TECHNICAL MANUAL

for

SIDEBAND STRIP EXCITER
MODEL STE-5

THE TECHNICAL MATERIEL CORPORATION
MAMARONECK, N.Y. OTTAWA, CANADA

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TMC (*Canada*) LIMITED

TELECOMMUNICATIONS ENGINEERS

MAILING ADDRESS: R.R. No. 5, Ottawa, Ontario

A Subsidiary of The Technical Materiel Corporation, Mamaroneck, N.Y.

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* Electron tubes also include semi-conductor devices.

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3. TMC Part Number.
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5. The contract or purchase order under which equipment was delivered.

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2. TMC Part Number.
3. Equipment in which used by TMC or Military Model Number.
4. Brief Description of the Item.
5. The *Crystal Frequency* if the order includes crystals.

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R.R. No.5, Ottawa, Ontario
Telegraphic Address: TEPEI, Ottawa.

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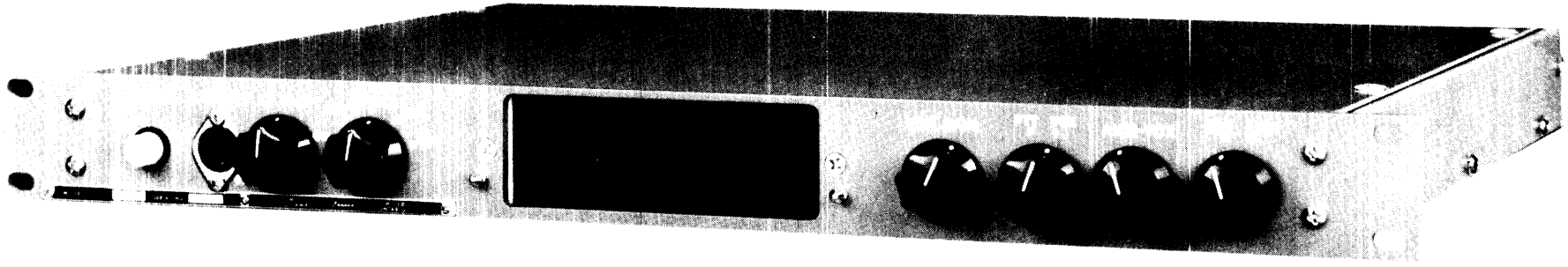


Figure 1-1. Sideband Strip Exciter, Model STE-5

SECTION 1

GENERAL INFORMATION

1-1. FUNCTIONAL DESCRIPTION.

The Sideband Strip Exciter Model STE-5 (figure 1-1) is a completely transistorized superheterodyne communications exciter that operates on any crystal-controlled frequency in the range of 2 to 32 MHz.

The STE-5 provides up to 100 milliwatts excitation for amplitude modulation equivalent (AME), continuous wave (CW), facsimile (FAX), frequency shift keying (FSK), modulated continuous wave (MCW), and single sideband (SSB) operating modes.

NOTE

Additional equipment is required to provide FAX and FSK signals.

Three models of the STE-5 are available: STE-5U which transmits upper sideband only, STE-5L which transmits lower sideband only, and STE-5U/L which transmits either sideband depending on the position of the sideband selector switch.

The STE-5 uses a fixed-tuned plug-in module (TTRT) for its RF section. Five models of the TTRT module are available to cover the complete frequency range of the STE-5. Other features of the STE-5 include:

a. Single conversion and a sharp cutoff bandpass filter.

b. Manual selection of either LSB or USB transmission for the STE-5U/L.

c. Built-in power compensation circuit to prevent transmitter overload when mode of operation is changed.

d. Automatic compression circuit for higher average power output.

e. Selectable voice or push-to-talk operation of exciter.

f. Low power consumption.

g. Compact, lightweight construction.

The STE-5 is designed to accept a wide variety of audio inputs including a carbon microphone, high-impedance microphone, low-impedance microphone, and a 600-ohm balanced line. Provision is made for operation with a handset (also available from TMC). The STE-5 contains an audio oscillator for CW and MCW transmission.

The performance specifications and other reference data for the STE-5 are given in paragraph 1-3.

Table 1-1 lists the loose items supplied with the STE-5.

Table 1-1. Loose Items Supplied

Name	Designation	Function	Qty.
Fanning strip	TM105-16AL	Aid for rear panel wiring	1
RF connector plug	UG88/U	Provides for coaxial cable connection to RF output jack.	1
Technical Manual	IN2032	Instructions for operation and maintenance of STE-5	1

1-2. PHYSICAL DESCRIPTION.

a. EXTERNAL.–The STE-5 is designed for mounting in a standard 19-inch rack, and has a protective cover on top. Most of the operator's controls are located on the front panel, and are described in section 3. There is also a jack on the front panel for connecting a handset. A terminal board mounted to the rear panel is provided for most input and output connections and a BNC connector is provided for connecting the RF output of the exciter to associated equipment with coaxial cable. In addition, the rear panel contains the ac power cable, the line fuse, and a HANDSET/LINE switch. Figure 2-2 illustrates the rear panel components.

b. INTERNAL.–Most of the smaller components in the STE-5 are soldered to printed circuit boards that are mounted to the chassis. There are five of these boards not including those in the TTRT modules. These are the transmitter IF board, the transmitter AF board, the power supply board, the preamplifier and CW oscillator board and the RF filter board. The remainder of the components in the exciter are chassis mounted.

The semiconductor complement of the exciter is given in table 1-2.

1-3. TECHNICAL SPECIFICATIONS

Frequency range — 2 to 32 MHz divided into five bands using the following TTRT modules:

Band 1: 2 to 4 MHz, TTRT-1()
Band 2: 4 to 8 MHz, TTRT-2()
Band 3: 8 to 16 MHz, TTRT-3()
Band 4: 16 to 24 MHz, TTRT-4(A)()
Band 5: 24 to 32 MHz, TTRT-4(B)()

Tuning system	The TTRT module is fixed tuned to a particular frequency within its band. Other pre-aligned TTRT modules must be used for other frequencies.
Frequency control	Crystal controlled oscillators are used throughout the exciter. For operating crystal frequency determination, see TTRT manual
Types of signals transmitted	AME, CW, FAX, FSK, MCW,and SSB.
Audio bandwidth	2.75 kHz ±2dB between 300 and 3000 Hz.
IF frequency	Single conversion to 1.75 MHz on all bands.
Signal-to-distortion ratio	Distortion products are down a minimum of 35 dB from full PEP output.
Unwanted sideband rejection	60 dB minimum at full PEP output.
Spurious signal level	Down a minimum of 50 dB at full PEP output.
Noise level	Down a minimum of 40 dB at full PEP output.
Carrier suppression	Automatically preset at -50dB, -20dB, or -6dB from sideband envelope power depending upon operating mode selected as follows: CW and SSB: -50dB. -20dB Carrier: -20dB. AME and MCW: - 6dB.
Output impedance	50 ohms (nominal) unbalanced.
Output power	100 milliwatts minimum PEP.
Primary power input	104, 115, 208, or 230V ±10%, 50/60 Hz, single phase, 14 watts.
Temperature range	0°C (32°F) to 50°C (122°F).

Dimensions	Depth: 15 inches
	Width: 19 inches
	Height: 1¾ inches
Weight, uncrated	10 pounds.

TABLE 1-2. SEMICONDUCTOR COMPLEMENT

Reference Designation	Type	Function
		POWER SUPPLY BOARD, A10545-6
CR910, 911, 913, 914, 916, 917	IN547	Rectifiers
CR912, CR915	IN3022B	Voltage references
CR918	IN3030B	Voltage reference
		MAIN CHASSIS
Q1501	2N350A	+12V series regulator
Q1502	2N350A	-12V series regulator
Q1503	2N3616	+28V series regulator
		PREAMPLIFIER AND CW OSCILLATOR BOARD
CR1901	IN758A	Voltage regulator
CR1902	1N34A	Bias
Q1901	MPF104	CW oscillator
Q1902	MPF104	Preamplifier
Q1903	2N3904	Buffer amplifier
		TRANSMITTER AF BOARD, A10540
CR1701, CR1702	IN34A	Anti-vox detector
CR1703, CR1704	IN34A	Vox detector
CR1705	IN34A	Relay suppressor

TABLE 1-2. (cont'd.)

Reference Designation	Type	Function
Q1701	2N1308	Anti-vox amplifier
Q1702	2N1370	Audio amplifier
Q1703	2N1370	Line amplifier
Q1704	2N1370	Emitter follower
Q1705	2N1370	Vox amplifier
Q1706	2N1308	DC amplifier
Q1707	2N1370	DC amplifier
Q1708	2N2001	Relay driver
		TRANSMITTER IF BOARD, A10603
CR1801, 1802, 1803, 1804	IN34A	Balanced modulator
CR1805, 1806, 1807, 1808	IN34A	Balanced modulator
Q1801	2N3904	1st IF amplifier
Q1802	2N3904	2nd IF amplifier
Q1803	2N3904	ALDC amplifier
Q1804	MPF104	Buffer amplifier
Q1805, Q1806	MPF104	RF switches
Q1807	MPF104	Carrier switch
Q1808	MPF104	Notch switch

SECTION 2

INSTALLATION

2-1. UNPACKING AND HANDLING.

The STE-5 is shipped from the factory in a packing case to ensure maximum protection from damage in transit. The inside of the packing case contains additional packing material to protect the unit not only from breakage due to shock, but also from the elements. The equipment supplied with the STE-5 (table 1-1) is packed in the box as loose items.

As soon as the exciter is unpacked, it should be visually inspected to make sure that it is not damaged. This examination should include the testing of each front panel control. The cover of the unit should be removed, and the inside of the unit checked carefully for damaged components and loose items.

With respect to damage to the equipment for which the carrier is liable TMC (Canada) Limited will assist in describing methods of repair and furnishing of replacement parts.

2-2. POWER REQUIREMENT.

The STE-5 can operate with 104 volts, 115 volts, 208 volts or 230 volts ac power, and is normally set for operation with 115 Vac ±10%. If the exciter is to operate from a power source other than 115 Vac, the wiring of the power transformer T1501 must be modified. Figure 2-1 illustrates the wiring of T1501 for each of the four input power possibilities. It is recommended that a 0.25 ampere fuse be used with 104 or 115 volts and a 0.125 ampere fuse be used with 208 or 230 volts.

NOTE

When any change is made to wiring on power transformer T1501, ensure that the oven remains connected to pins 2 and 4 on T1501.

2-3. MECHANICAL INSTALLATION.

Before installing the STE-5, consideration must be given to its location. The exciter should not be mounted directly adjacent to any unit that dissipates great amounts of heat. Since the STE-5 is completely solid state, internally generated heat is not a problem, and several of the units may be mounted in a stack. The STE-5 should be mounted so as to allow sufficient room to withdraw the TTRT plug-in module for frequency change purposes. If the audio compression feature is to be used intermittently, the LINE/HANDSET switch on the rear apron must be accessible to the operator.

Place the STE-5 in the desired location in the rack, then fasten the front panel to the rack with four screws. The rear of the exciter must be suitably supported to prevent excessive strain on the front panel. If the STE-5 is located in a vehicle or ship where it is subject to vibration, the rear of the unit should be rigidly supported to prevent possible damage due to vibration and vertical movement.

2-4. ELECTRICAL INSTALLATION. (Refer to figure 2-2.)

a. POWER INPUT.–Connect the power cord to the ac power source receptacle.

b. PUSH-TO-TALK.–Connect a push-to-talk switching device between ground and terminal 8 of TB1501.

c. AUDIO INPUT (600-OHM LINE).–Terminals 1 and 3 of terminal board TB1501 are provided for the connection of a 600-ohm input line. If the 600-ohm line is balanced, terminal 2 of TB1501 should be grounded.

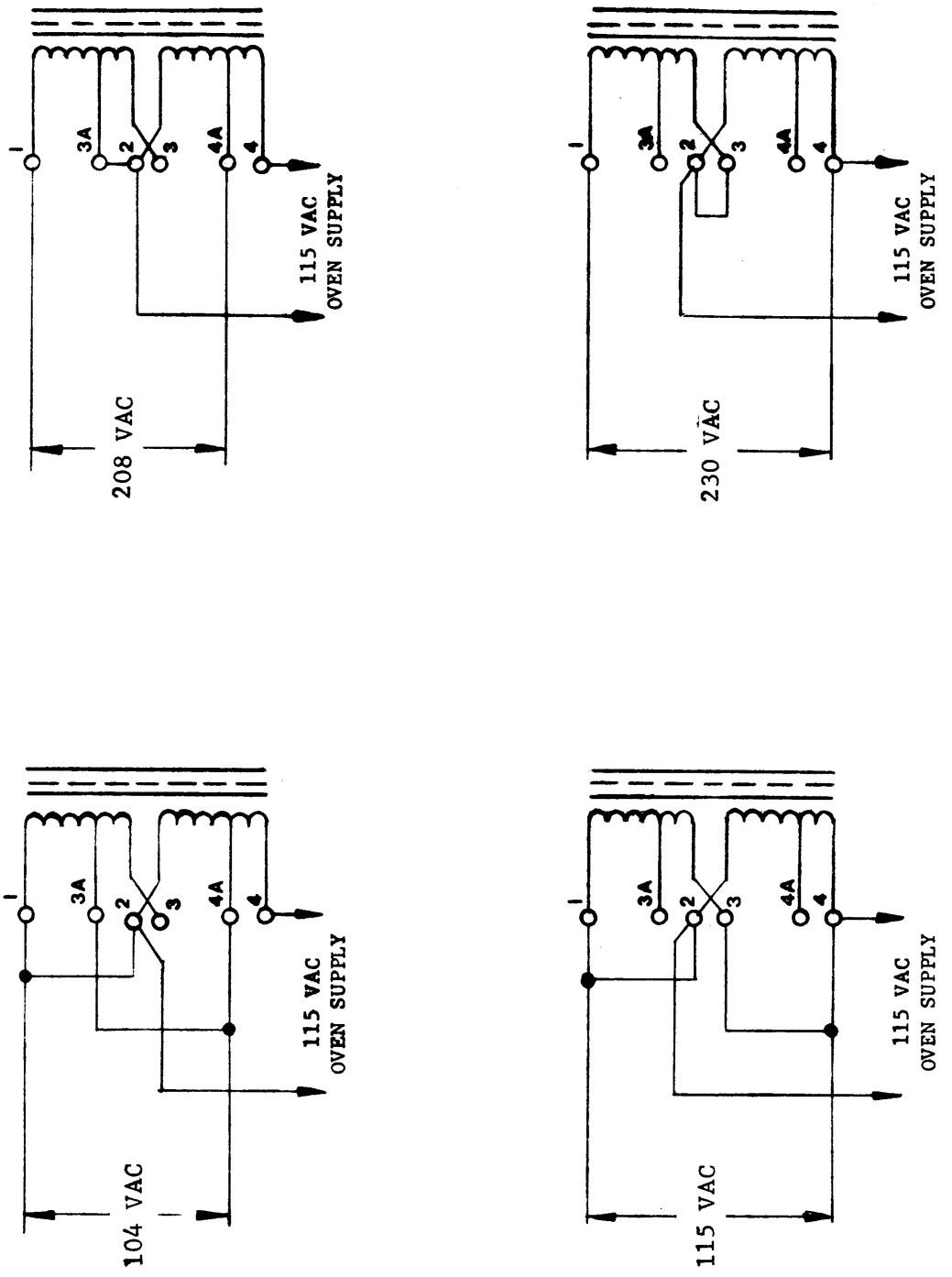


Figure 2-1. Power Transformer Wiring

d. MICROPHONE INPUTS.–Pins 4, 5, and 6 of HANDSET jack J1504 are provided for carbon microphone, low impedance microphone and high impedance microphone inputs respectively. Connect the microphone between ground and the appropriate pin.

e. KEY LINE.–Terminal 10 of terminal board TB1501 is provided for connection of a keying signal for CW and MCW transmission.

f. ANTI-VOX INPUT.–Connect the receiver audio output (unbalanced) to terminal 11 on TB1501. This audio signal is necessary for the operation of the anti-vox circuit. For earphone monitoring of the audio output, connect to pin 3 of J1504.

g. RF OUTPUT.–Connect the RF OUT jack J1502 to the transmitter input.

NOTE

If the linear amplifier portion of the transmitter with which the STE-5 is used does not have an RF gain control, a variable RF attenuator should be connected between the STE-5 and the linear amplifier.

h. ALDC INPUT.–Terminal 9 of TB1501 is provided for connection of an ALDC (automatic loading and drive circuit) signal when available.

i. OVEN SUPPLY.–Terminal 4 of TB1501 is provided for connection of a 12 V dc signal to the crystal oven on the transmitter IF board.

2-5. PERFORMANCE CHECK.

Immediately after the exciter has been installed it should be checked for proper operation as follows:–

NOTE

The RF output cable should be disconnected during the performance check, and a dummy load used (47 ohm, ½ watt resistor).

a. Select the AME, 20DB, or SSB mode, and check the operation for all of the possible audio inputs. An oscilloscope connected across the dummy load can be used to indicate that the signal is present at the exciter output. Check the AF GAIN control for proper operation as indicated by a variation in the magnitude of the oscilloscope waveform.

b. Using any one of the audio inputs, repeat step a for each of the two modes not selected in step a.

c. Repeat step a for both upper and lower sideband operation, when a model STE-5U/L is being tested.

d. Repeat step a using an external key for both CW and MCW modes.

e. Check the VOX circuit as follows:

(1) Set the VOX/PTT switch at VOX.

(2) Turn the VOX GAIN control fully counterclockwise.

(3) Turn the ANTI-VOX control fully counterclockwise.

(4) Select the AME, 20DB, or SSB mode.

(5) Apply the normal audio input to the exciter: AF GAIN control must be adjusted for normal operation.

(6) Rotate the VOX GAIN control slowly clockwise. A point should be reached where a click will be heard, which is the transmit/receive relay energizing.

NOTE

Be sure to set the VOX GAIN and ANTI-VOX controls according to the applicable operating procedure given in section 3 before using the STE-5 for transmitting.

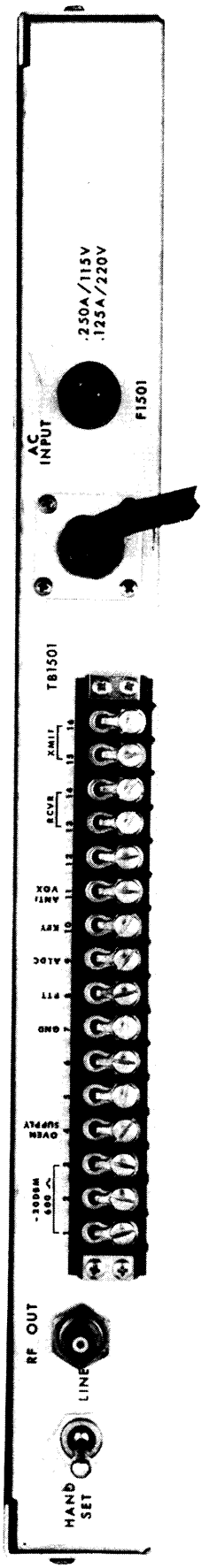


Figure 2-2. Rear Panel, STE-5

SECTION 3

OPERATOR'S SECTION

3-1. CONTROLS AND INDICATORS.

Before attempting to operate the STE-5, the operator should become familiar with the controls and indicators listed in table 3-1 and shown in figure 1-1. The type and purpose of each control is described in the table. It is important to stress that these descriptions are not operating instructions; for specific operating instructions see paragraph 3-2.

NOTE

The operating instructions for the TTRT modules are included in this section as part of the overall operating procedure for the exciter.

3-2. OPERATING PROCEDURES.

a. GENERAL.—A general operating procedure is given below to aid the operator in the correct use of the controls. The controls should be set in the sequence given.

b. SETTING THE CONTROLS.

(1) Set the AF GAIN control at OFF.

NOTE

If the TTRT module cannot provide the desired carrier frequency, and a spare TTRT module must be used, refer to paragraph 3-3 for the module changing procedures.

(2) With the mode switch, select the desired mode of transmission: CW, SSB, 20DB, AME or MCW.

(3) With the LSB/USB switch, select the desired sideband. (Refer to paragraph 1-1).

(4) Set the VOX/PTT switch at PTT.

(5) Energize the exciter by rotating the AF GAIN control clockwise from OFF.

(6) Close the push-to-talk switch. If the microphone or other audio source does not have a push-to-talk switch, ground terminal 8 of TB1501.

(7) Adjust AF GAIN control for desired output level.

(8) If VOX operation is desired, set VOX/PTT switch at VOX, continue to supply audio signal, and rotate VOX GAIN control until the keying relay closes.

NOTE

If the microphone is located near the loudspeaker of the associated receiver, sound from the speaker may actuate the VOX circuit. If this is the case, rotate the ANTI-VOX control until the keying relay is deenergized without an audio signal being applied.

3-3. CHANGING TTRT MODULES.

a. Rotate the AF GAIN control fully counterclockwise.

b. Slide catches located on each end of module upward to release module.

c. Pull module out of exciter. A knob is provided in the center of the module for this purpose.

d. Insert the new module with its frequency identification plate facing the mode switch.

e. Slide catches located on each end of module downward to lock module in place.

TABLE 3-1. OPERATOR'S CONTROLS AND INDICATORS

Designation	Function
POWER lamp (DS1501)	Lights when primary power is connected to the power supply.
AF GAIN/OFF rheostat switch (R1503, S1505)	Clockwise rotation connects the power supply to the primary power and increases the gain of the audio amplifier; full counter-clockwise rotation disconnects the primary power.
LSB/USB switch (S1502)	Selects either upper sideband or lower sideband operation.
CW/SSB/20DB/AME/MCW switch (S1503)	Selects mode of operation: 1. CW (A1) 2. SSB (single sideband, suppressed carrier). 3. 20DB (single sideband, reduced carrier). 4. AME (single sideband, full carrier). 5. MCW (A2)
VOX GAIN control (R1501)	Selects level of the audio input signal required to key the exciter when VOX/PTT switch is set at VOX.
VOX/PTT switch (S1501)	When set at VOX, enables the exciter to be keyed by input audio signals; when set at PTT, enables push-to-talk switch to key exciter.
ANTI-VOX control (R1502)	Selects level of receiver audio output signal required to cancel action of VOX circuit.
HANDSET jack (J1504)	Permits connection of handset to the exciter.
HANDSET/LINE switch (S1504 on rear of unit)	When set at HANDSET, enables compression circuit of audio amplifier; when set at LINE, disables compression circuit.

SECTION 4

PRINCIPLES OF OPERATION

4-1. GENERAL.

This section explains the principles of operation of the Sideband Strip Exciter STE-5. The TTRT module is discussed only to the extent necessary to describe its operation in the STE-5.

4-2. THEORY. (See figures 4-1 and 7-1).

a. INPUT CIRCUITS.–The audio signal for the STE-5 may be provided from any one of the following sources: carbon microphone, low-impedance microphone, high-impedance microphone, 600-ohm line, or an internal CW oscillator. Any one of the microphones can be wired into handset J1504.

The carbon microphone and 600-ohm line inputs are connected directly to the audio stage. The low-impedance and high-impedance microphone inputs are connected to the preamplifier and CW oscillator board whose output feeds the audio stage. The audio tone for CW and MCW is supplied by Q1901 on the board (energized by +12V) provided the external keying signal on terminal 11 of TB1501 is present.

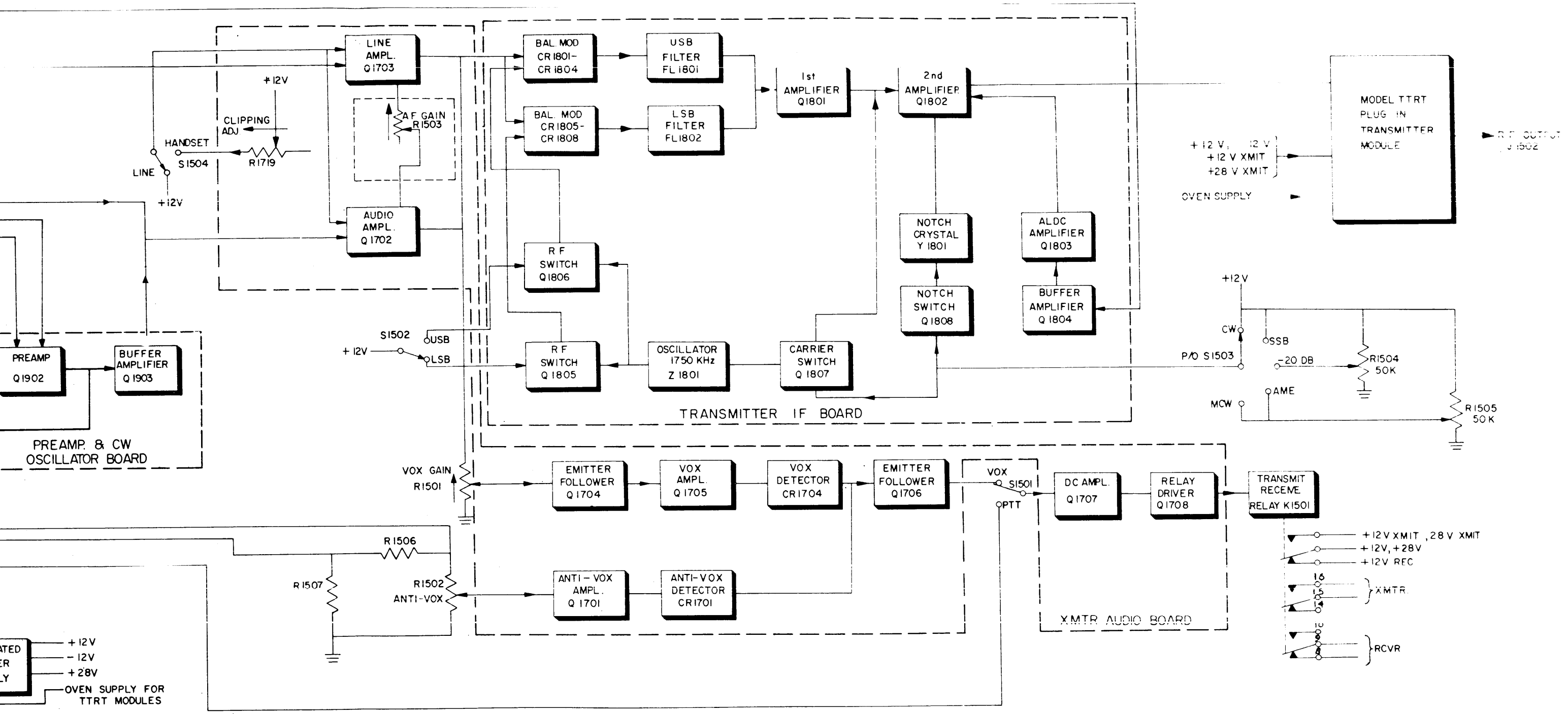
b. AUDIO STAGE.–The 600-ohm line input is amplified by line amplifier Q1703 and supplied as an audio output to the transmitter IF board and to VOX GAIN control R1501.

The carbon microphone input or audio signal from the preamplifier and CW oscillator board provides the input to audio amplifier Q1702. The audio output from this amplifier is supplied to the transmitter IF board and VOX GAIN control.

The XMTR AF GAIN control R1503 sets the gain of both the line amplifier and the audio amplifier. HANDSET/LINE SWITCH S1504 permits the insertion of a compression circuit, described below, that prevents abnormally high inputs from overmodulating the exciter. By flattening the sharp peaks of the input signal, the compression circuit permits an increase in the average sideband power generated. The output of the amplifier is supplied to the modulator and to the vox stages.

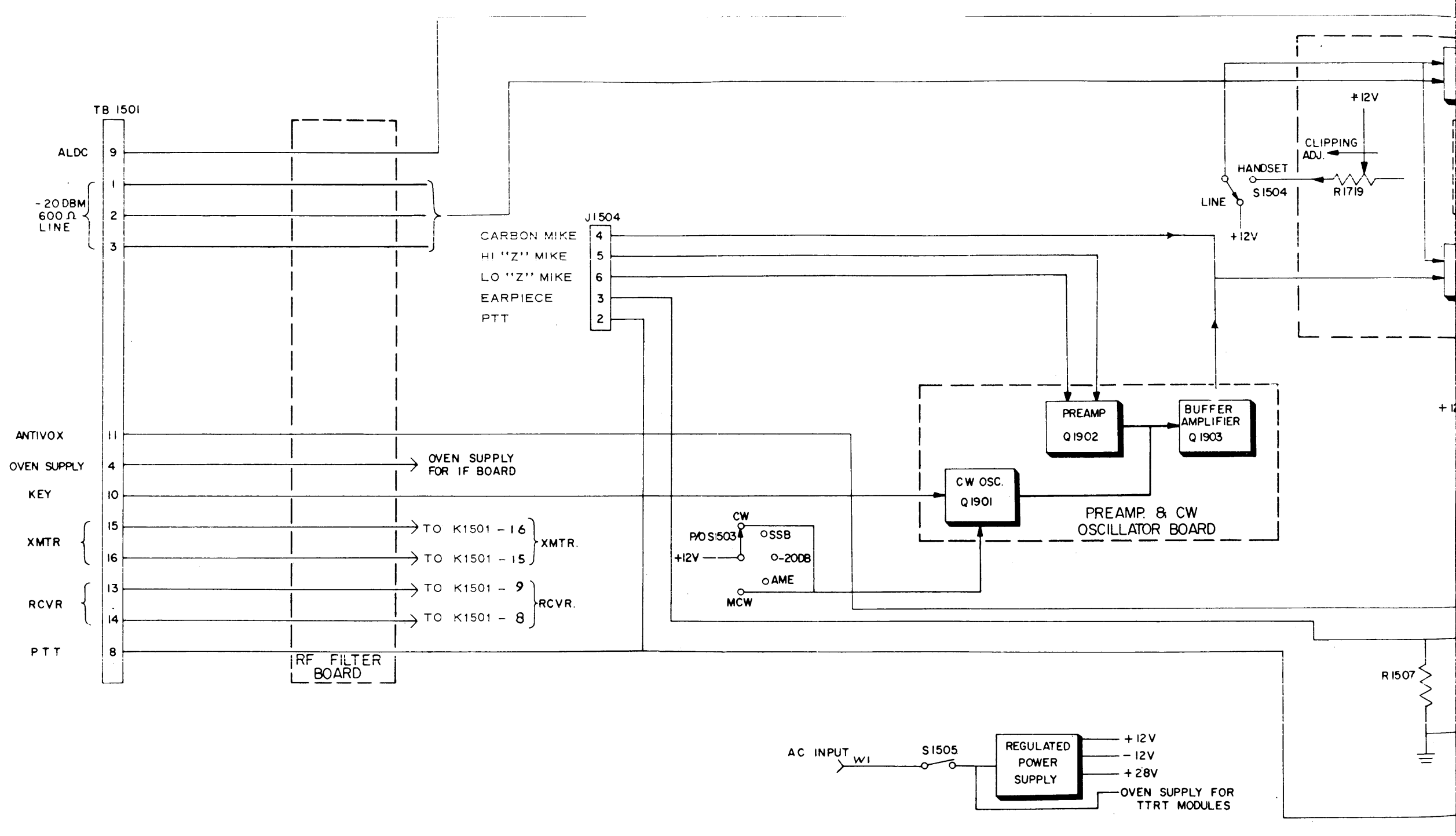
With S1504 set at LINE, +12V dc is supplied directly to the emitter resistors of both transistors Q1702 and Q1703. The emitter resistors establish an operating point for each transistor that is in the center of the transfer curve for each transistor. Thus, if the input signal does not overdrive the stage, the amplification of the stage is linear. With S1504 set at HANDSET, +12V dc is supplied through the CLIPPING ADJ control R1719 to the emitter resistors of both transistors. The additional resistance shifts each operating point down the transfer curve towards the cutoff region. The amount that the operating point is shifted is determined by the clipping adjustment. The operating point is selected so that abnormally high input amplitudes and voice peaks drive the transistors into the non-linear amplification region. As a result, these signals are compressed.

c. VOX AND ANTI-VOX STAGES.–The vox stages permit voice-controlled operation of the STE-5 by energizing the exciter output stages when an audio input is present. The anti-vox stages prevent a nearby receiver from keying



BLOCK DIAGRAM, SIDEBAND STRIP EXCITER, STE-5

FIGURE 4-1.


TB 1501
ALDC
9
-20 DBM 600 Ω LINE
1
2
3
ANTIVOX
11
OVEN SUPPLY
4
KEY
10
XMTR
15
16
RCVR
13
14
PTT
8
OVEN SUPPLY FOR IF BOARD
TO K1501 - 16
TO K1501 - 15
XMTR.
TO K1501 - 9
TO K1501 - 8
RCVR.
RF FILTER BOARD
J1504
CARBON MIKE
4
HI "Z" MIKE
5
LO "Z" MIKE
6
EARPIECE
3
PTT
2
+12V
CLIPPING ADJ.
HANDSET
LINE
S1504
R1719
+12V
PREAMP Q1902
BUFFER AMPLIFIER Q1903
CW OSC. Q1901
PREAMP. & CW OSCILLATOR BOARD
CW
P/O S1503
SSB
+12V
-200B
AME
MCW
R1507
AC INPUT
W1
S1505
REGULATED POWER SUPPLY
+12V
-12V
+28V
OVEN SUPPLY FOR TTRT MODULES

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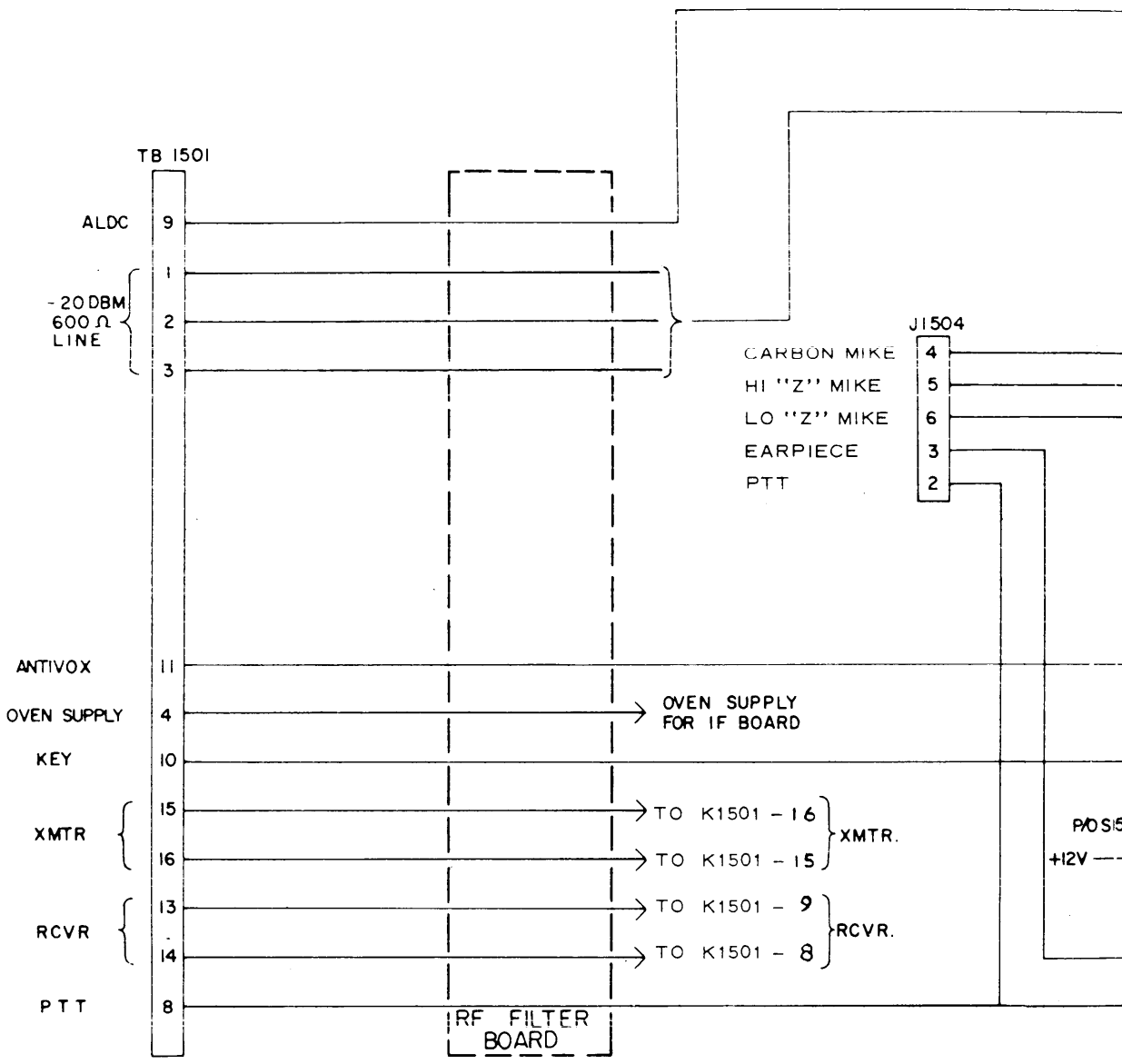

TB 1501
ALDC
9
-20 DBM 600Ω LINE
1
2
3
J1504
CARBON MIKE
4
HI "Z" MIKE
5
LO "Z" MIKE
6
EARPIECE
3
PTT
2
ANTIVOX
11
OVEN SUPPLY
4
OVEN SUPPLY FOR IF BOARD
KEY
10
XMTR
15
16
TO K1501 - 16
TO K1501 - 15
XMTR.
RCVR
13
14
TO K1501 - 9
TO K1501 - 8
RCVR.
PTT
8
RF FILTER BOARD
+12V

the exciter if the output of the receiver is picked up by a microphone connected to the exciter.

The output of the audio stage is supplied to vox detector CR1704 through VOX GAIN control R1501, emitter follower Q1704, and vox amplifier Q1705. The vox detector produces a positive dc voltage that is proportional to the magnitude of the audio signal. In the CW and MCW modes, the CW oscillator produces the audio signal. When a microphone is used, however, the dc voltage can be produced either by the signal intended for transmission or by the output of a nearby receiver that is unintentionally picked up by that microphone.

To prevent the output of a nearby receiver from keying the exciter, the output of the receiver is supplied to the STE-5 on pin 11 of terminal board TB1501. This signal is supplied to the anti-vox detector CR1701 through ANTI-VOX control R1502, and anti-vox amplifier Q1701. The anti-vox detector produces a negative voltage that is proportional to the magnitude of the anti-vox signal.

The output of the vox and anti-vox detectors are added algebraically at the input of the emitter follower Q1706. When the vox detector produces an output (positive) with no anti-vox present, the output of the emitter follower is positive. When, however, the vox signal results from pick-up from an associated receiver, and a negative anti-vox voltage is present, the algebraic sum of the two results in a slightly negative output from the emitter follower. Thus, the anti-vox voltage cancels any vox voltage produced by pickup from a nearby receiver. With the VOX GAIN and ANTI-VOX controls properly set, the output of the emitter follower is positive when (and only when) an intentional vox signal is produced by speaking into the microphone.

When VOX/PTT switch S1501 is set at VOX, the output of the emitter follower is supplied through dc amplifier Q1707 to relay driver Q1708, which controls transmit/receive relay K1501. When the output of the emitter follower is negative, K1501 is de-energized, and the IF and RF stages of the exciter have no supply voltages. When the output of the emitter follower goes positive, K1501 is energized, the -12V dc XMIT, +12V dc XMIT, and +28V dc XMIT supply voltages are connected to the IF and RF stages of the exciter. Additional contacts of K1501 provide an indication to the associated transmitter and receiver that the STE-5 is operating.

In operation, the VOX GAIN control is adjusted so that a normal voice into a microphone connected to the STE-5 or the output of the CW oscillator is sufficient to energize the transmit/receive relay. The ANTI-VOX control is then adjusted to prevent the output of a nearby receiver from energizing the relay.

With S1501 set at PTT, the transmit/receive relay is controlled by the PTT (push-to-talk) input from either TB1501 or J1504. The relay is energized when the PTT input is grounded, and is de-energized when the PTT input is an open circuit.

d. MODULATOR STAGES.–The two balanced modulators on the transmitter IF board (CR1801 – CR1804 and CR1805 – CR1808) receive the audio signal from the transmitter audio board. In addition, oscillator Z1801 provides a 1750 kHz signal to one of the modulators, as determined by switches Q1805 and Q1806. (The oscillator also provides a carrier output that can be inserted into 2nd amplifier Q1802.) The output from the modulators is an audio modulated IF signal that contains both upper and lower sidebands. The output from modulator CR1801 – CR1804 is supplied to filter FL1801 which allows only the upper sideband of the signal to pass. The output from modulator CR1805 – CR1808 is supplied to filter FL1802 which allows only the lower sideband of the signal to pass. Filters FL1801 and FL1802 are highly selective filters; the bandpass for FL1801 is 1750.3 to 1753.0 kHz, and the bandpass for FL1802 is 1747.0 to 1749.7 kHz.

NOTE

The sideband generated by the IF board is opposite to the sideband required for transmission as a reversal takes place in the TTRT module. Hence for upper sideband operation the IF board generates a lower sideband signal, and vice versa.

The STE-5U is provided with filter FL1802 only (for USB operation), STE-5L with filter FL1801 only (for LSB operation) and STE-5U/L with both. The following discussion is for the STE-5U/L.

Semiconductor switches Q1805 and Q1806 select the desired sideband by determining which balanced modulator will receive the 1750 KHz oscillator signal. These switches are in turn controlled by mode switch S1502. When S1502 is in the LSB position, +12V dc is supplied to switch Q1805, cutting off the transistor and therefore the input to modulator CR1805-CR1808. The switch Q1806, however, conducts and allows the 1750 KHz signal to be applied to CR1801-CR1804. Filter FL1801 passes only the upper sideband of the output from modulator CR1801-CR1804. This upper sideband signal from the IF board is inverted in the TTRT module, thus providing a lower sideband signal for transmission as required.

When S1502 is in the USB position +12V dc is supplied to switch Q1806, cutting off the transistor and 1750KHz signal from being supplied to modulator CR1801-CR1804. However, switch Q1805 conducts, and allows the oscillator signal to be applied to modulator CR1805-CR1808. Filter FL1802 passes only the lower sideband of the output of this modulator, hence an upper sideband signal will be transmitted, due to inversion in the TTRT module.

e. AMPLIFIER STAGES.–The USB or LSB IF signal from filter FL1801 or FL1802 is amplified by Q1801 and Q1802 and the output is supplied to the selected TTRT module.

In the AME, MCW and 20DB modes, a carrier signal is inserted at the second amplifier Q1802. The insertion of the carrier is controlled by switch S1503.

When S1503 is in the CW or SSB position the carrier control signal is +12V dc. When the +12V dc signal is applied to carrier switch Q1807, the switch cuts off the carrier signal provided by oscillator Z1801 so that no carrier is inserted at amplifier Q1802.

When S1503 is in the AME or MCW position, the carrier control signal is 0 volts. When the 0 volt signal is applied to switch Q1807, the switch allows the carrier signal from Z1801 to be applied to Q1802.

When S1503 is in the 20DB position, the carrier control signal is set to such a voltage that the carrier inserted at Q1802 is 20dB down from the IF signal.

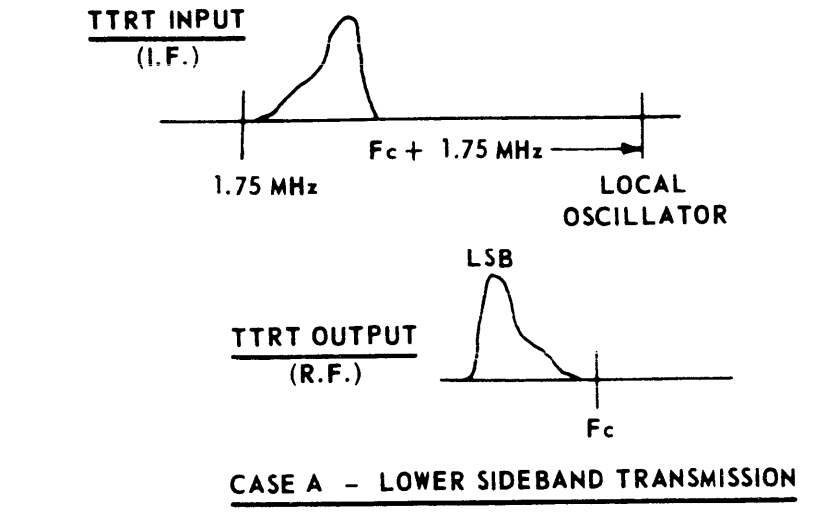
Crystal Y1801 is a notch device used to remove any undesirable carrier signal present at the output of amplifier Q1802. So that the carrier will not be removed by Y1801 when it is required at the output, notch switch Q1808 disables the notch device when the carrier control signal is 0 volts, and the carrier is applied to the output. When the carrier control signal is +12 volts, the notch switch is in the "off" condition and does not affect the operation of Y1801. This notch device is factory adjusted and is non-repairable in the field.

f. ALDC CIRCUIT.–The automatic loading and drive circuit (ALDC) input is supplied to the output of amplifier Q1802, through buffer amplifier Q1804 and ALDC amplifier Q1803. The ALDC signal is provided to reduce the IF output resulting from high level signals, to prevent overloading the linear amplifier. It is a delayed signal, derived from a portion of the output of the transmitter antenna.

g. TTRT PLUG-IN MODULE.–The IF signal from the transmitter IF board is supplied to the TTRT module. The TTRT module is fixed tuned to a pre-selected frequency, and contains a local oscillator, a balanced mixer, and three RF amplifiers. Figure 4-2 shows the input and output of the TTRT module. In each case, the mixer injection signal in the module is tuned 1.75 MHz above the desired transmission frequency. Thus the frequency spectrum of the IF signal is inverted as shown in the illustration. The bandpass of the RF amplifiers in the TTRT module is sufficient to pass either the upper or lower sideband.

The output of the TTRT module is supplied to RF OUTPUT jack J1502.

h. POWER SUPPLY.–The power supply produces regulated +12V dc, -12V dc and +28V dc for the operation of the STE-5. The power supply is energized by power switch S1505, which is ganged to the AF GAIN control.



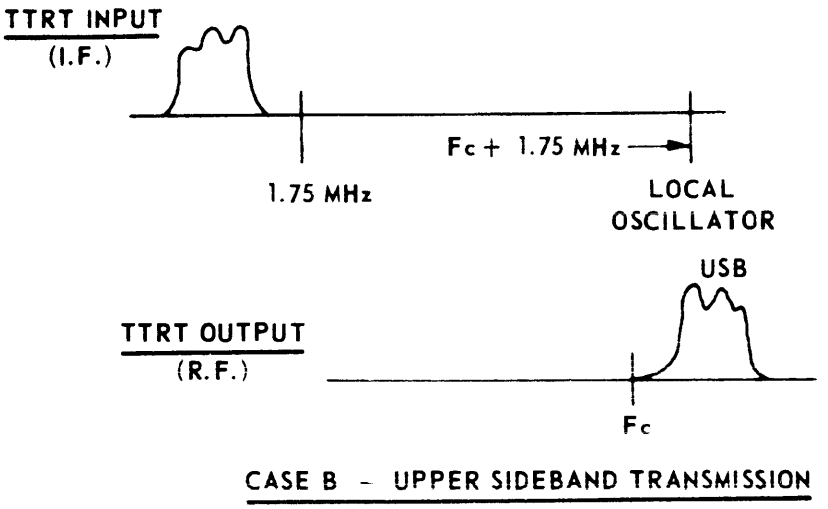


Figure 4-2. Frequency Inversion in SSB Transmission

SECTION 5

MAINTENANCE

5-1. PREVENTIVE MAINTENANCE.

Preventive maintenance of the STE-5 consists of routine inspection and cleaning. Cleaning is necessary because dust may accumulate on certain components and not only reduce efficiency of the exciter, but also increase component wear. Either a vacuum cleaner or a compressed air hose is the quickest and most effective method of cleaning the unit.

Visually checking the unit when it is opened for cleaning can prevent down-time due to component failure. Often a deteriorating component will look bad before it actually affects the operation of the unit. Some indications of trouble are: discoloured components, leaking transformers and capacitors, dirty or pitted switch and relay contacts, warping printed circuit boards, and damaged wiring. Any components found in this condition should be replaced. In addition, all hardware should be checked for tightness.

5-2. TROUBLESHOOTING.

Troubleshooting procedures are described for model STE-5U/L. For models STE-5U and STE-5L, operation is checked only in the appropriate sideband.

Refer to figure 5-2 to locate components in the STE-5.

a. QUICK TEST USING FRONT-PANEL CONTROLS.

(1) SIDEBAND TEST–Try to transmit with the USB/LSB switch set alternately in both of its positions. If transmission is not possible on one sideband the opposite sideband circuit on the transmitter IF board is defective.

(2) VOX/PTT TEST–Set VOX/PTT switch to PTT. Close the push-to-talk switch on the microphone. The exciter should key as evidenced by a click as relay K1501 actuates. If the exciter does not key, the transmit/receive relay or relay driver is defective. Set the VOX/PTT switch to VOX; rotate the VOX GAIN control fully clockwise. Speak into the microphone. The exciter should key as the AF GAIN control is rotated clockwise. If the exciter does not key, the VOX amplifier or detector is defective.

(3) CW/VOICE TEST–Alternately try to operate the exciter in the CW and SSB modes. If the exciter operates in the CW mode only, the microphone pre-amplifier is probably defective. If the exciter operates in the SSB mode only, the CW oscillator is probably defective.

b. SYSTEMATIC TROUBLESHOOTING.

(1) Disconnect all external wiring from TB1501.

(2) Connect a 47 ohm resistor across the RF output jack.

(3) Connect an audio signal generator to terminals 1 and 3 of TB1501. Adjust the generator to deliver 78 mV at 1 kHz. Measure the AF signal across pins 1 and 2 on the AF board. The level should be approximately 10 mV. If this signal is not obtained check audio amplifier Q1702/Q1703.

(4) Connect the audio generator between pin 3 and ground on the audio preamplifier and CW oscillator board. Adjust the generator to deliver 8 mV at 1 kHz. Repeat the measurement as in (3) above. If this signal is not obtained, check Q1902 and Q1903 on the preamplifier board and Q1702/Q1703 on the audio board.

(5) Switch the mode selector switch to CW and connect a jumper between terminal 10 of TB1501 and ground. Repeat the measurement as in (3) above. If this signal is not obtained, check Q1901.

(6) Jumper pin 8 of TB1501 to ground. Measure the RF output of Z1801 at the junction of R1829 and R1830. The level should be 0.9 V RMS or better.

(7) Connect an oscilloscope to pin 13 of the IF board. With the mode switch in SSB and no audio input check for the presence of 1.75 MHz carrier. There should be no carrier visible on the scope. Switch the mode switch to -20dB Approximately 20 mV peak-to-peak carrier should appear. Switch the mode switch to AME and then MCW. Approximately 200 mV peak-to-peak carrier should appear. If any of the above voltages are not obtained, check Q1801 and associated circuitry.

(8) Connect the audio generator and adjust the level as in (3) above. With the mode switch in SSB and the sideband switch in USB measure the IF level at pin 13 of the IF board. The level should be 400 mV peak-to-peak. (Adjust AUDIO GAIN as necessary). If this signal is not obtained, check CR1805 through CR1808, Q1805, Q1807 and Q1802.

(9) Repeat (7) above with the sideband switch in LSB. If the signal is not obtained, check CR1801 through CR1804, Q1806, Q1807 and Q1802.

5-3. REPAIR.

In most cases, the repair of the STE-5 will consist of the replacement of an electrical component. Although no special instruction is required to accomplish this, the following points are provided to ensure that the repairs are completed properly.

a. Always replace a defective component with its exact duplicate.

b. Always place a new component in the same position as the one it replaces. In general, never change the existing chassis layout, whether in the routing of wiring or component placement.

c. Never use a soldering iron with a power rating of more than 100 watts. Use a pair of long-nose pliers as a heat sink to protect components while soldering.

d. Be extremely careful when replacing components of printed circuit boards. Excessive heat applied to a board might cause the printed wiring to lift off.

e. Always double check any solder joints made. Cold or loose solder connections can cause trouble at a later time.

5-4. ALIGNMENT.

Alignment procedures are described for model STE-5U/L. For models STE-5U and STE-5L, alignment is required for operation in the appropriate sideband only.

a. Disconnect all external wiring from TB1501.

b. Connect one end of a jumper wire to terminal 8 of TB1501, and one end of a second jumper to terminal 10 of TB1501.

c. Connect an AF signal generator to terminals 1 and 3 of TB1501; adjust the generator output to deliver 78 mV at 1 kHz.

d. Set the power switch on the AF GAIN control ON; set the mode switch at SSB.

e. Connect the jumpers attached to pins 8 and 10 (step 6) to ground.

f. Rotate the AF GAIN control fully clockwise. Connect an oscilloscope to pins 1 and 2 on the transmitter audio board and adjust R1718 to obtain 10 mV RMS between pins 1 and 2.

g. Set the mode switch to CW; adjust R1903 (on the preamplifier and CW oscillator board) to obtain 10 mV RMS between pins 1 and 2 on the audio board.

h. Set the sideband switch to USB; set the AF GAIN control to its maximum clockwise position.

i. Adjust C1810 for maximum output.

j. Set the AF GAIN control to its minimum position; set the mode switch to SSB; connect an oscilloscope to pin 13 of the transmit IF board.

k. With the oscilloscope on its most sensitive range, adjust C1811 for a minimum signal.

l. Disconnect the audio generator; set the mode switch to MCW.

m. Adjust R1814 and C1806 for maximum output and minimum distortion. See figure 5-1.

NOTE

Distortion or jitter along the edge of the waveform is caused by carrier through the improperly balanced bridge. Proper balance will occur with potentiometer R1814 approximately mid-range.

n. Set the sideband switch to LSB and repeat step m using R1813 and C1804. Repeat steps m and n until waveform is stable in both USB and LSB.

o. Readjust C1810 trimming for equal amplitude in USB and LSB.

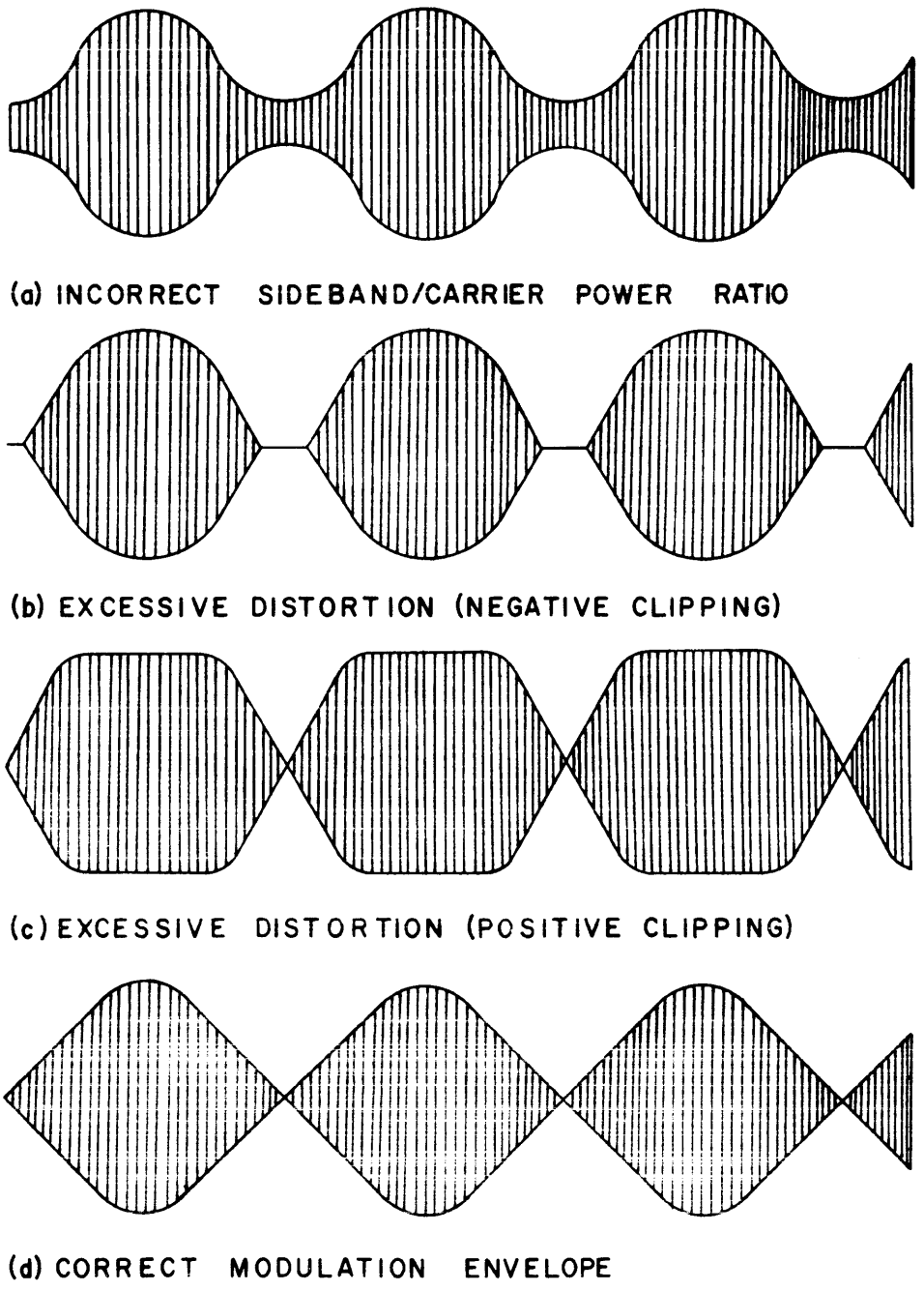


Figure 5-1. Two-tone SSB Modulation Envelopes

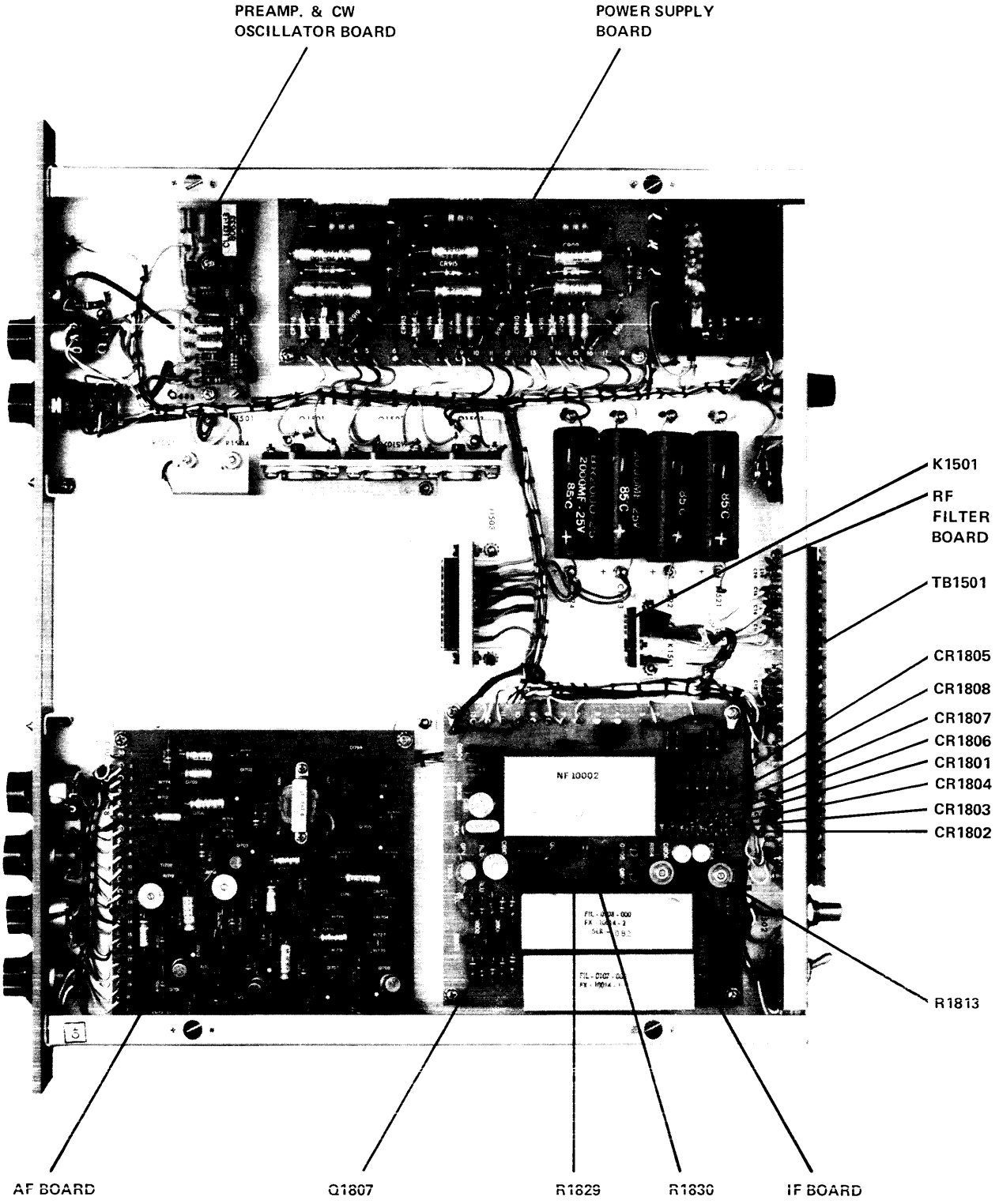


Figure 5-2. STE-5 Top View with Cover Removed

SECTION 6

PARTS LIST

6-1. INTRODUCTION.

Reference designations have been assigned to identify all electrical parts of the equipment. These designations are used for marking the equipment (adjacent to the part they identify) and are included on drawings, diagrams and the parts list. The letters of a reference designation indicate the kind of part (generic group), such as resistor, capacitor, transistor, etc. The number differentiates between parts of the same generic group. Sockets associated with a particular plug-in device, such as transistor or fuse, are identified by a reference designation which includes the reference designation of the plug-in device. For example, the socket for fuse F907 is designated XF907. To expedite delivery, when ordering replacement parts, specify the TMC part number and the model number of the equipment.

POWER SUPPLY BOARD, A10545-7
SYMBOL SERIES 900

Ref Symbol	Description	TMC Part Number
C901 thru C907	NOT USED	
C908	CAPACITOR, FIXED, ELECTROLYTIC: 100 uF, -10%+15% at 120 Hz at 25°C; 25 working V dc; polarized; insulated tubular case.	CE105-100-25
C909	Same as C908	
C910 and C911	NOT USED	
C912	Same as C908	
C913	Same as C908	
C914	NOT USED	
C915	CAPACITOR, FIXED, ELECTROLYTIC: 20 uF, -10%+15% at 120 Hz at 25°C; 100 working V dc; polarized; insulated tubular case.	CE105-20-100
C916	Same as C915	
C917	Same as C915	
C918	CAPACITOR, FIXED, ELECTROLYTIC: 25 uF, -10%+15% at 120 Hz at 25°C; 50 working V dc; polarized; insulated tubular case.	CE105-25-50
CR900 thru CR909	NOT USED	
CR910	SEMICONDUCTOR DEVICE, DIODE	1N547
CR911	Same as CR910	
CR912	SEMICONDUCTOR DEVICE, DIODE	1N3022B
CR913	Same as CR910	
CR914	Same as CR910	
CR915	Same as CR912	

POWER SUPPLY BOARD, A10545-7
SYMBOL SERIES 900

Ref Symbol	Description	TMC Part Number
CR916	Same as CR910	
CR917	Same as CR910	
CR918	SEMICONDUCTOR DEVICE, DIODE	1N3030B
L900 and L901	NOT USED	
L902	COIL, RF: fixed; 1 mH inductance; 23 ohms, ±10% resistance; current rating 75-100 mA max.	CL101-2
L903	Same as L902	
L904	Same as L902	
R900 thru R908	NOT USED	
R909	RESISTOR, FIXED, WIREWOUND: 10 ohms, ±5%; 3 watts	RW123-100J
R910	Same as R909	
R911	RESISTOR, FIXED, COMPOSITION: 100 ohms, ±5%; 1 watt	RC32GF101J
R912	Same as R911	
R913	NOT USED	
R914	Same as R909	
R915	Same as R909	
R916	Same as R911	
R917	Same as R911	
R918	Same as R909	
R919	RESISTOR, FIXED, COMPOSITION: 1 k ohm, ±5%; 1 watt	RC32GF102J
R920	Same as R919	
R921	Same as R919	

MAIN CHASSIS AND RF FILTER BOARD, A10640
SYMBOL SERIES 1500

Ref Symbol	Description	TMC Part Number
C1501 thru C1520	CAPACITOR, FIXED, CERAMIC: 1000 pF, GMV; 2000 working V dc.	CC100-29
C1521 thru C1524	CAPACITOR, FIXED, ELECTROLYTIC: 2000 uF, 25 working V dc.	CE116-5VS
C1525	CAPACITOR, FIXED, ELECTROLYTIC: 2 uF, 15 WV dc.	CE105-2-15
DS1501	LAMP, INCANDESCENT	BI110-7
F1501	FUSE, CARTRIDGE: 1/8 A; slow blow (for 208/230 V ac operation).	FU102-.125
F1501	FUSE, CARTRIDGE: 1/4 A; slow blow (for 115 V ac operation).	FU102-.250
J1501	NOT USED	
J1502	CONNECTOR, RECEPTACLE, ELECTRICAL: female, straight type, series BNC to BNC	JJ172
J1503	CONNECTOR, RECEPTACLE, ELECTRICAL: printed circuit board type; 20 female contacts.	JJ287-20
J1504	CONNECTOR, RECEPTACLE, ELECTRICAL: 6 #20 female contacts; straight type.	JJ212
K1501	RELAY, ARMATURE: 4 PDT	RL156-2
L1501 thru L1510	COIL, RF, FIXED: 150 uH ±10%	CL275-151
Q1501	TRANSISTOR	2N350A
Q1502	Same as Q1501	
Q1503	TRANSISTOR	2N3616
R1501	RESISTOR, VARIABLE, COMPOSITION: 10 K ohms ±10%; 2 watts.	RV4NAYSA 103AYY
R1502	RESISTOR, VARIABLE, COMPOSITION: 500 ohms ±10%; 2 watt	RV4NAYSA 501AYY

MAIN CHASSIS AND RF FILTER BOARD, A10640
SYMBOL SERIES 1500

Ref Symbol	Description	TMC Part Number
R1503	RESISTOR, VARIABLE, COMPOSITION: 5 K ohms ±10%; 2 watts; includes an SPST normally open switch (S1505)	RV4NBYSA 502AYY
R1504	RESISTOR, VARIABLE, COMPOSITION: 50 K ohms ±20%	RV106UX8B 503B
R1505	Same as R1504	
R1506	RESISTOR, FIXED, COMPOSITION: 3900 ohms ±5%; ½ watt	RC20GF392J
R1507	RESISTOR, FIXED, COMPOSITION: 10 K ohms ±5%; ½ watt	RC20GF103J
R1508	RESISTOR, FIXED, COMPOSITION: 100 K ohms ±5%, ¼watt	RC07GF104J
S1501	SWITCH, ROTARY: tap; 1 deck	SW10075
S1502	Same as S1501	
S1503	SWITCH, ROTARY: tap	SW10074
S1504	SWITCH, TOGGLE: SPDT	ST103-11-62
S1505	Refer to R1503	
T1501	TRANSFORMER, POWER, STEP-DOWN	TF298
TB1501	TERMINAL BOARD, BARRIER: 16 terminals	TM100-16
W1	CABLE ASSEMBLY AC POWER	CA10660-1
W1C1	CAPACITOR FIXED CERAMIC: .01 uF, 500 working V dc	CC100-16
W1C2	Same as W1C1	
XDS1501	Light, Ind, Wht	TS153-5

TRANSMITTER AF BOARD, A10540
SYMBOL SERIES 1700

Ref Symbol	Description	TMC Part Number
C1701	CAPACITOR, FIXED, ELECTROLYTIC: 6 uF, -10%+150% at 120 Hz at 25°C; 15 working V dc; polarized.	CE105-6-15
C1702	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 200,000 pF, +80%-20%; 25 working V dc.	CC100-33
C1703	CAPACITOR, FIXED, ELECTROLYTIC: 50 uF, -10%+150% at 120 Hz at 25°C; 15 working V dc; polarized.	CE105-50-15
C1704	Same as C1701.	
C1705	CAPACITOR, FIXED, ELECTROLYTIC: 10 uF, -10%+150% at 120 Hz at 25°C; 15 working V dc; polarized.	CE105-10-15
C1706	Same as C1703.	
C1707	Same as C1705	
C1708	CAPACITOR, FIXED, ELECTROLYTIC: 4 uF, -10%+150% at 120 Hz at 25°C; 15 working V dc; polarized.	CE105-4-15
C1709	Same as C1701	
C1710	Same as C1703	
C1711	Same as C1702	
C1712	CAPACITOR, FIXED, ELECTROLYTIC: 20 uF, -10%+150% at 120 Hz at 25°C; 15 working V dc; polarized.	CE105-20-15
C1729	Same as C1705	
C1761	Same as C1702	
C1764	Same as C1702	
CR1701	SEMICONDUCTOR DEVICE, DIODE	1N34A
CR1702 thru CR1705	Same as CR1701	
Q1701	TRANSISTOR	2N1308
Q1702	TRANSISTOR	2N1370

Ref Symbol	Description	TMC Part Number
Q1703 thru Q1705	Same as Q1702	
Q1706	Same as Q1701	
Q1707	Same as Q1702	
Q1708	TRANSISTOR	2N2001
R1701	RESISTOR, FIXED, COMPOSITION: 22 k ohms, ±5%, ½ watt	RC20GF223J
R1702	RESISTOR, FIXED, COMPOSITION: 10 k ohms, ±5%, ½ watt	RC20GF103J
R1703	NOT USED	
R1704	RESISTOR, FIXED, COMPOSITION: 4.7 k ohms, ±5%, ½ watt	RC20GF472J
R1705	RESISTOR, FIXED, COMPOSITION: 2.2 k ohms, ±5%, ½ watt	RC20GF222J
R1706	Same as R1702.	
R1707	Same as R1705	
R1708	RESISTOR, FIXED, COMPOSITION: 68 k ohms, ±5%, ½ watt	RC20GF683J
R1709	Same as R1702	
R1710	RESISTOR, FIXED, COMPOSITION: 3.3 k ohms, ±5%, ½ watt	RC20GF332J
R1711	Same as R1710	
R1712	RESISTOR, FIXED, COMPOSITION: 220 ohms, ±5%, ½ watt	RC20GF221J
R1713	Same as R1702	
R1714	Same as R1702	
R1715	RESISTOR, FIXED, COMPOSITION: 8.2 k ohms, ±5%, ½ watt	RC20GF822J
R1716	RESISTOR, FIXED, COMPOSITION: 3.9 k ohms, ±5%, ½ watt	RC20GF392J
R1717	RESISTOR, FIXED, COMPOSITION: 1 k ohm, ±5%, ½ watt	RC20GF102J
R1718	RESISTOR, VARIABLE, COMPOSITION: 500 ohms, ±10%; nom. power rating 0.25 watt at 70°C; linear taper.	RV111U501A

TRANSMITTER AF BOARD, A10540
SYMBOL SERIES 1700

Ref Symbol	Description	TMC Part Number
R1719	RESISTOR, VARIABLE, COMPOSITION: 250 k ohms, ±10%; nom. power rating 0.25 watt at 70°C; linear taper.	RV111U254A
R1720	RESISTOR, FIXED, COMPOSITION: 1.5M ohms, ±5%; ½ watt	RC20GF155J
R1721	NOT USED	
R1722	Same as R1702	
R1723	RESISTOR, FIXED, COMPOSITION: 5.6 k ohms, ±5%; ½ watt	RC20GF562J
R1724	Same as R1704	
R1725	Same as R1702	
R1726	Same as R1717	
R1727	Same as R1723	
R1728	RESISTOR, FIXED, COMPOSITION: 100 k ohms, ±5%; ½ watt	RC20GF104J
R1729	RESISTOR, FIXED, COMPOSITION: 150 k ohms, ±4%; ½ watt	RC20GF154J
R1730	Same as R1704	
R1731	Same as R1705	
R1732	Same as R1715	
R1733	Same as R1729	
R1734	RESISTOR, FIXED, COMPOSITION: 33 ohms, ±5%; 1 watt	RC32GF330J
R1735	Same as R1729	
R1774	RESISTOR, FIXED, COMPOSITION: 100 ohms, ±5%; ½ watt	RC20GF101J
T1701	TRANSFORMER, AUDIO FREQUENCY: primary impedance 25 k ohms, CT; dc resistance 1.55 k ohms, ±20%; secondary impedance 1.2 k ohms, CT; dc resistance 88 ohms, ±20%; operating frequency range 200 to 15000 Hz; frequency response ±3 dB at 250 to 3500 Hz.	TF267-4
T1702	TRANSFORMER, AUDIO FREQUENCY: primary impedance 500 ohms, CT; dc resistance 60 ohms; secondary impedance 600 ohms; dc resistance 105 ohms; frequency range 100 Hz to 20 kHz; miniature open frame type, lacquer coated.	TF246-17Z

TRANSMITTER IF BOARD, A-10603
SYMBOL SERIES 1800

Ref Symbol	Description	TMC Part Number
C1801	CAPACITOR, FIXED, CERAMIC: .01 uF, 500 working V dc	CC100-16
C1802	Same as C1801	
C1803	CAPACITOR, FIXED, MICA: 22 pF, ±5%, 500 working V dc	CM111C220J1S
C1804	CAPACITOR, VARIABLE, CERAMIC: 9-35 pF, 100 working Vdc	CV112-2
C1805	Same as C1803	
C1806	Same as C1804	
C1807	CAPACITOR, FIXED, MICA: 1000 pF, ±5%, 500 working Vdc	CM111C102J1S
C1808	Same as C1807	
C1809	CAPACITOR, FIXED, MICA: 47 pF, ±5%, 500 working V dc	CM111C470J1S
C1810	CAPACITOR, VARIABLE, CERAMIC: 10-75 pF, 350 working V dc.	CV109-8
C1811	Same as C1810	
C1812	CAPACITOR, FIXED, CERAMIC: 0.2 uF, +80%-20%, 25 working V dc.	CC100-33
C1813	Same as C1807	
C1814	Same as C1801	
C1815	Same as C1807	
C1816	Same as C1807	
C1817	Same as C1812	
C1818	Same as C1807	
C1819	CAPACITOR, FIXED, MICA: 100 pF, ±5%, 500 working V dc	CM111C101J1S
C1820	Same as C1801	
CR1801 thru CR1808	DIODE	IN34A
FL1801	FILTER, USB: 1750.3 to 1753.0 kHz	FX10014-1

TRANSMITTER IF BOARD, A-10603
SYMBOL SERIES 1800

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
FL1802	FILTER, LSB: 1747.0 to 1749.7 kHz	FX10014-2
L1801 thru L1805	COIL, RF, FIXED: 1000 uH	CL275-102
Q1801 thru Q1803	TRANSISTOR	2N3904
Q1804 thru Q1808	TRANSISTOR	MPF104
R1801 thru R1812	RESISTOR, FIXED, COMPOSITION: 1 k ohm, ±5%, ½ watt	RC20GF102J
R1813	RESISTOR, VARIABLE, COMPOSITION: 500 ohms, ±10%	RV111U501A
R1814	Same as R1813	
R1815 thru R1818	RESISTOR, FIXED, COMPOSITION: 10 ohms, ±5%, ½ watt	RC20GF100J
R1819	RESISTOR, FIXED, COMPOSITION: 4.7k ohms, ±5%, ½ watt	RC20GF472J
R1820	Same as R1819	
R1821	RESISTOR, FIXED, COMPOSITION: 470 k ohms, ±5%, ½ watt	RC20GF474J
R1822	RESISTOR, FIXED, COMPOSITION: 47 ohms, ±5%, ½ watt	RC20GF470J
R1823	RESISTOR, FIXED, COMPOSITION: 100 k ohms, ±5%, ½ watt	RC20GF104J
R1824	RESISTOR, FIXED, COMPOSITION: 15 k ohms, ±5%, ½ watt	RC20GF153J
R1825	RESISTOR, FIXED, COMPOSITION:3.3 kohms, ±5%, ½ watt	RC20GF332J
R1826	Same as R1822	
R1827	RESISTOR, FIXED, COMPOSITION: 6.8 k ohms, ±5%, ½ watt	RC20GF682J

TRANSMITTER IF BOARD, A-10603
SYMBOL SERIES 1800

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R1828	Same as R1815	
R1829	Same as R1801	
R1830	Same as R1825	
R1831	Same as R1824	
R1832	RESISTOR, FIXED, COMPOSITION: 330 ohms, ±5%, ½ watt	RC20GF331J
T1801	TRANSFORMER, RF.	TZ10001
Y1801	QUARTZ, CRYSTAL: 1750 kHz	CR10008-1.750000 MHz
Z1801	OSCILLATOR, OVEN, TEMPERATURE COMPENSATED: 0°C to 50°C	NF10002

AUDIO PREAMP/CW OSC BOARD A10598
SYMBOL SERIES 1900

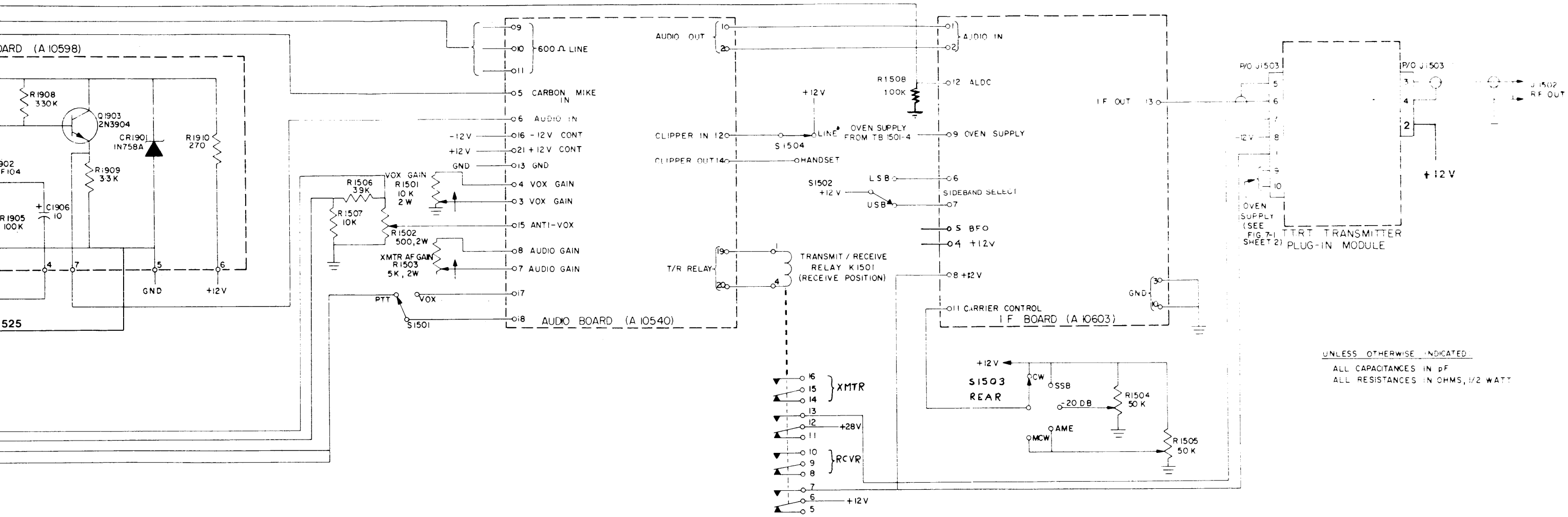
REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1901	CAPACITOR, FIXED, CERAMIC: 0.02 uF, +80%-40%, 150 working V dc.	CC100-35
C1902	CAPACITOR, FLAT, FOIL: 0.022 uF, 250 V dc	CC10011-3
C1903	CAPACITOR, FLAT, FOIL: 0.33 uF, 250 V dc	CC10011-10
C1904	Same as C1902	
C1905	Same as C1901	
C1906	CAPACITOR, FIXED, ELECTROLYTIC: 10 uF, 15 working V dc	CE105-10-15
C1907	Same as C1906	
C1908	CAPACITOR, FIXED, CERAMIC: 0.2 uF, +80%-20%, 25 working V dc.	CC100-33
C1909	CAPACITOR, FLAT, FOIL: 0.01 uF, 250 working V dc	CC10011-1
CR1901	DIODE, ZENER	IN758A
CR1902	DIODE	1N34A
L1901	INDUCTOR: 1.2 H	CL10033
Q1901	TRANSISTOR	MPF104
Q1902	Same as Q1901	
Q1903	TRANSISTOR	2N3904
R1901	RESISTOR, FIXED, COMPOSITION: 33 k ohms, ±5%, ½ watt	RC20GF333J
R1902	RESISTOR, FIXED, COMPOSITION: 4.7 k ohms, ±5%, ½ watt	RC20GF472J
R1903	RESISTOR, VARIABLE, COMPOSITION: 10 k ohms	RV10005-7
R1904	RESISTOR, FIXED, COMPOSITION: 22 k ohms, ±5%, ½ watt	RC20GF223J
R1905	RESISTOR, FIXED, COMPOSITION: 100 k ohms, ±5%, ½ watt	RC20GF104J
R1906	RESISTOR, FIXED, COMPOSITION: 8.2 k ohms ±5%, ½ watt	RC20GF822J
R1907	RESISTOR, FIXED, COMPOSITION: 2.2 k ohms, ±5%, ½ watt	RC20GF222J

AUDIO PREAMP/CW OSC BOARD, A10598
SYMBOL SERIES 1900

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R1908	RESISTOR, FIXED, COMPOSITION: 330 k ohms, ±5%, ½ watt	RC20GF334J
R1909	RESISTOR, FIXED, COMPOSITION: 3.3 k ohms, ±5%, ½ watt	RC20GF332J
R1910	RESISTOR, FIXED, COMPOSITION: 270 ohms, ±5%, ½ watt	RC20GF271J
R1911	RESISTOR, FIXED, COMPOSITION: 15 k ohms, ±5%, ½ watt	RC20GF153J
R1912	RESISTOR, FIXED, COMPOSITION: 6.8 k ohms, ±5%, ½ watt	RC20GF682J

SECTION 7

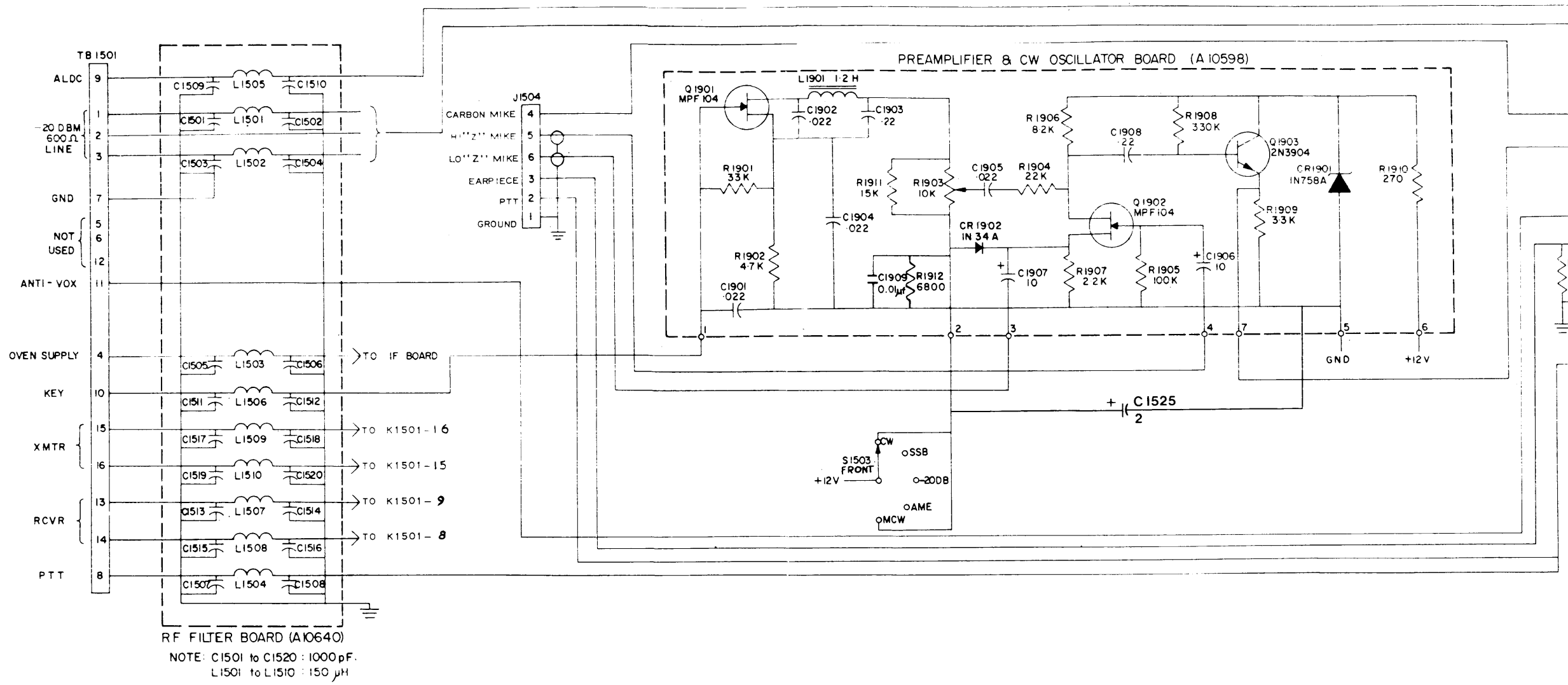
SCHEMATIC DIAGRAMS



UNLESS OTHERWISE INDICATED
ALL CAPACITANCES IN pF
ALL RESISTANCES IN OHMS, 1/2 WATT

SCHEMATIC DIAGRAM,
SIDEBAND STRIP EXCITER STE—5

FIGURE 7-1, (Sht. 1 of 2)


TB1501
ALDC 9
-20 DBM 600Ω LINE 1 2 3
GND 7
NOT USED 5 6 12
ANTI-VOX 11
OVEN SUPPLY 4
KEY 10
XMTR 15 16
RCVR 13 14
PTT 8
C1509 L1505 C1510
C1501 L1501 C1502
C1503 L1502 C1504
C1505 L1503 C1506
C1511 L1506 C1512
C1517 L1509 C1518
C1519 L1510 C1520
C1513 L1507 C1514
C1515 L1508 C1516
C1507 L1504 C1508
TO IF BOARD
TO K1501-16
TO K1501-15
TO K1501-9
TO K1501-8
RF FILTER BOARD (A10640)
NOTE: C1501 to C1520 : 1000 pF.
L1501 to L1510 : 150 μH
J1504
CARBON MIKE 4
HI "Z" MIKE 5
LO "Z" MIKE 6
EARPIECE 3
PTT 2
GROUND 1
PREAMPLIFIER & CW OSCILLATOR BOARD (A10598)
Q1901 MPF104
L1901 1.2 H
C1902 .022
C1903 .22
R1901 33K
C1901 .022
R1902 4.7K
R1911 15K
R1903 10K
C1904 .022
C1905 .022
R1904 22K
CR1902 IN34A
C1909 0.01μf
R1912 6800
C1907 10
R1906 82K
C1908 .22
R1908 330K
Q1903 2N3904
CR1901 IN758A
R1910 270
R1909 3.3K
Q1902 MPF104
R1907 2.2K
R1905 100K
C1906 10
1 2 3 4 7 5 6
GND
+12V
C1525
2
CW
SSB
S1503 FRONT
+12V
-20DB
AME
MCW
R150 39K
R1507 10K

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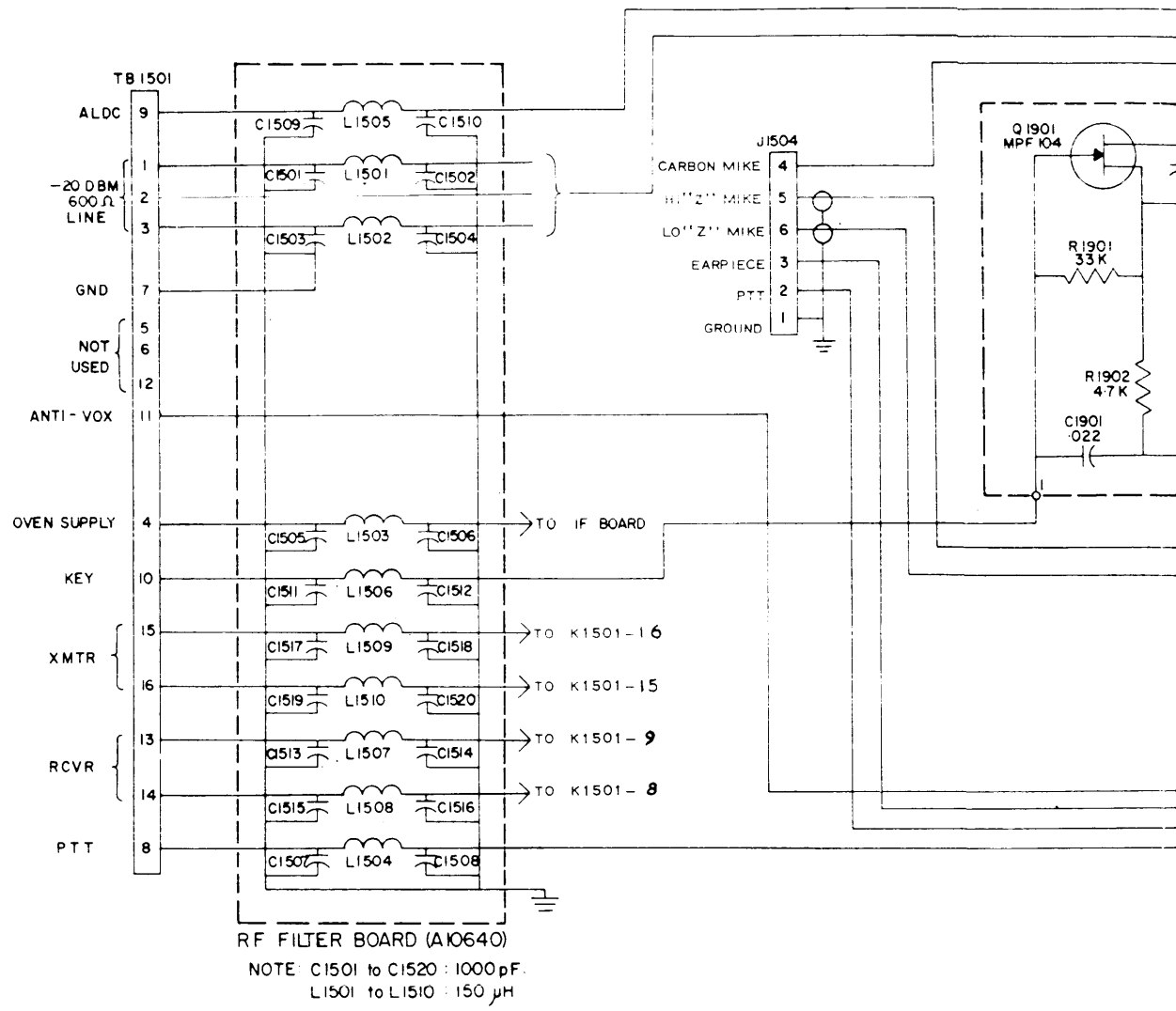
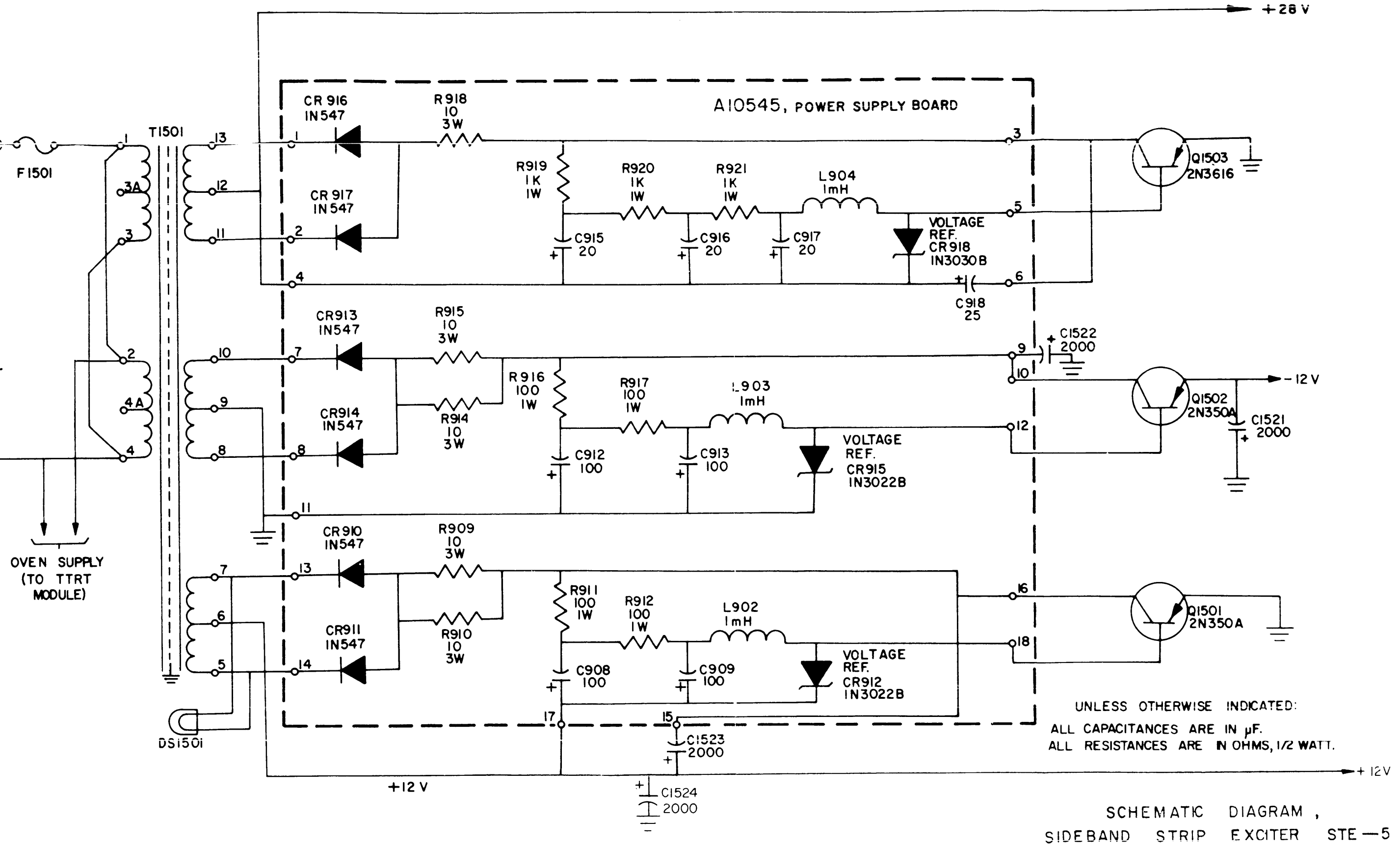

TB1501
ALDC 9
-20 DBM 600Ω LINE 1 2 3
GND 7
NOT USED 5 6 12
ANTI-VOX 11
OVEN SUPPLY 4
KEY 10
XMTR 15 16
RCVR 13 14
PTT 8
C1509 L1505 C1510
C1501 L1501 C1502
C1503 L1502 C1504
C1505 L1503 C1506
C1511 L1506 C1512
C1517 L1509 C1518
C1519 L1510 C1520
C1513 L1507 C1514
C1515 L1508 C1516
C1507 L1504 C1508
TO IF BOARD
TO K1501-16
TO K1501-15
TO K1501-9
TO K1501-8
J1504
CARBON MIKE 4
HI "Z" MIKE 5
LO "Z" MIKE 6
EARPIECE 3
PTT 2
GROUND 1
Q1901 MPF104
R1901 33K
R1902 4.7K
C1901 .022
RF FILTER BOARD (A10640)
NOTE: C1501 to C1520 : 1000 pF
L1501 to L1510 : 150 μH

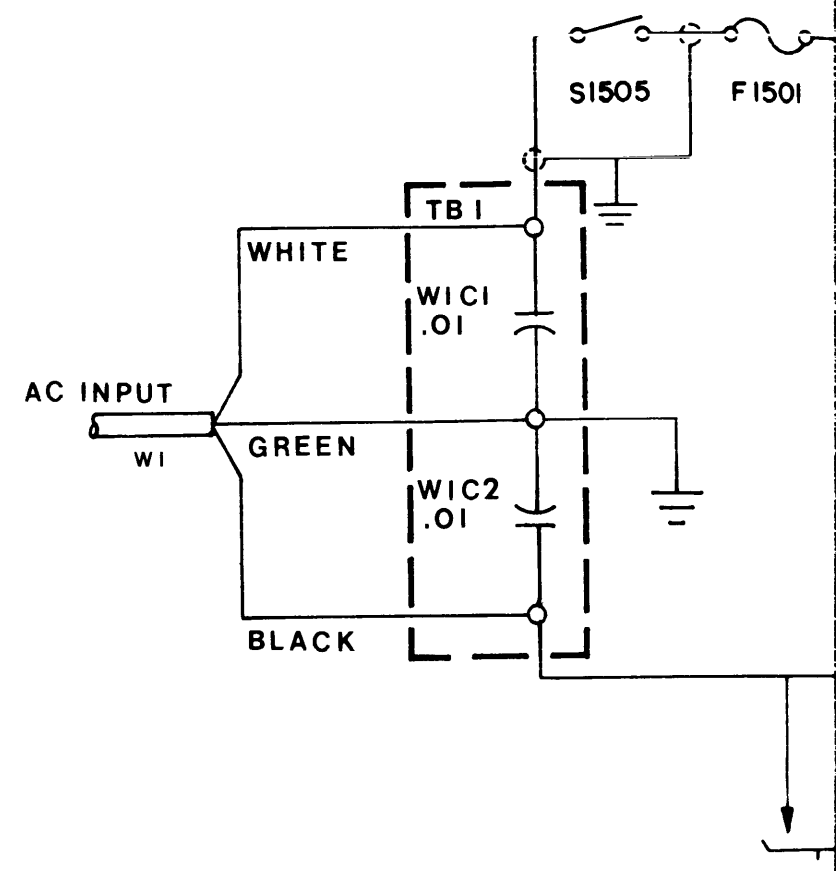
1587320320



SCHEMATIC DIAGRAM,
SIDEBAND STRIP EXCITER STE—5

FIGURE 7-1
SHEET 2 OF 2

158732032C


S1505
F1501
TB1
WHITE
W1C1
.01
AC INPUT
W1
GREEN
W1C2
.01
BLACK
OVEN S
(TO T
MODU

158732032C

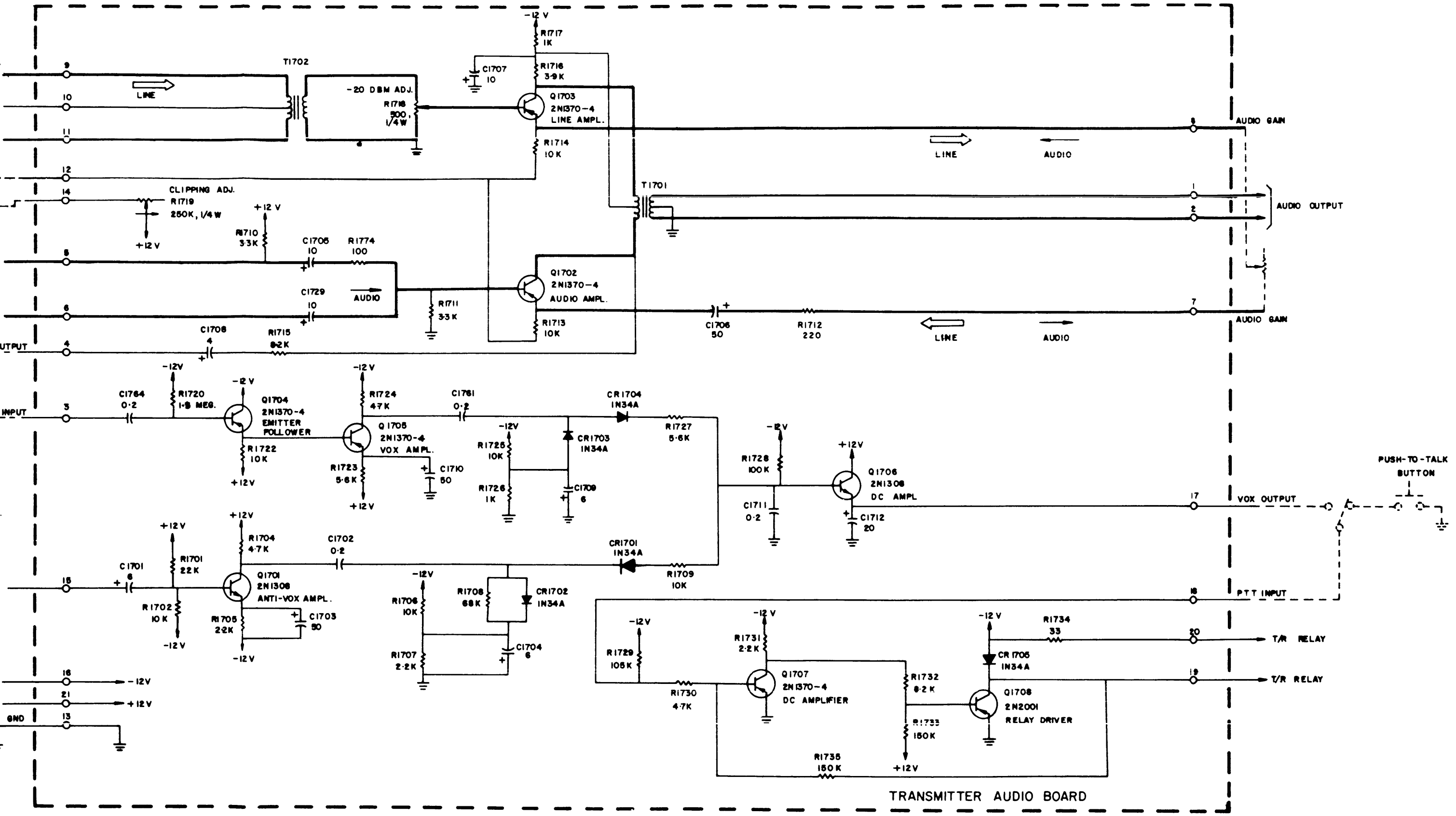
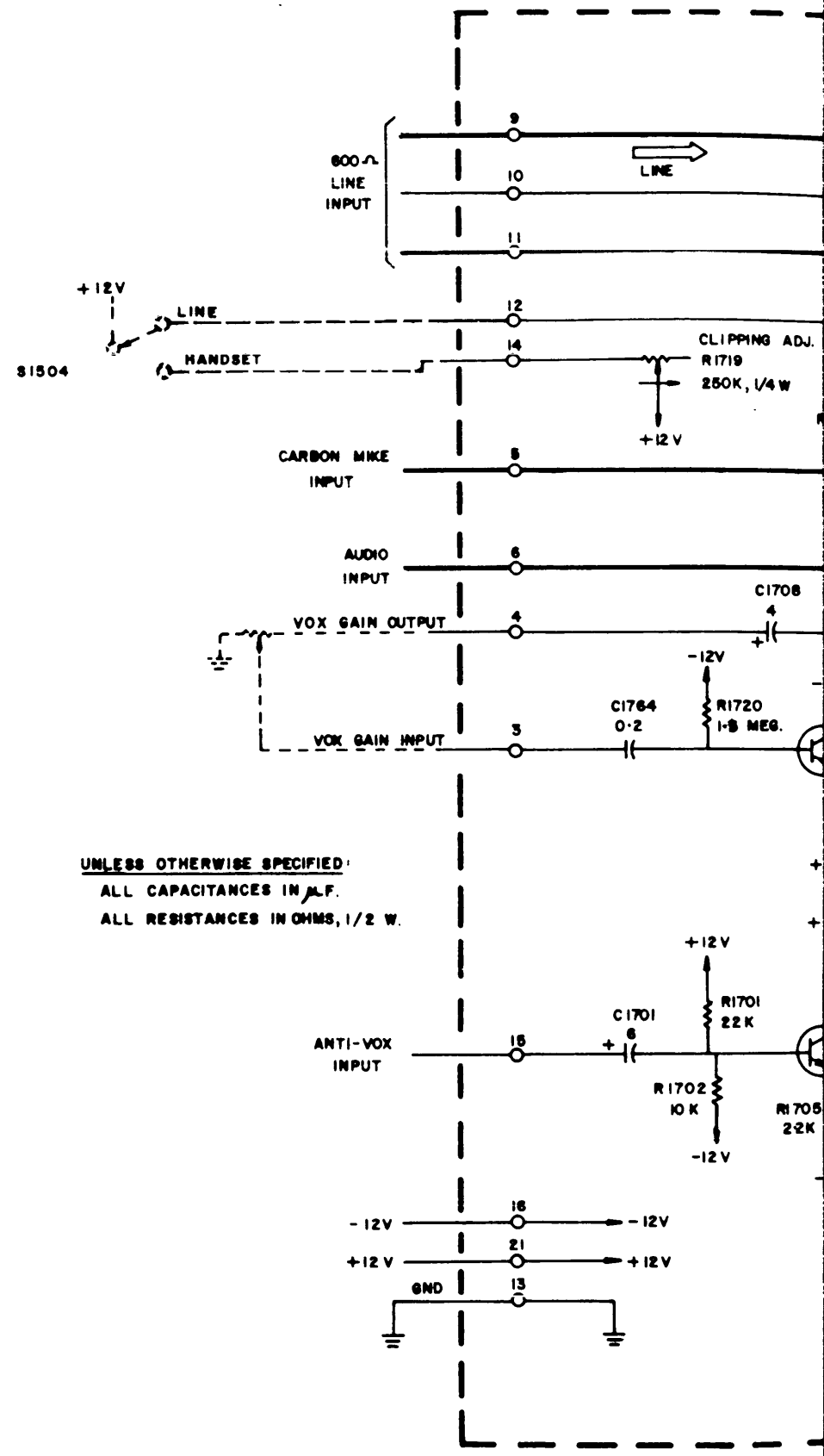


FIGURE 7-2 SCHEMATIC DIAGRAM,
TRANSMITTER AF BOARD
STE - 5


600Ω LINE INPUT
9
10
11
LINE
+12V
LINE
12
S1504
HANDSET
14
CLIPPING ADJ.
R1719
250K, 1/4 W
+12 V
CARBON MIKE INPUT
8
AUDIO INPUT
6
C1708
4
VOX GAIN OUTPUT
4
-12V
C1764
0·2
R1720
1·8 MEG.
VOX GAIN INPUT
3
UNLESS OTHERWISE SPECIFIED:
ALL CAPACITANCES IN µF.
ALL RESISTANCES IN OHMS, 1/2 W.
+12 V
R1701
22 K
C1701
6
ANTI-VOX INPUT
15
R1702
10 K
R1705
22K
-12 V
16
-12V
-12V
21
+12V
+12 V
GND
13

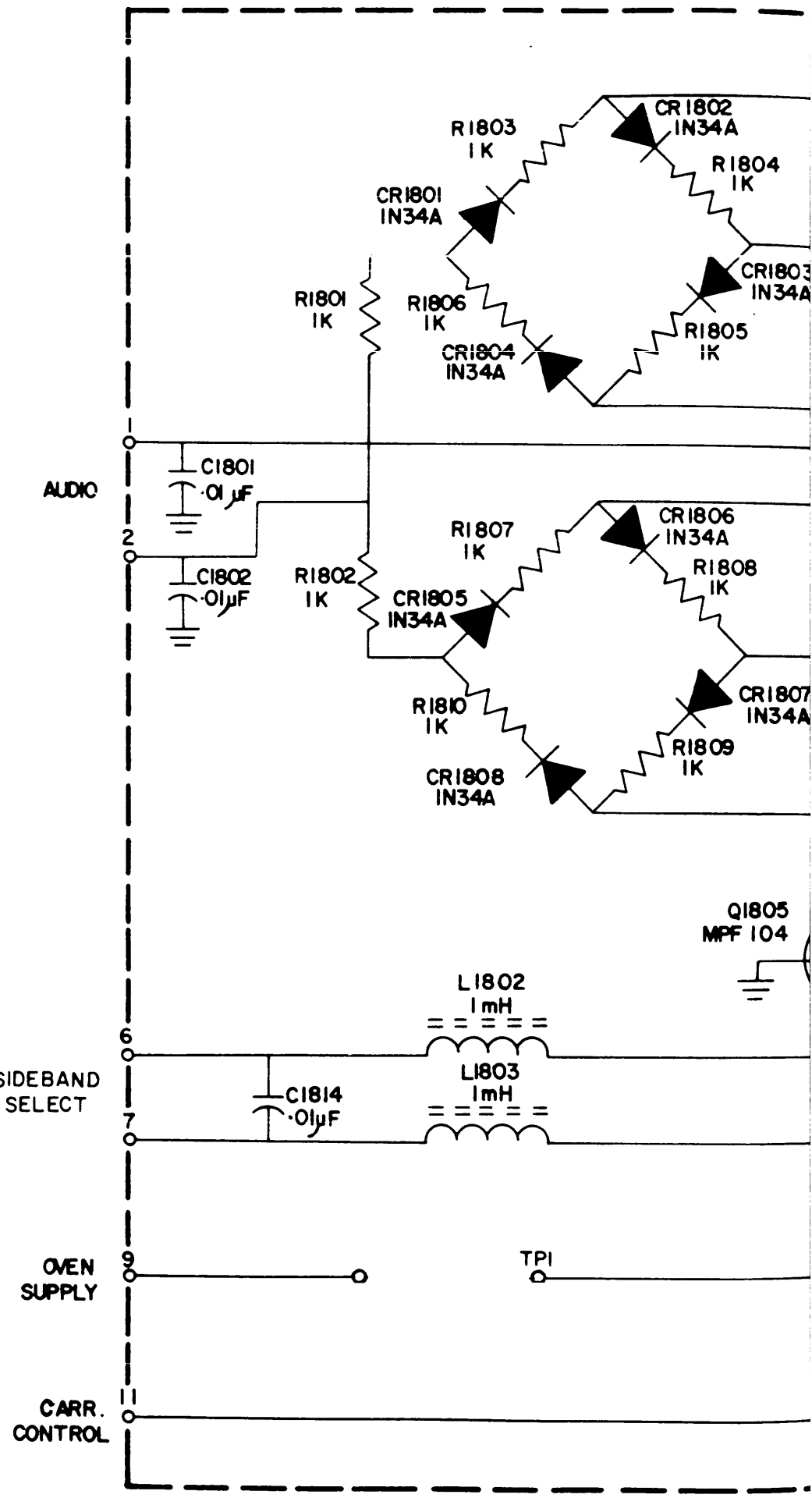
158732032C

NOTES: 1. FL 1801 IS FX10014-1 (1750.3 – 1753.0 KHz)
2. FL 1802 IS FX10014-2 (1747.0 – 1749.7 KHz)
3. FL1801 REMOVED FOR "USB ONLY" APPLICATION.
4. FL 1802 REMOVED FOR "LSB ONLY" APPLICATION.

R1803 1K
CR1802 1N34A
R1804 1K
CR1803 1N34A
R1805 1K
CR1804 1N34A
R1811 1K
R1813 500
R1815 10
C1803 22
C1804 9-35
R1816 10
FL1801
R1819 4.7K
R1821 470K
L1801 1mH
R1823 100K
C1810 10-75
C1809 47
T1801
13 IF OUT
R1827 6.8K
C1807 1000
Q1801 2N3904
C1808 1000
Q1802 2N3904
Q1803 2N3904
Y1801 1750 KHz
Q1804 MPF 104
12 ALDC
R1824 15K
R1822 47
R1820 4.7K
R1826 47
C1811 10-75
C1812 .2μF
R1828 10
C1813 1000
R1807 1K
CR1806 1N34A
R1808 1K
CR1807 1N34A
R1809 1K
CR1808 1N34A
R1812 1K
R1814 500
R1817 10
C1805 22
C1806 9-35
FL1802
R1818 10
R1825 3.3K
R1832 330
8 +12V XMTR
4 +12V
L1804 1mH
C1817 .2μF
Q1805 MPF 104
Q1806 MPF 104
L1802 1mH
L1803 1mH
C1815 1000
C1816 1000
R1829 1K
R1830 3.3K
Q1807 MPF 104
C1818 1000
C189 100
Q1808 MPF 104
5 BFO OUTPUT
Z1801 1750 KHz OSCILLATOR
L1805 1mH
C1820 .01μF
R1831 15K
3 GND.
10 GND.
TP1

UNLESS OTHERWISE INDICATED
ALL CAPACITANCES IN pF
ALL RESISTANCES IN OHMS, 1/2 WATT

FIGURE 7-3
SCHEMATIC DIAGRAM, TRANSMITTER IF BOARD, STE-5


CR1802
IN34A
R1803
1K
R1804
1K
CR1801
IN34A
CR1803
IN34A
R1801
1K
R1806
1K
R1805
1K
CR1804
IN34A
C1801
·01µF
AUDIO
2
R1807
1K
CR1806
IN34A
R1808
1K
C1802
·01µF
R1802
1K
CR1805
IN34A
CR1807
IN34A
R1810
1K
R1809
1K
CR1808
IN34A
Q1805
MPF 104
L1802
1mH
6
SIDEBAND
SELECT
C1814
·01µF
L1803
1mH
7
9
OVEN
SUPPLY
TP1
11
CARR.
CONTROL

158732032C