

TECHNICAL MANUAL
for
SPECTRUM ANALYZER
TS—1379 A/U

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NAVSHIPS 0969-094-3010

GENERAL INFORMATION

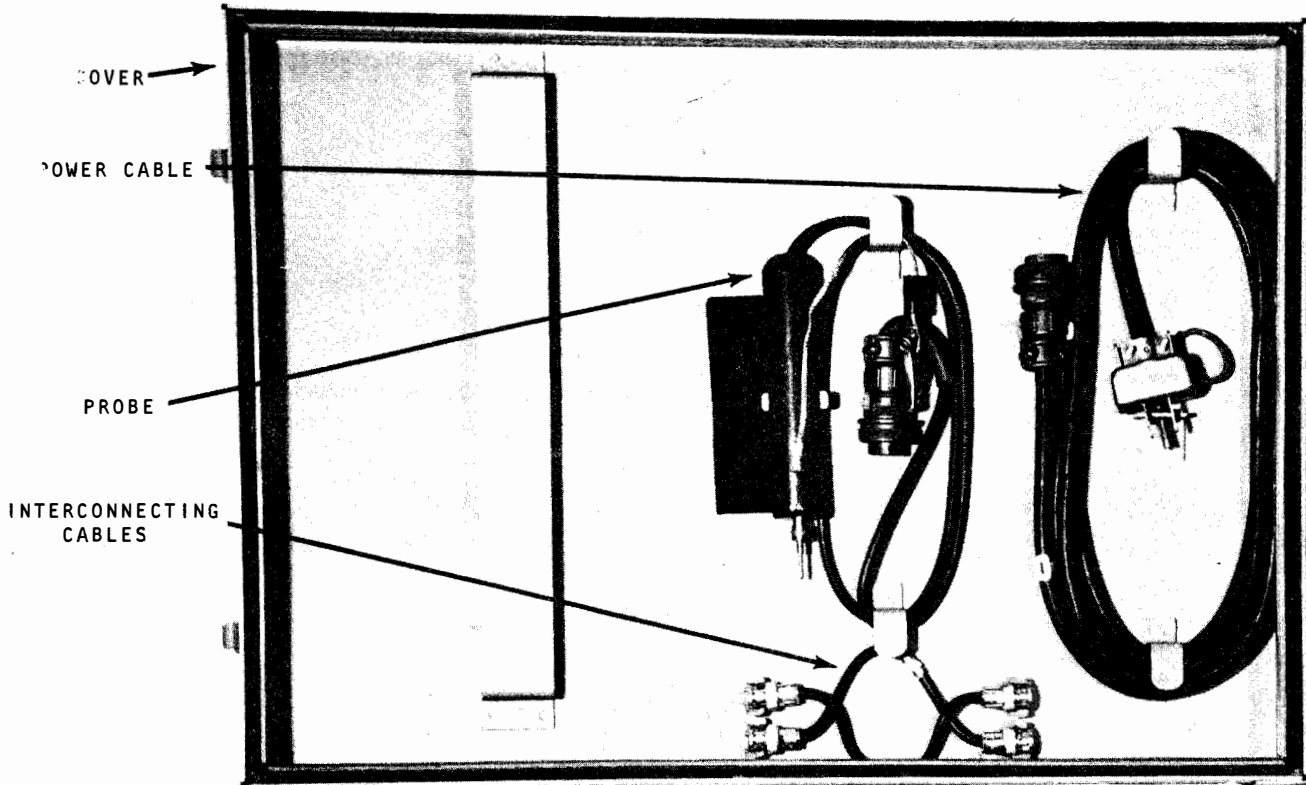
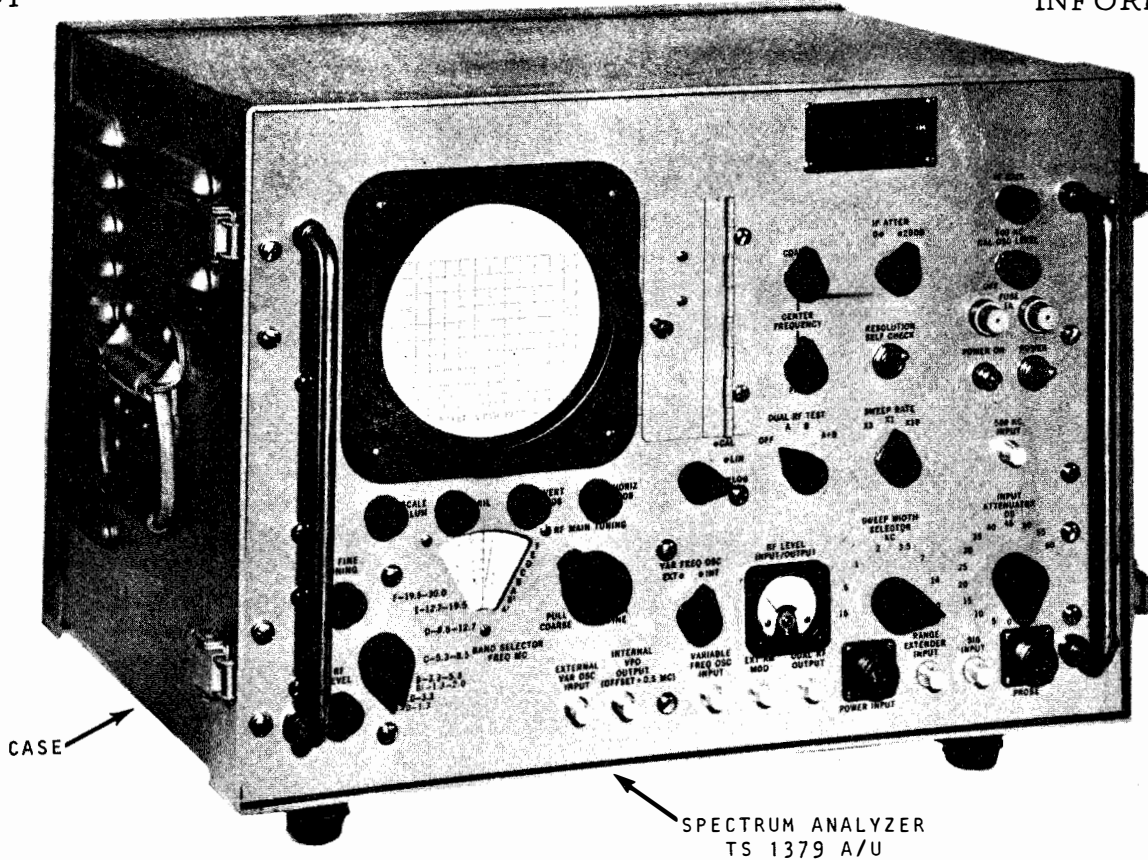
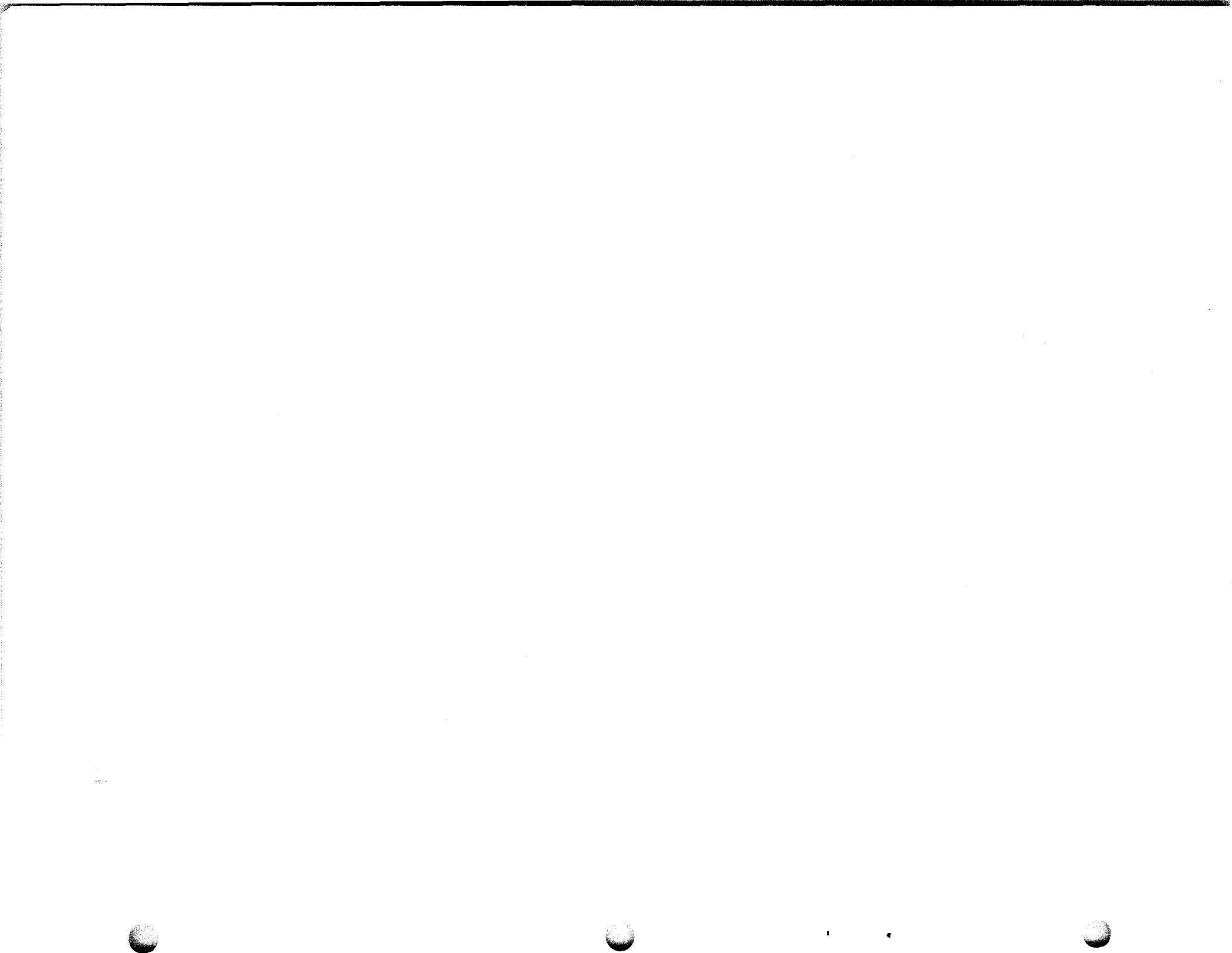


Figure 1-1: Outline Drawing Spectrum Analyzer



SECTION 1
GENERAL INFORMATION

1.1. SCOPE.

This Technical Manual describes the Spectrum Analyzer which is applied in the frequency range of 2 to 30 megacycles (mc) to measure single-sideband (SSB) transmitter characteristics such as intermodulation distortion, hum, noise level, carrier and unwanted sideband suppression, and similar characteristics.

1.2. GENERAL DESCRIPTION.

The Spectrum Analyzer is a precision test instrument designed for radio frequency rf spectrum analysis in narrow band communication systems. This instrument provides visual displays of the signal amplitude distribution over various selected portions of the radio-frequency band. The visual display is in the form of a plot of relative amplitude versus frequency on the screen of the cathode ray tube element. Figure 1-1 is the photograph of the complete test set.

1.3. REFERENCE DATA.

1.3.1. ELECTRICAL SPECIFICATIONS.

1.3.1.1. Input Frequency Range

- a. 485kc to 515 kc
- b. 2mc to 30mc
- c. 100 cps to 2mc with range extender (Not Supplied)

1.3.1.2. Sweep Widths (Sweep width factor indicates full frequency width, divided into plus and minus parts deviation from center frequency.)

Preset Ranges

- a. 150cps
- b. 500cps
- c. 1kc
- d. 2kc
- e. 3.5kc
- f. 7kc
- g. 14kc
- h. 30kc

1.3.1.3. Sweep Rates

- a. 10 seconds - Sweep widths of 150cps and 500cps
- b. 3.3 seconds - Sweep widths of 1kc and 2kc
- c. 1 second - Sweep widths of 3.5kc, 7kc, 14kc, 30kc

1.3.1.4. Fast Sweep

- a. 3.3 seconds and 1 second - Sweep width of 150cps and 500 cps

1. 3. 1. 4.

- b. 1 and .33 seconds - Sweep width of 1kc and 2kc
- c. .33 and 1 second - Sweep width of 3.5kc, 7kc, 14kc, 30kc.

1. 3. 1. 5. Frequency Separation (Minimum) for measurements 60db down- Skirt Selectivity

Sweep Width, KC	Frequency Separation, CPS
a. .150	50
b. .5	100
c. 1	400
d. 2	800
e. 3.5	600
f. 7.	900
g. 14	1400
h. 30	3200

1. 3. 1. 6. Input Impedance

50 ohms Any Range

1. 3. 1. 7. Input Attenuator

Rotary Switch Type, steps of 5db from 0 to 60db for the 2mc to 30mc Input Range.

1. 3. 1. 8. Input Sensitivity

a. Less than 1 millivolt rms for full scale deflection over 2mc to 30 mc Input Range.

b. Less than 0.1 millivolt rms for full scale deflection Linear or Log, at 485 to 515kc Input Range. (Direct Sensitivity).

1. 3. 1. 9. Frequency Response

a. Uniform over 2mc to 30mc range at 30mc less than 3db relative to 2mc response.

b. Uniform within $\pm 5\%$ over 485kc to 515kc band

1. 3. 1. 10. Leakage

Extraneous Signals down to at least 40db

1. 3. 1. 11. Residual Hum

Suppressed more than 60db

1. 3. 1. 12. Dynamic Amplitude Range

All in band, Odd-order Intermodulation products at least 60db below the level of two equal amplitude reference signals deflected 20db above full scale.

1.3.1.13. CRT Indicator

5 inch high persistence, flat face CRT with variable oscilloscope camera mounting bezel.

1.3.1.14. Scale Calibration

a. Amplitude Scale (Vertical)

- (1) Logarithmic Calibration, 0db to 40db, 5db intervals
- (2) Linear Calibration, 10:1, 0.1 linear intervals
- (3) Low range Extension: 20db calibration

b. Frequency Scale (Horizontal)

- (1) 10 linear incremental factor divisions of 0.1

1.3.1.15. Frequency Stability

a. Swept local oscillator drift less than 15cps per 10 minutes, after 1/2 hour warmup.

1.3.1.16. Tunable Oscillator

a. Frequency Range

- (1) 2.5mc to 30mc

b. Frequency Bands - Oscillator Frequency: Input Frequency

- (1) Band A - 2.5 mc to 3.8mc - 2mc to 3.3mc
- (2) Band B - 3.8mc to 5.8mc - 3.3mc to 5.3mc
- (3) Band C - 5.8mc to 9.0mc - 5.3mc to 8.5mc
- (4) Band D - 9.0mc to 13.2mc - 8.5mc to 12.7mc
- (5) Band E - 13.2mc to 20.0mc - 12.7mc to 19.5mc
- (6) Band F - 20.0mc to 30.5mc - 19.5mc to 30.0mc

c. Frequency Dial Calibration

(1) Calibration from 0 to 2mc is provided for use with frequency extending converter (Not Supplied)

d. Frequency Stability

(1) Better than +0.01% for a 10 minute interval after one-half hour warmup, and +0.005% for a 10 minute interval after 1 hour warmup.

e. Output Level

- (1) 0.3 volts rms adjustable monitored by front panel meter.

f. Output Impedance

- (1) 50 ohms nominal

g. Spurious Output

(1) Hum and noise sidebands at least 60db below the output level of the fundamental frequency.

1.3.1.17. External Variable Oscillator (Not Supplied)

An external variable oscillator with same characteristics as described in 1.3.1.16 may be used, it should not exceed 0.5 volts rms. The Panel meter monitors the voltage.

1.3.1.18. High Impedance Probe

Impedance of 12 megohms, shunted by 5uuf - 60db attenuation.

1.3.1.19. External Attenuator (Not Supplied)

Maximum Input voltage of 0.7 volts rms can be increased by insertion of external calibrated attenuation pads (50 ohms).

1.3.1.20. Maximum Input Voltage Level

- a. 2mc to 30mc range: 0.7 volts rms
- b. 485kc to 415kc range: 1 millivolt rms
- c. External calibrated pads for higher input voltages

1.3.1.21. Internal Self-Checking Features

a. Crystal controlled internal calibration oscillator

- (1) Frequency: 500kc
- (2) Frequency Stability: +0.02%, 10 minute intervals
- (3) Frequency Calibration Accuracy: +0.02%
- (4) Internal Voltage Level Adjustable to Maximum 0.05 volts rms
- (5) Spurious Output: Hum and noise level are at least 60db below

the output level.

(6) External Amplitude modulation capability. The 500kc oscillator may be amplitude modulated by an external audio frequency generator over the frequency range of 50 to 15000cps, 2 volts rms signal required.

b. Internal Dual Frequency RF Test Signal

- (1) Frequencies: 3000kc and 3002kc
- (2) Frequency Stability: +0.02%
- (3) Frequency Accuracy: +0.03%
- (4) Frequency Separation: 2kc +20%
- (5) Frequency Mixing: Linear, selectable either as a single frequency signal or dual frequencies.
- (6) Output Voltage: 0.1 volt rms for dual signals
- (7) Output Impedance: 50ohms nominal
- (8) Signal Setting: Equal Amplitude
- (9) Spurious Output: All Intermodulation products at least 60db

below single frequency level.

1. 3. 1. 22. Power Source

- a. Line Voltage: 115 volts +10% single phase 47.5 to 450cps.
- b. Total Power: 40 watts at 126.5 volts.

1. 3. 2. Mechanical Description

a. Dimensions: Combination Case

High	15-15/16 Inches
Wide	20-1/2 Inches
Deep	18-1/2 Inches

(Suitable for standard 19 inch rack mounting)

b. Weight

With Combination Case - 62 pounds
Without Combination Case - 30 pounds

c. Finish

Gray enamel type II, Class 2, of MIL-E-15090

1. 3. 3. Equipment Supplied

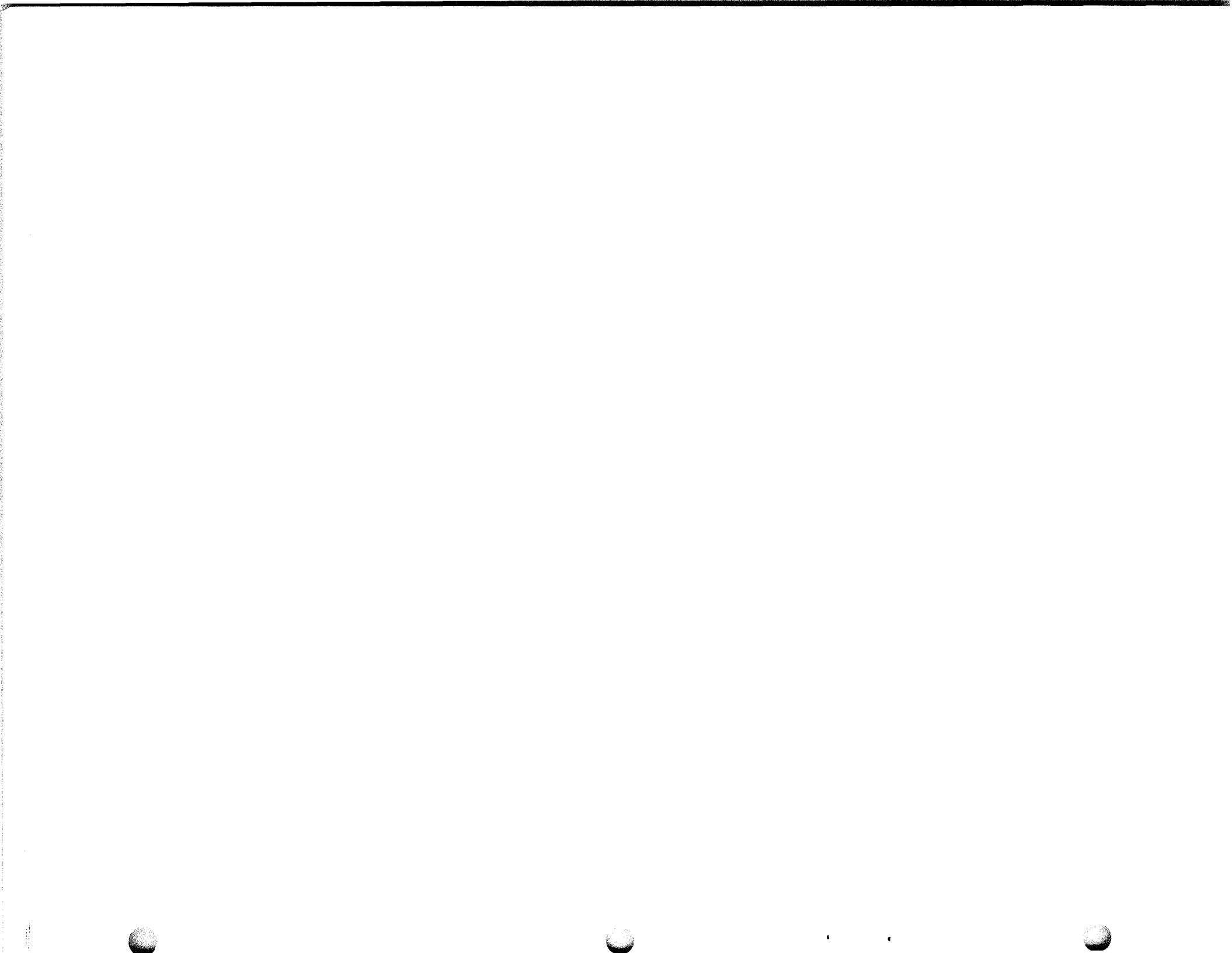
1. 3. 3. 1. Accessories

- a. Power Cable - 3 Conductor cable with UP-121M plug and MS3106R-14S-7S connector, 8 foot - 1 required
- b. Interconnection coaxial cable, 7 inches - 2 required
- c. High Impedance probe and cable - 4 feet with MS3102A Connector
1 required
- d. Instruction Manuals

1. 3. 4. Equipment Required But Not Supplied

1. 3. 4. 1. Accessory Equipment Required But Not Supplied

- a. Signal generator, audio frequency
- b. RF signal generator.
- c. Attenuators (50 ohms) calibrated pads
- d. Frequency Range Extender: 100cps to 2mc.



SECTION 2
INSTALLATION

2.1 UNPACKING AND INSPECTION

2.1.1. Unpacking

- a. Remove combination case from shipping container.
- b. Examine exterior of combination case for any evidence of damage due to rough handling, etc.
- c. Prepare damage report if required.
- d. Unscrew retaining clips and remove front of combination case.
- e. Remove analyzer and accessories from combination case.

2.1.2. Inspection

- a. Inspect for any visible damage. Tilt instrument to determine if any interior parts have broken loose.
- b. Check list of equipment supplied (Paragraph 1.3.3) for completeness.
- c. Report damage or shortage.

2.2. POWER REQUIREMENTS

- 2.2.1. The Power requirements are line voltage 115 vac $\pm 10\%$, single phase, 47.5 to 450cps.

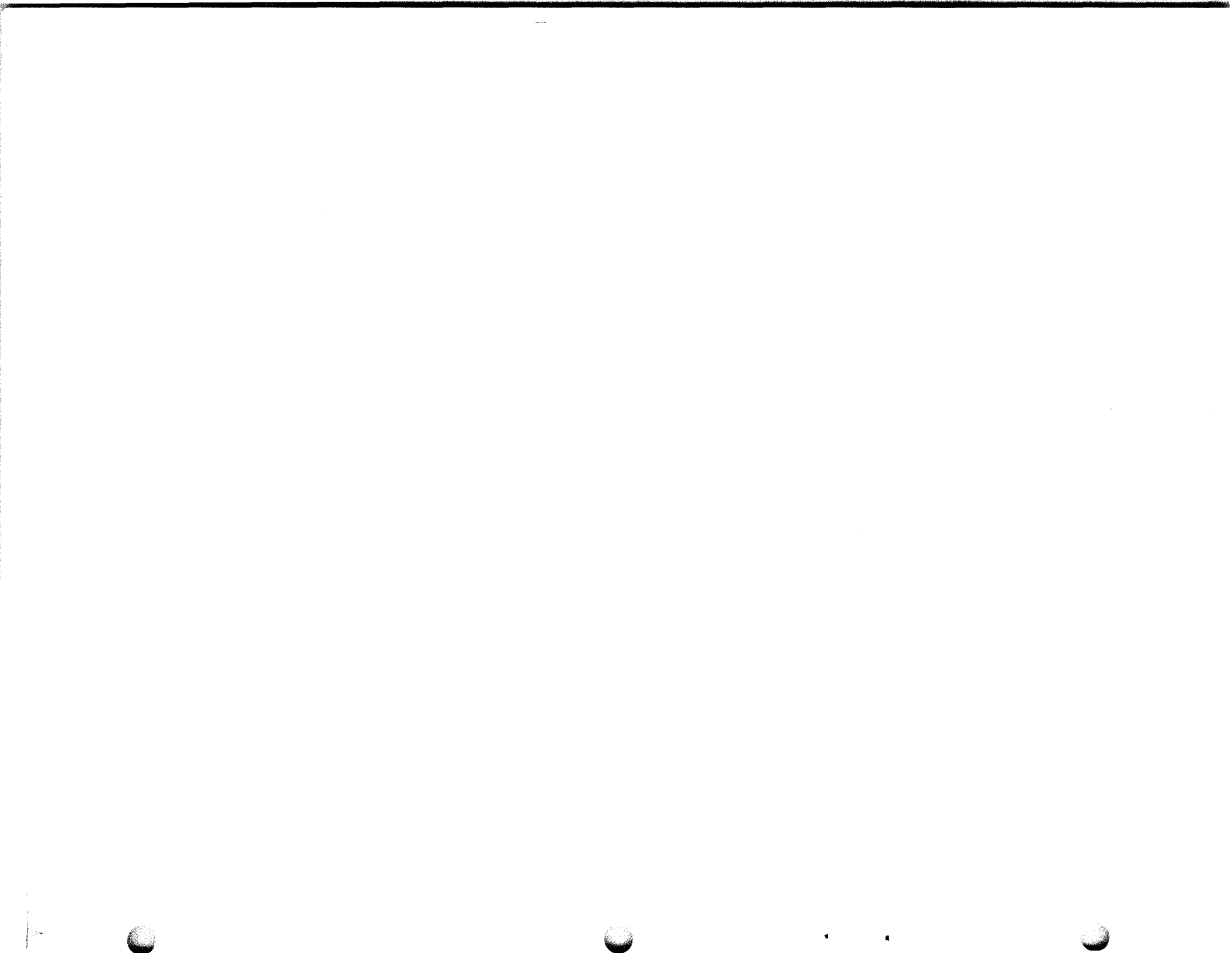
2.3. INSTALLATION

2.3.1. Bench mounted

- a. The spectrum analyzer, with combination case may conveniently be placed upon bench for use.

2.3.2. Rack Mounted

- a. Remove the analyzer from combination case and install in standard 19-inch rack.



3.1 GENERAL DESCRIPTION.

The Spectrum Analyzer TS-1379A/U is a sensitive, high resolution test instrument of the automatic scanning, superheterodyne receiver type.

The primary application is in testing Single Side Band (SSB) transmitters and receivers for measurement of third order distortion of the transmitted or received signal.

The Spectrum Analyzer permits analysis of one or many signals simultaneously. Each signal within the band scanned (sweep width) is displayed on the CRT element as one of a series of "pips". The pip amplitude indicates the signal level. The pip position along the horizontal axis indicates the signal frequency.

Any one of six parts of the rf band - the "Band Scanned" - within the 2mc - 30mc range of the Analyzer may be selected by means of the Band Selector tunable oscillator, and the "Scanning Width" may be selected by the Sweep Width Selector. The Sweep Width Selector positions provide eight different degrees of frequency separation of the signal display. A preset operating mode automatically adjusts Sweep Width, Gain, Resolution, and Scanning Rate at each one of the Sweep Width positions.

The Band Selector tunable oscillator is a high stability continuous tuning signal generator designed to provide local injection signals over the frequency range of 2.5mc to 30mc. It is a fully transistorized, precision, variable capacitor tuned oscillator. The 0.3 volts rms output signal is the first local oscillator in the heterodyne system. The tunable oscillator is free from spurious signals, hum and noise are suppressed at least 60db below signal level. The unit is particularly suitable for use in intermodulation testing.

The Spectrum Analyzer is also valuable for monitoring a frequency band for the appearance of or disappearance of and shift of signals. A display of frequency distribution can be obtained by selecting the Sweep Width, bringing the "Scanned Band" into the narrowest position (150cps) to enable examination of signals so closely adjacent in frequency that their corresponding "pips" normally are merged together. At this reduced Sweep Width (150cps) signals with an amplitude ratio of 60db separated by 50cps are clearly indicated. One of the internal self-checking features, the Internal Dual Frequency RF Test, simulates such a test.

NOTE: More details of operation are described in
SECTION 4.

3.2. PREPARATION FOR USE.

Spectrum Analyzer TS-1379A/U is operated from a 115 volt ac, $\pm 10\%$ single phase, 47.5 to 450cps power source.

3.2.1. Interconnection Procedure

- a. Plug the AC Power Line cord into the front panel 3 conductor connector, Power Input, connect the other end of cord to AC power source.
- b. Connect Internal Variable Freq. OSC, Output to Variable Freq. Osc. Input with Coaxial Cable W102.
- c. Connect Dual RF output to Signal Input with coaxial, if required. Use W103.
- d. Connect Coaxial (BNC) Attenuator Pad from Input Connector to the signal source if Input Signal level exceeds the specified level. (See SECTION 1.3.1.20).

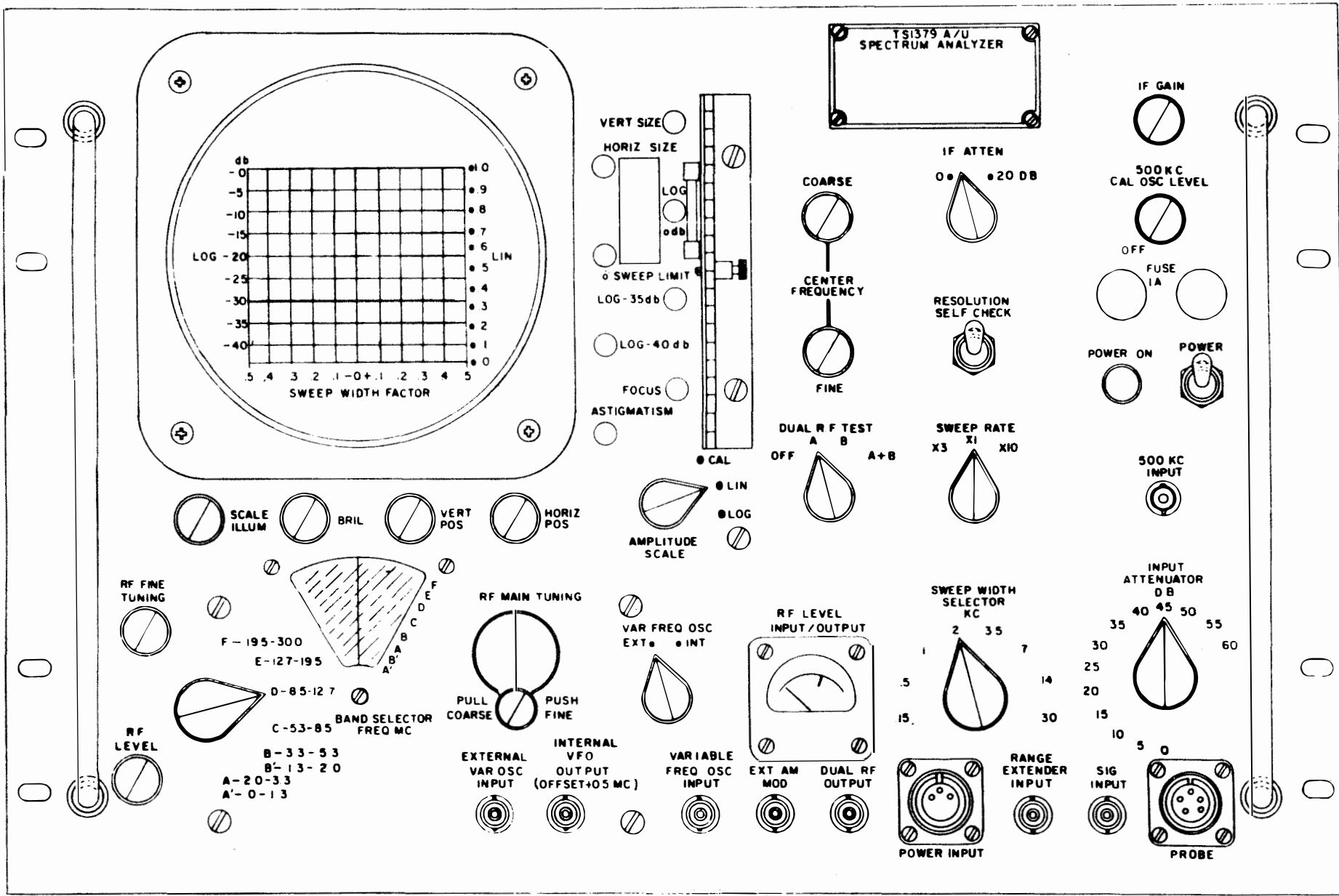


FIGURE 3-1: FRONT PANEL

CAUTION: Excessive signal level may damage input circuits, or produce unwanted harmonics, which leads to erratic evaluation.

3.3. OPERATION PROCEDURES

3.3.1. Description of Controls

3.3.1.1. Front Panel Controls

a. Input Attenuator

The Input Attenuator is a 13 position rotary switch and provides attenuation in 5db steps from 0 to 60db in the signal input circuit.

b. IF Gain

The IF Gain provides more than 20db range. It should initially be set in mid-position, turned clockwise for more gain, counterclockwise for less gain, in making fine adjustment.

c. IF Attenuator

This two-position rotary switch provides for insertion of 20db attenuation in the 140kc amplifier when required. When this switch is in the 20db attenuation position, the input signal may be adjusted for full scale log deflection. When this switch is in the 0db position, the full 60db dynamic range may be used. Only the lower 40db portion of the range will be displayed on the CRT within the scale limits.

d. Center Frequency, Coarse

This control sets the swept oscillator about its' mean frequency as indicated by the "pip" or "pips" corresponding to signals at the input (center frequency 500kc).

e. Center Frequency, Fine

This control serves as fine adjustment for the Center Frequency Adjustment. In use, it should be set at mid-position until the signal is set to the center by the coarse adjustment, the final adjustment is then made by this Fine adjustment.

f. Sweep Width Selector

This rotary switch provides choice of eight preset sweep widths, 150cps, 500cps, 1kc, 2kc, 3kc, 7kc, 14kc, and 30kc. In any position the selectivity of the IF amplifier (140kc) is automatically set for optimum resolution. The sensitivity of the Analyzer is constant within 2db on all ranges.

g. Sweep Rate

This automatic reset rotary switch provides three different sweep rates; X3, three times the scanning speed, X10, ten times the scanning speed of the X1 position. This allows centering signals on the CRT a screen without a wait of 10 or 3 seconds between sweeps. The fast sweep also shortens the search for signals. The switch circuit is automatically reset in the X1 position.

h. Band Selector, Frequency MC

This rotary switch provides choice of any one of six frequency bands for the variable frequency tunable oscillator. (See 1.3.1.6a).

i. Main Tuning

This dial shaft is geared down to provide fine tuning of the dial to cover any given band. The dial is pulled out for direct drive fast tuning for initial signal location.

j. Fine Tuning

This control is for venier tuning, following Main tuning adjustment.

k. RF Level

This control adjusts the RF level from 0 to greater than 0.3 volts rms. The calibrated meter indicates the output level. At normal operation the output level should be adjusted to 0.3 volts rms.

l. Calibration Oscillator Level

This control varies the output voltage of the 500kc calibration oscillator. The oscillator is internally connected through an attenuator circuit network to the 500kc input connector. The oscillator is crystal controlled, it serves to locate the center of the Analyzer display. When modulated by an external audio signal (2 volts rms), it provides side band marker signals to test sweep width.

Oscillator output is zero when the knob is turned fully counterclockwise and switch is turned off.

m. Dual RF Test

This rotary switch provides 4 positions:

- (1) OFF, both RF Generators are turned OFF.
- (2) A, 3000kc Generator ON.
- (3) B, 3002kc Generator ON.
- (4) A + B, both Generators ON.

In position A and position B, only single frequency output is available at the Dual RF output connector. In position A+B, both Generators are on and provide a linearly mixed output to the Dual RF output connector.

For internal RF Intermodulation Test the Dual RF output must be connected to the RF Input by connector cable.

n. Scale Illumination

This control knob is turned clockwise to increase the edge illumination of the calibrated CRT screen.

o. Brilliance

This control adjusts intensity of the CRT beam.

p. Vertical Position

This control adjusts the level of the base line trace up or down the vertical axis.

q. Horizontal Position

This control adjusts the base line trace along the horizontal axis.

r. Calibration Linear LOG

This rotary switch provides three positions, as follows:

(1) Calibrated Checks CRT operation. Base line trace is moved to top of calibrated reticle.

(2) LIN. Signals of amplitude ratio of 10 to 1 may be observed simultaneously on CRT screen. The dots on right hand side of CRT screen represent 0.1 increments up to 1.0.

(3) LOG. Signals of amplitude ratio of 100: (40db) may be observed simultaneously. Equally spaced horizontal lines on CRT scale represent 5db intervals.

s. Power

The power switch connects or disconnects the line voltage to the set, power ON is indicated by the amber light at the left of the switch.

t. Resolution Self-Check

This switch introduces a momentary change of Scanning Frequency which determines automatic resolution condition. The circuit is automatically reset so that the display returns to its' normal condition when the switch is released.

3.3.1.2. Infrequently Used Controls

The following controls are located behind the door on the front panel. They are as follows:

- a. Horizontal Size
This control adjusts the length of the horizontal trace.
- b. Vertical Size
This control adjusts the vertical gain of the deflection amplifier.
- c. Sweep Limit
This control adjusts the Swept Oscillation dispersion to proper sweep width.
- d. Log 0db
This control is used to adjust the log compressor in the top position of the vertical deflection.
- e. Log-35db
This control adjusts the log compression in the mid and lower position of the vertical deflection.
- f. Log-40db
This control sets the base line trace position for the logarithmic operation mode.
- g. Focus
This control adjusts the sharpness of the CRT beam presentation.
- h. Astigmatism
This control adjusts the uniformity of the CRT beam.

3.3.1.3 Front Panel Indicators

- a. RF LEVEL INPUT/OUTPUT
This meter indicates the RF input or RF output level.
- b. POWER ON
The POWER ON condition is indicated when the amber light is lit.

3.3.2. SEQUENCE OF OPERATION

3.3.2.1. IF Operation (485 to 515kc Band Pass Region)

- Step 1: Set the Power switch in the ON position. Amber indicator will light. In about two minutes the trace will appear on the CRT screen.
- Step 2: Adjust the BRIL control until the trace is just visible.

NOTE: Allow a 30 minute warm-up period before proceeding with further adjustments.

- Step 3: Set the front panel control as follows:

- a. BRIL Adjust as required
- b. FOCUS Adjust for sharp trace
- c. ASTIG Adjust for uniform trace
- d. AMPLITUDE SCALE Set in LIN position

- e. VERT POS Adjust trace to coincide with the Lin-0 line on CRT SCALE then select SCALE desired.
- f. HORIZ POS Center trace on CRT screen
- g. CENTER FREQ COARSE Center Position pointer up
- h. CENTER FREQ FINE Center Position pointer up
- i. IF GAIN Set in mid position
- j. IF ATTEN Set at 20db
- k. SWEEP WIDTH Set at 30kc
- l. CAL OSC. LEVEL Set position as required
- m. INPUT ATTENUATOR Set at 0db
- n. DUAL RF TEST Set in OFF position unless required
- o. VAR FREQ OSC External position

Step 4: Connect external signal 500kc IF input.

- a. Adjust IF GAIN until signal pip is displayed on CRT scale at full scale deflection (0db level).
- b. Adjust CENTER FREQ COARSE until pip moves into center of the screen.
- c. Change SWEEP WIDTH as required to observe signal on screen.
- d. Adjust CENTER FREQ. COARSE until pip comes to center of screen again.
- e. Adjust CENTER FREQ FINE if required until pip comes to center of screen.
- f. Change IF ATTEN to 0db position, observe pip height, pip goes over the 0db line which shows signal levels at -20db, level the center line -20db becomes the -40db level, and the bottom -40db line becomes the -60db level. Observe skirt width at the bottom line, this is the skirt selectivity at -60db down.

3.3.2.2. If modulation is present on signal, adjust Sweep Width Selector and gain as required to observe Modulation Amplitude and frequency or other characteristics.

3.3.2.3. Operation (2.0mc to 30.0mc)

Step 1: Connect external signal to SIGNAL INPUT.

- Step 2:
- a. Set the front panel control BRIL, FOCUS, ASTIG, VERT, POS, HORIZ. POS, CENTER FREQ COARSE, CENTER FREQ FINE AS given in Step 3 - a through h.
 - b. AMPLITUDE SCALE Set in LOG position
 - c. IF GAIN Set to mid position
 - d. IF ATTEN Set to 20db
 - e. SWEEP WIDTH Set to 30kc
 - f. CAL OSC LEVEL Set to OFF position

- g. INPUT ATTENUATOR Set as required depending on Input Signal level.
- h. DUAL RF TEST Set to OFF position
- i. BAND SELECTOR FREQ RANGE Set to Band for frequency desired
- j. MAIN TUNING Set to frequency desired
- k. RF LEVEL Set to 0.3 volt rms

- Step 3: Adjust the MAIN TUNING dial until signal is located near the center of the screen. Use the fast scanning X10 position during the search period to more quickly locate the signal. Use Fine Tuning if required.
- Step 4: Reduce SWEEP WIDTH to 14kc, or as required to observe signals. Adjust CENTER FREQ COARSE for symmetrical location of pip.
- Step 5: Adjust IF GAIN for full scale deflection (0db line).
- Step 6: Change IF ATTEN from 20db to 0db and observe the -20db level, -40db level or -60db level. Distortion components are distributed on either side of the input signal and at separations equal to the frequency difference if a two tone signal is being observed. Usually the first distortion pips are the largest. A SWEEP WIDTH 3 or 4 times greater than the frequency difference between tones should be chosen. See sketch (Paragraph 3-15)

3. 3. 3. Indicator Presentation

The following illustrations are typical spectrum presentations:

- a. Figure 3-2 shows a 500kc signal modulated at 800cps' SWEEP WIDTH in 2kc. Amplitude SCALE set on LOG position.

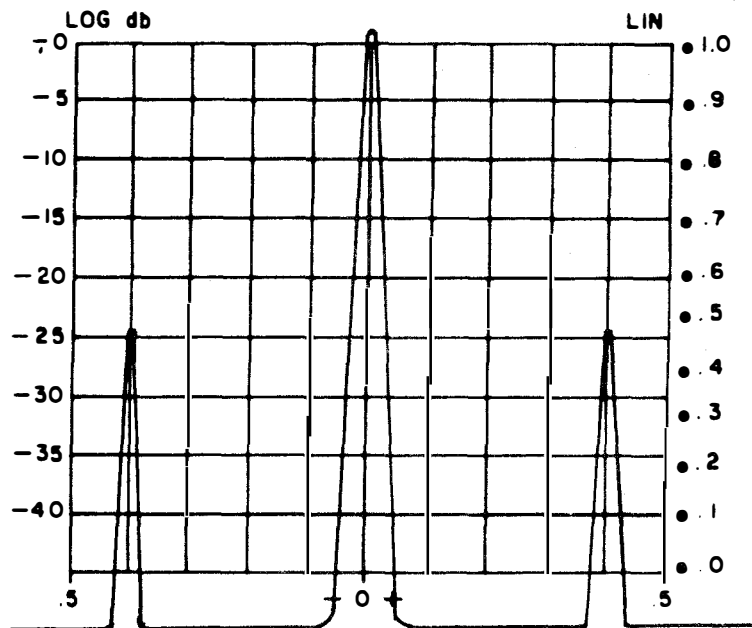


FIGURE 3-2
500KC SIGNAL, MODULATED AT 800CPS (2KC SWEEP RANGE)

b. Figure 3-3 shows a 500kc signal, SWEEP WIDTH 150cps. The two side pips are 60cps from the center, and indicate a 60cps HUM -40db below the signal level.

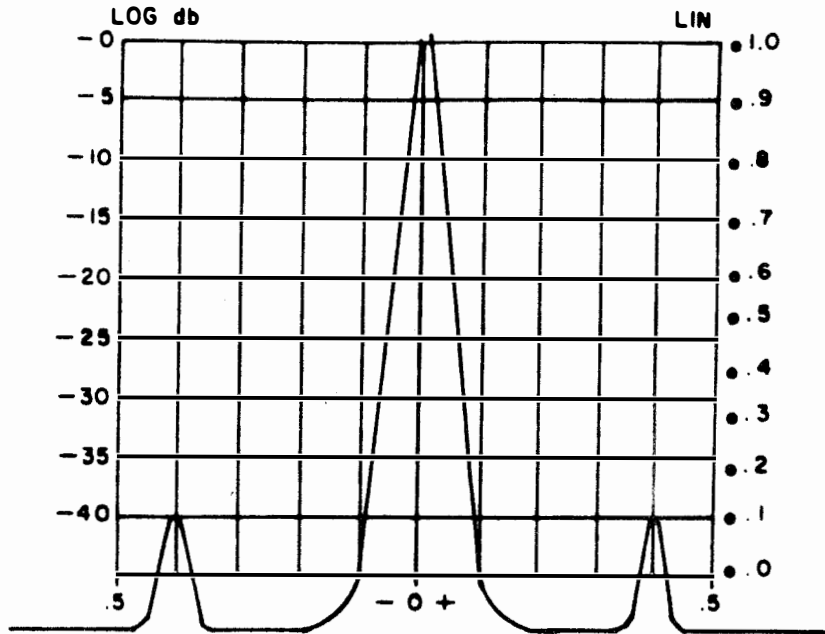


FIGURE 3-3
500KC SIGNAL MODULATED WITH 60CPS HUM (150CPS SWEEP RANGE)

c. Figure 3-4 shows 3mc signal, heavy HUM modulation produces many side pips; the first side pip represents the 60 cycle HUM modulation, the second side pip shows 120cps components, and the third side pip (right hand side) present 180cps components (3rd harmonic of 60cps).

SWEEP WIDTH	-	500cps
AMPLITUDE SCALE	-	LOG
IF ATTN	-	0db

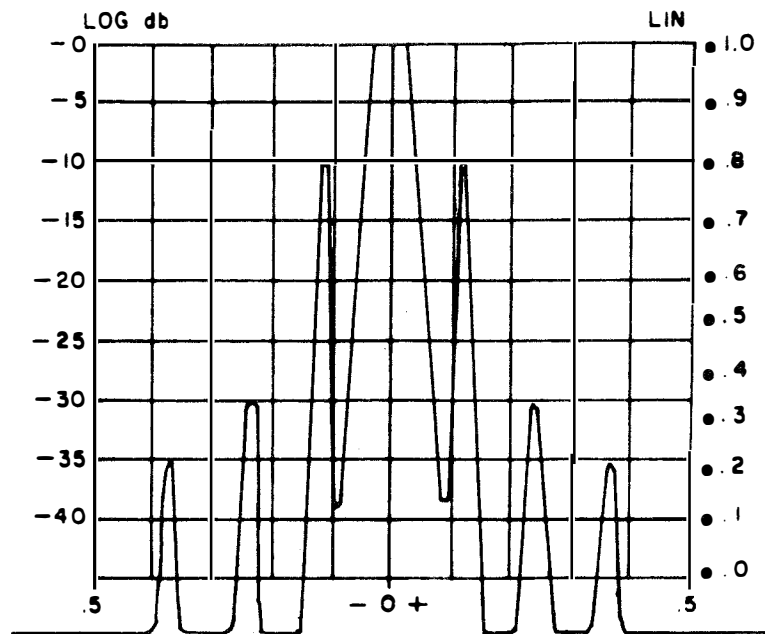


FIGURE 3-4
3MC SIGNAL MODULATED WITH 60CPS, 120CPS, 180CPS

With AM modulation the pips are symmetrically distributed along the main pip.

3.3.4. Tuning Adjustments

The Spectrum Analyzer TS-1379A/U has been factory aligned in normal use no tuning adjustments are required. Operation of the front panel controls cannot detune it. If the operating instructions are followed, normal conditions can always be re-established.

CAUTION: Touching or attempted tuning of the alignments can damage or misalign the Analyzer. In this case, a complete realignment might be necessary. See Manual of Instrument Calibration Procedures.

3.3.5. Auxiliary Equipment

The auxiliary equipment to be used in conjunction with the Analyzer is not yet available.

3.4. SUMMARY OF OPERATING PROCEDURES

3.4.1. Recommend Trial Operation

a. Use the Internal Calibration Oscillator to test center position, Sweep Width, Internal Hum, Dynamic Response, Resolution. Use the two-tone RF Test Oscillator to test intermodulation, spurious modulation.

b. When the operator has familiarized himself with these tests, he can then proceed to test external signals. The former tests provide an immediate comparison between clear signals and distorted signals, stable and noisy signals.

3.5. EMERGENCY OPERATION

In Sequence of Operations, 3.2.3.1., Step 3, normal operation procedure calls for a 30 minute warmup period. In the case of an emergency requirement however, the Spectrum Analyzer can be used in about two minutes after the power is turned on. Under these conditions, signal drift may occur during the first 30 minutes of operation, this can be balanced out with the normal operating controls, such as CENTER FREQ COARSE, or RF TUNING adjustments.

3.6. USE WITH RANGE EXTENDING FREQUENCY CONVERTER

The TS-1379A/U provides two additional V. F. O. Band ranges for use with Range Extending Converter equipments. The bands are marked in red on the dial and panel as A¹ and B¹. These two bands cover the frequency range from 0 to 1.3 mc and 1.3 to 2.0 mc respectively. The Range Extender output signal must be 2.0 mc above the Range Extender input signal for proper operation with the spectrum analyzer.

SECTION 4
TROUBLESHOOTING

4.1. GENERAL.

a. Most of the trouble encountered in the Spectrum Analyzer make themselves apparent by the appearance or non-appearance of one or more of the characteristic curves on the oscilloscope screen. Some of the more common troubles, with the appropriate remedial actions, are listed in the Troubleshooting Chart 4-1.

WARNING: DANGEROUS VOLTAGES ARE PRESENT IN THE EQUIPMENT, OBSERVE ALL POSSIBLE PRECAUTIONS WHEN WORKING WITH THE EQUIPMENT.

4.2. VOLTAGE AND RESISTANCE MEASUREMENTS.

a. All voltages should be measured with a vacuum-tube volt meter. Connect the meter with ac power off. Discharge all high voltage capacitors and attach a meter lead to the chassis first and then attach the other lead to the point under test. Observe the proper polarity. Place the meter on its highest range and reduce the range to obtain midscale deflection. Do not touch the voltmeter when making high voltage measurements.

b. All resistances are measured from the test point to ground unless otherwise stated. Generally, measured resistance values should be within plus or minus 10% of the stated value.

4.3. TEST EQUIPMENT REQUIRED.

a. For testing the Spectrum Analyzer TS-1739A/U the following test equipments are recommended. The first named unit in each group is preferred, the other being alternate equipment which may be used if the preferred unit is not available.

- b. Vacuum tube voltmeter with a Hi Impdenace Probe Type AN/USM-116
- c. Oscilloscope - AN/USM-140 or AN/USM-105 TEKTRONIC Model 545 with Plug-In Type C/A
- d. Signal Generator - SG-582/UN - CAQI GUGA
- e. Electronic Counter - AN/USM-207 or CAQI 524D U/525A
- f. 50 ohm Attenuators - HEWLET PACKARD 355C
HEWLET PACKARD 355D

TROUBLESHOOTING CHART 4-1

SYMPTOM	TROUBLE LOCATION	PROCEDURE
(1) With power switch on, no light from "Power On light" no trace on screen.	(1) AC power line defective	(1) Check voltages: 103.5V-126.5V, 47.5-450CPS
	(2) Poor connection on power switch	(1) Replace power line
	(3) Defective power switch	(2) Repair connections
	(4) Burned out fuses	(3) Replace switch
	(5) Defective filter	(4) Replace fuses
	(6) Transformer voltage on primary but not on secondary winding	(5) Replace filter
	(7) Defective rectifiers	(6) Replace transformer
	(8) Defective filter capacitors	(7) Replace rectifiers
	(9) RF level below normal	(8) Replace filter capacitors
	(10) Check for 170V at lamp socket and CRT	(9) Check - 13V power supply
	(11) Defective lamp socket or connections	(10) Check for -13VDC at converter input (10) Check for defective component (11) Replace lamp socket (socket contains a 62K resistor built in)
(2) With power switch on, light from Power on light - no trace on screen.	(1) Deflection operation controls improperly set	(1) Reset controls
	(2) No high voltage at CRT connector	(2) Check for open circuits in the converter circuits - <u>WARNING Dangerous Voltages are present in the Equipment.</u>
	(3) Defective CRT	(3) Replace CRT
(3) Trace on CRT is abnormal (Not sharp)	(1) Burn spots indicated on CRT	(1) Replace CRT
	(2) Dot or very short timing trace	(2) Adjust Horizontal line size
	(3) Trace is jittery	(2) Replace timing and horizontal amplifier board
	(4) Trace is fuzzy	(3) Check power supply for regulation (4) Adjust focus and Astigmatism controls
(4) Trace on CRT normal, but no amplitude indication.	(1) Check scale calibration for proper deflection	(1) Replace Vertical Amplifier board A-2 and adjust vertical size for proper calibration
	(2) No vertical movement	(2) Set amplifier scale switch to log position. Check calibration with 500KC internal oscillator performance check. See 3.3.2.
	(3) No pip on screen	(2) Perform RF test with signal through input. See 3.8.2.3. (2) Check vertical size control

TROUBLESHOOTING CHART 4-1 (Cont'd)

SYMPTOM	TROUBLE LOCATION	PROCEDURE
(4) (Cont'd)		(3) Check all amplifier boards (A-4, A-5, A-6, A-7, A-8) and replace the defective ones.
(5) Set operating normally but no scale illumination	(1) Scale is lit only when controls is fully clockwise.	(1) Check scale illumination control and components. (2) If one bulb is out, the other cannot operate. Replace defective bulb.

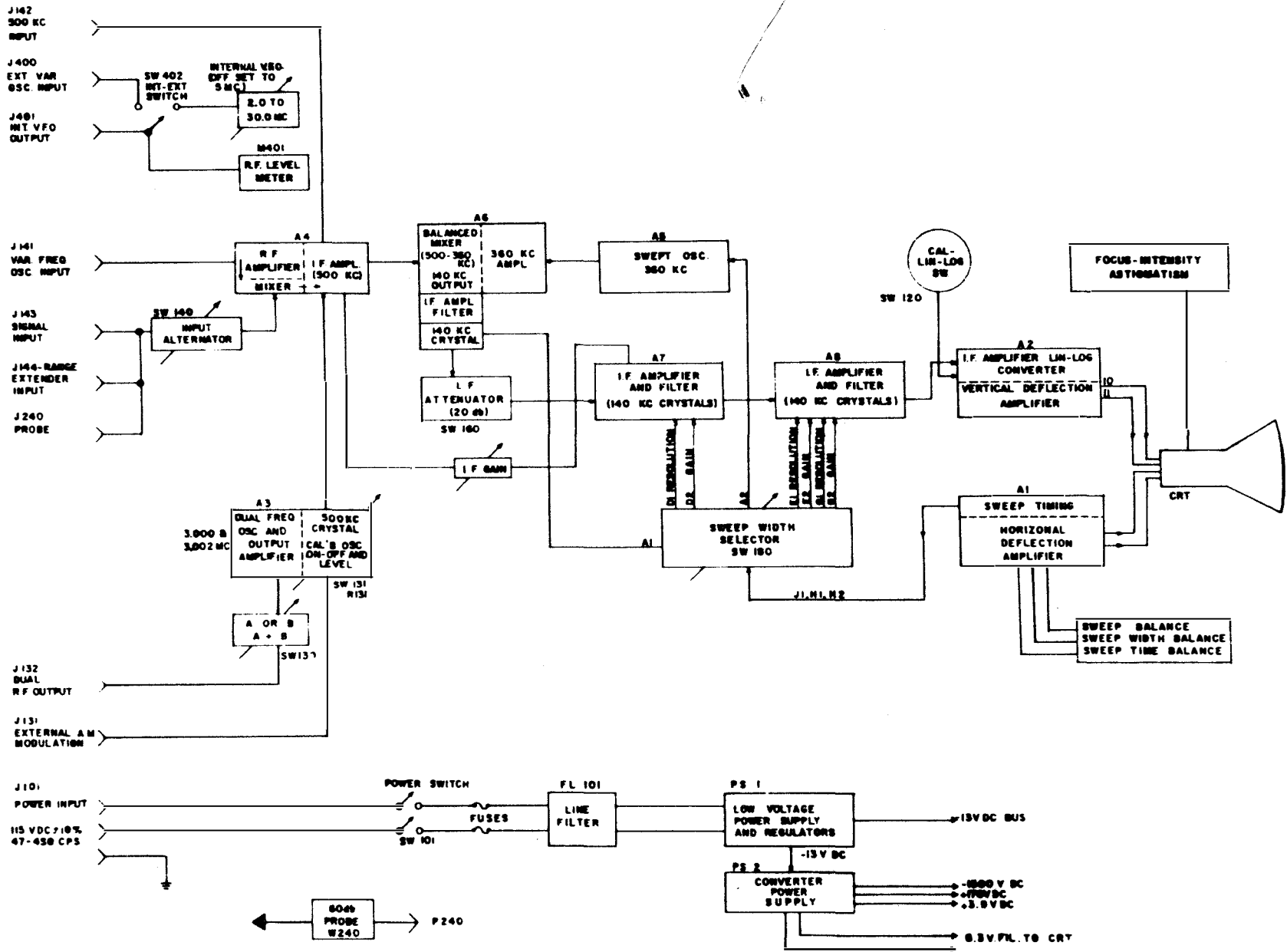


Figure 4-2: Block Diagram

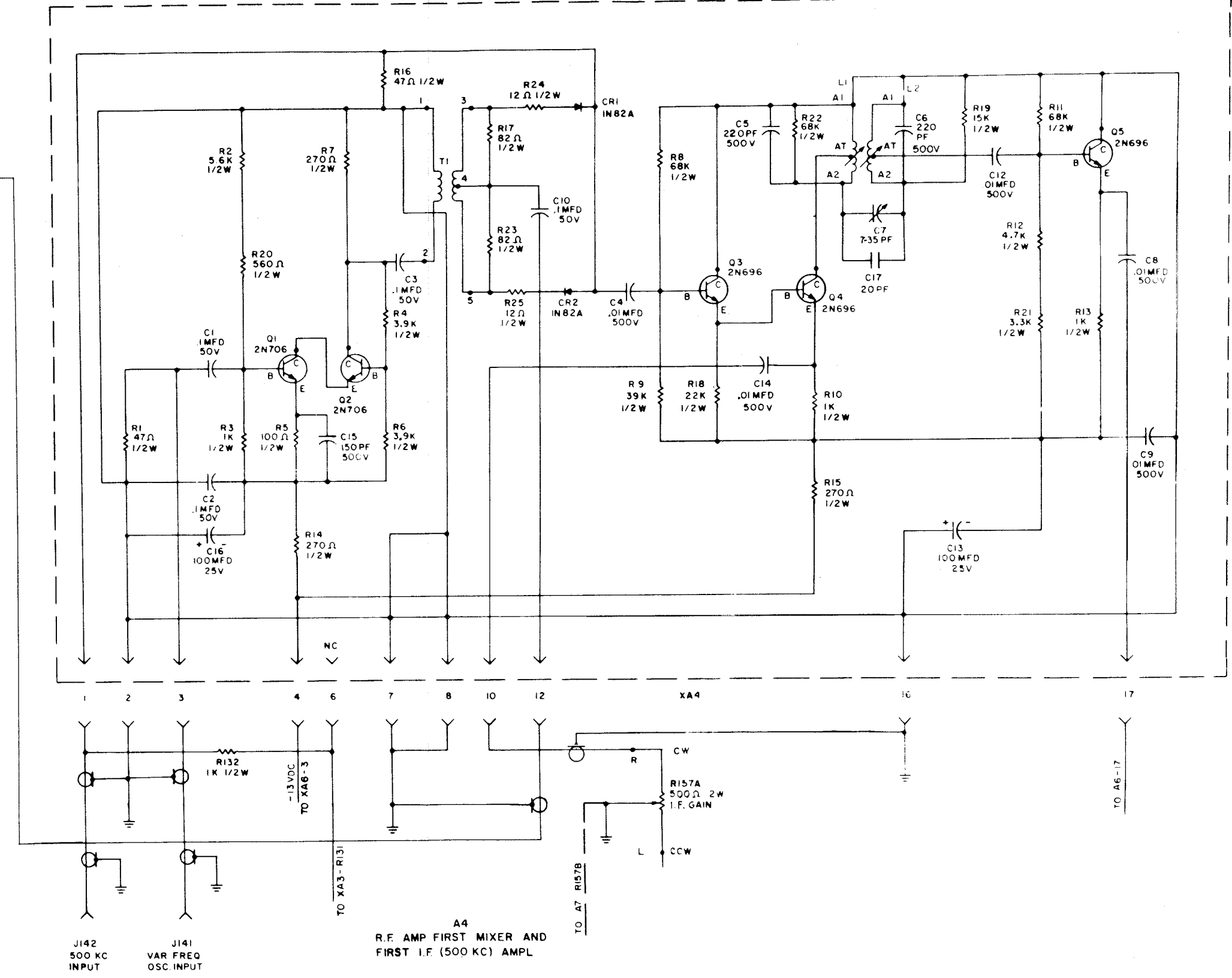
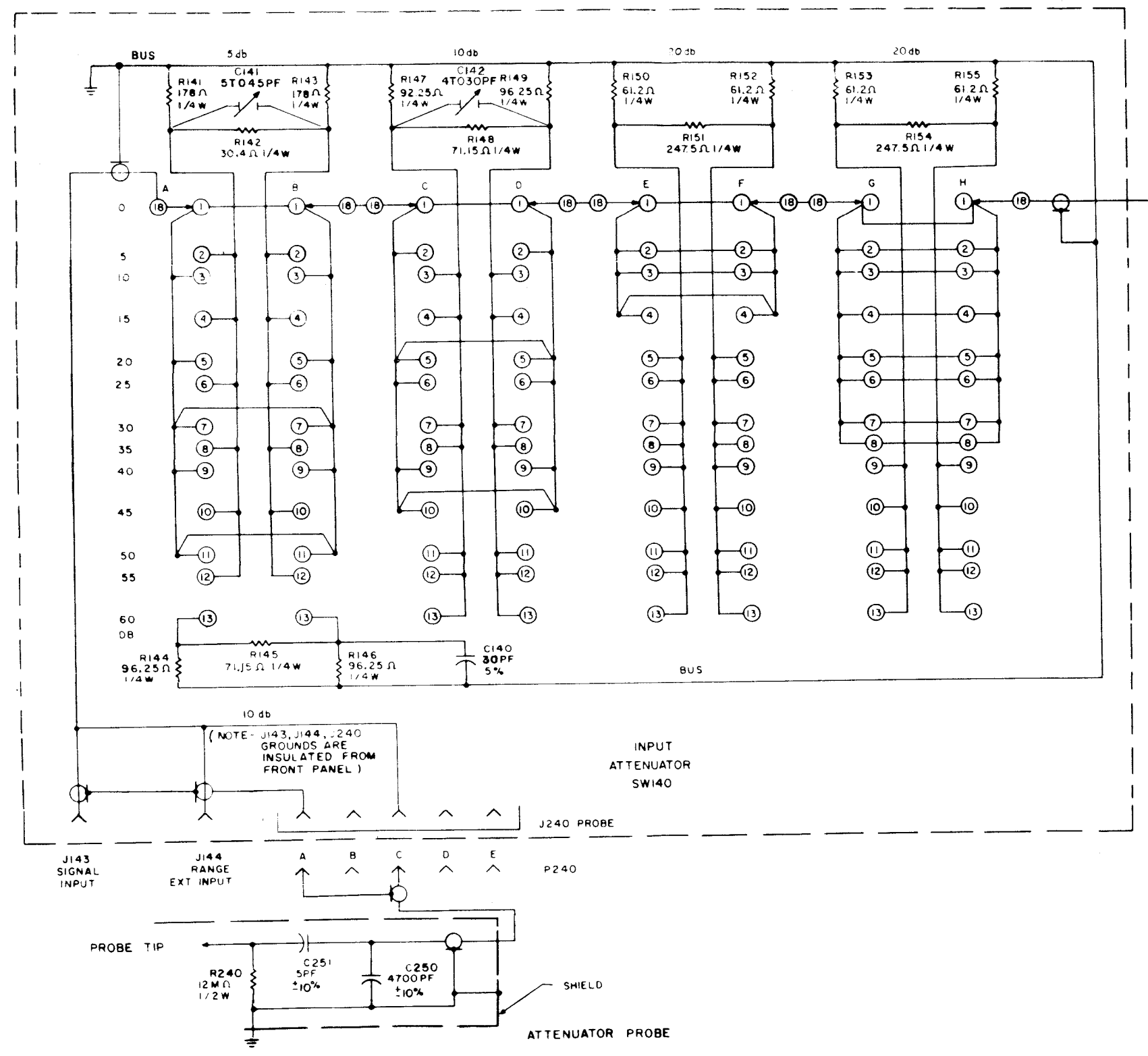


Figure 4-3. Schematic Diagram, Input Attenuator, R. F. Amplifier & First Mixer 4-5, 4-6

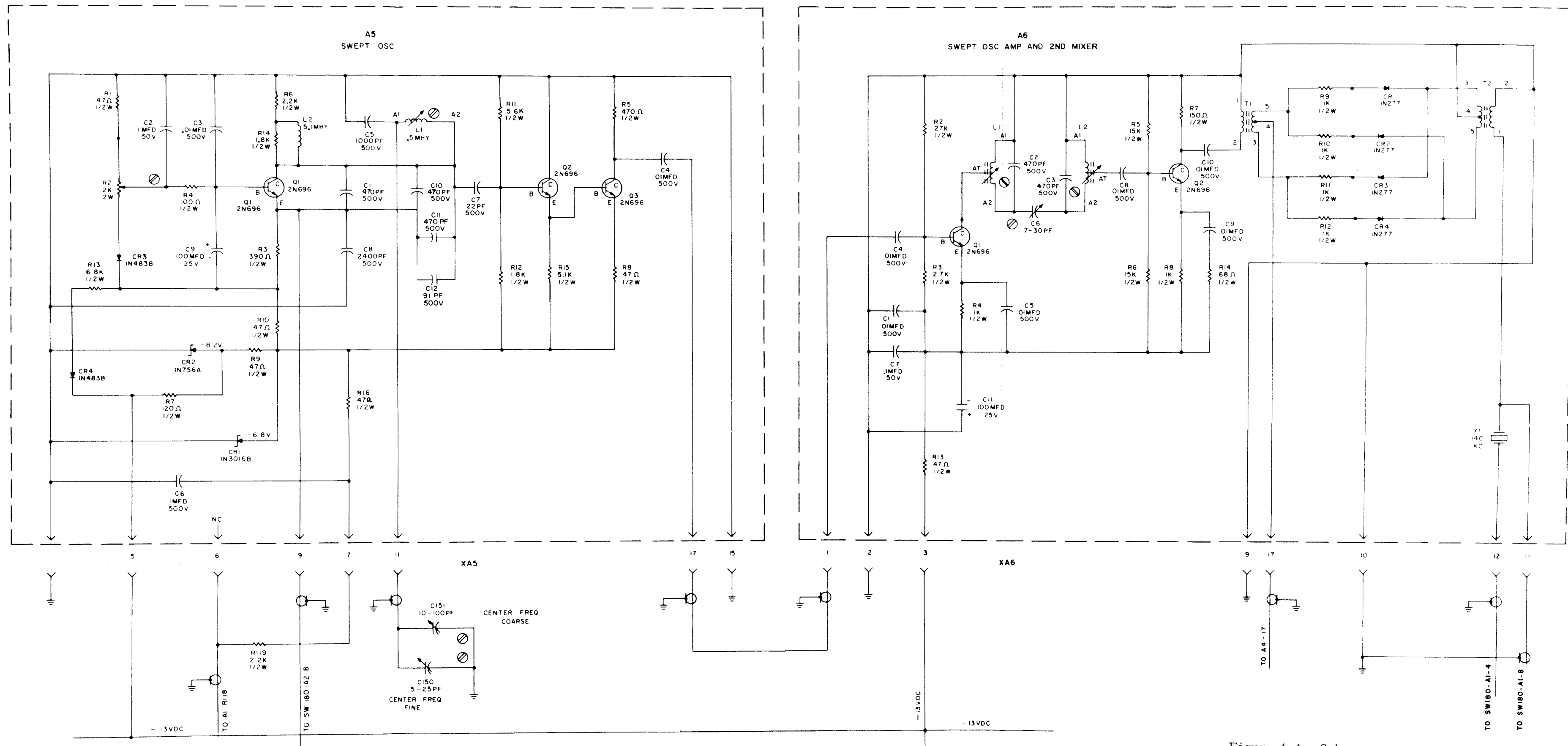


Figure 4-4. Schematic Diagram, Swept Oscillator & Second Mixer

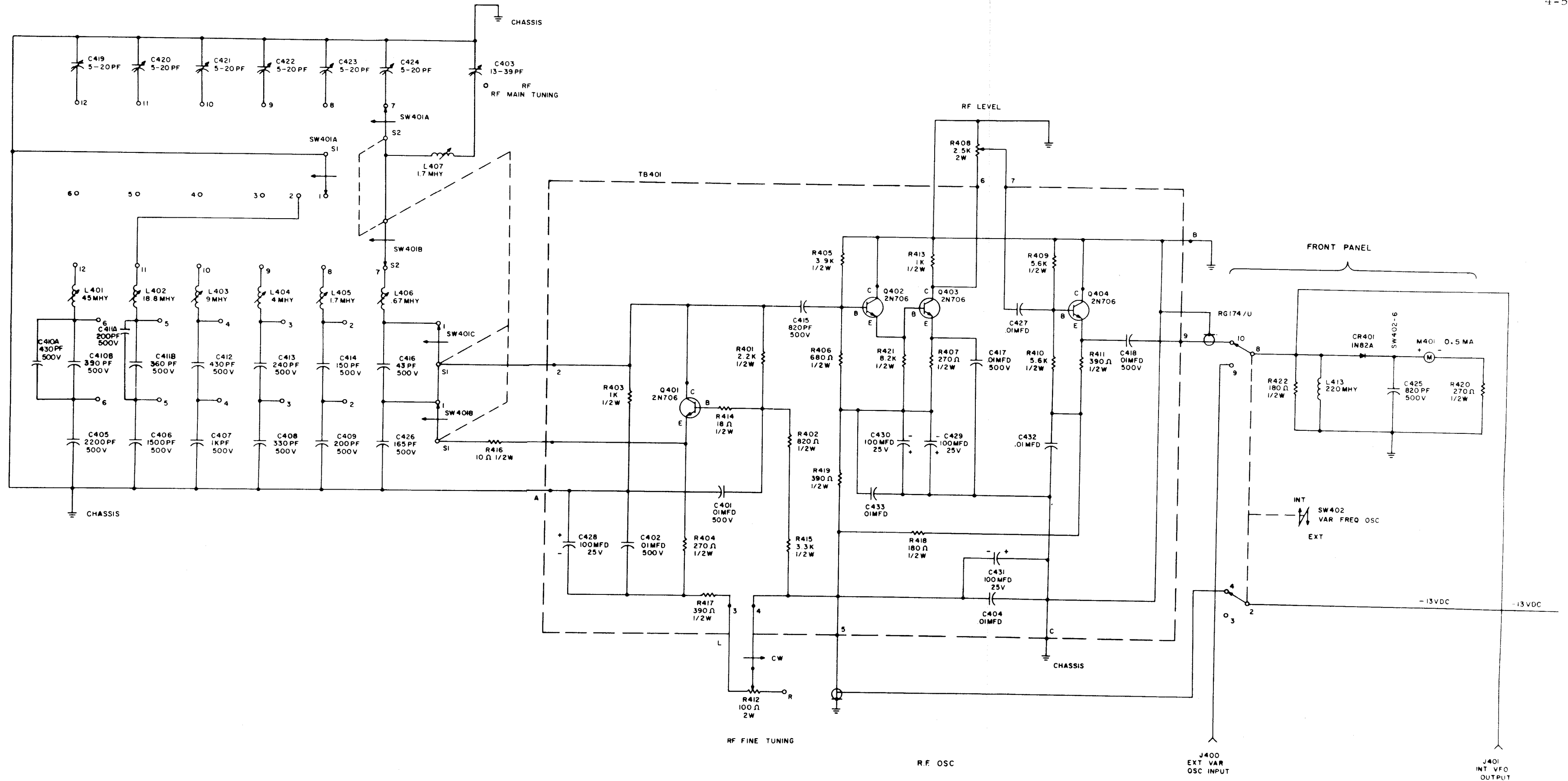


Figure 4-5. Schematic Diagram, Variable Frequency R. F. Oscillator 4-9, 4-10

5050

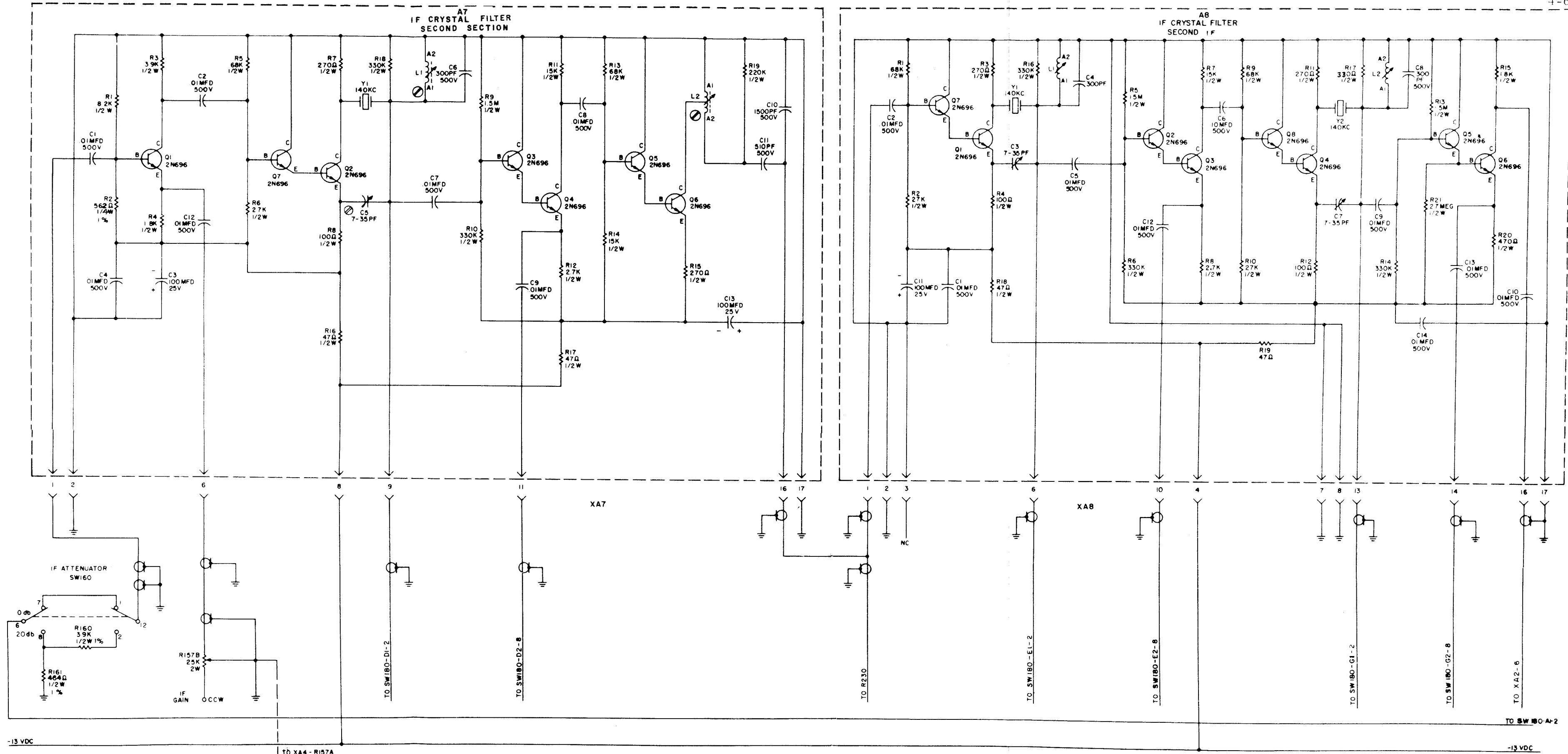


Figure 4-6. Schematic Diagram, 4-11, 4-12
Second IF & Crystal Filter

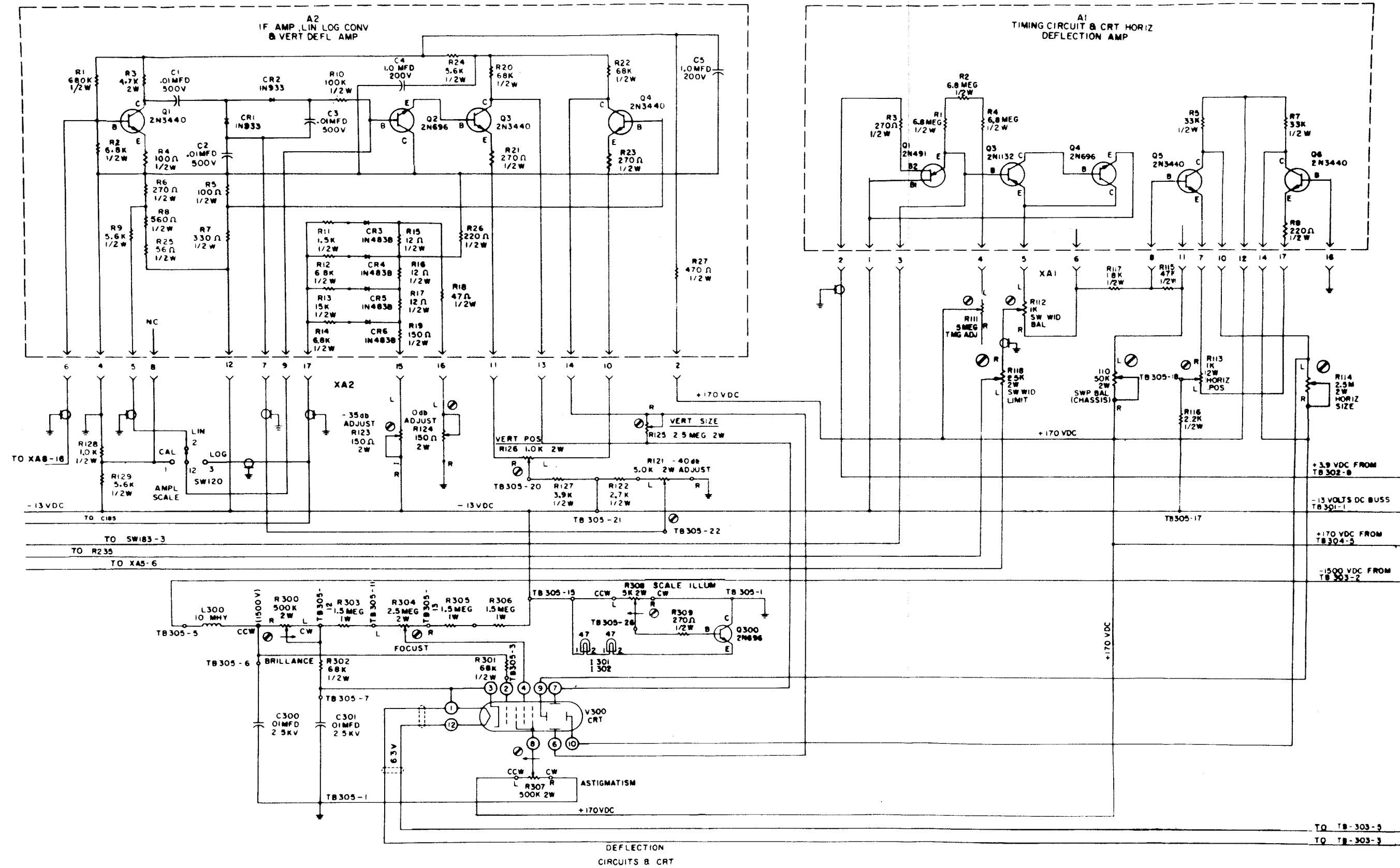


Figure 4-7. Schematic Diagram,
Vertical and Horizontal Deflection
Amplifiers and Display Section

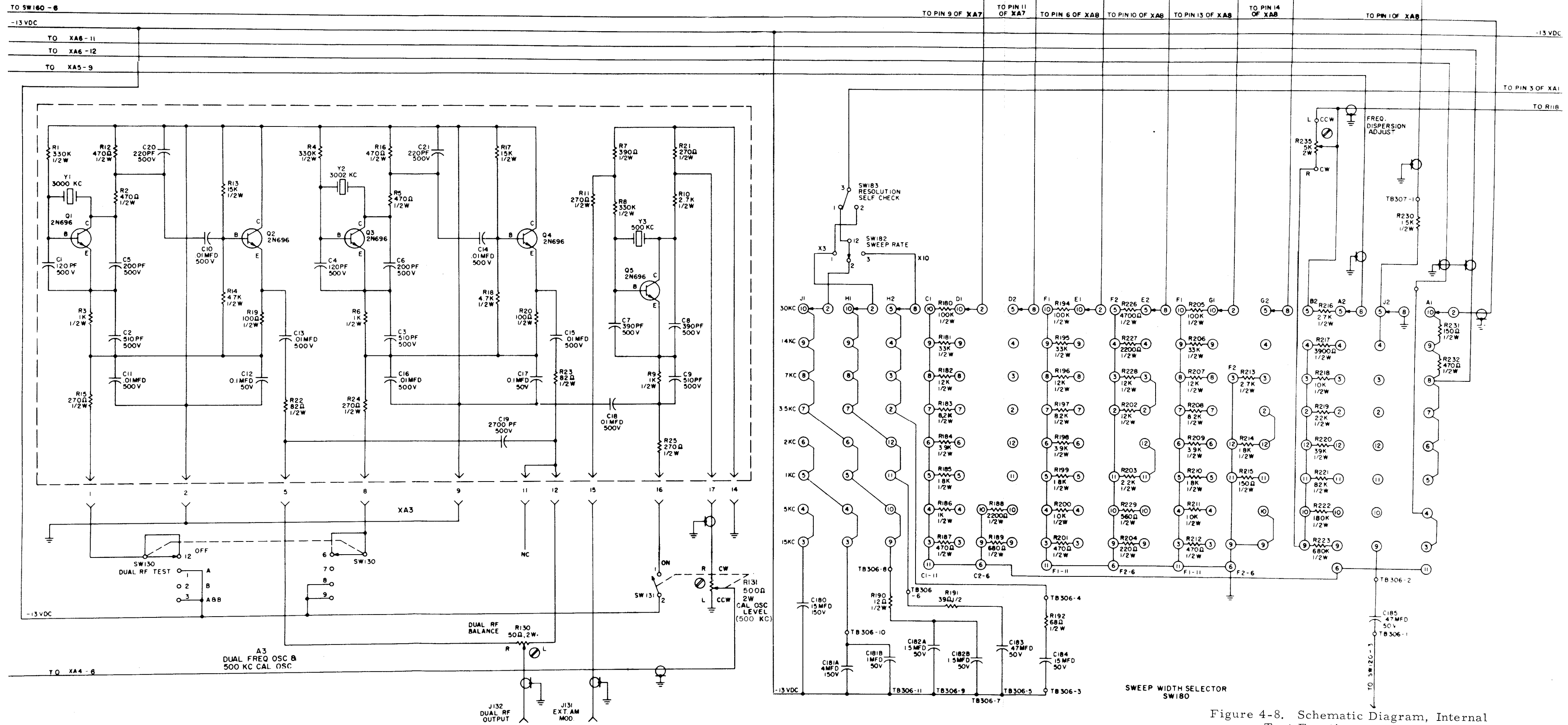
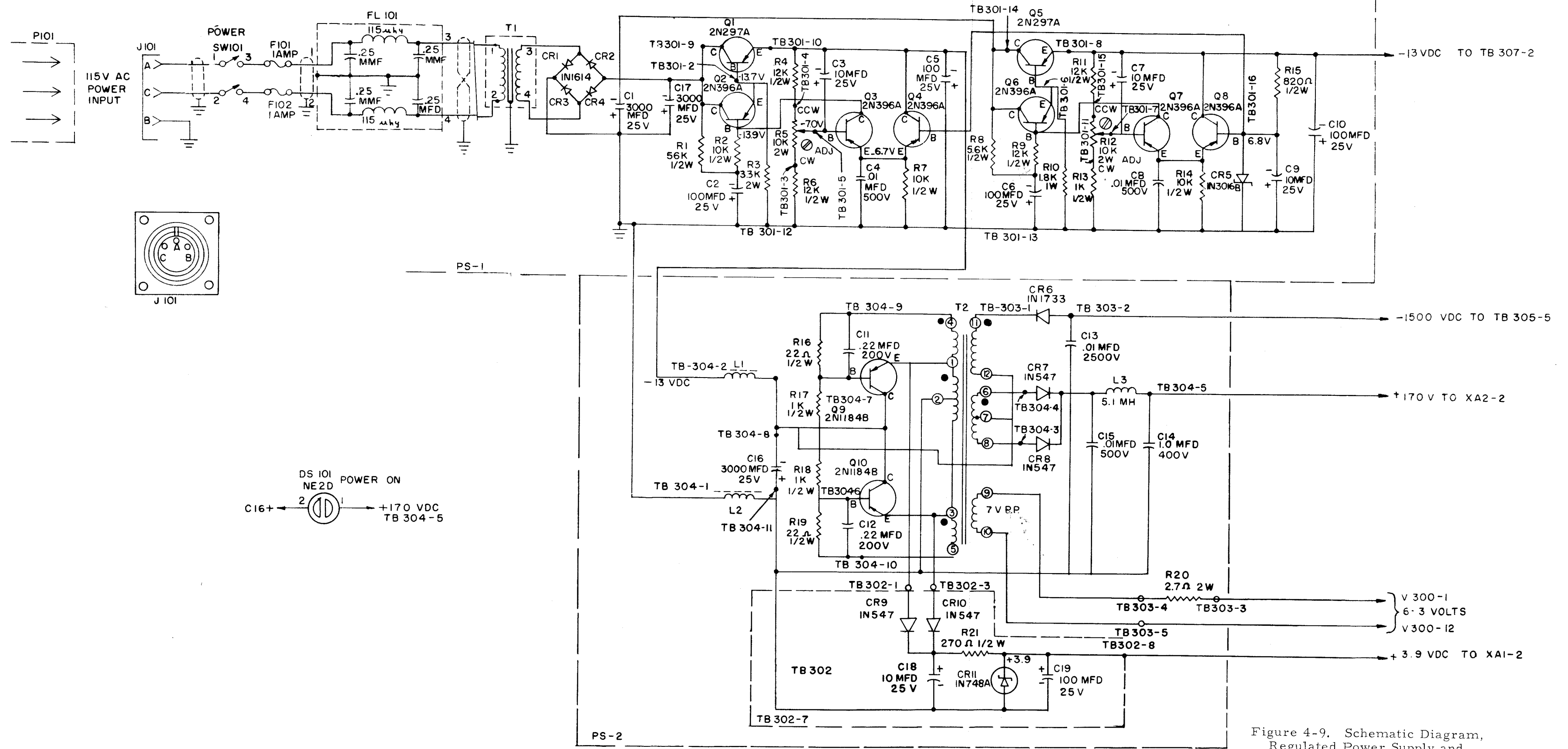


Figure 4-8. Schematic Diagram, Internal Test Functions and Sweep Range Circuits 4-15, 4-16



4-9

Figure 4-9. Schematic Diagram, Regulated Power Supply and High Voltage Converter

NO.	WIRE			TERMINATIONS		LENGTH INCHES
	COLOR	GAGE	TYPE	FROM	TO	
1	GREEN	22	STRD	XA3-1	SW130-12	3-1/2
2	YELLOW	22	STRD	XA3-5	R130-R	2
3	ORANGE	22	STRD	XA3-8	SW130-6	4
4	BLACK	22	STRD	XA3-9	XA3-2	2-1/4
5	BLUE	22	STRD	XA3-12	R130-L	3
6	WHITE	20	STRD SHIELDED	XA3-15	J131-CENTER	8
	-	SHIELD	-	-	J131-GRD	-
7	GRAY	22	STRD	XA3-16	SW131-1	10
8	-	RG-174/U	-	XA3-17	R131-R	10
	-	SHIELD	-	-	SW160-GRD	-
9	-	1/8	FLAT BRAID	XA4-7	XA4-8	3/8
10	-	1/8	FLAT BRAID	XA4-8	GRD-1A	1-3/4
11	-	RG-58A/U	-	XA4-10	R157A-R	12
	-	SHIELD	-	GRD-1	R157A-C	-
12	-	RG-174/U	-	XA4-12	SW140H-18	7
	-	SHIELD	-	GRD-1A	SW140-GRD	-
13	-	1/8	FLAT BRAID	XA4-16	GRD-1	2
14	-	RG-174/U	-	XA4-17	XA6-17	3-1/2
	-	SHIELD	-	-	GRD-3	-
15	-	22	SOLID BUSS	XA5-1	GRD-2	3/4

NO.	WIRE			TERMINATIONS		LENGTH
	COLOR	GAGE	TYPE	FROM	TO	
16	WHITE	20	STRD SHIELDED	XA5-9	SW180A2-8	5
	-	SHIELD	-	GRD-2	SW180A2-6	-
17	-	22	SOLID BUSS	C150-STRATOR	C151-STRATOR	1-1/2
18	WHITE	20	STRD SHIELDED	XA5-17	XA6-1	4
	-	SHIELD	-	XA5-15	XA6-2	-
19	-	22	SOLID BUSS	XA5-15	GRD-3	3/4
20	-	22	SOLID BUSS	XA6-2	GRD-2	3/4
21	BLACK	22	STRD	XA6-9	GRD-2	2
22	-	22	SOLID BUSS	XA6-10	XA6-9	5/8
23	WHITE	20	STRD SHIELDED	XA6-11	SW180A1-5	3-1/2
	-	SHIELD	-	XA6-10	-	-
24	WHITE	20	STRD SHIELDED	XA6-12	SW180A1-3	3
	-	SHIELD	-	GRD-3	-	-
25	-	22	SOLID BUSS	XA6-16	GRD-3	3/4
26	-	22	SOLID BUSS	XA7-2	GRD-4	3/4
27	WHITE	20	STRD SHIELDED	XA7-9	SW180D1-2	2-1/2
	-	SHIELD	-	GRD-5	-	-

NO.	WIRE			TERMINATIONS		LENGTH
	COLOR	GAGE	TYPE	FROM	TO	INCHES
28	WHITE	20	STRD SHIELDED	XA7-11	SW180D2-6	4-1/2
	-	SHIELD	-	GRD-5	-	-
29	WHITE	20	STRD SHIELDED	XA7-16	XA8-1	4-1/2
	-	SHIELD	-	XA7-17	XA8-2	-
30	-	22	SOLID BUSS	XA7-17	GRD-5	3/4
31	-	22	SOLID BUSS	XA8-2	GRD-4	3/4
32	WHITE	20	STRD SHIELDED	XA8-6	SW180E1-2	3-1/2
	-	SHIELD	-	GRD-4	-	-
33	BLACK	22	STRD	XA8-7	XA8-2	2
34	-	22	SOLID BUSS	XA8-8	XA8-7	5/8
35	WHITE	20	STRD SHIELDED	XA8-10	SW180E2-8	3-3/4
	-	SHIELD	-	GRD-5	-	-
36	WHITE	20	STRD SHIELDED	XA8-13	SW180G1-2	2
	-	SHIELD	-	GRD-5	-	-
37	WHITE	20	STRD SHIELDED	XA8-14	SW180G2-8	4-1/4
	-	SHIELD	-	GRD-5	-	-
38	BLACK	22	STRD	XA8-17	XA8-8	3

NO.	WIRE			TERMINATIONS		LENGTH
	COLOR	GAGE	TYPE	FROM	TO	INCHES
39	-	22	SOLID BUSS	R125-R	R125-C	5/8
40	GREEN	22	STRD	XA1-4	R1H-L	4
41	ORANGE	22	STRD	XA1-5	R112-L	3
42	GRAY	22	STRD	XA1-6	R112-R	4
43	W ORN	22	STRD	XA1-11	R110-L	7-1/4
44	-	22	SOLID BUSS	R114-R	R114-C	5/8
45	BLACK	22	STRD	XA1-16	XA1-GRD	2-1/4
46	TWISTED PAIR	20 20	STRD SHIELDED	J101-A J101-C	S101-1 S101-2	11
	-	SHIELD	-	J101-GRD	-	-
47	WHITE	20	STRD	S101-3	WITH F101 SLEEVING	2-1/2
48	BLACK	20	STRD	S101-4	WITH F102 SLEEVING	2
49	TWISTED PAIR	20 20	STRD SHIELDED	F101 F102	FL101-1 FL101-2	6-1/2
	-	SHIELD	-	-	FL101-GRD	-
50	TWISTED PAIR	20 20	STRD SHIELDED	FL101-3 FL101-4	T1-1 T1-2	11
	-	SHIELD	-	-	T1-GRD	-
51	ORANGE	20	STRD	T1-3	CR1-ANODE	5
52	WHITE	20	STRD	T1-4	CR3-ANODE	5
53	-	1/4	FLAT BRAID	CR1-CATHODE	C17-PLUS	3

NO.	WIRE			TERMINATIONS		LENGTH INCHES
	COLOR	GAGE	TYPE	FROM	TO	
54	-	1/4	FLAT BRAID	CR1-CATHODE	C1-PLUS	5
55	BLUE	20	STRD	CR2-ANODE	C1-MINUS	2-3/4
56	BLUE	20	STRD	CR2-ANODE	C17-MINUS	3-3/4
57	RED	22	STRD	XA1-12	R110-R	8
58	-	22	SOLID BUSS	R110-R	R110-C	5/8
59	RED	22	STRD	R110-C	R111-C	2
60	GREEN	22	STRD	Q9-C	Q10-C	2
61	GREEN	22	STRD	T2-7	T2-12	2-1/2
62	BLACK	22	STRD	TB304-11	TB302-7	3
63	WHITE	20	STRD SHIELDED	TB401-5	SW402-4	16-1/2
	-	SHIELD	-	TB401-C	-	-
64	-	RG-174/U	-	TB401-9	SW402-10	14-1/2
	-	SHIELD	-	TB401-B	-	-
65	-	22	SOLID BUSS	R123-R	R-123-C	5/8
66	-	22	SOLID BUSS	R124-L	R124-C	5/8
67	-	22	SOLID BUSS	R235-L	R235-C	5/8
68	GRAY	22	STRD	XDS301-2	XDS302-1	4
69	-	22	SOLID BUSS	R300-L	R300-C	5/8

NO.	WIRE			TERMINATIONS		LENGTH INCHES
	COLOR	GAGE	TYPE	FROM	TO	
70		22	SOLL BUSS	V300-1	V-3003 W/ SLEEVING	1-1/2
71	BLACK	22	STRD	R307-L	R121-R	4
72	VIOLET	22	STRD	TB306-11	C180-1	1-1/2
73	W/GRN	22	STRD	SW18302 WITH TERM. LUG	SW182-1	5-1/4
74	W/BLU	22	STRD	SW183-1 WITH TERM. LUG	SW182-12	3-1/4
75	VIOLET	22	STRD	SW131-2	SW130-9	8-1/4
76	-	22	SOLID BUSS	SW130-9	SW130-3 W/ SLEEVING	1-1/2
77	WHITE	20	STRD SHIELDED	R130-C	J132-CENTER	4-1/2
	-	SHIELD	-	-	J132-GRD	-
78	-	RG174/U		J143-CENTER	SW140A-18	3-1/2
		SHIELD		J143-GRD LUG	SW140-GRD BUS FRONT	
80	BLACK	22	STRD	SW180A2-6	GRD-3	3-1/2
81	BLACK	22	STRD	SW180G2-10	GRD-4	3-1/2
82	-	22	SOLID BUSS	R131-L	SW160-GRD	2-1/4
83	-	1/4	FLAT BRAID	CR1-CATHODE	GRD-6	3
84	-	22	SOLID BUSS	SW130-3	SW130-1	1
85	-	22	SOLID BUSS	SW130-8	SW130-9	5/8

NO.	WIRE			TERMINATIONS		LENGTH
	COLOR	GAGE	TYPE	FROM	TO	INCHES
88	-	22	SOLID BUSS	TB307-2	TB307-3	5/8
90	-	22	SOLID BUSS	XA3-14	GRD-1A	1-1/2
91	YELLOW	22	STRD	R235-R	SW180-B2-9	2-1/2
92	ORN	22	STRD	R235-C	SW180-B2-5	4
93	BLK	22	STRD	SW180-J2-8	GRD-6	4-3/4
94	GREEN	22	STRD	TB304-8	C16-MINUS	8
95	BLACK	22	STRD	TB304-11	C16-PLUS	9
96	GREEN	20	STRD 3000V	TB303-1	T2-11	10
97	YELLOW	22	STRD	TB304-9	T2-4	13
98	BLUE	22	STRD	TB304-7	Q9-B	9
99	GREEN	22	STRD	TB304-8	Q9-C	10
100	GREEN	22	STRD	TB304-8	T2-7	10-1/2
101	BLACK	22	STRD	TB303-C13	T2-2	12
102	W/BRN	22	STRD	TB304-10	T2-5	15-1/2
103	BLACK	22	STRD	TB303-C13	TB302-7	14
104	GRAY	22	STRD	TB304-6	Q10-B	10-1/2
105	ORANGE	22	STRD	TB302-1	Q9-E	9-3/4
106	ORANGE	22	STRD	TB302-1	T2-1	7-3/4

NO.	WIRE			TERMINATIONS		LENGTH
	COLOR	GAGE	TYPE	FROM	TO	INCHES
107	W/ORN	22	STRD	TB302-3	Q10-E	8-1/2
108	W/ORN	22	STRD	TB302-3	T2-3	12
109	W/GRN	22	STRD	TB304-4	T2-6	11
110	W/BLUE	22	STRD	TB304-3	T2-8	10-3/4
111	BLUE	20	STRD 3000V	TB303-4	T2-9	10-1/2
112	BLUE	20	STRD 3000V	TB303-5	T2-10	10-1/2
113	BLACK	22	STRD	XA3-2	GRD-2	7
114	-	RG-174/U	-	XA4-1	J14-2CENTER	12
	-	SHIELD	-	GRD-2	J142-GRD	
115	BLACK	22	STRD	XA4-2	GRD-2	5-1/2
116	-	RG-174/U	-	XA4-3	J141-CENTER	10
	-	SHIELD	-	XA4-2	J141-GRD	-
117	VIOLET	22	STRD	XA4-4	XA5-5	5
118	-	RG-174/U	-	XA4-6	R131-C	14
	-	SHIELD	-	-	R131-L	-
119	VIOLET	22	STRD	XA5-5	XA6-3	5
120	WHITE	20	STRD SHIELDED	XA5-6	R118-L	26-1/2
	-	SHIELD	-	GRD-2	-	-
121	-	RG-174/U	-	XA5-11	C150 STATOR	13
	-	SHIELD	-	GRD-3	-	-
122	VIOLET	22	STRD	XA6-3	XA7-8	6
123	-	RG-58A/U	-	XA7-1	SW160-12	15-1/2

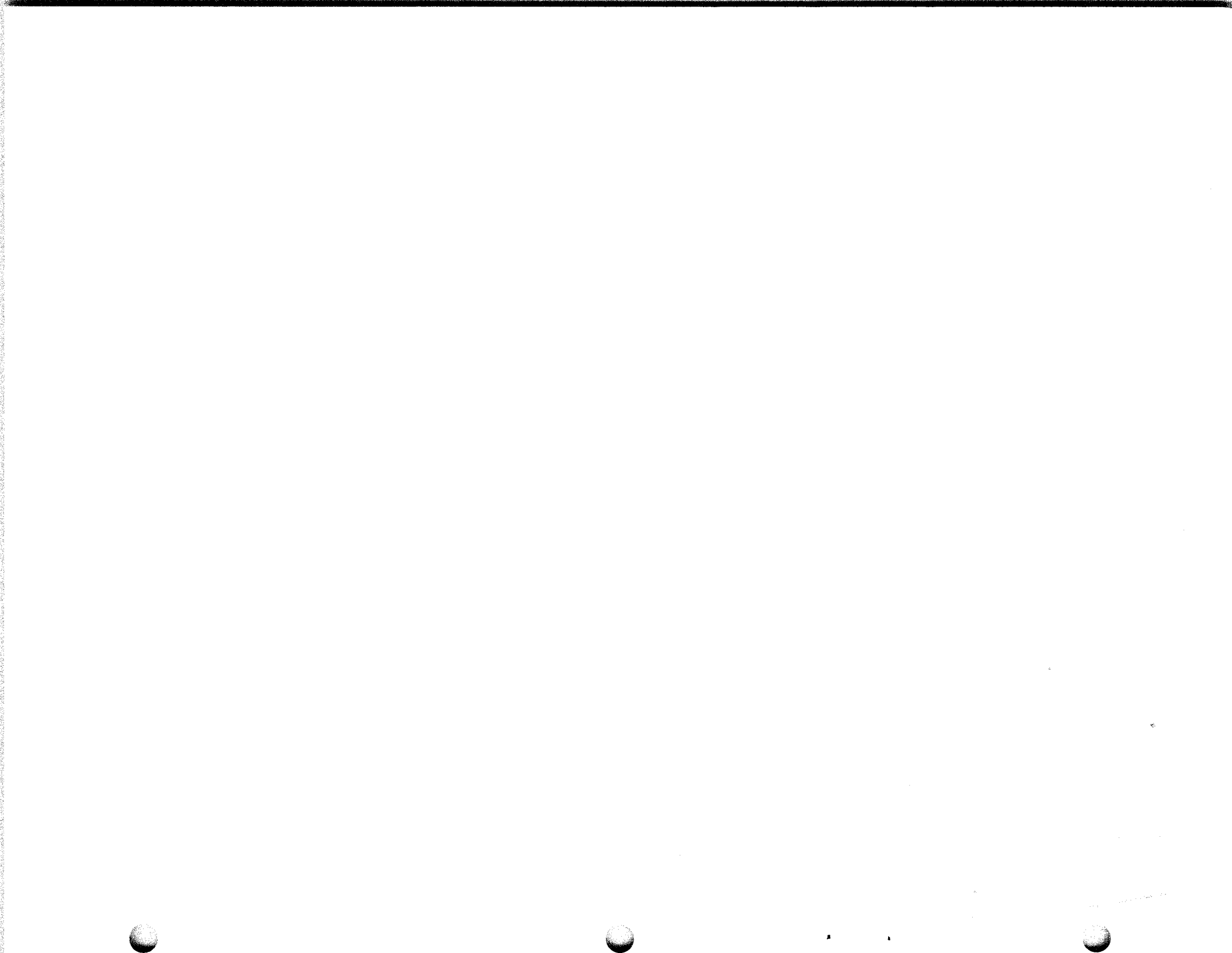
NO.	WIRE			TERMINATIONS		LENGTH INCHES
	COLOR	GAGE	TYPE	FROM	TO	
	-	SHIELD	-	GRD-4	SW160-GRD	-
124	-	RG-58A/U	-	XA7-6	R157B-R	19-3/4
	-	SHIELD	-	GRD-4	R157B-C	-
125	VIOLET	22	STRD	XA7-8	XA8-4	6
126	WHITE	20	STRD SHIELDED	XA8-1	TB307-1	4
	-	SHIELD	-	GRD-4	-	-
127	BLACK	22	STRD	XA8-2	GRD-6	14-1/2
128	VIOLET	22	STRD	XA8-4	TB307-2	5
129	WHITE	20	STRD SHIELDED	XA8-16	XA2-6	15
	-	SHIELD	-	XA8-17	XA2-GRD	-
130	BLACK	22	STRD	XA2-4	GRD-6	22
131	WHITE	20	STRD SHIELDED	XA2-17	TB306-1	24
	-	SHIELD	-	XA2-GRD	-	-
132	VIOLET	22	STRD	XA1-1	TB307-3	21
133	YELLOW	22	STRD	XA1-3	SW183-3	34-1/2
134	BLUE	20	STRD	C1-MINUS	TB301-14	3-1/4
135	BLUE	20	STRD	C17-MINUS	TB301-9	3-1/2
136	GREEN	20	STRD	TB301-10	TB304-2	14
137	VIOLET	20	STRD	TB301-8	TB307-2	12
138	BLACK	20	STRD	TB304-1	GRD-6	19-1/2
139	BLACK	20	STRD	TB301-12	GRD-6	7-1/2

NO.	WIRE			TERMINATIONS		LENGTH INCHES
	COLOR	GAGE	TYPE	FROM	TO	
140	RED	22	STRD	TB304-5	DS101-1	25-1/2
141	BLACK	22	STRD	DS101-2	C16-GRD	25-1/2
142	BLUE	22	STRD	TB301-9	Q1-C	22
143	GREEN	22	STRD	TB301-10	Q1-E	21
144	YELLOW	22	STRD	TB301-2	Q1-B	20-3/4
145	BLUE	22	STRD	TB301-14	Q6-C	22-1/2
146	VIOLET	22	STRD	TB301-8	Q6-E	24-1/2
147	GRAY	22	STRD	TB301-6	Q5-B	22
148	WHITE	22	STRD	TB301-1	R5-L	10-1/4
149	ORANGE	22	STRD	TB301-3	R5-R	11
150	W BLUE	22	STRD	TB301-5	R5-C	9-3/4
151	W GRN	22	STRD	TB301-15	R12-L	5-1/4
152	W BRN	22	STRD	TB301-1	R12-R	10
153	W ORN	22	STRD	TB301-7	R12-C	7-1/4
154	WHITE	20	STRD SHIELDED	SW402-2	TB307-2	15-3/4
	-	SHIELD	-	METER GRD	-	-
155	-	RG-58A/U	-	SW160-6	SW180A1-2	18-1/4
	-	SHIELD	-	SW160-GRD	SW180A1-11	-
156	GREEN	22	STRD	TB306-2	SW180J2-9	15
157	BLUE	22	STRD	TB306-4	SW180H2-3	11-1/4
158	YELLOW	22	STRD	TB306-6	SW180H2-11	12-1/2

NO.	WIRE			TERMINATIONS		LENGTH
	COLOR	GAGE	TYPE	FROM	TO	INCHES
159	ORANGE	22	STRD	TB306-8	SW180H2-9	13
160	W/ORN	22	STRD	TB306-10	SW180H1-3	8-3/4
161	W/ORN	22	STRD	TB306-10	C181A	8-1/2
162	VIOLET	22	STRD	C181A	TB306-11	9
163	VIOLET	22	STRD	C180-1	TB307-2	11
164	YELLOW	22	STRD	C180-2	SW180J1-3	10
165	W/GRN	22	STRD	SW182-1	SW180H1-2	21
166	W/ORN	22	STRD	SW182-2	SW180J1-2	22
167	W/BRN	22	STRD	SW182-3	SW180H2-8	20
168	VIOLET	22	STRD	SW130-3	TB307-3	14
169	BLACK	22	STRD	TB305-8	GRD-6	15-1/2
170	RED	22	STRD	XA2-2	TB304-5	22-1/2
171	WHITE	20	STRD SHIELDED	XA2-5	SW120-2	11
	-	SHIELD	-	XA2-GRD	-	-
172	WHITE	20	STRD SHIELDED	XA2-7	R121-C	16
	-	SHIELD	-	XA2-GRD	-	-
173	GREEN	22	STRD	XA2-8	SW120-1	11-1/2
174	BLUE	22	STRD	XA2-9	SW120-2	11
175	YELLOW	22	STRD	XA2-10	R126-L	17
176	WHITE	22	STRD	XA2-11	R126-R	17-1/2
177	VIOLET	22	STRD	XA2-12	XA1-1	22
178	GRAY	22	STRD	XA2-13	V300-7	19-1/4

NO.	WIRE			TERMINATIONS		LENGTH
	COLOR	GAGE	TYPE	FROM	TO	INCHES
179	GRAY	22	STRD	XA2-13	R125-L	20
180	W/ORN	22	STRD	XA2-14	V300-6	20
181	W/ORN	22	STRD	XA2-14	R125-R	20-1/2
182	W/BLUE	22	STRD	XA2-15	R123-L	18
183	W/GRN	22	STRD	XA2-16	R124-L	19
184	WHITE	20	STRD SHIELDED	XA2-17	SW120-3	13-1/2
	-	SHIELD	-	XA2-GRD	-	-
185	WHITE	20	STRD SHIELDED	XA1-2	TB302-8	18
	-	SHIELD	-	XA1-GRD	-	-
186	W/BRN	22	STRD	XA1-7	R113-R	32
187	WHITE	22	STRD	XA1-10	R114-L	33
188	WHITE	22	STRD	XA1-10	V300-10	18
189	RED	22	STRD	XA1-12	XA2-2	23-1/2
190	W/GRN	22	STRD	XA1-14	R114-R	34
191	W/GRN	22	STRD	XA1-14	V300-9	18-1/2
192	W/BLUE	22	STRD	XA1-17	R113-L	29-3/4
193	RED	22	STRD	R111-C	R307-R	26-1/2
194	BROWN	20	STRD 3000V	TB303-5	V300-12	20-1/4
195	BROWN	20	STRD 3000V	TB303-3	V300-1	20-1/4
196	GREEN	20	STRD 3000V	TB303-2	TB305-5	15-1/4

NO.	WIRE			TERMINATIONS		LENGTH INCHES
	COLOR	GAGE	TYPE	FROM	TO	
197	VIOLET	22	STRD	R123-R	TB305-21	16
198	BLACK	22	STRD	R124-R	R121-R	12-1/4
199	BLUE	22	STRD	TB305-20	R126-C	17-1/2
200	BLACK	22	STRD	R307-R	TB305-1	23-1/4
201	GREEN	22	STRD	R121-L	TB305-22	16-1/2
202	WHITE	20	STRD SHIELDED	R118-C	R235-L	29
	-	SHIELD	-	-	GRD-2	-
203	WHITE	20	STRD SHIELDED	R112-C	R118-R	29
204	GRAY	22	STRD	TB305-E	XDS302-2	17-1/4
205	GRAY	22	STRD	XDS301-1	R308-L	19-1/2
206	GRAY	22	STRD	R308-L	TB305-15	20
207	BLACK	22	STRD	R308-R	TB305-1	28
208	YELLOW	22	STRD	TB305-26	R308-C	16
209	BLUE	22	STRD 1000V	R304-C	V300-4	25-3/4
210	GREEN	22	STRD 1000V	TB305-13	R304-L	26
211	YELLOW	22	STRD 1000V	TB305-11	R304-R	25-1/2
212	ORANGE	20	STRD 3000V	TB305-12	R300-L	18
213	GREEN	20	STRD 3000V	TB305-6	R300-R	19-1/2



SECTION 5
MAINTENANCE

5.1. SHELF LIFE MAINTENANCE.

The Spectrum Analyzer has no periodic requirements and does not need shelf life maintenance other than the storage conditions specified for most electronic equipment.

5.2. Operator's Checks and Adjustments

The general operator's checks and adjustments are described in Paragraph 3.2.3 Sequence of Operations, particularly operation with the Self Checking Mode.

5.2.1. Logarithmic Compressor (Scale) Adjustments

-40db Adjustment

a. Set the front panel controls as follows:

- | | |
|---------------------|--------------|
| (1) AMPLIFIER SCALE | LOG position |
| (2) IF GAIN | mid position |
| (3) CAL OSC LEVEL | mid position |
| (4) SWEEP WIDTH | 7kc |
| (5) IF ATTEN | 0db |

b. Adjust IF GAIN and CAL OSC LEVEL until pip top reaches -20db line.

c. Change IF ATTEN to 20db, observe the top of the pip comes down to -40db.

d. If pip does not come down to -40db following adjustment in c above, adjust LOG -40db control to bring it to this position. Observe that LOG-baseline is below the engraved -40db line. Adjusting the -40db control moves the baseline up or down. LOG BASELINE IS NOT ADJUSTED: IT IS POSITIONED BY NORMAL ADJUSTMENTS. The LIN baseline can be adjusted without signal. The LIN baseline must coincide with the lowest screen calibration line.

5.2.1.1. Set the Front Panel Controls as follows:

BRIL, FOCUS, ASTIG, VERT POS, HORIZ POS, CENTER FREQ COARSE, CENTER FREQ FINE, as given in 3.2.3. Set remaining controls as given below.

- | | |
|--------------------|--------------|
| a. AMPLITUDE SCALE | LIN position |
| b. IF GAIN | mid position |
| c. SWEEP WIDTH | 7kc |
| d. CAL OSC LEVEL | mid position |
| e. DUAL RF TEST | OFF position |
| f. IF ATTENUATOR | 20db |

5.2.1.2. Adjust IF GAIN and CAL OSC LEVEL until pip is displayed at full screen deflection.

- 5.2.1.3. Adjust CENTER FREQ COARSE until pip is centered on screen.
- 5.2.1.4. Change AMPLITUDE SCALE to LOG position. Check to see that top of pip remains in same position.
- 5.2.1.5. If top of pip does not remain in same position, adjust LOG 0db to bring top of pip to 0db line.
- 5.2.1.6. Check pip for centering and if necessary, adjust again as in 5.2.1.2, 5.2.1.3, 5.2.1.4, 5.2.1.5.
- 5.2.1.7. -20db Adjustment
- a. Set front panel controls as follows:
- | | |
|---------------------|--------------|
| (1) AMPLITUDE SCALE | LOG position |
| (2) CAL OSC LEVEL | MID position |
| (3) SWEEP WIDTH | 7kc |
| (4) IF ATTENUATOR | 0db |
- 5.2.1.8. Adjust IF GAIN and CAL OSC LEVEL until pip top reaches 0db line.
- 5.2.1.9. Change IF ATTEN to 20db and check that top of the pip comes down to the -20db line.
- 5.2.1.10. If pip does not come down, adjust LOG -20db control to bring it to the -20db position. Check that the LOG baseline is below the -40db scale line. The adjustments or 5.2.1.1 thru 5.2.1.10 should be repeated until all checks can be made without further adjustments.

SECTION 6

MAINTENANCE PARTS LIST

6.1. ARRANGEMENT OF THE TABLE.

a. Table 1 constitutes the major portion of this section and falls into one main division including the parts of both the one major unit and the accessories of the Spectrum Analyzer TS-1739A/U. Table 2 includes repair parts for printed circuits.

b. Each sheet of the table is divided vertically into four columns, which are labelled from left to right:

- (1) "Ref. Designation"
- (2) "Notes"
- (3) "Name and Description"
- (4) "Figure Number"

c. Paragraphs 6-1-1 through 6-1-5 provide an explanation of each of these four columns. Paragraphs 6-2 and 6-3 respectively list the abbreviations used in the table.

6.1.1. COLUMN 1: REFERENCE DESIGNATION

a. A reference Designation, consisting of one or two uppercase letters and up to three significant figures, is assigned to each electrical component of the SPECTRUM ANALYZER TS-1739A/U equipment for which a replacement may be required or to which reference is made in the drawings and text of this handbook.

b. The alphabetical portion of each reference designation indicate the particular category of electrical component to which the designation is assigned. The list below covers all categories of component found in the table of replaceable parts for the Spectrum Analyzer TS-1739A/U equipment.

Description	Type of Component
A	Assembly, Sub Assembly
C	Capacitors of all types
CR	Crystal, rectifier type
DS	Indicating lamps
F	Fuses
FL	Filter
J	Jacks and receptacles
L	Inductors: radio frequency and audio frequency
M	Meter
P	Plugs
Q	Transistor
R	Resistors: fixed and variable (potentiometers, etc.)
S	Switches
T	Transformers: radio-frequency and power
TB	Terminal Board
V	Vacuum and gaseous discharge tubes
W	Cables
X	Sockets

c. In the Maintenance Parts List, the components included are listed in alphabetical and numerical series of their reference symbols.

6.1.2. COLUMN 2: NOTES

This column will give any notes applicable to the particular part.

6.1.3. COLUMN 3: NAME AND DESCRIPTION

This column gives the name and description of the component identified by reference in Column 1. The description, however, is given only for the first appearance of a given component. If it appears again (bearing a different reference symbol). Column 3 gives only the name and phrase "same as ..." (reference symbol associated with the component's first appearance.)

This column also contains the manufacturers or contractor's part or drawing number for the applicable component. Where applicable, JAN or AWS specifications are also listed in this column.

This column also contains all the parts required to manufacture the SPECTRUM ANALYZER TS-1739A/U. It does not include spare parts, hardware or structural items.

6.2. ABBREVIATIONS USED IN THE MAINTENANCE PARTS LIST.

ABBREVIATIONS - The following list of abbreviations used in describing the various components in Column 3 conform to the "Joint Army-Navy Manual of Standard Descriptions", Specification JANP-109. ANA Bulletin 261 abbreviations have been used to describe the electrical or mechanical function of the various components.

Abbreviation	Meaning
AC	alternating current
AF	Audio Frequency
amp	ampere(s)
AN	Army-Navy
approx	approximate(ly)
assem	assembly
AWG	American Wire Gauge
BNC	A type of coaxial connector
c to c	Center to center
coef	Coefficient
cond	Conductor(s)
cont	Contact(s)
cps	Cycles per second
CRS	Cold rolled steel
cyc	cycle(s)
d	Depth or deep
DC	Direct Current
deg	Degree of angle
°C	Degrees Centigrade
°F	Degrees Fahrenheit
diam	Diameter
dimen	Dimensions

Abbreviation	Meaning
DPST	Double Pole Single Throw
dwg	Drawing(s)
ea	Each
ext	External
ft	Foot(feet)
gnd	Ground
h	High
hex	Hexagonal
HF	High-Frequency
HV	High-Voltage
hy	Henry(ies)
ID	Inside Diameter
IF	Intermediate Frequency
term	Terminal(s)
thd	Thread(s)
thk	Thick
v	Volt(s) or Voltage
vdcw	DC working voltage
w	watt(s)
w/	With
wd	Wide or Width
x	By
mfd	Microfarad(s)
mmf	Micro-Microfarad(s)
mh	Micro-Herry(ies)

6.3. LIST OF MANUFACTURERS.

The names and addresses of the manufacturers for replaceable parts are listed in alphabetical order, not showing the prime proper identification to show the general items that can be obtained where the military chooses.

Cambridge Thermionic Corp.
445 Concord Avenue
Cambridge, Mass.

*Jetronic Industries Inc.
4312 Main Street
Philadelphia, Penna.

Elco Corporation
Maryland and Computer Road
Willow Grove, Penna.

Radio Condenser Corporation
Davis & Copewood Streets
Camden, New Jersey

Hammarlund Mfg. Inc.
53 West 23rd Street
New York City, New York

Waterman Elex Tube
26 West Queen Lane
Philadelphia, Penna.

Jan Hardware Mfg. Inc.
3801 Queens
o Long Island City, N. Y.

*Prime Manufacturer

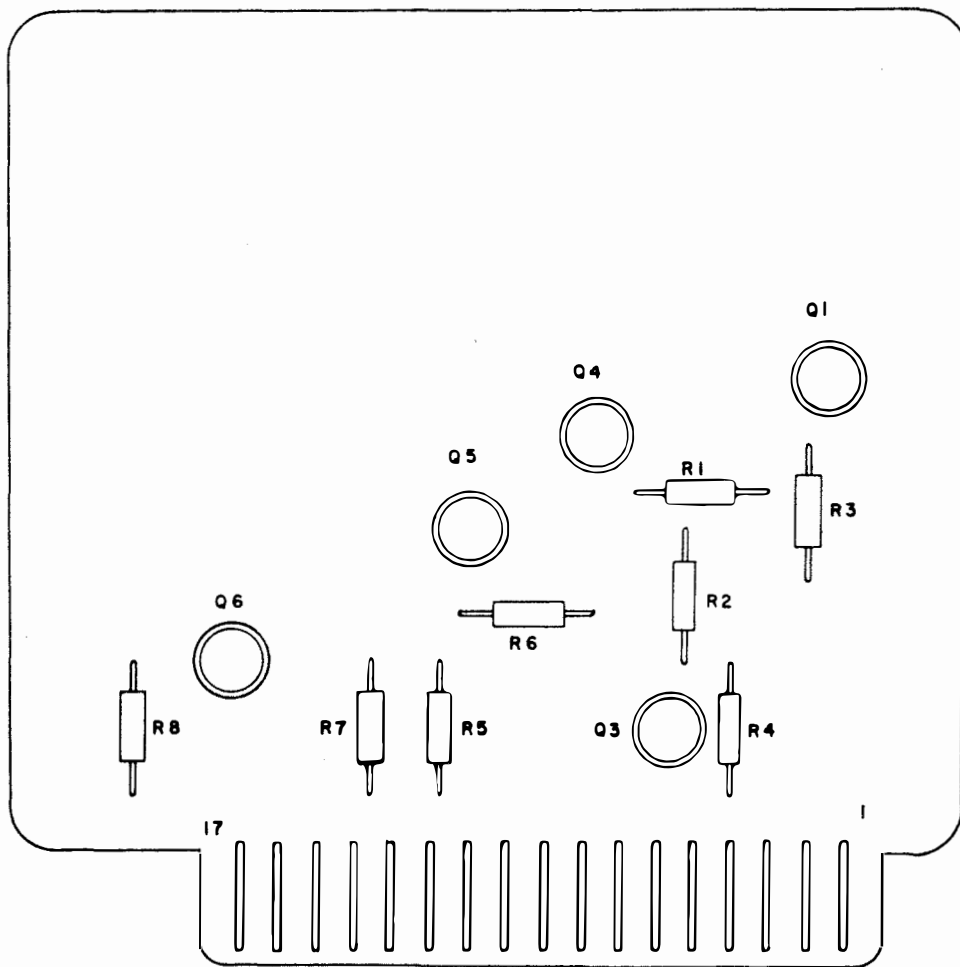


Figure 6-1: P.W. Board Assembly (A1 Timing CKT Horiz. Defl.)

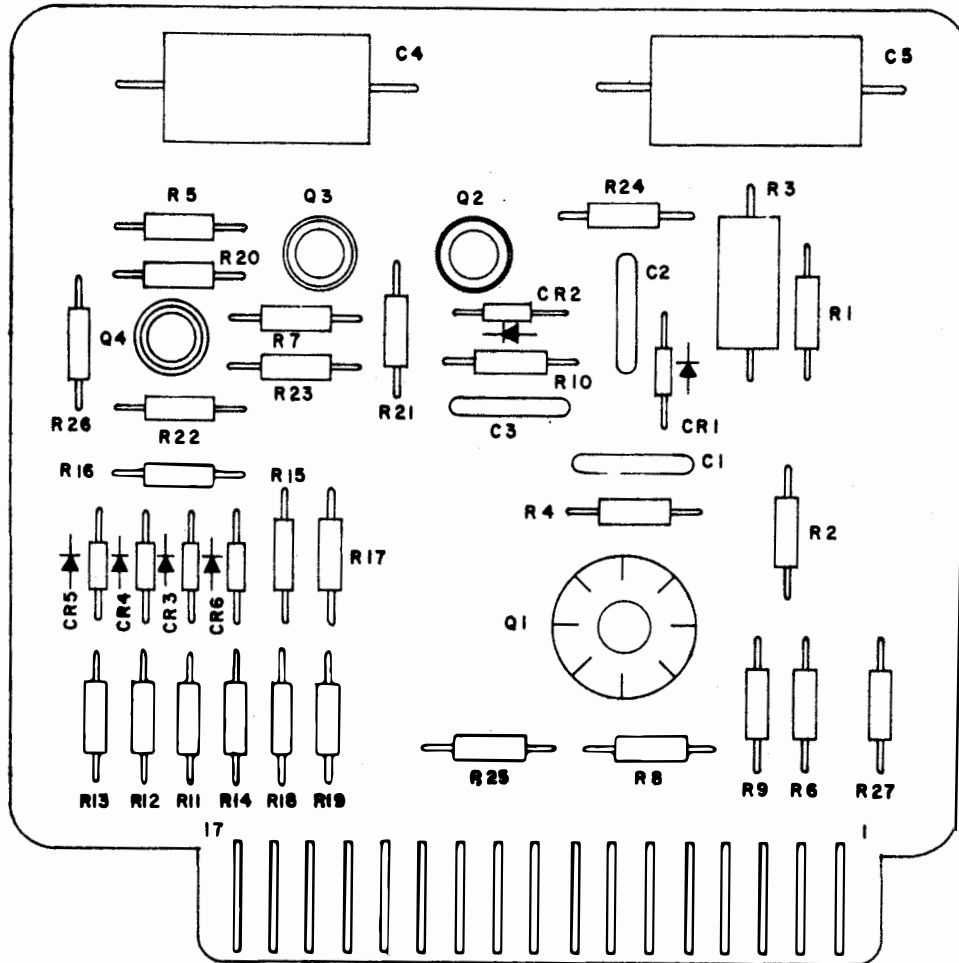


Figure 6-2: P.W. Assembly (A2-IF Amp, Lin-Log Converter, Vert. Defl.)

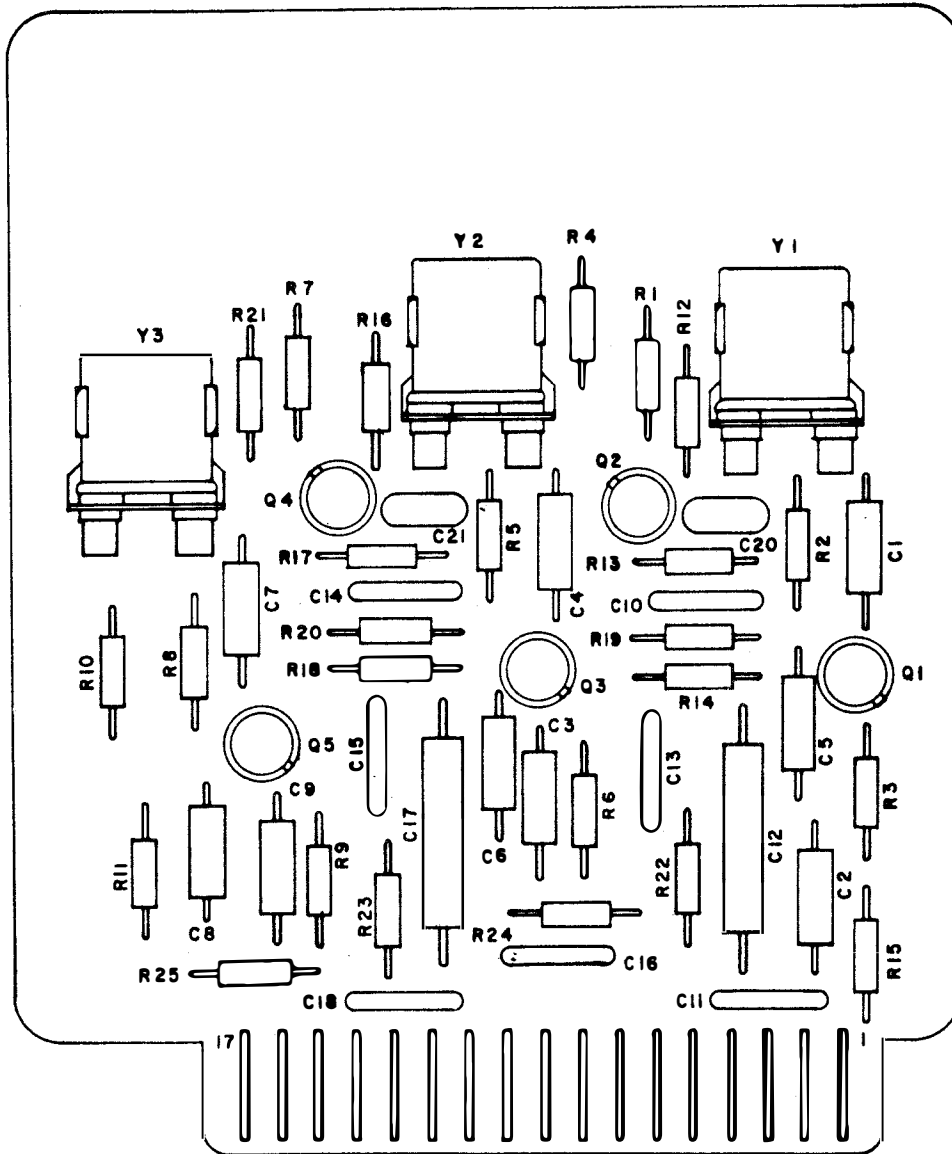


Figure 6-3: P.W. Board Assy (A3 Dual Freq.
Osc. & 500 KC Calibrated Osc.)

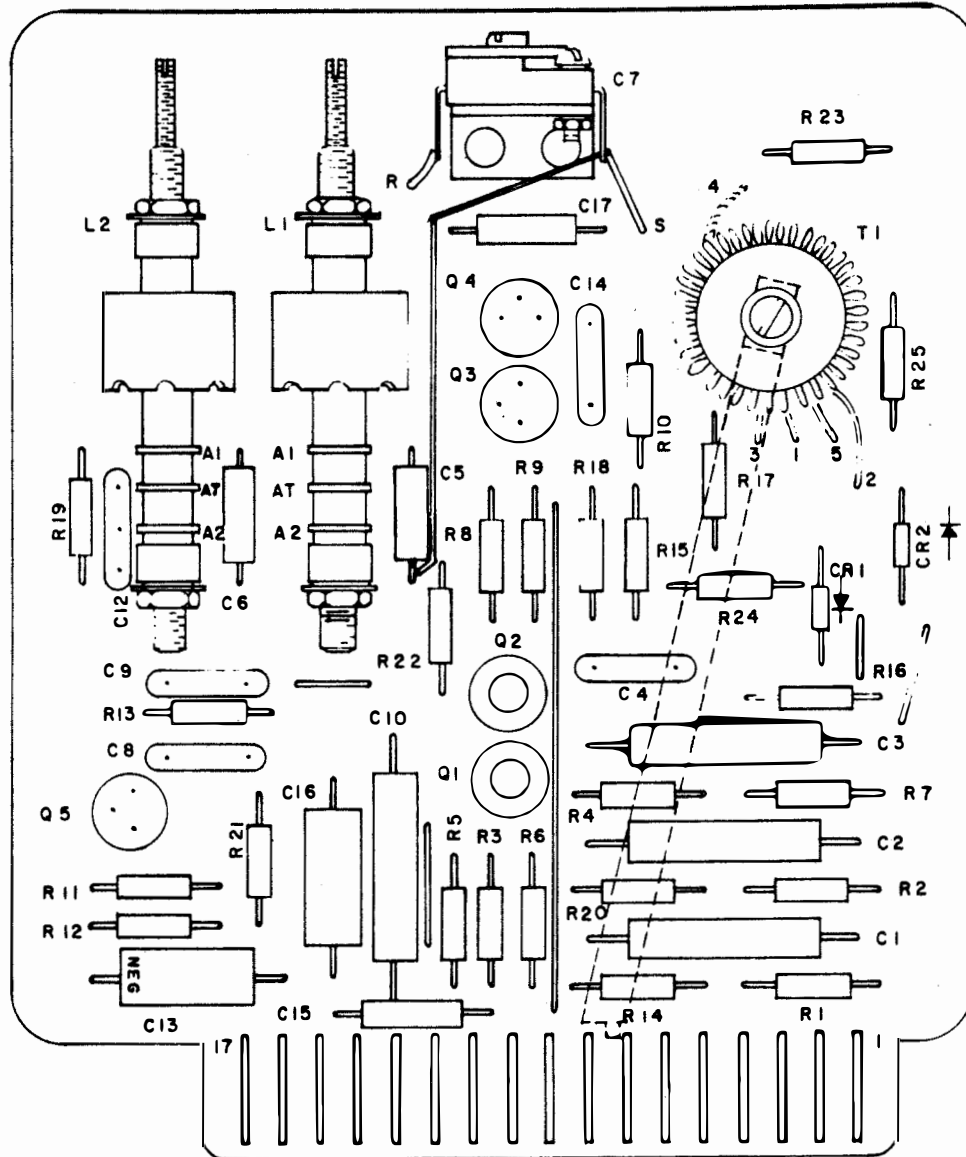


Figure 6-4: P. W. Board Assembly (A4 R. F. Amp.
1st Mixer & 500 KC IF)

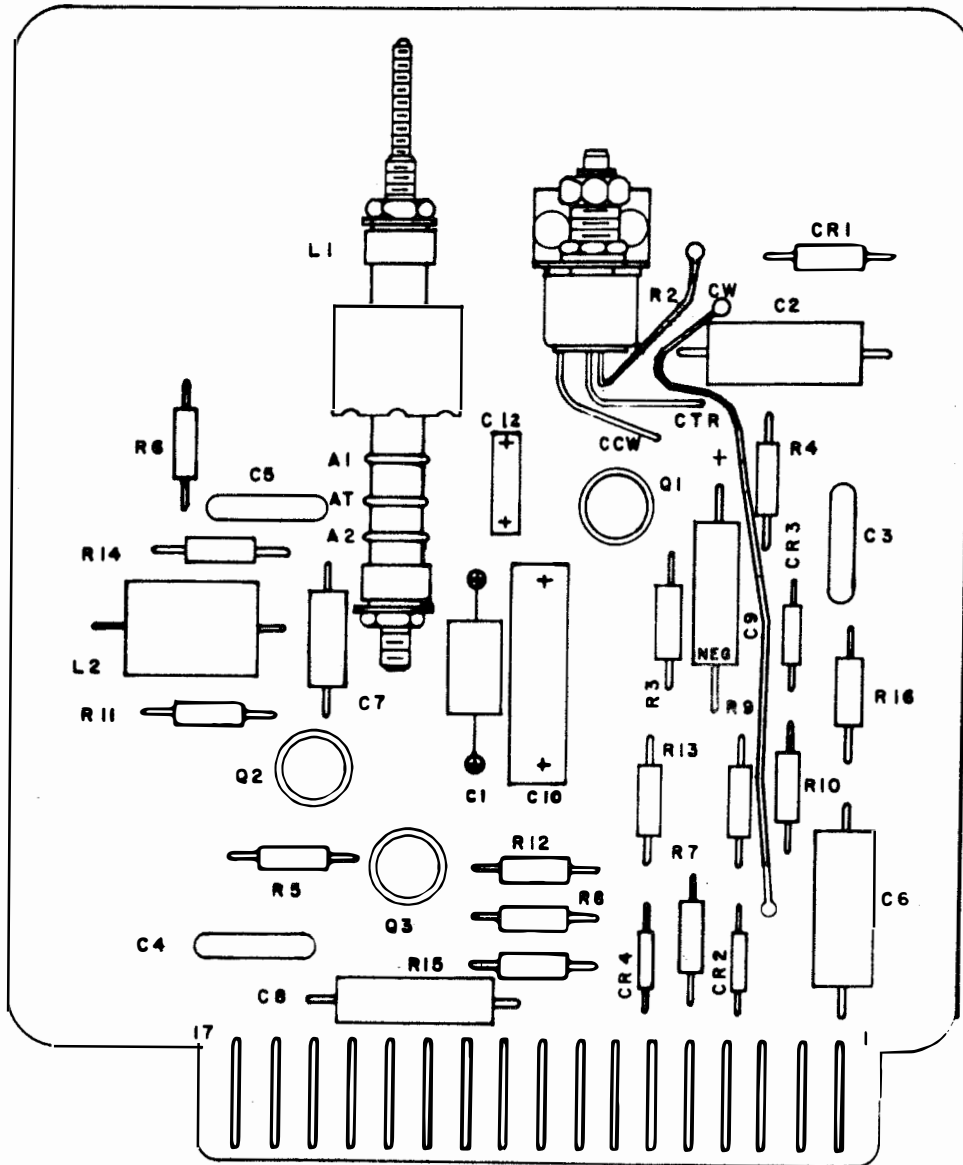


Figure 6-5: P. W. Board Assembly
(A5 Swept Osc.)

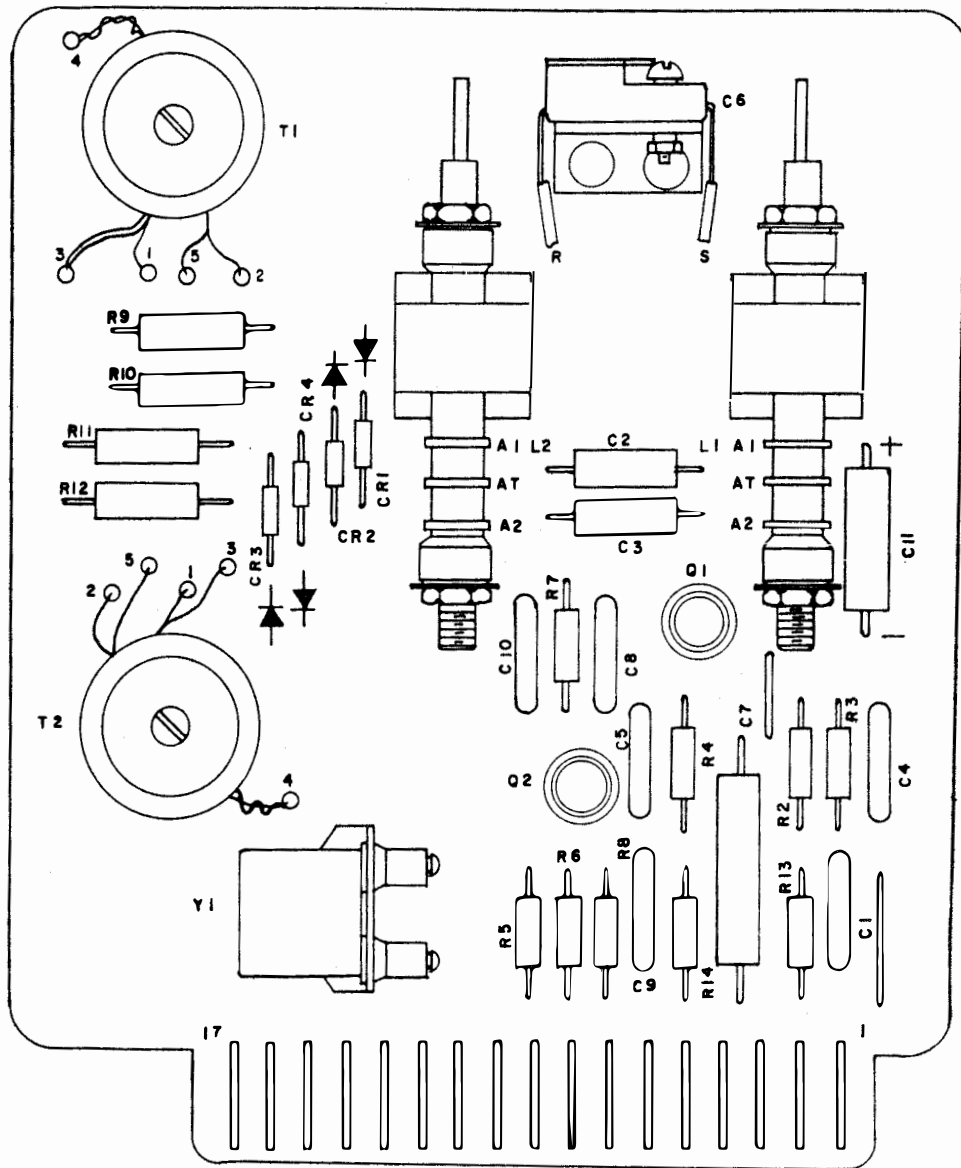


Figure 6-6: P. W. Board Assembly
A6 Swept Osc. Ampl.

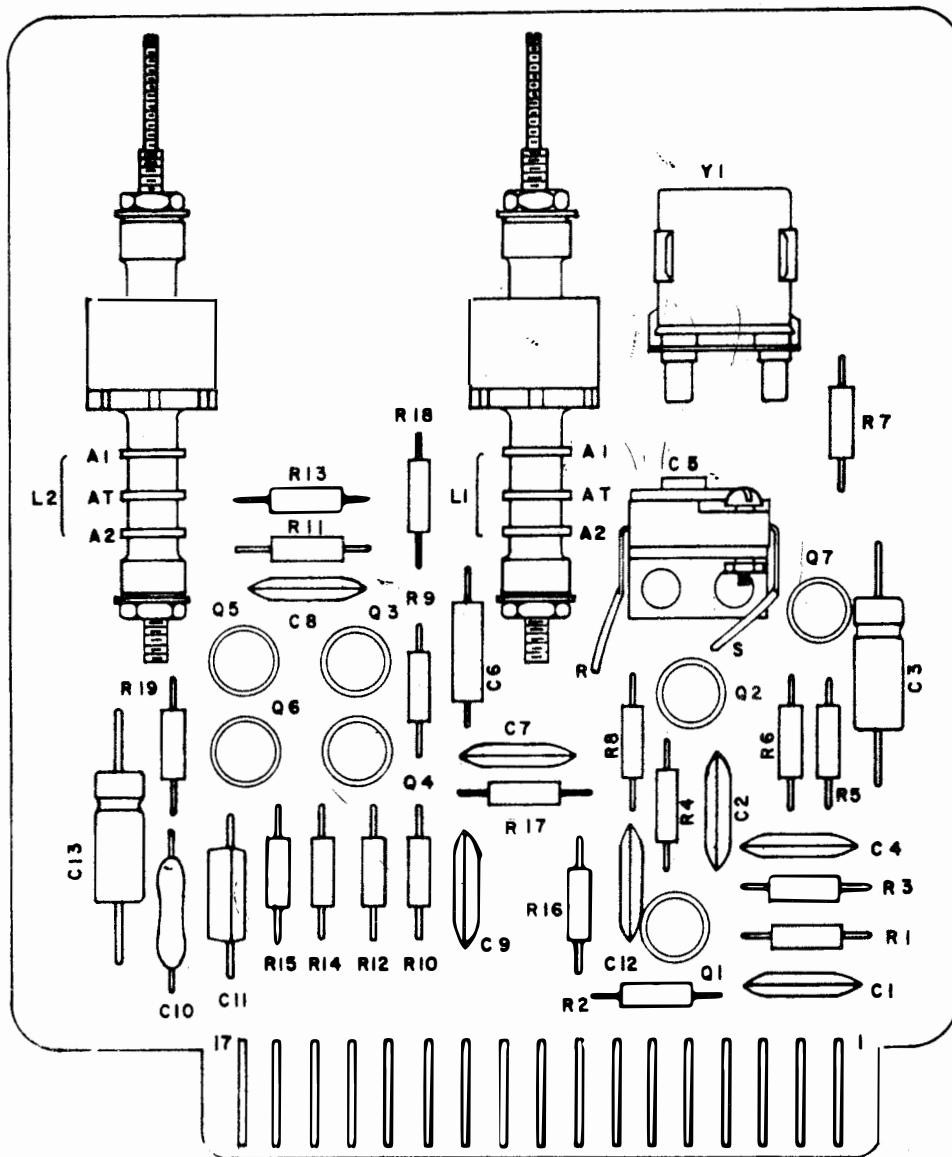


Figure 6-7: P. W. Board Assembly
(A7 IF Crystal Filter)

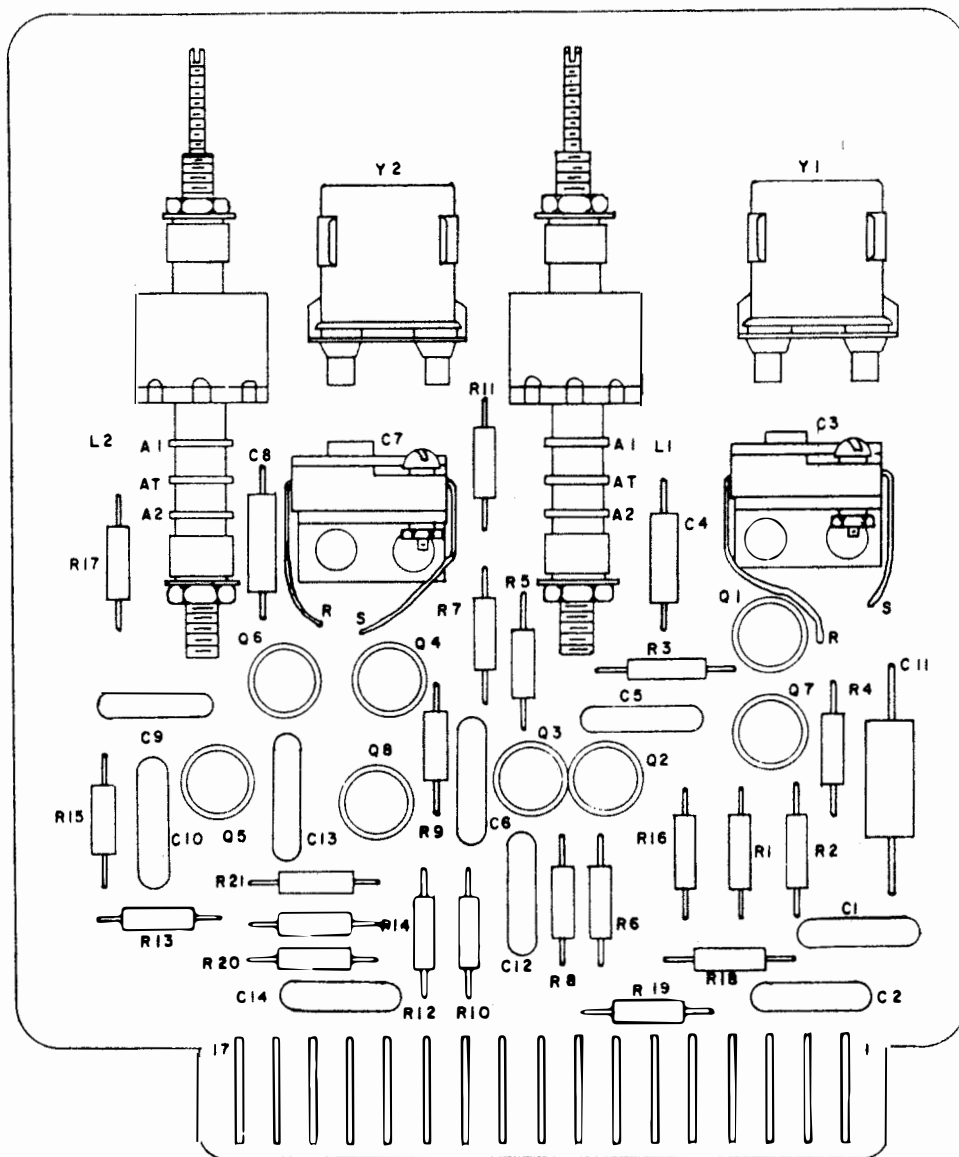


Figure 6-8: P.W. Board Assembly
(A8 IF Crystal Filter)

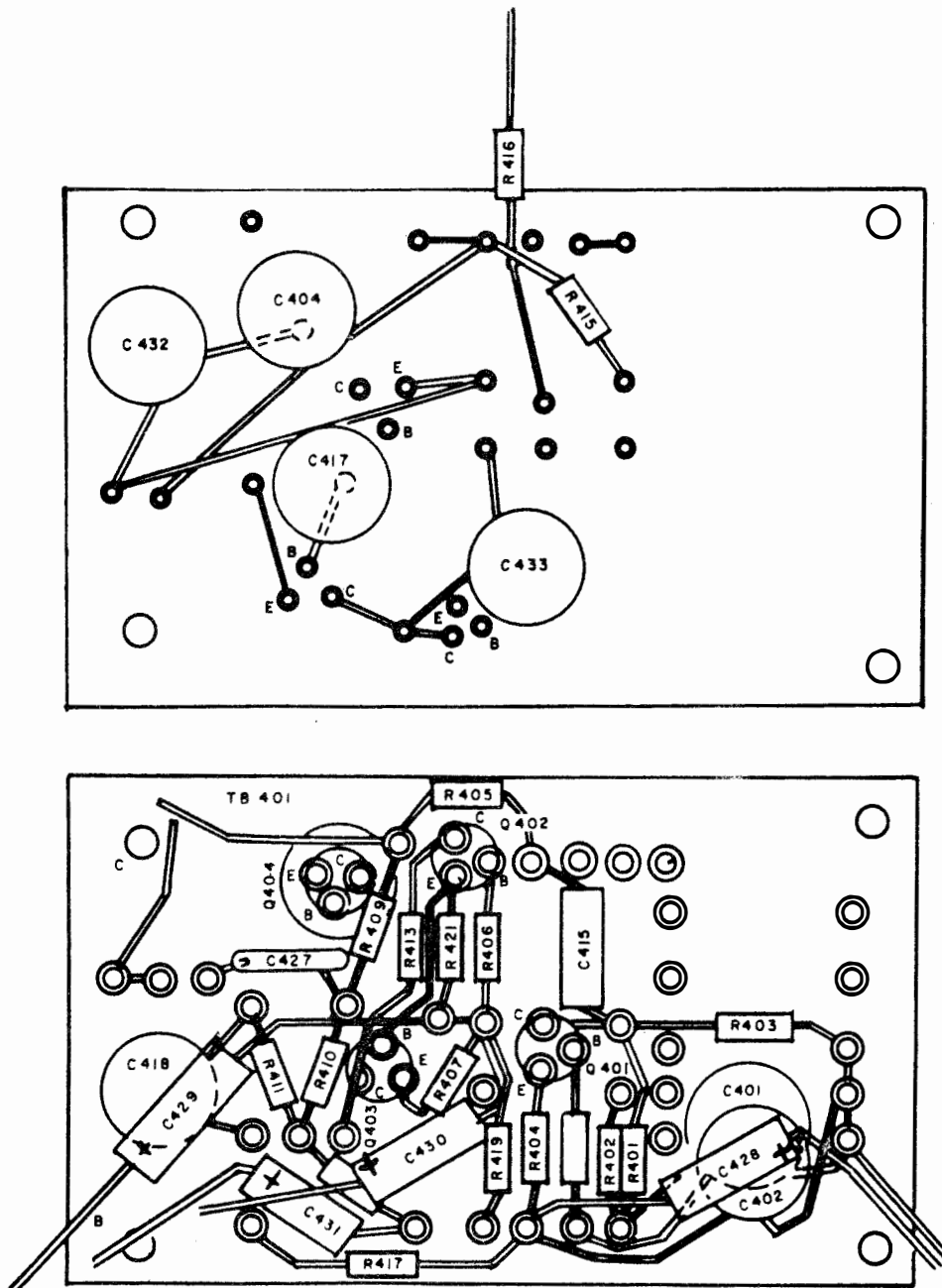


Figure 6-9: Terminal Board (Osc Sect) Assy. Wired TB-401

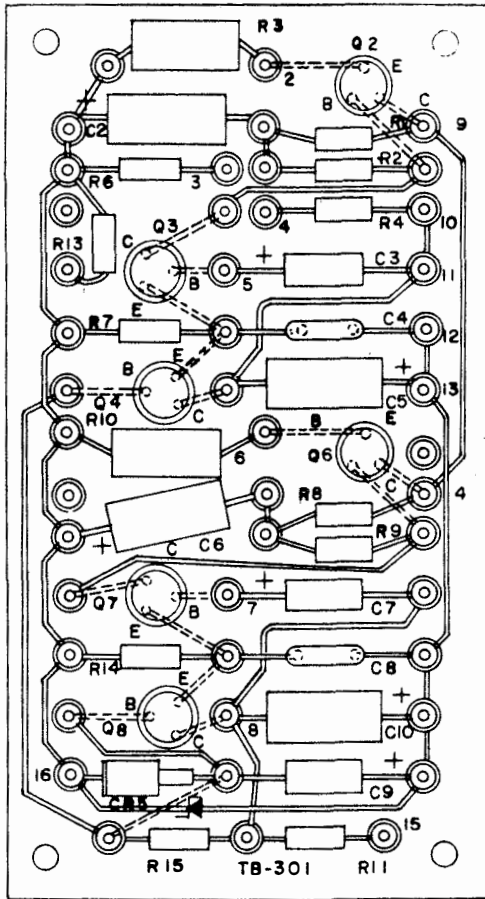


Figure 6-10: Terminal Board Low Voltage Assembly Wired TB-301

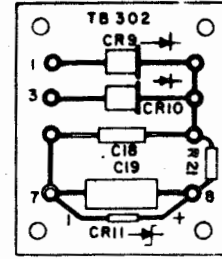


Figure 6-11: Terminal Board - 3.9 Volt Assy Wired TB-302

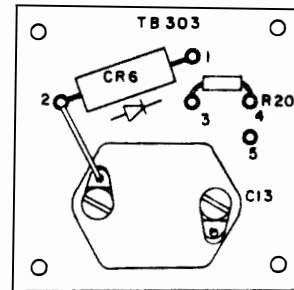


Figure 6-12: Terminal Board 1500V Assy Wired TB-303

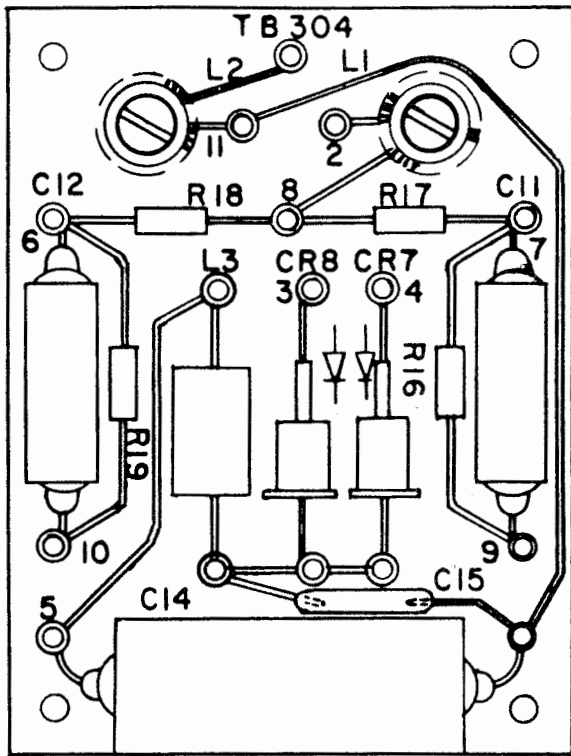


Figure 6-13: Terminal Board 200V
Assy Wired TB-304

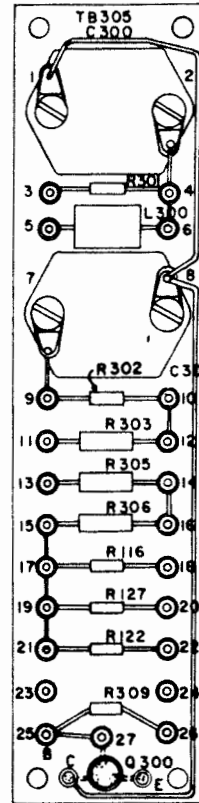


Figure 6-14: Terminal Board Display
Assy Wired TB-305

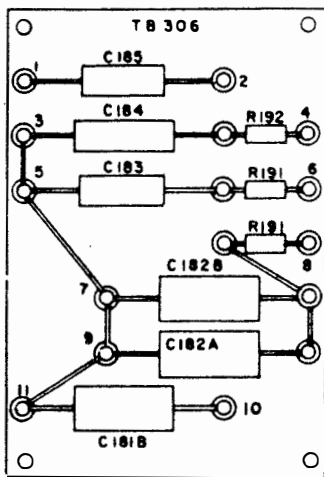


Figure 6-15: Terminal Board
Sweep Timing Assy Wired TB-306

TABLE 1: MAINTENANCE PARTS LIST*

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
A1	See Table 6-2 for Parts List- ing for A1 thru A8	ASSEMBLY, P. C. Board C-4551	6-1
A2		ASSEMBLY, P. C. Board C-4538	6-2
A3		ASSEMBLY, P. C. Board C-4541	6-3
A4		ASSEMBLY, P. C. Board C-4562	6-4
A5		ASSEMBLY, P. C. Board C-4564	6-5
A6		ASSEMBLY, P. C. Board C-4543	6-6
A7		ASSEMBLY, P. C. Board C-4567	6-7
A8		ASSEMBLY, P. C. Board C-4569	6-8
C1		CAPACITOR, electrolytic 3000mfd 25 v MIL Type CE71C302F as per MIL-C-62	4-1
C2		CAPACITOR, tantalum 100mfd 25v MIL type CL65BG101M-P3 as per MIL-C-3965.	6-10
C3		CAPACITOR, tandalum 10mfd 25 v MIL type CL64BG100M-P3 as per MIL-C-3965	4-1
C4		CAPACITOR, ceramic .01mfd 500 v MIL type CK63AW103M as per MIL-C-11015	4-1
C5		Same as C2	6-10
C6		Same as C2	6-10
C7		Same as C3	4-1
C8		Same as C4	4-1
C9		Same as C3	4-1

* For Major Unit & Accessories

TABLE 1: MAINTENANCE PARTS LIST*

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
C10		Same as C2	
C11		CAPACITOR, paper, 22mfd 10% 200v MIL type CH05A1NC224K as per MIL-C-18312	6-13
C12		Same as C11	
C13		CAPACITOR, mica .01mfd 10% 2500v MIL type CM60B103J-3 as per MIL-C-5	6-12
C14		CAPACITOR, paper 1.0 mfd 400v MIL type CH05A3NE105M as per MIL-C-18312	6-13
C15		CAPACITOR, ceramic .01mfd 500v MIL type CK63AX103K as per MIL-C-11015	6-13
C16		Same as C1	
C17		Same as C1	
C18		Same as C3	
C19		Same as C2	
C140		CAPACITOR, ceramic 33pf 5% 500v MIL type CK61CZ330K as per MIL-C-11015	4-1
C150		CAPACITOR, var MIL type MCA-20-S Hammarlund	4-1
C151		CAPACITOR, var MIL type MCA-100-S Hammarlund	4-1
C180		CAPACITOR, plastic 15mfd 50v MIL type CH70B1MV156 as per MIL-C-18312	4-1
C181A		CAPACITOR, plastic 4mfd 150v MIL type CH5381MV405K-3 as per MIL-C-18312	4-1
C181B		CAPACITOR, plastic 1.0mfd 50v MIL type CH03A3NG105K-3 as per MIL-C-18312	6-15
C182A		CAPACITOR, plastic 1.5mfd 50v MIL type CH03ANG155K-3 as per MIL-C-18312	6-15
C182B		Same as C182A	

*For Major Unit & Accessories

TABLE 1: MAINTENANCE PARTS LIST *

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
C183		CAPACITOR, plastic 0.47mfd 50v MIL type CH03A3NG474K-3 as per MIL-C-18312	6-15
C184		CAPACITOR, plastic 0.15mfd 50v MIL type CH03A3NG154K-3 as per MIL-C-18312	6-15
C185		Same as C183	6-15
C250		CAPACITOR, ceramic 4700pf 500v MIL type CK62AX472K as per MIL-C-11015	4-1
C251		CAPACITOR, mica 5pf 500v MIL type CM05C050K as per MIL-C-5	4-1
C300		CAPACITOR, mica 0.01mfd 2500v MIL type CM60B103J as per MIL-C-5	6-14
C301		Same as C300	6-14
C401		CAPACITOR, ceramic 0.01mfd 500v MIL type CK63AW103M as per MIL-C-11015	6-9
C402		Same as C401	6-9
C404		Same as C401	6-9
C405		CAPACITOR, mica 2200pf 500v type CM30D222J as per MIL-C-5	6-9
C406		CAPACITOR, mica 1500pf 500v type CM30D152J as per MIL-C-5	6-9
C407		CAPACITOR, mica 1000pf 500v type CM30D102J as per MIL-C-5	6-9
C408		CAPACITOR, mica 330pf 500v type CM15D331J as per MIL-C-5	6-9
C409		CAPACITOR, mica 200pf 500v type CM15D201J as per MIL-C-5	6-9
C410		CAPACITOR, mica 820pf 500v type CM20D821J as per MIL-C-5	6-9
C411		CAPACITOR, mica 560pf 500v type CM20D561J as per MIL-C-5	6-9

*For Major Unit & Accessories

TABLE 1: MAINTENANCE PARTS LIST*

REF DESIGN	NOTES	NAME AND DESCRIPTION	FIG. NO.
C412		CAPACITOR, mica 430pf 500v MIL type CM15D431J as per MIL-C-5	6-9
C413		CAPACITOR, mica 240pf 500v MIL type CM15C241J as per MIL-C-5	6-9
C414		CAPACITOR, mica 150pf 500v MIL type CM15C151J as per MIL-C-5	
C415		Same as C410	6-9
C416		CAPACITOR, mica 47pf 500v MIL type CM15C470J as per MIL-C-5	6-9
C417		Same as C401	6-9
C418		Same as C401	6-9
C419		CAPACITOR, trimmer 5-20pf MIL type CV11C200 as per MIL-C-81	4-1
C420		Same as C419	
C421		Same as C419	
C422		Same as C419	
C423		Same as C419	
C424		Same as C419	
C425		Same as C419	6-9
C426		Same as C414	
C427		Same as C401	
C428		CAPACITOR, tantalum 100mfd 25v MIL type CL65BG101M-J3 as per MIL-C-3965	4-1
C429		Same as C428	
C430		Same as C428	
C431		Same as C428	
C432		Same as C401	

*For Major Unit & Accessories

TABLE 1: MAINTENANCE PARTS LIST*

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
C433		Same as C401	
CR1		DIODE, semiconductor MIL type 1N1614 as per MIL-S-19500	4-1
CR2		Same as CR1	
CR3		Same as CR1	
CR4		Same as CR1	
CR5		DIODE, zener 6.8v MIL type 1N3016B as per MIL-S-19500	4-1
CR6		DIODE, semiconductor MIL type 1N1733 as per MIL-S-19500	6-12
CR7		DIODE, semiconductor MIL type 1N547 as per MIL-S-19500	6-13
CR8		Same as CR7	6-13
CR9		Same as CR7	6-11
CR10		Same as CR7	6-11
CR11		DIODE, zener MIL type 1N748A as per MIL-S-19500	6-11
CR401		DIODE, semiconductor MIL type 1N82A as per MIL-S-19500	6-9
DS101		LAMP, neon MIL type MS25252-NE2D	4-1
DS300		LAMP, incandescent 6.3 volt 0.14 amp MIL type MS15571-2 as per MIL-L-6363	4-1
DS301		Same as DS300	
F101		FUSE, 1 amp 250v MIL type F02A as per MIL-F-15160/02	4-1
F102		Same as F101	
FL101		LINE, filter as per A10090	4-1

*For Major Unit & Accessories

Table 1

NAVSHIPS 0969-094-3010
TABLE 1: MAINTENANCE PARTS LIST*

TS-1379A/U
PARTS LIST

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
J101		CONNECTOR, male MIL type MS3102A-14S-7P	4-1
J131		CONNECTOR, BNC MIL type UG625B/U	4-1
J132		Same as J131	
J141		Same as J131	
J142		Same as J131	
J143		Same as J131	
J144		Same as J131	
J240		CONNECTOR, female MIL type MS3102A-14S-55	4-1
J400		Same as J131	
J401		Same as J131	
L1		COIL, RF as per A9954	6-13
L2		Same as L1	6-13
L3		COIL, choke 5.1mh 10% MIL type LT4K072-4 as per MIL-C-15305	6-13
L140		COIL, RF MIL type B-8245	4-1
L300		CHOKE, 10 mh +10% MIL type LT4K013-5 as per MIL-C-15305	6-14
L401		COIL, var osc 45mh as per C4549	6-9
L402		COIL, var osc 18.8mh as per C4548	6-9
L403		COIL, var osc 9.0mh as per C4547	6-9
L404		COIL, var osc 4.0mh as per C4546	6-9
L405		COIL, var osc 1.7mh as per C4545	6-9
L406		COIL, var osc. 67mh as per C4544	6-9
L407		Same as L406	6-9

*For Major Unit & Accessories

TABLE 1: MAINTENANCE PARTS LISTS*

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
L413		COIL, RF choke 220mh +10% MIL type LT4K060-2 as per MIL-C-15305	6-9
M401		METER Dwg. B8237	4-1
P101		CONNECTOR, female MIL type MS3106A- 14S-7S	4-1
P240		CONNECTOR, male MIL type MS3106A-14S- 5P	4-1
Q1		TRANSISTOR MIL type 2N297A as per MIL-S-19500	4-1
Q2		TRANSISTOR MIL type 2N396A as per MIL-S-19500	4-1
Q3		Same as Q2	
Q4		Same as Q2	
Q5		Same as Q1	
Q6		Same as Q2	
Q7		Same as Q2	
Q8		Same as Q2	
Q9		TRANSISTOR MIL type 2N1184B as per MIL-S-19500	4-1
Q10		Same as Q9	
Q300		TRANSISTOR MIL type 2N696 as per MIL-S-19500	6-14
Q401		TRANSISTOR MIL type 2N706 as per MIL-S-19500	6-9
Q402		Same as Q401	6-9
Q403		Same as Q401	6-9
Q404		Same as Q401	6-9

* For Major Unit & Accessories

Table 1

NAVSHIPS 0969-094-3010
TABLE 1: MAINTENANCE PARTS LIST*

TS-1379A/U
PARTS LIST

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
R1		RESISTOR, carbon 5.6K 5% 1/2W MIL type RC20GF562J as per MIL-R-11	6-10
R2		RESISTOR, carbon 10K 5% 1/2W MIL type RC20GF103J as per MIL-R-11	6-10
R3		RESISTOR, carbon 3.3K 5% 2W MIL type RC20GF123J as per MIL-R-11	6-10
R4		RESISTOR, carbon 12K 5% 1/2W MIL type RC20GF123J as per MIL-R-11	6-10
R5		RESISTOR, var 10K 2W MIL type RV4LAYS A103B as per MIL-R-94	4-1
R6		Same as R4	6-10
R7		Same as R2	6-10
R8		Same as R1	6-10
R9		Same as R4	6-10
R10		RESISTOR, carbon 22K 5% 2W MIL type RC42GF223J as per MIL-R-11	6-10
R11		Same as R4	6-10
R12		Same as R5	
R13		Same as R4	6-10
R14		Same as R2	6-10
R15		RESISTOR, carbon 820ohms 1/2W MIL type RC20GF821J as per MIL-R-11	6-10
R16		RESISTOR, fixed 22ohms 5% 1/2W MIL type RC20GF220J as per MIL-R-11	6-13
R17		RESISTOR, fixed 1K 5% 1/2W MIL type RC20GF102J as per MIL-R-11	6-13
R18		Same as R17	6-13
R19		Same as R16	6-13

*For Major Unit & Accessories

TABLE 1: MAINTENANCE PARTS LIST *

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
R20		RESISTOR, wire wound 2.7ohm 3W MIL type RW59V2R7 as per MIL-R-26	6-12
R21		RESISTOR, carbon 1500ohm 5% 1/2W MIL type RC20GF152J as per MIL-R-11	6-11
R110		RESISTOR, var 50K 2W MIL type RV4LAYS503B as per MIL-R-94	4-1
R111		Same as R110	
R112		RESISTOR, var 1K 2W MIL type RV4LAYS102B as per MIL-R-94	4-1
R113		RESISTOR, var 1K 2W MIL type RV4LAYS102B as per MIL-R-94	4-1
R114		RESISTOR, var 2.5 meg 2W MIL type RV4NAYS255B as per MIL-R-94	4-1
R115		RESISTOR, fixed 47K 5% 1/2W MIL type RC20GF473J as per MIL-R-11	4-1
R116 RC		RESISTOR, fixed 2.2K 5% 1/2W MIL type RC20GF222J as per MIL-R-11	6-14
R117		RESISTOR, fixed 1.8K 5% 1/2W MIL type RC20GF182J as per MIL-R-11	4-1
R118		RESISTOR, var 2.5K 2W MIL type RV4NAYS252B as per MIL-R-94	4-1
R121		RESISTOR, var 5.0K 2W MIL type RV4NAYS502B as per MIL-R-94	4-1
R122		RESISTOR, fixed 2.7K 5% 1/2W MIL type RC20GF272J as per MIL-R-11	6-14
R123		RESISTOR, var 150ohm 2W MIL type RV4NAYS151B as per MIL-R-94	4-1
R124		Same as R123	
R125		RESISTOR, var 2.5 meg 2W MIL type RV4NAYS255B as per MIL-R-94	4-1
R126		Same as R113	

*For Major Unit & Accessories

Table 1

NAVSHIPS 0969-094-3010

TS-1379A/U
PARTS LIST

TABLE 1: MAINTENANCE PARTS LIST*

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
R127		RESISTOR, fixed 3.9K 5% 1/2W MIL type RC20GF392J as per MIL-R-11	6-14
R128		Same as R17	
R129		Same as R1	
R130		RESISTOR, var 50 ohm 2W MIL type RV4LAYSD500B as per MIL-R-94	4-1
R131		RESISTOR, var 500 ohm 2W MIL type RVNBYS501B	4-1
R132		Same as R17	
R141		RESISTOR, film 178.0 ohm 1% 1/4W MIL type RN65C1780B as per MIL-R-10509/2	4-1
R142		RESISTOR, fixed 30.4 ohm 5% 1/4W MIL type MIL-R-10509/2	4-1
R143		Same as R141	
R144		RESISTOR, fixed 96.25ohm .5% 1/4W as per MIL-R-10509/2	4-1
R145		RESISTOR, fixed 71.15ohm .5% 1/4W as per MIL-R-10509/2	4-1
R146		Same as R144	
R147		Same as R144	
R148		Same as R145	
R149		Same as R144	
R150		RESISTOR, fixed 61.2ohm .5% 1/4W MIL type RN65C61R2C as per MIL-R-10509/2	4-1
R151		RESISTOR, fixed 247.5ohm .5% 1/4W as per MIL-R-10509/2	4-1
R152		Same as R150	
R153		Same as R150	

*For Major Unit & Accessories

TABLE 1: MAINTENANCE PARTS LIST*

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
R154		Same as R151	
R155		Same as R150	
R157		RESISTOR, var 500ohm 2W MIL type RV4NAYS501B as per MIL-R-94	4-1
R160		Same as R127	
R161		RESISTOR, fixed 560ohm 5% 1/2W MIL type RC20GF561J as per MIL-R-11	4-1
R180		RESISTOR, fixed 100K 5% 1/2W MIL type RC20GF104J as per MIL-R-11	4-1
R181		RESISTOR, fixed 33K 5% 1/2W MIL type RC20GF333J as per MIL-R-11	4-1
R182		Same as R4	
R183		RESISTOR, fixed 8.2 ohm 5% 1/2W MIL type RC20GF822J as per MIL-R-11	4-1
R184		Same as R127	
R185		Same as R117	
R186		Same as R17	
R187		RESISTOR, fixed 470ohm 5% 1/2W MIL type RC20GF471J as per MIL-R-11	4-1
R188		Same as R116	
R189		RESISTOR, fixed 680ohm 5% 1/2W MIL type RC20GF681J as per MIL-R-11	4-1
R190		RESISTOR, fixed 12ohm 5% 1/2W MIL type RC20GF120J as per MIL-R-11	6-15
R191		RESISTOR, fixed 39ohm 5% 1/2W MIL type RC20GF390J as per MIL-R-11	6-15
R192		RESISTOR, fixed 68ohm 5% 1/2W MIL type RC20GF680J as per MIL-R-11	6-15
R194		Same as R180	

*For Major Unit & Accessories

Table 1

NAVSHIPS 0969-094-3010
TABLE 1: MAINTENANCE PARTS LIST *

TS-1379A/U
PARTS LIST

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
R195		Same as R181	
R196		Same as R4	
R197		Same as R183	
R198		Same as R127	
R199		Same as R117	
R200		Same as R17	
R201		Same as R187	
R202		Same as R4	
R203		Same as R116	
R204		RESISTOR, fixed 220K 5% 1/2W MIL type RC20GF221J as per MIL-R-11	4-1
R205		Same as R180	
R206		Same as R181	
R207		Same as R4	
R208		Same as R183	
R209		Same as R127	
R210		Same as R117	
R211		Same as R17	
R212		Same as R187	
R213		Same as R122	
R214		Same as R117	
R215		RESISTOR, fixed 150ohm 5% 1/2W MIL type RC20GF151J as per MIL-R-11	4-1
R216		Same as R17	
R217		Same as R127	

*For Major Unit & Accessories

TABLE 1: MAINTENANCE PARTS LIST*

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
R218		Same as R2	
R219		Same as R10	
R220		RESISTOR, fixed 39K 5% 1/2W MIL type RC20GF393J as per MIL-R-11	4-1
R221		RESISTOR, fixed 82K 5% 1/2W MIL type RC20GF823J as per MIL-R-11	4-1
R222		RESISTOR, fixed 180K 5% 1/2W MIL type RC20GF184J as per MIL-R-11	4-1
R223		RESISTOR, fixed 1 meg 5% 1/2W MIL type RC20GF105J as per MIL-R-11	4-1
R226		RESISTOR, fixed 4700ohm 5% 1/2W MIL type RC20GF472J as per MIL-R-11	4-1
R227		Same as R116	
R228		Same as R4	
R229		RESISTOR, fixed 560ohm 5% 1/2W MIL type RC20GF560J as per MIL-R-11	4-1
R230		Same as R226	
R231		Same as R215	
R232		Same as R187	
R235		RESISTOR, var 5000ohm 2W MIL type RV4LAYSA502B as per MIL-R-94	4-1
R240		RESISTOR, carbon 12 meg 5% 1/2W MIL type RC20GF126J as per MIL-R-11	4-1
R300		RESISTOR, var 500K 2W MIL type RV4NAYS504B as per MIL-R-94	4-1
R301		RESISTOR, fixed 68K 5% 1/2W MIL type RC20GF683J as per MIL-R-11	6-14
R302		Same as R301	6-14
R303		Same as R306	6-14

*For Major Unit & Accessories

TABLE 1: MAINTENANCE PARTS LIST*

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
R304		RESISTOR, var 2.5 meg 2W MIL type RV4NAYSB225B as per MIL-R-94	4-1
R305		Same as R306	6-14
R306		RESISTOR, fixed 1.5 meg 5% 1W MIL type RC32GF155J as per MIL-R-11	6-14
R307		RESISTOR, var 500K 2W MIL type RV4NAYSD504B as per MIL-R-94	4-1
R308		RESISTOR, var 5K 2W as per MIL-R-94	4-1
R309		RESISTOR, fixed 270 ohm 5% 1/2W MIL type RC20GF271J as per MIL-R-11	6-14
R401		Same as R116	6-9
R402		Same as R15	6-9
R403		Same as R17	6-9
R404		Same as R309	6-9
R405		Same as R127	6-9
R406		Same as R189	6-9
R407		Same as R309	6-9
R408		RESISTOR, var 2500 ohm 10% 2W MIL type RV4NAYSK252A as per MIL-R-94	6-9
R409		RESISTOR, carbon 5600 ohm 5% 1/2W MIL type RC20GF562J as per MIL-R-11	6-9
R410		Same as R409	6-9
R411		RESISTOR, carbon 390 ohm 5% 1/2W MIL type RC20GF391J as per MIL-R-11	6-9
R412		RESISTOR, var 100 ohm 10% 2W MIL type RV4NAYSK101A as per MIL-R-94	6-9
R413		Same as R17	6-9

*For Major Unit & Accessories

TABLE 1: MAINTENANCE PARTS LIST*

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
R414		RESISTOR, carbon 18 ohm 5% 1/2W MIL type RC20GF180J as per MIL-R-11	6-9
R415		Same as R3	
R416		RESISTOR, carbon 10 ohm 5% 1/2W MIL type RC20GF100J as per MIL-R-11	4-1
R417		Same as R411	
R418		RESISTOR, carbon 180 ohm 5% 1/2W MIL type RC20GF181J as per MIL-R-11	4-1
R419		Same as R411	
R420		Same as R309	
R421		Same as R183	
R422		Same as R418	
S101		SWITCH, toggle DPST MIL type MS35059	4-1
S120		SWITCH, rotary as per C4528	4-1
S130		SWITCH, rotary dual R. F. as per C4526	4-1
S131		SWITCH as per MIL-R-94	4-1
S140		SWITCH, rotary as per C4531	4-1
S160		SWITCH, rotary as per C4527	4-1
S180		SWITCH, rotary as per C4533	4-1
S182		SWITCH, rotary as per C4529	4-1
S183		SWITCH, toggle SPDT MIL type MS35058	4-1
S401		SWITCH, rotary as per C4530	6-9
S402		SWITCH, rotary as per C4532	4-1
T1		TRANSFORMER, power as per B8087	4-1
T2		TRANSFORMER, converter as per B8086	4-1

*For Major Unit & Accessories

Table 1

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TS-1379A/U
PARTS LIST

TABLE 1: MAINTENANCE PARTS LIST*

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
TB301		TERMINAL BOARD, low voltage assembly wired as per C4442	6-10
TB302		TERMINAL BOARD, 3.9v stud assembly as per B8210	6-11
TB303		TERMINAL BOARD, 1500v assembly wired as per B8172	6-12
TB304		TERMINAL BOARD, 200v assembly wired as per B8167	6-13
TB305		TERMINAL BOARD, display assembly wired as per C4478	6-14
TB306		TERMINAL BOARD, sweep timing assembly as per B8150	6-15
TB307		TERMINAL BOARD, barrier MIL type 37TB3 as per MIL-T-55164	4-1
TB401		TERMINAL BOARD, marking as per B8156	6-9
V300		CATHODE, ray tube as per A10091	4-1
W101		CABLE, assembly power electrical as per C4493	4-1
W102		CABLE, assembly coaxial as per C4491	4-1
W103		CABLE, assembly coaxial as per C4491	4-1
W240		CABLE, assembly coaxial Dwg. C4535	4-1
XDS101		LAMPHOLDER MIL type LH74LC13CN	4-1
XDS300		SOCKET, crt duodecal Cinch Jones	4-1
XDS301		SOCKET, miniature bayonet as per A10311	4-1
XDS302		Same as XDS301	
XF101		FUSE, holder MIL type FHN20G as per MIL-F-19207	4-1
XF102		Same as XF101	
XA1		CONNECTOR, electrical as per MIL-C-21097	4-1

*For Major Unit & Accessories

TABLE 1: MAINTENANCE PARTS LIST*

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
XA2		Same as XA1	
XA3		CONNECTOR, electrical as per MIL-C-21097	4-1
XA4		Same as XA3	
XA5		Same as XA3	
XA6		Same as XA3	
XA7		Same as XA3	
XA8		Same as XA3	

*For Major Unit & Accessories

Table 2

 NAVSHIPS 0969-094-3010
 TABLE 2: MAINTENANCE PARTS LIST*

 TS-1379A/U
 PARTS LIST

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
A1		ASSEMBLY, P. C. Board Dwg. C4551	6-1
A1 Q1		TRANSISTOR, 2N491 as per MIL-S-19500	
Q3		TRANSISTOR, 2N1132 per MIL-S-19500	
Q4		TRANSISTOR, 2N696 per MIL-S-19500	
Q5		TRANSISTOR, 2N3440 RCA	
Q6		TRANSISTOR, 2N3440 RCA	
R1		RESISTOR, fixed 6.8 meg. 5%, 1/2W Type RC20GF685J per MIL-R-11	
R2		Same as A1 R1	
R3		RESISTOR, fixed 270 ohm, 5%, 1/2W Type RC20GF271J per MIL-R-11	
R4		Same as A1 R1	
R5		RESISTOR, fixed 33K, 5%, 1/2W Type RC20GF333J per MIL-R-11	
R6		RESISTOR, fixed 220 ohm, 5%, 1/2W Type RC20GF221J per MIL-R-11	
R7		Same as A1 R5	
R8		Same as A1 R6	
A2		ASSEMBLY, P. C. Board Dwg. C4538	6-2
A2 C1		CAPACITOR, ceramic, .01 mfd 500V Type CK63AW103M per MIL-C-11015	
C2		Same as A2 C1	
C3		Same as A2 C1	
C4		CAPACITOR, paper, 1.0 mfd 200V Type CH04A3NC105K per MIL-C-18312	
C5		Same as A2 C4	

*For Printed Circuit Assemblies

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
A2 CR1		DIODE, 1N933 per MIL-S-19500	
		Same as A2 CR1	
		DIODE, 1N483B per MIL-S-19500	
		Same as A2 CR3	
		Same as A2 CR3	
		Same as A2 CR3	
		Same as A1 Q5	
		Same as A1 Q4	
		Same as A1 Q5	
		Same as A1 Q5	
		RESISTOR, fixed 680K, 5%, 1/2W Type RC20GF684J per MIL-R-11	
		RESISTOR, fixed 6800 ohm, 5%, 1/2W Type RC20GF682J per MIL-R-11	
		RESISTOR, fixed 4700 ohm 5% 2W, Type RC42GF472J Per MIL-R-11	
		RESISTOR, fixed 100 ohm 5% 1/2W, Type RC20GF101J per MIL-R-11	
		Same as A2 R5	
		Same as A2 R3	
		RESISTOR, fixed 330 ohm 5% 1/2W Type RC20GF331J per MIL-R-11	
		RESISTOR, fixed 560 ohm 5% 1/2W, Type RC20GF561J per MIL-R-11	
		RESISTOR, fixed 5600 ohm 5% 1/2W, Type RC20GF562J per MIL-R-11	
R10		RESISTOR, fixed 100K 5% 1/2 W, Type RC20GF104J per MIL-R-11	

*For Printed Circuit Assemblies

TABLE 2: MAINTENANCE PARTS LIST*

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
A2 R11		RESISTOR, fixed 1500 ohm 5% 1/2W, Type RC20GF152J per MIL-R-11	
R12		Same as A2 R2	
R13		RESISTOR, fixed 15K 5% 1/2W, Type RC20GF153J per MIL-R-11	
R14		RESISTOR, fixed 68K 5% 1/2W, Type RC20GF683J per MIL-R-11	
R15		RESISTOR, fixed 12 ohm 5% 1/2W, Type RC20GF120J per MIL-R-11	
R16		Same as A2 R15	
R17		Same as A2 R15	
R18		RESISTOR, fixed 47 ohm 5% 1/2W, Type RC20GF470J per MIL-R-11	
R19		RESISTOR, fixed 150 ohm 5% 1/2W, Type RC20GF151J per MIL-R-11	
R20		Same as A2 R14	
R21		Same as A2 R6	
R22		Same as A2 R14	
R23		Same as A2 R6	
R24		Same as A2 R9	
R25		RESISTOR, fixed 56 ohm 5% 1/2W, Type RC20GF560J per MIL-R-11	
R26		Same as A1 R6	
R27		RESISTOR, fixed 470 ohm 5% 1/2W, Type RC20GF471J per MIL-R-11	
A3		ASSEMBLY, P. C. BOARD Dwg. C4541	6-3
A3 C1		CAPACITOR, Mica 120pf 500V Type CM15C121J per MIL-C-5	

*For Printed Circuit Assemblies

TABLE 2: MAINTENANCE PARTS LIST*

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
A3 C2		CAPACITOR, mica 510pf 500V, Type CM15D511J per MIL-C-5	
C3		Same as A3 C2	
C4		Same as A3 C4	
C5		CAPACITOR, mica 200pf 500V, Type CM15C201J per MIL-C-5	
C6		Same as A3 C5	
C7		CAPACITOR, mica 390pf 500V, Type CM15C390J per MIL-C-5	
C8		Same as A3 C7	
C9		Same as A3 C2	
C10		Same as A2 C1	
C11		Same as A2 C1	
C12		CAPACITOR, paper 0.1 mfd 50V, Type CH03A3NG104K per MIL-C-18312	
C13		Same as A2 C1	
C14		Same as A2 C1	
C15		Same as A2 C1	
C16		Same as A2 C1	
C17		Same as A3 C12	
C18		Same as A2 C1	
C19		CAPACITOR, mica 2700pf 500V, Type CM06D272J per MIL-C-5	
C20		CAPACITOR, mica 220pf 500V, Type CM15C221J per MIL-C-5	

*For Printed Circuit Assemblies

TABLE 2: MAINTENANCE PARTS LIST*

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
A3 C21		Same as A3 C20	
Q1		Same as A1 Q4	
Q2		Same as A1 Q4	
Q3		Same as A1 Q4	
Q4		Same as A1 Q4	
Q5		Same as A1 Q4	
R1		RESISTOR, fixed 330K 5% 1/2W, Type RC20GF334J per MIL-R-11	
R2		Same as A2 R27	
R3		RESISTOR, fixed 1000 ohm 5% 1/2W, Type RC20GF102J per MIL-R-11	
R4		Same as A3 R1	
R5		Same as A2 R27	
R6		Same as A3 R3	
R7		RESISTOR, fixed 390 ohm 5% 1/2W, Type RC20GF391J per MIL-R-11	
R8		Same as A3 R1	
R9		Same as A3 R3	
R10		RESISTOR, fixed 2700 ohm 5% 1/2W, Type RC20GF272J per MIL-R-11	
R11		Same as A1 R3	
R12		Same as A2 R27	
R13		Same as A2 R13	
R14		RESISTOR, fixed 4700 ohm 5% 1/2W, Type RC20GF472J per MIL-R-11	
R15		Same as A1 R3	

*For Printed Circuit Assemblies

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
A3 R16		Same as A2 R27	
R17		Same as A2 R13	
R18		Same as A3 R14	
R19		Same as A2 R4	
R20		Same as A2 R4	
R21		Same as A1 R3	
R22		RESISTOR, fixed 82 ohm 5% 1/2W, Type RC20GF820J per MIL-R-11	
R23		Same as A3 R22	
R24		Same as A1 R3	
R25		Same as A1 R3	
Y1		CRYSTAL, Quartz, 3000.00 KC Frequency Type, CR18 A/U per MIL-STD-683	
Y2		CRYSTAL, Quartz, 3002.00 KC Frequency Type CR18 A/U per MIL-STD-683	
Y3		CRYSTAL, Quartz 500.00 KC Frequency Type CR63 A/U per MIL-STD-683	
A4 C1		Same as A3 C12	6-4
C2		Same as A3 C12	
C3		Same as A3 C12	
C4		Same as A2 C1	
C5		CAPACITOR, mica 220pf 500V, Type CM15C221J per MIL-C-5	
C6		Same as A4 C5	
C7		CAPACITOR, variable 7 to 45pf, Type CV11C450 per MIL-C-81	

*For Printed Circuit Assemblies

Table 2

NAVSHIPS 0969-094-3010
TABLE 2: MAINTENANCE PARTS LIST*TS-1379A/U
PARTS LIST

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
A4 C8		Same as A2 C1	
C9		Same as A2 C1	
C10		Same as A3 C12	
C12		Same as A2 C1	
C13		CAPACITOR, tantalum 100mfd 25V, Type CL65BG101M-P3 per MIL-C-3965	
C14		Same as A2 C1	
C15		CAPACITOR, mica 150 pf 500V, Type CM15C151J per MIL-C-5	
C16		Same as A4 C13	
C17		CAPACITOR, mica 22pf 500V, Type CM15C220J per MIL-C-5	
CR1		DIODE, type 1N82A per MIL-S-19500	
CR2		Same as A4 CR1	
L1		COIL, variable Dwg. A9955	
L2		Same as A4 L1	
Q1		TRANSISTOR, type 2N706 per MIL-S-19500	
Q2		Same as A4 Q1	
Q3		Same as A1 Q4	
Q4		Same as A1 Q4	
Q5		Same as A1 Q4	
R1		Same as A2 R18	
R2		Same as A2 R9	
R3		Same as A3 R3	

*For Printed Circuit Assemblies

TABLE 2: MAINTENANCE PARTS LIST*

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
A4 R4		RESISTOR, fixed 3900 ohm 5% 1/2W, Type RC20GF392J per MIL-R-11	
R5		Same as A2 R4	
R6		Same as A4 R4	
R7		Same as A1 R3	
R8		Same as A2 R14	
R9		RESISTOR, fixed 39K 5% 1/2W, Type RC20GF393J per MIL-R-11	
R10		Same as A3 R3	
R11		Same as A3 R14	
R12		Same as A3 R14	
R13		Same as A3 R3	
R14		Same as A1 R3	
R15		Same as A1 R3	
R16		Same as A2 R18	
R17		Same as A3 R22	
R18		RESISTOR, fixed 22K 5% 1/2W, Type RC20GF223J per MIL-R-11	
R19		Same as A2 R13	
R20		Same as A2 R8	
R21		Same as A1 R5	
R22		Same as A2 R14	
R23		Same as A3 R22	
R24		Same as A2 R15	
R25		Same as A2 R15	

*For Printed Circuit Assemblies

Table 2

NAVSHIPS 0969-094-3010
TABLE 2: MAINTENANCE PARTS LIST*TS-1379A/U
PARTS LIST

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
A4 R26			
T1		TRANSFORMER, IF Dwg. A9953	
A5		ASSEMBLY, P. C. Board Dwg. C4564	6-5
A5 C1		CAPACITOR, ceramic 470pf 500V, Type CC35UJ471J per MIL-C-20	
C2		CAPACITOR, paper 0.1 mfd 200V, Type CH04A3MC104M per MIL-18312	
C3		Same as A2 C1	
C4		Same as A2 C1	
C5		CAPACITOR, mica 1000pf 500V, Type CM06D102J per MIL-C-5	
C6		Same as A5 C2	
C7		Same as A4 C17	
C8		CAPACITOR, mica 2400pf 500V, Type CM30D242J per MIL-C-5	
C9		Same as A4 C13	
C10		Same as A5 C1	
C11		Same as A5 C1	
C12		CAPACITOR, ceramic 91pf 500V, Type CC25UJ910J per MIL-C-20	
CR1		DIODE, type 1N3016B per MIL-S-19500	
CR2		DIODE, type 1N756A per MIL-S-19500	
CR3		Same as A2 CR3	
CR4		Same as A2 CR3	
L1		Same as A4 L1	
L2		COIL, Choke, 5.1 mhy, Type LT4K072 per MIL-C-15305	

*For Printed Circuit Assemblies

TABLE 2: MAINTENANCE PARTS LIST*

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
A5 Q1		Same as A1 Q4	
Q2		Same as A1 Q4	
Q3		Same as A1 Q4	
R1		Same as A2 R18	
R2		RESISTOR, var. 2000 ohm 1/2W 10%, Type RV6LAYS202A per MIL-R-94	
R3		RESISTOR, fixed 390 ohm 5% 1/2W, Type RC20GF391J per MIL-R-11	
R4		Same as A2 R4	
R5		Same as A2 R27	
R6		RESISTOR, fixed, 2200 ohm 5% 1/2W, Type RC20GF222J per MIL-R-11	
R7		RESISTOR, fixed 120 ohm 5% 1/2W, Type RC20GF121J per MIL-R-11	
R8		Same as A2 R18	
R9		Same as A2 R18	
R10		Same as A2 R18	
R11		Same as A2 R9	
R12		RESISTOR, fixed 1800 ohm 5% 1/2W, Type RC20GF182J per MIL-R-11	
R13		Same as A2 R2	
R14		Same as A5 R12	
R15		RESISTOR, fixed 5100 ohm 5% 1/2W, Type RC20GF512J per MIL-R-11	
R16		Same as A2 R18	

*For Printed Circuit Assemblies

TABLE 2: MAINTENANCE PARTS LIST*

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
A6		ASSEMBLY, P. C. Board Dwg. C4543	
A6 C1		Same as A2 C1	
C2		CAPACITOR, mica 470pf 500V, Type CM15D471J per MIL-C-5	
C3		Same as A6 C2	
C4		Same as A2 C1	
C5		Same as A2 C1	
C6		CAPACITOR, variable 4 to 30pf, Type CV11C300 per MIL-C-81	
C7		Same as A3 C12	
C8		Same as A2 C1	
C9		Same as A2 C1	
C10		Same as A2 C1	
C11		Same as A4 C13	
CR1		DIODE, type 1N277 per MIL-S-19500	
CR2		Same as A6 CR1	
CR3		Same as A6 CR1	
CR4		Same as A6 CR1	
L1		Same as A4 L1	
L2		Same as A4 L1	
Q1		Same as A1 Q4	
Q2		Same as A1 Q4	
R2		RESISTOR, fixed 27K 5% 1/2W, type RC20GF273J per MIL-R-11	
R3		RESISTOR, fixed 2700 ohm 5% 1/2W, Type RC20GF272J per MIL-R-11	

*For Printed Circuit Assemblies

TABLE 2: MAINTENANCE PARTS LIST*

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
A6 R4		Same as A3 R3	
R5		Same as A2 R13	
R6		Same as A2 R13	
R7		Same as A2 R19	
R8		Same as A3 R3	
R9		RESISTOR, fixed 1000 ohm 1/4W 1%, Type RN65B1001F per MIL-R-10509	
R10		Same as A6 R9	
R11		Same as A6 R9	
R12		Same as A6 R9	
R13		Same as A2 R18	
R14		RESISTOR, fixed 68 ohm 5% 1/2W	
T1		Same as A4 T1	
T2		Same as A4 T1	
Y1	A6Y1, A7Y1, A8Y1 and A8Y2 must be replaced as a set.	CRYSTAL, Quartz, part of matched set of 4 per Dwg. A9993, Type CR37A/U per MIL-STD-683, 140 KC Frequency. See notes.	
A7		ASSEMBLY, P. C. Board Dwg. C4567	6-7
A7 C1		Same as A2 C1	
C2		Same as A2 C1	
C3		Same as A4 C13	
C4		Same as A2 C1	
C5		Same as A6 C6	
C6		CAPACITOR, mica 300pf 500V, Type CM15D301J per MIL-C-5	

*For Printed Circuit Assemblies

TABLE 2: MAINTENANCE PARTS LIST*

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
A7 C7		Same as A2 C1	
C8		Same as A2 C1	
C9		Same as A2 C1	
C10		CAPACITOR, mica 1500pf 500V, Type CM06F152J per MIL-C-5	
C11		Same as A3 C3	
C12		Same as A2 C1	
C13		Same as A4 C13	
L1		COIL, variable dwg. A9956	
L2		Same as A7 L1	
Q1		Same as A1 Q4	
Q2		Same as A1 Q4	
Q3		Same as A1 Q4	
Q4		Same as A1 Q4	
Q5		Same as A1 Q4	
Q6		Same as A1 Q4	
Q7		Same as A1 Q4	
R1		RESISTOR, fixed 8200 ohm 5% 1/2W, Type RC20GF822J per MIL-R-11	
R2		Same as A2 R9	
R3		Same as A2 R9	
R4		Same as A5 R12	
R5		Same as A2 R14	
R6		Same as A6 R2	
R7		Same as A1 R3	

*For Printed Circuit Assemblies

TABLE 2: MAINTENANCE PARTS LIST*

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
A7 R8		Same as A2 R4	
R9		RESISTOR, fixed 1.5 meg 5% 1/2"W, Type RC20GF155J per MIL-R-11	
R10		Same as A3 R1	
R11		Same as A2 R13	
R12		Same as A6 R3	
R13		Same as A2 R14	
R14		Same as A2 R13	
R15		Same as A1 R3	
R16		Same as A2 R18	
R17		Same as A2 R18	
R18		Same as A3 R1	
Y1	See note for A6Y1	Same as A6 Y1	
A8		ASSEMBLY, P. C. Board Dwg. C4569	6-8
A8 C1		Same as A2 C1	
C2		Same as A2 C1	
C3		Same as A4 C7	
C4		Same as A7 C6	
C5		Same as A2 C1	
C6		Same as A2 C1	
C7		Same as A4 C7	
C8		Same as A7 C6	
C9		Same as A2 C1	
C10		Same as A2 C1	

*For Printed Circuit Assemblies

TABLE 2: MAINTENANCE PARTS LIST*

Table 2

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
A8 C11		Same as A4 C13	
C12		Same as A2 C1	
C13		Same as A2 C1	
C14		Same as A2 C1	
L1		Same as A7 L1	
L2		Same as A7 L1	
Q1		Same as A1 Q4	
Q2		Same as A1 Q4	
Q3		Same as A1 Q4	
Q4		Same as A1 Q4	
Q5		Same as A1 Q4	
Q6		Same as A1 Q4	
Q7		Same as A1 Q4	
Q8		Same as A1 Q4	
R1		Same as A2 R14	
R2		Same as A6 R2	
R3		Same as A1 R3	
R4		Same as A2 R4	
R5		Same as A7 R9	
R6		Same as A3 R1	
R7		Same as A2 R13	
R8		Same as A6 R3	
R9		A2 R14	
R10		A6 R2	

*For Printed Circuit Assemblies

TABLE 2: MAINTENANCE PARTS LIST*

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
A8 R11		Same as A1 R3	
R12		Same as A2 R4	
R13		Same as A7 R9	
R14		Same as A3 R1	
R15		Same as A5 R12	
R16		Same as A3 R1	
R17		Same as A3 R1	
R18		Same as A2 R18	
R19		Same as A2 R18	
R20		Same as A2 R27	
R21		RESISTOR, fixed 2.7 meg. 5% 1/2W, Type RC20GF275J per MIL-R-11	
Y1	See note for A6 Y1	Same as A6 Y1	
Y2		Same as A6 Y1	

*For Printed Circuit Assemblies

