

★
NAVSHIPS 92503

INSTRUCTION BOOK
for
FREQUENCY SHIFT
CONVERTER

NAVY MODEL
CV-97/UX

MACLEOD & HANOPOL, INC.
CHARLESTOWN, MASS. U.S.A.

BUREAU OF SHIPS

NAVY DEPARTMENT

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From: Chief, Bureau of Ships
To: All Activities Concerned with the
Installation, Operation and Main-
tenance of the Subject Equipment
Subj: Instruction Book for Frequency
Shift Converter NAVSHIPS 92503

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A. G. MUMMA
Chief of Bureau

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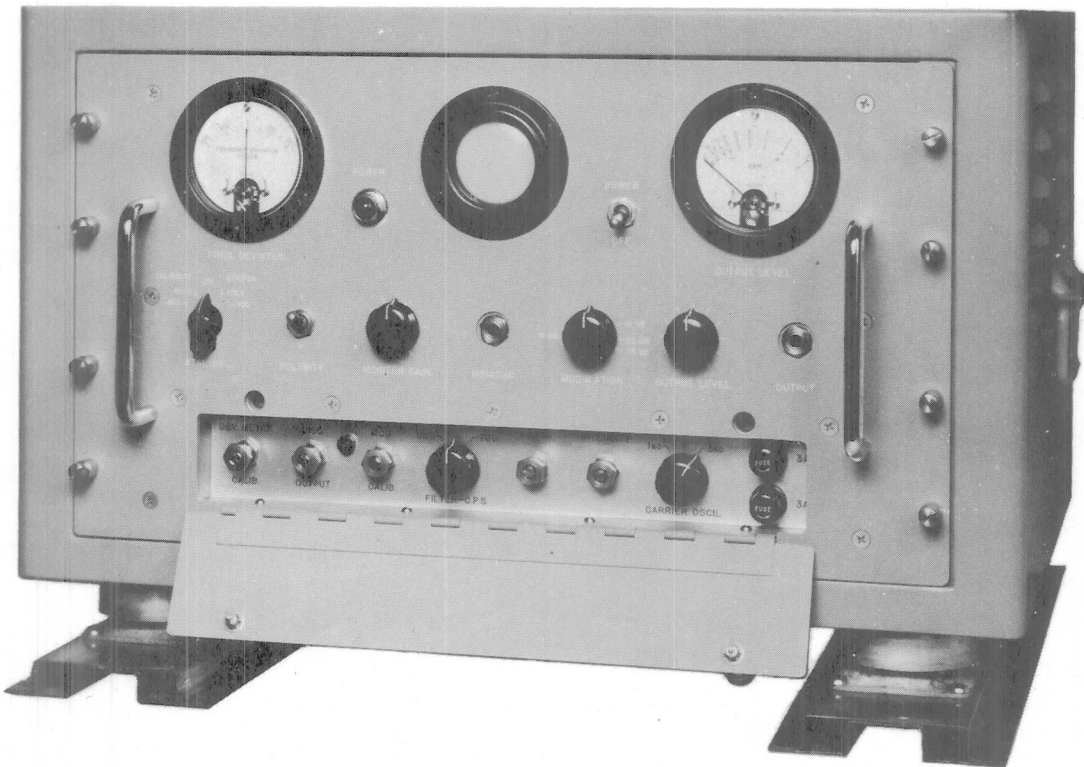
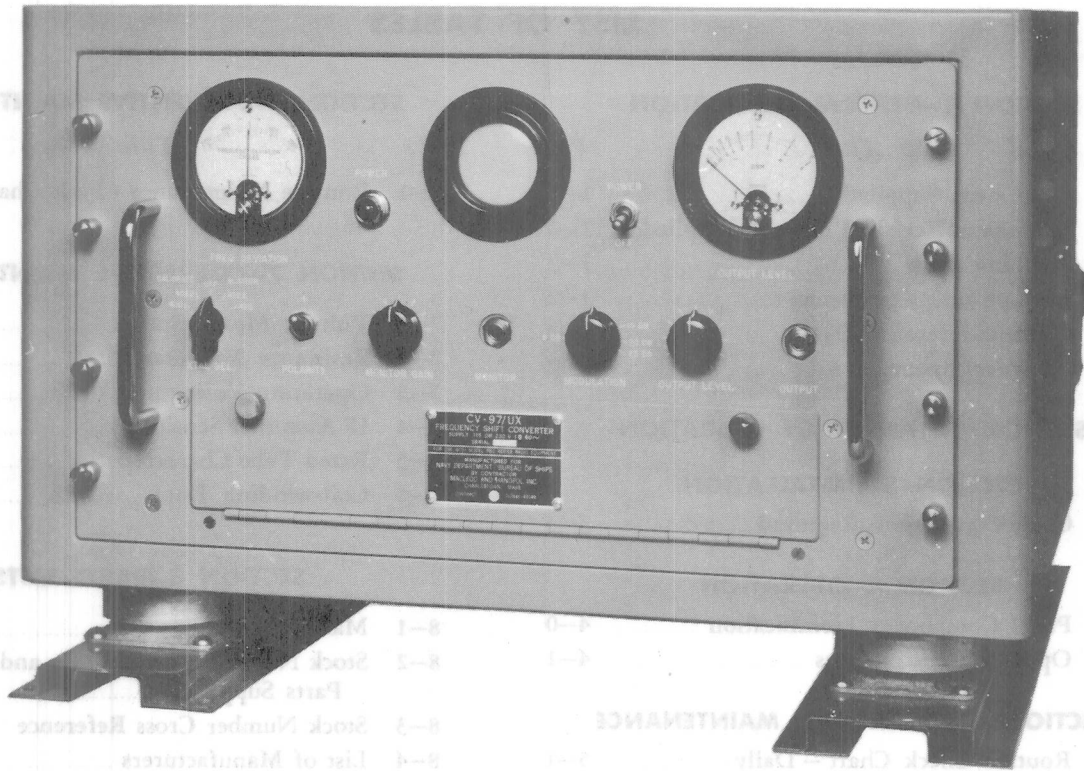


Figure 1-1. Model CV-97/UX Frequency Shift Converter

SECTION 1
GENERAL DESCRIPTION**1. GENERAL.**

The Navy Model CV-97/UX Frequency Shift Converter is designed for use in conjunction with Navy Models RBB/5, RBC/5, RBB/6, RBC/6 Radio Receiving Equipments and Navy Model RD-92/UX or similar Facsimile Recorders for the reception of facsimile photographs or line drawings transmitted by the frequency-shift system. The 400-kc intermediate frequency supplied by the receiving equipment is converted to a 1000-, 2000-, or 3000-cycle sub-carrier voltage which is amplitude modulated in proportion to the frequency deviation of transmitted signal and is suitable for direct connection to the facsimile recorder. Controls are provided for calibrating the unit and for adjusting the output level and percent modulation. A jack is provided for headphone monitoring of the incoming signal.

The unit is self-contained, and is supplied in a shock-mounted cabinet intended for table or shelf mounting. The unit may be removed from the cabinet and relay-rack mounted. Top and bottom internal dust covers are provided, and the panel mounting screws are spaced for rack holes.

2. DESCRIPTION.

The unit is composed of a main chassis and panel and a sub-assembly chassis, bolted together and housed in a single cabinet. The sub-assembly chassis contains the IF amplifiers, limiters, discriminator, rectifier, heterodyne oscillator, and mixer. The main chassis contains the power supply, sub-carrier oscillator, modulator, output amplifier, and cathode-ray-tube monitor. Component parts of the sub-assembly have been assigned

symbol designations in the 201-299 group; and those of the main chassis in the 101-199 group.

a. THE IF STRIP (SUB-ASSEMBLY CHASSIS).—This chassis contains an IF amplifier stage, three limiter stages including a discriminator-driver stage, and a discriminator-rectifier tube. The output of the rectifier is connected to the cathode follower on the main chassis. Also included on the strip are a crystal-controlled oscillator and a mixer stage. Two crystal frequencies are provided by the oscillator; 400 kc for aligning the IF stages and checking the discriminator zero setting, and 402.2 kc for checking the discriminator sensitivity. The 402.2-kc frequency is mixed with the signal fed to the discriminator, if desired, to provide an aural monitor of the incoming signal. This assembly may be removed and a similar unit substituted for operation at a different intermediate frequency.

b. MAIN CHASSIS.—The main chassis contains all of the power-supply components required for the entire unit. The discriminator output signal is fed to the diode modulator through a cathode follower and one of three low-pass filters: 250-, 450-, or 700-cycle cut-off frequency. The other modulator input is the sub-carrier frequency of 1000, 2000, or 3000 cycles. The modulated sub-carrier is amplified and is available as the output signal at a 600-ohm impedance level. The voltage at the output terminals is normally two volts maximum, but can be made seven volts maximum by short-circuiting one resistor. A cathode-ray-tube monitor is provided for visual examination of the output waveform. A frequency-deviation meter is provided to facilitate tuning the receiving equipment, and an output-level meter is provided for monitoring or setting the output-voltage level.

TABLE 1-1. EQUIPMENT SUPPLIED

QUANTITY PER EQUIPMENT	NAME OF UNIT	NAVY TYPE DESIGNATION	OVER-ALL DIMENSIONS			VOLUME CUBIC FEET	WEIGHT POUNDS
			HEIGHT INCHES	WIDTH INCHES	DEPTH INCHES		
1	Frequency Shift Converter	CV-97/UX	14 $\frac{3}{4}$	23 $\frac{1}{2}$	21	4.8	110

TABLE 1-2. EQUIPMENT REQUIRED BUT NOT SUPPLIED

QUANTITY PER EQUIPMENT	NAME OF UNIT	NAVY TYPE DESIGNATION	REQUIRED USE	REQUIRED CHARACTERISTICS
1	Facsimile Recorder	RD-92A/UX	For printing from CV-97/UX	0-2 volts input; 600 ohm impedance level; 1, 2, or 3-kc sub-carrier frequency
1	Radio Receiving Equipment	RBC5 or 6; RBC1 thru 4 with Type CLP10334 kit	For supplying 400-kc frequency-shift IF signal	0.5 maximum volts at 400 kc into 51 ohms

TABLE 1-3. SHIPPING DATA

SHIPPING BOX NUMBER	CONTENTS		OVER-ALL DIMENSIONS			VOLUME CUBIC FEET	WEIGHT POUNDS
			HEIGHT INCHES	WIDTH INCHES	DEPTH INCHES		
	NAME	DESIGNATION					
1	Frequency Shift Converter Instruction Manual (2) Power Cable (1) Input Cable (1)	CV-97/UX NAVSHIPS 92503 W-102 W-101	29½	26½	20	8.8	176
2	Equipment Spares (1 set)		7	10	15½	0.62	30

TABLE 1-4. ELECTRON-TUBE COMPLEMENT

TUBE TYPE	6AU6WA	12A17WA	5726	5R4WGB	1B3GT	6080WA	OC3W	5693	884	6SN7WGTA	6SL7WGT	6V6GT	2BP1	IN73	Total no. of tubes
QUANTITY	3	3	1	1	1	1	1	1	1	4	1	1	1	1	21

TABLE 1-5. CONTRACT REFERENCE DATA

Name of Equipment Frequency Shift Converter
Navy Model CV-97/UX

Contract NObsr 49149 dated
30 May 1950

Contractor MacLeod and Hanopol, Inc.
Charlestown, Massachusetts

Cognizant Naval Inspector Inspector of Naval Material
Boston, Massachusetts

TABLE 1-6. TECHNICAL SUMMARY

Input center frequency 400 ± 2 kc

Deviation 900 cycles

Input signal for full limiting 2800 microvolts

Rejection ratio (signals of same frequency) 2 db

Input impedance 51 ohms

Frequency shift versus black level Positive or negative

Output impedance 600 ohms

Keying frequency low-pass filters 250, 450, or 700 cycles

Output sub-carrier frequency 1, 2, or 3 kc

Output-modulation depth 6 to 25 db

Output-voltage level 0 to 2 volts rms; 0 to 7 volts rms with addition of a jumper

Primary voltage 115 or 230 volts

Primary power 150 watts

Primary current 1.3 amperes

Primary frequency 60 cycles per second

SECTION 2

THEORY OF OPERATION

1. GENERAL THEORY.

The Frequency Shift Converter changes the frequency-shifted intermediate-frequency signal from a receiver to an amplitude-modulated audio-frequency sub-carrier signal suitable for operating a facsimile recorder.

The frequency-shifted input signal is converted by the receiver to a frequency-shifted signal of the receiver intermediate frequency (400 kc). The converter amplifies, and then limits, the signal to remove all amplitude variations. The limited signal is then a frequency-modulated signal (400 kc, p/m 450 cycles) whose frequency is a function of the greyness of the original copy (black 399.55 kc, white 400.45 kc), and its keying frequency is a function of the picture detail. At this point the signal is mixed with the output from an internal 402.2-kc oscillator to provide aural monitoring of the signal. The limited signal is also passed through a discriminator of the "Foster-Seeley" type, is rectified, and appears as a direct voltage whose amplitude and polarity are a linear function of the magnitude and direction of the frequency deviation from 400 kc. This deviation is indicated on a meter.

The direct voltage, varying at the keying frequency, is then fed to the modulator, by means of a cathode follower to lower the circuit impedance, and any one of three low-pass filters (250, 450, and 700 cycles cut-off) for the elimination of high-frequency noise and interference elements. The modulator has sub-carriers of one, two, and three kilocycles, and a control for setting percentage modulation. The signal modulates the audio-frequency carrier (the percentage modulation being a linear function of the frequency deviation of the original RF signal) and the modulation frequency is the keying frequency.

This regenerated signal is amplified and fed to a cathode-ray tube for visual monitoring, and to an amplifier tube which provides 0.2 or 0.7 volts to operate the recorder. Its amplitude is varied by a gain control and measured on a DBM meter.

This system permits the use of frequency-shift transmission of facsimile, with its accompanying advantages of efficiency, high signal-to-noise discrimination, and resistance to fading and multipath transmission.

2. THE IF STRIP.

a. The input-signal cable is terminated by R201, and the signal is coupled to the grid of V201 by C201. V201 is a narrow-band high-gain IF amplifier stage coupled to V202 by a permeability tuned transformer with two adjustable cores.

b. V202 is a broad-band medium-gain IF amplifier stage which also functions as a limiter. Large signal

voltages from the secondary of T201 drive the grid of V202 to conduction on the positive half-cycles so that grid current flows. This current develops a direct voltage across R237 which biases the grid off, tending to hold the output voltage constant. C230 prevents the bias voltage from changing with each half-cycle, but allows the bias to follow fast signal changes.

c. V203 is a cathode-coupled amplifier stage which functions as a limiter when it is over driven. Both grids of V203 are biased to the same voltage, and plate currents in the two sections are equal. When a positive-going voltage is applied to the left-hand grid, the cathode voltage goes more positive and, if the signal is large enough, the right-hand section is cut off. When the left-hand grid goes negative, the cathode voltage drops, reducing the bias of the right-hand section and increasing its plate current to hold the cathode voltage slightly under its quiescent value. If the signal is large enough, the left-hand section will be cut off. Thus, for signals above a certain level, the plate current in the right-hand section varies between zero and a maximum value, and further increases of the input signal have no effect. The plate-current pulses are square but, when these pulses are passed through the primary of T203, the resonant circuits develop a sinusoidal voltage. R237 and C230 behave in a similar manner to R234 and C227 in the previous stage.

d. The operation of V204 is identical with that of V203 except that the interstage coupling transformer has been replaced with a discriminator transformer. In this transformer, one-half of the secondary voltage is added vectorially to the primary voltage coupled through C236 and applied to each section of rectifier V205. At the center frequency, the two AC voltages are equal and the rectified voltages developed across R223 and R224 are equal and opposite in polarity, resulting in a net output voltage of zero. As the frequency varies from 400 kc, the phase of the secondary voltage changes and the ac voltage applied to one rectifier section increases while the other decreases, resulting in a net dc output voltage whose polarity depends on the direction of frequency change and whose amplitude depends on the amount of change. C233 and C238 are temperature-compensating capacitors.

e. V206 is an electron-coupled crystal oscillator whose frequency is determined by either the 400- or 402.2-kc crystal selected by XTAL SELECTOR switch S201. In the first position of S201, CALIBRATE 400, the oscillator runs at 400 kc and its output voltage is fed to V201 through R229, R202, R203 which form a voltage divider to provide an input signal sufficiently large to ensure limiting. This frequency is used to check the zero setting of the discriminator transformer secondary. In the

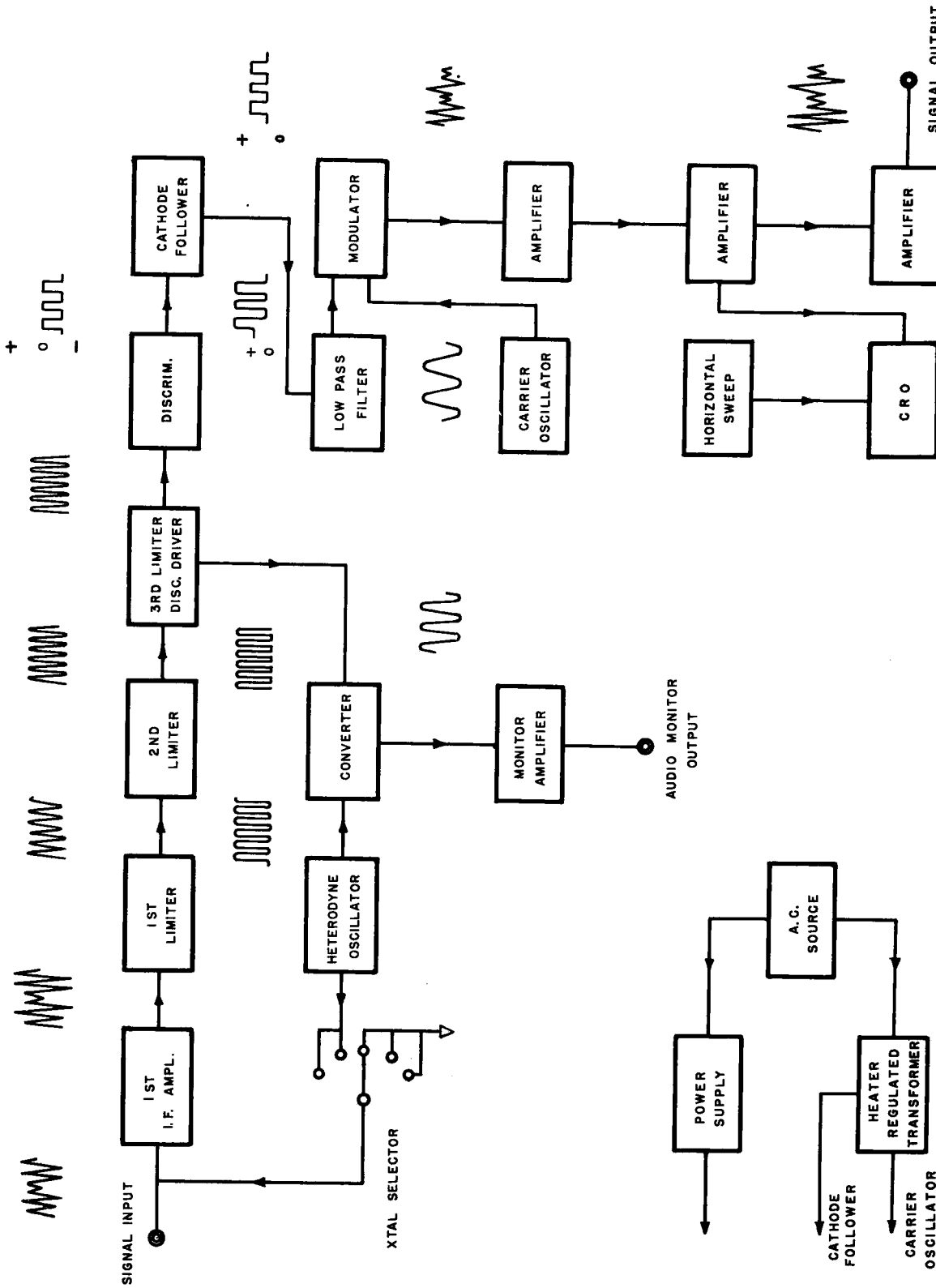


Figure 2-1. Overall Block Diagram

second switch position, CALIBRATE 402.2, the oscillator runs at 402.2 kc and this signal is fed into V201 as it was in the first switch position. This frequency is used to check the discriminator sensitivity and the overall operation of the strip. The third switch position, OFF, disables the oscillator. In position four, MONITOR 402.2, the oscillator runs at 402.2 kc and its output is fed to V207 only. Normal amplified and limited signals at the cathode of V204 are fed to the other grid of V207, which is a mixer stage, and the resulting audio beat-frequency of about 2200 cycles is developed across R232. This audio signal can be used to monitor the incoming 400-kc shifted signal from the receiving equipment. In position five, operation is similar except that the beat frequency is much lower and is used for setting external signal-generator frequencies. A zero-beat on a carrier will indicate that the receiving equipment is tuned exactly to the carrier frequency. It should be noted that V207 is operating in the first two switch positions as well, but no signal is heard since voltages of the same frequency are fed to both grids. In order to check the unit in the first two positions of S201,

the input signal from the receiving equipment must be reduced to zero.

3. MAIN CHASSIS.

a. V113 is a cathode follower which reduces the impedance level of the discriminator output voltage to a value which will match the low-pass filter Z103, Z104, or Z105, 500 ohms. The heater of this tube is supplied from constant-voltage transformer T101 to ensure stable operation. The filter output is fed to the diode ring modulator CR101.

b. V112 is a fed-back oscillator whose frequency is determined by L102 and a capacitance selected by CARRIER OSCILLATOR switch S102. C104 and R107 form a negative-feed-back loop to keep signal output independent of frequency. The output of V112 is fed to transformer T105 through a cathode follower, V109A, to reduce the effect of changing loads on the oscillator frequency. T105 isolates the modulator circuit from ground.

c. The modulator is made up of four germanium diodes connected in a ring, and is known as a "ring"

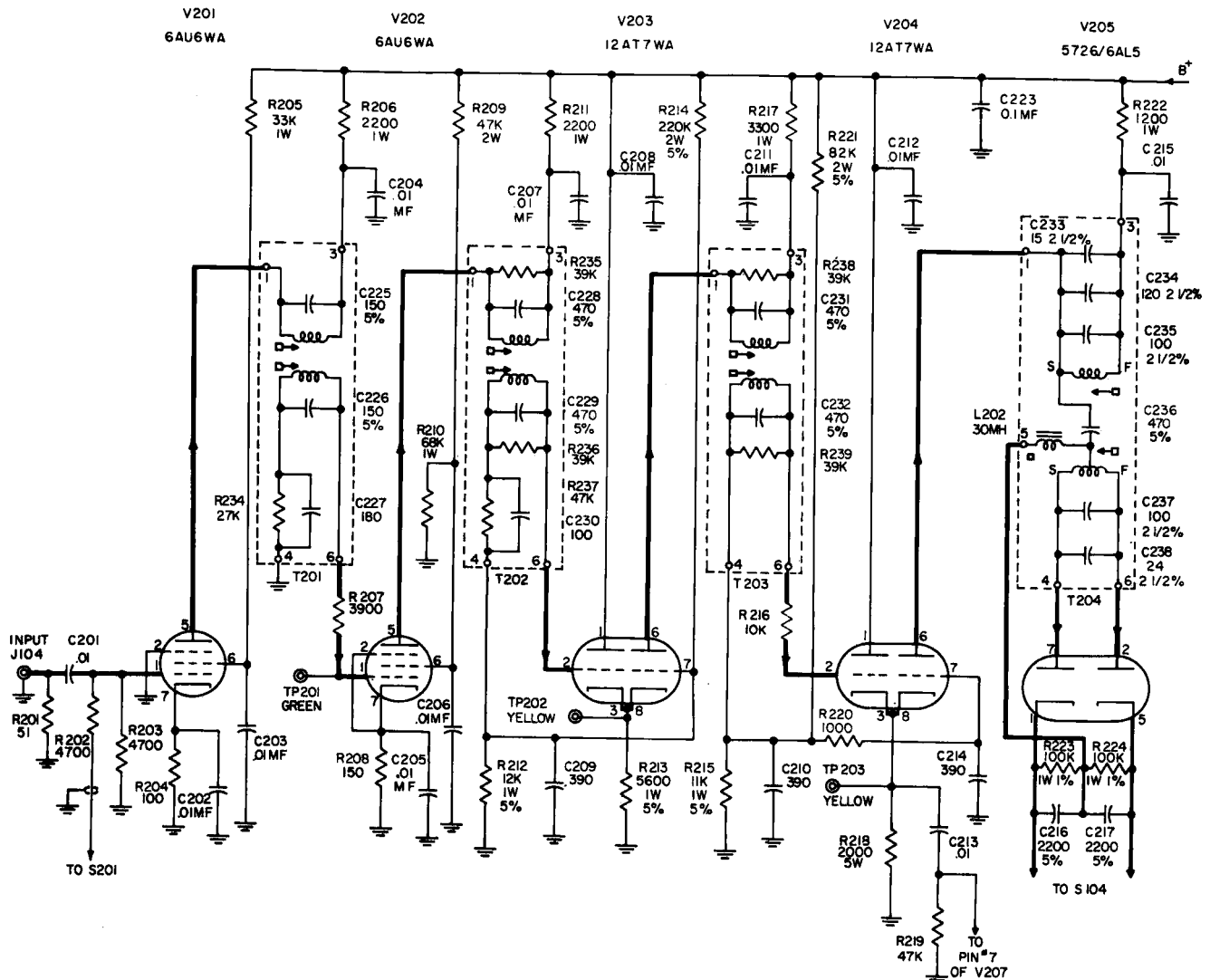


Figure 2-2. Schematic - IF Amplifier, Limiters and Discriminator

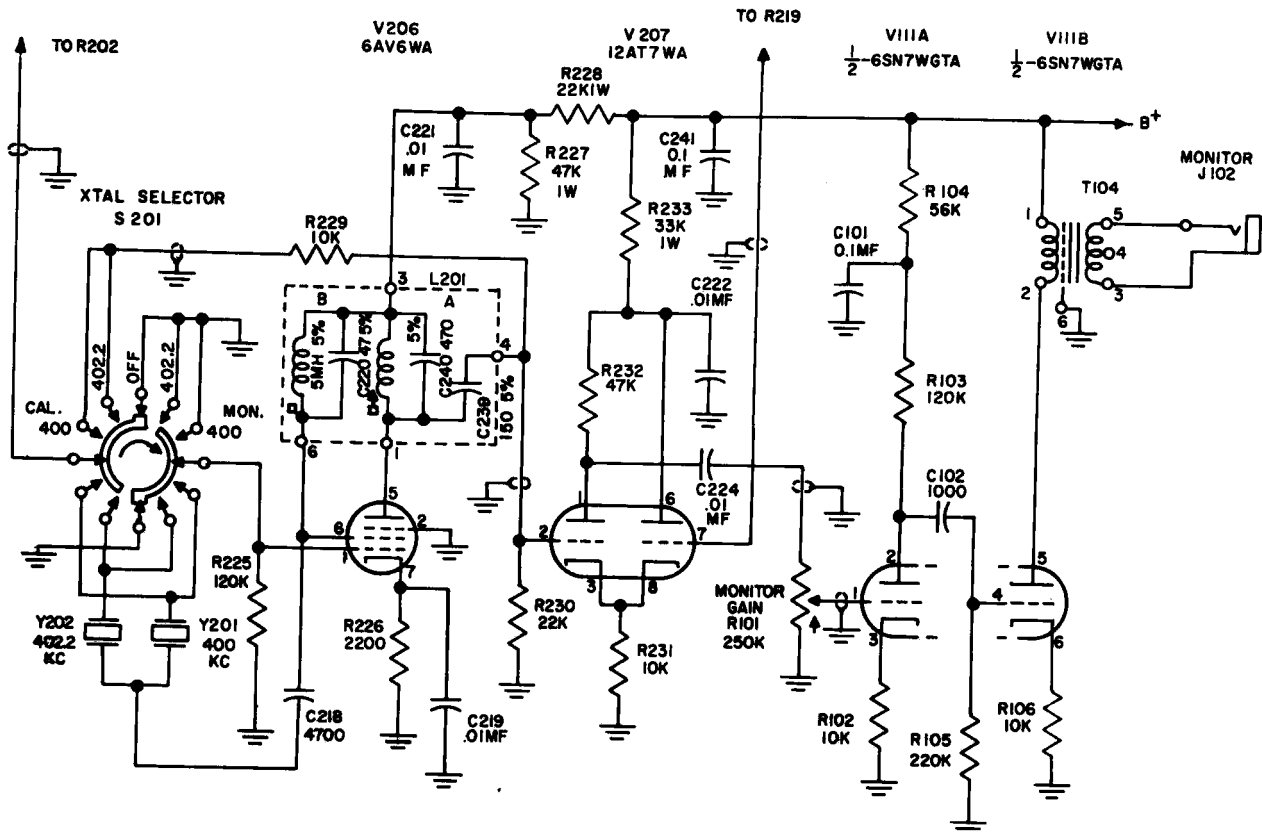


Figure 2-3. Schematic - IF Oscillator, Mixer, and Monitor Amp.

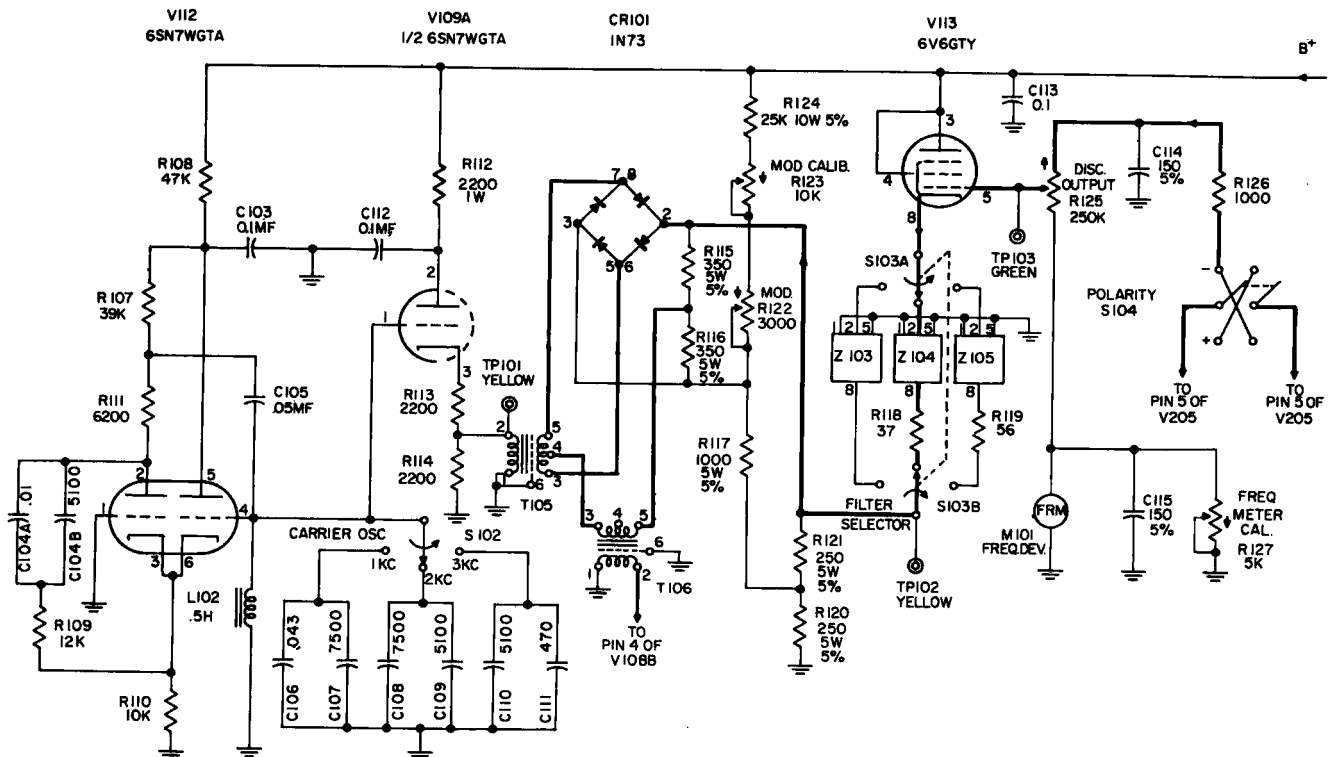


Figure 2-4. Schematic - Carrier Oscillator, Modulator, and Disc. Cathode Follower

modulator. The carrier voltage is applied across two opposite junctions, pins 5 and 7; the signal voltage is applied between another junction, pin 2, and ground; the remaining junction, pin 3, is connected to a variable dc reference voltage to balance the quiescent dc cathode-follower bias and to set the carrier level so that a given signal deviation of minus 450 to plus 450 cycles may provide all depths of modulation from 6 db to 25 db. The reference voltage is adjusted by two front-panel controls, MODULATION (R122) and MOD. CALIB. (R123). These controls vary the depth of modulation by varying the quiescent carrier level of the modulation while the input signal level remains constant. Signal voltage from the discriminator is applied to the modulator in such a direction that a shift of input frequency downward will increase the output voltage, and an upward shift of input signal frequency will decrease the output voltage. The POLARITY switch (S104) will reverse this relationship if necessary. The change in output audio carrier voltage is directly proportional to the frequency shift of the input signal. It corresponds to percent modulation, which is a linear function of the frequency shift. The rate of change corresponds to the keying frequency. The depth of modulation determines the tonal range from black to white. The tonal range desired depends on the nature of the material being transmitted and the reproducing range of the recording equipment.

d. V108 is a two-stage audio amplifier with feed-back from the second plate to the first cathode. The output of the second stage supplies the vertical-deflection voltage for the monitor cathode-ray tube and, through a voltage divider, drives the output amplifier stage V109B. As the unit is supplied, the OUTPUT LEVEL control R147 has a range of zero to two volts rms. A range of zero to seven volts can be obtained by soldering a jumper across R139. The output is available at a 600-ohm impedance level from J103 or E116. The output can be balanced to ground or have one side grounded.

e. V111 is a two-stage audio amplifier which amplifies the mixer (V207) output and makes it available at a 600-ohm impedance level.

f. V106 is a relaxation type of oscillator which generates a saw-tooth voltage waveform. This voltage is amplified by a push-pull amplifier, V107, and is used as a recurrent horizontal sweep for the monitor CRT. The sweep frequency is set by C116 and R131 at about 20 cycles per second.

g. The power supply for this unit is conventional. V102 with C121 provides the CRT accelerating potential of 1000 volts. R152 and R150 are part of a voltage divider for providing CRT FOCUS and INTENSITY potentials. V101 with L101 and C122 provides filtered low voltage dc for the regulator circuit. The heaters

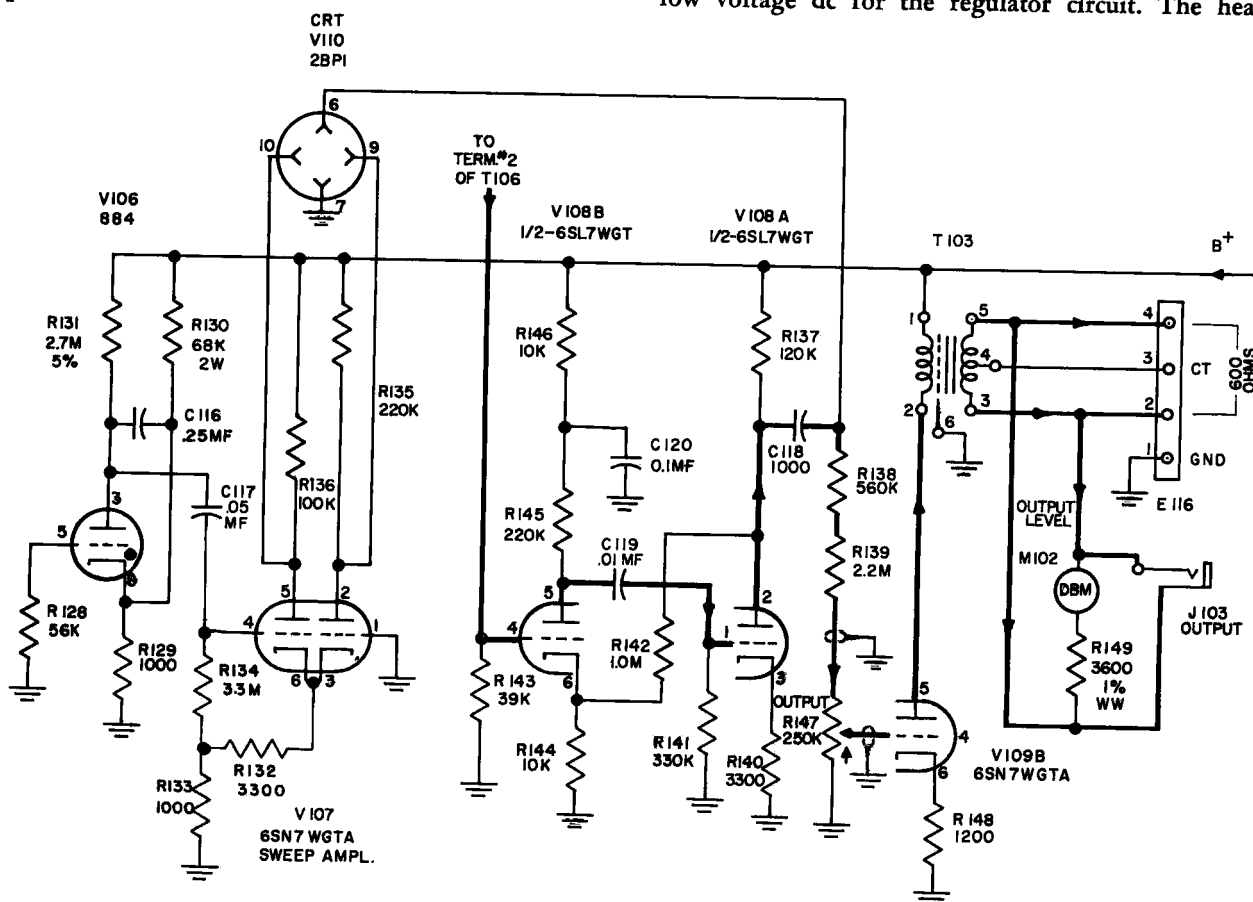


Figure 2-5. Schematic - Output Amplifier and Cathode-ray-tube Sweep Circuits

of V113 and V109 are supplied with regulated 6.3 volts from T101. All other heaters are unregulated.

b. The plate voltage for the unit is regulated by a conventional series regulator circuit in which V105 is the voltage-reference tube, V104 a high-gain dc amplifier and V103 the series regulator tube. The voltage output is determined by the potential at the junction

of R157 and R158, which sets the amplifier tube (V104) bias. Any change in output voltage appears, reduced, at the junction of these resistors; is compared with the reference voltage; and the difference is amplified and reversed in phase by V104, which biases regulator tube V103 in such a direction as to restore the original output voltage.

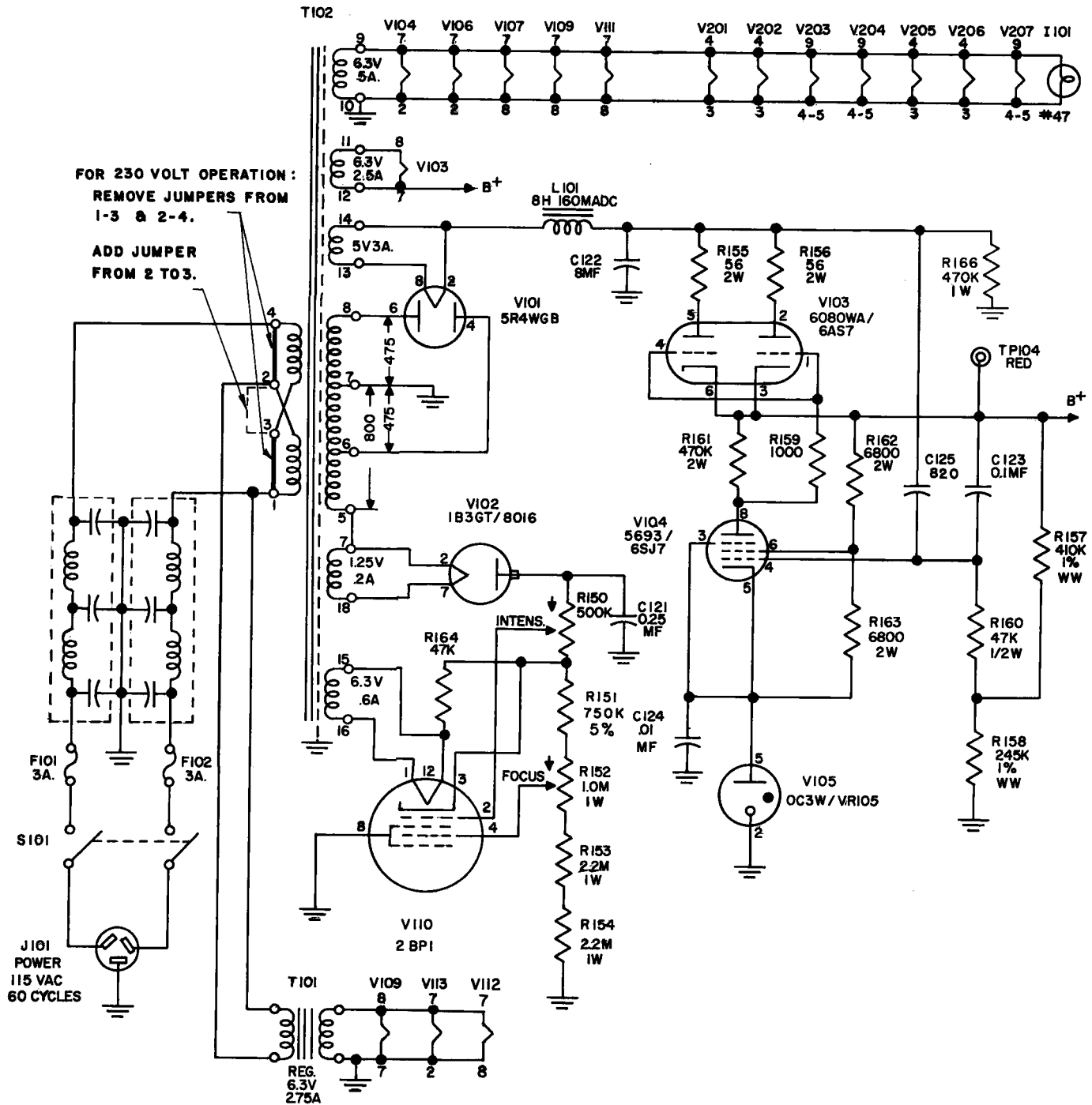


Figure 2-6. Schematic - Power Supply and Cathode-ray Tube

SECTION 3
INSTALLATION

1. UNPACKING.

- a. Cut the iron strapping around the wooden case.
- b. Remove nails from identified bottom of case.
- c. Turn case over on this bottom and lift off top of case.
- d. Remove barrier bag and break tape at bottom of cardboard carton and lift off carton.
- e. Remove bolts holding shock-mount channel.

2. INSTALLATION.

The unit is intended either for shelf or table-top installation or for relay-rack mounting.

a. **SHELF MOUNTING.**—The unit is supplied with shock mounts attached, and can be mounted on a shelf or table-top by following the drilling instructions in figure 3—(2). Adequate space should be provided behind the unit for cables. Normal clearance is about four inches. Hardware for mounting the unit is not furnished. Eight each 1/4" bolts (length determined by table thickness), nuts, and lockwashers are required.

b. **RELAY-RACK MOUNTING.**—Remove the unit from the cabinet by loosening the four captive screws on each side of the panel. Pull the unit out to the front and lift it off the retaining pins on the slides. The unit may now be mounted in a relay rack, first removing from the panel the eight captive thumb screws (10-32 thread) that held the unit in the cabinet and substituting eight 12-24 thread screws supplied with

the unit. Top and bottom dust covers protect the unit when it is relay-rack mounted.

c. **CABLE CONNECTIONS.**—Two cables are furnished with the unit. The input power cable W102 is run from the power source to J101.

Note

The instrument, as furnished by the manufacturer, is connected for operation from 115-volt 60-cycle power. If the instrument is to be operated from 230-volt 60-cycle power, remove the two jumpers, one between terminals 1 and 3 and the other between terminals 2 and 4 on the main power transformer T102. *Do not disturb any other wires.* Add a new jumper between terminals 2 and 3 on T102 and the instrument may then be operated from 230-volt 60-cycle power.

The signal cable W101 is run from the IF cathode-follower output of the receiver to J104. Cables are furnished in fixed length, but may be shortened to meet the requirements of a particular installation. No cable is furnished to connect the output signal from the unit to the recorder because of the wide variety of possible combinations. The output signal is available from terminal strip E116 on the rear of the chassis, or through a PJ055B plug from OUTPUT jack J103 on the front panel. The output-impedance level is 600 ohms and may be connected to either a balanced or an unbalanced line.

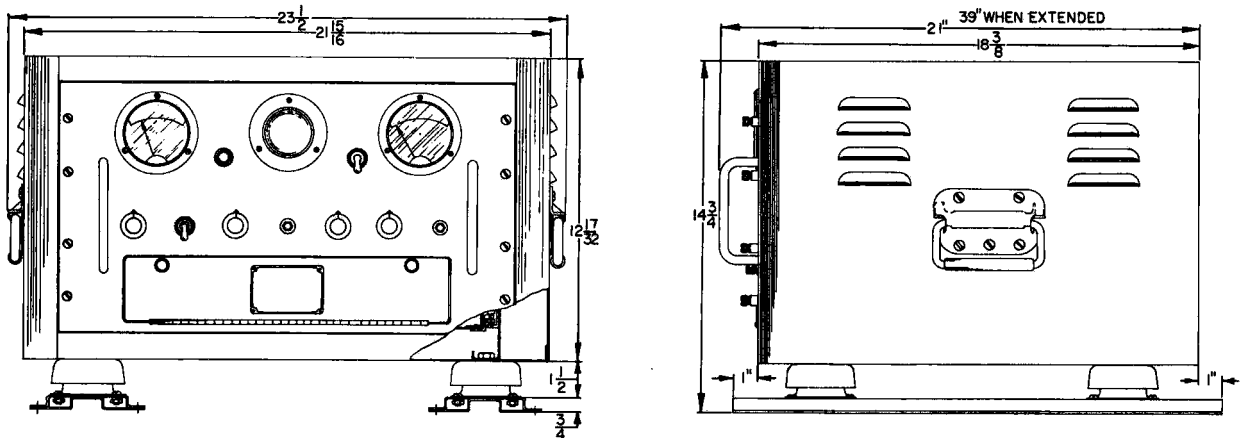


Figure 3—1. Front and Side Views of the Equipment, with Dimensions

Most Navy installations will require the use of at least two-pair rubber-covered shielded cable between the Converter and the recording equipment. One pair will be kept as a spare; the other pair will be connected to terminals 2 and 4 of E116, with terminal 3 grounded to provide operation as a balanced line. The cable shield

will also be grounded. Terminal 1 of E116 is connected to the chassis and may be used as ground.

3. INITIAL ADJUSTMENTS.

After installation has been completed, with the receiving equipment turned OFF, set the unit controls to the positions indicated:

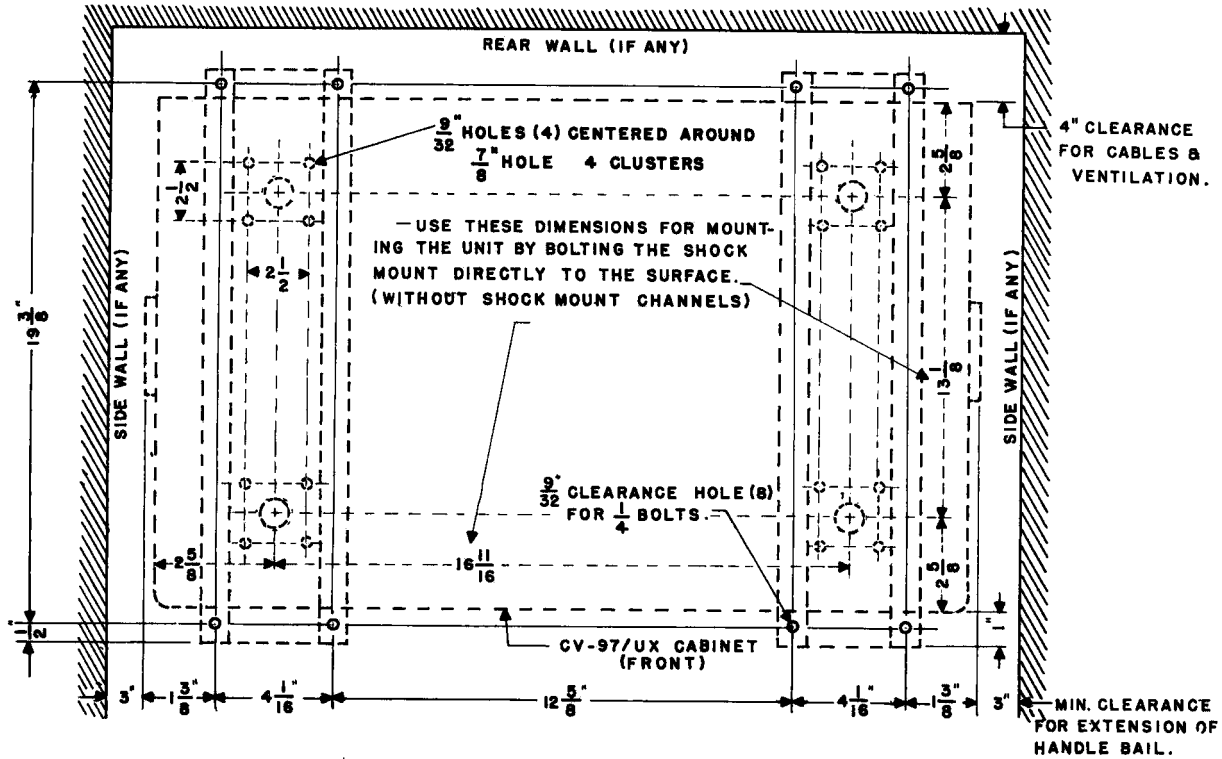


Figure 3-2 Drilling Plan for Mounting CV-97/UX.

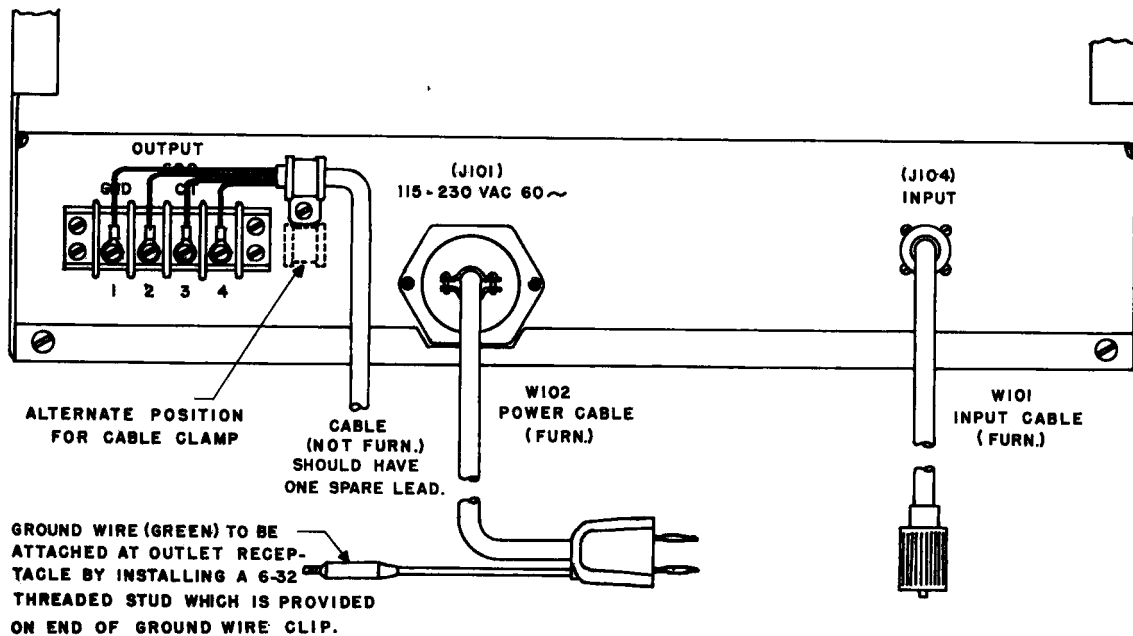


Figure 3-3. Cable Connections - Front and Rear

<i>Control</i>	<i>Position</i>
POWER	ON
XTAL SELECTOR	OFF
POLARITY	PLUS
MODULATION	25 DB
OUTPUT LEVEL	CCW

When the unit has warmed up, adjust the FOCUS and INTENSITY controls until a clear visible pattern appears on the cathode-ray tube.

Rotate the XTAL SELECTOR switch to CALIBRATE 400. Check that the FREQ. DEVIATION meter reads within 50 cycles of zero. A straight horizontal pattern about one-half-inch high will be seen on the CRT.

Rotate the CARRIER OSCIL. switch to the 1, 2, and 3 kc positions successively. Note that the CRT pattern is present in each position, and that the pattern becomes finer as the frequency is increased. Normal operation will be in the 3 kc position.

Rotate the MODULATION control CCW toward the 6 db position and check that the CRT pattern size increases appreciably. Restore this control to the 25 db position.

Rotate the OUTPUT LEVEL control CW and note that the OUTPUT LEVEL meter shows a reading. Leave this control in the full CCW position.

Rotate the XTAL SELECTOR switch to CALIBRATE 402.2. Check that the FREQ. DEVIATION meter reads plus 2200 cycles, and that the CRT pattern almost fills the tube vertically.

Throw the POLARITY switch to MINUS. Check that the FREQ. DEVIATION meter reads minus 2200 cycles, and that the CRT pattern almost fills the tube vertically.

Rotate the XTAL SELECTOR switch to MONITOR 402.2.

Turn the receiving equipment ON and tune in a facsimile broadcast channel. Set the receiver SELECTIVITY switch for maximum selectivity.

Plug a set of headphones into the MONITOR jack and adjust the MONITOR GAIN control until noise is heard. The receiver noise will be heard and seen on the CRT unless a carrier is present.

Tune the receiving equipment until the characteristic beating whistle is heard and a pattern similar to one of those in Figure 3-4 is seen on the CRT. When the receiving equipment is correctly tuned, the FREQ. DEVIATION meter will read plus 450 cycles for a white level and minus 450 cycles for a black level.

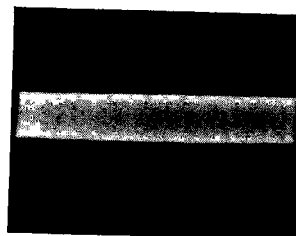
When a facsimile transmission is being received, rotate the FILTER switch from 250 to 450 to 700 cps and note that the picture signals become successively sharper.

The OUTPUT LEVEL control can now be adjusted to give the required recorder density and the system is ready to receive copy.

If any of the above checks indicate trouble, refer to Section 7 - Corrective Maintenance.

TABLE 3-1. CABLES AND ACCESSORIES REQUIRED

REQUIRED	FURNISHED	REMARKS
Signal cable from radio receiving equipment to Converter INPUT (J104)	Yes	W-101 Cable, signal input, co-axial, RG-8/U, 6 feet long, each end fitted with connector CPH 49190.
Power cable from power source to J101	Yes	W-102 Cable, power, 3-#18 conductors, 8 feet long, fitted with 2-contact cord cap and equipment-grounding lead one end, 3-contact "Twist-lok" connector on other end for J101.
Output cable from terminal strip E-116 to recorder	No	Cable, minimum of 2 conductors, shielded, with solder lugs to pass #6 screws for connection to E116.
Headset Navy type 49985-A (SNSN N17H-52029-7211) with PJ-055B plug for connection to MONITOR (J102)	No	
Optional output cable from OUTPUT (J103) to recorder	No	Cable, 2-conductor, shielded, with PJ-055B plug for connection to J103.



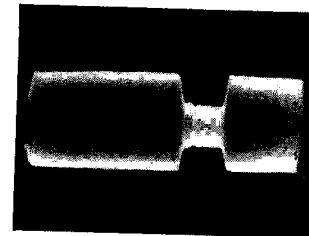
A. No Signal



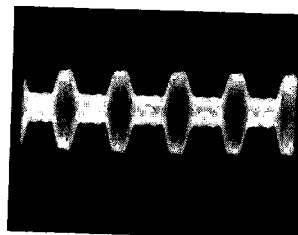
B. White Level; 25 db Modulation



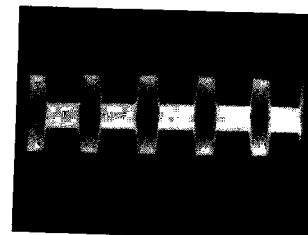
C. Black Level; 25 db Modulation



D. Typical Facsimile Synchronizing Pulse



E. Square Wave, Using 250-cycle Filter



F. Square Wave, Using 700-cycle Filter

Figure 3-4. Typical Cathode-ray-tube Patterns

SECTION 4
OPERATION

1. ROUTINE OPERATION.

The unit is designed to be used in conjunction with any receiver that will supply a 400-kc intermediate-frequency signal of 2.8 millivolts to 0.5 volts at the unit input.

For proper operation of the unit, the significance of each panel control should be clearly understood. In

operation, four controls, MODULATION, OUTPUT LEVEL, FILTER, CARRIER OSCILLATOR, (Nos. 4, 5, 12, and 15, Table 4-1) are adjusted, depending on the characteristics of the transmission. Three controls, FREQUENCY METER CAL., DISC. OUTPUT and MOD. CALIB., (9, 10, and 11) are set during calibration only, and the remaining controls adjust the visual and aural monitoring and are usually pre-set.

TABLE 4-1. PANEL COMPONENT IDENTIFICATION

NO.	COMPONENT	FUNCTION
1.	XTAL SELECTOR switch	CALIBRATE - enables checking of unit performance Sect. 3-3. MONITOR (in 402.2 kc position) enables aural monitoring of signal by means of head phones. Normal operating position is OFF.
2.	POLARITY switch	Used in conjunction with XTAL SELECTOR when checking performance, Sect. 3-3. Will produce a negative (reversed tone) print if operated in wrong position. Normal operating position is PLUS.
3.	MONITOR GAIN control	Control monitor signal level at MONITOR jack.
4.	MODULATION control	Controls depth of modulation of sub-carrier by signal. Operating position depends on transmission conditions, Sect. 2-3-C.
5.	OUTPUT LEVEL control	Controls signal level at OUTPUT jack and output terminal strip.
6.	FREQ. DEVIATION meter	Reads deviation of incoming signal from center frequency of 400 kc.
7.	MONITOR C.R.T.	Allows visual examination of character of OUTPUT signal.
8.	OUTPUT LEVEL meter	Reads level of output signal (dbm) at OUTPUT jack and output terminal strip.

NO.	COMPONENT	FUNCTION
THE FOLLOWING CONTROLS ARE LOCATED BEHIND THE ACCESS DOOR ON THE FRONT PANEL		
9.	FREQ. METER CALIB. control	Sets sensitivity of FREQ. DEVIATION meter.
10.	DISC. OUTPUT	Determines amount of discriminator output used.
11.	MOD. CALIB. control	Calibrates MODULATION control.
12.	FILTER switch	Selects low-pass filter of 250-, 450-, or 700-cycle cut-off frequency. Filter selected depends on amount of noise from discriminator. Normal filter for best resolution is 700 cycle.
13.	FOCUS control	Set for best focus of MONITOR CRT.
14.	INTENSITY control	Set for suitable intensity of MONITOR CRT.
15.	CARRIER OSCIL. switch	Sets sub-carrier frequency at 1000, 2000, or 3000 cycles/second. Normally used in 3-kc position.
16.	Pilot light	Indicates that unit is in operation.
17.	POWER switch	Controls input power to unit.

TABLE 4-2. OPERATING INSTRUCTIONS

NOTE: Normally the receiving equipment should be set for maximum selectivity to provide the best signal to noise ratio.

SEQUENCE	CONTROL AND POSITION	REMARKS
STARTING THE EQUIPMENT		
1.	FILTER — 700 cps	
2.	CARRIER OSCIL. — 3 kc	
3.	XTAL SELECTOR — OFF	
4.	POLARITY — PLUS	
5.	MONITOR GAIN — FULL CCW	
6.	MODULATION — 25 db	
7.	OUTPUT LEVEL — FULL CCW	
8.	POWER SWITCH — ON	
9.	Allow 20-minute warm-up period, if possible.	
OPERATING THE EQUIPMENT		
10.	OUTPUT LEVEL	Adjust for required signal level according to instructions furnished with the recording equipment.
11.	MODULATION	A setting of 15 db will usually equal or exceed the contrast range of reproducing equipment and should be adequate.

SEQUENCE	CONTROL AND POSITION	REMARKS
12.	MONITOR GAIN	Adjust for desired signal level in the headphones.
13.	FILTER	External interference and noise in the copy is reduced as the filter cut-off frequency is lowered. At the same time, the definition of the copy is reduced. For low-noise conditions use the 700-cycle filter; for moderate noise, the 450-cycle filter; and for extremely noisy conditions, use the 250-cycle filter. Choice is also governed by recorder speed and transmission-system characteristics.
14.	FOCUS	Adjust for best definition of the CRT.
15.	INTENSITY	Adjust for minimum usable brightness of the CRT.
16.	CARRIER OSCILLATOR	Choice of oscillator frequency is governed largely by operating speed of recorder — 1 kc, 2 kc, and 3 kc for 30, 60, 120 RPM recorders respectively. 3 kc can normally be used with all recorders for good definition.
17.	FREQ. DEVIATION	Tune receiving equipment so that a WHITE printing signal reads plus 450 cycles on the FREQ. DEVIATION meter and a BLACK printing signal reads minus 450 cycles.
STOPPING THE EQUIPMENT		
18.	POWER switch — OFF	

SECTION 5

OPERATORS MAINTENANCE

1. ROUTINE CHECK CHART.

Following the steps outlined in the Routine Check Chart (Table 5-1) will enable the operator to keep his equipment in optimum operating condition at all times.

2. EMERGENCY MAINTENANCE.

a. NOTICE TO OPERATORS.—Operators shall not perform any of the following emergency maintenance procedure without proper authorization.

b. REPLACEMENT OF TUBES AND FUSES.

(1) PROBABLE FUSE FAILURE.

WARNING

Never replace a fuse with one of higher rating unless continued operation is more important than probable damage. If a fuse burns out immediately after replacement, do not replace it a second time until the cause has been corrected.

If there is no evidence of plate or heater power from the first check in Table 5-1, check both fuses F101 and F102 located behind the front-panel access door. Both fuses have a 3-ampere, 250-volt rating.

(2) TUBE LOCATIONS.—Locations of the tubes are indicated and identified on figure 5-1.

(3) REPLACING ELECTRON TUBES.—All tubes are readily accessible except the MONITOR CRT which is located in a mu-metal shield. To remove this tube, turn POWER to OFF, loosen the base clamping screw, slide the two slide fasteners in toward the tube base, and slide the clamp back over the wires. The CRT socket may now be removed, and the tube can then be eased back out of the shield.

CAUTION

The cathode-ray tube is dangerous and should be handled carefully. It is retained at the front by a tight-fitting sponge rubber gasket and must be eased out with care.

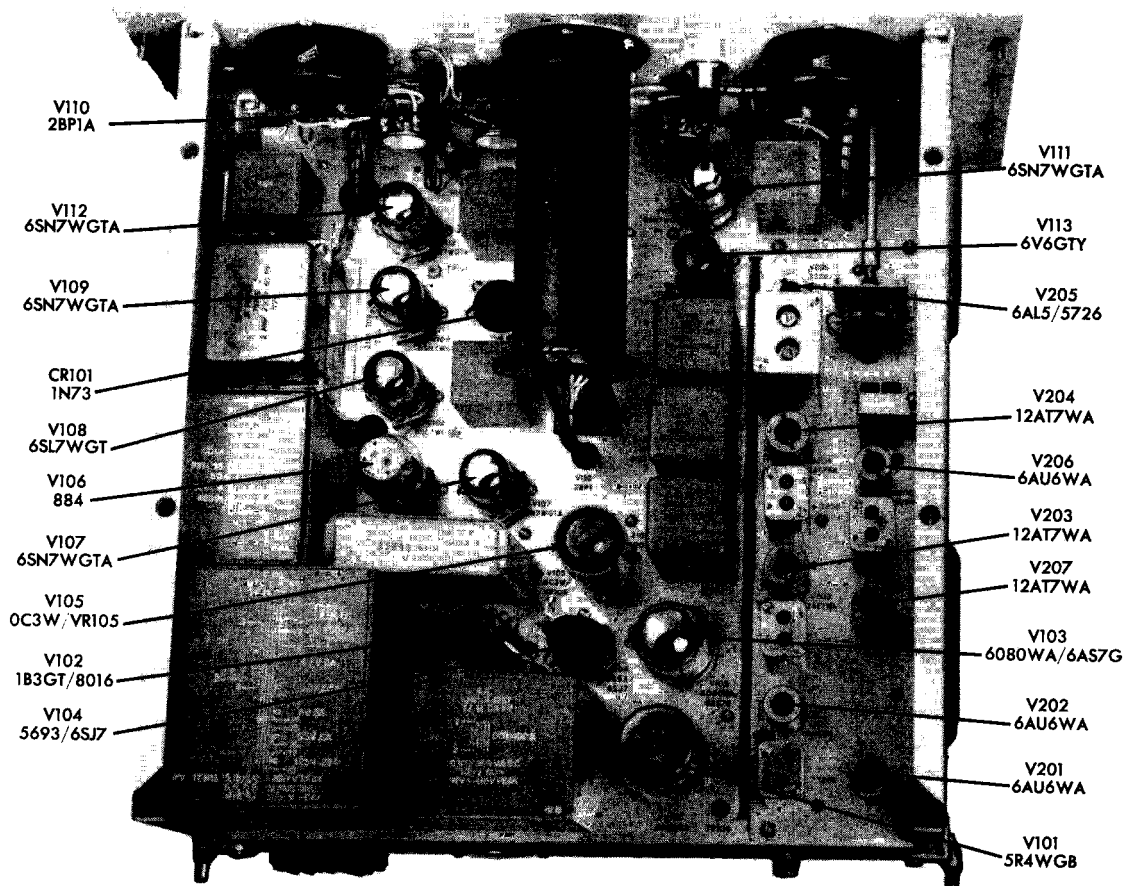


Figure 5-1. Tube Locations

TABLE 5-1. DAILY CHECK CHART

WHAT TO CHECK	HOW TO CHECK	OBSERVATIONS
Plate and heater power	POWER switch ON	Glowing of pilot light indicates presence of power. If none, check power cable, pilot lamp, and fuses as described under paragraph 2, "Emergency Maintenance", in this section. If plate voltage is not present, check V101, V103, V104, V105.
Discriminator zero	Receiver — RECEPTION — MOD. GAIN — Zero Converter — XTAL. SELECTOR — CALIBRATE — 400 POLARITY — PLUS	FREQ. DEVIATION meter should read approximately zero after 15 minutes warm-up. If reading exceeds 50 cycles plus or minus from zero, refer to Section 7-5, b (1) (b), 1, d.
Discriminator	Receiver — RECEPTION — MOD. GAIN — Zero Converter — XTAL. SELECTOR — CALIBRATE — 402.2 POLARITY — PLUS	FREQ. DEVIATION meter should read plus 2200 cycles. If reading exceeds 2200 cycles plus or minus 50, refer to Section 7-5 b, (1), (b), 1, d.
Carrier oscillator and output amplifier	Receiver — RECEPTION — MOD. GAIN — Zero Converter — XTAL. SELECTOR — OFF OUTPUT LEVEL — full CW CARRIER OSCIL. — 3 kc — 2 kc — 1 kc	OUTPUT LEVEL meter should read at least zero dbm in each carrier frequency position. The meter needle will not be steady because of Receiver noise. If meter does not read at least zero dbm for each frequency, check V112, V109A, V108A, V108B, V109B.
Modulator	Receiver — RECEPTION — CW GAIN — Zero Converter — XTAL. SELECTOR — OFF MODULATION — 25 db Adjust Receiver FREQUENCY VERNIER for minus 450 cycle reading on the FREQ. DEVIATION meter. Adjust OUTPUT LEVEL control for plus 5 dbm reading on the OUTPUT LEVEL meter. Throw POLARITY switch to opposite setting.	OUTPUT LEVEL meter should read minus 20 dbm. If not, a slight adjustment of the MOD. CALIB. control may be required. Before turning this control more than a few degrees, refer to Section 7-5, b, (1), (b), 2, a. OUTPUT meter should show a difference in reading of 25 dbm for the POLARITY switch in the PLUS and MINUS positions. Restore the POLARITY switch to PLUS position.
Monitor	Receiver — receiving normal signal Converter — XTAL. SELECTOR — MONITOR — 402.2 MONITOR GAIN — for normal signal level in earphones	Beating signal of about 2000 cycles should be heard in earphones. If not refer to Section 7-5, b, (1), (b), 1, b. Check V206, V207, V111A, V111B.
Limiter action	Receiver — RECEPTION — MOD. GAIN — Zero Converter — XTAL. SELECTOR — OFF MONITOR GAIN — 50% open Listen to MONITOR HEADPHONES as RECEIVER GAIN control is turned CW.	A rushing noise should be heard, increasing in level and then sharply subsiding to a faint crackle as the Receiver GAIN control is turned CW. If it does not, refer to Section 7-5, b, (1), (b), 1, c.
Monitor CRT.	Visual observation will check normal operation. Adjust FOCUS and INTENSITY to suit.	If operation is not normal, check V102, V106, V107, V110.
Filters	Observe a normal signal on the MONITOR CRT, as the FILTER switch is moved from 250 to 450 to 700 CPS.	The modulation level should not change noticeably. Waveshapes will become more nearly square in the 450 and 700 CPS. positions.

SECTION 6

PREVENTIVE MAINTENANCE

1. ROUTINE MAINTENANCE CHECK CHART.

Note

The attention of maintenance personnel is invited to the requirements of Chapter 67 of the Bureau of Ships Manual, of the latest issue.

2. TROPICALIZATION.

a. This equipment may be tropicalized with fungus-proof varnish, Interchemical Corp. No. 200457.

b. PROCEDURE.

- (1) Thoroughly clean all surfaces to be fungus-proofed.
- (2) Cover all screw terminals and jacks for external connections, switch contacts, and the top of tube sockets with masking tape.
- (3) Paint or spray with recommended varnish or equivalent.
- (4) Remove all masking tape.
- (5) Repeat as necessary to control fungus growth.

ORIGINAL

TABLE 6-1. ROUTINE MAINTENANCE CHECK CHART

WHAT TO CHECK	HOW TO CHECK	COMMENTS
MONTHLY		
Cables and connectors	Inspect	Note any damage that might cause trouble, particularly damage to coaxial leads. Check connectors for broken or loose pins. Remove any foreign matter between connector pins or holes, using small brush, air blast, or dry-cleaning solvent 140-F (SNSN G51-S-4718-10).
Terminal board connections	Inspect	Tighten any loose connections or mounting screws.
Knobs	Inspect	Tighten any loose set-screws.
Chassis	Inspect for charred insulation or on area of discolored metal.	Check circuit or adjacent components for cause.
Resistors and Capacitors	Inspect for spots, discoloration or leakage.	Check component value and circuit involved.
QUARTERLY		
Tubes	Check in transconductance tester if possible.	Replace any tube registering below normal. Remove tubes one at a time when testing, to insure replacement in same socket. This will avoid possibility of disturbing circuit alignment.
Spare tubes	Check condition.	Replace if defective.
Spare parts	Check quantity.	Order as necessary to bring stock to proper level.

FAILURE REPORTS

A FAILURE REPORT must be filled out for the failure of any part of the equipment whether caused by defective or worn parts, improper operation, or external influences. It should be made on Failure Report, form DD787, which has been designed to simplify this requirement. The card must be filled out and forwarded to BUSHIPS. Full instructions are to be found on each card.

Use great care in filling the card out to make certain it carries adequate information. For example under "Circuit Symbol" use the proper circuit identification taken from the schematic drawings, such as T-803, in the case of a transformer, or R-207, for a resistor. Do not substitute brevity for clarity. Use the back of the card to completely describe the cause of failure and attach an extra piece of paper if necessary.

The purpose of this report is to inform BUSHIPS of the cause and rate of failures. The information is used by the Bureau in the design of future equipment and in the maintenance of adequate supplies to keep the present equipment going. The cards you send in, together with those from hundreds of other ships, furnish a store of information permitting the Bureau to keep in touch with the performance of the equipment of your ship and all other ships of the Navy.

This report is not a requisition. You must request the replacement of parts through your Officer-in-Charge in the usual manner.

Make certain you have a supply of Failure Report cards and envelopes on board. They may be obtained from the nearest District Printing and Publication Office.

Figure 7-1. Failure Report

SECTION 7

CORRECTIVE MAINTENANCE

1. CORRECTIVE MAINTENANCE.

This section contains all information necessary to enable a technician to locate trouble and make repairs and adjustments to the Frequency Shift Converter CV-97/UX.

2. FAILURE REPORTS.

In the event of equipment failure, a failure report must be filled out in accordance with the instructions in Figure 7-1. Keep a careful record of all failures, corrections, adjustments and repairs for reference purposes and as a standard for comparison.

3. THEORY OF LOCALIZATION.

When trouble shooting, keep in mind that not all faulty operation is due to defects in the equipment. The operator may have failed to perform one of the required functions at the proper time, or there may be interference in the transmission circuit.

This equipment can be divided into four main sections for trouble-shooting purposes: the IF and discriminator section, the sub-carrier oscillator-modulator-output amplifier section, the monitoring sections—aural and visual, and the power supply. The method of checking each section to localize any trouble is described in detail in the trouble-shooting chart.

All necessary test points are provided to assist further in locating faults.

4. SYSTEM TROUBLE SHOOTING.

Before suspecting trouble in the converter, make certain that the other units of the system are functioning properly.

If no modulated output is available at the recorder, and no modulation is shown by the OUTPUT LEVEL meter or the cathode-ray tube, but the sub-carrier voltage is present, first check the receiving equipment to make sure that it is operating, by listening for receiver audio output in the loudspeaker or headphones. If audio signals are present, listen with headphones for audio signals at the MONITOR jack. If no signals are heard, inspect the input signal cable for broken wire or loose connections and then check the receiving equipment IF cathode-follower output section as directed in the appropriate instruction manual.

If the recorder does not print, or prints incorrectly, and the Converter appears to be functioning normally,

inspect the signal cable between the two units, and then check the recorder as directed in the appropriate instruction manual.

If no radio signals are available to make these and the following checks, it should be kept in mind that, in many cases, the receiver noise can be used as a rough guide to check the functioning of the system.

5. UNIT TROUBLE SHOOTING AND REPAIR.

a. TROUBLE SHOOTING.

(1) The trouble-shooting chart, Figure 7-2, will assist in locating the section of the unit which is at fault.

(2) CIRCUIT CONSTANTS.

(a) Location of circuit components.

Circuit components may be readily identified by reference to Figures 7-7 thru 7-10.

(b) Resistance and voltage measurements.

Refer to Table 7-1 for voltage measurements, and Table 7-2 for resistance measurements.

Make certain that all controls are set as shown in the tables when making these measurements.

When making resistance measurements, be sure that the power plug is removed from the ac outlet.

When making voltage measurements, use extreme caution to avoid coming in contact with the high-potential points in the electrical circuit.

b. REPAIR.

(1) ELECTRICAL ADJUSTMENTS.

(a) TEST EQUIPMENT REQUIRED.

1. Multimeter AN/PSM-4 series or equivalent.
2. Signal Generator AN/URM-25 series or equivalent.
3. Electronic Volt-Ohm-Milliammeter ME 25A/U series or equivalent.

(b) ALIGNMENT OF THE UNIT.

1. ALIGNMENT OF THE IF STRIP.

a. OSCILLATOR.

- (1) Set XTAL SELECTOR switch (S201) to CALIBRATE - 400.
- (2) Connect the R.F. voltmeter probe to pin 2 of V207, after first removing the tube.
- (3) Adjust the tuning slug in T205 for maximum voltage. (Approximately 7.0 volts.)

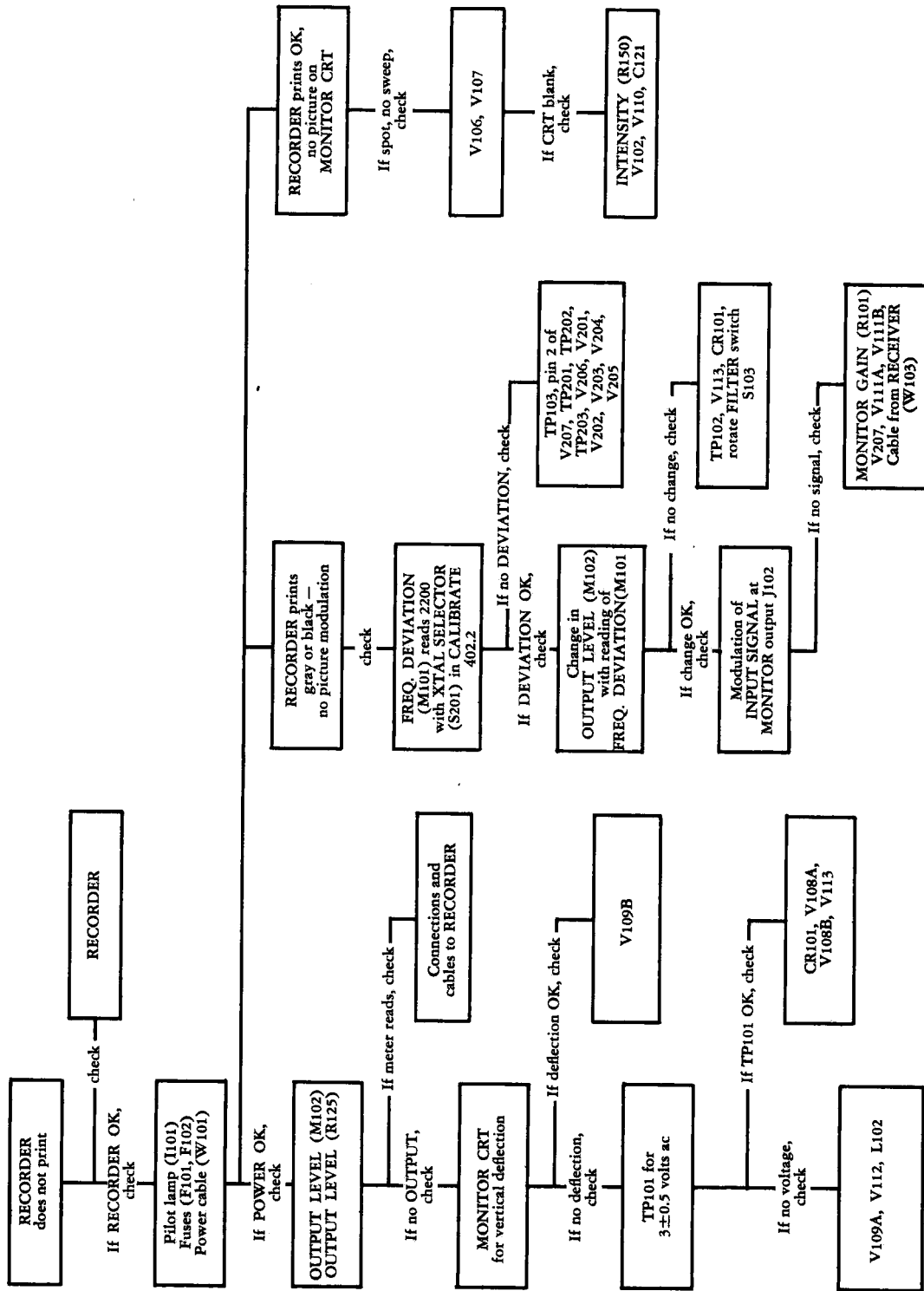


Figure 7-2. Trouble-shooting Chart

(4) Check that the same voltage appears at pin 2 of V207 when the XTAL SELECTOR switch (S201) is set to CALIBRATE - 402.2; MONITOR - 400; and MONITOR - 402.2.

(5) Replace V207.

b. MIXER.

(1) Apply a 400-kc unmodulated signal of greater than 3000 microvolts at the INPUT jack (J104).

(2) Set XTAL SELECTOR switch (S201) to MONITOR 402.2.

(3) Rotate the MONITOR GAIN control (R101) fully CW.

(4) A 2200-cycle signal of 1.5 volts amplitude will appear across a 600-ohm load resistor connected to the MONITOR jack J102.

(5) Set the XTAL SELECTOR switch (S201) to MONITOR - 400.

(6) A zero-beat signal will be heard in the headphone at the MONITOR jack (J102) as the signal generator is set to exactly 400 kc.

Note

The procedure of steps (5) and (6) above is recommended for setting the signal generator to 400 kc in all subsequent steps to remove any possibility of error caused by inaccuracy of the signal-generator calibration.

**TABLE 7-1. VOLTAGE MEASUREMENTS - FREQUENCY SHIFT CONVERTER
(VOLTAGE TO CHASSIS)**

TAKEN WITH SIMPSON MODEL 260, 20,000Ω/V; NO INPUT SIGNAL;
ALL READINGS ±10%; LINE VOLTS 115; CONTROL POSITIONS:

XTAL SEL - OFF
POLARITY - PLUS
MONITOR GAIN - FULL CCW
FOCUS - NORMAL

MODULATION - FULL CW
OUTPUT LEVEL - FULL CCW
FREQ METER CAL - NORMAL
INTENSITY - NORMAL

DISC OUTPUT - FULL CW
MOD CAL - NORMAL
FILTER - ANY
CARRIER OSC - ANY

TUBE	PIN 1	2	3	4	5	6	7	8	9	CAP/10	11	12
V201 6AU6WA	0	0	0	6.3 ac	250	150	1.4					
V202 6AU6WA	0	1.2	0	6.3 ac	260	100	1.2					
V203 12AT7WA	270	14	19	0	0	260	14	19	6.3 ac			
V204 12AT7WA	270	24	27	0	0	260	24	27	6.3 ac			
V205 5726/6AL5	0	0	0	6.3 ac	0	0	0					
V206 6AU6WA	0	0	0	6.3 ac	160	160	3.6					
V207 12AT7WA	220	0	6.8	0	0	240	0	6.8	6.3 ac			
V101 5R4WGB	NC	365	NC	465 ac	NC	465 ac	NC	365				
V102 1B3GT/8016	NC	800 ac	NC	NC	NC	NC	800 ac	NC		-1000		
V103 6080WA/6AS7	240	350	270	240	350	270	270	270				
V104 5693/6SJ7	0	0	105	100	105	185	6.3 ac	240				
V105 OC3W/VR105	NC	0	NC	NC	105	NC	NC	NC				
V106 884	NC	6.3 ac	25	NC	0	NC	0	4.1				
V107 6SN7WGTA	0	145	7.4	0	140	7.4	0	6.3 ac				
V108 6SL7WGT	0	175	2	0	220	3.5	0	6.3 ac				
V109 6SN7WGTA	0	260	10	0	255	8.6	0	7.1 ac				
V111 6SN7WGTA	0	150	7	0	265	12	6.3 ac	0				
V112 6SN7WGTA	0	187	12	0	215	12	0	6.3 ac				
V113 6V6GTY	0	7.1 ac	270	270	0	NC	0	18.5				
CR101 IN73	0	16	16	NC	16	16	16	16				
V110 2BP1	-1000	-1030	-1000	-740	NC	0	0	0	170	180	NC	-1000
Volts at TP101 2 TP102 16 TP103 0 TP104 270												

c. AMPLIFIER AND LIMITER STAGES.

CAUTION

Because the amplifier and limiter stages are designed for relatively wide-band operation, and the components are rugged and of high quality, it should not be necessary to re-align these stages, even when tubes are replaced. At most, it is expected that only very minor adjustments of the tuning slugs will be required throughout the life of the equipment.

(1) Set the XTAL SELECTOR switch (S201) to OFF.

TP203.

(2) Connect the RF voltmeter probe to the INPUT connector (J104).

(3) Connect the RF signal generator to the INPUT connector (J104).

(4) Set the signal generator for unmodulated 400-kc output and adjust the generator output to give approximately one volt at TP203.

(5) Adjust the primary and secondary tuning slugs in T203 for a maximum meter reading. When the meter reading exceeds one volt, reduce the generator output until the reading is one volt or slightly less.

TABLE 7-2. RESISTANCE MEASUREMENT - FREQUENCY SHIFT CONVERTER (RESISTANCE TO CHASSIS)

CONDITIONS SAME AS VOLTAGE MEASUREMENTS EXCEPT POWER-OFF

TUBE	PIN 1	2	3	4	5	6	7	8	9	CAP/10	11	12
V201 6AU6WA	2.3	0	0	0	13	48	100Ω					
V202 6AU6WA	33	150Ω	0	0	13	33	150Ω					
V203 12AT7WA	12	60	5.6	0	0	16	12	5.6	0			
V204 12AT7WA	12	20	2	0	0	13	7	2	0			
V205 5726/6AL5	0	75	0	0	110	NC	75					
V206 6AU6WA	0	0	0	0	22	22	2.2					
V207 12AT7WA	100	22	10	0	0	50	47	10	0			
V101 5R4WGB	NC	∞	NC	60Ω	NC	60Ω	NC	∞				
V102 1B3GT/8016	NC	370Ω	NC	NC	NC	NC	370Ω	NC		5 Meg		
V103 6080WA/6AS7	500	∞	12	500	∞	12	12	12				
V104 5693/6S17	0	0	27	200	27	20	0	500				
V105 OC3W/VR105	NC	0	NC	NC	27	NC	NC	NC				
V106 884	NC	0	2.7 Meg	NC	56	NC	0	1.0				
V107 6SN7WGTA	0	250	4.6	3 Meg	120	4.6	0	0				
V108 6SL7WGT	350	115	3.3	2	260	10	0	0				
V109 6SN7WGTA	40Ω	15	2.7	0	12	1.2	0	0				
V111 6SN7WGTA	0	190	10	220	12	10	0	0				
V112 6SN7WGTA	0	110	10	40Ω	62	10	0	0				
V113 6V6GT	0	0	12	12	110	NC	0	570Ω				
CR101 IN73	0	480Ω	720Ω	NC	670Ω	670Ω	670Ω	670Ω				
V110 2BP1	5 Meg	5 Meg	5 Meg	4 Meg	NC	2.7 Meg	0	0	250	120	NC	5 Meg
TP101 550Ω												
TP102 480Ω												
TP103 110												
TP104 12												

Note: All values not marked are X1000 ohms

Heater resistance less than 1 ohm is shown as zero ohms

TABLE 7-3. OPERATING VOLTAGES

VOLTAGE POINT No INPUT cable on J104	METER	XTAL SELECTOR SWITCH				
		CALIBRATE		OFF	MONITOR	
		400	402.2		402.2	400
Pin 2 of V207 (V207 removed)	VTVM RF Probe	7	7	0	7	7
TP201	VTVM RF Probe	1.5	1.5	0	0	0
TP202	VTVM RF Probe	16	16	0	0	0
TP203	VTVM RF Probe	7	7	0	0	0
TP103 with DISC. OUTPUT control (R125) full CW POLARITY switch (S104) PLUS	VTVM dc	0	17	0	0	0
TP101 with CARRIER OSC. switch (S102) in any position	VTVM ac	2.7	2.7	2.7	2.7	2.7
TP102 with FILTER switch (S103) in any position	VTVM dc	14	21	14	14	14
J103 with OUTPUT control (R147) full CW MODULATION control (R122) full CW	VTVM ac	1.4	4.1	1.0	0.3	1.4
J103 with OUTPUT control (R147) full CW MODULATION control (R122) full CCW	VTVM ac	2.7	4.1	2.3	1.7	2.7

(6) Repeat step 5 for T202 and T201.

(7) Connect the signal generator to

TP201.

Note

Dc-bias voltage is present at TP202 and TP203. If the signal generator does not have an output coupling capacitor, a capacitor of 0.01 mfd or greater must be connected between the generator output and TP202 and TP203 when a signal is to be injected at these points.

(8) Set the signal generator to 390 kc and adjust its output to give one volt at TP203.

(9) Set the signal generator to 410 kc with the same output as in (8) above.

(10) If the voltmeter reads between 0.95 and 1.05 volts, T202 and T203 are centered adequately. If the meter reads less than 0.95 volts at 410 kc, turn the primary tuning slugs in T202 and T203 a few degrees counter-clockwise, and the secondary tuning slugs a few degrees clockwise. If the meter reads more than 1.05 volts at 410 kc, turn the tuning slugs in the opposite direction.

(11) Repeat steps (8), (9) and (10) above until the meter readings at 390 kc and 410 kc are within 5 percent of each other, and the correct adjustment is then made; it should then be possible to vary the signal-generator frequency from 390 to 410 kc, and the output at TP203 will rise smoothly from 1 volt to approximately 1.3 to 1.5 volts at the center frequency and then drop to approximately 1 volt at the other extreme, showing no pronounced peaks or dips in this range.

(12) Connect the signal generator to J104.

(13) Repeat steps (8) and (9) above.

(14) If the voltmeter reads between 0.9 and 1.1 volts, T201 is centered adequately. If the meter reads less than 0.9 volts turn the tuning slugs in T201 a few degrees counter-clockwise. If the meter reads more than 1.1 volts, turn the tuning slugs in the opposite direction. (Note that the slugs in T201 both turn clockwise or counter-clockwise as required.)

(15) Repeat steps (8), (9) and (14) above until the meter readings at 390 kc and 410 kc are within 10 percent of each other.

(16) If trouble is experienced in obtaining a voltage at TP203, try a similar procedure at TP202, and TP201, if necessary, to locate the difficulty.

(17) Refer to Figure 7-4 for the shape of the pass-band at TP203 below limiting, approximately 10 kc wide at the 6-db points.

(18) Approximate sensitivities are shown below:

TABLE 7-4. IF AMPLIFIER SENSITIVITY

Input Microvolts	One Volt at:
40	TP203
180	TP202
23,000	TP201

(19) Check that 2800 microvolts input signal gives about 4.3 volts at TP203, and that increasing the input signal to one-half volt does not change the voltage at TP203 by more than three percent. This is a check on the limiter operation.

TABLE 7-5. RATED TUBE CHARACTERISTICS

TUBE TYPE	FILA- MENT VOLT- AGE (V)	FILA- MENT CUR- RENT (A)	PLATE VOLT- AGE (V)	GRID BIAS (V)	SCREEN VOLT- AGE (V)	PLATE CUR- RENT (MA)	SCREEN CUR- RENT (MA)	AC PLATE RESIST- ANCE (OHMS)	VOLT. AMP. FACTOR (MU)	TRANSCON- DUCTANCE (MICROMHOS)		EMISSION	
										NOR- MAL	MINI- MUM	I _s (MA)	TEST VOLTS
6AU6WA	6.3	0.3	250	-1.0	150	10.8	4.3	1.0 Meg	—	5200	3900	60	20
12AT7WA	6.3	0.3	250	-2.0	—	10.0	—	10900	60	5500	4500	50	10
5726	6.3	0.3	—	—	—	—	—	—	—	—	—	40	10
5R4WGB	5.0	2.0	—	—	—	—	—	—	—	—	—	225- 400	75
1B3GT	1.25	0.2	—	—	—	—	—	—	—	—	—	5.0- 15.0	100
6080WA	6.3	2.5	135	31.25	—	125	—	280	2.0	7000	5800	110	15
OC3W	—	—	105	—	—	5.40	—	—	—	—	—	—	—
5693	6.3	0.3	250	-3.0	100	3.0	0.85	1.0 Meg	—	1650	1400	85	30
884	6.3	0.6	250	-26.0	—	2.0	—	5600	—	—	—	—	—
6SN7WGTA	6.3	0.6	250	-8.0	—	9.0	—	7700	20	2600	2400	40	30
6SL7WGT	6.3	0.3	250	-2.0	—	2.3	—	44000	70	1600	1200	40	30
6V6GT	6.3	0.45	250	-12.5	250	45	4.5	50000	—	4100	3000	100	30
2BP1	6.3	0.6	2750	-200	1100	-0.015 to +0.01	—	—	—	—	—	—	—

d. DISCRIMINATOR.

- (1) Connect the VTVM dc meter probe to TP103.
- (2) Turn the DISC. OUTPUT control (R125) fully CW.
- (3) Apply exactly 400 kc (see b-6-NOTE), unmodulated greater than 3000 microvolts at the input.
- (4) Adjust the SECONDARY tuning slug in T203 until the voltmeter reads zero volts on the most sensitive scale.

- (5) Sweep the signal generator above and below 400 kc until the meter reaches a peak reading. Adjust the PRIMARY tuning slug in T204 until the voltages at the two peaks are equal; then repeat step (4).
- (6) Remove the signal-generator signal.
- (7) Set the XTAL SELECTOR switch (S201) to CALIBRATE 402.2.
- (8) Adjust the FREQ. METER CALIB. control (R127) until the FREQ. DEVIATION meter (M101) reads 2200 cycles plus or minus one division in either position of the POLARITY switch (S104).

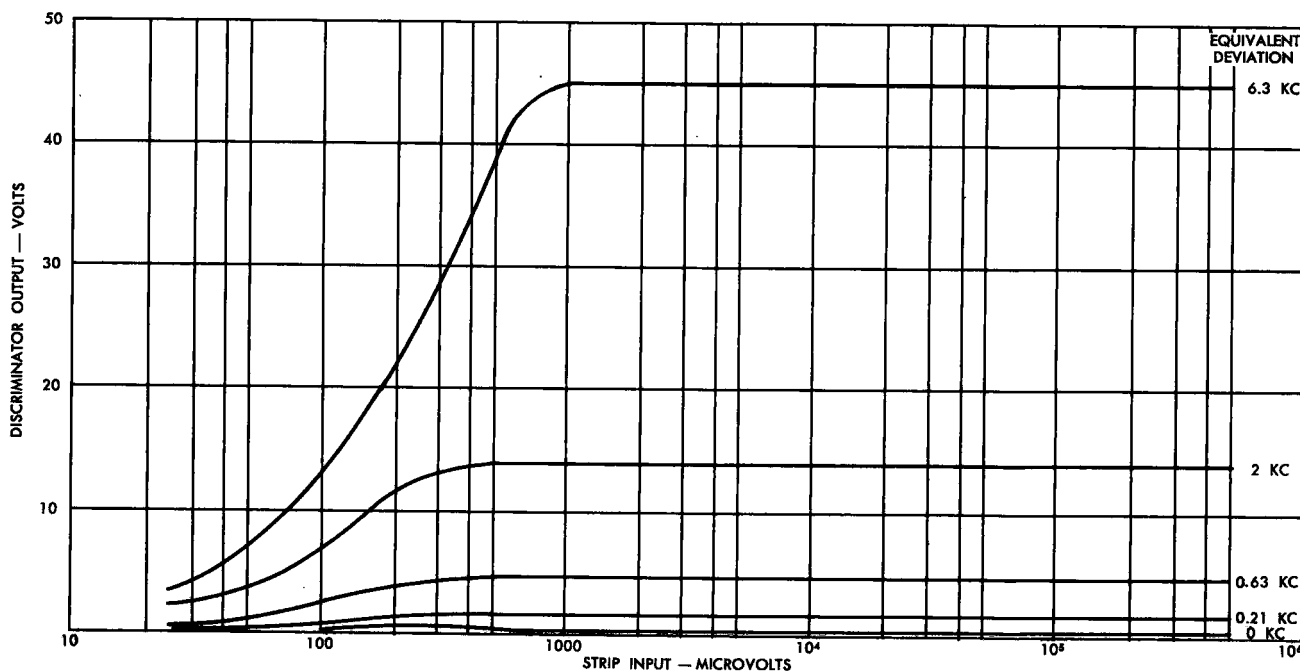


Figure 7-3. Limiting-characteristic Curves

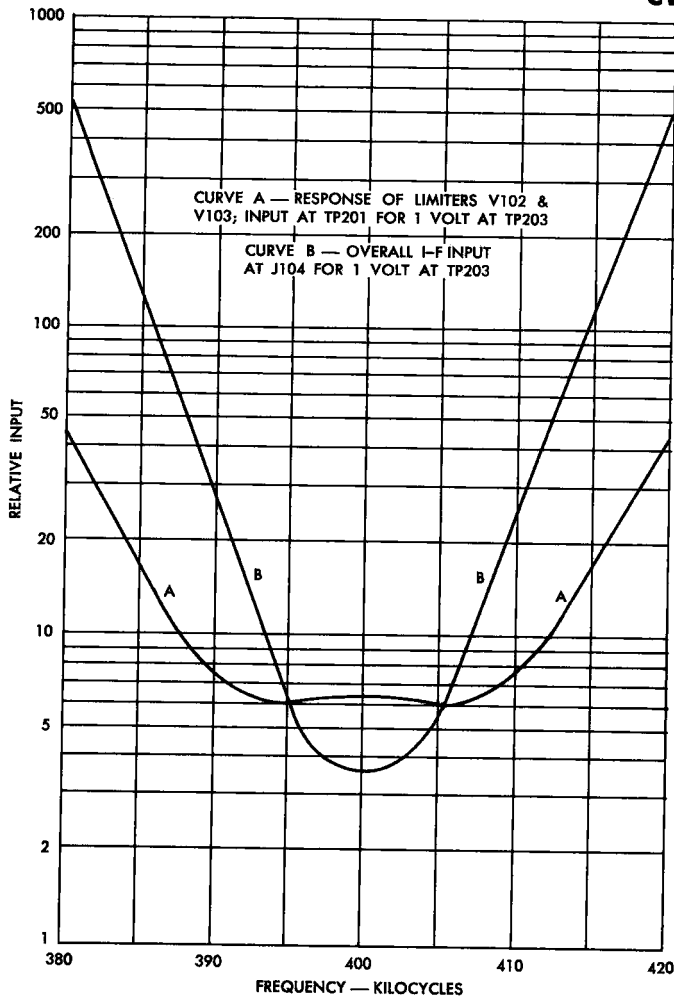


Figure 7-4. IF-selectivity Curves

- (9) Return the XTAL SELECTOR switch (S201) to the OFF position.
- (10) Restore the signal-generator signal.
- (11) Check that the limiting action at this point follows the curves in figure 7-3.

Note

Frequency deviations up to 2400 cycles may now be read directly from the **FREQ. DEVIATION** meter (M101).

(12) Check that a frequency deviation of 1000 cycles above and below 400 kc produces between 6 and 8 volts at TP103.

(13) Set the signal generator 450 cycles above or below 400 kc and adjust the **DISC. OUTPUT** control (R125) for 1.25 volts at TP103.

(14) Check that the **POLARITY** switch (S104) reverses the polarity of the voltage at TP103. Plus 450 cycles deviation should give plus 1.25 volts when S104 is in the **PLUS** position.

(15) If a signal generator is not available, the **DISC. OUTPUT** control (R125) can be set as follows: Remove input; set **XTAL SELECTOR** to **CALIBRATE - 400**; **DISC. OUTPUT** fully **CW**. Check that the dc voltmeter reads zero on its most sensitive

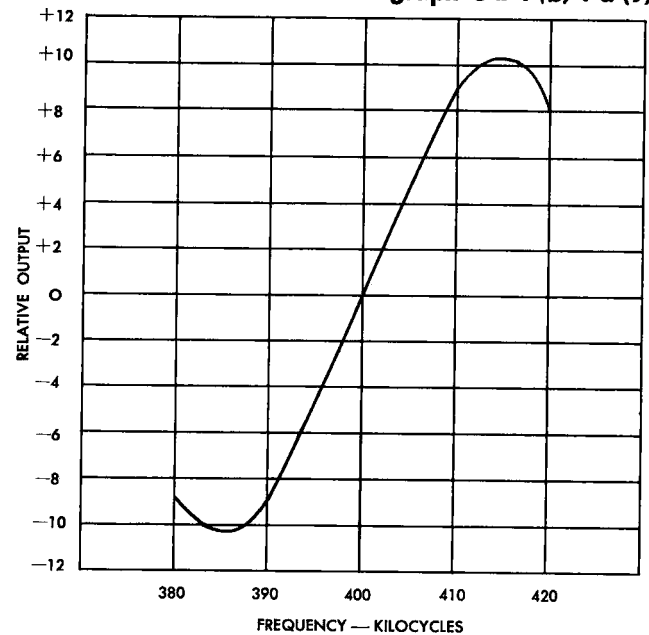


Figure 7-5. Discriminator Characteristic

scale at TP103. If the voltage is not zero, adjust the **SECONDARY** tuning slug in T204 until a zero reading is obtained. Set **XTAL SELECTOR** to **CALIBRATE 402.2**. The dc voltmeter at TP103 should read 6 to 8 times 2.2, or 13.2 to 17.6 volts. Rotate the **DISC. OUTPUT** control **CCW** until the voltmeter reads $\frac{2200}{450} \times 1.25 = 6.1$ or approximately 6 volts.

(2) ALIGNMENT OF THE MAIN CHASSIS.

a. MODULATOR.

(1) Set the signal generator (**FREQ. DEVIATION** meter (M101)) to 399.6 kc and apply more than 3000 microvolts to the input.

(2) Set the **XTAL SELECTOR** switch (S201) to **OFF**.

(3) Check that the **FREQ. DEVIATION** meter (M101) reads 400 cycles for both positions of the **POLARITY** switch (S104), and that the voltage at TP103 is 1.1 volts in both positions.

(4) Set the **MODULATION** control (R122) to 25 db.

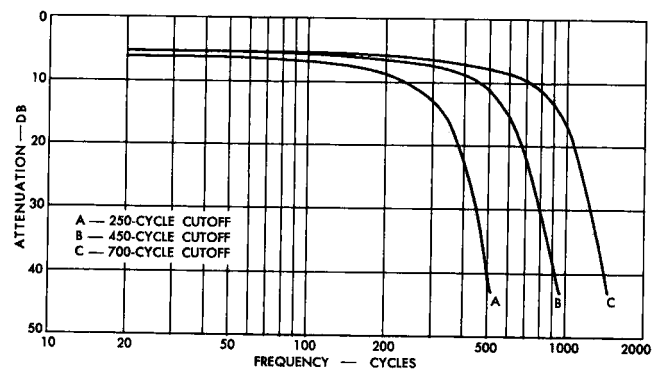


Figure 7-6. Low-pass-filter Response

(5) Set the POLARITY switch (S104) to PLUS.

(6) Adjust the OUTPUT LEVEL control (R147) for a reading of plus 5 dbm on the OUTPUT LEVEL meter (M102).

(7) Throw the POLARITY switch (S104) to MINUS.

(8) Adjust the MOD. CALIB. control (R123) for a reading of -20 dbm. Check that rotating MODULATION control (R122) CCW gives a continuously increasing output signal, and then restore to 25-db position.

If the output as read from the dbm meter or viewed on the oscilloscope decreases with a CCW rotation of the MODULATION control, restore the MODULATION control to the 25-db position, and then rotate the MOD. CAL. control in such a direction as to

decrease the output, which will then pass through a minimum. Continue rotation in the same direction until the output is restored to its original level of -20 dbm.

(9) Repeat steps (6), (7), (8) until the POLARITY switch (S104) changes the OUTPUT LEVEL meter (M102) reading 25 dbm.

(10) Set the POLARITY switch (S104) to PLUS.

(11) Set the MODULATION control (R123) to 6 db.

(12) Adjust the OUTPUT LEVEL control (R147) for a meter reading of plus 6 dbm.

(13) Throw the POLARITY switch (S104) to MINUS.

(14) Check that the OUTPUT LEVEL meter (M102) reads approximately zero dbm.

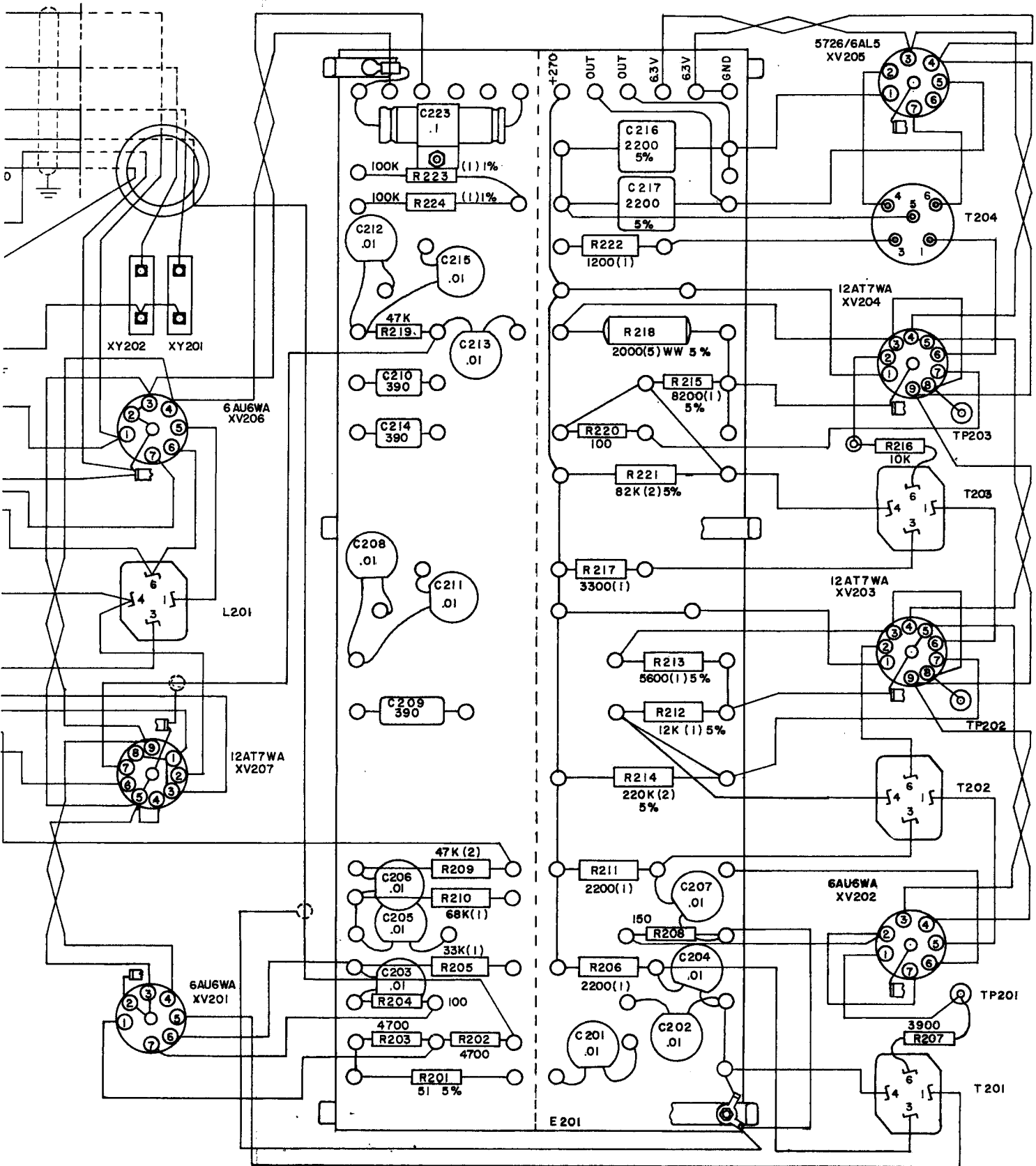
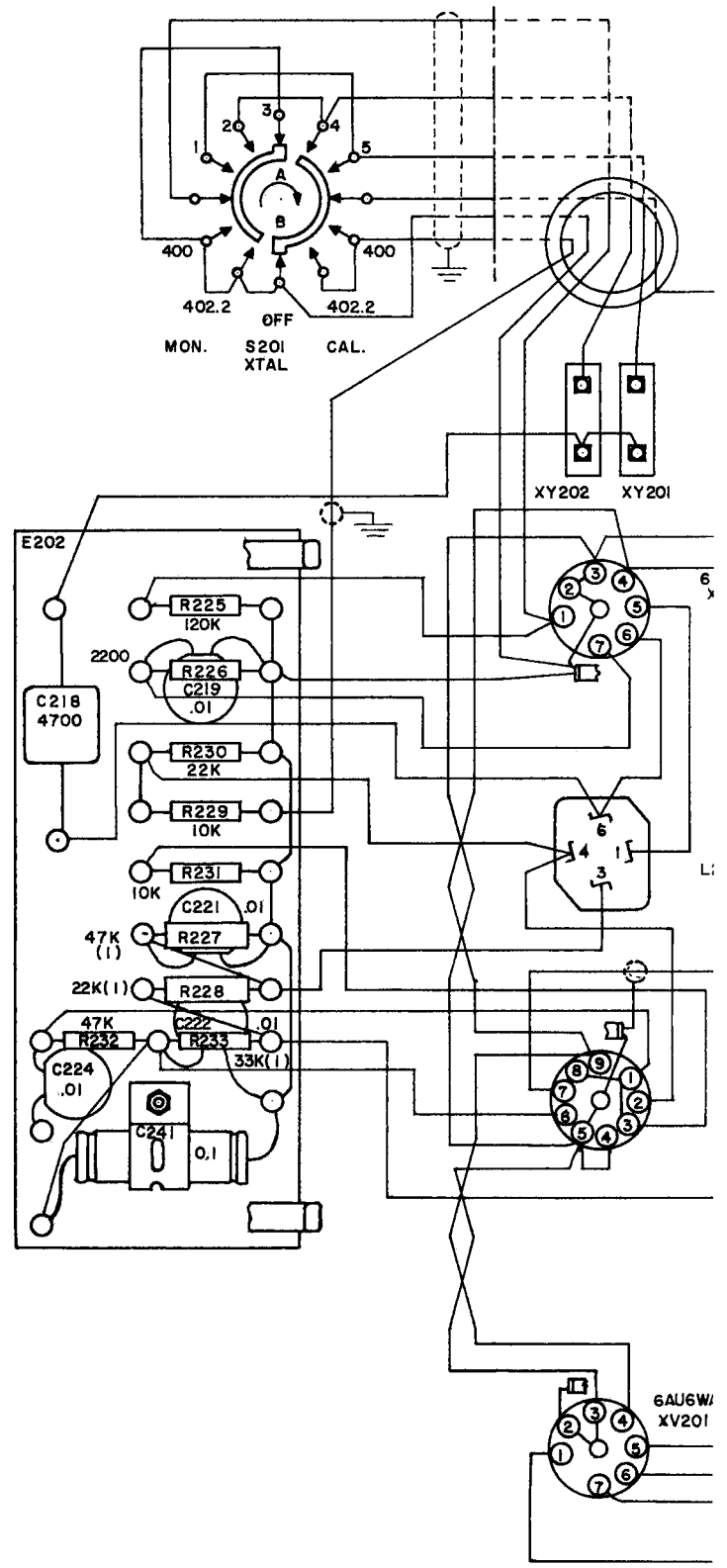


Figure 7-7. IF Wiring Diagram



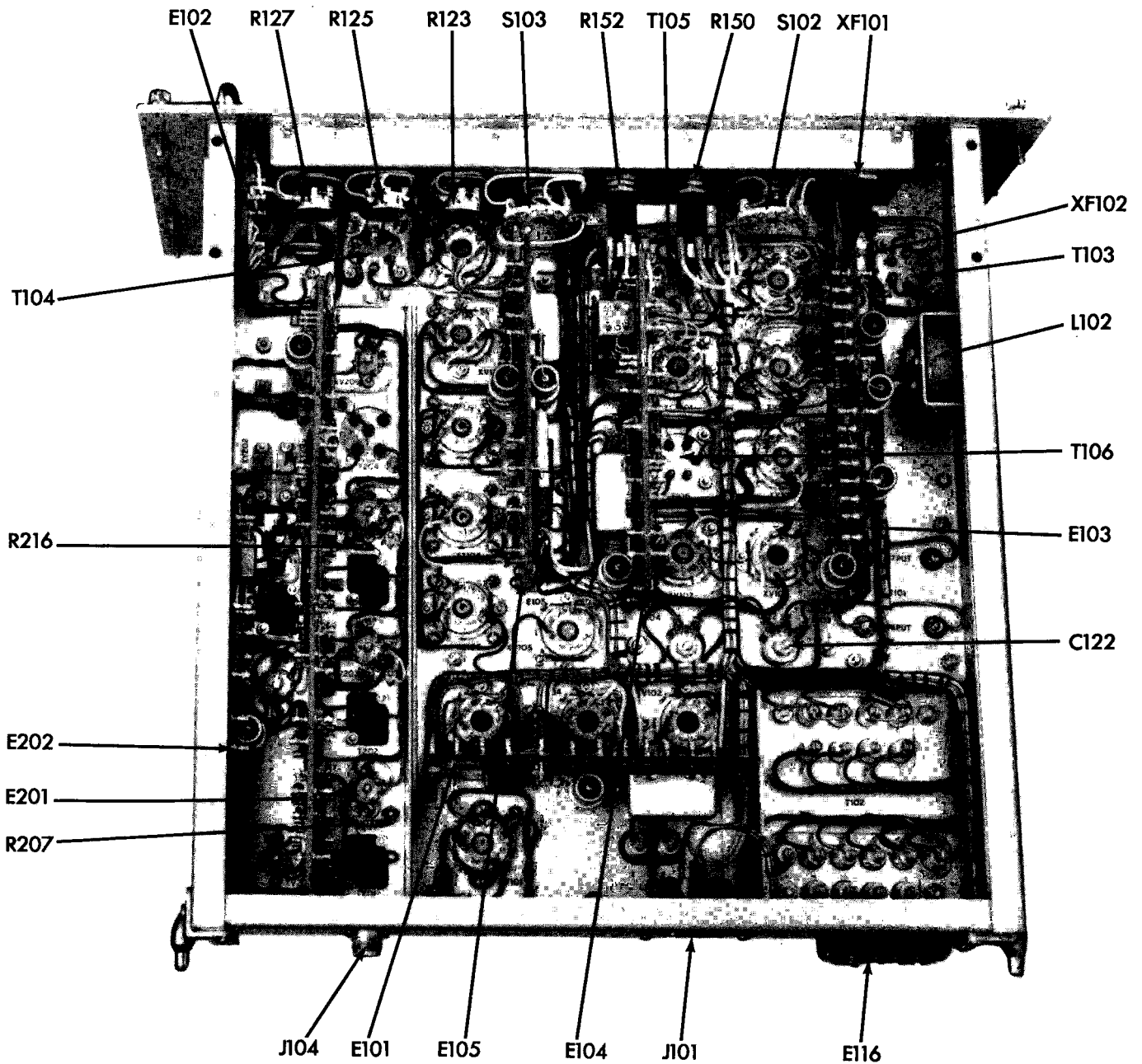


Figure 7-8. Bottom View

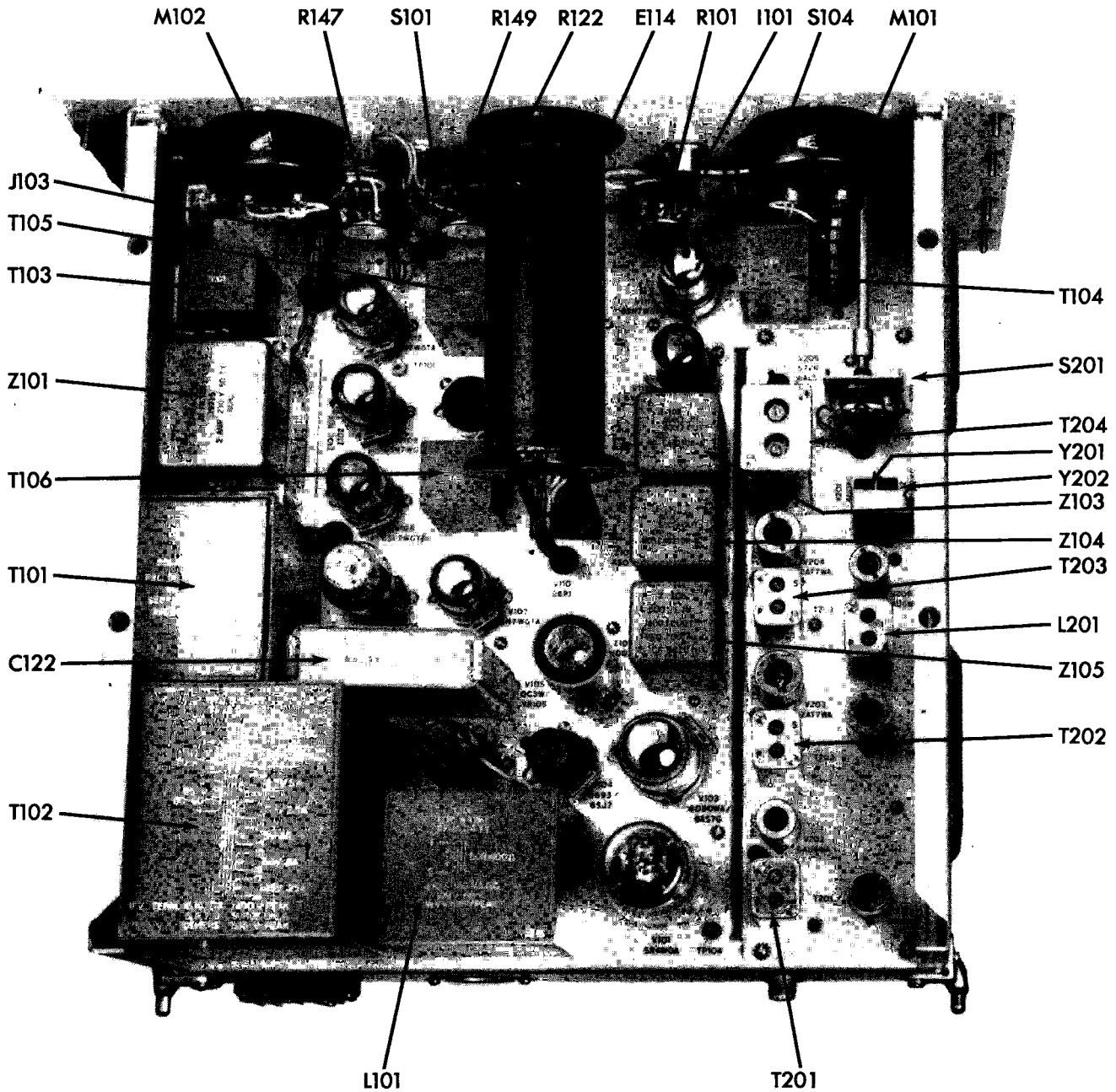
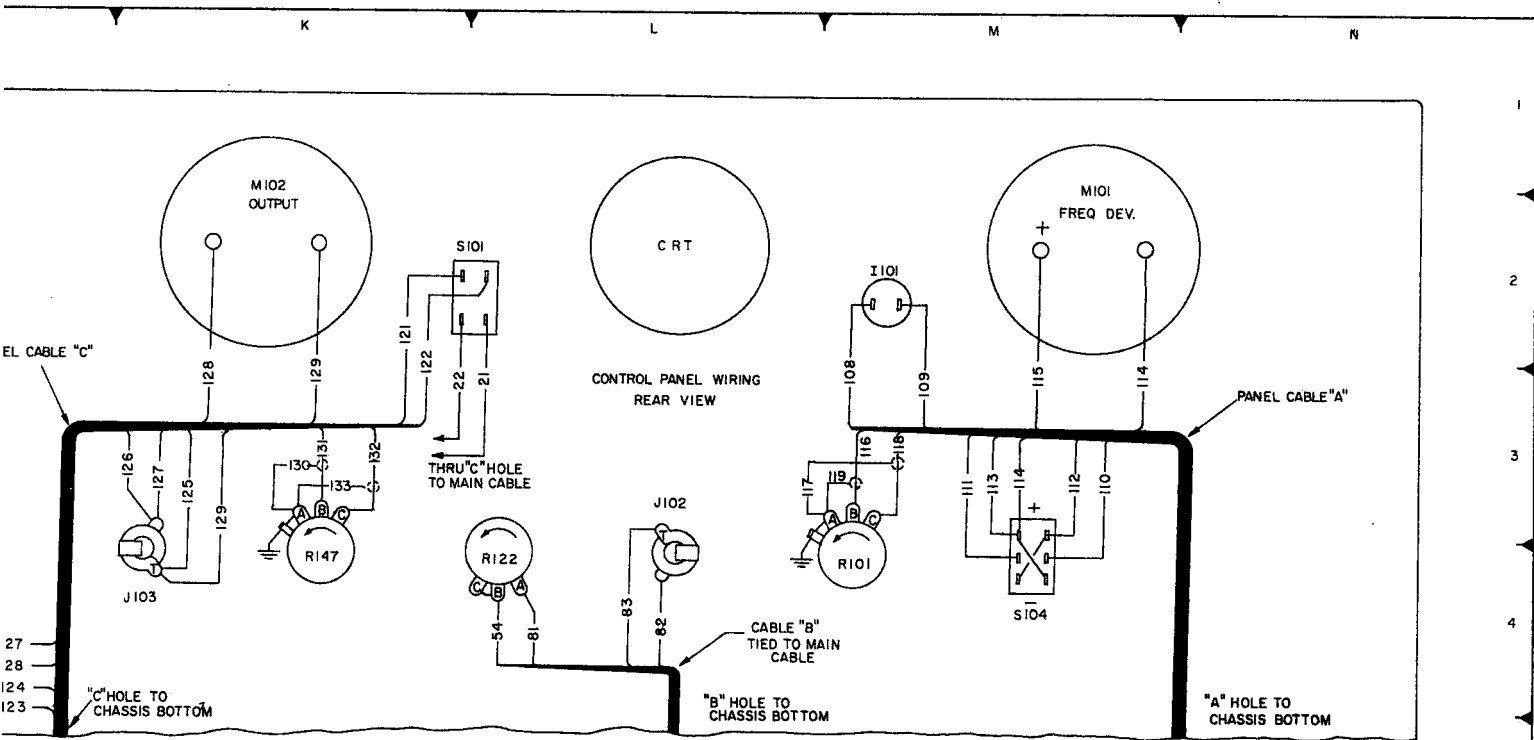


Figure 7-9. Top View



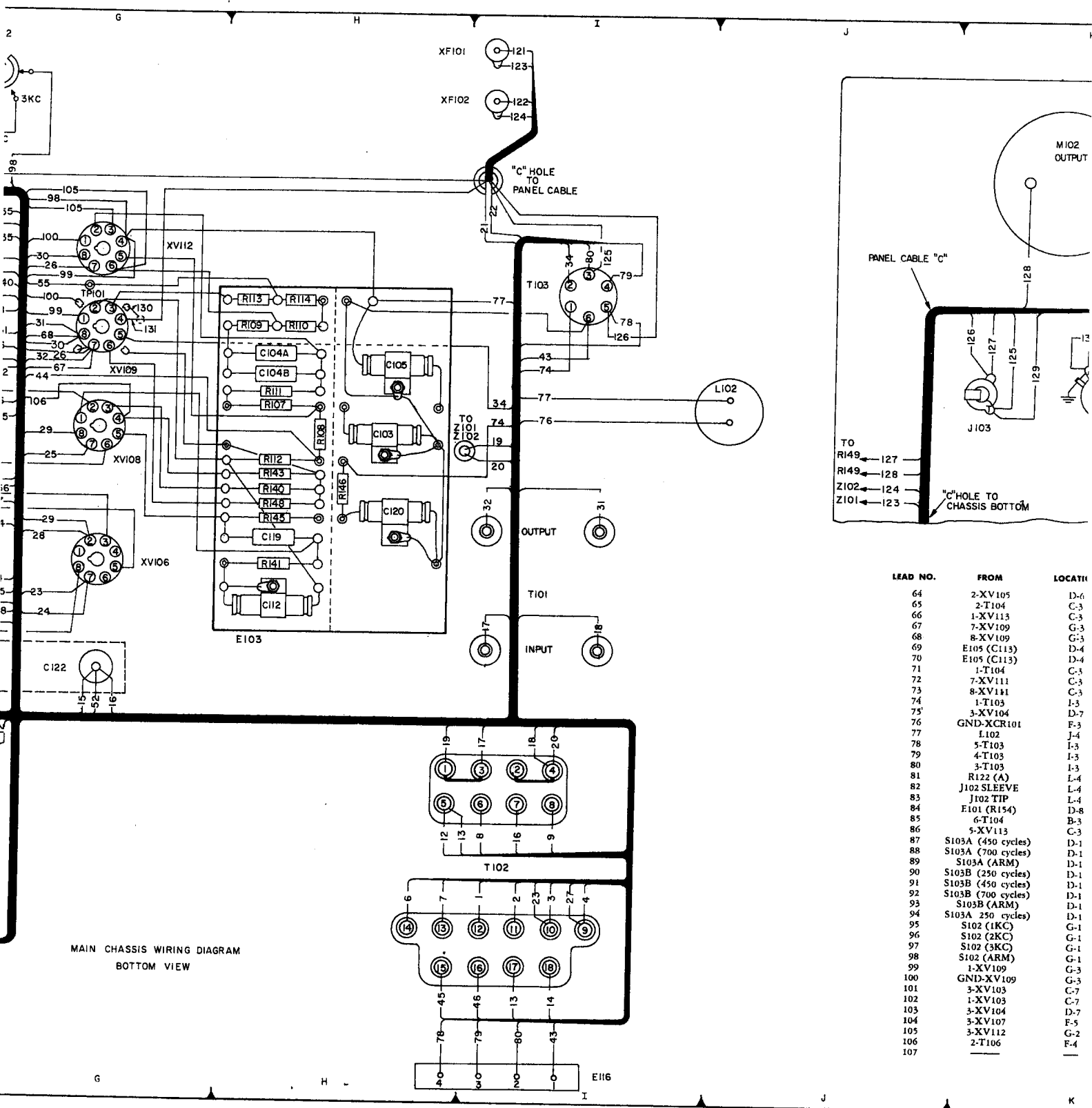
LEAD NO.	FROM	LOCATION	TO	LOCATION	LEAD NO.	FROM	LOCATION	TO	LOCATION
64	2-XV105	D-6	1-XV104	D-7	108	I101	M2	1-E102	A-3
65	2-T104	C-3	5-XV111	C-3	109	I101	M2	2-E102	A-3
66	1-XV113	C-3	GND-E102	B-3	110	S104 ARM	M4	3-E102	A-3
67	7-XV109	G-3	7-XV113	C-3	111	S104 ARM	M4	4-E102	A-3
68	8-XV109	G-3	2-XV113	C-3	112	S104	M4	E102 (R126)	A-2
69	E105 (C113)	D-4	1-T104	C-3	113	S104	M4	E102 (C115-114)	A-2
70	E105 (C113)	D-4	E101 (R157)	D-8	114	S104	M4	M101 (-)	M-2
71	1-T104	C-3	5-E102	A-3	115	M101 (+)	M2	E102 (C115 TOP)	A-2
72	7-XV111	C-3	2-E102	C-3	116	R101 (B)	M4	1-XV111	C-2
73	8-XV111	C-3	1-E102	B-3	117	R101 (A) SHIELD	M4	E102 SHIELD GND	A-2
74	1-T105	I-3	E103 (R146)	H-4	118	R101 (C)	M4	E102 (MON.)	A-2
75	3-XV104	D-7	5-XV105	D-6	119	R101 (A) SHIELD	M4	GND OF XV111	C-2
76	GND-XCR101	F-3	L102	J-4	120				
77	L102	J-4	E103 (C105)	H-3					
78	5-T103	I-3	4-E116	I-9					
79	4-T103	I-3	3-E116	I-9					
80	3-T103	I-3	2-E116	I-9					
81	R122 (A)	L-4	R123 (B)	C-1					
82	J102 SLEEVE	L-4	3-T104	B-3					
83	J102 TIP	L-4	5-T104	C-6					
84	E101 (R154)	D-8	5-XZ105	C-6					
85	6-T104	B-3	GND-E-102	B-3					
86	5-XV113	C-3	TP103	C-5					
87	S103A (450 cycles)	D-1	2-XZ104	C-5					
88	S103A (700 cycles)	D-1	2-XZ105	C-6					
89	S103A (ARM)	D-1	8-XV113	C-3					
90	S103B (250 cycles)	D-1	8-XZ103	C-4					
91	S103B (450 cycles)	D-1	E105 (R118)	C-5					
92	S103B (700 cycles)	D-1	E105 (R119)	C-5					
93	S103B (ARM)	D-1	E105 (R121)	C-5					
94	S103A 250 cycles)	D-1	2-XZ103	C-4					
95	S102 (1KC)	G-1	E104 (C107)	E-3					
96	S102 (2KC)	G-1	E104 (C108)	E-3					
97	S102 (3KC)	G-1	E104 (C110)	E-3					
98	S102 (ARM)	G-1	4-XV112	G-3					
99	1-XV109	G-3	4-XV112	G-3					
100	GND-XV109	G-3	1-XV112	G-3					
101	3-XV103	C-7	6-XV103	C-7					
102	1-XV103	C-7	4-XV103	C-7					
103	3-XV104	D-7	5-XV104	D-7					
104	3-XV107	E-5	6-XV107	F-5					
105	3-XV112	G-2	6-XV112	G-2					
106	2-T106	F-4	4-XV108	G-4					
107									

LEAD NO.	FROM	LOCATION	TO	LOCATION
108	I101	M2	1-E102	A-3
109	I101	M2	2-E102	A-3
110	S104 ARM	M4	3-E102	A-3
111	S104 ARM	M4	4-E102	A-3
112	S104	M4	E102 (R126)	A-2
113	S104	M4	E102 (C115-114)	A-2
114	S104	M4	M101 (-)	M-2
115	M101 (+)	M2	E102 (C115 TOP)	A-2
116	R101 (B)	M4	1-XV111	C-2
117	R101 (A) SHIELD	M4	E102 SHIELD GND	A-2
118	R101 (C)	M4	E102 (MON.)	A-2
119	R101 (A) SHIELD	M4	GND OF XV111	C-2
120				

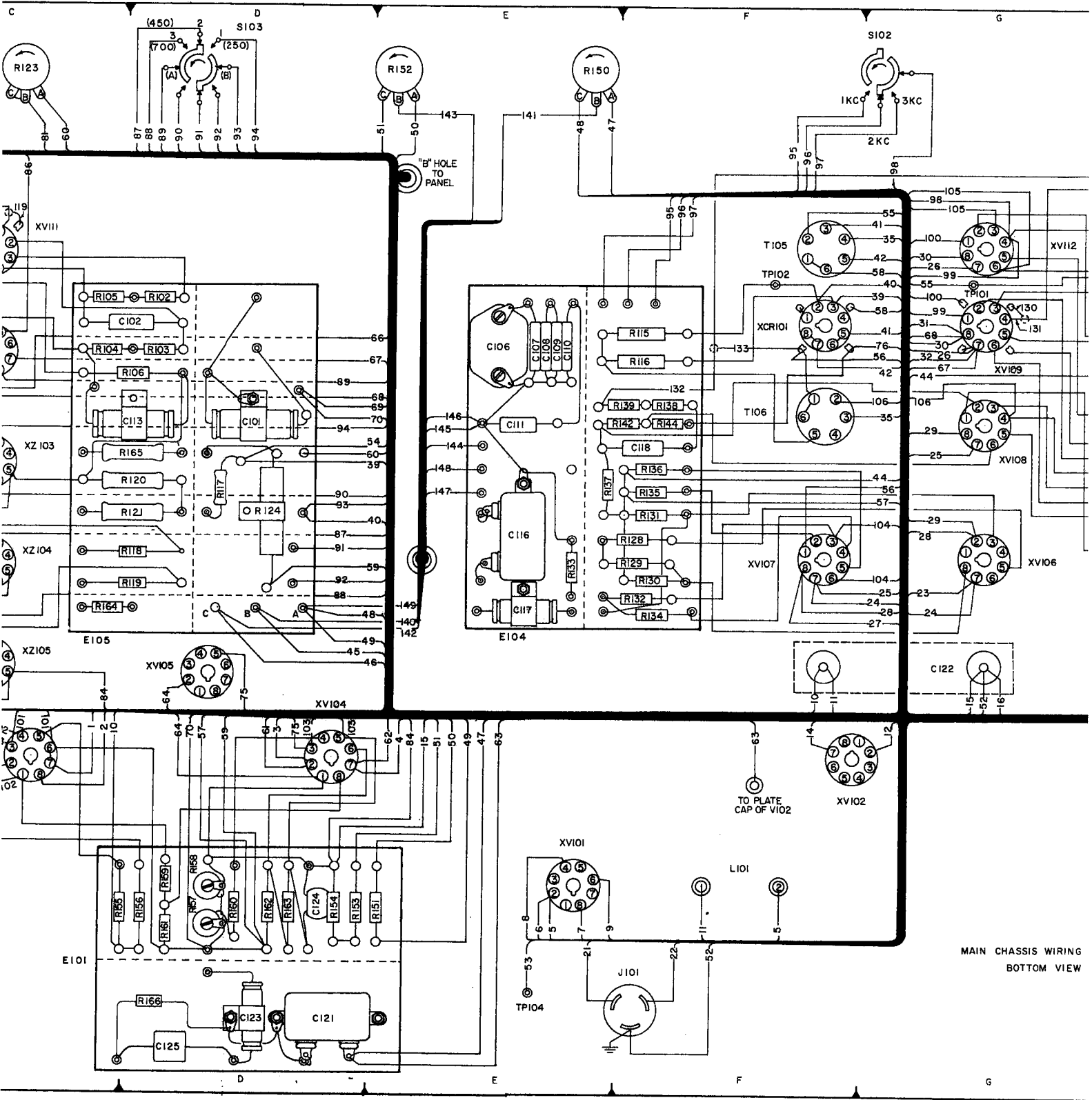
LEAD NO.	FROM	LOCATION	TO	LOCATION
121	S101	L-3	XF101	I-1
122	S101	L-3	XF102	I-1
123	Z101	CHASSIS TOP	XF101	I-1
124	Z102	CHASSIS TOP	XF102	I-1
125	J103 TIP	K-4	3-T103	I-3
126	J103 SLEEVE	K-4	5-T103	I-3
127	J103 SLEEVE	K-4	R149	K-2
128	M102	K-2	R149	CHASSIS TOP
129	M102	CHASSIS TOP	J103 (TIP)	K-4
130	R147 (A) SHIELD	K-4	GND-XV109 SHIELD	G-3
131	R147 (B)	K-4	4-XV109	G-3
132	R147 (C)	K-4	E104 (R139)	F-4
133	R147 (A) SHIELD	K-4	GND-XCR101 SHIELD	F-3

LEAD NO.	FROM	CRT SOCKET LOCATION	TO	LOCATION
140	1-XV110		E105 (B)	D-5
141	2-XV110	TOP	R150 (B)	E-1
142	3-XV110	SIDE	E105 (A)	D-5
143	4-XV110	OF	R152 (B)	E-1
144	6-XV110		E104 (C118)	E-4
145	7-XV110	CHASSIS	E104 (C111)	E-4
146	8-XV110	CRT	E104 (C111)	E-4
147	9-XV110	ASS'Y	E104 (R135)	E-4
148	10-XV110		E104 (R136)	E-4
149	12-XV110		E105 (C)	D-5

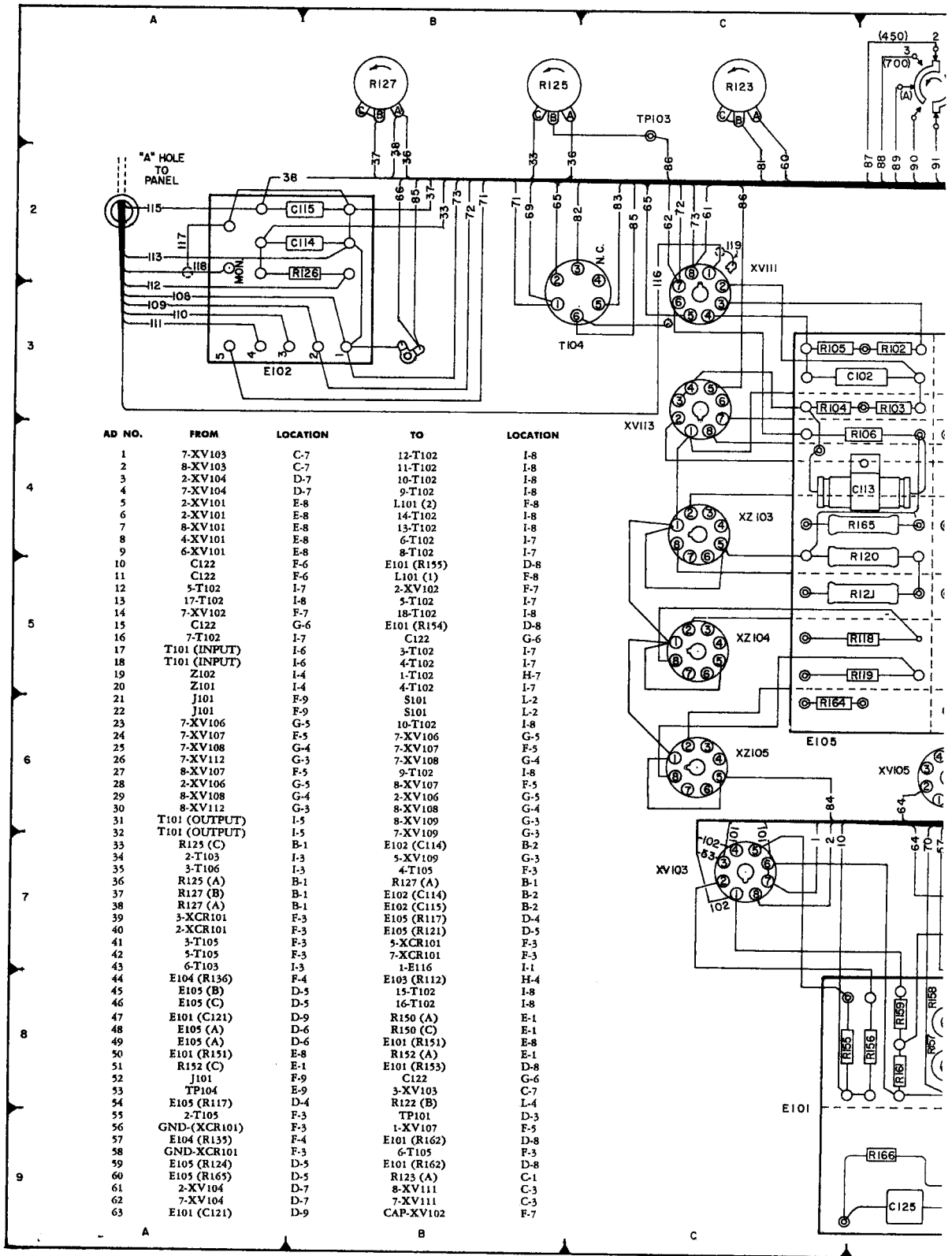
Figure 7-10. Component Locations and Wiring Diagram

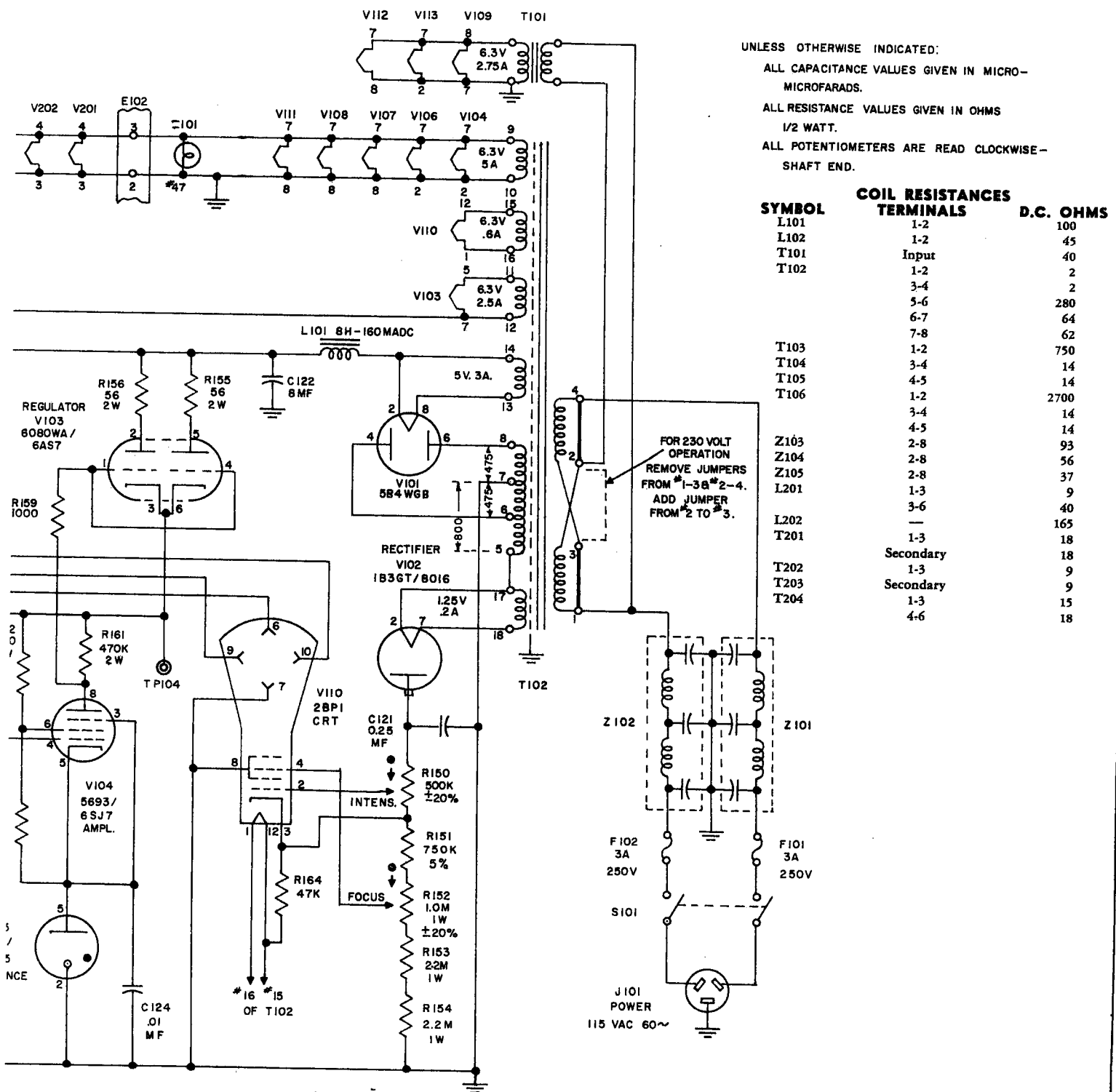


LEAD NO.	FROM	LOCATI
64	2-XV105	D-6
65	2-T104	C-3
66	1-XV113	C-3
67	7-XV109	G-3
68	8-XV109	G-3
69	E105 (C113)	D-4
70	E105 (C113)	D-4
71	1-T104	C-3
72	7-XV111	C-3
73	8-XV111	C-3
74	1-T103	I-3
75	3-XV104	D-7
76	GND-XCR101	F-3
77	L102	J-4
78	5-T103	I-3
79	4-T103	I-3
80	3-T103	I-3
81	R122 (A)	L-4
82	J102 SLEEVE	L-4
83	J102 TIP	L-4
84	E101 (R154)	D-8
85	6-T104	B-3
86	5-XV113	C-3
87	S103A (450 cycles)	D-1
88	S103A (700 cycles)	D-1
89	S103A (ARM)	D-1
90	S103B (250 cycles)	D-1
91	S103B (450 cycles)	D-1
92	S103B (700 cycles)	D-1
93	S103B (ARM)	D-1
94	S103A 250 cycles)	D-1
95	S102 (1KC)	G-1
96	S102 (2KC)	G-1
97	S102 (3KC)	G-1
98	S102 (ARM)	G-1
99	1-XV109	G-3
100	GND-XV109	G-3
101	3-XV105	C-7
102	1-XV105	C-7
103	3-XV104	D-7
104	3-XV107	F-5
105	3-XV112	G-2
106	2-T106	F-4
107		



MAIN CHASSIS WIRING
BOTTOM VIEW





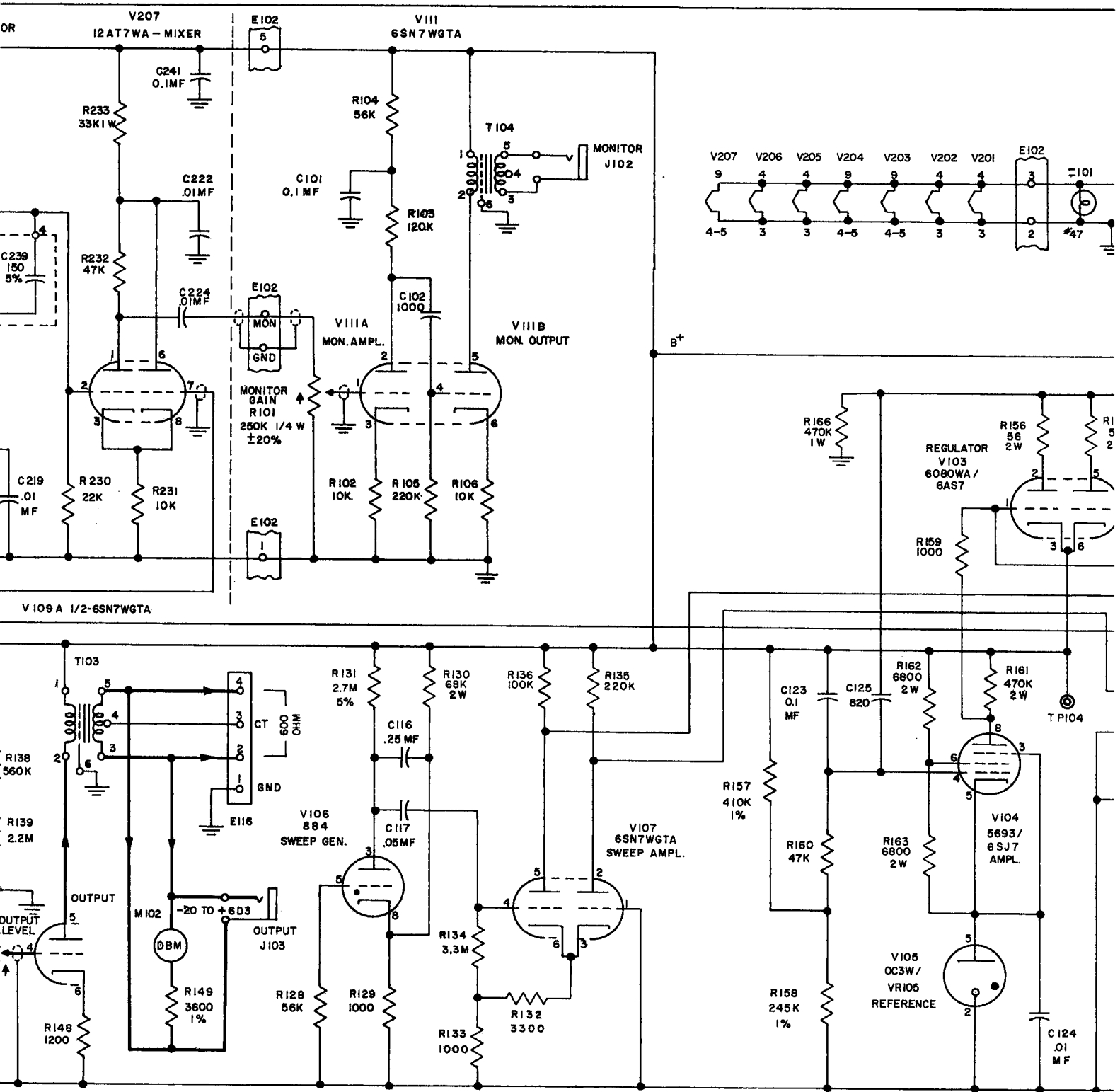
UNLESS OTHERWISE INDICATED:
ALL CAPACITANCE VALUES GIVEN IN MICRO-MICROFARADS.
ALL RESISTANCE VALUES GIVEN IN OHMS 1/2 WATT.
ALL POTENTIOMETERS ARE READ CLOCKWISE - SHAFT END.

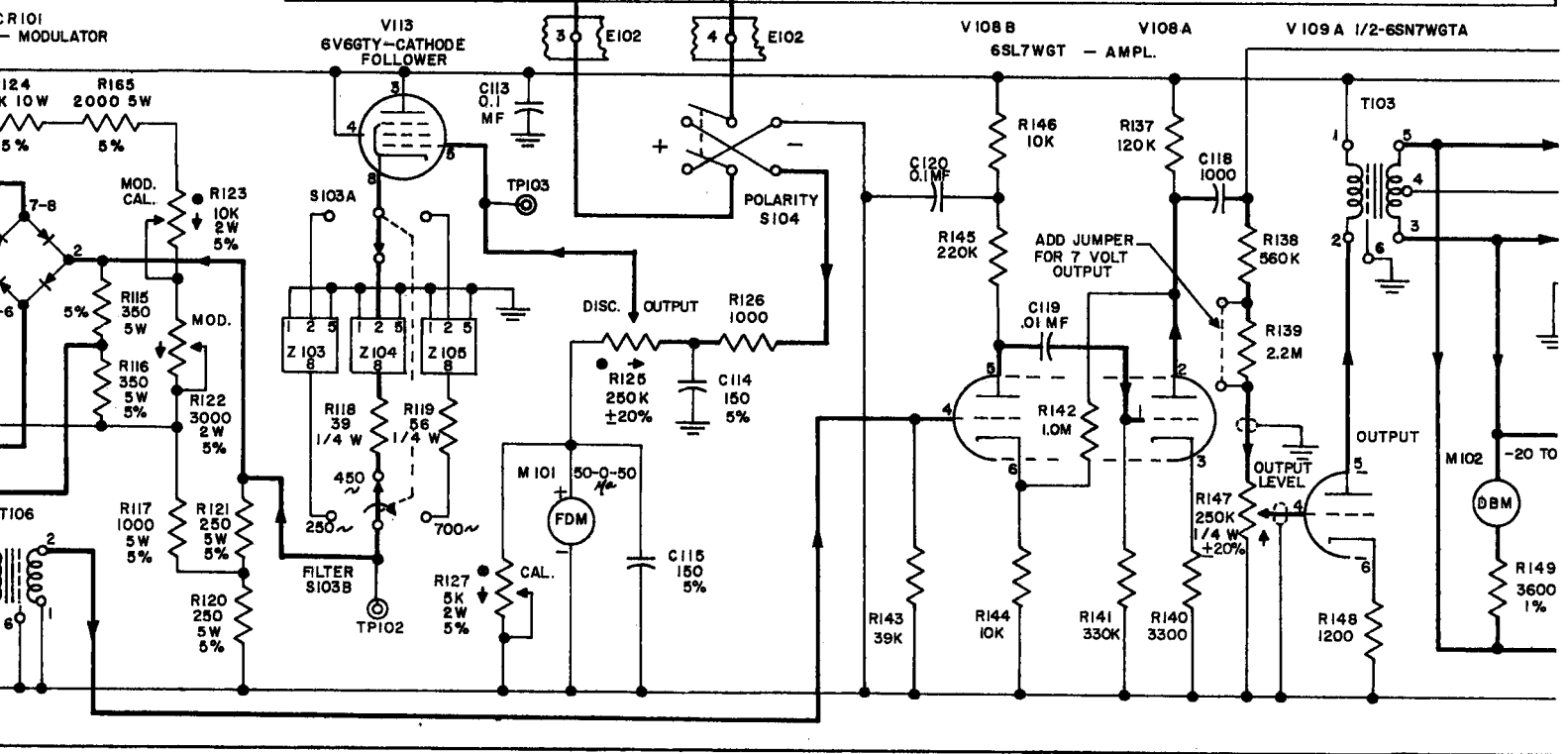
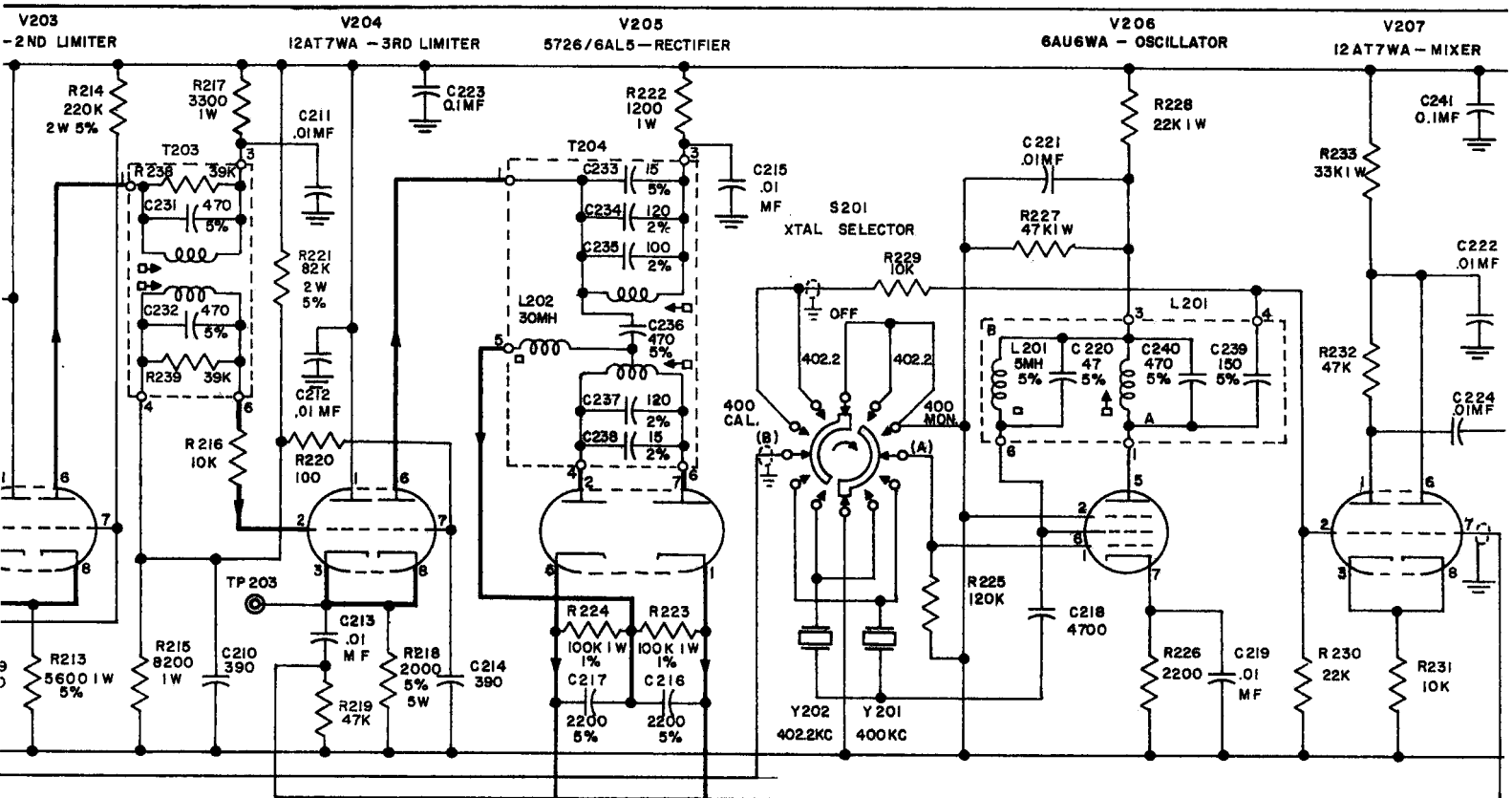
SYMBOL	COIL RESISTANCES TERMINALS	D.C. OHMS
L101	1-2	100
L102	1-2	45
T101	Input	40
T102	1-2	2
	3-4	2
	5-6	280
	6-7	64
	7-8	62
T103	1-2	750
T104	3-4	14
T105	4-5	14
T106	1-2	2700
	3-4	14
	4-5	14
Z103	2-8	93
Z104	2-8	56
Z105	2-8	37
L201	1-3	9
L202	3-6	40
T201	1-3	165
	Secondary	18
T202	1-3	18
T203	Secondary	9
T204	1-3	15
	4-6	18

Figure 7-11. Schematic - Complete Equipment

ORIGINAL

7-15, 7-16





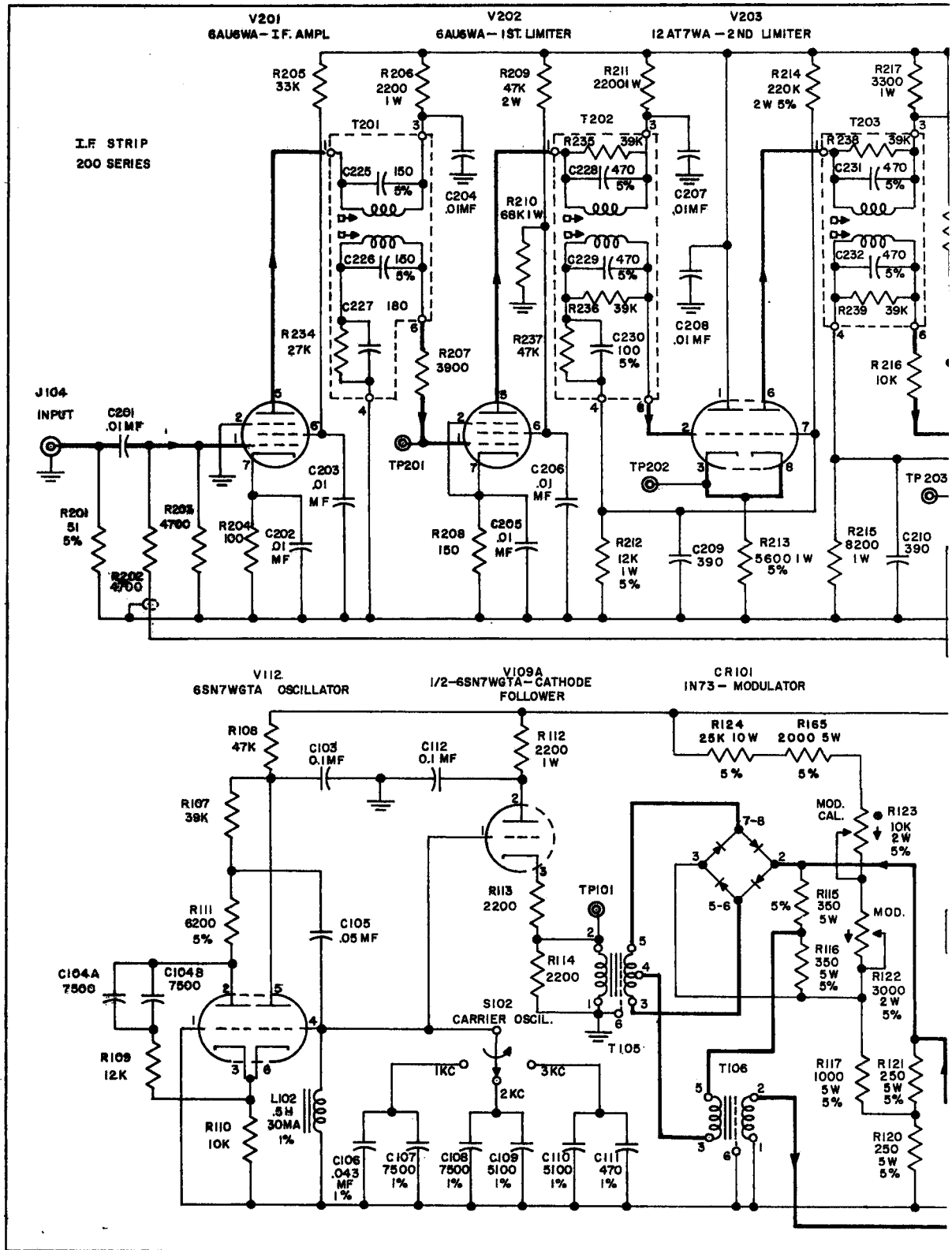


TABLE 7-6. WINDING DATA

DESIGNATION SYMBOL	M & H PT/DWG NO.	DIAGRAMS	WINDING	WIRE SIZE	TURNS	D. C. RES. (OHMS)	IMPEDANCE RATIO	HI-POT AC VOLTS	REMARKS	
L101	C45211B		Single	#28 Formex	2500	100		1500	L = 8 Henries 160 Milliamperes max.	
L102	A45212A		Single Toroidal	#31 Formex	2470	45			Furnished complete by United Transformer Co. Type HQA-10	
T101	C45245C		Input Output			40 0.4			Furnished complete by Sola Electric Co. Sola Part No. 302513 Primary 95-125v-60~ Secondary 6.3v-2.75a ±1%	
T102	C45208C		Primary Term 1-2 Term 3-4 Secondary H.V. (5-6) Plate (6-7-8) Fil #1 (9-10) #2 (11-12) #3 (13-14) #4 (15-16) #5 (17-18)	#21 Formex #21 Formex #29 Formex #29 Formex #12 Formex #15 Formex #15 Formex #21 Formex #21 Formex	176 176 516 1510 CT 10 10 8 10 2	2 2 280 64-62 0.15 0.21 0.25 0.40 0.24		1500 1500 Surge Surge 1500 1500 1500 2700 2700	Volts 115v-50-60~ 115v-50-60~ (term 5-7) 800 475-0-475 6.3 6.3 5.0 6.3 1.25	Amps. 0.002 0.16 5 2.5 3 0.6 0.2
T103 T104 T105	A45247C		Primary Term 1-2 Secondary Term 3-4-5	#40 Formex #40 Formex	3000 600 Center-tapped	750 28	5:1	1000 1000	Plate-to-line Freq. Response 1 db 400-4000~	
T106	A45246C		Secondary Term 1-2 Primary Term 3-4-5	#43 Formex #34 Formex	5500 600 Center-tapped	2700 28	9.15:1	500 500	Line-to-grid Freq. response 1 db 400-4000~	
Z101 Z102	A452171					0.45			Furnished complete by Sprague Electric Co. Sprague Part No. 79715	
Z103	C45210H(A)		Toroidal			(Term 2-8) 93			Furnished by Burnell & Co. L1 = 0.350h ±1% L2 = 0.350h ±1% L3 = 0.350h ±1%	

TABLE 7-6. WINDING DATA (Continued)

DESIGNATION SYMBOL	M & H PT/DWG NO.	DIAGRAMS	WINDING	WIRE SIZE	TURNS	D. C. RES. (OHMS)	IMPEDANCE RATIO	HI-POT AC VOLTS	REMARKS
Z104	C45210H(B)		Toroidal			(Term 2-8) 56			Furnished by Burnell & Co. L ₁ = 0.191h ±1% L ₂ = 0.191h ±1% L ₃ = 0.177h ±1%
Z105	C45210H(C)		Toroidal			(Term 2-8) 37			Furnished by Burnell & Co. L ₁ = 0.122h ±1% L ₂ = 0.122h ±1% L ₃ = 0.113h ±1%
L201	A45299A	L 201 A 	Universal, three sections	#38 SNE	186 each section. 558 total	40		600	Identical to primary of T202 Q @ 1000 ~ = .7 ± .1 L @ 1000 ~ = 5mh ±10% Q @ 400kc = 100 ±10% Two coats — polystyrene
L202	A45283C		Universal, four sections	#38 SNE	470 each section 1880 total	165		600	Q @ 1000 ~ = 1.2 ± .1 L @ 1000 ~ = 30 mh ±10%
T201	B45252D		Primary Universal, single section	#3/41 Litz SNE	268	18		600	Q @ 1000 ~ = .3 ± .1 L @ 1000 ~ = 800-1200 mh Center freq. = 400kc Q @ 400kc = 90 ±10% Two coats — polystyrene
			Secondary, single section	#3/41 Litz SNE	268	18		600	Q @ 1000 ~ = .3 ± .1 L @ 1000 ~ = 800-1200 mh Center freq. = 400kc Q @ 400kc = 90 ±10% Two coats — polystyrene
T202	A45253B		Primary, universal single section	#3/41 Litz SNE	150	9		600	Q @ 1000 ~ = .15 ± .05 L @ 1000 ~ = 200-400 mh Center freq. = 400kc Q @ 400kc = 75 ±10% Two coats — polystyrene
			Secondary, universal single section	#3/41 Litz SNE	150	9		600	Q @ 1000 ~ = .15 ± .05 L @ 1000 ~ = 200-400 mh Center freq. = 400kc Q @ 400kc = 75 ±10% Two coats — polystyrene
T203	A45254D	Primary and secondary identical to primary and secondary of T202							
T204	B452127B		Primary, universal two-section	#3/41 Litz SGE	115 each section 230 total	15		600	Q @ 1000 ~ = .25 ± .05 L @ 1000 ~ = 500-800 mh Center freq. = 400kc Q @ 400kc = 70 ±10% Two coats — phenolic
			Secondary, universal single-section, tapped	#3/41 Litz SGE	285.5 tapped at 142	Start to tap—8. tap to finish—10. Total 18		600	Q @ 1000 ~ = .3 ± .1 L @ 1000 ~ = 900-1500 mh Center freq. = 400kc Q @ 400kc = 70 ±10% Two coats — phenolic

ABBREVIATIONS USED ON COIL-DATA TABLES SGE = SINGLE GLASS ENAMEL SNE = SINGLE NYLON ENAMEL

SECTION 8

PARTS LISTS

INTRODUCTION

Table 8-1, Maintenance Parts List, is arranged in alphabetical and numerical order of Reference Designations. The series 100-199 appears first as these are the parts which are found on the Panel and Chassis Assembly (A105) of the equipment. The series 200-299 follows, and these parts are found on the IF Chassis Assembly (A201) mounted on the main chassis.

Table 8-1, column two, entitled "Notes", provides additional information with regard to the procurement of these items. A key to the supporting information for these numbers found in column two is given below:

1. Fabricate locally from bulk material having the stock number listed in Table 8-2.
2. Manufacture in a Navy Shop.
3. Will be procured on demand by the nearest Naval Shore Supply Activity.
4. Non-replaceable in this application. Listed for reference only.
5. Replace by adapting or modifying the standard item having the stock number listed in Table 8-2. Modify as indicated in the description.

6. Replace with the substituted part having the stock number listed in Table 8-2.

7. Assumed to be a non-failing item. If failure occurs, order replacement from ESO, referencing NavShips 900,180A.

Column three gives the part name and description, and column four describes the function of the part to assist in locating the item in the equipment or on the drawings.

Table 8-2, Stock Number Identification, lists the reference designations in alphabetical and numerical order and indicates the standard Navy stock number for each item. Stock numbers are repeated when items in the 201-299 series correspond to items already listed in the 101-199 series.

Table 8-3 Stock Number Cross Reference, lists the Standard Navy Stock Numbers in alphabetical and numerical order and indicates the reference designation. In cases where the same stock number applies to several items, only the first reference designation is listed, and Table 8-1 must be used to determine the corresponding items. Reference designations 100-199 are listed first, followed by the 200-299 series. Stock numbers are repeated where items in the 201-299 series correspond to items already listed in the 101-199 series.

TABLE 8-1. MAINTENANCE PARTS LIST

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
101-199 201-299		Frequency Shift Converter CV-97/UX: IF output (400 kc.) of Model RBC or equal Radio Receiver Equipment is converted to amplitude-modulated audio signal in accordance with the facsimile signal, with sub-carrier frequency 1, 2 or 3 kc. Signal input 50-ohm impedance, 0.5 volt peak, frequency shift \pm 450 cycles, center frequency 400 kc. Power 115/230 volts, 1 ph. 60 cycles, 150 watts. Output: 0-2 or 0-7 volts, 600-ohm impedance level. Assembled on chassis and 19" relay-rack panel 10-1/2" high; mounts in metal cabinet 14-3/4" h x 18-3/8" d x 23-1/2" w.o.a. for table mounting.	
A101	4	CABINET: one compartment; steel, zinc chromate primer; and light grey enamel finish; Dim: 23-1/2" wd. x 18-3/8" dp. x 12-17/32" h.; 8 louvres each side; one handle, A108, each side; 2 roller slides, A102 left, and A103 right, attached to side brackets, each having 4 #10 welded nuts; 2 chassis supports receptacles, A109, one on rear each side bracket front accepts 10-15/32" x 19" relay rack panel; mts. by 4, 25/64" holes on 16-11/16" x 13-1/8" centers, not watertight or waterproof. MacLeod & Hanopol part/drawing no. E-452116A.	Houses equipment
A101A	4	Slide latch spring, no part no.	Inside of cabinet, lower front edge
A102	7	ROLLER SLIDE LEFT: AL. with stainless steel balls; 18" lg. x 1-3/8" h. x 1-1/4" thk. o/a; 18" travel; inner slide has latching stud for extended position; two 3/16" studs on 2-1/2" centers on inner slide are chassis retainers. Mfr: Grant Pulley and Hardware Co. Part No. 353 modified. MacLeod & Hanopol part/drawing no. C-45237C left.	Located on bracket on left side of cabinet A101
A102A	2	Slide latching stud; MacLeod & Hanopol part/drawing no. A452142.	Rear of inner slide
A103	7	ROLLER SLIDE RIGHT: Same as A102, except for right hand; MacLeod & Hanopol part/drawing no. C-45237C right.	On bracket on right side of cabinet A101

TABLE 8-1 (Continued)

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
A104	4	SHOCK-MOUNT ASSEMBLY: Steel, zinc chromate primer, grey enamel finish; channel construction 20-3/8" lg. x 4-11/16" wd. x 3/4" h. excluding shock mts; 2 shock absorbers, A107 on 13-1/8" centers, each mounted in a 5-hole cluster of one 1" d. hole at center, and four 3/8" holes 90° apart on a concentric bolt circle 1.76" dia.; mounts to cabinet by 3/8" holes on 13-1/8" centers in center of shock absorber; mounts to table by four 9/32" holes on 4-1/16" x 19-3/8" centers in flanges.	Support the cabinet
A104A	4	SHOCK-MOUNT CHANNEL; MacLeod & Hanopol, Inc., part/drawing no. C45244B.	
A105	4	PANEL AND CHASSIS ASSEMBLY: Consists of: panel, aluminum, grey enamel finish; 10-15/32" h. x 19" lg. x 3/16" thk.; has opening 13-1/4" lg. x 1-7/8" h. for controls; with a door 13-5/8" lg. by 2-7/16" h. hinged at the bottom and locked by 2 thumb-screw latches, H102, on 10-5/8" centers; has 2 handles A111 on 15-7/16" centers. Mounts the assembly either on cabinet or relay rack cabinet by eight retained thumb screws H101, four to each side with horizontal centers of 18-1/4", and vertical centers of 2-1/4" x 3" x 2-1/4". Chassis; alum. anodized finish; bolted to panel by 8 C.S.K. head 8-32 bolts; 17-3/16" wd., x 17" dp. x 10-1/4" h. o/a; 4 louvres each side, has lower dust cover; has upper dust cover, fastening by 2 screwdriver studs, mfr.: Camlock, Inc., part no. 2600-5; rear surface has input receptacle J104, output terminal board E116, and power receptacle J101. MacLeod & Hanopol, Inc. part/drawing no. E-45206C.	
A106	4	CATHODE-RAY-TUBE WINDOW: Cast Al. bezel; black enamel finish; size, 3-3/16" O.D. x 1-7/8" I.D. x 25/64" thk; three .149" holes 120° apart on 2-13/16" B.C.; has lucite window 1-63/64" d. x 1/16" thk; retainer is molded neoprene U-section cemented to bezel, MacLeod & Hanopol, Inc., part/drawing no. A-452147. Retainer is 6-3/8" lg. Mfr: Atlantic India Rubber Co., part no. 650.	Mounted in upper center of panel
A106A	7	Bezel, MacLeod & Hanopol part/drawing no. C45240C.	
A106B	2	Window, lucite. MacLeod & Hanopol, Inc., part/drawing no. C45278.	
A106C	7	Retaining gasket. MacLeod & Hanopol, Inc., part/drawing no. A45285.	
A107	7	SHOCK ABSORBERS: Steel; cadmium plated with integrally molded rubber cushion; 3" lg. x 3" wd. x 1-1/2" h. o/a; mounts by center bushing with 3/8" d. hole, and four 0.255" holes on 2-1/2" x 2-1/2" centers. Mfr: Barry Corp., type C-2080-6. MacLeod & Hanopol, Inc., part/drawing no. A45288C.	On shock-mount assembly channels
A108	4	HANDLES, CABINET: Al. Bail 3-3/4" lg. x 1-1/4" dp. x 5/16" d.; plate 4-5/8" x 3-7/16" wd.; finish zinc chromate primer, grey enamel; spring-loaded to hold bail against plate; mounts by five 7/32" holes in two rows 2" apart, 2 holes in upper row on 2-1/2" centers; 3 holes in lower row on 1-1/4" centers; Mfr: Bendix-Friez, Inc. part no. 517875-1, (anodized finish); MacLeod & Hanopol, Inc., part/drawing no. A-452149.	One on each side of cabinet
A108A	4	Cabinet handle spring, no part. no.	
A109	7	SHOCK-SUPPORT RECEPTACLE: Cast bronze bracket and loop. 1-3/4" lg. x 1-1/8" wd. x 7/8" h.; nickel plate finish; has 5/16" d. receptacle hole; mounts by 4 #10 screw clearance slots on 9/16" x 1-1/4" centers. MacLeod & Hanopol, Inc., part/drawing no. C-45238D-B.	One at rear of each side bracket of cabinet
A110	7	SHOCK-SUPPORT STUD: Cast bronze angle bracket and stud; finish nickel plate; 1-5/8" lg. x 1-9/16" wd. x 1-3/8" dp. o/a; stud 5/16" d.; mounts by 4 #10 screw slots on 1" centers, 2 on each face of angle bracket, 1 pair 3/8" from corner, 2nd pair 5/8" from corner; MacLeod & Hanopol, Inc., part/drawing no. C-45238D-A.	Located at rear of main chassis
A111	4	HANDLE, PANEL: Brass, nickel plated; hand space 4-1/2" lg. x 1-1/4" dp.; mounts by 2 holes with 1/4-20 thrd. on 4-1/2" centers. MacLeod & Hanopol, Inc., part/drawing no. A-45231C.	One on each side of front of panel
C101	6	CAPACITOR, FIXED; CP29A1EF104V; paper dielectric; 0.1 mf p 20%, m 10% 600 vdcw; tubular metal case; oil impregnated and filled; uninsulated body; mounting bracket attached approx center of capacitor; 5/32" mounting hole in bracket; 2 axial wire terms. Mfr: Sprague, Type SP-CP29.	Plate decoupling V111A
C102	6	CAPACITOR, FIXED; CM25A102M; mica dielectric; 1000 mmf p/m 20%; 500 vdcw; 2 axial wire terms. Mfr: Electro-Motive, Type CM25.	Coupling V111A to V111B
C103		Same as C-101.	Plate decoupling
C104A	6	CAPACITOR, FIXED; CM35D752J; mica 7500 mmf; p/m 5%; 300 vdcw; 2 axial wire terminals; Mfr: Aerovox, Type 1464.	Feedback V112
C104B		Same as C104A.	
C105	6	CAPACITOR, FIXED; CP29A1EF503V; paper dielectric; 0.05 mf p 20%, m 10%; 600 vdcw; tubular metal case oil impregnated and filled; uninsulated body; mounting bracket attached approx. center of capacitor; 5/32" mounting hole in bracket; 2 axial wire terms. Mfr: Sprague, Type SP-CP29.	Feedback V112
C106	6	CAPACITOR, FIXED; CM60C433G; mica dielectric; 0.043 mf p/m 2%; 600 vdcw; terminals 2 brass inserts tapped #6/32 on 1-1/8" centers. Mfr: Aerovox, Type #1650.	Tuning condenser for carrier oscillator, 1000 cps with C107

TABLE 8-1 (Continued)

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C107	6	CAPACITOR, FIXED; CM35E752G; mica dielectric; 7500 mmf p/m 2%; 300 vdcw; 2 axial wire terms. Mfr: Electro-Motive, Type CM35.	Tuning capacitor for carrier oscillator, 1000 cps with C106
C108		Same as C107.	Tuning capacitor for carrier oscillator, 2000 cps with C109
C109	6	CAPACITOR, FIXED; CM35E512G; mica dielectric; 5100 mmf p/m 2%; 500 vdcw; 2 axial wire terms. Mfr: Electro-Motive, Type CM35.	Tuning capacitor for carrier oscillator, 2000 cps with C108
C110		Same as C109.	Tuning capacitor for carrier oscillator, 3000 cps with C111
C111	6	CAPACITOR, FIXED; CM20E471G, mica dielectric, 470 mmf, p/m 2%, 300 vdcw. Mfr: Electro-Motive, Type CM20.	Tuning capacitor for carrier oscillator, 3000 cps with C110
C112	6	Same as C101.	Plate bypass V109B
C113	6	Same as C101.	Plate bypass V113
C114	6	CAPACITOR, FIXED; CM15E151J; mica dielectric; 150 mmf p/m 5%, 300 vdcw; 2 axial wire terms. Mfr: Electro-Motive, Type CM15.	Discriminator output filter
C115		Same as C114.	Bypass, Freq. deviation meter
C116	6	CAPACITOR, FIXED; CP53B1EF254K; paper dielectric; 0.25 mf p/m 10%; 600 vdcw; metal case, mounting centers 2-1/8"; oil impregnated and filled; 2 solder-lug terminals; no internal ground. Mfr: Sprague, Type SP-CP53.	Sweep charging V106
C117		Same as C105.	Coupling V106 to V107
C118		Same as C102.	Coupling V108A to V110
C119	6	CAPACITOR, FIXED; CM35B103M; mica dielectric; 0.01 mf p/m 20%; 300 vdcw; 2 axial wire terminals. Mfr: Aerovox, Type 1464.	Coupling V108B to V108A
C120		Same as C101.	Plate decoupling V108B
C121	6	CAPACITOR, FIXED; CP53B1EG254K; paper dielectric; 0.25 mf p/m 10%; 1000 vdcw; metal case; mtg. centers 2-1/8"; oil impregnated and filled, 2 solder-lug terminals; no internal ground. Mfr: Sprague, Type SP-CP53.	CRT high-voltage-supply filter
C122	6	CAPACITOR, FIXED; CP70E1EF805K; paper dielectric; 8.0 mf p/m 10%; 600 vdcw, metal case; mtg. centers 4"; oil impregnated and filled; 2 terms #10-32 studs through ceramic insulators; no internal ground; mounting brackets, 2 — spade lug; CP07563. Mfr: Sprague, Type SP-CP70.	Power-supply filter
C123		Same as C101.	Grid coupling cond. V104
C124	6	CAPACITOR, FIXED; CK63Y103Z; ceramic dielectric; 0.01 mf p 100% m 20%; 500 vdcw; disc. Mfr: Aerovox, Type DI-6.	Bypass V105
C125	6	CAPACITOR, FIXED; CM30B821K; 820 mmf; mica dielectric; p/m 10%; 500 vdcw; 2 axial wire terminals. Mfr: Electro-Motive, Type CM-30.	Ripple-reduction grid V104
CR101	6	RING MODULATOR; Quad of 4 matched germanium diodes in MT-8 case, with 8-pin octal base. Forward voltage drop — 1.3 to 1.7 V. @ 15 ma voltage drop within 0.1V or 6.7 ohms; voltage drop of diode pairs within 0.03V or 2 ohms; Mfr: G. E., Type 1N73.	Modulator, adjacent to T205
E101	4	TERMINAL BOARD ASSEMBLY: Power Supply; general purpose; per MacLeod & Hanopol, Inc., part/drawing no. C-45270C; consisting of: 1 terminal board, GMG, 6-9/16" lg. x 2-13/16" w. x 1/8" thk., per MacLeod & Hanopol, Inc., part/drawing no. C-45271A; 1 insulating board, GMG, 4-13/16" lg. x 1-3/16" w. x 1/8" thk., per MacLeod & Hanopol, Inc., part/drawing no. A-45272; 2 brackets per MacLeod & Hanopol, Inc., part/drawing no. A-009001; 2 #6-32 thrd. holes on 6-3/16" centers mount assembly; turret lugs; mounts the following parts: C121, C123, C124, C125, R151, R153, R154, R155, R156, R158, R159, R160, R161, R162, R163.	Located parallel to rear of main chassis and panel assembly A105
E101A	2	Terminal board brackets, MacLeod & Hanopol part/drawing no. A-009001	
E102	4	TERMINAL BOARD ASSEMBLY: I.F. Interconnecting; general purpose; per MacLeod & Hanopol, Inc., part/drawing no. A-45276A; consisting of: 1 terminal board, GMG, 2-1/2" lg. x 2-3/4" w. x 1/8" thk., per MacLeod & Hanopol, Inc., part/drawing no. A-45277C; 2 brackets per MacLeod & Hanopol, Inc., part/drawing no. A-009001; 2 #6-32 thrd. holes on 1-1/2" centers mount assembly; turret lugs, mounts the following parts: C114, C115, R126.	Located in front corner of main chassis and panel assembly A105, adjacent to IF chassis assembly A201
E103	4	TERMINAL BOARD ASSEMBLY; Oscillator and Output Amplifier; general-purpose; per MacLeod & Hanopol, Inc., part/drawing no. C-45267C; consisting of: 1 terminal board, GMG, 7-1/2" lg. x 2-13/16" w. x 1/8" thk., per MacLeod & Hanopol, Inc., part/drawing no. C-45268A; 1 insulating board, GMG, 5-3/8" lg. x 1-1/8" w. x 1/8" thk., per MacLeod & Hanopol, Inc., part/drawing no. C-45269A; 2 brackets per MacLeod & Hanopol, Inc., part/drawing no. A-009001; 2 #6-32 thrd. holes on 7-1/8" centers mount assembly; turret lugs; mounts the following parts: C103, C104A, C104B, C105, C112, C119, C120, R107, R108, R109, R110, R111, R112, R113, R114, R140, R141, R143, R145, R146, R148.	Located adjacent to XV112, XV109, XV108, and XV106 on main chassis and panel assembly A105

TABLE 8-1 (Continued)

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
E104	4	TERMINAL BOARD ASSEMBLY; Cathode Ray Tube; general-purpose; consisting of: 1 terminal board, GMG, 7-1/4" lg. x 2-13/16" w. x 1/8" thk., per MacLeod & Hanopol, Inc., part/drawing no. C-45265A; 1 insulating board, GMG, 3-1/16" lg. x. 1-1/8" w. x 1/8" thk., per MacLeod & Hanopol, Inc., part/drawing no. C-45266A; 2 bracket per MacLeod & Hanopol, Inc., part/drawing no. A-009001; 2 #6-32 thrd. holes on 6-7/8" centers mount assembly; turret lugs; mounts the following parts; C106, C107, C108, C109, C110, C111, C116, C117, R115, R116, R128, R129, R130, R131, R132, R133, R134, R135, R136, R137, R138, R139, R142, R144; MacLeod & Hanopol, Inc., part/drawing no. C-45264C.	Located adjacent to XCR101, T106, and XV107 on underside of main chassis and panel assembly A105
E105	4	TERMINAL BOARD ASSEMBLY; Monitor amplifier; general-purpose, consists of board GMG 7-3/16" lg. x 2-13/16" wd. x 1/8" thk., MacLeod & Hanopol, Inc., part/drawing no. C-45265C; 2 brackets, MacLeod & Hanopol, Inc., part/drawing no. A-009001; turret lugs; mounts by two 6-32 thrd. holes on 6-13/16" mounting centers; mounts parts; C101, C102, C113, R102, R103, R104, R105, R106, R117, R118, R119, R120, R121, R124, R164, R165, MacLeod & Hanopol, Inc., part/drawing no. C-45262C.	Located on underside of chassis, A105 adjacent to XV212 and XV209
E106		Not used.	
E107	7	KNOB; Round with 8 fluted indentations 45° apart grooved pointer with white filled index line; black molded bakelite 1-1/16" d. x 5/8" h. o/a; brass insert for 1/4" shaft; two allen type 8-32 c.p. set screws 3/16" long, 60° and 180° c.w. from pointer. Mfr: Molded Insulation, Inc., part no. per Navy dwg. RE10F49C type A.	Used on XTAL SEL., MONITOR GAIN, MOD., OUTPUT LEVEL, CARRIER FREQ. and FILTER SEL.
E108	6	CLAMP, TUBE: Stainless steel; 1-1/4" I.D. closed x 3/4" h. including bracket; welded right-angle bracket; mounts with single slotted hole, clearance for #10 screw 27/32" off center; Mfr: Birtcher Corp., part no. 926B.	Used at XV102, XV107, XV108, XV109, XV111, XV112, XV113
E109	6	CLAMP, TUBE: Stainless steel; 1-5/32" I.D. closed x 3/4" h. including bracket; welded right-angle bracket; mounts with #10 screw clearance slot 51/64" from center; Mfr: Birtcher Corp., part no. 926A.	Located at XV105, and XV106
E110	6	CLAMP, TUBE: Stainless steel; 1-1/4" d. x 11/16" h. including bracket; welded right-angle bracket; mounts with #10 screw clearance slot 27/32" from center; Mfr: Birtcher Corp., part no. 926B-6.	Located at XV104 and XCR101
E111	6	CLAMP, TUBE: Stainless steel; 1-3/8" I.D. x 3/4" h. including bracket; welded right-angle bracket; mounts with #10 clearance slot 29/32" off center; Mfr: Birtcher Corp., part no. 926C.	Located at XV101
E112	6	CLAMP, TUBE: Stainless steel; 1-5/8" d. x 5/8" h. including bracket; welded right-angle bracket mounts with #10 screw clearance slot 1-1/32" off center; Mfr: Birtcher Corp., part no. 926H-4.	Located at XV103
E113	7	CLAMP, TUBE: Steel, nickel plated; 1-29/64" I.D. x 3/4" h. x 3-3/16" lg. o/a; clamps with #8 screw in retained 8-32 nut; mounts with 2 snap slides; Mfr: Aircraft Radio, Inc., part small snapslide, on 2-13/16" centers; MacLeod & Hanopol, Inc., part/drawing no. C-45257B-B.	Located at rear of CRT shield assembly E114
E113A	4	SNAP SLIDE ASSEMBLY: MacLeod & Hanopol part/drawing no. A45256C.	
E113B	7	SLIDE: Aircraft Radio part 3888.	
E113C	7	BUTTON: Aircraft Radio, Part 3890.	
E113D	7	WASHER: Aircraft Radio, Part 3889.	
E113E	7	GUIDE: Aircraft Radio, Part 3887.	
E114	7	SHIELD, CRT; Consists of Mu Metal cylinder with steel flanges at both ends and welded steel end bracket; finish zinc chromate primer and black enamel; 3-5/16" od x 7-1/4" l. o/a; mounting is three .150" holes 120° apart on 2-13/16" B.C. on front flange, and two 3/16" holes on 1" centers, on bracket; has cemented sponge rubber cushion 6-13/16" lg. x 5/8" wd. x 3/16" thk., at front; has 2 snapslide studs on 2-13/16" centers at rear, MacLeod & Hanopol, Inc., part/drawing no. C-45287A; Assembly is MacLeod & Hanopol, Inc., part/drawing no. C-45239E.	Mounted on center of chassis assembly A105
E114A	7	SNAP SLIDE STUD: MacLeod & Hanopol, Inc., part/drawing no. A45287A.	
E115	2	BUSHING INSULATOR; Laminated phenolic type LE; 11/16" O.D. x 3/8" I.D. x 1/16" thk. o/a with shoulder 1/2" x 1/32" MacLeod & Hanopol, Inc., part/drawing no. A-45234A.	One each side of jacks, monitor and output
E116	6	TERMINAL, STRIP: Molded phenolic; has barriers, 3/16" h. x 7/64" wd. x 1-1/8" lg.; four no. 6/32" x 5/16" lg. screw terminals on 7/16" centers; four 5/32" mounting holes on 2-3/16" x 27/64" centers; fungus varnished; Mfr: H. B. Jones Co., part no. 4-141Y-FV.	Mounted on rear of main chassis, A105
F101	6	FUSE, CARTRIDGE; JAN type #F02G3R00A, per MIL-F-15160; 3A; 250V; glass. Mfr: Bussman, Type AGC-3.	AC power-line fuse, sub-panel front
F102		Same as F101.	AC power-line fuse, sub-panel front
H101	2	THUMB SCREW, Panel; stainless steel, knurled slotted head; 1-1/2" lg., head 3/8" d., length under head 1.165", thrd. 10-32 x 9/16" lg., screw undercut from end of thread to head. MacLeod & Hanopol, Inc., part/drawing no. A-45220.	8, in retainers on panel

TABLE 8-1 (Continued)

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
H102	7	THUMB STUDS for panel latches; stainless steel, 1-7/16" lg. o/a. knurled head 9/16" diameter; 1" lg. under head with cross pin 7/8" below head. Assembly has stud, spring, spring cup, finish washer and retaining washer. Assembly MacLeod & Hanopol, Inc., part/drawing no. A-452148.	2, mount in holes in panel aperture door
H102A	2	STUD: MacLeod & Hanopol, Inc., part/drawing no. A45219A.	
H102B	2	CROSS PIN: MacLeod & Hanopol, Inc., part/drawing no. A45281A(D).	
H102C	7	SPRING: MacLeod & Hanopol, Inc., part/drawing no. A45281A(C)	
H102D	7	CUP: MacLeod & Hanopol, Inc., part drawing no. A45281A(B).	
H102E	7	Not used.	
H102F	2	RETAINING WASHER: MacLeod & Hanopol, Inc., part/drawing no. A45281(A).	
H103	2	THUMB SCREW for rack mounting; stainless steel, knurled slotted head; 1-1/2" lg., head 3/8" d., length under head 1.165"; thrd. 12-24 x 9/16" long, screw undercut from end of thread to head. MacLeod & Hanopol, Inc., part/drawing no. A452173.	Bolts panel to rack mtg. Kept in bag with unit
H104	6	ALLEN WRENCH; double end hex. 5/64" across flats; 2-3/4" long x 1/2" wide; steel, cadmium plate; 90° offset; for #8 Allen set screw.	Main chassis left side plate
I101	6	INDICATOR LAMP; INCANDESCENT miniature bayonet base; single contact; bulb size T-3-1/4; 6-8 volts, 150 amp; Mfr: General Electric, type 47.	Pilot light
J101	6	MALE FLUSH BASE, 3-conductor, polarized; 10 A., 250 volts; 1 terminal grounded to shell; Mfr: Harvey Hubbell, Type 7556-G.	Chassis connector for W102
J102	6	JACK, JAN type #JJ-034; for 2-conductor 0.25" diam. plug; single contact; per MIL-J-641; Mfr: Switchcraft, Type T331.	Connector for monitor phones
J103		Same as J102.	Connector for output signal
J104	6	CONNECTOR, COAX; Chassis mounting; NAV type #CPH49195; Mfr: Amphenol, Type 83-1R.	Connector for W101 at rear of chassis A105
L101	6	INDUCTOR, FILTER; per MIL-T-27; 8h; 160 ma; 100 ohms D.C. resistance; case — 3-3/8" lg. x 3-1/8" wd. x 4-1/4" h. excluding terminals; mounting studs — four #8-32 on 2-1/2" x 2-1/4" centers; terminals — two bifurcated studs on 5/8" centers; MacLeod & Hanopol, Inc., drawing #C-45211B; Mfr: U.T.C., part no. S-4267.	Plate supply filter (with C122)
L102	6	INDUCTOR, TOROID, Winding; per MIL-T-27; 0.5 H p/m 1%; Q 100 at 5000 c.p.s.; 30 MA D.C.; case 1-13/16" d. x 1-3/16" h.; #6-32 tapped holes on 1-1/8" centers; terminals — two solder lugs on 5/8" centers; MacLeod & Hanopol, Inc., drawing #A-45212A. Mfr: U. T. C., Type HQA-10.	Carrier oscillator inductor
M101	6	OUTPUT METER; AC voltmeter, rectifier type MIL-M-6A and JAN type #MR36W130 special per MIL-M-10304; calibrated — minus 20 to plus 6 DBM; 3-1/2" round meter. Mfr: Weston Elec. Inst. Corp. Type #1532; MacLeod & Hanopol, Inc., drawing #452141(2).	Signal output level
M102	6	FREQUENCY DEVIATION METER; 50-0-50 D.C. microampere meter; MIL-M-6A and JAN type #MR36W100 special; per MIL-M-10304; calibrated in frequency minus 2400 to plus 2400 cps linear; 3-1/2" round meter. Mfr: Weston Elec. Inst. Corp. Type #1531; MacLeod & Hanopol, Inc., drawing #452141(1).	Frequency deviation
O101	2	COUPLER SHAFT; brass nickel plated; 1/2" O.D. x 1/4" I.D. x 3/4" lg.; four 8-32 thrd., radial holes, 2 on 3/8" centers, at 90° from 2 on 3/8" centers. MacLeod & Hanopol, Inc., part/drawing no. A-45291; with four stainless steel Allen set-screws; 8-32 x 1/8" long; cup point.	Joins the shaft of S201 to its panel extension
O102	2	SHAFT EXTENSION; Stainless steel, 4-9/16" lg. x 1/4" d.; MacLeod & Hanopol, Inc., part/drawing no. A-45290.	Extends shaft of S201 to panel and knob (XTAL. SELECT.)
O103	2	SHAFT BUSHING; brass; nickel plated finish; hex flange 1/2" a.f. 3/8-32 thread 1/2" lg. below flange for 1/4" d. shaft. Mfr: H. F. Johnson Co. part no. 115-255.	Mount on panel for guiding shaft to XTAL. SEL. knob
P101	6	CONNECTOR, COAX; single-contact; NAV type #CPH-49190; Mfr: American Phenolic Corp., Type 83-1SP.	Terminates W101 cable
P102		Same as P101.	Terminates W101 cable
P103	4	MALE CORD, CAP NON-POLARIZED; 2-wire; integrally molded on W102 cable; furnished by Belden Mfg. Co.	Terminates W102
P104	6	CONNECTOR BODY, 3-conductor, polarized twistlok 10A; 250V; Mfr: Harvey Hubbell, Inc., Type 7555.	Terminates W102
R101	6	RESISTOR, VARIABLE (Pot); Comp; JAN type #RV3AURG254D, per JAN R-94; 250 k; 1/4 watt; p/m 20% Taper Z; shaft 1/4" d x 1/2" lg — RD.; bushing 3/8" 32THD. x 3/4" lg.; size 1-5/32" max. d. Mfr: Clarostat, Type 37C1-250K-2.	Monitor gain control
R102	6	RESISTOR, FIXED; comp; JAN type #RC20BF103K; 10K 1/2 watt; p/m 10%; spec MIL-R-11A.	Cathode bias V111A

TABLE 8-1 (Continued)

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R103	6	RESISTOR, FIXED; comp; JAN type #RC20BF124K; 120k; 1/2 watt; p/m 10%; spec MIL-R-11A.	Plate load V111A
R104	6	RESISTOR, FIXED; comp; JAN type #RC20BF563K; 56k; 1/2 watt; p/m 10%; spec MIL-R-11A.	Plate decoupling V111A
R105	6	RESISTOR, FIXED; comp; JAN type #RC20BF224K; 220k; 1/2 watt; p/m 10%; spec MIL-R-11A.	Grid Resistor V111B
R106		Same as R102.	Cathode bias V111B
R107	6	RESISTOR, FIXED; comp; JAN type #RC20BF393K; 39k; 1/2 watt; p/m 10%; spec MIL-R-11A.	Plate load and voltage divider with V112, R127
R108	6	RESISTOR, FIXED; comp; JAN type #RC20BF473K/ 47k; 1/2 watt; p/m 10%; spec MIL-R-11A.	Plate decoupling V112
R109	6	RESISTOR, FIXED; comp; JAN type #RC20BF123K; 12k; 1/2 watt; p/m 10%; spec MIL-R-11A.	Feedback V112
R110		Same as R102.	Cathode bias V112
R111	6	RESISTOR, FIXED; comp; JAN type #RC20BF622J; 6200 ohms; 1/2 watt; p/m 5%; spec MIL-R-11A.	Plate-load voltage divider with R107
R112	6	RESISTOR, FIXED; comp; JAN type #RC30BF222K; 2200 ohms; 1 watt; p/m 10%; spec MIL-R-11A.	Plate decoupling V109B
R113	6	RESISTOR, FIXED; comp; JAN type #RC20BF222K; 2200 ohms; 1/2 watt; p/m 10%; spec MIL-R-11A.	Cathode-load and signal-voltage divider with R114, V109B
R114		Same as R113.	Cathode-load and signal-voltage divider with R113, V109B
R115	6	RESISTOR, FIXED; W.W., JAN type #RW55G351; per MIL-R-26B; 350 ohms; 5 watts; p/m 5%; axial leads; ceramic body; vitreous-enamel coated. Mfr: W-L.	Modulator divider resistor with R116, for CR101
R116		Same R115.	Modulator divider resistor with R115, for CR101
R117	6	RESISTOR, FIXED; W.W., JAN type #RW55G102; per MIL-R-26B; 1000 ohms; 5 watts; p/m 5%; axial-lead; ceramic body; vitreous-enamel coated. Mfr: W-L.	Modulator calibration with R128, R129 and R130 divider
R118	6	RESISTOR, FIXED; JAN type #RB52AE56R00F; 1/4 W; W.W., accurate; 39 ohms p/m 1%; with axial leads; Mfr: Daven, Type 1195.	Filter insertion-loss equalizer Z103
R119	6	RESISTOR, FIXED; JAN type #RB52AE56R00F; 1/4 W; W.W., accurate; 56 ohms p/m 1%; with axial leads; Mfr: Daven, Type 1195.	Filter insertion-loss equalizer Z104
R120	6	RESISTOR, FIXED; W.W.; JAN type #RW55G251; per MIL-R-26B; 250 ohms; 5 watt; p/m 5%; axial leads; ceramic body; vitreous enamel coated. Mfr: W-L.	Cathode load V113
R121		Same as R120.	Cathode load V113
R122	6	RESISTOR, VARIABLE (Pot); W.W.; 3000 ohms; 2 watts; p/m 5%, shaft 1/4 d x 1/2" lg-RD; bushing 3/8" d., 32 THD x 3/4" lg.; size 1-5/32" max. D. Mfr: Clarostat, Type 43C1-3000.	Modulation control
R123	6	RESISTOR, VARIABLE (Pot); W.W.; 10K; 2 watt; p/m 5%, shaft SS 1/8" lg.; with locknut; bushing 3/8" d, 32 THD x 3/4" lg.; size 1-5/32 max. d. Mfr: Clarostat, Type 43C2-10000.	Modulator calibration control
R124	6	RESISTOR, FIXED; W.W.; JAN type #RW56G253; per MIL-R-26B; 25K; 10 watt; p/m 5%; axial leads, ceramic body; vitreous enamel coated. Mfr: Sprague, Type SP-RW56.	Modulator calibration network with R129, R130 and R136
R125	6	RESISTANCE, VARIABLE (Pot); comp; 250K; 1/2 watt; p/m 20%; linear taper; shaft SS 1/8" lg.; with locknut; bushing 3/8" d. 32 THD x 3/4" lg.; size 1-5/32" max. d. Mfr: Clarostat, Type 37C2-250K-S.	Discriminator output level
R126	6	RESISTOR, FIXED; comp; JAN type #RC20BF102K; 1000 ohms; 1/2 watt; p/m 10%; spec MIL-R-11A.	Noise and IF filter
R127	6	RESISTOR, VARIABLE; W.W.; 5K; 2W; p/m 5%; bushing 3/8" d. x 3/4" lg — 32 threads; shaft SS 1/8" beyond bushing; size 1-5/32" max. d.; with locknut; Mfr: Clarostat, Type 43-C2-5000.	Frequency-deviation-meter calibration control
R128		Same as R104.	Grid resistor V106
R129		Same as R126.	Cathode-bias voltage divider with R130 and V106
R130	6	RESISTOR, FIXED; comp; JAN type #RC40BF683K; 68K; 2 watts; p/m 10%; spec MIL-R-11A.	Cathode-bias voltage divider with R129 and V106
R131	6	RESISTOR, FIXED; comp; JAN type #RC20BF275J; 2.7M 1/2 watt; p/m 5%; spec MIL-R-11A.	Plate resistor and sweep time constant V106
R132	6	RESISTOR, FIXED; comp; JAN type #RC20BF332K; 3300 ohms; 1/2 watt; p/m 10%; spec MIL-R-11A.	Cathode bias divider with R133

TABLE 8-1 (Continued)

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R133	6	Same as R126.	Cathode-bias divider with R133
R134	6	RESISTOR, FIXED; comp; JAN type #RC20B335K; 3.3 M; 1/2 watt; p/m 10%; spec MIL-R-11A.	Grid return V107
R135		Same as R105.	Plate load V107B
R136	6	RESISTOR, FIXED; comp; JAN type #RC20BF104K; 100K; 1/2 watt; p/m 10%; spec MIL-R-11A.	Plate load V107A
R137		Same as R103.	Plate load V108A
R138	6	RESISTOR, FIXED; comp; JAN type #RC20BF564K; 560K; 1/2 watt; p/m 10%; spec MIL-R-11A.	Fixed attenuator for output range (with R139) V108A
R139	6	RESISTOR, FIXED; comp; JAN type #RC20BF225K; 2.2M; 1/2 watt; p/m 10%; spec MIL-R-11A.	Fixed attenuator for output range (with R138) V108A
R140	6	Same as R132.	Cathode bias V108A
R141		RESISTOR, FIXED; comp; JAN type #RC20BF334K; 330 K; 1/2 watt; p/m 10%; spec MIL-R-11A.	Grid resistor V108A
R142	6	RESISTOR, FIXED; comp; JAN type #RC20BF105K; 1.0 M; 1/2 watt; p/m 10%; spec MIL-R-11A	Feedback resistor V108A
R143		Same as R107.	Loading resistor for T106
R144		Same as R102.	Cathode bias V108B
R145		Same as R105.	Plate load V108B
R146		Same as R102.	Plate decoupling V108B
R147		Same as R101.	Output control
R148	6	RESISTOR, FIXED; comp; JAN type #RC20BF122K; 1200 ohms; 1/2 watt; p/m 10%; spec MIL-R-11A.	Cathode bias V109B
R149	6	RESISTOR, FIXED; W.W.; JAN type #RB17AE36000F; per MIL-R-93A; 3600 ohms; 1/2 watt; p/m 1%. Mfr: Daven, Type 1270.	Multiplier for output meter M101
R150	6	RESISTOR, VARIABLE (Pot); comp; 500K; 1/2 watt; p/m 20%; taper S; modified by addition of high-voltage coupler 3/8" d. x 3/4" lg. — 32 threads for locknut; shaft SS 1/8" beyond bushing (insulated); size 1-5/32" max. D. Mfr: Clarostat, Type 37C2-500K-S; with high-voltage coupler.	Intensity control and voltage divider (with R151, R152, R153, R154) for CRT
R151	6	RESISTOR, FIXED; comp; JAN type #RC20BF754J; 750K; 1/2 watt; p/m 5%; spec. MIL-R-11A.	Voltage divider (with R150, R152, R153, R154) for CRT
R152	6	RESISTOR, VARIABLE (Pot); comp; 1.0M; 1/2 watt; p/m 20%; taper S; modified by addition of high-voltage coupler; bushing on coupler 3/8" d. x 3/4" lg. — 32 thread for locknut; shaft SS 1/8" beyond bushing (insulated); size 1-5/32 max. D. Mfr: Clarostat, Type 37C2 — 1.0 meg.-S, with high-voltage coupler.	Focus control and voltage divider (with R150, R151, R153, R154) for CRT
R153	6	RESISTOR, FIXED; comp; JAN type #RC30BF225K; 2.2M; 1 watt; p/m 10%; spec MIL-R-11A.	Voltage divider (with R150, R151, R152, R154) for CRT
R154		Same as R153.	Voltage divider (with R150, R151, R152, R153) for CRT
R155	6	RESISTOR, FIXED; comp; JAN type #RC40BF560K; 56 ohms; 2 watts; p/m 10%; spec MIL-R-11A.	Plate limiting V103
R156		Same as R155.	Plate limiting V103
R157	6	RESISTOR, FIXED; W.W.; JAN type #RB17AE41002F; per MIL-R-93-A; 410K; 1/2 watt; p/m 1%; Mfr: Daven, Type 1270.	Grid voltage divider (with R158) V104
R158	6	RESISTOR, FIXED; W.W.; JAN type #RB17AE24502F; per MIL-R-93-A; 245K; 1/2 watt; p/m 1%; Mfr: Daven, Type 1270.	Grid voltage divider (with R157) V104
R159		Same as R126.	Grid isolating V102
R160		Same as R108.	Grid filter V104
R161	6	RESISTOR, FIXED; comp; JAN type #RC40BF474K; 470K; 2 watts; p/m 10%; spec MIL-R-11A.	Plate load V104
R162	6	RESISTOR, FIXED; comp; JAN type #RC40BF682K; 6800 ohms; 2 watts; 10%; spec MIL-R-11A.	Screen-voltage divider (with R163) V104 and limiting resistor for V105
R163		Same as R162.	Screen-voltage divider (with R162) V104 and limiting resistor for V105
R164		Same as R108.	CRT, V110, cathode to heater dc coupling
R165		RESISTOR, FIXED; W.W.; JAN type RW55G202; 2000 ohms, p/m 5%; 5 watts. Mfr: W-L.	Modulator bias voltage divider on E-105
R166		RESISTOR, FIXED; comp; JAN type #RC30BF474K; 470K; 1 watt; p/m 10%; spec MIL-R-11A.	C122 Bleeder, on E101
S101	6	SWITCH; Toggle; Type #ST22K, per MIL-S-23; DPST; 5A; 250V; bat handle; 4 solder lugs; bushing — 15/32" d. x 15/32" lg. — 32 threads; 28° throw; Mfr: A. H. & H., Type 82304.	AC power switch

TABLE 8-1 (Continued)

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
S102	6	SWITCH, Rotary; 1 ceramic wafer; 2 circuit, 5 position, non shorting; adjustable stop, set at 3rd position; shaft — 1/4" d. x 1/2 lg. beyond bushing — RD; bushing — 3/8" d. x 3/8" lg. 32 threads. Mfr: Centralab PA-2003 modified in accordance with MacLeod & Hanopol, Inc., drawing #45289C and MIL-S-3786.	Frequency selector switch for carrier oscillator; only 1 circuit employed
S103		Same as S102, stop set at 3rd position.	Low-pass filter selector switch
S104	6	SWITCH, Toggle; DPDT; Type ST22N, per MIL-S-23; bat handle, 6 solder lugs; 28° throw; Mfr: A. H & H., Type 82305.	Discriminator output-polarity reversing switch
T101	6	TRANSFORMER; filament regulating; sealed per MIL-T-27; pri. 95V to 125V 60 cycles only; sec. 6.3V p/m 1% @ 2.75 amp; Case, steel, grey finish; 3-5/8" lg. x 2-5/8" wd. x 5" h.; terminals, four bifurcated studs on 1-1/2" x 1-1/2" center; mounts by four 8-32 x 3/8" lg. thrd. studs on 2" x 3" centers; Mfr: Sola Electric Co., part no. 302513; MacLeod & Hanopol, Inc., part/drawing no. C-45245C.	Rear of chassis
T102	6	TRANSFORMER; plate and filament; per MIL-T-27; pri. 115/230V, 50 to 60 cycles, terminals 1, 2, 3, 4; sec. 1, 800V — 475V — 0V — 475V, terminals 5-6-7 (c.t.)-8; current 2ma at 800V and 160 ma at 475V; sec. 2, 6.3V/5 amp., terminals 9 and 10; sec. 3, 5V/3 amp., terminals 13, 14; sec. 4, 6.3V/.6 amp., (1 k.v. ins.), terminals 15 and 16; sec. 5, 1.25V/0.2 amp., (1200V ins.), terminals 17 and 18; sec. 6, 6.3V at 2.5 amp., terminals 11 and 12; case steel, grey finish, 5" lg. x 4-1/8" wd. x 6-1/4" h.; terminals 18 bifurcated studs; mounts by four studs 10-32 thrd. x 3/8" lg. on 3-3/4 x 3" centers. Mfr: U.T.C. part no. S-4266, MacLeod & Hanopol, Inc., part/drawing no. C45208C.	Rear of chassis A105
T103	6	TRANSFORMER; audio, plate to line; per MIL-T-27; power level, 10 dbm; dc 10 ma; frequency response 1 db, 400 to 4000 cycles; pri., 15000 ohms, terminals 1 and 2; dc res. 750 ohms; sec. 600 ohms C.T. terminals 3 — 4 (c.t.)-5; dc res. 28 ohms; internal shield terminal 6; terminals, 6 solder lugs; case steel, grey finish, 1-1/2" wd. x 1-1/2" dp. x 2-1/2" h.; mounts by four 6-32 thrd. x 3/8" lg. studs on 1-1/16" centers. Mfr: U.T.C., part no. S-4269, MacLeod & Hanopol, Inc., part/drawing no. A-45247C.	Signal output, lies between XV112 and side of chassis
T104		Same as T103.	Monitor output adjacent to XV111
T105		Same as T103.	Carrier oscillator output, adjacent XCR101
T106	6	TRANSFORMER, line to grid; per MIL-T-27; 0 mads; level 10 dbm; frequency response p/m 1 db from 400 to 4000 cycles; pri., 600 ohms c.t., terminals 3 — 4 (c.t.)-5, dc res. 28 ohms; sec. 50,000 ohms, terminals 1 and 2, d.c. res. 2700 ohms; internal shield terminal #6. All 6 terminals solder lugs on 3/4" B.C. case steel, grey finish, 1-1/2" wd. by 1-1/2" dp. x 2-1/2" h.; mounts by 4 6-32 thrd. x 3/8" lg. studs on 1-1/16" x 1-1/16" centers; Mfr: U.T.C., part no. S-4268, MacLeod & Hanopol, Inc., part/drawing no. A-45246C.	Input to carrier amplifier, adjacent to XCR101
TP101	6	TEST POINT; Molded nylon head and body; 3/8" d. x 15/16" lg. o/a; body 1/4" — 28 thread 9/16" lg. with turret lug at rear; mounts in 1/4" hole with 1/4" — 28 hex nut 3/8" A.F.; color yellow. Mfr: E. F. Johnson Co., part no. 105-607-1.	At cathode, pin 3 of V109; carrier oscillator output
TP102		Same as TP101.	Modulator input, connects to pin 2 CR101
TP103	6	TEST POINT: green; mechanically same as TP101. Mfr: E. F. Johnson Co., part no. 105-609-1.	Discriminator output, connects to V113 pin 5 (grid 1)
TP104	6	TEST POINT: red; mechanically same as TP101. Mfr: E. F. Johnson Co., part no. 105-602-1.	B plus, at cathode pins 3 and 6 of V103
V101	6	VACUUM TUBE; 5R4WGB. Chatham	Power rectifier
V102	6	VACUUM TUBE; 1B3-GT. RCA	High-voltage rectifier for CRT
V103	6	VACUUM TUBE; 6080WA. RCA	Series regulator
V104	6	VACUUM TUBE; 5693. RCA	Regulator amplifier
V105	6	VACUUM TUBE; 0C3W. Chatham	Reference voltage for voltage regulator circuit
V106	6	VACUUM TUBE; 884. Chatham	Sweep generator for CRT
V107	6	VACUUM TUBE; 6SN7WGTA. Sylvania	Sweep amplifier for CRT
V108	6	VACUUM TUBE; 6SL7WGT. Sylvania	A. Facsimile-recorder signal amplifier, 2nd stage and CRT deflection amp. B. Facsimile recorder signal amplifier, 1st stage deflection amp.
V109		Same as V107.	A. Facsimile-recorder signal power amplifier B. Carrier oscillator output cathode follower

TABLE 8-1 (Continued)

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
V110	6	VACUUM TUBE; 2BP1. RCA	CRT visual output monitor
V111		Same as V107.	Monitor amplifier
V112		Same as V107.	Carrier oscillator
V113	6	VACUUM TUBE; 6V6GTY. Hytron	Discriminator output cathode follower
W101	8	CABLE, SIGNAL INPUT; Coaxial cable type RG-8/U (SNSN N15-C012200-0600) termination 2, type 49190 connectors, one each end, (part P101 and P102). Length 6 feet o/a; MacLeod & Hanopol, Inc., part/drawing no. C-45250.	Accessory at input receptacle J104 at rear chassis
W102	7	POWER CABLE; 8 feet long; consists of SJ-3 neoprene covered cable; 3 #18AWG (16/30) rubber insulated conductors, green, black, white, 0.35" O.D., o/a; one end terminated in integrally molded 2-contact cord cap, non-polarized, with 6" of green conductor broken out at cap, and terminated in 6-32 thd. stud 1/4" lg. for grounding; other end terminated in "twist-loc" 3 terminal connector, P104; Mfr: Belden Wire Corp., part no. F-20449/KHS109; MacLeod & Hanopol, Inc., part/drawing no. C-452125.	Accessory for J101 at rear of chassis
XCR101	6	SOCKET, OCTAL; ceramic; JAN-TS-101-C01; Mfr: H. H. Eby, Inc., part no. 9756.	In main chassis front, center
XF101	6	FUSE HOLDER; finger operated; 3/4" d. x 2" lg. mounts in single 5/8" d. "D" hole with 5/8"-24 thrd. nut; accepts either 3AG or 4AG fuse; Mfr: Bussman, Inc., part no. HCM-EJQR.	Mounts in right side of subchassis behind door
XF102	6	Same as XF-101.	Adjacent XF101
XI101	6	PILOT LIGHT ASSEMBLY; Miniature bayonet socket; red jewel; 2-1/4" lg. x 13/16" d.; mounts in single 11/16" d. hole with 11/16"-27 thrd. nut; per MIL-L-3661; Mfr: Dial Light Co. of America, part no. 81410-111.	Front Panel
XV101		Same as XCR101.	
XV102		Same as XCR101.	
XV103		Same as XCR101.	
XV104		Same as XCR101.	
XV105		Same as XCR101.	
XV106		Same as XCR101.	
XV107		Same as XCR101.	
XV108		Same as XCR101.	
XV109		Same as XCR101.	
XV110	6	SOCKET, CRT; molded phenolic per MIL-P-14; 12 pins; 1-3/8" D. x 1/2" h. o/a; 28" lg., type SRHV #20 (7/30) leads, #1 brwn., #2 grn., #3 yel., #4 org., #5 N.C., #11 N.C., #12 brwn., 16" lg. type SRIR #20 leads, #6 violet, #7 blk., #8 blu., #9 wht., #10 red. Mfr: Alden Products part no. 212-MINC; MacLeod & Hanopol, Inc., part/drawing no. A-45273A.	On rear of CRT shield
XV111		Same as XCR101.	
XV112		Same as XCR101.	
XV113		Same as XCR101.	
XZ101		Not Used.	
XZ102		Not Used.	
XZ103		Same as XCR101.	For filter 250 cycles Z103 adjacent XV113
XZ104		Same as XCR101.	For filter 450 cycles, Z104 adjacent XZ103
XZ105		Same as XCR101.	For filter 700 cycles, Z-105 adjacent XZ104
Z101	6	FILTER, LINE-NOISE; volts 230 AC 60 cycles; amps. 2; voltage drop less than 13V; attenuation, 54 db at .014 mc and greater than 45 db at 100 mc; metal case 3-7/8" lg. x 2-1/4" wd. x 1-7/8" h. with four mounting holes 3/16" D., on 1-3/4" x 3-3/8" centers; 2 solder terminals one at each end; Mfr: Sprague Electric Co., part no. 79715. MacLeod & Hanopol, Inc., part/drawing no. A452171.	Top main chassis adjacent L101
Z102		Same as Z101.	Mounted with Z101
Z103	6	FILTER, LOW-PASS; impedance 500 ohms, 250-cycle attenuation 3-1/4 db; 500-cycle attenuation, 20 db; attenuation beyond 560 cycles greater than 40 db; insertion loss 2 db; dc resistance 95 ohms; time delay less than 4.5 millisecs; case, steel, grey finish, 1-3/4" wd. x 1-3/4" dp. x 3-1/2" h. excluding octal header in base; input pins 2 and 5, output pins 8 and 5, pin 1 can ground; mounts with four 6-32 thrd. bushings in can, on 1-1/4" centers, on same end as octal header; sealed per MIL-T-27. Mfr: Burnell and Co. part no. S-22670; MacLeod & Hanopol, Inc., part/drawing no. C-45210H(A).	Discriminator filter, adjacent V113

TABLE 8-1 (Continued)

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
Z104	6	FILTER, LOW-PASS; impedance 500 ohms; 450 cycle attenuation 3-1/4 db; 900-cycle attenuation, 20 db; attenuation beyond, 1010 cycles greater than 40 db; insertion loss 1 db; dc resistance 58 ohms. Time delay less than 3 milliseconds; mechanical details same as Z103. Mfr: Burnell & Co. part no. S-22671; MacLeod & Hanopol, Inc., part/drawing no. C-45210H(B).	Discriminator filter adjacent Z103
Z105	6	FILTER, LOW-PASS; impedance 500 ohms; 700-cycle attenuation 3-1/4 db; 1400-cycle attenuation 20 db; beyond 1570 cycles; attenuation is greater than 40 db; insertion loss 3/4 db; dc resistance 36 ohms; mechanical details same as Z103. Mfr: Burnell & Co. part no. S-22672; MacLeod & Hanopol, Inc., part/drawing no. C-45210H(C).	Discriminator filter adjacent Z104
A201	4	IF CHASSIS ASSEMBLY: 400 kc; consists of AL. chassis, anodized finish; 13-7/8" lg. x 3-15/16" wd. x 1-1/2" h. o/a; mounted by four 3/16" holes on 13-7/16" x 3" centers; mounted parts are switch bracket, MacLeod & Hanopol, Inc., part/drawing no. A-45229B, socket XV201, XV202, XV203, XV204, XV205, XV206, XV207, XY201, XY202, E207, E201, E202, L201, S201 and T201, T202, T203, T204. MacLeod & Hanopol, Inc., part/drawing no. E-45293A.	Mounted along left side of main chassis assembly A105
C201	6	CAPACITOR, FIXED; CK63Y103Z; Ceramic dielectric; 0.01 mf p 100%, m 20%; 500 vdcw; Disc. Mfr: Aerovox, Type DI-6.	Input coupling V201
C202		Same as C201.	Cathode bypass V201
C203		Same as C201.	Screen bypass V201
C204		Same as C201.	Plate decoupling V201
C205		Same as C201.	Cathode bypass V202
C206		Same as C201.	Screen bypass V202
C207		Same as C201.	Plate decoupling V202
C208		Same as C201.	Plate bypass V203A
C209	6	CAPACITOR, FIXED; CM20B391M; mica dielectric; 390 mmf p/m 20%; 500 vdcw; 2 axial wire terms. Mfr: Electro-Motive, Type CM-20.	Grid-bias bypass V203
C210		Same as C209.	Grid-bias bypass V204A
C211		Same as C201.	Plate decoupling V203B
C212		Same as C201.	Plate bypass V204A
C213		Same as C201.	Coupling V204 to V207
C214		Same as C209.	Grid-bias bypass V204B
C215		Same as C201.	Plate bypass V204B
C216	6	CAPACITOR, FIXED; CM30B222J; Mica dielectric; 2200 mmf p/m 5%; 500 vdcw. Mfr: Electro-Motive, Type CM-30.	Diode filter V205
C217		Same as C216.	Diode filter V205
C218	6	CAPACITOR, FIXED; CM35B472M; mica dielectric; 4700 mmf p/m 20%; 500 vdcw; 2 axial wire terms. Mfr: Electro-Motive, Type CM35.	Blocking capacitor V206
C219		Same as C201.	Cathode bypass V206
C220	6	CAPACITOR, FIXED; CM15B470J; mica dielectric; 47 mmf p/m 5%; 300 vdcw; 2 axial wire terms. Mfr: Electro-Motive, Type CM-15.	Screen tank capacitor V206
C221		Same as C201.	Plate and screen decoupling V206
C222		Same as C201.	Plate bypass V207
C223	6	CAPACITOR, FIXED; CP29A3EF104V; Paper dielectric; 0.1 mf p 20%, m 10%; 600 vdcw; tubular metal case; oil impregnated and filled; uninsulated body; mounting bracket attached approx. center of capacitor; 5/32" hole in bracket; 2 axial wire terms. Mfr: Sprague, Type SP-CP29.	Plate-supply IF bypass
C224		Same as C201.	Coupling V207 to V111A
C225	6	CAPACITOR, FIXED; CM15E151J; mica dielectric; 150 mmf p/m 5%; 300 vdcw; assembled in T201. Mfr: Electro-Motive, Type CM-15.	Tuning capacitor primary, T201
C226	6	Same as C225.	Tuning capacitor secondary, T201
C227	6	CAPACITOR, FIXED; CM15E181J; mica dielectric; 180 mmf p/m 5%; 300 vdcw; assembled in T201. Mfr: Electro-Motive, Type CM-15.	Time-constant-limiter grid V202
C228	6	CAPACITOR, FIXED; CM15E471J; mica dielectric; 470 mmf p/m 5%, 300 vdcw. Assembled in T202. Mfr: Electro-Motive, Type CM-15.	Tuning capacitor primary, T202
C229	6	Same as C228.	Tuning capacitor secondary, T202
C230	6	CAPACITOR, FIXED; CM15E101J; mica dielectric; 100 mmf p/m 5%; 300 vdcw; assembled in T202. Mfr: Electro-Motive, Type CM-15.	Time-constant-limiter grid V203
C231	6	Same as C230.	Tuning capacitor primary, T203
C232	6	Same as C230.	Tuning capacitor secondary, T203
C233	6	CAPACITOR, FIXED; CC20UJ150J; Ceramic dielectric; tubular; uninsulated body; 15 mmf p/m 2%; 500 vdcw; temperature coefficient N750. Mfr: Centralab, Type TCN-15.	Primary capacitor (with C234 and C235) T204

TABLE 8-1 (Continued)

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C234	6	CAPACITOR, FIXED; CC35CG121G; Ceramic dielectric; tubular; uninsulated body; 120 mmf p/m 2%; 500 vdcw; temperature coefficient NPO. Mfr: Centralab, Type TCZ-120.	Primary capacitor (with C233 and C235) T204
C235	6	CAPACITOR, FIXED; CC25CG101G; Ceramic dielectric; tubular; uninsulated body; 100 mmf p/m 2%; 500 vdcw; temp. coefficient NPO. Mfr: Centralab, Type TCZ-100.	Primary capacitor (with C233 and C234) in T204
C236	6	Same as C228	Secondary-to-primary coupling in T204
C237	6	Same as C234.	Secondary capacitor (with C238) in T204
C238	6	CAPACITOR, FIXED; CC20SH150G; Ceramic dielectric; tubular; uninsulated body; 15 mmf p/m 2%; 500 vdcw; temperature coefficient N330. Mfr: Centralab, Type TCA-15.	Secondary capacitor (with C237) in T204
C239	6	Same as C225.	Tuning capacitor (with 242) T205
C240	6	Same as C228.	Tuning capacitor (with C241) T205
C241	6	Same as C223.	Plate-supply IF bypass
E201	4	TERMINAL BOARD ASSEMBLY; IF, general-purpose; consists of: laminated paper base phenolic, with fungus proof varnish; 12-3/4" lg. x 2-13/16" wd. x 1/8" thk., MacLeod & Hanopol, Inc., part/drawing no. C-45260E; turret lugs; 3 brackets, MacLeod & Hanopol, Inc., part/drawing no. A009001; mounts by 3 holes 6-32 thrd. on 6-7/16" and 6" centers. Mounts parts, C201, C202, C203, C204, C205, C206, C207, C208, C209, C210, C211, C212, C213, C214, C215, C216, C217, C223, R201, R202, R203, R204, R205, R206, R208, R209, R210, R211, R212, R213, R214, R215, R217, R218, R219, R220, R221, R222, R223, R224; MacLeod & Hanopol, Inc., part/drawing no. E-45258C.	Located along center of IF strip A201
E202	4	TERMINAL BOARD ASSEMBLY; Converter oscillator general-purpose; consists of board GMG, 5-3/4" lg. x 2-13/16" wd. x 1/8" thk.; MacLeod & Hanopol, Inc., part/drawing no. A-45204C; has 2 brackets, MacLeod & Hanopol, Inc., part/drawing no. A009001; mounts by 2 holes 6-32 thrd. on 5-3/8" centers, mounts parts, C218, C219, C221, C222, C224, C241, R225, R226, R227, R228, R229, R230, R231, R232, R233, MacLeod & Hanopol, Inc., part/drawing no. C45203D.	Mounts along edge of IF strip assembly A201
E203	6	INSULATOR STANDOFF; Molded melamine with turret lug at one end, and insert at opposite end thrd. 4-40 x 5/32" dp.; 7/8" lg. x 1/4" A.F. o/a; Mfr: Winchester Corp., part no. 763.	Top of IF chassis adjacent XV204
E204	6	SHIELD TUBE, Miniature; brass, nickel plated; 13/16" I.D. x 1-3/4" h.; JAN-type TSF0T102; Mfr: Eby, Inc., part no. 9701-11.	Used for XV201, XV202, XV203
E205	6	SHIELD, TUBE, Miniature; brass, nickel plated; 13/16" I.D. x 1-3/8" lg.; JAN-type TSF0T101; Mfr: Eby, Inc., part no. 9700-9.	Used for XV205
E206	6	SHIELD, TUBE, Noval; brass, nickel plated; 61/64" I.D. x 1-15/16" lg.; JAN-type TSF105; Mfr: Eby, Inc., part no. 9704-5.	Used with XV203, XV204, XV207
E207	7	CLAMP, CRYSTAL: AL. anodized finish; post 2-5/8" lg. x 1/4" d. thrd. both ends 8-32 x 3/8" lg.; with clamp plate, MacLeod & Hanopol, Inc., part/drawing no. A-45296; spring, compression, MacLeod & Hanopol, Inc., part/drawing no. A45297A; and acorn nut 8-32 thrd, 5/16" across flats; MacLeod & Hanopol, Inc., part/drawing no. A-45294A.	Adjacent to XY201 on top of IF chassis assembly A201
L201	6	OSCILLATOR COIL ASSEMBLY; consists of one universal-wound coil, (L201A) with adjustable powdered iron core, tuned by 470 mmf capacitor, with 150 mmf output coupling capacitor; fixed inductor (L201B) universal-wound, four pies on powdered iron core, 5 millihenries $\pm 10\%$, tuned by 47 mmf capacitor. Contained in A1 can 1-1/4" lg. x 1" wide x 3" high with two 6-32 x 5/16" lg. mtg. studs on 1-1/16" mtg. centers; MacLeod & Hanopol, Inc., part/drawing no. A45299A.	Oscillator coil, on IF chassis
L202	6	Inductance, discriminator return; 30 m.h. p/m 10%; d.c. resistance 140 ohms; universal wound, 4 pies on powdered iron core 1/4" D. x 1" lg.; core, Speer Mfg. Co., part no. CFI-250; potted in plastic case 1-1/16" long x 3/4" wide x 15/16" high with two solder terminals; 2-1/8" diam mtg holes on 1-7/16" centers; M. & H., Inc. part/drawing no. A-45283C.	In discriminator shield can
R201	6	RESISTOR, FIXED; comp; JAN type #RC20BF510J; 51 ohms; 1/2 watt, p/m 5%; spec MIL-R-11A.	Input termination
R202	6	RESISTOR, FIXED; comp; JAN type #RC20BF472K; 4700 ohms; 1/2 watt; p/m 10%; spec MIL-R-11A.	Input-voltage divider (with R203) for local oscillator output
R203		Same as R202.	Input-voltage divider (with R202) for local oscillator output
R204	6	RESISTOR, FIXED; comp; JAN type #RC20BF101K; 100 ohms; 1/2 watt; p/m 10%; spec MIL-R-11A.	Cathode bias V201
R205	6	RESISTOR, FIXED; comp; JAN type #RC30BF333K; 33K; 1 watt; p/m 10%; spec MIL-R-11A.	Screen dropping V201
R206	6	RESISTOR, FIXED; comp; JAN type #RC30BF222K; 2200 ohms; 1 watt; p/m 10%; spec MIL-R-11A.	Plate decoupling V201

TABLE 8-1 (Continued)

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R207	6	RESISTOR, FIXED; comp; JAN type #RC20BF392K; 3900 ohms; 1/2 watt; p/m 10%; spec MIL-R-11A.	Grid limiting V202
R208		RESISTOR, FIXED; comp; JAN type #RC20BF151K; 150 ohms; p/m 10%; 1/2 watt; spec MIL-R-11A.	Cathode bias V202
R209	6	RESISTOR, FIXED; comp; JAN type #RC40BF473K; 47K; 2 watt; p/m 10%; spec MIL-R-11A.	Screen-voltage divider with R210, for V202
R210	6	RESISTOR, FIXED; comp; JAN type #RC30BF683K; 68K; 1 watt; p/m 10%; spec MIL-R-11A.	Screen-voltage divider V202
R211		Same as R206.	Plate decoupling V202
R212	6	RESISTOR, FIXED; comp; JAN type #RC30BF123J; 12K; 1 watt; p/m 5%; spec MIL-R-11A.	Grid-bias-divider (with R213) V203
R213	6	RESISTOR, FIXED; comp; JAN type #RC30BF562J; 5600 ohms; 1 watt; p/m 5%; spec MIL-R-11A.	Cathode load V203
R214	6	RESISTOR, FIXED; comp; JAN type #RC40BF224J; 220K; 2 watt; p/m 5%; spec MIL-R-11A.	Grid-bias divider V203
R215	6	RESISTOR, FIXED; comp; JAN type #RC30BF822J; 8200 ohms; 1 watt; p/m 5%; spec MIL-R-11A.	Grid-bias divider V204
R216	6	RESISTOR, FIXED; comp; JAN type #RC20BF103K; 10K; 1/2 watt; p/m 10%; spec MIL-R-11A.	Grid limiting V204
R217	6	RESISTOR, FIXED; comp; JAN type #RC30BF332K; 3300 ohms; 1 watt; p/m 10%; spec MIL-R-11A.	Plate decoupling V203
R218	6	RESISTOR, FIXED; W.W.; JAN type #RW55G202; 2000 ohms; 5W; plus or minus 5%. Mfr: W-L.	Cathode load V204
R219	6	RESISTOR, FIXED; comp; JAN type #RC20BF473K; 47K; 1/2 watt; p/m 10%; spec MIL-R-11A.	Grid return V207
R220		Same as R204.	Current limiting Res. V204
R221	6	RESISTOR, FIXED; comp; JAN type #RC40BF823J; 82K; 2W; plus or minus 5%; spec MIL-R-11A.	Grid-bias-voltage divider (with R215) for V204
R222	6	RESISTOR, FIXED; comp; JAN type #RC30BF122K; 1200 ohms; 1 watt; p/m 10%; spec MIL-R-11A.	Plate decoupling V204
R223	6	RESISTOR, FIXED; Film (high stability) JAN type #RN25X1003F; 100K; 1 watt; p/m 1%; Mfr: Mepco.	Discriminator load V205
R224		Same as R223.	Discriminator load V205
R225	6	RESISTOR, FIXED; comp; JAN type #RC20BF124K; 120K; 1/2 watt; p/m 10%; spec MIL-R-11A.	Grid resistor V206
R226	6	RESISTOR, FIXED; comp; JAN type #RC20BF222K; 2200 ohms; 1/2 watt; p/m 10%; spec MIL-R-11A.	Cathode bias V206
R227	6	RESISTOR, FIXED; comp; JAN type #RC30BF473K; 47K; 1 watt; p/m 10%; spec MIL-R-11A.	Plate and screen voltage divider V206
R228	6	RESISTOR, FIXED; comp; JAN type #RC30BF223K; 22K; 1K; p/m 10%; spec MIL-R-11A.	Plate and screen voltage divider V206
R229	6	RESISTOR, FIXED; comp; JAN type #RC20BF103K; 10K; 1/2 watt; p/m 10%; spec MIL-R-11A.	Oscillator output divider
R230	6	RESISTOR, FIXED; comp; JAN type #RC20BF223K; 22K; 1/2 watt; p/m 10%; spec MIL-R-11A.	Grid return V207A
R231		Same as R216.	Cathode load V207
R232		Same as R219.	Plate load V207
R233		Same as R205.	Plate decoupling V207
R234	6	RESISTOR, FIXED; comp; JAN type #RC20BF273K; 27K; 1/2 watt; p/m 10%; spec MIL-R-11A.	Grid leak V202
R235	6	RESISTOR, FIXED; comp; JAN type #RC20BF393K; 39K 1/2 watt; p/m 10%; spec MIL-R-11A.	Load for primary T202
R236	6	Same as R235.	Load for secondary T202
R237	6	Same as R219.	Grid limiting resistor V203
R238	6	Same as R235.	Load for primary T203
R239		Same as R235.	Load for secondary T203
S201	6	SWITCH, ROTARY; per MIL-S-3786; 1 ceramic wafer, 2-circuit, 5-position, non-shorting; shaft — 1/4" d. x 1/2" lg. beyond bushing; bushing — 3/8" d. with 32 thrd. x 3/8" lg.; modified per MacLeod & Hanopol, drwg. A-45289C; Mfr: Centralab, unmodified Part No. PA-2003, same as S-102.	Monitor-calibration switch

TABLE 8-1 (Continued)

REFERENCE DESIGNATION	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
T201		TRANSFORMER, IF; 400 kc center frequency; inter-stage; IF amp. #1 trans.; shield can 1-1/4" lg. x 1" wd. x 3" h. less mtg studs and terms; 2 mounting studs #6-32 x 5/16" lg. on 1-1/16" mounting centers; 6 solder-lug terminals; shielded assemb. includes 2 universal-wound coils with screwdriver-adjustable powdered-iron cores for tuning; 2-150 mmf p/m 5% silver mica tuning capacitors; 1-180 mmf silver mica capacitor and 1 27k; 1/2 watt resistor. M. & H. part drawing #B-45252D.	On IF strip (A201) adjacent V201
T202	6	TRANSFORMER, IF; 400 kc center frequency; inter-stage, IF limiter #1 transformer; shield can 1-1/4" lg. x 1" wd. x 3" h. less mounting studs and terminals; 2 #6-32 x 5/16" lg. mounting studs on 1-1/16" mounting centers; 6 solder-lug terminals; shielded assembly includes 2 universal-wound coils with 2 screwdriver-adjustable powdered-iron cores for tuning; 2-470 mmf p/m 5% silver mica tuning capacitors; 2-39k, 1/2 watt, p/m 10% resistors; 1-100 mmf silver mica capacitor and 1-47k 1/2 watt; p/m 10% resistor. M. & H. part drawing #B-45253B.	On IF strip (A201) adjacent V202
T203	6	TRANSFORMER, IF; 400 kc center frequency; inter-stage; IF limiter #2 transformer; shield can 1-1/4" lg. x 1" wd. x 3" h. less mounting studs and terminals; 2 #6-32 x 5/16" lg. mounting studs on 1-1/16" mounting centers; 6 solder-lug terminals. Shielded assembly includes 2 universal-wound coils and 2 screwdriver-adjustable powdered-iron cores for tuning; 2-470 mmf p/m 5% silver mica tuning capacitors and 2-39k 1/2 watt resistors. M. & H. part drawing #B-45254D.	On IF strip adjacent V203
T204	6	TRANSFORMER; Discriminator; 400 kc; center frequency; shield can 1-7/8" lg. x 1-7/16" wd. x 4" h. o/a; mounting studs; assembly includes; 2 universal coils with 2 screwdriver-adjustable powdered iron cores for tuning; primary fixed capacitance is made up of tubular ceramic; 1-100 mmf p/m 2% NPO temp coefficient, 1-120 mmf p/m 2%, NPO temp coefficient, and 1-15 mmf p/m 2% N750 temp coefficient. Secondary fixed capacitance made up of tubular ceramic condensers; 1-120 mmf, p/m 2-1/2% NPO temp coefficient and 1-15 mmf, p/m 2% N330 temp coefficient. Coupling capacity mica, 470 mmf p/m 5% choke 30 m.h. M. & H. part/drawing #B-452127B.	On IF assembly adjacent V204
TP201		Same as TP103.	Output 1st IF at grid 1, V202 pin 1
TP202		Same as TP101.	Output 1st limiter, at cathode V203, pins 3 and 8
TP203		Same as TP101.	Output 2nd limiter, cathode V204, pins 3 and 8
V201	6	VACUUM TUBE; 6AU6 WA. G. E.	IF amplifier — 1st stage
V202		Same as V201.	1st limiter amplifier
V203	6	VACUUM TUBE; 12AT7 WA. G. E.	2nd limiter
V204		Same as V203.	3rd limiter and discriminator driver
V205	6	VACUUM TUBE; 5726. Hytron	Discriminator rectifier
V206		Same as V201.	Conversion oscillator
V207		Same as V203.	Mixer
XV201	6	SOCKET, VACUUM TUBE; 7-pin miniature; ceramic, shield base; JAN-type TS102-C01. H. H. Eby #9715.	IF strip A201
XV202		Same as XV201.	
XV203	6	SOCKET, VACUUM TUBE; 9-pin miniature; ceramic; shield base; JAN-type TS103-C01. H. H. Eby #9717.	
XV204		Same as XV203.	
XV205		Same as XV201.	
XV206		Same as XV201.	
XV207		Same as XV203.	
XY201	6	SOCKET, CRYSTAL; ceramic; 7/16" wd. x 1-3/8" lg. x 7/8" h. o/a; mounts by two 1/8" holes on 1-3/32" centers; and two 5/16" clearance holes on .486 centers, same centerline as contacts. Accepts two .093" contact pins at .486 centers, supplied with 2 resilient washers for mounting screws; Mfr: Millen Co., part no. 33102.	On IF chassis A201
XY202		Same as XY201.	On IF chassis A201
Y201	6	CRYSTAL QUARTZ; 400 kc p/m .01%; metal plated spring mounted; FT-241A case 1-1/8" h. x 1-1/8" lg. x 5/16" wd.; 2 pins .093" d. on .486 centers per MacLeod & Hanopol, Inc., drawing #A45209C. Fig. A. Mfr: Reeves-Hoffman, type RH-41.	Calibrating oscillator frequency determining element V206
Y202	6	CRYSTAL QUARTZ; 402.2 kc p/m .01%, metal plated, spring mounted. Same construction as Y-201. MacLeod & Hanopol, Inc., drawing #A45209C. Fig. B. Mfr: Reeves-Hoffman, type RH-41.	Monitor oscillator frequency determining element V206

TABLE 8-2. STOCK NUMBER IDENTIFICATION AND LIST OF PARTS SUPPLIED.

REFERENCE DESIGNATION	PARTS SUPPLIED	STOCK NUMBER			
		FEDERAL	STANDARD NAVY	SIGNAL CORPS	AIR FORCE
C101			N16-C045777-3316		
C102			N16-C031095-6947		
C104A			N16-C033195-4353		
C106			N16-C035065-3344		
C107			N16-C033190-2878		
C109			N16-C032715-6063		
C111			N16-C030106-3975		
C114			N16-C028969-1660		
C116			N16-C046347-3081		
C119			N16-C033627-7705		
C121			N16-C046350-7112		
C122			N16-C051478-2106		
C124			N16-C099999-0746		
C125			N16-C030747-4964		
CR101	1		N16-T051773-0000		
E108			N16-C300798-0621		
C109			N16-C300798-0452		
E110			N16-C300442-0625		
E111			N16-C300798-0866		
E112			N16-C300799-0482		
E116			N17-B077637-3414		
F101			G17-F016302-0121		
H104			G41-W-2446		
I101			G17-L006297-0000		
J101			N17-C073471-6407		
J102			N17-J039248-4418		
J104			N17-C073108-5875		
L101			N16-R029187-2685		
L102			N16-R028903-3462		
M101			N17-M022682-2306		
M102			N17-M021830-8221		
P101			N17-C071412-8709		
P104			N17-C071168-1296		
R101			N16-R088081-1477		
R102			N16-R050282-0811		
R103			N16-R050651-0811		
R104			N16-R050516-0811		
R105			N16-R050714-0811		
R107			N16-R050444-0811		

TABLE 8-2. (Continued)

REFERENCE DESIGNATION	PARTS SUPPLIED	STOCK NUMBER			
		FEDERAL	STANDARD NAVY	SIGNAL CORPS	AIR FORCE
R108			N16-R050480-0811		
R109			N16-R050309-0811		
R111			N16-R050182-0431		
R112			N16-R050013-0231		
R113			N16-R50012-0811		
R115			N16-R065817-9498		
R117			N16-R068399-7846		
R118			N16-R078816-6849		
R119			N16-R080052-1432		
R120			N16-R068369-8386		
R122			N16-R090928-2885		
R123			N16-R091288-4849		
R124			N16-R066529-1979		
R125			N16-R088081-9073		
R126			N16-R049922-0811		
R127			N16-R091027-9179		
R130			N16-R050553-0726		
R131			N16-R051091-0431		
R132			N16-R050066-0811		
R134			N16-R051110-0811		
R136			N16-R050633-0811		
R138			N16-R050858-0811		
R139			N16-R051065-0811		
R141			N16-R050759-0811		
R142			N16-R050975-0811		
R148			N16-R049940-0811		
R149			N16-R079171-5919		
R150			N16-R088181-9174		
R151			N16-R050911-0431		
R152			N16-R088341-9077		
R153			N16-R051066-0231		
R155			N16-R049464-0726		
R157			N16-R079463-9448		
R158			N16-R079444-7791		
R161			N16-R050823-0726		
R162			N16-R050202-0726		
R165			N16-R068408-6686		
R166			N16-R050823-0231		
S101			N17-S073082-9028		
S102	1		N17-S060871-2703		
S104			N17-S074139-4844		
T101			N17-T069568-5848		

TABLE 8-2. (Continued)

REFERENCE DESIGNATION	PARTS SUPPLIED	STOCK NUMBER			AIR FORCE
		FEDERAL	STANDARD NAVY	SIGNAL CORPS	
T102	1		N17-T075386-5879		
T103			N17-T063957-8497		
T106			N17-T061574-8002		
TP101			N17-C073108-1968		
TP103			N17-C039980-5005		
TP104			N17-C073108-4416		
V101			N16-T055446-0005		
V102			N16-T051203-0000		
V103			N16-T076080-0000		
V104			N16-T075693-0000		
V105			N16-T053053-0000		
V106			N16-T068840-0000		
V107			N16-T056684-0030		
V108			N16-T056677-0040		
V110			N16-T052230-0000		
V113			N16-T056759-0050		
XCR101			N16-S063515-4160		
XF101			N17-F074267-6101		
XI101			N17-L076854-4324		
XV110			N16-S64286-3985		
Z101			N17-S050967-6934		
Z103	1		N16-F044007-6589		
Z104	1		N16-F044012-8366		
Z105	1		N16-F044019-5196		
C201			N16-C099999-0746		
C209			N16-C029898-4007		
C216			N16-C031903-1086		
C218			N16-C032651-9288		
C220			N16-C027577-1596		
C223			N16-C044257-1819		
C225			N16-C028969-1660		
C227			N16-C029128-2425		
C228			N16-C030104-1111		
C230			N16-C028547-8660		
C233			N16-C015981-2572		
C234			N16-C017195-8091		
C235			N16-C017064-3701		
C238			N16-C015980-8550		
E203			N17-T028255-2601		
E204			N16-S034557-8351		
E205			N16-S034520-3862		

TABLE 8-2. (Continued)

REFERENCE DESIGNATION	PARTS SUPPLIED	STOCK NUMBER			AIR FORCE
		FEDERAL	STANDARD NAVY	SIGNAL CORPS	
E206			N16-S034576-6513		
L201			N16-C076819-1625		
L202			N16-C076779-1781		
R201			N16-R049444-0431		
R202			N16-R050129-0811		
R204			N16-R049580-0811		
R205			N16-R050418-0231		
R206			N16-R050013-0231		
R207			N16-R050093-0811		
R208			N16-R049625-0811		
R209			N16-R050481-0461		
R210			N16-R050553-0231		
R212			N16-R050308-0751		
R213			N16-R050164-0751		
R214			N16-R050714-0106		
R215			N16-R050236-0751		
R216			N16-R050282-0811		
R217			N16-R050066-0811		
R218			N16-R068408-6686		
R219			N16-R050480-0811		
R220			N16-R049922-0811		
R221			N16-R050588-0171		
R222			N16-R049941-0231		
R223			N16-R073191-8556		
R225			N16-R050651-0811		
R226			N16-R050012-0811		
R227			N16-R050481-0231		
R228			N16-R050373-0231		
R230			N16-R050372-0811		
R234			N16-R050399-0811		
R235			N16-R050461-0431		
R238			N16-R050444-0811		
T201			N17-T067569-2266		
T202			N17-T065769-8024		
T203			N17-T067569-2161		
T204			N17-T067138-6473		
TP201			N17-C039980-5005		
TP202			N17-C073108-1968		
V201			N16-T056203-0053		
V203			N16-T058240-0014		
V205			N16-T075726-0000		

TABLE 8-2. (Continued)

REFERENCE DESIGNATION	PARTS SUPPLIED	STOCK NUMBER			AIR FORCE
		FEDERAL	STANDARD NAVY	SIGNAL CORPS	
XV201			N16-S062603-6700		
XV203			N16-S064063-6714		
XY201			N16-S054548-7001		
Y201	1		N16-C096383-4056		
Y202	1		N16-C096384-9567		

TABLE 8-3. STOCK NUMBER CROSS REFERENCE

STANDARD NAVY STOCK NUMBER	REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	REFERENCE DESIGNATION
G17-F016302-0120	F101	N16-R051091-0431	R131	N16-C015980-8550	C238
G17-L006297-0000	I101	N16-R051110-0811	R134	N16-C015981-2572	C233
G41-W-2446	H104	N16-R065817-9498	R115	N16-C017064-3701	C235
N15-C102200-0600	W101	N16-R066529-1979	R124	N16-C017195-8091	C234
N16-C6028969-1660	C114	N16-R068369-8386	R120	N16-C027577-1596	C220
N16-C030106-3975	C111	N16-R068399-7846	R117	N16-C028547-8660	C230
N16-C030747-4964	C125	N16-R068408-6686	R165	N16-C028969-1660	C225
N16-C031095-6947	C102	N16-R078816-6849	R118	N16-C029128-2425	C227
N16-C032715-6063	C109	N16-R079171-5919	R149	N16-C029898-4007	C209
N16-C033190-2878	C107	N16-R079444-7791	R158	N16-C030104-1111	C228
N16-C033195-4353	C104A	N16-R079463-9448	R157	N16-C031903-1086	C216
N16-C033627-7705	C119	N16-R080052-1432	R119	N16-C032651-9288	C218
N16-C035065-3344	C106	N16-R088081-1477	R101	N16-C044257-1819	C223
N16-C044257-1819	C105	N16-R088081-9073	R125	N16-C076779-1781	L202
N16-C045777-3316	C101	N16-R088181-9174	R150	N16-C076819-1625	L201
N16-C046347-3081	C116	N16-R088341-9077	R152	N16-C096383-4056	Y201
N16-C046350-7112	C121	N16-R090928-2885	R122	N16-C096384-9567	Y202
N16-C051478-2106	C122	N16-R091027-9179	R127	N16-C099999-0746	C201
N16-C099999-0746	C124	N16-R091288-4849	R123	N16-R049444-0431	R201
N16-C300442-0625	E110	N16-S063515-4160	XCR101	N16-R049580-0811	R204
N16-C300798-0452	E109	N16-S064286-3985	XV110	N16-R049625-0811	R208
N16-C300798-0621	E108	N16-T051203-0000	V102	N16-R049922-0811	R220
N16-C300798-0866	E111	N16-T051773-0000	CR101	N16-R049941-0231	R222
N16-C300799-0482	E112	N16-T052230-0000	V110	N16-R050012-0811	R226
N16-F044007-6589	Z103	N16-T053053-0000	V105	N16-R050013-0231	R206
N16-F044012-8366	Z104	N16-T055446-0005	V101	N16-R050066-0811	R217
N16-F044019-5196	Z105	N16-T056677-0040	V108	N16-R050093-0811	R207
N16-R028903-3462	L102	N16-T056684-0030	V107	N16-R050129-0811	R202
N16-R029187-2685	L101	N16-T056759-0050	V113	N16-R050164-0751	R213
N16-R049464-0726	R155	N16-T068840-0000	V106	N16-R050236-0751	R215
N16-R049922-0811	R126	N16-T075693-0000	V104	N16-R050282-0811	R216
N16-R049940-0811	R148	N16-T076080-0000	V103	N16-R050308-0751	R212
N16-R050012-0811	R113	N17-C071168-1296	P104	N16-R050372-0811	R230
N16-R050013-0231	R112	N17-C071412-8709	P101	N16-R050373-0231	R228
N16-R050066-0811	R132	N17-C073108-1968	TP101	N16-R050399-0811	R234
N16-R050182-0431	R111	N17-C073108-4416	TP104	N16-R050418-0231	R205
N16-R050202-0726	R162	N17-C073108-5875	J104	N16-R050444-0811	R238
N16-R050282-0811	R102	N17-C073471-6407	J101	N16-R050461-0431	R235
N16-R050309-0811	R109	N17-F074267-6101	XF101	N16-R050480-0811	R219
N16-R050444-0811	R107	N17-J039248-4418	J102	N16-R050481-0231	R227
N16-R050480-0811	R108	N17-J039980-5005	TP103	N16-R050481-0461	R209
N16-R050516-0811	R104	N17-L076854-4324	XI101	N16-R050553-0231	R210
N16-R050553-0726	R130	N17-M021830-8221	M102	N16-R050558-0171	R221
N16-R050633-0811	R136	N17-M022682-2306	M101	N16-R050651-0811	R225
N16-R050651-0811	R103	N17-S050967-6934	Z101	N16-R050714-0106	R214
N16-R050714-0811	R105	N17-S060871-2703	S102	N16-R068408-6686	R218
N16-R050759-0811	R141	N17-S073082-9028	S101	N16-R073191-8556	R223
N16-R050823-0231	R166	N17-S074139-4844	S104	N16-S034520-3862	E205
N16-R050823-0726	R161	N17-T061574-8002	T106	N16-S034557-8351	E204
N16-R050858-0811	R138	N17-T063957-8497	T103	N16-S034576-6513	E206
N16-R050911-0431	R151	N17-T069568-5848	T101	N16-S054548-7001	XY201
N16-R050975-0811	R142	N17-T075386-5879	T102	N16-S062603-6700	XV201
N16-R051065-0811	R139				
N16-R051066-0231	R153				

TABLE 8-3. (Continued)

STANDARD NAVY STOCK NUMBER	REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	REFERENCE DESIGNATION
N16-T058240-0014	V203	N17-C039980-5005	TP201	N17-T067569-2161	T203
N16-T075726-0000	V205	N17-T028255-2601	E203	N17-T067569-2266	T201
N17-B077637-3414	E-116	N17-T065769-8024	T202	N16-S064063-6714	XV203
N17-C073108-1968	TP202	N17-T067138-6473	T204	N16-T056203-0053	V201

TABLE 8-4. LIST OF MANUFACTURERS

ABR.	PREFIX	NAME	ADDRESS	
Aerovox	CAW	Aerovox Corp.	740 Belleville Ave., New Bedford, Mass.	
	CBY	Aircraft Radio Corp.	Boonton, N. J.	
	CYA	Alden Products Co.	112 N. Main St. Brockton 64, Mass.	
A-B	CBZ	Allen-Bradley Co.	136 W. Greenfield Ave. Milwaukee, Wisconsin	
Amphenol	CPH	American Phenolic Corp.	1830 S. 54th Ave. Chicago 50, Illinois	
		Atlantic India Rubber Works, Inc.	571 Polk St. Chicago 7, Illinois	
	CAYU	The Barry Corp.	700 Pleasant St. Watertown 72, Mass.	
	CQG	Belden Mfg. Co.	4647 W. Van Buren St. Chicago 44, Illinois	
	CAIS	Birtcher Corp.	4371 Valley Blvd. Los Angeles 32, Calif.	
	CBIS	Burnell and Co.	45 Warburton Ave. Yonkers 2, N. Y.	
	CFA	Bussman Mfg. Co.	St. Louis 7, Mo.	
	Centralab	CBN	Centralab, Div. of Globe Union, Inc.	914Y E. Keefe Ave. Milwaukee 1, Wisconsin
	Chatham	CAHG	Chatham Electronics Corp.	473 Washington St. Newark, N. J.
	Clarostat	CMC	Clarostat Mfg. Co., Inc.	Dover, N. H.
CAE		Cutler Hammer, Inc.	1333 W. St. Paul Ave. Milwaukee, Wisconsin	
CAYZ		Dial Light Corp.	900 Broadway New York, N. Y.	
	CEB	Hugh H. Eby	4700 Stenton Ave. Philadelphia, Pa.	
Electro-Motive	CMF	Electro-Motive Mfg. Co.	Willimantic, Conn.	
Friez	CJF	Friez Instrument Div. of Bendix Aviation Corp.	Taylor Ave. Baltimore, Md.	
GE	CG	General Electric Co.	1 River Road Schenectady 5, N. Y.	
		Grant Pulley and Hardware Co.	31-85 Whitestone Pkwy. Flushing, N. Y.	

TABLE 8-4 (Continued)

ABR.	PREFIX	NAME	ADDRESS
Hubbell	CHU	Harvey Hubbell, Inc.	447 Concord Ave. Bridgeport, Conn.
	CEJ	E. F. Johnson Co.	Waseca, Minn.
	CJC	Howard B. Jones	2300 W. Wabansia Ave. Chicago, Illinois
	CJA	James Millen Mfg. Co.	150 Exchange St. Malden, Mass.
	CMI	Molded Insulation Co.	335 East Price St. Philadelphia, Pa.
RCA	CRV	Radio Corp. of America Tube Division	151 Westside Ave. Harrison, N. J.
		Reeves-Hoffman Corp.	145 Cherry St. Carlisle, Pa.
	CSY	Sola Electric Co.	2525 Clybourn Ave. Chicago, Illinois
Sprague		Speer Carbon Co.	St. Marys, Pa.
	CSF	Sprague Electric Co.	No. Adams, Mass.
	CBIM	Switchcraft Co.	1328-30 N. Halsted St. Chicago, Illinois
UTC	CUT	United Transformer Corp.	148 Varick St. New York, N. Y.
WL	CAO	Ward Leonard Electric Co.	6 South St., Mount Vernon, N. Y.
Weston	CV	Weston Electrical Instrument Co.	619 Frelinghuysen Ave. Newark, N. J.
		Winchester Electronics, Inc.	15 Crescent St. Glennbrook, Conn.

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