



HAMMARLUND

The Hammarlund Manufacturing Co., Inc.
460 West 34th Street, New York 1, N. Y.

International Division, 13 East 40th Street, New York 16, N. Y.

THE HQ-180 COMMUNICATIONS RECEIVER

INSTRUCTION AND SERVICE INFORMATION



ESTABLISHED 1910

ISSUE NO. 3

(Starting with serial numbers approximately 1335)

In order to receive the full unconditional 90-day warranty against defective material and workmanship in this receiver, the warranty card must be filled out and mailed within two weeks of purchase. Please refer to serial number of warranty in correspondence.

THE HAMMARLUND MANUFACTURING CO., INC.
460 West 34th Street New York 1, N.Y.



Figure 1. The RD-100 Communications Receiver

TUBE COMPLEMENT

SYMBOL	TYPE	TUBE	FUNCTION
V1	6BD6	Pentode	RF Amplifier
V2	6BE6	Pentagrid Converter	1st Mixer
V3	6BE6	Pentagrid Converter	Converter
V4	6BA6	Pentode	455 Kcs IF Amplifier
V5	6BE6	Pentagrid Converter	Converter
V6	6BA6	Pentode	60 Kcs IF Amplifier
V7	6BA6	Pentode	60 Kcs IF Amplifier
V8	6AV6	Double Diode-Triode	60 Kcs IF Amplifier, AVC, AM Det.
V9	12AU7	Double Triode	500 Product Detector
V10	6AL5	Double Diode	Noise Limiter
V11	6X25	Pentode	Crystal Calibrator Oscillator
V12	6C4	Triode	High Frequency Oscillator
V13	12AU7	Double Triode	60 Kcs BFO, "S" Meter Amplifier
V14	6A2	Gas Filled Diode	Voltage Regulator
V15	504-GB	Two Diode	Rectifier
V16	6AV6	Double Diode-Triode	First AF Amplifier, Delayed AVC
V17	6X05	Pentode	AF Output
V18	6BA6	Pentode	455 Kc Gate



INTRODUCTION

The new HQ-180 communications receiver has been designed to provide the most solid contacts under all conditions of reception. It will provide years of top performance with a minimum of maintenance. The HQ-180 has a self-contained power supply operating from a 60 c.p.s., 105-125 volt a-c source. The model HQ-180C incorporates a telechron automatic electric clock timer in its design. The export model, HQ-180E, will operate from a 50-60 c.p.s., 115-230 volt a-c source. Because of the power supply operating frequency and voltage of the export model, the clock (automatic timer) is not incorporated in this model. Approximate power consumption is 120 watts.

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

BAND SPREAD TUNING DIAL

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

A tuned RF stage with the addition of an antenna trimmer assures maximum sensitivity and a high signal to noise ratio for outstanding reception of

weak and distant signals. A manual sensitivity (RF gain) control prevents overloading by strong signals.

The most prominent features in the HQ-180 receiver are the selectivity and sideband selectors. They enable you to adjust for optimum reception under the most adverse conditions with each type of signal. The panel knob indicates fixed and precisely known hand widths approaching mechanical filter type of skirt selectivity.

One special feature of the HQ-180 is a "razor sharp" adjustable slot filter to eliminate co-channel interference. Proper adjustment of its slot frequency and depth controls provides attenuation of approximately 60 db for an interfering signal.

The first IF (3035 kcs) used from 7.85 to 30.0 mcs is made highly selective by the use of a crystal filter. This minimizes noise and spurious responses.

To compensate for wide input signal variation, the receiver incorporates a fast attack (charge), adjustable decay AVC and switch with OFF-SLOW-MEDIUM-FAST positions suitable for all types of reception.

CW and SSB signals are detected by a separate linear product detector for the highest signal to noise ratio and freedom from interference.

A continuously variable (audio type) noise limiter provides limiting on both positive and negative noise pulses.

The "S" meter indicates carrier level on all types of reception where AVC is used. It is calibrated for AM signals with the AVC on SLOW-MEDIUM-FAST to indicate the accuracy of tuning and the relative strength.

The receiver possesses the Auto Response feature which automatically narrows and widens the frequency range of the audio output, according to the gain required. This feature permits higher fidelity reception on stronger signals, while providing the sharp cut-off required in receiving communications under adverse conditions. A second advantage of the Hammarlund Auto-Response is the rapid damping of the audio power in the speaker voice coil which greatly minimizes undesirable speaker "hangover". The receiver may be used with either speaker or headphones. AC hum is made inaudible by means of adequate filtering.

Large comfortable controls in logical groupings are provided for greatest operating ease. The front panel is clearly marked to permit full attention to the operation at hand.

The HQ-180 was designed with you in mind. You will have many hours of pleasure in operating this truly fine communications instrument.



INSTALLATION

UNPACKING

Unpack the receiver carefully. Make sure the tubes, associated tube shields and pilot lamps are in place.

SPEAKER CONNECTION

Connect a 3.2 ohm permanent magnet dynamic speaker (Hammarlund Matched Speaker) to the two terminals marked SPKR and ground on the rear of the chassis (see Figure 4). For best performance do not place speaker on top of receiver cabinet.

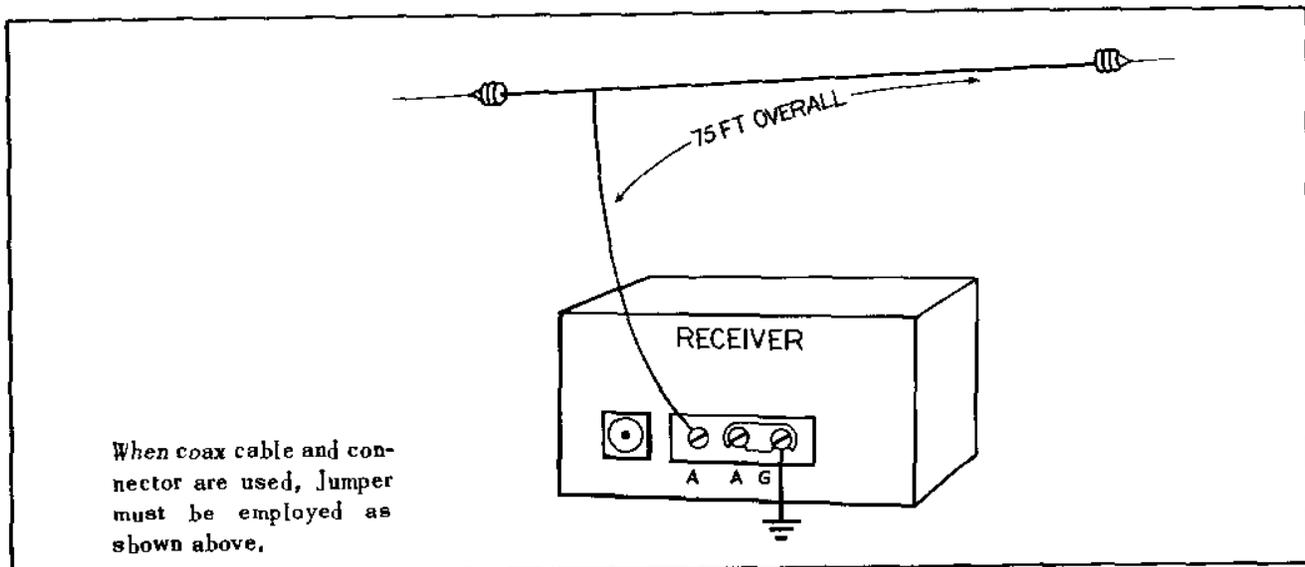


Figure 2. Single Wire Antenna Connections (all bands)

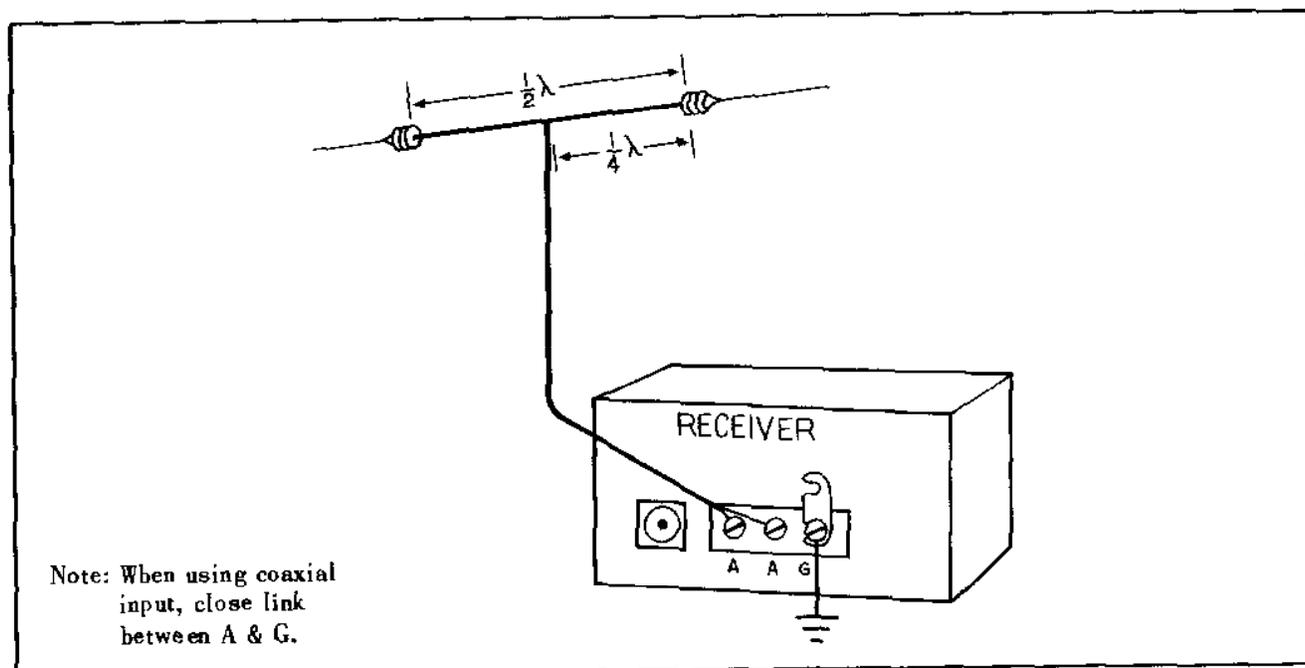


Figure 3. Balanced Transmission Line Antenna Connections



POWER CONNECTIONS

Before inserting attachment plug into power outlet, make certain power source is of proper voltage and frequency. (Refer to paragraph one of introduction.)

NOTE

If receiver pilot lights fail to come on when the sensitivity or RF gain control is rotated clockwise, check the position of the clock timer switch and make sure it is in the "ON" position. See clock timer instructions which follow for further information.

INSTALLING ANTENNA

The HQ-180 is designed to operate with either a balanced or unbalanced transmission line.

The front panel antenna trimmer control (figure 5) permits a good impedance match to most antenna systems of 50 to 300 ohms (on all bands).

For general coverage a single wire antenna of 20 to 50 feet length will provide surprisingly good reception. A long single wire outdoor antenna, such as the one shown in Figure 2, will generally provide entirely satisfactory performance. This wire may be 50 to 150 feet long.

A coaxial connector, SO-239, is provided for use with the single wire shielded antenna lead-in connection. This will employ a PL-259 plug and coaxial cable which is not supplied.

For best reception, the antenna should be isolated as much as possible from neighboring objects and at right angles to the power lines or busy highways so as to minimize interference pickups.

Optimum performance on a particular amateur band or other narrow tuning range will be obtained by using a tuned half-wave dipole or folded dipole using coaxial cable, 300 ohm transmission line or other suitable lead-in, as shown in Figure 3.

To tune the one-half wave length dipole use the following formula to determine the length of the antenna:

$$\text{Length (feet)} = \frac{468}{\text{Freq. (Mcs)}}$$

Each arm (1/4 wave length) is half the length obtained from the above formula.

A good ground, although not always necessary, will generally aid reception and reduce stray line hum. In some locations further hum reduction may be obtained by reversing the power plug.

EXTERNAL RELAY CONNECTION

A standard power type receptacle is provided on the rear apron of the chassis for the connection of an external relay-operated switch. This receptacle accommodates a standard power plug and when so used the SEND-REC switch of the RECEIVER should be left in the SEND position.

The usual antenna change over relay equipped with a set of normally closed contacts is suggested. The choice of this relay will depend on the particular antenna system involved, such as whether a co-ax

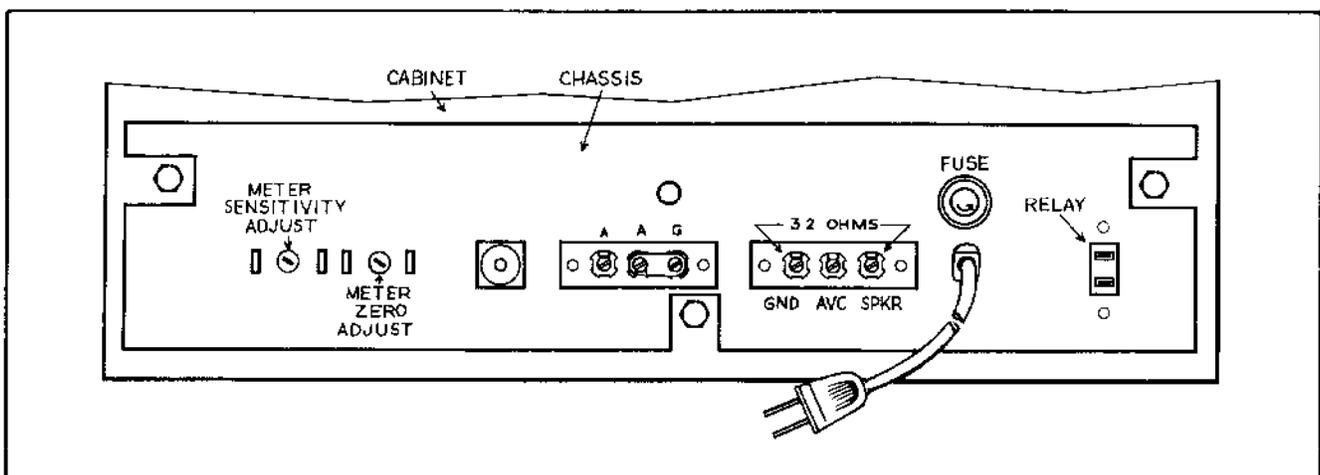


Figure 4. Connection Points at Rear of Chassis

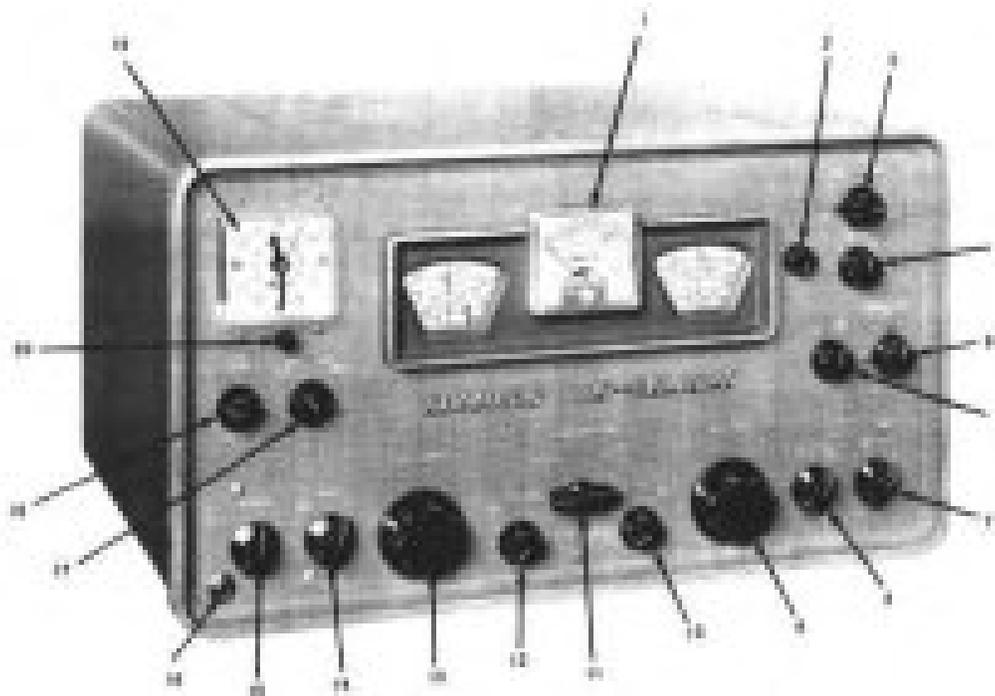


Figure 3. Location of Controls

- | | |
|-------------------------------------------------|-------------------------------------------------|
| 1. "S" Meter Carrier Level | 12. Audio Frequency Gain Control |
| 2. Calibration Set Control | 13. Main Tuning Control |
| 3. Slot Frequency Control (Slot Depth at Rear) | 14. Function Switch (Send-Receive-Calibrator) |
| 4. Beat Frequency Oscillator Control (BF Pitch) | 15. Antenna Trimmer |
| 5. Function Switch (Type of Reception) | 16. Phone Jack (Output for Headphone Operation) |
| 6. Variable Tuning Control | 17. AVC Time Constant Selector |
| 7. Bandwidth Selector | 18. Noise Limiter Level Control with Switch |
| 8. Sideband Selector | 19. Teletouch Automatic Clock (Timer) |
| 9. Band Spread Tuning Control | 20. Timer Switch |
| 10. BF Sensitivity Control | |
| 11. Tuning Range Switch (Band Selector) | |



relay or one for open wire line is employed. In either case the extra set of contacts to control the receiver will be necessary.

CAUTION

The receptacle pins open and close a part of the +150 volt D.C. regulated supply load; consequently, check all external wires and the relay for possible short circuits to ground.

In the event that RF feed back is experienced when the relay terminals on the rear of the HQ-180 are employed, this usually indicates that the relay leads between the receiver and antenna relay are picking up RF. This may be due to the particular lead length or a high standing wave ratio on the antenna system. The solution is of course, to prevent the RF pickup of the relay leads from getting into the receiver. Adding a pair of .01 disc ceramic capacitors from each of the relay terminals to ground will usually eliminate the feed back condition. These extra .01 capacitors should be installed using as short lead length as possible.

AVC MUTING

The terminal adjacent to the speaker terminal on the rear apron marked AVC, is provided for use with an external switched, negative potential dc of from 80 to 100 volts if desired.

GRID BLOCK BIASING FOR VOX CIRCUITS

Many of the single side band transmitters being produced today provide 100 volts negative bias which is switched from the transmitter to the receiver by the VOX circuit. The new Hammarlund HX-500 transmitter is a good example. As a result of the voice control operating the relay in the transmitter, the 100 volts negative bias available in the transmitter is made available to silence the receiver. When this type of receiver silencing is desired the relay receptacle on the rear of the HQ-180 is not employed. The 100 volt negative bias lead from the VOX circuit is then connected to the receiver's AVC terminal. It is now necessary to employ a common ground connection between the receiver and transmitter chassis.

WARNING

This system in no way implies that the antenna changeover relay or a suitable TR switch will not be required. Failure to employ one or the other may result in burning out the antenna coils of the receiver, or other possible damage.

Tests indicate that minus 75 volts will silence the receiver when one volt of RF is applied to the antenna terminals. 75 volts negative bias is therefore, the suggested minimum value for complete silencing. The full bias voltage is not applied to the grids due to a voltage division which takes place as a result of the 2.2 megohm resistor R102 and the other resistors employed in the AVC System.

VOX CIRCUIT REQUIREMENTS

In the event that the VOX circuit in your transmitter may be designed for 500 ohm input and that sufficient gain in this circuit may not be available to provide proper performance from the 3.2 voice coil winding, the matching transformer referred to in the headphone paragraph may be employed. Under these circumstances, the voice coil winding should be connected to the speaker terminals with the 500 ohm line winding to the VOX circuit. Such a matching transformer may also be required or useful for phone patch operation, depending, of course, on the design of the phone patch.

HEADPHONES OUTPUT

The headphone jack results in a deliberate mismatch to high impedance phones, in order to reduce the level supplied to them. The lower the impedance of the phones, the more volume will usually be obtained. If it is desirable to increase the headphone volume, an inexpensive line to voice coil transformer is suggested. This transformer is connected backwards with the voice coil connections to headphone plug and the 500 ohm line connections to the phones. The resultant impedance step up will provide higher headphone volume. This procedure should only be resorted to when absolutely necessary such as when a person may have hard of hearing. It should be remembered that as a result of increasing the headphone level any residual hum will also be increased, which the hard of hearing person will not find objectionable, whereas a person with normal hearing may.



OPERATION

AM RECEPTION

For AM reception the position of controls nominally should be as follows:

Function Switch	AM
Send-Receive-Cal Switch	Receive
Selectivity Switch	*3 Kcs
Sideband Switch	*Both
Vernier Tuning Control	0
Band Spread Tuning	100
Beat Frequency Oscillator Control	0
Slot Frequency Control	***Counter Clockwise
Slot Depth Control	****Center
Cal Set Control	Set to Vertical Marker
RF (Sensitivity) Control	**Fully Clockwise
AF (Gain) Control	*****Adjnst to desired level
Tuning Range Switch	Set to Desired Frequency Range
Main Tuning Control	Tuae for highest "S" meter reading
Antenna Trimmer	Tuae for highest "S" meter reading
AVC Time Constant	Slow or Medium
Noise Limiter Level	OFF
Timer Switch (Clock Model)	On

* To obtain maximum fidelity in AM reception, the widest bandwidth is normally used. However, under conditions of severe interference, the bandwidth is reduced to improve intelligibility, although some sacrifice of fidelity results. Adjust bandwidth for best reception. Single side band technique may be employed to advantage on AM when interference is experienced.

** For normal AM reception, the RF gain control is rotated fully clockwise. The "S" meter calibration holds only when the AVC switch is on SLOW-MEDIUM or FAST. In the presence of extremely strong signals, the sensitivity control may be reduced to prevent overload.

When the receiver is operated in the slow AVC position, high level noise pulses may cause a momentary blocking to occur. This is evidenced by the S meter swinging to full scale and a drop in signal strength, with a gradual return to normal. In high level noise urens, or when the receiver behaves in the above manner, it is suggested that the AVC be placed in the fast or medium decay position.

*** The Slot Frequency control provides an extremely sharp adjustable slot or hole in the selectivity curve (see Figure 6). It is normally located outside of the passband of the 2nd IF (455 Kcs). It

is brought into the passband for the purpose of eliminating interference from heterodyne signals on AM and monkey chatter on SSB. On CW Reception, the slot filter will materially aid in reducing or eliminating adjacent or co-channel interference.

**** The slot depth control is actually a very gradual vernier adjustment. In view of this its effect will not be very noticeable unless the proper procedure is employed. The suggested procedure is as follows:

Tune in a crystal calibrator point.

After tuning in the constant carrier and peaking on the S meter, rotate the slot frequency control. It will be noticed that upon approaching the zero setting, the S meter reading will be affected. A very definite null or minimum S meter reading will be obtained with the slot frequency control adjnated at or near zero. Observe this S meter reading. With the slot frequency control set at the minimum S meter reading position, the slot depth control located inside the cabinet on a bracket behind the slot frequency control should be rotated very slowly throughout its range, observing the S meter. It will be found that adjustment of the slot depth control will produce a further reduction in the S meter reading. Once this setting has been obtained, the slot depth control may be left permanently in this position, and all future slot filter adjustment made by the slot frequency control only. A check of the slot depth control setting may be advisable periodically.

CAUTION

When tuning the receiver across any band, make certain that the Slot Frequency control is at the 5 Kcs position, not on "0". Otherwise the center of the desired signal will be nulled.

***** A feature of the audio system is the variable negative feedback employed. Maximum feedback is provided at low settings of the Audio Gain Control for the best quality reception of strong signals. As the Audio Gain Control is increased, the feedback decreases to provide additional selectivity by the audio system for reception of weak signals. This results in an increased signal to noise ratio. A further advantage is the critical damping of the speaker for elimination of speaker "bangover". This upgrades the reception of speech and decreases receiver output noise. Another advantage is the reduction of distortion at low settings of the Audio Gain Control.



CODE SIGNAL RECEPTION

For CW code reception the position of the controls nominally should be as follows:

- Function Switch CW-SSB
- Send-Receive-Cal Switch Receive
- Selectivity Switch *3 Kcs or less
- Sideband Switch *Both
- Vernier Tuning Control 0
- Band Spread Tuning Control As required
- Beat Frequency Oscillator Control Adjust to desired pitch
- Slot Frequency Control Counter Clockwise

- Slot Depth Control see AM Reception
- Cal Set Control As required
- RF (Sensitivity) Control Adjust to desired level
- AF (Gain) Control Adjust to desired level
- Tuning Range Switch Set to desired frequency range
- Main Tuning Control Tune for highest "S" meter reading
- Antenna Trimmer Tune for highest "S" meter reading
- AVC Time Constant Adjust as desired
- Noise Limiter Level Off
- Timer Switch On

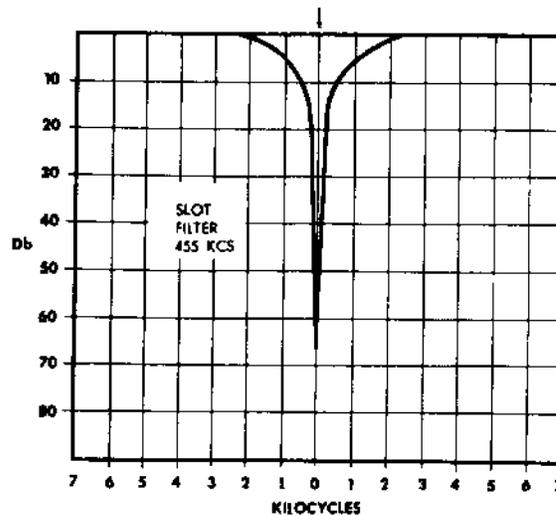


Figure 6. Slot Filter Response Curve

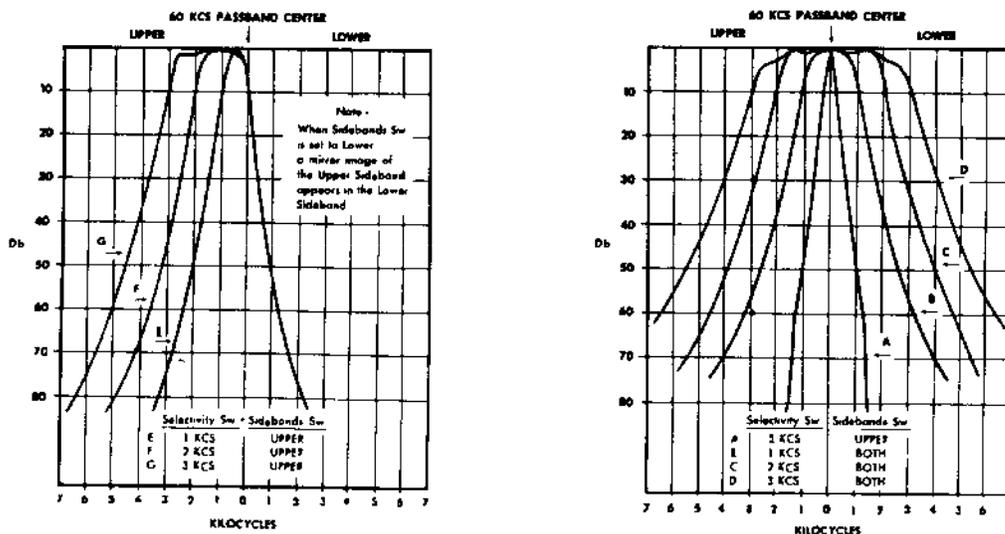


Figure 7. IF Passband Response Curves



.5 Kc SELECTIVITY POSITION

Whenever the .5 kc Selectivity switch position is employed, for best results the side band switch should be in the lower side band position. Since this band width is only usable on CW, the HFO pitch or frequency control should always be plus or minus approximately .5 kc for best CW performance.

SINGLE SIDE BAND RECEPTION

For SSH reception the position of the controls nominally should be as follows:

Function Switch CW-SSB
 Send-Receive-Cal Switch Receive
 Selectivity Switch 2 or 3 Kcs

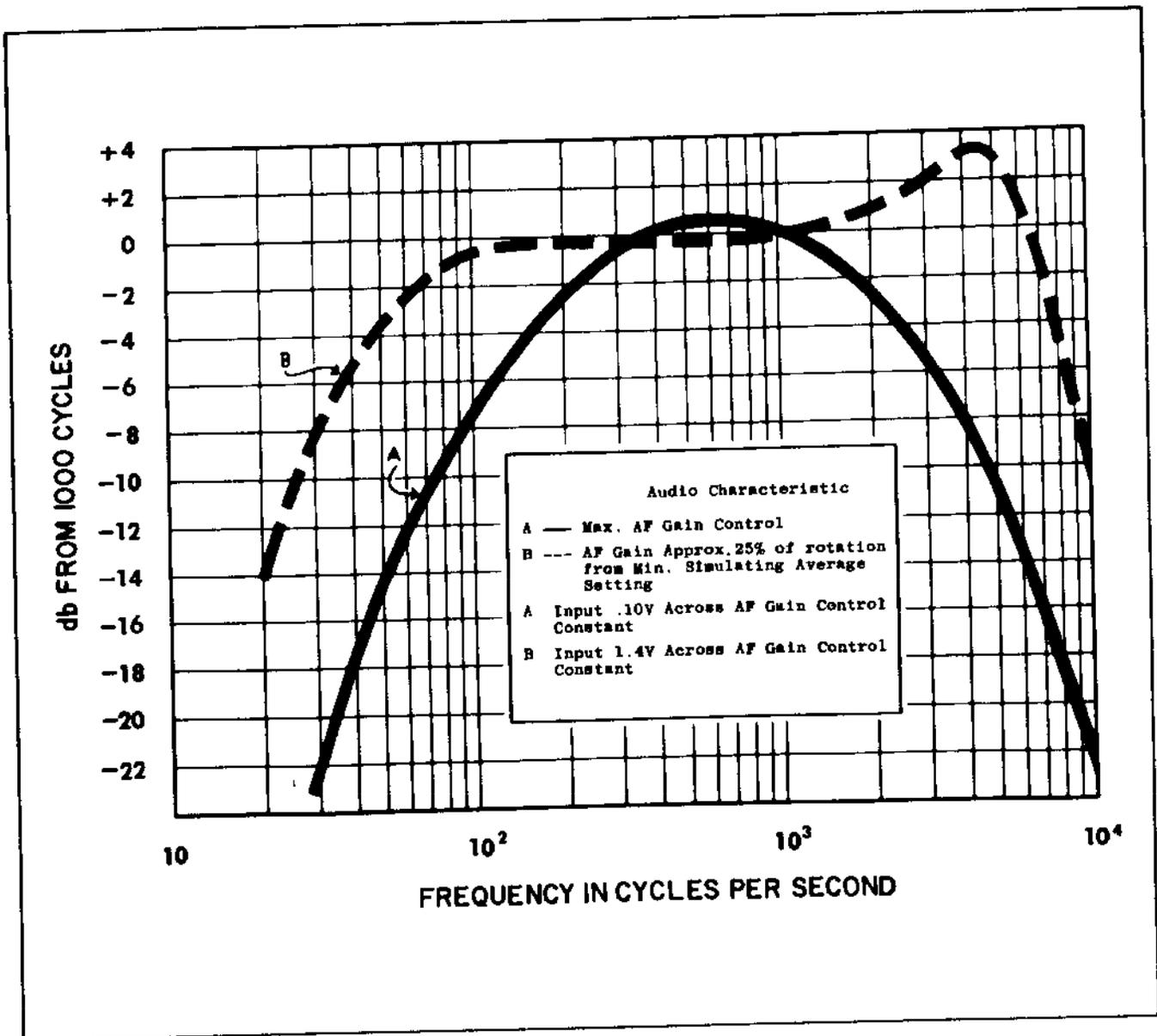


Figure 8. Auto-Response Curve



Vernier Tuning Control	Adjust to zero in signal
Sideband Switch	Adjust for U or L
Band Spread Tuning Control ..	Adjust to Zero in Signal
Heat Frequency Oscillator Control	0
Slot Frequency Control	Counter clockwise
Slot Depth Control	see AM Reception
Cal Set Control	As required
RF (Sensitivity) Control	Adjust to desired level
AF (Gain) Control	Adjust to desired level
Tuning Range Switch	Set to desired frequency range
Main Tuning Control	As required
Antenna Trimmer	Tune for highest "S" meter reading
AVC Time Constant	Adjust to suit signal
Noise Limiter Level	Off
Timer Switch	On

The procedure for tuning in an SSH signal is relatively easier with this receiver than many other receivers which depend upon rotation of the BFO knob for "zeroing in". With the controls adjusted as specified above, peak the antenna trimmer for maximum output by either "S" meter or aural indication. Determine from experience the most commonly used method of sideband operation on the particular band desired. Turn sideband switch to U or L. Tune in an SSH signal using a moderate amount of RF and AF gain. SSB signals cause the "S" meter to vary rapidly from zero upward with audio modulation. Disregarding intelligibility, tune in the signal for maximum loudness. Then adjust the vernier tuning for optimum intelligibility. The vernier tuning having a planetary drive system, is most useful for the critical tuning of SSH signals. It will shift the frequency of the received signal within the passband as indicated on the front panel.

HOW TO CHECK THE DIAL CALIBRATION

The send-receive-calibrate switch is set to the CAL position and all other controls should be set as listed under Code Signal Reception. With the BFO control set at 0 the main dial is tuned to produce zero beat at multiples of 100 kcs, (.1 mcs), in the desired band. The calibration should be within one half of one dial division. If the calibration error exceeds this at the alignment frequencies, indicated in Figure 9, adjustments should be made in accordance with the procedure given under RF ALIGNMENT.

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.

CALIBRATOR ALIGNMENT

The crystal calibrator is factory adjusted to zero beat with the National Bureau of Standards Radio Signal emanating from WWV. If minor adjustment is determined to be necessary to re-zero the calibrator, tune in a strong signal on any one of the WWV frequencies and zero-beat the calibrating oscillator with WWV by slowly rotating the ceramic trimmer C50 at the top rear of the chassis.



TELECHRON AUTOMATIC TIMER

If your receiver is equipped with the built-in Telechron Automatic Clock-Timer, the following instructions should be noted:

Every Radio-frequency device is stable only at pre-determined operating temperatures. In order to eliminate waiting for the receiver to warm-up to operating temperature, the Telechron Timer automatically turns on the receiver ahead of anticipated operating time. This is accomplished by setting the band of the timer (small knob at the rear of the clock) to approximately one-half hour before operating time. The front panel control under the Clock-Timer is then set to "auto" position. The function switch is set to "Rec" and the R.F. gain is advanced to power "on". The receiver is then automatically turned on at the desired (preset) time. If the function switch is set to "Send" instead of "Rec." the receiver will automatically be turned on and will be in the standby position.

The clock hands are set by the rear knob. "Push-in" and turn the knob to set the switch timing hand; and "Pull-out" and turn the knob to set the clock hands. The front switch is set to "Auto" only when it is desired to use the automatic clock switch for pre-warming the receiver before operation or for use as an alarm to turn the receiver on to a pre-tuned station. To use the function switch normally, the clock switch should be left in the "ON" position.

The clock will continue to run as long as the receiver line cord is connected to the power outlet, and is extremely useful for checking sign-in periods and schedules.

If your receiver is not equipped with the Telechron Automatic Clock Timer, and you would care to have the accessory added, the Clock Kit with full instructions may be purchased from your local Hammarlund dealer. (See Parts List for Part Number).

CIRCUIT THEORY

The HQ-180 is a triple conversion superheterodyne receiver (double conversion from .54 to 7.85 mc.) Eighteen tubes are used including the Rectifier and Voltage Regulator of the self-contained power supply. The circuitry of the receiver includes a 100 kcs crystal calibrator, selectable sideband control, adjustable bandwidth (.5 to 6 Kcs) control, slot filter and depth control, adjustable AVC Decay Time constant, an effective noise limiter and a tuning control provided with expanded scales for the 10 through 80 meter amateur bands. In addition a micro accurate vernier tuning control is provided.

PRE-SELECTION

The antenna input coupling and RF amplifier stage provide the necessary preselection and gain for high performance and rejection of undesired signals. The high signal level at the mixer grid, V2, contributes to a favorable signal-to-noise ratio.

Both grid and plate circuits of the RF stage are tuned; individual tuning coils are selected for each band.

The antenna compensation capacitor, adjustable from the front panel, permits the receiver to be resonated for optimum performance with the particular antenna in use.

MIXER STAGE

A high degree of oscillator stability is attained by the use of a separate mixer (6BE6) V2, and an independent oscillator (6C4) V12.

The output signal from the RF amplifier V1, is heterodyned with the output of the high frequency oscillator V12, and electronically combined within the mixer tube V2. From .54 to 7.85 mc the HF oscillator is located 455 Kcs above the signal frequency. From 7.85 to 30 mc the HF oscillator is 3035 Kcs above the signal frequency.

When operating the 7.85 to 30 mc bands, the difference frequency of 3035 kcs is fed through a crystal filter and is heterodyned with the 2580 kcs crystal controlled oscillator in the converter tube V3, to produce 455 kcs, 2nd IF. When the Band Selector switch indicates .54 to 7.85 mc the converter tube ceases to function and the gate tube V18 becomes a regular 455 kcs IF amplifier.

Low-loss ceramic tube sockets, temperature compensating capacitors, and stable, coaxial trimmers, all contribute to the oscillator's stability. Additional frequency stability is attained by applying regulated voltage to the oscillator circuit and by the rugged constructional design of the entire HF oscillator section.

455 KCS IF AMPLIFIER

The output of the converter V3, or gate V18 is fed into a single stage 455 kcs IF Amplifier. The gain of this amplifier, V4, is controlled by one section of the RF (Sensitivity) gain control.

The output circuit of this stage consists of two IF transformers, T4 and T5, which are interconnected by a means of a network of resistors, capacitors and



coils comprising the Slot Filter section. This network forms a balanced bridge arrangement known as Hillier "T" Trap, providing high attenuation of an undesired signal within the passband of the receiver. Relative balance is controlled by the Slot Depth potentiometer R26.

2ND CONVERTER STAGE

The second converter stage contains its own variable oscillator. The variable tuning capacitor, C-156 is connected across the oscillator tank circuit. High stability is achieved by using a high C to L ratio in the tank circuit and by using silver mica capacitors.

60 KCS IF AMPLIFIER STAGES

The three stage 60 Kcs IF Amplifier V6, V7 and V8 incorporates six high-Q tuned circuits which are capacitively coupled and separately shielded. High Q tuned circuits with the addition of ferrite shielding provide long time stability and freedom from external fields.

The tuned circuits are staggered in a multiplicity of combinations which are selectable by means of the selectivity and sideband switch selectors. The overall response curves in the various positions are shown in Figure 3.

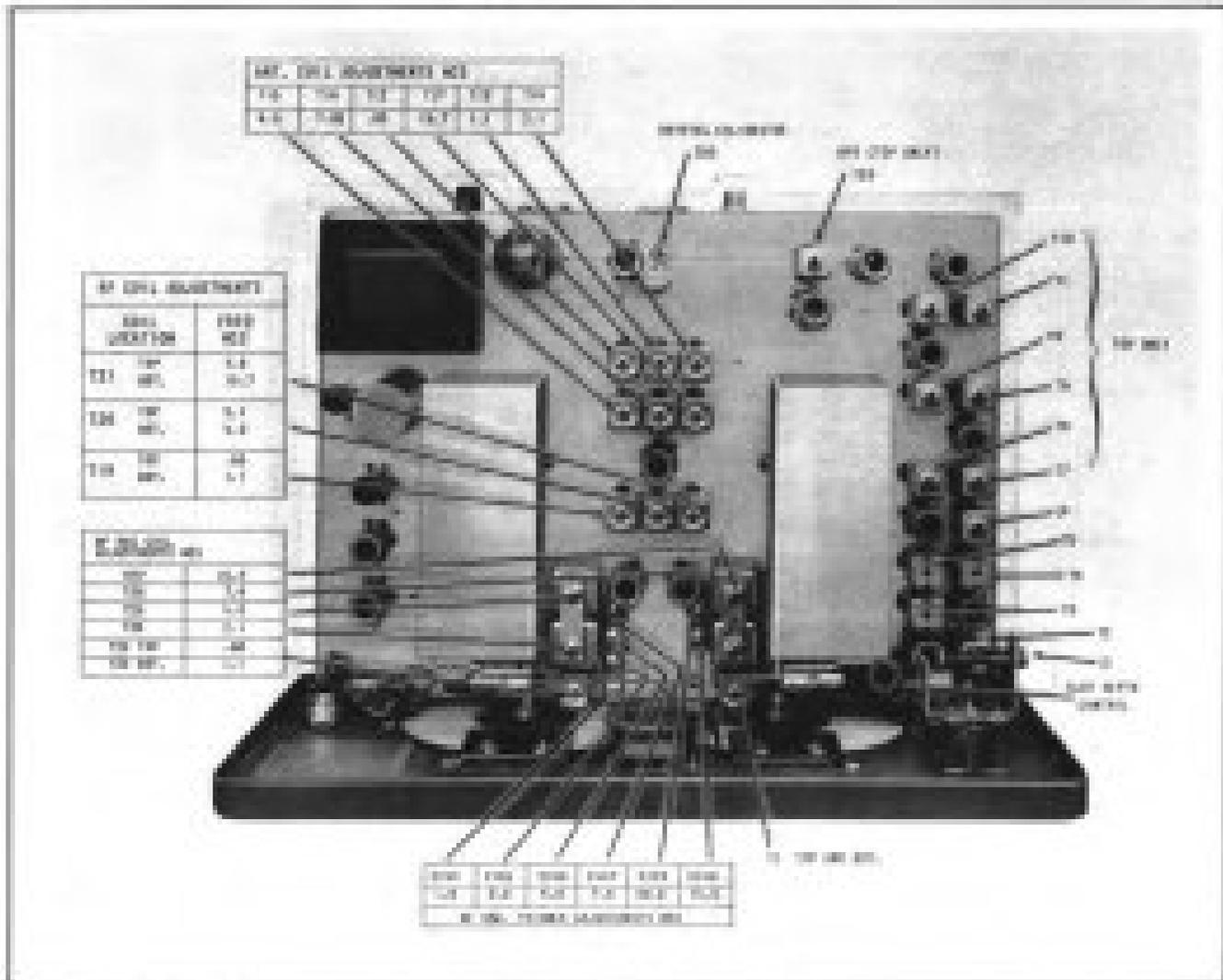


Figure 5. Top View of Chassis



AVC SYSTEM

Automatic Volume Control minimizes fading and signal strength variations by controlling the gain of the RF stage V1, 455 Kcs IF stage V4, 2nd Converter Stage V5, and the first 60 Kcs IF stage V6. As a result, a comfortable and constant audio level is maintained. The fast attack (charge) and adjustable decay (SLOW-MEDIUM-FAST) can be used for the three types of signals received. The AVC voltage for the IF amplifier V1, is provided with a delay voltage. This prevents the AVC from operating on the RF Amplifier on extremely weak signals, thus maintaining maximum sensitivity and signal to noise ratio.

"S" METER (Carrier Level)

The "S" or tuning meter is provided to assist in tuning and to give an indication of relative signal strength. The "S" meter is connected in the well-known highly stable balanced bridge meter circuit and utilizes the current amplification of one half section of V13 (12 AU7). The input to the "S" meter circuit is connected to the separate AVC GAIN section of V8 (6BY6) and gives an indication of signal strength on all positions of AVC. However, the "S" meter calibration is valid only with the IF Gain control at maximum.

The meter which is calibrated to 40 db over 50, is factory adjusted so that a signal input of approxi-

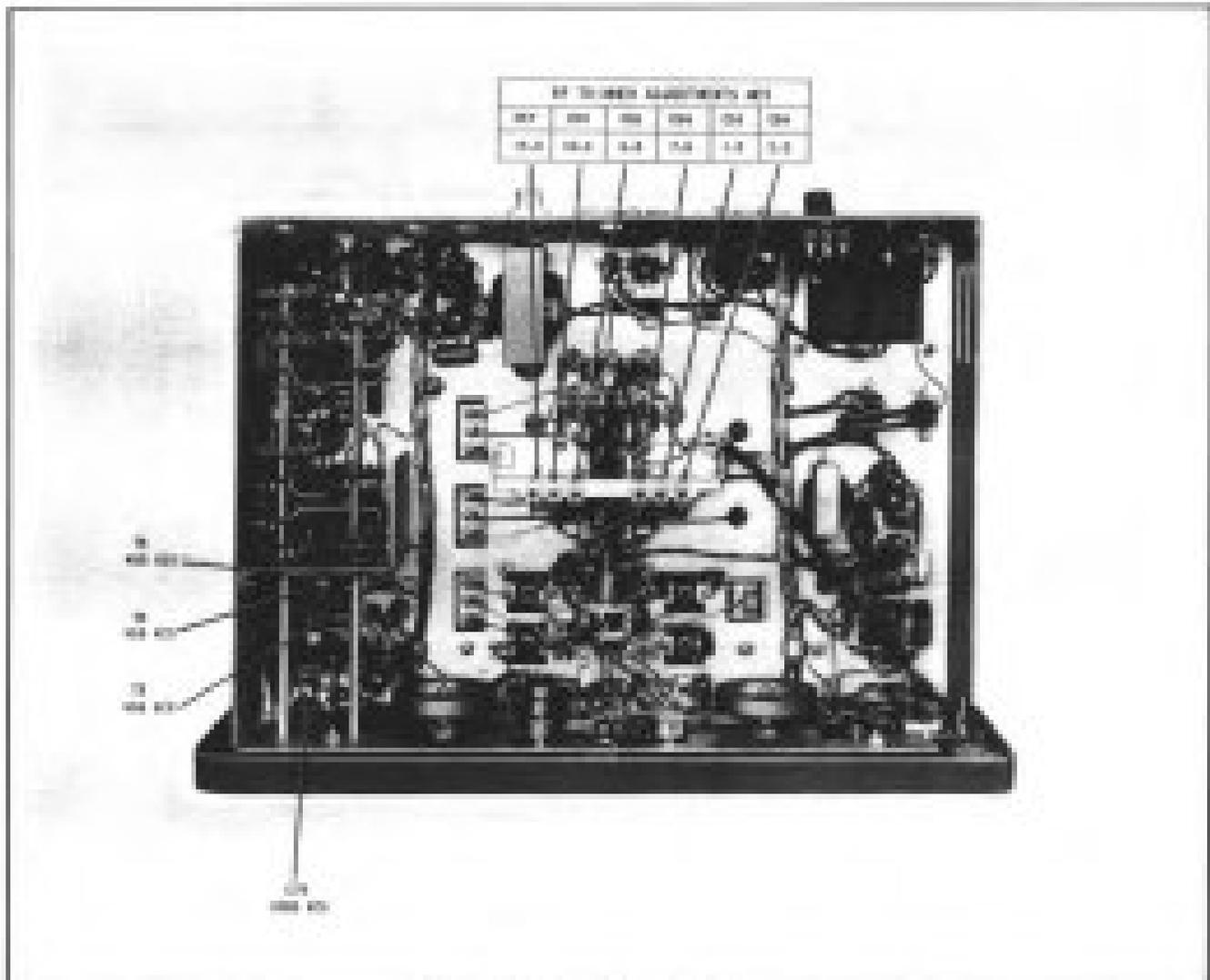


Figure 10. Bottom View of Chassis



mately 50 microvolts gives a reading of S-9. Each "S" unit indicates approximately a 6 db increase equivalent to doubling signal strength.

DETECTOR-NOISE LIMITER SYSTEM

The double diode sections of V8 (6BV8) comprise two AM diode detector circuits; one for use with the AVC and meter system, and the other for detection of AM signals. This system produces minimum distortion.

When the Reception switch is turned to SSB/CW, the AM diode detector is disabled and the 60 Kcs IF Signal is fed into the product detector tube V9 (12AU7). Simultaneously, the BFO (1/2 section of V13) is turned on and is coupled to the product detector, V9 (pin 7).

The best means of detection of SSB signals is with the double-triode product detector circuit. It recovers the intelligence from the RF signal with the least amount of distortion under large variation of input signal strength.

Tube V10 (6AL5) functions as an adjustable positive and negative noise pulse-clipping limiter.

BEAT FREQUENCY OSCILLATOR

The Beat Frequency Oscillator control C129 varies the tuning of the 60 Kcs Beat Frequency Oscillator (1/2 of 12AU7-V13) over a range from zero beat to plus or minus 2 Kcs. The BFO employs the well-known high stability Clapp circuit.

AUDIO AMPLIFIER

The first audio stage V16 (6AV6) is a resistance coupled voltage amplifier. The audio output stage V17 (6AQ5) is a beam power amplifier, providing an undistorted output of at least one watt.

A feature of the audio system is the variable negative feedback employed (see Auto Response Curve, Figure 8). Maximum feedback is provided at low settings of the Audio Gain control for fine quality reception of strong stations.

As the Audio Gain control is increased, the feedback decreases so that on reception of weak signals additional selectivity is provided by the audio section. This results in an increased signal to noise ratio. A further advantage is the critical damping of the speaker for elimination of speaker "hangover". This upgrades the reception of speech and music and decreases the noise output of the receiver. Still

another advantage is the reduction of distortion at the lower settings of the Audio Gain Control.

SERVICE AND ALIGNMENT PROCEDURE

The HQ-180 is designed to give years of trouble-free service. Tube failure is the most common source of trouble. The second most common cause of difficulty is component failure among small resistors and fixed capacitors.

The tube voltage and resistance tables give normal values when measured between tube socket pins and chassis with a vacuum tube volt-ohmmeter. Slight variations in the order of 10% from indicated values should be disregarded.

With the aid of the tables, schematic circuit diagram and photographs, components can usually be located. The parts listing in the back pages of this manual gives component values and Hammarlund part numbers. Standard items may be purchased locally, non-standard components are available on order from the factory.

A sensitive communications receiver should be entrusted only to a qualified technician. Should difficulty be experienced, please write Hammarlund Manufacturing Company for advice or to arrange for factory service.

All alignment adjustments have been carefully made at the factory and should require only a minimum amount of adjustment for any realignment except where replacement of tuned circuit components are necessary.

NOTE

Before servicing this receiver, disconnect from the power source and remove all lead wires attached to terminal connections located at the rear of the chassis apron. Carefully turn the receiver onto its front panel face on a smooth clean surface (preferably a soft cloth). Remove the three No. 10 hex head machine screws which fasten the chassis to the rear of the cabinet. Remove the No. 10 hex head machine screw from the bottom of the cabinet at the front center. Lift the cabinet straight up and off the chassis. To re-assemble, reverse this procedure.



IF ALIGNMENT

NOTE

Two non-metallic alignment tools are required for complete alignment:

General Cement Co., No. 5097, or equal.

General Cement Co., No. 8282, or equal.

A thin blade alignment screw driver for HF oscillator and RF trimmer adjustments. Unless otherwise specified, all front panel controls shall be positioned as follows for the complete alignment of the receiver:

KNOB FUNCTION	NOMINAL POSITION
Band Selector	7.85 - 15.35 mc hand
Band Spread Tuning Dial (arbitrary).....	100
AM/SSH/CW Selector	AM
Side Band Selector	L
Selectivity Selector5 Kcs
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

NOTE

The receiver should be warmed up for a period of at least 1/2 hour before proceeding with alignment.

Connect the output cable of a 60 kcs unmodulated signal generator known to be accurate, to the junction of C28 and T5 and the chassis. Connect a dc vacuum tube voltmeter between the junction of L8 and C44 and the chassis. Peak transformers T6, T7, T8, T9, T10 and T11 for maximum negative D-C volts. Always keep output volts in the vicinity of -4 volts D.C.

Turn the Function Switch to SSB/CW and with the BFO KCS control set at zero, adjust the BFO transformer T28 for zero beat heard in the loudspeaker, then return switch to AM.

Reduce Signal Generator output to zero and adjust the "S" meter zero position by means of the screw-driver slotted control R20 which is located on the rear apron of the chassis. Remove the generator lead and connect it to the grid (pin 7) of the mixer V2 (6BE6) and the chassis. Carefully adjust the signal generator frequency for 3035 kcs to obtain maximum vacuum tube voltmeter reading, adjusting the RF gain control and the generator output to prevent overloading and to maintain approximately -4 volts output. With the frequency of the generator undisturbed, adjust L4 for maximum output voltage and adjust the bottom and top of T3, T4 and T5 for maximum output voltage. Turn the Slot Frequency control to 0 and adjust the slot filter coil L3, located directly behind the slot frequency control, for minimum output increasing the input as necessary. Adjust the Slot Depth control for minimum output, noting its position. This position of the slot depth control will be thus found, for future use of the slot filter. Return the slot frequency control to its extreme counter-clockwise position. Note that in the above the 3035 kcs crystal, in the fixed crystal filter, determined the setting of the signal generator.

The bottom adjustment of T1 and the adjustment of T2, together with the phasing capacitor C79, constitute a 3035 kcs crystal filter circuit and are factory adjusted by sweep frequency method. These adjustments should not be disturbed unless T1 or T2 become defective and are replaced. In this case, adjust only the replaced transformer for maximum voltage output. The bottom adjustment of T1 is proper for this Frequency.

HF OSCILLATOR AND

RF ALIGNMENT

All HF Oscillator and RF core adjustments are made from the top of the shield cans. See Fig. 9. RF trimmer adjustments are made from the bottom of the chassis. See Fig. 10.

Figures 9 and 10 show the location of the adjustments and the frequencies that are to be used. Connect the unmodulated signal generator to the antenna terminal through a series composition type resistor of such value as is required to make the sum of this resistor and the output impedance of the generator equal 75 to 100 ohms. The generator output ground is connected to the ground terminal and the link closed. Turn the Band switch to the .54 to 1.05 mcs



band and the Selectivity switch to 1 kcs. 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 mcs. Set the signal generator frequency to .60 mcs. Note that the frequency accuracy of the generator may be checked by adjusting it to zero beat with the 100 kcs calibrator. Make sure that the Band spread adjustable indicator is set at the center marker and the hand spread dial is set at 100 on the 0 to 100 arbitrary scale. Adjust the top slug in T23, the top T19 and T12 for maximum output voltage, adjusting the generator output and the RF control to prevent overloading and to maintain approximately -4 Volts output. Adjust the top slug in T1 for maximum output. Now set the main dial to 1.0 mcs and the generator frequency to 1.0 mcs and adjust C144, C53 and the Antenna control for maximum output, using the same precautions as above for checking frequency accuracy of the generator and to prevent overloading. 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 either end of this range, re-set it as required and adjust T12 as found necessary to keep it within range. Since the adjustments at each alignment frequency of the hand 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.

The other frequency bands are aligned, using the same procedure as above, merely following specified frequencies and adjustments, given in Figures 9 and 10.

"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 warmup.
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.



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 6BY8	5	0	235	0	--	- .24	0	0	-4
V9 PRG 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 AP 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	10	11	12	13	14	15	16	17	18
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 IP 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 IP AMP 6BA6	1.47 MEG	0	--	0	19K	61K	68	--	--	--	--	--	--	--	--	--	--	--
V7 IP AMP 6BA6	470K	0	--	0	20K	50K	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	--	--	--	--	--	--	--	--	--	--	--



PARTS LIST HQ-180

SCHEMATIC DESIGNATION	DESCRIPTION	HAMMARLUND PART NO.
CAPACITORS		
C1, A-C	Variable, Main Tuning	P-26469-1
C2, A-I	Variable, Band Spread Tuning	P-26470-1
C3, C8, C31, C51, C157	Fixed, Silver Mica 100 mmf, 500 W.V.D.C.	K-23006-1
C4, C5, C6, C7, C9, C28	Fixed, Ceramic Disc .01 mfd, 600 W.V.D.C.	M-23034-19
C10, C11, C15, C17, C18, C21, C32, C41, C47, C75, C76, C124, C130, C133, C135, C139, C141, C152	Fixed, Ceramic Disc .02 mfd, 600 W.V.D.C.	M-23034-9
C12, C83, C36, C39, C40, C46, C136, C137	Fixed, Silver Mica, 20 mmf, 500 W.V.D.C.	K-23006-17
C13, C89, C97, C111, C113, C120, C123	Fixed, Silver Mica, 560 mmf, 500 W.V.D.C.	K-23027-6
C14	Fixed, Silver Mica, 3mmf 500 W.V.D.C.	K-23006-18
C16, C83, C101, C103, C114	Fixed, Ceramic Disc, .04 mfd, 600 W.V.D.C.	K-23034-12
C19, C20, C85	Fixed, Ceramic Disc, .01 mfd, 10%, 1000 W.V.D.C.	K-23034-25
C22, C27	Fixed, Silver Mica, 15 mmf, 300 W.V.D.C.	K-23006-25
C23	Fixed, Silver Mica, 1200 mmf, 500 W.V.D.C.	K-23027-4
C24	Fixed, Mylar, .033 mfd, 200 W.V.D.C.	K-23044-1
C25	Variable, Slot Tuning	K-42041-1
C26	Fixed, Silver Mica, 7 mmf 500 W.V.D.C.	K-23006-24
C104, C110, C115, C117, C122	Fixed, Silver Mica, 780 mmf, 500 W.V.D.C.	K-23006-39
C29	Fixed, Silver Mica, 47 mmf, 300 W.V.D.C.	K-23006-47
C30, C63, C64, C78, C149	Fixed, Silver Mica, 24 mmf, 500 W.V.D.C.	K-23006-7
C34, C37	Fixed, Ceramic Disc, Temp Comp. 330N750	K-23010-9
C35	Fixed, Ceramic Disc, 500 mmf, 1000 W.V.D.C.	K-23034-13
C39, C42	Fixed, Silver Mica, 10 mmf, 500 W.V.D.C.	K-23006-8
C43	Fixed, Ceramic Disc, .002 mfd, 1000 W.V.D.C.	M-23034-18
C44, C45	Fixed, Dur-Paper, .1 mfd, 200 W.V.D.C.	K-23045-3
C48, C87, C131	Fixed, Dur-Paper, .047 mfd, 400 W.V.D.C.	K-23045-2
C49, C85, C105	Variable, Calibrator, 8-50 mmf	K-23038-5
C50	Variable, Antenna Tuning	K-34454-G24
C52	Variable, Mica Trimmer, 1.5-20mmf	K-23043-6
C53, C54, C55, C56, C57, C58	Fixed, Ceramic Disc, Temp. Comp. 27N470	K-23010-26
C59	Fixed, Ceramic Disc, Temp. Comp. 27N220	K-23010-25
C60	Fixed, Ceramic Disc, Temp. Comp. 27N470	K-23010-23
C61	Fixed, Ceramic Disc, Temp. Comp. 27N750	K-23010-24
C62	Fixed, Silver Mica, 60 mmf, 300 W.V.D.C.	K-23006-51
C65	Fixed, Silver Mica, 85 mmf, 500 W.V.D.C.	K-23006-3
C66	Fixed, Silver Mica, 150 mmf 300 W.V.D.C.	K-23006-53
C67	Fixed, Silver Mica, 220 mmf, 500 W.V.D.C.	K-23006-10
C68, C80	Fixed, Silver Mica, 180 mmf, 300 W.V.D.C.	K-23006-60
C69	Fixed, Silver Mica, 333 mmf, 300 W.V.D.C.	K-23006-61
C70	Fixed, Silver Mica, 673 mmf, 300 W.V.D.C.	K-23006-57
C71	Fixed, Silver Mica 1030 mmf, 300 W.V.D.C.	K-23027-19
C72	Fixed, Silver Mica, 363 mmf, 300 W.V.D.C.	K-23006-76
C73	Fixed, Silver Mica, 438 mmf, 300 W.V.D.C.	K-23006-75
C74	Fixed, Ceramic Disc, Temp. Comp. 100N470	K-23010-30
C77	Variable, Crystal Phasing 1.5-9.1 mmf	K-23057-1
C79	Fixed, Silver Mica, 1000 mmf, 300 W.V.D.C.	K-23027-9
C81	Fixed, Electrolytic, 80-40-40-40 mfd,	K-15504-71
C82, A-D	Fixed Ceramic Disc, .01 mfd, 1400 W.V.D.C.	K-23034-26
C83, C84	Fixed, Silver Mica, 31 mmf, 500 W.V.D.C.	K-23006-15
C86, C94	Fixed, Silver Mica, 29 usf, 500 W.V.D.C.	K-23006-16
C88, C90, C96, C98	Fixed, Silver Mica, 28 mmf, 500 W.V.D.C.	K-23006-19
C91, C99	Fixed, Silver Mica, 27 mmf, 500 W.V.D.C.	K-23006-20
C92, C100	Fixed, Silver Mica, 9 usf, 500 W.V.D.C.	K-23006-21
C102, C109, C118, C153	Fixed, Silver Mica, 10 usf, 500 W.V.D.C.	K-23006-22
C154, C155	Fixed, Silver Mica, 14 mmf, 500 W.V.D.C.	K-23006-25
C106	Fixed, Silver Mica, 21 mmf, 500 W.V.D.C.	K-23006-26
C107, C116	Fixed, Silver Mica, 18 mmf, 500 W.V.D.C.	K-23006-23
C108, C119	Fixed, Silver Mica, 47 mmf, 500 W.V.D.C.	K-23006-6
C112, C121	Fixed, Mylar, .01 mfd, 400 W.V.D.C.	K-23044-2
C125	Fixed, Ceramic Disc .001 mfd, 500 W.V.D.C.	K-2304-30
C126, C127	Variable, BFO, 98.5 mmf	K-42042-1
C128	Fixed, Ceramic Disc, .005 mfd, 1000 W.V.D.C.	M-23034-10
C129	Fixed, Silver Mica, 2 mmf, 500 W.V.D.C.	K-23006-37
C132	Fixed, Ceramic, Temp. Comp. 47N750	K-23061-26J
C134	Fixed, electrolytic, 20 mfd, 25 W.V.D.C.	K-23091-1
C138	Fixed, Ceramic Disc, Temp. Comp. 440N750	K-23010-27
C140	Variable, Cylindrical Trimmer, 1-8 mmf	K-23006-2
C142		
C144, C145, C146, C147, C148, C149	Fixed, Ceramic Disc, Temp. Comp. 110N750	K-23010-5
C150	Fixed, Ceramic Disc, Temp. Comp. 500N1500	K-23010-29
C151	Variable, Vernier Tuning 24uuf	K42187-G1
C156		



PARTS LIST HQ-180 (Cont'd)

SCHEMATIC DESIGNATION	DESCRIPTION	HAMMARLUND PART NO.
SPECIAL ASSEMBLIES		
CMC M1 Y1 Y2 Y3 Z1 Z2	Crystal panel, clock window Clock, Telechron auto-timer Meter "S" (carrier level) Quartz crystal, 2.580 Mcs Quartz crystal, 100.0 Kcs Crystal 3035 Kcs RC printed network (Calibrator) RC printed network (Audio)	M-38877-1 K-38874-1 K-26149-5 K-38972-2 K-38661-1 K-26481-1 K-38981-1 K-38846-1
COILS		
L1, L9, L10 L2 L3 L4 L5, L7, L8 L6	RF Choke, 2.5 millihenry Bifilar Coil Slot Filter Coil Passband Tuning Coil RF Choke, 330 millihenries Filter Choke, 8.0 henries	K-15627-1 K-42032-1 K-42034-1 K-26301-1 K-42019-1 K-26302-1
RESISTORS		
R1, R16, R41, R82, R95 R2, R9, R12, R17, R47, R62, R99 R3, R57 R4 R5, R14, R80 R6, R7, R42, R49, R65, R70 R72, R73, R75, R84, R100 R8 R10, R13, R18, R27, R36, R40, R51, R74, R106, R107 R11, R29, R97, R101 R15 R19 R20 R21 R22 R23, R44 R24 R25 R26 R28, R43, R45, R48, R68, R71 R30, R32, R37, R46, R76, R85, R91, R93, R104 R31, R33 R34 R35 R39 R50 R52 R53 R54 R55 R56 R58 R59, R63, R69 R60, R61, R66, R67 R64 R77 R78 R79 R81 R83 R86 R87, R98 R88 R89 R90 R92 R94 R96 R102 R103 R105	10K ohms, 1/2 W., 10% 1K ohms, 1/2 W., 10% 6.8K ohms, 1/2 W., 10% 10 ohms, 1/2 W., 10% 180 ohms, 1/2 W., 5% Variable, 1.5 K ohms, dual with R15 and S3 47K ohms, 1/2 W., 10% 160 ohms, 1/2 W., 5% 100K ohms, 1/2 W., 10% 22K ohms, 1/2 W., 10% Variable, 10K ohms, part of R6 Variable, 1.5K ohms, meter sens. adj. Variable, 300 ohms, meter zero adj. 22K ohms, 1 W., 10% 820 ohms, 1/2 W., 5% 1 megohm, 1/2 W., 10% 120 ohms, 1/2 W., 5% 39 ohms, 1/2 W., 5% Variable, 200 ohms, slot depth 220K ohms, 1/2 W., 10% 470 K ohms, 1/2 W., 10% 68 ohms, 1/2 W., 10% 560 ohms, 1/2 W., 10% 1K ohms, 1 W., 10% 820 ohms, 1/2 W., 10% 20 ohms, 1/2 W., 5% 10 ohms, 1/2 W., 5% 2K ohms, 10 W., ± 10% 880 ohms, 1/2 W., 10% 3K ohms, 1/2 W., 5% 15K ohms, 1/2 W., 10% 27K ohms, 2 W., 10% 2.2K ohms, 1/2 W., 10% 330K ohms, 1/2 W., 10% 270 ohms, 1/2 W., 10% 27 ohms, 1/2 W., 10% Variable, 500K ohms, limiter includes S1 Variable, 1 Megohm, Audio Gain 1.5K, 1 W., 10% 4.7 Megohm, 1/2 W., 10% 430 ohms, 1 W., 5% 470 ohms, 1/2 W., 10% 2.7K ohms, 1/2 W., 5% 6.2K ohms, 1/2 W., 5% 3.6K ohms, 1/2 W., 5% 5.6K ohms, 1/2 W., 10% 68 ohms, 1/2 W., 5% 4.7K ohms, 1/2 W., 10% 2.2 Megohm, 1/2 W., 10% 13K ohms, 1 W., 10% 11K ohms, 1/2 W., 5%	K-19309-73 K-19309-49 K-19309-69 K-19309-1 K-19309-260 K-38940-1 K-19309-89 K-19309-199 K-19309-97 K-19309-81 K-15379-2 K-15379-1 K-19310-81 K-19309-266 K-19309-121 K-19309-258 K-19309-253 K-15368-7 K-19309-105 K-19309-113 K-19309-21 K-19309-43 K-19310-49 K-19309-47 K-19309-188 K-19309-246 K-19337-5 K-19309-45 K-19309-212 K-19309-77 K-19304-52 K-19309-57 K-19309-109 K-19309-35 K-19309-11 K-15378-3 K-36218-3 K-19310-53 K-19309-137 K-19310-212 K-19309-41 K-19309-272 K-19309-176 K-19309-179 K-19309-67 K-19309-256 K-19309-65 K-19309-129 K-19310-227 K-19309-215



PARTS LIST HQ-180 (Cont'd)

SCHEMATIC DESIGNATION	DESCRIPTION	HAMMARLUND PART NO.
SWITCHES		
S1	Noise Limiter ON-OFF (Part of R78)	K-26472-3
S2A	Switch Wafer, Ant. primary	K-26472-2
S2B,C	Switch Wafer, Ant. sec. mixer grid	K-26472-1
S2D	Switch Wafer, RF Plate	K-26495-3
S2E	Switch Wafer, RF Osc Tap	K-26495-2
S2F	Switch Wafer, HF Osc. Tank	K-26495-1
S2G	Switch Wafer, Conversion Switching	
S3	AC ON-OFF (Part of R6 and R15)	K-26452-1
S4	Send-Receive-Calibrate	K-26296-1
S5	Selectivity	K-26303-1
S6	Sideband	K-42037-2
S7	AM-SSB/CW	K-26309-2
S8	AVC	
TRANSFORMERS		
T1	IF transformer, Composite Mixer Plate	K-26474-1
T2	IF transformer, Crystal Grid	K-26473-1
T3	IF transformer, 455 Kcs	K-38829-2
T4, T5	IF transformer, 455 Kcs	K-38946-1
T6, T7, T8, T9, T10, T11	IF transformer, 60 Kcs	M-42005-1
T12	Antenna transformer, .54 to 1.05 Mcs	K-26455-1
T13	Antenna transformer, 1.05 to 2.05 Mcs	K-26456-1
T14	Antenna transformer, 2.05 to 4.04 Mcs	K-26457-1
T15	Antenna transformer, 4.0 to 7.85 Mcs	K-26458-1
T16	Antenna transformer, 7.85 to 15.35 Mcs	K-26459-1
T17	Antenna Transformer, 15.35 to 30 Mcs	K-26460-1
T19	RF transformer, .54-1.05 and 1.05-2.05 mcs	K-26461-1
T20	RF transformer, 2.05-4.04 and 4.0-7.85 scs	K-26462-1
T21	RF transformer, 7.85-15.35 and 15.35-30 mcs.	K-26463-1
T22	Osc Coils 1.05 and 1.05 to 2.05 Mcs	K-26464-1
T24	Osc Coil 2.05 to 4.04 Mcs	K-26465-1
T25	Osc Coil 4.0 to 7.85 Mcs	K-26466-1
T26	Osc Coil 7.85 to 15.35 Mcs	K-26467-1
T27	Osc Coil 15.35 to 30 Mcs	K-26468-1
T28	BFO transformer, 60 Kcs	K-42005-4
T29	Audio Output transformer	K-38828-1
T30	Power Transformer 117 V.A.C.	P-26305-1
T30E	Power transformer 115-230 V Export Model	P-26305-2
MISCELLANEOUS		
E1	Fuse, holder	K-15923-1
F1	Fuse, 3 Amp. type 3AGC	K-15928-6
I1, I2, I3	Lamp, pilot No. 47, 6.3 V. .15A	K-16004-1
J1	External Relay Receptacle	K-35013-1
J2	Phone Jack	K-35608-1
J3	Antenna Connector, SO-239	K-16111-1
OPTIONAL ACCESSORIES		
	Telechron Clock Assembly Conversion Kit including instructions for converting model HQ-180 to Model HQ-180C	PL-26380-G1
	Loudspeaker assembly in cabinet matched to the Models HQ-180, HQ-180C and HQ-180E	PL-26394-G1

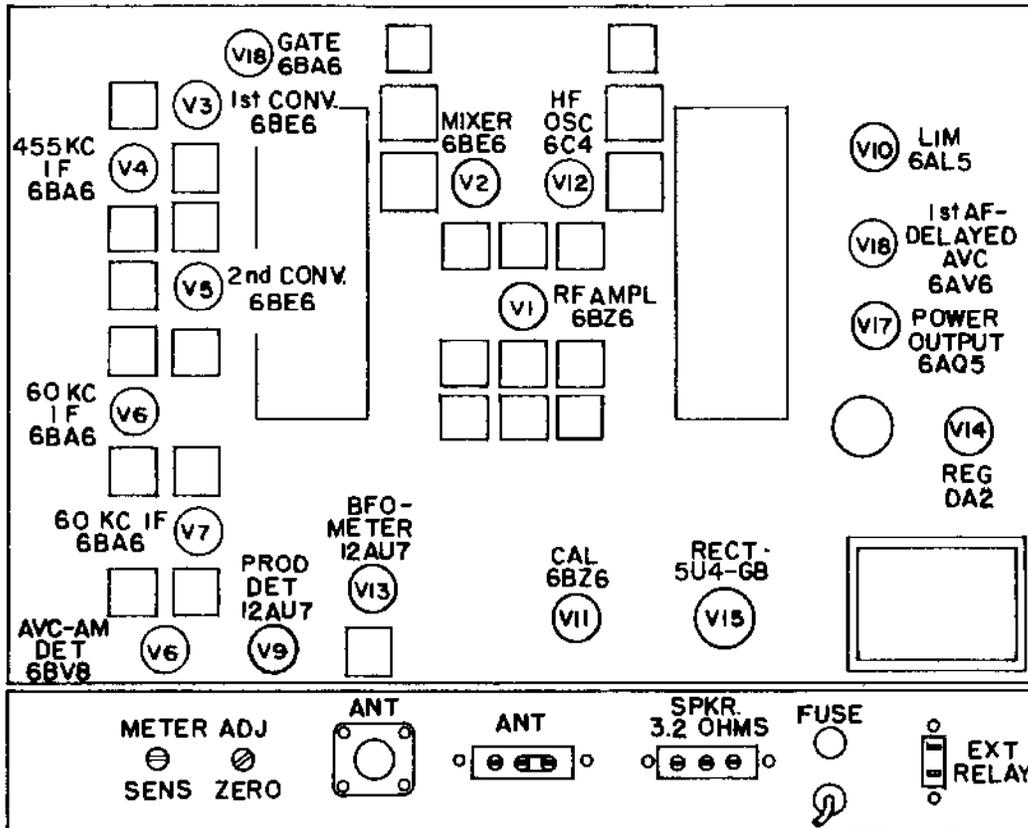
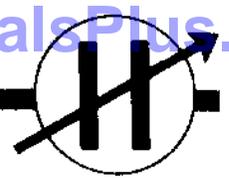


Figure 11. Tube Location Diagram

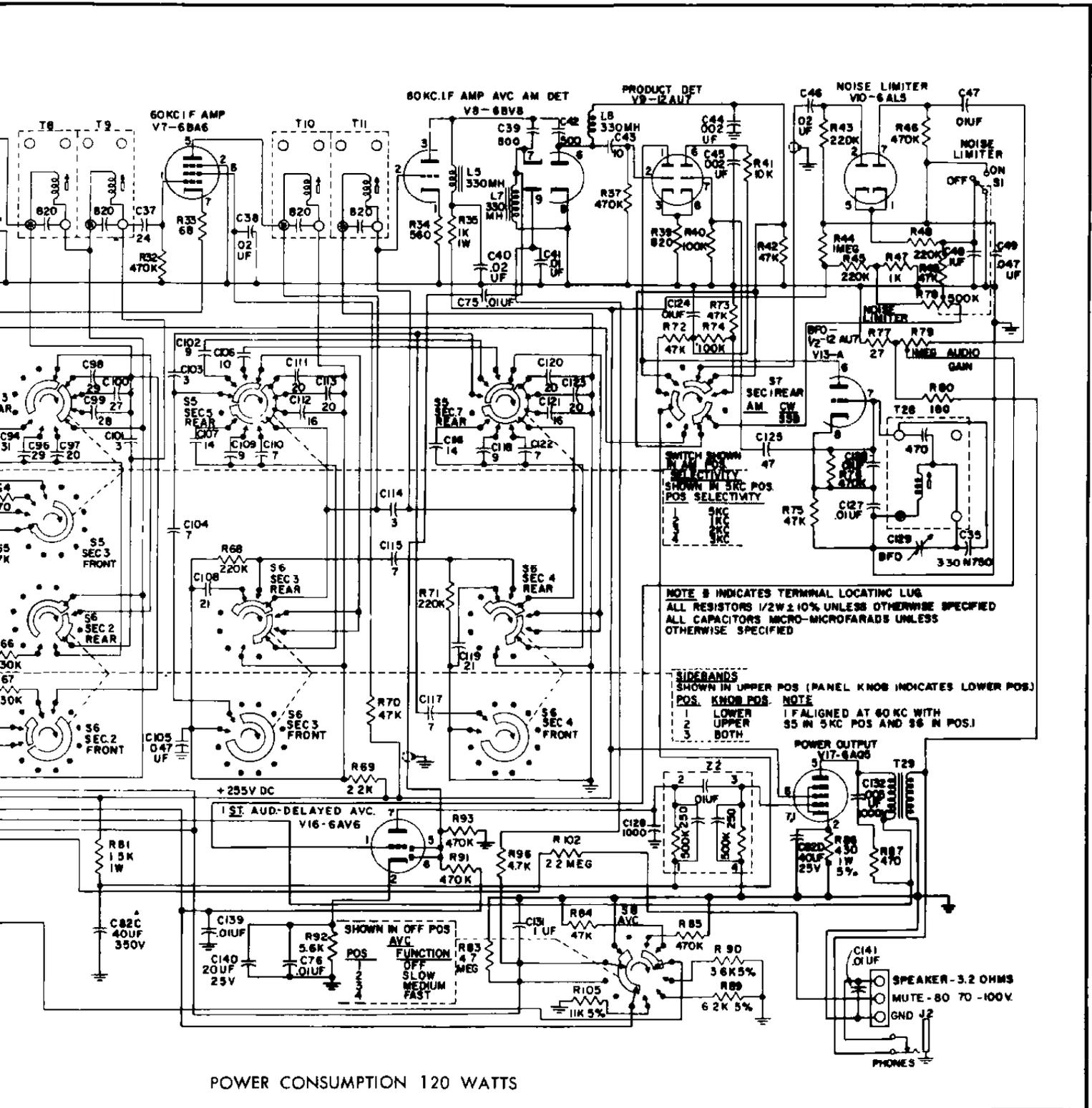


Figure 12. Hammarlund HQ-180 Communications Receiver, Schematic Diagram

