oscillator

[2] See TABLE A. Momentarily remove −48V fuse associated with out-of-range oscillator and then reinstall

[3] Allow DRO oscillator to initialize. During initialization:
- **FREE RUN** LED flashes
- **MAJOR** alarm LED is lighted
- HEX display indicates INIT
- **RF OUTPUT** is disabled

When initialization is complete (approximately 20 min):
- **FREE RUN** LED is out
- **MAJOR** alarm LED is out
- Hex display indicates 2000
- **RF OUTPUT** is enabled

[4] At TTY, enter
RST:NCLK 0,OSC a!
a = oscillator removed in Step 1

AND

[5] Is REPT:NCSU 0:OSC RANGE EXCEEDED message received within next 24 hours

No

Yes

[6] Is replacement DRO oscillator available

Yes → Page 2

No

[7] Is oscillator still in service

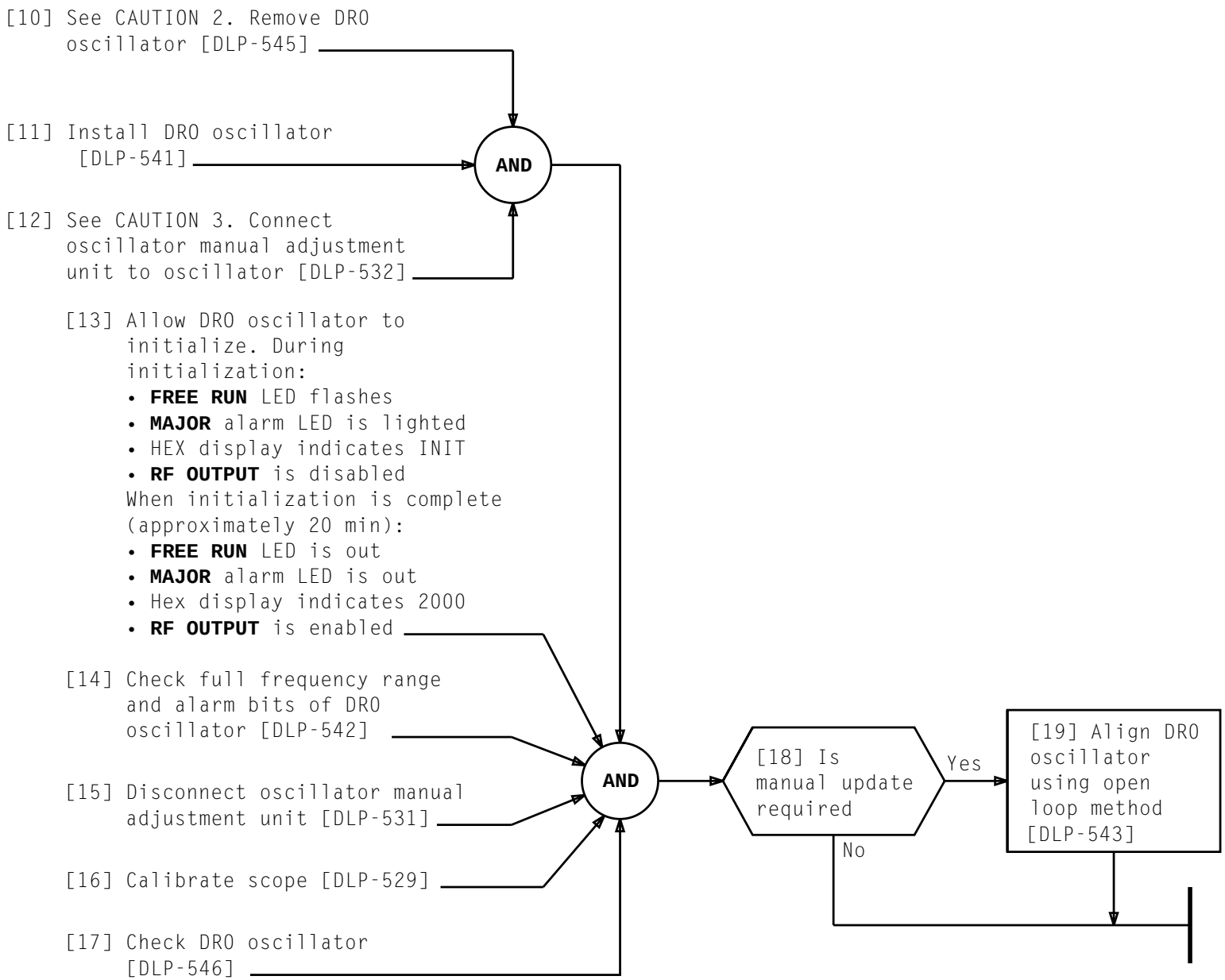
Yes → [8] Order should be placed for replacement DRO oscillator

No → [9] Remove oscillator and return to vendor for repair. Include details of trouble encountered

TABLE A

CLOCK CHAIN	OSCILLATOR LOCATION	SD-4A014-02 FUSES	FUSE LOCATION	
			BAY	HMP
0	033-21	**DC**	0	07
1	033-56	**DD**	0	07
2	133-21	**DC**	1	07
3	133-56	**DD**	1	07

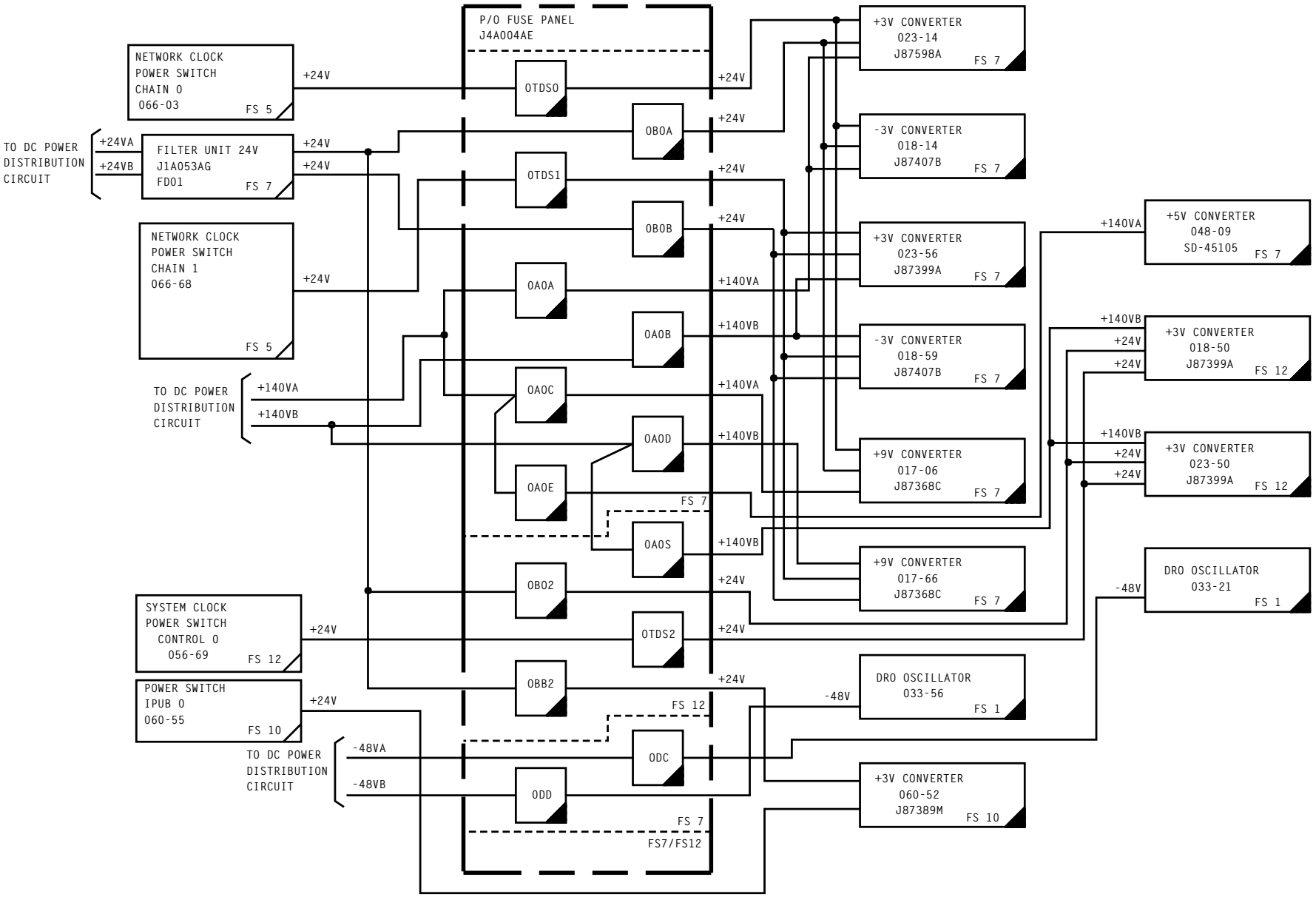
CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*



CAUTIONS

2. *Remove RF OUTPUT cable (**P13**) immediately even if oscillator is not physically removed immediately*
3. *Clock chain of oscillator being checked; must be powered down*

CLEAR REPETITIVE DISCIPLINED RUBIDIUM OSCILLATOR RANGE EXCEEDED MESSAGE, NCSU



24, 48 AND 140 VOLT FRAME DISTRIBUTION, BAY 0 — DISCIPLINED RUBIDIUM OSCILLATOR

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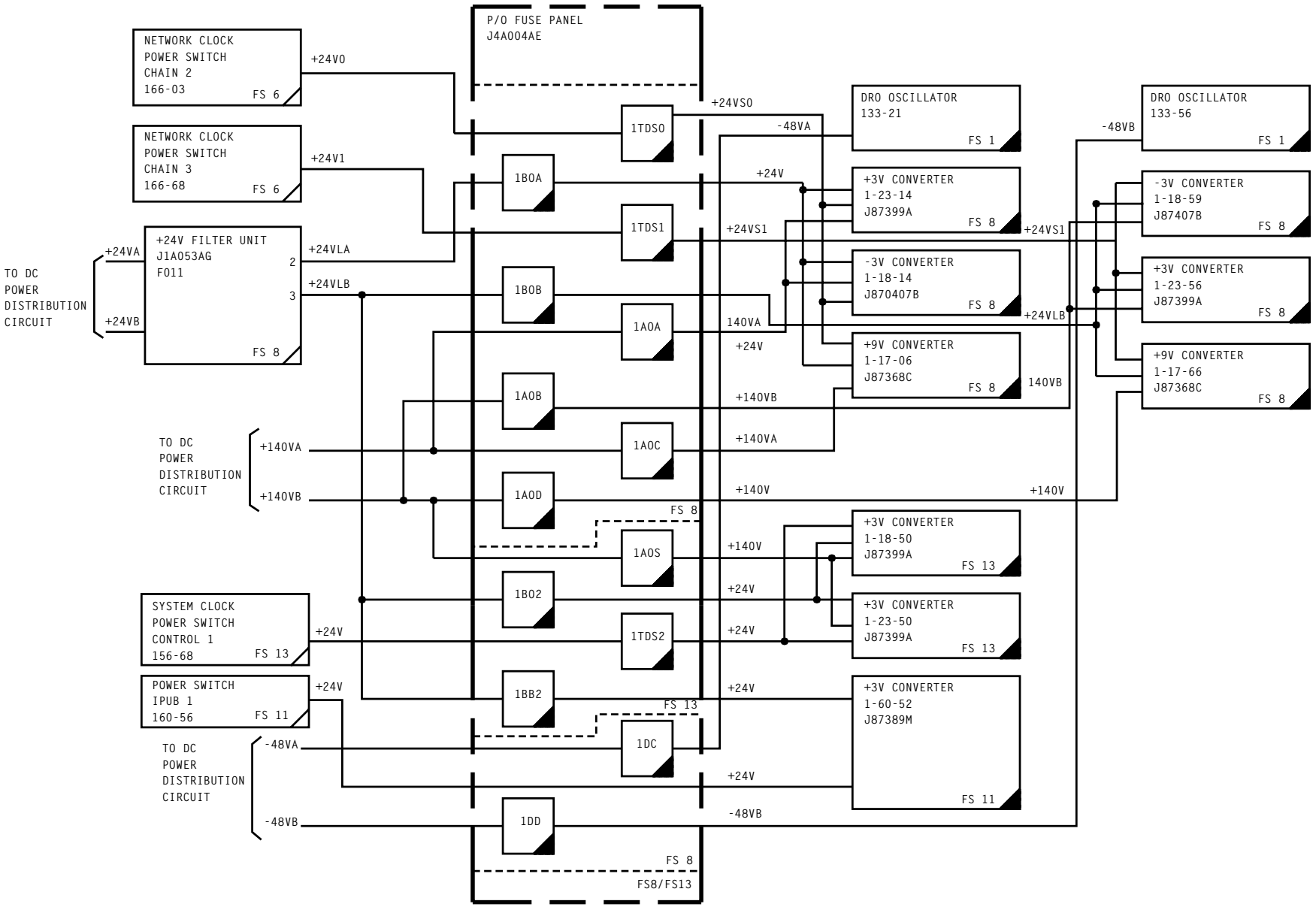

24, 48 AND 140 VOLT FRAME DISTRIBUTION, BAY 1 — DISCIPLINED RUBIDIUM OSCILLATOR

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CLEAR R1 OR PLS FAULT — DISCIPLINED RUBIDIUM OSCILLATOR

[1] See CAUTION 1. Obtain volt/ohmmeter (KS-14510)

[2] At appropriate power switch, ensure **ROS/OFF** switch is rotated to **ROS** (**OS** and **OFF NORM** lamps lighted)

[3] Depress **ROS/OFF** switch to remove power from clock chain (**OFF NORM** and **PWR OFF** lamps lighted)

AND

[4] Is clock chain cover removed

Yes

No

[5] At rear of frame, remove six panhead screws holding rear of network clock chain control cover [Figure 1]

[6] At front of frame, remove four flathead screws and network clock chain control cover

AND

[7] Using ohmmeter, measure resistance between pin 3 of **PLS** switch [Figure 2] and positive (+) terminal of coil [Figure 3]

[8] Is resistance between 38 ohms and 40 ohms

Yes

Page 2

No

[9] Replace **R1**

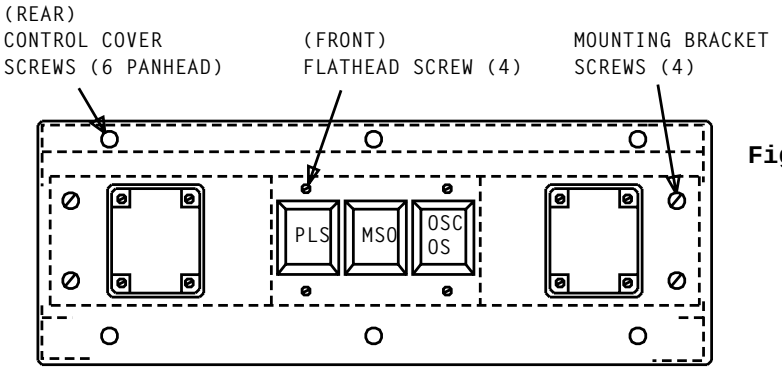

Figure 1 - Network Clock Control

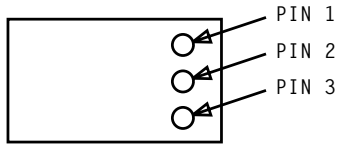

Figure 2 — PLS Circuit (Front View)

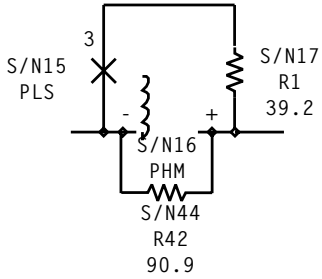

Figure 3 — R1/PLS Circuit Schematic

CAUTION 1
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** *switch) before working on any network clock problem*

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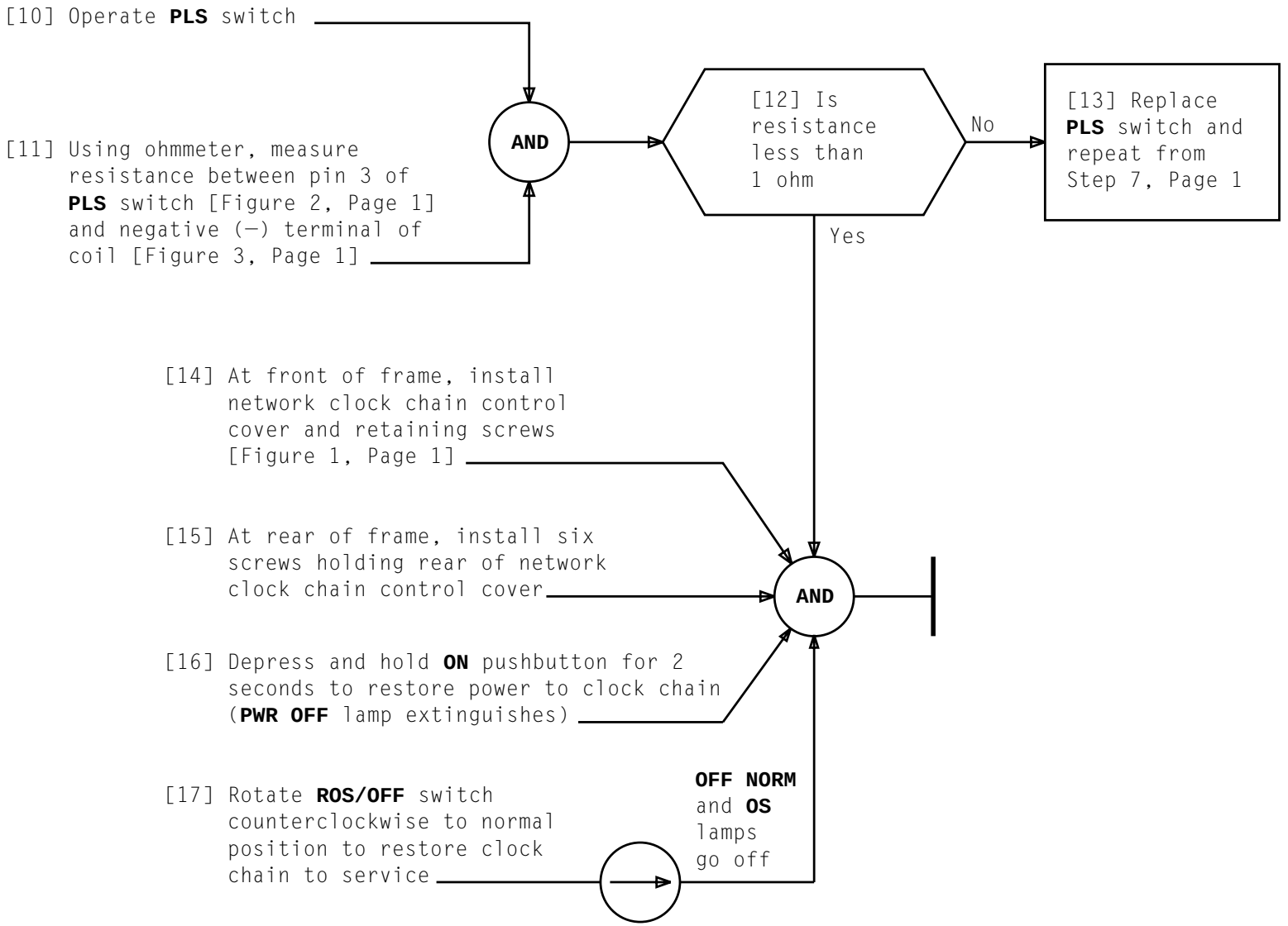
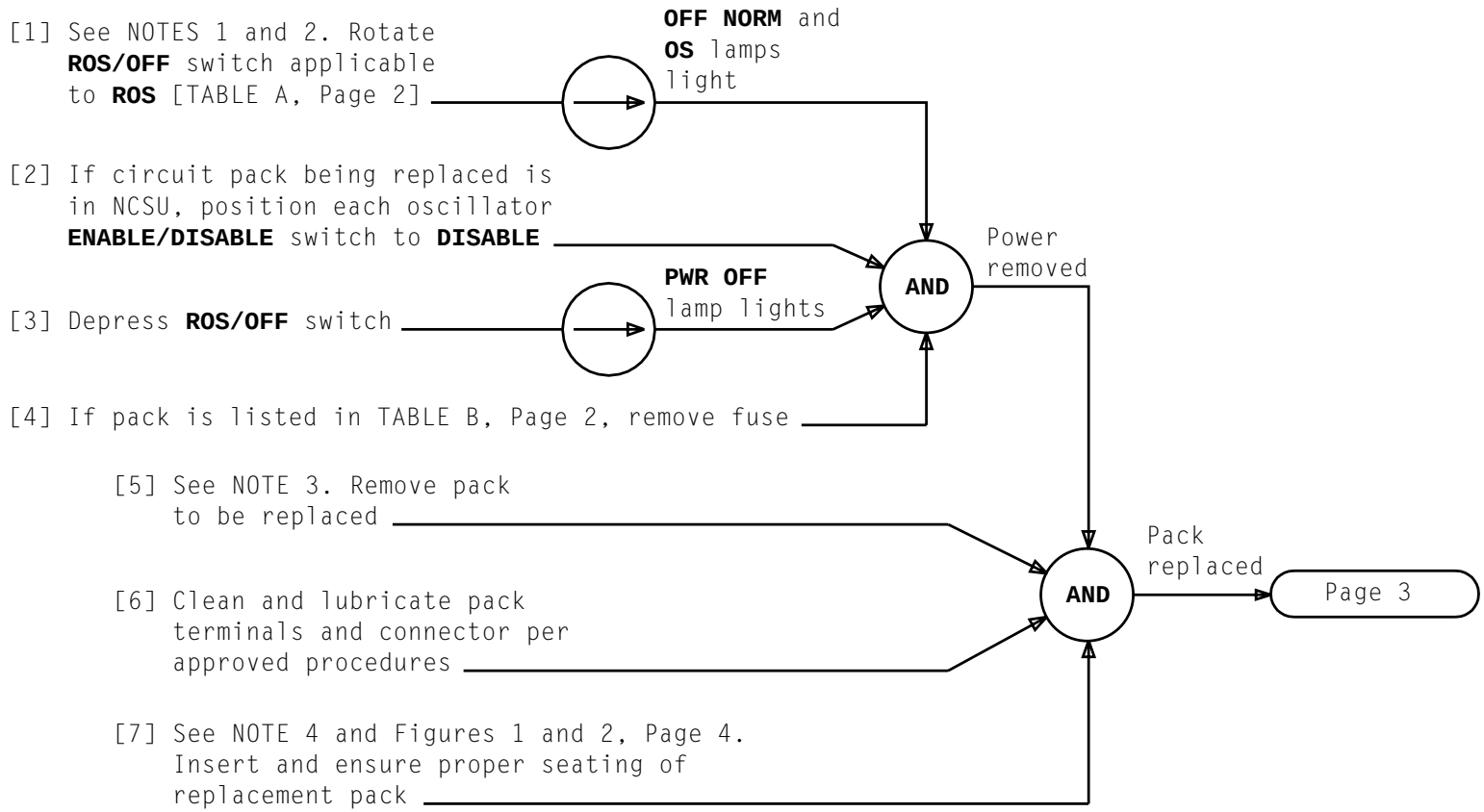


CLEAR R1 OR PLS FAULT — DISCIPLINED RUBIDIUM OSCILLATOR



NOTES

1. Packs at locations 66-31,-33,-34,-37, -39, and -40 are located behind screw-held covers of phase lock ovens
2. When packs at locations 66-31, -33,-34,-37,-39, -40, 78-20 and -52 are replaced, a 15-minute wait is required before returning unit to service to allow oven to stabilize
3. To remove pack which is stuck, gently move pack up and down to loosen and pull outward
4. Settings of DIP switches on **FG63** and **FG73** packs are important. If switches are set incorrectly, Phase 6 of the NCSU diagnostic will fail

REPLACE CIRCUIT PACK (EXCEPT FB211 TYPE)

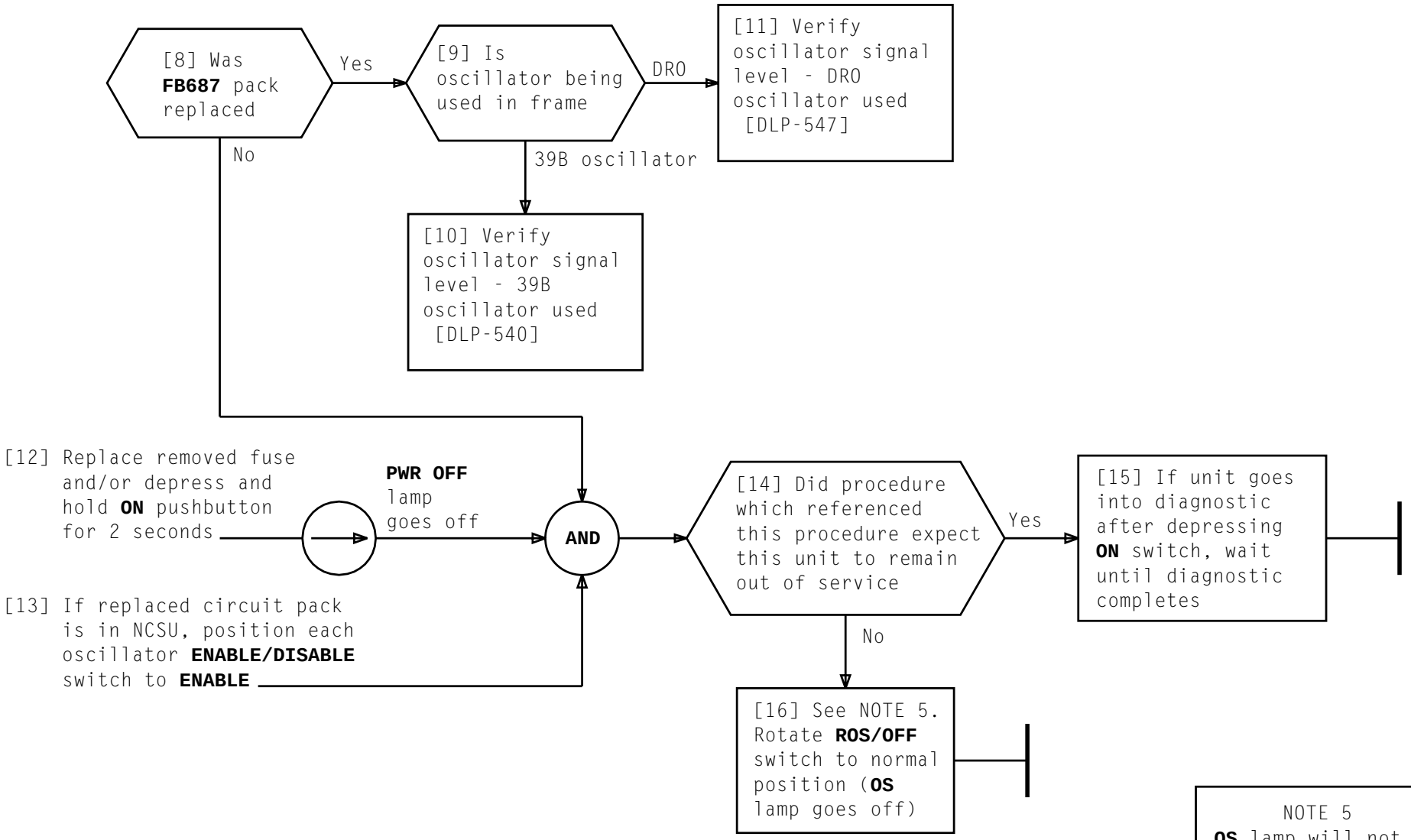
TABLE A
CIRCUIT PACK POWER CONTROLS

PACK LOCATION BAY 0/BAY 1	REQUIRED TO REMOVE CIRCUIT PACK		
	POWER CONTROL		CONTROL LOCATION
	BAY 0	BAY 1	
66-31, 66-33, 66-34, 70-19 to 70-34, 74-26 to 74-33, 78-02, 78-03, 78-07 to 78-17, 78-20	**CHAIN 0**	**CHAIN 2**	66-03
66-39, 70-37 to 70-52, 74-38 to 74-45, 78-52, 78-54 to 78-64, 78-68, 78-69	**CHAIN 1**	**CHAIN 3**	66-68
60-27 to 60-40	**IPUB 0**	**IPUB 1**	60-55
56-06 to 56-44, 56-52, 56-53	**CONTR 0**	**CONTR 1**	56-69
(BAY 0) 50-25 to 50-67	**NCSU**	**—**	048-03

TABLE B
CIRCUIT PACK FUSES

PACK LOCATION BAY 0/BAY 1	REQUIRED TO REMOVE CIRCUIT PACK		
	FUSE		FUSE LOCATION
	BAY 0	BAY 1	
78-03	**OAB**	**1AB**	07-20
66-31, 66-34, 78-20	**OHT0**	**1HT0**	07-20
66-39	**OA10**	**1A10**	07-32
66-33	**OB9**	**1B9**	07-45
66-37, 66-40, 78-52	**OHT1**	**1HT1**	07-51
78-68	**OCB**	**1CB**	07-51
56-52	**OAA2**	**1AA2**	09-51
50-25 (NCSU) (BAY 0)	**OSB** **OSC** **OSD**	**—**	009-32
50-27 (NCSU) (BAY 0)	**OSD**	**—**	009-32

REPLACE CIRCUIT PACK (EXCEPT FB211 TYPE)



NOTE 5
OS lamp will not go off if TTY message was used to remove unit from service

REPLACE CIRCUIT PACK (EXCEPT FB211 TYPE)

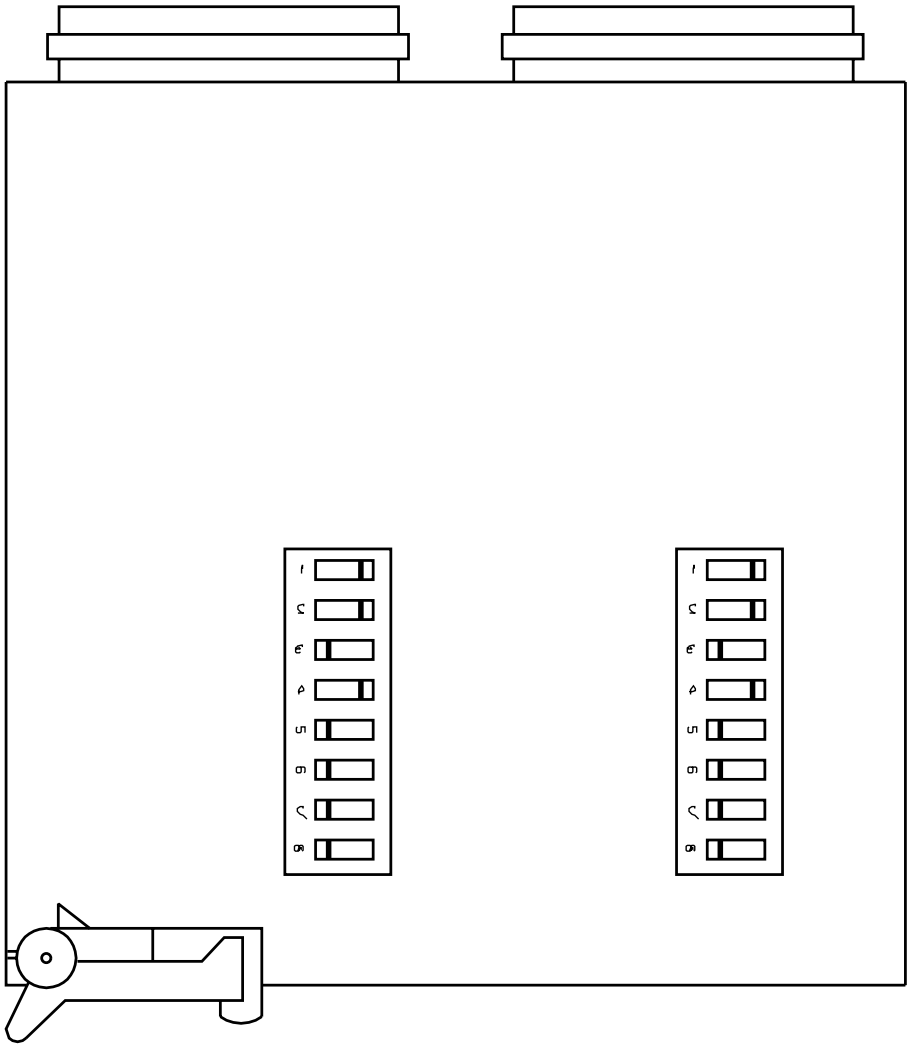


Figure 1 – FG63 Switch Positions

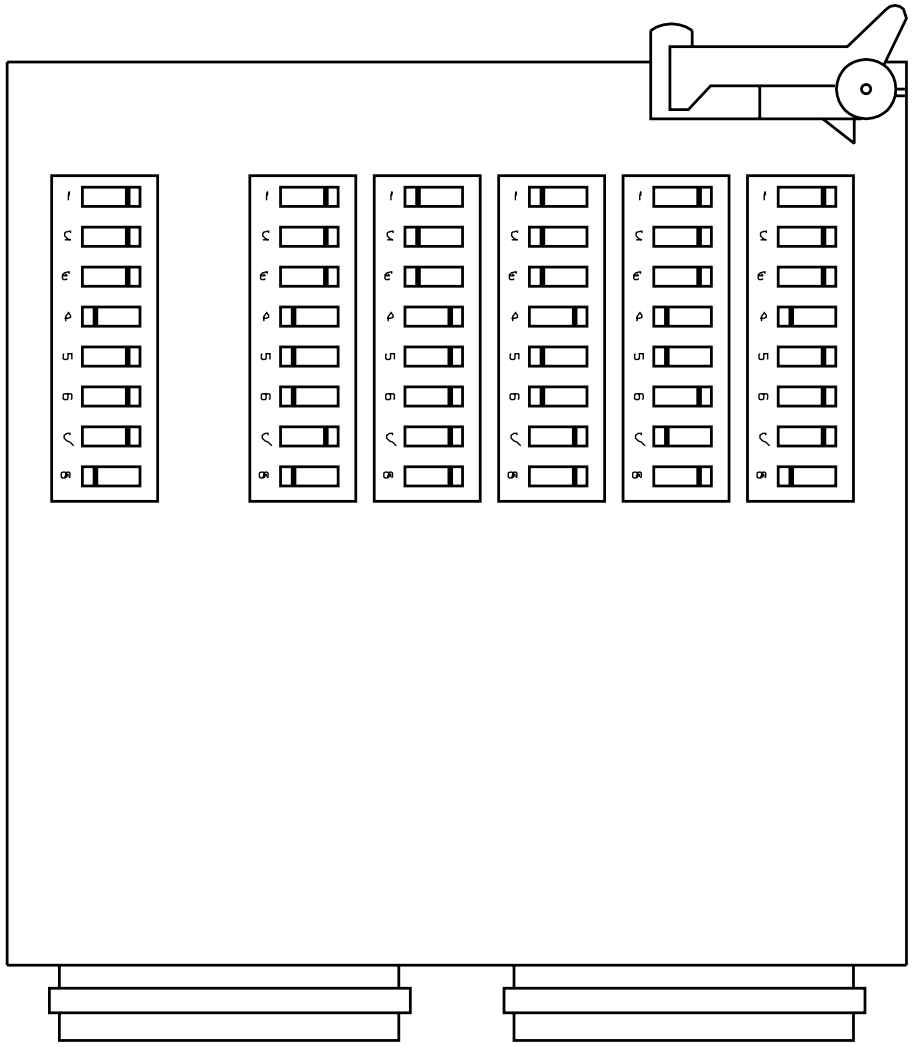
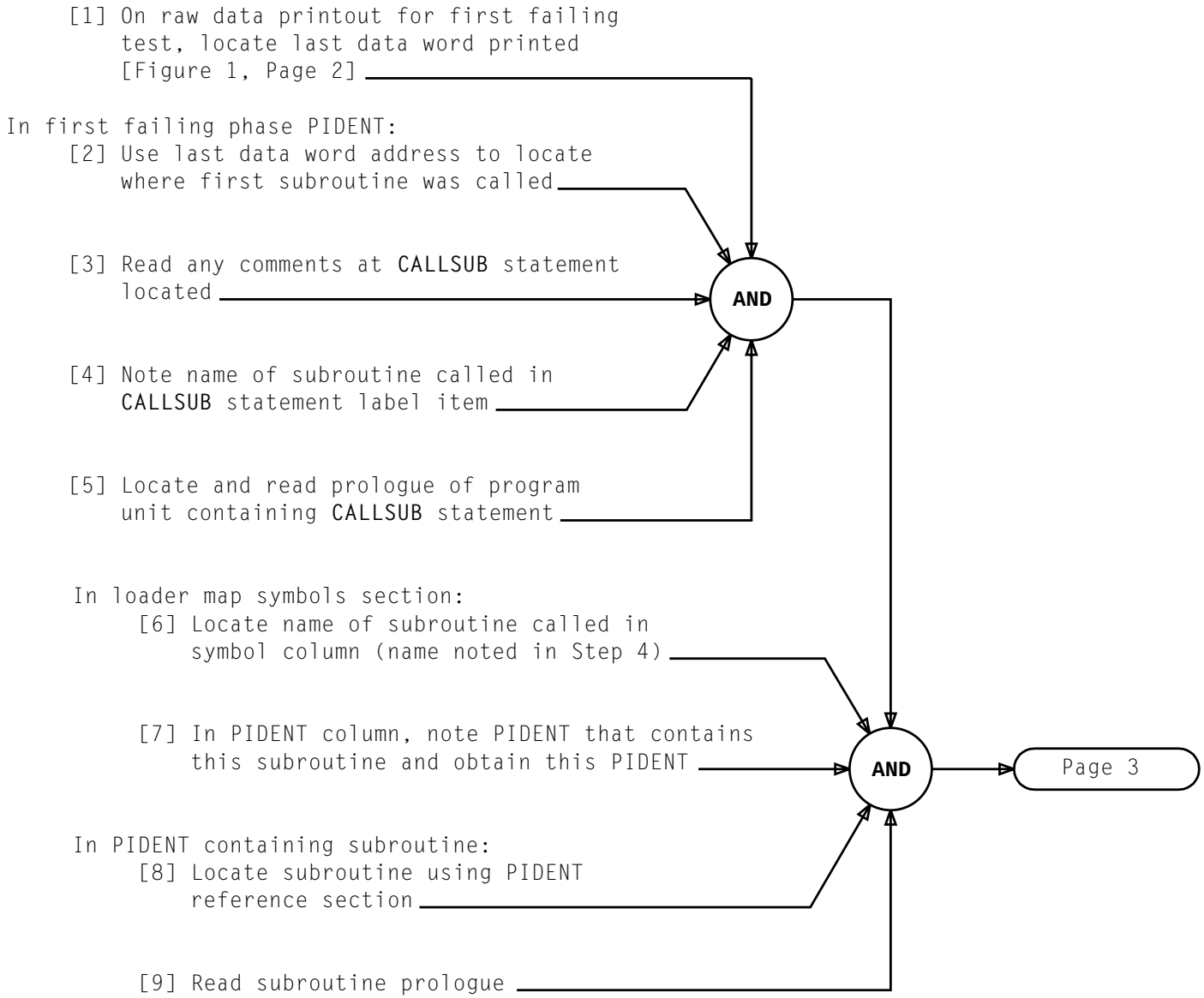
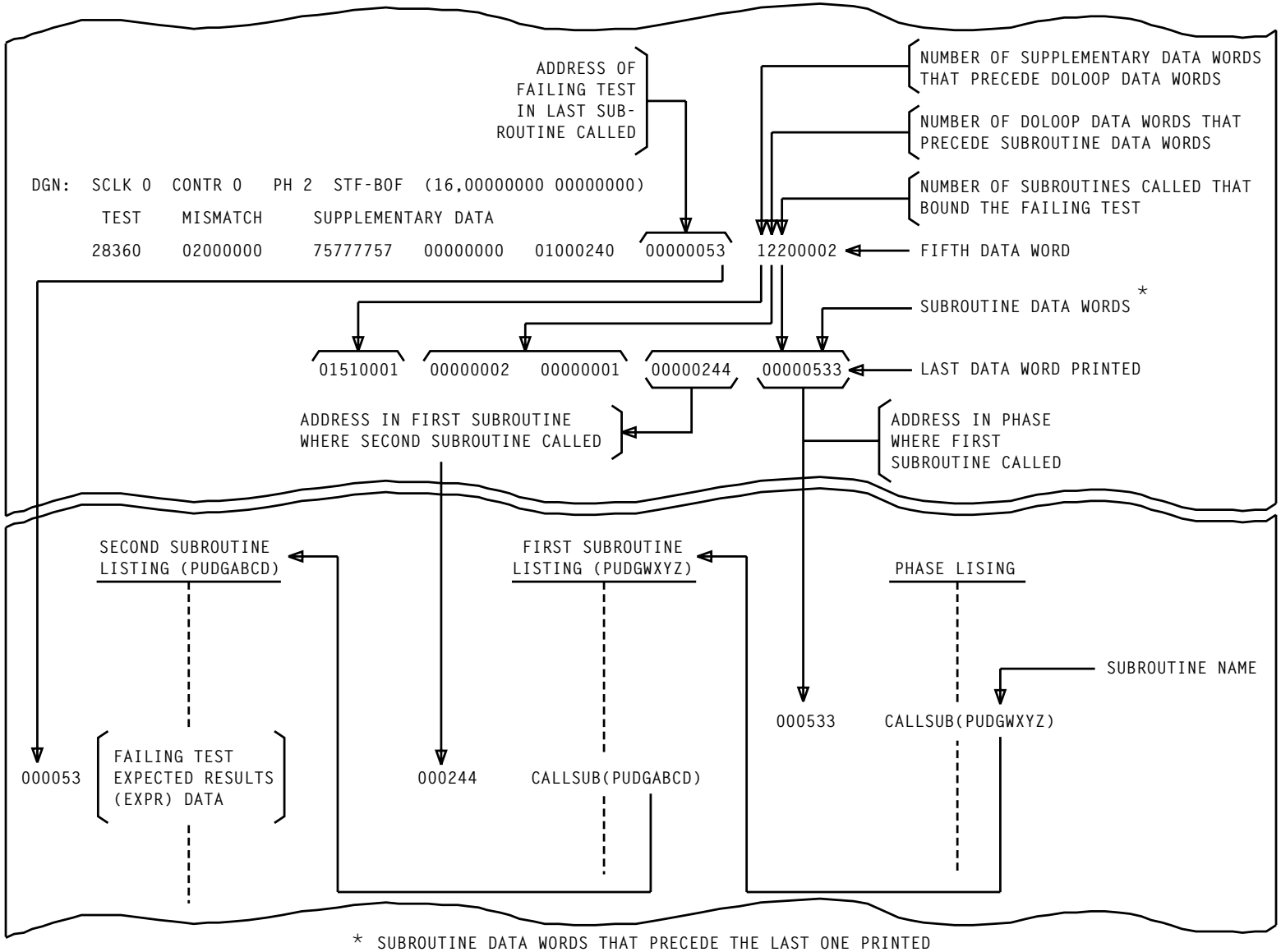


Figure 2 – FG73 Switch Positions

REPLACE CIRCUIT PACK (EXCEPT FB211 TYPE)

DETERMINE LOCATION AND FUNCTION OF SUBROUTINES CALLED

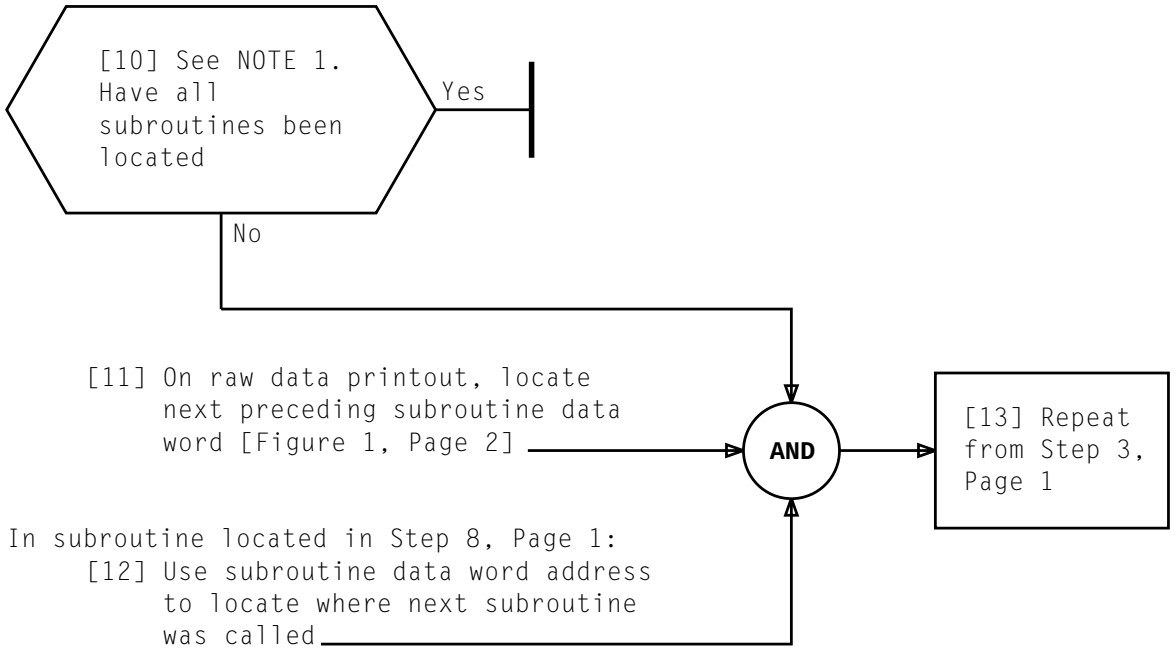




* SUBROUTINE DATA WORDS THAT PRECEDE THE LAST ONE PRINTED ARE FOR THE 2ND, 3RD, ETC SUBROUTINES CALLED (RIGHT TO LEFT)

Figure 1 — Relationship of Subroutine Data Words to Phase and Subroutine Listings

DETERMINE LOCATION AND FUNCTION OF SUBROUTINES CALLED



NOTE 1
On raw data printout, the sixth digit in fifth data word following mismatch data indicates number of subroutines called

DETERMINE LOCATION AND FUNCTION OF SUBROUTINES CALLED

1. Read several **DIAL** statements just before failing test to determine what was occurring prior to test failing

   NOTE: Section 234-180-020 contains a description of DIAL statements

2. Read failing test **DIAL** statement and any comments

3. Note "asterisk data" that follows failing test number in listing

4. Note relationship of asterisk line data to first five raw data printout words that follow mismatch data [Figure 1]

5. In TABLE A, Page 2, locate failing **DIAL** statement and use description column to determine meaning of data contained in second and third raw data words following mismatch data

6. Use TABLE B, Page 3, to obtain additional information with respect to second and third data words

   NOTE: For scan point, SD point, and SP point addresses, third data word breaks down as follows: 23-17 = Don't care, 16-12 = SP number, 11-10 = Matrix, 09-04 = Row, 03-00 = Column

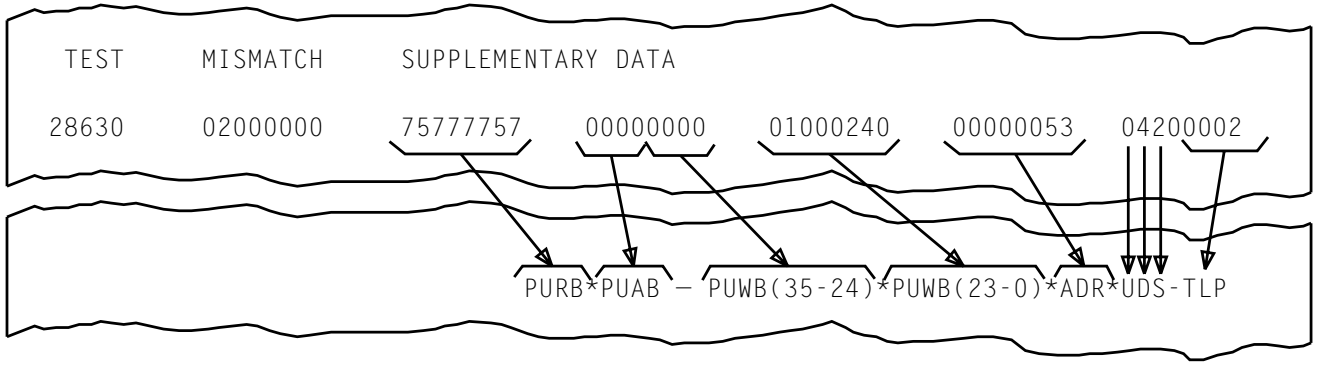


Figure 1 — Example of Raw Data Printout Relationship to Asterisk Line at Failing Test

ANALYZE FAILING TEST DATA TO DETERMINE TEST FUNCTION

TABLE A
DESCRIPTION OF DATA CONTAINED IN SECOND AND THIRD DATA WORD FOR EACH TYPE DIAL TEST STATEMENT

DIAL TEST STATEMENT	DESCRIPTION*
CCBB	A = B = 0, C = buffer bus address
CITOP CITOPI	Standard PUB format†
CLKOP	A = fault chain, B = reply bus C = CC pulse point address (see PIDENT prolog)
MEMOPI	Standard PUB format† PUWB bits 16-10 = address of memory accessed PUWB bits 9-7 = memory level For time slot memories and busy-idle map Memories bit 0 = switching and permuting CKT
MTXMOP	Standard PUB format† PUWB bits 8-0 = matrix under test
PLOP	"MA" pulse point accessed by an SP: A (bits 11-2) = SP K code B = SP OPCODE to bit pulse point 0 (1640) C = address of point "MA" pulse point accessed by CC pulse point A = B = 0, C = CC pulse point address
PUDROP PUDROPI	Standard PUB format†
PULSE	A = B = 0, C = CC pulse point address
PULSI	Same as PLOP statement
PUOP PUOPI	Standard PUB format†
PUOPBBR PUOPIBBR	PUOP part: standard PUB format† BBR part: A = B = 0, C = buffer bus address

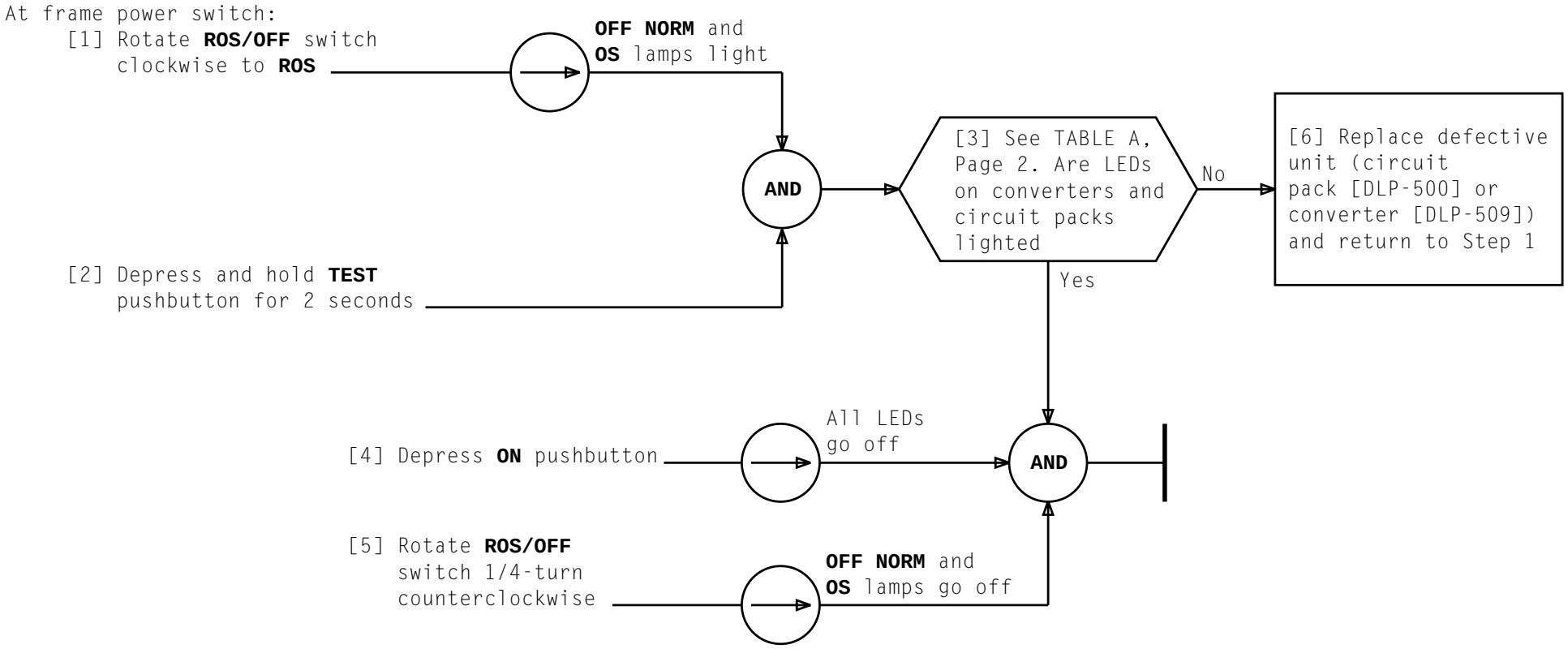
DIAL TEST STATEMENT	DESCRIPTION*
SCANI	A(bits 11-2) = SP K code B = SP OP code to read scan points 0(1540) C = address of point
SDI	A(bits 11-2) = SP K code B = SP OPCODE to read SD points 0(1440) C = address of point
SESOP	Standard PUB format†
STORE	A = B = 0, C = specified expected result for VIC diagnostic B = VIC failing test
TMSOP TMSOPI	Standard PUB format† PUWB bits 16-10 = address of memory accessed
TSIESR	Standard PUB format† except C = don't care
TSIMOP	Same as MEMOPI statement

*The following format relates A, B, and C to the second and third data words following mismatch data:

SECOND WORD	THIRD WORD
AAAABBBB	CCCCCCCC

†The standard PUB format is:
A = PUEA/PUAB
B = PUWB (bits 35-24) = OPAD, (bits 35-29) = OPCODE
C = PUWB (bits 23-0) = ADDRESS

TABLE B		
SECOND AND/OR THIRD DATA WORD	LOCATION OF INFORMATION	
	NETWORK CLOCK	SYSTEM CLOCK
OPAD/OPCODE	CD4A036-01 (TABLES H and I)	CD4A037-01/02 (TABLES A and B)
SD point address	VER:SPMTXPK:SDP,MDN O'a! a = SD point address	
Scan point address	VER:SPMTXPK:SCP,MSN O'a! a = scan point address	



TEST POWER ALARM CIRCUITS

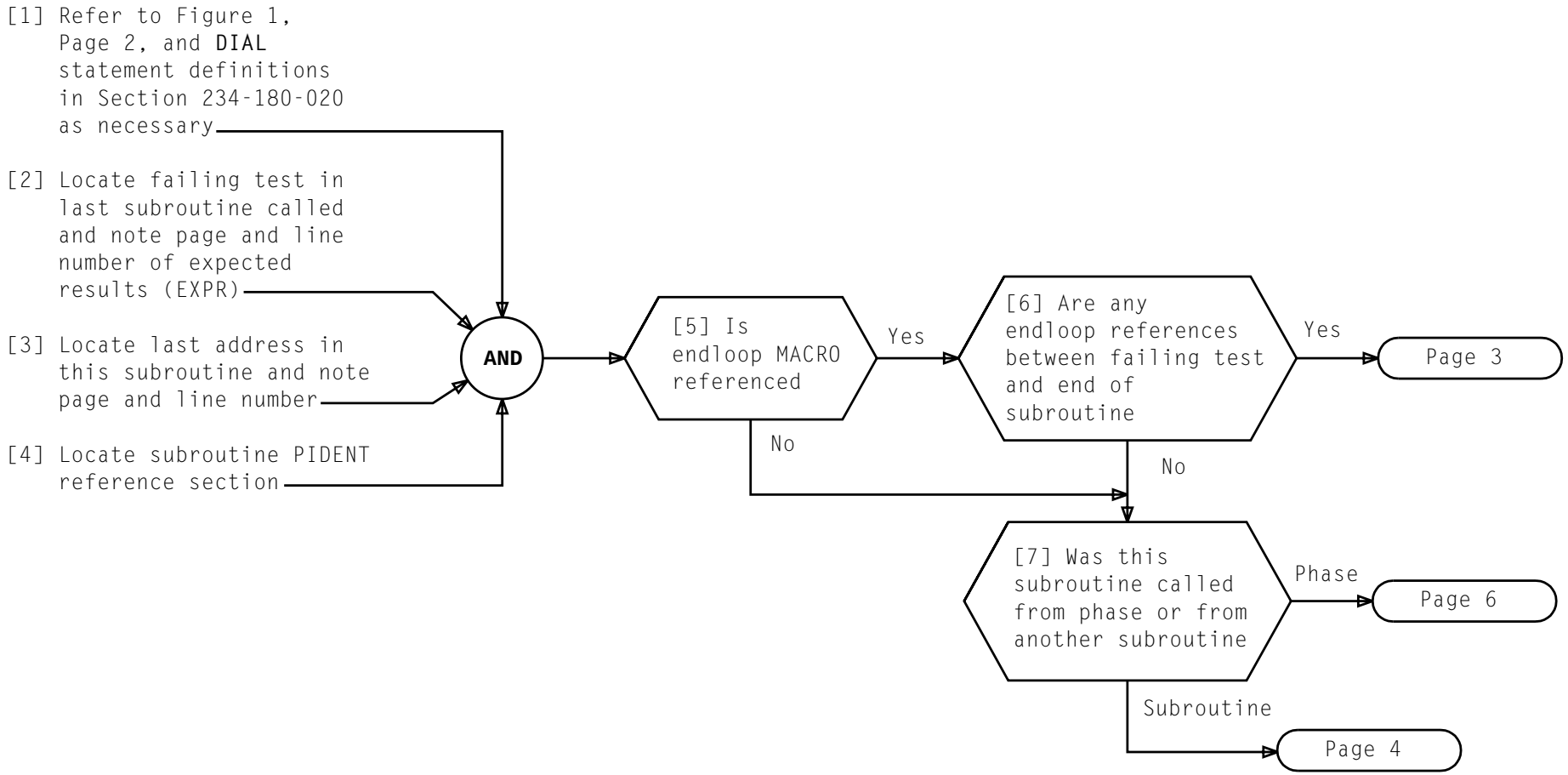
TABLE A
LED LOCATIONS

UNIT CONTAINING LED	NCLK UNIT LOCATION	SCLK UNIT LOCATION	PUB UNIT LOCATION	NCSU LOCATION
Circuit pack **FB152**	078-03, 178-03 078-68, 178-68	056-52, 156-52	—	—
Circuit pack **FG76**	—	—	—	050-27†
+3V converters	023-14, 123-14 023-56, 123-56	018-50, 118-50 023-50, 123-50	060-52, 160-52	—
+5V converters	019-31, 119-31 019-42, 119-42	—	—	048-09*
−24V converters	012-22, 112-22 012-50, 112-50	—	—	—
−3V converters	018-14, 118-14 018-59, 118-59	—	—	—
+9V converters	017-06, 117-06 017-66, 117-66	—	—	—

* LED should not light
† All four LEDs should light

SUMMARY

Locate failing test in last subroutine called. Look past failing test for endloop statements. For each endloop statement located in subroutine, use endloop label variable to identify location of associated doloop statements. Locate each doloop statement. Obtain doloop index values from raw data printout and determine their meaning for each doloop [Figure 1, Page 2]. If endloop statement was not found in subroutine, go where subroutine was called and look for endloop statements after **CALLSUB** statement. Continue looking for endloop statements after **CALLSUB** statements until all doloops indicated on raw data printout for first failing test are located. Read any comments at doloop statements.



DETERMINE LOCATION AND FUNCTION OF DOLOOPS, SUBROUTINES CALLED

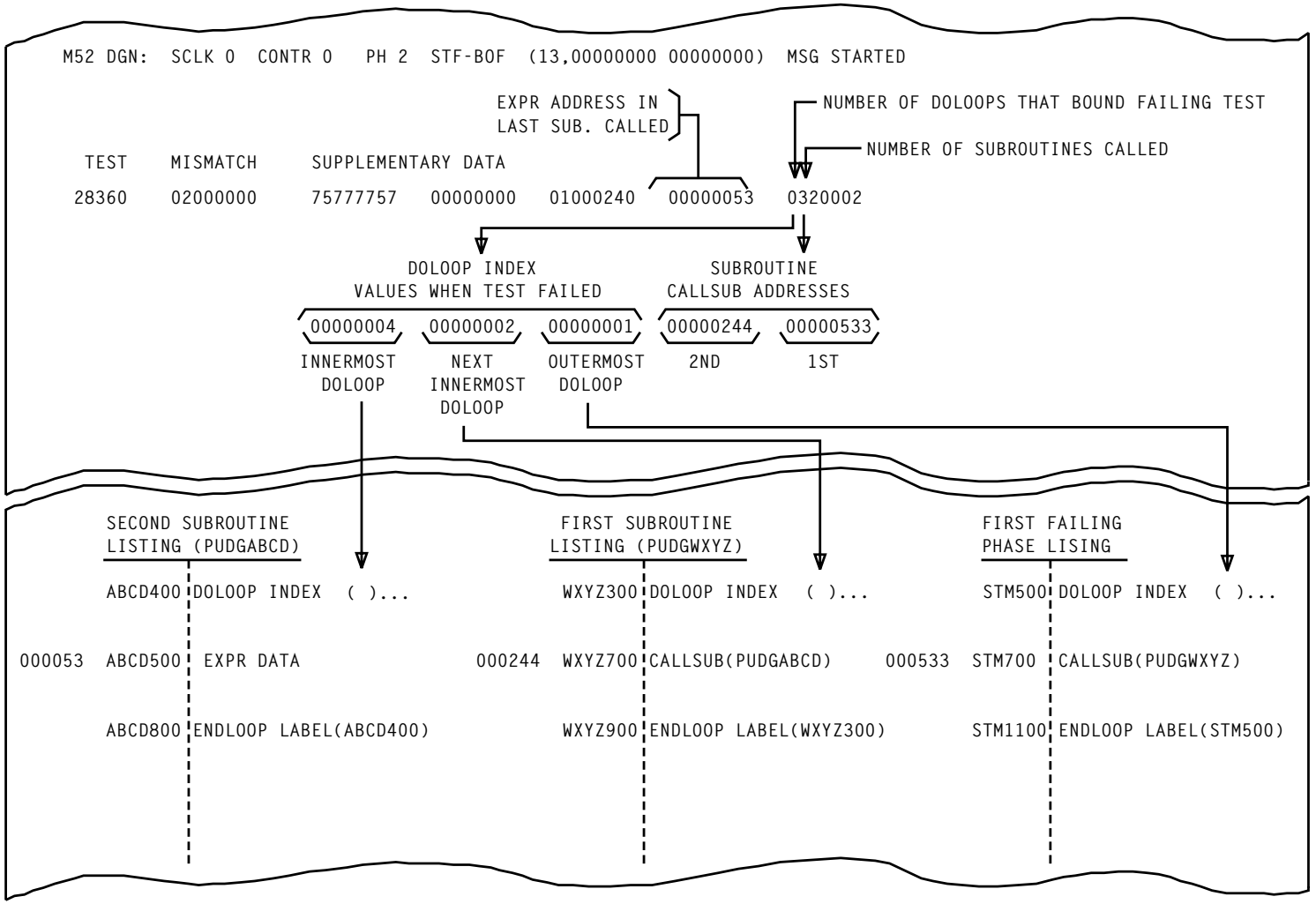
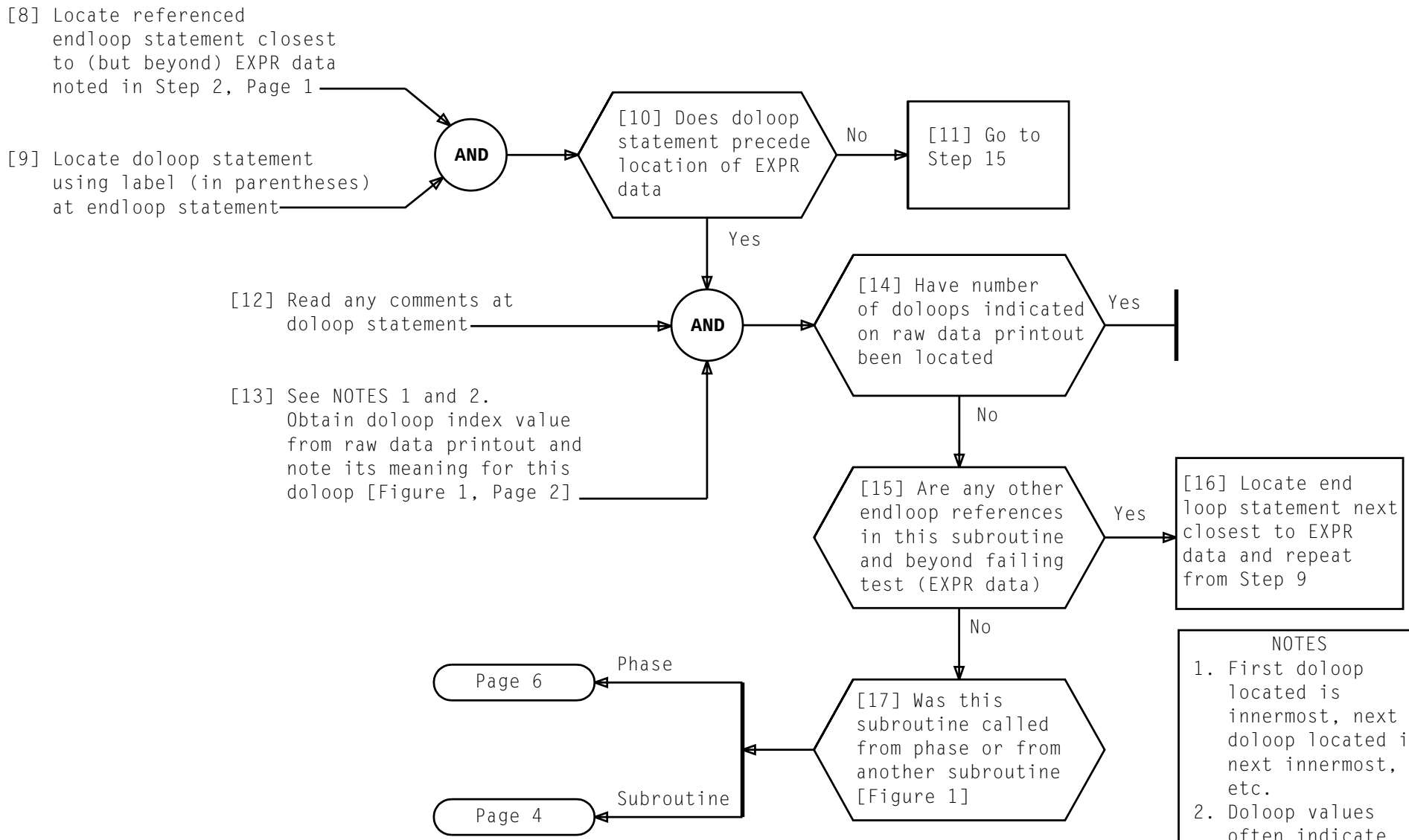
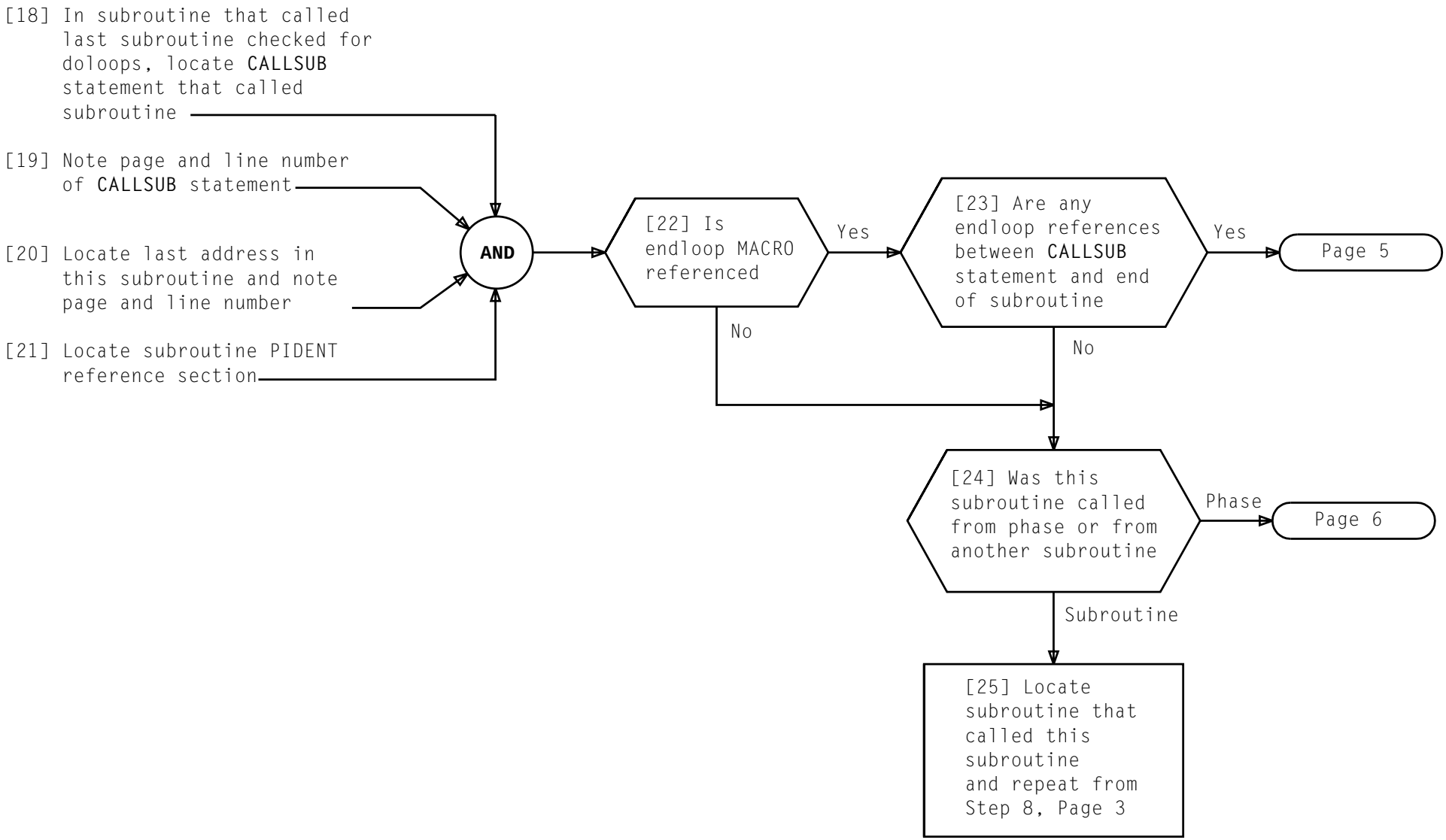


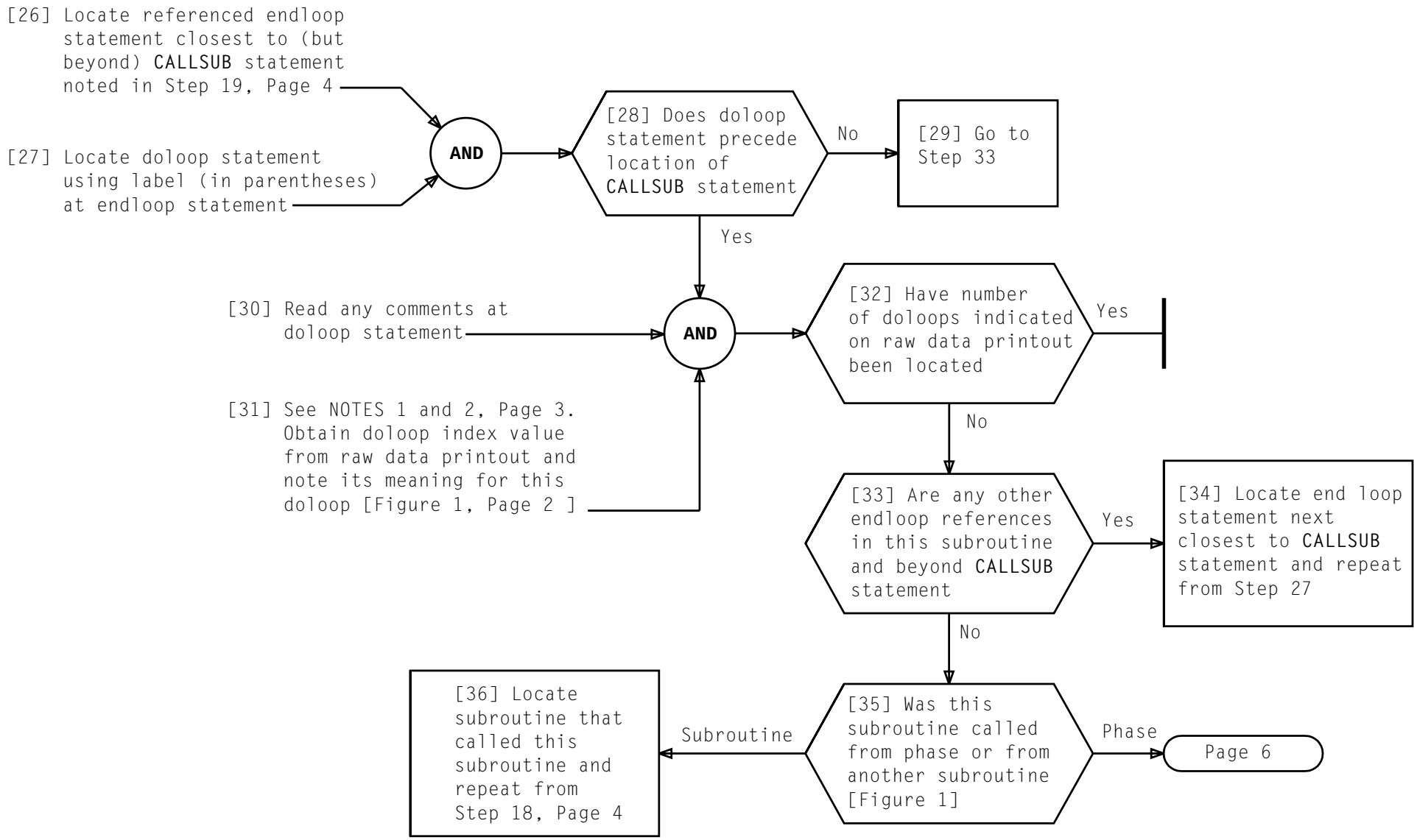
Figure 1 — Example of Doloop Raw Data Relationship to Listings When Subroutines Called



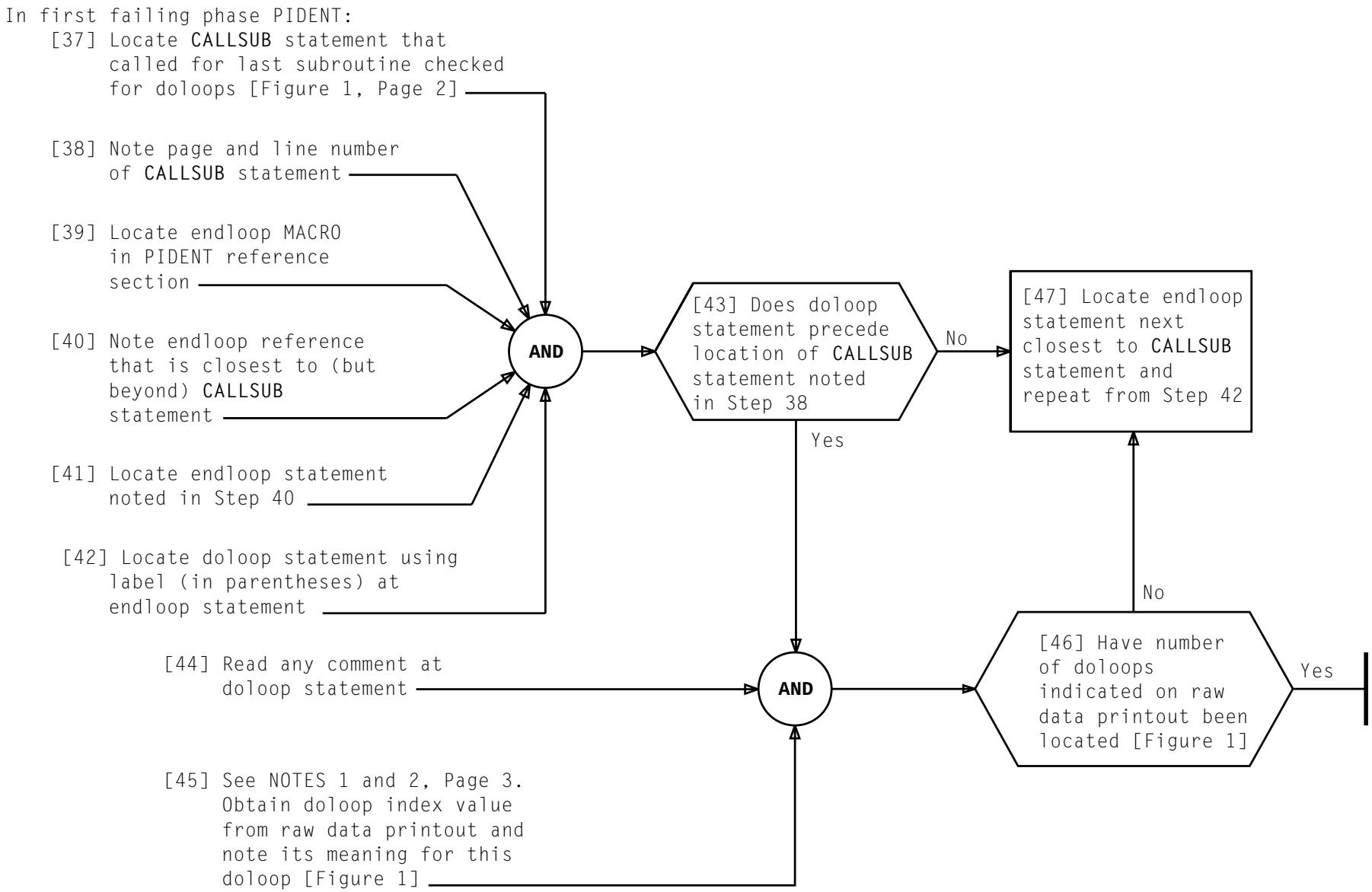
DETERMINE LOCATION AND FUNCTION OF DOLOOPS, SUBROUTINES CALLED



DETERMINE LOCATION AND FUNCTION OF DOLOOPS, SUBROUTINES CALLED

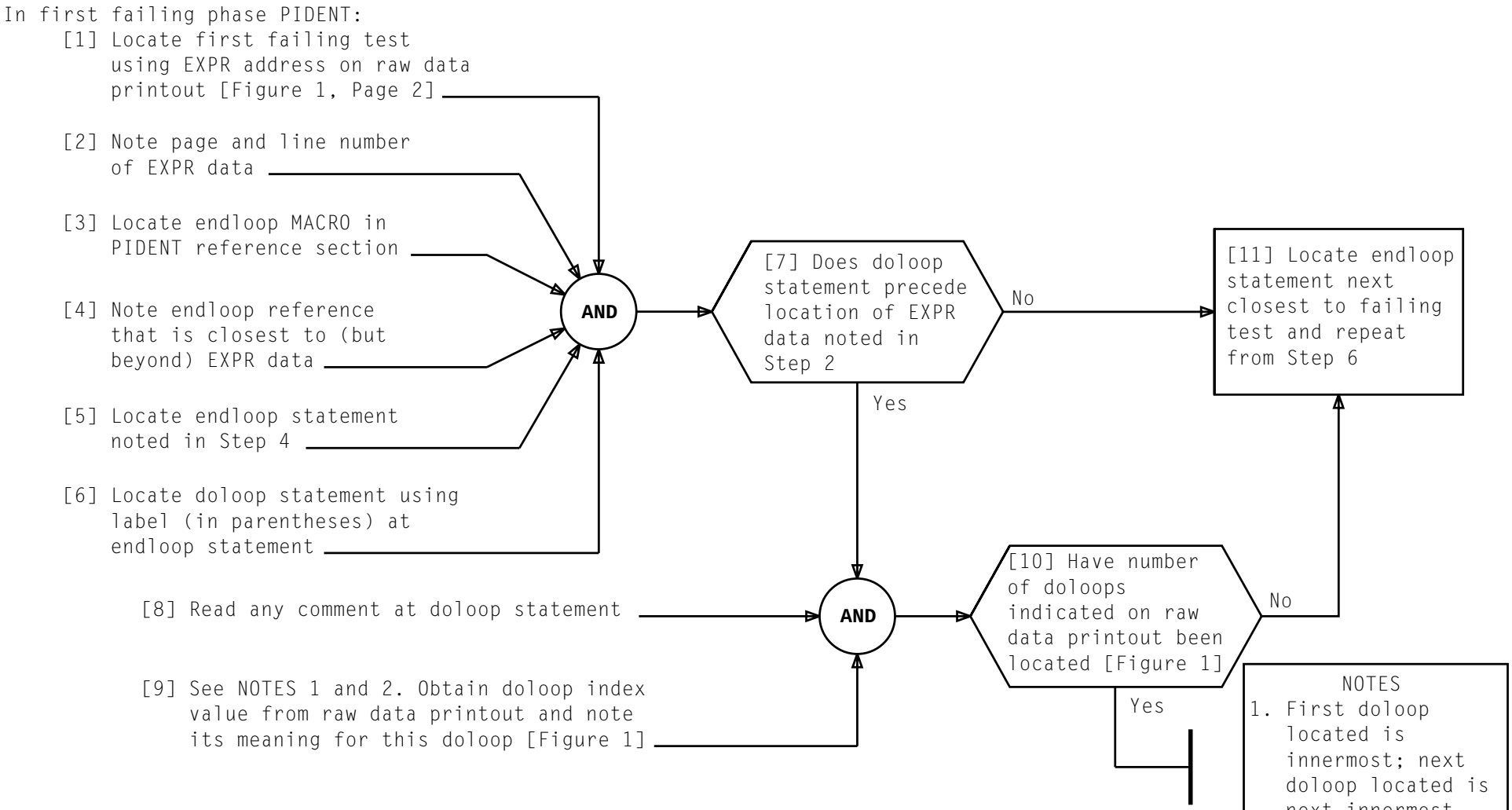


DETERMINE LOCATION AND FUNCTION OF DOLOOPS, SUBROUTINES CALLED



DETERMINE LOCATION AND FUNCTION OF DOLOOPS, SUBROUTINES CALLED

DETERMINE LOCATION AND FUNCTION OF DOLOOPS, NO SUBROUTINES CALLED



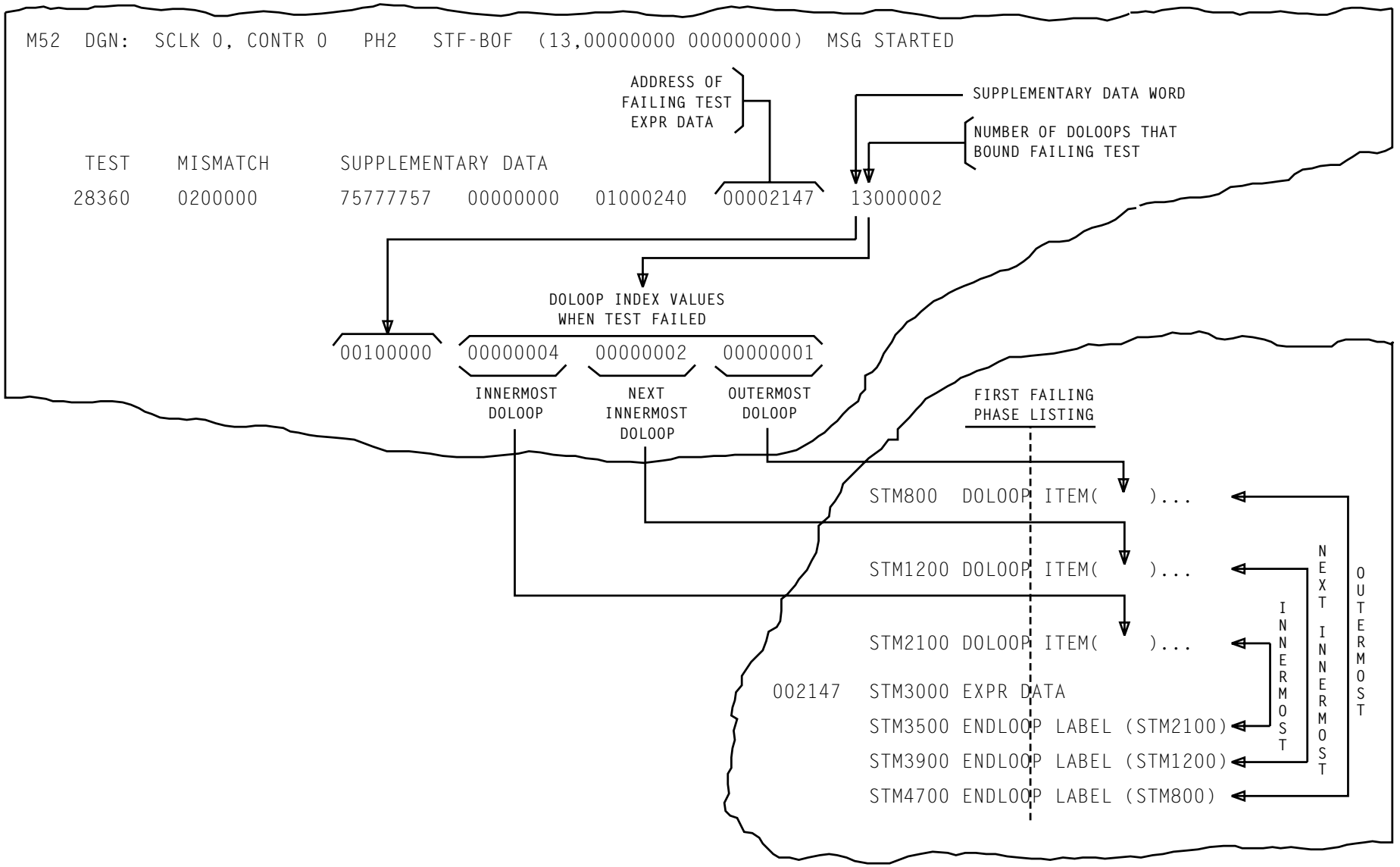


Figure 1 – Example of Raw Data Doloop Word Relationship to Phase Listing

DETERMINE LOCATION AND FUNCTION OF DOLOOPS, NO SUBROUTINES CALLED

SUMMARY

Open cover door and depress **LOCAL/REMOTE** pushbutton, then mount reel. Thread tape and turn take-up reel two or three turns and release brake. Depress **ARMS NORMAL** pushbutton, then **FORWARD** pushbutton; obtain **25 IPS** and **REMOTE** conditions and close door

At tape transport:

[1] Open interlocked cover door; at upper right of tape transport, pull interlock plunger out

[2] Depress **LOCAL/REMOTE** pushbutton to obtain **LOCAL** lighted condition

LOCAL lamp lighted

[3] Verify that empty lower (take-up) tape reel is same size or larger than tape reel to be mounted

[4] With hub (knob) of upper reel in counterclockwise position, mount reel with tape on reel holder

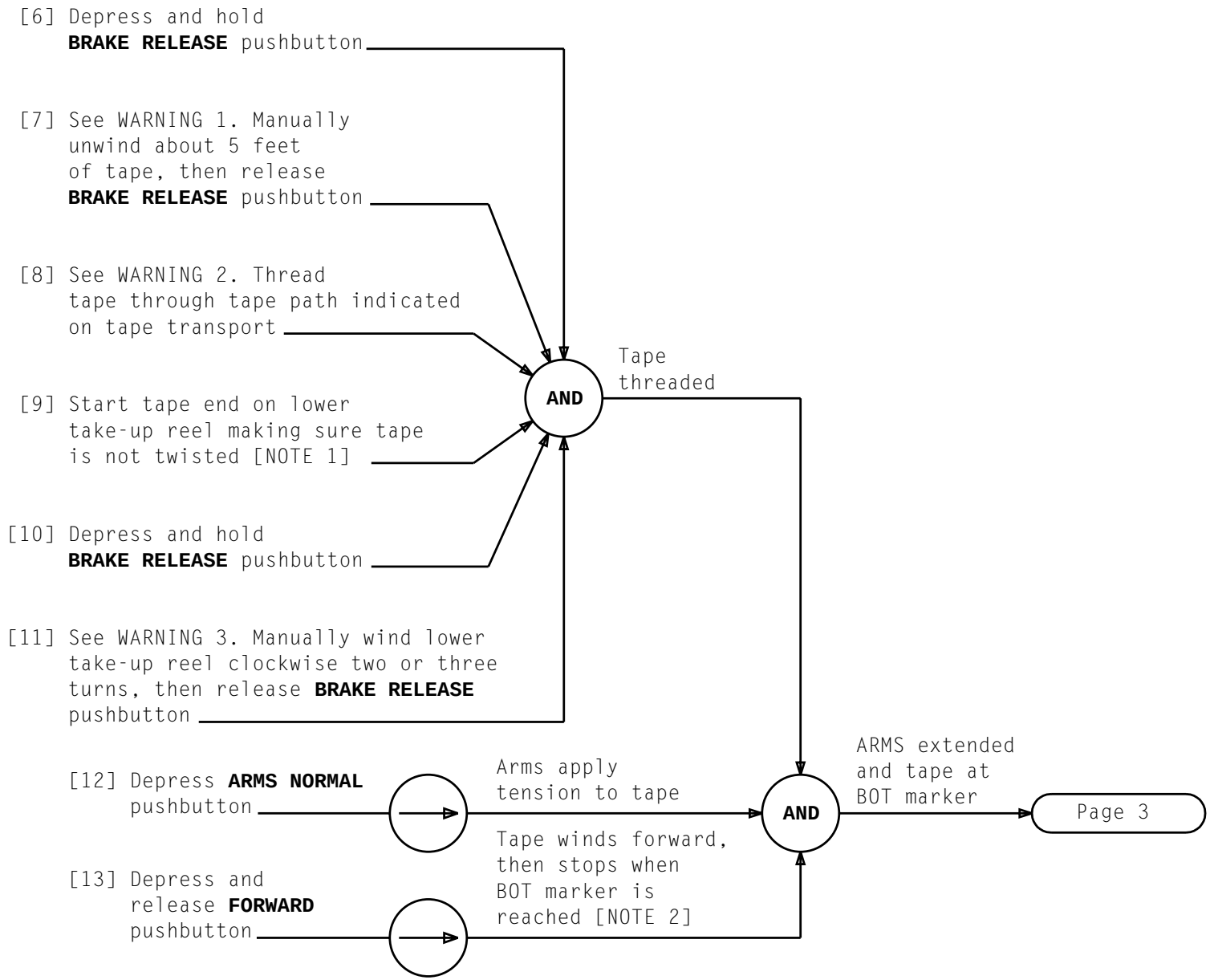
[5] Rotate hub (knob) of upper reel clockwise to detent to lock tape reel securely

AND

Tape reel and take-up reel mounted

Page 2

MOUNT TAPE ON TAPE UNIT



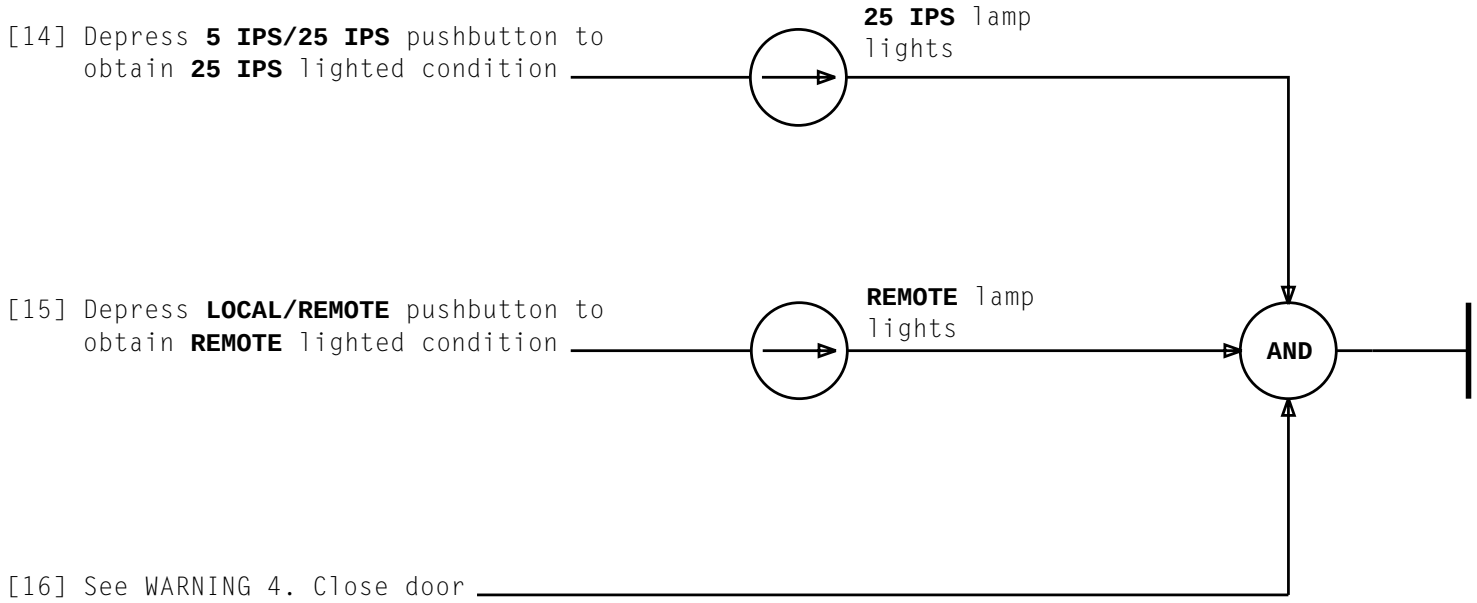
NOTES

1. To start tape on take-up reel, it may help to moisten the tape end (moistened fingers) and stick it to reel axle
2. Tape may not stop at BOT marker if **FAST FORWARD** is depressed

WARNINGS

1. *Contamination of tape by contact with floor damages tape heads*
2. *Do not touch tape head surfaces; body oils contaminate tape*
3. *If tape is not properly aligned along rollers and guides, or is too loose, it may be damaged*

MOUNT TAPE ON TAPE UNIT

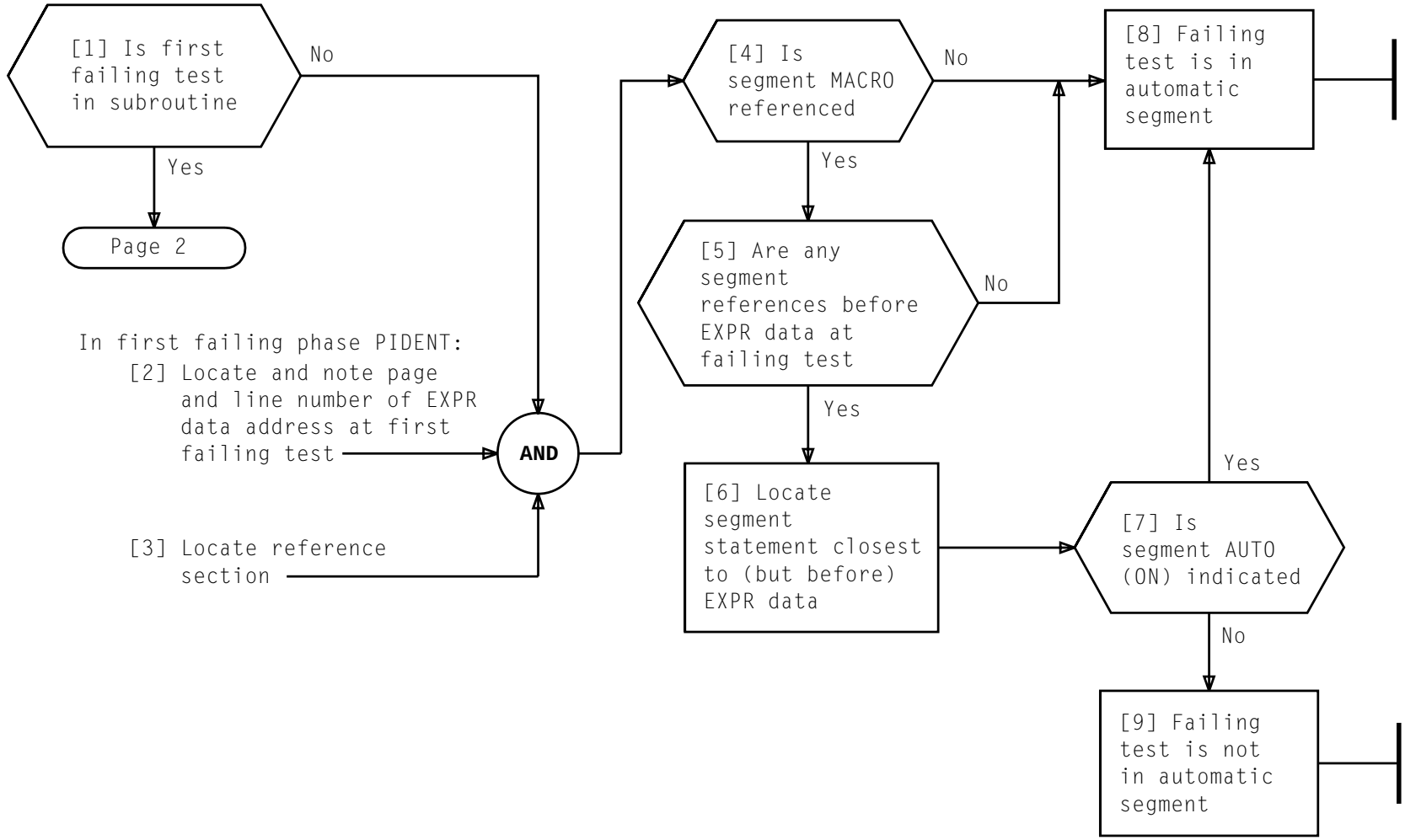


WARNING 4
Closing tape transport door in harsh manner may upset alignment

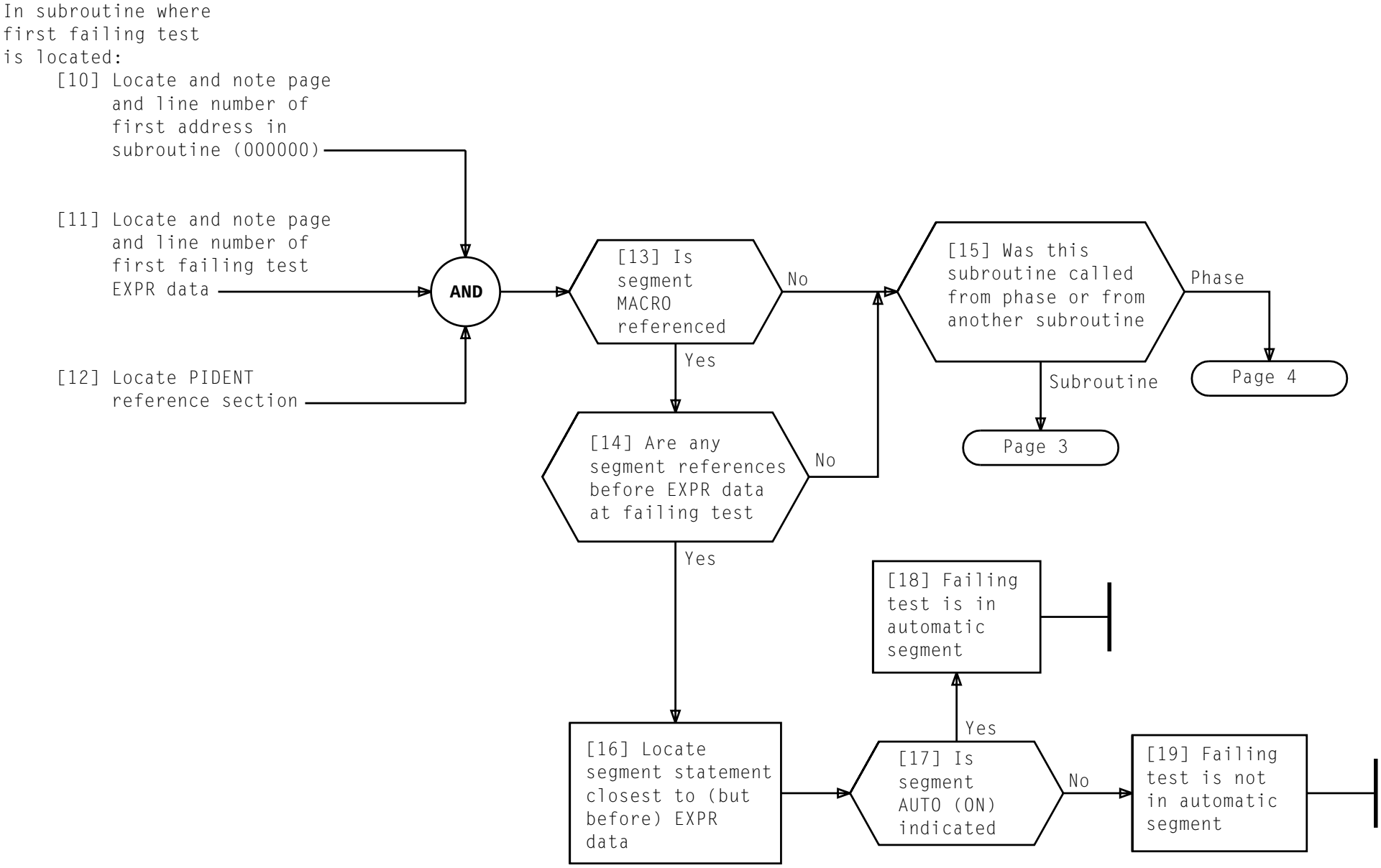
MOUNT TAPE ON TAPE UNIT

SUMMARY

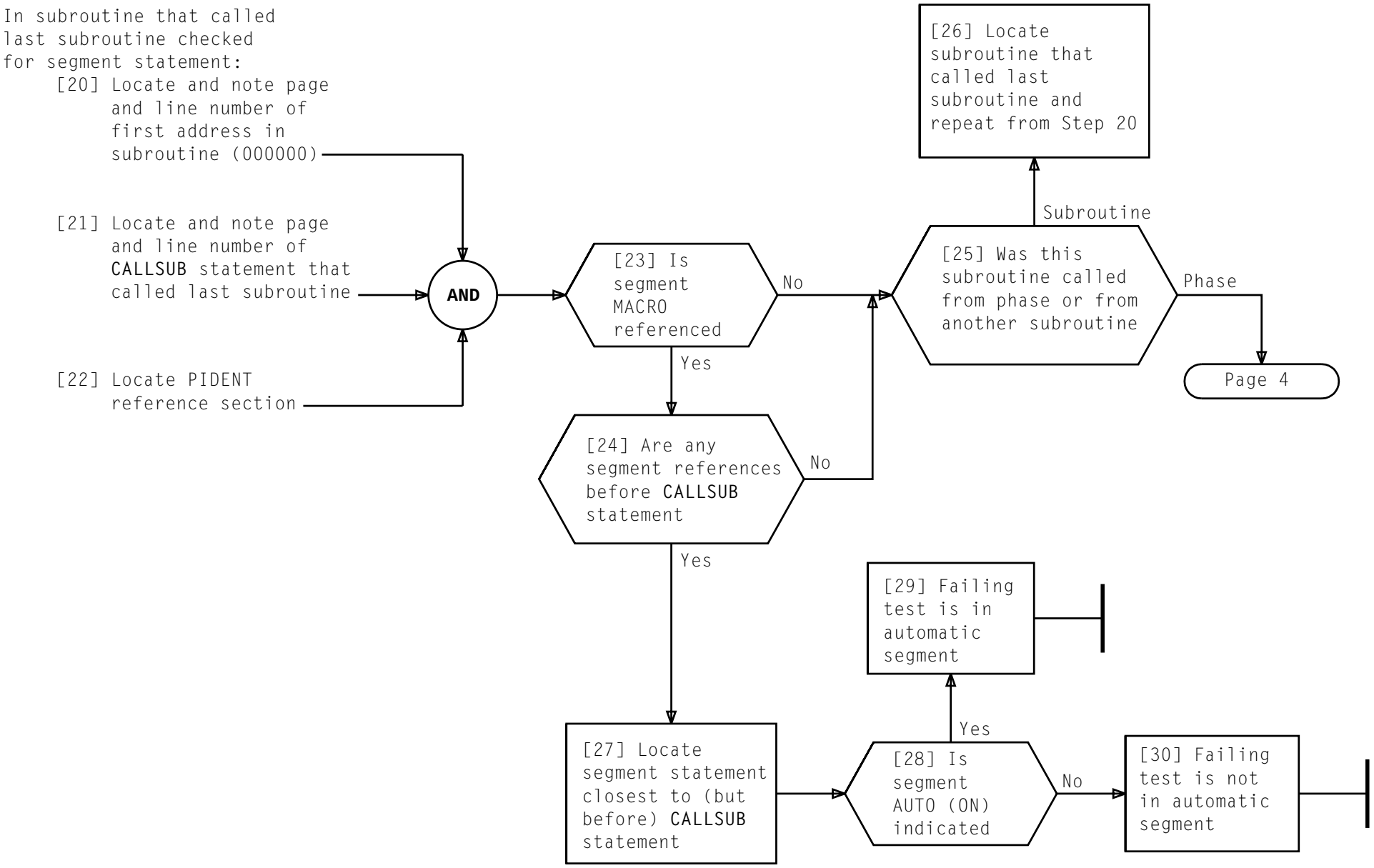
Locate FIRST segment statement BEFORE first failing test. If segment statement has AUTO (ON) indicated, failing test is in automatic segment. If AUTO (ON) is not indicated, failing test is not in automatic segment. If no segment statement is found before first failing test, failing test is in automatic segment



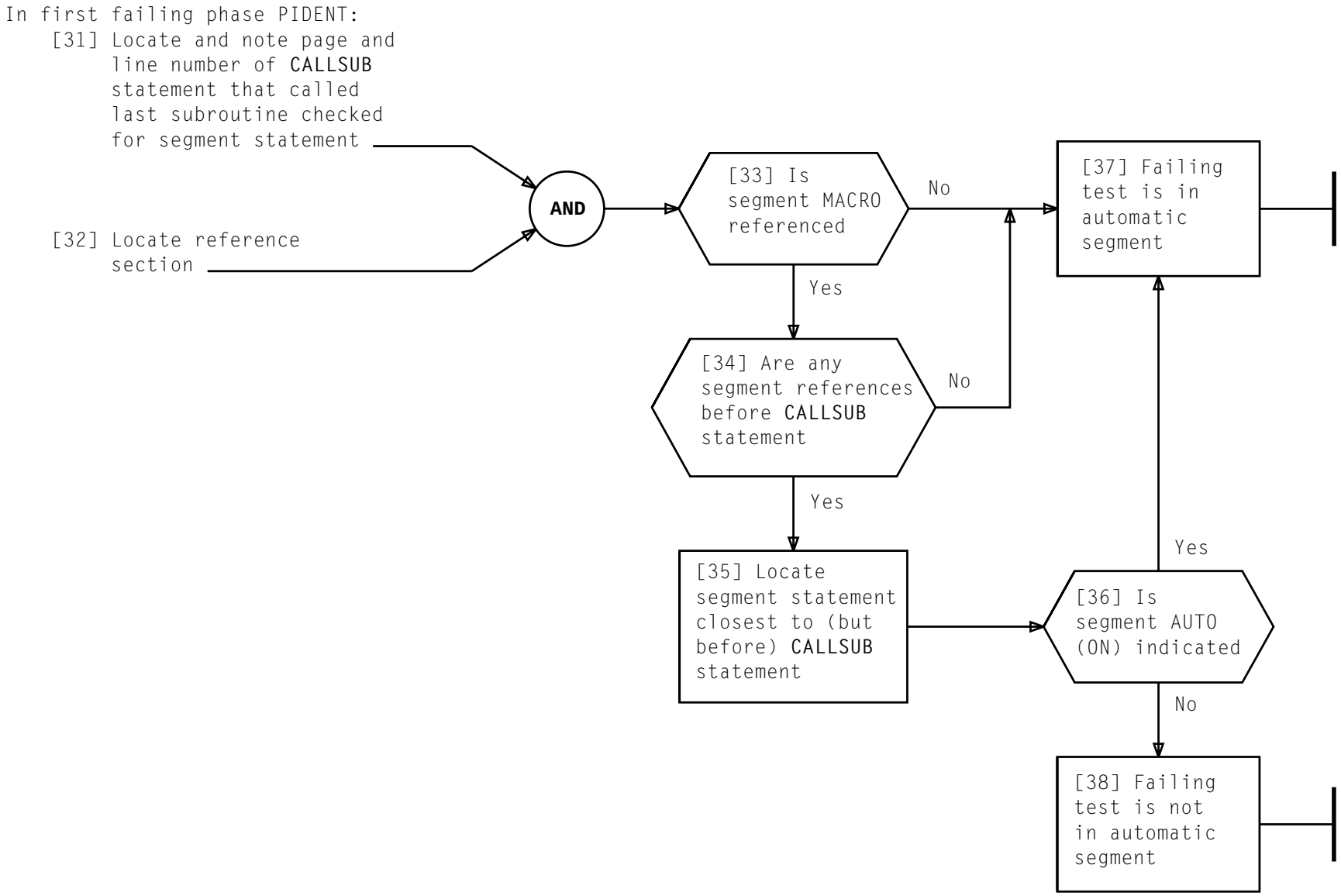
DETERMINE IF FAILING TEST IS IN AUTOMATIC SEGMENT



DETERMINE IF FAILING TEST IS IN AUTOMATIC SEGMENT



DETERMINE IF FAILING TEST IS IN AUTOMATIC SEGMENT



DETERMINE IF FAILING TEST IS IN AUTOMATIC SEGMENT

1. Locate segment statement that determined failing test was not in automatic segment

2. Note segment statement index word address for later use (loop start address)

3. Locate first segment statement after first failing test

4. Note index word address of **DIAL** statement that follows segment statement located in Step 3 (loop end address)

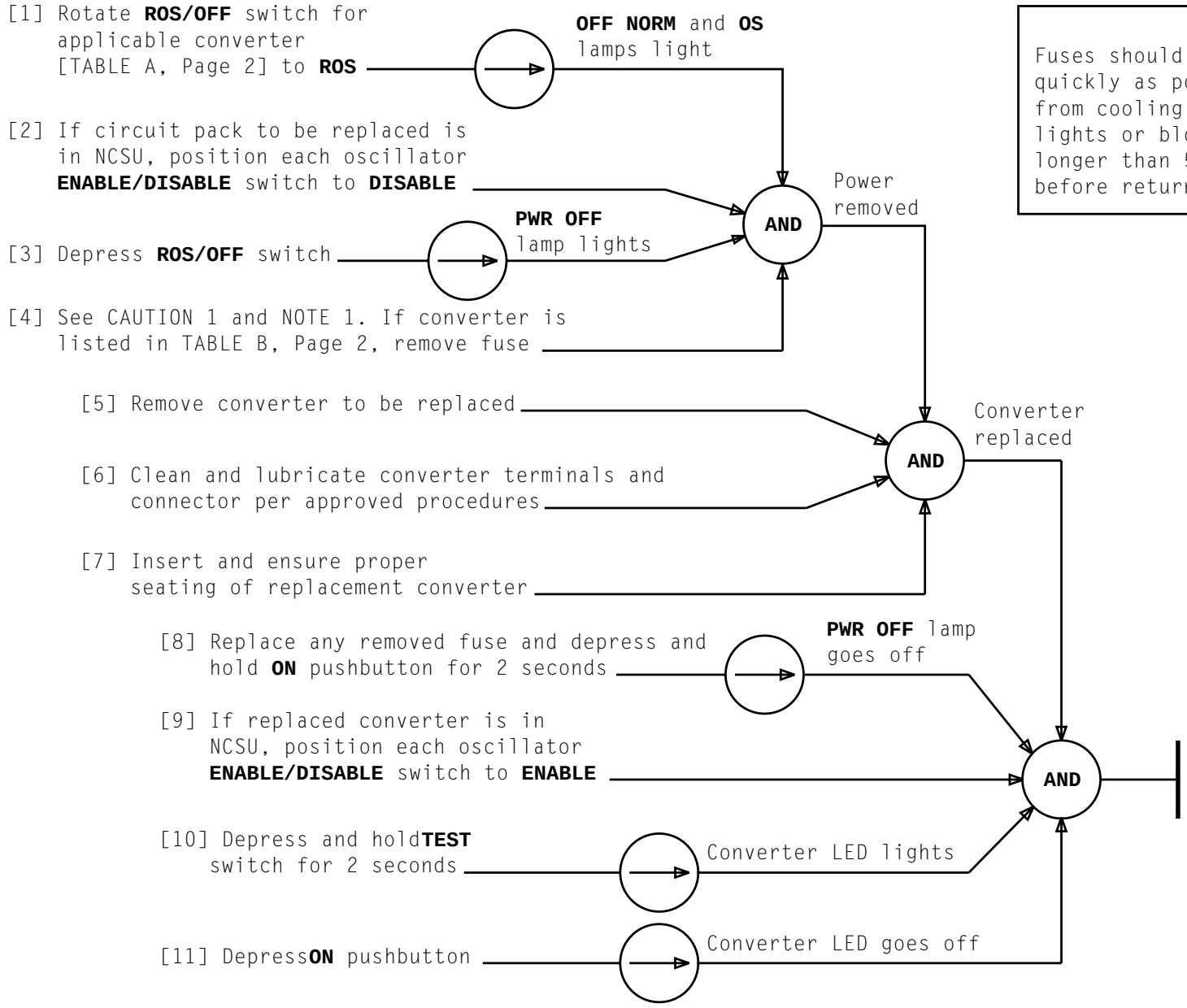
5. Enter appropriate TABLE A message

End of procedure

TABLE A
EX:NCLK 0;RPT 2:PH a,ADR b-c!
EX:SCLK 0;RPT 2:PH a,ADR b-c!
a = first failing phase b = loop start address (Step 2) c = loop end address (Step 4)

SET UP LOOP OVER FIRST FAILING TEST, TEST IN FORCE SEGMENT

REPLACE CONVERTER



NOTE 1

Fuses should always be replaced as quickly as possible to prevent oscillator from cooling down. If converter LED lights or blown fuse remains removed for longer than 5 minutes, allow 24 hours before returning oscillator to service

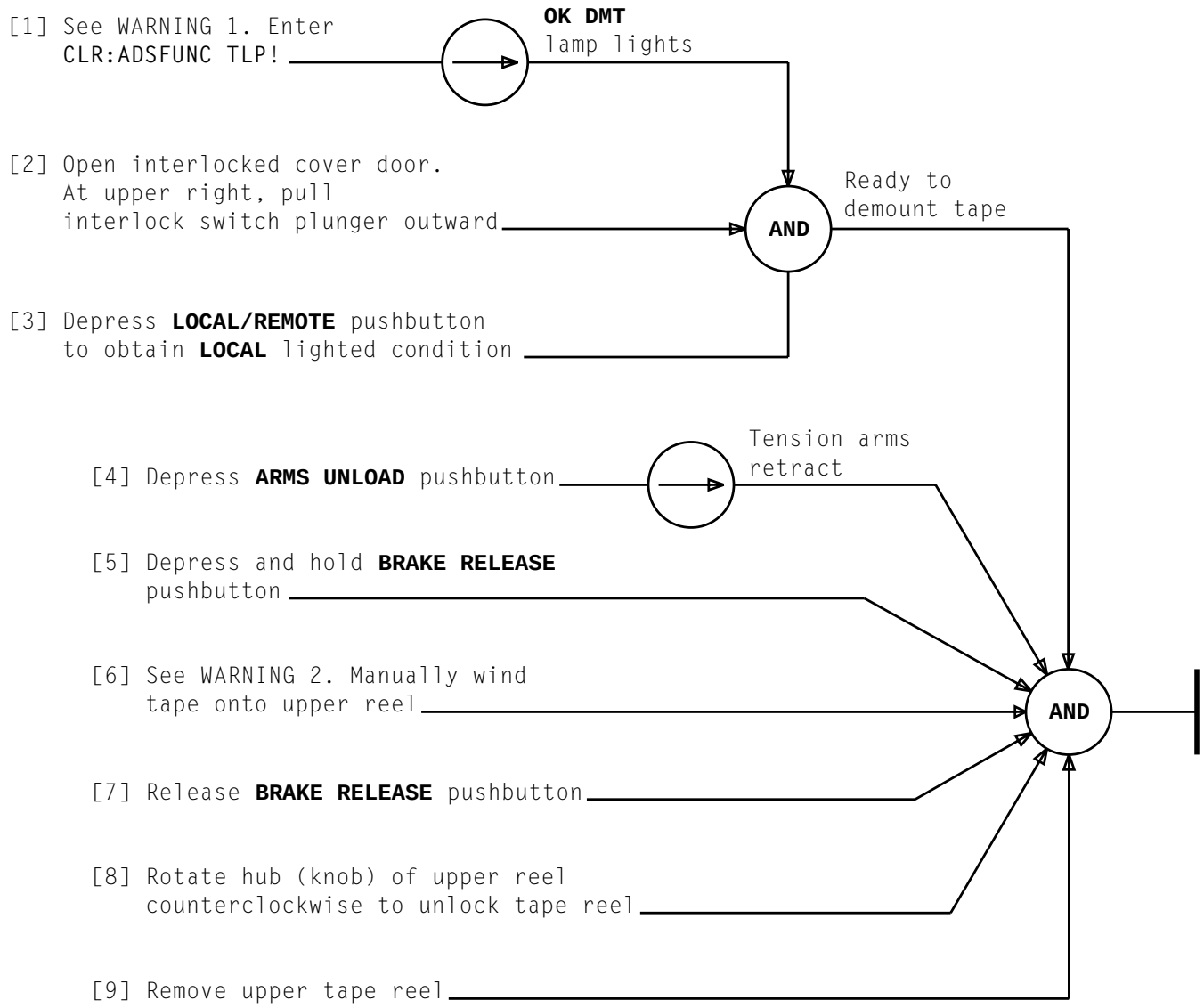
CAUTION 1

When replacing a +5v converter at location 19-31 or 19-42, always prevent the opposite +5v converter from dislodging by holding it in with one hand while removing or inserting a +5v converter with the other hand.

If a +5v converter accidentally dislodges in an in-service chain when replacing a +5v converter, DO NOT touch the dislodged converter. Fault recovery software recovers that chain. After the chain being worked on is restored to service, proceed with correctly restoring the dislodged converter, associated oscillator, and associated chain by repeating from Step 1 of this procedure and proceeding to Step 2 of NTP-009.

TABLE A CONVERTER POWER CONTROLS			
CONVERTER LOCATION	REQUIRED TO REMOVE CONVERTER		
	POWER SWITCH		SWITCH LOCATION
	BAY 0	BAY 1	
60-52	**IPUB 0**	**IPUB 1**	60-55
12-22, 17-06, 18-14, 19-31, 23-14	**CHAIN 0**	**CHAIN 2**	66-03
12-50, 17-66, 18-59, 19-42, 23-56	**CHAIN 1**	**CHAIN 3**	66-68
18-50, 23-50	**CONTR 0**	**CONTR 1**	56-69
48-09	**NCSU**	**—**	46-03 (BAY 0)

TABLE B CONVERTER FUSES			
CONVERTER LOCATION	REQUIRED TO REMOVE CONVERTER		
	FUSE		FUSE LOCATION
	BAY 0	BAY 1	
12-22, 19-31	**OBOA** (CHAIN 0)	**1BOA** (CHAIN 2)	07-20
12-50, 19-42	**OBOB** (CHAIN 1)	**1BOB** (CHAIN 3)	07-51



WARNINGS

1. *Cycling tape transport or tape unit controller with tape over read/write heads may damage tapes*
2. *Pulling or dragging last 2 feet of tape across heads may contaminate heads*

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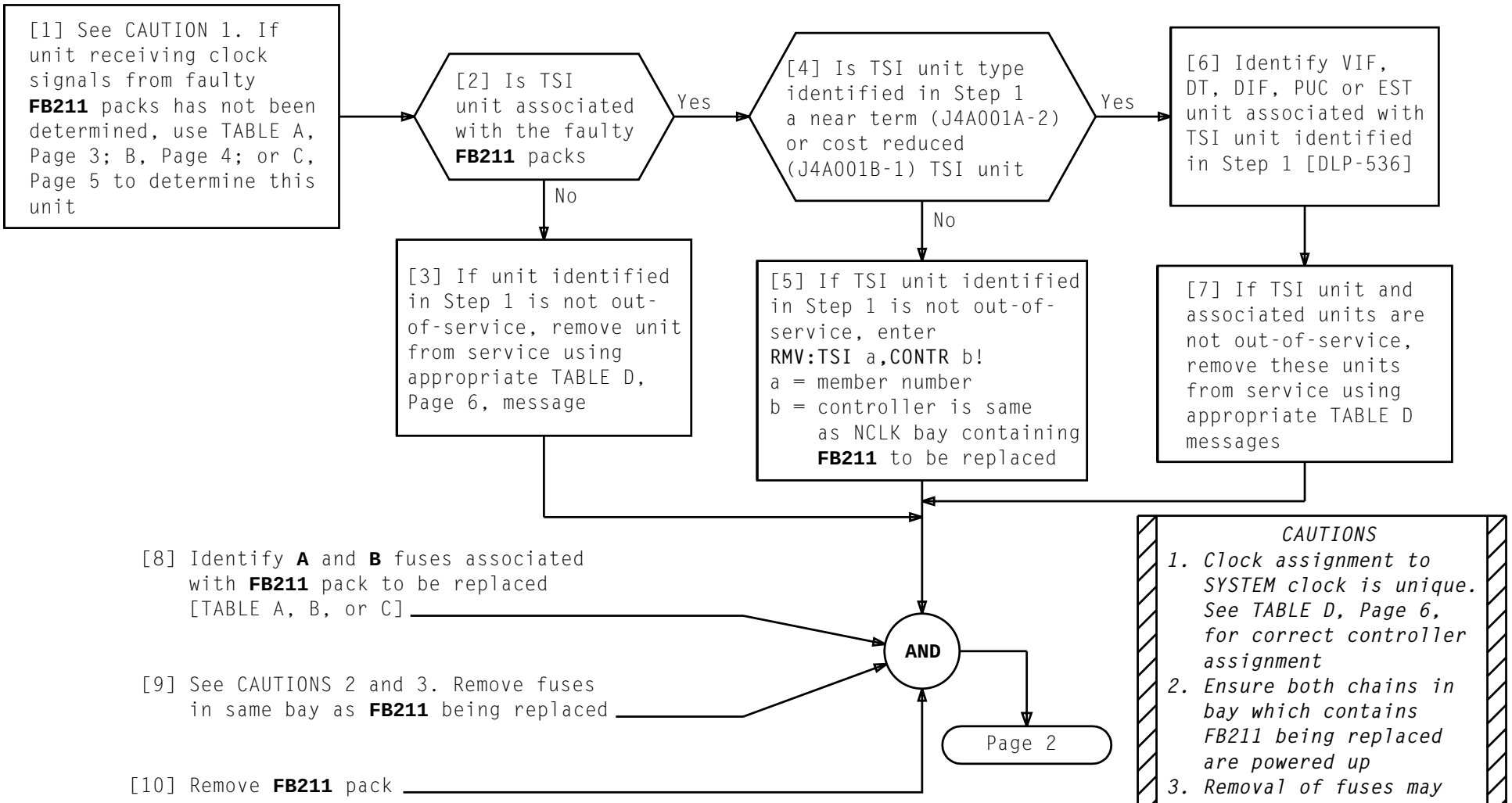
DEMOUNT TAPE ON TAPE UNIT

REPLACE FB211 CIRCUIT PACK

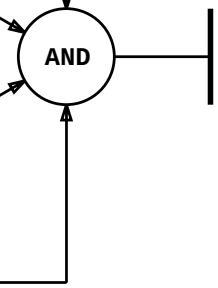


[11] Clean and lubricate replacement pack terminals and connector per approved procedures

[12] Insert and ensure proper seating of replacement pack

[13] Install fuses removed in Step 9, Page 1

[14] Restore units removed from service in Steps 3, 5, or 7, Page 1, using appropriate TABLE E, Page 6, messages



REPLACE FB211 CIRCUIT PACK

TABLE A
FB211 PACK/FUSE/USER ASSIGNMENT FOR OFFICES NOT EQUIPPED WITH CRTSI FRAMES

FB211 PACK LOC	FUSE DESIG		USER	FB211 PACK LOC	FUSE DESIG		USER	FB211 PACK LOC	FUSE DESIG		USER	FB211 PACK LOC	FUSE DESIG		USER	FB211 PACK LOC	FUSE DESIG		USER
74-04	**A1**	**B6**	TSI 08	74-19	**A9**	**B6**	TSI 22	74-54	**A9**	**B3**	TSI 36	78-21	**A6**	**B7**	SYS CLK	78-37	**A7**	**B2**	NOTE 1
74-05	**A3**	**B5**	TSI 09	74-20	**A8**	**B5**	TSI 23	74-55	**A2**	**B4**	TSI 37	78-22	**A6**	**B8**	SYS CLK	78-38	**A7**	**B1**	NOTE 1
74-06	**A3**	**B6**	TSI 10	74-21	**A8**	**B6**	TSI 24	74-56	**A2**	**B3**	TSI 38	78-23	**A3**	**B7**	TMS 0	78-39	**A5**	**B2**	NOTE 1
74-07	**A6**	**B5**	TSI 11	74-22	**A8**	**B7**	TSI 25	74-57	**A5**	**B4**	TSI 39	78-24	**A3**	**B8**	TMS 1	78-40	**A5**	**B1**	NOTE 1
74-08	**A6**	**B6**	TSI 12	74-23	**A8**	**B8**	TSI 26	74-58	**A5**	**B3**	TSI 40	78-25	**A1**	**B7**	TMS 2	78-41	**A2**	**B2**	NOTE 1
74-09	**A4**	**B5**	TSI 13	74-24	**A9**	**B7**	TSI 27	74-59	**A7**	**B4**	TSI 41	78-26	**A1**	**B8**	TMS 3	78-42	**A2**	**B1**	NOTE 1
74-10	**A4**	**B6**	TSI 14	74-25	**A9**	**B8**	TSI 28	74-60	**A7**	**B3**	TSI 42	78-27	**A4**	**B7**	TSI 00	78-43	**A4**	**B2**	NOTE 1
74-11	**A7**	**B5**	TSI 15	74-46	**A9**	**B2**	TSI 29	74-61	**A4**	**B4**	TSI 43	78-28	**A4**	**B8**	TSI 01	78-44	**A4**	**B1**	NOTE 1
74-12	**A7**	**B6**	TSI 16	74-47	**A9**	**B1**	TSI 30	74-62	**A4**	**B3**	TSI 44	78-29	**A2**	**B7**	TSI 02	78-45	**A1**	**B2**	NOTE 1
74-13	**A5**	**B5**	TSI 17	74-48	**A8**	**B2**	TSI 31	74-63	**A6**	**B4**	TSI 45	78-30	**A2**	**B8**	TSI 03	78-46	**A1**	**B1**	NOTE 1
74-14	**A5**	**B6**	TSI 18	74-49	**A8**	**B1**	TSI 32	74-64	**A6**	**B3**	TSI 46	78-31	**A5**	**B7**	TSI 04	78-47	**A3**	**B2**	NOTE 1
74-15	**A2**	**B5**	TSI 19	74-50	**A8**	**B4**	TSI 33	74-65	**A3**	**B4**	TSI 47	78-32	**A5**	**B8**	TSI 05	78-48	**A3**	**B1**	NOTE 1
74-16	**A2**	**B6**	TSI 20	74-51	**A8**	**B3**	TSI 34	74-66	**A3**	**B3**	TSI 48	78-33	**A7**	**B7**	TSI 06	78-49	**A6**	**B2**	NOTE 1
74-17	**A9**	**B5**	TSI 21	74-52	**A9**	**B4**	TSI 35	74-67	**A1**	**B4**	TSI 49	78-34	**A7**	**B8**	TSI 07	78-50	**A6**	**B1**	NOTE 1

NOTE 1:
The last 14 clock outputs are assigned on an as-required basis. Currently, some offices have the last output in each bay connected to an NE-01489-31 assembly mounted at location 170-280. This assembly then connects to a sync converter circuit NS-01489-01 located in the transmission area. This is used to provide a sync signal to a Master Primary Frequency Supply. The NE-01489-31 assembly employs transformers to isolate the external cable shields from 4ESS equipment ground.

TABLE B

FB211 PACK/FUSE/USER ASSIGNMENT FOR OFFICES EQUIPPED WITH MIXED TSI TYPES (CRTSI AND OTHER TYPES)

FB211 PACK LOC	FUSE DESIG		USER OR EQL*	FB211 PACK LOC	FUSE DESIG		USER OR EQL*	FB211 PACK LOC	FUSE DESIG		USER OR EQL*	FB211 PACK LOC	FUSE DESIG		USER OR EQL*	FB211 PACK LOC	FUSE DESIG		USER OR EQL*
74-04	**A1**	**B6**	81-12	74-19	**A9**	**B6**	81-23	74-54	**A9**	**B3**	81-49	78-21	**A6**	**B7**	SYS CLK	78-37	**A7**	**B2**	81-60
74-05	**A3**	**B5**	80-12	74-20	**A8**	**B5**	80-23	74-55	**A2**	**B4**	80-49	78-22	**A6**	**B8**	SYS CLK	78-38	**A7**	**B1**	80-60
74-06	**A3**	**B6**	81-14	74-21	**A8**	**B6**	81-24	74-56	**A2**	**B3**	81-51	78-23	**A3**	**B7**	TMS 0	78-39	**A5**	**B2**	81-61
74-07	**A6**	**B5**	80-14	74-22	**A8**	**B7**	80-24	74-57	**A5**	**B4**	80-51	78-24	**A3**	**B8**	TMS 1	78-40	**A5**	**B1**	80-61
74-08	**A6**	**B6**	81-15	74-23	**A8**	**B8**	81-26	74-58	**A5**	**B3**	81-52	78-25	**A1**	**B7**	TMS 2	78-41	**A2**	**B2**	81-63
74-09	**A4**	**B5**	80-15	74-24	**A9**	**B7**	80-26	74-59	**A7**	**B4**	80-52	78-26	**A1**	**B8**	TMS 3	78-42	**A2**	**B1**	80-63
74-10	**A4**	**B6**	81-17	74-25	**A9**	**B8**	81-27	74-60	**A7**	**B3**	81-54	78-27	**A4**	**B7**	81-06	78-43	**A4**	**B2**	81-64
74-11	**A7**	**B5**	80-17	74-46	**A9**	**B2**	80-43	74-61	**A4**	**B4**	80-54	78-28	**A4**	**B8**	80-06	78-44	**A4**	**B1**	80-64
74-12	**A7**	**B6**	81-18	74-47	**A9**	**B1**	81-45	74-62	**A4**	**B3**	81-55	78-29	**A2**	**B7**	81-08	78-45	**A1**	**B2**	81-66
74-13	**A5**	**B5**	80-18	74-48	**A8**	**B2**	80-45	74-63	**A6**	**B4**	80-55	78-30	**A2**	**B8**	80-08	78-46	**A1**	**B1**	80-66
74-14	**A5**	**B6**	81-20	74-49	**A8**	**B1**	81-46	74-64	**A6**	**B3**	81-57	78-31	**A5**	**B7**	81-09	78-47	**A3**	**B2**	81-67
74-15	**A2**	**B5**	80-20	74-50	**A8**	**B4**	80-46	74-65	**A3**	**B4**	80-57	78-32	**A5**	**B8**	80-09	78-48	**A3**	**B1**	80-67
74-16	**A2**	**B6**	81-21	74-51	**A8**	**B3**	81-48	74-66	**A3**	**B3**	81-58	78-33	**A7**	**B7**	81-11	78-49	**A6**	**B2**	81-69
74-17	**A9**	**B5**	80-21	74-52	**A9**	**B4**	80-48	74-67	**A1**	**B4**	80-58	78-34	**A7**	**B8**	80-11	78-50	**A6**	**B1**	80-69

* EQL numbers (not stamped on coax jack panels) are equipment locations of coax jacks which feed clock signals to TSI frames. See Figure 1. Assignments for these positions are office engineered and TSI member number is stamped adjacent to assigned output (coax jack). EQL = Equipment Location. Also see NOTE 1, TABLE A

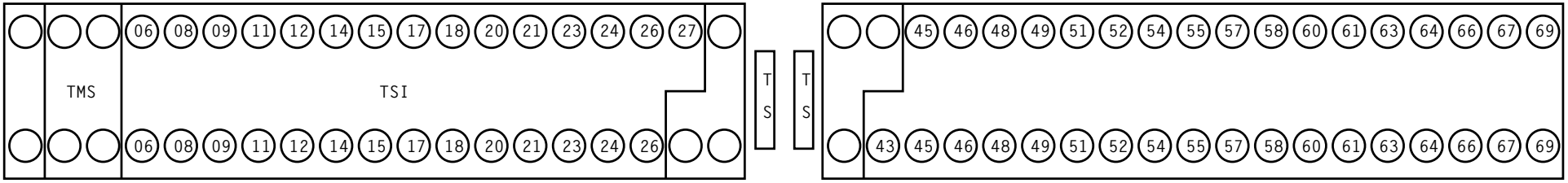


Figure 1 – Coax Jack Panels at Top of Network Clock Bay (Top Row – Level 81, Bottom Row Level 80)

REPLACE FB211 CIRCUIT PACK

TABLE C
FB211 PACK/FUSE/USER ASSIGNMENT FOR OFFICES EQUIPPED WITH CRTSIs ONLY

FB211 PACK LOC	FUSE DESIG		USER	FB211 PACK LOC	FUSE DESIG		USER*	FB211 PACK LOC	FUSE DESIG		USER*	FB211 PACK LOC	FUSE DESIG		USER*	FB211 PACK LOC	FUSE DESIG		USER*
74-04	**A1**	**B6**	TSI 16,17	74-19	**A9**	**B6**	TSI 44,45	74-54	**A9**	**B3**	NA	78-21	**A6**	**B7**	SYS CLK	78-37	**A7**	**B2**	NOTE 1
74-05	**A3**	**B5**	TSI 18,19	74-20	**A8**	**B5**	TSI 46,47	74-55	**A2**	**B4**		78-22	**A6**	**B8**	SYS CLK	78-38	**A7**	**B1**	NOTE 1
74-06	**A3**	**B6**	TSI 20,21	74-21	**A8**	**B6**	TSI 48,49	74-56	**A2**	**B3**		78-23	**A3**	**B7**	TMS 0	78-39	**A5**	**B2**	NOTE 1
74-07	**A6**	**B5**	TSI 22,23	74-22	**A8**	**B7**	TSI 50,51	74-57	**A5**	**B4**		78-24	**A3**	**B8**	TMS 1	78-40	**A5**	**B1**	NOTE 1
74-08	**A6**	**B6**	TSI 24,25	74-23	**A8**	**B8**	TSI 52,53	74-58	**A5**	**B3**		78-25	**A1**	**B7**	TMS 2	78-41	**A2**	**B2**	NOTE 1
74-09	**A4**	**B5**	TSI 26,27	74-24	**A9**	**B7**	TSI 54,55	74-59	**A7**	**B4**		78-26	**A1**	**B8**	TMS 3	78-42	**A2**	**B1**	NOTE 1
74-10	**A4**	**B6**	TSI 28,29	74-25	**A9**	**B8**	TSI 56,57	74-60	**A7**	**B3**		78-27	**A4**	**B7**	TSI 00,01	78-43	**A4**	**B2**	NOTE 1
74-11	**A7**	**B5**	TSI 30,31	74-46	**A9**	**B2**	TSI 58,59	74-61	**A4**	**B4**		78-28	**A4**	**B8**	TSI 02,03	78-44	**A4**	**B1**	NOTE 1
74-12	**A7**	**B6**	TSI 32,33	74-47	**A9**	**B1**	TSI 60,61	74-62	**A4**	**B3**		78-29	**A2**	**B7**	TSI 04,05	78-45	**A1**	**B2**	NOTE 1
74-13	**A5**	**B5**	TSI 34,35	74-48	**A8**	**B2**	TSI 62,63	74-63	**A6**	**B4**		78-30	**A2**	**B8**	TSI 06,07	78-46	**A1**	**B1**	NOTE 1
74-14	**A5**	**B6**	TSI 36,37	74-49	**A8**	**B1**	NA	74-64	**A6**	**B3**		78-31	**A5**	**B7**	TSI 08,09	78-47	**A3**	**B2**	NOTE 1
74-15	**A2**	**B5**	TSI 38,39	74-50	**A8**	**B4**		74-65	**A3**	**B4**		78-32	**A5**	**B8**	TSI 10,11	78-48	**A3**	**B1**	NOTE 1
74-16	**A2**	**B6**	TSI 40,41	74-51	**A8**	**B3**		74-66	**A3**	**B3**		78-33	**A7**	**B7**	TSI 12,13	78-49	**A6**	**B2**	NOTE 1
74-17	**A9**	**B5**	TSI 42,43	74-52	**A9**	**B4**	NA	74-67	**A1**	**B4**	NA	78-34	**A7**	**B8**	TSI 14,15	78-50	**A6**	**B1**	NOTE 1

* NA = Not assigned

NOTE 1:
The last 14 clock outputs are assigned on an as-required basis. Currently, some offices have the last output in each bay connected to an NE-01489-31 assembly mounted at location 170-280. This assembly then connects to a sync converter circuit NS-01489-01 located in the transmission area. This is used to provide a sync signal to a Master Primary Frequency Supply. The NE-01489-31 assembly employs transformers to isolate the external cable shields from 4ESS equipment ground.

TABLE D
REMOVE MESSAGES

FRAME TYPES		
TMSP OR SCLK	**TSI-2 (SD-4A011-02)**	**TSIB (SD-4A083-01)**
RMV:TMSP a,CONTR b!	RMV:VIF a,CONTR b!	RMV:VIF a,CONTR b!
RMV:SCLK a,CONTR c!	RMV:DT a,CONTR b!	RMV:DT a,CONTR b!
	RMV:DIF a,CONTR b!	RMV:DIF a,CONTR b!
	RMV:PUC a,CONTR b!	RMV:PUC a,CONTR b!
	RMV:EST a,CONTR b!	RMV:EST a,CONTR b!
	RMV:TSI a,CONTR b!	RMV:TSI a,CONTR b!

a = user number
b = controller is same as NCLK bay containing **FB211** to be replaced
c = controller is same as NCLK bay containing **FB211** in position 78-21, or opposite to NCLK bay containing **FB211** in position 78-22

TABLE E
RESTORE MESSAGES

FRAME TYPES		
TMSP OR SCLK	**TSI-2 (SD-4A011-02)**	**TSIB (SD-4A083-01)**
RST:TMSP a,CONTR b!	RST:VIF a,CONTR b!	RST:VIF a,CONTR b!
RST:SCLK a,CONTR b!	RST:DT a,CONTR b!	RST:DT a,CONTR b!
	RST:DIF a,CONTR b!	RST:DIF a,CONTR b!
	RST:PUC a,CONTR b!	RST:PUC a,CONTR b!
	RST:EST a,CONTR b!	RST:EST a,CONTR b!
	RST:TSI a,CONTR b!	RST:TSI a,CONTR b!

a = user number
b = controller number

REPLACE FB211 CIRCUIT PACK

[1] Enter
RMV:NCLK 0,CHAIN a!
(a = chain to be adjusted)

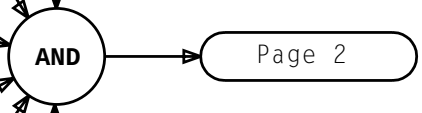
[2] On 39B oscillator, position
STROBE switch to **DISABLE**

[3] Connect oscillator manual adjustment unit, ED4A178, to **J20** of 39B oscillator to be adjusted

[4] Ensure oscillator manual adjustment unit power LED lights

[5] On 39B oscillator, position
STROBE switch to **ENABLE**

[6] See NOTE 1. Adjust oscillator manual adjustment unit thumbwheels to frequency word 2000 and depress
LOAD pushbutton



ADJUST 39B OSCILLATOR FREQUENCY USING OSCILLATOR MANUAL ADJUSTMENT UNIT (OMAU)

NOTE 1
When using oscillator manual adjustment unit, increasing frequency word decreases 39B oscillator frequency; conversely, decreasing frequency word increases oscillator frequency

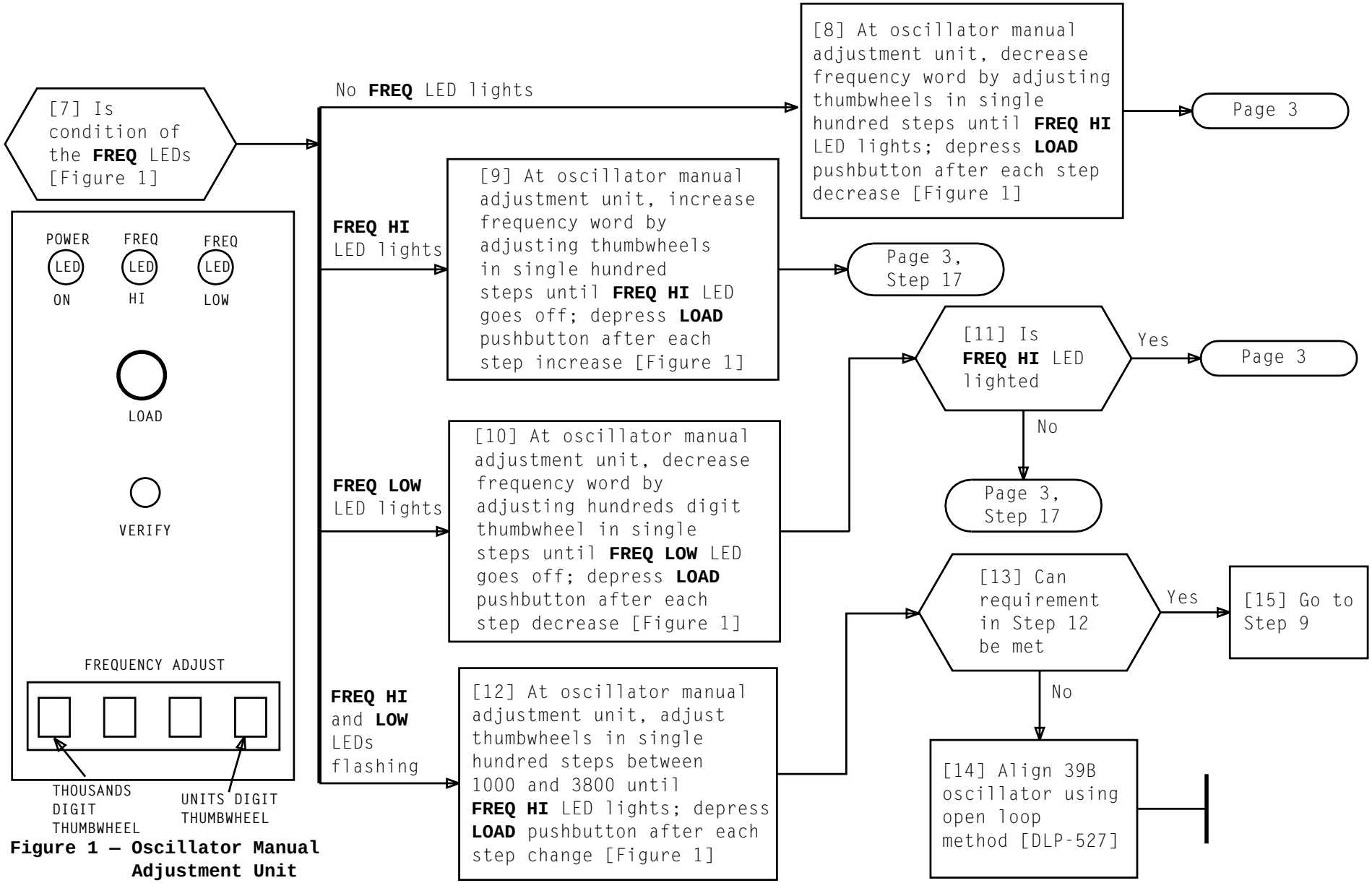
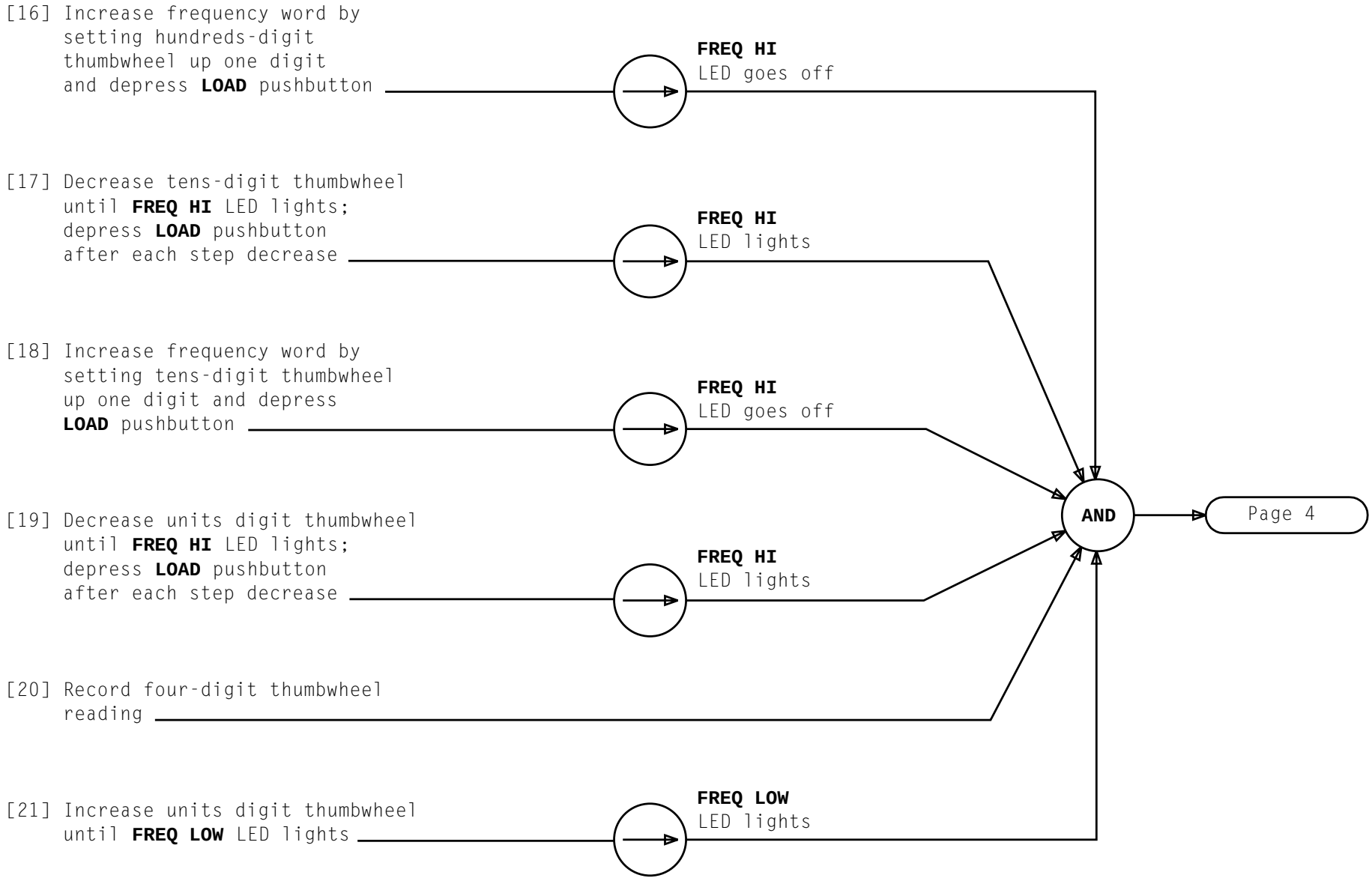
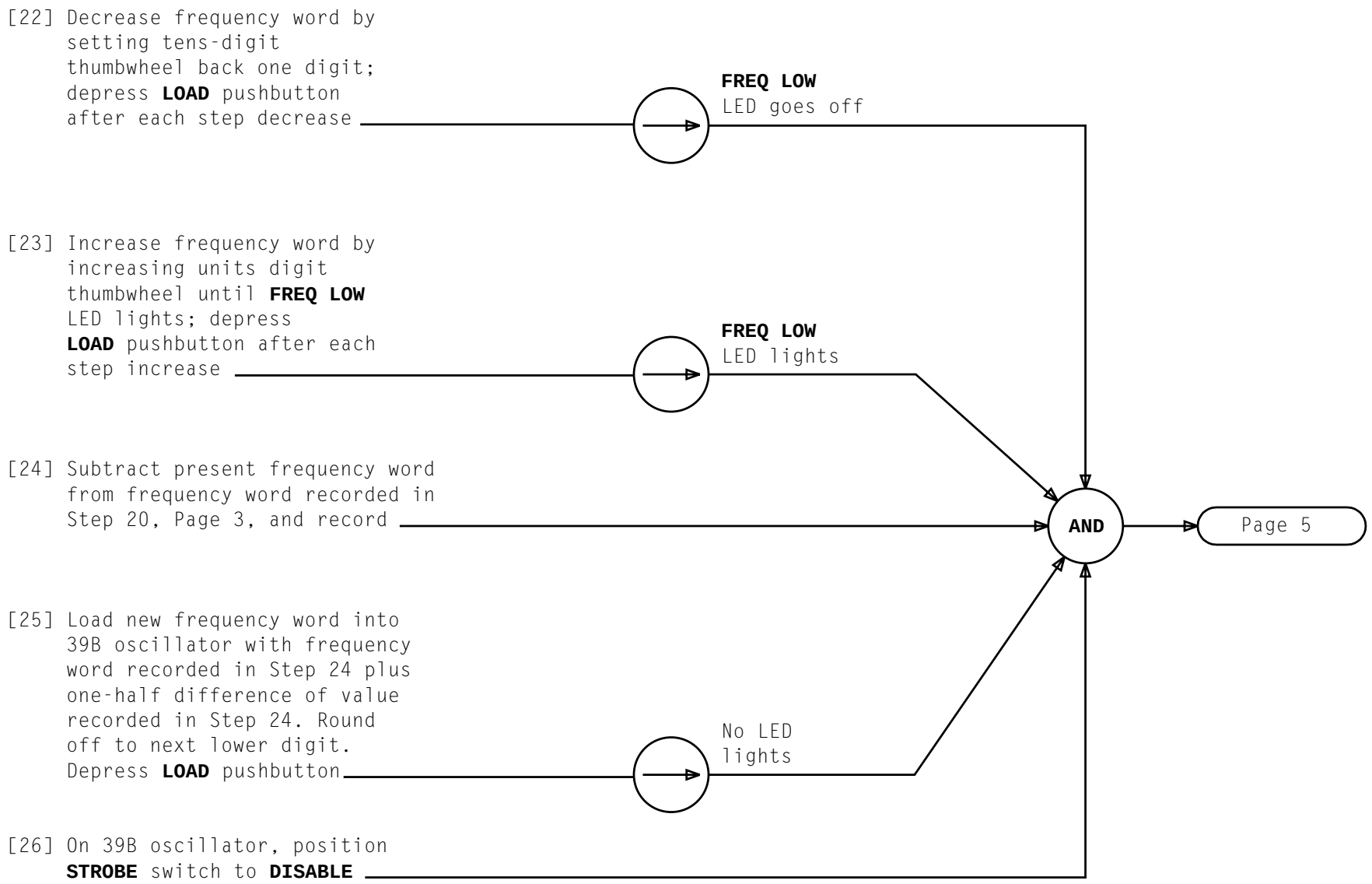


Figure 1 – Oscillator Manual Adjustment Unit

ADJUST 39B OSCILLATOR FREQUENCY USING OSCILLATOR MANUAL ADJUSTMENT UNIT (OMAU)



ADJUST 39B OSCILLATOR FREQUENCY USING OSCILLATOR MANUAL ADJUSTMENT UNIT (OMAU)



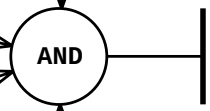
ADJUST 39B OSCILLATOR FREQUENCY USING OSCILLATOR MANUAL ADJUSTMENT UNIT (OMAU)

[27] Disconnect oscillator manual adjustment unit connector from **J20** of 39B oscillator

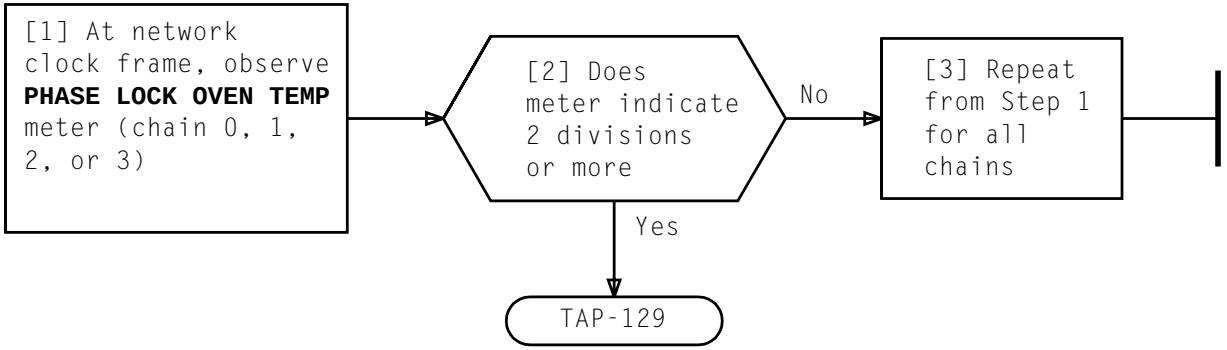
[28] Connect NCSU cable to **J20** of 39B oscillator

[29] On 39B oscillator, position **STROBE** switch to **ENABLE**

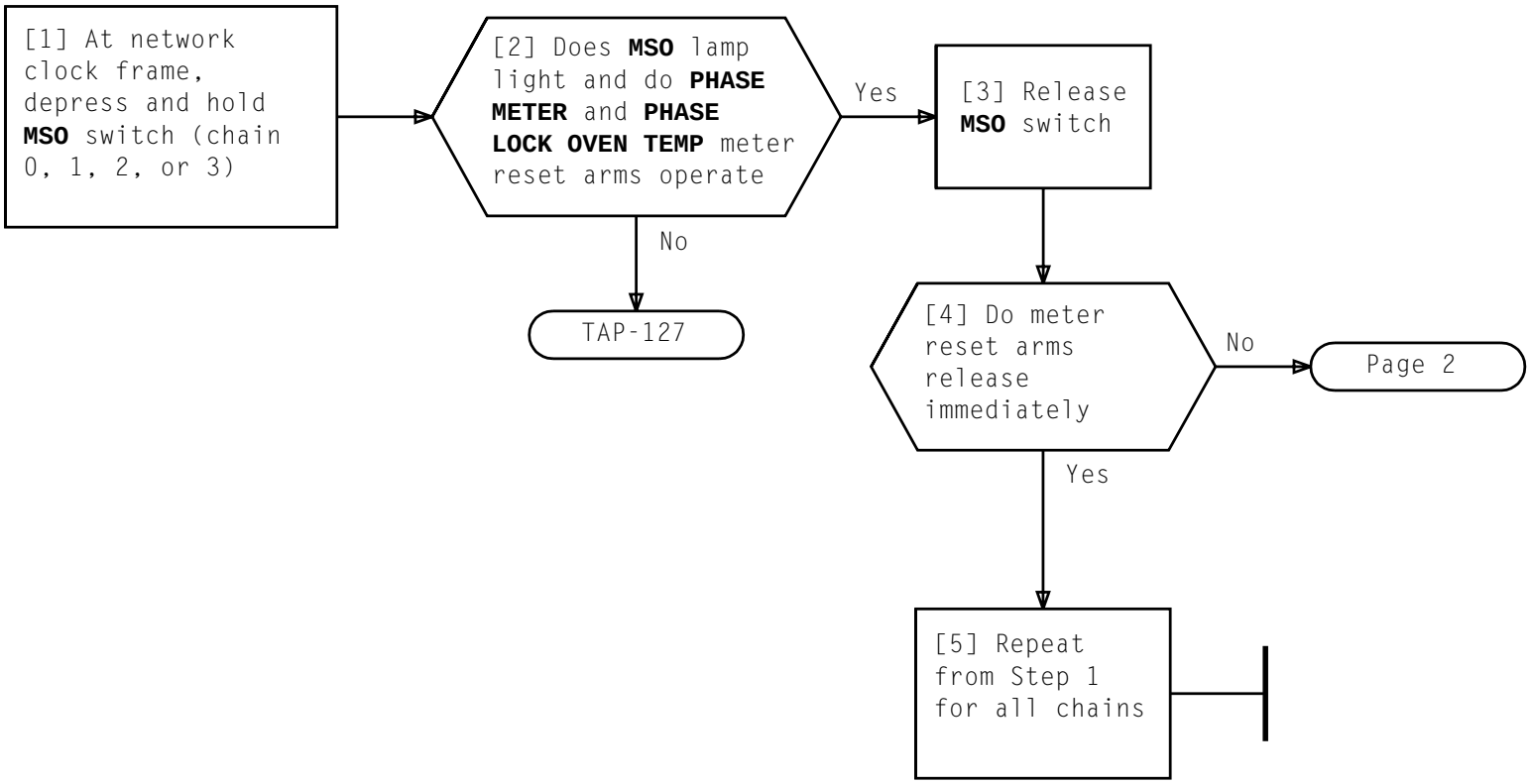
[30] At TTY, enter
RST:NCLK 0,CHAIN a!
(a = chain adjusted)



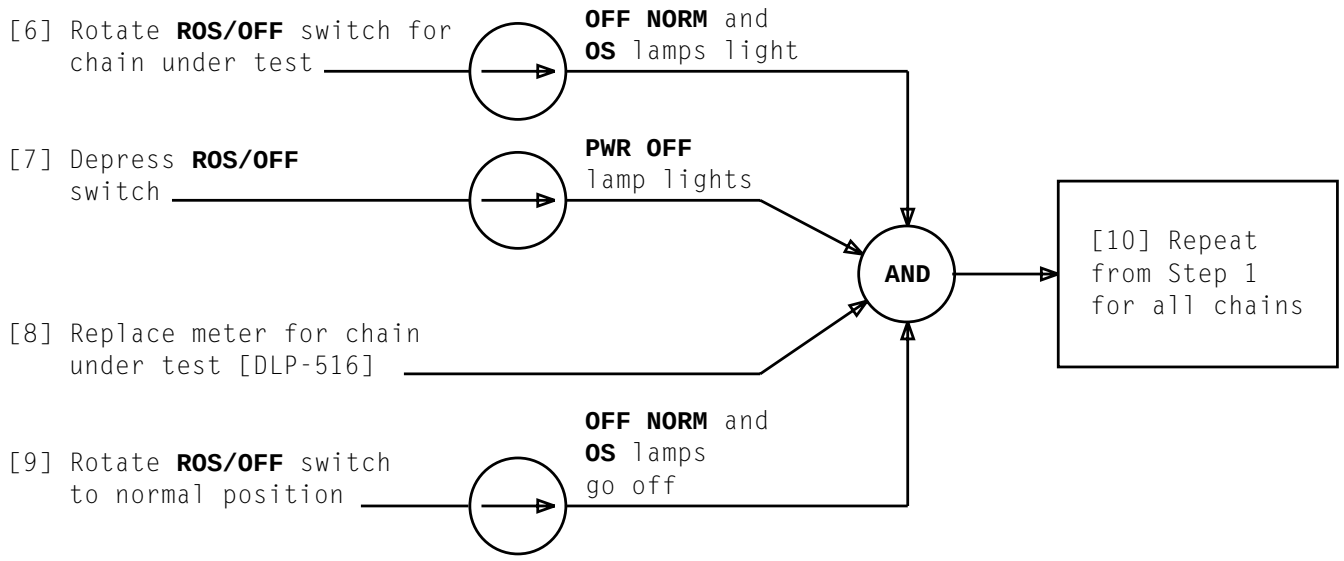
ADJUST 39B OSCILLATOR FREQUENCY USING OSCILLATOR MANUAL ADJUSTMENT UNIT (OMAU)



CHECK PHASE LOCK OVEN TEMP METER



TEST METER SOLENOID OPERATE (MSO) LAMP, PHASE METER RESET, AND PHASE LOCK OVEN TEMP METER RESET



TEST METER SOLENOID OPERATE (MSO) LAMP, PHASE METER RESET, AND PHASE LOCK OVEN TEMP METER RESET

[1] Obtain tools and parts [TABLE A]

[2] At appropriate switch location [TABLE B], depress **ROS/OFF** switch to remove power

[3] At rear of frame, remove six panhead screws holding rear of NCLK chain control cover [Figure 1]

[4] At front of frame, remove four flathead screws and NCLK control cover [Figure 1]

[5] At rear of frame, remove four screws holding mounting bracket [Figure 1] (lower outside screw is behind capacitor cover)

[6] At front of frame, lower mounting bracket to access switch/lamp assembly terminals

[7] At item being replaced, remove and tag leads

AND

Leads tagged and removed

Page 2

TABLE A	
COMMON NAME	**PART NUMBER**
Screw-starter	Kedman Co., No. 1253 or equivalent
Wire-wrapper	KS-16363, L1
MSO pushbutton indicator or **PLS** pushbutton indicator or **OSC OS** lamp	KS-20901, L5 KS-20901, L8 KS-20902, L1

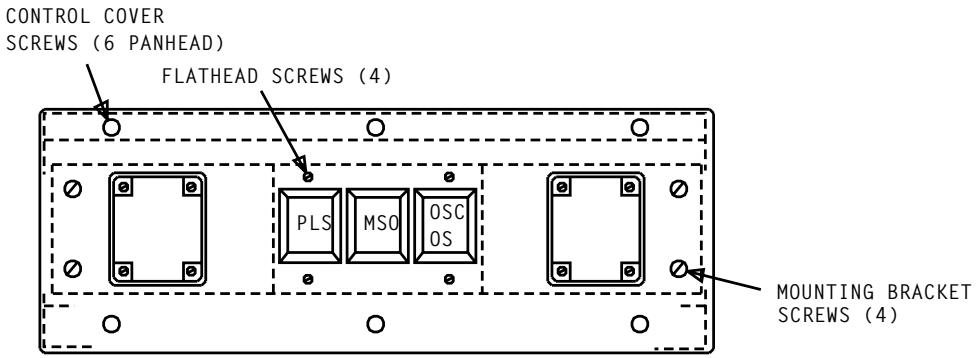
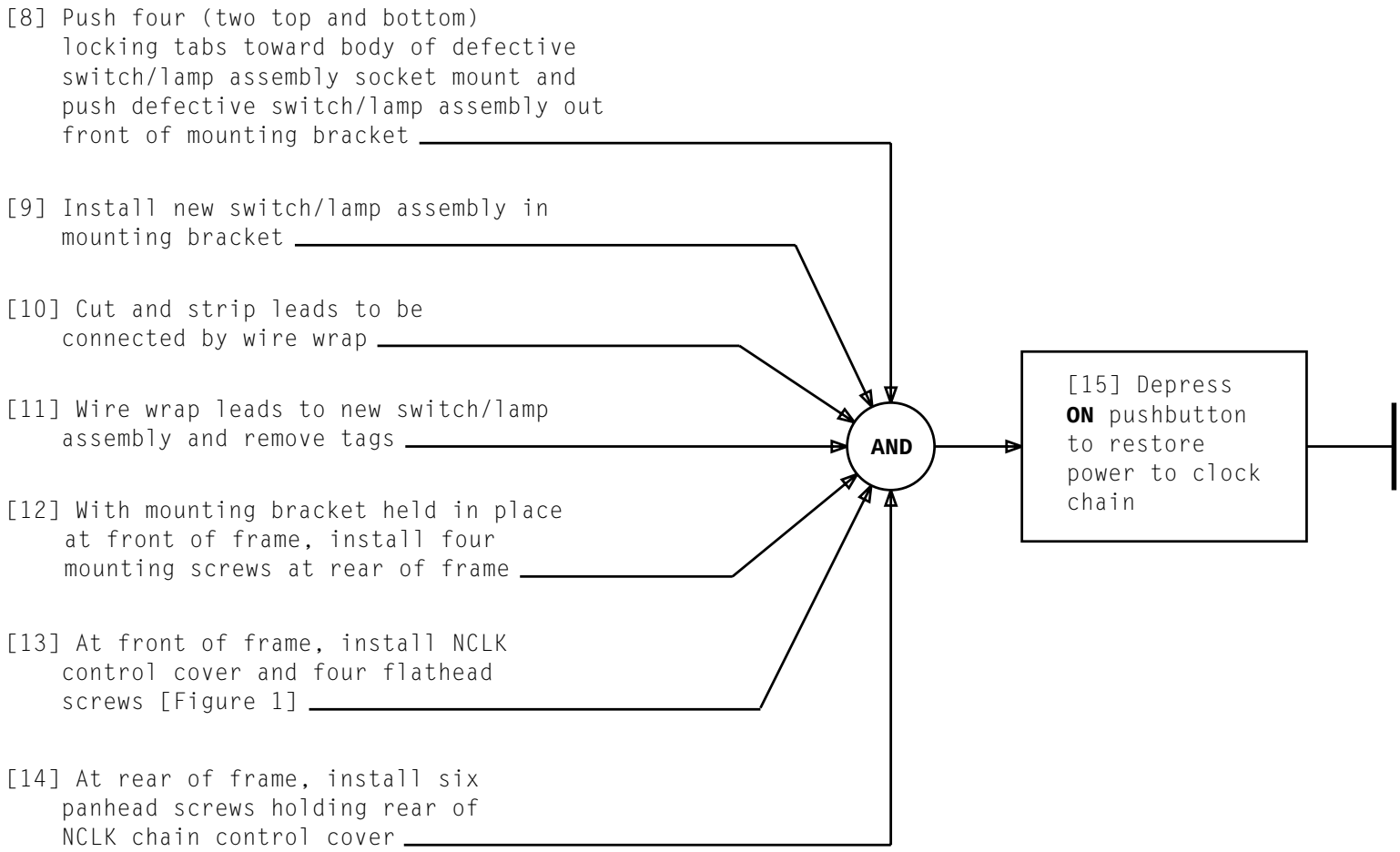


Figure 1 — Network Clock Control

TABLE B	
CLOCK CHAIN	**POWER SWITCH FRAME LOCATION**
0	066-03
1	066-68
2	166-03
3	166-68

REPLACE METER SOLENOID OPERATE SWITCH, PHASE LOCK SHUNT SWITCH, OR OSC OS LAMP ASSEMBLY



REPLACE METER SOLENOID OPERATE SWITCH, PHASE LOCK SHUNT SWITCH, OR OSC OS LAMP ASSEMBLY

REPLACE PHASE METER OR PHASE LOCK OVEN TEMP METER

[1] Obtain tools and parts [TABLE A]

[2] Ensure **OS** lamp lights and power is removed from chain containing meter to be replaced

[3] Remove fuse associated with meter to be replaced [TABLE B, Page 2]

[4] At rear of frame, remove six panhead screws holding rear of network clock chain control cover [Figure 1]

[5] At front of frame, remove four flathead screws and network clock chain control cover

[6] Ensure front and rear network clock control chain covers removed

AND

Network clock control cover removed

[7] Place solder drop cloth close to bottom of network clock control

[8] Tag and remove leads from defective meter using grounded tip soldering iron

[9] Remove four meter mounting screws [Figure 2] holding meter to mounting bracket and remove meter

AND

Defective meter removed

Page 2

TABLE A	
COMMON NAME	**PART NUMBER**
Screw-starter	Kedman Co., No. 1253 or equivalent
Grounded tip soldering iron	—
Meter, 50-0-50UA DC 24V, electric reset	API Instrument Co.

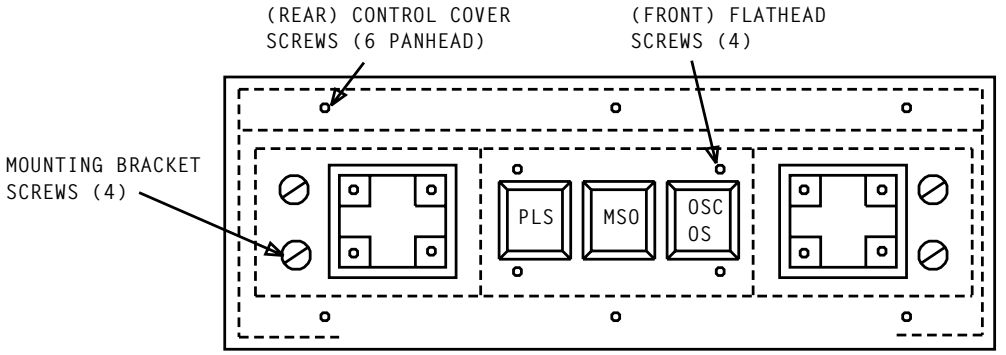


Figure 1 — Network Clock Control

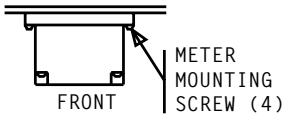


Figure 2 — Mounted Meter — Top View

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[10] Holding new meter in place, install and tighten four meter mounting screws [Figure 2, Page 1]

[11] Solder leads to their corresponding positions on new meter using grounded-tip soldering iron, and remove tags

[12] Remove solder drop cloth from network clock frame

AND

[13] At front of frame, install network clock chain control cover and retaining screws [Figure 1, Page 1]

[14] At rear of frame, install six panhead screws holding rear of network clock chain control cover

AND

[15] Replace fuse removed in Step 3, Page 1

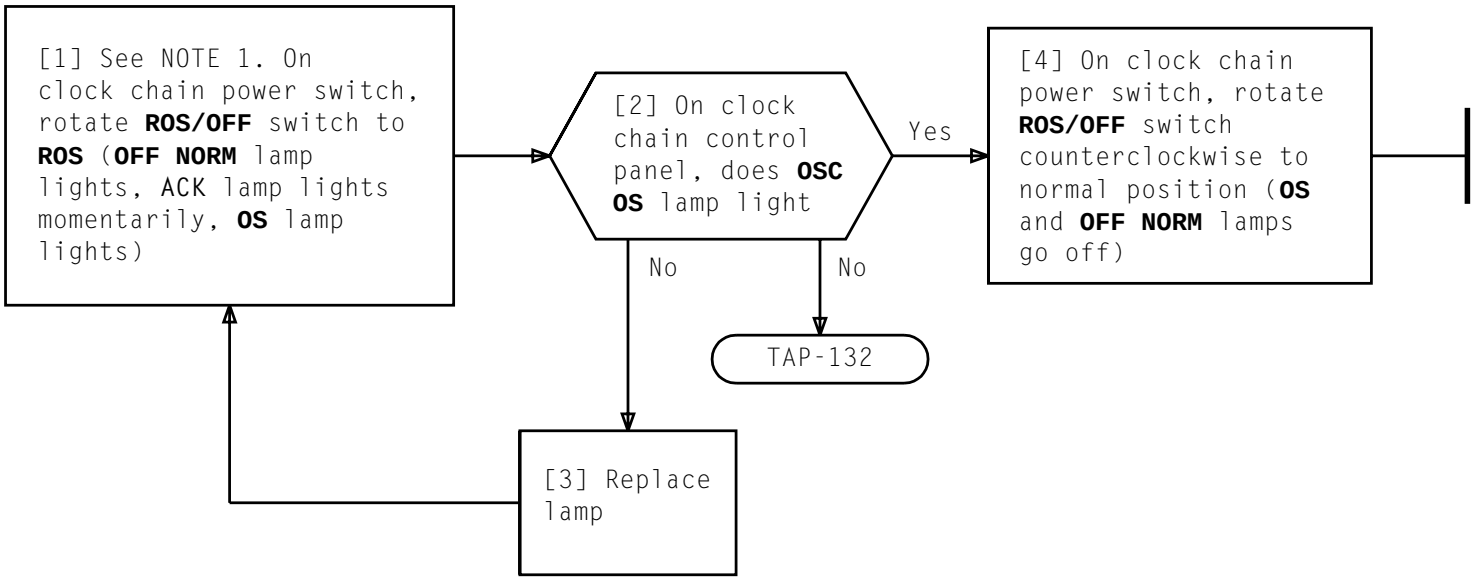
[16] Depress and hold **ON** switch for 2 seconds

PWR OFF lamp goes off

[17] If **PHASE LOCK OVEN TEMP** meter replaced, wait 15 minutes before restoring chain to service

TABLE B			
CLOCK CHAIN	**METER**	**FUSE**	**LOCATION**
0	**PHASE**	**BC**	009-32
	OVEN	**B9**	007-45
1	**PHASE**	**BD**	009-39
	OVEN	**A10**	007-32
2	**PHASE**	**BC**	109-32
	OVEN	**B9**	107-45
3	**PHASE**	**BD**	109-39
	OVEN	**A10**	107-32

REPLACE PHASE METER OR PHASE LOCK OVEN TEMP METER



TEST OSCILLATOR OUT-OF-SERVICE LAMP

NOTE 1
Test is valid only if oscillator is in service

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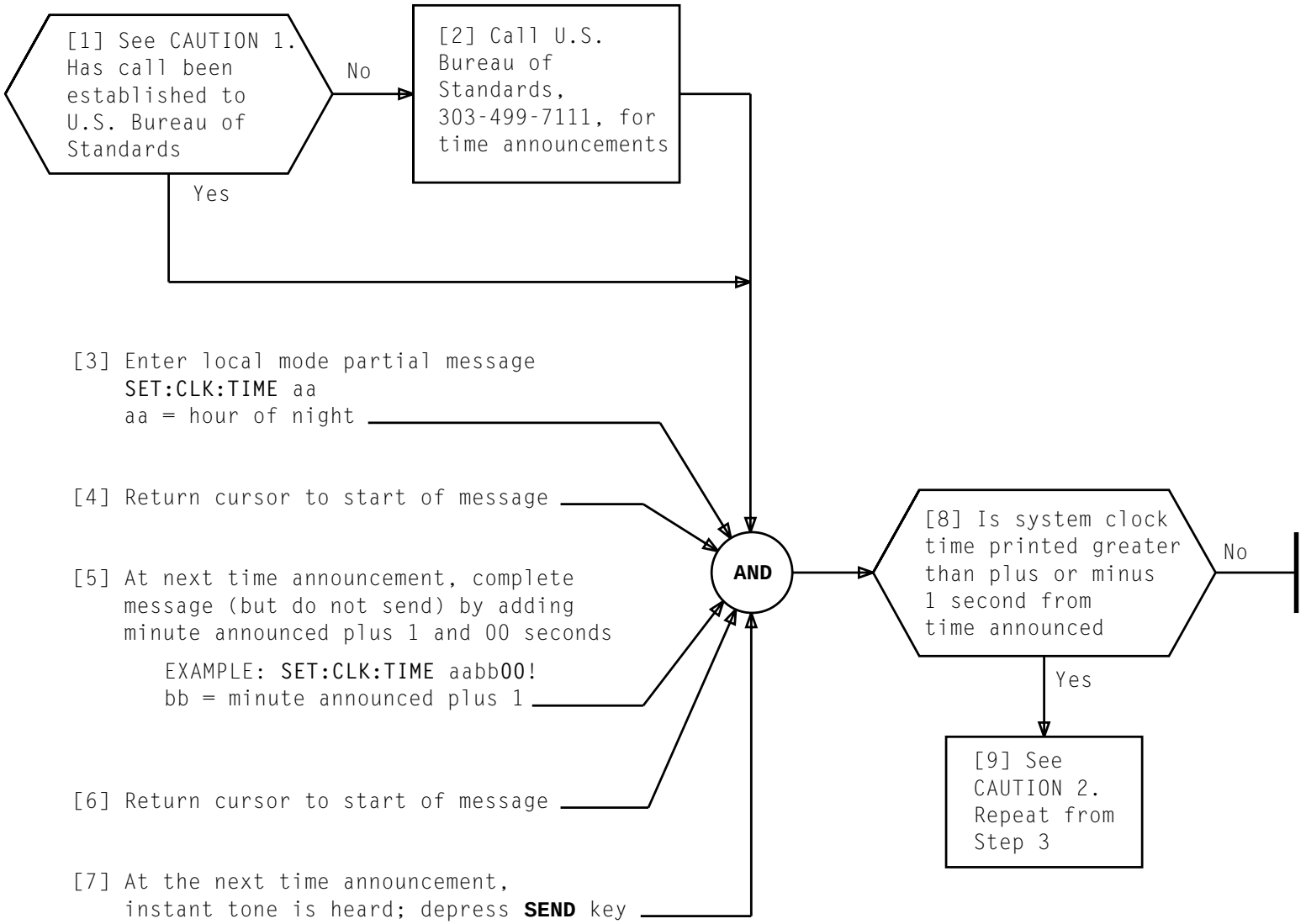

CAUTIONS

1. *System clock time changes must be made between 2:02 AM and 2:12 AM*
2. *Do not reset clock immediately. Wait at least 1 hour before resetting clock. Otherwise, recovery of AMA data may be affected*

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CORRECT SYSTEM CLOCK TIME OF DAY

INSTALL 39B OSCILLATOR

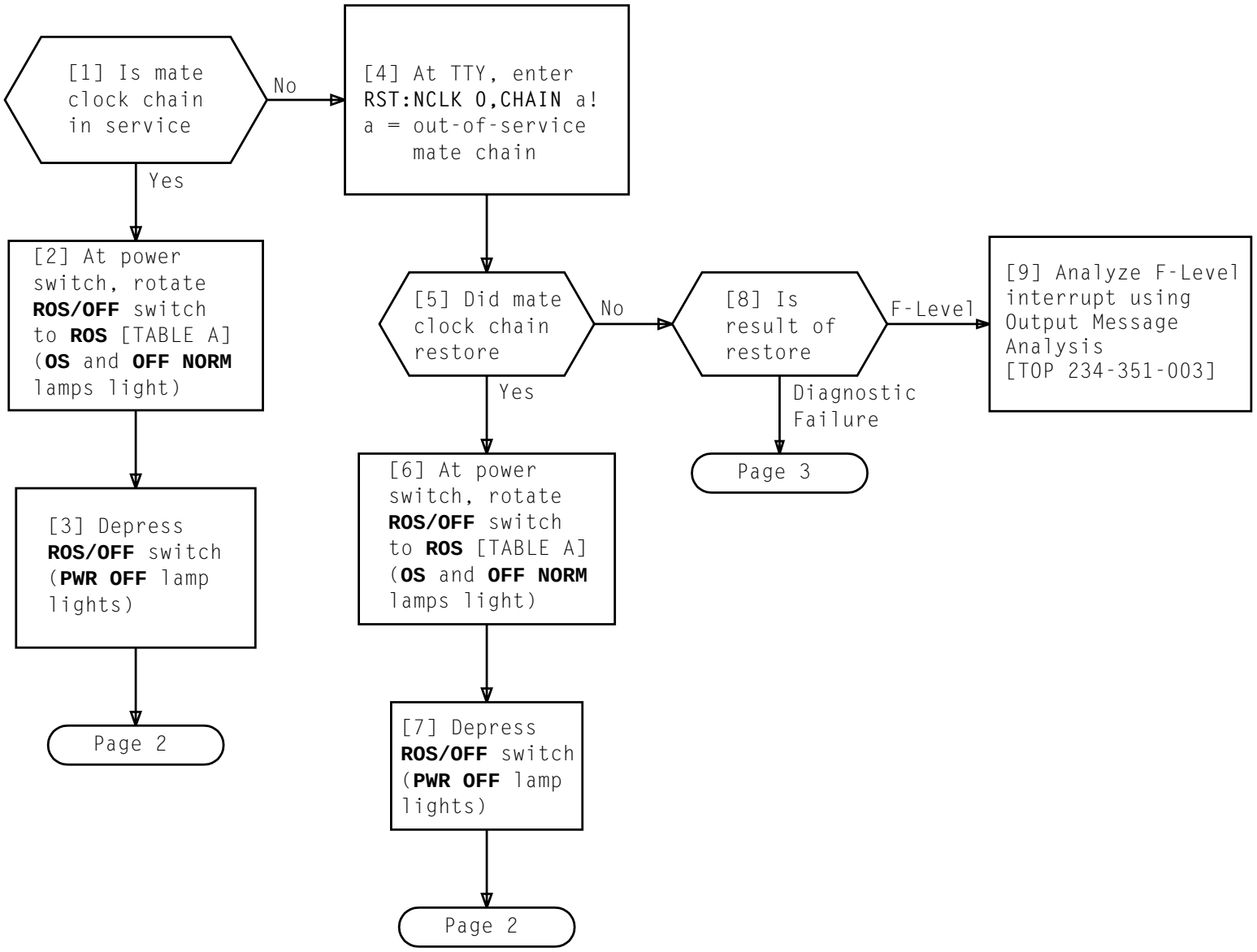


TABLE A	
CLOCK CHAIN	**POWER SWITCH FRAME LOCATION**
0	066-03
1	066-68
2	166-03
3	166-68

[10] Remove screws holding oscillator to oscillator mounting plate and retain rubber washers

[11] Align rubber washers with screw holes on bottom of new oscillator

[12] Place oscillator mounting plate on bottom of new oscillator

[13] Install and tighten screws with star washers to hold oscillator to oscillator mounting plate

[14] Place oscillator in network clock frame [Figure 1]

[15] Install and tighten screws with star washers holding oscillator mounting plate to frame

AND

[16] Connect ground strap from frame upright to oscillator [Figure 1]

[17] Remove +24 volt fuse for the oscillator being installed [TABLE B]

[18] Connect **FREQ CONTROL INPUT P21** and **POWER INPUT P18** and **P19** connectors and **D/A INPUT/OUTPUT** connector **J20** (do not connect RF output cable **P13**)

[19] Install the 24-volt fuse [TABLE B]

[20] At TTY, enter RMV:NCLK 0,OSC a! (a = oscillator installed)

AND

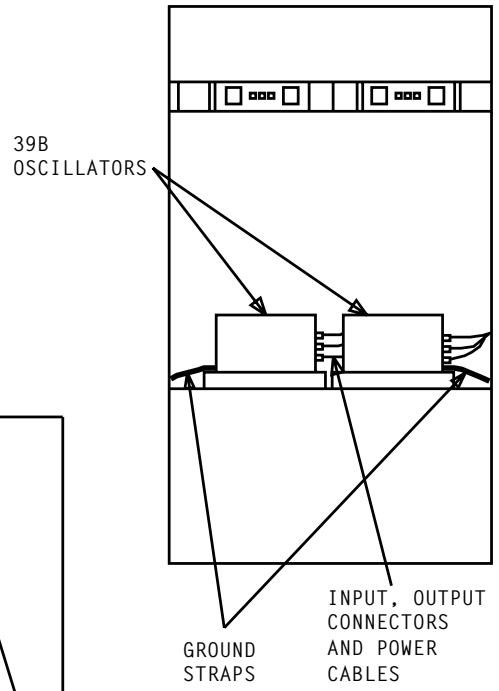
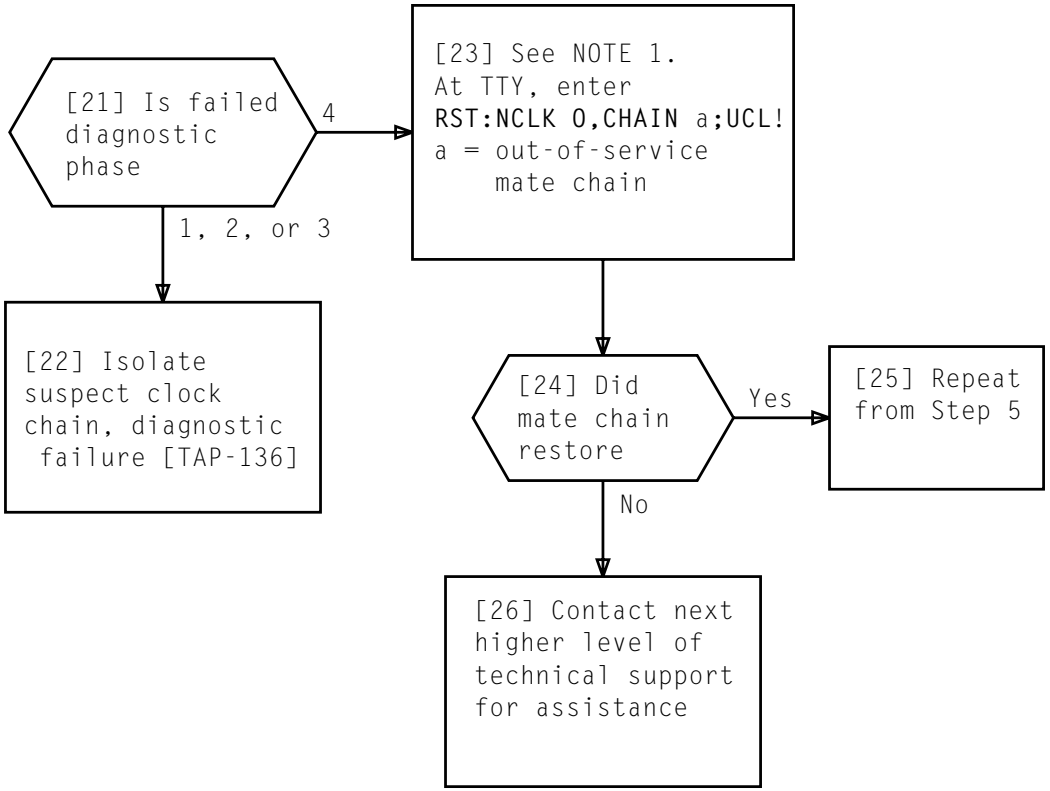


Figure 1 – Network Clock Frame

TABLE B				
CLOCK CHAIN	OSCILLATOR LOCATION	FUSES	FUSE LOCATION	
			BAY	HMP
0	033-21	**0B0A**	0	07
1	033-56	**0B0B**	0	07
2	133-21	**1B0A**	1	07
3	133-56	**1B0B**	1	07

INSTALL 39B OSCILLATOR



INSTALL 39B OSCILLATOR

NOTE 1 Ensure clock chain is powered up before restoring unconditionally	
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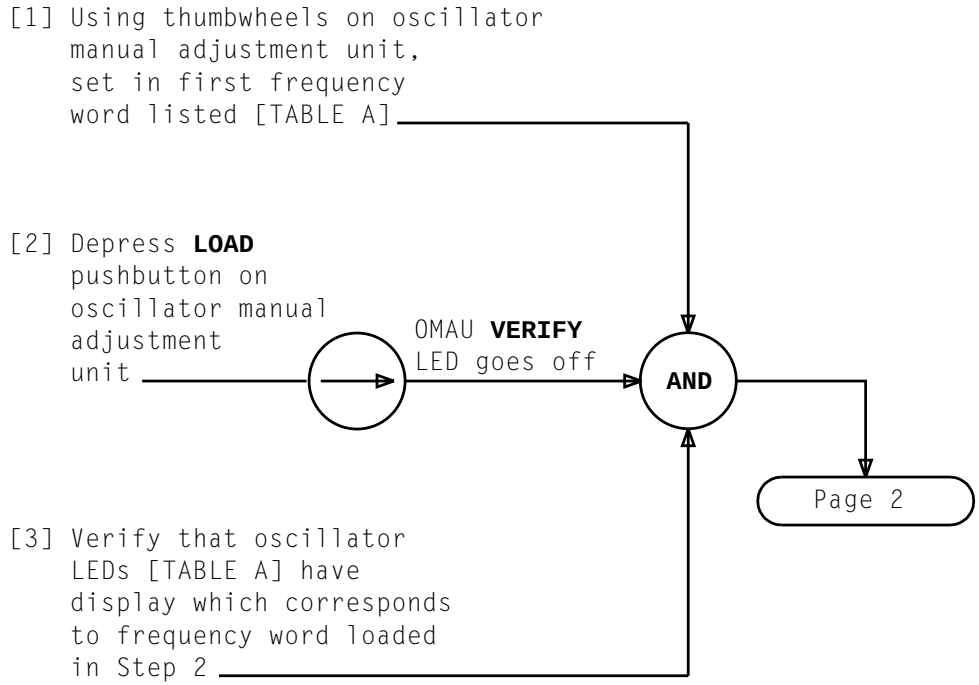
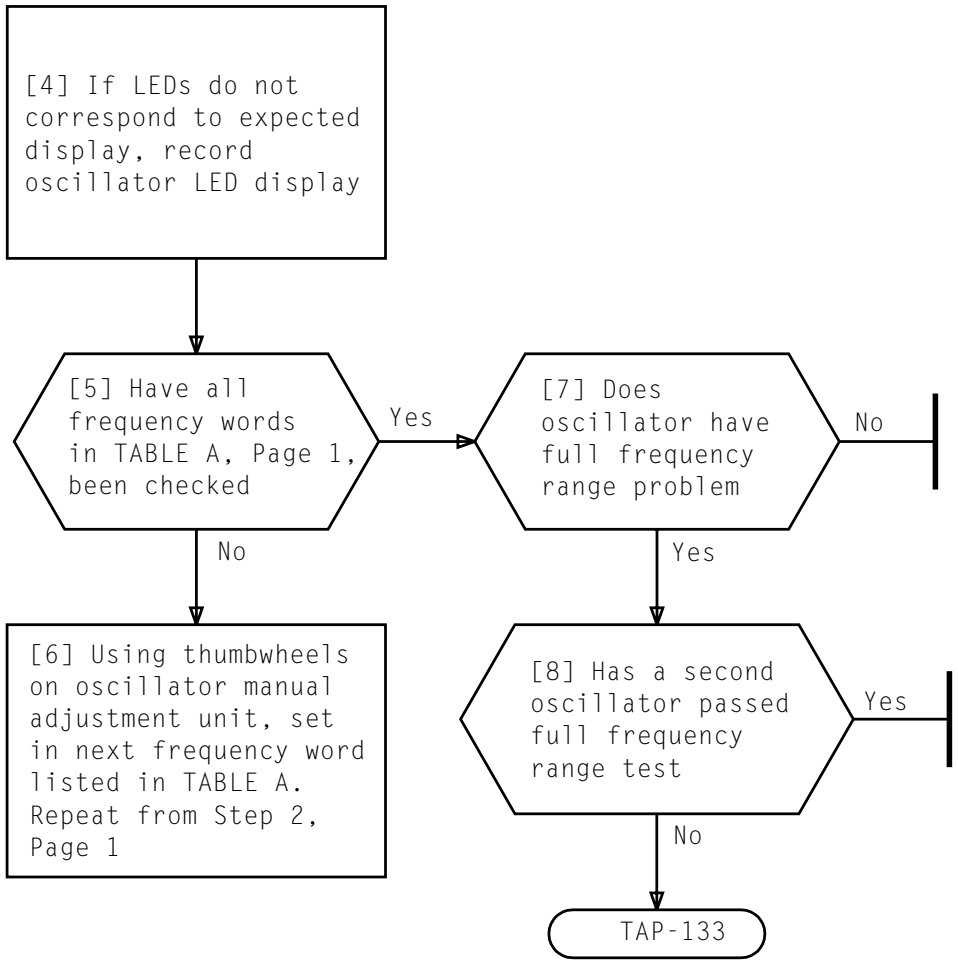


TABLE A

OMAU FREQUENCY WORD THUMBWHEEL POS.				CORRESPONDING OSCILLATOR LED DISPLAY (1 → 14)													
				OSCILLATOR LEDS													
4	3	2	1	14	13	12	11	10	9	8	7	6	5	4	3	2	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0
0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	1	0	0
0	0	0	8	0	0	0	0	0	0	0	0	0	0	1	0	0	0
0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
0	0	4	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
0	0	8	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
0	4	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
0	8	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
3	F	F	F	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

CHECK FULL FREQUENCY RANGE OF 39B OSCILLATOR



CHECK FULL FREQUENCY RANGE OF 39B OSCILLATOR

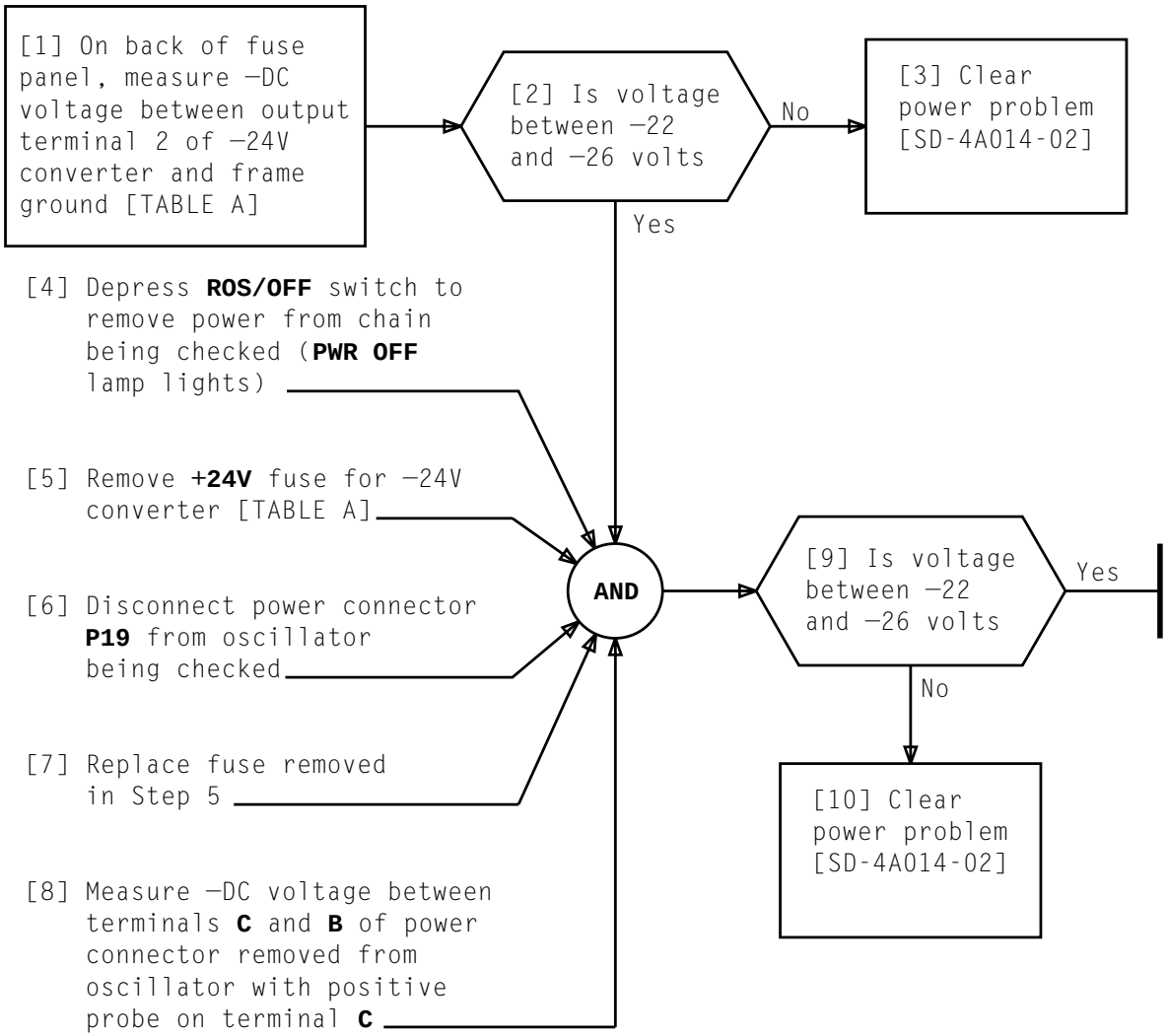
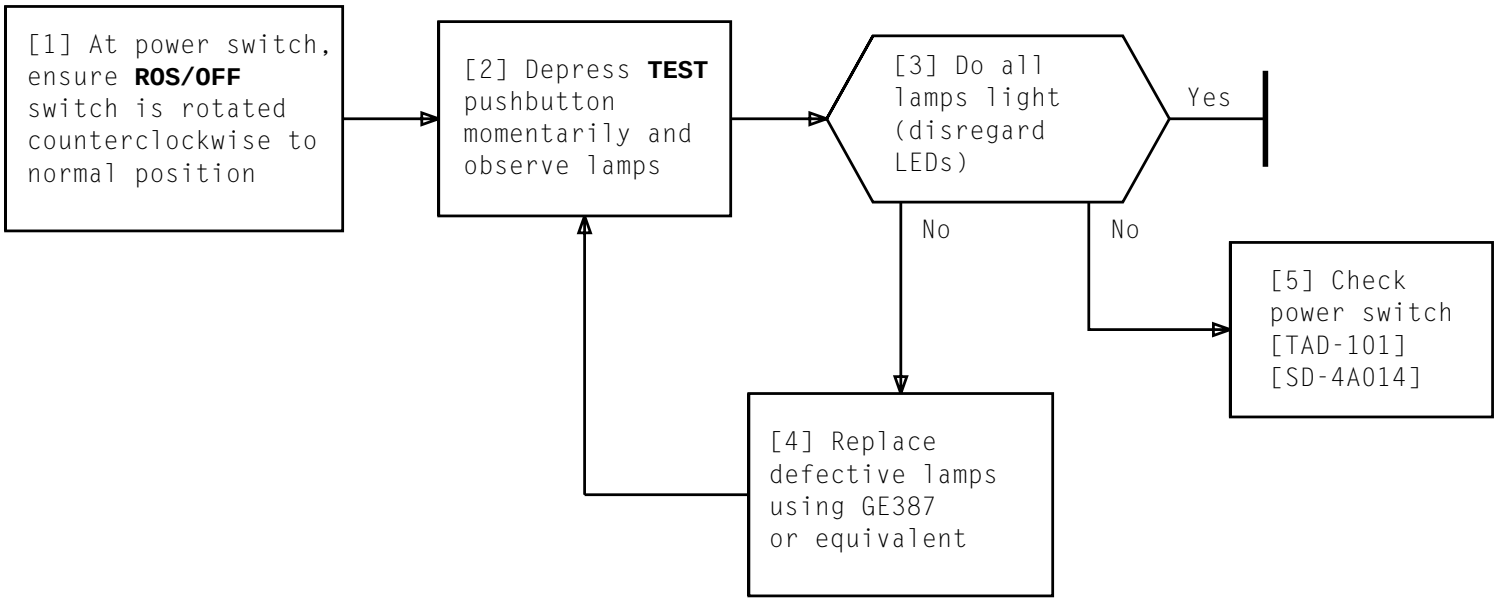


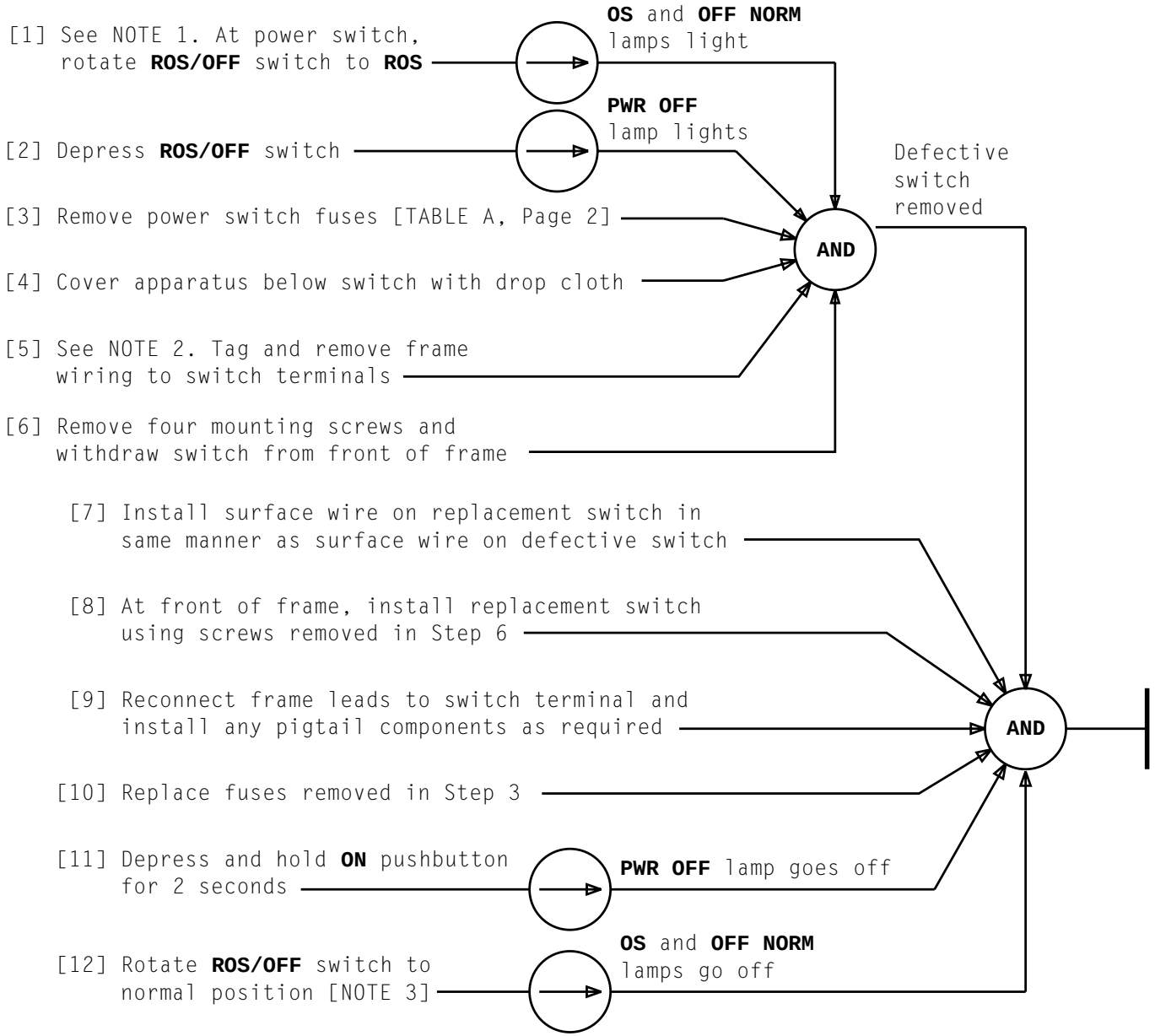
TABLE A

CLOCK CHAIN	—24V CONVERTER LOCATION	+24V FUSE	
		DESIGNATION	LOCATION
0	012-22	**OBOA**	007-20
1	012-50	**OBOB**	007-51
2	112-22	**1B0A**	107-20
3	112-50	**1B0B**	107-51

CHECK 39B OSCILLATOR —24V POWER



TEST LAMPS ON POWER SWITCH



NOTES

1. If switch to be replaced is for NCSU, operate **ENABLE/DISABLE** switch on each 39B oscillator to **DISABLE**
2. Do not remove surface wiring on switch terminals. It is used to surface wire replacement switch (Step 7)
3. If switch replaced was for NCSU, operate **ENABLE/DISABLE** switch on each 39B oscillator to **ENABLE**

REPLACE POWER SWITCH

Reissued

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TABLE A				
UNIT LOCATION	UNIT DESIGNATION	SWITCH LOCATION	FUSES	
			FUSE BLOCK LOCATION	FUSE DESIG
062	Network clock unit	066-04	007-20	**0ST0 0LA**
		066-68	007-51	**0ST1 0LB**
058	Peripheral bus unit	060-55	009-51	**0BB2 0L3**
054	System clock and bus controller unit	056-66	009-51	**0ST2 0L2**
162	Network clock unit	166-04	107-20	**1ST0 1LA**
		166-68	107-51	**1ST1 1LB**
158	Peripheral bus unit	160-55	109-51	**1BB2 1L3**
154	System clock and bus controller unit	156-66	109-51	**1ST2 1L2**
046	NCSU	048-03	009-32	**OSA OSC**

REPLACE POWER SWITCH

1. Enter **RMV:SCLK 0,NCSU 0!**

   NOTE: Bit 12 of word A indicates controller status. If 0, use word C in CONTR 0. If 1, use word C in CONTR 1

2. Identify oscillator using bits 0, 1, and 2 of word C and TABLE A [Figure 1]

3. At oscillator, disable oscillator using **ENABLE/DISABLE** switch

4. Locate cable connectors at NCSU [TABLE A]

5. Remove cable connectors and inspect for broken connectors, broken leads, etc.

6. Reseat cable connectors

7. At oscillator identified in Step 2, remove and reseat cable connector (labeled **D/A INPUT/OUTPUT**)

8. Enable oscillator using **ENABLE/DISABLE** switch on oscillator

9. Enter **RST:SCLK 0,NCSU 0!**

End of procedure

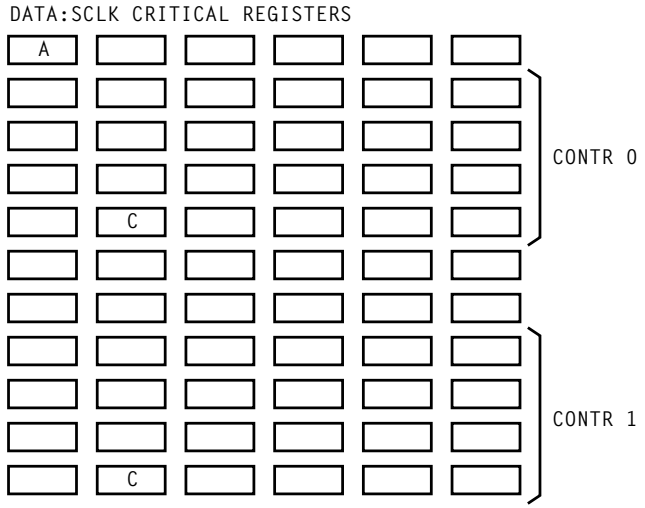


Figure 1 – SCLK Critical Registers

TABLE A

BIT 2	BIT 1	BIT 0	OSC	NCSU CONNECTORS
0	0	0	0	0-48-56
0	0	1	1	0-52-56
0	1	0	2	0-52-58
0	1	1	3	0-48-58
1	0	0	0	0-48-56
1	0	1	1	0-52-56
1	1	0	2	0-52-58
1	1	1	3	0-48-58

RESEAT NCSU, OSCILLATOR CABLE CONNECTORS

STABILIZE 39B OSCILLATOR

[1] See NOTE 1. At TTY, enter
RST:NCLK 0,CHAIN a;UCL!
(a = chain removed from
service)

[2] On all in-service 39B oscillators,
set **STROBE** switch to **ENABLE**

[3] At TTY, enter RST:SCLK 0,NCSU 0!

[4] Allow oscillator to stabilize and warm
up at least 24 hours, preferably
48 hours

[5] At TTY, enter RMV:SCLK 0,NCSU 0!

[6] At all 39B oscillators, set
STROBE switch to **DISABLE**

AND

[7] At power switch [TABLE A],
rotate **ROS/OFF** switch
clockwise

OS and **OFF NORM**
lamps lighted

PWR OFF
lamp lights

[8] Depress **ROS/OFF** switch

AND

[9] See NOTE 2. Connect RF OUTPUT
connector **P13** to new oscillator

TABLE A	
CLOCK CHAIN	**POWER SWITCH FRAME LOCATION**
0	066-03
1	066-68
2	166-03
3	166-68

NOTES
1. Ensure clock chain is powered up before restoring unconditionally
2. Warmup of 24 hours is required prior to connection of oscillator

On Summary Data Printout [Figure 1]:

1. Note monitor point address on first CD line under V1 column

2. Convert to decimal the octal failing bit in leftmost four octal digits of word under adjacent V2 column

NOTE 1: Negative addresses, (for example, 77771510) precede positive addresses in PK. If address is not found, other addresses and bits may be investigated using other V column pairs (first CD line or other CD lines). PK data for these addresses will be further removed from fault and PR data may be of greater value

In Test Access PK Document:

3. Find address and failing bit

4. Note pack type and gate name for failing bit

In CPS for Pack Type:

5. Locate component list section

NOTE 2: If A or B appears after gate name in Test Access PK, it indicates A or B half of register (gate)

6. Look in each DESIG column for gate name

7. In adjacent SH LOC column, use location indicated to find gate in CPS

8. At gate, note lead name and terminal leaving gate to outside of pack [Figure 2]

In Test Access PK Document:

9. For failing bit, note FS, SD, and symbol name

In SD and FS Indicated:

10. Locate symbol number having same symbol name as indicated in Test Access PK for failing bit

11. Find lead interconnection section for this symbol

12. Using terminal and lead name noted in Step 8, find corresponding SD lead name

End of procedure

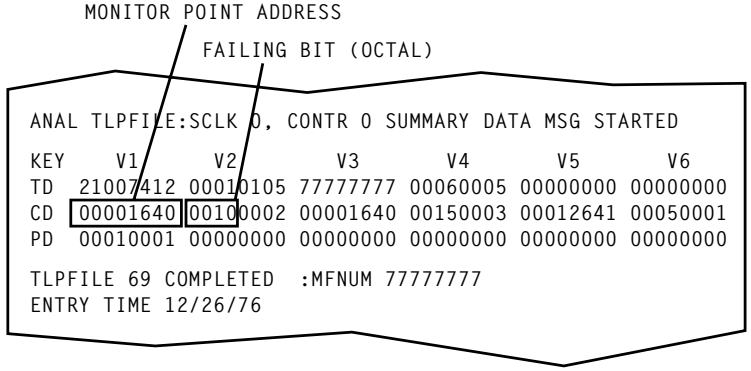


Figure 1 — Example of Summary Data Printout

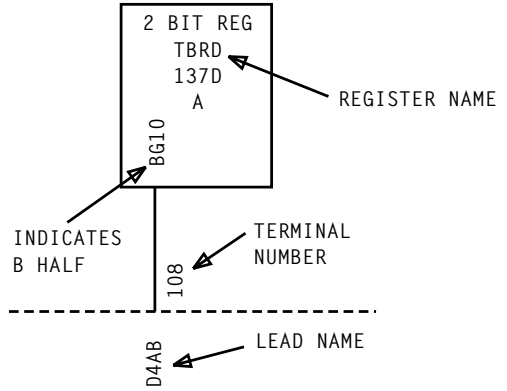


Figure 2 — Example of Lead Leaving B Half of a CPS Register

IDENTIFY LEAD IN PATH OF FAILING BIT USING SUMMARY DATA PRINTOUT AND TEST ACCESS PK DOCUMENT

ALIGN 39B OSCILLATOR USING OPEN LOOP METHOD

[1] Obtain scope and allow it to warm up

[2] Enter **RMV:NCLK 0,CHAIN a!**
a = chain to be adjusted

[3] At rear of clock chain, connect cliplead between terminal 1 of **PHR** relay associated with clock chain removed from service and frame ground [TABLE A]

[4] Connect channel 1 scope probe to terminal 218 of **FB214** pack associated with clock chain removed from service [TABLE B]

[5] SYNC scope to signal connected to channel 1

[6] Connect channel 2 probe to terminal 018 of **FB214** pack associated with clock chain removed from service [TABLE B]

[7] Connect oscillator manual adjustment unit to 39B oscillator [DLP-532]

[8] Set oscillator manual adjustment unit thumbwheels to 2000 and enter by depressing **LOAD** pushbutton

AND

AND

OMAU **VERIFY** LED goes off

[9] See NOTE 1. Has channel 2 waveform appeared to stop moving

Yes → Page 2

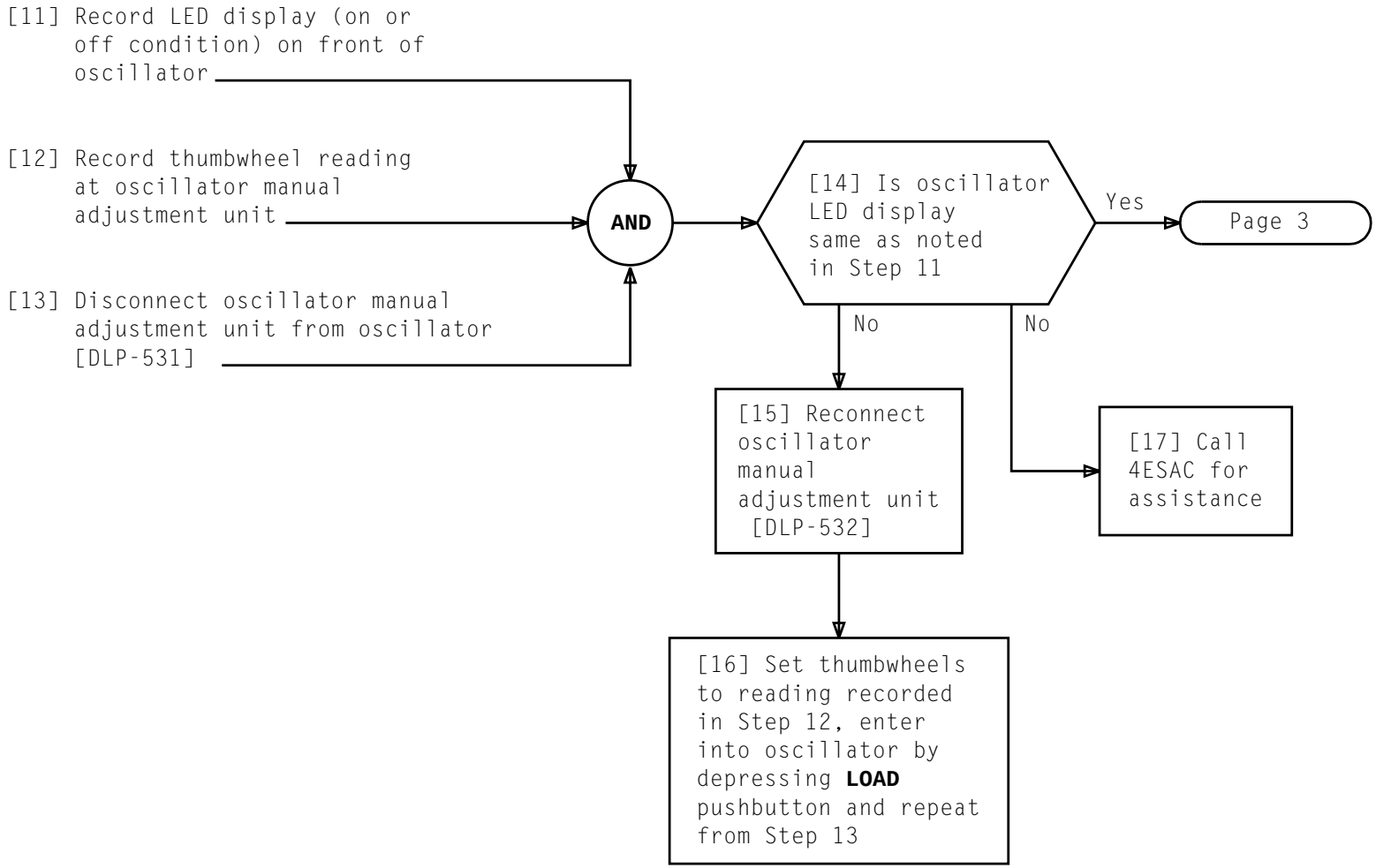
No

[10] Repeat from Step 8 changing thumbwheel settings to stop movement of waveform

TABLE A		
CLOCK CHAIN	**PHR RELAY**	**LOCATION**
0	**0PHR**	066-24
1	**1PHR**	066-47
2	**0PHR**	166-24
3	**1PHR**	166-47

TABLE B	
CLOCK CHAIN	**FB214 PACK LOCATION**
0	066-33
1	066-39
2	166-33
3	166-39

NOTE 1
Final frequency word entered into oscillator that is not between 0800 and 3800 is indication that replacement oscillator should be obtained. Call next level of technical support for assistance.



ALIGN 39B OSCILLATOR USING OPEN LOOP METHOD

[18] Recheck 39B oscillator level by connecting scope probe to terminal 018 of **FB214** pack associated with clock chain removed from service [TABLE B, Page 1]

[19] Is waveform between 1.8 volts and 2.0 volts peak-to-peak

Yes

[21] Remove all clipleads and probes used during this procedure

No

[20] Remove level adjustment cover from front left side of 39B oscillator [Figure 1] of chain being tested, adjust potentiometer to measure 1.9 volts peak-to-peak, and replace level adjustment cover

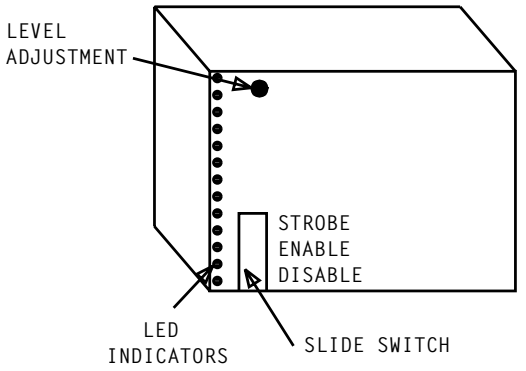


Figure 1 – 39B Oscillator

ALIGN 39B OSCILLATOR USING OPEN LOOP METHOD

1. Ensure chain containing oscillator to be adjusted is removed from service

2. At TTY, enter
   VER:UTYPE:SCLK 0!

3. Using octal word 13 of UTMN translator data, determine timing reference port equipage [FIG. 1, TABLE A]

End of procedure

BIT	23	22 21	20 19	18 17
WORD 13	NA	DS1B	DS1A	BSRF

FIG. 1 – System Clock Unit Type Layout (WORD 13)

TABLE A

WORD 13

BITS						OFFICE TYPE PORT EQUIPAGE CODES
22	21	20	19	18	17	
0	0	0	0	0	0	BSRF UNEQ DS1A UNEQ DS1B UNEQ
0	0	0	0	0	1	BSRF REG DS1A UNEQ DS1B UNEQ
0	0	0	1	0	0	BSRF UNEQ DS1A REG DS1B UNEQ
0	0	1	0	0	1	BSRF REG DS1A ALT DS1B UNEQ
1	0	0	1	0	0	BSRF UNEQ DS1A REG DS1B ALT

UNEQ = unequipped
ALT = alternate reference
REG = regular reference

DETERMINE TIMING REFERENCE EQUIPAGE

CALIBRATE SCOPE

[1] Warm up three (150 MHz or higher) oscilloscopes (1-hour warmup preferred)

[2] See NOTE 1. Obtain at least two good 6-foot, 12.5pf, X10 probes with 4-inch or less ground leads

[3] Select one oscilloscope

AND → Scope selected

[4] If scope has bandwidth switch, make sure switch is set to full bandwidth

[5] Connect probe to channel 1 and set vertical volts/ divisions switch to display 0.5 volts/division (typical setting with 10X probe would be 50 mv)

[6] Set vertical mode switch to select channel 1

[7] Set horizontal controls for normal internal trigger

[8] Set horizontal time base to 0.5 ms

AND → Controls initially set

[9] See CAUTION 1. Connect channel 1 scope probe to scope's calibration output and sync scope to this 1 kHz square wave

[10] Set vertical volts/division switch to display 4 or more divisions of signal

[11] See FIG. 1. Compensate probe by using small screwdriver to turn trimmer capacitor in probe housing

AND → Scope probe compensated → Page 2

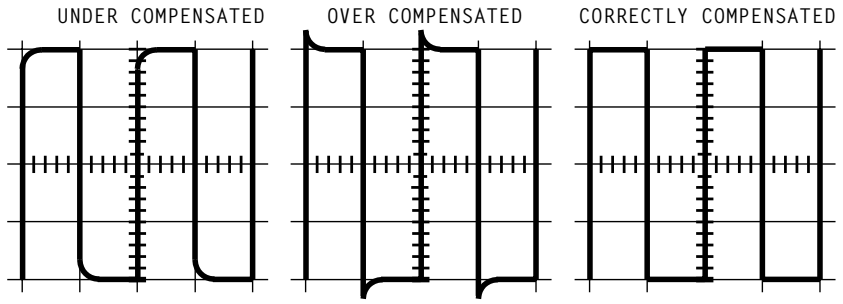


FIG. 1

NOTE 1
Two 2-meter, 13.0 pf, X10 probes with 4-inch or less ground leads may be used if 6-foot probes are not available

CAUTION 1
Improper scope calibration can affect service

CALIBRATE SCOPE

[12] Ensure volts/division switch is set to 0.5 volts/division

[13] Use a small screwdriver to adjust channel 1 vertical gain to display amplitude of calibration source (if source amplitude is 1 volt, adjust for 2 divisions [FIG. 2]

AND

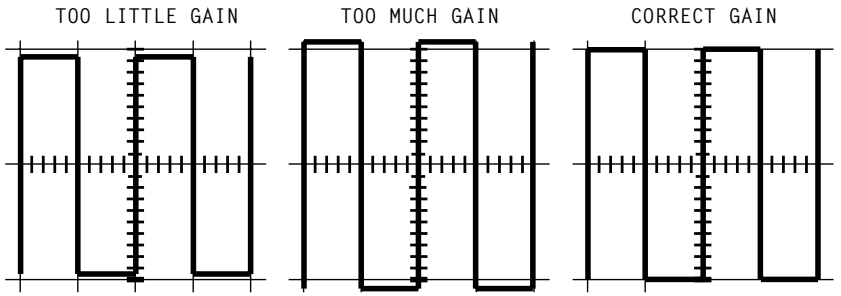


FIG. 2

[14] Connect channel 1 scope probe to calibrate source for each of other scopes one at a time and note amplitude for each

[15] See EXAMPLE 1. With calibration amplitude known for each of three scopes, select scope calibration source that disagrees least with the other two sources

AND

Calibrate source selected

[16] Connect another probe obtained in Step 2, Page 1, to channel 1 of second scope

[17] Repeat Steps 4, Page 1, through 13 for second scope using calibration source selected in Step 15

AND

[18] When ready to use scope, connect both channel 1 probes to clock chain [TABLE A, Page 3] location using **SAFELEED** test lead adapter for both signal point and ground point

[19] Set horizontal time base to 0.02 µs for both scopes

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EXAMPLE 1

SCOPE	CAL SOURCE AMPLITUDE
1	1.0 volts
2	1.2 volts
3	1.3 volts

Scope 2 calibrate source selected

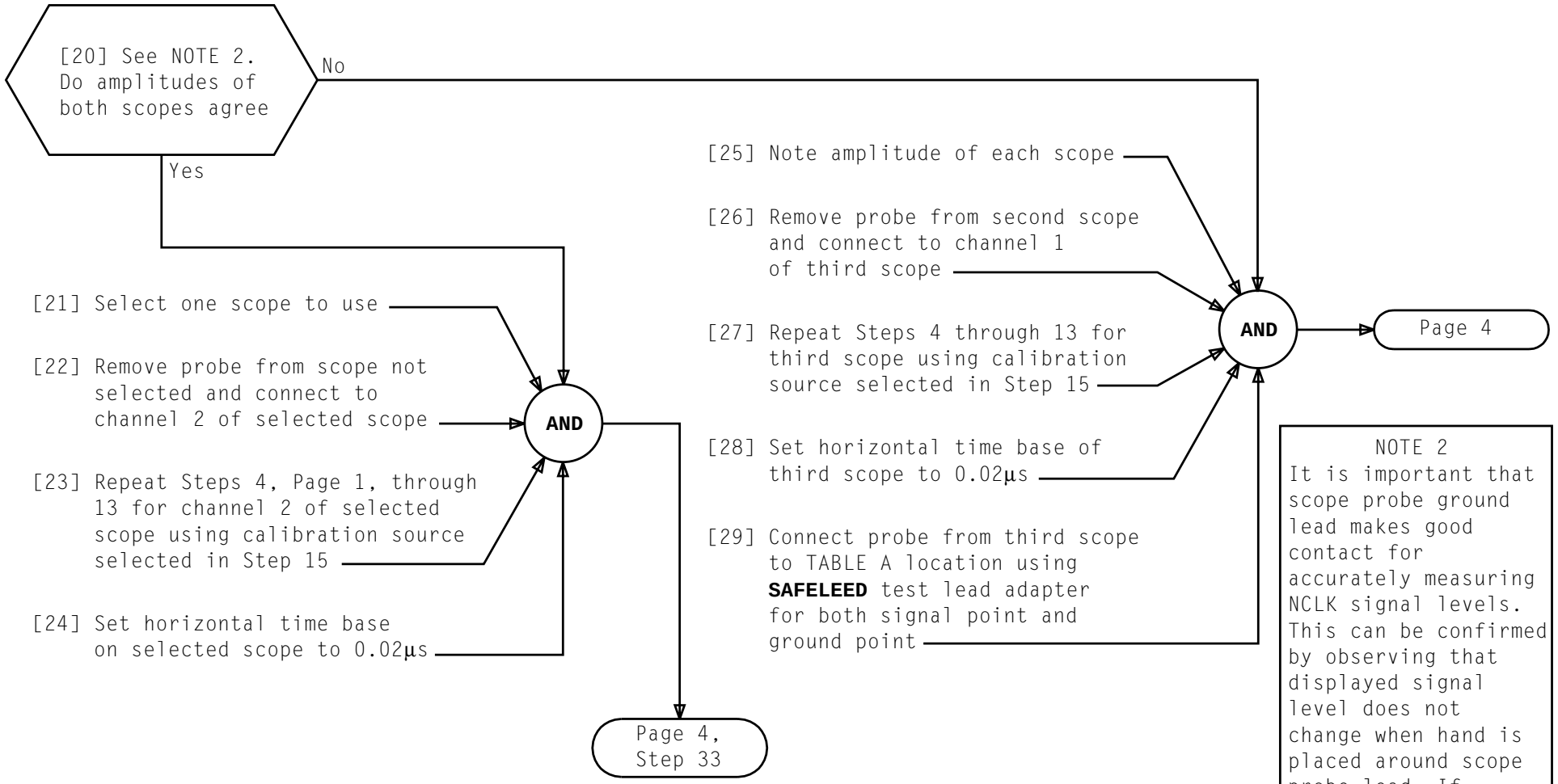

TABLE A				
CLOCK CHAIN	**0**	**1**	**2**	**3**
Probe	**LOCATION**			
Signal	066-33-018	066-39-018	166-33-018	166-39-018
Ground	066-34-2GD	066-39-0GD	166-34-2GD	166-37-0GD

NOTE 2

It is important that scope probe ground lead makes good contact for accurately measuring NCLK signal levels. This can be confirmed by observing that displayed signal level does not change when hand is placed around scope probe lead. If signal level changes, some ground impedance is suspected and problem must be corrected before proceeding with measurements

CALIBRATE SCOPE

[30] Note amplitude and select scope that disagrees least with other two scopes

[31] Was first or third scope selected

No

[33] Calibrate channel 1 and channel 2 with probes to be used by repeating Steps 4 through 13 for each channel using calibration source chosen in Step 15

Yes

[32] Calibrate channel 2 of scope selected (first or third) with probe from other scope by repeating Steps 4, Page 1, through 13 using calibration source chosen in Step 15, Page 2

[34] See NOTE 2, Page 3, and CAUTION 2. Refer to FIG. 3 and 4 for correct reading of 16-MHz clock signal

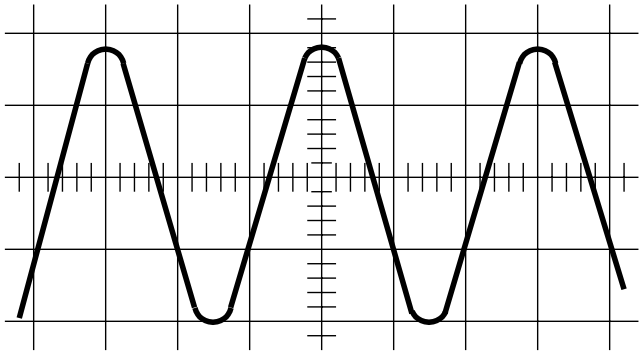

FIG. 3 — Correct 1.9V Peak-to-Peak Reading With No High Frequency Noise Vert = 0.5V/DIV, Hor = 0.02μs/DIV

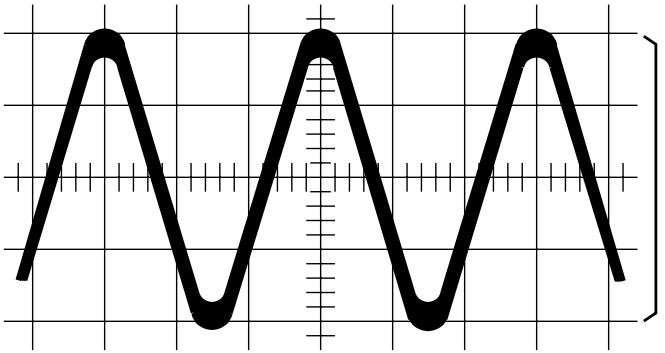

FIG. 4 — Correct 1.9V Peak-to-Peak Reading With High Frequency Noise Vert = 0.5V/DIV, Hor = 0.02μs/DIV

CAUTION 2

High frequency measurement verifies that oscilloscope is calibrated and set to full band-width. Connect probe to terminal directly or use **SAFELEED** *test lead adapter. Never use cliplead to connect probe to terminal. Always use short (4" or less) probe ground lead*

CALIBRATE SCOPE

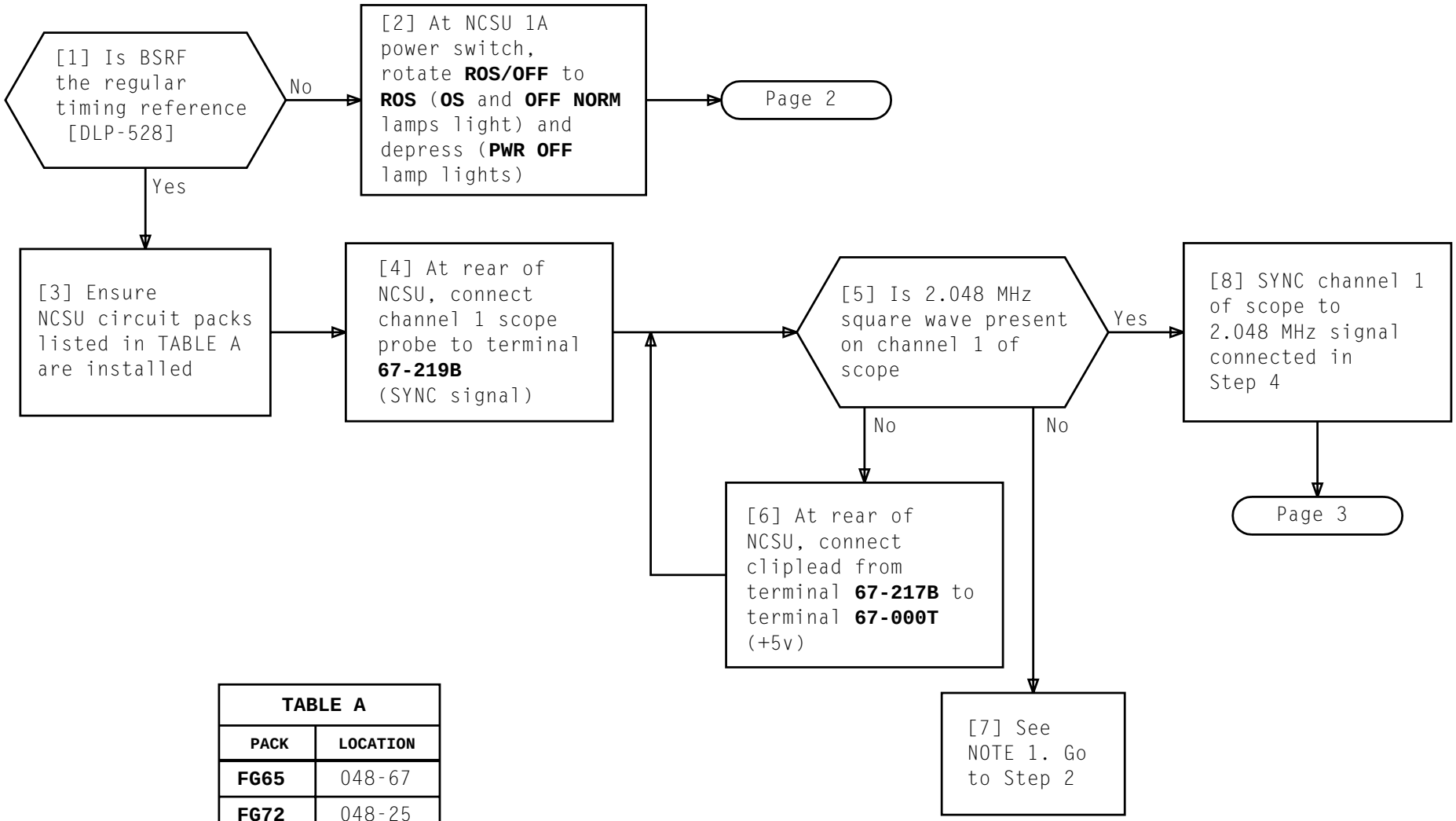

TABLE A	
PACK	**LOCATION**
FG65	048-67
FG72	048-25
FG76	048-27

NOTE 1
BSRF is not operative. Alternate DS1A must be used

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ALIGN 39B OSCILLATOR FREQUENCY USING EXTERNAL REFERENCE

[9] Ensure NCSU circuit packs listed in TABLE B are installed

[10] Remove NCSU circuit packs located at 050-63 and 050-59 (**FG61** and **FG62**)

[11] At 1A power switch, depress **ON** pushbutton (**PWR OFF** lamp extinguishes)

[12] At rear of NCSU, connect channel 1 scope probe to terminal 65-205T (SYNC signal)

[13] Using cliplead, tie terminal 65-108T to terminal **OGDT**

[14] Using clipleads, tie terminals listed in TABLE C to ground terminals

[15] See NOTE 2. SYNC channel 1 of scope to 4-kHz signal connected in Step 12

AND

[16] Is 4-kHz square wave present on channel 1 of scope

Yes → Page 3

No

[17] Is BSRF the regular timing reference

Yes → [18] Call 4ESAC for assistance

No

[19] See NOTE 3. Remove cliplead from terminal **65-OGDT** and tie this cliplead to terminal **65-000T**

→ Page 3

TABLE B

PACK	LOCATION
FG64	050-65
FG65	050-67
FG72	050-25
FG76	050-27

TABLE C

65-100T	65-102T	65-103T
65-106T	65-117B	65-019B

NOTES

2. SYNC channel 1 on negative edge of 4-kHz signal
3. DS1A is not operative; alternate DS1B must be used

ALIGN 39B OSCILLATOR FREQUENCY USING EXTERNAL REFERENCE

[20] Connect channel 2 scope probe to terminal 018 of **FB214** pack [TABLE D]

[21] At scope, set CRT display to **CHOP** mode

[22] Set horizontal controls for 5 ns/div [Figure 1]

[23] Connect oscillator manual adjustment unit to 39B oscillator [DLP-532]

[24] Set oscillator manual adjustment unit thumbwheel to 2000 and enter by depressing **LOAD** pushbutton

On OMAU, **VERIFY** LED goes off

AND

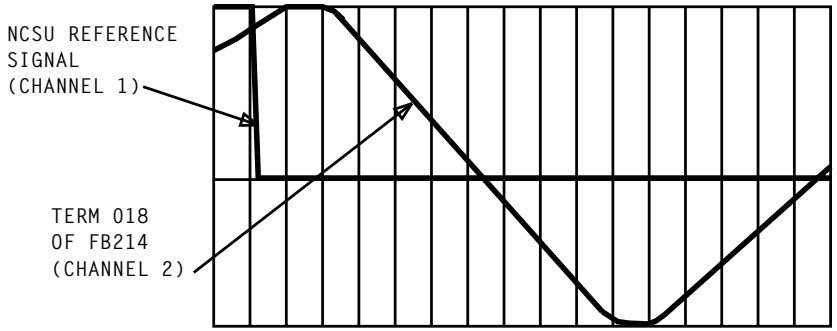
[25] Is channel 2 waveform moving

Yes

[26] Repeat from Step 24 changing thumbwheel settings to cause waveform to stop moving

No

Page 4



Figures 1

TABLE D	
CLOCK CHAIN	**FB214 LOCATION**
0	066-33
1	066-39
2	166-33
3	166-39

ALIGN 39B OSCILLATOR FREQUENCY USING EXTERNAL REFERENCE

[27] See NOTE 4. Make additional adjustments until channel 2 waveform moves less than 30 ns in 5 minutes [Figure 2]

[28] Record LEDs display (on/off conditions) at front of oscillator

[29] Record thumbwheel reading at oscillator manual adjustment unit

[30] Disconnect oscillator manual adjustment unit from oscillator [DLP-531]

AND

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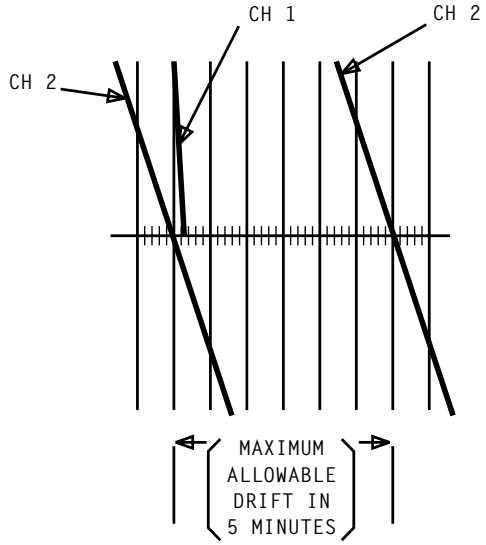
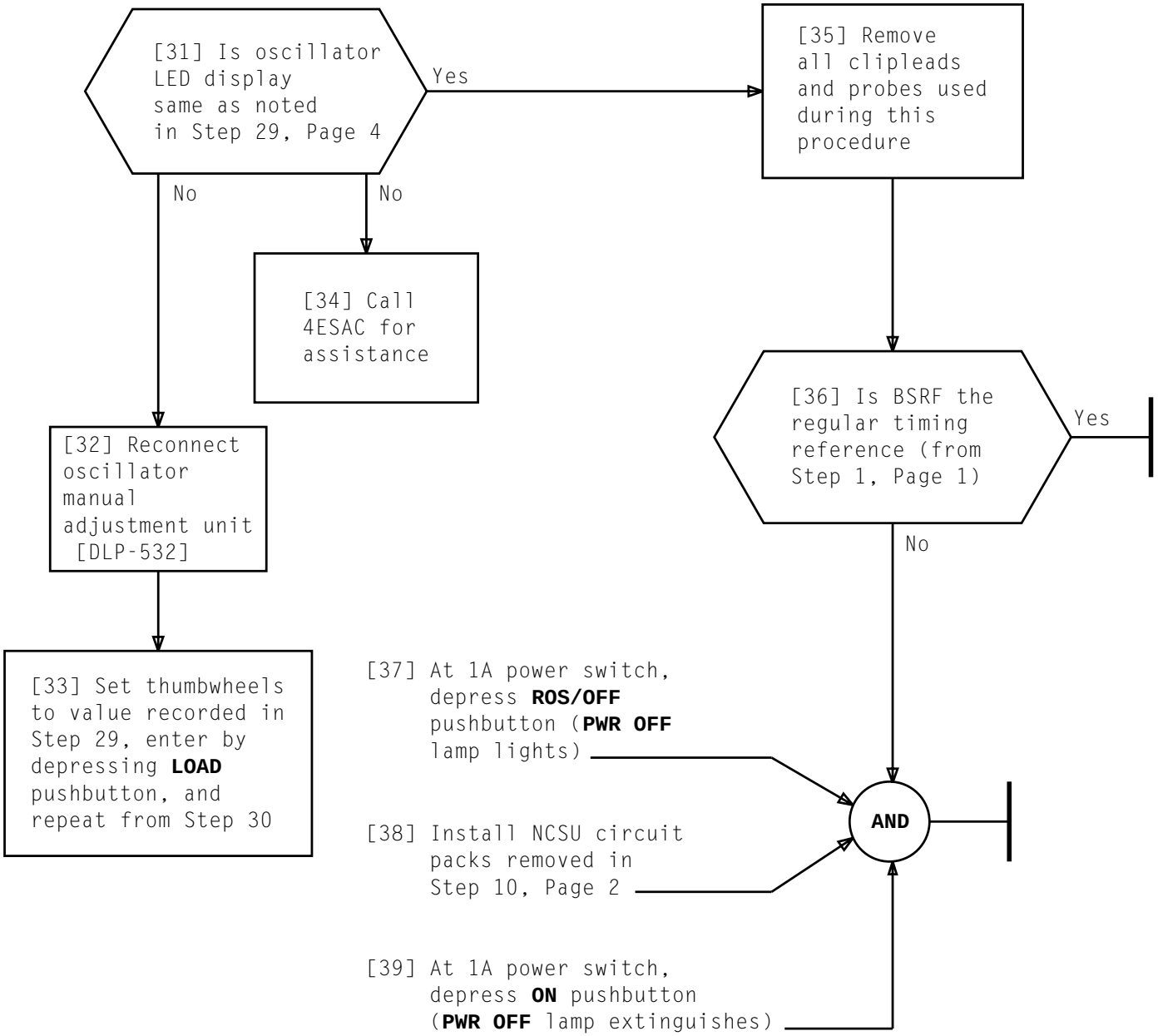


Figure 2

NOTE 4
Final frequency word entered into oscillator that is not between 0800 and 3800 is indication that replacement oscillator should be obtained

ALIGN 39B OSCILLATOR FREQUENCY USING EXTERNAL REFERENCE



ALIGN 39B OSCILLATOR FREQUENCY USING EXTERNAL REFERENCE

1. On oscillator, position **ENABLE/DISABLE** switch to **DISABLE**

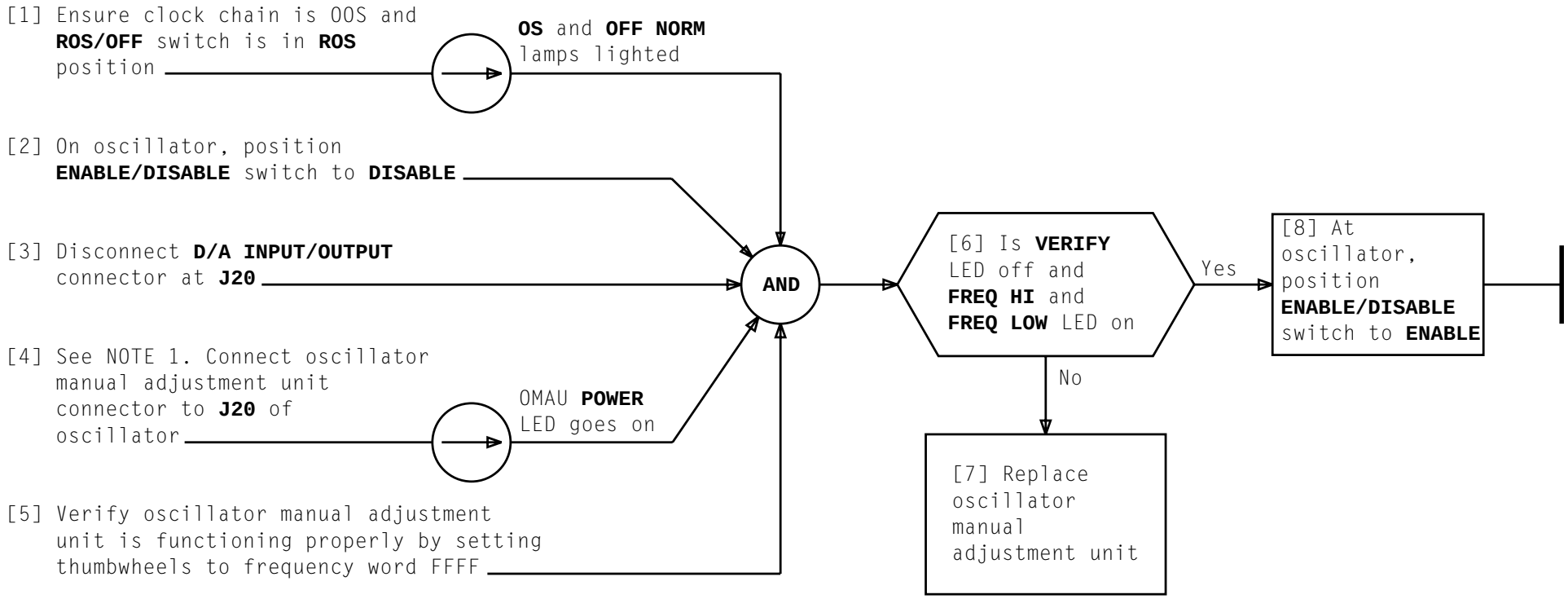
2. Disconnect oscillator manual adjustment unit connector from **J20** of oscillator

3. Connect NCSU cable **J20** to oscillator

4. On oscillator, position **ENABLE/DISABLE** switch to **ENABLE**

End of procedure

DISCONNECT OSCILLATOR MANUAL ADJUSTMENT UNIT FROM OSCILLATOR



NOTE 1
Ensure good cable connection at oscillator manual adjustment unit and oscillator

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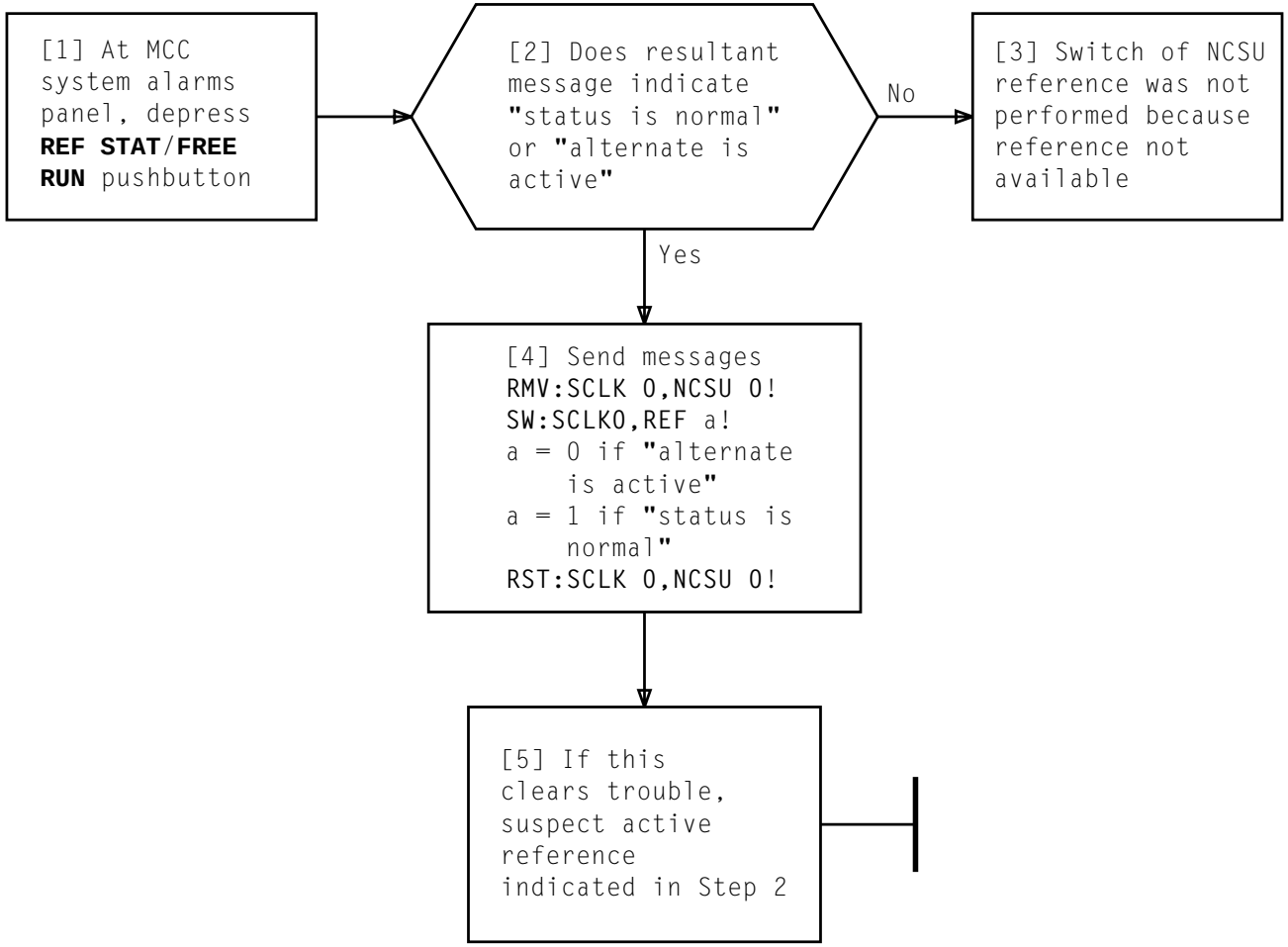
CONNECT OSCILLATOR MANUAL ADJUSTMENT UNIT (OMAU) TO OSCILLATOR



SWITCH NCSU REFERENCE

SUMMARY

Remove and replace, one at a time, **FB211** circuit pack fuses **A1** through **A9**, then **B1** through **B8** in BAY 0 and **A1** through **A9**, then **B1** through **B8** in BAY 1. As each fuse is removed,

F-level interrupt occurs if open diode exists in **FB211** circuit pack. After fuse is removed and replaced, check of the TTY printout identifies any units interrupted

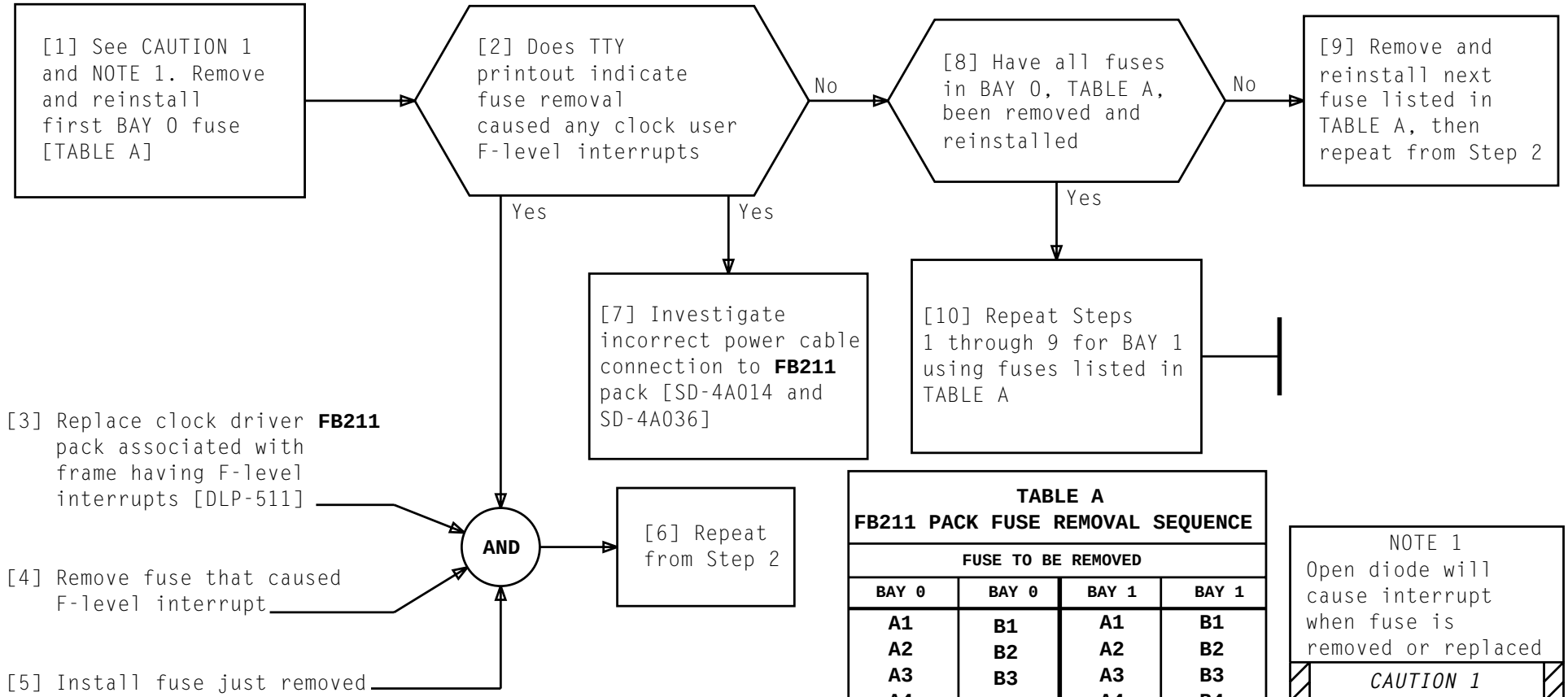


TABLE A
FB211 PACK FUSE REMOVAL SEQUENCE

FUSE TO BE REMOVED			
BAY 0	BAY 0	BAY 1	BAY 1
A1	B1	A1	B1
A2	B2	A2	B2
A3	B3	A3	B3
A4	B4	A4	B4
A5	B5	A5	B5
A6	B6	A6	B6
A7	B7	A7	B7
A8	B8	A8	B8
A9		A9	

NOTE 1
Open diode will cause interrupt when fuse is removed or replaced

CAUTION 1
Ensure that frames receiving clock signal from FB211 pack in NCLK are in full duplex mode

CHECK FOR OPEN DIODE IN FB211 CIRCUIT PACK

SUMMARY

Remove first group of fuses listed in TABLE A and measure output voltage of each fuse socket. Note name of any fuses with voltage equal to or greater than 0.5 volts.

Replace first group of fuses and continue removing groups of fuses, using procedure used in checking first group of fuses

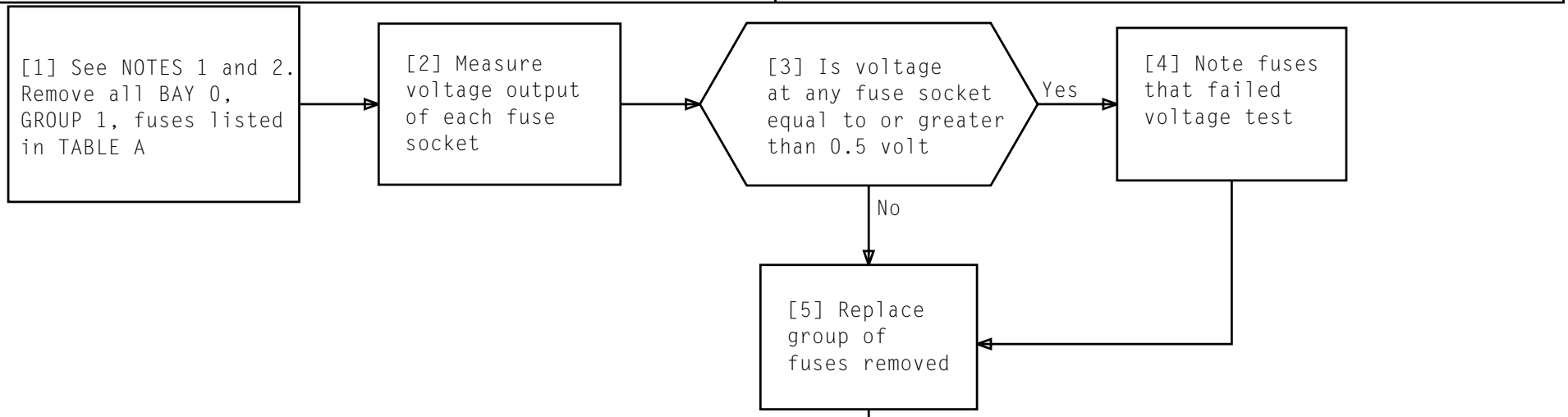


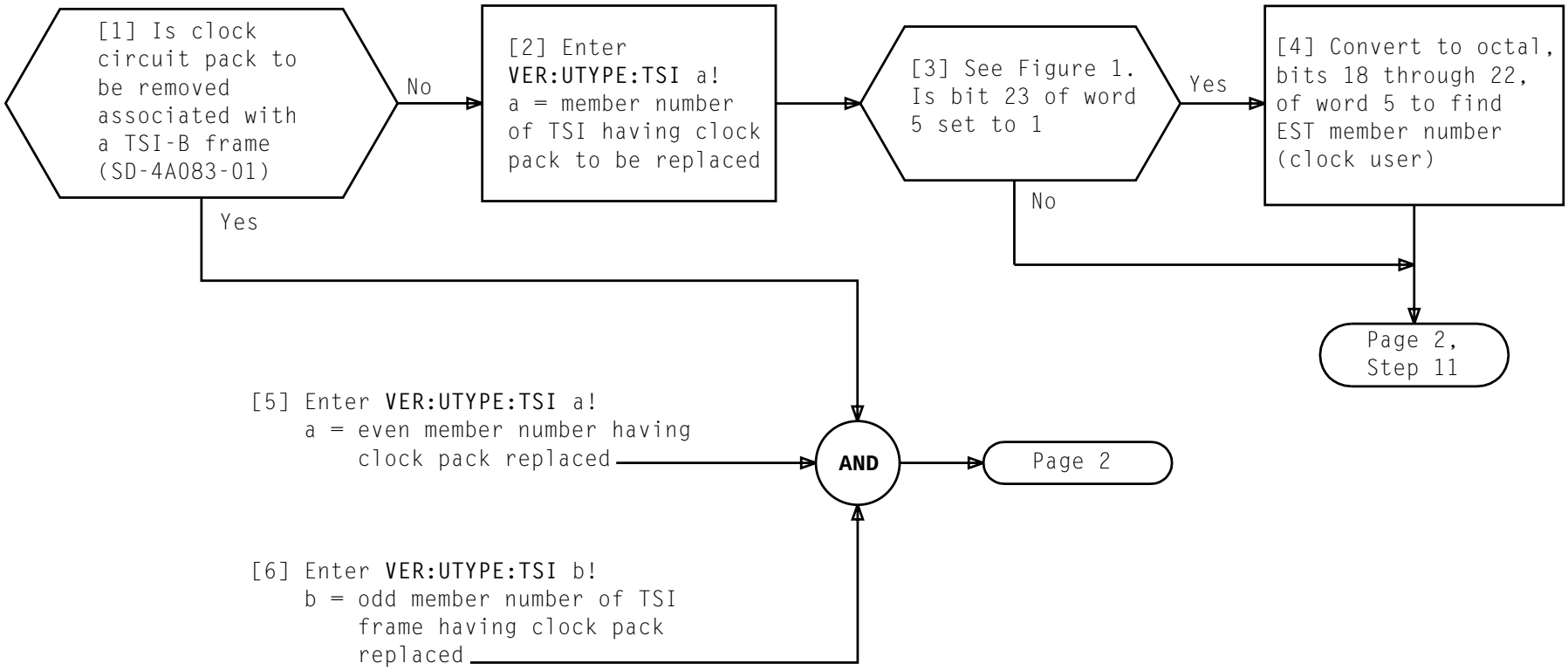
TABLE A
NCLK FB211 PACK FUSES
REMOVAL SEQUENCE

BAY 0		BAY 1	
GROUP 1	GROUP 2	GROUP 3	GROUP 4
A1	B1	A1	B1
A2	B2	A2	B2
A3	B3	A3	B3
A4	B4	A4	B4
A5	B5	A5	B5
A6	B6	A6	B6
A7	B7	A7	B7
A8	B8	A8	B8
A9		A9	

NOTES

1. Removal of fuses may cause F-level interrupts from TSI, TMS, or SCLK controllers if open diode exists in **FB211** pack
2. All clock chains must be powered up and should remain in service during performance of this procedure

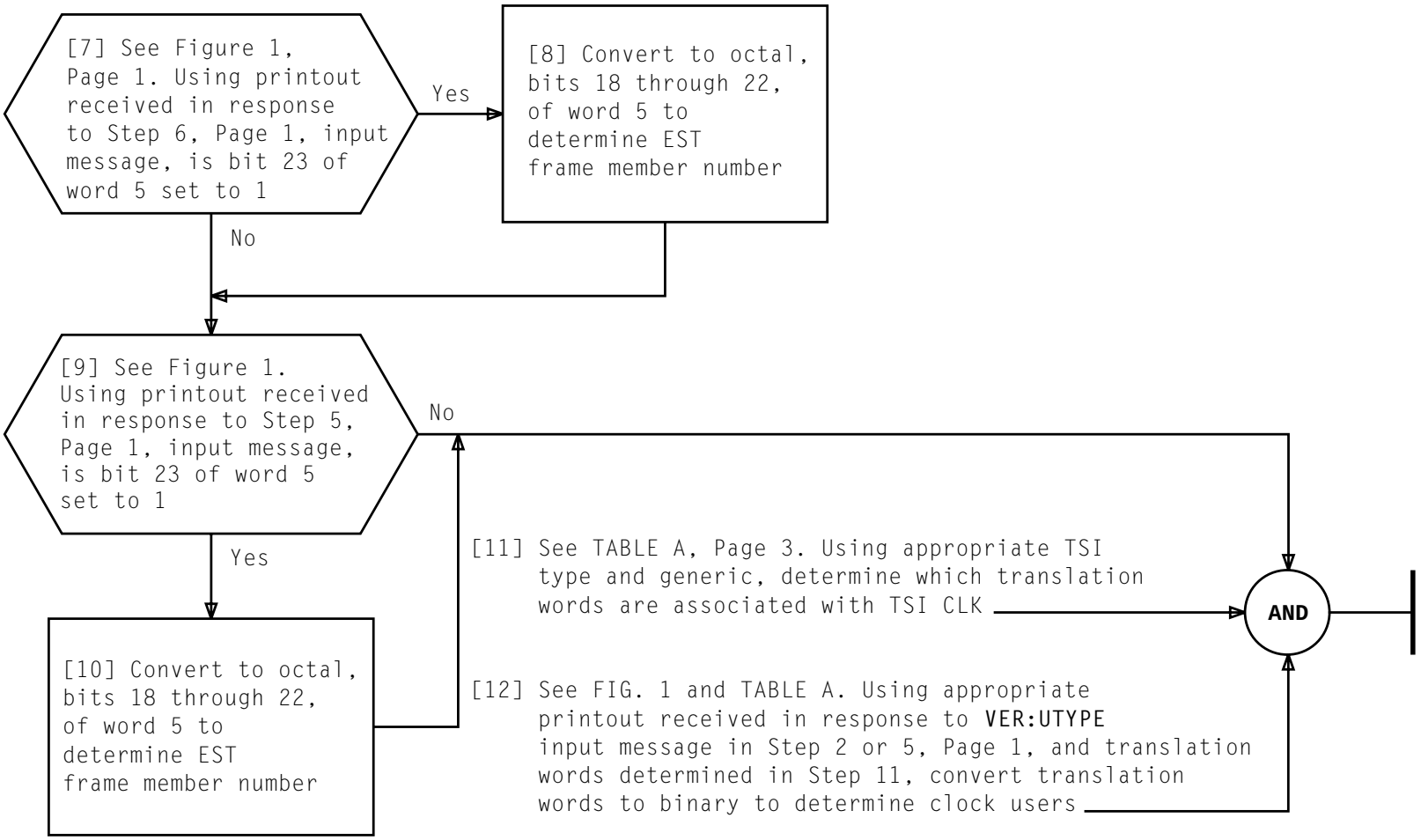
CHECK FOR SHORTED DIODES IN FB211 CIRCUIT PACK




```
VER:UTYPE:TSI 021 PF

M 49 VER:UTMN;OPT(),CUR:      FIN 16006.02,

MEMN    2,     MS OPER,                          WORD 5
ENTRY ADDRESS  07612704          ENTRY SIZE 25

CUR
WORD 0   22637777  04014002  00001110  20000070
         00000110  00011110  00000130  00000150
WORD 10  00000000  00000017  00000403  00037777
         00000000  00000000  60415046  60436042
WORD 20  60456044  00006046  60616060  60636062
         60656064  00006066  60606040  60706050
WORD 30  00000020
```

Figure 1 – Typical Example of VER:UTYPE Output Message

IDENTIFY VIF, DT, PUC, AND EST CONTROLLERS RECEIVING CLOCK SIGNALS FROM TSI FRAMES

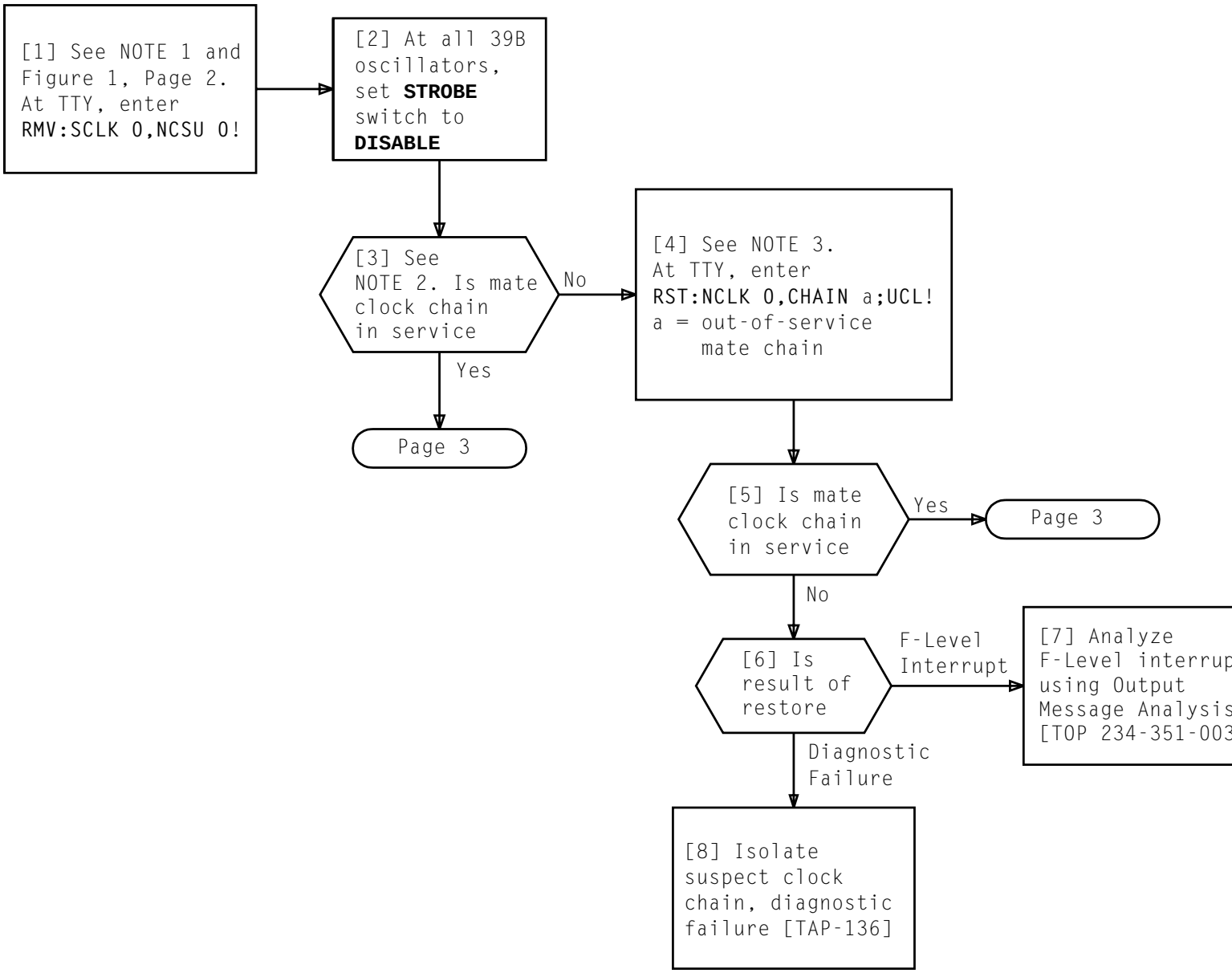


IDENTIFY VIF, DT, PUC, AND EST CONTROLLERS RECEIVING CLOCK SIGNALS FROM TSI FRAMES

TABLE A

TSI TYPE	ASSOC TSI CLOCK	TRNSL WORD	BITS 23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
TSI-A SD-4A011-02	Clock 0 Bit (0-10) Clock 1 Bit (11-21)	16	NA		Frame type (DT=0001) (VIF=0011) (DIF=0100) (PUC=0101)				Member number (DT, VIF, DIF, PUC)							Frame type (DT=0001) (VIF=0011) (DIF=0100) (PUC=0101)				Member number (DT, VIF, DIF, PUC)						
TSI-B SD-4A083-01	Clock A Bit (0-10) Clock B Bit (11-21)	16	NA		Frame type (DT=001) (VIF=011) (DIF=100) (PUC=101)				Member number (DT, VIF, DIF, PUC)							Frame type (DT=001) (VIF=011) (DIF=100) (PUC=101)				Member number (DT, VIF, DIF, PUC)						
	Clock C Bit (0-10) Clock D Bit (11-21)	17																								
	Clock E Bit (0-10)	20	NA																							

IDENTIFY VIF, DT, PUC, AND EST CONTROLLERS RECEIVING CLOCK SIGNALS FROM TSI FRAMES



NOTES

1. 39B Oscillator Trouble Form must be completed and returned with defective oscillator
2. Clock chains 0 and 1 are paired and clock chains 2 and 3 are paired
3. Ensure clock chain is powered up before restoring unconditionally

REMOVE 39B OSCILLATOR

39B OSCILLATOR TROUBLE FORM

SERIAL NUMBER _____

OFFICE CLLI _____

MODE OF FAILURE

BENCH TEST _____
IN FRAME PRESERVICE CHECK _____
IN FRAME SERVICE FAILURE _____

-24V CURRENT DRAIN (SKIP INITIAL CHECK IF IN SERVICE)

INITIAL CURRENT 1.5 TO 2.7 AMPS) _____A
AFTER WARM-UP (0.5 TO 1.2 AMPS) _____A

FULL FREQ. RANGE CHECK
FAILING BITS BITS _____

FREQ. HI/LO BIT CHECK
FAILING BITS BITS _____

OSCILLATOR ENABLE/DISABLE SWITCH
SWITCH ON/OFF FAILURE _____

OSCILLATOR -4V REFERENCE
OUT OF RANGE (-4.1 to -3.9 VOLTS) _____V

RF OUTPUT CHECK (>24 HOURS OF POWER UP)
CAN'T ADJ. TO RANGE (0.87 TO 0.97V P-P) _____
LEVEL CHANGES AT A STEADY LOW RATE* _____
LEVEL CHANGES AFTER SOME PERIOD (<1HR) _____
LEVEL CHANGES >.2V P-P DURING FREQ. ADJ _____

FREQ. WORD OUT OF RANGE (<0800 OR >3800)
FREQUENCY PHASE-LOCK WORD HEX _____

PHASE LOCK FAILURE (CONTACT PECC OR NESAC)**
CAN'T PHASE LOCK _____

FREQUENCY TRACKING (CONTACT PECC OR NESAC)**
FAILING BITS BITS _____

*IF TESTED IN FRAME, OSC, MUST BE PHASE LOCKED
**PECC OR NESAC MUST BE CONTACTED BEFORE OSC. IS RETURNED FOR REPAIR

OTHER (EXPLAIN)

Figure 1 — Example — 39B Oscillator Trouble Form

REMOVE 39B OSCILLATOR

REMOVE 39B OSCILLATOR

See TABLE A. At switch location associated with oscillator being removed:

[9] Ensure chain OOS; **ROS/OFF** switch is in **ROS** position

OS and **OFF NORM** lamps lighted

[10] Depress **ROS/OFF** switch to remove power

PWR OFF lamp lights

AND

Oscillator power removed

[11] Remove +24V fuse for oscillator being removed [TABLE B]

At oscillator

[12] Disconnect **RF OUTPUT** connector **P13**

[13] Disconnect ground strap from oscillator to frame upright

[14] Disconnect **FREQ CONTROL INPUT** **P21** and **POWER P18** and **P19** connectors

[15] Disconnect **D/A INPUT/OUTPUT** connector **J20**

[16] Remove eight screws holding oscillator mounting plate to frame

[17] See WARNING 1. Remove oscillator from network clock frame

AND

Defective oscillator removed

Page 4

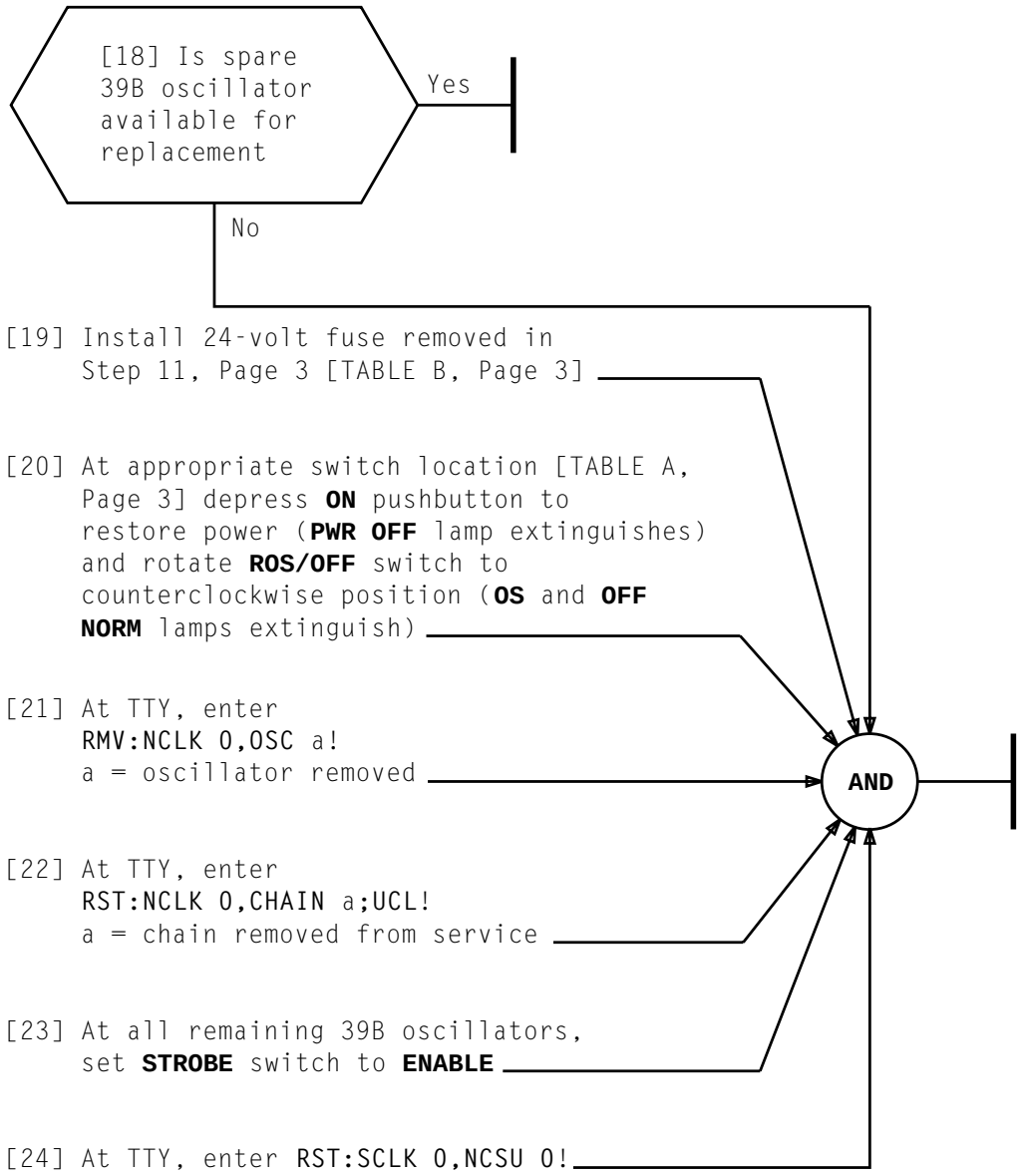
TABLE A

CLOCK CHAIN	POWER SWITCH FRAME LOCATION
0	066-03
1	066-68
2	166-03
3	166-68

TABLE B

CLOCK CHAIN	OSCILLATOR LOCATION	SD-4A014-02 FUSES	FUSE LOCATION	
			BAY	HMP
0	033-21	**0B0A**	0	07
1	033-56	**0B0B**	0	07
2	133-21	**1B0A**	1	07
3	133-56	**1B0B**	1	07

WARNING 1
39B oscillator is fragile item. Defective units are repairable at repair location only



REMOVE 39B OSCILLATOR

CHECK 39B OSCILLATOR

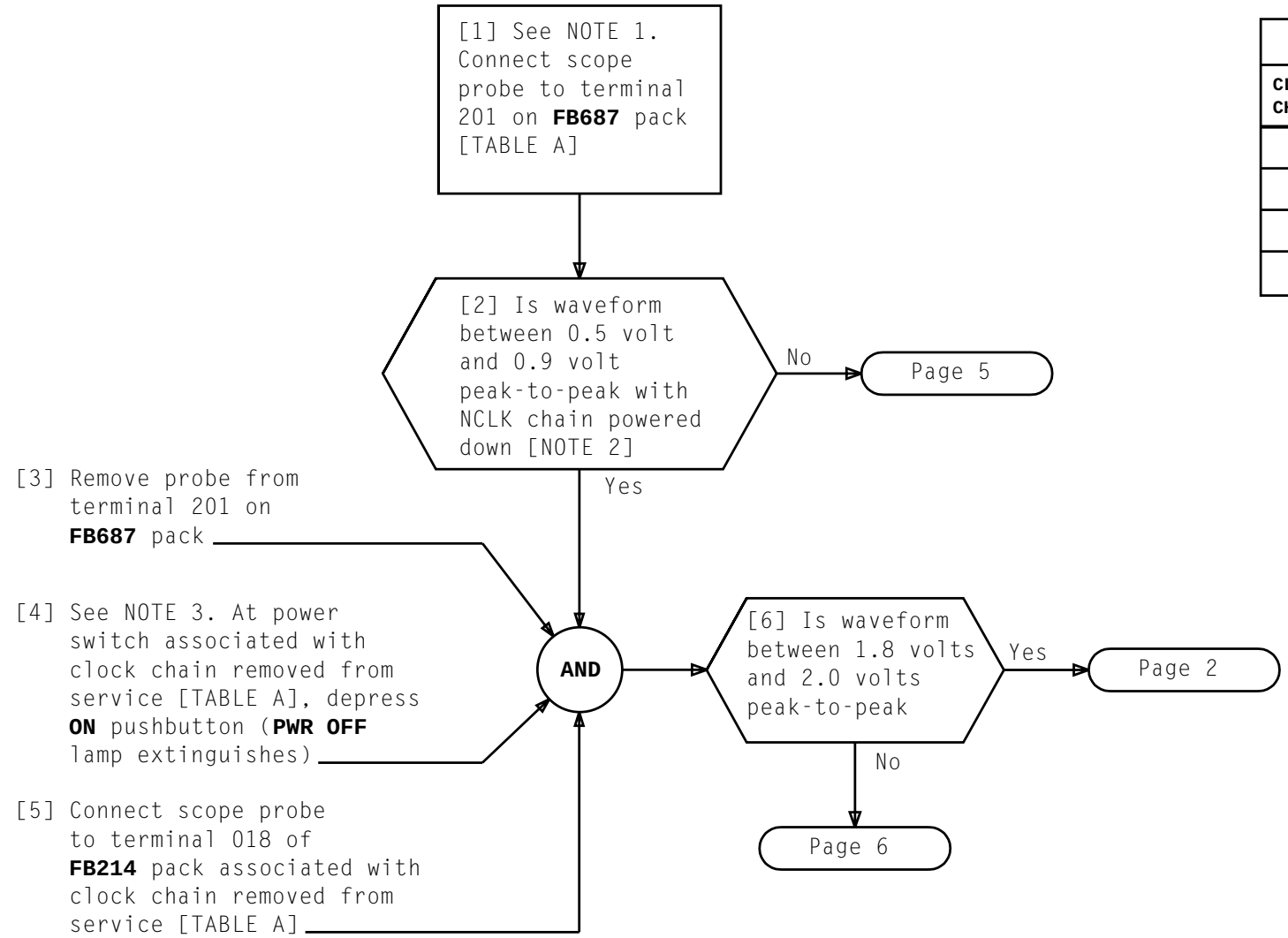


TABLE A

CLOCK CHAIN	FB687 LOCATION	FB214 LOCATION	PWR SW LOCATION
0	070-34	066-33	066-03
1	070-37	066-39	066-68
2	170-34	166-33	166-03
3	170-37	166-39	166-68

NOTES
1. Connect scope probe ground lead to ground terminal before making scope probe signal connection
2. Levels are lower because chain is powered down
3. If chain goes into diagnostic after depressing **ON** pushbutton, wait until diagnostic completes before proceeding to next step

CHECK 39B OSCILLATOR

[7] Remove scope probe from pack

[8] Connect Oscillator Manual Adjustment Unit (OMAU) to oscillator [DLP-532]

[9] Check 39B oscillator frequency hi/low bits [DLP-539]

[10] Disconnect Oscillator Manual Adjustment Unit from oscillator [DLP-531]

AND

[11] Verify connector **J20** of oscillator and cable connector at NCSU are well seated

[12] On all 39B oscillators, set **STROBE** switch to **ENABLE** [Figure 1]

[13] At TTY, enter RST:SCLK 0,NCSU 0! and allow to restore. Wait for copy soft-to-hard BLM on SCLK-0, NCSU-0

AND

[14] At TTY, enter RST:NCLK 0,OSC a!
a = oscillator being checked

RST:NCLK 0,OSC a COMPL
REPT:NCSU 0:OSC UPDATE STARTED – WAIT FOR NCSU COMPLETION REPORT

[15] See NOTE 4. Does report message indicate manual update required (TTY Response: RST:NCLK 0,OSC a ABORTED: UPDATE FAILED)

Yes

No

Page 3

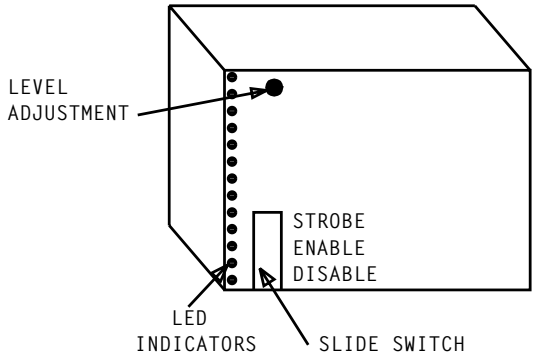
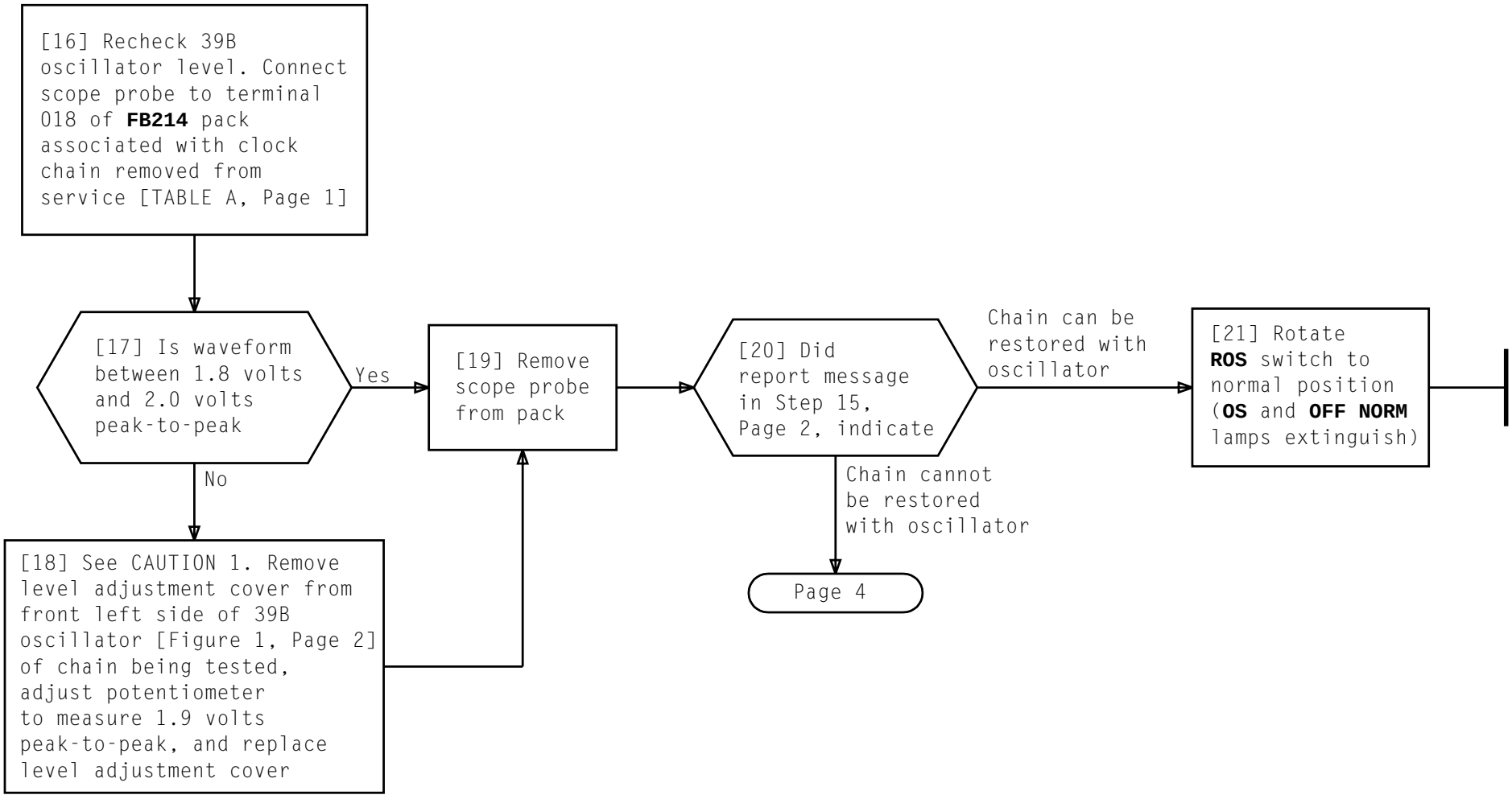


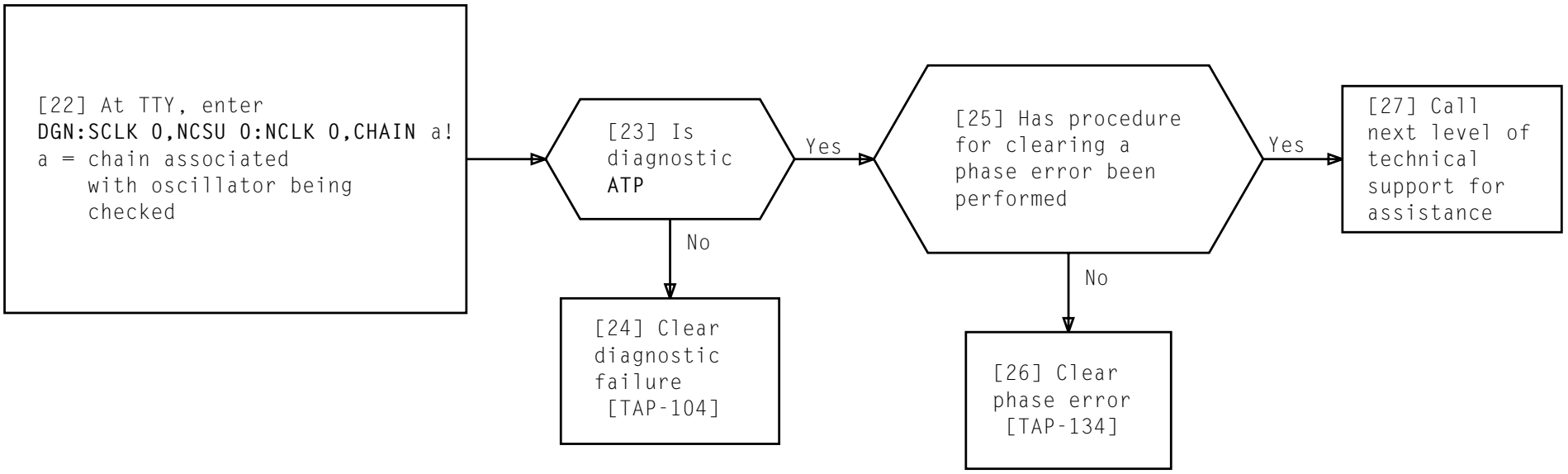
Figure 1 – 39B Oscillator

NOTE 4
May take 5 minutes to receive report message

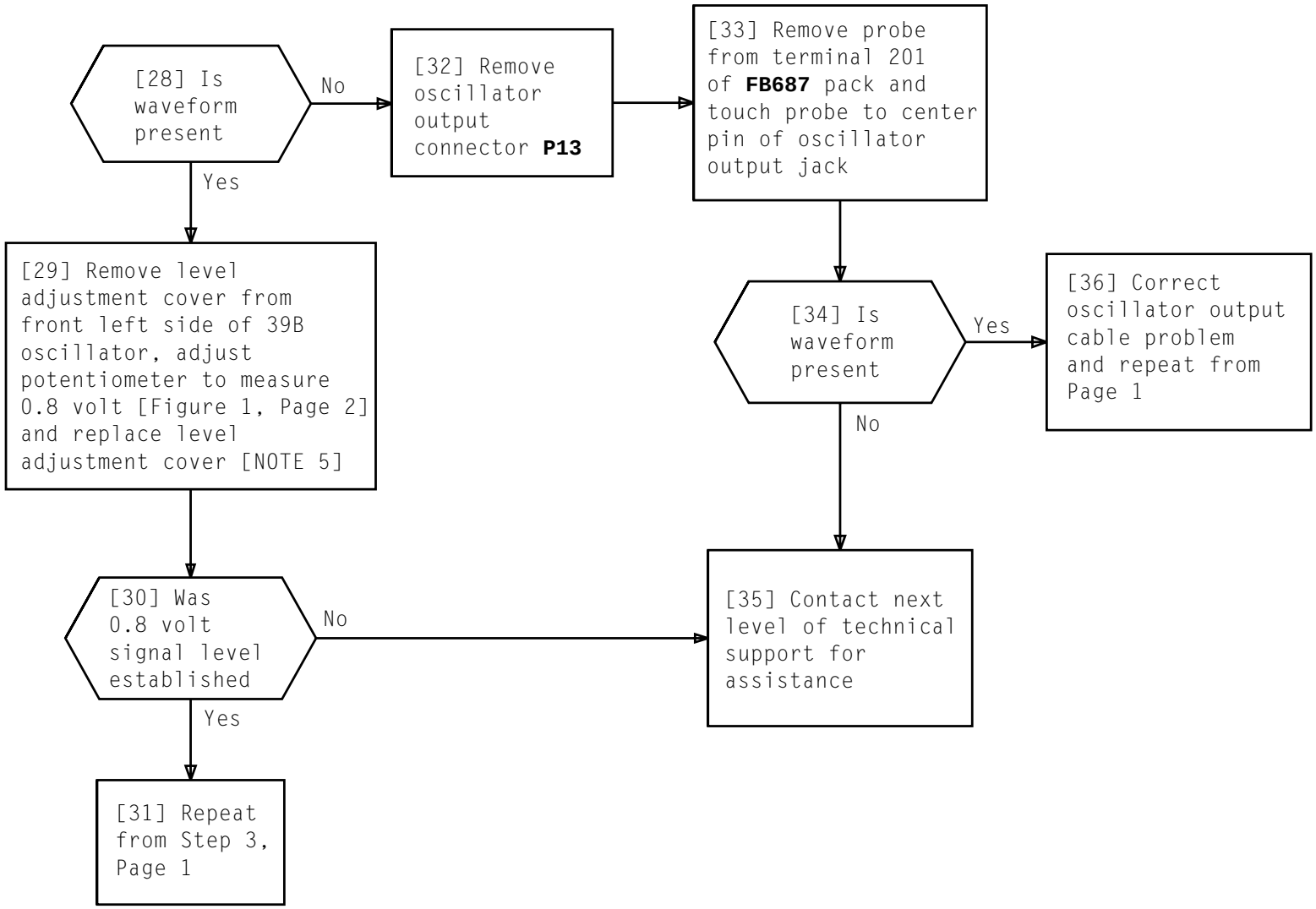


CAUTION 1
Screwdriver shank must be insulated

CHECK 39B OSCILLATOR

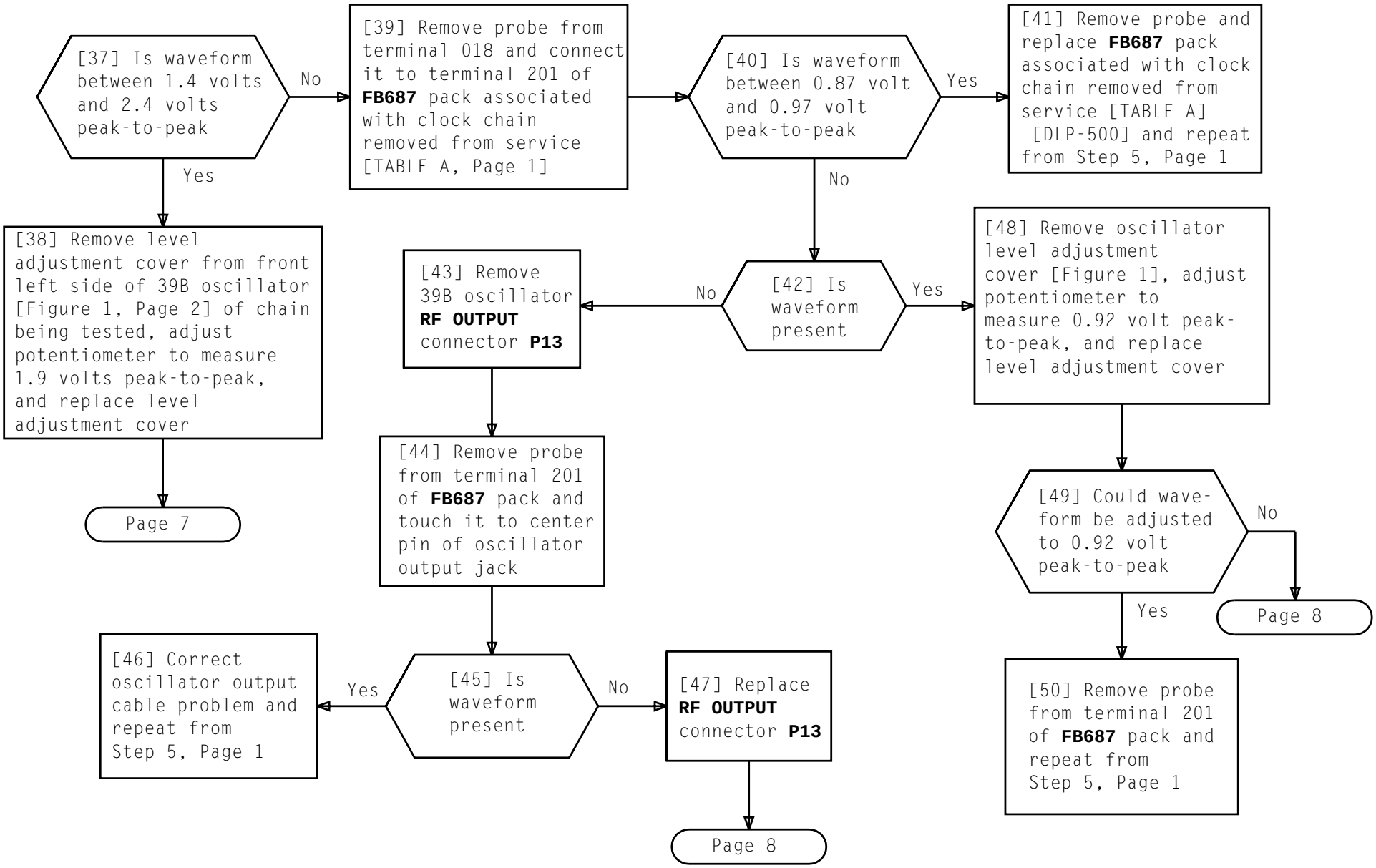


CHECK 39B OSCILLATOR

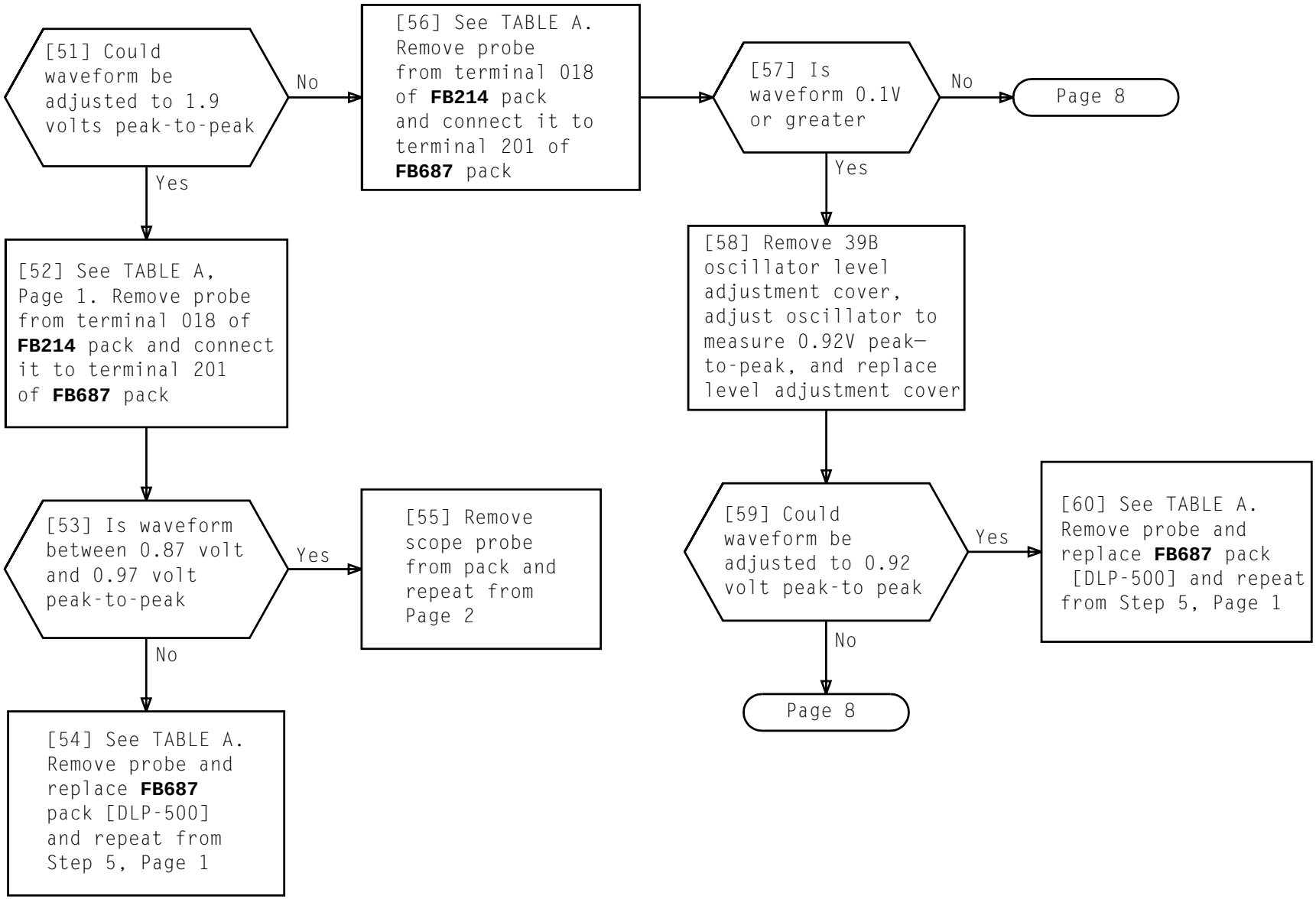


NOTE 5
This is a preliminary level adjustment to establish that oscillator is operational

CHECK 39B OSCILLATOR



CHECK 39B OSCILLATOR



CHECK 39B OSCILLATOR

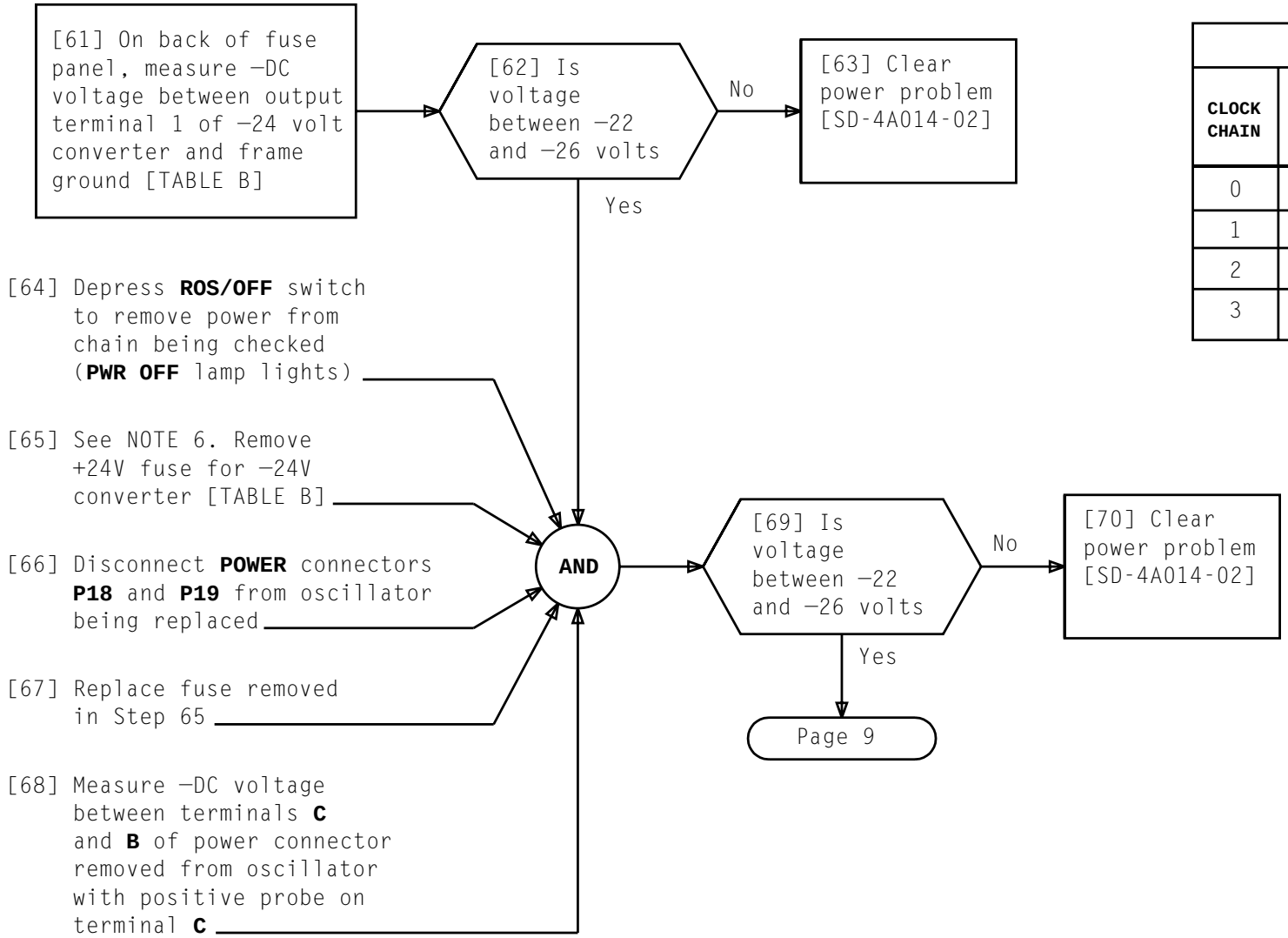
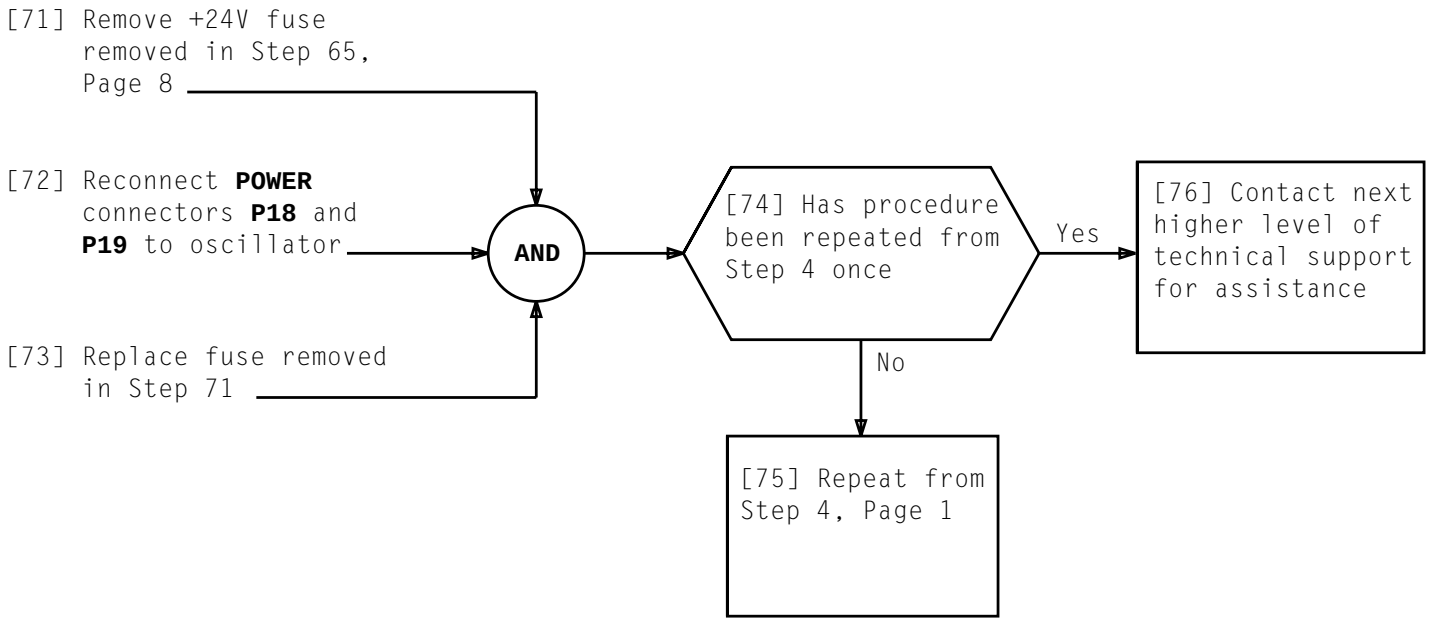


TABLE B

CLOCK CHAIN	—24V CONVERTER LOCATION	SD-4A014-02 FUSES	+24V FUSE LOCATION
0	012-22	**0B0A**	007-20
1	012-50	**0B0B**	007-51
2	112-22	**1B0A**	107-20
3	112-50	**1B0B**	107-51

Note 6
If oscillator power is off for more than 5 minutes, allow 48-hour warmup after power is restored to stabilize oscillator before proceeding

CHECK 39B OSCILLATOR



CHECK 39B OSCILLATOR

[1] With the clock chain of the oscillator being checked powered down, note the zero setting (mechanical zero) of the phase meter [See NOTE 1]

[2] At clock chain power switch, with **ROS/OFF** switch in **ROS** position, depress **ON** switch (**PWR OFF** lamp extinguishes)

[3] Set OMAU thumbwheels to 2000 [Figure 1]

[4] Depress **LOAD** button on OMAU [Figure 1]

AND

Page 2

OMAU **VERIFY** LED goes off

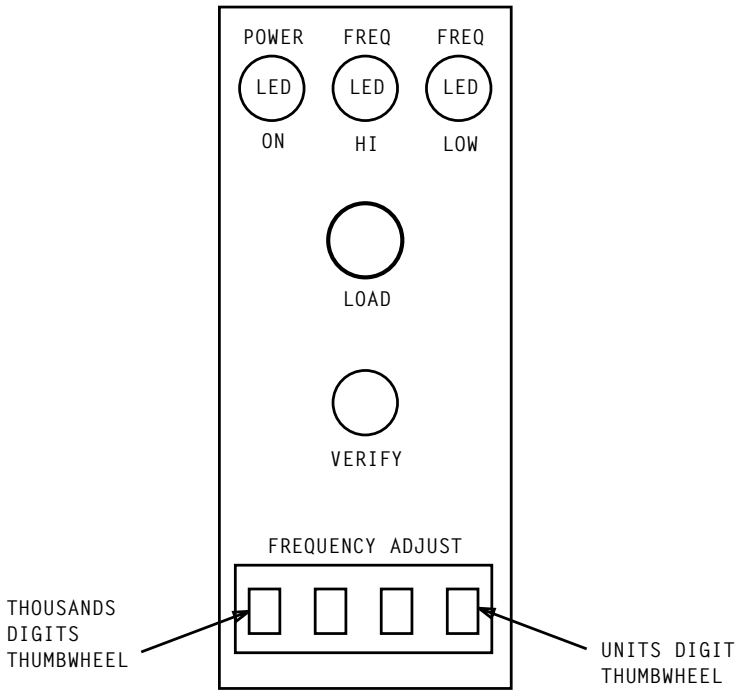
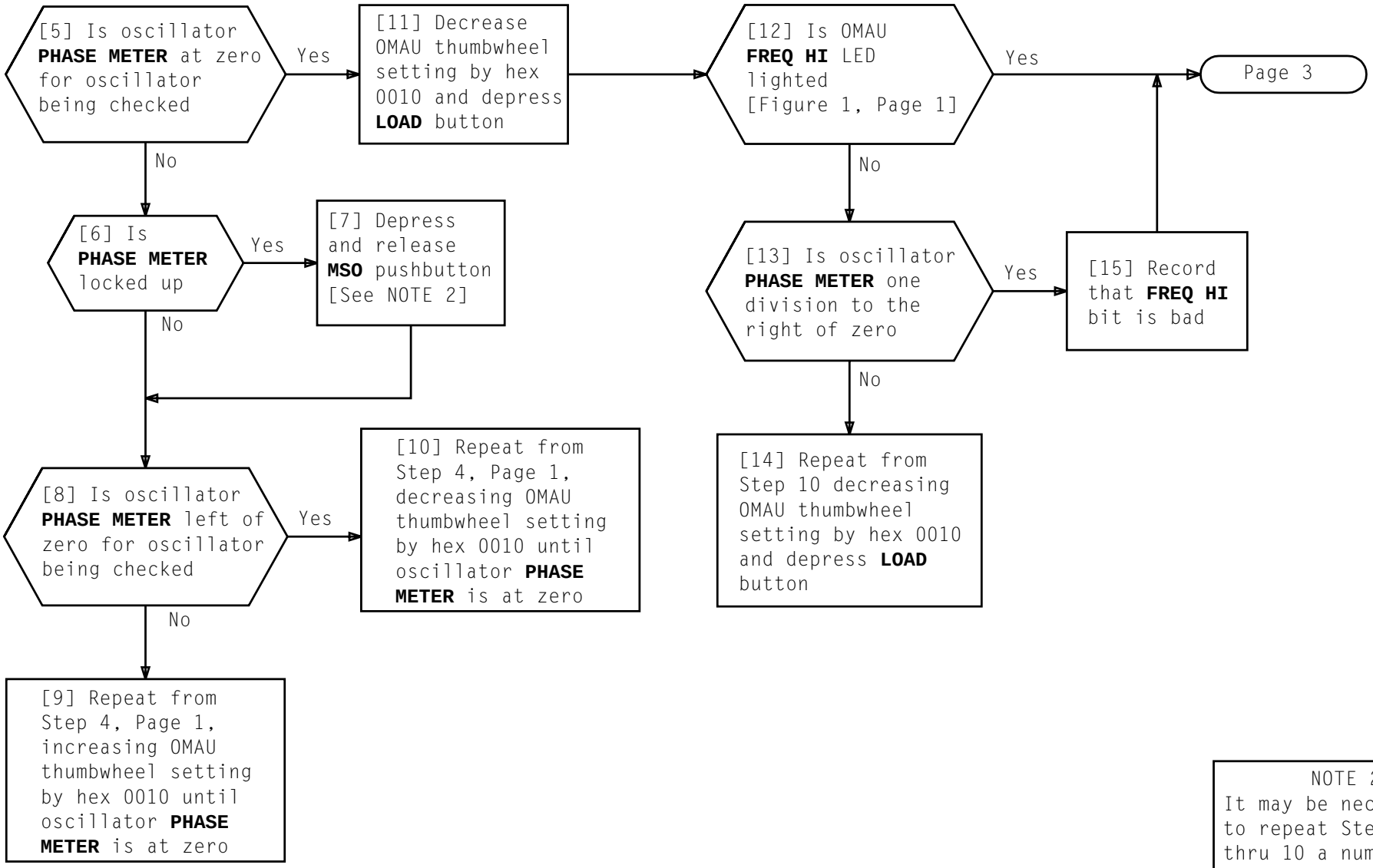


Figure 1 – Oscillator Manual Adjustment Unit

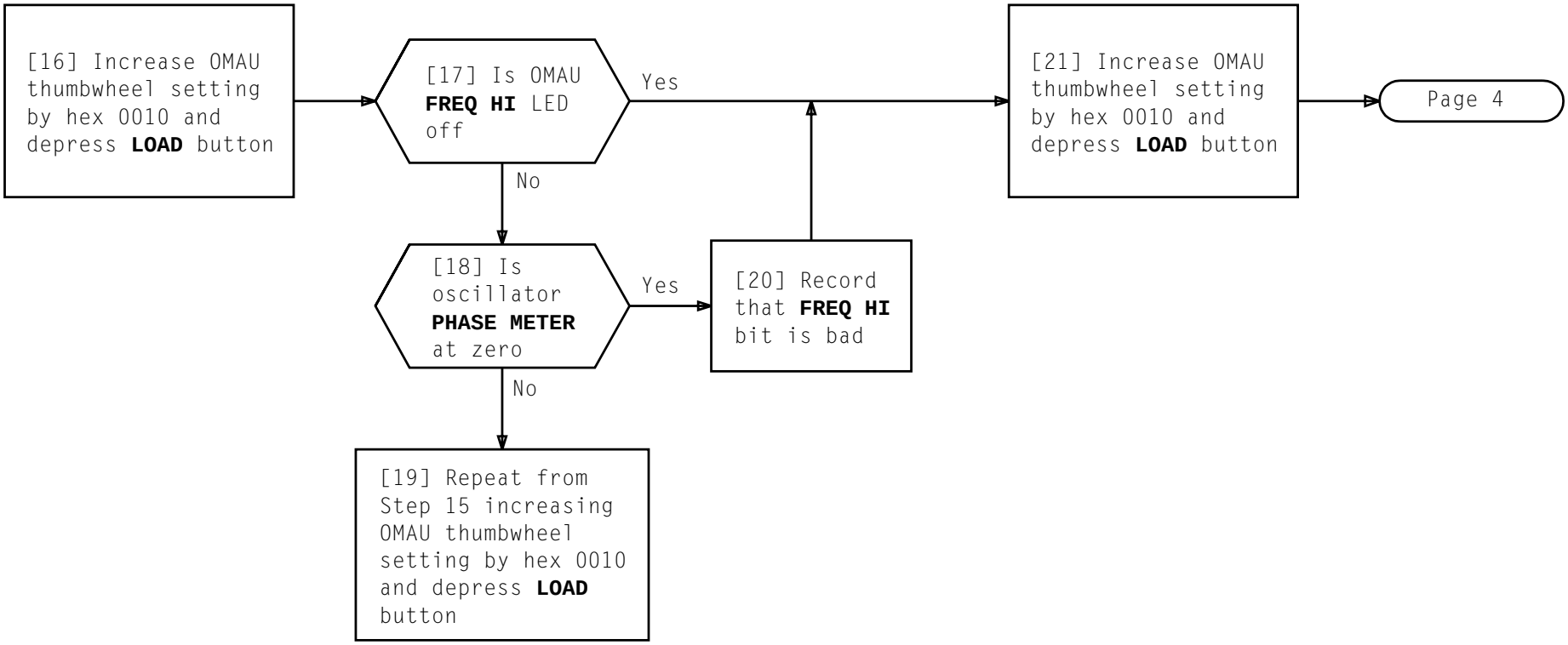
NOTE 1
The mechanical zero may be offset somewhat from the actual zero mark on the meter. This mechanical zero is referred to as zero in this procedure

CHECK 39B OSCILLATOR FREQUENCY HI/LOW BITS

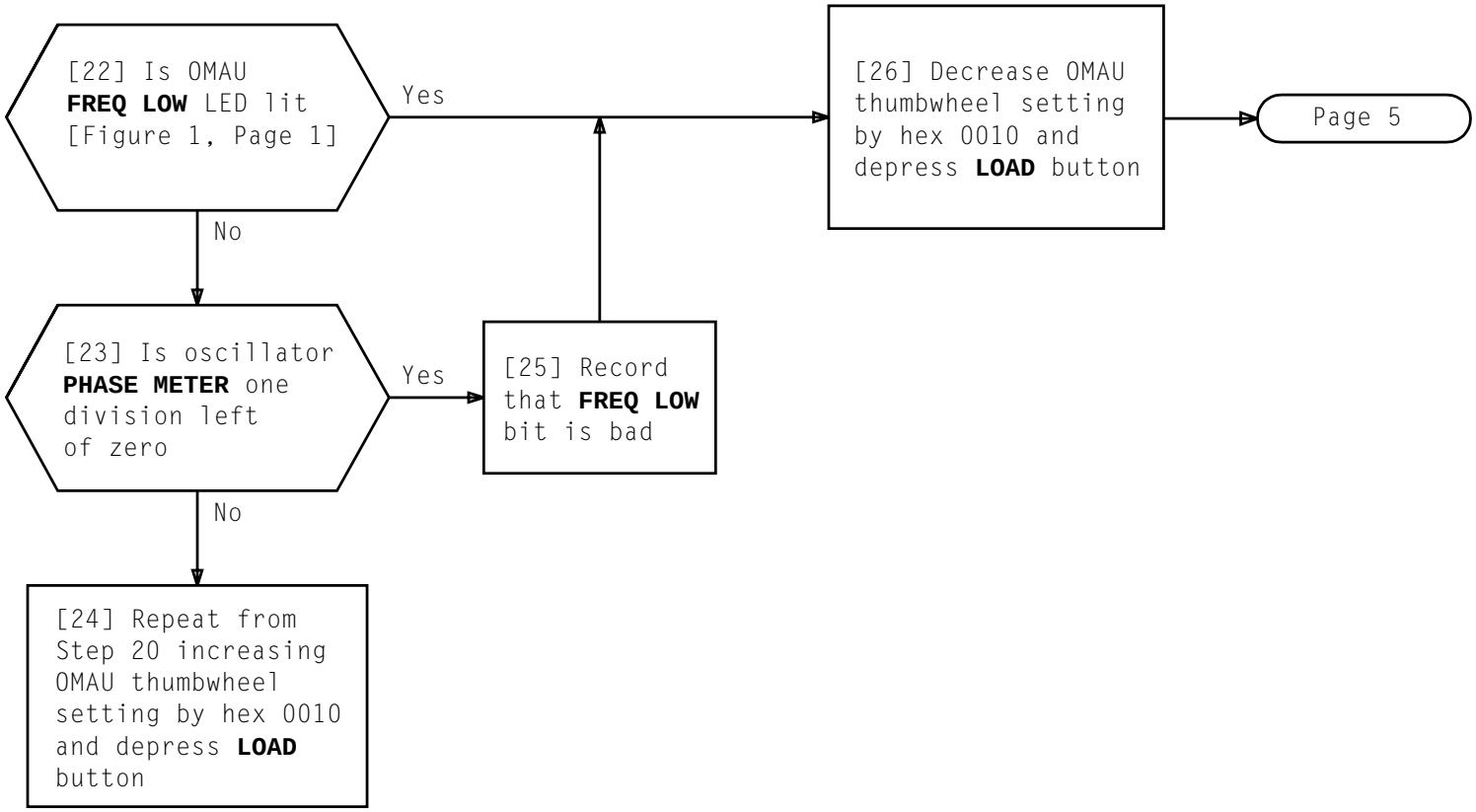


NOTE 2
It may be necessary to repeat Steps 4 thru 10 a number of times before phase meter does not relock

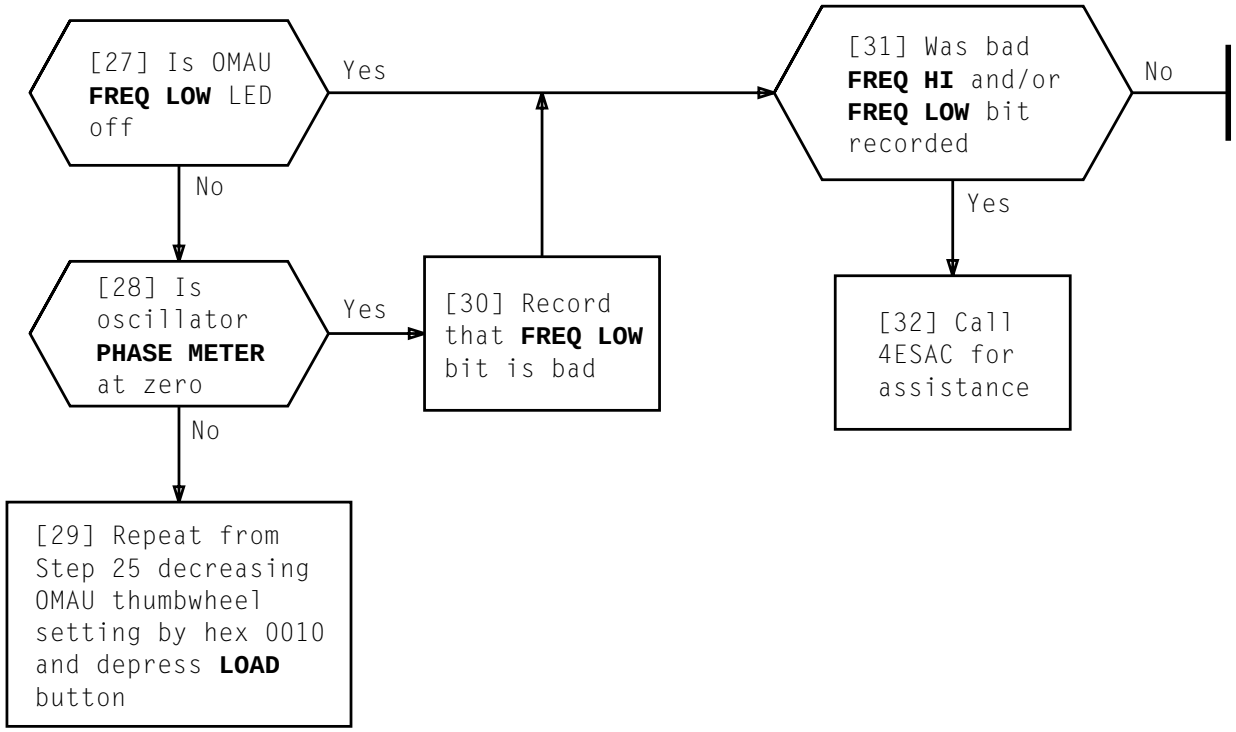
CHECK 39B OSCILLATOR FREQUENCY HI/LOW BITS



CHECK 39B OSCILLATOR FREQUENCY HI/LOW BITS



CHECK 39B OSCILLATOR FREQUENCY HI/LOW BITS



CHECK 39B OSCILLATOR FREQUENCY HI/LOW BITS

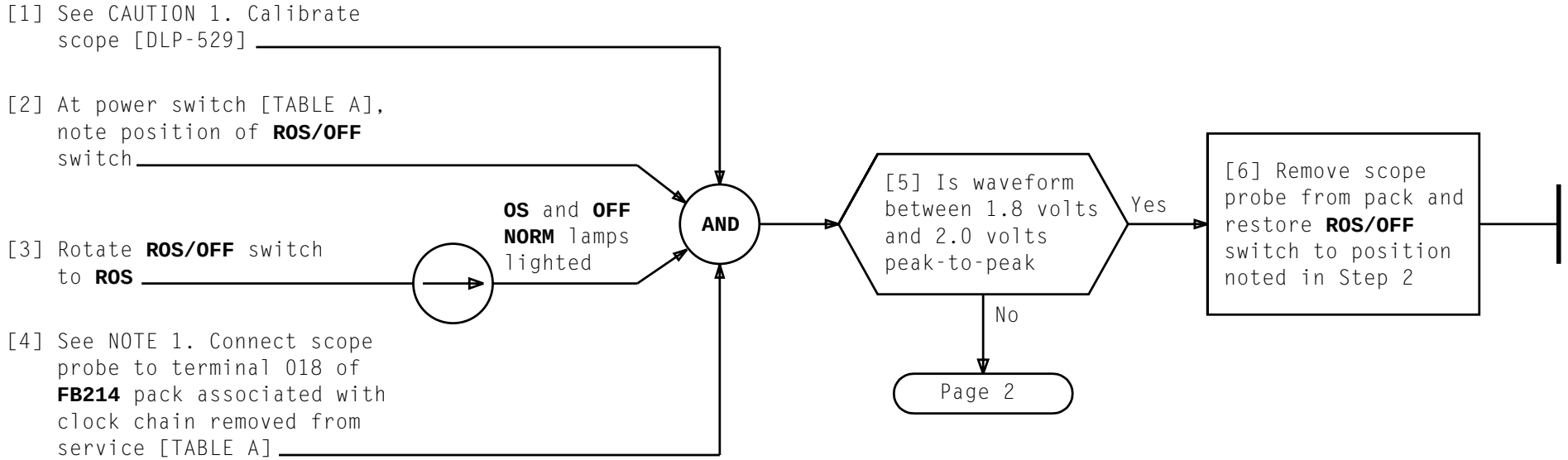


TABLE A			
FB687 LOCATION	**CLOCK CHAIN**	**PWR SW LOCATION**	**FB214 LOCATION**
070-34	0	066-03	066-33
070-37	1	066-68	066-39
170-34	2	166-03	166-33
170-37	3	166-68	166-39

NOTE 1
Connect scope probe ground lead to ground terminal before making scope probe signal connection

CAUTION 1
Improper scope calibration may affect service

VERIFY OSCILLATOR SIGNAL LEVEL — 39B OSCILLATOR

[7] Remove level adjustment cover from front left side of 39B oscillator [Figure 1] of chain being tested [TABLE A, Page 1]

[8] Adjust level adjustment potentiometer to measure 1.9 volts peak-to-peak

[9] Replace level adjustment cover

AND

[10] Could waveform be adjusted to 1.9 volts peak-to-peak

Yes

[11] Remove scope probe from pack and restore **ROS/OFF** switch to position noted in Step 2, Page 1

No

[12] Has **FB687** pack been replaced twice

Yes

[13] At power switch [TABLE A], depress **ROS/OFF** switch to power down chain (**PWR OFF** lamp lights)

No

[15] Replace **FB687** pack [TABLE A, Page 1] [DLP-500] and repeat from Step 4, Page 1

[14] Check 39B oscillator [DLP-538]

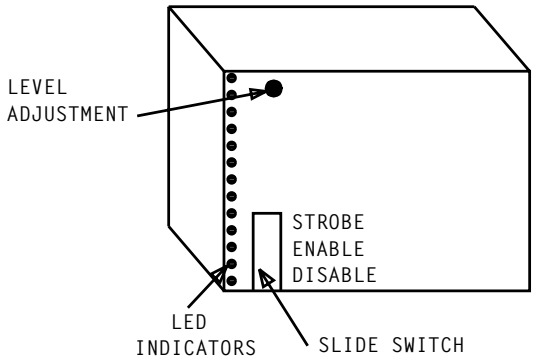


Figure 1 – 39B Oscillator

VERIFY OSCILLATOR SIGNAL LEVEL – 39B OSCILLATOR

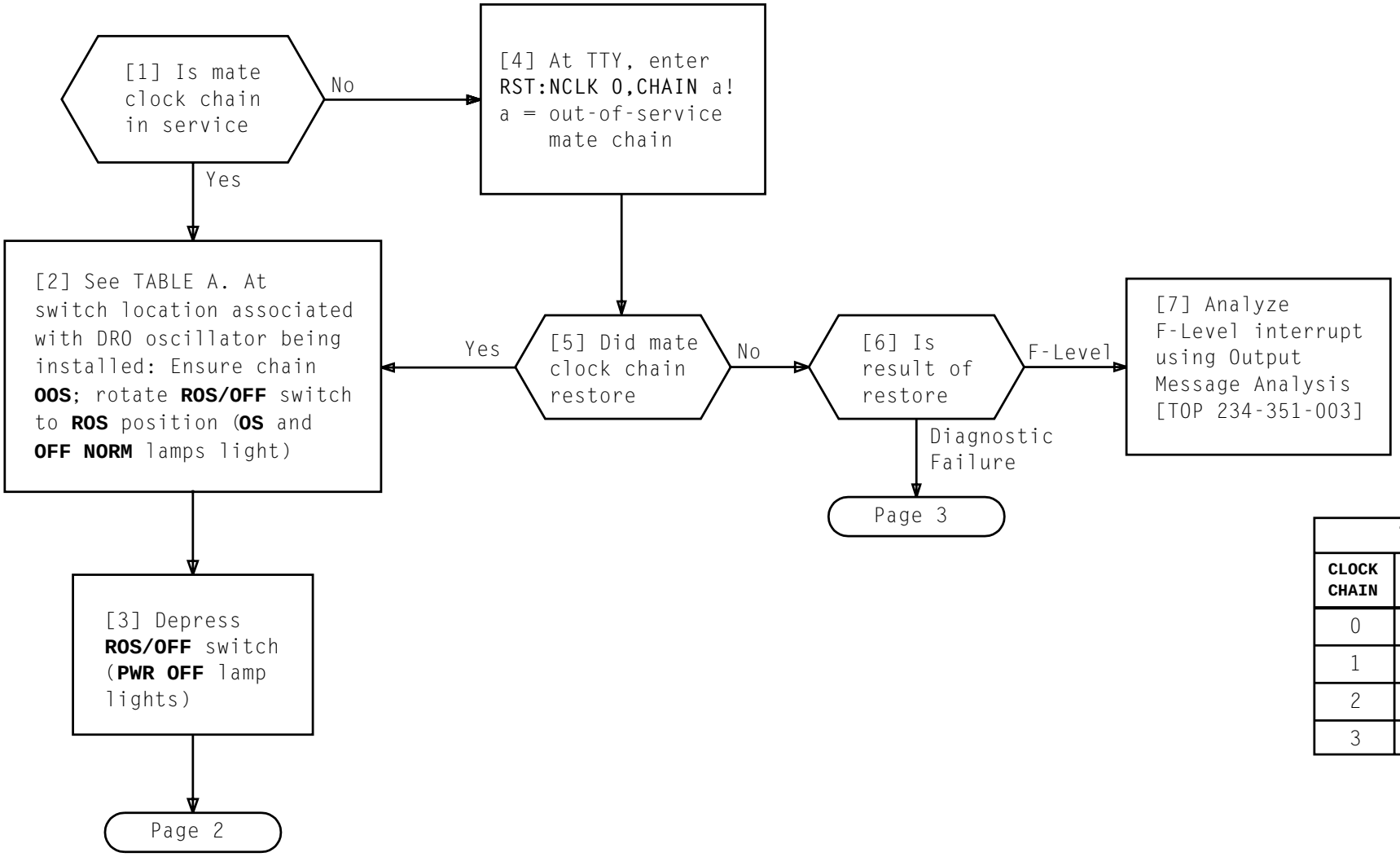


TABLE A	
CLOCK CHAIN	POWER SWITCH FRAME LOCATION
0	066-03
1	066-68
2	166-03
3	166-68

INSTALL DISCIPLINED RUBIDIUM OSCILLATOR

[8] Place DRO oscillator in network clock frame [Figure 1]

[9] Install and tighten screws with star washers holding DRO oscillator mounting plate to frame

[10] Connect ground strap from frame upright to DRO oscillator [Figure 1]

[11] Remove –48V fuse for the DRO oscillator being installed [TABLE B]

AND

[12] Connect **PHASE LOCK INPUT P21** and **POWER INPUT –48V DC P19** connectors and **D/A INPUT/OUTPUT** connector **J20**. Connect **RF OUTPUT** cable **P13**

[13] Install the –48V fuse [TABLE B]

AND

[14] During initialization:
- **FREE RUN** LED flashes
- **MAJOR** LED is lighted
- **OSC WRITE WORD** displays INIT
- **RF OUTPUT** is disabled

[15] When initialization is finished: (approximately 20 minutes)
- **FREE RUN** LED goes off
- **MAJOR** LED goes off
- **OSC WRITE WORD** displays 2000
- **RF OUTPUT** is enabled

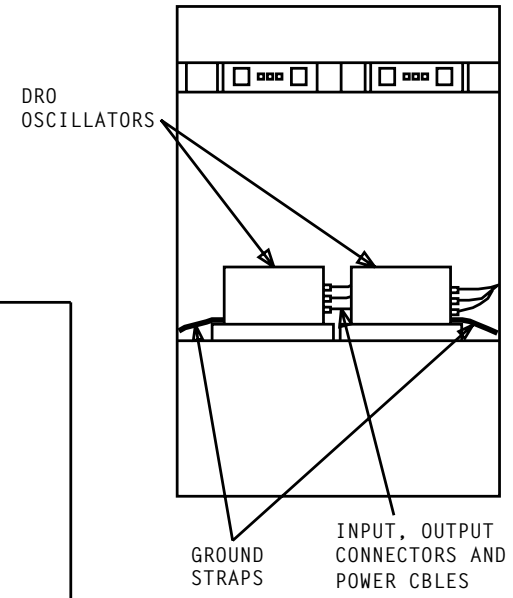
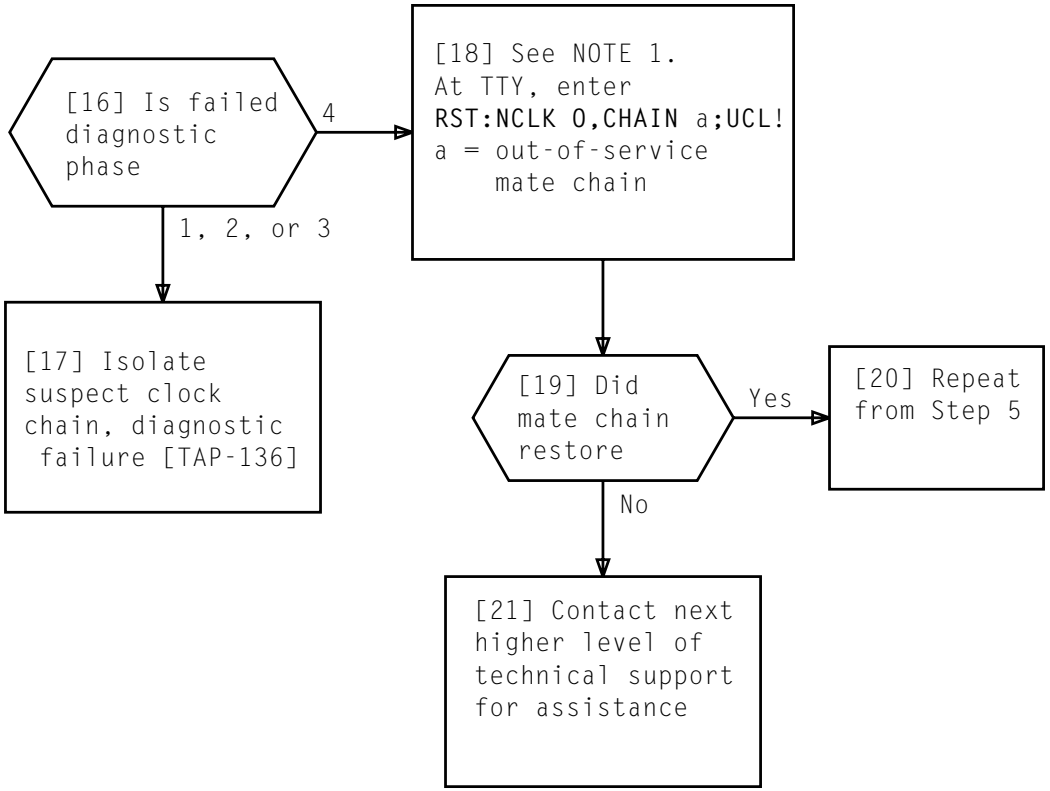


Figure 1 – Network Clock Frame

TABLE B

CLOCK CHAIN	OSCILLATOR LOCATION	FUSES	FUSE LOCATION	
			BAY	HMP
0	033-21	**DC**	0	07
1	033-56	**DD**	0	07
2	133-21	**DC**	1	07
3	133-56	**DD**	1	07

INSTALL DISCIPLINED RUBIDIUM OSCILLATOR



INSTALL DISCIPLINED RUDIDIUM OSCILLATOR

NOTE 1
Ensure clock chain is powered up before restoring unconditionally

[1] Using thumbwheels on oscillator manual adjustment unit, set in first frequency word listed [TABLE A]

[2] Depress **LOAD** pushbutton on oscillator manual adjustment unit

OMAU **VERIFY** LED goes off

AND

Page 2

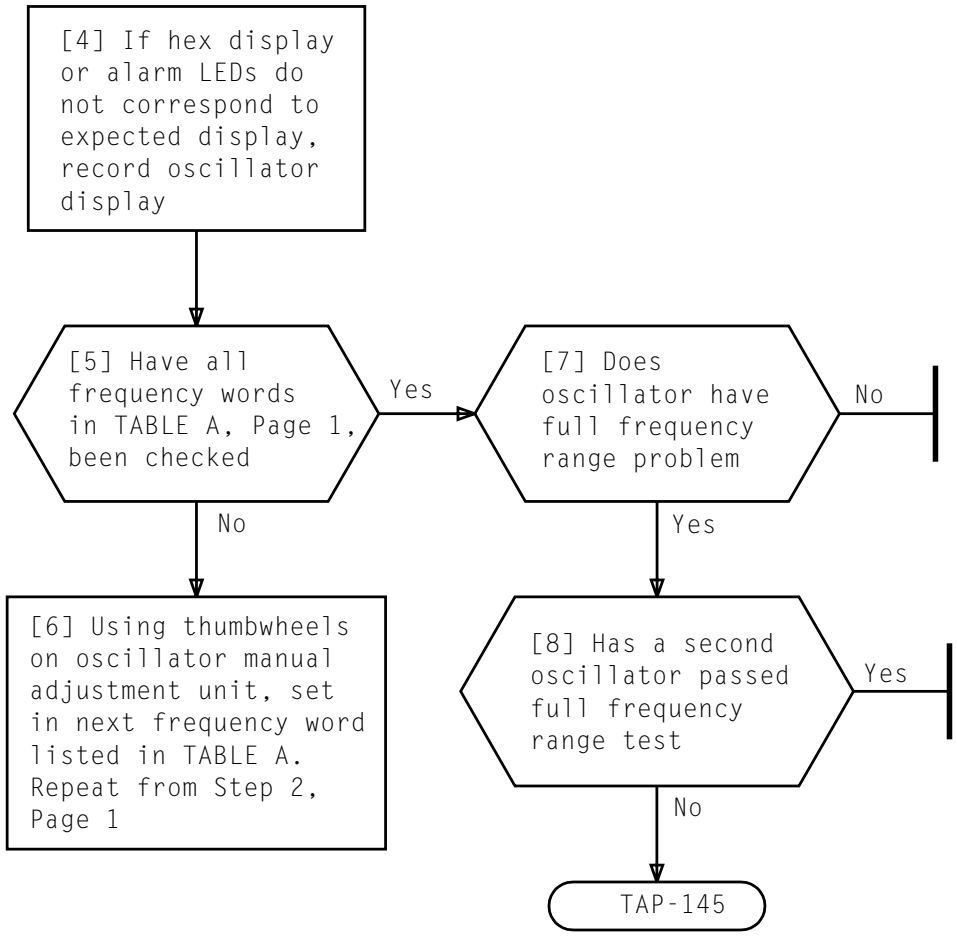
[3] See NOTE 1. Verify that **OSC WRITE WORD** (hex) display, alarm LEDs, and **FREQ HI** and **FREQ LOW** LEDs on the OMAU [TABLE A] correspond to frequency word set in Step 1 and loaded in Step 2

TABLE A

FREQUENCY ADJUST THUMBWHEEL				OSC WRITE WORD DISPLAY (HEX)				ALARMS LED		OMAU	
								MAJOR	MINOR	FREQ HI	FREQ LOW
0	0	0	0	0	0	0	0	OFF	OFF	OFF	OFF
0	0	0	1	0	0	0	1	ON	OFF	ON	OFF
0	0	0	2	0	0	0	2	ON	ON	ON	ON
0	0	0	0	0	0	0	0	OFF	OFF	OFF	OFF
0	0	1	0	0	0	1	0	—	—	—	—
0	0	1	1	0	0	1	1	—	—	—	—
0	0	1	2	0	0	1	2	—	—	—	—
0	0	1	4	0	0	1	4	—	—	—	—
0	0	1	8	0	0	1	8	—	—	—	—
0	0	2	0	0	0	2	0	—	—	—	—
0	0	4	0	0	0	4	0	—	—	—	—
0	0	8	0	0	0	8	0	—	—	—	—
0	1	0	0	0	1	0	0	—	—	—	—
0	2	0	0	0	2	0	0	—	—	—	—
0	4	0	0	0	4	0	0	—	—	—	—
0	8	0	0	0	8	0	0	—	—	—	—
1	0	0	0	1	0	0	0	—	—	—	—
3	F	E	F	3	F	E	F	—	—	—	—
2	0	0	0	2	0	0	0	—	—	—	—

NOTE 1
On OMAU, **FREQ HI** LED indicates a major alarm and **FREQ LOW** LED indicates a minor alarm

CHECK FULL FREQUENCY RANGE AND ALARM BITS OF DISCIPLINED RUBIDIUM OSCILLATOR



CHECK FULL FREQUENCY RANGE AND ALARM BITS OF DISCIPLINED RUBIDIUM OSCILLATOR

ALIGN DISCIPLINED RUBIDIUM OSCILLATOR USING OPEN LOOP METHOD

[1] Obtain scope and allow it to warm up

[2] Enter **RMV:NCLK 0,CHAIN a!**
a = chain to be adjusted

[3] At rear of clock chain, connect cliplead between terminal 1 of **PHR** relay associated with clock chain removed from service and frame ground [TABLE A]

[4] Connect channel 1 scope probe to terminal 218 of **FB214** pack associated with clock chain removed from service [TABLE B]

[5] SYNC scope to signal connected to channel 1

[6] Connect channel 2 probe to terminal 018 of **FB214** pack associated with clock chain removed from service [TABLE B]

AND

[7] Connect oscillator manual adjustment unit to DRO oscillator [DLP-532]

AND

[8] Set oscillator manual adjustment unit thumbwheels to 2000 and enter by depressing **LOAD** pushbutton

OMAU **VERIFY** LED goes off

[9] See NOTE 1. Has channel 2 waveform appeared to stop moving

Yes → Page 2

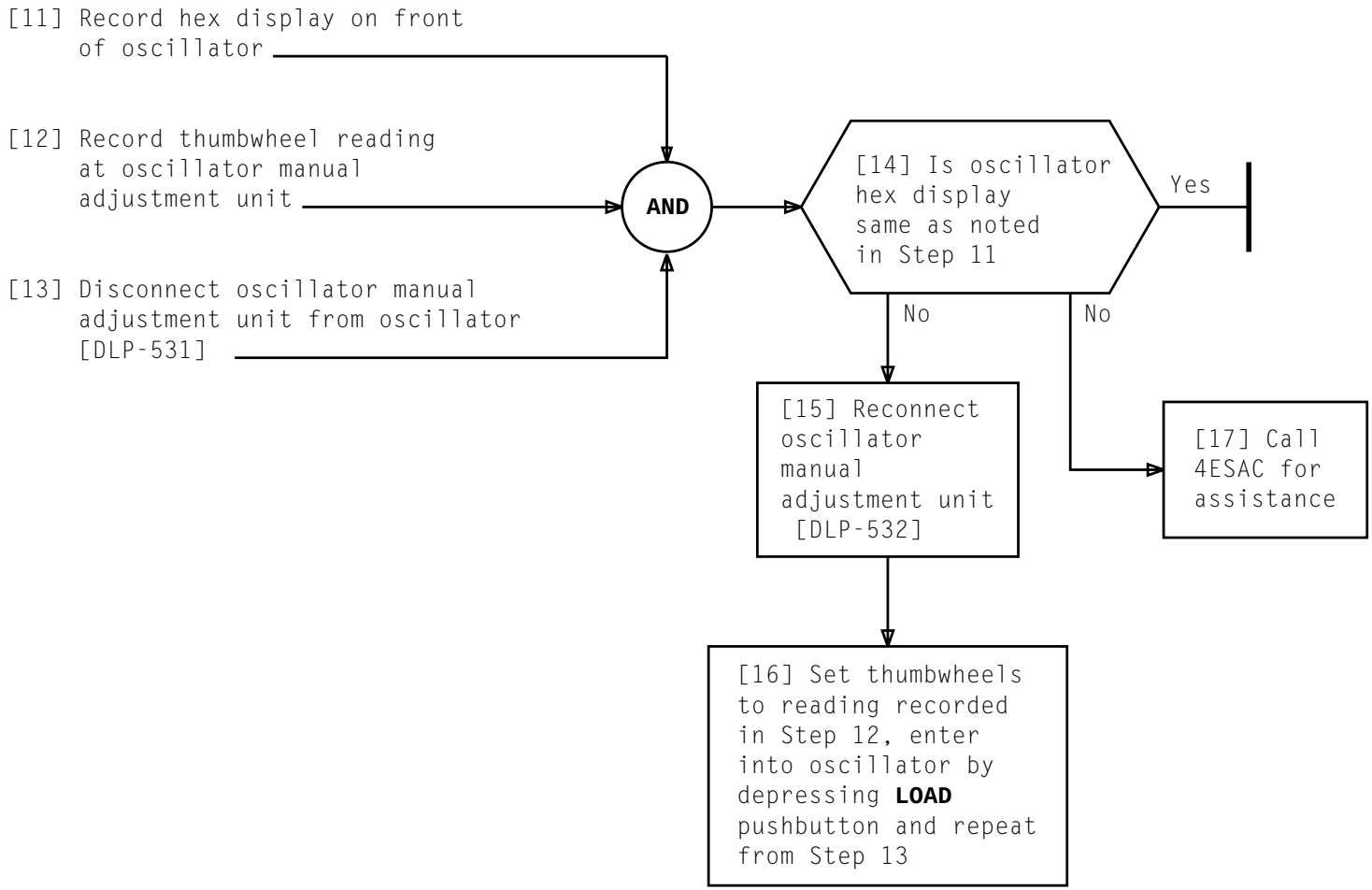
No

[10] Repeat from Step 8 changing thumbwheel settings to stop movement of waveform

TABLE A		
CLOCK CHAIN	**PHR RELAY**	**LOCATION**
0	**0PHR**	066-24
1	**1PHR**	066-47
2	**0PHR**	166-24
3	**1PHR**	166-47

TABLE B	
CLOCK CHAIN	**FB214 PACK LOCATION**
0	066-33
1	066-39
2	166-33
3	166-39

NOTE 1
Final frequency word entered into oscillator that is not between 0800 and 3800 may be an indication that replacement oscillator should be obtained. Contact next level of technical support for assistance.



ALIGN DISCIPLINED RUBIDIUM OSCILLATOR USING OPEN LOOP METHOD

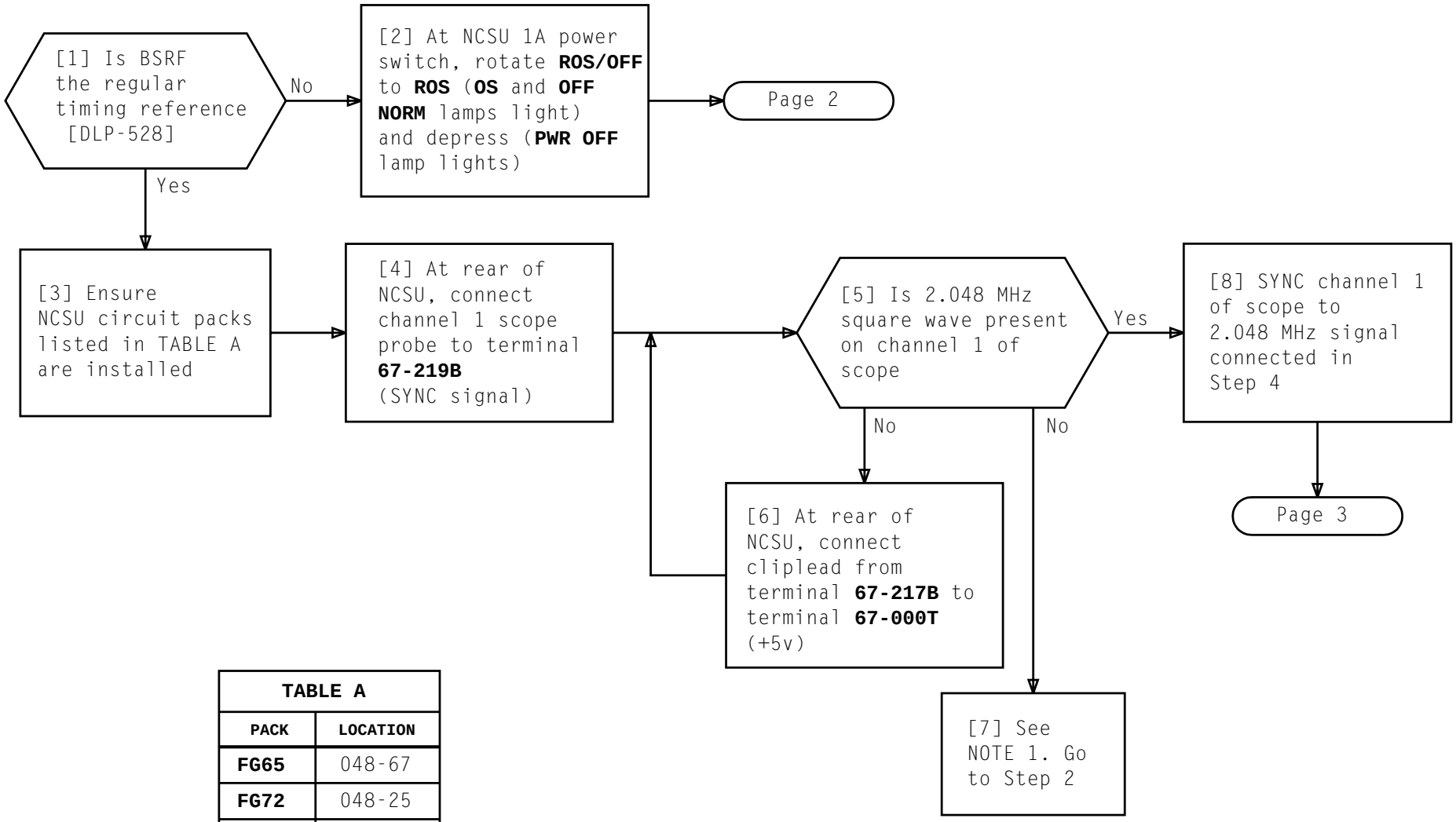


TABLE A	
PACK	**LOCATION**
FG65	048-67
FG72	048-25
FG76	048-27

NOTE 1
BSRF is not operative. Alternate DS1A must be used

ALIGN DISCIPLINED RUBIDIUM OSCILLATOR FREQUENCY USING EXTERNAL REFERENCE

ALIGN DISCIPLINED RUBIDIUM OSCILLATOR FREQUENCY USING EXTERNAL REFERENCE

[9] Ensure NCSU circuit packs listed in TABLE B are installed

[10] Remove NCSU circuit packs located at 050-63 and 050-59 (**FG61** and **FG62**)

[11] At 1A power switch, depress **ON** pushbutton (**PWR OFF** lamp extinguishes)

[12] At rear of NCSU, connect channel 1 scope probe to terminal 65-205T (SYNC signal)

[13] Using cliplead, tie terminal 65-108T to terminal **OGDT**

[14] Using clipleads, tie terminals listed in TABLE C to ground terminals

[15] See NOTE 2. SYNC channel 1 of scope to 4-kHz signal connected in Step 12

AND

TABLE B

PACK	LOCATION
FG64	050-65
FG65	050-67
FG72	050-25
FG76	050-27

TABLE C

65-100T	65-102T	65-103T
65-106T	65-117B	65-019B

[16] Is 4-kHz square wave present on channel 1 of scope

Yes → Page 3

No

[17] Is BSRF the regular timing reference

Yes → [18] Call 4ESAC for assistance

No

[19] See NOTE 3. Remove cliplead from terminal **65-OGDT** and tie this cliplead to terminal **65-000T**

→ Page 3

NOTES

2. SYNC channel 1 on negative edge of 4-kHz signal
3. DS1A is not operative; alternate DS1B must be used

[20] See NOTE 4. Connect channel 2 scope probe to 8-kHz framing pulse at terminal 210 of **FA626** pack [TABLE D]

[21] At scope, set CRT display to **CHOP** mode

[22] See NOTE 5. Set horizontal controls for .1 μs/div [Figure 1]

[23] Connect oscillator manual adjustment unit to oscillator [DLP-532]

[24] Set oscillator manual adjustment unit thumbwheel to 2000 and enter by depressing **LOAD** pushbutton

On OMAU, **VERIFY** LED goes off

AND

[25] Is channel 2 waveform moving

Yes

[26] Repeat from Step 24, changing thumbwheel settings to cause waveform to stop moving

No

Page 4

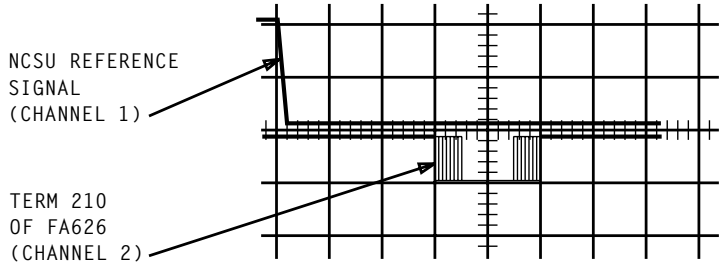


Figure 1

TABLE D

CLOCK CHAIN	FA626 LOCATION
0	070-24
1	070-47
2	170-24
3	170-47

NOTES

4. The external reference signal is expected to have some amount of jitter which will cause the 8-kHz framing pulse to appear to have jitter
5. It will be necessary to use channel B delayed feature on scope because 8-kHz framing pulse may appear anywhere with respect to the synced edge of the reference signal

ALIGN DISCIPLINED RUBIDIUM OSCILLATOR FREQUENCY USING EXTERNAL REFERENCE

[27] See NOTE 6. Make additional adjustments until channel 2 waveform moves less than 100 ns in 15 minutes [Figure 2]

[28] Record hex display at front of oscillator

[29] Record thumbwheel reading at oscillator manual adjustment unit

[30] Disconnect oscillator manual adjustment unit from oscillator [DLP-531]

AND

Page 5

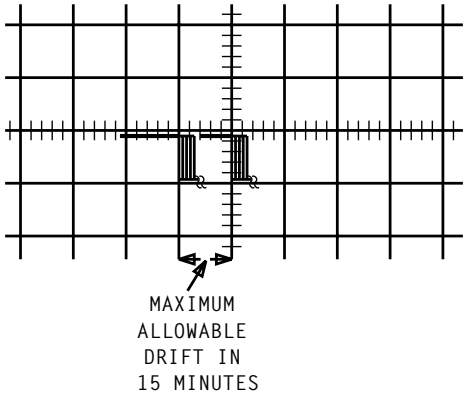
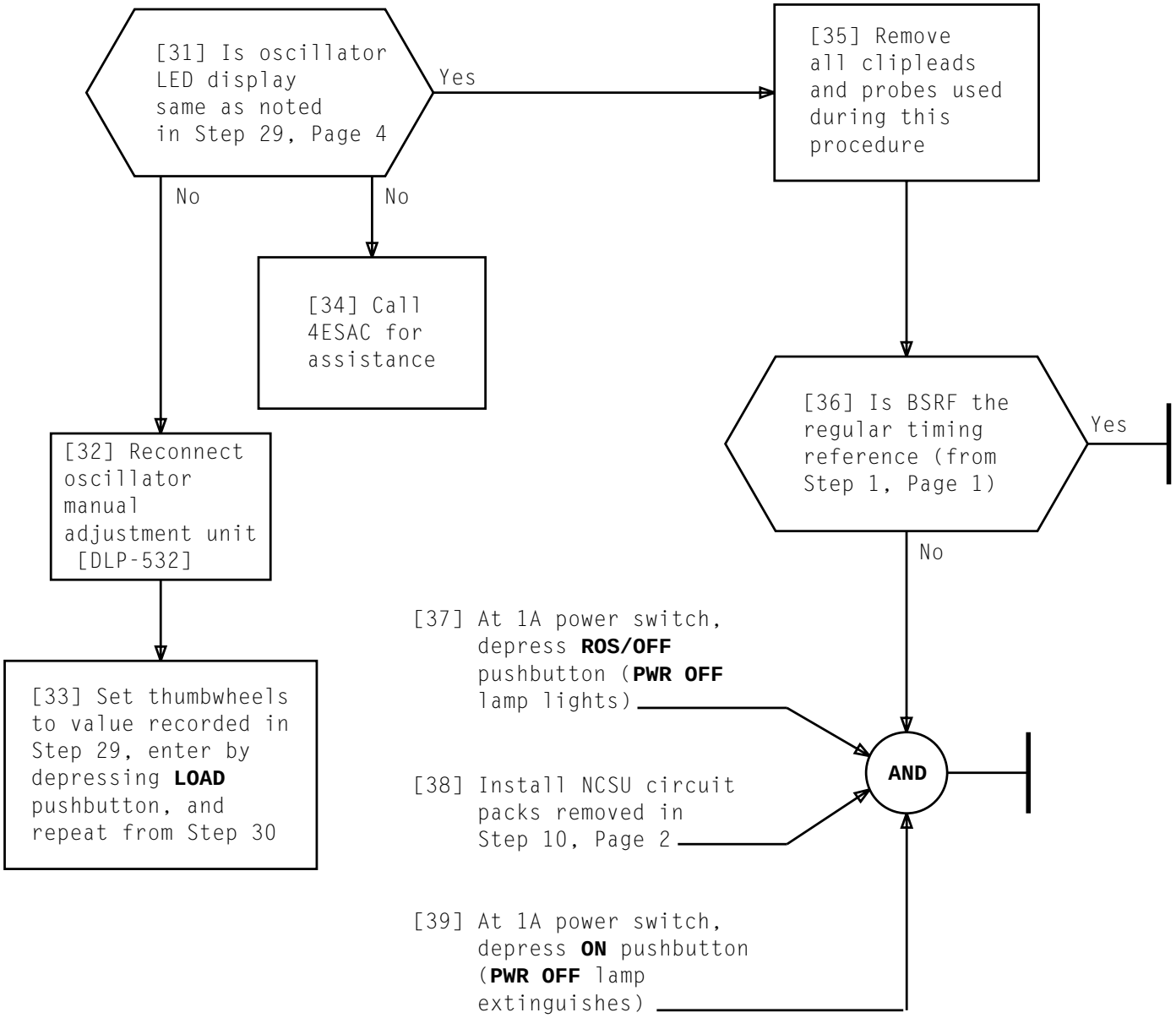


Figure 2

NOTE 6
Final frequency word entered into oscillator that is not between 0800 and 3800 is indication that replacement oscillator should be obtained. Contact next level of technical support for assistance

ALIGN DISCIPLINED RUBIDIUM OSCILLATOR FREQUENCY USING EXTERNAL REFERENCE



ALIGN DISCIPLINED RUBIDIUM OSCILLATOR FREQUENCY USING EXTERNAL REFERENCE

REMOVE DRO OSCILLATOR

[1] At TTY, enter
RMV:SCLK 0,NCSU 0!

[2] At all DRO oscillators, set **ENABLE/DISABLE** switch to **DISABLE** [Figure 1]

[3] See NOTE 1. Is mate clock chain in service

No

[4] See NOTE 2. At TTY, enter
RST:NCLK 0,CHAIN a;UCL!
a = out of service mate chain

Yes

Page 2

[5] Is mate clock chain in service

Yes

Page 2

No

[6] Is result of restore

F-Level Interrupt

[7] Analyze F-Level interrupt using Output Message Analysis TOP 234-351-003

Diagnostic Failure

[8] Isolate suspect clock chain, diagnostic failure [TAP-136]

NOTES
1. Clock chains 0 and 1 are paired and clock chains 2 and 3 are paired
2. Ensure clock chain is powered up before restoring unconditionally

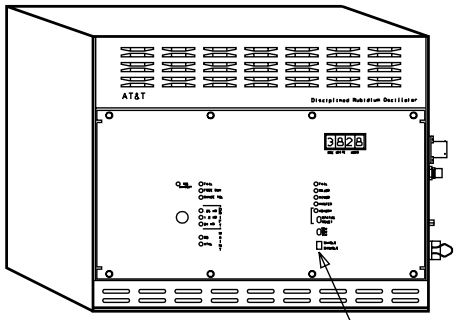


Figure 1 — Disciplined Rubidium Oscillator

REMOVE DRO OSCILLATOR

See TABLE A. At switch location associated with oscillator being removed:

[9] Ensure chain OOS; **ROS/OFF** switch is in **ROS** position

OS and **OFF NORM** lamps go on

[10] Depress **ROS/OFF** switch to remove power

PWR OFF lamp goes on

AND

Oscillator power removed

[11] Remove −48 volt fuse for oscillator being removed [TABLE B]

At oscillator

[12] Disconnect **RF OUTPUT** connector **P13**

[13] Disconnect ground strap from oscillator to frame upright

[14] Disconnect **FREQ CONTROL INPUT P21** and **POWER INPUT P19** connectors

[15] Disconnect **D/A INPUT/OUTPUT** connector **J20**

[16] Remove eight screws holding oscillator mounting plate to frame

[17] See WARNING 1. Remove oscillator from network clock frame

AND

Defective oscillator removed

Page 3

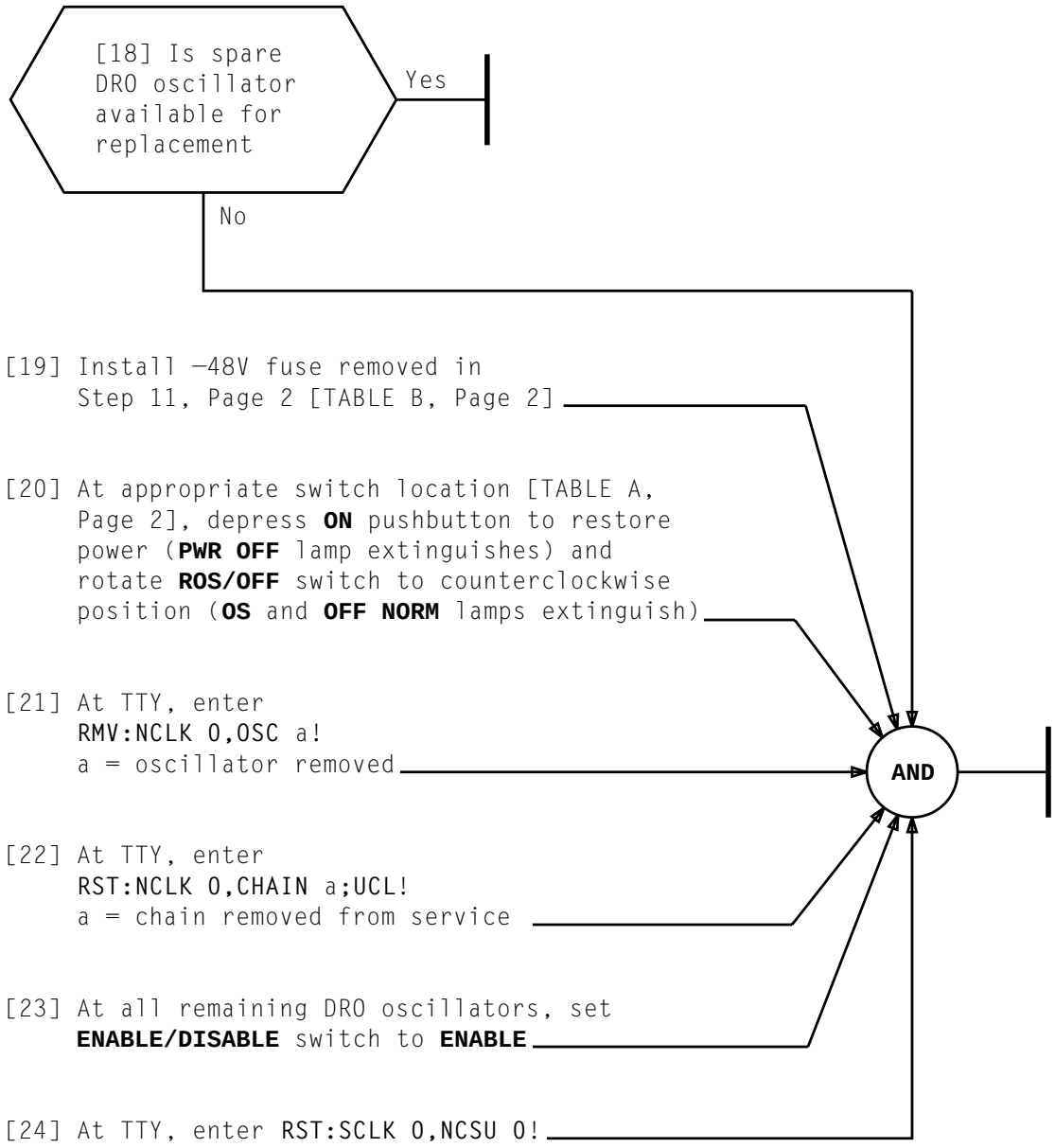
TABLE A

CLOCK CHAIN	POWER SWITCH FRAME LOCATION
0	066-03
1	066-68
2	166-03
3	166-68

TABLE B

CLOCK CHAIN	OSCILLATOR LOCATION	SD-4A014-02 FUSES	FUSE LOCATION	
			BAY	HMP
0	033-21	**DC**	0	07
1	033-56	**DD**	0	07
2	133-21	**DC**	1	07
3	133-56	**DD**	1	07

WARNING 1
DRO oscillator is fragile item. Defective units are repairable at repair location only



REMOVE DRO OSCILLATOR

CHECK DISCIPLINED RUBIDIUM OSCILLATOR

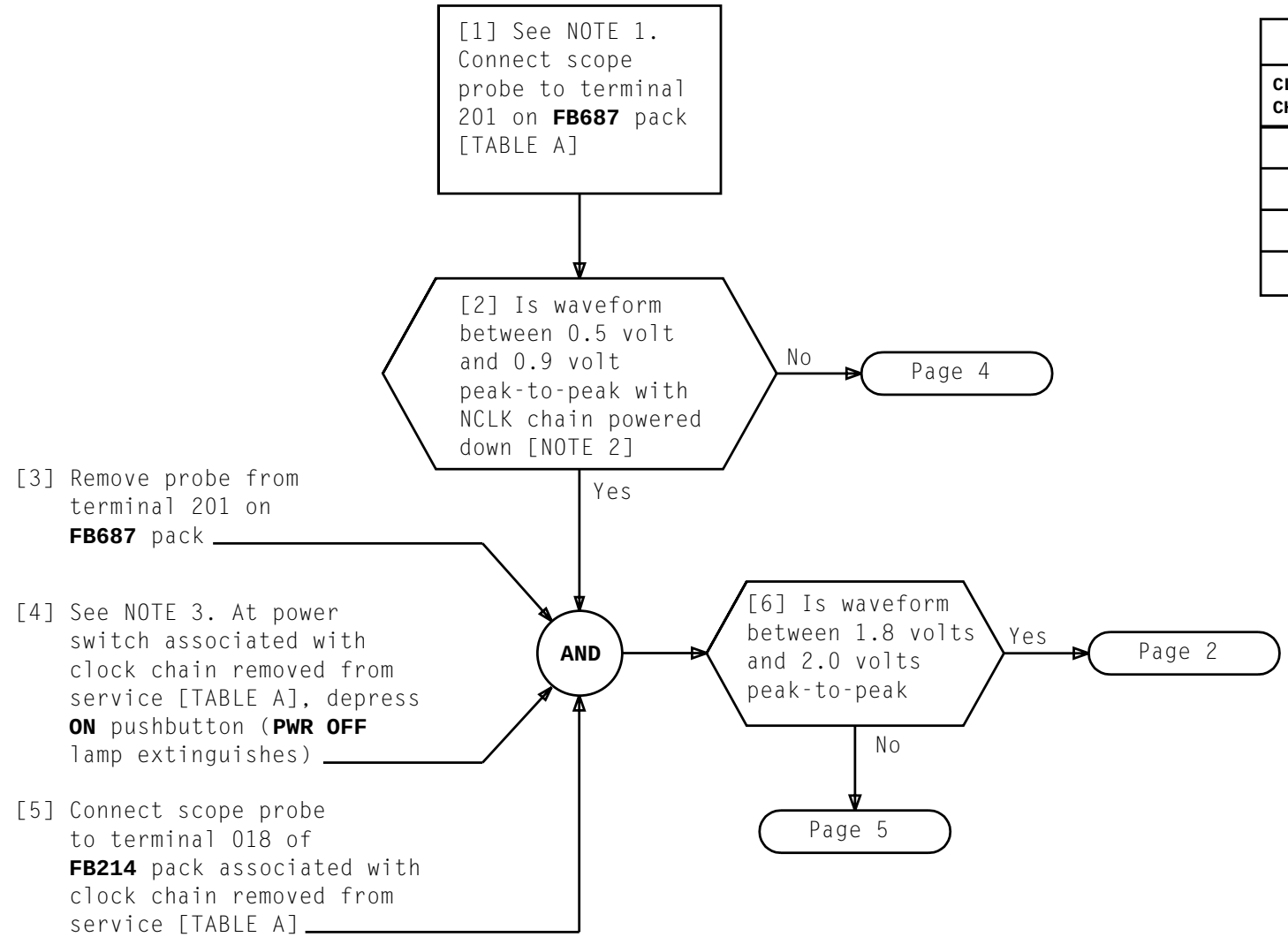


TABLE A

CLOCK CHAIN	FB687 LOCATION	FB214 LOCATION	PWR SW LOCATION
0	070-34	066-33	066-03
1	070-37	066-39	066-68
2	170-34	166-33	166-03
3	170-37	166-39	166-68

NOTES

1. Connect scope probe ground lead to ground terminal before making scope probe signal connection
2. Levels are lower because chain is powered down
3. If chain goes into diagnostic after depressing **ON** pushbutton, wait until diagnostic completes before proceeding to next step

[7] Remove scope probe from pack

[8] Verify connector **J20** of oscillator and cable connector at NCSU are well seated

[9] On all DRO oscillators, ensure **ENABLE/DISABLE** switch is set to **ENABLE** [Figure 1]

[10] At TTY, enter RST:SCLK 0,NCSU 0! and allow to restore. Wait for copy soft-to-hard BLM on SCLK-0, NCSU-0

[11] At TTY, enter RST:NCLK 0,OSC a!
a = oscillator being checked

RST:NCLK 0,OSC a COMPL
REPT:NCSU 0:OSC UPDATE STARTED –
WAIT FOR NCSU COMPLETION REPORT

AND

[12] See NOTE 4.
Does report message indicate manual update required (TTY Response: RST:NCLK 0,OSC a ABORTED: UPDATE FAILED)

Yes

No

Page 3

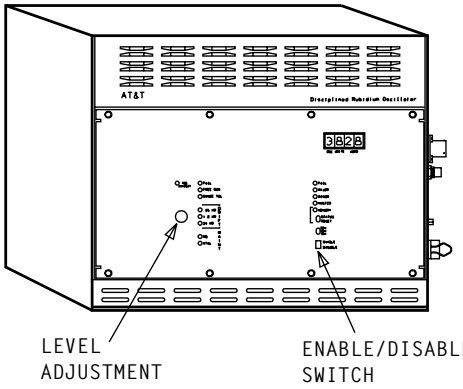
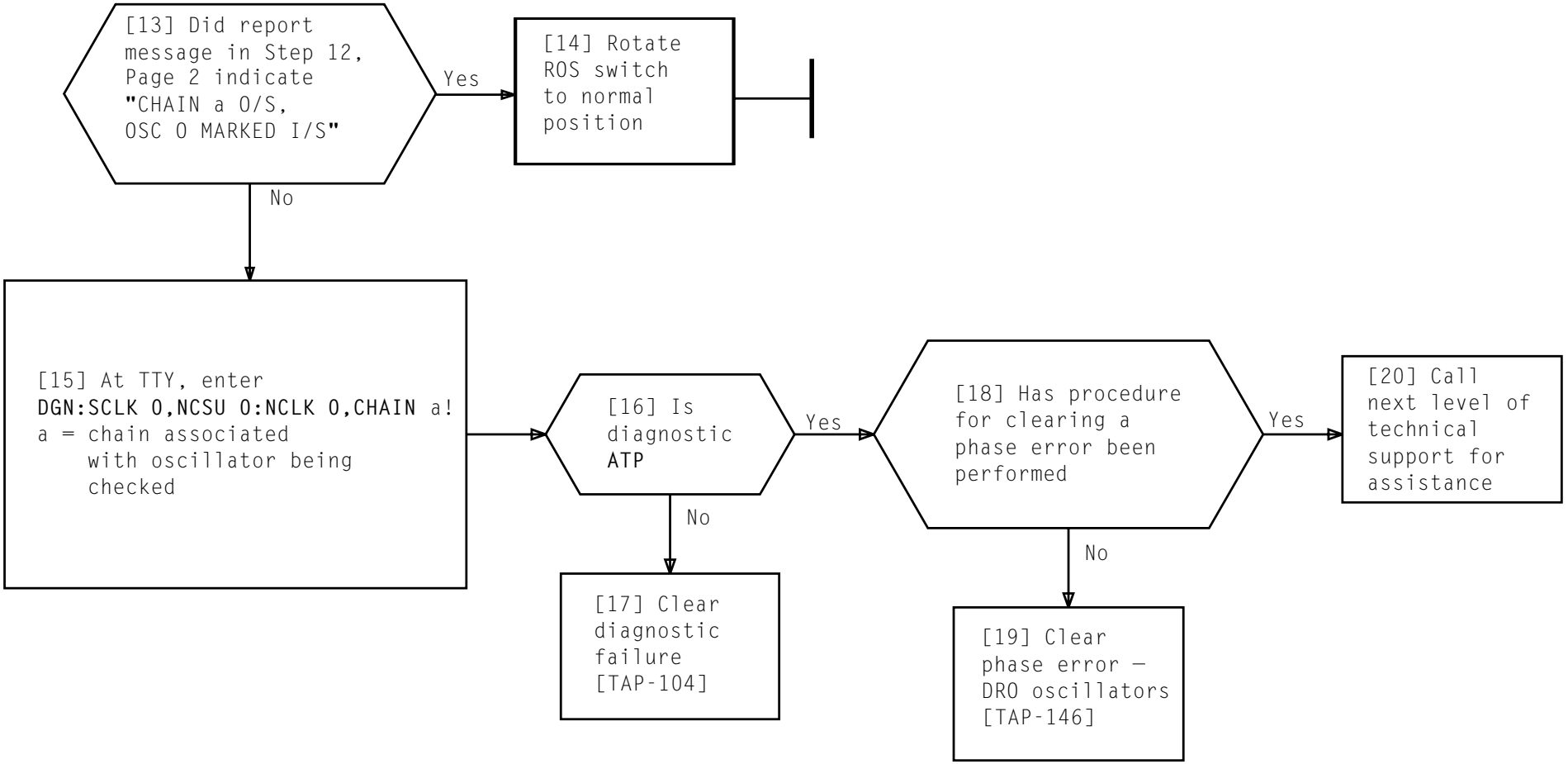


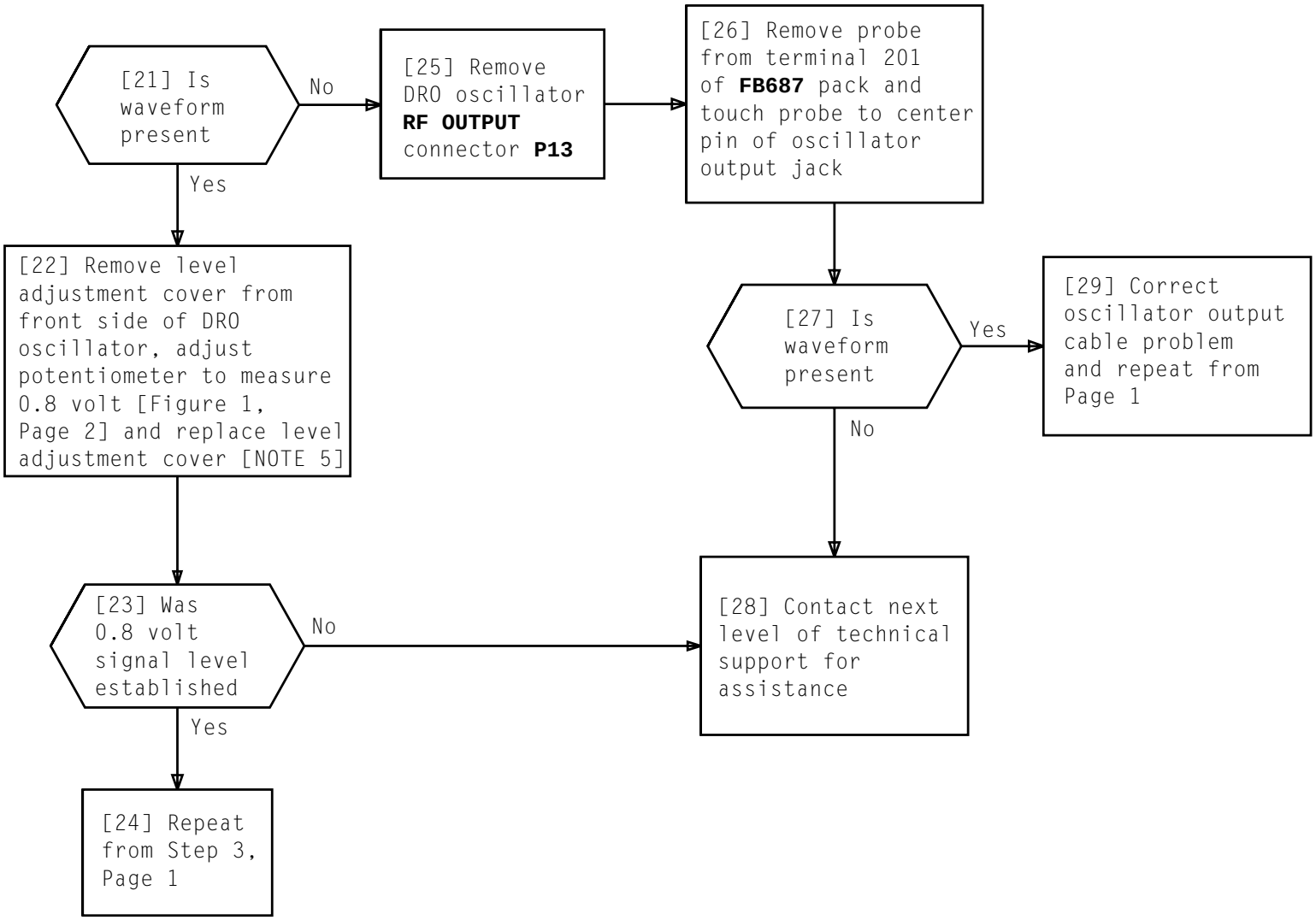
Figure 1 – Disciplined Rubidium Oscillator

NOTE 4
May take 5 minutes to receive report message

CHECK DISCIPLINED RUBIDIUM OSCILLATOR

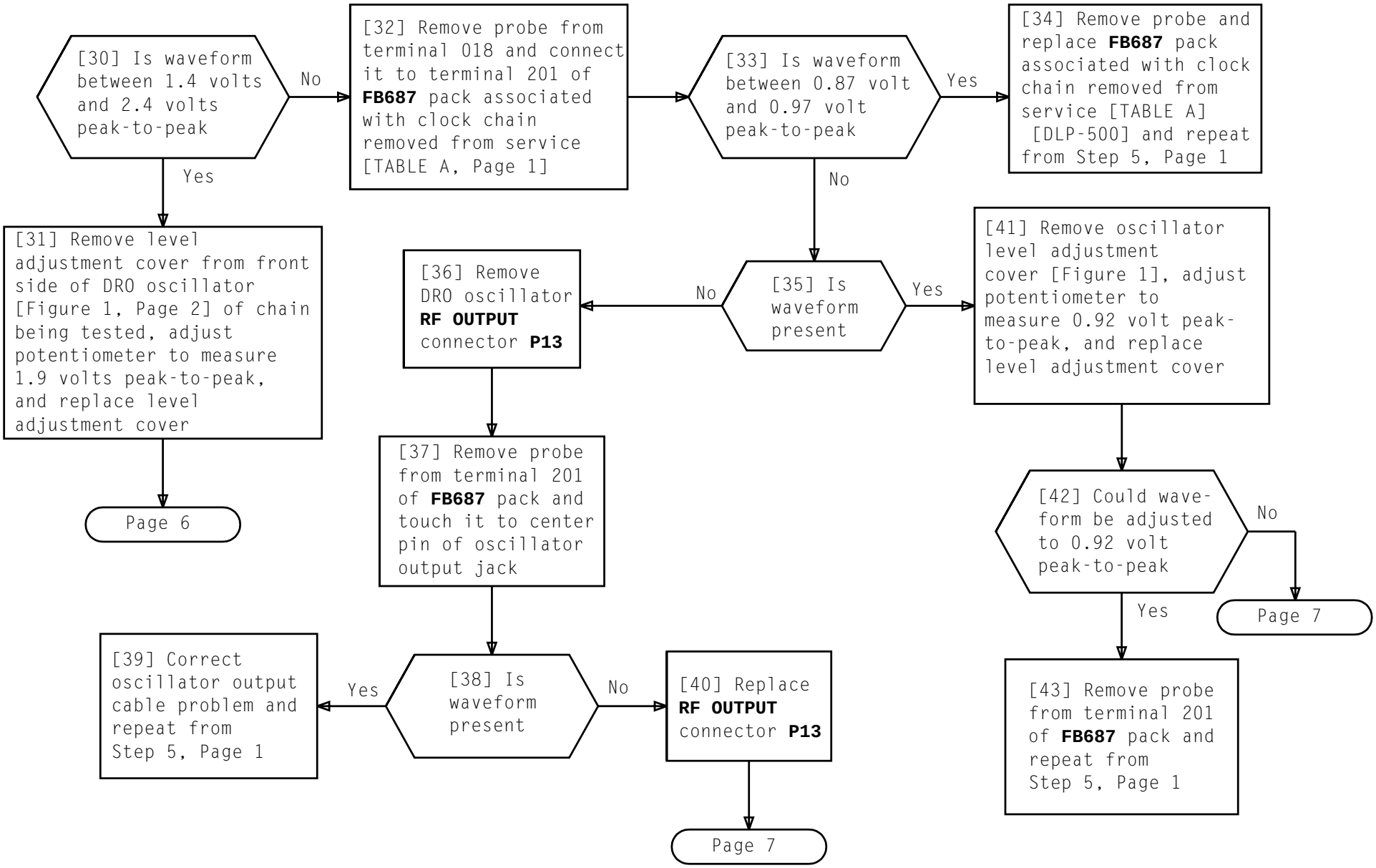


CHECK DISCIPLINED RUBIDIUM OSCILLATOR

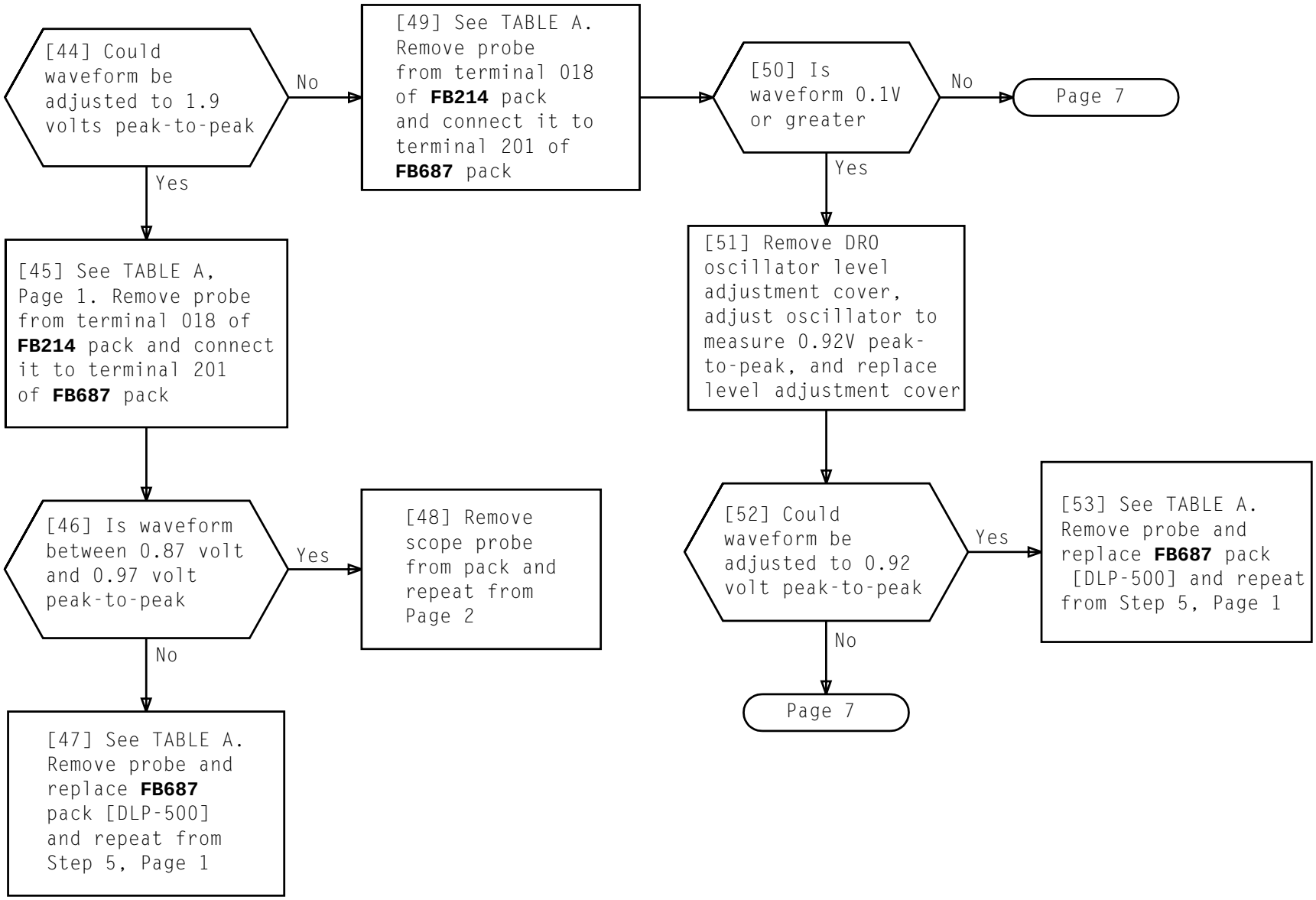


NOTE 5
This is a preliminary level adjustment to establish that oscillator is operational

CHECK DISCIPLINED RUBIDIUM OSCILLATOR



CHECK DISCIPLINED RUBIDIUM OSCILLATOR



CHECK DISCIPLINED RUBIDIUM OSCILLATOR

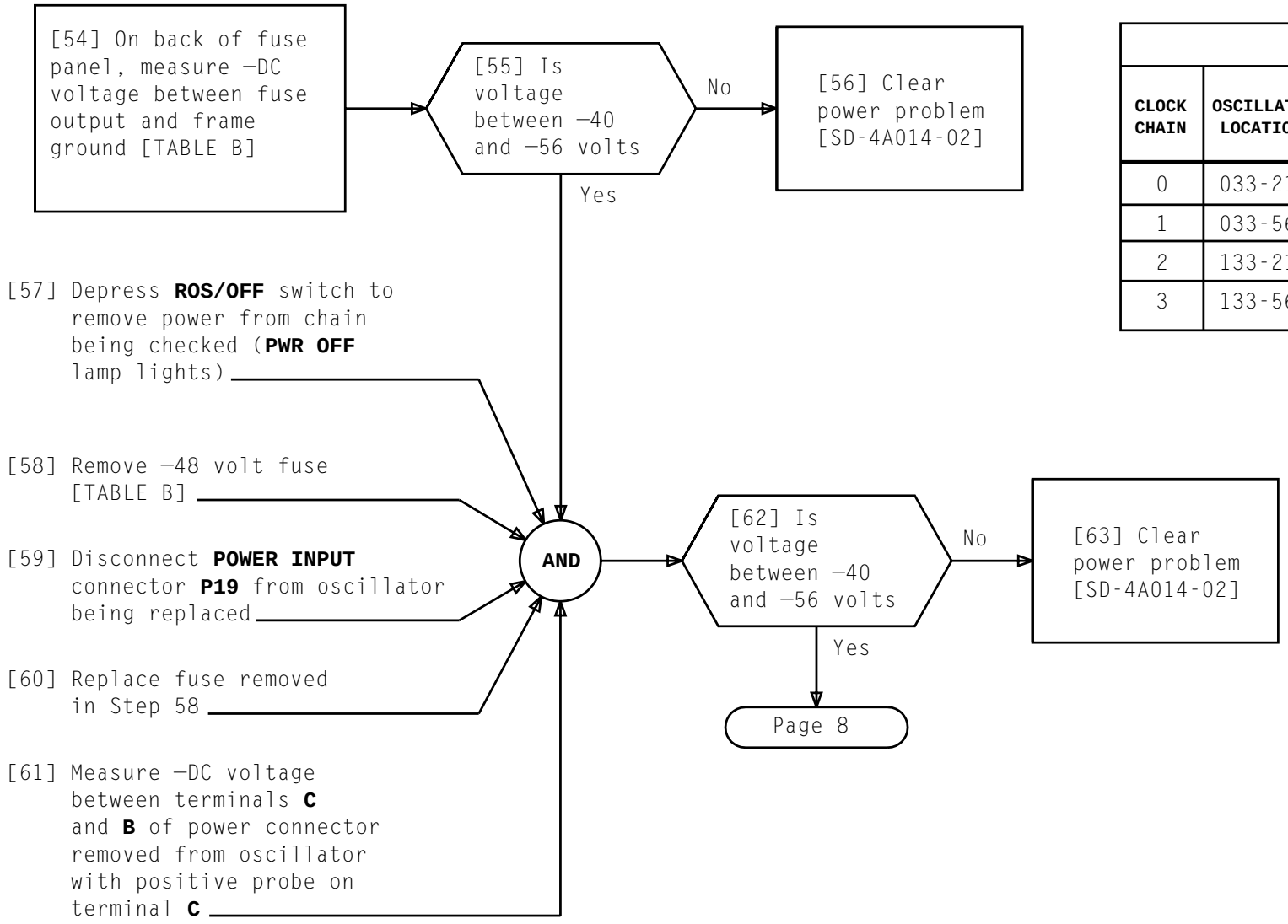
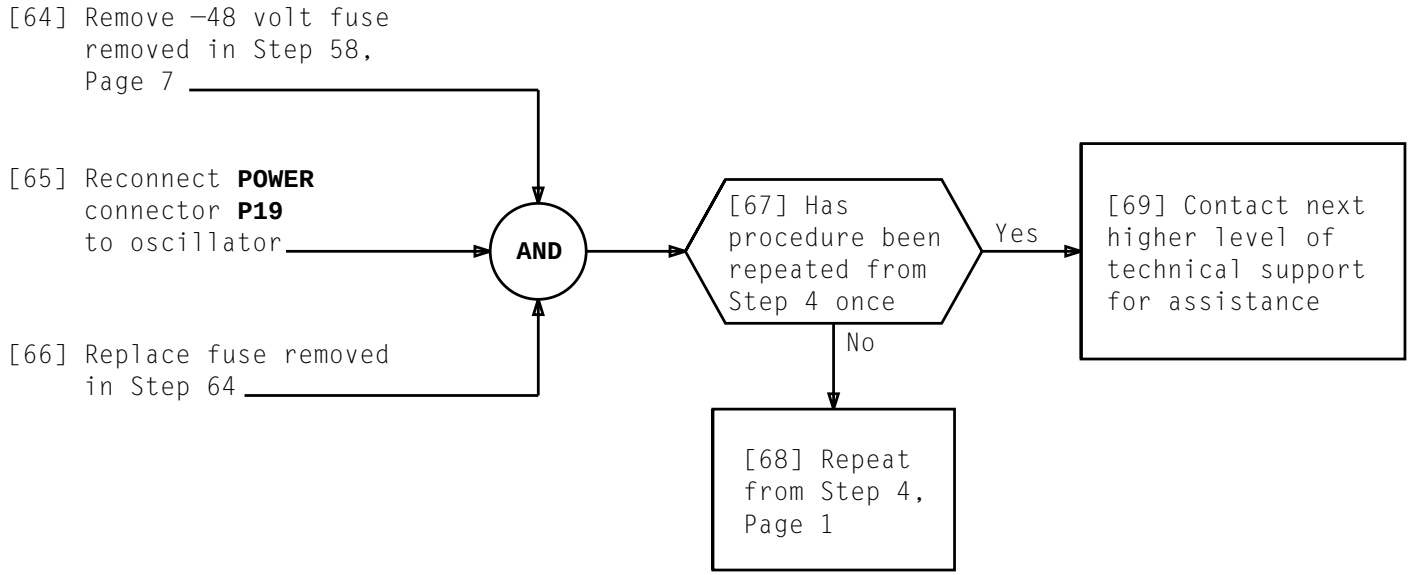


TABLE B

CLOCK CHAIN	OSCILLATOR LOCATION	SD-4A014-02 FUSES	FUSE LOCATION	
			BAY	HMP
0	033-21	**DC**	0	07
1	033-56	**DD**	0	07
2	133-21	**DC**	1	07
3	133-56	**DD**	1	07

CHECK DISCIPLINED RUBIDIUM OSCILLATOR



CHECK DISCIPLINED RUBIDIUM OSCILLATOR

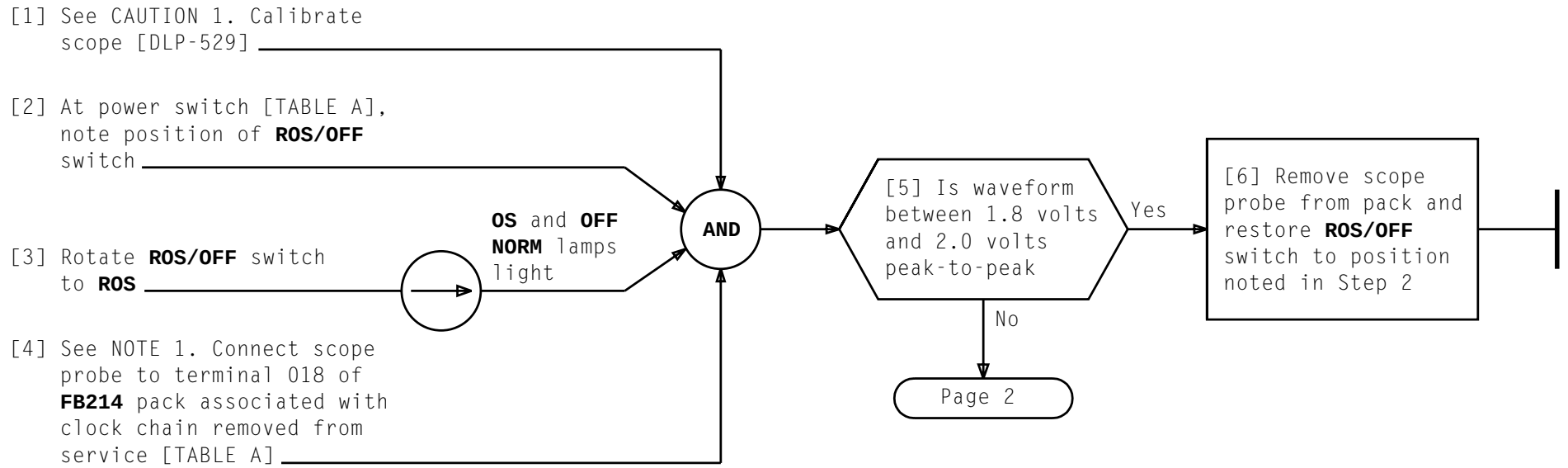


TABLE A			
FB687 LOCATION	**CLOCK CHAIN**	**PWR SW LOCATION**	**FB214 LOCATION**
070-34	0	066-03	066-33
070-37	1	066-68	066-39
170-34	2	166-03	166-33
170-37	3	166-68	166-39

NOTE 1
Connect scope probe ground lead to ground terminal before making scope probe signal connection

CAUTION 1
Improper scope calibration may affect service

VERIFY OSCILLATOR SIGNAL LEVEL — DISCIPLINED RUBIDIUM OSCILLATOR

[7] Remove level adjustment cover from front side of DRO oscillator [Figure 1] of chain being tested [TABLE A, Page 1]

[8] Adjust level adjustment potentiometer to measure 1.9 volts peak-to-peak

[9] Replace level adjustment cover

AND

[10] Could waveform be adjusted to 1.9 volts peak-to-peak

Yes

[11] Remove scope probe from pack and restore **ROS/OFF** switch to position noted in Step 2, Page 1

No

[12] Has **FB687** pack been replaced twice

Yes

[13] At power switch [TABLE A], depress **ROS/OFF** switch to power down chain (**PWR OFF** lamp lights)

No

[15] Replace **FB687** pack [TABLE A, Page 1] [DLP-500] and repeat from Step 4, Page 1

[14] Check DRO oscillator [DLP-546]

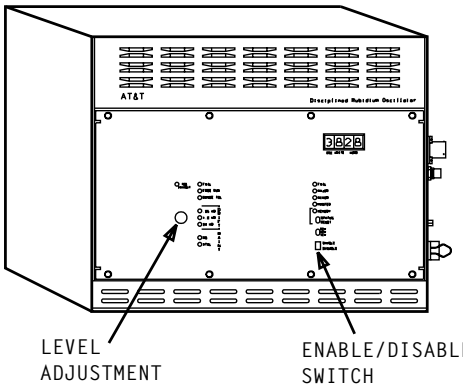
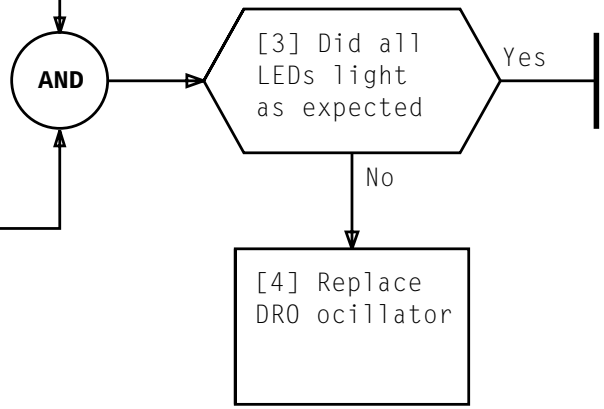


Figure 1 — Disciplined Rubidium Oscillator

[1] Operate **STATUS-OFF-RESET/LAMP** switch [Figure 1] to **RESET/LAMP** position and hold until status indicator test begins

[2] See NOTE 1. Verify that all status LEDs and all HEX display segments light except for **TOS INHIBIT** and two **FAIL** LEDs



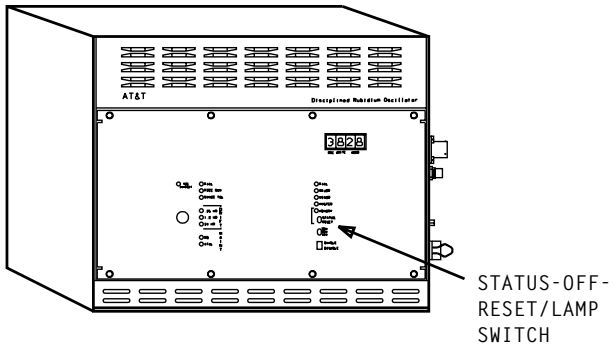


Figure 1 – Disciplined Rubidium Oscillator

NOTE 1 **TOS INHIBIT** LED and two **FAIL** LEDs are not tested	
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CHECK DISCIPLINED RUBIDIUM OSCILLATOR STATUS INDICATORS

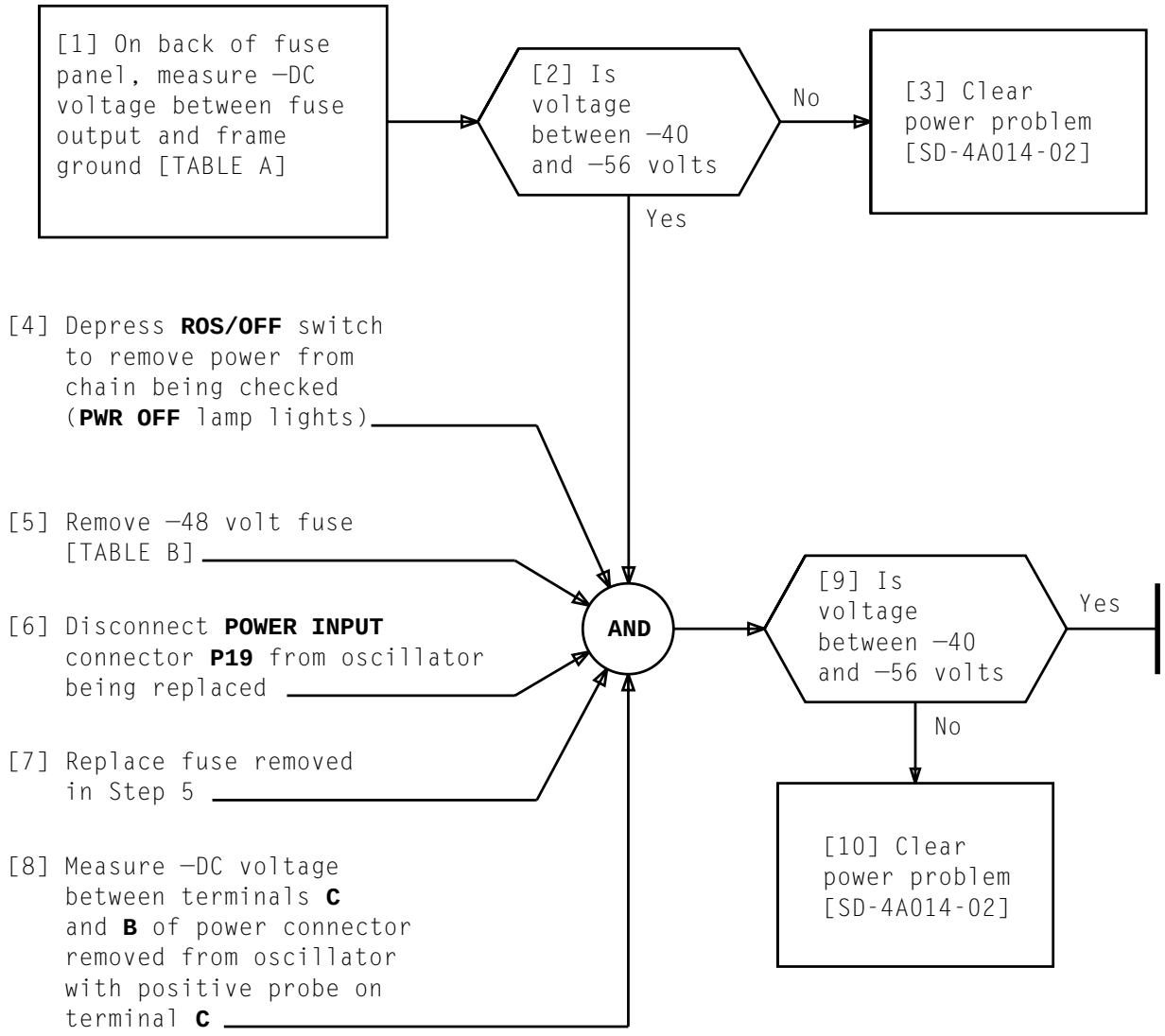

TABLE A

CLOCK CHAIN	OSCILLATOR LOCATION	SD-4A014-02 FUSES	FUSE LOCATION	
			BAY	HMP
0	033-21	**DC**	0	07
1	033-56	**DD**	0	07
2	133-21	**DC**	1	07
3	133-56	**DD**	1	07

CHECK DISCIPLINED RUBIDIUM OSCILLATOR —48V POWER

CHECK DS1 SYNC REFERENCE SIGNAL

[1] See CAUTION 1. Calibrate scope [DLP-529]

[2] At terminal block 052-03, attach probe ground to pin 090 and scope probe to pin 091

[3] See Figure 1. Observe waveform for symmetry and amplitude [NOTES 1 & 2]

AND

[4] Does waveform resemble Figure 1

No → [5] Contact sync coordinator for assistance

Yes

[6] At terminal block 052-03, move probe ground to pin 092 and scope probe to pin 093

[7] See Figure 1. Observe waveform for symmetry and amplitude [NOTES 1 & 2]

AND

[8] Does waveform resemble Figure 1

Yes

No → [9] Contact sync coordinator for assistance

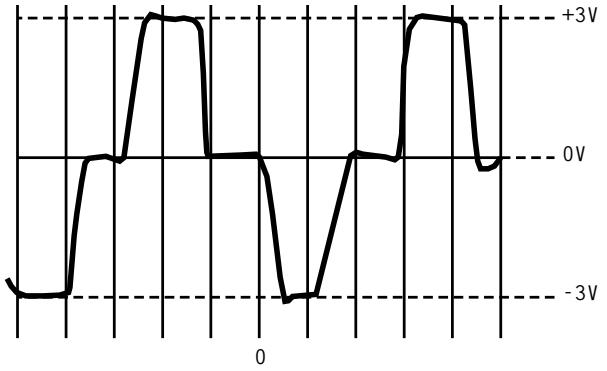

Figure 1 — Typical DS1 Sync Reference Signal
Vert = 2V/DIV, Horiz = 0.1 µs/DIV

NOTES
1. Symmetry may vary slightly depending on cable lengths and grounding conditions
2. Amplitude limits are 3.5V p-p minimum and 8V p-p maximum

CAUTION 1
Improper scope calibration may affect service

ITEM	ISSUE	ITEM	ISSUE	ITEM	ISSUE	ITEM	ISSUE	ITEM	ISSUE	ITEM	ISSUE
• IXL-001		TAP-123		DLP-506		• DLP-541					
NTP-002		TAP-124		DLP-507		DLP-542					
NTP-003		TAP-125		DLP-508		DLP-543					
NTP-004		TAP-126		DLP-509		DLP-544					
NTP-005		TAP-127		DLP-510		• DLP-545					
NTP-006		TAP-128		DLP-511		DLP-546					
NTP-007		TAP-129		DLP-512		DLP-547					
NTP-008		TAP-130		DLP-513		DLP-548					
NTP-009		ISD-131		DLP-514		DLP-549					
NTP-010		TAP-132		DLP-515		DLP-550					
NTP-011		TAP-133		DLP-516		CKL-891					
NTP-012		TAP-134		DLP-517		TNG-893					
TAD-100		TAP-135		DLP-518							
TAD-101		TAP-136		• DLP-519							
TAP-102		TAP-137		DLP-520							
TAP-103		TAP-138		DLP-521							
TAP-104		TAP-139		DLP-522							
TAP-105		TAP-140		DLP-523							
TAP-106		□ TAP-141		DLP-524							
TAP-107		□ TAP-142		DLP-525							
TAP-108		□ TAP-143		DLP-526							
TAP-109		□ TAP-144		DLP-527							
TAP-110		TAP-145		DLP-528							
TAP-111		TAP-146		DLP-529							
TAP-112		TAP-147		DLP-530							
TAP-113		TAP-148		DLP-531							
TAP-114		ISD-149		DLP-532							
ISD-115		ISD-150		DLP-533							
ISD-116		TAP-151		DLP-534							
ISD-117		DLP-500		DLP-535							
TAP-118		DLP-501		DLP-536							
ISD-119		DLP-502		DLP-537							
ISD-120		DLP-503		DLP-538							
ISD-121		DLP-504		DLP-539							
TAP-122		DLP-505		DLP-540							

• REVISED OR ADDED ITEM □ CANCELED ITEM

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CHECKLIST

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