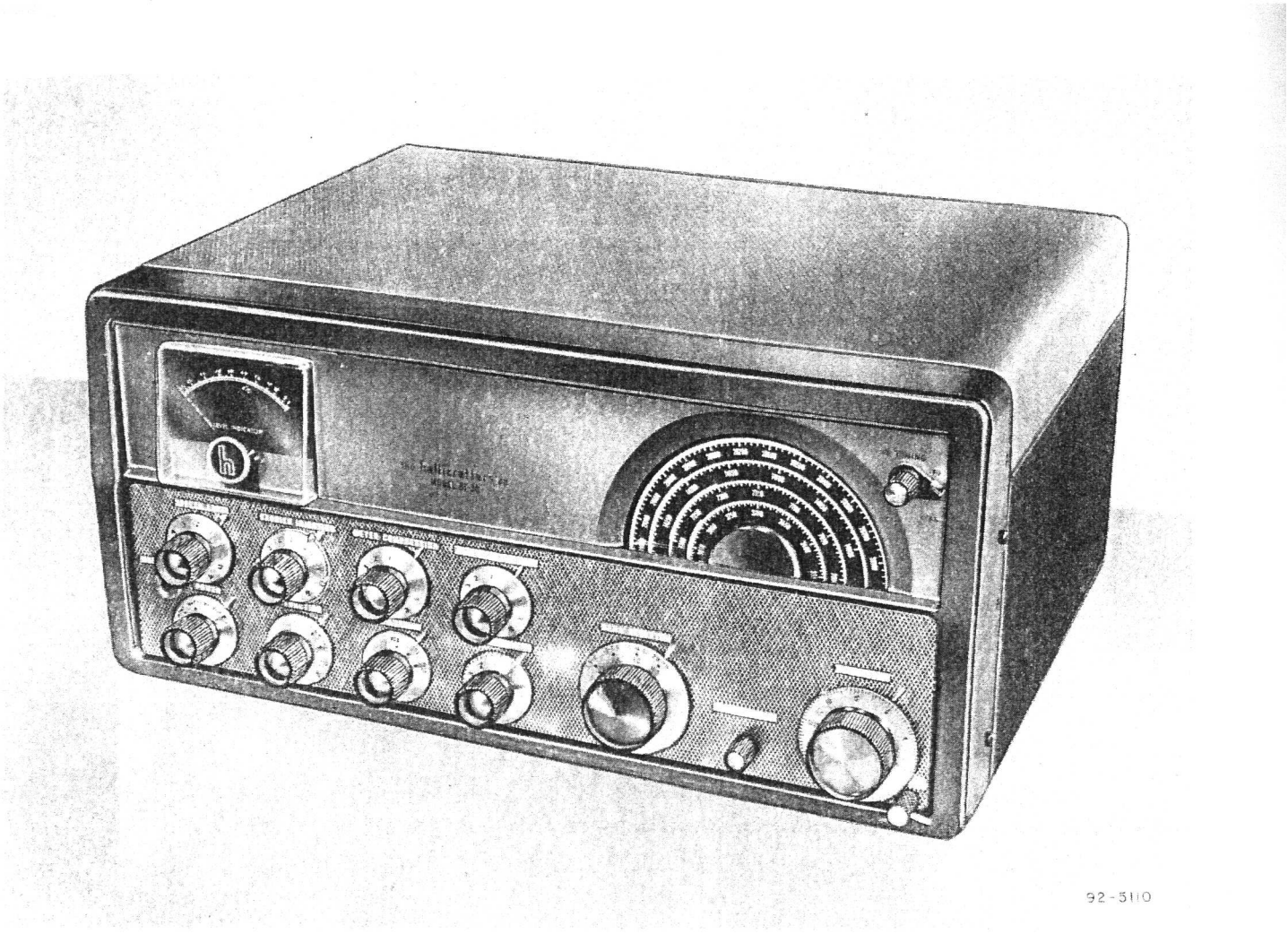


Figure 1. Hallicrafters Model HT-30 Transmitter-Exciter

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 Hallicrafter 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.

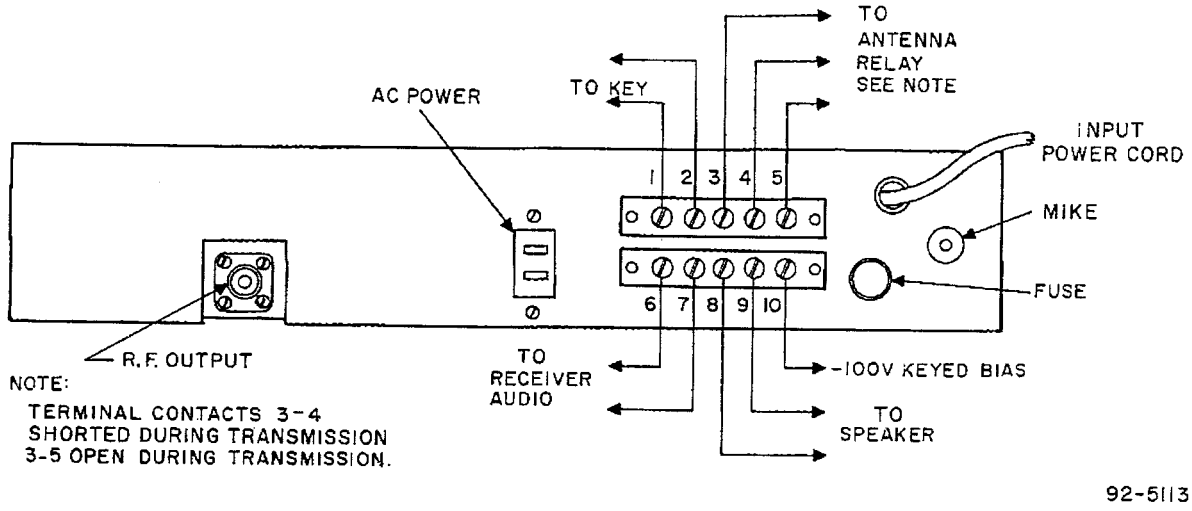


Figure 2. Connections to Rear of Chassis

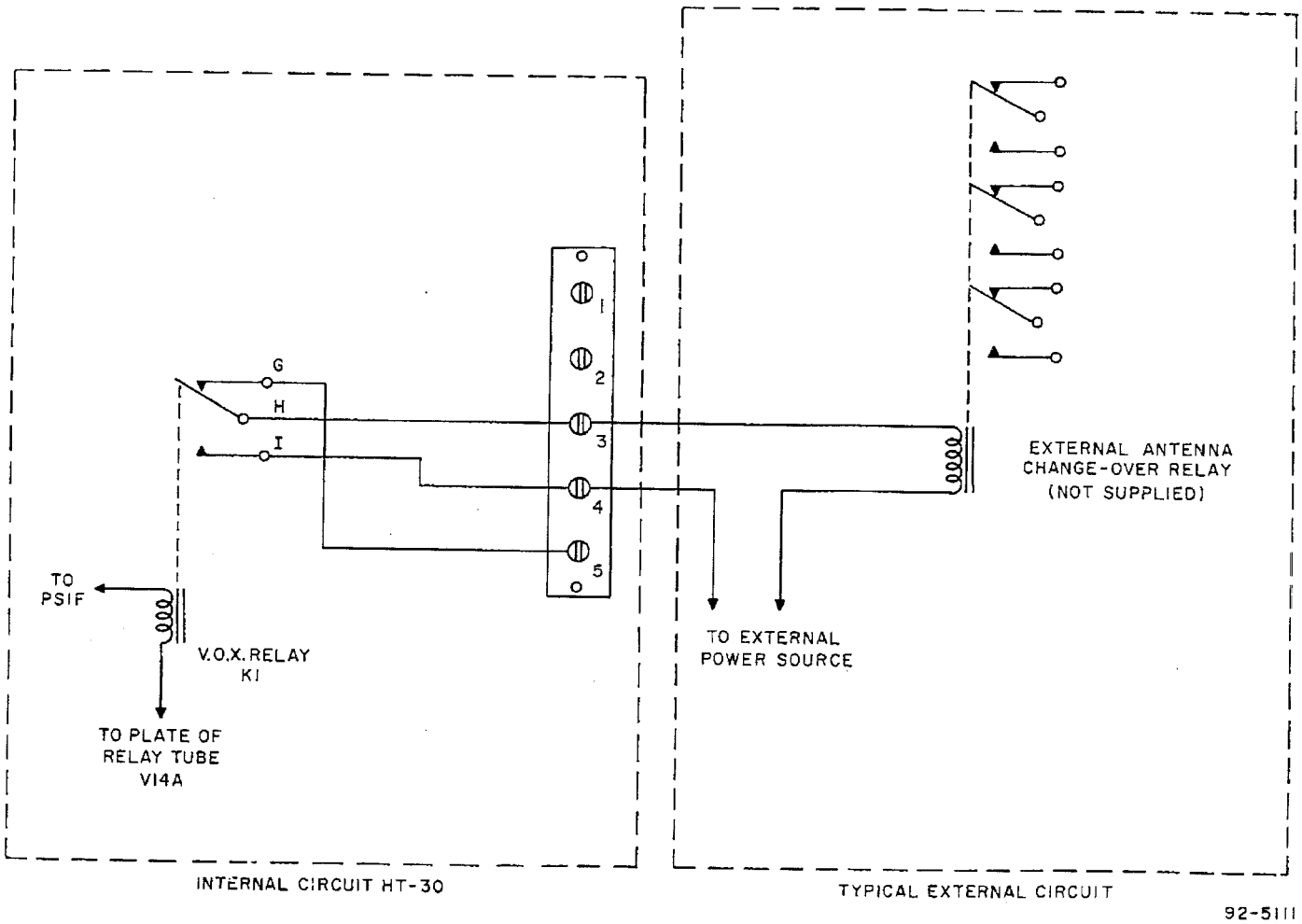


Figure 3. Terminal Board Connections to Antenna Change-over Relay

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.

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.

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 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.

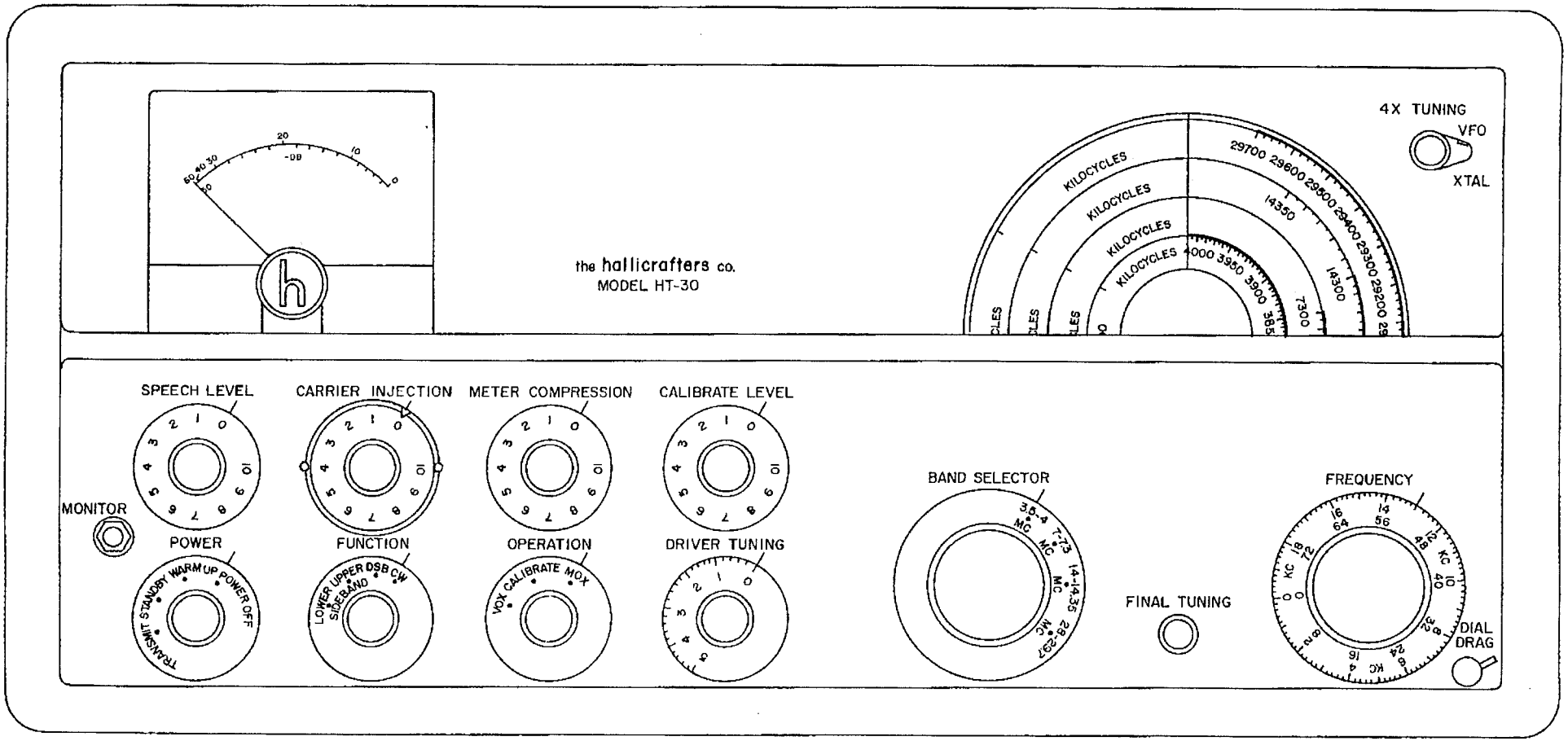


Figure 4. Front Panel Controls

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.

3. 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:

1. 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.

2. Set the POWER switch to the "TRANSMIT" position.

3. 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 Hallicrafters 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 supression, 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.

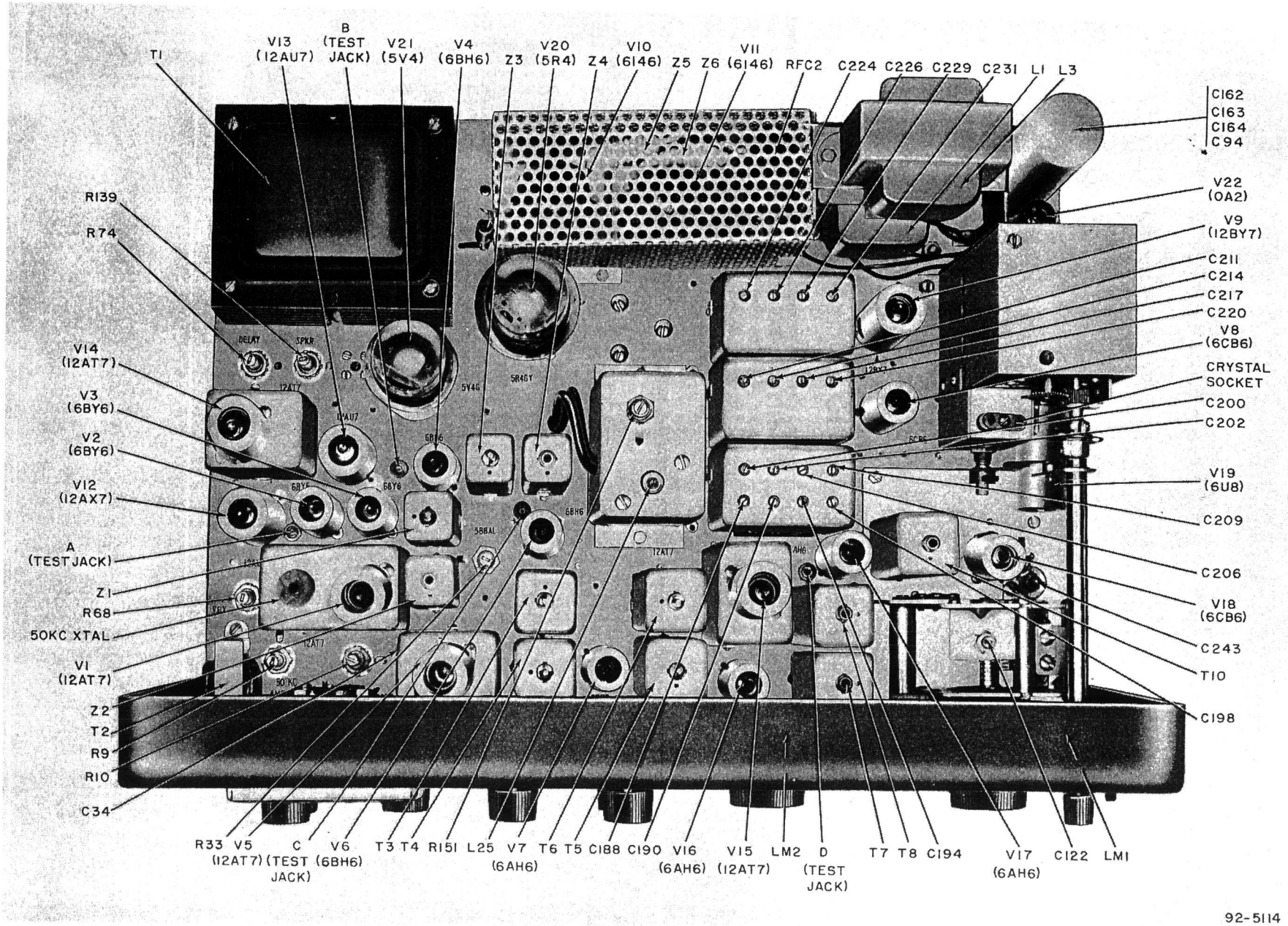


Figure 5. Model HT-30 Chassis, Top View

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.

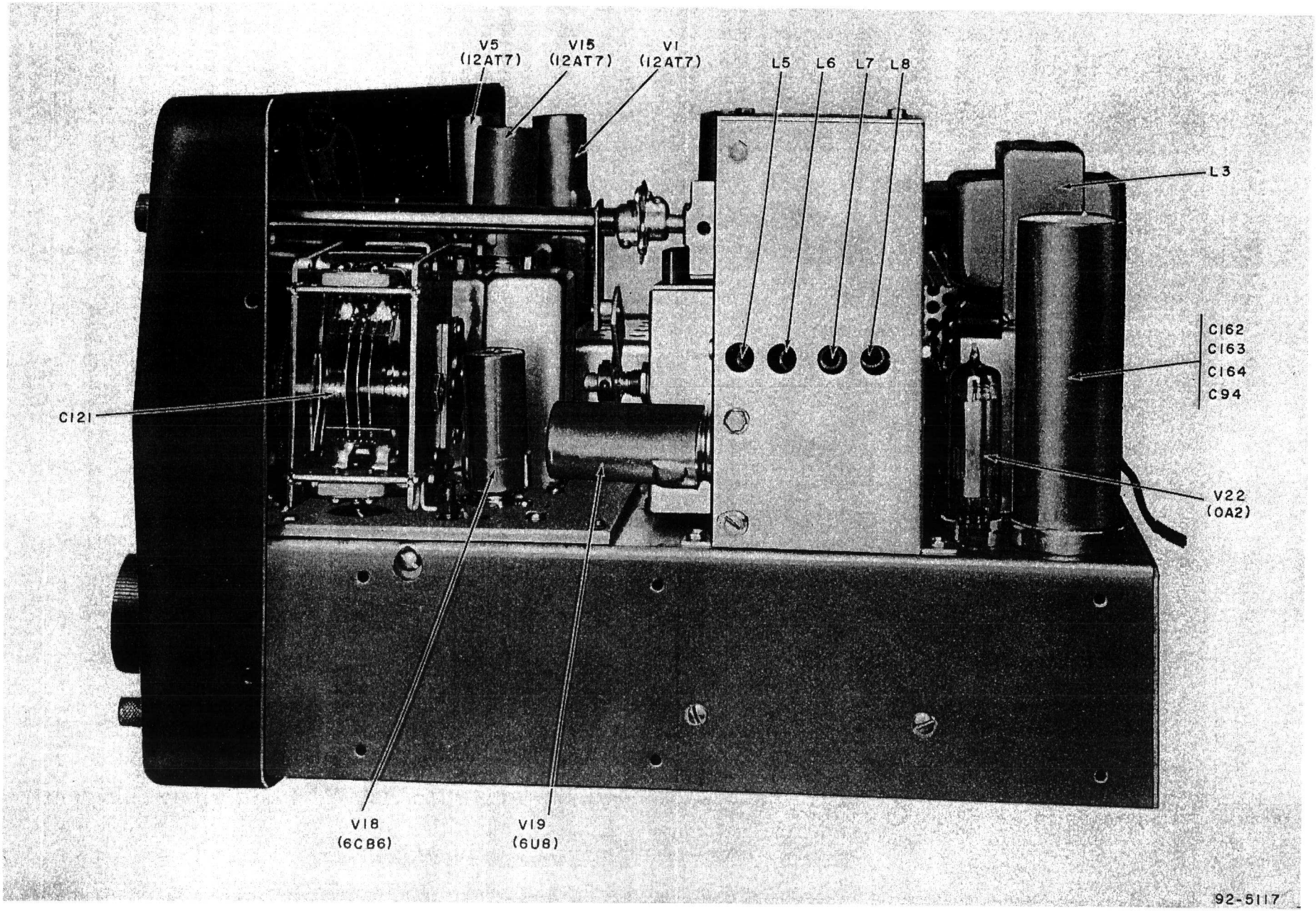


Figure 6. Model HT-30 Chassis, Right Side

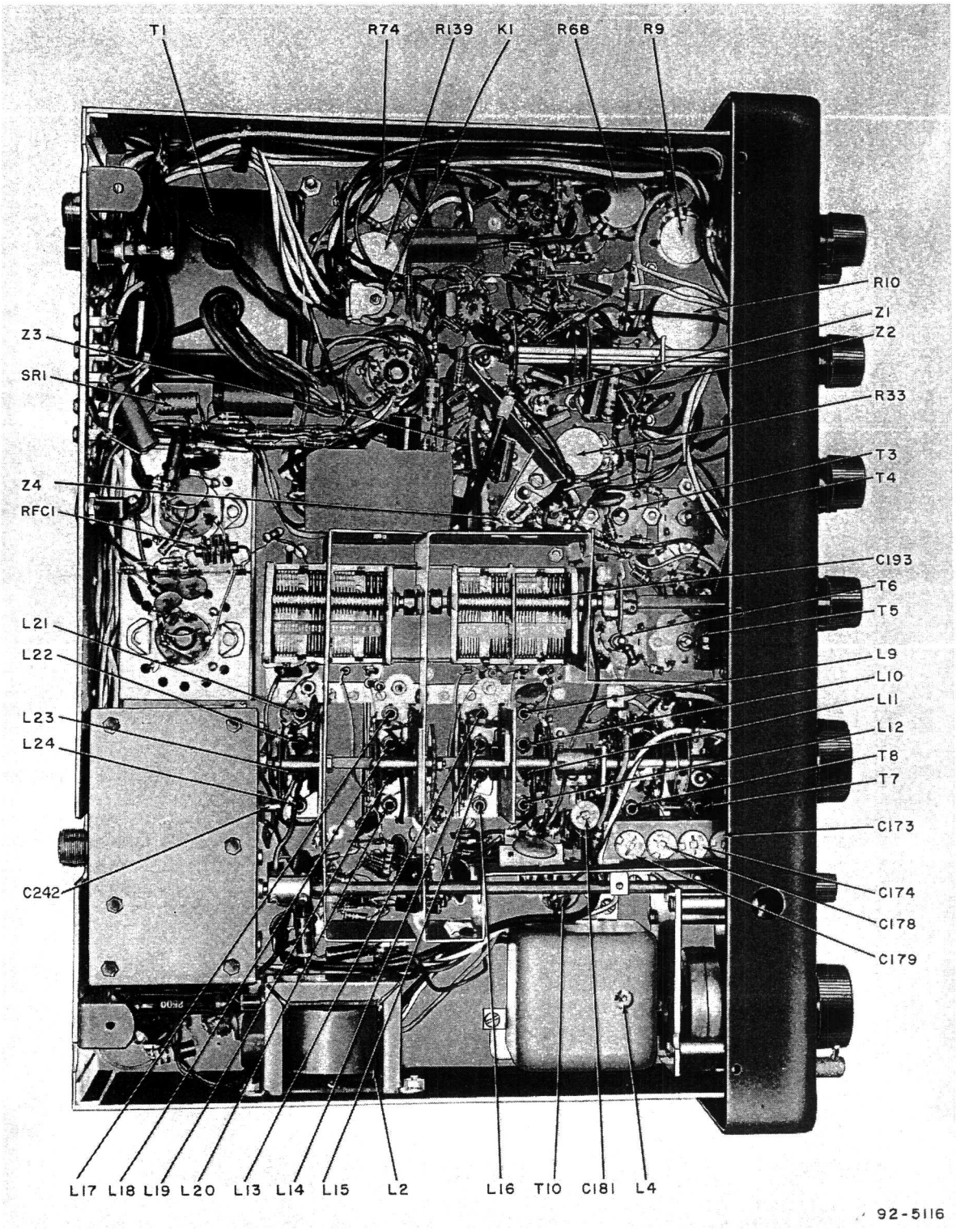


Figure 7. Model HT-30 Chassis, Bottom View

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.

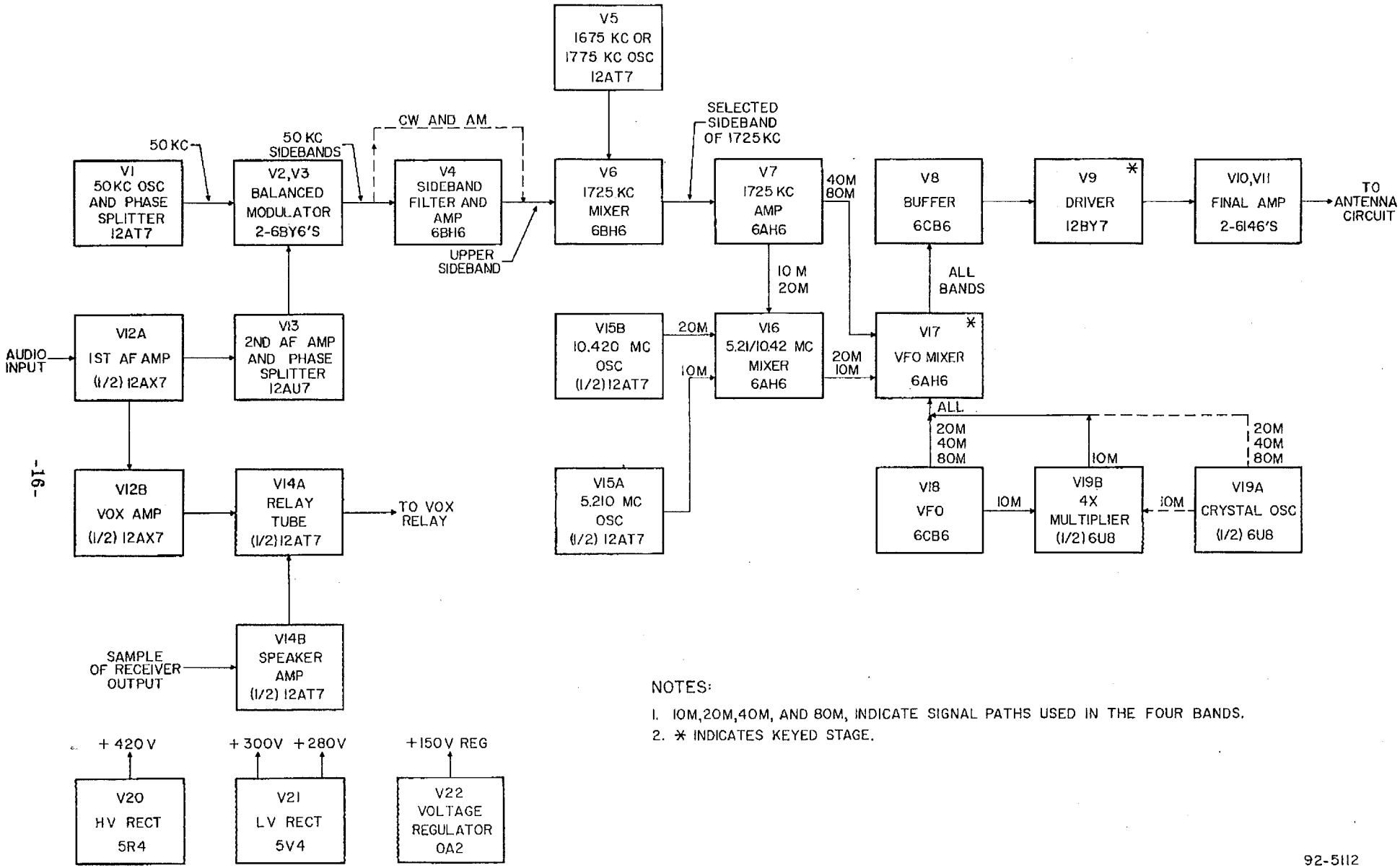


Figure 8. Model HT-30, Block Diagram

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.

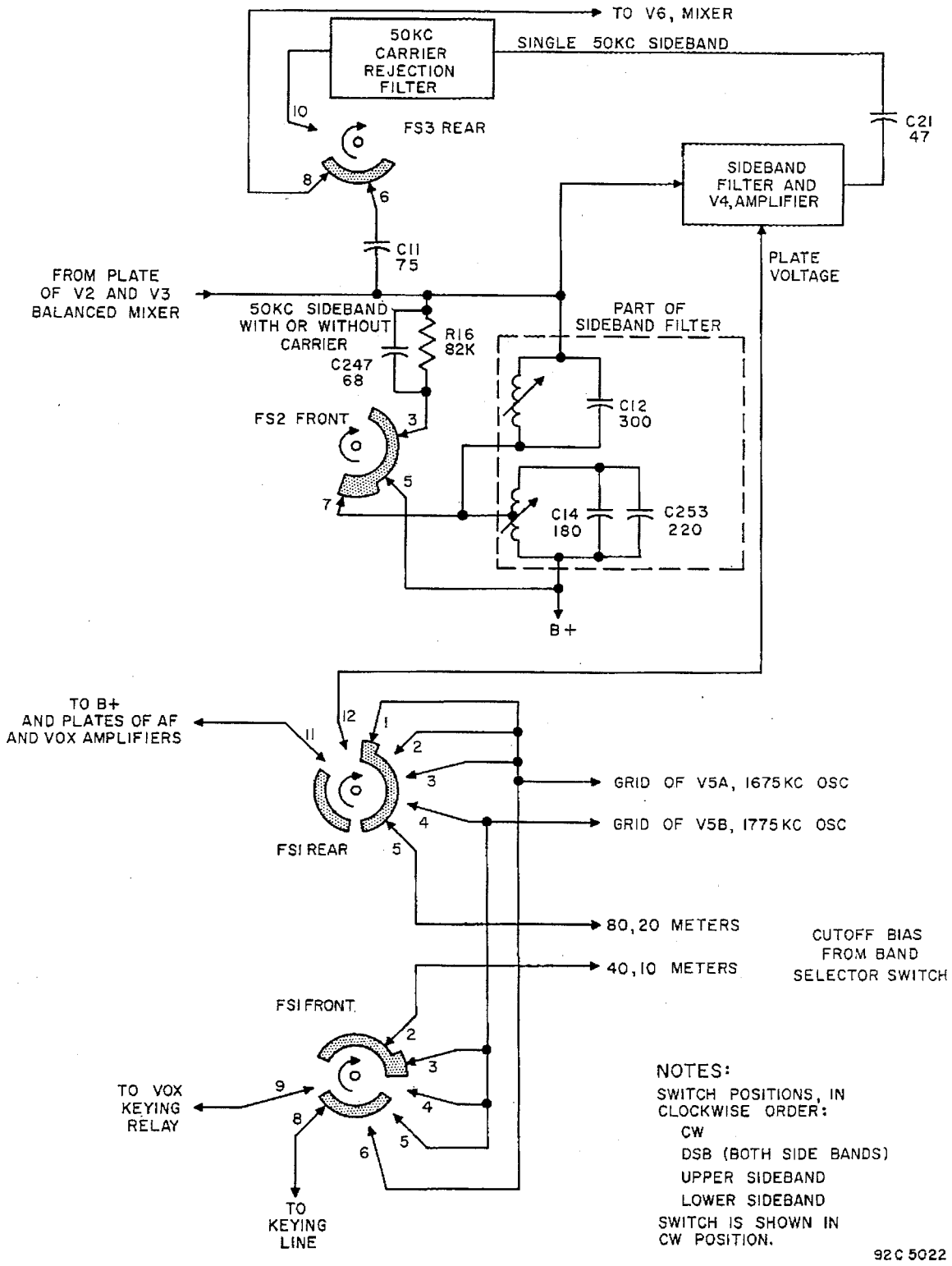
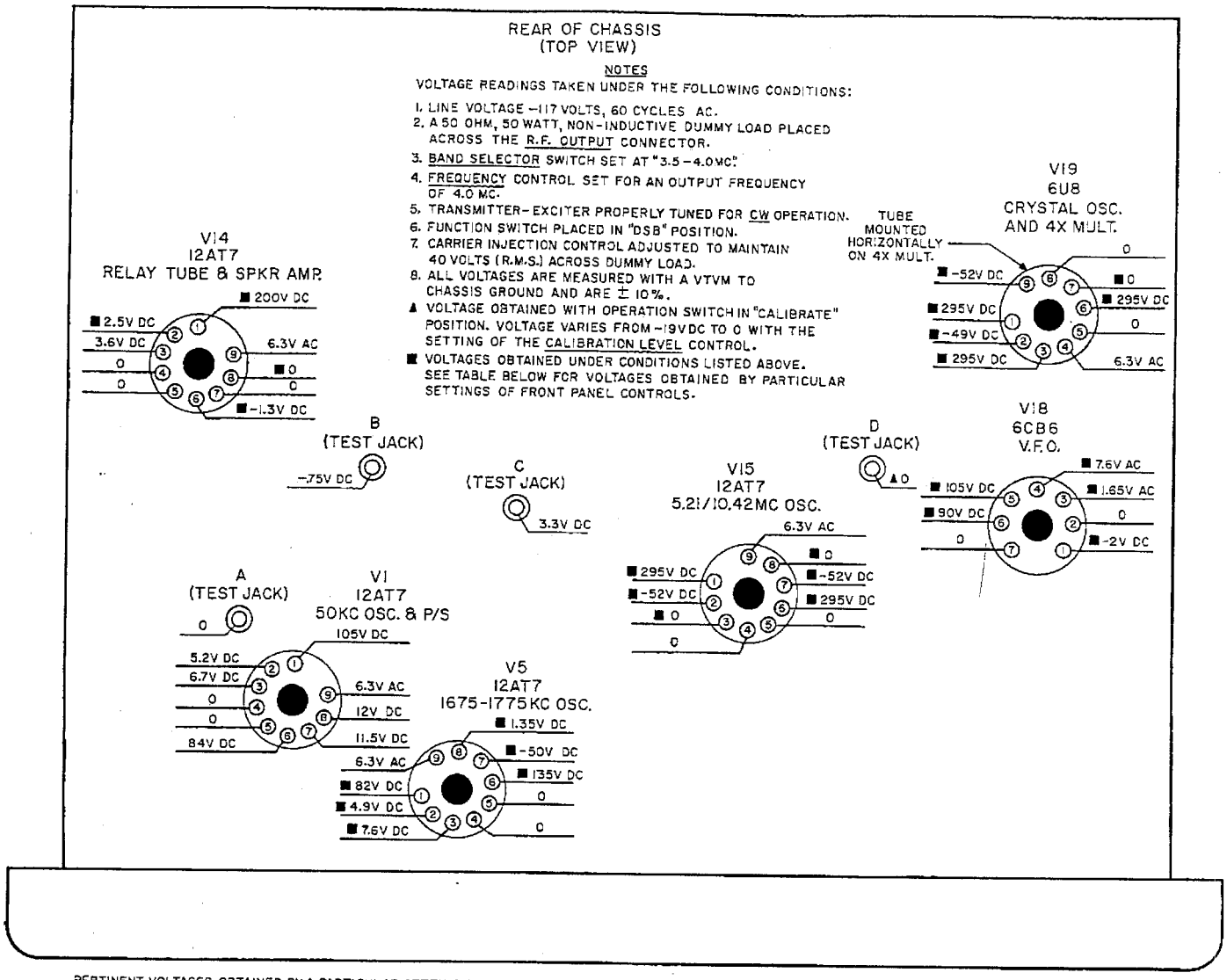


Figure 9. Function Switch, Simplified Diagram



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 RETUNED 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	80			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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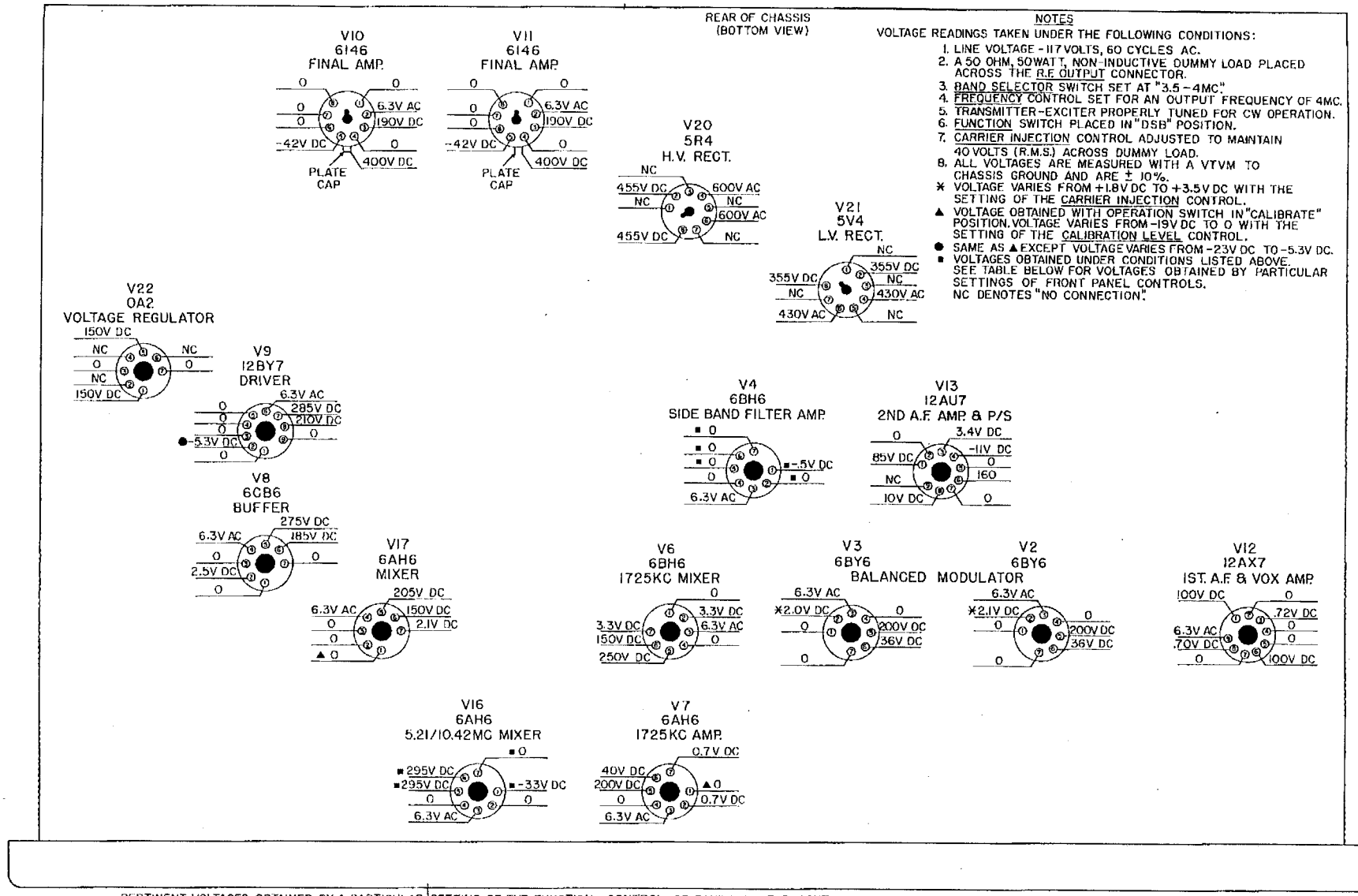
Figure 10. Tube Socket Voltage Chart, Top of Chassis



PERTINENT VOLTAGES, OBTAINED BY A PARTICULAR SETTING OF THE FUNCTION CONTROL OR BAND SELECTOR CONTROL ARE LISTED IN THE FOLLOWING TABLE. THE UNIT MUST BE RETUNED FOR THE HIGH END OF THE 40 OR 10 METER BAND WHEN TAKING VOLTAGE MEASUREMENTS 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
V4-6BH6	FUNCTION-UPPER SIDEBAND	0	2.2			240	100	2.2		
V16-6AH6	BAND SELECTOR 14-14.35	0				290	195	3.1		
	BAND SELECTOR 28-29.7	0				290	195	3.4		

92-5118

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.

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.

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

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 bandpass 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	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: 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. With this adjustment completed, perform the minor alignment as instructed above (Step 1).

6-5. RF ALIGNMENT

IMPORTANT - The rf alignment of any band should only be attemped 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 mechanical stop in this manner will assure a ballanced 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 excerised 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 "DBS" 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 little or no output on 10 meters.	Defective V15A, V19B, or associate circuitry.
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. However, 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.

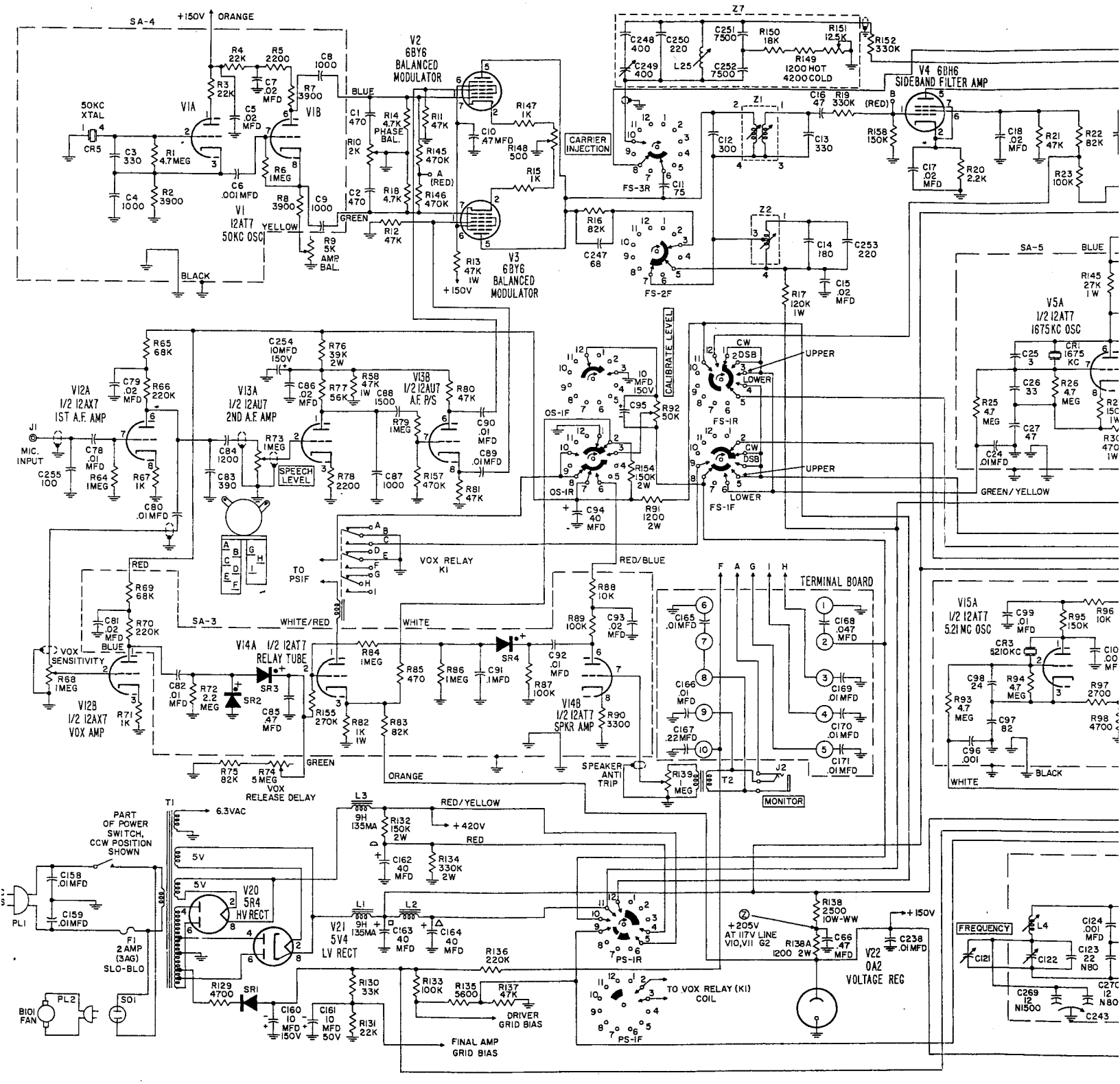
Specific conditions, under which voltage measurement is made, are noted on each voltage chart.

SERVICE PARTS LIST

Schematic Symbol	Description	Hallicrafters Part Number
	CAPACITORS	
C-34	1.5-7 mmf., trimmer	44A457
	Trimmer strip	44B464
C-181	3-12 mmf., trimmer	44A465
C-161	10 mfd. 50 V, elect.	45B211
C-162, 163, 164, 94	2 x 40 mfd. 350 V; 40 mfd. 400 V; 40 mfd. 500 V., elect.	45C301
C-160, 95, 254	10 mfd. 150 V, elect.	45B307
C-83	390 mmf., 10% 500 V	47X20B391K
C-91	.1 mfd. 200 V, molded paper.	46BR104L2
C-167	.22 mfd. 200 V, molded paper.	46BR224L2
C-168	.047 mfd. 200 V, molded paper.	46BR473L2
C-85, 10	.47 mfd. 200 V, molded paper.	46BR474L2
C-60A, B	2 x .004 mfd. 500 V, Cer Disc.	47A218
C-24, 28, 29, 31, 32, 33, 37, 39, 45, 53, 55, 58, 65, 70, 74, 75, 78, 80, 82, 89, 90, 92, 99, 100, 108, 109, 111, 112, 120, 135, 140, 143, 144, 145, 149, 158, 159, 165, 166, 169, 170, 171, 232, 233, 234, 235, 236, 237, 238, 239, 240, 244, 245, 257, 126, 127, 149	.01 mfd. 500 V, cer disc.	47A224
C-6, 106, 96	.001 mfd. 500 V, cer disc.	47B230
C-5, 7, 15, 17, 18, 20, 40, 79, 81, 86, 93, 189, 201, 212, 264, 221, 47	.02 mfd. 500 V, cer disc.	47A242
C-68	.001 mfd. 3000 V, cer disc.	47A311
C-101, 103, 139, 142, 148	.002 mfd. 500 V, cer disc.	47A395
C-114, 177	0.51 mmf. 10% 500 V, fixed	47B403-0
C-265, 266, 267, 268	2.2 mmf. 10% 500 V, fixed	47B403-4
C-199	1 mmf. 10% 500 V, fixed	47B403-2
C-196	2.7 mmf. 10% 500 V, fixed	47B403-14
C-131	47 mmf. 500 V, fixed mica	47CB470K
C-56, 57, 61, 63, 64, 67, 118, 119, 245	.005 mfd. 500 V, cer disc.	47A442
C-223, 241, 187, 210	.005 mfd. 20% 500 V, cer disc.	47B523
C-76	180 mmf., fixed toothpick	47-595
C-72	220 mmf., fixed toothpick	47-596
C-124, 125	1000 mmf 5% 300 V, fixed mica.	47A623
C-248	400 mmf. 5% N 5250, fixed cer.	47A639
C-69	.01 mfd. 1000 V, cer disc.	47A598
C-87	1000 mmf. 10% 500 V, mica.	47X20B102K
C-4, 8, 9	1000 mmf. 5% 500 V, mica.	47X20D102J
C-84	1200 mmf. 10% 500 V, mica.	47X20B122K
C-88	1500 mmf. 10% 500 V, mica.	47X20B152K
C-197, 208, 219, 230	240 mmf. 2% 500 V, mica.	47X20D241G
C-12	300 mmf. 2% 500 V, mica.	47X20D301G
C-13, 19, 22	330 mmf. 2% 500 V, mica.	47X20D331G
C-3	330 mmf. 5% 500 V, mica.	47X20D331J
C-128, 129, 130	10,000 mmf. 10% 300 V, mica	47X40E103K
C-14, 23	180 mmf. 1% 500 V, mica.	47X20F181F
C-1, 2	470 mmf. 2% 500 V, mica.	47X20F471G
C-269	12 mmf. ±5%, N1500 ±250 PPM cer.	47D20V120J
C-251, 252	7500 mmf. 2% 500 V, mica.	47X35F752G
C-247	68 mmf. 5% NPO	47X32CG680J
C-253, 256	220 mmf. 2% N330	47X35SH221G
C-150, 156	1.5 mmf. ±.25 mmf NPO, fixed cer. tub	47X20CG015G
C-153	2.2 mmf. ±25% NPO, fixed cer.	47X20CG2R2C
C-25	3 mmf. 2% NPO, cer.	47X20CG030G
C-132	6 mmf., 10%, cer	47X20CG060K
C-73	4 mmf. 5% NPO, cer tub.	47X20CG040J
C-262	5 mmf. ±.25 mmf, NPO cer	47X20CG050C
C-43, 50, 5, +.5 N 250		47X20UJ050D
C-54, 259	10 mmf. 5% NPO, cer	47X20CG100J
C-270	12 mmf. ±5%, NPO ±30 PPM, cer.	47X20CG120J
C-258	15 mmf. 5% NPO, cer	47X20CG150J
C-123	22 mmf. ±5% N80 ±30 PPM, cer	47X20LG220J
C-172, 175, 176	20 mmf. 5% NPO, cer	47X20CG200J
C-98	24 mmf. 2% NPO, cer tub.	47X20CG240G
C-260	22 mmf. 5% NPO, cer.	47X20CG220J
C-141	27 mmf. 5%, 500 V, fixed cer tub	47X30CG270J
C-26, 35, 185	33 mmf. 2% NPO, cer	47X30CG330G
C-222	33 mmf.	47X25CG330J
C-104	36 mmf. 2%, cer tub.	47X30CG360G
C-27, 36, 102, 105, 137, 138, 152, 155, 191, 203, 213	47 mmf. 2% NPO, fixed cer tub	47X25CG470G
C-97	82 mmf. 2%, NPO, cer tub.	47X32CG820G
C-185	5 mmf. 10% N750, cer.	47X20UK050K/D
C-261	100 mmf. 5% N750	47X25UK101J
C-107	100 mmf. 10% N750	47X25UK101K/D
C-184, 255	100 mmf. 10% N750, cer cer	47X30UK101K/D
C-59	110 mmf. 10% 500 V. cer	47X15D111K
C-30, 16, 21, 62, 180, 182, 183	47 mmf. 10% N750, cer.	47X20UK470K/D
C-247	68 mmf. 10% N750, cer.	47X30UK680K/D
C-250	220 mmf. N2200 10%, cer.	47D25W221K
C-11	75 mmf. 10% N750, cer.	47X30UK750K/D
C-192, 205, 216, 228	82 mmf. 5% 500 V, cer.	47X25RH820J
	Trimmer, variable	48D316
C-121	Variable capacitor, main tuning.	48C343
C-71	Variable capacitor, air, final tank.	48D344
C-193, A, B, C, D	Variable capacitor, RF Amp, front	48D353
C-193, E, F, G, H	Variable capacitor, RF Amp, rear	48D364
C-146, 151, 154, 157	Variable capacitor, 4th Harm. Mult.	48D365
C-243	Variable capacitor, trimmer.	48-375
C-122	Variable capacitor, trimmer.	48-376
C-249	Variable capacitor	48B384
	RESISTORS	
R-157	470K 10% 1/2 w	23X20X474K
R-145, 146	470K ohm 1% 1/2 w comp.	23DCC474
R-149	Temp. comp	23A120
R-56, 67, 71, 117, 126, 141, 140, 108	1000 ohm 10% 1/2 w comp.	23X20X102K
R-15, 147	1000 ohm 5% 1/2 w comp.	23X20X102J
R-49, 88, 96, 100, 122	10,000 ohm 10% 1/2 w comp.	23X20X103K
R-23, 42, 45, 47, 51, 87, 89, 104, 109, 114, 125, 127, 133, 156	100K ohm 10% 1/2 w comp.	23X20X104K
R-6, 64, 79, 84, 86	1 meg. 10% 1/2 w comp.	23X20X105K
R-39, 40	1200 ohm 10% 1/2 w comp.	23X20X122K
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
	RESISTORS (cont)	
R-72	2.2 meg 10% 1/2 w comp.	23X20X225K
R-97, 99	2700 ohm 10% 1/2 w comp.	23X20X272K
R-155	270K ohm 10% 1/2 w comp.	23X20X274K
R-48, 106, 111	330 ohm 10% 1/2 w comp.	23X20X331K
R-90	3300 ohm 10% 1/2 w comp.	23X20X332K
R-130	33K ohm 10% 1/2 w comp.	23X20X333K
R-19, 24, 152	330K ohm 10% 1/2 w comp.	23X20X334K
R-2, 7, 8	3900 ohm 5% 1/2 w comp.	23X20X392J
R-118	3900 ohm 10% 1/2 w comp.	23X20X392K
R-57, 59, 144	47 ohm 10% 1/2 w comp.	23X20X470K
R-85	470 ohm 10% 1/2 w comp.	23X20X471K
R-14, 18	4700 ohm 5% 1/2 w comp.	23X20X472J
R-98, 129, 153	4700 ohm 10% 1/2 w comp.	23X20X472K
R-11, 12, 21, 50, 52, 80, 81, 107, 112 113, 123, 137, 110	47K ohm 10% 1/2 w comp.	23X20X473K
R-1, 25, 26, 37, 38, 93, 94, 102, 103, 119, 120	4.7 meg. 10% 1/2 w comp.	23X20X475K
R-46, 53	560 ohm 10% 1/2 w comp.	23X20X561K
R-121, 135	5600 ohm 10% 1/2 w comp.	23X20X562K
R-77, 124	56K ohm 10% 1/2 w comp.	23X20X563K
R-41, 44	560K ohm 10% 1/2 w comp.	23X20X564K
R-128	68 ohm 10% 1/2 w comp.	23X20X680K
R-43	680 ohm 10% 1/2 w comp.	23X20K681K
R-65, 69	68K ohm 10% 1/2 w comp.	23X20X683K
R-142, 143	820 ohm 10% 1/2 w comp.	23X20X821K
R-16, 22, 75, 83	82K ohm 10% 1/2 w comp.	23X20X823K
R-82	1000 10% 1 w comp	23X30X102K
R-154	150K ohm 1 w comp.	23X30X153M
R-29, 34	100K 10% 1 w comp.	23X30X104K
R-31	1200 ohm 10% 1 w	23X30X122K
R-17	120K ohm 10% 1 w comp.	23X30X124K
R-27, 36	1500 ohm 10% 1 w comp.	23X30X152K
R-115	22,000 ohm 10% 1 w comp.	23X30X223K
R-35, 145	27K 10% 1 w	23X30X273K
R-116, 30, 32	4700 ohm 10% 1 w comp.	23X30X472K
R-13, 58	47K ohm 10% 1 w comp.	23X30X473K
R-138A, 91	1200 ohm 10% 2 w comp.	23X40X122K
R-132	150K ohm 10% 2 w comp.	23X40X154K
R-55	22K ohm 10% 2 w comp.	23X40X223K
R-134	330K ohm 10% 2 w comp	23X40X334K
R-76	39K ohm ±10% 2 w comp.	23X42X393K
R-54	470 ohm 10% 2 w comp.	23X40X471K
R-60	4700 ohm 5% 2 w comp.	23X40X472J
R-61	6800 ohm 5% 2 w comp.	23X40X682J
R-138	2500 ohm 5% 10 w W.W.	24BG252D
R-62	Variable, 50K W.W. (meter composition)	25B1227
R-33	Variable, 100K side band bal.	25B1136
R-68, 139	Variable, 1 meg speech level voice control	25B1137
R-73	Variable, 1 meg speech level	25B1138
R-10	Variable, 2K injection W.W.	25B1393
R-74	Variable, 5 meg. - time delay	25B1141
R-92	Variable, 50K ohm, calibrate level	25B1273
R-148	Variable 500 ohm W.W.	25B1391
R-9	Variable 5000 ohm	25B1392
R-151	Variable, 12.5K ohm	25B1394
	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
	TRANSFORMERS AND COILS (cont)	
L-11, 15, 19, 23		
	Coil, RF (7.0-7.3 MC)	51B2017
L-12, 16, 20, 24		
	Coil, RF (3.5-4 MC)	51B2018
L-5, 6, 7, 8		
	Coil, (4 x mult)	51B2046
L-26	Coil, final tank	51B2106
L-1	Choke, filter (9 Hy 135 ma.)	56C205
L-2	Choke, filter (10 Hy 80 ma.)	56C213
L-3	Choke, filter (9 Hy 135 ma.)	56A248
T-3, 4, 5, 6		
	Transformer, coil 1725 KC	50B662
T-10	Transformer, (VFO bandpass filter)	50B679
T-7,8	Transformer, IF 6935-8695 KC	50C685
T-1	Transformer, power	52C337
T-9	Choke, VFO output assembly	53B359
T-2	Transformer, audio input	55B261
Z-1,3	Transformer, balance 50 KC	50B658
Z-2, 4	Transformer, 50 KC trap	50C699
Z-5, 6	Choke, parasitic	53B334
RFC-1, 4, 11		
	Choke, RF 2.5 MH	53B335
RFC-2	Choke, RF (final plate)	53C340
RFC-5, 6, 7, 8, 9, 10		
	Choke, fil.	53B358
RFC-3	Choke, RF 0.3 MH	53A369
	SWITCHES	
BS	Switch, band	60B664
FS	Switch, function	60B668
PS	Switch, power off-on-standby	60B666
OS	Switch, voc-cal-manual	60B665
	Switch, VFO-Xtal	60 B745
	TUBES	
V-22	Electron, type OA2 voltage regulator	90X0A2
V-20	Electron, type 5R4GY high voltage rect.	90X5R4GY
V-21	Electron, type 5V4G low voltage rect	90X5V4G
V-7	Electron, 6AH6, 1725 KC amp.	90X5V4G
V-16	Electron, 6AH6, 5.2/10.42 mc mixer	90X5V4G
V-17	Electron, 6AH6, VFO mixer	90X5V4G
V-4	Electron, type 6BH6, sideband filter amp	90X6BH6
V-6	Electron, type 6BH6, 1725 KC mixer	90X6BH6
V-2	Electron, type 6BY6, balanced mod	90X6BY6
V-3	Electron, type 6BY6, balanced mod	90X6BY6
V-8	Electron, type 6CB6, RF amp.	90X6CB6
V-18	Electron, type 6CB6, VF)	90X6CB6
V-19	Electron, type 6U8, crystal Osc/4 X mult.	90X6U8
V-1	Type 12AT7, 50 KC osc	90X12AT7
V-5	Type 12AT7, 1675 KC/1775 KC osc	90X12AT7
V-14	Type 12AT7, relay tube/Spkr. amp	90X12AT7
V-15	Type 12AT7, 5.21 MC/10.42 MC osc	90X12AT7
V-12	Tube, type 12AX7, 1st AF amp/vox amp	90X12AX7
V-13	Type 12AU7, 2nd AF amp/AF P/S	90X12AU7
V-9	Type 12BY7, driver	90X12BY7
V-10	Type 6146, final amp	90X6146
V-11	Type 6146, final amp	90X6146
	RECTIFIERS AND CRYSTALS	
SR-2, 3, 4		
	Selenium diode	19B1908
CR-6	Diode	19A1916
CR-2	Crystal, 1775 KC	19-1903
CR-1	Crystal, 1675 KC	19-1904
CR-3	Xtal, 5210 KC	19-1905
CR-4	Xtal, 10420 KC	19-1906
CR-5	Crystal, 50KC	19B1946
SR-1	Selenium rectifier	27B224
	MISCELLANEOUS	
	Arm link	18A125
	Arm link	63B2105
	Base, sub chassis	70C1242
	Bracket, cap. mtg.	67B3507
	Bracket, cap. mtg.	67B3508
	Bracket, cap. mtg (tandem)	67C3460
	Bracket, carrier rej. filter	67A4185
	Bracket, chassis mtg.	67C797
	Bracket, choke mtg.	67D4149
	Bracket, coil mtg. (front mult).	67B3099
	Bracket, coil mtg. (rear mult).	67B3098
	Bracket, cover last mixer	67A3922
	Bracket, Gear adj.	67A3011
	Bracket, Gear drive & shield mtg.	67A3459
	Bracket, motor mtg.	67B4182
	Bracket, motor support	67B4183
	Bracket, mtg. (coil assy)	67A3458
	Bracket, mtg. (mult cond)	67B3457
	Bracket, mtg. (stop arm)	67B3162
	Bracket, mtg. trimmer	67B3456
	Bracket & shaft assy.(idler gear)	67B3113
	Bracket, shield mtg. & drive gear	67A3011
	Bracket, trimmer mtg.	67A3922
	Bushing, dial	77B1038
	Bushing, (friction brake)	77A1037
	Bushing, (final tank)	77A1044
	Cabinet, detail	66E1081
	Channel, rubber	16A180
	Chassis, base	70-1216
	Clamp, electric	76B1784
J-3	Connector	10A056
J-1	Connector, mike	29A043
	Coupler, flexible	29A051
	Coupler, flexible	29A294
	Coupler, solid	29A269
	Cover, cabinet top	66 E118
	Cover, final amp.	66C1284
	Cover, last mixer	66B1364
	Cover, shield (final tank)	66B1227
	Dial scale mtg.	83 C523
	Fan, blade	80C305
	Flywheel	71A205
	Foot, rubber (black)	16A007
F-1	Fuse, 2 amp, 125 V., Slo-Blo	39A428
	Gear, idler assembly	26B283
	Grommet	16A034
	Grommet	16A180
	Holder, fuse	6A451
	Gear, pinion (shaft)	26B281
J-2	Jack, phone monitor	36A002
A, B	Jack, tip (black) test jack	36A083
C, D	Jack, tip (red) test jack	36 A084
	Knob - Speech Level	83B493
	Knob - Carrier Injection	83B493
	Knob - Meter Compression	83B493
	Knob - Calibrate Level	83B493
	Knob - Power, etc	83B497
	Knob - Function	83B498
	Knob - Operation	83B495
	Knob - Band Selector	83B496
	Knob - Driver Tuning	83B491
	Knob - Frequency	83B492
	Knob - Dial Drag	15B899
	Knob - 4 X Tuning, VFO, XTAL, Final Tuning	15B936
	Lever, brake (friction)	74B999
	Line cord	87A3644
PL-1	Line cord & plug	87B4833
	Lock, line cord	76A397-1
	Lock, line cord	76A397-2
	Meter, output level	82-292
	MISCELLANEOUS (cont)	
B-101	Motor	20B088
	Overlay, front panel	68C363
	Panel, front	68E340
LM-1, 2	Pilot lamp, type 47	39A004
	Pilot light assy.	86A219
	Pin, roll	74B1034
	Pin, roll (.062 x 3/8)	74A954
	Plate, cap w/leads	76-1579
	Plate, gear (1st)	63B1786
	Plate, gear (2nd)	63B1787
	Plate, gear (3rd)	63B1788
	Plate, var. cap.(VFO sub chassis	63C1811
	Post, latch	11A226
S-01	Receptacle, AC w/leads	10B921
K-1	Relay, voice control	21-197
	Retainer, glass	87A3629
	Rubber, spacer	16A694
	Shaft, actuator	74C1078
	Shaft, bandswitch	74A1009
	Shaft, cond. (final tank)	74B1012
	Shaft, cond. (RF amp)	74B1011
	Shaft, friction brake	74B1000
	Shaft, (mult)	74B1010
	Shield, 50 KC amp	69B848
	Shield, base	69-842
	Shield, can	69-750
	Shield, can	69-751
	Shield, can	69B752
	Shield, can	69B839
	Shield, can (coil assy)	69A833
	Shield, can (coil assy)	69B825
	Shield, cap., 2nd RF	69C748
	Shield, cap., left RF	69C755
	Shield, cap., right RF	69C754
	Shield, carrier rejector filter	69C929
	Shield, case (front final tank)	69C826
	Shield, case (front mult)	69C823
	Shield, case (rear final tank)	69C827
	Shield, case (rear mult)	69C824
	Shield, case (VFO & Xtal switch)	69C857
	Shield, center (coil assy)	69B822
	Shield, chassis top	69B840
	Shield, coil	69A828
	Shield, mixer grid (1675-1775)	69A938
	Shield, rear	69C747
	Shield, tube	69-863
	Shield, tube	69A097
	Shield, tube	69A306
	Shield, tube	69A519
	Shield, tube	69B834
	Shield, tube	69B838
	Shield, tube (noval)	69B855
	Shield, (VFO)	69C900
V-10, 11	Socket, octal	6A317
V-1, 5, 14, 15, 19		
	Socket, 9 pin (mica filled)	6B664
V-13	Socket, 9 pin min w/base	6B672
V-2, 3, 4, 6, 7, 8, 16, 17, 22		
	Socket, tube, (7 pin min)	6B505
V-15	Socket, tube (7 pin min cer)	6A354
V-20, 21	Socket, tube (8 pin octal)	6A298
V-9, 12	Socket, tube (9 pin min) mica filled	6B500
4XMJLT	Socket, Xtal	6A346
	Spacer	73A458
	Spacer, gear plate (1-2)	73B1052
	Spacer, gear plate (2-3)	73A1083
	Spacer, stop arm	73A1208
	Spacer, switch	73A1209
	Spacer, switch	73A1243
	Spacer, switch (3/16)	73A1132
	Spring	75A345
	Spring, compression (idler gear)	75A376
	Spring, tension	75B417
	Spring, tension (stop arm)	75A381
	Stop, balance mod.	74B1244
	Stop, knob	74B1245
	Strap, copper	76-371
	Stud, arm link	73A860
	Stud, shoulder	73B1127
	Stud, shoulder (stop arm)	73B1123
	Support post	73A1197
	Terminal strip, special	86A1355
	Window, Dial panel	22C438


SA-4
+150V
ORANGE
V1A
V1B
V1
12AT7
50KC OSC
50KC XTAL
CR5
BLACK
YELLOW
GREEN
BLUE
V2
6BY6
BALANCED MODULATOR
V3
6BY6
BALANCED MODULATOR
+150V
CARRIER INJECTION
FS-3R
FS-2F
Z7
Z1
Z2
V4 6BH6
SIDEBAND FILTER AMP
(RED)
SA-5
V5A
1/2 12AT7
1675KC OSC
GREEN/YELLOW
V12A
1/2 12AX7
1ST A.F. AMP
MIC. INPUT
V13A
1/2 12AU7
2ND A.F. AMP
SPEECH LEVEL
V13B
1/2 12AU7
A.F. P/S
CALIBRATE LEVEL
OS-IF
OS-IR
FS-IR
FS-IF
CW
DSB
LOWER
UPPER
TO PSIF
VOX RELAY K1
SA-3
RED
WHITE/RED
WHITE
RED/BLUE
V14A 1/2 12AT7
RELAY TUBE
V12B
1/2 12AX7
VOX AMP
VOX SENSITIVITY
V14B
1/2 12AT7
SPKR AMP
SR1
SR2
SR3
SR4
VOX RELEASE DELAY
SPEAKER ANTI TRIP
TERMINAL BOARD
MONITOR
T2
J2
V15A
1/2 12AT7
5.21MC OSC
CR3
5210KC
WHITE
BLACK
T1
6.3VAC
PART OF POWER SWITCH, CCW POSITION SHOWN
PL1
F1
2 AMP (3AG) SLO-BLO
PL2
BIOI FAN
SOI
5V
V20
5R4
HV RECT
V21
5V4
LV RECT
L1
L2
L3
9H
135MA
+420V
RED
RED/YELLOW
+205V AT 117V LINE
VIO,VII G2
V22
OA2
VOLTAGE REG
TO VOX RELAY (K1) COIL
DRIVER GRID BIAS
FINAL AMP GRID BIAS
PS-IR
PS-IF
FREQUENCY
L4
C121
C122
C123
22
N80
C124
.001
MFD
C269
12
N1500
C270
12
N80
C243

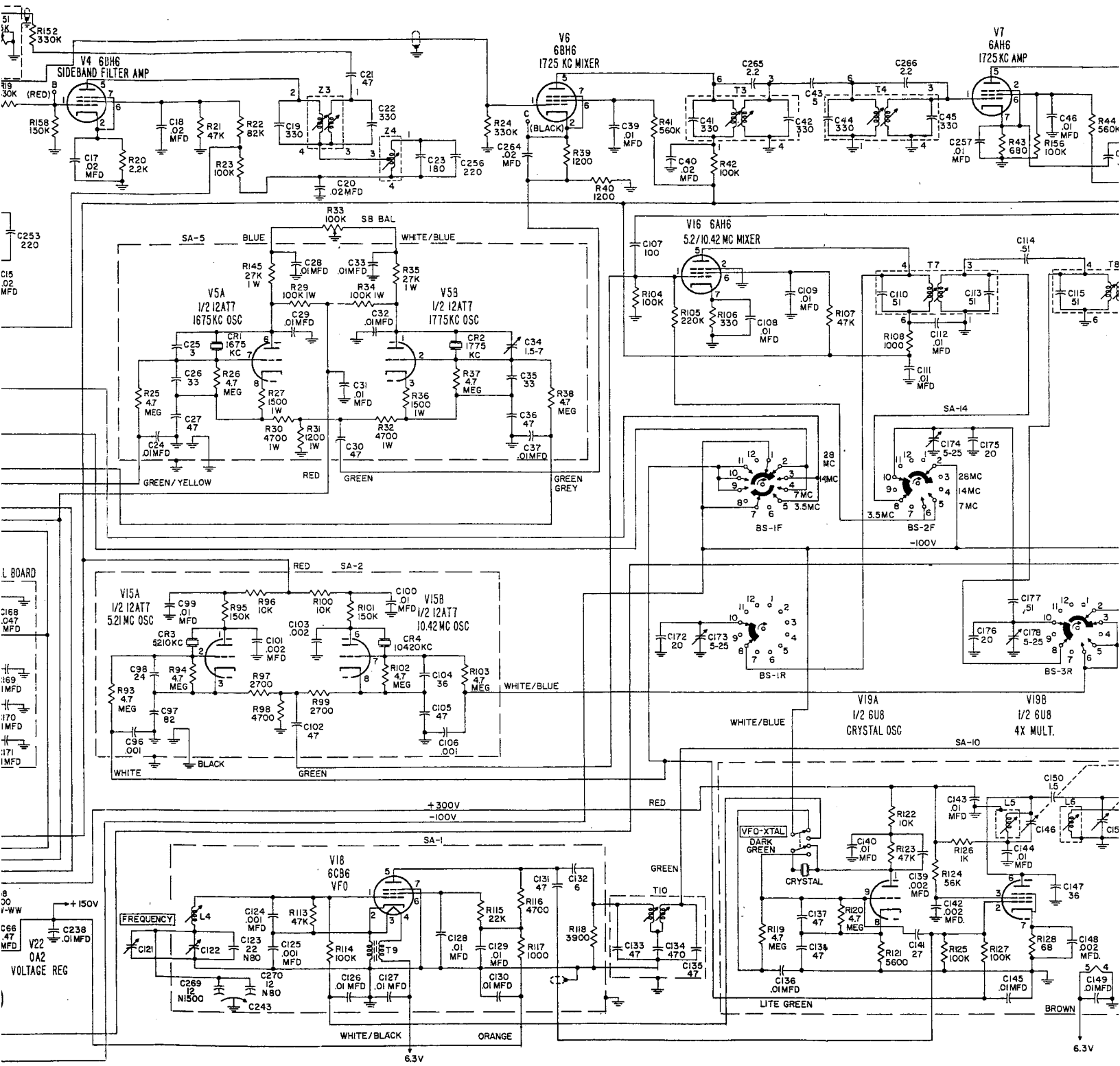


Figure 12. HT-30, Schematic D

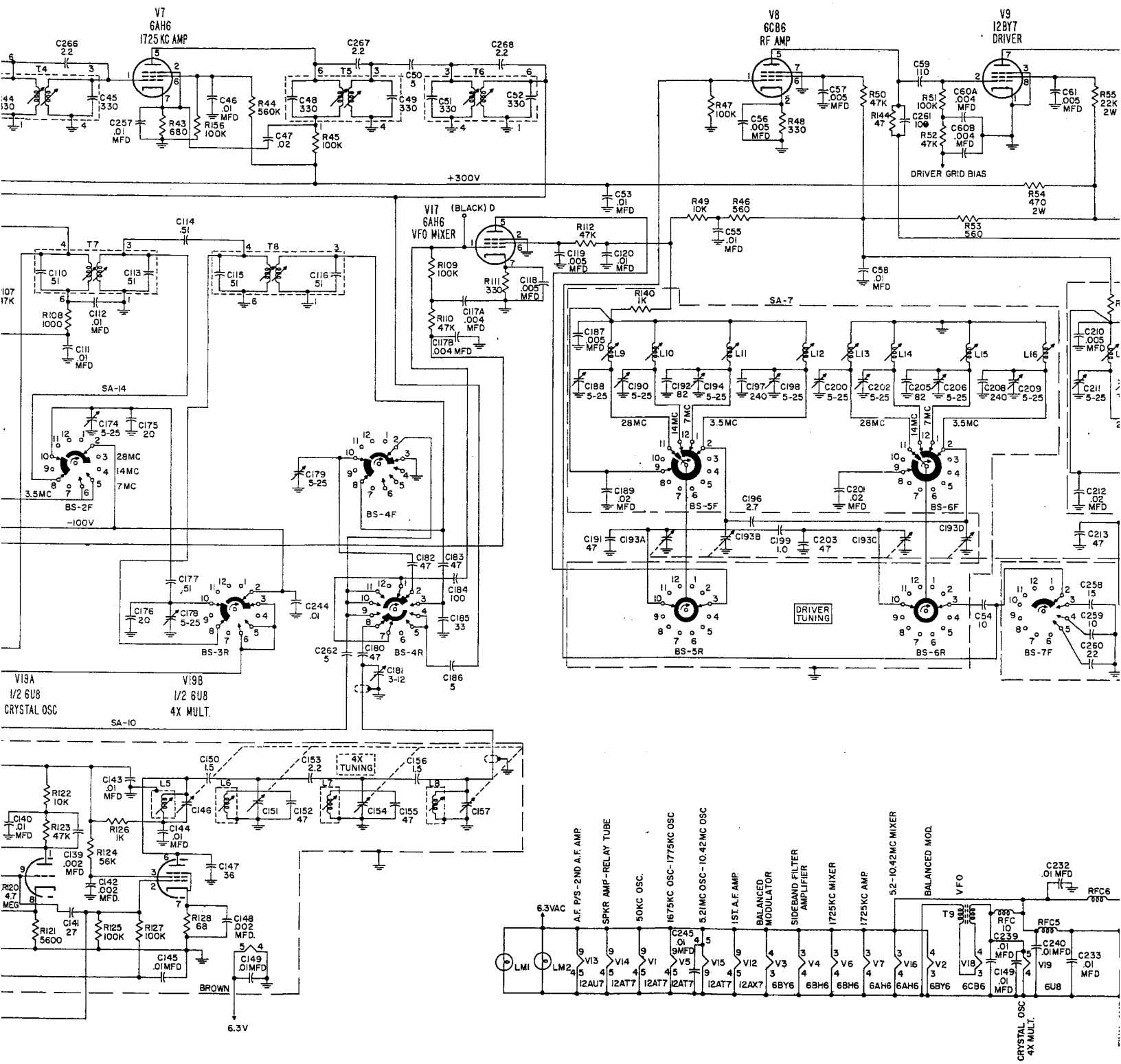
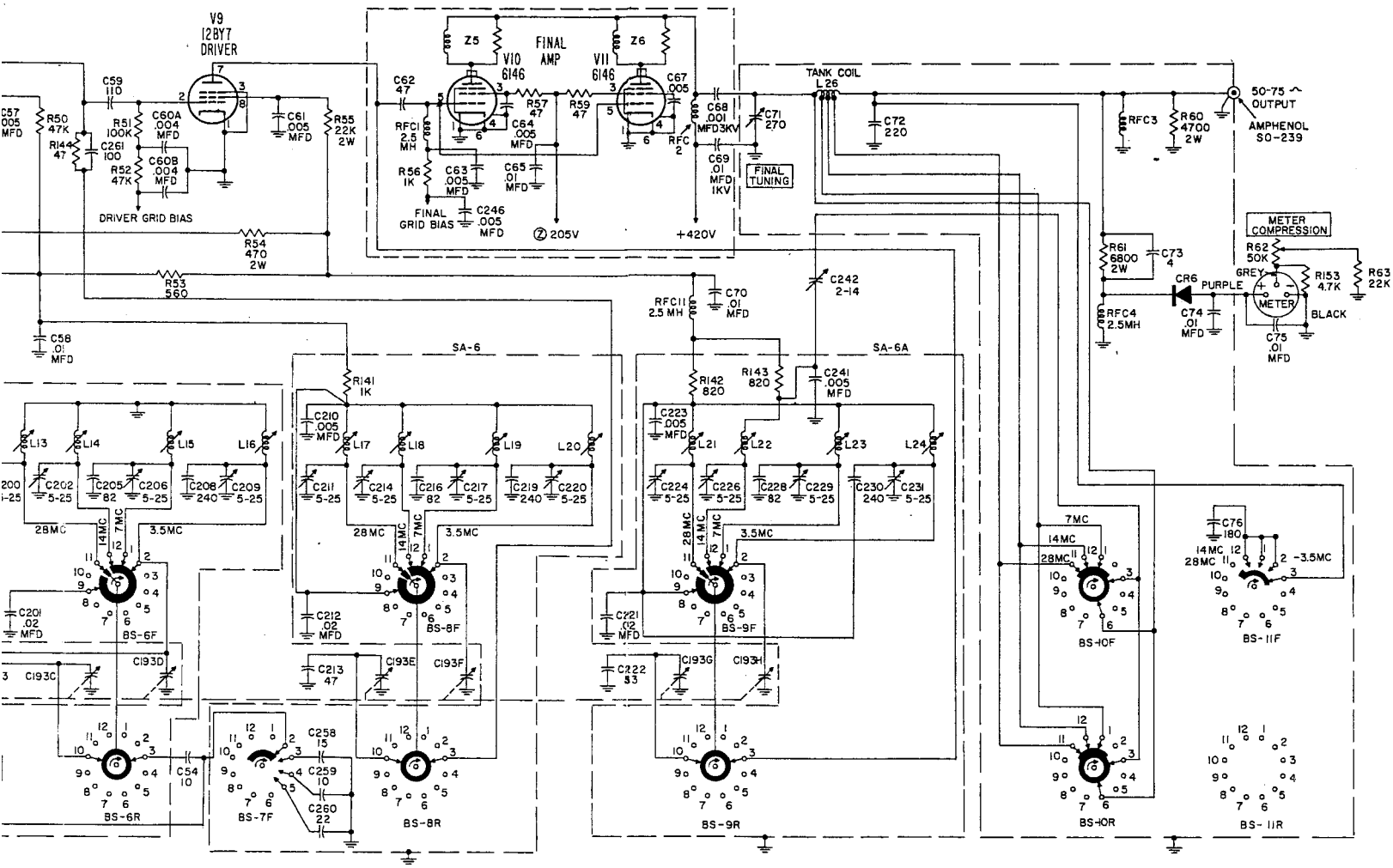
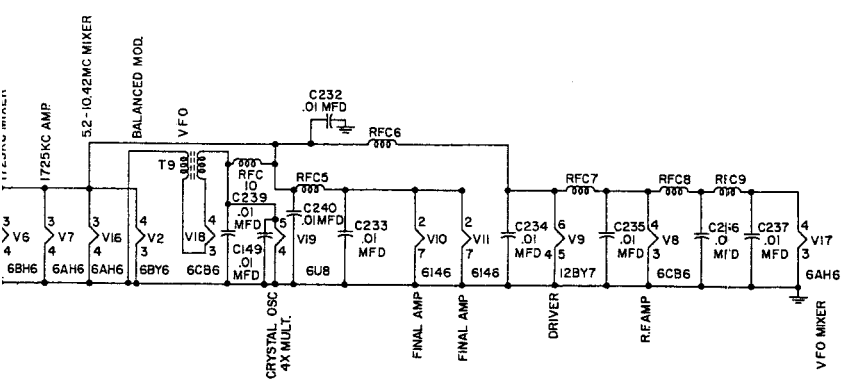


Figure 12. HT-30, Schematic Diagram





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.

SWITCH POSITIONS IN CLOCKWISE ORDER;

POWER	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	14MC	1.775MC	1.675MC
5.210MC	28MC	1.675MC	1.775MC

HT-30
TRANSMITTER - EXCITER
MARK I