

**HQ-105TR
COMMUNICATIONS
TRANSCEIVER**

**TECHNICAL
DESCRIPTION
AND
OPERATING
INSTRUCTIONS**

HAMMARLUND

The Hammarlund Manufacturing Co., Inc.
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International Division: 13 East 40th Street, New York 16, N. Y.



Figure 1. The HQ-105TR Receiver

TUBE COMPLEMENT

Symbol	Type	Tube	Function
V1	6BZ6	Pentode	RF Amplifier
V2	6BE6	Pentagrid Converter	Mixer
V3	6C4	Triode	HF Oscillator
V4A	1/2 12AX7	Triode	Q Multiplier
V4B	1/2 12AX7	Triode	Mic Pre-Amp
V5	6BA6	Remote Cutoff Pentode	First IF Amplifier
V6	6BA6	Remote Cutoff Pentode	Second IF Amplifier
V7	6BV8	Twin Diode, Triode	DET. AVC. Series Noise Limiter, BFO
V8	6BM8	Triode, Pentode	Audio Power Output, First AF Amp.
V9	OB2	Gas Filled Diode	Voltage Regulator
V10	6CA4	Twin Diode	Rectifier
V11	6CX8	Triode, Pentode	Crystal Osc. - RF Power Amp.



INTRODUCTION

The Hammarlund HQ-105TR is an all new transceiver representing entirely new concepts in electrical and mechanical design. It will provide years of top performance with minimum maintenance. The HQ-105TR has a self contained power supply operating from 60 cps, 105-125 volt AC source. The HQ-105TR-C incorporates a 24 hour telechron automatic clock timer in its design. The export model, the HQ-105TR-E will operate from a 50-60 cps, 115-230 volt AC source. Because of the power supply operating frequency of the export model, the automatic clock timer is not incorporated in this model.

The HQ-105TR contains a superhetrodyne receiver with a frequency coverage continuously tunable from 540KCS to 30 MCS with extremely fine control in separation of crowded signals. A very high signal-to-noise ratio plus the famous Hammarlund noise limiter circuit, permits full use of the receiver's excellent sensitivity on the weakest signals. A Q-Multiplier is provided for varying the selectivity of the receiver and eliminating interference from adjacent signals.

The HQ-105TR includes a built-in crystal controlled transmitter for use on the class "D" Citizen Band channels or on the ten meter amateur band. It is supplied complete with one Citizens Band crystal. To comply with regulations, maximum transmitter power is limited to five watts. Electrical bandsread tuning is provided with direct calibration every 10 KCS on the 80, 40, and 20 meter bands; every 20 KCS on the 15 meter band and every 50 KCS on the 10 meter band. In addition an arbitrary bandsread logging scale is provided for use throughout the tuning range of the receiver, as well as calibration for all the Citizen Band channels. Red markers on the main tuning dial scale indicate wherein the majority of the international short wave stations may be found.

A new audio output circuit feature is the Auto-Response which automatically narrows and widens the frequency range of the audio output, depending upon the gain required. This feature permits the receiver to be used as a high fidelity receiver on stronger signals, while providing the sharp cut-off required in receiving communications signals. 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. A speaker terminal is provided at the rear in order to connect a suitable speaker such as the S-100. A headphone jack is also provided for low impedance phones. Fast acting AVC maintains a constant audio level. Adequate filtering practically eliminates AC power ripple.

The HQ-105TR is equipped with a stable beat frequency oscillator provides the operator with a continuous range of audio tones when receiving telegraph, code signals, or for excellent sideband reception.

An S meter is provided to obtain accurate readings on received phone signals and to assure "on the nose" tuning. The meter functions as a relative power output indicator in the transmit position. A send-receive switch is provided on the front panel to activate the transmitter. Push-to-talk operation is also available for use with the built-in transmitter.

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

The HQ-105TR was designed with you in mind. You'll have many hours of pleasure and use in operating this truly fine communications instrument.

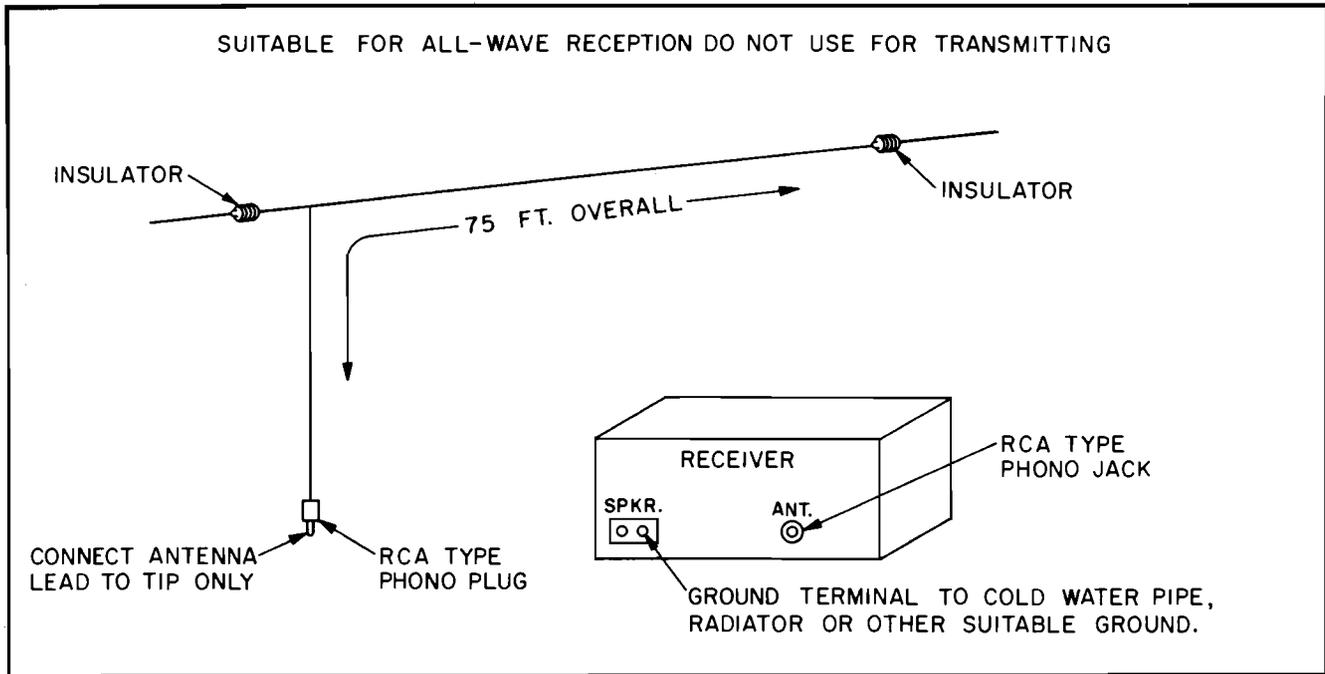


Figure 2. Installation of Single-wire Antenna

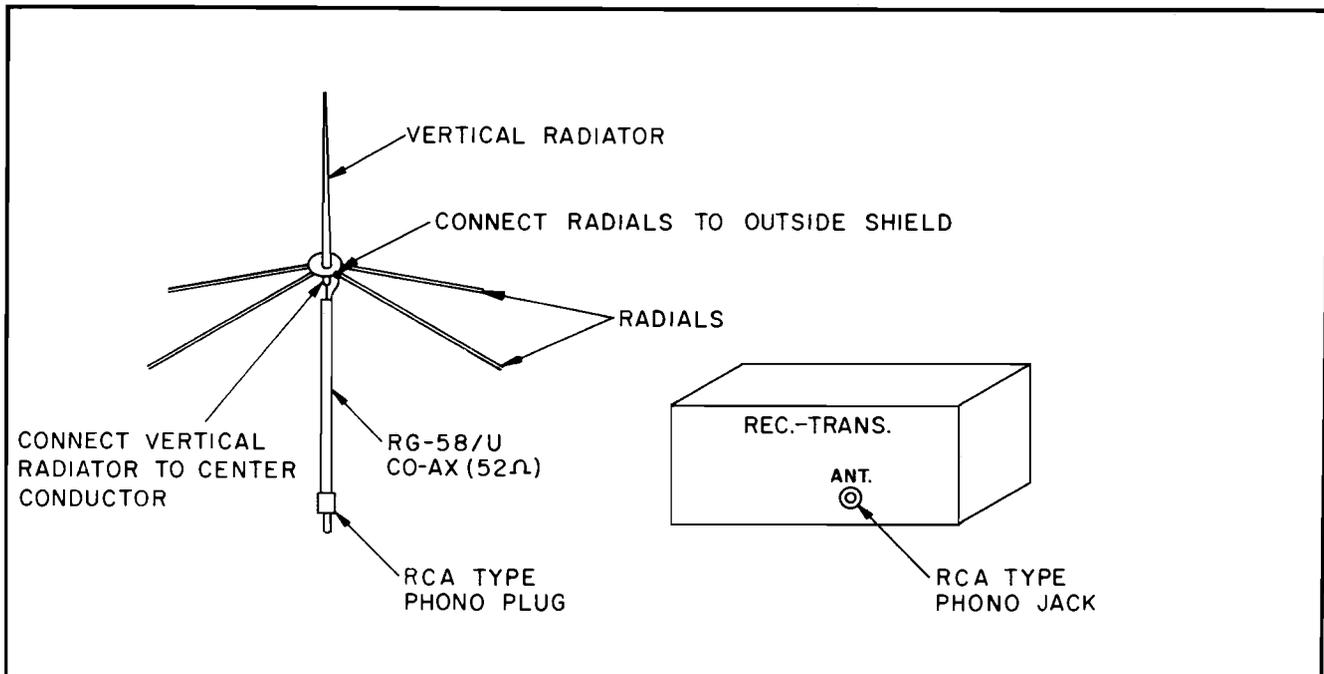


Figure 3. Installation of Ground Plane Antenna



CITIZENS RADIO LICENSE

DO NOT TRANSMIT WITH YOUR EQUIPMENT UNTIL YOU HAVE RECEIVED YOUR LICENSE FROM THE F.C.C. Illegal operation can result in severe penalties

F.C.C. will only issue a Citizens Radio License, Class D for 2 or more equipments since except under circumstances where an individual may be part of a group, the essential purpose of this license is to provide communication between a fixed station and one or more mobile units; between 2 or more mobile units; or between 2 or more fixed stations. In applying for a license it is further advisable to specify the initial and contemplated number of units. F.C.C. classifies all class D citizens band equipment mobile in nature despite the fact that a unit such as the HQ-105TR is primarily intended for fixed application.

Listed herewith are some of the other more important rules governing citizens radio service.

1. You may not engage in communications for hire or broadcasting (radio programs, music, etc.) and must not use profane, indecent or obscene language.
2. Any citizen 18 years of age or older can obtain a license. Anyone of any age can operate the equipment. However, it is the responsibility of the licensee to have the equipment operated properly.
3. The tip of the antenna may not extend more than 20 feet above the highest point of the building or natural formation upon which it is mounted. If the antenna is mounted upon an existing antenna support structure, the tip of the antenna may not extend above the highest point of such structure.
4. You may not use your equipment for any purpose contrary to federal, state or local law.
5. Equipment adjustments of the transmitter which can affect proper operation must not be made by anyone other than a licensed commercial radio operator with a first or second class radiotelephone license.
6. Transmissions should be kept to the minimum length practicable to avoid unnecessary interference to other stations sharing the same channel. There is no time restriction when communicating between units of your own (or group) but when communicating with other than your own group you cannot communicate more than 5 minutes for each 15 minute period. No general calls (CQ calls) may be made, you must always call a specific station.

Fill out the license application, FCC Form 505, as soon as possible, have it notarized and forward it to Federal Communications Commission, Washington 25, D.C.

Read the Form 505 Instructions carefully, then detach the WORK SHEET which should be completed first. Your HQ-105TR will be operated in Class D service so fill out the WORK SHEET as follows:

Study the Regulations, Part 19, governing the Citizens Radio Service. When you sign the license application, you certify under oath that you have a copy of the Rules and Regulations and have read them. The following item numbers refer to the numbered sections on Form 505:

ITEM 1 Under "1 (a) Frequencies" and "1 (b) Emission," write "CLASS D." In the column "Number of Transmitters," under the heading "Mobile," write the total number of transceivers you intend to use. Do not write anything under "Base or Fixed" as these do not apply to the Class D stations.

ITEM 2 Under 2 (a) and 2 (b) write your name and mailing address

ITEM 3 Draw a line through this box, as it requires no answer for Class D stations.

ITEM 4 Check the box marked "D".

ITEM 5 See FCC Instruction Sheet and Part 19, Section 19.91 (c). Then write in: State (or

ITEM 6 Draw a line through this box. Not applicable to Class D.

ITEM 7 Check appropriate box. If applicant is a corporation or an association, fill out Part (15 and 16) on reverse side of the form.

ITEM 8 Check boxes as appropriate; however, if relationship between owner and applicant is such that (b) and/or (c) must be checked "no," it is quite likely that the Application will be returned as "defective." For this reason, it is best that the applicant be the owner of the equipment. In this case, check (a) "yes," leave (b) blank and check (c) "yes," recognizing the responsibility attached to (c).

ITEM 9 State factually and briefly, the contemplated use of the equipment; appropriately worded examples follow:

"For communication between office and residence."

"To maintain contact between my Radio and TV Service Shop and my service trucks."

"For personal and business communication between and/or among residence, boat, auto and place of employment."

"For emergency and routine communication between medical office and my auto while making home calls."

ITEM 10 Draw a line through this box. Not applicable to Class D.

ITEM 11 Check box marked "yes."

ITEM 12 Draw a line through this box. Not applicable to Class D.

ITEM 13 Draw a line through this box.

ITEM 14 Draw a line through this box. Not applicable to Class D since the transmitter is crystal controlled.

ITEM 15 These questions are quite clear; factual answers should be given if applicant is a corporation or association.



DO NOT FAIL TO HAVE THE APPLICATION NOTORIZED. IT SHOULD BE SIGNED IN THE PRESENCE OF THE NOTARY.

After signing, mail all five copies of the application to:
Federal Communications Commission, Washington 25,
D.C.

Note:

The work sheet you detach should be retained for possible reference in any correspondence from the F.C.C. prior to issuance of your license. The work sheet should be filled out in complete detail so as to eliminate changes or erasures on the final application (page under the work sheet).

TRANSMITTER IDENTIFICATION CARD

When you have received your license, you are required to fill out the Transmitter Identification Card, FCC Form 452-C (reprinted), and attach it to your unit.

1. Enter your call sign which is on the upper right hand corner of your license. The unit designation should agree with the number of stations licensed to you.
2. Enter the name of the licensee.
3. Enter here the home address of individual or address of business if license is kept at a business, location.
4. Already answered.
5. The date of expiration on the license should be entered here.
6. Sign the card in this space.

UNITED STATES OF AMERICA FEDERAL COMMUNICATIONS COMMISSION	
(Station Call Sign)	(Unit)
TRANSMITTER IDENTIFICATION CARD Citizen's Radio Service	
This Card Attests that Authorization has been Received from the F.C.C. for installation and or Operation of the Radio Transmitter to Which Attached. (Fill in items 1 through 6).	
2. Name of permittee or licensee _____	
3. Location(s) of transmitter records _____	
4. Transmitter operating frequencies. CLASS D _____ _____ MC.	
5. Current F.C.C. authorization for this transmitter expires _____	
6. Signature _____ (Permittee, licensee, or responsible official thereof)	
Equivalent to F.C.C. Form 452-C (Revised)	

THE HAMMARLUND MANUFACTURING CO. certifies that its equipment has been designed, manufactured and furnished in accordance with the specifications contained in subparagraphs (1), (2), (3), (4), (5), of part 19.71 (C) of the FCC rules and regulations as amended effective 11/15/59.

INSTALLATION

UNPACKING

Unpack the transceiver 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 (Hammurland S-100 Speaker) to the terminals marked SPKR. on the rear of the chassis. (Note Figure 4). For the best performance do not place on top of transceiver cabinet.

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.)

INSTALLING ANTENNA

The HQ-105TR is designed to operate with a single wire or a 50 ohm Dipole antenna. The front panel antenna trimmer control (Figure 5) permits a good match to most antennae systems of 50 to 600 ohms.

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

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



Optimum performance on CB or 10M amateur bands will be obtained with any of the standard whip or ground plane type or antennas. See figure 3 for a typical installation.

An antenna to be used at a fixed location by Class D Citizens Band station shall not exceed 20 feet in height above any man made structure or natural formation on which it is mounted.

Any standard Citizens Band antenna employing 50 or 75 ohm coaxial cable will provide optimum performance on the Citizens Band channels. This antenna will also be suitable for general coverage reception throughout the tuning range of the receiver. However, optimum performance on a particular amateur band or other narrow tuning range will be obtained by using a tuned half-wave dipole fed with 50 or 75 ohm

coaxial cable transmission line or other suitable lead-in.

To tune the one-half wave length dipole, the following formula for the length of the antenna may be used:

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

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

A good ground, although not always necessary, will generally aid in reception and reduce stray line hum. Reversal of polarity of power cord plug may possibly further reduce line hum in some locations.

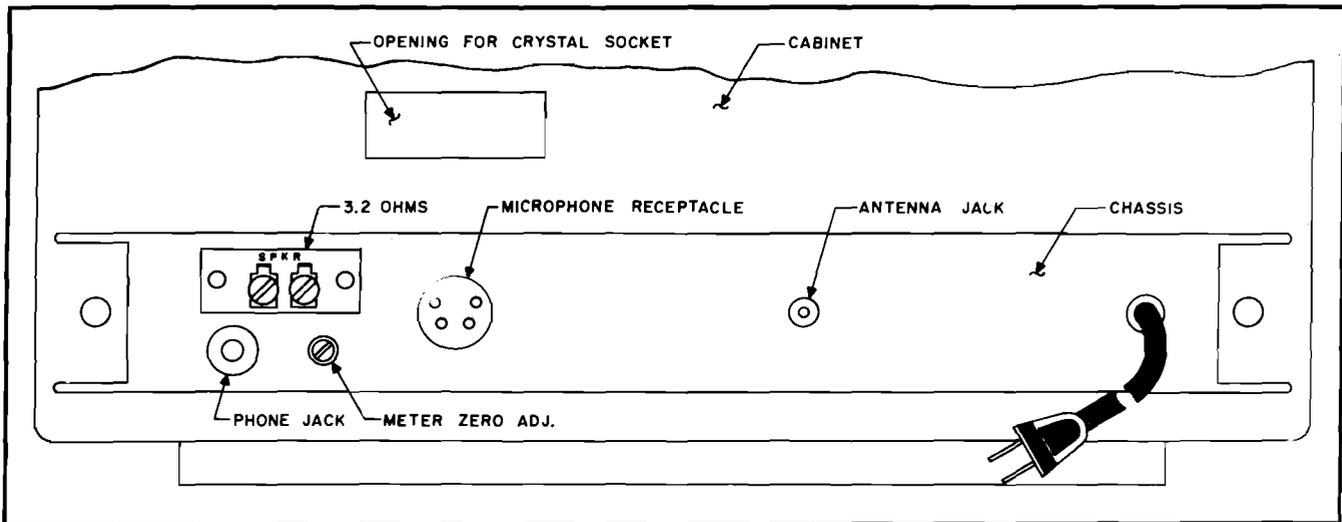


Figure 4. Connection Points at Rear of Chassis

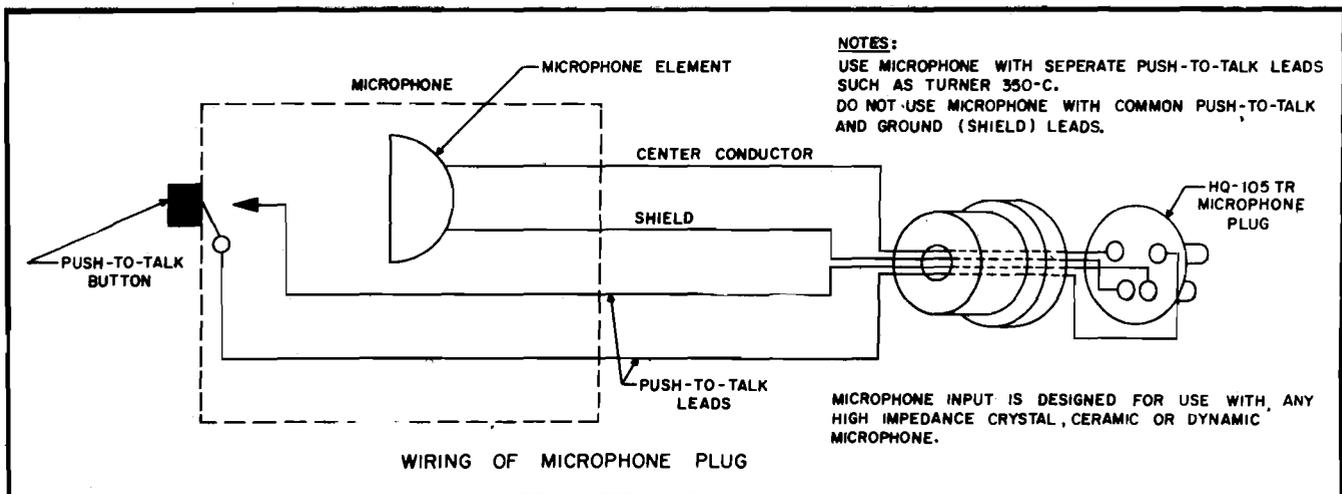


Figure 4A. Push-to-talk Microphone Connections



INDEX NO.	CONTROL	INDEX NO.	CONTROL
1	Automatic Clock-Timer Control	9	AUDIO GAIN Control
2	Function Switch	10	Electrical BAND SPREAD Control
3	ANTENNA Trimmer	11	SELECTIVITY Control, Q Mult.
4	MAIN TUNING Control	12	Frequency Control, Q Mult.
6	MAN.-A VC Switch	14	Main Tuning Dial
7	Band Selector Switch	15	Electrical Band Spread Dial
8	Noise Limiter Switch	16	Telechron Automatic Clock Timer
		17	BFO "FREQ" Control

Figure 5. Location of Controls



OPERATION

Basically, all that is necessary to operate a radio receiver are the tuning and volume controls. The additional controls found on the front panel of a communications receiver such as the HQ-105TR, control functions which greatly improve operating performance and make possible reception of otherwise unintelligible signals.

NORMAL CONTROL SETTINGS

For "normal" operation such as broadcast, short wave listening, etc., the position of the various controls should be as follows:

Function Switch	Receive (REC.)
ANTENNA Trimmer	Tune for highest "S" meter reading on signal.
MAIN TUNING Control	Tune for highest "S" meter reading on signal.
SENSITIVITY CONTROL..	Fully clockwise
MAN.-AVC Switch	AVC
Band Selector (TUNING... RANGE MCS) Switch	Set to desired frequency range
Noise Limiter Switch	OFF
AUDIO GAIN Control	Adjust for proper level.
BAND SPREAD Control....	Set counterclockwise to "100" on band spread dial.
SELECTIVITY Control	OFF
Frequency (FREQ.) Control.	Set pointer to triangular marking.

CODE SIGNAL RECEPTION

For reception of code signals, the controls should be as follows:

Function Switch	BFO
ANTENNA Trimmer	Peak for Maximum output on "S" meter.
MAIN TUNING Control	Peak for maximum output on "S" meter.
SENSITIVITY Control	Adjust for desired output level.
MAN.-AVC Switch	Manual (MAN.)
Band Selector (TUNING... RANGE MCS) Switch	Set to desired frequency range
Noise Limiter Switch	OFF or ON as required by local noise conditions.
AUDIO GAIN Control	2/3 or 3/4 clockwise rotation.
SELECTIVITY Control	ON
BFO Control	Tune signal to zero beat with pointer on zero and then offset either left or right for desired pitch.

FUNCTION SWITCH

Three operating and an off position are provided. For AM reception the REC position is used. CW or SSB signals may be received with the function switch

on BFO position. Operation of the transmitter is accomplished by placing the function switch on Send. If push-to-talk operation is desired the function switch should be left on REC. Transmit operation is then accomplished by activating the push-to-talk switch on the mike.

SINGLE SIDE BAND OPERATION

The setting of the controls for Single Side Band reception is the same as for CW reception, with the BFO being used for carrier reinsertion. The BFO frequency control should be set approximately 2-1/2 divisions to the left or right of the zero indice, depending upon whether the upper or lower sideband intelligence is desired. Final tuning should be accomplished with the BAND SPREAD control in order that proper speech quality be achieved.

BAND SPREAD OPERATION

The BAND SPREAD control may be used for fine tuning by setting it at approximately 90 on the band spread dial and tuning in the signal with the MAIN TUNING control. Final peaking of the signal is then accomplished by adjustment of the BAND SPREAD control. It should be understood that the setting of the BAND SPREAD control will affect the Main Dial calibration in that a higher frequency setting of the main tuning dial will be required. Rotating the band spread dial from 100 toward 0 tunes the receiver to a lower frequency.

For Band Spread operation in the amateur bands, the following procedure must be followed: The main tuning dial is set to the line marking the high frequency (right-hand end) of a given amateur band. The Band spread tuning and calibration may then be accomplished solely with the BAND SPREAD control and dial.

20BS SWITCH POSITION

A separate switch position is provided on the TUNING RANGE control for spreading the 20-meter band. This switches in another band spread capacitor for optimum spreading of this band.

CITIZENS BAND CALIBRATION

Class "D" Citizens Band channels covering the range of 26.965 to 27.255MCS are indicated on both the main dial and bandspread dial of the HQ-105TR. The bandspread Citizens Band calibration covers the 77-90 numerical points on the bandspread 0-100 general logging scale. There are approximately 3½ channels per dial division on this scale. As this is too narrow a range to indicate the 23 channels directly a special adhesive backed decal ring is provided to be used with the bandspread knob giving an effective vernier for this range of frequencies.



To set up the receiver for proper calibration of the Citizens Band channels the following procedure should be adhered to:

1. Remove the tuning knob from the bandspread shaft, by loosening the set screw found on the side of the knob.
2. Remove the paper backing from the special channel decal supplied, and carefully place it over the bandspread shaft on to the panel, being careful to center the decal properly. The adhesive backing on this decal will affix it to the panel.
3. Re-install the knob on the bandspread shaft, allowing sufficient clearance to prevent the knob from scraping on the decal.
4. Set the bandspread dial at the number on the logging scale corresponding to the channel in use. For example, if channel 11 is supplied with the transceiver, the bandspread dial should be set at 83 on the 0-100 logging scale. Other settings can be determined by referring to the chart.
5. With the transmitter on, or in other words the function switch on Send, or the push-to-talk switch activated, and the bandspread dial set as described above, adjust the main tuning dial for a maximum reading on the "S" meter. The setting of the main tuning dial will be found at approximately 27.2 MCS.
6. Affix the small triangular sticker supplied to the skirt or rim of the bandspread knob in the proper position to indicate the particular channel tuned in. This will then put the receiver in calibration for all the Citizens Band channels, which should now be tuned in with the bandspread knob only, leaving the main tuning set at approximately 27.2 MCS.

The setting of the main tuning dial for proper calibration should be noted for future reference. To re-tune the receiver for correct Citizens Band operation after receiving frequencies on other portions of the dial or on other bands it is only necessary to set the bandspread to the channel in use (transmitter frequency) and with the transmitter "on" tune in the signal on the main tuning dial for maximum "S" meter reading.

Citizens Band Channel Number	Frequency MCS.	Approximate Bandspread Logging Scale
1	26.965	77
2	26.975	77.5
3	26.985	78
4	27.005	79
5	27.015	79.5
6	27.025	80
7	27.035	80.5
8	27.055	81.5
9	27.065	82
10	27.075	82.5
11	27.085	83
12	27.105	84
13	27.115	84.5
14	27.125	85
15	27.135	85.5
16	27.155	86.5
17	27.165	87
18	27.175	87.5
19	27.185	88
20	27.205	89
21	27.215	89.5
22	27.225	90
*23	27.255	91

* This channel reserved for Radio Control application only.

CIRCUIT THEORY

The HQ-105TR is basically a single conversion, four band superhetrodyne receiver and five watt transmitter for the Citizens Band or the ten meter amateur band. Its circuitry incorporates a Q-Multiplier for full control of selectivity and a stable BFO.

PRESELECTION

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

CONVERTER STAGE

A high degree of oscillator stability is attained by the use of a separate mixer (6BE6), V2, and an independent oscillator (6C4), V3.

The output signal from RF amplifier V1 is heterodyned with the output of the local high frequency oscillator, V3, and electronically combined within the mixer tube, V2. On the four frequency ranges the local oscillator is 455 KCS above the signal frequency.

Low-loss tube sockets, low-loss, phenolic temperature compensating capacitors, and stable, coaxial trimmers all contribute to oscillator stability. Additional frequency stability is attained by applying regulated voltage to the oscillator circuit and by the rugged construction of the entire HF oscillator section assembly.



Q MULTIPLIER

The Q-Multiplier frequency control provides a means of peaking any signal within the pass band of the IF amplifier. The degree of peaking is controlled by the SELECTIVITY control. This same SELECTIVITY control when turned completely counter clockwise disconnects the Q-Multiplier.

The "Q" Multiplier is generally never employed on the standard broadcast band or when short wave broadcast stations are being received. The use of the Q-Multiplier under these circumstances will only result in limiting the frequency response of the broadcast band and short wave broadcast stations in view of the very narrow band width that is provided by the Q-Multiplier. Of course, the SELECTIVITY control will make it possible to control this response characteristic. If, by chance, when receiving foreign short wave broadcast stations interference is experienced caused by two stations operating very close to one another, the Q-Multiplier may be employed under these circumstances to minimize, if not eliminate, the interference by the improved selectivity or decreased band width proper adjustment will provide. The proper use of the Q-Multiplier can actually enhance many times the results obtained with this receiver. In view of this, it is suggested that a little time be spent in learning just how to properly adjust the Q-Multiplier frequency and selectivity controls under different receiving conditions. As the Q-Multiplier SELECTIVITY control is advanced, a decided decrease in noise will be apparent. This is due to the narrowing of the pass band. On AM phone signals this control will usually be between the 7 and 11 o'clock positions. The FREQUENCY control should then be adjusted for clarity of signal or for minimum adjacent channel interference. The SELECTIVITY control may be advanced progressively more for SSB and CW reception. The more this control is advanced, the more critical the setting of the FREQUENCY control becomes. Advancing the SELECTIVITY control too far will cause the Q-Multiplier to oscillate. This should be avoided. The Q-Multiplier is a very handy tool in the hands of an experienced operator and, unfortunately, it is beyond the scope of this instruction manual to attempt to be more definite than we have.

IF AMPLIFIER

Seven, stable tuned circuits, in two stages of IF amplification (V5 and V6), contribute to sensitivity and selectivity. Iron core permeability-tuned transformers improve performance and add to the ease of adjustment. The intermediate frequency is 455 KCS, the EIA standard.

AVC SYSTEM

Automatic Volume control minimizes fading and signal strength variations by controlling the gain of the RF stage V1 and the IF stage V5. As a result, a comfortable and constant level of audio is maintained.

"S" METER (CARRIER LEVEL)

The "S", or Tuning, Meter is provided to assist in tuning and to give an indication of relative signal strength. Because the meter readings are proportional to AVC voltage, it is operative only in the AVC position.

The meter, which is calibrated to 40 db over S-9, is factory adjusted so that signal input of approximately 50 microvolts gives a reading of S-9. Each "S" unit indicates a 6db increase, equivalent to doubling signal strength. Should meter readjustment be necessary:

1. Set function switch to REC.
2. Set front panel SENSITIVITY control to "10" and Q-Multiplier SELECTIVITY control to OFF.
3. With receiver off, mechanically zero pointer with a fine screwdriver.
4. With AVC on and the ANT. terminals shorted, zero pointer with ZERO ADJ potentiometer R-15.

In the transmit position the meter functions as a relative output indicator, when the receiver is tuned to the transmitter operating frequency.

DETECTOR AND NOISE LIMITER

One diode section of the 6BV8 tube, V7, is used for the second detector and AVC system. This system produces a minimum of distortion.

The other diode of V7 operates as a series, self-adjusting noise limiter. It will reduce automobile ignition and other types of impulse noise to a minimum. Intelligibility is not affected by the noise limiter, although it may be switched off if desired.



BEAT FREQUENCY OSCILLATOR (BFO)

The BFO is activated by the function switch for reception of CW or SSB signals or as an aid in locating weak SW BDCST stations. The BFO control is used under these conditions to vary the pitch. Each calibration division of this control represents approximately 1000 cycles. When receiving single side band transmission, the generally accepted procedure of setting the beat frequency oscillator approximately 1000 cycles above or below zero beat should be employed. In other words, if the beat frequency oscillator FREQ. Control is set one degree clockwise or counterclockwise from the center position, optimum single side band reception will usually be obtained. Whether the beat frequency oscillator control will be set clockwise from zero beat will depend on whether upper or lower side band is being transmitted. If the beat frequency oscillator is on the wrong side of zero beat, it will be impossible to obtain intelligibility of the single side band signal when the band spread dial is tuned very slowly through the single side band signal. Should such a condition arise, merely rotate the B.F.O. control from the one degree counterclockwise to the one degree clockwise position and then very carefully adjust the BANDSPREAD for intelligible speech. Here again experience is the best teacher. The stability of both the high frequency oscillator and the beat frequency oscillator employed in this receiver plus the excellent mechanical rigidity will provide excellent single side band reception. Refer to the above paragraph on the Q-Multiplier for improved single side band reception.

AUDIO AMPLIFIER

The first audio stage is a resistance coupled voltage amplifier employing the triode section of the 6BM8 V-8. The audio output stage uses the pentode section

of V-8. This pentode section of V-8 also serves as the audio modulator when in the transmit or send position. One triode section of V-4 serves as a mike preamp. when transmitting. It is out of the circuit on the "Rec" position. The audio level is fixed on the transmit position.

A feature of the audio system on receive is the variable negative feedback employed (see Auto-Response Curve, Figure 6). Maximum feedback is provided at low settings of the AUDIO GAIN control for the fine quality reception of local broadcast and strong short wave 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. A further advantage is the reduction of distortion at lower settings of the AUDIO GAIN control.

TRANSMITTER

A crystal controlled transmitter is incorporated in the HQ-105TR for operation on either the Class "D" Citizens Band or the 10 meter amateur band. V11, a 6CX8 is a dual purpose tube. The triode section serves as a crystal oscillator, while the pentode section as the modulated RF power amplifier. A built-in relay provides complete changeover from receive to transmit. The transmitter is activated by throwing the front panel function switch to "Send". If a push to talk microphone is employed, the function switch should remain on the REC. position. Transmit operation is then accomplished by activating the push to talk switch on the mike. See Figure 4-A for the proper mike connections.

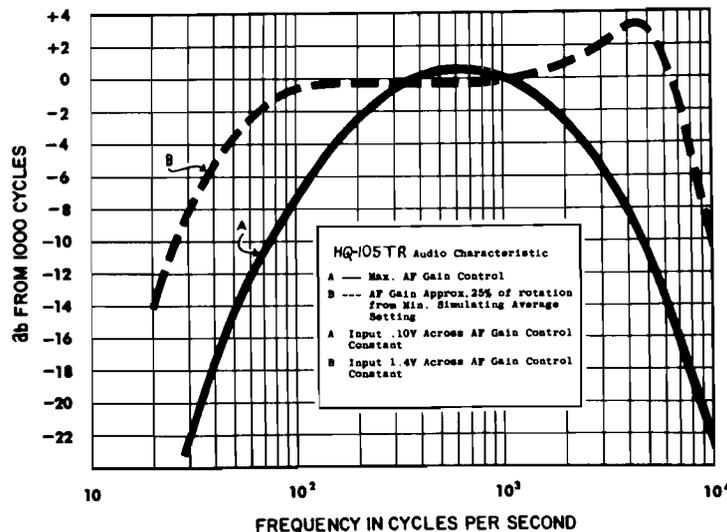


Figure 6. Auto-Response Curve



ACCESSORIES

The XC-100 Crystal Calibrator is available, providing checkpoints every 100 KCS within the range of the receiver.

The kit is quickly and easily installed. It is complete with easy-to-follow instructions operating switch and mounting hardware.

This is not usually required by the average short wave listener, although it will prove an aid as a means of correcting for possible dial error.

The amateur operator will find this of most value since the 100 KCS checkpoints this unit provides, will make it possible to accurately set amateur band edges. This will result in improving the accuracy of the amateur band spread dial, by determining the exact setting of the main tuning dial.

PL-38657-G5 -- \$15.95



TELECHRON AUTOMATIC TIMER

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

Every radio-frequency device is stable only at predetermined operating temperatures. In order to eliminate waiting for 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 hand of the timer (small knob at rear of receiver) to approximately one-half hour before operating hour. The front panel control under Timer is then set to "Auto" position. The function switch is set to REC. The receiver is then automatically turned on at the desired time.

The clock hands are set by the rear knob. Push in on the knob to set the switch timing hand and pull out

on the knob to set the clock hands. The front switch is set to AUTO and the operation switch is set to REC. when it is desired to use the automatic clock switch for pre-warning the receiver before operation or for use as an alarm to turn the receiver on to a pre-tuned station. To use the operation 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, clock kits, with full installation instructions, may be had by writing the Hammarlund Mf. Co., 460 West 34th St., New York 1, N.Y. Order CLOCK KIT 38920 G2, or by contacting the nearest Hammarlund dealer.

POSSIBLE RECEIVER DIFFICULTIES

1. If, upon turning the function switch from "off" to "receive" position, the dials are not illuminated and the receiver fails to operate after two minutes, this indicates that the clock timer switch just above the function switch is not in the proper position. This switch should always be in the ON position unless auto timer is employed.
2. Excessive hum or failure of the Q multiplier to operate properly will usually be due to a defective 12AX7 type tube. Such a defective tube may test good in a tube tester but be unsatisfactory because of higher than normal heater-to-cathode leakage. Poor noise limiter action is usually due to a poor or defective 6BV8 type tube. The use of the noise limiter will result in some distortion which must be tolerated for most efficient noise limiting. Because of this, when listening to broadcast stations or other strong local signals the noise limiter switch should be in the "off" position un-

less the slight distortion is preferable to excessive pulse type noise, such as ignition interference.

3. Erratic S meter performance, lack of sufficient variation, etc., is usually due to the two 6BA6 tubes employed in the S meter circuit. These are the two 6BA6 tubes, V5 and V6, in the schematic diagram. Merely interchanging these tubes will sometimes provide sufficient improvement. Replacing one or both may be found advisable before suspecting other troubles.
4. Excessive drift, after allowing sufficient time for warm up, may be due to a poor type 6C4 tube, V3, in the diagram or 6BE6, V2, in the schematic diagram.

Ninety-nine percent of all receiver trouble has been found to be due to one or more defective tubes. This can undoubtedly be attributed to the rough handling equipments receive in shipment. Please, therefore, be sure to follow the above suggestions in addition to having all tubes tested before writing the Home Office.



SERVICE AND REALIGNMENT PROCEDURE

NOTE

To service this transceiver, disconnect from power source and remove all leadwires attached to terminal connections at rear of chassis apron. Carefully turn the transceiver up onto the front panel face on a smooth clean surface. Remove the two #10 hex machine screws at the extreme ends of the chassis apron at the rear of the cabinet, and the knob from the clock adjustment shaft if receiver is so equipped. Lift cabinet straight up and off of chassis. To reassemble, use reverse procedure.

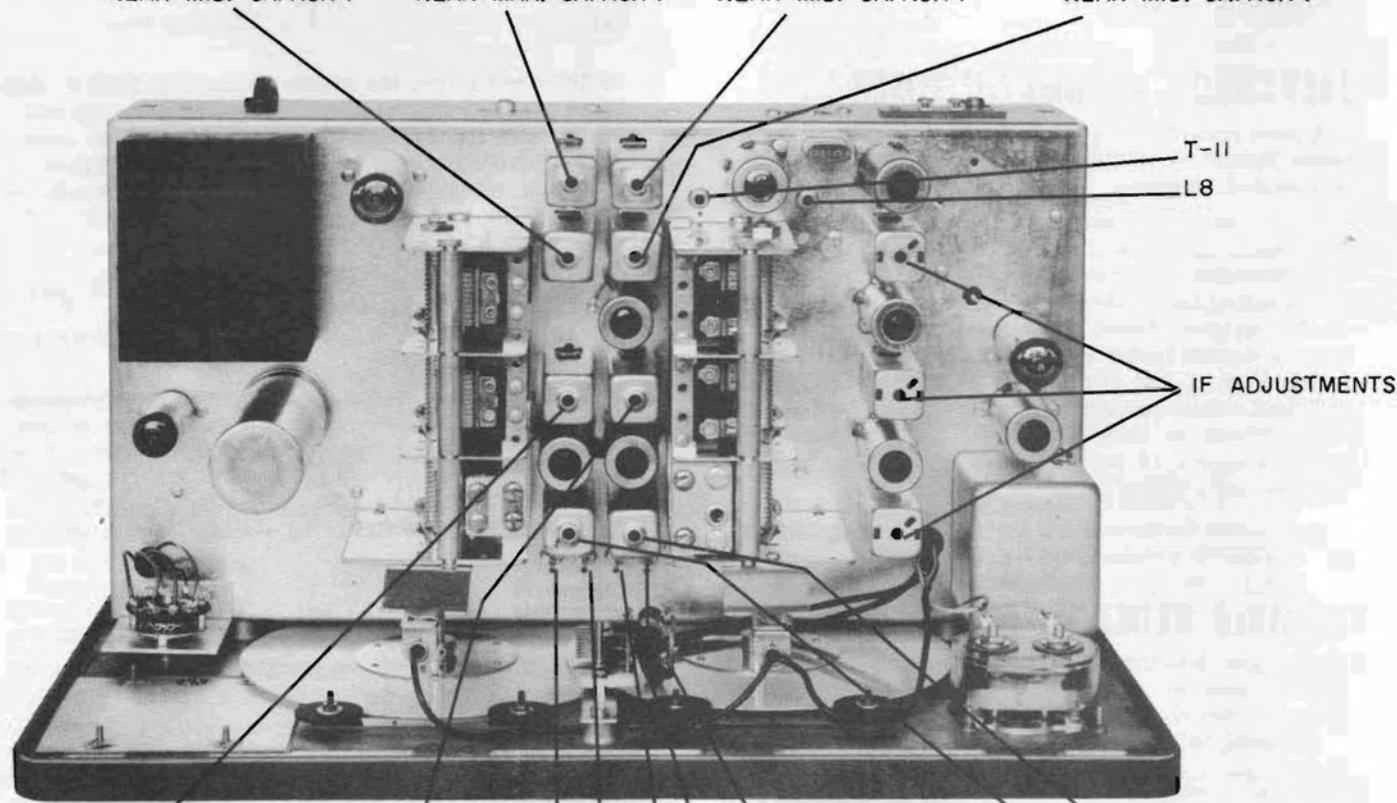
ANTENNA ADJUSTMENTS

ADJUST SLUG AT 4 MC WITH ANT. CAPACITOR NEAR MID. CAPACITY

ADJUST SLUG AT 6 MC WITH ANT. CAPACITOR NEAR MAX. CAPACITY

ADJUST SLUG AT 1.65 MC WITH ANT. CAPACITOR NEAR MID. CAPACITY

ADJUST SLUG AT 10 MC WITH ANT. CAPACITOR NEAR MID. CAPACITY



TOP SLUG ADJUST AT 1.65 MC FOR MIN. AMPLITUDE. BOTTOM SLUG ADJUST AT 1.65 MC FOR MAX. AMPLITUDE

TOP SLUG ADJUST AT 4 MC - BOTTOM SLUG ADJUST AT 10 MC

1.5 4 10 30 L7
H.F. OSC. TRIMMERS

COIL LOCATION	TOP	.6	4
	BOTTOM	1.65	10

H.F. OSC. COIL ADJUSTMENTS--MCS.

RF ADJUSTMENTS

Figure 7. Top View of Chassis



IF ALIGNMENT

NOTE

Use a non-metallic alignment tool such as General Cement Co. No. 5097, or equal.

- a. Connect the output cable of a 455 KCS unmodulated, signal generator to the bus lead of the 6BE6 mixer grid. The frequency accuracy of the generator may be checked with sufficient precision by picking up its second harmonic (910 KCS) in any receiver whose calibration at 910 KCS has been checked as correct and then adjusting the generator frequency.
- b. Connect a DC vacuum tube voltmeter, set for negative voltage reading to pin 8 of the V7, 6BV8 socket.
- c. Set the receiver controls as follows:
 - BAND SPREAD dial on 100
 - Function Switch on REC.
 - Main tuning dial on .54 MC
 - Noise limiter switch on OFF
 - AUDIO GAIN control at minimum
 - SELECTIVITY control on OFF
 - Band selector switch on .54 - 1.6 MC
 - MAN.-AVC switch on MAN.
 - SENSITIVITY control on 3 from maximum.
- d. During alignment, adjust the generator output and the SENSITIVITY control to prevent overloading. Final adjustment should be made with the SENSITIVITY control at approximately the third indice from its maximum (clockwise) position. Adjust each of the three IF transformers for maximum meter reading. Topside adjustments (Figure 7) are secondaries or grid circuits; bottom of chassis adjustments (Figure 8) are primaries or plate circuits.

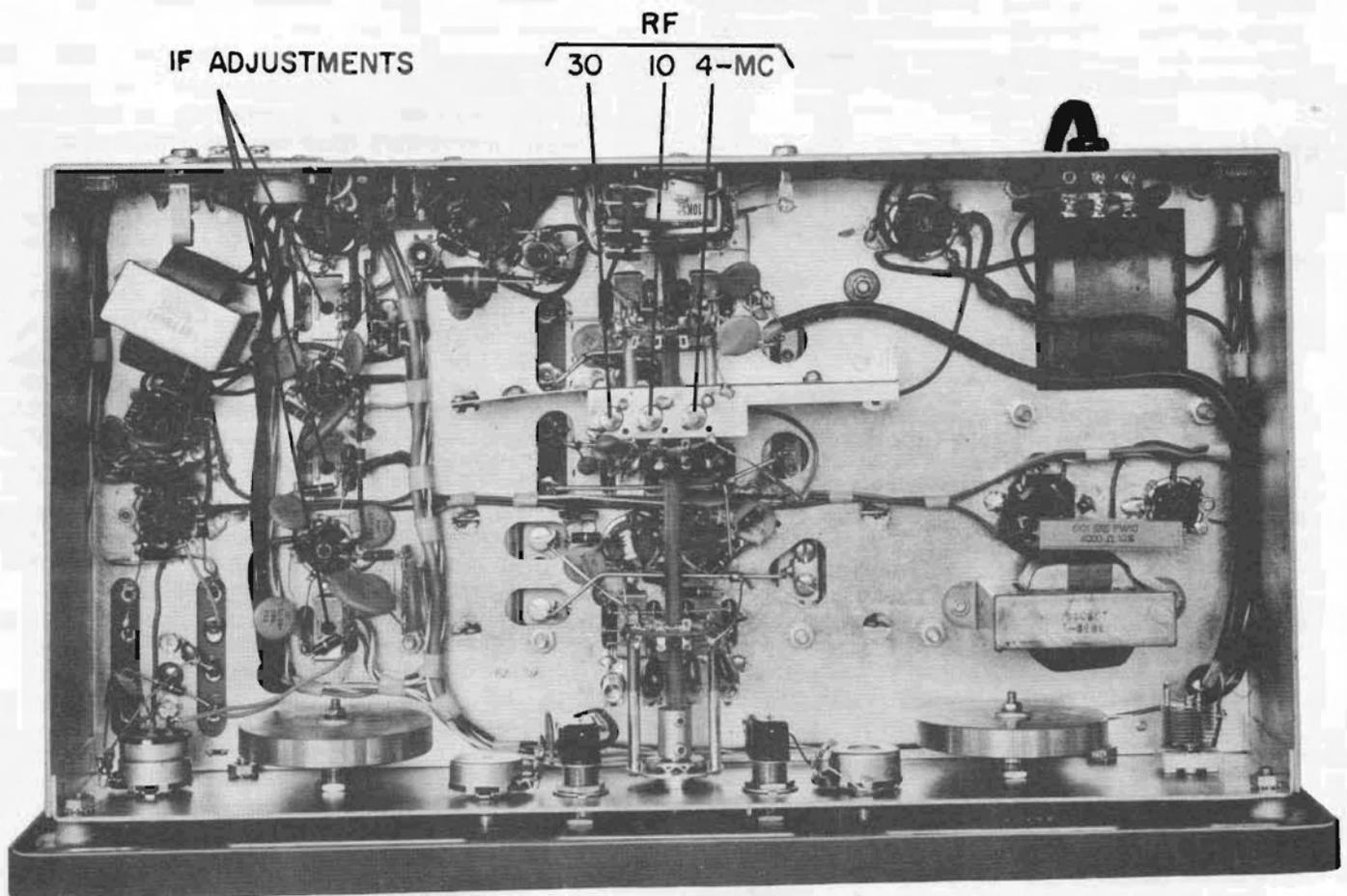


Figure 8. Bottom View of Chassis



- e. Turn the Q MULT. switch to ON and adjust the SELECTIVITY control counterclockwise to a position below the oscillating point. With its panel bushing nut loosened to permit the frequency shaft to turn without hindrance by the stop, adjust the Q MULT. FREQ. control to obtain a maximum indication. The input signal must be adjusted to a value just sufficient to obtain a good meter swing. This adjustment is the center frequency of the pass band. While the meter is at maximum turn the stop lug to a position 180 degrees directly opposite the stop pin in the frequency shaft. Holding it in this position, tighten the bushing in the nut making sure that the shaft or the stop lug have not turned by checking the zero setting.
- f. Turn function switch to BFO. With frequency control on zero adjust slug L7 for zero beat with AVC-MAN switch on MAN position and sensitivity control adjusted at a position below overload.
- g. With the MAN.-AVC switch on AVC, the SENSITIVITY control at maximum, with grid pin 1 of the V5 amplifier tube grounded, and with no signal input, adjust the METER ZERO ADJUST. pot at the rear of the chassis (Figure 4) for a reading of zero on the "S" meter.

RF ALIGNMENT

NOTE

Use a non metallic alignment tool such as General Cement Co. No. 8282, or equal.

- a. The slugs and trimmers, having been factory adjusted, should require a minimum amount of adjustment for any realignment.
- b. All RF and oscillator slug adjustments are made from the top of the shield cans. See Figure 7.
- c. Connect the unmodulated, signal generator output cable to the antenna and ground terminals of the receiver, with the A terminal adjacent to the G terminal jumped together. See Figure 4.
- d. Set the controls the same as for IF alignment above. Adjust the SENSITIVITY control as required to obtain a sufficient voltmeter reading and to prevent overloading.
- e. The oscillator adjustment is made first. The RF is adjusted next to obtain maximum amplitude. The antenna slugs are last. A certain amount of interaction will occur between the oscillator and RF adjustments, particularly on the higher frequency bands. Final adjustment should be accomplished by combined or alternate adjustment of the oscillator and RF for maximum amplitude.

NOTE

The trimmer adjustments, if required, should be the final adjustment for each band. See Figure 7 and 8 for location of trimmers.

There is no RF amplifier adjustment for the .54 – 1.6 MC band.

- f. Note that the oscillator frequency in the HQ-105TR is always on the high side of the signal frequency by 455 KCS. Therefore, it is necessary to make sure that the oscillator frequency is not adjusted below the signal frequency which would be an image response of the signal.
- g. It will be necessary to repeat low and high end alignment adjustments of each band since the adjustments are interdependent. The process should be repeated until maximum amplitude is obtained at both alignment frequencies of each band.

NOTE

The receiver should be warmed up at least one-half hour before final oscillator frequency adjustments are made for the dial calibration check.

DIAL CALIBRATION

- a. Use a crystal calibrator having 100 KCS and 1000 KCS output. Set the arbitrary band spread dial scale to 100. Set the function switch to BFO. Set the BFO control to zero. Set the SELECTIVITY control to OFF. Set the MAN.—AVC switch to AVC.
- b. Check to see that the frequencies at or near the alignment frequencies are "on the line." If not, make minor adjustments of the slugs and trimmers (Figures 7 and 8) to make them correct.

CAUTION

Weaker signals will be observed at dial settings approximately 10 KCS above each calibration dial marking. These are image signals from 1 MC above the desired signal and may be recognized by their somewhat weaker strength and may be further reduced by proper adjustment of the gain controls, they will, of course, be more noticeable on the higher bands. Keeping the antenna tuned will help.

TRANSMITTER ADJUSTMENT

Class "D" Citizens Band

As shipped from the factory the HQ-105TR is equipped with a crystal for operation on one of the Citizens Band channels. The transmitter has been completely aligned and tested according to F.C.C. regulations. No Attempt Should Be Made to Adjust or change the Frequency or alignment except by the holder of a 2nd Class Commercial Radiotelephone license or higher.

Power output has been limited to 5 watts maximum and the output frequency has been set within .005% as required by law. Modulation limiting has been built into the circuitry so as not to exceed 100% modulation.

The output transformer (T11) may be peaked up for maximum R.F. output, but no attempt should be made

to adjust L-8 in the oscillator plate circuit at this would adversely affect the operating frequency. If it is desired to change channels it must be performed by a properly licensed operator.

10 Meter Amateur Band

If it is desired to operate on the 10 meter amateur band the crystal as supplied with the unit must be changed. Only properly licensed (General Class) amateurs may operate on this 10 Meter band or make changes or adjustments to the transmitter section. Crystals should be of the third overtone type and in an HC-6/U holder. The transmitter may be put on frequency by peaking L-8 and T-11 for maximum reading on the receiver "S" meter. There is enough stray radiation in the IF strip to give an accurate reading. Sharpness of the tuning may be enhanced with the use of the Q-Multiplier.

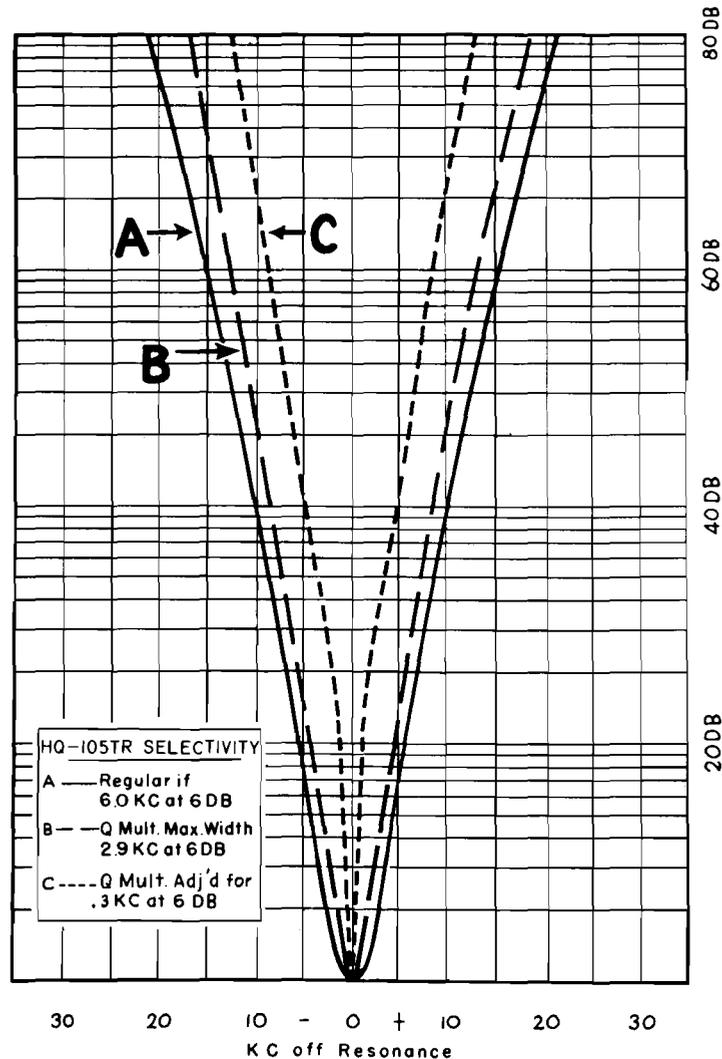


Figure 9. Selectivity Curves

TABLE 1: TUBE SOCKET VOLTAGES

Measured from tube socket pins to chassis with vacuum tube voltmeter. AUDIO GAIN control minimum. Band Selector switch on 10-30 MCS. Noise Limiter switch OFF. MAN.-AVC on MAN. SENSITIVITY control maximum except where noted. Function switch on REC. except where noted. Q MULTIPLIER – OFF. Line voltage 117. No signal input.

TUBE SOCKET NO.	SOCKET PIN NUMBERS								
	1	2	3	4	5	6	7	8	9
V1 RF 6BZ6	–	1.8	6.3-AC	–	245	105	–	–	–
V2 MIXER 6BE6	-1.3	1.3	6.3 AC	–	235	70	–	–	–
V3 HFO 6C4	100	–	6.3-AC	–	100	-3 TO -9	–	–	–
V4 12AX7 Q MULT. MIC AMP	100	–	1.6	O	O	235	–	20	6.3 AC
V5 1st IF 6BA6	–	–	6.3 AC	–	230	105	2.2 12 MIN SENS	–	–
V6 2nd IF 6BA6	–	–	6.3 AC	–	230	95	2.2 12 MIN SENS	–	–
V7 6BV8 DET. LIM. AVC BFO	O	-8 BFO ON	110 BFO ON	6.3 AC	1.2 AC	-9 BFO ON	O	-9 BFO ON	-10 BFO
V8 6BM8 1st AF AUDIO PA	O	26	-3	–	6.3 AC	230	245	2.5	175
V9 OA2 VR	105	–	–	–	105	–	–	–	–
V10 6CA4 RECTIFIER	250 AC	–	300	–	6.3 AC	2-	250 AC	–	–
V11 6CX8 XTAL OSC RF OUT (XMTR KEYED)	O	-10	85	O	6.3 AC	O	-10	130	200

TABLE 2. TUBE SOCKET RESISTANCES

Measured from tube socket pins to chassis with vacuum tube ohmmeter. AUDIO GAIN control maximum. SELECTIVITY control OFF. Noise Limiter switch On. SENSITIVITY control maximum except where noted. MAN.-AVC on MAN. Function switch on REC Band Selector switch on 10-30 MCS.

TUBE SOCKET NO.	SOCKET PIN NUMBERS								
	1	2	3	4	5	6	7	8	9
V1 RF 6BZ6	10K 2.4M ON AVC	180	0	0	.5 MEG	.5 MEG	0	—	—
V2 MIXER 6BE6	22K	180	0	0	.5 MEG	.5 MEG	0	—	—
V3 HF 6C4	.5 MEG	INF	0	0	.5 MEG	47K	0	—	—
V4 12AX7 Q MULT. MIC AMP	.5 MEG	2.2 MEG	16K	0	0	.5 MEG	1 MEG	INF	0
V5 1st IF 6BA6	0 2.4M ON AVC	0	0	0	.5 MEG	.5 MEG	180 10K MIN SEL	—	—
V6 2nd IF 6BA6	470K	0	0	0	.5 MEG	.5 MEG	200 10K MIN SEL	—	—
V7 6BV8 DET. LIM. AVD BFO	0	100K	.5 MEG	0	0	120K	0	2.2 MEG	190K
V8 6BM8 1st AF AUDIO OUTPUT	1 MEG	430	470K	0	0	.5 MEG	.5 MEG	3900	.5 MEG
V9 OA2 VR	.5 MEG	0	INF	0	.5 MEG	INF	0	—	—
V10 6CA4 RECTIFIER	55	—	.5 MEG	0	0	—	55	—	—
V11 6CX8 XTAL OSC RF OUT (XMTR KEYED)	0	47K	.5 MEG	0	0	0	22K	.5 MEG	.5 MEG

PARTS LIST

Schematic Designation	Description	Hammarlund Part No.
RESISTORS		
R1	22 Ohms, 1/2 W	K19309-9
R2	Potentionmeter, 10,000 Ohms	K26218-2
R3	10,000 Ohms, 1/2W	K19309-73
R4	1,000 Ohms, 1/2W	K19309-49
R5	22,000 Ohms, 1/2W	K19309-81
R6	180 Ohms, 1/2W	K19309-31
R8	6,2000 Ohms, 1/2W	K19309-176
R9	47,000 Ohms, 1/2W	K19309-89
R10	1,000 Ohms, 1/2W	K19309-49
R11	2.2 Megohms, 1/2W	K19309-129
R12	6,800 Ohms, 1/2W	K19309-69
R13	Potentionmeter, 10,000 Ohms	K15378-4
R14	2,200 Ohms, 1/2W	K19309-57
R15	Potentionmeter, 200 Ohms	K15379-3
R16	2,200 Ohms, 1/2W	K19309-57
R17	1,600 Ohms, 1/2W 5%	K19309-210
R19	180 Ohms, 1/2W 5%	K19309-260
R20	4,000 Ohms, 10W	K19337-3
R21	2,200 Ohms, 1/2 W	K19309-57
R27	Potentiometer, 1 Meg	K26218-3
R28	47 Ohms, 1/2 W	K19309-17
R29	2,200 Ohms, 1/2W	K19309-57
R30	100 Ohms, 1/2W	K19309-25
R31	430 Ohms, 1 W	K19309-212
R32	22 Ohms, 1/2W	K19309-9
R33	180 Ohms, 1/2 W	K10309-31
R34	47,000 Ohms, 1/2W	K19309-89
R35	2,200 Ohms, 1/2 W	K19309-57
R36	10 Ohms, 1/2 W	K19309-1
R37	470K Ohms 1/2 W	K19309-113
R38, R44	100K Ohms, 1/2 W	K19309-97
R39	3.3K Ohms, 5 W	K19336-1
R40	4.7K Ohms, 1/2 W	K19309-65
R41	220K Ohms, 1/2 W	K19309-105
R42, 43	3.9K Ohms, 1/2 W	K19309-63
R45	470K Ohms, 1/2 W	K19309-113
R46	47K Ohms, 1/2W	K19309-89
R47, 48	22K Ohms, 2 W	K19304-50
R49	22K Ohms, 1/2 W	K19309-81
R50	10K Ohms, 1/2 W	K19309-73
J1	Phone Jack	K35608-1
J2	Connector, Antenna	K42123-1
J3	Connector, Microphone	K41138-1
CAPACITORS		
C1, A-C	Variable, Main tuning	P38834-1
C2, A-F	Variable, Bandsread	P38335-1
C3	Variable, Antenna Compensator	34454-G38
C4,5,6,7,8 9,10,15	Fixed, Ceramic disk . . . 01mf 600 WVDC	M23034-14
C11,12,13	Trimmer, 1-8mmf 600 WVDC	K23008-1
C16,17,18,	Fixed, mica silver, 100mmf, 500 WVDC	K23006-1
C19	Fixed, ceramic disk, .01 600 WVDC	K23034-14
C20,21,22,23	Trimmer, 1-8mmf 500 WVDC	K23008-2
C24	Fixed, Dur-mica, 430mmf 300 WVDC	K23027-22
C25	Fixed, Dur-mica, 1300mmf 500 WVDC	K23027-23
C26	Fixed, Dur-mica, 3000mmf 500 WVDC	K23027-21
C27	Fixed, Dur-mica, 1100mmf 500 WVDC	K23027-2

C28	Fixed, Dur-mica, 3300mmf 500 WVDC	K23027-24
C29	Fixed, Dur-mica, 510mmf, 500 WVDC	K23027-3
C30,31,32	Fixed, ceramic disc, .01mf 600 WVDC	M23034-12
C33	Fixed, ceramic disc, .04mf 600 WVDC	M23034-14
C34,35,36	Fixed, ceramic disc, .01mf 600 WVDC	M23034-14
C38	Fixed, Four-section electrolytic	K15504-71
C38A	40mf 350 WVDC (Part of K15504-71)	
C38B	40mf 25 WVDC (Part of K15504-71)	
C38C	60mf 400 WVDC (Part of K15504-71)	
C38D	40mf 400 WVDC (Part of K15504-71)	
C41	Fixed, ceramic disc, 0.1mf 600 WVDC	M23034-14
C42	Fixed, ceramic disc, .005mf 1000 WVDC	M23034-10
C43,44	Fixed, ceramic disc, .01mf 1400 WVDC	M23034-10
C45,46	Fixed, ceramic disc, .04mf 600 WVDC	M23034-12
C47	Fixed, Temp. Comp. 12mmf N220	K23010-2
C48	Fixed, ceramic disc .01mf 600 WVDC	M23034-14
C49,50	Fixed, Temp. Comp. 2.7mmf N220	K23010-1
C51	Fixed, Temp. Comp. 6.8mmf N220	K23010-3
C52	Fixed, Temp. Comp. 1.5mmf N1400	K23061-208C
C53	Fixed, Dur-mica 5mmf 500 WVDC	K23006-5
C54	Fixed, Temp. Comp. 4.7mmf N220	K23010-38
C55	Fixed, ceramic disc, .02mf 500 WVDC	M23034.27
C56	Fixed, Temp. Comp. 330mmf N775	K23010-9
C57	Fixed, Dur-mica 3000mmf 500 WVDC	K23027-21
C58	Fixed, Dur-mica 220mmf 500 WVDC	K23006-10
C59	Variable, B.F.O.	K34454-G38
C60,62,63,67	Fixed, ceramic disc, .005mmf 1000 WVDC	M23034-10
C61	Fixed, ceramic disc .001mf 1000 WVDC	M23934-20
C64	Fixed, Temp. Comp. 4.7mmf N220	K23010-38
C65	Fixed, Dur-mica 6mmf 500 WVDC	K23006-63
C66	Fixed, Dur-mica 10mmf 500 WVDC	K23006-22
C68	Fixed, Dur-mica 350mmf 1000 WVDC	K23006-98
	COILS	
LI	R.F. Coil Assembly (Bands 1 and 2)	K38816-1
L2	R.F. Coil Assembly (Bands 3 and 4)	K38817-1
L3	H.F. Osc. Coil Assembly (Bands 1 and 2)	K38818-1
L4	H.F. Osc. Coil Assembly (Bands 3 to 4)	K38819-1
L5	Coil & Ferrule Assembly	K26215-G2
L6	Choke, Filter	K38939-1
L7	Coil, BFO	K39019-1
L8	Oscillator coil	K39041-1
	TRANSFORMERS AND IMPEDANCE ASSEMBLIES	
T1	Antenna Transformer Assembly (Band 1)	K38812-1
T2	Antenna Transformer Assembly (Band 2)	K38813-1
T3	Antenna Transformer Assembly (Band 3)	K38814-1
T4	Antenna Coil Assembly (Band 4)	K38815-1
T5,6,7	Transformer, 1st, 2nd, and 3rd I.F.	K38829-1
T8	Audio Output, Modulation Transformer	K39035-1
T9	Transformer Power, Primary 115V-60 cycle, Secondary 250-0-250V-90 ma.	P38826-3
T9A	Power Transformer 110-220 V Primary	P38826-4
T11	Tank Coil	K390421
	SWITCHES	
S1A, S1B	Switch Wafer Rf	K38824-1
S1C	Switch Wafer HF OSC	K39027-1
S2	On-Off, SPST (Part of R13, K15378-1)	
S3	OFF-REC-SEND-BFO, Single Sect. Four Position.	K38848-1
S4	MAN.-AVC, SPST	K38857-1
S5	LIMITER, SPST	K38857-1
I1,2	Lamp, Pilot, No. 47, 6.3V, .15A	K16004-1
K1	Relay	K40380-4
M1	Meter, "S" (Carrier Level)	K26149-4
Y1	Crystal, Citizens Band HC-6/U	K39003-
Z1	RC Printed Network	K38846-1
Z2	RC Printed Network	K38885-1

ADDITIONAL HINTS FOR THE NOVICE AND SHORT WAVE LISTENER

A voltage reading of 45-50 volts may be obtained between the chassis and a ground as the result of the two power line by-pass condensers that are connected across the power line with the center tap grounded. Since we are dealing with AC, these capacitors will look like resistors to a volt meter. This will also produce a slight shock if the chassis is not grounded, and one happens to contact a grounded object, and the chassis or any exposed part of the receiver. This also will account for a slight spark, if the receiver is connected to the power line and the ground connection is made. For protection a good ground should always be employed.

In using the receiver for CW, or with the BFO in the oscillating state, it is absolutely necessary to take the receiver out of the AVC position and put it into the Manual position. Failure to do this will result in the receiver blocking and erratic action of the S meter. The S meter is only usable in the AVC position. When using BFO the audio control should be used at 2/3 to 3/4 rotation clockwise position and the RF sensitivity control employed as a means of adjusting volume.

When employing the Q multiplier for phone use the function switch will, of course, be in the REC and it is advisable to start with the Q multiplier selectivity control in the complete counter clock wise position. If this control is advanced past approximately the 2 o'clock position, the Q multiplier may go into oscillation resulting in the blocking of the receiver. For use on phone the Q multiplier selectivity control, will also usually be employed between maximum counter clock wise position and approximately straight up. Beyond this point or even at approximately the straight up position the receiver is usually so selective that it is capable of wiping the modulation off the carrier by actually rejecting the side bands. For normal phone use or broadcast reception the selectivity control should always be employed in the OFF or counter clock wise position, since this results in the operation of a switch which disconnects the Q multiplier from the IF system.

It may be found desirable to place the function switch on BFO while tuning to aide in locating weak signals. As a result of activating the BFO, each carrier tuned in will produce a beat note or whistle, easily discernable. If phone signal is

located in this manner, adjust the bandsread tuning control for the lowest pitch tone or zero beat. This will result in centering the desired phone signal and now placing the function switch on REC will allow for normal AM operation.

If interference is experienced, either between stations close to one another or from an interfering CW signal, gradually advance the Q Multiplier selectivity control from its normally off or extreme counterclockwise position. This will result in increased selectivity be producing a spike or narrow bandwidth that is adjustable from approximately 3 Kcs to 100 cycles in width. The narrowest bandwidth being obtained by adjustment on the Q multiplier selectivity control to the point just below that which would cause the Q Multiplier to break into self oscillation as evidenced by the receiver blocking with a resultant loss of volume.

The spike can be moved around within the IF pass band that is nominally approximately 6 kc wide. The frequency control is the means for varying the position of this spike. Assuming that the selectivity control is adjusted to produce a spike 1 KC wide and also assuming that the band width of the IF system is 6 kc wide, it can be appreciated that the shape of the IF system response curve can be varied by moving the 1 kc band width anywhere within the 6 kc band width. This will produce a valley on either side of the spike or peak. By proper tuning, therefore, of the band spread dial and the frequency control of the Q multiplier, it should be apparent that an interfering signal may be placed in a valley and the desired signal on the peak, with the net result of decreasing the strength or eliminating the signal that is in the valley, without seriously affecting the desired signal intelligibility.

Since the use of the Q multiplier naturally means narrower band width, it should only be employed when interference is present. Never use the Q multiplier on the broadcast band unless you are hunting weak DX signals and are therefore not after maximum fidelity response. The same, more or less, applies to short wave broadcast listening. Here the use of the Q multiplier in addition to functioning as previously described may also prove advantageous from a noise reduction standpoint as a direct result of the decreased band width.

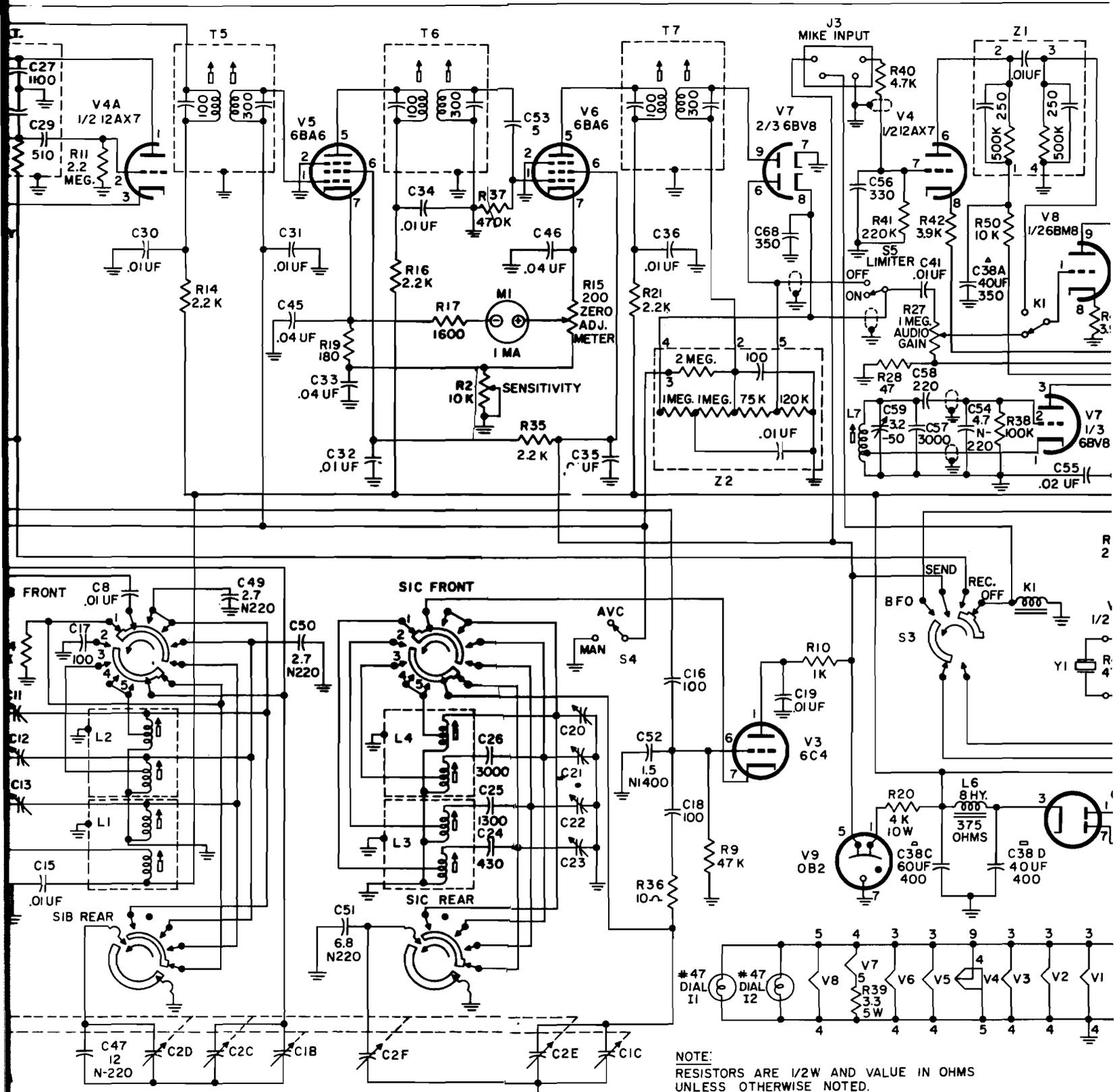
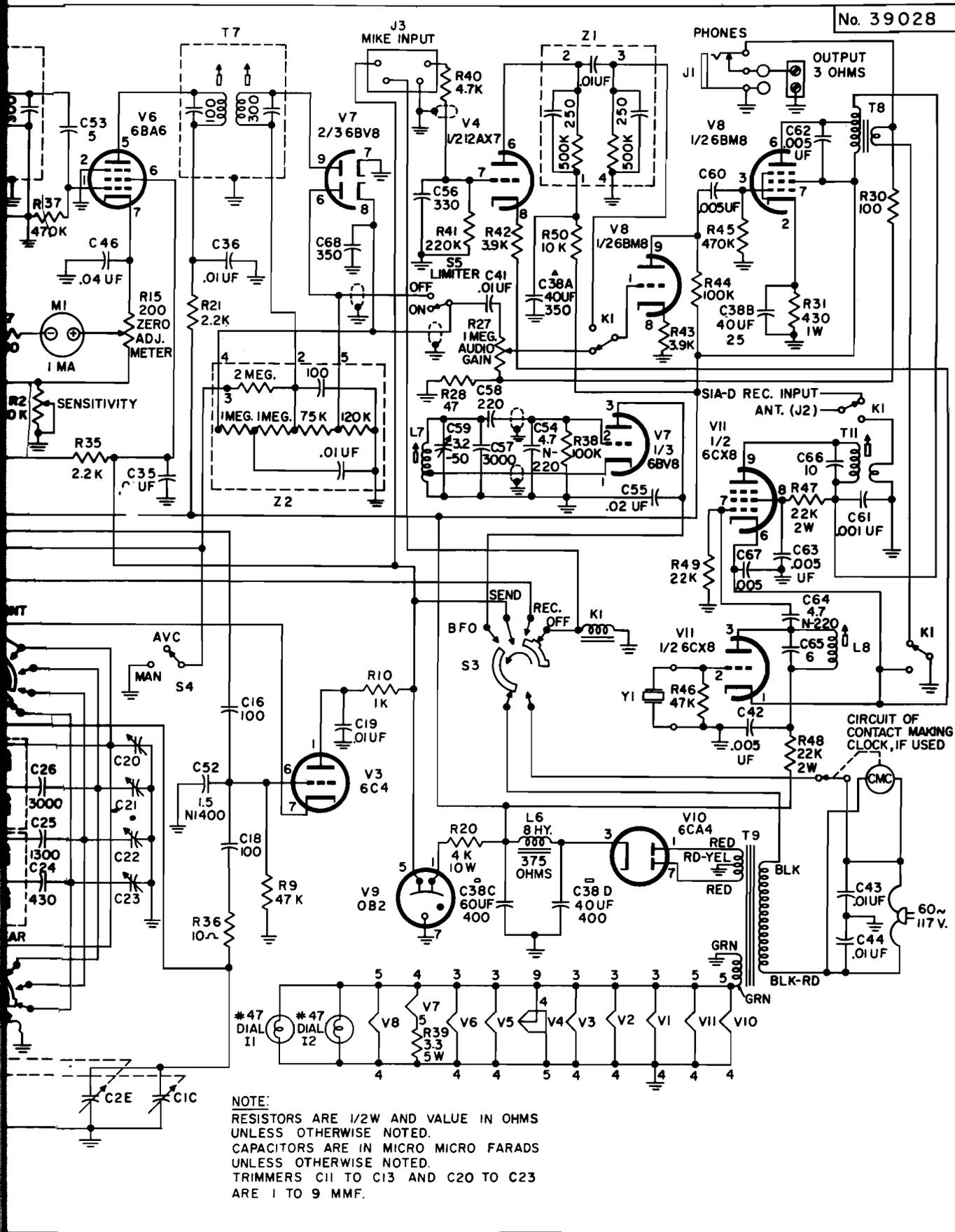


Figure 10. Hammurand HQ-105TR Transceiver Schematic Diagram

No. 39028



Q-105TR Transceiver Schematic Diagram

THE HAMMARLUND MANUFACTURING COMPANY, INC.**Standard Warranty**

The Hammarlund Manufacturing Company, Inc., warrants this equipment to be free from defects in workmanship and materials under normal and proper use and service for the uses and purposes for which it is designed, and agrees to repair or replace, without charge, all parts thereof showing such defects which are returned for inspection to the Company's factory, transportation prepaid, within a period of 90 days from date of delivery, provided such inspection discloses to the satisfaction of the Company that the defects are as claimed, and provided also, that the equipment has not been altered, repaired, subjected to misuse, negligence or accident, or damaged by lightning, excessive current or otherwise, or had its serial number or any part thereof altered, defaced, or removed. Tubes shall be deemed to be covered by the manufacturer's standard warranty applicable thereto, and such items shall be and are hereby excluded from the provisions of this warranty. Pilot lamps and fuses are not guaranteed for length of service.

Except as herein specifically provided, no warranty, express or implied, other than that of title, shall apply to any equipment sold hereunder. In no event shall the Company be liable for damages by reason of the failure of the equipment to function properly or for any consequential damages.

This Warranty is valid for the original owner of the equipment, and is contingent upon receipt of the Warranty Registration Card by the Company. No equipment shall be returned to the factory for repairs under warranty unless written authorization is obtained by the Company, and the equipment is shipped prepaid by the owner. The Company maintains Authorized Service Stations, names and locations of which will be sent upon request of the owner.

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





ESTABLISHED 1910