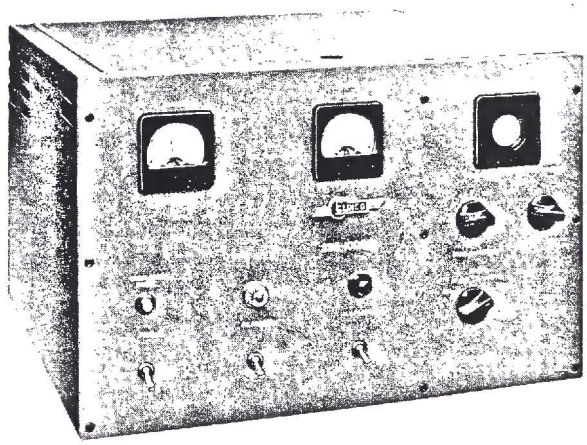
SSB-1000F

LINEAR AMPLIFIER



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SECTION I

DESCRIPTION

1. INTRODUCTION

The SSB-1000F is a one-thousand watt linear amplifier designed as a companion unit to the ELDICO SSB-100F Exciter. The unit operates in Amplitude Modulation (AM), Single Sideband (SSB), and Continuous Wave (CW). The SSB-1000F covers the range of the 80-to-10 meter amateur bands. It requires 30 watts peak drive on SSB, AM or CW for peak output.

2. FEATURES

The SSB-1000F has been designed to provide the utmost in flexibility in a linear amplifier. It is capable of handling a full kilowatt when operating on SSB or CW (750 watts carrier input on AM). Some of the features which contribute to the high standard of performance and ease of operation are as follows:

A. Completely self-contained, the SSB-1000F incorporates all the necessary power supplies within the same cabinet as the linear amplifier itself.

B. Two 4CX300A radial beam tetrodes handle the amplification of the signal. More than adequate plate dissipation is insured by the use of these tubes, which are also extremely rugged.

C. Resistive grid circuit consists of a 50 ohm, non-inductive load resistance replacing the usual grid circuit. This insures a proper load for the exciter as well as simplifying operation and providing extreme stability in the linear amplifier.

D. A built-in 1CP1 cathode-ray oscilloscope monitors the outgoing signal and gives a positive indication of linearity at all times. Automatic intensification of the scope pattern insures adequate brightness of the display for all types of operation at all signal levels and prevents burning of the phosphorous screen in the tube.

E. To provide continuous metering of plate and screen, separate plate and screen meters allow integrated, fool-proof tuning procedures and give the operator a clear picture of what is occuring in the amplifier at all times.

F. A built-in automatic overload relay with an electronic latching circuit provides complete protection to the final amplifier tubes.

G. For slow motion tuning, special planetary drive units reduce the tuning rates of the plate tuning and loading controls to permit ease of tuning.

H. Safety is provided with an interlock switch which disables the high voltage power supply when the cabinet cover of the SSB-1000F is raised. This removes

all voltages from points in the unit which are exposed. Protective shields are also incorporated in the amplifier section to prevent contact with any point where high voltage DC is present in case of failure of the bleeder circuits to discharge the filter capacitors in the power supply.

3. SPECIFICATIONS

Frequency Range:	80 through 10 meters in five bands.
Types of Operation:	Single Sideband (SSB) Frequency Modulation (FM) Amplitude Modulation (AM) Frequency Shift Keying (FSK) Continuous Wave (CW)
Power Requirements:	117 volts, 60 cps, 15 amps maximum, single phase.
Power Ratings:	SSB 1250 watts P.E.P. input FM 1000 watts input AM 750 watts input FSK 1000 watts input CW 1000 watts input
Distortions:	Third order distortion products better than 30 db down.
Drive Requirements:	30 watts P.E.P. maximum
Drive Impedance:	52 ohms, unbalanced
Input Circuit:	52 ohms resistive input
Output Circuit:	Pi Network
Output Impedance:	50 to 75 ohms nominal

SECTION II

INSTALLATION

1. UNPACKING

Open the packing carton carefully to avoid damage to the equipment. Check all the packing material carefully for small packages. Inspect the SSB-1000F for mechanical damage and check the panel controls for bent shafts and broken couplings. Any claim for damages must be filed with the transportation company immediately, and the original packing material should be preserved.

2. LOCATION AND MOUNTING

The SSB-1000F is a table-top linear amplifier. The location chosen for the unit should be as dry and as cool as possible. Adequate clearance should be allowed for the connections to the rear and for proper ventilation of the linear amplifier.

3. EXTERNAL CONNECTIONS

A. RF Output (to antenna through antenna changeover relay): The linear amplifier is equipped with an 83-1R coaxial receptacle and mating connector, on the rear of the chassis, for use with 52 ohm coaxial cable output. If balanced feedlines are used, they should be connected through a balun or antenna tuner. The balun or antenna tuner is then connected to the transmitter output with 52 ohm coaxial cable. If the feedline shows an appreciable reactance at the transmitter, it may be impossible to load it properly. In that case, changing the length of the feedline a few feet at a time or tuning the antenna tuner will alleviate the problem.

CAUTION: Do not operate this equipment without a proper external load. Excessive RF voltages may develop which might cause the components to break down.

B. RF Input: An 83-1R coaxial receptacle and mating connector on the rear of the chassis should be connected to the output of the exciter to be used. A 52 ohm coaxial cable (RG-8/U, RG-58/U, etc.) should be used.

C. Terminal Strip, Terminals 1 and 2: Terminals 1 and 2 have 117 volts AC present when the High Voltage Plate Switch is ON. They are to be used for "Hi-Lo" power operation as described in Section III, Paragraph 4, and Figure 1.

D. Terminal Strip, Terminals 3 and 4: Terminals 3 and 4 are connected to the bias switching relay in the SSB-1000F and must have 117 volts AC applied to them when the exciter is in the Transmit position. See Figure 1.

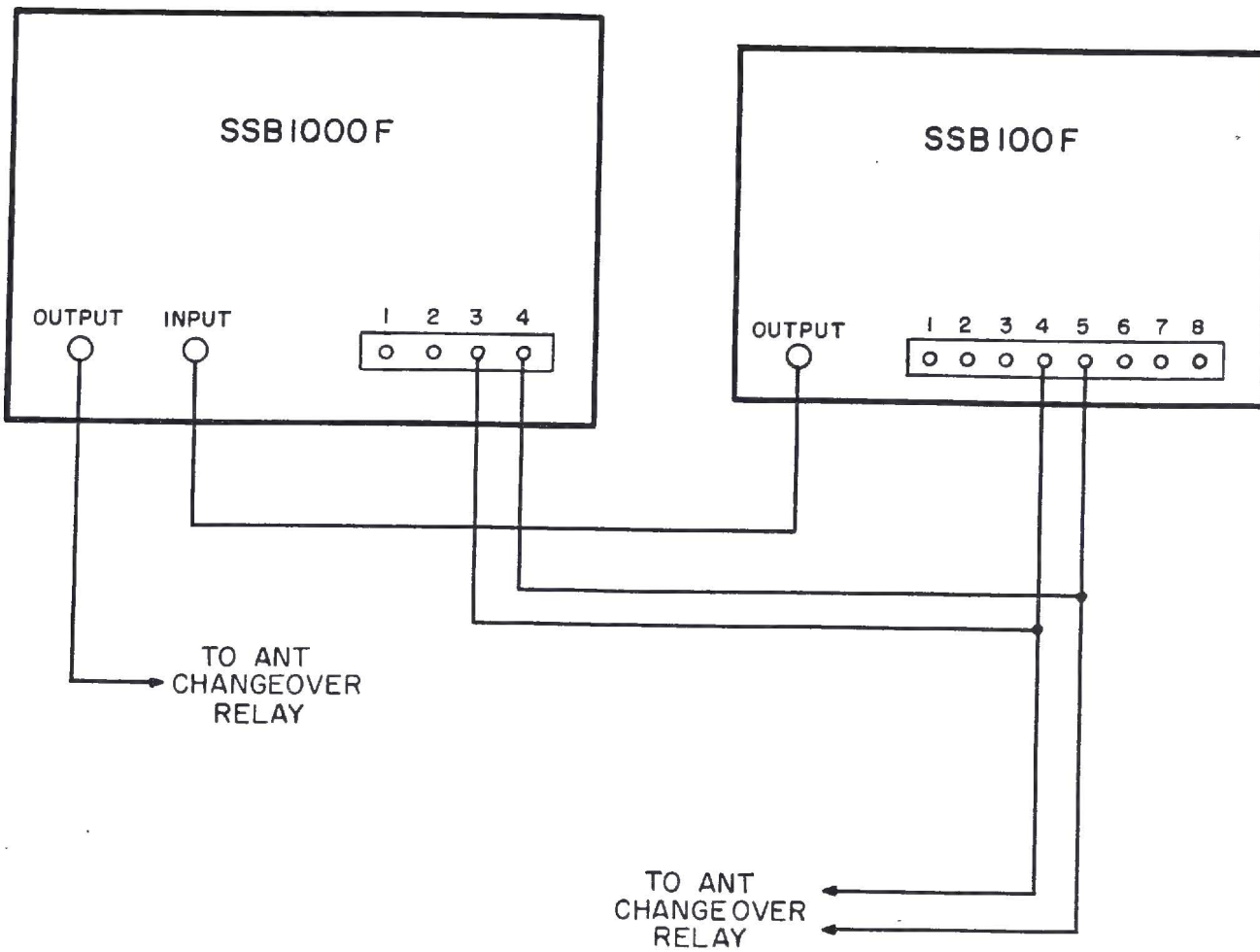


FIGURE 1

Typical Hookup

SECTION III
OPERATION

1. CONTROLS

Control	Function
Filament	In the ON position, the filaments, bias supply, blower motor and control circuits are energized.
High Voltage Plate	In the ON position, the high voltage power supply is energized providing plate and screen voltage to the amplifier and oscilloscope circuits.
Tune/Operate	In the TUNE position, reduced screen voltage is supplied to the linear amplifier reducing the plate current. In the OPERATE position, normal screen voltage is supplied to the amplifier.
Overload Reset	This push-button switch resets the overload relay to return plate and screen voltage to the amplifier.
Band Change	This switch selects the desired frequency range.
Plate Tuning	Resonates the plate circuit of the amplifier. The capacity of this control increases clockwise.
Loading	This control adjusts the amount of coupling between the plate circuit of the amplifier and the antenna. The capacity of this control increases clockwise.

2. INITIAL ADJUSTMENTS

It is assumed here that an exciter capable of supplying 117 volts AC in the Transmit position has been connected to the SSB-1000F as described in Section II, Paragraph 3D. If this has not been done, it will be necessary to connect jumper wires between the following terminals on the terminal strip at the rear of the SSB-1000F: Jumper #1 between Terminals 1 and 3; Jumper #2 between Terminals 2 and 4. This will energize the bias switching relay when the High Voltage Plate Switch is ON.

A. All switches should be placed in the OFF position and the tuning controls should be set at the maximum clockwise position.

B. Plug the unit into a source of 117 volt, 60 cycle, alternating current.

C. Place Filament Switch in the ON position. Allow the unit to warm up for at least 30 seconds (1 minute is preferable).

D. Place the Tune/Operate Switch in the Operate position and place the High Voltage Plate Switch ON. If an exciter is connected to the SSB-1000F, it will be necessary to put it into the Transmit position so as to energize the bias switching relay. This is not necessary if jumper wires are connected as explained above.

E. With no RF drive being supplied to the SSB-1000F, note the current indicated on the plate meter. This should be 200 Ma. If the current indicated is higher or lower than 200 Ma, the bias adjust potentiometer on the rear of the SSB-1000F should be adjusted until 200 Ma is indicated on the meter.

F. Place the Tune/Operate Switch in the Tune position.

G. The plate current should drop to 50 Ma or less.

H. A very faint spot should appear on the face of the oscilloscope tube. If no spot is visible, or if the spot is bright, it will be necessary to adjust the bias intensity potentiometer on the oscilloscope chassis. To do this, place the High Voltage Plate Switch in the OFF position and raise the cover of the SSB-1000F. Note the screwdriver adjustment on the oscilloscope chassis marked "Intensity". To make the spot brighter, turn the control clockwise; to make the spot dimmer, turn the control counterclockwise. This control should be moved a little at a time. Each time, the cover should be closed and the High Voltage Plate Switch turned ON so the oscilloscope may be checked for the proper spot brightness. This completes the initial adjustments.

3. TUNING PROCEDURE

With the completion of the initial adjustments, the SSB-1000F is ready to be tuned up and put on the air. The tune-up procedure below should be followed carefully until the operator is completely familiar with the operation of the unit.

A. Turn filaments ON and allow SSB-1000F to warm up for 30 seconds. The exciter should also be turned ON and allowed to warm up.

B. Place Tune/Operate Switch in the Tune position.

NOTE: The following instructions refer specifically to operation with the ELDICO SSB-100F Exciter. Operating with other exciters is similar.

C. Place Band Switch to desired band.

E. Leaving the High Voltage Plate Switch in the OFF position, put the exciter in the Transmit position. Tune the exciter for normal operation as into a 50 ohm dummy load.

F. When the exciter is properly tuned, reduce the Carrier Control until there is no RF drive to the SSB-1000F (Audio Gain and Carrier should be at zero). Turn the exciter Control Switch to Standby.

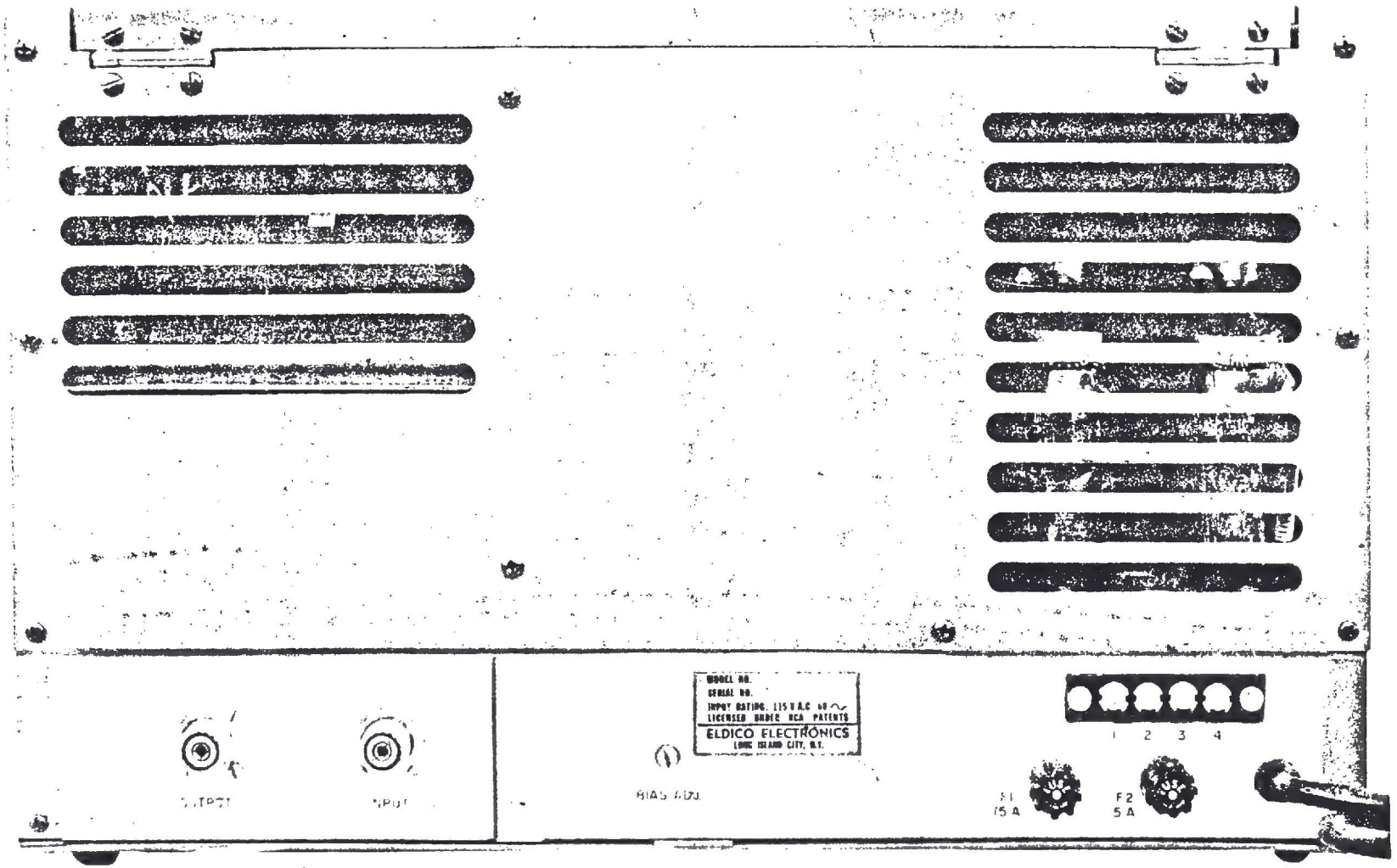


FIGURE 3

Back View

G. Place High Voltage Plate Switch in the ON position. Turn the exciter Control Switch to Transmit. Note that the plate meter on the SSB-1000F should now read approximately 30 Ma.

H. Turn the Carrier Control up only far enough to cause a spot to appear on the oscilloscope.

I. Adjust the Plate Control until the spot becomes a vertical line.

J. Turn the Carrier Control back to zero and place the Tune/Operate Switch in the Operate position. Note that the plate current on the SSB-1000F should now be approximately 200 Ma.

K. Insert enough carrier to cause the plate current meter to read about 300 Ma, and then dip the Plate Tuning Control.

L. Note the screen current and increase the carrier until approximately +15 to +20 Ma is indicated.

M. Rotate the Loading Control counterclockwise until the screen current drops to zero to -10 Ma and then adjust the Plate Tuning Control until the screen current peaks. (This will happen at the same time the plate current dips.)

N. Repeat Steps L and M until the plate current is 500 Ma with the Plate Control tuned to resonance and the screen current peaked at between zero and +10 Ma.

O. When Step N is completed, reduce the carrier to zero and use the information below for the type of operation desired.

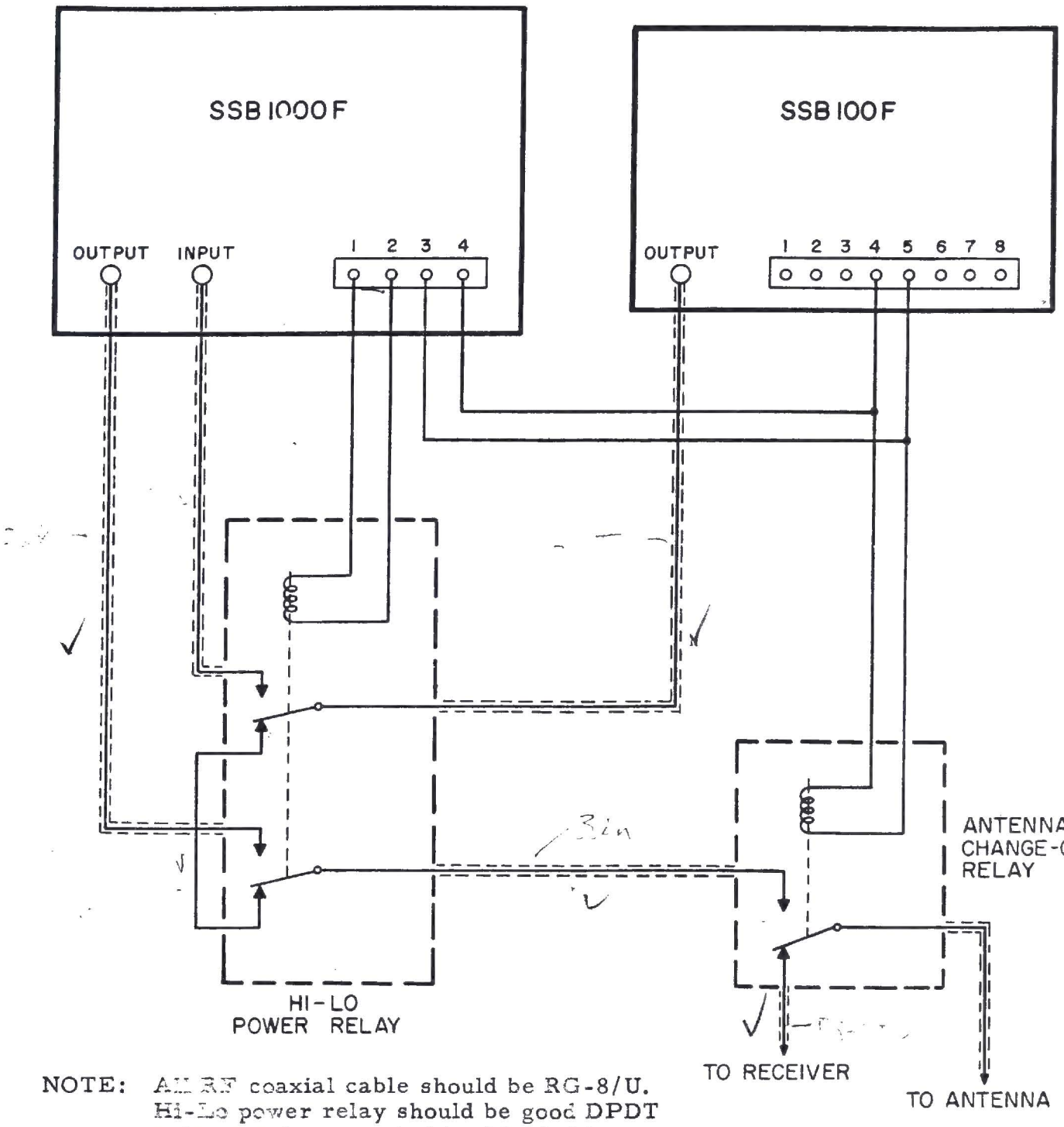
SSB: Increase the audio gain while talking into the microphone until the screen current meter kicks up to between zero and +10 Ma on modulation peaks, and the oscilloscope pattern is similar to Figure 2.

AM: Increase the Carrier Control until 300 Ma is indicated on the plate current meter. Increase the audio gain while talking into the microphone until the pattern on the oscilloscope just forms a complete trapezoid. (See Figure 2.)

CW: Increase the Carrier Control with the key closed until the plate current is 400 Ma.

The SSB-1000F is now tuned up and is ready for operation.

It will have been noted during the above tune-up procedure that the screen current peaks at the same place the plate current dips, when the Plate Control is tuned through resonance. This relationship between the plate and screen current makes tuning the SSB-1000F simple even though the amplifier is heavily loaded and the plate current dip is barely noticeable. For precise tuning, the screen current peak should always be used as the indication of resonance rather than the dip of the plate current.



NOTE: All RF coaxial cable should be RG-8/U. Hi-Lo power relay should be good DPDT antenna relay mounted in shielded box or two coaxial relays.

FIGURE 4

Hi-Lo Power Wiring

4. "HI-LO" POWER OPERATION

The SSB-1000F, when used with the ELDICO SSB-100F or similar exciter, may be switched in or out of operation, allowing high power (one kilowatt) or low power (100 watts) to be used at the discretion of the operator. When the Plate Switch is on, 117 volts AC is available at Terminals 1 and 2 on the rear of the SSB-1000F. This voltage may be used to switch the input and output of the SSB-1000F into or out of the circuit with the SSB-100F by using a pair of coaxial relays or a DPDT, high quality antenna relay as shown in Figure 2.

If an antenna relay is used, it should be mounted in a completely enclosed box and care should be taken to insure that all leads in the box are as short as possible. The following tune-up procedure should be followed for this type of operation.

A. With the Plate Switch of the SSB-1000F in the OFF position, tune the SSB-100F into the antenna.

NOTE: A good match is necessary between the SSB-100F and the antenna. Otherwise, the SSB-100F tuning will change when going from "Lo" to "Hi".

B. Refer to the normal tuning procedure (Paragraph 3 of this Section), and tune up the SSB-1000F starting at Step F. Do not retune the exciter.

C. When the SSB-1000F is properly tuned, leaving the Plate Switch OFF connects the SSB-100F directly to the antenna. Turning the Plate Switch ON connects the SSB-100F to the input of the SSB-1000F and the output of the SSB-1000F to the antenna.

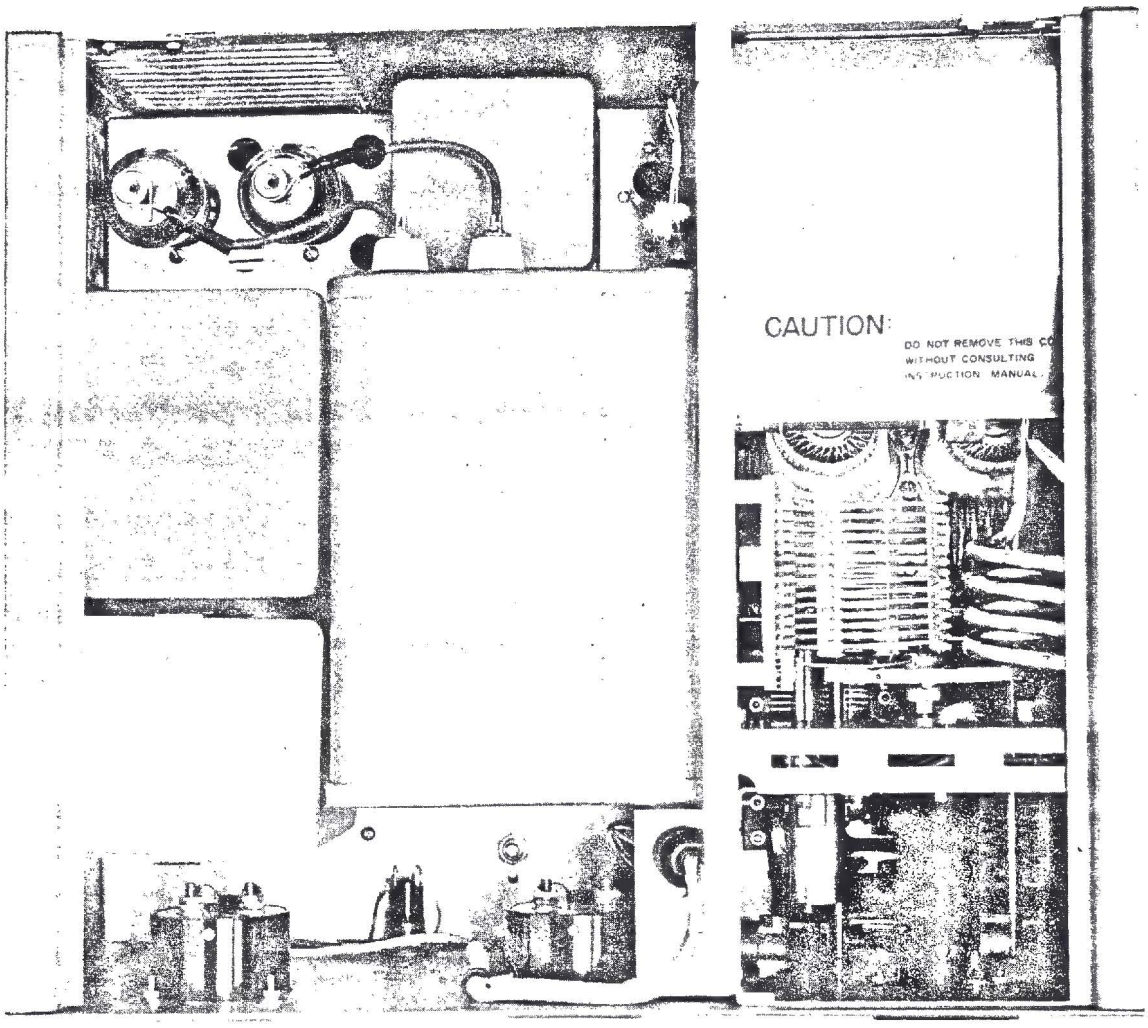


FIGURE 5

Top View with Cabinet in Place

SECTION IV

THEORY OF OPERATION

1. GENERAL

A linear amplifier, unlike a Class C amplifier stage where the output voltage stays almost constant over a wide range of changes in grid excitation, has to give faithful reproduction of the input signal. In other words, the output voltage must be exactly proportional to the input voltage. Three classes of operation can be used for linear amplifiers. They are Class A, Class B and Class AB1. Each class has its own advantages and disadvantages.

Class A operation gives the best linearity, but the efficiency is theoretically limited to 50% at maximum output. Therefore, in the case of high power linear amplifiers, Class A would be uneconomical.

Class B amplifiers have very good efficiency at maximum output, approaching Class C amplifiers (78.5%). However, distortion products are quite high. Also, the Class B amplifier usually reflects a varying dynamic load to the driver stage, which necessitates excellent driver regulation.

Class AB1 operation avoids all the problems of Class B operation, giving only slightly increased distortion products over Class A operation, while the efficiency approaches that of Class B.

There is also an apparent difference in efficiency of linear amplifiers depending on the type of service. It has been stated that linear amplifiers operated on AM are limited to an efficiency of 33-1/3%. This is not entirely correct. It would be more proper and less confusing to state that the efficiency of a linear amplifier at AM carrier level is 50% of the peak efficiency. In the case of AB1 operation, this is limited to about 70% and occurs at the peak of the modulation envelope. Thus, the efficiency of a linear amplifier is proportional to the amount of excitation, being zero for zero excitation and about 70%, in the case of the SSB-1000F, at the point where the tube is just about starting to draw grid current.

For CW operation, the efficiency will be about 70%, since the tube can be run at top level because the input is a steady signal. On AM, however, where the tube has to be capable of following the upward swing of the modulated envelope, the drive level on the carrier has to be reduced to the point where the efficiency at the unmodulated carrier level is about 50% of the peak efficiency of which the amplifier is capable.

On single sideband (suppressed carrier), efficiency considerations are of little importance since the average signal level is very low. Therefore, the average plate dissipation is also very low.

For a more detailed discussion of these facts, refer to the February 1956 issue of QST; "Linear Amplifiers for AM".

2. CIRCUIT DESCRIPTION

A. RF Section

Grid Box - Two 4CX300A (V1, V2) radial beam power tetrodes are connected in parallel in a conventional grounded cathode configuration. A 50 ohm, 50 watt, non-inductive resistor bank is used instead of a conventional tuned grid circuit. This resistor bank acts as a 50 ohm dummy load for the exciter and insures a constant input impedance of the SSB-1000F at all frequencies. The 4CX300A amplifier tubes are biased for Class AB1 operation, and, as a result, no grid current is drawn. The driving voltage for the amplifier grids is taken from the 50 ohm load resistor. Bias for the tubes is fed in parallel with the resistive grid circuit, the bias voltage being kept out of the 50 ohm resistors by blocking capacitor. As a result of the excellent inter-electrode shielding in the 4CX300A and the 50 ohm resistive loading in the grid, neutralization is not necessary. Parasitic suppressors are incorporated in the grid lead to each tube to prevent V.H.F. parasitic oscillations. The screen grids obtain their operating voltage through an RC decoupling network, and bypass capacitors are incorporated in the tube sockets.

A 6AL5 (V3) dual diode is used as an oscilloscope horizontal deflection detector and oscilloscope intensification rectifier. Capacitive voltage dividers are used to apply the correct RF voltages to the two diode sections. The diode used to detect the envelope of the incoming signal uses a variable piston type trimmer capacitor in the voltage divider so that the voltage can be adjusted to provide the proper horizontal sweep voltage to the oscilloscope. The diode section, used for deriving the necessary positive bias voltage to unblank the oscilloscope, uses a fixed capacitive divider.

Plate Tank Circuit Assembly - A pi-network is used for the tank circuit to insure good harmonic suppression and proper loading of the amplifier. The plate tank coil is divided into three sections with taps on the mid-frequency and low frequency sections. On the 80 meter band, all three sections are connected in series. As the plate tank circuit is changed to each higher band, the band switch taps the plate tank coil to provide the correct inductance for each band and the unused portions of the plate tank coil are shorted out.

The plate tuning capacitor is used to resonate the tank circuit and is controlled by a knob on the front panel which drives the capacitor through a special planetary drive reduction unit. The loading capacitor is composed of two separate variable capacitors connected in parallel. The shafts of the loading capacitors are driven together by means of a bead chain and are controlled from the front panel by a drive reduction unit which is similar to that used on the plate tank capacitor.

On the 80 meter band, an additional 400 mmfd fixed mica capacitor is switched into the loading circuit to supply the extra capacity necessary to insure proper loading into a 50 ohm load.

B. Oscilloscope Chassis

A 1CP1 (V5) cathode ray tube is used to continuously monitor the signal being amplified in the SSB-1000F so that the operator is always aware of the

quality of the signal. The pattern displayed on the oscilloscope tube is in the form of a trapezoid (see Figure 2). This is produced by applying a signal derived from the envelope of the driving signal from the exciter to the horizontal deflection plates. At the same time, RF voltage from the plate tank circuit is applied to the vertical plates. The linearity of the amplifier is thus indicated by the shape of the pattern.

The horizontal signal is taken from the 6AL5 (V3) detector in the amplifier grid circuit and amplified by a 6AU6 (V4) voltage amplifier. Plate voltage to operate the 6AU6 is regulated by V.R. tubes in the power supply and the screen voltage is in turn regulated by an NE-23 neon lamp. The amplified signal is then applied to the horizontal deflection plates of the oscilloscope by a special high voltage coupling capacitor.

The vertical signal for the oscilloscope is taken directly from the plate tank circuit through a special coupling capacitor. A positive voltage is applied to the cathode of the 1CP1 so that sufficient cathode bias is present to cut off the oscilloscope tube to prevent any display until a signal is present in the grid circuit of the amplifier. This signal is rectified by one of the diode sections of the 6AL5 to produce a positive voltage. This voltage is applied to the control grid of the 1CP1, thus causing the pattern to be intensified so that it can be easily seen even with high ambient light levels. A potentiometer which varies the cathode bias voltage on the 1CP1 is used to adjust the intensity of the oscilloscope pattern.

C. Power Supply

The power supply contained in the SSB-1000F delivers the following voltages to the various circuits:

+2500 volts at 500 Ma
+405 volts at 30 Ma
+300 volts at 30 Ma
-125 volts bias
-55 volts bias

The high voltage plate supply (+2500 volts) is a conventional full-wave power supply using two 866AX (V9, V10) mercury vapor rectifier tubes. A 4-to-24 henry swinging choke and a 10 mfd, oil filled capacitor filter the output of the power supply.

Bleeder resistors are used to draw enough current from the supply to insure proper operation of the swinging choke and to drop the voltage to supply the OB2 (V6) and OA2's (V7, V8) gaseous voltage regulator tubes for the +405 and +300 volt outputs. The +2500 volts is also dropped through the bleeder resistors to supply +850 volts for the 1CP1 oscilloscope.

The bias supply (-125 and -55 volts) uses a full-wave selenium rectifier and is filtered with large electrolytic capacitors. The -55 volts is only approximate as this voltage is adjustable with the bias adjustment potentiometer mounted on the rear of the unit and should be set to allow the amplifier tubes to draw their correct idling current.

Meters are incorporated in both the high voltage plate and screen supplies. The plate current meter is connected in the negative lead of the +2500 volt supply while the screen current meter is connected in series with the output of the screen supply. The screen voltage is dropped from +405 to +300 for tune-up purposes.

D. Control Circuits

The control circuits in the SSB-1000F completely control all functions of the power supply. A heavy duty relay is used to control the power input to the high voltage plate power transformer. This relay is interconnected with the interlock circuits as well as the overload circuits so that there is no voltage present when either of these is activated. A microswitch, operated by the top cover of the cabinet is used for the interlock circuit. The overload circuit uses two relays to provide fool-proof protection. A current operated DC relay has its coil connected in series with the negative side of the high voltage plate supply. The contacts on this relay, when closed, energize a 117 volt AC relay whose contacts are arranged to keep the relay closed until the overload reset push-button is operated, or until the plate power switch is turned off. When this relay is energized, it opens the circuit which operates the power relay in the plate supply.

A potentiometer is connected in parallel with the DC current overload relay so that the pull in current can be adjusted.

A bias switching relay is also incorporated so that when the exciter used with the SSB-1000F is in the Standby position, cut-off bias (-125 volts) is applied to the amplifier tubes. When this relay is energized by 117 volts AC from the exciter in the Transmit position, normal operating bias is applied to the tubes.

The coil of the bias switching relay is connected to Terminals 3 and 4 on the terminal strip on the rear of the unit and must have 117 volts AC applied for operation of the unit. The 117 volts AC is available on Terminals 1 and 2 of the terminal strip. When the high voltage plate supply is ON, these terminals may be used to operate the bias switching relay if no 117 volt AC is available from the exciter. Voltage from these terminals may also be used to operate a "Hi-Lo" power switching setup as illustrated in Section III, Paragraph 4.

SECTION V

MAINTENANCE

1. PREVENTIVE MAINTENANCE

Preventive maintenance is work performed on equipment to keep it in good working order so that breakdowns and needless interruptions in service will be kept to a minimum. Preventive maintenance differs from troubleshooting and repair. Its object is to prevent certain troubles before they occur. The list below presents a maintenance program which should be followed at least once a month.

A. Clean dirt and moisture from all exposed items.

B. Inspect controls for binding, scraping, excessive looseness and positive action.

C. Inspect cords, cables, wire and mounts for cuts, breaks, fraying, deterioration, kinks and strain.

D. Inspect equipment for looseness of accessible items such as switches, knobs, jacks, connectors, transformer, relays, capacitors and pilot lights.

E. Inspect seating of readily accessible items such as tubes, lamps, fuses, connectors and all other plug-in items.

F. Check tubes, lamps, and other plug-in items for bent or corroded pins.

G. Inspect resistors, bushings and insulators for cracks, chipping, blistering, discoloration and dust.

H. Inspect all screw-type terminals for loose connections, cracks and breaks.

J. Inspect transformer, chokes (and fixed capacitors) for overheating and oil leakage.

2. SERVICING

If the SSB-1000F is used according to this manual, little or no maintenance should be required to keep the unit in good operating condition at all times. Other than keeping the unit dry and free of dust, the blower bearings and the voltage regulator tubes are the only things requiring periodic check-ups. In normal use, the blower bearings should be oiled with one or two drops of oil about every six months. These bearings are made of porous bronze, so they can lubricate for a considerable length of time. Any good household utility oil will serve the purpose. The oilers are located behind the final plate circuit and can be reached from the top of the unit. (See Figure 6.)

The voltage regulator tubes should be checked periodically for their ability to regulate voltages, since aging causes an increase in their internal resistance.

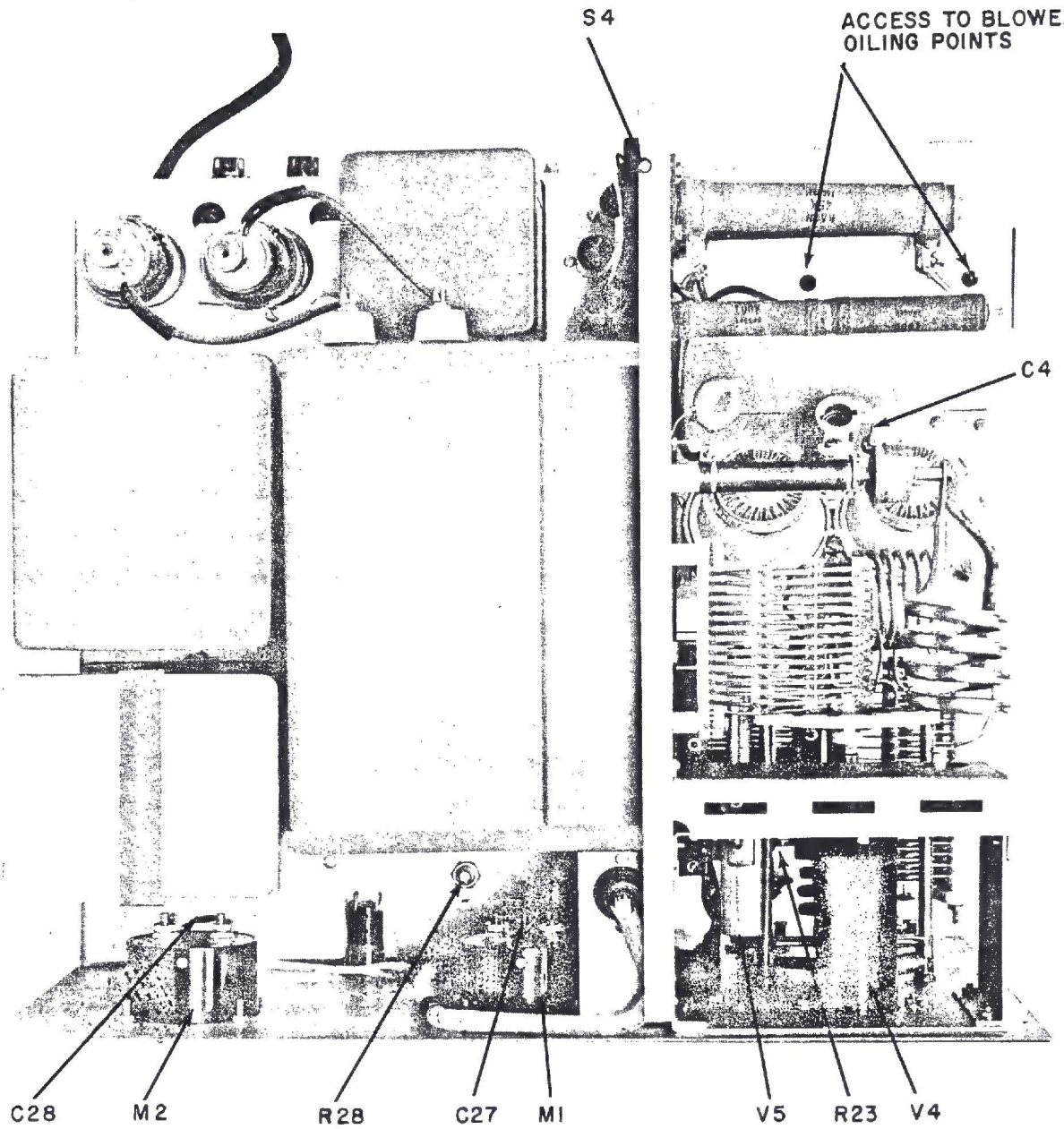


FIGURE 6

Top View with Cabinet and Shields Removed

The nominal screen voltage is 405 volts, and if the screen voltage is found to be more than 20 volts higher, the voltage regulator tubes should be replaced. Should component failure occur, a list of voltages at various points is of great assistance in locating the source of trouble. A voltage chart for this purpose will be found at the end of this section.

3. FACTORY SERVICE

If the trouble experienced is of a complex nature, and cannot be cured with ordinary measures, it is suggested that a letter be sent to the factory giving the following information:

A. Item, type number, and serial number of the equipment.

B. From whom the item was purchased and date of delivery.

C. Date on which equipment was placed into service and total number of houses of service.

D. Nature of trouble and cause (if known).

E. Remarks.

If necessary, authorization will be given to return the equipment to the factory for servicing. Refer to the Warranty at the front of the manual for further details in regard to returning equipment to the factory.

4. TROUBLESHOOTING PRECAUTIONS

Great care should be exercised if and when any troubleshooting becomes necessary. While troubleshooting is being done on the SSB-1000F, remember that with the unit connected to a source of power, lethal voltages are present in the various circuits. NEVER work on the SSB-1000F alone! Have someone on hand who can take action to remove the power from the unit and assist the person doing the servicing if this should be necessary.

VOLTAGE CHART

TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V1 4CX300	Plate 2600VDC	Screen 300VDC	Grid -45DC	Cathode 0	Fil. 6.3VAC	-	-	-
V2 4CX300	Plate 2600VDC	Screen 300VDC	Grid -45DC	Cathode 0	Fil. 6.3VAC	-	-	-
V3 6AL5	.25VDC	0	0	6.3VAC	.25VDC	0	0	-
V4 1CP1	6.3VAC	840VDC	770VDC	770VDC	Neg. 0-6.5VDC	770VDC	0-34VDC	0
V5 6AU6	0	0	6.3VDC	0	170VDC	65VDC	1.3VDC	-
V6 OB2	420VAC	310VDC	310VDC	310VDC	420VDC	180VDC	310VDC	-
V7 OA2	155VDC	-	-	-	155VDC	0	0	-
V8 OA2	310VDC	150VDC	115VDC	155VDC	310VDC	115VDC	155VDC	-
V9 866AX	2600VDC	Plate 2750VAC	-	2600VDC	-	-	-	-
V10 866AX	2600VDC	Plate 2750VAC	-	2600VDC	-	-	-	-

Control Positions: Fil - ON; H.V. -OFF; Tune Switch - OPER; Band Switch - 15 Meters

RESISTANCE CHART

TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9	Pin 10	Pin 11
V1 4CX300	Plate 220K	Screen 200K	Grid 5K	Cathode 0 ohms	-	-	-	-	-	-	-
V2 4CX300	Plate 220K	Screen 220K	Grid 5K	Cathode 0 ohms	-	-	-	-	-	-	-
V3 6AL5	520K	0 ohms	0 ohms	.1 ohms	500K	0 ohms	0 ohms	-	-	-	-
V4 1CP1	.1 ohm	1M	3.5M	3.5M	1M	3.5M	0-100K	0 ohm	-	-	-
V5 6AU6	500K	0 ohm	.1 ohm	0 ohm	600K	700K	1.1K	-	-	-	-
V6 OB2	220K	320K	320K	270K	220K	Inf.	320K	-	-	-	-
V7 OA2	Inf.	.2 ohm	Inf.	.2 ohm	Inf.	Inf.	.2 ohm	-	-	-	-
V8 OA2	240K	Inf.	Inf.	Inf.	140K	Inf.	Inf.	-	-	-	-
V9 866AX	220K	-	-	220K	-	-	-	-	-	-	-
V10 866AX	220K	-	-	220K	-	-	-	-	-	-	-
Plug 1	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	-	-
Plug 2	1.5 ohm	700K	Inf.	Inf.	Inf.	27K	0 ohm	-	-	-	-
TB1	Inf. to Gnd. .2 ohm		Inf. to Gnd. 1.2K		-	-	-	-	-	-	-
TS1	0 ohm	.1 ohm	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	1.4K	5K	5K

Control Positions: Fil - ON; H.V. - OFF; Tune Switch - OPER; Band Switch - 15 Meters

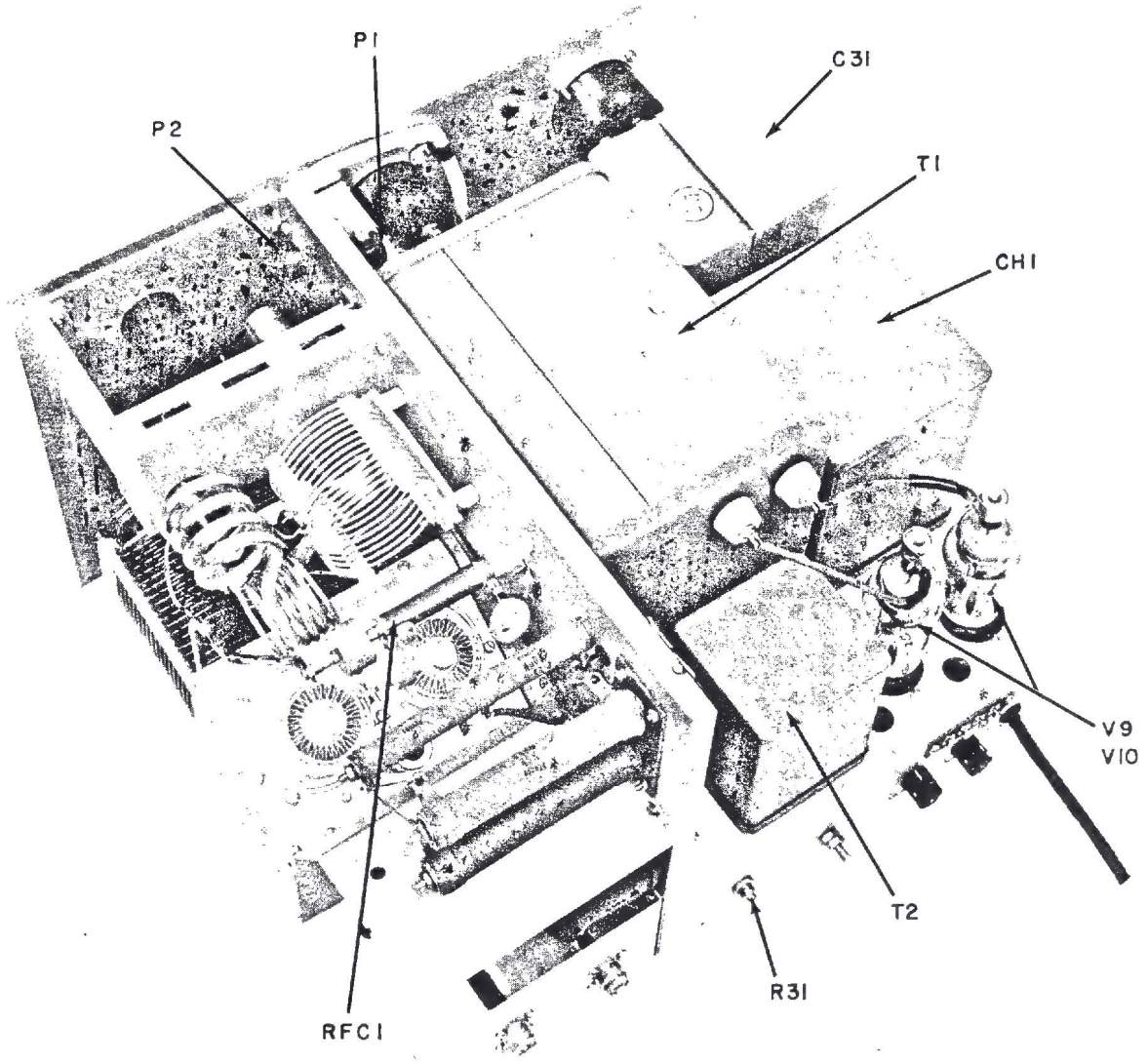


FIGURE 7

Three-Quarters Rear View with Cabinet and Shield Removed

SECTION VI

PARTS LIST

PART NO.	DESCRIPTION	LOCATION Fig. #	Grid
C1	Capacitor, .001 mfd disc ceramic	10	D6
C2	Capacitor, .0033 mfd, 3 KV disc ceramic	8	-
C3	Capacitor, 3.3 mmf, tubular ceramic	10	E6
C4	Capacitor, 0.5-5 mmf piston trimmer	10	H5
C5	Capacitor, 3.3 mmf tubular ceramic	10	D7
C6	Capacitor, .01 mf disc ceramic	10	G10
C7	Capacitor, .01 mf disc ceramic	10	H4
C8	Capacitor, 500 mmf, 12.5 KV molded ceramic	8	-
C9	Capacitor, 250 mmf variable air	8	-
C10	Capacitor, .0004 mf, 2500 V mica	8	-
C11	Capacitor, 1040 mmf variable air (2x520 mmf)	8	-
C12	Capacitor, .01 mf disc ceramic	10	F4
C13	Capacitor, .01 mf disc ceramic	10	F9
C14	Capacitor, .01 mf disc ceramic	10	G7
C15	Capacitor, .003 mf, 2 KV disc ceramic	11	E5
C16	Capacitor, .025 mf disc ceramic	11	E4
C17	Capacitor, .01 mf disc ceramic	11	D9
C18	Capacitor, 10 mf, 50 V electrolytic	11	E10
C19	Capacitor, .025 mf disc ceramic	11	E3
C20	Capacitor, .02 mf (2x. 01) disc ceramic	11	C8
C21	Capacitor, .025 mf disc ceramic	11	E3
C22	Capacitor, .01 mf, disc ceramic	11	C6
C23	Capacitor, .02 mf (2x. 01), 1600V disc ceramic	11	D3
C24	Capacitor, coupling, special	11	B2
C25	Capacitor, .01 mf disc ceramic	11	E5
C26	Capacitor, .01 mf disc ceramic	11	B11
C27	Capacitor, .01 mf disc ceramic	6	-
C28	Capacitor, .01 mf disc ceramic	6	-
C29	Capacitor, 16 mf, 450 V, electrolytic	9	-
C30	Capacitor, 16 mf, 450 V, electrolytic	9	-
C31	Capacitor, 10 mf, 2500 V, oil	7	-
C32	Capacitor, 500 mf, 15 V, electrolytic	9	-
C33	Capacitor, .003 mf, 2 KV disc ceramic	9	-
C34	Capacitor, .003 mf, 2 KV disc ceramic	9	-
C35	Capacitor, 16 mf, 450 V, electrolytic	9	-
C36	Capacitor, 50 mf, 150 V, electrolytic	9	-
R1	Resistor, 50 ohm, 50 watt non-inductive (5-250 ohm, 10 watt in parallel)	In Grid Box	
R2	Resistor, 1K ohm, 1/2 watt, carbon	10	D6
R3	Resistor, 47 ohm, 1 watt, carbon	10	C5
R4	Resistor, 47 ohm, 1 watt, carbon	10	C8
R5	Resistor, 47 ohm, 1 watt, carbon	10	H3
R6	Resistor, 47 ohm, 1 watt, carbon	10	G5
R7	Resistor, 470K ohm, 1/2 watt, carbon	10	H7

PART NO.	DESCRIPTION	LOCATION Fig. #	Grid
R8	Resistor, 10K ohm, 1/2 watt, carbon	10	G8
R9	Resistor, 470K ohm, 1/2 watt, carbon	10	G10
R10	Resistor, 45K ohm, 50 watt, wire wound	8	-
R11	Resistor, 20K ohm, 50 watt, wire wound	8	-
R12	Resistor, 100K ohm, 25 watt, wire wound	8	-
R13	Resistor, 100K ohm, 25 watt, wire wound	8	-
R14	Resistor, 1 meg ohm, 1 watt, carbon	11	G4
R15	Resistor, 270K ohm, 1/2 watt, carbon	11	C7
R16	Resistor, 470K ohm, 1/2 watt, carbon	11	B11
R17	Resistor, 22K ohm, 1/2 watt, carbon	11	B8
R18	Resistor, 150K ohm, 1/2 watt, carbon	11	B7
R19	Resistor, 120 ohm, 1/2 watt, carbon	11	E7
R20	Resistor, 1000 ohm, 1/2 watt carbon	11	F5
R21	Resistor, 470K ohm, 1/2 watt, carbon	11	B6
R22	Resistor, 680K ohm, 1 watt, carbon	11	E6
R23	Potentiometer, 100K ohm, 2 watt	6	-
R24	Resistor, 2.2 meg ohm, 1/2 watt, carbon	11	B5
R25	Resistor, 2.2 meg ohm, 1/2 watt, carbon	11	D7
R26	Resistor, 2.2 meg ohm, 1/2 watt, carbon	11	B4
R27	Resistor, 120 ohm, 1 watt, carbon	9	-
R28	Potentiometer, 40 ohm, 5 watt, wire wound	9	-
R29	Resistor, 470 ohm, 1 watt, carbon	9	-
R30	Resistor, 47 ohm, 2 watt, carbon	9	-
R31	Potentiometer, 5K ohm, 25 watt, wire wound	7	-
R32	Resistor, 470K ohm, 1/2 watt, carbon	9	-
RFC1	Choke, RF, plate, special	7	-
RFC2	Choke, RF, 1 mh, 500 Ma	8	-
RFC3	Choke, RF, 2.5 mh	10	D6
L1a	Coil, high frequency plate tank	8	-
L1b	Coil, medium frequency plate tank	8	-
L1c	Coil, low frequency plate tank	8	-
L2	Parasitic suppressor, wound on R3	10	C5
L3	Parasitic suppressor, wound on R4	10	C8
K1	Relay, current operated overload	9	-
K2	Relay, high voltage, 117 VAC coil	9	-
K3	Relay, overload holding, DPDT, 117 VAC coil	9	-
K4	Relay, bias switching, DPDT, 117 VAC coil	9	-
T1	Transformer, ET348, 2500 V at 500 Ma	7	-
T2	Transformer, ET314B, bias and filament	7	-
CH1	Choke, swinging, EC306A	7	-
S1	Switch, Band	8	-
S2	Switch, SPST toggle		Front Panel
S3	Switch, SPST toggle		Front Panel
S4	Switch, micro, SPST	6	-
S5	Switch, N.C. pushbutton		Front Panel
S6	Switch, SPDT toggle		Front Panel

PART NO.	DESCRIPTION	LOCATION Fig. #	Grid
I1	Neon bulb, NE51		Front Panel
I2	Neon bulb, NE51		Front Panel
I3	Neon bulb, NE23	11	D8
CR1	Selenium rectifier	9	-
M1	Meter, 0-600 Ma.		Front Panel
M2	Meter, -20/0/+30 Ma.		Front Panel
F1	Fuse, 5 Amp, 250 V	4	
F2	Fuse, 15 Amp, 250 V	4	
V1	Tube, 4CX300A		
V2	Tube, 4CX300A		
V3	Tube, 6AL5		
V4	Tube, 1CP1		
V5	Tube, 6AU6		
V6	Tube, OB2		
V7	Tube, OA2		
V8	Tube, OA2		
V9	Tube, 866AX		
V10	Tube, 866AX		

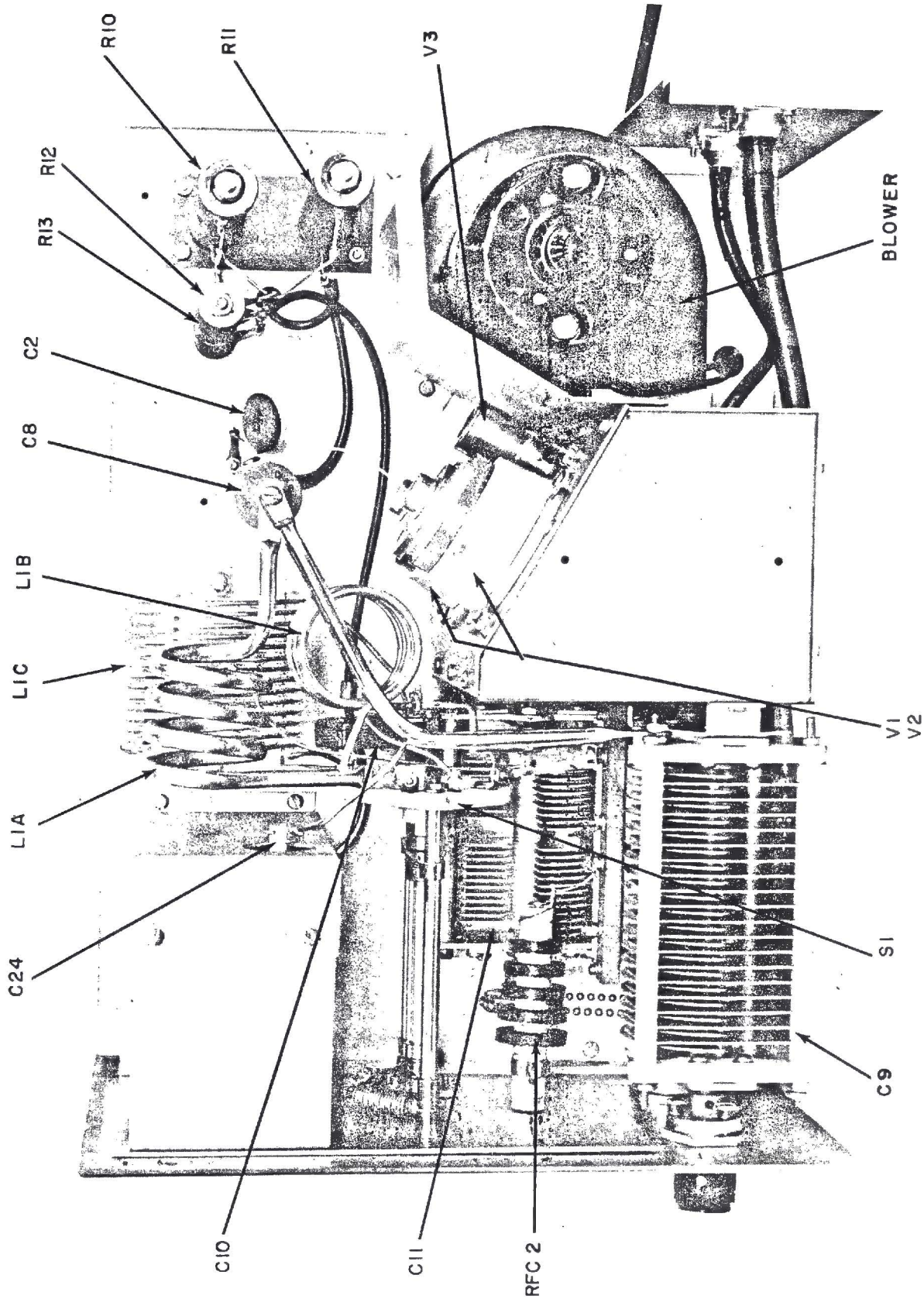


FIGURE 8

Left Side View

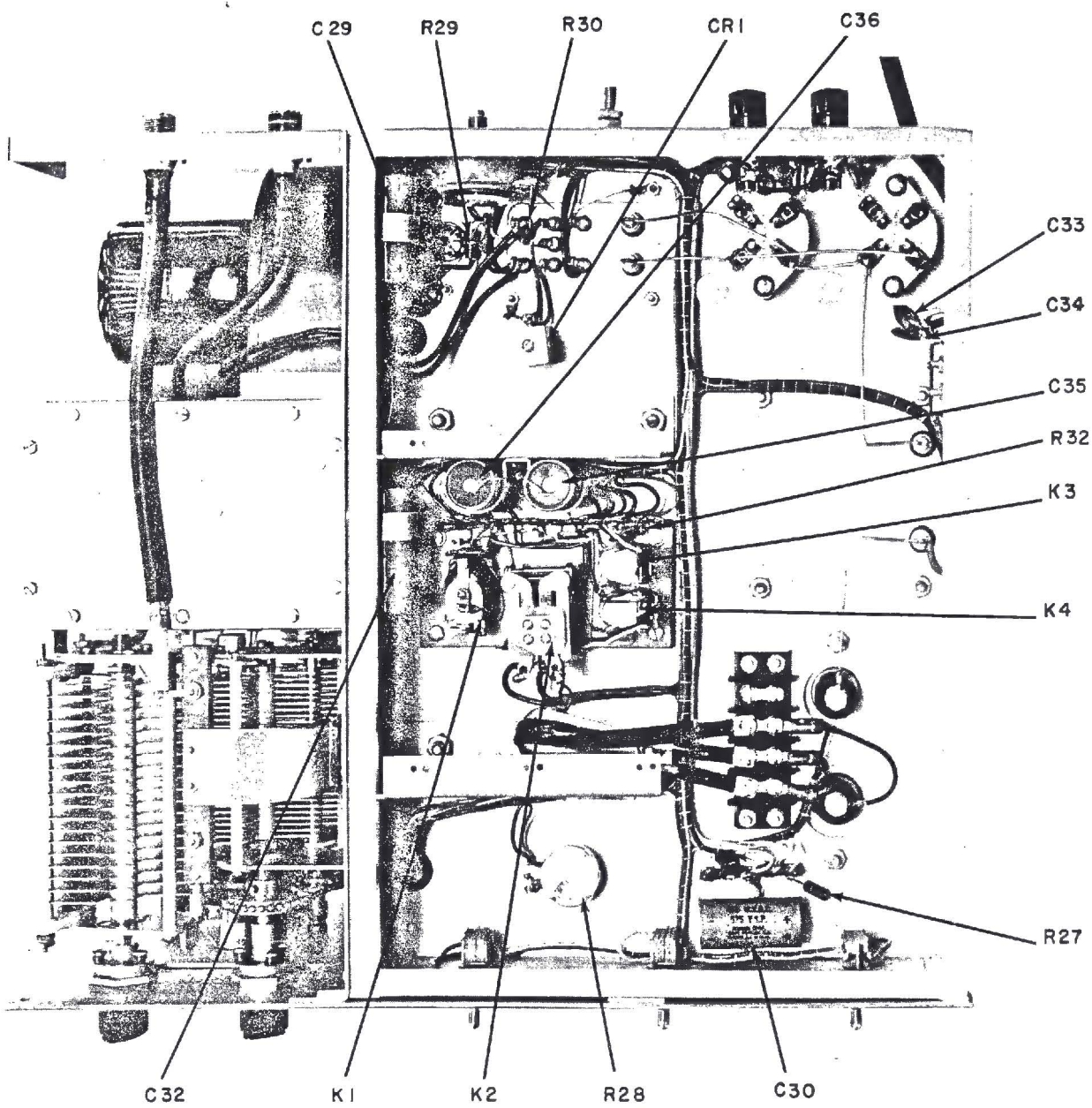


FIGURE 9
Bottom View

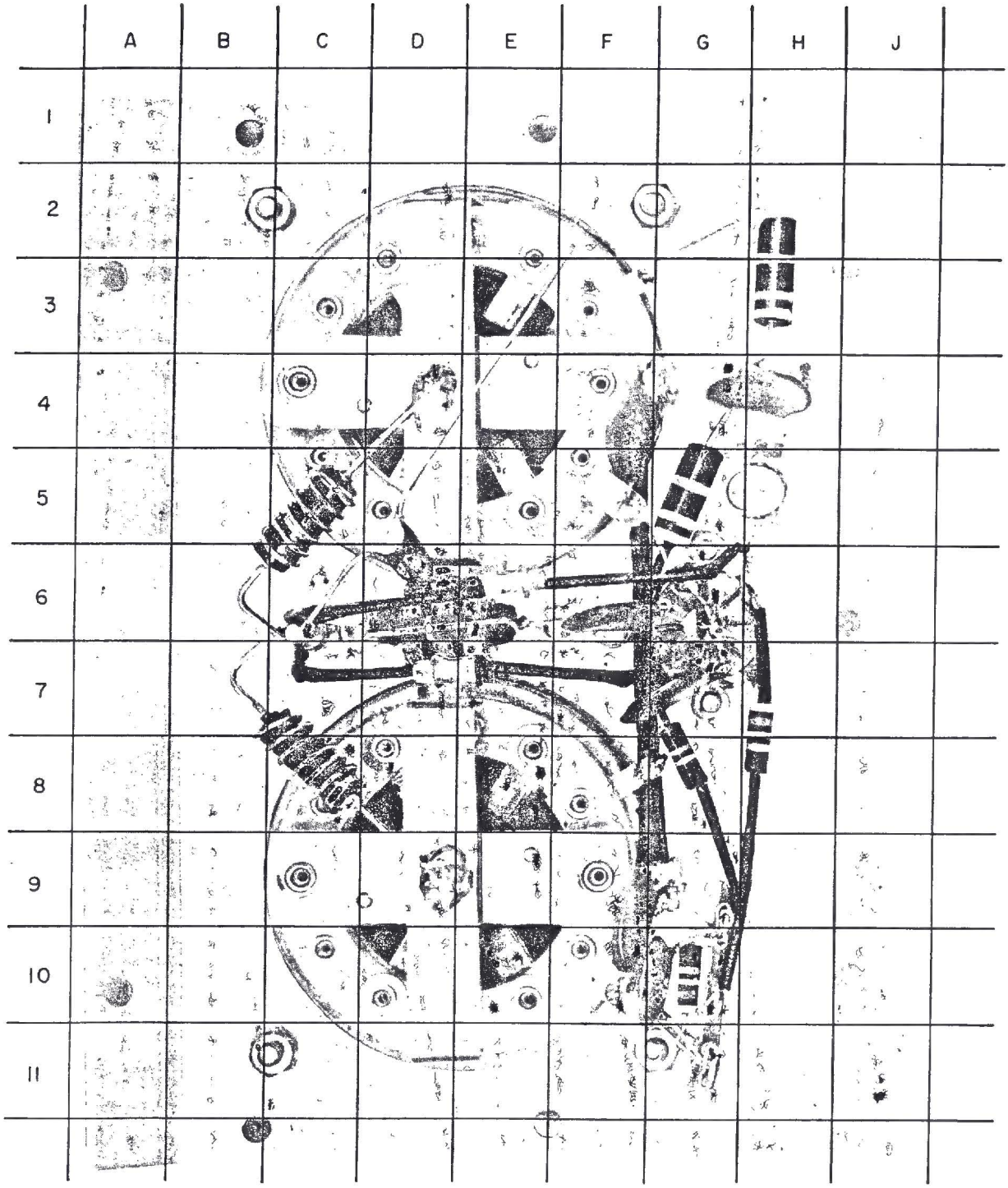


FIGURE 10

Bottom View of Grid Box Assembly

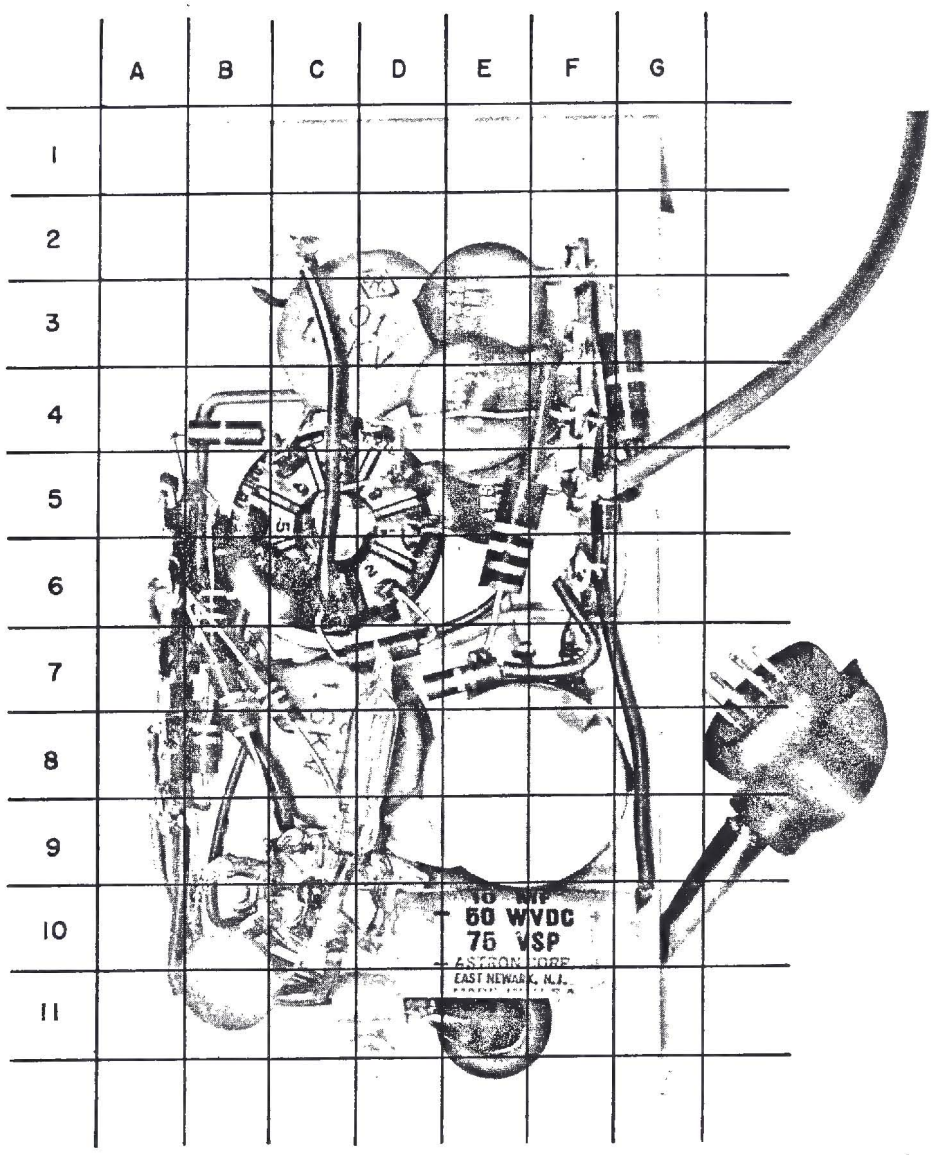
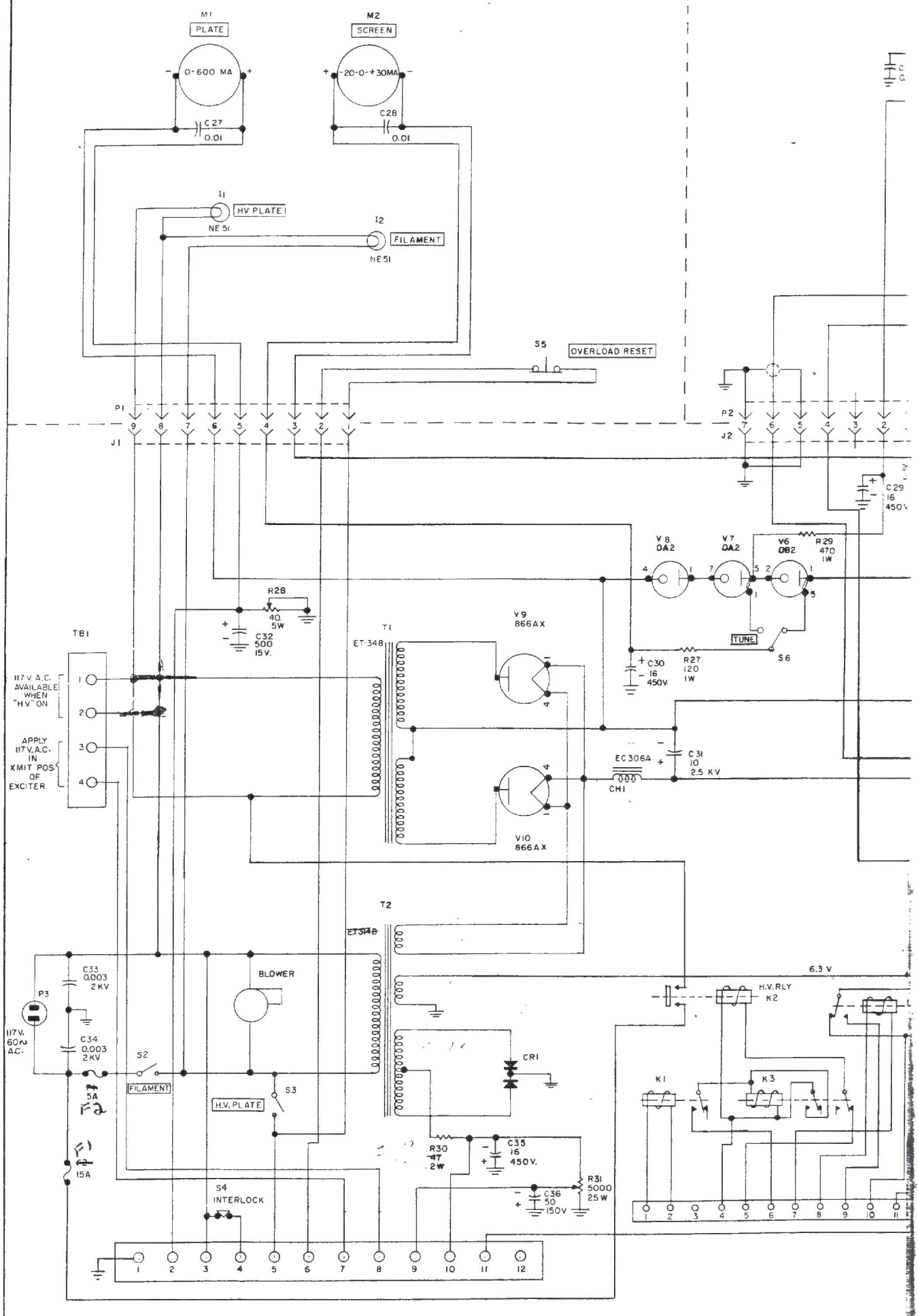
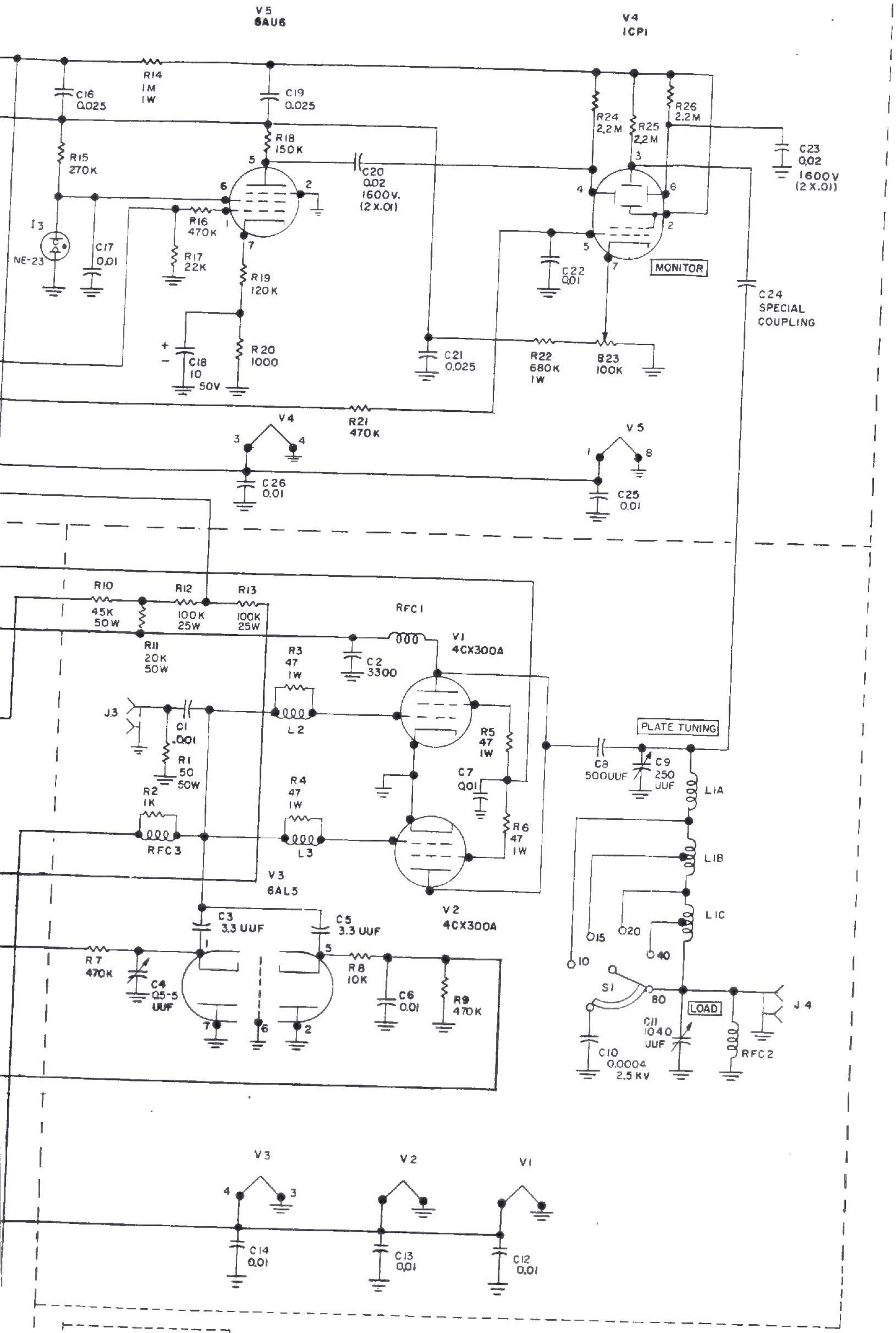
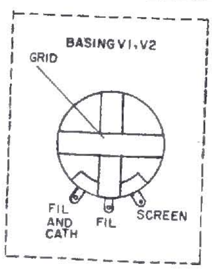


FIGURE 11

Rear View of Oscilloscope Chassis


M1
PLATE
0-600 MA
C27
0.01
M2
SCREEN
-20-0-+30MA
C28
0.01
I1
HV PLATE
NE 51
I2
FILAMENT
NE 51
S5
OVERLOAD RESET
P1
J1
P2
J2
C29
16
450V
V8
0A2
V7
0A2
V6
0B2
R29
470
1W
R28
40
5W
C32
500
15V.
TB1
117 V. A.C. AVAILABLE WHEN "H.V." ON
APPLY 117 V.A.C. IN XMIT POS OF EXCITER
T1
ET-348
V9
866AX
V10
866AX
TUNE
S6
C30
16
450V.
R27
120
1W
EC306A
CH1
C31
10
2.5 KV
T2
ET-348
6.3 V
H.V. RLY
K2
K1
K3
CR1
BLOWER
P3
117V.
60~
A.C.
C33
0.003
2KV
C34
0.003
2KV
S2
FILAMENT
5A
F2
S3
H.V. PLATE
F1
15A
R30
47
2W
C35
16
450V.
R31
5000
25W
C36
50
150V
S4
INTERLOCK

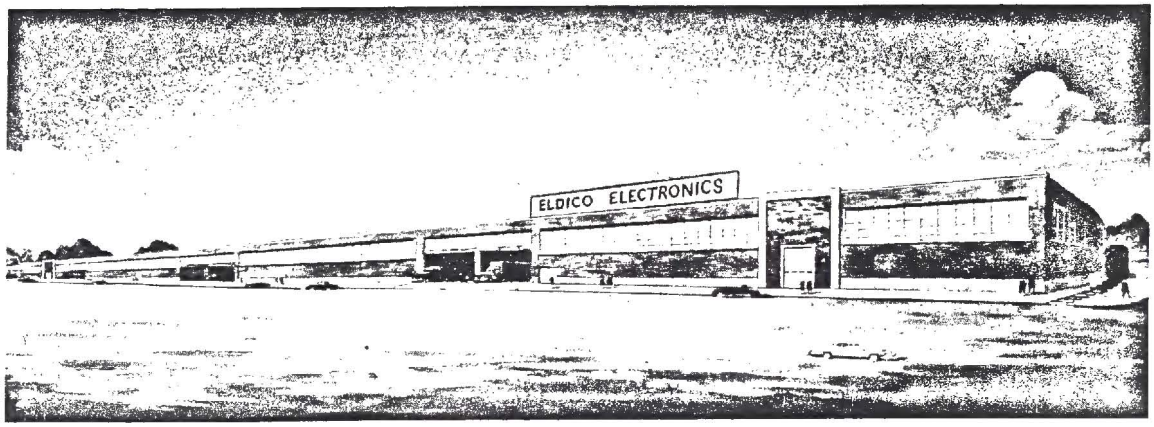




NOTE:

1) RESISTANCES ARE IN OHMS. K=1000, M=1,000,000
2) CAPACITORS ARE IN MICROFARADS UF UNLESS OTHERWISE MARKED

DRAFTSMAN	DATE	NOMENCLATURE AND DRAWING TITLE	ELDICO ELECTRONICS
CHECKER		SSB 1000 F	
ENGINEER		SCHEMATIC	
APPROVED		DIAGRAM	DWG NO. E-3497
		SCALE	WEIGHT



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