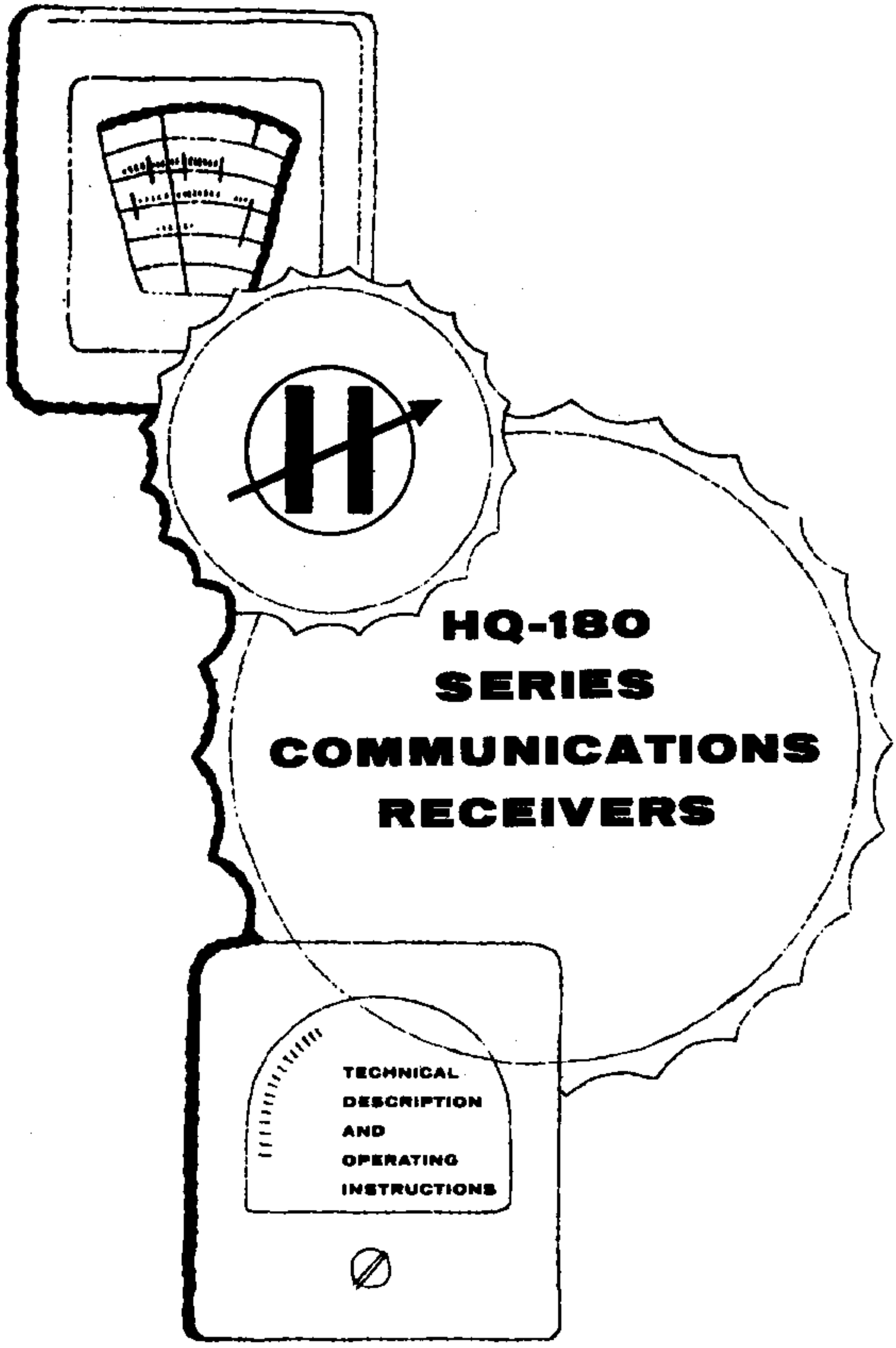


HQ-180 SERIES COMMUNICATIONS RECEIVERS

TECHNICAL DESCRIPTION AND OPERATING INSTRUCTIONS

HAMMARLUND

Hammarlund Manufacturing Company, Inc.
A Giannini Scientific Co.
53 West 23rd Street, New York 10, N. Y.
Export Department: 13 East 40th Street, New York 16, N. Y.

52787-1

THE HQ-180 AND 180-A SERIES OF COMMUNICATIONS RECEIVERS

THE HAMMARLUND 180 AND 180-A SERIES OF COMMUNICATIONS RECEIVERS

CONTENTS OF INSTRUCTION AND SERVICE MANUAL

HQ-180 AND 180-"A" SERIES SPECIFICATIONS

Frequency Range Covered:
.54-1.05mc/s; 1.05-2.05 mc/s; 2.05-4.04 mc/s; 4.0-7.85 mc/s; 7.85-15.35 mc/s; 15.35-30.0 mc/s.

Bandspread Calibration:
Dial markings every 5 kc/s on 15, 20, 40 and 80 meter bands; every 10 kc/s on 10 meter band; plus arbitrary 0-100 logging scale.

Maximum Audio Output:
1.0 Watt (Undistorted)

Passband Tuning Range:
plus/minus 3 KCS with calibration every 1 KC. 8:1 vernier tuning ratio.

Output impedance:
3.2 Ohms (E1A Standard) plus 500 Ohms.

AVC Action:
Operates on RF and 3 1F stages. Provides fast charge--adjustable discharge smooth acting AVC. Delayed AVC applied to the RF stage. Better than .001 second attack time and .01-.1-1 second decay time. Off position.

Adjustable Selectivity and Selectable Sidebands:
6 db bandwidths 'Upper sideband--1-2-3 kcs Lower sideband--1-2-3 kcs Both sidebands--.5-2-4-6 kcs

Sensitivity:
An average of 1.5 microvolts produces 10:1 signal-to-noise ratio on AM approximately .7 uv on CW and SSB.

Antenna Input:
50 to 600 ohms; balanced or unbalanced.

Antenna Compensator:
Permits compensation for loading effects of various type antennas, or balanced transmission line.

Beat Frequency Oscillator:
Variable from zero beat plus/minus 2 kcs plus fixed position for SSB.

Slot Filter:
Range plus/minus 5 kcs of center frequency. Attenuation over plus/minus 5 kcs range provides over 40 db. Calibrations every 1 kc. Maximum attenuation using slot depth control is 60 db. 8:1 vernier tuning ratio.

Tube Complement:

6BZ6	RF Amplifier
6BE6	1st Converter
6C4	HF Oscillator
6BE6	2nd Mixer-Crystal Osc.
6BA6	455 kc Gate
6BA6	455 kc 1F Amp.
6BE6	3rd Mixer-Variable Osc.
6BA6	60 kc 1F Amp.
6BA6	60 kc 1F Amp.
6BV8	60 kc 1F amp. AVC-AM Det.
12AU7	SSB Product Detector
6AL5	Noise Limiter
12AU7	BFO-"S" Meter Amplifier
6AV6	1st A F Amp. - Delayed AVC Clamp
6AQ5	Audio Power Output
OA2	Voltage Regulator
6BZ6	Crystal Calibrator
6CW4	Crystal Oscillator

Semiconductor Complement:
Rectifier -- Two 800 P.I.V. at 1/2 amp.

Power Supply:
105-125 Volts 50-60 cps. a.c. power consumption. 120 watts.

"S" Meter:
Calibrated 1 to 9 in steps approximately 6 db. Also includes db scale, above 5-9 to plus 40 db. (Meter deflects on all types of signals.)

Noise Limiter:
Adjustable series type provides both positive and negative clipping.

Front Panel Equipment:

Main Tuning
Bandspread Tuning
Vernier or Bandpass Tuning
Sensitivity (RF Gain):
  on/off switch
Selectivity: 0.5-1-2-3 Kcs.
  (per sideband)
Sideband: Upper-lower-both
Audio Gain
Antenna Compensator
Tuning Range (Band Selector)
Function Switch: AM-SSB-CW
Slot Freq. Calib.
CW Tone (BFO Pitch)
Noise Limiter, adjustable
  -on/off switch
AVC, off-slow-medium-fast
Send-Receive-Calibrate
Phone Jack
"S" Meter
Dial Scale reset

Rear Panel Equipment:
Terminals for speaker connections
  3.2 ohm for voice coil
  500 ohm for line or VOX

Accessory socket for preamp, Q-multiplier or converter. System socket for simplified associated transmitter/receiver control.

S-meter controls.

Antenna input terminals plus SO239.

Dimensions:
10-1/2" H x 19" W x 13' D
Wt. 38 lbs.
Shipping Wt. 45 lbs.

HQ-180AX
Universal model of the HQ-180A receiver with provisions for 11 fixed-frequency crystal controlled channels. Six of the crystals are easily interchangeable from the front panel--the balance are located within the cabinet but are readily accessible from the trap-door top. 3 kc vernier tuning control permits compensation for minor frequency variations of the crystals.

24 HOUR CLOCK-TIMER

Combination clock and automatic timer. Aids in meeting prearranged schedules. Optional extra.

IF AMPLIFIER The 3035 KCS and 455 KCS IF amplifiers provide eight tuned circuits in three stages of amplification. Six tuned circuits in the three-stage 60 KCS amplifier provide either the second or third conversion, depending upon the operating band. All IF circuits employ iron-core permeability-tuned transformers for the high performance and retention of alignment accuracy. The 60 KCS amplifier selectivity is controlled from the front panel by seven positions: 1-2-3 KCS on either sideband, and .5-2-4-6 KCS on both sidebands. The skirt selectivity of this system approaches that of the mechanical filter. A separate front panel switch is used to select upper, lower, or both sidebands, providing rapid, simple means of sideband selection.

SLOT FILTER The slot filter provides a notch of better than 60 db attenuation over the entire range of ± 5 KCS from the center IF (455 KCS) frequency. The slot filter control provides 40 db attenuation, plus an additional attenuation of up to 20 db obtainable by use of the slot depth control at a particular frequency. The 6 db width of the slot is approximately 1.5 KCS. Accurate frequency adjustment of the slot is obtained by means of an 8:1 vernier control. The slot filter circuit consists of a Bifilar "T" trap.

SEPARATE VERNIER TUNING ± 3 KCS vernier tuning allows extra-fine passband tuning between the 455 KCS IF and the 60 KCS IF for additional selectivity and easy tuning of the desired signal.

AVC An extremely fast-attack delayed AVC circuit is employed. A four position control on the front panel permits the selection of OFF-AVC or SLOW-MEDIUM-FAST AVC decay time for optimum results on various signals. The AVC is taken from the high selectivity 60 KCS IF.

S-METER Readings of signal strength and "on-the-point" tuning indications are provided on all types of signals by a high-response S meter circuit. The scale is calibrated to 40 db over S-9 and is factory-calibrated so a signal of approximately 50 microvolts reads S-9. Each S-unit indicates approximately a 6 db increase, equivalent to doubling the signal strength. S-meter is extremely effective on SSB and CW when using slow decay AVC.

AUDIO The HQ-180A features the exclusive Hammarlund Auto-Response which automatically adjusts the audio passband to best meet the receiving conditions. A (6AQ5) provides 1.0 watt for maximum undistorted output. The Auto-Response circuit employs controlled feedback which is decreased as the gain control is turned up, thus narrowing the audio passband. As the gain is decreased, the feedback increases, thus permitting a greater frequency response in the audio output. The result is crisper, easier to read sound on weaker signals, and broader, more realistic reproduction on stronger signals.

The audio output may be used with either earphones or loudspeaker. The phone plug automatically silences the speaker upon insertion. The Audio-Response permits tops in listening pleasure of AM, SSB, and CW reception.

HQ-180A DESCRIPTION

Starting with the front panel layout, the careful selection of high-reliability components, the craftsmanship of skilled technicians, and the addition of engineering leadership result in a receiver worthy of the Hammarlund name in quality and performance.

The HQ-180A offers the listener a practically endless combination of tuning techniques whereby reception of SSB/CW and AM/MCW may be achieved. Through the use of the vernier tuning, adjustable bandwidth, and the basic, precision front-end of the HQ-180A the user has full control over SSB signals as well as adjacent, or co-channel signals. If there's a signal to be received, the HQ-180A can ferret it out...

The HQ-180A is a "hot" receiver. It will provide 10 db signal-to-noise ratio at 1.5 uvolt AM or approximately .5 uvolt CW, or better depending on bandwidth. The front end provides continuous tuning .54 mc/s to 30 mc/s. The receiver is designed for use with a single wire flat top, a folded dipole, or doublet antenna.

CIRCUITRY The HQ-180 is an eighteen tube triple conversion superheterodyne receiver (double conversion, .54 to 7.85 megacycles) that has been designed to provide the best possible performance for reception of AM, SSB and CW signals. The most important performance characteristics of a communications receiver have been made adjustable by means of the front panel knobs.

The RF tuning system covers the following bands:

MAIN TUNING DIAL

.54 to	1.05	mc...cal in	10 kc divs.
1.05 to	2.05	mc...cal in	10 kc divs.
2.05 to	4.04	mc...cal in	20 kc divs.
4.0 to	7.85	mc...cal in	50 kc divs.
7.85 to	15.35	mc...cal in	100 kc divs.
15.35 to	30.0	mc...cal in	100 kc divs.

BAND SPREAD TUNING DIAL

Arbitrary scale		0 to 100 divs.
3.44 to	4.040	mc..cal in 5 kc divs.
6.810 to	7.3	mc..cal in 5 kc divs.
13.980 to	14.425	mc..cal in 5 kc divs.
20.925 to	21.60	mc..cal in 5 kc divs.
27.890 to	29.7	mc..cal in 10 kc divs.

A built-in 100 kcs crystal calibrator provides marker signals at every 100 kcs on all bands for checking dial calibration accuracy.

The dial calibration reset knob enables you to adjust the frequency calibration to approach frequency meter standards on each amateur band.

Starting at the front-end, the HQ-180A utilizes a (6BZ6) tuned RF amplifier and a separate mixer (6BE6) and oscillator (6C4) for a high degree of stability. Advanced design and modern tube types account for the very high gain and low noise factor. Refer to page one for complete listing of the many possible functions and the complete tube lineup.

Low-loss, coil forms, and bandswitch wafers, plus temperature-compensating capacitors, and the application of regulated power to the oscillator circuit provide a high degree of stability.

TRIPLE CONVERSION The HQ-180A offers triple conversion with IF frequencies of 3035 KCS, 455 KCS, and 60 KCS, providing excellent rejection of image-response. The second IF is heterodyned with a crystal-controlled oscillator. The third IF is heterodyned with a high stability, adjustable oscillator which contains micro-accurate vernier tuning control, located on the front panel.

The HQ-180A Series differs from the 180 Series in the following respects:

1. The power supply is designed for 115/230 v. 50, 60 cycle AC operation. This applies to the power transformer T-30 and the new filament transformer T22.

2. A separate filament transformer is employed, T-22 in the schematic diagram. This transformer provides 24 hour a day operation of the heaters of the high frequency oscillator and first converter, to reduce initial warm up drift. In addition, this transformer also supplies the systems socket which is a new added feature. If the receiver is not to be operated for long periods (upwards of 3 days) the line cord should be removed from the socket.

3. A new accessory socket plus a systems socket has been added. The accessory socket may be used to power most 6 and 2 meter converters. The systems socket will be found convenient when the HQ-180AX series of receiver is employed in conjunction with a transmitter since all of the necessary VOX anti trip and/or relay connections are available from this socket. This also provides a rapid disconnect without the need of tools once the installation has been completed properly. A Coordination Cable is available for use with the HQ-180A or HQ-170A series of receivers designed primarily for use with the HX-50 Hammarlund transmitter but useable with other transmitters as well. This is part #PL39286-G1 at $8.50.

4. A new three (3) position BFO switch is provided enabling the BFO to be in the off position, SSB, where the BFO is fixed for optimum SSB audio response with reference to the passband. The CW position enables the BFO to be adjusted plus or minus 2 KC thus providing the usual pitch control adjustment. For CW reception, the BFO should always be set plus or minus 500 cycles to 1000 cycles especially in the .5 KC selectivity position so as to prevent detuning of the desired signal for the desired pitch.

5. 3.2 ohms and 500 ohms output terminations are now provided for voice coil or line operation. The 500 ohm line termination will be found very advantageous for phone patch and improved anti trip operation of most VOX circuits.

6. The 5U4G tube formerly used in the HQ-180 has now been replaced with two (2) silicon diode rectifiers thus providing cooler operation and better regulation from the power supply.

7. The HQ-180AX series of receivers provides an 11 position fixed frequency crystal oscillator assembly which is factory installed in the panel space provided for the 24 hour clock timer. The knob on this assembly allows selection of normal variable frequency tuning or any one of eleven fixed frequencies crystal controlled. Six crystals are mounted on the front plate of the oscillator assembly and may be changed quite readily to shift frequency. The remaining

5 crystals are mounted behind the front panel on the oscillator box and may be changed by lifting the top cover of the cabinet. It is intended that the five inside crystals will be for commonly used channels not subject to being changed very often. The receiver can be zeroed into the channel frequency by manipulating the vernier tuning control on the front panel. This will correct for frequency discrepancy due to crystal tolerance and assure accurate "netting".

The use of the crystal controlled oscillator will permit the highly stable reception of signals on the eleven channels selected. The only operation required beside turning the selector switch to the desired crystal position is to turn the band switch to the required position and tune the main dial to the approximate frequency rocking the knob finally for maximum "S" meter indication.

In order to ensure proper operation the crystals should be ordered from your local authorized Hammarlund distributor.

The oscillator or actual crystal frequency for a given signal frequency shall be determined from the following:

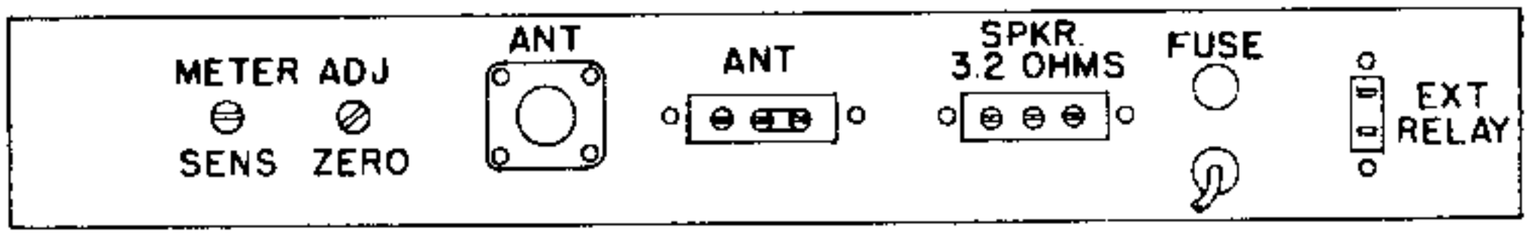
SIGNAL FREQUENCY RANGE mc	ADD IF ------- FREQUENCY mc	SUBTRACT IF- FREQUENCY mc	MODE OF OPERATION
.54 to 1.05 mc	.455000		Fundamental
1.05 to 2.05 mc	.455000		Fundamental
2.05 to 4. mc	.455000		Fundamental
4.0 to 7.85 mc	.455000		Fundamental
7.85 to 15.35 mc	3.035		Fundamental
15.35 to 20.662 mc	3.035		Fundamental
20.662 to 30.000 mc		3.035	2nd Harmonic

NOTE: WHERE LOW SIDE INJECTION IS SPECIFIED, HIGH SIDE INJECTION MAY BE USED AT REDUCED SENSITIVITY.

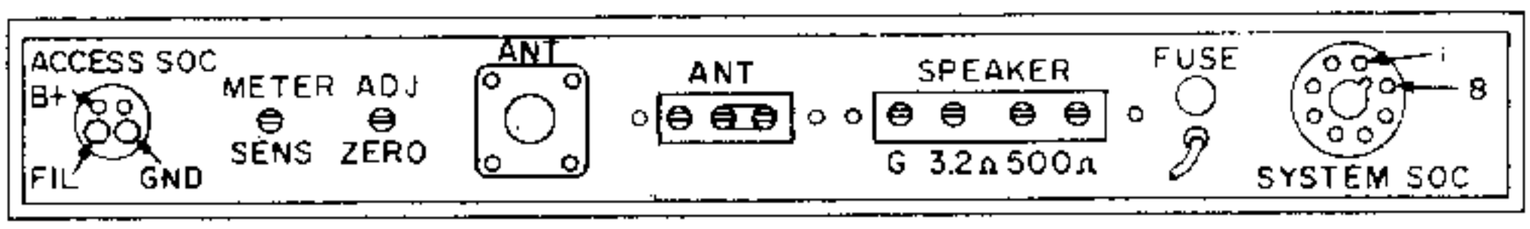
HQ-180A INSTALLATION

Your Hammarlund Receiver is designed to give you the very best results. A few minutes to be sure it is installed correctly is worth while. Even though we have developed the most sensitive circuitry to select and amplify the signal you want to hear, remember that it can work only on the RF you feed it from your antenna. It is to obtain the most satisfaction in its operation that we urge you to put up the best antenna system you can. The HQ-180A will work very well with a temporary wire strung out of a window, but only use this method while constructing or having constructed a proper antenna system. Finally, a good ground, serves many purposes; one, it eliminates tendencies towards AC hum pickup, often straying through homes or apartments; two, it minimizes atmospheric and man-made noise; three, it ensures a safe path for any voltage coming from a possible short or from an associated transmitter. When using an outside antenna, it is always best to install a lightning arrestor. Such a device drains off the atmospheric charge in a safe manner, protecting you, and the Receiver.

Note that all of the Receiver connections are at the rear of the set, and that there are a variety of very useful terminal points, permitting a number of important system connections to be permanently attached in a neat manner. The illustrations below show you all of them, allowing you full freedom to use those that are most useful to you, whether you are only listening or are operating with a transmitter. The Accessory and System sockets, are all for special applications associated with reception, but not necessary for ordinary operation. The speaker and antenna connections are required in any case.



HQ-180 SERIES



HQ-180A SERIES

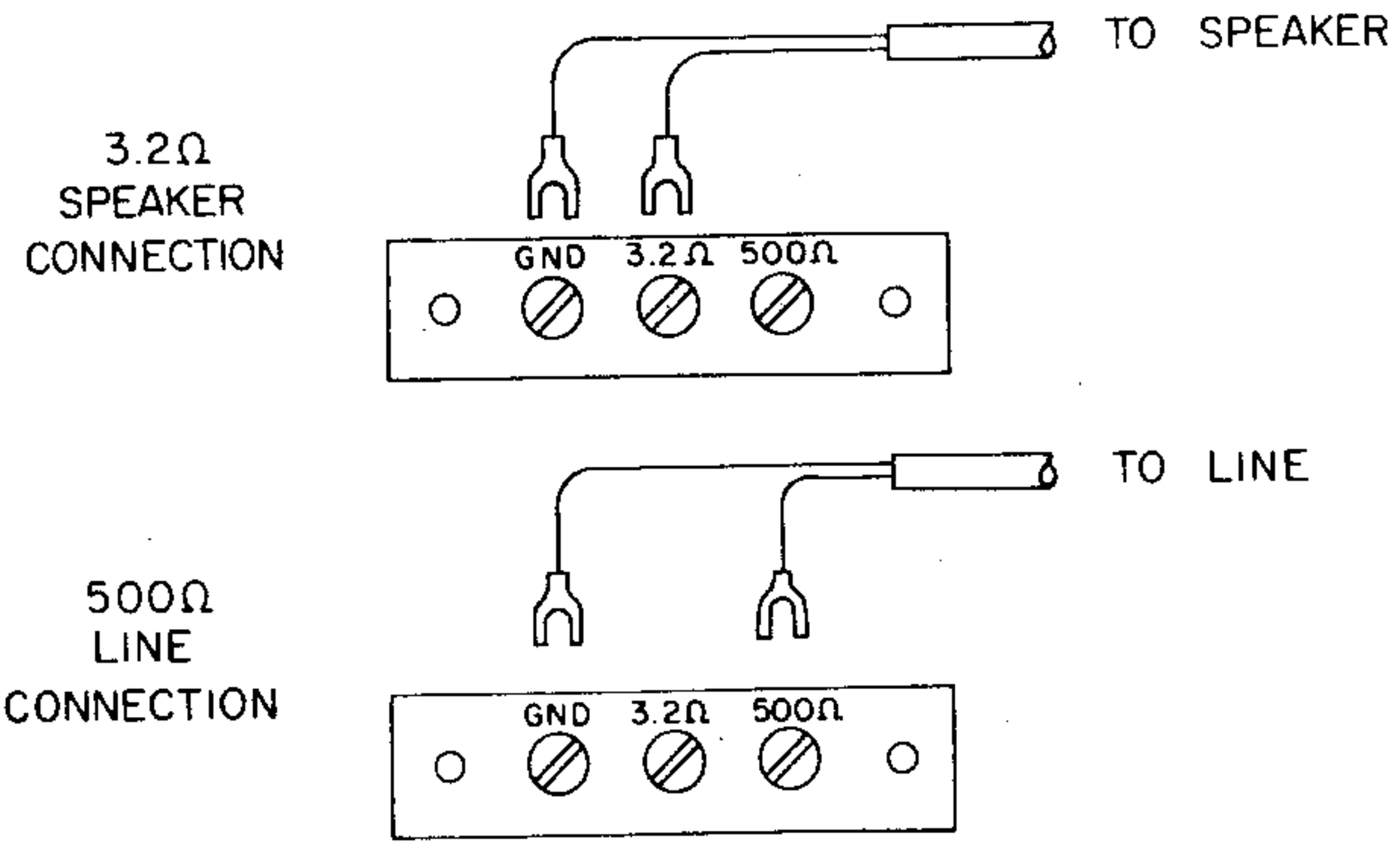
RECEIVER REAR CONNECTIONS

Connect a suitable 3.2-ohm loudspeaker to the 3.2-ohm terminal screws as shown in the diagram. Use a Hammarlund S-200 Speaker for best results, but any equivalent speaker in a cabinet will operate satisfactorily. Do not place the speaker cabinet on top of the Receiver, because the HQ-180A is a very sensitive set, and speaker vibration can cause regenerative oscillation electronically, impairing reception. Note that a jack is provided in the lower left corner of the front of the Receiver for headphone plug insertion. The loudspeaker is automatically disconnected when the phone plug is inserted.

HEADPHONES

High impedance magnetic phones will usually be found satisfactory when the headphone jack is employed. The phones are deliberately mismatched to reduce the level into them. If more level or volume is desirable, low impedance phones may be employed. These may be any of the popular impedances such as 8, 16 or 24 ohms. If you do not have headphones and desire to purchase a pair, the low impedance type is suggested since it will always be possible to reduce the volume by making use of the audio volume control.

Another alternative, if high impedance phones are available, is to permanently connect these to the 500 ohm line output terminals on the rear of the receiver. These will provide more volume than the headphone jack since the headphone jack impedance is 3.2 ohms or the same as the speaker. ("A" Series only.)

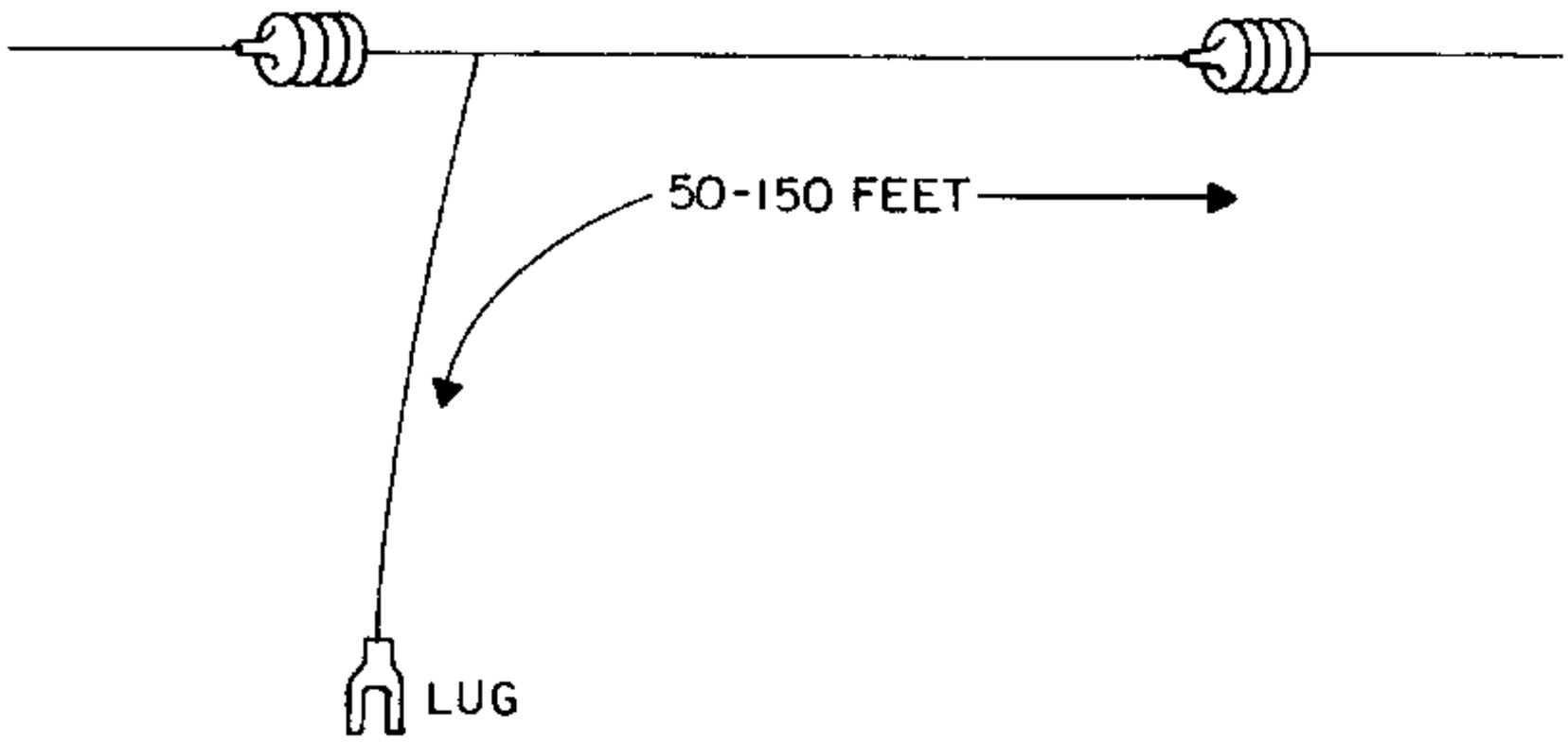


3.2Ω SPEAKER & 500Ω LINE CONNECTIONS

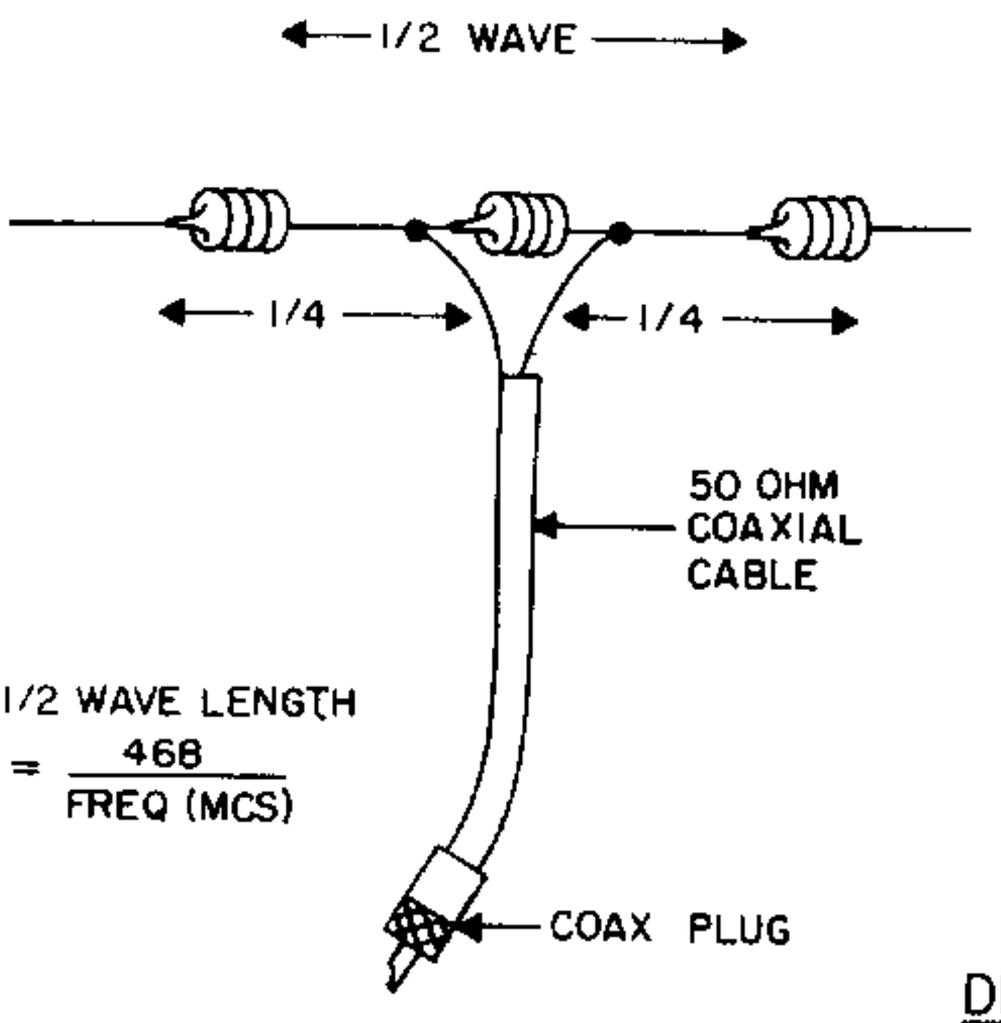
The Receiver connections for the antenna and ground are clearly illustrated on these pages, and a few hints are given for antenna installation, but the HQ-180A owner is urged to read a good antenna book to select the best type for his purpose. The Amateur Radio Relay League publishes this type of information. Its Antenna Book provides all you need to know about antennas for both reception and transmission. Other publishers produce equivalent books on this subject.

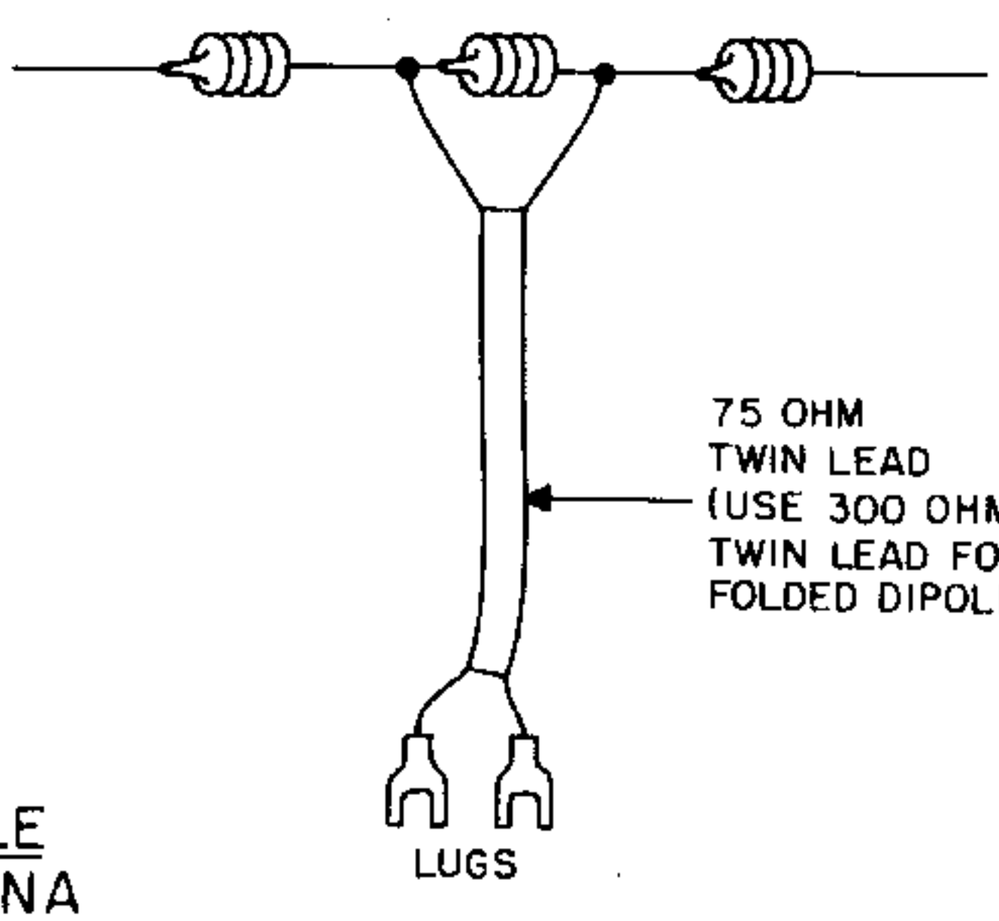
After selecting the antenna desired, consult the diagrams in this Manual to make the proper connections to the receiver. Following are some tips on antenna system selection and installation.

Either a single-wire or a balanced antenna may be used with the HQ-180A. The front panel antenna trimmer control is designed to permit a good match to almost all antenna systems of 50 to 600 ohms, balanced or unbalanced. The coaxial connector is intended to be used for 50-ohms types, the terminal strip for up to 300 ohms. While general coverage can be obtained from a short wire of 20 to 50 feet, much improved reception will be developed from an outdoor single-wire system of 50 to 150 feet in length. It is recommended that the antenna be isolated as much as possible from near-by objects, buildings, trees, etc., and that it be located at right angles to power lines or busy highways. This will minimize interference pickup from the lines or from passing vehicles.



SINGLE WIRE ANTENNA

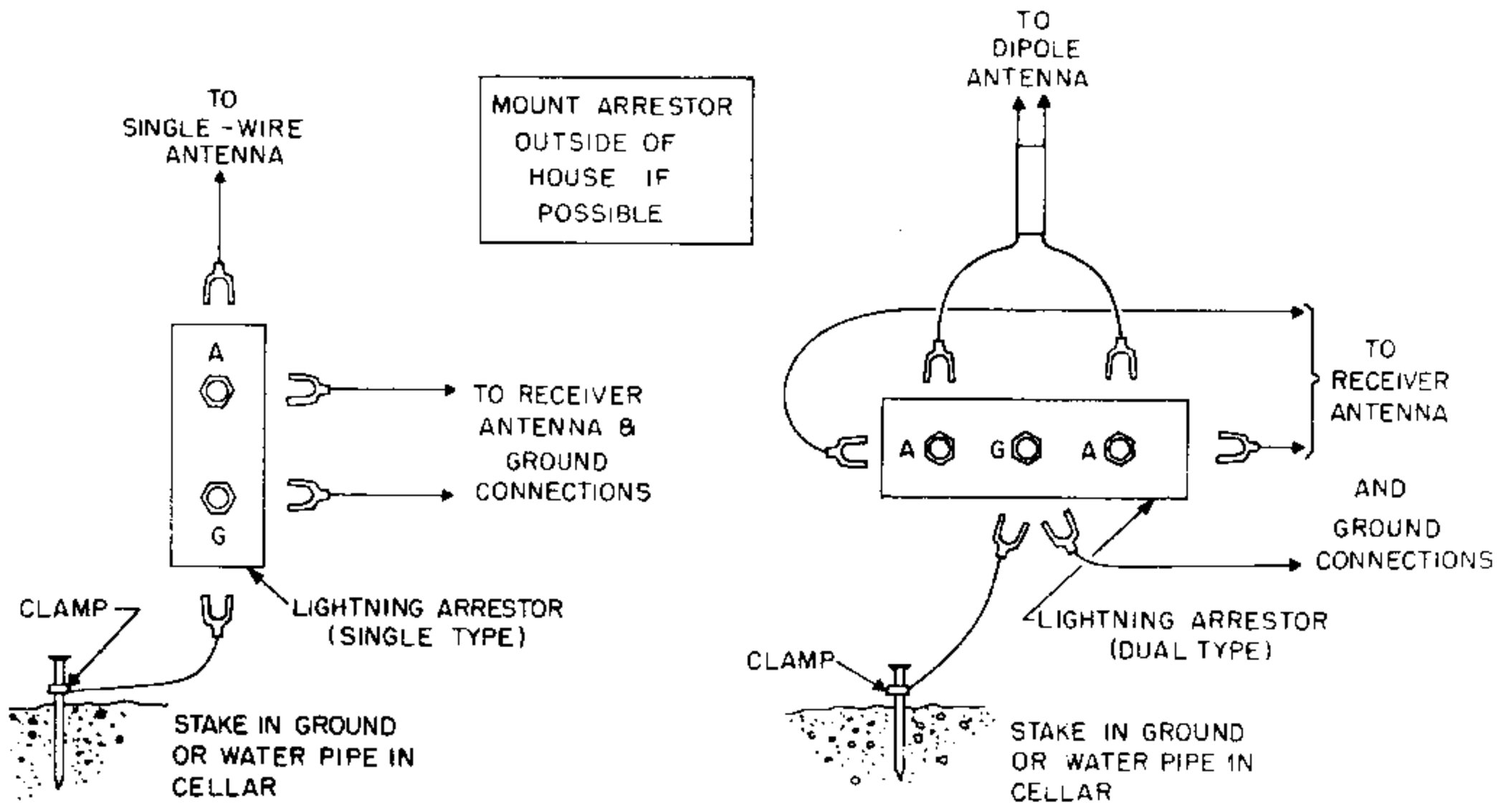




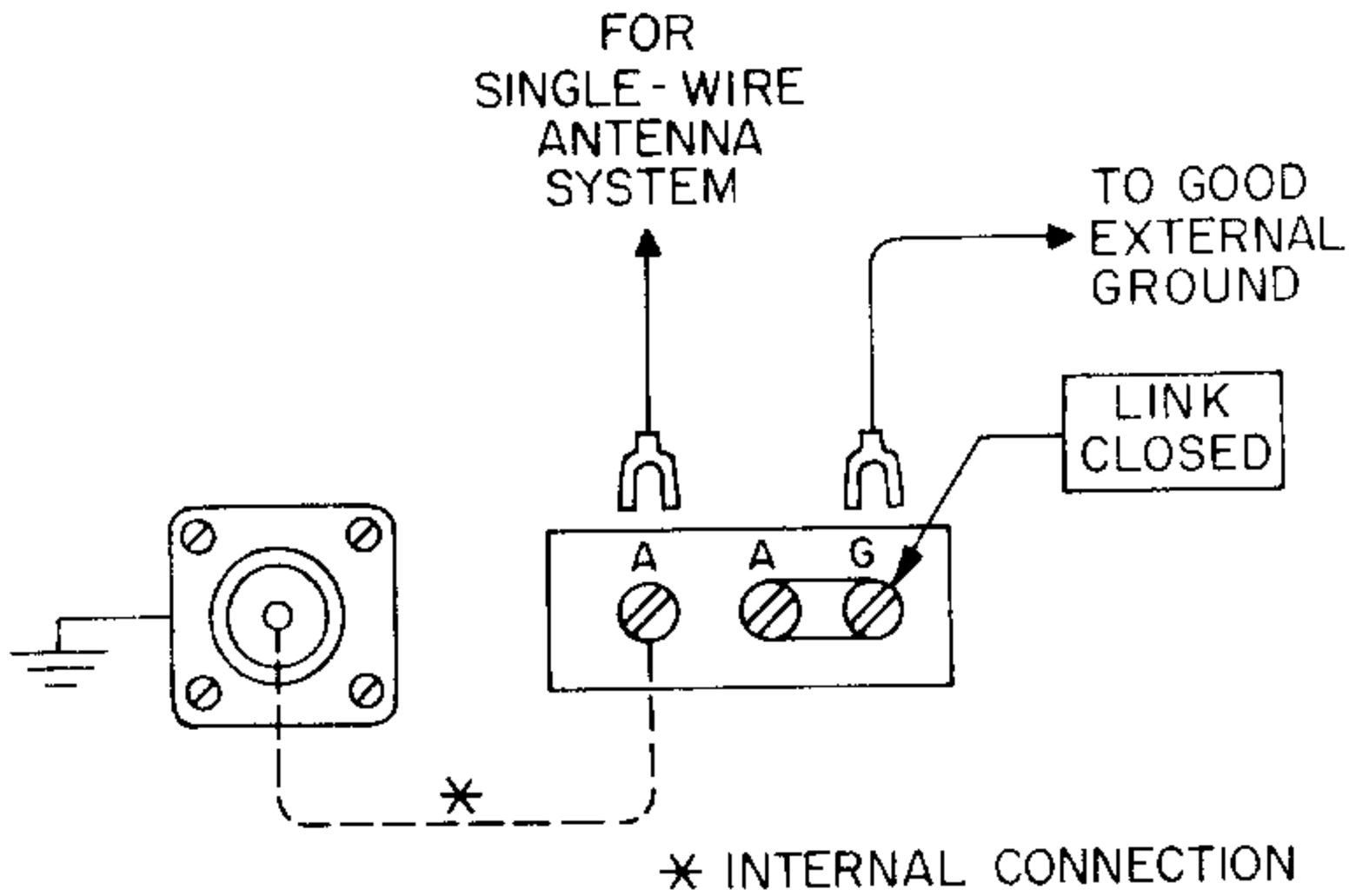
DIPOLE
ANTENNA

The first antenna connection illustration shows the simplest system. This arrangement provides good overall coverage, but if a particular band is intended to be used consistantly, the use of a dipole tuned to that band is recommended. The illustrations show how such an antenna is made and what Receiver connections are necessary. For all antennas, the shielded or twin-lead methods are a decided improvement over the single wire to minimize man-made interference and noise signals. In especially noisy areas, this may be the only way to develop an acceptable signal.

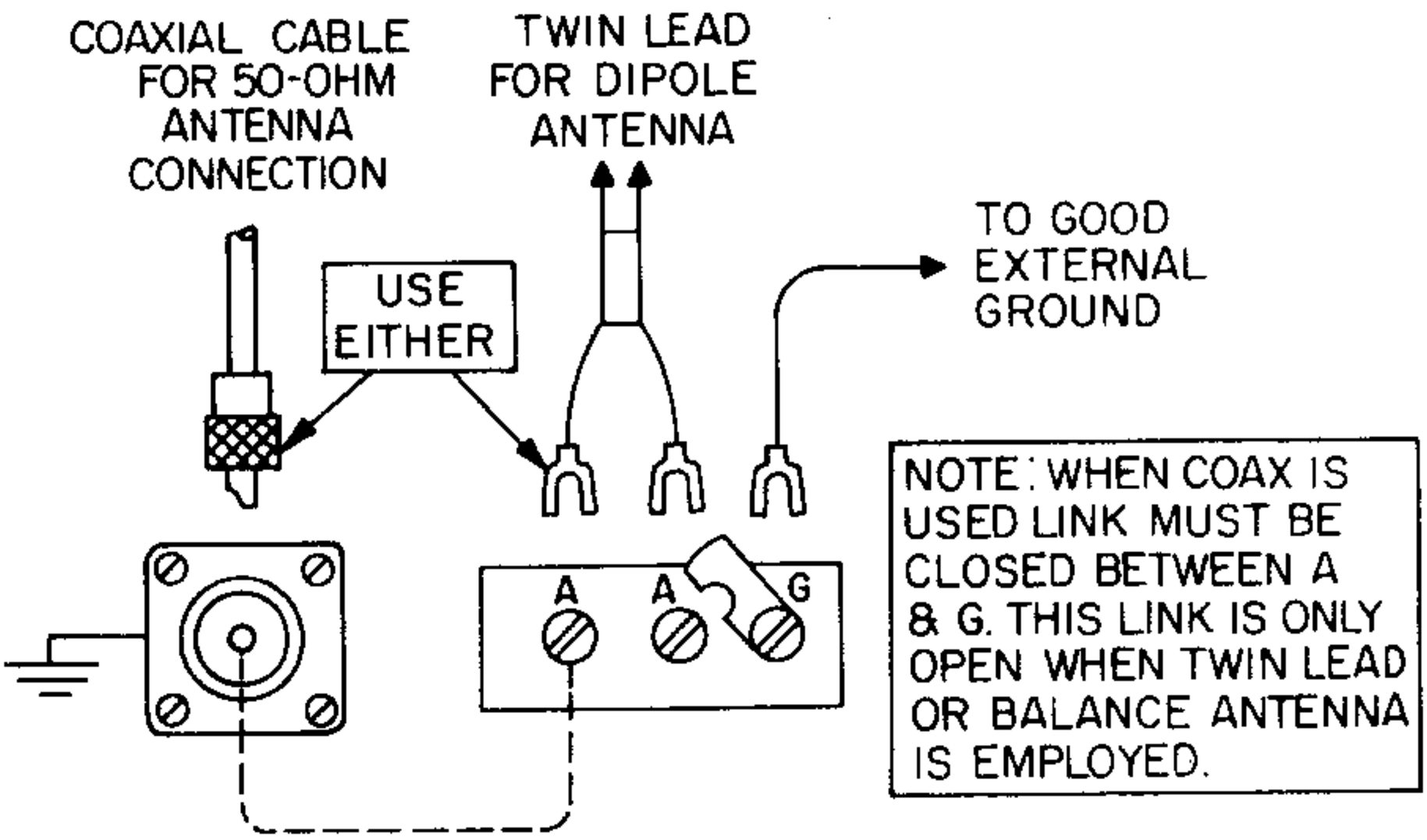
Each of the antenna connection schemes require very little wiring complications or soldering technique. For those familiar with soldering, no trouble will appear. For those who have never soldered, it is recommended that some practice be obtained before attaching a plug to a shielded cable. However, the experience gained from work on even one hi-fit kit or radio is ample for this work. For convenience, some simple instructions in plug and cable installation are included in this book. Remember not to apply too much heat, just enough to allow solder flow. Excess heat will melt some plastic insulations, possibly causing a short between the center conductor and the shield.



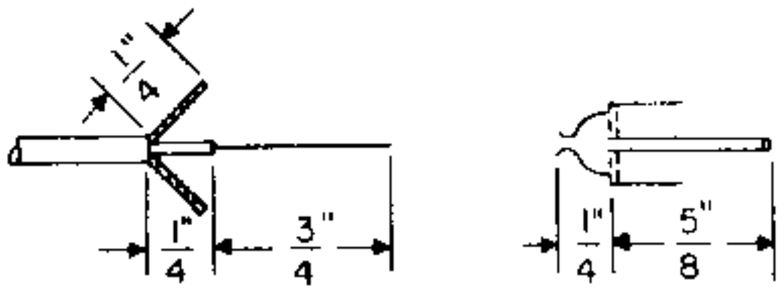
TYPICAL LIGHTNING ARRESTOR INSTALLATIONS



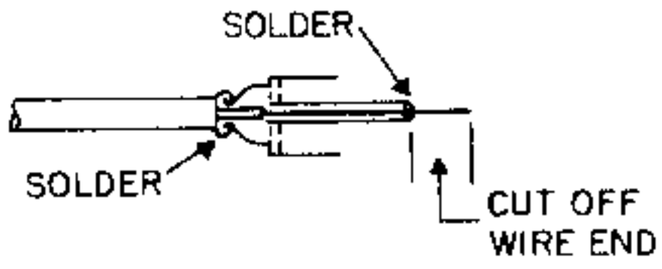
ANTENNA CONNECTIONS FOR SINGLE WIRE ANTENNA



ANTENNA CONNECTIONS FOR DIPOLE ANTENNA



1. STRIP INSULATION.
2. CUT AND SPREAD SHIELD.
3. INSERT CABLE INTO PLUG, CENTER CONDUCTOR THRU PIN. SOLDER CENTER CONDUCTOR, CUT OFF EXCESS.
4. SOLDER SHIELD AROUND OUTER NECK OF BODY.



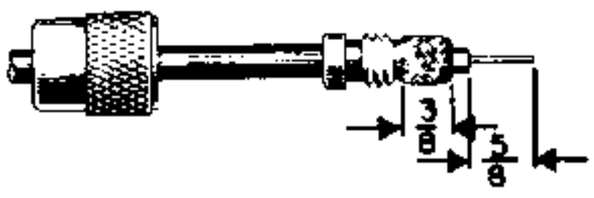
CAUTION: DO NOT USE TOO MUCH HEAT, CENTER CONDUCTOR INSULATION MELTS EASILY!

ATTACHING SHIELDED CABLE TO PHONO TYPE CONNECTOR

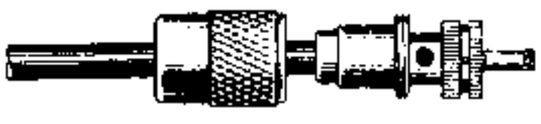
ASSEMBLY OF CABLES TO 83-1SP PLUG USING ADAPTER 83-168 OR 83-185

CUT END OF CABLE EVEN. REMOVE VINYL JACKET 3/4". SLIDE COUPLING RING AND ADAPTER ON CABLE.

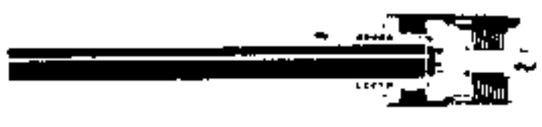
FAN BRAID SLIGHTLY AND FOLD BACK AS SHOWN.



POSITION ADAPTER TO DIMENSION SHOWN. PRESS BRAID DOWN OVER BODY OF ADAPTER AND TRIM TO 3/8." BARE 5/8" OF CONDUCTOR. TIN EXPOSED CENTER CONDUCTOR.

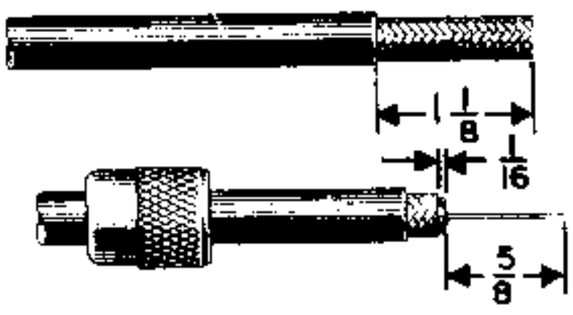


SCREW PLUG SUB-ASSEMBLY ON ADAPTER. SOLDER BRAID TO SHELL THROUGH SOLDER HOLES. USE ENOUGH HEAT TO CREATE BOND OF BRAID TO SHELL. SOLDER CONDUCTOR TO CONTACT.



FOR FINAL ASSEMBLY, SCREW COUPLING RING ON PLUG SUB-ASSEMBLY.

ASSEMBLY OF CABLES TO 83-ISP PLUG



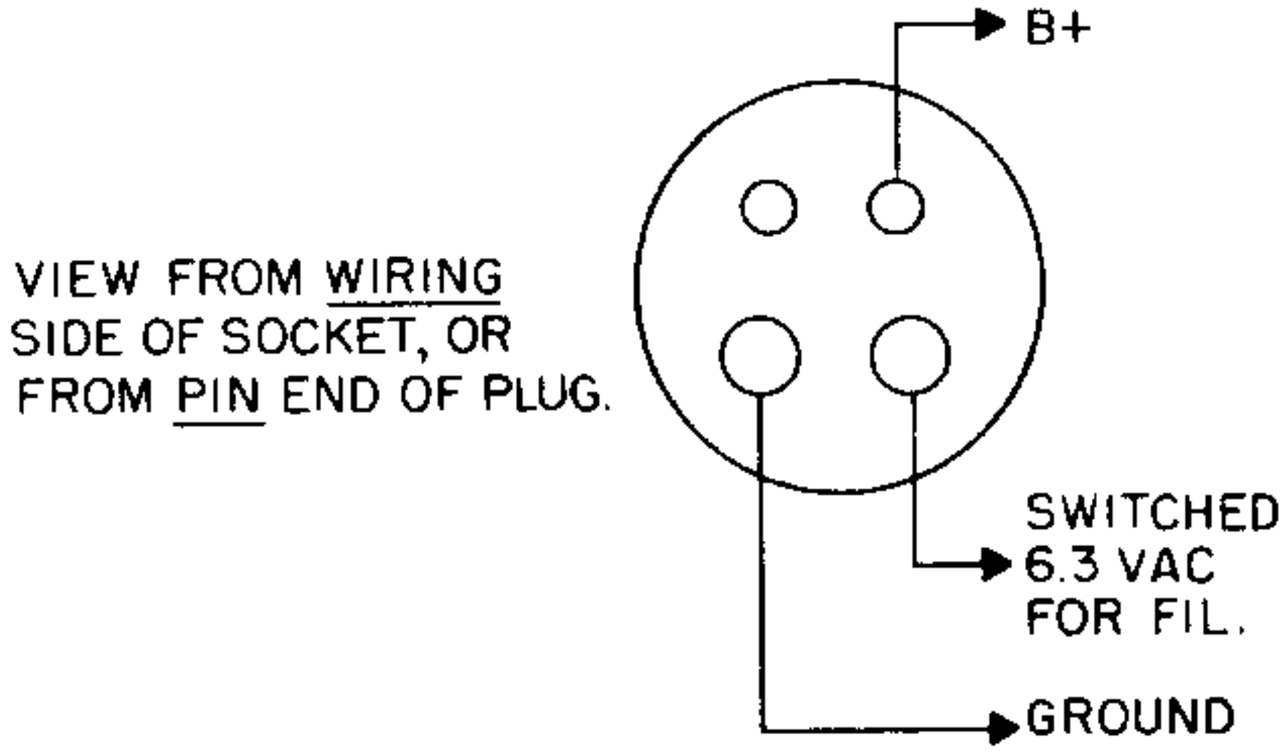
CUT END OF CABLE EVEN. REMOVE VINYL JACKET 1 1/8." BARE 5/8" OF CENTER CONDUCTOR. TRIM BRAIDED SHIELD. SLIDE COUPLING RING ON CABLE. TIN EXPOSED CENTER CONDUCTOR AND BRAID.

SCREW THE PLUG SUB-ASSEMBLY ON CABLE. SOLDER ASSEMBLY TO BRAID THROUGH SOLDER HOLES, USE ENOUGH HEAT TO CREATE BOND OF BRAID TO SHELL. SOLDER CENTER CONDUCTOR TO CONTACT.

FOR FINAL ASSEMBLY SCREW COUPLING RING ON PLUG SUB-ASSEMBLY.

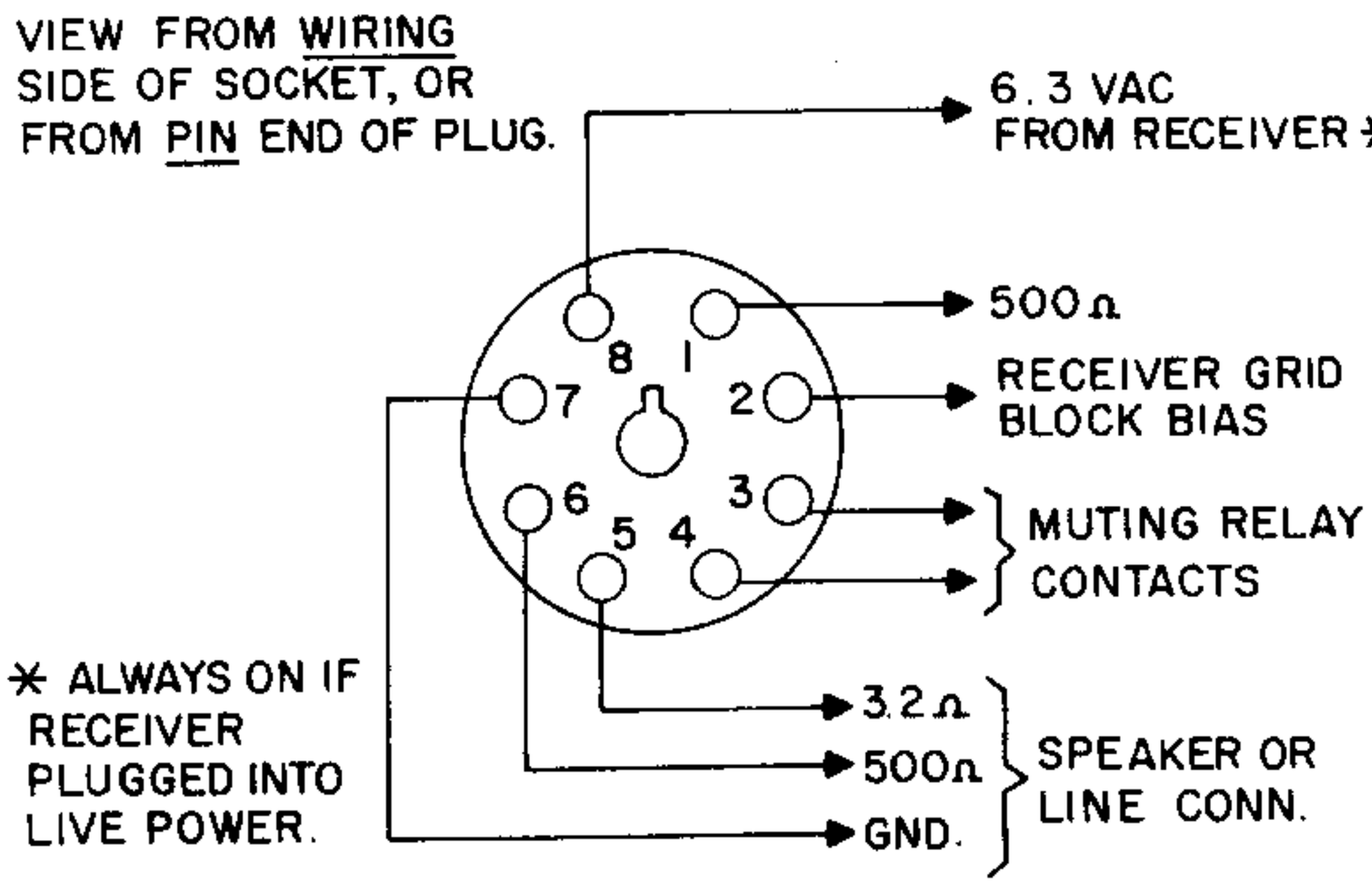
Using 6 and 2 meter converters with the HQ-180 and "A" series receivers

When building or purchasing a converter for 6 or 2 meters, we recommend using an IF frequency of 10.0 to 14.0 mc/s. In the "A" series of receivers the accessory socket may be used for convenience in supplying power to the converter. Consult the Accessory Socket Connections Diagram for the proper plug wiring.



ACCESSORY SOCKET CONNECTIONS

The system socket connections provide for a variety of uses, depending upon the transmitter system installed. (Compatibility with Hammarlund HX-50 or HX-500 Transmitters included. See their instruction manuals for details).



SYSTEM SOCKET CONNECTIONS

"A" SERIES ONLY

HQ-180A OPERATION

With the antenna, speaker and any accessories installed, you are ready to receive transmissions on the amateur bands. These pages are intended to show you the operating methods that will permit the Receiver to give you the best audible signal possible, considering atmospherics and man-made noise. Three most important reminders:

1. Check the listening aids like the noise limiter and slot frequency control -- be sure incorrect setting is not reducing Receiver capability.

2. Always tune the Receiver properly to produce the maximum signal.

3. Don't forget the antenna trimmer -- it requires a different setting on each band. This is because antenna impedance changes with frequency; the trimmer is there to allow for a maximum match at all frequencies.

Plug the Receiver line cord into a 117-volt, 60-cycle line (the export model HQ-180A -E will accommodate 117 or 230 volts, 50 or 60 cycles). Turn the Receiver on, using the RF gain control and the clock timer switch if installed. Check that all tubes are lit. Note that the high-frequency oscillator and mixer tube filaments remain heated at all times, (in the HQ-180A series) if the line cord is left inserted into a source of AC power. Heating of these tubes eliminate drift that occurs in all oscillator circuits as they heat up. Tube life is not reduced through continuous operation. In fact, its life is often extended to many times normal because it is not subjected to the hardships of physical expansion and contraction due to heating and cooling when power is applied and removed. If the receiver is not to be used for extended periods (upwards of 3 days) the line cord should be removed from the power socket. If the oscillator has not been maintained heated, then allow one hour for the Receiver to settle down to a steady tuned condition. Readjust tuning as necessary during this period. Do not attempt to calibrate or set the S-meter until drifting has stopped.

The HQ-180 and "A" Series Receiver is arranged to provide the best reception for AM (voice), for Code (modulated or unmodulated CW), and for SSB (single sideband) operation. To be sure of the best results and the clearest reception, read all of the instructions presented here. Set the controls as shown in each illustration for normal operation, and follow the guidelines to improve performance and to tune over the bands. Become familiar with each control and see what each can do for you. Even after you are familiar in every way with the controls, refer occasionally to these instructions to check that you are still getting the most out of the many features of the HQ-180A.

Finally, your particular location and installation will affect operation; experiment with control settings to obtain the best results. And consult with us if there are any problems. The Receiver is for your enjoyment, use it correctly and it will give you years of service.

The Carrier Level S-meter has been adjusted at the factory for correct and calibrated operation, however, two zero adjustments should be checked and reset if necessary; one is mechanical, the other, electrical.

1. With the Receiver turned off, adjust the meter pointer screw on the front face of the meter to set the needle exactly over the zero mark on the scale.

2. Turn on the Receiver; be sure to allow a 1/2 hour warm-up before proceeding further. Set the HQ-180A to "Receive", and set the RF Gain control fully counterclockwise, without actually turning the set off.

3. Now adjust the meter zero control at the rear of the Receiver chassis again for zero on the meter. A small screwdriver inserted through the chassis is required for this setting. Do NOT adjust the meter sensitivity, this requires a special technique and an input signal generator, not normally available for home use. Check carefully with the rear of chassis illustration to be sure of the location of the meter zero adjust.

HOW TO USE THE BAND SPREAD DIAL

The main dial is provided with markers, just below the scales at 4.04, 7.3, 14.425, 21.6 and 29.7 mcs, to establish points for the approximate settings of the main dial when using the band spread scales.

Please remember that we do not claim frequency meter accuracy; also that the high frequency markers, mentioned above, are approximate settings of the main dial to be used in setting up the amateur scales of the band spread dial.

Set the band spread dial at the 100 kcs point at, or nearest to, the high frequency end of the desired amateur band. The main dial should then be carefully adjusted, close to the high frequency band edge marker, to obtain zero beat with the 100 kcs calibrator. Care must be taken that the proper 100 kcs point is employed in order to prevent setting the main dial 100 kcs higher or lower than the amateur band. Next turn the band spread dial to the 100 kcs marker nearest the desired operating frequency. It may be found that this 100 kcs marker is slightly off the exact dial marker. The dial indicator is set to the exact 100 kcs marker, with the small knob to the right of the band spread dial.

If it is desired to use the band spread dial for other, limited frequency ranges than those for which scales are provided, set the band spread dial at the 100 marker of 0 to 100 arbitrary scale and adjust the main dial for zero beat at the highest 100 kcs marker of the desired range. The frequency coverage of the band spread, under this condition, can be determined by counting the 100 kcs intervals covered and by noting the arbitrary scale readings at which they occur, the wanted frequencies can be identified and logged for future use.

GENERAL OPERATING PROCEDURE (ANY MODE)

1. Select mode -- AM, SSB, CW.

2. Set controls for normal operation as shown on the mode illustration -- AVC, RECEIVE, SIDEBANDS, SELECT KCS -- NOISE LIMITER off, SLOT FREQ $\pm$ 5 KCS, BFO centered, VERNIER TUNING zero.

3. Tune in station -- TUNING RANGE, MAIN TUNING, AF and RF GAIN, ANTENNA TRIMMER -- use BAND SPREAD for bandspread, and VERNIER TUNING for single side band intelligibility.

4. Readjust special controls for signal reception improvement, noise or interference elimination, etc. -- NOISE LIMITER, AVC, CALIBRATE, SIDEBANDS, SELECT KCS, BFO, SLOT FREQ.

OPERATION NOTES

AM RECEPTION

1. To obtain maximum fidelity, the widest bandwidth is normally used. However, under conditions of severe interference from spurious signals or atmospheric noise, the bandwidth is reduced to improve intelligibility although some sacrifice of fidelity results. Adjust bandwidth for best reception.

2. The Slot Frequency control provides an extremely sharp adjustable slot or hole in the selectivity curve. It is normally located outside of the passband of the second IF (455kc/s). It is brought into the passband for the purpose of eliminating interference from heterodyne signals on AM and reducing "monkey chatter" on SSB. On CW reception it will materially aid in reducing or eliminating adjacent or co-channel interference.

   Whenever the receiver is being tuned for normal reception be sure to first rotate the Slot Frequency control to either minus 5KC or plus 5KC for normal tuning or the center of the passband will be slotted out, producing 2 spot or 2 peak "S" meter readings.

The Slot Depth control (located behind the front panel) is a very gradual vernier adjustment. In view of this, its effect will not be very noticeable unless proper procedure is employed. This procedure is explained in the service section of this manual. As this control is properly adjusted at the factory, the setting should not have to be changed unless changes have taken place in the circuitry due to component aging etc.

AM RECEPTION

CLOCK TIMER - SET TO ON, OR AUTO IF DESIRED. INSIDE LID, PULL CLOCK SETTING KNOB TO REAR TO ADJUST TIME. PUSH KNOB TO FRONT TO SET AUTO ON-CONTROL. ONCE ON BY AUTO TIMER, SET MUST BE TURNED OFF MANUALLY BEFORE RESETTING CLOCK.

DIAL CALIBRATION - TO BE USED WITH CALIBRATION CRYSTAL. SEE CODE RECEPTION INSTRUCTIONS.

IN CASE OF SIGNAL INTERFERENCE, TURN TO POINT WHERE UNWANTED SIGNAL IS LEAST. (SEE NOTE 2)

SET TO JUST BEFORE THE POINT WHERE AUDIO OUTPUT STARTS TO DECREASE IN LEVEL. (SEE NOTE 3)

SET TO "SLOW" "MEDIUM" OR "FAST".

A.M. POSITION

VERNIER

TUNE FOR MAX. CARRIER LEVEL METER READING.

HEADPHONES

SET TO "RECEIVE" IF RECEIVER IS USED ALONE. IF RECEIVER IS TO BE MUTED BY TRANSMITTER RELAY CONTACTS (REAR CONNECTIONS), SET TO "SEND."

TO USE CALIBRATE CRYSTAL, SEE CODE RECEPTION INSTRUCTIONS.

REDUCE BANDWIDTH IN CASES OF SEVERE INTERFERENCE OR NOISE. (SEE NOTE 1)

SIDEBANDS "BOTH"

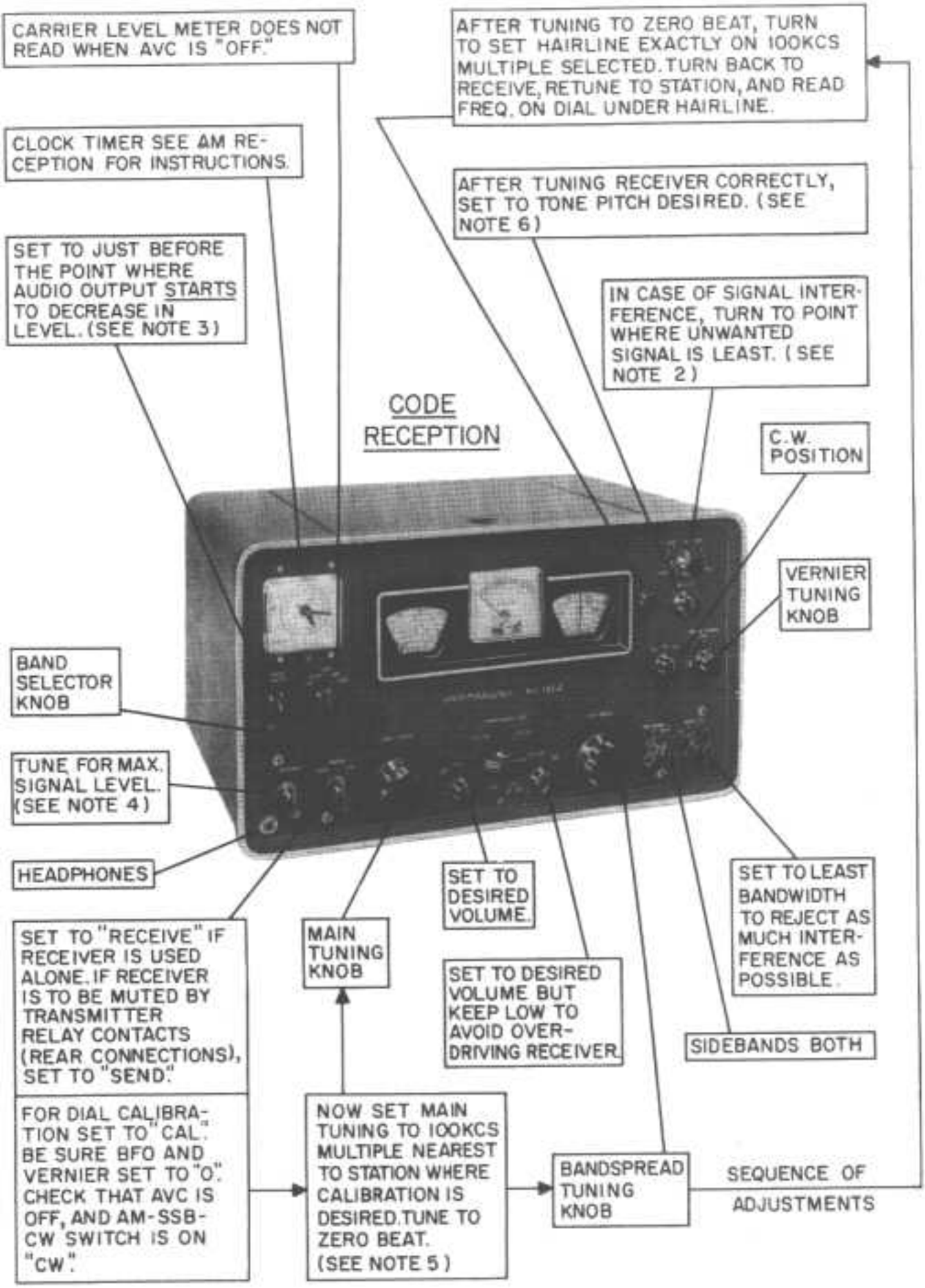
BANDSPREAD TUNING KNOB

MAIN TUNING KNOB

SET TO DESIRED VOLUME

BAND SELECTOR KNOB

FOR AM, SET TO MAX. REDUCE IF CARRIER LEVEL METER EXCEEDS +40. S METER CALIBRATION ACCURATE ONLY WHEN RF GAIN MAX, AND AVC IN "SLOW", "MEDIUM" OR "FAST".


CARRIER LEVEL METER DOES NOT READ WHEN AVC IS "OFF."
AFTER TUNING TO ZERO BEAT, TURN TO SET HAIRLINE EXACTLY ON 100KCS MULTIPLE SELECTED. TURN BACK TO RECEIVE, RETUNE TO STATION, AND READ FREQ. ON DIAL UNDER HAIRLINE.
CLOCK TIMER SEE AM RECEPTION FOR INSTRUCTIONS.
AFTER TUNING RECEIVER CORRECTLY, SET TO TONE PITCH DESIRED. (SEE NOTE 6)
SET TO JUST BEFORE THE POINT WHERE AUDIO OUTPUT STARTS TO DECREASE IN LEVEL. (SEE NOTE 3)
IN CASE OF SIGNAL INTERFERENCE, TURN TO POINT WHERE UNWANTED SIGNAL IS LEAST. (SEE NOTE 2)
CODE RECEPTION
C.W. POSITION
VERNIER TUNING KNOB
BAND SELECTOR KNOB
TUNE FOR MAX. SIGNAL LEVEL. (SEE NOTE 4)
HEADPHONES
SET TO DESIRED VOLUME.
SET TO LEAST BANDWIDTH TO REJECT AS MUCH INTERFERENCE AS POSSIBLE.
SET TO "RECEIVE" IF RECEIVER IS USED ALONE. IF RECEIVER IS TO BE MUTED BY TRANSMITTER RELAY CONTACTS (REAR CONNECTIONS), SET TO "SEND."
MAIN TUNING KNOB
SET TO DESIRED VOLUME BUT KEEP LOW TO AVOID OVER-DRIVING RECEIVER.
SIDEBANDS BOTH
FOR DIAL CALIBRATION SET TO "CAL." BE SURE BFO AND VERNIER SET TO "0". CHECK THAT AVC IS OFF, AND AM-SSB-CW SWITCH IS ON "CW".
NOW SET MAIN TUNING TO 100KCS MULTIPLE NEAREST TO STATION WHERE CALIBRATION IS DESIRED. TUNE TO ZERO BEAT. (SEE NOTE 5)
BANDSPREAD TUNING KNOB
SEQUENCE OF ADJUSTMENTS

3. The automatic noise limiter can reduce noise to the point where its audio level is electrically no higher than the desired signal level. This point is indicated by the start of audio level decrease as the limiter control is rotated clockwise. The proper setting for this control is therefore at the point just before the audio output of the desired signal is reduced. Further rotation decreases noise and signal equally without improving signal-to-noise ratio.

CODE AND SINGLE SIDEBAND RECEPTION

4. Interrupted continuous-wave (ICW) transmissions do not normally provide steady signals for S-meter readings. However, readings can be made fairly well in CW reception using the "SLOW" AVC position of the AVC switch. In any case tune for the loudest signal level heard.

5. The 100 KCS multiples of the Crystal Calibrator will be found at or near the one decimal numbers only, such as 1.9, 14.3, etc. when the Send/Rec/Cal switch is in the Cal position. (Read "How To Use The Band Spread Dial" in the Operation section of this manual.)

6. For code reception, never set tone by adjusting main tuning, because this detunes the Receiver. Always set BFO to zero first, tune receiver for zero beat, THEN set BFO for desired tone.

7. On SSB, carrier level meter fluctuates with audio. Tune for maximum audio or apparent S-meter level.

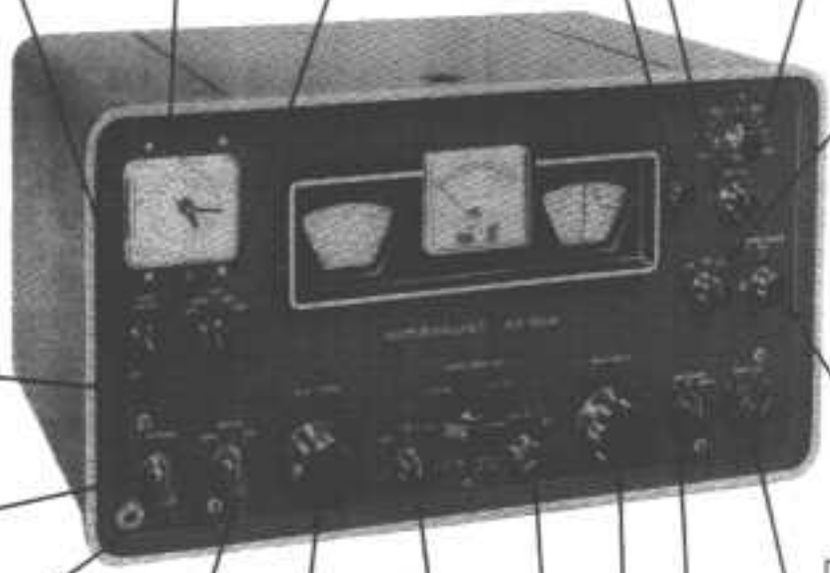
8. SSB, (Single Side Band) signals can be identified by the lack of a carrier or beat note ("whistle") when tuning across the signal. A Single Side Band signal NOT properly tuned in will sound scrambled and extremely nasal. Adjust the Main Tuning dial for maximum signal strength (to be judged by ear or S-meter). Adjust the Vernier Tuning for maximum speech intelligibility. (The Vernier Tuning must be tuned slowly for effectiveness) Intelligibility can only be obtained by proper choice of upper (u) or lower (l) sideband reception. The BFO (Beat Frequency Oscillator) control is disconnected in SSB position.

9. The accepted or most popular transmission of single sideband signals insofar as the sideband used will usually be as follows:

75 meters	3.8 to 4 mc	Lower Sideband
40 meters	7.0 to 7.2 mc	Lower Sideband
20 meters	14.200 to 14.350 mc	Upper Sideband
15 meters	21.250 to 21.450 mc	Upper Sideband
10 meters	28.6 to 28.7 mc	Upper Sideband

The use of upper or lower sideband will vary on the other bands covered by this receiver and it is not unusual for the other sideband to be used on the above mentioned bands. If a SSB signal cannot be made intelligible using the vernier tuning control, change to the other sideband switch position.

SINGLE SIDEBAND RECEPTION



CLOCK TIMER SEE AM RECEPTION FOR INSTRUCTIONS.

DIAL CALIBRATION - TO BE USED WITH CALIBRATION CRYSTAL, SEE CODE RECEPTION INSTRUCTIONS.

SET TO JUST BEFORE THE POINT WHERE AUDIO OUTPUT STARTS TO DECREASE IN LEVEL. (SEE NOTE 3)

BFO: SET TO CENTER FOR HQ-180. FREQUENCY DOES NOT VARY IN "A" SERIES.

SET TO "SLOW" OR "MEDIUM".

IN CASE OF SIGNAL INTERFERENCE, TURN TO POINT WHERE UNWANTED SIGNAL IS LEAST. (SEE NOTE 2)

SSB POSITION

BAND SELECTOR KNOB

TUNE FOR MAX. SIGNAL LEVEL. (SEE NOTE 7)

HEADPHONES

VERNIER TUNING ADJUST FOR BEST INTELLIGIBILITY

SET TO "RECEIVE" IF RECEIVER IS USED ALONE. IF RECEIVER IS TO BE MUTED BY TRANSMITTER RELAY CONTACTS (REAR CONNECTIONS), SET TO "SEND".

SET TO DESIRED VOLUME.

MAINTAIN 2 OR 3KCS BANDWIDTH TO ASSURE INTELLIGIBILITY

TO USE CALIBRATE CRYSTAL, SEE CODE RECEPTION INSTRUCTIONS.

FOR SSB, SET TO MAX. OR AS DESIRED.

SET TO "U" (UPPER) OR "L" (LOWER) DEPENDING ON SIDEBAND USED. SELECTION RESULTS FROM EXPERIENCE AND METHOD OF SSB OPERATION ON PARTICULAR BAND.

MAIN TUNING - SET FOR LOUDEST SIGNAL, IGNORE INTELLIGIBILITY. (SEE NOTE 8)

SEQUENCE OF TUNING →

BANDSPREAD TUNING

HQ-180A MAINTENANCE

This Receiver has been carefully constructed, inspected, adjusted and aligned at the factory to provide a long period of trouble-free use. Unless you have the proper equipment and the detailed knowledge to service complex electronic circuitry, it is not recommended that any other maintenance but tube testing be attempted. In particular, DO NOT ADJUST TRIMMERS OR TRANSFORMER CORES, because this will reduce the reception capabilities, unless it is done while following the alignment instructions correctly.

HQ-180A CIRCUIT DESCRIPTION

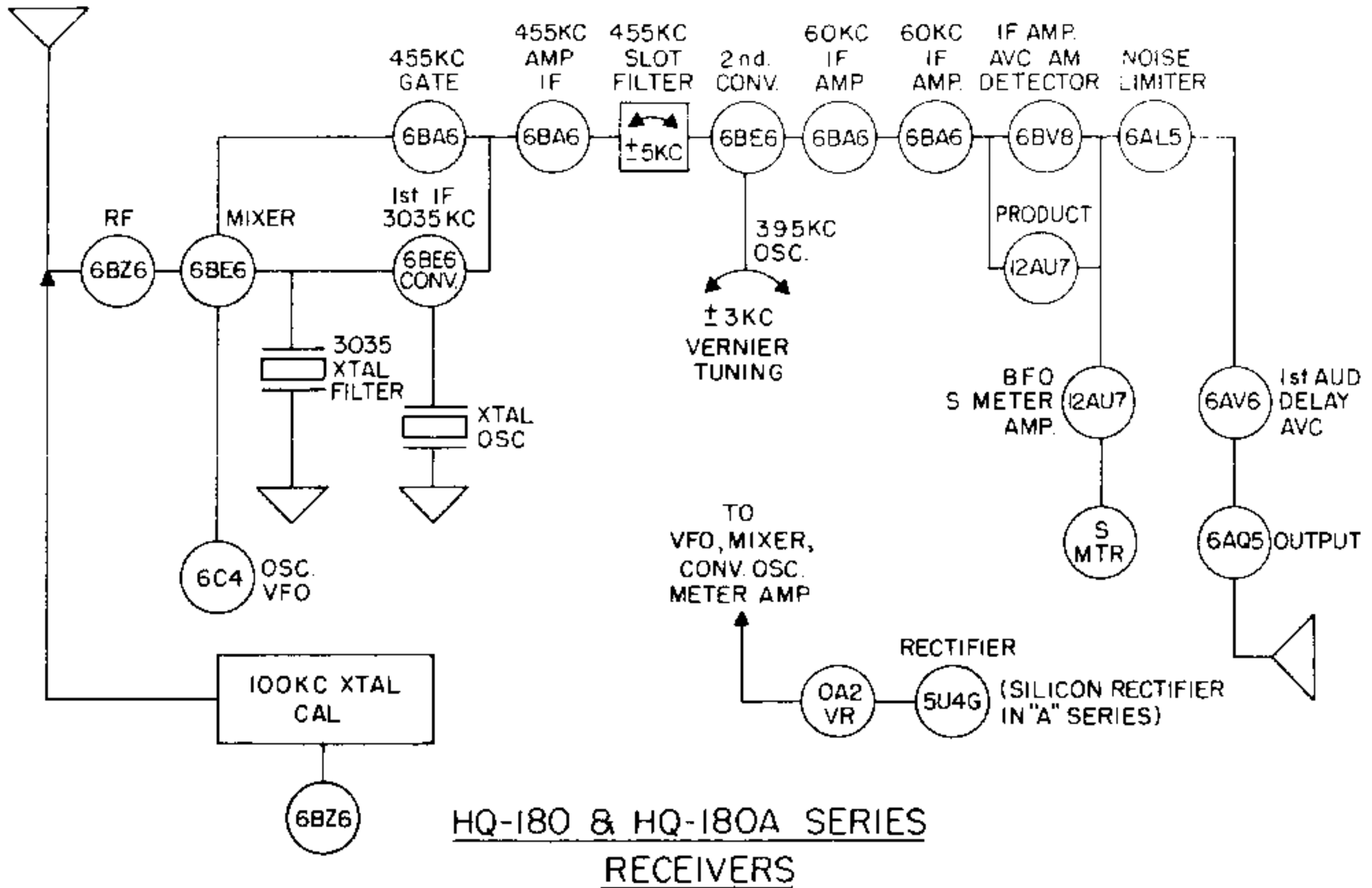
Many Receiver troubles can frequently be resolved simply by testing and changing tubes and by making a few minor adjustments, but in order to properly service this set it is important to be able to diagnose obscure troubles through an understanding of the circuits involved. It is for this purpose that this section is provided. A communications receiver of this type contains several special circuits not normally included in the home radio. Examples of such circuits are the BFO (beat frequency oscillator), the slot, triple conversion, delayed AVC (automatic volume control), etc.

The complete circuitry of the HQ-180 and "A" Series, is shown in the schematic diagrams included at the end of this book. To help in understanding these diagrams, a block version is presented on the next page. While reading the test, follow both the block and schematic diagrams -- one will illustrate the overall system, while the other will provide all of the connection details.

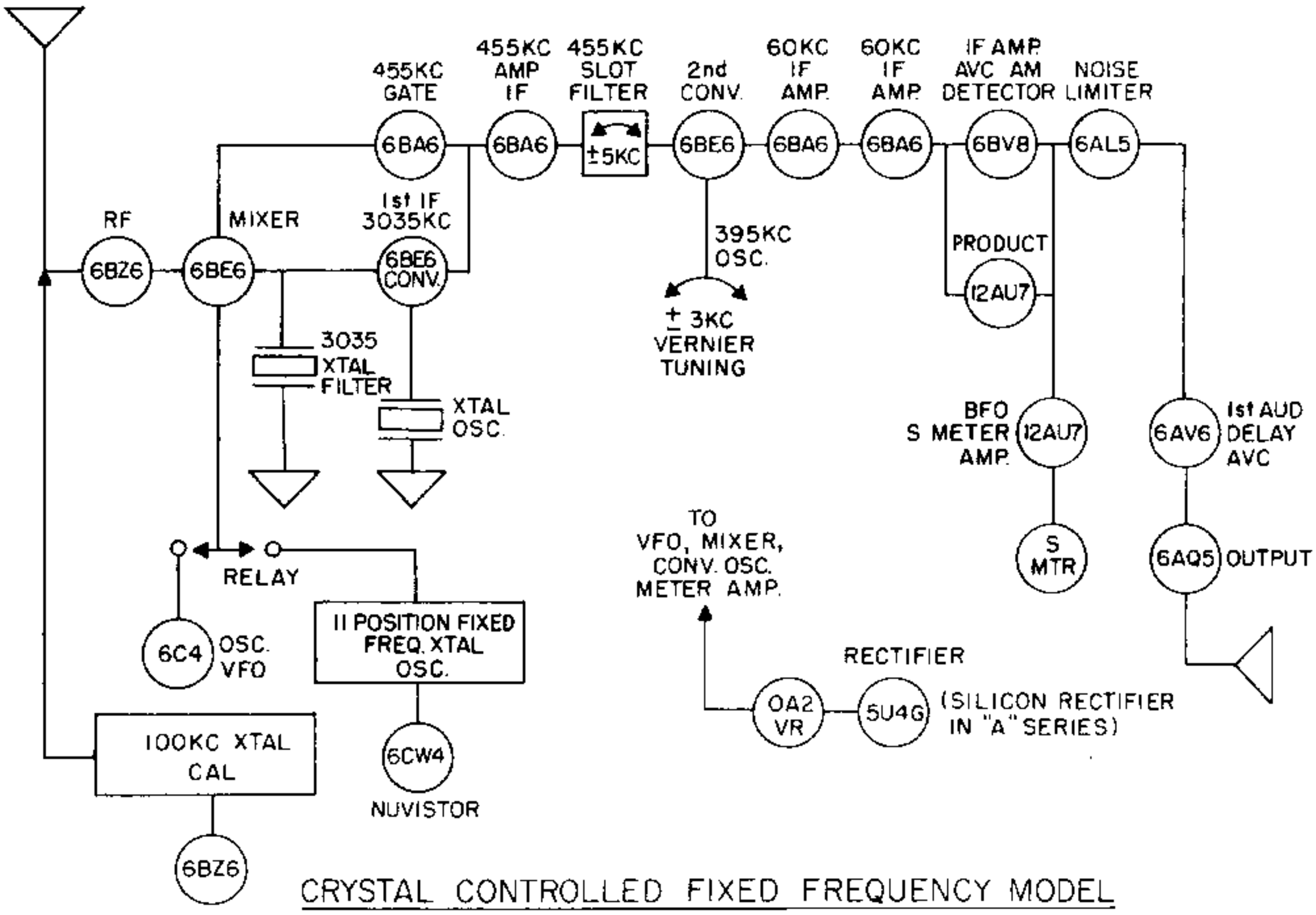
The "X" series of receivers provides an eleven position fixed frequency crystal oscillator assembly which is factory installed in the panel space provided for the 24 hour clock timer. The knob allows selection of normal variable frequency tuning or any one of eleven fixed frequencies crystal controlled. Six crystals are mounted on the front plate of the oscillator assembly and may be changed quite readily to shift frequencies. The remaining five crystals are mounted behind the front panel on the oscillator box and may be changed by lifting the top cover of the cabinet. It is intended that the five inside crystals will be for commonly used channels not subject to being changed very often. The receiver can be zeroed into the channel frequency by manipulating the vernier tuning control on the front panel. This will correct for frequency discrepancy due to crystal tolerance and assure accurate "netting".

The use of the crystal controlled oscillator will permit the highly stable reception of signals on the eleven channels selected. The only operation required besides turning the selector switch to the desired crystal position is to turn the band switch to the desired crystal position and tune the main dial to the approximate frequency rocking the knob for maximum "S" meter indication.

In order to ensure proper operation, the crystals should be ordered from your local authorized Hammarlund distributor.



HQ-180 & HQ-180A SERIES RECEIVERS



CRYSTAL CONTROLLED FIXED FREQUENCY MODEL HQ-180XE & HQ-180AX

The oscillator or actual crystal frequency for a given signal frequency shall be determined from the following:

SIGNAL FREQUENCY RANGE mc	ADD IF----- FREQUENCY mc	SUBTRACT IF- FREQUENCY mc	MODE OF OPERATION
.54 to 1.05 mc	.455000		Fundamental
1.05 to 2.05 mc	.455000		Fundamental
2.05 to 4. mc	.455000		Fundamental
4.0 to 7.85 mc	.455000		Fundamental
7.85 to 15.35 mc	3.035		Fundamental
15.35 to 20.662 mc	3.035		Fundamental
20.662 to 30.000 mc		3.035	2nd Harmonic

NOTE: WHERE LOW SIDE INJECTION IS SPECIFIED, HIGH SIDE INJECTION MAY BE USED AT REDUCED SENSITIVITY.

The RF signal is received at the antenna and applied to the RF amplifier through the antenna terminal strip or shielded connectors, and through the band-switched antenna tuned circuit. The antenna trimmer, compensating for differing antenna characteristics at differing frequencies, is located across the secondary of the antenna transformer. The calibration oscillator, turned on in the calibrate position, applies its signal to the RF amplifier. This oscillator is a crystal controlled type at 100 KCS, developing a very large number of 100 KCS harmonics to cover all of the bands in the Receiver.

To control the Receiver sensitivity, one section of the RF gain control sets the bias of the RF amplifier stage. Rotating the control clockwise decreases tube bias, permitting increased amplification and thereby increasing sensitivity to weaker signals.

From the RF amplifier the signal is applied to the first mixer where it is heterodyned with the output of a separate high frequency oscillator. The resulting frequency is the first intermediate frequency (IF). From .54 to 7.85 mc/s the HF oscillator is located 455 kc/s above the signal frequency. From 7.85 to 30 mc/s the HF oscillator is 3035 kc/s above the signal frequency. When operating the 7.85 to 30 mc/s bands, the difference frequency of 3035 kc/s is fed through a crystal filter and is heterodyned with 2580 kc/s crystal controlled oscillator in the converter tube to produce 455 kc/s 2nd IF. When the Band Selector switch indicates .54 to 7.85 mc/s the converter tube ceases to function and the gate tube becomes a regular 455 kc/s amplifier. Band switching and frequency tuning occurs in the grids of the mixer and of the oscillator. The arrangement of heterodyning used in this Receiver is listed in the accompanying chart. The stability of the oscillator circuit, a must for accurate and repeatable tuning, is maintained by using a separate tube, and keeping the heater supply on at all times, minimizing drift tendencies. In the "A" series only, the filament is supplied with power through filament transformer T30 as long as the line cord is connected to a source of power. If the clock is mounted, power will be required at all times.

The chart of the heterodyning system shows that the second mixer becomes a 455 KCS amplifier on the two lowest frequency bands. Section 32F of the band switch accomplishes this by removing the crystal circuit from the oscillator portion of the tube at this time. When the oscillator is allowed to work, the first IF signal beats with the oscillator signal to become the second IF.

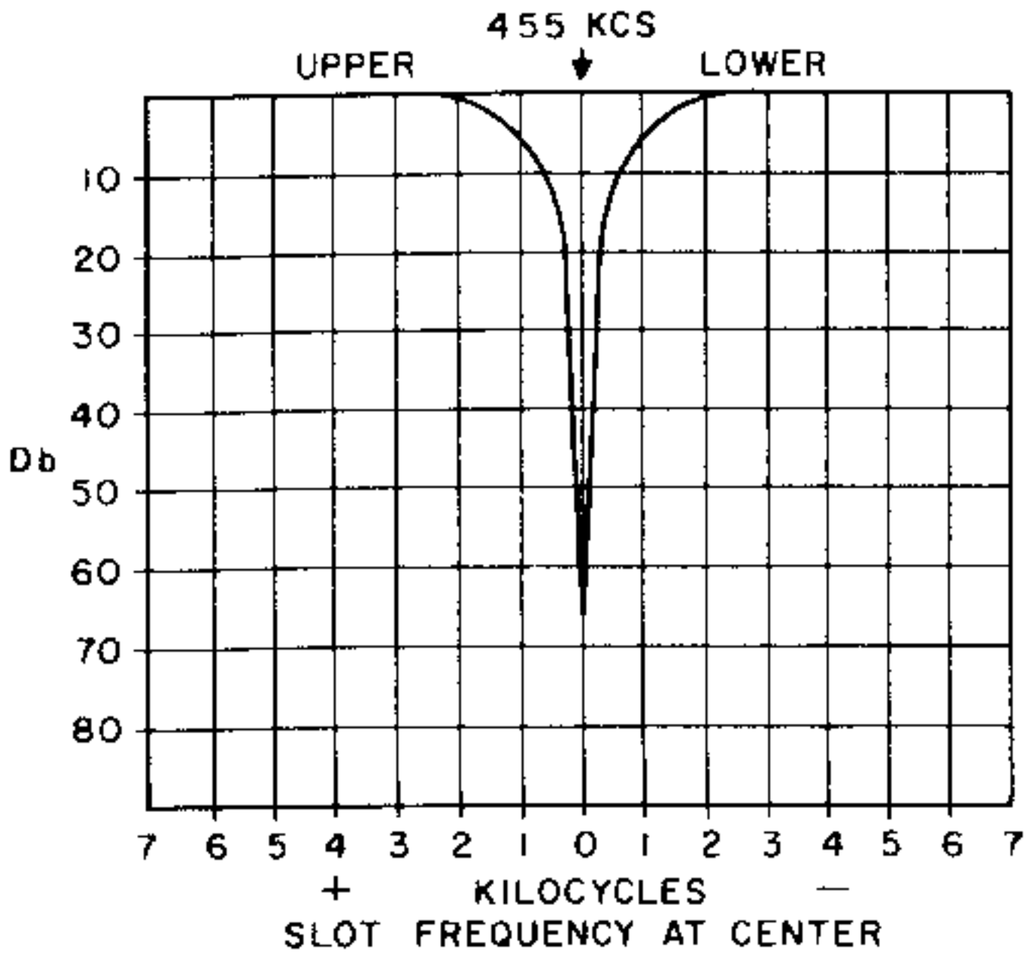
V4 is a 455 KCS amplifier whose gain is also controlled by a second section of the RF gain control, resulting in receiver sensitivity adjustment in the same manner as before.

Before the 455 KCS signal is applied to the third mixer, it is passed through the slot circuit. This circuit is designed to provide a narrow section of frequency rejection capable of being set precisely on an interfering signal. The slot depth control permits its depth or amount of rejection to be set as required for best results. The diagrams show the characteristics and the capabilities of this circuit.

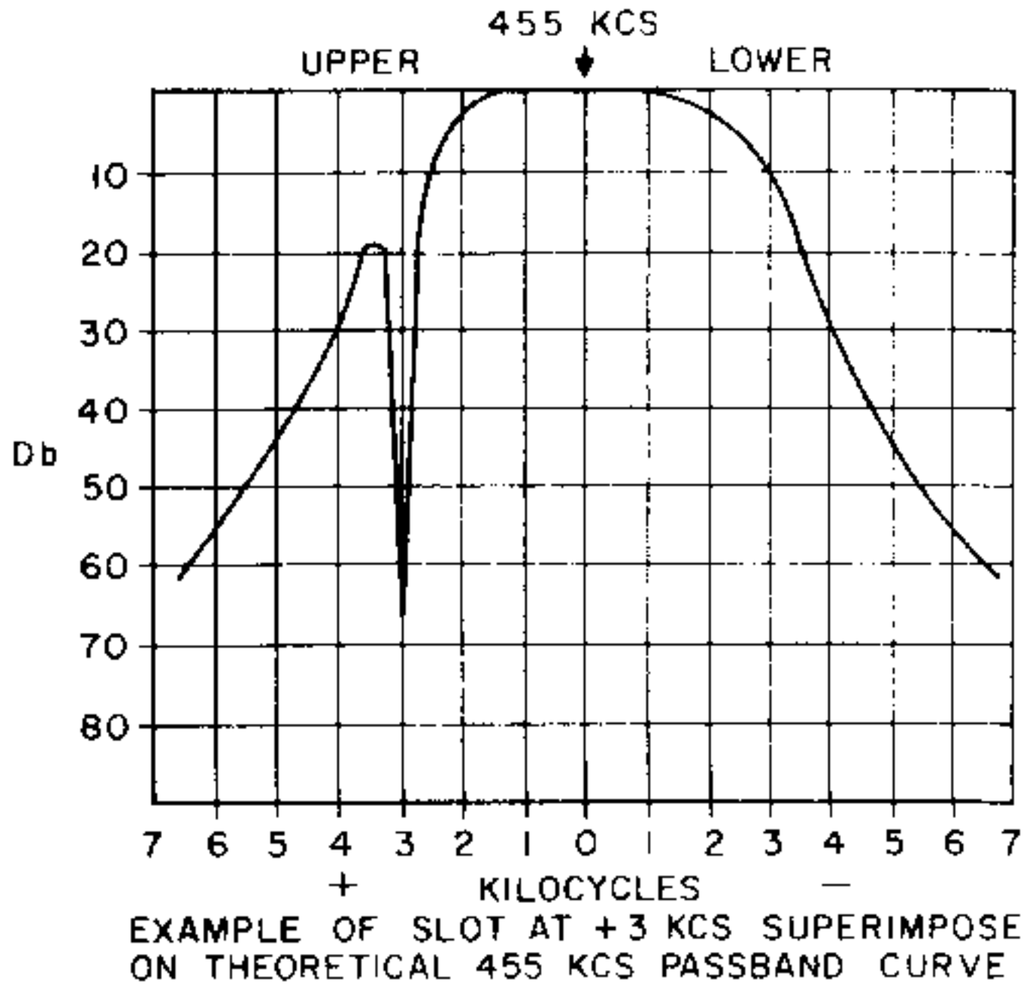
BAND MCS		Frequencies in KCS						
	RF	1st OSC	1st IF	2nd OSC	2nd IF	3rd OSC	3rd IF
.54 - 1.05	S	S ≠ 455	455	(Amplifier Stage)		395	60
1.05 - 2.05	S	S ≠ 455	455	(Amplifier Stage)		395	60
2.05 - 4.0	S	S ≠ 455	455	(Amplifier Stage)		395	60
4.0 - 7.85	S	S ≠ 455	455	(Amplifier Stage)		395	60
7.85 - 15.35	S	S ≠ 3035	3035	2580	455	395	60
15.35 - 30.0	S	S ≠ 3035	3035	2580	455	395	60

S = Signal Frequency Received

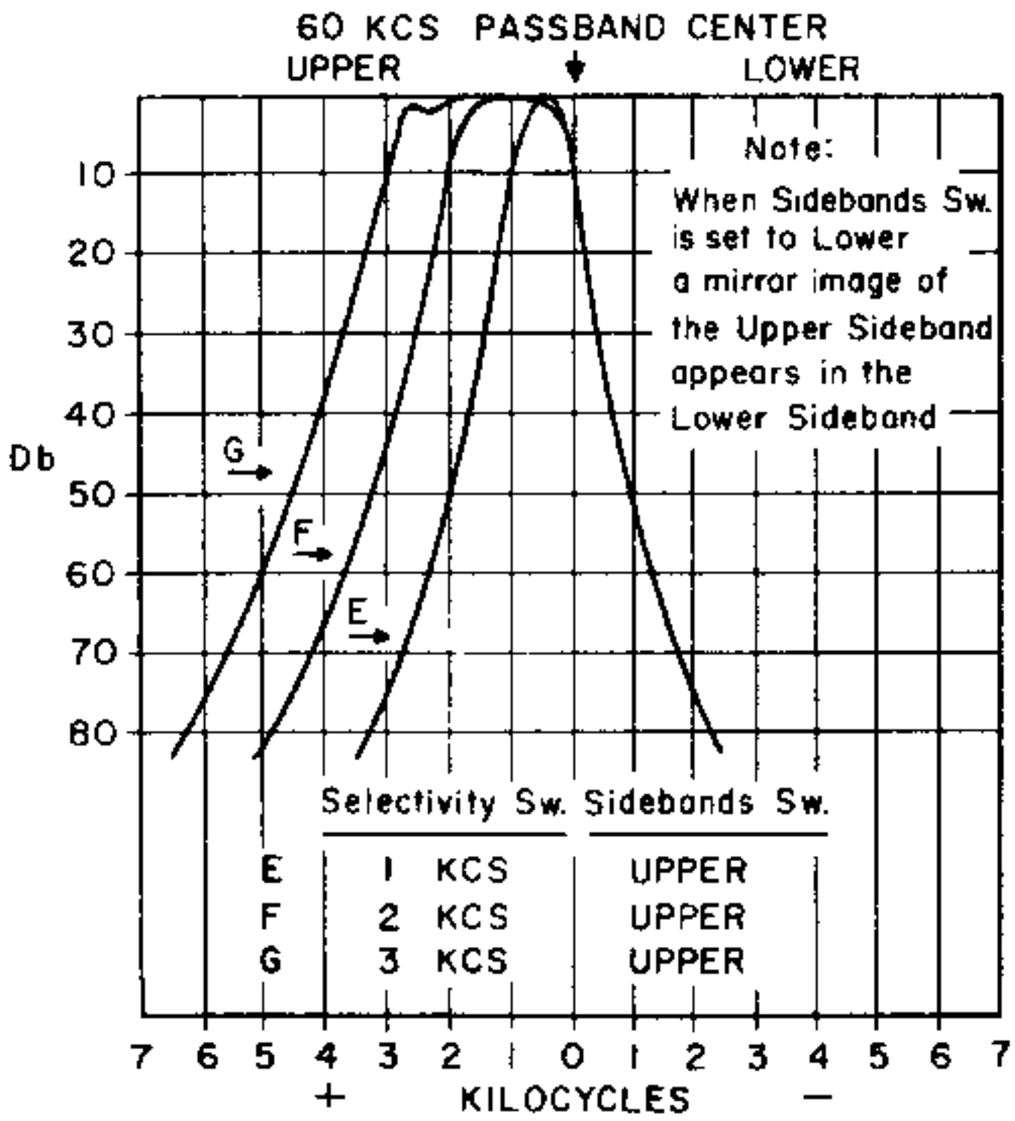
CHART OF FREQUENCY HETERODYNING



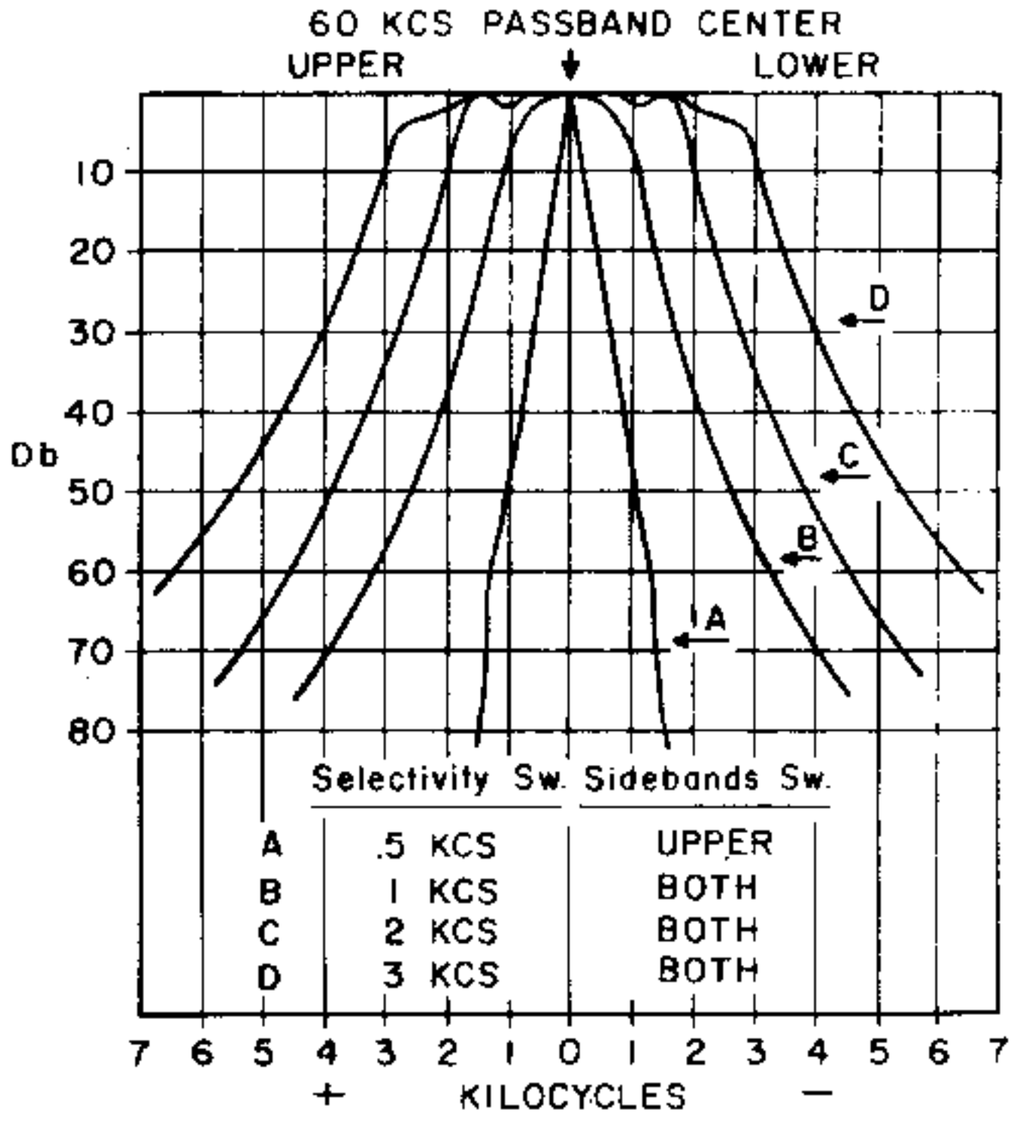
SLOT FREQUENCY AT CENTER



EXAMPLE OF SLOT AT +3 KCS SUPERIMPOSED ON THEORETICAL 455 KCS PASSBAND CURVE



SINGLE SIDEBAND PASSBAND CURVES



FULL RESPONSE CURVES, BOTH SIDEBANDS

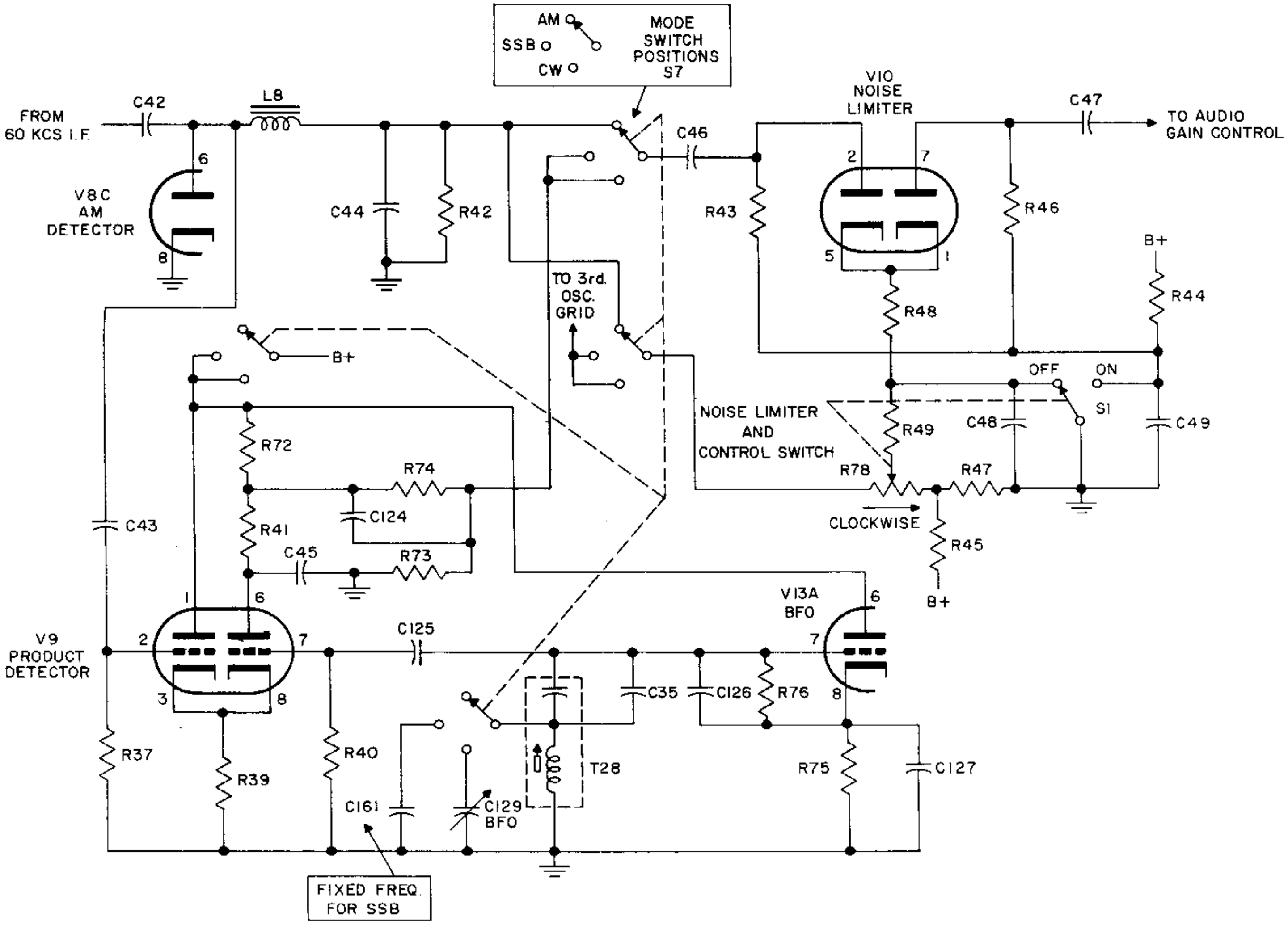
Conversion again occurs to result in a third IF of 60 KCS. Three stages of 60 KCS IF amplification are provided along with means for adjusting the selectivity of the receiver to aid in the rejection of unwanted interfering signals. This is especially useful for code reception where little sidebands are transmitted. A wide band receiver is a detriment here because of such a receiver's capability of amplifying all nearby stations almost as well as the one to be listened to. For single sideband operation, a second switch permits setting the receiver passband for maximum reception only on the side of the carrier required for reception.

The signal delivered from the 60 KCS amplifier stages is then applied to four separate detector circuits, two for efficient audio development, and two for the generation of correct AVC voltages that will assure the best possible reception of all types and levels of RF signals. The general block diagram shows that AM reception is handled by a normal diode detector circuit. See the simplified schematic of the detector, BFO and noise limiter circuits. In the AM position, the resulting audio is passed through the noise limiter tube V10 and on to the audio gain control.

In the CW position, V9 acts as a product detector, and the audio is developed from the beat between the incoming 60 KCS and the output of the BFO at a frequency that is at or near 60 KCS depending on the setting of the BFO control. The BFO is aligned so that zero beat occurs when the BFO control is centered. The audio output is then taken from the junction of R73 and R74 and applied through the CW position of the mode switch to V10 in the same manner as for the AM audio.

Single sideband detection is exactly the same as for CW except that the BFO is a fixed frequency in the "A" series. For the HQ-180 series, keep BFO control at "0". In SSB operation tuning for intelligibility requires that the suppressed carrier be replaced within the receiver. The BFO does just that, the vernier tuning dial being used to precisely tune the receiver to the sideband that has been transmitted. The heterodyning between the BFO frequency and the received sideband produces audio in the same manner as audio is produced for CW.

The noise limiter is a very useful circuit that is designed to assure that no noise or interference signal peaks will be higher than the wanted signal. If the "OFF" position, B+ is applied to the plates of V10, while the cathodes are grounded. Since the tube sections are conducting, any signal applied to V10 from the detectors is passed through to the audio gain control. In the "ON" position, the plates are connected to ground, while B+ is applied to the cathodes through the noise limiter control. The circuit is arranged that when the control is at its counterclockwise end of rotation, audio is permitted to pass through almost unreduced. As the control is turned clockwise, the B+ applied to the cathodes increases so that strong peaks are clipped. In operation, it will be noted that the noise limiter is used to clip noise peaks that are higher than the desired audio; the control is therefore turned clockwise until it is noted that the wanted audio starts to be clipped (volume reduced). The correct position of the control is just below the point where this occurs. At this point, maximum clipping is occurring without reducing the wanted signal. The noise limiter is capable of operation on any type of signal, but it should be noted that less noise and interference can often be obtained by reducing the receiver bandwidth as well.



DETECTOR, BFO & NOISE LIMITER CIRCUITS

Automatic volume control voltages are developed from the two circuits illustrated. RF detection takes place through both V8B and the diode section of V16. Each circuit is arranged to reduce a negative voltage that will increase as the received signal increases. Except in the "OFF" position, AVC voltages are applied to the RF amplifier, to the 2nd IF amplifier, to the 3rd mixer, and to the 1st 60 KCS IF amplifier. The positive voltage developed across R92 prevents AVC from being applied to the RF amplifier until the incoming signal is high enough to overcome it. This delayed AVC improves the reception of weak signals.

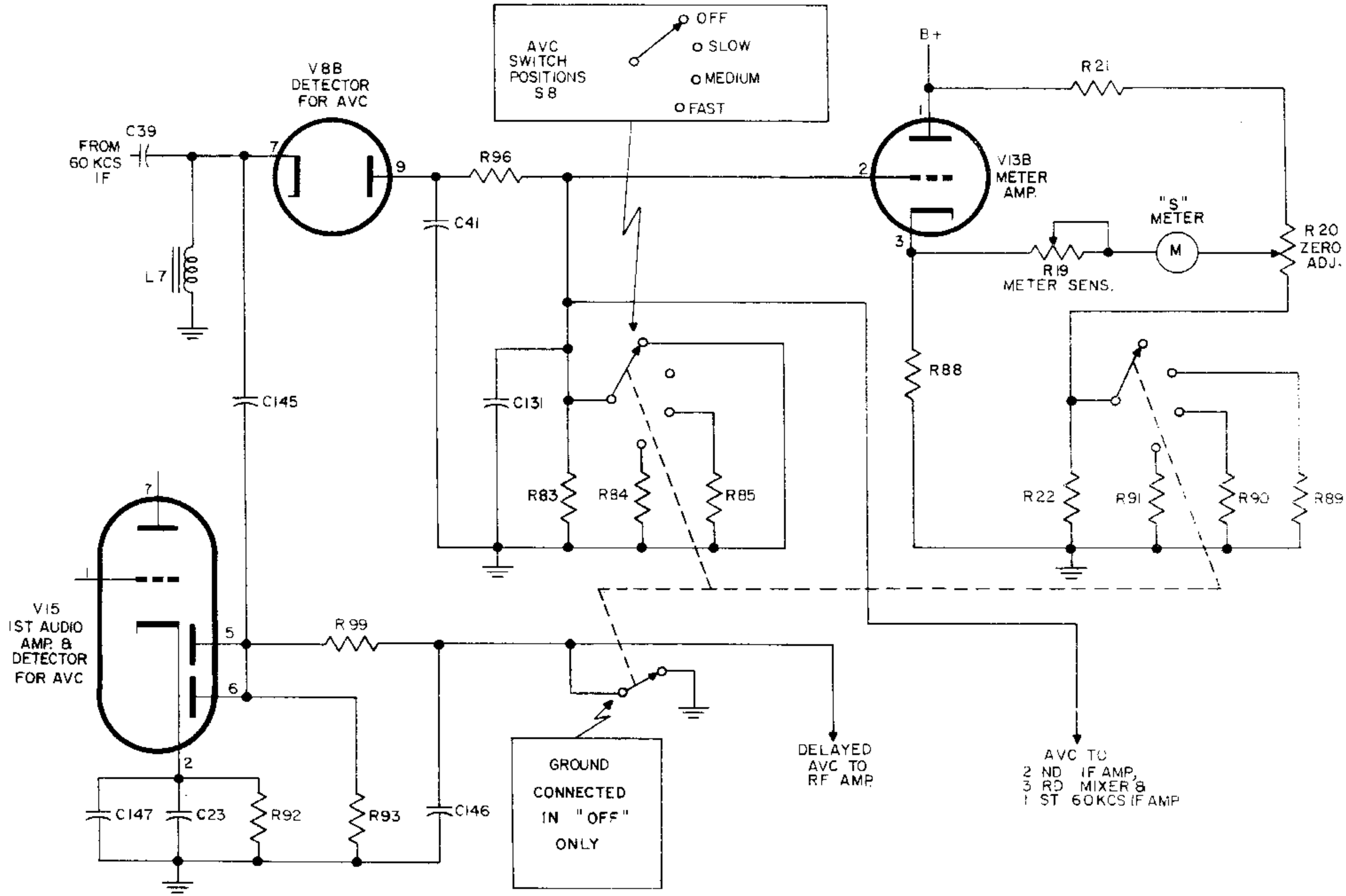
The other AVC circuit is not biased in this fashion, but it is designed to allow for an adjustable decay characteristic. AVC is applied immediately, but its decay in the event of fading is adjustable to be slow, medium or fast depending on the type of signal and on the atmospheric conditions of the time. R83, R84 and R85 set the discharge time of C131, creating the appropriate AVC decay.

The carrier level "S" meter circuit operates on the same AVC signal just described. The circuit is a bridge, with the tube and R88 on one side, and R21, R20 and R22 with its switched resistors on the other. The meter is in the center of the bridge, set to zero in the absence of a signal (AVC zero). When a signal is received, AVC is developed, the tube current changes to unbalance the bridge, and the meter reads. The greater the signal, the greater the unbalance, and the higher the meter reading. The sensitivity setting is made only when a signal of known strength is applied to the receiver, usually from a precise signal generator whose output level can accurately be measured.

The audio stages are conventional in nature, except for the special auto-response circuit illustrated. This is a negative feedback system that provides maximum effect at low audio gain control settings. Strong signals are then permitted the highest fidelity of response and lowest distortion, while increasing the gain on weak signals narrows the audio response to improve signal selectivity. An improved signal-to-noise ratio results. A further advantage is the critical damping of the speaker for elimination of speaker resonance effects. Speech reception is improved and receiver output noise is reduced.

The receiver power supply is arranged to permit the 1st oscillator and mixer to remain heated even when the rest of the set is turned off (in the "A" series only). As has been previously mentioned, this to provide increased receiver stability. The schematic diagram shows these tubes heated from a separate filament transformer, connected to the power line through only the fuse. The electric clock timer is also connected to the line in the same manner. The timer switch mechanism is in series with the normal on-off switch so that the set can be turned on automatically at any desired time. The timer mechanism is designed that it must be turned off manually to reset the mechanism for automatic turn-on in the next 24-hour period.

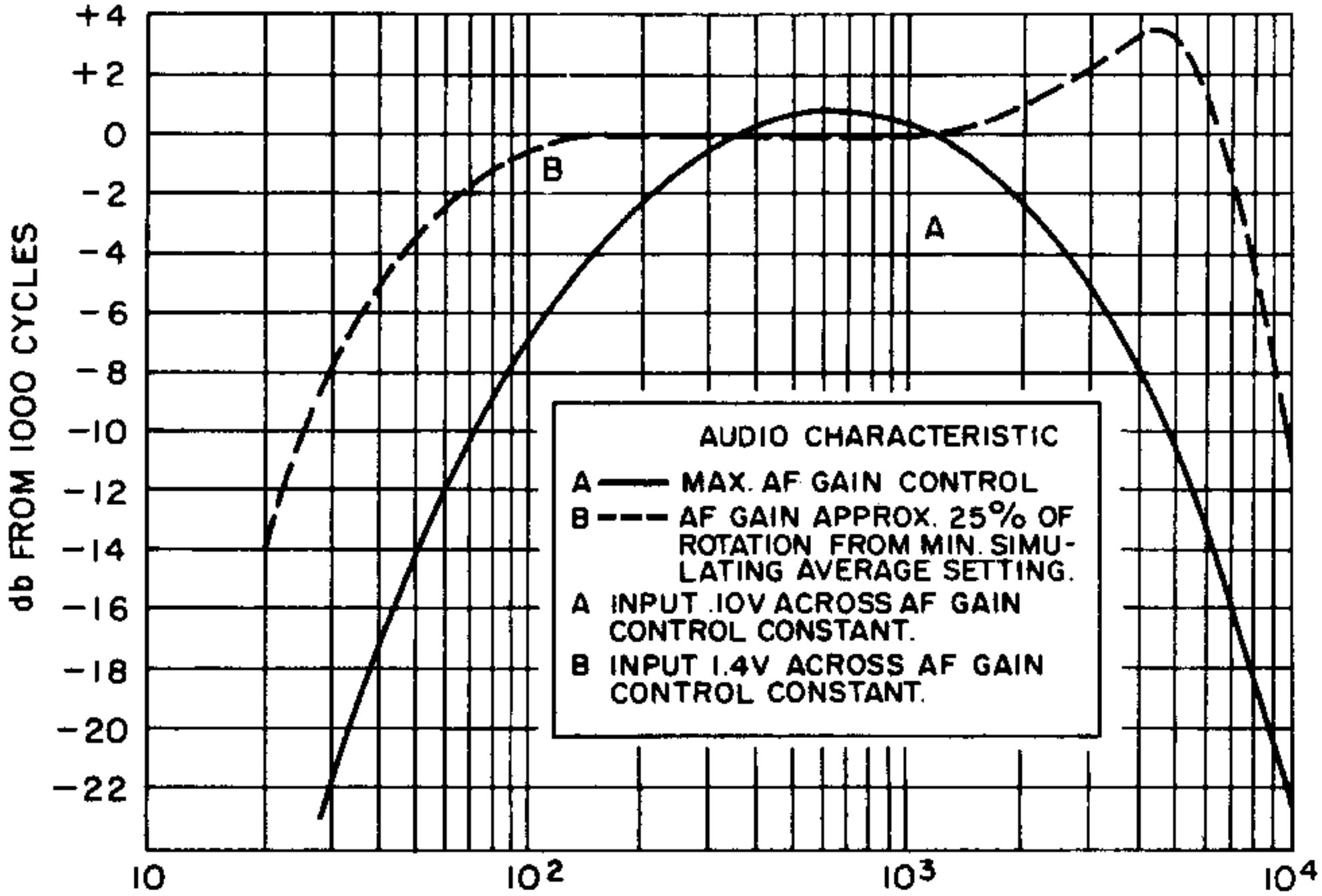
Plate voltage regulation is enhanced through the use of silicon rectifiers (in the "A" series only), and further stability is established with a gas regulator tube for the critical RF stages and for the calibrated "S" meter.



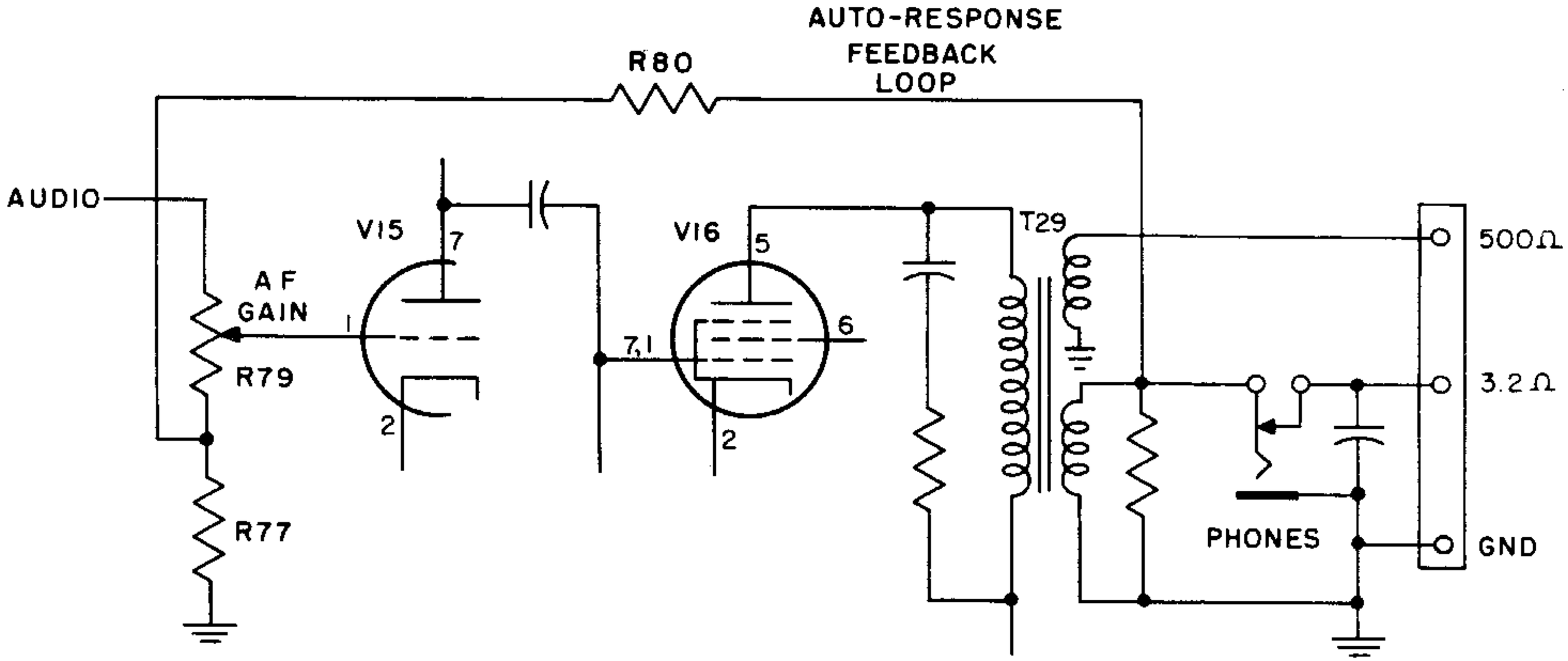
AVC & "S" METER CIRCUITS

Except for the power transformer primary connections, the supply circuitry for the export version is the same.

Finally, there are the accessory and system sockets, and the send- receive switch, each clearly illustrated on the schematic diagram and self-explanatory. In the send position, the B+ to the RF amplifier, the 2nd mixer and the 2nd IF amplifier is removed, muting the receiver. Further or alternate muting can be applied through the system socket from the transmitter (in the "A" series only).



AUTO-RESPONSE CURVE



AUTO-RESPONSE CIRCUIT

This section will provide the instructions for the correct servicing of the Receiver. While no particularly unusual procedures are called for, it should be noted that proper tools and test equipment must be available to undertake the electrical alignment. Inadequate or inaccurate test equipment may result in generally poor operating results.

Excessive oscillator drift which is most noticeable on all of the high frequency bands plus a microphonic condition, is usually the result of a poor 6C4 (V12) high frequency oscillator. This tube is also capable of producing a poor beat note with a ripple in it, also especially noticeable on the high bands. Excessive drift can also be attributed to a poor 6BE6 (V2). This tube can also cause hum modulation most evident on the two highest frequency bands. Sometimes interchanging the 6BE6s between V2 and V3 can produce a noticeable improvement.

Normally there is no reason to remove the chassis from the cabinet, because the top cover allows access to all of the tubes, and to the clock adjustment. However, in the case of RF and IF alignment, it will be necessary to take the chassis out to gain access to the under-chassis alignment settings.

Further disassembly is not recommended except in the case of dial cord replacement. As this is a steel cable, breakage is unlikely, but if it should, it will be required to remove the front panel from the chassis, and to remove the two calibrated dials.

The instructions for the removal of the chassis from the cabinet, and for the disassembly of the front panel, are presented here. Follow the instruction steps with care, and there will be no trouble identifying and replacing all of the parts. Note particularly the knob and dial alignment procedures.

Removing Receiver Chassis from the Cabinet

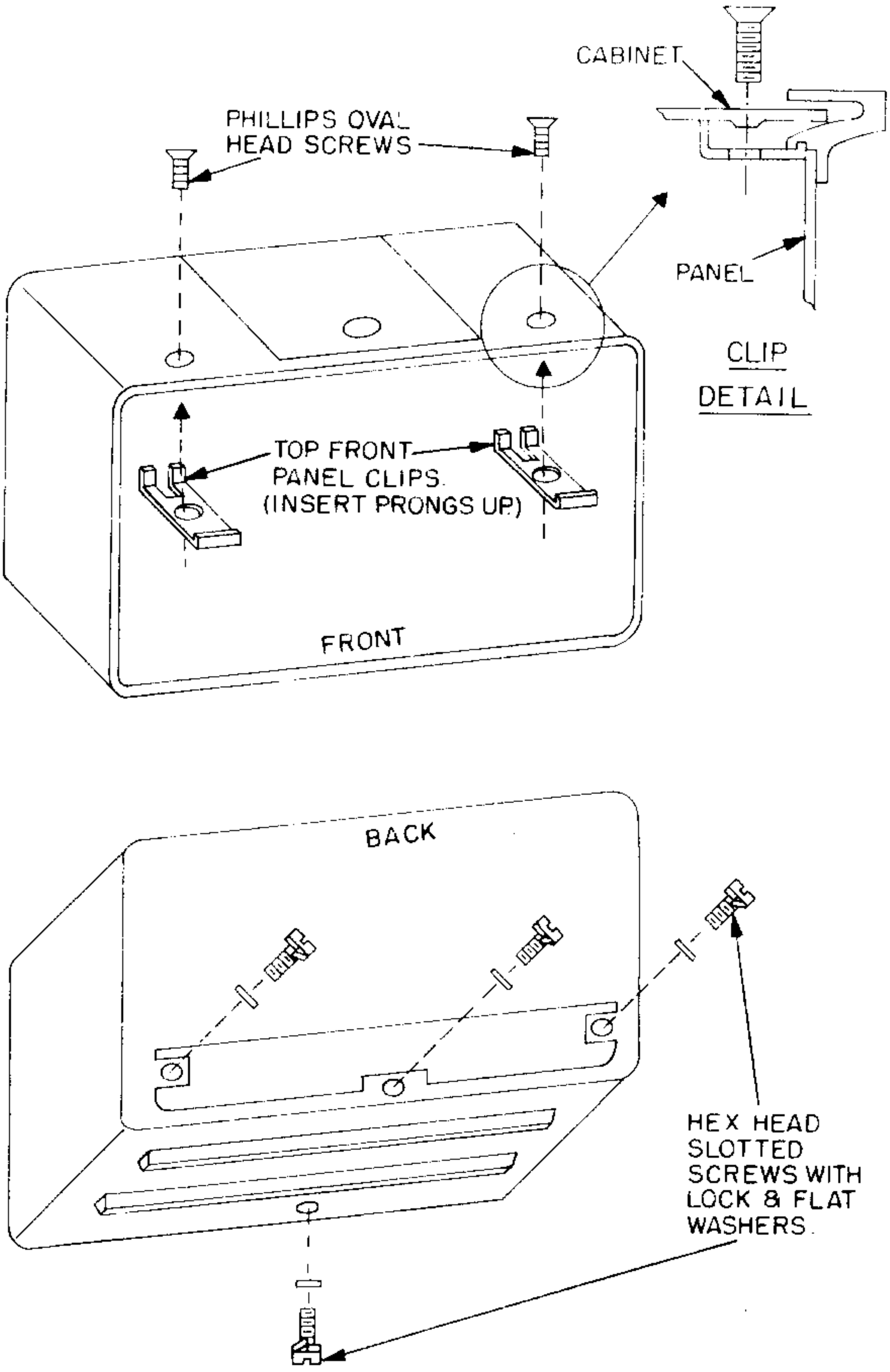
1. Disconnect all wires and cables at the rear of the chassis.

2. Tip the cabinet up from the front and remove the hex head screw on the bottom.

3. Remove the three hex head screws at the back of the cabinet.

4. Loosen the two Phillips head screws at the top front of the cabinet; do not remove them.

5. Slide the panel and chassis forward to clear the cabinet. Guide the line cord as necessary. It is advisable to set the chassis down so that the panel overhangs the edge of a table. This will protect the panel finish, and relieve strain on the panel mounting screws.



HARDWARE TO FASTEN CHASSIS TO CABINET

Replacing Receiver Chassis in the Cabinet

1. Slide the chassis and panel into the cabinet, guiding the line cord through the rear opening as necessary. Check that the "L" bracket under the chassis does not catch under the cabinet as the chassis is slid into it. Make sure the cabinet edges are fitted into the slot around the inside edge of the panel. Check that the clips fit under the panel edge as shown in the illustration.

2. Insert the three screws, lock and flat washers in the back of the cabinet. Do not tighten firmly yet.

3. Tip up the cabinet and insert the screw, lock and flat washer in the bottom front of the cabinet. Do not tighten yet.

4. Tighten the three screws in the rear first, then tighten the screw on the bottom.

5. Tighten the two Phillips head screws in the top of the cabinet.

Removal of the Front Panel from the Chassis

Refer to the diagrams for the locations and identification of all parts.

Step 1. Remove all knobs except those of the clock and dial calibration. Turn all capacitors so that their plates are fully meshed.

Step 2. Remove the following:

Nuts from the controls shown on the diagram.
Nut and lock washer from the headphone jack.
Screws and lock washers from the capacitors.
Pry off the two red pointers; be careful not to bend them.

Step 3. On the back of the front panel, remove the following:

Large nuts and fiber washers.
Dial calibration drive discs.
"S" meter lamp assembly.

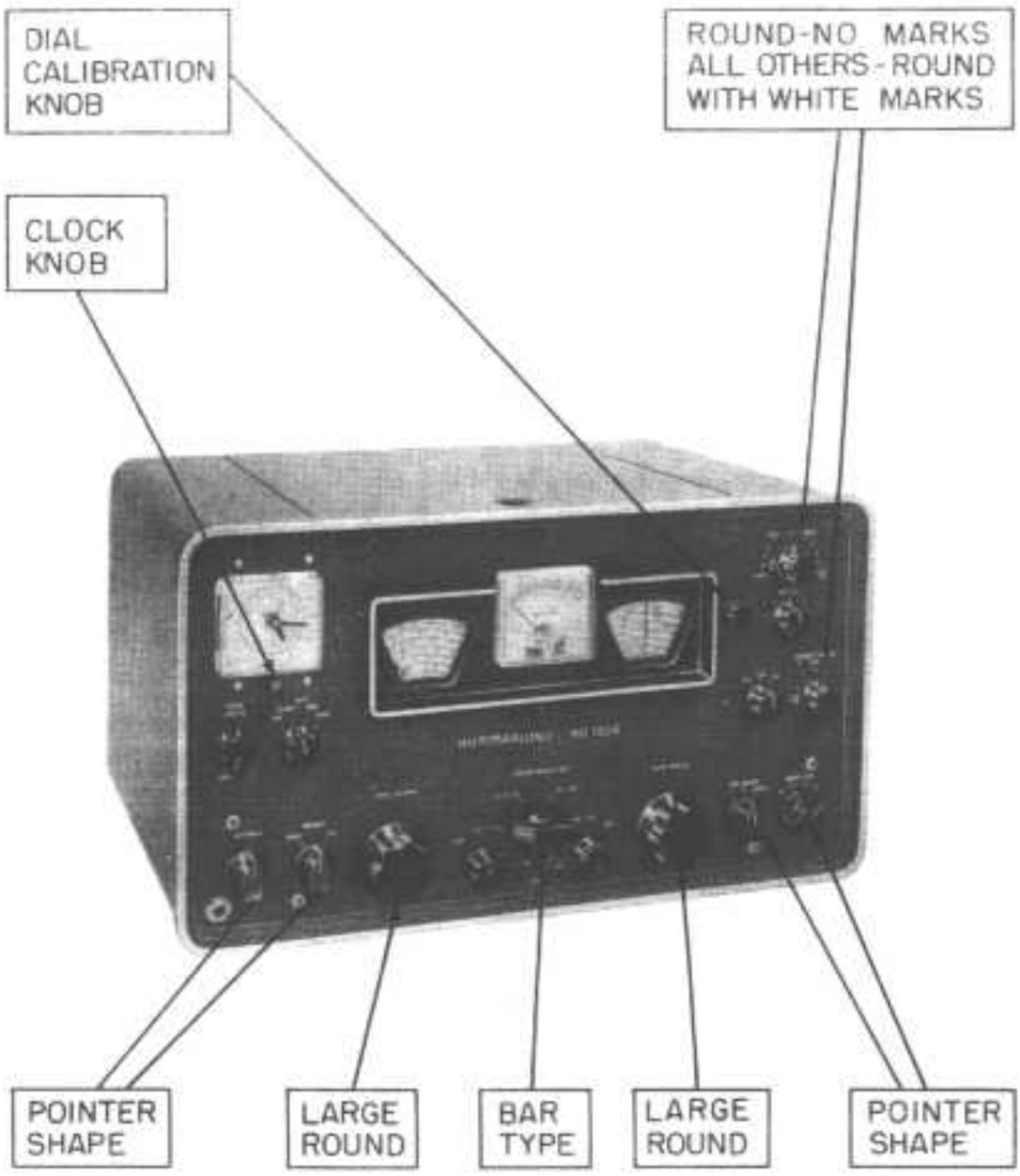
Unsolder the two wires to the meter, and the three wires on the clock.

Pull off the other two lamp assemblies for working convenience in later steps.

Step 4. On the front of the panel, remove:

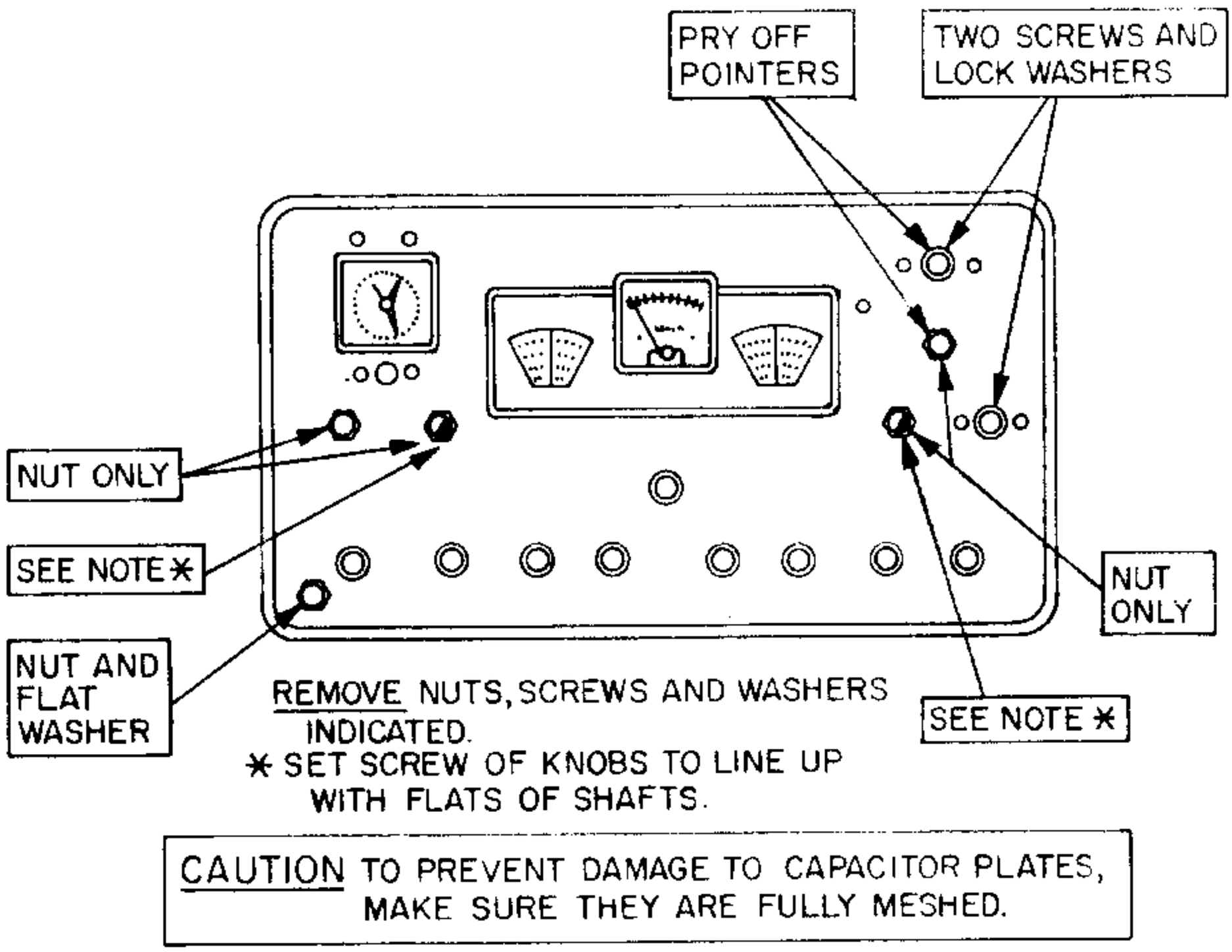
Four Phillips screws and nuts.
One smaller Phillips screw and "L" bracket. Hold panel to prevent it from falling as the last screw is removed.

This completes the removal of the front panel.



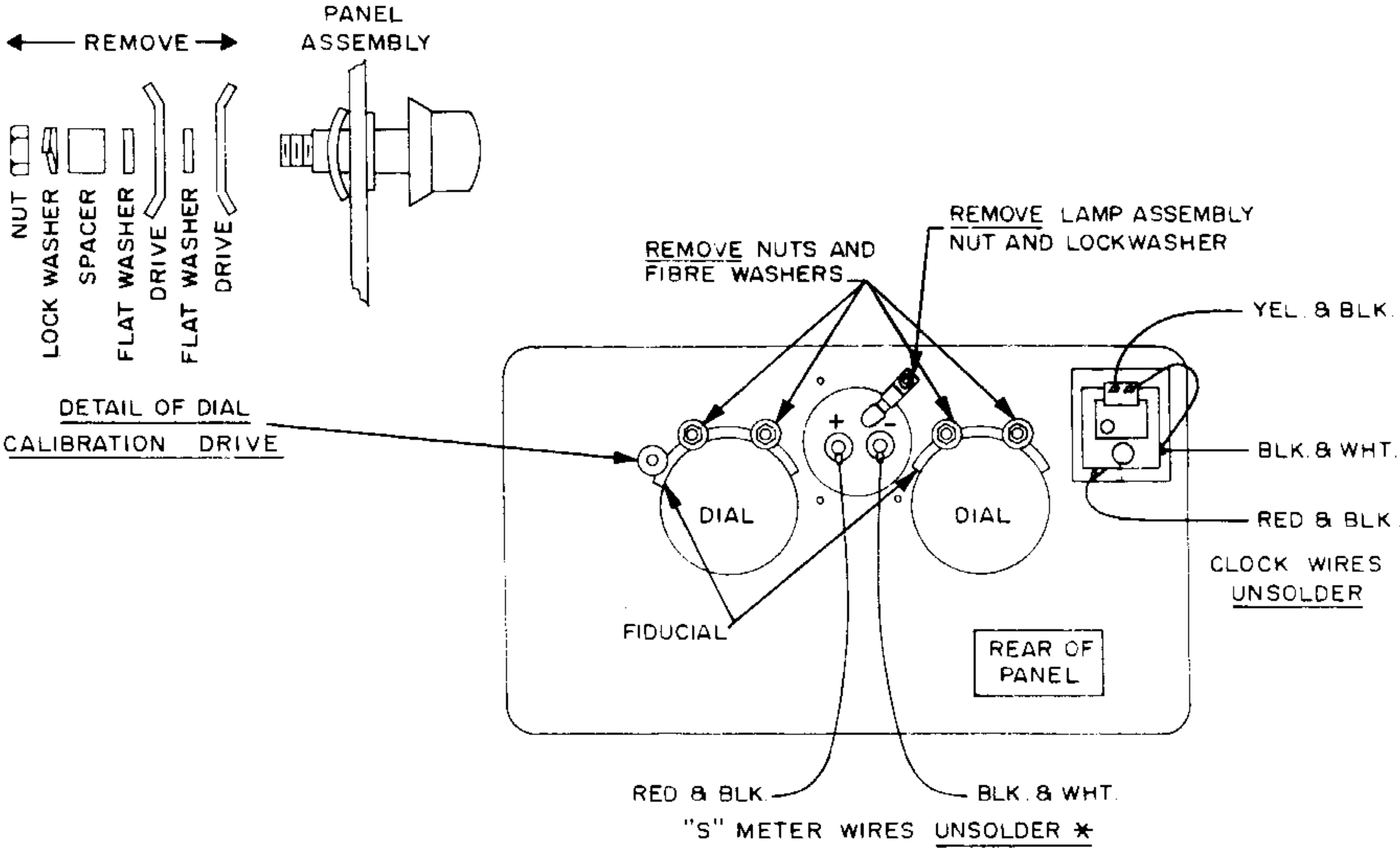
REMOVE ALL KNOBS EXCEPT CLOCK AND DIAL CALIBRATION

STEP 1



CAUTION TO PREVENT DAMAGE TO CAPACITOR PLATES, MAKE SURE THEY ARE FULLY MESHED.

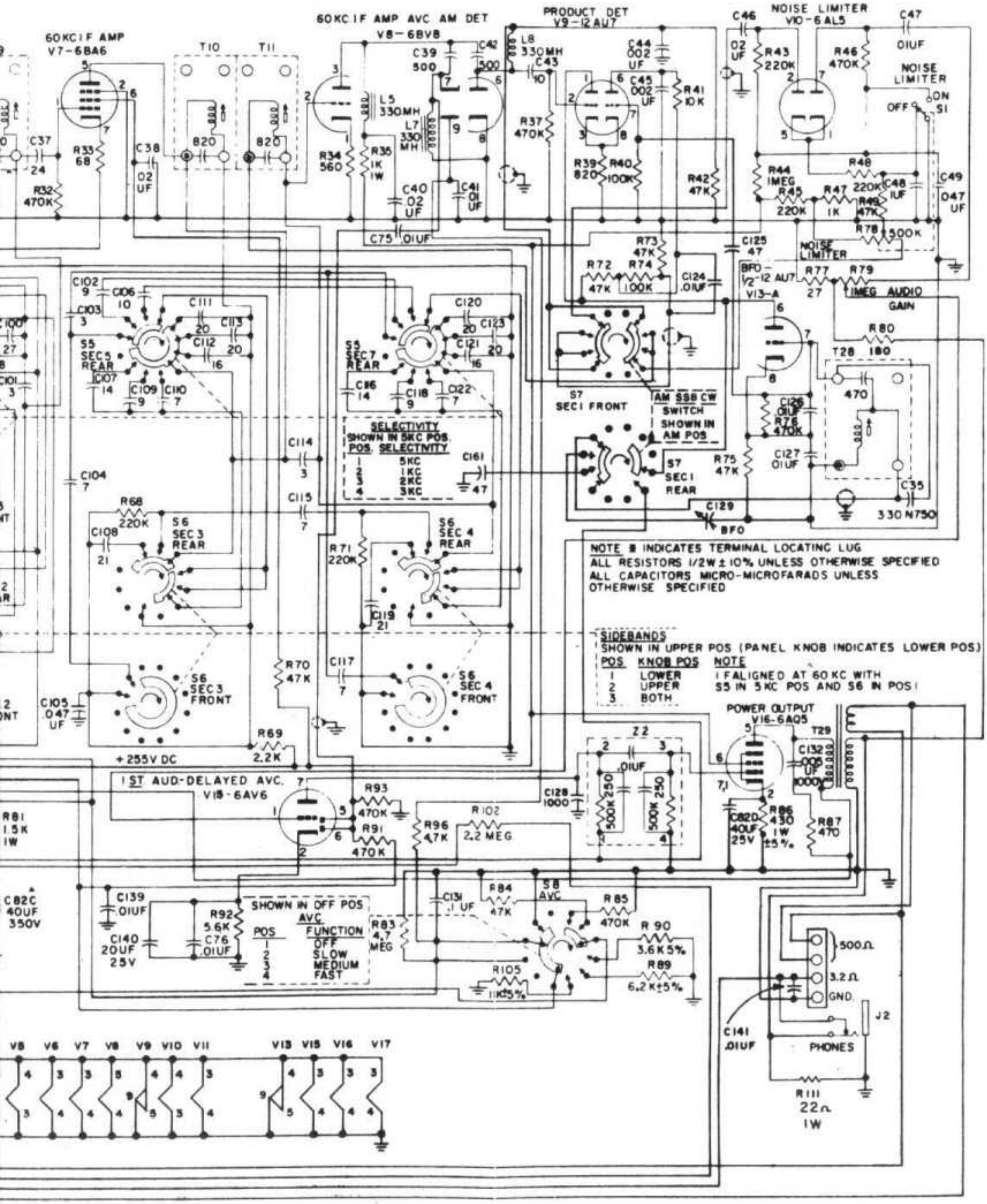
STEP 2



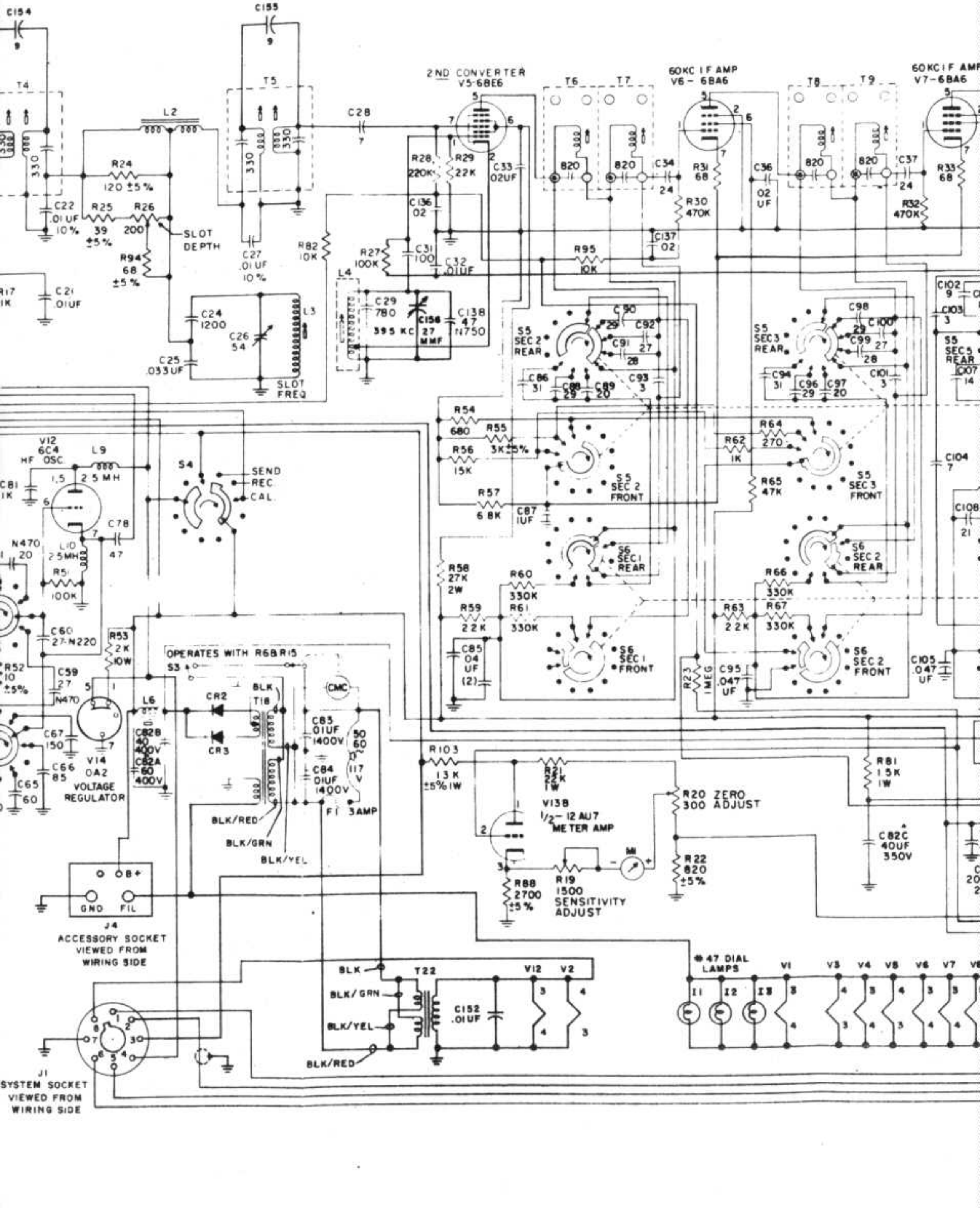
REMOVE AND UNSOLDER AS INDICATED - FOR CONVENIENCE, - PULL OFF OTHER TWO LAMPHOLDERS.

* DO NOT REMOVE NUTS FROM METER, THESE ARE INTERNAL MOUNTING STUDS

STEP 3



SCHEMATIC DIAGRAM, HQ-180A


C154
C155
T4
T5
L2
R24
120 ±5%
C22
.01 UF
10%
R25
39
±5%
R26
200
SLOT
DEPTH
R94
68
±5%
C27
.01 UF
10%
C24
1200
C26
54
C25
.033 UF
L3
SLOT
FREQ
C28
2ND CONVERTER
V5-6BE6
R28
220K
R29
22K
C33
02UF
C136
02
R27
100K
C31
100
C32
.01UF
R82
10K
L4
C29
780
395 KC
C156
27
MMF
C138
47
N750
T6
T7
60KC I F AMP
V6 - 6BA6
820
C34
24
R31
68
R30
470K
C137
02
R95
10K
C36
02
UF
T8
T9
60KC I F AMP
V7-6BA6
C37
24
R33
68
R32
470K
S5
SEC 2
REAR
C90
C92
C91
27
C86
31
C88
29
C89
20
C93
3
S5
SEC3
REAR
C98
C100
C99
27
C94
31
C96
29
C97
20
C101
3
C102
9
C103
3
S5
SEC5
REAR
C107
14
R54
680
R55
3K ±5%
R56
15K
R57
6.8K
S5
SEC 2
FRONT
C87
1UF
R64
270
R62
1K
R65
47K
S5
SEC 3
FRONT
C104
7
C108
21
S6
SEC 1
REAR
S6
SEC 2
REAR
R58
27K
2W
R60
330K
R59
22K
R61
330K
C85
04
UF
(2)
S6
SEC 1
FRONT
R66
330K
R63
22K
R67
330K
S6
SEC 2
FRONT
R23
1 MEG
C95
.047
UF
C105
.047
UF
V12
6C4
HF OSC
L9
1.5
2.5 MH
C81
1K
C78
47
L10
2.5MH
R51
100K
N470
20
C60
27-N220
R52
10
±5%
C59
27
N470
C67
150
C66
85
C65
60
V14
0A2
VOLTAGE
REGULATOR
R53
2K
10W
L6
C82B
40
400V
C82A
60
400V
S4
SEND
REC
CAL
OPERATES WITH R68 R15
S3
BLK
T18
CR2
CR3
CMC
C83
01UF
1400V
C84
01UF
1400V
50
60
117
V
F1 3AMP
BLK/RED
BLK/GRN
BLK/YEL
R103
13K
±5% 1W
R21
22K
1W
V13B
1/2 - 12 AU7
METER AMP
R88
2700
±5%
R19
1500
SENSITIVITY
ADJUST
M
R20 ZERO
300 ADJUST
R22
820
±5%
R81
15K
1W
C82C
40UF
350V
B+
GND
FIL
J4
ACCESSORY SOCKET
VIEWED FROM
WIRING SIDE
J1
SYSTEM SOCKET
VIEWED FROM
WIRING SIDE
BLK
T22
BLK/GRN
BLK/YEL
BLK/RED
C152
.01UF
V12
V2
#47 DIAL
LAMPS
V1
V3
V4
V5
V6
V7
V8
I1
I2
I3

V17 6BA6 455 KC GATE

V3 6BE6 1 ST CONVERTER

V4 6BA6 455 KC IF AMP

V12 6C4 HF OSC

V14 0A2 VOLTAGE REGULATOR

S2G FRONT

S2G REAR

S2D FRONT

S2D REAR

S2C FRONT

S2C REAR

S2F FRONT

S2F REAR

S2E FRONT

S2E REAR

ANT TRIMMER

SENSITIVITY OPERATES WITH R6

OPERATES S3

SLOT DEPT

RF

HF OSC

J4 ACCESSORY SOCKET VIEWED FROM WIRING SIDE

J1 SYSTEM SOCKET VIEWED FROM WIRING SIDE

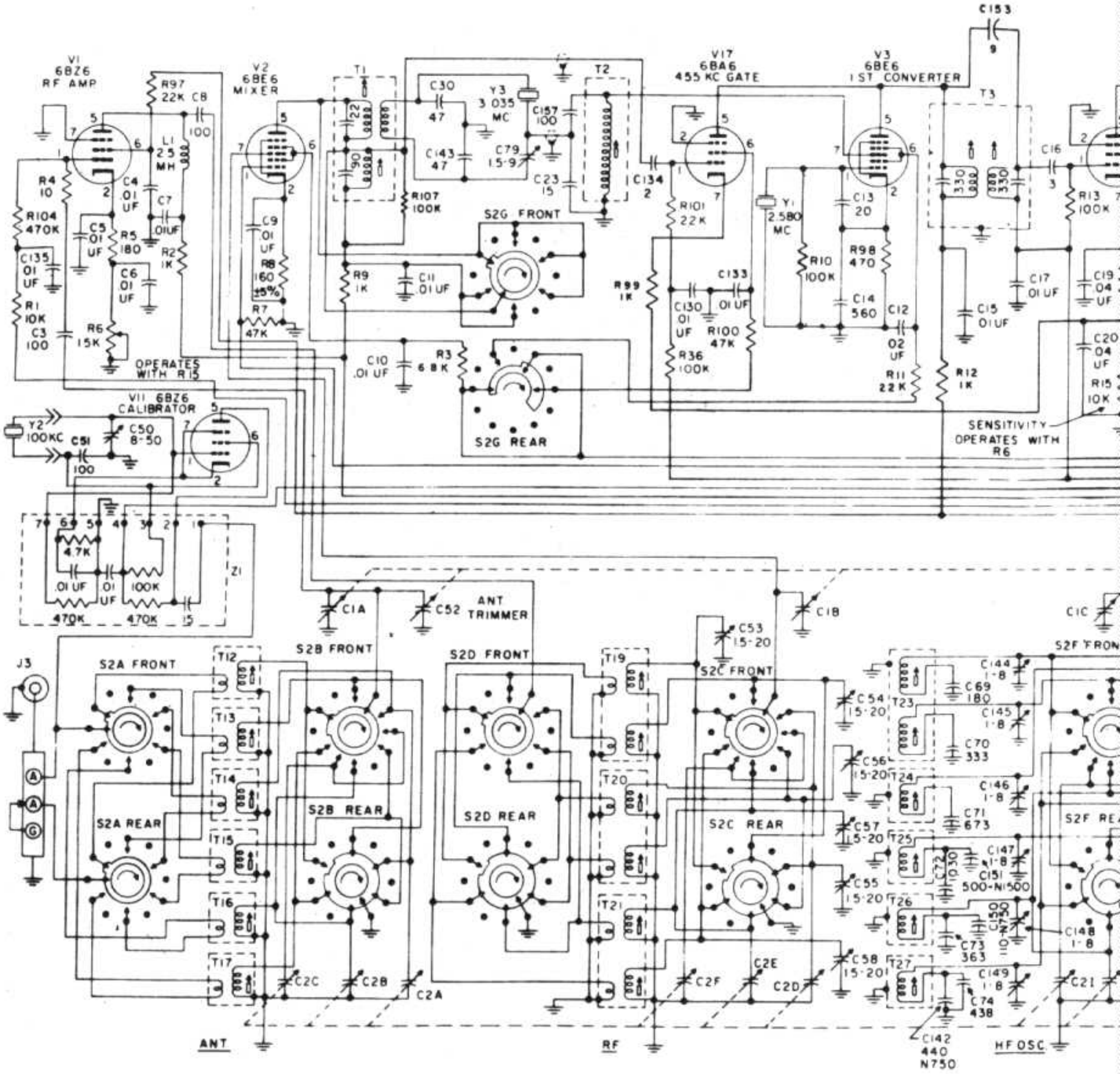
230V AC 50-60~

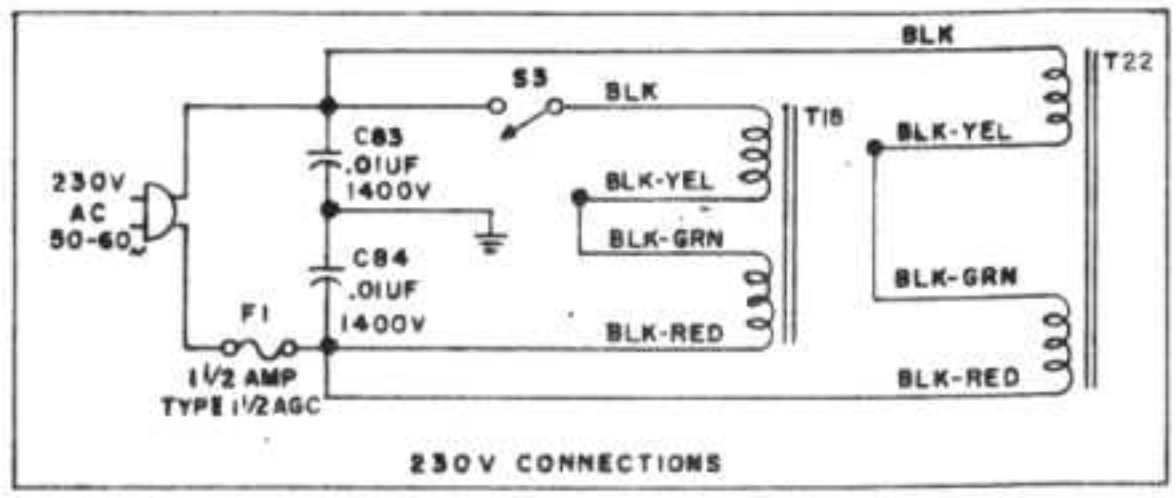
F1 1½ AMP TYPE 1½AGC

C83 .01UF 1400V

C84 .01UF 1400V

230V CONNECTIONS


V1 6BZ6 RF AMP
V2 6BE6 MIXER
T1
T2
V17 6BA6 455 KC GATE
V3 6BE6 1ST CONVERTER
T3
C153 9
R97 22K CB
100
L1 2.5 MH
C4 .01 UF
C7 .01UF
R4 10
R104 470K
C135 .01 UF
R1 10K
C3 100
C5 .01 UF
R5 180
C6 .01 UF
R2 1K
R6 15K
OPERATES WITH R15
C9 .01 UF
R8 160 ±5%
R7 47K
C30 47
Y3 3.035 MC
C143 47
C157 100
C79 1.5-9
C23 15
R107 100K
C134 2
R101 22K
S2G FRONT
R9 1K
C11 .01 UF
C10 .01 UF
R3 6.8K
S2G REAR
R99 1K
C130 .01 UF
C133 .01 UF
R36 100K
R100 47K
Y1 2.580 MC
R10 100K
C13 20
R98 470
C14 560
C12 .02 UF
R11 22K
C16 3
C17 .01 UF
C15 .01 UF
R12 1K
R13 100K
C19 .04 UF
C20 .04 UF
R15 10K
SENSITIVITY OPERATES WITH R6
VII 6BZ6 CALIBRATOR
Y2 100KC
C51 100
C50 8-50
4.7K
.01 UF
.01 UF
100K
470K
470K
15
Z1
C1A
C52 ANT TRIMMER
C18
C1C
J3
S2A FRONT
S2A REAR
S2B FRONT
S2B REAR
S2D FRONT
S2D REAR
S2C FRONT
S2C REAR
S2F FRONT
S2F REAR
T12
T13
T14
T15
T16
T17
T19
T20
T21
T23
T24
T25
T26
T27
C53 15-20
C54 15-20
C56 15-20
C57 15-20
C55 15-20
C58 15-20
C69 180
C70 333
C71 673
C73 363
C74 438
C144 1-8
C145 1-8
C146 1-8
C147 1-8
C151 500-N1500
C148 1-8
C149 1-8
C21
C2A
C2B
C2C
C2D
C2E
C2F
C142 440 N750
ANT
RF
HF OSC


BLK
T22
S3
BLK
T18
BLK-YEL
C83 .01UF 1400V
BLK-YEL
230V AC 50-60
BLK-GRN
C84 .01UF 1400V
BLK-GRN
F1
BLK-RED
BLK-RED
1½ AMP TYPE 1½AGC
230V CONNECTIONS

SCHEMATIC DIAGRAM, HQ-180AX

NOTE ⊞ INDICATES TERMINAL LOCATING LUG
ALL RESISTORS 1/2W ± 10% UNLESS OTHERWISE SPECIFIED
ALL CAPACITORS MICRO-MICROFARADS UNLESS OTHERWISE SPECIFIED
⊞ CRYSTAL USED DEPENDS ON BAND & FREQUENCY DESIRED

SIDEBANDS
SHOWN IN UPPER POS (PANEL KNOB INDICATES LOWER POS)

POS	KNOB POS	NOTE
1	LOWER	1 FALIGNED AT 60 KC WITH
2	UPPER	S5 IN 5KC POS AND S6 IN POS 1
3	BOTH	

POS	SELECTIVITY
1	5KC
2	1KC
3	2KC
4	3KC

POS	AVC FUNCTION
1	OFF
2	SLOW
3	MEDIUM
4	FAST

V4 6BA6 455 KC IF AMP

T4

T5

L2

C154

C155

C16

R13 100K

R14 180 ±5%

R15 10K

R16 10K

R17 1K

R18 100K 1W

R106 100K

C17 01 UF

C18 01 UF

C19 04 UF

C20 04 UF

C21 .01UF

C22 .01 UF 10%

R24 120 ±5%

R25 39 ±5%

R26 200

R94 68 ±5%

SLOT DEPTH

C24 1200

C25 .033UF

C26 54

L3

SLOT FREQ.

C27 01 UF 10%

C28

R82 10K

2ND CONVERTER V5-6BE6

R28 220K

R29 22K

C33 02UF

C136 02 UF

R27 100K

C31 100

C32 01UF

L4

C29 780

C156 27 MMF

395 KC

C138 47 N750

60KC I.F AMP V6 - 6BA6

T6

T7

T8

820

C34 24

R31 68

R30 470K

C36 02 UF

C137 02 UF

R95 10K

S5 SEC 2 REAR

S5 SEC 2 FRONT

S5 SEC 3 REAR

S6 SEC 1 REAR

S6 SEC 1 FRONT

R54 680

R55 3K ±5%

R56 15K

R57 6.8K

C87 1UF

R58 27K 2W

R59 22K

R60 330K

R61 330K

C85 04 UF (2)

R62 1K

R64 270

R65 47K

R66 330K

R63 22K

R67 330K

R23 1 MEG

C95 047 UF

C1C

S2F FRONT

S2F REAR

S2E FRONT

S2E REAR

C63 47

C61 N470 20

C64 47

C77 100 N470

R50 20 ±5%

R52 10 ±5%

C60 27 N220

C80 220

C59 27 N470

C68 220

C62 27 N750

C65 60

C67 150

C66 85

C148 1-8

C21 C2H C2G

HF OSC

C78 47

V14 0A2 VOLTAGE REGULATOR

R53 2K 10W

S4

SEND

REC

CAL

V12 6C4 HF OSC

R51 100K

L10 2.6 MH

C81 1K

OPERATES WITH R68 R15

S3

CR2

CR3

L6

C82B 40 400V

C82A 60 400V

BLK

T18

CMC

C83 01UF 1400V

C84 01UF 1400V

50 60 117 V

F1 3 AMP

BLK-RED

BLK-GRN

BLK-YEL

L9 2.5 MH

K1

R103 1.3 K ±5% 1W

R21 22K 1W

V13B 1/2 - 12AU7 METER AMP

M

R88 2700 ±5%

R19 1500 SENSITIVITY ADJUST

R20 ZERO 300 ADJUST

R22 820 ±5%

V20 6CW4 TAL OSC

R109 62K ±5%

C160 .005 UF

R110 16K ±5%

S9 REAR

CR1 IN1490

C158 200UF 25V

NON POLARIZED

R47 DIAL LAMPS

I1 I2 I3

V1 V3 V4 V5 V6 V7

BLK T22

C152 .01 UF

V12 V2

BLK-GRN

BLK-YEL

BLK-RED

J4 ACCESSORY SOCKET VIEWED FROM WIRING SIDE

GND FIL B+

J1 SYSTEM SOCKET VIEWED FROM WIRING SIDE

BLK

T22

BLK-YEL

BLK-GRN

BLK-RED

V17 6BA6 455 KC GATE

V3 6BE6 1ST CONVERTER

V4 6BA6 455 KC IF AMP

V14 0A2 VOLTAGE REGULATOR

V12 6C4 HF OSC

V20 6CW4 CRYSTAL OSC

T1 T2 T3 T4 T5

T18 T19 T20 T21 T22 T23 T24 T25 T26 T27

Y1 2.580 MC

Y3 3.035 MC

L2 L6 L9 L10

S2G FRONT S2G REAR

S2D FRONT S2D REAR

S2C FRONT S2C REAR

S2F FRONT S2F REAR

S2E FRONT S2E REAR

S3 FRONT

SLOT DEPTH

SENSITIVITY OPERATES WITH R6

OPERATES WITH S3

ANT TRIMMER

RF

HF OSC

SEE NOTE 66

J4 ACCESSORY SOCKET VIEWED FROM WIRING SIDE

J1 SYSTEM SOCKET VIEWED FROM WIRING SIDE

K1

X31 X30 X29 X28 X27 X26 X25 X24 X23 X22 X21

GND FIL B+

230V AC 50-60~

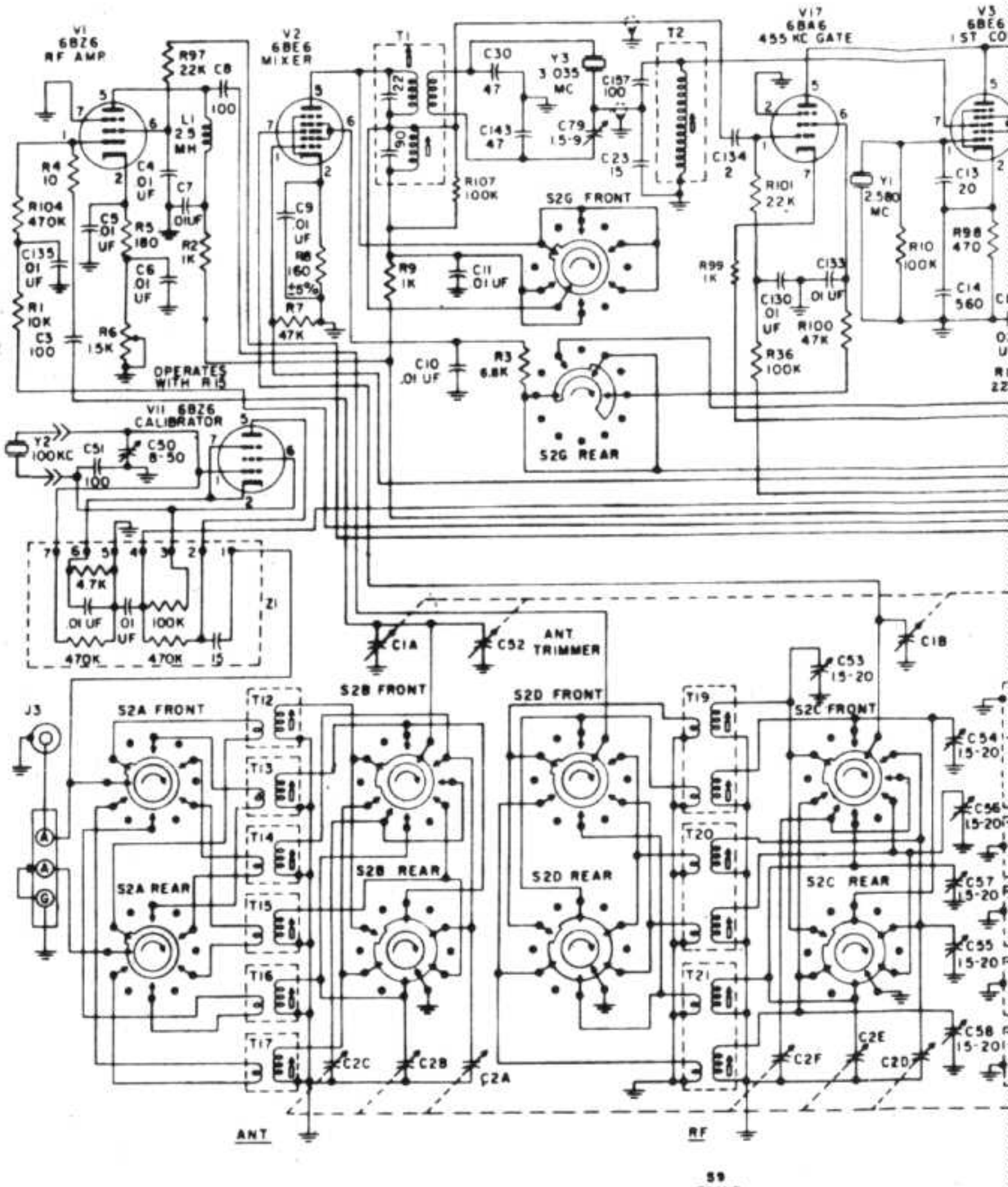
F1 1½ AMP TYPE 1½ AGC

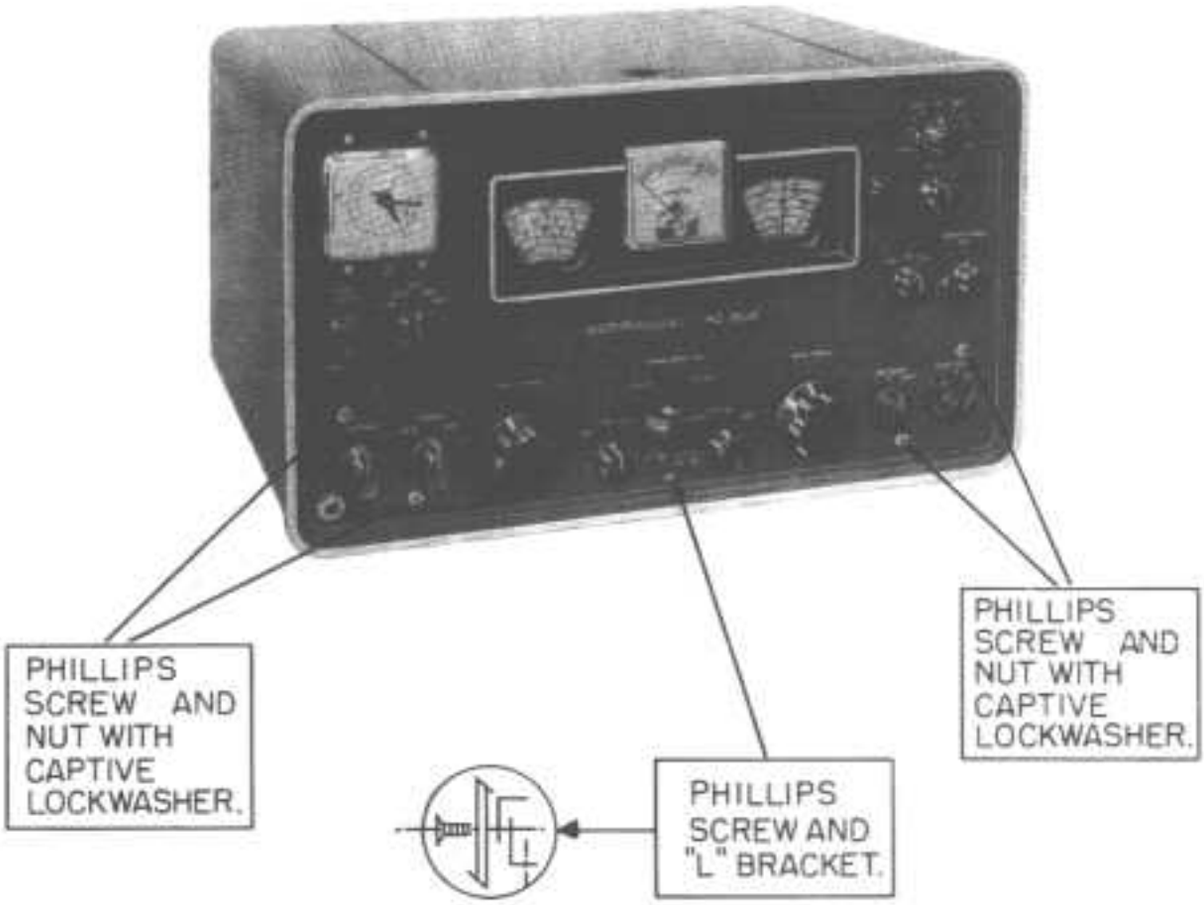
230V CONNECTIONS

BLK BLK-YEL BLK-GRN BLK-RED

C83 .01UF 1400V

C84 .01UF 1400V


V1 6BZ6 RF AMP
V2 6BE6 MIXER
T1
T2
V17 6BA6 455 KC GATE
V3 6BE6 1ST CO
R97 22K
C8 100
L1 2.5 MH
C4 .01 UF
C7 .01UF
R4 10
R104 470K
C5 .01 UF
R5 180
R2 1K
C135 .01 UF
C6 .01 UF
R1 10K
C3 100
R6 15K
OPERATES WITH R15
C9 .01 UF
R8 160 ±5%
R7 47K
C22
C90
R107 100K
C30 47
C143 47
Y3 3.035 MC
C157 100
C79 15-9
C23 15
S2G FRONT
R9 1K
C11 .01 UF
C10 .01 UF
R3 6.8K
S2G REAR
C134 2
R101 22K
R99 1K
C133
C130 .01 UF
.01 UF
R100 47K
R36 100K
Y1 2.580 MC
R10 100K
C13 20
R98 470
C14 560
V11 6BZ6 CALIBRATOR
Y2 100KC
C51 100
C50 8-50
Z1
4.7K
.01 UF
.01 UF
100K
470K
470K
15
C1A
C52 ANT TRIMMER
C1B
C53 15-20
J3
S2A FRONT
S2B FRONT
S2D FRONT
S2C FRONT
T12
T13
T14
T15
T16
T17
T19
T20
T21
S2A REAR
S2B REAR
S2D REAR
S2C REAR
C54 15-20
C56 15-20
C57 15-20
C55 15-20
C58 15-20
C2C
C2B
C2A
C2F
C2E
C2D
ANT
RF
S9 FRONT
SEE NOTE 88
R108 100K
X31 X30 X29 X28 X27 X26 X25 X24 X23 X22 X21
S3
C83 .01UF 1400V
C84 .01UF 1400V
230V AC 50-60~
F1
1½ AMP TYPE 1½ AGC
230

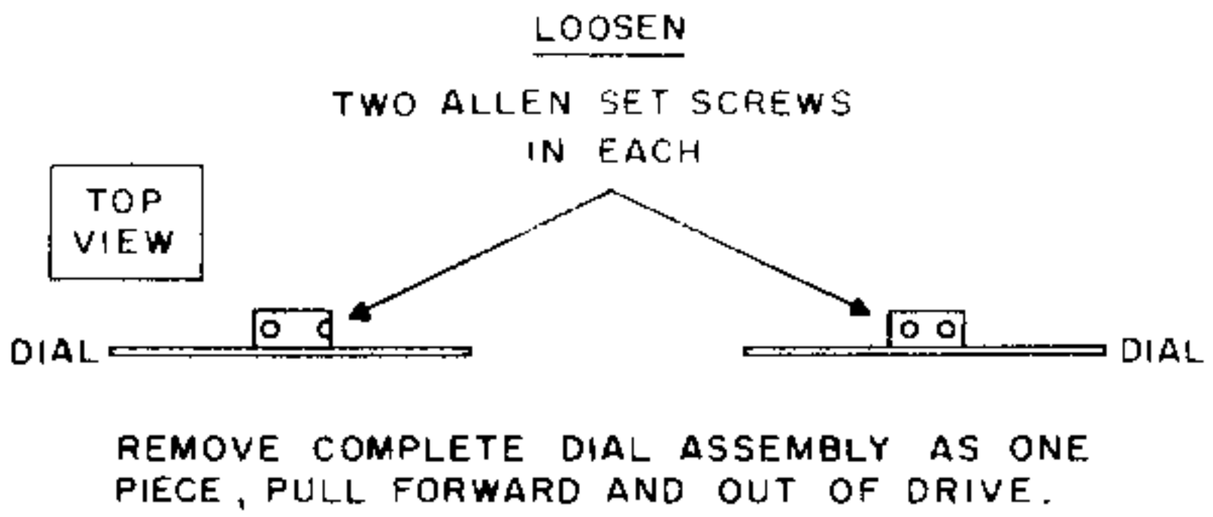


REMOVE SCREWS, NUTS AND BRACKET INDICATED

CAUTION - HOLD PANEL TO PREVENT FALLING

STEP 4

Step 5. Loosen but do not remove the set screws on the two dials. DO NOT MOVE THE SET SCREWS OF THE PULLEYS. Now pull the two dial assemblies forward, at the same time guiding the left dial out of the tuning drive discs.



STEP 5.

Step 6. Replace the two dial assemblies on their shafts, inserting the left dial into the tuning drive discs. Make sure that the tuning capacitor plates are fully meshed, then turn the dials so that the left end of each dial is approximately vertical.

Push on the dials so that the shaft ends are about 1/8 inch recessed. It should be possible to see the previous set screw marks on the shafts to help in this setting.

Now tighten one set screw on each shaft. Final setting will come in a later step.

Step 7. Check that the proper nuts and lock washers are in place on the controls that were removed from the front panel.

Locate the panel in place, inserting the controls in their proper holes.

Secure the front panel by replacing the hardware removed in Step 4.

Note that the "L" bracket fits over the small terminal strip located inside the chassis.

Step 8. On the back of the front panel, replace the hardware removed in Step 3. Check that the dial calibration drive is correctly restored with the transparent segment within the discs. Resolder the wires to the meter and to the clock; see the Step 3 illustration for the wire color code.

Step 9. On the front of the panel, replace the hardware removed in Step 2. Be careful not to scratch the panel when tightening the nuts, and remember to line up the flats of the two controls indicated in the Step 2 illustration.

After Step 9 is completed, check that the dials and the dial calibration system operate smoothly and without interference. If necessary, loosen the front panel screws of Step 4 and readjust panel positioning to obtain proper dial operation.

Step 10. Replace the two red pointers by pushing them onto the inner shafts. Be careful not to bend them. Follow the instructions on the Step 11 diagram for capacitor plate meshing, then replace all knobs. Knob identification appears in the Step 1 illustration.

Step 11. This step is for dial alignment.

Reconnect the Receiver and turn it on. Allow it to warm up for about a half hour.

After the warm-up period, tune in to 4 MCS on the Main Tuning Dial and 100 on the logging scale of the Band Spread Dial, and turn on the crystal calibrator (see instructions in the User's Manual).

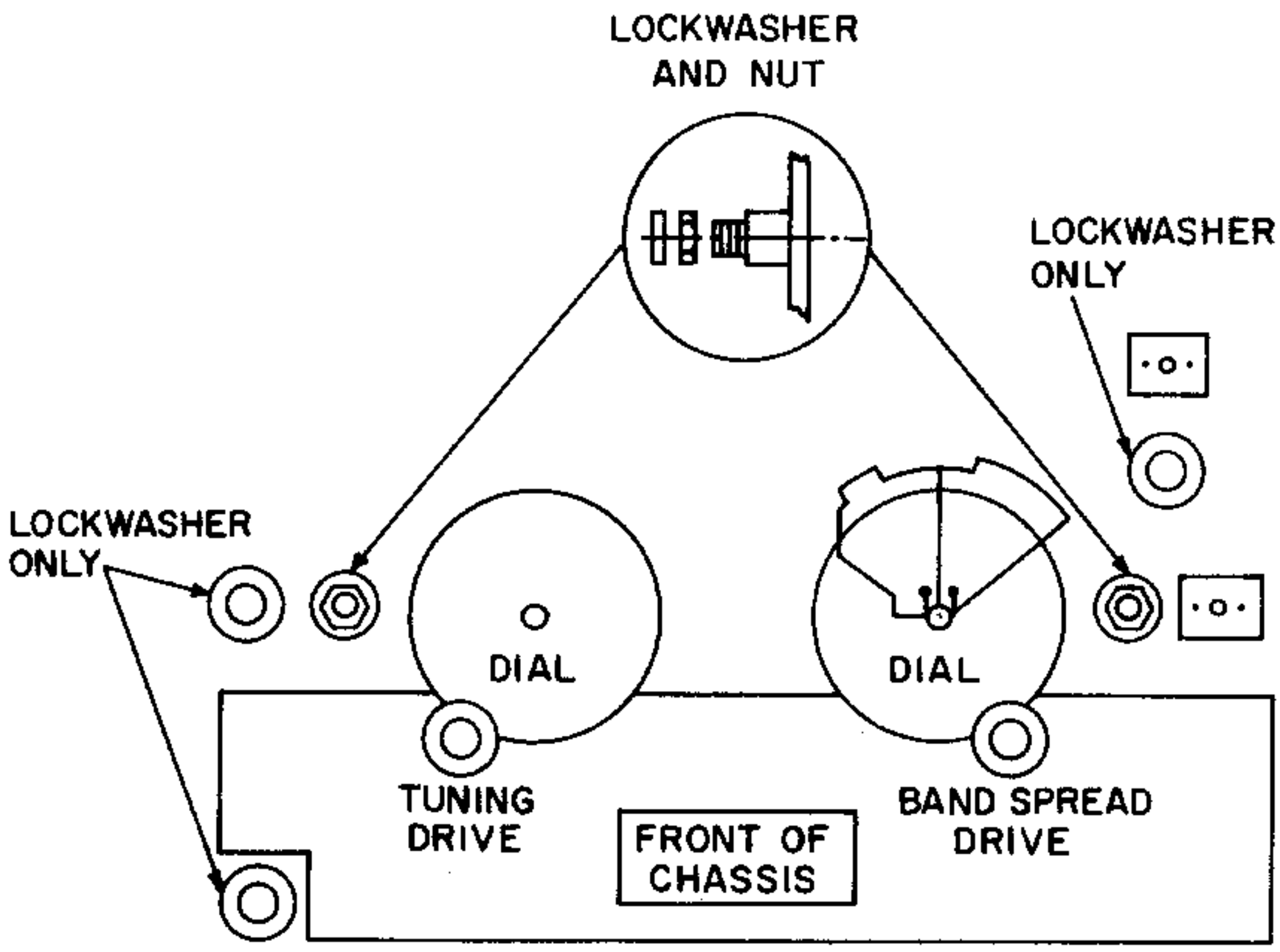
Set the dial calibrator so that the hairline is in line with the mark on the top of the opening in the dial escutcheon.

Noting that the tuning capacitor plates are in the correct position for the low end of the band (fully meshed), tune for zero beat, ignoring the dial frequency setting.

Loosen the left dial set screw, hold the capacitor pulley to maintain zero beat, then set the dial to exactly 4 MCS. Now tighten the dial set screw again FIRMLY.

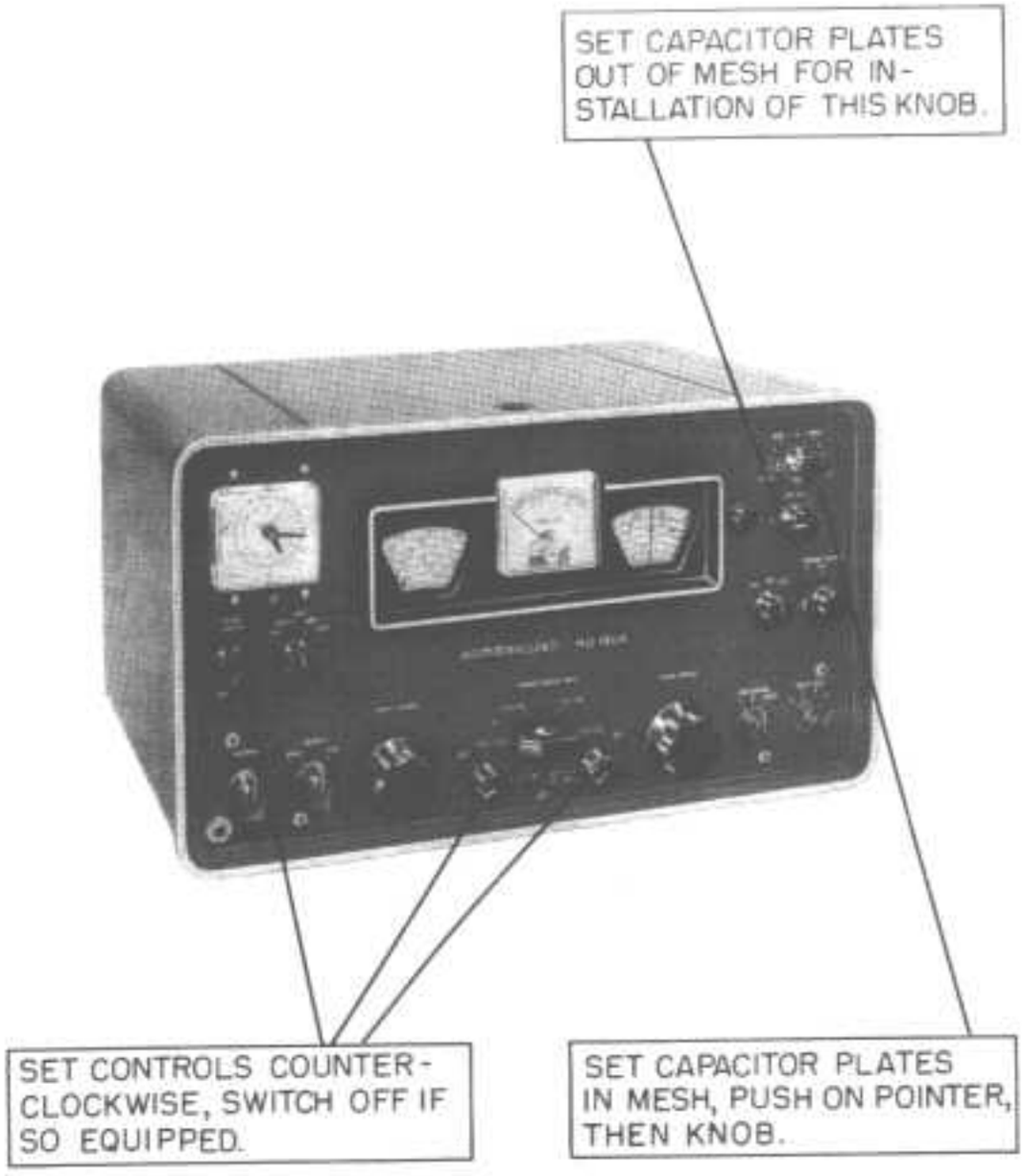
Turn the dial to gain access to the other set screw on that dial, and tighten it firmly as well. Repeat the same procedure for the right dial, but using 100 on the logging scale this time.

This completes the dial calibration procedure. Check on other bands; if dial calibration is far out, or not possible to be attained, RF alignment will have to be undertaken.



HARDWARE FOR MOUNTING CONTROLS - WHEN PANEL IS REMOVED

STEP 7



KNOB ALIGNMENT POSITIONS - REMAINING SHAFTS HAVE FLATS IF KNOB ALIGNMENT IS REQUIRED.

REPLACING POINTERS AND KNOBS

STEP 10

Alignment Procedure

This Receiver has been carefully aligned at the factory and should never require any more than a touch-up to retain the peak of its performance. If alignment is necessary, follow the instructions provided below with care.

For the alignment procedure, the equipment listed is required:

Non-metallic alignment tools, general Cement #509Y and #8282, or equivalents.

DC Vacuum-tube Voltmeter.

Signal Generator(s) capable of accurately producing unmodulated signals of:
60 KCS, 455 KCS, 3035 KCS, and RF ranging from .54 MCS to 30.0 MCS.

Alignment must be undertaken with the Receiver out of its cabinet. Remove the chassis from the cabinet as instructed in this Manual. When removed, set the chassis on its end with the power transformer down nearest the table top. This is to permit access to both the top and bottom of the chassis.

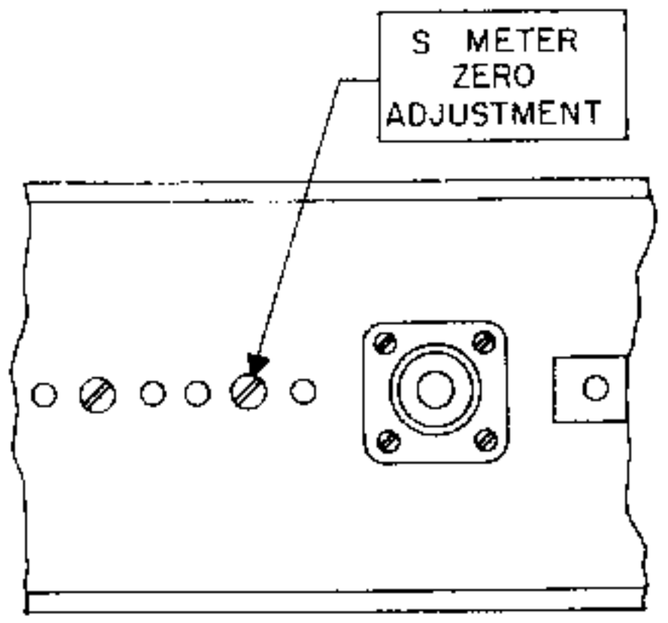
Before operating the Receiver, adjust the "S" meter pointer screw on the front face of the meter to set the needle exactly over the zero mark on the scale.

Connect the speaker to the Receiver, plug the set into a source of power, and turn it on.

BEFORE ALIGNMENT, THE RECEIVER MUST BE ALLOWED TO WARM UP FOR AT LEAST A HALF HOUR. This is to assure frequency stability.

KNOB FUNCTION	NOMINAL POSITION
Band Selector	7.85 - 15.35 mc band
Band Spread Tuning Dial (arbitrary)	100
AM/SSB/CW Selector	AM
Side Band Selector	U
Selectivity Selector	5Kcs
Slot Frequency	Counter-clockwise
Slot Depth	See AM Reception
Beat Frequency Oscillator	0
Noise Limiter	Off
AVC	Off
Antenna	Center
Calibration Reset	Center
Send-Receive Switch	Receive
Audio & RF Gain	Adjust to Test Requirements

After warm-up, set the RF gain control fully counterclockwise without actually turning the set off, and adjust the motor zero control at the rear of the Receiver chassis again for zero on the scale. The AVC switch must be set to a position other than "OFF" for the meter to read.



REAR OF CHASSIS

Set all of the front panel controls as shown in the illustration at the start of the alignment procedure. Changes to these settings will be required as the alignment progresses.

Except where noted in the diagrams, the coil slugs are set from the top of the can. Be careful that you are actually turning the proper slug; it is sometimes easy to be adjusting the wrong one, or even to be turning both at once if they happen to be close together inside the coil.

IF ALIGNMENT

Step 1. Connect the VTVM to the junction of L8 and C44 and chassis ground.

Connect the Signal Generator for the 60 KCS First Adjustments to the junction of C28 and T5 and chassis ground.

Apply an unmodulated 60 KCS, and set T6, T7, T8, T9, T10 and T11 for a maximum negative reading. Remember to reduce the IF input signal level as necessary to maintain about -5 volts D.C.

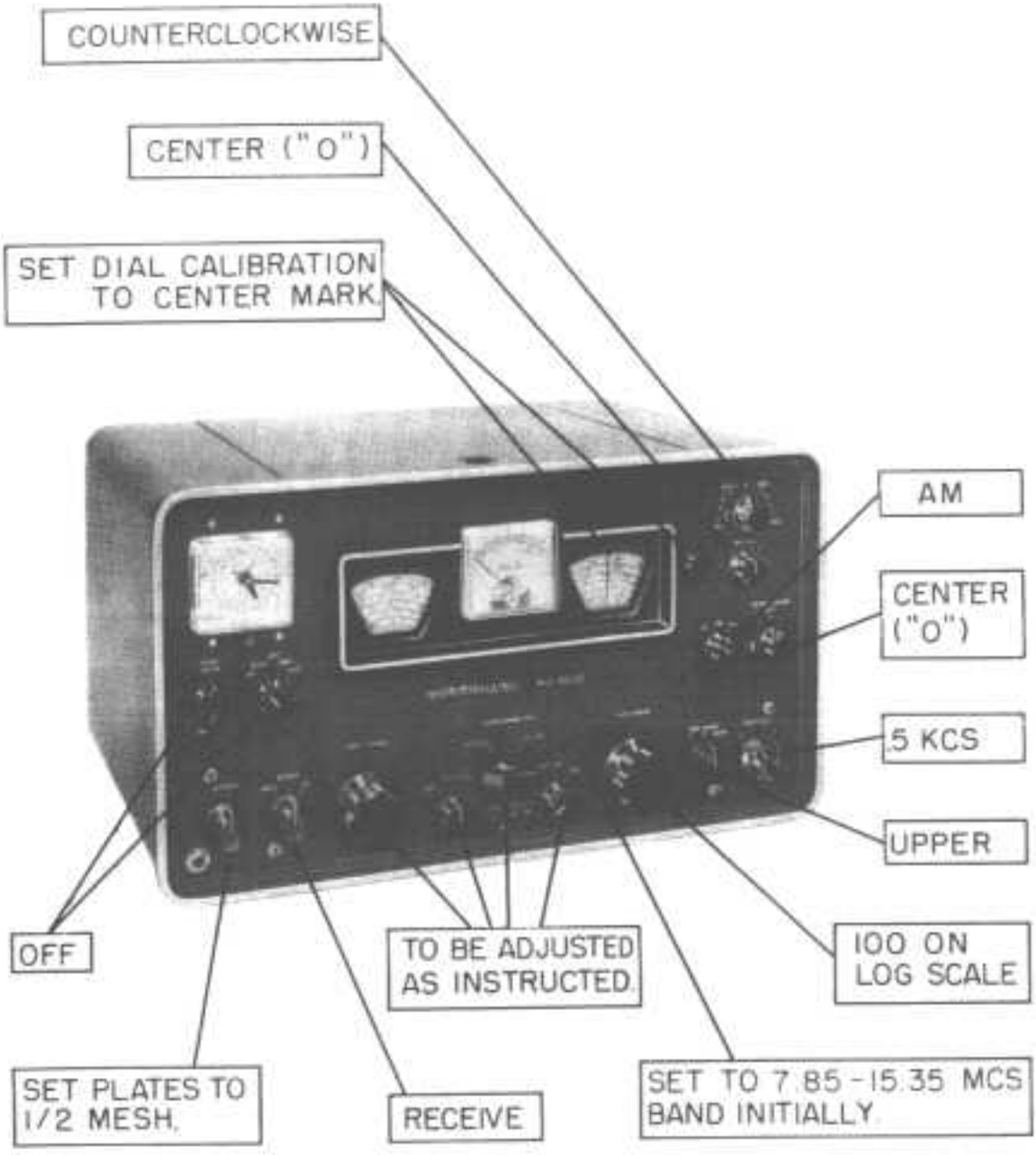
Step 2. Turn the mode switch from AM to CW.

Check that the BFO is set to zero, then adjust T28 for zero beat as heard in the loud speaker.

Return the switch to AM.

Sideband SW to Both.

Selectivity SW to 3 kcs



CONTROL SETTING AT START OF ALIGNMENT

Step 3. Disconnect the Signal Generator from V5 and reconnect it to Pin 7 of V2.

Apply on unmodulated 3035 kcs.

Adjust L4, the top and bottom slugs of T5, T4, and T3, and the bottom slug of T2 and peak T1, for a maximum negative reading.

Remember to reduce the IF input signal level as necessary to maintain about -5 volts.

Step 4. Turn the Slot Frequency control to zero, and the Slot Depth control to its mid-position.

Set L3 for minimum meter reading. It may be necessary to raise the IF input level to be sure of indicating the absolute minimum.

Return the generator level and the Slot Frequency and Depth controls to their previous conditions.

Step 5. For alignment of 455 kc/s IFs, leave the signal generator and VTVM as they were in Step 3 and adjust the top and bottom cores of T3, T4, and T5 for maximum negative reading of the VTVM. Remember to reduce the IF input signal level as necessary to maintain about -5 volts.

This completes the IF alignment procedure. For RF alignment continue with Step 6 below.

RF ALIGNMENT

Step 6. All HF Oscillator and RF core adjustments are made from the top of the shield cans. RF trimmer adjustments are made from the bottom of the chassis.

Connect the unmodulated signal generator to the antenna terminal and the generator output ground lead to the antenna ground terminal with the link closed.

Turn the Band Switch to the .54 to 1.05 mc/s band and the Selectivity switch to 1 kc/s. Turn the SideBand Selector to Both.

Set the Antenna control about 30 degrees to the left of vertical (approximately 10 o'clock) and the Main Tuning dial to .60 mc/s.

Set the signal generator frequency to .60 mc/s.

(Step 6 - con't.)

Make sure that the Band Spread adjustable indicator is set at the center marker and the Band Spread dial is set at 100 on the logging scale.

Adjust the top slug in T23, the top slug of T19, and the top slug of T12 for maximum negative reading of the VTVM.

Remember to adjust the generator output and RF gain control to maintain VTVM reading of approximately -5 volts.

Now adjust the top slug of T1 for maximum negative reading on the VTVM.

Set the Main Tuning dial to 1.0 mc/s and the generator frequency to 1.0 mc/s.

Adjust C144, C53 and the Antenna control for maximum negative reading of the VTVM.

Note that the range of the Antenna trimmer is 180 degrees and the control pointer is set for decreasing capacity from horizontal left to horizontal right and should be well within this range from the low frequency to the high frequency adjustments.

Check and if the pointer is at the either end of this range, reset it as required and Adjust T12 as found necessary to keep it within range.

Since the adjustments at each alignment frequency of the band reacts on the other, it is necessary to repeat the adjustments until no improvement is obtained. The final adjustments of the band should be the trimmers C144 and C53 at the high frequency alignment point.

Band Switch to 1.05 to 2.05 position
Main dial to 1.1 mc/s
Generator to 1.1 mc/s
Adjust T23 and bottom slugs of T19 and T13 for maximum negative reading of VTVM.

Generator and Main dial to 2.0 mc/s.
Adjust C145 and C54 and Ant. Comp. for maximum negative reading on the VTVM. Repeat the two frequency adjustments until no further improvement can be noted. Finish with the high frequency adjustments.

(Step 6 - Con't.)

Band Switch to 2.05 - 4.04 mc/s.
Dial and Generator to 2.1 mc/s.
Adjust T24, T14 and top of T20 for maximum negative reading on the VTVM.

Dial and Generator to 4.0 mc/s.
Adjust C146, C55, and Ant. Comp. for maximum negative reading of the VTVM.

Repeat the two frequency adjustments until no further improvement can be noted. Finish with the high frequency adjustments.

Band Switch to 4.0 - 7.85 mc/s band.
Generator and dial to 4.0 mc/s.
Adjust T25, bottom slug of T20 and T15 for maximum negative reading on the VTVM.

Generator and dial to 7.85 mc/s.
Adjust C147, C56, and the Ant. Comp. for maximum negative reading on the VTVM. Repeat the two frequency adjustments until no further improvement can be noted. Finish with the high frequency adjustments.

Band Switch to 7.85 - 15.35 mc/s.
Generator and dial to 7.85 mc/s.
Adjust T26, Top of T21 and T16 for maximum negative reading of the VTVM.

Generator and dial to 15.0 mc/s.
Adjust C148, C57 and Ant. Comp. for maximum negative reading of the VTVM. Repeat the two frequency adjustments until no further improvement can be noted. Finish with the high frequency adjustments.

Band Switch to 15.35 - 30.0 mc/s band
Generator and dial to 15.7 mc/s.
Adjust T27, bottom of T21, and T17 for maximum negative reading of the VTVM.

Generator and dial to 30.0 mc/s.
Adjust C149, C58, and the Ant. Comp. for maximum negative reading of the VTVM. Repeat the two frequency adjustments until no further improvement can be noted. Finish with the high frequency adjustments.

"S" METER ADJUSTMENT

1. Turn receiver off, and if necessary adjust the mechanical zero of pointer with a small bladed screw driver.

2. Turn receiver on, and allow 1/2 hour warm-up.

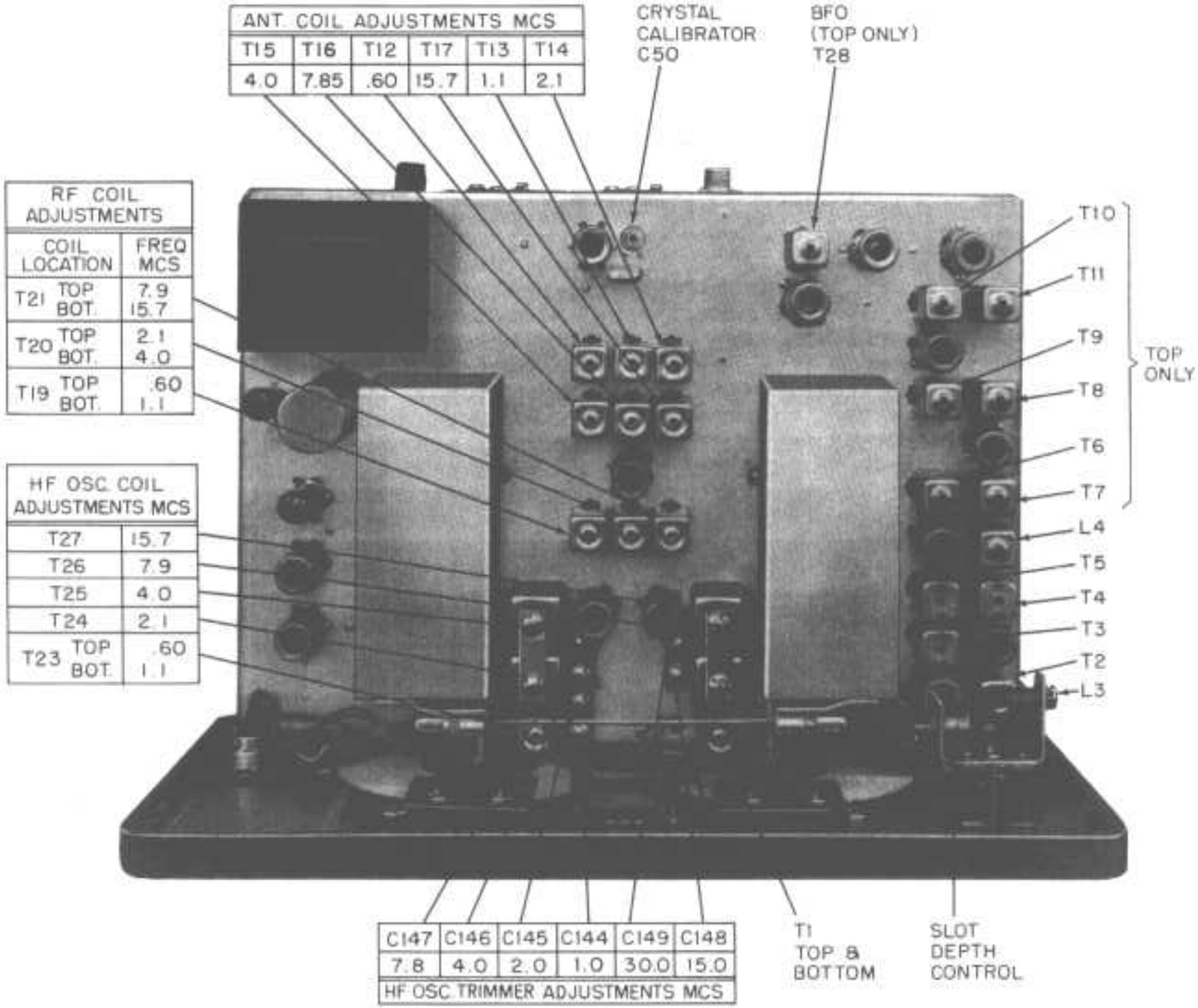
3. Set Function Switch to receive and turn Sensitivity (RF) control counter-clockwise.

4. Adjust meter "zero adjust potentiometer" R20 (rear of chassis) to zero.

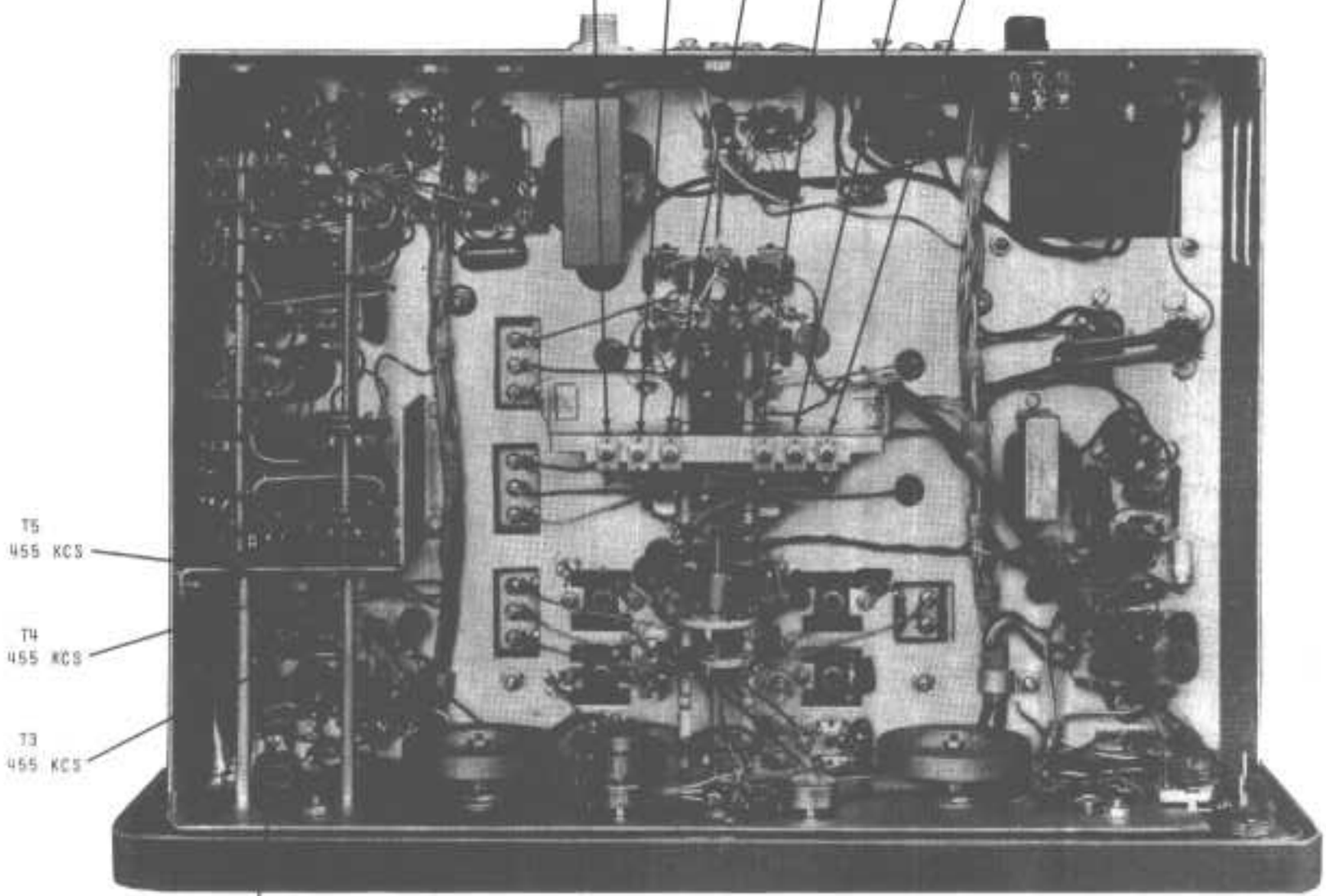
5. The meter sensitivity adjustment, R19, is set to obtain an S9 reading with 50 microvolts input with the RF gain control at max.

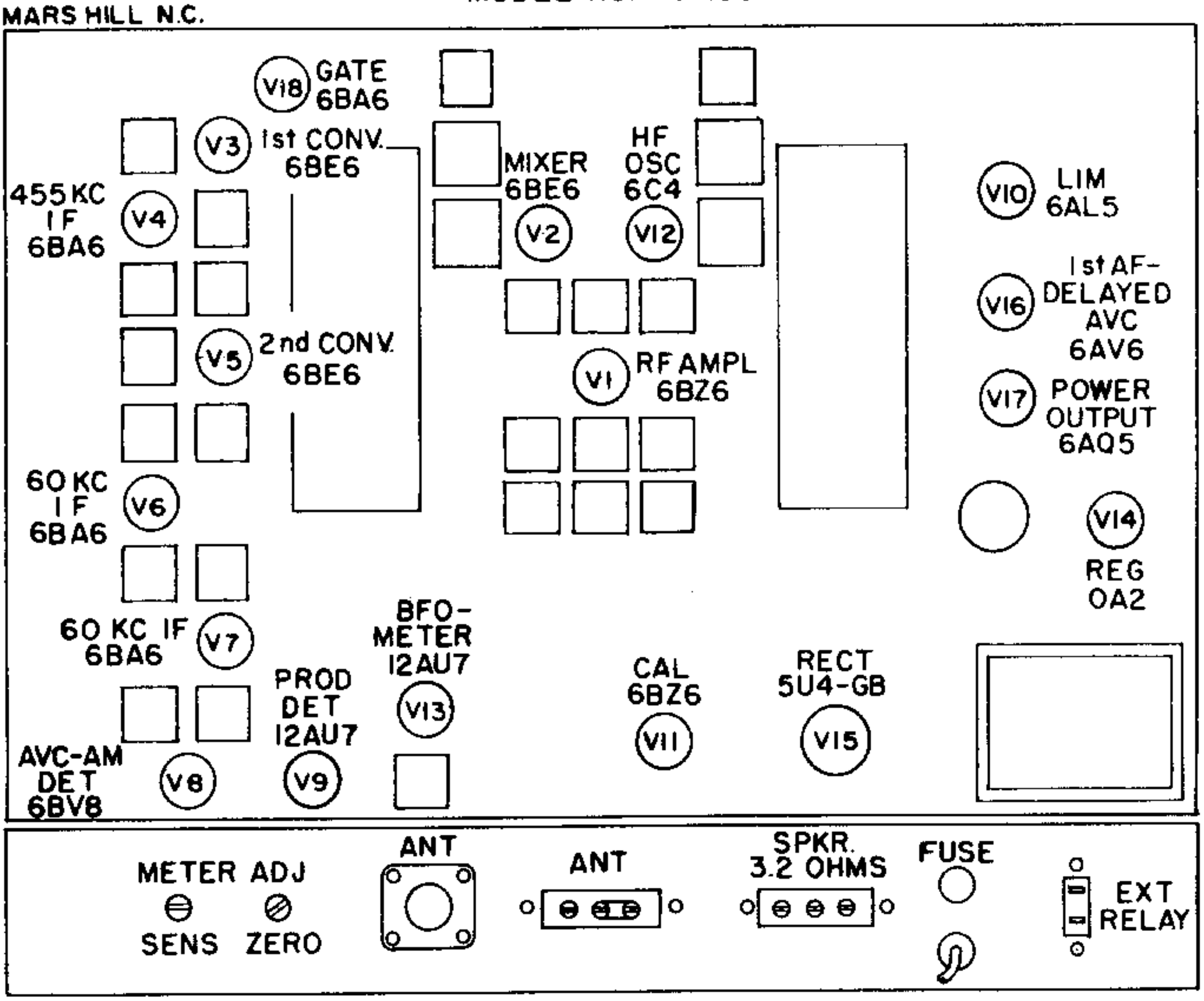
NOTE

Usually, R19 will not require readjustment, since the factory setting will vary only slightly as a result of tube changes, ageing, etc. R19 should, therefore, be adjusted only in the event that it is desirable to make the meter more sensitive, or as part of the complete realignment procedure.


ANT. COIL ADJUSTMENTS MCS
T15 T16 T12 T17 T13 T14
4.0 7.85 .60 15.7 1.1 2.1
CRYSTAL CALIBRATOR C50
BFO (TOP ONLY) T28
RF COIL ADJUSTMENTS
COIL LOCATION FREQ MCS
T21 TOP 7.9
BOT. 15.7
T20 TOP 2.1
BOT. 4.0
T19 TOP .60
BOT. 1.1
HF OSC. COIL ADJUSTMENTS MCS
T27 15.7
T26 7.9
T25 4.0
T24 2.1
T23 TOP .60
BOT. 1.1
T10
T11
T9
T8
T6
T7
L4
T5
T4
T3
T2
L3
TOP ONLY
C147 C146 C145 C144 C149 C148
7.8 4.0 2.0 1.0 30.0 15.0
HF OSC TRIMMER ADJUSTMENTS MCS
T1 TOP & BOTTOM
SLOT DEPTH CONTROL

RF TRIMMER ADJUSTMENTS MCS					
C57	C58	C55	C56	C53	C54
15.0	30.0	4.0	7.8	1.0	2.0

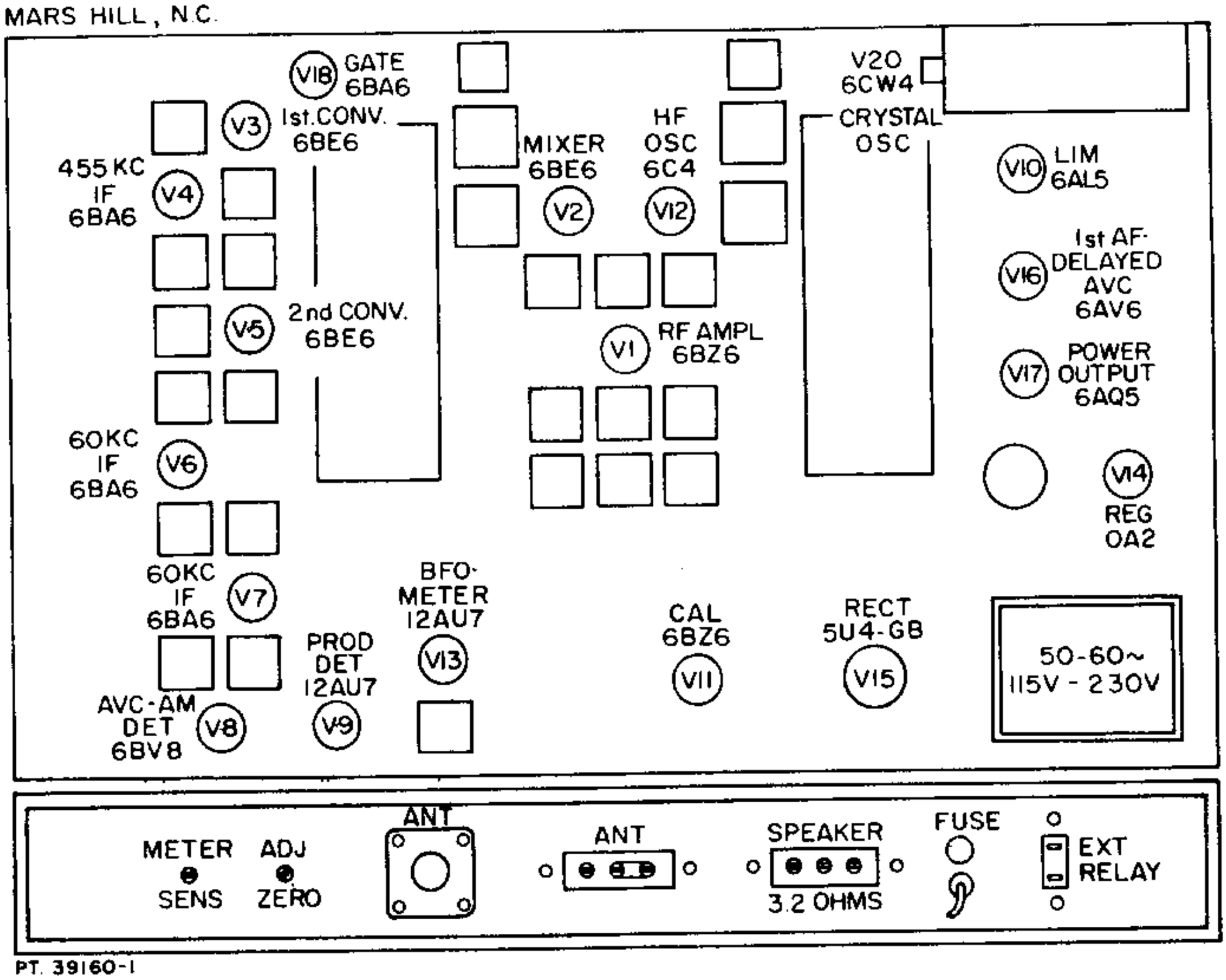




TUBE LOCATION LABEL

HAMMARLUND MFG. CO.
MARS HILL, N.C.

MODEL NO. HQ-180-XE

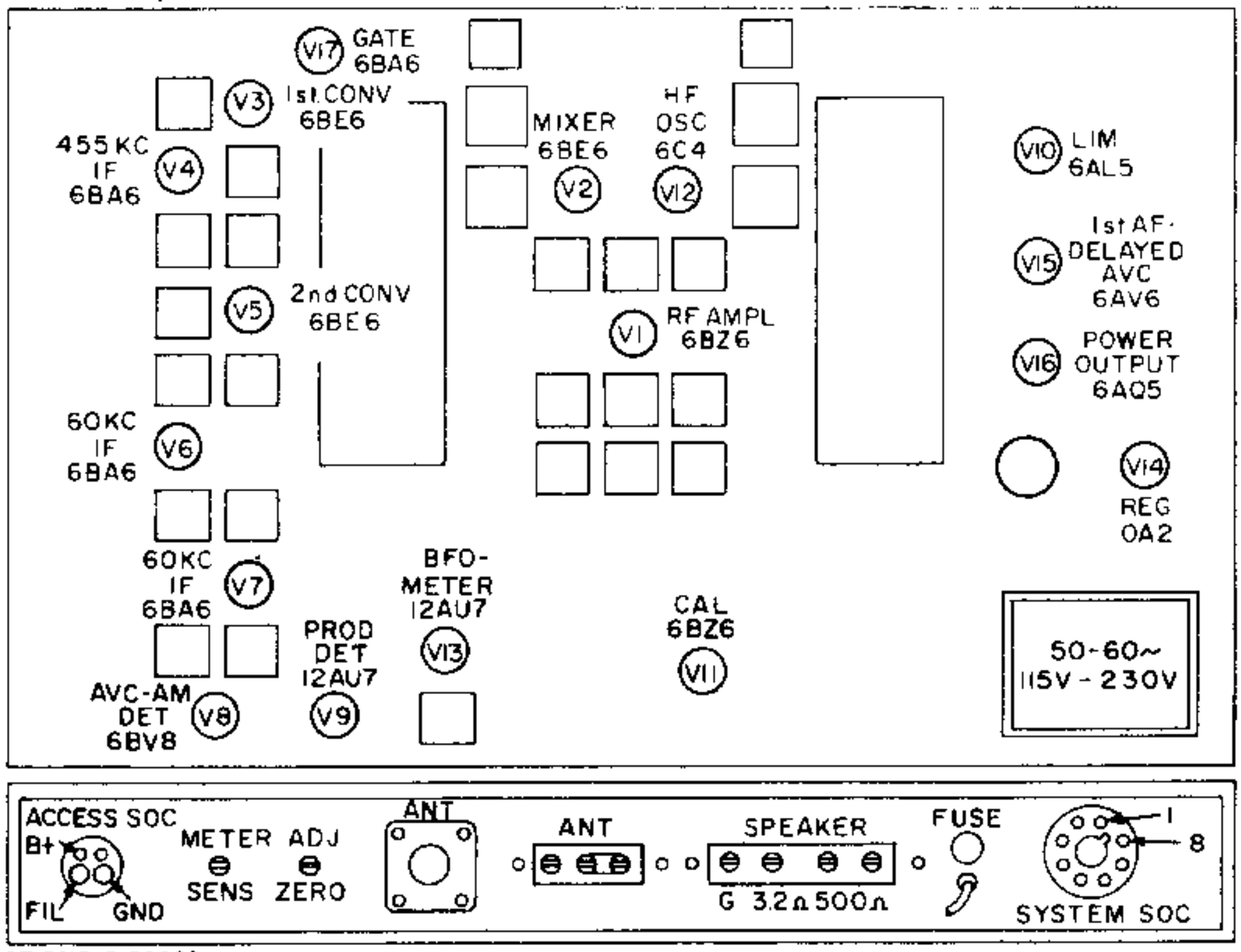


PT. 39160-1

TUBE LOCATION LABEL

HAMMARLUND MFG. CO.
MARS HILL, N.C.

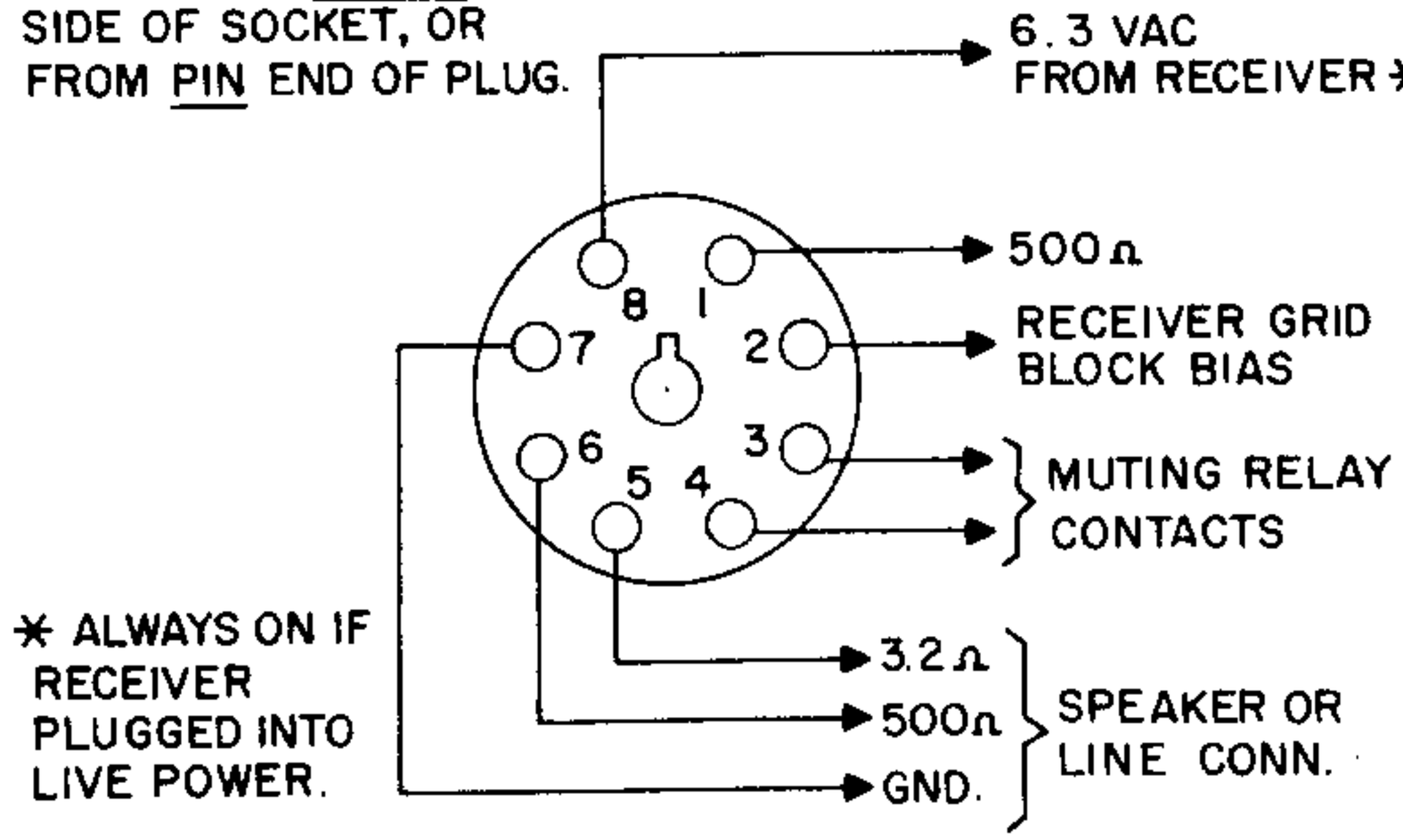
MODEL NO. HQ-180-A



PT 2418-2-00009

TUBE LOCATION LABEL

VIEW FROM WIRING SIDE OF SOCKET, OR FROM PIN END OF PLUG.

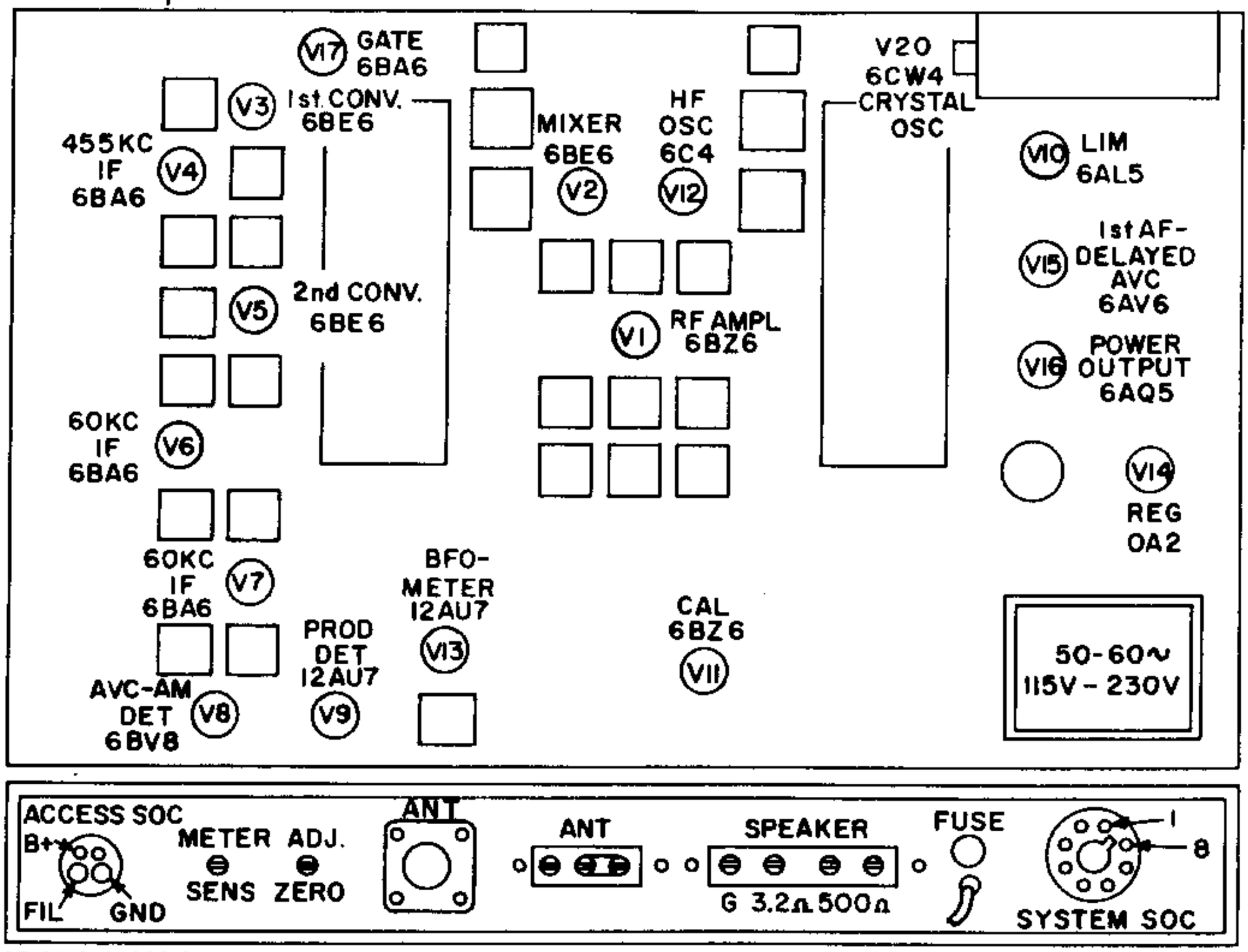


SYSTEM SOCKET CONNECTIONS

"A" SERIES ONLY

HAMMARLUND MFG. CO.
MARS HILL, N.C.

MODEL NO. HQ-180-AX



PT. 2418-2-00010

TUBE LOCATION LABEL

TABLE 1. TUBE SOCKET VOLTAGES

Measured with VTVM; 117 Line Volts, No Antenna; Unless otherwise specified, Band and Dial 10 MC, AM, AVC OFF, 3KC Both Sidebands, Rec., Limiter OFF, RF Gain Max., AF Gain Min.

TUBE		SOCKET PIN NUMBERS								
		1	2	3	4	5	6	7	8	9
V1	RF 6BZ6	0	1.5 RF 5.8(MIN)	6.3 AC	0	245	105	0	--	--
V2	MIXER #1 6BE6	-2.8 APPROX	1.35	0	6.3 AC	245	110	0	--	--
V3	MIXER #2 6BE6	-2.4 APPROX	2	0	6.3 AC	140	74 0(1 MC)	0	--	--
V4	IF AMP. 6BA6	0	0	6.3 AC	0	245	110	2.1 RF 29(MIN)	--	--
V5	MIXER #3 6BE6	-7.4 APPROX	0	0	6.3 AC	250	84	0	--	--
V6	IF AMP. 6BA6	0	0	6.3 AC	0	240	83	1.0	--	--
V7	IF AMP. 6BA6	0	0	6.3 AC	0	230	82	1.0	--	--
V8	DET. AVC 6BV8	5	0	235	0	--	-.24	0	0	-4
V9	PROD DET 12AU7	220(SSB)	0	7.0(SSB)	6.3 AC	6.3 AC	100(SSB)	0	7.0(SSB)	0
V10	LIMITER 6AL5	36(OFF) .24(MAX)	30(OFF) 0(MAX)	0	6.3 AC	36(OFF) .24(MAX)	0	30(OFF) 0(MAX)	--	--
V11	CAL. 6BZ6	-60(CAL) APPROX	9.0(CAL)	6.3 AC	0	75(CAL)	88(CAL)	9.0(CAL)	--	--
V12	HF OSC. 6C4	130	--	6.3 AC	0	130	-6.0	0	--	--
V13	BFO METER 12AU7	80	0	3.7	6.3 AC	6.3 AC	200(SSB)	125(SSB)	125(SSB)	0
V14	VOLT.REG. 0A2	150	--	--	--	150	--	--	--	--
V15	RECT. 5U4-GB	6.3 AC TIE PT.	260	--	253 AC	245 TIE PT.	253 AC	117 AC TIE PT.	260	--
V16	AF AVC 6AV6	0	1.3	6.3 AC	0	0	0	115	--	--
V17	POWER AMP 6AQ5	0	13	6.3 AC	0	275	250	--	--	--
V18	IF GATE 6BA6	0	0	6.3 AC	0	140	0 88(IMC)	.02 4(IMC)	--	--

TABLE 2. TUBE SOCKET RESISTANCES

Measured with VT Ohmeter; Power Plug and Antenna Disconnected; Unless otherwise specified, Band and Dial 10 MC, AM, AVC OFF, 3 KC Both Sidebands, Rec., Limiter OFF, RF Gain Max., AF Gain Min.

TUBE		SOCKET PIN NUMBERS								
		1	2	3	4	5	6	7	8	9
V1	RF 6BZ6	480K	180 RF 1.7K(MIN)	--	0	19K	44K	0	--	--
V2	MIXER #1 6BE6	47K	160	0	--	21K	25K	0	--	--
V3	MIXER #2 6BE6	100K	470	0	--	21K	45K INF(1MC)	1.8	--	--
V4	IF AMP 6BA6	1.1 MEG	0	--	0	19K	33K	180 RF 10K(MIN)	--	--
V5	MIXER #3 6BE6	22K	.8	0	--	22K	44K	1.2 MEG	--	--
V6	IF AMP 6BA6	1.47 MEG	0	--	0	19K	61K	68	--	--
V7	IF AMP 6BA6	470K	0	--	0	20K	60K	68	--	--
V8	DET. AVC 6BV8	560	17	30K	0	--	47K	70	0	4.7K
V9	PROD DET 12AU7	INF 20K(SSB)	470K	820	--	--	55K	100K	820	0
V10	LIMITER 6AL5	210K	1.4 MEG 200K(LIM ON)	0	--	220K	0	1.5 MEG 470K(LIM ON)	--	--
V11	CAL. 6BZ6	470K	4.7K	--	0	INF 500K(CAL)	INF 110K(CAL)	4.7K	--	--
V12	HF OSC. 6C4	24K	--	--	0	24K	100K	27	--	--
V13	BFO METER 12AU7	17K	0	1K	--	--	INF 20K(SSB)	545K	47K	0
V14	VOLT.REG. 0A2	24K	--	--	--	24K	--	0	--	--
V15	RECT. 5U4-GB	--	20K	--	28	21K TIE PT.	30	AC LINE TIE PT.	20K	--
V16	AF AVC 6AV6	50 APPROX	5.6K	--	0	235K	235K	540K	--	--
V17	POWER AMP. 6AQ5	500K	430	--	0	22K	21K	500K	--	--
V18	IF GATE 6BA6	1.1 MEG	0	--	0	21K	INF 61K(1MC)	1K	--	--

TABLE 1. TUBE SOCKET VOLTAGES

Measured with VTVM; 117 Line Volts, No Antenna; Unless otherwise specified, Band and Dial 10 MC, AM, AVC OFF, 3KC Both Sidebands, Rec., Limiter OFF, RF Gain Max., AF Gain Min.

TUBE		SOCKET PIN NUMBERS								
		1	2	3	4	5	6	7	8	9
V1	RF 6BZ6	0	1.5 RF 5.8(MIN)	6.3 AC	0	245	105	0	--	--
V2	MIXER #1 6BE6	-2.8 APPROX	1.35	0	6.3 AC	245	110	0	--	--
V3	MIXER #2 6BE6	-2.4 APPROX	2	0	6.3 AC	140	74 0(1 MC)	0	--	--
V4	IF AMP. 6BA6	0	0	6.3 AC	0	245	110	2.1 RF 29(MIN)	--	--
V5	MIXER #3 6BE6	-7.4 APPROX	0	0	6.3 AC	250	84	0	--	--
V6	IF AMP. 6BA6	0	0	6.3 AC	0	240	83	1.0	--	--
V7	IF AMP. 6BA6	0	0	6.3 AC	0	230	82	1.0	--	--
V8	DET. AVC 6BV8	5	0	235	0	--	-.24	0	0	-4
V9	PROD DET 12AU7	220(SSB)	0	7.0(SSB)	6.3 AC	6.3 AC	100(SSB)	0	7.0(SSB)	0
V10	LIMITER 6AL5	36(OFF) .24(MAX)	30(OFF) 0(MAX)	0	6.3 AC	36(OFF) .24(MAX)	0	30(OFF) 0(MAX)	--	--
V11	CAL. 6BZ6	-60(CAL) APPROX	9.0(CAL)	6.3 AC	0	75(CAL)	88(CAL)	9.0(CAL)	--	--
V12	HF OSC. 6C4	130	--	6.3 AC	0	130	-6.0	0	--	--
V13	BFO METER 12AU7	80	0	3.7	6.3 AC	6.3 AC	200(SSB)	125(SSB)	125(SSB)	0
V14	VOLT.REG. 0A2	150	--	--	--	150	--	--	--	--
V15	RECT. 5U4-GB	6.3 AC TIE PT.	260	--	253 AC	245 TIE PT.	253 AC	117 AC TIE PT.	260	--
V16	AF AVC 6AV6	0	1.3	6.3 AC	0	0	0	115	--	--
V17	POWER AMP 6AQ5	0	13	6.3 AC	0	275	250	--	--	--
V18	IF GATE 6BA6	0	0	6.3 AC	0	140	0 88(IMC)	.02 4(IMC)	--	--

TABLE 2. TUBE SOCKET RESISTANCES

Measured with VT Ohmeter; Power Plug and Antenna Disconnected; Unless otherwise specified, Band and Dial 10 MC, AM, AVC OFF, 3 KC Both Sidebands, Rec., Limiter OFF, RF Gain Max., AF Gain Min.

TUBE		SOCKET PIN NUMBERS								
		1	2	3	4	5	6	7	8	9
V1	RF 6BZ6	480K	180 RF 1.7K(MIN)	--	0	19K	44K	0	--	--
V2	MIXER #1 6BE6	47K	160	0	--	21K	25K	0	--	--
V3	MIXER #2 6BE6	100K	470	0	--	21K	45K INP(1MC)	1.8	--	--
V4	IF AMP 6BA6	1.1 MEG	0	--	0	19K	33K	180 RF 10K(MIN)	--	--
V5	MIXER #3 6BE6	22K	.8	0	--	22K	44K	1.2 MEG	--	--
V6	IF AMP 6BA6	1.47 MEG	0	--	0	19K	61K	68	--	--
V7	IF AMP 6BA6	470K	0	--	0	20K	60K	68	--	--
V8	DET. AVC 6BV8	560	17	30K	0	--	47K	70	0	4.7K
V9	PROD DET 12AU7	INF 20K(SSB)	470K	820	--	--	55K	100K	820	0
V10	LIMITER 6AL5	210K	1.4 MEG 200K(LIM ON)	0	--	220K	0	1.5 MEG 470K(LIM ON)	--	--
V11	CAL. 6BZ6	470K	4.7K	--	0	INF 500K(CAL)	INF 110K(CAL)	4.7K	--	--
V12	HF OSC. 6C4	24K	--	--	0	24K	100K	27	--	--
V13	BFO METER 12AU7	17K	0	1K	--	--	INF 20K(SSB)	545K	47K	0
V14	VOLT.REG. 0A2	24K	--	--	--	24K	--	0	--	--
V15	RECT. 5U4-GB	--	20K	--	28	21K TIE PT.	30	AC LINE TIE PT.	20K	--
V16	AF AVC 6AV6	50 APPROX	5.6K	--	0	235K	235K	540K	--	--
V17	POWER AMP. 6AQ5	500K	430	--	0	22K	21K	500K	--	--
V18	IF GATE 6BA6	1.1 MEG	0	--	0	21K	INF 61K(1MC)	1K	--	--

HQ-180-A

TABLE 1 TUBE SOCKET VOLTAGES

MEASURED WITH VTVM; 117 LINE VOLTS; NO ANTENNA; UNLESS OTHERWISE SPECIFIED, BAND AND DIAL 10 MC, AM, AVC OFF, 3 KC BOTH SIDEBANDS, REC., LIMITER OFF, RF GAIN MAX., AF GAIN MIN.

TUBE		SOCKET PIN NUMBERS								
		1	2	3	4	5	6	7	8	9
V 1	RF 6BZ6	0	1.5 RF 5.8 (min)	6.3 AC	0	245	105	0	--	--
V 2	Mixer #1 6BE6	-2.8 approx.	1.35	0	6.3 AC	245	110	0	--	--
V 3	Mixer #2 6BE6	-2.4 approx.	2	0	6.3 AC	250	74 0 (1 mc)	0	--	--
V 4	IF Amp 6BA6	0	0	6.3 AC	0	245	110	2.1 RF 29 (min)	--	--
V 5	Mixer #3 6BE6	-7.4 approx.	0	0	6.3 AC	250	84	0	--	--
V 6	IF Amp 6BA6	0	0	6.3 AC	0	240	83	1.0	--	--
V 7	IF Amp 6BA6	0	0	6.3 AC	0	230	82	1.0	--	--
V 8	DET AVC 6BV8	5	0	235	0	--	-.24	0	0	-4
V 9	Prod Det 12AU7	220 (SSB)	0	7.0 (SSB)	6.3 AC	6.3 AC	100 (SSB)	0	7.0 (SSB)	0
V 10	Limiter 6AL5	36 (off) .24 (max)	30 (off) 0 (max)	0	6.3 AC	36 (off) .24 (max)	0	30 (off) 0 (max)	--	--
V 11	Cal 6BZ6	-60 (cal) approx.	9.0 (cal)	6.3 AC	0	75 (cal)	88 (cal)	9.0 (cal)	--	--
V 12	HF Osc. 6C4	130	--	6.3 AC	0	130	-6.0	0	--	--
V 13	BFO Meter 12AU7	80	0	3.7	6.3 AC	6.3 AC	200 (SSB)	125 (SSB)	125 (SSB)	0
V 14	Volt. Reg. 0A2	150	--	--	--	150	--	--	--	--
V 15	AF AVC 6AV6	0	1.3	6.3 AC	0	0	0	115	--	--
V 16	Power Amp 6AQ5	0	13	6.3 AC	0	275	250	--	--	--
V 17	IF Gate 6BA6	0	0	6.3 AC	0	250	0 88 (1 mc)	.02 4 (1 mc)	--	--
Systems Socket		0	A.V.C.	105	105	0	0	0	6.3 V.A.C.	--
Ace Socket		0	0	300 v D.C.	6.3 V.A.C.	--	--	--	--	--

TABLE 2 TUBE SOCKET RESISTANCES

MEASURED WITH VT OHMETER; POWER PLUG AND ANTENNA DISCONNECTED; UNLESS OTHERWISE SPECIFIED, BAND AND DIAL 10 MC, AM, AVC OFF, 3 KC BOTH SIDEBANDS, REC., LIMITER OFF, RF GAIN MAX., AF GAIN MIN.

TUBE		SOCKET PIN NUMBERS								
		1	2	3	4	5	6	7	8	9
V 1	RF 6BZ6	480K	180 RF 1.7K (min)	--	0	19K	44K	0	--	--
V 2	Mixer #1 6BE6	47K	160	0	--	21K	25K	0	--	--
V 3	Mixer #2 6BE6	100K	470	0	--	21K	45K Inf (1 mc)	1.8	--	--
V 4	IF Amp 6BA6	1.1 meg	0	--	0	19K	33K	180 RF 10K (min)	--	--
V 5	Mixer #3 6BE6	22K	.8	0	--	22K	44K	1.2 MEG	--	--
V 6	IF Amp 6BA6	1.47 MEG	0	--	0	19K	61K	68	--	--
V 7	IF Amp 6BA6	470K	0	--	0	20K	60K	68	--	--
V 8	Det. AVC 6BV8	560	17	30K	0	--	47K	70	0	4.7K
V 9	Prod Det 12AU7	INF 20K (SSB)	470K	820	--	--	55K	100K	820	0
V 10	Limiter 6AL5	210K	1.4 MEG 200K (LIM ON)	0	--	220K	0	1.5 MEG 470K (LIM ON)	--	--
V 11	Cal. 6BZ6	470K	4.7K	--	0	INF 500K (CAL)	INF 110K (CAL)	4.7K	--	--
V 12	HF Osc 6C4	24K	--	--	0	24K	100K	27	--	--
V 13	BFO Meter 12AU7	17K	0	1K	--	---	INF 20K (SSB)	545K	47K	0
V 14	Volt. Reg. 0A2	24K	--	--	--	24K	--	0	--	--
V 15	AF AVC 6AV6	50 Approx.	5.6K	--	0	235K	235K	540K	--	--
V 16	Power Amp 6AQ5	500K	430	--	0	22K	21K	500K	--	--
V 17	IF Gate 6BA6	1.1 MEG	0	--	0	21K	INF 61K (MC)	1K	--	--
Systems Socket		0	2.2 MEG	B + 20K	B + 20K	0	∞	0	0	
Ace Socket		0	∞	B + 20K	0					

TABLE 1 TUBE SOCKET VOLTAGES

MEASURED WITH VTVM; 117 LINE VOLTS; NO ANTENNA; UNLESS OTHERWISE SPECIFIED, BAND AND DIAL 10 MC, AM, AVC OFF, 3 KC BOTH SIDEBANDS, REC., LIMITER OFF, RF GAIN MAX., AF GAIN MIN.

TUBE		SOCKET PIN NUMBERS								
		1	2	3	4	5	6	7	8	9
V 1	RF 6BZ6	0	1.5 RF 5.8 (min)	6.3 AC	0	245	105	0	--	--
V 2	Mixer #1 6BE6	-2.8 approx.	1.35	0	6.3 AC	245	110	0	--	--
V 3	Mixer #2 6BE6	-2.4 approx.	2	0	6.3 AC	250	74 0 (1 mc)	0	--	--
V 4	IF Amp 6BA6	0	0	6.3 AC	0	245	110	2.1 RF 29 (min)	--	--
V 5	Mixer #3 6BE6	-7.4 approx.	0	0	6.3 AC	250	84	0	--	--
V 6	IF Amp 6BA6	0	0	6.3 AC	0	240	83	1.0	--	--
V 7	IF Amp 6BA6	0	0	6.3 AC	0	230	82	1.0	--	--
V 8	DET AVC 6BV8	5	0	235	0	--	-.24	0	0	-4
V 9	Prod Det 12AU7	220 (SSB)	0	7.0 (SSB)	6.3 AC	6.3 AC	100 (SSB)	0	7.0 (SSB)	0
V 10	Limiter 6AL5	36 (off) .24 (max)	30 (off) 0 (max)	0	6.3 AC	36 (off) .24 (max)	0	30 (off) 0 (max)	--	--
V 11	Cal 6BZ6	-60 (cal) approx.	9.0 (cal)	6.3 AC	0	75 (cal)	88 (cal)	9.0 (cal)	--	--
V 12	HF Osc. 6C4	130	--	6.3 AC	0	130	-6.0	0	--	--
V 13	BFO Meter 12AU7	80	0	3.7	6.3 AC	6.3 AC	200 (SSB)	125 (SSB)	125 (SSB)	0
V 14	Volt. Reg. 0A2	150	--	--	--	150	--	--	--	--
V 15	AF AVC 6AV6	0	1.3	6.3 AC	0	0	0	115	--	--
V 16	Power Amp 6AQ5	0	13	6.3 AC	0	275	250	--	--	--
V 17	IF Gate 6BA6	0	0	6.3 AC	0	250	0 88 (1 mc)	.02 4 (1 mc)	--	--
Systems Socket		0	A.V.C.	105	105	0	0	0	6.3 V.A.C.	--
Ace Socket		0	0	300 v D.C.	6.3 V.A.C.	--	--	--	--	--

V20 6CW4 crystal dsc* Pin 2 78V+, Pin 4 8.6V-, Pin 8 .08V+, Pin 10 6.3V AC

*Readings taken with switch in crystal position with 3 MC crystal in use.

TABLE 2 TUBE SOCKET RESISTANCES

MEASURED WITH VT OHMETER; POWER PLUG AND ANTENNA DISCONNECTED; UNLESS OTHERWISE SPECIFIED, BAND AND DIAL 10 MC, AM, AVC OFF, 3 KC BOTH SIDEBANDS, REC., LIMITER OFF, RF GAIN MAX., AF GAIN MIN.

TUBE		SOCKET PIN NUMBERS								
		1	2	3	4	5	6	7	8	9
V 1	RF 6BZ6	480K	180 RF 1.7K (min)	--	0	19K	44K	0	--	--
V 2	Mixer #1 6BE6	47K	160	0	--	21K	25K	0	--	--
V 3	Mixer #2 6BE6	100K	470	0	--	21K	45K Inf (1 mc)	1.8	--	--
V 4	IF Amp 6BA6	1.1 meg	0	--	0	19K	33K	180 RF 10K (min)	--	--
V 5	Mixer #3 6BE6	22K	.8	0	--	22K	44K	1.2 MEG	--	--
V 6	IF Amp 6BA6	1.47 MEG	0	--	0	19K	61K	68	--	--
V 7	IF Amp 6BA6	470K	0	--	0	20K	60K	68	--	--
V 8	Det. AVC 6BV8	560	17	30K	0	--	47K	70	0	4.7K
V 9	Prod Det 12AU7	INF 20K (SSB)	470K	820	--	--	55K	100K	820	0
V 10	Limiter 6AL5	210K	1.4 MEG 200K (LIM ON)	0	--	220K	0	1.5 MEG 470K (LIM ON)	--	--
V 11	Cal. 6BZ6	470K	4.7K	--	0	INF 500K (CAL)	INF 110K (CAL)	4.7K	--	--
V 12	HF Osc 6C4	24K	--	--	0	24K	100K	27	--	--
V 13	BFO Meter 12AU7	17K	0	1K	--	---	INF 20K (SSB)	545K	47K	0
V 14	Volt. Reg. 0A2	24K	--	--	--	24K	--	0	--	--
V 15	AF AVC 6AV6	50 Approx.	5.6K	--	0	235K	235K	540K	--	--
V 16	Power Amp 6AQ5	500K	430	--	0	22K	21K	500K	--	--
V 17	IF Gate 6BA6	1.1 MEG	0	--	0	21K	INF 61K (MC)	1K	--	--
Systems Socket		0	2.2 MEG	B + 20K	B + 20K	0	∞	0	0	
Ace Socket		0	∞	B + 20K	0					

V 20 Pin 2 70K, Pin 4 100K, Pin 8 Infinity, Pin 10 .4 ohms

SCHEMATIC DESIGNATION	DESCRIPTION	HAMMARLUND PART NO.
	CAPACITORS	
C1, A-C	Variable, Main Tuning	T41604-G1
C2, A-I	Variable, Band Spread Tuning	T41604-G2
C3,C8,C31,C51,C157	Fixed, Silver - Dur Mica DM-15 100 mmf, 500 W.V.D.C.	K23006-1
C4,C5,C6,C7,C9,C28 C10,C11,C15,C17, C18,C21,C32, C41,C47,C75,C76, C124,C130,C133, C135,C139,C141,C152	Fixed, Ceramic Disc .01 mfd, 600 W.V.D.C.	M23034-19
C12,C33,C36,C38, C40,C46,C136,C137	Fixed, Ceramic Disc .02 mfd, 600 W.V.D.C.	M23034-9
C13,C89,C97,C111 C113,C120,C123	Fixed, Silver - Dur Mica DM-15 20 mmf, 500 W.V.D.C.	K23006-17
C14	Fixed, Silver - Dur Mica DM-15 360 mmf, 500 W.V.D.C.	K23027-6
C16,C93,C101 C103,C114	Fixed, Silver - Dur Mica DM-15 3 mmf, 500 W.V.D.C.	K23006-18
C19,C20,C85	Fixed, Ceramic Disc, .04 mfd, 600 W.V.D.C.	K23034-12
C22, C27	Fixed, Ceramic Disc, .01 mfd, 10%, 1000 W.V.D.C.	K23034-25
C23	Fixed, Silver - Dur Mica DM-15, 15 mmf, 300 W.V.D.C.	K23006-35
C24	Fixed, Silver - Dur Mica DM-15, 1200 mmf, 500 W.V.D.C.	K23027-4
C25	Fixed, Mylar, .033 mfd, 200 W.V.D.C.	K23044-1
C26	Variable, Slot Tuning	K42041-1
C28,C104,C110,C115 C117, C122	Fixed, Silver - Dur Mica DM-15, 7 mmf, 500 W.V.D.C.	K23006-24
C29	Fixed, Silver - Dur Mica DM-15, 780 mmf, 500 W.V.D.C.	K23006-39
C30,C63,C64,C78,C143	Fixed, Silver-Dur Mica DM-15, 47 mmf, 300 W.V.D.C.	K23006-47
C34,C37	Fixed, Silver - Dur Mica DM-15, 24 mmf, 500 W.V.D.C.	K23006-7
C35	Fixed, Ceramic Disc, Temp. Comp. 330N750	K23010-9
C39,C42	Fixed, Ceramic Disc, 500 mmf, 1000 W.V.D.C.	K23034-13
C43	Fixed, Silver - Dur Mica DM-15, 10 mmf, 500 W.V.D.C.	K23006-8
C44,C45	Fixed, Ceramic Disc, .002 mfd, 1000 W.V.D.C.	M23034-18
C48,C87,C131	Fixed, Dur-Paper, .1 mfd, 200 W.V.D.C.	K23045-3
C49,C95,C105	Fixed, Dur-Paper, .047 mfd, 400 W.V.D.C.	K23045-2
C50	Variable, Calibrator, 8-50 mmf	K23038-5
C52	Variable, Antenna Tuning	K34454-G24
C53,C54,C55, C56,C57,C58	Variable, Mica Trimmer, 1.5 - 20 mmf	K23043-6
C59	Fixed, Ceramic Disc. Temp. Comp. 27N470	K23010-26
C60	Fixed, Ceramic Disc. Temp. Comp. 27N220	K23010-25
C61	Fixed, Ceramic Disc, Temp. Comp. 27N470	K23010-23
C62	Fixed, Ceramic Disc. Temp. Comp. 27N750	K23010-24
C65	Fixed, Silver - Dur Mica DM-15, 60 mmf, 300 W.V.D.C.	K-23006-51
C66	Fixed, Silver - Dur Mica DM-15, 85 mmf, 500 W.V.D.C.	K23006-3

SCHEMATIC DESIGNATION	DESCRIPTION	HAMMARLUND PART NO.
C67	Fixed, Silver - Dur Mica DM-15, 150 mmf, 300 W. V. D. C.	K23006-53
C68, C80	Fixed, Silver - Dur Mica DM-15, 220 mmf, 500 W. V. D. C.	K23006-10
C69	Fixed, Silver - Dur Mica DM-15, 180 mmf, 300 W. V. D. C.	K23006-60
C70	Fixed, Silver - Dur Mica DM-15, 333 mmf, 300 W. V. D. C.	K23006-61
C71	Fixed, Silver - Dur Mica DM-15, 673 mmf, 300 W. V. D. C.	K23006-57
C72	Fixed, Silver - Dur Mica DM-15, 1030 mmf, 300 W. V. D. C.	K23027-19
C73	Fixed, Silver - Dur Mica DM-15, 363 mmf, 300 W. V. D. C.	K23006-76
C74	Fixed, Silver - Dur Mica DM-15, 438 mmf, 300 W. V. D. C.	K23006-75
C77	Fixed, Ceramic Disc, Temp. Comp. 100N470	K23010-30
C79	Variable, Crystal Phasing 1.5-9.1 mmf	K23057-1
C81	Fixed, Silver - Dur Mica DM-15, 1000 mmf, 300 W. V. D. C.	K23027-9
C82, A-D	Fixed, Electrolytic, 60-40-40-40 mfd	K15504-71
C83, C84	Fixed, Ceramic Disc, .01 mfd, 1400 W. V. D. C.	K23034-26
C86, C94	Fixed, Silver - Dur Mica DM-15, 31 mmf, 500 W. V. D. C.	K23006-15
C88, C90, C96, C98	Fixed, Silver - Dur Mica DM-15, 29 mmf, 500 W. V. D. C.	K23006-16
C91, C99	Fixed, Silver - Dur Mica DM-15, 28 mmf, 500 W. V. D. C.	K23006-19
C92, C100	Fixed, Silver - Dur Mica DM-15, 27 mmf, 500 W. V. D. C.	K23006-20
C102, C109, C118, C153 C154, C155	Fixed, Silver - Dur Mica DM-15, 9 mmf, 500 W. V. D. C.	K23006-21
C106	Fixed, Silver - Dur Mica DM-15, 10 mmf, 500 W. V. D. C.	K23006-22
C107, C116	Fixed, Silver - Dur Mica DM-15, 14 mmf, 500 W. V. D. C.	K23006-25
C108, C119	Fixed, Silver - Dur Mica DM-15, 21 mmf, 500 W. V. D. C.	K23006-26
C112, C121	Fixed, Silver - Dur Mica DM-15, 16 mmf, 500 W. V. D. C.	K23006-23
C125	Fixed, Silver - Dur Mica DM-15, 47 mmf, 500 W. V. D. C.	K23006-6
C126, C127	Fixed, Mylar, .01 mfd, 400 W. V. D. C.	K23044-2
C128	Fixed, Ceramic Disc, .001 mfd, 500 W. V. D. C.	K2304-30
C129	Variable, BFO, 100 mmf	K11730-G9
C132	Fixed, Ceramic Disc, .005 mfd, 1000 W. V. D. C.	M23034-10
C134	Fixed, Silver - Dur Mica DM-15, 2 mmf, 500 W. V. D. C.	K23006-37
C138	Fixed, Ceramic Temp. Comp. 47N750	K23061-26J
C140	Fixed, electrolytic, 20 mfd, 25 W. V. D. C.	K23091-1
C142	Fixed, Ceramic Disc, Temp. Comp. 440N750	K23010-27
C144, C145, C146 C147, C148, C149	Variable, Cylindrical Trimmer, 1-8 mmf	K23008-2
C150	Fixed, Ceramic Disc, Temp. Comp. 110N750	K23010-5
C151	Fixed, Ceramic Disc, Temp. Comp. 500N1500	K23010-29
C156	Variable, Vernier Tuning 24uuf	K42187-G1

SPECIAL ASSEMBLIES

	Crystal panel, clock window	M38877-1
CMC	Clock, Telechron auto-timer (60 cycle operation)	K38874-G2
CMC	Clock, Telechron auto-timer (50 cycle operation)	K38874-G3
M1	Meter "S" (carrier level)	K-26149-5
Y1	Quartz crystal, 2.580 Mcs	K38972-2
Y2	Quartz crystal, 100.0 Kcs	K38661-1
Y3	Crystal 3035 Kcs	K26481-1
Z1	RC printed network (Calibrator)	K38981-1
Z2	RC printed network (Audio)	K38846-1

SCHEMATIC DESIGNATION	DESCRIPTION	HAMMARLUND PART NO.
	COILS	
L1, L9, L10	RF Choke, 2.5 millihenry	K15627-1
L2	Bifilar Coil	K42032-1
L3	Slot Filter Coil	K42034-1
L4	Passband Tuning Coil	K26301-1
L5, L7, L8	RF Choke, 330 millihenries	K42019-1
L6	Filter Choke, 8.0 henries	K26302-1
	RESISTORS	
R1, R16, R41, R82, R95	10K ohms, 1/2 w., 10%	K19309-73
R2, R9, R12, R17, R47, R62, R99	1K ohms, 1/2 w., 10%	K19309-49
R3, R57	6.8K ohms, 1/2 w., 10%	K19309-69
R4	10 ohms, 1/2 w., 10%	K19309-1
R5, R14, R80	180 ohms, 1/2 w., 5%	K19309-260
R6	Variable, 1.5K ohms, dual with R15 and S3	K38940-1
R7, R42, R49, R65, R70 R72, R73, R75, R84, R100	47K ohms, 1/2 w., 10%	K19309-89
R8	160 ohms, 1/2 w., 5%	K19309-199
R10, R13, R18, R27, R36 R40, R51, R74, R106, R107	100K ohms, 1/2 w., 10%	K19309-97
R11, R29, R97, R101	22K ohms, 1/2 w., 10%	K19309-61
R15	Variable, 10K ohms, part of R6	
R19	Variable, 1.5K ohms, meter sens. adj.	K15379-2
R20	Variable, 300 ohms, meter zero adj.	K15379-1
R21	22K ohms, 1 w., 10%	K19310-81
R22	820 ohms, 1/2 w., 5%	K19309-266
R23, R44	1 megohm, 1/2 w., 10%	K19309-121
R24	120 ohms, 1/2 w., 5%	K19309-258
R25	39 ohms, 1/2 w., 5%	K19309-253
R26	Variable, 200 ohms, slot depth	K15368-7
R28, R43, R45, R48, R68, R71	220K ohms, 1/2 w., 10%	K19309-105
R30, R32, R37, R46, R76 R85, R91, R93, R104	470K ohms, 1/2 w., 10%	K19309-113
R31, R33	68 ohms, 1/2 w., 10%	K19309-21
R34	560 ohms, 1/2 w., 10%	K19309-43
R35	1K ohms, 1w., 10%	K19310-49
R39	820 ohms, 1/2 w., 10%	K19309-47
R50	20 ohms, 1/2 w., 5%	K19309-188
R52	10 ohms, 1/2 w., 5%	K19309-246
R53	2K ohms, 10 w., ± 10%	K19337-5
R54	680 ohms, 1/2 w., 10%	K19309-45
R55	3K ohms, 1/2 w., 5%	K19309-212
R56	15K ohms, 1/2 w., 10%	K19309-77
R58	27K ohms, 2 w., 10%	K19304-52

SCHEMATIC DESIGNATION	DESCRIPTION	HAMMARLUND PART NO.
R59, R63, R69	2.2K ohms, 1/2 w., 10%	K19309-57
R60, R61, R66, R67	330K, ohms, 1/2 w., 10%	K19309-109
R65	270 ohms, 1/2 w., 10%	K19309-35
R77	27 ohms, 1/2 w., 10%	K19309-11
R78	Variable, 500K ohms, limiter includes 61	K15378-3
R79	Variable, 1 megohm, audio gain	K26218-3
R81	1.5K, 1 w., 10%	K19310-53
R83	4.7 megohm, 1/2 w., 10%	K19309-137
R86	430 ohms, 1 w., 5%	K19310-212
R87, R98	470 ohms, 1/2 w., 10%	K19309-41
R88	2.7K ohms, 1/2 w., 5%	K19309-272
R89	6.2K ohms, 1/2 w., 5%	K19309-176
R90	3.6K ohms, 1/2 w., 5%	K19309-179
R92	5.6K ohms, 1/2 w., 10%	K19309-67
R94	68 ohms, 1/2 w., 5%	K19309-256
R96	4.7K ohms, 1/2 w., 10%	K19309-65
R102	2.2 megohm, 1/2 w., 10%	K19309-129
R103	13K ohms, 1 w., 10%	K19310-227
R105	11K ohms, 1/2 w., 5%	K19309-215
	SWITCHES	
S1	Noise Limiter ON-OFF (Part of R78)	
S2A	Switch Wafer, Ant. primary	K26472-3
S2B, C	Switch Wafer, Ant. sec. mixer grid	K26472-2
S2D	Switch Wafer, RF Plate	K26472-1
S2E, S2F, S2G	HF Oscillator Switch Assembly	K26480-1
S3	AC ON-OFF (Part of R6 and R15)	
S4	Send-Receive-Calibrate	K26452-1
S5	Selectivity	K26296-1
S6	Sideband	K26303-1
S7	AM-SSB/CW	K42037-2
S8	AVC	K26309-2
	TRANSFORMERS	
T1	Transformer, Mixer Plate 3035 and 455 KC	K26474-2
T2	IF Transformer, Crystal Grid	K26473-1
T3	IF Transformer, 355 Kcs	K38829-2
T4, T5	IF Transformer, 455 Kcs	K38946-1
T6, T7, T8, T9	IF Transformer, 60 KCS	K42005-1
T10, T11		
T12	Antenna Transformer, .54 to 1.05 Mcs	K26455-1
T13	Antenna Transformer, 1.05 to 2.05 Mcs	K26456-1
T14	Antenna Transformer, 2.05 to 4.04 Mcs	K26457-1
T15	Antenna Transformer, 4.0 to 7.85 Mcs	K26458-1
T16	Antenna Transformer, 7.85 to 15.35 Mcs	K26459-1

SCHEMATIC DESIGNATION	DESCRIPTION	HAMMARLUND PART NO.
T17	Antenna Transformer, 15.35 to 30 Mcs	K26460-1
T19	RF Transformer, .54-1.05 and 1.05-2.05 mcs	K26461-1
T20	RF Transformer, 2.05-4.04 and 4.0-7.85 mcs	K26462-1
T21	RF Transformer, 7.85-15.35 and 15.35-30 mcs	K26463-1
T23	Osc Coils .54 to 1.05 and 1.05 to 2.05 mcs	K26464-1
T24	Osc Coil 2.05 to 4.04 Mcs	K26465-1
T25	Osc Coil 4.0 to 7.85 mcs	K26466-1
T26	Osc Coil 7.85 to 15.35 mcs	K26467-1
T27	Osc Coil 15.35 to 30 mcs	K26468-1
T28	BPO Transformer, 60 Kcs	K42005-4
T29	Audio Output Transformer	K38828-1
T30	Power Transformer 117 V.A.C.	P26305-1
T30E	Power Transformer 115-230 V Export Model	P26305-2

MISCELLANEOUS

E1	Fuse, Holder	K15923-1
F1	Fuse, 3 Amp. type 3 AGC	K15928-8
I1, I2, I3	Lamp, pilot No. 47, 6.3 V. .15A	K16004-1
J1	External Relay Receptacle	K35013-1
J2	Phone Jack	K35608-1
J3	Antenna Connector, SO-239	K16111-1

OPTIONAL ACCESSORIES

Telechron Clock Assembly Conversion Kits including instructions for converting model HQ-180 to Model HQ-180C are listed as follows:	
24 Hour Clock Kit (115V/230V - 50 cycles)	PL26380-G3
24 Hour Clock Kit (115V/230V - 60 cycles)	PL26380-G4
Loudspeaker assembly in cabinet matched to the Models HQ-180, HQ-180C and HQ-180E	PL26394-G1

ADDENDA TO PARTS LIST FOR HQ-180XE

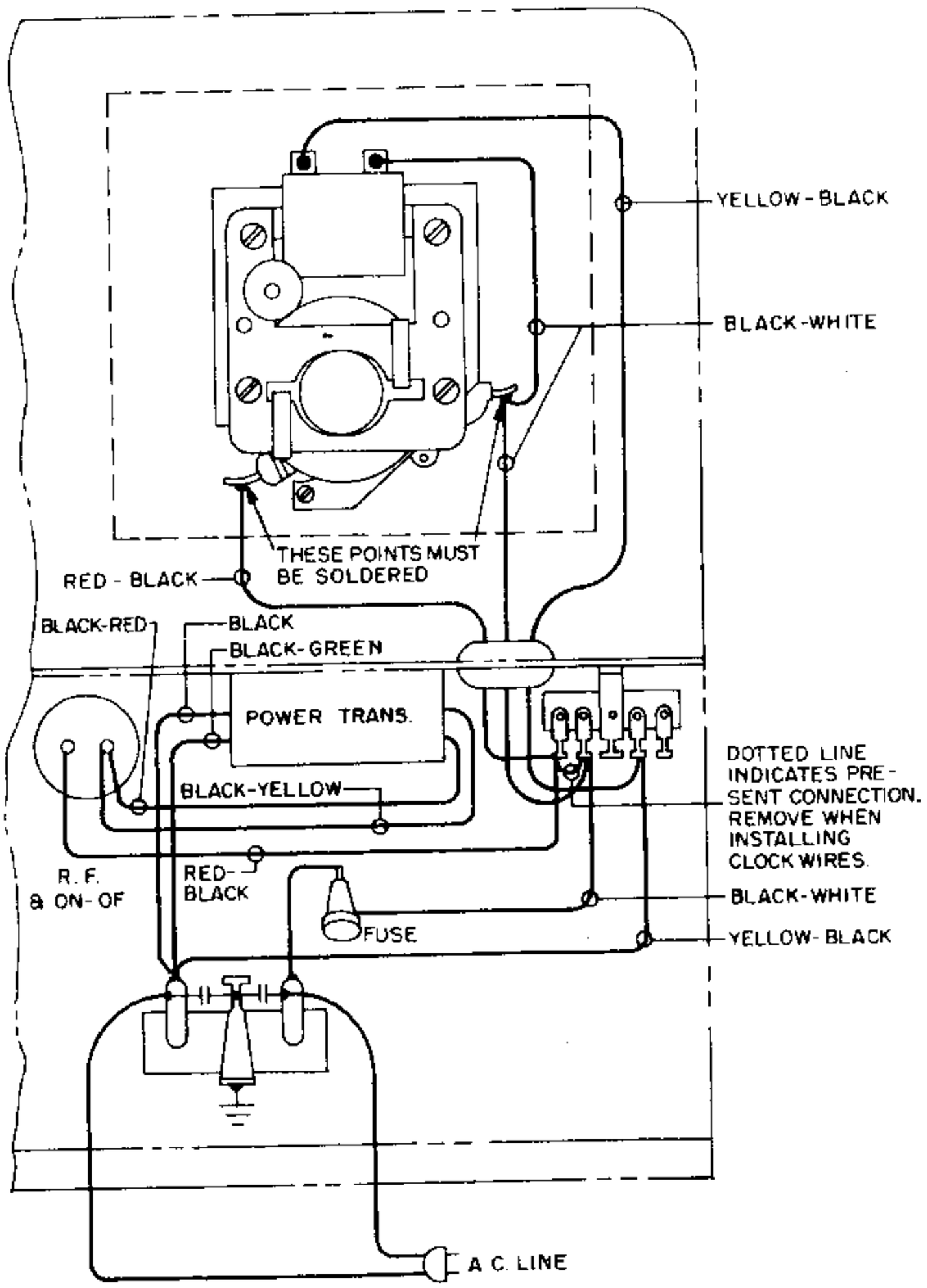
SCHEMATIC DESIGNATION	DESCRIPTION	HAMMARLUND PART NO.
C158	Cap Fixed, Electrolytic, 200 mfd, 25V DC NP	K23925-1
C159	Cap Fixed, Dur-Mica DM-15, 25 mmf ± 5%, 500V	K23006-142
C160	Cap Fixed, Ceramic Disc, .005 mfd -80 - 20%, 500V	M23034-37
CR1	Diode, Silicon (in 1490)	K41212-1
K1	Relay, Amps	K40404-1
R108	Res. 100K ohms, 1/2 w., ± 10%	K19309-97
R109	Res. 62K ohms, 1/2 w., ± 5%	K19309-183
R110	Res. 16K ohms, 1/2 w., ± 5%	K19309-217
R111	Res. 22 ohms, 1 w., ± 10%	K19310-9
S9	Switch, Crystal Selector	K39145-1

ADDENDA TO PARTS LIST FOR HQ-180A

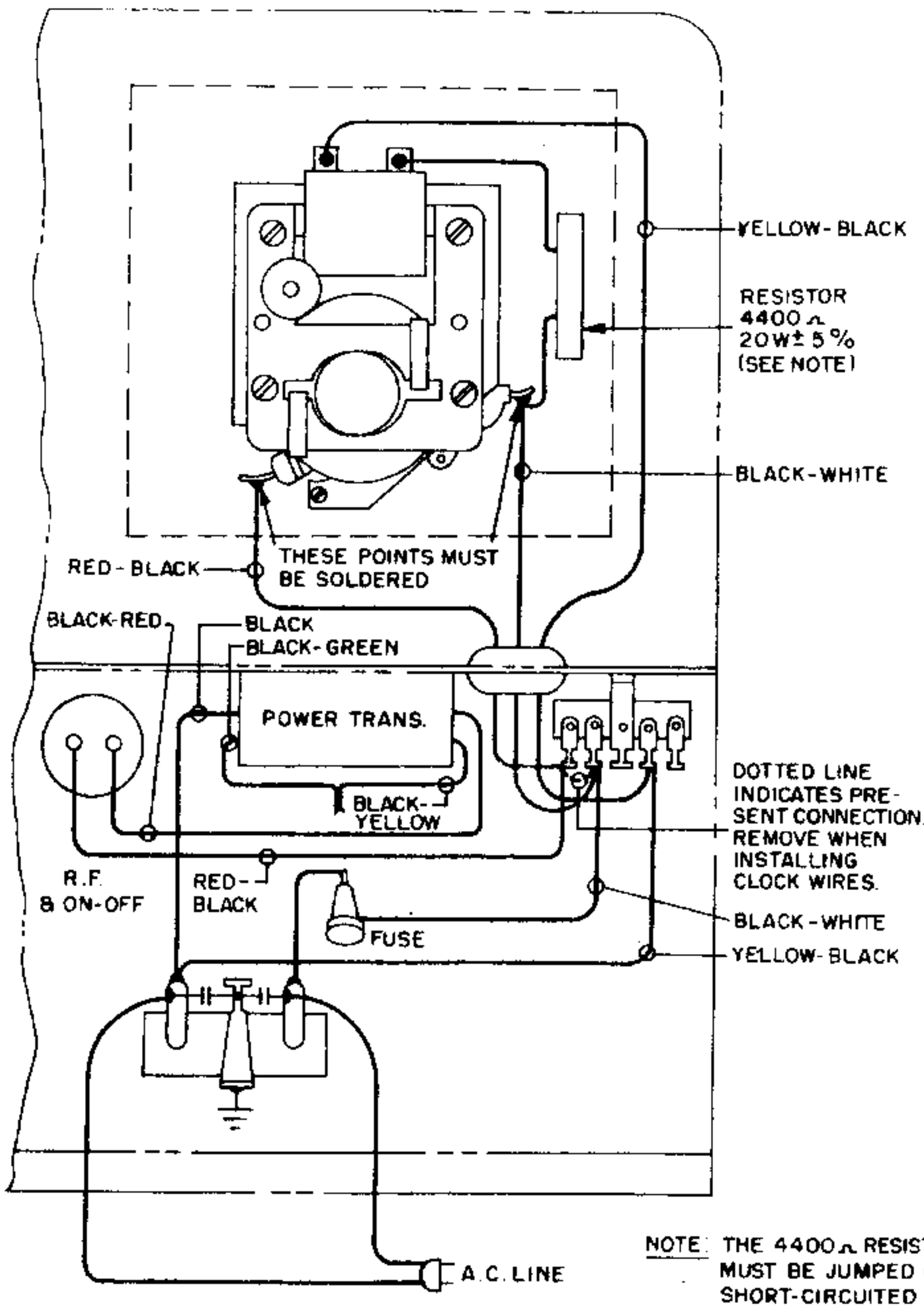
SCHEMATIC DESIGNATION	DESCRIPTION	HAMMARLUND PART NO.
CR2, CR3	Rectifier, Silicon (CER72C) 800 PIV, 255	M41215-3
F1	Fuse, 1-1/2 Amp Type 3 AGC for 50-60 Cycles 230V operation	K15928-6
J1	Socket (8 pin) (System Socket)	K16083-1
J4	Connector Female (Accessory Socket	K41138-1
S2E, F, G	HF Oscillator Switch Assem.	K26480-1
S7	Switch (AM-SSB-CW)	K52033-1
T18	Power Transformer	P26305-4
T22	Filament Transformer	K39224-2
T29	Output Transformer	K38828-2
C161	Capacitor, Fixed, Dur-Mica DM-15, 47 mmf, 300V	K23006-47

ADDENDA TO PARTS LIST FOR HQ-180AX

SCHEMATIC DESIGNATION	DESCRIPTION	HAMMARLUND PART NO.
CR2, CR3	Rectifier, Silicon (CER72C) 800 PIV, 255	M41215-3
F1	Fuse 1-1/2 Amp Type 3 AGC for 50-60 Cycles 230V Operation	K15928-6
J1	Socket (8 pin) (System Socket)	K16083-1
J4	Connector Female (Accessory Socket)	K41138-1
S2E, F, G	HF Oscillator Switch Assem.	K26480-1
S7	Switch (AM-SSB-CW)	K52033-1
T18	Power Transformer	P26305-4
T22	Filament Transformer	K39224-2
T29	Output Transformer	K38828-2
C161	Capacitor, Fixed, Dur-Mica DM-15, 47 mmf, 300V	K23006-47



CLOCK INSTALLATION HQ-170 & HQ-180
115V 50 OR 60~

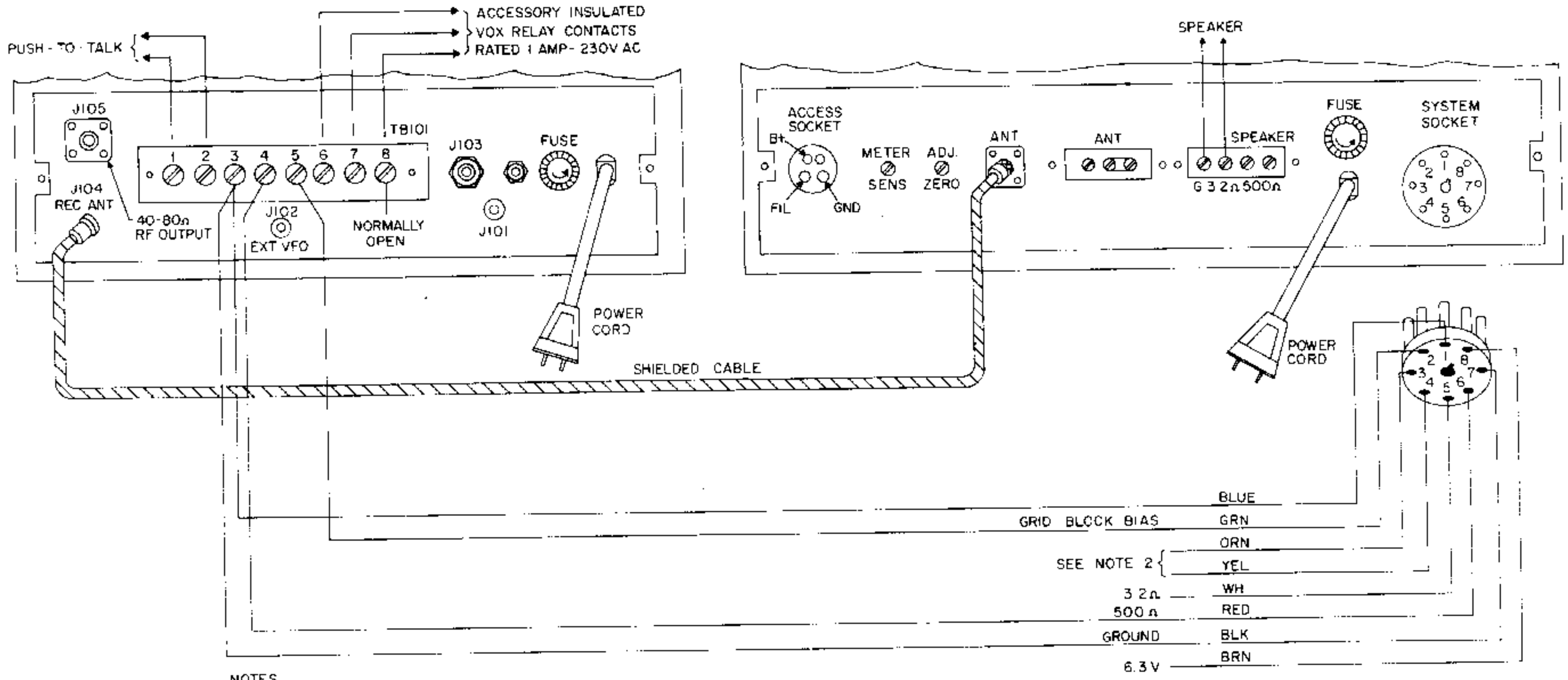


NOTE: THE 4400Ω RESISTOR MUST BE JUMPED OR SHORT-CIRCUITED FOR 115-117 VOLT OPERATION.

CLOCK INSTALLATION HQ-170 & HQ-180
230V 50 OR 60 ~

HX-50 TRANSMITTER

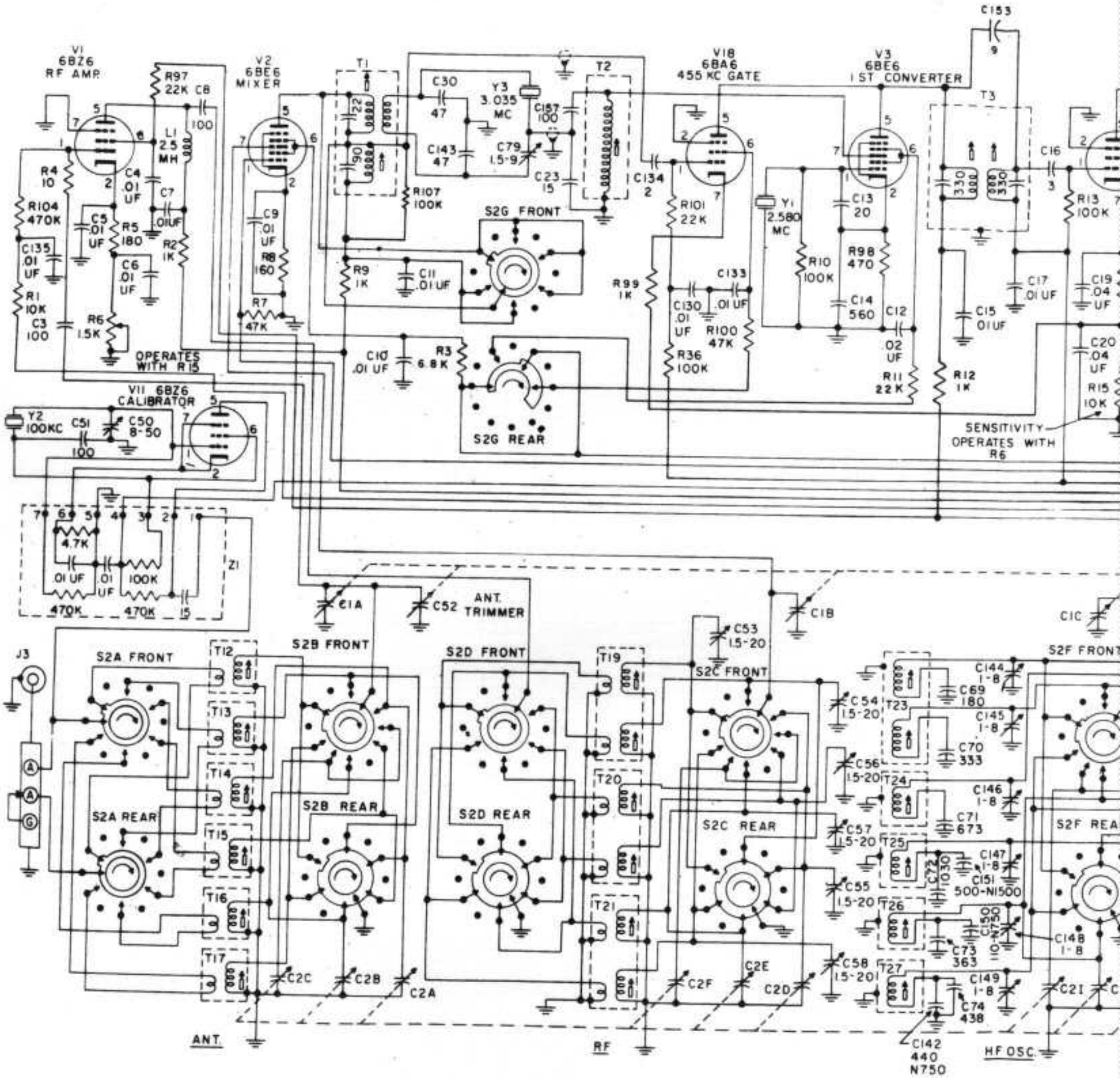
HQ-180A RECEIVER

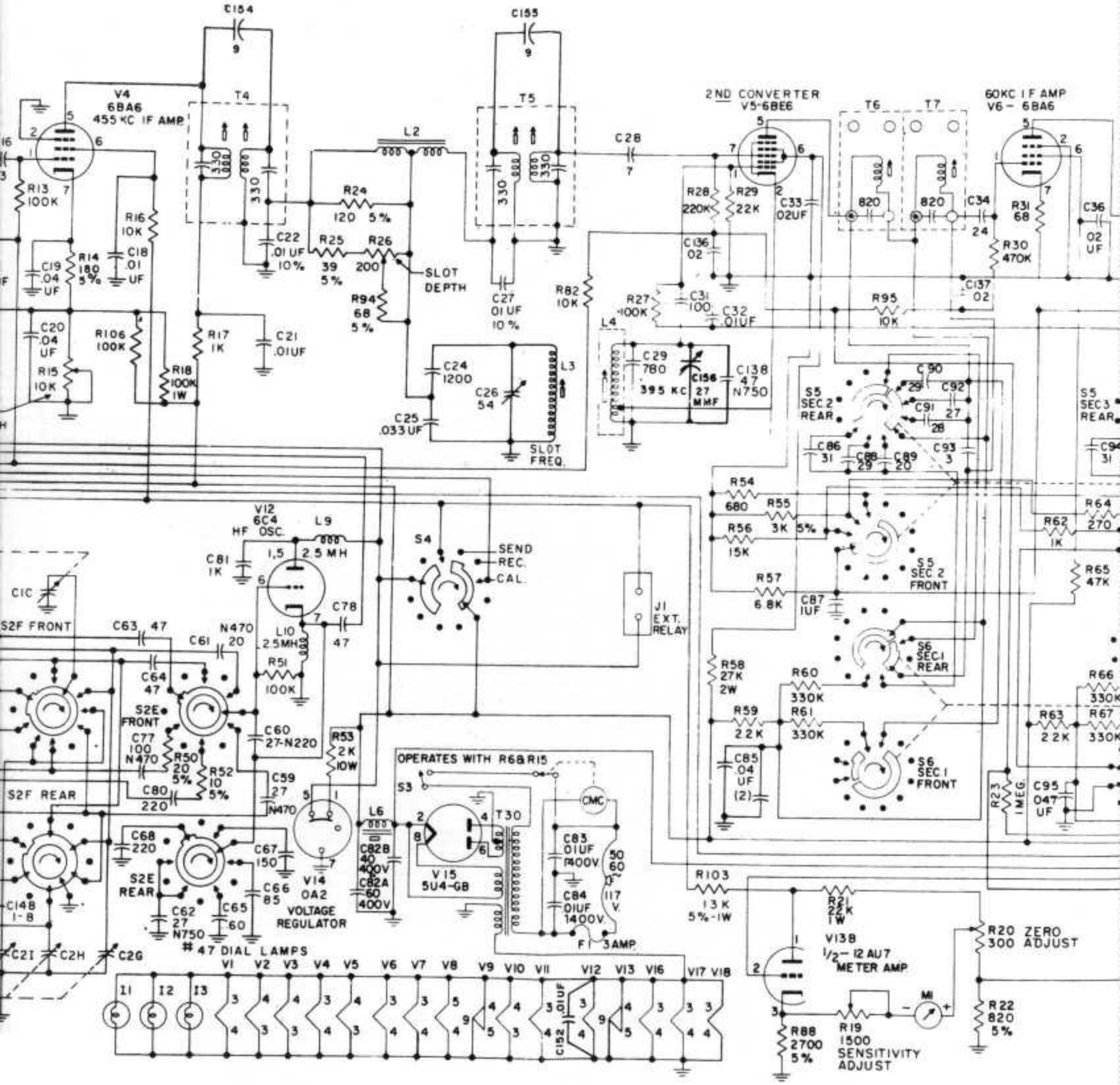


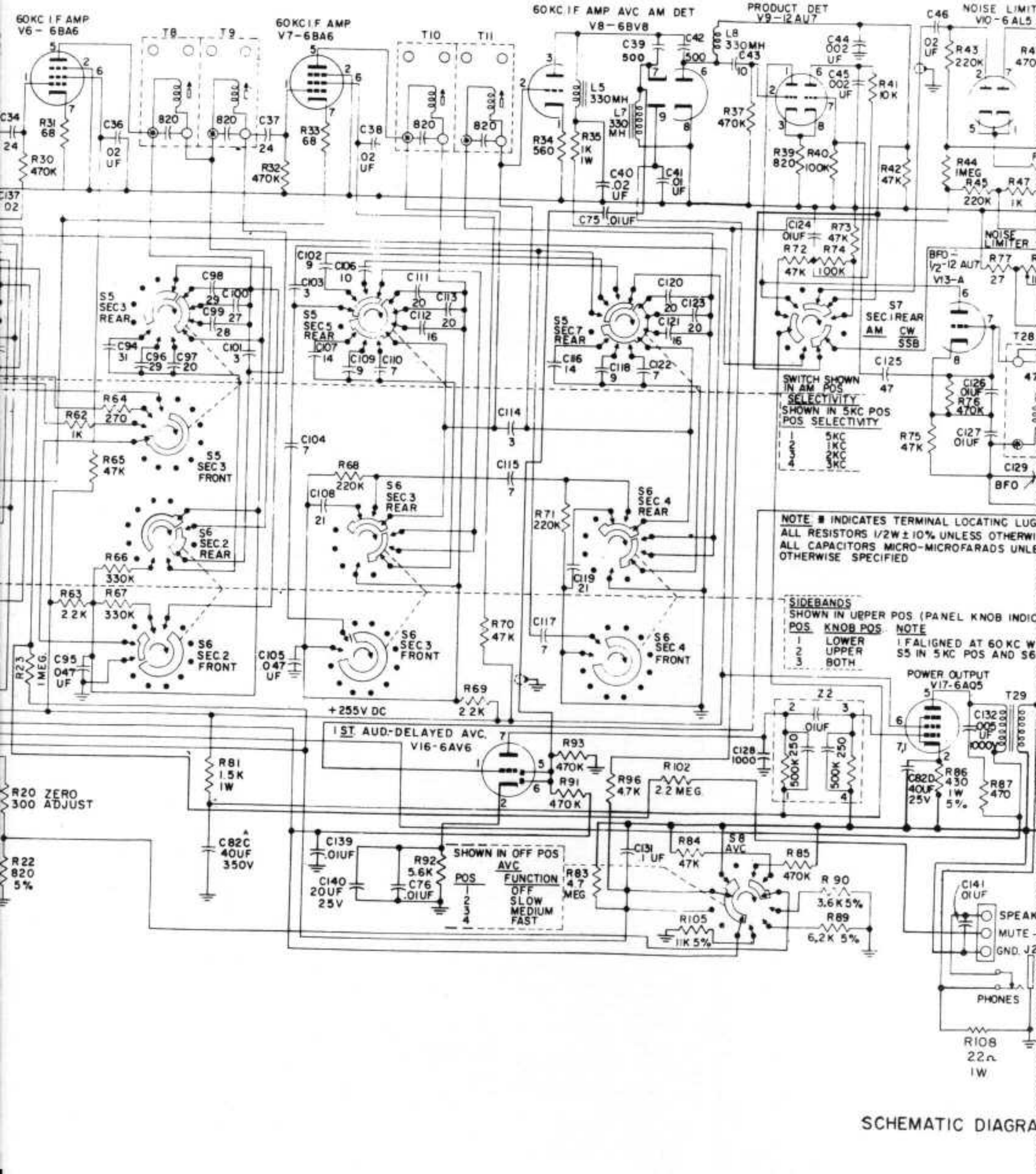
NOTES

1. HOOK-UP SHOWN IS USING GRID BLOCK BIAS TO THE HQ-180-AX
2. IF RELAY SWITCHING IS DESIRED
   a. DISCONNECT GRID BLOCK BIAS (GREEN LEAD) FROM PIN 5 OF TB101
   b. WIRE ORANGE LEAD TO PIN 7 AND YELLOW LEAD TO PIN 6
3. IF GRID BLOCK BIAS IS USED, RELAY CONTACTS PINS 6 & 7 ON HX-50 MAY BE USED FOR OTHER FUNCTIONS THESE ARE NORMALLY CLOSED
4. WHEN USING VOX CONTROL OF THE HX-50 TRANSMITTER, PIN NO. 1 OF THE HQ-180A OR HQ180AX RECEIVERS SYSTEM SOCKET SHOULD BE CONNECTED TO PIN NO 3 OF HX-50 TERMINAL BOARD AS SHOWN IN DIAGRAM

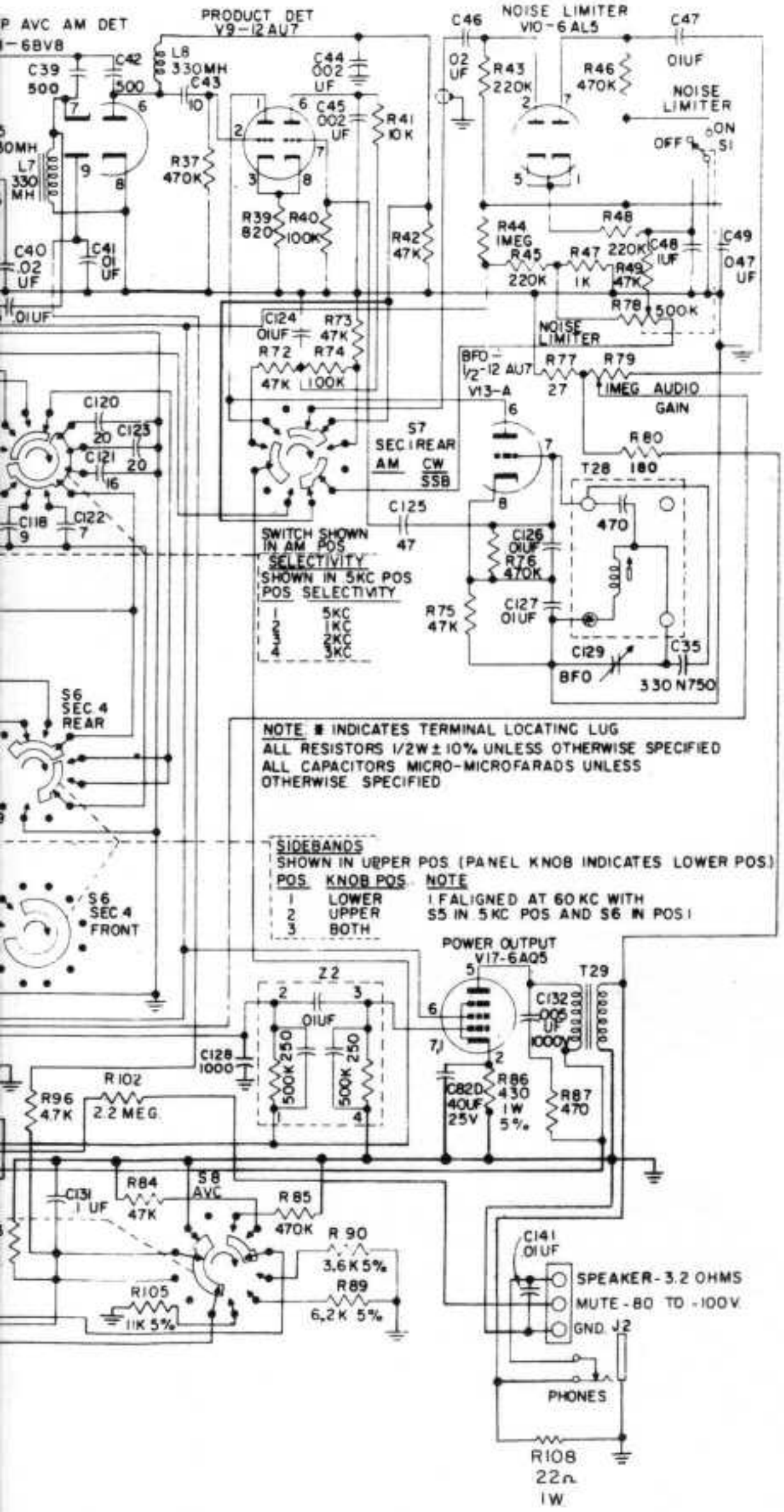
SUGGESTED INTERCONNECTIONS
(HX-50 HQ-180-AX)


V1 6BZ6 RF AMP
V2 6BE6 MIXER
T1
T2
V18 6BA6 455 KC GATE
V3 6BE6 1ST CONVERTER
T3
C153
R97 22K
C8 100
L1 2.5 MH
C30 47
Y3 3.035 MC
C157 100
C79 1.5-9
C143 47
C23 15
C134 2
R107 100K
R101 22K
Y1 2.580 MC
R10 100K
C13 20
R98 470
C14 560
C12 .02 UF
R11 22K
C15 .01 UF
C16 3
C17 .01 UF
R13 100K
R12 1K
C19 .04 UF
C20 .04 UF
R15 10K
R4 10
C4 .01 UF
C7 .01UF
R104 470K
C5 .01 UF
R5 180
R2 1K
C135 .01 UF
C6 .01 UF
R1 10K
C3 100
R6 1.5K
OPERATES WITH R15
C9 .01 UF
R8 160
R7 47K
R9 1K
C11 .01 UF
S2G FRONT
S2G REAR
C10 .01 UF
R3 6.8K
R99 1K
C133 .01 UF
C130 .01 UF
R100 47K
R36 100K
SENSITIVITY OPERATES WITH R6
V11 6BZ6 CALIBRATOR
Y2 100KC
C51 100
C50 8-50
4.7K
.01 UF
100K
470K
15
Z1
C1A
C52 ANT. TRIMMER
C1B
C1C
C53 1.5-20
J3
S2A FRONT
S2A REAR
S2B FRONT
S2B REAR
S2D FRONT
S2D REAR
S2C FRONT
S2C REAR
S2F FRONT
S2F REAR
T12
T13
T14
T15
T16
T17
T19
T20
T21
T23
T24
T25
T26
T27
C54 1.5-20
C56 1.5-20
C57 1.5-20
C55 1.5-20
C58 1.5-20
C144 1-8
C69 180
C145 1-8
C70 333
C146 1-8
C71 673
C147 1-8
C151 500-N1500
C148 1-8
C73 363
C149 1-8
C74 438
C142 440 N750
C2A
C2B
C2C
C2D
C2E
C2F
C21
ANT.
RF
HF OSC.

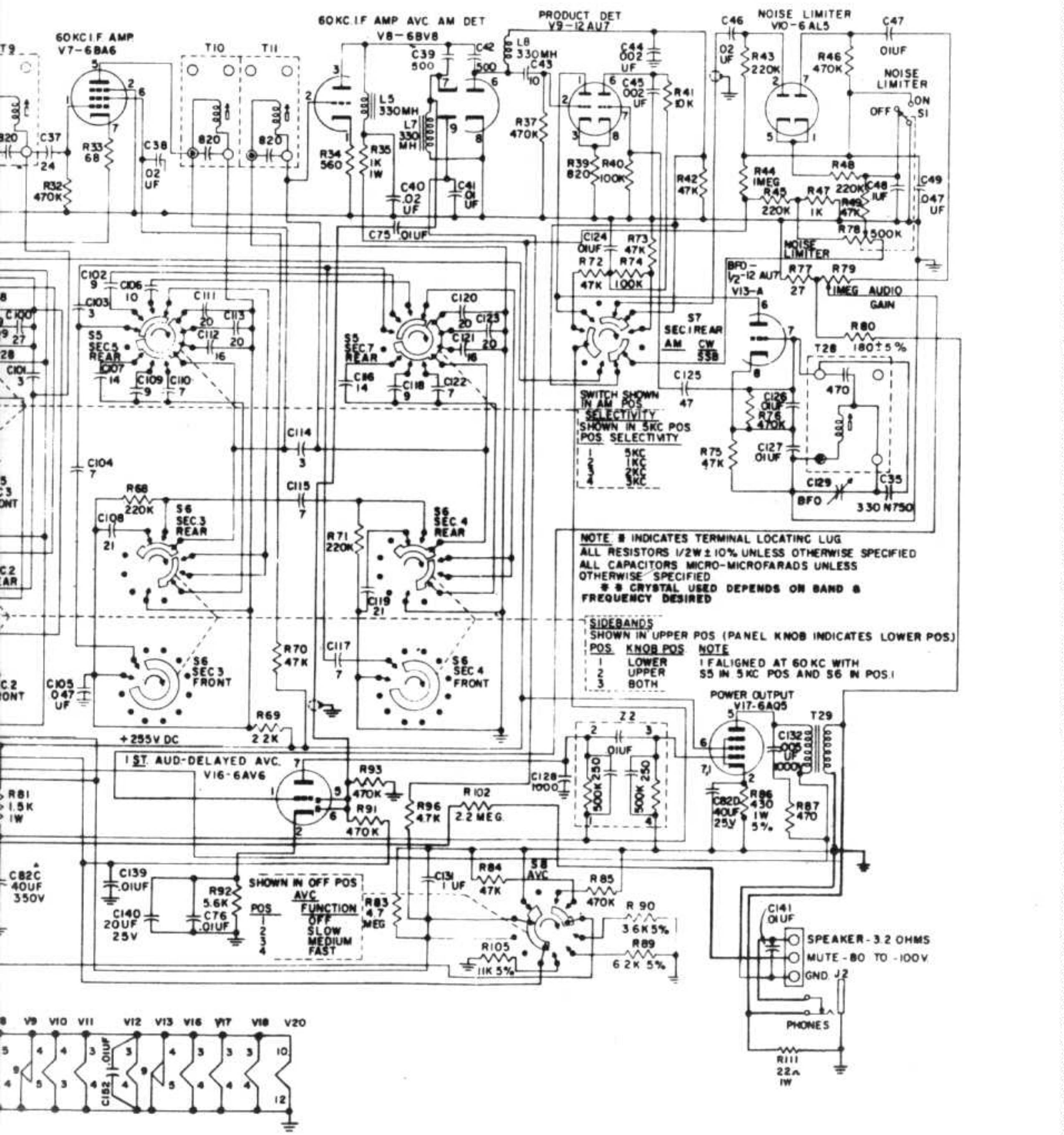

V4
6BA6
455 KC IF AMP
T4
T5
L2
C154
C155
C28
2ND CONVERTER
V5-6BE6
T6
T7
60KC I F AMP
V6 - 6BA6
R13 100K
R14 180 5%
R15 10K
R16 10K
C18 .01 UF
C19 .04 UF
C20 .04 UF
R106 100K
R17 1K
R18 100K 1W
C21 .01UF
C22 .01 UF 10%
R24 120 5%
R25 39 5%
R26 200
SLOT DEPTH
R94 68 5%
C24 1200
C25 .033 UF
C26 54
L3
SLOT FREQ.
C27 01 UF 10 %
R82 10K
R28 220K
R29 22K
C33 02UF
C136 02
R27 100K
C31 100
C32 .01UF
L4
C29 780
C156 27 MMF
395 KC
C138 47 N750
R95 10K
C137 02
R31 68
R30 470K
C34 24
C36 02 UF
820
820
S5 SEC.2 REAR
S5 SEC.3 REAR
C90
C92
C91 27
C86 31
C88 29
C89 20
C93 3
R54 680
R55 3K 5%
R56 15K
R57 6.8K
C87 1UF
S5 SEC 2 FRONT
S6 SEC.1 REAR
S6 SEC.1 FRONT
R58 27K 2W
R60 330K
R61 330K
R59 2.2K
C85 .04 UF (2)
R62 1K
R64 270
R65 47K
R66 330K
R63 2.2K
R67 330K
R23 1 MEG.
C95 047 UF
V12 6C4 HF OSC.
L9 1.5 2.5 MH
C81 1K
C78 47
L10 2.5MH
R51 100K
S4
SEND
REC.
CAL.
J1 EXT. RELAY
C1C
S2F FRONT
C63 47
C61 N470 20
C64 47
S2E FRONT
C77 100 N470
R50 20 5%
R52 10 5%
C80 220
S2F REAR
C60 27-N220
C59 27 N470
R53 2K 10W
C68 220
C67 150
C66 85
S2E REAR
C62 27 N750
C65 60
V14 0A2 VOLTAGE REGULATOR
L6
C82B 40 400V
C82A 60 400V
OPERATES WITH R68 R15
S3
T30
V15 5U4-GB
CMC
C83 01UF 1400V
C84 01UF 1400V
50 60 ~ 117 V.
F1 3AMP
C148 1-8
C21
C2H
C2G
#47 DIAL LAMPS
I1
I2
I3
V1 V2 V3 V4 V5 V6 V7 V8 V9 V10 V11 V12 V13 V16 V17 V18
C152 .01UF
R103 13K 5%-1W
R21 22K 1W
V13B 1/2-12AU7 METER AMP
R88 2700 5%
R19 1500 SENSITIVITY ADJUST
M1
R20 ZERO 300 ADJUST
R22 820 5%



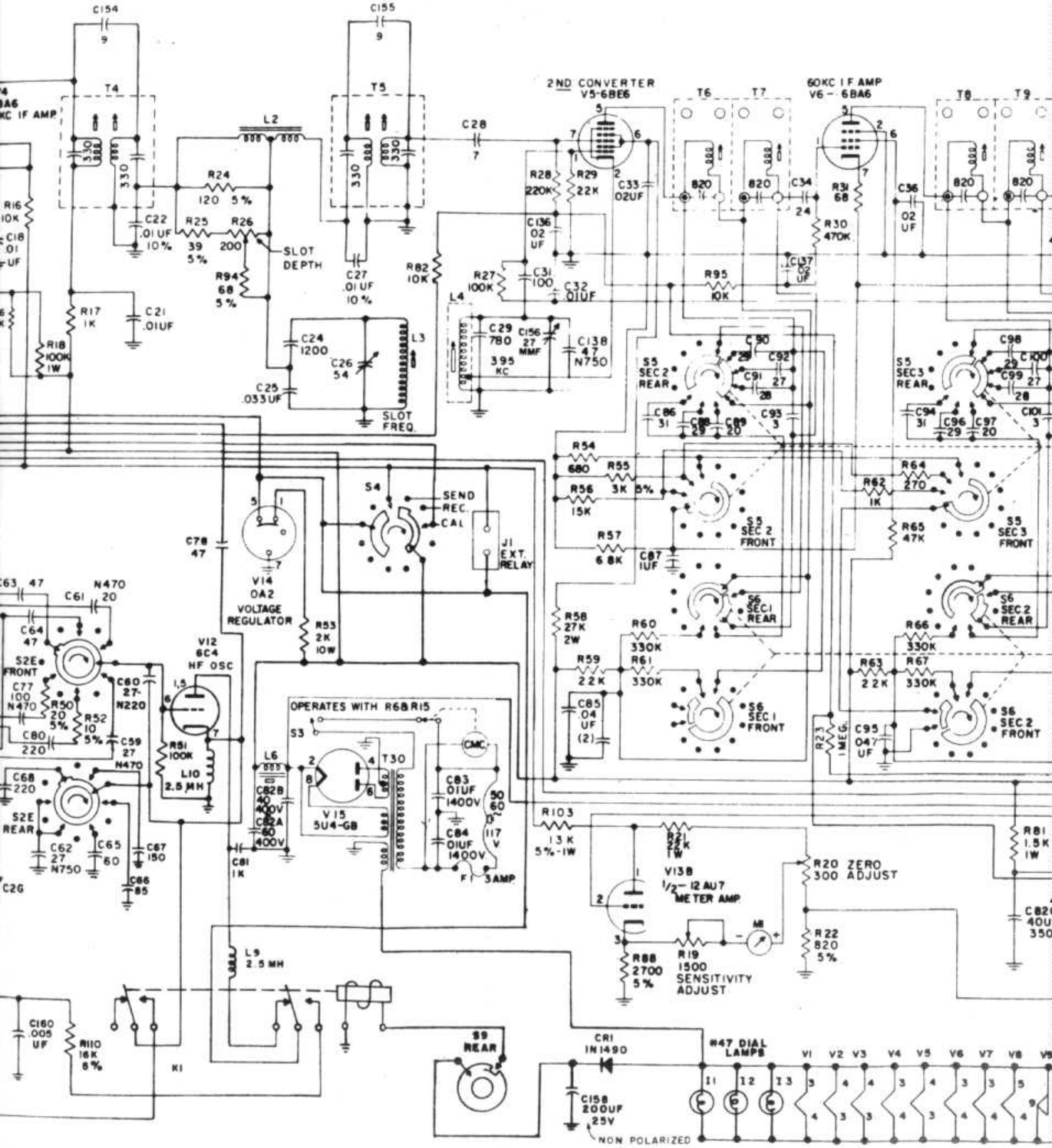
SCHEMATIC DIAGRA

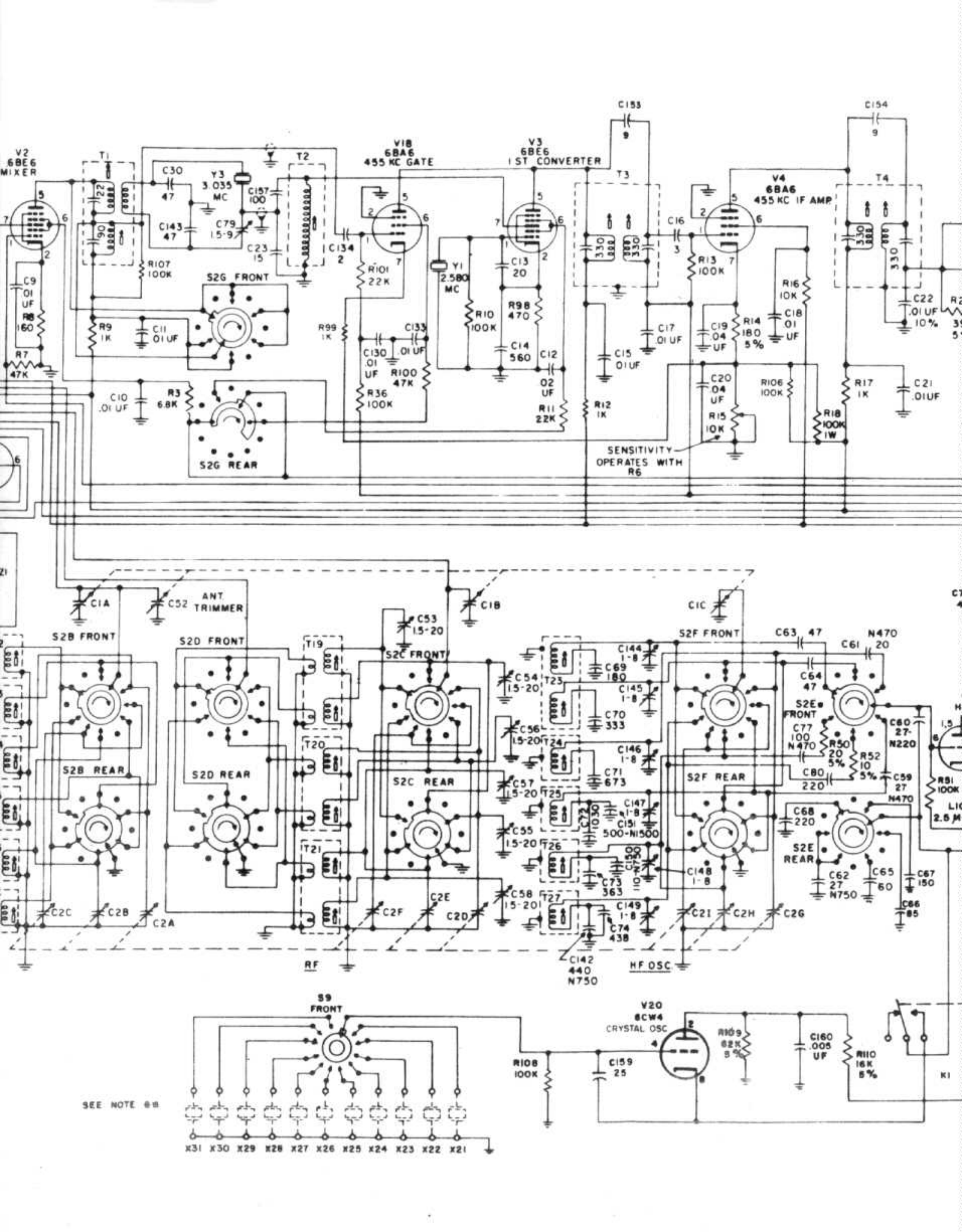


SCHEMATIC DIAGRAM, HQ-180



SCHEMATIC DIAGRAM, HQ-180XE


C154
T4
T4
IF AMP
R16
10K
C18
01
UF
R17
1K
C21
.01UF
R18
100K
1W
L2
R24
120 5%
C22
.01 UF
10%
R25
39
5%
R26
200
SLOT
DEPTH
R94
68
5%
C24
1200
C26
54
C25
.033UF
L3
SLOT
FREQ.
C155
T5
330
330
330
330
C27
.01 UF
10%
C28
7
2ND CONVERTER
V5-6BE6
R28
220K
R29
22K
C33
02UF
C136
02
UF
R27
100K
C31
100
C32
.01UF
L4
C29
780
395
KC
C156
27
MMF
C138
47
N750
R82
10K
T6
T7
60KC I F AMP
V6 - 6BA6
820
820
C34
24
R31
68
R30
470K
C36
02
UF
C137
02
UF
R95
10K
T8
T9
820
820
S5
SEC2
REAR
C90
C92
C91
27
C86
31
C88
29
C89
20
C93
3
S5
SEC3
REAR
C98
C100
C99
27
C94
31
C96
29
C97
20
C101
3
R54
680
R55
3K 5%
R56
15K
R57
6.8K
C87
1UF
S5
SEC 2
FRONT
R62
1K
R64
270
R65
47K
S5
SEC 3
FRONT
S4
SEND
REC.
CAL
J1
EXT.
RELAY
C78
47
V14
0A2
VOLTAGE
REGULATOR
R53
2K
10W
S6
SEC1
REAR
S6
SEC 2
REAR
R66
330K
R58
27K
2W
R60
330K
R59
22K
R61
330K
C85
.04
UF
(2)
S6
SEC 1
FRONT
R63
22K
R67
330K
S6
SEC 2
FRONT
R23
1 MEG
C95
.047
UF
C63 47
C61 N470
20
C64
47
S2E
FRONT
C77
100
N470
R50
20
5%
R52
10
5%
C80
220
C60
27-
N220
C59
27
N470
V12
6C4
HF OSC
R51
100K
L10
2.5 MH
C68
220
S2E
REAR
C62
27
N750
C65
60
C67
150
C66
85
C2G
OPERATES WITH R68 R15
S3
L6
C82B
40
400V
C82A
60
400V
C81
1K
T30
V15
5U4-GB
CMC
C83
.01UF
1400V
C84
.01UF
1400V
50
60
117
V
F1 3AMP
R103
13K
5%-1W
R21
22K
1W
V13B
1/2 - 12AU7
METER AMP
R20 ZERO
300 ADJUST
R22
820
5%
M
R88
2700
5%
R19
1500
SENSITIVITY
ADJUST
R81
1.5K
1W
C82
40U
350
L9
2.5 MH
K1
C160
.005
UF
R110
16K
5%
S9
REAR
CR1
IN1490
C158
200UF
25V
NON POLARIZED
#47 DIAL
LAMPS
I1
I2
I3
V1
V2
V3
V4
V5
V6
V7
V8
V9


V2
6BE6
MIXER
T1
T2
V18
6BA6
455 KC GATE
V3
6BE6
1ST CONVERTER
T3
V4
6BA6
455 KC IF AMP
T4
C153
C154
C30
47
Y3
3.035
MC
C157
100
C79
1.5-9
C143
47
C23
15
C134
2
R107
100K
C9
.01
UF
R8
160
R7
47K
S2G FRONT
S2G REAR
R9
1K
C11
.01 UF
C10
.01 UF
R3
6.8K
R101
22K
R99
1K
C130
.01
UF
.01 UF
C133
R100
47K
R36
100K
Y1
2.580
MC
R10
100K
C13
20
R98
470
C14
560
C12
.02
UF
R11
22K
R12
1K
C15
.01 UF
C16
3
C17
.01 UF
R13
100K
C19
.04
UF
R14
180
5%
R16
10K
C18
.01
UF
C20
.04
UF
R15
10K
SENSITIVITY
OPERATES WITH
R6
R106
100K
R18
100K
1W
R17
1K
C21
.01UF
C22
.01 UF
10%
330
330
330
330
330
330
S2B FRONT
S2B REAR
S2D FRONT
S2D REAR
T19
T20
T21
S2C FRONT
S2C REAR
C1A
C52
ANT
TRIMMER
C1B
C1C
C53
15-20
C54
15-20
C56
15-20
C57
15-20
C55
15-20
C58
15-20
T23
T24
T25
T26
T27
C144
1-8
C69
180
C145
1-8
C70
333
C146
1-8
C71
673
C147
1-8
C151
500-N1500
C148
1-8
C149
1-8
C74
438
C142
440
N750
S2F FRONT
S2F REAR
S2E
FRONT
S2E
REAR
C63
47
C61
N470
20
C64
47
C77
100
N470
R50
20
5%
R52
10
5%
C60
27-
N220
C80
220
C59
27
N470
C68
220
C62
27
N750
C65
60
C67
150
C66
85
RF
HF OSC
C2A
C2B
C2C
C2D
C2E
C2F
C2G
C2H
C21
S9
FRONT
SEE NOTE 88
X31 X30 X29 X28 X27 X26 X25 X24 X23 X22 X21
V20
6CW4
CRYSTAL OSC
R108
100K
C159
25
R109
62K
5%
C160
.005
UF
R110
16K
5%
K1

V1 6BZ6 RF AMP
V2 6BE6 MIXER
T1
T2
V18 6BA6 455 KC GATE
V3 6BE6 1ST CONVERTER
T3
C153 9
R97 22K
C8 100
L1 2.5 MH
C4 01 UF
C7 01UF
R4 10
R104 470K
C5 01 UF
R5 180
R2 1K
C135 01 UF
C6 01 UF
R1 10K
C3 100
R6 15K
OPERATES WITH R15
C30 47
Y3 3.035 MC
C157 100
C79 15-9
C143 47
C23 15
C134 2
R107 100K
C9 01 UF
R8 160
R7 47K
S2G FRONT
R9 1K
C11 01 UF
C10 .01 UF
R3 6.8K
S2G REAR
R99 1K
R101 22K
C130 01 UF
C133 .01 UF
R100 47K
R36 100K
Y1 2.580 MC
R10 100K
C13 20
R98 470
C14 560
C12 02 UF
R11 22K
C16 3
C17 01 UF
C15 01UF
R12 1K
SENSITIVITY OPERATES WITH R6
VII 6BZ6 CALIBRATOR
Y2 100KC
C51 100
C50 8-50
4.7K
.01 UF
.01 UF
100K
470K
470K
15
Z1
C1A
C52 ANT. TRIMMER
C1B
C1C
J3
S2A FRONT
S2B FRONT
S2D FRONT
S2C FRONT
S2F F
T12
T13
T14
T15
T16
T17
T19
T20
T21
T23
T24
T25
T26
T27
S2A REAR
S2B REAR
S2D REAR
S2C REAR
C2C
C2B
C2A
C2F
C2E
C2D
C53 15-20
C54 15-20
C56 15-20
C57 15-20
C55 15-20
C58 15-20
C144 1-8
C69 180
C145 1-8
C70 333
C146 1-8
C71 673
C147 1-8
C151 500-N1500
C148 1-8
C73 363
C149 1-8
C74 438
C142 440 N750
ANT
RF
HF OSC
S9 FRONT
SEE NOTE 6
X31 X30 X29 X28 X27 X26 X25 X24 X23 X22 X21
V20 6CW4 CRYSTAL OSC
R108 100K
C159 25