

92-5110

Figure 1. Hallicrafters Model HT-30 Transmitter-Exciter

SECTION I GENERAL

1.1. DESCRIPTION

The Hallicrafters Model HT-30 is a precision built transmitter-exciter capable of SSB (single side band with suppressed carrier), AM, or CW transmission in the 80, 40, 20, and 10 meter bands. The transmitter-exciter can represent the complete transmitting complement at an amateur station. A power source, an antenna and a key or microphone are the only external requirements for immediate "on the air" operation.

This unit may be used as a complete self-contained transmitter, or as an exciter for a linear power amplifier such as the Hallicrafters Model HT-31. If other linear amplifiers are employed, they should be capable of approaching the high performance standards of the HT-31 to utilize the full capabilities of the HT-30. Maximum power output ratings of the HT-30 are: SSB, 35 watts P. E. P. (peak envelope power); CW 35 watts; and AM 9 watts.

Prominent features of the HT-30 transmitter-exciter are: built-in highly stable V. F. O. ; full function control; crystal-like stability (0.009%), T. V. I. suppression, and for all practical purposes, complete suppression of

spurious frequencies. The circuitry employs the proven r-f selective filter system used by major commercial communications companies. This system assures continued suppression of unwanted side band energy and spurious emissions. Hum, noise and unwanted side band are down 40 db or more, while undesired beat frequencies are down at least 60 db.

Throughout the design of the HT-30, ease of operation has been stressed in addition to high performance standards. Provision is made for frequency control either by means of the built in V. F. O. (variable frequency oscillator) or by means of a crystal in the built-in crystal holder for fixed frequency operation. The large V. F. O. dial reads directly in kilocycles. Each black minor marker on the skirt of the FREQUENCY control is equivalent to approximately 200 cycles on the 80, 40, and 20 meter bands. Each red minor marker is equivalent to approximately 800 cycles on the 10 meter band. One control performs full band switching for the 80, 40, 20, and 10 meter bands, enabling the operator to shift frequency without the use of plug-in coils. SSB, DSB or CW operation may be selected by means of a single switch on the front panel. The built-in VOX (voice controlled transmission) system with ad-

justable delay and anti-trip features, is designed to control your receiver, the transmitter-exciter, and when used, a linear power amplifier. Two triode stages of resistance coupled speech amplifiers provide more than ample gain for low level crystal or dynamic microphones. Air circulation and high internal temperature protection is maintained by a power driven fan mounted under the unit's cover. The entire unit is ruggedly constructed and built to the same high precision standards that have made Hallicrafters a leader in the communications field.

1-2. T.V.I. (Television Interference) SUPPRESSION

Exceptional engineering ingenuity has been employed throughout the design and construction of the HT-30 to eliminate spurious and harmonic radiations that may cause television interference. The TVI problem was given full consideration in the design of every circuit as well as in the selection and layout of parts. More than adequate filtering has been provided for control circuits and AC power lines. Low impedance paths to ground for all harmonic frequencies are provided by specially constructed tuned circuits. Components were specifically selected to avoid self resonance at harmonic frequencies and arranged to prevent parasitic oscillation.

Another important T.V.I. proofing feature is employed in the output coupling circuit of the final amplifier. The tuned output circuit is a pi network that has

inherently excellent harmonic suppression ability. The unique design of this network is such that the conventional loading control is unnecessary and only the final tank tuning need be adjusted. The pi network is connected to a coaxial connector and permits the use of all antenna systems having an impedance within the range of 50 to 70 ohms. In addition to these factory installed precautions, a 50-ohm low pass TVI filter, which connects in series with the transmitter-exciter output, is available as an accessory. This unit may be obtained from your Hallicrafters dealer under part number 1X2621.

The Model HT-30 transmitter-exciter, as received from the factory, has had every advantage of Hallicrafters advanced engineering to minimize television interference. There are, however, some types of TVI that cannot be prevented within the transmitter itself. For example, when a television receiver is located in the immediate vicinity of the transmitter-exciter it is entirely possible that a fundamental signal will reach the input grid of the receiver in sufficient strength to cause a slight amount of interference. In such cases, it will be necessary to install a filter or trap at the television receiver. If the interfering signal does not enter the television receiver through the antenna, special shielding or filters on the TV receiver may be necessary. For a more complete discussion of measures that may be used to handle these special television interference problems, refer to the booklet entitled "TELEVISION INTERFERENCE", written and published by the Remington Rand Laboratory of Advanced Research, Norwalk, Conn.

SECTION II INSTALLATION

2-1. UNPACKING

After unpacking the HT-30 Transmitter-exciter, examine it closely for any possible damage which may have occurred during transit. Should any sign of damage be apparent, file a claim immediately with the carrier stating the extent of damage. Carefully check all shipping labels and tags for any special instructions before removing or destroying them.

2-2. LOCATION

Although the Model HT-30 transmitter-exciter is provided with a built-in power driven fan for cooling purposes, avoid excessively warm locations such as those near radiators and heating vents. The unit should be placed in a location that provides adequate space around it, permitting free circulation of air through the cabinet openings.

2-3. POWER SOURCE

The transmitter-exciter is designed to operate on 105 to 125 volt, 50-60 cycle AC current.

IMPORTANT: If in doubt about your power source, contact your local power company prior to inserting the power cord into an AC power outlet. Plugging the power cord into the wrong power source can cause extensive damage to the unit, requiring costly repairs.

2-4. REAR CHASSIS CONNECTIONS

(See Figure 2)

All external connections to the HT-30 transmitter-exciter are made to the connectors and terminals provided on the rear of the chassis.

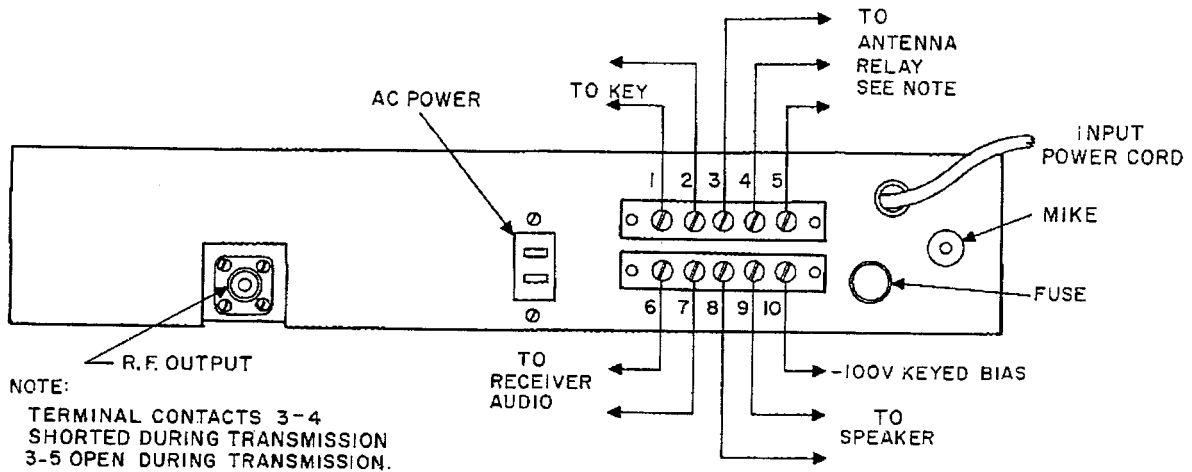
A. MIKE

The MIKE connector will accommodate any high impedance microphone (crystal, dynamic, etc.) that has an output level of -56 db or higher. The microphone cable should be fitted with an Amphenol type FC1F connector. The MIKE connector has a unique mechanical feature in that the center contact is spring tensioned and upon the removal of the microphone connector, the input circuit of the first audio stage is automatically shorted out.

B. TERMINAL LOAD

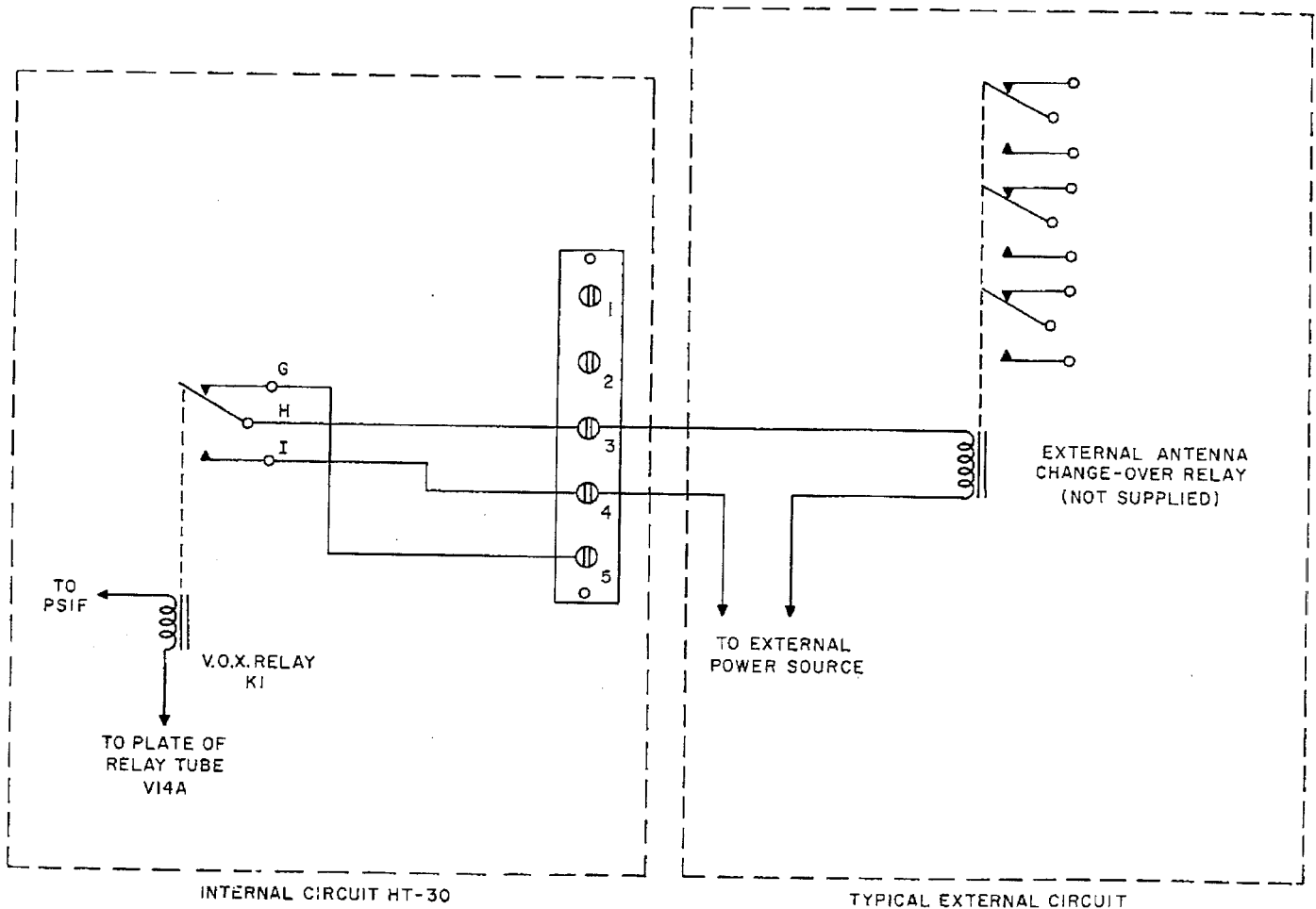
A terminal board is provided at the rear of the chassis to connect the HT-30 transmitter-exciter into your present system. The instructions given below may be modified to suit your particular needs.

KEY (terminals 1 and 2) - For CW operation, the hand key or "bug" is connected to terminals 1 and 2 of the terminal board. Terminal 1 is internally grounded in the transmitter-exciter. When the key is up, cut-off bias is maintained at the V.F.O.



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Figure 2. Connections to Rear of Chassis



92-5111

Figure 3. Terminal Board Connections to Antenna Change-over Relay

mixer and driver stages. Closing the key removes the cut-off bias providing signal excitation to the succeeding rf amplifier stages.

IMPORTANT: Never close the key when operating in SSB or AM.

ANTENNA RELAY (terminals 3, 4, and 5) - An external antenna change-over relay may be employed by utilizing terminals 3, 4, and 5 on the terminal board. These terminals are internally connected to spare contacts on the VOX RELAY of the transmitter-exciter. Fig. 3 illustrates typical connections of an antenna change-over relay to the terminal board. During periods of transmission, the VOX RELAY shorts out terminals 3 and 4 enabling the external power source to activate the antenna change-over relay. The voltage required of the external power source is dependent upon the type of change-over relay used.

RECEIVER AUDIO (terminals 6 and 7) and **SPEAKER** (terminals 8 and 9) - Connect the audio output of the stations receiver directly to terminals 6 and 7 of the terminal board. An 18 ohm, 2 watt resistor should also be connected across the receiver audio output to maintain a load at all times. The receiver speaker is connected directly to terminals 8 and 9. Connecting the receiver and speaker in this manner prevents the actuating of the transmitter-exciter's VOX circuit by incoming audio signals from the receiver and also disconnects the receiver output to the speaker when the transmitter-exciter is on the air.

NEGATIVE 100V KEYED BIAS (terminal 10) - The transmitter-exciter provides -100 volts to terminal 10. This feature was included to provide a convenient method of supplying control bias to an external linear power amplifier during receiving periods.

SECTION III FUNCTION OF OPERATING CONTROLS

3-1. POWER

The POWER control is a four position rotary switch which applies power to the unit in stages for warm up and operation.

In the "POWER OFF" position, the unit is inoperative. As the control is turned clockwise to any of the other three positions, the transmitter-exciter is turned on.

In the "WARM UP" position of the control, power is applied to all tube filaments; and plate power to all stages except the speaker amplifier, relay tube, and audio stages. When starting from the "POWER OFF" position, this control should remain at the "WARM UP" position for a minimum of 30 seconds.

The "STANDBY" position of the control is used during

C. AC POWER

This connector provides 105 to 125 volt, 50-60 cycle AC for the built-in fan.

D. R.F. OUTPUT

This is a coaxial connector which connects the transmitter-exciter to the antenna system or a linear amplifier. The connecting cable (52 ohm coax) should be fitted with an Amphenol type 83-1SP connector or its equivalent. The selection of the type of antenna and coupling will depend upon the frequencies used and the purpose of operation. Refer to the ARRL ANTENNA HANDBOOK for detailed information concerning transmitting antennas.

2-5. CRYSTAL INSTALLATION

Provision has been made for the installation of a crystal if fixed frequency crystal-controlled operation is desired. Switching from the built-in VFO to the crystal may be accomplished by means of the "VFO-XTAL" switch on the front panel. The location of the crystal holder socket is shown in Fig. 5. Crystals must have a pin spacing of .486" and a pin diameter of .093". Data pertaining to crystal frequency selection is given in paragraph 4-8A.

NOTE

Quartz crystals are not supplied with the Model HT-30 Transmitter-Exciter or stocked by The Hallicrafters Company. Crystals employed in the HT-30 must have a tolerance of .005%. Most of the standard types commercially available are satisfactory for use in this unit.

receiving periods of M.O.X. and C.W. operation. Placing the control in this position from "TRANSMIT", removes plate voltage from the 1st and 2nd audio amplifiers, the audio phase splitter, vox amplifier, relay tube, and speaker amplifier stages. Grid bias is also placed on the driver and VFO mixer stages making these circuits inoperative.

The "TRANSMIT" position reduces the bias on the driver stage and applies plate power to those stages in which power was removed while in the "STANDBY" position.

3-2. FUNCTION

The FUNCTION control is a four position rotary switch which selects CW, DSB, UPPER or LOWER SIDEBAND type of transmission as desired by the operator. An analysis of the FUNCTION switch operation is given in paragraph 5-5.

3-3. OPERATION

This control is a three position rotary switch which selects the mode of operation (VOX or MOX). The "CALIBRATE" position is used in conjunction with the CALIBRATE LEVEL control. (See paragraph 3-12.)

The "MOX" position energizes the transmitter control relay to the transmit position. This position of the OPERATION switch is used when manual control of transmission is desired. The POWER switch must be set to the "STANDBY" position during receiving periods.

In the "CALIBRATE" position, the transmitter-exciter control relay (VOX RELAY) is de-energized, permitting normal receiving operation with an antenna change-over relay (if used) in a receive position. This condition is also desirable since the "amount" of grid bias applied to the driver and vfo mixer stages can now be controlled by the setting of the CALIBRATE LEVEL control. A low power output can be obtained from the final amplifier stage for tuning purposes by adjusting the CALIBRATE LEVEL control. See paragraph 3-12.

In the "VOX" position, the transmitter control relay is operated by voice energy from the microphone. Placing the OPERATION control in this position applies B+ to the speaker amplifier and relay tube. The relay tube is biased at cut-off and will not energize the VOX RELAY until signal excitation is received from the audio amplifier and vox amplifier stages.

3-4. DRIVER TUNING

This control is a variable capacitor in the vfo mixer plate, rf amplifier grid, and driver plate circuits, and will resonate the circuits to any frequency in the 80, 40, 20, and 10 meter bands.

3-5. BAND SELECTOR

The BAND SELECTOR control is a four position rotary switch which selects the proper combination of tuned circuits and stages for the desired frequency band. It also selects the correct crystal oscillator (1675 or 1775 KC) to produce the desired sideband when the FUNCTION switch is set at either "UPPER" or "LOWER SIDEBAND".

In the "3.5-4 MC" and "7-7.3 MC" position, the 5.210 mc. osc., 10.420 mc. osc., the 5.2/10.42 mc. mixer, and 4 x multiplier stages are biased to cut-off.

The "14-14.35 MC" position removes bias from the 10.420 mc. osc. and 5.2/10.42 mc. mixer stage.

In the "28-29.7 MC" position, bias is applied to the 10.420 mc. osc. stage, and removed from the 5.210 mc. osc., and 4 x multiplier stages.

The frequency range of each position of the BAND SELECTOR control is indicated directly on the control.

3-6. FINAL TUNING

This control is a variable capacitor in the final amplifier tank circuit and will resonate the circuit to the operating frequency of the selected band.

3-7. FREQUENCY

The FREQUENCY control is a variable capacitor which sets the VFO frequency. The VFO has a frequency range of 5,225 kilocycles to 5,725 kilocycles. Due to mixing circuits, the VFO will set the transmitter-exciter to the desired operating frequency as indicated on the dial in any of the four bands. Each black minor marker on the skirt of the FREQUENCY control is equivalent to approximately 200 cycles on the 80, 40, and 20 meter bands. Each red minor marker is equivalent to approximately 800 cycles on the 10 meter band.

3-8. DIAL DRAG

This is a mechanical brake which can be adjusted either to lock or apply drag to the FREQUENCY control to avoid accidental rotation of the control during operation.

3-9. SPEECH LEVEL

This control is a potentiometer connected in the grid circuit of the second audio amplifier stage and adjusts the amount of audio drive to the balanced modulator stage. It has sufficient range to permit adjustment for any desired percentage of modulation.

3-10. CARRIER INJECTION

The CARRIER INJECTION control is a potentiometer in the cathode circuit of the balanced modulator. The amount of carrier in the output signal is determined by the control setting. A mechanical reference indicator stop is also provided with this control. The adjustment of the stop has been made at the factory and probably will not require any re-adjustment throughout the service of the transmitter-exciter. The stop is rotated and locked in place at the exact setting of the CARRIER INJECTION control which produces complete carrier suppression. This feature enables the operator to immediately locate the proper setting of the CARRIER INJECTION control when returning to SSB operation.

3-11. METER COMPRESSION

This is a potentiometer which allows the operator to set the meter at maximum deflection "0" db for desired output level when establishing proper drive levels in the transmitter-exciter. (See LEVEL INDICATOR METER, paragraph 3-16.)

3-12. CALIBRATE LEVEL

The CALIBRATE LEVEL control is a potentiometer used to select the amount of bias applied to the driver and vfo mixer stage when the OPERATION control is set in the "CALIBRATE" position. The use of the CALIBRATE LEVEL control enables the operator to easily set the transmitter-exciter on a desired net frequency. To obtain maximum results from this feature of your transmitter-exciter, the following procedure is recommended.

1. Tune in the desired SSB net frequency on your station receiver. Remove the receiver supplied carrier by switching off the receiver bfo.
2. Set the OPERATION control to the "CALIBRATE" position, thus de-energizing the carrier control

relay and placing the driver and vfo mixer stage at cut-off. Gradually reduce the cut-off bias by slowly advancing the CALIBRATE LEVEL control and vary the output frequency of the transmitter until the receiver SSB signal is clear. Set the OPERATION switch to the desired mode of operation (VOX or MOX). By utilizing the transmitter output frequency instead of the bfo as a carrier insertion oscillator, the transmitter is set exactly on the net frequency.

- Return the CALIBRATE LEVEL control to "0". Turn on the receiver bfo. The adjustment is now complete.

NOTE

If sufficient carrier is present in the received SSB signal, the transmitter-exciter may zero beat to the incoming frequency without the use of the receiver bfo.

3-13. VFO-XTAL

This control is a two position rotary switch which selects VFO or crystal controlled operation. When in the "XTAL" position, bias is placed on the VFO stage making it inoperative. Data on crystal selection is given in paragraph 4-8A.

3-14. 4X TUNING

The 4 X TUNING control is a variable capacitor which tunes the plate circuit of the quadrupler stage and the

three following tuned circuits to four times the VFO or crystal frequency, in 10 meter operations only.

3-15. MONITOR

This is a phone jack which allows monitoring of the received signal with a headset. Inserting the plug of a headset in the jack will automatically cut off the receiver speaker when it is connected as instructed in paragraph 2-4.

3-16. LEVEL INDICATOR METER

The LEVEL INDICATOR METER indicates the output of the transmitter-exciter in db below "0" db, enabling the adjusting of the transmitter-exciter for correct output (drive level required for a linear amplifier or approximate rated output for "barefoot" operation). Tuning of the Model HT-30 has been simplified by the design of the front panel meter circuit. The meter scale is compressed to enable low-level signals to produce a useable indication, yet strong signals do not drive the meter pointer off scale. This feature gives the meter a wide useable dynamic range which is not possible to obtain with a linear scale. The desired amount of compression may be obtained by adjusting the METER COMPRESSION control on the front panel. The output reading on the LEVEL INDICATOR METER can be shifted to read full scale ("0" db) and any level below can easily be read on the meter. A log of METER COMPRESSION control settings, for normal output into loads of controlled and reproducible characteristics, will aid in re-establishing proper drive levels and determining the proper operation of the unit. The log should be recorded at various frequencies and modes of operation.

SECTION IV TUNING PROCEDURE

4-1. GENERAL

The tuning procedure for CW operation will first be presented since AM(DSB) and SSB tuning procedures are modifications of that required for CW operation.

4-2. INITIAL CONTROL SETTINGS

Set the front panel controls to their starting positions as outlined below.

POWER	WARM UP
OPERATION	MOX
FUNCTION	DSB
SPEECH LEVEL	0
CARRIER INJECTION	0
METER COMPRESSION	5
CALIBRATE LEVEL	0
DRIVER TUNING	3
FINAL TUNING	CENTER OF ROTATION
BAND SELECTOR	DESIRED BAND
FREQUENCY	DESIRED FREQUENCY
VFO-XTAL	APPROPRIATE POSITION
4 X TUNING	CENTER OF ROTATION

4-3. CW TUNING

The tuning procedure of Model HT-30 for CW operation is as follows:

- Connect a 50 ohm impedance to the R. F. OUTPUT connector on the transmitter-exciter. The impedance may be an antenna or a properly tuned linear amplifier. However, a 50 ohm non-reactive load of at least 50 watts dissipation is advised for initial tuning.
- Set the POWER switch to the "TRANSMIT" position.
- Rotate the CARRIER INJECTION control to approximately 4.

CAUTION

When using the Model HT-30 to drive a linear amplifier, the CARRIER INJECTION control should not be advanced any farther than required to supply the correct amount of drive. If Hallcrafters HT-31 linear amplifier is being used,

refer to page 4 of the HT-31 Instruction Book for grid loading instructions.

4. Tune the driver and final amplifier stages by adjusting the DRIVER TUNING and FINAL TUNING control for maximum deflection on the front panel meter.

When tuning on the 10 meter band, the 4X TUNING control must also be adjusted for maximum deflection since the quadrupler stage has been placed in the circuit by the BAND SELECTOR switch. Prior to adjusting the 4 X TUNING control, rotate the FINAL TUNING control completely clockwise; then the DRIVER TUNING and 4 X TUNING must be adjusted simultaneously. While slowly rotating the 4 X TUNING control, "rock" the DRIVER TUNING control and observe the front panel meter. Set both controls at a position resulting in maximum output. After peaking the driver and quadrupler stages, the FINAL TUNING control should now be adjusted for maximum deflection on the panel meter.

NOTE

As full meter deflection ("0" db) is approached while tuning the driver and final amplifier stages (and quadrupler when on 10 meters), the amount of carrier injection should be decreased to maintain a level below "0" db. This will enable more accurate tuning and prevent "pinning" the needle of the panel meter.

5. Rotate the CARRIER INJECTION control fully counterclockwise and set at "0".
6. Advance the CARRIER INJECTION control slowly while observing the meter. Set the control at a point where further rotation does not cause an appreciable increase in the meter reading. Adjust the METER COMPRESSION control (counterclockwise) to set the indicator of the panel meter exactly on "0" db. Slowly rotate the CARRIER INJECTION control counterclockwise 1 db. Readjust the METER COMPRESSION control to maintain the panel meter indicator on "0" db. At this position, the maximum allowable drive excitation is being applied to the final amplifier stage.
7. Recheck the setting of the DRIVER TUNING and FINAL TUNING controls (also 4 X TUNING CONTROL if on 10 meters) for maximum meter deflection.
8. If there is a noticeable increase in meter deflection (indicator reading off scale) after performing step 7, repeat steps 5, 6 and 7 until step 7 results in no appreciable change in meter deflection.
9. Set the FUNCTION switch to "CW" position. Proceed with CW transmission.

4-4. AM (DSB) TUNING - ALTERNATE METHOD

To tune the transmitter-exciter for AM transmission, proceed as follows:

1. Perform the first eight steps of the CW tuning procedure, paragraph 4-3.
2. Reduce the CARRIER INJECTION control setting until the meter reads approximately 3 db. This reduces the rf excitation to the final amplifier to approximately one-half that employed in CW transmission and to the maximum level for 100% modulation.
3. Set the OPERATION switch to "MOX" or "VOX" as desired.
4. With another station monitoring the output of the transmitter-exciter, adjust the amount of modulation by slowly advancing the SPEECH LEVEL control. Set the SPEECH LEVEL control just below that setting which produces distortion (over 100% modulation) in the transmitter-exciter output. Proceed with AM transmission.

4-5. AM (DSB) TUNING - PREFERRED METHOD

Adjusting the SPEECH LEVEL control for 100% modulation can be accomplished by using the front panel LEVEL INDICATOR meter and an audio tone. The audio tone may be obtained by tuning your station receiver to an unmodulated signal and setting the bfo for an approximate 1000 cycle tone or any tone pleasing to the ear. Set the audio output of the station receiver to your normal speaking voice level. Place your microphone in front of the receiver speaker at the same equivalent distance as normally used when speaking into the microphone. Then proceed as follows:

1. Perform the first two steps of the AM tuning procedure, paragraph 4-4.
2. Slowly advance the SPEECH LEVEL control while observing the front panel LEVEL INDICATOR meter. The meter reading will decrease, reach a null, then begin to increase. The null corresponds to approximately 100% modulation and the increase is over 100% modulation. Reduce the setting of the SPEECH LEVEL control counterclockwise until the meter is at the base of the null. Note the meter reading, then continue reducing the setting one-half db past the null point.
3. Set the OPERATION switch to "VOX" or "MOX" as desired.
4. Set the station receiver to the operating frequency and proceed with AM transmission.

4-6. SSB TUNING

The tuning procedure of the transmitter-exciter for SSB operation is as follows:

1. Tune the transmitter-exciter as instructed for CW operation, paragraph 4-3.
2. Set the FUNCTION switch to "UPPER" or "LOWER" SIDEBAND as desired.
3. Set the CARRIER INJECTION control to "0" (minimum carrier).

4. Set the OPERATION switch to "MOX" or "VOX" as desired.
5. While monitoring the transmitter-exciter output, proceed with SSB transmission, setting the SPEECH LEVEL control to the highest setting which does not produce distortion. The SSB tuning is now complete.

4-7. SSB TRANSMISSION WITH CARRIER

If it is desired to transmit a SSB signal with a carrier, proceed as follows:

1. Tune the transmitter-exciter as instructed for SSB (paragraph 4-6).
2. Advance the CARRIER INJECTION control injecting the desired amount of carrier into the output of the transmitter-exciter.

4-8. ADDITIONAL TUNING INFORMATION FOR 11 METERS AND 80 METERS

The characteristics of the heterodyne systems in a single sideband transmitter often result in the presence of a few spurious harmonics of the 1725 kc and 6985 kc IF's which fall near or within the 80-meter and 11-meter amateur bands, respectively. Extreme care has been taken to reduce the level of these spurious frequencies to a negligible level when the HT-30 is properly tuned. However there is a possibility of tuning the output to one of these highly attenuated spurious harmonic frequencies (3450 kc and 27,940 kc) unless the following precautions are followed.

1. CARRIER INJECTION, DRIVER TUNING, and FINAL TUNING controls.

When adjusting carrier injection, advance the CARRIER INJECTION control only as far clockwise as necessary for final tune-up, and when adjusting the DRIVER TUNING and FINAL TUNING controls begin at the high frequency end (fully counterclockwise) and proceed downward in frequency.

2. Carrier Suppression.

After initial tune-up, set the FUNCTION switch to DSB, the CARRIER INJECTION control at 0, and the METER COMPRESSION control at 10. If the carrier suppression indicated on the meter is not between 25 and 30 db, proceed as follows:

- a. Loosen the two thumb screws at the CARRIER INJECTION control, but first note the setting of the mechanical reference indicator with respect to the calibration numbers on the control.

- b. Rock the CARRIER INJECTION control back and forth for maximum suppression, and compare it with the previously marked knob setting.
- c. Adjust the 50-kc amplitude balance control (R9, see Fig. 5) for maximum suppression.
- d. Repeat step b.
- e. Adjust the phase balance control (R10, Fig. 5) for maximum suppression.
- f. Repeat step b.
- g. Hold the CARRIER INJECTION control, rotate the mechanical reference indicator in a counterclockwise direction up to the dial calibration of maximum suppression, and lock the two thumb screws.

4-9. CRYSTAL-CONTROLLED OPERATION

When crystal-controlled operation is desired, insert a crystal into the crystal socket (Fig. 5) and place the VFO-XTAL switch in the "XTAL" position. The tune-up procedure for crystal-controlled operation is identical to VFO operation.

A. SELECTION OF CRYSTAL FREQUENCY

In crystal-controlled operation, the VFO is rendered inoperative and its normal function is replaced by the crystal oscillator; therefore, the crystal frequency must be within the range (5.225 mc to 5.725 mc) originally covered by the VFO.

To obtain a desired operating frequency, select the crystal frequency (5.225 mc to 5.725 mc) by using the formulas listed below. The crystal and operating frequencies must be in megacycles.

- 80 meters; Crystal Frequency = Operating Frequency + 1.725 mc
- 40 meters; Crystal Frequency = Operating Frequency - 1.725 mc
- 20 meters; Crystal Frequency = Operating Frequency - 8.695 mc
- 10 meters; Crystal Frequency = (Operating Frequency - 6.935 mc) ÷ 4

B. TYPICAL CRYSTAL FREQUENCIES

Typical examples of crystal frequencies required to obtain various operating frequencies is listed in the crystal frequency table. In many cases, one crystal frequency can be used on all bands with the resultant frequency still remaining within the band limits. The resultant operating frequencies marked with an asterisk indicate that these frequencies are out of the band limits.

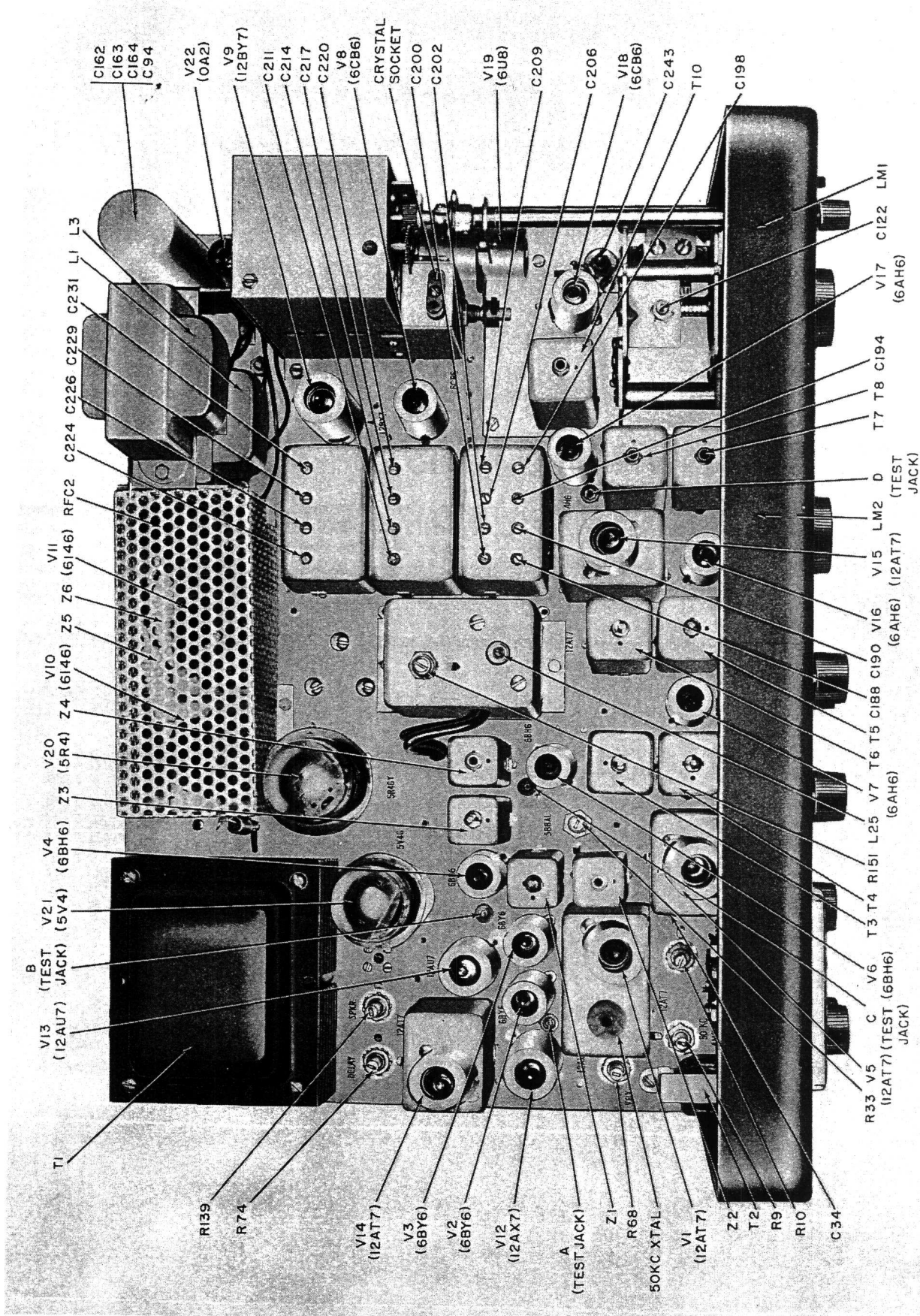


Figure 5. Model HT-30 Chassis, Top View

CRYSTAL FREQUENCY TABLE

Crystal Frequency (mc)	RESULTANT OPERATING FREQUENCY (mc)			
	80 Meters	40 Meters	20 Meters	10 Meters
5.225	3.500	6.9950*	13.920*	27.835*
5.3	3.575	7.025	13.995	28.135
5.4	3.675	7.125	14.095	28.535
5.5	3.775	7.225	14.195	28.935
5.6	3.875	7.325	14.295	29.335
5.725	4.000	7.450*	14.420*	29.835*

4-10. USE OF VOX AND DELAY CONTROLS

The VOX and DELAY controls are potentiometers located on the top of the transmitter-exciter chassis as illustrated in Fig. 5. Both controls are utilized in conjunction with VOX operation and are semi-permanently adjusted to your personal speaking characteristics.

A. The VOX control (R68) is an audio sensitivity control which determines the audio level which will trip (energize) the VOX RELAY placing the transmitter-exciter "on the air". This control should be adjusted with the microphone at the normal speaking distance from the mouth. Advance the VOX control to a setting slightly above that which will "trip" the VOX RELAY. Increasing the setting will increase the sensitivity and will have the undesirable result of background noise "tripping" the VOX RELAY and placing the transmitter-exciter on the air.

B. The DELAY control (R74) is in the grid circuit of the relay tube and determines the time lag in the de-energizing of the VOX RELAY when audio excitation is removed from the audio amplifier and VOX amplifier stages. This control should be advanced while speaking into the microphone and set at a position in which the time lapse between words will not de-energize the VOX RELAY. This adjustment will eliminate the constant keying of the transmitter-exciter at the beginning of each word when speaking. There is a slight interaction between the VOX and DELAY circuits, consequently, a slight readjustment of both controls may be necessary to obtain desired results.

4-11. USE OF SPEAKER CONTROL

This control is a potentiometer (R139) located on top of the transmitter-exciter chassis (Fig. 5) and is used in conjunction with VOX operation. When the station receiver and speaker are connected to the terminal board for VOX operation (paragraph 2-4B), the SPEAKER anti-trip control is advanced to a setting where the normal incoming audio signal will not energize the VOX RELAY. This feature prevents the retransmitting of the incoming audio signals from your station receiver.

4-12. MODEL HT-30 WITH LINEAR AMPLIFIER

When the Model HT-30 transmitter-exciter is used in conjunction with a linear amplifier, such as the Hallicrafters HT-31, it is desirable to use a swamping resistor across the rf transmission line between the two units. This resistor should have a value of 100 ohms, 9 watts (minimum) and be a non-inductive type, such

as a globar type CX. There are two reasons for the use of this resistor.

1. The instantaneous input impedance of a class B stage changes as the driving voltage goes through a cycle. This change in impedance represents a change in load for the transmitter-exciter, which causes distortion during peaks when the load impedance is lowest. Adding a constant load impedance in parallel with the exciter output reduces the dynamic load change.
2. The signal to noise ratio (ratio of residual noise to maximum power output) in SSB operation is based on the maximum transmitter-exciter output capabilities. When the amount of transmitter-exciter output utilized is less than maximum, this ratio becomes less favorable since the maximum power output is decreased while the residual noise output remains the same.

IMPORTANT: Do not use less than 100 ohms resistance to swamp the exciter output. Too low a resistance value will result in distortion and a reduced amount of reserve power available.

4-13. SERVICE OR OPERATING QUESTIONS

For any further information regarding operation or servicing of your Model HT-30 transmitter-exciter, write to:

General Service Manager
The Hallicrafters Co.
4401 West Fifth Ave.
Chicago 24, Illinois

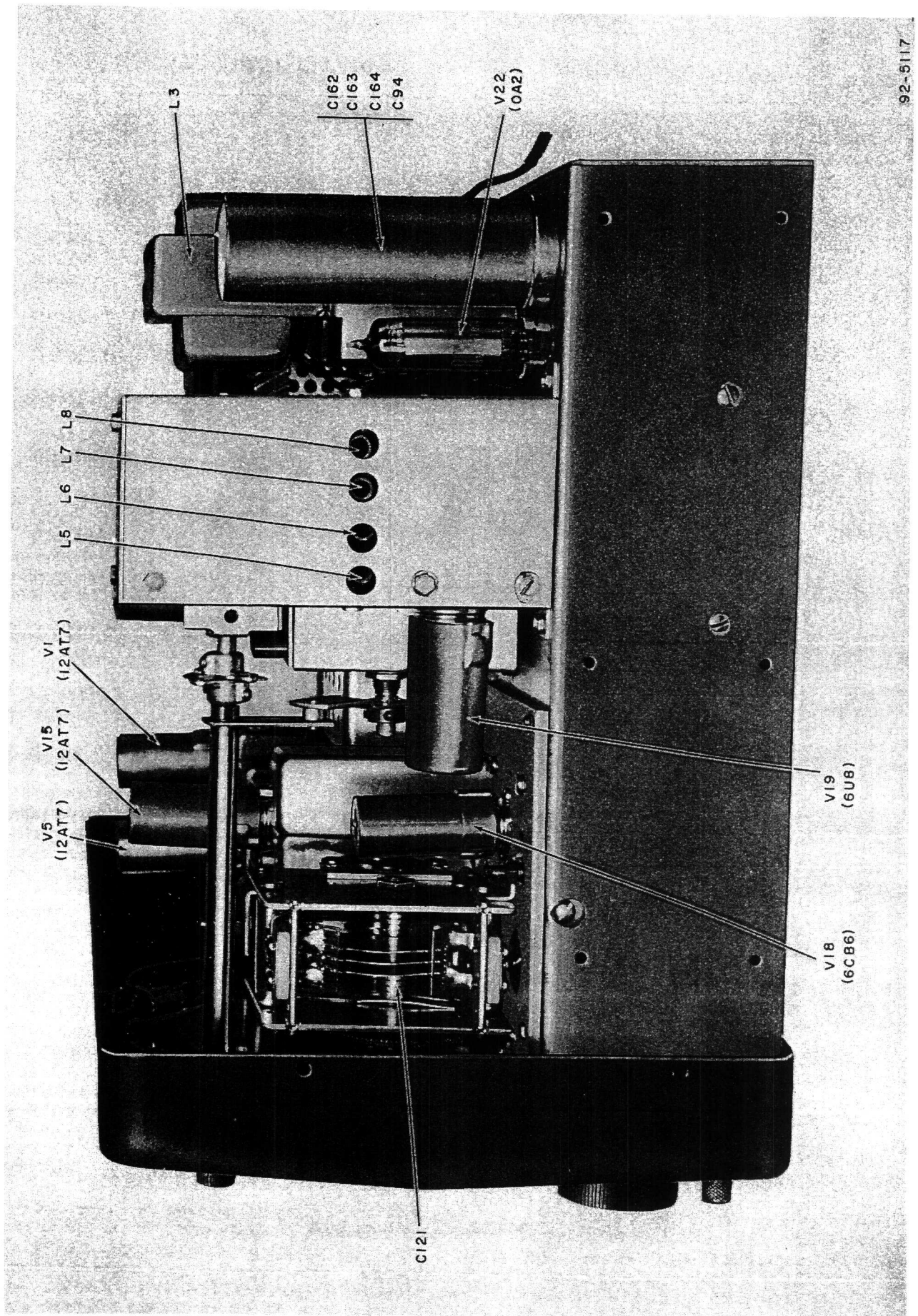
Be sure to include the model, serial, mark number, and date purchased.

Make no service shipments to the factory unless instructed to do so by letter. The Hallicrafters Company will not accept the responsibility for unauthorized shipments.

The Hallicrafters Company reserves the privilege of making revisions in current production of equipment and assumes no obligation to incorporate these revisions in earlier models.

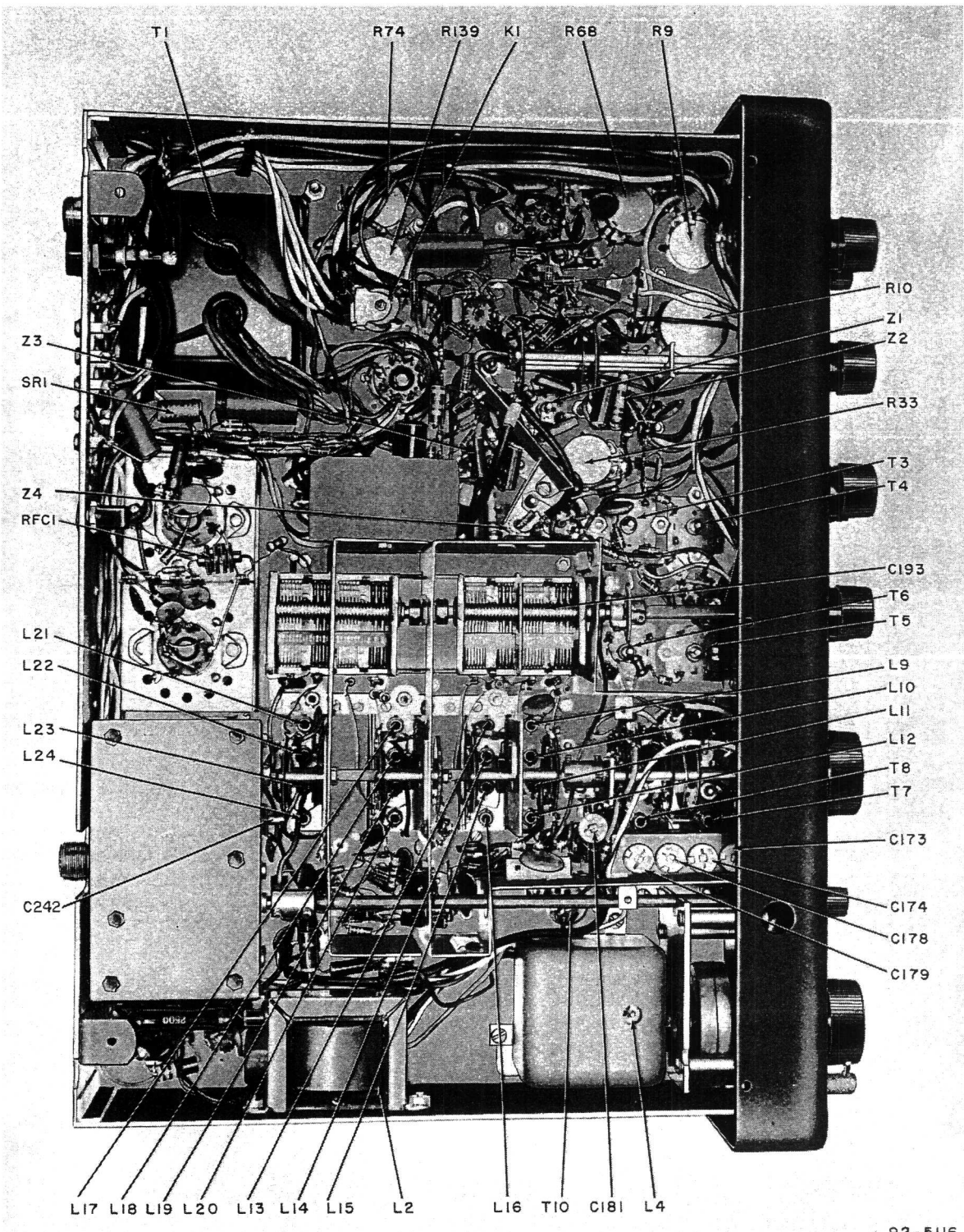


9241401-C



92-5117

Figure 6. Model HT-30 Chassis, Right Side



92-5116

Figure 7. Model HT-30 Chassis, Bottom View

SECTION V SERVICE DATA

5-1. TECHNICAL SPECIFICATIONS

TUBES.....	19 plus 1 voltage regulator and 2 voltage rectifiers
POWER SOURCE.....	105-125 volts, 50/60 cycles
POWER OUTPUT	
SSB (PEP).....	35 watts
CW	35 watts
AM	9 watts
AUDIO INPUT	55 db minimum
STABILITY.....	00.009 percent
HUM AND NOISE OUTPUT	At least 40 db below carrier
UNWANTED BEAT OUTPUT ..	At least 40 db below carrier
FREQUENCY COVERAGE.....	80, 40, 20, and 10 meter bands
FREQUENCY SELECTION ..	Self-contained VFO or crystal
DIMENSIONS.....	9 x 18-3/8 x 12-7/8"
SHIPPING WEIGHT.....	51 lbs.

5-2. CHASSIS REMOVAL

The chassis and front panel assembly are removable as a unit from the cabinet by removing 2 screws at each side of the front panel and the 5 screws on the under side of the cabinet.

5-3. TUBE AND DIAL LAMP REPLACEMENT

Access to the dial lamps and all tubes may be obtained by raising the top cover of the cabinet.

5-4. BASIC OPERATING PRINCIPLES

The basic operating principles of the Model HT-30 transmitter-exciter is explained in the following subparagraphs. Fig. 8 is a block diagram of the transmitter-exciter and Fig. 12 is the schematic diagram. The complete system is first discussed for SSB operation and a brief description of CW and AM operation follows.

A. GENERAL OPERATION

Tube V1 is a 50 KC crystal controlled oscillator and a phase splitter. The output of V1B is two 50 KC signals, 180 degrees out of phase. This signal, plus the modulation signal from the audio phase splitter stage V13B, are fed to a balanced modulator stage, V2 and V3. The rf drive and audio inputs to the balanced modulator stage are in push-pull and the output is connected in push-pull. The proper phase and amplitude relation has been obtained by the factory set PHASE BAL. and AMP. BAL. controls.

In SSB operation, when the CARRIER INJECTION control is set at "0", the balanced modulator stage is placed in a balanced condition and carrier output is at least 40 db below peak envelope power. Advancing the CARRIER INJECTION control unbalances this stage and injects the 50 KC carrier into the system.

Under balanced conditions, the output of the balanced modulator stage V2 and V3 consists of the upper and lower sideband of 50 kc. A filter system, in the input and output circuits of the sideband filter amplifier stage, V4, suppresses the lower sideband of the modulated 50 kc signal. The upper sideband is fed to the 1725 kc mixer, V6, where it is combined with 1675 kc or 1775 kc, as selected, from V5. The frequency used determines whether the upper or lower sideband is employed. For example:

1. Upper sideband - The upper sideband of 50 kc is mixed (sum) with 1675 kc to obtain the upper sideband of 1725 kc. The output circuit of the 1725 kc mixer stage, V6, consists of a coupled pair of tuned transformers, T3 and T4, which pass only a band of frequencies near 1725 kc.
2. Lower sideband - The upper sideband of 50 kc is mixed with 1775 kc to obtain the lower sideband of 1725 kc. As in the upper sideband condition, the output circuit of V6 passes only the frequencies near 1725 kc.

Up to this stage, the operation of the HT-30 transmitter-exciter is identical on all bands. The remaining stages "beat" (sum or difference) the selected 1725 kc sideband to the desired operating frequency. The "beating" of a sideband with progressively higher frequencies to obtain a desired operating frequency reduces "image" frequency problems. Frequency multiplication cannot be used since doubling the frequency would double the spacing of the sidebands. This would change the relative frequency of the modulating frequencies when the signal is detected.

B. 80 METER OPERATION

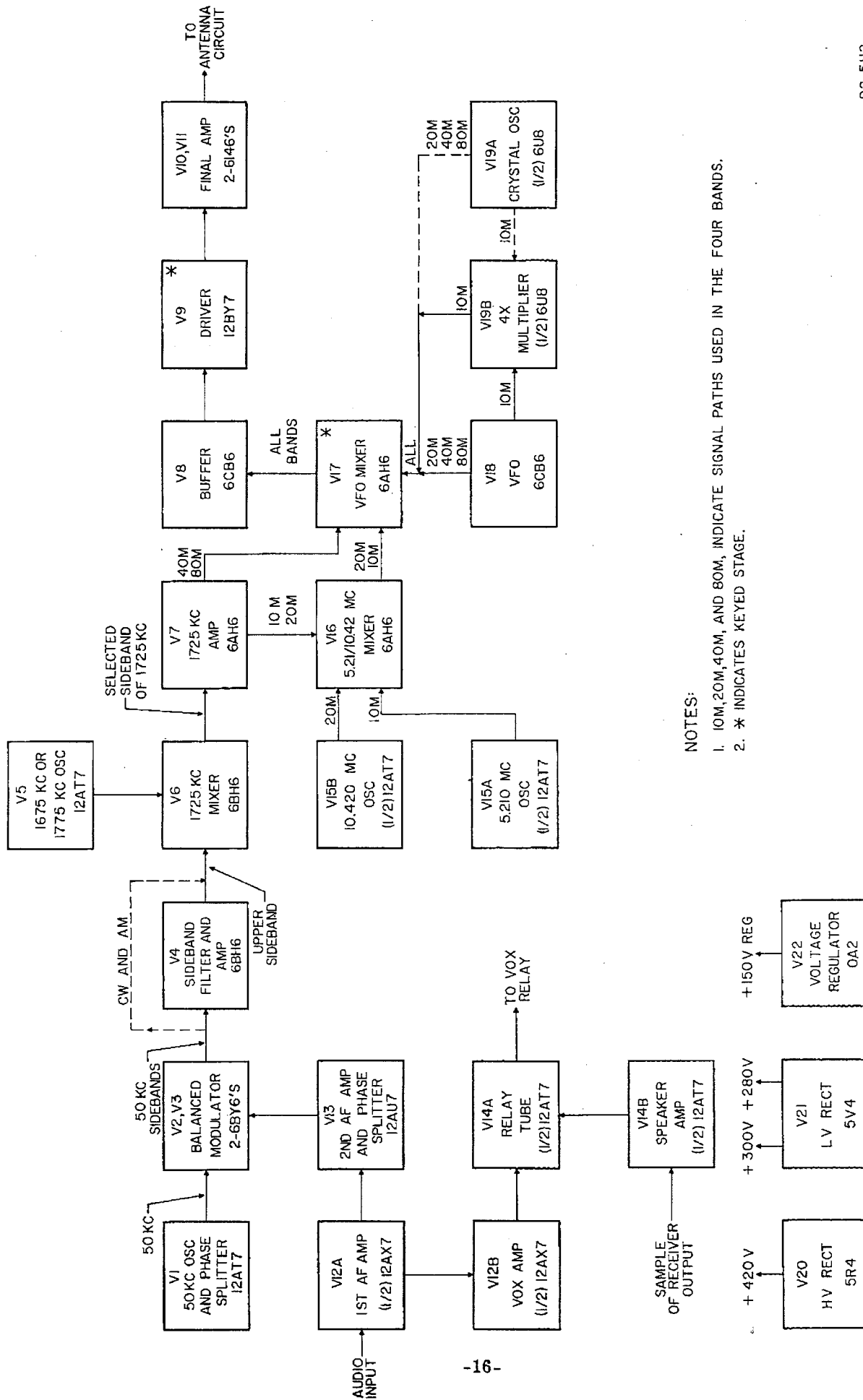
The selected sideband (upper or lower) of 1725 kc is amplified by 1725 kc amplifier, V7, and mixed (difference) by V17 with the output frequency of the VFO. Since the VFO output frequency is selectable from 5.225 to 5.725 mc, the difference output of the mixer is the sideband of a frequency between 3.500 to 4.000 mc.

C. 40 METER OPERATION

Operation on 40 meters is essentially the same as 80 meters except that "sum" mixing is employed in place of "difference" mixing. When the VFO output (5.225 to 5.725 mc) is mixed with the selected (upper or lower) sideband of 1725 kc, the resulting signal is the sideband of a frequency between 6.950 mc to 7.450 mc.

D. 20 METER OPERATION

For 20 meter operation, the selected sideband (upper or lower) of 1725 kc is mixed (difference) by V16 with the output of V15B, a 10.420 mc crystal oscillator. The output of V16, a sideband of 8.695 mc, is mixed (sum) again in V17 with the VFO output (5.225 to 5.725 mc). The output of V17 is the selected sideband of a frequency between 13.920 mc to 14.420 mc.



NOTES:
 1. 10M, 20M, 40M, AND 80M, INDICATE SIGNAL PATHS USED IN THE FOUR BANDS.
 2. * INDICATES KEYED STAGE.

Figure 8. Model HT-30, Block Diagram

E. 10 METER OPERATION

The selected sideband (upper or lower) of 1725 kc is mixed (sum) by V16 with the output of V15A, a 5.210 mc crystal oscillator. The output of V16, a sideband of 6.935 mc, is mixed (sum) by V17 with the output of quadrupler V19B. The quadrupler multiplies the VFO frequency four times (20.900 mc to 22.900 mc). The result of the mixing action is a sideband of a frequency from 27.835 mc to 29.835 mc.

F. CW OPERATION

Advancing the CARRIER INJECTION control unbalances the balanced modulator stage (V2 and V3), allowing a carrier to be amplified and heterodyned to the desired output frequency. A section of the FUNCTION switch bypasses the 50 kc filter (V4 and associated circuitry) in the "CW" position. With these exceptions, CW operation is the same as SSB operation.

G. DSB (AM) OPERATION

As in CW operation, the carrier frequency is present in the signal and the 50 KC filter is bypassed. Amplitude modulation of the carrier occurs in the balanced modulator (V2 and V3). The resulting signal is amplified and heterodyned as in CW and SSB operation.

5-5. FUNCTION SWITCH

The position of the FUNCTION switch determines the type of transmission (CW, DSB, UPPER or LOWER SIDEBAND). Fig. 9 is a schematic diagram of the FUNCTION switch showing it in the "CW" position. The sections are marked "FS", followed by the wafer number and a letter designating front or rear as viewed from the front of the chassis. For example FS1R indicates; FUNCTION switch, first wafer, rear. FUNCTION switch operation is briefly explained in the following paragraphs.

A. CW OPERATION

The 50 kc carrier from the balanced modulator is routed around the 50 kc carrier and sideband filter to the 1725 kc mixer stage by FS3R. Section FS2F of the "FUNCTION" switch shorts the input of the sideband filter, since the passband characteristic of the filter would attenuate the carrier. The left-hand portion of FS1R and FS1F are open, removing plate voltage from the sideband filter amplifier, V4, and removing the keying line from the VOX relay. The right-hand portion of these switch sections have no effect in CW operation since the 1675 kc oscillator and 1775 kc oscillator produce the same carrier frequency.

B. DSB (AM) OPERATION

Rotating the FUNCTION switch one position clockwise, to "DSB", does not alter any connections in FS3R, FS2R,

and FS1R. The only change that occurs are in FS1F, where the keying line is connected to the VOX relay.

C. SSB OPERATION

Rotating the switch to the third and fourth position, section FS3R connects the output of the sideband filter amplifier stage, V4, to the succeeding stages. FS2F opens the short across part of the sideband filter and removes the 82K swamping resistor from the remainder of the filter. The left hand sections of FS1R applies voltage to the plate of V4, and FS1F still connects the keying line to the VOX relay.

The right-hand portions of FS1R and FS1F select the 1675 kc or 1775 kc oscillator to obtain the upper or lower sideband as selected by the operator. For frequency selection on the four bands, sum or difference mixing is employed. Difference mixing reverses the position of the sideband. For example, in 80 meter operation, the lower sideband of 1725 KC is mixed (difference) with the VFO frequency; the resultant signal is on upper sideband. Therefore, a section of the BAND SELECTOR switch applies cut-off bias to either FS1R or FS1F of the FUNCTION switch. When a particular sideband is selected by the operator, the BAND SELECTOR switch automatically selects the correct local oscillator frequency (1675 kc or 1775 kc) as required, to compensate for the change between sum and difference mixing on each band.

5-6. VOLTAGE MEASUREMENT

Tube socket voltages for the transmitter-exciter are shown in Fig. 10 and Fig. 11. Voltage readings for the 50 kc oscillator (V1), 1675/1775 kc oscillator (V5), vox amplifier and relay tube (V14), 5.21/10.42 mc oscillator (V15), vfo (V18), and the crystal oscillator and 4X multiplier (V19) must be taken from the top of the chassis as they are unattainable from the underside. Access to pin voltages are easily obtained by utilizing commercially available tube adapters. The adapters have external test prod points and are simply inserted between the tube and socket.

It is possible to also obtain pin voltages by removing the tube and winding one or two turns (insulation removed at turns) of #20 solid wire around the pin in question and reinserting the tube in its socket. However, if this procedure is utilized, care should be exercised to prevent inadvertent shorting of the tube pin to chassis or to the adjacent tube pin.

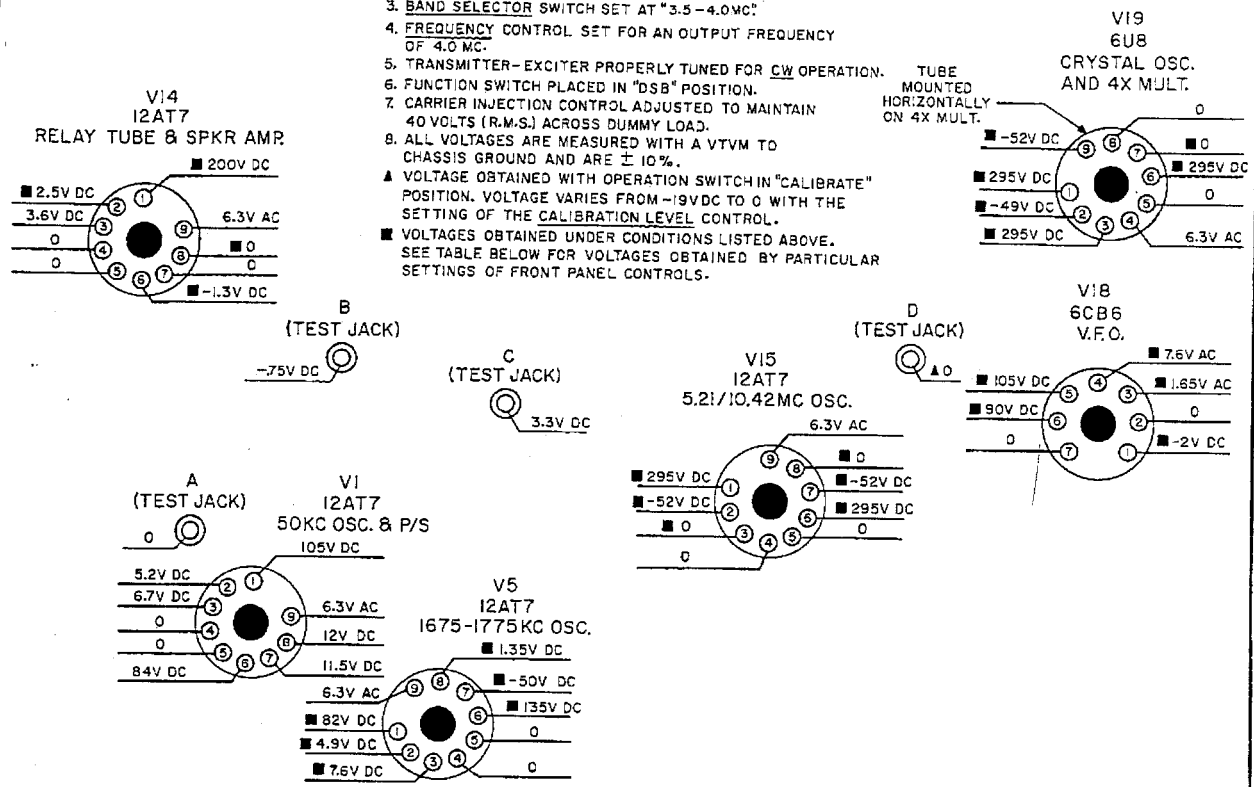
Specific conditions, under which voltage measurement is made, are noted on each voltage chart.

REAR OF CHASSIS
(TOP VIEW)

NOTES

VOLTAGE READINGS TAKEN UNDER THE FOLLOWING CONDITIONS:

1. LINE VOLTAGE -117 VOLTS, 60 CYCLES AC.
 2. A 50 OHM, 50 WATT, NON-INDUCTIVE DUMMY LOAD PLACED ACROSS THE R.F. OUTPUT CONNECTOR.
 3. BAND SELECTOR SWITCH SET AT "3.5-4.0MC"
 4. FREQUENCY CONTROL SET FOR AN OUTPUT FREQUENCY OF 4.0 MC.
 5. TRANSMITTER-EXCITER PROPERLY TUNED FOR CW OPERATION.
 6. FUNCTION SWITCH PLACED IN "DSB" POSITION.
 7. CARRIER INJECTION CONTROL ADJUSTED TO MAINTAIN 40 VOLTS (R.M.S.) ACROSS DUMMY LOAD.
 8. ALL VOLTAGES ARE MEASURED WITH A VTVM TO CHASSIS GROUND AND ARE $\pm 10\%$.
- ▲ VOLTAGE OBTAINED WITH OPERATION SWITCH IN "CALIBRATE" POSITION. VOLTAGE VARIES FROM -19VDC TO 0 WITH THE SETTING OF THE CALIBRATION LEVEL CONTROL.
- VOLTAGES OBTAINED UNDER CONDITIONS LISTED ABOVE. SEE TABLE BELOW FOR VOLTAGES OBTAINED BY PARTICULAR SETTINGS OF FRONT PANEL CONTROLS.



PERTINENT VOLTAGES, OBTAINED BY A PARTICULAR SETTING OF THE FUNCTION, BAND SELECTOR, OR XTAL-VFO CONTROL, ARE LISTED IN THE FOLLOWING TABLE. THE UNIT MUST BE RETURNED FOR THE HIGH END OF EACH BAND WHEN TAKING VOLTAGE MEASUREMENTS ON THE 40, 20, OR 10 METER BAND AS INSTRUCTED IN THE TABLE. ALSO, THE CARRIER INJECTION CONTROL IS ADJUSTED TO MAINTAIN 30 VOLTS (RMS) ACROSS THE DUMMY LOAD WHEN ON THE 10 METER BAND. ALL VOLTAGES ARE DC UNLESS OTHERWISE SPECIFIED.

TUBE	CONTROL AND SETTING	TUBE PIN NUMBER								
		1	2	3	4	5	6	7	8	9
V5-12AT7	FUNCTION-LOWER SIDEBAND	90	-48.0	1.48			83.0	7.8	9.0	
V14-12AT7	OPERATION-CALIBRATE	0	2.5	3.4			-1.4		0	
	OPERATION-VOX	275	2.5	8.0			180		4.0	
V15-12AT7	BAND SELECTOR 14-14.35	290	-52	5.8			97.0	4.7	9.7	
	BAND SELECTOR 28-29.7	105	-2.4	8.5			290	-52	5.2	
V18-6CB6	XTAL VFO XTAL (CRYSTAL REMOVED)	-33.0		0	0	150	150			
V19-6U8	BAND SELECTOR 28-29.7	290	-3.1	175			295	.59		-52.0

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Figure 10. Tube Socket Voltage Chart, Top of Chassis

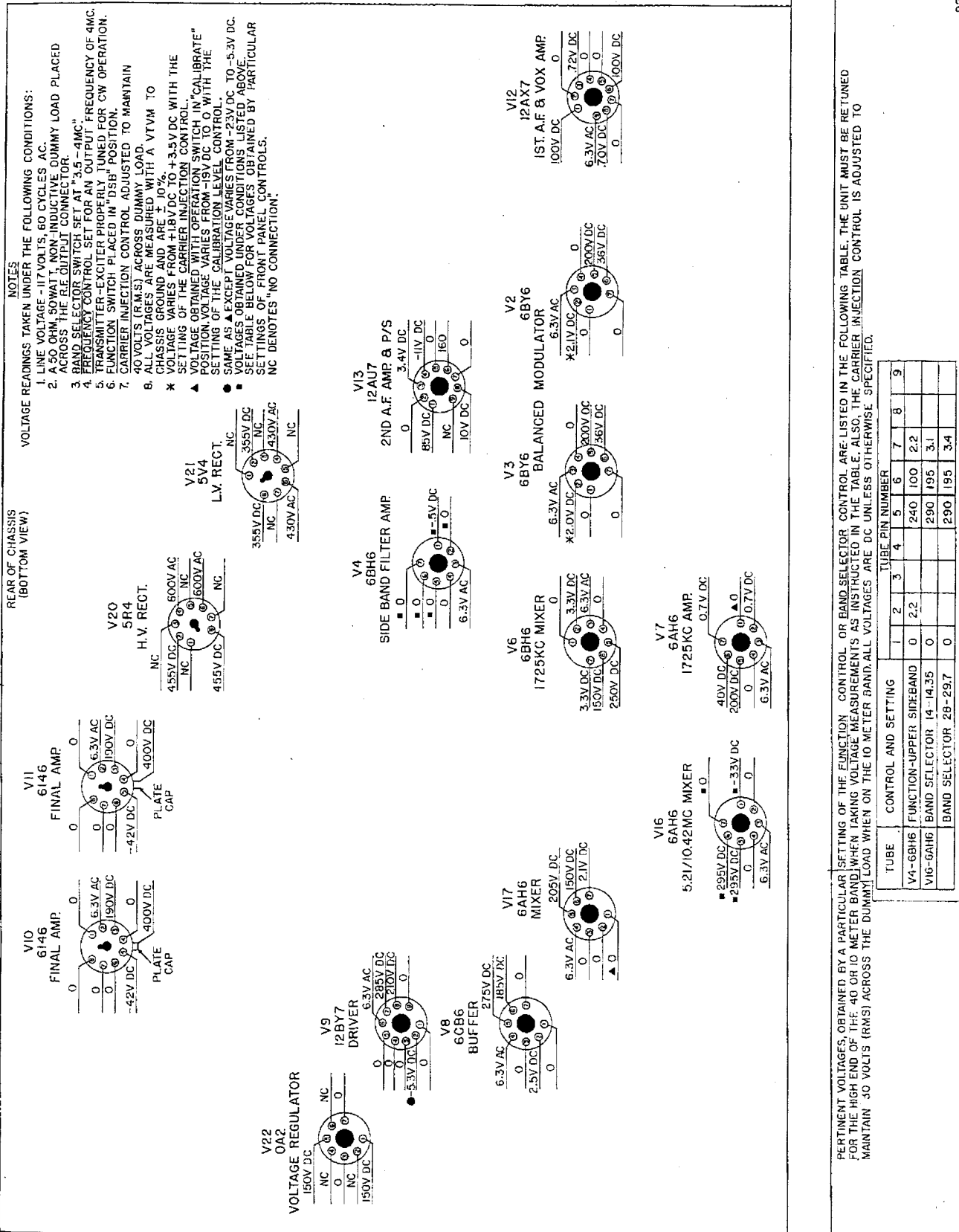


Figure 11. Tube Socket Voltage Chart, Bottom of Chassis

SECTION VI ALIGNMENT

The Model HT-30 Transmitter-exciter has been carefully aligned at the factory by specially trained technical personnel using precision equipment. Alignment of the transmitter-exciter should not be attempted until all other possible causes of faulty operation have been investigated. Alignment should not be required unless the transmitter-exciter has been tampered with or component parts have been replaced. Alignment should not be attempted unless the servicing personnel is thoroughly familiar with communications equipment and experienced in their alignment. Refer to Figs. 5, 6 and 7 for location of all alignment adjustments.

3. Dummy load - 50 ohms non-inductive rated at 50 watts. The dummy load may be a Global resistor, carbon resistor, or Bird Wattmeter.

6-1. EQUIPMENT REQUIRED

1. R.F. Signal Generator - Standard Measurement Model-65B or equivalent having an output impedance of 70 ohms or less. (A .01 mfd dc blocking capacitor must be placed in series with the rf lead.)
2. Vacuum tube voltmeter (VTVM) - Hewlett Packard 410A or equivalent having an rf probe.

6-2. INITIAL CONTROL SETTINGS

POWER.....	TRANSMIT
FUNCTION.....	DSB
OPERATION.....	MOX
DRIVER TUNING.....	Fully clockwise (open gang)
FINAL TUNING.....	Fully clockwise (open gang)
FREQUENCY.....	Fully clockwise (open gang)
BAND SELECTOR.....	As instructed
SPEECH LEVEL.....	0
CARRIER INJECTION.....	0
METER COMPRESSION.....	10
CALIBRATE LEVEL.....	0
4X TUNING.....	Fully clockwise (open gang)
VFO-XTAL.....	XTAL (Crystal must be removed from socket)

6-3. IF ALIGNMENT PROCEDURE

Step	Signal Generator Connections	Signal Generator Frequency	Output Connections	Control Setting	Remarks
1725 KC IF ALIGNMENT					
1	High side directly to test jack "C". See Fig. 5. Common side to chassis.	1725 KC at .1 volt output. (unmod.)	VTVM rf probe to test jack "D". See Fig. 5. Common side to chassis.	BAND SELECTOR 3.5-4.0 MC position.	Remove osc. tubes V1, V5, from sockets. Peak upper and lower slugs of T3, T4, T5, and T6 for maximum deflection of VTVM and a symmetrical band-pass characteristic.
8695 KC (20 METER IF ALIGNMENT)					
2	High side to pin No. 1 of V16. Common side to chassis.	8695 KC at .1 volt output. (unmod.)	Same as STEP 1.	BAND SELECTOR 14-14.35 MC position.	Adjust the top and bottom slugs of T7 and T8 respectively for maximum deflection on VTVM.
6935 KC (10 METER IF ALIGNMENT)					
3	Same as STEP 2.	6935 KC at .1 volt output. (unmod.)	Same as STEP 1.	BAND SELECTOR 28-29.7 MC position.	Adjust trimmer capacitors C173, C174, C178, C179, (Fig. 7) for maximum deflection on VTVM. Replace V1, V5, V15 removed in STEP 1, after completion of all IF Alignments.

6-4. 4X MULTIPLIER ALIGNMENT

MINOR ALIGNMENT			
Step	VTVM Connections	Control Setting	Remarks
1	VTVM RF probe connected to test jack D. Fig. 5.	BAND SELECTOR..... 10 meter XTAL-VFO VFO FREQUENCY.....See remarks 4X TUNING.....See remarks	Remove osc. tube V15. Set FREQUENCY control to 29.7 mc for "high end" tracking. Adjust 4X TUNING control for maximum deflection on VTVM.
Adjust trimmer capacitor C181 for maximum deflection. Set FREQUENCY control to 28.0 mc for "low end" tracking. Tune 4X TUNING control for maximum deflection on VTVM. Adjust slugs of L5, L6, L7, and L8 for maximum meter deflection.			
Repeat entire procedure until trimmer and coil adjustments result in no appreciable increase in meter deflection. The 4X multiplier stage is then correctly tracking with maximum output.			
MAJOR ALIGNMENT			
2	<p>The following alignment should not be required unless a major component (L5, L6, etc.) has been replaced or tampered with in the 4X multiplier stage. If a major alignment is required, proceed as follows:</p> <p>Set the FREQUENCY control to 28.0 mc for "low end" tracking. Place the VTVM RF probe on the stator side of C151 and adjust the 4X TUNING control for maximum deflection on the VTVM. Next, peak L5 and L6 for maximum output. Place the RF probe on the plate side of C154. Peak L7 and "touch up" L5 and L6. Place the VTVM RF probe on the plate side of C157. Adjust for maximum output by peaking L8 and re-adjusting L5, L6, and L7.</p> <p>With this adjustment completed, perform the minor alignment as instructed above (Step 1).</p>		

6-5. RF ALIGNMENT

IMPORTANT - The rf alignment of any band should only be attempted when a transmitter-exciter malfunction has been analyzed and definitely traced to rf mis-alignment.

Step	Band	Signal Generator Connections	Output Connections	Trimmers Adjust. for Max.	Coils Adj. for Max.	Sig. Generator Freq. (megacycles)			
						f1	f2	f3	f4
1	80	High side to test jack "D". Common to chassis. (Any extension on generator leads must be kept to absolute minimum to prevent parasitic oscillations.) See Figs. 5 and 7.	Dummy load and VTVM connected to R. F. OUTPUT.	C198 C209 C220 C231	L12 L16 L20 L24	4.2	3.4	4.0	3.5
2	40	"	"	C194 C206 C217 C229	L11 L15 L19 L23	7.4	6.95	7.3	7.0
3	20	"	"	C190 C202 C214 C226	L10 L14 L18 L22	14.7	13.5	14.35	14.0
4	10	"	"	C188 C200 C211 C224	L9 L13 L17 L21	30.0	27.4	29.7	28.0

PROCEDURE:

The rf alignment procedure for all bands is essentially the same, differences being only in frequency used and parts adjusted. The following is the alignment procedure for 80 meters. Frequency settings and parts to be adjusted for the 40, 20 and 10 meter band may be obtained from the chart above. The controls must be preset at their INITIAL CONTROL SETTINGS (paragraph 5-2) with the BAND SELECTOR switch set on the band being aligned (80 meters).

1. Adjust trimmers (C198, C209, C220, and C231) to mid-capacity.
2. Rotate the DRIVER TUNING control fully clockwise (open gang).
3. Set the rf generator frequency to f1 (4.2 mc) using sufficient generator output to obtain a readable indication on the VTVM.
4. Adjust the FINAL TUNING control for maximum indication on the VTVM.
5. Preset slugs of rf coils (L12, L16, L20, and L24) to their maximum counterclockwise position (minimum inductance).
6. Carefully adjust each slug clockwise for maximum indication on the VTVM.
7. Rotate the DRIVER TUNING control fully counterclockwise (closed gang).

8. Adjust the output frequency of the rf generator for maximum indication on the VTVM. Generator frequency resulting in maximum indication should be approximately f2 (3.4 mc).
9. Adjust the FINAL TUNING control for maximum deflection on the VTVM.
10. Adjust slugs of rf coils (L12, L16, L20, and L24) noting if the slug goes in or out (increased or decreased inductance) to obtain maximum indication on the VTVM. If slug adjustment increases inductance, the companion trimmer capacitor must be decreased in value accordingly. Conversely, if slug adjustment decreased inductance, the companion trimmer capacitor must be adjusted for a comparative increase in value. The trimmers and associated rf coils are listed directly opposite each other in the chart above.
11. Set the rf generator frequency to f3 (4.0 mc) for high end tracking and adjust DRIVER TUNING, FINAL TUNING, and all rf coils (L12, L16, L20, and L24) for maximum deflection on the VTVM.
12. Set the rf generator frequency to f4 (3.5 mc). Adjust DRIVER and FINAL tuning controls for maximum meter indication; then repeat Procedure 10.
13. Procedures 11 and 12 must be repeated until the adjustments of the rf coils (Procedure 10) results in no appreciable increase in meter deflection. The band is then correctly tracking with maximum output.

6-6. NEUTRALIZATION OF FINAL AMPLIFIER

Step	Signal Generator Connections	VTVM Connections	Control Setting	Remarks
1	High side to R. F. OUTPUT connector. (Without .01 MFD capacitor.) Common side to chassis.	VTVM rf probe to pin No. 5 (grid of V10. Common side to chassis.	BAND SELECTOR 14.-14.35 MC position. (All other controls at INITIAL CONTROL SETTINGS.)	Adjust rf generator to 14.7 MC at 1 volt output.

PROCEDURE:

1. Adjust DRIVER TUNING for maximum deflection on VTVM.
2. Adjust FINAL TUNING for a dip in the meter on the rf generator. The dip indicates a desired resonant condition.
3. Adjust neutralizing capacitor C242 (Fig. 7) for a minimum indication on the VTVM.
4. Repeat entire procedure until the adjustment of capacitor C242 results in no appreciable decrease in the VTVM reading. The final amplifier stage is then properly neutralized.

6-7. SS BAL. ADJUSTMENT

The SS BAL. control is a potentiometer (R33, Fig. 5) in the plate circuits of the 1675 kc oscillator (V5A) and 1775 kc oscillator (V5B, Fig. 5) stages. This control is utilized to maintain sideband symmetry and may not require adjustment throughout the use of the transmitter-exciter. However, if adjustment is necessary, proceed as follows;

1. Tune the transmitter-exciter on CW operation as instructed in paragraph 4-3.
2. Rotate the FUNCTION switch to "UPPER SIDEBAND" and note the reading of the front panel meter.

3. Rotate the FUNCTION switch to "LOWER SIDEBAND". The meter indication for both "UPPER" and "LOWER SIDEBAND" should be essentially the same. Any difference in output between the 1675 kc oscillator and 1775 kc oscillator can be compensated by adjusting the SS BAL. control. Rotating the SS BAL. control will increase the output of one sideband and decrease the other simultaneously. Consequently, it is necessary to alternate between the "UPPER" and "LOWER SIDEBAND" positions of the FUNCTION switch, checking for equal output, while adjusting the SS BAL. control.

6-8. PHASE BAL. AND AMP. BAL. ADJUSTMENT

The PHASE BAL. (R10) and AMP. BAL. (R9) controls are potentiometers located on the top of the transmitter-exciter chassis (Fig. 5). These controls maintain the proper phase and amplitude relation at the input of the balanced modulator stage V1 and V2. Both controls are factory set and readjustment should not be required unless component parts have been replaced in the balanced modulator. The adjustment of the PHASE BAL. and AMP. BAL. controls is divided into a minor and major adjustment. If the carrier suppression is less than 20 db down, the minor adjustment should be performed. If it is impossible to obtain a carrier suppression of at least 20 db with the minor adjustment, the major adjustment must be performed.

A. MINOR ADJUSTMENT

1. Tune the transmitter-exciter for CW operation.
2. Set the FUNCTION switch to "DSB" position.
3. Set the CARRIER INJECTION control to "O". The LEVEL INDICATOR METER should read at least 20 db carrier suppression.
4. If carrier suppression is less than 20 db, loosen the two knurled knobs at each side of the CARRIER INJECTION control on the mechanical reference indicator stop and rock the CARRIER INJECTION control for maximum carrier suppression.
5. If carrier suppression is less than 20 db, adjust the PHASE BAL. and CARRIER INJECTION controls simultaneously for maximum carrier suppression. The PHASE BAL. control is very sensitive, consequently its adjustment is critical.
6. If at least 20 db carrier suppression is obtained by performing step 5, the mechanical reference indicator stop can be locked in place with the index directly opposite the "O" of the CARRIER INJECTION control. Locking the me-

chanical stop in this manner will assure a balanced condition and maximum carrier suppression whenever the CARRIER INJECTION control is returned to "O".

7. Set the FUNCTION switch to "UPPER" or "LOWER SIDEBAND" position. The LEVEL INDICATOR METER should read at least 40 db carrier suppression.

B. MAJOR ADJUSTMENT (See Figures 4 and 5 for parts location)

1. Perform the first five steps of the minor adjustment.
2. Detune the DRIVER TUNING for ease of adjustment.
3. Set PHASE BAL. to mid-range and adjust the AMP. BAL. and CARRIER INJECTION controls simultaneously for maximum carrier suppression.
4. Adjust the PHASE BAL. and CARRIER INJECTION controls simultaneously for maximum carrier suppression.
5. Retune DRIVER TUNING as per CW operation.
6. Readjust the AMP. BAL., PHASE BAL., and CARRIER INJECTION controls for maximum carrier suppression. The LEVEL INDICATOR METER should read at least 20 db carrier suppression.
7. Set the FUNCTION SWITCH to "UPPER" or "LOWER SIDEBAND". Connect a lead from the Receiver antenna post to the Dummy Load and adjust the Receiver (tuned for CW operation) to the beat note of the operating frequency.

CAUTION

Care must be exercised to insure little or no carrier is injected into the receiver.

8. Adjust L25 and R151 for a null of the beat note in the receiver. Remove the lead between the Receiver and the Dummy Load. The LEVEL INDICATOR METER should read at least 40 db carrier suppression.
9. If necessary, repeat the entire procedure until a carrier suppression of at least 20 db in "DSB" and 40 db in "SSB" are obtained.
10. Lock the mechanical reference indicator stop as instructed in step 6 of MINOR ADJUSTMENT. The adjustment is now complete.

SECTION VII MAINTENANCE

7-1. MALFUNCTION ISOLATION AND CORRECTION

Throughout the design of the Model HT-30 Transmitter-exciter, full consideration was given to keep maintenance problems at an absolute minimum. In all well designed communications equipments, maintenance and repair problems are generally confined to the checking and replacement of tubes which may become defective. Malfunctions of this nature are easily isolated and corrected. However, it is entirely possible that a more obscure malfunction may arise. In this event, only thoroughly trained technical personnel should attempt servicing the unit. The schematic diagram, voltage charts, and the following table will prove to be a valuable aid in isolating and correcting a malfunction.

Symptom	Possible Cause
1. Dead unit.	Bad AC connection, POWER control at "POWER OFF", blown fuse (F1), open primary (T1).
2. Lack of B+ in high voltage supply.	Defective V20, open secondary (T1), open L3.
3. Lack of B+ in low voltage supply.	Defective V21, open secondary (T1), open L1 or L2.
4. Filaments of V20, and V21 light, all others out.	Defective filament winding (T1 secondary).
5. Insufficient or no bias.	Defective R129, SR1, R130, R133, R135, and R136.
6. Lack of B+ to the VFO and 50 kc oscillator stages.	Open R138.
7. Excessive hum on carrier output.	Open C254, or heater to cathode leakage in V2, V3, V12, and V13. Also, leakage in any signal stage where the cathode is above ground.
8. Normal operation with VFO but little or no output on XTAL operation.	Defective crystal, V19A, and/or associate circuitry.
9. Normal operation on 80, 40, and 10 meters but little or no output on 20 meters.	Defective V15B or associate circuitry.
10. Normal operation on 80, 40, and 20 meters but	Defective V15A, V19B, or associate circuitry.

Symptom	Possible Cause
little or no output on 10 meters.	
11. Normal operation on 80 and 40 meters but little or no output on 20 and 10 meters.	Defective V15, V16, or associate circuitry.
12. "UPPER SIDEBAND" SSB operation normal on 80 and 20 meters but little or no output on "LOWER SIDEBAND".	Defective V5A, CR1 (1675 kc XTAL), or associate circuitry.
13. "UPPER SIDEBAND" SSB operation normal on 40 meters but little or no output on "LOWER SIDEBAND".	Defective V5B, CR2 (1775 kc XTAL), or associate circuitry.
14. CW operation normal but little or no modulation on DSB or SSB.	Improper setting of SPEECH LEVEL, defective V12A, V13, or associate circuitry.
15. CW and BSD operation normal but little or no power output on SSB.	Defective V4, or associate circuitry.
16. DRIVER TUNING adjustment will peak on panel meter but little or no indication when adjusting FINAL TUNING control.	Defective V10, V11, or associate circuitry.
17. Crystal operation normal but little or no output with VFO.	Defective V18, T10, or associate circuitry.

7-2. VOLTAGE MEASUREMENT

Tube socket voltages for the Transmitter-exciter are shown in Fig. 10 and Fig. 11. Voltage readings for the 50 kc oscillator (V1), 1675/1775 kc oscillator (V5), vox amp, and relay tube (V14), 5.21/10.42 mc oscillator (V15), vfo (V18), and the crystal oscillator and 4X multiplier (V19) must be taken from the top of the chassis as they are unattainable from the underside. Access to pin voltages are easily obtained by utilizing commercially available tube adapters. The adapters

have external test prod points and are simply inserted between the tube and socket.

It is possible to also obtain pin voltages by removing the tube and winding one or two turns (insulation removed at turns) of #20 solid wire around the pin in question and re-inserting the tube in its socket. How-

ever, if this procedure is followed, care should be exercised to prevent inadvertent shorting of the tube pin to chassis or to the adjacent tube pin.

Specific conditions, under which voltage measurement is made, are noted on each voltage chart.

SERVICE PARTS LIST

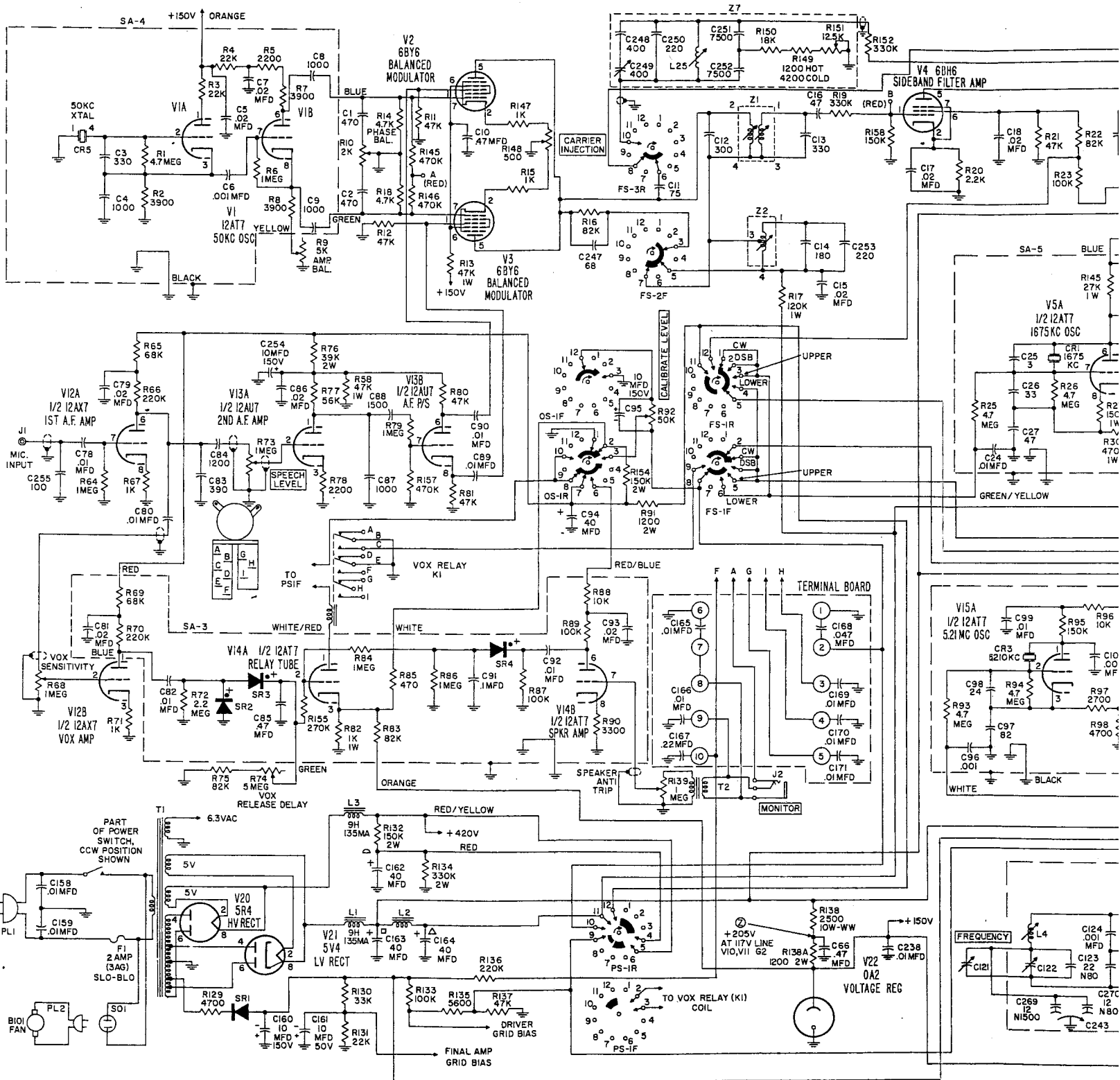
Schematic Symbol	Description	Hallcrafters Part Number	Schematic Symbol	Description	Hallcrafters Part Number	Schematic Symbol	Description	Hallcrafters Part Number
CAPACITORS			CAPACITORS (cont)			RESISTORS (cont)		
C-34...	1.5-7 mmf., trimmer	44A457	C-43, 50, 5,	+5 N 250	47X20UJ050D	R-72...	2.2 meg 10% 1/2 w comp	23X20X225K
	Trimmer strip	44 B464	C-54, 259			R-97, 99,	270K ohm 10% 1/2 w comp	23X20X272K
C-181...	3-12 mmf., trimmer	44A465		10 mmf. 5% NPO, cer	47X20CG100J	R-155...	270K ohm 10% 1/2 w comp	23X20X274K
C-161...	10 mfd. 50 V, elect.	45B211	C-270...	12 mmf. ±5%, NPO ±30 PPM, cer.	47X20CG120J	R-48, 106,	111	
C-162, 163,	164, 94			15 mmf. 5% NPO, cer	47X20CG150J		330 ohm 10% 1/2 w comp	23X20X331K
	2 x 40 mfd. 350 V; 40 mfd. 500 V, elect.	45 C301	C-258...	22 mmf. ±5% N80 ±30 PPM, cer	47X20LG220J	R-90...	3300 ohm 10% 1/2 w comp	23X20X332K
C-160, 95,	254		C-123...	20 mmf. 5% NPO, cer	47X20CG200J	R-130...	33K ohm 10% 1/2 w comp	23X20X333K
	10 mfd. 150 V, elect.	45B307	C-172, 175,	176		R-19, 24,	152	
C-83...	390 mmf., 10% 500 V	47X20B391K		24 mmf. 2% NPO, cer tub	47X20CG240G		330K ohm 10% 1/2 w comp	23X20X334K
C-91...	.1 mfd. 200 V, molded paper	46ER104L2	C-98...	22 mmf. 5% NPO, cer.	47X20CG220J	R-2, 7, 8,	3900 ohm 5% 1/2 w comp	23X20X392J
C-167...	.22 mfd. 200 V, molded paper.	46BR224L2	C-260...	27 mmf. 5%, 500 V, fixed cer tub	47X30CG270J	R-118...	3900 ohm 10% 1/2 w comp	23X20X392K
C-168...	.047 mfd. 200 V, molded paper.	46BR473L2	C-141...	33 mmf. 2% NPO, cer	47X30CG330G	R-57, 59,	144	
C-85, 10,	.47 mfd. 200 V, molded paper.	46BR474L2	C-222...	36 mmf. 2%, cer tub	47X30CG360G		47 ohm 10% 1/2 w comp	23X20X470K
C-60A, B	2 x .004 mfd. 500 V, Cer Disc	47A218	C-104...	100 mmf. 10% N750	47X25UK101J	R-85...	470 ohm 10% 1/2 w comp	23X20X471K
C-24, 28,	29, 31, 32, 33, 37, 39, 46, 53, 55,		C-27, 38,	102, 105, 137, 138, 152, 155,		R-14, 18,	4700 ohm 5% 1/2 w comp	23X20X472J
58, 65, 70,	74, 75, 78, 80, 82, 89, 90, 92, 99,		191, 203,	213		R-98, 129,	153	
100, 108,	109, 111, 112, 120, 136, 140, 143,			47 mmf. 2% NPO, fixed cer tub	47X25CG470G		4700 ohm 10% 1/2 w comp	23X20X472K
144, 145,	149, 153, 159, 165, 166, 169, 170,		C-97...	82 mmf. 2%, NPO, cer tub	47X32CG820G	R-11, 12,	21, 50, 52, 80, 81, 107, 112	
171, 232,	233, 234, 235, 236, 237, 238, 239,		C-185...	5 mmf. 10% N750, cer	47X20UK050K/D	113, 123,	137, 110	
240, 244,	245, 257, 126, 127, 149		C-261...	.01 mfd. 500 V, cer disc	47A224		47K ohm 10% 1/2 w comp	23X20X473K
			C-107...	100 mmf. 10% N750	47X25UK101K/D	R-1,	25, 26, 37, 38, 93, 84, 102, 103,	
C-6, 106,	96		C-184,	255			119, 120	
	.001 mfd. 500 V, cer disc	47B230		100 mmf. 10% N750, cer			4.7 meg. 10% 1/2 w comp	23X20X475K
C-5, 7, 15,	17, 18, 20, 40, 79, 81, 86, 93,			cer	47X30UK101K/D	R-46, 53,	560 ohm 10% 1/2 w comp	23X20X561K
189, 201,	212, 264, 221, 47		C-59...	110 mmf. 10% 500 V, cer	47X15D111K	R-121,	135	
	.02 mfd. 500 V, cer disc	47A242	C-30, 16,	21, 62, 180, 182, 183			5600 ohm 10% 1/2 w comp	23X20X562K
C-68...	.001 mfd. 3000 V, cer disc	47A311		47 mmf. 10% N750, cer	47X20UK470K/D	R-77, 124,	56K ohm 10% 1/2 w comp	23X20X563K
C-101, 103,	103, 139, 142, 148		C-247...	68 mmf. 10% N750, cer	47X30UK680K/D	R-41, 44,	560K ohm 10% 1/2 w comp	23X20X564K
	.002 mfd. 500 V, cer disc	47A395	C-250...	220 mmf. N2200 10%, cer.	47D25W221K	R-128...	68 ohm 10% 1/2 w comp	23X20X680K
C-114, 177,			C-11...	75 mmf. 10% N750, cer	47X30UK750K/D	R-43...	680 ohm 10% 1/2 w comp	23X20X681K
	0.51 mmf. 10% 500 V, fixed	47B403-0	C-192,	205, 218, 228		R-65, 69,	68K ohm 10% 1/2 w comp	23X20X683K
C-265, 266,	267, 268			82 mmf. 5% 500 V, cer.	47X25RH820J	R-142,	143	
	2.2 mmf. 10% 500 V, fixed	47B403-4	C-247...	Trimmer, variable	48D316	R-16, 22,	75, 83	
C-199...	1 mmf. 10% 500 V, fixed	47B403-2	C-250...	220 mmf. N2200 10%, cer.	47D25W221K		82K ohm 10% 1/2 w comp	23X20X823K
C-196...	2.7 mmf. 10% 500 V, fixed	47B403-14	C-11...	75 mmf. 10% N750, cer	47X30UK750K/D	R-82...	1000 10% 1 w comp	23X20X823K
C-131...	47 mmf. 500 V, fixed mica	47CBA70K	C-192,	205, 218, 228		R-154...	150K ohm 1 w comp	23X30X153M
C-56, 57,	61, 63, 64, 67, 118, 119, 245			82 mmf. 5% 500 V, cer.	47X25RH820J	R-29, 34,	100K ohm 1 w comp	23X30X104K
	.005 mfd. 500 V, cer disc	47A442	C-121...	Variable capacitor, main tuning.	48C343	R-31...	1200 ohm 10% 1 w	23X30X122K
C-223, 241,	187, 210		C-71...	Variable capacitor, air, final tank.	48D344	R-17...	120K ohm 10% 1 w comp	23X30X124K
	.005 mfd. 20% 500 V, cer disc	47B523		Variable capacitor, RF Amp, front	48D353	R-27, 36,	1500 ohm 10% 1 w comp	23X30X152K
C-78...	180 mmf., fixed toothpick	47-595	C-193, A,	B, C, D		R-115...	22,000 ohm 10% 1 w comp	23X30X223K
C-72...	220 mmf., fixed toothpick	47-596		Variable capacitor, RF Amp, rear	48D364	R-35, 145	27K 10% 1 w	23X30X273K
C-124, 125,				Variable capacitor, RF Amp, rear	48D364	R-116,	30, 32	
	1000 mmf 5% 300 V, fixed mica	47A623	C-193, E,	F, G, H			4700 ohm 10% 1 w comp	23X30X472K
C-248...	400 mmf. 5% N 5250, fixed cer.	47A639		Variable capacitor, RF Amp,		R-13, 58,	47K ohm 10% 1 w comp	23X30X473K
C-69...	.01 mfd. 1000 V, cer disc	47A598		rear	48D364	R-138A,	91	
C-87...	1000 mmf. 10% 500 V, mica	47X20B102K	C-146,	151, 154, 157			1200 ohm 10% 2 w comp	23X40X122K
C-84, 8, 9,	1000 mmf. 5% 500 V, mica	47X20D102J		Variable capacitor, 4th		R-132...	150K ohm 10% 2 w comp	23X40X154K
C-4...	1200 mmf. 10% 500 V, mica	47X20B122K		Harm. Mult.	48D365	R-55...	22K ohm 10% 2 w comp	23X40X223K
C-88...	1500 mmf. 10% 500 V, mica	47X20B152K	C-243...	Variable capacitor, trimmer	48-375	R-134...	330K ohm 10% 2 w comp	23X40X334K
C-197, 208,	219, 230		C-122...	Variable capacitor, trimmer	48-376	R-76...	39K ohm ±10% 2 w comp	23X42X393K
	240 mmf. 2% 500 V, mica	47X20D241G	C-249...	Variable capacitor	48 B384	R-54...	470 ohm 10% 2 w comp	23X40X471K
C-12...	300 mmf. 2% 500 V, mica	47X20D301G				R-60...	4700 ohm 5% 2 w comp	23X40X472J
C-13, 19,	22					R-61...	6800 ohm 5% 2 w comp	23X40X682J
	330 mmf. 2% 500 V, mica	47X20D331G				R-138...	2500 ohm 5% 10 W. W.	24B6252D
C-3...	330 mmf. 5% 500 V, mica	47X20D331J				R-62...	Variable, 50K W. W. (meter composition)	25B1227
C-128, 129,	130					R-33...	Variable, 100K side band bal.	25B1136
	10,000 mmf. 10% 300 V, mica	47X40E103K				R-68, 139	Variable, 1 meg speech level voice control	25B1137
C-14, 23,	180 mmf. 1% 500 V, mica	47X20F181F	R-157...	470K 10% 1/2 w	23X20X474K		Variable, 1 meg speech level	25B1138
C-1...	470 mmf. 2% 500 V, mica	47X20F471G	R-145,	146		R-73...	Variable, 2K injection W. W.	25B1393
C-269...	12 mmf. ±5%, N1500 ±250 PPM cer.	47D20V120J		470K ohm 1% 1/2 w comp	23DCC474	R-74...	Variable, 5 meg. - time delay	25B1141
C-251,	252		R-149...	Temp. comp	23A120	R-92...	Variable, 50K ohm, calibrate level	25B1273
	7500 mmf. 2% 500 V, mica	47X35F752G	R-56, 67,	71, 117, 126, 141, 140, 108			Variable 500 ohm W. W.	25B1391
C-247...	68 mmf. 5% NPO	47X32CG680J	R-15,	147		R-9...	Variable 5000 ohm	25B1392
C-253, 258,			R-49,	88, 96, 100, 132		R-151...	Variable, 12.5K ohm	25B1394
	220 mmf. 2% N330	47X35SH221G		10,000 ohm 10% 1/2 w comp	23X20X103K			
C-150, 156,			R-23, 42,	45, 47, 51, 87, 89, 104, 109,				
	1.5 mmf. ±.25 mmf NPO, fixed cer. tub	47X20CG015G	114, 125,	127, 133, 156				
C-153...	2.2 mmf. ±25% NPO, fixed cer.	47X20CG2R2C		100K ohm 10% 1/2 w comp	23X20X104K			
C-25...	3 mmf. 2% NPO, cer.	47X20CG030G	R-6,	64, 79, 84, 86				
C-132...	6 mmf., 10%, cer	47X20CG060K		1 meg. 10% 1/2 w comp	23X20X105K			
C-73...	4 mmf. 5% NPO, cer tub	47X20CG045J	R-39, 40,	1200 ohm 10% 1/2 w comp	23X20X122K			
C-262...	5 mmf. ±.25 mmf, NPO cer	47X20CG050C	R-95, 101	150K ohm 10% 1/2 w comp	23X20X154K			
			R-158...	150K ohm 5% 1/2 w comp	23X20X154J			
			R-150...	18K ohm 5% comp	23X20X183J			
			R-5...	2200 ohm 5% 1/2 w comp	23X20X222J			
			R-20, 78,	2200 ohm 10% 1/2 w comp	23X20X222K			
			R-3,	4, 63, 131				
				22K ohm 10% 1/2 w comp	23X20X223K			
			R-66,	105, 136, 70				
				220K ohm 10% 1/2 w comp	23X20X224K			

TRANSFORMERS AND COILS

L-25...	Coil Assy. carrier rej. filter	50B700
L-4...	Coil Assy. VFO	51B1940
L-9, 13,	17, 21	
	Coil, RF (28.0-29.7 MC)	51B2015
L-10, 14,	18, 22	
	Coil, RF (14.0-14.35 MC)	51B2016

SERVICE PARTS LIST (Cont)

Schematic Symbol	Description	Hallicrafters Part Number	Schematic Symbol	Description	Hallicrafters Part Number	Schematic Symbol	Description	Hallicrafters Part Number	
TRANSFORMERS AND COILS (cont)			RECTIFIERS AND CRYSTALS (cont)			MISCELLANEOUS (cont)			
L-11, 15, 19, 23	Coil, RF (7.0-7.3 MC)	51B2017	CR-3	Xtal, 5210 KC	19-1905	B-101	Motor	20B088	
L-12, 16, 20, 24	Coil, RF (3.5-4 MC)	51B2018	CR-4	Xtal, 10420 KC	19-1906		Overlay, front panel	68C353	
L-5, 6, 7, 8	Coil, (4 x mult)	51B2046	CR-5	Crystal, 50KC	19B1946		Panel, front	68E340	
L-26	Coil, final tank	51B2106	SR-1	Selenium rectifier	27B224	LM-1, 2	Pilot lamp, type 47	39A004	
L-1	Choke, filter (9 Hy 135 ma.)	56C205	MISCELLANEOUS				Pilot light Assy.	86A219	
L-2	Choke, filter (10 Hy 80 ma.)	56C213	Arm link		18A125		Pin, roll	74B1034	
L-3	Choke, filter (9 Hy 135 ma.)	56A248	Base, sub chassis		70C1242		Pin, roll (.062 x 3/8)	74A954	
T-3, 4, 5, 6	Transformer, coil 1725 KC	50B662	Bracket, cap. mtg.		67B3507		Plate, cap w/leads	76-1579	
T-10	Transformer, (VFO bandpass filter)	50B879	Bracket, cap. mtg.		67B3508		Plate, gear (1st)	63B1786	
T-7, 8	Transformer, IF 6935-8695 KC	50C685	Bracket, cap. mtg (tandem)		67C3460		Plate, gear (2nd)	63B1787	
T-1	Transformer, power	52C337	Bracket, carrier rej. filter		67A4185		Plate, gear (3rd)	63B1788	
T-9	Choke, VFO output assembly	53B359	Bracket, chassis mtg.		67C797		Plate, var. cap. (VFO sub chassis)	63C1811	
T-2	Transformer, audio input	55B261	Bracket, choke mtg.		67D4149		Post, latch	11A226	
Z-1, 3	Transformer, balance 50 KC	50B658	Bracket, coil mtg. (front mult.)		67B3099	S-01	Receptacle, AC w/leads	10B921	
Z-2, 4	Transformer, 50 KC trap	50C699	Bracket, coil mtg. (rear mult.)		67B3098	K-1	Relay, voice control	21-197	
Z-5, 6	Choke, parasitic	53B334	Bracket, cover last mixer		67A3922		Retainer, glass	87A3829	
RFC-1, 4, 11	Choke, RF 2.5 MH	53B335	Bracket, Gear adj.		67A3011		Rubber, spacer	16 A694	
RFC-2	Choke, RF (final plate)	53C340	Bracket, Gear drive & shield mtg.		67A3459		Shaft, actuator	74C1078	
RFC-5, 8, 7, 8, 9, 10	Choke, fil.	53B358	Bracket, motor mtg.		67B4182		Shaft, bandswitch	74A1009	
RFC-3	Choke, RF 0.3 MH	53A369	Bracket, motor support		67B4183		Shaft, cond. (final tank)	74B1012	
SWITCHES			Bracket, mtg. (coil assy)		67A3458		Shaft, cond. (RF amp)	74B1011	
ES	Switch, band	60B664	Bracket, mtg. (mult cond.)		67B3457		Shaft, friction brake	74B1000	
FS	Switch, function	60B658	Bracket, mtg. (stop arm)		67B3152		Shaft, (mult)	74B1010	
PS	Switch, power off-on-standby	60B666	Bracket, mtg. trimmer		67B3456		Shield, 50 KC amp	69B848	
OS	Switch, voc-cal-manual	60B665	Bracket & shaft Assy. (idler gear)		67B3113		Shield, base	69-842	
	Switch, VFO-Xtal	60B745	Bracket, shield mtg. & drive gear		67A3011		Shield, can	69-751	
TUBES			Bracket, trimmer mtg.		67A3922		Shield, can	69E752	
V-22	Electron, type OA2 voltage regulator	90X0A2	Bushing, dial		77B1038		Shield, can	69B839	
V-20	Electron, type 5R4GY high voltage rect.	90X5R4GY	Bushing, (friction brake)		77A1037		Shield, can (coil assy)	69E825	
V-21	Electron, type 5V4G low voltage rect.	90X5V4G	Bushing, (final tank)		77A1044		Shield, cap., 2nd RF	69C748	
V-7	Electron, 6AH6, 1725 KC amp.	90X5V4G	Cabinet, detail		66E1081		Shield, cap., left RF	69C755	
V-16	Electron, 6AH6, 5.2/10.42 mc mixer	90X5V4G	Channel, rubber		16A180		Shield, cap., right RF	69C754	
V-17	Electron, 6AH6, VFO mixer	90X5V4G	Chassis, base		70-1216		Shield, carrier rejector filter	69C929	
V-4	Electron, type 6BH6, sideband filter amp	90X6BH6	Clamp, electric		76B1784		Shield, case (front final tank)	69C826	
V-6	Electron, type 6BH6, 1725 KC mixer	90X6BH6	Connector		10A056		Shield, case (front mult.)	69C823	
V-2	Electron, type 6BY6, balanced mod	90X6BY6	J-3	Connector, mike	29A043		Shield, case (rear final tank)	69C827	
V-3	Electron, type 6BY6, balanced mod	90X6BY6	J-1	Coupler, flexible	29A051		Shield, case (rear mult.)	69C824	
V-8	Electron, type 6CB6, RF amp.	90X6CB6		Coupler, flexible	29A294		Shield, case (VFO & Xtal switch)	69C857	
V-18	Electron, type 6CB6, VF	90X6CB6		Coupler, solid	29A269		Shield, center (coil assy)	69B822	
V-19	Electron, type 6U8, crystal Osc/4 X mult.	90X6U8		Cover, cabinet top	66 E118		Shield, chassis top	69B840	
V-1	Type 12AT7, 50 KC osc	90X12AT7		Cover, final amp.	66C1284		Shield, coil	69A828	
V-5	Type 12AT7, 1875 KC/1775 KC osc	90X12AT7		Cover, last mixer	66B1364		Shield, mixer grid (1675-1775)	69 A938	
V-14	Type 12AT7, relay tube/Spkr. amp	90X12AT7		Cover, shield (final tank)	66B1227		Shield, rear	69C747	
V-15	Type 12AT7, 5.21 MC/10.42 MC osc.	90X12AT7		Dial scale mtg.	83 C523		Shield, tube	69-883	
V-12	Tube, type 12AX7, 1st AF amp/vox amp	90X12AX7		Fan, blade	80 C305		Shield, tube	69A097	
V-13	Type 12AU7, 2nd AF amp/AF P/S	90X12AU7		Flywheel	71A205		Shield, tube	69A306	
V-9	Type 12BY7, driver	90X12BY7		Foot, rubber (black)	16A007		Shield, tube	69A519	
V-10	Type 6146, final amp	90X6146		F-1	Fuse, 2 amp, 125 V., Slo-Blo	39A428	Shield, tube	69B834	
V-11	Type 6148, final amp	90X6146			26B283		Shield, tube	69B833	
RECTIFIERS AND CRYSTALS					16A180		Shield, tube (noval)	69B853	
SR-2, 3, 4	Selenium diode	19B1908			6A451		Shield, (VFO)	69C900	
CR-6	Diode	19A1916			26B281		V-10, 11	Socket, octal	5A317
CR-2	Crystal, 1775 KC	19-1903			36A002		V-1, 5, 14, 15, 19	Socket, 9 pin (mica filled)	6E664
CR-1	Crystal, 1875 KC	19-1904			36A083		V-13	Socket, 9 pin min w/base	6E672
					36 A084		V-2, 3, 4, 6, 7, 8, 16, 17, 22	Socket, tube (7 pin min)	6E505
					83B493		V-15	Socket, tube (7 pin min cer)	6A354
					83B493		V-20, 21	Socket, tube (8 pin octal)	6A298
					83B493		V-9, 12	Socket, tube (9 pin min) mica filled	6E50C
					83B496		4XMJLT	Socket, Xtal	6A346
					83B491			Spacer	73A458
					83B492			Spacer, gear plate (1-2)	73B1052
					15B899			Spacer, gear plate (2-3)	73A1083
					74B989			Spacer, stop arm	73A1208
					87A3644			Spacer, switch	73A1209
					87B4833			Spacer, switch	73A1243
					76A397-1			Spacer, switch (3/16)	73A1132
					76A397-2			Spring	75A345
					82-292			Spring, compression (idler gear)	75 A376
								Spring, tension	75B417
								Spring, tension (stop arm)	75A381
								Stop, balance mod.	74B1244
								Stop, knob	74B2245
								Strap, copper	76-371
								Stud, arm link	73A86C
								Stud, shoulder	73B1127
								Stud, shoulder (stop arm)	73B1123
								Support post	73A1197
								Terminal strip, special	88A1355
								Window, Dial panel	22C438



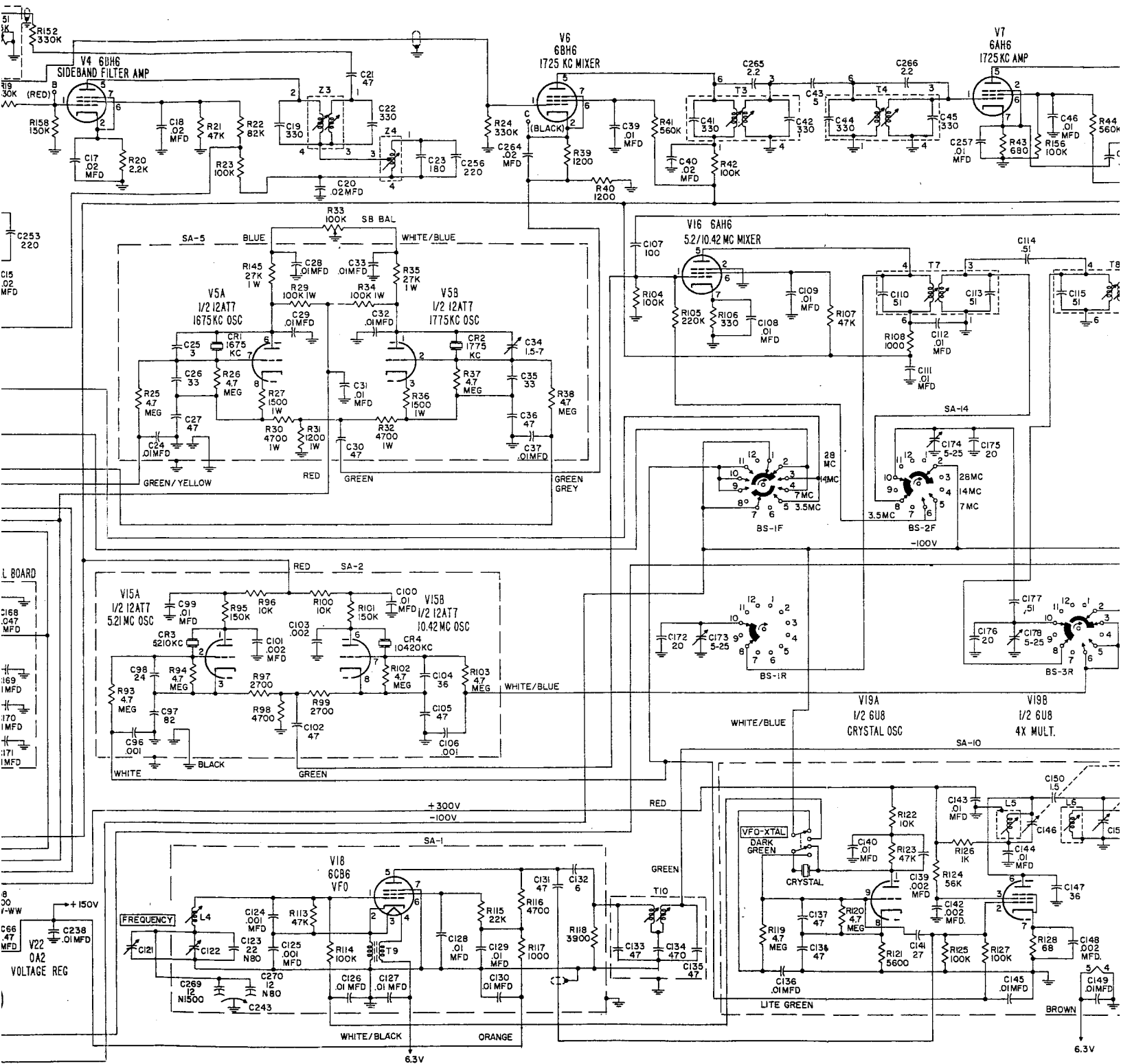


Figure 12. HT-30, Schematic D

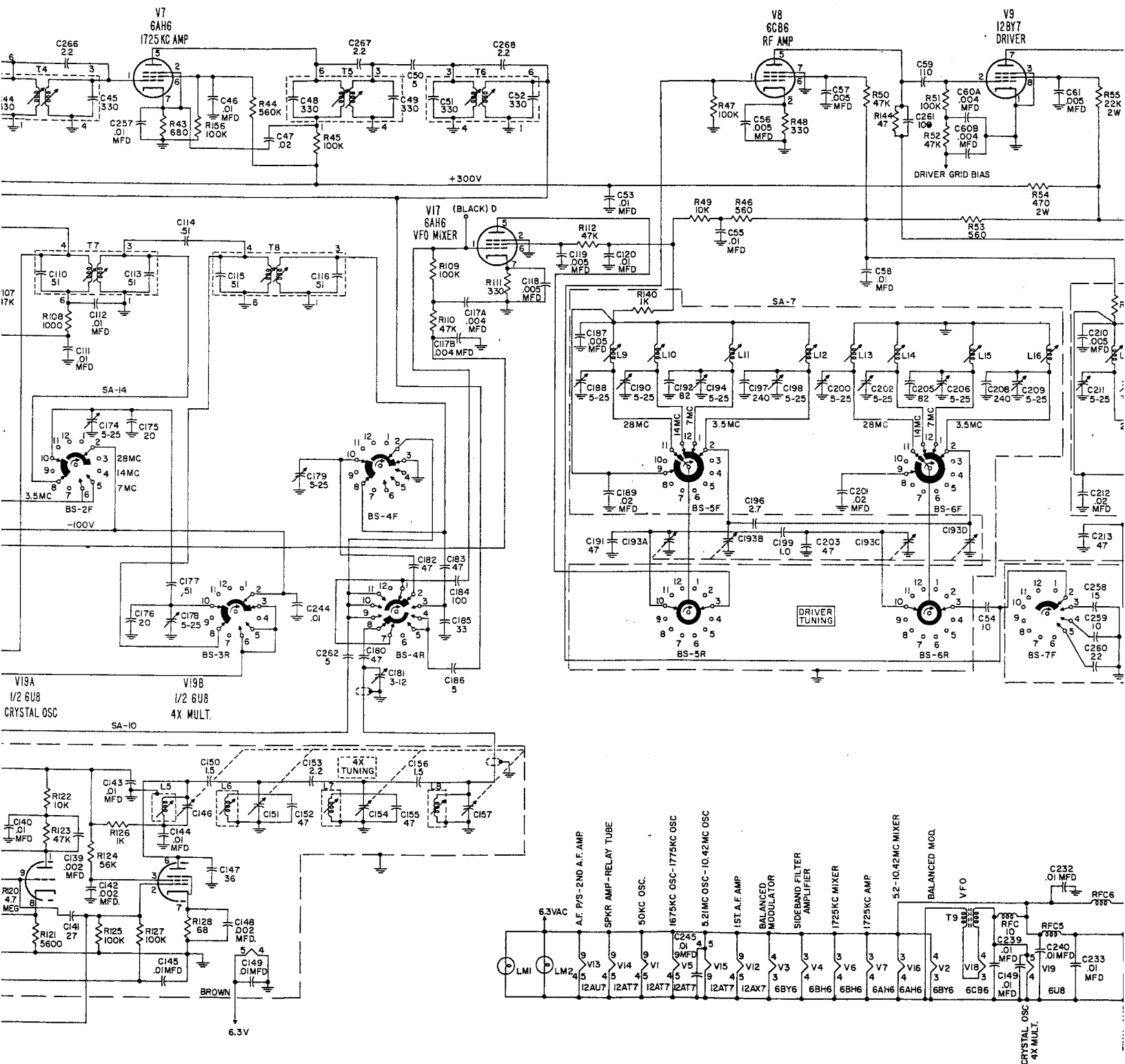
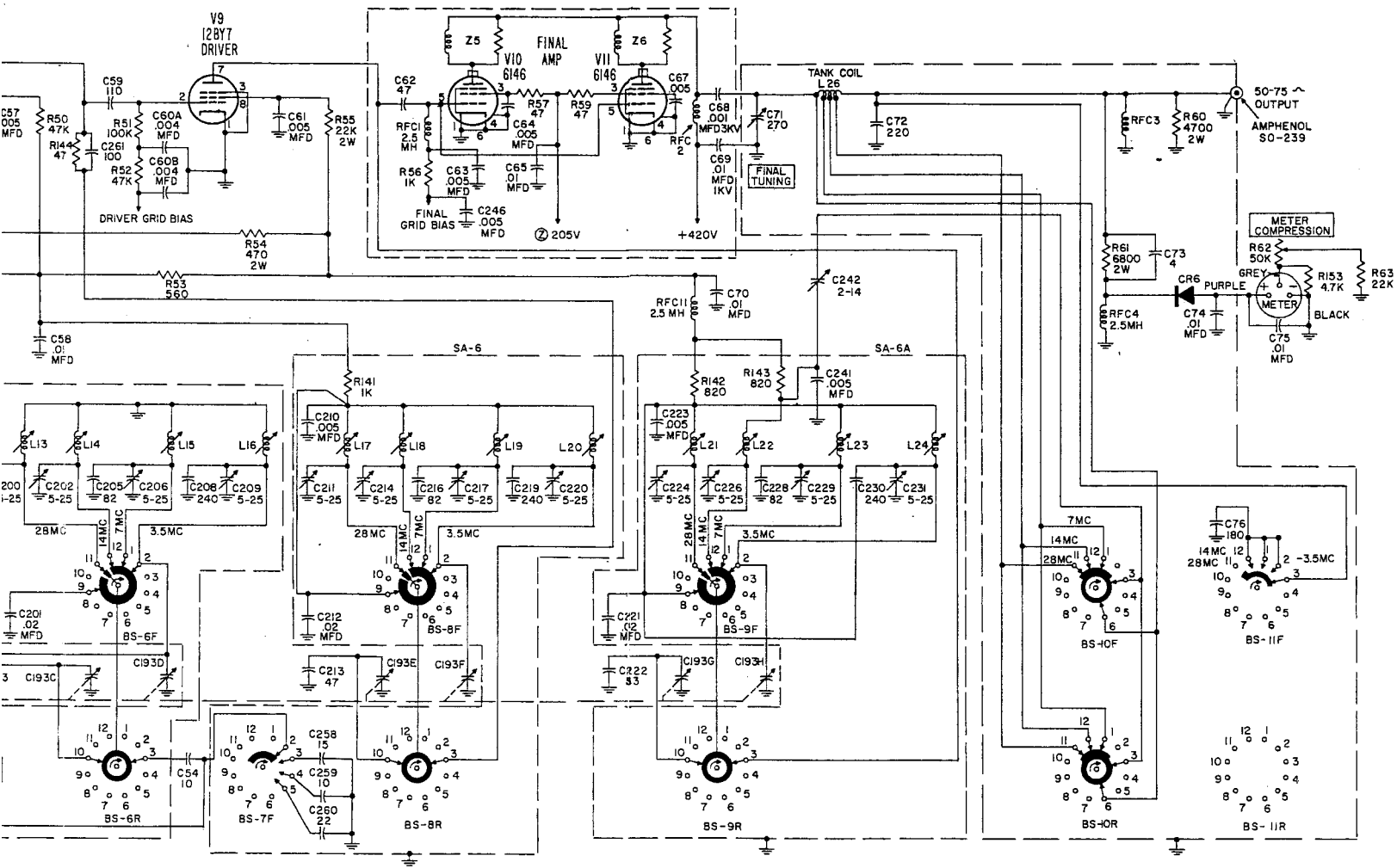


Figure 12. HT-30, Schematic Diagram



NOTES:

- UNLESS OTHERWISE SHOWN, ALL RESISTORS IN OHMS, ALL CAPACITORS IN UUF.
- SWITCHES NUMBERED BY; FUNCTION, WAFER NO, AND FRONT OR REAR. FOR EXAMPLE; BS-9F INDICATES BAND SWITCH, WAFER NINE, FRONT OF WAFER, COUNTING FROM KNOB END. SWITCHES SHOWN IN COUNTER CLOCKWISE POSITION.
- POWER OFF
- WARM UP
- STANDBY
- TRANSMIT
- FUNCTION
- CW
- DSB (AM)
- UPPER SIDEBAND
- LOWER SIDEBAND
- OPERATION
- MOX
- CALIBRATE
- VOX
- BAND SELECTOR
- 28-29.7 MC
- 14-14.35 MC
- 7-7.3 MC
- 3.5-4 MC

2D CONV. OSC (V15) FREQ	BAND	XTAL OSC (V5) FREQ UPPER S.B.	XTAL OSC (V5) FREQ LOWER S.B.
	3.5MC	1.775MC	1.675MC
	7MC	1.675MC	1.775MC
	10.420MC	1.775MC	1.675MC
	5.210MC	1.675MC	1.775MC

HT-30 TRANSMITTER-EXCITER MARK I

