COLLINS

479U-1
SIGNAL GENERATOR

#27

INSTRUCTION BOOK

INSTRUCTION BOOK

for

479U-1 SIGNAL GENERATOR

#27

MANUFACTURED BY

COLLINS RADIO COMPANY

CEDAR RAPIDS, IOWA

TABLE OF CONTENTS

SECTION 1 - GENERAL DESCRIPTION

SECTION 2 - INSTALLATION

SECTION 3 - OPERATION

SECTION 4 - CIRCUIT DESCRIPTION

TABLE OF CONTENTS (Cont.)

SECTION 4 - CIRCUIT DESCRIPTION (Cont.)

SECTION 5 - MAINTENANCE AND SUPPLEMENTARY DATA

479U-1 LIST OF ILLUSTRATIONS.

SECTION 1 - GENERAL DESCRIPTION.

SECTION 4 - CIRCUIT DESCRIPTION.

SECTION 5 - MAINTENANCE AND SUPPLEMENTARY DATA.

SECTION 7 - ILLUSTRATIONS.

SECTION 8 - AUXILIARY EQUIPMENT.

LIST OF TABLES

SECTION 5 - MAINTENANCE AND SUPPLEMENTARY DATA

GUARANTEE

The equipment described herein is sold under the following guarantee:

Collins agrees to repair or replace, without charge, any equipment, parts or accessories which are defective as to design, workmanship or material, and which are returned to Collins at its factory in Cedar Rapids, Iowa, transportation prepaid, provided that the foregoing shall not be applicable to.

(a) Equipment or accessories as to which notice of the claimed defect is not given Collins within one year from date of delivery;

(b) Equipment and accessories manufactured by others than Collins, tubes and batteries, all of which are subject only to such adjustment as Collins may obtain from supplier thereof;

(c) Equipment or accessories which shall fail to operate in a normal or proper manner due to exposure to excessive moisture in the atmosphere or otherwise after delivery, any such failure not being deemed a defect within the meaning of the foregoing provisions.

Collins further guarantees that any radio transmitter described herein will deliver full radio frequency power output at the antenna lead when connected to a suitable load, but such guarantee shall not be construed as a guarantee of any definite coverage or range of said apparatus.

The guarantee of these paragraphs is void if equipment is altered or repaired by others than Collins.

Notice of any claimed defect must be given to Collins prior to return of any item. Such notice must give full information as to nature of defect and identification (including part number if possible) of part considered defective. Upon receipt of such notice, Collins will promptly advise respecting return of equipment. Failure to secure our advice prior to the forwarding of goods for return may cause unnecessary delay in the handling of such merchandise.

No other warranties, expressed or implied, shall be applicable to said equipment, and the foregoing shall constitute the Buyer's sole right and remedy under the agreements in this paragraph contained. In no event shall Collins have any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of the products, or any inability to use them either separately or in combination with other equipment or materials, or from any cause.

HOW TO ORDER REPLACEMENT PARTS

When ordering replacement parts, you should direct your order as indicated below and furnish the following information in so far as applicable:

Address: Collins Radio Company
Sales Service Department
Cedar Rapids, Iowa

Information Needed.

(A) Quantity required
(B) Part number of item
(C) Item number (obtain from Parts List or Schematic Diagram)
(D) Type number of unit
(E) Serial number of unit
(F) Serial number of equipment

HOW TO RETURN MATERIAL OR EQUIPMENT

If, for any reason, you should wish to return material or equipment, whether under the guarantee or otherwise, you should notify us, giving full particulars including the details listed below, in so far as applicable. Upon receipt of such notice, Collins will promptly advise you respecting the return. Failure to secure our advice prior to the forwarding of the goods or failure to provide full particularls may cause unnecessary delay in handling of your returned merchandise.

Address: Collins Radio Company
Sales Service Department
Cedar Rapids, Iowa

Information Needed.

(A) Date of delivery of equipment
(B) Date placed in service
(C) Number of hours in service
(D) Part number of item
(E) Item number (obtain from Parts List or Schematic Diagram)
(F) Type number of unit from which part is removed
(G) Serial number of unit
(H) Serial number of the complete equipment
(I) Nature of failure
(J) Cause of failure
(K) Remarks

SECTION 1

GENERAL DESCRIPTION

1-1. GENERAL

This instruction book has been prepared to aid in the operation and maintenance of the Collins Model 479U-1 Signal Generator.

1-2. PURPOSE OF EQUIPMENT.

The Collins Type 479U-1 Signal Generator is designed to afford a means for quickly field checking Omni-Range Navigation Receivers and Glide Slope Receivers for aircraft use. It provides a synthesis of signals encountered in reception of (1) omni-range, (2) tone localizer, (3) phase localizer, and (4) glide slope facilities. It is not intended that this equipment should be used in calibrating navigation réceivers, but rather that it should be used as a "go no-go" gauge for quickly checking their operation.

1-3. MECHANICAL DESCRIPTION.

1-3-1. GENERAL. - The Collins Type 479U-1 is a portable instrument, self contained except for the power source. The removable, hinged cover is equipped with a handle which permits the unit to be moved easily from place to place.

1-3-2. OPERATING CONTROLS.

(a) All controls for the operation of the 479U-1 are panel mounted under the hinged cover.

(b) Centrally located on this panel is the function selector control. All of the selector switches embodied in the equipment are of the ten position rotary type, ganged together and controlled by this function selector control knob.

(c) Also located on this panel are (1) the power input receptacle, (2) the power on-off switch, (3) a push button marked FLAGS, which increases the percent of modulation to afford a flag sensitivity check on glide slope and 90/150 localizer channels, and (4) the calibration control to adjust RF output level as indicated on (5) the output meter.

(d) Two output jacks, located in the upper right hand corner of the panel, permit coupling of the output signal into either an antenna or directly into a receiver.

1-3-3. CALIBRATING CONTROLS. - To gain access to the controls necessary for calibration, the 479U-1 unit must be removed from the case. These controls are then readily accessible through holes in both the left and right hand sides of the chassis.

1-3-4. POWER SUPPLY.

(a) The power supply furnished with the equipment mounts inside the case and connects to the 479U-1 through a Jones connector and cable. It is supplied less dyna-

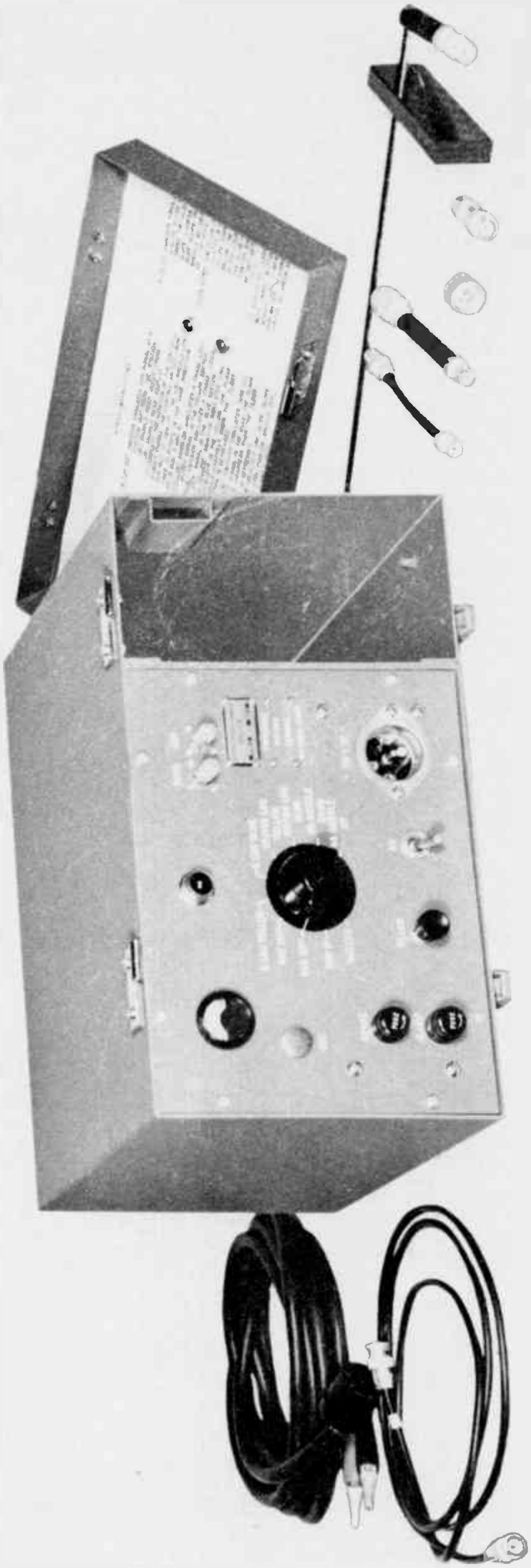

Figure 1-1. 479U-1 Signal Generator.

motor unit and will accommodate either a 12 volt or 24 volt unit.

(b) An auxiliary, electronic power supply is available for 115 volt 60-400 cycle operation. This unit also will mount inside of the case and utilizes the same interconnecting cable used with the dynamotor supply.

1-3-5. COLOR, DIMENSIONS AND WEIGHT. - The case is finished in Collins Gray Wrinkle and is about 13-1/2 x 13-1/2 x 8 inches in size. The weight of the equipment, including cables and power supply is approximately 17 pounds.

1-4. ELECTRICAL DESCRIPTION.

1-4-1. GENERAL.

(a) Electronic oscillators are the primary sources for all signals except the signals for checking voice channels, which are produced by a mechanical buzzer.

(b) Audio frequency signals of 30, 90, 150, and 9960 cycles per second are produced by RC phase shift type oscillators. Precision parts and careful design make these oscillators relatively stable. The 9960 cycle per second oscillator has in conjunction with it, an automatic frequency control circuit resulting in satisfactory degree of frequency stability. The 9960 cycle per second subcarrier is frequency modulated at a 30 cps rate with a deviation ratio of 16 ($\pm$ 480 cps.) Hereafter this frequency modulated subcarrier will be referred to as the "9960 cps signal". The 30 cps signal recovered from a slope detector, excited by the 9960 cps signal, will hereafter be called the "reference 30 cps signal".

(c) RF signals are generated by a crystal oscillator which utilizes mode type crystals.

1-4-2. ANALYSIS OF OUTPUTS.

(a) BUZZER. - In the buzzer position of the function selector switch, a mechanical vibrator is energized. The electrical arcing of this "buzzer" includes all radio frequencies modulated with an audio signal between 500 and 1000 cycles for checking the RF circuits of the navigation receiver.

(b) VOR 0°. - When the function selector switch is in the VOR 0° position, the VOR frequency at the output jacks is modulated with both a 30 cps (called the "variable 30 cps signal") signal and the 9960 cps signal. The phase relationship between reference 30 cps and the variable 30 cps signals is similar to a signal at a point magnetic north of an omni-range transmitter.

(c) VOR 315°. - When the function selector switch is in the VOR 315° position the same signal is present at the output jacks as when it is in the VOR 0° position except that the phase relationship between the reference 30 cps and the variable 30 cps is similar to the signal at a point 315° from the transmitter.

(d) VOR 150°. - In the VOR 150° position of the function selector switch, there is again present at the output jacks a standard VOR frequency, but in this instance the phase relationship between the reference 30 cps and the variable 30 cps signals is similar to that which would be found at a point 150° from the transmitting antenna.

(e) Ø LOCALIZER YELLOW. - In this position of the function selector switch, the signal appearing at the output jacks is of a frequency determined by the localizer crystal in the RF oscillator, and the modulation thereon includes the 30 cps and 9960 cps FM present in phase localizer signals. The phase relationship of the reference 30 cps and the variable 30 cps signals is the same as would be encountered when the phase localizer needle is in the yellow sector.

(f) Ø LOCALIZER BLUE. - With the function selector switch in this position, a standard phase localizer signal will again appear at the output jacks, but the phase relationship of the reference 30 cps and the variable 30 cps signals is the same as would be encountered when the phase localizer needle is in the blue sector.

(g) 90/150 LOCALIZER YELLOW. - Here again the same localizer frequency appears at the output jacks, but it is modulated only with a 90 cps signal. This will cause the localizer needle to move into the yellow sector but will not cause the flag to drop completely. Actuation of the push button marked FLAGS on the front panel will increase the percentage of modulation and should cause the flag to fall.

(h) 90/150 LOCALIZER BLUE. - In this position of the function selector switch the modulation on the localizer frequency signal appearing at the output jacks is 150 cps, and the needle will move into the blue sector. The FLAGS button on the front panel must again be activated before the flag will fall completely.

(i) GLIDE SLOPE. - In either of the glide slope positions of the function selector switch, the RF signal appearing at the output jacks is controlled by a third crystal in the RF oscillator. The modulation present on this signal is either 90 or 150 cycles, the 90 cycle signal causing the needle to move upward, and the 150 cycle signal causing it to move downward. Here again the FLAGS button must be depressed before the flag will fall.

1-5. REFERENCE DATA.

1-5-1. CABLES AND ADAPTERS. - The cables and adapters provided allow the 479U-1 to be connected to any of the present VOR and ILS navigation equipments. These cables and adapters include:

1. 10 foot power cable.
2. 10 foot RF cable with a male BNC on each end.
3. 1/2 foot RF cable with a female BNC on each end.
4. 1/2 foot RF adapter with a male twinex on one end and a female BNC on the other.
5. Female BNC to a male AN adapter.

6. RF pad assembly contained in one female BNC and one male BNC.

7. The antenna is provided with a male BNC.

1-5-2. POWER INPUT REQUIREMENTS. - The power required for the 479U-1 is 13.3V DC @ 4 amps or 26.5V DC @ 2 amps or 115V 60-400 cycles @ 1/2 amp.

1-5-3. FREQUENCY COMBINATIONS. - The 479U-1 can be tuned to any of the following frequency combinations:

VOR	112.1	112.1	112.5	112.5
LOCALIZER	109.9	110.3	109.9	110.3
GLIDE SLOPE	333.8	335.0	333.8	335.0

Two engraved plates on the front panel indicate the frequencies to which the equipment has been calibrated. To change frequencies, replace the existing crystals with the crystals of desired frequency, and retune the RF section. After recalibrating, the engraved plates should be removed and turned over in order that the information contained thereon will be correct.

SECTION 2

INSTALLATION

2-1. UNCRATING.

Caution should be exercised when uncrating to avoid damaging the equipment. A nail puller should be used to remove the nails instead of a hammer or bar. All units should be inspected carefully. Inspect equipment for loose screws and bolts. Check all panel controls for proper operation as far as can be determined without application of power. All claims for damage should be filed promptly with the transportation company.

2-2. INTERNAL CONNECTIONS.

After removing the eight screws securing the 479U-1 panel, lift the unit from its case and check all tubes to be sure they are tight in their sockets. Install the proper dynamotor unit upon the power supply chassis, or remove this supply and substitute the electronic supply if desired. Make sure the Jones plug is firmly seated in its socket, then replace the unit in its case.

2-3. EXTERNAL CONNECTIONS.

The only external connection necessary, except for the included output cables and adapters, is to the power source. The recessed power receptacle has three terminals, the two outer ones being used for 115 volt AC operation. Since there is no ground on this AC input circuit there is no danger of shorting due to reversed ground leads from the 115 volt source. The largest of the three terminals and the center terminal are employed when connecting to either a 12 volt or 24 volt DC source.

SECTION 3

OPERATION

3-1. GENERAL.

The Collins Type 479U-1 Signal Generator is intended to be used as a quick check of VOR and ILS Navigation Receivers and systems. It has been designed to give the operator an indication of the overall sensitivity and accuracy of the receiver and instrumentation, but should not be used as a standard for the calibration or adjustment of the equipment.

3-2. TYPICAL CONNECTIONS.

To connect the 479U-1 to the various navigation receivers or to the antenna, the following cables and adapters are required:

EQUIPMENT	CABLES AND ADAPTERS
1. 51R (VOR Rcvr)	Ten foot RF cable, BNC to AN adapter.
2. 51V (G.S.Rcvr)	Ten foot RF cable, BNC to AN adapter.
3. 733D localizer receiver	Ten foot RF cable, BNC to twinex adapter, RF pad assembly.
4. R89 glide slope receiver	Ten foot RF cable, BNC to twinex adapter, RF pad assembly.
5. To patch cord to the antenna	Ten foot RF cable, 1/2 foot RF cable.

3-3. RF CIRCUITS.

To check the RF circuits in the receiver, connect the 479U-1 to either the antenna or the receiver through the cables and adapters shown above. With the power on in both the receiver and the 479U-1, set the function selector to the BUZZER position. As the channel selector on the receiver is operated, a 500 - 1000 cycle note should be heard in the head phones on all channels.

3-4. VOR CHANNELS.

With the function selector switch in the VOR 0° position, the OBS should read 0° ± 5° FROM, and the OBI should read 180° ± 7°. Similarly, with the function selector switch in either of the other VOR positions, the OBS should read the indicated track FROM the station and the OBI should read the reciprocal bearing, with the same tolerances as noted for the VOR 0° position of the switch. To complete the rotation of the OBI dial, quickly change the function selector switch from VOR 150° to VOR 0°. An R.M.I. pointer should give same reading as the OBI.

3-5. LOCALIZER.

With the receiver properly set for phase localizer operation and the function selector of the 479U-1 in either of the phase localizer positions, the FPDI pointer should deflect between two and five dots into the sector indicated by the function selector switch, and the flag should disappear.

3-6. TONE LOCALIZER.

With the receiver properly set for tone localizer operation and the function selector of the 479U-1 in either of the tone localizer positions, the FPDI pointer should deflect between two and five dots into the sector indicated by the function selector switch. The flag should disappear when the FLAGS button is depressed.

3-7. GLIDE SLOPE.

With both the 479U-1 and the Glide Slope Receiver operating, and the function selector in either of the glide slope positions, the FPDI pointer should move up or down two to five dots. The direction of this deflection should be as indicated by the function selector switch. The flag should disappear when the FLAGS button is depressed.

SECTION 4

CIRCUIT DESCRIPTION

4-1. PRELIMINARY.

The 479U-1 has been designed to provide a quick and simple means of checking VOR, Localizer, and Glide Slope facilities in navigation receivers. It is possible to feed the output of this test equipment directly into the receiver, but the usual procedure is to feed the 479U-1 into the antenna, and pick up the transmitted signal in the receiver antenna. It is not intended that the 479U-1 should be used as a standard or that it be used in any way to calibrate or make adjustments in the navigation receivers. Its accuracy in the VOR positions is $\pm 3^\circ$. It will, however, serve to indicate whether or not the equipment is working within practical limits.

4-2. GENERAL.

The output signals from the 479U-1 include all the information encountered in the transmission and interpretation of VOR, Localizer, and Glide Slope signals. The information included at any particular time is dependent upon the position of the function selector switch on the front panel of the equipment. Ten signals are available, including:

1- Buzzer
2- VOR 0°
3- VOR 315°
4- VOR 150°
5- Ø Localizer Yellow
6- Ø Localizer Blue
7- 90/150 Localizer Yellow
8- 90/150 Localizer Blue
9- G.S. Needle Up
10-G.S. Needle Down

The overall block diagram follows.

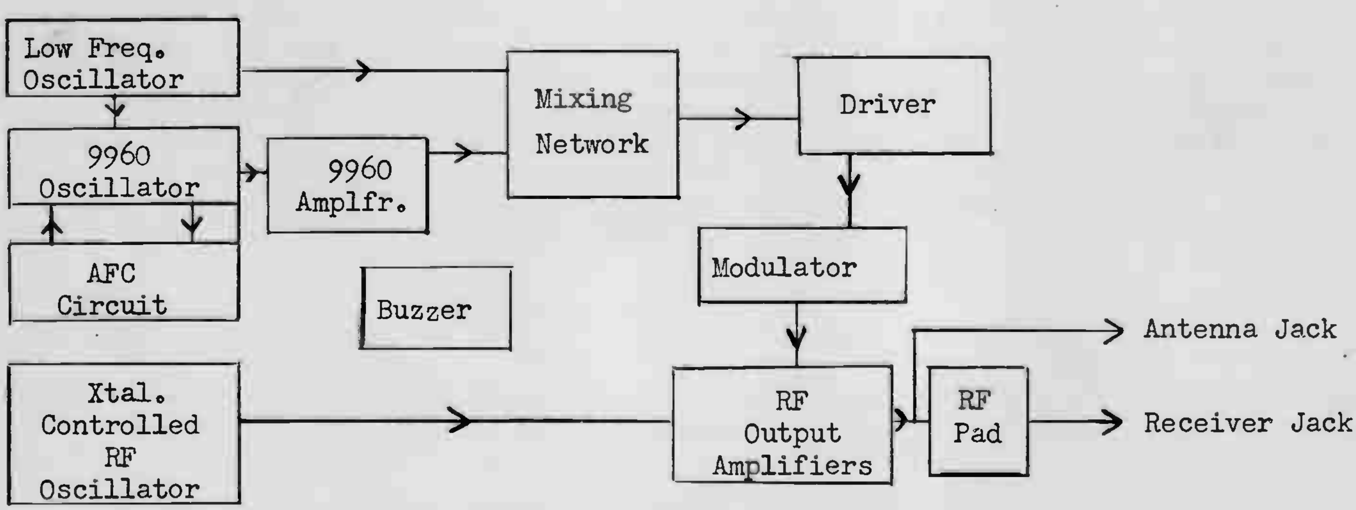

Figure 4-1. 479U-1 Functional Block Diagram.

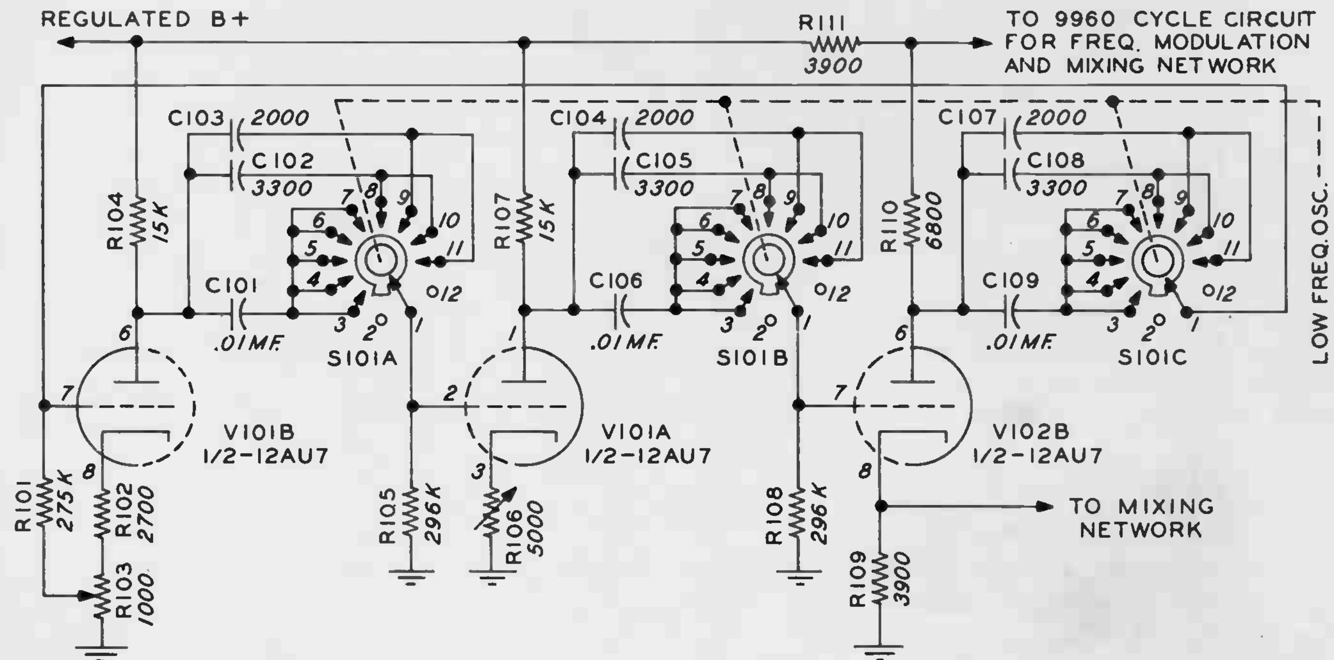

Figure 4-2. Low Frequency Oscillator - Schematic.

4-3. LOW FREQUENCY OSCILLATOR.

The low frequency oscillator is a resistance-capacitance phase shift oscillator utilizing three low gain audio amplifier stages, V101A, V101B, and V102B, along with their associated capacitors and resistors. The oscillator frequency of 30, 90, or 150 cps is established by the size of the coupling capacitors selected by the function selector switch. The use of heavy negative feedback in each stage makes the tube characteristics unimportant, and consequently tube changes will make negligible difference in frequency, waveshape, or stability. Since, in addition to this, the capacitors used are very stable and the resistors R101, R105, and R108 are of a low temperature coefficient variety, the oscillator is very stable over a wide range of operating conditions. Loading of the oscillator is held to a minimum by taking the outputs from very low impedance points and using large series resistors in the mixing circuits. The frequency of the low frequency oscillator is adjusted by varying R103. This varies the impedance in the grid circuit of V101A, correcting the phase shift to the amount required for the desired frequency. The gain of V101A and therefore the oscillator output level, is controlled by R106.

4-4. 9960 CYCLE CIRCUITS.

4-4-1. OSCILLATOR. - The 9960 cps oscillator is a resistance-capacitance phase shift oscillator consisting of V103A, V103B and V104B and their associated components.

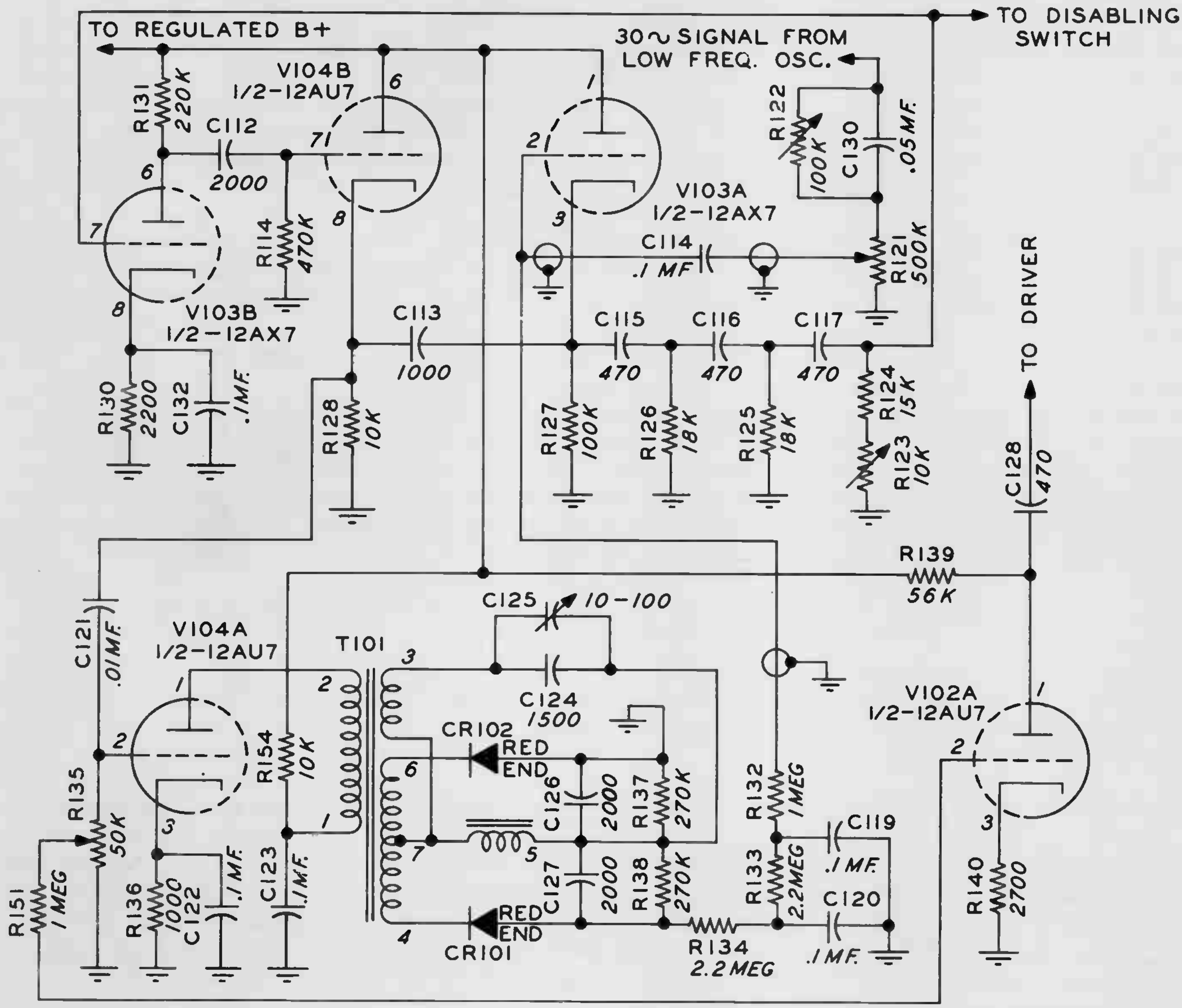

Figure 4-3. 9960 Cycle Circuits - Schematic.

V103B is a high gain audio amplifier feeding the cathode follower V104B, and impedance changing stage. The signal is then fed through C113 to V103A, another cathode follower. A small phase shift in the 9960 cycle signal is provided by C113 and R127. The signal at the cathode of V103A is fed through an RC network where the remaining phase shift necessary for oscillation occurs before the output is fed back to the grid of V103B.

4-4-2. AUTOMATIC FREQUENCY CONTROL CIRCUIT. - The 9960 cps signal at the cathode of V104B, a low impedance point, is fed to the grid of V104A where it is amplified and impressed upon the primary of T101. T101 is a discriminator transformer tuned by C124 and C125 to 9960 cps. The output of this discriminator circuit is fed back to the grid of V103A through a filter consisting of R133, R134, C119 and C120. Since the output impedance of a cathode follower depends upon the instantaneous voltage on the grid of the tube, the effective resistance of R127, and therefore, the frequency of the 9960 cps oscillator can be made to vary by varying the DC voltage on the grid of V103A. If the oscillator should not be tuned to exactly the same frequency as is the discriminator, the DC output from the discriminator will then change the tuning of the oscillator, holding its frequency constant.

4-4-3. FREQUENCY MODULATION OF THE 9960 CYCLE SIGNAL. - In order to frequency modulate the 9960 cps signal at a 30 cycle rate, a 30 cps signal is fed from the low frequency oscillator into the grid of V103A. By this means the effective resistance of R127 is varied at a 30 cycle rate, and hence the output frequency of the oscillator is varied at this rate. The discriminator filter is large enough to prevent the 30 cps component of the discriminator output from being fed back to the grid of V103A. The frequency deviation from the 9960 cycle mid-frequency is a function of the amplitude of the 30 cps signal fed to the grid of V103A. Since R121 varies the amplitude of this signal, it acts as the deviation control. The phase shift network consisting of C130 and R122 act to give the proper phase relationship between the 30 cps signal (variable 30 cps) delivered to the mixing network and the 30 cycle signal present on the 9960 cycle signal (reference 30 cps).

4-4-4. 9960 AMPLIFIER. - A portion of the 9960 cps signal is picked off R135, the 9960 cycle level control, and fed through a series resistor R151 to the grid of V102A, a triode acting as an amplifier for the 9960 cps signal. From the plate of this stage, the signal is impressed upon the grid of V105, C129 and R142 acting as a common mixing impedance for the output of the mixing circuits.

4-5. MIXING NETWORK.

In order to maintain the proper percentage of modulation for the various outputs, switched attenuators have been incorporated in the mixing section. If the voltage developed at the upper end of C129 due to the low frequency oscillator when the control switch is in the VOR 315° position is used as a base, the voltage at that point would be found to vary when the control switch is moved to either VOR 0° or to VOR 150°. This is due to the voltage split taken through C110, C111, C118, C133 and C134. In order to equalize these voltages, R117, R143, R115 and R141 were used. This allows the percentage of modulation to remain constant in each of the VOR positions. The phase localizer audio levels are set by R112, R157, R113 and R158. The tone localizer signals are set by R120, R129 and R159. When S102 is closed, R120 is shorted and the percentage of modulation is increased. In the tone localizer and glide slope positions, the 9960 cps oscillator feedback is shorted out.

4-6. DRIVER AND MODULATOR STAGES.

The driver stage, V105, is fed from the modulation gain control, R142. It will be noticed that the screen grid has been left unbypassed to prevent 30 cycle phase shift. The grid of the modulator, V106, is set at a positive voltage so that a positive voltage is available on the cathode of V106 to be used as RF supply voltage. The audio signal

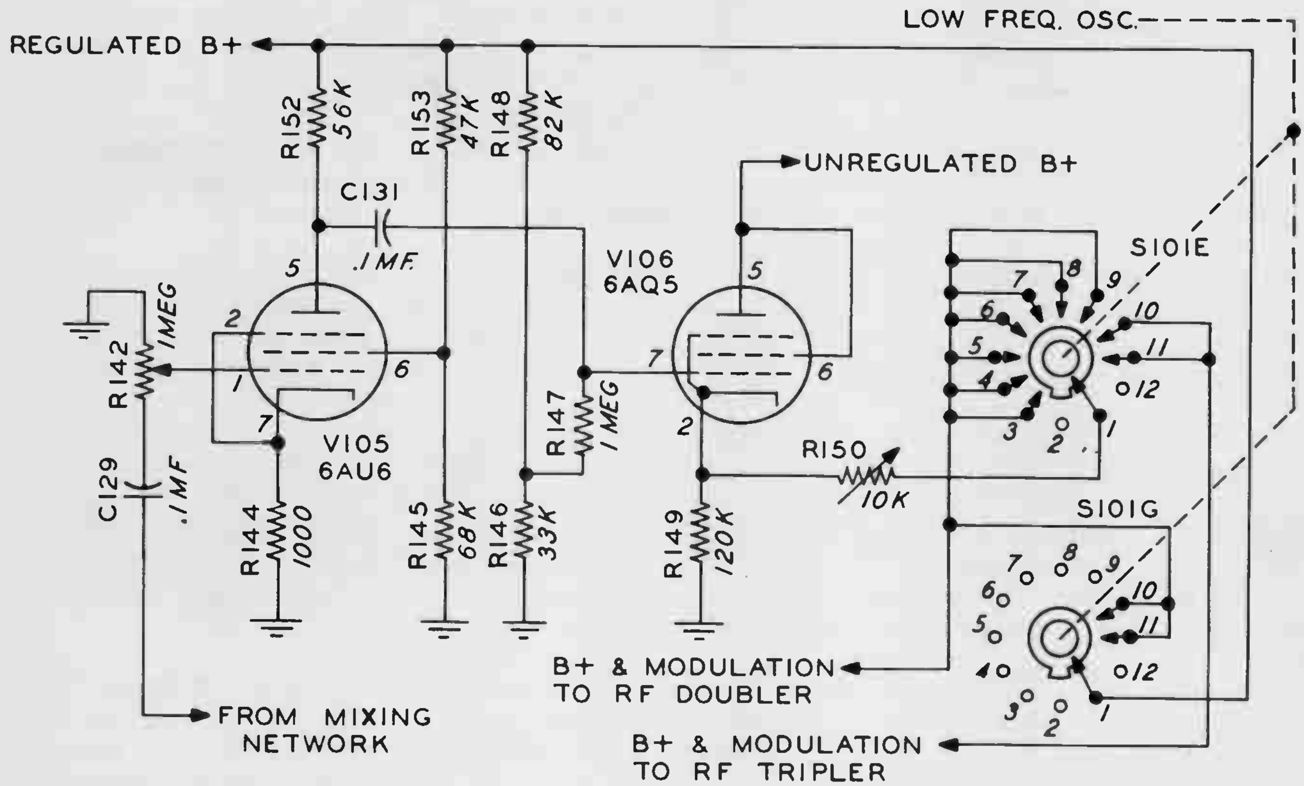

Figure 4-4. Driver and Modulator - Schematic.

coupled from V105 to V106 is reproduced on the cathode of V106 which is triode-connected to get a linear cathode-grid voltage curve, thus preventing serious distortion in the modulator. R150 is the calibration control on the front panel. By placing this pure resistance in the plate circuit of the RF stage, the output may be varied and at the same time the percentage of modulation remains constant as determined by the modulation gain control setting.

4-7. RF SECTION.

The RF oscillator uses mode type crystals connected between the cathodes of V201A and V201B. The plate tank of V201A is tuned to the fundamental of the crystal while the plate tank of V201B is tuned to twice the oscillator frequency. The mode crystal is series resonant and at the crystal frequency provides a low impedance feedback path, while off resonance it offers an extremely high impedance path to the signal. The grid of V202A is capacitively coupled to the plate of V201B. V202A acts as a class C stage and doubles the frequency up to the VOR and localizer frequencies. V202B is coupled to the plate of V202A and triples the frequency up to the glide slope band. The grid current of V202B is measured by the output meter on the front panel. The frequency of the RF signal at the antenna output jack is

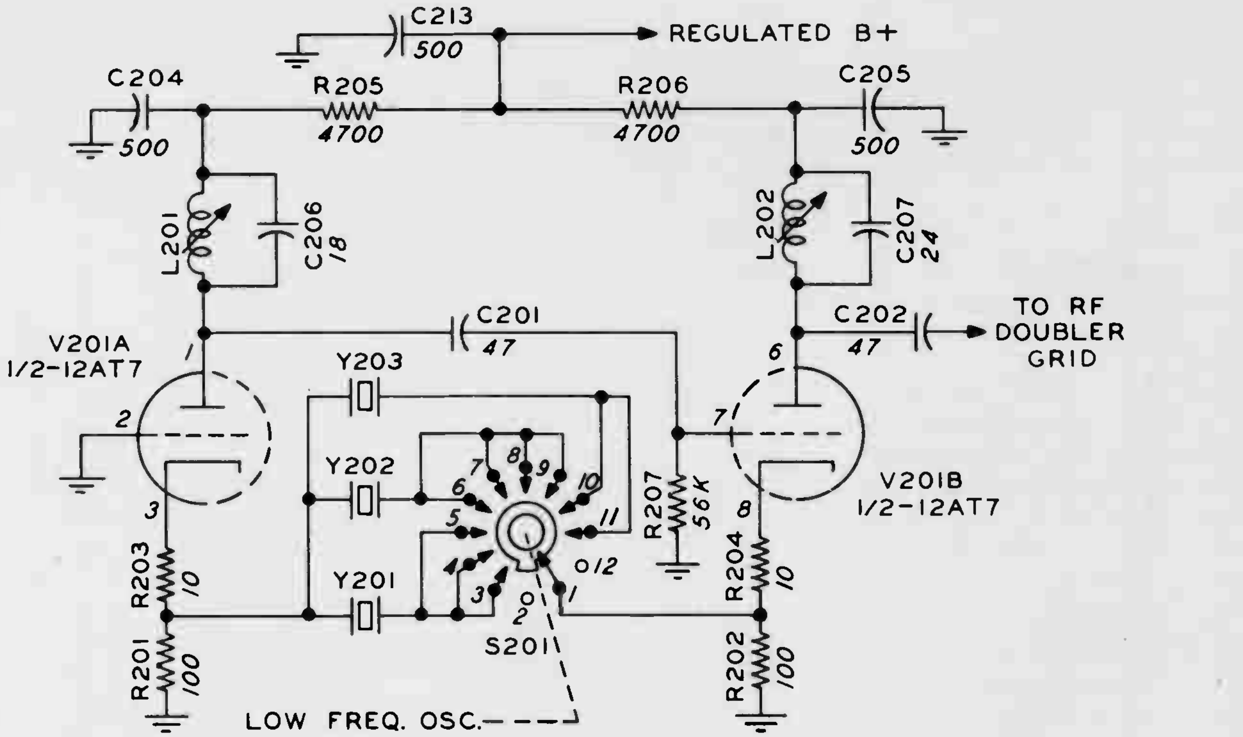

Figure 4-5. RF Oscillator - Schematic.

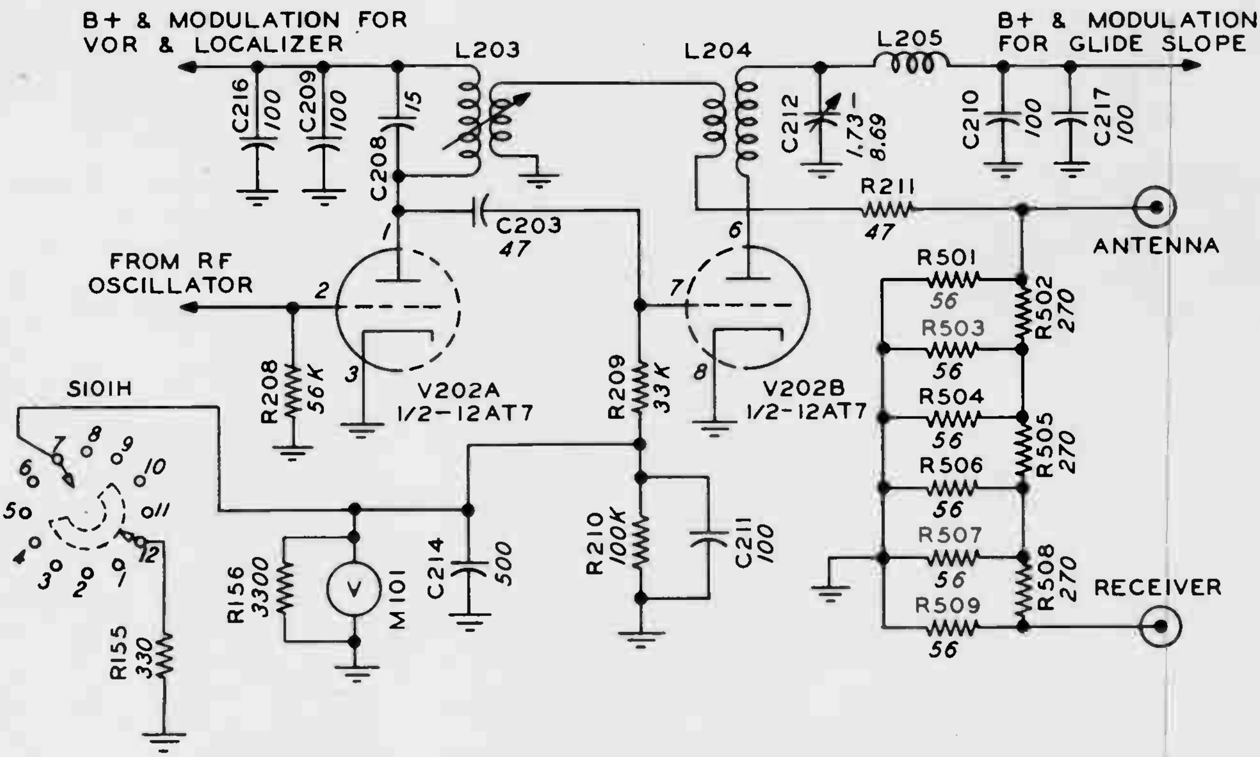

Figure 4-6. RF Doubler and Tripler - Schematic.

determined by the switches that select the modulation and the regulated DC. In the VOR and localizer positions the modulated voltage from V106 is switched to V202A and in the glide slope positions the modulated voltage is on V202B while V202A is supplied regulated DC. The output meter reads at all times the rectified grid current whether V202B has plate voltage applied or not.

4-8. POWER SUPPLY.

4-8-1. DC SUPPLY. - The DC power supply is a conventional dynamotor supply utilizing a resistance capacitance filter in the high voltage line. The regulator tube handles all the voltage to the 479U-1 except the modulator supply. The modulator plate voltage comes from a higher level in the resistance and capacitance filter. In order to make the supply adaptable to 13.3 or 26.5 volts, the DC power unit has been wired so that all the necessary filament switching is done by the wiring contained in the dynamotors. When changing from 26.5 volt operation to 13.3 volt operation the pilot light must be changed to agree. The dynamotor used for 26.5 volt operation is the DM-53A and for 13.3 volt operation, the DM-53AZ.

4-8-2. AC SUPPLY. - The alternate 115 volt AC supply is a normal electronic supply utilizing an LC filter in conjunction with a voltage regulator tube. This supply was designed for operation from conventional 60-400 cycle, 115 volt lines. (See section 8).

SECTION 5

MAINTENANCE AND SUPPLEMENTARY DATA

5-1. CALIBRATION PROCEDURE.

5-1-1. TEST EQUIPMENT REQUIRED. - To adjust and align the Collins Type 479U-1 Signal Generator, the following test equipment is necessary:

(a) Oscilloscope.

(b) A.C. VTVM (Ballantine or equivalent).

(c) D.C. VTVM.

(d) Collins Type 479S Audio Signal Generator (or equivalent).

(e) Boonton 211-A RF Signal Generator (or equivalent).

(f) Grid Dip Meter.

(g) Collins Type 51R Navigation Receiver (or equivalent).

5-1-2. R.F. SECTION.

(a) TUNING.

(1) Set the function selector switch to one of the glide slope positions.

(2) Tune the oscillator coil (L201) for maximum output at the crystal frequency as indicated on a grid dip meter.

(3) Referring to the output meter on the front panel, adjust the doubler coil (L202), the 100 mc output coil (L203), and the 300 mc tuning capacitor (C212) for maximum meter reading.

(4) The tuning of the other crystals now falls within the bandwidth of the tuning assemblies.

(b) LEVEL ADJUSTMENT.

(1) At the same VOR frequency of the 479U-1, feed a 25 microvolt signal through a 6db pad from a Boonton 211-A RF Signal Generator into a Collins Type 51R Navigation Receiver, and measure the AVC voltage developed. (The 51R receiver may now be used as a transfer device to set the RF level at the RCVR jack on the front panel of the 479U-1).

(2) Set the function selector switch of the 479U-1 to one of the VOR positions and connect the 51R receiver to the RCVR jack. Do not use the 6db pad.

(3) Set the CAL control on the front panel of the 479U-1 to its center position.

(4) Adjust the pickup loop on the 100 mc output coil (L203) until the AVC voltage developed in the receiver is equal to that developed when using the Boonton 211-A with 25 microvolt output.

5-1-3. LOW FREQUENCY OSCILLATOR.

(a) LEVEL. - Connect the A.C. VTVM to the cathode of V102B and adjust R106 until equal voltages (± 1 db) appear at this point when the function selector is switched between 90/150 localizer positions.

(b) FREQUENCY.

(1) Insert the correct circuit constants into the low frequency oscillator to give approximately a 30 cps output by setting the function selector switch to one of the VOR positions.

(2) Connect the vertical or "Y axis" input of the oscilloscope to the cathode of V102B, and the horizontal of "X axis" input to the 60 cps test signal terminal (power line frequency).

(3) Adjust the 30 cps frequency control (R105) until a vertical figure eight Lissajous pattern remains stationary on the oscilloscope.

(4) The 90 and 150 cps signals should now fall within ± 5% of the nominal frequency. They may be checked against a calibrated audio signal generator using an oscilloscope as a comparison device.

5-1-4. 9960 CPS CIRCUITS.

(a) DISCRIMINATOR.

(1) Connect a standard 9960 cps FM signal from a Collins Type 479S Audio Signal Generator to the grid of V104A.

(2) Ground the grid of V103B, killing the 9960 cps oscillator in the 479U-1.

(3) Connect the D.C. VTVM to the discriminator output (junction of R134 and R138).

(4) Adjust the 9960 cycle frequency control (C125) until the DC voltage developed at this point is zero.

(b) AFC CIRCUITS. - The AFC circuit and the 9960 cps oscillator are so arranged that a positive correction voltage causes the center frequency to lower. This may be checked in the following manner:

(1) Remove the connections from the 479S Audio Signal Generator and the ground from the grid of V103B.

(2) Ground the grid of V103A and adjust R123 until a small DC voltage, either positive or negative, is developed at the discriminator output.

(3) When the ground on the grid of V103A is removed, the DC voltage at the discriminator output should drop sharply.

(c) OSCILLATOR.

(1) Ground the grid of V103A and adjust R123 until the DC output voltage from the discriminator is again zero.

(2) Remove the ground from V103A and again note discriminator output voltage. This voltage should still be zero.

(d) DEVIATION.

(1) At the VOR frequency of the 479U-1, feed a 25 microvolt signal modulated by only a 9960 cps signal using a properly calibrated 479S Audio Signal Generator, from the Boonton 211-A through a 6 db pad into a 51R receiver.

(2) Measure the recovered 30 cps voltage on the reference tank of the 51R with an A.C. VTVM.

(3) Set the 9960 cps level control (R135) on the 479U-1 to about its midpoint.

(4) Feed the 479U-1 into the 51R receiver (without the 6 db pad), and adjust the deviation control (R121) until the voltage measured in step (2) is duplicated.

(e) LEVEL.

(1) With an input to the 51R as in (1) preceding, measure the voltage on the detector load of the 51R with an A.C. VTVM.

(2) With the function selector switch on the VOR 315° position, and one end of R116 open to remove the 30 cps signal, feed the 479U-1 into the 51R receiver. Do not use the 6 db pad.

(3) Adjust the 9960 cps level control (R135) until the A.C. voltage on the detector load is the same as noted in step (1).

5-1-5. MODULATION.

(a) GAIN.

(1) At the VOR frequency of the 479U-1, feed a 25 microvolt signal which is modulated by a standard VOR signal, from the Boonton 211-A through a 6 db pad into the 51R receiver.

(2) Measure the A.C. voltage across the load of the detector.

(3) With R116 again connected into the circuit, feed the 479U-1 into the 51R receiver. Do not use the 6 db pad.

(4) Adjust the modulation gain control (R142) until the A.C. voltage on the detector load is the same as noted in step (1).

(b) VOR ZERO.

(1) Feed the 479U-1 into the 51R receiver with the track selector set at 0°.

(2) With the function selector switch set at VOR 0°, adjust the VOR zero control (R122) on the 479U-1 until the cross pointer needle is centered.

(3) Check the VOR 315° and VOR 150° positions of the function selector switch against the track selector with the cross pointer needle centered.

(4) If necessary, readjust R122 until all three of these readings are within $\pm$ 3 degrees of nominal.

TABLE 5-1

Typical DC voltage measurements for 479U-1. 26.5 V DC input-Measured with a DC VTVM.

	V101						V102						V103					
	1	2	3	6	7	8	1	2	3	6	7	8	1	2	3	6	7	8
1	130	0	6.3	130	0	5.9	74	-.1	3.4	130	0	6.0	150	-.1	9.7	74	0	.7
2	130	0	6.6	130	0	6.1	74	-.1	3.4	130	0	6.6	150	-.1	8.7	74	0	.7
3	130	0	6.6	130	0	6.1	74	-.1	3.4	130	0	6.6	150	-.1	8.7	74	0	.7
4	130	0	6.6	130	0	6.1	74	-.1	3.4	130	0	6.6	150	-.1	8.7	74	0	.7
5	130	0	6.6	130	0	6.1	74	-.1	3.4	130	0	6.6	150	-.1	8.7	74	0	.7
6	130	0	6.6	130	0	6.1	74	-.1	3.4	130	0	6.6	150	-.1	8.7	74	0	.7
7	130	0	6.6	130	0	6.1	74	0	3.4	130	0	6.6	150	0	2.6	74	0	.7
8	130	0	6.6	130	0	6.1	74	0	3.4	130	0	6.4	150	0	2.6	74	0	.7
9	130	0	6.6	130	0	6.1	74	0	3.4	130	0	6.6	150	0	2.6	74	0	.7
10	130	0	6.6	130	0	6.1	74	0	3.4	130	0	6.4	150	0	2.6	74	0	.7

	V104						V105						V106					
	1	2	3	6	7	8	1	2	5	6	7		1	2	5	6	7	
1	110	0	4	150	0	9.7	0	1.8	75	65	1.8		35	58	185	185	35	
2	110	0	4	150	0	9.7	0	1.8	75	65	1.8		35	58	185	185	35	
3	110	0	4	150	0	9.7	0	1.8	75	65	1.8		35	58	185	185	35	
4	110	0	4	150	0	9.7	0	1.8	75	65	1.8		35	58	185	185	35	
5	110	0	4	150	0	9.7	0	1.8	75	65	1.8		35	58	185	185	35	
6	110	0	4	150	0	9.7	0	1.8	75	65	1.8		35	58	185	185	35	
7	110	0	4	150	0	8.7	0	1.8	75	65	1.8		35	58	185	185	35	
8	110	0	4	150	0	8.7	0	1.8	75	65	1.8		35	58	185	185	35	
9	110	0	4	150	0	8.7	0	1.8	75	65	1.8		35	58	185	185	35	
10	110	0	4	150	0	8.7	0	1.8	75	65	1.8		35	58	185	185	35	

TABLE 5-2

Typical AC voltage measurements for 479U-1. 26.5 V DC input Measured with a Ballantine AC VTVM.

	V101		V102		V103		V104		V106	
	3	8	1	8	3	1	8	5	7	2
1	0	0	3.7	0	0	38	4.2	0	0	0
2	5.2	4.4	4.7	5.4	1.9	38	4.2	25	.8	2.3
3	5.2	4.4	4.7	5.4	1.9	38	4.2	25	.8	2.3
4	5.2	4.4	4.7	5.4	1.9	38	4.2	25	.8	2.3
5	5.2	4.4	4.2	5.4	1.9	38	4.2	16	.52	15.5
6	5.2	4.4	4.2	5.4	1.9	38	4.2	16	.52	15.5
7	5.2	4.4	0	5.4	1.9	0	0	9	.29	8.2
8	4.9	4.2	0	5.1	1.9	0	0	8.9	.28	8.1
9	5.2	4.4	0	5.4	1.9	0	0	18	.55	16
10	4.9	4.2	0	5.1	1.9	0	0	17	.53	15

TABLE 5-3.

Typical resistances to ground for 479U-1. Power unit disconnected
Switch in VOR 0^{o} position.

V101	1	62k	V105	1	350k
	2	296k		2	1000
	3	4k		5	90k
	6	62k		6	44k
	7	282k		7	1000
	8	3600			
V102	1	110k	V106	1	1 meg
	2	1.2 meg		2	130k
	3	2700		5	∞
	6	47k		6	∞
	7	296k		7	1 meg
	8	3500			
V103	1	47k	V201	1	52k
	2	6 meg		2	0
	3	110k		3	110
	6	270k		6	52k
	7	25k		7	56k
	8	2200		8	110
V104	1	60k	V202	1	125k
	2	52k		2	56k
	3	1000		3	0
	6	47k		6	∞
	7	440k		7	35k
	8	10k		8	0

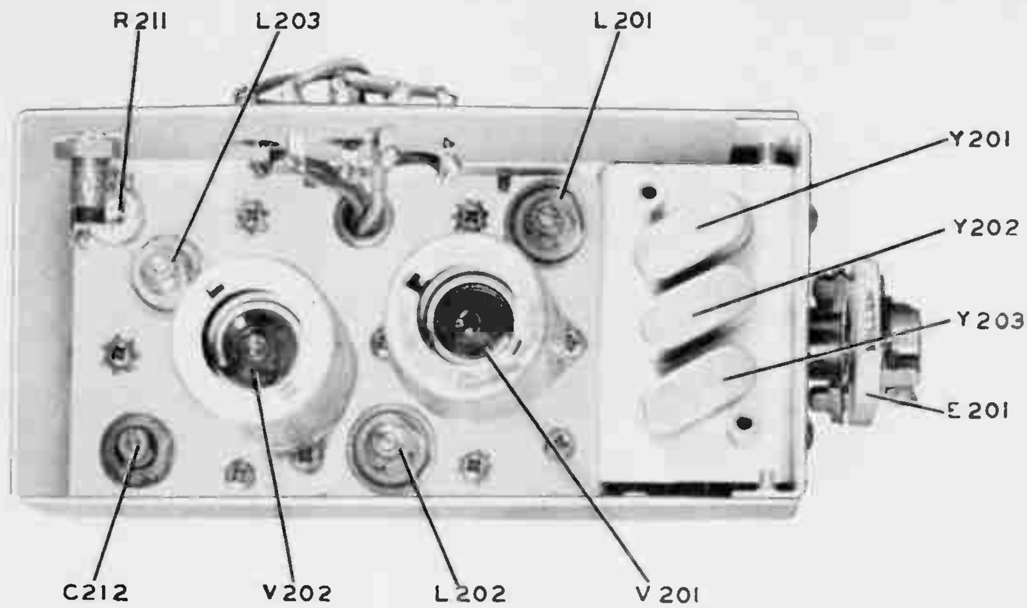

Figure 5-1. RF Oscillator - Top View Cover Removed.

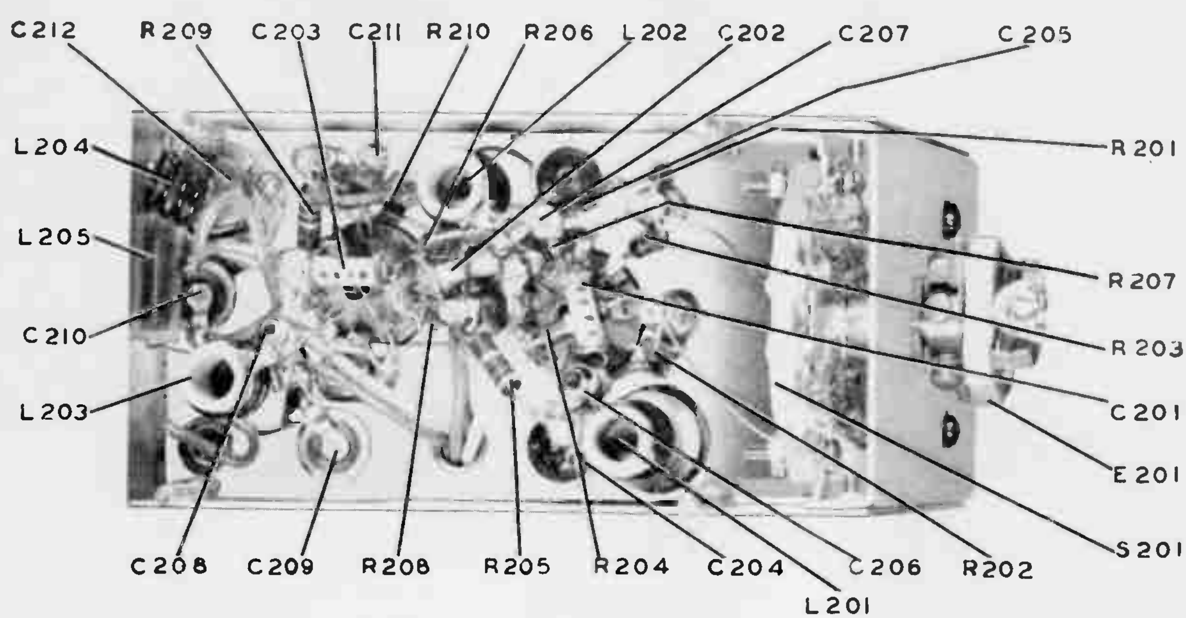

Figure 5-2. RF Oscillator - Bottom View.

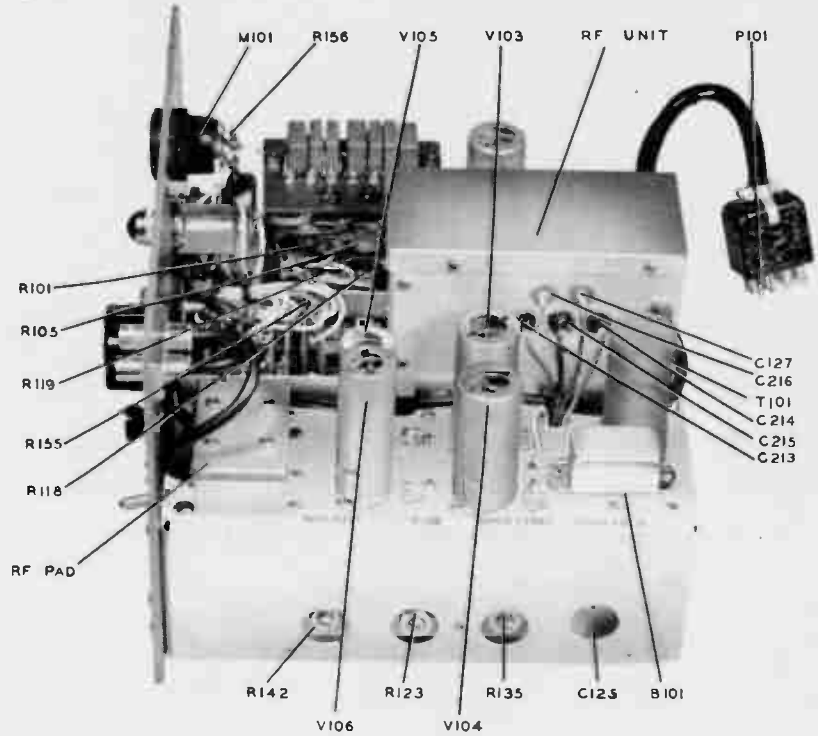

Figure 5-3. 479U-1 Parts Arrangement - Right Side.

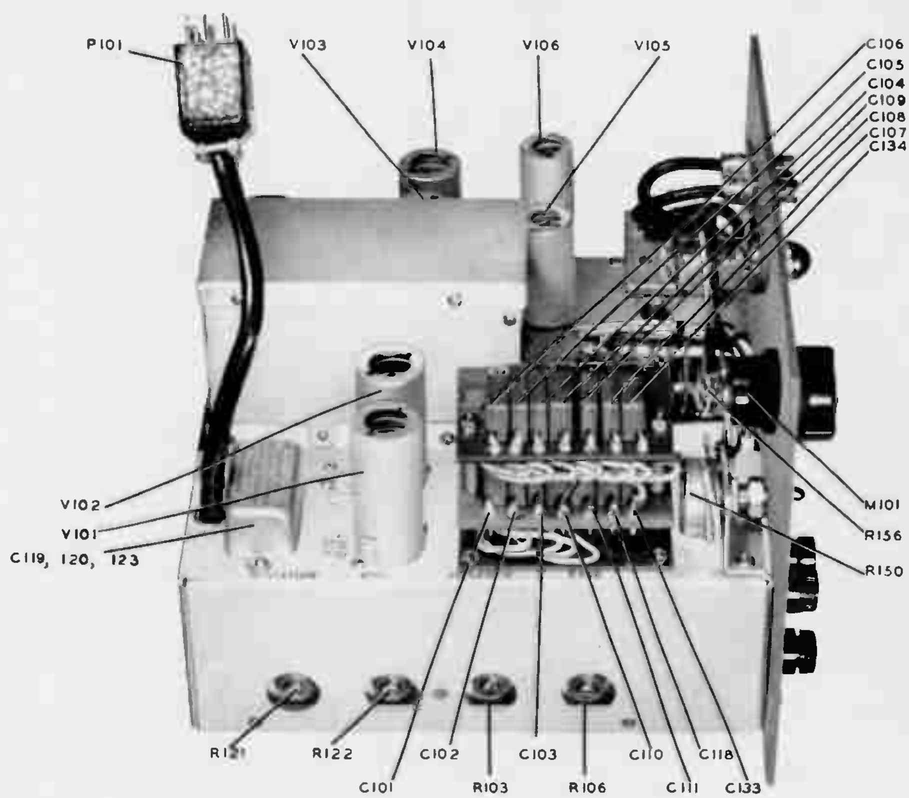

Figure 5-4. 479U-1 Parts Arrangement - Left Side.

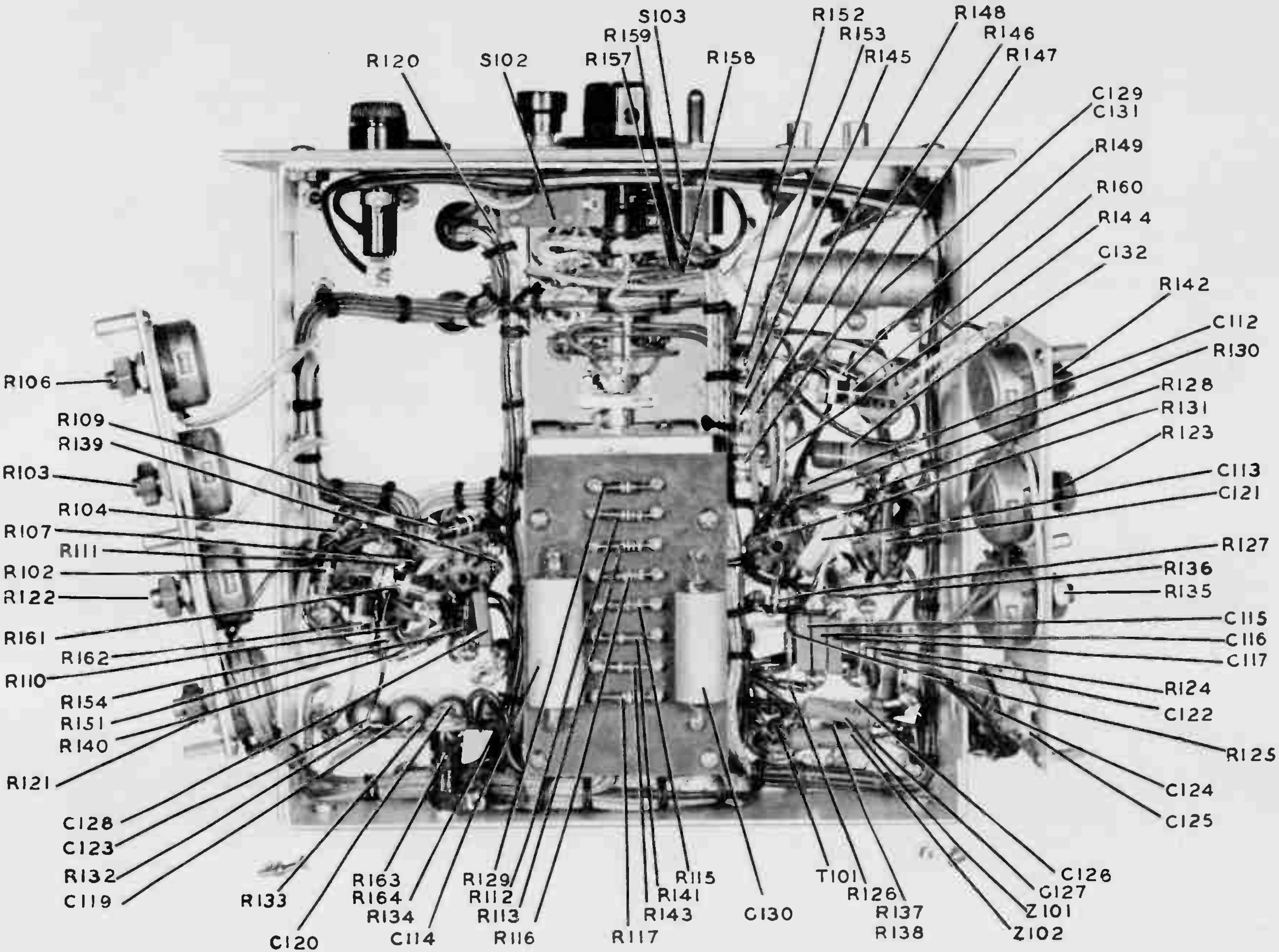

Figure 5-5. 479U-1 Parts Arrangement - Bottom View.

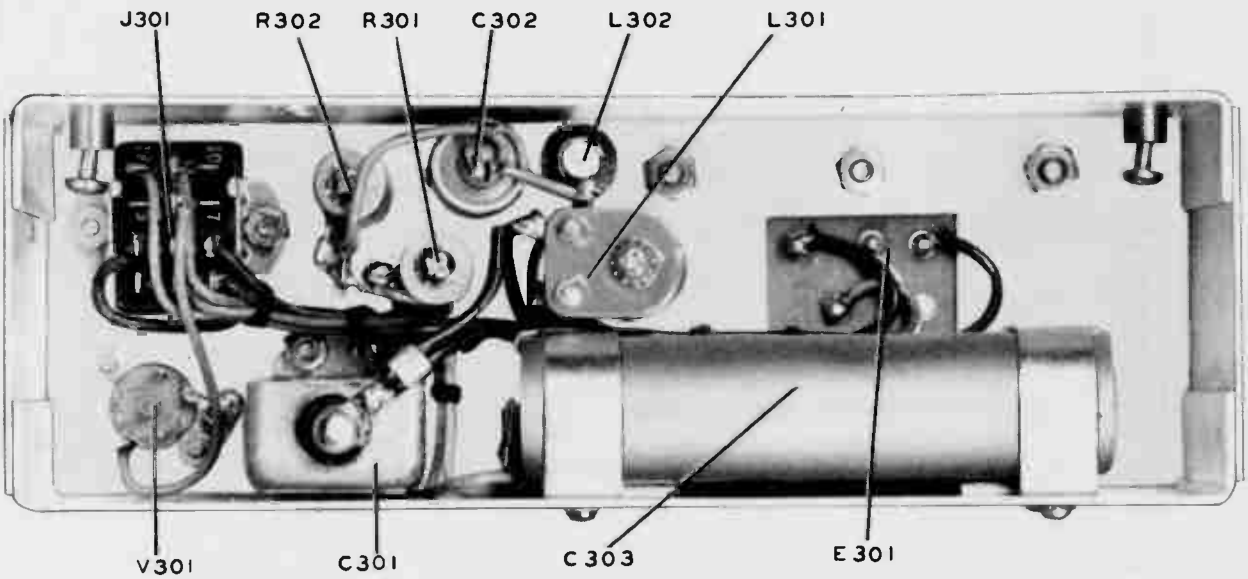

Figure 5-6. D.C. Power Supply - Parts Arrangement - Bottom View.

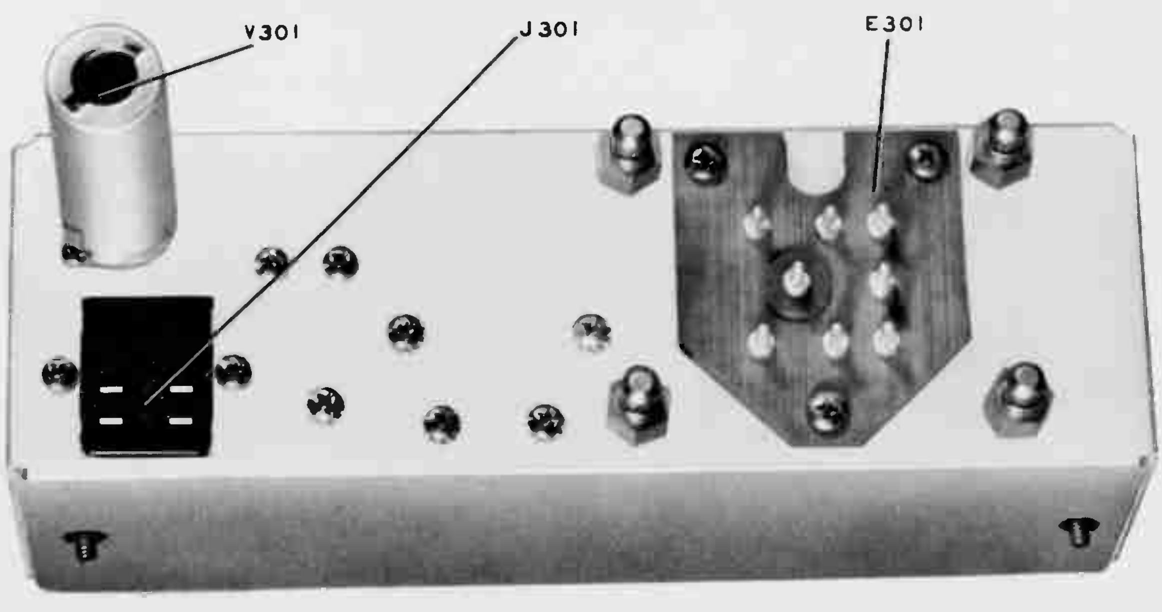

Figure 5-7. D.C. Power Supply - Parts Arrangement - Top View.

SECTION 6

PARTS LIST

479U-1 SIGNAL GENERATOR

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
B101	Provides signal for checking R.F. circuits	BUZZER: 26 v DC, 400-1000 cps	271 0173 00
C101	Coupling V101B to V101A providing necessary phase shift for 30 cyc	CAPACITOR: Mica, 10,000 mmf p/m 2%, 300 WV	935 2391 00
C102	Coupling V101B to V101A providing necessary phase shift for 90 cyc	CAPACITOR: Mica, 3300 mmf p/m 2%, 500 WV	935 2358 00
C103	Coupling V101B to V101A providing necessary phase shift for 150 cyc	CAPACITOR: Mica, 2000 mmf p/m 2%, 500 WV	935 2345 00
C104	Coupling V101A to V102B providing necessary phase shift for 150 cyc	CAPACITOR: Mica, 2000 mmf p/m 2%, 500 WV	935 2345 00
C105	Coupling V101A to V102B providing necessary phase shift for 90 cyc	CAPACITOR: Mica, 3300 mmf p/m 2%, 500 WV	935 2358 00
C106	Coupling V101A to V102B providing necessary phase shift for 30 cyc	CAPACITOR: Mica, 10,000 mmf p/m 2%, 300 WV	935 2391 00
C107	Coupling V102B back to V101B providing necessary phase shift for 150 cycles	CAPACITOR: Mica, 2000 mmf p/m 2%, 500 WV	935 2345 00
C108	Coupling V102B back to V101B providing necessary phase shift for 90 cycles	CAPACITOR: Mica, 3300 mmf p/m 2%, 500 WV	935 2358 00
C109	Coupling V102B back to V101B providing necessary phase shift for 30 cycles	CAPACITOR: Mica, 10,000 mmf p/m 2%, 300 WV	935 2391 00

479U-1 SIGNAL GENERATOR

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
C110	Part of phase shift constants in mixing network for VOR 150° and VOR 315°	CAPACITOR: Mica, 10,000 mmf p/m 2%, 300 WV	935 2391 00
C111	Part of phase shift constants in mixing network for VOR 150° and VOR 315°	CAPACITOR: Mica, 10,000 mmf p/m 2%, 300 WV	935 2391 00
C112	Coupling V103B to V104B	CAPACITOR: Mica, 2000 mmf p/m 20%, 300 WV	909 0005 00
C113	Coupling cathode V104B to cathode V103A	CAPACITOR: Mica. 1000 mmf p/m 2%, 300 WV	935 5012 00
C114	Coupling 30 cycles from R121 to grid of V103A	CAPACITOR: Paper, 0.1 mf p/m 20%, 600 WV	930 0058 00
C115	p/o phase shift circuit in cathode of V103A	CAPACITOR: Mica, 470 mmf p/m 5%, 500 WV	935 0218 00
C116	Part of phase shift circuit in cathode of V103A	CAPACITOR: Mica, 470 mmf p/m 5%, 500 WV	935 0218 00
C117	Part of phase shift circuit in cathode of V103A	CAPACITOR: Mica, 470 mmf p/m 5%, 500 WV	935 0218 00
C118	p/o phase shift constants in mixing network for VOR 315° and VOR 150°	CAPACITOR: Mica, 10,000 mmf p/m 2%, 300 WV	935 2391 00
C119	Discriminator output filter capacitor	CAPACITOR: Paper, 0.1-0.1-0.1 mf p/m 20%, 600 WV	961 6183 00
C120	Discriminator output filter capacitor	CAPACITOR: Section of C119	
C121	Coupling cathode of V-104 B to grid V104A	CAPACITOR: Paper, .01 mf p/m 10%, 400 TV	931 0321 00
C122	V104A cathode bypass	CAPACITOR: Paper, .1 mf p/m 10%, 400 TV	931 0333 00
C123	V104A plate decoupling	CAPACITOR: Section of C119	

479U-1 SIGNAL GENERATOR

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
C124	Tune T101	CAPACITOR: Mica, 1500 mmf p/m 2%, 500 WV	935 2336 00
C125	Trimmer across C124 9960 FREQ ADJ.	CAPACITOR: Variable ceramic, minus 10 to plus 100 mmf, 500 WV	917 1003 00
C126	Part of discriminator circuit	CAPACITOR: Mica, 2000 mmf p/m 20%, 300 WV	909 0005 00
C127	Part of discriminator circuit	CAPACITOR: Mica, 2000 mmf p/m 20%, 300 WV	909 0005 00
C128	Coupling V102A plate to mixing network	CAPACITOR: Mica, 470 mmf p/m 5%, 500 WV	935 0218 00
C129	p/o common mixing impedance in grid of V105	CAPACITOR: Paper, 0.1 mf p/m 20%, 600 WV	961 2079 00
C130	p/o phase shift network associated with VOR-0 control	CAPACITOR: Paper, 0.05 mf plus 20% minus 10%, 600 WV	930 0010 00
C131	Coupling V105 to V106	CAPACITOR: Paper, 0.1 mf p/m 20%, 600 WV	961 2079 00
C132	Cathode bypass V103B	CAPACITOR: Paper, .1 mf p/m 10%, 400 TV	931 0333 00
C133	Part of phase shift constants in mixing network for VOR 315° and VOR 150°	CAPACITOR: Mica, 10,000 mmf p/m 2%, 300 WV	935 2391 00
C134	Part of phase shift constants in mixing network for VOR 315° and VOR 150°	CAPACITOR: Mica, 10,000 mmf p/m 2%, 300 WV	935 2391 00
C201	Coupling V201 A to V201B	CAPACITOR: Ceramic, 47 mmf p/m 5%, 500 WV	916 4463 00
C202	Coupling V201 B to V202A	CAPACITOR: Ceramic, 47 mmf p/m 5%, 500 WV	916 4463 00
C203	Coupling V202 A to V202B	CAPACITOR: Ceramic, 47 mmf p/m 5%, 500 WV	916 4463 00
C204	V201A plate decoupling	CAPACITOR: Silver mica, 500 mmf p/m 2%, 500 WV	912 0279 00

479U-1 SIGNAL GENERATOR

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
C205	V201B plate decoupling	CAPACITOR: Silver mica, 500 mmf p/m 2%, 500 WV	912 0279 00
C206	Tunes L201	CAPACITOR: Ceramic, 18 mmf p/m 5%, 500 WV	916 4416 00
C207	Tunes L202	CAPACITOR: Ceramic, 24 mmf p/m 5%, 500 WV	916 4428 00
C208	Tunes L203 primary	CAPACITOR: Ceramic, 15 mmf p/m 5%, 500 WV	916 4412 00
C209	V202A plate decoupling	CAPACITOR: Silver mica, 100 mmf p/m 2%, 500 WV	912 0271 00
C210	V202B plate decoupling	CAPACITOR: Silver mica, 100 mmf p/m 2%, 500 WV	912 0271 00
C211	RF Bypass around meter multiplier R210	CAPACITOR: Ceramic, 100 mmf p/m 5%, 500 WV	916 4059 00
C212	300 MC tuning capacitor	CAPACITOR: Variable midget single section, 1.73 to 8.69 mmf, 150 v rms at 2.0 mc	504 4944 001
C213	Feed thru capacitor on regulated B+ supply to V201A and V201B	CAPACITOR: Mica, 500 mmf plus 40% minus 15%, 500 WV	912 0270 00
C214	Feed thru capacitor on metering lead	CAPACITOR: Silver mica, 500 mmf plus 40% minus 15%, 500 WV	912 0270 00
C215	Feed thru capacitor on filament lead	CAPACITOR: Silver mica, 500 mmf plus 40% minus 15%, 500 WV	912 0270 00
C216	Feed thru on B+ lead to V202A	CAPACITOR: Button mica, 100 mmf p/m 20%, 500 WV	912 0647 00
C217	Feed thru on B+ lead to V202B	CAPACITOR: Button mica, 100 mmf p/m 20%, 500 WV	912 0647 00
C301	Bypass on input lead to power supply	CAPACITOR: Paper, 1.3 mf p/m 20%, 50 WV	930 0004 00
C302	Power supply filter	CAPACITOR: Paper, 100,000 mmf p/m 20%, 600 WV	930 0029 00
C303	Power supply filter	CAPACITOR: Paper, 3.9 mf p/m 6%, 330 WV	930 0095 00

479U-1 SIGNAL GENERATOR

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
CR101	Discriminator rectifier	RECTIFIER: High voltage, half-wave selenium for low current control	353 0082 00
CR102	Discriminator rectifier	RECTIFIER: High voltage, half-wave selenium for low current control	353 0082 00
E101	Function selector switch knob	KNOB: Bar, bakelite with brass insert for 1/4" shaft	281 1150 00
E201	Couples S101 and S201	COUPLING: Flexible	015 0027 00
E301	Makes connections for dynamotor	PLUG ASSEM: 8 banana spring terminals	504 3527 002
F101	Line fuse	FUSE: Glass enclosed cartridge, 5 amp, 250 v	264 4090 00
I101	Panel pilot light	BULB: Pilot light bulb with miniature bayonet base, 28 v, 0.17 amp	262 3270 00
J301	Power connector on D.C. supply	CONNECTOR: 12 prong socket	366 2120 00
L201	Oscillator coil	COIL ASSEM: Oscillator, 12 turns, #18 AWG	504 4923 002
L202	Doubler coil	COIL ASSEM: Doubler, 5 turns, #18 AWG	504 4924 002
L203	100 MC output coil	COIL ASSEM: Output, 3 turns, #18 AWG	504 4925 002
L204	300 MC output coil	COIL RF: 3-1/2 turns, #18 AWG	504 4940 001
L205	V202B plate choke	COIL: RF Choke, 45 plus 0 minus 3 turns, #30 AWG wire, 300 ma max	240 0012 00
L301	R.F. Choke in DC power supply input	COIL: RF Choke, 1 mh, 300 ma, 10 ohms, 1.5 mf max 3 sections, multiple duolateral wound	240 5800 00
L302	R.F. Choke in DC power supply output	COIL: RF Choke, single layer, close wound, #20 AWG	240 0048 00
M101	Output meter	METER: DC Microammeter, 0-100 microamperes, 1110 ohm p/m 10%, 1500 v AC	458 0194 00
P101	Connections to power supply	CONNECTOR: 12 prong plug	365 8120 00

479U-1 SIGNAL GENERATOR

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
P102	Input power receptacle	CONNECTOR: 3 male contacts	368 0016 00
R101	Grid Resistor V101B	RESISTOR: 275,000 ohm p/m 1%, 1/2 w	748 9001 00
R102	Cathode Resistor V101B	RESISTOR: 2700 ohm p/m 10%, 1 w	745 3104 00
R103	Frequency control for low frequency oscillator	RESISTOR: Variable, 1,000 ohm p/m 20%, 1 w	376 0051 00
R104	Plate load V101B	RESISTOR: 15,000 ohm p/m 10%, 1 w	745 3135 00
R105	Grid Resistor V101A	RESISTOR: 296,000 ohm p/m 1%, 1/2 w	748 9002 00
R106	Cathode Resistor V101A low frequency oscillator level control	RESISTOR: Variable, 5000 ohm p/m 20%, 1 w	376 0053 00
R107	V101A plate load	RESISTOR: 15,000 ohm p/m 10%, 1 w	745 3135 00
R108	V102B Grid Resistor	RESISTOR: 296,000 ohm p/m 10%, 1/2 w	748 9002 00
R109	V102B cathode Resistor	RESISTOR: 3,900 ohm p/m 5%, 1 w	745 3110 00
R110	V102B plate load	RESISTOR: 6,800 ohm p/m 10%, 1 w	745 3121 00
R111	V102B plate load	RESISTOR: 3,900 ohm p/m 5%, 1 w	745 3110 00
R112	Part of voltage divider for Ø localizer yellow in mixing network	RESISTOR: .47 megohm p/m 10%, 1/2 w	745 1198 00
R113	Part of voltage divider for Ø localizer blue in mixing network	RESISTOR: .47 megohm p/m 10%, 1/2 w	745 1198 00
R114	R104B Grid Resistor	RESISTOR: .47 megohm p/m 10%, 1/2 w	745 1198 00
R115	Part of voltage divider in VOR positions in mixing network	RESISTOR: .47 megohm p/m 10%, 1/2 w	745 1198 00
R116	Series dropping Resistor for VOR 315° in mixing network	RESISTOR: .47 megohm p/m 10%, 1/2 w	745 1198 00

479U-1 SIGNAL GENERATOR

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R117	Part of voltage divider for VOR 0° position in mixing network	RESISTOR: .47 megohm p/m 10%, 1/2 w	745 1198 00
R118	Phase shift Resistor for VOR 150° in mixing network	RESISTOR: 196,000 ohm p/m 1%, 1/3 w	748 0759 00
R119	Phase shift Resistor for VOR 315° in mixing network	RESISTOR: 113,000 ohm p/m 1%, 1/3 w	748 0756 00
R120	Series dropping Resistor for tone localizer and glide slope signals in mixing network	RESISTOR: .56 megohm p/m 10%, 1/2 w	745 1202 00
R121	9960 cycle FM deviation control	RESISTOR: Variable, .50 megohm p/m 20%, 1 w	376 0058 00
R122	VOR 0° control	RESISTOR: Variable, .10 megohm p/m 20%, 1 w	376 0057 00
R123	9960 cycle mid-frequency control	RESISTOR: Variable, 10,000 ohm p/m 20%, 1 w	376 0054 00
R124	Part of phase shift network in cathode V103A	RESISTOR: 15,000 ohm p/m 10%, 1/2 w	745 1135 00
R125	Part of phase shift network in cathode V103A	RESISTOR: 18,000 ohm p/m 10%, 1/2 w	745 1139 00
R126	Part of phase shift network in cathode V103A	RESISTOR: 18,000 ohm p/m 10%, 1/2 w	745 1139 00
R127	Part of phase shift network in cathode V103A	RESISTOR: .10 megohm p/m 10%, 1/2 w	745 1170 00
R128	Cathode Resistor V104B	RESISTOR: 10,000 ohm p/m 10%, 1/2 w	745 1128 00
R129	Part of voltage divider for tone localizer and glide slope in mixing network	RESISTOR: .56 megohm p/m 10%, 1/2 w	745 1202 00

479U-1 SIGNAL GENERATOR

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R130	Cathode Resistor V103B	RESISTOR: 2200 ohm p/m 10%, 1/2 w	745 1100 00
R131	Plate load V103B	RESISTOR: .22 megohm p/m 10%, 1/2 w	745 1184 00
R132	Series dropping Resistor grid V103A	RESISTOR: 1.0 megohm p/m 10%, 1/2 w	745 1212 00
R133	Discriminator output filter Resistor	RESISTOR: 2.2 megohm p/m 10%, 1/2 w	745 1226 00
R134	Discriminator output filter Resistor	RESISTOR: 2.2 megohm p/m 10%, 1/2 w	745 1226 00
R135	V104A Grid Resistor 9960 level control	RESISTOR: Variable, 50,000 ohm p/m 20%, 1 w	376 0056 00
R136	V104A cathode resistor	RESISTOR: 1,000 ohm p/m 10%, 1/2 w	745 1086 00
R137	Part of discriminator load	RESISTOR: .27 megohm p/m 5%, 1/2 w	745 1187 00
R138	Part of discriminator load	RESISTOR: .27 megohm p/m 5%, 1/2 w	745 1187 00
R139	V102A plate load	RESISTOR: 56,000 ohm p/m 10%, 1/2 w	745 1160 00
R140	V102A cathode resistor	RESISTOR: 2700 ohm p/m 10%, 1/2 w	745 1104 00
R141	Part of voltage divider for VOR positions in mixing network	RESISTOR: 2.2 megohm p/m 10%, 1/2 w	745 1226 00
R142	Grid V106 modulation gain control	RESISTOR: Variable, 1.0 megohm p/m 20%, 1 w	376 0059 00
R143	Part of voltage divider for VOR 0° position in mixing network	RESISTOR: 1.2 megohm p/m 10%, 1/2 w	745 1216 00
R144	V105 cathode Resistor	RESISTOR: 1,000 ohm p/m 10%, 1/2 w	745 1086 00
R145	Part of V105 screen supply voltage divider	RESISTOR: 68,000 ohm p/m 10%, 1/2 w	745 1163 00
R146	Part of V106 grid voltage divider	RESISTOR: 33,000 ohm p/m 10%, 1/2 w	745 1149 00

479U-1 SIGNAL GENERATOR

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R147	V106 Grid Resistor	RESISTOR: 1.0 megohm p/m 10%, 1/2 w	745 1212 00
R148	Part of V106 Grid voltage divider	RESISTOR: 82,000 ohm p/m 5%, 1/2 w	745 1166 00
R149	V106 cathode Resistor	RESISTOR: .12 megohm p/m 10%, 1/2 w	745 1174 00
R150	Calibrate control on front panel	RESISTOR: Variable, 10,000 ohm p/m 20%, 1 w	376 0054 00
R151	V102A Grid Resistor	RESISTOR: 1.0 megohm p/m 10%, 1/2 w	745 1212 00
R152	Plate load V105	RESISTOR: 56,000 ohm p/m 10%, 1/2 w	745 1160 00
R153	Part of V103 screen supply voltage divider	RESISTOR: 47,000 ohm p/m 10%, 1/2 w	745 1156 00
R154	V104A Plate decoupling	RESISTOR: 10,000 ohm p/m 10%, 1/2 w	745 1128 00
R155	Shunts meter in glide slope positions	RESISTOR: 330 ohm p/m 10%, 1/4 w	745 0065 00
R156	Meter shunt	RESISTOR: 3300 ohm p/m 10%, 1/4 w	745 0107 00
R157	Part of voltage divider for Ø localizer yellow in mixing network	RESISTOR: 82,000 ohm p/m 10%, 1/4 w	745 0167 00
R158	Part of voltage divider for Ø localizer blue in mixing network	RESISTOR: 82,000 ohm p/m 10%, 1/4 w	745 0167 00
R159	Part of voltage divider for tone localizer and glide slope in mixing network	RESISTOR: .56 megohm p/m 10%, 1/2 w	745 1202 00
R160	Shunts fil V105	RESISTOR: 43 ohm p/m 5%, 2 w	745 5028 00
R161	Part of fil shunt for V101 and V102	RESISTOR: 43 ohm p/m 5%, 2 w	745 5028 00
R162	Part of fil shunt for V101 and V102	RESISTOR: 43 ohm p/m 5%, 2 w	745 5028 00
R163	Filament series Res.	RESISTOR: 0.75 ohm p/m 10%, 5 w	747 9021 00

479U-1 SIGNAL GENERATOR

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R164	Filament series Res.	RESISTOR: 0.75 ohm p/m 10%, 5 w	747 9021 00
R201	Cathode of V201A	RESISTOR: 100 ohm p/m 10%, 1/2 w	745 1044 00
R202	Cathode of V201B	RESISTOR: 100 ohm p/m 10%, 1/2 w	745 1044 00
R203	Cathode of V201A	RESISTOR: 10 ohm p/m 10%, 1/2 w	745 1002 00
R204	Cathode of V201B	RESISTOR: 10 ohm p/m 10%, 1/2 w	745 1002 00
R205	V201A plate decoupling	RESISTOR: 4700 ohm p/m 10%, 1/2 w	745 1114 00
R206	V201B plate decoupling	RESISTOR: 4700 ohm p/m 10%, 1/2 w	745 1114 00
R207	V201B grid resistor	RESISTOR: 56,000 ohm p/m 10%, 1/2 w	745 1160 00
R208	V202A grid resistor	RESISTOR: 56,000 ohm p/m 10%, 1/2 w	745 1160 00
R209	V202B grid resistor	RESISTOR: 33,000 ohm p/m 10%, 1/2 w	745 1149 00
R210	Metering resistor	RESISTOR: .10 megohm p/m 10%, 1/2 w	745 1170 00
R211	Output to antenna	RESISTOR: 47 ohm p/m 10%, 1/2 w	745 1030 00
R301	Power supply filter Resistor	RESISTOR: 750 ohm p/m 5%, 10 w	710 1750 10
R302	Power supply filter Resistor	RESISTOR: 750 ohm p/m 5%, 10 w	710 1750 10
R501	p/o RF Pad	RESISTOR: 56 ohm p/m 10%, 1/2 w	745 1034 00
R502	p/o RF Pad	RESISTOR: 270 ohm p/m 10%, 1/2 w	745 1062 00
R503	p/o RF Pad	RESISTOR: 56 ohm p/m 10%, 1/2 w	745 1034 00
R504	p/o RF Pad	RESISTOR: 56 ohm p/m 10%, 1/2 w	745 1034 00
R505	p/o RF Pad	RESISTOR: 270 ohm p/m 10%, 1/2 w	745 1062 00
R506	p/o RF Pad	RESISTOR: 56 ohm p/m 10%, 1/2 w	745 1034 00
R507	p/o RF Pad	RESISTOR: 56 ohm p/m 10%, 1/2 w	745 1034 00
R508	p/o RF Pad	RESISTOR: 270 ohm p/m 10%, 1/2 w	745 1062 00

479U-1 SIGNAL GENERATOR

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R509	p/o RF Pad	RESISTOR: 56 ohm p/m 10%, 1/2 w	745 1034 00
S101	Function selector	SWITCH: 10 circuit, 10 pole, 10 pos, 8 deck rotary wafer with 30° detent and stops limiting rotation to 10 pos	259 0382 00
S101A	Switch coupling capacitors between V101B and V101A	SWITCH: Section of S101	
S101B	Switch coupling capacitors between V101A and V102B	SWITCH: Section of S101	
S101C	Switch coupling capacitors in feed-back loop between V102B and V-101B	SWITCH: Section of S101	
S101D	Switch outputs from mixing network	SWITCH: Section of S101	
S101E	Switches modulator output	SWITCH: Section of S101	
S101F	Switches phase shift constants and levels in VOR positions in mixing network	SWITCH: Section of S101	
S101G	Switches modulator output	SWITCH: Section of S101	
S101H	Grounding and disabling switch in mixing network	SWITCH: Section of S101	
S102	Increase modulation for checking flag sensitivity in tone localizer and glide slope positions	SWITCH: Push button, 2 circuit, 2 pole, single throw, 1 circuit normally ON, 1 circuit normally OFF, 1 amp, 125 v AC	260 0861 00
S103	Power "ON-OFF" switch	SWITCH: Toggle, SPST	260 0529 00
S201	R.F. frequency selector (Ganged with S101)	SWITCH SECTION: Rotary wafer, 1 circuit, 1 pole, 10 pos, non-shorting	269 1276 00

479U-1 SIGNAL GENERATOR

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
T101	Discriminator transformer	TRANSFORMER: Special audio transformer, Pri: 600 ohm, Sec #1: 450, 500 ohm Sec #2: 150 ohm, 500 TV rms	677 0197 00
V101A V101B	2nd stage low freq.osc. 1st stage low freq.osc.	TUBE: Type 12AU7, twin triode	255 0199 00
V102A V102B	9960 cycle amplifier 3rd stage low freq.osc.	TUBE: Type 12AU7, twin triode	255 0199 00
V103A V103B	p/o 9960 cycle osc. p/o 9960 cycle osc.	TUBE: Type 12AX7, twin triode	255 0201 00
V104A V104B	9960 AFC stage p/o 9960 cycle osc.	TUBE: Type 12AU7, twin triode	255 0199 00
V105	Modulator Driver	TUBE: Type 6AU6, Pentode	255 0202 00
V106	Modulator	TUBE: Type 6AQ5, pentode	255 0195 00
V201A V201B	p/o RF oscillator p/o RF oscillator	TUBE: Type 12AT7, double triode	255 0205 00
V202A V202B	RF doubler RF tripler	TUBE: Type 12AT7, double triode	255 0205 00
V301	Regulate B plus voltage	TUBE: Type OA2, voltage regulator	257 0052 00
XF101	Holds F-101	HOLDER: Extractor post type, for 3AG fuse	265 1002 00
XI101	Holds I-101	MOUNTING: Mounting bracket for miniature bayonet base pilot light bulb JEWEL: smooth-clear	262 1260 00 262 2190 00
XV101	Mounts V101	SOCKET: 9 cont miniature	220 1063 00
XV102	Mounts V102	SOCKET: 9 cont miniature	220 1063 00
XV103	Mounts V103	SOCKET: 9 cont miniature	220 1063 00
XV104	Mounts V104	SOCKET: 9 cont miniature	220 1063 00
XV105	Mounts V105	SOCKET: 7 contact miniature	220 1034 00
XV106	Mounts V106	SOCKET: 7 contact miniature	220 1034 00

479U-1 SIGNAL GENERATOR

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
XV201	Mounts V201	SOCKET: 9 cont miniature	220 1063 00
XV202	Mounts V202	SOCKET: 9 cont miniature	220 1063 00
XV301	Mounts V301	SOCKET: 7 cont miniature	220 1034 00
XY201	Mounts Y201	SOCKET: Type CR-7 low loss steatite	292 0023 00
XY202	Mounts Y202	SOCKET: Type CR-7 low loss steatite	292 0023 00
XY203	Mounts Y203	SOCKET: Type CR-7 low loss steatite	292 0023 00
Y201	VOR osc. Xtal	CRYSTAL UNIT: CR-23/U modified, temp range 40° to 70° C	291 7001 00
Y202	Loc. Osc. Xtal	CRYSTAL UNIT: CR-23/U modified, temp range 40° to 70° C	291 7004 00
Y203	Glide slope Xtal	CRYSTAL UNIT: CR-23/U modified, temp range 40° to 70° C	291 7005 00

AC 479U-1 POWER SUPPLY

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
C401	Filter capacitor	CAPACITOR: Paper, 2 mf plus 40% minus 15%, 600 WV	930 0023 00
C402	Filter capacitor	CAPACITOR: Paper, 2 mf plus 40% minus 15%, 600 WV	930 0023 00
CR401	Rectifier for Buzzer supply voltage	RECTIFIER: Selenium, miniature, single phase half-wave, 130 v rms	353 0006 00
J401	Power connector	CONNECTOR: 12 prong socket	366 2120 00
L401	Filter choke	REACTOR: Filter, 15 hy, 60 ma plus 20% minus 0, 0-60 cps, 1500 TV	678 0020 00
R401	Voltage dropping	RESISTOR: 750 ohm p/m 5%, 10 w	710 1750 00
R401	Power transformer	TRANSFORMER: Power, Pri: 115 v, 1600 TV, Sec #1: v CT, Sec #2: 57, 26.4, 6.3 v, 1600 TV	672 0329 00
V401	Rectifier	TUBE: Type 6X4, rectifier	255 0196 00
V402	D.C. Output voltage regulation	TUBE: Type OA2, voltage regulator	257 0052 00
XV401	Mounts V401	SOCKET: 7 contact miniature	220 1034 00
XV402	Mounts V402	SOCKET: 7 contact miniature	220 1034 00

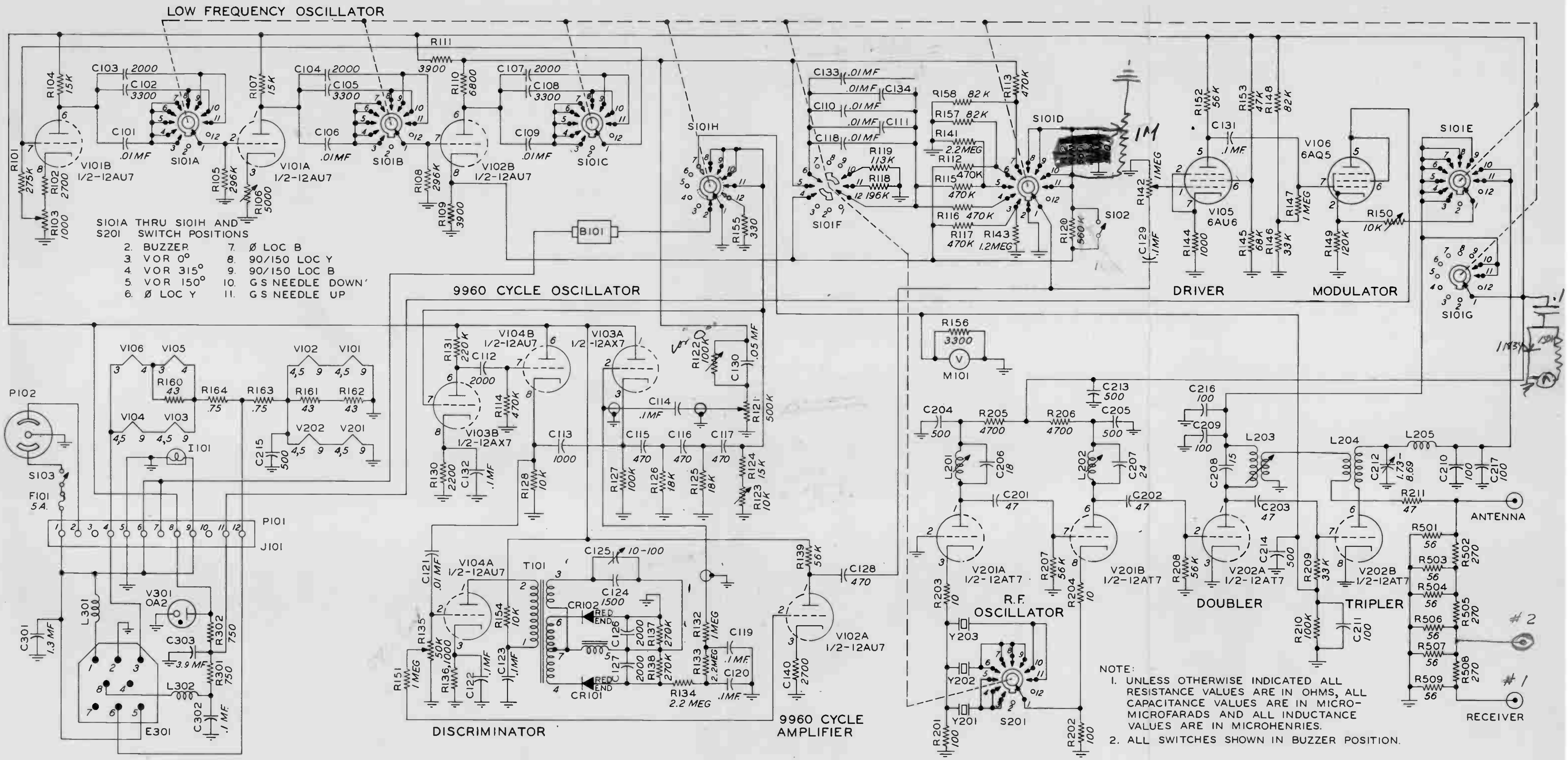

Figure 7-1. 479U-1 Signal Generator - Complete Schematic.

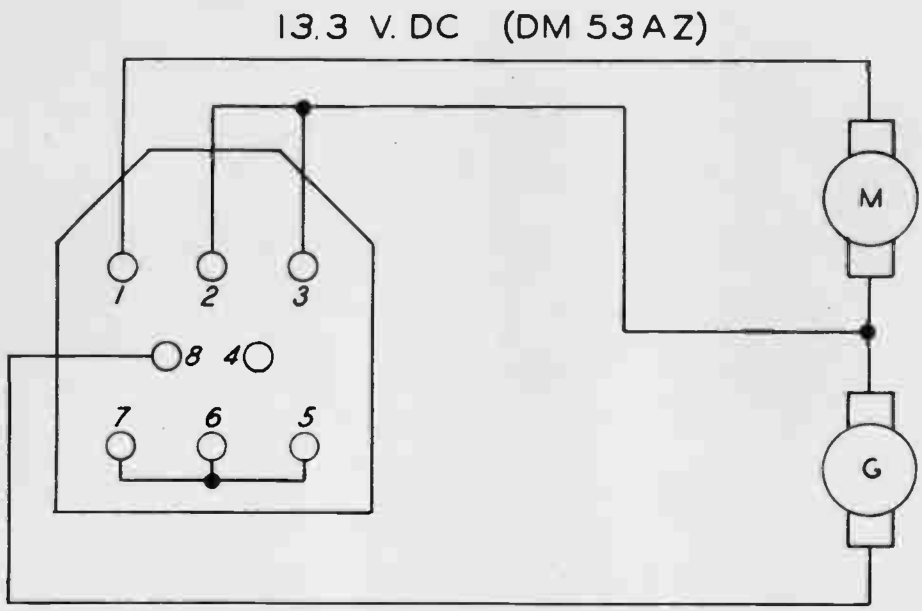

Figure 7-2. Dynamotor DM-53AZ - Internal Wiring.

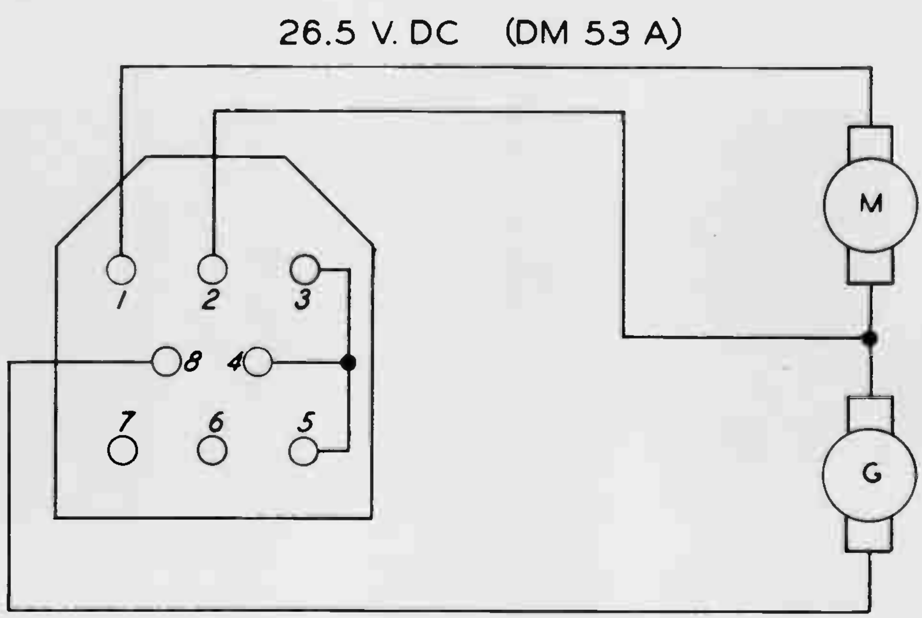

Figure 7-3. Dynamotor DM-53A - Internal Wiring.

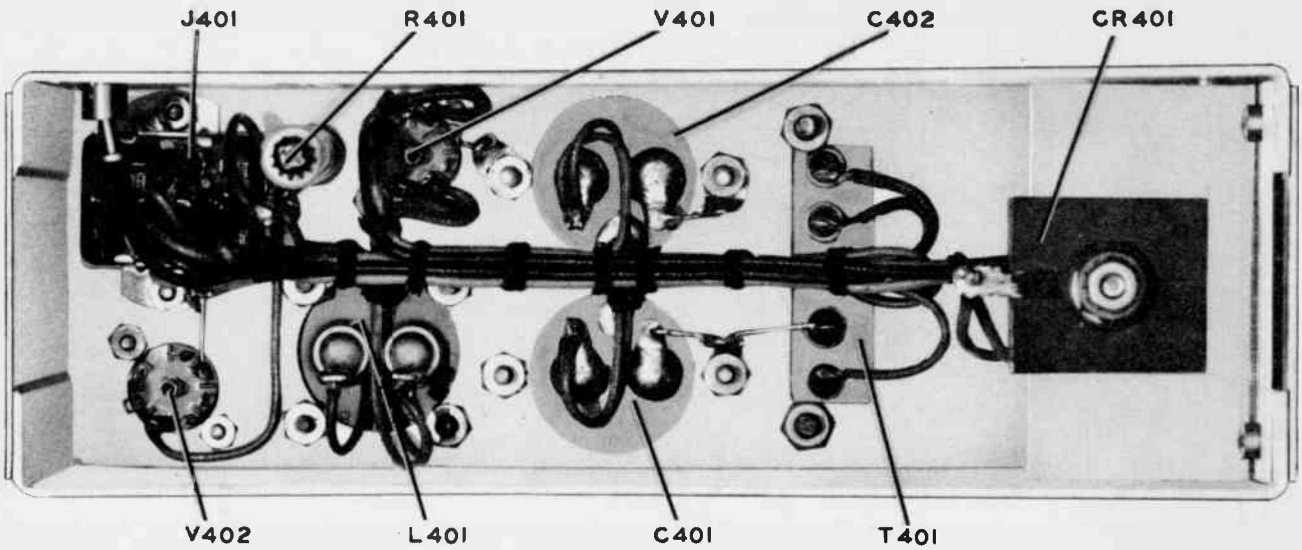

Figure 8-1. AC Power Supply - Parts Arrangement - Bottom View.

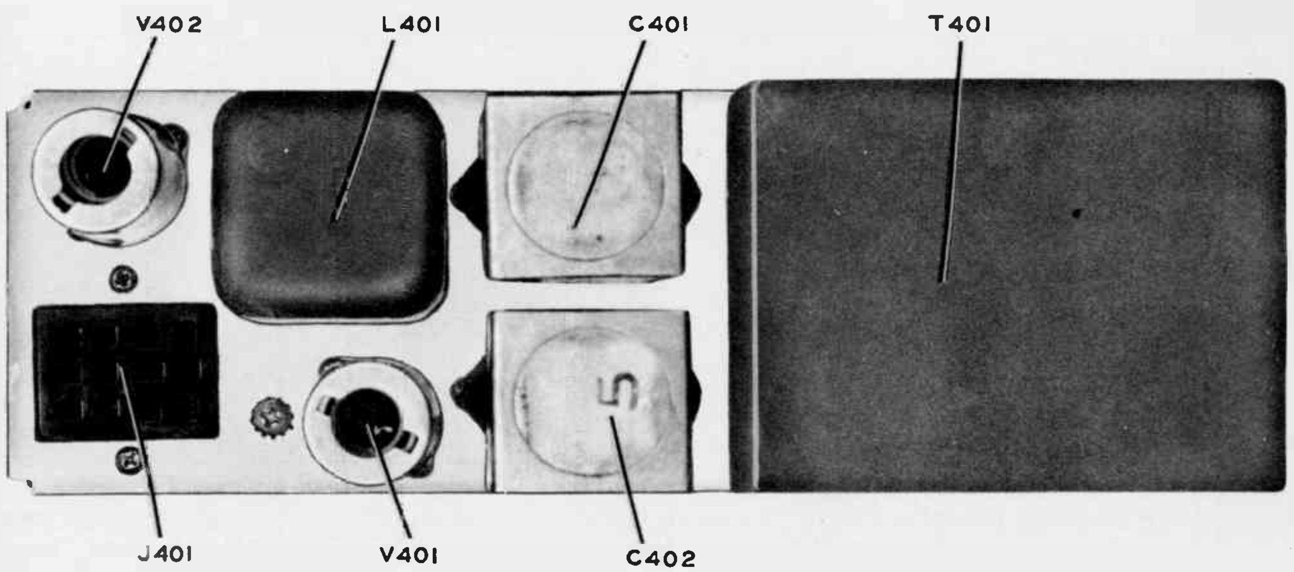

Figure 8-2. AC Power Supply - Parts Arrangement - Top View.

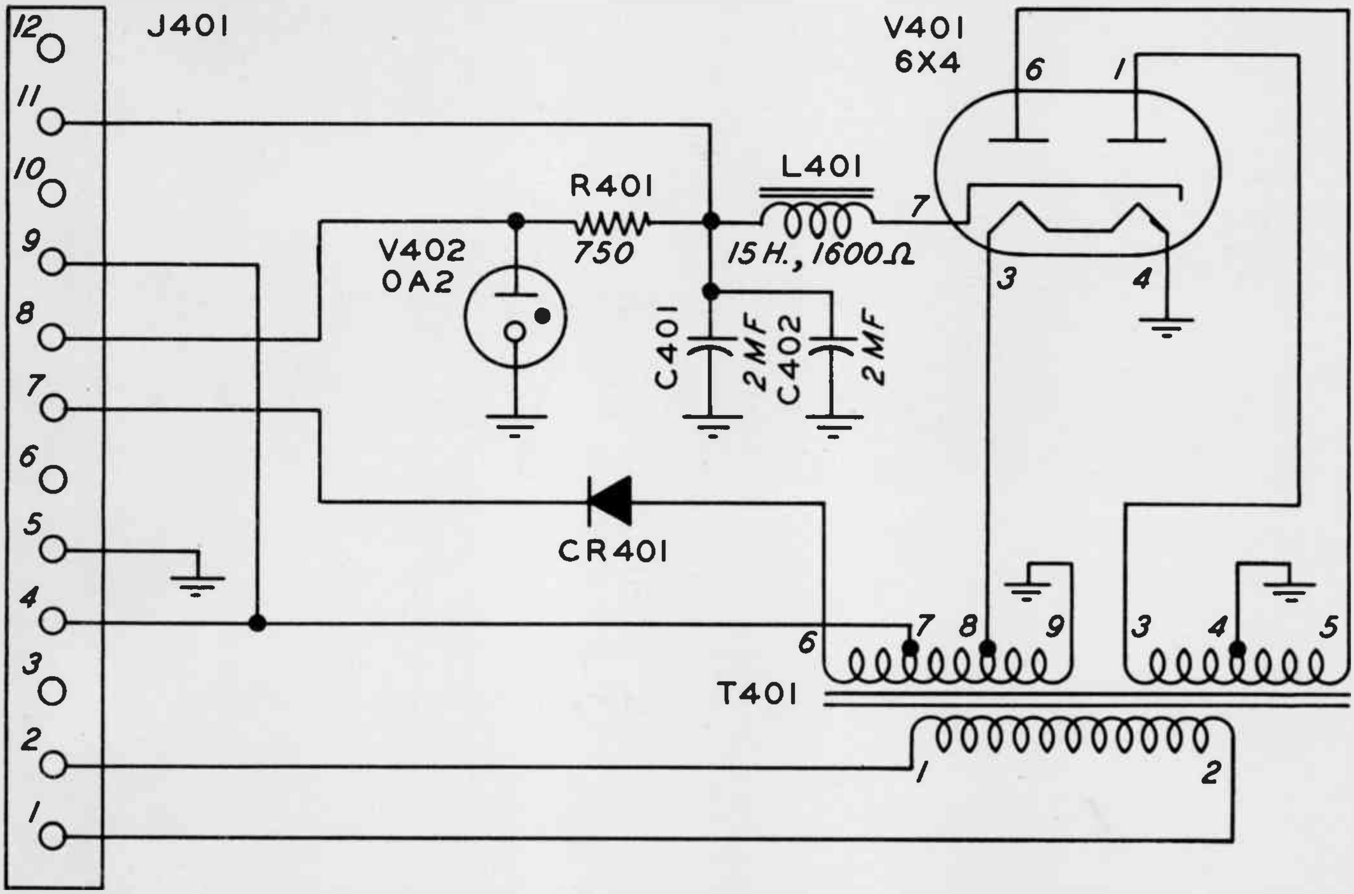

Figure 8-3. AC Power Supply - Schematic.

SECTION 8

AUXILIARY AC POWER SUPPLY

The Auxiliary Power Supply has been designed to provide greater flexibility in the operation of the Collins Type 479U-1 Test Equipment. It is interchangeable with the provided DC supply both mechanically and electrically. The Auxiliary Power Supply operates from 115 volt AC source at either 60 or 400 cycles per second, drawing approximately 1/2 amp. from the primary source. Figure 8-3 shows the schematic diagram of this power supply.