

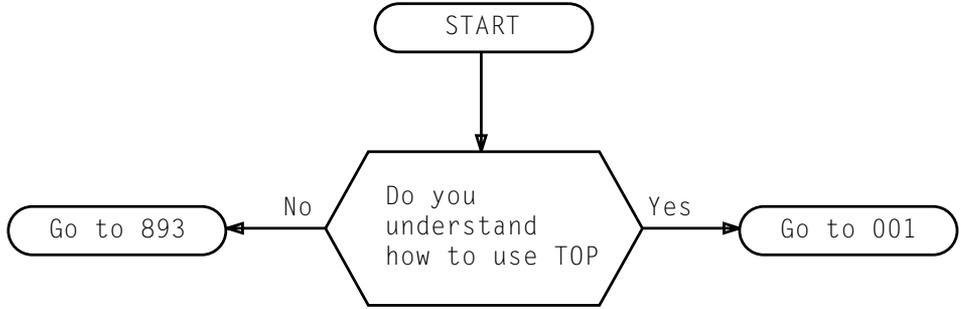


Task Oriented Practice (TOP)

**4ESS™ SWITCH**

**Switching Network**

**Network Clock Frame (Network Clock and System Clock)**



*TOP Comments Hot Line:*  
Monday through Friday  
8:00 a.m. - 4:00 p.m. (Eastern)  
Call: 1-888-LTINFO6  
Or FAX to: 1-910-727-3043

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Issue 2	SEP 1998
234-351-013	TPG
TITLE PAGE	000

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Issue 2	SEP 1998
234-351-013	LPG
PAGE 1 of 1	000

# How Are We Doing?

Document Title: **4ESS™** Switch  
 Switching Network  
 Network Clock Frame (Network Clock and System Clock)

Document No.: 234-351-013

Issue: 2            Date: September 1998

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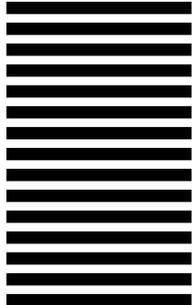
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**FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO**

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

Clear Alarm – Major/Minor – DR0 . . . . . TAP-152

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

DR0 Alarm – Major/Minor – Clear . . . . . TAP-152

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**

Maintenance Philosophy . . . . .	TAD-100
Meters – Phase Lock Control Panel – Replace . . . . .	NTP-004
Meter Solenoid Operate ( <b>MSO</b> ) Lamp and <b>PHASE</b> or <b>PHASE LOCK OVEN TEMP</b> Meter Reset Fault – Clear . . . . .	TAP-127
Meter Solenoid Operate ( <b>MSO</b> ) Lamp, <b>PHASE METER</b> Reset, and <b>PHASE LOCK OVEN TEMP</b> Meter Reset – Test . . . . .	DLP-514
NCLK Chain PHASE METER Error – Clear . . . . .	TAP-135
<b>R1 or PLS Fault – Clear – 39B Oscillator . . . . .</b>	<b>TAP-128</b>
<b>R1 or PLS Fault – Clear – Disciplined Rubidium Oscillator . . . . .</b>	<b>TAP-147</b>
Oscillator; 39B – Check . . . . .	NTP-010
Oscillator; Disciplined Rubidium – Check . . . . .	NTP-012
Oscillator; 39B – Replace and Check . . . . .	NTP-008
Oscillator; Disciplined Rubidium – Replace and Check . . . . .	NTP-011
Oscillator Out-of-Service (OSC OS) Lamp – Test . . . . .	DLP-517
Phase Error – Clear – 39B Oscillator . . . . .	TAP-134
Phase Error – Clear – Disciplined Rubidium Oscillator . . . . .	TAP-142
<b>PHASE LOCK OVEN TEMP Meter – Check . . . . .</b>	<b>DLP-513</b>
Phase Lock Oven Temperature Fault – Clear . . . . .	TAP-129
Power Alarm Circuits – Test . . . . .	DLP-503
Power-ORing Diodes – FB211 Circuit Pack – Check . . . . .	NTP-003
Power Switch – Replace . . . . .	DLP-523
<b>REF STAT/FREE RUN Lighted Lamp – Clear . . . . .</b>	<b>TAP-138</b>
Repetitive Range Exceeded Message – NCSU – Clear 38B Oscillator . . . . .	TAP-140
Repetitive Range Exceeded Message – NCSU – Clear Disciplined Rubidium Oscillator . . . . .	TAP-144

**TASK INDEX LIST**

**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**

TTY Printout - DGN:NCLK 0,CHAIN a PH b STF  
 ANALY:TLPFILE:NCLK 0,CHAIN a SUSPECTED FAULTY EQUIPMENT  
 Note Column Contains NOTE 2  
 Fuse Blown - A1-A9 or B1-B9 . . . . . TAP-123

TTY Printout - DGN:NCLK 0,CHAIN a PH b STF  
 ANALY:TLPFILE:NCLK 0,CHAIN a SUSPECTED FAULTY EQUIPMENT  
 Note Column Contains NOTE 2  
 Fuse Blown - Not A1-A9 or B1-B8 (+9, +24 Volt Distribution) . . . . . TAP-118

TTY Printout - DGN:NCLK 0,CHAIN a PH b STF  
 ANALY:TLPFILE:NCLK 0,CHAIN a SUSPECTED FAULTY EQUIPMENT  
 Note Column Contains NOTE 2  
 Fuse Blown - Not A1-A9 or B1-B8 (+24, +48 and +140 Volt Distribution) . . . . . TAP-122

TTY Printout - DGN:NCLK 0,CHAIN a PH b STF  
 Note Column Contains NOTE 2  
 No Fuse Blown . . . . . TAP-126

TTY Printout - DGN:NCLK 0,CHAIN a PH b STF  
 ANALY:TLPFILE:NCLK 0,CHAIN a NULL PACK TEST GENERATED . . . . . TAP-105

TTY Printout - DGN:NCLK 0,CHAIN a PH b STF  
 ANALY:TLPFILE:NCLK 0,CHAIN a SUMMARY DATA  
 QUEUE ACCESS DENIED:DATA NOT RETAINED:CODE 0001 . . . . . TAP-107

TTY Printout - DGN:NCLK 0,CHAIN a PH b STF  
 ANALY:TLPFILE:NCLK 0,CHAIN a SUMMARY DATA  
 QUEUE ACCESS DENIED:DATA NOT RETAINED:CODE 0002 . . . . . TAP-108

TTY Printout - DGN:NCLK 0,CHAIN a PH b STF  
 ANALY:TLPFILE:NCLK 0,CHAIN a SUMMARY DATA  
 QUEUE ACCESS DENIED:DATA NOT RETAINED:CODE 0004 . . . . . TAP-109

TTY Printout - DGN:NCLK 0,CHAIN a PH b STF  
 ANALY:TLPFILE:NCLK 0,CHAIN a SUMMARY DATA  
 ALL PENDING TLP SEARCHES INHIBITED . . . . . TAP-114

TTY Printout - DGN:NCLK 0,CHAIN a PH b STF  
 ANALY:TLPFILE:NCLK 0,CHAIN a ABORTED . . . . . TAP-110

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

TTY Printout - DGN:NCLK 0,CHAIN a PH b STF  
 ANALY:TLPFILE:NCLK 0,CHAIN a 0  
 TLP PROGRAM ABORTED . . . . . TAP-110

TTY Printout - DGN:NCLK 0,CHAIN a PH b STF  
 ANALY:TLPFILE:NCLK 0,CHAIN a TLP  
 CURRENT TLP SEARCH ABORTED  
 ALL PENDING TLP SEARCHES INHIBITED . . . . . TAP-110

TTY Printout - DGN:NCLK 0,CHAIN a PH b STF  
 ANALY:TLPFILE:NCLK 0,CHAIN a TLP  
 WARNING;VERSION x DOES NOT MATCH EXPECTED VERSION y . . . . . TAP-111

TTY Printout - DGN:NCLK 0,CHAIN a PH b STF  
 ANALY:TLPFILE:NCLK 0,CHAIN 2  
 TLP TAPE ACQUISITION ERROR  
 MOUNT TAPE WITH FILE ID = f . . . . . TAP-112

TTY Printout - DGN:NCLK 0,CHAIN a PH b STF  
 REPT:TAPE MUST BE MOUNTED FOR FUNCTION TLP . . . . . TAP-113

TTY Printout - DGN:SCLK 0, {IPUB a|CONT b|NCSU 0} PH c STF  
 ANALY:TLPFILE:SCLK 0 {IPUB a|CONTR b|NCSU 0} SUSPECTED FAULTY EQUIPMENT  
 Note Column Contains NOTE 2  
 Fuse Blown-A1-A9 or B1-B8 . . . . . TAP-123

TTY Printout - DGN:SCLK 0, {IPUB a|CONTR b|NCSU 0} PH c STF  
 ANALY:TLPFILE:SCLK 0 {IPUB a|CONTR b|NCSU 0} SUSPECTED FAULTY EQUIPMENT  
 Code Column Contains NOTE 2  
 Fuse Blown-Not A1-A9 or B1-B8 (+9 and +24 Volt Distribution) . . . . . TAP-118

TTY Printout - DGN:SCLK 0, {IPUB a|CONTR b|NCSU 0} PH c STF  
 ANALY:TLPFILE:SCLK 0 {IPUB a|CONTR b|NCSU 0} SUSPECTED FAULTY EQUIPMENT  
 Note Column Contains NOTE 2  
 Fuse Blown-Not A1-A9 or B1-B8 (+24, +48 and +140 Volt Distribution) . . . . . TAP-122

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

TTY Printout - DGN:SCLK 0, {IPUB a|CONTR b|NCSU 0} PH c STF  
 ANALY:TLPFILE:SCLK 0 {IPUB a|CONTR b|NCSU 0} SUSPECTED FAULTY EQUIPMENT  
 Note Column Contains NOTE 2  
 No Fuse Blown . . . . . TAP-126

TTY Printout - DGN:SCLK 0, {IPUB a|CONTR b} PH c STF  
 ANALY:TLPFILE SCLK 0, {IPUB a|CONTR b} SUSPECTED FAULTY EQUIPMENT . . . . . TAP-103

TTY Printout - DGN:SCLK 0,NCSU 0 PH a STF  
 ANALY:TLPFILE SCLK 0,NCSU 0 SUSPECTED FAULTY EQUIPMENT . . . . . TAP-104

TTY Printout - DGN:SCLK 0, {IPUB a|CONTR b|NCSU 0} PH c STF  
 ANALY:TLPFILE SCLK 0, {IPUB a|CONTR b|NCSU 0} NULL PACK TEST GENERATED . . . . . TAP-105

TTY Printout - DGN:SCLK 0, {IPUB a|CONTR b|NCSU 0} PH c STF  
 ANALY:TLPFILE SCLK 0, {IPUB a|CONTR b|NCSU 0} SUMMARY DATA  
 QUEUE ACCESS DENIED:DATA NOT RETAINED:CODE 0001 . . . . . TAP-107

TTY Printout - DGN:SCLK 0, {IPUB a|CONTR b|NCSU 0} PH c STF  
 ANALY:TLPFILE SCLK 0, {IPUB a|CONTR b|NCSU 0} SUMMARY DATA  
 QUEUE ACCESS DENIED:DATA NOT RETAINED:CODE 0002 . . . . . TAP-108

TTY Printout - DGN:SCLK 0, {IPUB a|CONTR b|NCSU 0} PH c STF  
 ANALY:TLPFILE SCLK 0, {IPUB a|CONTR b|NCSU 0} SUMMARY DATA  
 QUEUE ACCESS DENIED:DATA NOT RETAINED:CODE 0004 . . . . . TAP-109

TTY Printout - DGN:SCLK 0, {IPUB a|CONTR b|NCSU 0} PH c STF  
 ANALY:TLPFILE SCLK 0, {IPUB a|CONTR b|NCSU 0} SUMMARY DATA  
 ALL PENDING TLP SEARCHES INHIBITED . . . . . TAP-114

TTY Printout - DGN:SCLK 0, {IPUB a|CONTR b|NCSU 0} PH c STF  
 ANALY:TLPFILE SCLK 0, {IPUB a|CONTR b|NCSU 0} ABORTED . . . . . TAP-110

TTY Printout - DGN:SCLK 0, IPUB a|CONTR b|NCSU 0 PH c STF  
 ANALY:TLPFILE SCLK 0, {IPUB a|CONTR b|NCSU 0}  
 TLP PROGRAM ABORTED . . . . . TAP-110

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

- TTY Printout - DGN:SCLK 0, {IPUB a|CONTR b|NCSU 0} PH c STF  
 ANALY:TLPFILE SCLK 0, {IPUB a|CONTR b|NCSU 0} TLP  
 CURRENT TLP SEARCH ABORTED  
 ALL PENDING TLP SEARCHES INHIBITED . . . . . TAP-110
- TTY Printout - DGN:SCLK 0, {IPUB a|CONTR b|NCSU 0} PH c STF  
 ANALY:TLPFILE SCLK 0, {IPUB a|CONTR b|NCSU 0} TLP  
 WARNING:VERSION x DOES NOT MATCH EXPECTED VERSION y . . . . . TAP-111
- TTY Printout - DGN:SCLK 0, {IPUB a|CONTR b|NCSU 0} PH c STF  
 ANALY:TLPFILE SCLK 0, {IPUB a|CONTR b|NCSU 0} TLP  
 TLP TAPE ACQUISITION ERROR  
 MOUNT TAPE WITH FILE ID = F . . . . . TAP-112
- TTY Printout - DGN:SCLK 0, {IPUB a|CONTR b|NCSU 0} PH c STF  
 REPT:TAPE MUST BE MOUNTED FOR FUNCTION TLP . . . . . TAP-113
- TTY Printout - REPT:NCSU 0:OSC RANGE EXCEEDED (Repetitive Messages) - 39B Oscillator . . . . . TAP-140
- TTY Printout - REPT:NCSU 0:OSC RANGE EXCEEDED (Repetitive Messages) - Disciplined Rubidium Oscillator . . . . . TAP-144
- TTY Printout - REPT:NCSU 0:FREERUN 10 MINUTES . . . . . TAP-138
- TTY Printout - OP:DGSTAT h,SLIP . . . . . TAP-139

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**

Issue 2	SEP 1998
234-351-013	NTP
PAGE 1 of 1	<b>002</b>

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

1	Check for Open Diodes in <b>FB211</b> Circuit Pack	DLP-534
2	Check for Shorted Diodes in <b>FB211</b> Circuit Pack	DLP-535

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

1	On Power Switch, Rotate <b>ROS/OFF</b> Switch to <b>ROS</b> <i>Response: OS and OFF NORM Lamps Light, ACK Lamp Lights Momentarily</i>	-
2	Depress <b>ROS/OFF</b> Switch <i>Response: OFF NORM and PWR OFF Lamps Light</i>	-
3	Identify <b>PHASE</b> Meter or <b>PHASE LOCK OVEN TEMP</b> Meter To Be Replaced	
	A. ED4A057-10,G1 Equipped With Magnetic Locking Meter	DLP-516
	B. ED4A057-10,G1 Equipped With LED Display Meter	DLP-551
	C. ED4A057-10,G2 Equipped With LED Display Meter	DLP-552
4	On Power Switch, Rotate <b>ROS/OFF</b> Switch Fully Counterclockwise <i>Response: OFF NORM and OS Lamps Extinguish</i>	-

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

1	On Power Switch, Rotate <b>ROS/OFF</b> Switch to <b>ROS</b> <i>Response: OS</i> and <b>OFF NORM</b> Lamps Light, <b>ACK</b> Lamp Lights Momentarily	-
2	Identify Meter Solenoid Operate ( <b>MSO</b> ) Switch, Phase Lock Shunt ( <b>PLS</b> ) Switch, or <b>OSC OS</b> Lamp Assembly To Be Replaced	
	A. ED4A057-10,G1 Equipped With Retangular Shaped Switch or Lamp	DLP-516
	B. ED4A057-10,G1 Equipped With Square Shaped Switch or Lamp	DLP-553
	C. ED4A057-10,G2 Equipped With Square Shaped Switch or Lamp	DLP-554
3	On Power Switch, Rotate <b>ROS/OFF</b> Switch Fully Counterclockwise <i>Response: OFF NORM</i> and <b>OS</b> 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) <b>OP:CLK!</b>	-
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**

	<i>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</i>	-
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 <b>ROS/OFF</b> Switch to <b>ROS</b> <i>Response: OS and OFF NORM Lamps Light, ACK Lamp Lights Momentarily</i>	-
2	Remove 39B Oscillator	DLP-537
3	Install 39B Oscillator	DLP-519
<i>CAUTION: Clock Chain of Oscillator Being Checked Must be Removed From Service And Then Powered Down</i>		
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 <b>ROS/OFF</b> Switch Fully Counterclockwise <i>Response: OFF NORM and OS Lamps Extinguish</i>	-

**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 <b>ROS/OFF</b> Switch to Normal Position <i>Response: OFF NORM and OS Lamps Extinguish</i>	-

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

	<i>CAUTION: Clock Chain Having Oscillator Checked Must Be Powered Down</i>	
1	Connect Oscillator Manual Adjustment Unit to <b>J20</b> 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 <b>ROS/OFF</b> Switch Fully Counterclockwise <i>Response: OFF NORM and OS Lamps Extinguish</i>	-

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

1	On Clock Chain Power Switch, Rotate <b>ROS/OFF</b> Switch to <b>ROS</b> <i>Response: OS and OFF NORM Lamps Light, ACK Lamp Lights Momentarily</i>	-
2	Remove DRO Oscillator	DLP-545
3	Install DRO Oscillator	DLP-541
<i>CAUTION: Clock Chain of Oscillator Being Checked Must be Removed From Service And Then Powered Down</i>		
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 <b>ROS/OFF</b> Switch Fully Counterclockwise <i>Response: OFF NORM and OS Lamps Extinguish</i>	-

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

	<i>CAUTION: Clock Chain Having Oscillator Checked Must Be Powered Down</i>	
1	Connect Oscillator Manual Adjustment Unit to <b>J20</b> 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 <b>ROS/OFF</b> Switch Fully Counterclockwise <i>Response: OFF NORM and OS Lamps Extinguish</i>	—

## 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 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

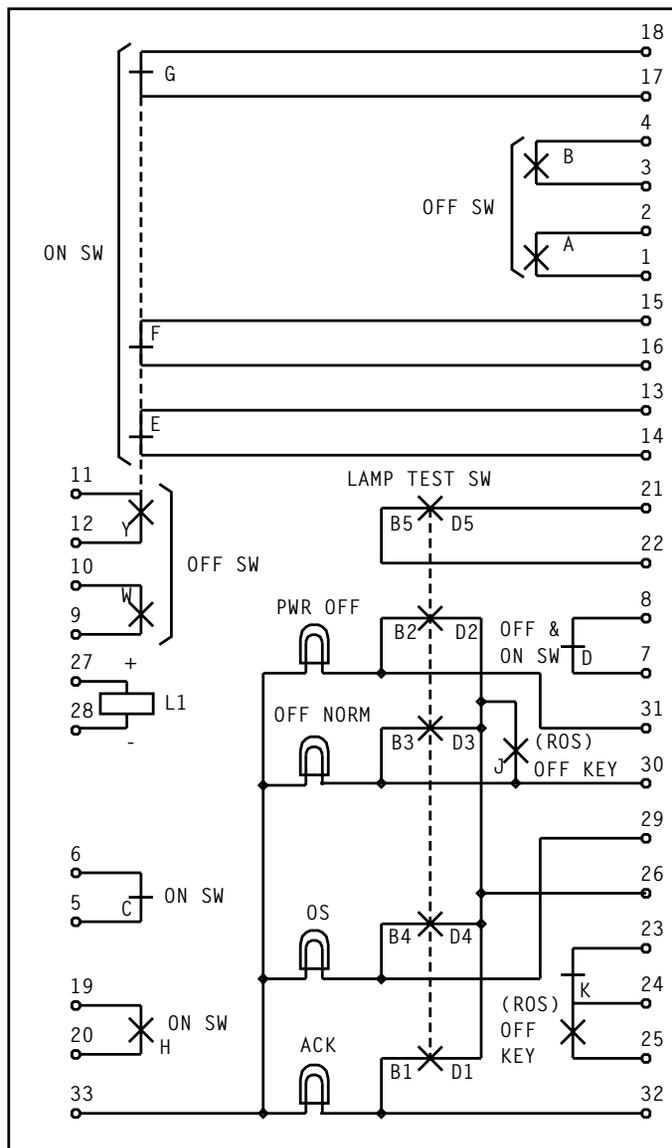
additional knowledge and skill in the setup and use of test equipment (oscilloscopes, voltmeters, etc.).

#### 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 can be used to 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**

Issue 2	SEP 1998
234-351-013	TAD
PAGE 1 of 1	<b>101</b>

[1] See CAUTIONS 1 and 2.  
Identify first pack on TLP list located in suspect clock chain

[2] Replace pack [DLP-500]

AND

[3] Is diagnostic result ATP

Yes

[4] If chain was removed from service with TTY message, enter  
RST:NCLK 0,CHAIN a!  
a = ATP chain  
(Response:  
RST:NCLK 0 CHAIN a COMPL)

No

[5] Have all packs on TLP list, located in clock chain, been replaced

Yes

[9] Which equipment is indicated as being suspect in CODE column 9 of TLP listing

Meter

[10] Clear diagnostic failure by analyzing raw data [TAP-105]

Packs only

Page 2

OSC

[11] Clear phase error in oscillator  
-39B osc. [TAP-134]  
-DRO osc. [TAP-142]

No

[6] Replace original pack [DLP-500]

AND

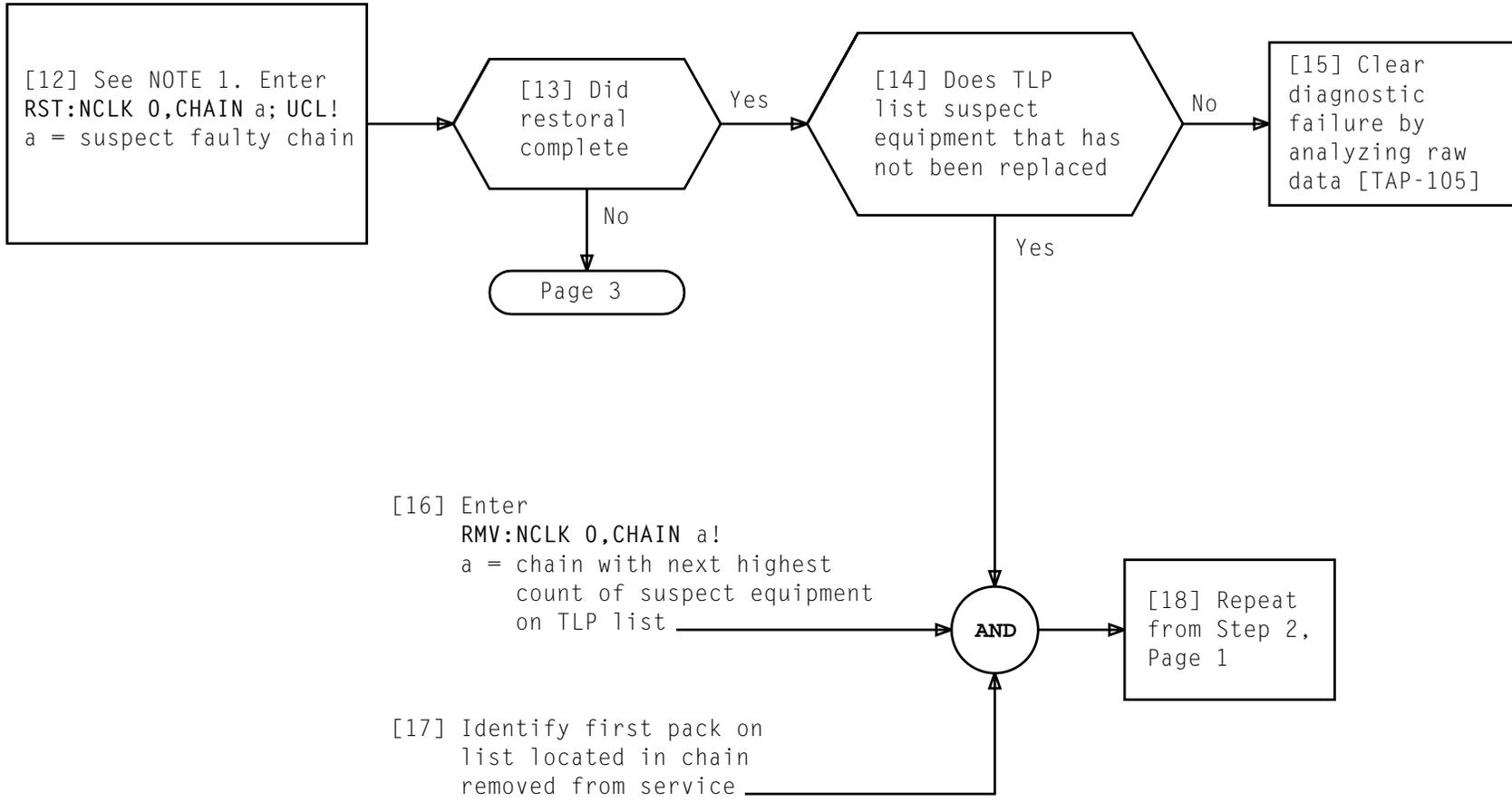
[8] Repeat from Step 2

[7] Identify next listed pack in suspect faulty chain

**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**



NOTE 1	
Ensure chain is powered up before restoring chain unconditionally	
Issue 2	SEP 1998
234-351-013	TAP
PAGE 2 of 3	102

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

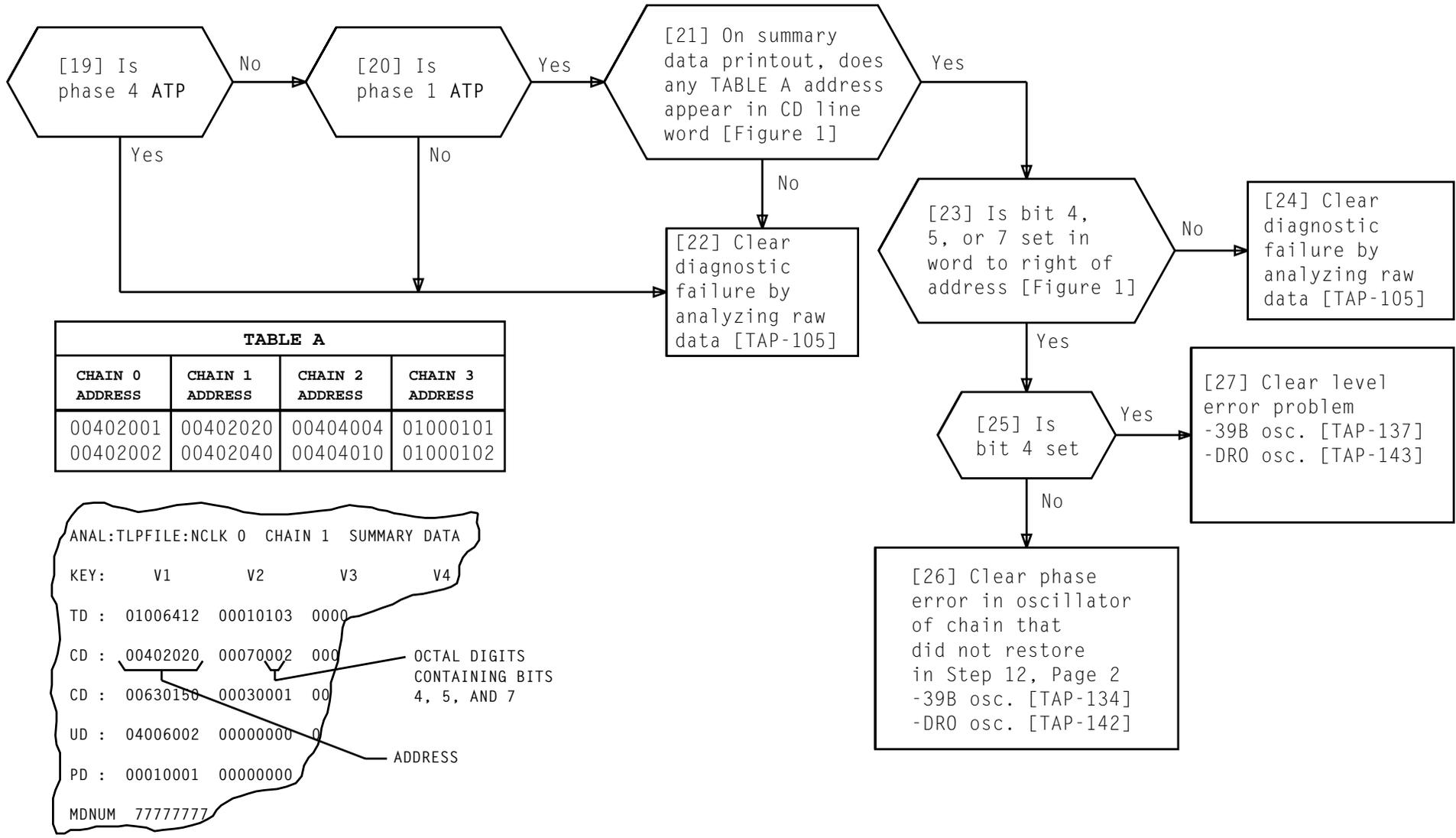


TABLE A			
CHAIN 0 ADDRESS	CHAIN 1 ADDRESS	CHAIN 2 ADDRESS	CHAIN 3 ADDRESS
00402001	00402020	00404004	01000101
00402002	00402040	00404010	01000102

```

ANAL:TLPFILE:NCLK 0 CHAIN 1 SUMMARY DATA
KEY:   V1      V2      V3      V4
TD : 01006412 00010103 0000
CD : 00402020 00070002 0000
CD : 00630150 00030001 0000
UD : 04006002 00000000 0000
PD : 00010001 00000000
MDNUM 77777777
  
```

OCTAL DIGITS CONTAINING BITS 4, 5, AND 7

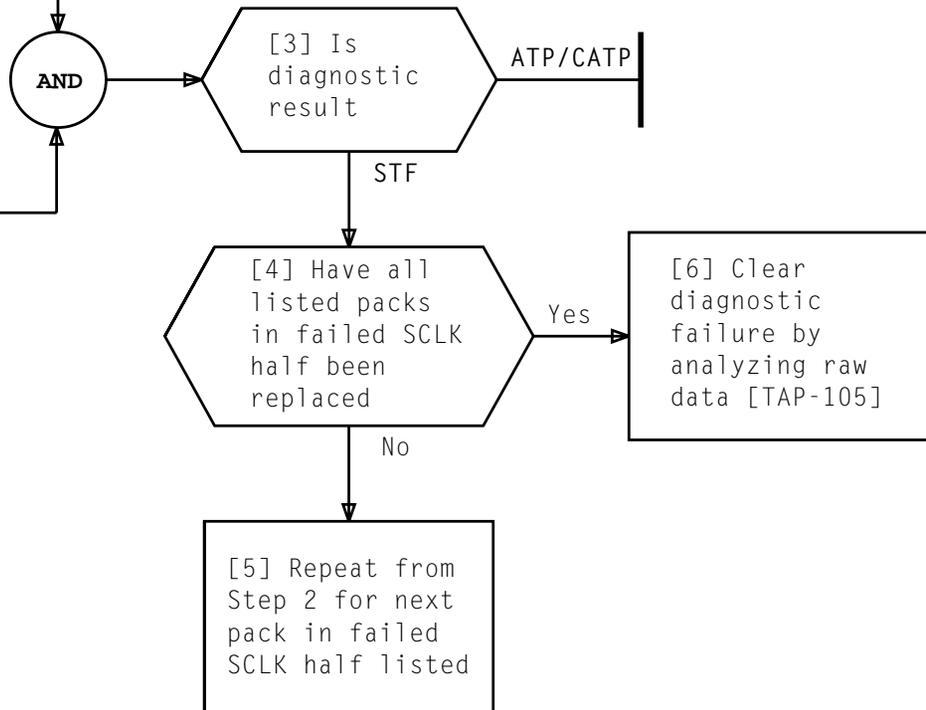
ADDRESS

Figure 1 - Summary Data

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

[1] See CAUTION 1. Identify first pack on TLP list located in failed SCLK half

[2] Replace pack [DLP-500]



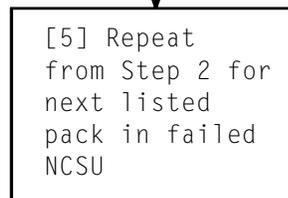
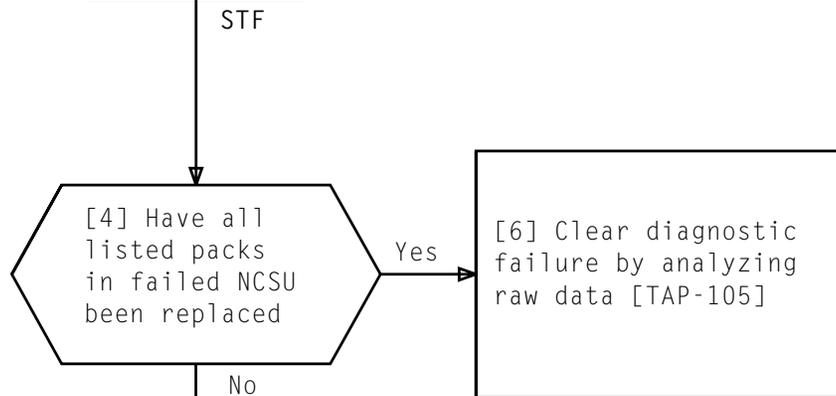
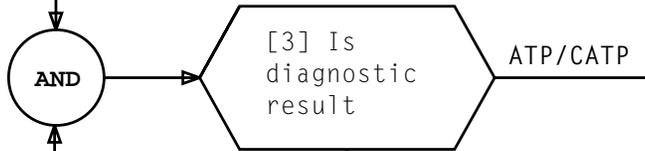
**CAUTION 1**  
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** switch) before working on any network clock problem

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 1	103

### CLEAR DIAGNOSTIC FAILURE USING TLP SUSPECT PACK LIST, SCLK

[1] See CAUTION 1. Identify first pack on TLP list located in failed NCSU

[2] Replace pack [DLP-500]



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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 1	<b>104</b>

**CLEAR DIAGNOSTIC FAILURE USING TLP SUSPECT PACK LIST, NCSU**

<p><b>SUMMARY</b></p> <p>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</p>	<p>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</p>
---	---

[1] See CAUTION 1. Obtain diagnostic PIDENT for first failing phase and read prologue [TABLE A]

[2] See Figure 1, Page 2. On raw data printout, locate first failing test raw data

[3] Locate sixth digit in fifth data word following mismatch data

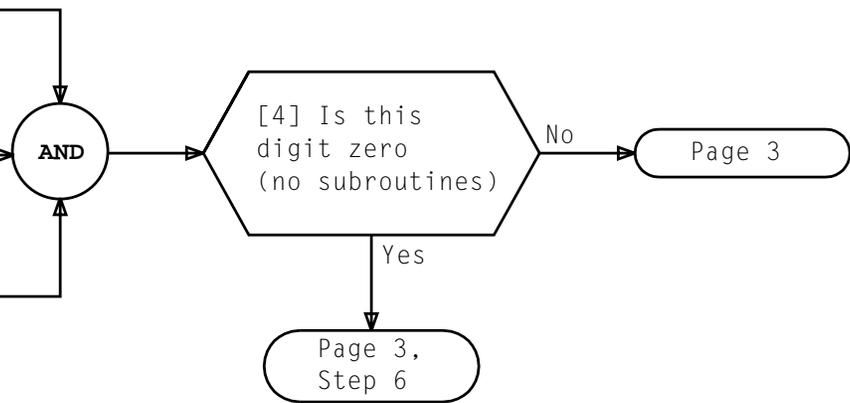


TABLE A DIAGNOSTIC DOCUMENTATION	
NETWORK CLOCK	NCLK SYNCHRONIZATION UNIT
PR number=4A504 + phase number PIDENT is PUDGNCXX (XX = phase number) Subroutines in PUDGNCHI (4A504)	PR numbers - phase number 4A420 - 1 4A419 - 2 4A418 - 3 4A417 - 4 4A421 - 5 4A465 - 6 4A466 - 7 4A452 - 8
SYSTEM CLOCK	
PR number=4A517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

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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 6	<b>105</b>

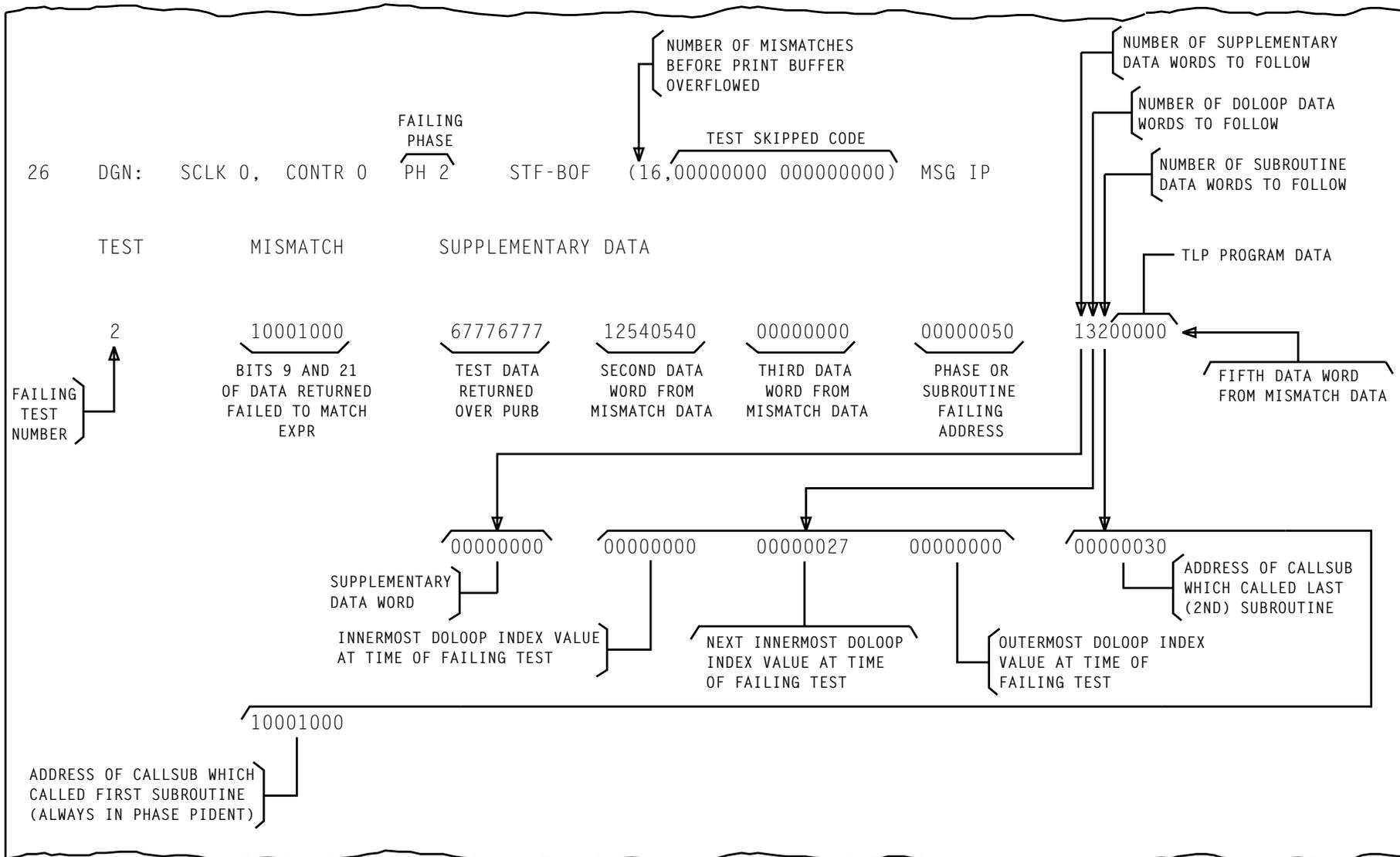


Figure 1 - Example of SCLK Raw Data Printout

Issue 2	SEP 1998
234-351-013	TAP
PAGE 2 of 6	105

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

Figure 2 - Example of PUMACRO DIAL Statement

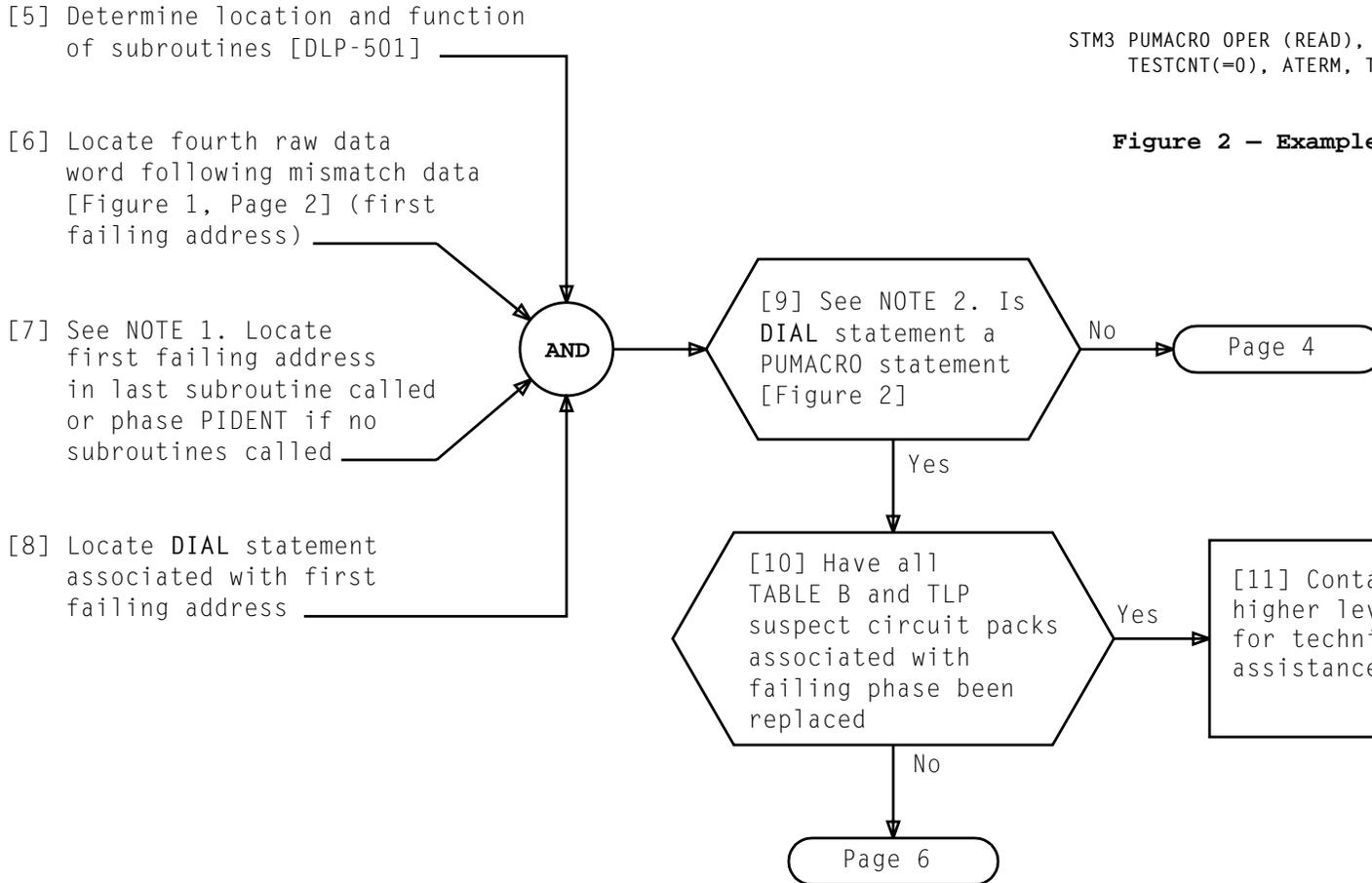


TABLE B NCSU DIAGNOSTIC PHASES CONTAINING A PUMACRO DIAL STATEMENT		
FAILING PHASE	CIRCUIT PACK ASSOCIATED WITH FAILING PHASE	CIRCUIT PACK LOCATION
6	FG55, 57, 61, 62, 63, 73	048-40, 42, 63, 59, 52, 49
7	FG61, 62, 64, 65	048-63, 59, 65, 67
8	FG60, 63, 64, 75	048-55, 52, 65, 57

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

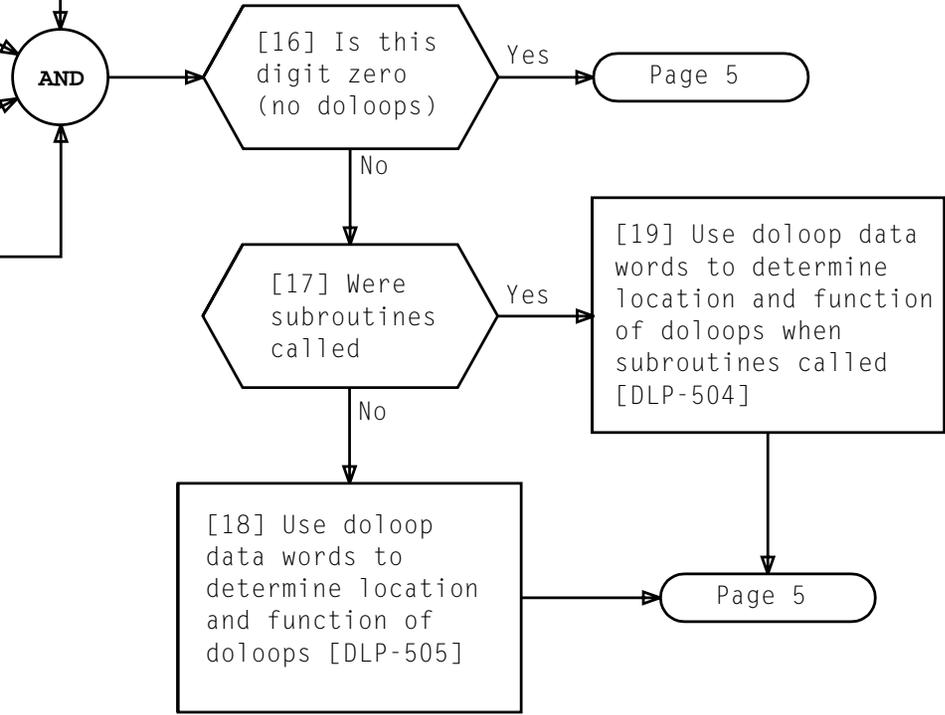
Issue 2	SEP 1998
234-351-013	TAP
PAGE 3 of 6	105

[12] See NOTE 3.  
 Read prologue of program  
 unit containing first  
 failing test

[13] Analyze failing test data  
 to determine failing test  
 function [DLP-502]

[14] On raw data printout, locate  
 fifth word from mismatch  
 data [Figure 1, Page 2]

[15] Locate seventh digit in  
 fifth data word



NOTE 3	
Program unit name is indicated in upper left of each listing page	
Issue 2	SEP 1998
234-351-013	TAP
PAGE 4 of 6	105

**CLEAR DIAGNOSTIC FAILURE BY ANALYZING RAW DATA**

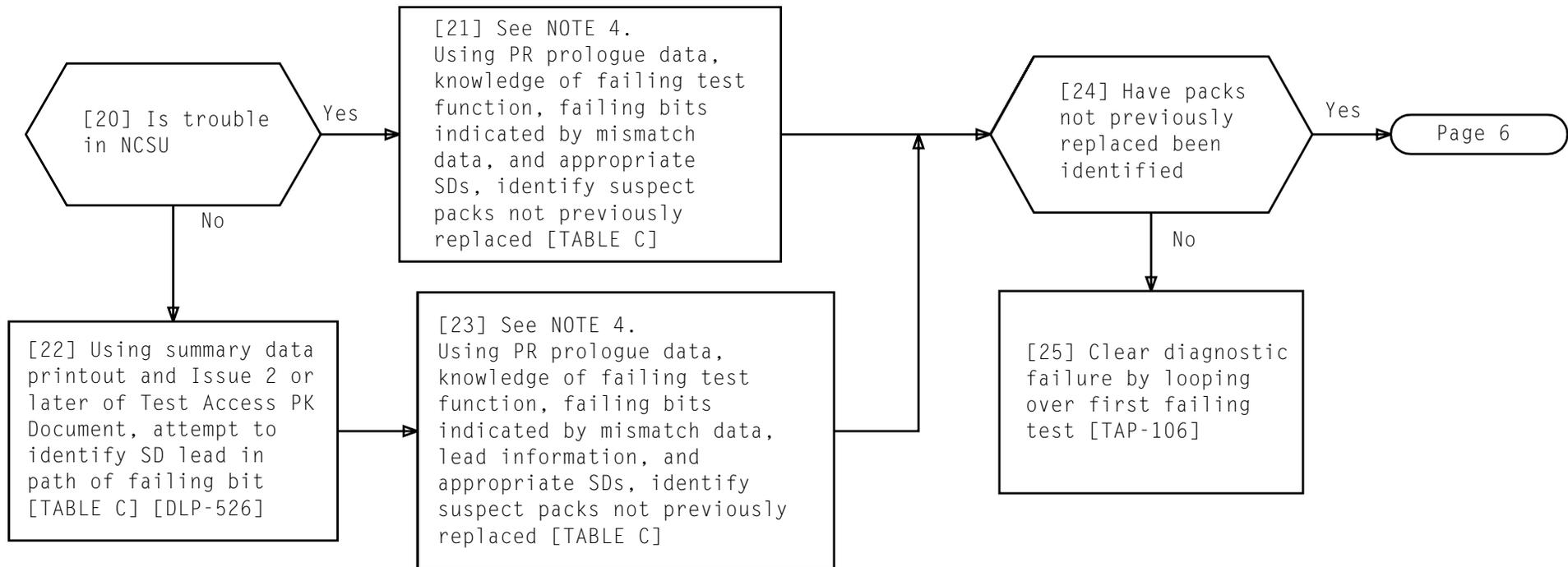


TABLE C UNIT DOCUMENTATION		
UNIT	SD/CD	PK
NCLK	4A014-02	4A014-01
SCLK	4A037-02	4A037-02
NCSU	4A105-01	—

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	
Issue 2	SEP 1998
234-351-013	TAP
PAGE 5 of 6	105

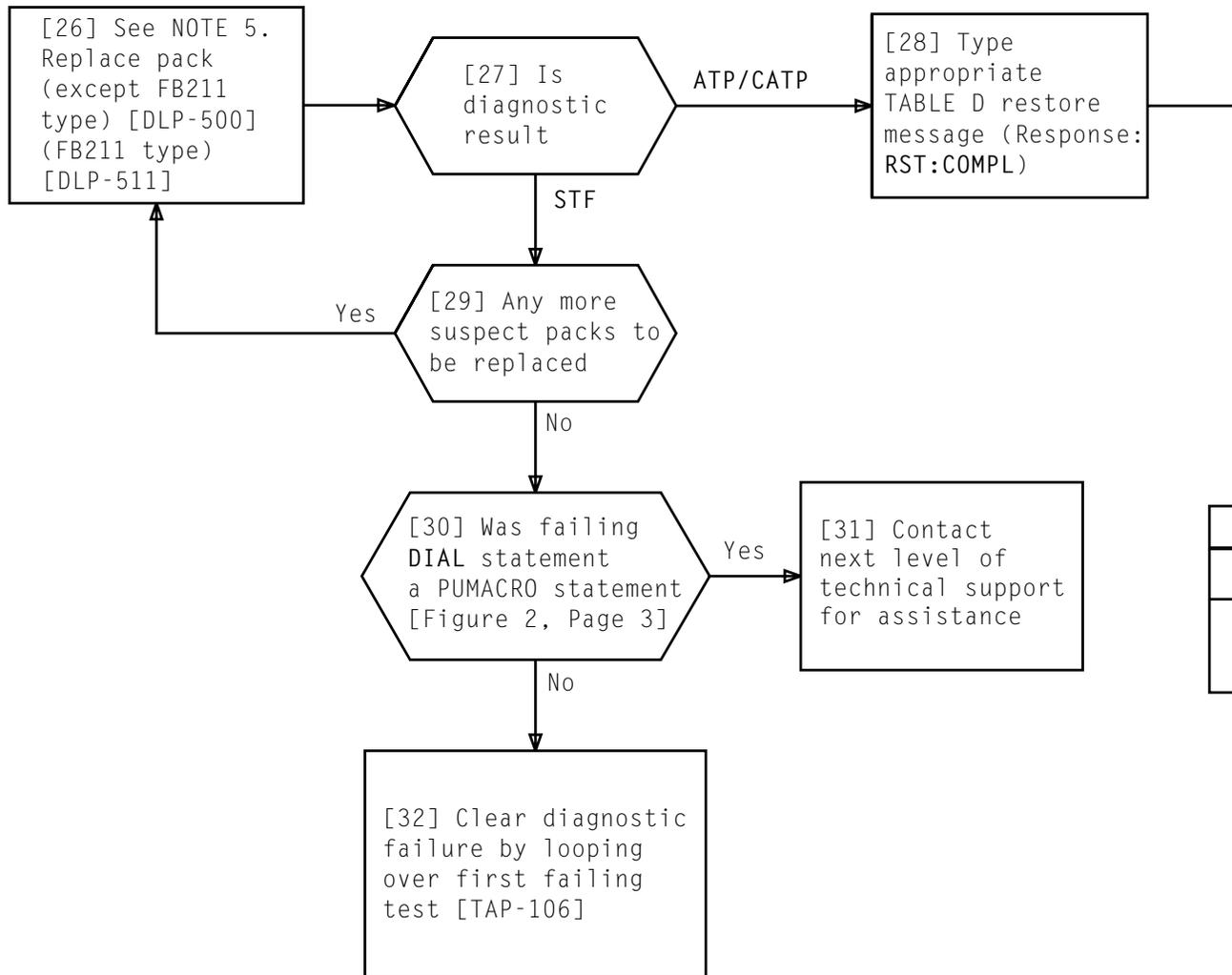


TABLE D	
RST:NCLK 0,CHAIN a!	
RST:SCLK 0, {IPUB b CONTR c NCSU 0}!	

NOTE 5 Red designation marker at pack indicates fuse removal required to replace packs	
Issue 2	SEP 1998
234-351-013	TAP
PAGE 6 of 6	105

<p style="text-align: center;">SUMMARY</p> <p>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</p>	<p>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</p>
--	--

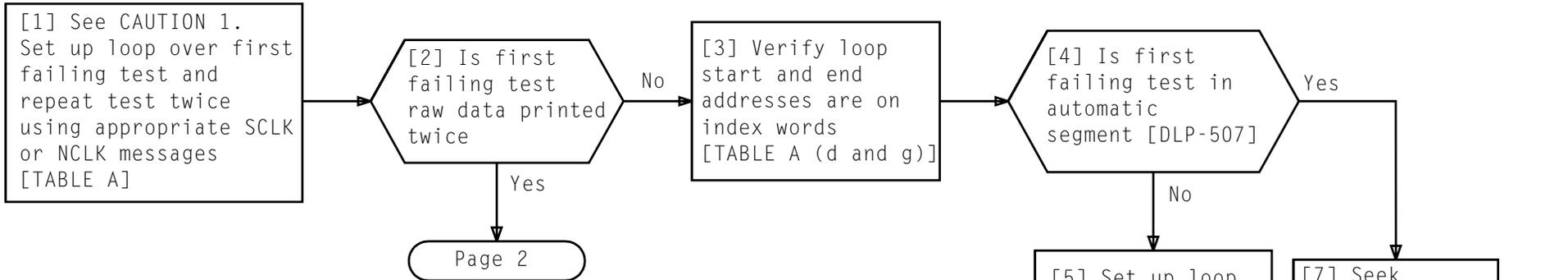


TABLE A - MESSAGES TO ESTABLISH LOOP	
Enter a or b messages:	
1a. EX:SCLK 0, {CONTR a IPUB b NCSU 0};START!	Response:SUSPENDED
1b. EX:NCLK 0,CHAIN c; START!	
2a. EX:SCLK 0:[SYNC d],ENABLE e!	Response:SUSPENDED
2b. EX:NCLK 0:[SYNC d],ENABLE e!	
3a. EX:SCLK 0;RPT 2:PH f,ADR d-g!	Response:(raw data)
3b.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

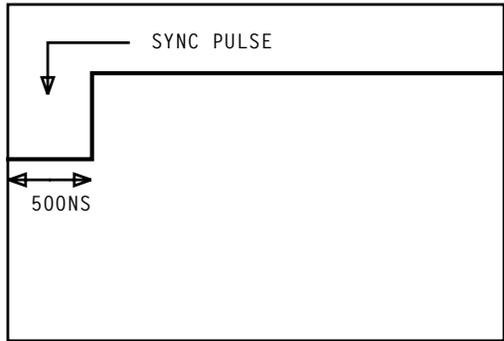
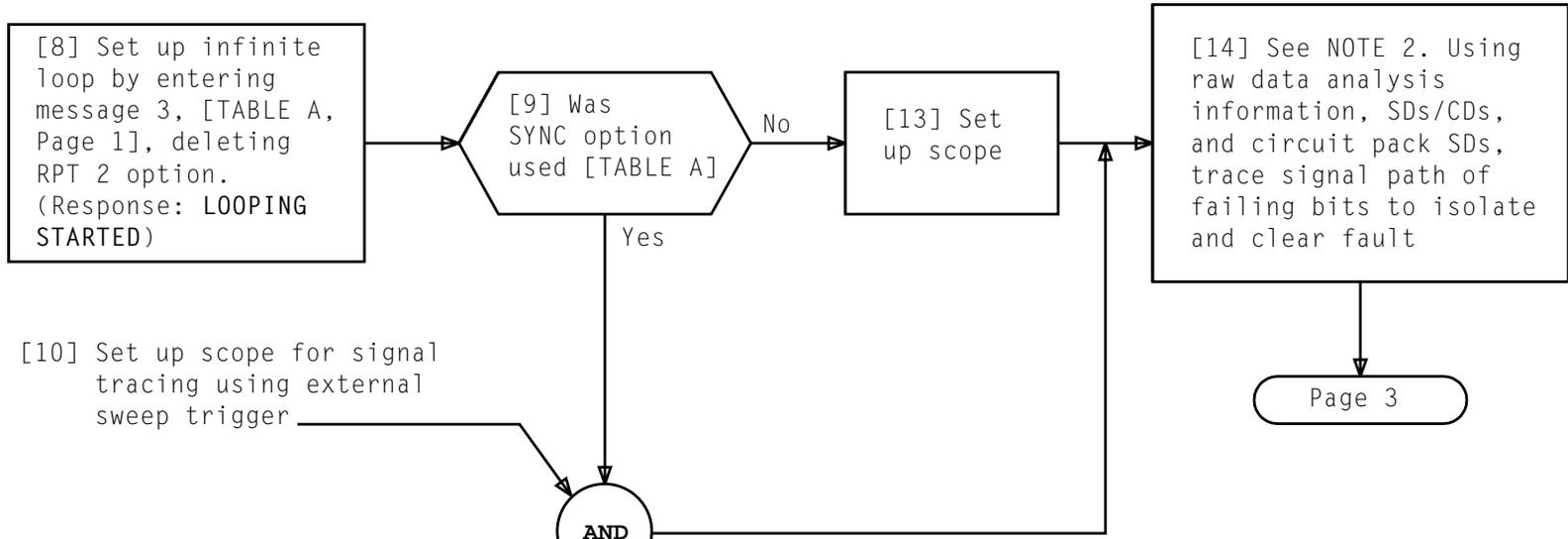


Figure 1 - SYNC Pulse Display

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	
Issue 2	SEP 1998
234-351-013	TAP
PAGE 2 of 3	106

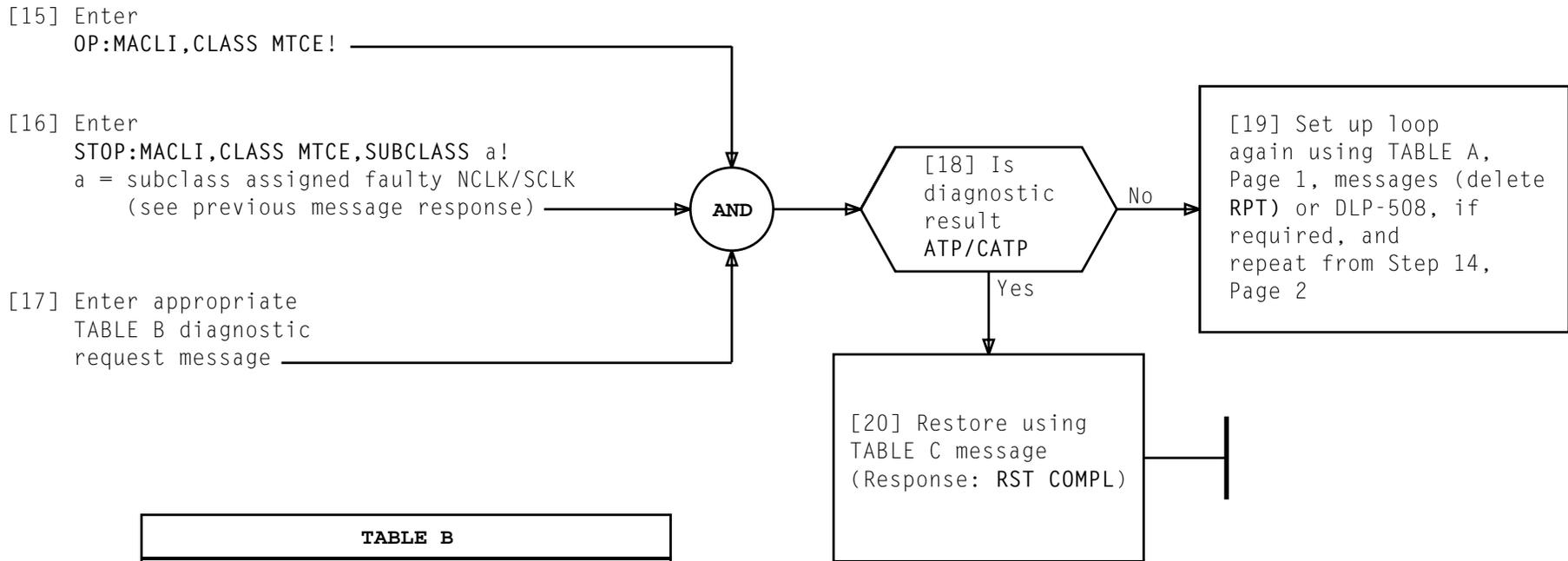
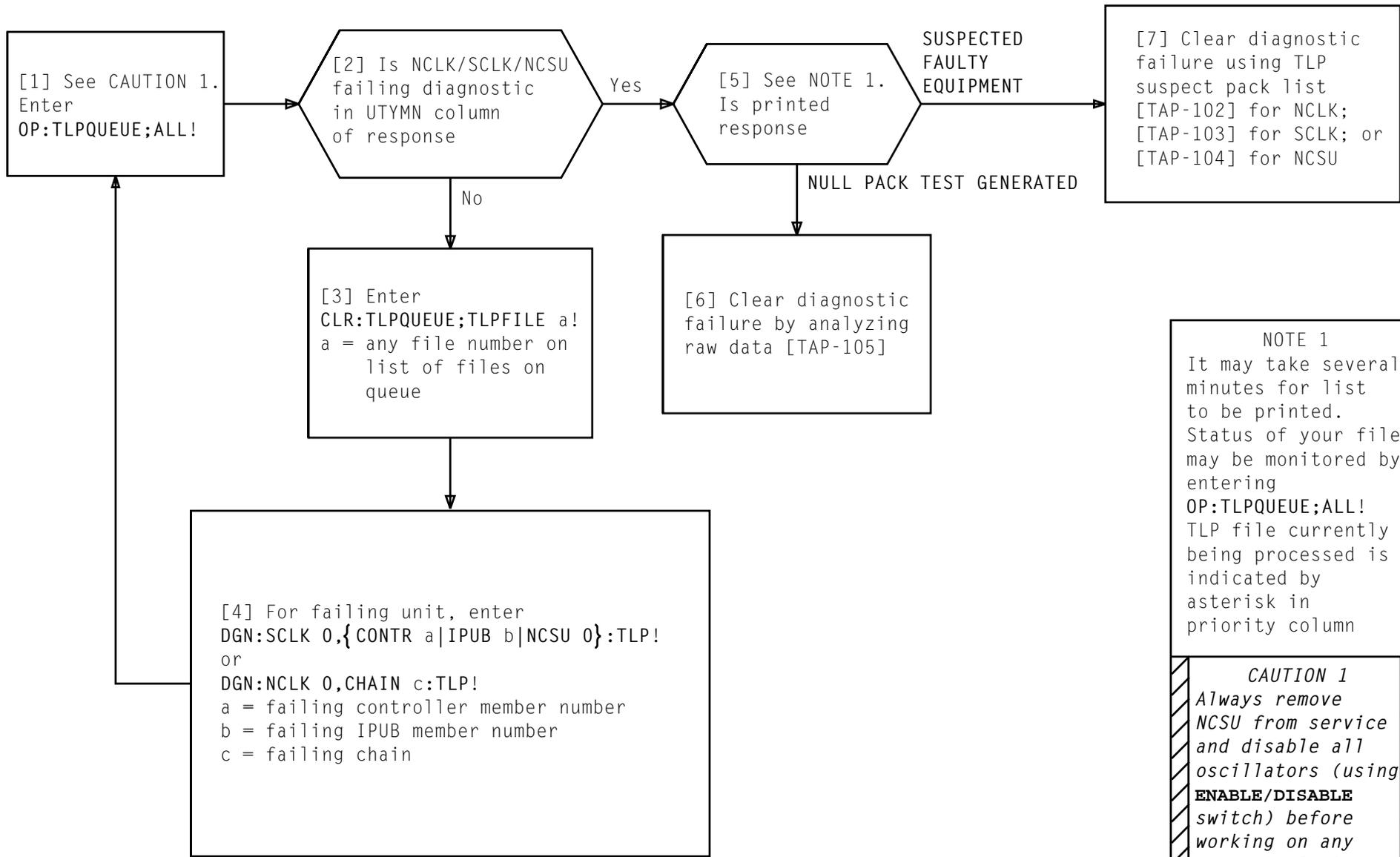


TABLE B
DGN:NCLK 0,CHAIN a!
DGN:SCLK 0, {CONTR b IPUB c NCSU 0}!

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

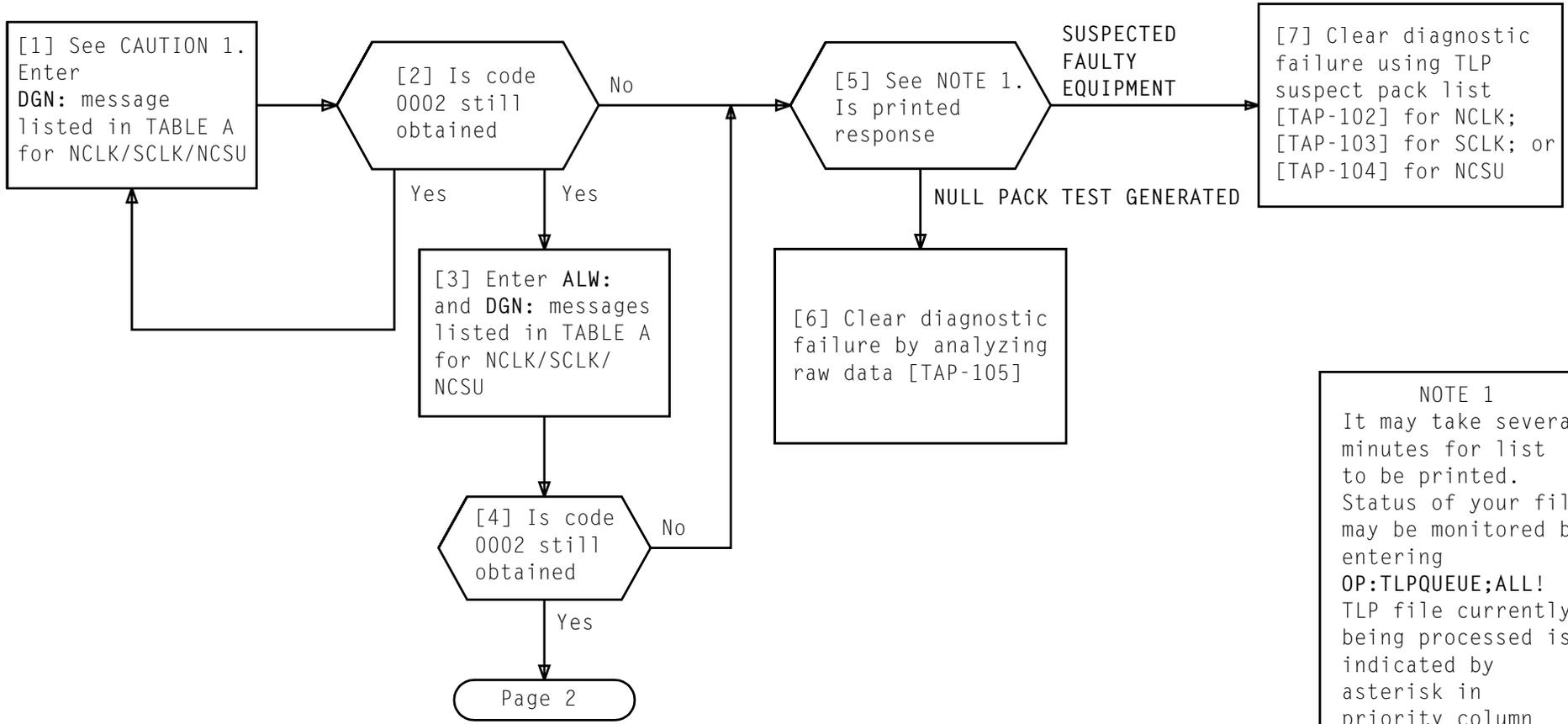
Issue 2	SEP 1998
234-351-013	TAP
PAGE 3 of 3	106



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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 1	107



**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

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

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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 2	108

**CLEAR DIAGNOSTIC FAILURE, TLP QUEUE BLOCKAGE**

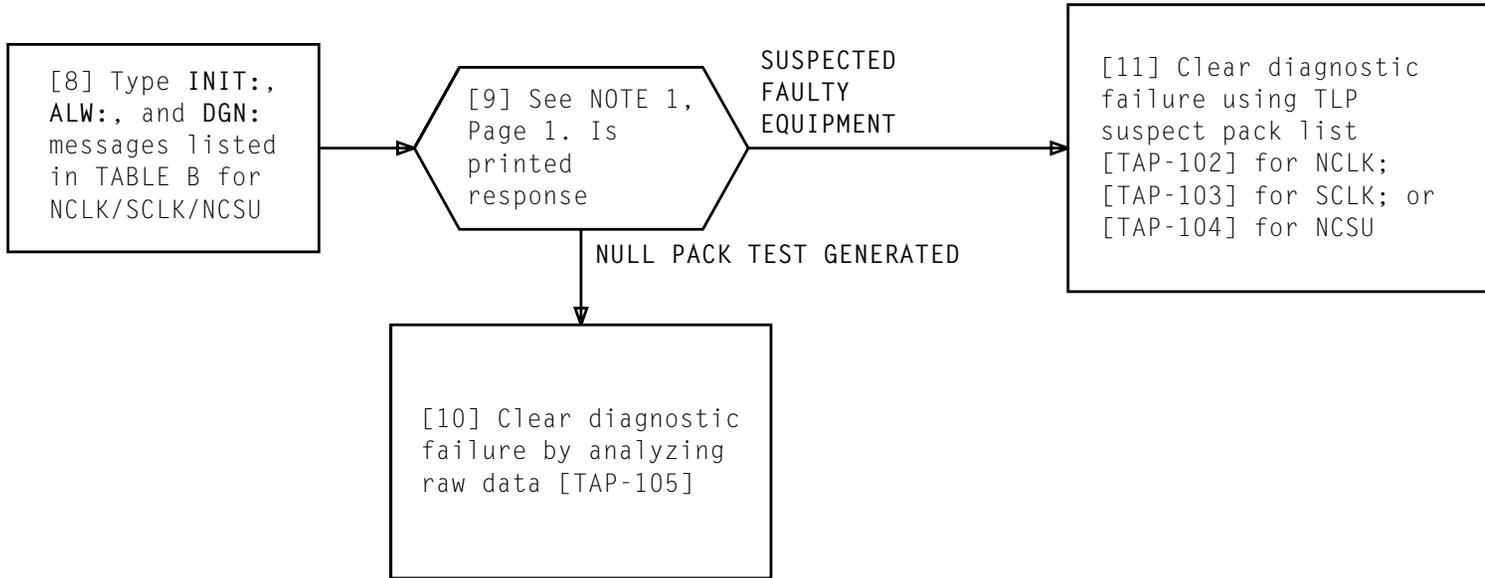
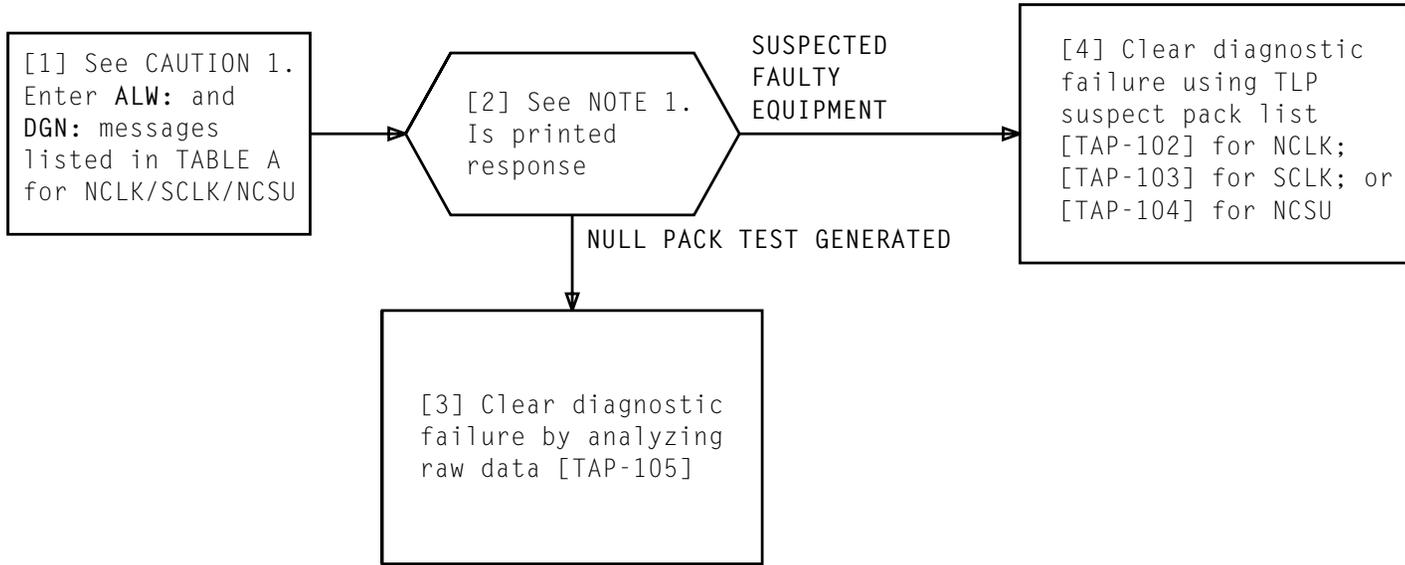


TABLE B
INIT:TLP!
ALW:TLP:SCLK! or ALW:TLP:NCLK!
DGN:SCLK 0, {CONTR a IPUB b NCSU 0}! or DGN:NCLK 0,CHAIN c:TLP!
a = failing controller b = failing IPUB c = failing chain



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*

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 1	<b>109</b>

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

[1] See CAUTION 1. For failing unit, enter appropriate TABLE A  
DGN: message

[2] Did TLP abort message reoccur

Yes

[3] Clear diagnostic failure by analyzing raw data [TAP-105]

No

[4] See NOTE 1. Is printed response

SUSPECTED FAULTY EQUIPMENT

[6] Clear diagnostic failure using TLP suspect pack list [TAP-102] for NCLK; [TAP-103] for SCLK; or [TAP-104] for NCSU

NULL PACK TEST GENERATED

[5] Clear diagnostic failure by analyzing raw data [TAP-105]

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

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

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

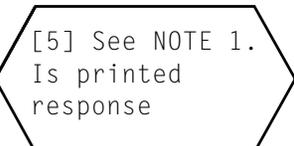
Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 1	110

[1] See CAUTION 1. If TLP tape being used is not correct issue for this generic, obtain correct TLP tape

[2] Demount tape [DLP-510]

[3] Mount correct tape [DLP-506]

[4] Enter TABLE A SET:, ALW:, and DGN: messages for NCLK/SCLK/NCSU



[6] Clear diagnostic failure by analyzing raw data [TAP-105]

SUSPECTED FAULTY EQUIPMENT

[7] Clear diagnostic failure using TLP suspect pack list [TAP-102] for NCLK; [TAP-103] for SCLK; or [TAP-104] for NCSU

**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

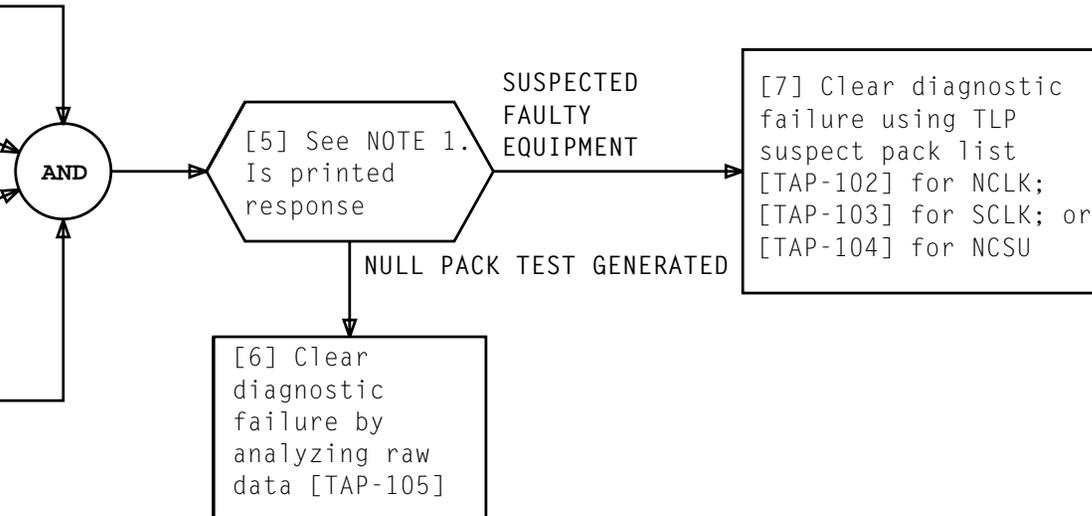
**CLEAR DIAGNOSTIC FAILURE, TLP TAPE VERSION X DOES NOT MATCH VERSION Y**

[1] See CAUTION 1. If TLP tape being used does not contain NCLK/SCLK/NCSU data file, obtain correct TLP tape

[2] Demount tape [DLP-510]

[3] Mount correct tape [DLP-506]

[4] Enter TABLE A SET:, ALW:, and DGN: messages for NCLK/SCLK/NCSU



**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

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

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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 1	112

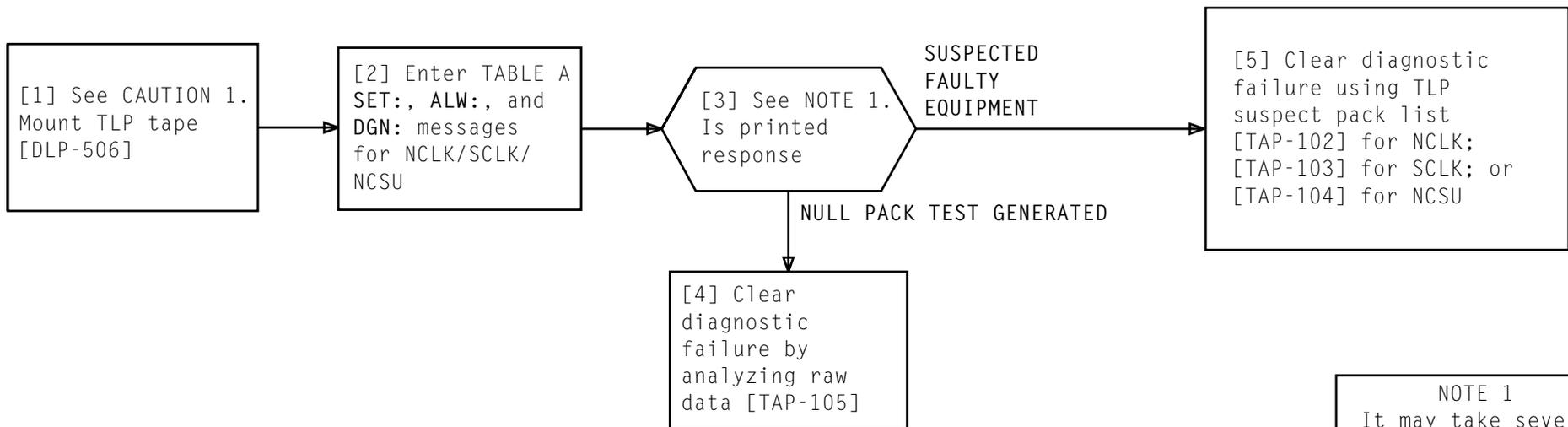


TABLE A
SET:TUC a;FUNCTION TLP!
ALW:TUC a:RO!
ALW:TLP:SRCH,SCLK! or ALW:TLP:SRCH,NCLK!
DGN:SCLK 0,{CONTR b IPUB c NCSU 0}:TLP! or DGN:NCLK 0,CHAIN d:TLP!
a = member number of TUC with TLP tape mounted b = failing controller member number c = failing IPUB member number d = failing chain

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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 1	113

[1] See CAUTION 1.  
Enter  
ALW:TLP:SRCH!

[2] For failing unit, type  
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

[3] Is printed  
response  
[NOTE 1]

SUSPECTED  
FAULTY  
EQUIPMENT

[5] Clear diagnostic  
failure by using  
TLP suspect pack list  
[TAP-102] for NCLK;  
[TAP-103] for SCLK; or  
[TAP-104] for NCSU

NULL PACK  
TEST GENERATED

[4] Clear diagnostic  
failure by analyzing  
raw data [TAP-105]

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

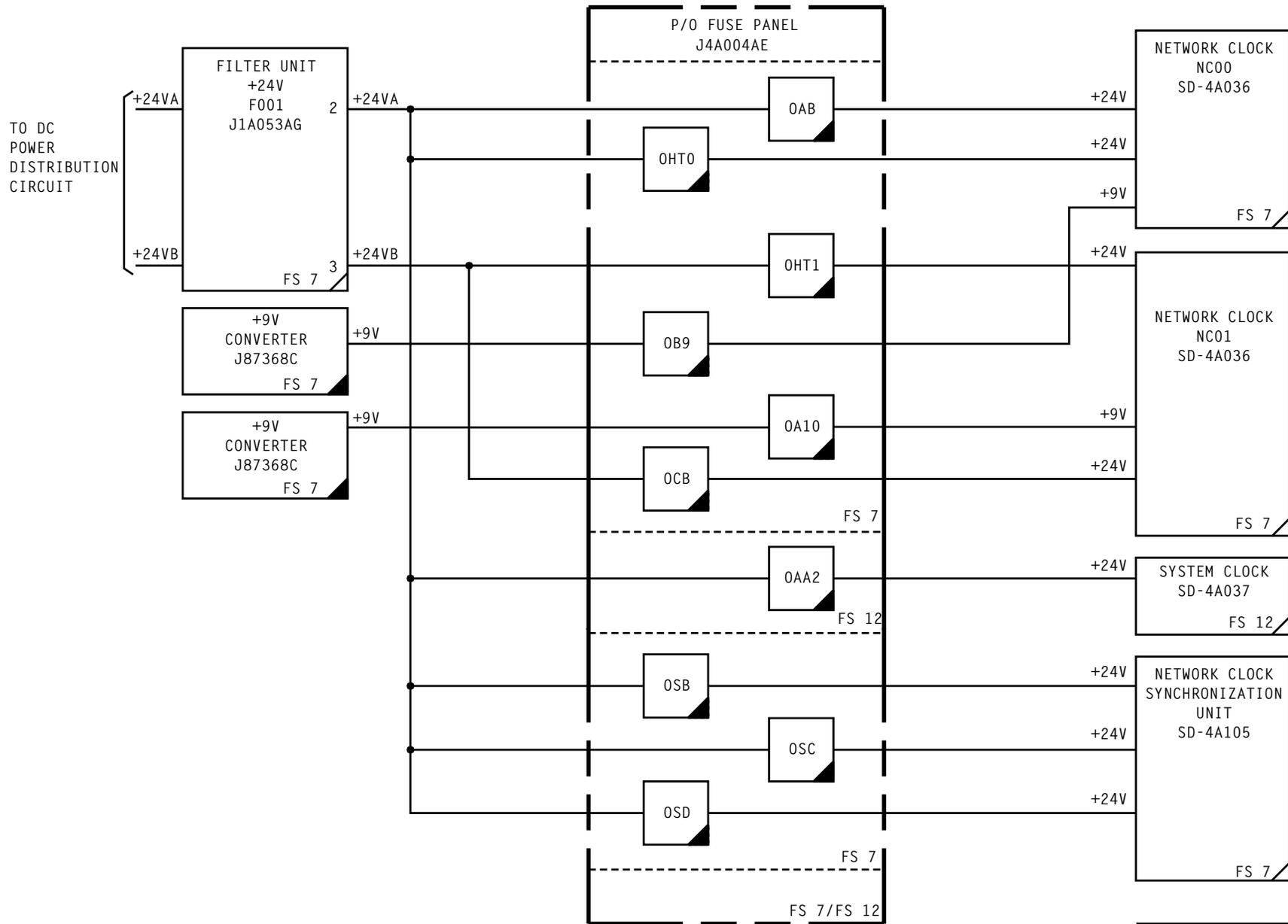
**CAUTION 1**  
*Always remove  
NCSU from service  
and disable all  
oscillators (using  
ENABLE/DISABLE  
switch) before  
working on any  
network clock  
problem*

Issue 2 | SEP 1998

234-351-013 | TAP

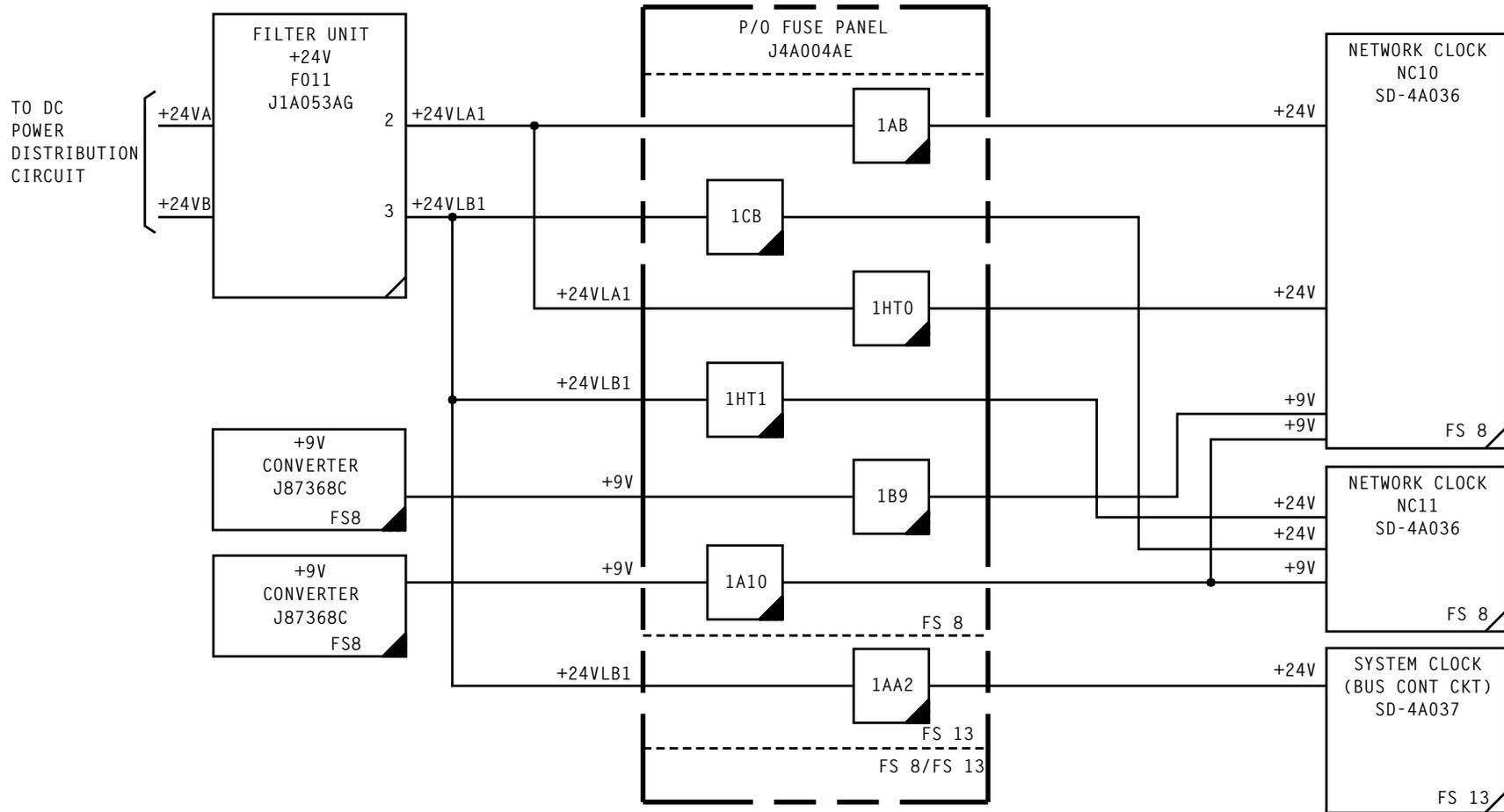
PAGE 1 of 1 | 114

**CLEAR DIAGNOSTIC FAILURE, ALL PENDING TLP SEARCHES INHIBITED**



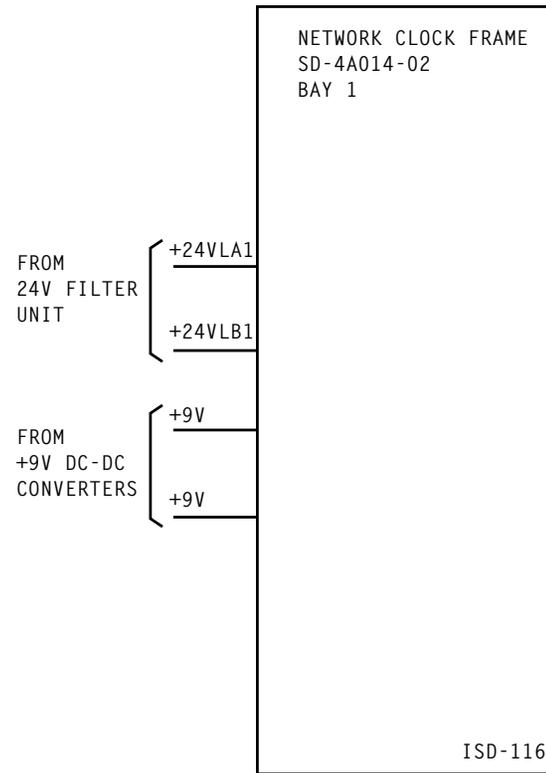
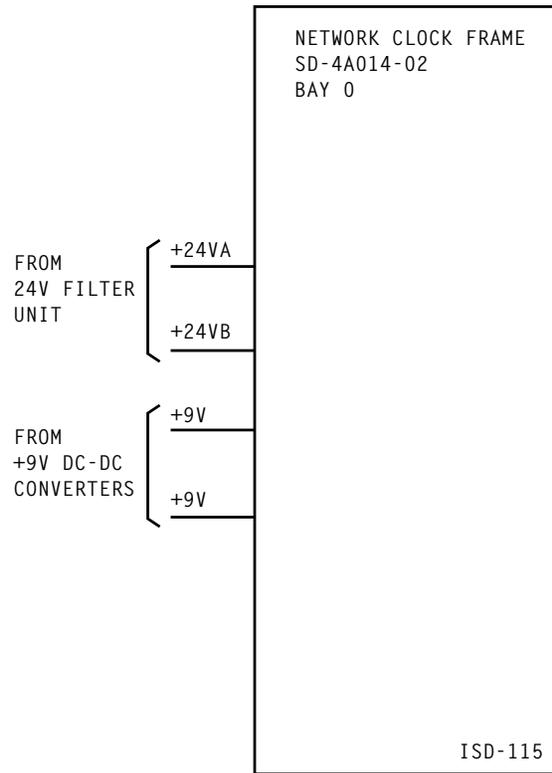
**+9 AND +24 VOLT FRAME DISTRIBUTION SD-4A014-02, BAY 0**

Issue 2	SEP 1998
234-351-013	ISD
PAGE 1 of 1	<b>115</b>



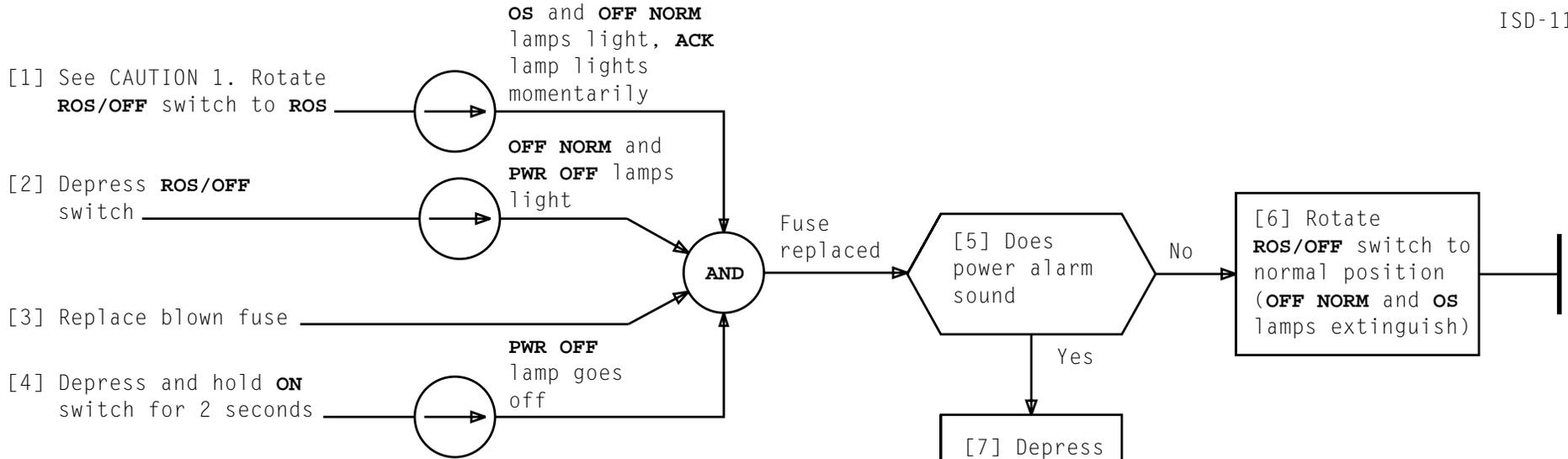
**+9 AND +24 VOLT FRAME DISTRIBUTION SD-4A014-02, BAY 1**

Issue 2	SEP 1998
234-351-013	ISD
PAGE 1 of 1	<b>116</b>



**+9 AND +24 VOLT FRAME DISTRIBUTION**

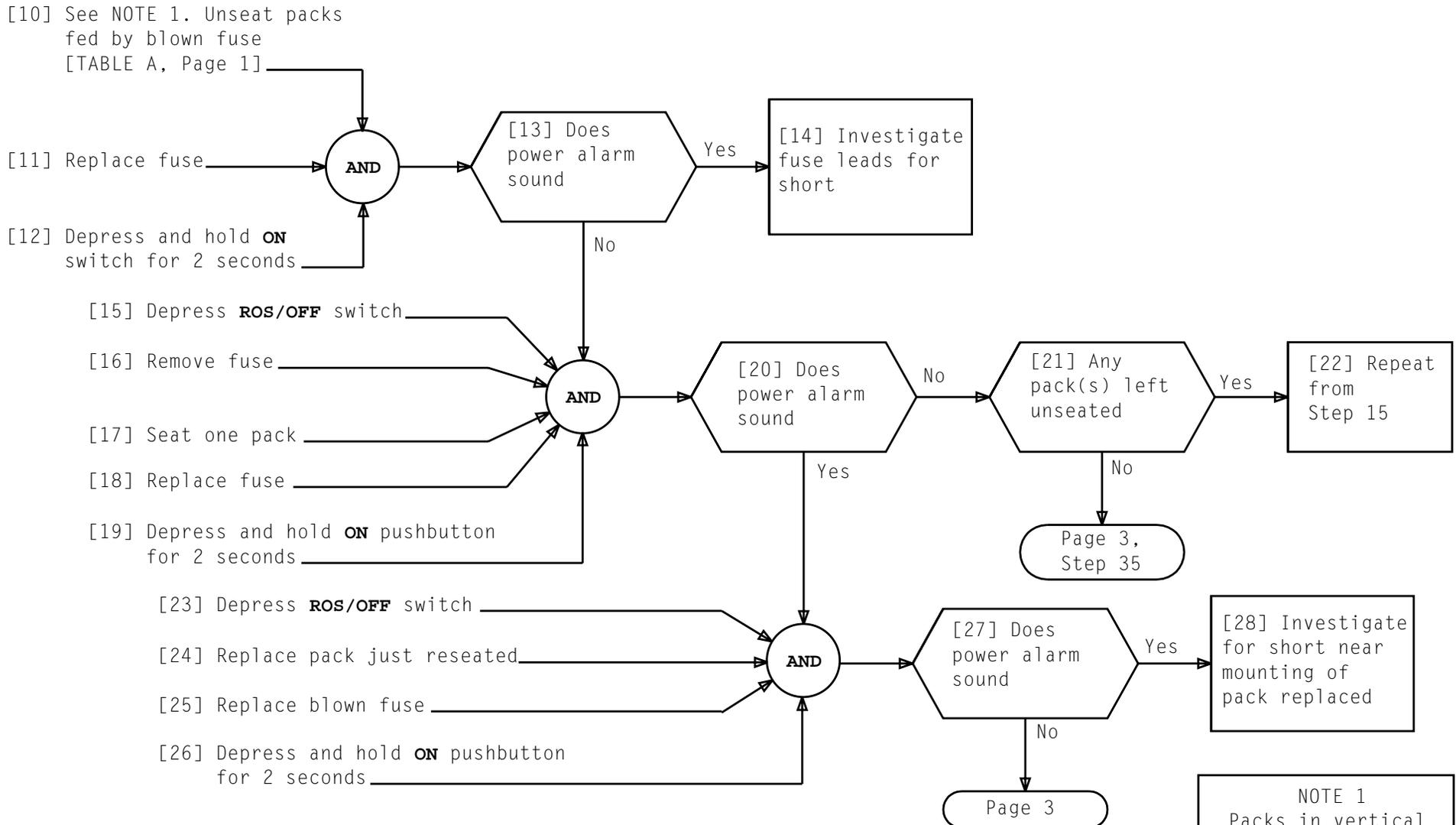
Issue 2	SEP 1998
234-351-013	ISD
PAGE 1 of 1	<b>117</b>



FUSE BAY 0	PACKS FED AT LOCATION	FUSE BAY 1	PACKS FED AT LOCATION
OAB	0-78-03	1AB	1-78-03
OHT0*	0-78-20	1HT0*	1-78-20
	0-66-31		1-66-31
OHT1*	0-66-34	1HT1*	1-66-34
	0-78-52		1-78-52
OB9*	0-66-37	1B9*	1-66-37
	0-66-40		1-66-40
OBA10*	0-66-33	1BA10*	1-66-33
OCB	0-66-39	1CB	1-66-39
OAA2	0-78-68	1AA2	1-78-68
OSB	0-56-52	-	-
	0-50-25		
OSC	0-50-27	-	-
	0-50-25		
OSD	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

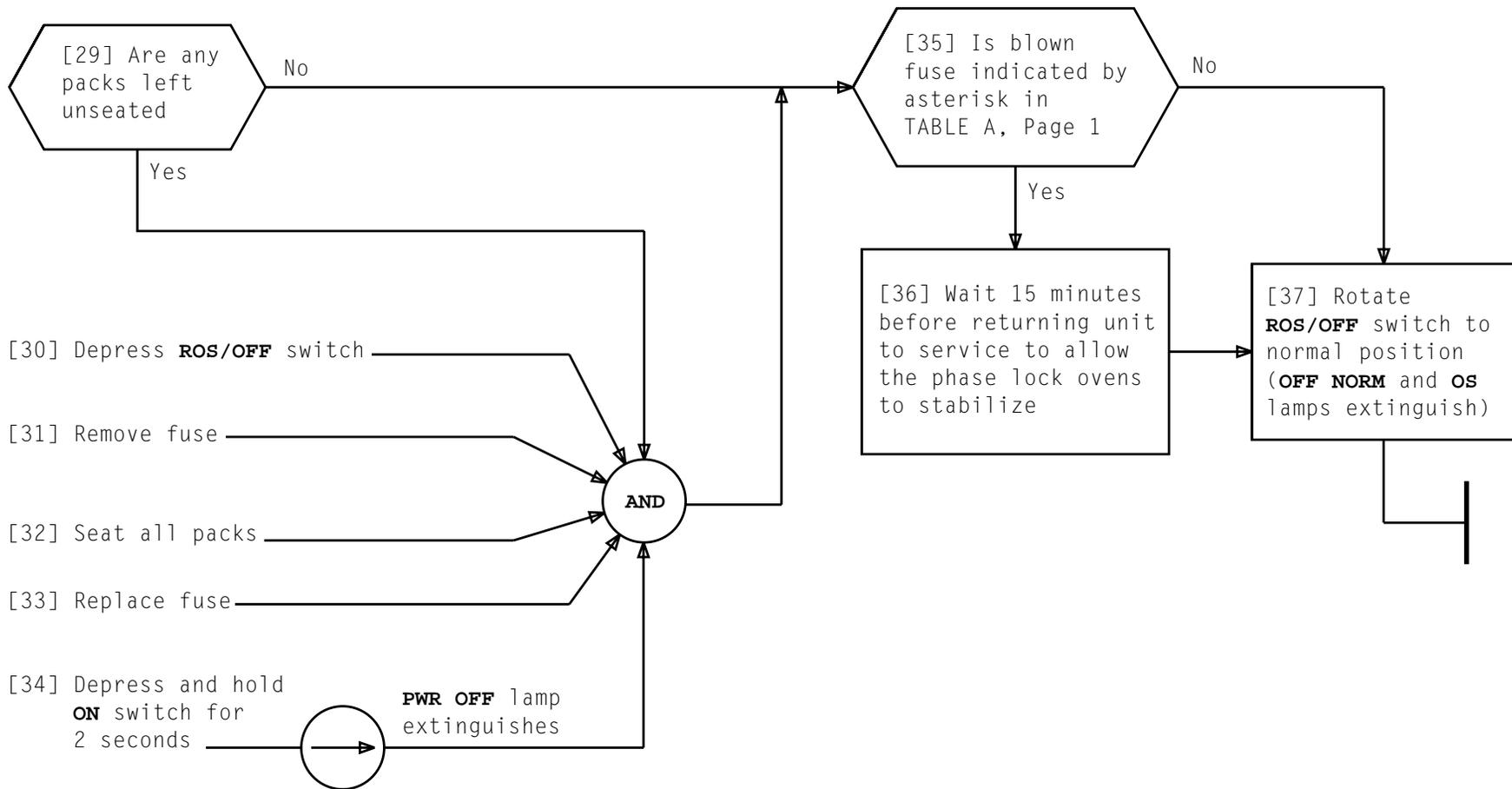
**CLEAR BLOWN FUSE, NOT A1-A9 OR B1-B8 (+9 AND +24 VOLT DISTRIBUTION)**



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

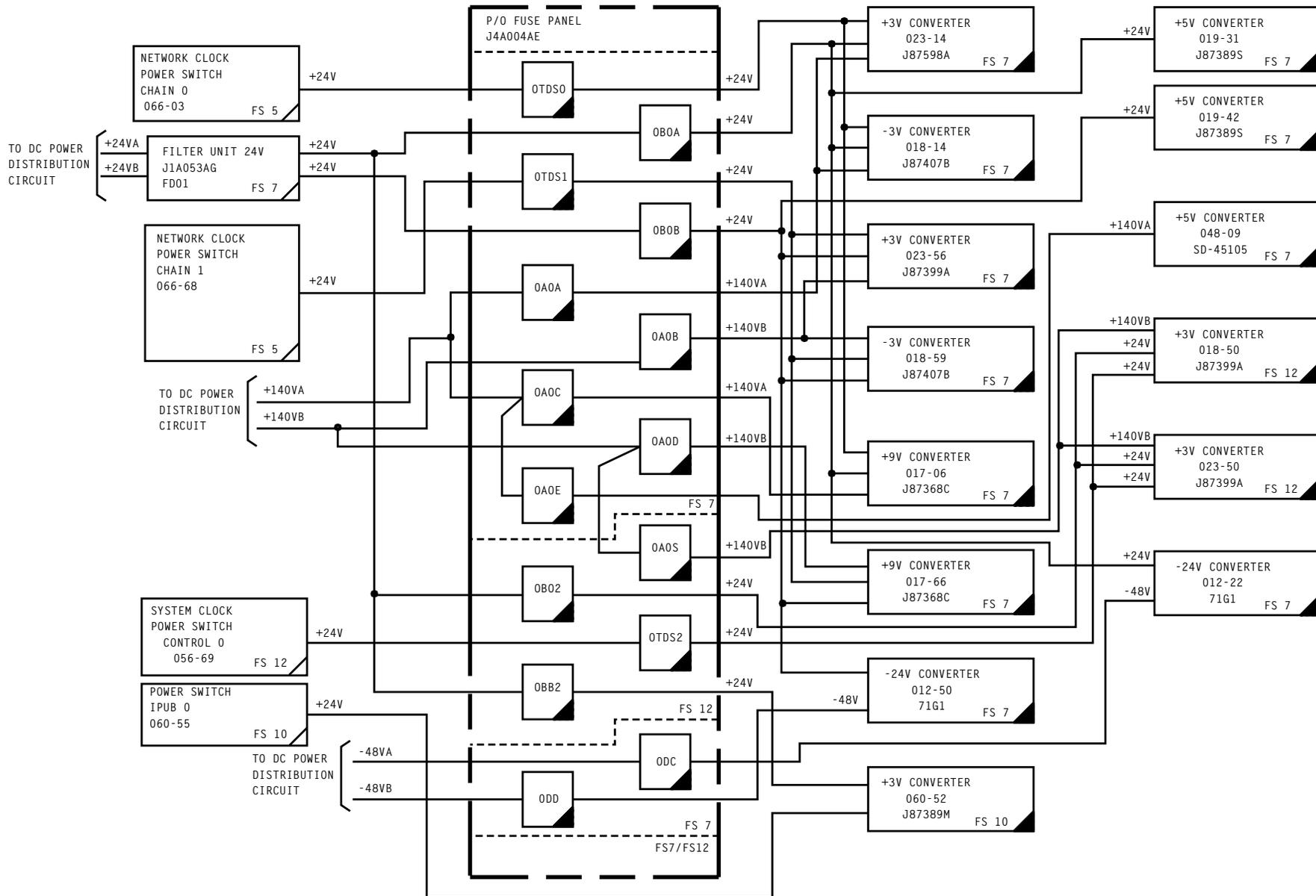
Issue 2	SEP 1998
234-351-013	TAP
PAGE 2 of 3	118

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



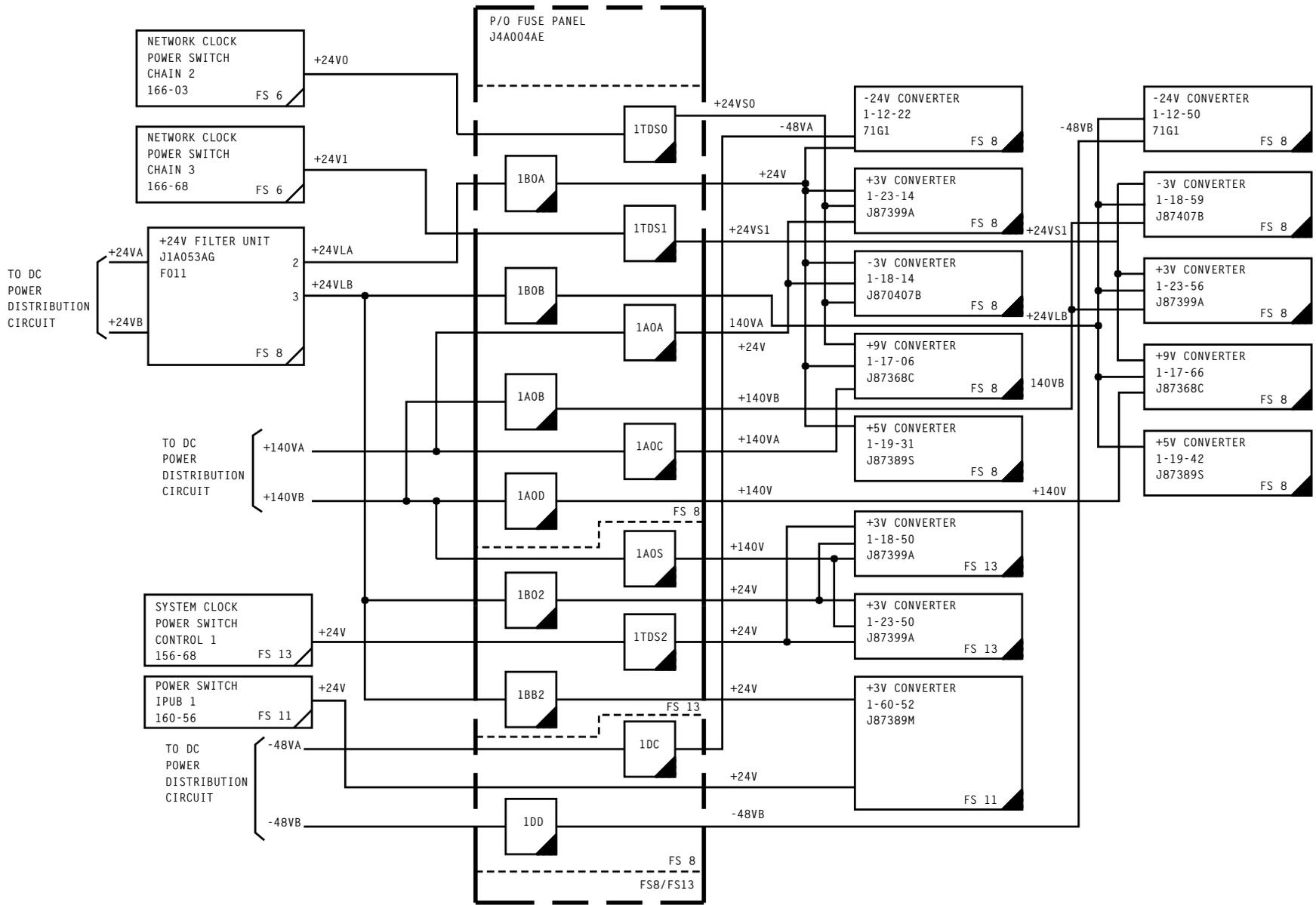
**CLEAR BLOWN FUSE, NOT A1-A9 OR B1-B8 (+9 AND +24 VOLT DISTRIBUTION)**

Issue 2	SEP 1998
234-351-013	TAP
PAGE 3 of 3	<b>118</b>



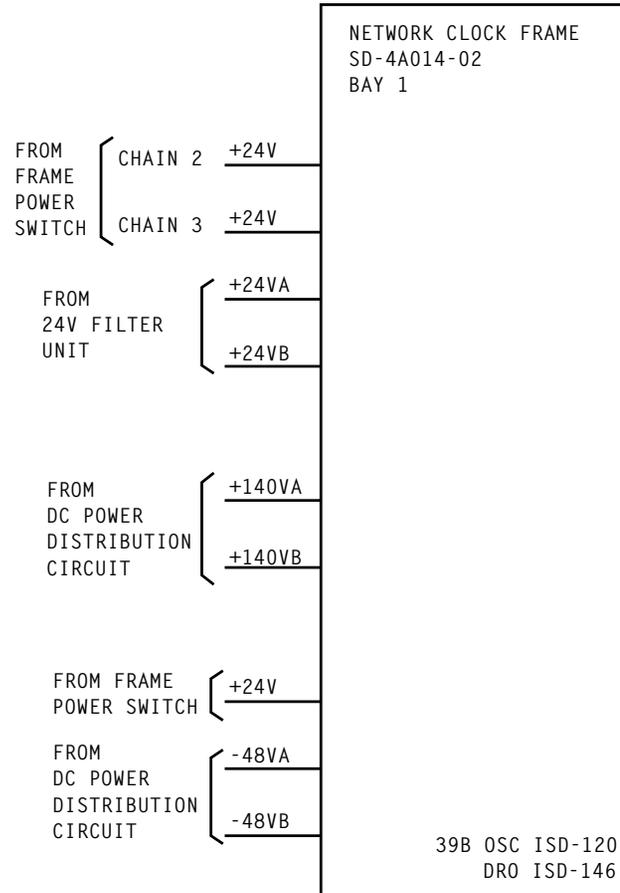
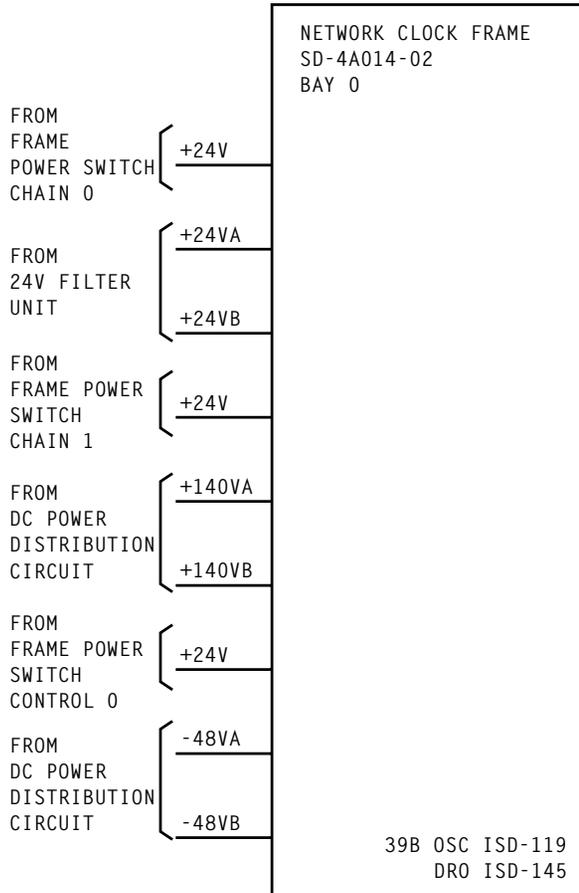
**+24, -48 AND +140 VOLT FRAME DISTRIBUTION,  
BAY 0 - 39B OSCILLATOR**

Issue 2	SEP 1998
234-351-013	ISD
PAGE 1 of 1	119



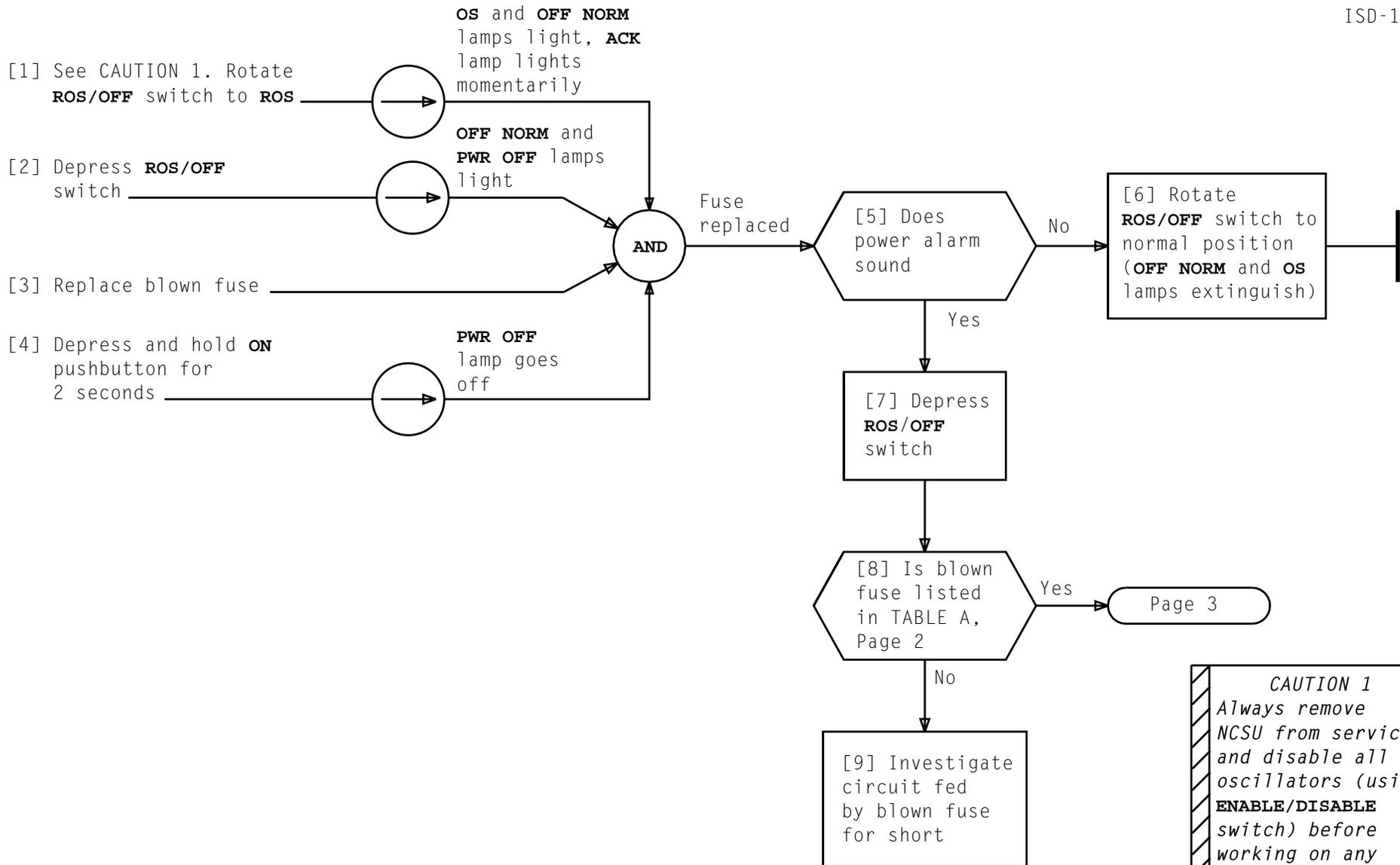
**+24, -48 AND +140 VOLT FRAME DISTRIBUTION,  
BAY 1 - 39B OSCILLATOR**

Issue 2	SEP 1998
234-351-013	ISD
PAGE 1 of 1	120



**+24, -48 AND +140 VOLT FRAME DISTRIBUTION,**

Issue 2	SEP 1998
234-351-013	ISD
PAGE 1 of 1	<b>121</b>



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

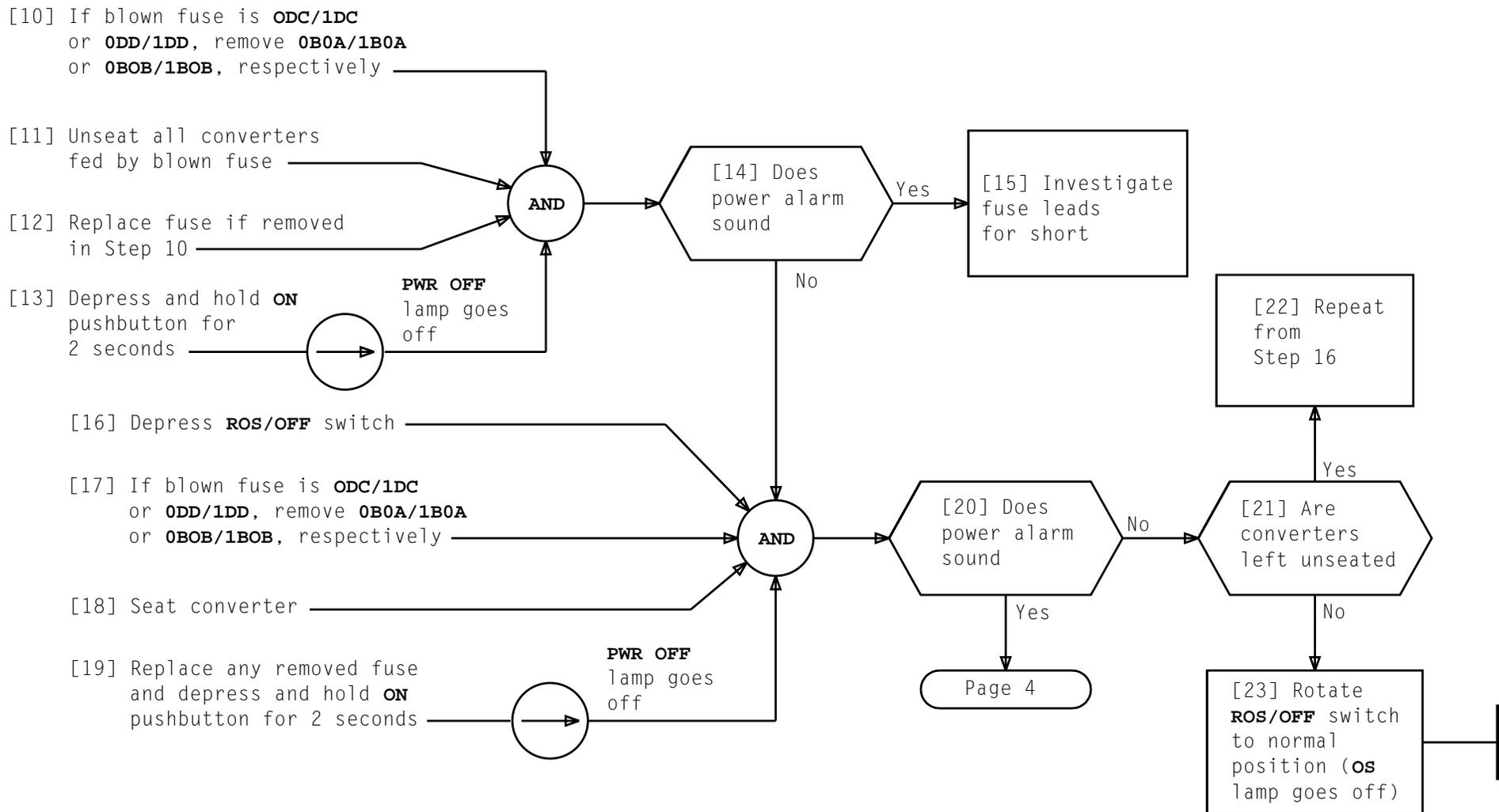
*CAUTION 1*  
 Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** switch) before working on any network clock problem

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 4	<b>122</b>

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

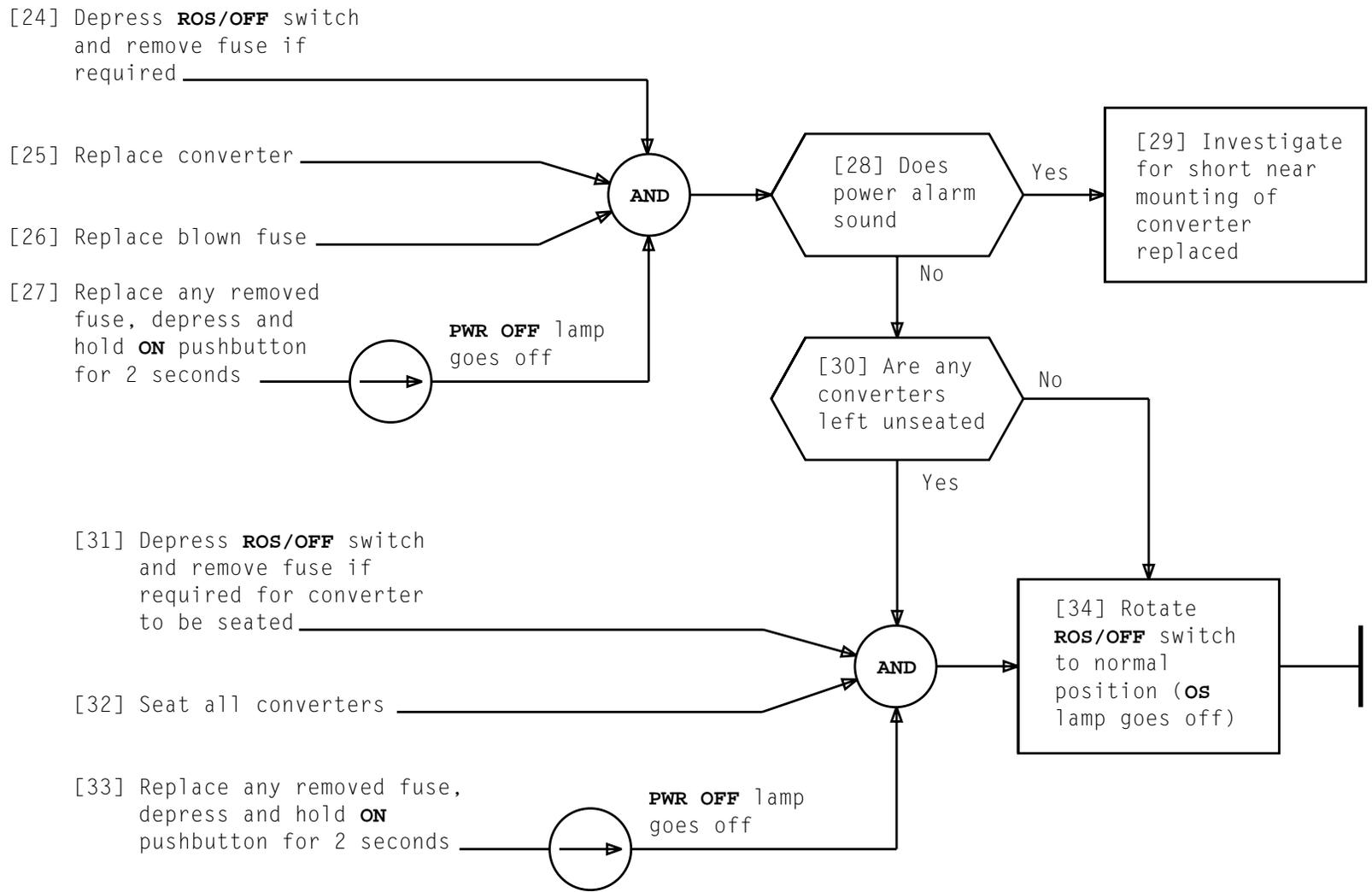
**CLEAR BLOWN FUSE, NOT A1-A9 OR B1-B8 (+24, -48 AND +140 VOLT DISTRIBUTION)**

<b>Issue 2</b>	<b>SEP 1998</b>
<b>234-351-013</b>	<b>TAP</b>
<b>PAGE 2 of 4</b>	<b>122</b>



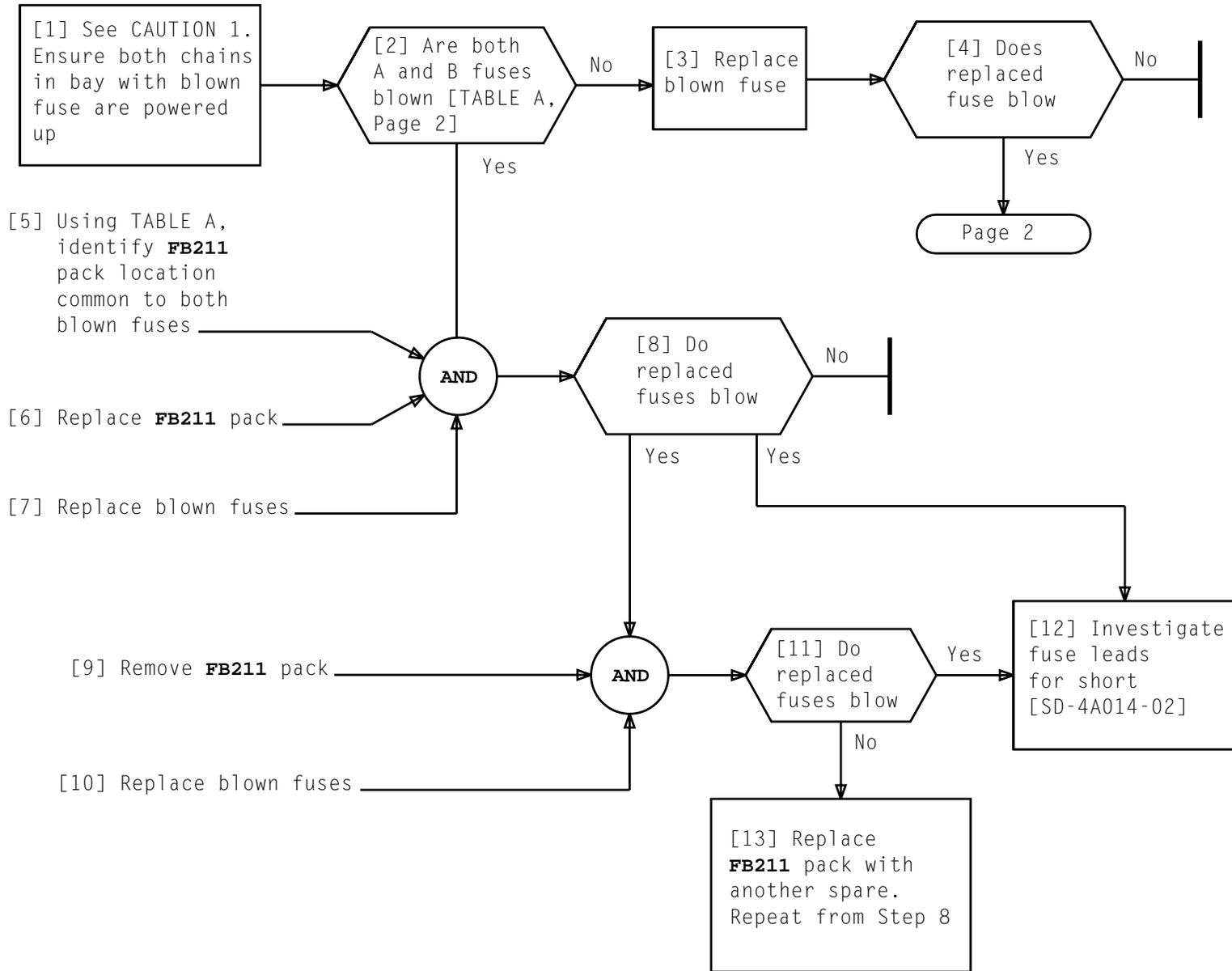
**CLEAR BLOWN FUSE, NOT A1-A9 OR B1-B8 (+24, -48 AND +140 VOLT DISTRIBUTION)**

Issue 2	SEP 1998
234-351-013	TAP
PAGE 3 of 4	122



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

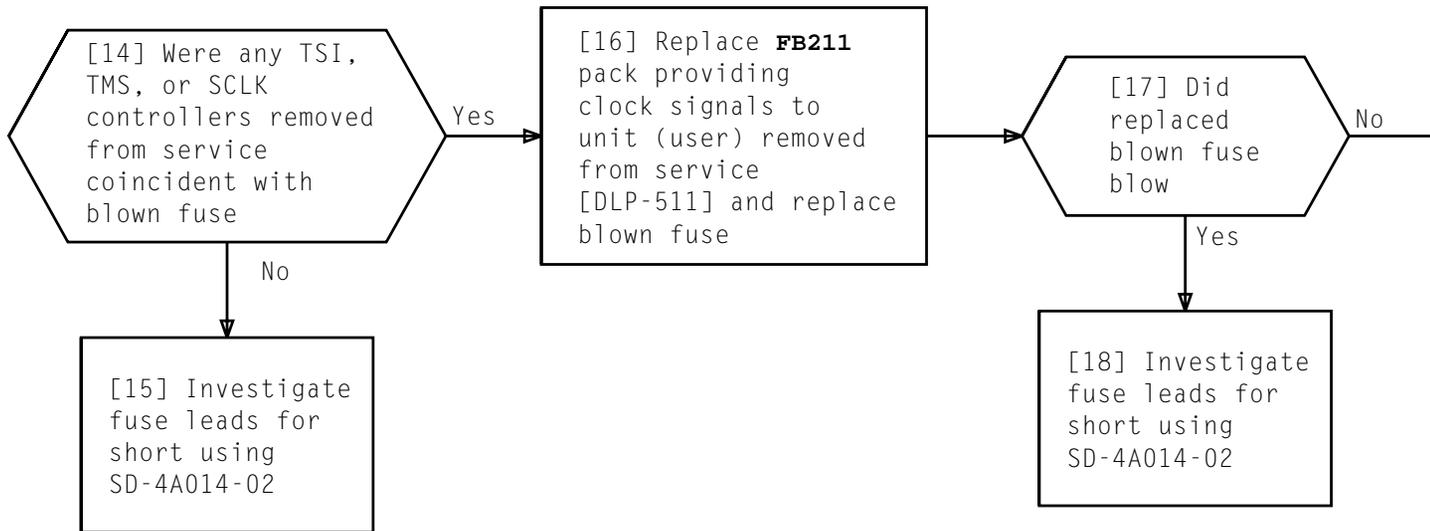
Issue 2	SEP 1998
234-351-013	TAP
PAGE 4 of 4	122



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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 2	<b>123</b>

**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**

[1] See CAUTION 1. Rotate **ROS/OFF** switch to **ROS** (**OS** and **OFF NORM** lamps light; **ACK** lamp lights momentarily)

[2] Depress **ON** pushbutton

[3] Did converter LED go off

[4] Rotate **ROS/OFF** switch counterclockwise to normal position (**OFF NORM** and **OS** lamps extinguish)

[5] Replace converter [DLP-509]

[6] Did converter LED go off

[7] Rotate **ROS/OFF** switch to normal position (**OFF NORM** and **OS** lamps extinguish)

[9] Investigate **ON** switch circuitry for clearing LED lamps

[8] Did LED go off for other converters

[10] Investigate circuitry fed power from converter for short

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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 1	124

**CLEAR CONVERTER LED LIGHTED CONDITION**

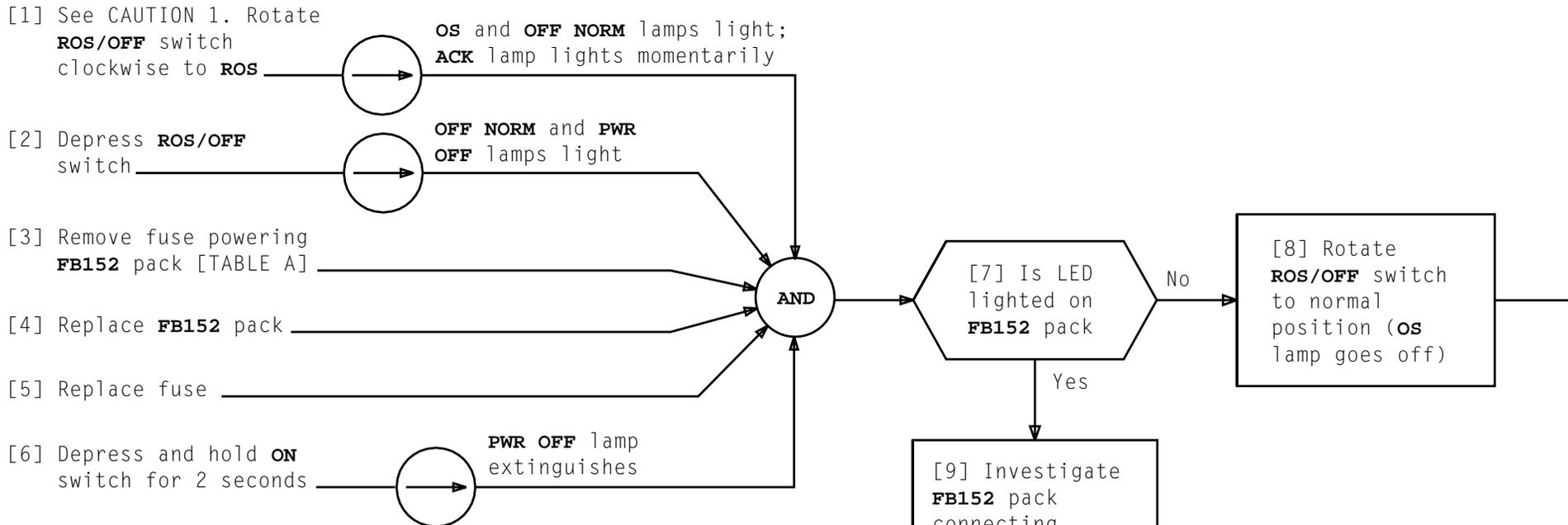


TABLE A			
UNIT	FB152 LOCATION	FUSE DESIGNATION	FUSE LOCATION
NCLK CHAIN 0	0-78-03	0AB	0-07-20
NCLK CHAIN 2	1-78-03	1AB	1-07-20
NCLK CHAIN 1	0-78-68	0CB	0-07-51
NCLK CHAIN 3	1-78-68	1CB	1-07-51
SCLK CONTR 0	0-56-52	0AA2	0-09-51
SCLK CONTR 1	1-56-52	1AA2	1-09-51

**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**

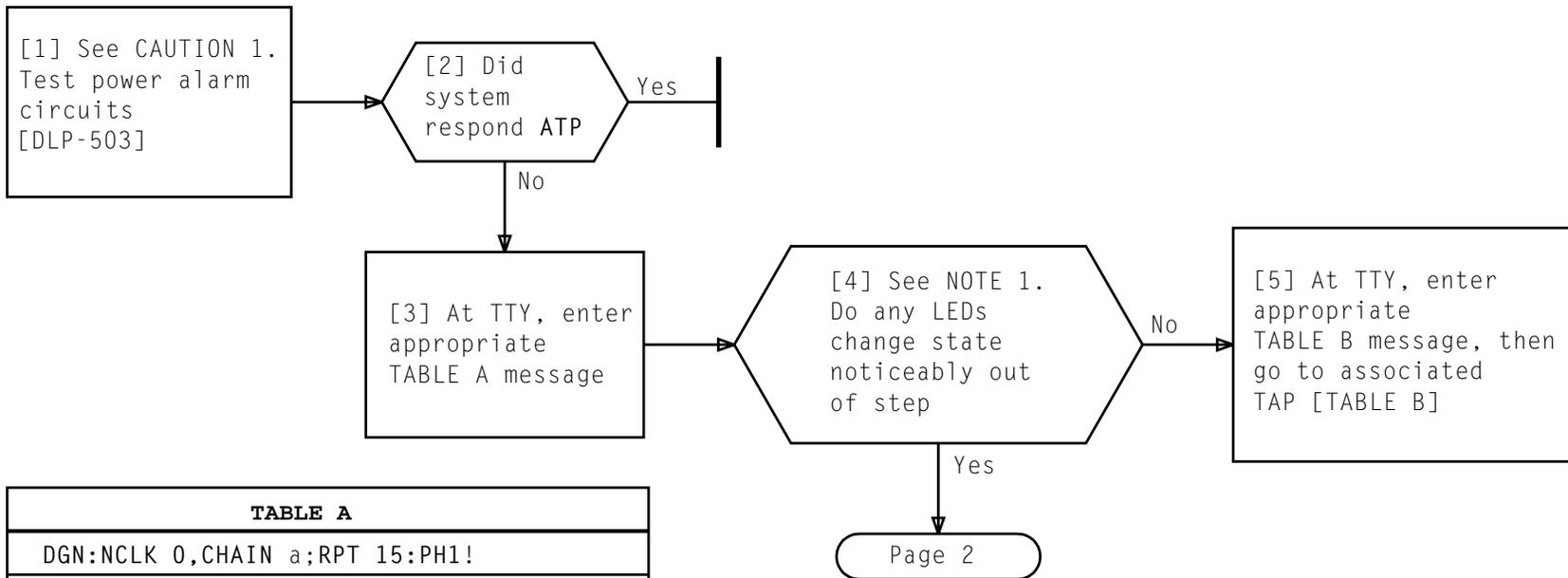


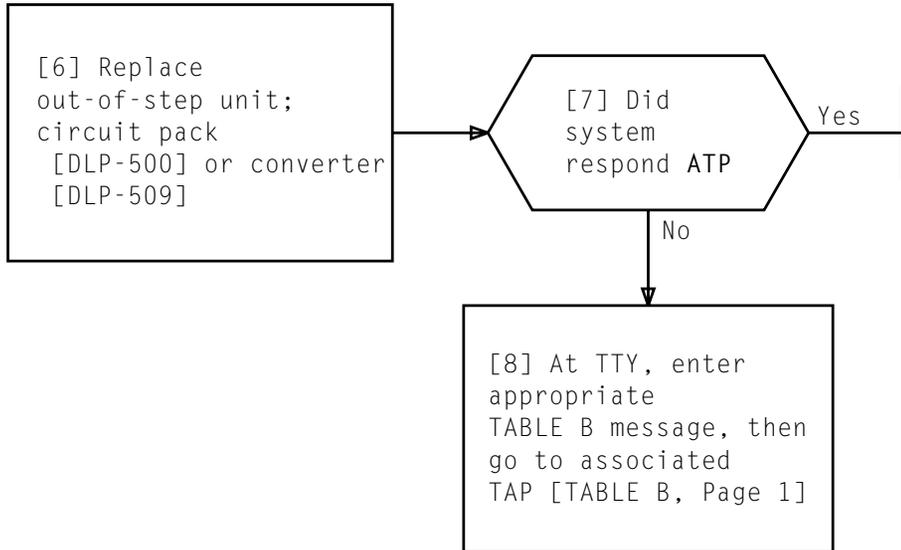
TABLE A
DGN:NCLK 0,CHAIN a;RPT 15:PH1!
DGN:SCLK 0,{CONTR b NCSU 0};RPT 15:PH1!
a = NCLK chain 0-3 b = controller number (IPUBs are diagnosed with controller)

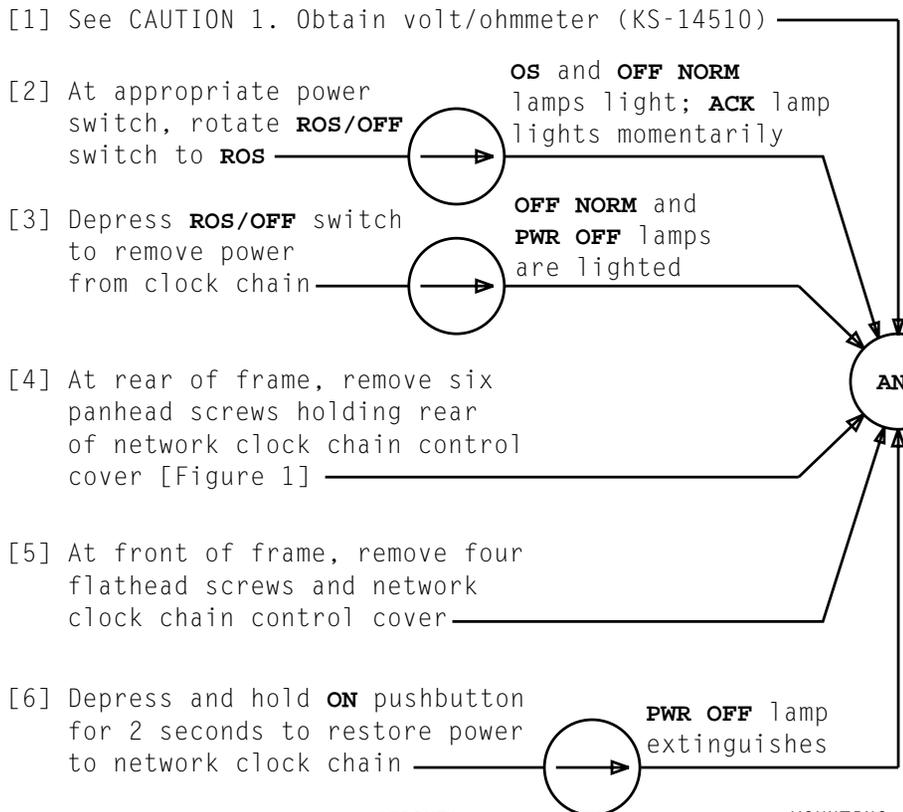
TABLE B	
DIAGNOSTIC MESSAGE	ASSOCIATED TAP
DGN:NCLK 0,CHAIN a:TLP!	[TAP-102]
DGN:SCLK 0,{CONTR b IPUB c}:TLP!	[TAP-103]
DGN:SCLK 0,NCSU 0:TLP!	[TAP-104]
a = NCLK chain 0-3 b = controller number c = IPUB number	

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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 2	126





Meter circuit  
(PHASE or PHASE  
LOCK OVEN TEMP) → Page 3

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

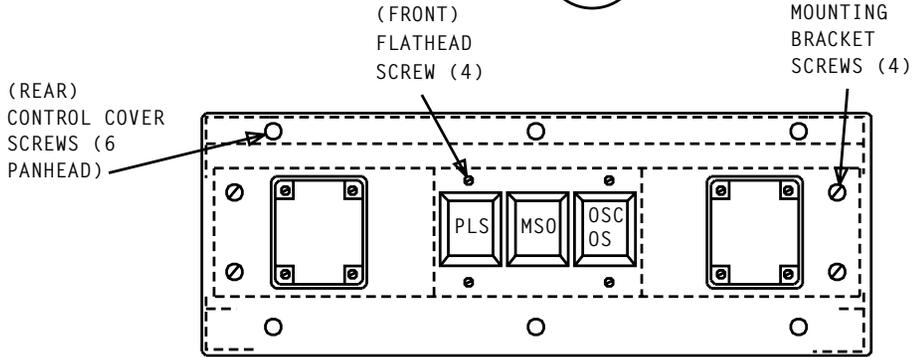


Figure 1 - Network Clock Control

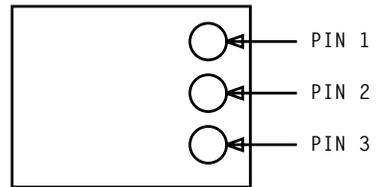
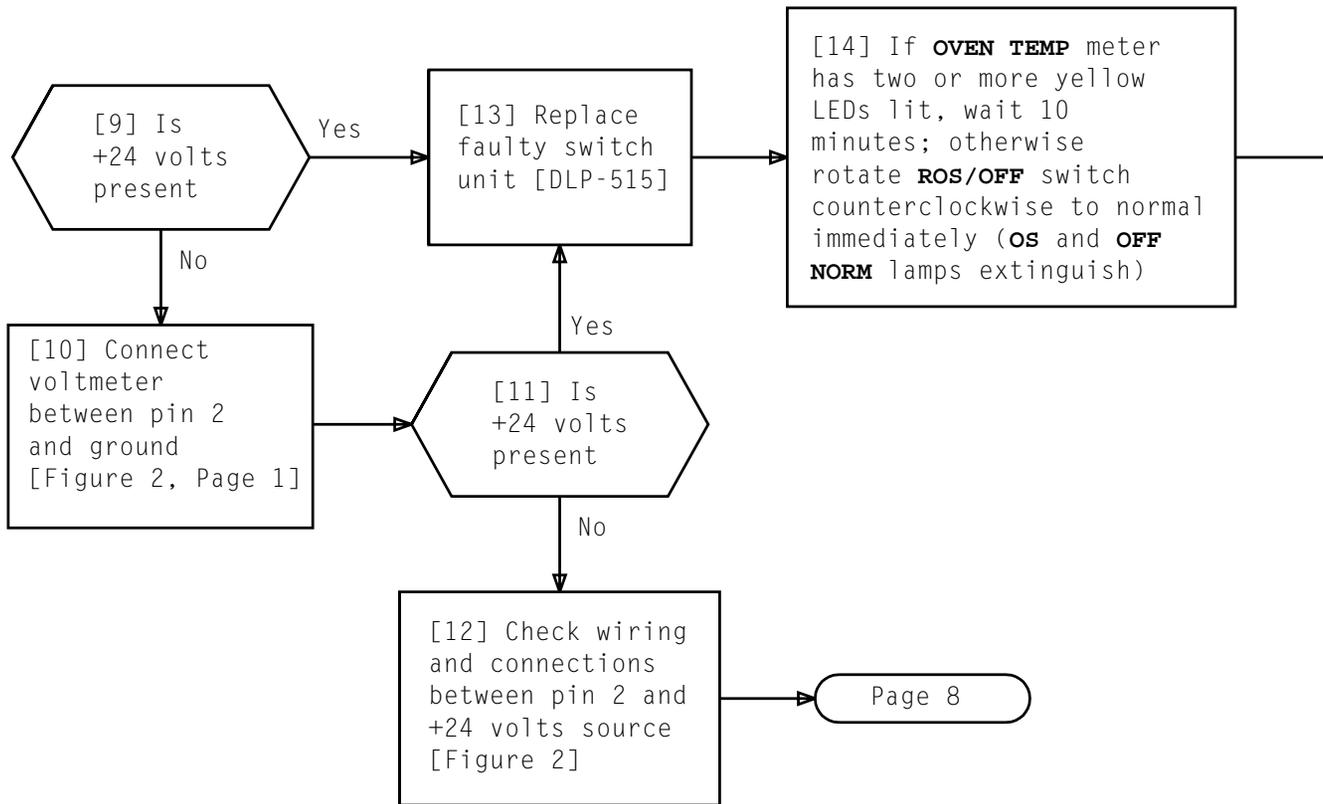


Figure 2 - Lamp Circuit (Front View)

**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**

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 8	127



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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 2 of 8	<b>127</b>

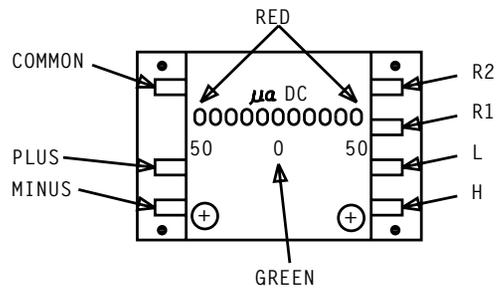
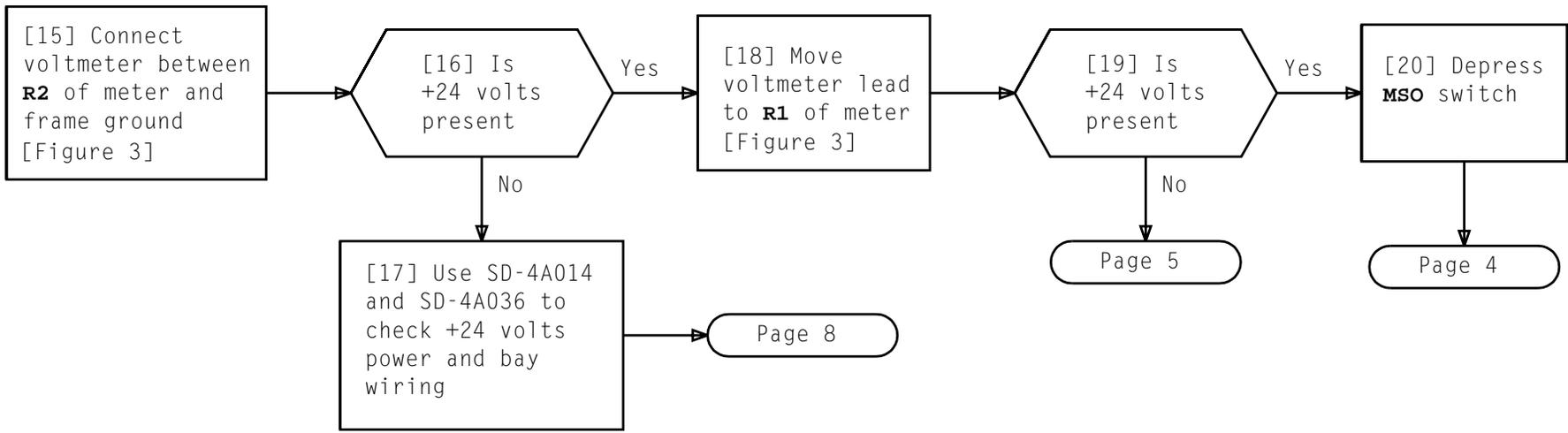
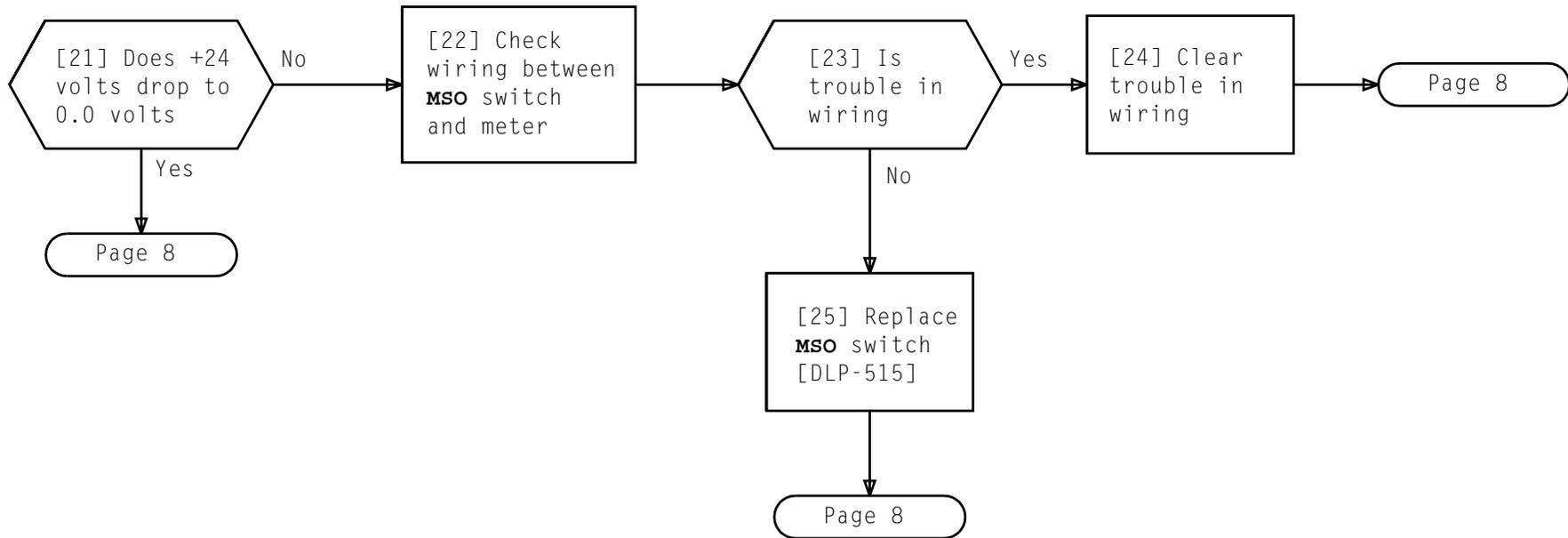


Figure 3 - Meter Circuit

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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 3 of 8	127



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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 4 of 8	<b>127</b>

- [26] Depress **ROS/OFF** switch to remove power from desired clock chain \_\_\_\_\_
- [27] Remove fuse associated with **FB217** circuit pack [TABLE A] \_\_\_\_\_
- [28] Remove **FB217** circuit pack from chain [TABLE A] \_\_\_\_\_
- [29] Depress **ON** switch to restore power to clock chain \_\_\_\_\_
- [30] Depress and hold appropriate chain **MSO** pushbutton \_\_\_\_\_

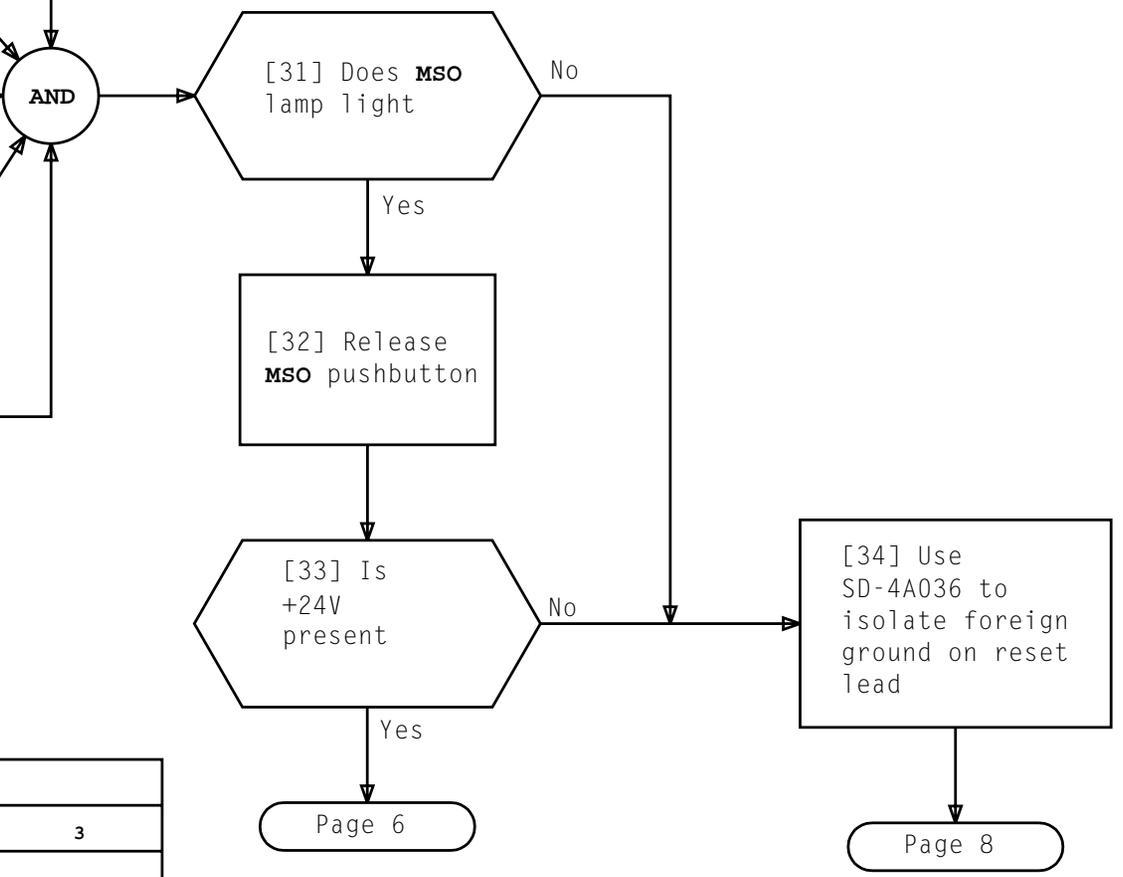
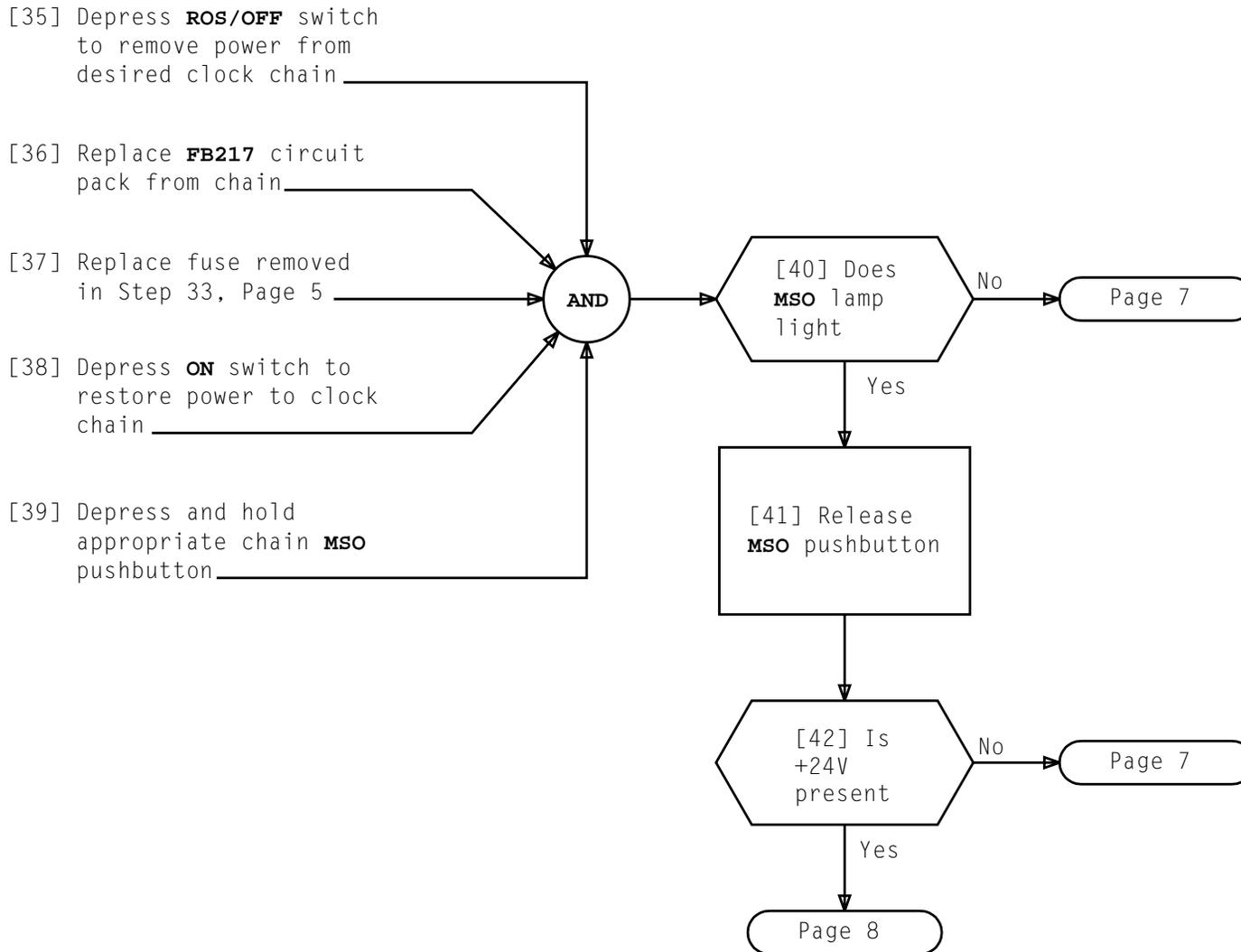


TABLE A				
CHAIN	0	1	2	3
PACK	LOCATION/FUSE			
<b>FB217</b>	078-20/OHT0	078-52/OHT1	178-20/LHT0	178-52/LHT1

**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**

Issue 2	SEP 1998
234-351-013	TAP
PAGE 6 of 8	<b>127</b>

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

[44] Replace **FA627** [TABLE B] circuit pack with spare

[45] Depress **ON** switch to restore power to clock chain

[46] Depress and hold appropriate chain **MSO** pushbutton

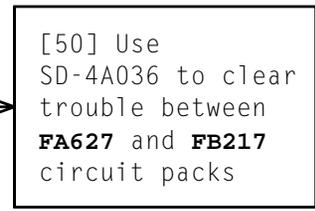
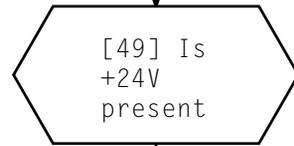
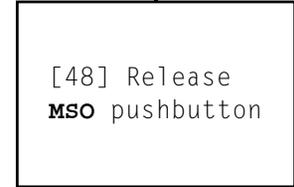
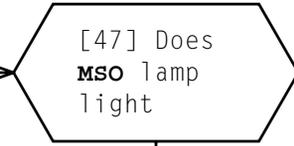
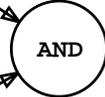
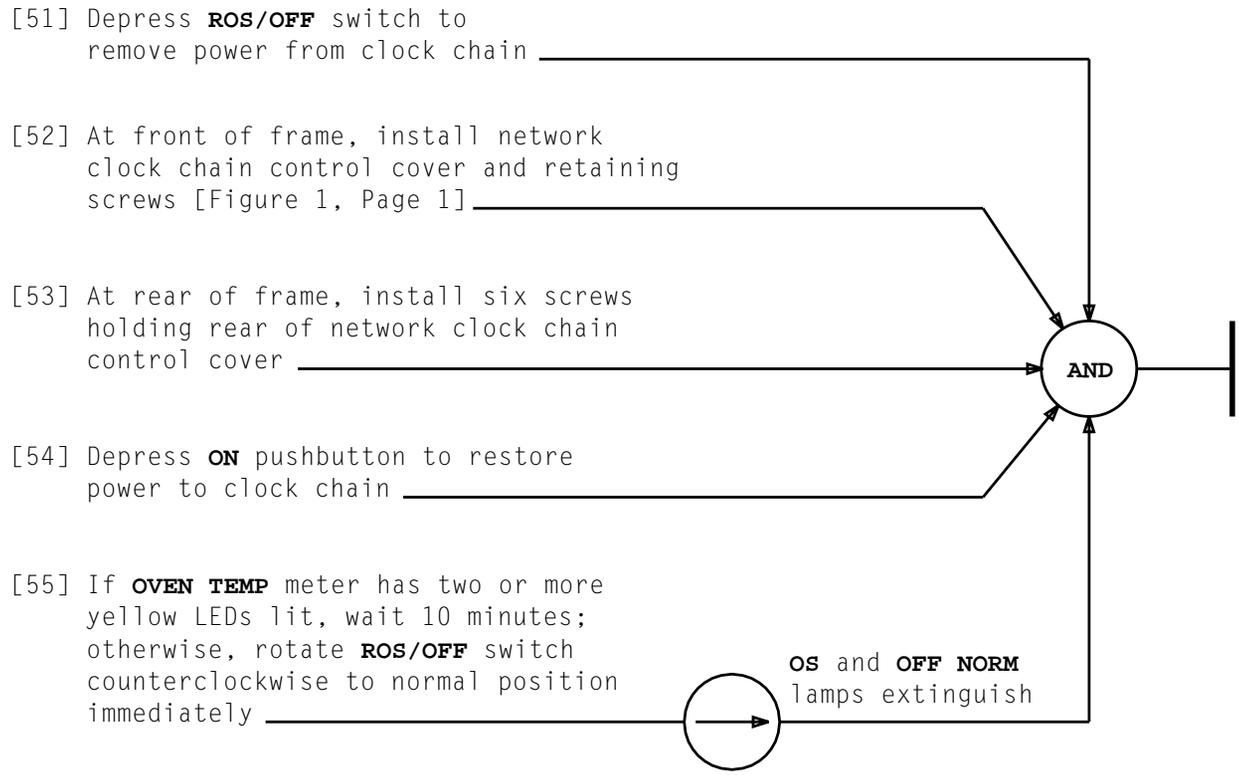


TABLE B	
CLOCK CHAIN	FA627 LOCATION
0	070-23
1	070-48
2	170-23
3	170-48

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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 7 of 8	127



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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 8 of 8	<b>127</b>

- [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

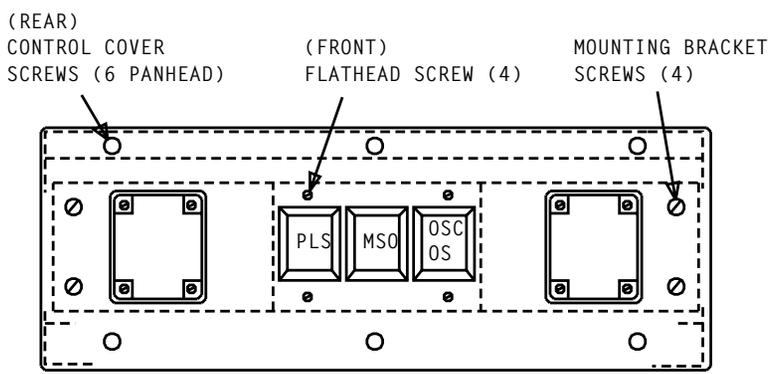
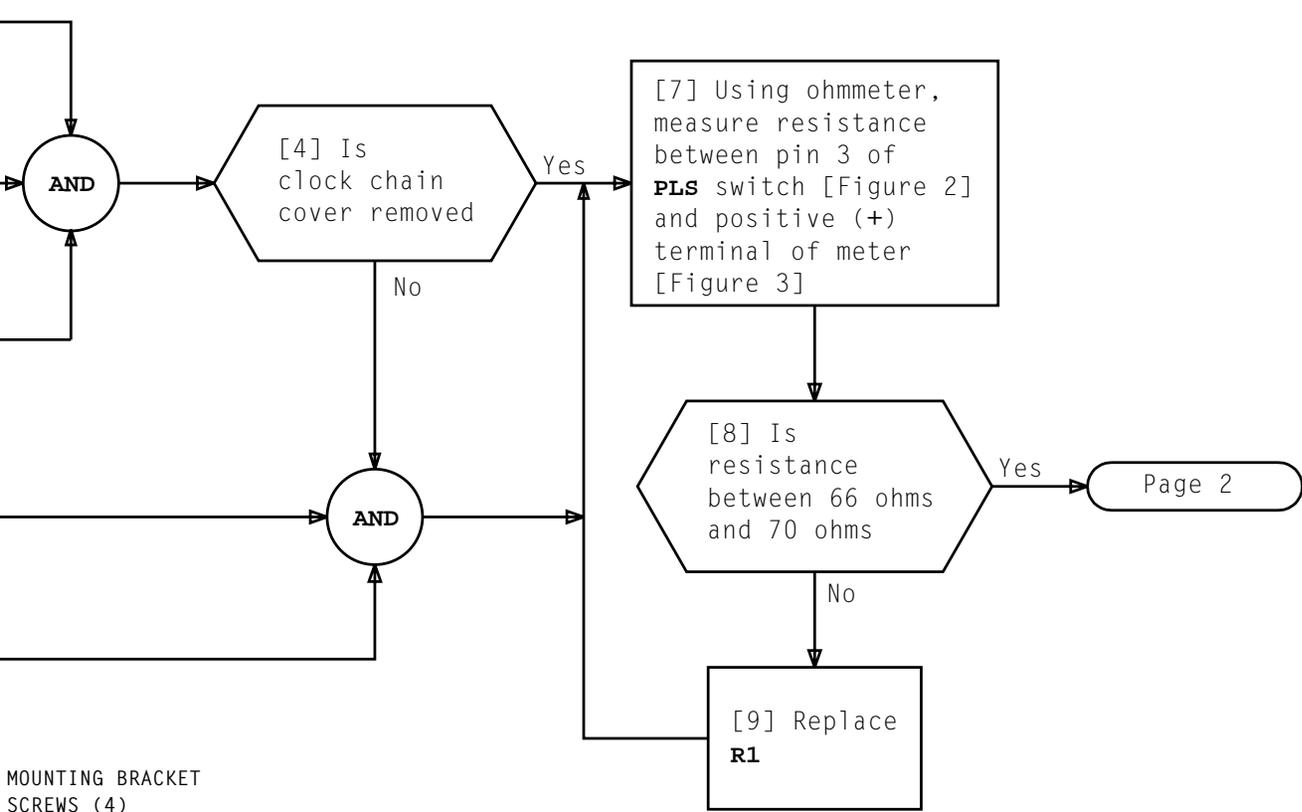


Figure 1 - Network Clock Control

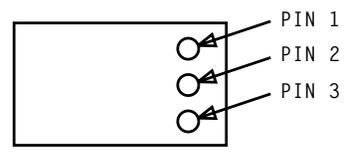


Figure 2 - PLS Circuit (Front View)

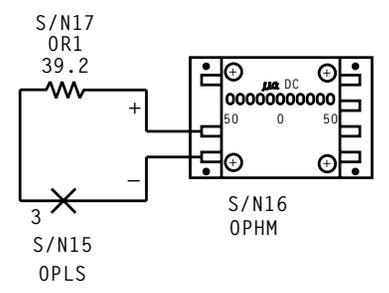
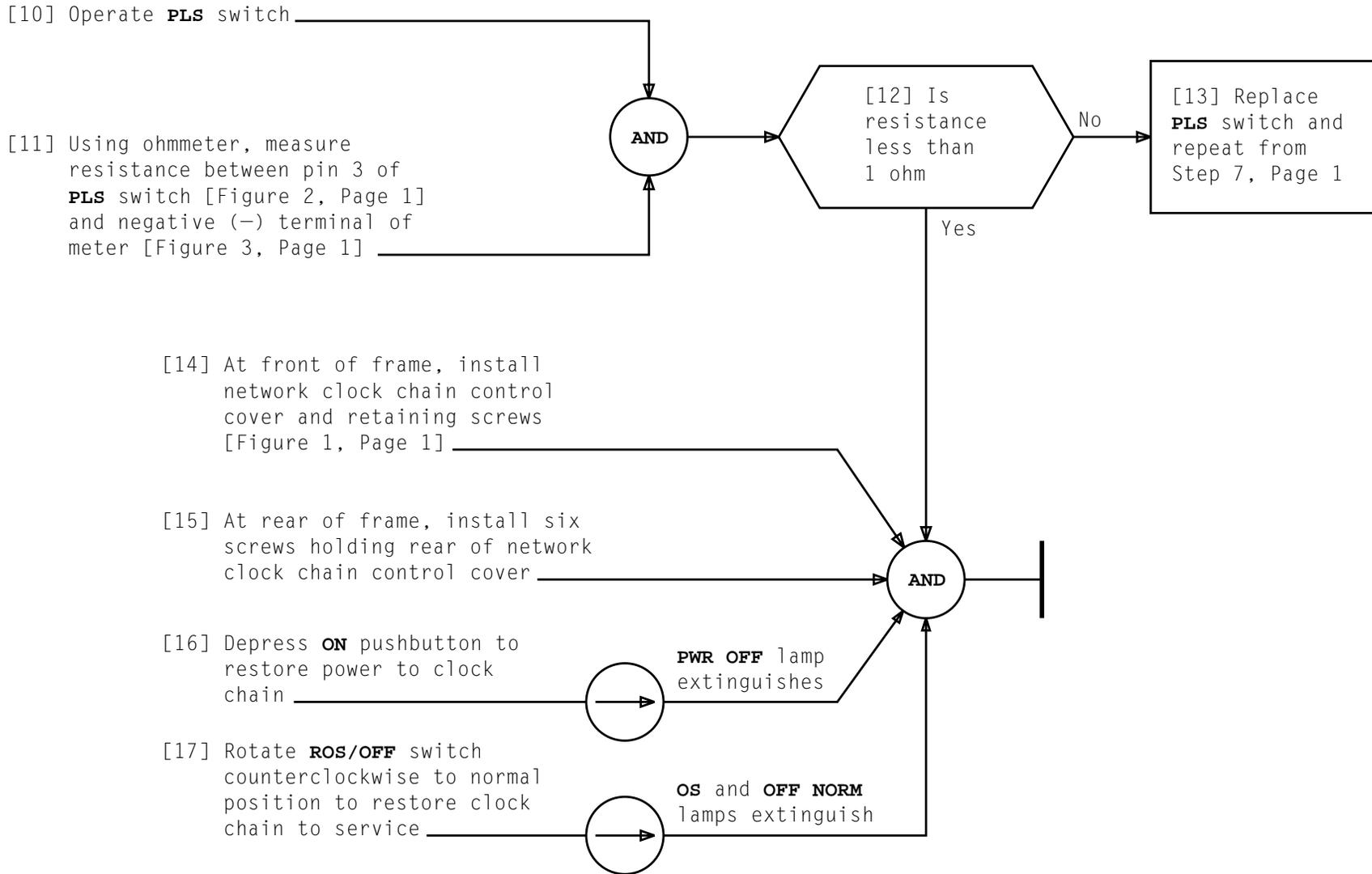


Figure 3 - R1/PLS Circuit Schematic

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

**CLEAR R1 OR PLS FAULT - 39B OSCILLATOR**

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 2	128



[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. Momentarily depress **MSO** switch

MSO lamp lights;

[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. Momentarily depress **MSO** switch

AND

[4] Does **PHASE LOCK OVEN TEMP** meter have two or more yellow LEDs lit in either direction

No

Yes

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

AND

[8] Does **PHASE LOCK OVEN TEMP** meter have one or no yellow LEDs lit

No

Yes

Page 2

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

Page 2,  
 Step 12

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

Issue 2 SEP 1998

234-351-013 TAP

PAGE 1 of 2 129

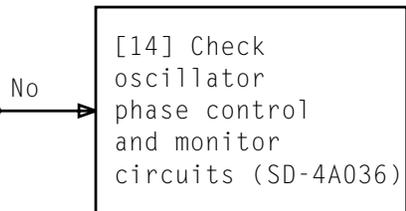
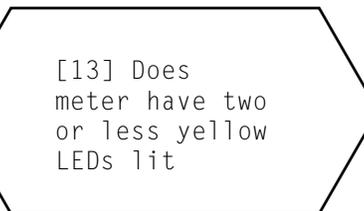
TABLE A CIRCUIT PACK LOCATION				
CHAIN	0	1	2	3
<b>FB214</b>	066-33	066-39	166-33	166-39
<b>FB217</b>	078-20	078-52	178-20	178-52

## CLEAR PHASE LOCK OVEN TEMPERATURE FAULT

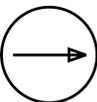
[10] Install **FB214** circuit pack and fuse removed in Step 6, Page 1, but do not restore power or chain to service [DLP-500]

[11] Replace meter [DLP-516]

[12] See NOTE 1, Page 1. Momentarily depress **MSO** switch



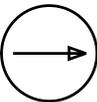
[15] At clock chain power switch, rotate **ROS/OFF** switch counterclockwise



**OFF NORM** and **OS** lamps extinguish



[16] At TTY, enter **RST:NCLK 0,CHAIN a!**  
a = clock chain 0-3



TTY response  
**RST:NCLK 0 CHAIN a**  
**COMPL**



**CLEAR PHASE LOCK OVEN TEMPERATURE FAULT**

Issue 2	SEP 1998
234-351-013	TAP
PAGE 2 of 2	<b>129</b>

[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

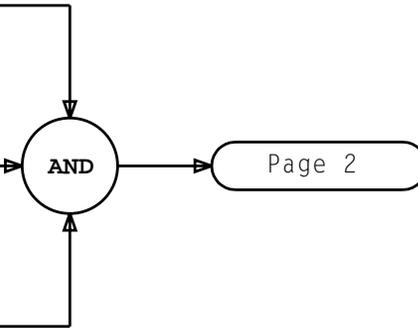


TABLE A FB211 PACK LOCATION TO FUSE ASSIGNMENT									
FUSE DESIG	A1	A2	A3	A4	A5	A6	A7	A8	A9
B1	78-46	78-42	78-48	78-44	78-40	78-50	78-38	74-49	74-47
B2	78-45	78-41	78-47	78-43	78-39	78-49	78-37	74-48	74-46
B3	—	74-56	74-66	74-62	74-58	74-64	74-60	74-51	74-54
B4	74-67	74-55	74-65	74-61	74-57	74-63	74-59	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

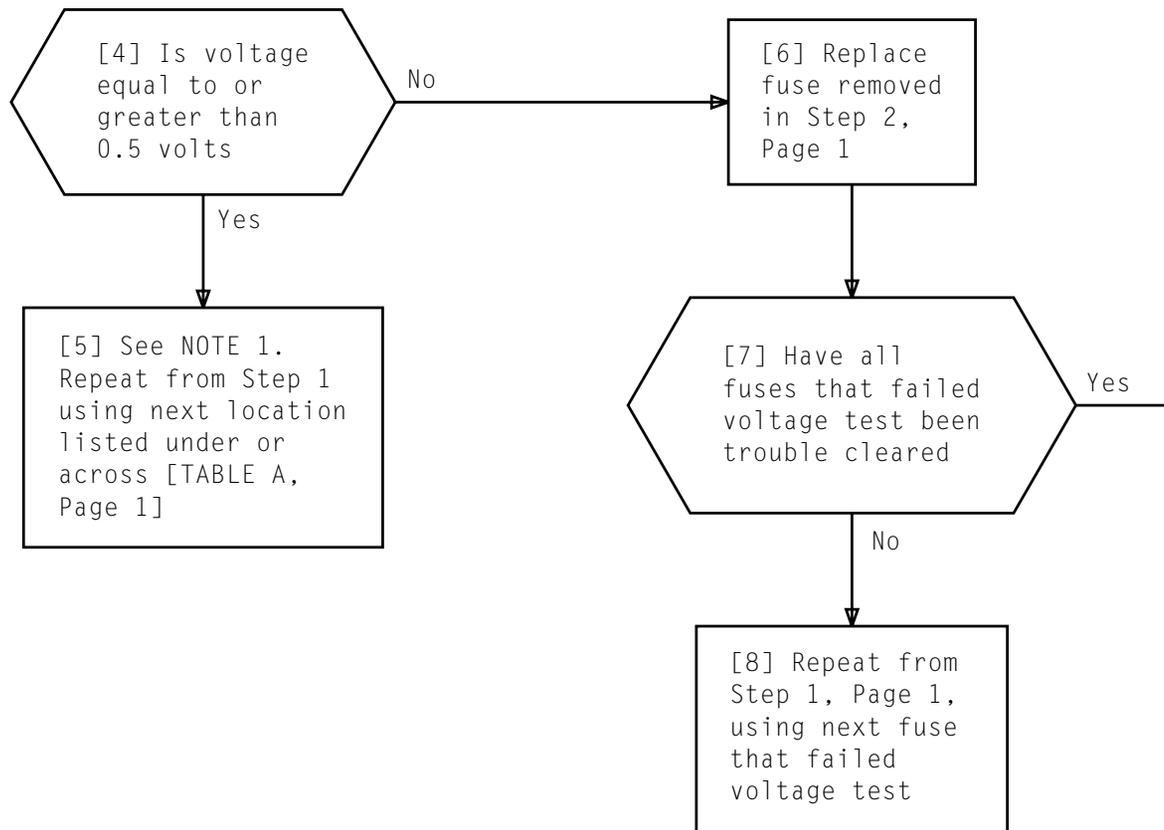
**CAUTION 1**  
 Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** switch) before working on any network clock problem

Issue 2 | SEP 1998

234-351-013 | TAP

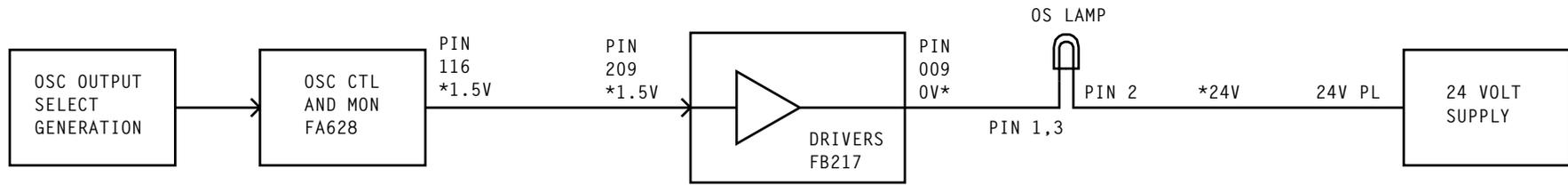
PAGE 1 of 2 | 130

**CLEAR SHORTED POWER-ORING DIODE IN FB211 CIRCUIT PACK**



NOTE 1	
FB211 pack removed will be used as spare	
Issue 2	SEP 1998
234-351-013	TAP
PAGE 2 of 2	130

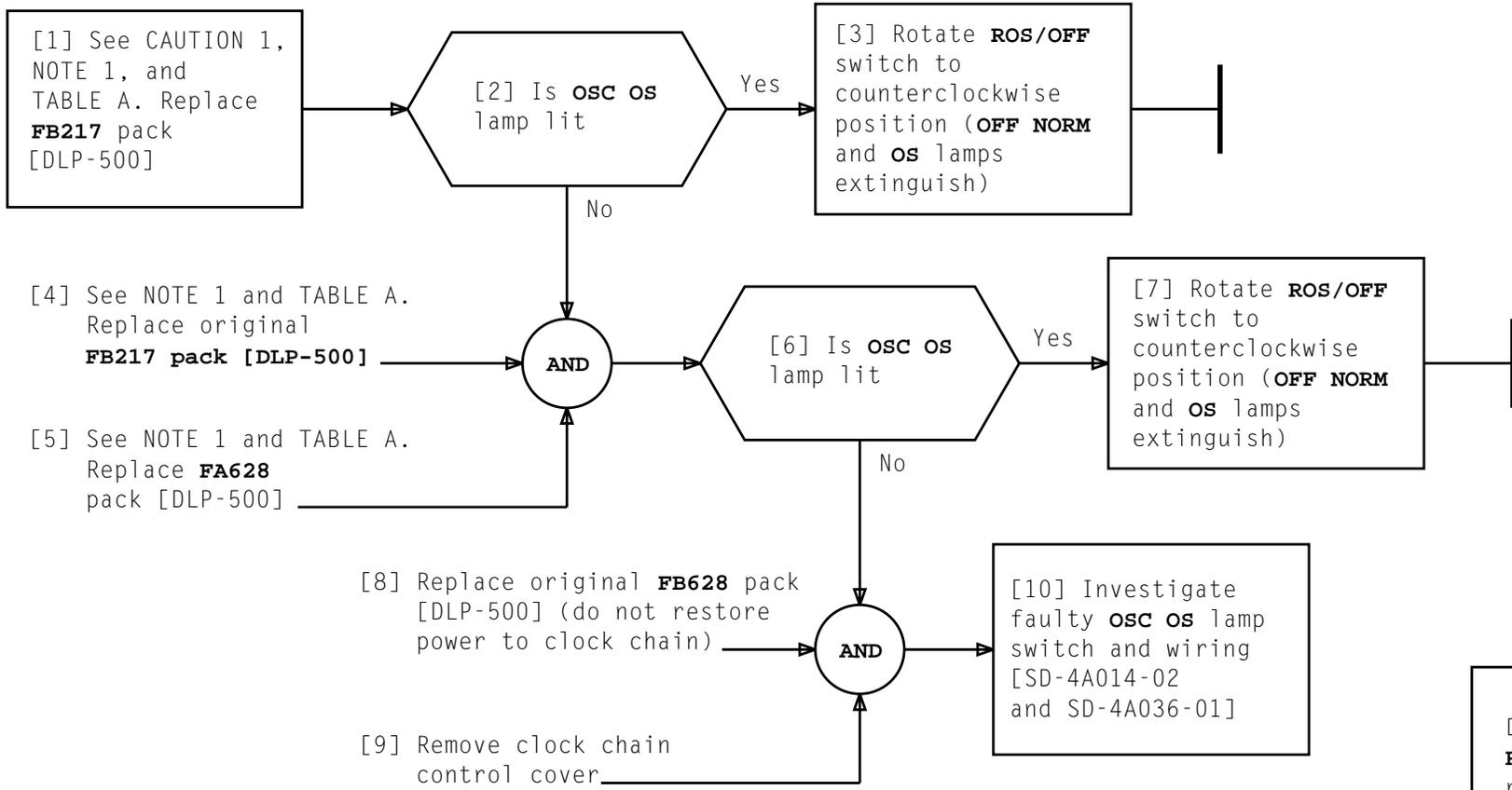
**CLEAR SHORTED POWER-ORING DIODE IN FB211 CIRCUIT PACK**



\*APPROXIMATE VOLTAGE TO LIGHT LAMP

# OSCILLATOR OUT-OF-SERVICE LAMP CIRCUIT

Issue 2	SEP 1998
234-351-013	ISD
PAGE 1 of 1	<b>131</b>



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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 1	132

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

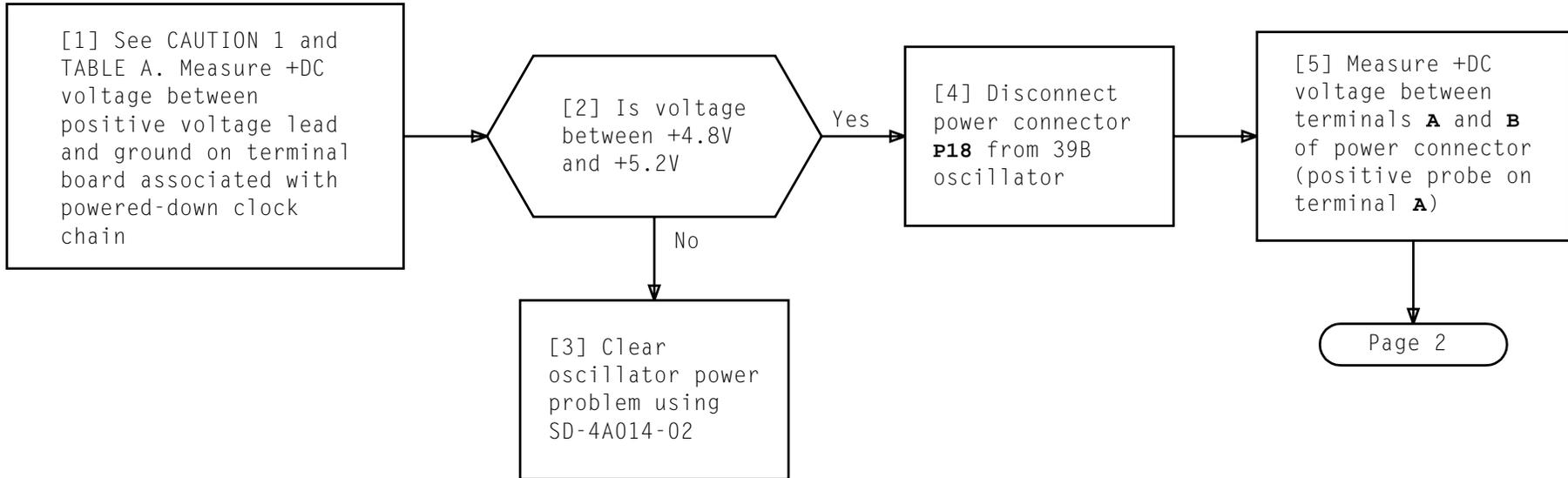
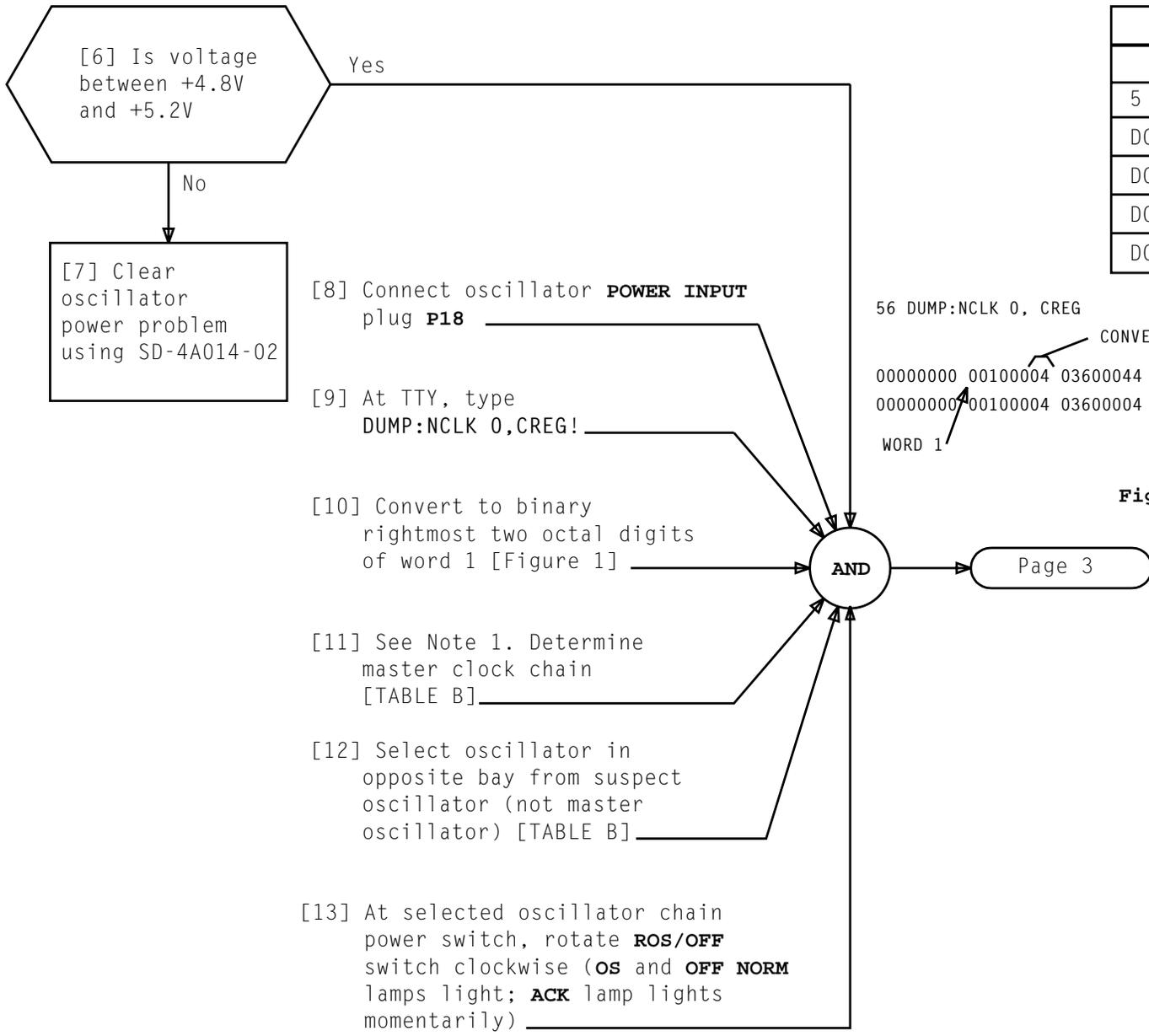


TABLE A					
CLOCK CHAIN	CONVERTER LOCATION	POSITIVE VOLTAGE LEAD	PIN	GROUND LEAD	PIN
0	019-31	0+5V00	1	0+5T00	2
1	019-42	0+5V01	1	0+5T01	2
2	119-31	1+5V00	1	1+5T00	2
3	119-42	1+5V01	1	1+5T01	2

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



**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**

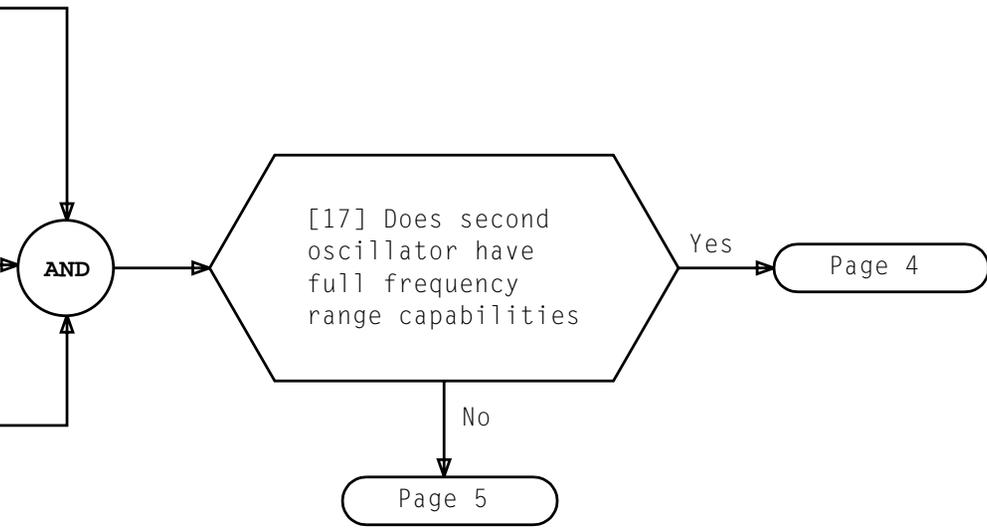
NOTE 1  
Network Clock synchronization unit (if operational) display may be used to determine master clock chain. Otherwise use procedure in Steps 9, 10, and 11

Issue 2	SEP 1998
234-351-013	TAP
PAGE 2 of 5	133

[14] Connect oscillator manual adjustment unit to oscillator selected in Step 12, Page 2 [DLP-532]

[15] At selected oscillator, translate LED display into corresponding thumbwheel setting of oscillator manual adjustment unit and record value [Figure 2]

[16] Check full frequency range of second oscillator [DLP-520]



	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

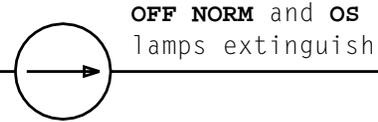
Issue 2	SEP 1998
234-351-013	TAP
PAGE 3 of 5	133

[18] Adjust oscillator manual adjustment unit thumbwheels to original frequency word recorded in Step 15, Page 3

[19] Load frequency word into second oscillator by depressing **LOAD** pushbutton

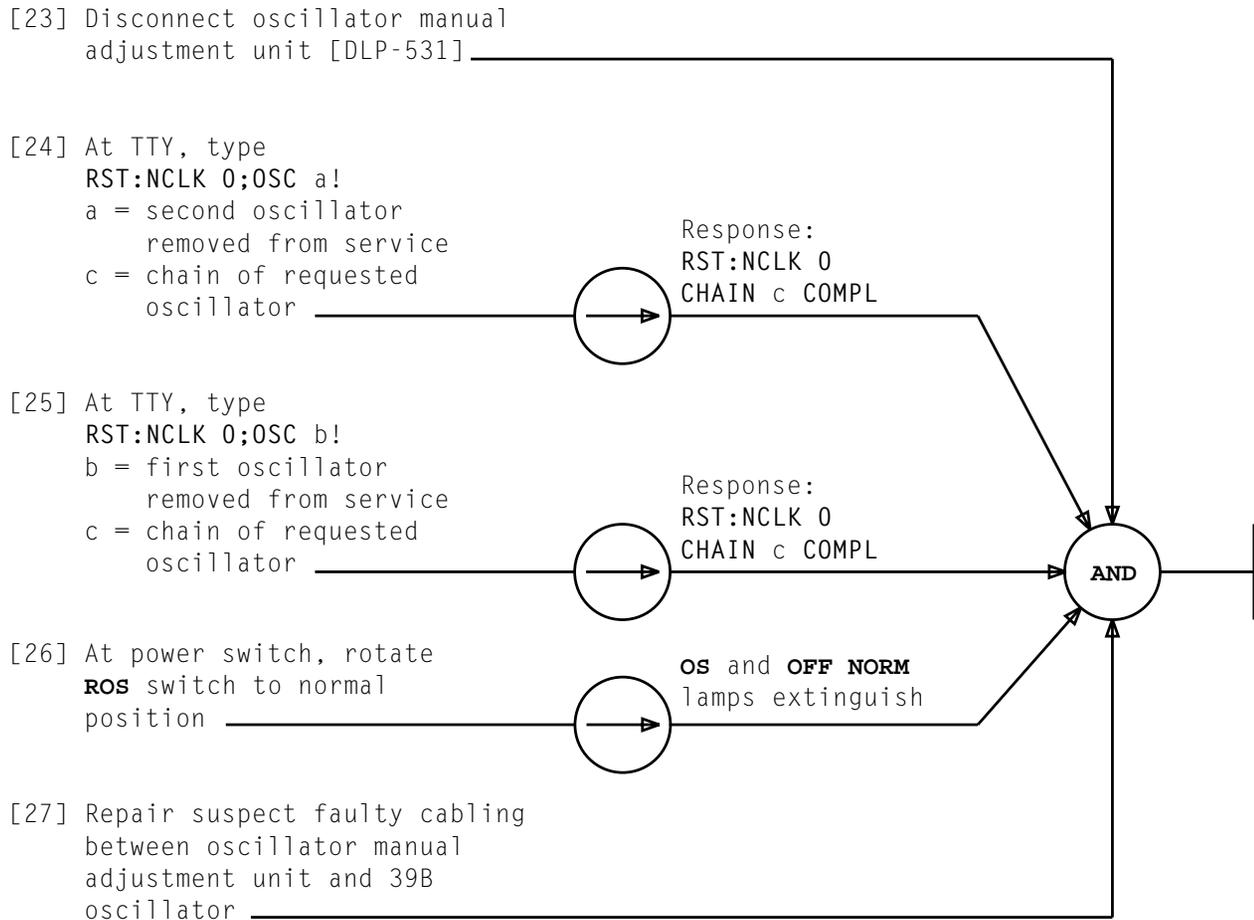
[20] Disconnect oscillator manual adjustment unit [DLP-531]

[21] At second oscillator chain power switch, rotate **ROS/OFF** switch to counterclockwise position



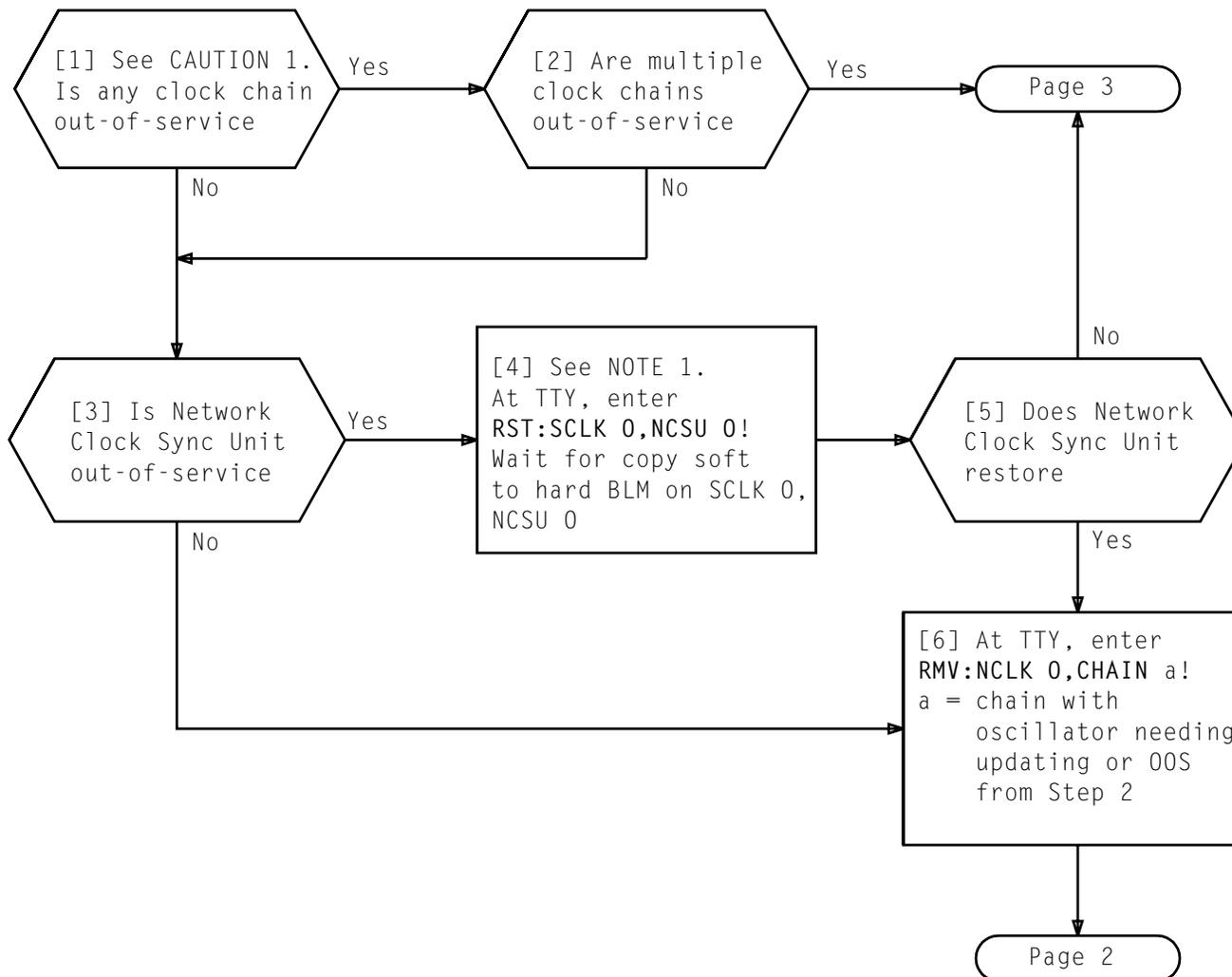
AND

[22] Contact next higher level of technical support for assistance



**CLEAR 39B OSCILLATOR FULL FREQUENCY RANGE PROBLEM**

Issue 2	SEP 1998
234-351-013	TAP
PAGE 5 of 5	<b>133</b>



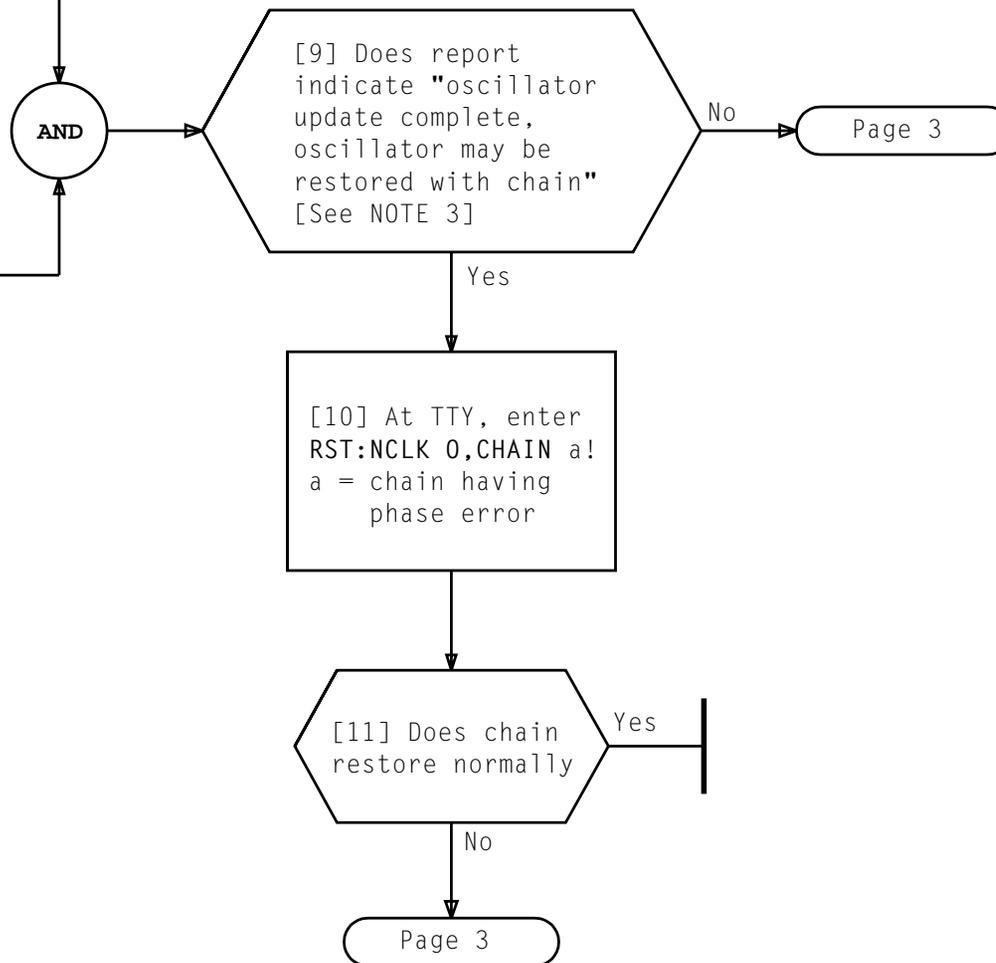
NOTE 1  
**STROBE** switches on all 39B oscillators should be in the up or **ENABLE** position

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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 19	134

[7] At TTY, enter  
 RMV:NCLK 0,OSC a!  
 a = chain having phase  
 error

[8] At TTY, enter  
 RST:NCLK 0,OSC a!  
 a = chain having phase  
 error  
 See NOTE 2



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"	
Issue 2	SEP 1998
234-351-013	TAP
PAGE 2 of 19	<b>134</b>

[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

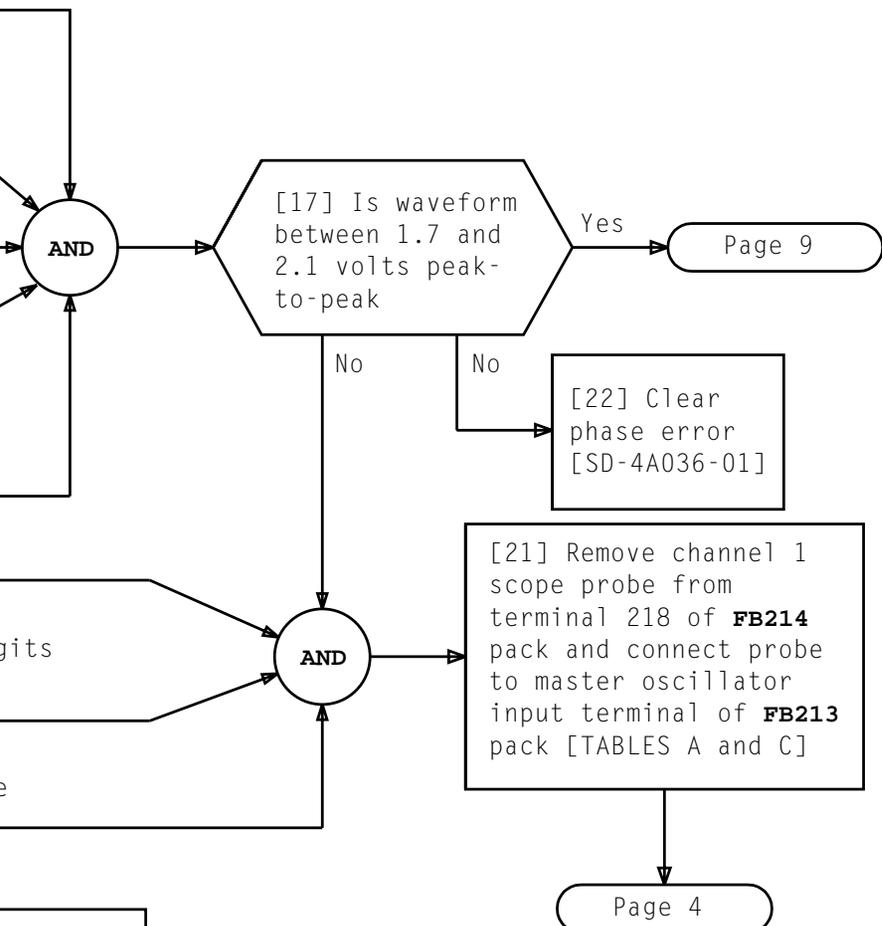
[15] See CAUTION 2. Calibrate scope [DLP-529]

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

[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]



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

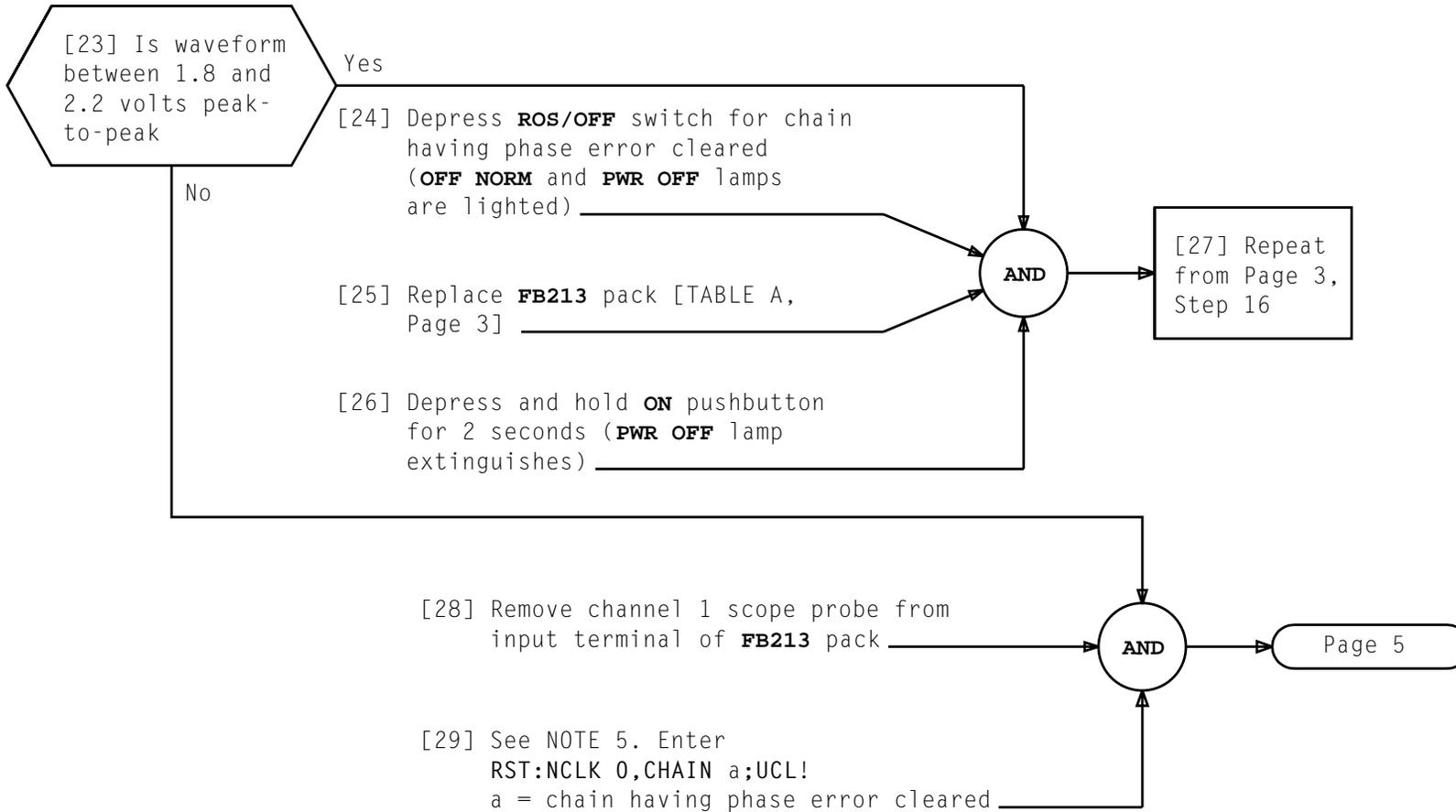
CLOCK CHAIN	0	1	2	3
<b>CIRCUIT PACK</b>	<b>LOCATION</b>			
<b>FB213</b>	070-32	070-39	170-32	170-39
<b>FB214</b>	066-33	066-39	166-33	166-39
<b>FB687</b>	070-34	070-37	170-34	170-37

MASTER CLOCK CHAIN	0	1	2	3
<b>FB213</b> 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**



56 DUMP:NCLK 0,CREG

00000000 00100004 03600044 37760000 00006464 03670064 00000000 00000000

00000000 00100004 03600004 00000000 00000004 03600044 00000000 00000000

WORD 1

CONVERT TO BINARY

Figure 1 - CREG Dump

NOTE 5	
Ensure chain is powered up before restoring unconditionally	
Issue 2	SEP 1998
234-351-013	TAP
PAGE 4 of 19	<b>134</b>

[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)

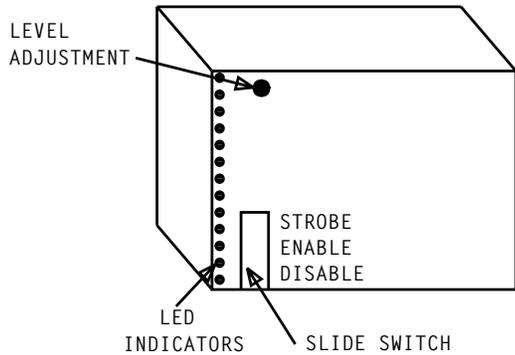
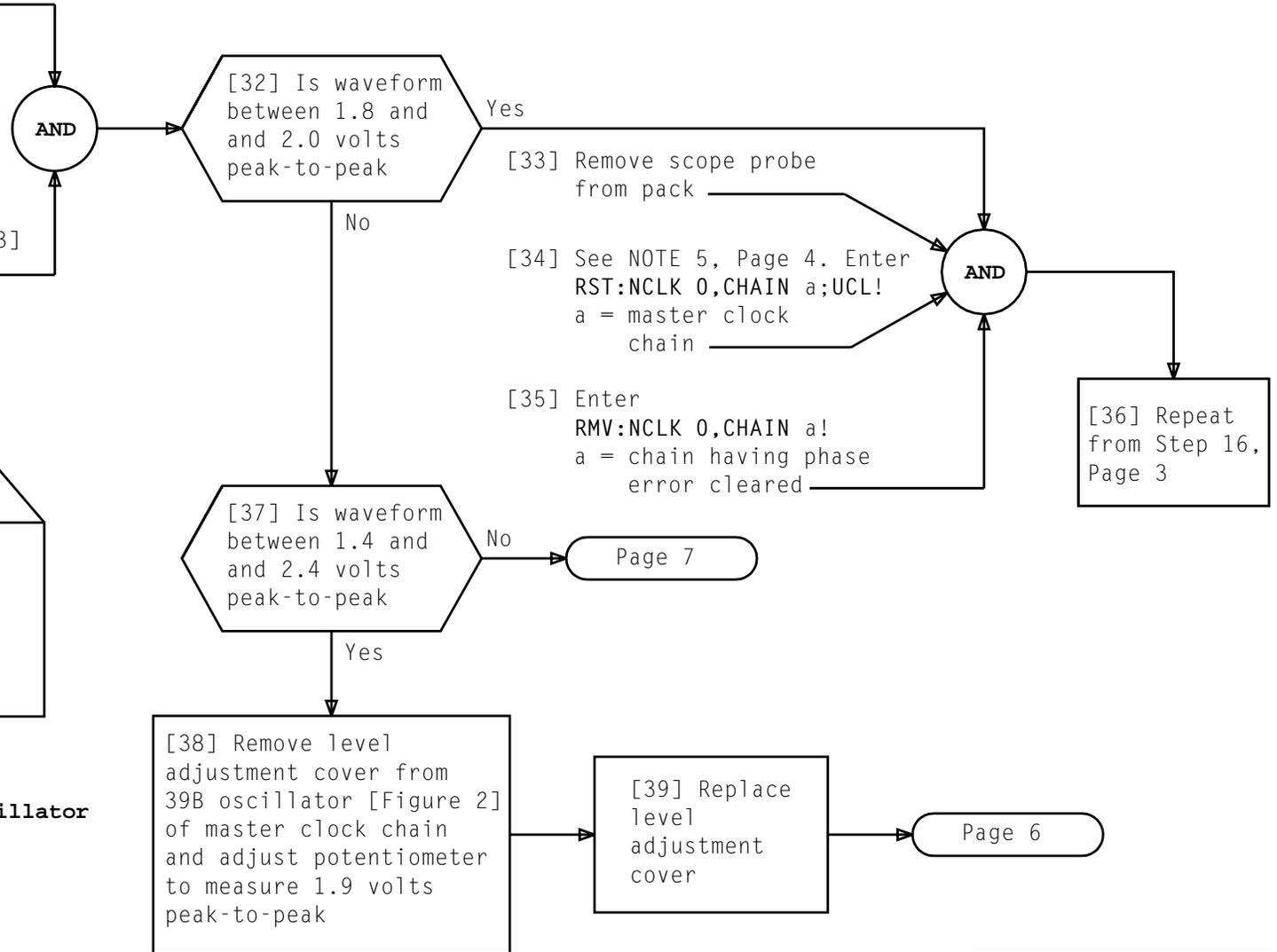
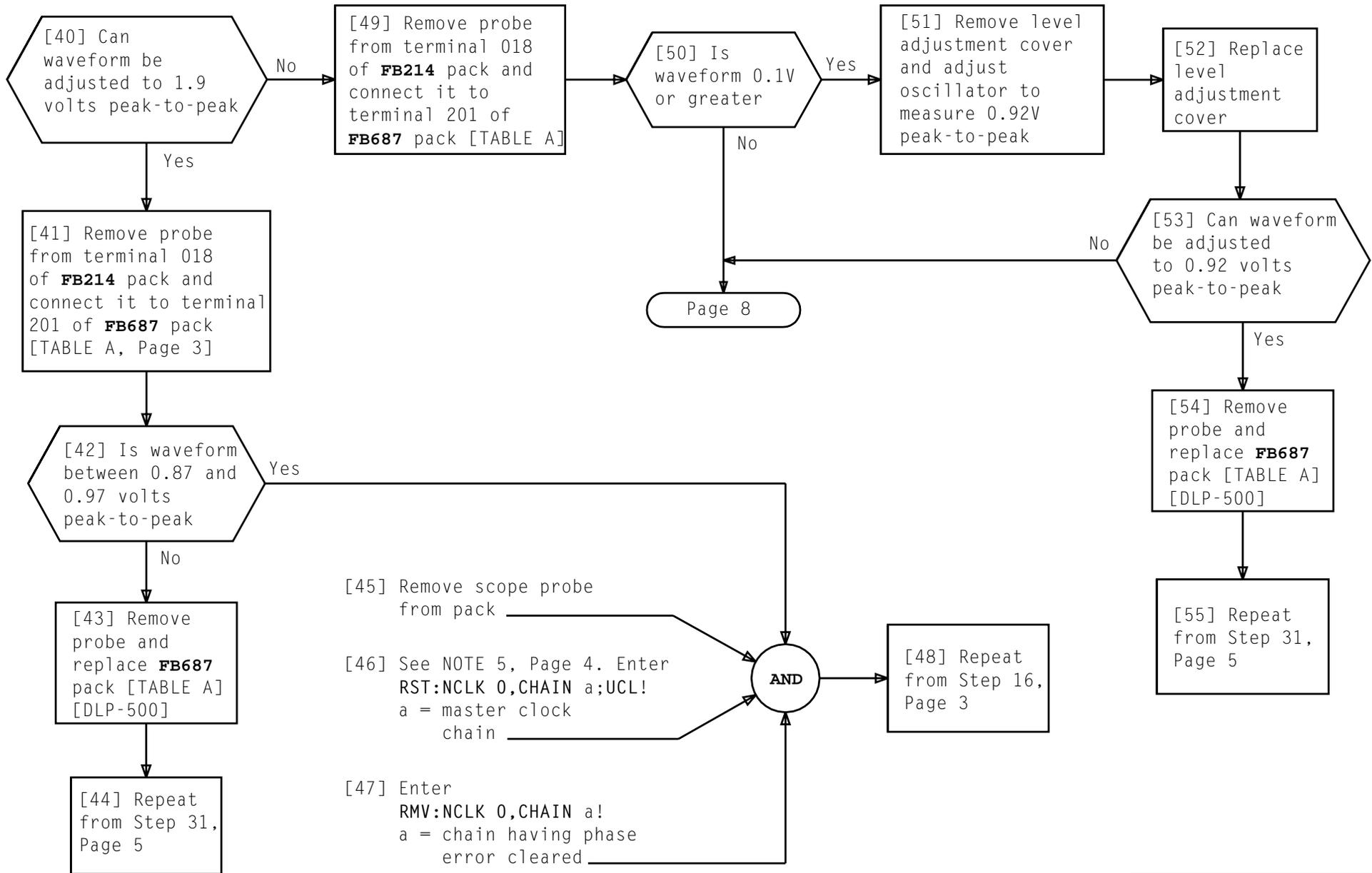
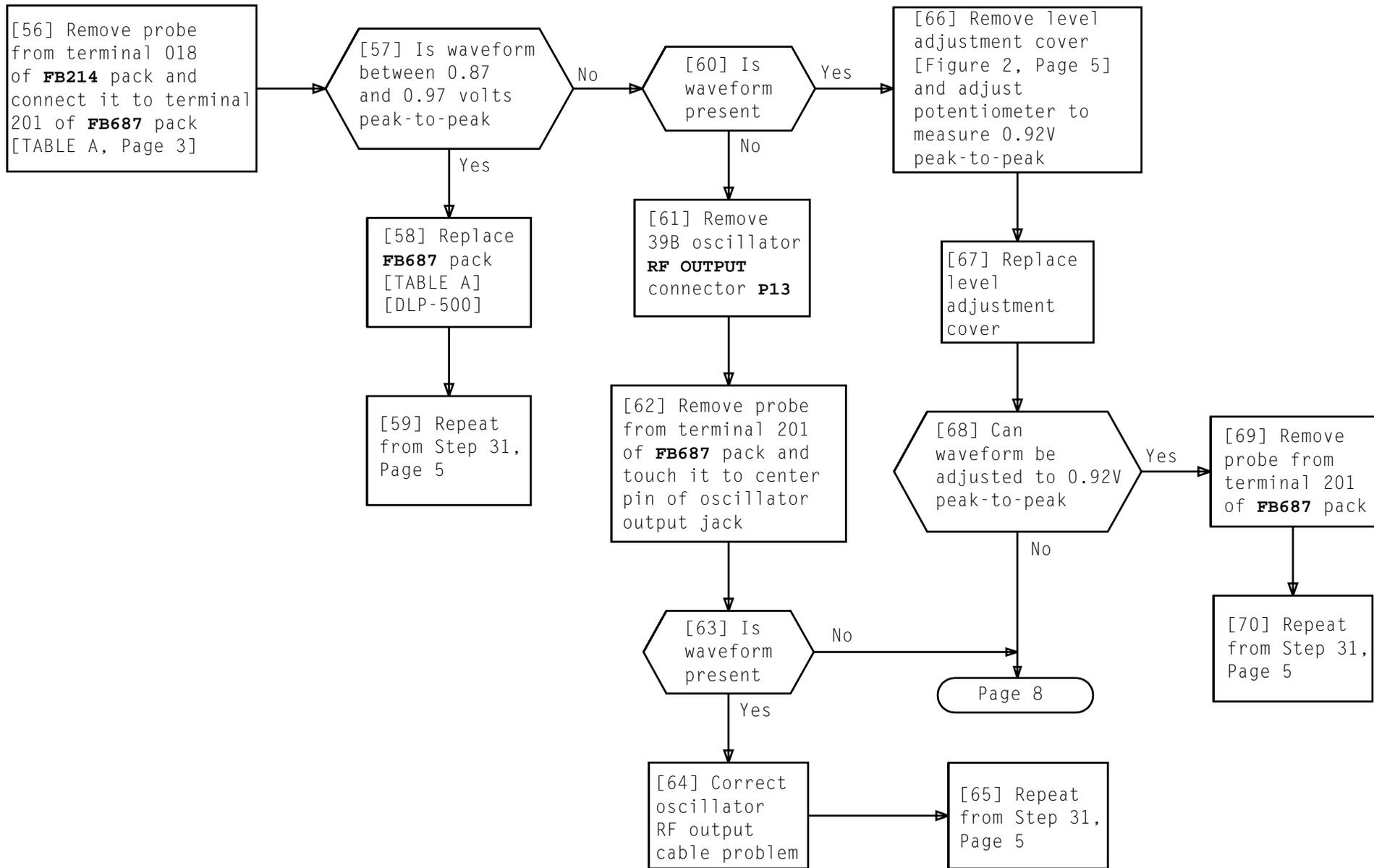


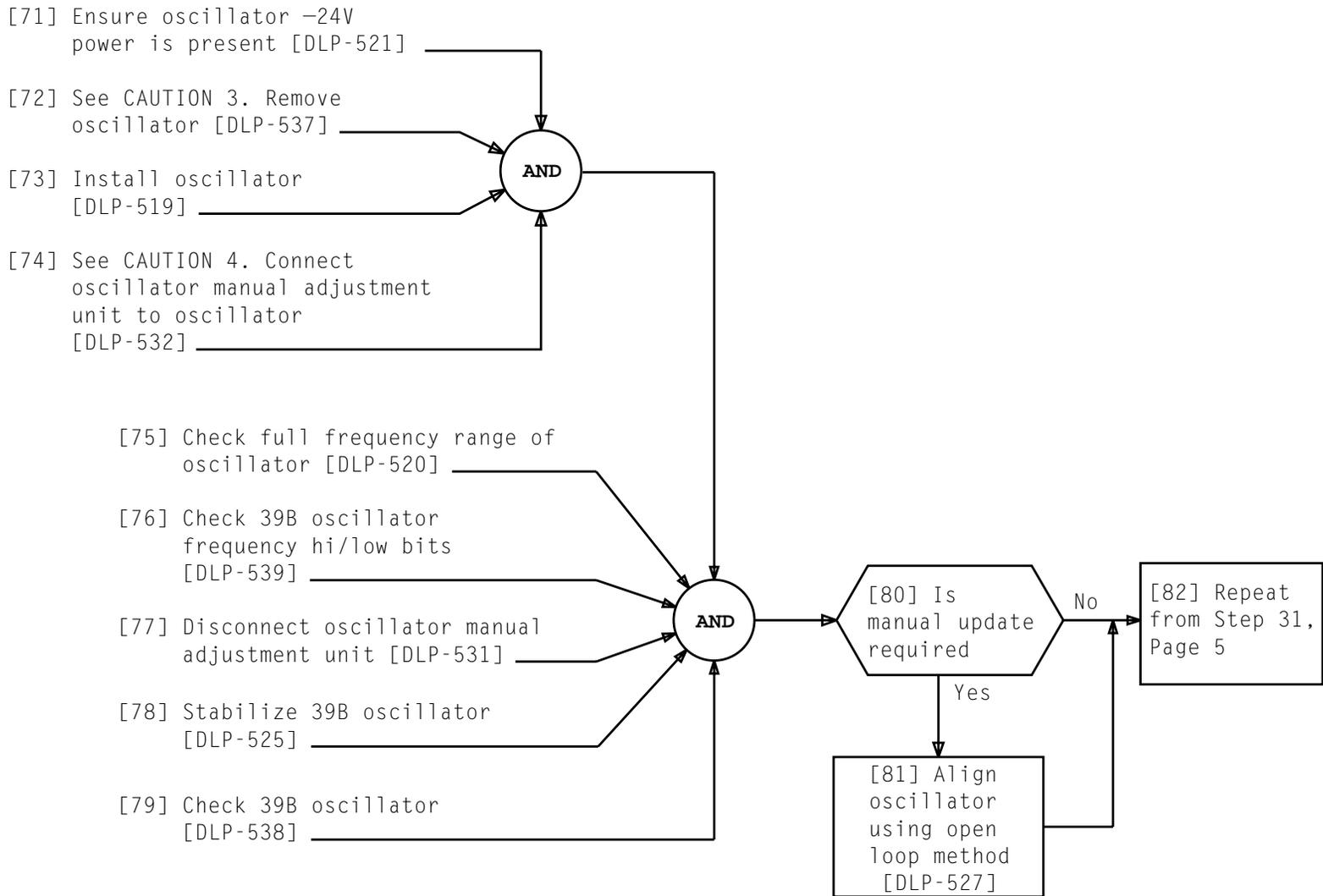
Figure 2 - 39B Oscillator







Issue 2	SEP 1998
234-351-013	TAP
PAGE 7 of 19	134



<i>CAUTIONS</i>	
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	

Issue 2	SEP 1998
234-351-013	TAP
PAGE 8 of 19	<b>134</b>

[83] Connect channel 2 scope probe to terminal 018 of **FB214** pack at TABLE A, Page 3, location

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

Page 10

TABLE D		
CLOCK CHAIN	RELAY	RELAY LOCATION
0	<b>0PHR</b>	066-24
1	<b>1PHR</b>	066-47
2	<b>0PHR</b>	166-24
3	<b>1PHR</b>	166-47

[85] At rear of clock chain, connect cliplead between terminal 1 of PHR relay and frame ground [TABLE D]

AND

[87] Does **PHASE METER** have one or no yellow LEDs lit

Page 14

[86] Momentarily depress **MSO** pushbutton

[91] Clear phase error using SD-4A036-01

[88] Depress **ROS/OFF** switch to remove power from chain having phase error cleared (**OFF NORM** and **PWR OFF** lamps light)

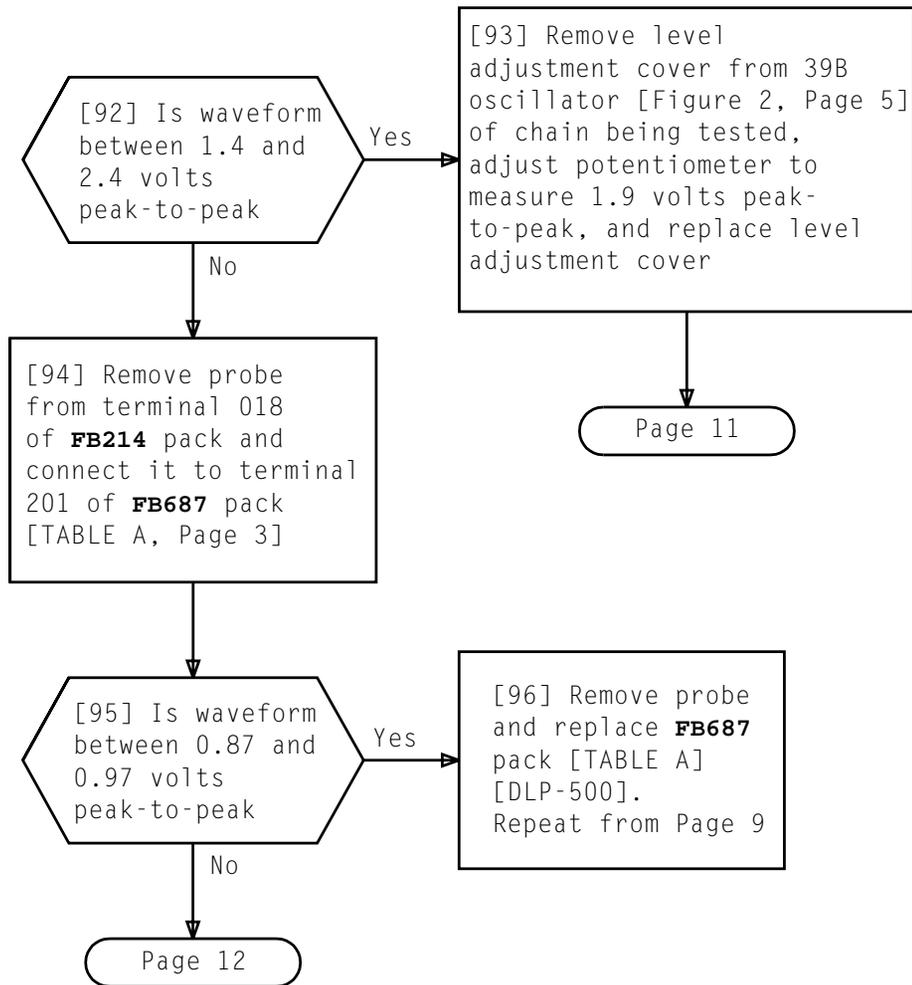
AND

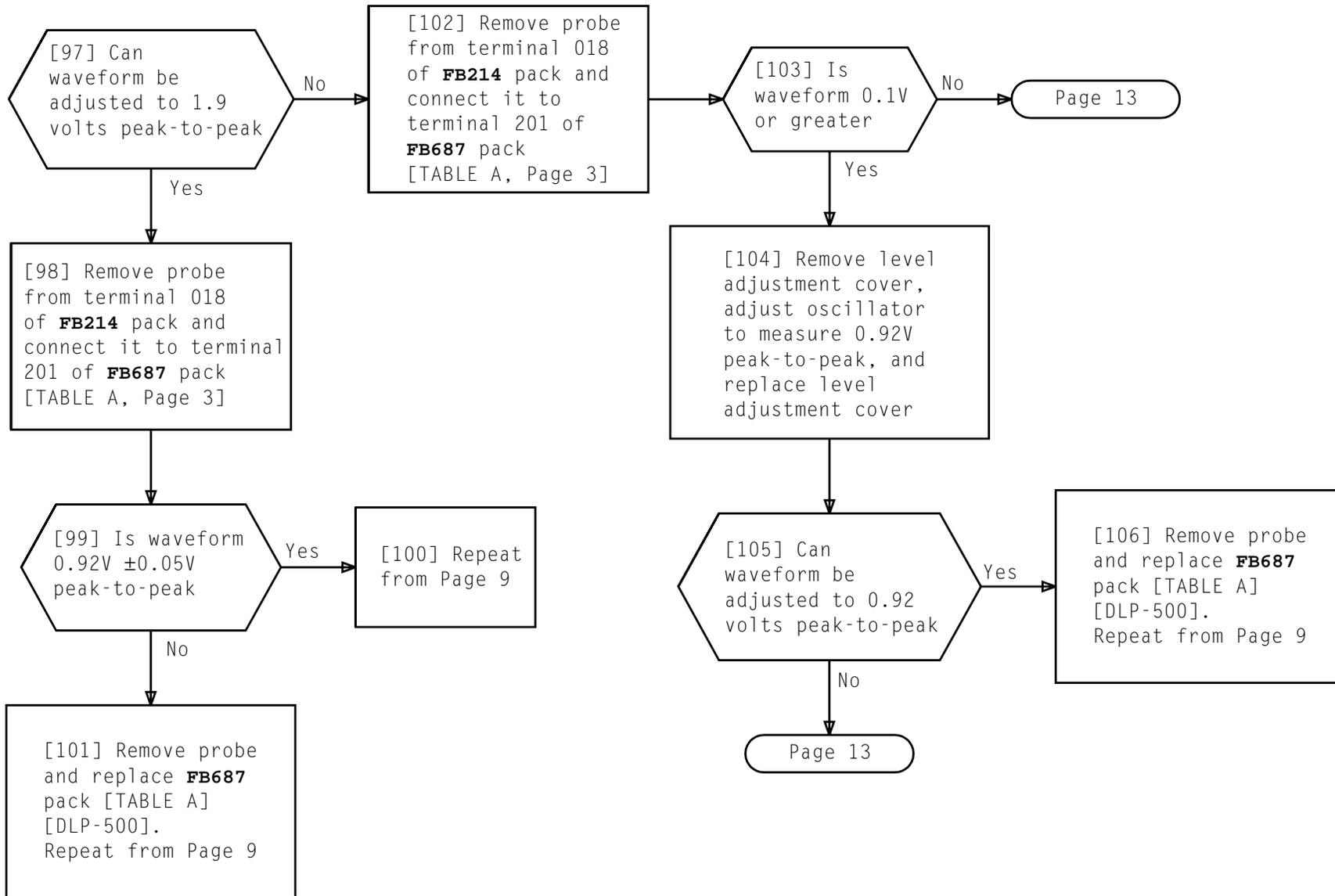
[90] Repeat from Step 86

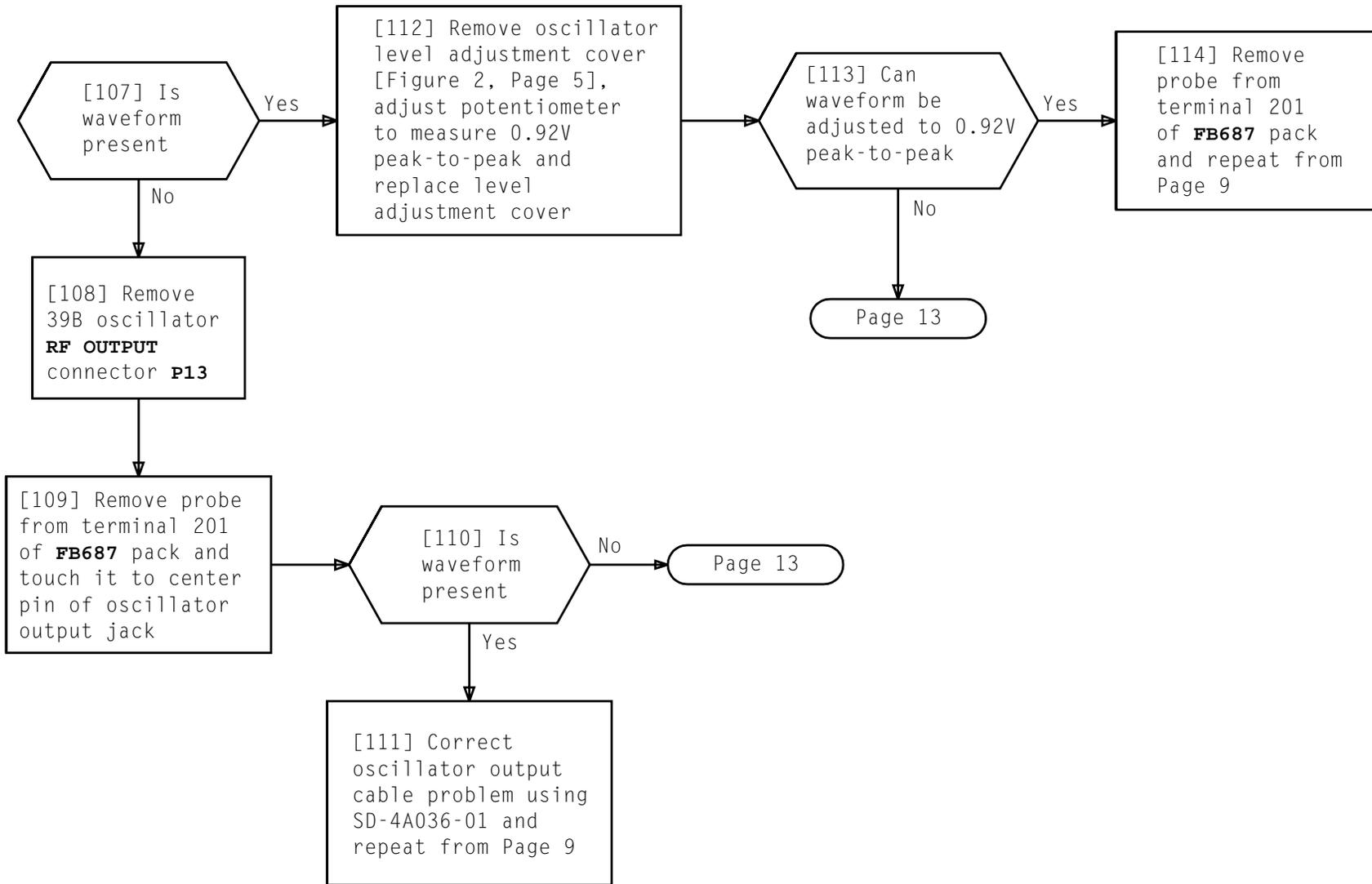
[89] Replace phase meter [DLP-516]

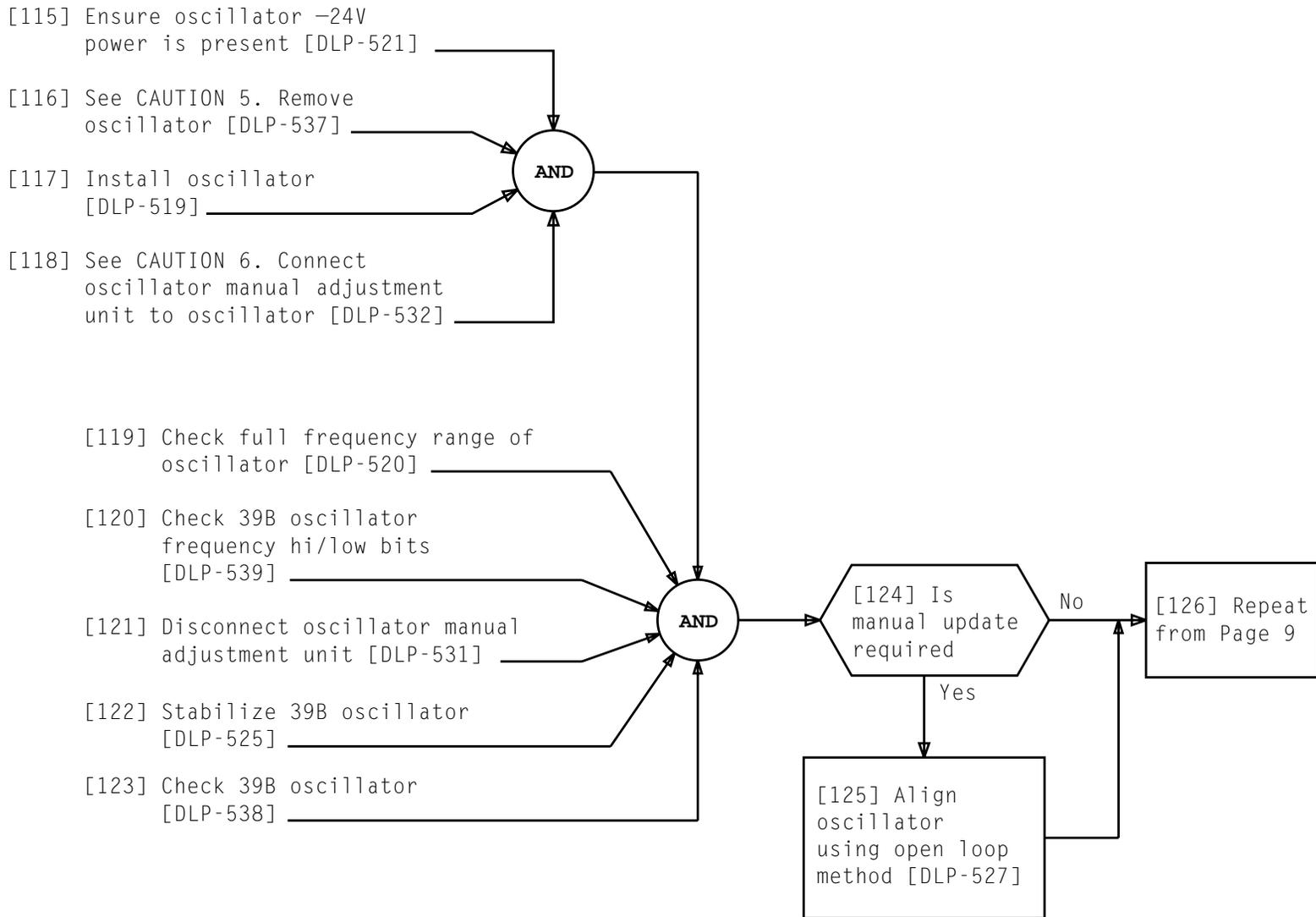
**CLEAR PHASE ERROR – 39B OSCILLATORS**

Issue 2	SEP 1998
234-351-013	TAP
PAGE 9 of 19	<b>134</b>







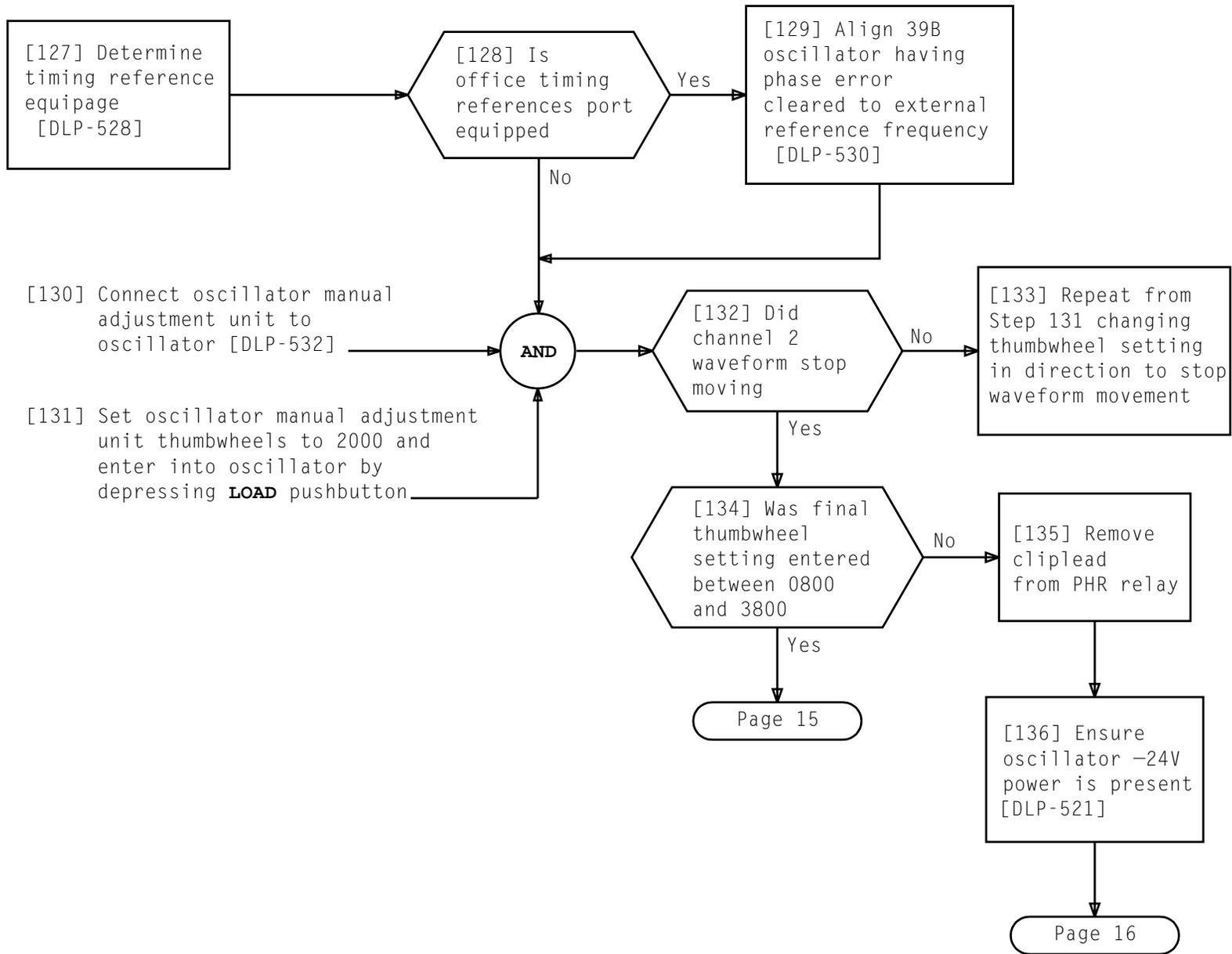


*CAUTIONS*

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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 13 of 19	<b>134</b>



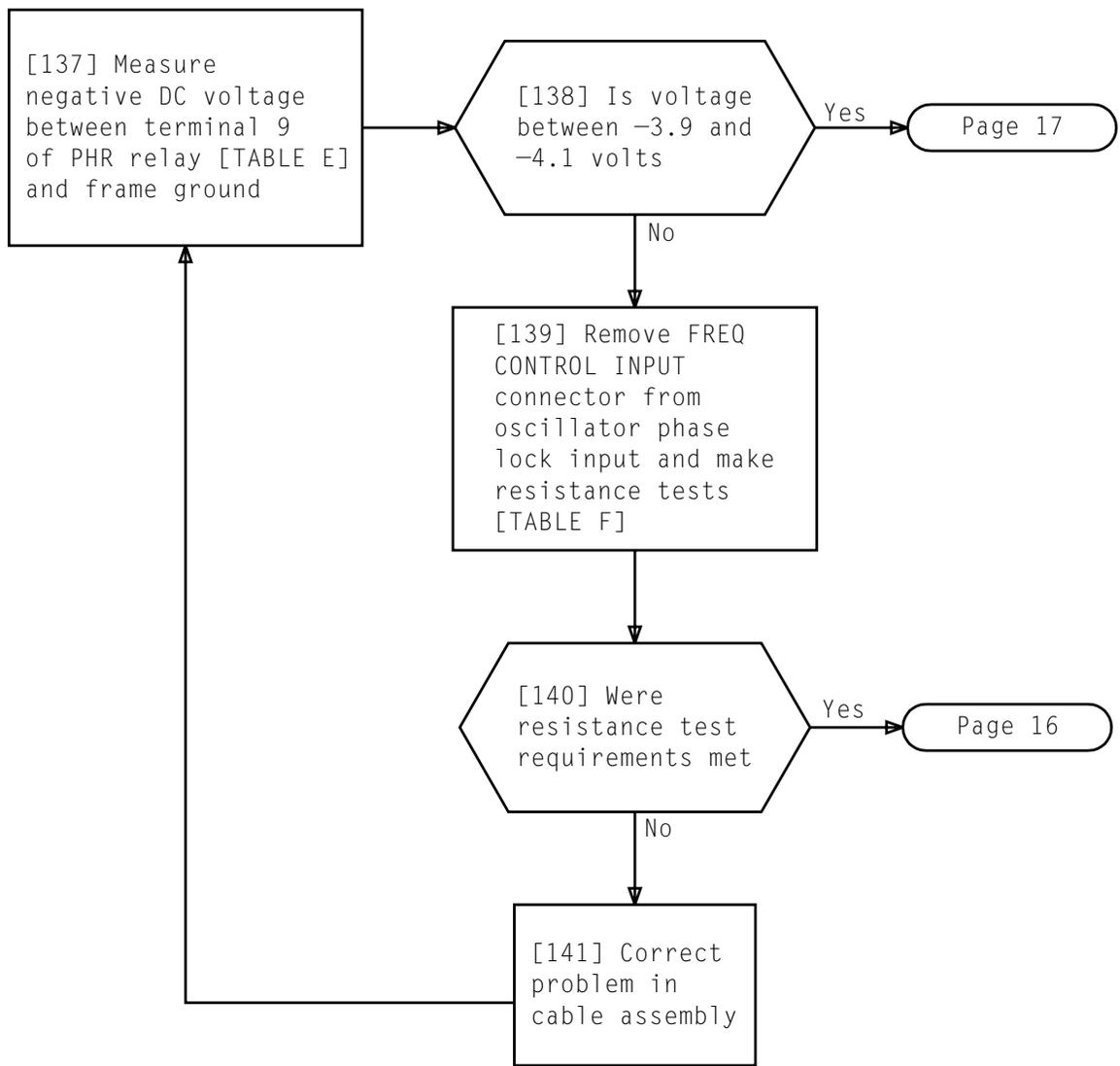


TABLE E		
CLOCK CHAIN	RELAY	RELAY LOCATION
0	0PHR	066-24
1	1PHR	066-47
2	0PHR	166-24
3	1PHR	166-47

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		

[142] See CAUTION 7. Remove oscillator [DLP-537]

[143] Install oscillator [DLP-519]

[144] See CAUTION 8. Connect oscillator manual adjustment unit to oscillator [DLP-532]

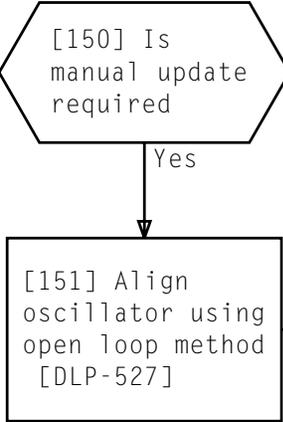
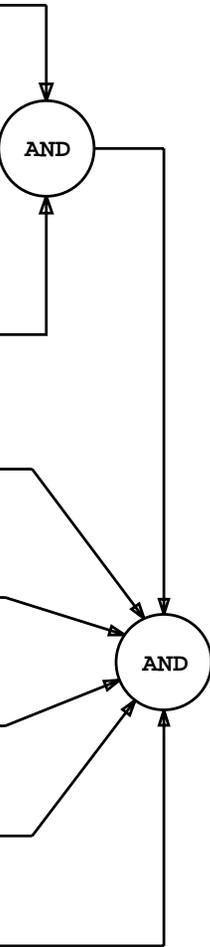
[145] Check full frequency range of oscillator [DLP-520]

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

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

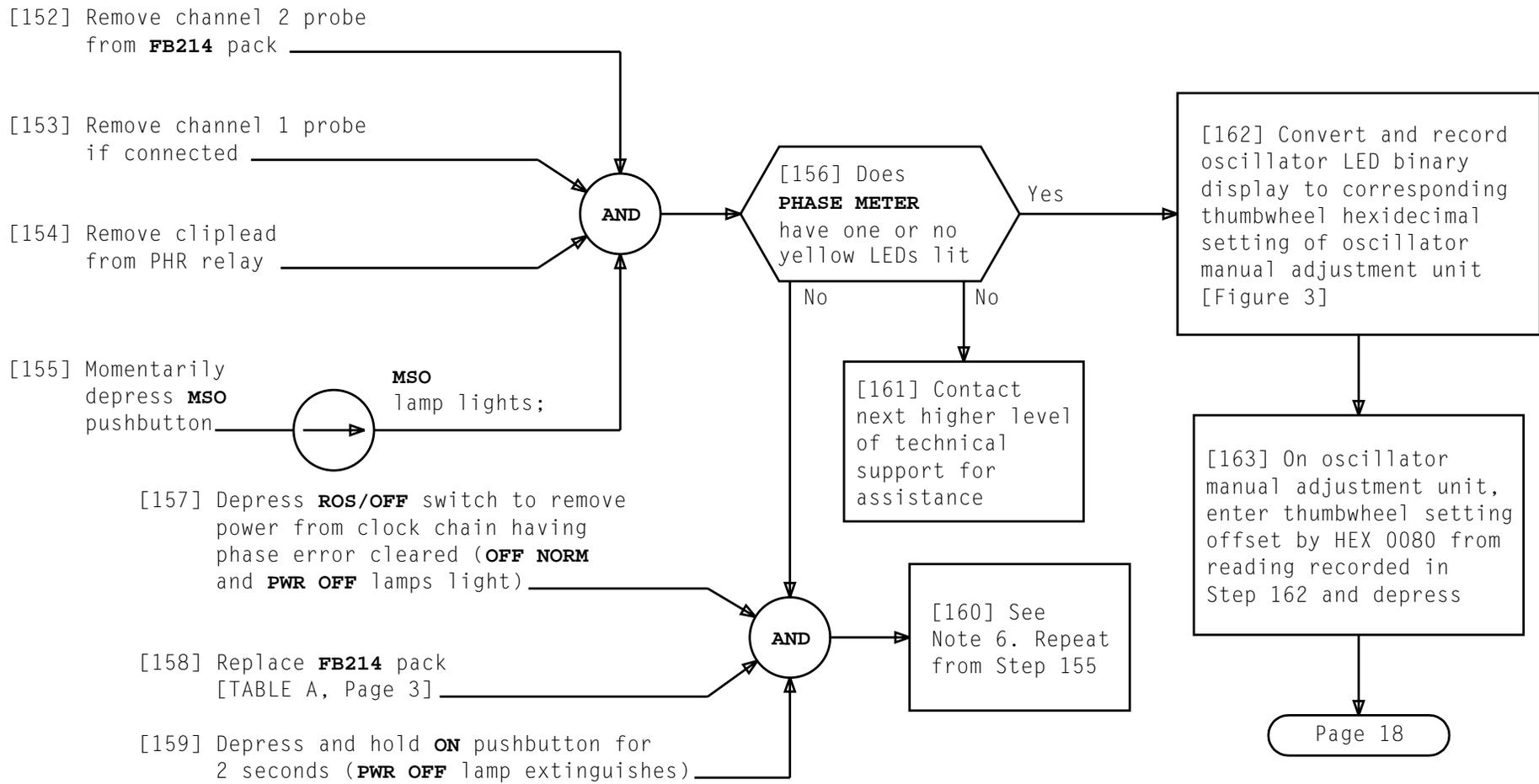
[148] Stabilize 39B oscillator [DLP-525]

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



**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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 16 of 19	<b>134</b>

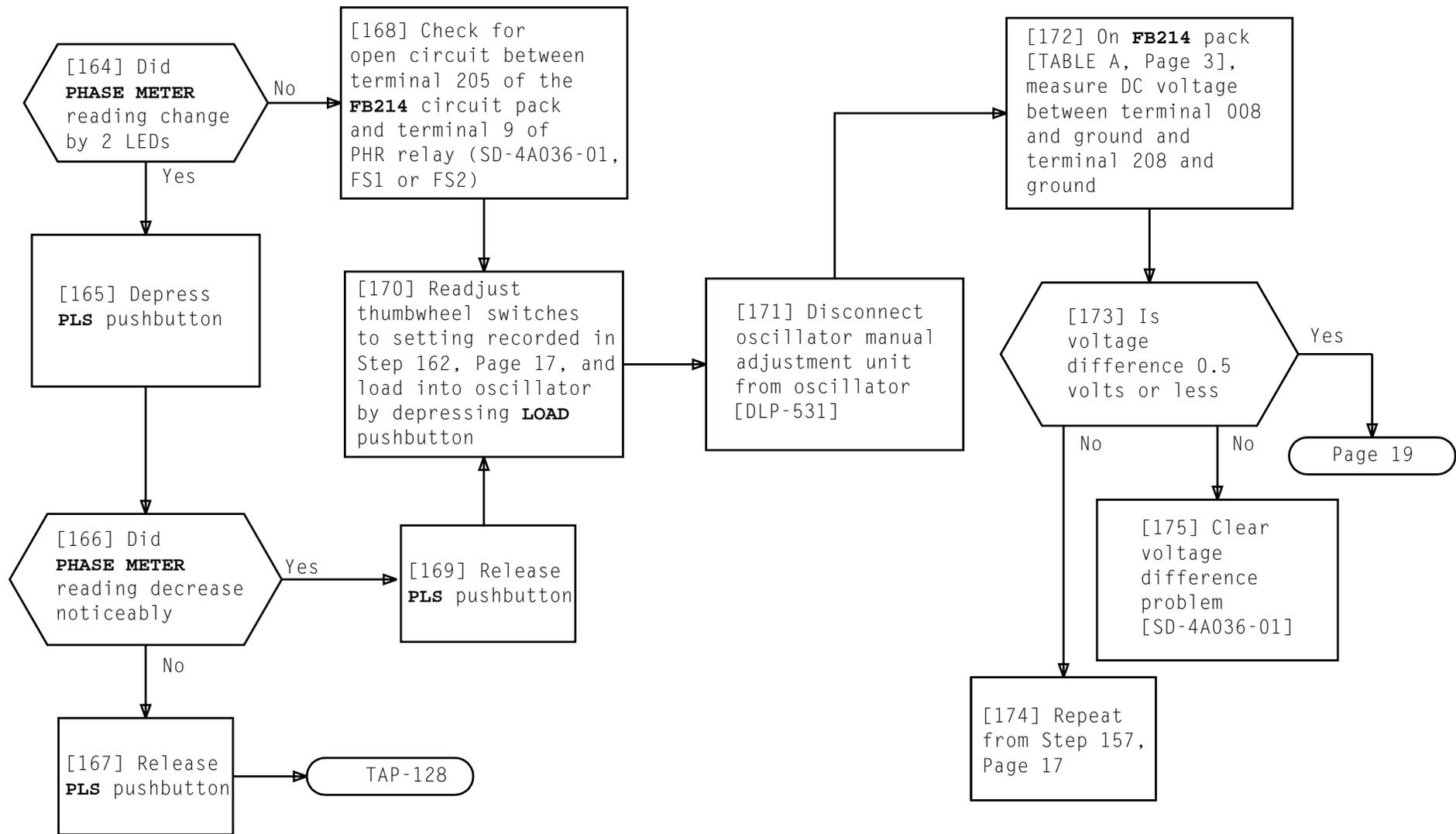


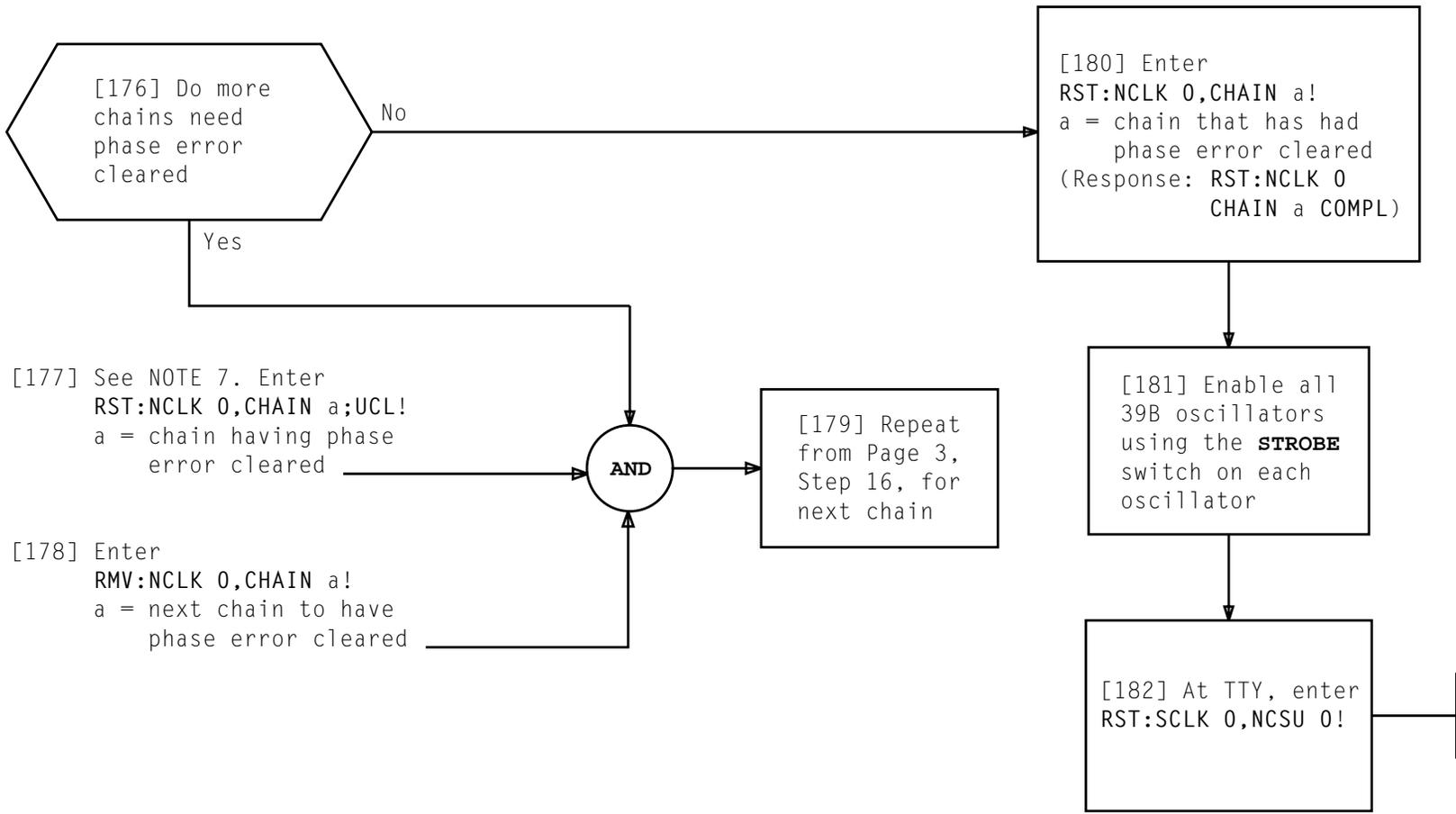
LED POSITION (TOP → BOTTOM)														
	14	13	12	11	10	9	8	7	6	5	4	3	2	1
LED BINARY NUMBER	1	0	1	0	1	0	1	0	0	1	1	1	1	1
THUMBWHEEL HEX NUMBER	2		A			9			F					

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

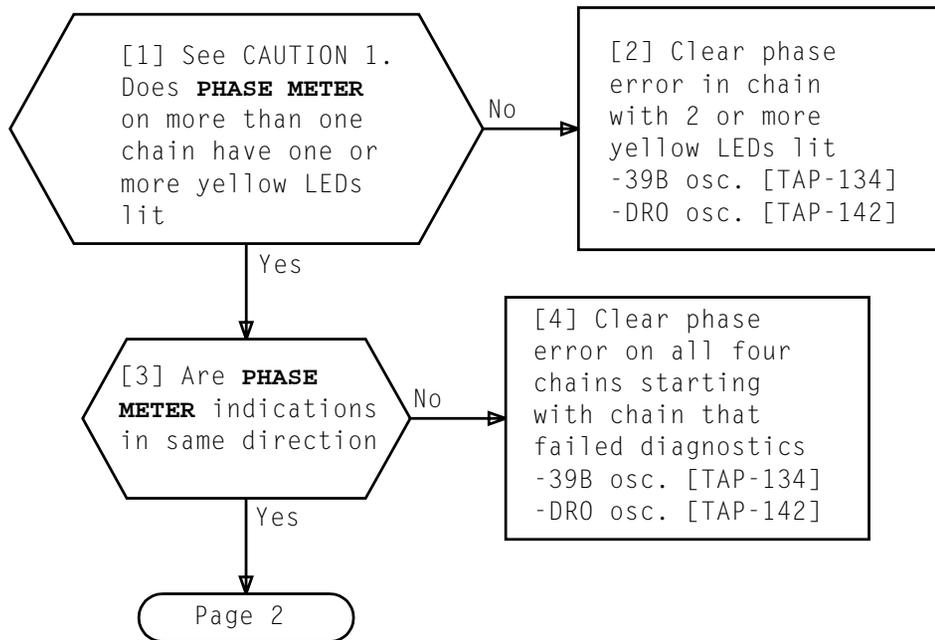
NOTE 6  
**FB214** pack contains oven control and thermistor monitoring bridges that require 15 minutes to stabilize

Issue 2	SEP 1998
234-351-013	TAP
PAGE 17 of 19	<b>134</b>





NOTE 7	
Ensure chain is powered up before restoring unconditionally	
Issue 2	SEP 1998
234-351-013	TAP
PAGE 19 of 19	134



**CLEAR NCLK CHAIN PHASE METER ERROR**

<i>CAUTION 1</i>	
<i>Always remove NCSU from service and disable all oscillators (using <b>ENABLE/DISABLE</b> switch) before working on any network clock problem</i>	
<b>Issue 2</b>	<b>SEP 1998</b>
<b>234-351-013</b>	<b>TAP</b>
<b>PAGE 1 of 2</b>	<b>135</b>

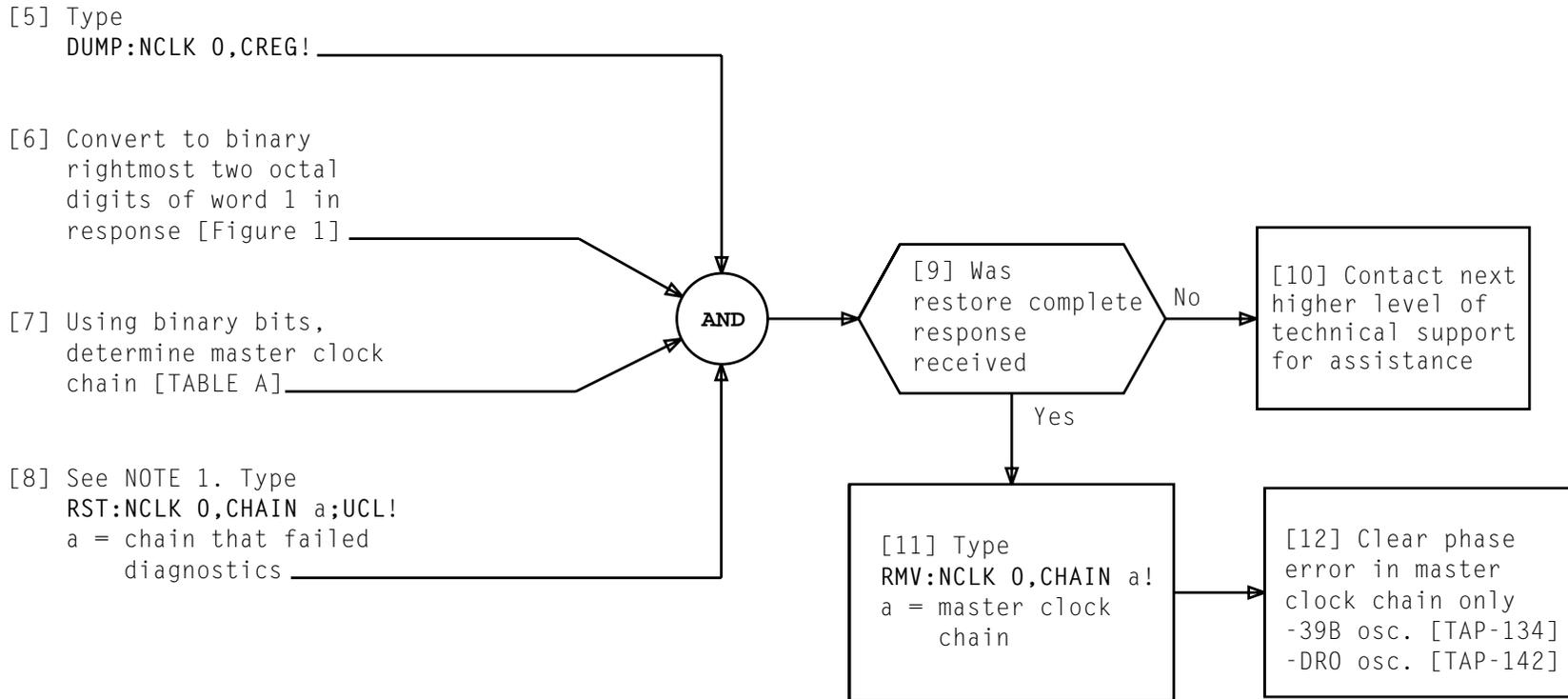


TABLE A						
BINARY BITS						MASTER CHAIN
5	4	3	2	1	0	
DC	DC	DC	0	0	1	0
DC	DC	DC	0	1	0	1
DC	DC	DC	1	0	0	2
DC	DC	1	0	0	0	3

56 DUMP:NCLK 0,CREG

CONVERT TO BINARY

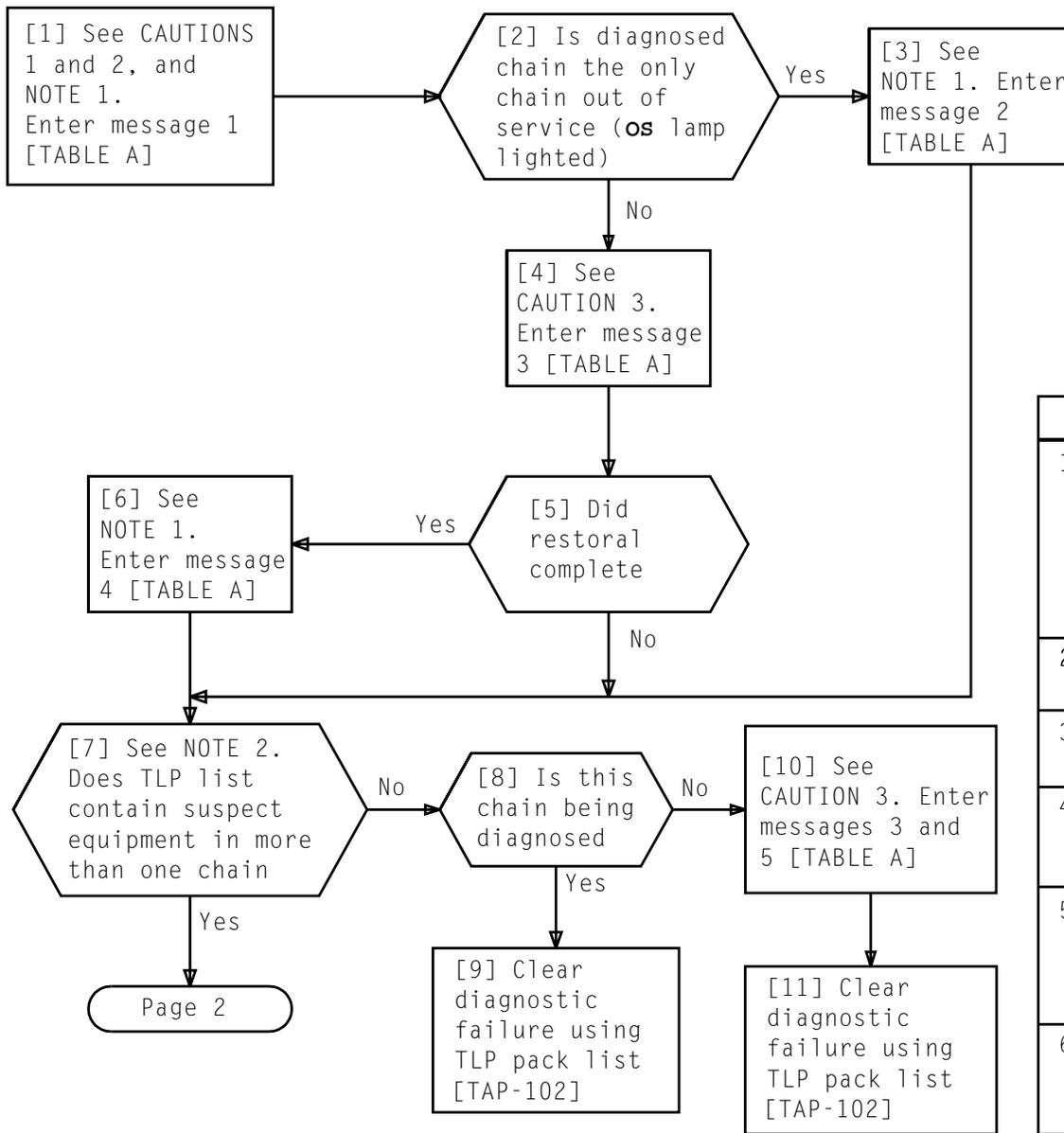
```

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	
Issue 2	SEP 1998
234-351-013	TAP
PAGE 2 of 2	135



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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 2	136

## ISOLATE SUSPECT CLOCK CHAIN, DIAGNOSTIC FAILURE

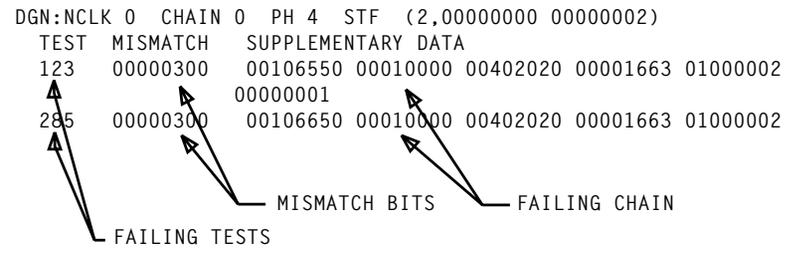
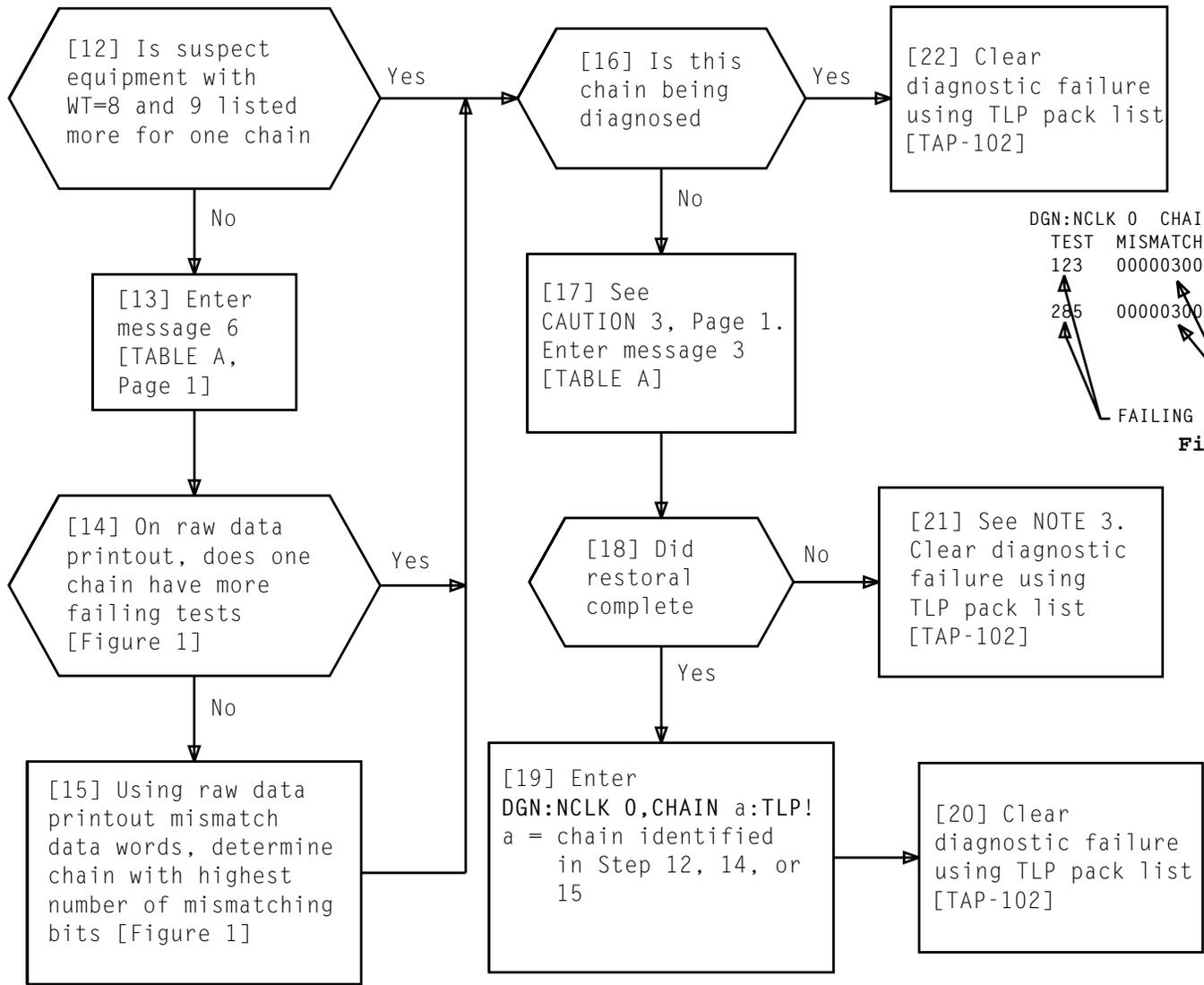


Figure 1 - Raw Data Printout

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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 2 of 2	136

ISOLATE SUSPECT CLOCK CHAIN, DIAGNOSTIC FAILURE

[1] See CAUTION 1.  
Ensure faulty  
chain is out of  
service

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

[3] Connect scope probe  
to terminal 018 of  
**FB214** pack  
[TABLE A]

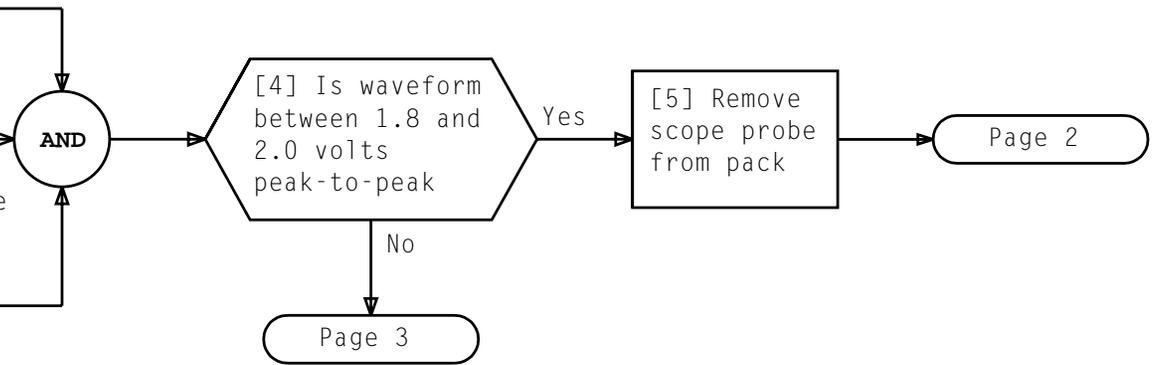
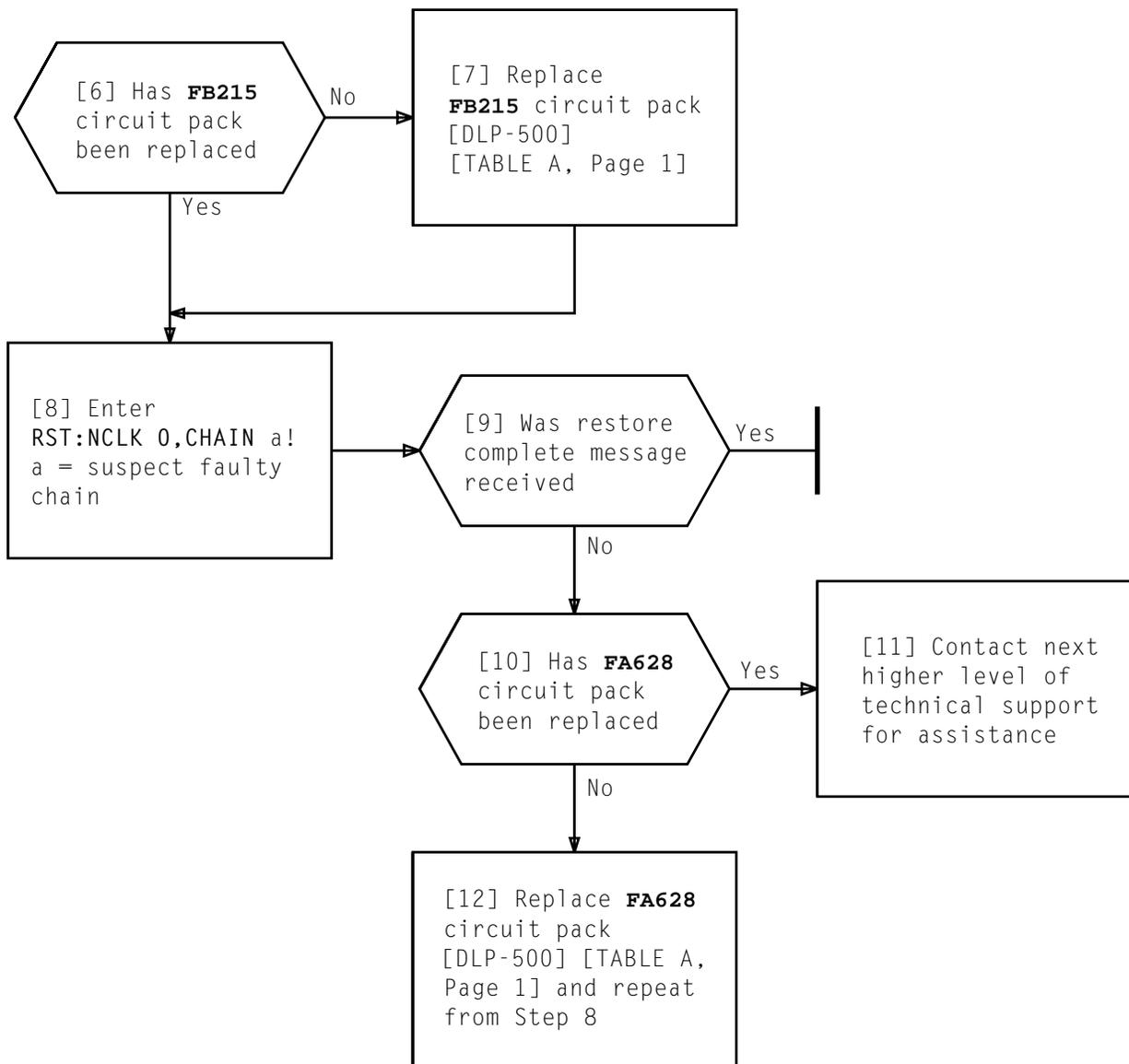


TABLE A				
CHAIN	0	1	2	3
PACK	LOCATION			
<b>FB214</b>	066-33	066-39	166-33	166-39
<b>FB687</b>	070-34	070-37	170-34	170-37
<b>FB215</b>	070-31	070-40	170-31	170-40
<b>FA628</b>	070-29	070-42	170-29	170-42

**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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 6	<b>137</b>



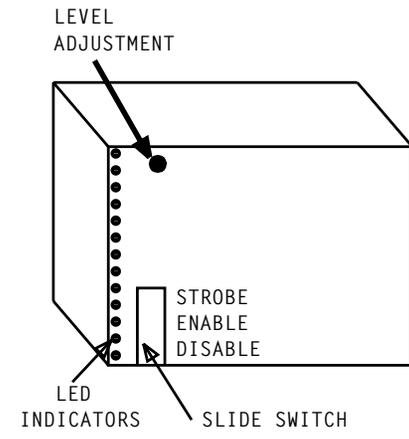
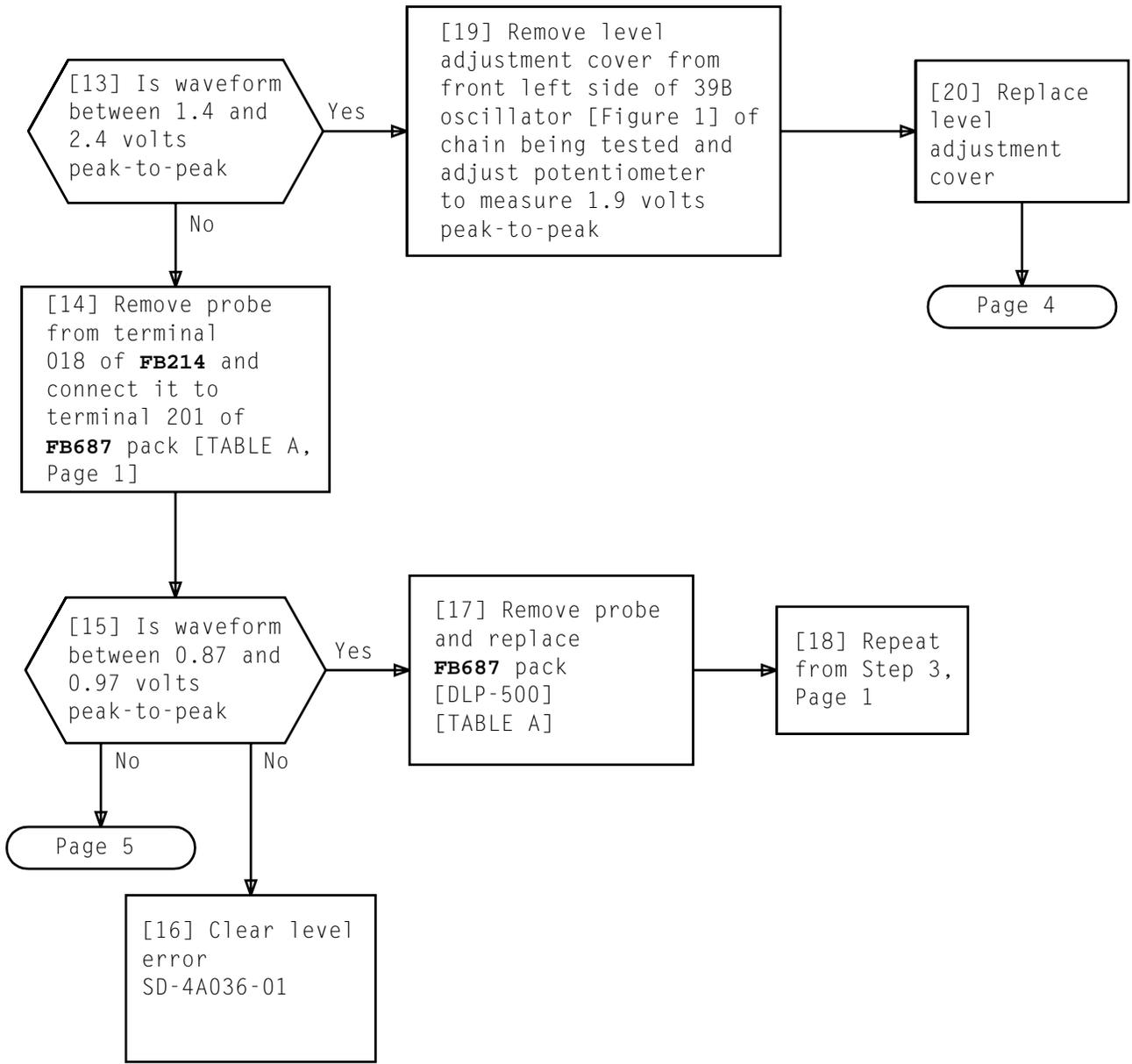
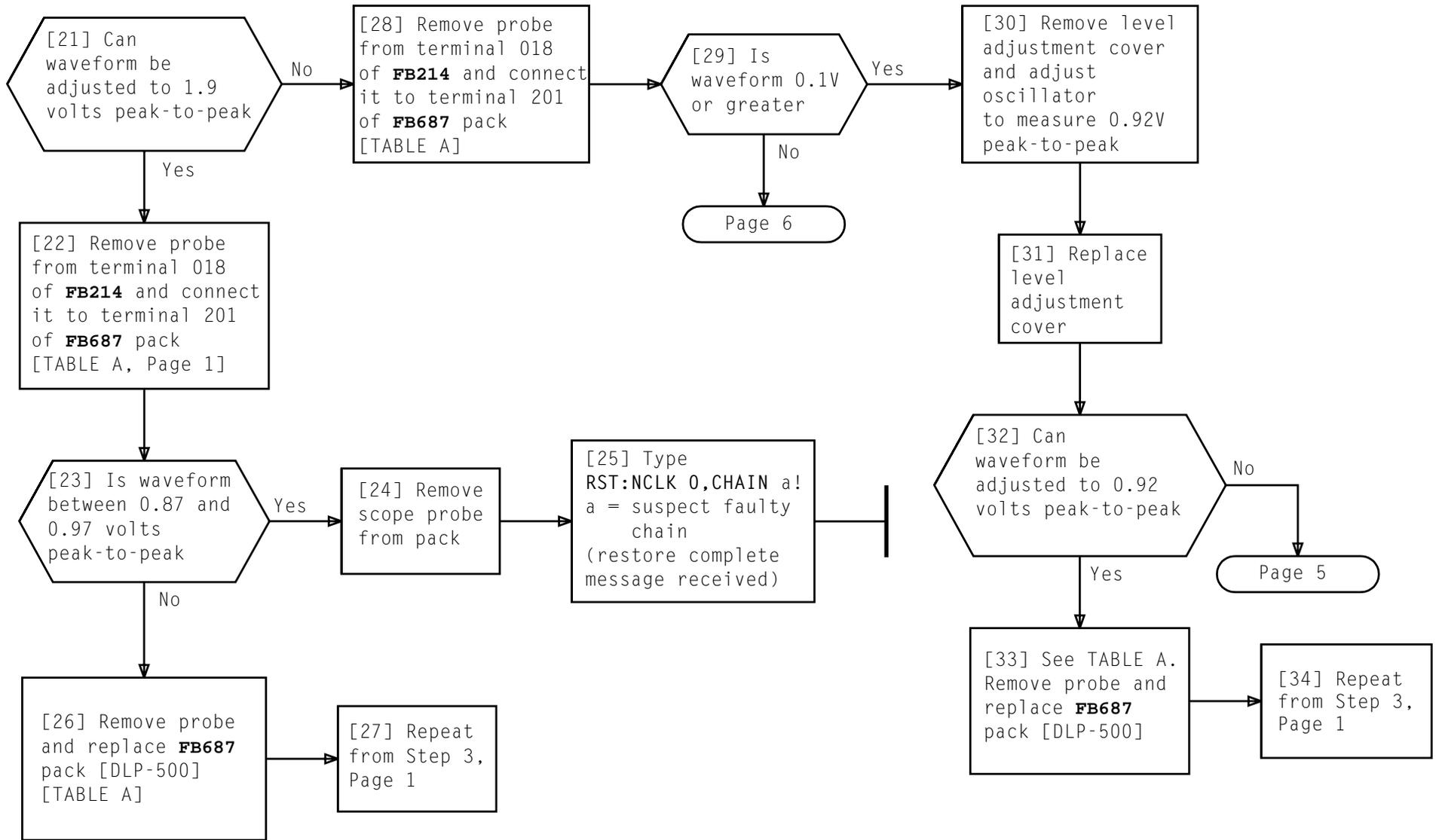
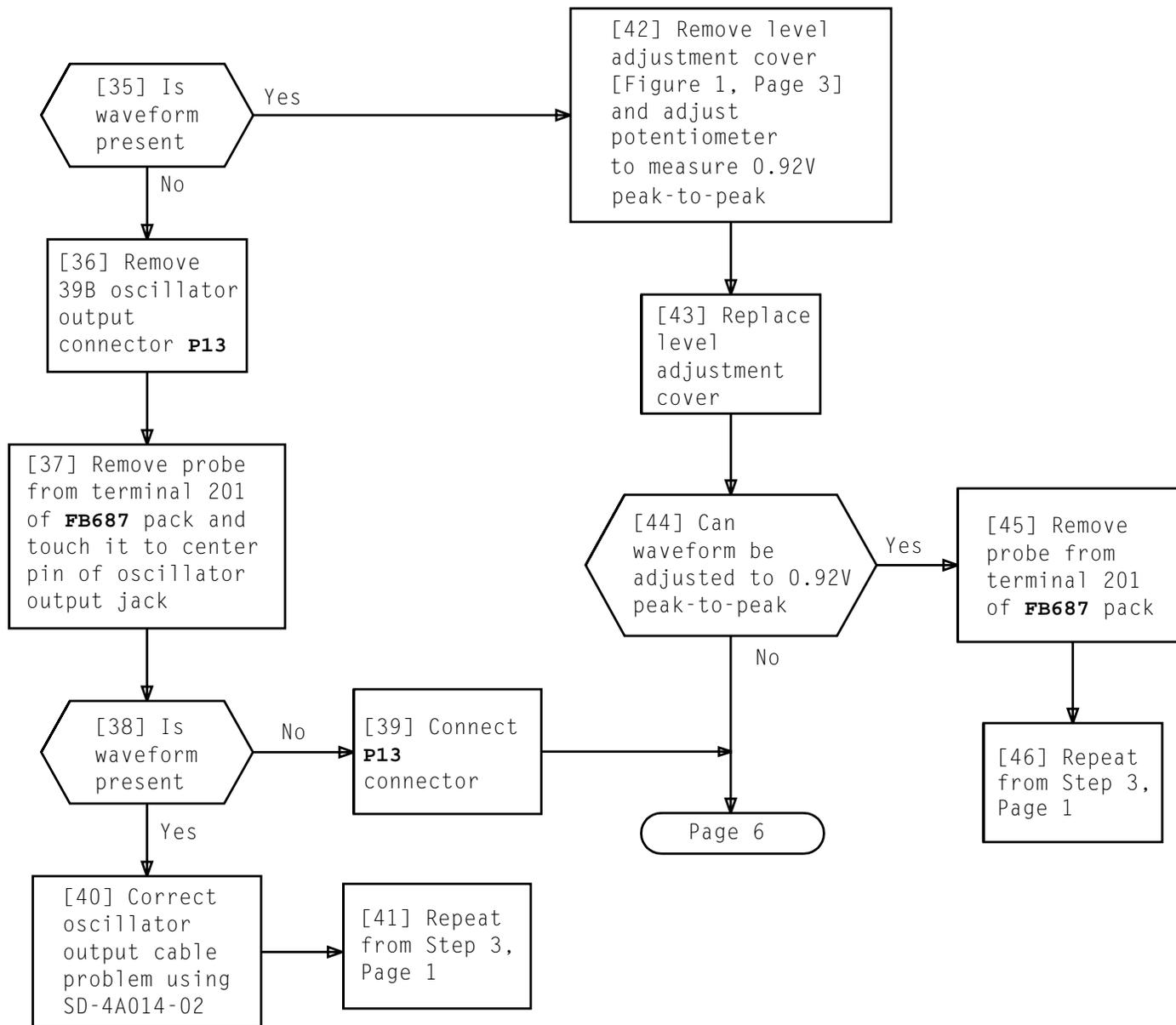


Figure 1 - 39B Oscillator

**CLEAR 39B OSCILLATOR LEVEL ERROR PROBLEM**

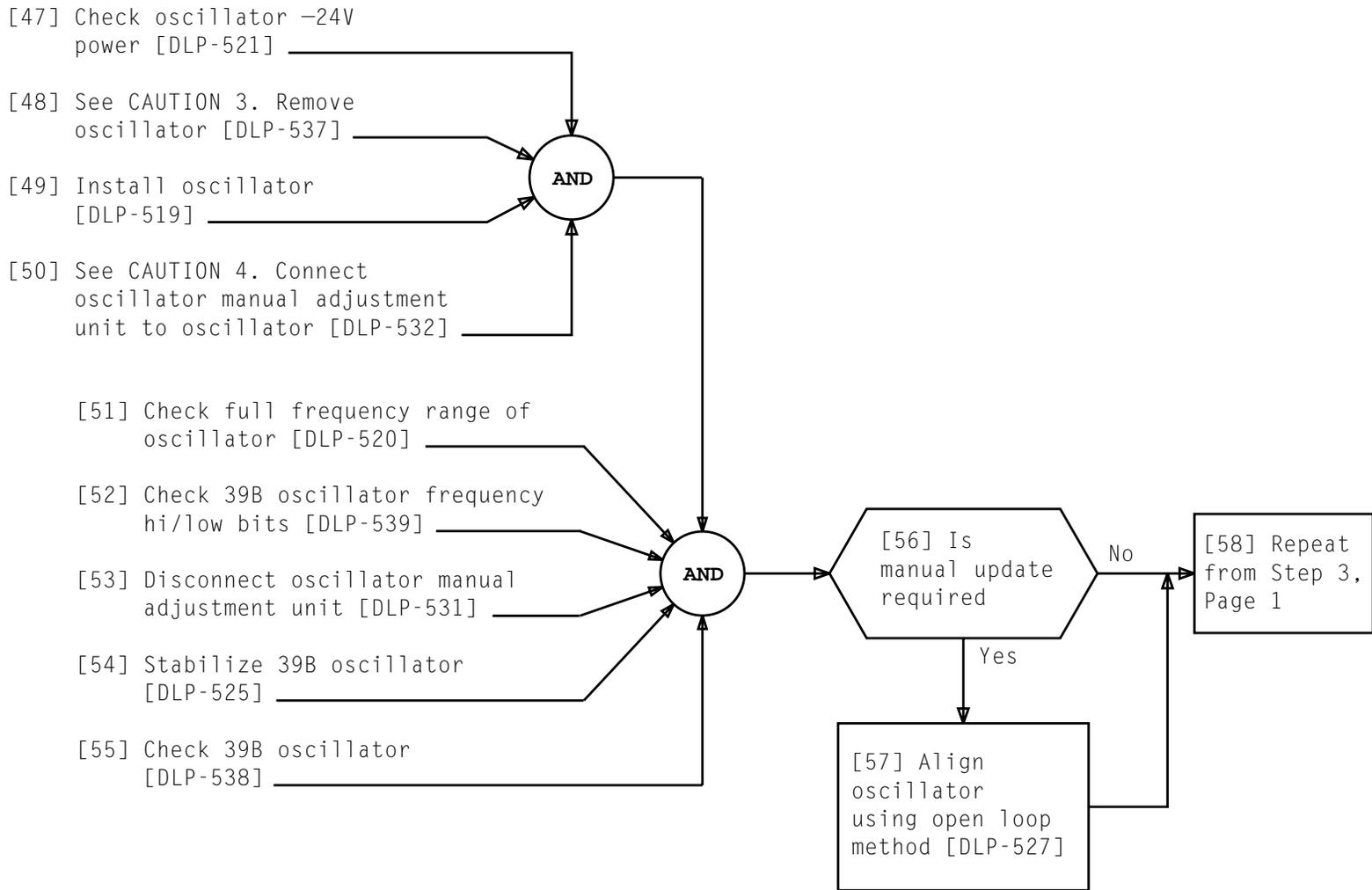
Issue 2	SEP 1998
234-351-013	TAP
PAGE 3 of 6	137





**CLEAR 39B OSCILLATOR LEVEL ERROR PROBLEM**

Issue 2	SEP 1998
234-351-013	TAP
PAGE 5 of 6	<b>137</b>



**CAUTIONS**

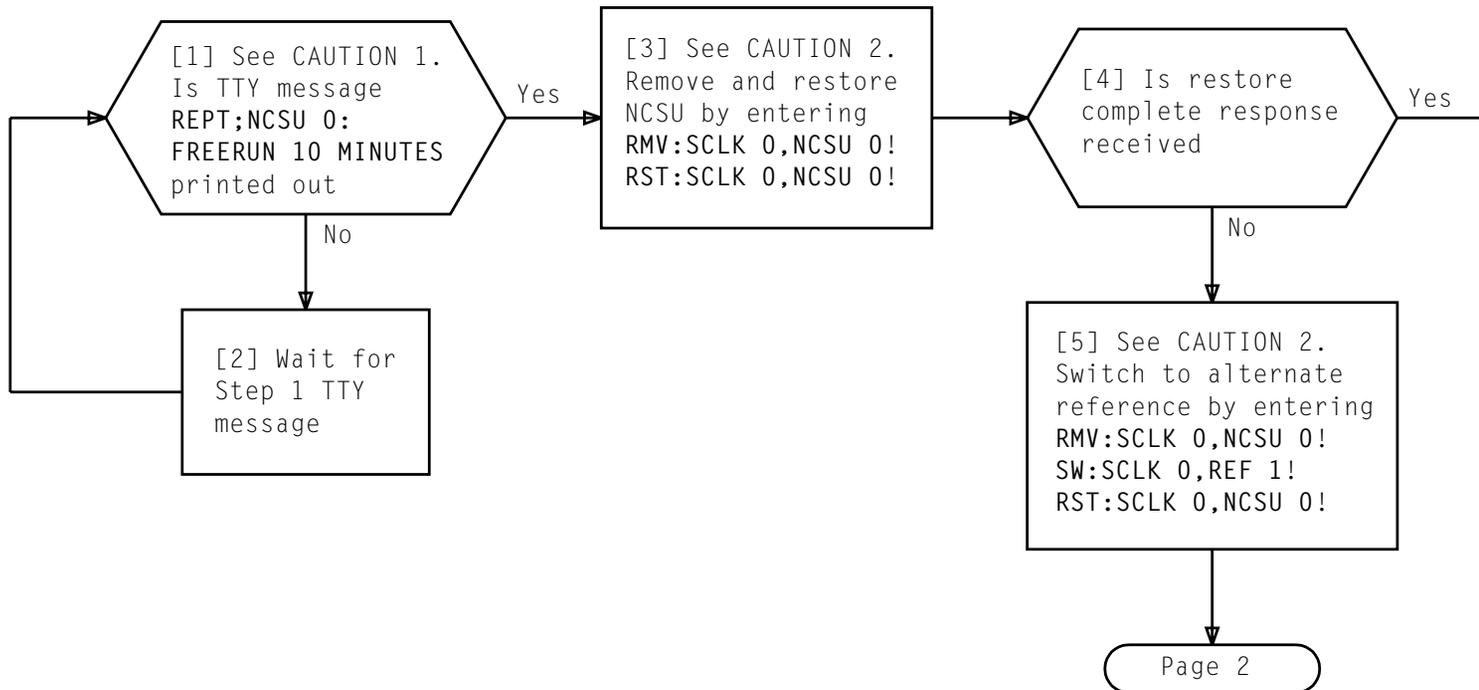
3. Remove RF output cable (P13) immediately even if oscillator is not physically removed immediately

4. Clock chain of oscillator being checked must be powered down

Issue 2 | SEP 1998

234-351-013 | TAP

PAGE 6 of 6 | 137

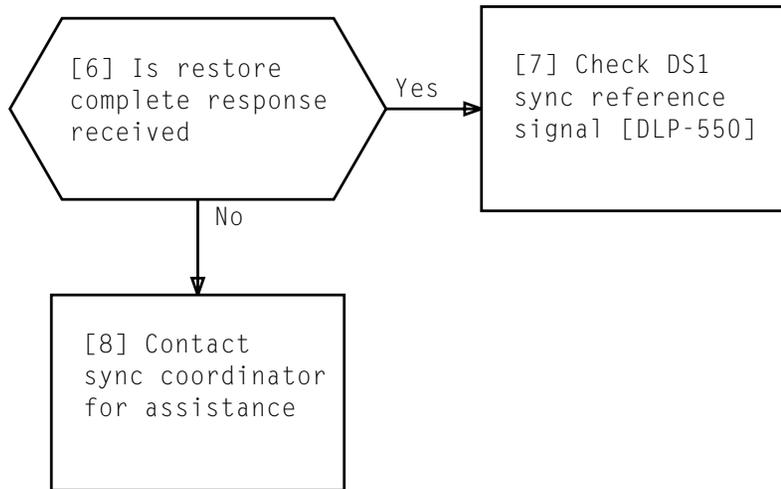


**CAUTIONS**

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

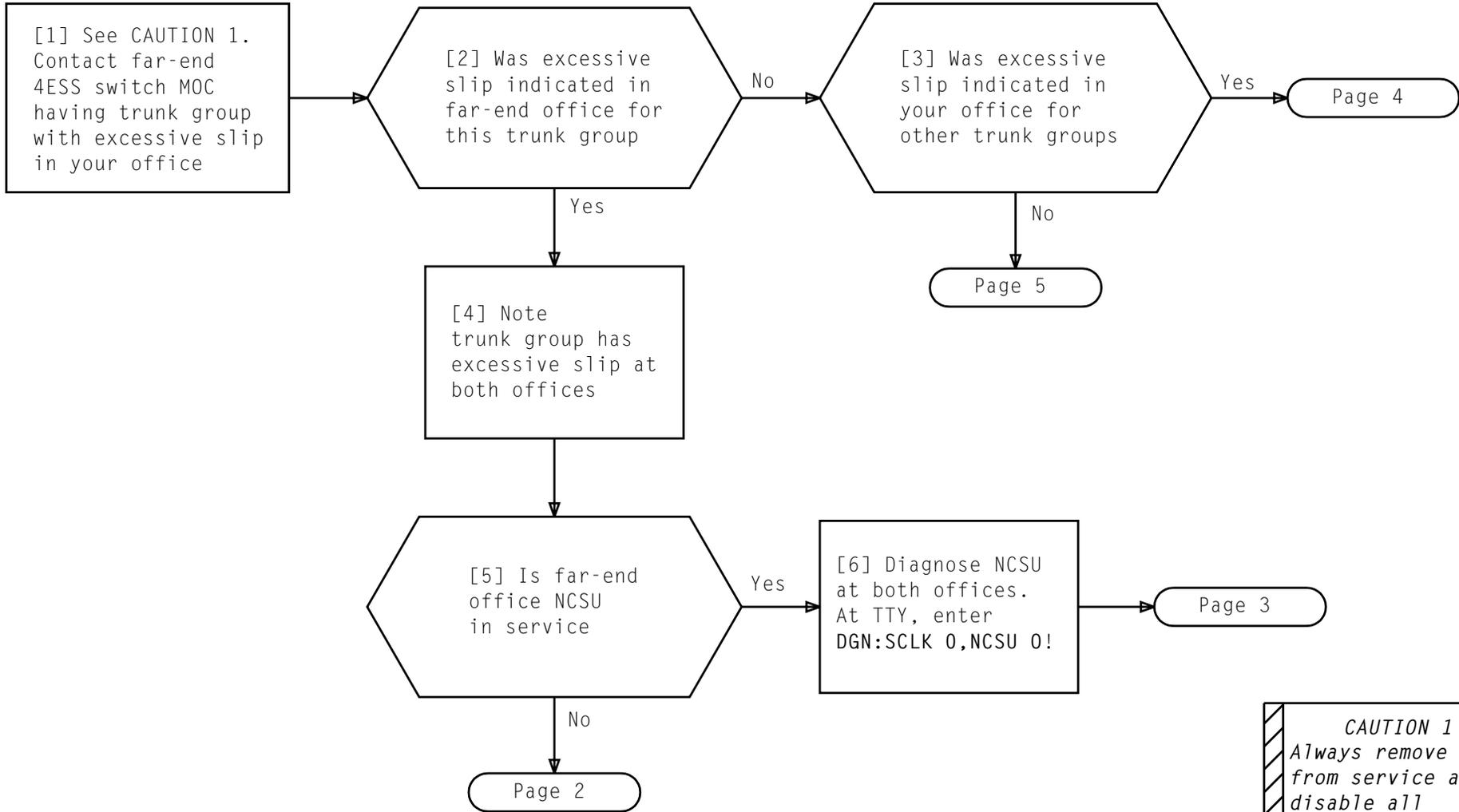
Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 2	<b>138</b>

**CLEAR REF STAT/FREE RUN LAMP LIGHTED**



**CLEAR REF STAT/FREE RUN LAMP LIGHTED**

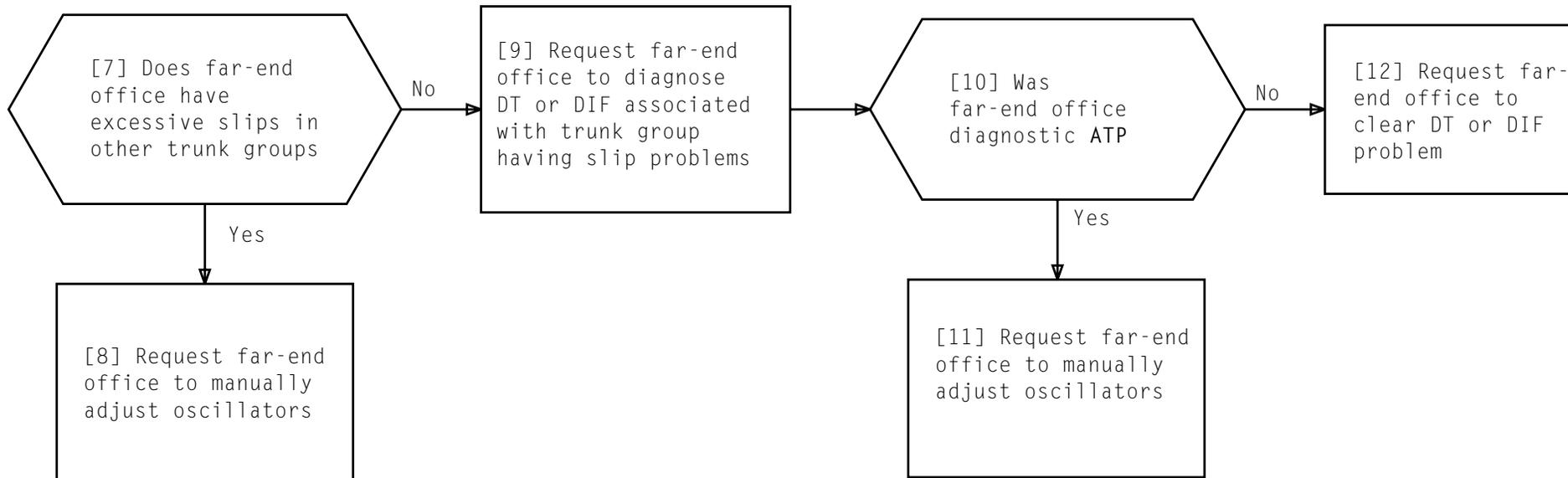
Issue 2	SEP 1998
234-351-013	TAP
PAGE 2 of 2	<b>138</b>



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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 5	<b>139</b>

**CLEAR EXCESSIVE SLIPS IN YOUR OFFICE**



**CLEAR EXCESSIVE SLIPS IN YOUR OFFICE**

Issue 2	SEP 1998
234-351-013	TAP
PAGE 2 of 5	<b>139</b>

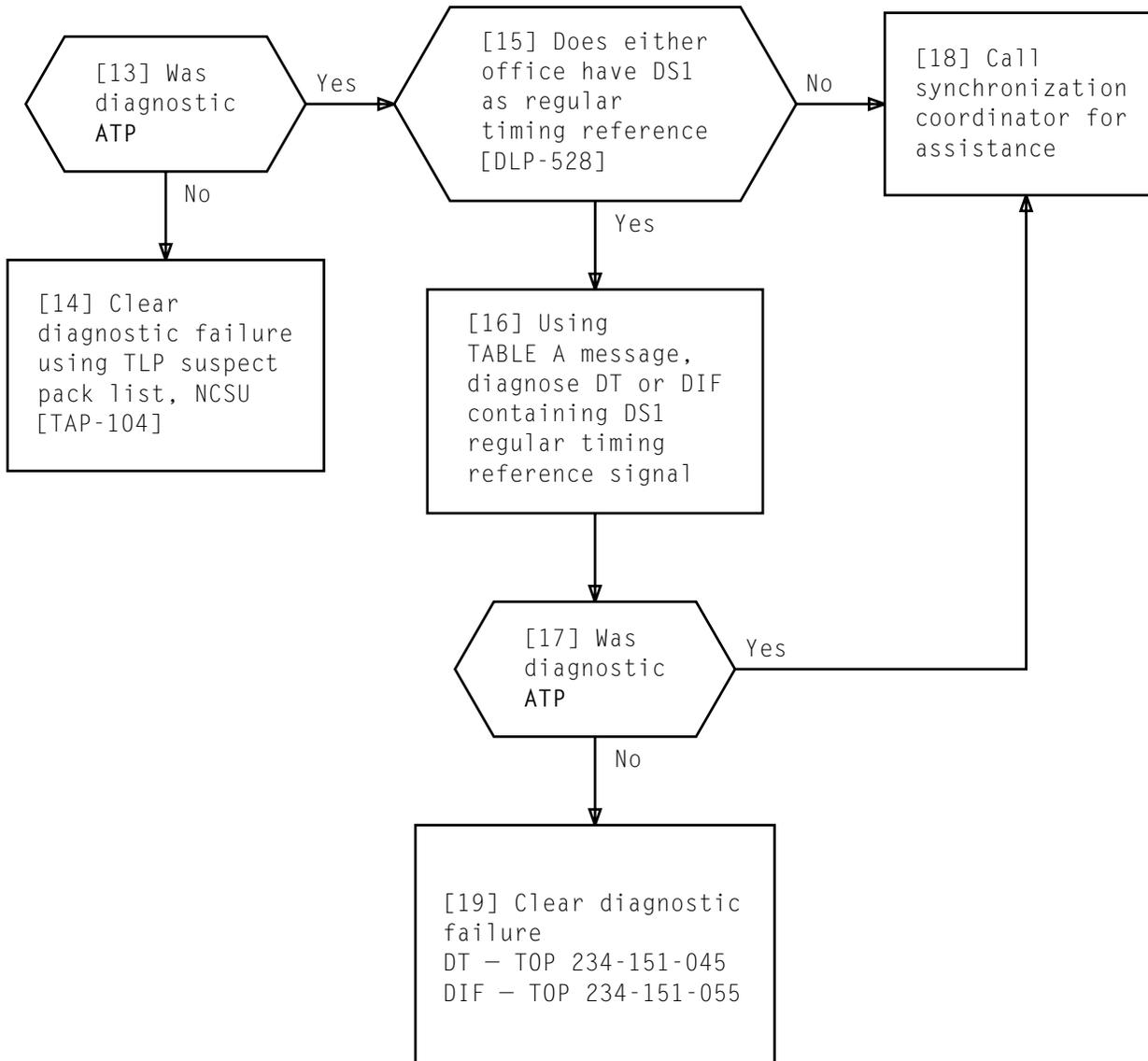


TABLE A	
DGN:DT	a,DIU b!
DGN:DIF	a,DIU b!
a = member number containing DSI reference	
b = submember number	

**CLEAR EXCESSIVE SLIPS IN YOUR OFFICE**

Issue 2	SEP 1998
234-351-013	TAP
PAGE 3 of 5	<b>139</b>

[20] Switch NCSU reference signal to alternate reference by entering  
 RMV:SCLK 0,NCSU 0!  
 SW:SCLK 0:REF 1  
 RST:SCLK 0,NCSU 0!  
 (**REF STAT** lamp lights)

[21] Monitor slips in your office for 24 hours

[22] Is office experiencing excessive slips since alternate reference was selected

Yes

[23] Contact far-end 4ESS switch MOC office having trunk groups with excessive slips in your office

No

Page 5

[24] Is far-end office experiencing excessive slips

No

Page 5

Yes

[25] See NOTE 1. Call synchronization coordinator for assistance

NOTE 1

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

Issue 2	SEP 1998
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234-351-013	TAP
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PAGE 4 of 5	139
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**CLEAR EXCESSIVE SLIPS IN YOUR OFFICE**

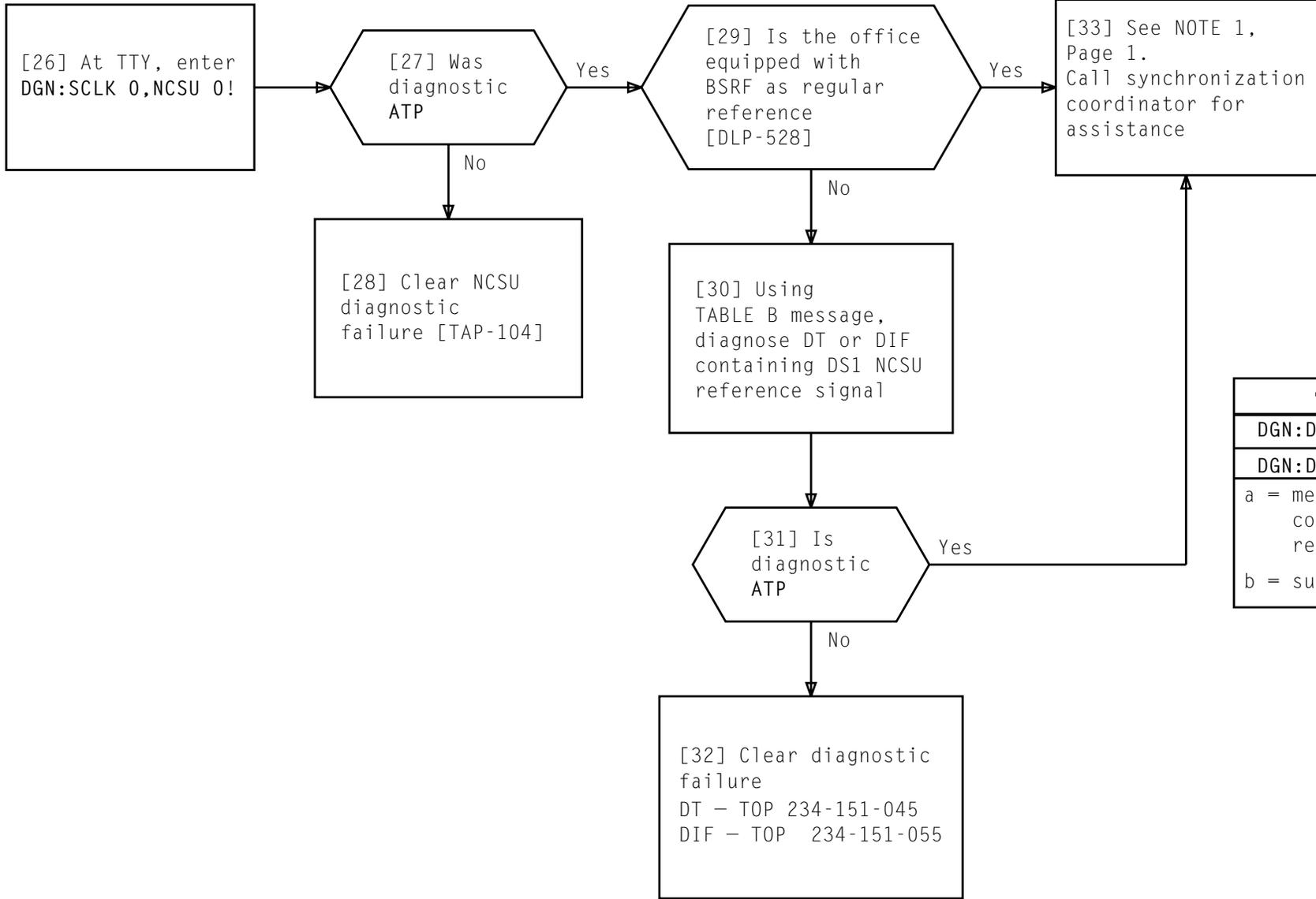
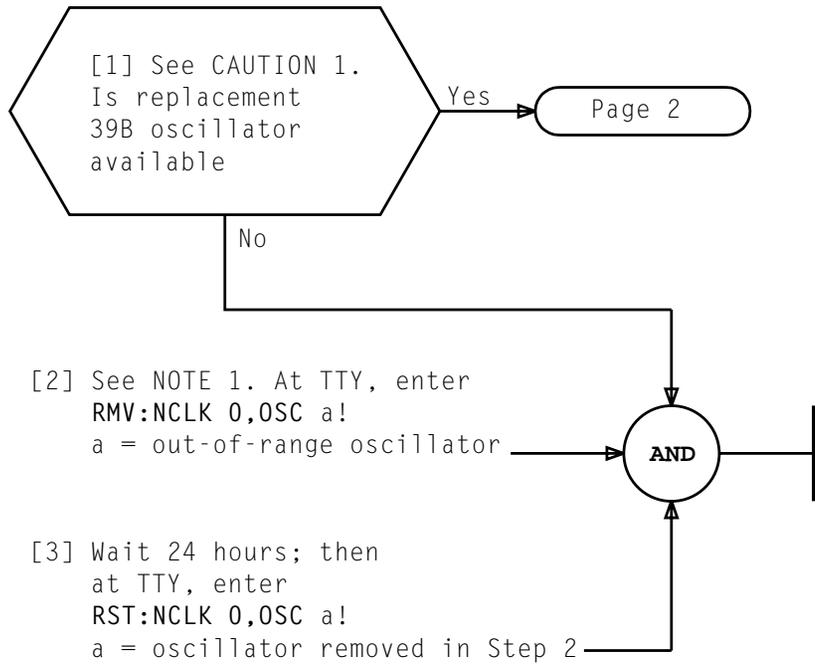


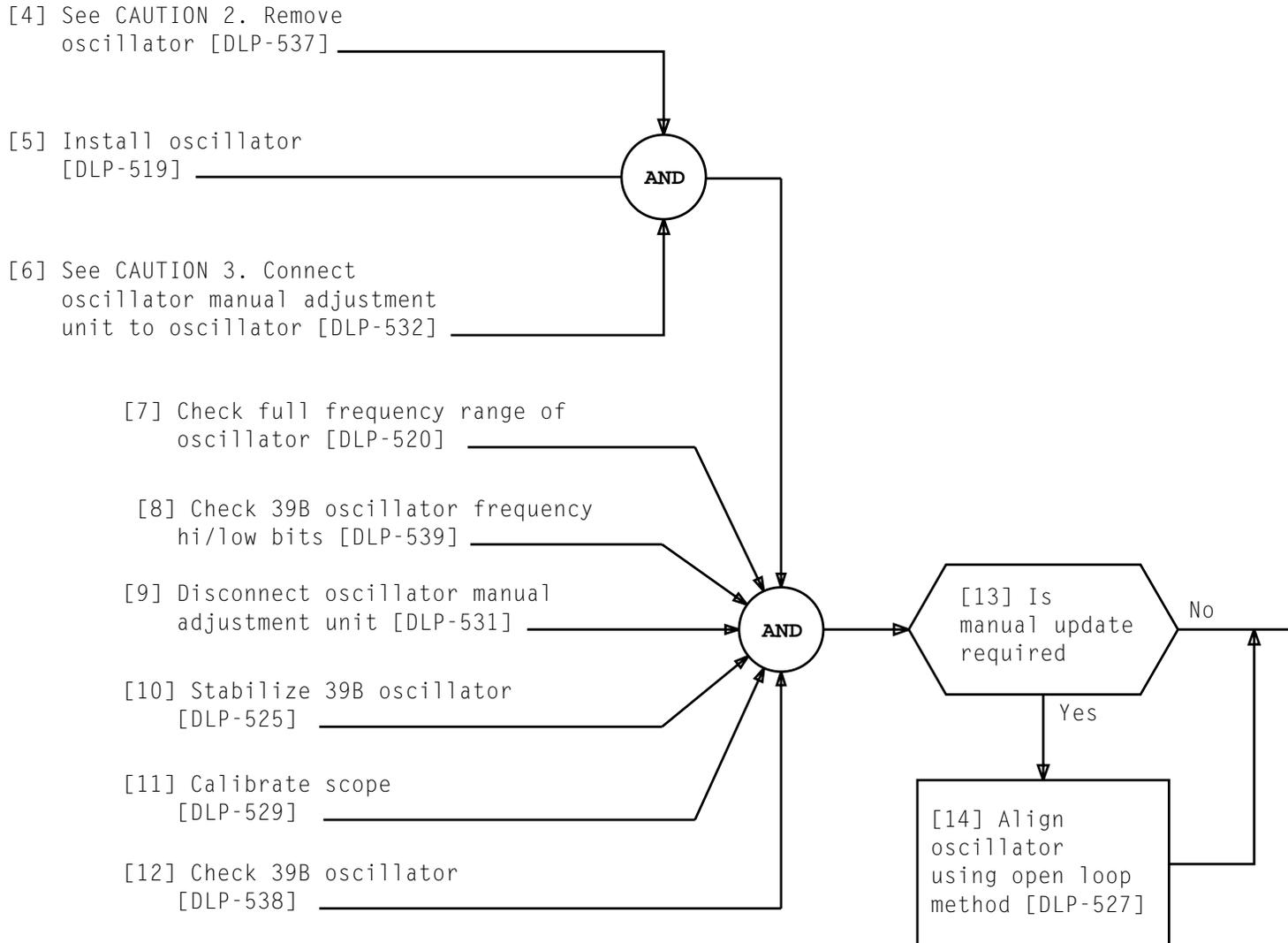
TABLE B	
DGN:DT	a,DIU b!
DGN:DIF	a,DIU b!
a = member number containing DSI reference	
b = submember number	

**CLEAR EXCESSIVE SLIPS IN YOUR OFFICE**



NOTE 1 Order should be placed for replacement 39B oscillator	
<i>CAUTION 1</i> Always remove NCSU from service and disable all oscillators (using <b>ENABLE/DISABLE</b> switch) before working on any network clock problem	
Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 2	140

**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

[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)

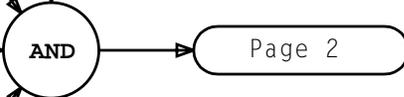


TABLE B						
BINARY BITS						MASTER CHAIN
5	4	3	2	1	0	
DC	DC	DC	0	0	1	0
DC	DC	DC	0	1	0	1
DC	DC	DC	1	0	0	2
DC	DC	1	0	0	0	3

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

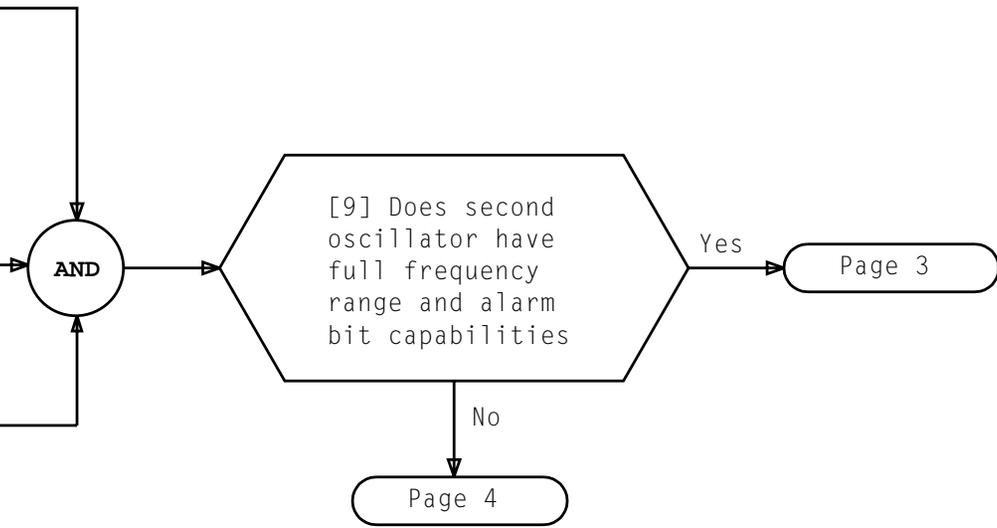
NOTE 1 Network Clock synchronization unit (if operational) display may be used to determine master clock chain. Otherwise, use procedure in Steps 1, 2, and 3	
Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 4	141

**CLEAR DISCIPLINED RUBIDIUM OSCILLATOR FULL FREQUENCY  
RANGE PROBLEM**

[6] Connect oscillator manual adjustment unit to oscillator selected in Step 4, Page 1 [DLP-532]

[7] At selected oscillator, hex display corresponds to thumbwheel setting of oscillator manual adjustment unit. Record value

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



**CLEAR DISCIPLINED RUBIDIUM OSCILLATOR FULL FREQUENCY RANGE PROBLEM**

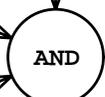
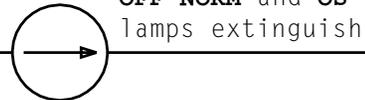
Issue 2	SEP 1998
234-351-013	TAP
PAGE 2 of 4	<b>141</b>

[10] Adjust oscillator manual adjustment unit thumbwheels to original frequency word recorded in Step 7, Page 2

[11] Load frequency word into second oscillator by depressing **LOAD** pushbutton

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

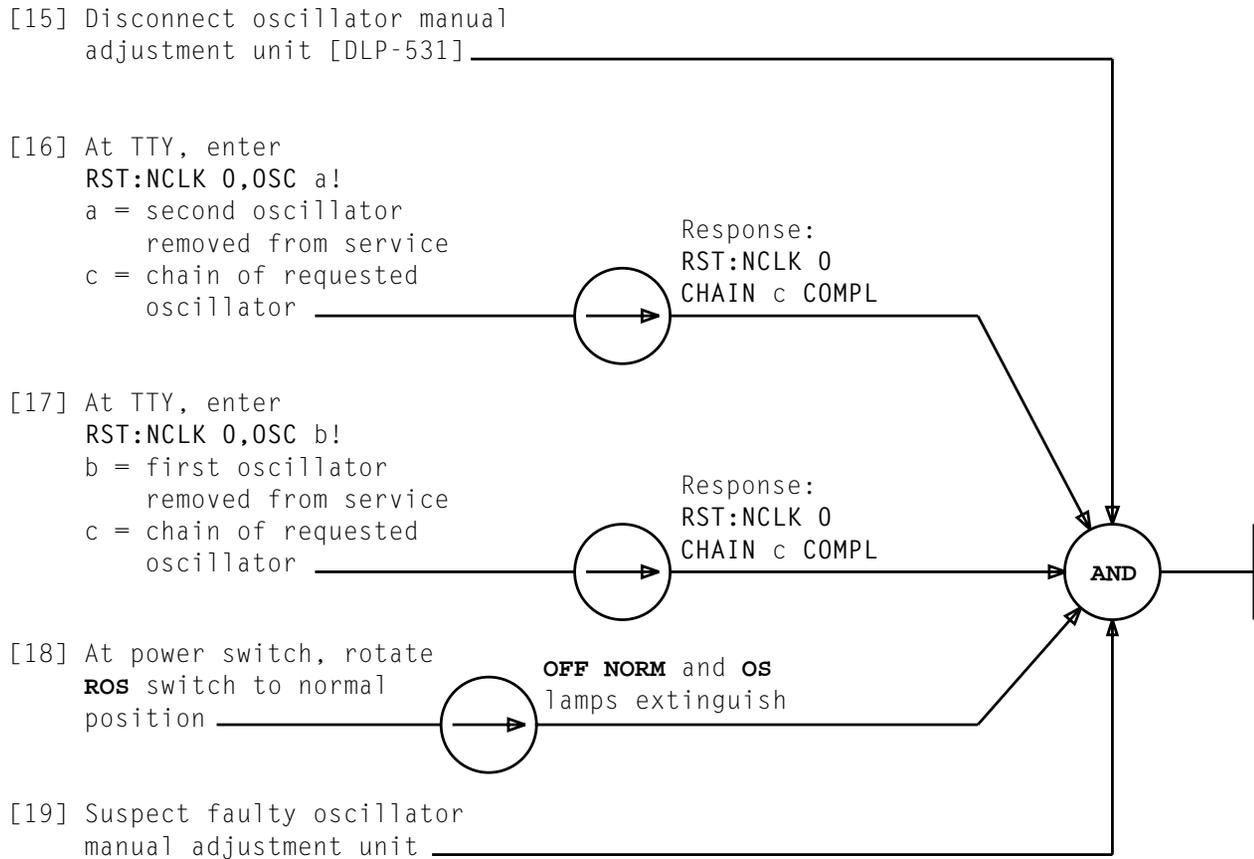
[13] At second oscillator chain power switch, rotate **ROS/OFF** switch counterclockwise to normal position



[14] Contact next higher level of technical support for assistance

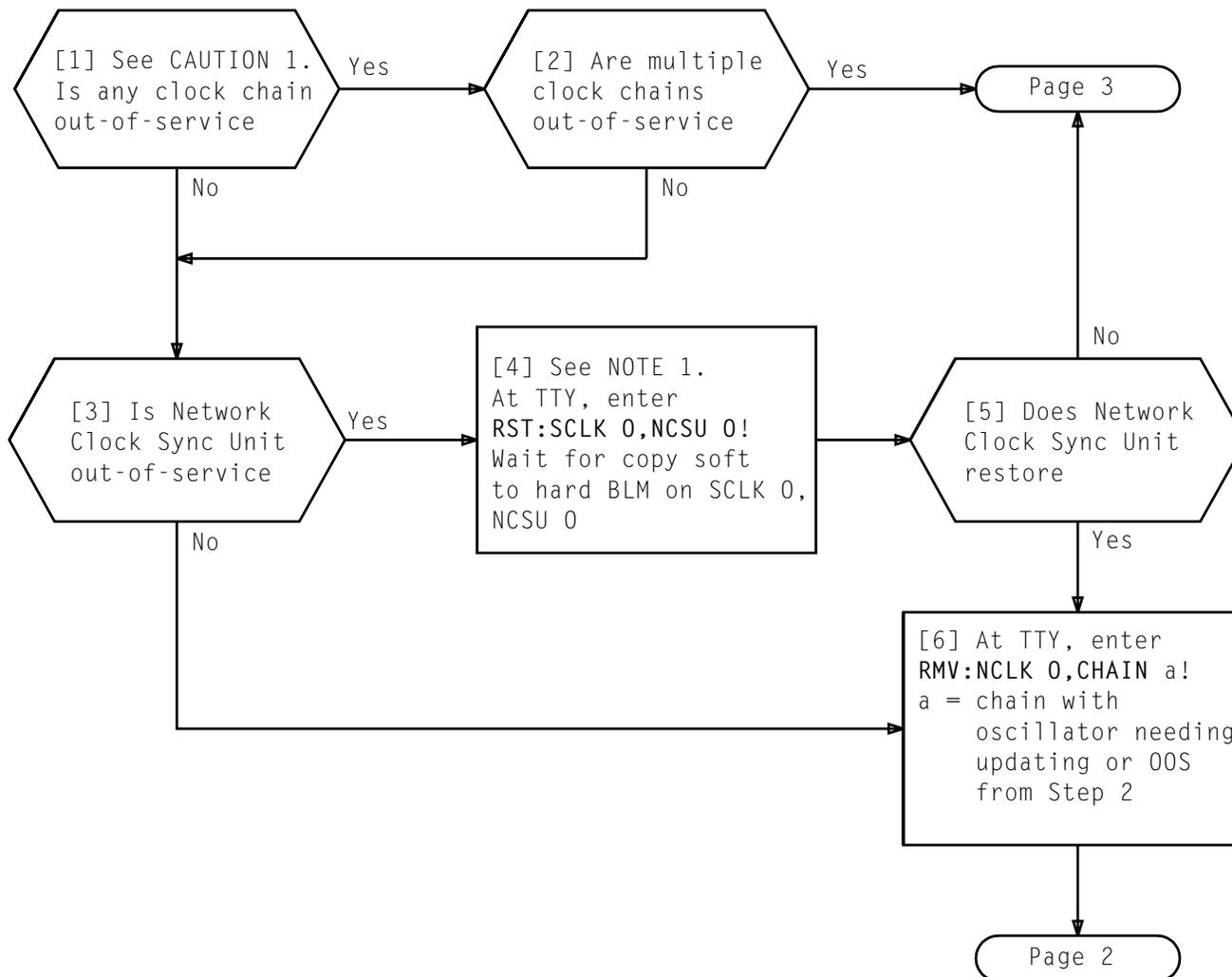
**CLEAR DISCIPLINED RUBIDIUM OSCILLATOR FULL FREQUENCY RANGE PROBLEM**

Issue 2	SEP 1998
234-351-013	TAP
PAGE 3 of 4	<b>141</b>



**CLEAR DISCIPLINED RUBIDIUM OSCILLATOR FULL FREQUENCY RANGE PROBLEM**

Issue 2	SEP 1998
234-351-013	TAP
PAGE 4 of 4	<b>141</b>



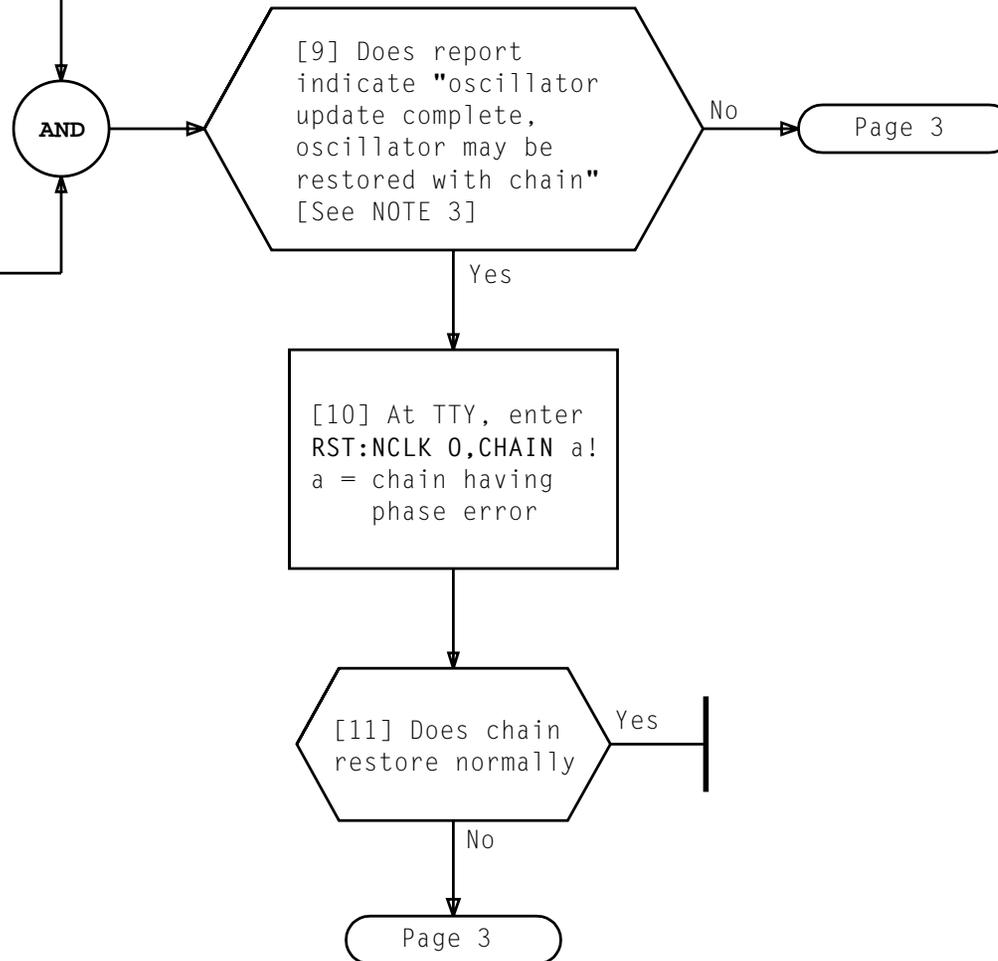
NOTE 1  
**ENABLE/DISABLE**  
 switches on all DR0  
 oscillators should  
 be in the up or  
**ENABLE** position

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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 19	142

[7] At TTY, enter  
 RMV:NCLK 0,OSC a!  
 a = chain having phase  
 error

[8] At TTY, enter  
 RST:NCLK 0,OSC a!  
 a = chain having phase  
 error  
 See NOTE 2



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"	
Issue 2	SEP 1998
234-351-013	TAP
PAGE 2 of 19	<b>142</b>

[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

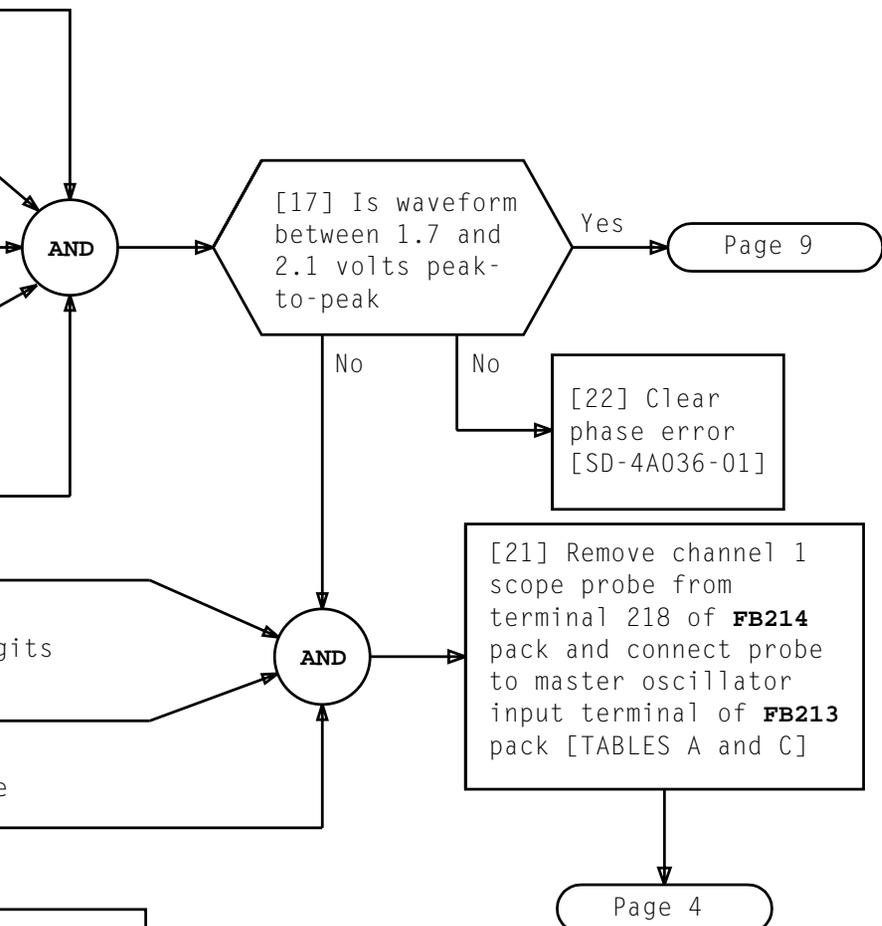
[15] See CAUTION 2. Calibrate scope [DLP-529]

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

[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]



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

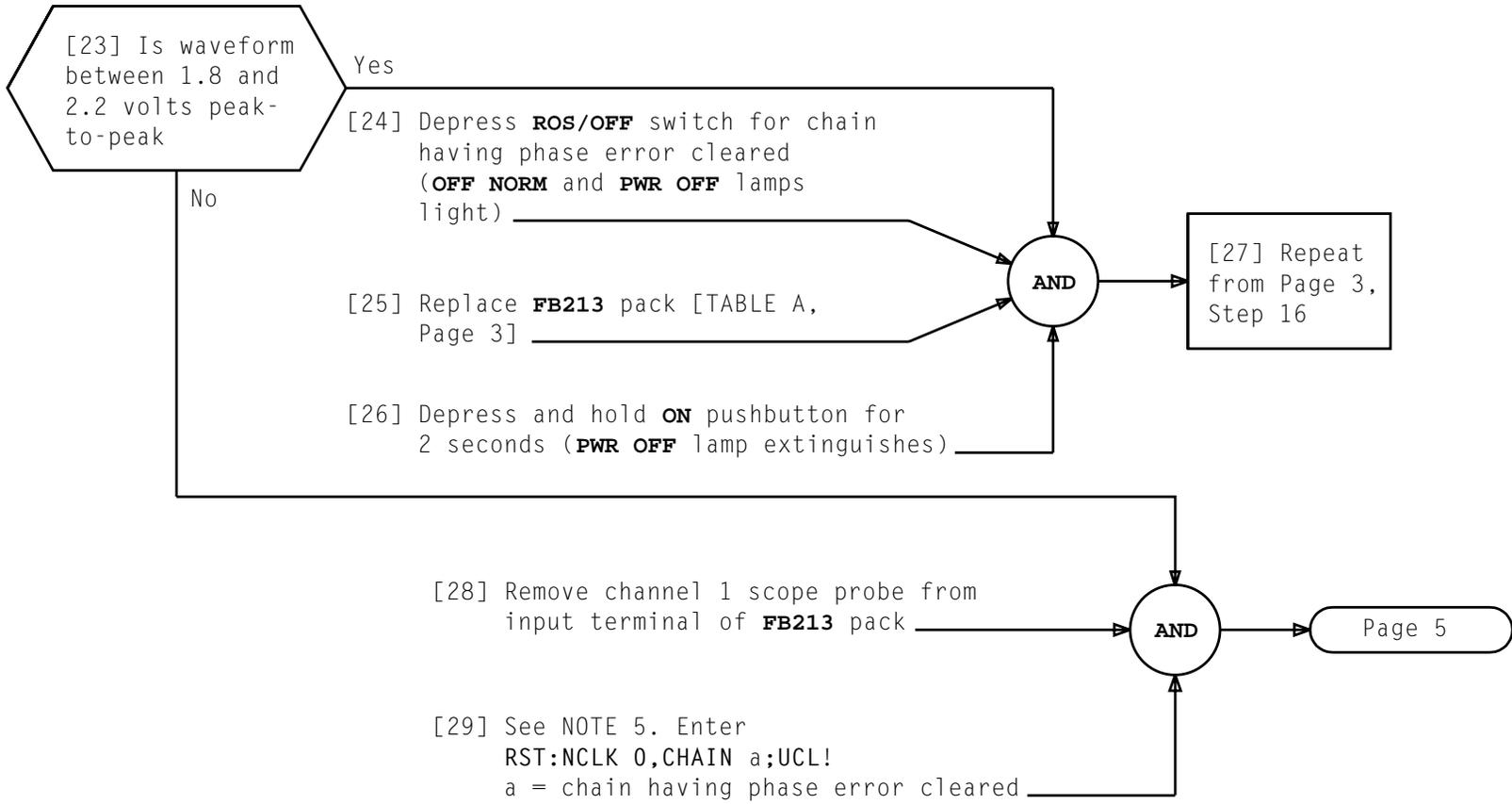
CLOCK CHAIN	0	1	2	3
<b>CIRCUIT PACK</b>	<b>LOCATION</b>			
<b>FB213</b>	070-32	070-39	170-32	170-39
<b>FB214</b>	066-33	066-39	166-33	166-39
<b>FB687</b>	070-34	070-37	170-34	170-37

MASTER CLOCK CHAIN	0	1	2	3
<b>FB213</b> 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*

Issue 2	SEP 1998
234-351-013	TAP
PAGE 3 of 19	142



56 DUMP:NCLK 0,CREG

00000000 00100004 03600044 37760000 00006464 03670064 00000000 00000000

00000000 00100004 03600004 00000000 00000004 03600044 00000000 00000000

WORD 1

CONVERT TO BINARY

Figure 1 - CREG Dump

NOTE 5	
Ensure chain is powered up before restoring unconditionally	
Issue 2	SEP 1998
234-351-013	TAP
PAGE 4 of 19	142

[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)

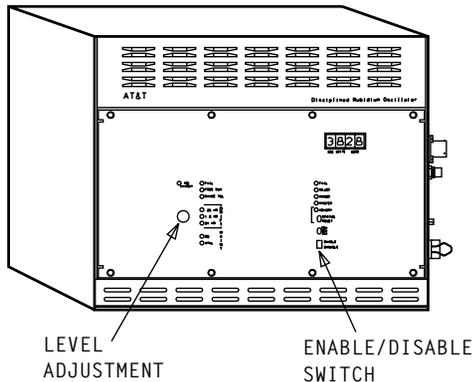
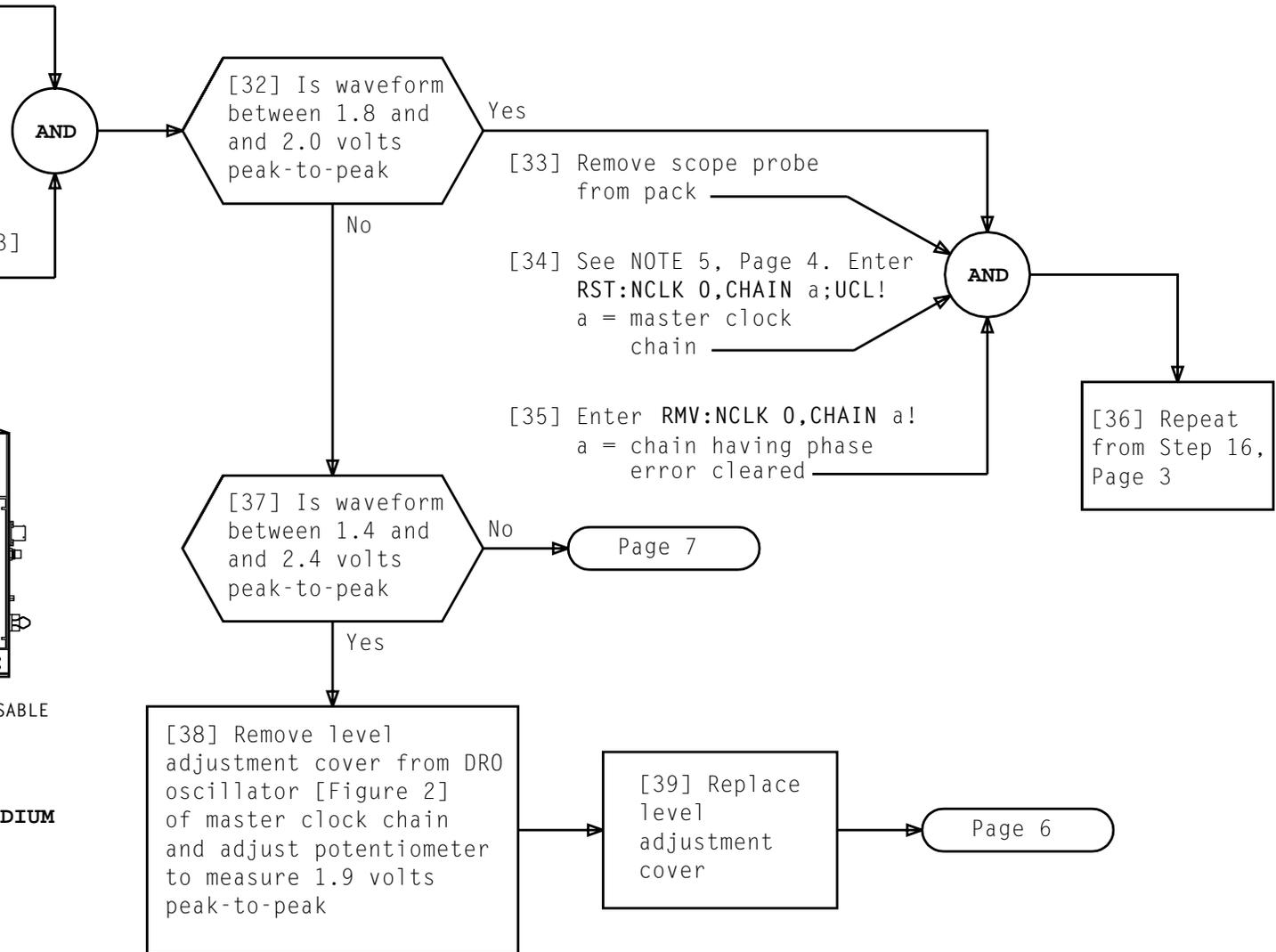
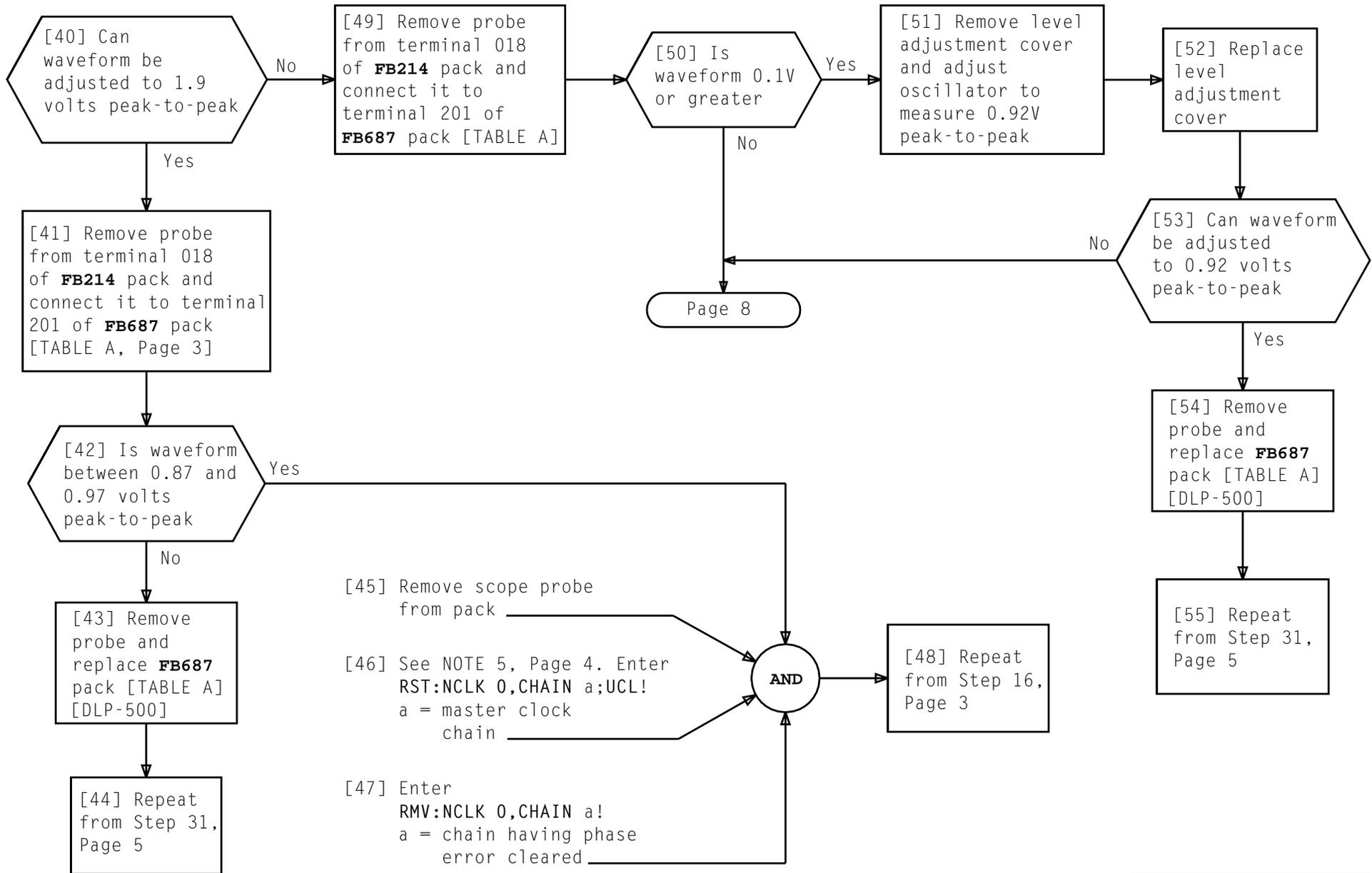
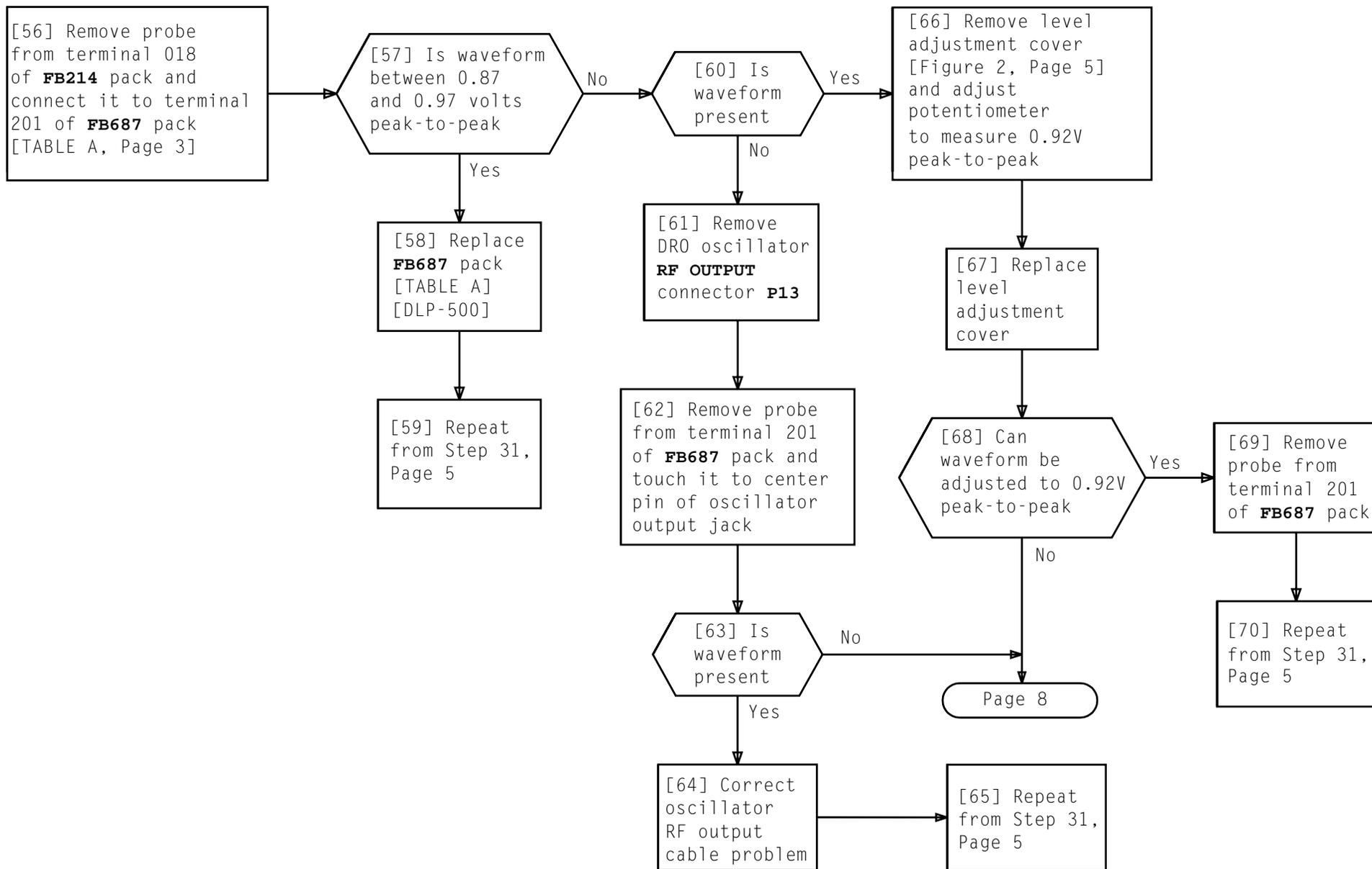


Figure 2 - DISCIPLINED RUBIDIUM  
 OSCILLATOR







Issue 2	SEP 1998
234-351-013	TAP
PAGE 7 of 19	142

[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]

[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

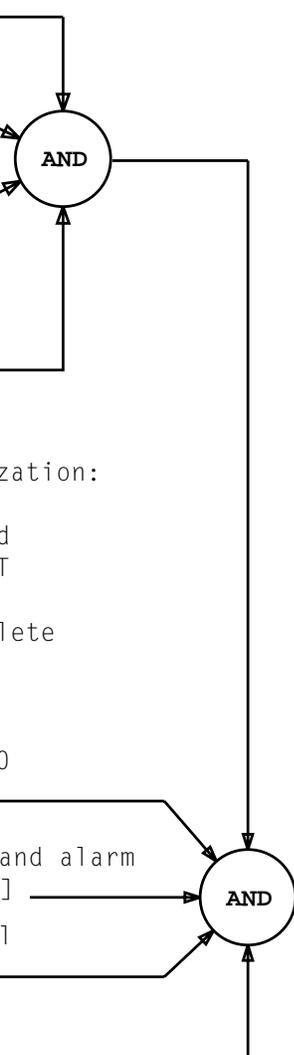
When initialization is complete (approximately 20 min):

- **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]



[81] Repeat from Step 31, Page 5

*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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 8 of 19	142

[82] Connect channel 2 scope probe to terminal 018 of **FB214** pack at TABLE A, Page 3, location

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

No → Page 10

Yes

[84] At rear of clock chain, connect cliplead between terminal 1 of PHR relay and frame ground [TABLE D]

AND

[85] Momentarily depress **MSO** pushbutton

[86] Does **PHASE METER** have one or no yellow LEDs lit

Yes → Page 14

No

[90] Clear phase error using SD-4A036-01

No

[87] Depress **ROS/OFF** switch to remove power from chain having phase error cleared (**OFF NORM** and **PWR OFF** lamps light)

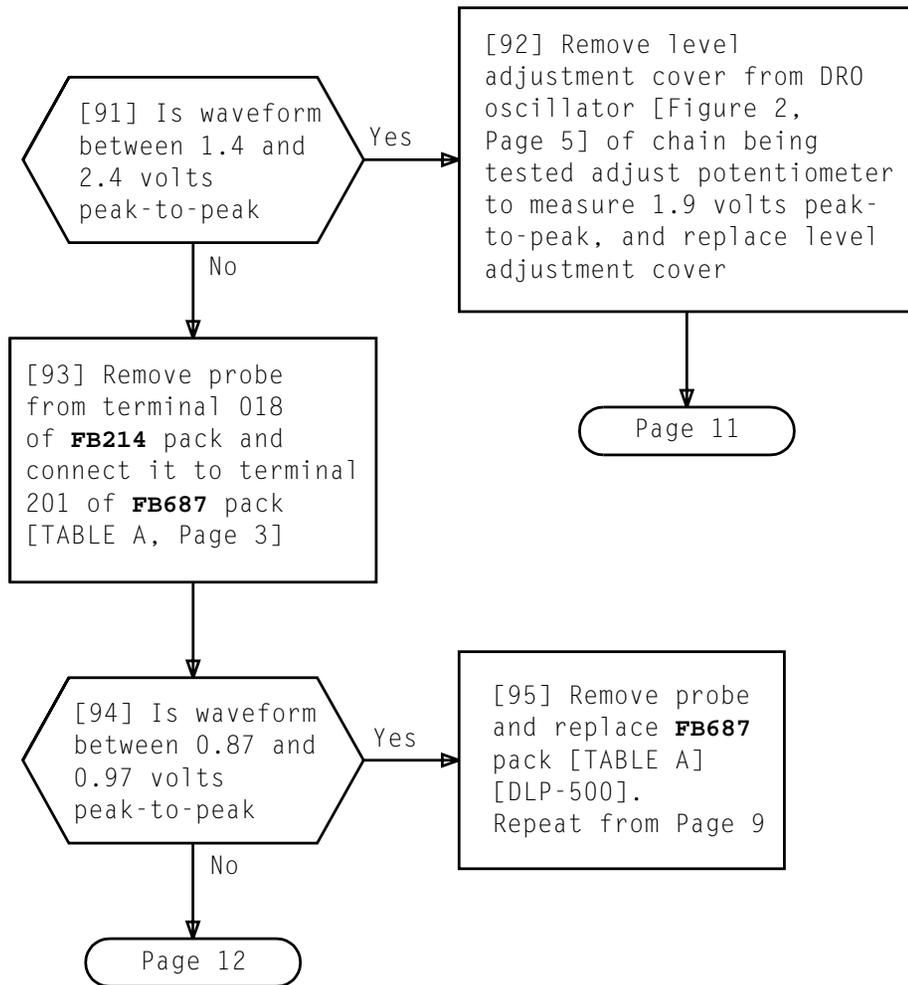
AND

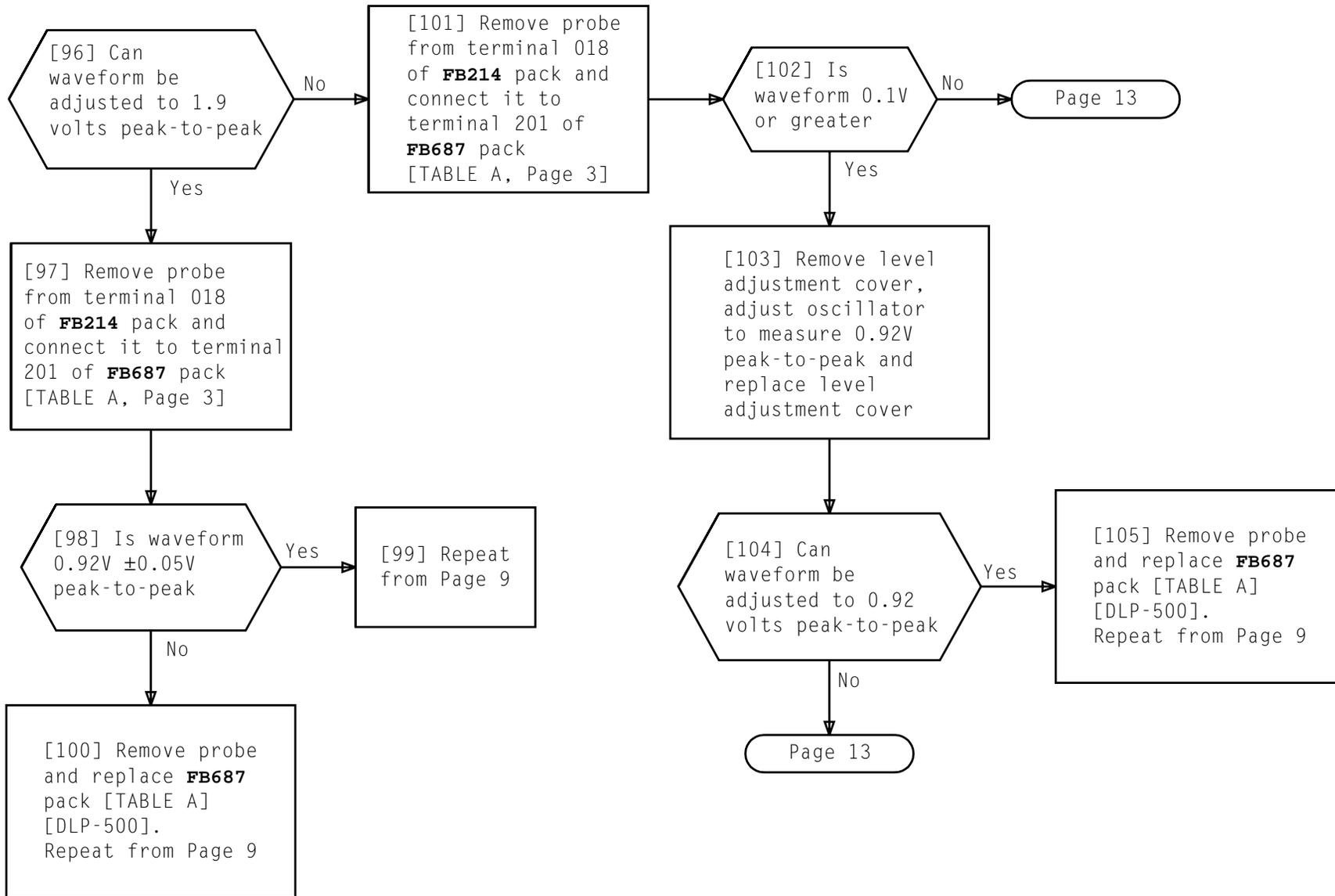
[89] Repeat from Step 85

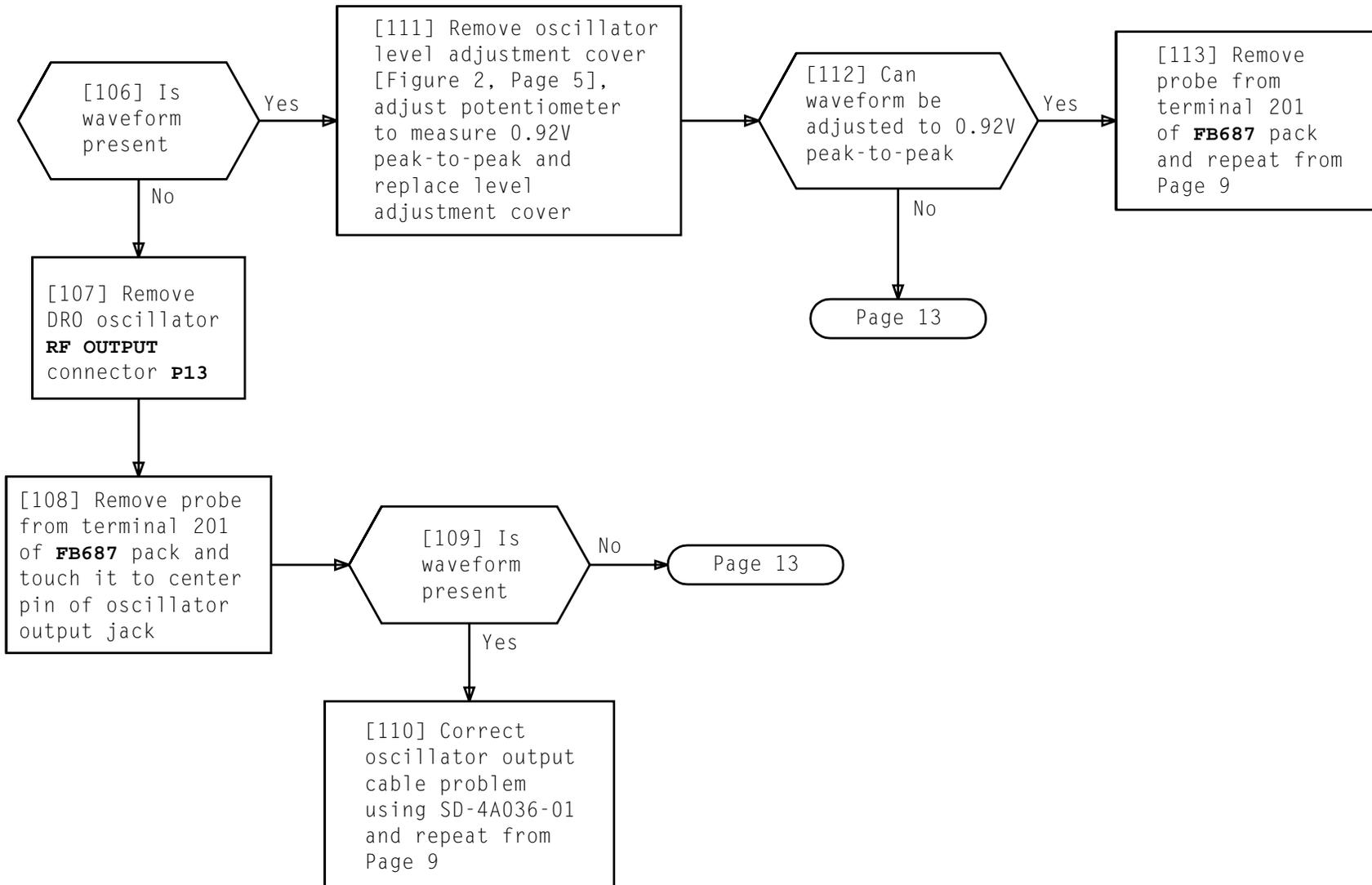
[88] Replace phase meter [DLP-516]

TABLE D		
CLOCK CHAIN	RELAY	RELAY LOCATION
0	<b>0PHR</b>	066-24
1	<b>1PHR</b>	066-47
2	<b>0PHR</b>	166-24
3	<b>1PHR</b>	166-47

**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]

[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

AND

[122] Is manual update required

No

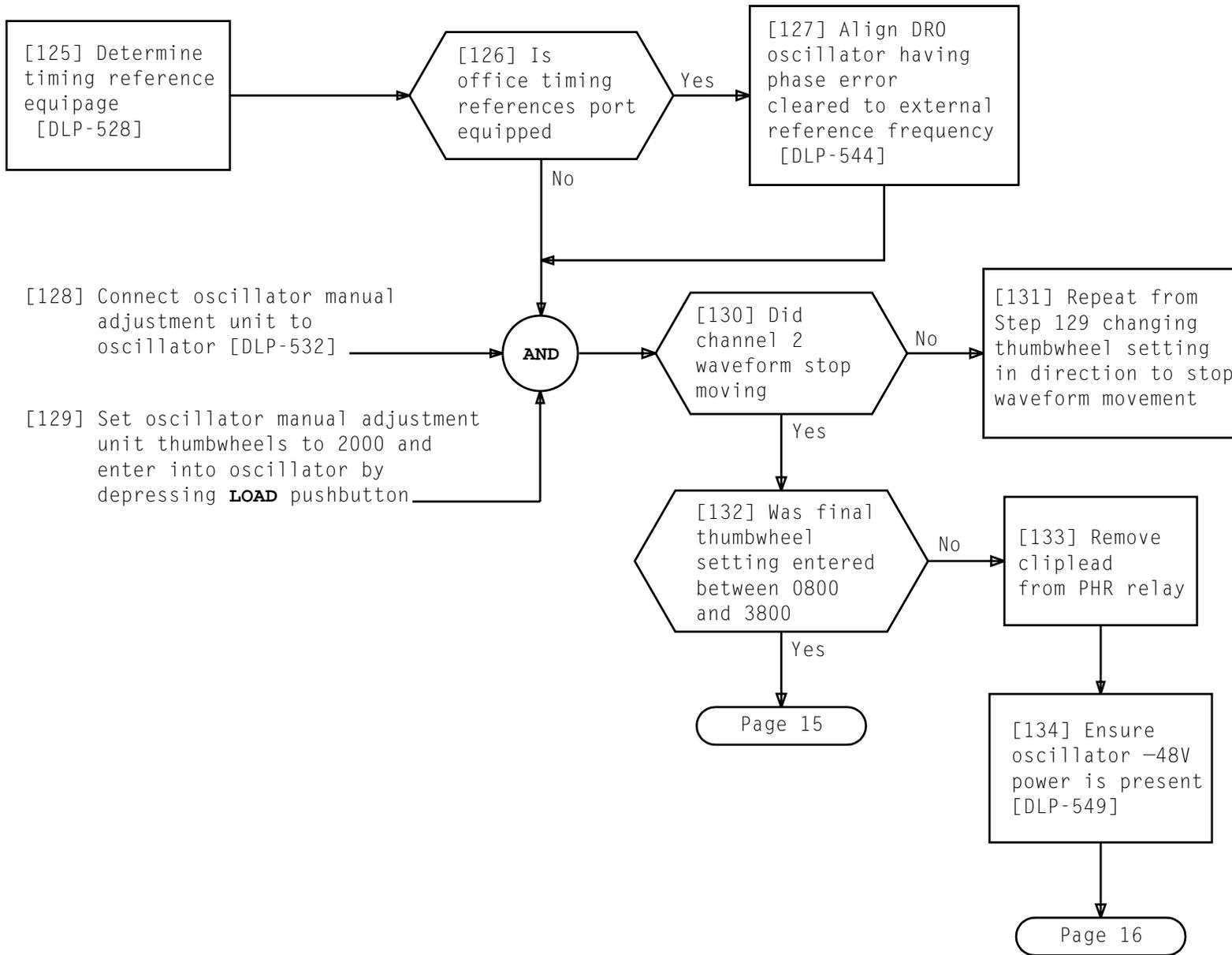
Yes

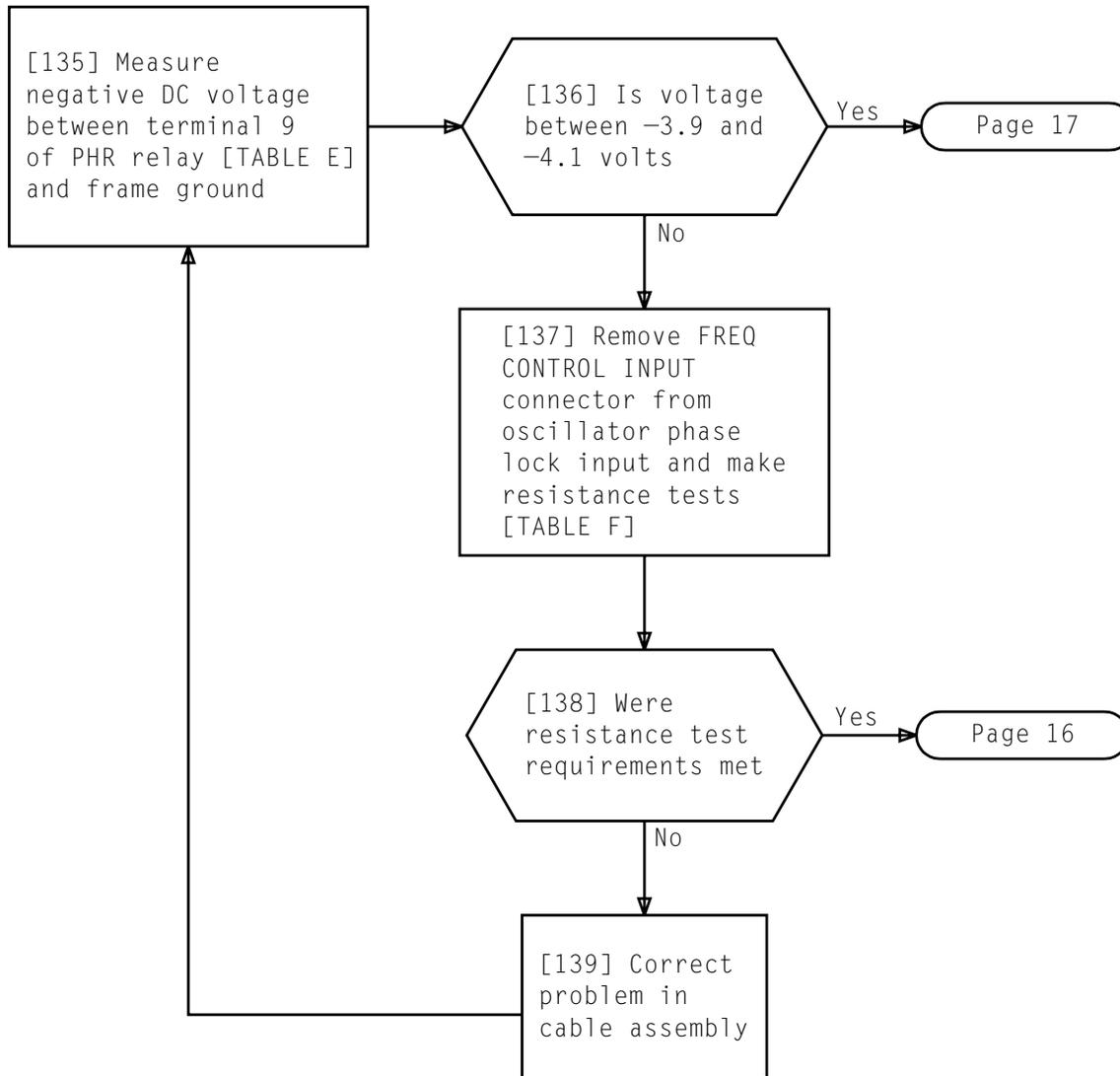
[124] Repeat from Page 9

[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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 13 of 19	142





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

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

\* Infinity reading

Issue 2	SEP 1998
234-351-013	TAP
PAGE 15 of 19	142

[140] See CAUTION 7. Remove DRO oscillator [DLP-545]

[141] Install DRO oscillator [DLP-541]

[142] See CAUTION 8. Connect oscillator manual adjustment unit to oscillator [DLP-532]

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

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

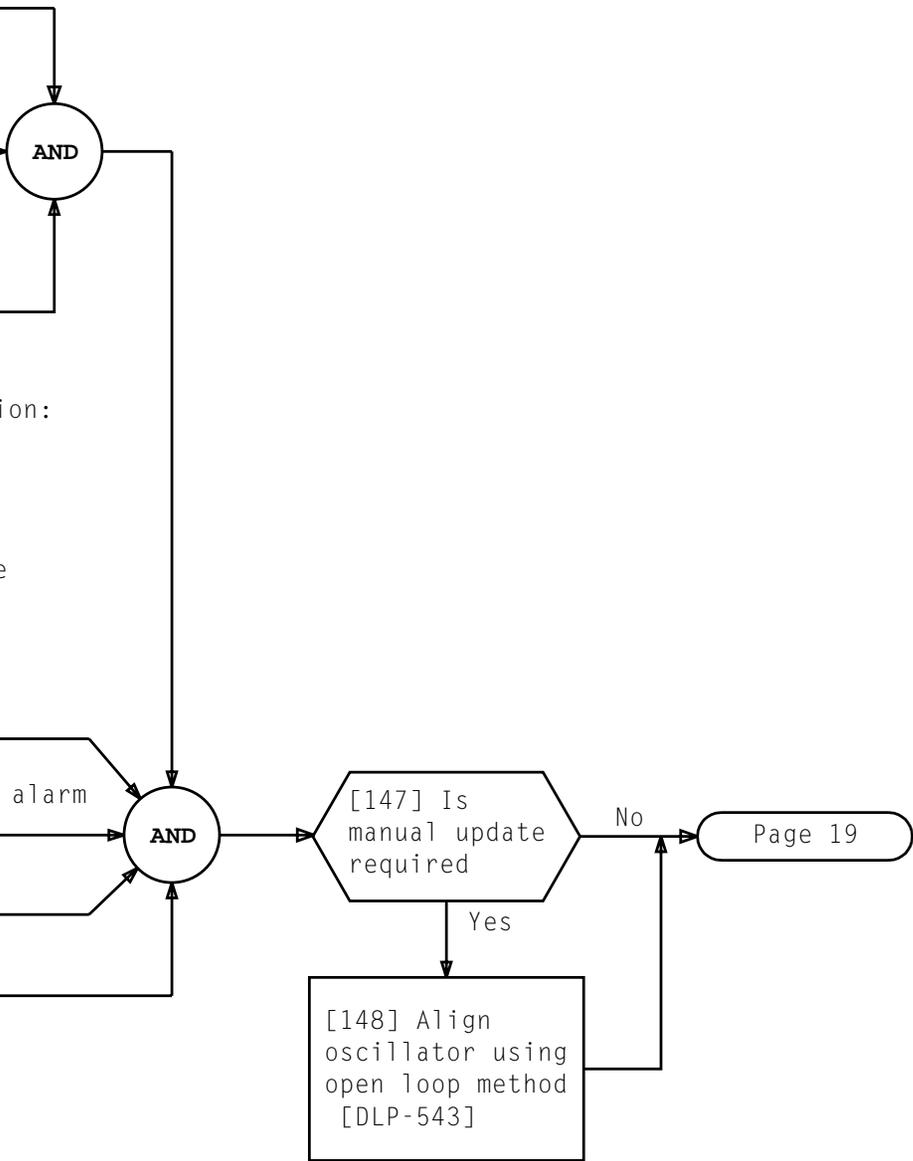
When initialization is complete (approximately 20 min):

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

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

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

[146] Check DRO oscillator [DLP-546]

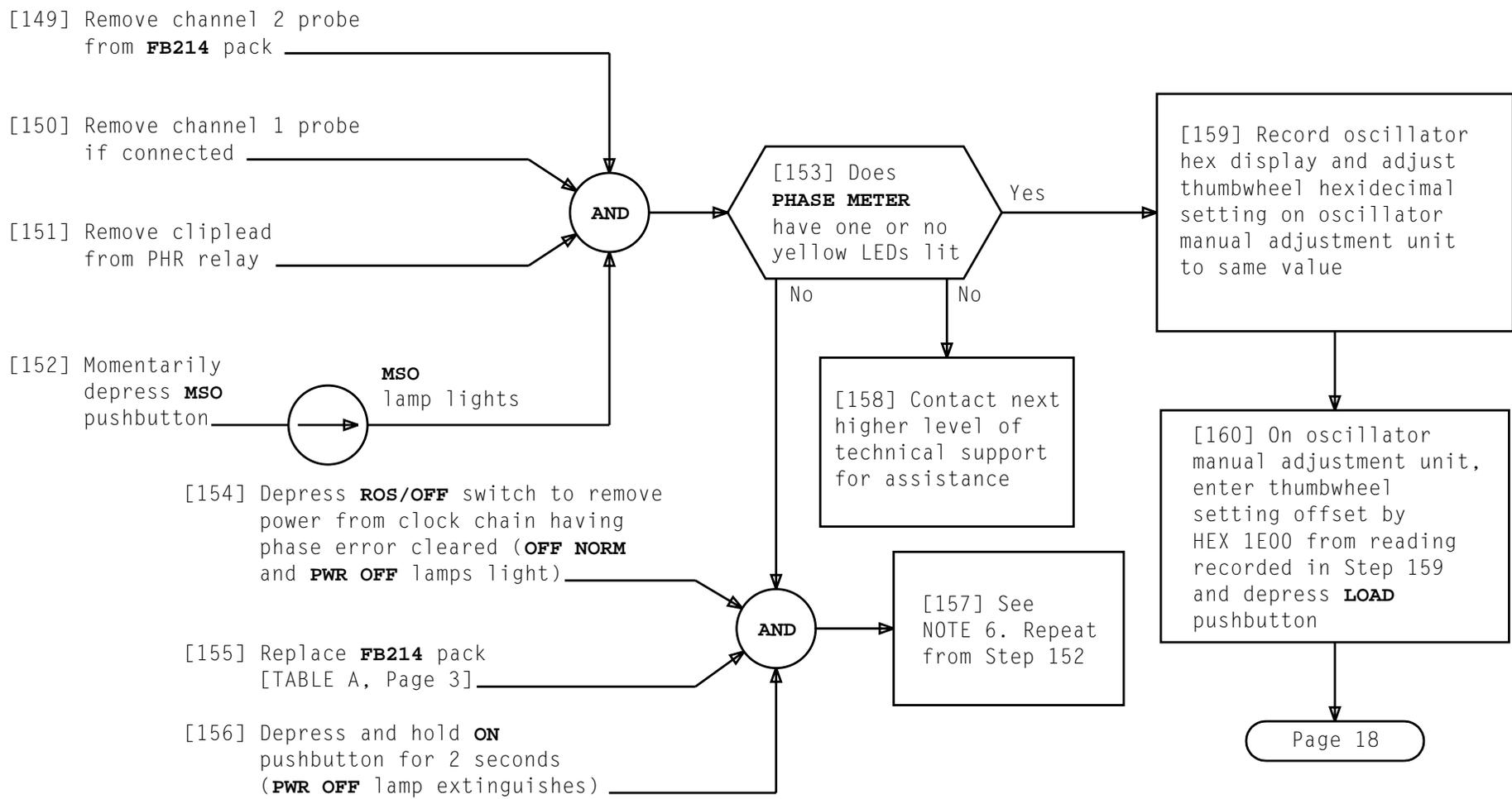


**CAUTIONS**

7. Remove RF OUTPUT cable (P13) immediately even if oscillator is not physically removed immediately

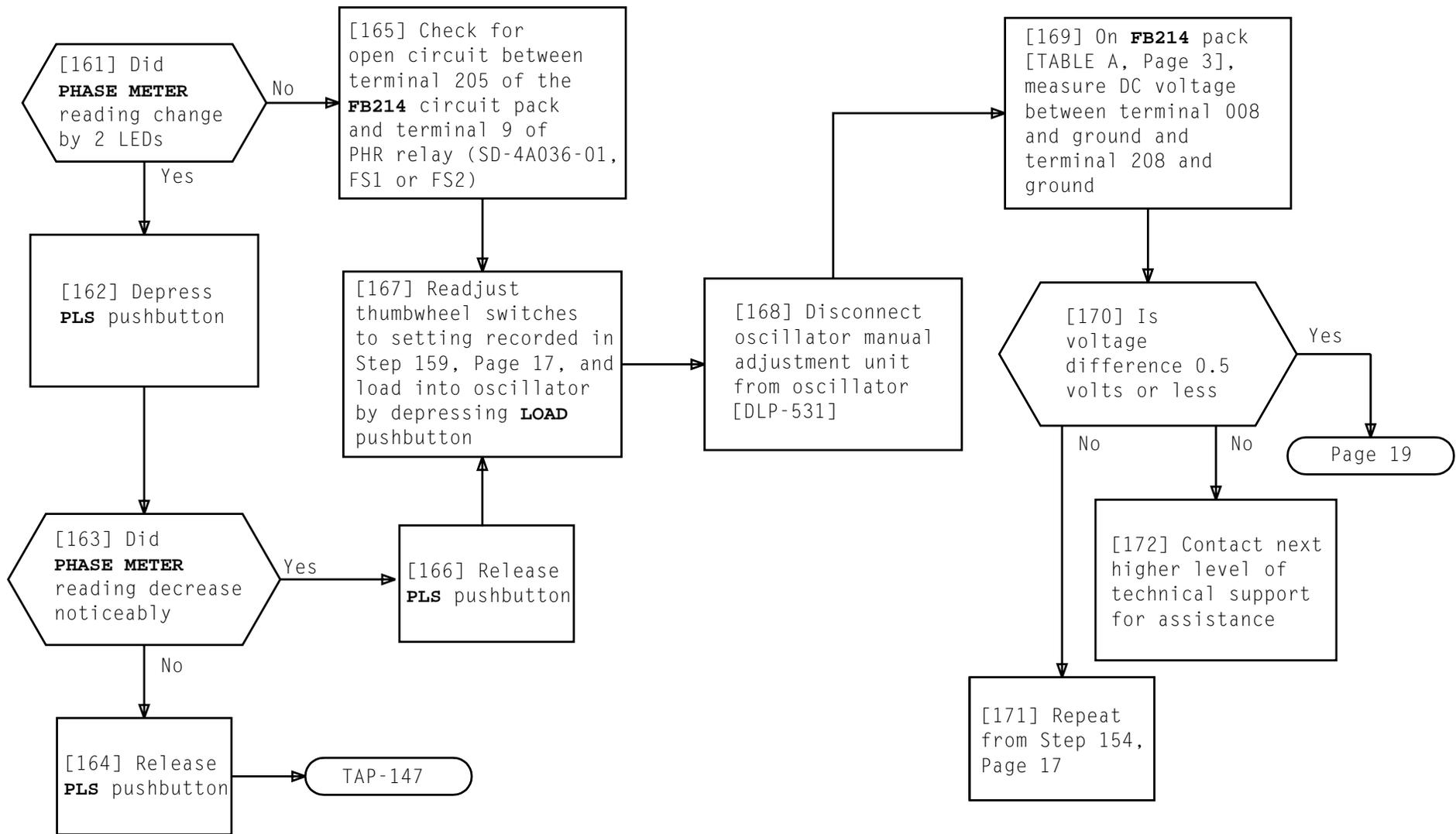
8. Clock chain of oscillator being checked must be powered down

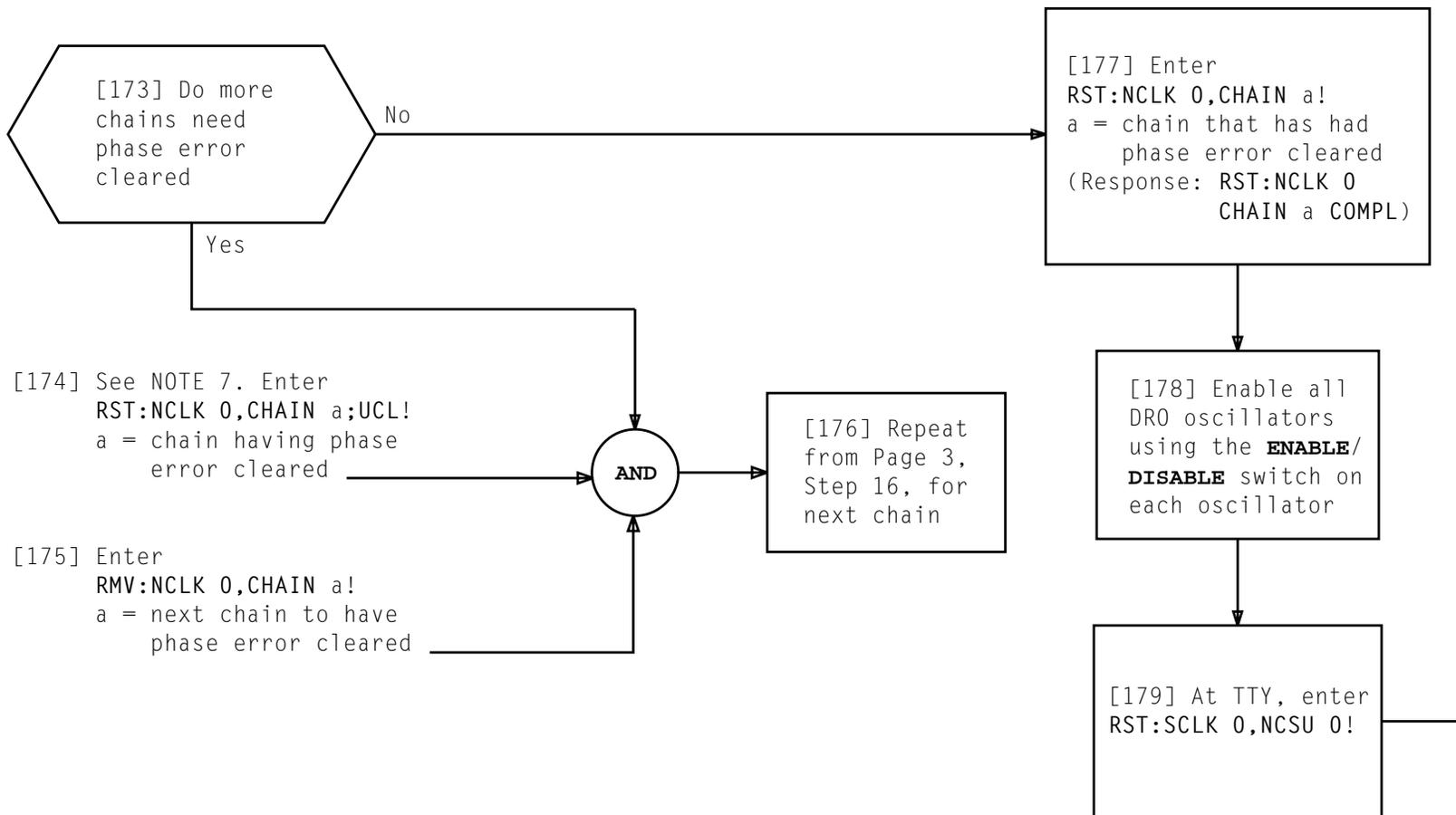
Issue 2	SEP 1998
234-351-013	TAP
PAGE 16 of 19	142



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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 17 of 19	<b>142</b>





NOTE 7 Ensure chain is powered up before restoring unconditionally	
Issue 2	SEP 1998
234-351-013	TAP
PAGE 19 of 19	142

[1] See CAUTION 1.  
Ensure faulty  
chain is out of  
service

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

[3] Connect scope probe  
to terminal 018 of  
**FB214** pack  
[TABLE A]

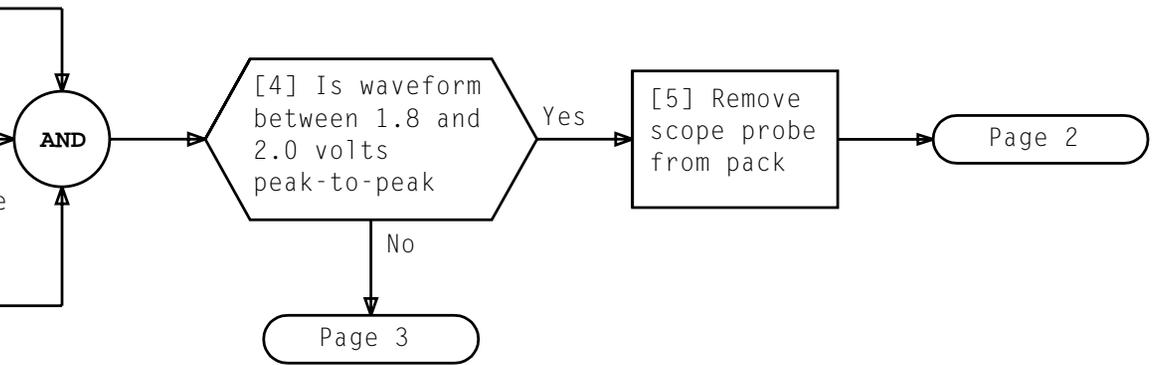
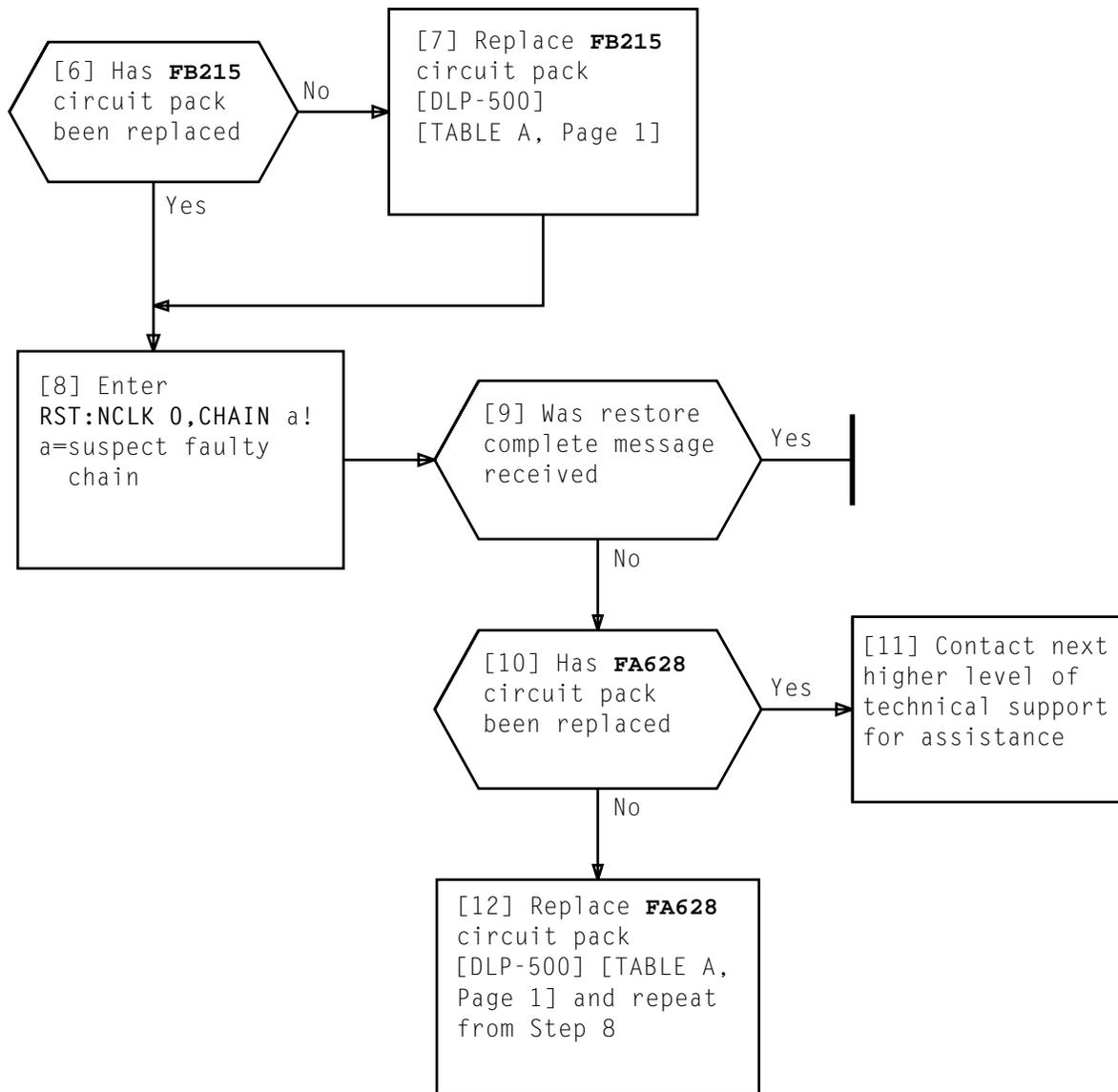


TABLE A				
CHAIN	0	1	2	3
PACK	LOCATION			
<b>FB214</b>	066-33	066-39	166-33	166-39
<b>FB687</b>	070-34	070-37	170-34	170-37
<b>FB215</b>	070-31	070-40	170-31	170-40
<b>FA628</b>	070-29	070-42	170-29	170-42

*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

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 6	<b>143</b>



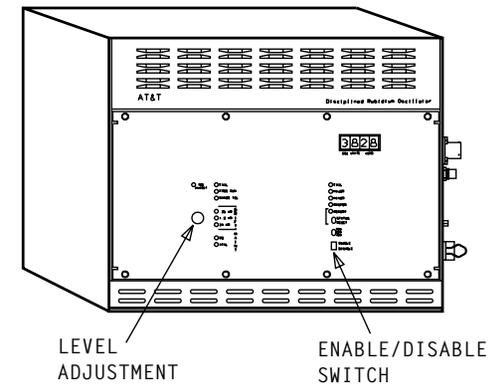
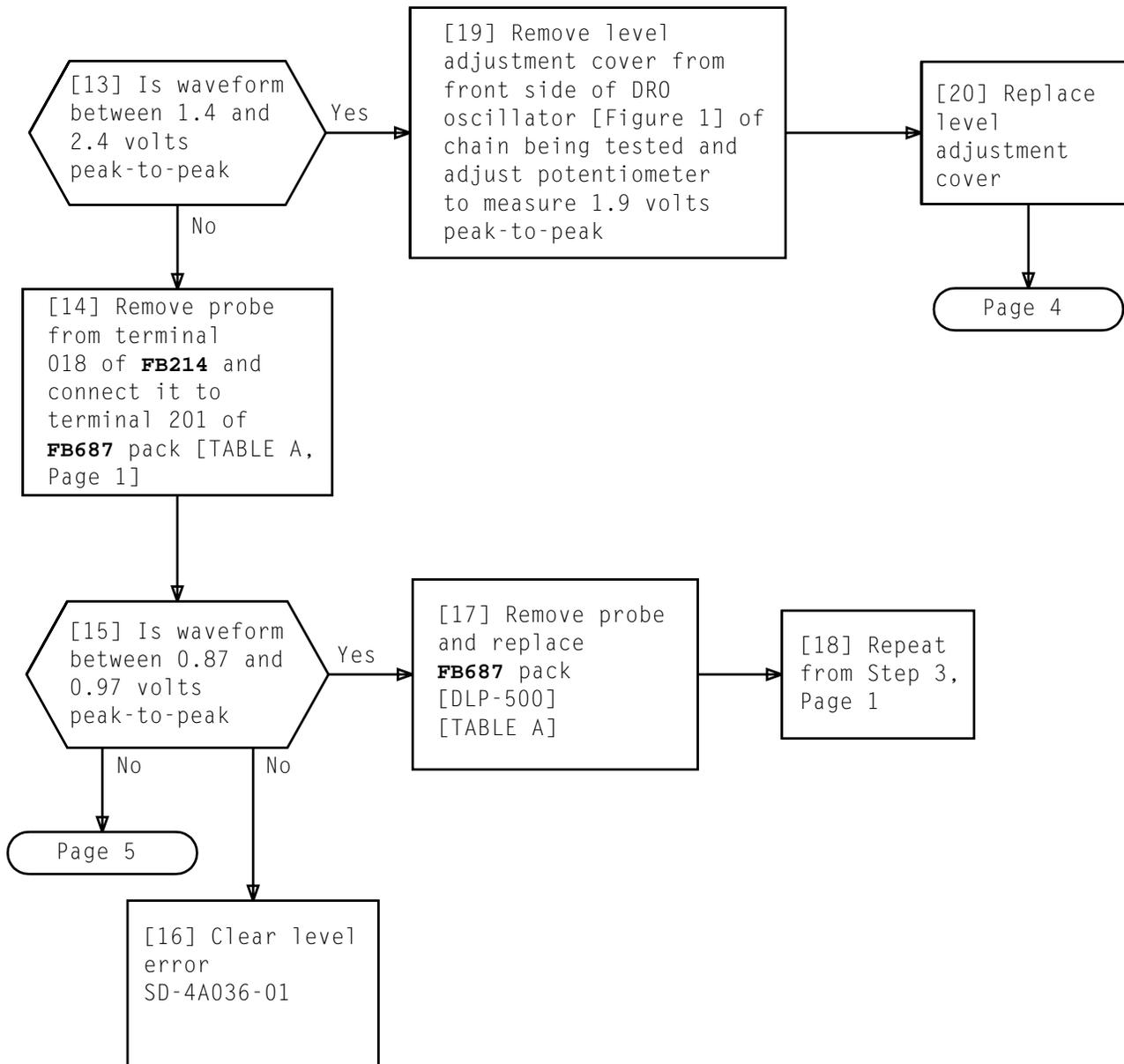
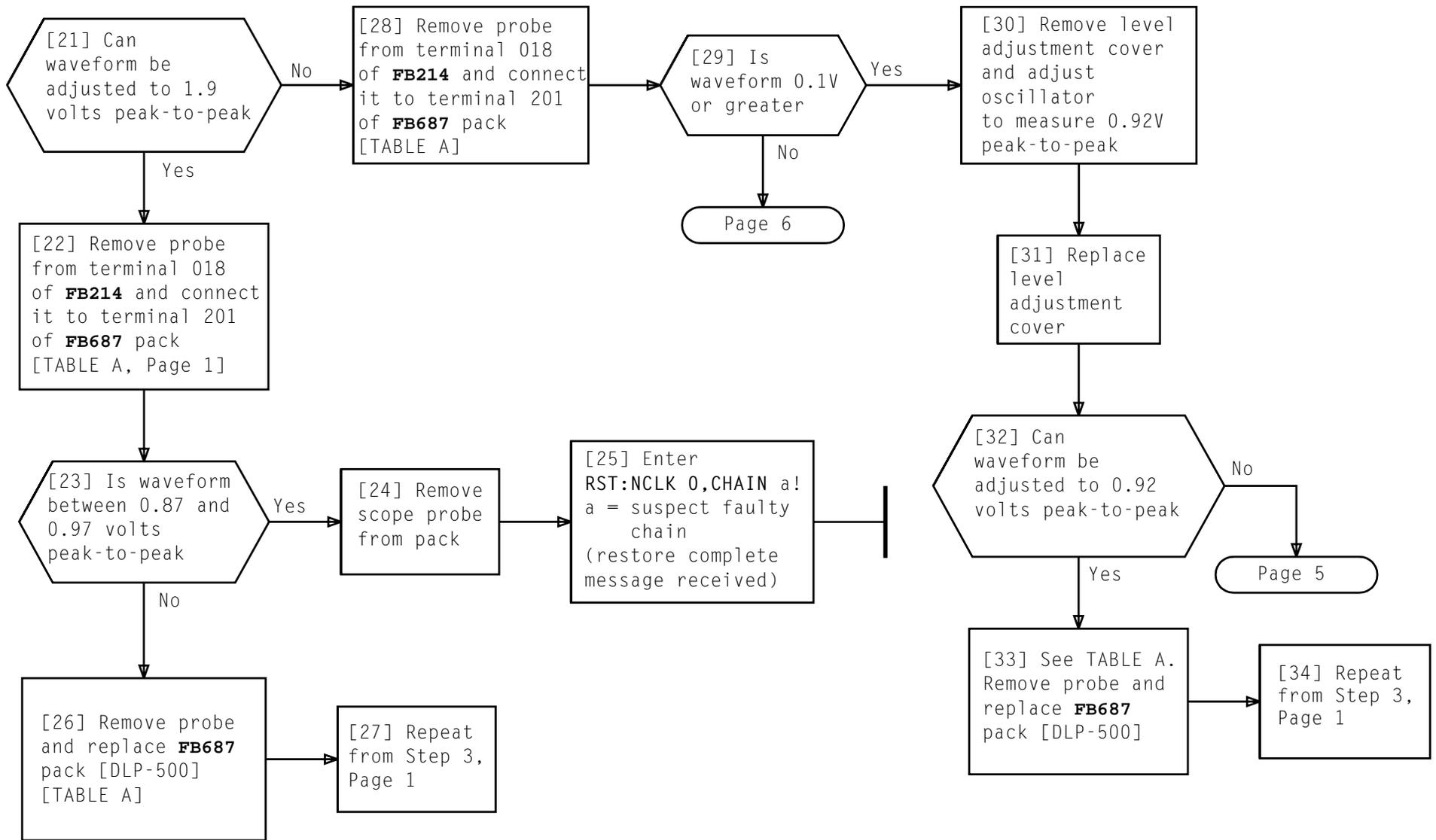
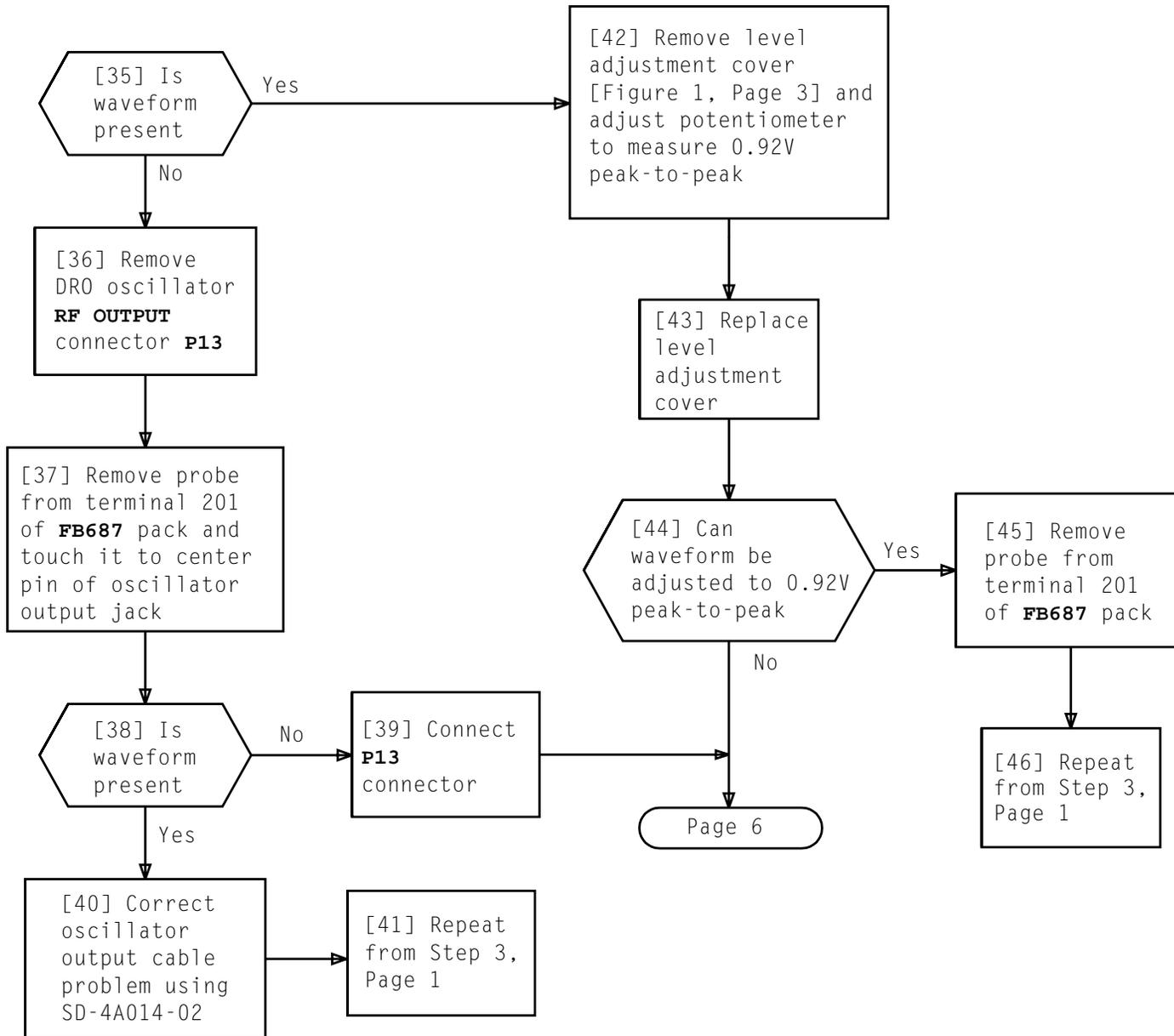


Figure 1 - Disciplined Rubidium Oscillator





**CLEAR DISCIPLINED RUBIDIUM OSCILLATOR LEVEL ERROR PROBLEM**

Issue 2	SEP 1998
234-351-013	TAP
PAGE 5 of 6	143

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

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

[49] Install DRO oscillator [DLP-541]

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

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

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

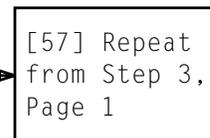
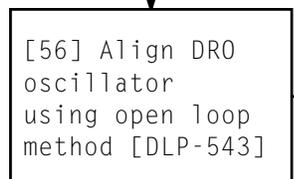
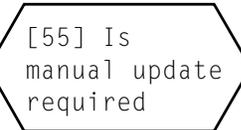
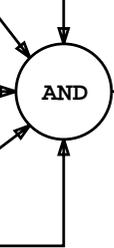
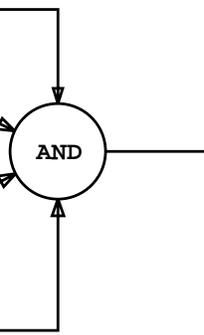
When initialization is complete (approximately 20 min):

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

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

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

[54] Check DRO oscillator [DLP-546]



<i>CAUTIONS</i>	
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	

Issue 2	SEP 1998
234-351-013	TAP
PAGE 6 of 6	143

**CLEAR DISCIPLINED RUBIDIUM OSCILLATOR LEVEL ERROR PROBLEM**

[10] See CAUTION 2. Remove DRO oscillator [DLP-545]

[11] Install DRO oscillator [DLP-541]

[12] See CAUTION 3. Connect oscillator manual adjustment unit to oscillator [DLP-532]

[13] 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):

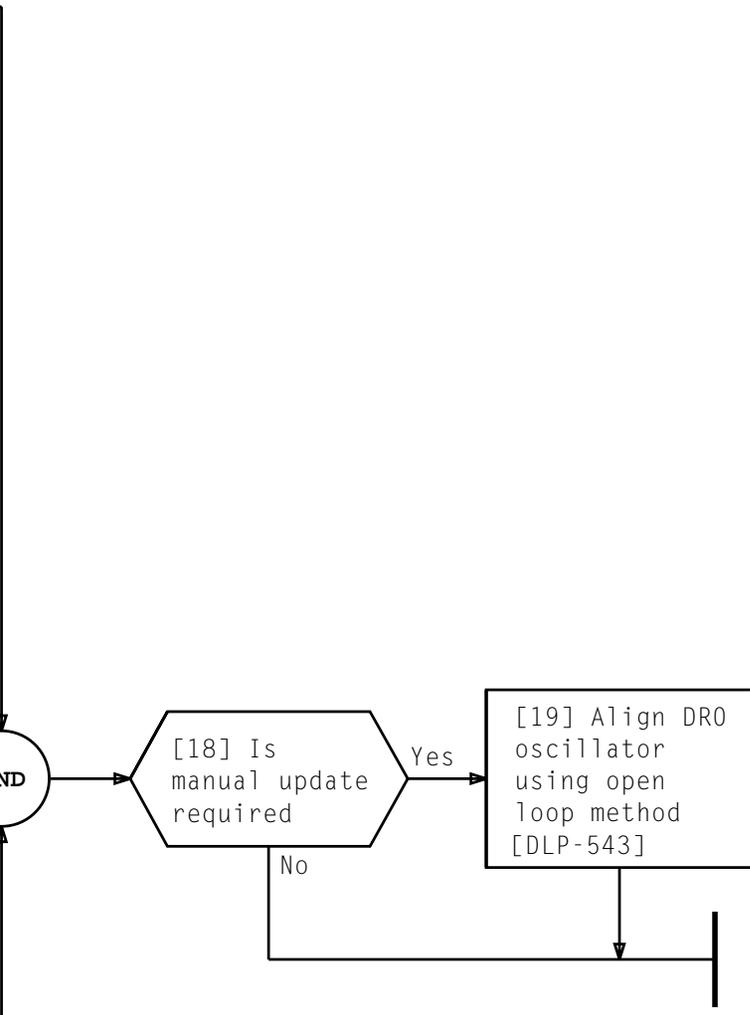
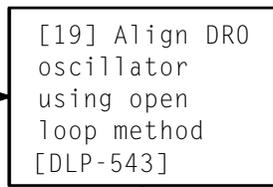
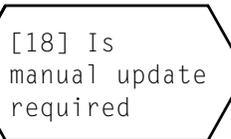
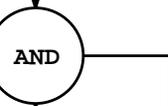
- **FREE RUN** LED is out
- **MAJOR** alarm LED is out
- Hex display indicates 2000
- **RF OUTPUT** is enabled

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

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

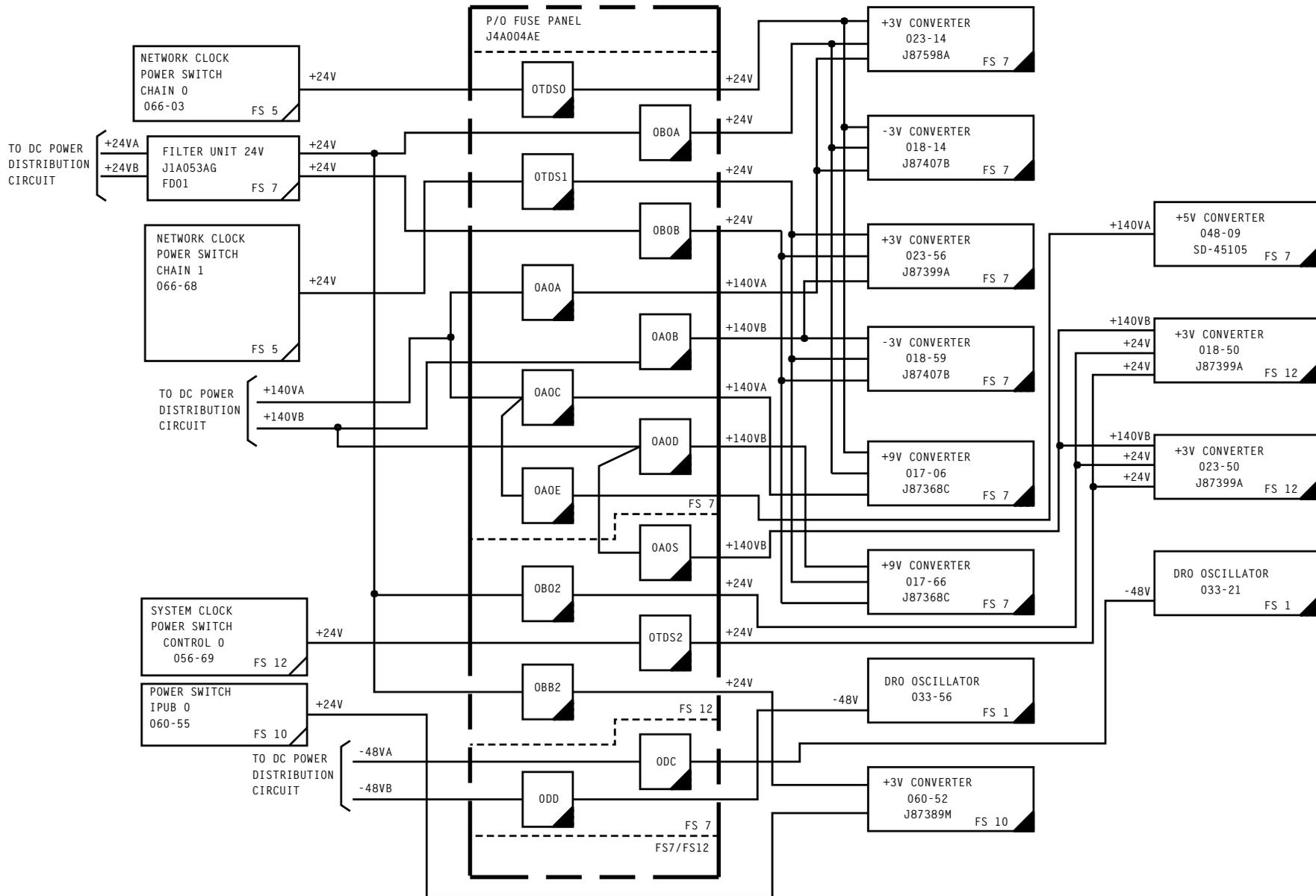
[16] Calibrate scope [DLP-529]

[17] Check DRO oscillator [DLP-546]



<i>CAUTIONS</i>	
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**

Issue 2	SEP 1998
234-351-013	ISD
PAGE 1 of 1	145



[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

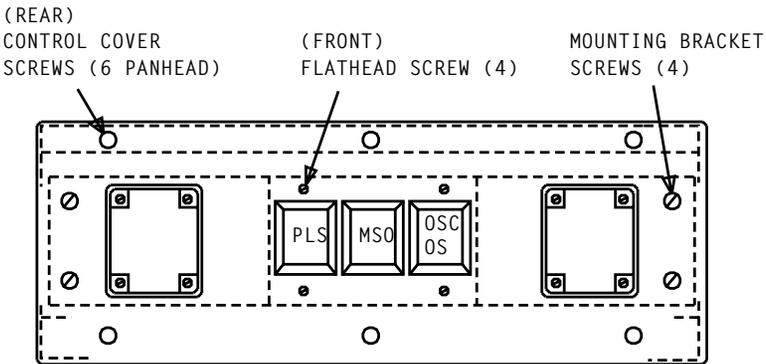


Figure 1 - Network Clock Control

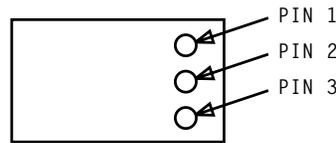


Figure 2 - PLS Circuit (Front View)

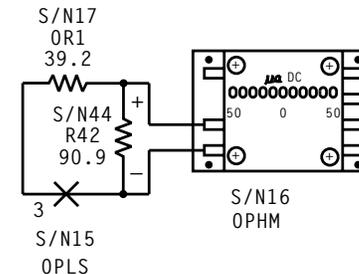
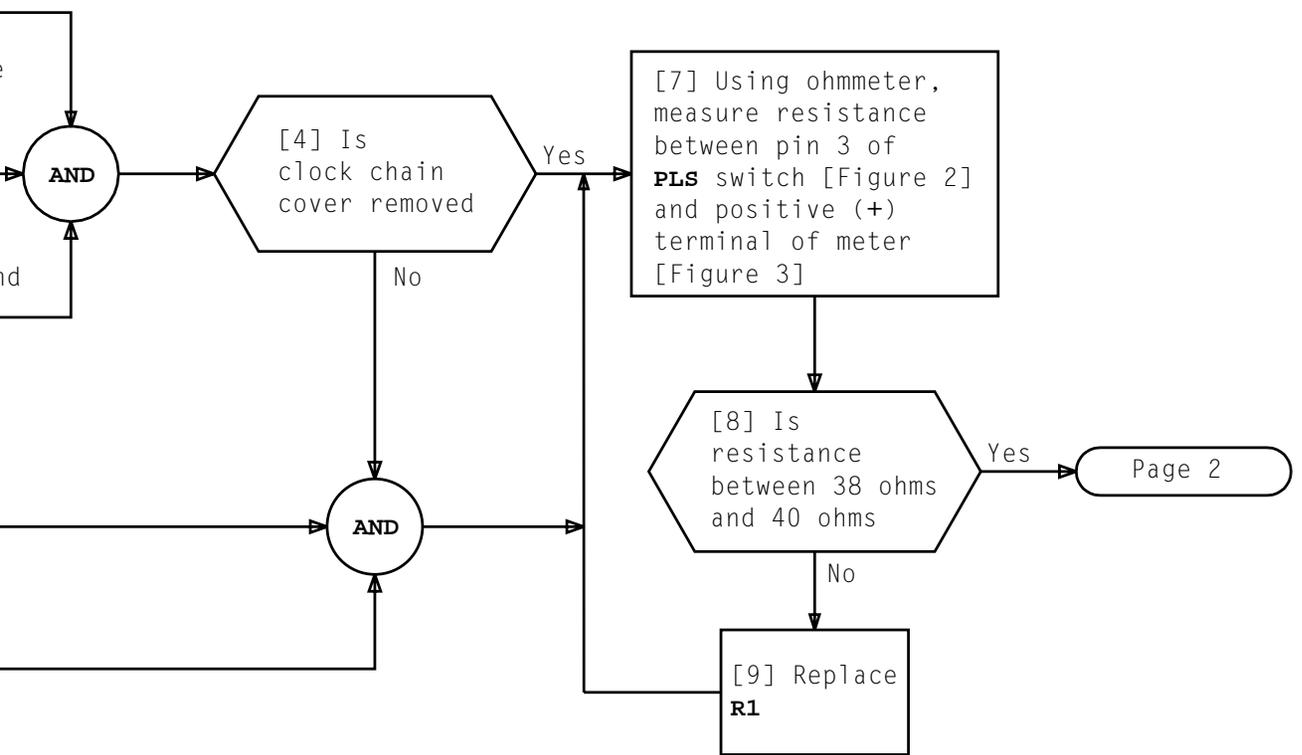
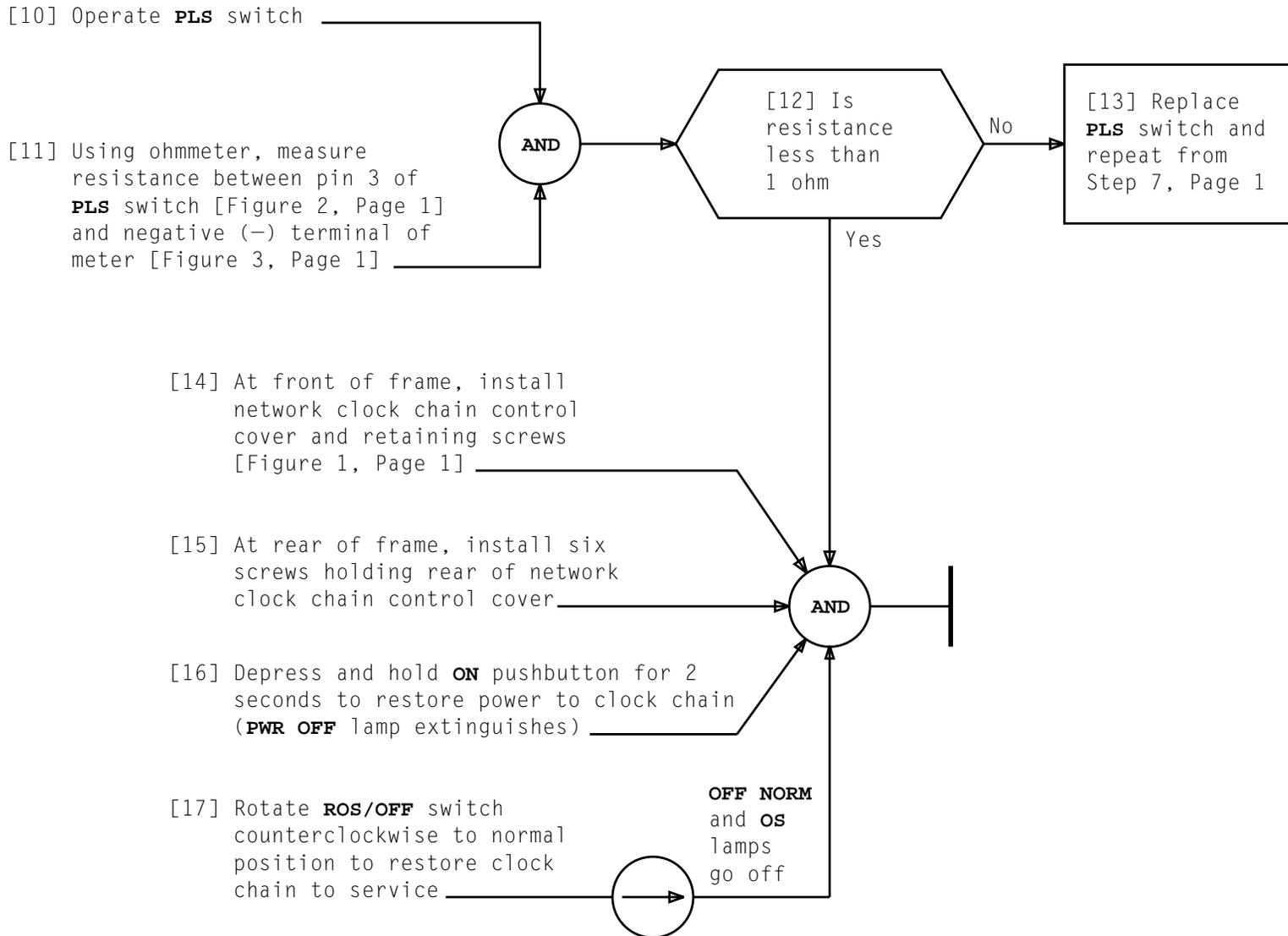


Figure 3 - R1/PLS Circuit Schematic



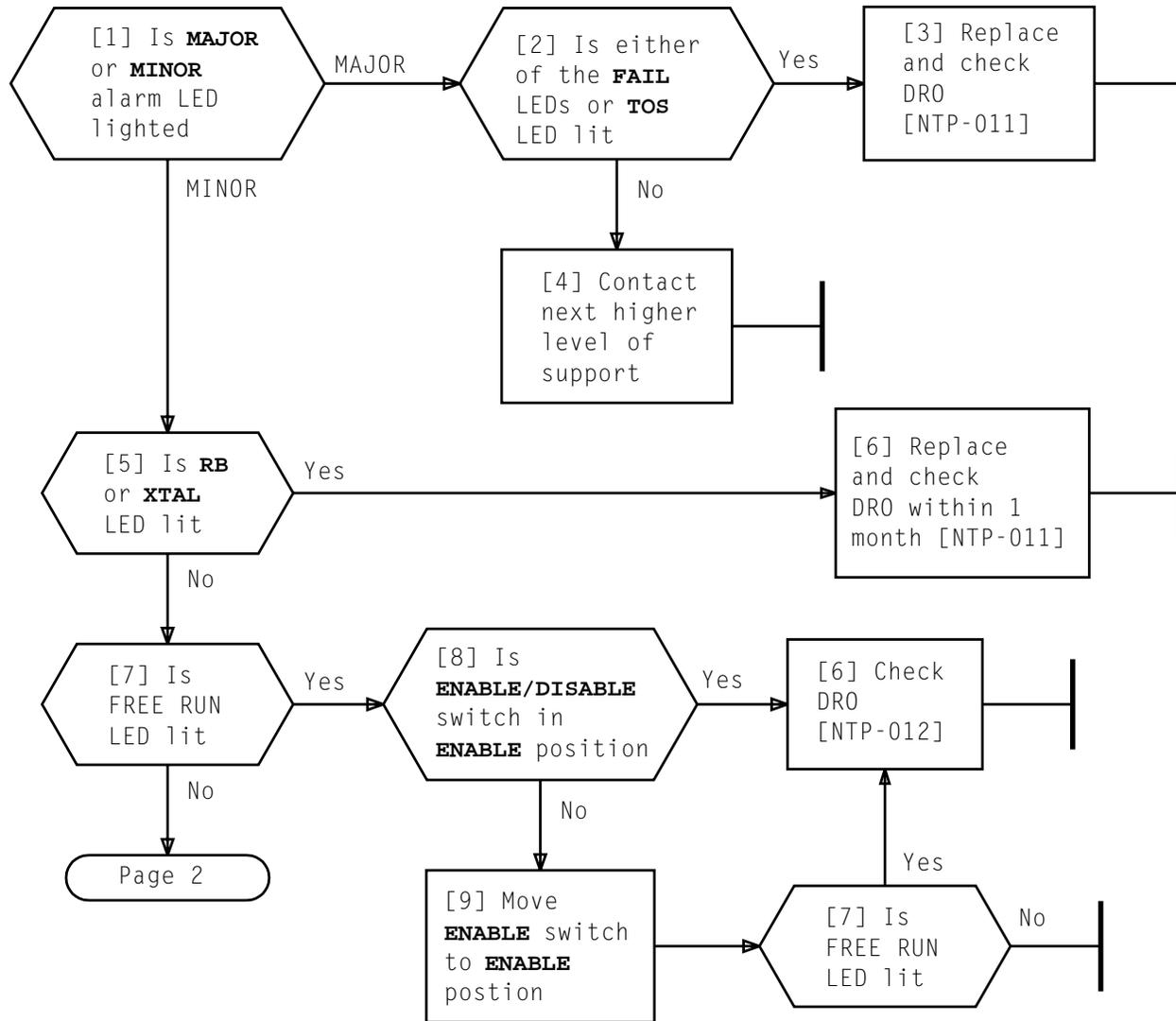
**CAUTION 1**  
Always remove NCSU from service and disable all oscillators (using **ENABLE/DISABLE** switch) before working on any network clock problem

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 2	147



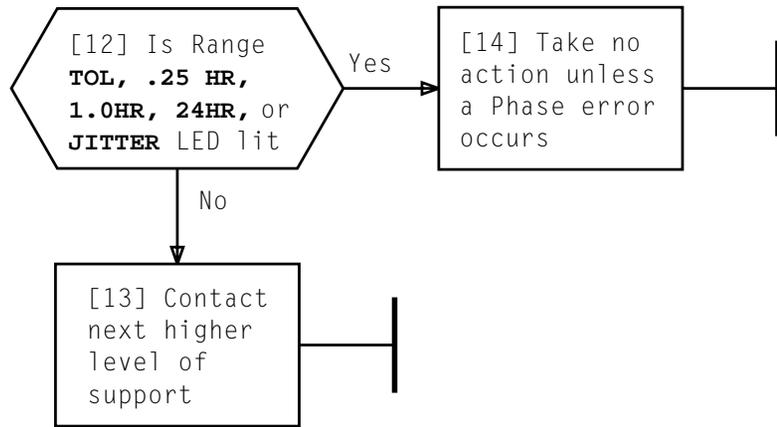
**CLEAR R1 OR PLS FAULT – DISCIPLINED RUBIDIUM OSCILLATOR**

Issue 2	SEP 1998
234-351-013	TAP
PAGE 2 of 2	147



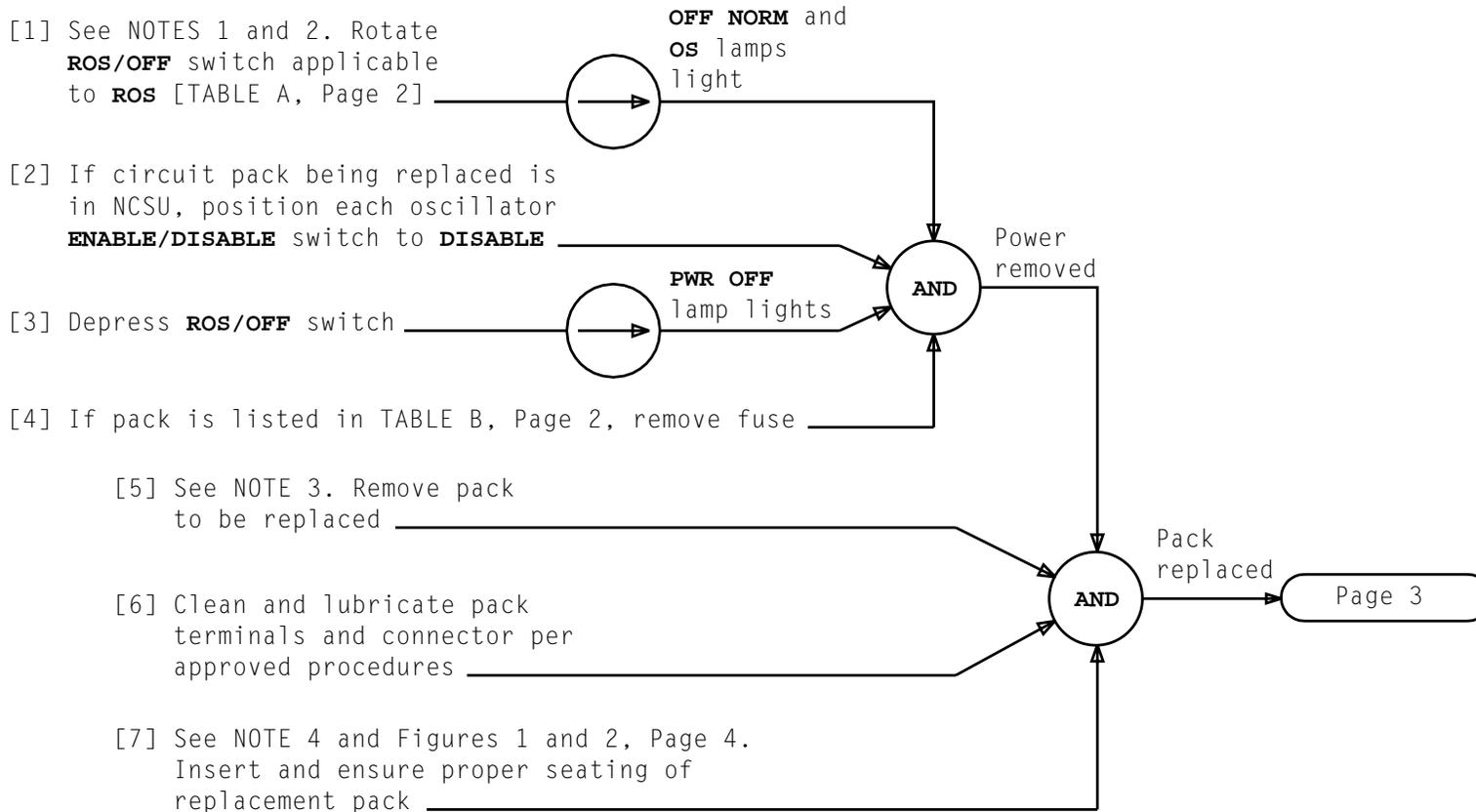
**CLEAR DRO MAJOR/MINOR ALARM**

Issue 2	SEP 1998
234-351-013	TAP
PAGE 1 of 2	<b>152</b>



**CLEAR DRO MAJOR/MINOR ALARM**

Issue 2	SEP 1998
234-351-013	TAP
PAGE 2 of 2	<b>152</b>



- NOTES
- Packs at locations 66-31, -33, -34, -37, -39, and -40 are located behind screw-held covers of phase lock ovens
  - 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
  - To remove pack which is stuck, gently move pack up and down to loosen and pull outward
  - Settings of DIP switches on **FG63** and **FG73** packs are important. If switches are set incorrectly, Phase 6 of the NCSU diagnostic will fail

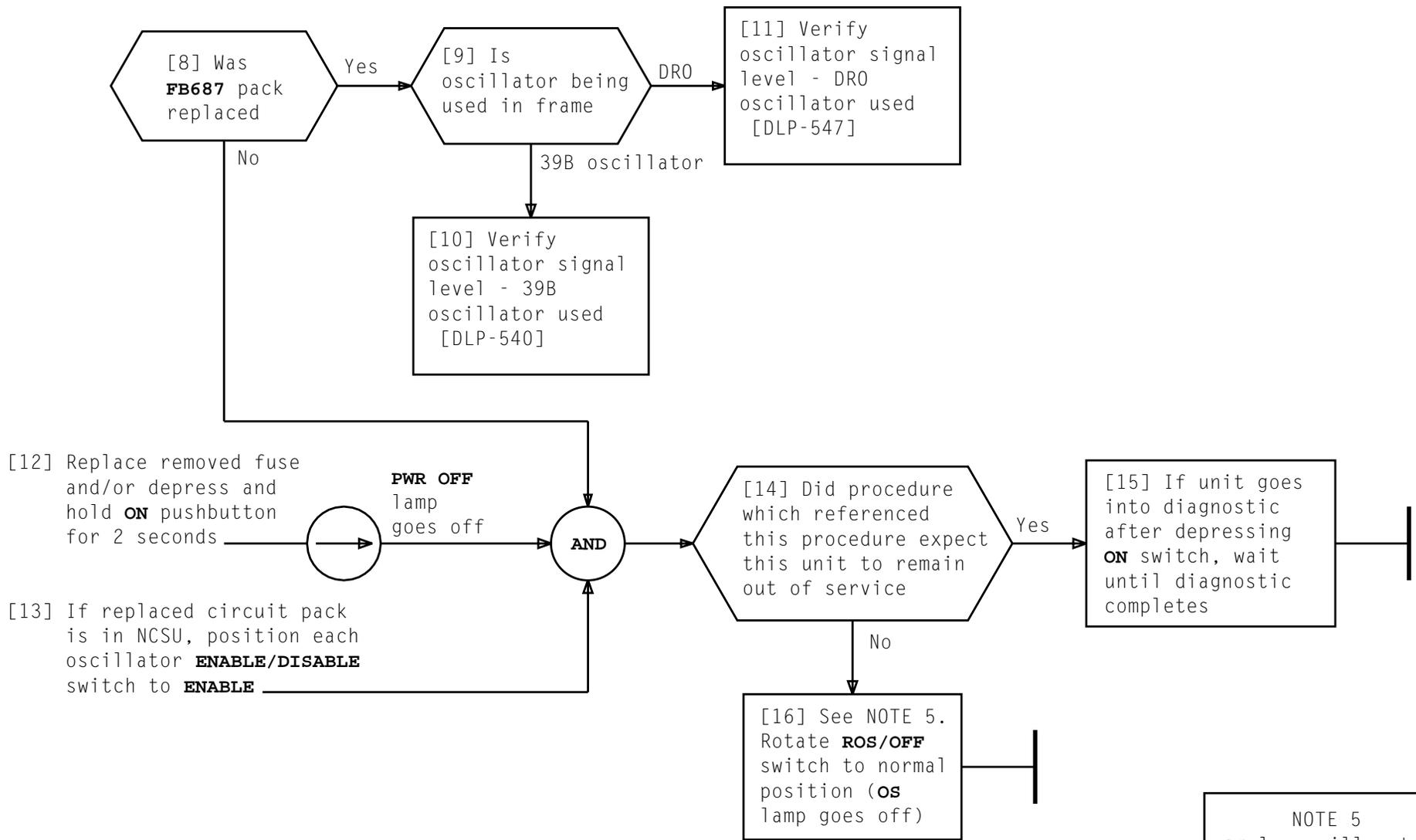
Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 4	500

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)

Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 4	500



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

Issue 2	SEP 1998
234-351-013	DLP
PAGE 3 of 4	500

**REPLACE CIRCUIT PACK (EXCEPT FB211 TYPE)**

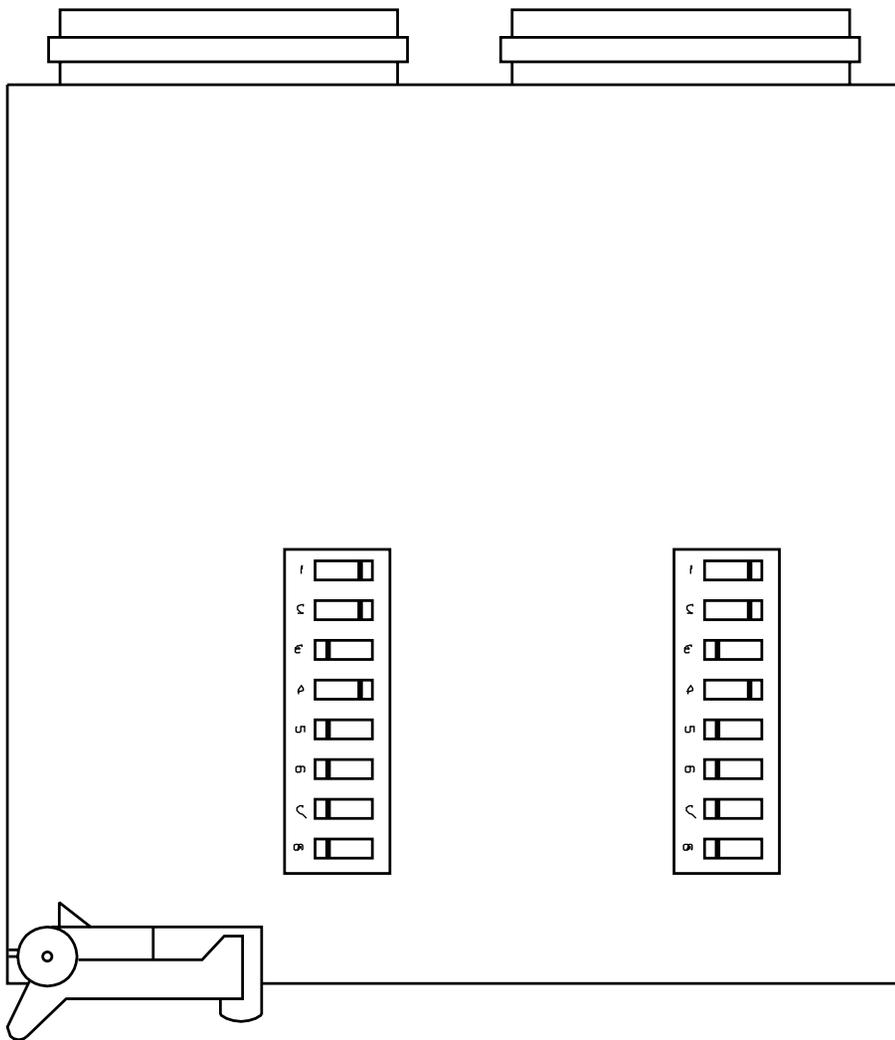


Figure 1 - FG63 Switch Positions

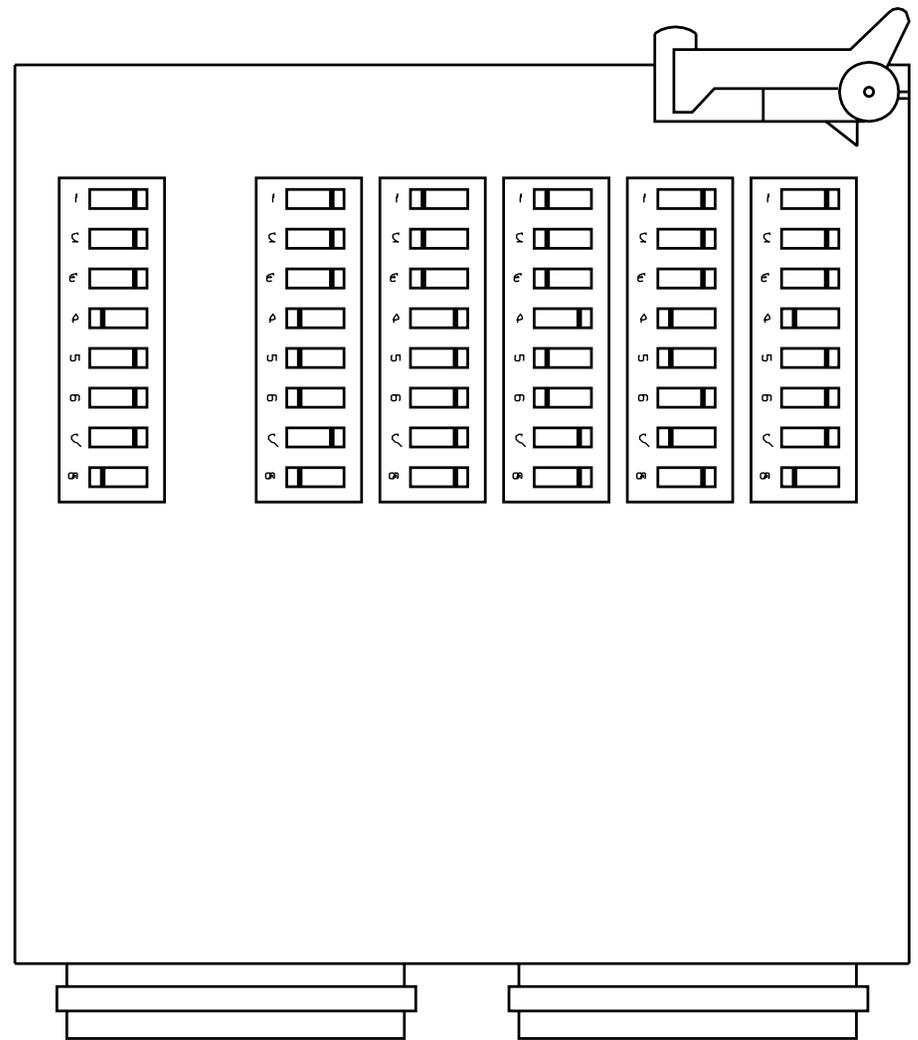


Figure 2 - FG73 Switch Positions

REPLACE CIRCUIT PACK (EXCEPT FB211 TYPE)

Issue 2	SEP 1998
234-351-013	DLP
PAGE 4 of 4	500

[1] On raw data printout for first failing test, locate last data word printed  
[Figure 1, Page 2]

In first failing phase PIDENT:

[2] Use last data word address to locate where first subroutine was called

[3] Read any comments at CALLSUB statement located

[4] Note name of subroutine called in CALLSUB statement label item

[5] Locate and read prologue of program unit containing CALLSUB statement

In loader map symbols section:

[6] Locate name of subroutine called in symbol column (name noted in Step 4)

[7] In PIDENT column, note PIDENT that contains this subroutine and obtain this PIDENT

In PIDENT containing subroutine:

[8] Locate subroutine using PIDENT reference section

[9] Read subroutine prologue

AND

AND

Page 3

## DETERMINE LOCATION AND FUNCTION OF SUBROUTINES CALLED

Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 3	501

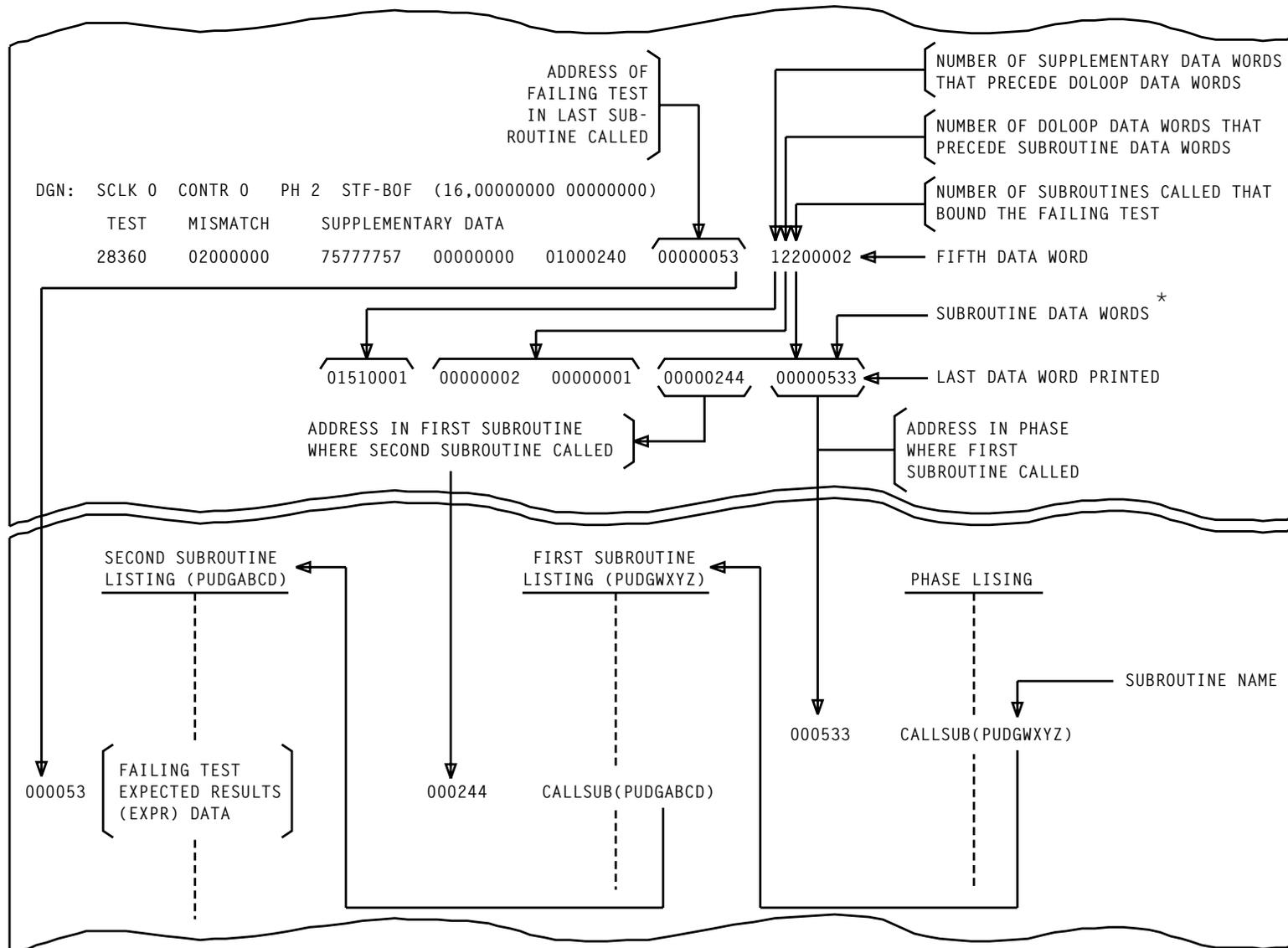
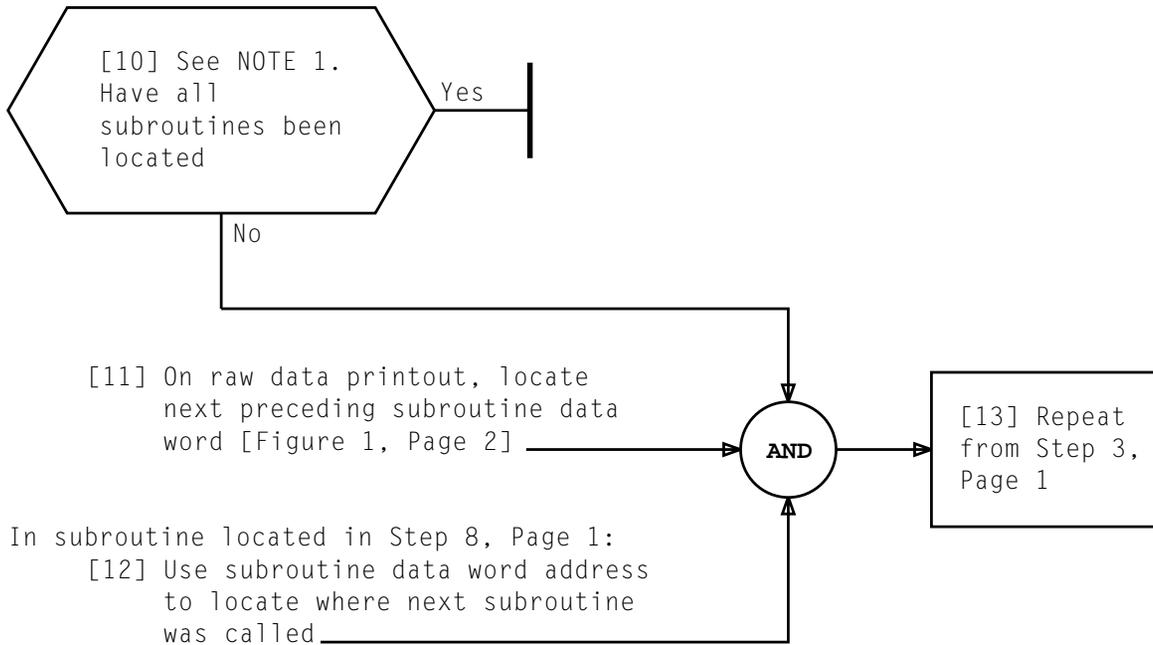


Figure 1 - Relationship of Subroutine Data Words to Phase and Subroutine Listings

Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 3	501



NOTE 1	
On raw data printout, the sixth digit in fifth data word following mismatch data indicates number of subroutines called	
Issue 2	SEP 1998
234-351-013	DLP
PAGE 3 of 3	501

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

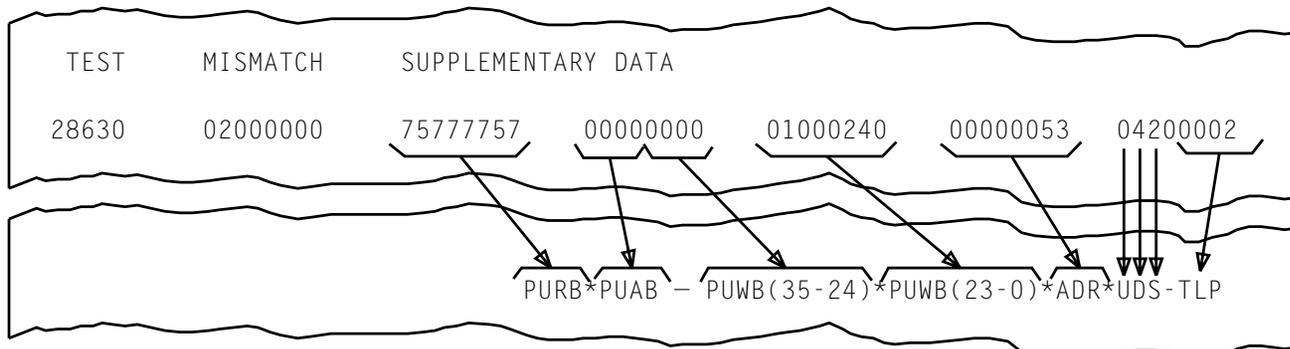


Figure 1 - Example of Raw Data Printout Relationship to Asterisk Line at Failing Test

TABLE A DESCRIPTION OF DATA CONTAINED IN SECOND AND THIRD DATA WORD FOR EACH TYPE DIAL TEST STATEMENT					
DIAL TEST STATEMENT	DESCRIPTION*	DIAL TEST STATEMENT	DESCRIPTION*		
CCBB	A = B = 0, C = buffer bus address	SCANI	A(bits 11-2) = SP K code B = SP OP code to read scan points 0(1540) C = address of point		
CITOP CITOPI	Standard PUB format†				
CLKOP	A = fault chain, B = reply bus C = CC pulse point address (see PIDENT prolog)	SDI	A(bits 11-2) = SP K code B = SP OPCODE to read SD points 0(1440) C = address of point		
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	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		
MTXMOP	Standard PUB format† PUWB bits 8-0 = matrix under test	TSIESR	Standard PUB format† except C = don't care		
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	TSIMOP	Same as MEMOPI statement		
		<p>*The following format relates A, B, and C to the second and third data words following mismatch data:</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;"><u>SECOND WORD</u></td> <td style="text-align: center;"><u>THIRD WORD</u></td> </tr> <tr> <td style="text-align: center;">AAAABBBB</td> <td style="text-align: center;">CCCCCCC</td> </tr> </table> <p>†The standard PUB format is: A = PUEA/PUAB B = PUWB (bits 35-24) = OPAD, (bits 35-29) = OPCODE C = PUWB (bits 23-0) = ADDRESS</p>		<u>SECOND WORD</u>	<u>THIRD WORD</u>
<u>SECOND WORD</u>	<u>THIRD WORD</u>				
AAAABBBB	CCCCCCC				
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				

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 0'a! a = SD point address	
Scan point address	VER:SPMTXPK:SCP,MSN 0'a! a = scan point address	

ANALYZE FAILING TEST DATA TO DETERMINE TEST FUNCTION

Issue 2	SEP 1998
234-351-013	DLP
PAGE 3 of 3	502

At frame power switch:

[1] Rotate **ROS/OFF** switch clockwise to **ROS**

**OFF NORM** and **OS** lamps light

[2] Depress and hold **TEST** pushbutton for 2 seconds

[4] Depress **ON** pushbutton

[5] Rotate **ROS/OFF** switch 1/4-turn counterclockwise

All LEDs go off

**OFF NORM** and **OS** lamps go off

[3] See TABLE A, Page 2. Are LEDs on converters and circuit packs lighted

[6] Replace defective unit (circuit pack [DLP-500] or converter [DLP-509]) and return to Step 1

# TEST POWER ALARM CIRCUITS

Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 2	503

TABLE A LED LOCATIONS				
UNIT CONTAINING LED	NCLK UNIT LOCATION	SCLK UNIT LOCATION	PUB UNIT LOCATION	NCSU LOCATION
Circuit pack <b>FB152</b>	078-03, 178-03 078-68, 178-68	056-52, 156-52	—	—
Circuit pack <b>FG76</b>	—	—	—	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.

[1] Refer to Figure 1, Page 2, and DIAL statement definitions in Section 234-180-020 as necessary

[2] Locate failing test in last subroutine called and note page and line number of expected results (EXPR)

[3] Locate last address in this subroutine and note page and line number

[4] Locate subroutine PIDENT reference section

AND

[5] Is endloop MACRO referenced

Yes

No

[6] Are any endloop references between failing test and end of subroutine

Yes

No

Page 3

[7] Was this subroutine called from phase or from another subroutine

Phase

Subroutine

Page 6

Page 4

Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 6	504

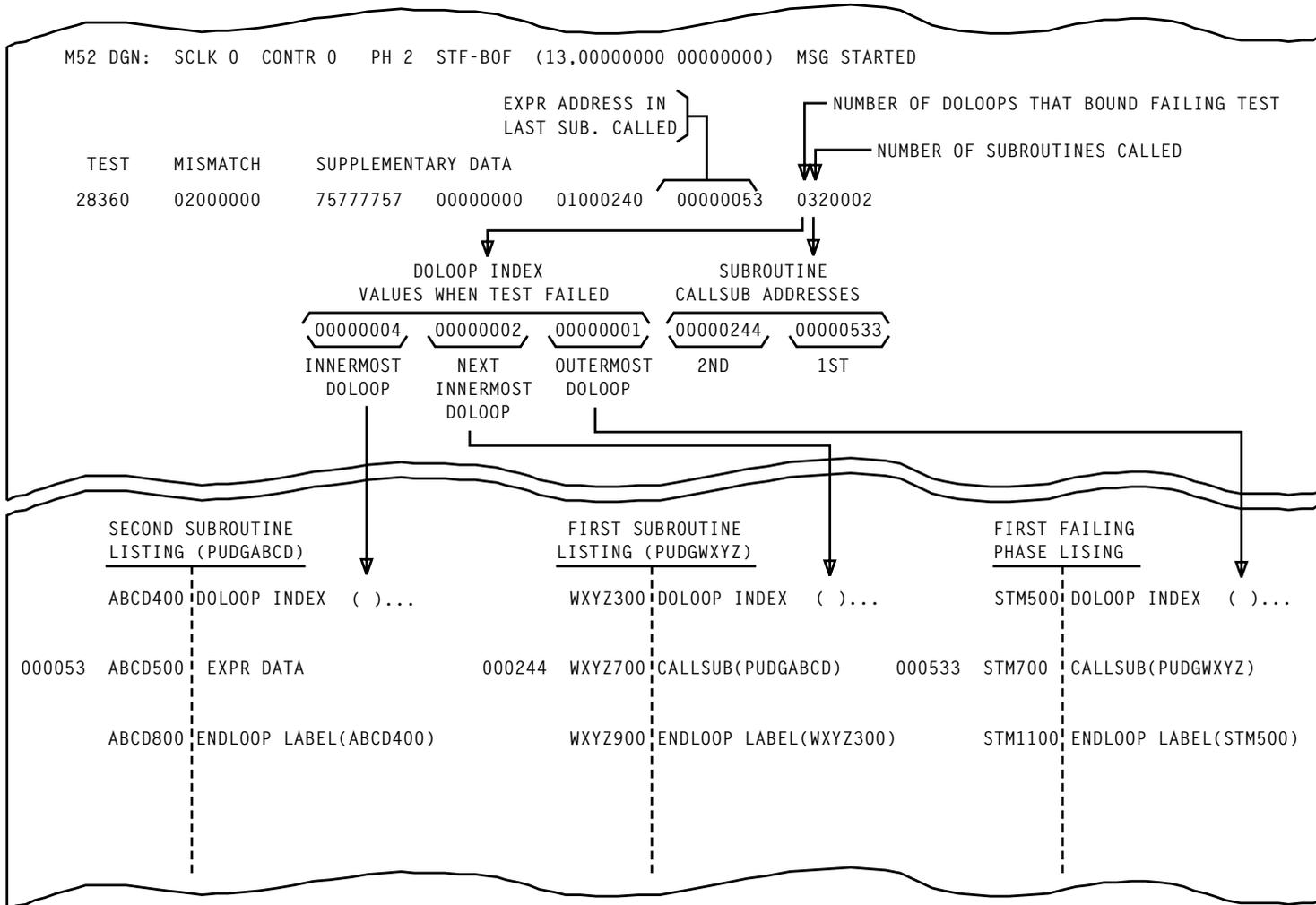
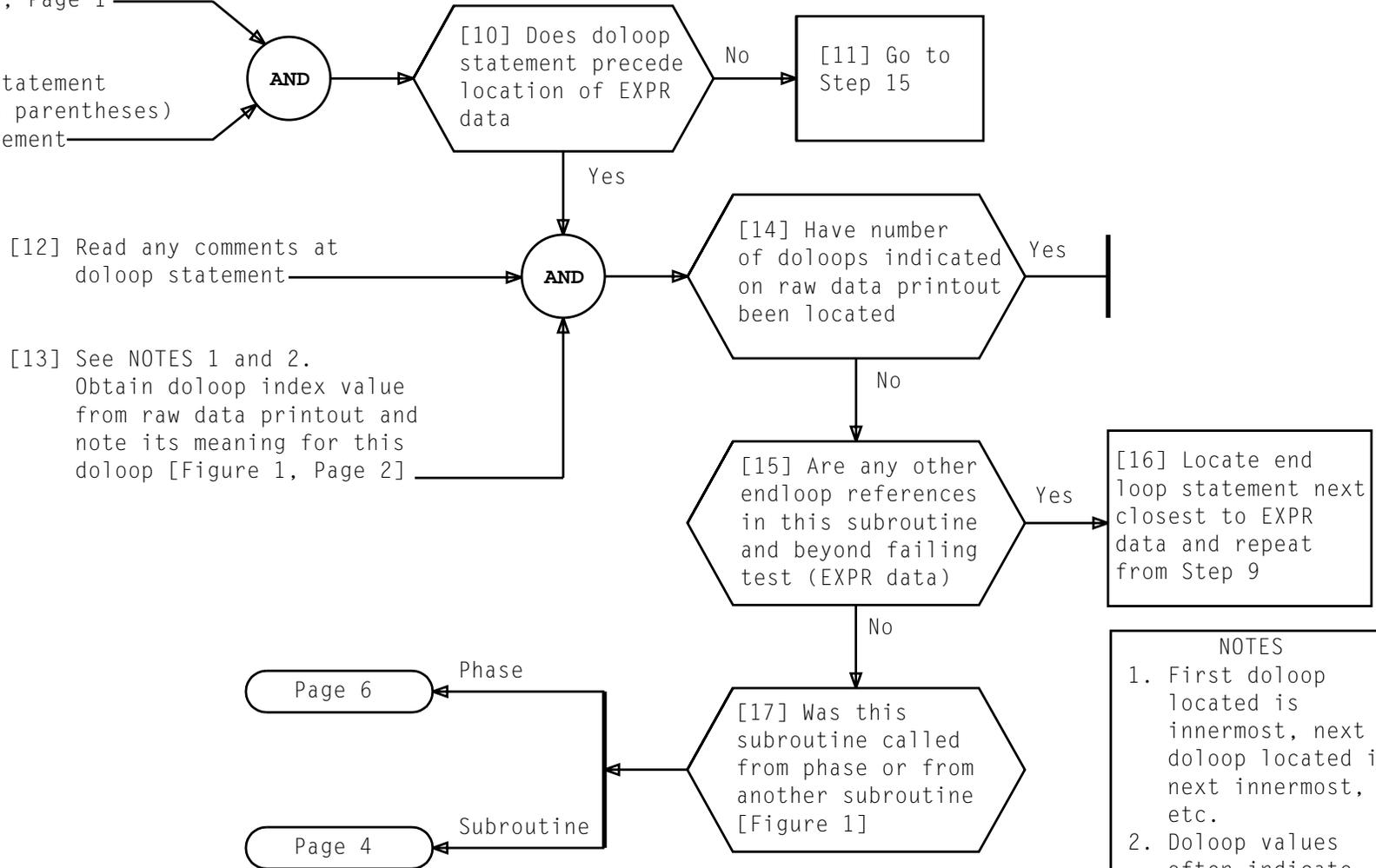


Figure 1 - Example of Doloop Raw Data Relationship to Listings When Subroutines Called

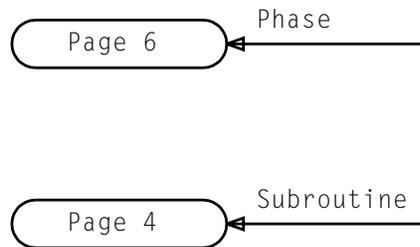
[8] Locate referenced endloop statement closest to (but beyond) EXPR data noted in Step 2, Page 1

[9] Locate doloop statement using label (in parentheses) at endloop statement



[12] Read any comments at doloop statement

[13] See NOTES 1 and 2. Obtain doloop index value from raw data printout and note its meaning for this doloop [Figure 1, Page 2]



[16] Locate end loop statement next closest to EXPR data and repeat from Step 9

**NOTES**  
 1. First doloop located is innermost, next doloop located is next innermost, etc.  
 2. Doloop values often indicate unit under test, memory, etc.

Issue 2	SEP 1998
234-351-013	DLP
PAGE 3 of 6	504

[18] In subroutine that called last subroutine checked for doloops, locate CALLSUB statement that called subroutine

[19] Note page and line number of CALLSUB statement

[20] Locate last address in this subroutine and note page and line number

[21] Locate subroutine PIDENT reference section

AND

[22] Is endloop MACRO referenced

Yes

[23] Are any endloop references between CALLSUB statement and end of subroutine

Yes

Page 5

No

No

[24] Was this subroutine called from phase or from another subroutine

Phase

Page 6

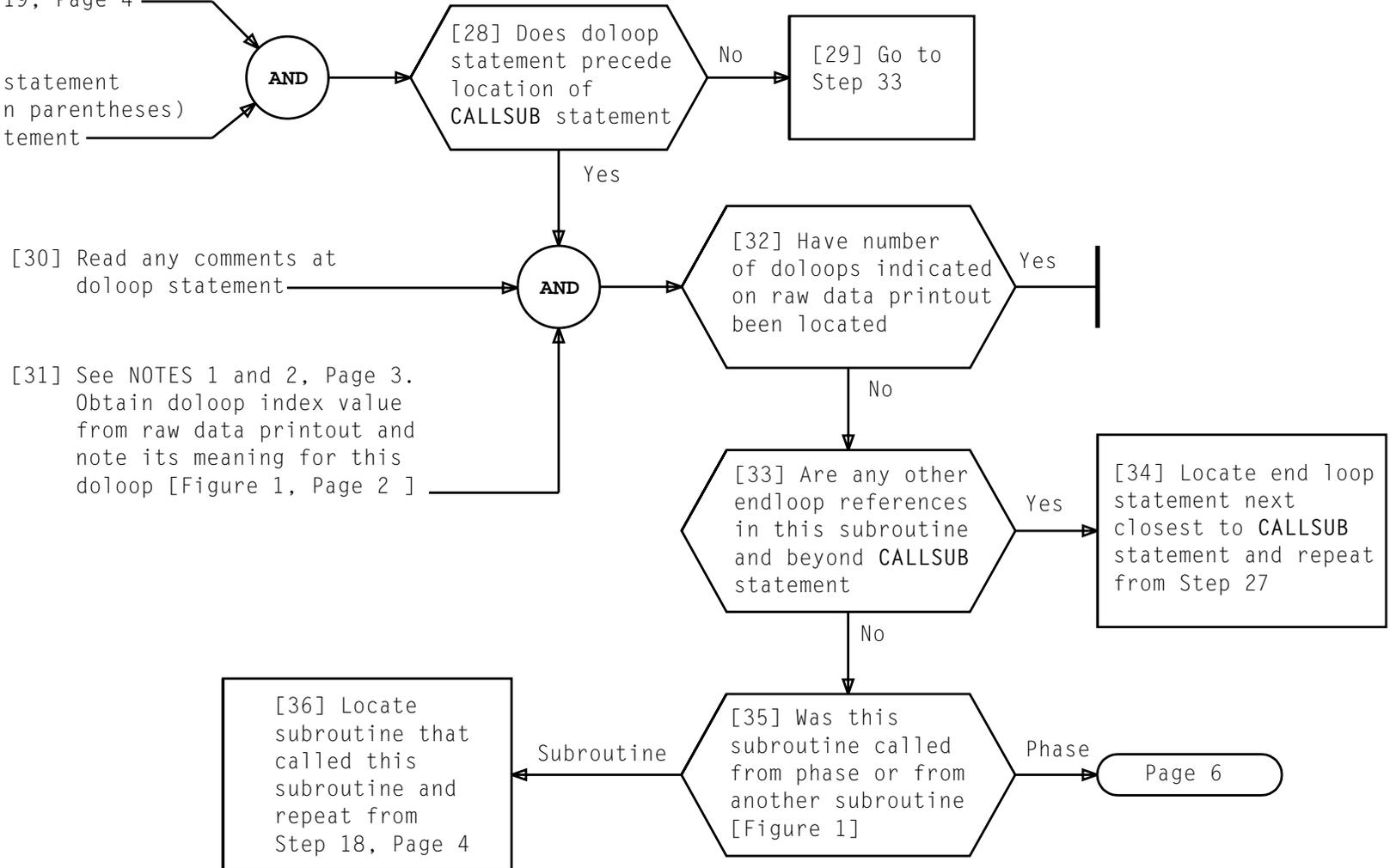
Subroutine

[25] Locate subroutine that called this subroutine and repeat from Step 8, Page 3

Issue 2	SEP 1998
234-351-013	DLP
PAGE 4 of 6	504

[26] Locate referenced endloop statement closest to (but beyond) CALLSUB statement noted in Step 19, Page 4

[27] Locate doloop statement using label (in parentheses) at endloop statement



Issue 2	SEP 1998
234-351-013	DLP
PAGE 5 of 6	504

In first failing phase PIDENT:

[37] Locate **CALLSUB** statement that called for last subroutine checked for doloops [Figure 1, Page 2]

[38] Note page and line number of **CALLSUB** statement

[39] Locate endloop **MACRO** in PIDENT reference section

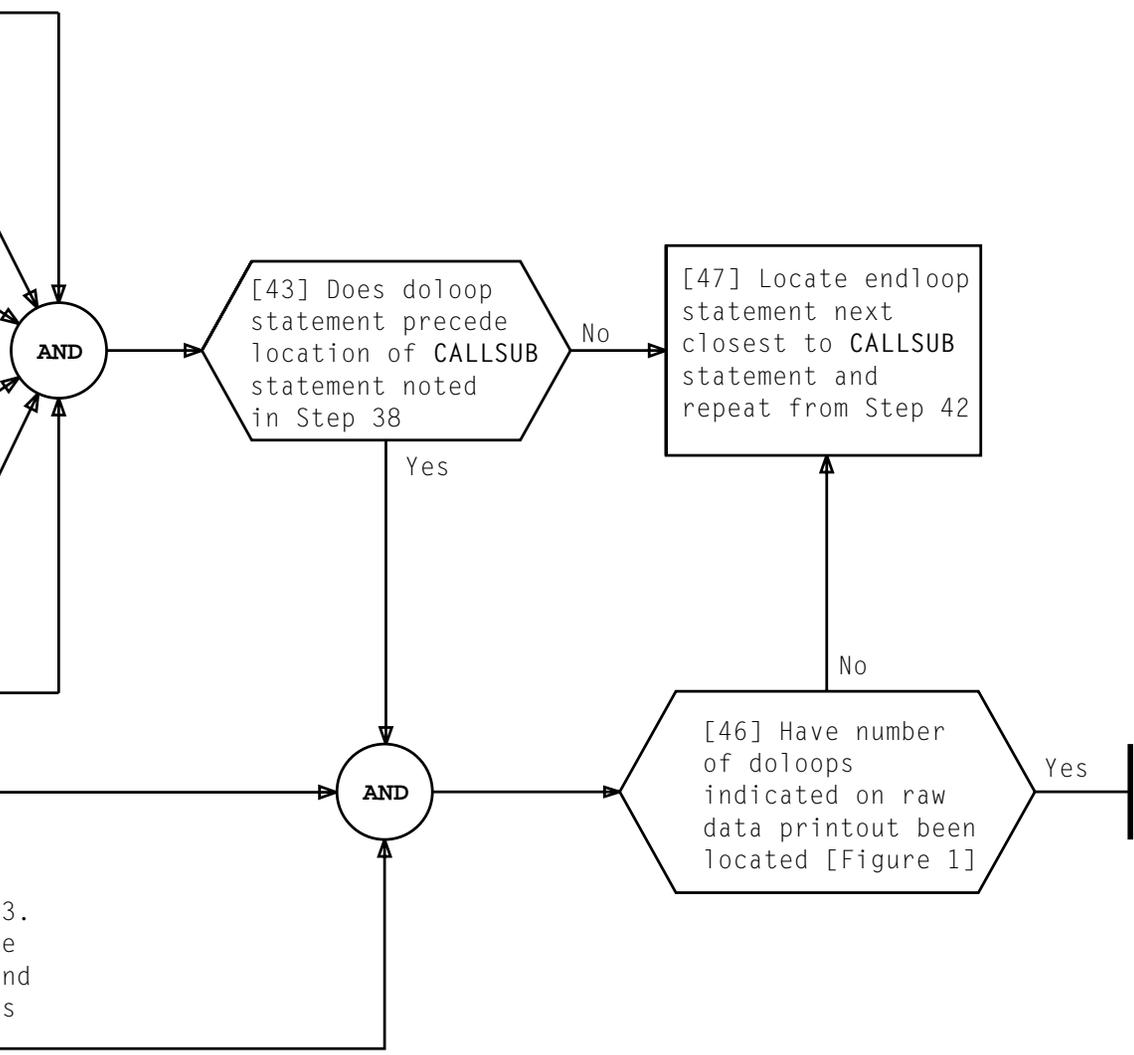
[40] Note endloop reference that is closest to (but beyond) **CALLSUB** statement

[41] Locate endloop statement noted in Step 40

[42] Locate doloop statement using label (in parentheses) at endloop statement

[44] Read any comment at doloop statement

[45] See NOTES 1 and 2, Page 3. Obtain doloop index value from raw data printout and note its meaning for this doloop [Figure 1]



In first failing phase PIDENT:

[1] Locate first failing test using EXPR address on raw data printout [Figure 1, Page 2]

[2] Note page and line number of EXPR data

[3] Locate endloop MACRO in PIDENT reference section

[4] Note endloop reference that is closest to (but beyond) EXPR data

[5] Locate endloop statement noted in Step 4

[6] Locate doloop statement using label (in parentheses) at endloop statement

[8] Read any comment at doloop statement

[9] See NOTES 1 and 2. Obtain doloop index value from raw data printout and note its meaning for this doloop [Figure 1]

AND

[7] Does doloop statement precede location of EXPR data noted in Step 2

Yes

No

AND

[10] Have number of doloops indicated on raw data printout been located [Figure 1]

Yes

No

[11] Locate endloop statement next closest to failing test and repeat from Step 6

NOTES  
 1. First doloop located is innermost; next doloop located is next innermost, etc.  
 2. Doloop values often indicate unit under test, memory, etc.

**DETERMINE LOCATION AND FUNCTION OF DOLOOPS, NO SUBROUTINES CALLED**

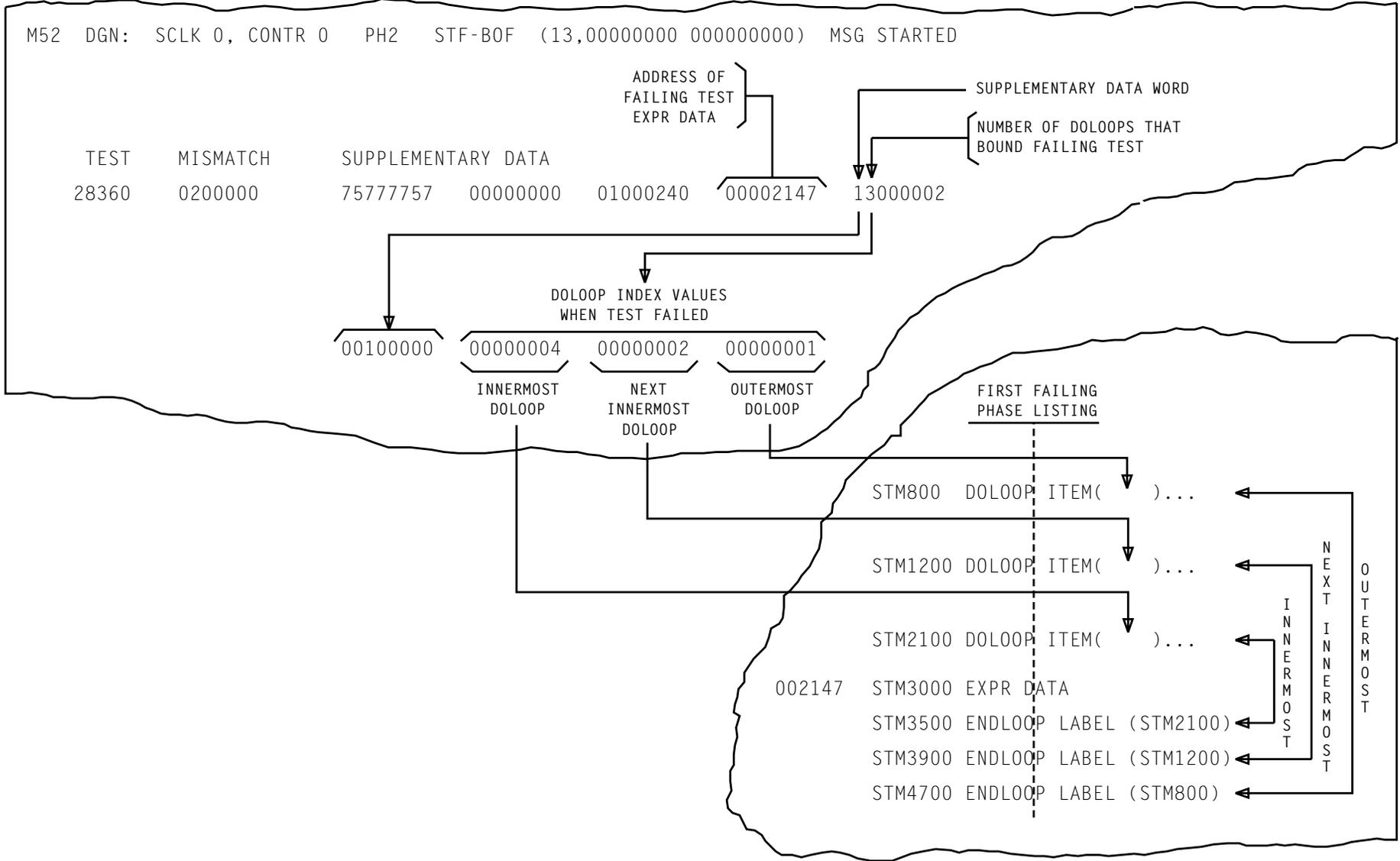


Figure 1 - Example of Raw Data Doloop Word Relationship to Phase Listing

**DETERMINE LOCATION AND FUNCTION OF DOLOOPS, NO SUBROUTINES CALLED**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 2	505

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



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

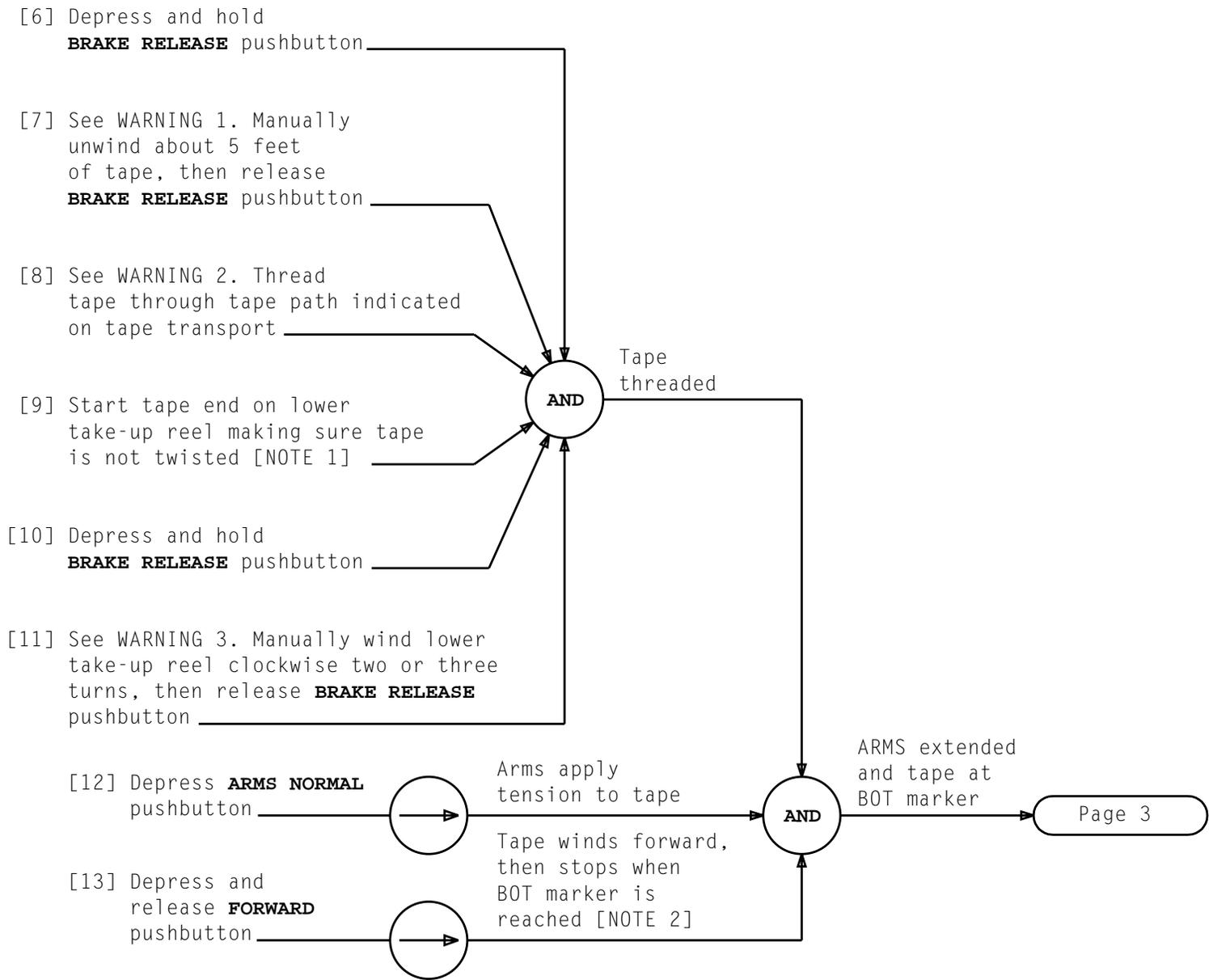
[4] With hub (knob) of upper reel in  
counterclockwise position, mount reel  
with tape on reel holder

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



Tape reel and  
take-up reel mounted

Page 2



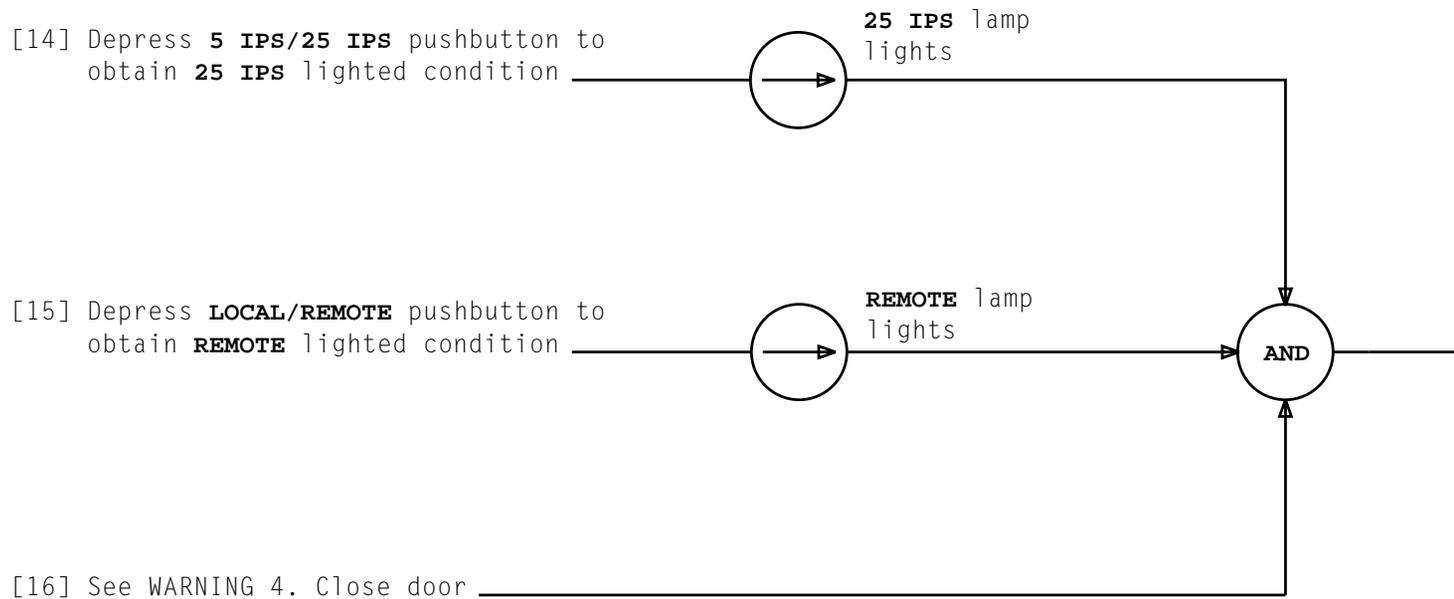
NOTES

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

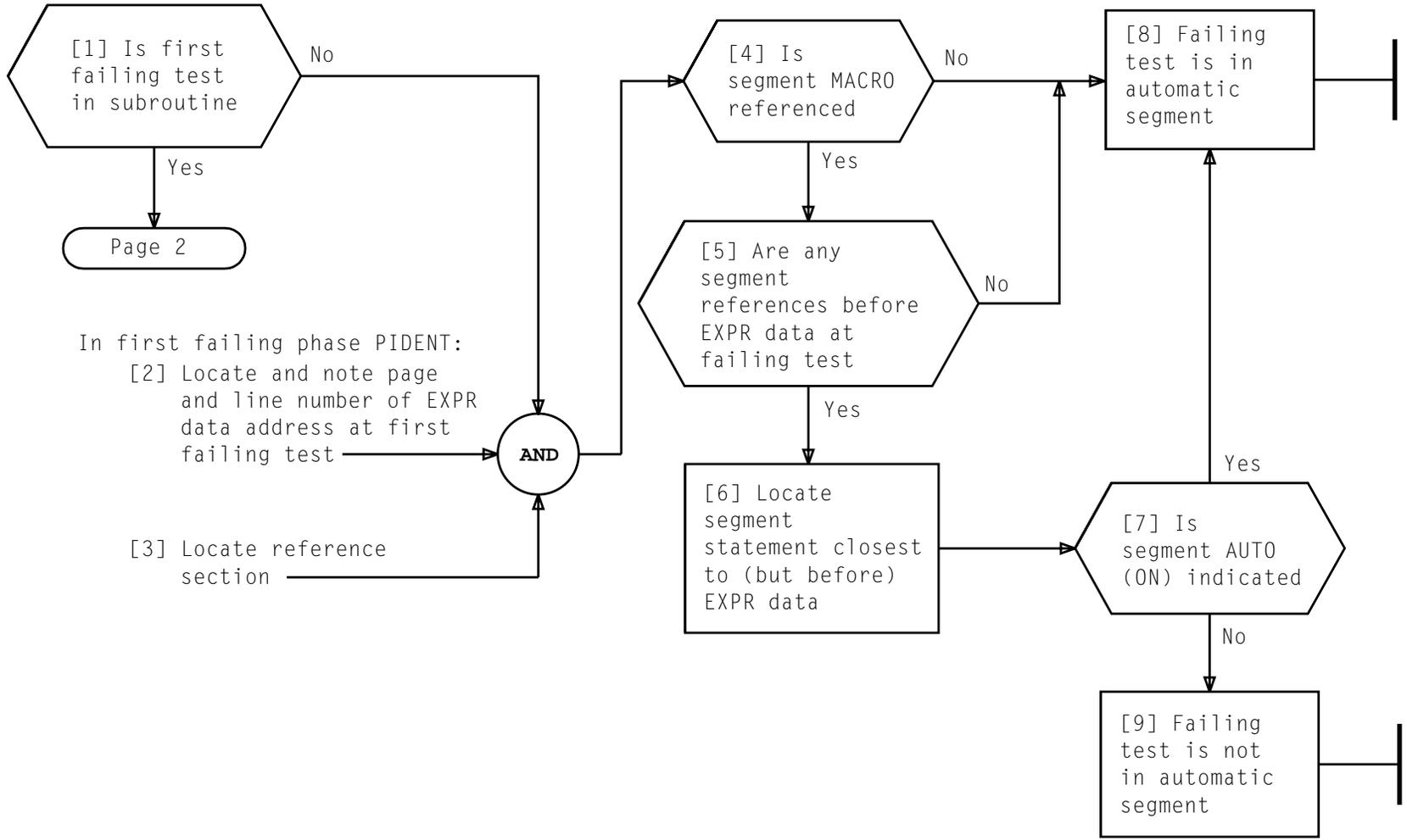
**MOUNT TAPE ON TAPE UNIT**



<i>WARNING 4</i>	
<i>Closing tape transport door in harsh manner may upset alignment</i>	
<b>Issue 2</b>	<b>SEP 1998</b>
<b>234-351-013</b>	<b>DLP</b>
<b>PAGE 3 of 3</b>	<b>506</b>

**MOUNT TAPE ON TAPE UNIT**

<p style="text-align: center;">SUMMARY</p> <p>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,</p>	<p>failing test is not in automatic segment. If no segment statement is found before first failing test, failing test is in automatic segment</p>
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**DETERMINE IF FAILING TEST IS IN AUTOMATIC SEGMENT**

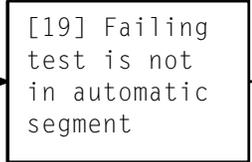
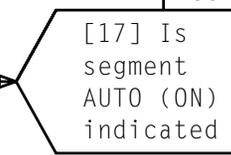
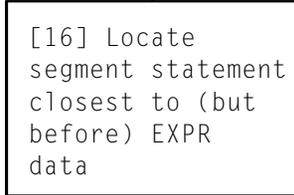
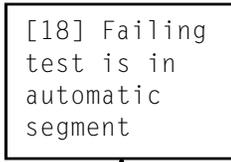
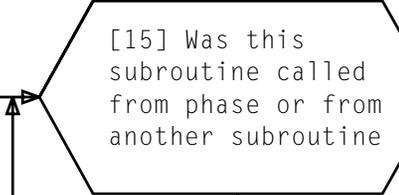
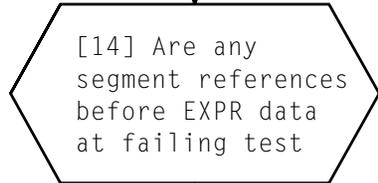
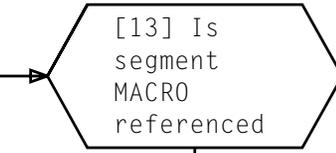
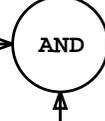
Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 4	507

In subroutine where  
first failing test  
is located:

[10] Locate and note page  
and line number of  
first address in  
subroutine (000000)

[11] Locate and note page  
and line number of  
first failing test  
EXPR data

[12] Locate PIDENT  
reference section



Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 4	507

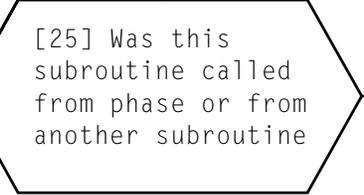
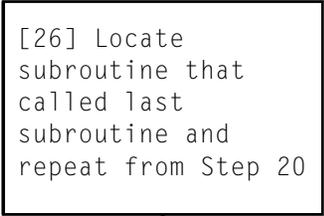
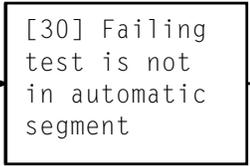
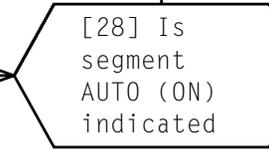
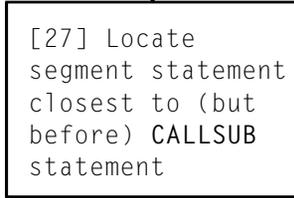
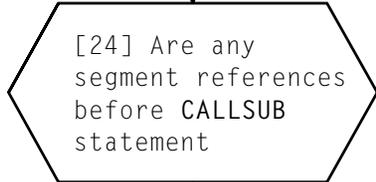
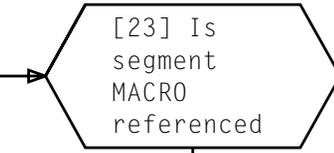
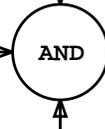
**DETERMINE IF FAILING TEST IS IN AUTOMATIC SEGMENT**

In subroutine that called  
last subroutine checked  
for segment statement:

[20] Locate and note page  
and line number of  
first address in  
subroutine (000000)

[21] Locate and note page  
and line number of  
CALLSUB statement that  
called last subroutine

[22] Locate PIDENT  
reference section



**DETERMINE IF FAILING TEST IS IN AUTOMATIC SEGMENT**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 3 of 4	507

In first failing phase PIDENT:

[31] Locate and note page and line number of CALLSUB statement that called last subroutine checked for segment statement

[32] Locate reference section

AND

[33] Is segment MACRO referenced

No

Yes

[34] Are any segment references before CALLSUB statement

No

Yes

[35] Locate segment statement closest to (but before) CALLSUB statement

[37] Failing test is in automatic segment

Yes

[36] Is segment AUTO (ON) indicated

No

[38] Failing test is not in automatic segment

**DETERMINE IF FAILING TEST IS IN AUTOMATIC SEGMENT**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 4 of 4	507

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

<b>TABLE A</b>
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**

<b>Issue 2</b>	<b>SEP 1998</b>
<b>234-351-013</b>	<b>DLP</b>
<b>PAGE 1 of 1</b>	<b>508</b>

SUMMARY

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 39B oscillator to service, or allow 1 hour before returning DRO oscillator to service.

[1] Rotate **ROS/OFF** switch for applicable converter [TABLE A, Page 2] to **ROS**

[2] If circuit pack to be replaced is in NCSU, position each oscillator **ENABLE/DISABLE** switch to **DISABLE**

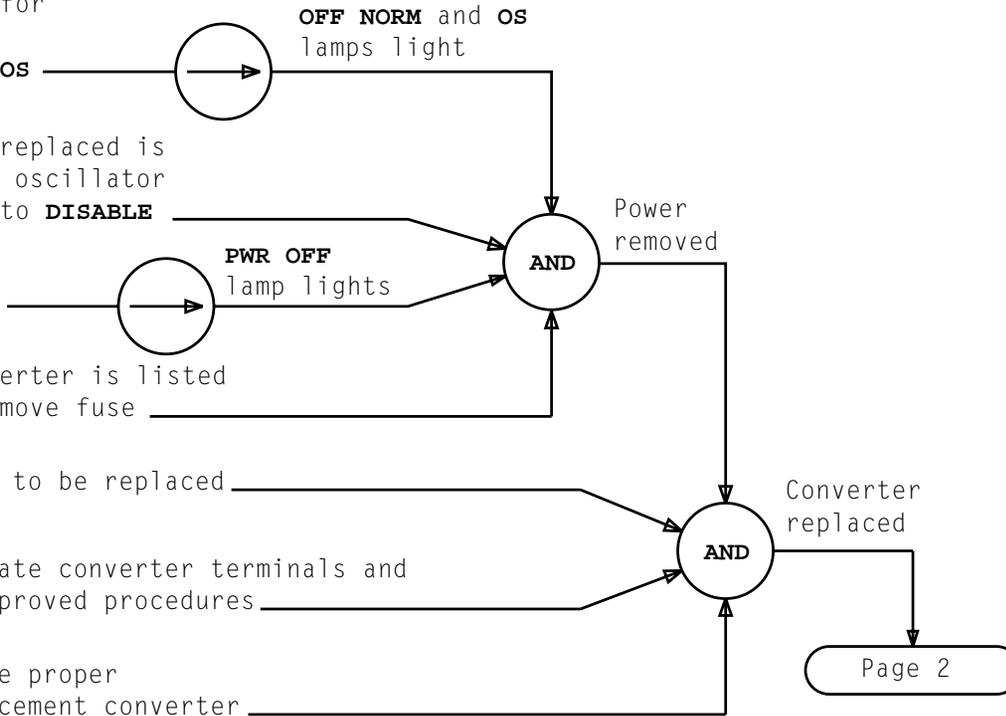
[3] Depress **ROS/OFF** switch

[4] See CAUTION 1. If converter is listed in TABLE B, Page 2, remove fuse

[5] Remove converter to be replaced

[6] Clean and lubricate converter terminals and connector per approved procedures

[7] Insert and ensure proper seating of replacement converter



**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.

Revised

Issue 2 | SEP 1998

234-351-013 | DLP

PAGE 1 of 2 | 509

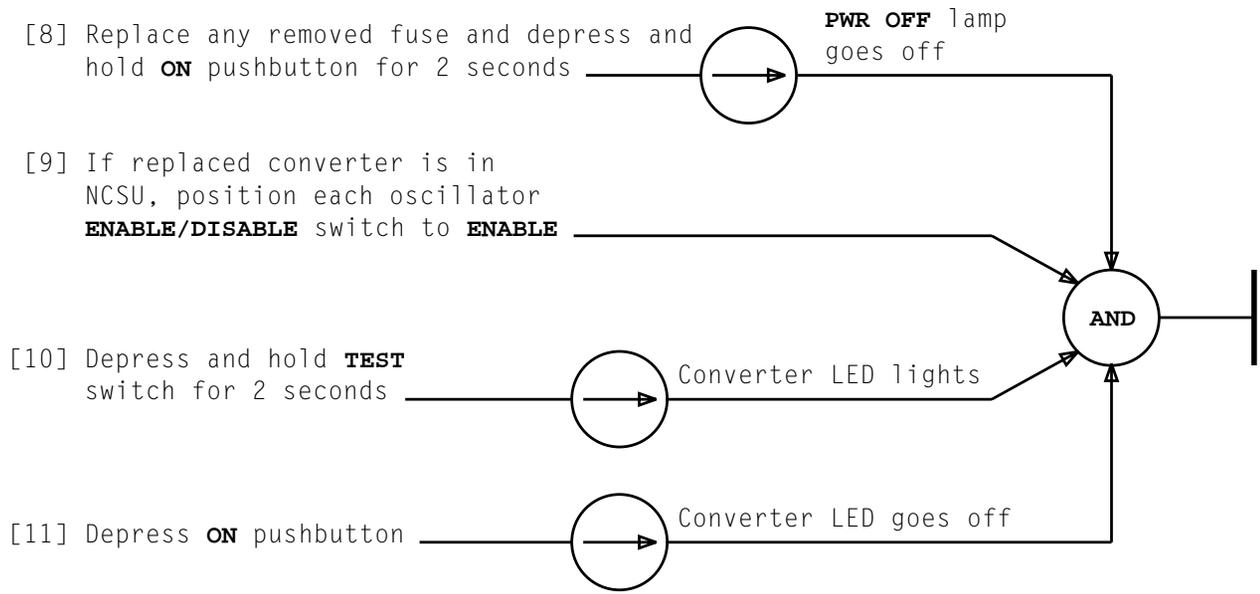


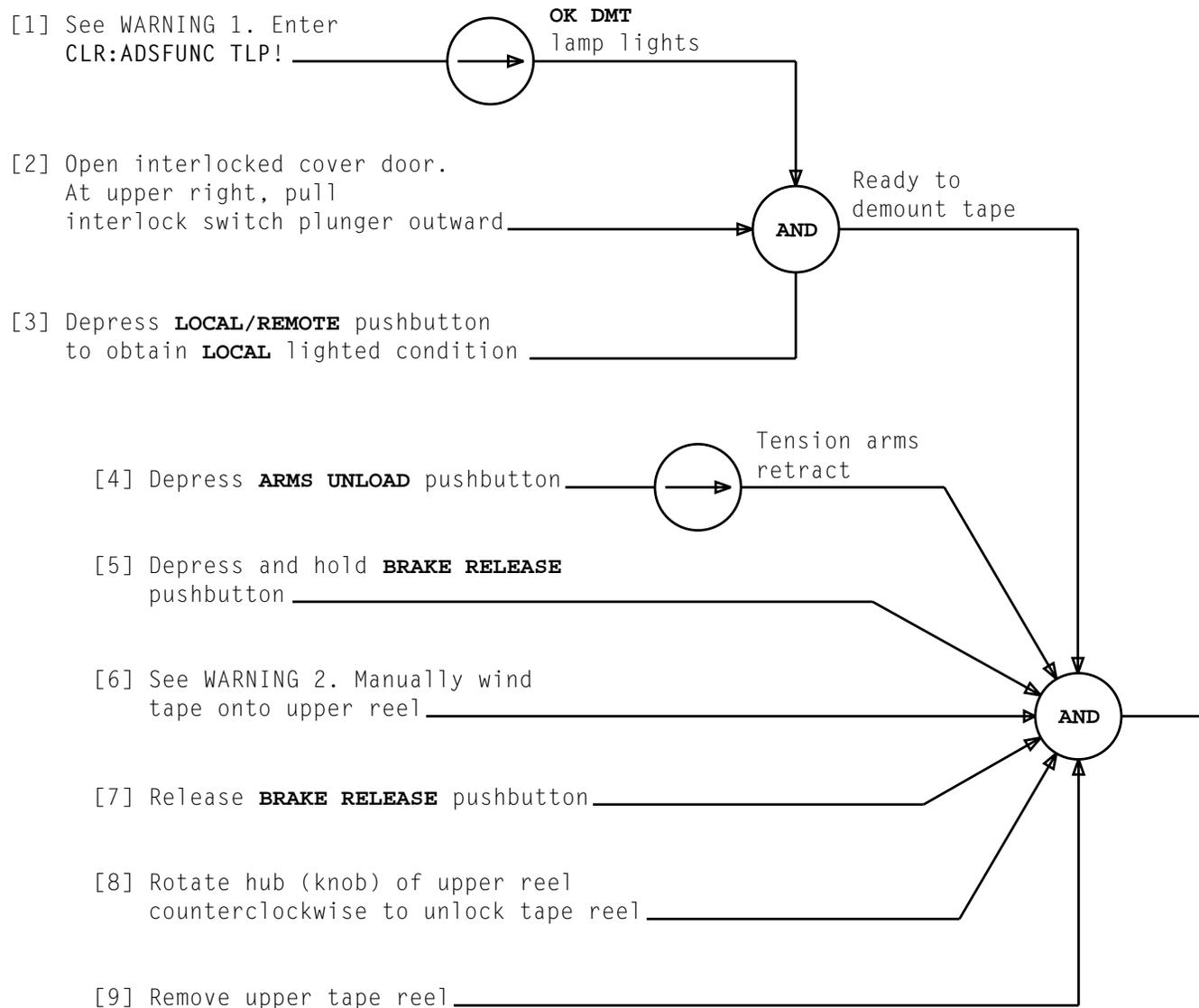
TABLE A CONVERTER POWER CONTROLS			
CONVERTER LOCATION	REQUIRED TO REMOVE CONVERTER		
	POWER SWITCH		SWITCH LOCATION
	BAY 0	BAY 1	
60-52	IPUB 0	IPUB 1	60-55
12-22, 17-06, 18-14, 19-31, 23-14	CHAIN 0	CHAIN 2	66-03
12-50, 17-66, 18-59, 19-42, 23-56	CHAIN 1	CHAIN 3	66-68
18-50, 23-50	CONTR 0	CONTR 1	56-69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

Revised

Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 2	509

**REPLACE CONVERTER**

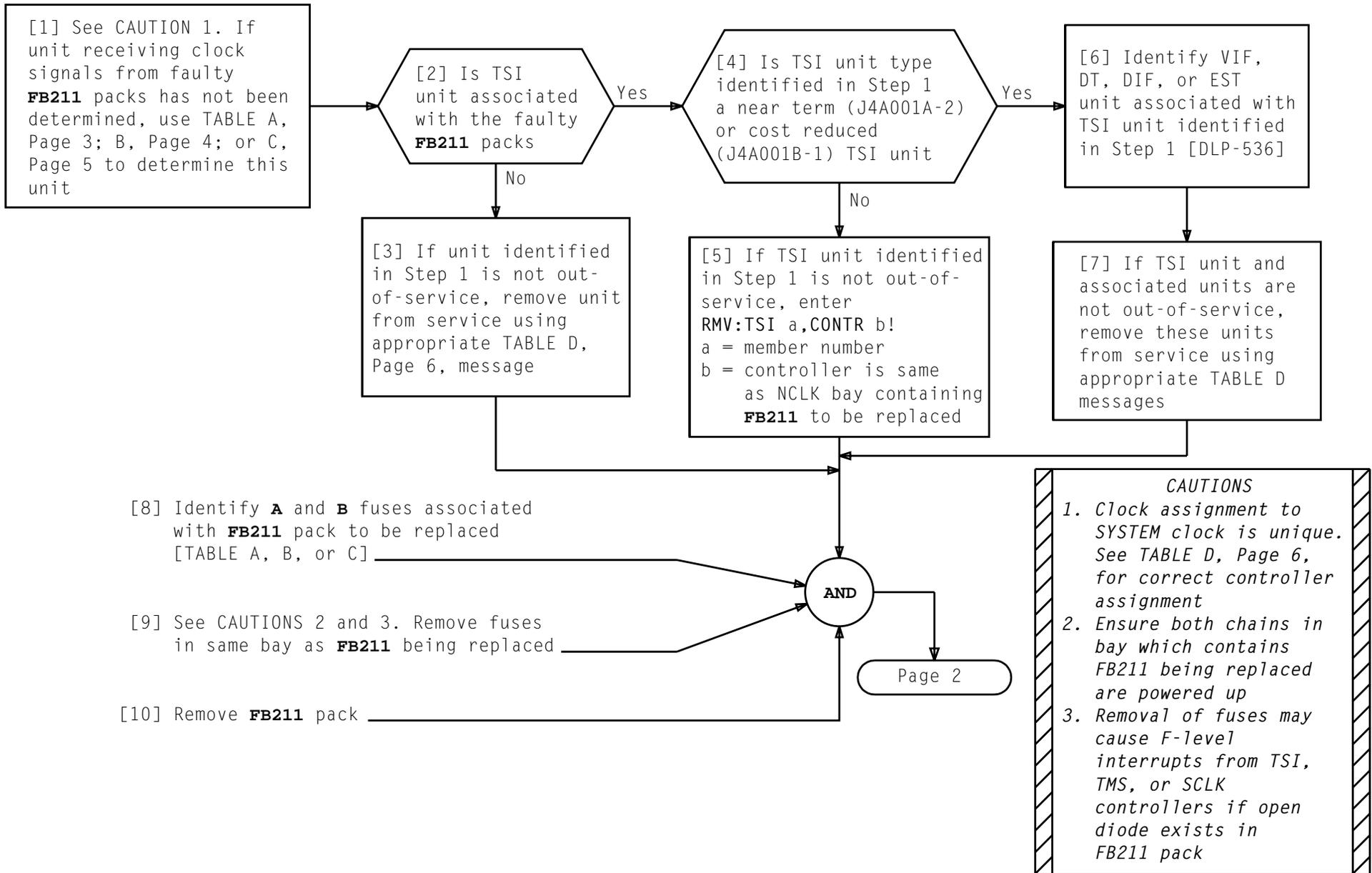


**WARNINGS**

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

Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 1	510

**DEMOUNT TAPE ON TAPE UNIT**

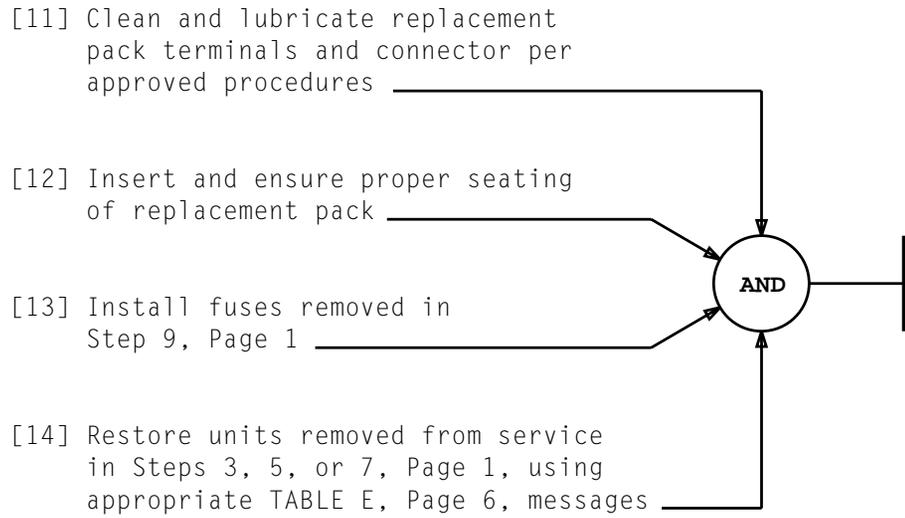


**CAUTIONS**

1. Clock assignment to SYSTEM clock is unique. See TABLE D, Page 6, for correct controller assignment
2. Ensure both chains in bay which contains FB211 being replaced are powered up
3. Removal of fuses may cause F-level interrupts from TSI, TMS, or SCLK controllers if open diode exists in FB211 pack

Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 6	511

**REPLACE FB211 CIRCUIT PACK**



**REPLACE FB211 CIRCUIT PACK**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 6	<b>511</b>

**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												
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 (XTSI, 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

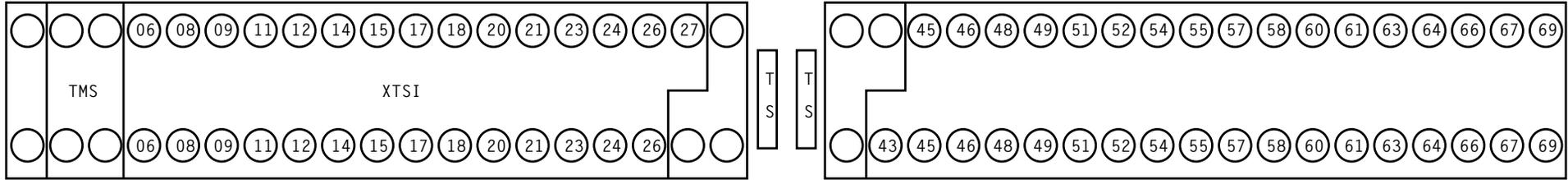


Figure 1 - Coax Jack Panels at Top of Network Clock Bay (Top Row - Level 81, Bottom Row Level 80)

**REPLACE FB211 CIRCUIT PACK**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 4 of 6	<b>511</b>

**TABLE C**  
**FB211 PACK/FUSE/USER ASSIGNMENT FOR OFFICES EQUIPPED WITH XTSSIs and CRTSSIs 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:SCLK a,CONTR c!	RMV:VIF a,CONTR b! RMV:DT a,CONTR b! RMV:DIF a,CONTR b! RMV:PUC a,CONTR b! RMV:EST a,CONTR b! RMV:TSI a,CONTR b!	RMV:VIF a,CONTR b! RMV:DT a,CONTR b! RMV:DIF a,CONTR b! RMV:PUC a,CONTR b! RMV:EST a,CONTR b! RMV:TSI a,CONTR b!
a = user number b = controller is same as NCLK bay containing <b>FB211</b> to be replaced c = controller is same as NCLK bay containing <b>FB211</b> in position 78-21, or opposite to NCLK bay containing <b>FB211</b> 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:SCLK a,CONTR b!	RST:VIF a,CONTR b! RST:DT a,CONTR b! RST:DIF a,CONTR b! RST:PUC a,CONTR b! RST:EST a,CONTR b! RST:TSI a,CONTR b!	RST:VIF a,CONTR b! RST:DT a,CONTR b! RST:DIF a,CONTR b! RST:PUC a,CONTR b! RST:EST a,CONTR b! RST:TSI a,CONTR b!
a = user number b = controller number		

[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

AND

Page 2

NOTE 1

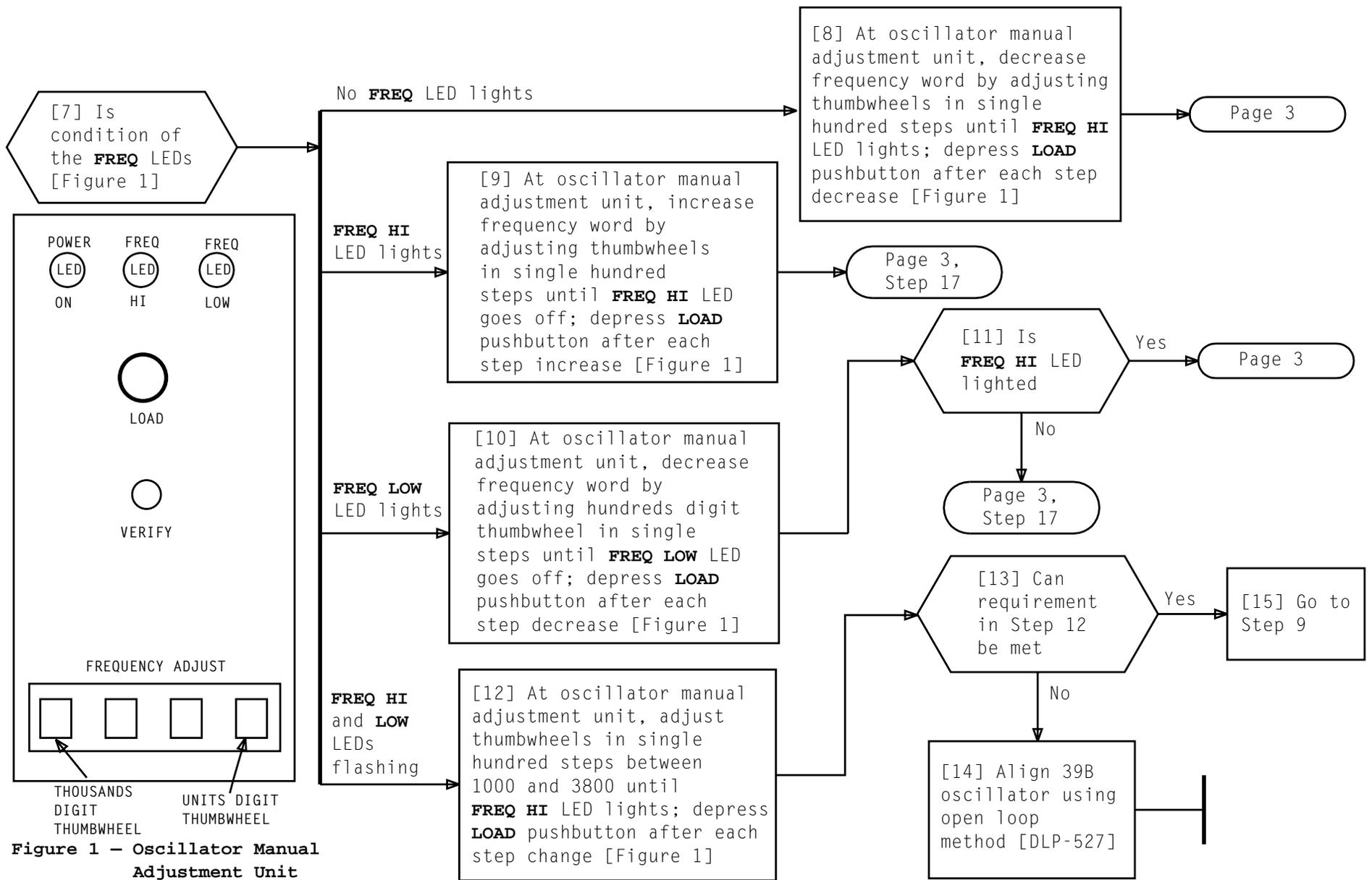
When using oscillator manual adjustment unit, increasing frequency word decreases 39B oscillator frequency; conversely, decreasing frequency word increases oscillator frequency

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

**Issue 2** | **SEP 1998**

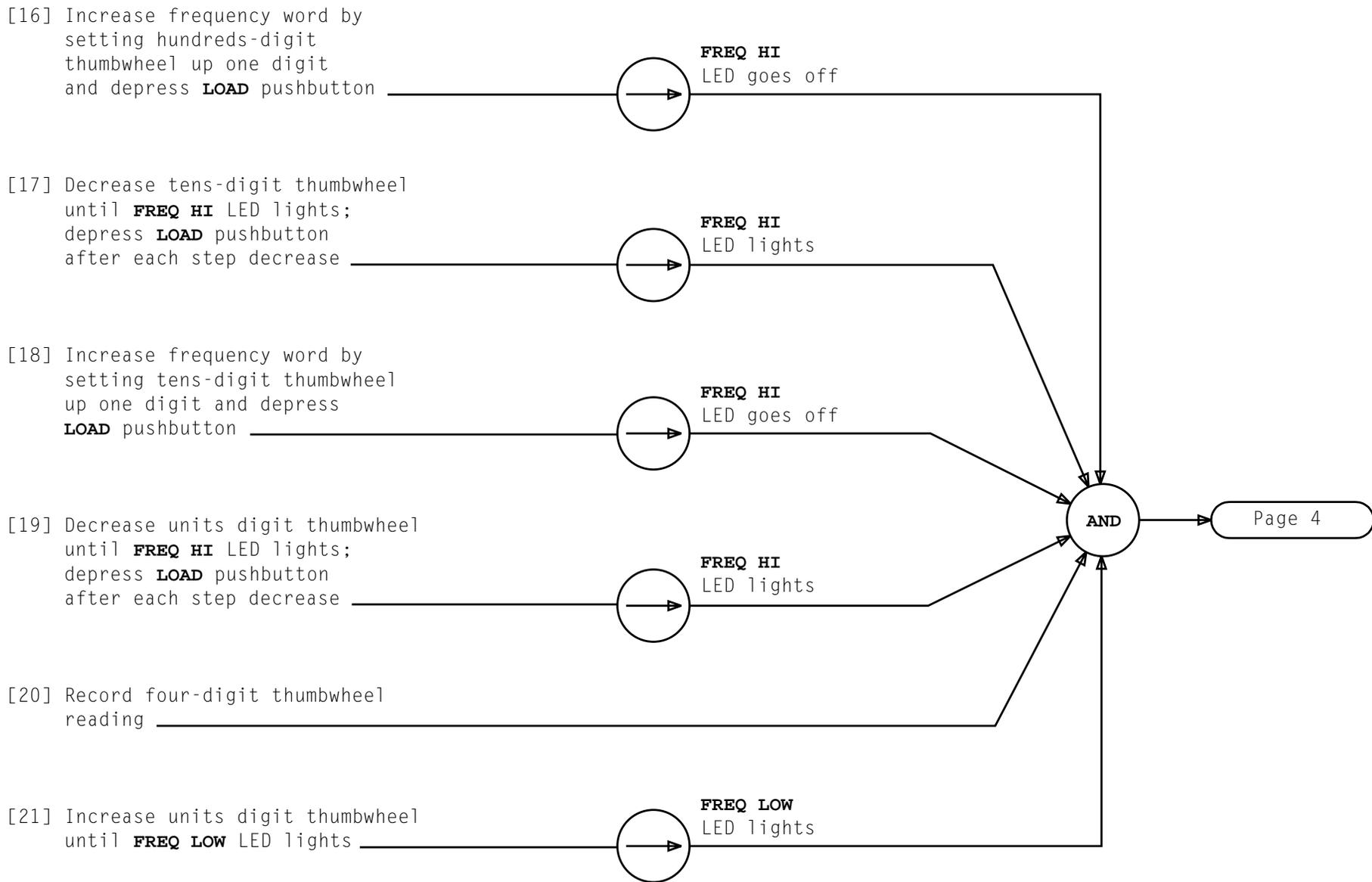
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**PAGE 1 of 5** | **512**



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

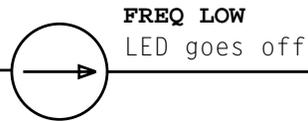
Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 5	512



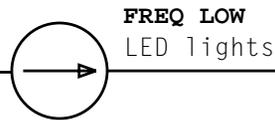
**ADJUST 39B OSCILLATOR FREQUENCY USING OSCILLATOR MANUAL  
ADJUSTMENT UNIT (OMAU)**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 3 of 5	<b>512</b>

[22] Decrease frequency word by setting tens-digit thumbwheel back one digit; depress **LOAD** pushbutton after each step decrease

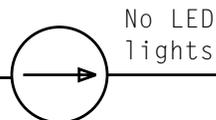


[23] Increase frequency word by increasing units digit thumbwheel until **FREQ LOW** LED lights; depress **LOAD** pushbutton after each step increase

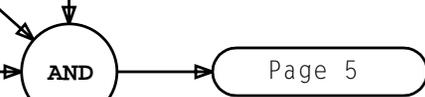


[24] Subtract present frequency word from frequency word recorded in Step 20, Page 3, and record

[25] Load new frequency word into 39B oscillator with frequency word recorded in Step 24 plus one-half difference of value recorded in Step 24. Round off to next lower digit. Depress **LOAD** pushbutton

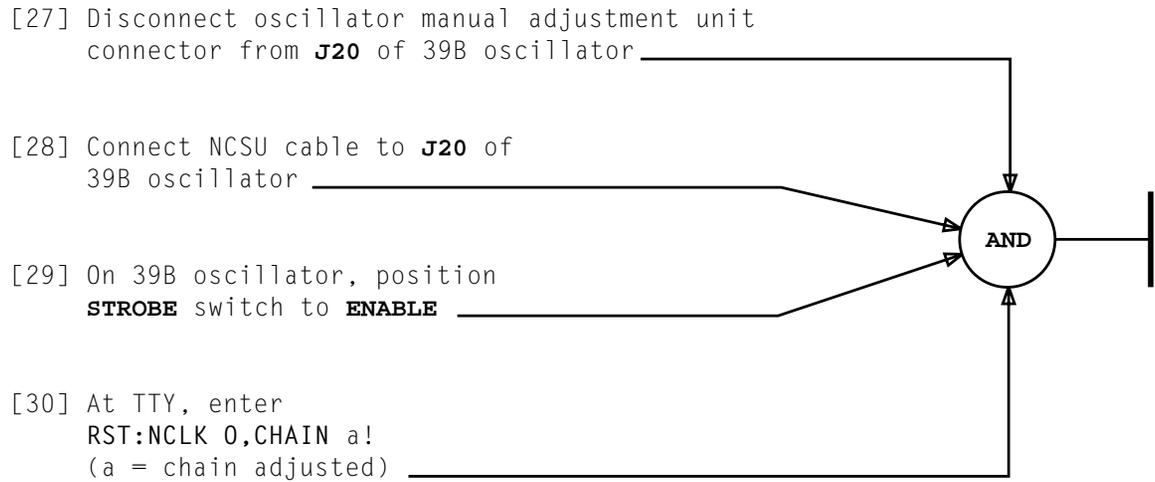


[26] On 39B oscillator, position **STROBE** switch to **DISABLE**



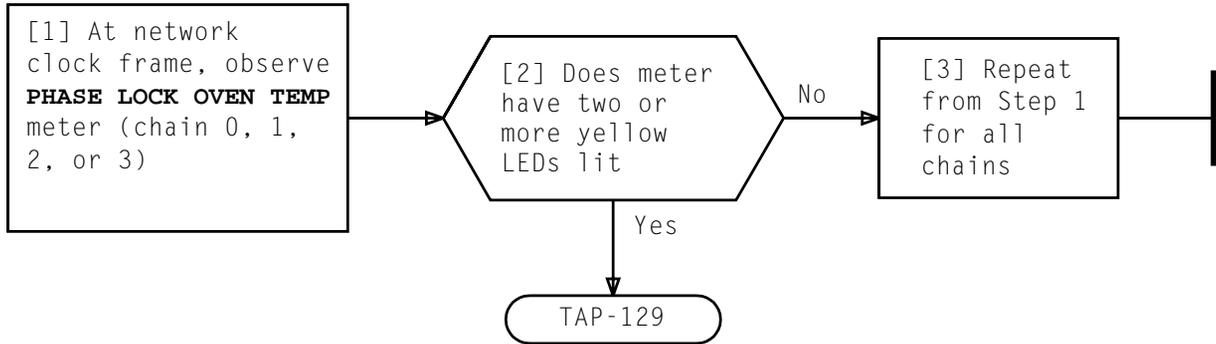
## ADJUST 39B OSCILLATOR FREQUENCY USING OSCILLATOR MANUAL ADJUSTMENT UNIT (OMAU)

Issue 2	SEP 1998
234-351-013	DLP
PAGE 4 of 5	512



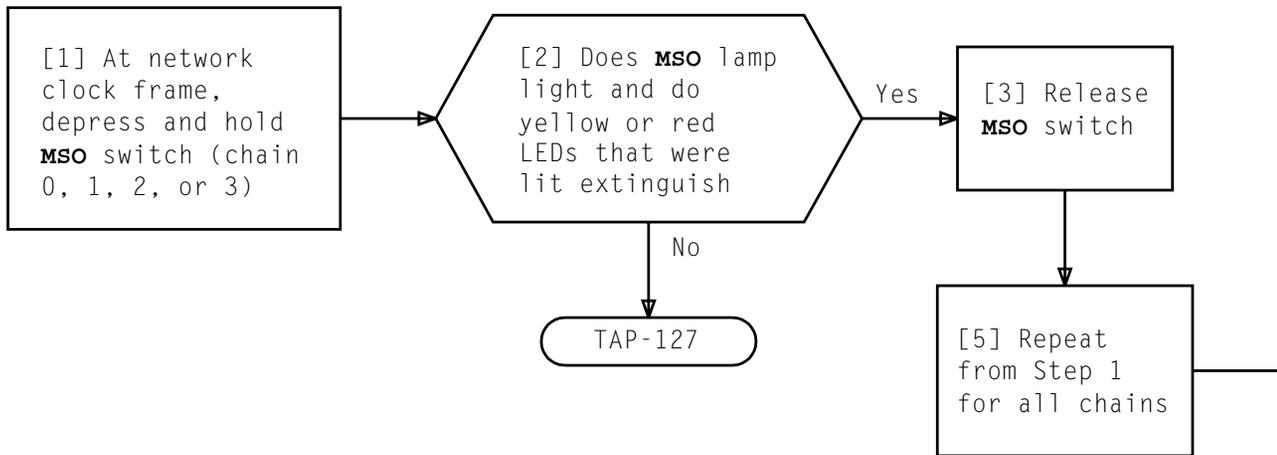
**ADJUST 39B OSCILLATOR FREQUENCY USING OSCILLATOR MANUAL  
ADJUSTMENT UNIT (OMAU)**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 5 of 5	<b>512</b>



**CHECK PHASE LOCK OVEN TEMP METER**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 1	<b>513</b>



- [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

Leads tagged and removed

Page 2

TABLE A	
COMMON NAME	PART NUMBER
Screw-starter	Kedman Co., No. 1253 or equivalent
Grounded tip soldering iron	-
<b>MSO</b> pushbutton indicator or <b>PLS</b> pushbutton indicator or <b>OSC OS</b> lamp	ED4A057-10,G5 ED4A057-10,G4 ED4A057-10,G6

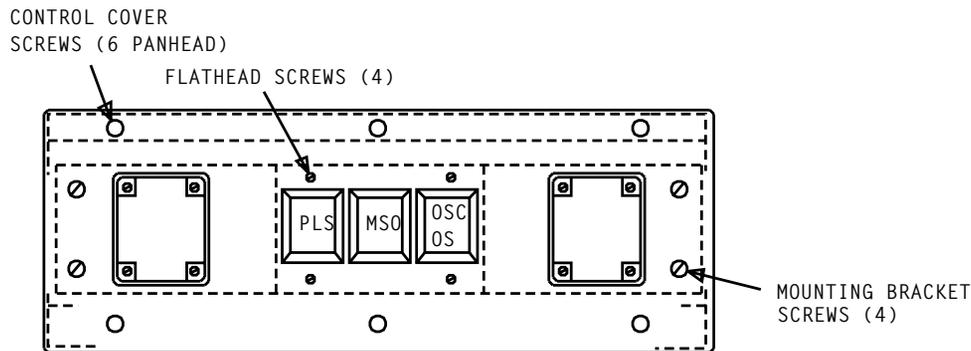


Figure 1 - Network Clock Control

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 - ED4A057-10,G1 RECTANGULAR SHAPED**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 2	515

[8] Push four (two top and bottom) locking tabs toward body of defective switch/lamp assembly socket mount and push defective switch/lamp assembly out front of mounting bracket

[9] See Figure 2. Install new switch/lamp assembly in mounting bracket using front (tabbed) and rear (flat) mounting adapters

[10] Cut and strip leads to be connected by soldering

[11] See Figures 2 and 3. Solder leads to new switch/lamp assembly and remove tags

[12] With mounting bracket held in place at front of frame, install four mounting screws at rear of frame

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

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

AND

[15] Depress ON pushbutton to restore power to clock chain

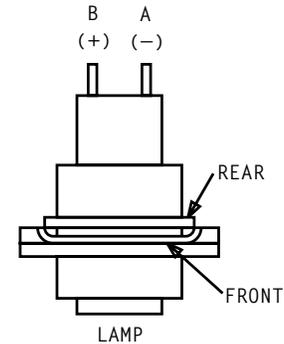


Figure 2 - Example of Mounting Adapters

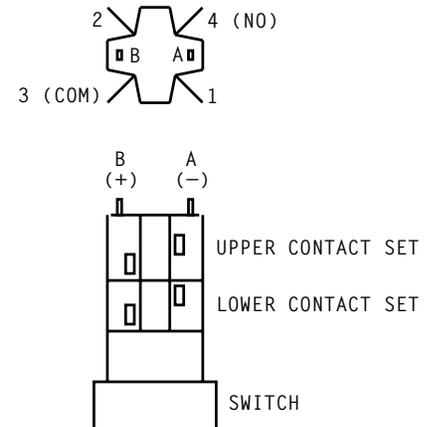


Figure 3 - Example of Switch Leads

REPLACE METER SOLENOID OPERATE SWITCH, PHASE LOCK SHUNT SWITCH, OR OSC OS LAMP ASSEMBLY - ED4A057-10,G1 RECTANGULAR SHAPED

Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 2	515

- [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

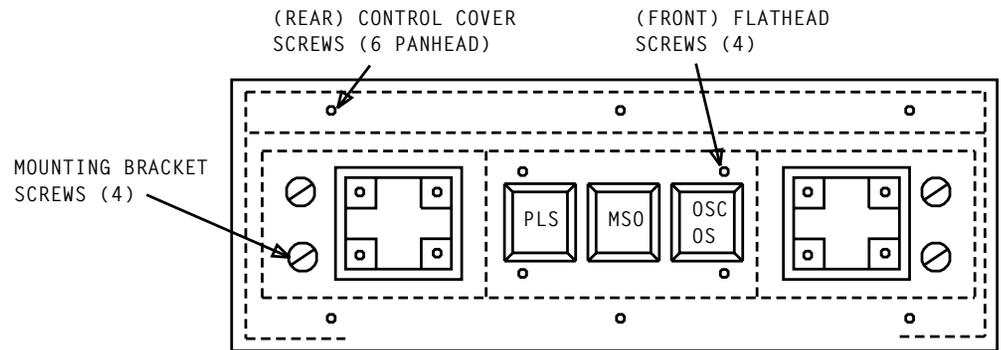


Figure 1 - Network Clock Control

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

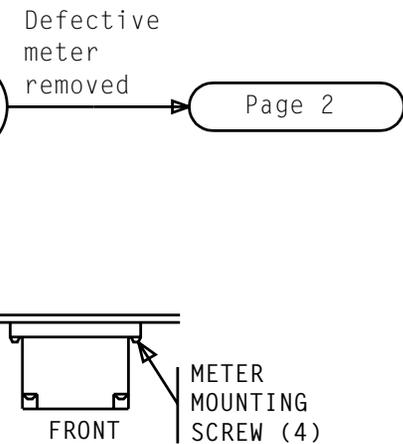


Figure 2 - Mounted Meter - Top View

TABLE A	
COMMON NAME	PART NUMBER
Screw-starter	Kedman Co., No. 1253 or equivalent
Grounded tip soldering iron	-
Meter, 50-0-50UA DC 24V	ED4A057-10,G3

**REPLACE PHASE METER OR PHASE LOCK OVEN TEMP METER  
ED4A057-10,G1 MAGNETIC LOCKING METER**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 2	<b>516</b>

[10] Holding new meter in place, install and tighten four meter mounting screws [Figure 3]

[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

[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

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

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

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

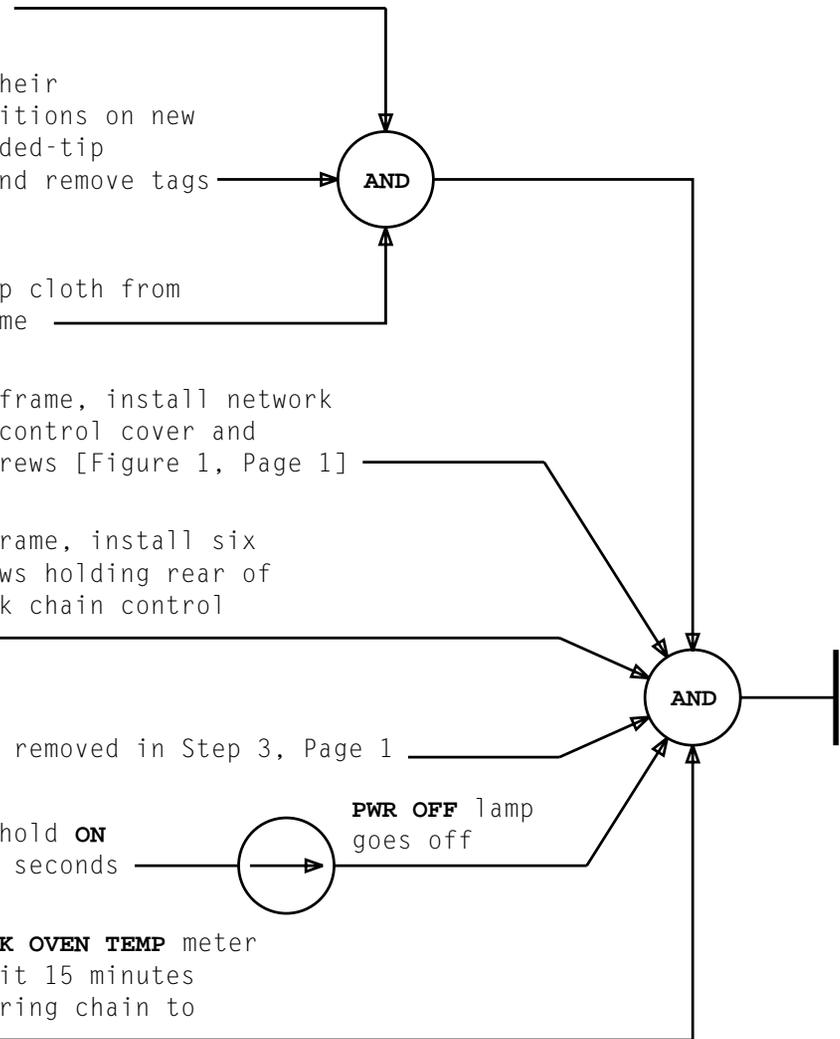


TABLE B			
CLOCK CHAIN	METER	FUSE	LOCATION
0	PHASE	BC	009-32
	OVEN	B9	007-45
1	PHASE	BD	009-39
	OVEN	A10	007-32
2	PHASE	BC	109-32
	OVEN	B9	107-45
3	PHASE	BD	109-39
	OVEN	A10	107-32

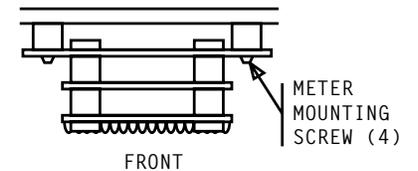
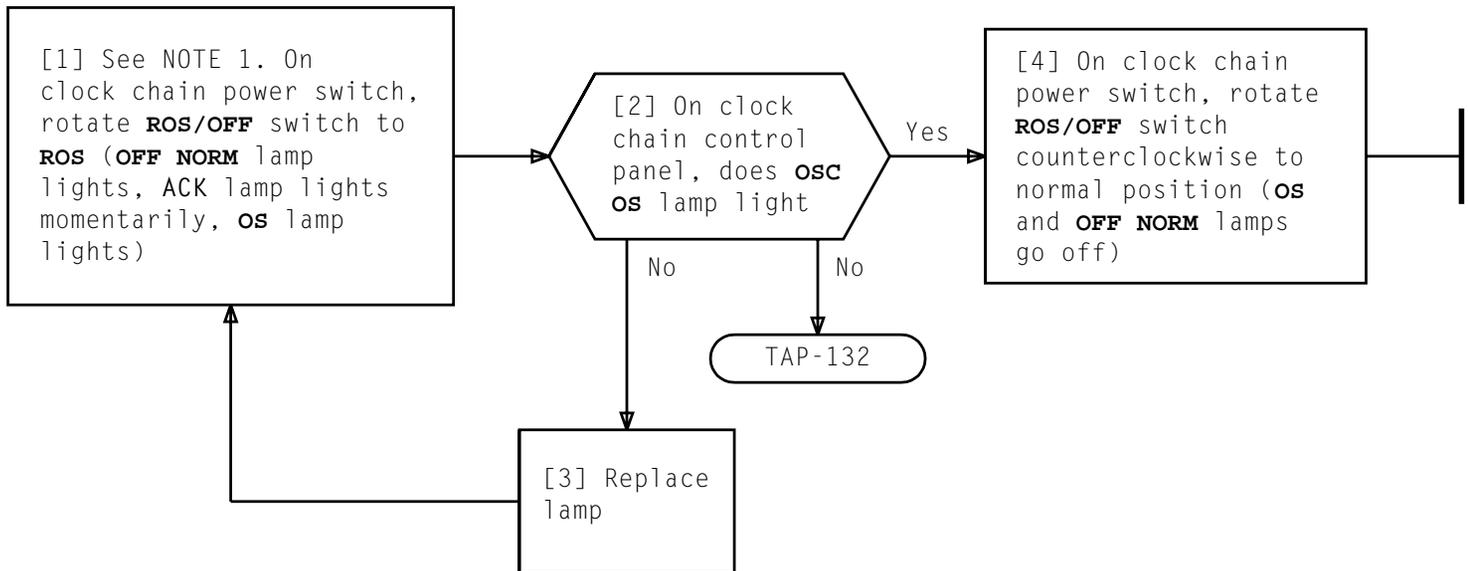


Figure 3 - Mounted Meter - Top View

**REPLACE PHASE METER OR PHASE LOCK OVEN TEMP METER  
ED4A057-10,G1 MAGNETIC LOCKING METER**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 2	<b>516</b>



NOTE 1	
Test is valid only if oscillator is in service	
Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 1	517



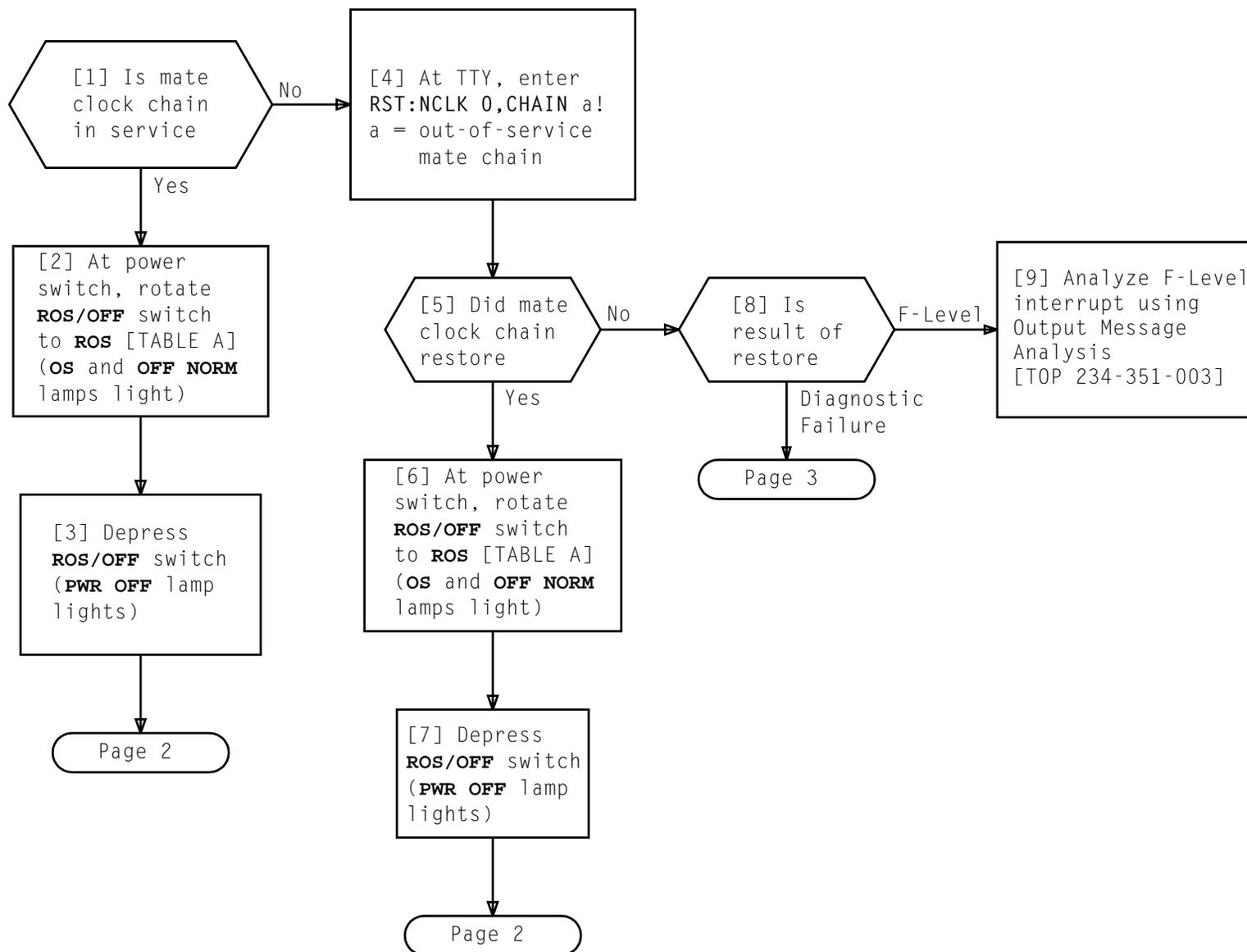


TABLE A	
CLOCK CHAIN	POWER SWITCH FRAME LOCATION
0	066-03
1	066-68
2	166-03
3	166-68

- [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

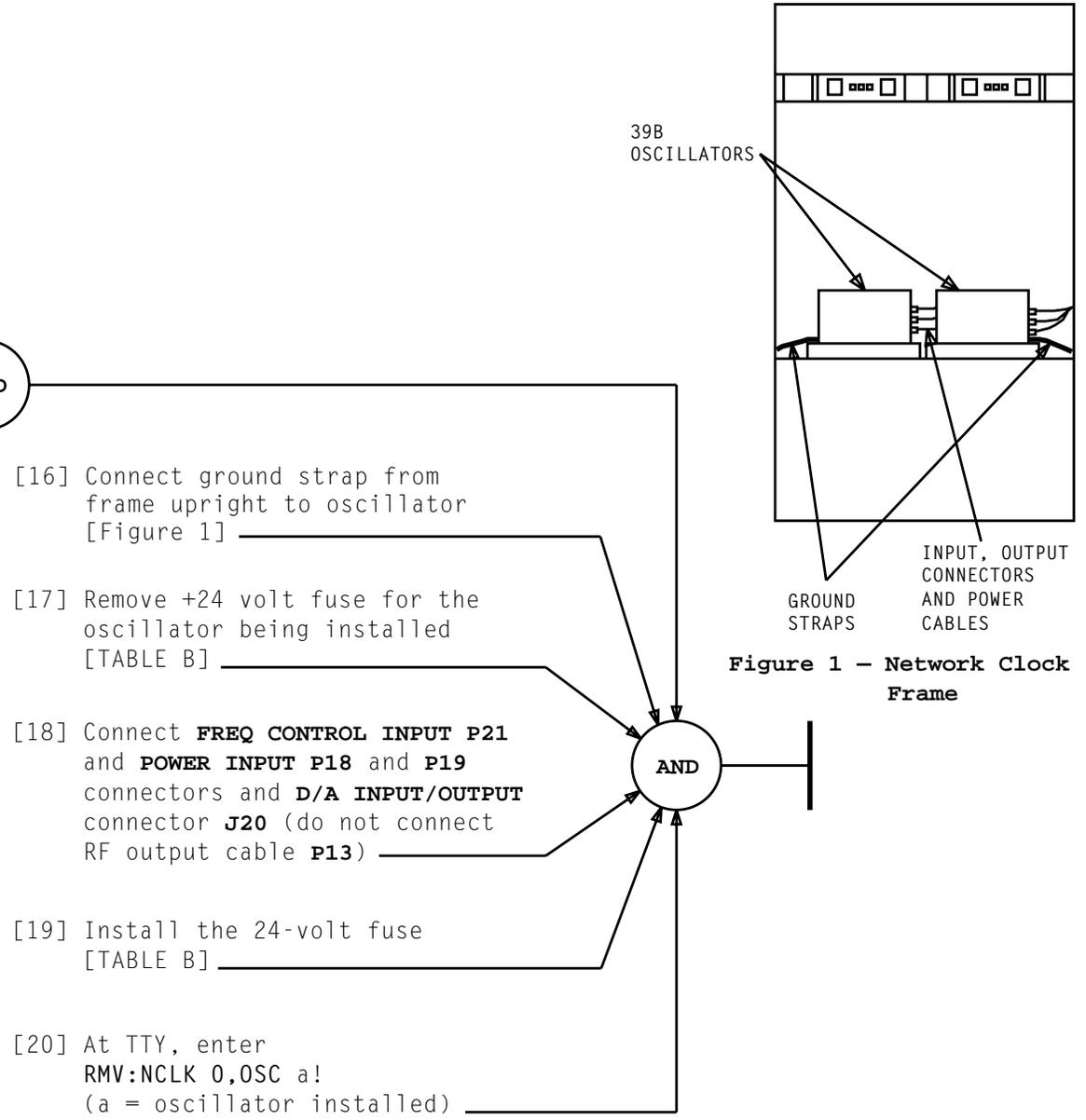
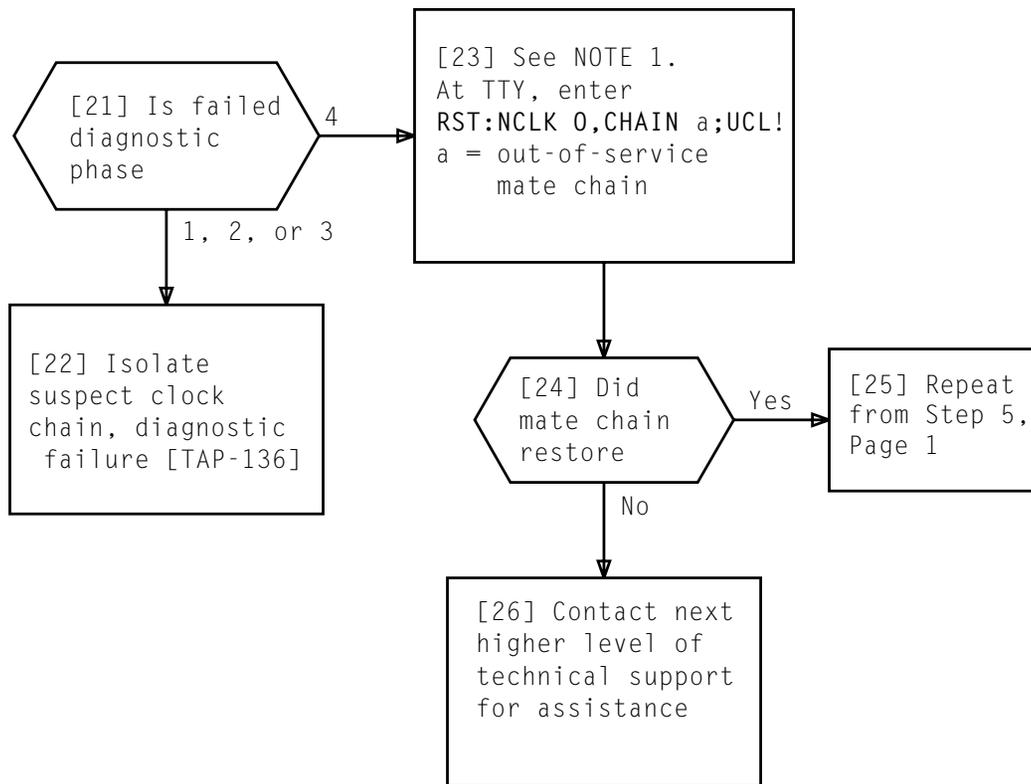


Figure 1 - Network Clock Frame

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

- [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)

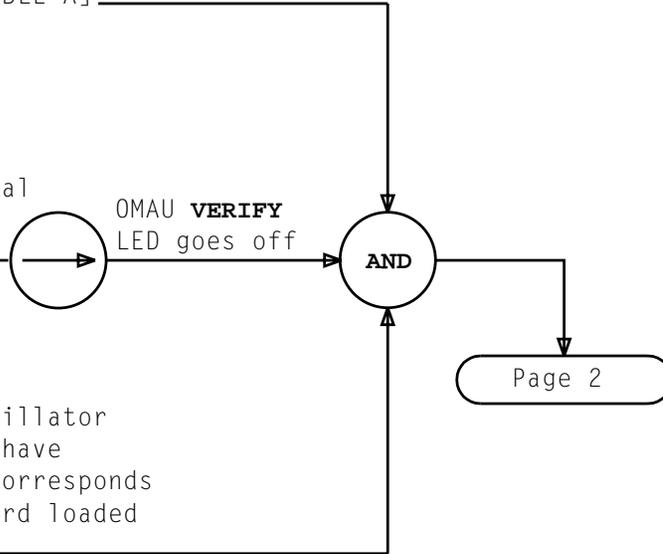
**INSTALL 39B OSCILLATOR**



NOTE 1	
Ensure clock chain is powered up before restoring unconditionally	
Issue 2	SEP 1998
234-351-013	DLP
PAGE 3 of 3	519

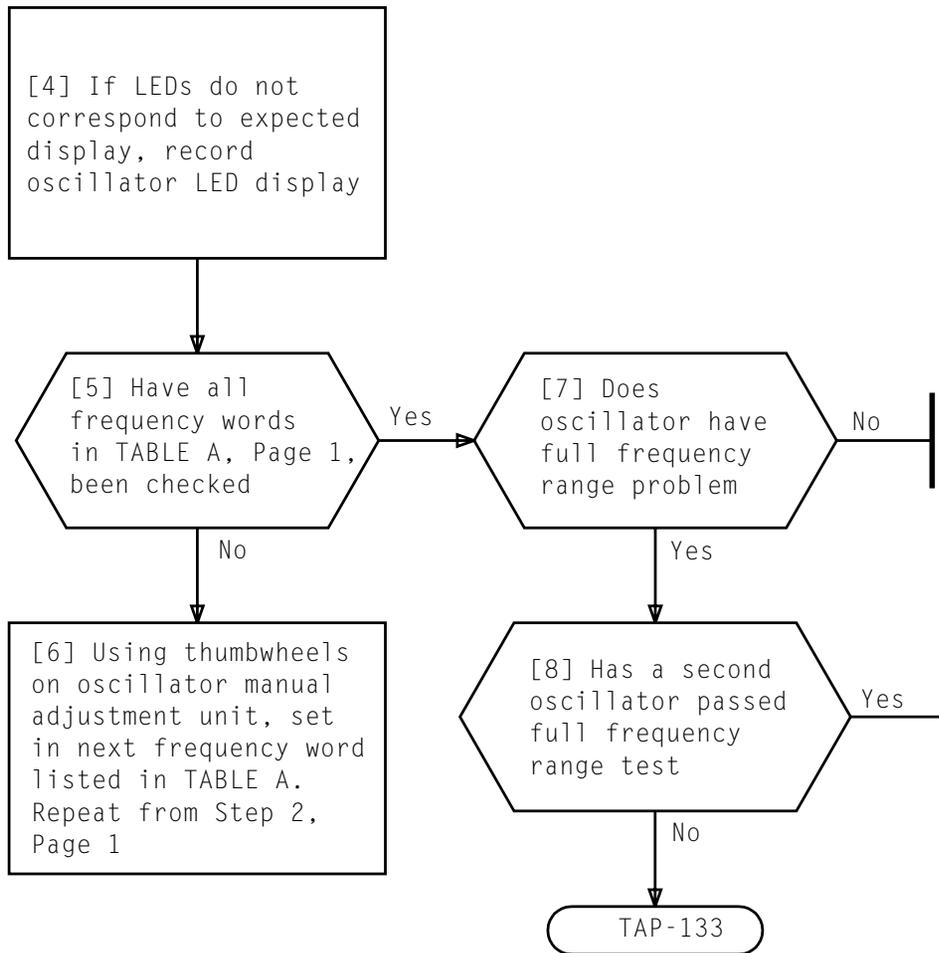
[1] Using thumbwheels on oscillator manual adjustment unit, set in first frequency word listed [TABLE A]

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



[3] Verify that oscillator LEDs [TABLE A] have display which corresponds to frequency word loaded in Step 2

TABLE A																	
OMA U FREQUENCY WORD THUMBWHEEL POS.				CORRESPONDING OSCILLATOR LED DISPLAY (1 → 14)													
				OSCILLATOR LE DS													
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**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 2	520

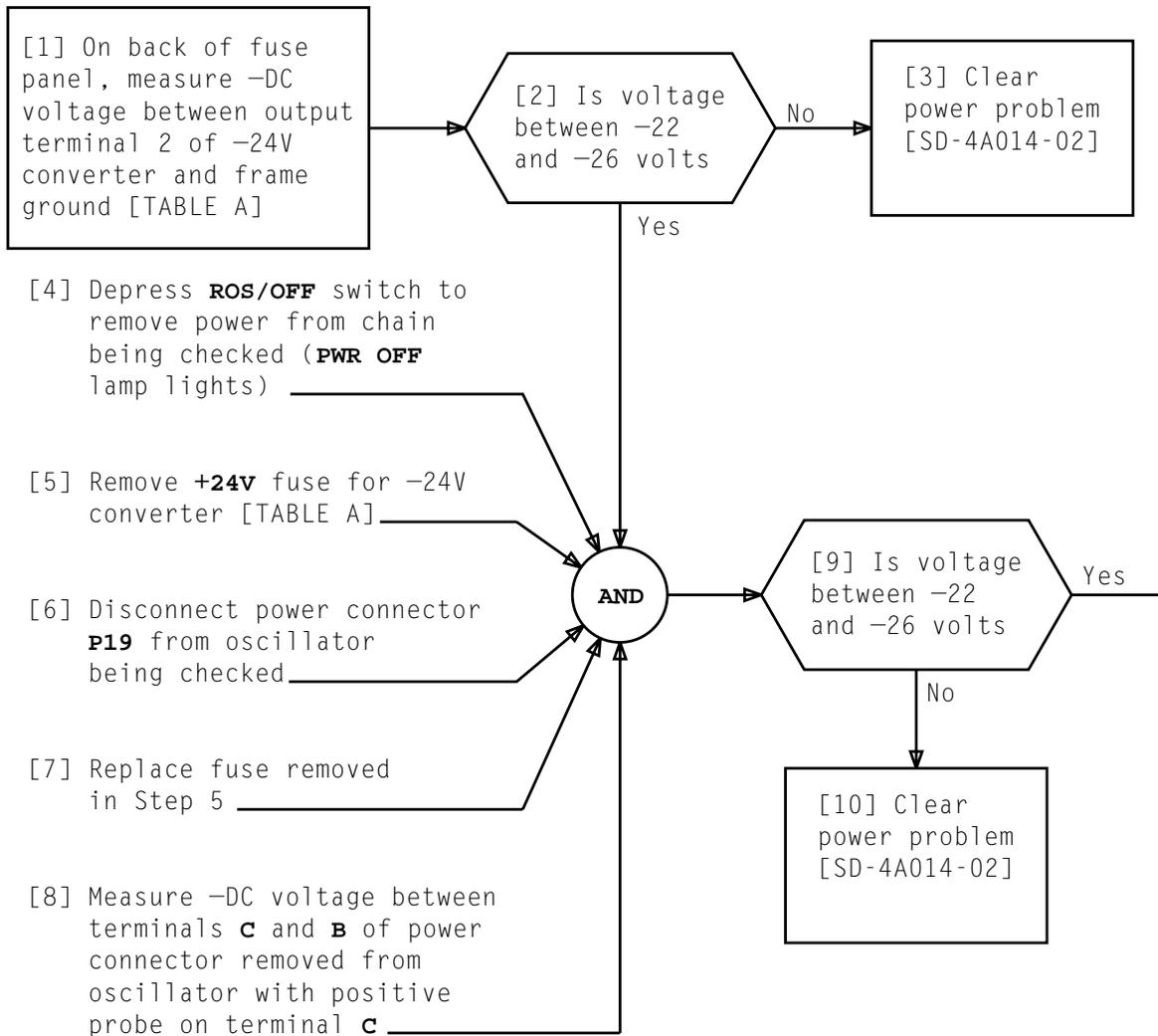
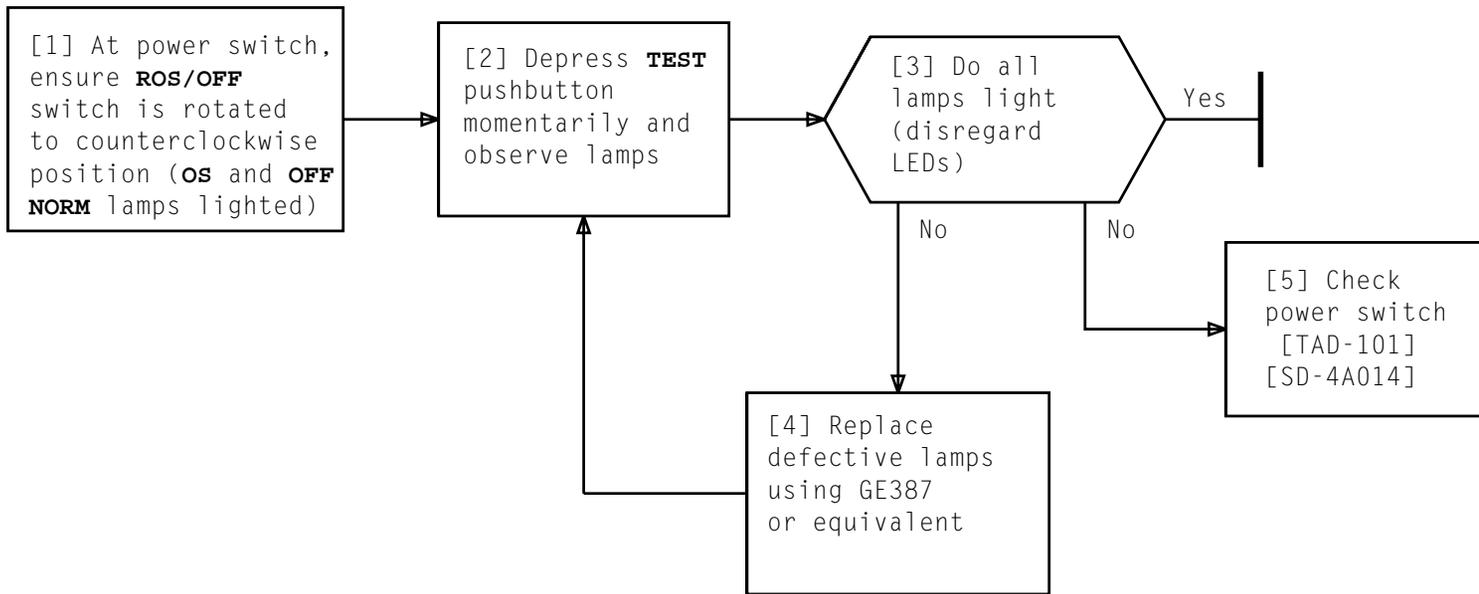
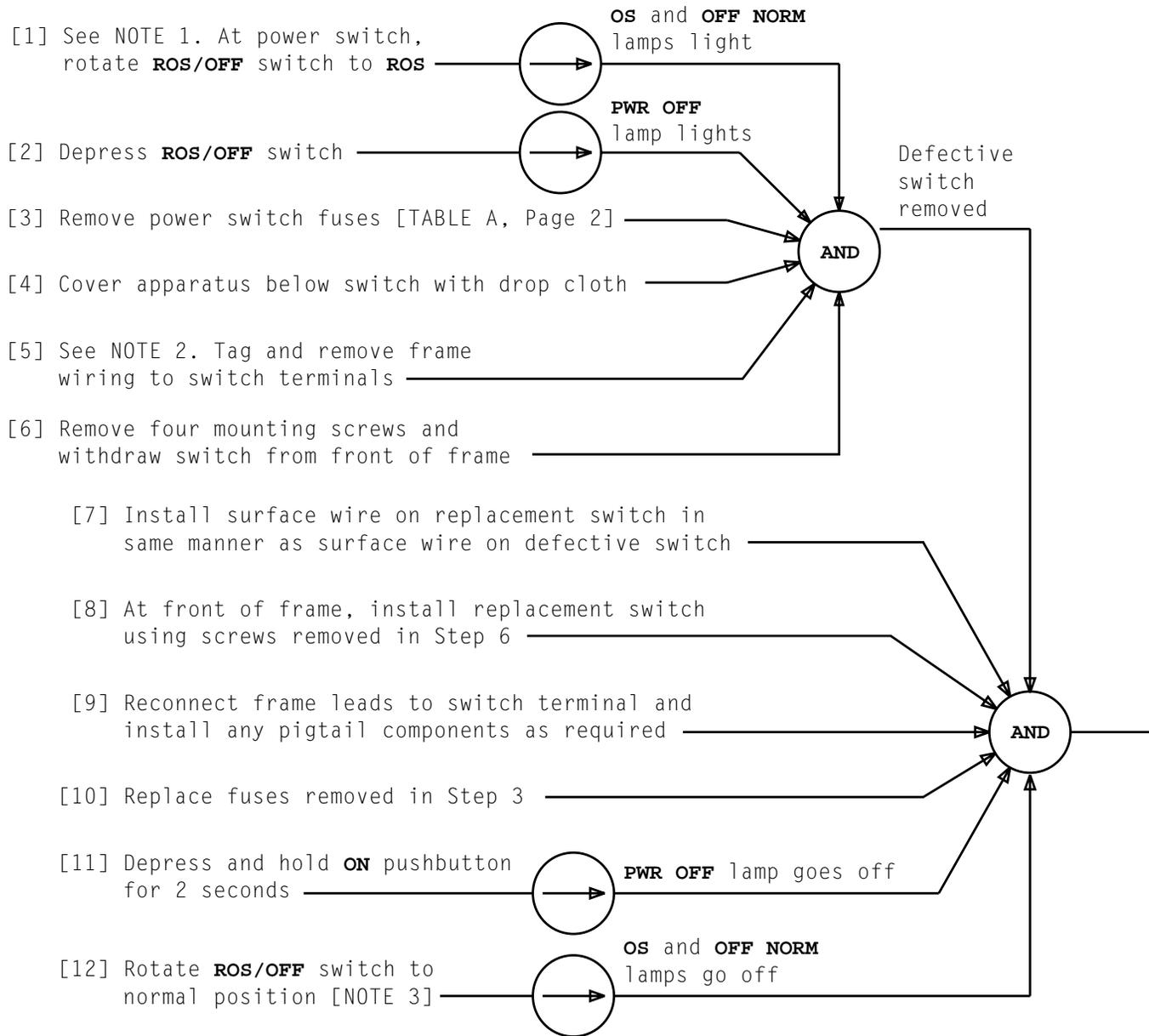


TABLE A			
CLOCK CHAIN	-24V CONVERTER LOCATION	+24V FUSE	
		DESIGNATION	LOCATION
0	012-22	OBOA	007-20
1	012-50	OBOB	007-51
2	112-22	1B0A	107-20
3	112-50	1B0B	107-51



**TEST LAMPS ON POWER SWITCH**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 1	<b>522</b>



NOTES	
1.	If switch to be replaced is for NCSU, operate <b>ENABLE/DISABLE</b> switch on each 39B oscillator to <b>DISABLE</b>
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 <b>ENABLE/DISABLE</b> switch on each 39B oscillator to <b>ENABLE</b>
Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 2	523

## REPLACE POWER SWITCH

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

**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

DATA:SCLK CRITICAL REGISTERS

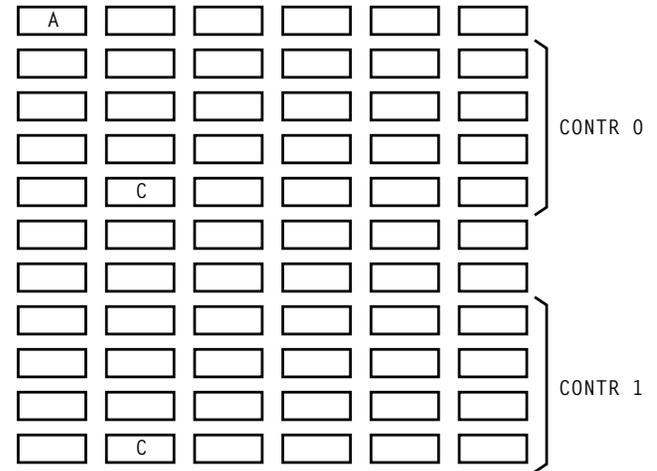


Figure 1 - SCLK Critical Registers

TABLE A				
BIT			OSC	NCSU CONNECTORS
2	1	0		
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

[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**

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

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

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

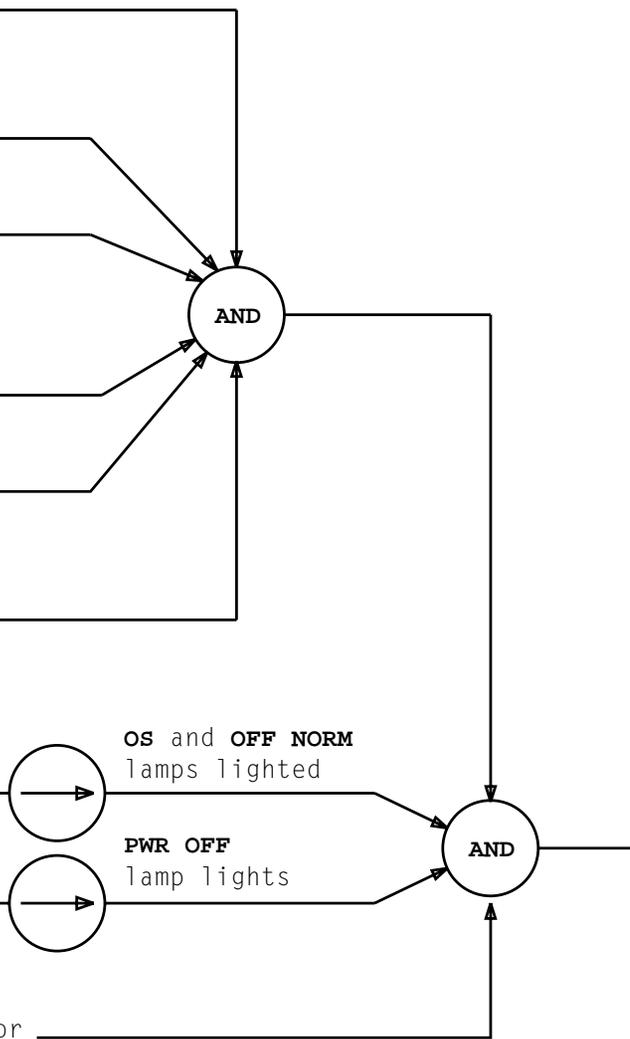


TABLE A	
CLOCK CHAIN	POWER SWITCH FRAME LOCATION
0	066-03
1	066-68
2	166-03
3	166-68

NOTES	
1. Ensure clock chain is powered up before restoring unconditionally	
2. Warmup of 24 hours is required prior to connection of oscillator	
Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 1	525

## STABILIZE 39B 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

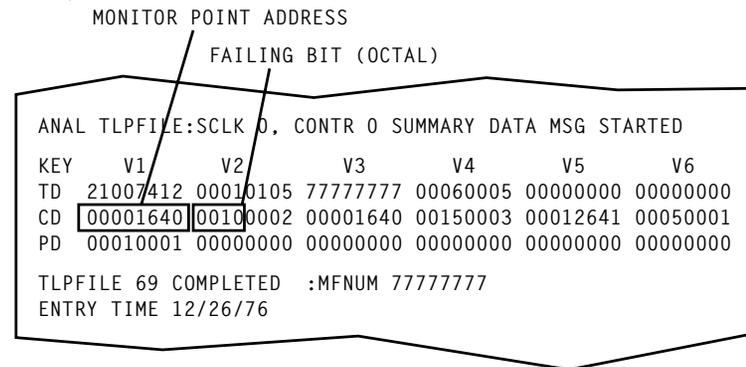


Figure 1 - Example of Summary Data Printout

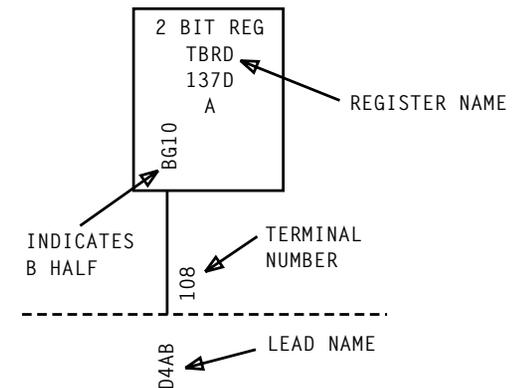


Figure 2 - Example of Lead Leaving B Half of a CPS Register

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

Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 1	526

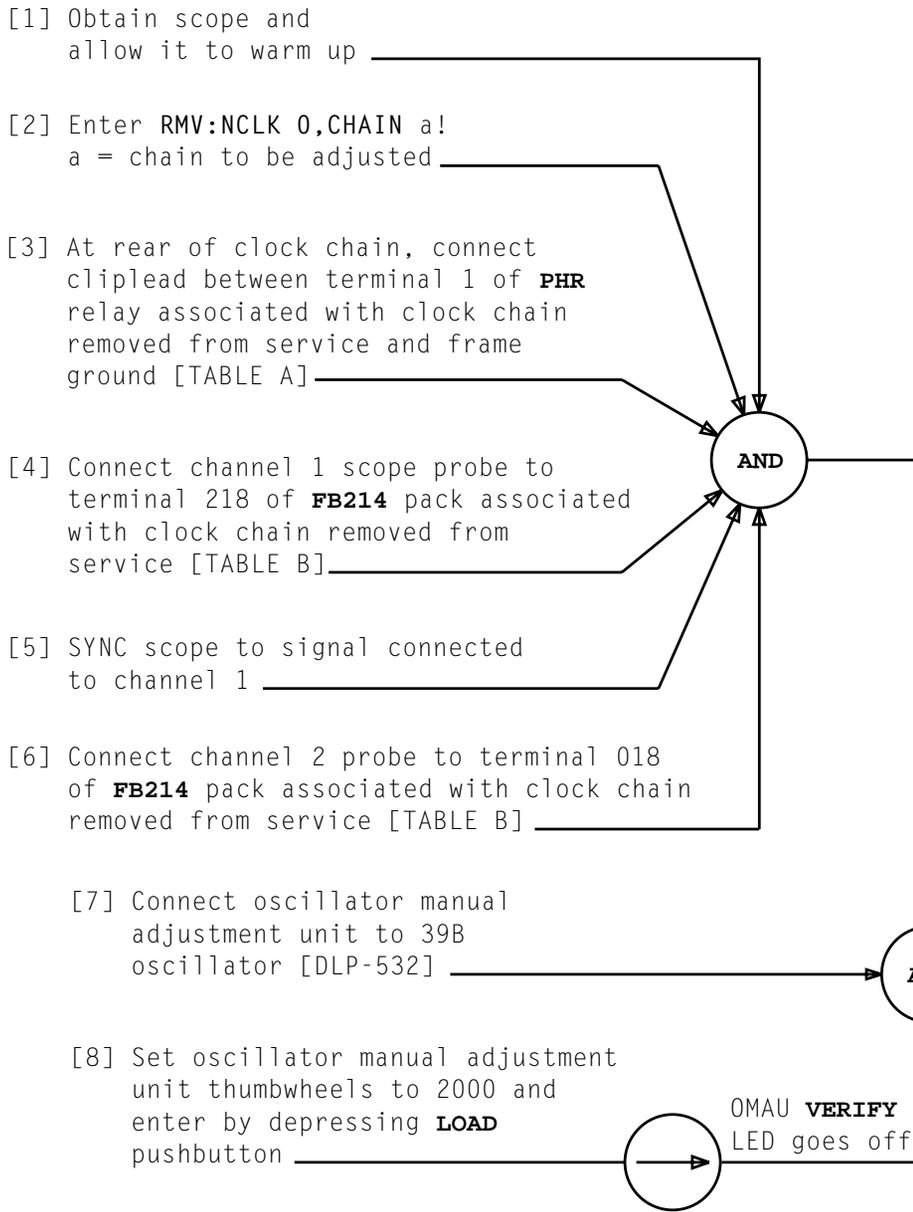


TABLE A		
CLOCK CHAIN	PHR RELAY	LOCATION
0	0PHR	066-24
1	1PHR	066-47
2	0PHR	166-24
3	1PHR	166-47

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**

[11] Record LED display (on or off condition) on front of oscillator

[12] Record thumbwheel reading at oscillator manual adjustment unit

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

AND

[14] Is oscillator LED display same as noted in Step 11

Yes

Page 3

No

[15] Reconnect oscillator manual adjustment unit [DLP-532]

No

[17] Contact next higher level of technical support for assistance

[16] Set thumbwheels to reading recorded in Step 12, enter into oscillator by depressing **LOAD** pushbutton and repeat from Step 13

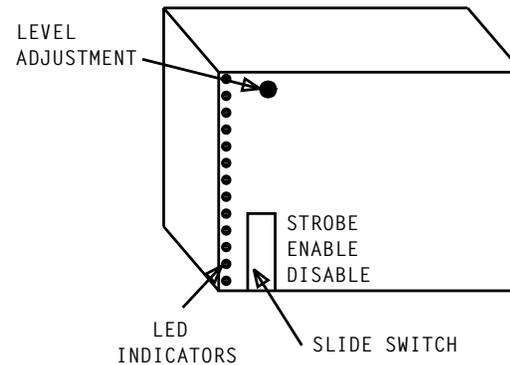
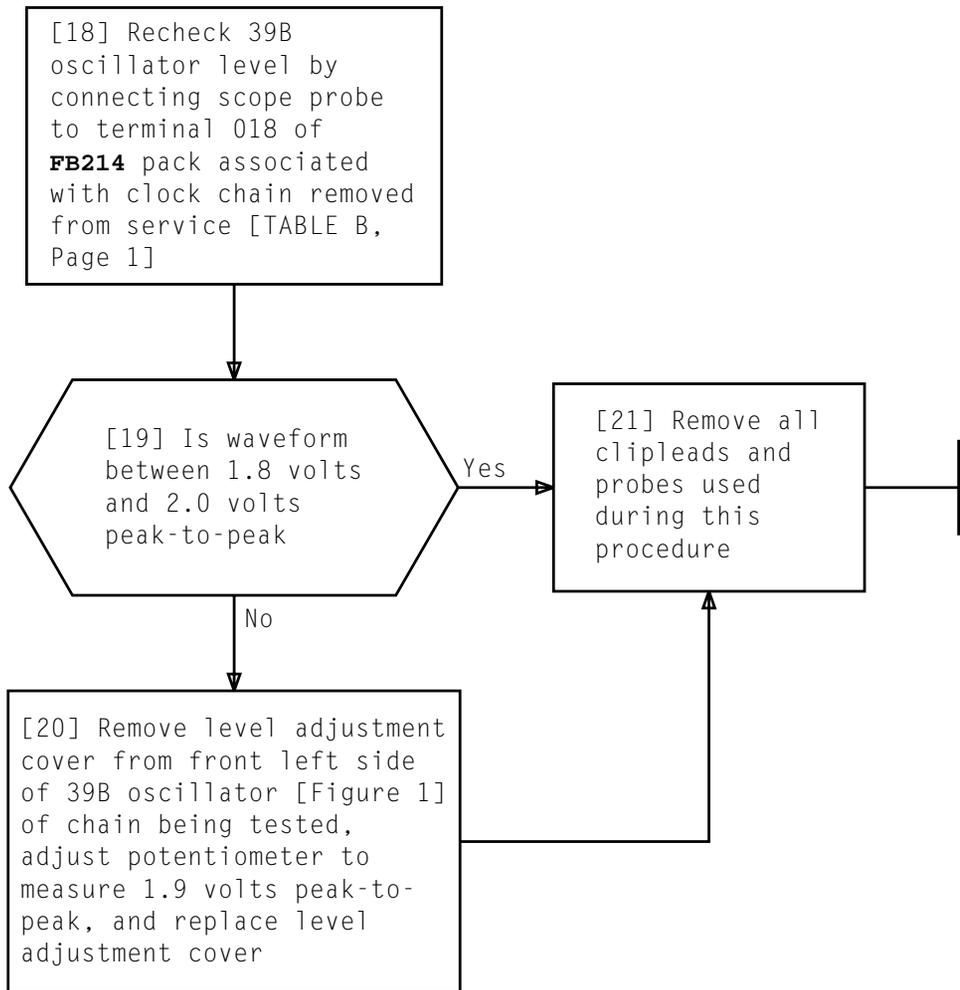


Figure 1 - 39B Oscillator

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

[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

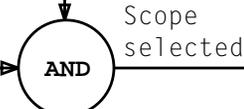
[4] If scope has bandwidth switch, make sure switch is set to full bandwidth

[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



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

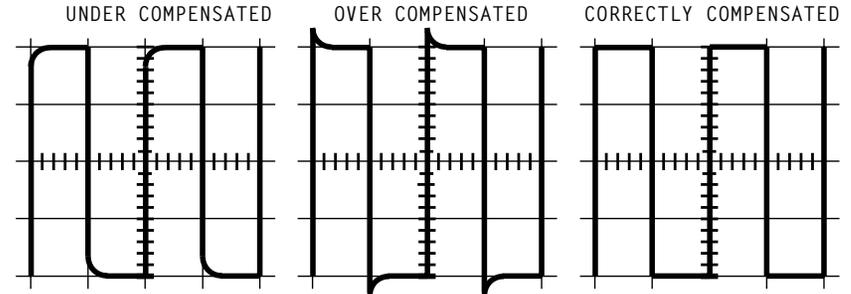


FIG. 1

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

Scope probe compensated



Page 2

**CAUTION 1**  
Improper scope calibration can affect service

Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 4	529

**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])

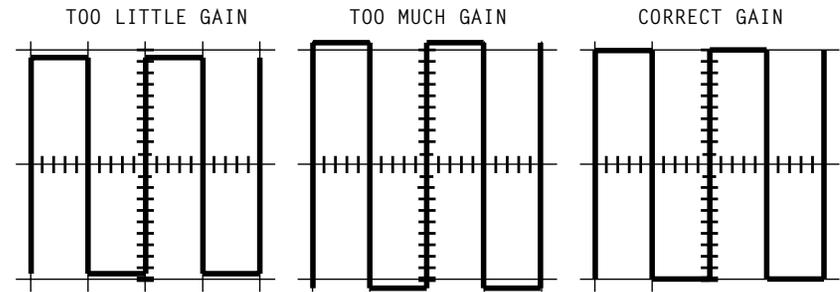


FIG. 2

[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

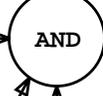
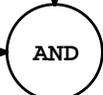
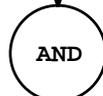
Calibrate source selected

[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

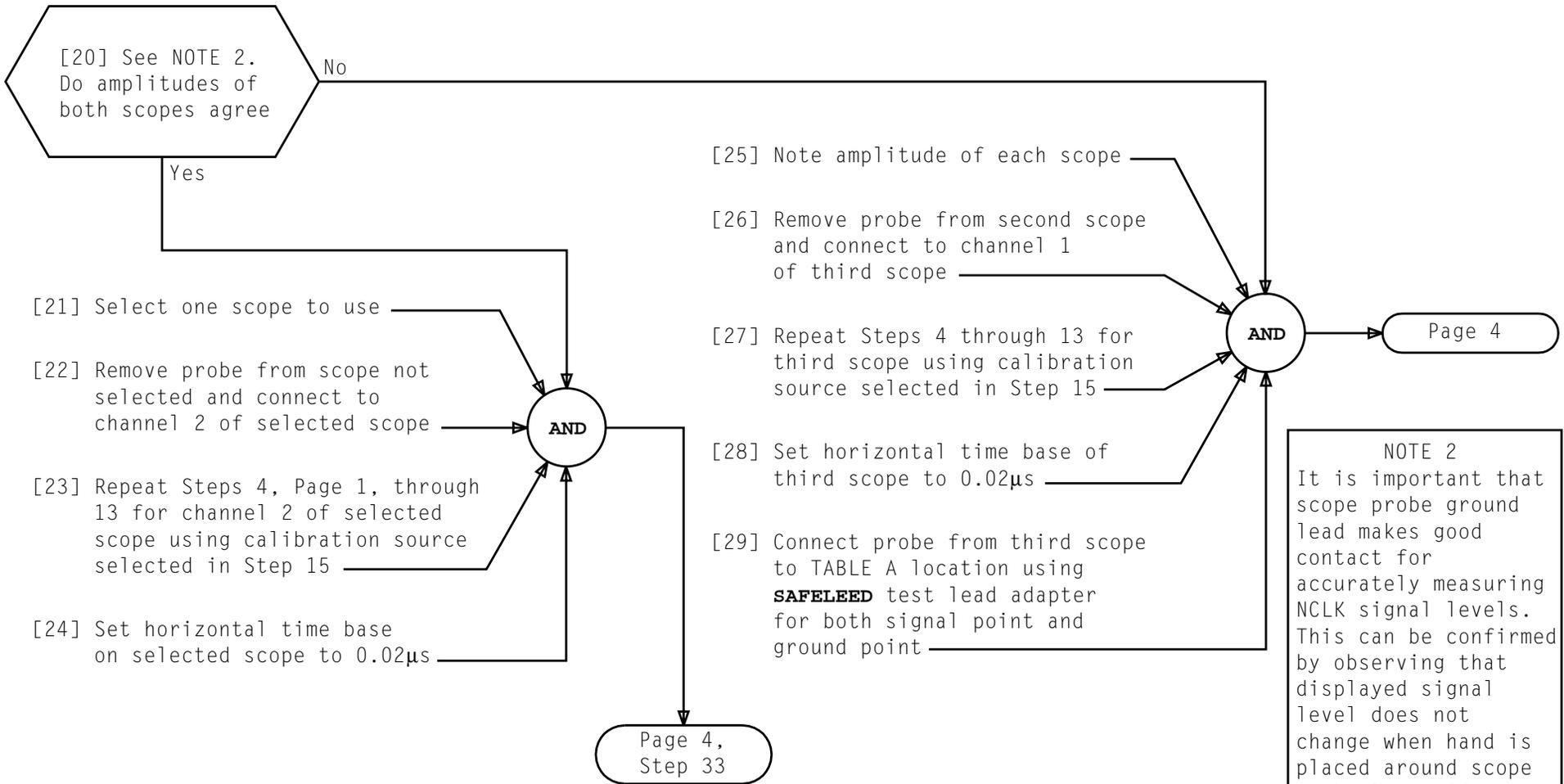
[18] When ready to use scope, connect both channel 1 probes to clock chain [TABLE A, Page 3] location using **SAFELEED** test lead adapter for both signal point and ground point

[19] Set horizontal time base to 0.02  $\mu$ s for both scopes



Page 3

EXAMPLE 1	
SCOPE	CAL SOURCE AMPLITUDE
1	1.0 volts
2	1.2 volts
3	1.3 volts
Scope 2 calibrate source selected	
Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 4	529



**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

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

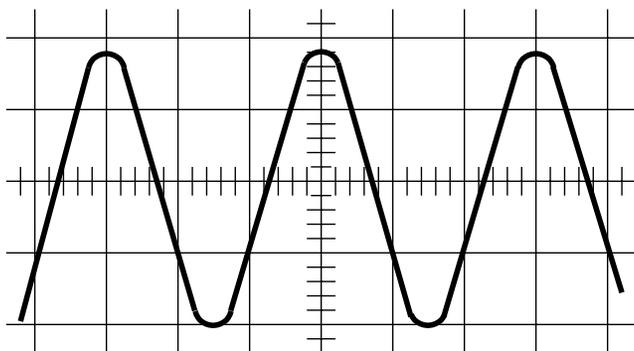
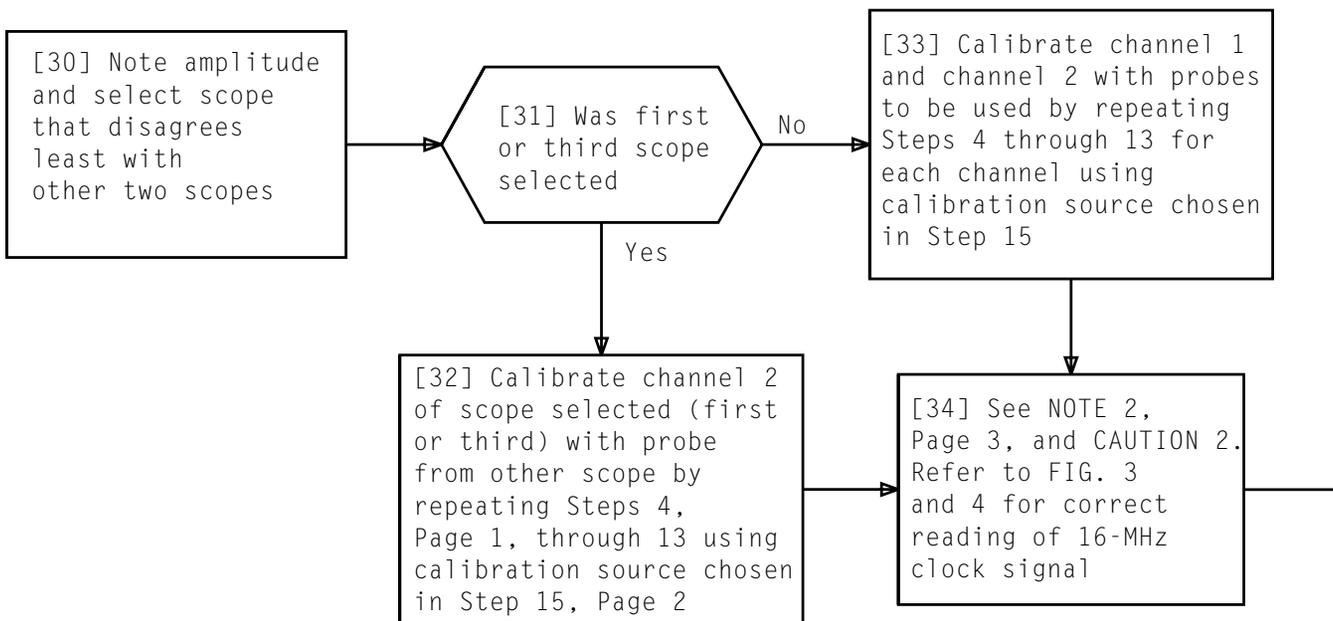


FIG. 3 - Correct 1.9V Peak-to-Peak Reading With No High Frequency Noise  
Vert = 0.5V/DIV, Hor = 0.02µs/DIV

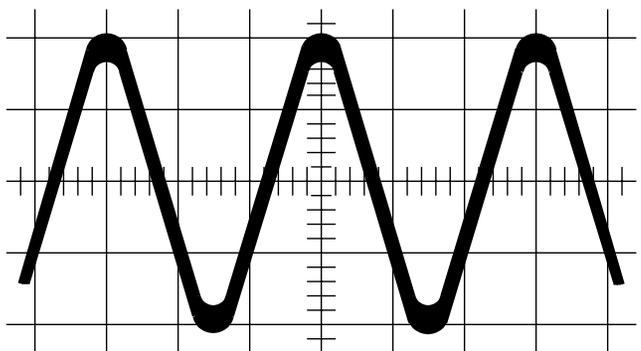


FIG. 4 - Correct 1.9V Peak-to-Peak Reading With High Frequency Noise  
Vert = 0.5V/DIV, Hor = 0.02µs/DIV

1.9V PEAK-TO-PEAK  
MEASURED TO  
CENTER OF FAT  
PORTION OF  
SIGNAL AT PEAK

**CAUTION 2**  
High frequency measurement verifies that oscilloscope is calibrated and set to full bandwidth. 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

Issue 2	SEP 1998
234-351-013	DLP
PAGE 4 of 4	529

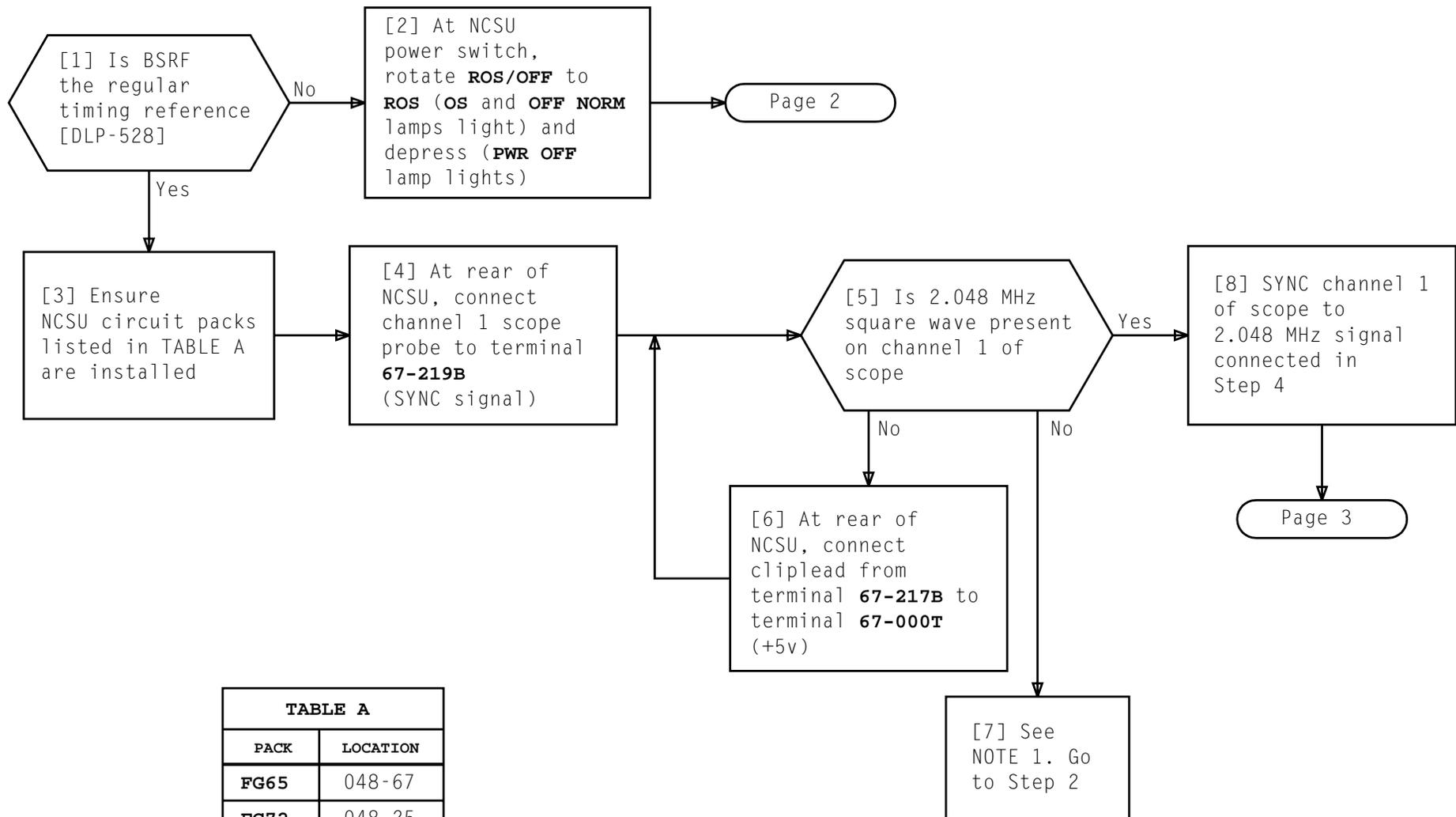


TABLE A	
PACK	LOCATION
FG65	048-67
FG72	048-25
FG76	048-27

NOTE 1	
BSRF is not operative. Alternate DS1A must be used	
Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 5	530

[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 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)

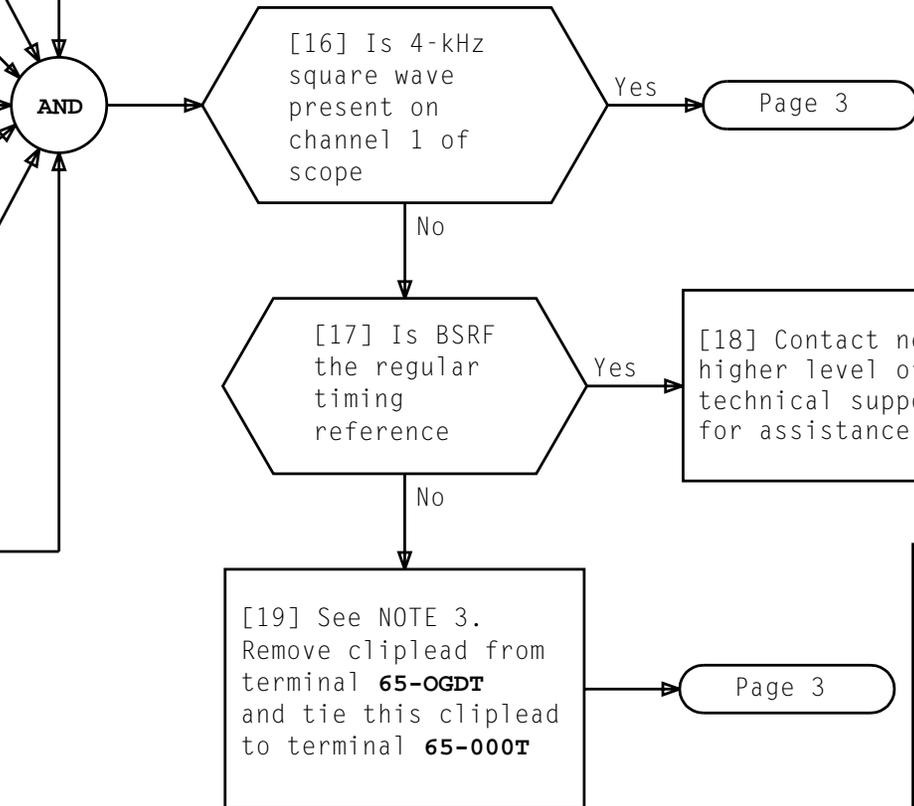
[13] Using cliplead, tie terminal 65-108T to terminal **OGDT**

[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

TABLE B	
PACK	LOCATION
<b>FG64</b>	050-65
<b>FG65</b>	050-67
<b>FG72</b>	050-25
<b>FG76</b>	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

Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 5	530

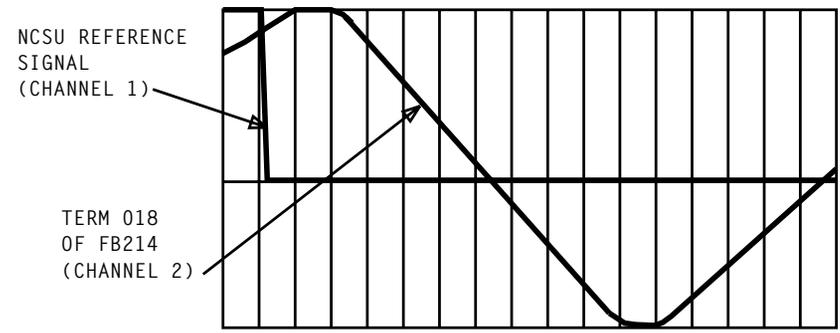
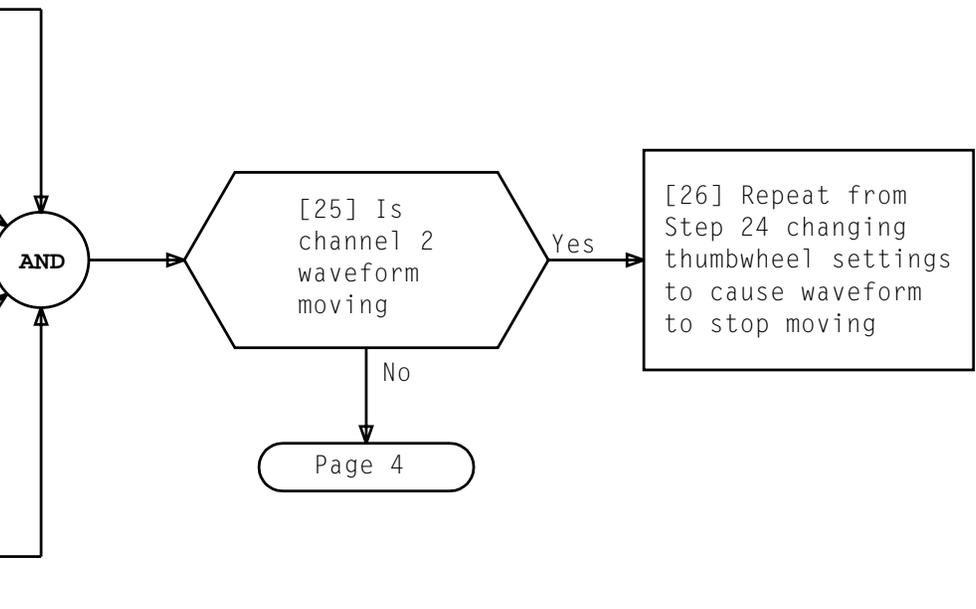
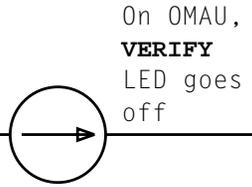
[20] Connect channel 2 scope probe to terminal 018 of **FB214** pack [TABLE D]

[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



Figures 1

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

Issue 2	SEP 1998
234-351-013	DLP
PAGE 3 of 5	530

[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]

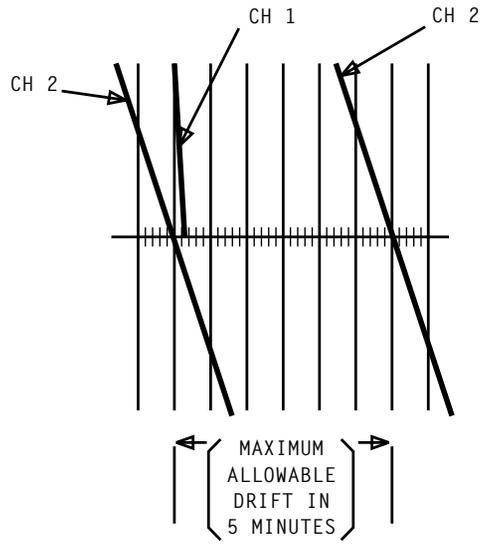
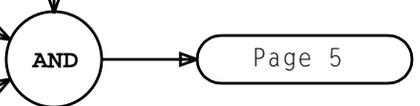
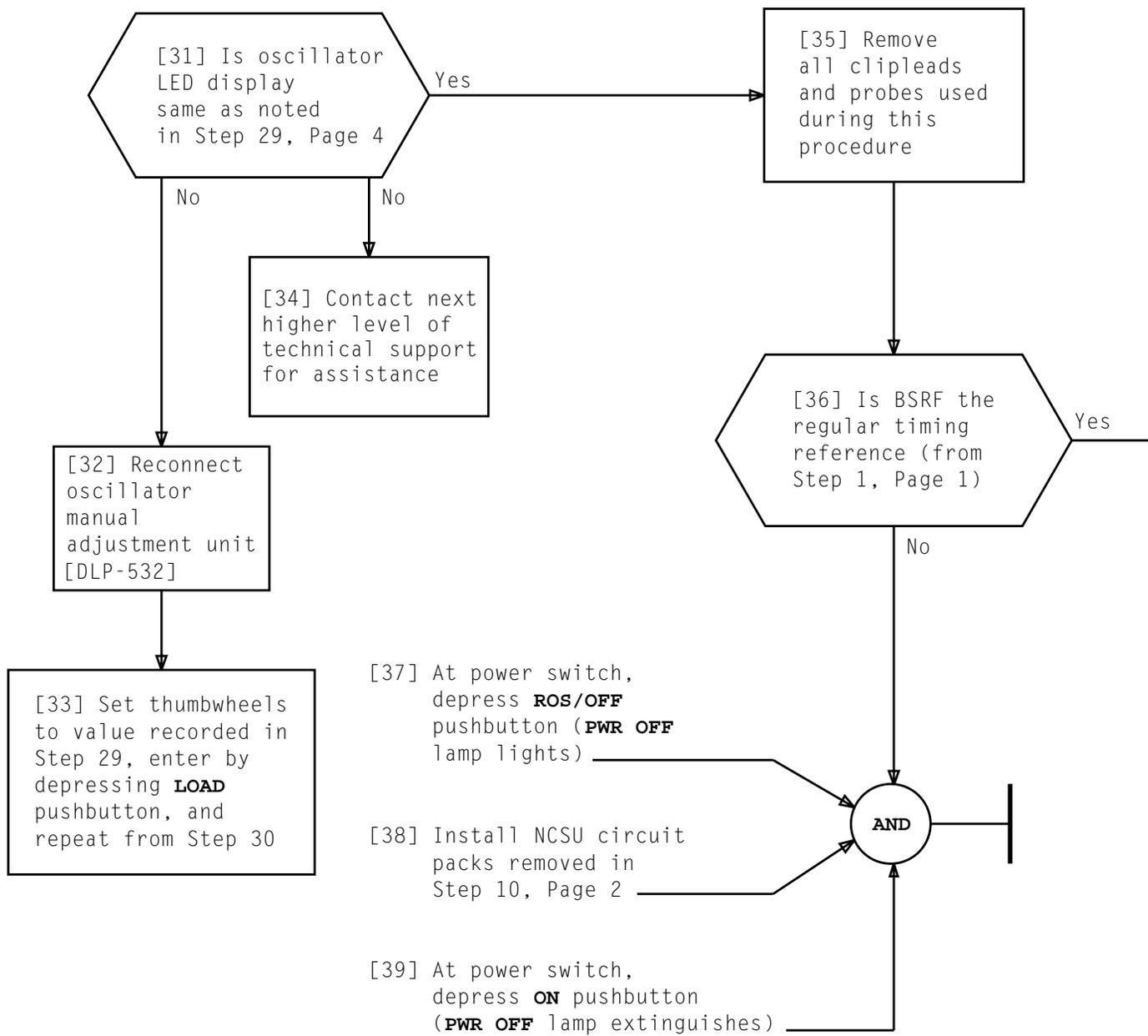


Figure 2

NOTE 4	
Final frequency word entered into oscillator that is not between 0800 and 3800 is indication that replacement oscillator should be obtained	
Issue 2	SEP 1998
234-351-013	DLP
PAGE 4 of 5	530



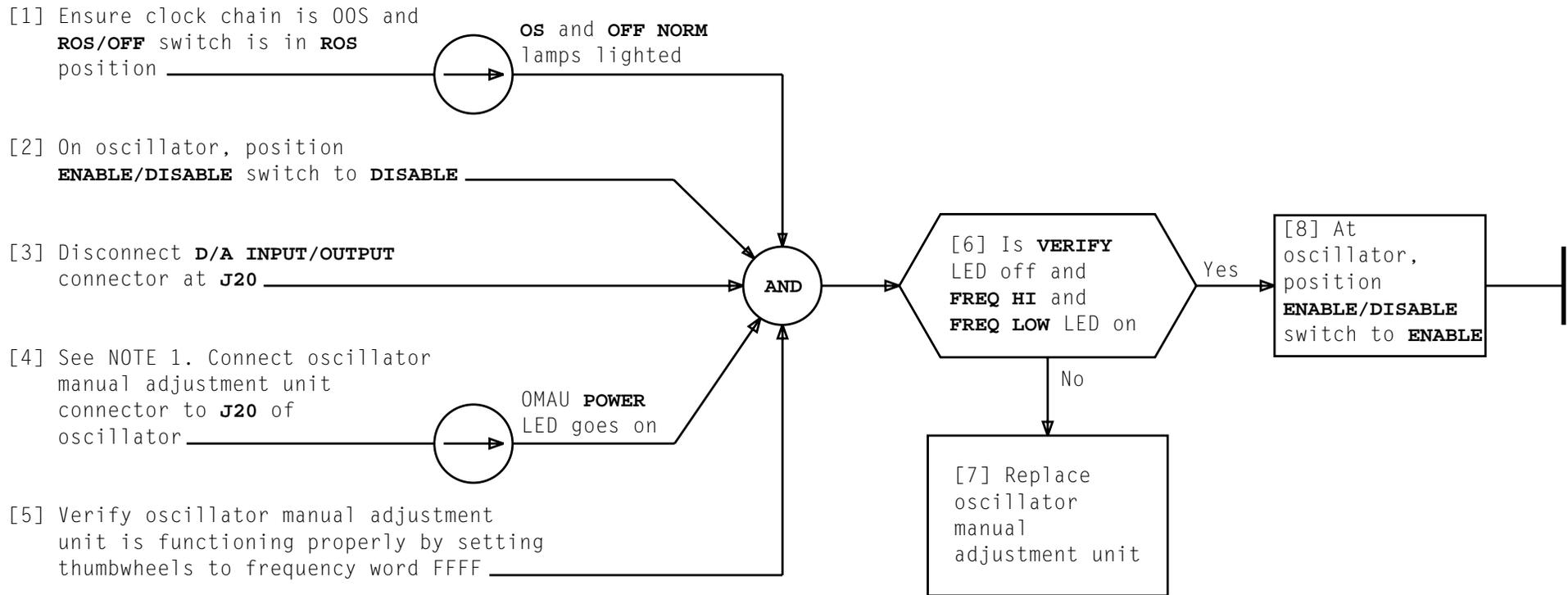
**ALIGN 39B OSCILLATOR FREQUENCY USING EXTERNAL REFERENCE**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 5 of 5	530

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

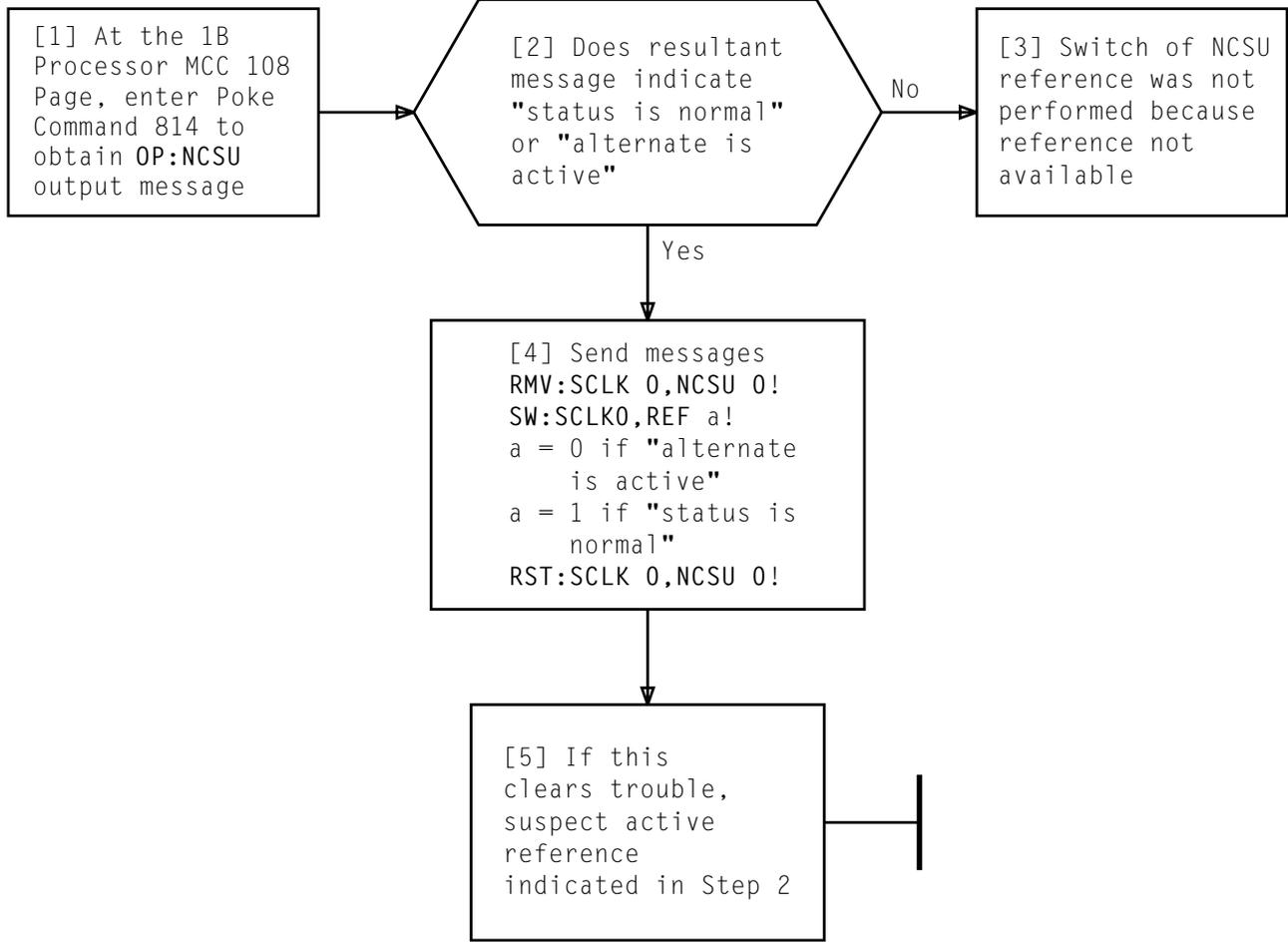
**DISCONNECT OSCILLATOR MANUAL ADJUSTMENT UNIT FROM OSCILLATOR**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 1	<b>531</b>



NOTE 1	
Ensure good cable connection at oscillator manual adjustment unit and oscillator	
Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 1	532

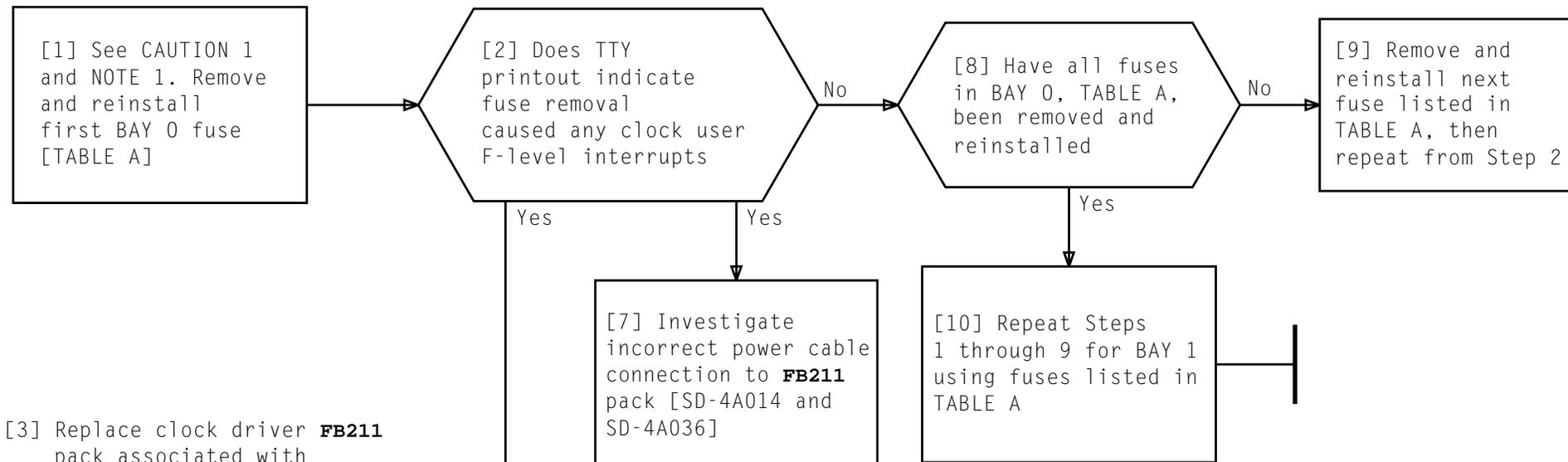
**CONNECT OSCILLATOR MANUAL ADJUSTMENT UNIT (OMAU) TO OSCILLATOR**



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



[3] Replace clock driver **FB211** pack associated with frame having F-level interrupts [DLP-511]

[4] Remove fuse that caused F-level interrupt

[5] Install fuse just removed

[7] Investigate incorrect power cable connection to **FB211** pack [SD-4A014 and SD-4A036]

[6] Repeat from Step 2

[10] Repeat Steps 1 through 9 for BAY 1 using fuses listed in TABLE A

**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**

<p style="text-align: center;">SUMMARY</p> <p>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.</p>	<p>Replace first group of fuses and continue removing groups of fuses, using procedure used in checking first group of fuses</p>
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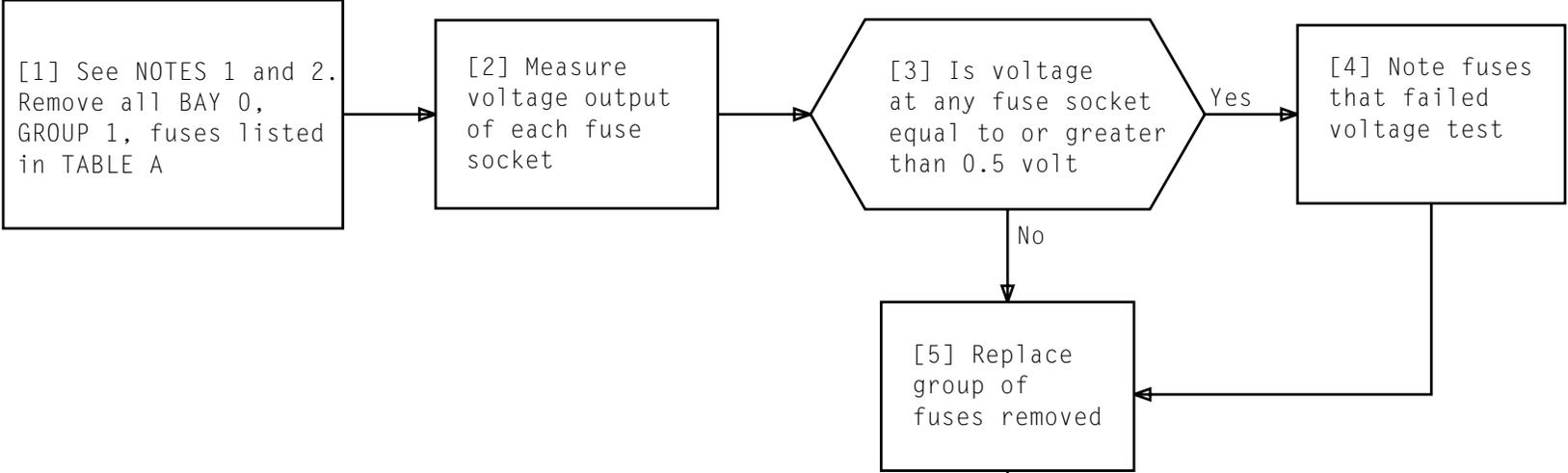
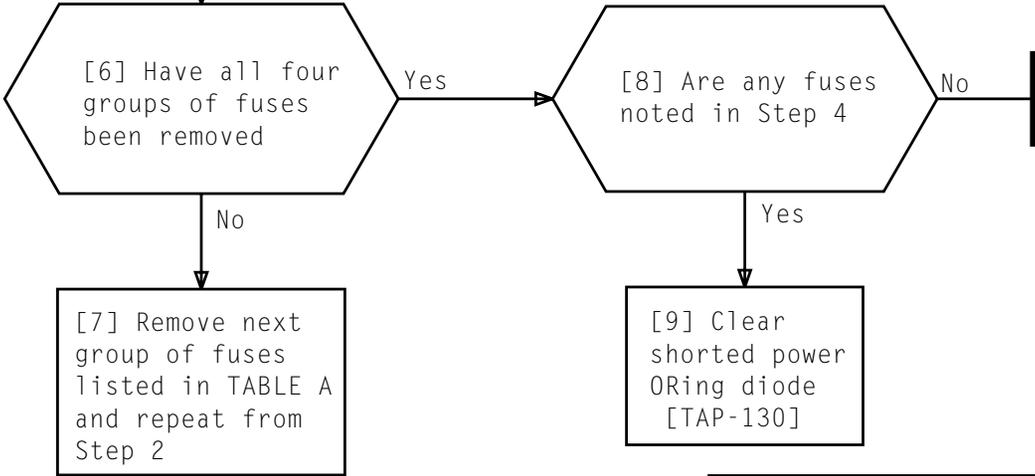


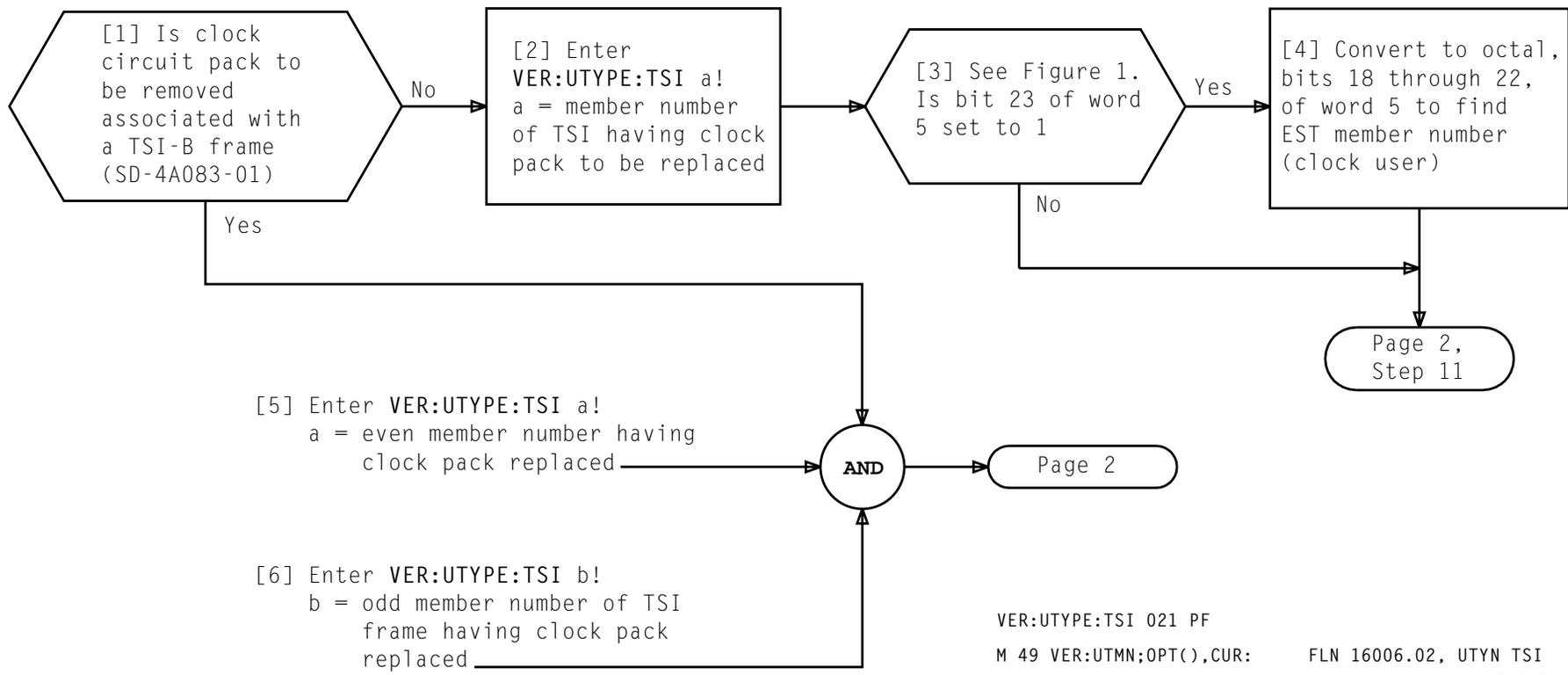
TABLE A NCLK FB211 PACK FUSES REMOVAL SEQUENCE			
BAY 0		BAY 1	
GROUP 1	GROUP 2	GROUP 3	GROUP 4
A1	B1	A1	B1
A2	B2	A2	B2
A3	B3	A3	B3
A4	B4	A4	B4
A5	B5	A5	B5
A6	B6	A6	B6
A7	B7	A7	B7
A8	B8	A8	B8
A9		A9	

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**



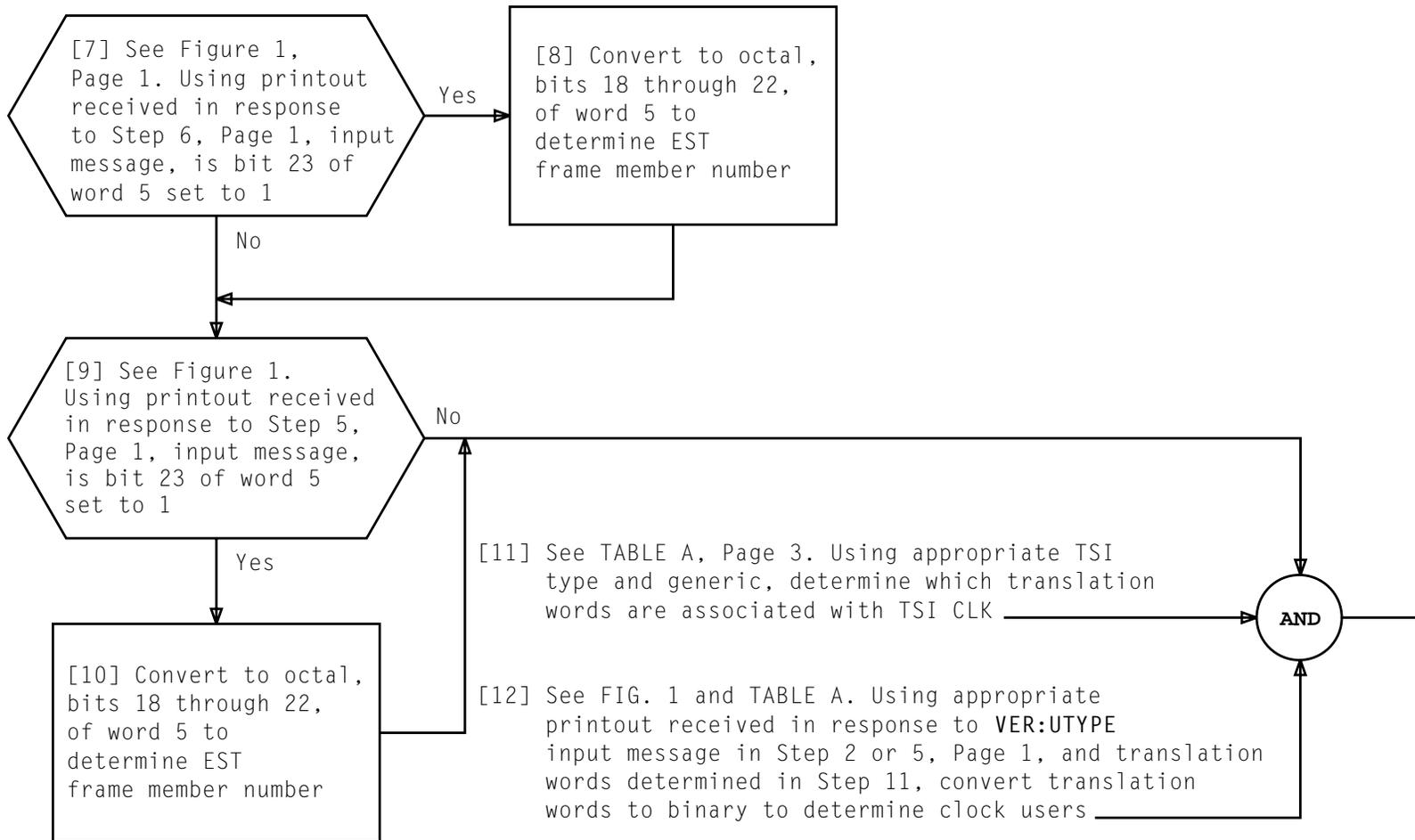
```

VER:UTYPE:TSI 021 PF
M 49 VER:UTMN;OPT(),CUR:      FLN 16006.02, UTYN TSI
MEMN  2,  ME OPER,
ENTRY ADDRESS 07612704      ENTRY SIZE 37
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 00000000 00010040 00010041 00010042
        00010043 00000000 00010045 00010046
WORD 40 00000000 00000000 00000000 00000000
        00000000
WORD 50
  
```

Figure 1 - Typical Example of VER:UTYPE Output Message

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

Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 3	536

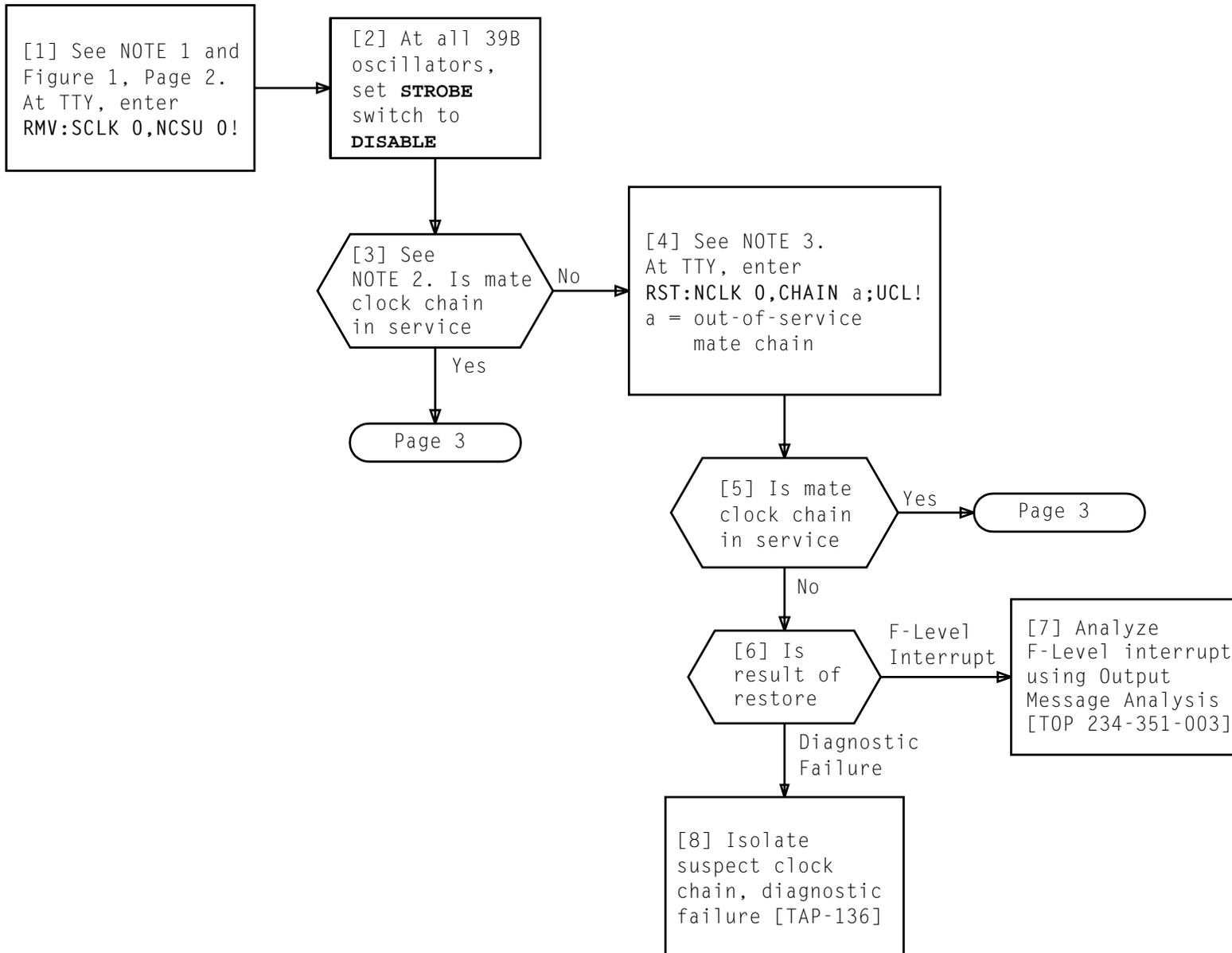


**IDENTIFY VIF, DT, AND EST CONTROLLERS RECEIVING  
CLOCK SIGNALS FROM TSI FRAMES**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 3	<b>536</b>

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)				Member number (DT, VIF, DIF)				Frame type (DT=0001) (VIF=0011) (DIF=0100)				Member number (DT, VIF, DIF)										
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)				Member number (DT, VIF, DIF)				Frame type (DT=001) (VIF=011) (DIF=100)				Member number (DT, VIF, DIF)										
				Clock C Bit (0-10) Clock D Bit (11-21)	17	NA				NA				NA				NA								
	Clock E Bit (0-10)	20	NA				NA				NA				NA											

IDENTIFY VIF, DT, 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
<b>Issue 2</b>	<b>SEP 1998</b>
<b>234-351-013</b>	<b>DLP</b>
<b>PAGE 1 of 4</b>	<b>537</b>

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

Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 4	537

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

[9] Ensure chain 00S;  
**ROS/OFF** switch is in **ROS** position

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

[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

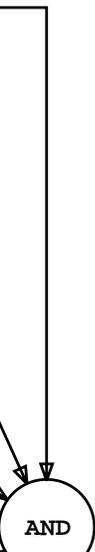
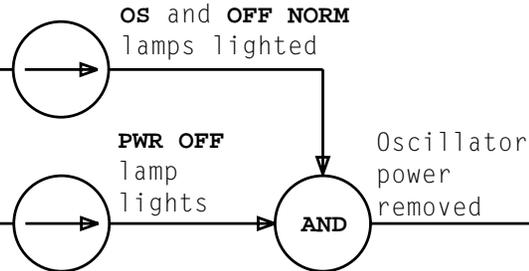


TABLE A	
CLOCK CHAIN	POWER SWITCH FRAME LOCATION
0	066-03
1	066-68
2	166-03
3	166-68

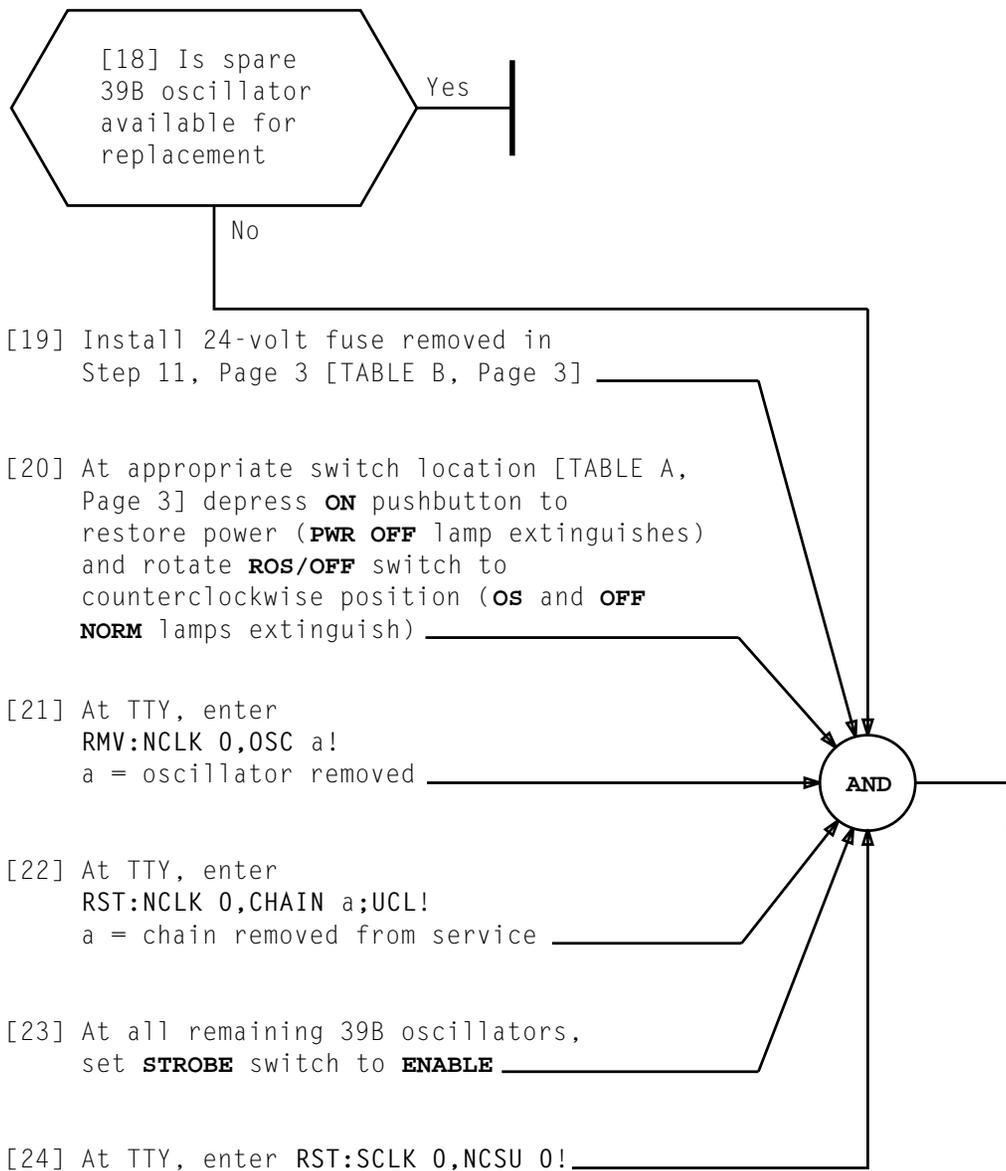
TABLE B				
CLOCK CHAIN	OSCILLATOR LOCATION	SD-4A014-02 FUSES	FUSE LOCATION	
			BAY	HMP
0	033-21	0B0A	0	07
1	033-56	0B0B	0	07
2	133-21	1B0A	1	07
3	133-56	1B0B	1	07

Page 4

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

Issue 2	SEP 1998
234-351-013	DLP
PAGE 3 of 4	537

**REMOVE 39B OSCILLATOR**



**REMOVE 39B OSCILLATOR**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 4 of 4	<b>537</b>

[1] See NOTE 1.  
Connect scope  
probe to terminal  
201 on **FB687** pack  
[TABLE A]

[2] Is waveform  
between 0.5 volt  
and 0.9 volt  
peak-to-peak with  
NCLK chain powered  
down [NOTE 2]

No → Page 5

Yes

[3] Remove probe from  
terminal 201 on  
**FB687** pack

[4] See NOTE 3. At power  
switch associated with  
clock chain removed from  
service [TABLE A], depress  
**ON** pushbutton (**PWR OFF**  
lamp extinguishes)

AND

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

Yes → Page 2

No

Page 6

[5] Connect scope probe  
to terminal 018 of  
**FB214** pack associated with  
clock chain removed from  
service [TABLE A]

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

Issue 2 | SEP 1998

234-351-013 | DLP

PAGE 1 of 9 | 538

[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]

[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

[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

AND

AND

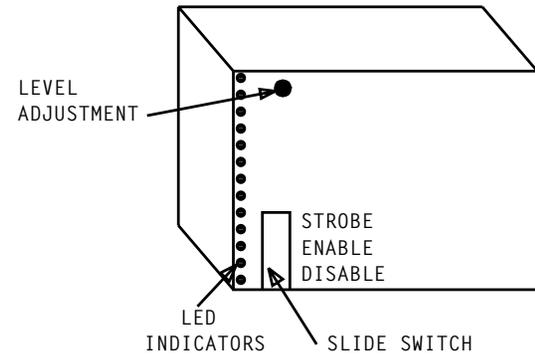


Figure 1 - 39B Oscillator

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

Yes

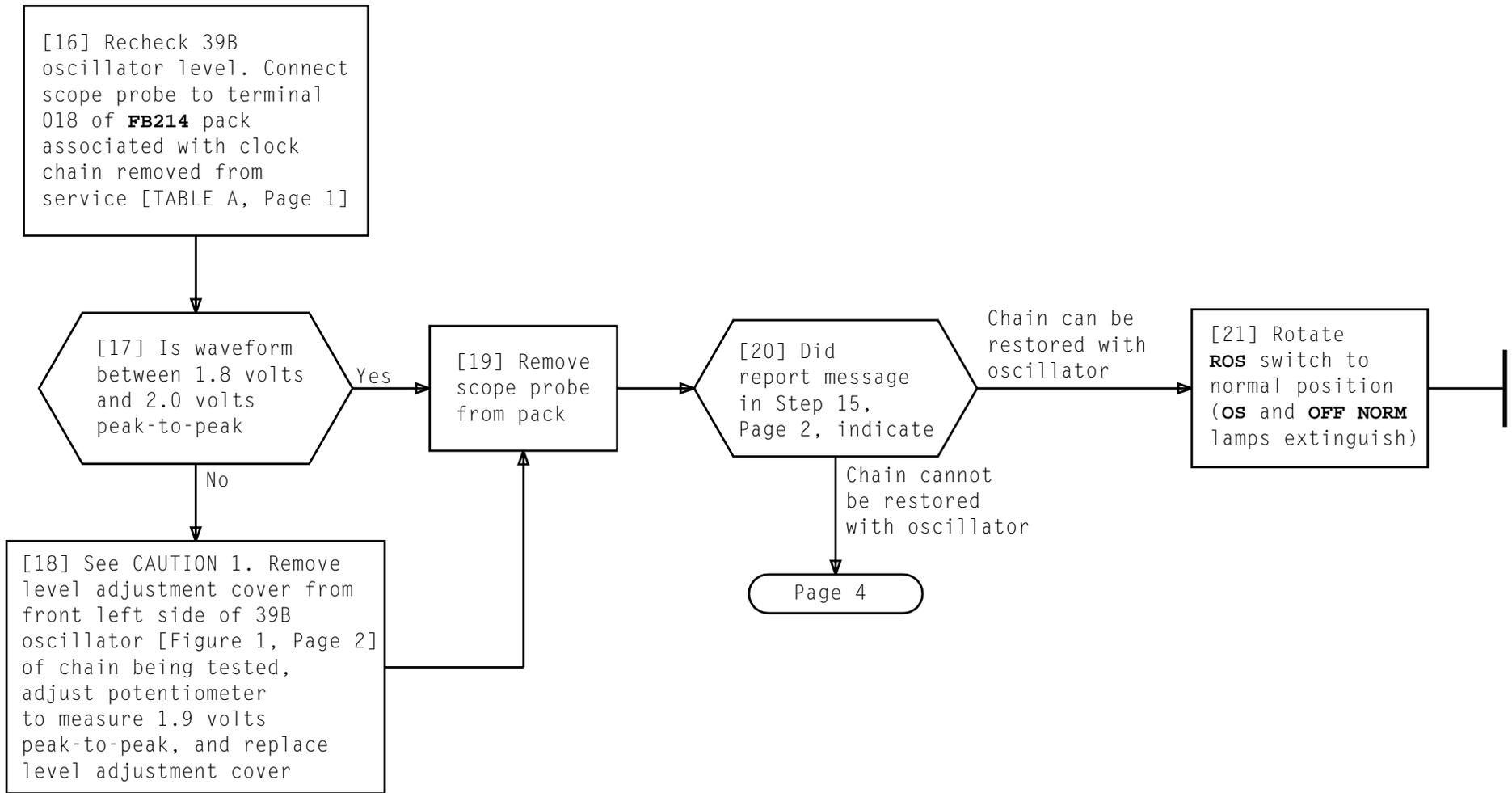
No

Page 3

NOTE 4  
May take 5 minutes to receive report message

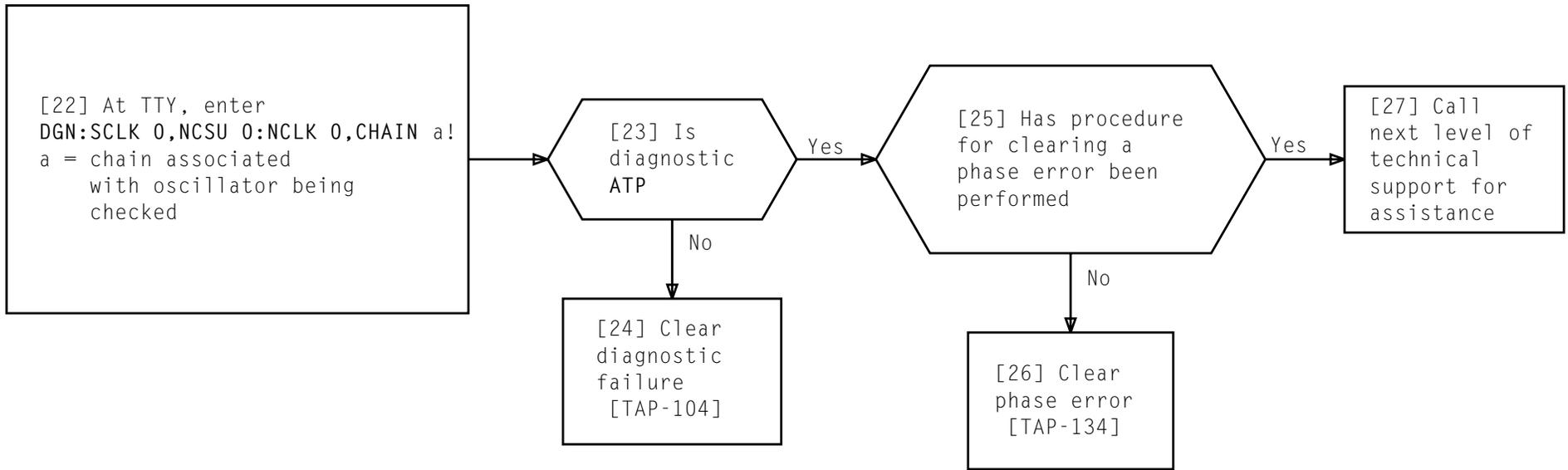
Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 9	538

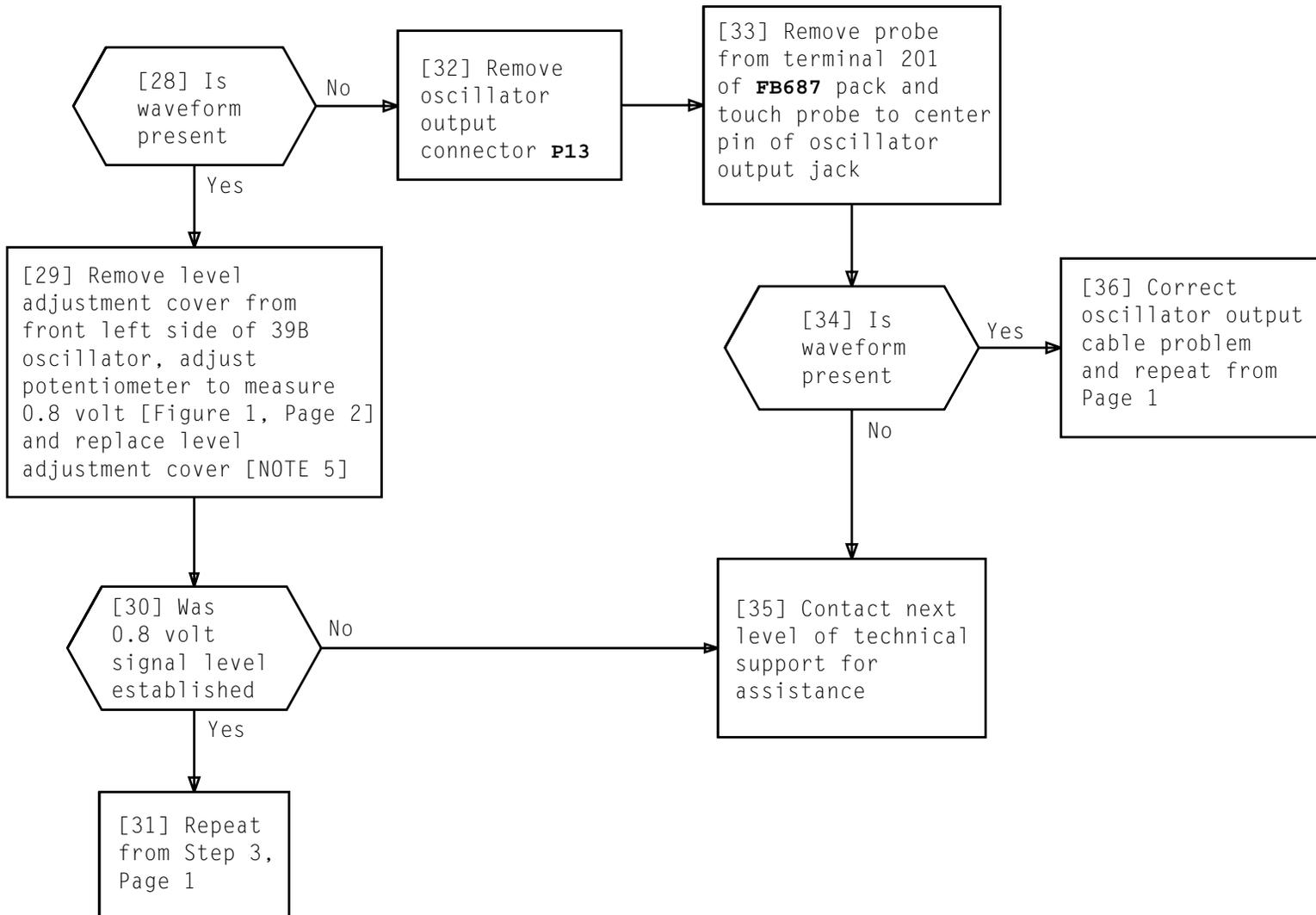
CHECK 39B OSCILLATOR



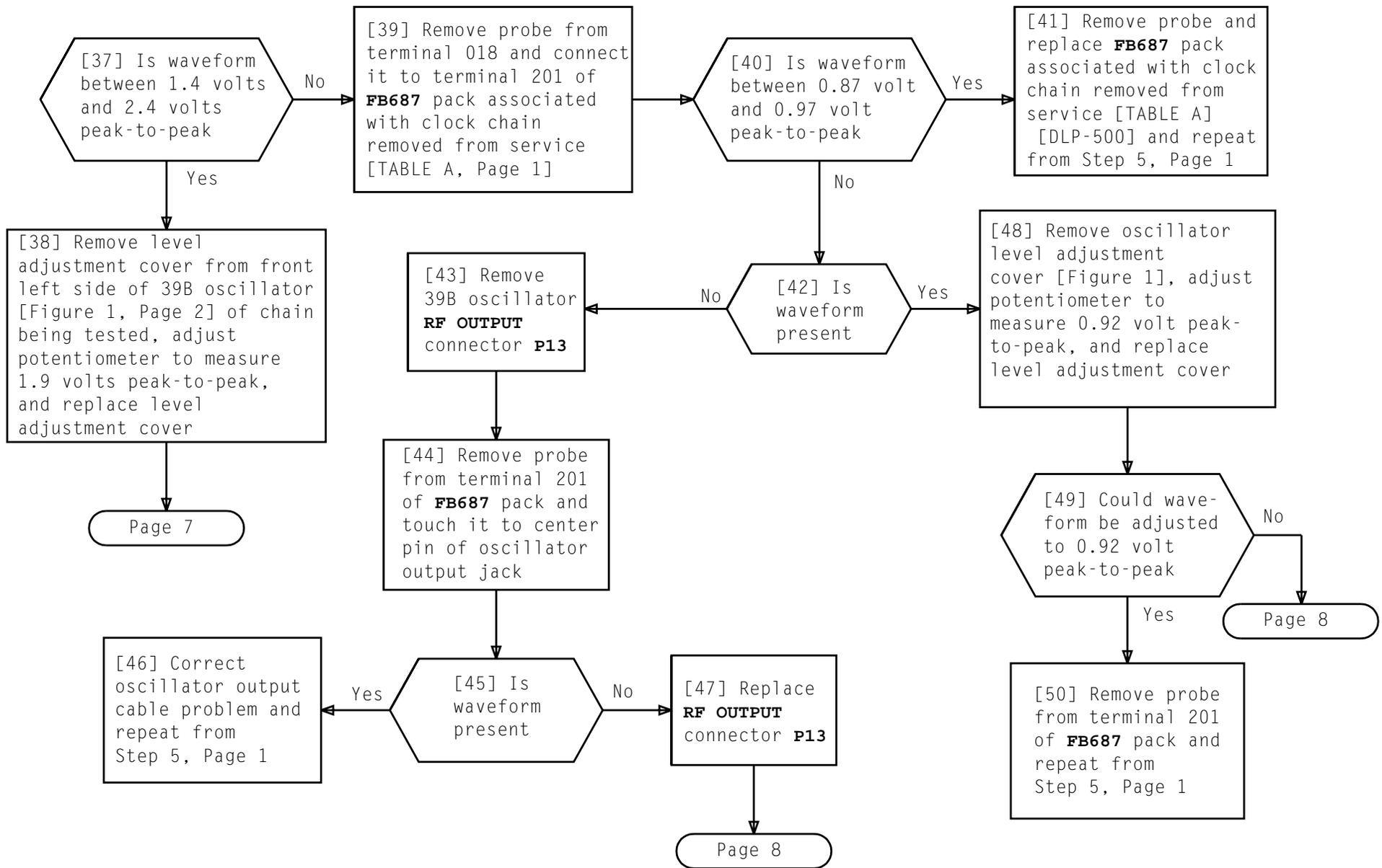
**CHECK 39B OSCILLATOR**

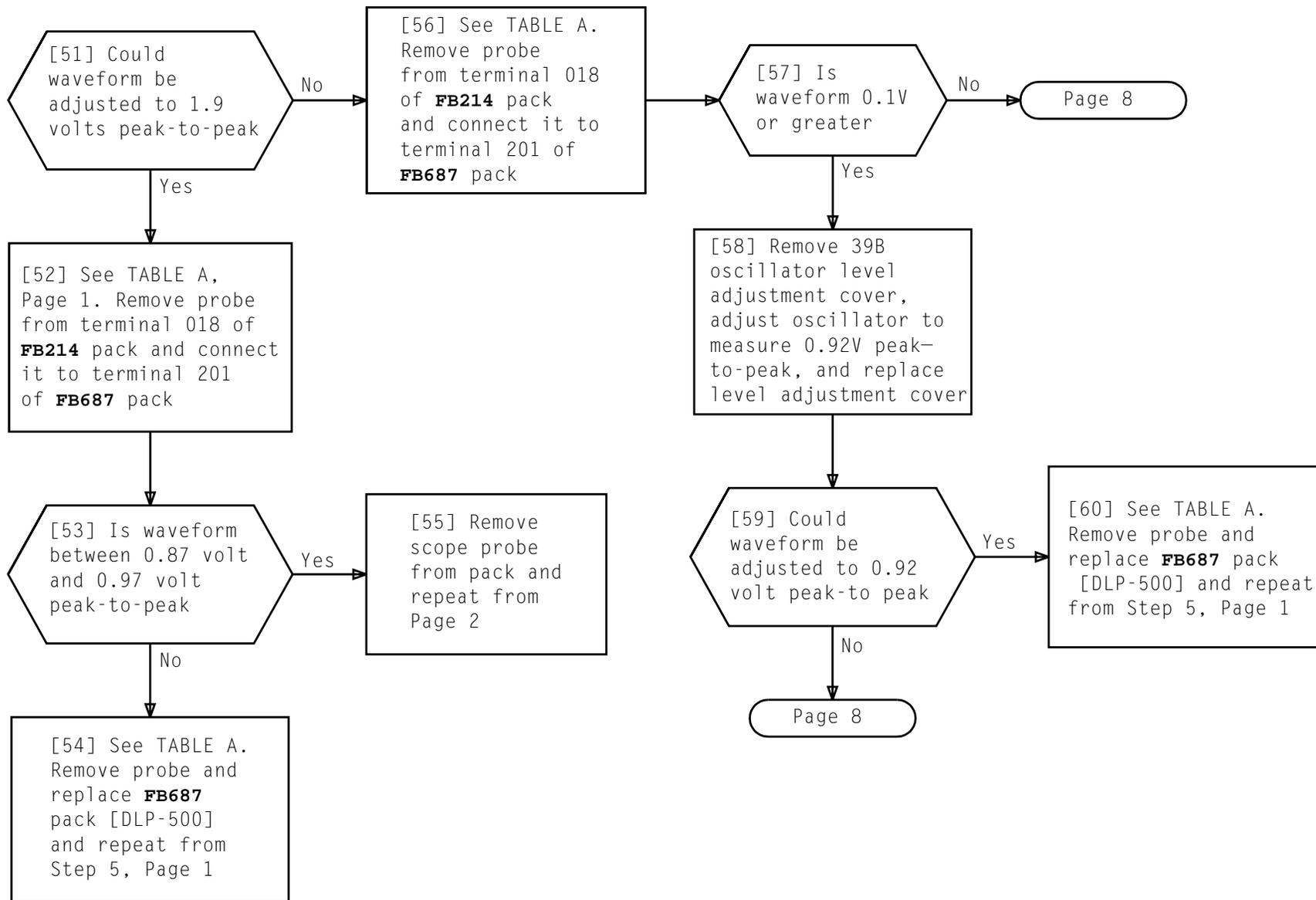
<i>CAUTION 1</i>	
<i>Screwdriver shank must be insulated</i>	
Issue 2	SEP 1998
234-351-013	DLP
PAGE 3 of 9	<b>538</b>





NOTE 5	
This is a preliminary level adjustment to establish that oscillator is operational	
Issue 2	SEP 1998
234-351-013	DLP
PAGE 5 of 9	<b>538</b>





**CHECK 39B OSCILLATOR**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 7 of 9	<b>538</b>

[61] On back of fuse panel, measure -DC voltage between output terminal 1 of -24 volt converter and frame ground [TABLE B]

[62] Is voltage between -22 and -26 volts

No

[63] Clear power problem [SD-4A014-02]

Yes

[64] Depress **ROS/OFF** switch to remove power from chain being checked (**PWR OFF** lamp lights)

[65] See NOTE 6. Remove +24V fuse for -24V converter [TABLE B]

[66] Disconnect **POWER** connectors **P18** and **P19** from oscillator being replaced

[67] Replace fuse removed in Step 65

[68] Measure -DC voltage between terminals **C** and **B** of power connector removed from oscillator with positive probe on terminal **C**

AND

[69] Is voltage between -22 and -26 volts

No

[70] Clear power problem [SD-4A014-02]

Yes

Page 9

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

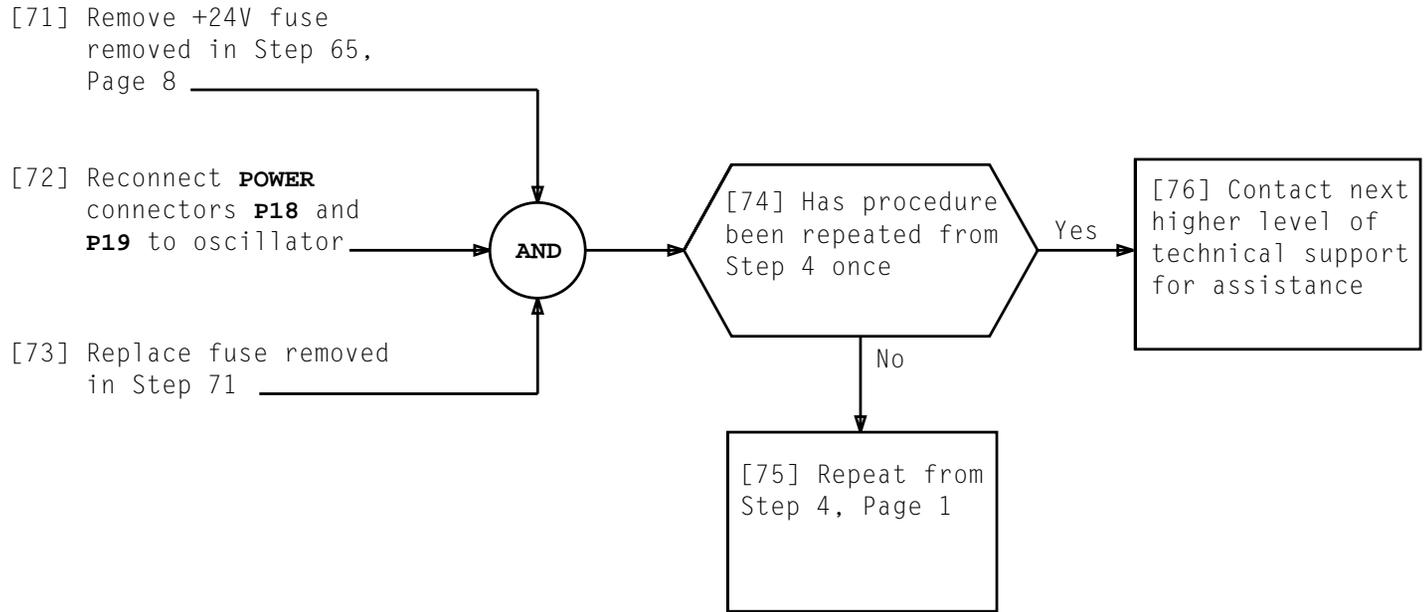
Note 6

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

Issue 2 | SEP 1998

234-351-013 | DLP

PAGE 8 of 9 | 538



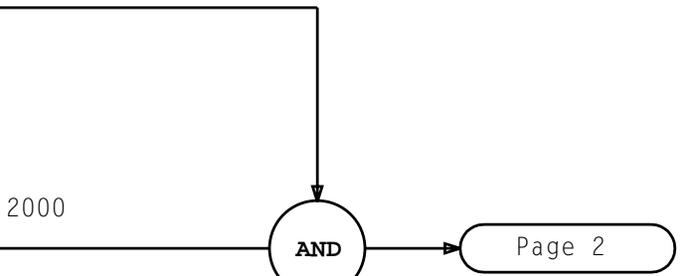
**CHECK 39B OSCILLATOR**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 9 of 9	538

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

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

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



OMA**U** **VER****I****F****Y**  
 LED goes off

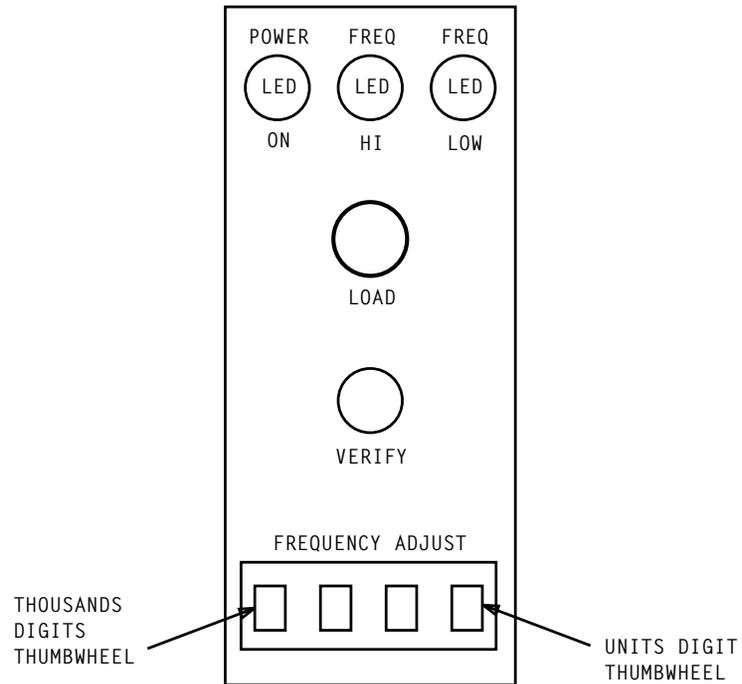
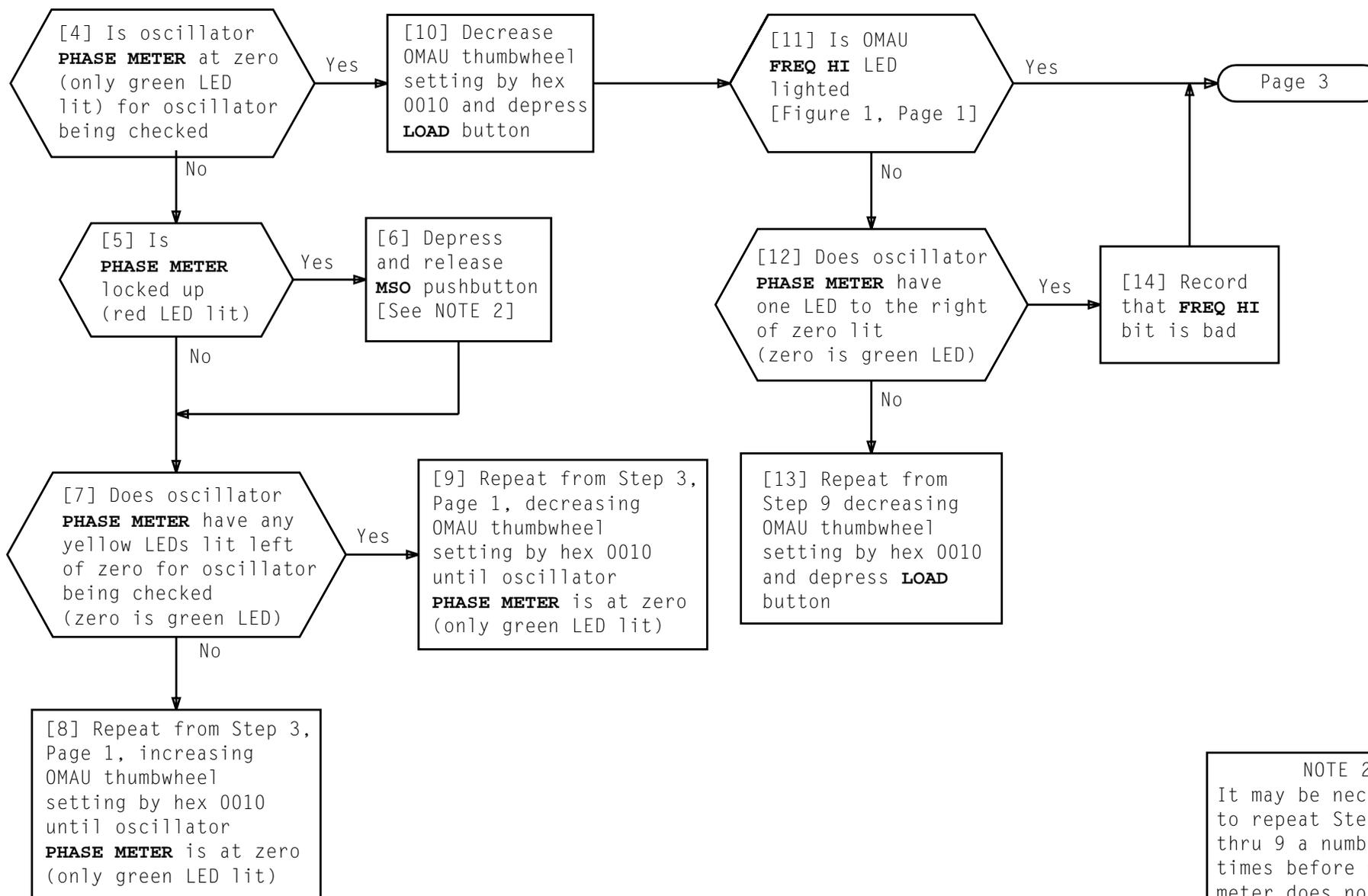


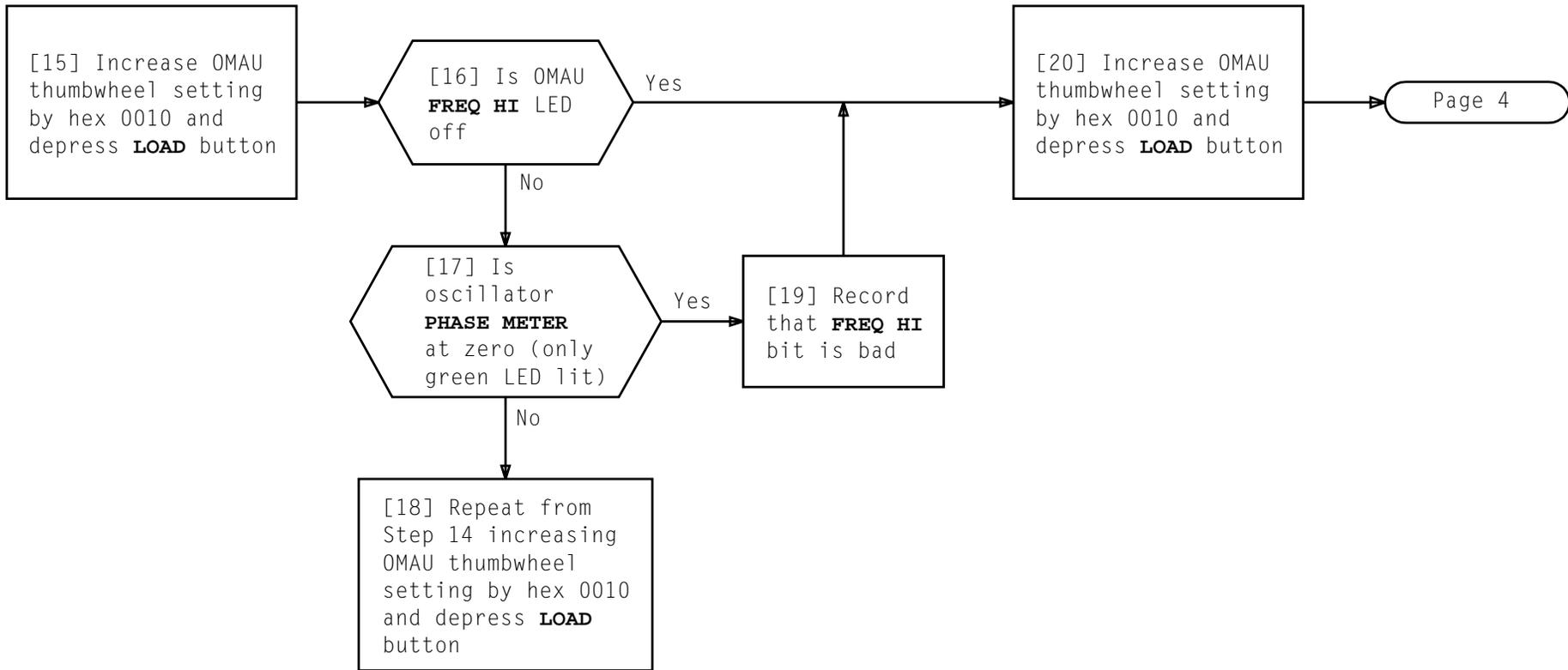
Figure 1 - Oscillator Manual Adjustment Unit

**CHECK 39B OSCILLATOR FREQUENCY HI/LOW BITS**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 5	539

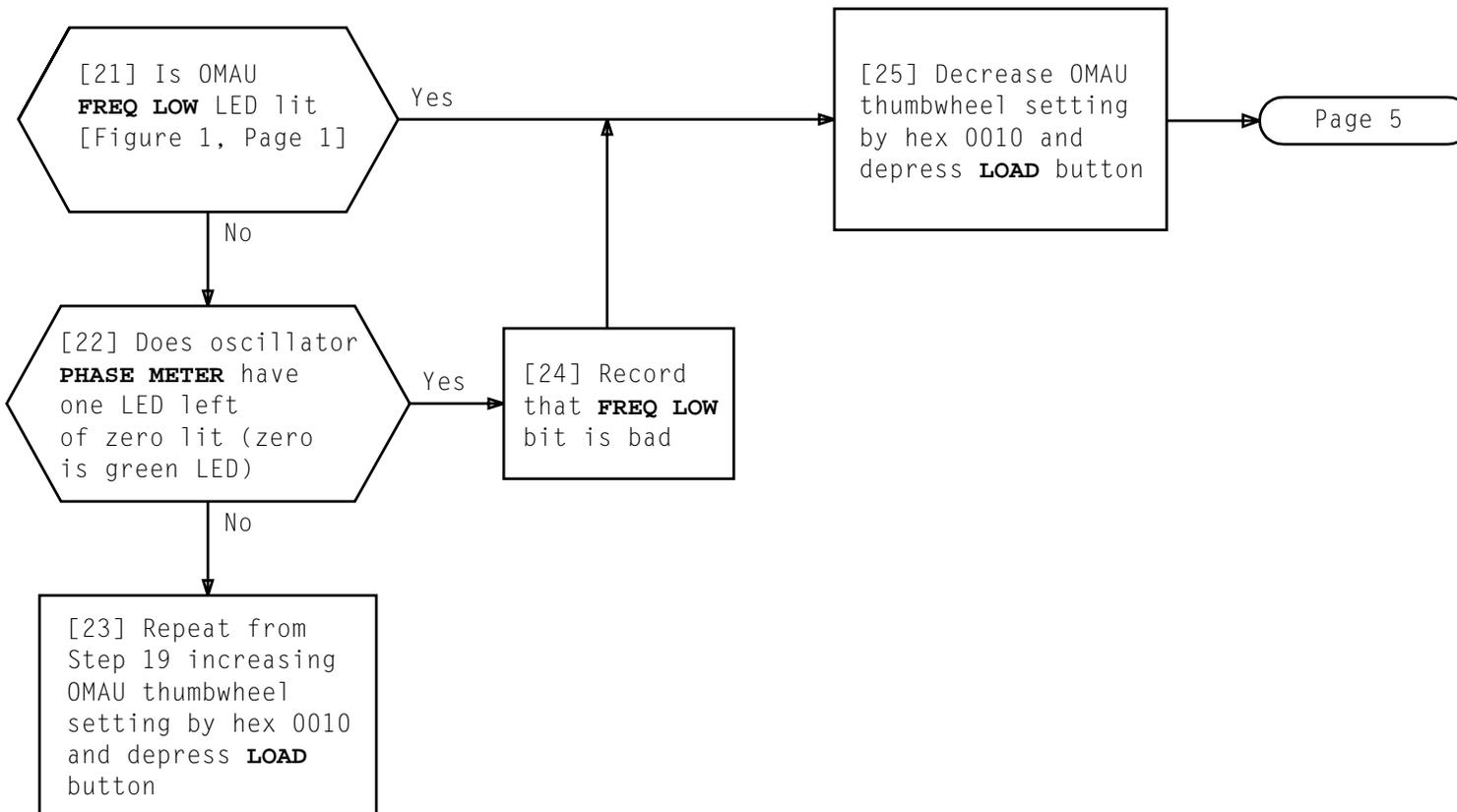


NOTE 2	
It may be necessary to repeat Steps 3 thru 9 a number of times before phase meter does not relock	
Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 5	539



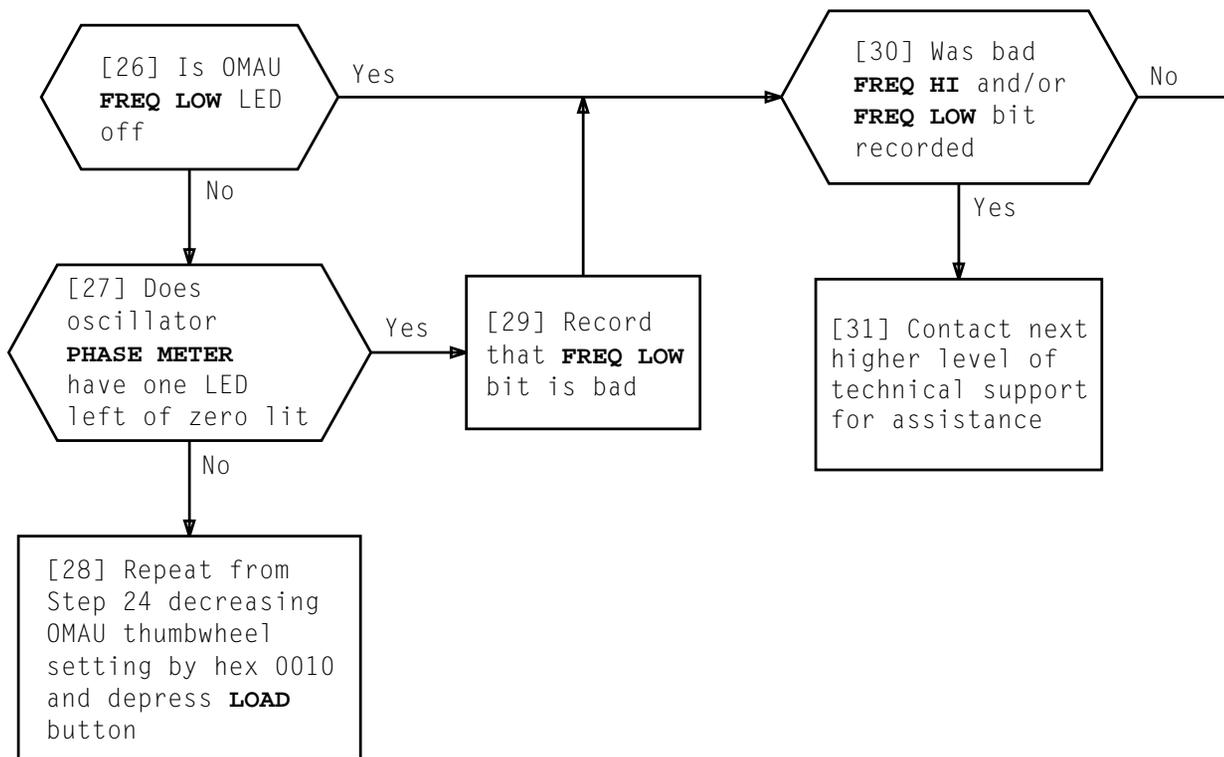
CHECK 39B OSCILLATOR FREQUENCY HI/LOW BITS

Issue 2	SEP 1998
234-351-013	DLP
PAGE 3 of 5	539



**CHECK 39B OSCILLATOR FREQUENCY HI/LOW BITS**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 4 of 5	<b>539</b>



CHECK 39B OSCILLATOR FREQUENCY HI/LOW BITS

Issue 2	SEP 1998
234-351-013	DLP
PAGE 5 of 5	539

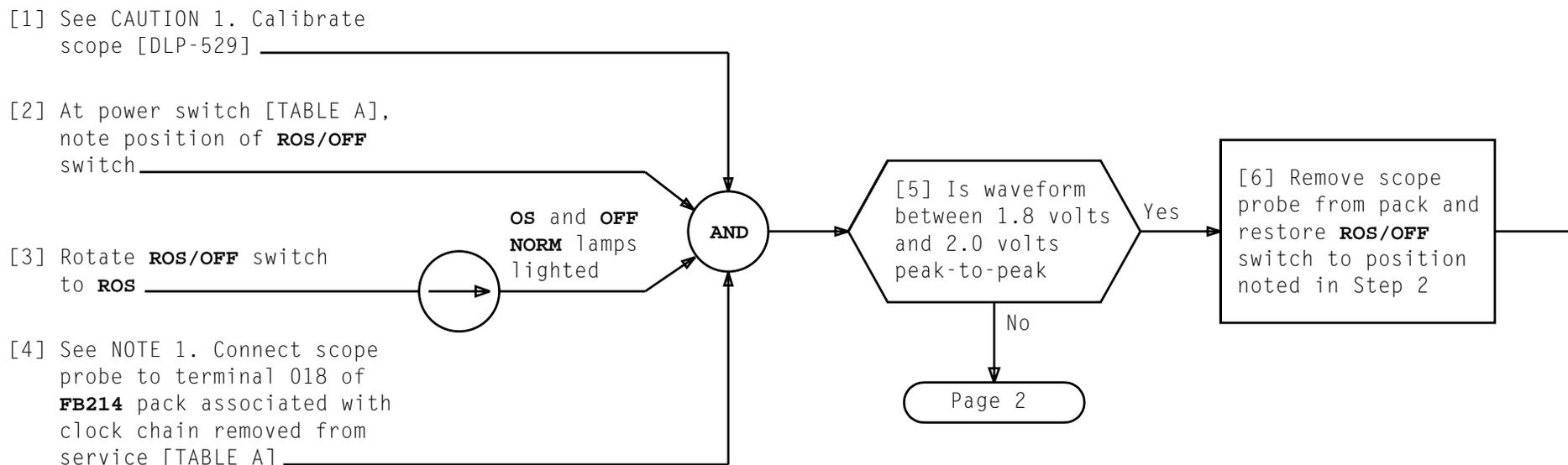


TABLE A			
FB687 LOCATION	CLOCK CHAIN	PWR SW LOCATION	FB214 LOCATION
070-34	0	066-03	066-33
070-37	1	066-68	066-39
170-34	2	166-03	166-33
170-37	3	166-68	166-39

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

**CAUTION 1**  
*Improper scope calibration may affect service*

Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 2	540

[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

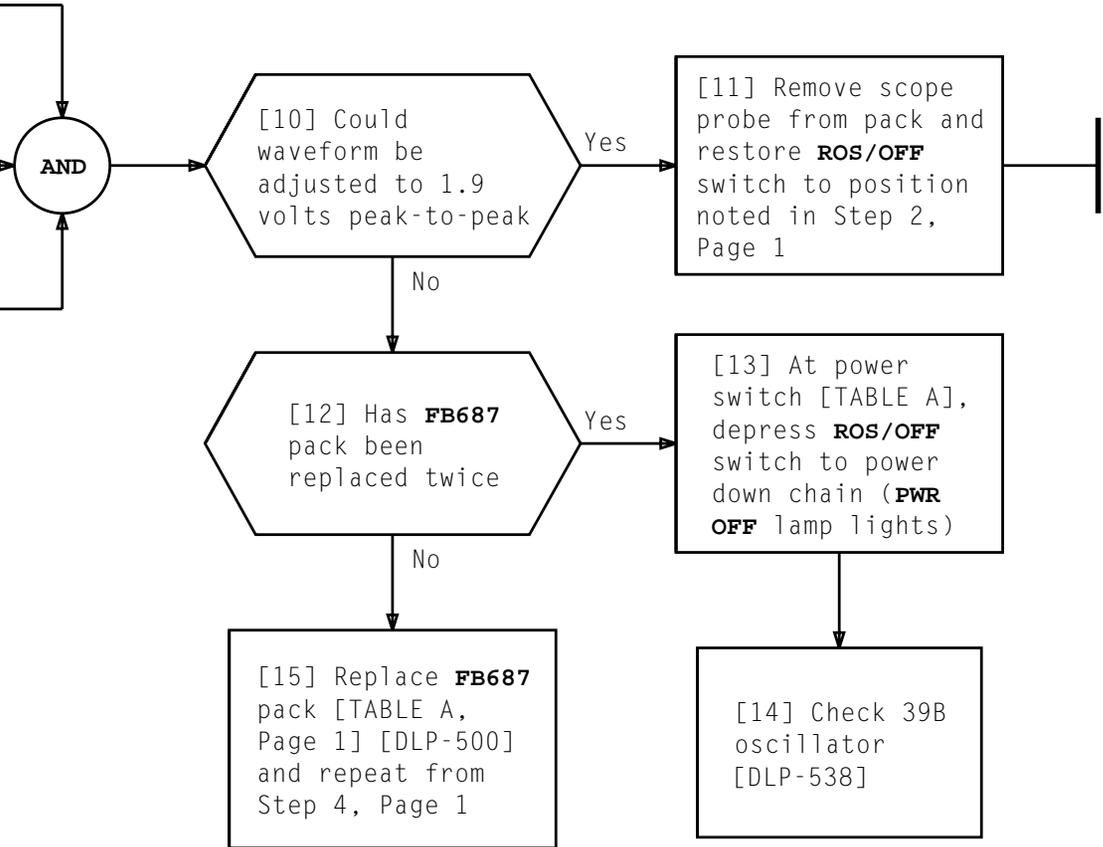
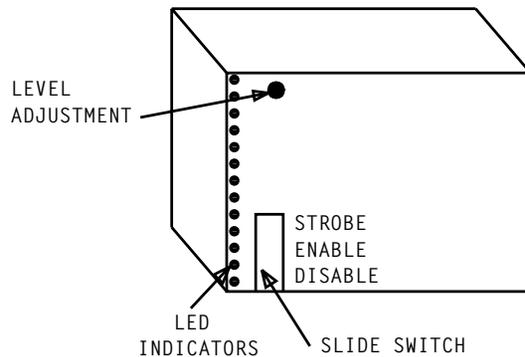
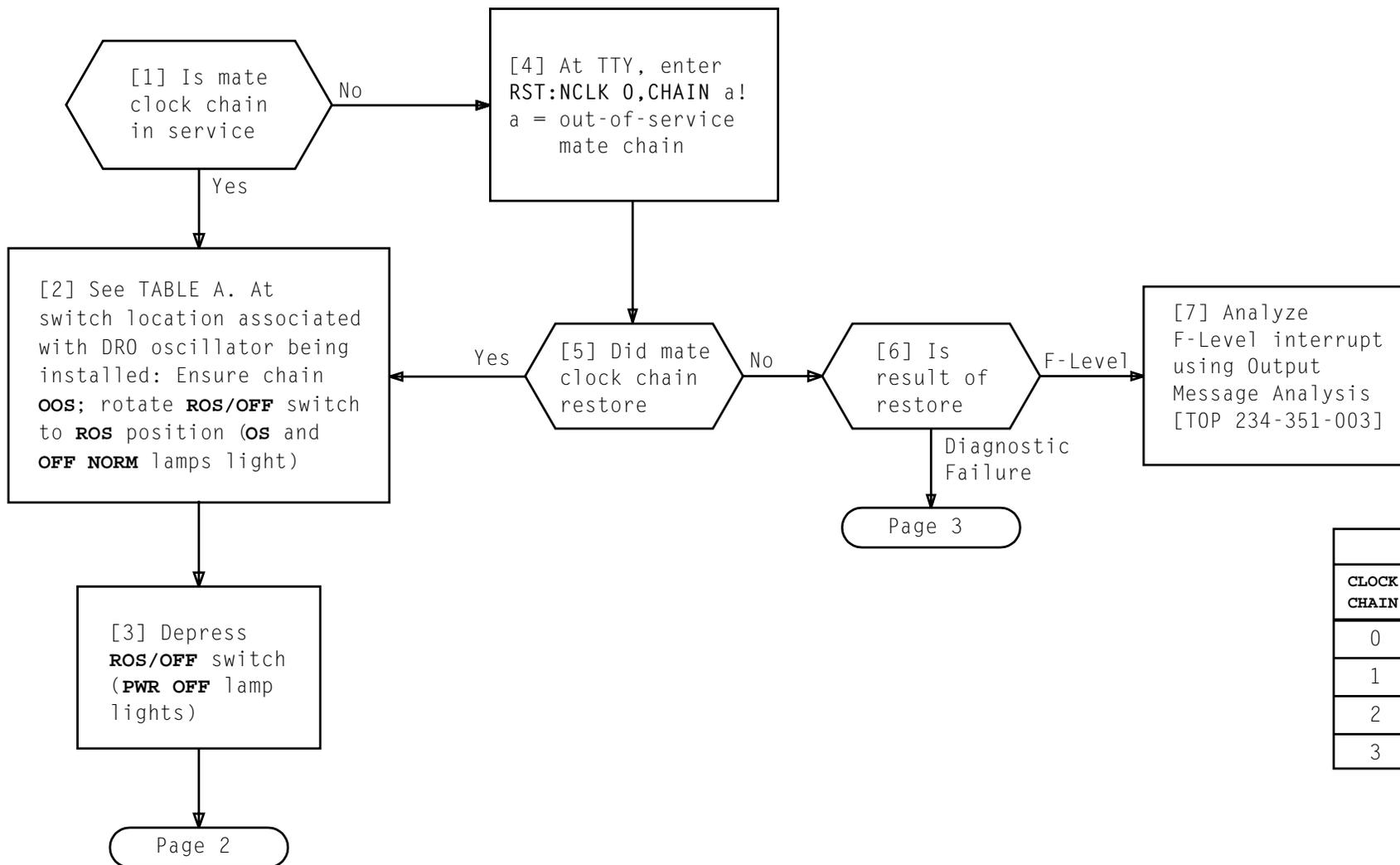


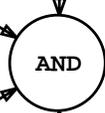
Figure 1 - 39B Oscillator



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

Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 3	541

- [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]



- [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**

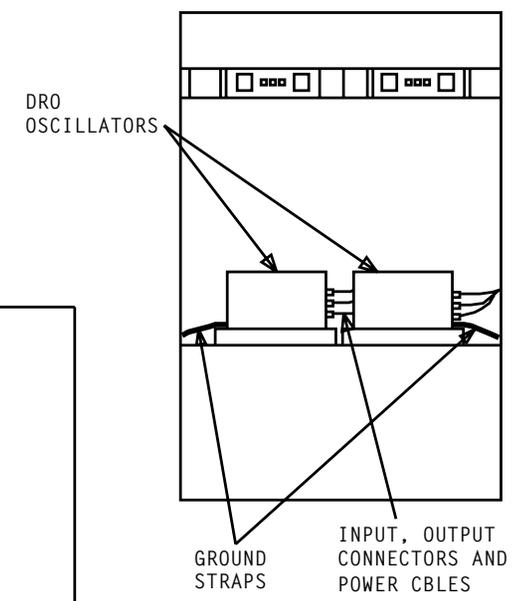


Figure 1 - Network Clock Frame

- [13] Install the -48V fuse [TABLE B]
- [14] During initialization:
  - **FREE RUN** LED flashes
  - **MAJOR** LED is lighted
  - **OSC WRITE WORD** displays INIT
  - **RF OUTPUT** is disabled

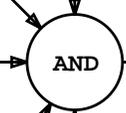
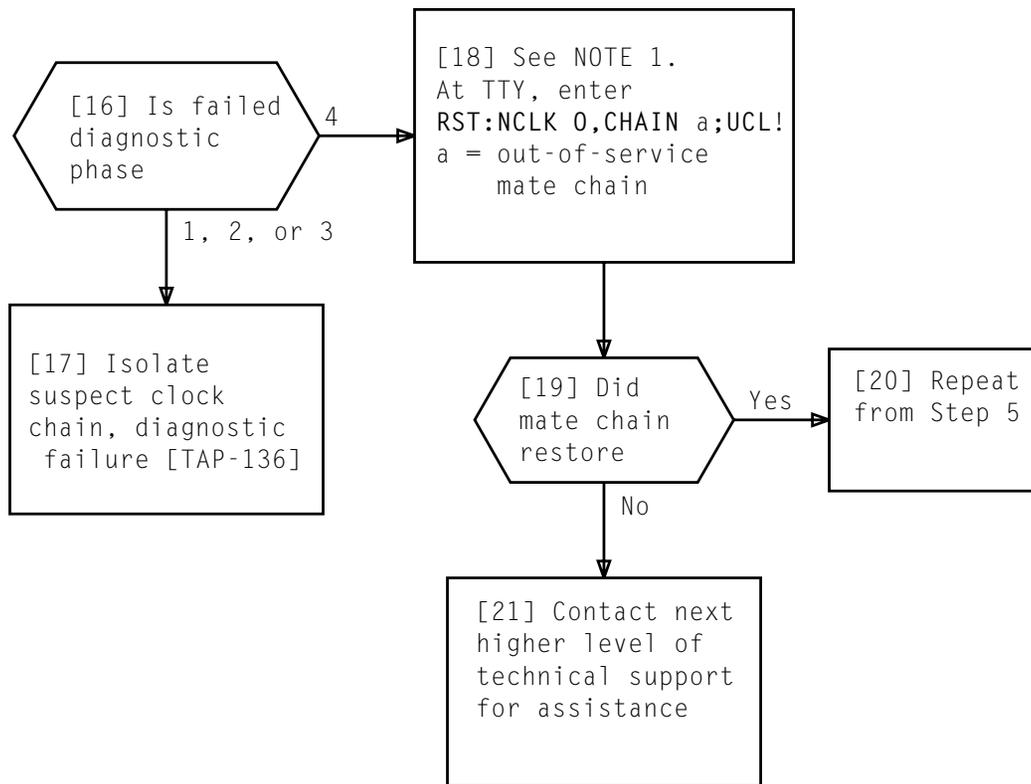


TABLE B				
CLOCK CHAIN	OSCILLATOR LOCATION	FUSES	FUSE LOCATION	
			BAY	HMP
0	033-21	DC	0	07
1	033-56	DD	0	07
2	133-21	DC	1	07
3	133-56	DD	1	07

- [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

**INSTALL DISCIPLINED RUBIDIUM OSCILLATOR**

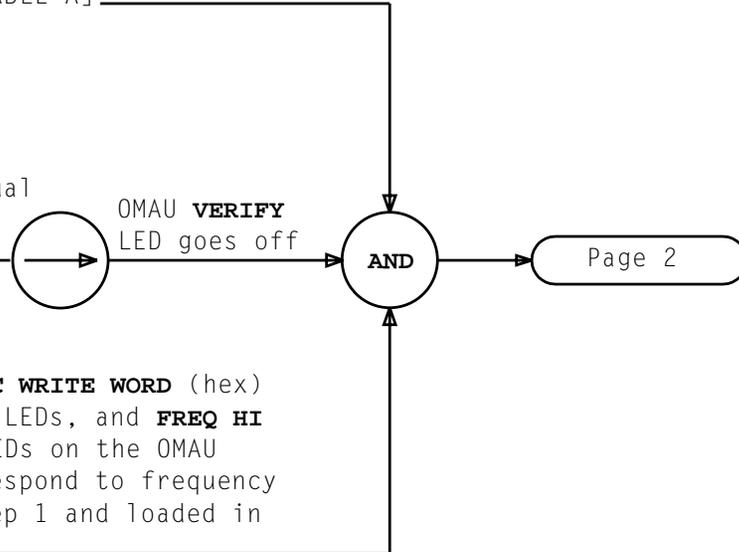


NOTE 1	
Ensure clock chain is powered up before restoring unconditionally	
Issue 2	SEP 1998
234-351-013	DLP
PAGE 3 of 3	541

[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

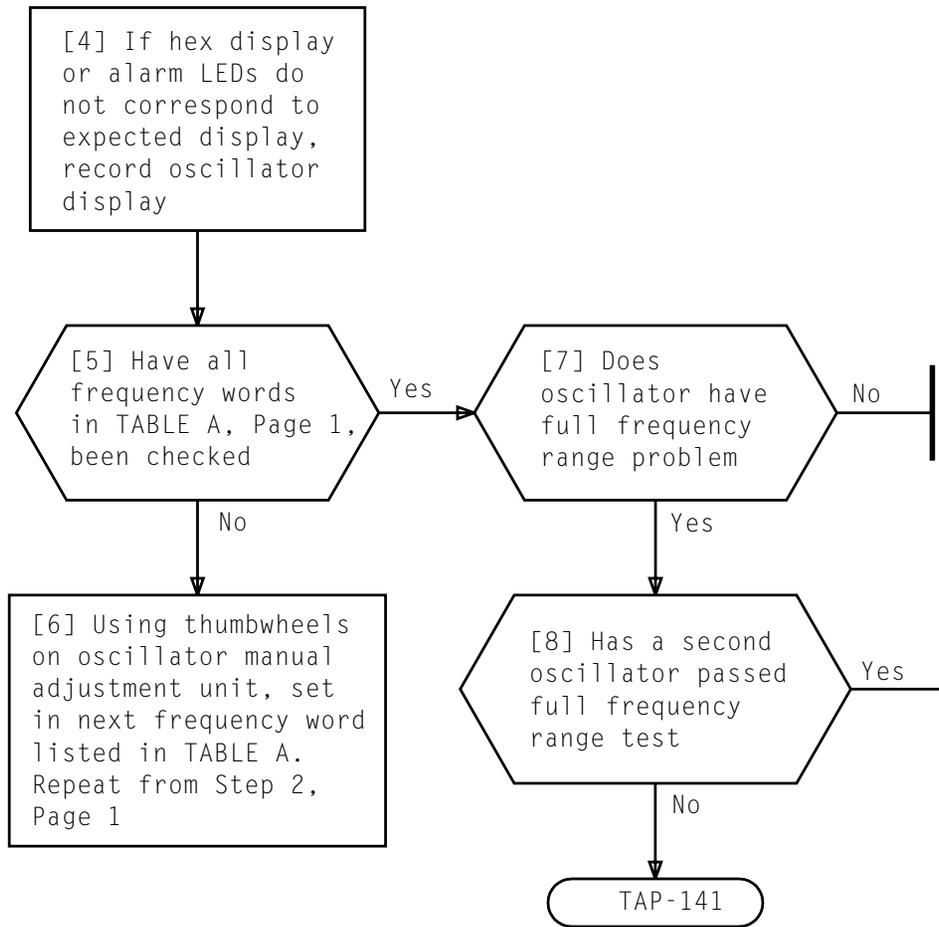
[3] See NOTE 1. Verify that **OSC WRITE WORD** (hex) display, alarm LEDs, and **FREQ HI** and **FREQ LOW** LEDs on the OMAU [TABLE A] correspond to frequency word set in Step 1 and loaded in Step 2



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

Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 2	542



**CHECK FULL FREQUENCY RANGE AND ALARM BITS OF DISCIPLINED RUBIDIUM OSCILLATOR**

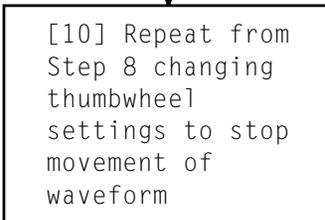
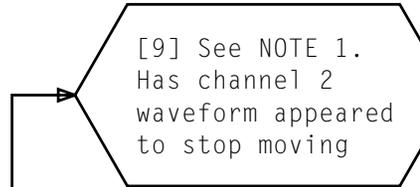
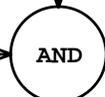
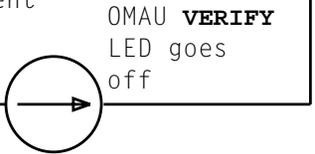
Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 2	<b>542</b>

- [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]

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

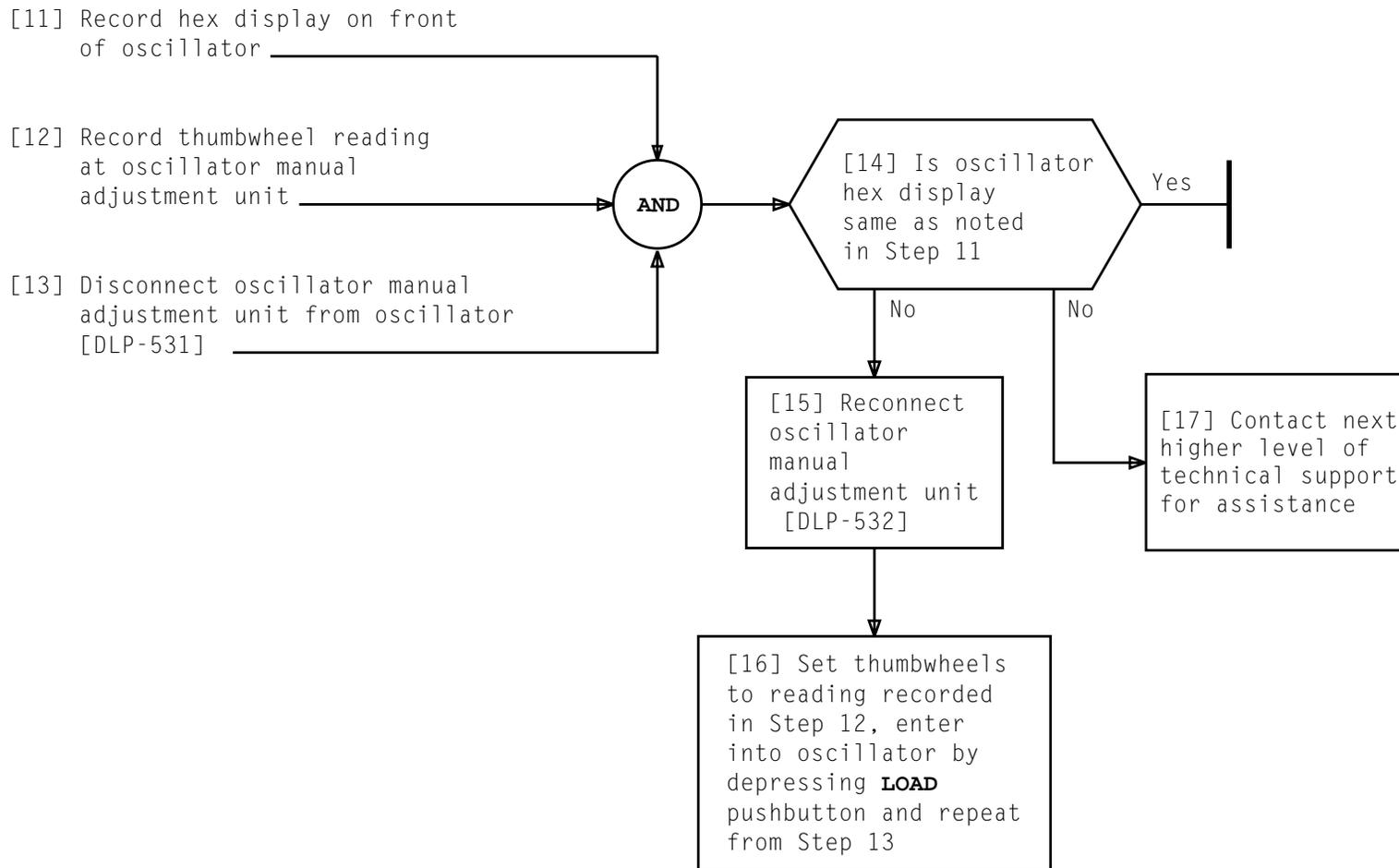
TABLE B	
CLOCK CHAIN	FB214 PACK LOCATION
0	066-33
1	066-39
2	166-33
3	166-39

- [7] Connect oscillator manual adjustment unit to DRO oscillator [DLP-532]
- [8] Set oscillator manual adjustment unit thumbwheels to 2000 and enter by depressing **LOAD** pushbutton



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**



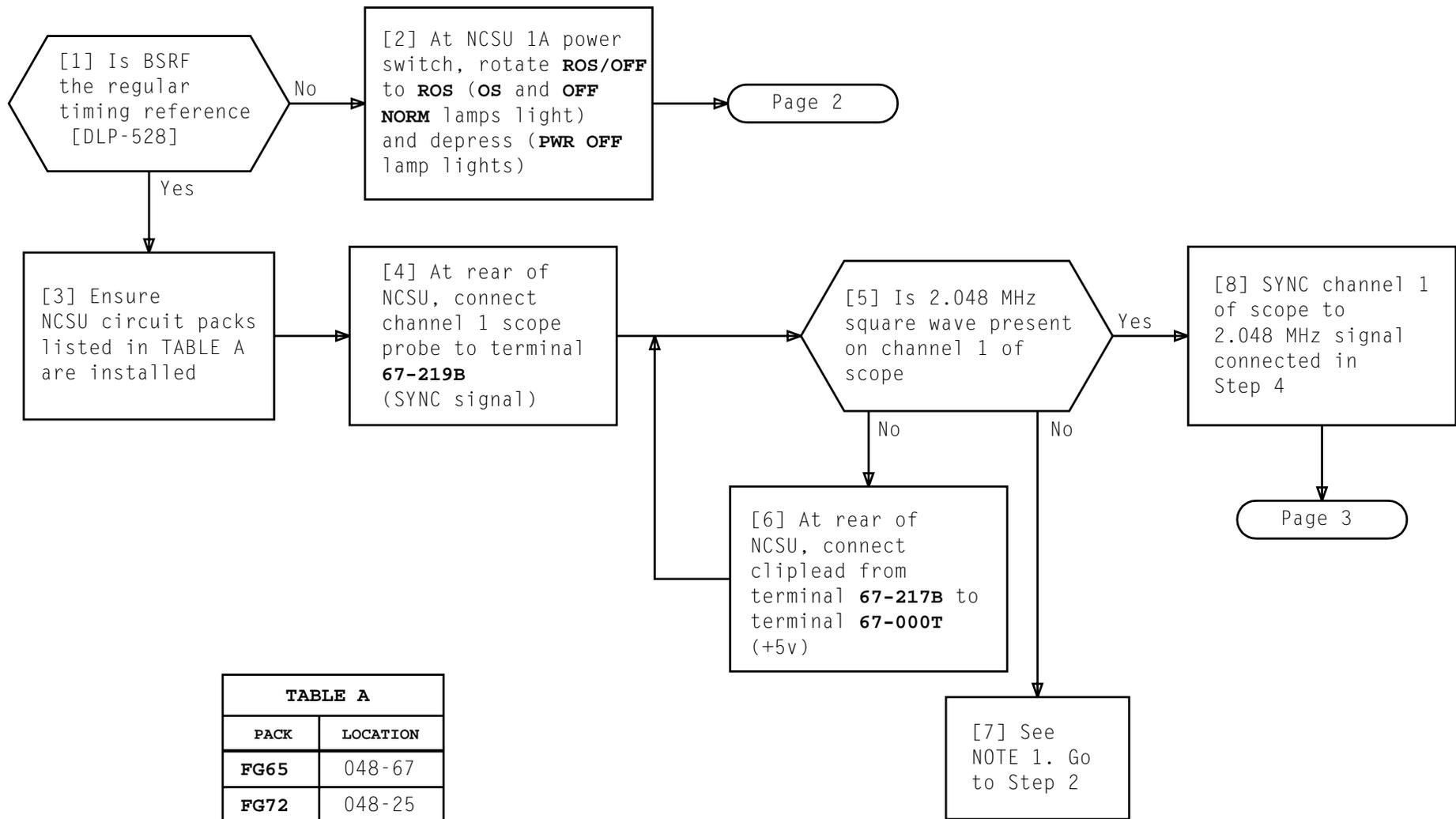


TABLE A	
PACK	LOCATION
FG65	048-67
FG72	048-25
FG76	048-27

NOTE 1	
BSRF is not operative. Alternate DS1A must be used	
Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 5	544

**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)

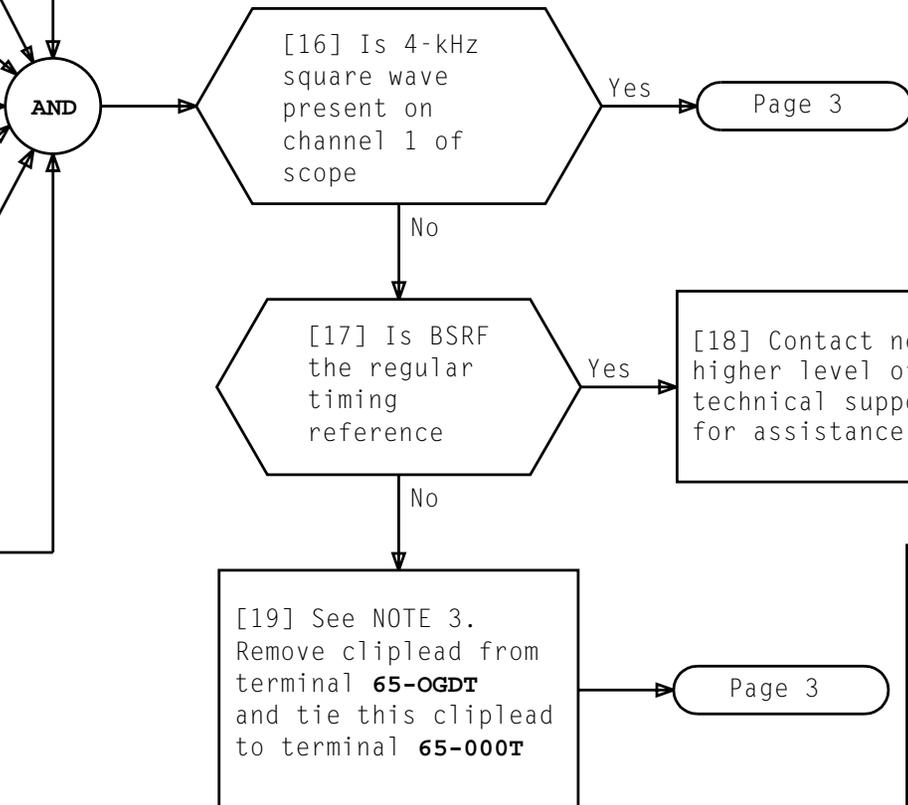
[13] Using cliplead, tie terminal 65-108T to terminal **OGDT**

[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

TABLE B	
PACK	LOCATION
<b>FG64</b>	050-65
<b>FG65</b>	050-67
<b>FG72</b>	050-25
<b>FG76</b>	050-27

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



**ALIGN DISCIPLINED RUBIDIUM OSCILLATOR FREQUENCY USING EXTERNAL REFERENCE**

NOTES	
2. SYNC channel 1 on negative edge of 4-kHz signal	
3. DS1A is not operative; alternate DS1B must be used	
Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 5	<b>544</b>

[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  $\mu$ s/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

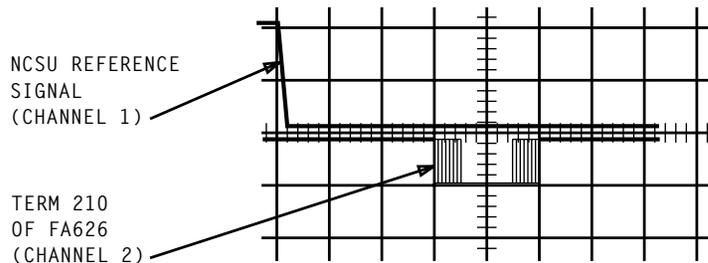
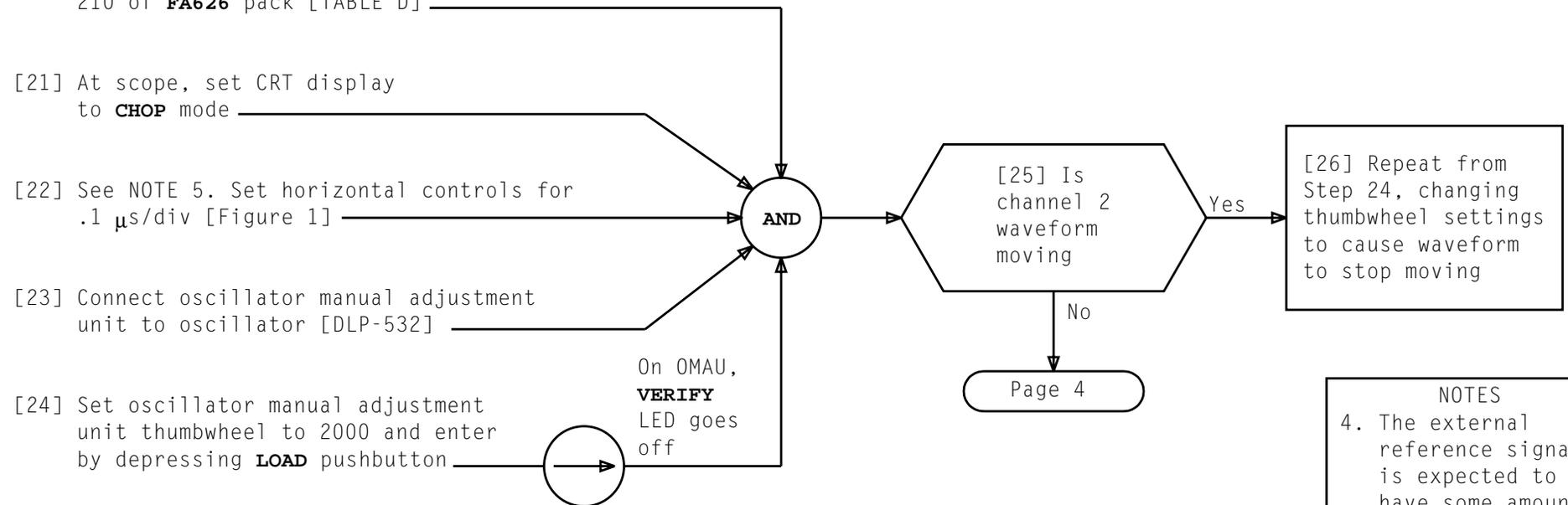


Figure 1

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



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

Page 4

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

Issue 2	SEP 1998
234-351-013	DLP
PAGE 3 of 5	<b>544</b>

**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]

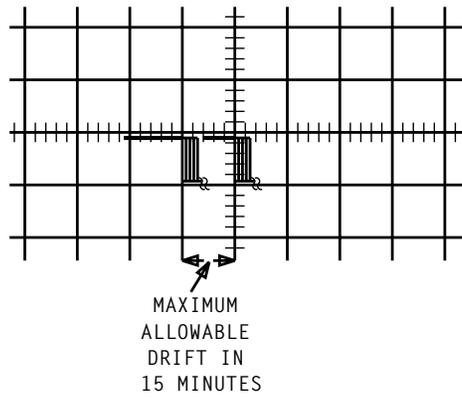
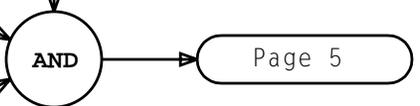
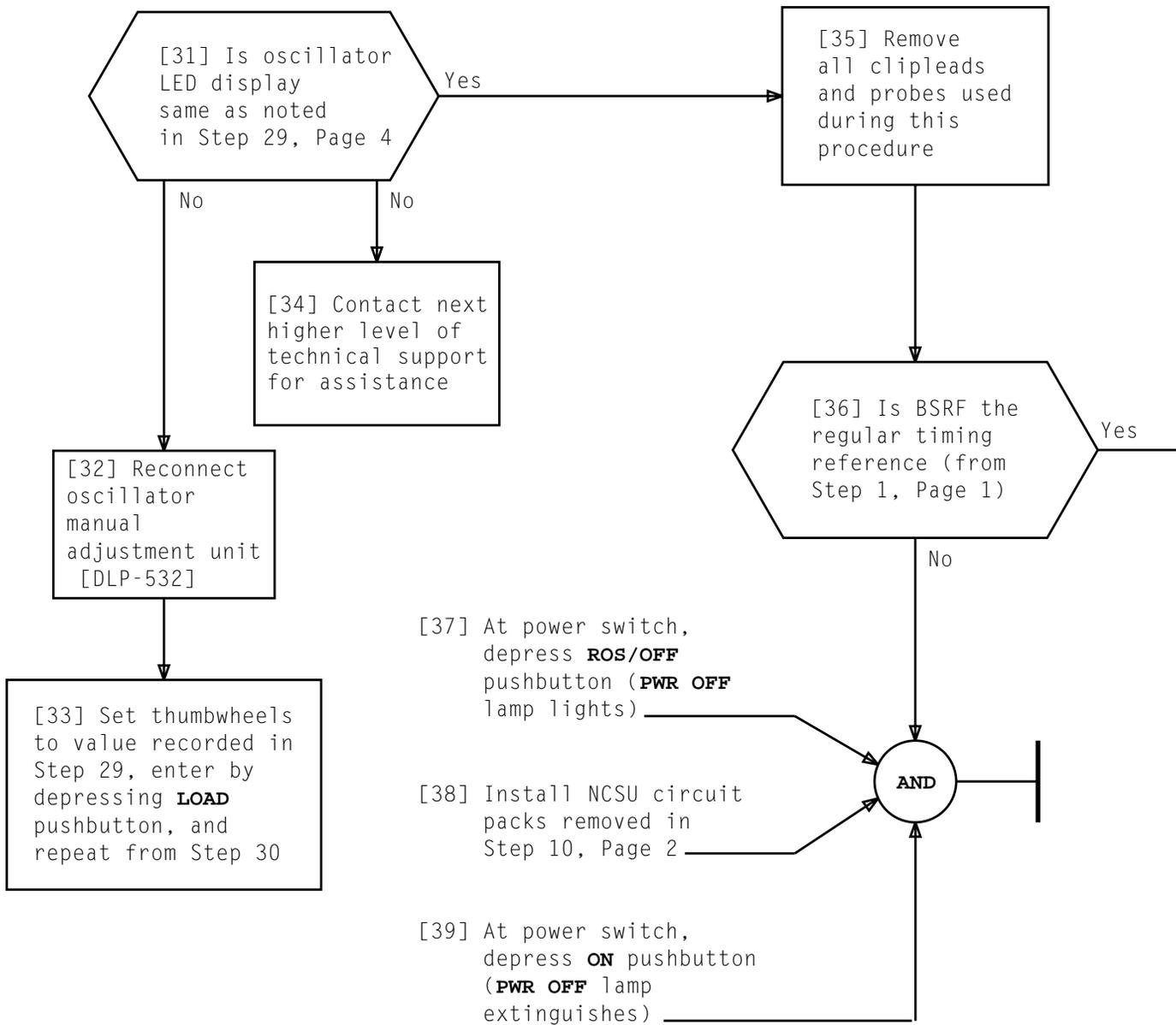


Figure 2

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	
Issue 2	SEP 1998
234-351-013	DLP
PAGE 4 of 5	<b>544</b>

**ALIGN DISCIPLINED RUBIDIUM OSCILLATOR FREQUENCY USING EXTERNAL REFERENCE**



**ALIGN DISCIPLINED RUBIDIUM OSCILLATOR FREQUENCY  
USING EXTERNAL REFERENCE**

[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

Page 2

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

[5] Is mate clock chain in service

Page 2

[6] Is result of restore

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

[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

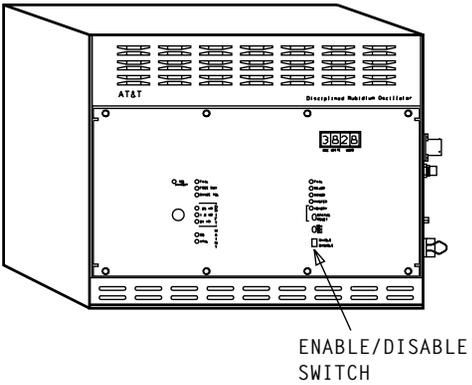


Figure 1 - Disciplined Rubidium Oscillator

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

[9] Ensure chain 00S;  
**ROS/OFF** switch is in **ROS** position

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

[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 **PHASE LOCK 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

**OS and OFF NORM** lamps go on

**PWR OFF** lamp goes on

Oscillator power removed

Defective oscillator removed

Page 3

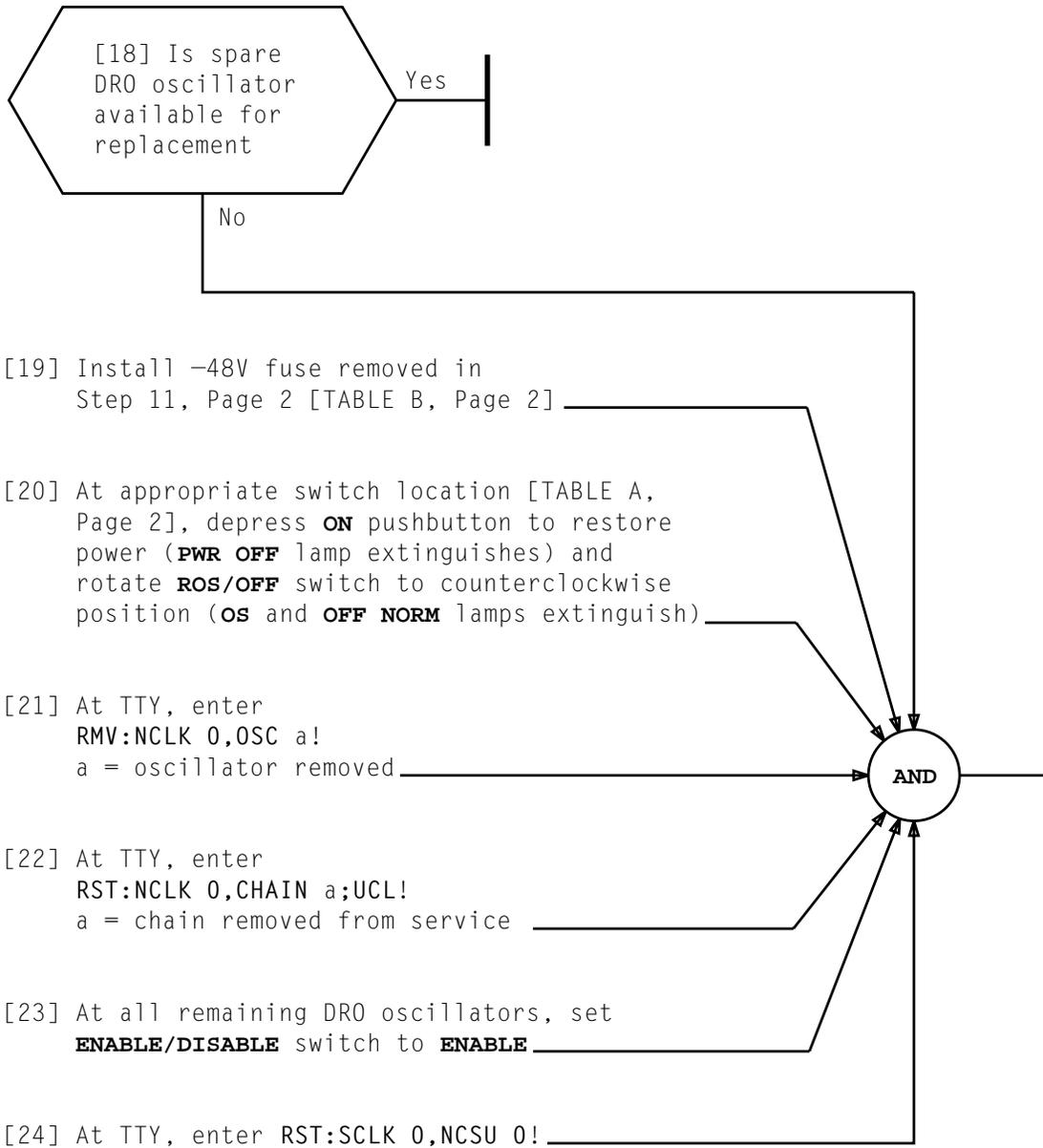
TABLE A	
CLOCK CHAIN	POWER SWITCH FRAME LOCATION
0	066-03
1	066-68
2	166-03
3	166-68

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*

Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 3	545

## REMOVE DRO OSCILLATOR



**REMOVE DRO OSCILLATOR**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 3 of 3	<b>545</b>

[1] See NOTE 1.  
Connect scope  
probe to terminal  
201 on **FB687** pack  
[TABLE A]

[2] Is waveform  
between 0.5 volt  
and 0.9 volt  
peak-to-peak with  
NCLK chain powered  
down [NOTE 2]

[3] Remove probe from  
terminal 201 on  
**FB687** pack

[4] See NOTE 3. At power  
switch associated with  
clock chain removed from  
service [TABLE A], depress  
**ON** pushbutton (**PWR OFF**  
lamp extinguishes)

[5] Connect scope probe  
to terminal 018 of  
**FB214** pack associated with  
clock chain removed from  
service [TABLE A]

AND

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

Page 5

Page 2

Page 4

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

Issue 2 | SEP 1998

234-351-013 | DLP

PAGE 1 of 8 | 546

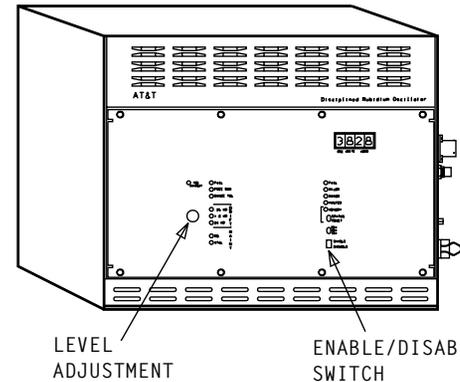
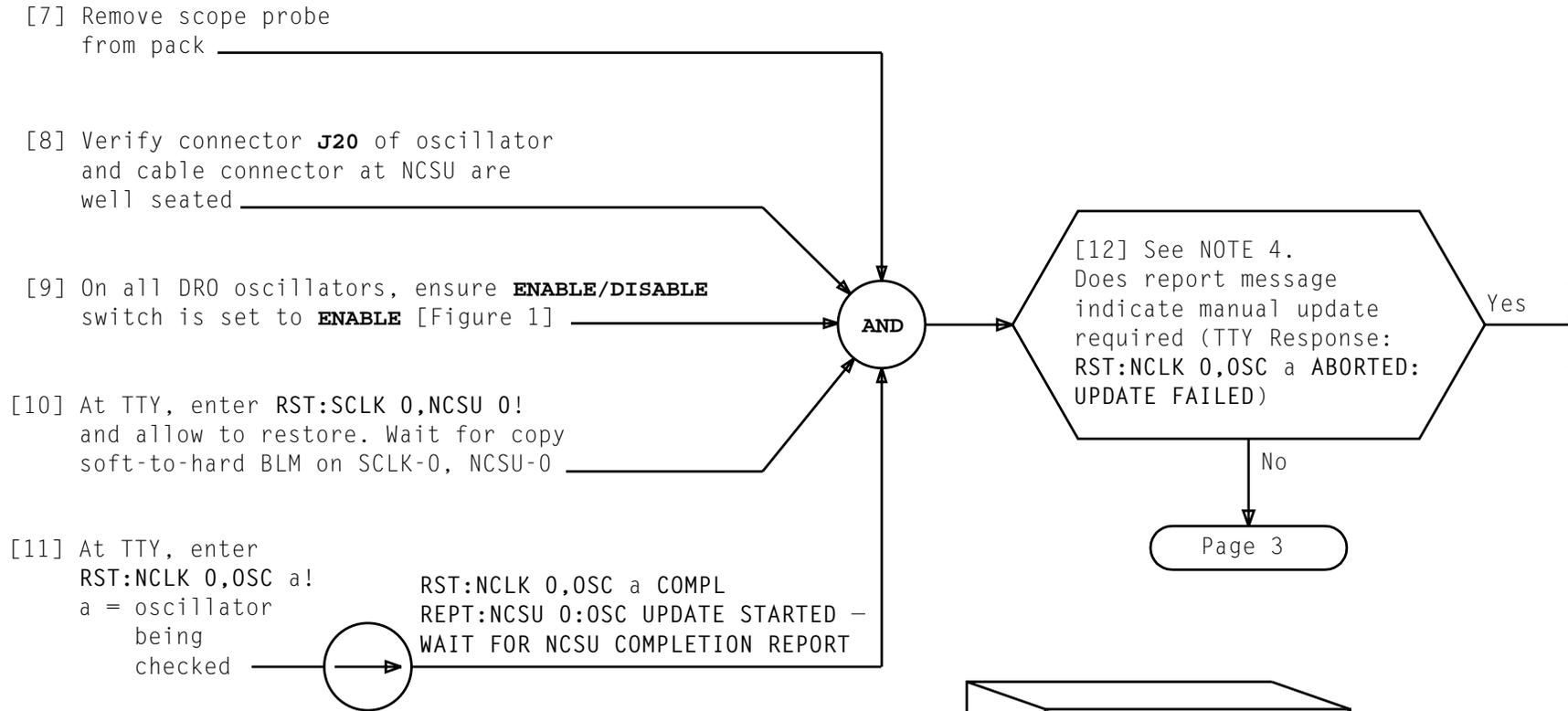
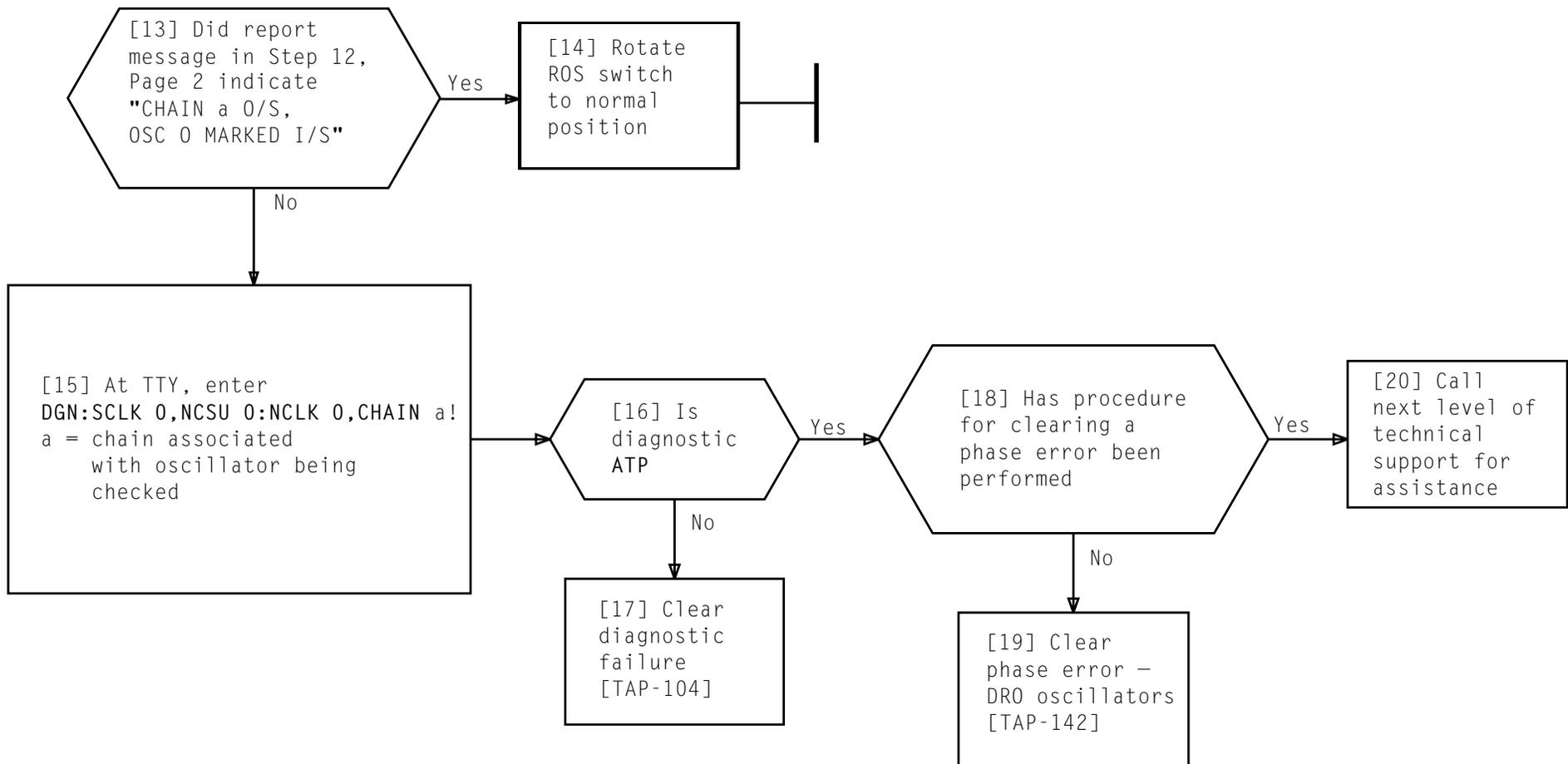
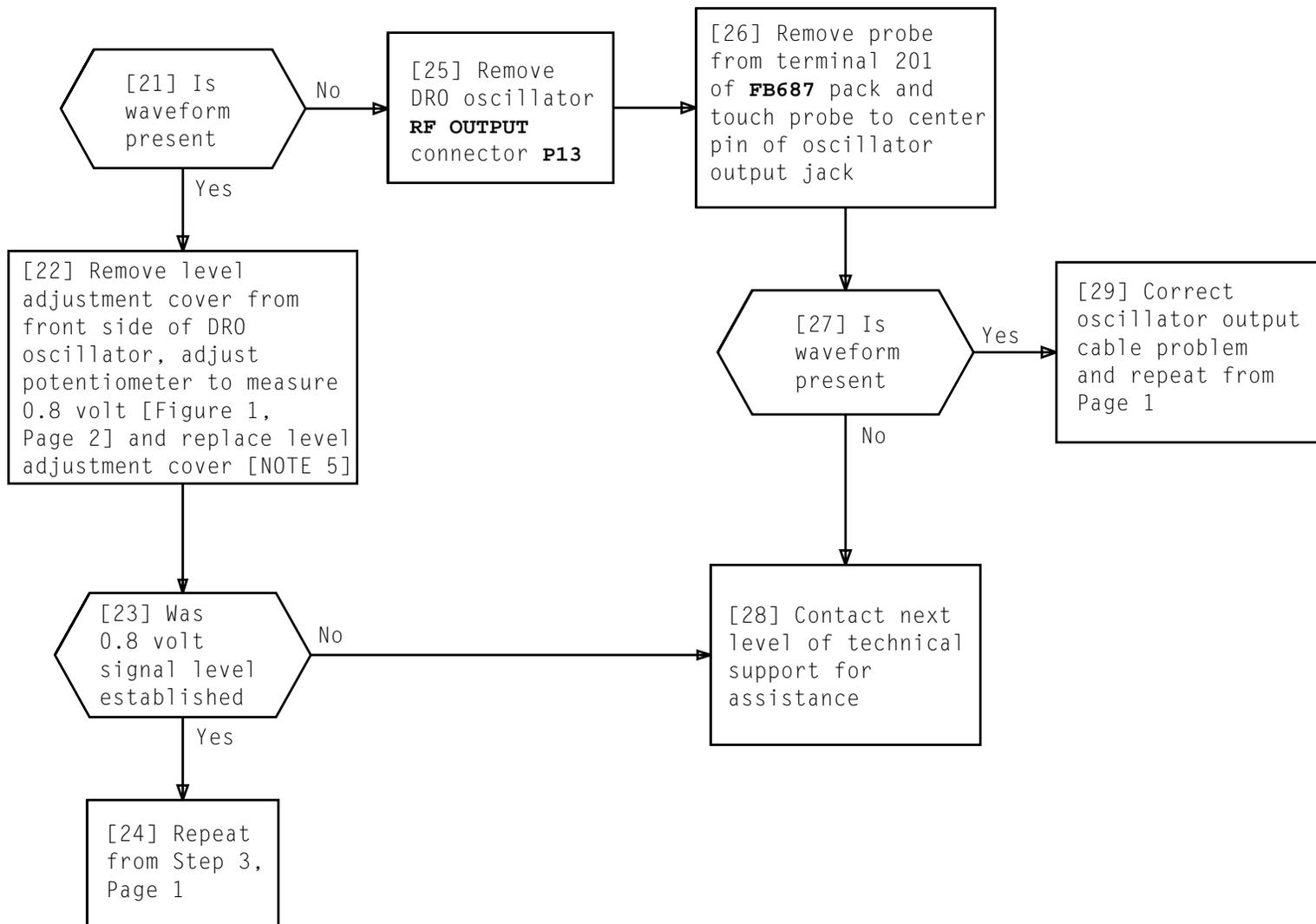


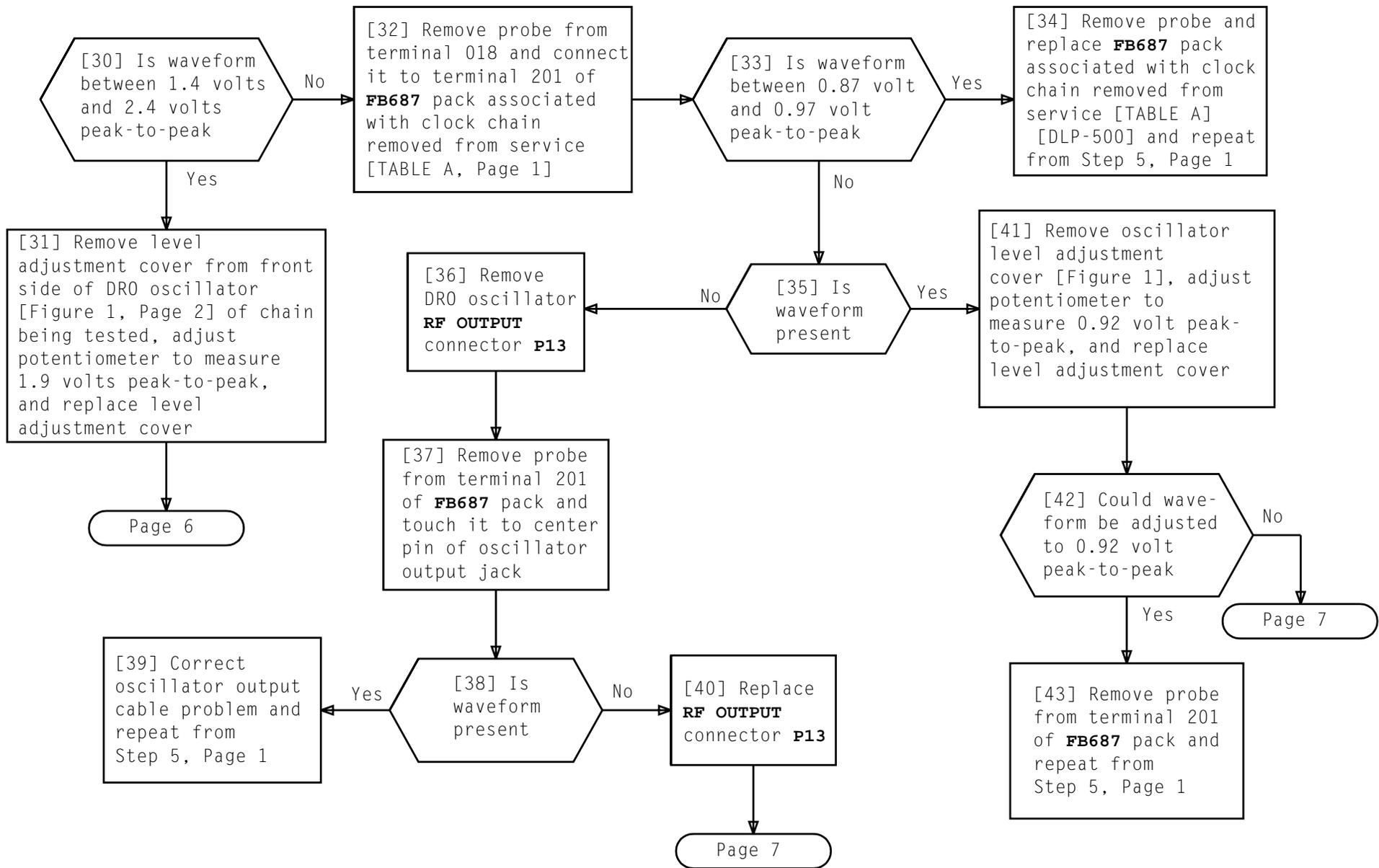
Figure 1 - Disciplined Rubidium Oscillator

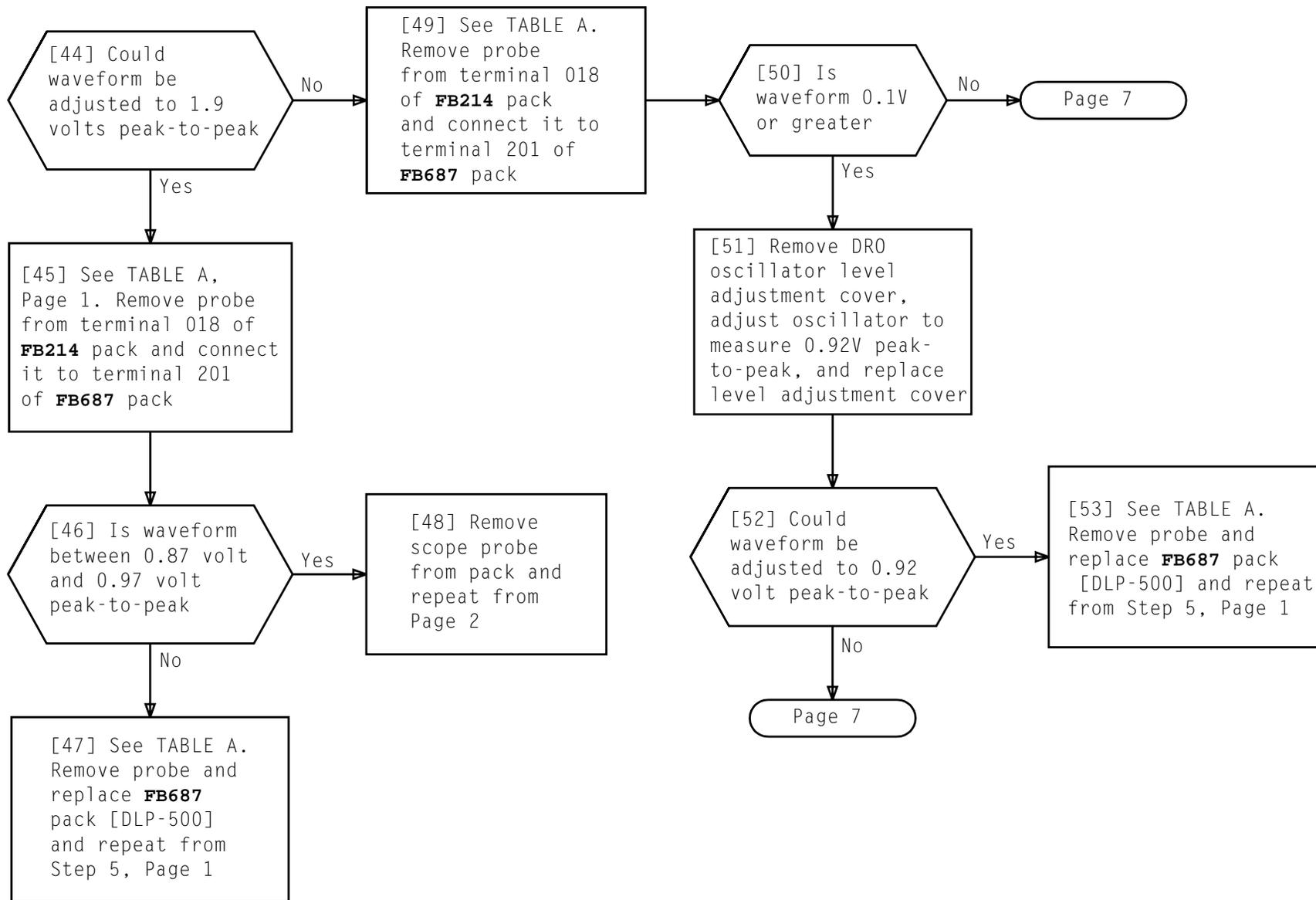
NOTE 4	
May take 5 minutes to receive report message	
Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 8	546



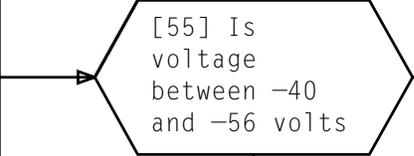


NOTE 5	
This is a preliminary level adjustment to establish that oscillator is operational	
Issue 2	SEP 1998
234-351-013	DLP
PAGE 4 of 8	<b>546</b>





[54] On back of fuse panel, measure -DC voltage between fuse output and frame ground [TABLE B]



[56] Clear power problem [SD-4A014-02]

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

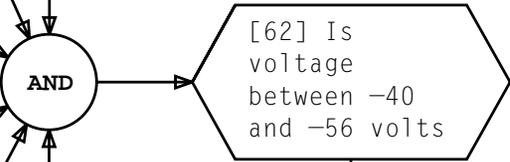
[57] Depress **ROS/OFF** switch to remove power from chain being checked (**PWR OFF** lamp lights)

[58] Remove -48 volt fuse [TABLE B]

[59] Disconnect **POWER INPUT** connector **P19** from oscillator being replaced

[60] Replace fuse removed in Step 58

[61] Measure -DC voltage between terminals **C** and **B** of power connector removed from oscillator with positive probe on terminal **C**



[63] Clear power problem [SD-4A014-02]

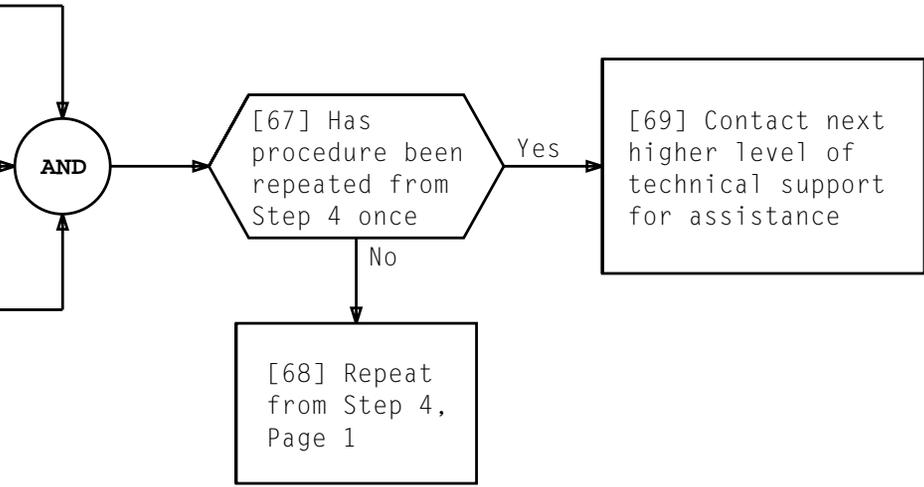
Page 8

CHECK DISCIPLINED RUBIDIUM OSCILLATOR

[64] Remove -48 volt fuse removed in Step 58, Page 7

[65] Reconnect **POWER** connector **P19** to oscillator

[66] Replace fuse removed in Step 64



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

[2] At power switch [TABLE A], note position of **ROS/OFF** switch

[3] Rotate **ROS/OFF** switch to **ROS**

[4] See NOTE 1. Connect scope probe to terminal 018 of **FB214** pack associated with clock chain removed from service [TABLE A]

OS and OFF  
NORM lamps  
light

AND

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

Yes

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

No

Page 2

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

Issue 2 | SEP 1998

234-351-013 | DLP

PAGE 1 of 2 | 547

[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

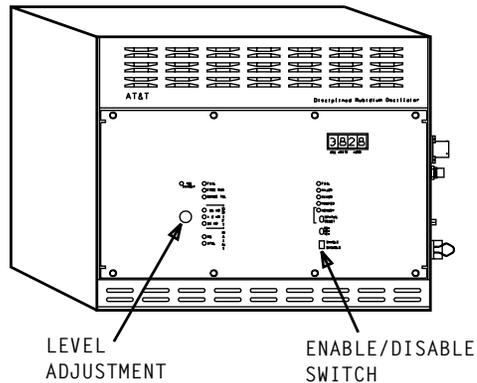
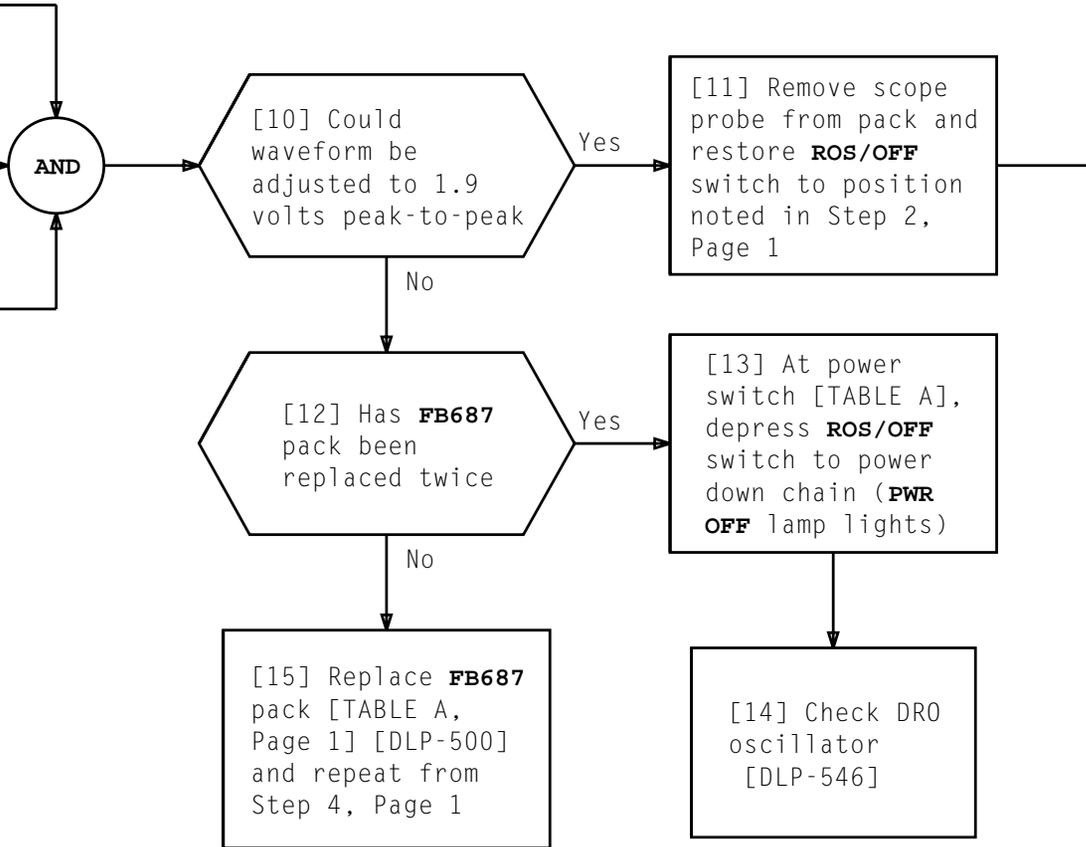


Figure 1 - Disciplined Rubidium Oscillator



Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 2	547

[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

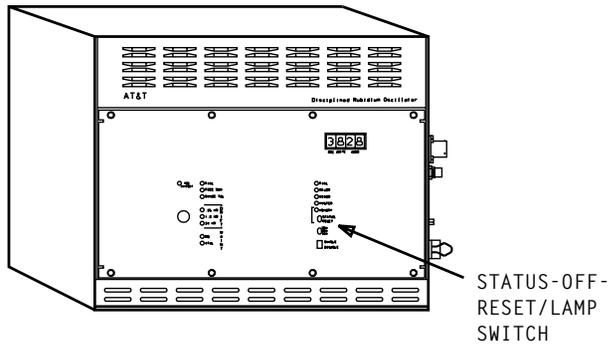
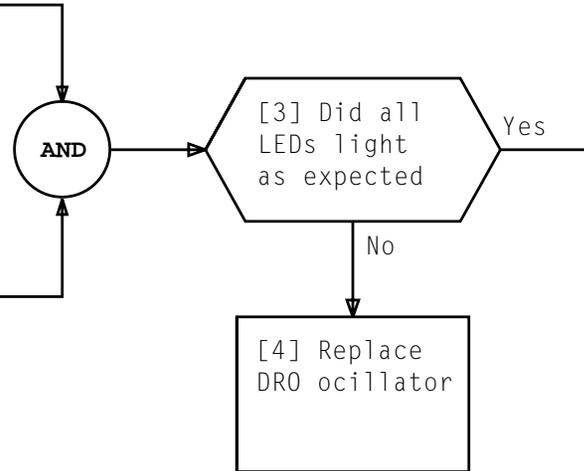
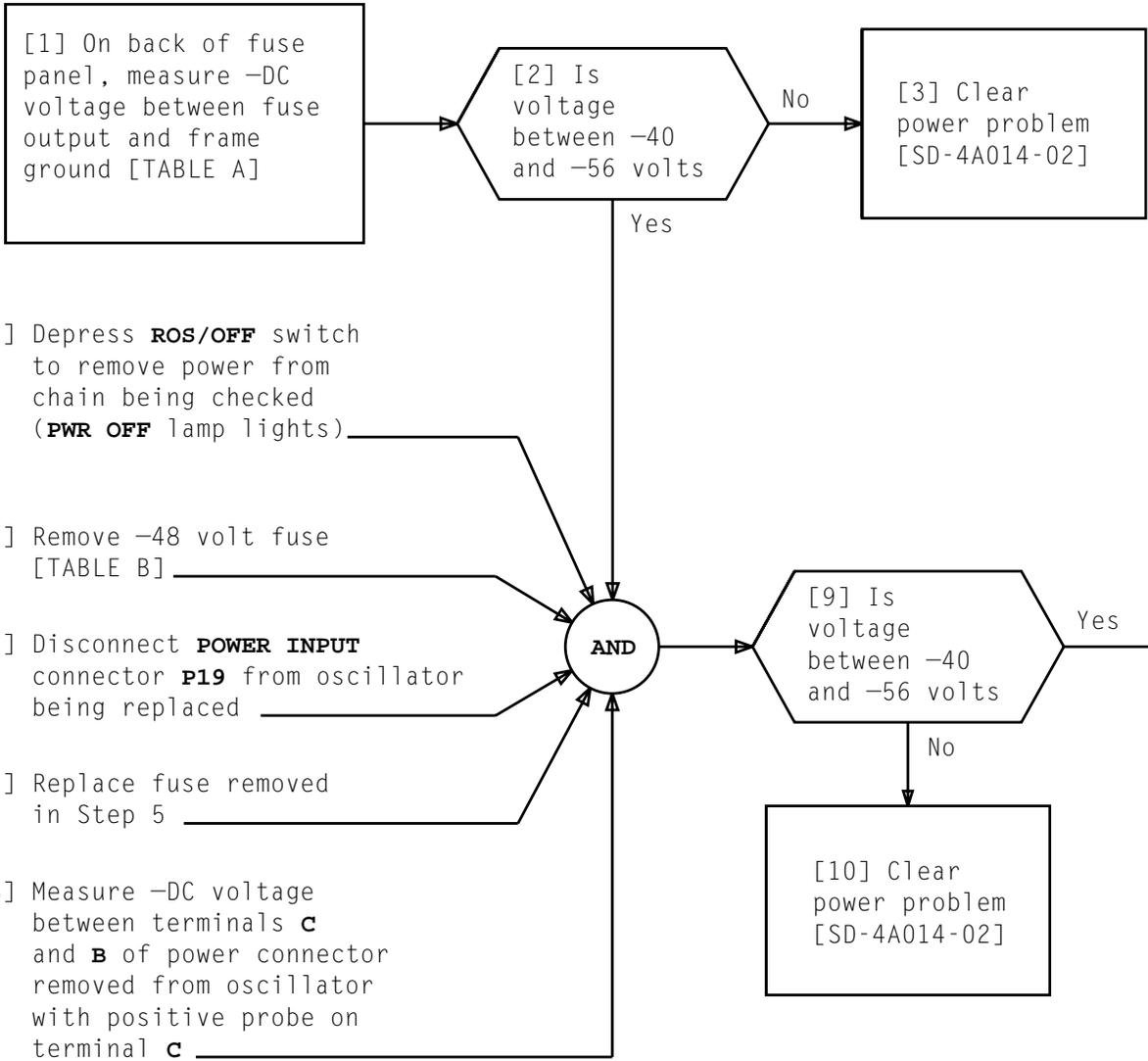


Figure 1 – Disciplined Rubidium Oscillator

NOTE 1	
TOS INHIBIT LED and two FAIL LEDs are not tested	
Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 1	<b>548</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 -48V POWER

[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]

[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]

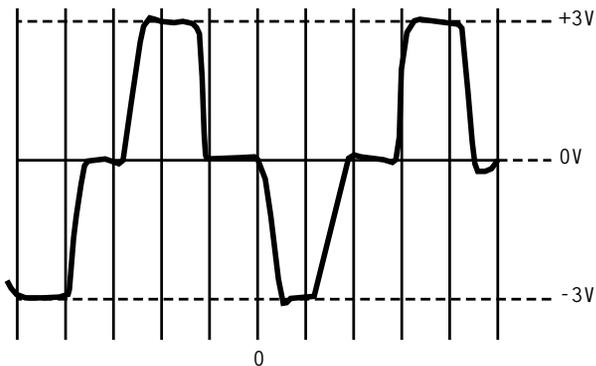
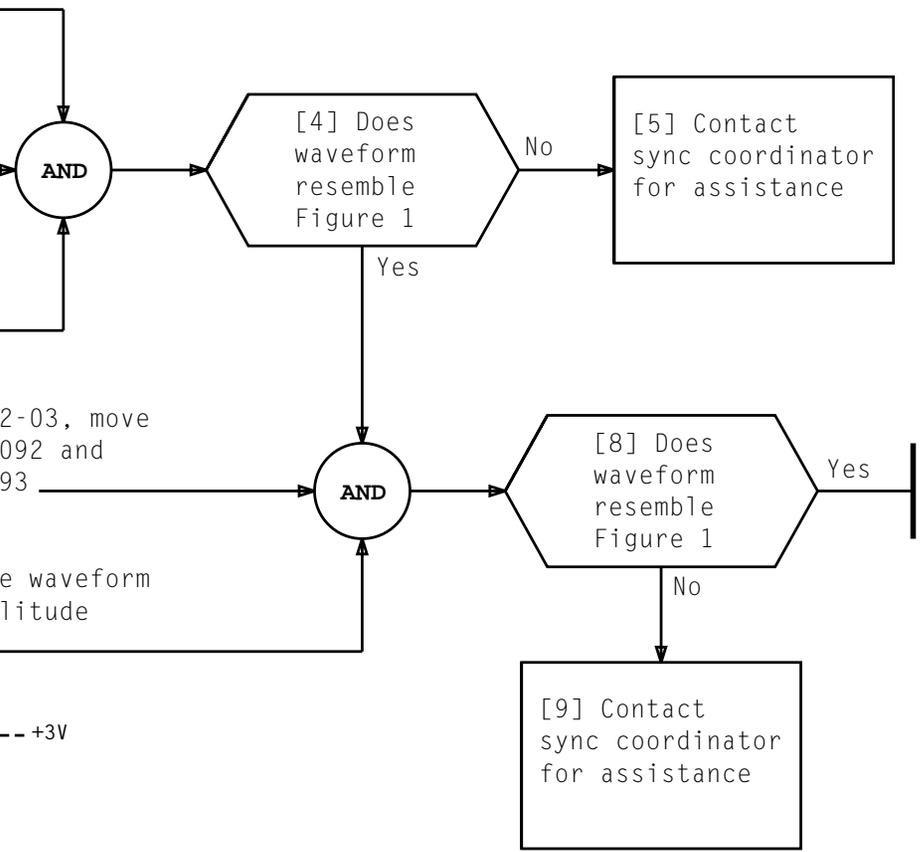


Figure 1 - Typical DS1 Sync Reference Signal  
Vert = 2V/DIV, Horiz = 0.1 μs/DIV



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*

Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 1	550

**CHECK DS1 SYNC REFERENCE SIGNAL**

- [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

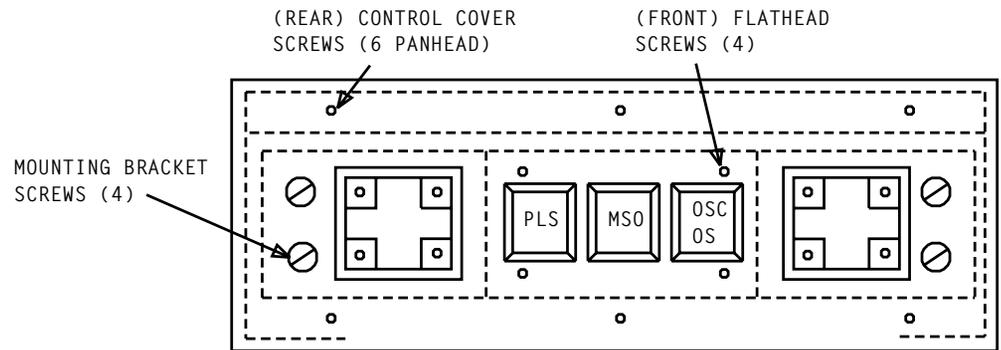


Figure 1 - Network Clock Control

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

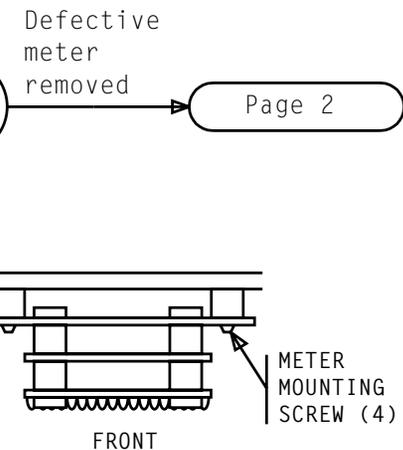


Figure 2 - Mounted Meter - Top View

TABLE A	
COMMON NAME	PART NUMBER
Screw-starter	Kedman Co., No. 1253 or equivalent
Grounded tip soldering iron	-
Meter, 50-0-50UA DC 24V	ED4A057-10,G3

**REPLACE PHASE METER OR PHASE LOCK OVEN TEMP METER  
ED4A057-10,G1 LED DISPLAY METER**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 2	551

[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

[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

[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

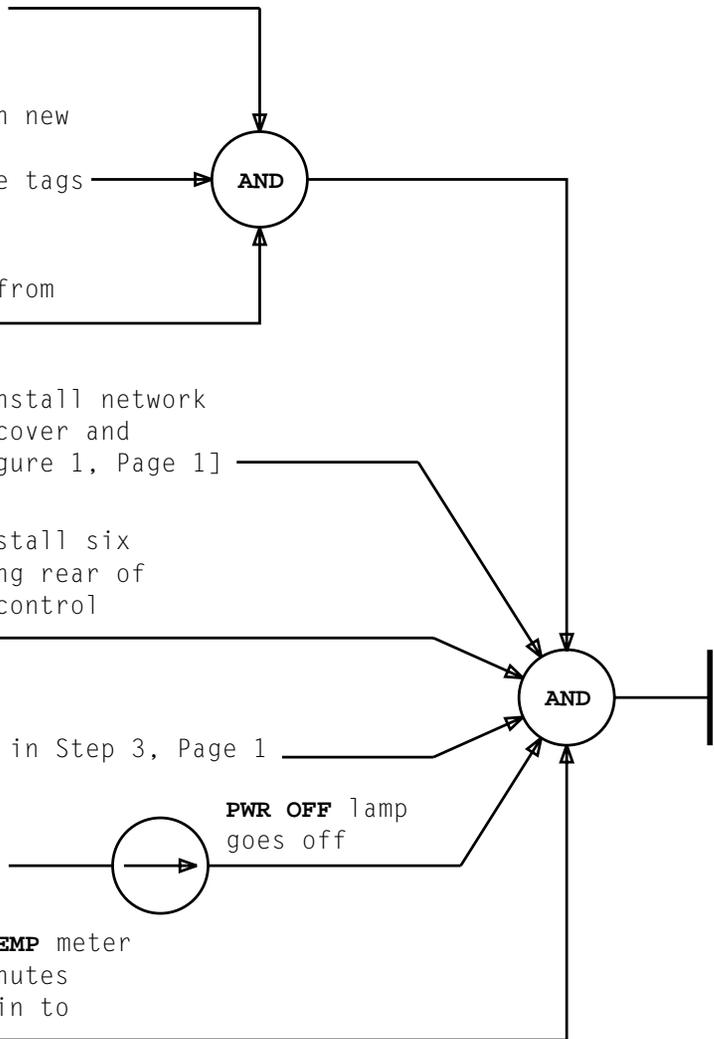


TABLE B			
CLOCK CHAIN	METER	FUSE	LOCATION
0	PHASE	BC	009-32
	OVEN	B9	007-45
1	PHASE	BD	009-39
	OVEN	A10	007-32
2	PHASE	BC	109-32
	OVEN	B9	107-45
3	PHASE	BD	109-39
	OVEN	A10	107-32

**REPLACE PHASE METER OR PHASE LOCK OVEN TEMP METER  
ED4A057-10,G1 LED DISPLAY 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

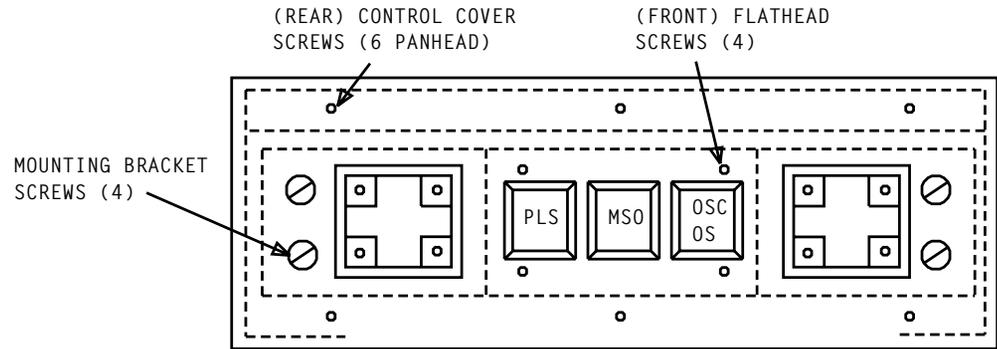


Figure 1 - Network Clock Control

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

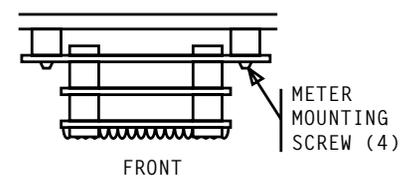


Figure 2 - Mounted Meter - Top View

AND

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	ED4A057-10,G3

**REPLACE PHASE METER OR PHASE LOCK OVEN TEMP METER  
ED4A057-10,G2 LED DISPLAY METER**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 2	552

[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

[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

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

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

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

PWR OFF lamp goes off

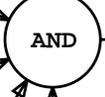


TABLE B			
CLOCK CHAIN	METER	FUSE	LOCATION
0	PHASE	BC	009-32
	OVEN	B9	007-45
1	PHASE	BD	009-39
	OVEN	A10	007-32
2	PHASE	BC	109-32
	OVEN	B9	107-45
3	PHASE	BD	109-39
	OVEN	A10	107-32

**REPLACE PHASE METER OR PHASE LOCK OVEN TEMP METER  
ED4A057-10,G2 LED DISPLAY METER**

- [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

Leads tagged and removed

Page 2

TABLE A	
COMMON NAME	PART NUMBER
Screw-starter	Kedman Co., No. 1253 or equivalent
Grounded tip soldering iron	-
<b>MSO</b> pushbutton indicator or <b>PLS</b> pushbutton indicator or <b>OSC OS</b> lamp	ED4A057-10,G5 ED4A057-10,G4 ED4A057-10,G6

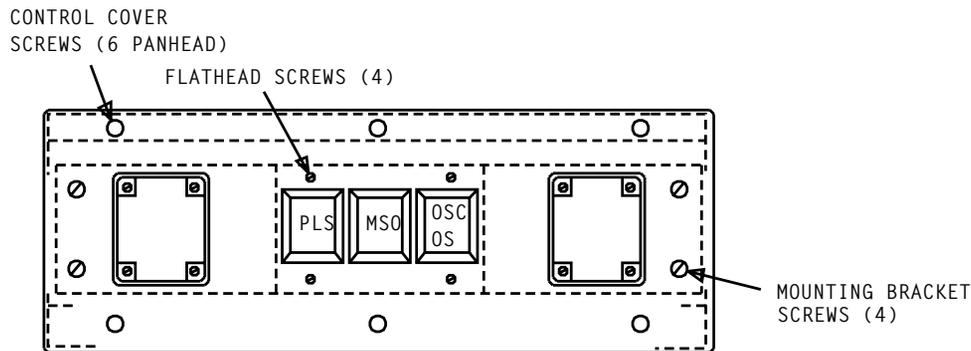


Figure 1 - Network Clock Control

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 - ED4A057-10,G1 SQUARE SHAPED**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 2	553

- [8] Unscrew retaining nut of defective switch/lamp assembly, remove rear mounting adapter and push defective assembly along with front mounting adaptor out front of mounting bracket
- [9] See Figure 2. Install new switch/lamp assembly in mounting bracket using front (tabbed) and rear (flat) mounting adapters
- [10] Cut and strip leads to be connected by soldering
- [11] See Figures 2 and 3. Solder leads to new switch/lamp assembly and remove tags
- [12] With mounting bracket held in place at front of frame, install four mounting screws at rear of frame
- [13] At front of frame, install NCLK control cover and four flathead screws [Figure 1]
- [14] At rear of frame, install six panhead screws holding rear of NCLK chain control cover

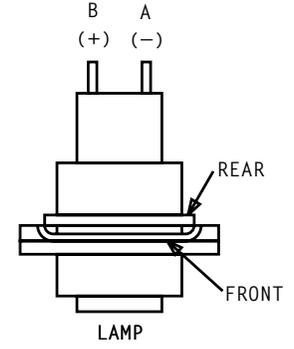
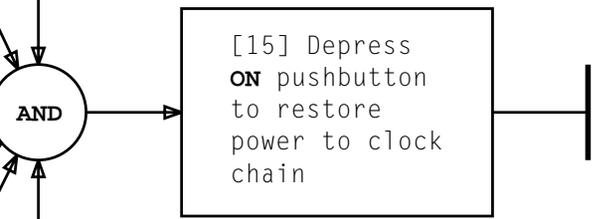


Figure 2 - Example of Mounting Adapters

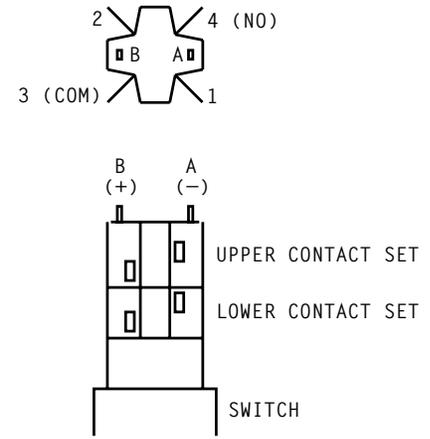


Figure 3 - Example of Switch Leads

**REPLACE METER SOLENOID OPERATE SWITCH, PHASE LOCK SHUNT SWITCH, OR OSC OS LAMP ASSEMBLY - ED4A057-10,G1 SQUARE SHAPED**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 2	553

- [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

Leads tagged and removed

Page 2

TABLE A	
COMMON NAME	PART NUMBER
Screw-starter	Kedman Co., No. 1253 or equivalent
Grounded tip soldering iron	-
<b>MSO</b> pushbutton indicator or <b>PLS</b> pushbutton indicator or <b>OSC OS</b> lamp	ED4A057-10,G5 ED4A057-10,G4 ED4A057-10,G6

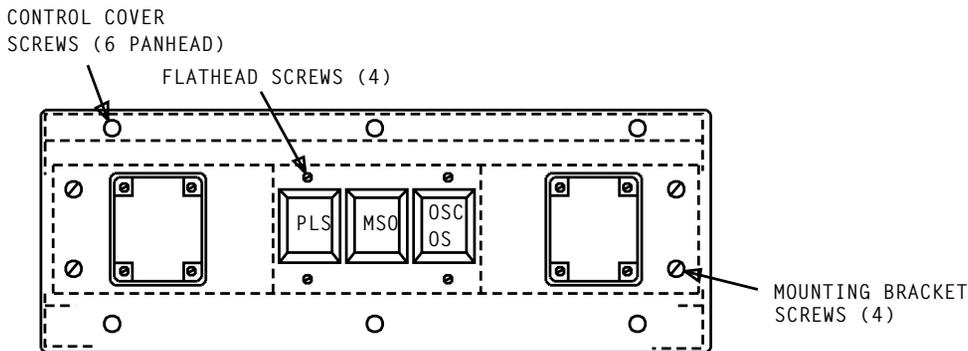


Figure 1 - Network Clock Control

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 - ED4A057-10,G2 SQUARE SHAPED**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 1 of 2	<b>554</b>

[8] Unscrew retaining nut of defective switch/lamp assembly, remove rear mounting adapter and push defective assembly along with front mounting adaptor out front of mounting bracket

[9] See Figure 2. Install new switch/lamp assembly in mounting bracket using front (tabbed) and rear (flat) mounting adapters

[10] Cut and strip leads to be connected by soldering

[11] See Figures 2 and 3. Solder leads to new switch/lamp assembly and remove tags

[12] With mounting bracket held in place at front of frame, install four mounting screws at rear of frame

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

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

AND

[15] Depress ON pushbutton to restore power to clock chain

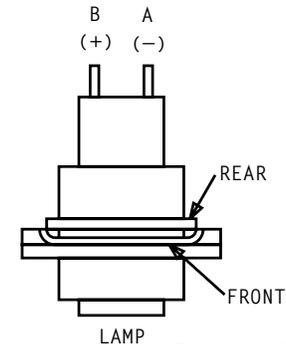


Figure 2 - Example of Mounting Adapters

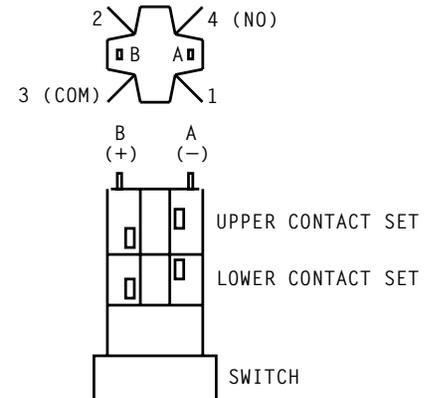


Figure 3 - Example of Switch Leads

**REPLACE METER SOLENOID OPERATE SWITCH, PHASE LOCK SHUNT SWITCH, OR OSC OS LAMP ASSEMBLY - ED4A057-10,G2 SQUARE SHAPED**

Issue 2	SEP 1998
234-351-013	DLP
PAGE 2 of 2	554

ITEM	ISSUE	ITEM	ISSUE	ITEM	ISSUE	ITEM	ISSUE	ITEM	ISSUE	ITEM	ISSUE
• IXL-001 NTP-002 NTP-003 • NTP-004 • NTP-005		TAP-123 TAP-124 TAP-125 TAP-126 • TAP-127		DLP-505 DLP-506 DLP-507 DLP-508 • DLP-509		DLP-540 DLP-541 DLP-542 DLP-543 DLP-544					
NTP-006 NTP-007 NTP-008 NTP-009 NTP-010		• TAP-128 • TAP-129 TAP-130 ISD-131 TAP-132		DLP-510 DLP-511 DLP-512 • DLP-513 • DLP-514		DLP-545 DLP-546 DLP-547 DLP-548 DLP-549					
NTP-011 NTP-012 TAD-100 TAD-101 TAP-102		TAP-133 • TAP-134 TAP-135 TAP-136 TAP-137		• DLP-515 • DLP-516 DLP-517 DLP-518 DLP-519		DLP-550 • DLP-551 • DLP-552 • DLP-553 • DLP-554					
TAP-103 TAP-104 TAP-105 TAP-106 TAP-107		TAP-138 TAP-139 TAP-140 TAP-141 • TAP-142		DLP-520 DLP-521 DLP-522 DLP-523 DLP-524		• CKL-891 TNG-893					
TAP-108 TAP-109 TAP-110 TAP-111 TAP-112		TAP-143 TAP-144 • ISD-145 • ISD-146 • TAP-147		DLP-525 DLP-526 DLP-527 DLP-528 DLP-529							
TAP-113 TAP-114 • ISD-115 • ISD-116 • ISD-117		• TAP-148 • ISD-149 • ISD-150 • TAP-151 • TAP-152		DLP-530 DLP-531 DLP-532 DLP-533 DLP-534							
• TAP-118 • ISD-119 • ISD-120 • ISD-121 • TAP-122		DLP-500 DLP-501 DLP-502 DLP-503 DLP-504		DLP-535 DLP-536 DLP-537 DLP-538 • DLP-539							

• REVISED OR ADDED ITEM

CANCELED ITEM

Issue 2 | SEP 1998

234-351-013

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PAGE 1 of 1

891

**CHECKLIST**