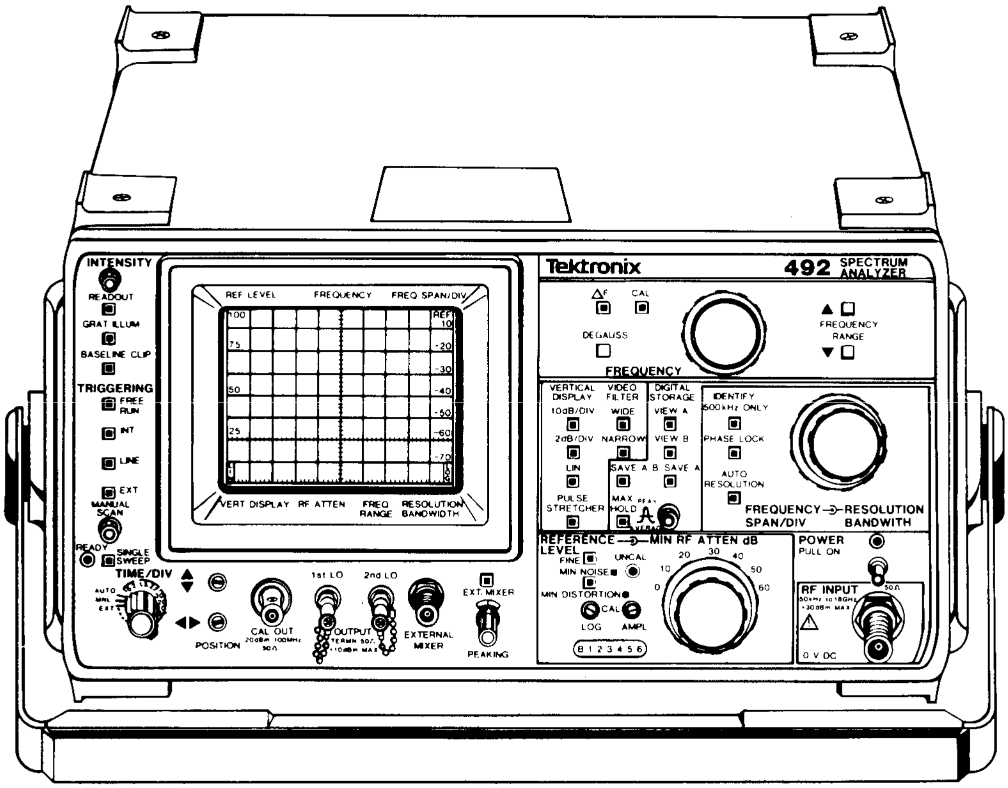
TECHNICAL MANUAL

GENERAL SUPPORT MAINTENANCE



This publication is required for official use or for administrative or operational purposes only. Distribution is limited to US Government Agencies. Other requests for this document must be referred to Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-P, Fort Monmouth, NJ 07703-5000.

SPECTRUM ANALYZER
AN/USM-489(V)1
(6625-01-079-9495)

HEADQUARTERS, DEPARTMENT OF THE ARMY

1 MARCH 1987

5 SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

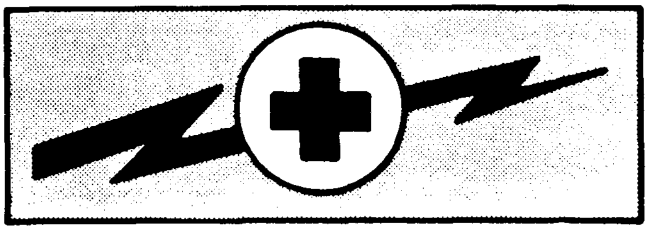
1 DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

2 IF POSSIBLE, TURN OFF THE ELECTRICAL POWER

3 IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH, OR LIFT THE PERSON TO SAFETY USING A WOODEN POLE OR A ROPE OR SOME OTHER INSULATING MATERIAL

4 SEND FOR HELP AS SOON AS POSSIBLE

5 AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION



WARNING

HIGH VOLTAGE

is used in the operation of this equipment

DEATH ON CONTACT

may result if personnel fail to observe safety precautions

Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When technicians are aided by operators, they must be warned about dangerous areas.

Be careful not to contact high-voltage connections of 115-volt ac input connections when installing or operating this equipment.

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.

WARNING

Do not be misled by the term "low voltage". Potentials as low as 50 volts may cause death under adverse conditions.

For Artificial Respiration, refer to FM 21-11

WARNING

A periodic review of safety precautions in TB 385-4, Safety Precautions for Maintenance of Electrical/Electronic Equipment is recommended. When the equipment is operated with covers removed, DO NOT TOUCH exposed connections or components. MAKE CERTAIN you are not grounded when making connections or adjusting components inside the test instrument.

WARNING

Hot equipment parts can cause serious burns. Before working on equipment that has just been shut down, allow equipment to cool.

Technical Manual

No. 11-6625-3136-40

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 1 March 1987

GENERAL SUPPORT MAINTENANCE MANUAL
SPECTRUM ANALYZER AN/USM-489(V)1
(NSN 6625-01-079-9495)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2, located in the back of this manual direct to: Commander, US Army Communications-Electronics Command, and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, NJ 07703-5000

In either case, a reply will be furnished direct to you.

TABLE OF CONTENTS

CONTENTS (Cont'd)

HOW TO USE THIS MANUAL

Spend a few minutes looking through this manual. It has a new look that is very different from the manuals you've been using. You'll find the new look is a lot easier to use, and you can find what you're looking for a lot faster. We got rid of as many words as we could and put in lots of pictures to show just about everything you'll be doing to troubleshoot and repair your equipment. So **HOW DO YOU USE THIS MANUAL?**

Like this:

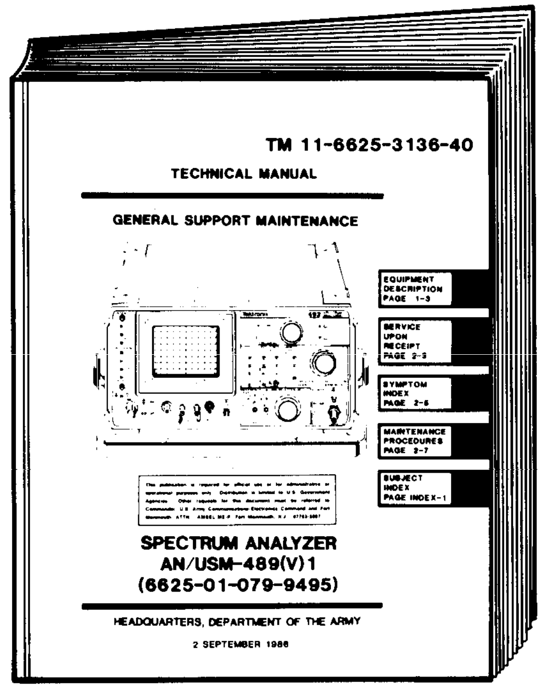
1. Suppose you want to fix the spectrum analyzer.

2. Look at the cover and you'll see index boxes near the right-hand edge with subject titles next to them. You'll find **"SYMPTOM INDEX PAGE 2-5."** You can skip over to page 2-5.

or

3. Bend the pages a bit and look at the edges. You'll see black bars on some of the pages that are lined up with the index boxes on the cover.

4. If you put your thumbnail on the black bar that is lined up with the index box on the cover for **SYMPTOM INDEX** and open the manual, you'll be on page 2-5.

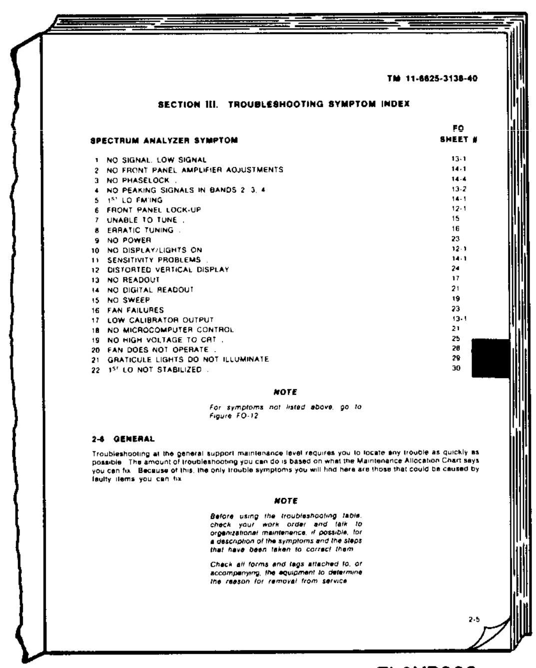


EL9VP001

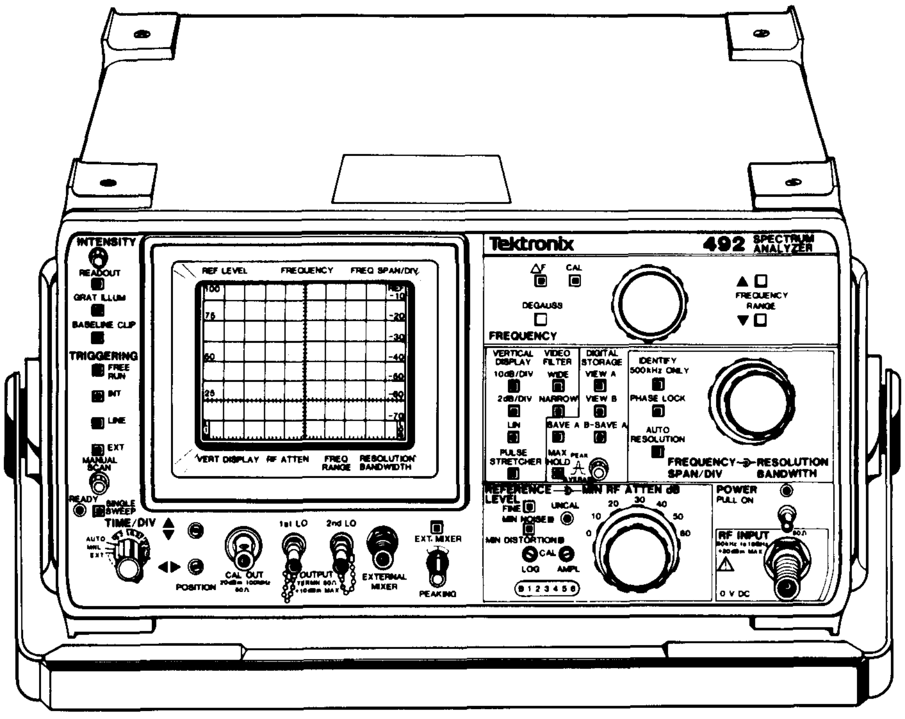
5. On page 2-5, you'll find the troubleshooting symptom index. Now you're ready to begin.

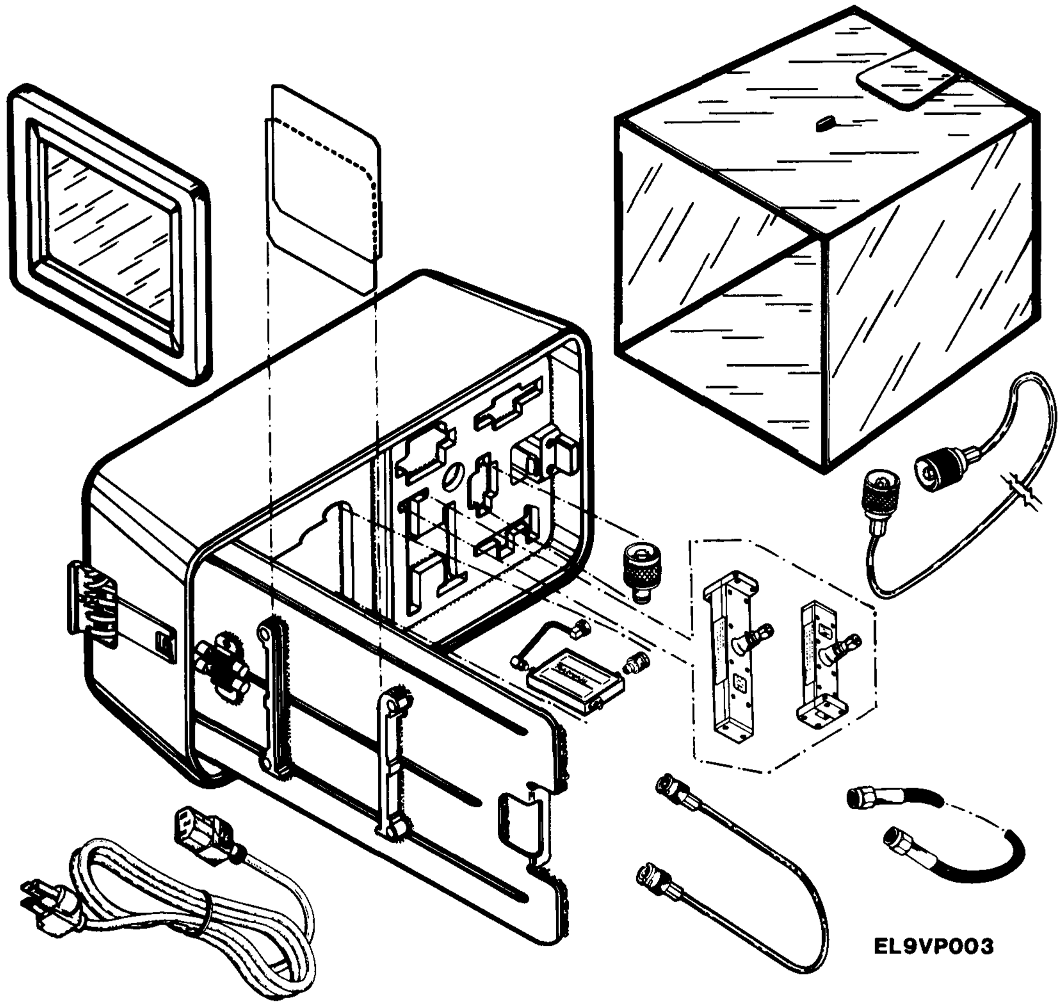
6. Look down the symptom column until you find the symptom, in this case **"No power"** and it gives you FO-23.

7. Turn to FO-23 and follow the flowchart.



EL9VP002


Tektronix
492 SPECTRUM ANALYZER
INTENSITY
READOUT
GRAT ILLUM
BASELINE CLIP
TRIGGERING
FREE RUN
INT
LINE
EXT
MANUAL SCAN
READY
SINGLE SWEEP
TIME/DIV
POSITION
CAL OUT
1st LO
2nd LO
OUTPUT
EXT. MIXER
EXTERNAL MIXER
PEAKING
REF LEVEL
FREQUENCY
FREQ SPAN/DIV
VERT DISPLAY
RF ATTEN
FREQ RANGE
RESOLUTION BANDWIDTH
CAL
DEGAUSS
FREQUENCY
FREQUENCY RANGE
VERTICAL DISPLAY
10dB/DIV
2dB/DIV
LIN
PULSE STRETCHER
VIDEO FILTER
WIDE
NARROW
DIGITAL STORAGE
VIEW A
VIEW B
SAVE A
B-SAVE A
MAX HOLD
IDENTIFY 500kHz ONLY
PHASE LOCK
AUTO RESOLUTION
FREQUENCY RESOLUTION
SPAN/DIV
BANDWITH
REFERENCE LEVEL
MIN RF ATTEN dB
FINE
UNCAL
MIN NOISE
MIN DISTORTION
CAL
LOG
AMPL
POWER
PULL ON
RF INPUT
0 V DC



EL9VP003

CHAPTER 1

INTRODUCTION

SECTION I. GENERAL INFORMATION

1-1 SCOPE

This manual contains general support maintenance instructions for Spectrum Analyzer AN/USM-489(V)1. This manual includes procedures for removal, replacement, disassembly, cleaning, inspection, repair, test, and adjustment as authorized by the Maintenance Allocation Chart (MAC). Information is provided for maintenance of the spectrum analyzer that is beyond the scope of tools, equipment, personnel, or supplies normally available to the operator or organizational maintenance.

1-2 CONSOLIDATED INDEX OF ARMY PUBLICATIONS AND BLANK FORMS

Refer to the latest issue of DA Pam 310-1 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

1-3 MAINTENANCE FORMS, RECORDS, AND REPORTS

a. **Reports of Maintenance and Unsatisfactory Equipment.** Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, as contained in Maintenance Management Update.

b. **Report of Packaging and Handling Deficiencies.** Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2/DLAR 4140.55/NAVMATINST 4355.73B/AFR 400-54/MCO 4430.3H.

c. **Discrepancy in Shipment Report (DISREP) (SF 361).** Fill out and forward (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33C/AFR 75-18/MCO P4610.19D/ DLAR 4500.15.

1-4 CALIBRATION

Calibration procedures for Spectrum Analyzer AN/USM-489(V)1 are found in TB 9-6625-2134-35.

1-5 DESTRUCTION OF ARMY ELECTRONICS MATERIEL TO PREVENT ENEMY USE

Destruction of Army electronics materiel to prevent enemy use is described in TM 750-244.2.

1-6 PREPARATION FOR STORAGE OR SHIPMENT

Preparation instructions for storage and shipment are found Chapter 2, Section V.

1-7 QUALITY ASSURANCE/QUALITY CONTROL

Maintenance standards for Spectrum Analyzer AN/USM-489(V)1 are given in the maintenance procedures. By performing the maintenance procedures, quality control of the equipment will be maintained.

1-8 NOMENCLATURE CROSS-REFERENCE LIST

Common names will be used when major components of the spectrum analyzer are mentioned in this manual.

NOTE

Official nomenclature must be used when filling out report forms or looking up Technical Manuals.

COMMON NAME	OFFICIAL NOMENCLATURE
Spectrum Analyzer	Spectrum Analyzer AN/USM-489(V)1

1-9 REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your spectrum analyzer needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-PA-MA-D, Fort Monmouth, New Jersey 07703-5000. We'll send you a reply.

1-10 WARRANTY INFORMATION

The spectrum analyzer is warranted for 12 months. Warranty starts on the date of shipment to the original buyer. Report all defects in material or workmanship to your supervisor who will take appropriate action.

SECTION II. EQUIPMENT DESCRIPTION AND DATA

1-11 EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

For information on equipment characteristics, capabilities, and features of the equipment covered in this manual, refer to TM 11-6625-3136-12.

1-12 LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

For information on the location and description of the major components, refer to TM 11-6625-3136-12.

1-13 EQUIPMENT DATA

For equipment data on the equipment covered in this manual, refer to TM 11-6625-3136-12.

1-14 SAFETY, CARE, AND HANDLING

Observe all ***WARNINGS, CAUTIONS,*** and ***NOTE's*** in this manual. This equipment can be extremely dangerous if these instructions are not followed.

SECTION III. PRINCIPLES OF OPERATION

1-15 GENERAL FUNCTIONAL DESCRIPTION *(FO-1)*

Spectrum Analyzer AN/USM-489(V)1 permits the observation of the amplitudes and frequencies of the various discrete sinusoidal signals during the measurement interval. Signals can be applied directly to the RF INPUT or to an external mixer to extend the measurement range of the spectrum analyzer.

(1) **1^ST^ CONVERTER** Mixes the input signal with the 1^ST^ LO signal to produce either a 829 MHz or 2072 MHz IF signal. The IF signal frequency is determined by the frequency band being used. The 1^ST^ mixer is designed to handle frequencies from 50kHz to 21GHz, however an external mixer may be used to extend the spectrum analyzer's capability up to 40GHz. The Preselector and lowpass filter attenuate most images and spurious response.

(2) **2^ND^ CONVERTER** Consists of two mixers. Only the 2072 MHz or 829 MHz mixers are operational at a given time depending on the frequency band. The selection of either mixer is automatic, a function performed by the microcomputer located in the Digital Control section. The output of both mixer stages is 110MHz. Each mixer stage is provided with its own local oscillator. The 719 MHz LO Phaselock maintains a constant relationship between the two oscillators.

(3) **3^RD^ CONVERTER** Amplifies and mixes the 110MHz IF with the 3^RD^ LO 100MHz signal. The 3^RD^ mixer output is 10MHz.

(4) **IF SECTION** The 10MHz signal is applied to the IF Section Variable Resolution circuits, where selection of resolution bandwidth and approximately 35 dB of system gain are provided. The Log Amplifier provides seven stages of amplification producing an output that is proportional to the logarithm of the input.

The Detector circuit detects and filters the Log Amplifier output signal and produces the VIDEO signal.

(5) **DISPLAY SECTION** The Video Signals from the IF section are applied to the Video Amplifier which functions in two modes:

a. Logarithmic

b. Linear

In the logarithmic mode the signal is amplified linearly. In the linear mode the amplification is exponential to convert the logarithmic characteristic to linear function. The Processor applies baseline compensation to the Video Signal to compensate for any unflatness in the 1^ST^ Converter response.

The outputs of the Video Amplifier/Processor and Sweep Generator are applied to the CRT deflection circuits thru the Deflection Amplifier.

Vertical and Horizontal Digital Storage circuits provides operator selection of various display modes for observing the Video signals from the Processor.

CRT Readout circuit generates letters and numbers for display under control of the microcomputer.

Z–Axis receives beam intensity and turn-on instruction from the front panel.

(6) **FREQUENCY CONTROL SECTION** The Center Frequency Control circuits tune the 1^ST^ and 2^ND^ LOs to the frequency required to produce the 110MHz IF frequency. The Sweep Generator and Span Attenuator generate the analyzer's sweep. As the Sweep Generator sweeps through its range, the trace is deflected across the CRT. The output of the Span Attenuator drives the 1^ST^ LO to sweep wide spans and the 2^ND^ LO to sweep narrow spans.

(7) **PHASE LOCK SECTION** Stabilizes the 1^ST^ LO in narrow spans.

(8) **DIGITAL CONTROL SECTION** Front panel controls' commands are communicated to the microcomputer and all parts of the spectrum analyzer through an instrument bus. The microcomputer controls circuits functions such as; the Span Attenuator, IF GAIN, and the CRT Readout. The microcomputer also receives information from circuit functions such as, the sweep and phase lock circuit.

(9) **POWER SUPPLY** Provides regulated dc power for all parts of the instrument. Signal, power, and control connections are accomplished by a mother board distribution system.

1-16 DETAILED FUNCTIONAL DESCRIPTION

1-17 1ST CONVERTER *(Fig. FO-2)*

The 1ST Converter mixes the incoming RF signal with a tunable local oscillator signal to produce intermodulation products. All of these are filtered out except the 2072 MHz and 829 MHz IF signals which are applied to the 2ND Converter circuit.

(1) **STEP ATTENUATOR** provides 0 to 60 dB attenuation to signals from the RF INPUT. It is controlled by drive signals from Z-Axis and INTERFACE BOARD.
The output is applied to the Preselector or 2GHz Limiter and 1.8GHz Filter.

(2) **PRESELECTOR** provides selectivity to eliminate spurious responses and image frequencies. It is the signal path for frequencies from 1.7 to 21GHz.
Filter Select Switches select low-band/hand-band signal paths as determined by the Preselector Driver.
The 2GHz Limiter protects the 1ST Mixer diodes from signals 2GHz and above by reflecting RF energy to the input source.
1.8GHz Low Pass Filter attenuates signals to reduce spurious responses caused by frequencies above 1.8GHz.

(3) **1ST MIXER** receives the RF signal through the 3 dB attenuator and the 1ST LO signal through the Power Divider. The 2.072GHz or 829MHz IF output is applied to the 2.072GHz Directional Filter through the Transfer Switch.
The Transfer Switch selects the 1ST Mixer IF input or the EXTERNAL MIXER input.

(4) **1ST LO** has a tuning range of 2.072 to 6.35GHz. Tune and operating voltages are provided by the 1ST LO Driver.
The Phase Gate samples a small amount of the 1ST LO Signal output to compare with a strobe signal from the Phaselock Assembly. The output is an error signal that is used by the Phaselock for determining the FM tuning current for the 1ST LO.

(5) **POWER DIVIDER** splits the signal from the 1ST LO and applies it to the front panel 1ST LO OUTPUT connector and Phase Gate. Provides optimum load to the 1ST LO.

(6) **FILTERS AND DIPLEXER** select only the 2.072GHz and 829 MHz IF signals for applications to the 2ND Converter.
The 2.072GHz Directional Filter couples the 2.072GHz IF signal to the 2ND Converter through the 4.5GHz Low Pass Filter.
The Diplexer filters the 829 MHz IF signal and applies it to the 2ND Converter through the 4.5GHz Low Pass Filter. Also provides optimum impedance matching to the 1ST Mixer output at frequencies above 1MHz. This match is important for the overall flatness and frequency response of the spectrum analyzer.

1-18 2ND CONVERTER *(Fig. FO-3)*

Two 2ND Converter circuits are used in the spectrum analyzer. One converts 2072 MHz to 110MHz; the other converts 829 MHz to 110MHz. Only one converter is operational at any time, and is selected as a function of the measurement band being used.

(1) **2072MHZ 2ND CONVERTER**

(A) The 4 Cavity Band pass Filter passes only the 2072 MHz 1ST IF signal and, prevents unwanted signals generated within the 2ND Converter from passing back through to the 1ST Converter.

(B) Mixes the IF output of the 1ST Converter with the output of the 2182 MHz Phaselocked 2ND LO to produce a 110MHz IF signal.

(C) The 110MHz Lowpass Filter allows the 100MHz IF signal to reapplied to the 829MHz 2ND Converter and blocks higher frequencies.

(2) 2182MHz PHASELOCKED 2ND LO

(A) Generates 2182 MHz for the 2072 MHz and 829 MHz 2ND Converter circuits.

(B) The 220 MHz Reference circuit receives a 100MHz drive signal from the 3RD Converter oscillator. It generates 100 MHz harmonics; the 22ND harmonic or 2200 MHz is mixed with a 2182 MHz signal from the 2ND LO, generating a 18MHz output.

(C) The Phase/Frequency Detector compares the 18 MHz signal from the mixer with the 18MHz output of the 14-22 MHz VCO. The Phase/Frequency Detector output tunes the 2182MHz 2ND LO.

(D) Tune and sweep signals from the Span Attenuator and Center Frequency control circuits tune the 14–22MHz VCO.

(3) 829 MHz 2ND CONVERTER *(IF SECTION)*

(A) 829 MHz Diplexer passes the 829 MHz IF, from the 1ST Converter, with minimum attenuation and with an approximate pass-band of 200MHz.

(B) 1.2GHz Lowpass Filter passes the 829 MHz IF with minimum attenuation. Cutoff frequency of this filter is approximately 1.2GHz.

(C) Gain stages consist of two cascaded amplifiers which provide approximately 18 dB gain at 829MHz, the IF frequency.

(D) 3 dB Attenuators provide impedance matching between the gain stages and 829 MHz Bandpass Filter; and 1300 MHz Lowpass Filters and 450 MHz Highpass Filter, respectively.

(E) 829 MHz Bandpass Filter blocks unwanted signals, primarily the 609 MHz image signal.

(F) 1300 MHz Lowpass Filter blocks high frequency signals, passing the 829 MHz IF with minimum loss.

(G) 450 MHz Highpass Filter blocks signals below 450MHz, passing the 829 MHz IF with minimum loss.

(H) Mixer mixes the 829 MHz IF with the 719 MHz output of the VCO. The mixer outputs are 110MHz and 1548MHz.

(I) 300 MHz Lowpass Filter blocks the 1548 MHz and passes the 110MHz Mixer outputs. The 1548 MHz is reflected by the 829 MHz Bandpass Filter to the Mixer, in-phase with the VCO harmonics output to increase energy of the 110MHz signal.

(J) 110MHz Amplifier provides gain to the 110MHz IF output from the 2072 MHz 2ND Converter.

(K) 6 dB Attenuator provides impedance matching between the 110MHz Amplifier and the input of the 110MHz IF Amplifier.

(L) Selector Driver selects the 110MHz IF signal from either the 829 MHz 2ND Converter or the 2072 MHz IF Amplifier.

(4) 829 MHz 2ND CONVERTER

(A) Front Panel 2ND LO Output circuit. The output of the 2182 MHz 2ND LO and 719 MHz VCO is applied through Power Splitters and a Power Combiner to the Front Panel 2ND LO OUTPUT.

(B) Harmonic Mixer mixes the 719 MHz signal from the 719 MHz VCO and the 2182 MHz signal from the 2182 MHz 2ND LO. The principal output is a 25MHz signal that is applied to the Phase/Frequency Detector.

(C) Isolation Amplifiers provide attenuation to higher order products from the Harmonic Mixer preventing that they appear as real signals on the CRT.

(D) Phase/Frequency Detector receives 25MHz reference signals form the Harmonic Mixer and the 3RD converter to generate correction voltages to control the output frequency of the 719MHZ VCO.

(E) The output of the 2182MHz 2ND LO is used as a swept reference to derive the 719MHz output. The 719MHz VCO is controlled so that the 3RD harmonic of its output frequency is a constant difference from the 2182MHz reference. The 719MHz VCO is enabled or disabled by the IF Select signal from the Z-Axis and RF Interface Board, and is dependent upon the frequency band being analyzed.

1-19 3RD CONVERTER *(Fig. FO-4)*

Accepts the 110MHz output from the 2ND Converters, amplifies and converts the signal to a 10MHZ IF signal which is applied to the resolution circuits in the IF section.

(1) **110MHz IF AMPLIFIER** provides initial gain to the analyzer. This gain compensates for signal level losses in the three mixers.
Three stages of amplification are used for a typical gain of 21 dB.

(A) The Matching Network provides a high impedance input and 50Ω output impedance.

(B) PIN Diode Attenuator receives the 110MHz IF through a 3 dB impedance matching Attenuator. It provides resistance to the 110MHz IF, controlled by the current through the PIN diodes in an inverse proportion. Higher current results in less resistance to the 110MHz IF.

(2) **110MHz HELICAL BAND-PASS FILTER** consists of three sections using helical resonators. Its bandwidth of 1 MHz defines the broadest resolution bandwidth of the analyzer. It provides good image rejection, and limits noise in the frequency spectrum in which desirable signals appear.

(3) **3RD CONVERTER**

(A) Mixer receives the 110MHz IF from the 110MHz Helical Band-Pass Filter and 100MHz signal from the 100MHz Crystal Controlled Oscillator. It mixes both signals generating the 10 MHz IF which is applied to the IF section.

(B) 100 MHz Crystal Controlled Oscillator output is applied to an amplifier driver that provides a +10 dBm gain, to drive all the reference amplifiers, and the mixer amplifier.

(C) Buffer Amplifiers provide isolation among the reference oscillator and mixer circuits.

(D) Limiting Amplifier provides a –20 dBm 100MHz output to the CAL OUT connector, in the Front Panel. This output is stable and rich in harmonics. In this manner it provides a useful signal comb of 100MHZ markers to approximately 2GHz.

1-20 IF SECTION *(Fig. FO-5)*

Receives the 110MHz IF signal from the 3RD Converter, established the system resolution through selective filtering, levels the gain of all bands and logarithmically amplifies and detects the signal to produce the video output to the Display section.

(1) **VARIABLE RESOLUTION**

(A) VR Input receives the –35 dBm 10MHz IF from the 3RD Converter. The 1.2 MHz Filter augments the 110MHz Helical Band-Pass Filter, in the 3RD Converter, and provides additional selectivity. The 6 dB attenuator provides 50Ω impedance interface to the 1ST Filter select.

(B) 1ST Filter Select operates in conjunction with the 2ND Filter Select F to determine the overall system bandwidth through bands of switched filters that are selectable under control of the analyzer microcomputer: Bandwidth selections are 1MHz to 100MHz in decade steps.

Selection of filters is done by PIN diode switching. At the input and output of each filter is a series and a shunt diode. When a filter is selected, the series diodes are biased on and the shunt diodes are biased off. For the filters that are not selected the bias conditions are reversed. Only one filter is selected at a time.

(C) 10 dB Gain Steps provide 10 dB gain when selected by the microcomputer. The circuit consists of three stages of amplification, one stage provides variable gain, the other two are fixed gain steps. The nominal input signal level from the 1ST Filter Select is -27 dBm for a resolution bandwidth of 100KHz. The nominal output gain is –5 dBm.

(D) 20 dB Gain Steps provide –6 dB, +4 dB, +14 dB, and +24 dB of gain in precise 10 dB steps. The 10 MHz –5 dBm signal from the 10 dBm Gain Steps is applied to a chain of three common-emitter amplifiers, each using emitter degeneration. Changing emitter resistance is used to change amplifier gain under the direction of the microcomputer.

(E) Band leveling corrects the gain variations caused by the 1ST Converter. These band-to-band variations are caused by mixing of different harmonics in the 1ST Converter and losses from the Preselector. The output level of this board is –3 dBm while the nominal input is – 11 dBm. The input level occurs on band 1 but decreases in the higher bands. The output is kept constant by using the microcomputer to adjust the amplification for each band. The two amplifier blocks in this circuit are similar to the amplifiers in the 10 dB Gain Steps circuit.

(F) 2ND Filter Select operates in conjunction with the 1ST Filter Select to determine the overall system bandwidth. Its operation is similar to that of the 1ST Filter Select.

(G) Post VR Amplifier provides the final Variable Resolution system gain to bring the signal to the required output level and provides the final bandpass filtering to assure clean performance. This stage consists of two stages of gain followed by a filter. The output signal of the filter is applied to the Log Amplifier and Detector Stage.

(2) **LOG AMPLIFIER AND DETECTOR** recieves input signals from the Variable Resolution stage. It amplifies these signals so the output is proportional to-the logarithm of the input. These signals are applied to the Detector to produce the Video output signal. By controlling the gain of each amplifier stage, each dB of change in the input signal level results in an equal increment of change in the output. Thus, in the 10 dB/DIV mode, each division of displacement on the screen represents 10 dB of input signal level change.

1-21 DISPLAY SECTION *(Fig. FO-6)*

The Display Section performs several functions:

- Accepts the VIDEO signal from the IF section, processes the signal, and provides the vertical CRT plate drive signals.
- Processes the sweep voltages from the sweep section and produces the horizontal CRT plate drive voltage. Vertical and horizontal signals are further processed.
- Accepts character information from the instrument data bus and generates CRT plate signals to display alpha and numeric characters.
- Accepts control levels from front panel beam controls and generates unblinking signals to control display presence, brightness and focus.

(1) **VIDEO AMPLIFIER** receives Video signals from the IF section.

(A) In the LOG mode the signal is amplified linearly and applied to the Video Processor. In the LIN mode, amplification is exponential to convert the logarithmic characteristic to linear function.

(B) Pulse Stretcher circuit alters narrow pulses so data can be displayed by the Digital Storage logic.

(2) **VIDEO PROCESSOR** provides unflatness compensation for 1ST converter response varations.

(A) Video filters allow for selection of six video bandwidths, 30KHz, 3KHz, 300Hz, 3Hz, and 0.3 Hz, under control of the analyzer microcomputer. The microcomputer makes the selection, based on such factors as sweep rate and total dispersion.

Two signal inputs can be applied to the Video Filters. EXT VIDEO and Video from the IF section.

(B) Out-of-Band Blanking stage allows for selective blanking of the lower and upper ends of the local oscillator range. This is required because the local oscillator sweeps full span mode regardless of the prescribed band limits. Thus, the video system is designed to effectively open a display window only during the time for display.

The Preselector Drive signal provides frequency information in voltage form. When a low input is provided, the Out-of-Band Blanking switch opens, thus output of the Video Filters may easily be blanked at will.

(C) Baseline Leveler provides baseline compensation to the Video Amplifier to compensate for any unflatness in the 1ST Converter response.

(3) **DIGITAL STORAGE VERTICAL**

(A) Sample and Hold circuits “freezes” the changing analog Video. Signal input to be applied to the Analog to Digital (A to D) Converter and PEAK/AVERAGE Amparator.

(B) A to D Converter produces the binary equivalent of the Video input signal, and applies the digital output to the Digital Processor.

(C) PEAK/AVERAGE Comparator is a multiplexer that selects either the peak or average value of the Video signal to be routed to the Digital Processor.

(D) Digital Processor contains special Y-value processing circuits. The output is applied to the RAM in the Digital Storage Horizontal.

(E) Vector Generator consists of an integrator, sample and sample and hold circuits that act as an output buffer. The output is applied to the Deflection Amplifier through the Cursor switch, which selects between the stored data and the marker under control of the buffered PEAK/AVERAGE LEVEL control.

(4) **DIGITAL STORAGE HORIZONTAL**

(A) A to D Converter receives analog sweep signal from the Frequency Control Section. This voltage is converted to a current table value through the use of an up/down interlock and 10-bit up/down counter. As the sweep moves to the right, the counter increments; as the sweep retraces, the counter decrements. Each time the counter increments, a new X coordinate value is generated to start the storage cycle. When SAVE A mode is selected, the counter skips every other binary number.

(B) Digital Storage Control receives Sweep Gate blanking signals from the Frequency Control section. Provides control signals to the Storage/Sweep switch in the Deflection Amplifier. Digital signals generated by the counter in the A to D converter are provided to the Counter, D to A converter the Z-Axis stage.

(C) RAM provides 8K bits of random access memory for storage of the 1024 data points used in the digital storage system. The output is provided to the D to A Converter in the Digital Storage Vertical.

(5) **DEFLECTION AMPLIFIER**

(A) Horizontal Section, HORIZ SIG and SWEEP signals from the Digital Storage Horizontal and Frequency Control sections are applied to the STORAGE switch, controlled by the Digital Storage Control. Either signal is applied to the CRT deflection plates through a buffer amplifier and the READOUT switch. The READOUT switch is controlled by the character and Dot Generator circuits. Either the READOUT or HORIZ SIG/SWEEP signals are selected and applied to the CRT horizontal deflection plates, through amplifiers.

(B) **Vertical Section.** VERT SIG from the Digital Storage Vertical stage is applied to the READOUT switch through a Baseline Clamp amplifier where the VERT SIG is inverted and clamped to ground, A sample of the VERT SIG is applied to the Z-Axis stage. The READOUT switch is controlled by the Character and Dot Generator circuits. The READOUT switch selects either the VERT SIG or the READOUT signals to be applied to the CRT vertical deflection plates, through amplifiers.

(6) **CRT READOUT** stage stores readout characters and generates deflection and Z-Axis signals to display the characters. It also handles the frequency dot marker display. Both characters and frequency dot displays are time shared with the spectrum trace.

(7) **Z-AXIS STAGE** receives the various beam control inputs such as SWEEP GATE, INTENSITY, etc., combines them, and furnishes the drive currents and bias voltages required to operate the CRT electrodes. The Z-Axis circuits consist of the Intensity Control Logic Circuits which control the CRT beam current for normal signal display operations. It also includes the unblinking gates which furnish current to the Z-Axis Drive Amplifier to drive the CRT control grid. The Z-Axis circuits also include voltage-setting circuits for astigmatism, CRT trace rotation coil, geometry, and other CRT electrode voltages.

(8) **HIGH VOLTAGE STAGE** furnishes the –3860 volts to the CRT cathode, the filament voltage for the CRT, and provides restoration for the Z-Axis Drive signal.

1-22 FREQUENCY CONTROL *(Fig. FO-7)*

The Frequency Control Section performs the tuning and scan function for the Preselector, 1^{ST} LO, and 2^{ND} LO.

(1) **CENTER FREQUENCY CONTROL CIRCUITS** form the electrical interface between the front-panel controls and the Converter stages.

(A) Coarse and Fine Tune D to A circuits convert the digital inputs from the storage registers into analog current and voltage equivalent values.

(B) Coarse and Fine Track/Hold Amplifiers store the analog output values during the approximation routine, and compare the stored value and the approximated value for the microcomputer.

(2) **1^{ST} LO DRIVER**

(A) Mixer Bias Controls and Switching, selects the required mixer bias, connects or disconnects the TUNE VOLTS and SPAN VOLTS signals for the summing ampifier, energizes the filter switch for the 1^{ST} LO, and controls the drive and filtering of the oscillator driver stage.

(B) Tune Volts Buffer buffers the COARSE TUNE VOLTS signal from the Center Frequency Control circuits, and reduces the signal amplitude to drive the dot marker circuits.

(C) Input switching circuits combines the SPAN VOLTS and COARSE TUNE signals, and applies these signals to summing amplifier.

(D) Summing Amplifier furnishes the drive signal to the oscillator driver. It sums the SPAN VOLTS ramp signal from the Span Attenuator with the COARSE TUNE signal from the Center Frequency Control circuit. In less than maximum span, a sweep voltage of ±10V sweeps the 1^{ST} LO at a rate of 333 MHz/division. As the TUNE VOLTS signal varies from –10 to ±10V, the 1^{ST} LO center frequency is moved over its full range of 2.072 to 6.35GHz, plus about 50 MHz overtune at each end.

(E) Oscillator Filter Driver furnishes drive current to the NOISE Filter Capacitors.

(F) Oscillator Driver furnishes swept current drive to the 1^{ST} LO coil.

(G) –10V Reference produces a precise -10V reference for the Preselector Driver and 1^{ST} LO Driver.

(3) **PRESELECTOR DRIVER** provides input selectivity that reduces spurious responses between 1.7 and 21GHz.

(A) IF Offset stage applies an offset voltage to the summing amplifier that is proportional to the IF frequency in use, and to fine tuning frequency changes of the 2^{ND} LO.

(B) Summing Amplifier combines the effective oscillator frequency voltage and the IF Offset voltage, and drives the tracking adjustment circuits.

(C) Tracking Adjustment circuit compensates for different preselector sensitivities, IF Offset, preselector offset, for non-linear operation caused by magnetic saturation of the Preselector.

(D) Final Driver stage changes the applied voltage signal into a current drive signal for the preselector coil.

(E) Preselector Switch Driver drives the Preselector Switch which requires a positive pulse to select the lowpass filter and a negative pulse to select the Preselector.

(4) **SPAN ATTENUATOR,** under control of the microcomputer, selects the appropriate attenuation factor for the incoming sweep signal, to establish the frequency span.

(A) Input Amplifiers, perform noise reduction and signal inversion on the incoming sweep signal.

(B) Digital to Analog Converter, attenuates the sweep signal to the desired amplitude for driving the 1^{ST} LO Driver and Preselector Driver circuits.

(C) Decade Attenuator, provides three decades of attenuation for the output signals.

(5) **SWEEP CIRCUIT** provides the ramp signal to drive the Horizontal Deflection Amplifier, the 1^{ST} LO Driver, and the Preselector Driver.

(A) Sweep Generator, generates the voltage ramp that drives the Deflection Amplifiers, Digital Storage, and the swept oscillators.

(B) Trigger Circuits, process and multiplex the three trigger signals.

(C) Sweep Control, generates the SWEEP GATE and PEN LIFT signals. Determines the holdoff time for the Sweep Generator.

1-23 PHASE LOCK SYSTEM *(Fig. FO-8)*

The Phaselock section, is a frequency control system that substantially improves the stabilization of the 1^{ST} LO.

(1) **PHASELOCK SYSTEM** consists of two frequency servo loops, called the outer loop and inner loop. Operation of the inner loop is as follows: The 100 MHz reference signal from the 3^{RD} Converter is applied to the Synthesizer, where it is first divided by two, then sent to the phaselock circuits to be used as a reference frequency. It is further divided to 25 MHz in the synthesizer circuits and applied to the ÷ N circuits which reduce the signal to a reference frequency (depending on the ÷ N number), between 32 and 94kHz and applied to the Offset Mixer, where it is compared with the mixer output. The original 25 MHz is also applied to the Offset Mixer.

The Controlled Oscillator operates between 25.032 and 25.094MHz, depending on the drive from the Error Amplifier. This signal is applied to the Offset Mixer, where it mixes with the 25 MHz reference frequency. The difference frequency, which is from 32 to 94kHz, is applied to the phase/frequency detector and compared to the ÷ N reference frequency, If the two signals are edge and frequency coincident, phaselock occurs. If they do not coincide, an error signal is generated, passed through the Error Amplifier, and applied to the Controlled Oscillator. This forces the oscillator to shift to the reference frequency. This evolution typically lasts for only a few milliseconds, so the inner loop phaselock is, for all practical purposes, instantaneous.

(2) **THE OUTER LOOP,** which includes the inner loop circuits (Offset Mixer, Error Amplifier, and Controlled Oscillator), consists of the Strobe Driver, Phase Gate, Error Amplifier, and 1^{ST} LO. (The phaselock control circuits are a part of the operation, but are not considered a part of the loop.)

The 25.032 to 25.094 MHz output from the Controlled Oscillator is applied to the Strobe Driver, where it is divided by five, filtered, and sent to the Phase Gate Detector as a 5.006 to 5.019 MHz strobe signal.

This signal generates line spectra that are equally spaced about 5MHz apart over the entire spectrum (at about the 400TH line, which corresponds to about 2GHz). Assuming that the 1^{ST} LO is tuned in that vicinity, one of these lines is within 2.5 MHz of the 1^{ST} LO frequency. The Phase Gate outputs a signal that is proportional to the difference between the 1^{ST} LO frequency and that of the nearest strobe line. The signal is counted by the phaselock control circuits.

Now, as the search for phaselock begins the microcomputer moves the strobe in about 1 MHz increments. It does so by sending a new number for each step to the ÷ N Counter. With each change in ÷ N output signal, the Controlled Oscillator frequency changes to match, and the strobe signal shifts toward the 1^{ST} LO frequency. When the Phase Gate generates an error that is below 500kHz, it passes through the filter in the Error Amplifier circuits, and the microcomputer is notified of the proximity of the strobe. The microcomputer now backs the strobe away from the 1^{ST} LO frequency in smaller increments until the 500kHz bandwidth is encountered. This locates the 1^{ST} LO to be about 500kHz away from the strobe signal. The microcomputer now moves the strobe to the middle of the bandwidth, about 250kHz away, then takes three small steps closer while noting the change in error frequency with each step. With this information, the microcomputer can compute the position of the 1^{ST} LO frequency, does so, and places the strobe within approximately 10kHz of the 1^{ST} LO frequency. Then, the microcomputer commands “lock,” which puts a more precise servo system into operation.

Previously, the microcomputer was moving the strobe around to find coincidence with the 1^{ST} LO frequency. The F(s) amplifier in the Error Amplifier circuits will now change the current to the FM Coil of the 1^{ST} LO so the 1^{ST} LO frequency finds and locks on frequency with the strobe. Any frequency difference between the strobe signal and the 1^{ST} LO will generate a correction voltage of low frequency that is filtered by the F(s) amplifier, then used to drive the FM Coil back to the strobe position. If the 1^{ST} LO drifts beyond the operating range of the F(s) amplifier, the microcomputer is alerted and the remainder of the circuits indicate the direction of drift. The microcomputer then tunes the Center Frequency Control circuits to null out any FM coil current in the phaselock loop.

1-24 DIGITAL CONTROL *(Fig. FO-9)*

The Digital Control section provides the operator and Digital Controller interfaces. It translated changes in front-panel controls and instructions received via the accessories interface.

The Digital Control section simplifies operating the instrument. Unless overridden by the operator, the microcomputer automatically selects secondary parameters. Some examples are: when the operator selects span, the microcomputer chooses an appropriate bandwidth; when the operator changes the reference level, the microcomputer trades off input attenuation and IF gain.

(1) THE MICROCOMPUTER is based on a 6800 microprocessor; its operating program is stored in ROM. The microprocessor accesses the ROM-RAM, and I/O interface via the micro computer bus. The bus operates with 16-bit addresses, 8-bit bytes, and several control lines for data transfers.

(2) FRONT PANEL and the addressable registers that control some other instrument assemblies reside on the instrument bus. This bus requires only 8-bit addresses and transfers 8-bit bytes. The bytes may be codes to set or indicate the status of an assembly or, in the case of digital storage and CRT readout, data values that correspond to the display. When one of the assemblies requires the attention of the microcomputer, it asserts a service request line. The microcomputer responds by finding the source of the service request and executing the appropriate service routine.

1-25 POWER SUPPLY *(Fig. FO-10)*

The Main Power Supply furnishes all the regulated voltages for the spectrum analyzer, except for the CRT high-voltage supply. In order to reduce total weight and conserve energy, the Main Power Supply is of the high-efficiency design. The Power Supply consists of the line input circuit, which rectifies and filters the incoming line voltage; the inverter, which drives the primary of the power transformer; the rectifier-filter circuit, which rectifies and filters the secondary voltages; the voltage reference circuit, which furnishes a stable and precise reference for the regulators; the regulator circuits, which control the voltage and current for the supplies that requires precise regulation.

The Fan Driver board houses the Fan Driver circuit, which furnishes the appropriate drive current for the fan motor. It also contains the Overvoltage Protection circuit, which shuts down the +5V supply in case of overvoltage.

CHAPTER 2

MAINTENANCE INSTRUCTIONS

SECTION I. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

2-1 COMMON TOOLS AND EQUIPMENT

Common tools and equipment required for general support maintenance for Spectrum Analyzer AN/USM-489(V)1 are listed in the Maintenance Allocation Chart (MAC), TM 11-6625-3136-12, Appendix B.

2-2 SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

There are no special tools, TMDE, or support equipment required for general support maintenance of the spectrum analyzer.

2-3 REPAIR PARTS

Repair parts are listed and illustrated in the repair parts and special tools list, TM 11-6625-3136-24P, covering organizational and general support maintenance for this equipment.

SECTION II. SERVICE UPON RECEIPT

2-4 SERVICE UPON RECEIPT OF MATERIEL

a. Unpacking. The spectrum analyzer is packed in its own shipping carton. Unpack the equipment as follows:

(1) Open shipping carton and remove equipment.

(2) Place equipment on a suitable clean and dry surface for inspection.

(3) Keep all shipping materials for use in repacking and reshipping.

b. Checking Unpacked Equipment.

(1) Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on SF-364, Report of Discrepancy (ROD).

(2) Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.

(3) Check to see whether the equipment has been modified.

2-5 PRELIMINARY SERVICING AND ADJUSTMENT OF EQUIPMENT

Do performance test. See paragraph 2-9.

SECTION III. TROUBLESHOOTING SYMPTOM INDEX

SPECTRUM ANALYZER SYMPTOM	FO SHEET #
1. NO SIGNAL, LOW SIGNAL	13-1
2. NO FRONT PANEL AMPLIFIER ADJUSTMENTS	14-1
3. NO PHASELOCK	14-4
4. NO PEAKING SIGNALS IN BANDS.	13-2
5. 1^{ST} LO FM'ING	14-1
6. FRONT PANEL LOCK-UP	12-1
7. UNABLE TO TUNE	15
8. ERRATIC TUNING	16
9. NO POWER	23
10. NO DISPLAY/LIGHTS ON	12-1
11. SENSITIVITY PROBLEMS	14-1
12. DISTORTED VERTICAL DISPLAY	24
13. NO READOUT	17
14. NO DIGITAL READOUT	21
15. NO SWEEP	19
16. FAN FAILURES	23
17. LOW CALIBRATOR OUTPUT..	13-1
18. NO MICROCOMPUTER CONTROL	21
19. NO HIGH VOLTAGE TO CRT	25
20. FAN DOES NOT OPERATE	28
21. GRATICULE LIGHTS DO NOT ILLUMINATE-	29
22. 1^{ST}LO NOT STABILIZED	30

NOTE

For symptoms not listed above, go to Figure FO-12.

2-6 GENERAL

Troubleshooting at the general support maintenance level requires you to locate any trouble as quickly as possible. The amount of troubleshooting you can do is based on what the Maintenance Allocation Chart says you can fix. Because of this, the only trouble symptoms you will find here are those that could be caused by faulty items you can fix.

NOTE

Before using the troubleshooting table, check your work order and talk to organizational maintenance, if possible, for a description of the symptoms and the steps that have been taken to correct them.

Check all forms and tags attached to, or accompanying, the equipment to determine the reason for removal from service.

2-7 EQUIPMENT INSPECTION

The following inspection procedures shall be used to locate obvious malfunctions within the spectrum analyzer.

a. Remove cover as required to access components. See paragraph 2-11.

b. Inspect printed circuit boards for discoloration, cracks, breaks, and warping. A slight discoloration is normal.

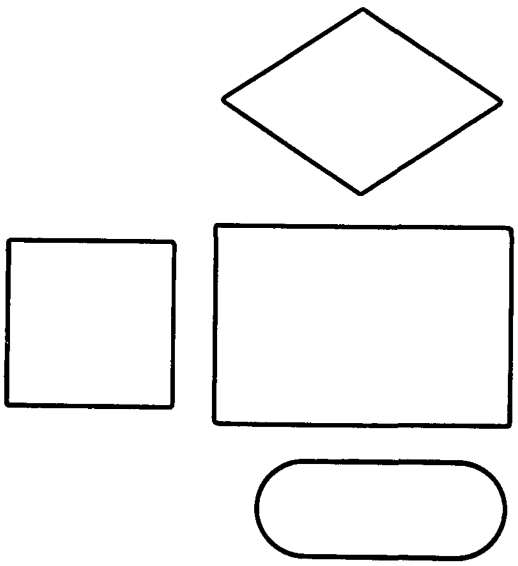
c. Inspect printed circuit board conductors for breaks, cracks, cuts, erosion, or looseness.

d. Inspect all assemblies for burnt or loose components.

e. Inspect equipment for broken, cut, or loose wires.

2-8 USING THE TROUBLESHOOTING FLOWCHARTS

The following symbols are used on the troubleshooting flowcharts:



This symbol is used as a direction, such as showing the start or routing to a continuing flowchart to fix a particular malfunction.

These symbols are used to show a process, operation or a setting.

This symbol is used to show that a decision is required.

EL9VP004

When the symptom has been isolated, use these symbols to understand the flowchart corresponding to the symptoms.

Troubleshooting flowcharts are used to identify common malfunctions found during operation or maintenance of the spectrum analyzer. Perform the tests/inspections and corrective actions in the order listed.

For ease in measuring pins on edge connectors, remove circuit board from mounting bracket.

NOTE

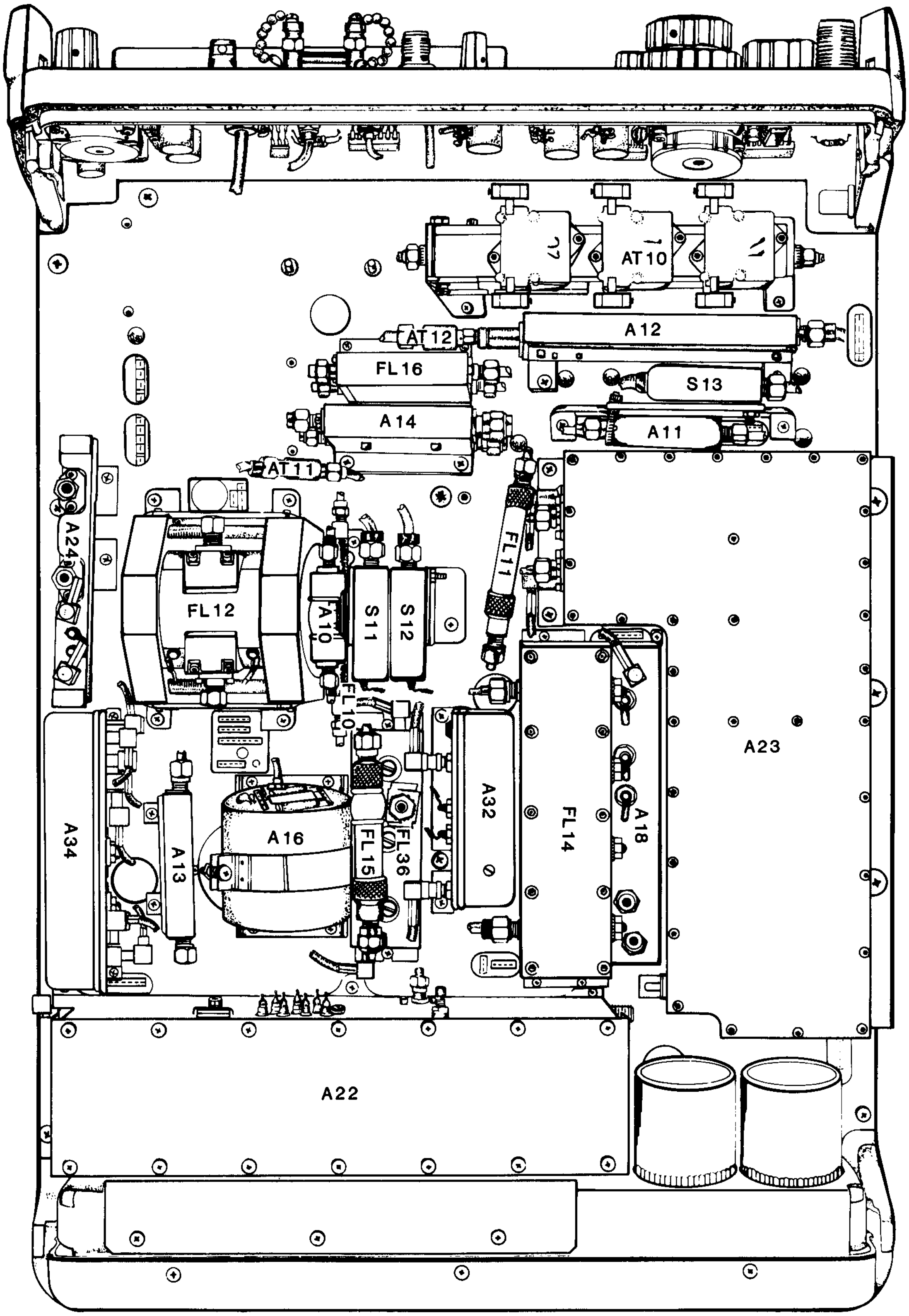
This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed, or is not corrected by listed actions, notify the next higher level of maintenance.

SECTION IV. MAINTENANCE PROCEDURES

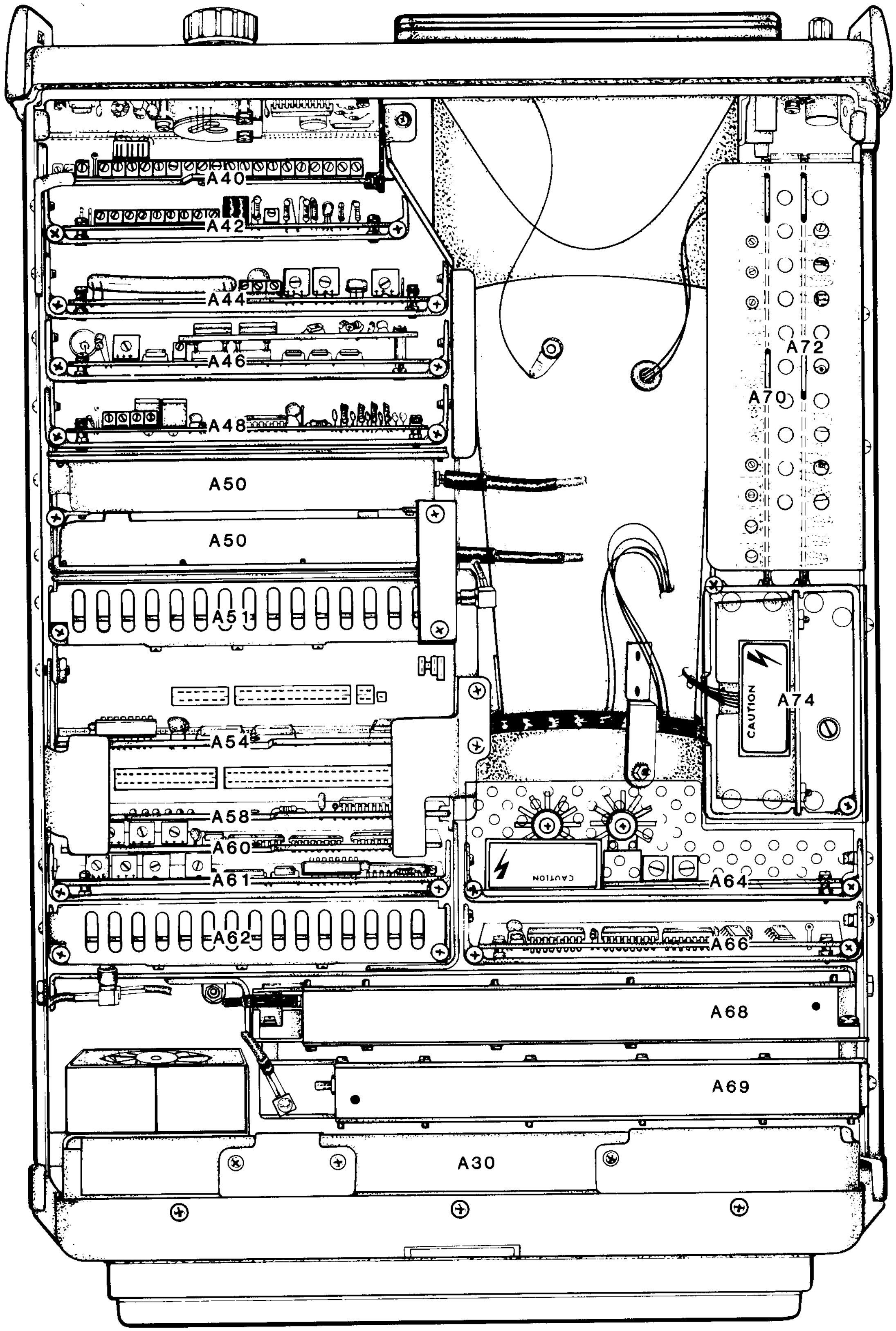
PROCEDURE (CONT'D)

AN/USM-489(V)1 COMPONENTS CROSS-REFERENCE LIST

NUMBER	NOMENCLATURE
A10	Limiter
A11	Bias Return
A12	1ST Converter
A13	Power Divider
A14	Dipiexer
A15	1ST L O
A18	2072MHz 2ND Converter
A22	2182MHz Phaselocked 2ND LO
A23	829MHz 2ND Converter
A24	Phase Gate Detector
A30	Main Power Supply
A32	110MHZ IF Amplifier
A34	110MHZ and 3RD Converter
A38	Front Panel
A40	Video Processor
A42	Preselector Driver
A44	1ST LO Driver
A46	Phaselock Control
A48	Controlled Oscillator, Offset Mixer and Strobe Driver
A50	Error Amplifier and Synthesizer Assembly
A51	Phaselock Control
A54	Memory
A58	Processor
A60	Horizontal Digital Storage
A61	Vertical Digital Storage
A62	Log Amplifier and Detector
A64	Deflection Amplifier
A66	CRT Readout
A68	Variable Resolution No. 1
A69	Variable Resolution No. 2
A70	Z-Axis and RF Interface
A72	Sweep
A74	High Voltage
AT10	Step Attenuator
AT11	Attenuator
AT12	Attenuator
FL10	Filter
FL11	Filter
FL12	Preselector
FL14	4 Cavity Filter
FL15	Filter
FL16	Directional Filter
FL36	Filter
S11	Filter Selector Switch
S12	Filter Selector Switch
S13	Transfer Switch


AT10
A12
AT12
FL16
S13
A14
A11
AT11
A24
FL12
A10
S11
S12
FL11
FL10
A23
A32
FL14
A18
A34
A13
A16
FL15
FL36
A22

EL9VP005


A40
A42
A44
A46
A48
A50
A50
A51
A54
A58
A60
A61
A62
A72
A70
A74
CAUTION
CAUTION
A64
A66
A68
A69
A30

EL9VP006

2-9 PERFORMANCE TESTS

The test procedures in the following pages should be performed in the sequence given.

The normal standard equipment condition for testing is with POWER ON. Equipment condition is not listed unless some other condition is required besides the power being on.

This procedure covers the following tests:

- Frequency Readout Accuracy
- Calibrator Frequency
- Calibrator Output Level
- RF Attenuator
- IF Gain Accuracy
- Display Accuracy and Range
- Amplitude Variation with Change in Resolution Bandwidth
- Frequency Response
- Preselector Ultimate Rejection
- Frequency Span/Div Accuracy
- Time/Div Accuracy
- Pulse Stretcher
- Resolution Bandwidth and Shape Factor
- Sensitivity
- Frequency Drift
- Residual FM
- Harmonic Distortion
- Noise Sidebands
- Residual Response
- Digital Storage
- Triggering Operation and Sensitivity
- External Sweep Operation
- Vertical Output
- Horizontal Output

FREQUENCY READOUT ACCURACY TEST

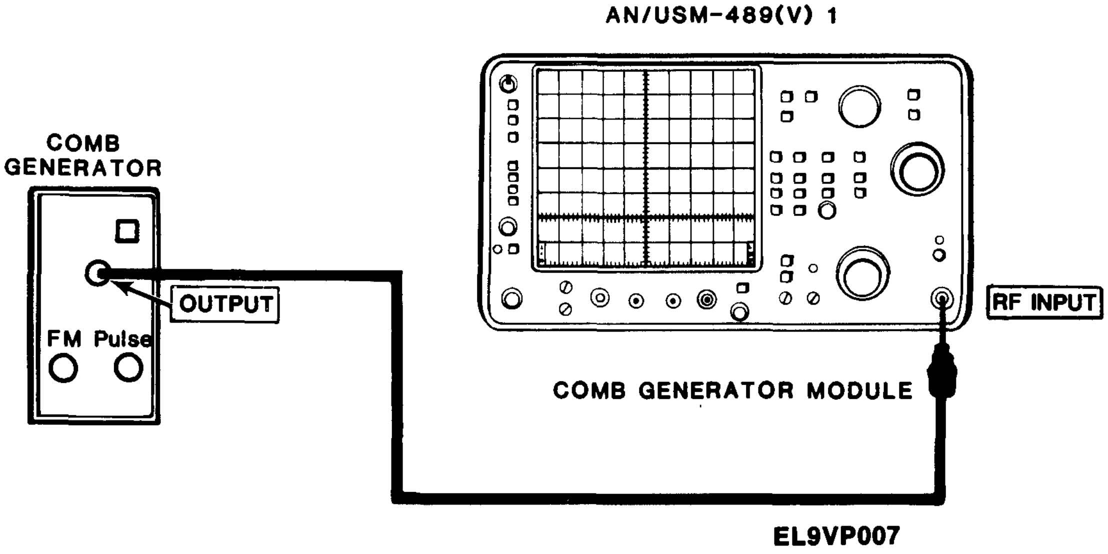
WARNING

High voltages can cause burns and electrical shock. See general warning page.

1. Set spectrum analyzer controls as follows:

CONTROL	SETTING
FREQUENCY RANGE	0 — 1.8GHZ
FREQUENCY SPAN/DIV	200 MHZ
FREQUENCY	1.0 GHz (±0.02GHz)
AUTO RESOLUTION	On
MIN RF ATTEN dB	20 dB
VERTICAL DISPLAY	10 dB/DIV
VIDEO FILTER	WIDE
TIME/DIV	AUTO
DIGITAL STORAGE	VIEW A and VIEW B

2. Connect spectrum analyzer and comb generator.



3. Adjust FREQUENCY SPAN/DIV control for 2MHz. Keep 1GHz comb line centered on CRT.
4. Press and release DEGAUSS switch.
5. Adjust FREQUENCY SPAN/DIV for 500kHz. Keep 1GHz comb line centered on CRT.
6. Set IDENTIFY 500kHz/ONLY switch on.
   - Signal changes in amplitude with each sweep.
7. Set IDENTIFY 500kHz/ONLY switch off.
8. Set CAL switch on.
9. Adjust FREQUENCY control for 1.000GHz.
10. Set CAL switch off.
11. Adjust FREQUENCY SPAN/DIV control for 200MHz.
12. Adjust FREQUENCY control for 1.5GHz comb line.
13. Adjust FREQUENCY SPAN/DIV control for 2MHz. Keep 1.5GHz comb line centered on CRT.
14. Press and release DEGAUSS switch.
15. Adjust FREQUENCY SPAN/DIV for 500kHz. Keep 1.5GHz comb line centered on CRT.
16. Set IDENTIFY 500kHz/ONLY switch on.
   - Signal changes in amplitude with each sweep. If spurious response, tune to next marker and check.
   - Check FREQUENCY readout accuracy, must equal 1.5000GHz ±5.1 MHz or; ±(0.2) of center frequency ±20% SPAN/DIV) whichever is greater.

17. Set IDENTIFY 500kHz/ONLY switch off.
18. Set FREQUENCY RANGE control to 1.7 — 5.5GHz band.
19. Adjust FREQUENCY SPAN/DIV control for 100MHz.
20. Adjust REFERENCE LEVEL for -10 dBm.
21. Adjust FREQUENCY control for 3GHz comb line centered on CRT.
22. Press and release DEGAUSS switch.
23. Adjust FREQUENCY SPAN/DIV control for 500kHz. Keep 3GHz comb line centered on CRT.
24. Set IDENTIFY 500kHz/ONLY switch on.
    - Signal changes in amplitude with each sweep.
25. Set IDENTIFY 500kHz/ONLY switch off.
26. Set CAL switch on.
27. Adjust FREQUENCY control for 3.000GHz.
28. Set CAL switch off.
29. Adjust FREQUENCY SPAN/DIV control for 20MHz.
30. Adjust FREQUENCY control for 3.5GHz comb line.
31. Adjust FREQUENCY SPAN/DIV control for 2MHz. Keep 3.5GHz comb line centered on CRT.
32. Press and release DEGAUSS switch.
33. Adjust FREQUENCY SPAN/DIV control for 500kHz. Keep 3.5GHz comb line centered on CRT.
34. Set IDENTIFY 500kHz/ONLY switch on.
    - Signal changes in amplitude with each sweep. If spurious response, tune to next marker and check.
    - Check FREQUENCY readout accuracy, must equal 3.5000GHz ±5.1 MHz or; ±(0.2% of center frequency ±20% SPAN/DIV) whichever is greater.
35. Set IDENTIFY 500kHz/ONLY switch off.
36. Adjust FREQUENCY SPAN/DIV for 20MHz.
37. Adjust FREQUENCY control for 5.0GHZ comb line.
38. Adjust FREQUENCY SPAN//DIV for 2MHz. Keep 5.0GHZ comb line centered on CRT.
39. Press and release DEGAUSS switch.
40. Adjust FREQUENCY SPAN/DIV control for 500kHz. Keep 5GHz comb line centered on CRT.
41. Set IDENTIFY 500kHz/ONLY switch on.
    - Signal changes in amplitude with each sweep.
42. Set IDENTIFY 500kHz/ONLY switch off.
43. Set CAL switch on.
44. Adjust FREQUENCY control for 5.000GHz.
45. Set CAL switch off.

46. Adjust FREQUENCY SPAN/DIV control for 20MHz.
47. Adjust FREQUENCY control for 5.5GHz comb line.
48. Adjust FREQUENCY SPAN/DIV control for 2MHz. Keep 5.5GHz comb line centered on CRT.
49. Press and release DEGAUSS switch.
50. Adjust FREQUENCY SPAN/DIV control for 500kHz. Keep 5.5GHz comb line centered on CRT.
51. Set IDENTIFY 500kHz/ONLY switch on.
    - Signal changes in amplitude with each sweep. If spurious response, tune to next marker and check.
    - Check FREQUENCY readout accuracy, must equal 5.5000GHz ±5.1MHz or; ±(0.2 of center frequency ±20% SPAN/DIV) whichever is greater.
52. Set IDENTIFY 500kHz/ONLY switch off.
53. Set FREQUENCY RANGE to 3 — 7.1GHz band.
54. Adjust FREQUENCY SPAN/DIV control for 20MHz.
55. Adjust FREQUENCY control for 6.0GHz comb line.
56. Press and release DEGAUSS switch.
57. Adjust FREQUENCY SPAN/DIV control for 500kHz. Keep 6.0GHz comb line centered on CRT.
58. Set IDENTIFY 500kHz/ONLY switch on.
    - Signal changes in amplitude with each sweep.
59. Set IDENTIFY 500kHz/ONLY switch off.
60. Set CAL switch on.
61. Adjust FREQUENCY control for 6.000GHz.
62. Set CAL switch off.
63. Adjust FREQUENCY SPAN/DIV control for 20MHz.
64. Adjust FREQUENCY control for 6.50GHz comb line.
65. Press and release DEGAUSS switch.
66. Adjust FREQUENCY SPAN/DIV for 500kHz. Keep 6.5GHz comb line centered on CRT.
67. Set IDENTIFY 500kHz/ONLY switch on.
    - Signal changes in amplitude with each sweep. if spurious response, tune to next marker and check.
    - Check FREQUENCY readout accuracy, must equal 6.5000GHz ±5.1 MHz or; ±(0.2% of center frequency ±20% SPAN/DIV) whichever is greater.
68. Set IDENTIFY 500kHz/ONLY switch off.
69. Disconnect comb generator from spectrum analyzer.

END OF TEST

CALIBRATOR FREQUENCY TEST

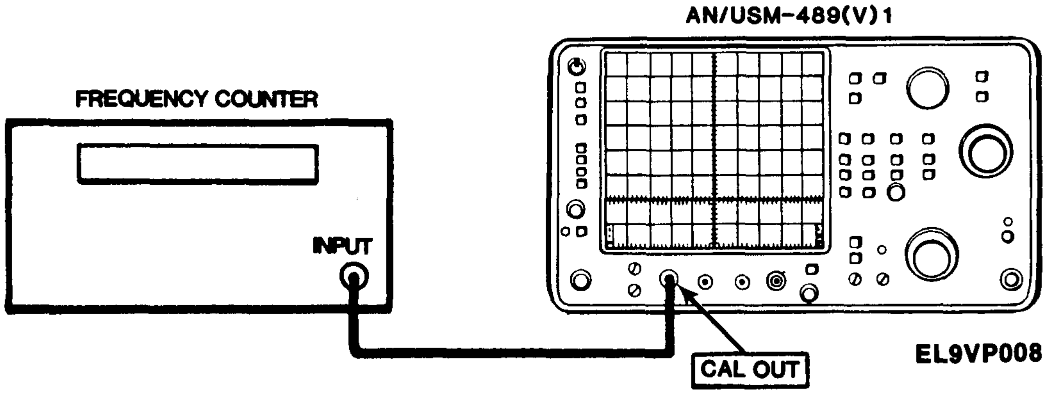
WARNING

High voltages can cause burns and electrical shock. See general warning page.

1. Set frequency counter controls as follows:

CONTROL	SETTING
FREQ	A
ATTEN	X1
SLOPE	+
COUPLE	AC

2. Connect spectrum analyzer and frequency counter.



3. Check frequency counter for 100 MHz ±1.7kHz.

4. Disconnect frequency counter from spectrum analyzer.

END OF TEST

CALIBRATOR OUTPUT LEVEL TEST

WARNING

High voltages can cause burns and electrical shock. See general warning page.

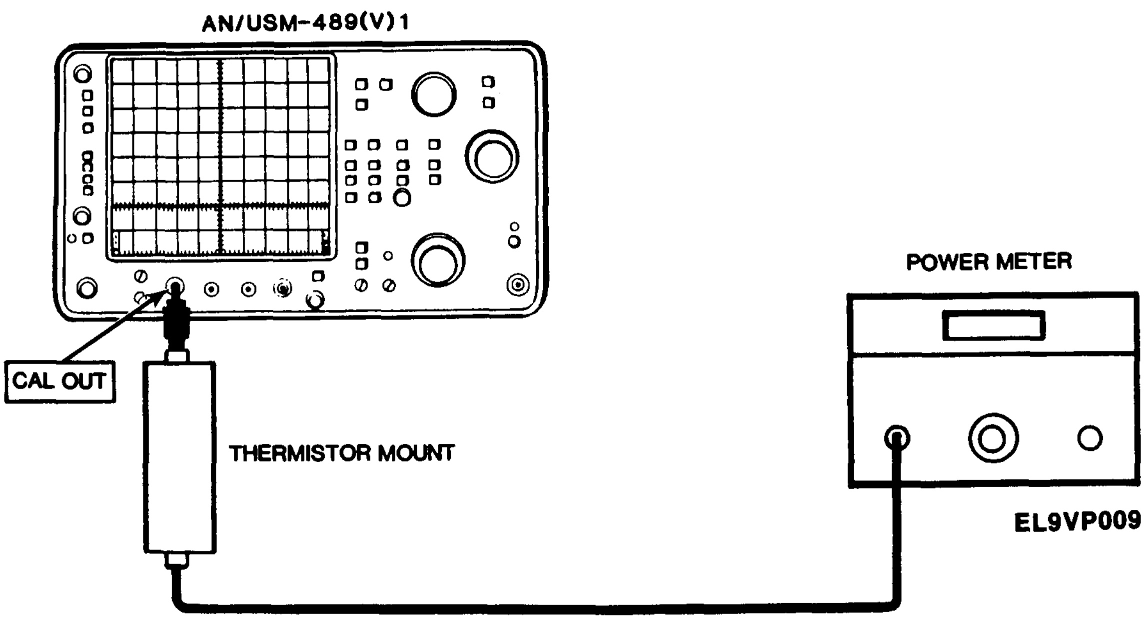
NOTE

All spectrum analyzer settings refer to the spectrum analyzer under test.

1. Set spectrum analyzer controls as follows:

CONTROL	SETTING
VERTICAL DISPLAY	2 dB/DIV
FREQUENCY RANGE	0 — 1.8GHZ
FREQUENCY SPAN/DIV	10 MHz
FREQUENCY	100 MHz
REFERENCE LEVEL	-18 dBm
AUTO RESOLUTION	On
READOUT	On
TRIGGERING	FREE RUN
TIME/DIV	AUTO
DIGITAL STORAGE	VIEW A and VIEW B
MIN RF ATTEN	0 dB

2. Connect CALIBRATOR OUTPUT of the reference spectrum analyzer to the RF INPUT of the spectrum analyzer under test.



3. Adjust FREQUENCY control for 100 MHz signal centered on CRT.

4. Adjust FREQUENCY SPAN/DIV for 1 MHz.

5. Adjust RESOLUTION BANDWIDTH for 1MHz.

6. Note the signal level on screen and activate SAVE A.

NOTE

Signal displayed in SAVE A is the reference that will be used.

7. Disconnect cable from CALIBRATOR OUT of the reference and connect it to CALIBRATOR OUT of the spectrum analyzer under test.

6. Compare the displayed signal amplitude with the amplitude of the signal stored in SAVE A.

- Displayed signal should be within ±.6 dB of signal stored in SAVE A.

END OF TEST

RF ATTENUATOR TEST

WARNING

High voltages can cause burns and electrical shock. See general warning page.

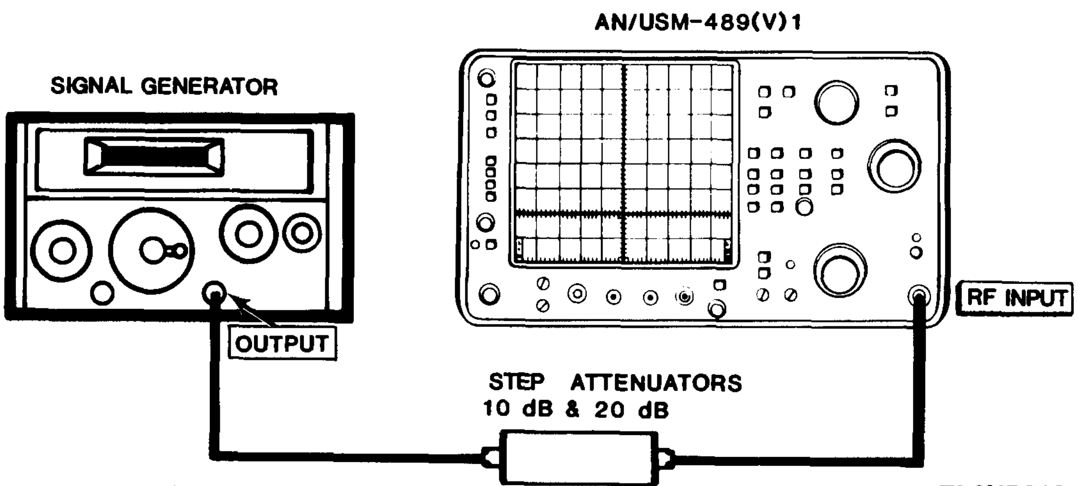
1. Set spectrum analyzer controls as follows:

CONTROL	SETTING
REFERENCE LEVEL	–30 dBm
FREQUENCY RANGE	3.0 — 7.1 GHZ
FREQUENCY	4.00GHZ
FREQUENCY SPAN/DIV	200 MHZ
MIN RF ATTEN	0 dB
RESOLUTION BANDWIDTH	1MHz
VERTICAL DISPLAY	10 dB/DIV
READOUT	On
TRIGGERING	FREE RUN
TIME/DIV	AUTO
DIGITAL STORAGE	VIEW A and VIEW B
AUTO RESOLUTION	On

2. Set signal generator controls as follows:

CONTROL	SETTING
FREQUENCY	4GHz
OUTPUT	0 dBm

3. Connect spectrum analyzer and signal generator.



EL9VP010

4. Set step attenuator to 30 dB.
5. Adjust FREQUENCY control for 4.000GHz signal centered on CRT.
6. Adjust FREQ SPAN/DIV control for 20kHz. Keep 4.000GHz signal centered on CRT.
7. Set AUTO RESOLUTION switch on.
   - RESOLUTION BANDWIDTH changes to 10kHz,
   - Phaselock turns on.

8. Set VERTICAL DISPLAY to 2dB/DIV.
9. Set VIDEO FILTER to NARROW.
10. On signal generator, adjust ATTENUATION control for signal amplitude of 7 divisions on CRT.
11. Set SAVE A switch on.
12. Adjust REFERENCE LEVEL control for –20 dBm.
    - RF ATTENUATION changes to 10 dB.
13. Set step attenuator to 20 dB.
    - Compare the difference between the reference level and the new level.
    - Variation plus the calibrated 10 dB step attenuator correction factor should not exceed 0.3 dB.

CORRECTION FACTOR TABLE

Ratio in dB of signal plus noise—noise	3.01	4.0	5.0	6.0	7.0	8.0	9.0	10.0	12.0	14.0
Subtract this correction factor for true signal value	3.01	2.20	1.65	1.26	0.97	0.75	0.58	0.46	0.28	0.18

14. Set SAVE A switch off.
15. Adjust REFERENCE LEVEL control for –30 dBm.
16. On signal generator, adjust ATTENUATION control for signal amplitude of 7 divisions on CRT.
17. Set SAVE A switch on.
18. Adjust REFERENCE LEVEL control for –10 dBm.
    - RF ATTENUATION changes to 20 dB.
19. Set step attenuator to 0 dB.
    - Compare difference between the reference level and the new level.
    - Variation plus 0 dB step attenuator correction factor should not exceed 0.6 dB.
20. Set SAVE A switch off.
21. Set step attenuator to 30 dB.
22. Adjust REFERENCE LEVEL control for -30 dBm.
23. On signal generator, adjust ATTENUATION control for signal amplitude of 7 divisions on CRT.
24. Set SAVE A switch on.
25. Adjust REFERENCE LEVEL control for 0 dBm.
    - RF ATTENUATION changes to 30 dB.
26. Set step attenuator to 0 dB.
    - Compare difference between the reference level and the new level.
    - Variation plus 0 dB step attenuator correction factor should not exceed 0.7 dB.
27. Disconnect signal generator from spectrum analyzer.

END OF TEST

IF GAIN ACCURACY TEST

WARNING

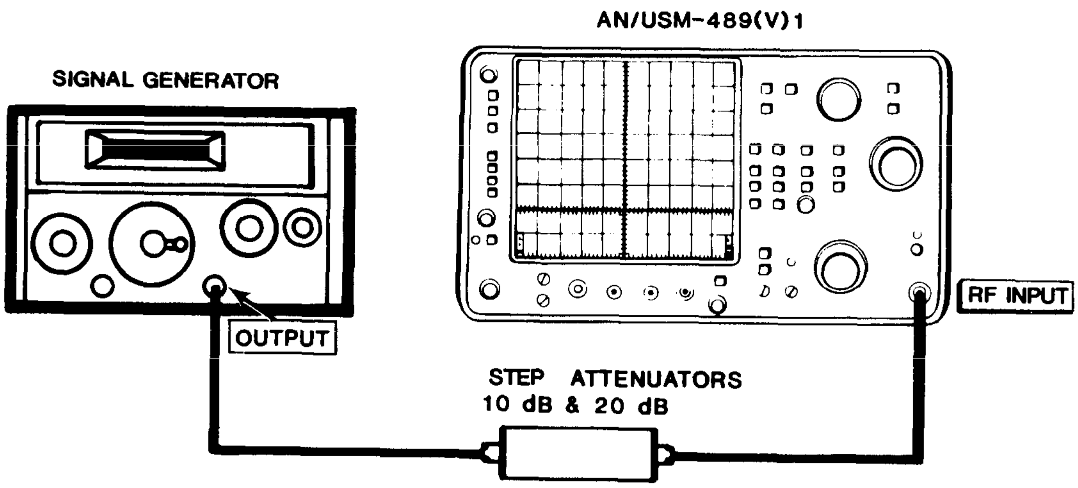
High voltages can cause burns and electrical shock. See general warning page.

1. Set spectrum analyzer controls as follows:

CONTROL	SETTING
FREQUENCY SPAN/DIV	20 MHZ
FREQUENCY	100 MHz
VERTICAL DISPLAY	10 dB/DIV
VIDEO FILTER	WIDE
DIGITAL STORAGE	VIEW A and VIEW B
AUTO RESOLUTION	On
REFERENCE LEVEL	–10 dB/DIV
MIN RF ATTEN	0 dB
TIME/DIV	AUTO
TRIGGERING	FREE RUN

2. Set step attenuators to 0 dB.

3. Connect spectrum analyzer and signal generator.



EL9VP010

4. Set signal generator controls as follows:

CONTROL	SETTING
FREQUENCY	100 MHz
ATTENUATION	–20 dBm

5. Adjust FREQUENCY control for 100 MHZ signal centered on CRT.

6. Adjust FREQUENCY SPAN/DIV control for 10kHz. Keep 100 MHz signal centered on CRT.

7. Adjust RESOLUTION BANDWIDTH control for 10kHz.

8. Set VERTICAL DISPLAY to 2 dB/DIV.

9. Adjust signal generator output for 6 divisions signal amplitude on CRT. Keep 100MHZ signal centered on CRT.
10. Set MIN NOISE switch on.
    - Signal change in amplitude should not exceed ±0.8 dB.
11. Adjust signal generator output for 6 divisions signal amplitude on CRT. Keep 100MHz signal centered on CRT.
12. Adjust REFERENCE LEVEL control for -11 dBm.

NOTE

Wait for sweep completion at each step.

13. Set step attenuator to 1 dB.
    - Check and note signal change in amplitude.
    - Signal change should not exceed 0.2 dB.
14. Adjust REFERENCE LEVEL control for -12 dBm.
15. Set step attenuator to 2 dB.
    - Check and note signal change in amplitude.
    - Signal change should not exceed 0.2 dB.
16. Adjust REFERENCE LEVEL control for -13 dBm.
17. Set step attenuator to 3 dB.
    - Check and note signal change in amplitude.
    - Signal change should not exceed 0.2 dB.
18. Adjust REFERENCE LEVEL control for -14 dBm.
19. Set step attenuator to 4 dB.
    - Check and note signal change in amplitude.
    - Signal change should not exceed 0.2 dB.
20. Adjust REFERENCE LEVEL control for -15 dBm.
21. Set step attenuator to 5 dB.
    - Check and note signal change in amplitude.
    - Signal change should not exceed 0.2 dB.
22. Adjust REFERENCE LEVEL control for -16 dBm.
23. Set step attenuator to 6 dB.
    - Check and note signal change in amplitude.
    - Signal change should not exceed 0.2 dB.
24. Adjust REFERENCE LEVEL control for -17 dBm.
25. Set step attenuator to 7 dB.
    - Check and note signal change in amplitude.
    - Signal change should not exceed 0.2 dB.
26. Adjust REFERENCE LEVEL control for -18 dBm.

27. Set step attenuator to 8 dB.
   - Check and note signal change in amplitude.
   - Signal change should not exceed 0.2dB.
28. Adjust REFERENCE LEVEL control for –19 dBm.
29. Set step attenuator to 9 dB.
   - Check and note signal change in amplitude.
   - Signal change should not exceed 0.2 dB.
30. Adjust REFERENCE LEVEL control for –20 dBm.
31. Set step attenuator to 10 dB.
   - Check and note signal change in amplitude.
   - Signal change should not exceed 0.2 dB.
   - Cumulative error should not exceed 1 dB.
32. Set MIN NOISE switch off.
33. Set step attenuator to 0 dB.
34. Adjust signal generator output for 6 divisions signal amplitude on CRT. Keep 100 MHz signal centered on CRT.
35. Repeat steps 12 through 31 for REFERENCE LEVEL –20 dBm to –30 dBm; –30 dBm to –40 dBm; –40 dBm to –50 dBm; –50 dBm to –60 dBm; –60 dBm to –70 dBm and –70 dBm to –80 dBm. Adjust step attenuator as appropriate to establish 6 division reference level.
   - Cumulative error should not exceed 1.0 dB.
36. Adjust RESOLUTION BANDWIDTH for 1 kHz. Keep 100MHZ signal centered on CRT.
37. Adjust FREQUENCY SPAN/DIV for 1 kHz.
38. Set step attenuator to 60 dB.
39. Adjust REFERENCE LEVEL for –80 dBm.
40. Adjust signal generator output for signal amplitude of 6 divisions on CRT.
41. Adjust REFERENCE LEVEL control for –81 dBm.
42. Set step attenuator to 61 dB.
   - Check and note signal change in amplitude.
   - Signal change should not exceed 0.2 dB.
43. Adjust REFERENCE LEVEL control for –82 dBm.
44. Set step attenuator to 62 dB.
   - Check and note signal change in amplitude.
   - Signal change should not exceed 0.2 dB.
45. Adjust REFERENCE LEVEL control for –83 dBm.
46. Set step attenuator to 63 dB.
   - Check and note signal change in amplitude.
   - Signal change should not exceed 0.2 dB.
47. Adjust REFERENCE LEVEL control for –84 dBm.

48. Set step attenuator to 64dB.
    - Check and note signal change in amplitude.
    - Signal change should not exceed 0.2 dB.
49. Adjust REFERENCE LEVEL control for –85 dBm.
50. Set step attenuator to 65 dB.
    - Check and note signal change in amplitude.
    - Signal change should not exceed 0.2 dB.
51. Adjust REFERENCE LEVEL control for –86 dBm.
52. Set step attenuator to 66 dB.
    - Check and note signal change in amplitude.
    - Signal change should not exceed 0.2 dB.
53. Adjust REFERENCE LEVEL control for –87 dBm.
54. Set step attenuator to 67 dB.
    - Check and note signal change in amplitude.
    - Signal change should not exceed 0.2 dB.
55. Adjust REFERENCE LEVEL control for –88 dBm.
56. Set step attenuator to 68 dB.
    - Check and note signal change in amplitude.
    - Signal change should not exceed 0.2 dB.
57. Adjust REFERENCE LEVEL control for –89 dBm.
58. Set step attenuator to 69 dB.
    - Check and note signal change in amplitude.
    - Signal change should not exceed 0.2 dB.
59. Adjust REFERENCE LEVEL control for –90 dBm.
60. Set step attenuator to 70 dB.
    - Check and note signal change in amplitude.
    - Signal change should not exceed 0.2 dB.
    - Cumulative error should not exceed 0.7 dB.
61. Repeat steps 38 through 60 for REFERENCE LEVEL –80 dBm to -90 dBm.
    - Cumulative error should not exceed 0.7 dB.
    - This range cannot be checked accurately because of baseline noise.
62. Disconnect signal generator from spectrum analyzer.

END OF TEST

DISPLAY ACCURACY AND RANGE TEST

WARNING

High voltages can cause burns and electrical shock. See general warning page.

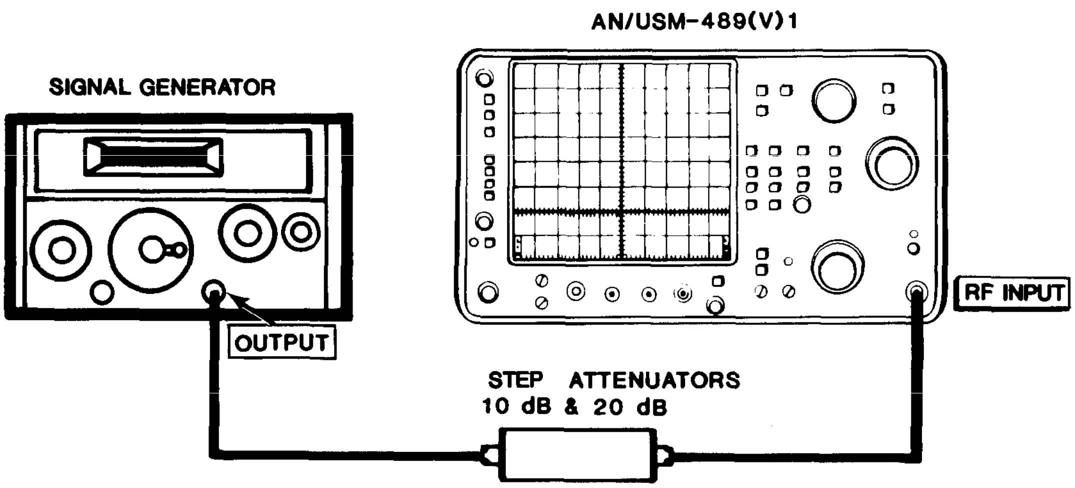
1. Set spectrum analyzer controls as follows:

CONTROL	SETTING
REFERENCE LEVEL	+10 dBm
MIN RF ATTEN	0 dBm
VIDEO FILTER	NARROW
VERTICAL DISPLAY	10 dB/DIV
FREQUENCY SPAN/DIV	10 MHz
RESOLUTION BANDWIDTH	1MHz

2. Set signal generator controls as follows:

CONTROL	SETTING
FREQUENCY	100 MHz
ATTENUATION	+10 dBm

3. Connect spectrum analyzer and signal generator.



EL9VP010

4. Set 10 dB and 1 dB step external attenuators to 0 dB attenuation.
5. Adjust FREQUENCY control for 100MHZ signal centered on CRT.
6. Adjust FREQUENCY SPAN/DIV control for 10kHz. Keep 100 MHz signal centered on CRT.
7. Adjust RESOLUTION BANDWIDTH control for 10kHz.
8. Adjust signal generator ATTENUATION control for signal amplitude on top graticule. (Keep 100 MHz signal centered on CRT.)

9. Set 10 dB step external attenuator to 80 dB in 10 dB increments.
   - Observe and note that the 100 MHz signal steps down screen in 10 dB ±1.0 dB steps.
   - Maximum cumulative error should not exceed 2.0 dB over the display window.
10. Set 10 dB step external attenuator to 0 dB.
11. Set VERTICAL DISPLAY to 2 dB/DIV.
12. Adjust FREQUENCY SPAN/DIV control for 20kHz.
13. Adjust RESOLUTION BANDWIDTH control for 100kHz.
14. Adjust signal generator ATTENUATION control for signal amplitude on top graticule.
15. Set 1 dB step external attenuator to 16 dB in 2 dB increments.
   - Deviation should not exceed ±0.4 dB per each 2 dB steps.
   - Maximum cumulative deviation should not exceed ±1.0 dB over the 16 dB range.
16. Set 1 dB step external attenuator to 0 dB.
17. Set VERTICAL DISPLAY to LIN.
   - Observe that the signal amplitude decreases half the screen to 4 ±0.4 divisions.
18. Set 10 dB step external attenuator to 10 dB.
19. Set 1 dB step external attenuator to 2 dB.
   - Signal amplitude decreases to 2 ±0.4 divisions.
20. Set 1 dB step external attenuator to 8 dB.
   - Signal amplitude decrease to 1 ±0.4 divisions.
21. Disconnect signal generator and attenuators from spectrum analyzer.

END OF TEST

AMPLITUDE VARIATION WITH CHANGE IN RESOLUTION BANDWIDTH TEST

WARNING

High voltages can cause burns and electrical shock. See general warning page.

1. Set spectrum analyzer controls as follows:

CONTROL	SETTING
FREQUENCY RANGE	0 — 1.8GHZ
FREQUENCY SPAN/DIV	20 MHZ
FREQUENCY	200 MHZ
RESOLUTION BANDWIDTH	1MHz
VERTICAL DISPLAY	2 dB/DIV
REFERENCE LEVEL	–20 dBm
MIN RF ATTEN	0 dB
PEAK/AVERAGE	Fully CCW
TIME/DIV	AUTO
DIGITAL STORAGE	VIEW A and VIEW B

2. Connect CAL OUT to RF INPUT.
3. Adjust FREQUENCY control for center CRT position of 200 MHz calibrator marker.
4. Adjust FREQUENCY SPAN/DIV control for 500kHz. Keep 200 MHz signal centered on CRT.
5. Set FINE AA dB/ONLY switch on.
6. Adjust REFERENCE LEVEL control for a signal amplitude of 6 divisions.
7. Adjust RESOLUTION BANDWIDTH control for 100kHz.
8. Adjust FREQUENCY SPAN/DIV control for 100kHz. Keep 200 MHz signal centered on CRT.
   - Amplitude change should not be more than 0.5 dB.
9. Adjust RESOLUTION BANDWIDTH control for 10kHz.
10. Adjust FREQUENCY SPAN/DIV control for 10kHz. Keep 200 MHz signal centered on CRT.
    - Amplitude change should not be more than 0.5 dB.
11. Turn PEAK AVERAGE control fully CW.
12. Adjust RESOLUTION BANDWIDTH control for 1 kHz.
13. Adjust FREQUENCY SPAN/DIV control for 1 kHz. Keep 200 MHz signal centered on CRT.
    - Amplitude change should not be more than 0.5 dB.
14. Disconnect CAL OUT from RF INPUT.

END OF TEST

FREQUENCY RESPONSE TEST

WARNING

High voltages can cause burns and electrical shock. See general warning page.

1. Set spectrum analyzer controls as follows:

CONTROL	SETTING
FREQUENCY RANGE	0 — 1.8GHz
FREQUENCY SPAN/DIV	1MHz
FREQUENCY	5MHz
MIN RF ATTEN	30 dB
REFERENCE LEVEL	0 dBm
AUTO RESOLUTION	On
TIME/DIV	20 ms
VERTICAL DISPLAY	2 dB/DIV
DIGITAL STORAGE	VIEW B; SAVE A; MAX HOLD

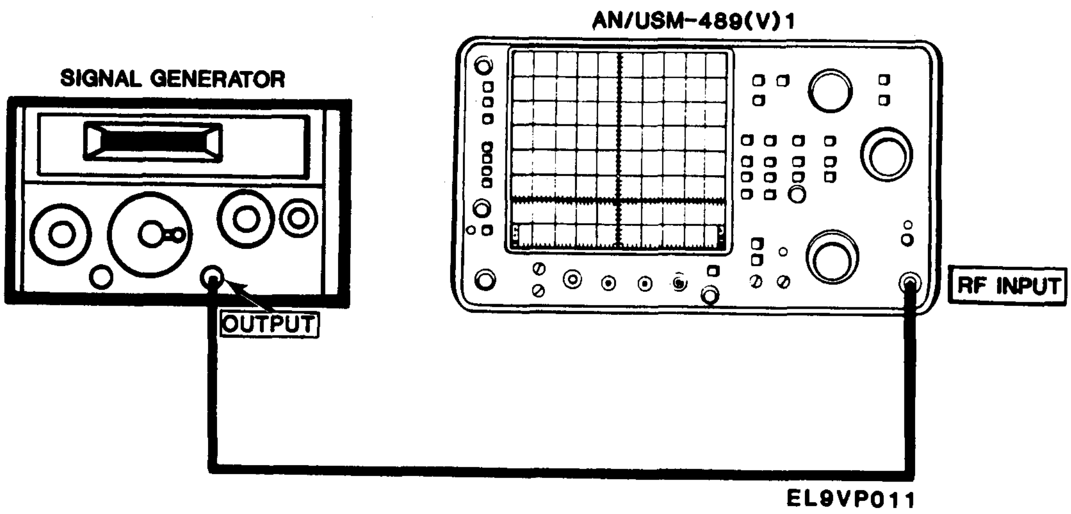
NOTE

MAX HOLD must be reactivated for each sweep to update data stored for each sweep.

2. Set signal generator controls as follows:

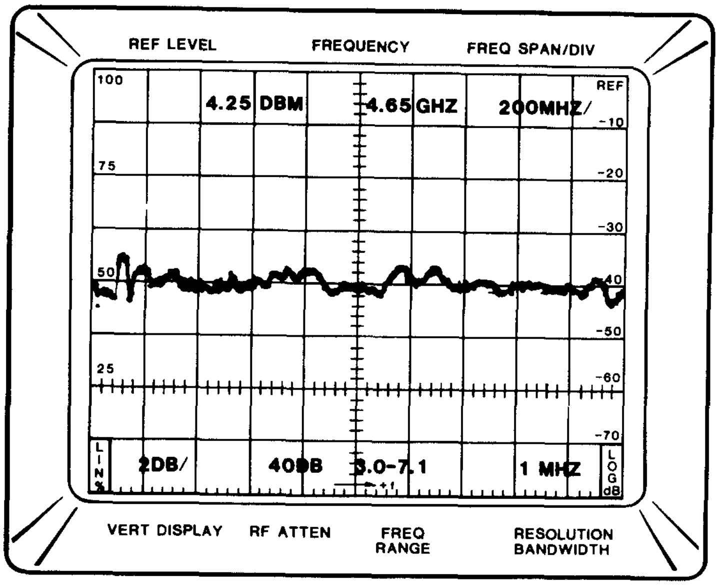
CONTROL	SETTING
FREQUENCY	5MHz
ATTENUATION	–10 dBm

3. Connect spectrum analyzer and signal generator.



4. Adjust REFERENCE LEVEL control for approximate half CRT deflection of 5MHz signal.
5. Slowly adjust the signal generator FREQUENCY control from 100kHz to 10MHz. Keep signal centered

   - Observe the CRT display and note any amplitude deviation above and below the average.
   - Amplitude deviation should not exceed ±1.5 dB. See figure below.



EL9VP012

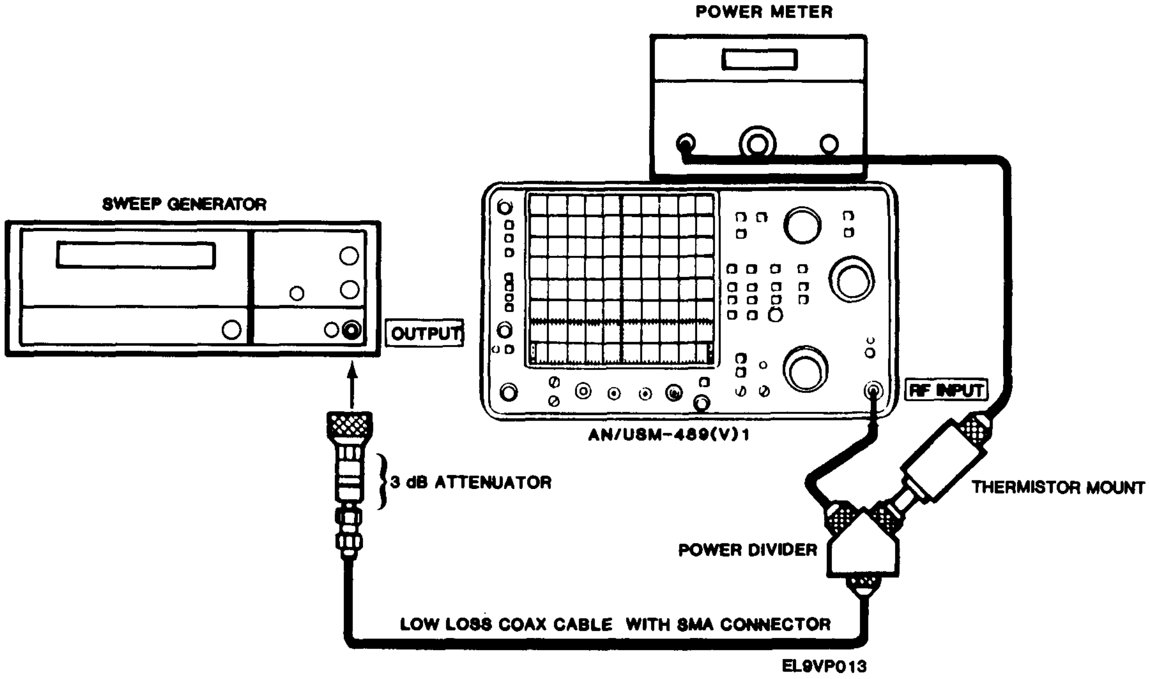
6. Disconnect signal generator from spectrum analyzer.
7. Set sweep generator controls as follows:

CONTROL	SETTING
START	0. 01GHz
STOP	2.4GHz
SWEEP MODE	AUTO

NOTE

If UNCAL indicator lights, lower TIME/DIV control until indicator goes off.

8. Connect spectrum analyzer and 0.01—18GHz sweep generator.



9. Adjust FREQUENCY SPAN/DIV control for 200MHz.
10. Adjust FREQUENCY control for approximately 1.0GHz.
11. On the sweep generator, select a 1.0GHz marker.
12. On the sweep generator, adjust OUTPUT control for approximately -6 dBm reading on the power meter.
13. Set VERTICAL DISPLAY to 2 dB/DIV.
14. Adjust REFERENCE LEVEL control for signal amplitude of approximately half CRT.
15. On the sweep generator, set SWEEP MODE control to AUTO INTERNAL SWEEP.
16. On the sweep generator, set SWEEP TIME control to 100s.
    - Observe and note variations in signal amplitude as the sweep generator scans across the 10 MHz to 2.0GHz span.
    - Amplitude variations must not exceed ±1.5 dB.

17. Set FREQUENCY RANGE to 1.7 — 5.5GHz band.
18. Adjust FREQUENCY contrll for approximately 2.0GHz.
19. Adjust FREQUENCY SPAN/DIV control for 100MHz.
20. On the sweep generator, set CW MARKER switch to on.
21. On the sweep generator, adjust CW MARKER control for 2.0GHz.
22. Adjust PEAK control for maximum signal amplitude.
23. On the sweep generator, set to SWEEP MODE.
24. On the sweep generator, set START/STOP markers for 1.5 and 2.5GHz.
25. On the sweep generator, sweep the 1.7 — 2.5GHz band.
    - Observe and note variations in amplitude.
    - Variations in amplitude must not exceed ±2.5 dB.

NOTE

If any segment or portion of the band fails to meet the ±2.5 dB specification, adjust the spectrum analyzer FREQUENCY control for the center of this portion, apply a CW marker at the center frequency and readjust PEAKING for maximum amplitude. Decrease the FREQUENCY SPAN/DIV to display that portion and then recheck frequency response.

26. On the sweep generator, adjust the power level to approximately –6 dBm.
27. On the sweep generator, adjust GAIN control for stable output.
28. Adjust FREQUENCY SPAN/DIV control for 200MHz.
29. Adjust FREQUENCY control for 4.0GHz.
30. On the sweep generator, set CW marker to ON.
31. On the sweep generator, adjust CW MARKER control for 4.0GHz.
32. Adjust PEAK control for maximum signal amplitude.
33. On the sweep generator, set to SWEEP MODE.
34. On the sweep generator, set START/STOP markers for 3.5 and 5.0GHz.
35. On the sweep generator, sweep the 3.5 — 5.0GHz band.
    - Observe and note variations in amplitude.
    - Variations in amplitude must not exceed ±2.5 dB.
    - Recheck those portions that do not meet specifications after the PEAK control has been adjusted for that frequency portion.

36. Set FREQUENCY RANGE to 3.0 — 7.1GHz band.

37. Adjust FREQUENCY control for approximately 5.0GHz.

38. Adjust FREQUENCY SPAN/DIV control for MAX.

39. On the sweep generator, adjust CW marker control for 5.0GHz.

40. Adjust PEAK control for maximum signal amplitude.

41. On the sweep generator, set START/STOP markers for 2.9 and 7.1GHz.

42. On the sweep generator, sweep the 3.0 — 7.1GHz band.

- Observe and note variations in amplitude.
- Variations in amplitude must not exceed ±2.5 dB.
- It may be necessary to check variations in amplitude in smaller segments, with PEAK control adjusted for the shorter spans, if portions of the frequency band do not meet specifications.

43. Set FREQUENCY RANGE to 5.4 — 18GHz band.

44. Adjust FREQUENCY SPAN/DIV control for 200MHz.

45. Adjust FREQUENCY control for approximately 10GHz.

46. Adjust FREQUENCY SPAN/DIV control for MAX.

47. On the sweep generator, adjust CW MARKER control for 10GHz.

48. Adjust PEAK control for maximum signal amplitude.

49. On the sweep generator, set START/STOP markers for 5.3 and 18GHz.

50. On the sweep generator, sweep the 5.4 — 18GHz band.

- Observe and note variations in amplitude.
- Variations in amplitude must not exceed ±3.5 dB.
- It may be necessary to check variations in amplitude in smaller segments, with PEAK control adjusted for the shorter spans, if portions of the frequency band do not meet specifications.

END OF TEST

PRESELECTOR ULTIMATE REJECTION TEST

WARNING

High voltages can cause burns and electrical shock. See general warning page.

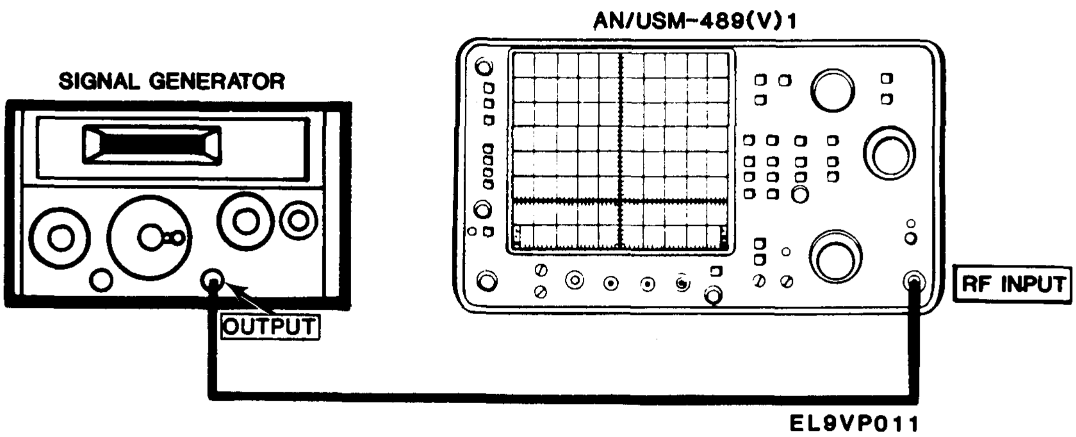
1. Set spectrum analyzer controls as follows:

CONTROL	SETTING
FREQUENCY RANGE	1.7 — 5.5GHz
FREQUENCY SPAN/DIV	1MHz
AUTO RESOLUTION	On
VERTICAL DISPLAY	10 dBm/DIV
REFERENCE LEVEL	–30 dBm
MIN RF ATTEN	0 dB
TIME/DIV	AUTO
DIGITAL STORAGE	VIEW A and VIEW B
VIDEO FILTER	WIDE

2. Set signal generator controls as follows:

CONTROL	SETTING
FREQUENCY	3.5GHz
FUNCTION	SINE
MODE	CW
ATTENUATION	–30 dBm

3. Connect spectrum analyzer and signal generator.



4. Adjust FREQUENCY control for 3.5GHz signal centered on CRT.
5. Adjust FREQUENCY SPAN/DIV control for 10kHz. Keep 3.5GHz signal centered on CRT.
6. On signal generator adjust ATTENUATION control for full CRT display. Adjust PEAK/AVERAGE control to maximize the 3.5GHz signal amplitude.
7. Set FREQUENCY RANGE to 3.0 — 7.1GHz band. Keepsignal centered on CRT.
8. Check for spurious response on the display.
   - Spurii must be down 70 dB or more from the level in step 6.
9. Disconnect signal generator from spectrum analyzer.

END OF TEST

FREQUENCY SPAN/DIV ACCURACY TEST

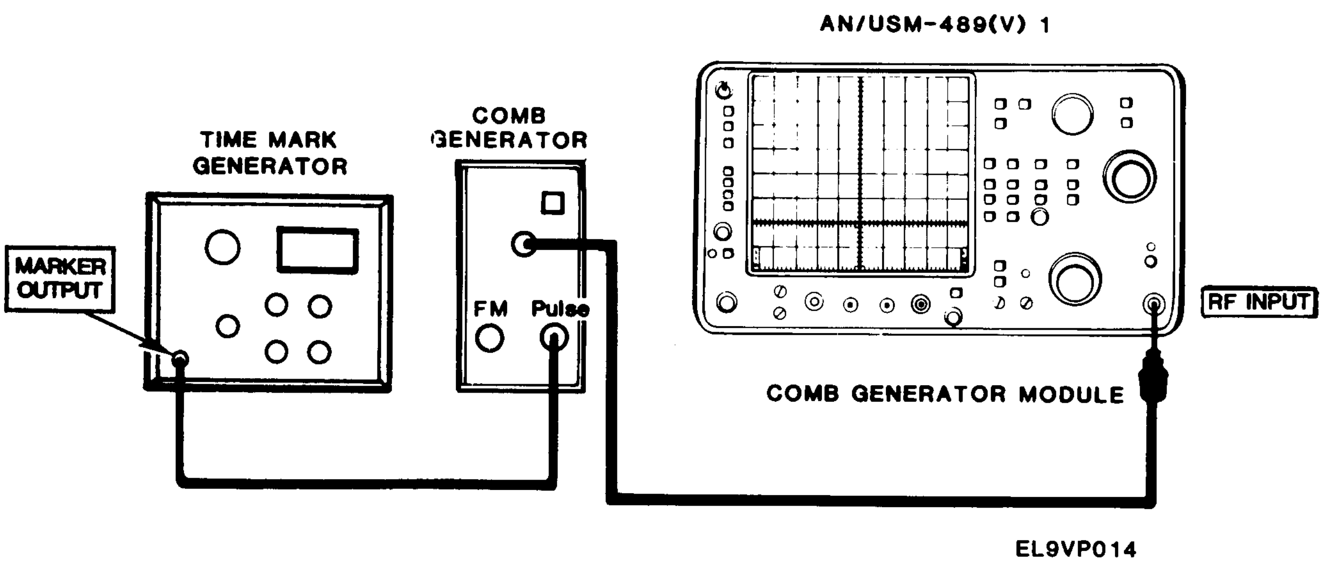
WARNING

High voltages can cause burns and electrical shock. See general warning page.

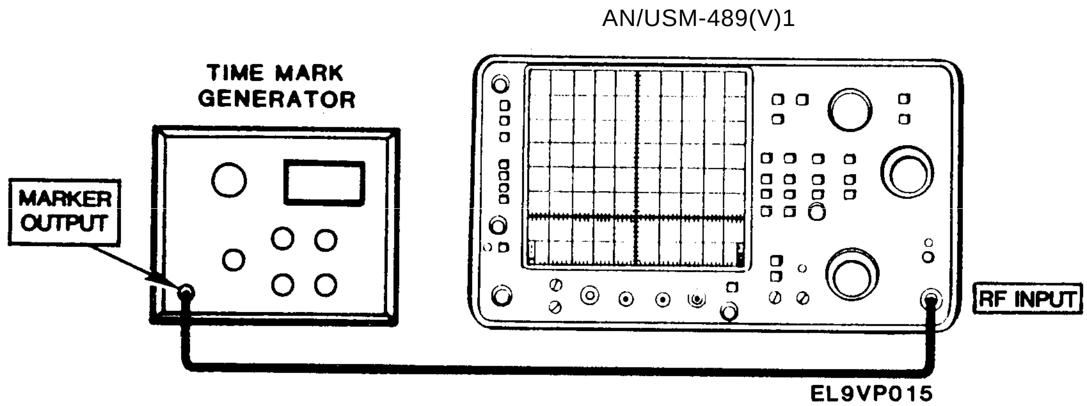
1. Set spectrum analyzer controls as follows:

CONTROL	SETTING
FREQUENCY RANGE	0 — 1.8GHz
RESOLUTION BANDWIDTH	1.0MHz
FREQUENCY SPAN/DIV	200 MHz
TIME/DIV	0.1 s
VERTICAL DISPLAY	10 dB/DIV
REFERENCE LEVEL	–30 dB
MIN RF ATTEN	0 dB
DIGITAL STORAGE	VIEW A and VIEW B
AUTO RESOLUTION	On

2. Connect CAL OUT to RF INPUT.
3. Adjust FREQUENCY control to align 100 MHz markers over center 8 divisions of CRT.
   - It may be necessary to adjust REFERENCE LEVEL control to obtain adequate markers.
   - Maximum deviation must not exceed 2 minor divisions.
4. Adjust FREQUENCY SPAN/DIV control for 100MHz.
   - Check that maximum deviation does not exceed 2 minor divisions.
5. Adjust MIN RF ATTEN control for 10 dB.
6. Disconnect CAL OUT from RF INPUT.
7. Connect comb generator to spectrum analyzer.



8. Set time mark generator to 20 ns.
9. Adjust REFERENCE LEVEL for –10 dBm.
10. Set FREQUENCY RANGE to 5.4 — 18GHz band.
11. Adjust FREQUENCY SPAN/DIV control for 500MHz.
12. Adjust PEAK/AVERAGE control for maximum marker amplitude.
13. Adjust FREQUENCY control to position a marker to center of CRT.
    - Check that deviation does not exceed 2 minor divisions.
14. Set FREQUENCY RANGE to 0 — 1.8GHz band.
15. Adjust REFERENCE LEVEL control for +20 dBm.
16. Adjust FREQUENCY SPAN/DIV control for 50MHz.
17. Adjust FREQUENCY control for 500MHz.
18. Disconnect spectrum analyzer from comb generator.
19. Connect time mark generator OUTPUT to spectrum analyzer.



20. Adjust FREQUENCY control towards low end of band until 50 MHz markers are displayed over center 8 divisions of CRT.
    - Check that 10 MHz markers appear between each 50 MHz marker.
    - Check that maximum deviation does not exceed 2 minor divisions.
21. Adjust FREQUENCY SPAN/DIV control for 20MHz.
22. Set time mark generator to 50 ns.
23. Adjust FREQUENCY control towards low end of band until 20 MHz markers are displayed over center 8 divisions of CRT.
    - Check that maximum deviation does not exceed 2 minor divisions.
    - Insure that AUTO RESOLUTION switch is on.
24. Adjust FREQUENCY SPAN/DIV control for 10MHz.
25. Set time mark generator to 0.1 µs.
26. Adjust FREQUENCY control towards low end of band until 10 MHz markers are displayed over center 8 divisions of CRT.
    - Check that maximum deviation does not exceed 2 minor divisions.
27. Adjust FREQUENCY SPAN/DIV control for 5MHz.

28. Set time mark generator to 0.2 µs.
29. Adjust FREQUENCY control towards low end of band until 5MHz markers are displayed over center 8 divisions of CRT.
    - Check that maximum deviation does not exceed 2 minor divisions.
30. Adjust FREQUENCY SPAN/DIV control for 2MHz.
31. Set time mark generator to 0.5 µs.
32. Adjust FREQUENCY control towards low end of band until 2MHz markers are displayed over center 8 divisions of CRT.
    - Check that maximum deviation not exceed 2 minor divisions.
33. Adjust FREQUENCY SPAN/DIV control for 1 MHz.
34. Set time mark generator to 1 µs.
35. Adjust FREQUENCY control towards low end of band until 1 MHz markers are displayed over center 8 divisions of CRT.
    - Check that maximum deviation does not exceed 2 minor divisions.
36. Disconnect time mark generator from spectrum analyzer.
37. Connect spectrum analyzer and comb generator as indicated in step 7.
38. Set time mark generator to 2 µs.
39. Adjust REFERENCE LEVEL control for –20 dBm.
40. Adjust FREQUENCY SPAN/DIV control for 500kHz.
41. Adjust FREQUENCY control toward 500 MHz until 500kHz markers are displayed over center 8 divisions of CRT.
    - Check that maximum deviation does not exceed 2 minor divisions.
42. Set AUTO RESOLUTION switch on.
43. Adjust FREQUENCY SPAN/DIV control for 50kHz.
44. Set time mark generator to 20 µs.
45. Adjust FREQUENCY control until 50kHz markers are displayed over center 8 divisions of CRT.
    - Check that maximum deviation does not exceed 2 minor divisions.
46. Turn BASELINE switch on.
47. Set TIME/DIV switch to 50 ms.
48. Adjust FREQUENCY SPAN/DIV control for 5kHz.
49. Set time mark generator to 0.2 ms.
50. Adjust FREQUENCY control until 5kHz markers are displayed over center 8 divisions of CRT.
    - Check that maximum deviation does not exceed 2 minor divisions.
51. Adjust FREQUENCY SPAN/DIV control for 2kHz.
52. Set time mark generator to 0.5 ms.
53. Adjust FREQUENCY control until 2kHz markers are displayed over center 8 divisions of CRT.
    - Check that maximum deviation does not exceed 2 minor divisions.
54. Disconnect comb generator from spectrum analyzer.

END OF TEST

TIME/DIV ACCURACY TEST

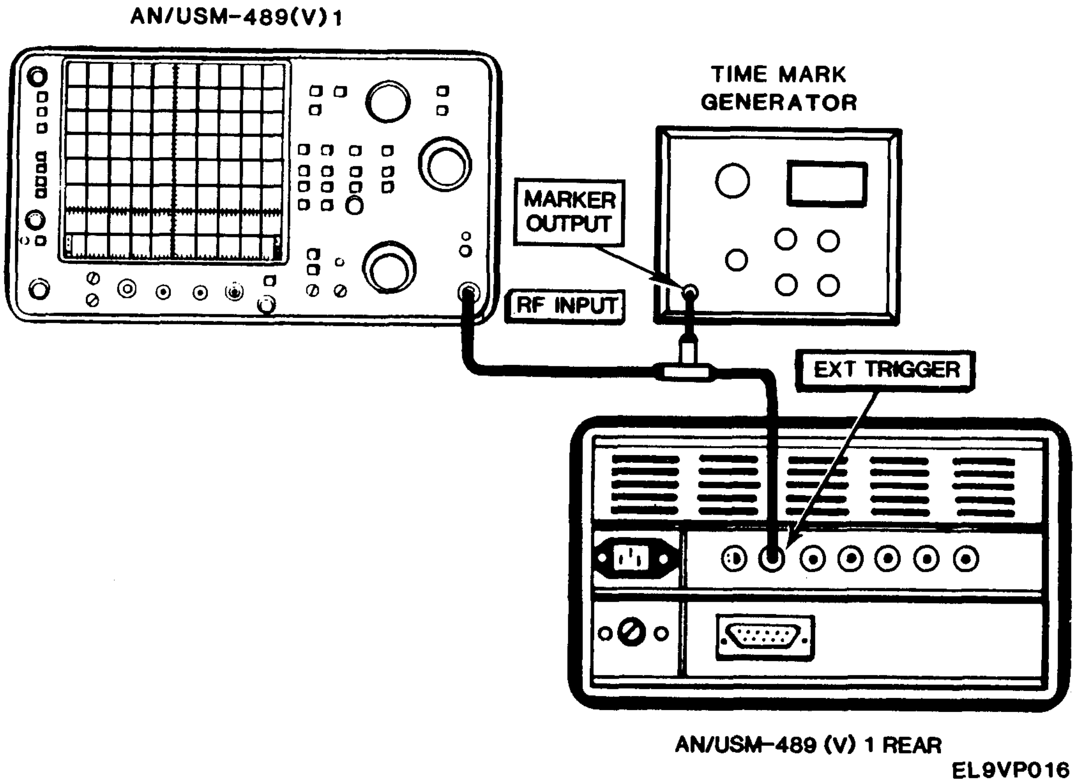
WARNING

High voltages can cause burns and electrical shock. See general warning page.

1. Set spectrum analyzer controls as follows:

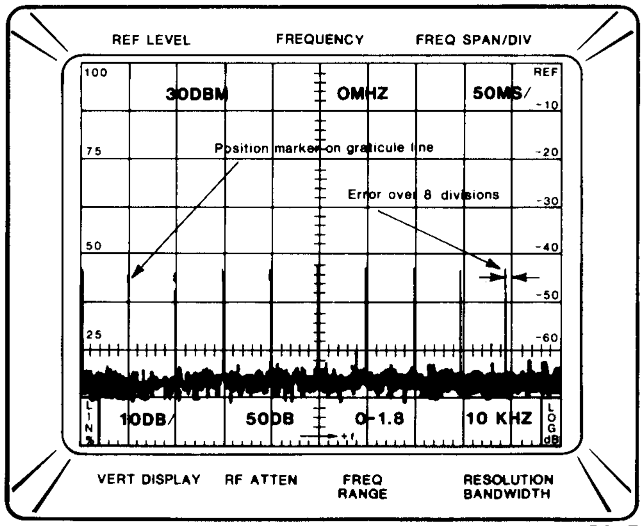
CONTROL	SETTING
FREQUENCY SPAN/DIV	100 MHz
FREQUENCY	≈1MHz
REFERENCE LEVEL	–20 dB
RESOLUTION BANDWIDTH	10kHz
AUTO RESOLUTION	off
TIME/DIV	50 ms
TRIGGERING	EXT
MIN RF ATTEN	20 dB

2. Connect spectrum analyzer and time mark generator.



3. Set time mark generator to 50 ms.
4. Adjust FREQUENCY SPAN/DIV control for 50 ms.
5. Adjust horizontal POSITION control on spectrum analyzer to align markers on graticule lines.

6. Adjust FREQUENCY control toward 0MHz as FREQUENCY SPAN/DIV is reduced so time markers are displayed on the time domain display. See following figure.



EL9VP017

7. Adjust PEAK/AVERAGE control for optimum amplitude of markers.

8. On the spectrum analyzer, adjust horizontal POSITION control to align a marker on the 1^{ST} graticule line.

- Check the displacement of markers from their respective positions over CRT center 8 divisions.
- Individual marker displacement must not exceed 2 minor divisions.

9. Set TIME/DIV switch to 20 ms.

10. Set time mark generator to 20 ms.

11. On the spectrum analyzer, adjust horizontal POSITION control to align a marker on the 1^{ST} graticule line.

- Check the displacement of markers from their respective positions over CRT center 8 divisions.
- Individual marker displacement must not exceed 2 minor divisions.

12. Set TIME/DIV switch to 10 ms.

13. Set time mark generator to 10 ms.

14. On the spectrum analyzer, adjust horizontal POSITION control to align a marker on the 1^{ST} graticule line.

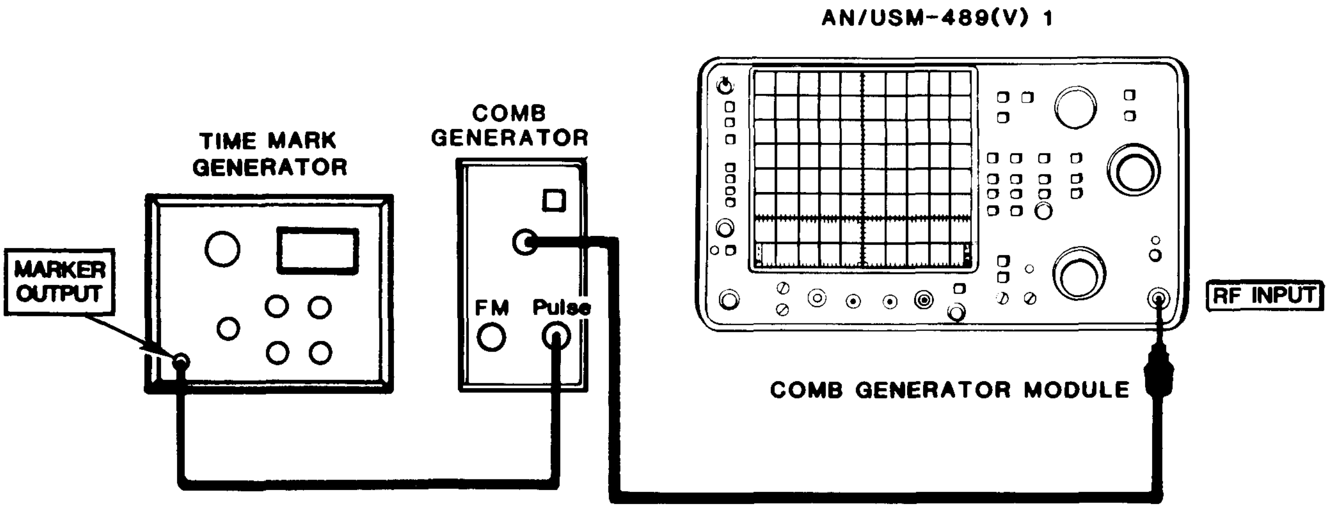
- Check the displacement of markers from their respedctive positions over CRT center 8 divisions.
- Individual marker displacement must not exceed 2 minor divisions.

15. Set DIGITAL STORAGE to Off.

16. Set TIME/DIV switch to 5 ms.

17. Set time mark generator to 5 ms.

18. On the spectrum analyzer, adjust horizontal POSITION control to align a marker on the 1ST graticule line.
    - Check the displacement of markers from their respective positions over CRT center 8 divisions.
    - Individual marker displacement must not exceed 2 minor divisions.
19. Set TIME/DIV switch to 2 ms.
20. Set time mark generator to 2 ms.
21. On the spectrum analyzer, adjust horizontal POSITION control to align a marker on the 1ST graticule line.
    - Check the displacement of markers from their respective positions over CRT center 8 divisions.
    - Individual marker displacement must not exceed 2 minor divisions.
22. Adjust RESOLUTION BANDWIDTH control for 1 MHz.
23. Adjust FREQUENCY control for optimum display of markers.
24. Check accuracy of the 1 ms and 20 µs TIME/DIV selections.
25. Disconnect time mark generator from spectrum analyzer.
26. Connect spectrum analyzer and comb generator.



EL9VP014

27. Set time mark generator to 0.1 s.
28. Set TIME/DIV switch to 0.1 s.
29. Set DIGITAL STORAGE to VIEW A and VIEW B.
30. Set TRIGGERING to INT.

31. Adjust MIN RF ATTEN for 0 dB.
32. Adjust FREQUENCY SPAN/DIV control for 50MHz.
33. Adjust REFERENCE LEVEL control for -30 dBm.
34. Adjust FREQUENCY control for center display of 500 MHz comb signal.
35. Adjust RESOLUTION BANDWIDTH control for 1 kHz.
36. Adjust FREQUENCY SPAN/DIV control for 100kHz. Keep 500 MHz comb signal centered on CRT.
37. Adjust FREQUENCY SPAN/DIV for 100 ms.
    - Individual marker displacement must not exceed 2 minor divisions.
38. Set time mark generator to 0.2s.
39. Set TIME/DIV switch to 0.2s.
    - Individual marker displacement must not exceed 2 minor divisions.
40. Set time mark generator to 0.5s.
41. Set TIME/DIV switch to 0.5s.
    - Individual marker displacement must not exceed 2 minor divisions.
42. Set time mark generator to 1 s.
43. Set TIME/DIV switch to 1 s.
    - Individual marker displacement must not exceed 2 minor divisions.
44. Set time mark generator to 2s.
45. Set TIME/DIV switch to 2s.
    - Individual marker displacement must not exceed 2 minor divisions.
46. Set time mark generator to 5s.
47. Set TIME/DIV switch to 5s.
    - Individual marker displacement must not exceed 2 minor divisions.
48. Disconnect comb generator from spectrum analyzer.

END OF TEST

PULSE STRETCHER TEST

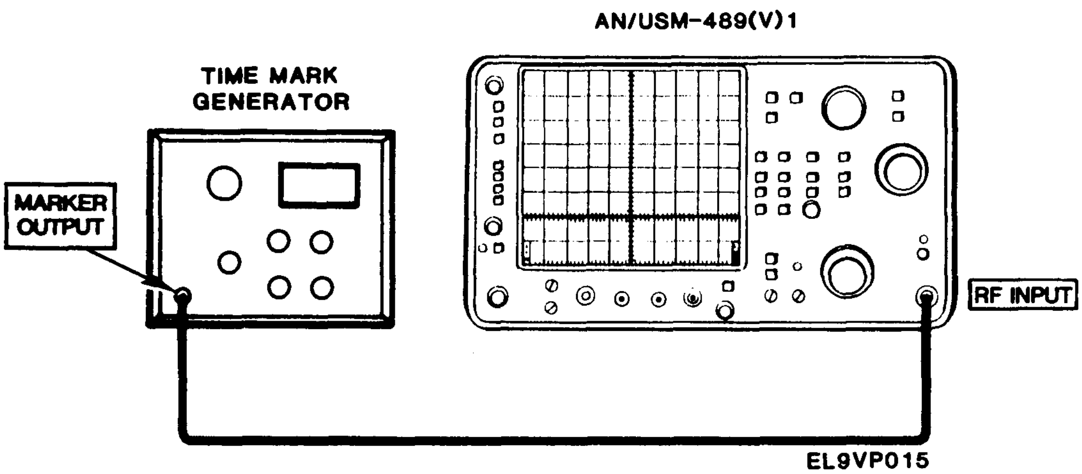
WARNING

High voltages can cause burns and electrical shock. See general warning page.

1. Set spectrum analyzer controls as follows:

CONTROL	SETTING
TRIGGERING	INT
TIME/DIV	0.5 ms
RESOLUTION BANDWIDTH	1MHz
VERTICAL DISPLAY	2 dB/DIV
MIN RF ATTEN	0 dB
REFERENCE LEVEL	–10 dBm
FREQUENCY SPAN/DIV	20 MHZ
DIGITAL STORAGE	Off

2. Connect spectrum analyzer and time mark generator.



3. Set time mark generator to 1 ms.
4. Adjust FREQUENCY SPAN/DIV control for 500 µs.
5. Adjust FREQUENCY control for approximately 0MHZ for maximum amplitude of markers. Adjust REFERENCE LEVEL control as required.
6. Set DIGITAL STORAGE to Off.
7. Set VERTICAL DISPLAY to PULSE STRETCHER.
   - Check that it extends the full time of the markers.
8. Disconnect time mark generator from spectrum analyzer.

END OF TEST

RESOLUTION BANDWIDTH AND SHAPE FACTOR TEST

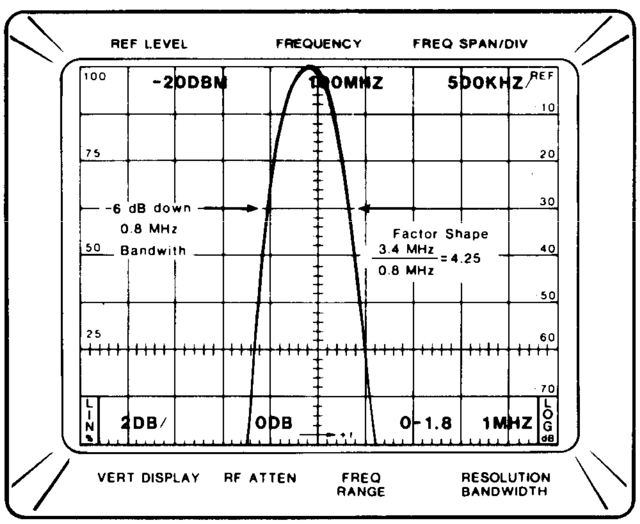
WARNING

High voltages can cause burns and electrical shock. See general warning page.

1. Set spectrum analyzer controls as follows:

CONTROL	SETTING
FREQUENCY RANGE	0 — 1.8GHz
FREQUENCY	≈100MHz
FREQUENCY SPAN/DIV	500kHz
REFERENCE LEVEL	–20 dBm
VERTICAL DISPLAY	2 dB/DIV
RESOLUTION BANDWIDTH	1MHz
PEAK/AVERAGE	Fully CW
DIGITAL STORAGE	VIEW A and VIEW B
TIME/DIV	AUTO
MIN NOISE	On

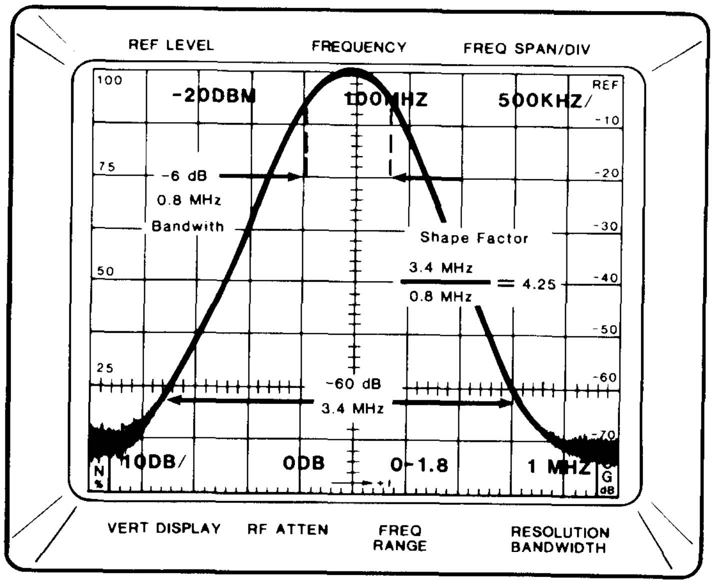
2. Connect CAL OUT to RF INPUT.
3. Adjust FREQUENCY control for 100 MHz signal display on the center of the CRT.
4. Measure the –6 dB bandwidth. See following figure.
   - Bandwidth must equal 1 MHz ±200kHz.



EL9VP018

5. Set VERTICAL DISPLAY to 10 dB/DIV.

6. Measure the –60dB bandwidth. See following figure.
   - Calculate the shape factor (60/6 dB bandwidth ratio).
   - Shape factor should equal 7.5:1 or less.



EL9VP019

7. Adjust RESOLUTION BANDWIDTH control for 100kHz.
8. Adjust FREQUENCY SPAN/DIV control for 100kHz.
9. Set VERTICAL DISPLAY to 2 dB/DIV.
10. Measure the –6 dB bandwidth following procedures in step 4.
    - Bandwidth must equal 1 MHz ±200kHz.
11. Set VERTICAL DISPLAY to 10 dB/DiV.
12. Measure the –60 dB bandwidth. See previous figure.
    - Calculate the shape factor (60/6 dB bandwidth ratio).
    - Shape factor should equal 7.5:1 or less.
13. Disconnect CAL OUT from RF INPUT.

END OF TEST

SENSITIVITY TEST

WARNING

High voltages can cause burns and electrical shock. See general warning page.

1. Set spectrum analyzer controls as follows:
1. Perform Initial Checks and Procedures. See TM 11-6625-3136-12.
2. Disconnect CAL OUT from RF INPUT.
3. Set spectrum analyzer controls as follows:

CONTROL	SETTING
FREQUENCY RANGE	0 — 1.8GHZ
FREQUENCY SPAN/DIV	50 MHZ
FREQUENCY	500 MHZ
VERTICAL DISPLAY	10 dB/DIV
MIN RF ATTEN	0 dB
REFERENCE LEVEL	-30 dB
RESOLUTION BANDWIDTH	1MHz
VIDEO FILTER	WIDE
TIME/DIV	0.5 s
DIGITAL STORAGE	VIEW A and VIEW B
PEAK/AVERAGE	Fully CW

4. Adjust FREQUENCY SPAN/DIV for 10kHz.
5. Check noise level below –30 dBm reference.
   - Noise level must be –80 dBm or better.
6. Adjust RESOLUTION BANDWIDTH control for 100kHz.
7. Check noise level below -30 dBm reference.
   - Noise level must be -90 dBm or better.
8. Adjust RESOLUTION BANDWIDTH control for 10kHz.
9. Check noise level below –30 dBm reference.
   - Noise level must be – 100 dBm or better.
10. Adjust REFERENCE LEVEL control for –60 dBm.
11. Set TIME/DIV to 2s.
12. Adjust RESOLUTION BANDWIDTH control for 1 kHz.
13. Check noise level below –60 dBm reference.
    - Noise level must be – 110 dBm or better.
14. Set FREQUENCY RANGE to 5.4 — 18GHz band.
15. Adjust FREQUENCY SPAN/DIV control for 20MHz.
16. Adjust FREQUENCY control for 11GHz.
17. Adjust FREQUENCY SPAN/DIV control for 20kHz.

18. Check noise level below –60 dBm reference.
    - Noise level must be –95 dBm or better.
19. Adjust RESOLUTION BANDWIDTH control for 10kHz.
20. Check noise level below –60 dBm reference.
    - Noise level must be –85 dBm or better.
21. Adjust RESOLUTION BANDWIDTH control for 100kHz.
22. Check noise level below –60 dBm reference.
    - Noise level must be –75 dBm or better.
23. Adjust RESOLUTION BANDWIDTH control for 1 MHz.
24. Check noise level below -60 dBm reference.
    - Noise level must be –65 dBm or better.
25. Adjust RESOLUTION BANDWIDTH control for 100 Hz.
26. Adjust FREQUENCY SPAN/DIV control for 2kHz.
27. Check noise level below –60 dBm reference.
    - Noise level must be – 103 dBm or better.
28. Set FREQUENCY RANGE to 15 — 21GHz band.
29. Adjust FREQUENCY SPAN/DIV control for 200MHz.
30. Adjust FREQUENCY control for 18GHz.
31. Adjust FREQUENCY SPAN/DIV control to 1 kHz.
32. Check noise level below –60 dBm reference.
    - Noise level must be –93 dBm or better.
33. Adjust RESOLUTION BANDWIDTH control for 10kHz.
34. Check noise level below –60 dBm reference.
    - Noise level must be –75 dBm or better.
35. Adjust RESOLUTION BANDWIDTH control for 100kHz.
36. Check noise level below –60 dBm reference.
    - Noise level must be –65 dBm or better.
37. Adjust REFERENCE LEVEL control for –30 dBm.
38. Adjust RESOLUTION BANDWIDTH control for 1 MHz.
39. Check noise level below the –30 dBm reference.
    - Noise level must be –55 dBm or better.

END OF TEST

FREQUENCY DRIFT TEST

WARNING

High voltages can cause burns and electrical shock. See general warning page.

1. Set spectrum analyzer controls as follows:

CONTROL	SETTING
REFERENCE LEVEL	-20 dBm
FREQUENCY RANGE	0 — 1.86GHz
FREQUENCY	100 MHz
FREQUENCY SPAN/DIV	10 MHz
VERTICAL DISPLAY	10 dB/DIV
MIN RF ATTEN	10 dB
RESOLUTION BANDWIDTH	1MHz
READOUT	On
TRIGGERING	FREE RUN
TIME/DIV	AUTO
DIGITAL STORAGE	VIEW A and VIEW B
AUTO RESOLUTION	On

2. Connect CAL OUT to the RF INPUT.
3. Adjust FREQUENCY control for 100 MHz signal centered on CRT.
4. Adjust FREQUENCY SPAN/DIV control for 1 MHz.
5. Press and release DEGAUSS switch.
6. Set FINE switch on.
7. Adjust REFERENCE LEVEL control for a signal amplitude of 7 divisions.
8. Set FINE switch off.
9. Adjust FREQUENCY SPAN/DIV control for 50kHz. Keep 100 MHz signal centered on CRT.
10. Set PHASE LOCK off.
11. Set SAVE A switch on.
12. Set MAX HOLD switch on.
    - Check spectrum analyzer screen for frequency drift of not less than 15kHz per 10 minutes. should appear as the width of the overall drift minus the resolution bandwidth after specified time.
13. Set PHASE LOCK on.
14. Adjust FREQUENCY SPAN/DIV control for 2kHz.
15. Set MAX HOLD switch off.

16. Set SAVE A switch off.

17. Set PHASE LOCK switch off.

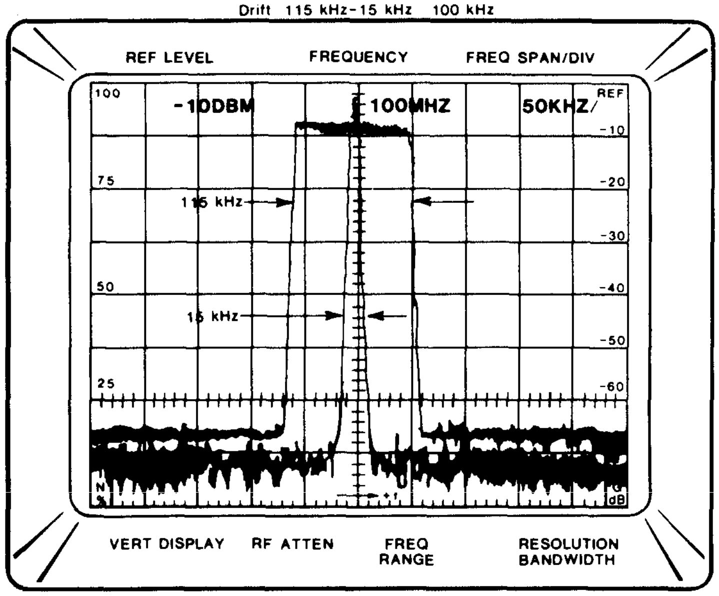
18. Adjust FREQUENCY control for 100 MHz signal centered on CRT.

19. Set SAVE A switch on.

20. Set MAX HOLD switch on.

- Check spectrum analyzer screen for a frequency drift of not less than 15kHz per 10 minutes. Drift should appear as the width of the overall drift minus the resolution bandwidth after the specified time.

Drift 115 kHz-15 kHz 100 kHz



EL9VP20

21. Disconnect CALL OUT from RF INPUT.

END OF TEST

RESIDUAL FM TEST

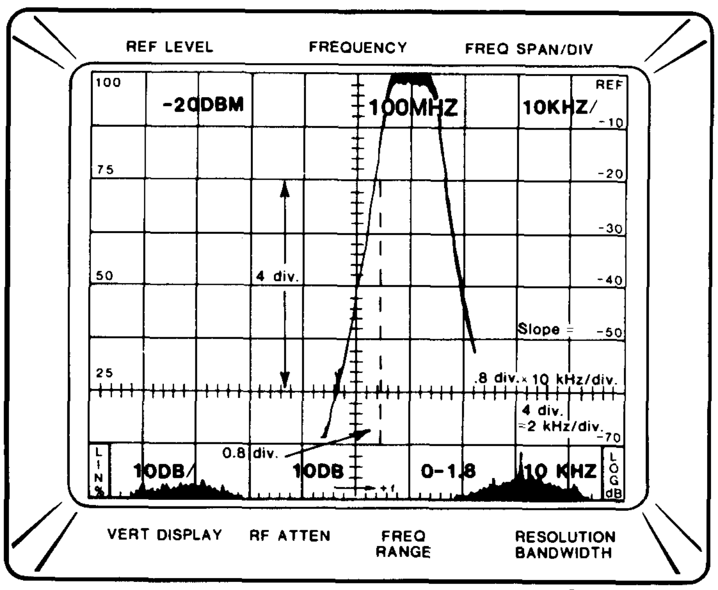
WARNING

High voltages can cause burns and electrical shock. See general warning page.

1. Set spectrum analyzer controls as follows:

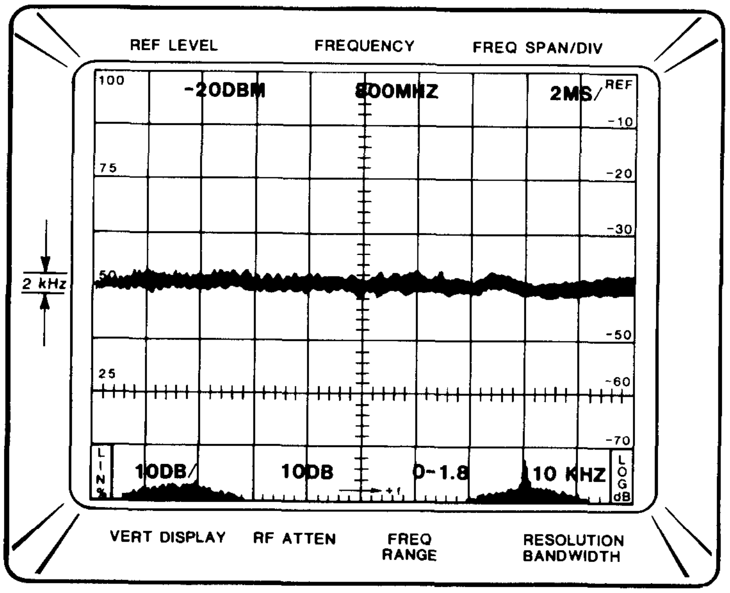
CONTROL	SETTING
FREQUENCY RANGE	0 — 1.8GHz
FREQUENCY SPAN/DIV	200 MHZ
RESOLUTION BANDWIDTH	1MHz
VERTICAL DISPLAY	10 dB/DIV
FREQUENCY	≈100MHZ
REFERENCE LEVEL	–20 dBm
PHASE LOCK	Off
DIGITAL STORAGE	VIEW A and VIEW B
AUTO RESOLUTION	On

2. Connect CAL OUT to RF INPUT.
3. Adjust FREQUENCY control for 100MHz signal centered on CRT.
4. Adjust FREQUENCY SPAN/DIV control for 10kHz/DIV. Keep 100 MHz signal centered on CRT.
5. Adjust RESOLUTION BANDWIDTH control for 10kHz.
6. Set VERTICAL DISPLAY to LIN.
7. Set A FINE 2 dB/only switch on.
8. Adjust REFERENCE LEVEL control for full screen display.
9. Adjust FREQUENCY control to position 100 MHz marker signal as shown in the figure below.
   - Measure the slope response as illustrated below.
   - SINGLE SWEEP may be advantageous to freeze the display.



EL9VP021

10. Adjust FREQUENCY SPAN/DIV control for 10ms. Keep 100 MHz signal centered on CRT.
11. Set TIME/DIV switch to 20 ms.
12. Set VERTICAL DISPLAY to 10 dB/DIV.
13. Adjust FREQUENCY control to position the display near center of CRT as shown in the figure below.
    - Note the peak-to-peak amplitude of the display.
    - Residual FM must not exceed 50Hz for 20 ms period.



EL9VP022

14. Set TIME/DIV switch to AUTO.
15. Set PHASE LOCK switch on.
16. Adjust FREQUENCY SPAN/DIV control for 200MHz.
17. Set AUTO RESOLUTION switch on.
18. Adjust FREQUENCY control for 100MHz signal centered on CRT.
19. Adjust FREQUENCY SPAN/DIV control for 500 Hz. Keep 100MHz signal centered on CRT.
20. Adjust RESOLUTION BANDWIDTH control for 1kHz. Keep 100 MHz signal centered on CRT.
    - Measure the slope response as indicated in step 9.
21. Adjust FREQUENCY SPAN/DIV control for 10ms. Keep 100 MHz signal centered on CRT.
22. Set TIME/DIV switch to 10 ms.
    - Note the peak-to-peak amplitude of the display.
    - Residual FM must not exceed 50Hz for a 20 ms period.
23. Disconnect CAL OUT from RF INPUT.

END OF TEST

HARMONIC DISTORTION TEST

WARNING

High voltages can cause burns and electrical shock. See general warning page.

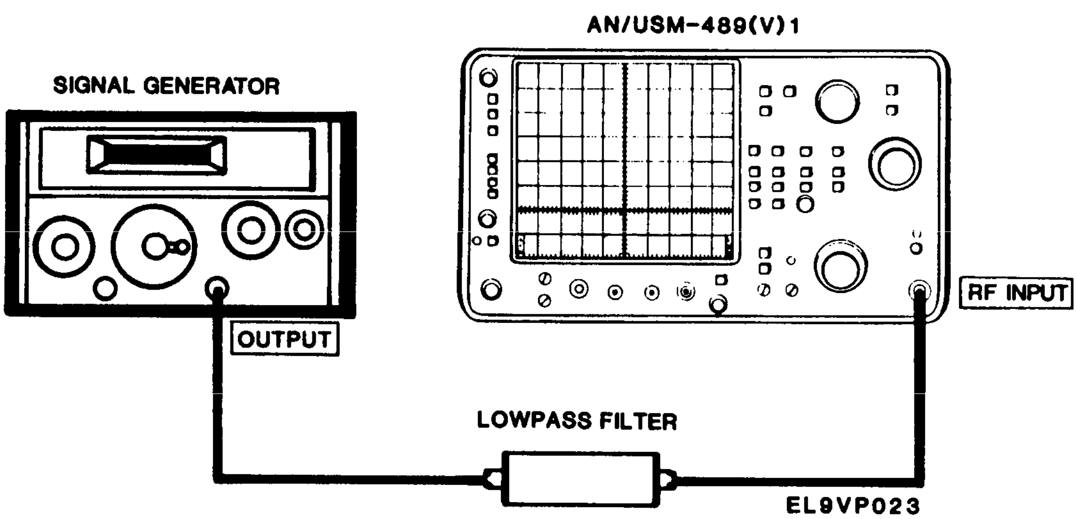
1. Set spectrum analyzer controls as follows:

CONTROL	SETTING
FREQUENCY RANGE	0 — 1.8GHz
FREQUENCY SPAN/DIV	5MHZ
FREQUENCY	150 MHZ
AUTO RESOLUTION	On
VERTICAL DISPLAY	10 dB/DIV
REFERENCE LEVEL	–30 dBm
MIN RF ATTEN	0 dB
VIDEO FILTER	WIDE
DIGITAL STORAGE	VIEW A and VIEW B

2. Set signal generator controls as follows:

CONTROL	SETTING
FREQUENCY	150 MHZ
ATTENUATION	As required

3. Connect spectrum analyzer and signal generator.



4. Adjust signal generator output to top graticule.
5. Adjust FREQUENCY control for 2[ND] harmonic signal centered on CRT.
6. Adjust REFERENCE LEVEL for -50 dBm.
7. Adjust FREQUENCY SPAN/DIV for 500kHz.

8. Adjust RESOLUTION BANDWIDTH for 10kHz.

9. Check the display for harmonic spurii.

- Harmonic spurii must be 40 dB below CRT reference level.

10. Adjust FREQUENCY control for 3[RD] harmonic signal centered on CRT.

11. Check the display for harmonic spurii.

- Harmonic spurii must be 80 dB below CRT reference level.

12. Adjust REFERENCE LEVEL for –70 dBm.

13. Adjust RESOLUTION BANDWIDTH for 100Hz.

14. Check the display for harmonic spurii.

- Harmonic spurii must be 100 dB or more below CRT reference level.

15. Disconnect signal generator from spectrum analyzer.

END OF TEST

NOISE SIDEBANDS TEST

WARNING

High voltages can cause burns and electrical shock. See general warning page.

1. Set spectrum analyzer controls as follows:

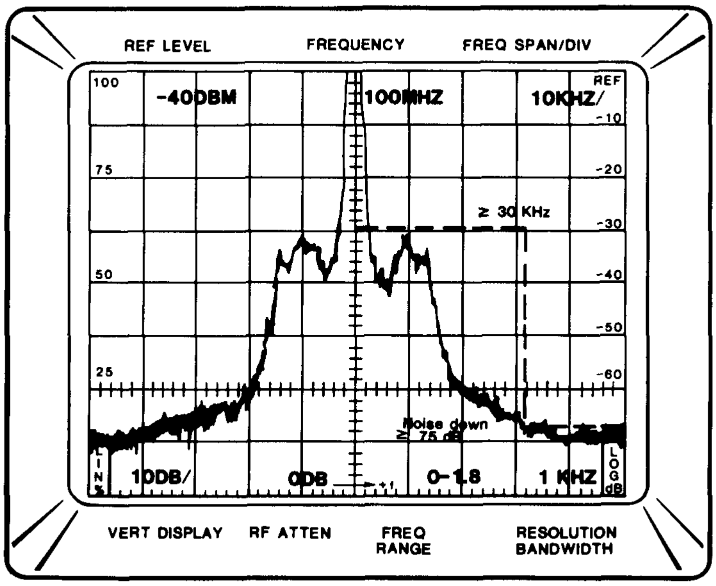
CONTROL	SETTING
REFERENCE LEVEL	-20 dBm
FREQUENCY RANGE	0 — 1.8GHz
FREQUENCY SPAN/DIV	20 MHZ
FREQUENCY	100 MHz
VERTICAL DISPLAY	10 dB/DIV
MIN RF ATTEN	10 dB
RESOLUTION BANDWIDTH	1MHz
READOUT	On
TRIGGERING	FREE RUN
TIME/DIV	AUTO
VIDEO FILTER	WIDE
DIGITAL STORAGE	VIEW A and VIEW B
AUTO RESOLUTION	On

2. Connect CAL OUT to the RF INPUT.

3. Adjust FREQUENCY control for 100MHz signal centered on CRT.

4. Adjust REFERENCE LEVEL control for full CRT display.

5. Adjust FREQUENCY SPAN/DIV control for 1 MHz.
   - RESOLUTION BANDWIDTH changes to 100kHz.
6. Press and release DEGAUSS switch.
7. Adjust FREQUENCY SPAN/DIV control for 10kHz. Keep 100MHz signal centered on CRT.
   - RESOLUTION BANDWIDTH changes to 1 kHz.
   - PHASE LOCK is on.
8. Adjust REFERENCE LEVEL control for –40 dBm.
   - This positions the signal peak 20 dB above the reference line.



EL9VP024

   - Check the amplitude of the noise sidebands 30kHz away from the signal.
   - Noise sidebands should be 55 dB or more below the top of the CRT.
9. Adjust FREQUENCY SPAN/DIV control for 1kHz.
   - RESOLUTION BANDWIDTH changes to 100Hz.
   - Check the amplitude of the noise sidebands 3kHz away from signal.
   - Noise sidebands should be 50 dB below the top of the screen.
10. Disconnect CAL OUT from RF INPUT.

END OF TEST

WARNING

High voltages can cause burns and electrical shock. See general warning page.

1. Disconnect all signals to the RF INPUT.
2. Set spectrum analyzer controls as follows:

CONTROL	SETTING
FREQUENCY RANGE	0 — 1.8GHz
FREQUENCY SPAN/DIV	10 MHz
REFERENCE LEVEL	–50 dBm
MIN RF ATTEN	0 dB
RESOLUTION BANDWIDTH	10kHz
TIME/DIV	AUTO
VERTICAL DISPLAY	10 dB/DIV
DIGITAL STORAGE	VIEW A and VIEW B
READOUT	On
TRIGGERING	FREE RUN
PEAK/AVERAGE	Fully CW

3. Rotate FREQUENCY control from 0 to 1.8GHz in 100 MHz increments. **Set ΔF switch on after each** increment. It is easier to determine 100 MHz increments.
   - Observe the CRT for the presence of spurious responses.
   - Spurii amplitude should not exceed – 100 dBm.
4. Set FREQUENCY RANGE to 1.7 — 5.5GHz band.
5. Rotate FREQUENCY control from 1.7 to 5.5GHz in 100MHz increments. **Set ΔF switch on after each** increment. It is easier to determine 100 MHz increments.
   - Observe the CRT for the presence of spurious responses.
   - Spurii amplitude should not exceed – 100 dBm.
6. Set FREQUENCY RANGE to 3.0 — 7.1GHz band.
7. Rotate FREQUENCY control from 3.0 to 7.1GHz in 100 MHz increments. **Set ΔF switch on after each** increment. It is easier to determine 100 MHz increments.
   - Observe CRT for the presence of spurious responses.
   - Spurii amplitude should not exceed –100 dBm.

END OF TEST

DIGITAL STORAGE TEST

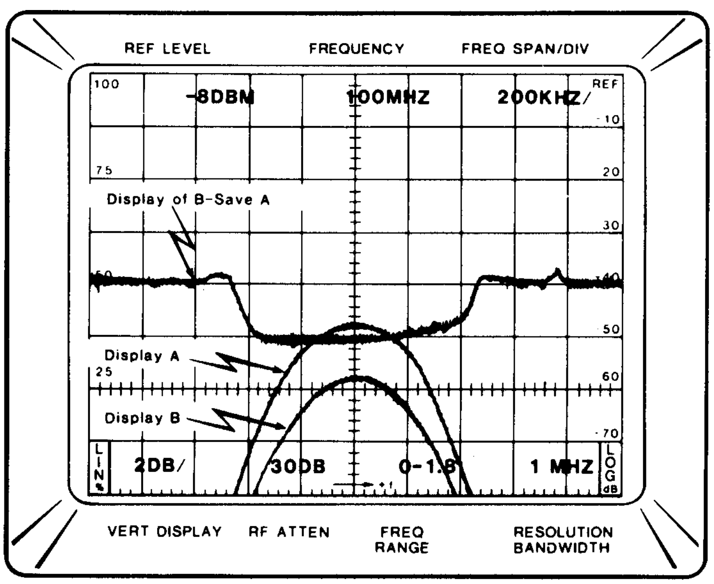
WARNING

High voltages can cause burns and electrical shock. See general warning page.

1. Set spectrum analyzer controls as follows:

CONTROL	SETTING
FREQUENCY RANGE	0 — 1.8GHz
FREQUENCY SPAN/DIV	10 MHz
FREQUENCY	100MHz
RESOLUTION BANDWIDTH	1MHz
VERTICAL DISPLAY	2 dB/DIV
REFERENCE LEVEL	–12 dBm
MIN RF ATTEN	20 dB
DIGITAL STORAGE	VIEW A

2. Connect CAL OUT to RF INPUT.
3. Adjust FREQUENCY SPAN/DIV control for 200kHz. Keep 100MHz signal centered on CRT.
4. Adjust RESOLUTION BANDWIDTH control for 1 MHz.
5. Set SAVE A switch on.
6. Adjust REFERENCE LEVEL control for -10 dBm.
7. Set VIEW B switch on.
   - Display B should be 2 dB below display A.
8. Set B — SAVE A switch on.
   - Check that B — SAVE A display is the algebraic difference between display B and display A (see following figure).



EL9VP025

9. Set SAVE A switch off.
   - Observe that SAVE A switch goes off.
10. Disconnect CAL OUT from RF INPUT.

END OF TEST

TRIGGERING OPERATION AND SENSITIVITY TEST

WARNING

High voltages can cause burns and electrical shock. See general warning page.

1. Set spectrum analyzer controls as follows:

CONTROL	SETTING
FREQUENCY SPAN/DIV	10kHz
RESOLUTION BANDWIDTH	1MHz
DIGITAL STORAGE	VIEW A and VIEW B
REFERENCE LEVEL	–30 dBm
VERTICAL DISPLAY	LIN
TIME/DIV	20 ms

2. Set signal generator controls as follows:

CONTROL	SETTING
FREQUENCY	100MHz
ATTENUATION	-30 dBm

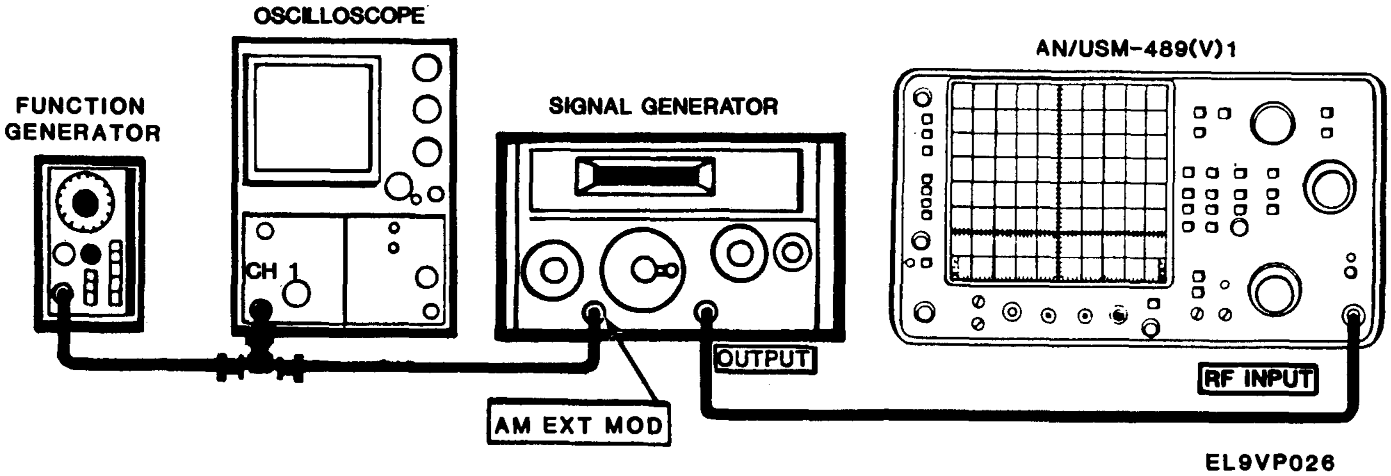
3. Set function generator controls as follows:

CONTROL	SETTING
FREQUENCY	1 kHz
AMPLITUDE	MID RANGE

4. Set oscilloscope controls as follows:

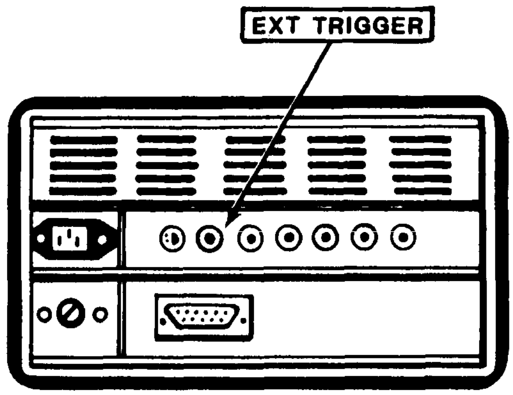
CONTROL	SETTING
VOLTS/DIV	1 V
TIME DIV	10 ms
CHANNEL	1
TRIGGER	AUTO

5. Connect spectrum analyzer and signal generator.



6. Adjust FREQUENCY for 100 MHz signal centered on CRT.
7. On the function generator adjust ATTENUATION control for half CRT display on oscilloscope.
8. Adjust FREQUENCY SPAN/DIV control for 20 ms. Keep 100MHz signal centered on CRT.

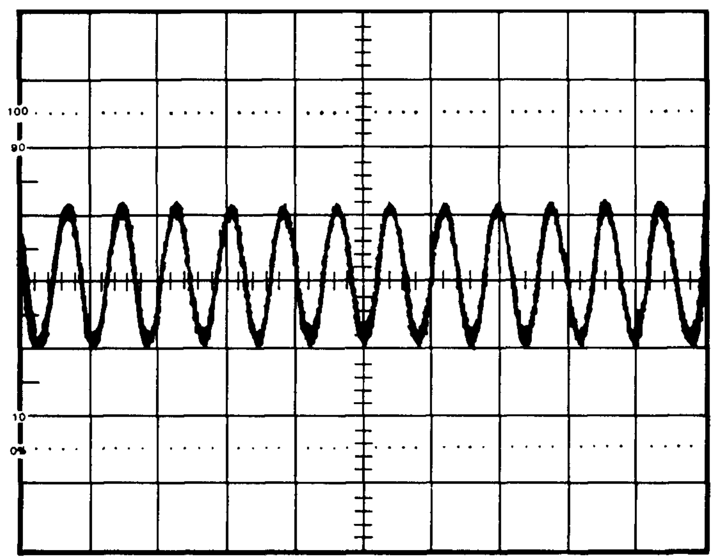
9. On the function generator, adjust AMPLITUDE control for a modulation amplitude of 2 divisions on oscilloscope CRT.
10. Set TRIGGERING to INT.
11. On the function generator, slowly adjust FREQUENCY control from 15Hz to 1 MHz.
    - Internal trigger sensitivity should be equal to or greater than 2 divisions on the oscilloscope CRT.
12. Connect function generator to spectrum analyzer EXT TRIGGER.



AN/USM-489 (V)1 REAR

EL9VP027

13. On the function generator, adjust FREQUENCY control for 1 kHz.
14. On the function generator, adjust AMPLITUDE control for a 2 V peak-to-peak displayon oscilloscope. See following figure.



EL9VP028

15. Set TIME/DIV to 0.2s.
16. Set TRIGGERING to EXT.
17. On the function generator, adjust FREQUENCY control from 15Hz to 1 MHz.
    - External trigger sensitivity should be equal to or greater than 1 division on oscilloscope CRT.

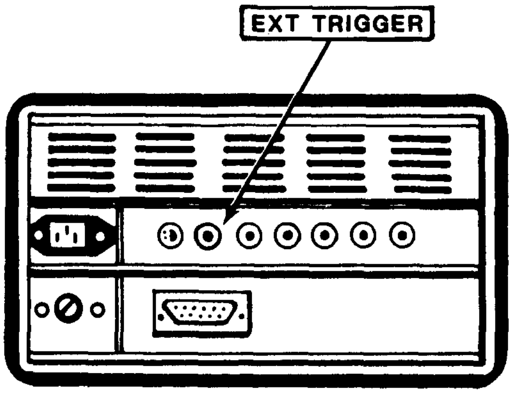
END OF TEST

EXTERNAL SWEEP OPERATION TEST

WARNING

High voltages can cause burns and electrical shock. See general warning page.

1. Connect test equipment as shown below.



2. This test is performed with the spectrum analyzer connected to the test equipment as in step 12 of the previous test.
3. Set TIME/DIV switch to EXT.
4. Set DIGITAL STORAGE VIEW A and VIEW B to off.
5. Set VERTICAL DISPLAY to 2 dB/DIV.
6. Adjust POSITION control to position the CRT beam on left graticule. This establishes 0V reference.
7. On the function generator, adjust FREQUENCY control for 1 kHz.
8. On the function generator, adjust AMPLITUDE control for a full 10 division sweep on spectrum analyzer CRT.
9. Check oscilloscope for signal generator output.
   - Output should equal 10V ±1V peak-to-peak.
10. Disconnect test equipment.

END OF TEST

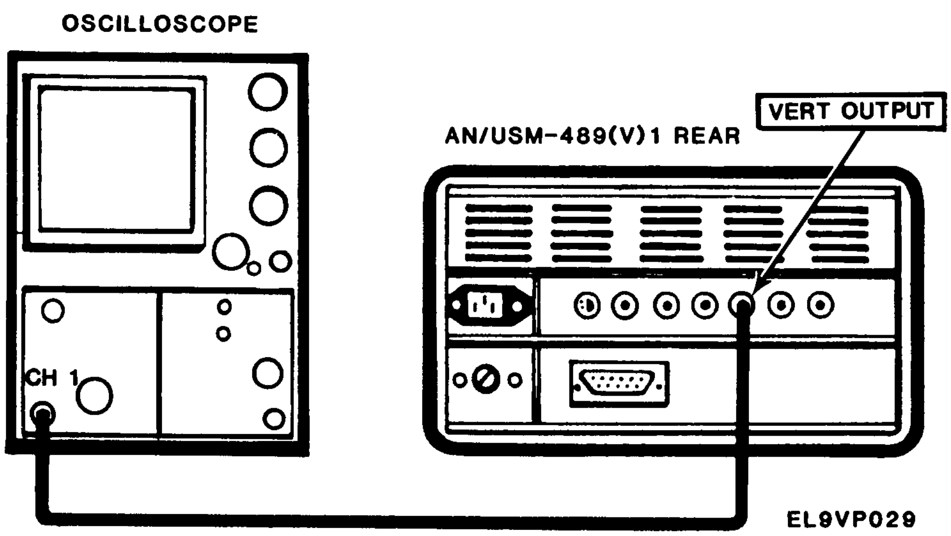
VERTICAL OUTPUT TEST

WARNING

High voltages can cause burns and electrical shock. See general warning page.

1. Set the front panel controls of the spectrum analyzer as follows:

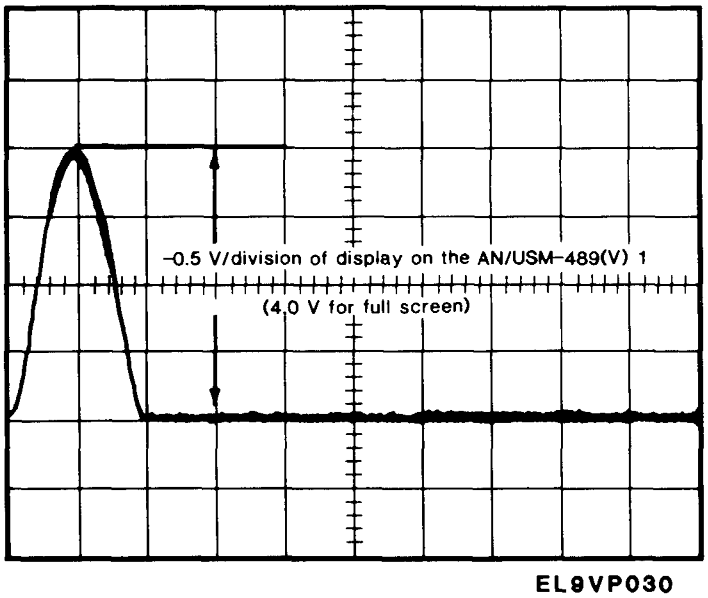
CONTROL	SETTING
FREQUENCY	100 MHz
TRIGGERING	FREE RUN
TIME/DIV	AUTO
VERTICAL DISPLAY	2 dB/DIV
RESOLUTION BANDWIDTH	100kHz
FREQUENCY SPAN/DIV	100kHz
REFERECE LEVEL	-20 dB
DIGITAL STORAGE	Off



2. Connect VERT OUTPUT to the input of a de-coupled test oscilloscope with a sensitivity of 1 V/DIV and sweep rate of 10 ms.
3. Apply the CAL OUT signal to the RF INPUT.
4. Tune the 100 MHz signal to center screen.
5. Activate the FINE step REF LEVEL function.
6. Adjust the REF LEVEL for an eight division display.

7. Check the vertical signal output level on the test oscilloscope.

- Output level should equal Plus and minus 2 V for a total of 4 V ±.2V (see following figure).



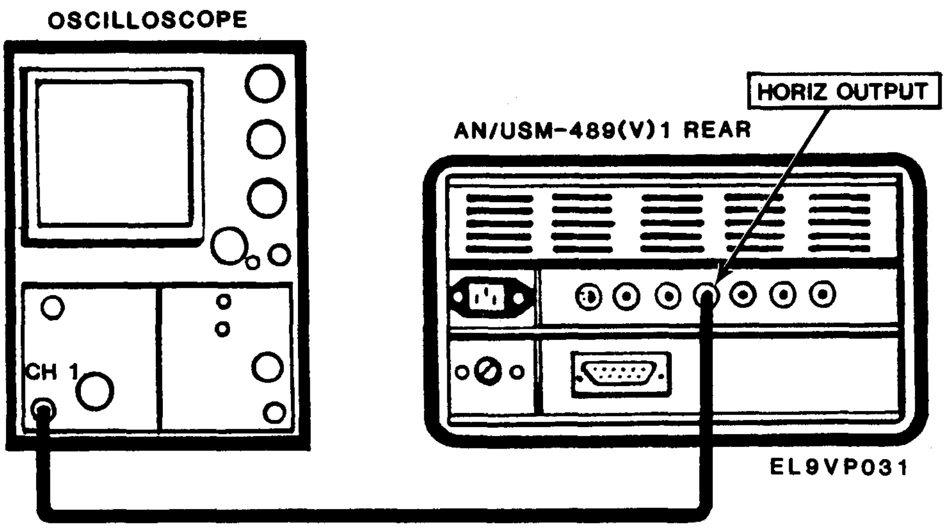
END OF TEST

HORIZONTAL SIGNAL OUTPUT TEST

WARNING

High voltages can cause burns and electrical shock. See general warning page.

1. Connect spectrum analyzer and oscilloscope.



2. Set spectrum analyzer controls as follows:

CONTROL	SETTING
VERTICAL DISPLAY	2 dB/DIV
REFERENCE LEVEL	-21 dBm
FREQUENCY RANGE	0 — 1.8GHz
FREQUENCY	100 MHz
FREQUENCY SPAN/DIV	100kHz
MIN RF ATTEN	20 dB
RESOLUTION BANDWIDTH	100kHz
READOUT	On
TRIGGERING	FREE RUN
TIME/DIV	MNL
DIGITAL STORAGE	

CAUTION

Adjust spectrum analyzer INENSITY control to low level to prevent damage to the CRT.

3. Set oscilloscope controls as follows:

CONTROL	SETTING
CH 1 VOLTS/DIV	1 V
CH 1 DC COUPLE	On
VERTICAL MODE	CH 1
TRIGGER SOURCE	CH 1
A + B SEC/DIV	2 ms
HORIZONTAL MODE	A
A TRIGGER	NORM
A SOURCE	INT

4. Adjust MANUAL SCAN for 5 divisions amplitude on either side of spectrum analyzer's screen.
5. DIGITAL STORAGE to VIEW A and VIEW B.
   - Check oscilloscope for display of 5V ±0.5V peak-to-peak.
6. Disconnect test equipment.

END OF TEST

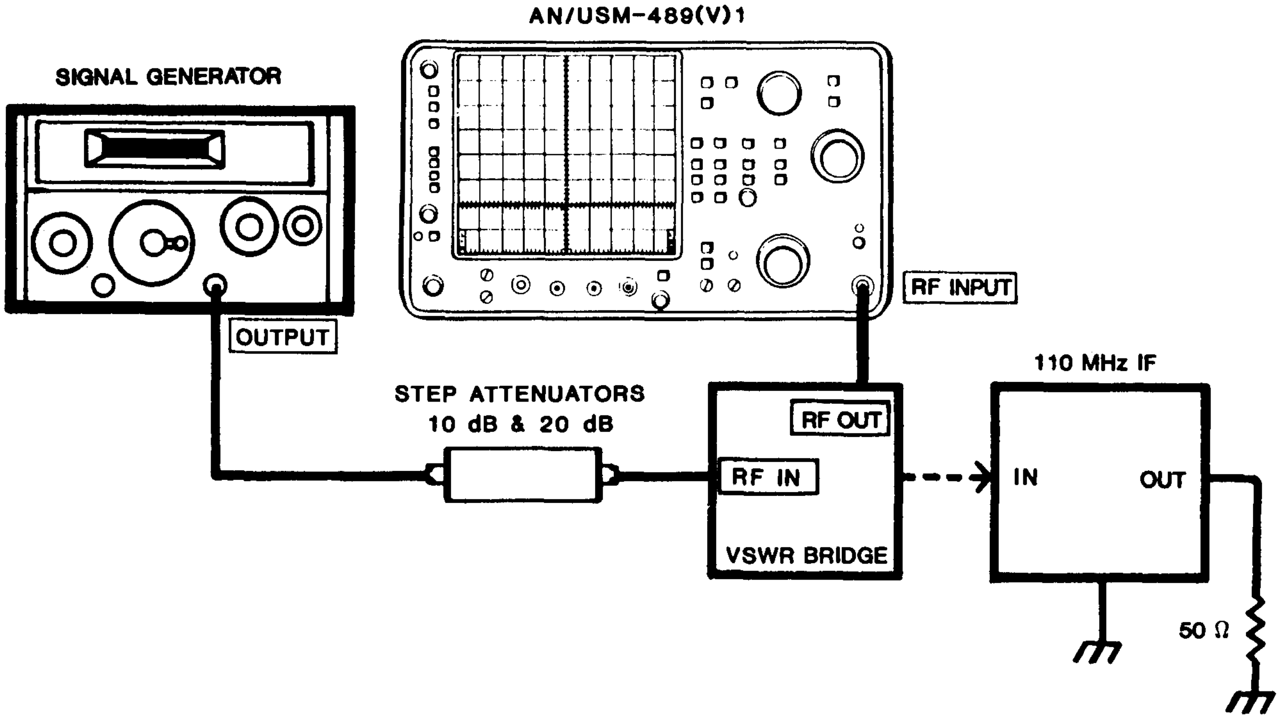
2-10 MAINTENANCE ADJUSTMENTS

DESCRIPTION

This procedure covers the 110MHz IF Assembly Return Loss Adjustment. This adjustment is performed only when the 110MHz IF A32A1 assembly has been replaced.

110MHz IF ASSEMBLY RETURN LOSS ADJUSTMENT

1. Remove spectrum analyzer cover. See paragraph 2-11.
2. Remove A32 110MHz IF Amplifier assembly. See paragraph 2-31.
3. Connect spectrum analyzer and test equipment.



EL9VP032

4. Turn power on.
5. Set spectrum analyzer controls as follows:

CONTROL	SETTING
READOUT	On
TRIGGERING	FREE RUN
TIME/DIV	AUTO
VERTICAL DISPLAY	10 dB/DIV
VIDEO FILTER	WIDE
DIGITAL STORAGE	VIEW A and VIEW B
AUTO RESOLUTION	On
FREQUENCY SPAN/DIV	5MHZ
FREQUENCY	110MHz
RESOLUTION BANDWIDTH	3 MHz
REFERENCE LEVEL	-20 dBm

6. Set signal generator controls as follows:

CONTROL	SETTING
FREQUENCY	110MHz
ATTENUATION	+10 dBm

7. Adjust step attenuator for –20dBm 110MHz signal amplitude.

8. Turn spectrum analyzer power off.

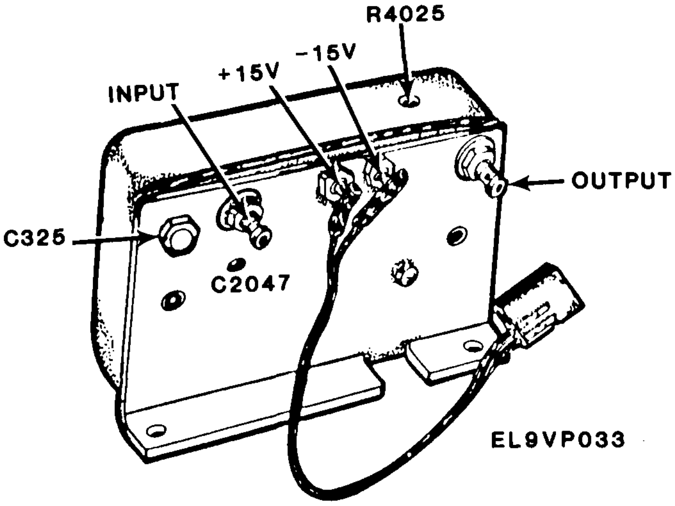
9. Connect A32 110MHz IF Amplifier to VSWR bridge.

10. Connect A32P3045 power cable to Mother Board A28J3045, turn power on.

11. Adjust C2047 and C325 simultaneously for minimum signal amplitude on CRT.

    - Minimum amplitude must be at least 35 dB down from the -20 dBm reference.

12. Turn spectrum analyzer power off.



13. Install A32 110MHz IF Amplifier in spectrum analyzer. See paragraph 2-31.

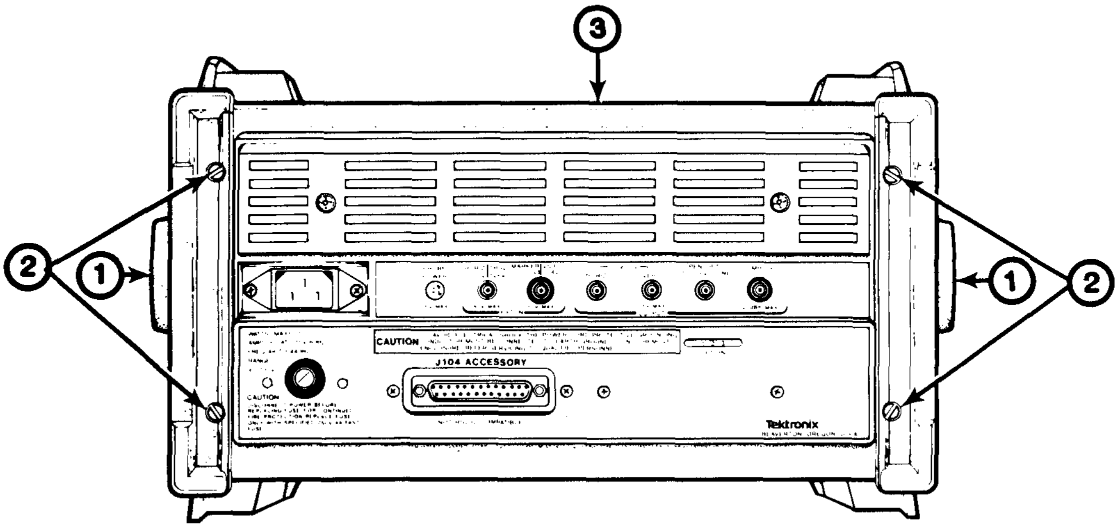
2-11 REPLACE INSTRUMENT COVER

DESCRIPTION

This procedure covers: Remove, Install.

REMOVE

1. Place the spectrum analyzer on its rear surface and fold the handle (1) above the instrument.
2. Set the spectrum analyzer on its front surface.
3. Loosen four screws (2) on the rear of the instrument.
4. Slide the spectrum analyzer cover (3) off the rear of the instrument.



EL9VP034

INSTALL

1. Set spectrum analyzer on its front surface.
2. Slide the instrument cover (3) onto the rear of the instrument.
3. Tighten four screws (2).

END OF TASK

2-12 REPLACE CRT

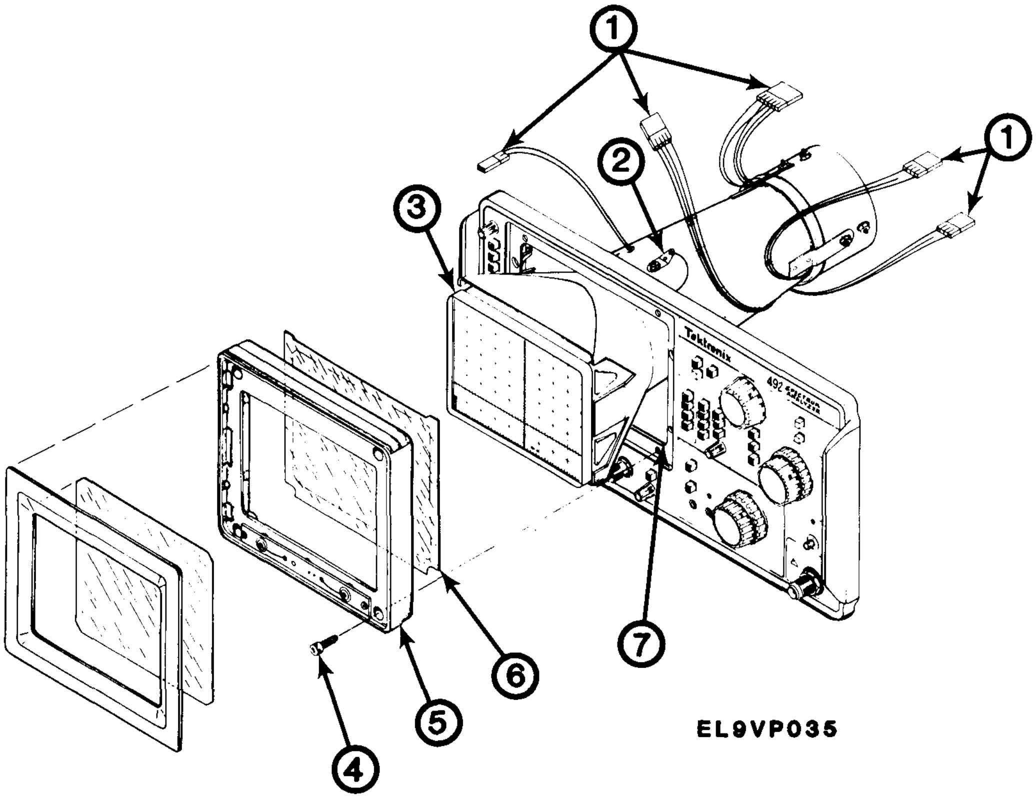
DESCRIPTION

This procedure covers: Remove, Install.

REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.
2. Remove light filter. See TM 11-6625-3136-12.

3. Tag and disconnect connectors (1) from surrounding modules.
4. Tag and unsolder wire (2).
5. Remove four screws (4).
6. Remove inner bezel (5) and clear plastic (6).
7. Carefully slide CRT (3) out through front panel (7) frame opening.



INSTALL

1. Carefully slide CRT (3) into spectrum analyzer through front panel frame opening.
2. Install clear plastic (5) and inner bezel (5).
3. Install four screws (4).
4. Solder wire (2) as tagged.
5. Install connectors (1) to surrounding modules as tagged.
6. Install light filter. See TM 11-6625-3136-12.
7. Install cover. See paragraph 2-11.

END OF TASK

2-13 REPLACE FRONT PANEL CONTROL KNOBS

TM 11-6625-3136-12.

2-14 REPLACE LIGHT FILTER

TM 11-6625-3136-12.

2-15 REPLACE FRONT PANEL

DESCRIPTION

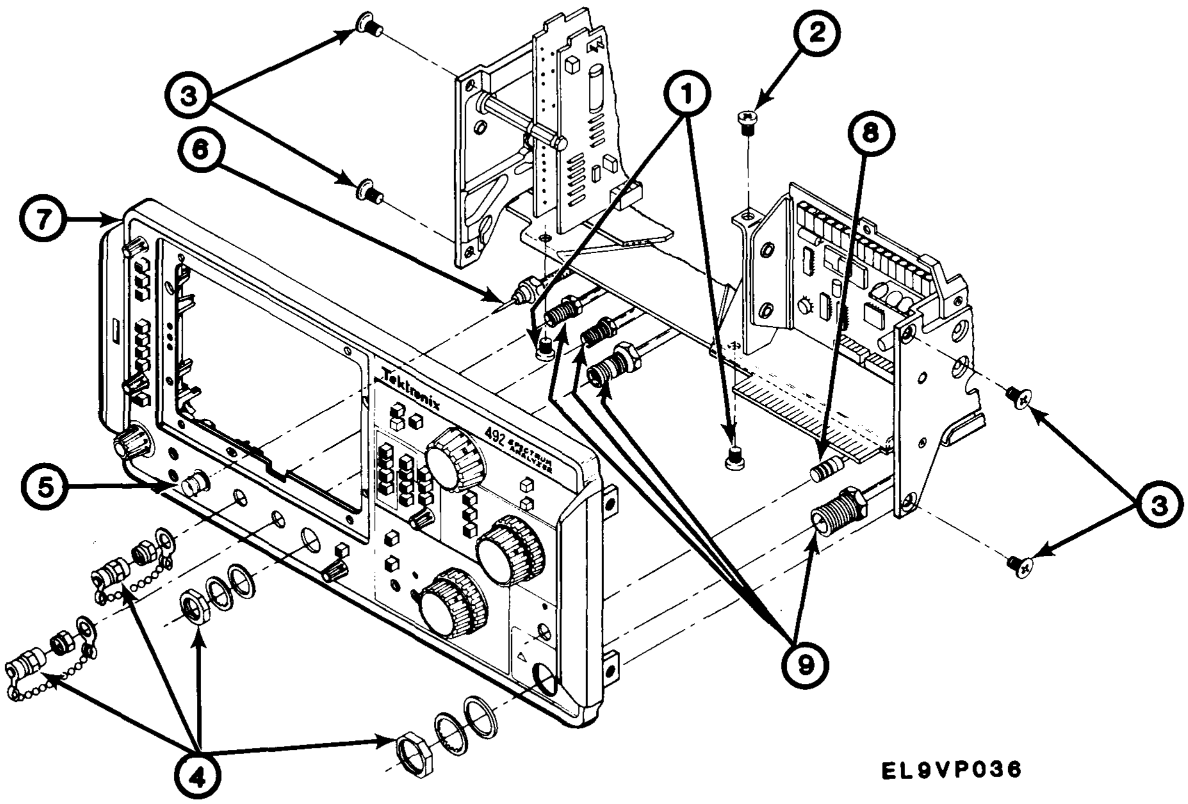
This procedure covers: Remove, Install.

REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.
2. Remove CRT. See paragraph 2-12.
3. Remove two screws (1).
4. Remove screw (2).
5. Remove four screws (3).
6. Remove connector covers, nuts and washers (4).
7. Remove CAL OUT connector (5) (6).
8. Position spectrum analyzer on rear panel.
9. Carefully lift front panel (7) off instrument.

NOTE

Front Panel pulls off power switch (8) and five connectors (9).



INSTALL

1. Position spectrum analyzer on rear panel.
2. Position front panel (7) over power switch (8) and five connectors (9).
3. Carefully lower front panel (7) over power switch (8) five connectors (9) and mother board.
4. Install CAL OUT connector (5) (6), washers, nuts and connector covers (4).
5. Install four screws (3).
6. Install screw (2).
7. Install two screws (1).
8. Install CRT. See paragraph 2-12.
9. Install cover. See paragraph 2-11.

END OF TASK

2-16 REPLACE A10 LIMITER

DESCRIPTION

This procedure covers: Remove, Install.

REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.

CAUTION

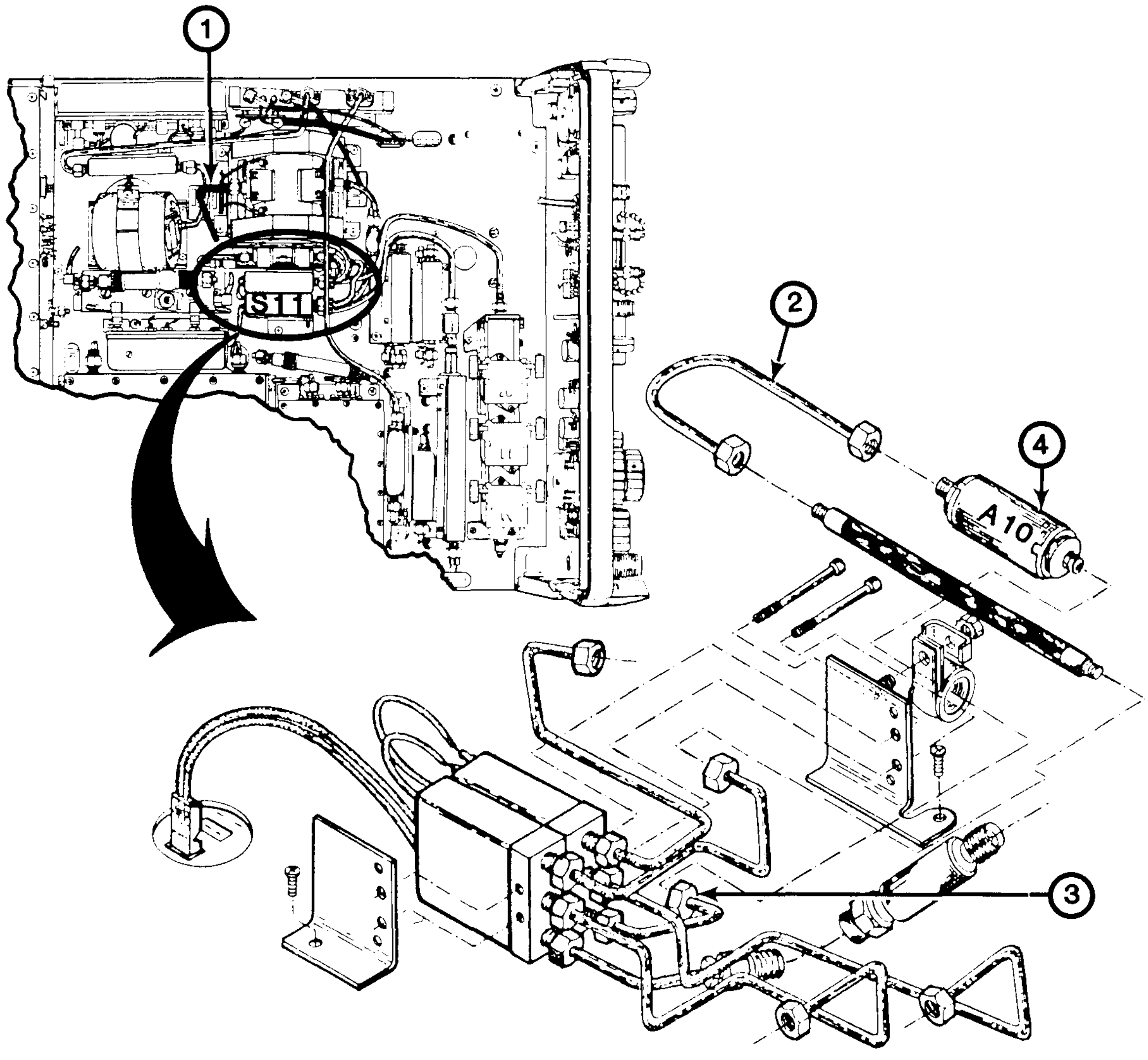
Rigid conductors will be damaged if twisted or bent.

2. Tag, disconnect and remove W114 (1) from rear of YIG Filter (FL12).
3. Tag, disconnect and remove W106 from A10 (2).
4. Tag and disconnect W116P107 (3).
5. Remove A10 (4).

INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.



1. Position A10 (4) in place.
2. Connect W116P107 (3) as tagged.
3. Install and connect W106 (2) as tagged.
4. Install and connect W114 (1) as tagged.
5. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-17 REPLACE A11 BIAS RETURN

DESCRIPTION

This procedure covers: Remove, Install.

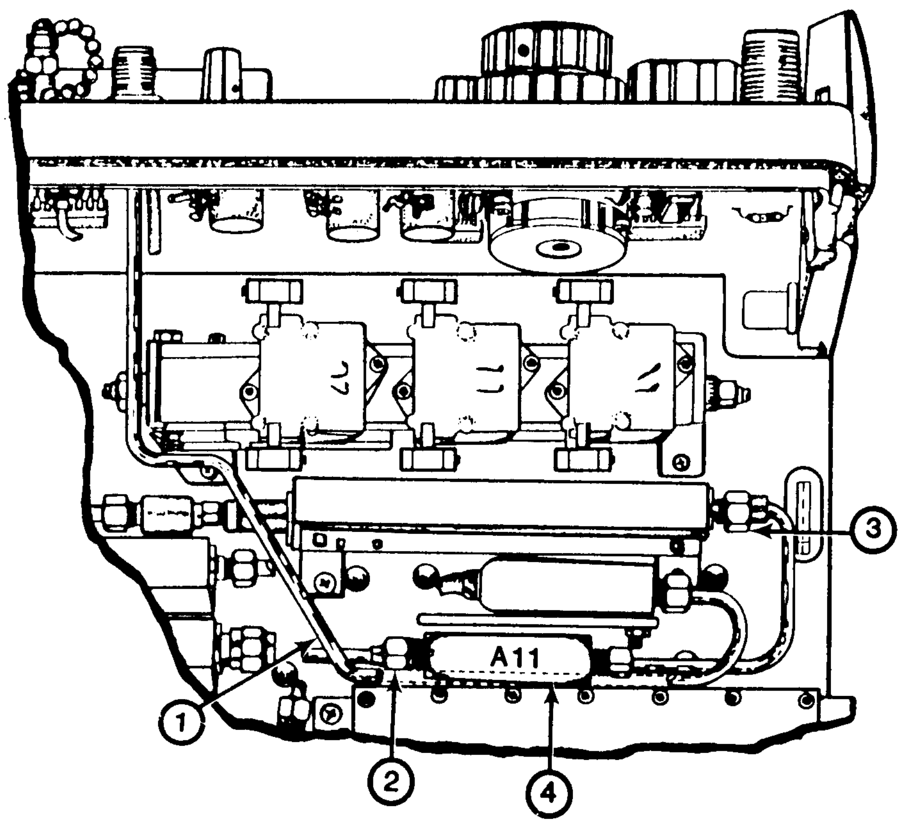
REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.

CAUTION

Rigid conductors will be damaged if twisted or bent.

2. Tag and disconnect W137 (1) from S13.
3. Tag and disconnect W240P240 (2).
4. Tag and disconnect W118P127 (3).
5. Carefully lift, tag, disconnect and remove A11 (4).



EL9VP038

INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Connect and install A11 (4) as tagged.
2. Connect W118P127 (3) as tagged.

3. Connect W240P240 (2) as tagged.
4. Connect and install W137 (1).
5. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-18 REPLACE A12 1ST CONVERTER MODULE

DESCRIPTION

This procedure covers: Remove, Install.

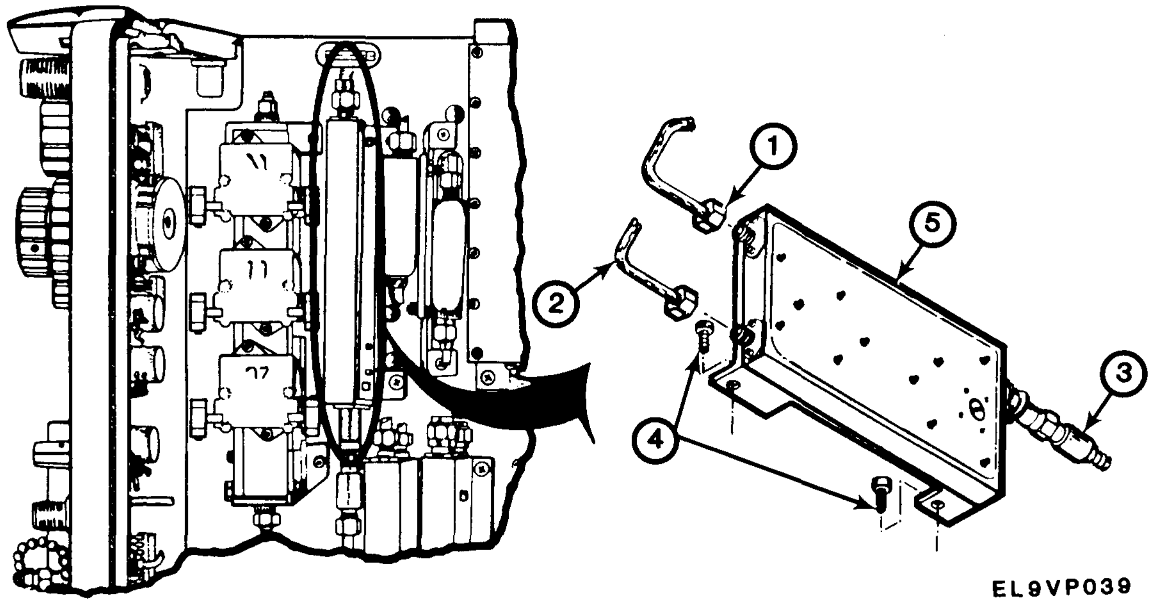
REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.

CAUTION

Rigid conductors will be damaged if twisted or bent.

2. Tag and disconnect W118P128 (1).
3. Tag and disconnect W124P124 (2) from S13.
4. Tag and disconnect P123 (3).
5. Remove two screws (4).
6. Carefully remove A12 (5) out of the instrument.



EL9VP039

INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Carefully position A12 (5) in place.
2. Install two screws (4).
3. Connect P123 (3) as tagged.
4. Connect W124P124 (2) as tagged.
5. Connect W118P128 (1) as tagged.
6. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-19 REPLACE A13 POWER DIVIDER

DESCRIPTION

This procedure covers: Remove, Install.

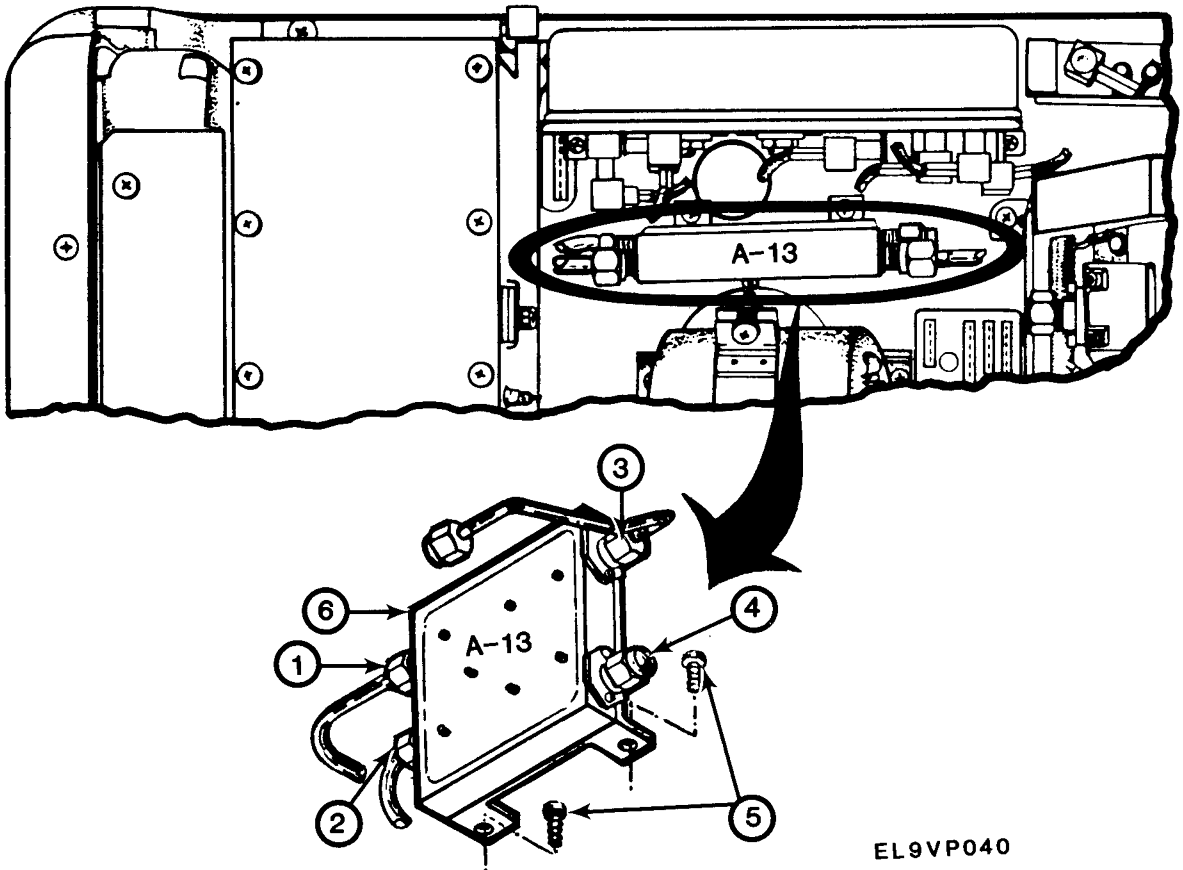
REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.

CAUTION

Rigid conductors will be damaged if twisted or bent.

2. Tag and disconnect W132P132 (1).
3. Tag and disconnect W131P130 (2).
4. Tag and disconnect W166P131 (3).
5. Tag and remove P133 (4).
6. Remove two screws (5).
7. Carefully lift A13 (6) out.



INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Position A13 (6) in place.
2. Install two screws (5).
3. Connect P133 (4) as tagged.
4. Connect W166P131 (3) as tagged.
4. Connect W131P130 (2) as tagged.
5. Connect W132P132 (1) as tagged.
6. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-20 REPLACE A14 DIPLEXER

DESCRIPTION

This procedure covers: Remove, Install.

REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.

CAUTION

Rigid conductors will be damaged if twisted or bent.

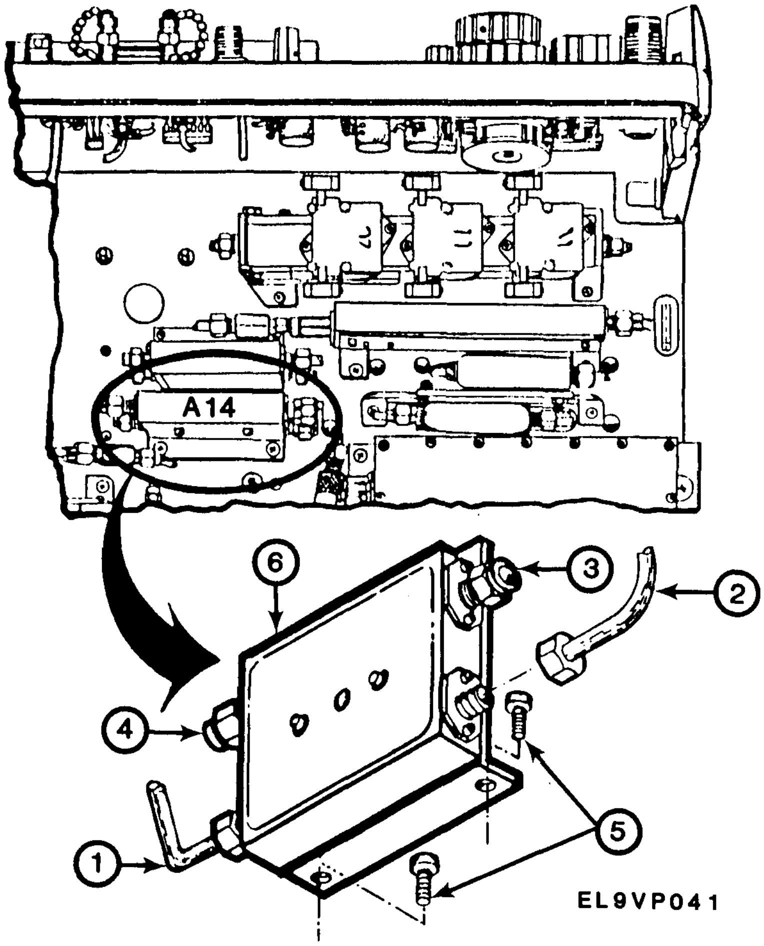
2. Tag, disconnect and remove W162 (1).
3. Tag, disconnect and remove W142 (2).
4. Tag and disconnect P144 (3).
5. Tag and disconnect P145 (4).
6. Remove two screws (5).
7. Carefully lift A14 (6) out.

INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Carefully position A14 (6) in place.
2. Install two screws (5).
3. Connect P145 (4) as tagged.
4. Connect P144 (3) as tagged.
5. Install and connect W142 (2) as tagged.
6. Install and connect W162 (1) as tagged.
7. Install spectrum analyzer cover. See paragraph 2-11.



END OF TASK

2-21 REPLACE A16 1[ST] L O

DESCRIPTION

This procedure covers: Remove, Install.

REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.

CAUTION

Rigid conductors will be damaged if twisted or bent.

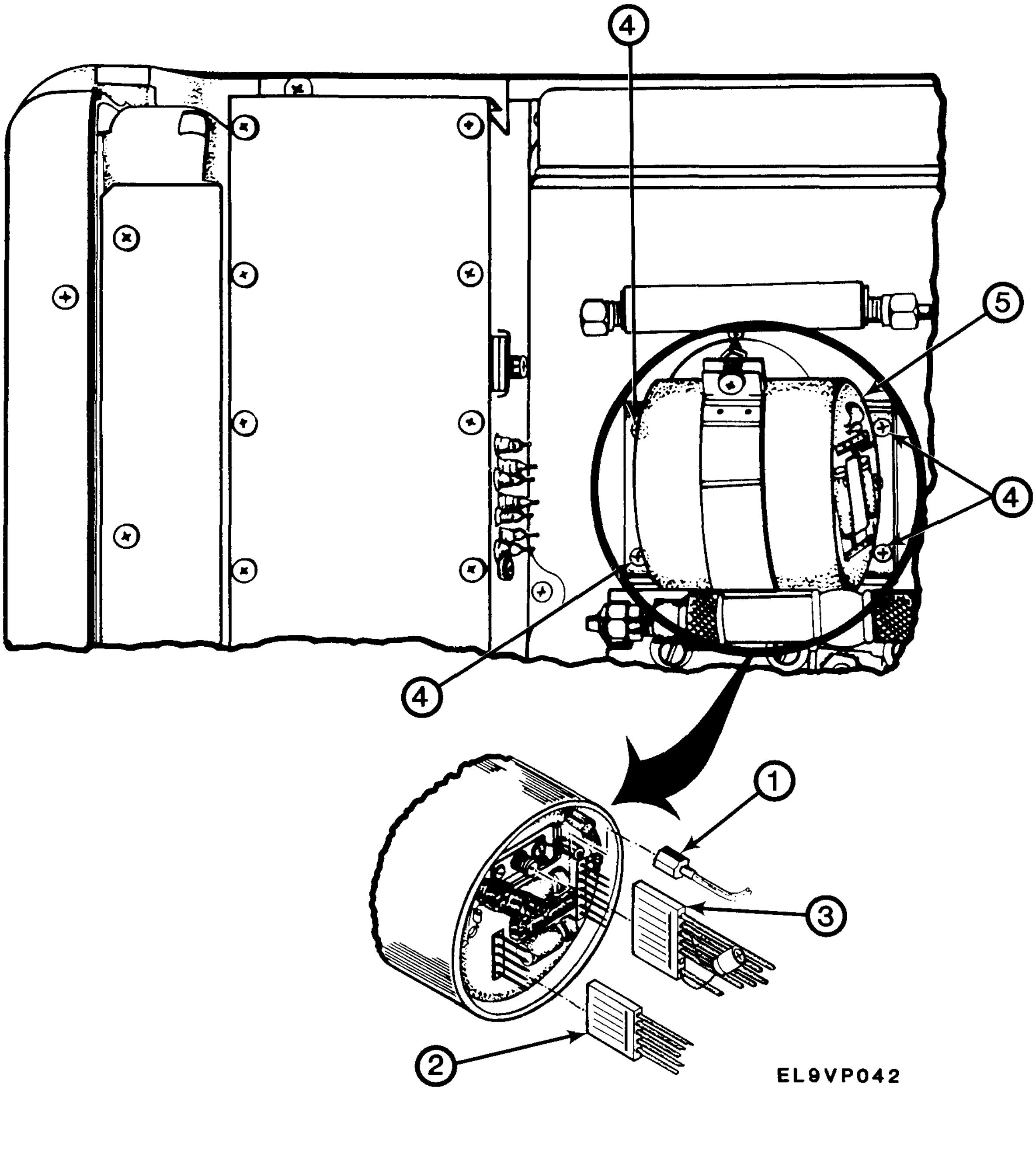
2. Tag and disconnect W166P166 (1).
3. Tag and disconnect P1017 (2).
4. Tag and disconnect P1013 (3).
5. Remove four screws (4).
6. Carefully slide A16 (5) toward the back of the instrument until it clears side components.
7. Lift A16 (5) in place

INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Carefully position A16 (5) in place.
2. Install four screws (4).
3. Connect P1013 (3) as tagged.
4. Connect P1017 (2) as tagged.
5. Connect W166P166 (1) as tagged.
6. Install spectrum analyzer cover. See paragraph 2-11.



END OF TASK

2-22 REPLACE A16A1 1ST LO INTERFACE BOARD

DESCRIPTION

This procedure covers: Remove, Install.

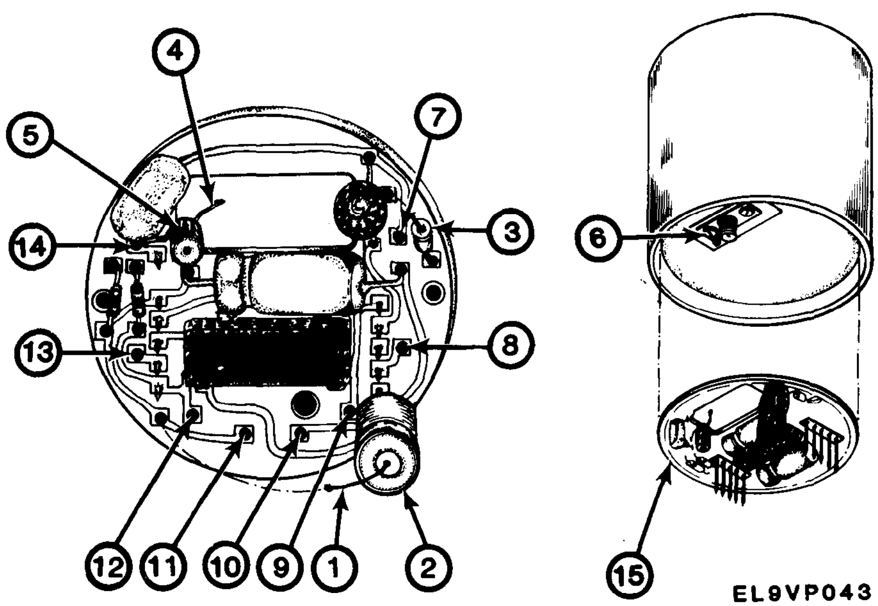
REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.
2. Remove A16. See paragraph 2-21.

CAUTION

Too much heat can damage printed circuit boards. Be careful when soldering and unsoldering components or equipment will be damaged.

3. Tag and unsolder plus (+) side (1) of C1014 (2).
4. Lift unsoldered side of C1014 (2).
5. Tag, unsolder and lift end of VR1010 (3).
6. Tag and unsolder wire (4) from C1013 (5) to ground lug (6).
7. Tag and unsolder eight leads (7) through (14).
8. Carefully lift A16A1 (15) out from YIG assembly.



INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Carefully position A16A1 (15) in place.
2. Solder eight leads (7) through (14) as tagged.
3. Solder wire (4) as tagged.
4. Solder VR1010 lead (3).
5. Solder C1014 (2) plus (+) side lead (1).
6. Install A16. See paragraph 2-21.
7. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-23 REPLACE A18 2072 MHz 2ND CONVERTER AND FL14 4 CAVITY FILTER

DESCRIPTION

This procedure covers: Remove, Install.

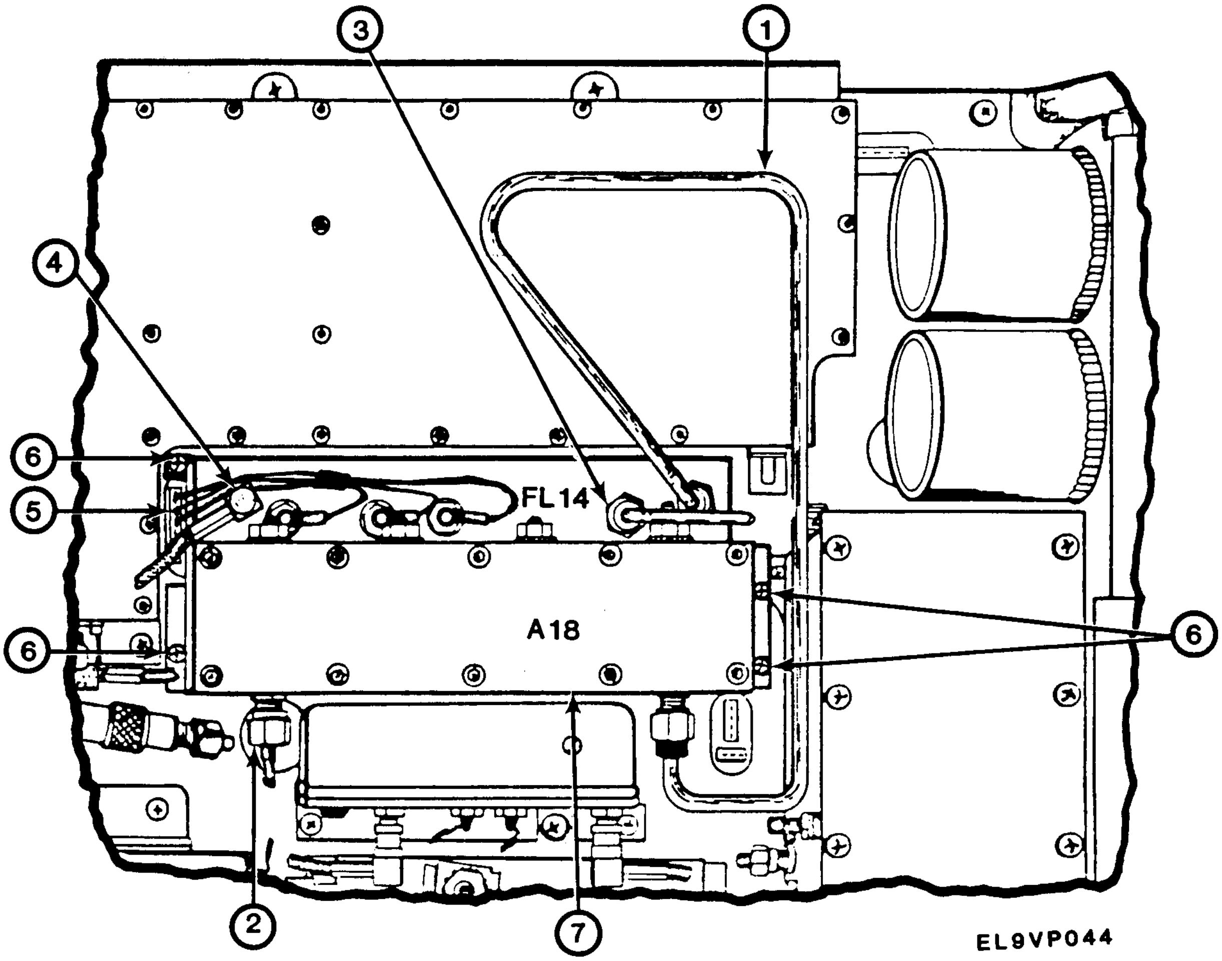
REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.

CAUTION

Rigid conductors will be damaged if twisted or bent.

2. Tag, disconnect and remove W140 (1).
3. Tag and disconnect W110P141 (2).
4. Tag and disconnect W222P183 (3).
5. Tag and disconnect W182P182 (4).
6. Tag and disconnect J3035 (5).
7. Remove four screws (6).
8. Lift FL14 and A18 (7) out.



INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Carefully position FL14 and A18 (7) in place.
2. Install four screws (6).
3. Connect J3035 (5) as tagged.
4. Connect W182P182 (4) as tagged.
5. Connect W222P183 (3) as tagged.
6. Connect W110P141 (2) as tagged.
7. Install and connect W140 (1) as tagged.
8. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

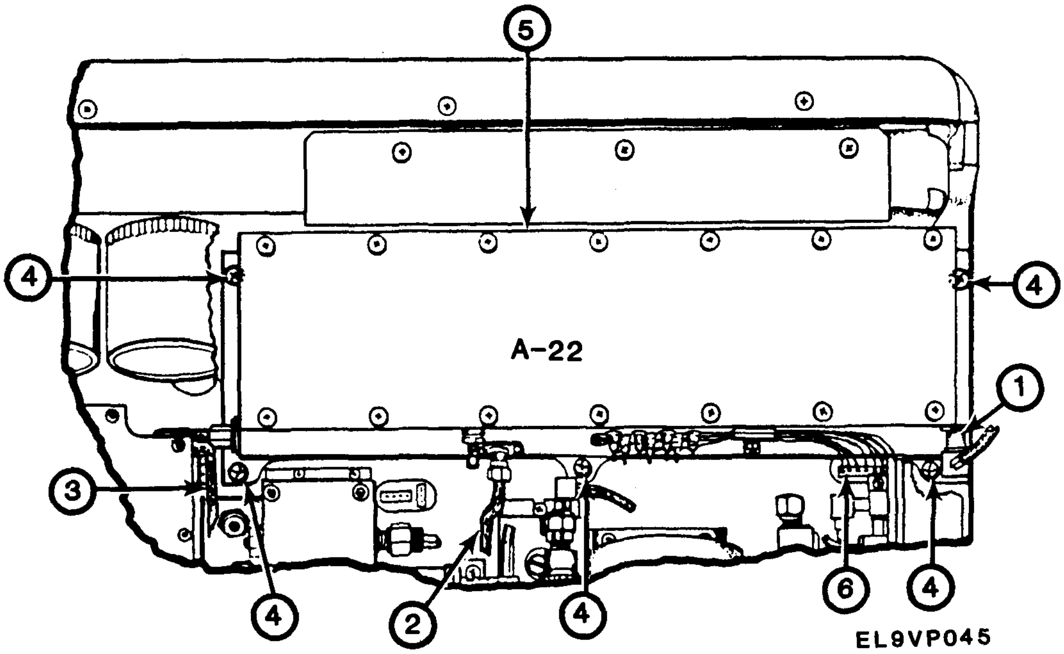
2-24 REPLACE A22 2182 MHz PHASELOCKED 2^{ND} LO

DESCRIPTION

This procedure covers: Remove, Install.

REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.
2. Tag and disconnect W346P221 (1).
3. Tag, disconnect and remove W220 (2).
4. Tag, disconnect and remove W222 (3).
5. Remove five screws (4).
6. Carefully lift A22 (5) to clear chassis.
7. Tag and disconnect J1046 and J1048 (6).
8. Remove A22 (5).



INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Place A22 (5) approximately 10 inches above its location.
2. Connect J1046 and J1048 (6) as tagged.
3. Position A22 (5) in place.

4. Install five screws (4).
5. Connect and install W222 (3) as tagged.
6. Connect and install W220 (2) as tagged.
7. Connect W346P221 (1) as tagged.
8. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-25 REPLACE A23 829 MHz 2ND CONVERTER

DESCRIPTION

This procedure covers: Remove, install.

REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.

CAUTION

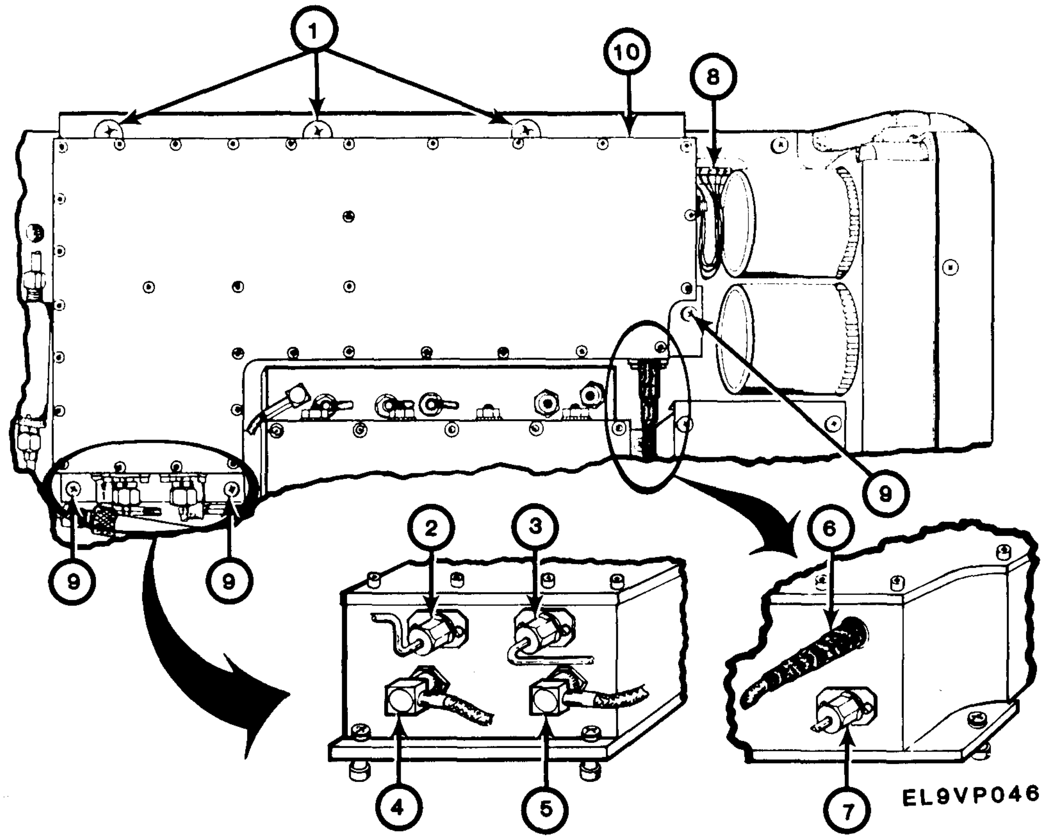
Rigid conductors will be damaged if twisted or bent.

3. Tag and disconnect W236P236 (2).
4. Tag and disconnect W220P237 (3).
5. Tag and disconnect W182P233 (4).
6. Tag and disconnect W232P232 (5).
7. Tag and remove W222.
8. Tag and disconnect W150P231 (6).
9. Tag and disconnect W348P235 (7).
10. Tag and disconnect A23P4050 (8).
11. Remove three screws (9).
12. Slide A23 (10) away from instrument.

INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.



1. Carefully position A23 (10) in place.
2. Install three screws (9).
3. Connect A23P4050 (8) as tagged.
4. Connect W348P235 (7) as tagged.
5. Connect W150P231 (6) as tagged.
6. Connect W222 as tagged.
7. Connect W232P232 (5) as tagged.
8. Connect W182P233 (4) as tagged.
9. Connect W220P237 (3) as tagged.
10. Connect W236P236 (2) as tagged.
11. Install three screws (1).
12. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-26 REPLACE A24 PHASE GATE DETECTOR

DESCRIPTION

This procedure covers: Remove, Install.

REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.

CAUTION

Rigid conductors will be damaged if twisted or bent.

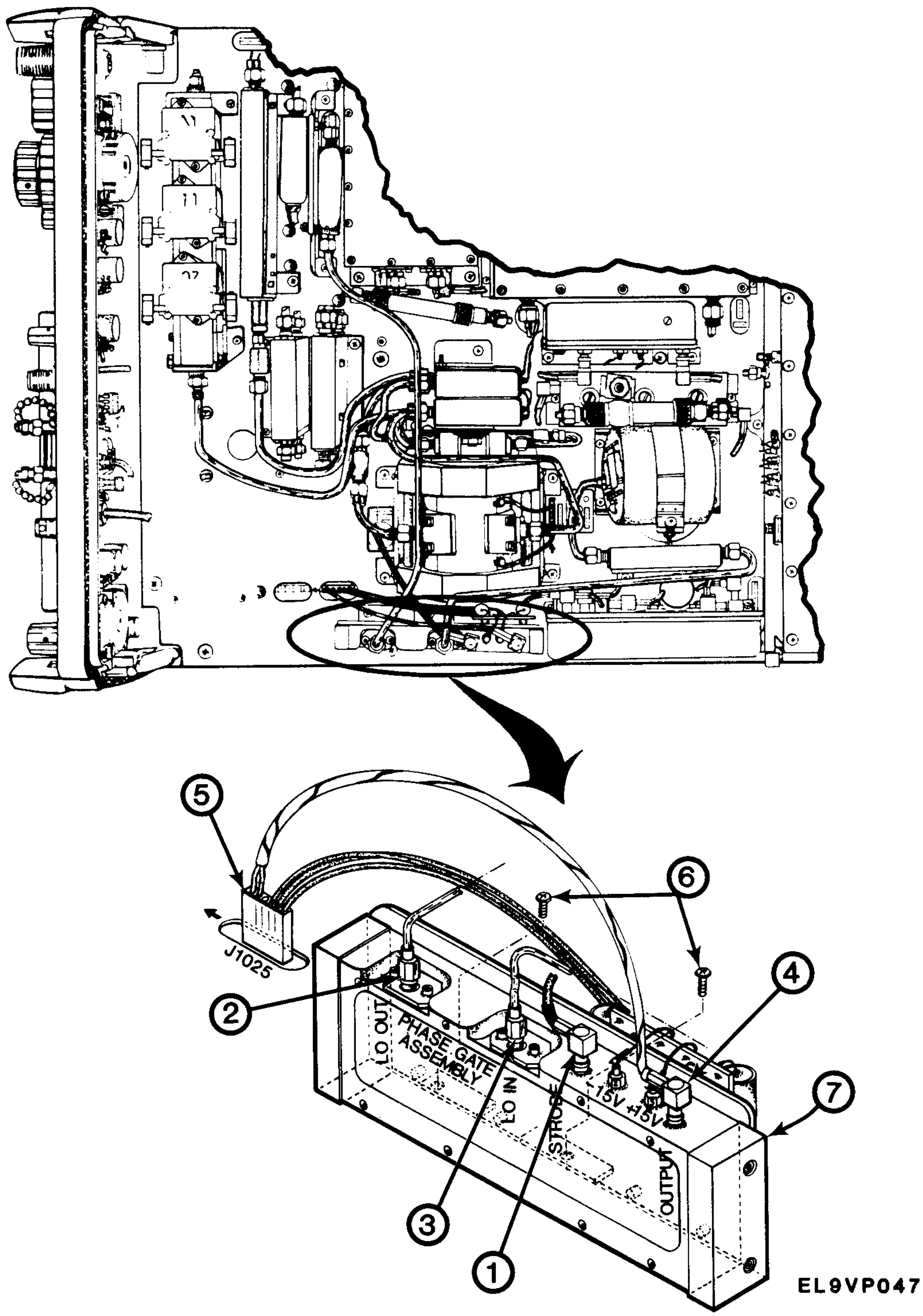
2. Tag and disconnect W502P243 (1).
3. Tag and disconnect W240P240 (2).
4. Tag and disconnect W131P241 (3).
5. Tag and disconnect W242P242 (4).
6. Tag and disconnect P1025 (5).
7. Remove two screws (6).
8. Carefully lift A24 (7) out.

INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Carefully position A24 (7) in place.
2. Install two screws (6).
3. Connect P1025 (5) as tagged.
4. Connect W242P242 (4) as tagged.
5. Connect W131P241 (3) as tagged.
6. Connect W240P240 (2) as tagged.
7. Connect W502P243 (1) as tagged.
8. Install spectrum analyzer cover. See paragraph 2-11.


5
6
4
7
2
3
1
J1025
LO OUT
PHASE GATE
ASSEMBLY
LO IN
STROBE
-15V
+15V
OUTPUT
EL9VP047

END OF TASK

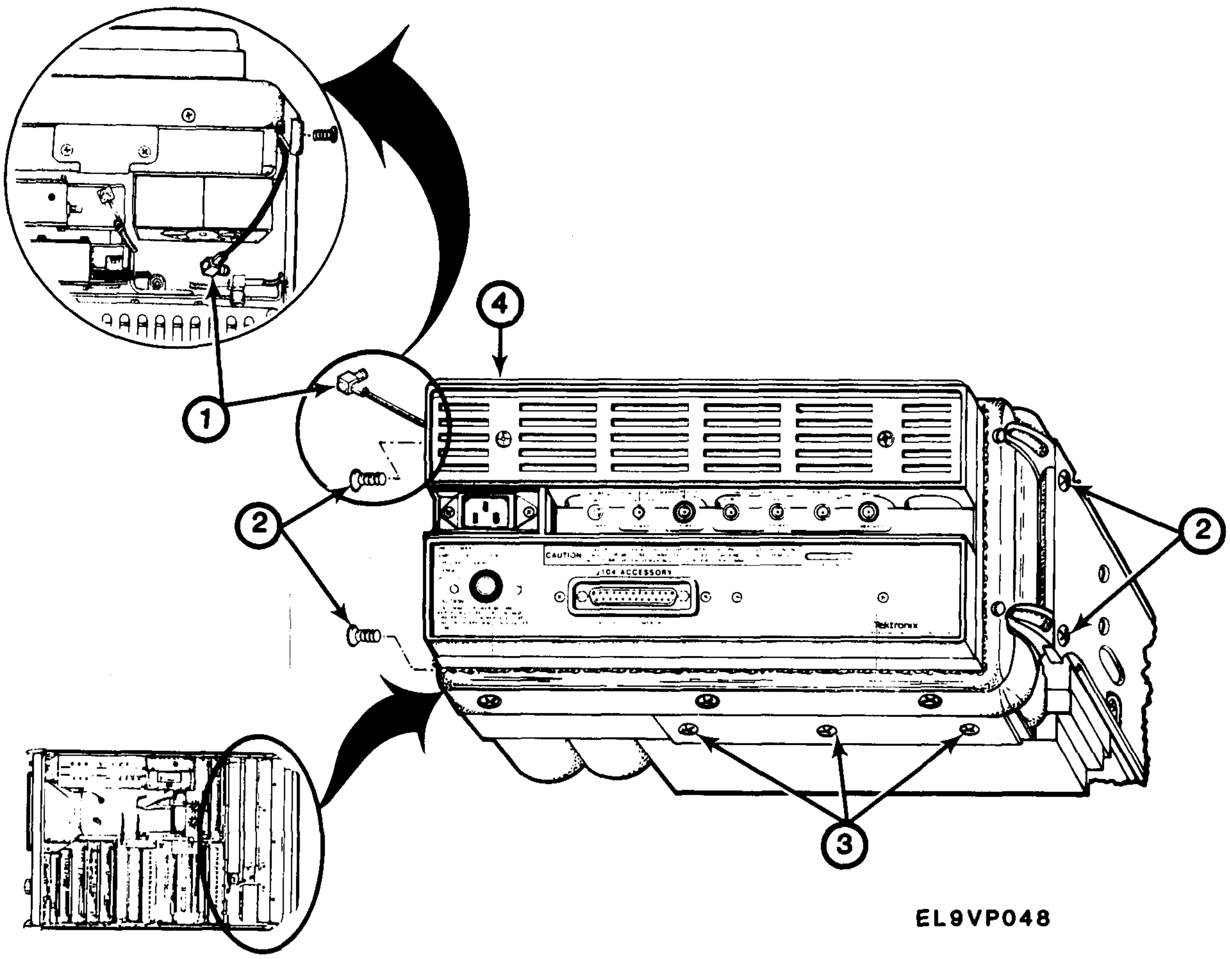
2-27 REPLACE A30 MAIN POWER SUPPLY REAR PANEL ASSEMBLY

DESCRIPTION

This procedure covers: Remove, Install.

REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.
2. Tag and disconnect cable connector W620P620 (1).
3. Remove four screws (2).
4. Remove three screws (3).
5. Place instrument on front surface.
6. Lift power supply (4) out of instrument.



EL9VP048

INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Position power supply on instrument chassis.
2. Carefully lower power supply (4) until it is firmly seated on Mother Board connector.
3. Install three screws (3).
4. Install four screws (2).
5. Connect W620P620 (1) as tagged.
6. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-28 REPLACE A30A1 MAIN POWER SUPPLY BOARD

DESCRIPTION

This procedure covers: Remove, Install.

REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.
2. Remove main power supply rear panel assembly. See paragraph 2-27.
3. Remove six screws (1).
4. Carefully lift power supply cover (2).
5. Tag and disconnect J3045 (3).
6. Remove power supply cover (2).

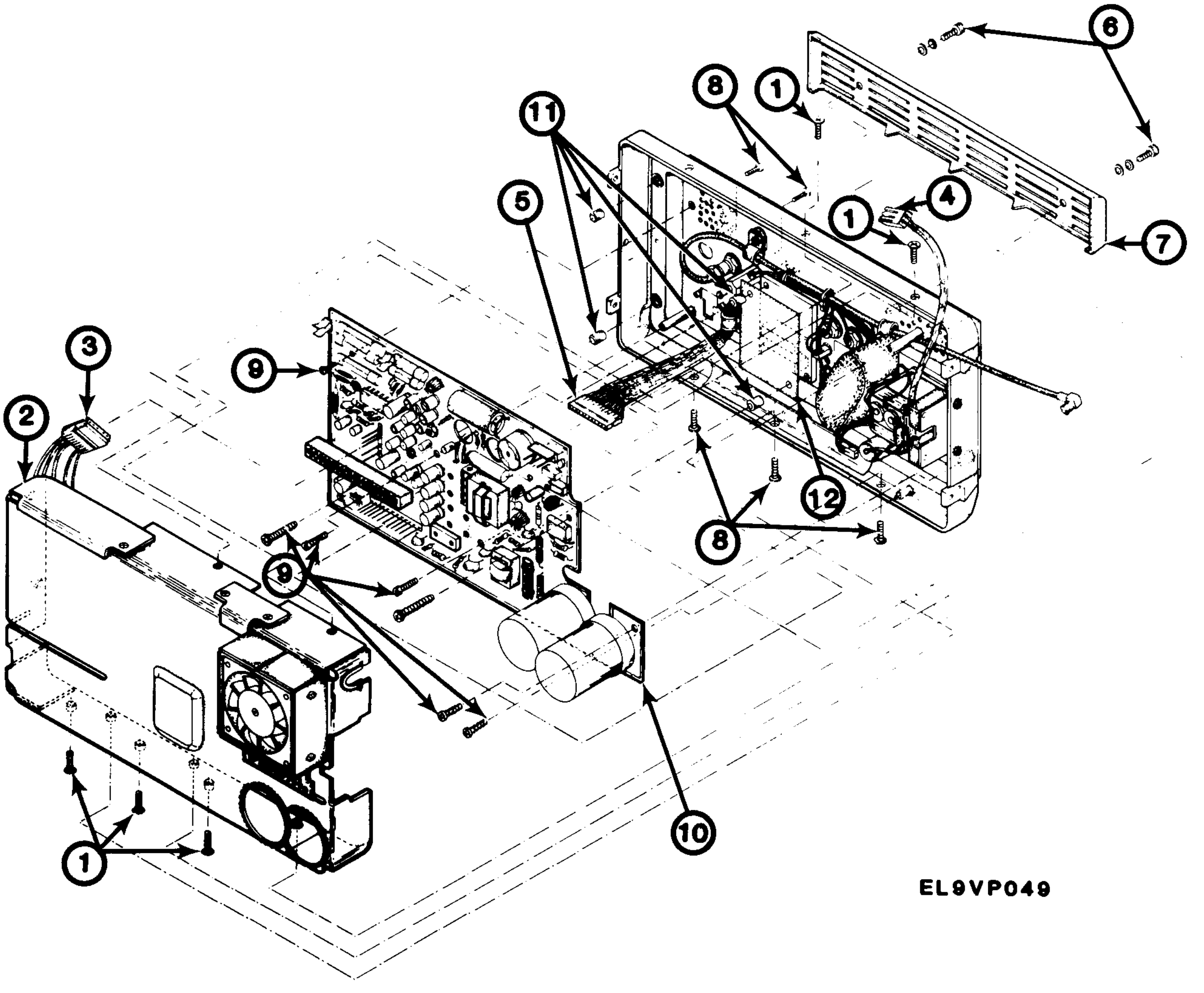
7. Tag and disconnect J1091 (4).
8. Tag and disconnect J5042 (5).
9. Remove two screws and washers (6).
10. Remove rear grille (7).
11. Remove eight screws (8).
12. Remove seven screws (9).
13. Carefully lift out A30A1 (10).
14. Remove two standoffs (11) and heat sink insulator (12).

INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Position heat sink (13) insulator (12) and two standoffs (11) on heat sink assembly.
2. Carefully position A30A1 (10) over standoffs (11).
3. Install seven screws (9).
4. Install eight screws (8).
5. Install rear grille (7).
6. Install two screws and washers (6).
7. Connect J5042 (5) as tagged.
8. Connect J1091 (4) as tagged.
9. Position power supply cover (2) over power supply.
10. Connect J3045 (3) as tagged.
11. Install six screws (1).
12. Install power supply rear panel assembly. See paragraph 2-27.
13. Install spectrum analyzer cover. See paragraph 2-11.



END OF TASK

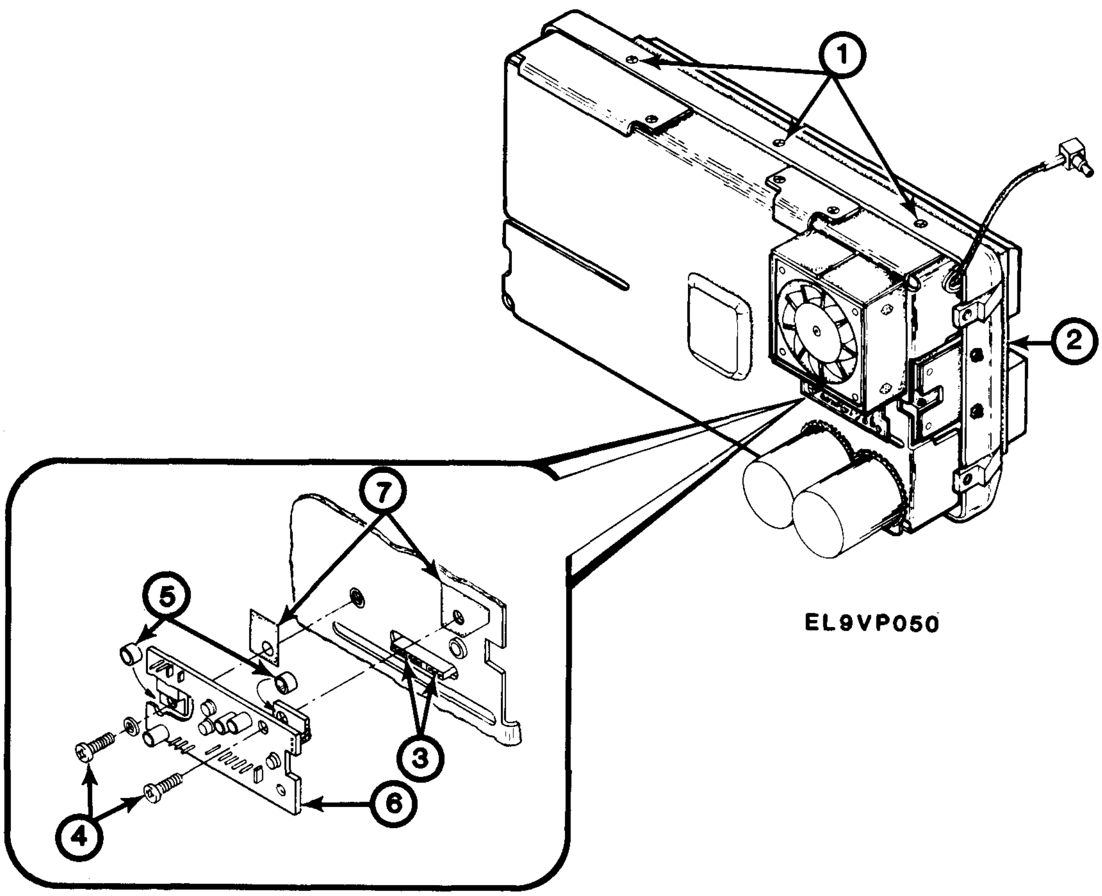
2-29 REPLACE A30A2 FAN DRIVER BOARD

DESCRIPTION

This procedure covers: Remove, Install.

REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.
2. Remove main power supply rear panel assembly. See paragraph 2-27.
3. Remove six screws (1).
4. Carefully lift power supply cover (2), tag and disconnect J3045 (8).
5. Remove power supply cover (2).
6. Tag and disconnect connectors (3).
7. Remove two screws (4) standoffs (5).
8. Remove A30A2 (6).
9. Remove two insulators (7).



INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Position A30A2 (6) on power supply.
2. Install two screws (4) standoffs (5) and insulators (7).
3. Connect connectors (3) as tagged.
4. Position power supply cover (2) on power supply.
5. Connect J3045 (8) as tagged.
6. Install six screws (1).
7. Install main power supply rear panel assembly. See paragraph 2-27.
8. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

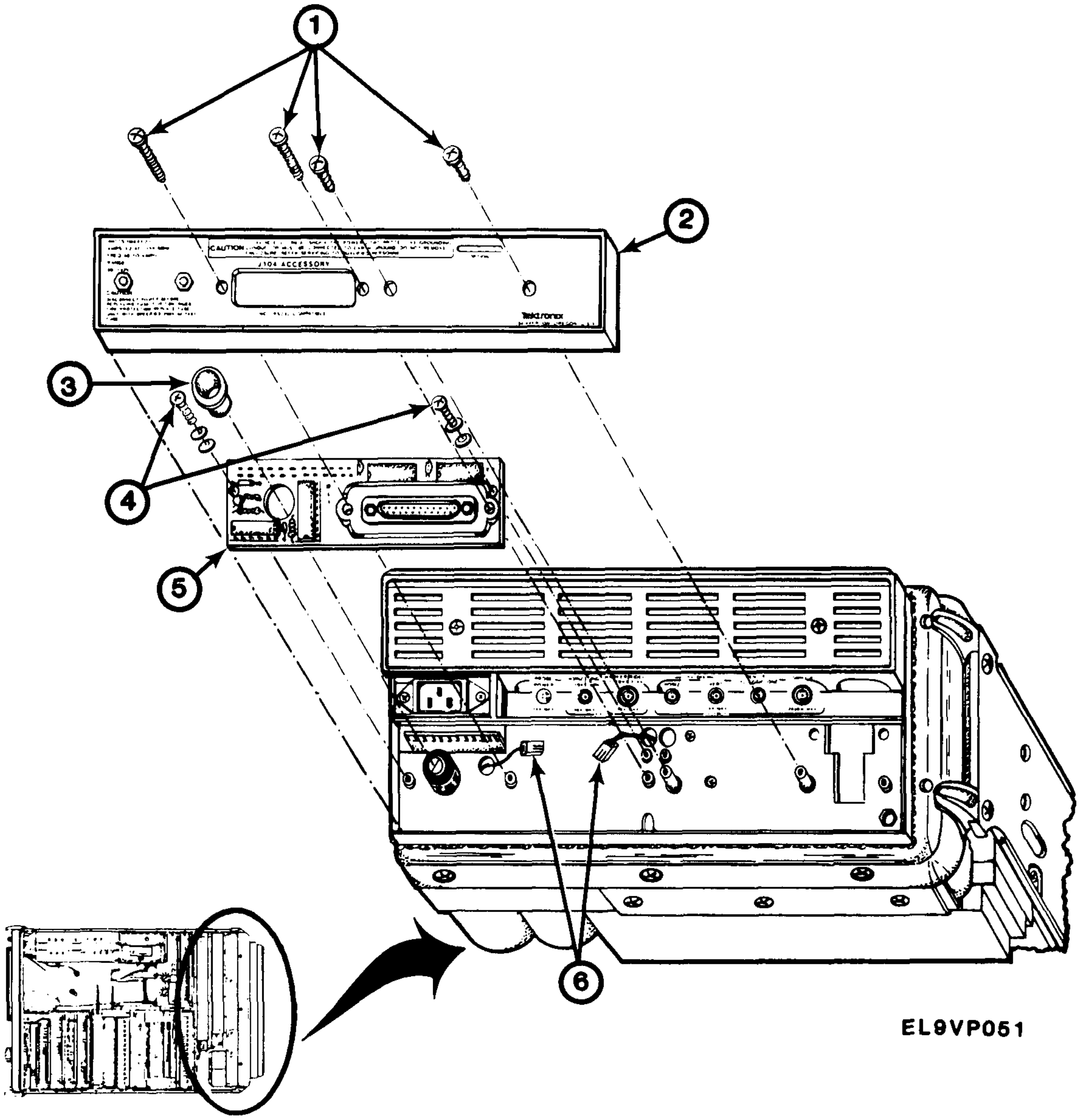
2-30 REPLACE A30A76 ACCESSORIES INTERFACE BOARD

DESCRIPTION

This procedures covers: Remove, Install.

REMOVE

1. Remove four screws (1).
2. Remove rear housing (2).
3. Remove rubber grommet (3).
4. Remove two screws and respective washers (4).
5. Carefully lift Accessories Interface Board (5) until you meet resistance.
6. Tag and disconnect two connectors (6).
7. Remove Accessories Interface Board (5).



INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Connect two connectors (6) as tagged.
2. Position Accessories Interface Board (5) on Power Supply assembly (7).
3. Install two screws (4).

4. Install rubber grommet (3).

5. Install rear housing (2).

6. Install four screws (1).

END OF TASK

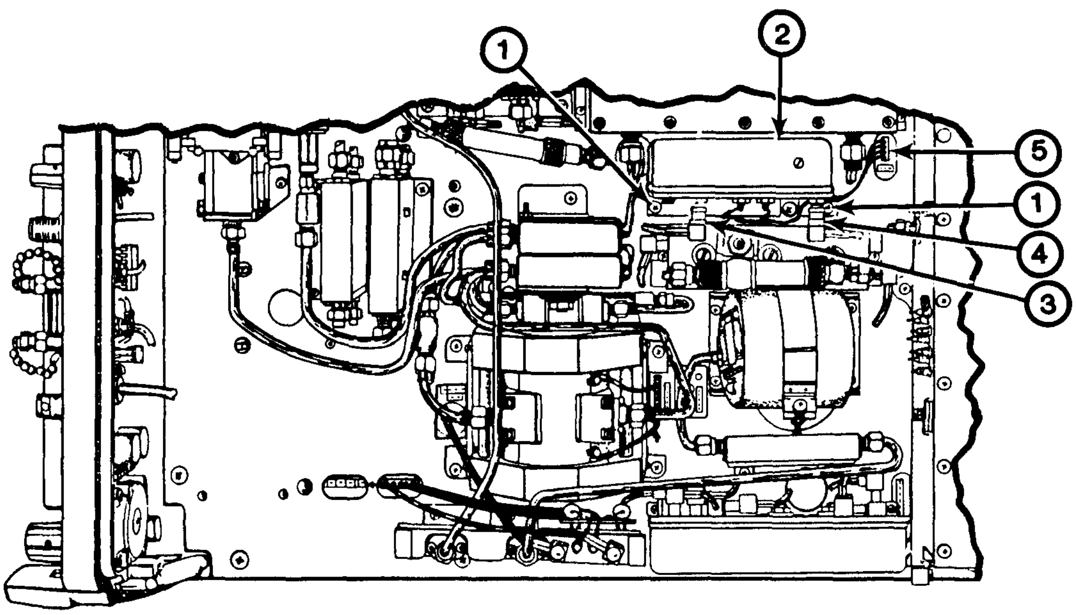
2-31 REPLACE A32 110MHZ IF AMPLIFIER

DESCRIPTION

This procedure covers: Remove, Install.

REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.
2. Remove 2 screws (1).
3. Carefully lift A32 (2) straight up slightly above other components.
4. Tag and disconnect W232P321 (3).
5. Tag and disconnect W320P320 (4).
6. Tag and disconnect J3045 (5).
7. Lift A32 (2) out.



EL9VP052

INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Position A32 (2) in place and hold slightly above other components.
2. Connect J3045 (5) as tagged.
3. Connect W320P320 (4) as tagged.
4. Connect W232P321 (3) as tagged.
5. Lower A32 (2) in place.
6. Install two screws (1).
7. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-32 REPLACE A34 100 MHz AND 3RD CONVERTER

DESCRIPTION

This procedure covers: Remove, Install.

REMOVE

1. Remove spectrum analyzer cover. See Paragraph 2-11

CAUTION

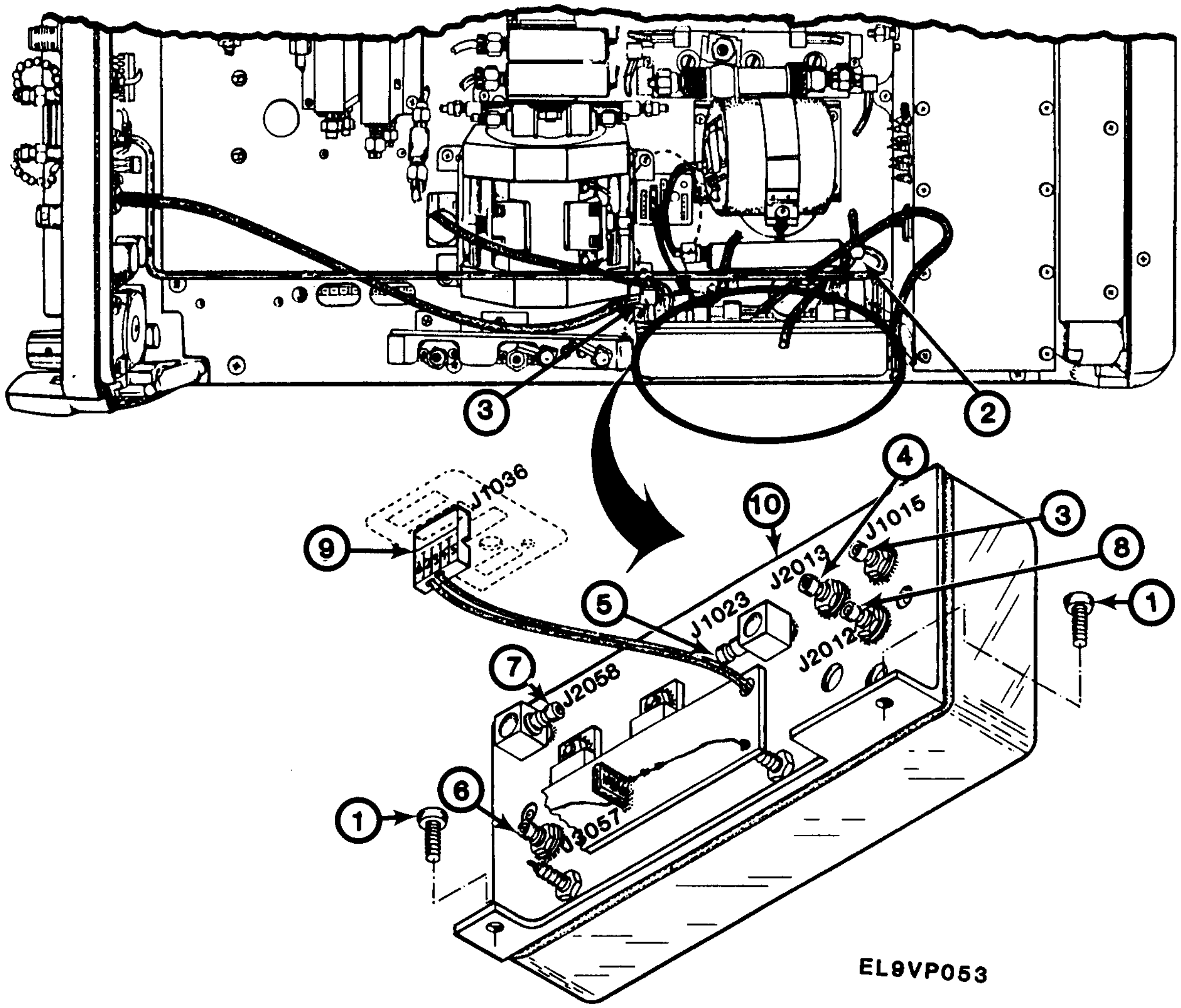
Rigid conductors will be damaged if twisted or bent.

2. Remove two screws (1).
3. Tag and disconnect W132P132 (2).
4. Tag and disconnect W340P340 (3).
5. Tag and disconnect W348P348 (4).
6. Tag and disconnect W350P350 (5).
7. Tag and disconnect W344P344 (6).
8. Tag and disconnect W360P341 (7).
9. Tag and disconnect W346P346 (8).
10. Tag and disconnect J1036 (9).
11. Carefully remove A34 (10).

INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.



1. Position A34 (10) in place.
2. Connect J1036 (9) as tagged.
3. Connect W346P346 (8) as tagged.
4. Connect W360P341 (7) as tagged.
5. Connect W344P344 (6) as tagged.
6. Connect W350P350 (5) as tagged.
7. Connect W348P348 (4) as tagged.
8. Connect W340P340 (3) as tagged.
9. Connect W132P132 (2) as tagged.
10. Install two screws (1).
11. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-33 REPLACE A38 FRONT PANEL BOARD

DESCRIPTION

This procedure covers: Remove, Install.

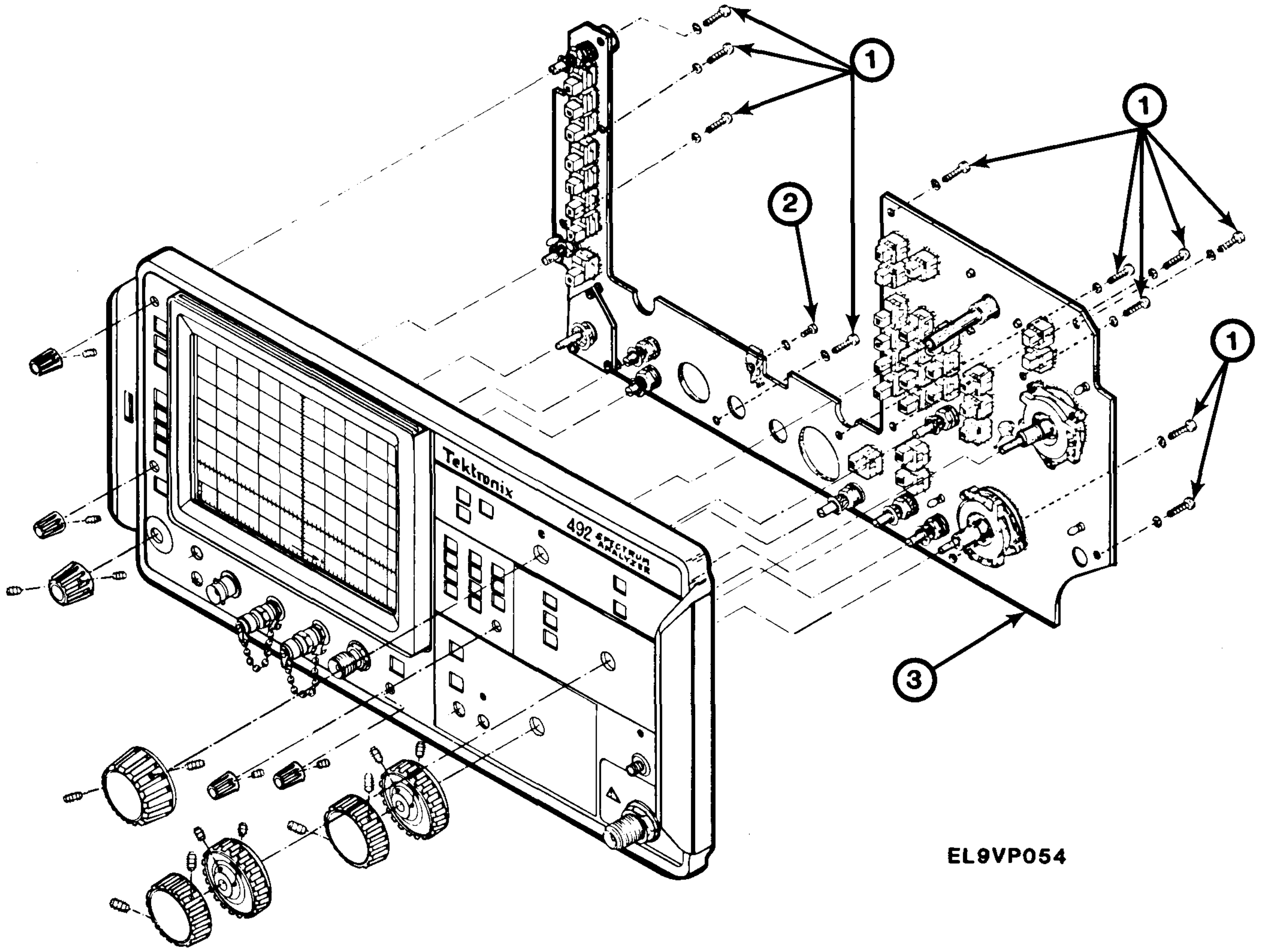
REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.
2. Remove front panel. See paragraph 2-15.
3. Remove front panel control knobs. See TM 11-6625-3136-12, paragraph 3-11.
4. Place instrument on rear panel.
5. Remove eleven screws and respective grounding springs (1).
6. Remove screw (2).
7. Carefully lift A38 (3) out.

CAUTION

Graticule Light wire is still attached to front panel.

8. Tag and disconnect CRT graticule light wire.



INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Position A38 (3) on flat surface with shafts (5) facing up.
2. Position front panel (6) on A38 (3).
3. Connect CRT graticule light wire as tagged.
4. Install screw (2).
5. Install eleven screws and respective grounding springs (1).
6. Install front panel control knobs. See TM 11-6625-3136-12, paragraph 3-11.
7. Install front panel. See paragraph 2-15.
8. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-34 REPLACE A40 VIDEO PROCESSOR BOARD

DESCRIPTION

This procedure covers: Remove, Install.

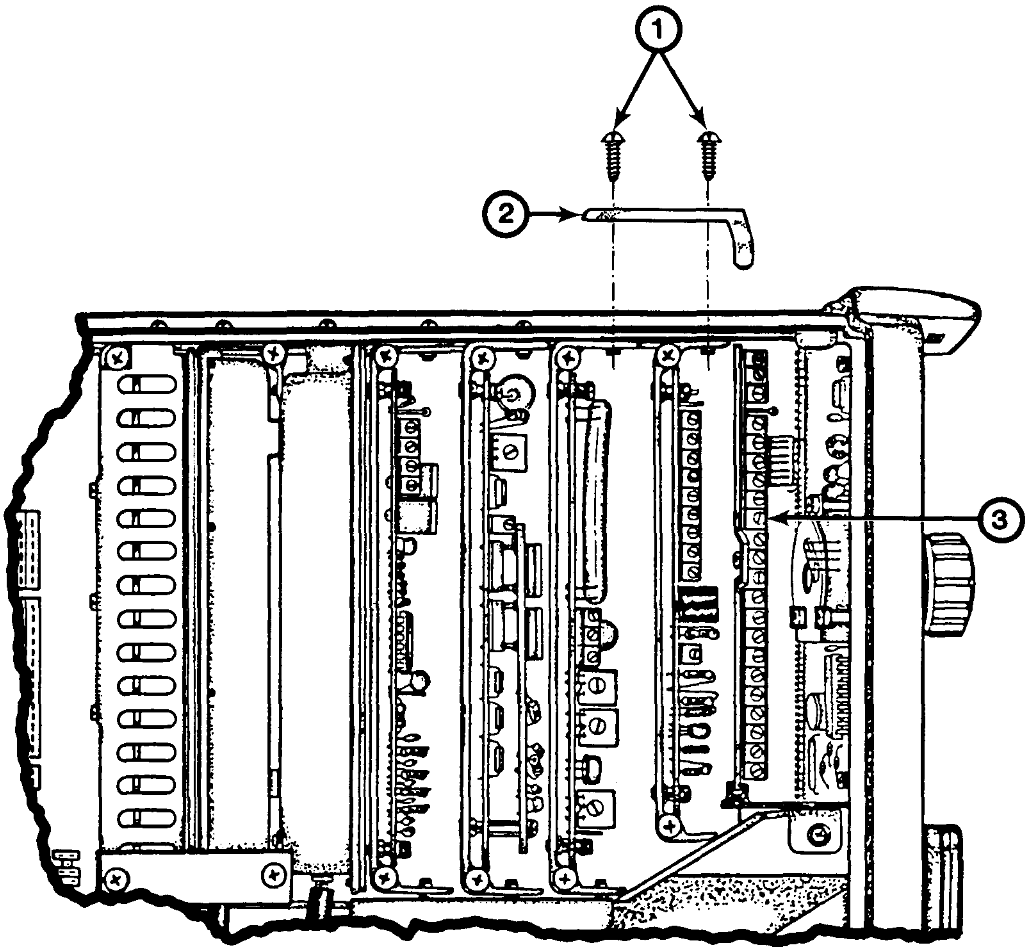
REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.
2. Remove two screws (1).
3. Remove hold down bracket (2).
4. Carefully pull A40 (3) straight up by top center of board to disengage from mating connector.
5. Continue straight up motion until A40 (3) is clear of guides.

INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.



1. Insert A40 (3) module in each of its guides and carefully slide the module into position until it contacts its socket.
2. Apply even pressure on both top corners until module is firmly seated in socket.
3. Install hold down bracket (2).
4. Install two screws (1).
5. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-35 REPLACE A42 PRESELECTOR DRIVER BOARD

DESCRIPTION

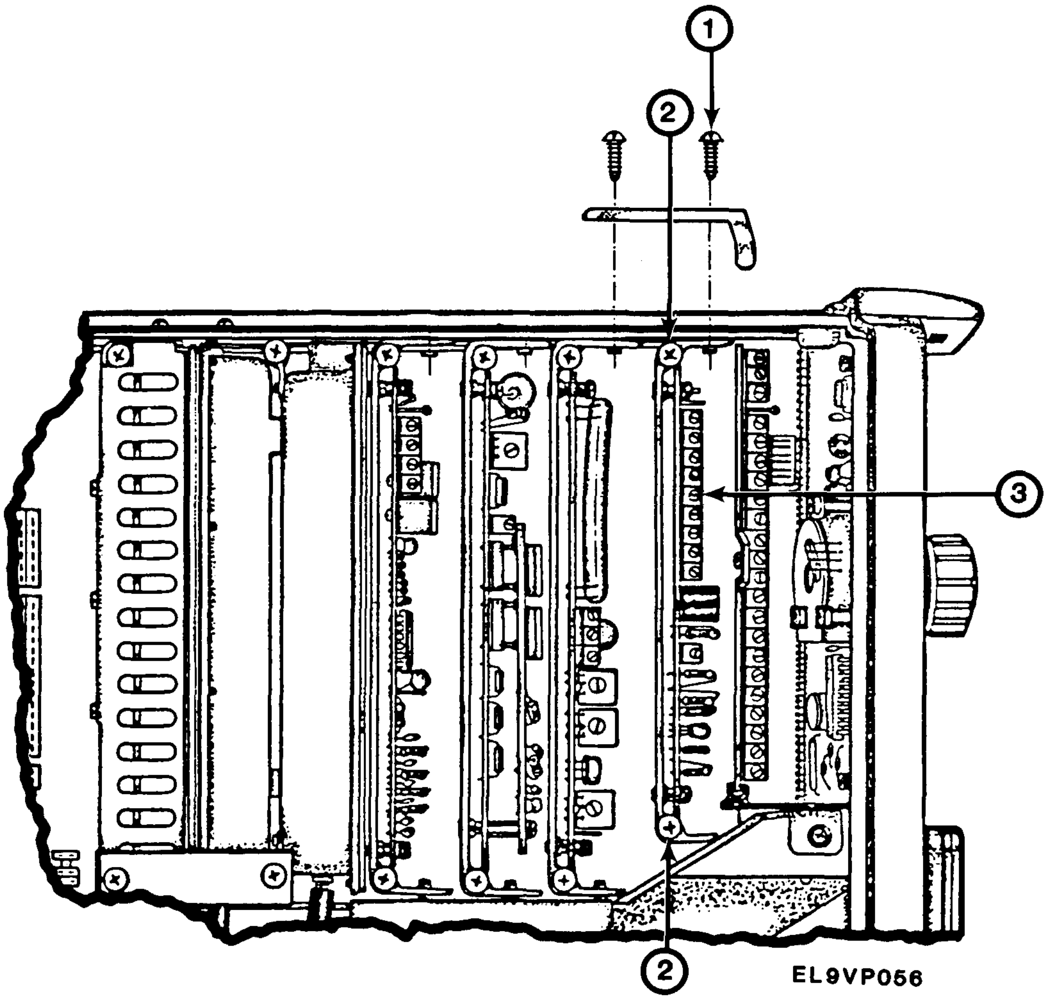
This procedure covers: Remove, Install.

REMOVE

NOTE

This procedure applies to A44, A46, A48, A61, A62, A64 and A66 modules.

1. Remove spectrum analyzer cover. See paragraph 2-11.
2. Remove screw (1).
3. Loosen two captive screws (2).
4. Carefully pull A42 (3), by module frame, straight up to disengage from mating connector.
5. Continue straight up motion until module clears instrument.



INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Insert A42 (3) aligned on mating connectors and carefully slide the module into position until it contacts its socket.
2. Apply even pressure on both top corners until module is firmly seated in socket.
3. Tighten two captive screws (2).
4. Install screw (1).
5. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-36 REPLACE A46A1 AND/OR A46A2 DAC 1200 INTERFACES

DESCRIPTION

This procedure covers: Remove, Install.

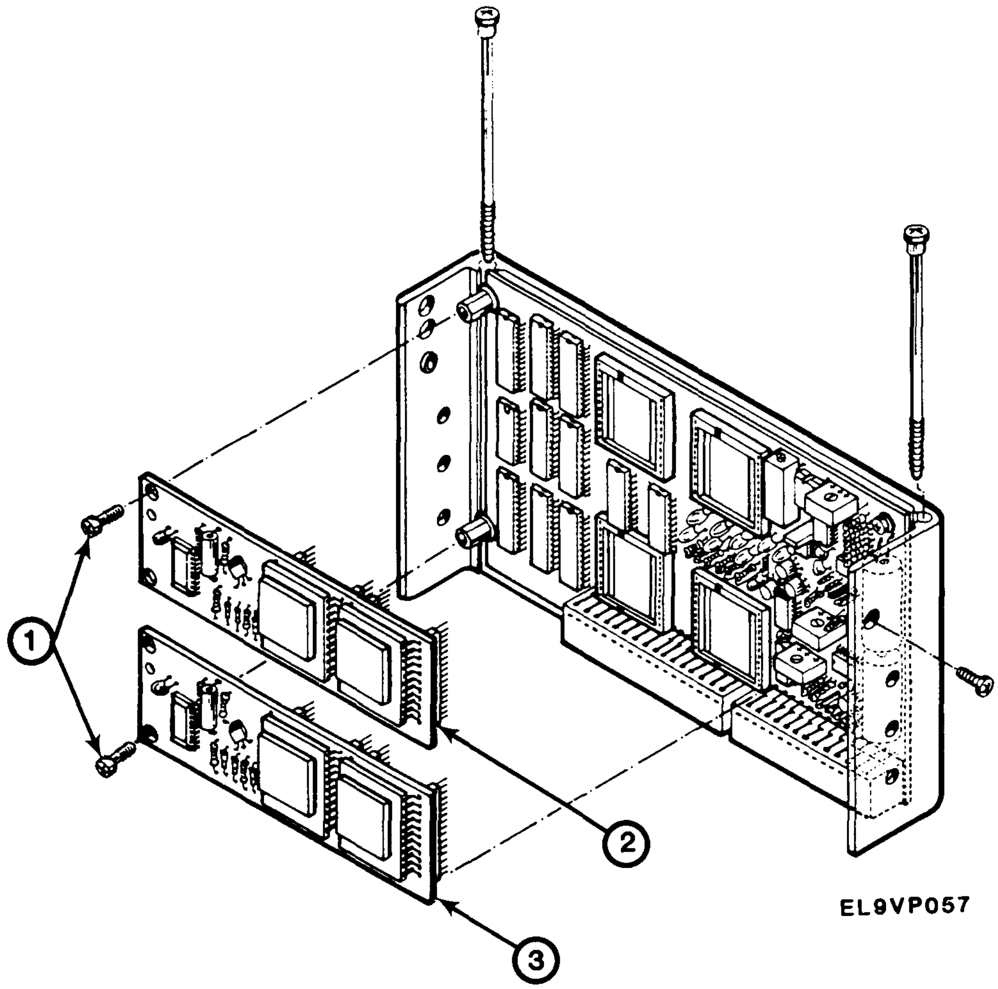
REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.
2. Remove A46 module. See paragraph 2-35.
3. Remove screw (1).
4. Carefully pull A46A1 (2) and/or A46A3 (3) to disengage from mating connector.
5. Continue pull motion until module clears mating connector.

INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.



1. Align A46A1 (2) and/or A46A3 (3) on mating connectors.
2. Apply even pressure on both top corners until module(s) is firmly seared on mating connectors.
3. Install screw (1).
4. Install A46 module. See paragraph 2-35.
5. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-37 REPLACE A50 ERROR AMPLIFIER AND SYNTHESIZER ASSEMBLY

DESCRIPTION

This procedure covers: Remove, Install.

REMOVE

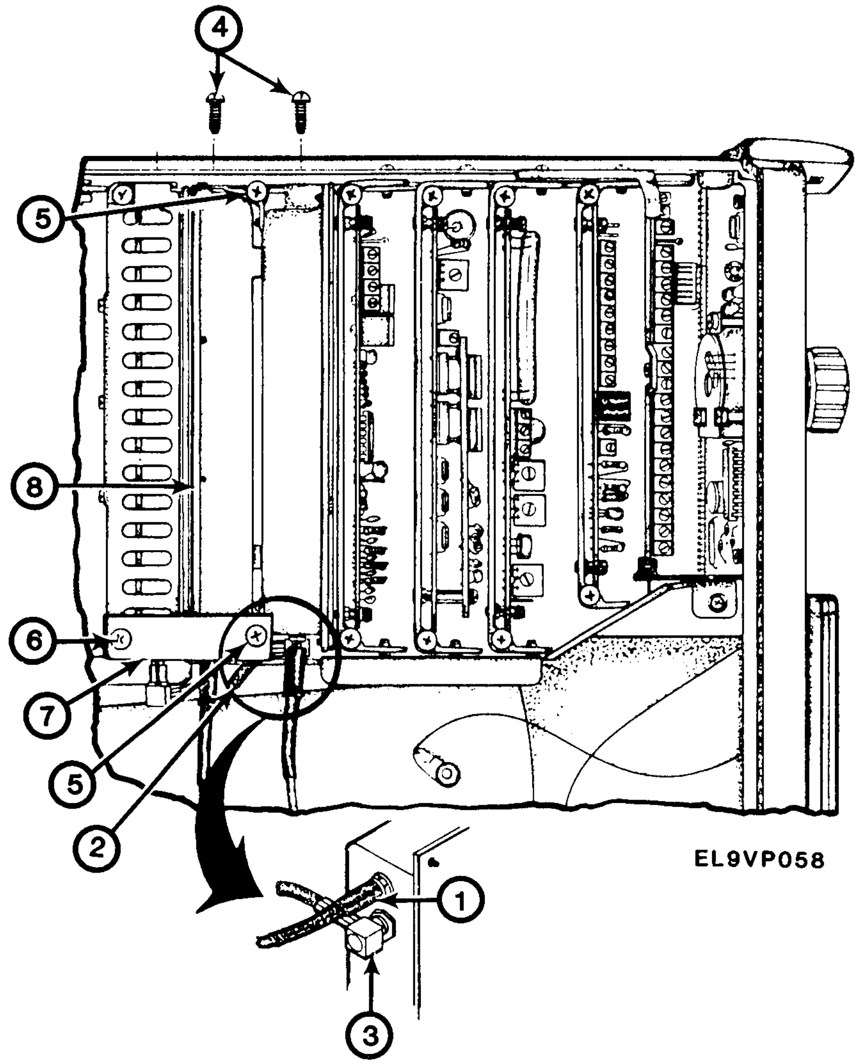
1. Remove spectrum analyzer cover. See paragraph 2-11.
2. Tag and disconnect W350P501 (1).
3. Tag and disconnect W502P502 (2).
4. Tag and disconnect W500P500 (3).
5. Remove two screws (4).
6. Remove two screws (5).
7. Loosen screw (6).
8. Move hold down plate (7) away from A50.
9. Carefully pull A50 assembly (8), holding module frame, straight up to disengage from mating connector.
10. Continue straight up motion until module clears instrument.

INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Carefully insert A50 assembly (8) aligned on mating connectors and carefully slide module into position until it contacts socket.
2. Apply even pressure on both top corners until A50 module (8) is firmly seated in socket.
3. Move hold down plate (7) into proper position.
4. Tighten screw (6).
5. Install two screws (5).
6. Install two screws (4).



7. Connect W500P500 (3) as tagged.
8. Connect W502P502 (2) as tagged.
9. Connect W350P501 (1) as tagged.
10. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

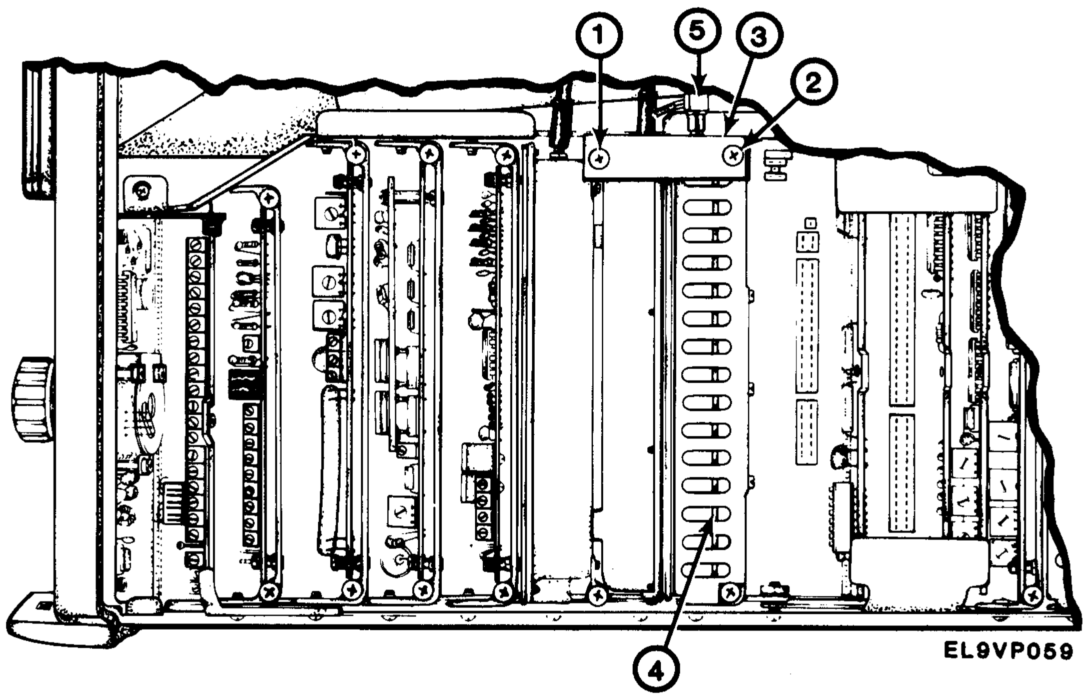
2-38 REPLACE A51 PHASELOCK CONTROL BOARD

DESCRIPTION

This procedure covers: Remove, Install.

REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.
2. Loosen screw (1).
3. Remove screw (2).
4. Move hold down plate (3) away from A51 module (4).
5. Tag and disconnect W500P511 (5).
6. Carefully pull A51 module (4) holding module frame, straight up to disengage from mating connector.
7. Continue straight up motion until module clears instrument.



INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Carefully insert A51 module (4) aligned on mating connectors and carefully slide module into position until it contacts its socket.
2. Apply even pressure on both top corners until A51 module (4) is firmly seated in socket.

3. Connect W500P511 (5) as tagged.
4. Position hold down plate (3) in place.
5. Install screw (2).
6. Tighten screw (1).
7. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

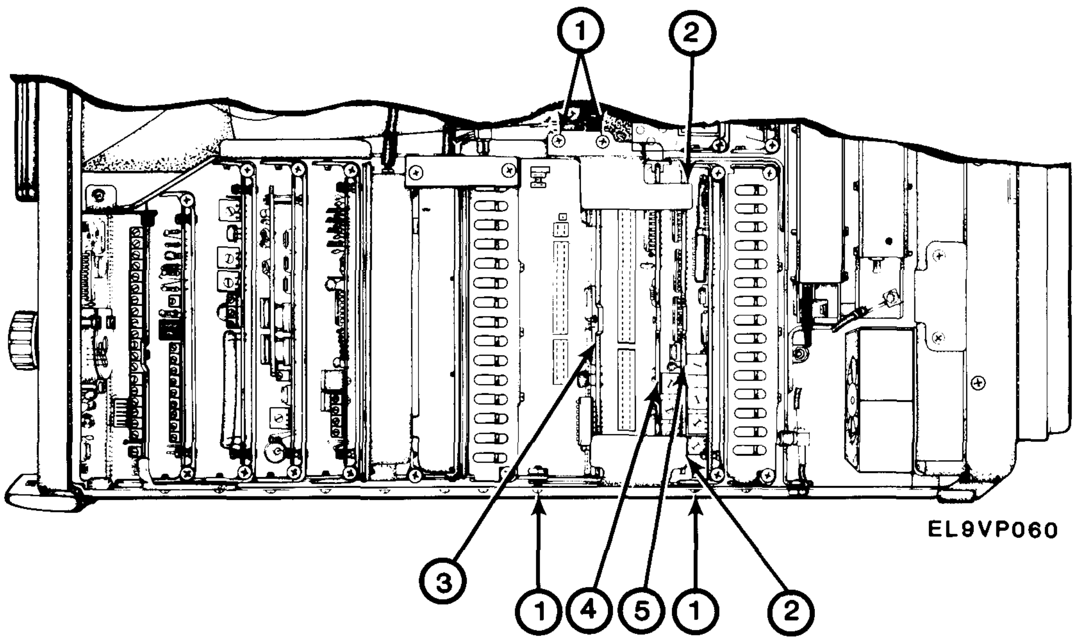
2-39 REPLACE A54 MEMORY BOARD, A58 PROCESSOR BOARD AND A60 HORIZONTAL DIGITAL STORAGE BOARD

DESCRIPTION

This procedure covers: Remove, install.

REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.
2. Remove four screws (1).
3. Remove two hold down brackets (2).
4. Carefully pull A54 (3), A58 (4), and A60 (5) boards straight up to disengage from mating connector.
5. Continue straight up motion until board clears instrument.



INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Carefully insert A60, (5) A58 (4) and A54 (3) boards aligned on mating connectors, slide module into position until it contacts its sockets.
2. Apply even pressure on both top corners until each board is firmly seated in socket.
3. Position two hold down brackets (2) in place.
4. Install four screws (1).
5. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

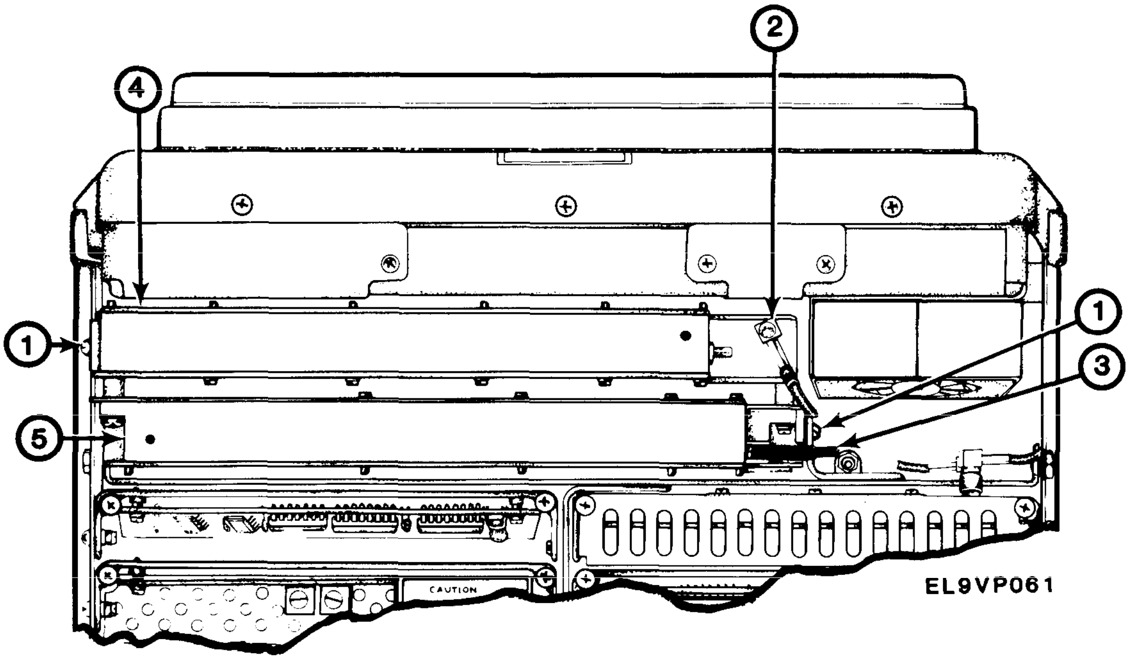
2-40 REPLACE A68 AND A69 VARIABLE RESOLUTION BOARDS

DESCRIPTION

This procedure covers: Remove, Install.

REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.
2. Remove two screws (1).
3. Tag and disconnect W344P693 (2).
4. Tag and disconnect W682P682 (3).
5. Carefully pull A68 (4) and A69 (5) boards straight up to disengage from mating connector.
6. Continue straight up motion until boards clear instrument.



INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Carefully insert A68 (4) and A69 (5) boards aligned on mating connectors, slide module into position until it contacts its sockets.
2. Connect W682P682 (3) as tagged.
3. Connect W344P693 (2) as tagged.
4. Install two screws (1).
5. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

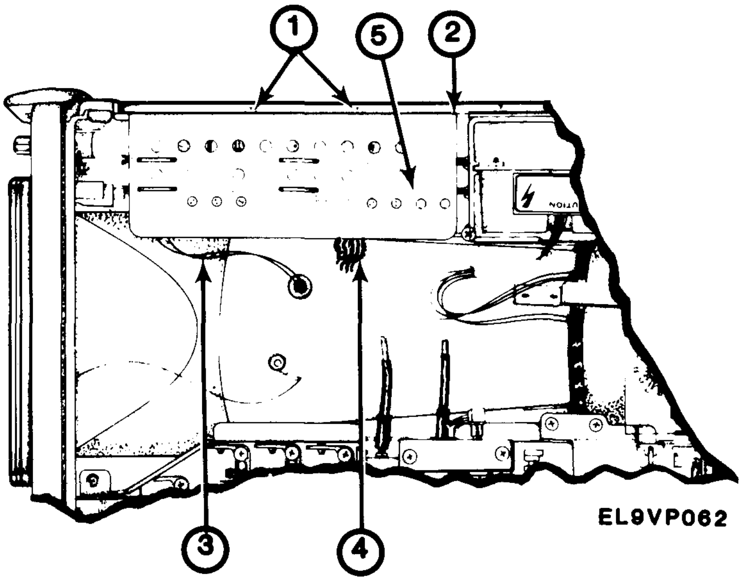
2-41 REPLACE A70 Z-AXIS AND RF INTERFACE BOARD

DESCRIPTION

This procedure covers: Remove, Install.

REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.
2. Remove two screws (1).
3. Remove cover plate (2).
4. Tag and disconnect J1015 (3).
5. Tag and disconnect J1056 (4).
6. Carefully pull A70 (5) straight up to disengage from mating connector.
7. Continue straight up motion until board clears instrument.



INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Insert A70 (3) module in each of its guides and carefully slide the board into position until it contacts its socket.
2. Apply even pressure on both top corners until module is firmly seated in socket.
3. Connect J1056 (4) as tagged.
4. Connect J1015 (3) as tagged.
5. Install cover plate (2).
6. Install two screws (1).
7. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

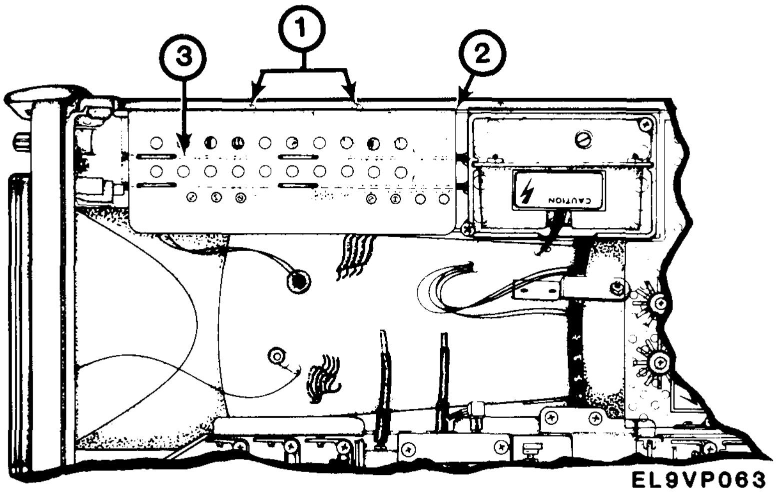
2-42 REPLACE A72 SWEEP BOARD

DESCRIPTION

This procedure covers: Remove, Install.

REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.
2. Remove two screws (1).
3. Remove cover plate (2).
4. Carefully pull A72 (3) straight up to disengage from mating connector.
5. Continue straight up motion until board clears instrument.



INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Insert A72 (3) module in each of its guides and carefully slide the board into position until it contacts its socket.
2. Apply even pressure on both top corners until module is firmly seated in socket.
3. Install cover plate (2).
4. install two screws (1).
5. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-43 REPLACE A74 HIGH VOLTAGE BOARD

DESCRIPTION

This procedure covers: Remove, Install.

REMOVE

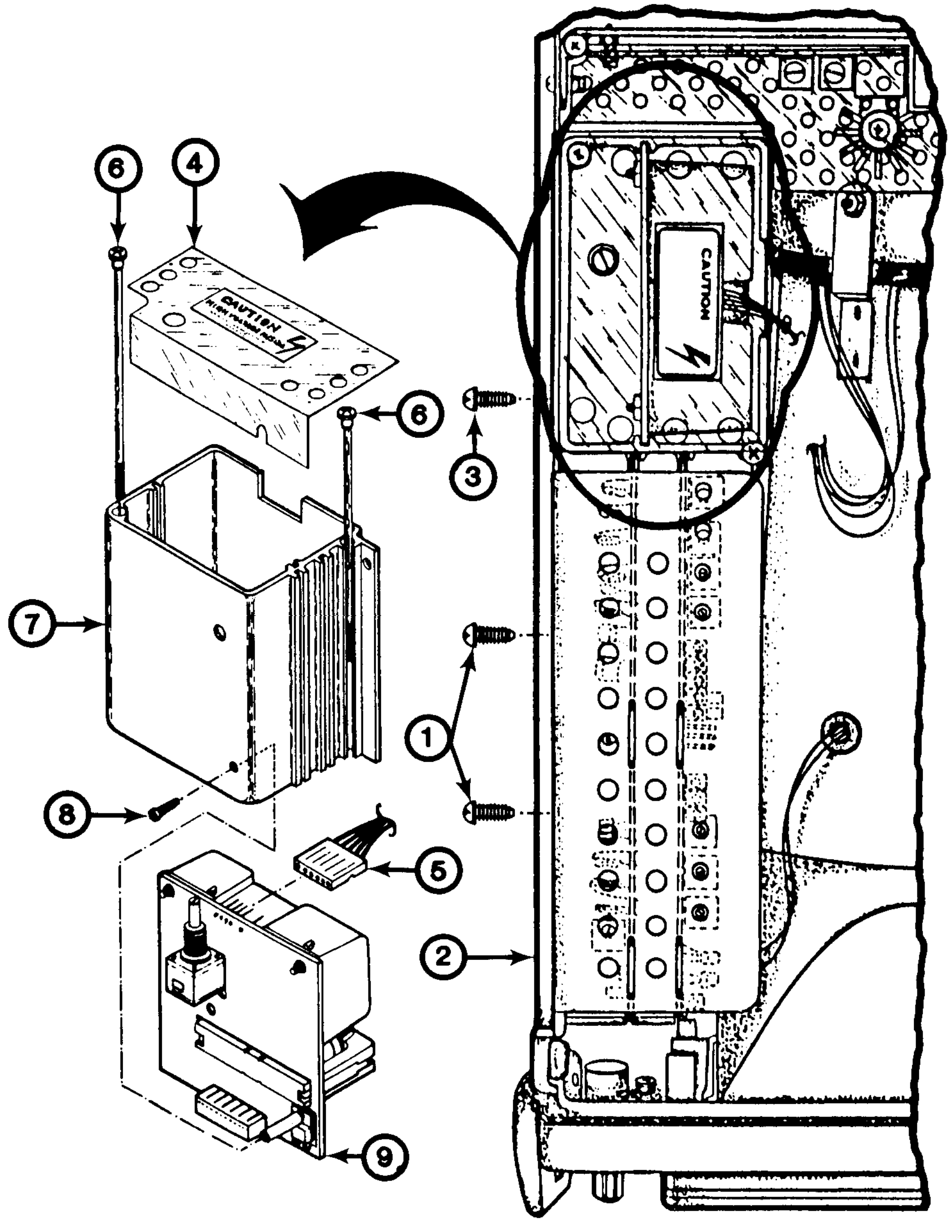
1. Remove spectrum analyzer cover. See paragraph 2-11.
2. Remove 2 screws (1).
3. Remove cover (2).
4. Remove screw (3).
5. Remove circuit board guard (4).
6. Tag and disconnect J711 (5).
7. Remove two screws (6).
8. Carefully lift A74 electrical shield (7) straight up to disengage from mating connector.
9. Continue straight up motion until electrical shield (7) clears instrument.
10. Remove screw (8).
11. Slide A74 (9) board down and out of the electrical shield (7).

INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Insert A74 (9) board at the bottom of the electrical shield (7) in each of its guides and carefully slide A74 (9) up into position.
2. Install screw (8).
3. Position electrical shield (7) in place and carefully slide the shield until the module contacts its socket.
4. Apply even pressure on both top corners until module is firmly seated in socket.
5. Install two screws (6).
6. Connect J711 (5) as tagged.
7. Position circuit board guard (4) in place.



EL9VP064

8. Install screw (3).

9. Position cover (2) in place.

10. Install two screws (1).

11. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

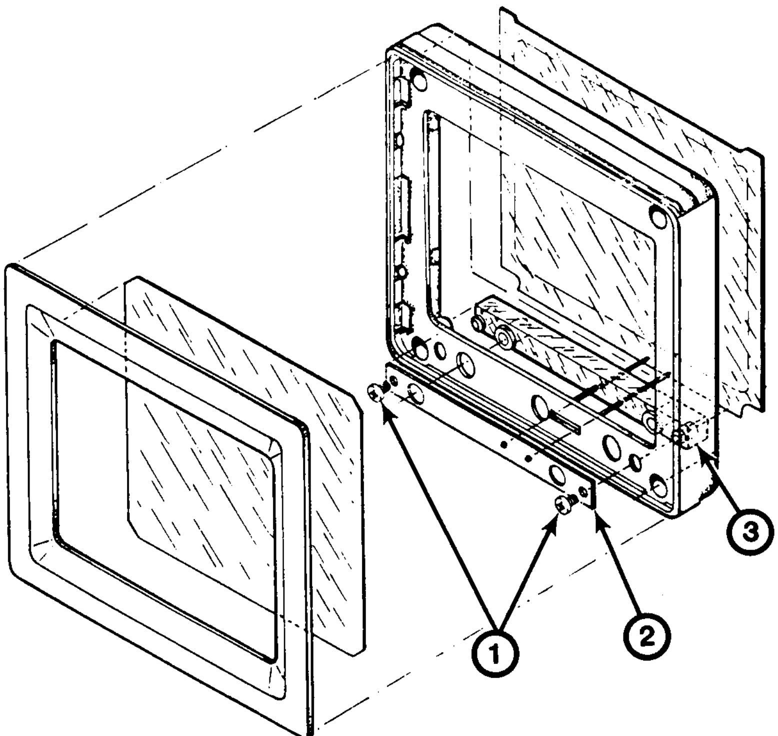
2-44 REPLACE A77 GRATICULE LIGHT BOARD

DESCRIPTION

This procedure covers: Remove, Install.

REMOVE

1. Remove light filter. See TM 11-6625-3136-12, paragraph 3-12.
2. Remove two screws (1).
3. Carefully pull A77 (2) off CRT connector (3).



EL9VP065

INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Carefully position A77 (2) aligned with CRT connector (3).
2. Gently press A77 (2) until it makes full contact with CRT connector.
3. Install two screws (1).
4. Install light filter. See TM 11-6625-3136-12, paragraph 3-11.

END OF TASK

2-45 REPLACE AT10 STEP ATTENUATOR

DESCRIPTION

This procedure covers: Remove, Install.

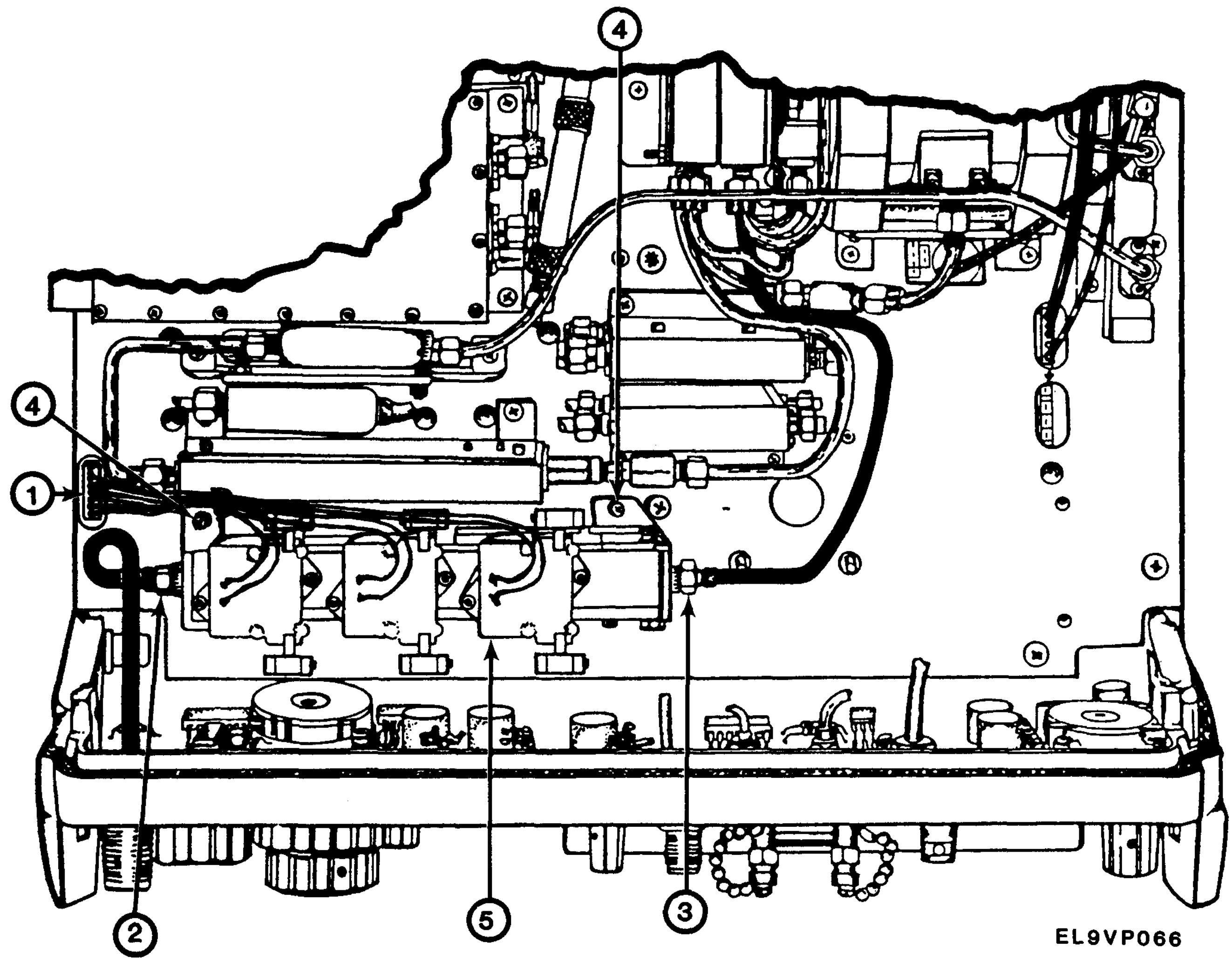
REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.

CAUTION

Rigid conductors will be damaged if twisted or bent.

2. Tag and disconnect AT10J4018 (1).
3. Tag and disconnect W101P101 (2).
4. Tag and disconnect W101P101 (3).
5. Remove two screws (4).
6. Carefully lift AT10 (5) off the instrument.



EL9VP066

INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Position AT10 (5) in place.
2. Install two screws (4).
3. Connect W100P100 (3) as tagged.
4. Connect W101P101 (2) as tagged.
5. Connect AT10J4018 (1) as tagged.
6. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-46 REPLACE AT11 ATTENUATOR

DESCRIPTION

This procedure covers: Remove, Install.

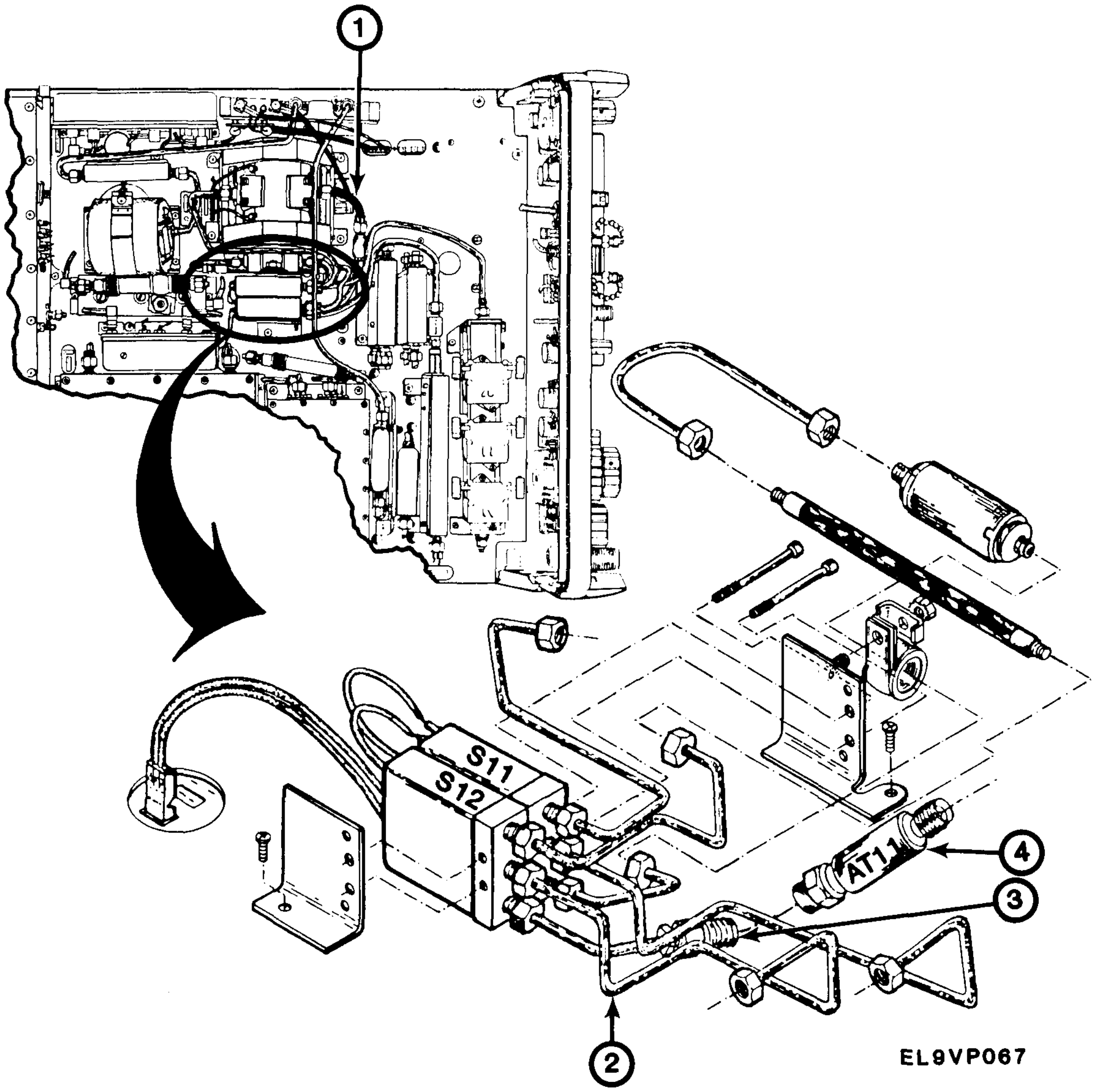
REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.

CAUTION

Rigid conductors will be damaged if twisted or bent.

2. Tag, disconnect and remove W126 (1).
3. Tag, disconnect and remove W104 (2).
4. Tag and disconnect W112P112 (3).
5. Remove AT11 (4).



INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Position AT11 (4) in place.
2. Connect W112P112 (3) as tagged.
3. Install and connect W104 (2) as tagged.
4. Install and connect W126 (1) as tagged.
5. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-47 REPLACE AT12 ATTENUATOR

DESCRIPTION

This procedure covers: Remove, Install.

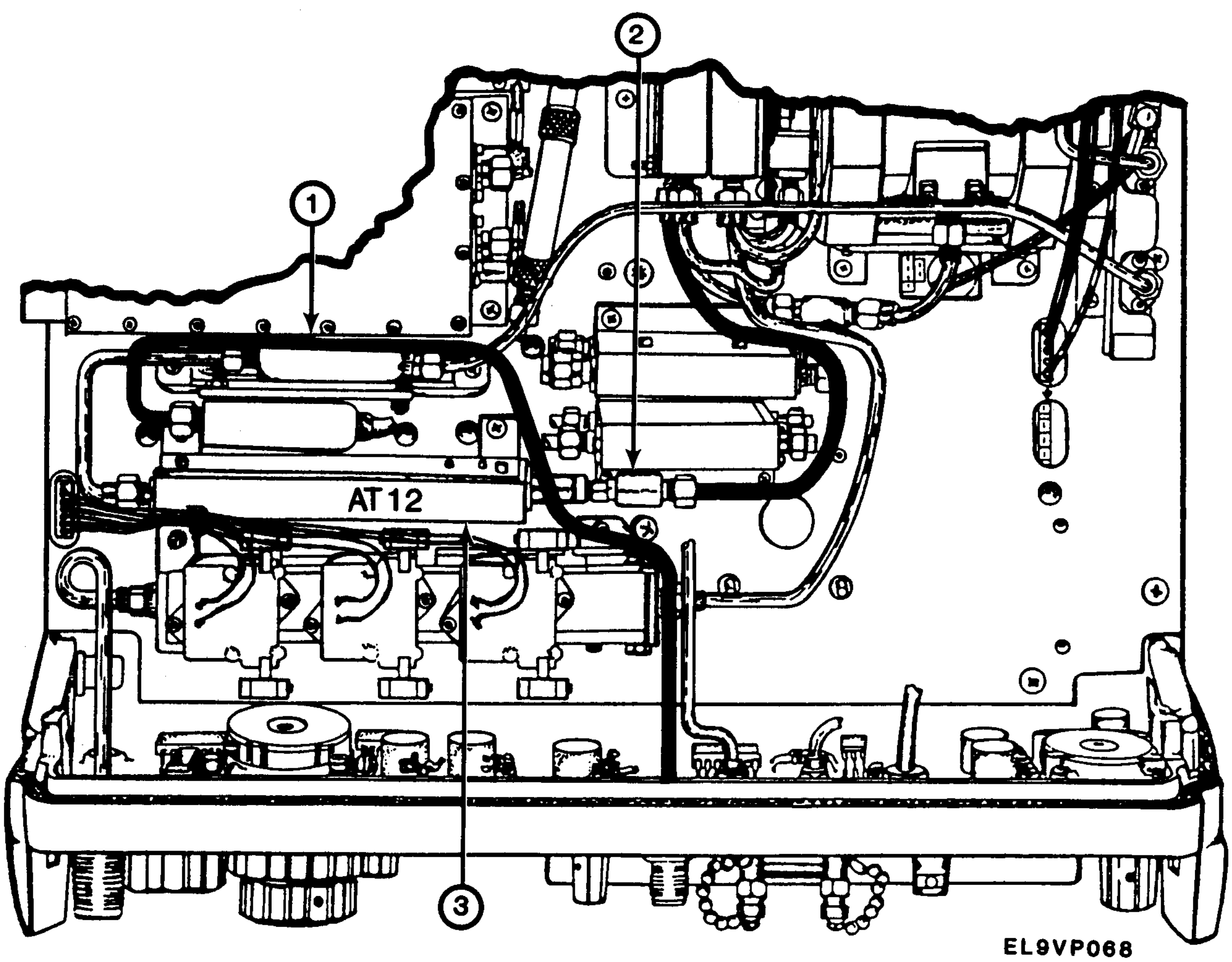
REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.

CAUTION

Rigid conductors will be damaged if twisted or bent.

2. Tag, disconnect and remove W137 (1).
3. Tag and disconnect W104P121 (2).
4. Tag, disconnect and remove AT12 (3).



INSTALL

CAUTION

Before installing module, make certain of-its proper location and orientation.

1. Install and connect AT12 (3) as tagged.
2. Connect W104P121 (2).
3. Install and connect W137 (1) as tagged.
4. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-48 REPLACE FL10 FILTER

This procedure covers: Remove, Install.

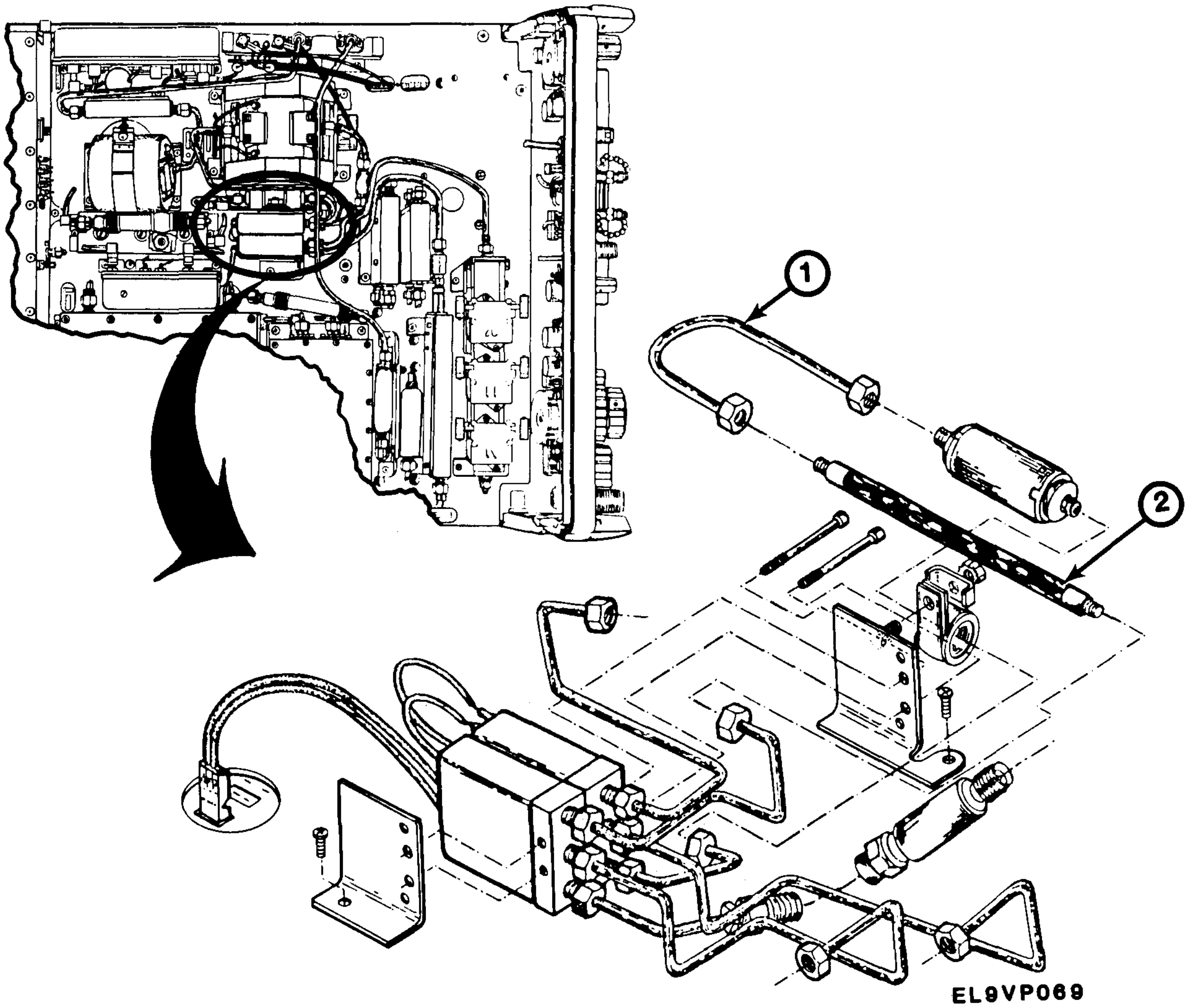
REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.

CAUTION

Rigid conductors will be damaged if twisted or bent.

2. Remove S11 and S12. See paragraph 2-54.
3. Tag, disconnect and remove W106 (1).
4. Tag and remove FL10 (2).



INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Position FL10 (2) in place as tagged.
2. Install and connect W106 (1) as tagged.
3. Install S11 and S12. See paragraph 2-54.
4. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-49 REPLACE FL11 FILTER

DESCRIPTION

This procedure covers: Remove, Install.

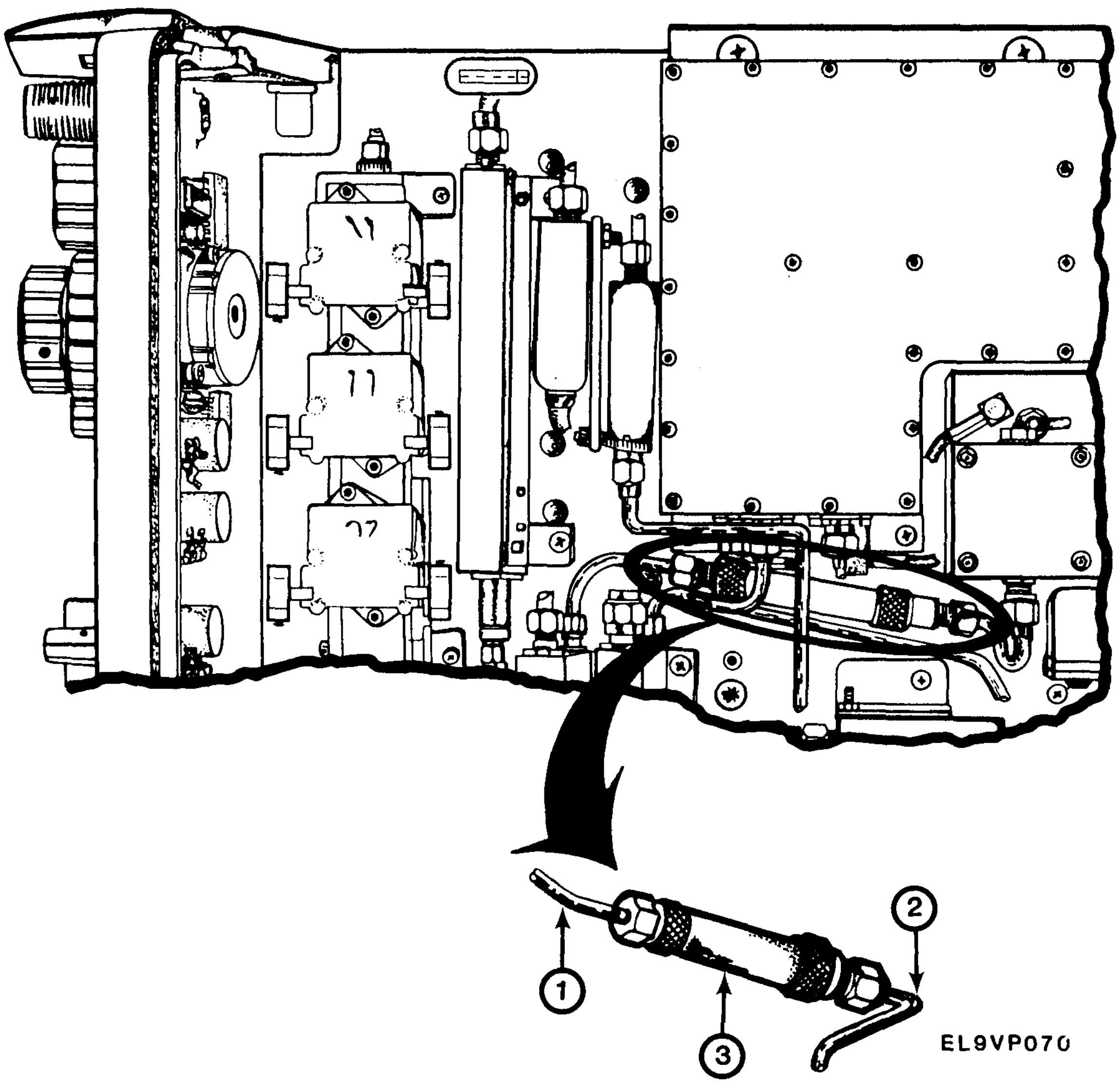
REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.

CAUTION

Rigid conductors will be damaged if twisted or bent.

2. Tag, disconnect and remove W110 (1).
3. Tag, disconnect and remove W160 (2).
4. Remove FL11 (3).



INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Position FL11 (3) in place.
2. Install and connect W 160 (2) as tagged.
3. Install and connect W110 (1) as tagged.
4. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-50 REPLACE FL12 PRESELECTOR

DESCRIPTION

This procedure covers: Remove, Install.

REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.

CAUTION

Rigid conductors will be damaged if twisted or bent.

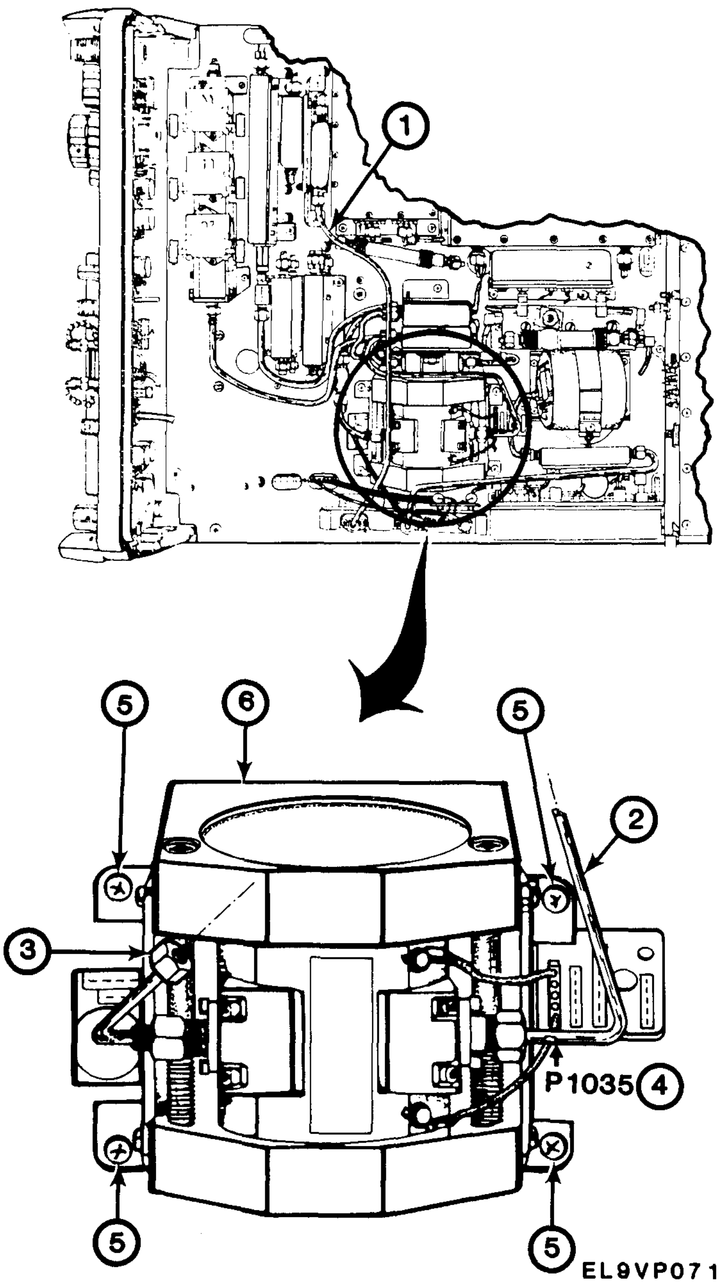
2. Tag, disconnect and remove W240 (1).
3. Tag, disconnect and remove W114 (2).
4. Tag and disconnect W126P126 (3).
5. Tag and disconnect P1035 (4).
6. Remove four screws (5).
7. Carefully lift FL12 (6) out.

INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Carefully position FL12 (6) in place.
2. Install four screws (5).
3. Connect P1035 (4) as tagged.
4. Connect W126P126 (3) as tagged.



5. Install and connect W114 (2) as tagged.
6. Install and connect W240 (1) as tagged.
7. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-51 REPLACE FL15 FILTER

DESCRIPTION

This procedure covers: Remove, Install.

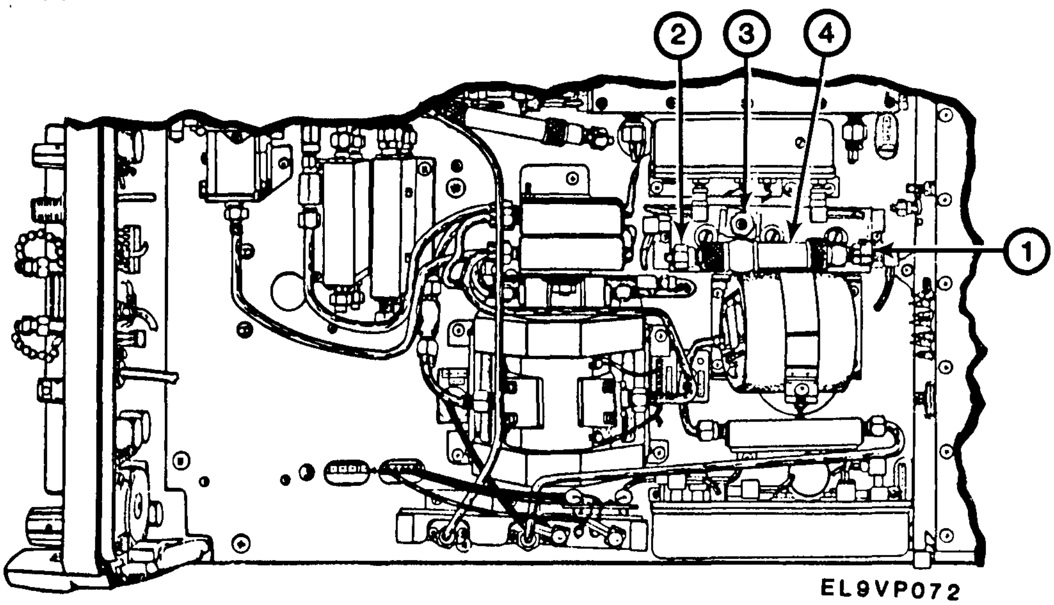
REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11

CAUTION

Rigid conductors will be damaged if twisted or bent.

2. Tag and disconnect W150P150 (1).
3. Tag and disconnect W142P151 (2).
4. Remove nut (3).
5. Lift FL15 (4) out.



EL9VP072

INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Position FL15 (4) in place.
2. Install nut (3).
3. Connect W142P152 (2) as tagged.
4. Connect W150P150 (1) as tagged.
5. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-52 REPLACE FL16 DIRECTIONAL FILTER

DESCRIPTION

This procedure covers: Remove, Install.

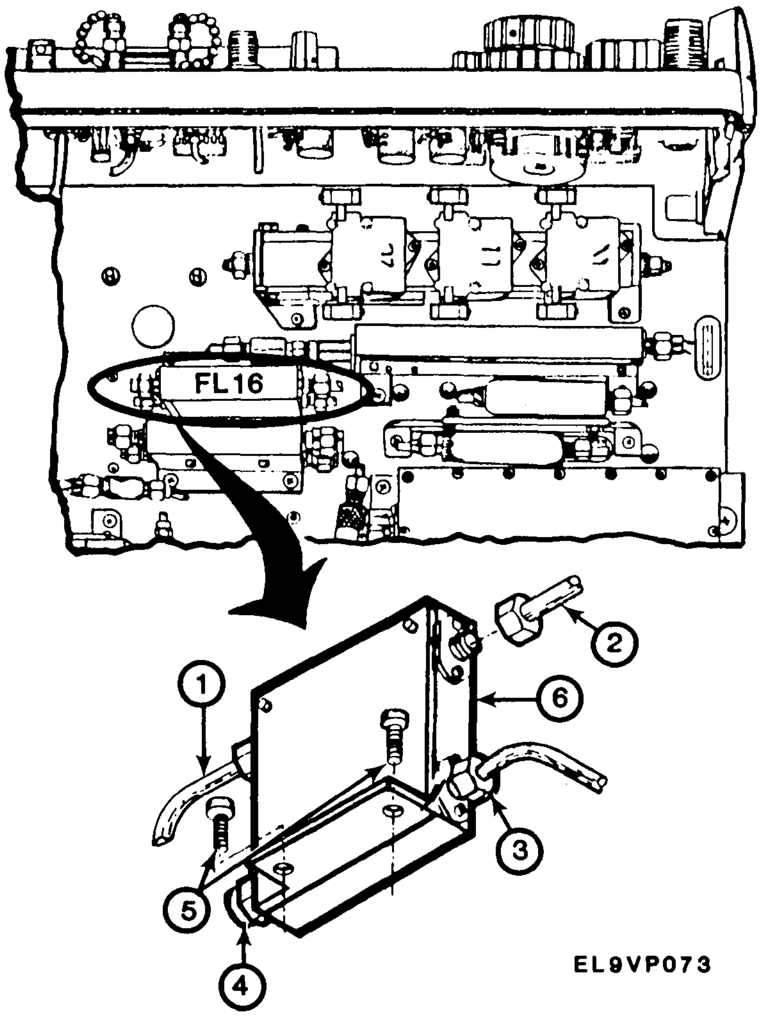
REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.

CAUTION

Rigid conductors will be damaged if twisted or bent.

2. Tag, disconnect and remove W162 (1).
3. Tag, disconnect and remove W138 (2).
4. Tag and disconnect W160P160 (3).
5. Tag and disconnect P164 (4).
6. Remove two screws (5).
7. Lift FL16 (6) out.



EL9VP073

INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Position FL16 (6) in place.
2. Install two screws (5).
3. Connect P164 (4) as tagged.
4. Connect W160P160 (3).
5. Install and connect W138 (2) as tagged.
6. Install and connect W162 (1) as tagged.
7. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-53 REPLACE FL36 FILTER

DESCRIPTION

This procedure covers: Remove, Install.

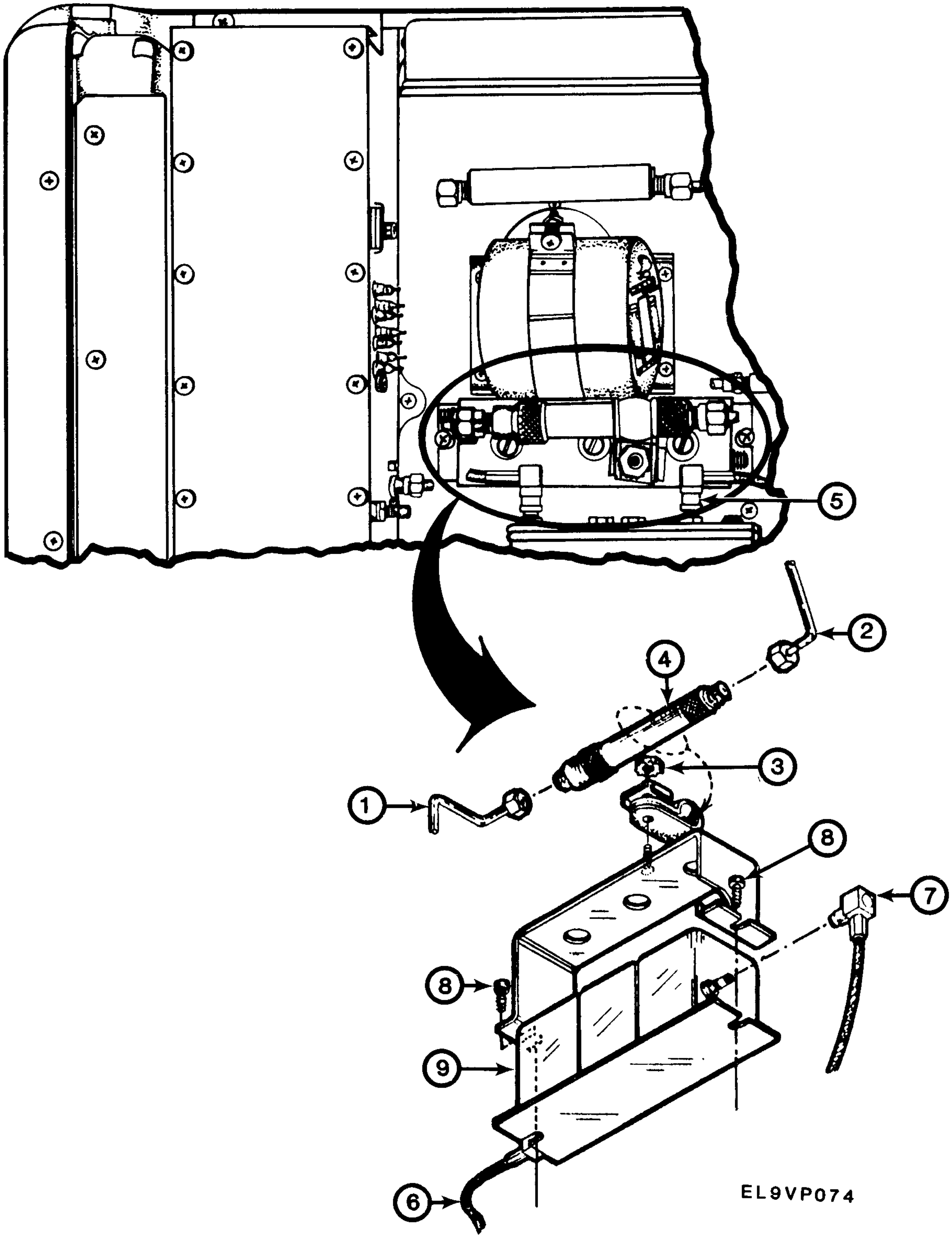
REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.

CAUTION

Rigid conductors will be damaged if twisted or bent.

2. Tag, disconnect and remove W142 (1).
3. Tag, disconnect and remove W150 (2).
4. Remove nut (3).
5. Remove FL15 (4).
6. Tag and disconnect W232P321 (5).
7. Tag, disconnect and remove W320 (6).
8. Tag and disconnect W360P360 (7).
9. Remove two screws (8).
10. Carefully lift FL36 (9) out.


1
2
3
4
5
6
7
8
8
9
EL9VP074

INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Position FL36 (9) in place.
2. Install two screws (8).
3. Connect W360P360 (7) as tagged.
4. Install and connect W320 (6) as tagged.
5. Connect W232P321 (5) as tagged.
6. Install FL15 (4).
7. Install nut (3).
8. Install and connect W150 (2) as tagged.
9. Install and connect W142 (1) as tagged.
10. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-54 REPLACE S11 AND S12 FILTER SELECTOR SWITCHES

DESCRIPTION

This procedure covers: Remove, Install.

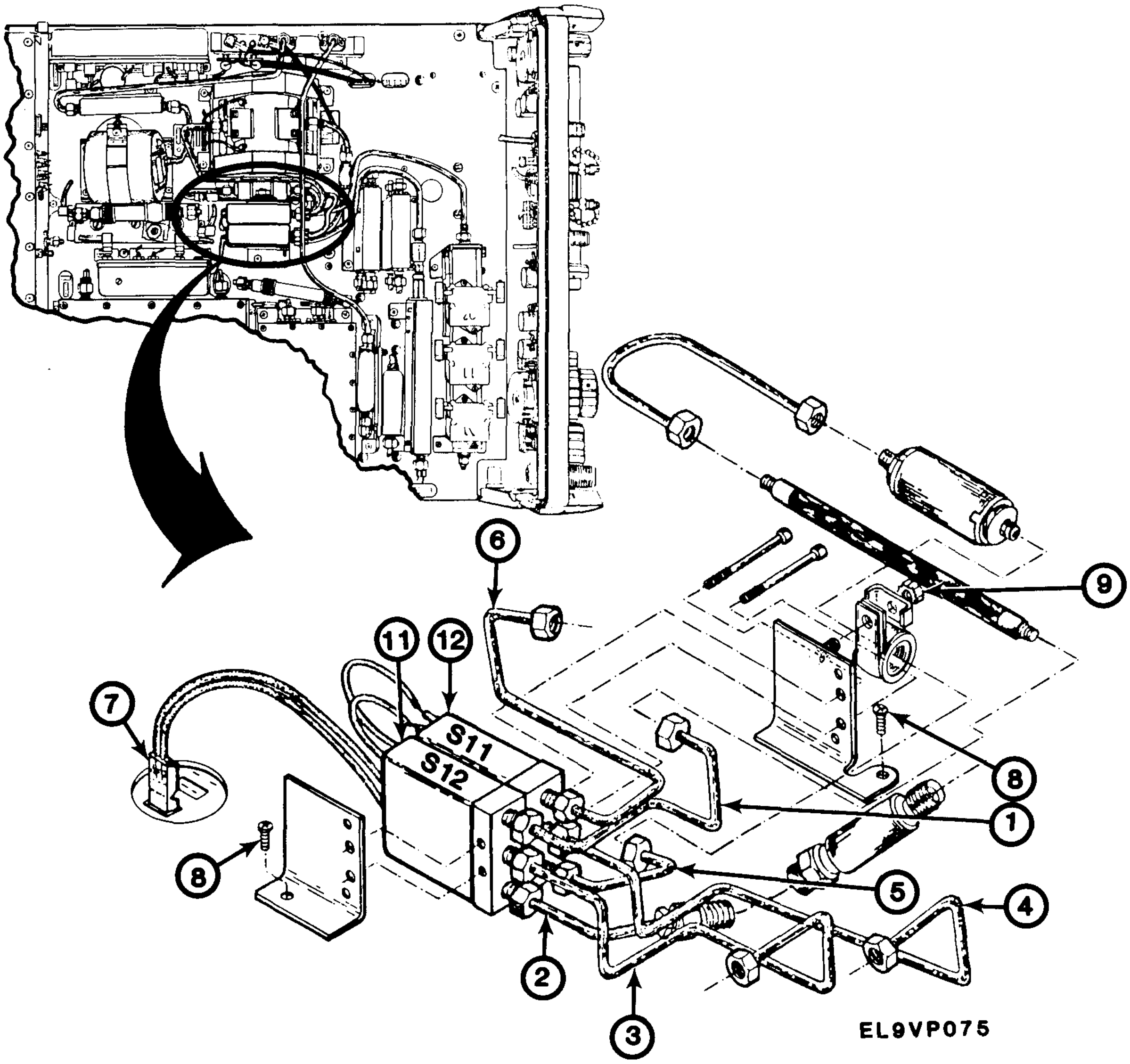
REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.

CAUTION

Rigid conductors will be damaged if twisted or bent.

2. Tag, disconnect and remove W102 (1).
3. Tag, disconnect and remove W112 (2).
4. Tag, disconnect and remove W104 (3).
5. Tag, disconnect and remove W116 (4).
6. Tag, disconnect and remove W114 (5).
7. Tag, disconnect and remove W100 (6).
8. Tag and disconnect P3038 (7).
9. Remove two screws (8).
10. Remove nut (9).
11. Carefully lift S11 (10) and S12 (11) out.



INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Carefully position S11 (10) and S12 (11) in place.
2. Install nut (9).
3. Install two screws (8).
4. Connect P3038 (7) as tagged.
5. Install and connect W100 (6) as tagged.

6. Install and connect W114 (5) as tagged.
7. Install and connect W116 (4) as tagged.
8. Install and connect W104 (3) as tagged.
9. Install and connect W112 (2) as tagged.
10. Install and connect W102 (1) as tagged.
11. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-55 REPLACE S13 TRANSFER SWITCH

DESCRIPTION

This procedure covers: Remove, Install.

REMOVE

1. Remove spectrum analyzer cover. See paragraph 2-11.

CAUTION

Rigid conductors will be damaged if twisted or bent.

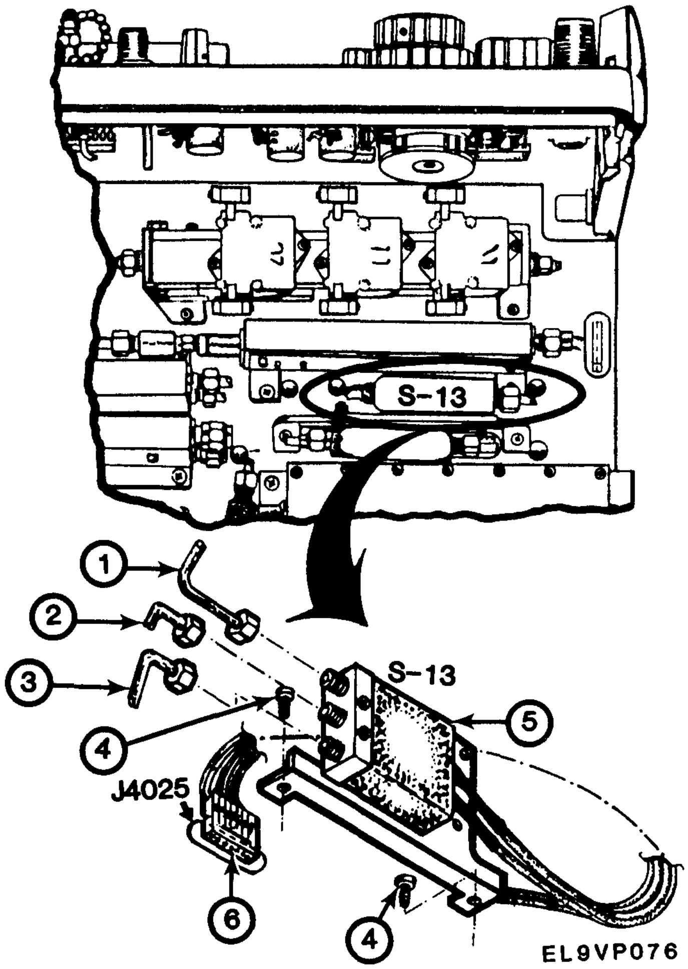
2. Tag, disconnect and remove W137 (1).
3. Tag, disconnect and remove W138 (2).
4. Tag, disconnect and remove W124 (3).
5. Remove two screws (4).
6. Carefully lift S13 (5), tag and disconnect S13P4025 (6).
7. Remove S13 (5).

INSTALL

CAUTION

Before installing module, make certain of its proper location and orientation.

1. Carefully position S13 (5) in place.
2. Connect S13P4025 (6) as tagged.
3. Install two screws (4).
4. Connect and install W124 (3) as tagged.



5. Connect and install W138 (2) as tagged.
6. Connect and install W137 (1) as tagged.
7. Install spectrum analyzer cover. See paragraph 2-11.

END OF TASK

2-56 PREPARATION FOR STORAGE OR SHIPMENT

a. Find a carton of corrugated cardboard with inside measurements that are six inches more than the equipment dimensions (to allow for cushioning).

b. Install the front panel cover on the spectrum analyzer and wrap the equipment in heavy paper or plastic to protect the finish. Place the equipment in the container.

c. Cushion the instrument on all surfaces with packing material or foam.

d. Seal the container with shipping tape or an industrial stapler.

2-57 TYPES OF STORAGE

a. Short-term (administrative) = 1 to 45 days. All equipment in administrative storage must be able to be made ready within 24 hours for use on a mission. Before placing any item in administrative storage, make sure the next scheduled PMCS have been done and any deficiencies have been corrected. The administrative storage site should provide required protection from extreme weather conditions and allow you access to the equipment for visual inspections or exercises when applicable.

b. Intermediate = 46 to 180 days.

c. Long-term = over 180 days.

APPENDIX A

REFERENCES

A-1 SCOPE

This appendix lists all forms, technical bulletins, technical manuals, and miscellaneous publications referenced in this manual.

A-2 FORMS

Recommended Changes to Publications and Blank Forms	DA Form 2028
Recommended Changes to Equipment Technical Manuals.	DA Form 2028-2
Equipment Inspection and Maintenance Worksheet	DA Form 2404
Report of Discrepancy	Form SF 364
Quality Deficiency Report	Form SF 368

A-3 TECHNICAL MANUALS

The Army Maintenance Management System (TAMMS)	DA Pam 738-750
Administrative Storage Procedures..	TM 740-90-1
Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Cormmand)	TM 750-244-2
Spectrum Analyzer AN/USM-489(V)1 Repair Parts and Special Tools List	TM 11-6625-3136-24P
Spectrum Analyzer AN/USM-489(V)1 Operator's and Organizational Maintenance Manual	TM 11-6625-3136-12

A-4 MISCELLANEOUS

Common Table of Allowances	CTA 50-970
Consolidated Index of Army Publications and Blank Forms	DA Pam 310-1
First Aid for Soldiers	FM 21-11
Abbreviations for Use on Drawings and in Specifications, standards and Technical Documents	MIL-STD-12D
Preservation, Packaging, Packing and Marking Materials, Supplies and Equipment Used By the Army	SB 38-100

APPENDIX B

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I

INTRODUCTION

B-1 Scope

This appendix lists expendable supplies and materials you will need to operate and maintain the AN/USM-489(V)1. These items are authorized to you by CTA 50-970, Expendable Items (Except Medical, Class V, Repair parts, and Heraldic Items).

B-2 Explanation of Columns

a. ***Column (1) - Item Number.*** This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, item 1, App. E").

b. ***Column (2) - Level.*** This column identifies the lowest level of maintenance that requires the listed.

C - Operator/Crew
O - Organizational Maintenance
F - Direct Support Maintenance
H - General Support Maintenance

c. ***Column (3) - National Stock Number.*** This is the National stock number assigned the item; use it to request or requisition the item.

d. ***Column (4) - Description.*** Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parentheses followed by the part number.

e. ***Column (5) - Unit of Measure (U/M).*** Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II

EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	C		Detergent, Mild, Liquid	oz
2	C	8305-00-267-3015	Cloth, Cheese Cotton	yd
3	H		Cable Ties	

GLOSSARY

The following glossary is presented as an aid to better understand the terms as they are used in this document.

SECTION I. ABBREVIATIONS

There are no unusual abbreviations in this manual.

SECTION II. DEFINITION OF UNUSUAL TERMS

CENTER FREQUENCY - That frequency which corresponds to the center of a frequency span, expressed in hertz.

EFFECTIVE FREQUENCY RANGE - That range of frequency over which the instrument performance is specified. The lower and upper limits are expressed in hertz.

FREQUENCY BAND - A part of effective frequency range over which the frequency can be adjusted, expressed in hertz.

INTERMODULATION SPURIOUS RESPONSE (INTERMODULATION DISTORTION) - An unwanted spectrum analyzer response resulting from the mixing of the nth order frequencies. This is due to non-linear elements of the spectrum analyzer, resulting in an unwanted spurious response being displayed.

LINE SPECTRUM - A spectrum composed of signal amplitudes of the discrete frequency components.

PULSE STRETCHER - A pulse shaper that produces an output pulse, whose duration is greater than that of the input pulse, and whose amplitude is proportional to that of the peak amplitude of the input pulse.

SIGNAL IDENTIFIER - A means to identify the spectrum of the input signal when spurious responses are possible.

SPECTRUM ANALYZER - An apparatus which is generally used to display the power distribution of an incoming signal as a function of frequency.

NOTE

It is useful in analyzing the characteristics of repetitive electrical waveforms in general, since repetitively sweeping through the frequency range of interest will display all components of the signal.

VIDEO FILTER - A post detection low-pass filter.

TERMS RELATED TO FREQUENCY

DISPLAY FREQUENCY - The input frequency as indicated by the spectrum analyzer and expressed in hertz.

FREQUENCY DRIFT - Gradual shift or change in displayed frequency over the specified time due to internal changes in the spectrum analyzer, and expressed in hertz per second, where other conditions remain constant.

FREQUENCY LINEARITY ERROR - The error of the relationship between the frequency of the input signal and the frequency displayed (expressed as a ratio).

FREQUENCY SPAN (DISPERSION) - The magnitude of the frequency band displayed, expressed in hertz or hertz per division.

RESIDUAL FM (INCIDENTAL FM) - Short term displayed frequency instability or jitter due to instability in the spectrum analyzer local oscillators, given in terms of peak-to-peak frequency deviation and expressed in hertz or percent of the displayed frequency.

SHAPE FACTOR (SKIRT SELECTIVITY) - The ratio of the frequency separation of the two (60 dB/6 dB) down points on the response curve to the static resolution bandwidth.

STATIC (AMPLIFIER) RESOLUTION BANDWIDTH - The specified bandwidth of the spectrum analyzer's response to a cw signal, if sweep time is kept substantially long.

NOTE

This bandwidth is the frequency separation of two down points, usually 6 dB, on the response curve, if it is measured either by manual scan (true static method) or using a very low sweep speed (quasi-static method).

TERMS RELATED TO AMPLITUDE

DISPLAY FLATNESS - The unwanted variation of the displayed amplitude over a specified frequency span, expressed in decibels.

DISPLAY LAW - The mathematical law that defines the input-output function of the instrument.

NOTE

The folio wing cases apply:

1. *Linearity - A display in which the scale divisions are a linear function of the input signal voltage.*
2. *Square law (power) - A display in which the scale divisions are a linear function of the input signal power.*
3. *Logarithmic - A display in which the scale divisions are a logarithmic function of the input signal voltage.*

DISPLAY REFERENCE LEVEL - A designated vertical position representing a specified input level.

NOTE

The level may be expressed in decibels (e.g., 1 mW), volts, or any other units.

EQUIVALENT INPUT NOISE SENSITIVITY - The average level of a spectrum analyzer's internally generated noise referenced to the input.

FREQUENCY RESPONSE - The unwanted variation of the displayed amplitude over a specified center frequency range, measured at the center frequency, expressed in decibels.

INPUT IMPEDANCE - The impedance at the desired input terminal.

NOTE

Usually expressed in terms of VSWR, return loss, or other related terms for low impedance devices and resistance-capacitance parameters for high impedance devices.

RELATIVE DISPLAY FLATNESS - The display flatness measured relative to the display amplitude at a fixed frequency within the frequency span, expressed in decibels.

NOTE

Display flatness is closely related to frequency response. The main difference is that the spectrum display is not recentered.

RESIDUAL RESPONSE - A spurious response in the absence of an input signal. (Noise and zero pip are excluded).

SENSITIVITY - Measure of a spectrum analyzer's ability to display minimum level signals, at a given IF bandwidth, display mode, and any other influencing factors, and expressed in decibels.

SPURIOUS RESPONSE - A response of a spectrum analyzer wherein the displayed frequency does not conform to the input frequency.

TERMS RELATED TO DIGITAL STORAGE FOR SPECTRUM ANALYZER

DIGITALLY AVERAGED DISPLAY - A display of the average value of digitized data computed by combining serial samples in a defined manner.

DIGITALLY STORED DISPLAY - A display method whereby the displayed function is held in a digital memory. The display is generated by reading the data out of memory.

MAX HOLD (PEAK MODE) - Digitally stored display mode which, at each frequency address, compares the incoming signal level to the stored level and retains the greater. In this mode, the display indicates the peak level at each frequency after several successive sweeps.

MULTIPLE DISPLAY MEMORY - A digitally stored display having multiple memory sections which can be displayed separately or simultaneously.

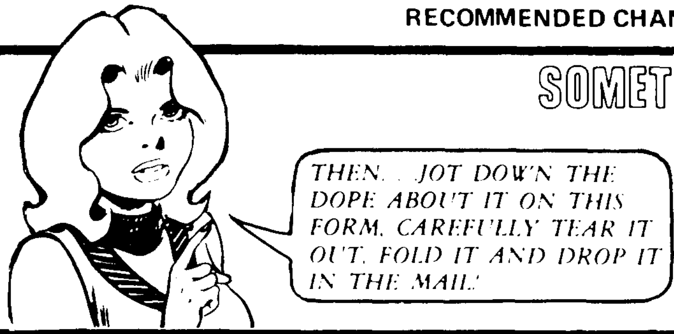
SAVE - A function that inhibits storage update, saving existing data in a section of a multiple memory (e.g., Save A).

SCAN ADDRESS - A number representing each horizontal data position increment on a directed beam type display. An address in a memory is associated with each scan address.

VIEW (DISPLAY) - Enables viewing of contents of the chosen memory section (e.g., “View A” displays contents of memory A; “View B” displays the contents of memory B).

SUBJECT INDEX

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



SOMETHING WRONG WITH THIS PUBLICATION?

FROM (PRINT YOUR UNIT'S COMPLETE ADDRESS)
Commander
Stateside Army Depot
ATTN: AMSTA-US
Stateside, N.J. 07703-5007

DATE SENT
10 July 1975

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5840-340-12	23 Jan 74	Radar Set AN/PRC-76

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
2-25	2-28			Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°. REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.
3-10	3-3		3-1	Item 5, Function column. Change "2 db" to "3db." REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.
5-6	5-8			Add new step f.1 to read, "Replace cover plate removed in step e.1, above." REASON: To replace the cover plate.
		FO3		Zone C 3. On J1-2, change "+24 VDC to "+5 VDC." REASON: This is the output line of the 5 VDC power supply. +24 VDC is the input voltage.

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER	SIGN HERE
SSG I. M. DeSpiritof 999-1776	SSG I. M. DeSpiritof

DA FORM 1 JUL 79 2028-2 PREVIOUS EDITIONS ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS

TEAR ALONG PERFORATED LINE

REVERSE OF DA FORM 2028-2

FILL IN YOUR UNIT'S ADDRESS

FOLD BACK

TEAR ALONG PERFORATED LINE

DEPARTMENT OF THE ARMY

____

____

OFFICIAL BUSINESS

SAMPLE

Commander
US Army Communications-Electronics Command
and Fort Monmouth
ATTN: AMSEL-ME-MP
Fort Monmouth, New Jersey 07703-5000

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-6625-3136-40	1 March 1987	Spectrum Analyzer AN/USM-489(V)1

BE EXACT PIN-POINT WHERE IT IS				IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	

PRINTED NAME GRADE OR TITLE AND TELEPHONE NUMBER	SIGN HERE

TEAR ALONG PERFORATED LINE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPE OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

REVERSE OF DA FORM 2028-2

FILL IN YOUR UNIT'S ADDRESS

FOLD BACK

TEAR ALONG PERFORATED LINE

DEPARTMENT OF THE ARMY

____

____

OFFICIAL BUSINESS

Commander
US Army Communications-Electronics Command
and Fort Monmouth
ATTN: AMSEL-ME-MP
Fort Monmouth, New Jersey 07703-5000

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-6625-3136-40	1 March 1987	Spectrum Analyzer AN/USM-489(V)1

BE EXACT PIN-POINT WHERE IT IS				IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	

PRINTED NAME GRADE OR TITLE AND TELEPHONE NUMBER	SIGN HERE

TEAR ALONG PERFORATED LINE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPE OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

REVERSE OF DA FORM 2028-2

TEAR ALONG PERFORATED LINE

FILL IN YOUR UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

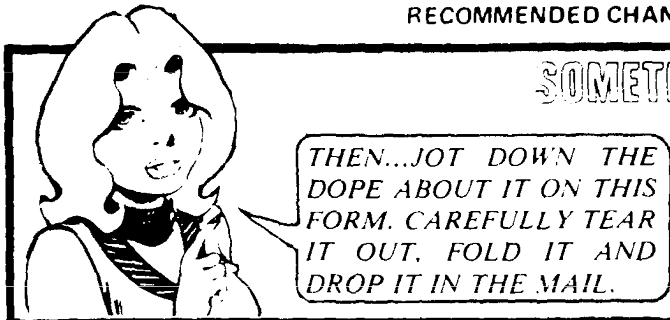
____

____

OFFICIAL BUSINESS

Commander
US Army Communications-Electronics Command
and Fort Monmouth
ATTN: AMSEL-ME-MP
Fort Monmouth, New Jersey 07703-5000

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-6625-3136-40	1 March 1987	Spectrum Analyzer AN/USM-489(V)1

BE EXACT PIN-POINT WHERE IT IS				IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	

PRINTED NAME GRADE OR TITLE AND TELEPHONE NUMBER	SIGN HERE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPE OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

TEAR ALONG PERFORATED LINE

REVERSE OF DA FORM 2028-2

FILL IN YOUR UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS

TEAR ALONG PERFORATED LINE

Commander
US Army Communications-Electronics Command
and Fort Monmouth
ATTN: AMSEL-ME-MP
Fort Monmouth, New Jersey 07703-5000

By Order of the Secretary of the Army:

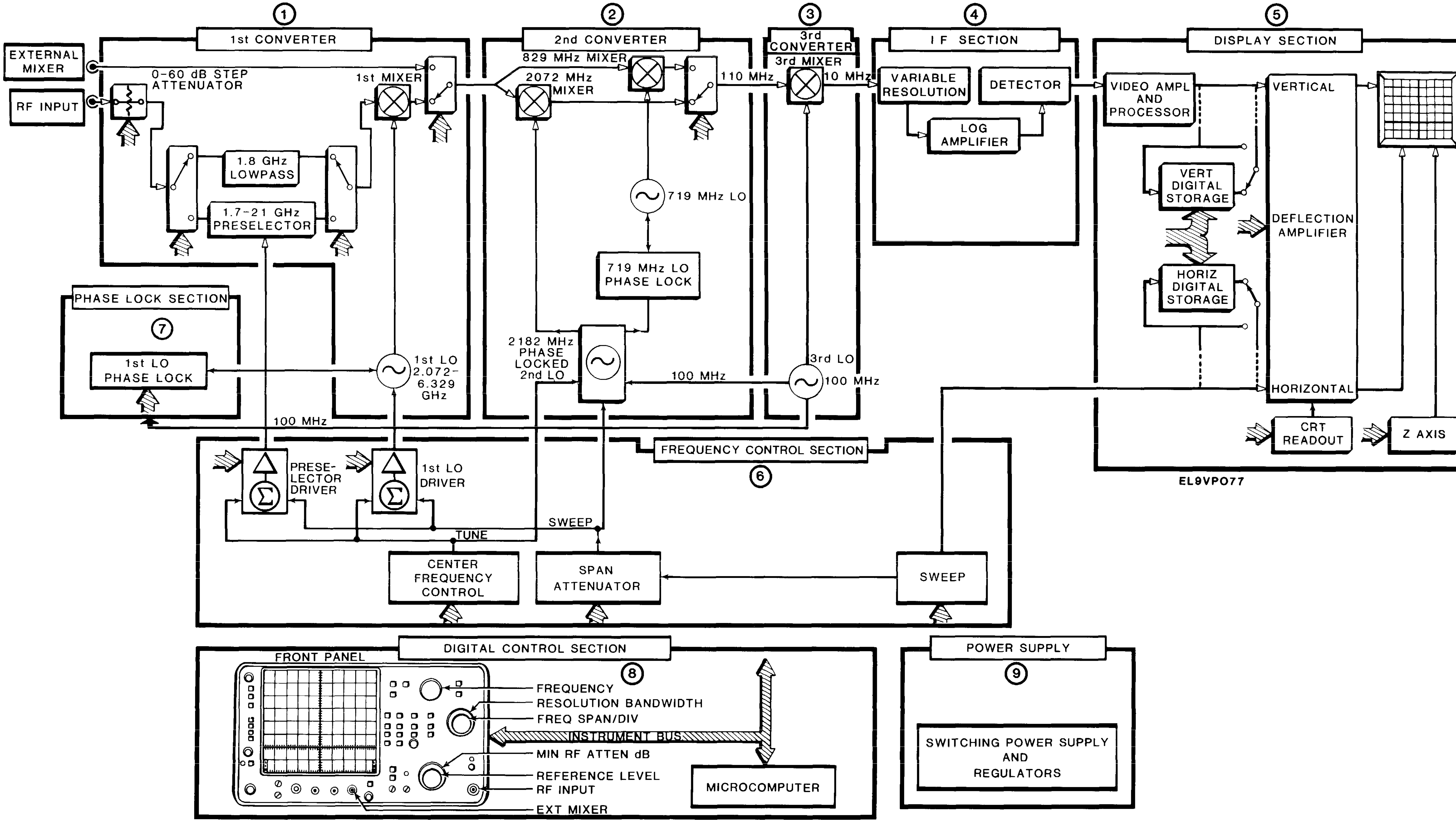
JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

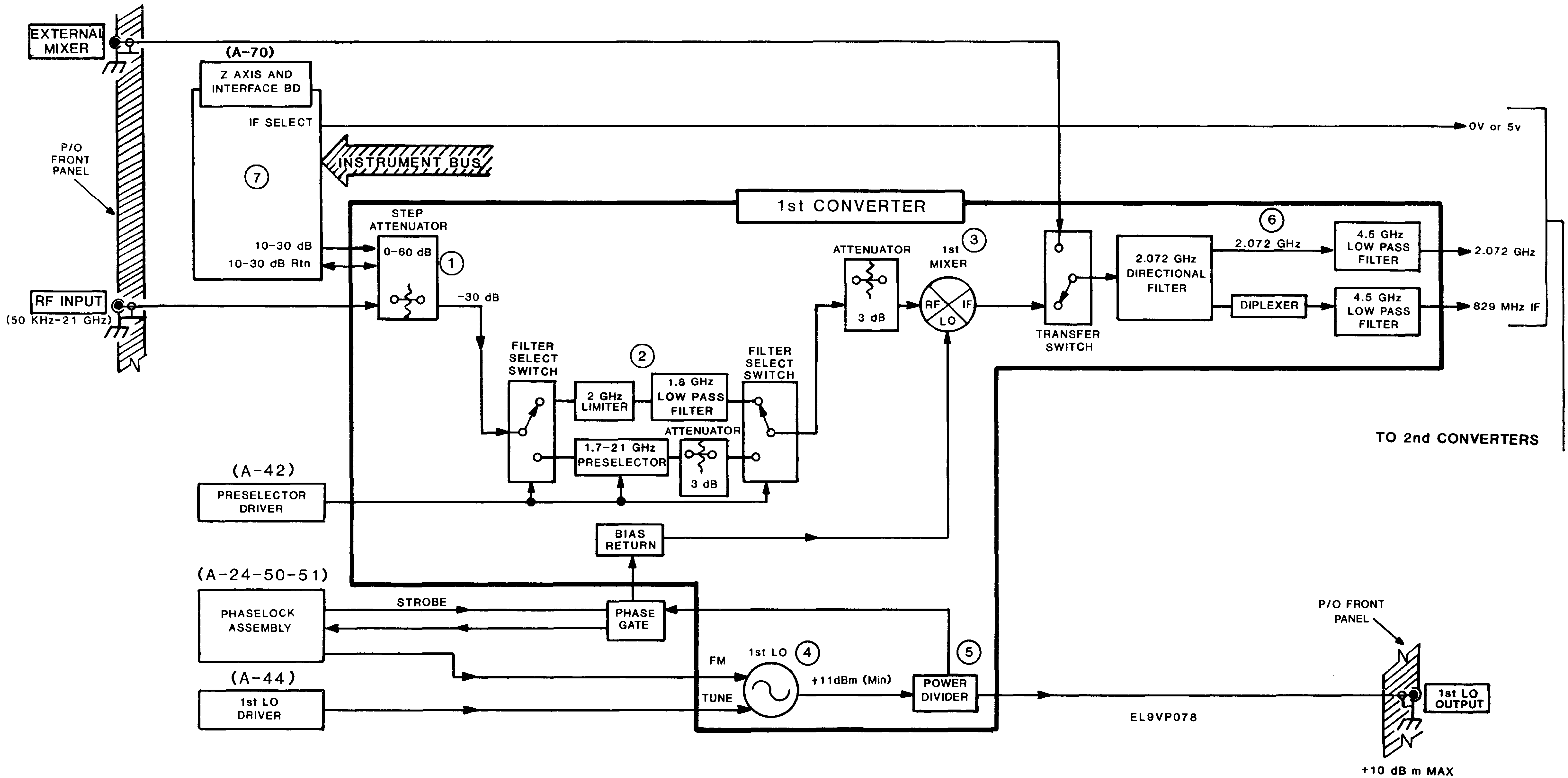
R.L. DILWORTH
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-51 literature requirements for AN/USM-489(V).

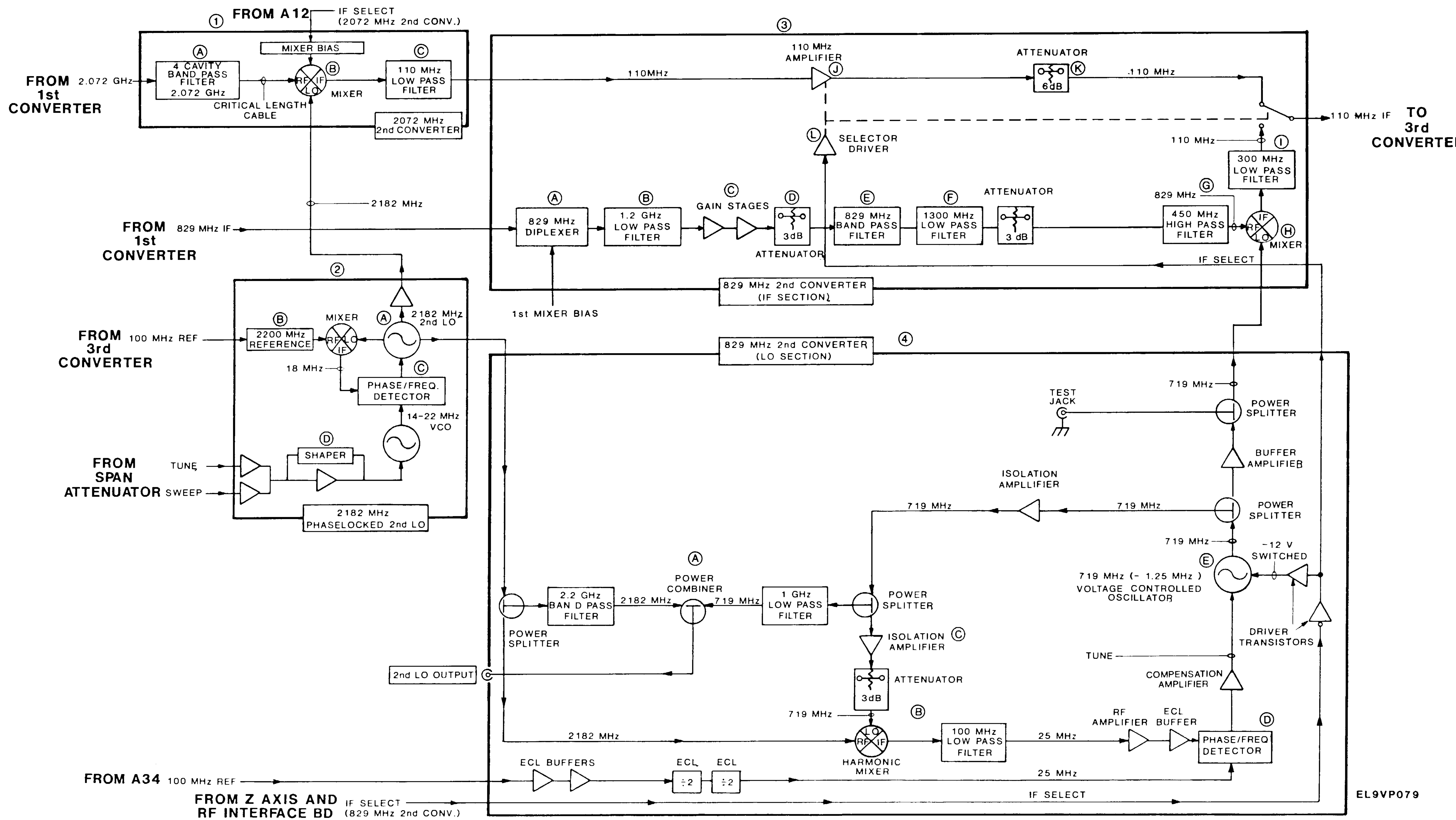
☆U.S. GOVERNMENT PRINTING OFFICE: 1994 O - 300-769 (12235)



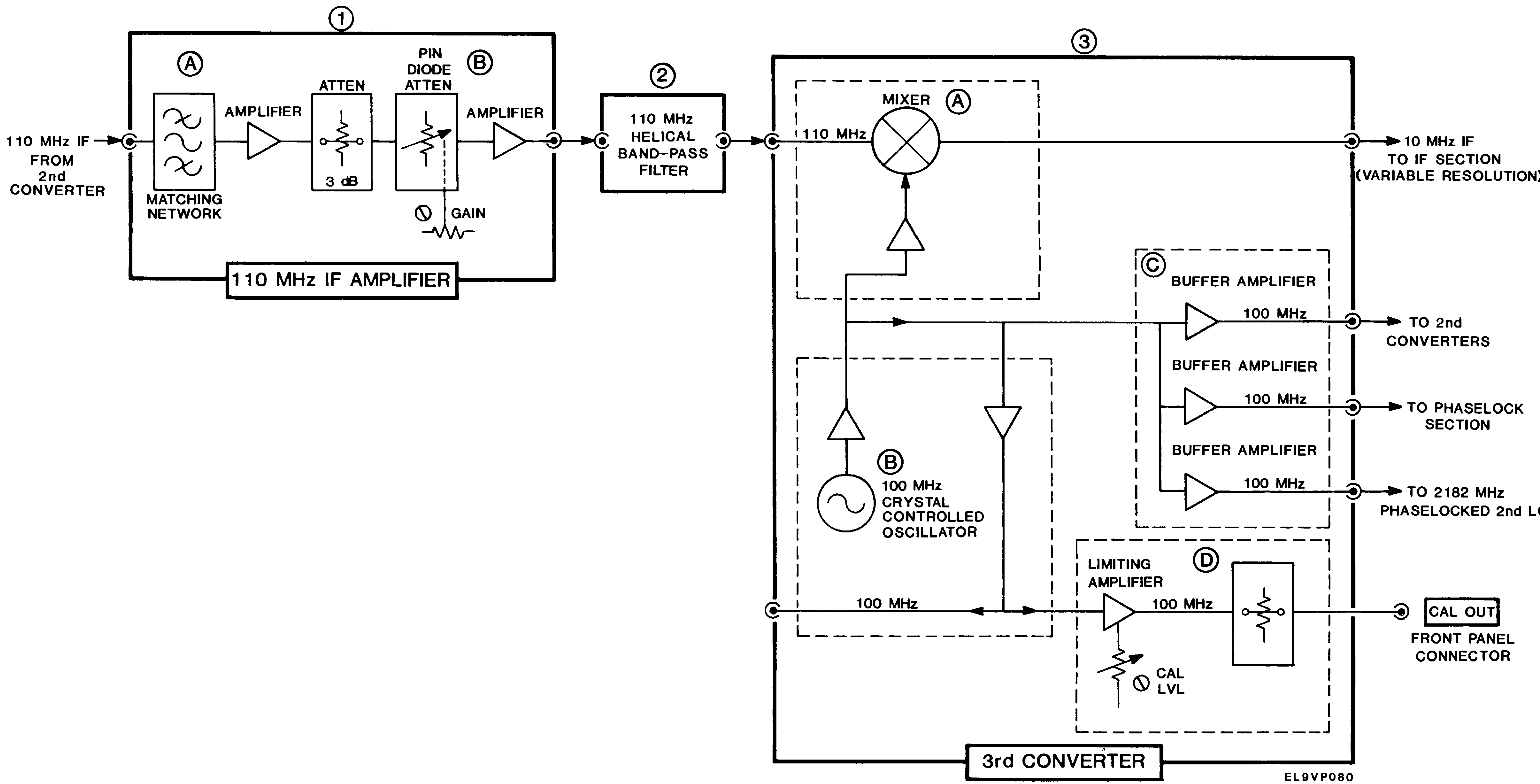
Spectrum Analyzer Block Diagram Figure FO-1



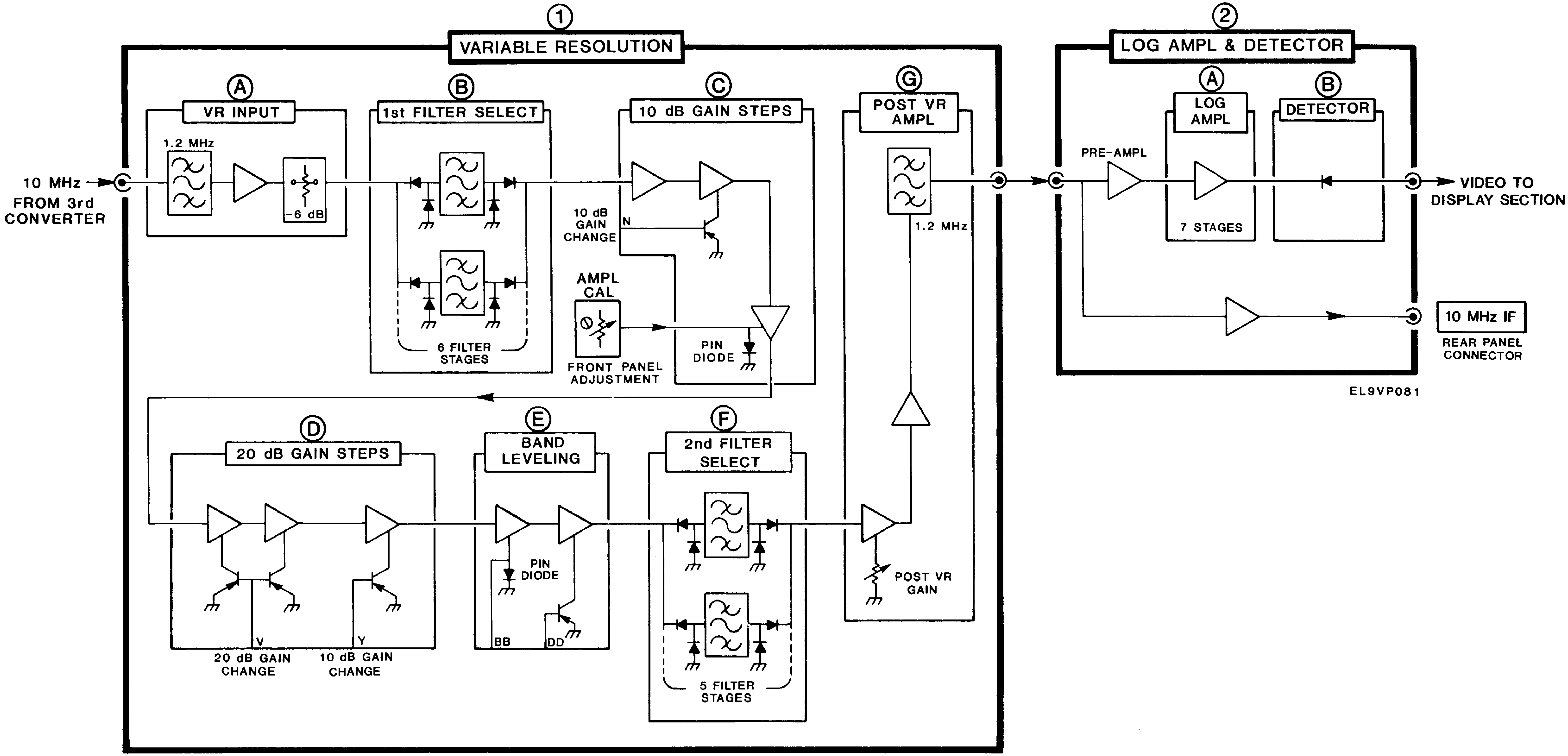
1ST Converter Block Diagram Figure FO-2



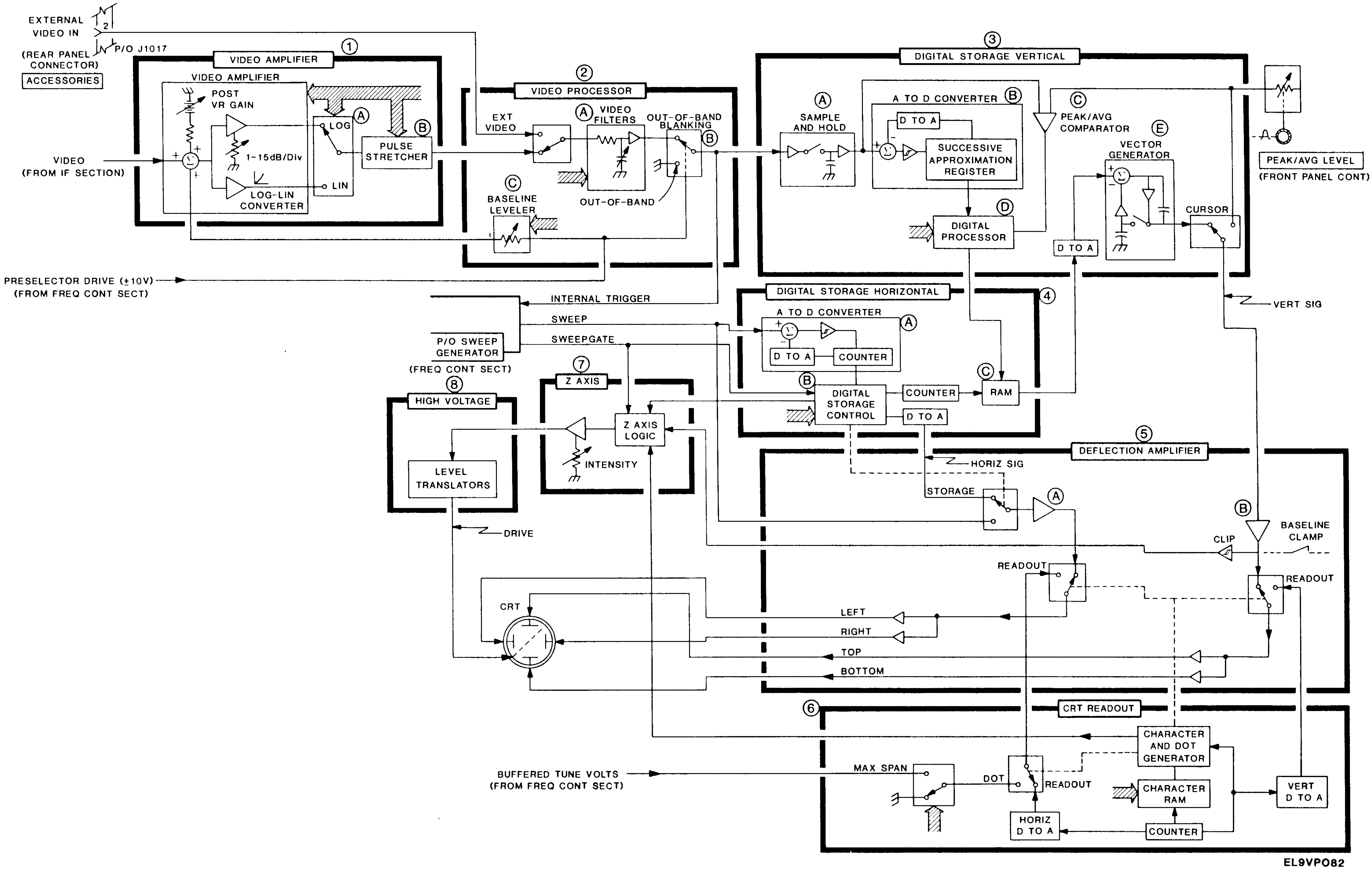
2ND Converter Figure FO-3



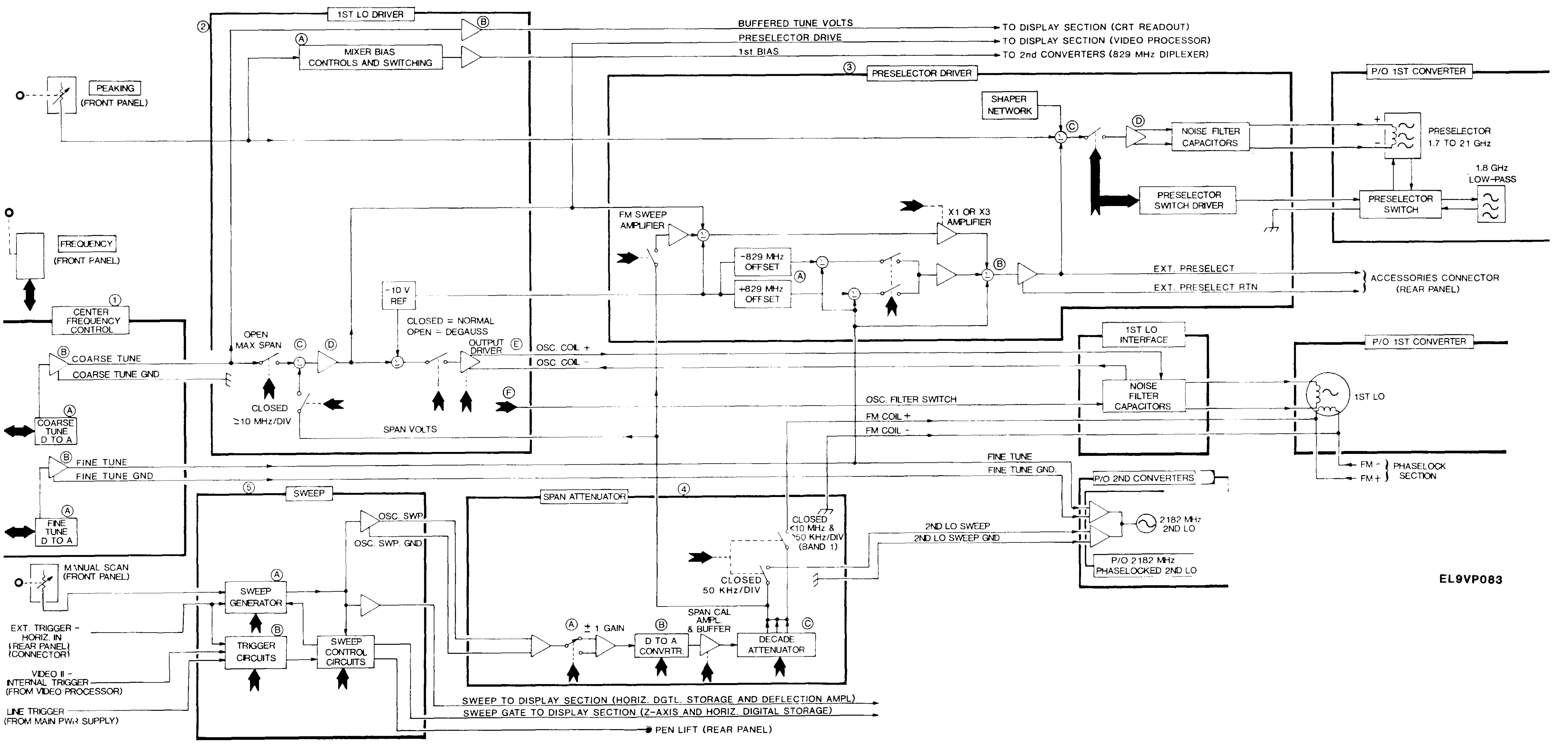
3RD Converter Block Diagram Figure FO-4



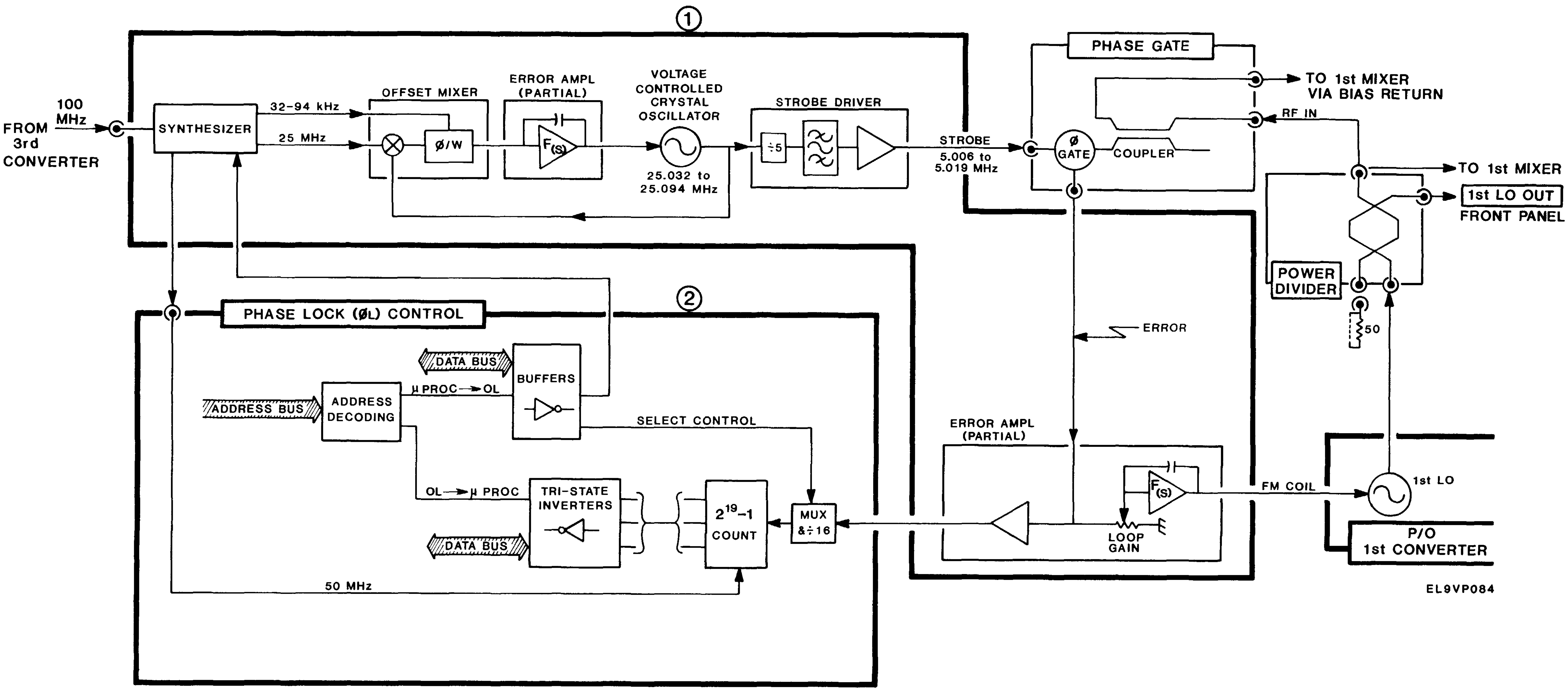
IF Section Block Diagram Figure FO–5



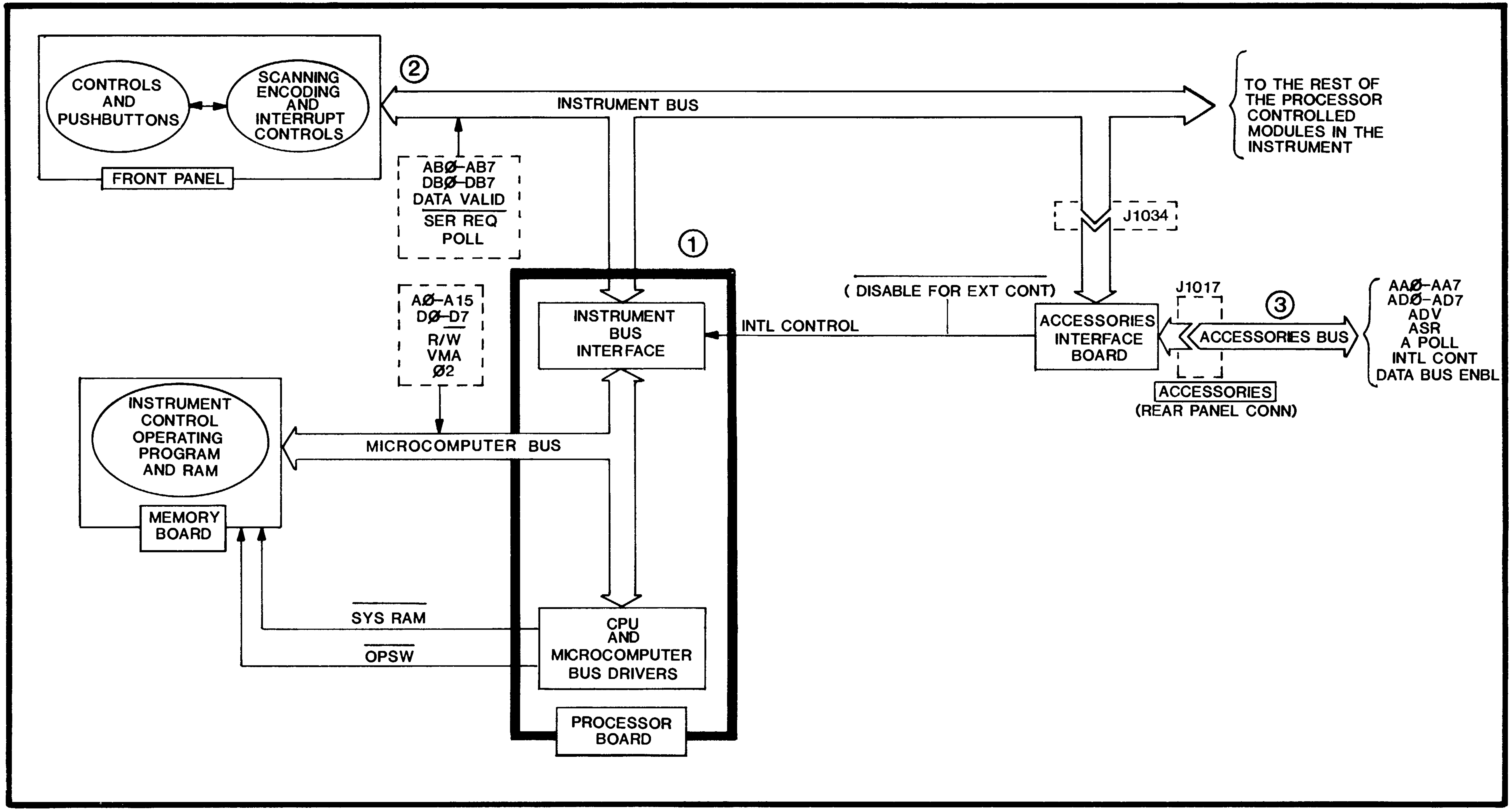
Display Section Block Diagram Figure FO-6



Frequency Control Block Diagram Figure FO-7

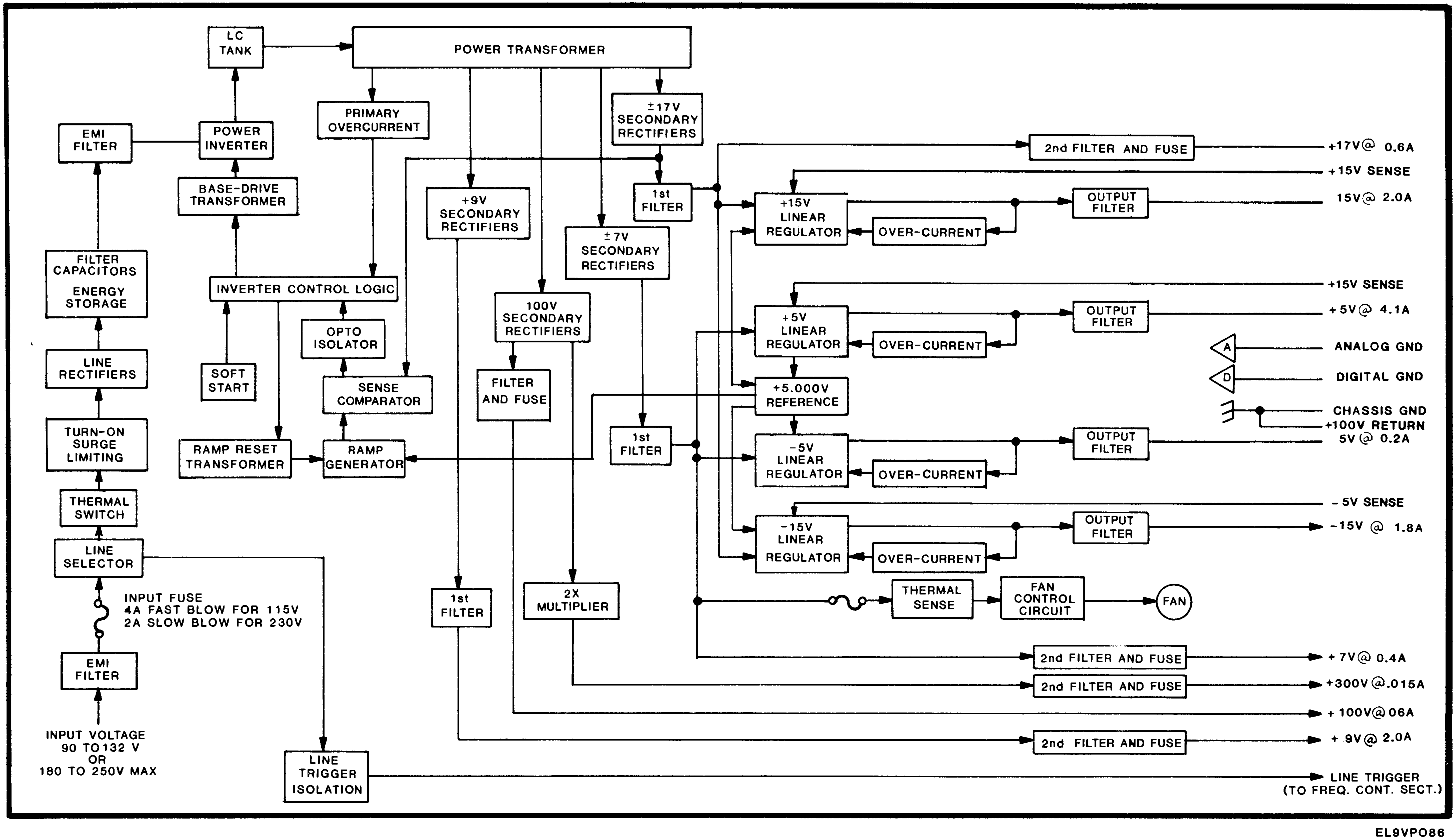


Phase Lock Section Block Diagram Figure FO-8

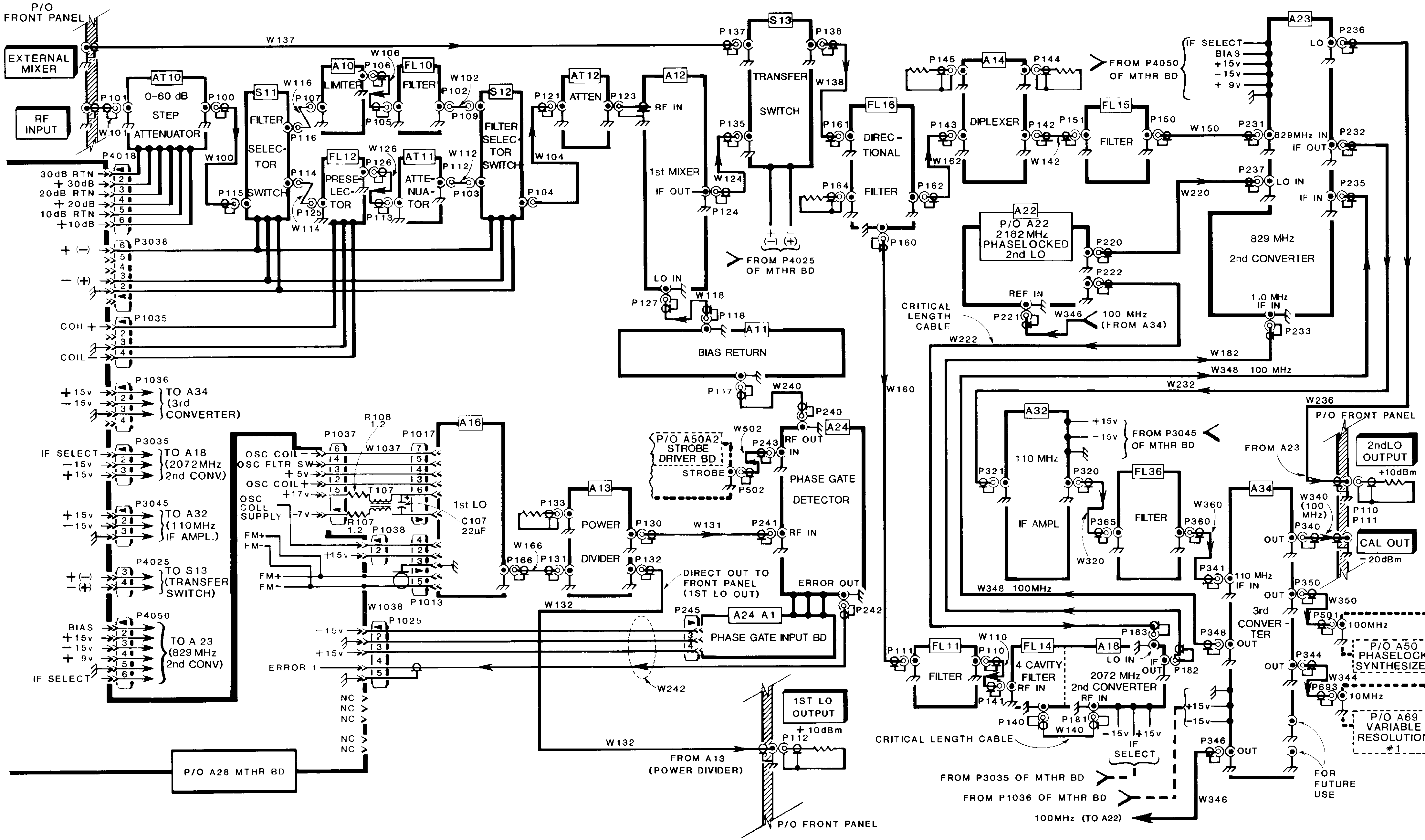


EL9VP085

Digital Control Block Diagram Figure FO-9

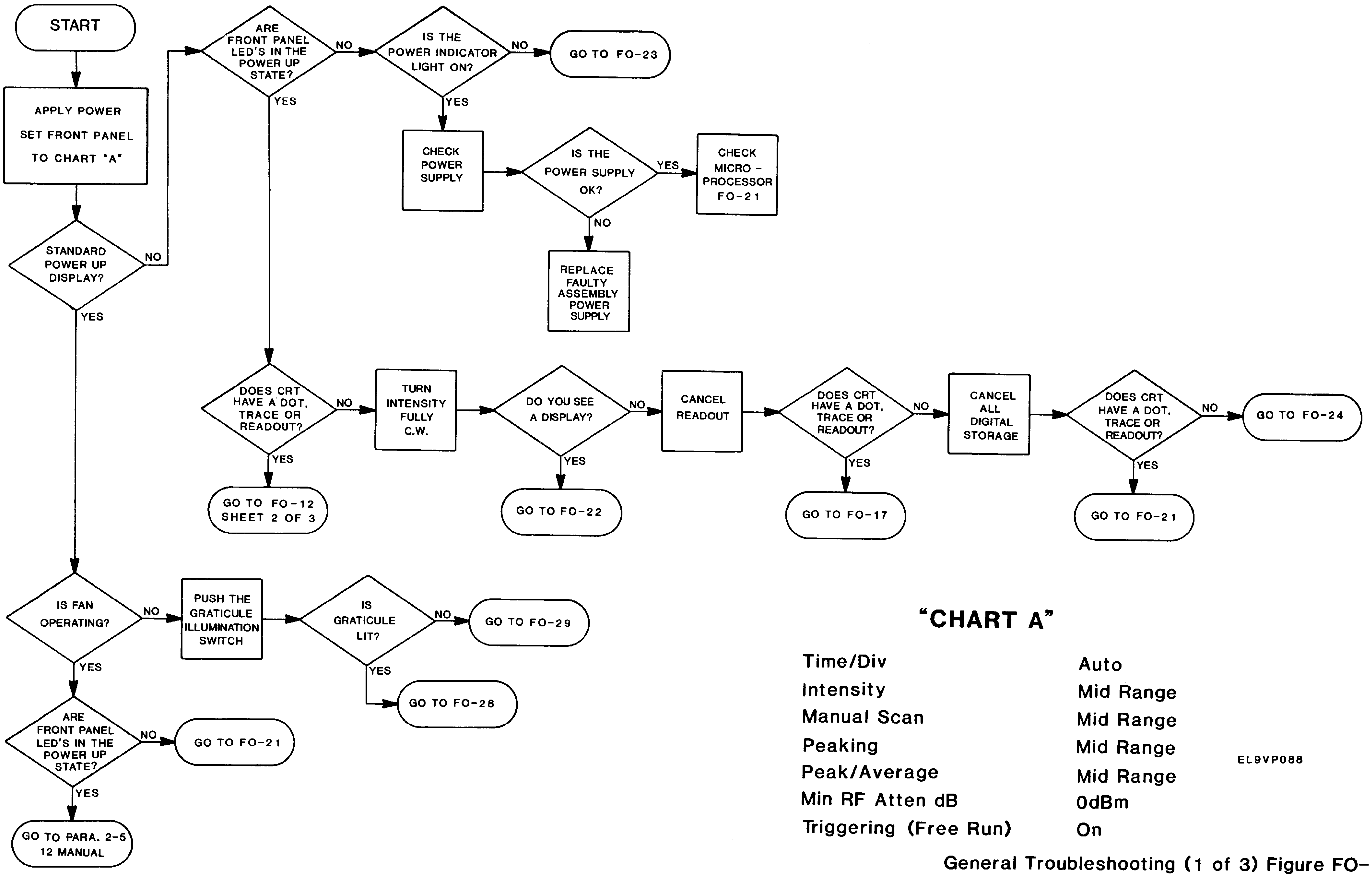


Power Supply Block Diagram Figure FO-10



EL9VP087

Interconnection Block Diagram Figure FO-11

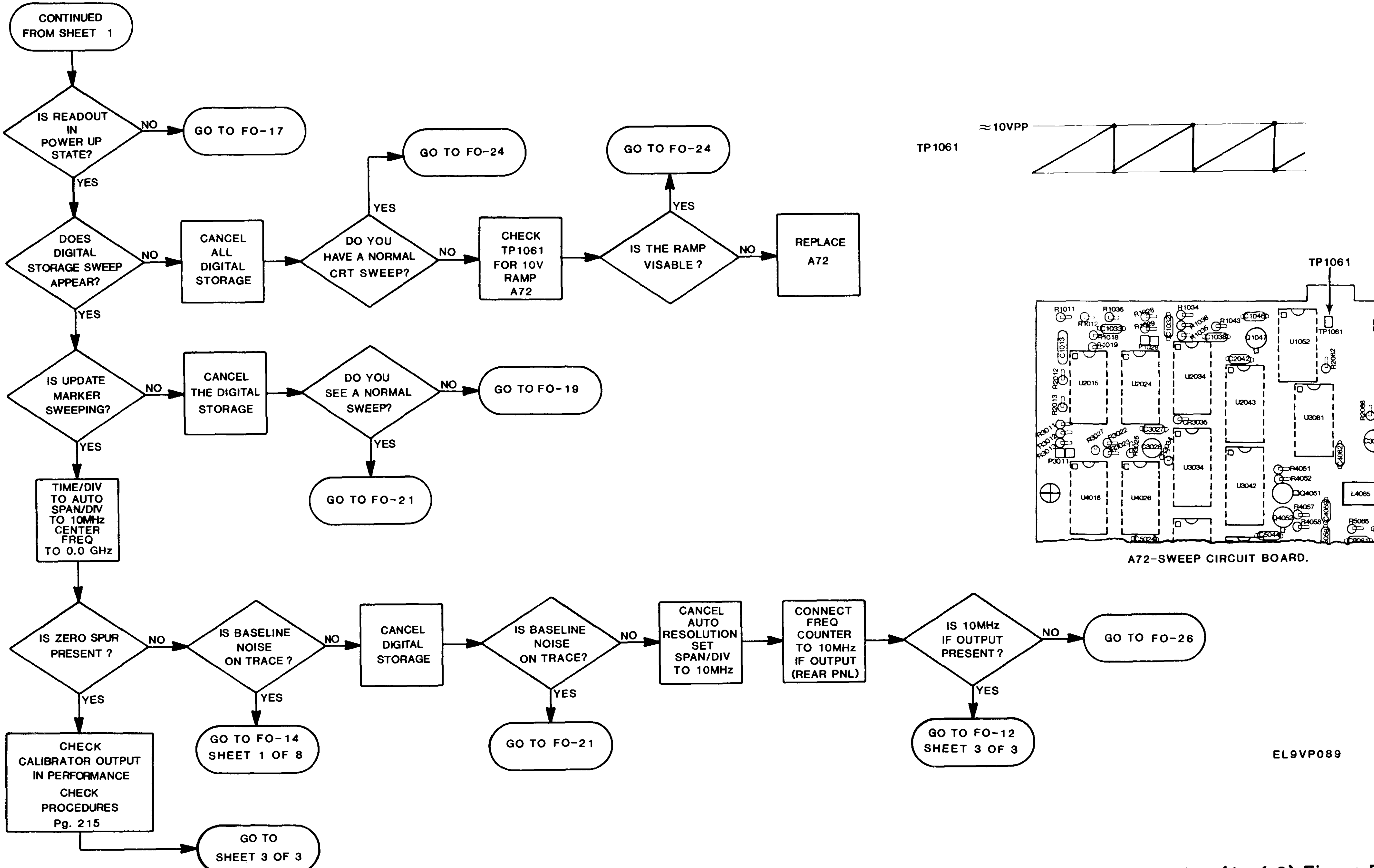


"CHART A"

Time/Div	Auto
Intensity	Mid Range
Manual Scan	Mid Range
Peaking	Mid Range
Peak/Average	Mid Range
Min RF Atten dB	0dBm
Triggering (Free Run)	On

EL9VP088

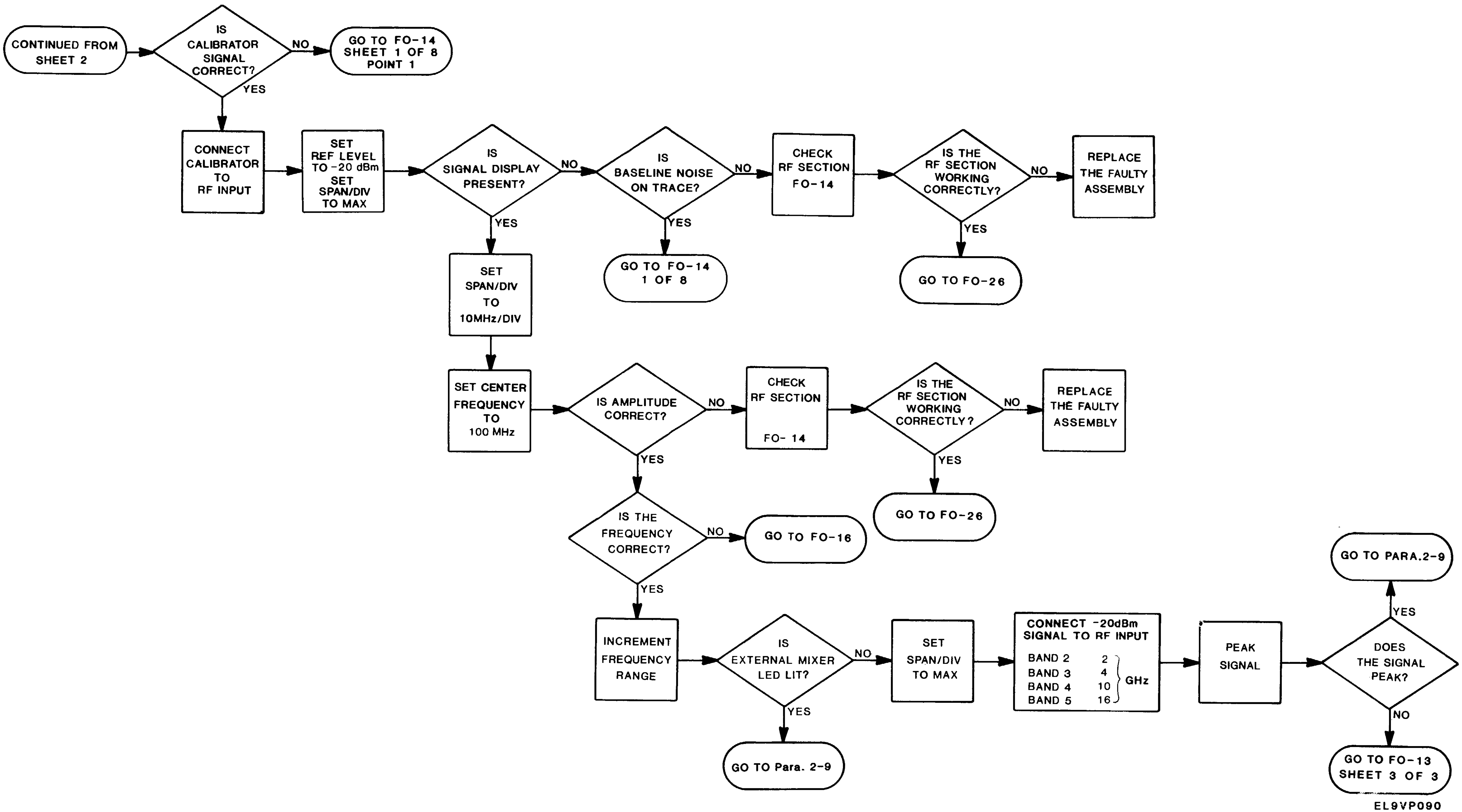
General Troubleshooting (1 of 3) Figure FO-12



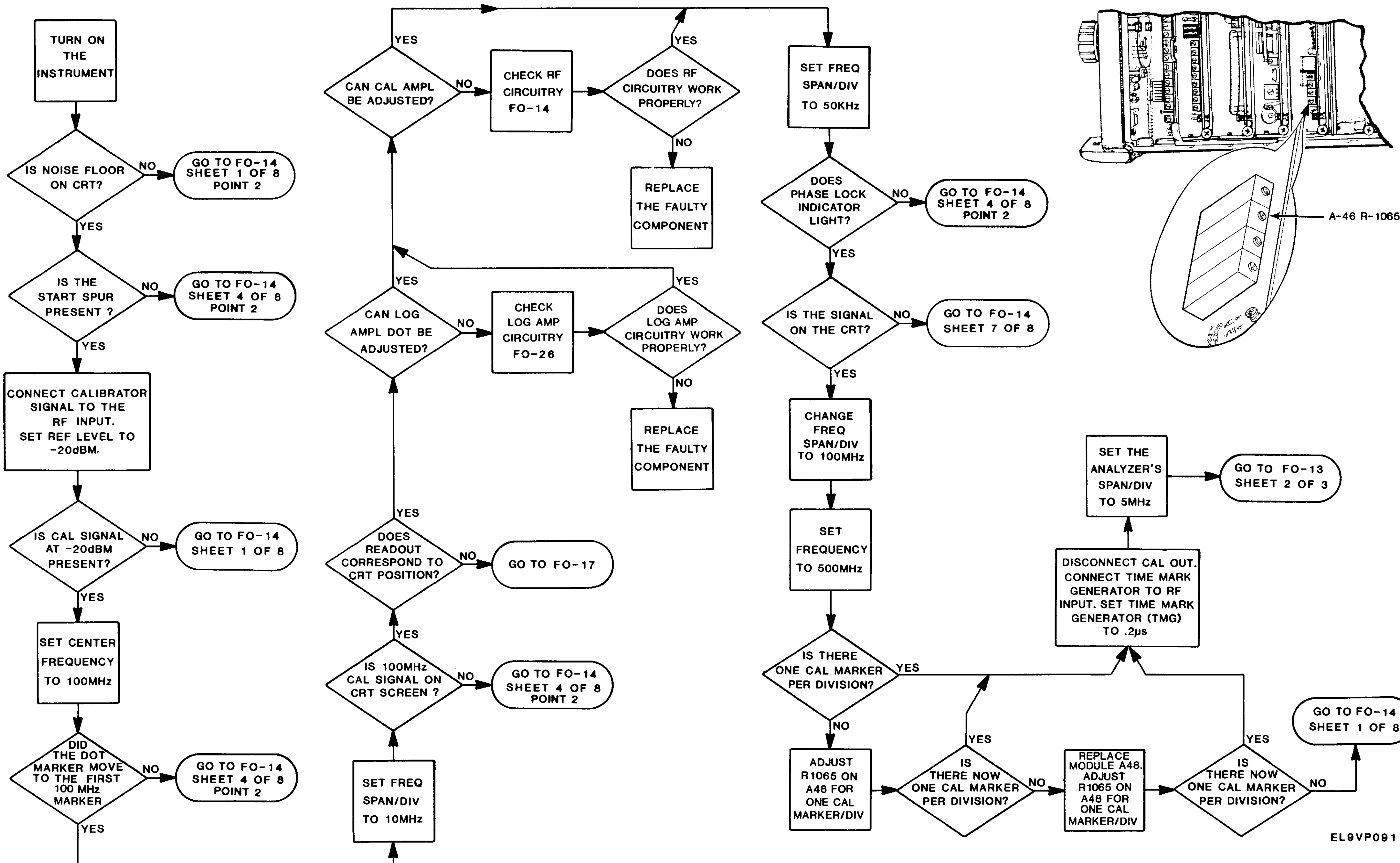
A72-SWEEP CIRCUIT BOARD.

EL9VP089

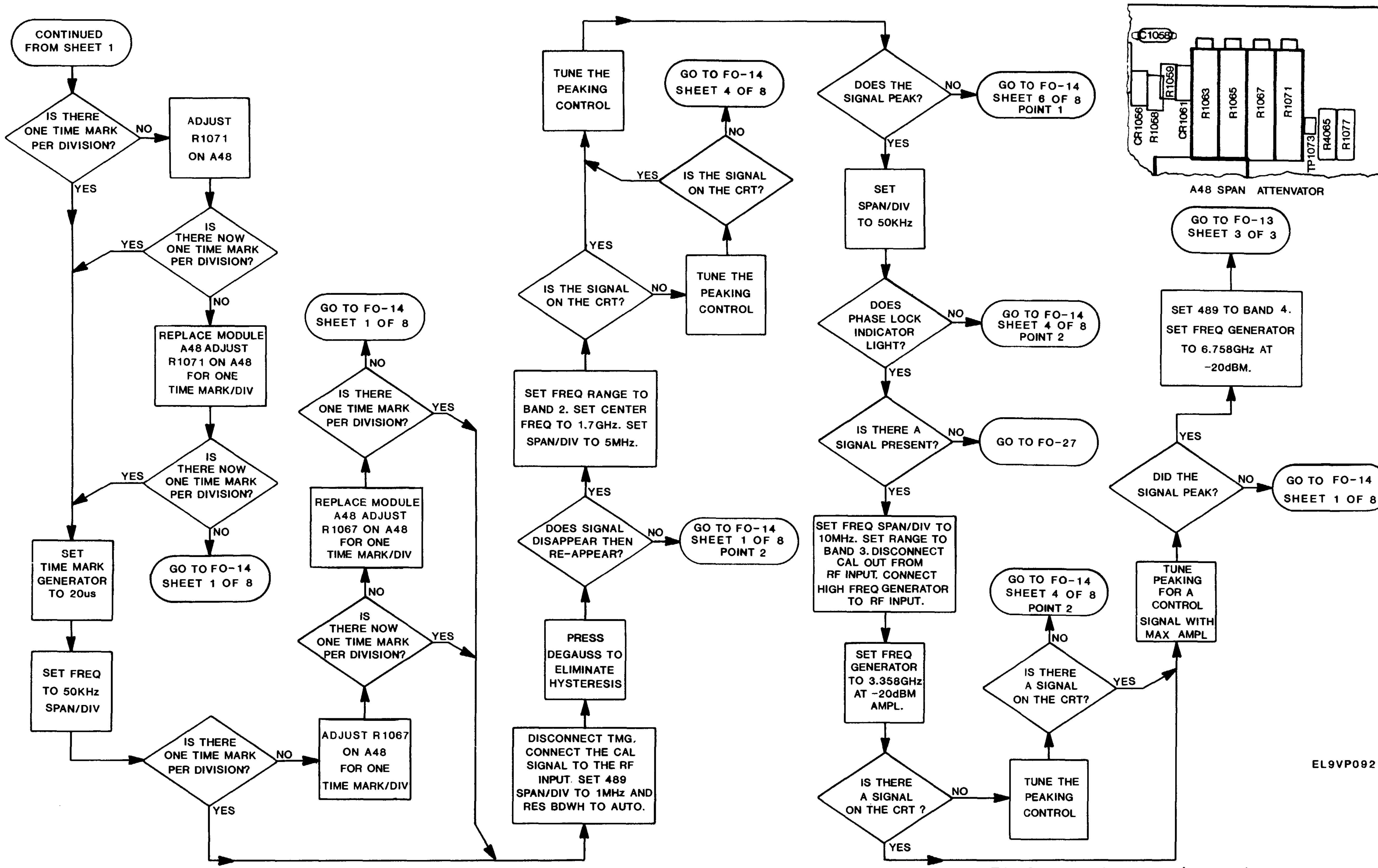
General Troubleshooting (2 of 3) Figure FO-12



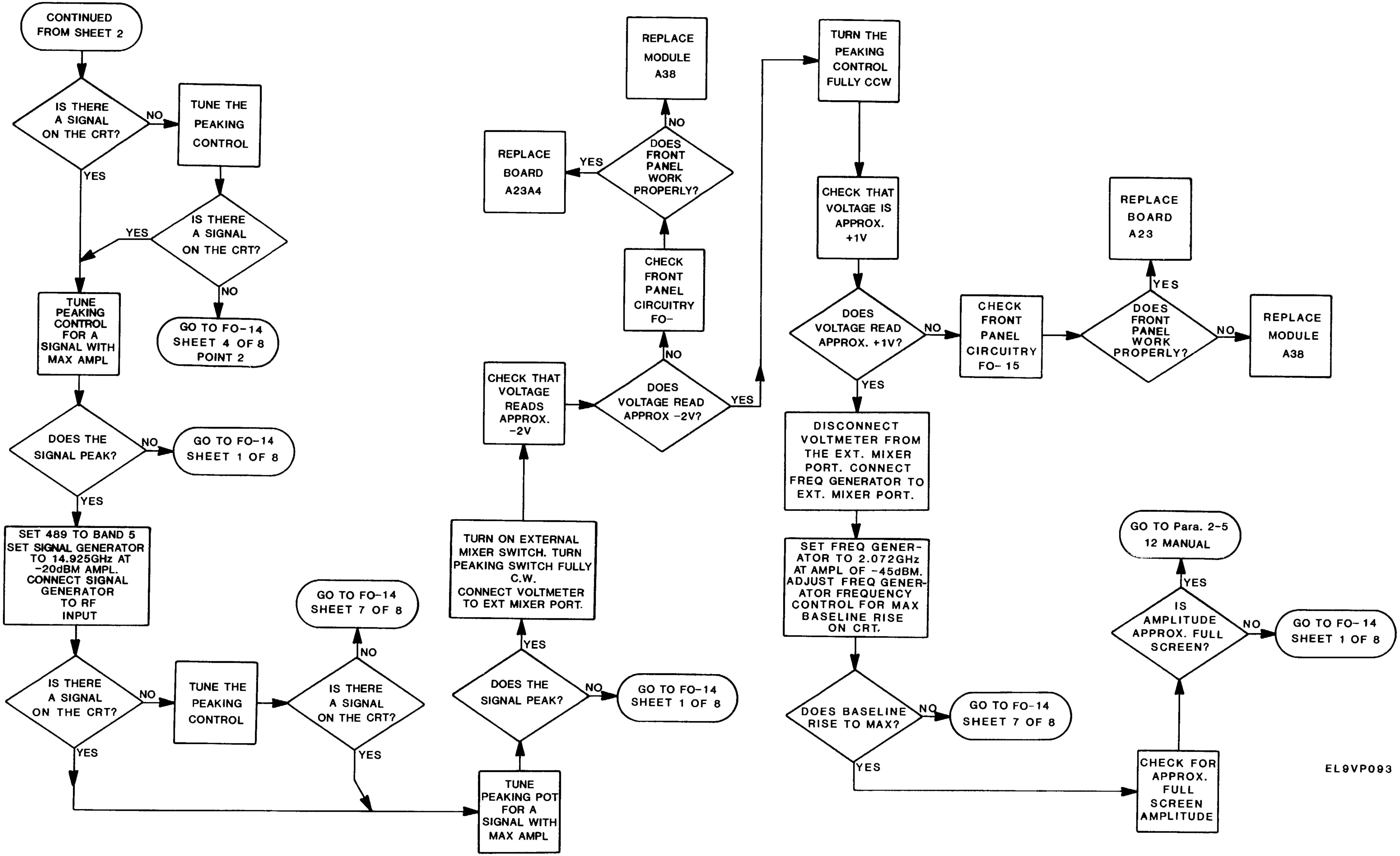
General Troubleshooting (3 of 3) Figure FO-12



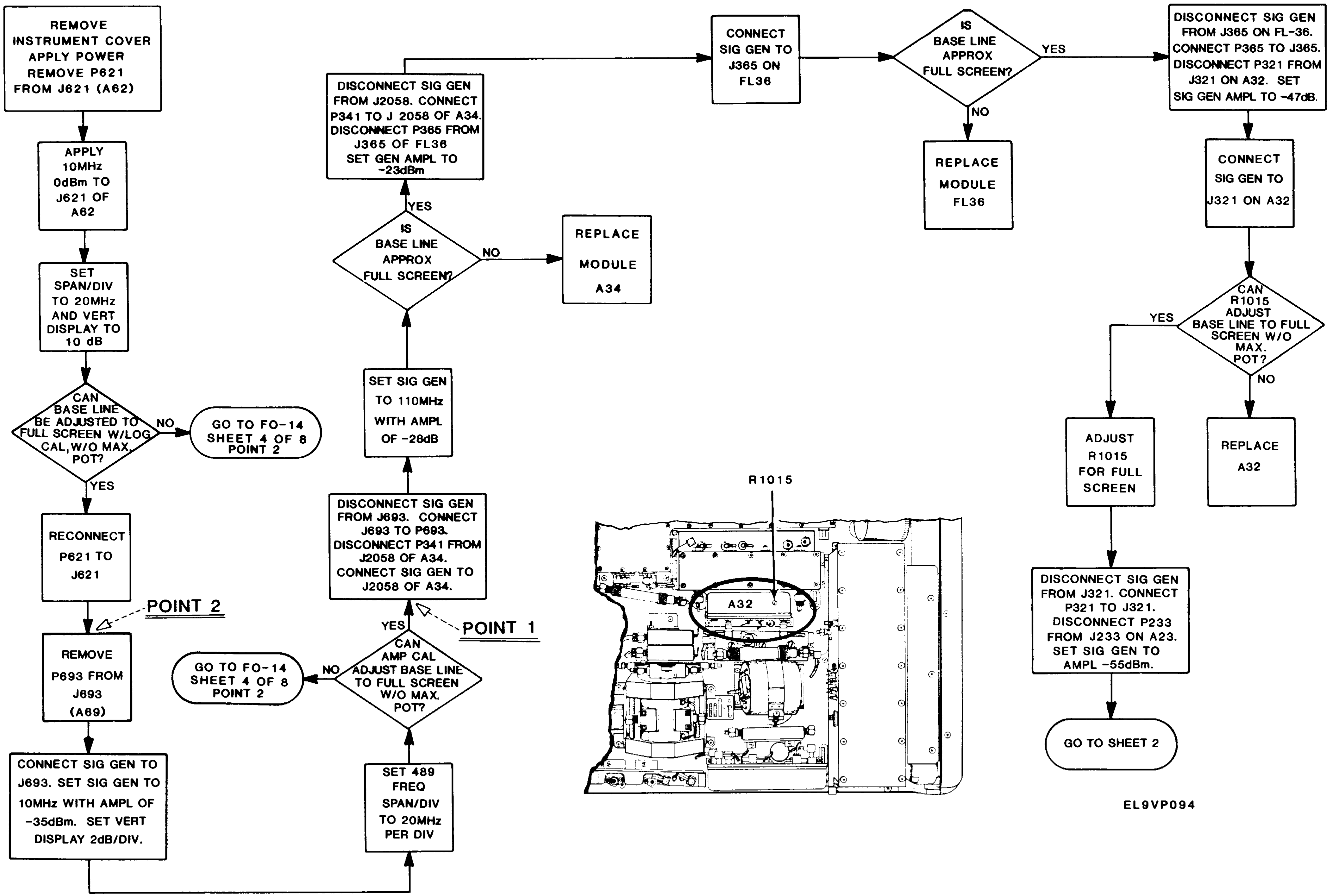
RF Troubleshooting (1 of 3) Figure FO-13



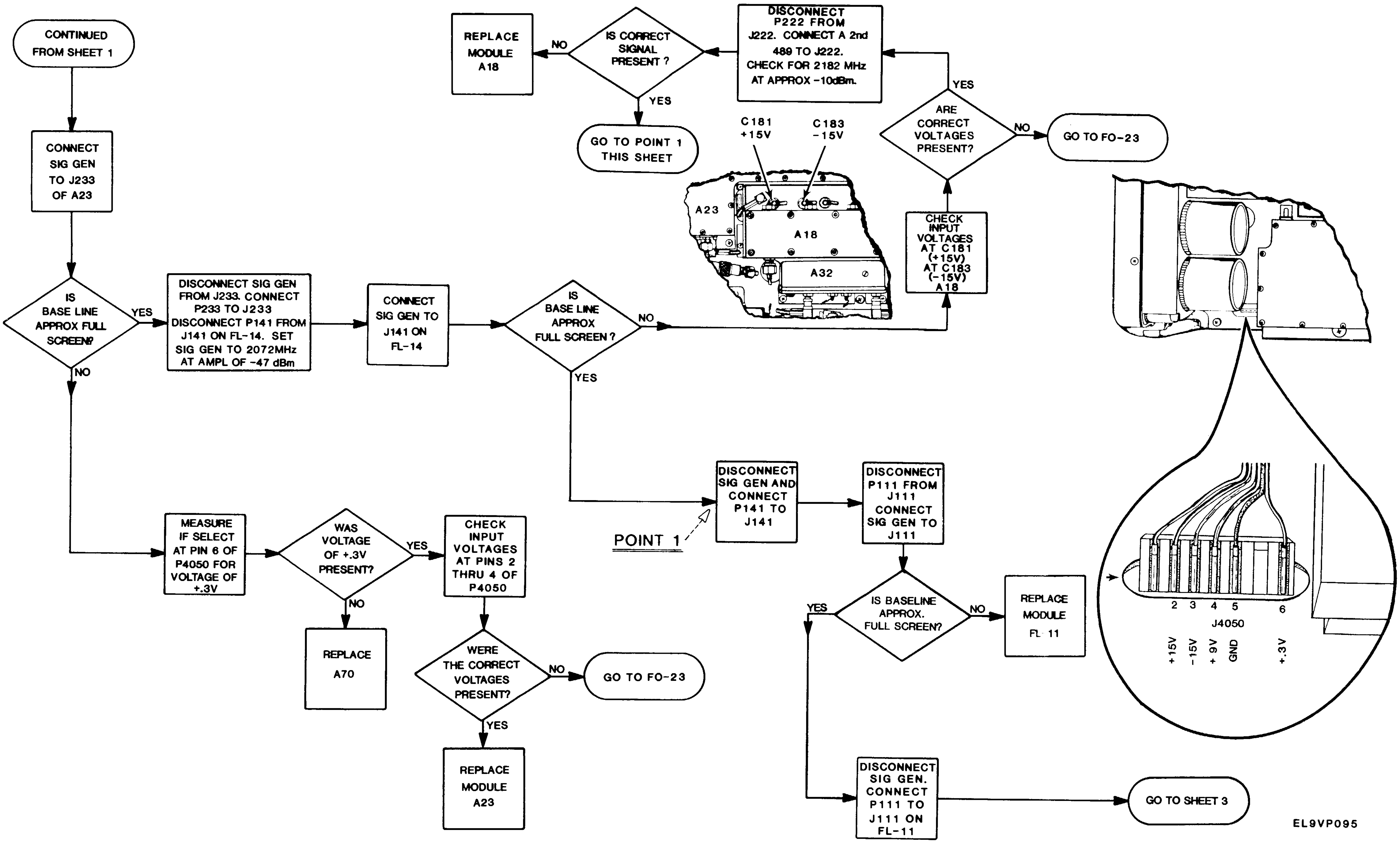
RF Troubleshooting (2 of 3) Figure FO-13



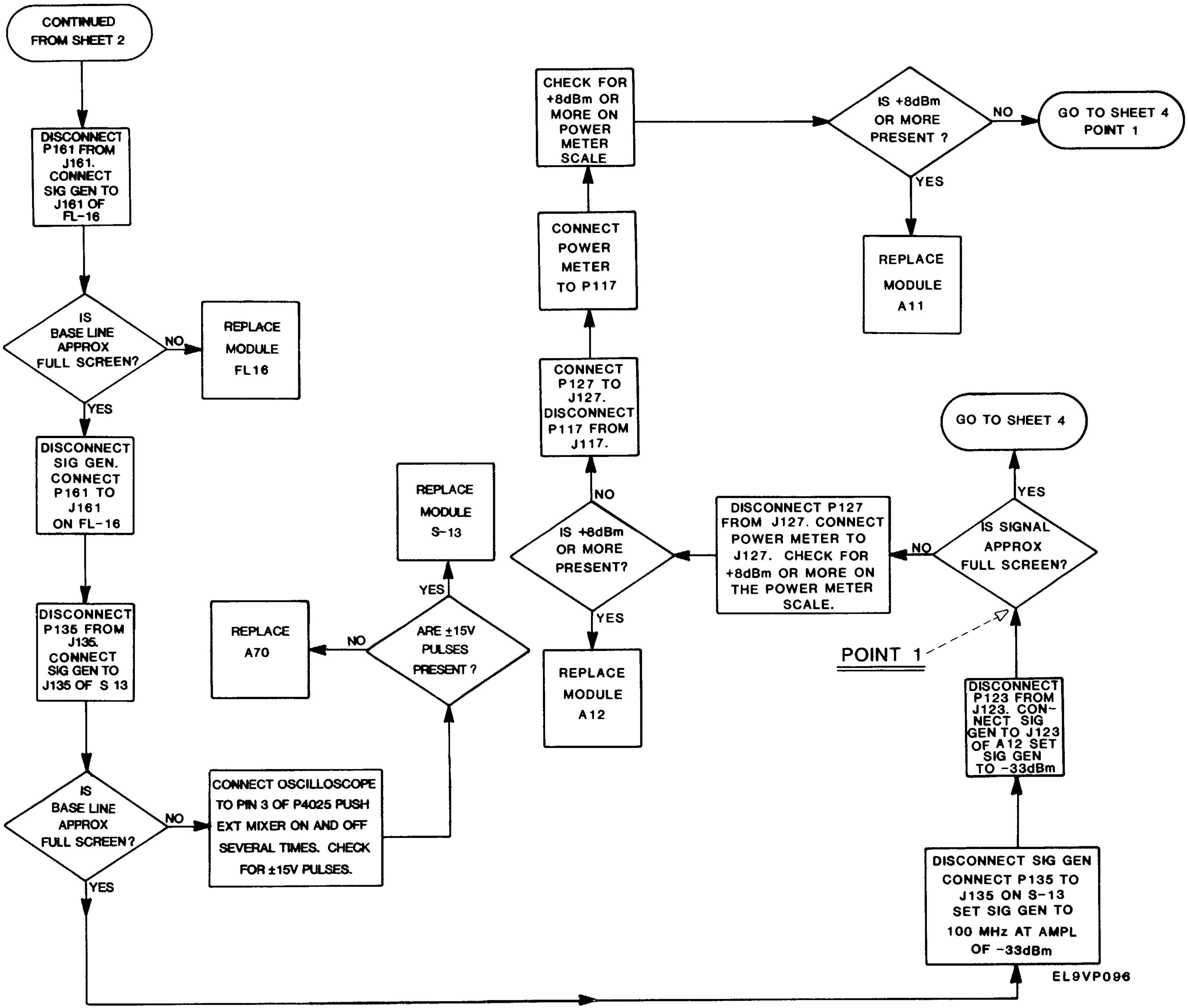
RF Troubleshooting (3 of 3) Figure FO-13



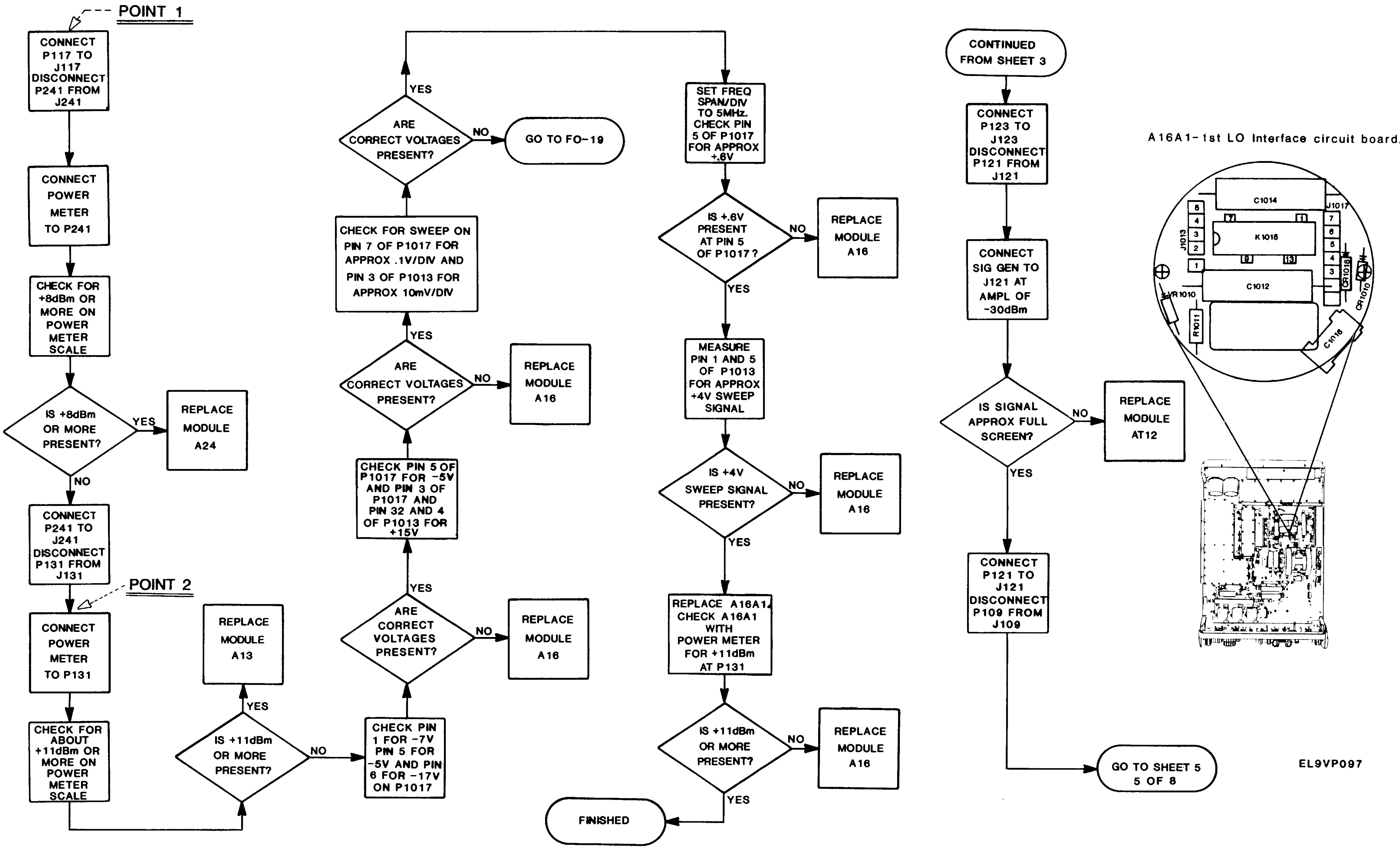
RF Section Troubleshooting (1 of 8) Figure FO-14



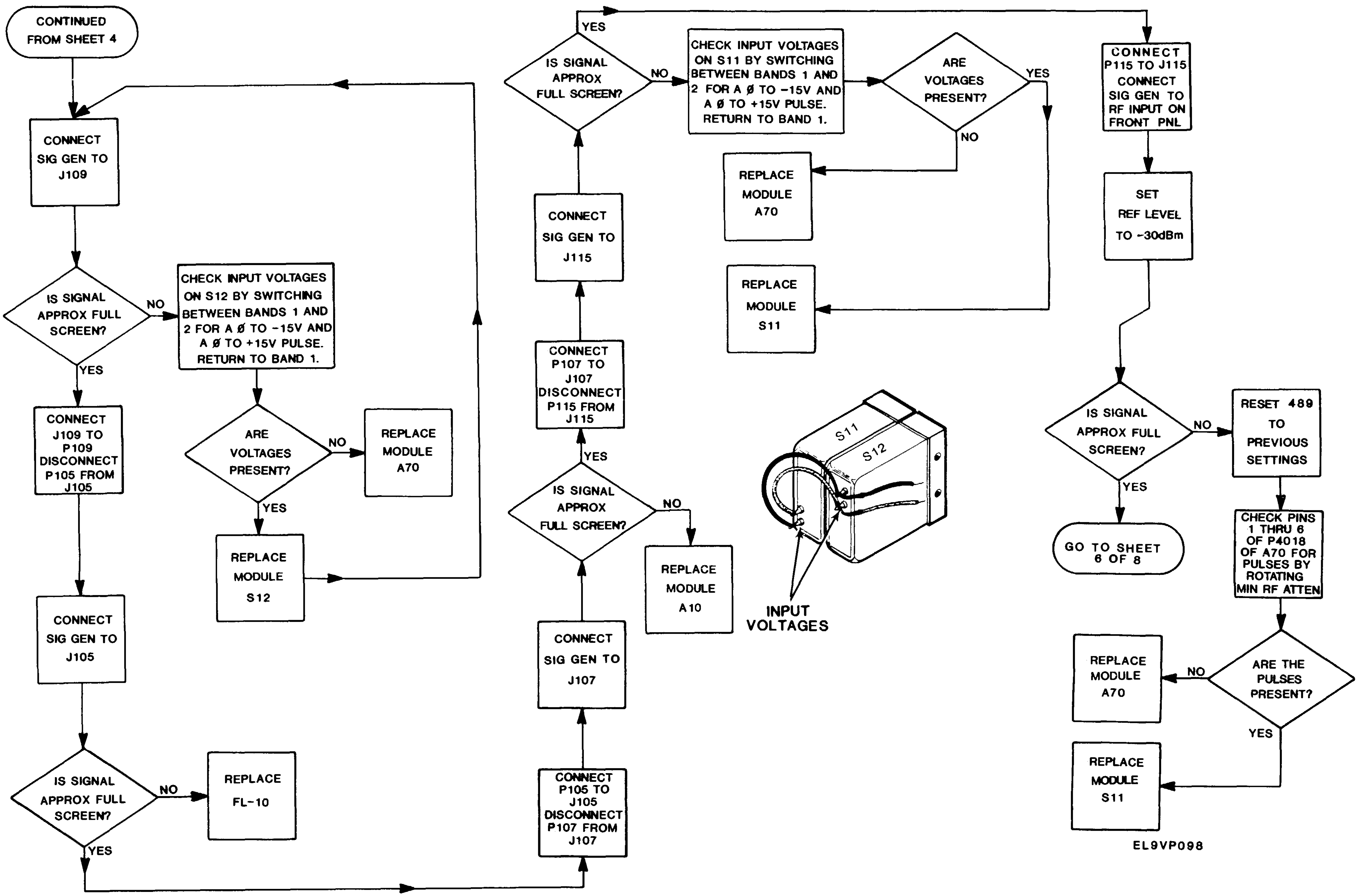
RF Section Troubleshooting (2 of 8) Figure FO-14



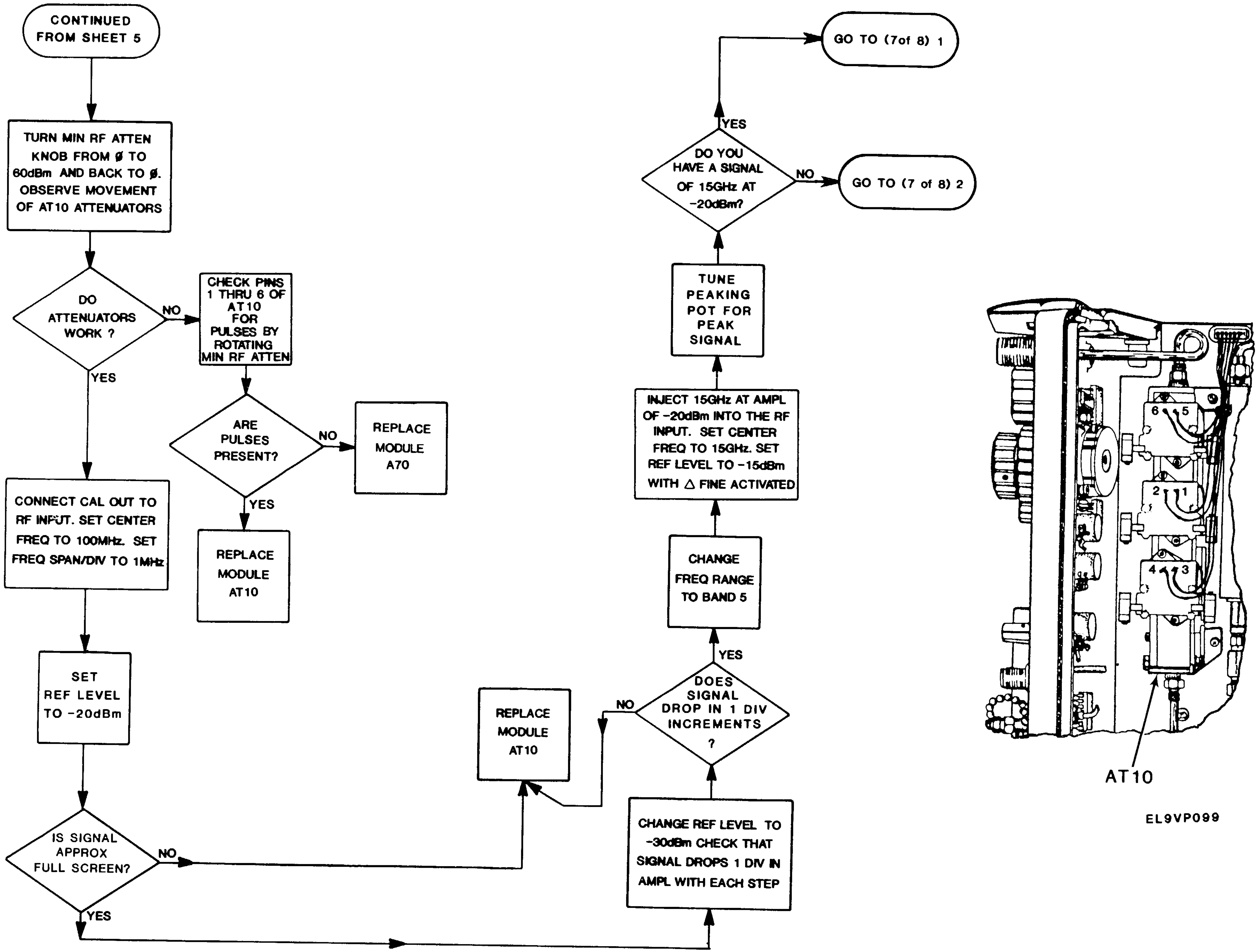
RF Section Troubleshooting (3 of 8) Figure FO-14



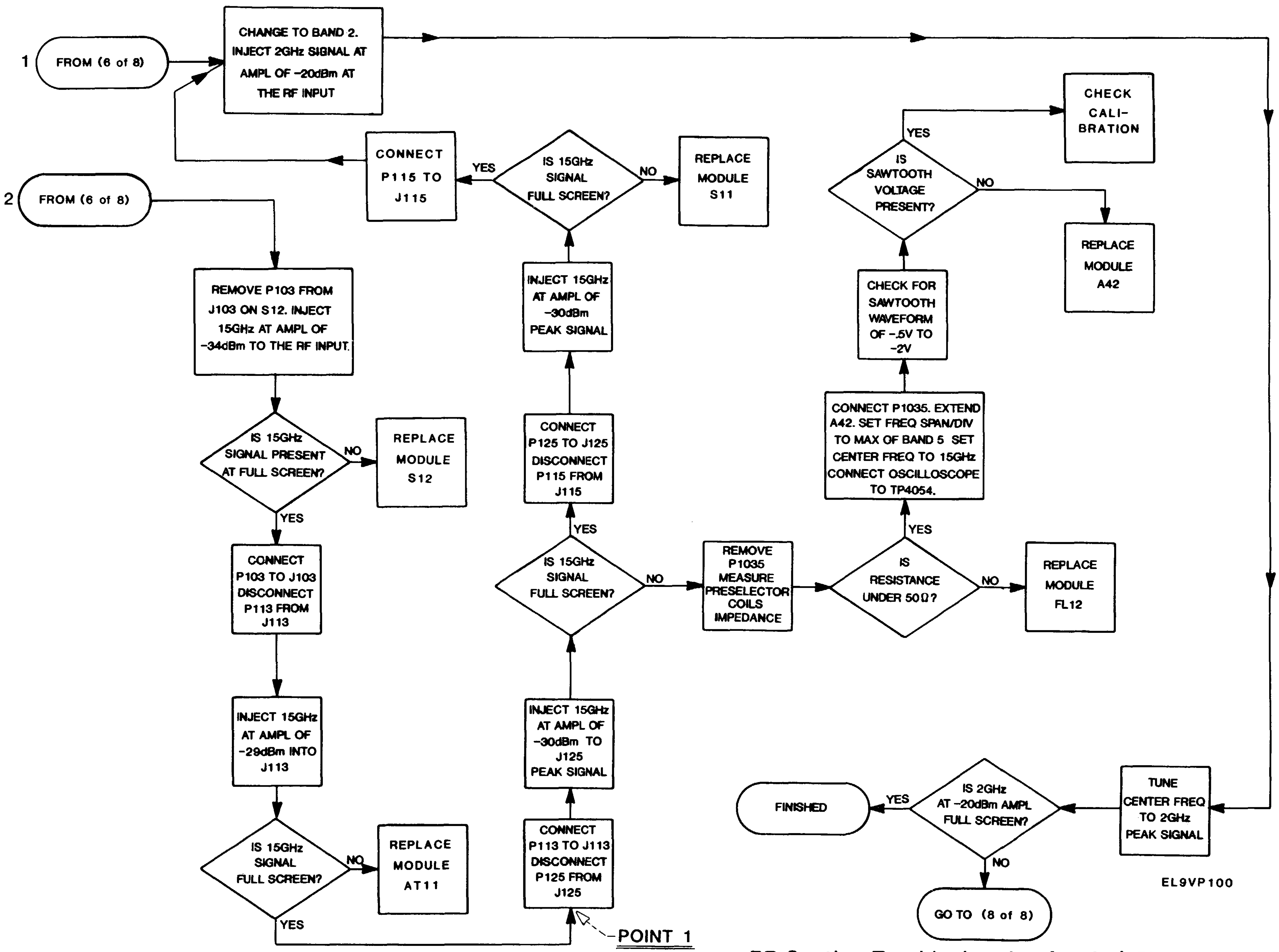
RF Section Troubleshooting (4 of 8) Figure FO-14



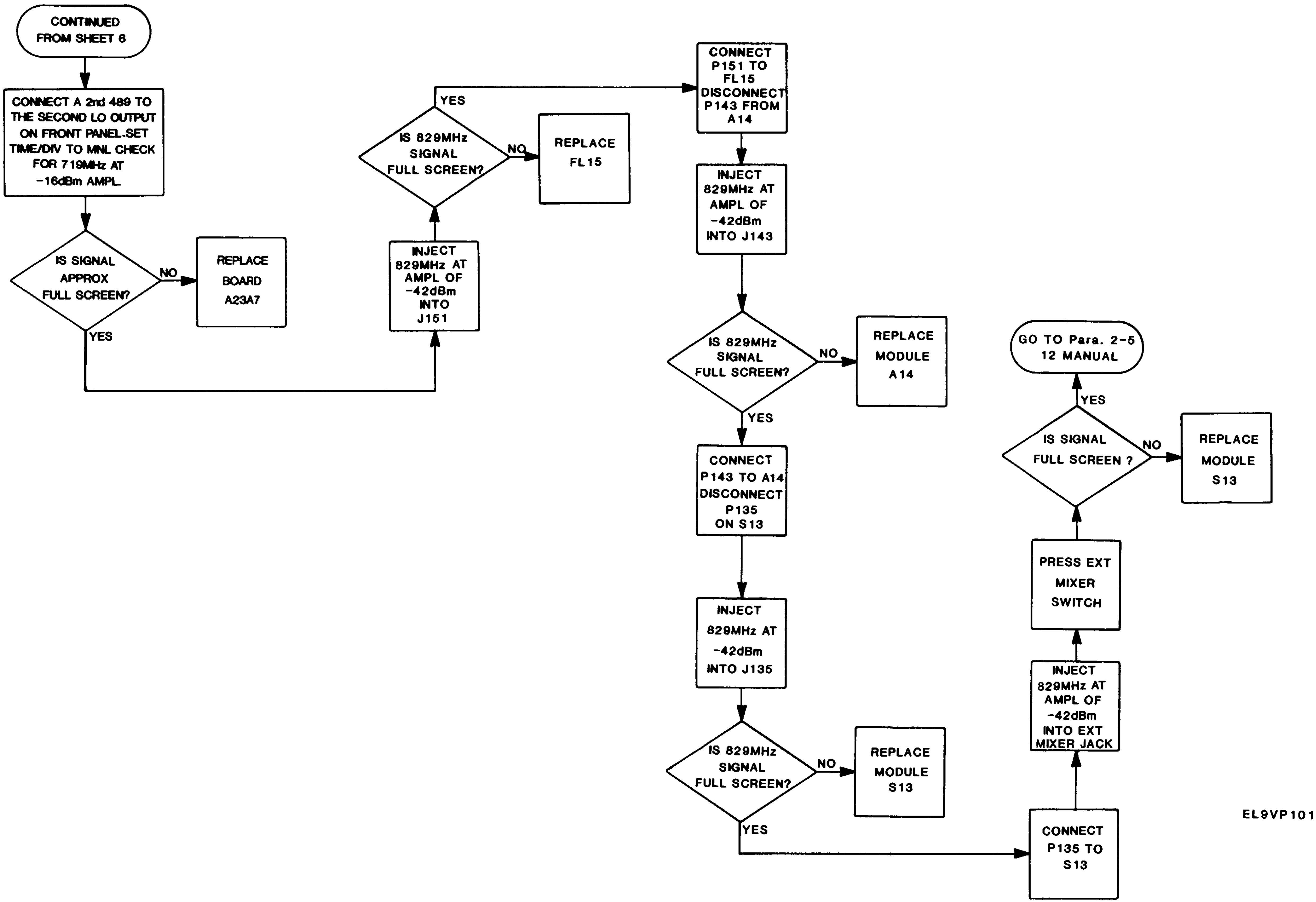
RF Section Troubleshooting (5 of 8) Figure FO-14



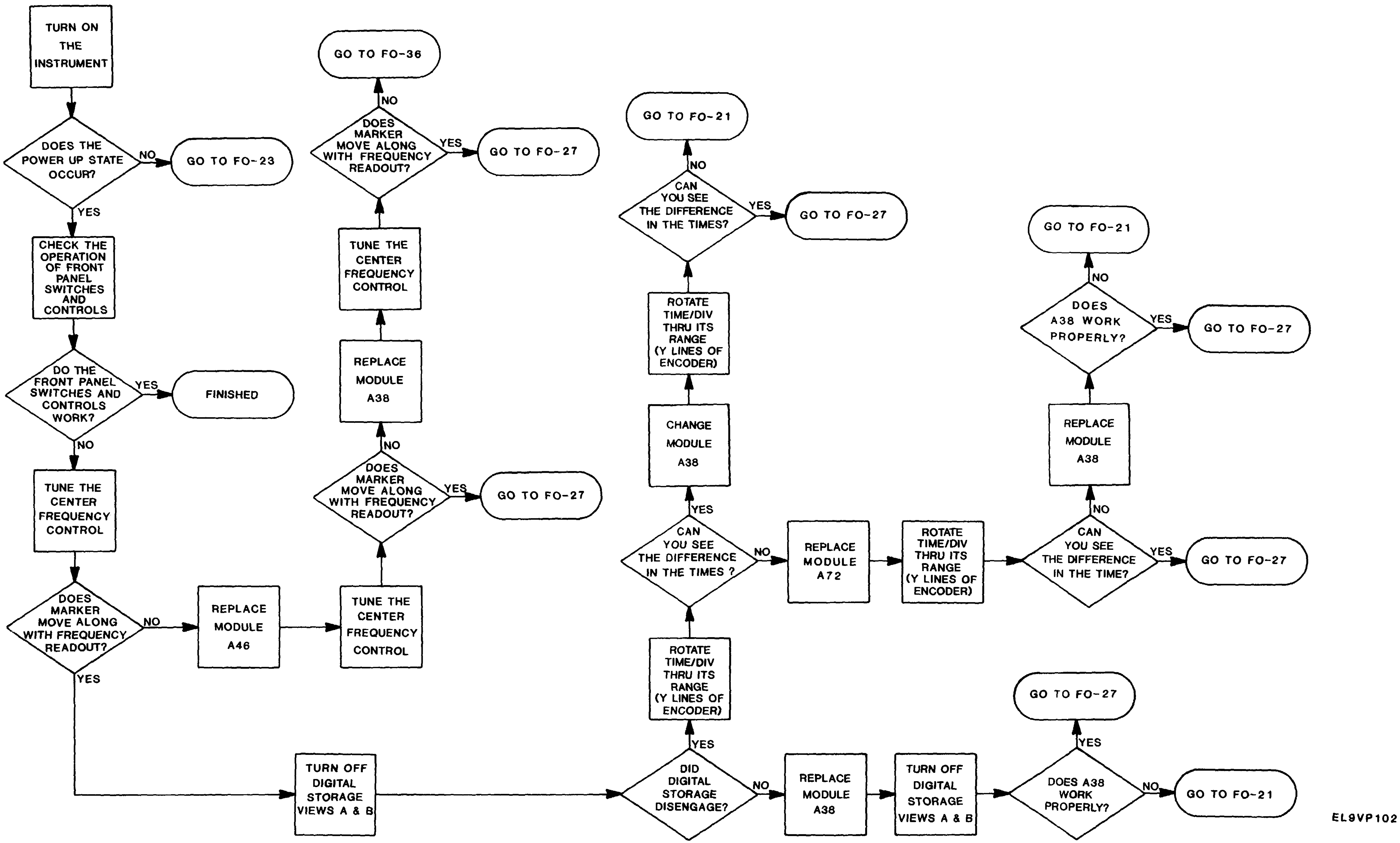
RF Section Troubleshooting (6 of 8) Figure FO-14



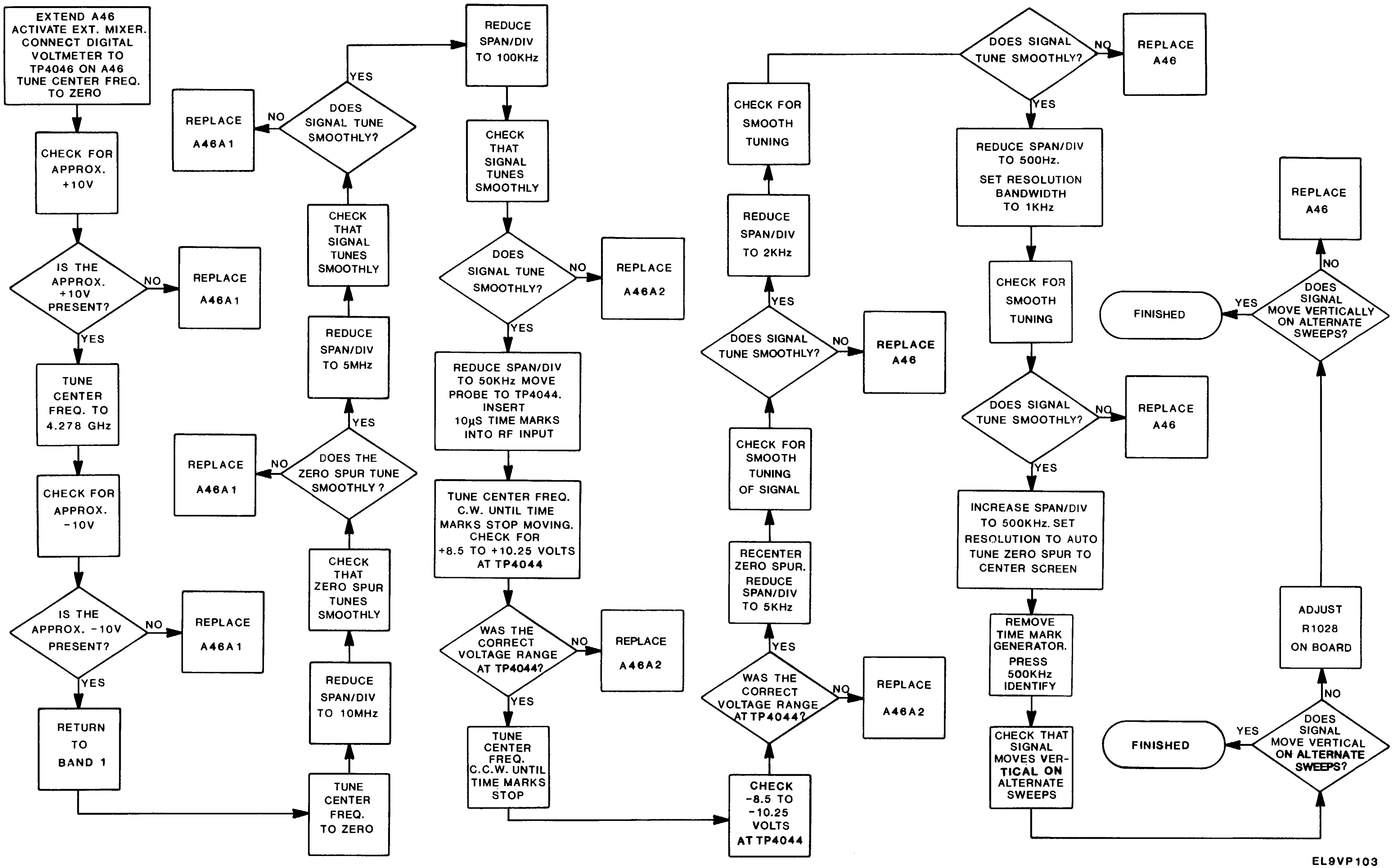
RF Section Troubleshooting (7 of 8) Figure FO-14



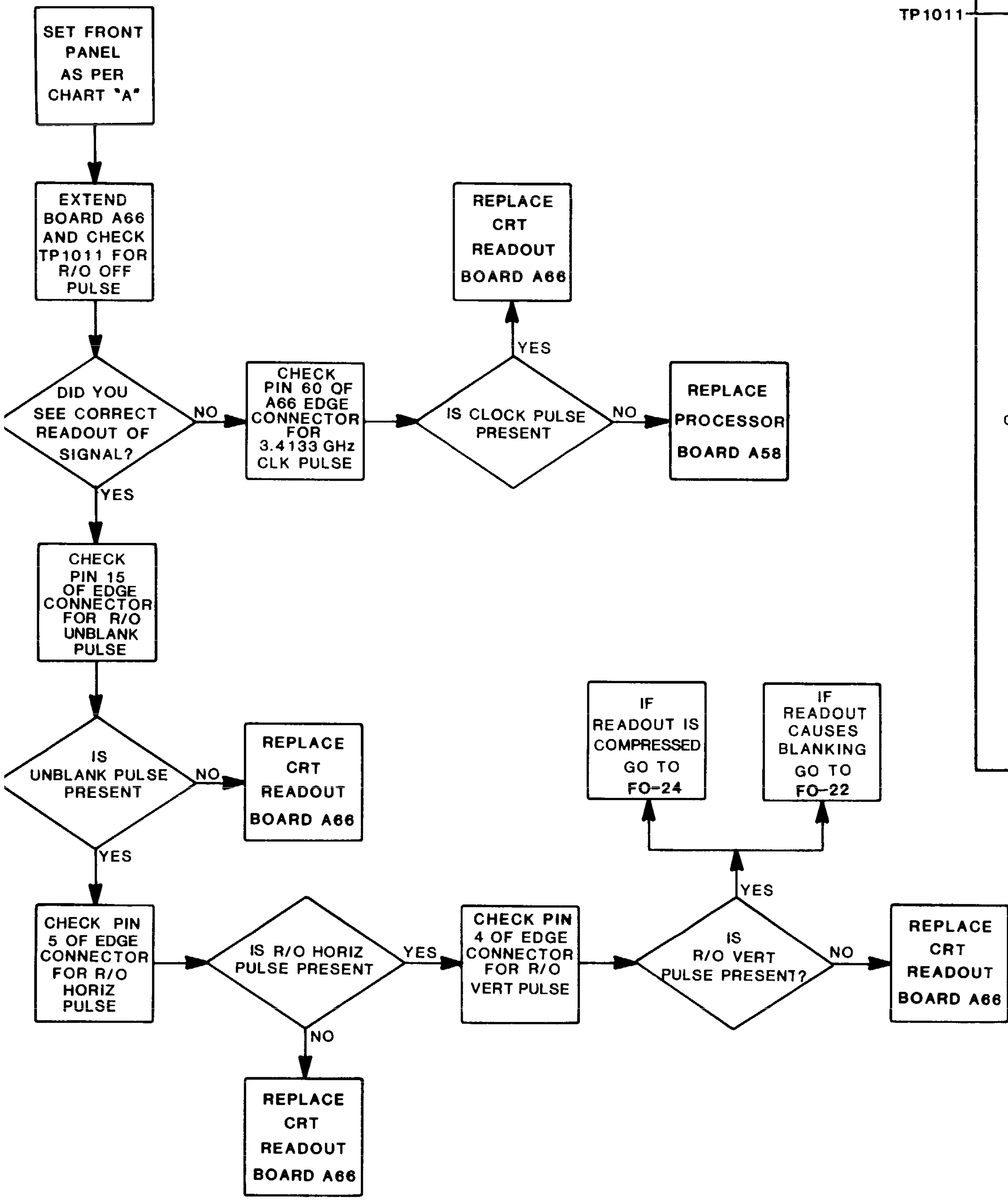
RF Section Troubleshooting (8 of 8) Figure FO-14

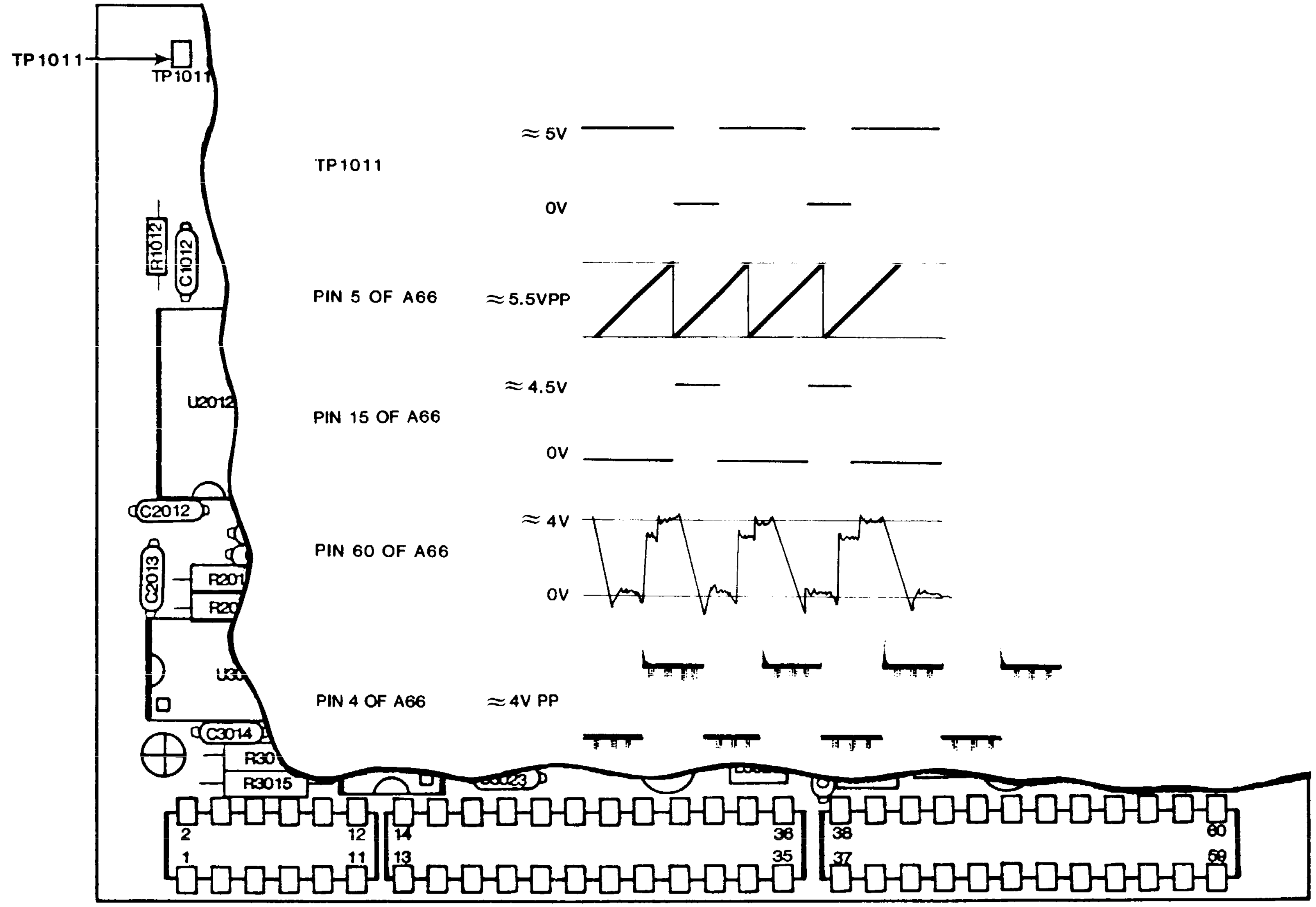


Front Panel Troubleshooting Figure FO-15



Center Frequency Troubleshooting Figure FO-16





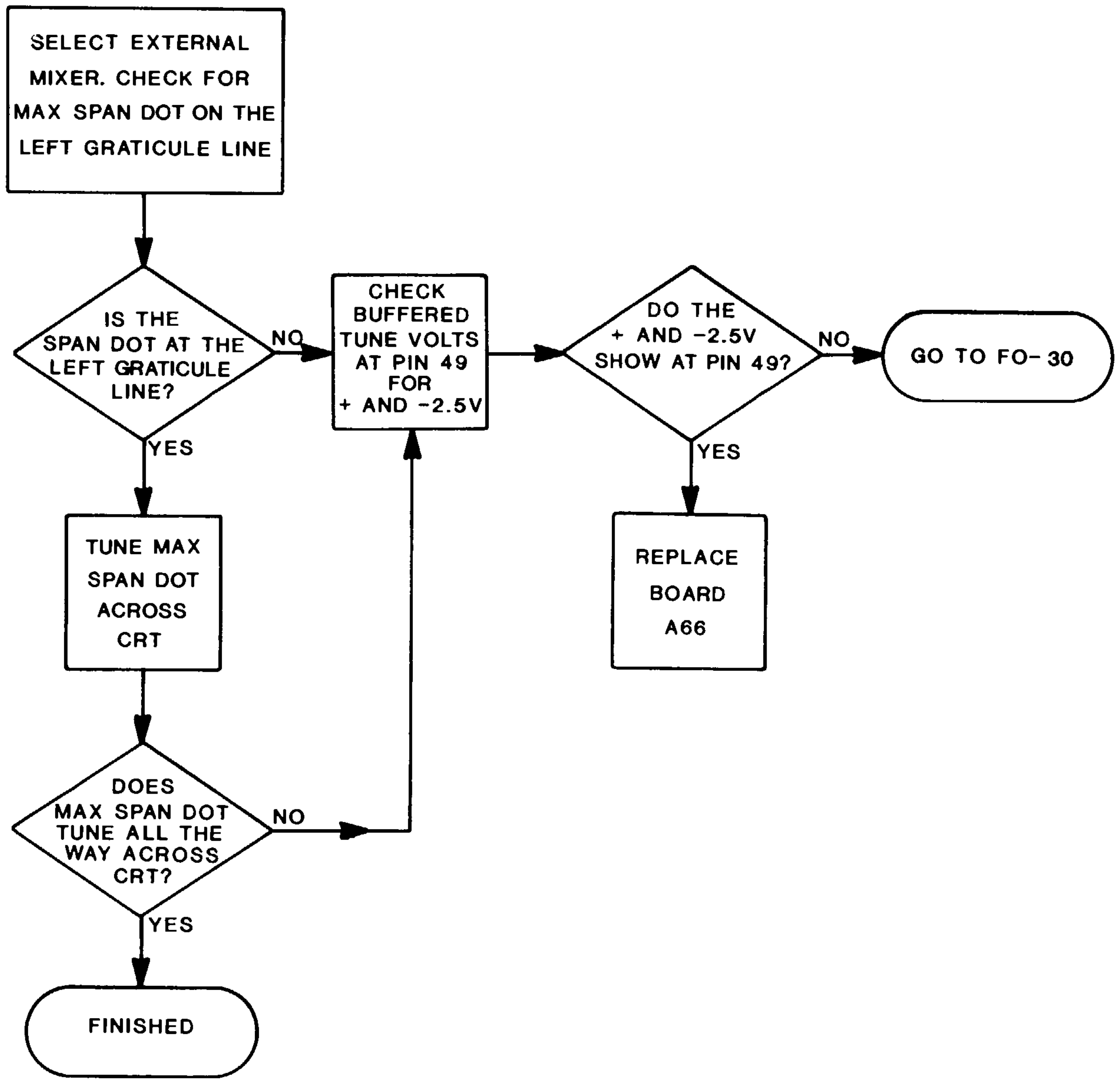
A66–CRT READOUT CIRCUIT BOARD.

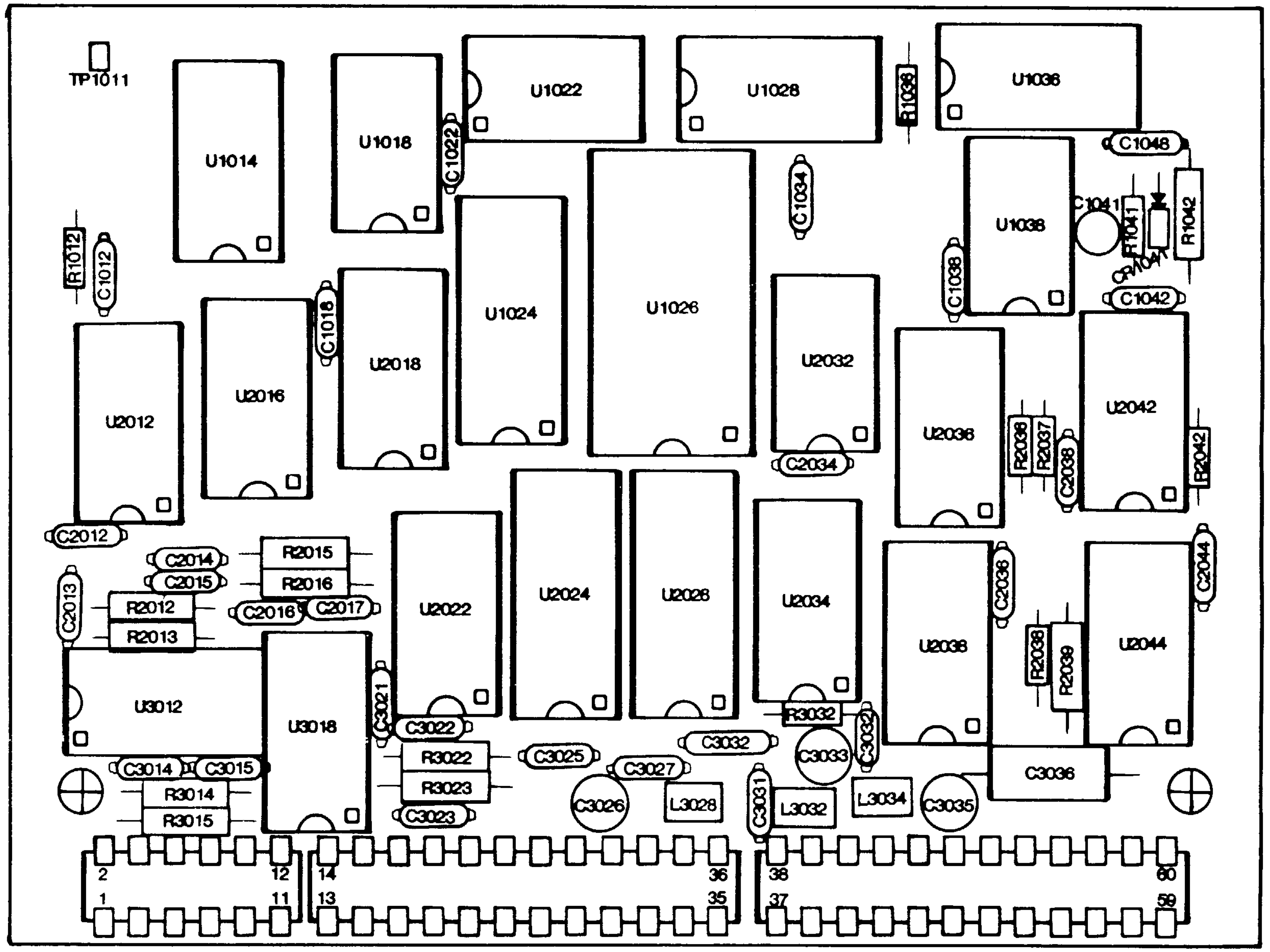
"CHART A"

Time/Div	Auto
Intensity	Mid Range
Manual Scan	Mid Range
Peaking	Mid Range
Peak/Average	Mid Range
Min RF Atten dB	0dBm
Triggering (Free Run)	On

EL9VP104

CRT Readout Troubleshooting Figure FO-17

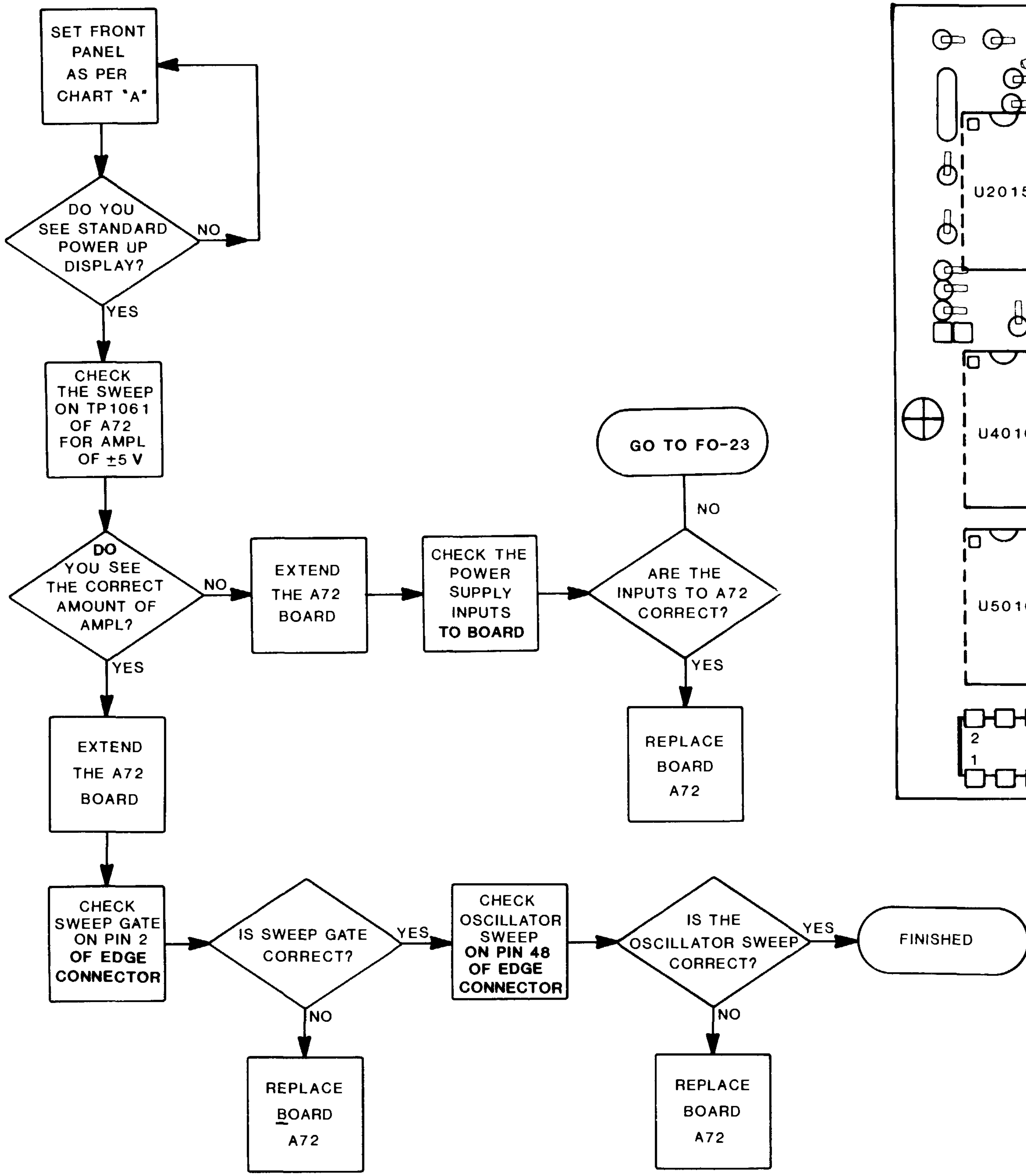


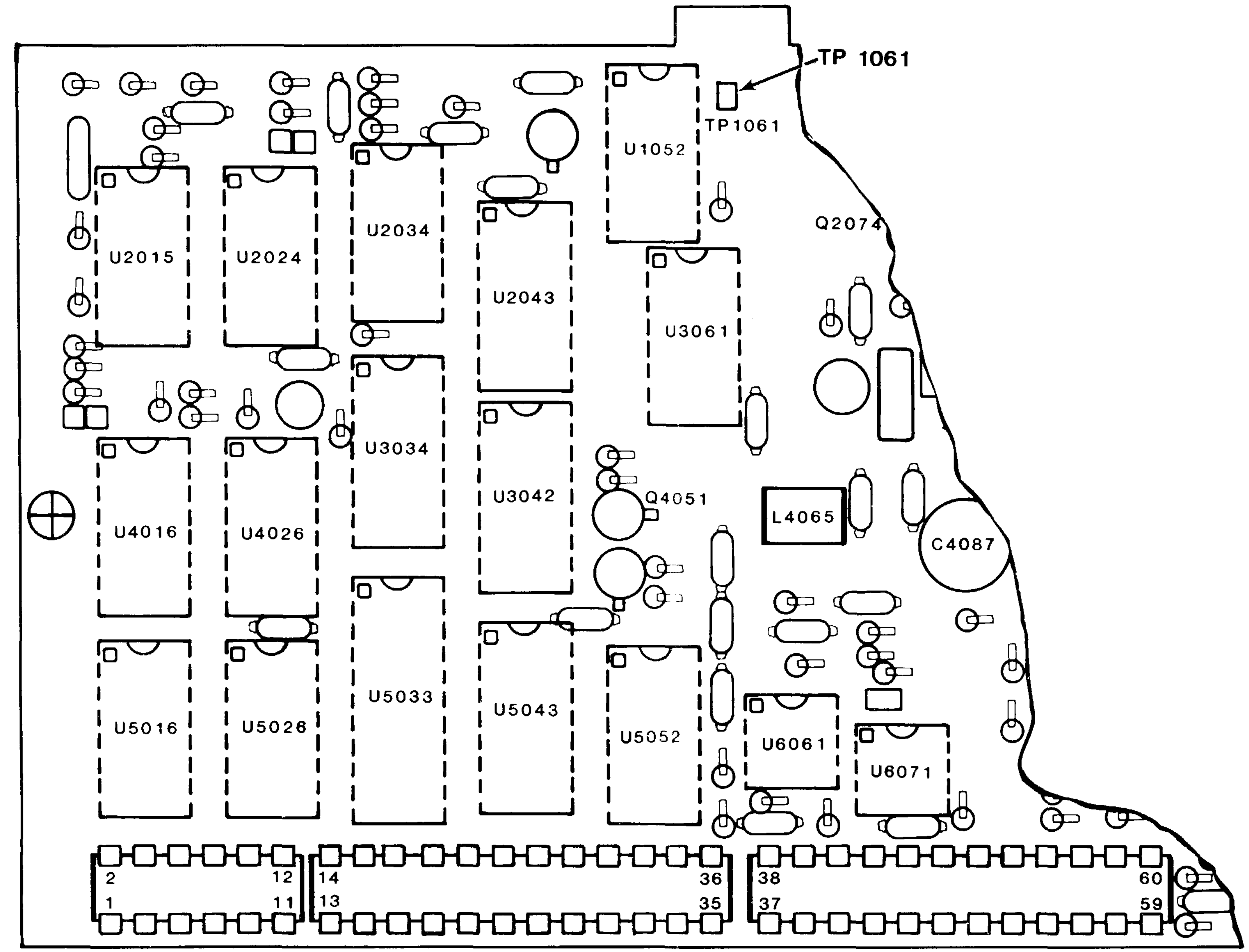


A66-CRT Readout circuit board.

EL9VP105

Max Span Dot Tuning Troubleshooting Figure FO-18





INPUT VOLTAGES
PIN 36 +15 V
PIN 44 −15 V
PIN 41 +5 V
PIN 43 −5 V

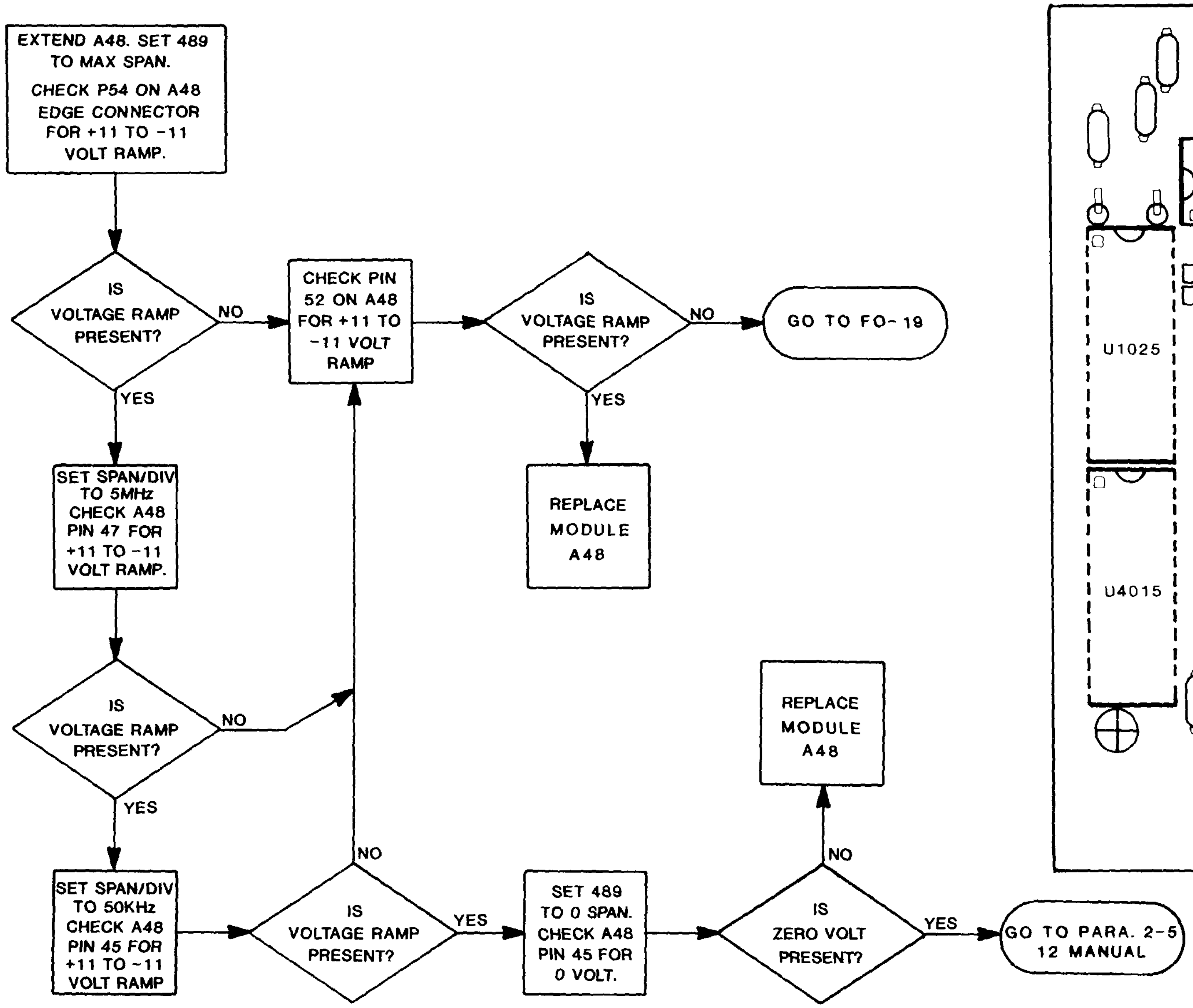
A72–Sweep circuit board.

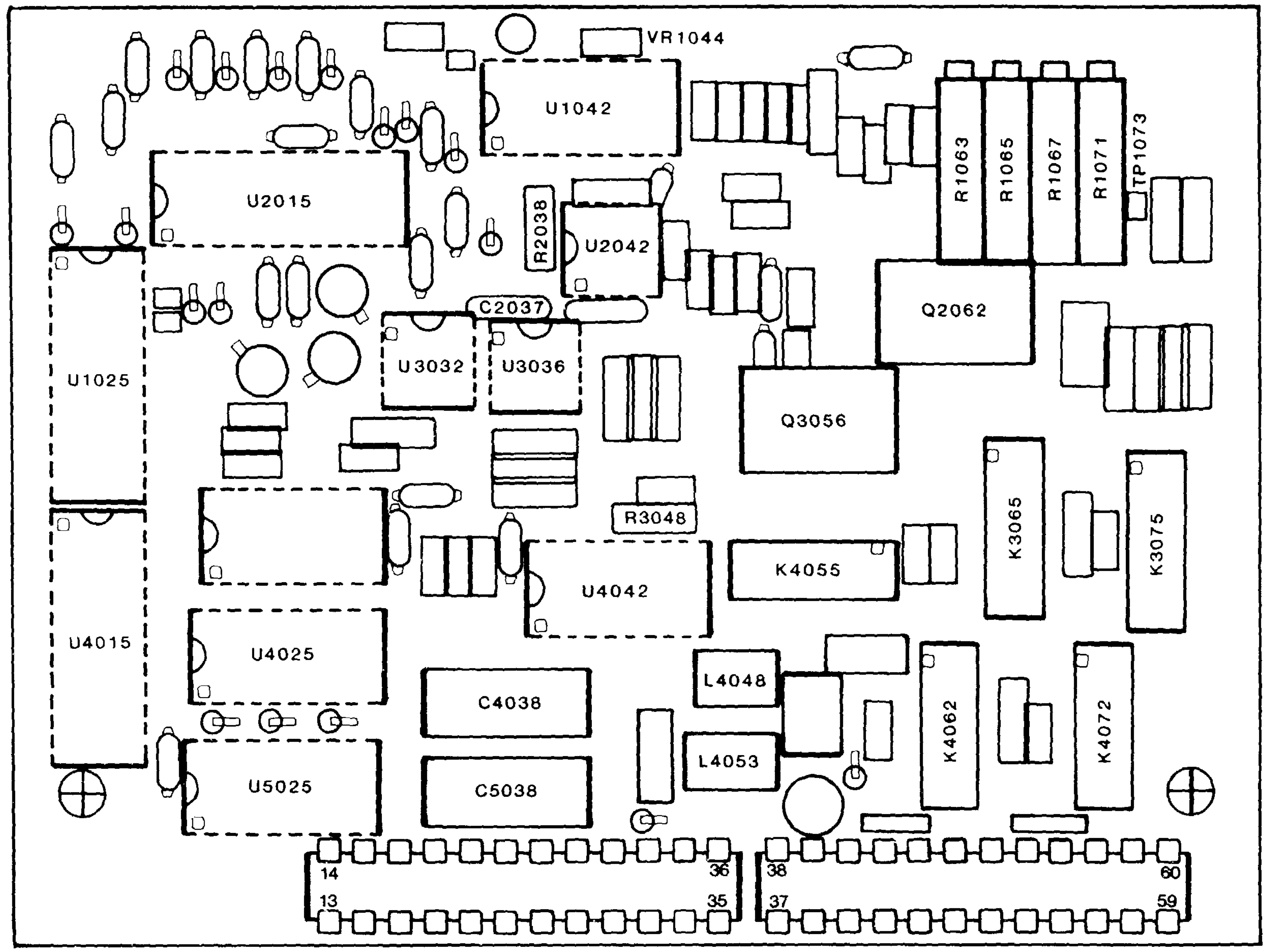
EL9VP106

"CHART A"

Time/Div	Auto
Intensity	Mid Range
Manual Scan	Mid Range
Peaking	Mid Range
Peak/Average	Mid Range
Min RF Atten dB	0dBm
Triggering (Free Run)	On

Sweep Troubleshooting Figure FO-19

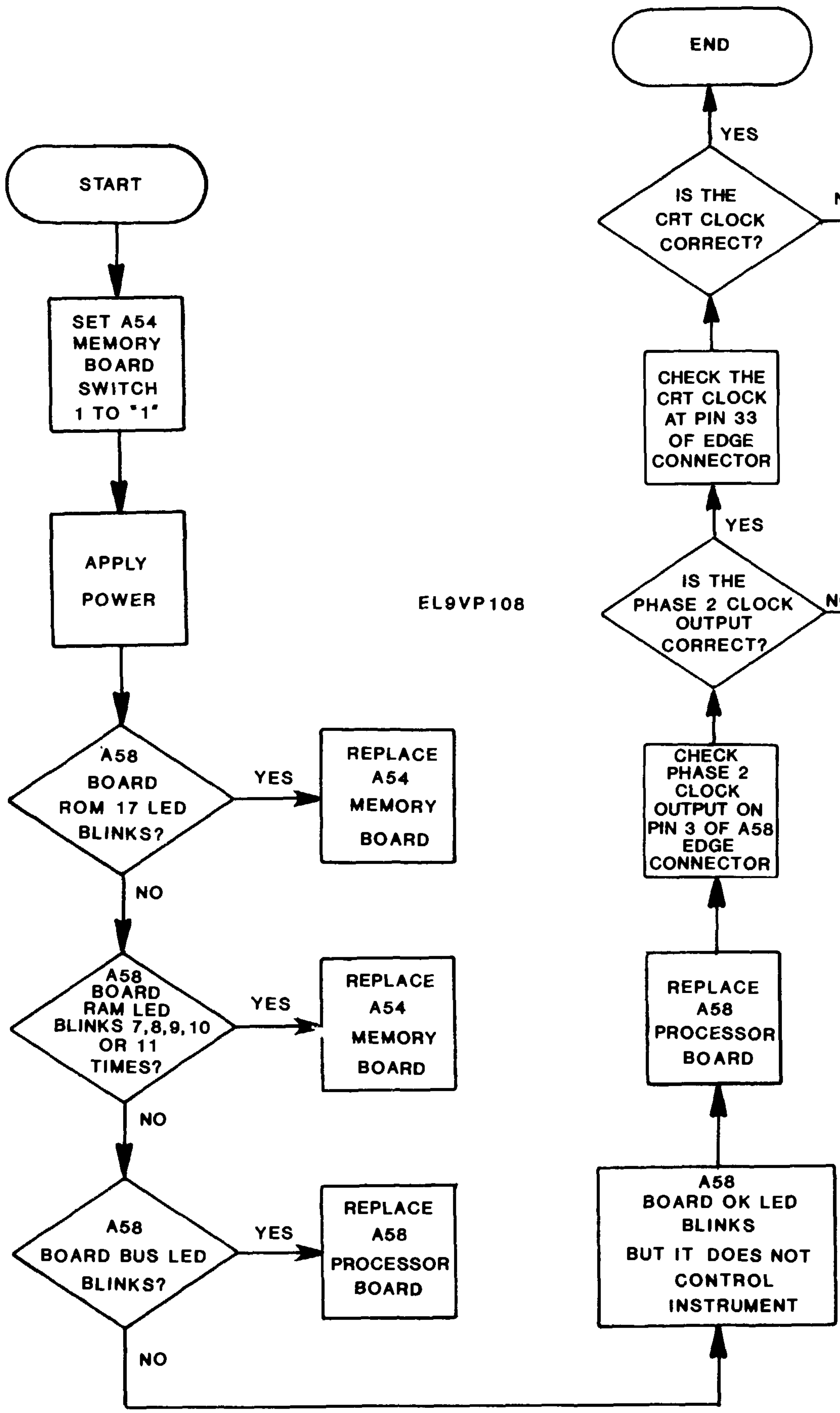


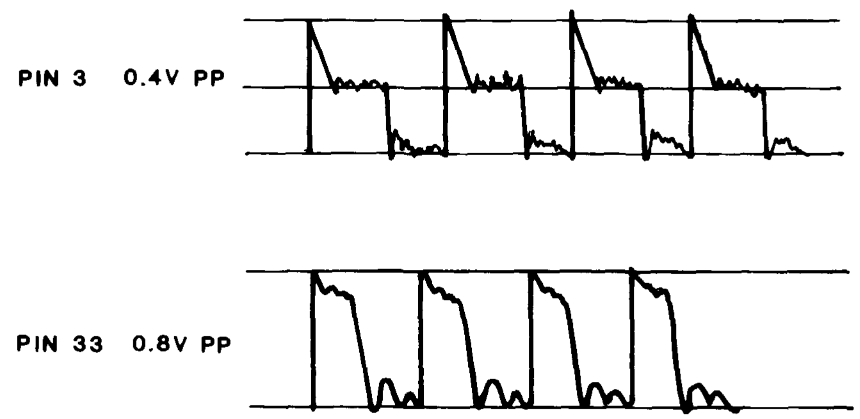


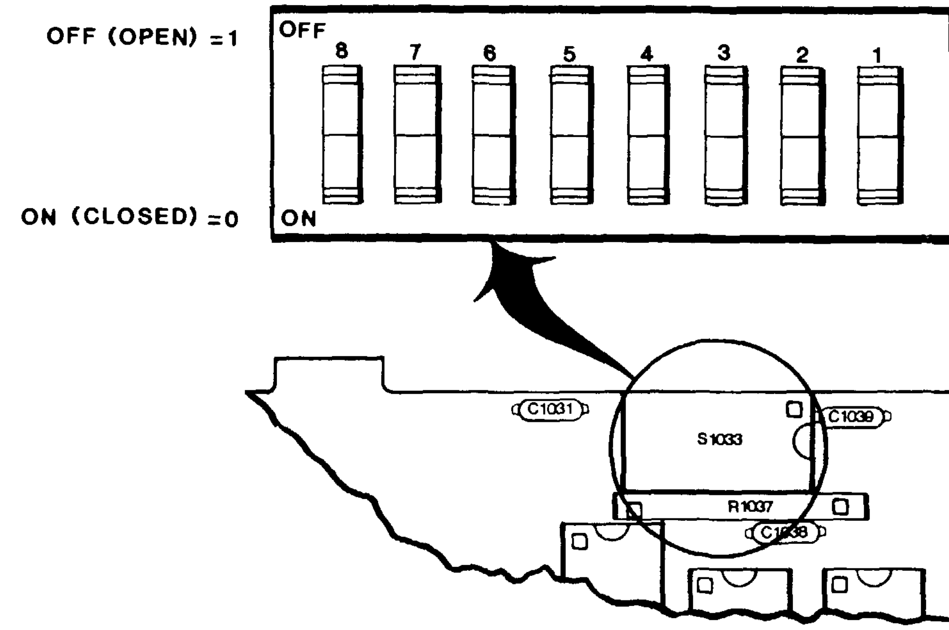
A48-Span Attenuator circuit board.

EL9VP107

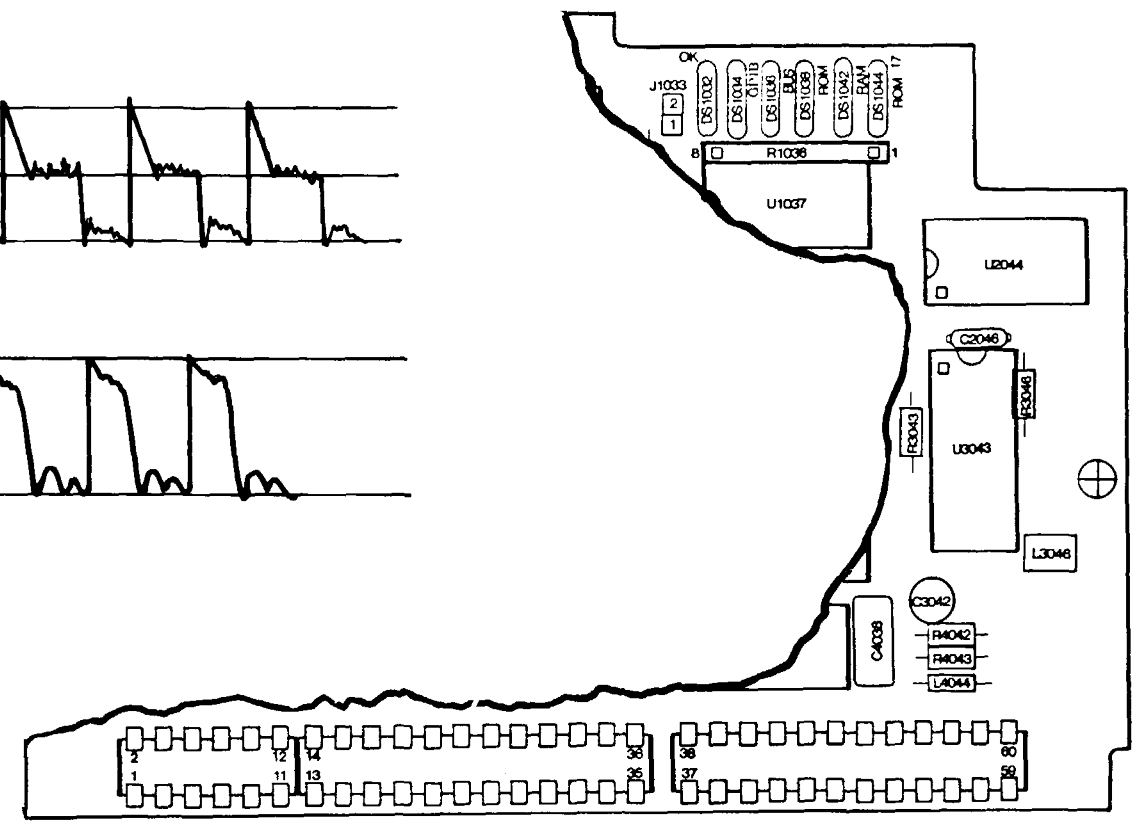
Span Attenuaor Troubleshooting Figure FO-20





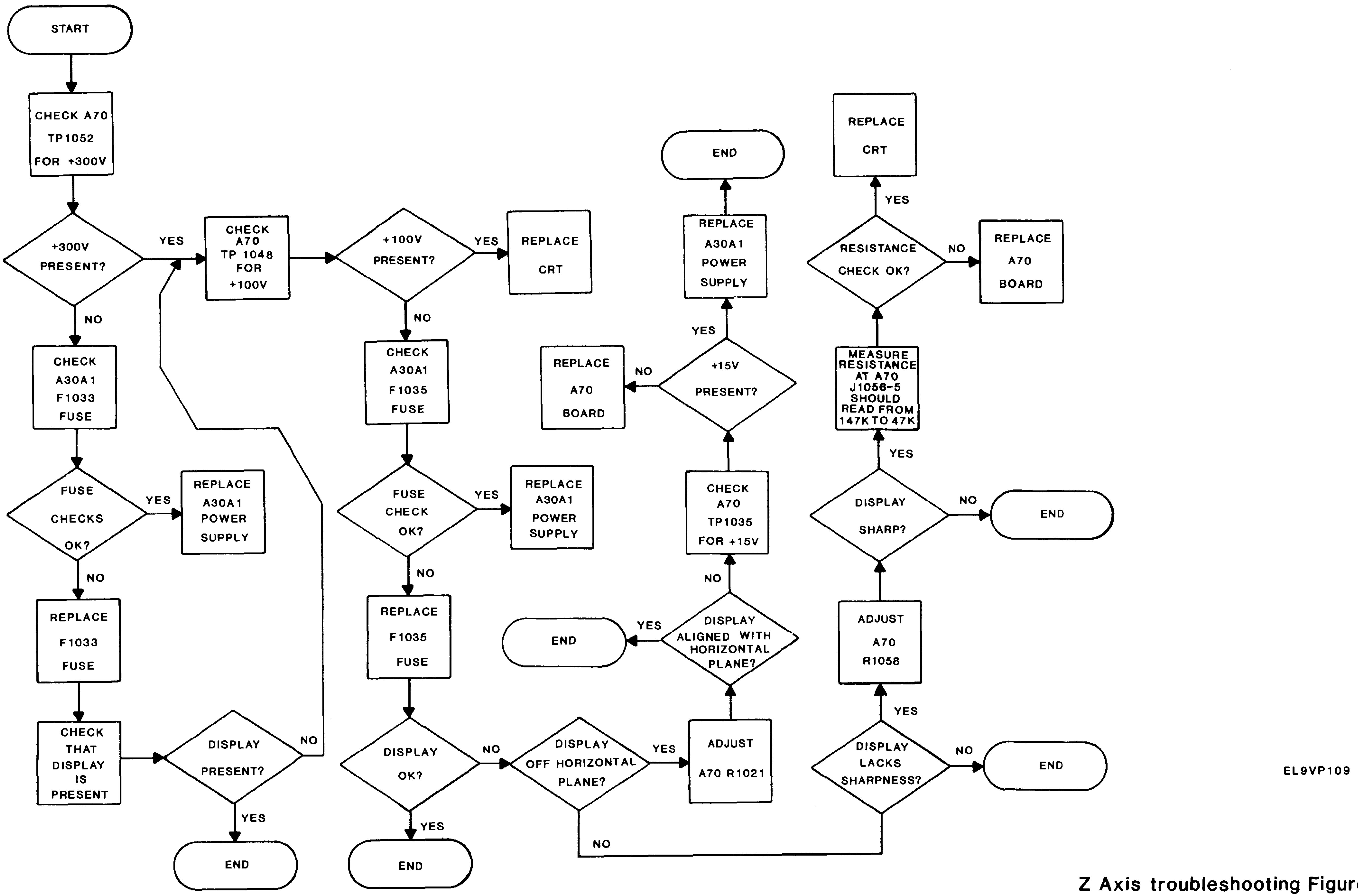


A54-MEMORY CIRCUIT BOARD.

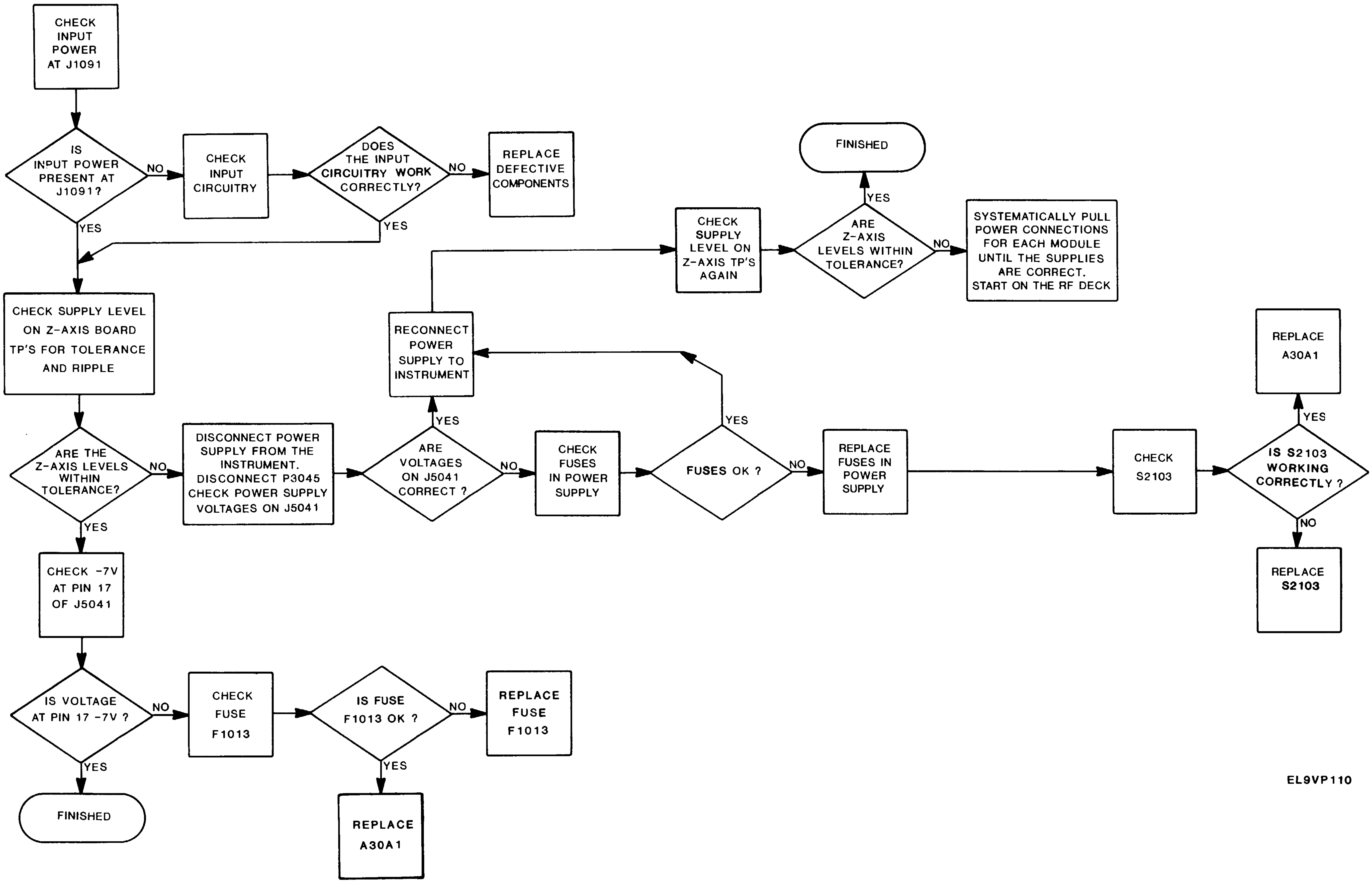


A58-PROCESSOR CIRCUIT BOARD

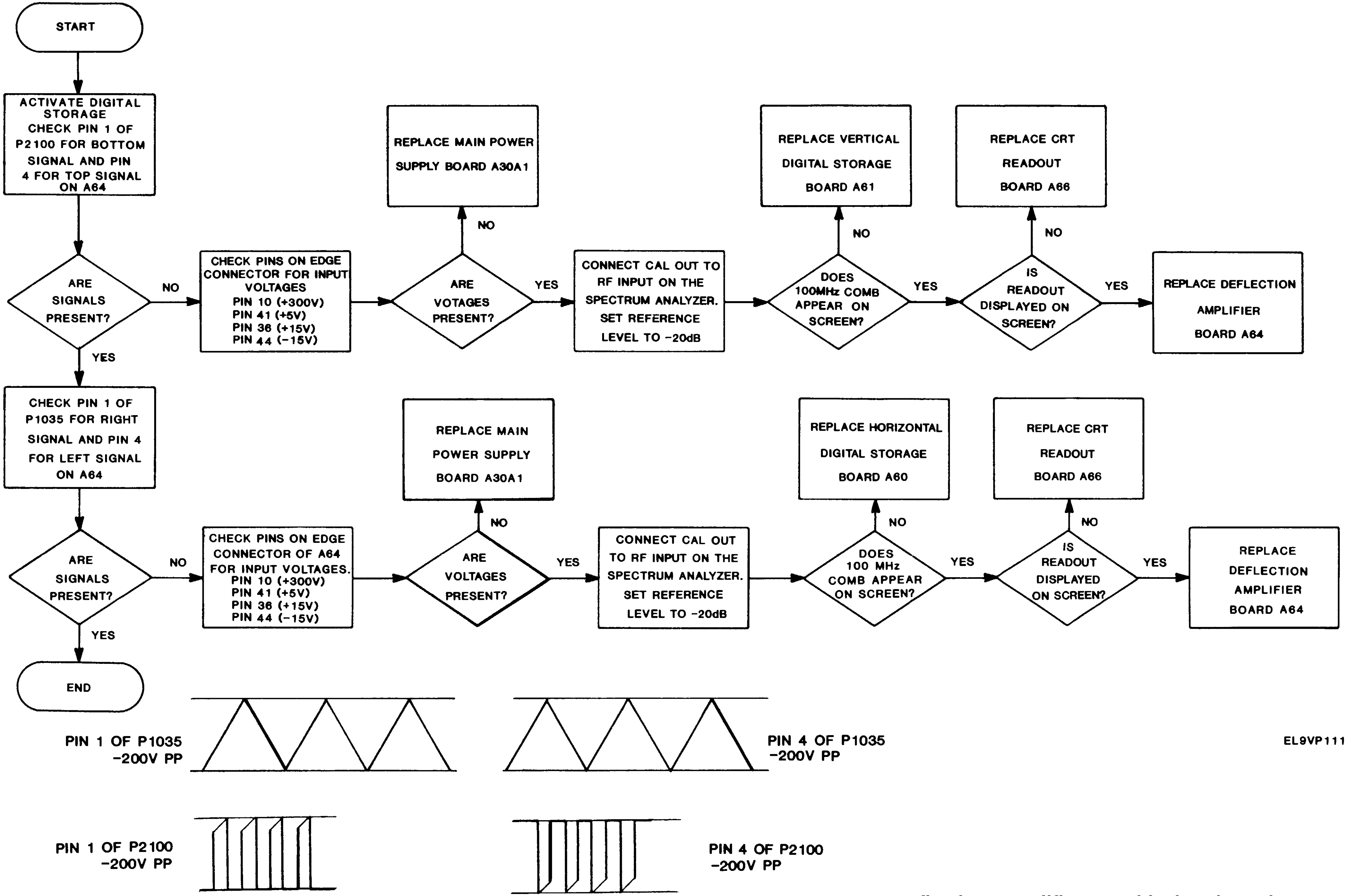
Memory And Processor Troubleshooting Figure FO-21



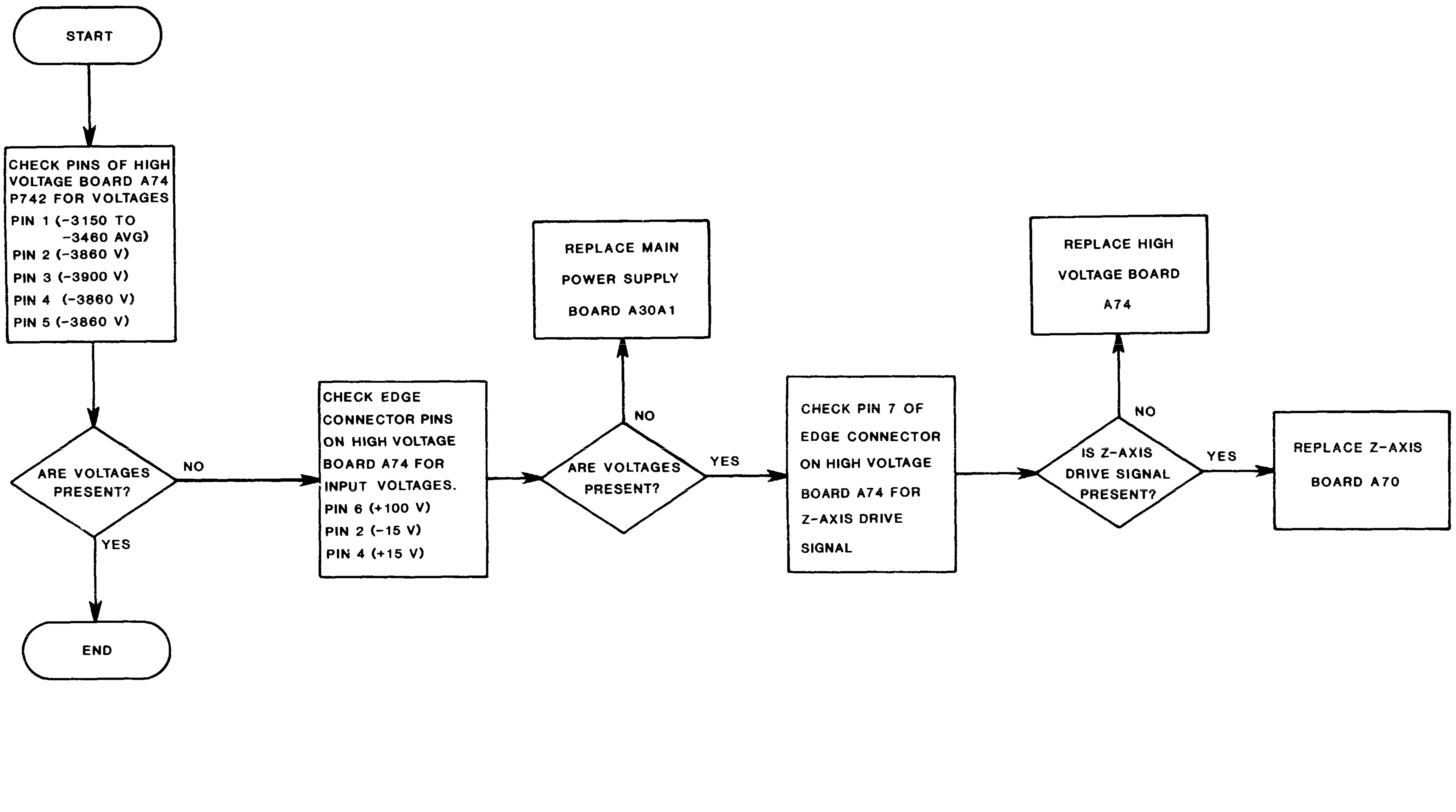
Z Axis troubleshooting Figure FO-22



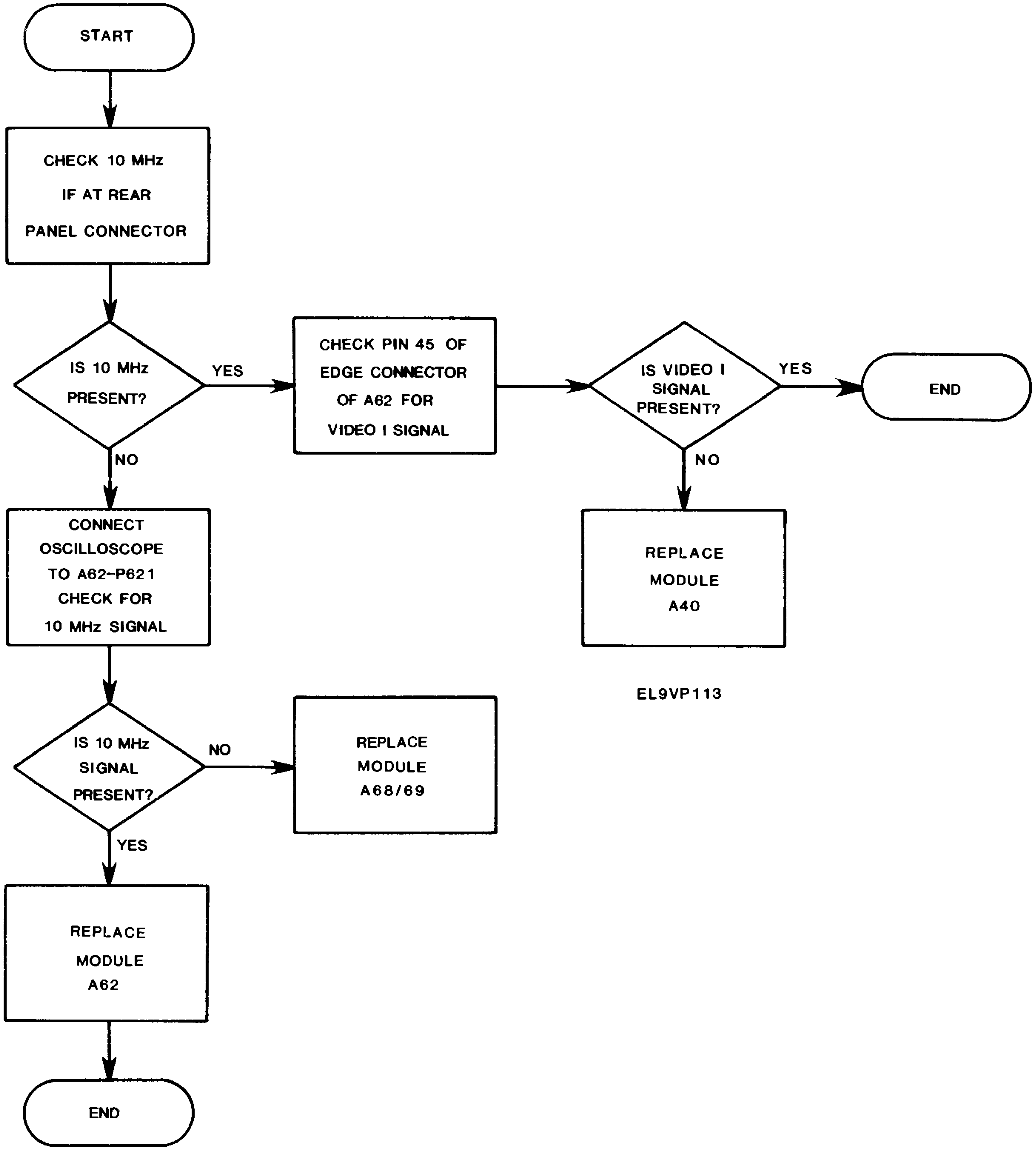
Power Supply Troubleshooting Figure FO-23



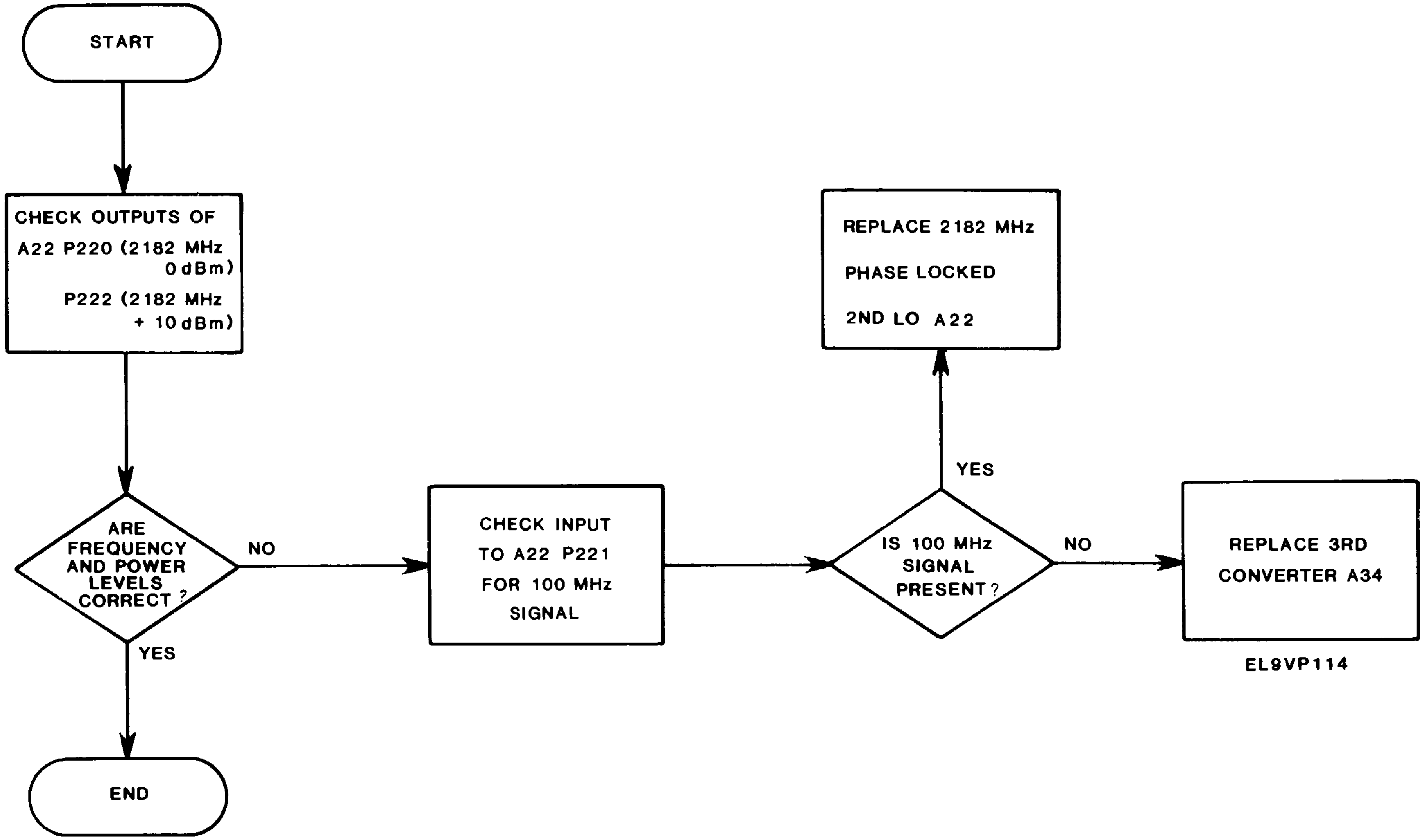
Deflection Amplifier Troubleshooting Figure FO–24



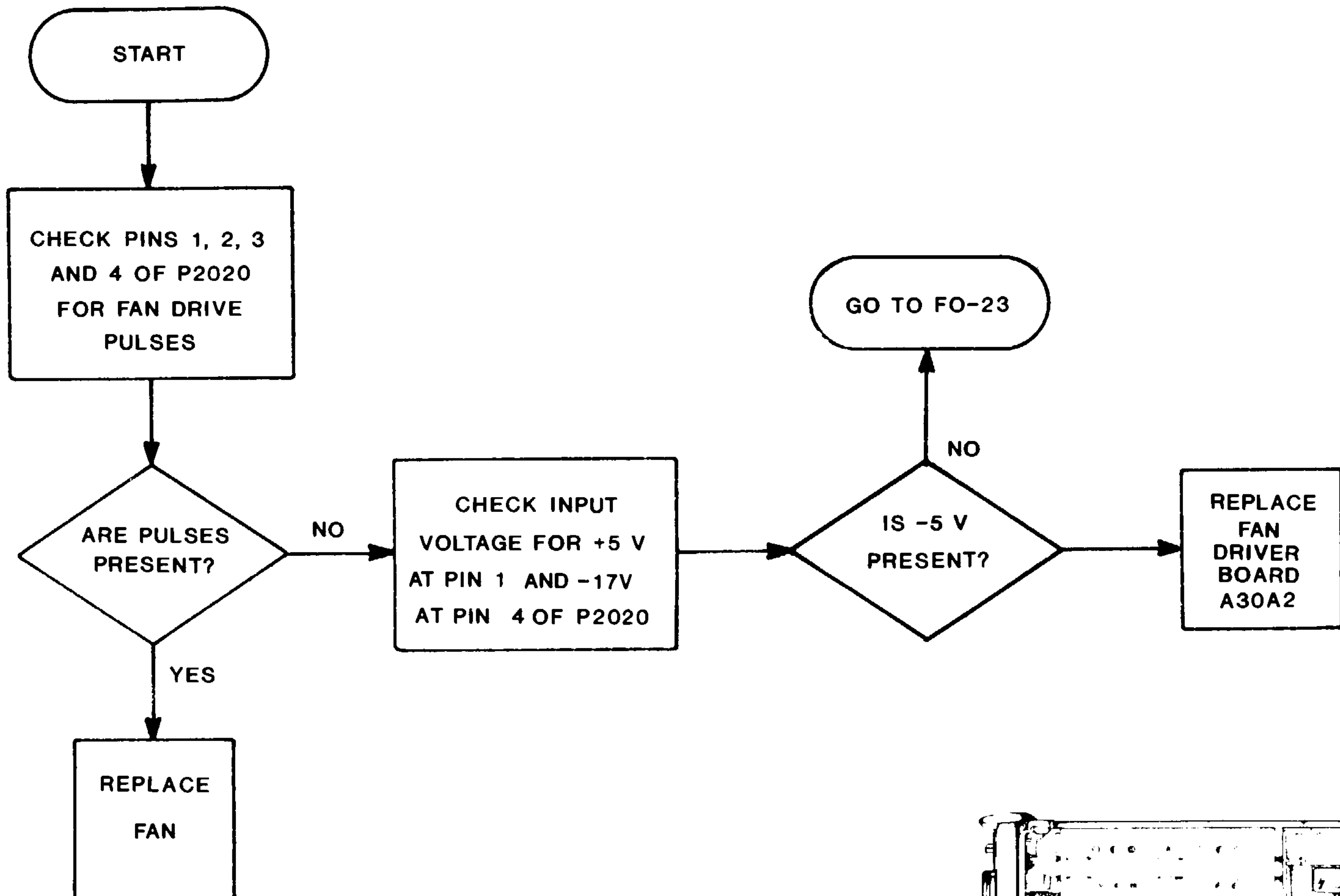
High Voltage Board Troubleshooting Figure FO-25

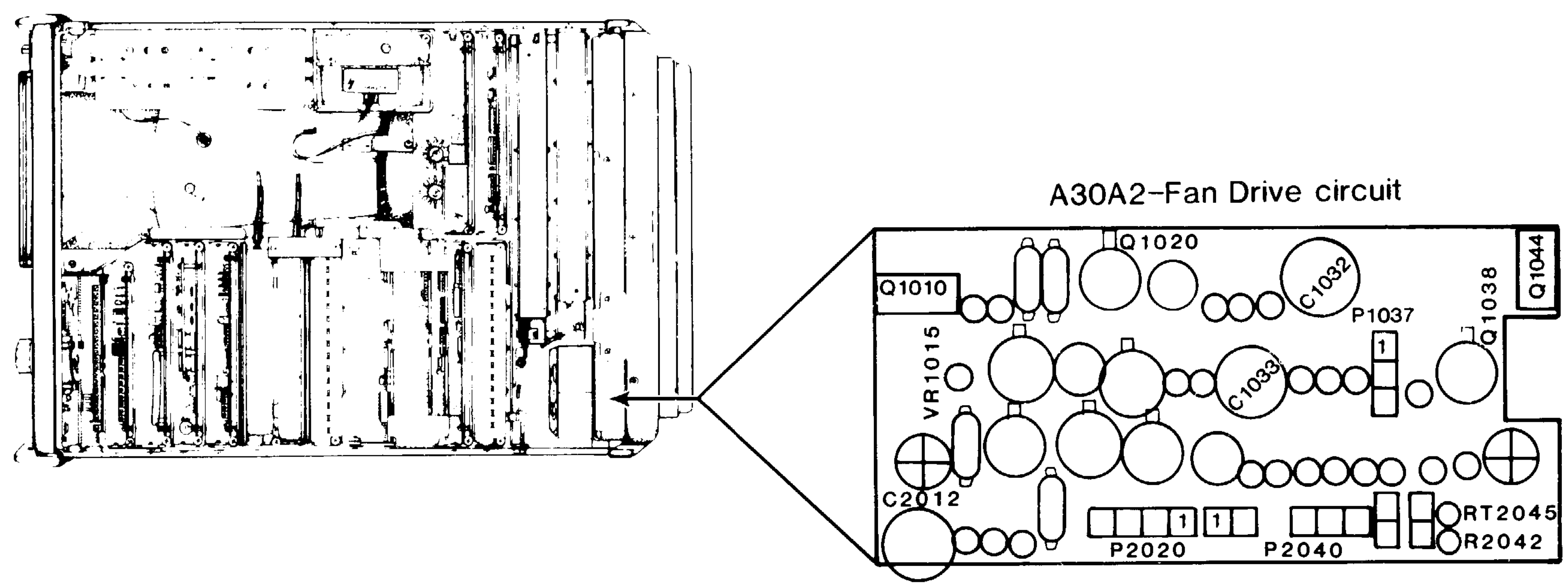


Log Amplifier And Detector Troubleshooting Figure FO-26



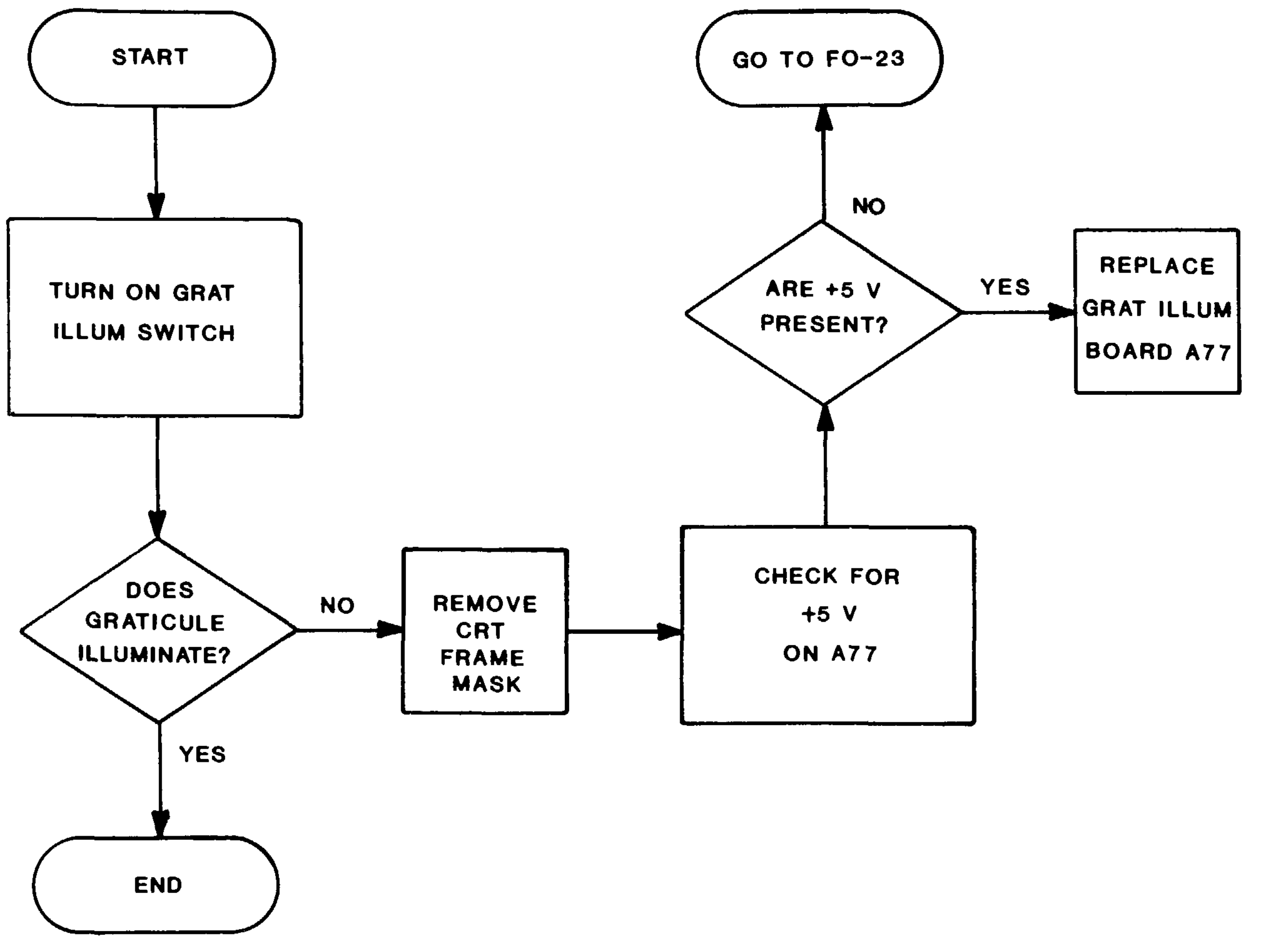
2182 MHz Phaselocked 2ND LO Troubleshooting Figure FO-27

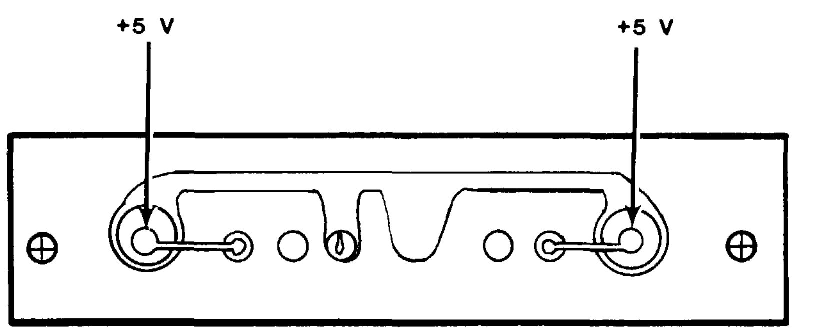




EL9VP115

Fan Driver Board Troubleshooting Figure FO-28

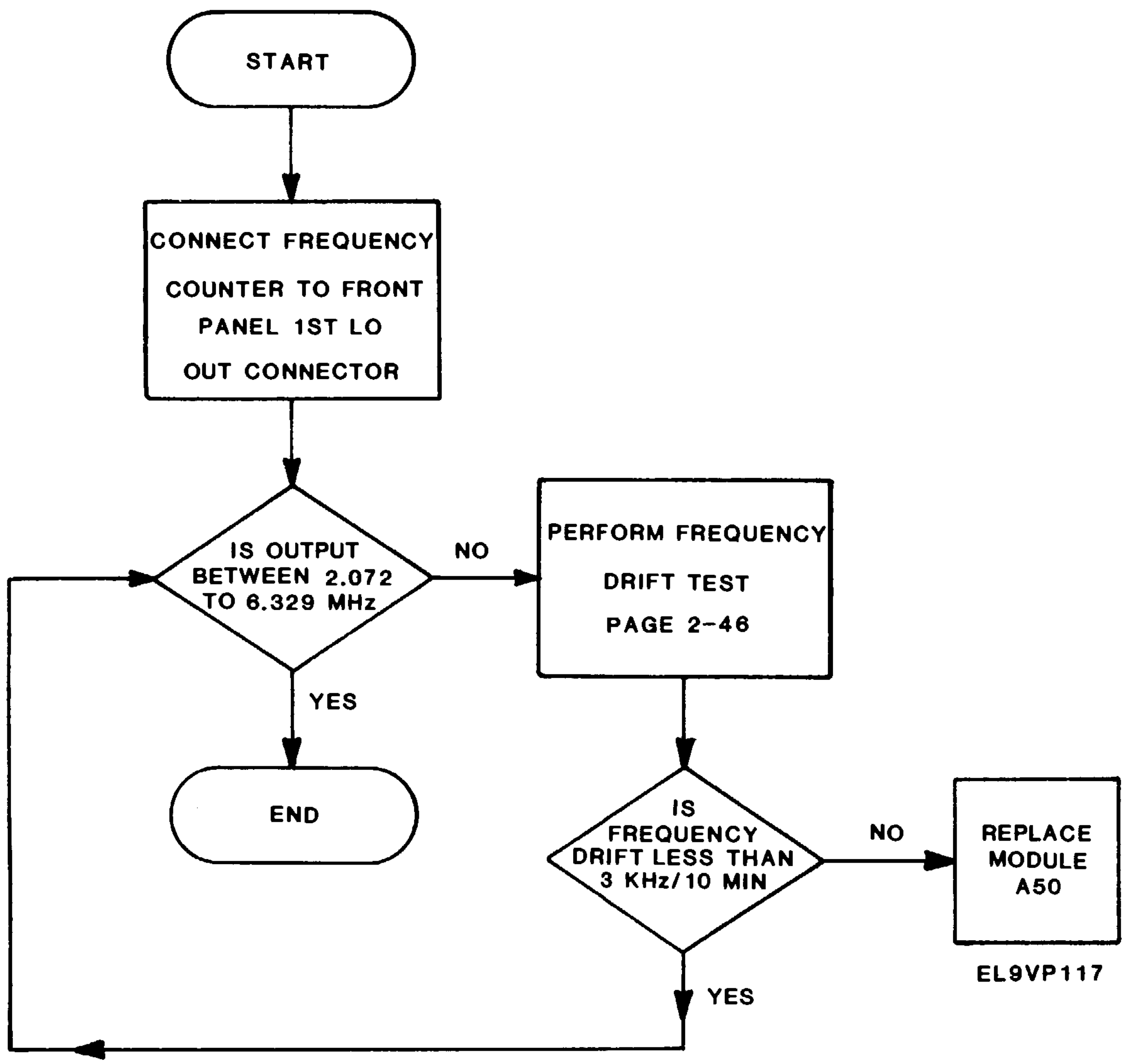




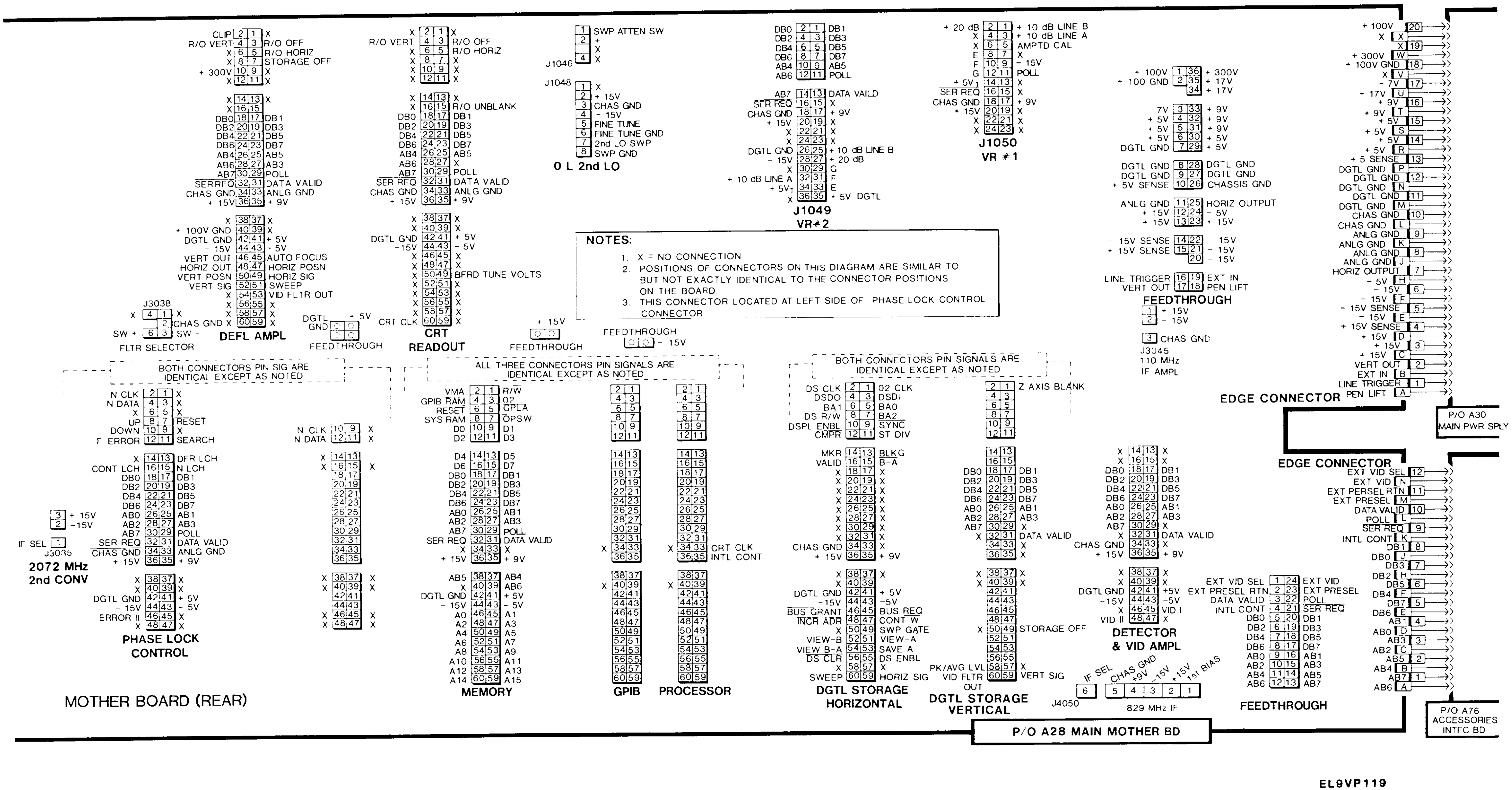
A77 GRATICULE LIGHT BOARD

EL9VP116

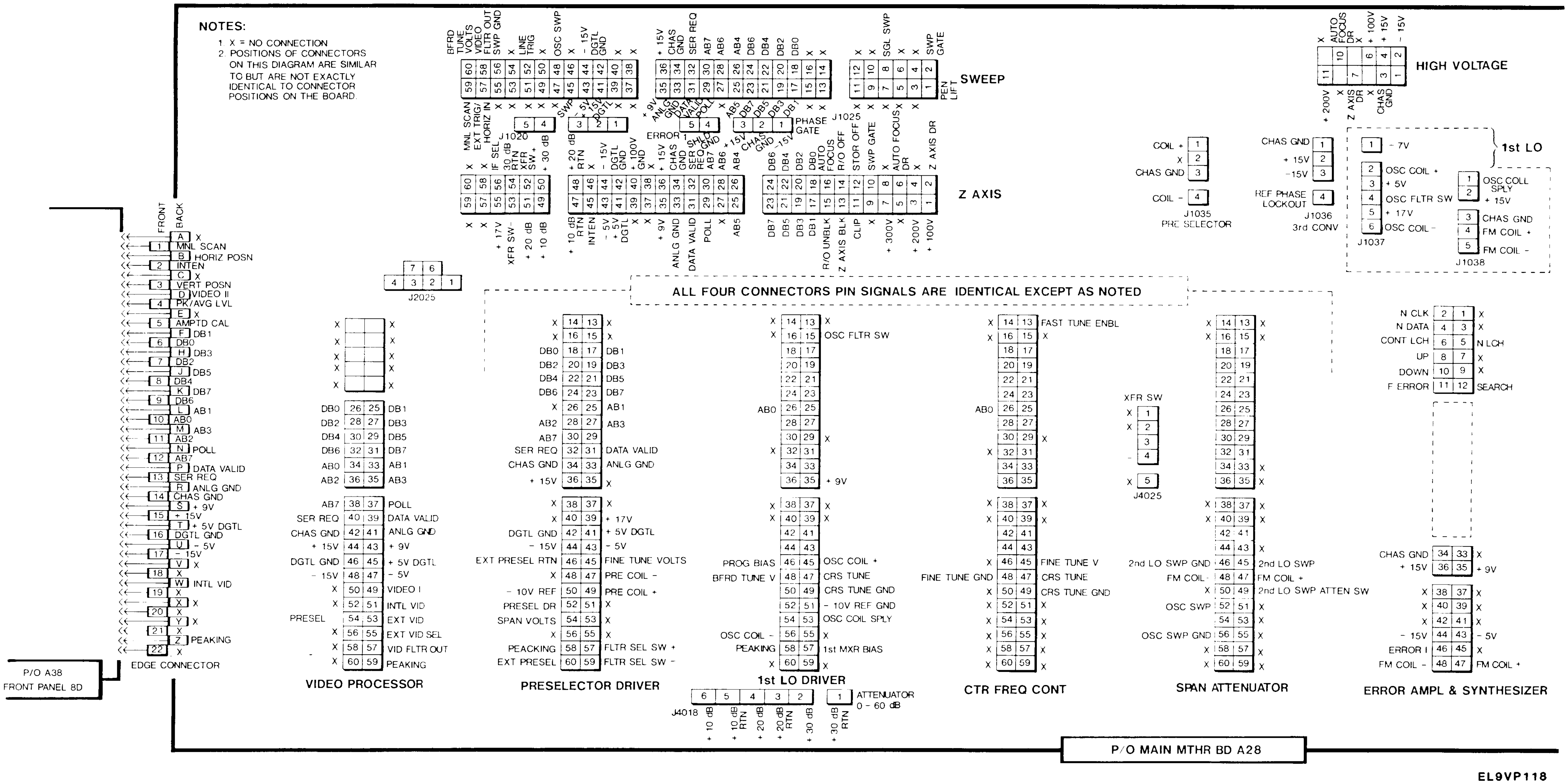
Graticule Ligght Board Troubleshooting Figure FO-29



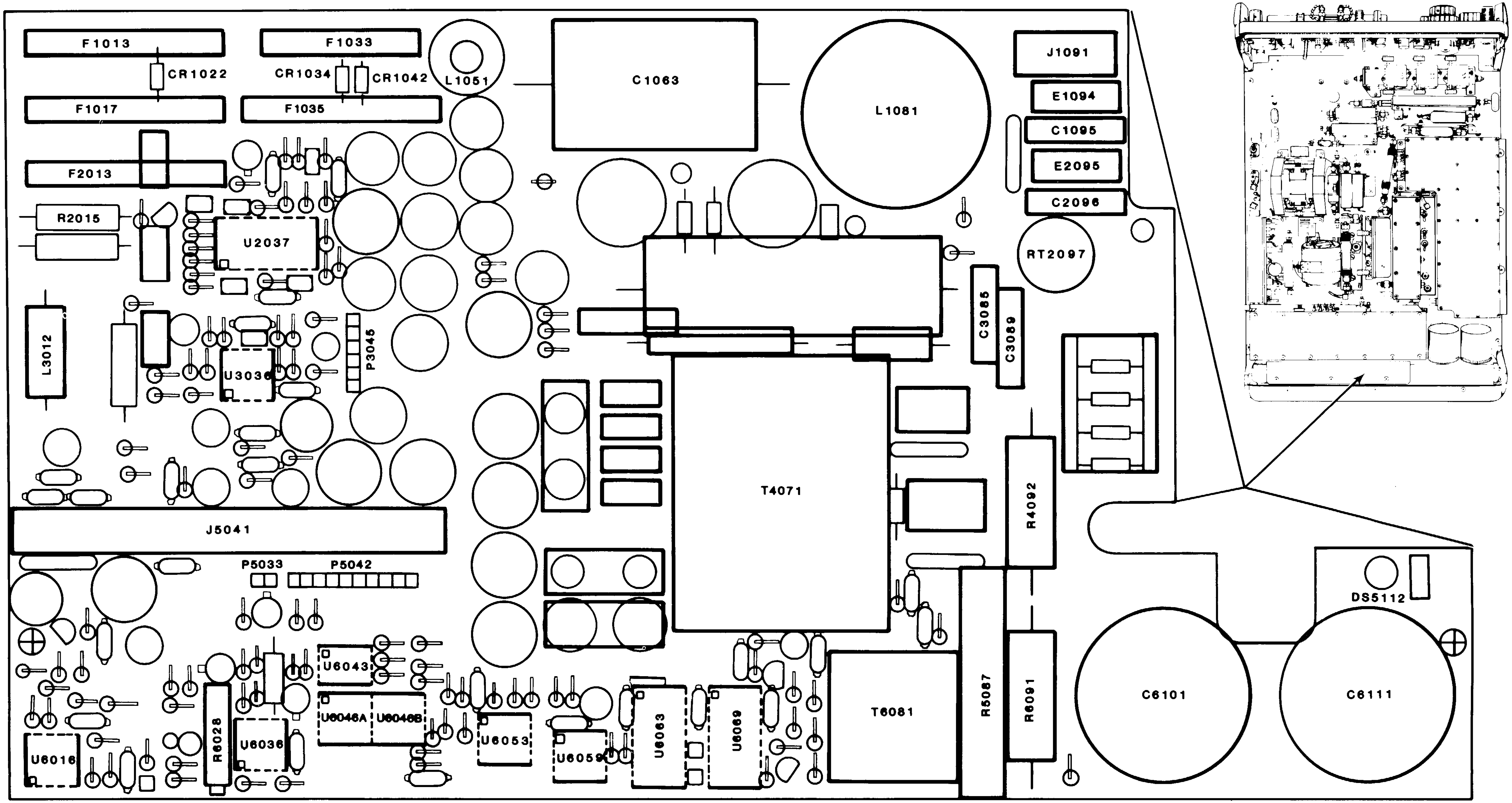
1ST LO Troubleshooting Figure FO-30



Main Mother Board (1 of 2) Figure FO-31



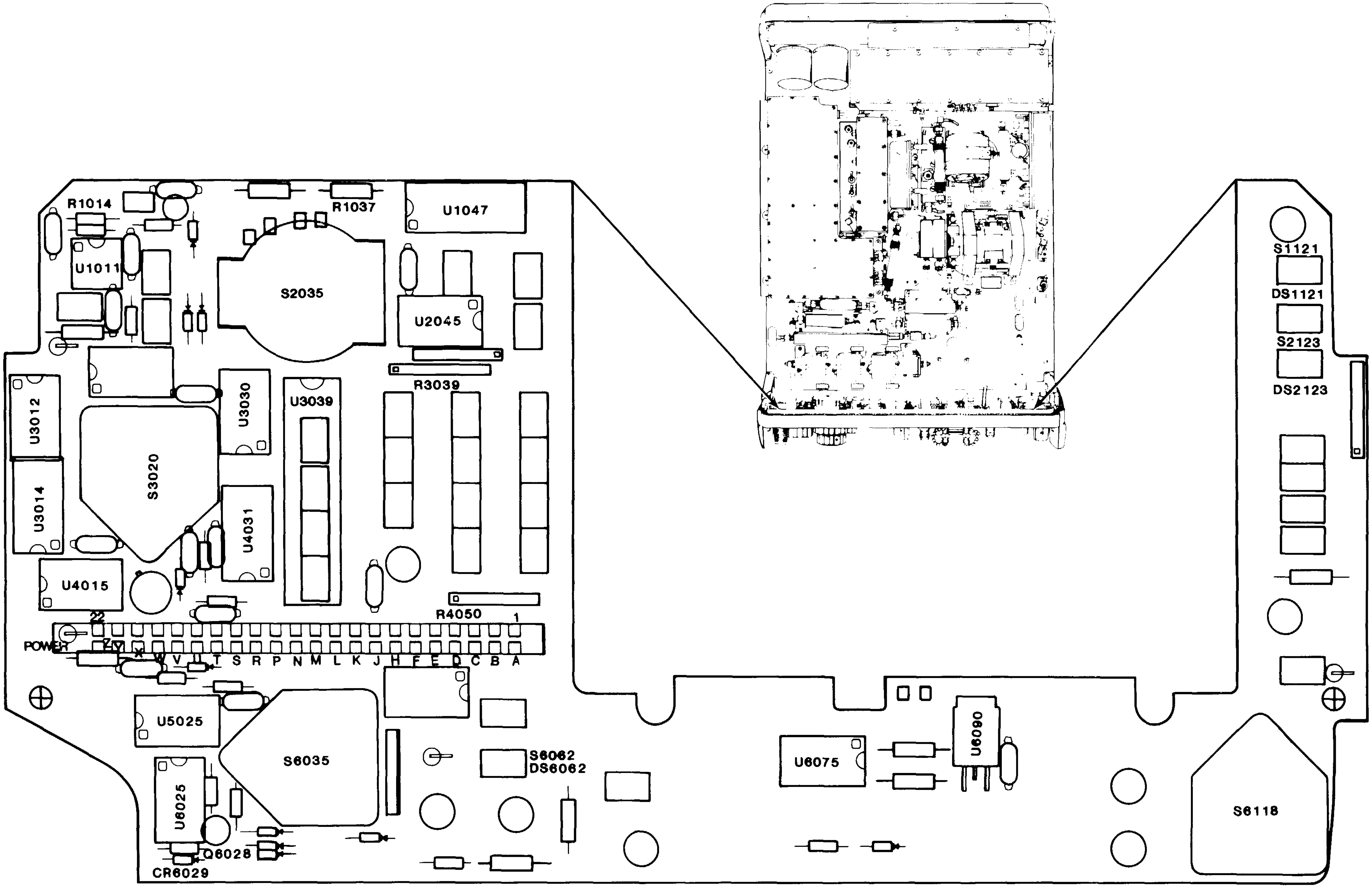
Main Mother Board (2 of 2) Figure FO-31



A30A1-Main Power Supply cicuit board

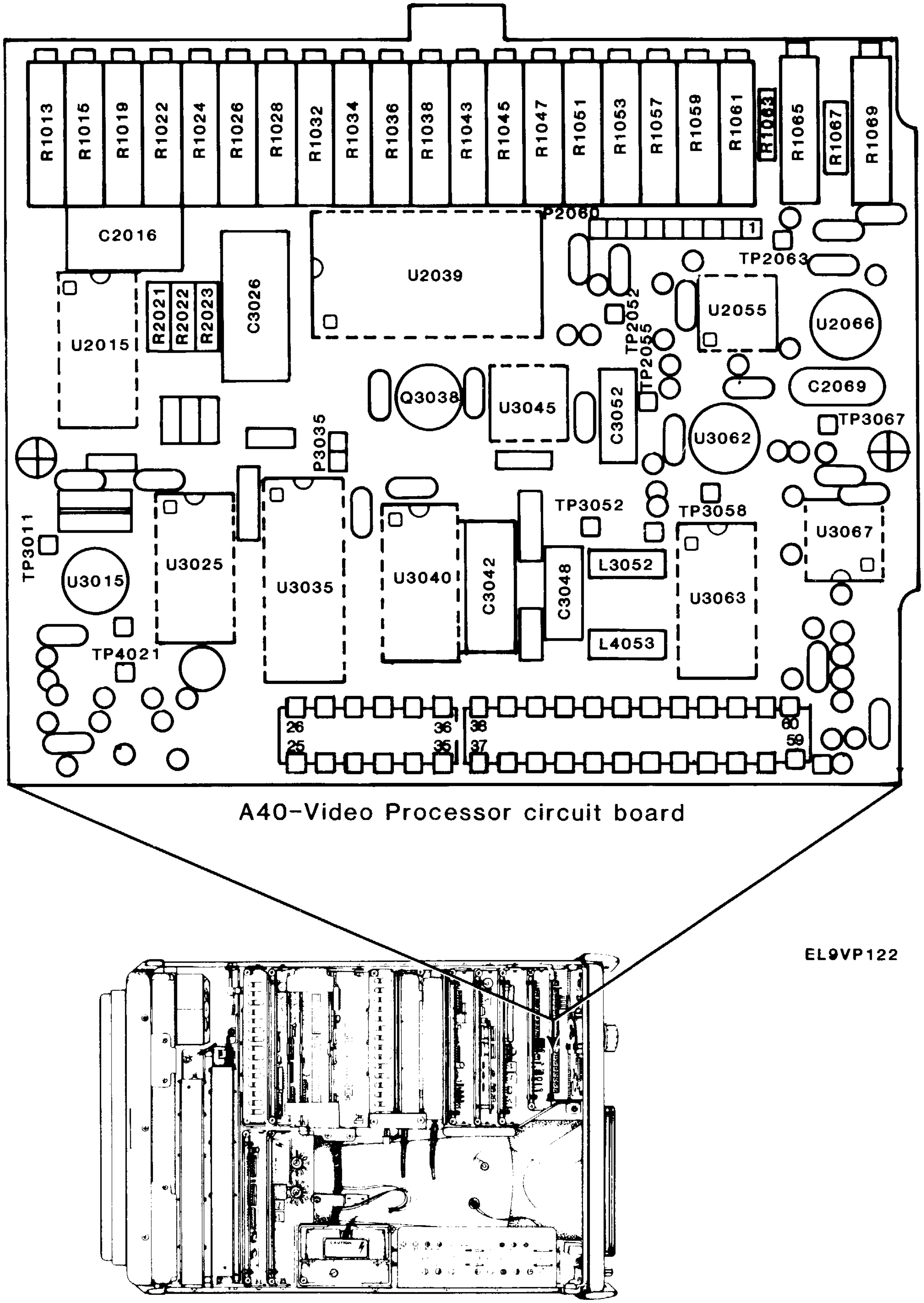
EL9VP120

Main Power Supply Board Layout Figure FO-32

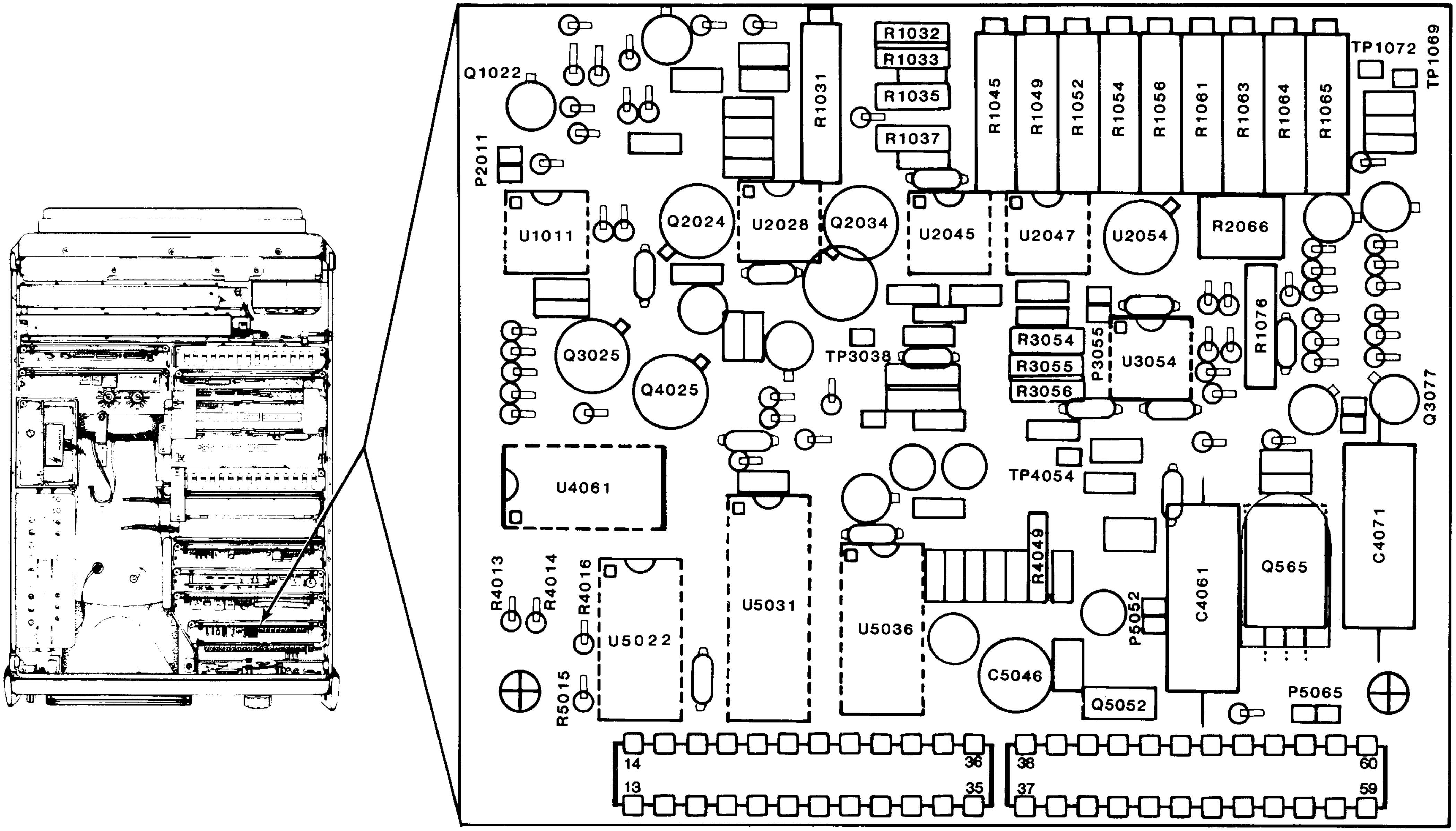


A38-Front Panel circuit board

Front Panel Board Layout Figure FO-33



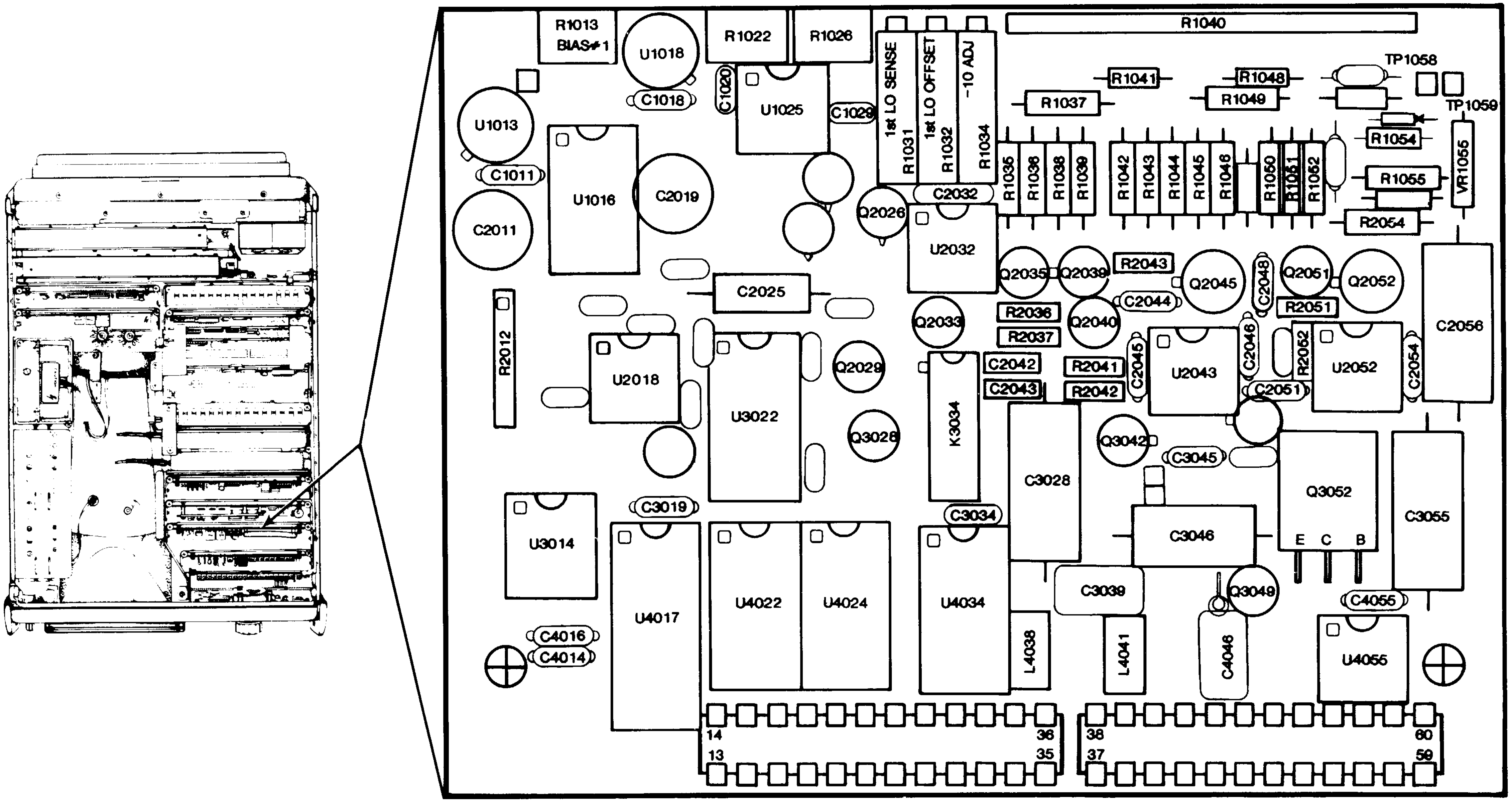
Video Processor Board Layout Figure FO–34



A42–Preselector Driver circuit board.

EL9VP123

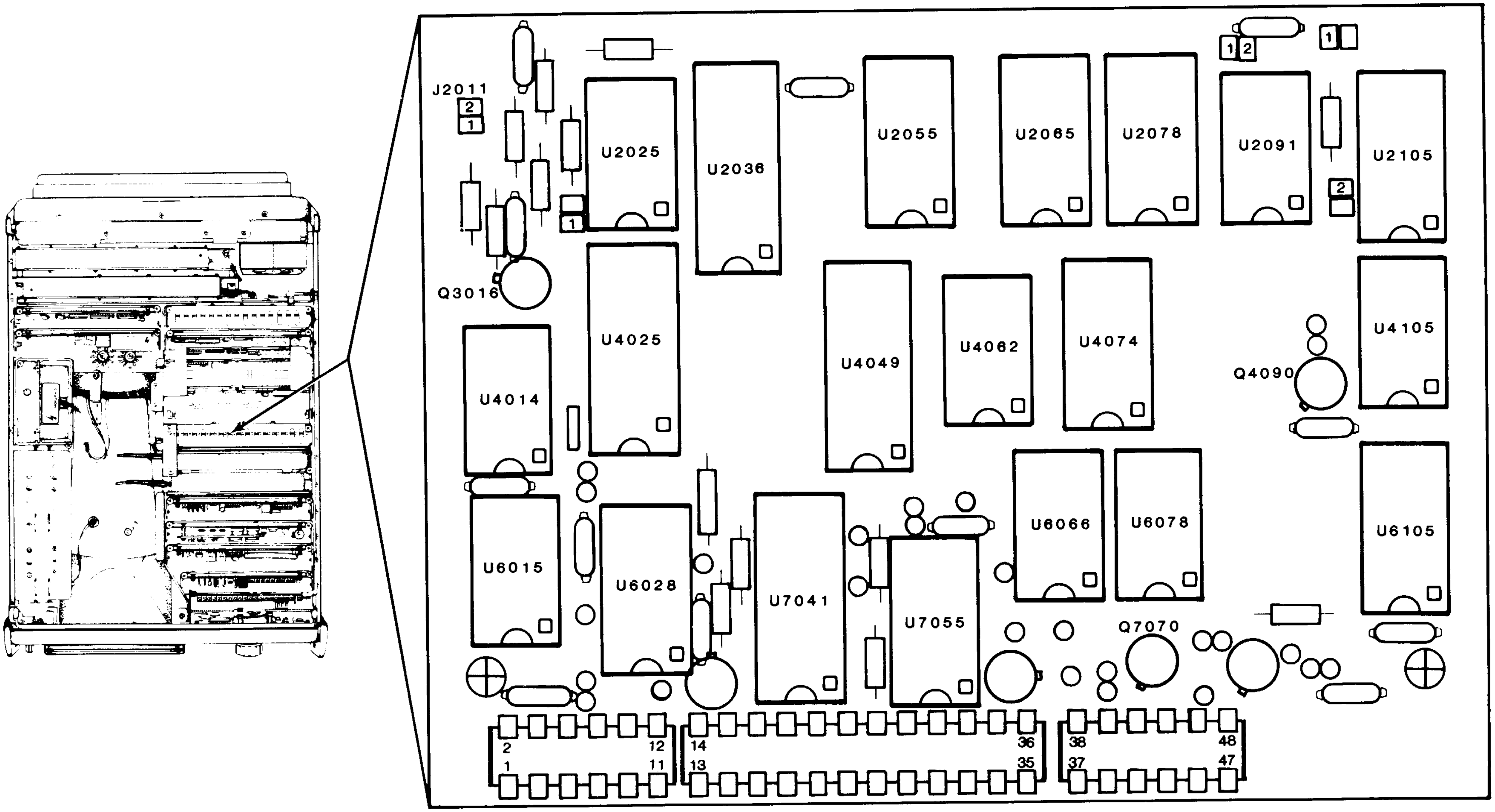
Preselector Driver Board Layout Figure FO-35



A44–1st LO Driver circuit board.

EL9VP124

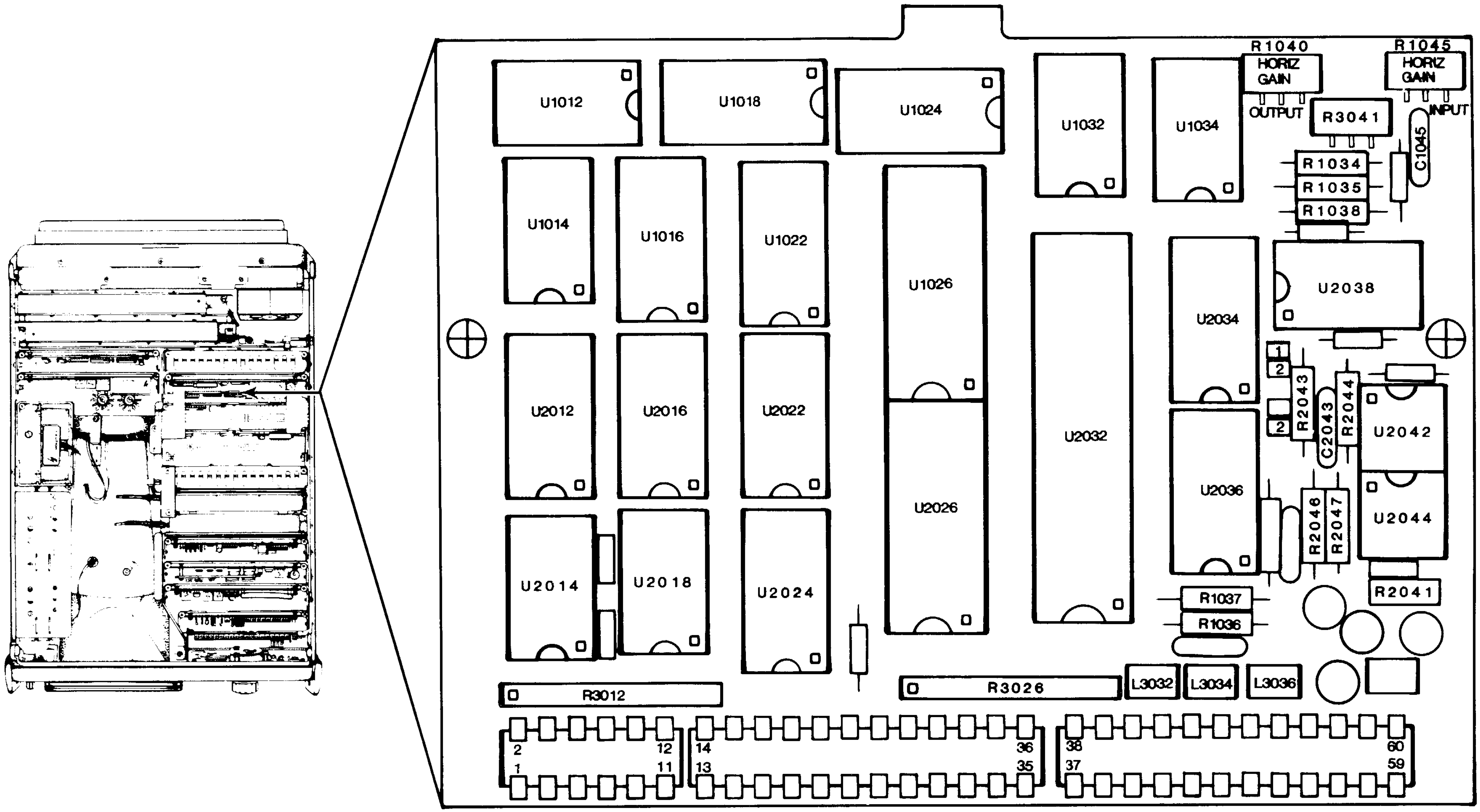
1ST LO Driver Board Layout Figure FO-36



A51-Phase Lock Control circuit board.

EL9VP125

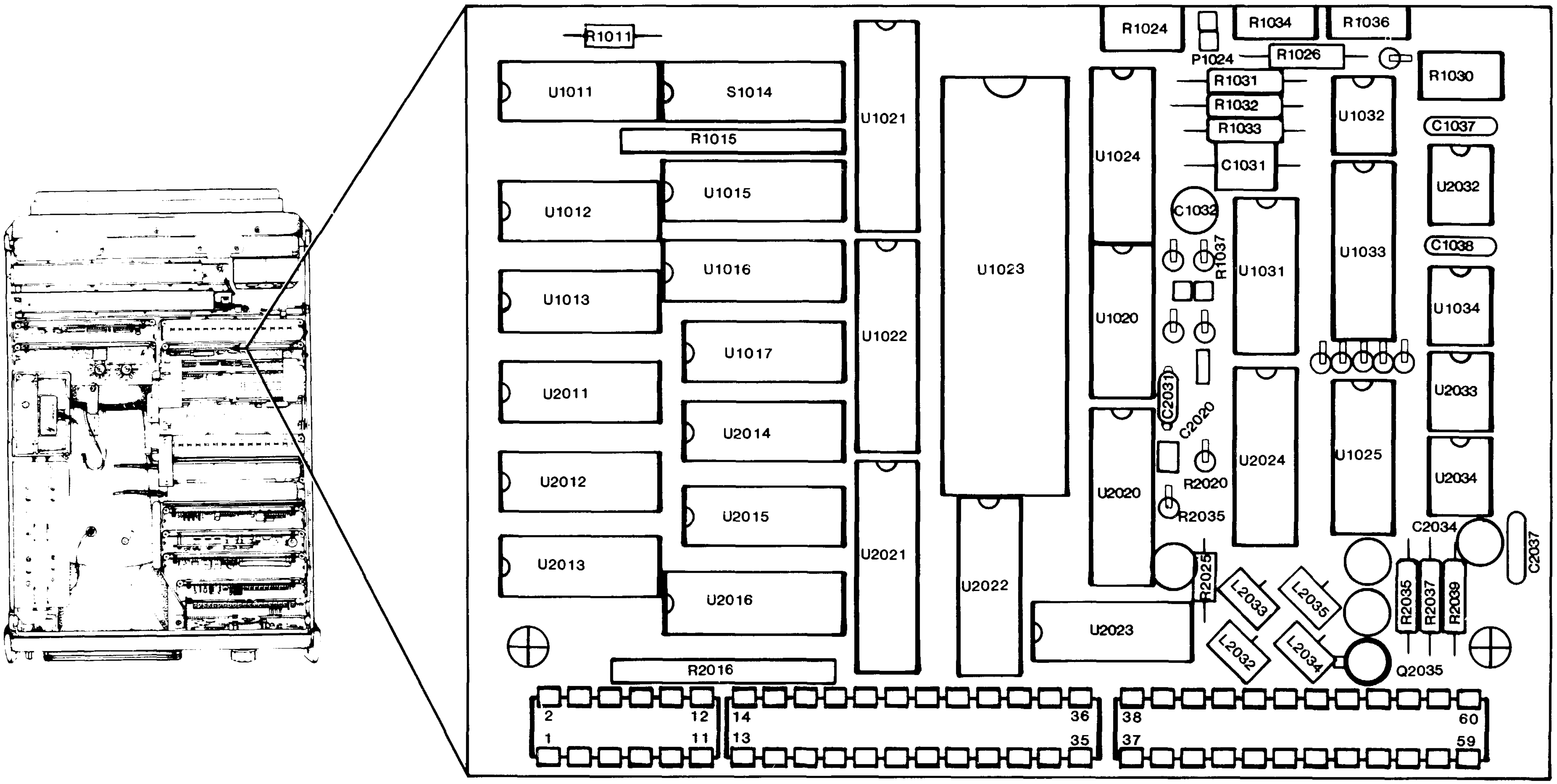
Phase Lock Control Board Layout Figure FO-37



A60–Digital Storage Horizontal circuit board.

EL9VP126

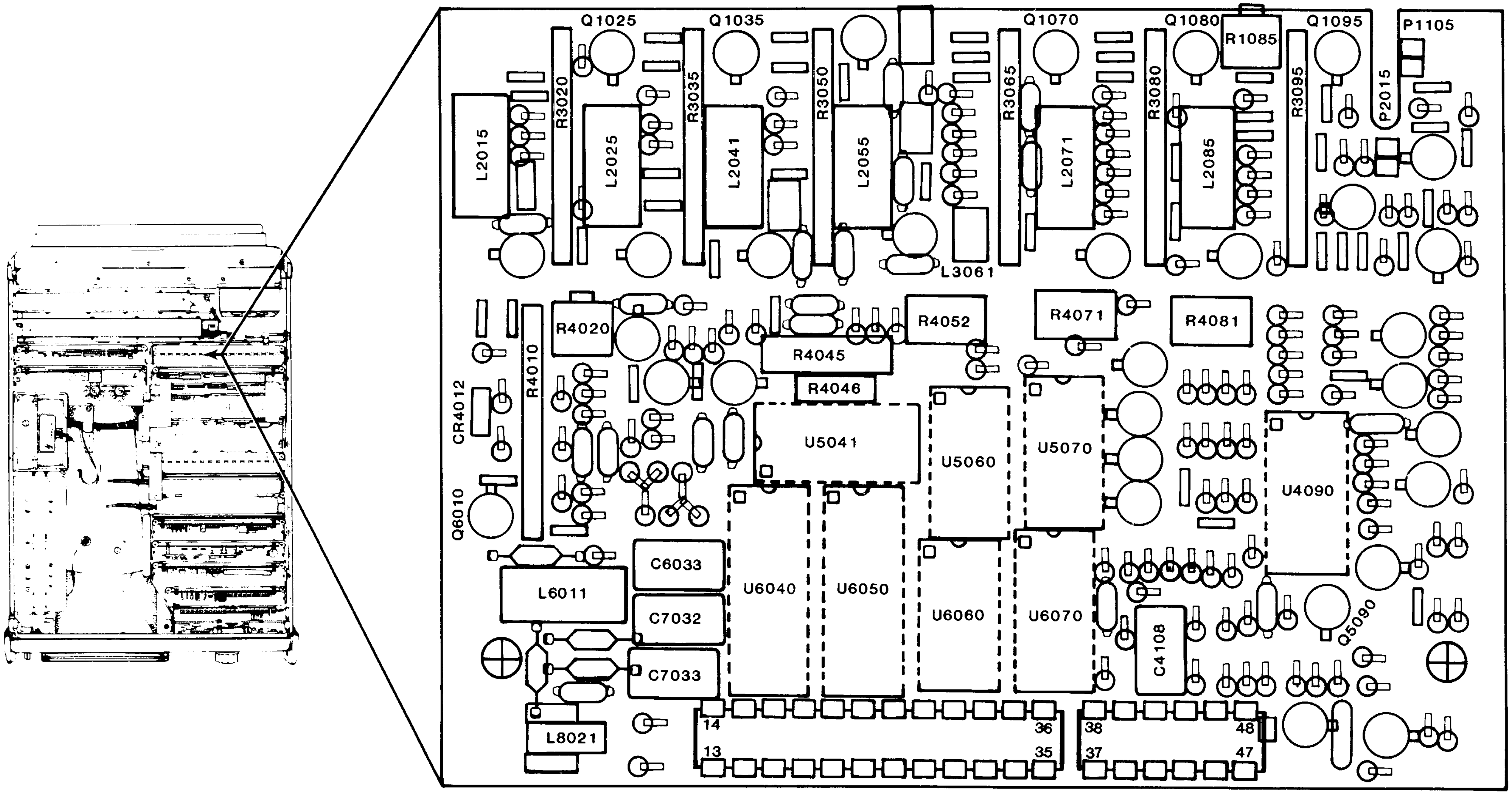
Digital Storage Horizontal Board Layout Figure FO-38



A61-Digital Storage Vertical circuit board.

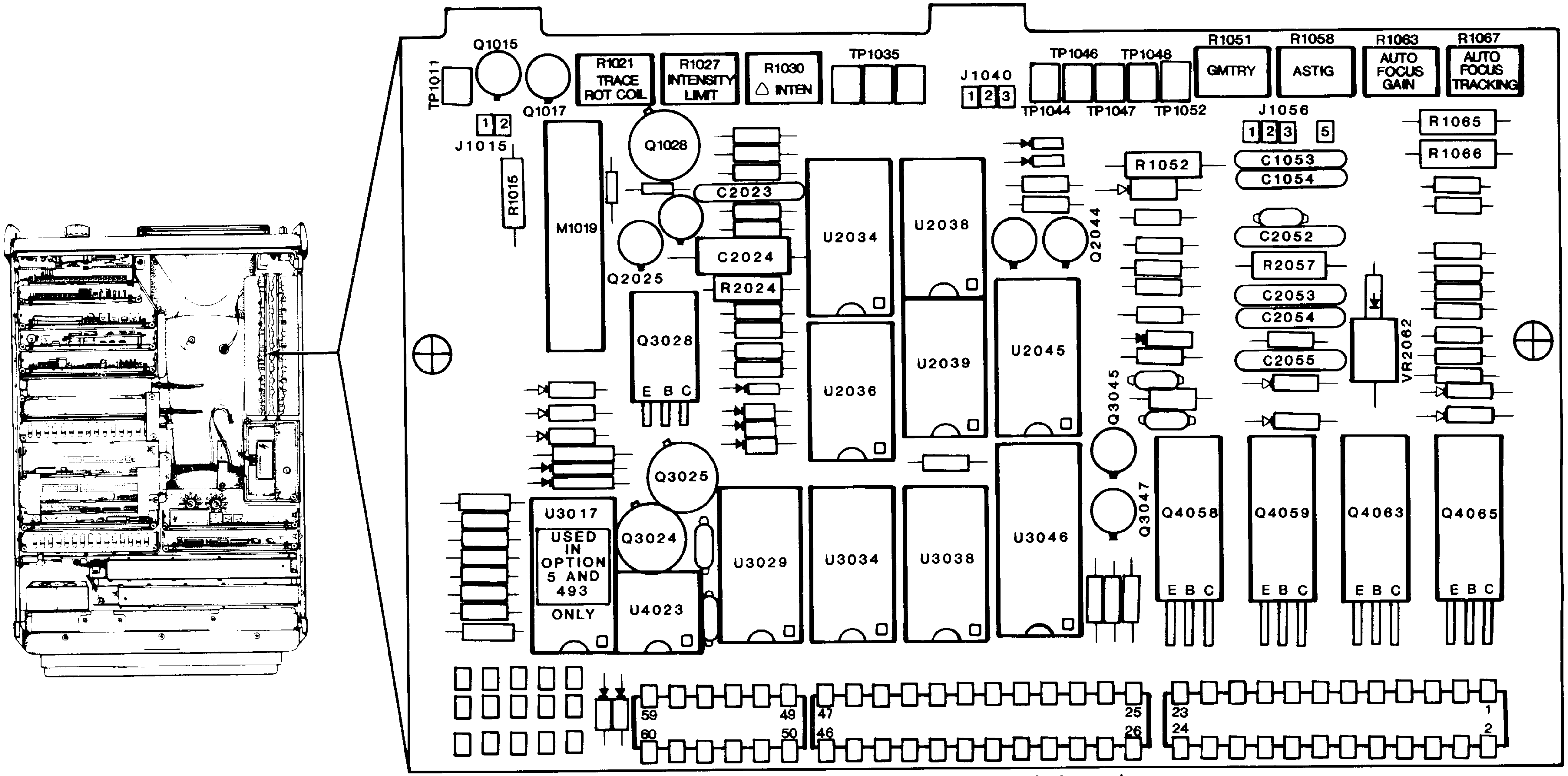
EL9VP127

Digital Storage Vertical Board Layout Figure FO–39



A62-Log &Video Amplifier circuit board.

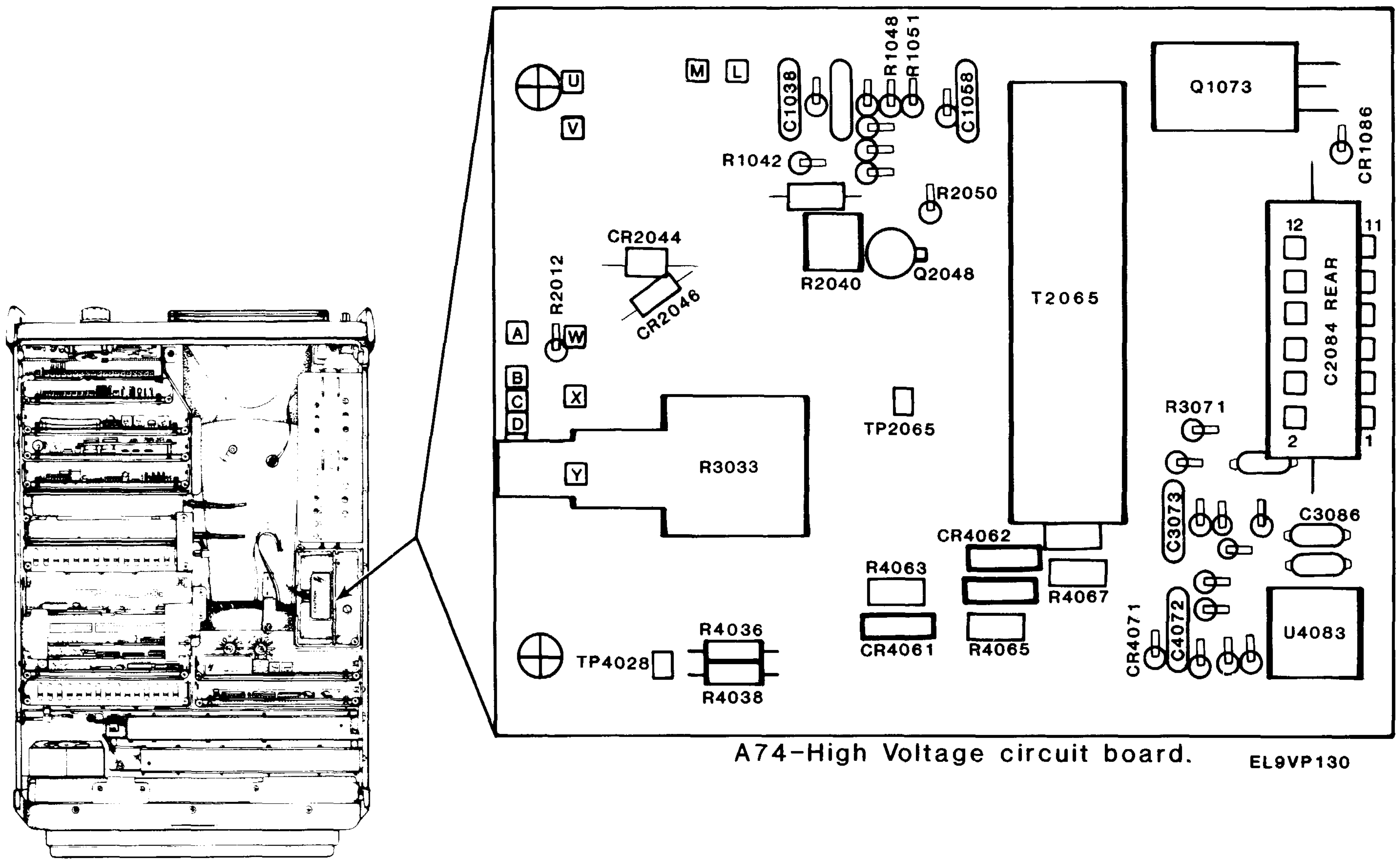
EL9VP128



A70-Z Axis circuit board.

EL9VP129

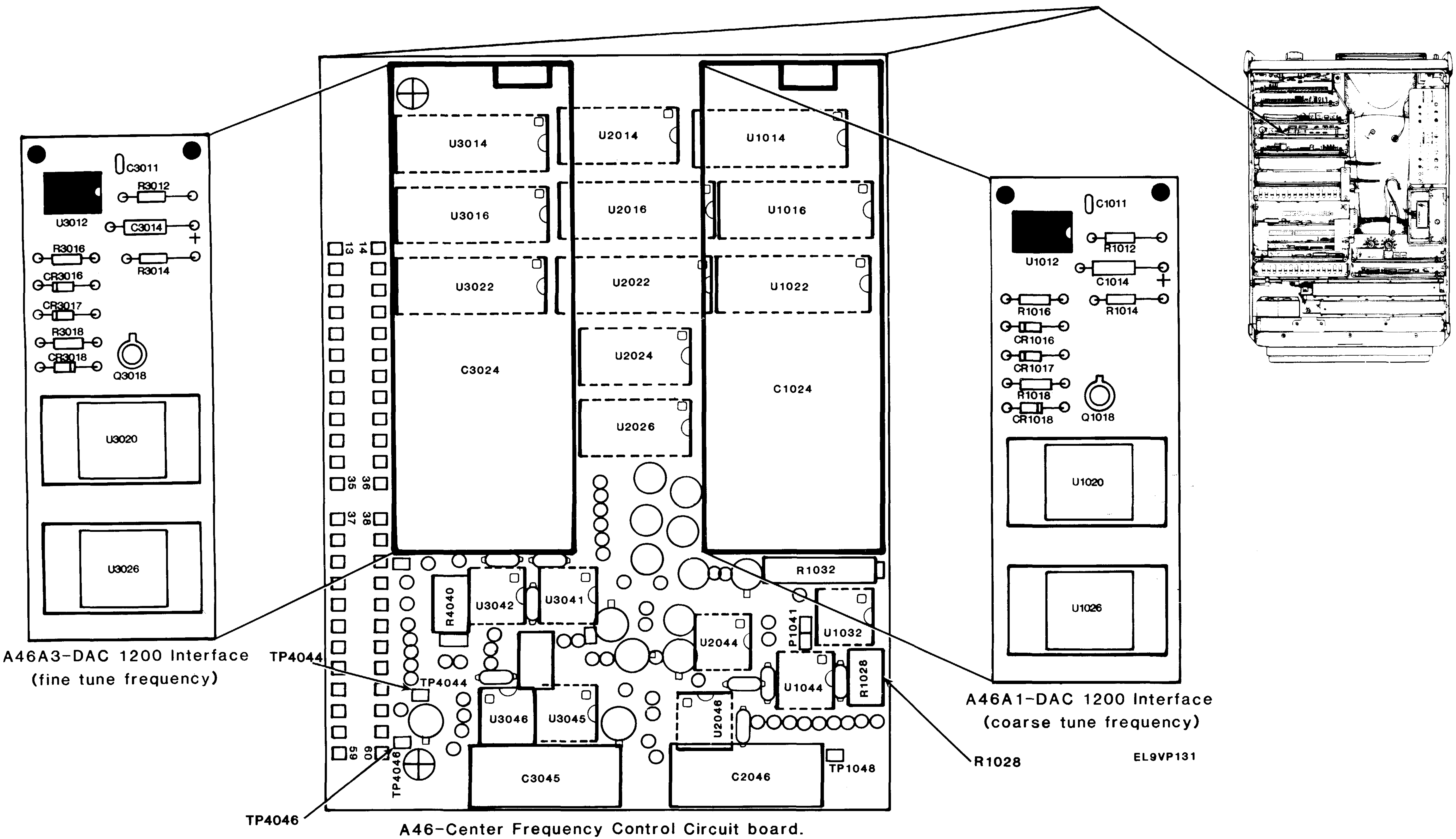
Z Axis Board Layout Figure FO-41



A74–High Voltage circuit board.

EL9VP130

High Voltage Board Layout Figure FO-42



Center Frequency Control Board Layout Figure FO-43

PIN: 061267-000