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TECHNICAL MANUAL

for

SIDEBAND STRIP EXCITER
MODEL STE-1



THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y.

OTTAWA, CANADA



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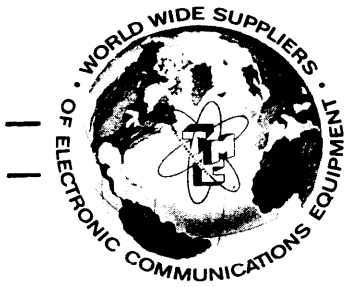
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THE TECHNICAL MATERIEL CORPORATION

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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.
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THE TECHNICAL MATERIEL CORPORATION
Engineering Services Department
700 Fenimore Road
Mamaroneck, New York

TABLE OF CONTENTS

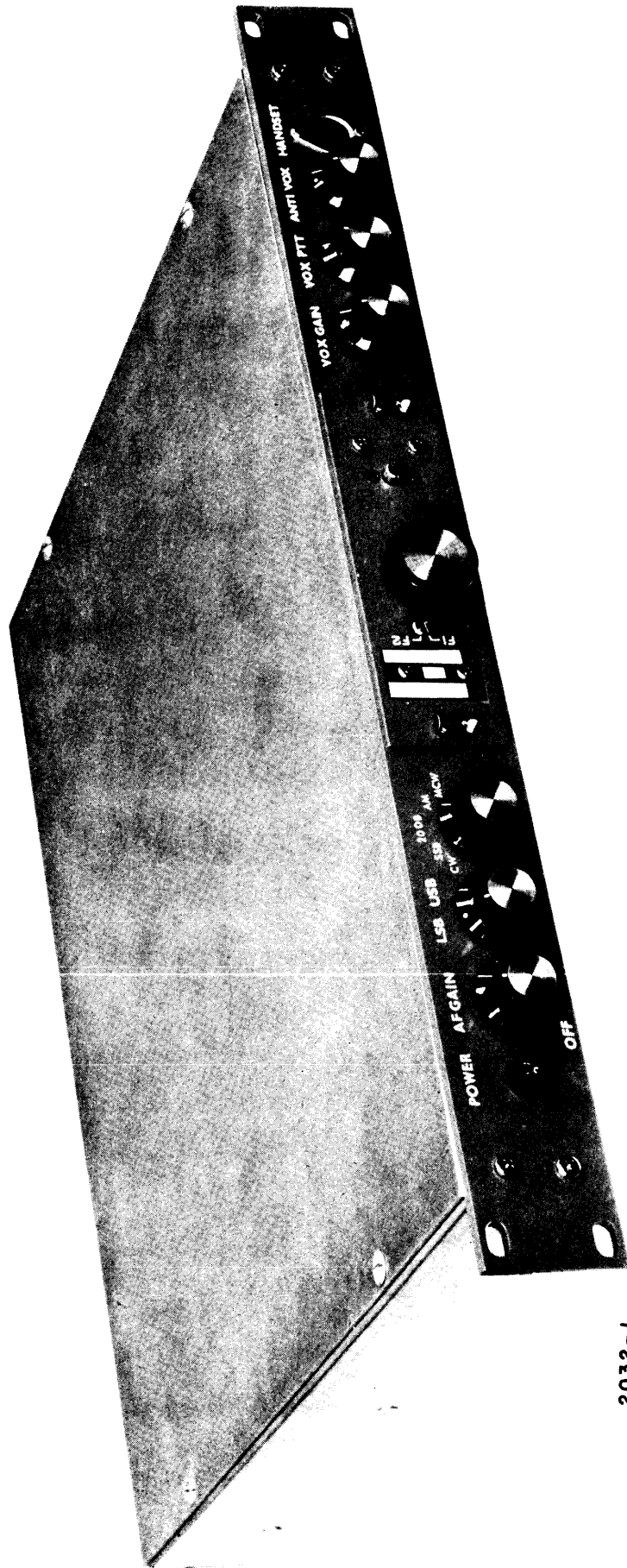
Paragraph	Page	Paragraph	Page
SECTION 1 – GENERAL INFORMATION		SECTION 4 – PRINCIPLES OF OPERATION (Cont)	
1-1	Functional Description 1-1	4-2	Theory 4-1
1-2	Physical Description 1-2	a.	Input Circuits 4-1
	a. External 1-2	b.	Audio Stage 4-1
	b. Internal 1-2	c.	VOX and Anti-VOX Stages 4-1
1-3	Technical Specifications 1-3	d.	Modulator and 250KC Oscillator . 4-3
		e.	Balanced Mixer and I-F Amplifier 4-3
		f.	TTRT Plug-in Module 4-5
		g.	Power Supply 4-5
SECTION 2 – INSTALLATION		SECTION 5 – MAINTENANCE	
2-1	Unpacking and Handling 2-0	5-1	Preventive Maintenance 5-1
2-2	Power Requirement 2-0	5-2	Troubleshooting 5-1
2-3	Mechanical Installation 2-0	a.	Quick Test Using Front- Panel Controls 5-1
2-4	Electrical Installation 2-0	b.	Systematic Troubleshooting . . 5-1
2-5	Performance Check 2-3	5-3	Repair 5-2
		5-4	Alignment 5-2
SECTION 3 – OPERATOR'S SECTION		SECTION 6 – PARTS LIST	
3-1	Controls and Indicators 3-0	6-1	Introduction 6-1
3-2	Operating Procedures 3-2	SECTION 7 – SCHEMATIC DIAGRAMS	
	a. General 3-2		
	b. Setting the Controls 3-2		
3-3	Changing TTRT Modules 3-2		
SECTION 4 – PRINCIPLES OF OPERATION			
4-1	General 4-1		

LIST OF ILLUSTRATIONS

Figure	Page	Figure	Page
SECTION 1 – GENERAL INFORMATION		SECTION 4 – PRINCIPLES OF OPERATION (Cont)	
1-1	Sideband Strip Exciter STE ii	4-2	Frequency Inversion In SSB Transmission 4-4
SECTION 2 – INSTALLATION		SECTION 5 – MAINTENANCE	
2-1	Power Transformer Wiring 2-1	5-1	STE, Top View 5-3
2-2	STE, Rear View 2-2	5-2	Xmtr Audio Board, Top View 5-4
SECTION 3 – OPERATOR'S SECTION		5-3	Xmtr I-f Board Top View 5-5
3-1	STE, Front View 3-1	5-4	Modulation Envelopes 5-6
SECTION 4 – PRINCIPLES OF OPERATION		SECTION 7 – SCHEMATIC DIAGRAMS	
4-1	Sideband Strip Exciter STE, Block Diagram 4-2	7-1	Schematic Diagram, STE (4 sheets) 7-3

LIST OF TABLES

Table	Page	Table	Page
SECTION 1 – GENERAL INFORMATION		SECTION 3 – OPERATOR'S SECTION	
1-1	Equipment Supplied 1-1	3-1	Operator's Controls and Indicators 3-0
1-2	Semiconductor Complement 1-2		



2032-1

Figure 1-1. Sideband Strip Exciter STE

SECTION 1

GENERAL INFORMATION

1-1. FUNCTIONAL DESCRIPTION.

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

The STE provides up to 250 mw 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 input signals.

The STE uses a fixed-tuned plug-in module (Model TTRT) for its r-f section. This module has two selectable local oscillator frequencies that permit transmission on one of two closely adjacent frequencies (F1 or F2) that are within the module's r-f bandpass. Four models of the TTRT module are available to cover the complete frequency range of the STE. Other features of the STE include:

- a. Double conversion and a sharp cutoff bandpass filter.
- b. Manual selection of either LSB or USB transmission.
- 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 transmitter with provision for controlling associated transmitters and receivers.
- f. Low power consumption.
- g. Compact, lightweight construction.

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

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

Table 1-1 lists the equipment supplied with the STE.

Table 1-1. Equipment Supplied

NAME	DESIGNATION	FUNCTION	QUANTITY
Sideband Strip Exciter	STE	Communications exciter	1
Cable assembly**	CA555-4	Ac power cord	1
Fanning strip	TM105-16AL	Aid for rear panel wiring	1
Rf connector plug	UG88*/U	Provides for coaxial cable connection to r-f output jack	1

**This cable can be ordered with terminations other than the 115v polarized plug provided.

1-2. PHYSICAL DESCRIPTION.

a. **EXTERNAL.** - The STE 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 and illustrated in section 3. There is also a jack on the front panel for connecting a handset. A terminal board mounted to the rear panel provided for most input and output connections. A BNC connector is provided at the rear panel for connecting the r-f output of the exciter to associated equipment with coaxial cable. In addition, the rear panel contains the power-input connector, 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 are soldered to printed circuit boards that are mounted to the chassis. There are five of these boards not including those in the TTRT module. These are the Xmtr audio board, the Xmtr i-f board, the power supply board, the preamp board, and the CW oscillator board. These boards are shown in figures 5-1, 5-2, and 5-3. The remainder of the components in the exciter are chassis-mounted.

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

Table 1-2. Semiconductor Complement

REFERENCE DESIGNATION	TYPE	FUNCTION
CR910, CR911, CR913, CR914, CR916, and CR917	1N547	Rectifiers
CR912 and CR915	1N3022B	Voltage references
CR918	1N3033B	Voltage reference
CR1701 and CR1702	1N34A	Anti-vox detector
CR1703 and CR1704	1N34A	Vox detector
CR1705	1M34A	Relay suppressor
CR1706 through CR1709	1N34A	Balanced modulator
Q900	2N350A	+12V series regulator
Q901	2N350A	-12V series regulator
Q902	2N350A	-36V series regulator
Q1500	2N1308	CW oscillator
Q1501	2N1308	Preamp
Q1701	2N214	Anti-vox amplifier
Q1702	2N1370-4	Audio amplifier
Q1703	2N1370-4	Line amplifier
Q1704	2N1370-4	Emitter follower
Q1705	2N1370-4	Vox amplifier
Q1706	2N1308	Dc amplifier
Q1707	2N1370-4	Dc amplifier
Q1708	2N2001	Relay driver
Q1709 and Q1710	2N2084	Balanced mixer
Q1711	2N2084	I-f amplifier
Q1712	2N2084	Xmtr 250-kc oscillator
Q1713, Q1714, and Q1715	2N2084	Buffer amplifiers
Q1716	2N2084	Lower sideband oscillator
Q1717	2N2084	Upper sideband oscillator

1-3. TECHNICAL SPECIFICATIONS.

Frequency range	2-32 mc divided into four bands using the following TTRT modules: Band 1: 2-4 mc, TTRT-1 Band 2: 4-8 mc, TTRT-2 Band 3: 8-16 mc, TTRT-3 Band 4: 16-32 mc, TTRT-4
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.
Types of signals transmitted	AME, CW, FAX, FSK, MCW, and SSB (upper or lower).
Audio bandwidth	2.75 kc \pm 2 db between 250 and 3000 cps.
I-f frequency	Double conversion from 250 kc to 1.75 mc on all bands.
Signal-to-distortion ratio	Distortion products are down a minimum of 45 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 -50 db, -20 db, or -6 db from sideband envelope power depending upon operating mode selected as follows: CW and SSB: -50 db 20 DB: -20 db AM and MCW: -6 db
Output impedance	50 ohms (nominal) unbalanced.
Output power	250 milliwatts minimum PEP
Primary power input	104, 115, 208, or 230V \pm 10%, 50/60 cps, single-phase, 8 watts. If a crystal oven is used in the TTRT module, an additional 6 watts is required.
Temperature range	0°C (32°F) to 50°C (122°F)
Dimensions	Depth: 15 inches Width: 19 inches Height: 1-3/4 inches
Weight, uncrated	10 pounds.

SECTION 2 INSTALLATION

2-1. UNPACKING AND HANDLING.

The STE is shipped from the factory in a wooden crate to ensure maximum protection from damage in transit. The inside of the crate 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 (table 1-2) 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, the Technical Materiel Corporation will assist in describing methods of repair and furnishing of replacement parts.

2-2. POWER REQUIREMENT.

The STE can operate with 104 volts, 115 volts, 208 volts, or 230 volts a-c power, and is normally shipped for operation with 115 vac $\pm 10\%$. If the exciter is to operate from a power source other than 115 vac, the wiring of power transformer T902 must be modified. Figure 2-1 illustrates the wiring of T902 for each of the four input power possibilities. It is recommended that a .250 ampere fuse be used with 104 or 115 volts, and a .125 ampere fuse be used with 208 or 230 volts.

NOTE

The crystal oven (if used) in the TTRT module must be compatible with the primary power line voltage.

2-3. MECHANICAL INSTALLATION.

Before installing the STE, 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 is completely solid state, internally generated heat is not a problem, and several of the units may be mounted in a stack, one above the other. The STE should be mounted so as to allow sufficient room to withdraw the TTRT plug-in module for frequency-change purposes. Also, 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 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 in order to prevent excessive strain on the front panel. If the STE 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. Connect power cord between the a-c power source receptacle and AC INPUT jack J904.

b. PUSH-TO-TALK. - Connect a push-to-talk switching device between ground and terminal 8 of TB1502.

c. AUDIO INPUT (600-OHM LINE). - Terminals 1 and 3 of terminal board TB1502 are provided for connection of a 600-ohm input line. If the 600-ohm line is balanced, terminal 2 of TB1502 should be grounded.

d. MICROPHONE INPUTS. - Terminals 4, 5, and 6 of terminal board TB1502 are provided for various types of microphone inputs. Connect the microphone between ground and the appropriate terminal as identified by rear-panel markings (CAR, LO Z, and HI Z). Also, if a high-impedance microphone is used, a jumper must be connected between terminals 14 and 15 on the CW oscillator printed circuit board (refer to figure 5-1).

e. KEY LINE. - Terminals 9 and 10 of terminal board TB1502 are provided for the attachment of a dry-keying device.

NOTE

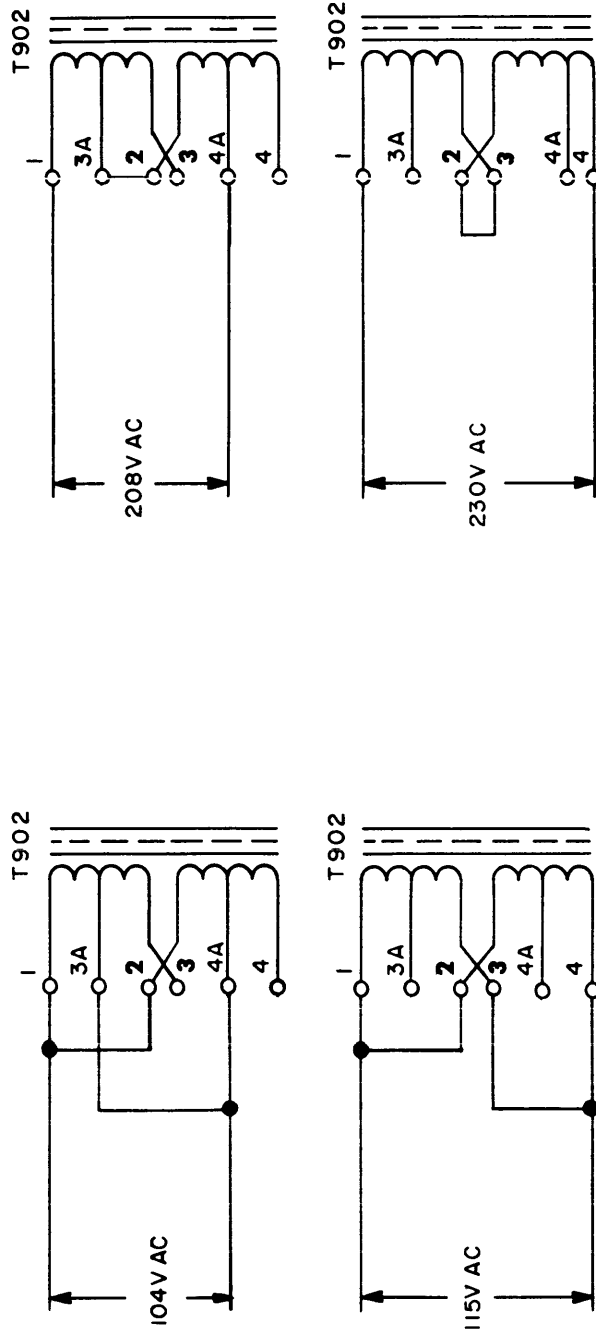
An audio tone is used in the STE keying system. The key line should be kept as short as possible, preferably under 50 feet.

f. RECEIVER AUDIO. - Connect receiver audio output (unbalanced) to terminal 11 on TB1502. This audio signal is necessary for operation of the anti-vox circuit. For earphone monitoring of audio output, connect to terminal 12 of TB1502.

g. R-F OUTPUT. - Connect RF OUT jack J1516 to transmitter input.

NOTE

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



3014-2

Figure 2-1. Power Transformer Wiring



2032-2

Figure 2-2. STE, Rear View

2-5. PERFORMANCE CHECK.

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

NOTE

The r-f output cable should be disconnected during the performance check, and a dummy load used (47 ohm, 1/2-watt resistor).

a. Select the AM, 20 DB, or SSB mode, and check 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.

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

e. Check the VOX circuit as follows:

(1) Set VOX/PTT switch at VOX.

(2) Turn VOX GAIN control fully counterclockwise.

(3) Turn ANTI-VOX control fully counterclockwise.

(4) Select the AM, 20 DB, 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 for transmitting.

SECTION 3 OPERATOR'S SECTION

3-1. CONTROLS AND INDICATORS.

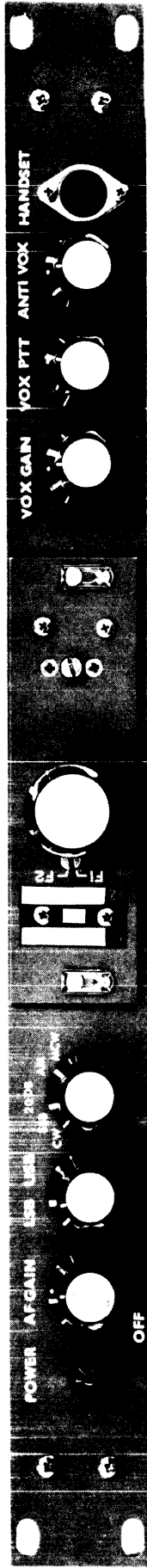
NOTE

Before attempting to operate the STE, the operator should become familiar with the controls and indicators listed in table 3-1. These are shown in figure 3-1. 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.

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

Table 3-1. Operator's Controls and Indicators

DESIGNATION	FUNCTION
POWER lamp (DS1501)	Lights when primary power is connected to power supply.
AF GAIN/OFF rheostat switch (R1547, S1512)	Clockwise rotation connects power supply to primary power and increases gain of audio amplifier; full counter-clockwise rotation disconnects primary power.
LSB/USB switch (S1502)	Selects either upper-sideband or lower-sideband operation.
CW/SSB/20 DB/AM/ MCW switch	Selects mode of operation: <ol style="list-style-type: none"> 1. CW (keyed carrier telegraphy). 2. SSB (single sideband, suppressed carrier). 3. 20 DB (single sideband, reduced carrier). 4. AM (single sideband, full carrier). 5. MCW (keyed tone telegraphy).
F1/F2 switch (on TTRT module)	Selects one of two closely adjacent operating frequencies as noted on TTRT front panel.
No identification (screwdriver controlled trimmer on TTRT module)	Permits fine adjustment of output frequency.
VOX GAIN control (R1513)	Selects level of audio input signal required to key exciter when VOX/PTT switch is set at VOX.
VOX/PTT switch (S1501)	When set at VOX, enables exciter to be keyed by input audio signal; when set at PTT, enables push-to-talk switch to key exciter.
ANTI VOX control (R1517)	Selects level of receiver audio-output signal required to cancel action of VOX circuit.
HANDSET jack (J1515)	Permits connection of handset to exciter.
HANDSET/LINE switch (S1518, on rear of unit)	When set at HANDSET, enables compression circuit of audio amplifier; when set at LINE, disables compression circuit.



2032 - 3

Figure 3-1. STE, Front View

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. No specific operating procedure for the STE is given in this manual; the operator must select the mode, sideband, signal level, and type of operation as desired.

b. SETTING THE CONTROLS.

(1) Set AF GAIN control at OFF.

(2) Using F1/F2 switch, select desired operating frequency.

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.

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

(4) With the LSB/USB switch, select the desired sideband.

(5) Set VOX/PTT switch at PTT.

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

(7) Close push-to-talk switch. If the microphone or other audio source does not have a push-to-talk switch, ground terminal 8 of TB1502.

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

(9) 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 ANTI-VOX control until the keying relay is de-energized when no audio signal is applied.

3-3. CHANGING TTRT MODULES.

a. Rotate AF GAIN control fully counter-clockwise.

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.

CAUTION

Before continuing, be sure that the voltage rating of the crystal oven (if used) in the module to be inserted is compatible with the a-c line voltage that powers the exciter.

d. Insert new module with its F1/F2 identification plate facing LSB/USB switch.

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

SECTION 4

PRINCIPLES OF OPERATION

4-1. GENERAL.

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

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

a. INPUT CIRCUITS. The audio signal for the STE can be provided from any one of the following sources: carbon microphone, low-impedance microphone, high-impedance microphone, 600-ohm line, or internal CW oscillator. Any of the microphones can be wired to TB1502 or be incorporated in a handset plugged into J1515.

The carbon microphone and 600-ohm line inputs are supplied to the audio stage. The low-impedance and high-impedance microphone inputs are supplied to preamplifier Q1501 whose output is supplied to the audio stage through section B of S1517 in the SSB, 20 DB, and AM modes. The audio tone for CW and MCW is supplied by CW oscillator Q1500 (energized in the CW and MCW modes by +12V from section A of S1517). The output of the CW oscillator is supplied through an external key (connected to TB1502) and section B of S1517 in the CW and MCW modes to the audio stages.

b. AUDIO STAGE.- Transistors Q1702 and Q1703 are connected as a push-pull amplifier and phase-inverter whose gain is determined by the setting of AF GAIN control R1547. The input to the stage can be supplied to either transistor as shown. HANDSET/LINE switch S1518 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 S1518 set at LINE, +12V 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 S1518 set at HANDSET, +12V is supplied through CLIPPING ADJ 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 nonlinear

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 by energizing the exciter output stages only when an audio input is present. The anti-vox stages prevent a nearby receiver from keying 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 R1513, 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 as an anti-vox input. This signal is supplied to anti-vox detector CR1701 through ANTI-VOX control R1517, and anti-vox amplifier Q1701; the receiver-output signal can be monitored by phones connected to either J1515 or TB1502. 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 to 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 pickup from an associated receiver, and a negative anti-vox voltage is also 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 K1500. When the output of the emitter follower is negative, K1500 is deenergized, and the i-f and rf stages of the exciter have no supply voltages. When the output of the emitter follower goes positive, K1500 is energized, the -12V XMIT, +12V XMIT, and

-36V XMIT supply voltages are connected to the i-f and r-f stages of the exciter. Additional contacts of K1500 provide an indication to the associated transmitter and receiver that the STE is operating.

In operation, the VOX GAIN control is adjusted so that a normal voice into a microphone connected to the STE 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 TB1502 or J1515. The relay is energized when the PTT input is grounded, and is deenergized when the PTT input is an open circuit.

d. MODULATOR AND 250 KC OSCILLATOR.- XMTR 250 KC oscillator Q1712 is a crystal-controlled modified Colpitts oscillator; its output is supplied to two buffer amplifiers. Q1713 provides the switching signal for the modulator. Q1714 provides a carrier output that can be inserted in the balanced mixer. Both buffer amplifiers minimize oscillator instability by reducing the loading of the oscillator.

The modulator (Figure 7-1, sheet 4) is the diode network that includes diodes CR1706 through CR1709 and resistors R1736 through R1739. It receives a balanced audio input and the 250 kc input. One side of the audio input is applied at the junction of R1736 and R1737. The other is applied at the junction of R1738 and R1739. The 250 kc input is applied to the cathodes of CR1706 and CR1709. Adjustments R1742 and C1715 provide equal magnitudes of the 250 kc signal at the two input points. The output of the modulator is taken across R1742.

The 250 kc signal controls the switching of the diodes in the modulator. The amplitude of the audio input is sufficiently low so that the 250 kc signal does not lose control of the diode switching. The output is an audio modulated i-f signal that contains both the upper and lower sidebands. Since the 250 kc signal is in phase at the two output points, it is self-canceling. The modulator output is supplied to crystal bandpass filter FL1701. This is a highly selective filter with a bandpass of 3 kc. It rejects frequencies below 250.3 kc and above 253.3 kc. Thus, only the upper sideband of the modulator output is passed, while all noise and signal frequencies outside of the upper sideband are rejected. The output of the crystal filter is supplied to the balanced mixer. Figure 4-2 (both A and B) shows the output of the modulator and the effect of the crystal filter in producing the balanced mixer input.

e. BALANCED MIXER AND I-F AMPLIFIER.- Balanced mixer Q1709 and Q1710 receives three inputs. The first is the upper sideband signal from FL1701. The second is the 250 kc carrier signal from section C of S1517 (which is present in the

20 DB, AM, and MCW modes only) at a level dependent upon the mode selected. The third is the output of either the LSB oscillator (1.5 mc) or the USB oscillator (2.0 mc) depending upon the position of LSB/USB switch S1502. The balanced mixer produces an i-f signal whose carrier frequency is 1.75 mc. This signal consists of a single sideband that is either above or below the carrier frequency depending upon which sideband oscillator output is supplied to the mixer.

Figure 4-2 shows the inputs and output of the balanced mixer for the two possible cases. In case A, the LSB oscillator output (250 kc below the center frequency of the mixer output) is supplied to the mixer; the frequency spectrum of the i-f input signal is inverted. Thus, the selection of upper or lower sideband transmission is determined by which oscillator output is supplied to the mixer.

NOTE

Beat frequencies below 1.5 mc and above 2.0 mc are also produced in the mixer. These are not shown because they are rejected by i-f amplifier Q1711.

The position of LSB/USB switch S1502 determines which of the two oscillators supplies the mixer. If S1502 is at LSB, +12V XMIT is supplied to LSB oscillator Q1716 through R1555 (a modified Colpitts circuit); USB oscillator Q1717 also a modified Colpitts circuit is disabled at this time. The output of the LSB oscillator is supplied through buffer amplifier Q1715 to the mixer. The buffer amplifier minimizes the loading of the oscillator so that its frequency and output magnitude are very stable. When S1502 is at USB, +12V XMIT is supplied to the USB oscillator through R1554; LSB oscillator Q1716 is cut off at this time. R1554 and R1555 are adjusted to provide optimum bias, respectively, for the two oscillators.

Since the output circuit of the mixer is a push-pull configuration, and the sideband oscillator output is connected to the mixer in a parallel configuration, the sideband oscillator signal (1.5 mc or 2.0 mc) is essentially self-canceling.

The carrier input to the mixer is taken from section C of S1517. In the CW and SSB positions, this input is grounded. In the AM, MCW, and 20DB positions, the carrier level is determined by the voltage divider consisting of R1536, R1537, and R1538.

The output of the balanced mixer is supplied to i-f amplifier Q1711. This amplifier is tuned to 1.75 mc and rejects the undesirable beat frequencies produced in the balanced mixer. The output of the i-f amplifier is supplied through section D of S1517 to the TTRT plug-in module.

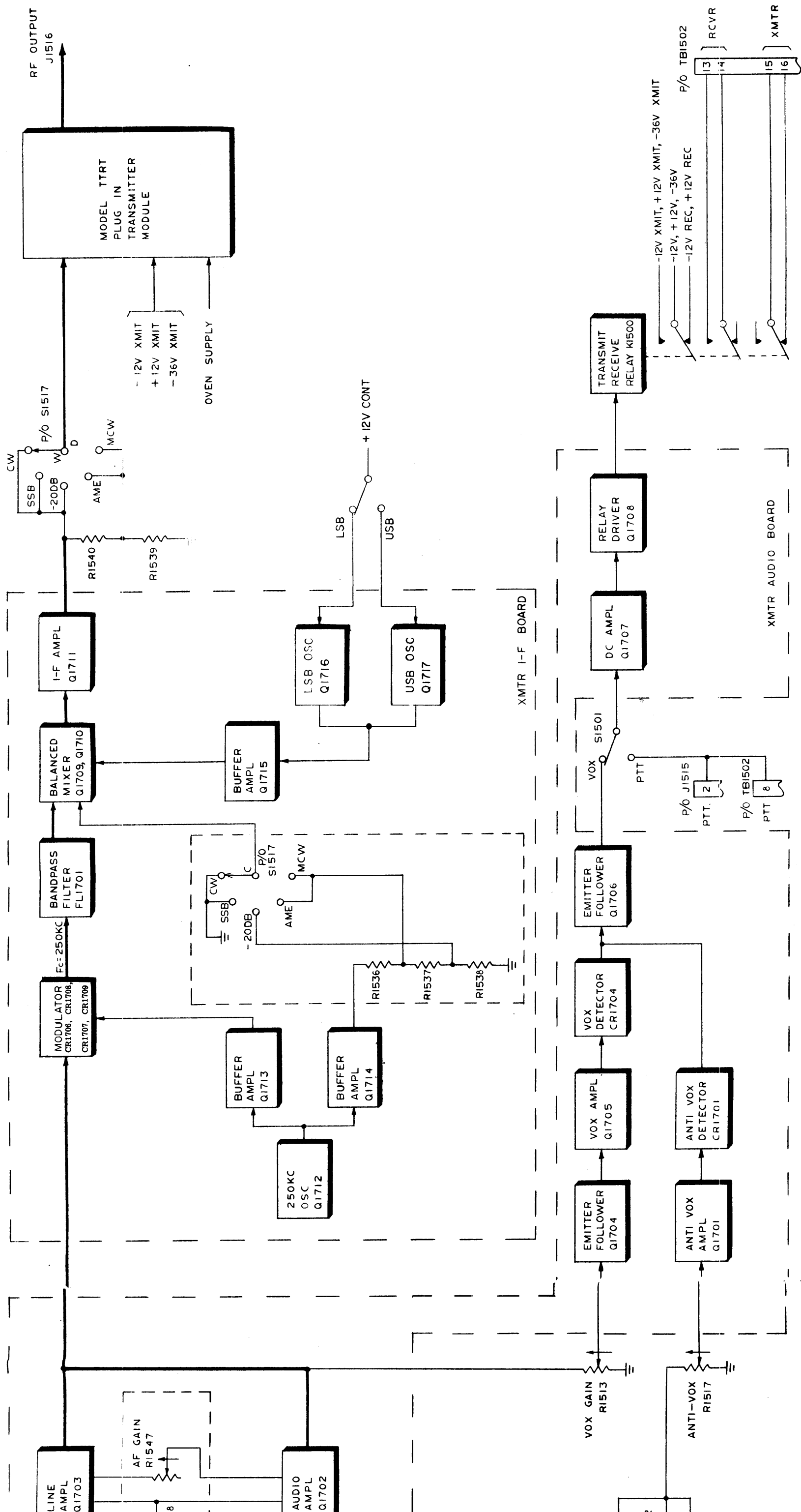
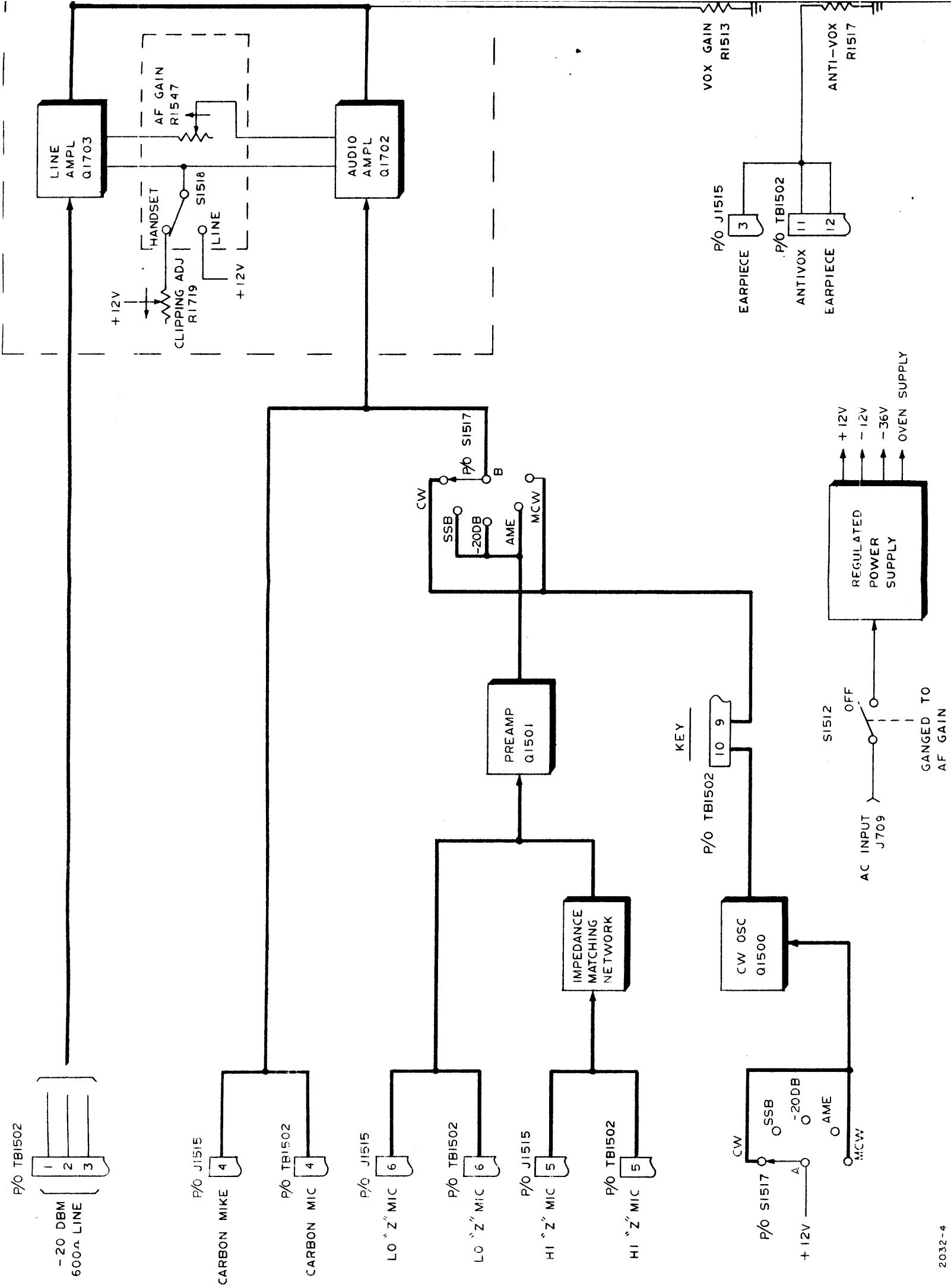
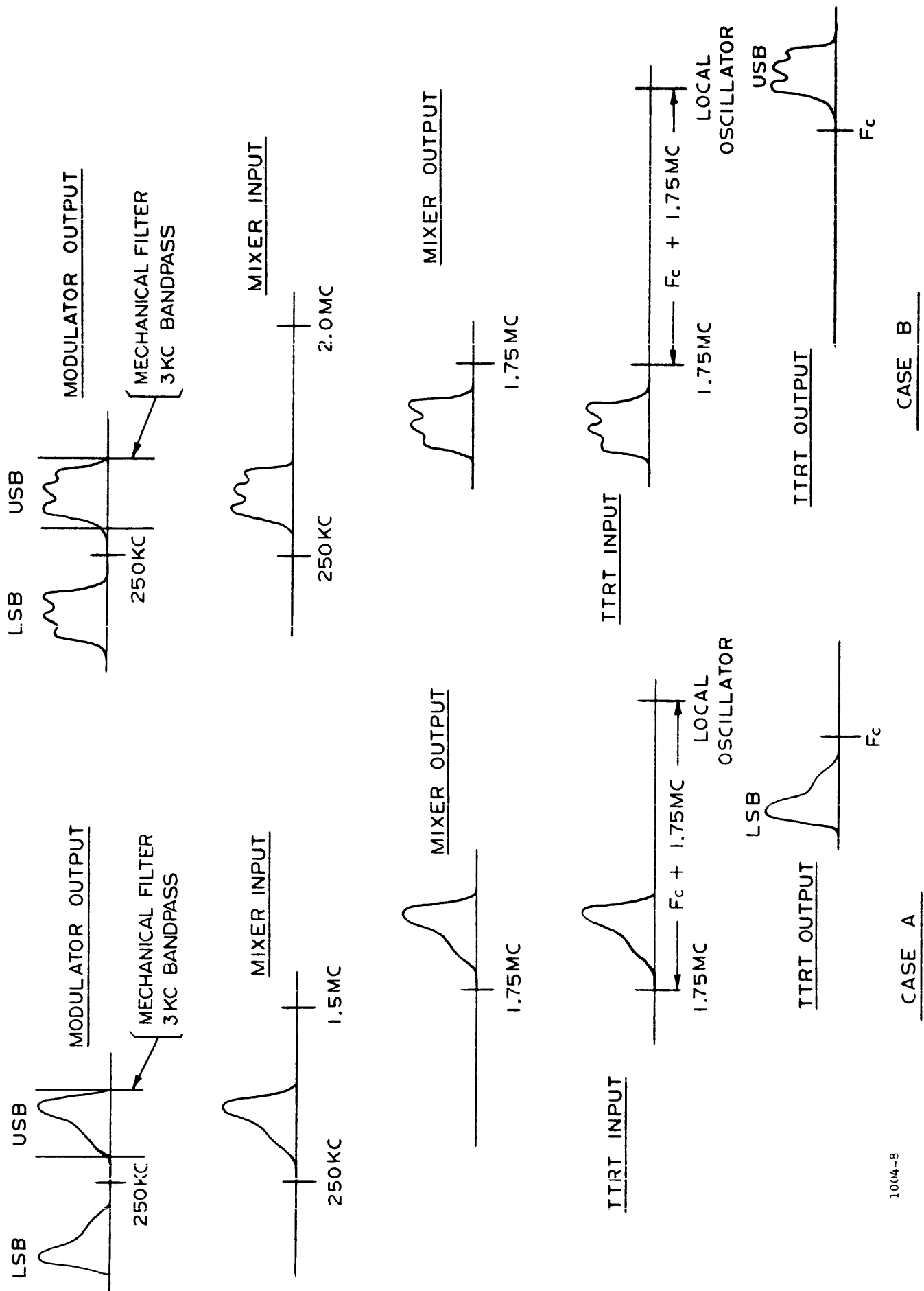


Figure 4-1. Sideband Strip Exciter STE, Block Diagram



2032-4

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008652032

1004-8

Figure 4-2. Frequency Inversion In SSB Transmission

In the CW, SSB, and 20DB modes, the signal is coupled directly through S1517. In the AM and MCW modes, the signal is attenuated by the voltage divider consisting of R1540 and R1539 to keep the power output level constant in spite of increased carrier level.

f. TTRT PLUG-IN MODULE. - The i-f signal from S1517 is supplied to the TTRT module. The TTRT module is fixed-tuned to a preselected 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 mc above the desired transmission frequency. Thus, the frequency spectrum of the i-f signal input is inverted as shown in the illustration. The bandpass of the r-f 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 J1516.

g. POWER SUPPLY. - The power supply produces regulated +12vdc, -12vdc, -36vdc for the operation of the STE. The power supply is energized by power switch S1512, which is ganged to the AF GAIN control.

SECTION 5 MAINTENANCE

5-1. PREVENTIVE MAINTENANCE.

Preventive maintenance of the STE consists of routine visual inspection and cleaning. Cleaning is necessary because dust may accumulate on certain components and not only reduce the 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 downtime 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: discolored components, leaking transformers and capacitors, dirty or pitted switch and relay contacts, warped 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.

Refer to figures 5-1, 5-2, and 5-3 to locate components on the printed circuit boards or chassis of the STE.

a. QUICK TEST USING FRONT-PANEL CONTROLS.

(1) **SIDEBAND TEST.** - Try to transmit with the USB/LSB switch set alternately at both of its positions. If transmission is possible on lower sideband only, the USB oscillator is defective.

(2) **VOX/PTT TEST.** - Set VOX/PTT switch at PTT. Close push-to-talk switch on microphone. Exciter should key as evidenced by a click as relay K1500 actuates. If the exciter does not key, the transmit/receive relay or relay driver is defective. Set PTT/VOX switch at VOX; rotate VOX GAIN control fully clockwise. Speak into microphone; 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 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 TB1502.

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

(3) Connect a jumper wire between terminals 7 and 8 of TB1502 to key exciter. Set LSB/USB switch at LSB. Measure r-f signal at junction of capacitors C1723 and C1724 on i-f board; level should be between 0.5 and 1.0 v rms. If this signal is not obtained, check LSB oscillator Q1716 and buffer Q1715.

(4) Set USB/LSB switch at USB. Measure r-f signal at junction of capacitors C1723 and C1724 on i-f board, level should be between 0.5 and 1.0 v rms. If this signal is not obtained, check USB oscillator Q1717.

(5) Measure r-f signal at arm of potentiometer R 1742 on i-f board, level should be approximately 2 v rms. If this level is not obtained, check carrier oscillator Q1712 and buffer Q1713.

(6) Remove crystal Y1701. Connect signal generator to terminals 1 and 3 of terminal board TB1502; adjust generator to deliver 78 mv (0.078 v) at 1 kc.

(7) Measure a-f signal across terminals 1 and 2 on a-f board; level should be approximately 10 mv (adjust XMTR AF GAIN control as necessary). If this signal is not obtained, check audio amplifier Q1702/Q1703.

(8) Connect signal generator to terminal 6 on TB1502 and ground; adjust generator to deliver 14 mv (0.014 v) at 1 kc. Signal across terminals 1 and 2 on a-f board should be as noted in step (7) above. If this signal is not obtained, check audio preamplifier Q1501.

(9) Set mode switch at CW. Connect jumper wire to terminals 11 and 12 on TB1502. Signal across terminals 1 and 2 on a-f board should be as noted in step (7) above. If this signal is not obtained, check CW oscillator Q1500.

(10) Replace crystal Y1701. Measure r-f signal at terminal 9 on i-f board; level should be approximately 45 mv (0.045 v). If this signal is not obtained, check balanced modulator, balanced mixer Q1709/Q1710, and i-f amplifier Q1711.

(11) Set mode switch at MCW. Observe r-f signal at terminal 9 on i-f board.

If scope pattern does not comply with figure 5-4d, check buffer amplifier Q1714.

5-3. REPAIR.

In most cases, the repair of the STE will consist of the replacement of an electrical component. Although no special instruction is required to accomplish this, the following hints 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 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.

a. Disconnect all external wiring from TB1502.

b. Connect a jumper wire between terminals 11 and 12 on TB1502.

c. Connect one end of a jumper wire to terminal 8 on TB1502.

d. Connect an a-f signal generator to terminals 1 and 3 on TB1502; adjust signal generator to deliver 78 mv at 1 kc.

e. Set POWER switch at ON; set mode switch at SSB.

f. Rotate AF GAIN control fully clockwise. Connect oscilloscope to terminals 1 and 2 on transmitter a-f board; adjust R1718 to obtain 10 mv rms between terminals 1 and 2.

g. Set mode switch at CW. Adjust R1553 (on CW oscillator board) to obtain 10 mv mcs between terminals 1 and 2 on the audio board.

h. Connect oscilloscope to terminal 9 on the i-f board. Ground terminal 8 of TB1502 with clip lead.

i. Adjust R1555, C1762, C1725, and C1730 to obtain maximum signal at terminals 9 of i-f board.

j. Set USB/LSB switch at LSB. Adjust R1554 to obtain maximum signal at terminal 9 of i-f board.

k. Remove jumper from terminals 11 and 12 of TB1502.

l. Adjust R1742 and C1715 to obtain minimum signal at terminal 9 of i-f board.

m. Connect oscilloscope to base of Q1703; adjust R1748 to obtain minimum signal at this point.

n. Re-connect jumper between terminals 11 and 12 of TB1502

o. Set mode switch at SSB. Make sure that output of a-f signal generator is exactly 1000 cps. Connect frequency counter to terminal 9 of i-f board; adjust C1746 until frequency of signal at terminal 9 is 1751 kc ± 2 cps.

p. Set USB/LSB switch at USB. Adjust C1749 until frequency of signal at terminal 9 is 1749 kc ± 2 cps. Disconnect frequency counter.

q. If necessary, align TTRT module as outlined in the TTRT equipment manual. Measure signal at RF OUT jack; level should be 3.5 v peak-to-peak.

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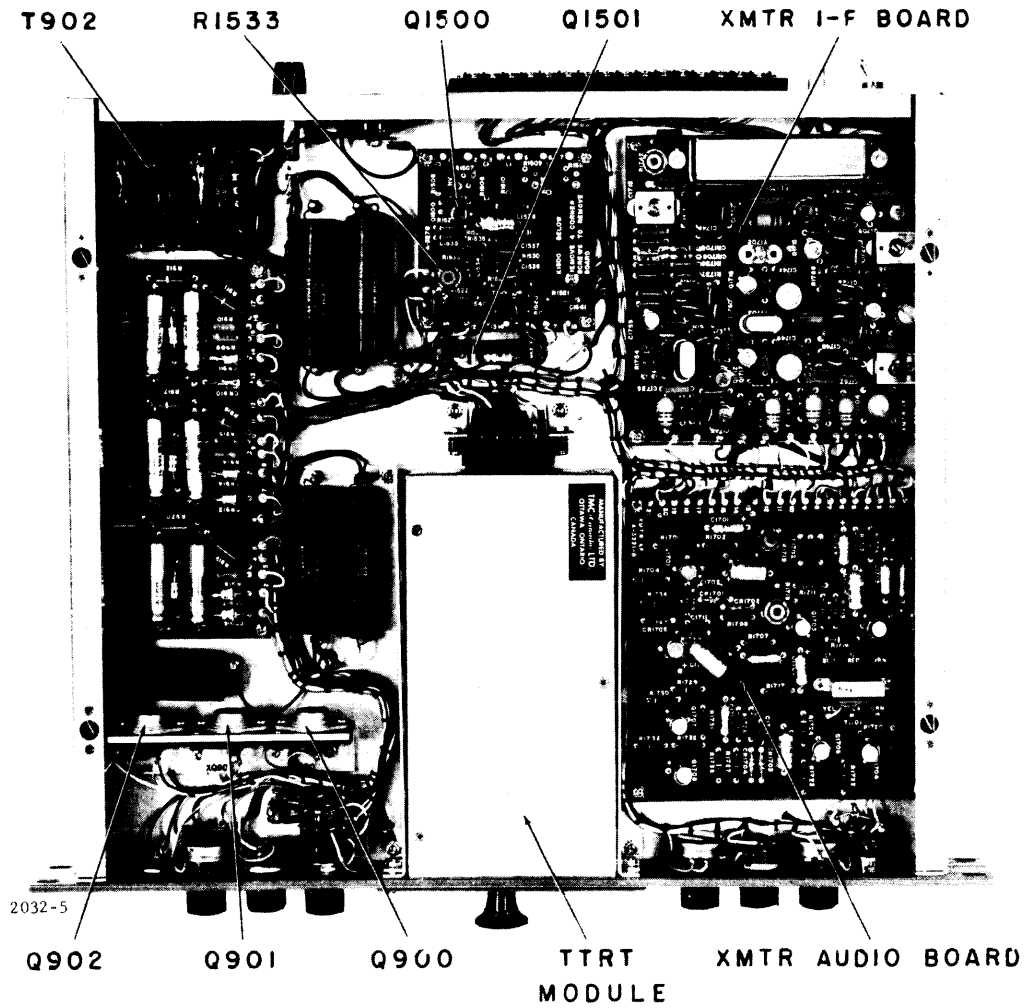


Figure 5-1. STE, Top View

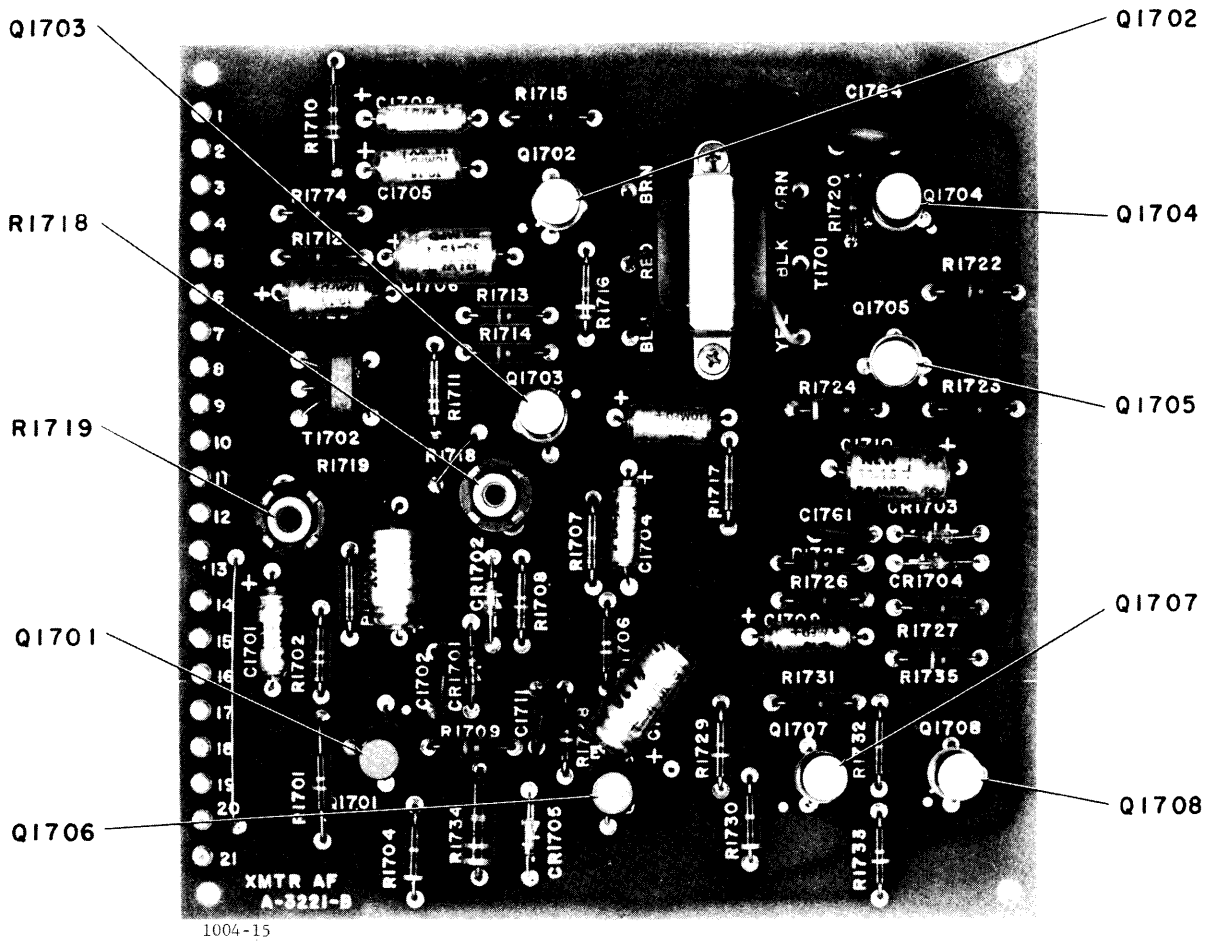
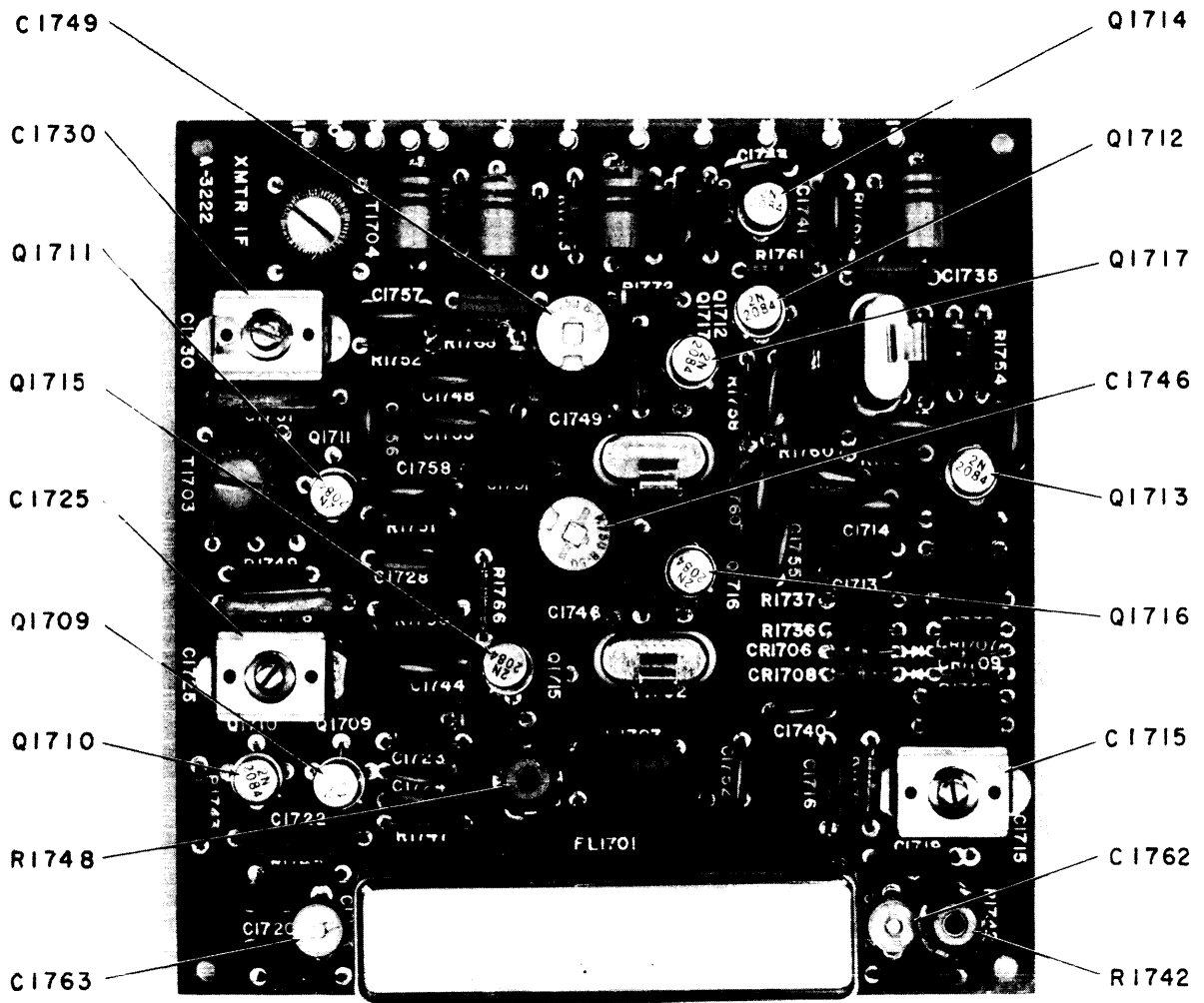
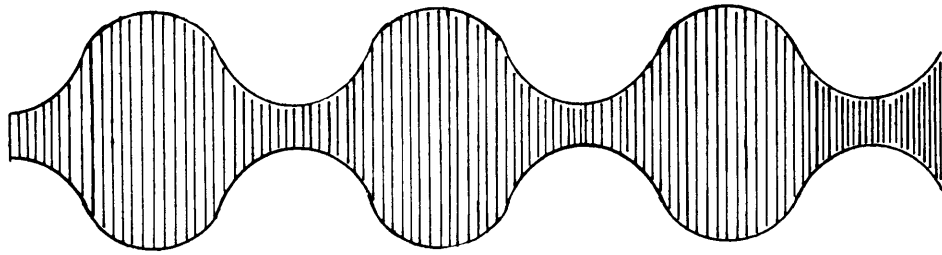


Figure 5-2. Xmtr Audio Board, Top View

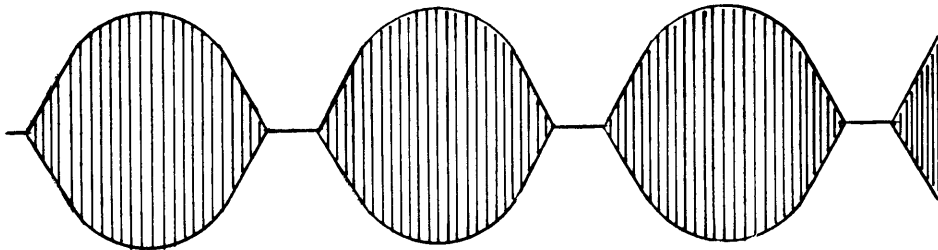


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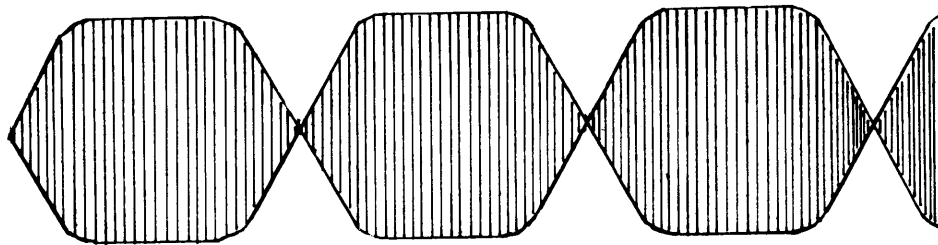
Figure 5-3. Xmtr I-f Board, Top View



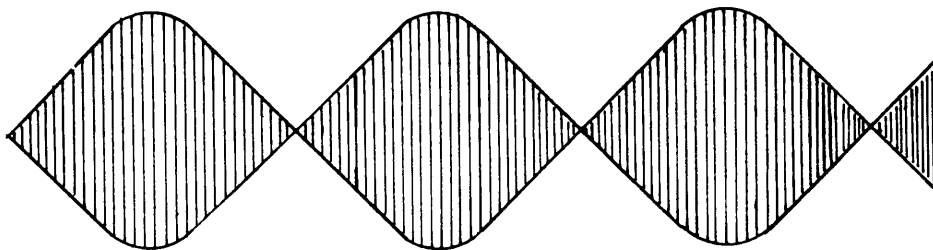
(a) INCORRECT SIDEBAND/CARRIER POWER RATIO



(b) EXCESSIVE DISTORTION (NEGATIVE CLIPPING)



(c) EXCESSIVE DISTORTION (POSITIVE CLIPPING)



(d) CORRECT MODULATION ENVELOPE

1004-10

Figure 5-4. Modulation Envelopes

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 making 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.

Assembly or Sub-assembly	Page
Power Supply, Main Chassis (Symbol Series 900)	6-1
Main Chassis (Symbol Series 1500)	6-4
IF and Audio Transmitter Boards (Symbol Series 1700)	6-7

POWER SUPPLY, MAIN CHASSIS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C900 thru C906	NOT USED	
C907	CAPACITOR, FIXED, ELECTROLYTIC: 2,000 uf, 25 WVDC; polarized; hermetically sealed aluminum case with clear vinyl plastic sleeve.	CE116-5VN
C908	CAPACITOR, FIXED, ELECTROLYTIC: 100 uf, -10% +150% at 120 cps at 25°C; 25 WVDC; polarized; insulated tubular case.	CE105-100-25
C909	Same as C908.	
C910	Same as C907.	
C911	Same as C907.	
C912	Same as C908.	
C913	Same as C908.	
C914	NOT USED	
C915	CAPACITOR, FIXED, ELECTROLYTIC: 20 uf, -10% +150% at 120 cps at 25°C; 100 WVDC; polarized; insulated tubular case.	CE105-20-100
C916	Same as C915.	
C917	Same as C915.	
C918	CAPACITOR, FIXED, ELECTROLYTIC: 25 uf, -10% +150% at 120 cps at 25°C; 50 WVDC; polarized; insulated tubular case.	CE105-25-50
C919	NOT USED	
C920	NOT USED	

POWER SUPPLY, MAIN CHASSIS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C921	CAPACITOR, FIXED, ELECTROLYTIC: 100 uf, 150 WVDC; polarized; hermetically sealed aluminum case with clear vinyl plastic sleeve.	CE116-7VN
CR900 thru CR909	NOT USED	
CR910	SEMICONDUCTOR DEVICE, DIODE: silicon; 600 V max, peak inverse voltage; 0.75 max. DC forward amperes at 150°C.	1N547
CR911	Same as CR910.	
CR912	SEMICONDUCTOR DEVICE, DIODE: silicon; nom. ref. voltage 12 V; max. power dissipation 1 watt at 25°C; current rating 21 ma; max. impedance 9 ohms; hermetically sealed metal case.	1N3022B
CR913	Same as CR910.	
CR914	Same as CR910.	
CR915	Same as CR912.	
CR916	Same as CR910.	
CR917	Same as CR910.	
CR918	SEMICONDUCTOR DEVICE, DIODE: Zener; nom. voltage 36 volts; current rating 7.0 ma; max. impedance 50 to 100 ohms, 0.25 ma; max. reverse current 5 ua; max. DC current 24 ma; junction-storage temperature range -65°C to +175°C; hermetically sealed metal and glass welded case.	1N3033B
F900 thru F906	NOT USED	
F907	FUSE, CARTRIDGE: 1/4 amp; time lag; 1-1/4" lg. x 1/4" dia.; slow blow. (For 115 VAC operation)	FU102-.250
F907	FUSE, CARTRIDGE: 1/8 amp; time lag; 1-1/4" lg. x 1/4" dia.; slow blow. (For 208/230 VAC operation)	FU102-.125
J900 thru J903	NOT USED	
J904	CONNECTOR, RECEPTACLE, ELECTRICAL: male; polarized; rated for 10 amps, 250 V or 5 amps, 125 V; midget size, twist lock.	JJ299
L900	NOT USED	
L901	NOT USED	
L902	COIL, RADIO FREQUENCY: fixed; 3 PI; 1 mh inductance; 23 ohms, +10% resistance; current rating 75-100 ma max.	CL101-2
L903	Same as L902	
L904	Same as L902	

POWER SUPPLY, MAIN CHASSIS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
Q900	TRANSISTOR: germanium; base 50 V; emitter 40 V; power dissipation 90 watts at 25°C; normal operating temperature range -65°C to +100°C; load resistance 2.2 ohms, collector current 3 amps, base current .013 amps; 1.56" lg. x 1.05" wide x 0.32" high; male plug-in type.	2N350A
Q901	Same as Q900.	
Q902	Same as Q900.	
R900 thru Q908	NOT USED	
R909	RESISTOR, FIXED, WIREWOUND: 10 ohms, $\pm 5\%$; 3 watts	RW123-100J
R910	Same as R909.	
R911	RESISTOR, FIXED, COMPOSITION: 100 ohms $\pm 10\%$; 1 watt.	RC32GF101K
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: 1,000 ohms, $\pm 10\%$; 1 watt.	RC32GF102K
R920	Same as R919.	
R921	Same as R919.	
T900	NOT USED	
T901	NOT USED	
T902	TRANSFORMER, POWER, STEP-DOWN: primary input (#1) 104/115 or 208/230 VAC; secondary (#1, #2) 24 volts at 300 ma, (#3) 80 volts at 100 ma, CT; 15 solder lug type terminals; open frame case.	TF298
XF900 thru XF906	NOT USED	
XF907	FUSEHOLDER: extractor post type, moveable end terminals.	FH100-1
XQ900	SOCKET, SEMICONDUCTOR DEVICE: 2 pin contract accommodation, 0.040 or 0.050 dia. ; polarized; 1 terminal lug grounding strap; o/a dimensions 1-37/64" x 1" max.	TS166-S1
XQ901	Same as XQ900.	
XQ902	Same as XQ900.	

MAIN CHASSIS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1500	CAPACITOR, FIXED, ELECTROLYTIC: 2,000 uf, 25 WVDC; polarized; hermetically sealed aluminum case with clear vinyl plastic sleeve.	CE116-5VN
C1501 thru C1533	NOT USED	
C1534	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10,000 uuf, GMV; 500 WVDC.	CC100-16
C1535	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 200,000 uuf, +80% -20%; 25 WVDC.	CC100-33
C1536	Same as C1534.	
C1537	Same as C1534.	
C1538	CAPACITOR, FIXED, ELECTROLYTIC: 50 uf, -10% +150% at 120 cps at 25°C; 15 WVDC; polarized; insulated tubular case.	CE105-50-15
C1539	NOT USED	
C1540	NOT USED	
C1541	CAPACITOR, FIXED, MICA DIELECTRIC: 39 uuf, +5%; 500 WVDC; char. C.	CM15C390J
C1542	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 5,000 uuf, GMV; 500 WVDC.	CC100-15
C1543	Same as C1535.	
C1544	CAPACITOR, FIXED, ELECTROLYTIC: 5 uf, -10% +150% at 120 cps at 25°C; 15 WVDC; polarized; insulated tubular case.	CE105-5-15
DS1500	NOT USED	
DS1501	LAMP, INCANDESCENT: single contact, rated for 28.0 VAC/VDC, 0.04 amps; T-3-1/4 bulb.	BI110-7
J1500 thru J1506	NOT USED	
J1507	CONNECTOR, RECEPTACLE, ELECTRICAL: printec circuit board type; 20 female contacts, 5 amps continuous current rating; 600 V RMS.	JJ287-20
J1508 thru J1514	NOT USED	
J1515	CONNECTOR, RECEPTACLE, ELECTRICAL: 6 #20 female contacts; straight type.	JJ212
J1516	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 round female contact, straight type; series BNC to BNC.	JJ172

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
K1500	RELAY, ARMATURE: 6PDT; 185 ohms, +10% DC resistance; operating voltage 12 VDC; current rating 60 ma; 700 mu at 25°C; 18 contacts rated for 2 amps at 20 VDC resistance; clear high impact styrene dust cover case.	RL156-6
Q1500	TRANSISTOR: germanium; NPN; JEDEC type 2N1308 transistor with a controlled hfe limit of 80-150; JEDEC type T05 case.	TX106
Q1501	Same as Q1500.	
R1500 thru R1512	NOT USED	
R1513	RESISTOR, VARIABLE, COMPOSITION: 10,000 ohms, ±10%; 2 watts; taper A.	RV4NAYSA-103AYY
R1514 thru R1516	NOT USED	
R1517	RESISTOR, VARIABLE, COMPOSITION: 500 ohms, +10%; 2 watts; taper A.	RV4NAYSA-501AYY
R1518	NOT USED	
R1519	NOT USED	
R1520	RESISTOR, FIXED, COMPOSITION: 68 ohms, ±5%; 1/2 watt.	RC20GF680J
R1521	Same as R1520.	
R1522	RESISTOR, FIXED, COMPOSITION: 10,000 ohms, ±5%; 1/2 watt.	RC20GF103J
R1523	Same as R1522.	
R1524	RESISTOR, FIXED, COMPOSITION: 3,900 ohms, ±5%; 1/2 watt.	RC20GF392J
R1525	Same as R1524.	
R1526	Same as R1522.	
R1527	RESISTOR, FIXED, COMPOSITION: 43,000 ohms, ±5%; 1/2 watt.	RC20GF433J
R1528	RESISTOR, FIXED, COMPOSITION: 4,700 ohms, ±5%; 1/2 watt.	RC20GF472J
R1529 thru R1531	Same as R1528.	
R1532	RESISTOR, FIXED, COMPOSITION: 1,800 ohms, ±5%; 1/2 watt.	RC20GF182J
R1533	RESISTOR, VARIABLE, COMPOSITION: 10,000 ohms +10%; nom. power rating 0.25 watt at 70°C; counter clockwise modified log.	RV111B103A
R1534	NOT USED	
R1535	RESISTOR, FIXED, COMPOSITION: 47,000 ohms, ±5%; 1/2 watt.	RC20GF473J

MAIN CHASSIS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R1536	RESISTOR, FIXED, COMPOSITION: 10,00 ohms, $\pm 10\%$; 1/2 watt.	RC20GF103K
R1537	RESISTOR, FIXED, COMPOSITION: 110,000 ohms, $\pm 10\%$; 1/2 watt.	RC20GF114K
R1538	Same as R1536.	
R1539	RESISTOR, FIXED, COMPOSITION: 47 ohms, $\pm 10\%$; 1/2 watt.	RC20GF470K
R1540	RESISTOR, FIXED, COMPOSITION: 75 ohms, $\pm 10\%$; 1/2 watt.	RC20GF750K
R1541	RESISTOR, FIXED, COMPOSITION: 330 ohms, $\pm 10\%$; 1/2 watt.	RC20GF331K
R1542	RESISTOR, FIXED, COMPOSITION: 1 megohm, $\pm 5\%$; 1/2 watt.	RC20GF105J
R1543 thru R1546	NOT USED	
R1547	RESISTOR, VARIABLE, COMPOSITION: 5,000 ohms, $\pm 10\%$; 2 watts; taper A; includes a SPST normally open switch, symbol number S1512.	RV4NBYS-A-502AYY
R1548	RESISTOR, FIXED, COMPOSITION: 330,000 ohms, $\pm 10\%$; 1/2 watt.	RC20GF334K
R1549	RESISTOR, FIXED, COMPOSITION: 22 ohms, $\pm 10\%$; 1/2 watt.	RC20GF220K
R1550	RESISTOR, FIXED, COMPOSITION: 1,800 ohms, $\pm 10\%$; 1/2 watt.	RC20GF182K
R1551	RESISTOR, FIXED, COMPOSITION: 33,000 ohms, $\pm 10\%$; 1/2 watt.	RC20GF333K
R1552	NOT USED	
R1553	NOT USED	
R1554	RESISTOR, VARIABLE, COMPOSITION: 50,000 ohms, $\pm 20\%$; continuous power rating 0.5 watt at 70°C; 350 V RMS; linear taper.	RV106UX8B-503B
R1555	Same as R1554.	
R1556	RESISTOR, FIXED, COMPOSITION: 100,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF104J
S1500	NOT USED	
S1501	SWITCH, ROTARY: tap; 1 deck, 2 non-shortening type contacts; AC current type; max. voltage 115 V; max. current switching capacity 1 amp resistive; 10 amps continuous current rating; solder lug type terminals.	SW336-1
S1502	Same as S1501.	
S1503 thru S1511	NOT USED	
S1512	See symbol number R1547.	
S1513 thru S1516	NOT USED	

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REF SYMBOL	DESCRIPTION	TMC PART NUMBER
S1517	SWITCH , ROTARY: tap.	SW375-1
S1518	SWITCH, TOGGLE: SPDT; nom. current rating 1 amp at 250 VAC/VDC or 3 amps at 125 VAC/VDC; lug end type terminals; bat type toggle.	ST103-11-62
T1500	NOT USED	
T1501	TRANSFORMER, AUDIO FREQUENCY: primary impedance 200,000 ohms, 6,500 ohms DC resistance; secondary impedance 1,000 ohms, 245 ohms DC resistance; frequency range 100 cps to 20 kc; fully enclosed black molded epoxy case.	TF246-6X
TB1500	NOT USED	
TB1501	NOT USED	
TB1502	TERMINAL BOARD, BARRIER: 16 terminals; 6-32 thd. x 1/4" long binder head screws; phenolic black bakelite.	TM100-16
XDS1500	NOT USED	
XDS1501	LIGHT, INDICATOR: with white translucent lens; sub-miniature type.	TS153-5

IF AND AUDIO TRANSMITTER BOARDS

C1701	CAPACITOR, FIXED, ELECTROLYTIC: 6 uf, -10% +150% at 120 cps at 25°C; 15WVDC; polarized; insulated tubular case.	CE105-6-15
C1702	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 200,000 uuf, +80% -20%; 25 WVDC.	CC100-33
C1703	CAPACITOR, FIXED, ELECTROLYTIC: 50 uf, -10% +150% at 120 cps at 25°C; 15 WVDC; polarized, insulated tubular case.	CE105-50-15
C1704	Same as C1701.	
C1705	CAPACITOR, FIXED, ELECTROLYTIC: 10 uf, -10% +150% at 120 cps at 25°C; 15 WVDC; polarized, insulated tubular case.	CE105-10-15
C1706	Same as C1703.	
C1707	Same as C1705.	
C1708	CAPACITOR, FIXED, ELECTROLYTIC: 4 uf, -10% +150% at 120 cps at 25°C; 15 WVDC; polarized; insulated tubular case.	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 cps at 25°C; 15 WVDC; polarized; insulated tubular case.	CE105-20-15

IF AND AUDIO TRANSMITTER BOARDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1713	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10,000 uuf, GMV; 500 WVDC.	CC100-16
C1714	Same as C1713.	
C1715	CAPACITOR, VARIABLE MICA DIELECTRIC: 280 uuf max. when tight, 25 uuf max. at 3 turns; 175 WVDC.	CV114-1
C1716	CAPACITOR, FIXED, MICA DIELECTRIC: 160 uuf, $\pm 5\%$; 500 WVDC; char. F.	CM15F161J
C1717	CAPACITOR, FIXED, MICA DIELECTRIC: 100 uuf, $\pm 5\%$; 500 WVDC; char. F.	CM15F101J
C1718	CAPACITOR, FIXED, MICA DIELECTRIC: 180 uuf, $\pm 5\%$; 500 WVDC; char. F.	CM15F181J
C1719	Same as C1718.	
C1720	CAPACITOR, FIXED, MICA DIELECTRIC: 180 uuf, $\pm 2\%$; 500 WVDC; straight wire leads.	CM111D181G5S
C1721	Same as C1720.	
C1722	CAPACITOR, FIXED, MICA DIELECTRIC: 1,000 uuf, $\pm 2\%$; 500 WVDC; char. F.	CM20F102S
C1723	Same as C1702.	
C1724	Same as C1702.	
C1725	Same as C1715.	
C1726	CAPACITOR, FIXED, MICA DIELECTRIC: 1,500 uuf, $\pm 2\%$; 500 WVDC; char. F.	CM100-10
C1727	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 100,000 uuf, $+80\%$ - 20% ; 100 WVDC.	CC100-28
C1728	Same as C1702.	
C1729	Same as C1705.	
C1730	Same as C1715.	
C1731	Same as C1726.	
C1732	Same as C1727.	
C1733	CAPACITOR, FIXED, MICA DIELECTRIC: 47 uuf, $\pm 5\%$; 500 WVDC; char. C.	CM15C470J
C1734	NOT USED.	
C1735	CAPACITOR, FIXED, MICA DIELECTRIC: 270 uuf, $\pm 5\%$; 500 WVDC; char. F.	CM15F271J
C1736	CAPACITOR, FIXED, MICA DIELECTRIC: 5,100 uuf, $\pm 10\%$; 300 WVDC; straight wire leads.	CM112E512K3S

IF AND AUDIO TRANSMITTER BOARDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1737	Same as C1702.	
C1738	Same as C1727.	
C1739	Same as C1702.	
C1740	Same as C1713.	
C1741	Same as C1727.	
C1742	Same as C1702.	
C1743	Same as C1713 .	
C1744	Same as C1727.	
C1745	Same as C1722.	
C1746	CAPACITOR, VARIABLE, CERAMIC DIELECTRIC: 8-50 uuf; operating temperature range -55°C to +85°C; 350 WVDC.	CV109-6
C1747	CAPACITOR, FIXED, MICA DIELECTRIC: 24 uuf, $\pm 5\%$; 500 WVDC; char. C.	CM15C240J
C1748	Same as C1727.	
C1749	Same as C1746.	
C1750	Same as C1747.	
C1751	Same as C1735.	
C1752	Same as C1702.	
C1753	Same as C1727.	
C1754	Same as C1735.	
C1755	Same as C1702.	
C1756 thru C1760	Same as C1727.	
C1761	Same as C1702.	
C1762	CAPACITOR, VARIABLE, CERAMIC DIELECTRIC: 9-35 uuf; operating temperature range -55°C to +125°C; 100 WVDC.	CV112-2
C1763	Same as C1762.	
C1764	Same as C1702.	

IF AND AUDIO TRANSMITTER BOARDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
CR1701	SEMICONDUCTOR DEVICE, DIODE: germanium; max. peak inverse voltage 60 V; continuous average forward current 50 ma; max. peak forward 150 ma; max. surge current 500 ma; max. inverse current 500 ua at 50 volts on 30 ua at 10 volts.	1N34A
CR1702 thru CR1709	Same as CR1701.	
FL1701	FILTER, BANDPASS: operating freq. 250 KC; bandwidth, 250.3-253.3 KC; input and output imped. 100 K ohms nom.; hermetically sealed brass case.	FX195-1
L1701	COIL RADIO FREQUENCY: fixed; .220 uh, $\pm 10\%$; current rating 200 ma; molded case.	CL140-6
L1702 thru L1705	Same as L1701.	
Q1701	TRANSISTOR: germanium; NPN; JEDEC type 2N1308 transistor with a controlled hfe limit of 80-150; JEDEC type T05 case.	TX106
Q1702	TRANSISTOR: germanium; PNP; JEDEC type 2N1370 transistor with a controlled hfe limit of 60-75; JEDEC type T09 case.	TX107
Q1703 thru Q1705	Same as Q1702.	
Q1706	Same as Q1701.	
Q1707	Same as Q1702.	
Q1708	TRANSISTOR: germanium; PNP; max. collector dissipation 300 mw; fab. = 6 mc; collector current 1 ma; collector cut-off current 100 ua hfe limit 80.	2N2001
Q1709	TRANSISTOR: germanium; PNP; JEDEC type 2N2084 transistor with a controlled hfe limit of 100-150; JEDEC type T033 case.	TX109
Q1710 thru Q1717	Same as Q1709.	
R1701	RESISTOR, FIXED, COMPOSITION: 22,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF223J
R1702	RESISTOR, FIXED, COMPOSITION: 10,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF103J
R1703	NOT USED	
R1704	RESISTOR, FIXED, COMPOSITION: 4,700 ohms, $\pm 5\%$; 1/2 watt.	RC20GF472J
R1705	RESISTOR, FIXED, COMPOSITION: 2,200 ohms, $\pm 5\%$; 1/2 watt.	RC20GF222J
R1706	Same as R1702.	
R1707	Same as R1705.	
R1708	RESISTOR, FIXED, COMPOSITION: 68,00 ohms, $\pm 5\%$; 1/2 watt.	RC20GF683J

IF AND AUDIO TRANSMITTER BOARDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R1709	Same as R1702.	
R1710	RESISTOR, FIXED, COMPOSITION: 3,300 ohms, $\pm 5\%$; 1/2 watt.	RC20GF332J
R1711	Same as R1710.	
R1712	RESISTOR, FIXED, COMPOSITION: 220 ohms, $\pm 5\%$; 1/2 watt.	RC20GF221J
R1713	Same as R1702.	
R1714	Same as R1702.	
R1715	RESISTOR, FIXED, COMPOSITION: 8,200 ohms, $\pm 5\%$; 1/2 watt.	RC20GF822J
R1716	RESISTOR, FIXED, COMPOSITION: 3,900 ohms, $\pm 5\%$; 1/2 watt.	RC20GF392J
R1717	RESISTOR, FIXED, COMPOSITION: 1,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF102J
R1718	RESISTOR, VARIABLE, COMPOSITION: 500 ohms, $\pm 10\%$; nom. power rating 0.25 watt at 70°C; linear taper.	RV111U501A
R1719	RESISTOR, VARIABLE, COMPOSITION: 250,000 ohms, $\pm 10\%$; nom. power rating 0.25 watt at 70°C; linear taper.	RV111U254A
R1720	RESISTOR, FIXED, COMPOSITION: 1.5 megohms, $\pm 5\%$; 1/2 watt.	RC20GF155J
R1721	NOT USED	
R1722	Same as R1702.	
R1723	RESISTOR, FIXED, COMPOSITION: 5,600 ohms, $\pm 5\%$; 1/2 watt.	RC20GF562J
R1724	Same as R1704.	
R1725	Same as R1702.	
R1726	Same as R1717.	
R1727	Same as R1723.	
R1728	RESISTOR, FIXED, COMPOSITION: 100,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF104J
R1729	RESISTOR, FIXED, COMPOSITION: 150,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF154J
R1730	Same as R1704.	
R1731	Same as R1705.	
R1732	Same as R1715.	
R1733	Same as R1729.	
R1734	RESISTOR, FIXED, COMPOSITION: 33 ohms, $\pm 5\%$; 1 watt.	RC32GF330J
R1735	Same as R1729.	
R1736 thru R1739	Same as R1717.	

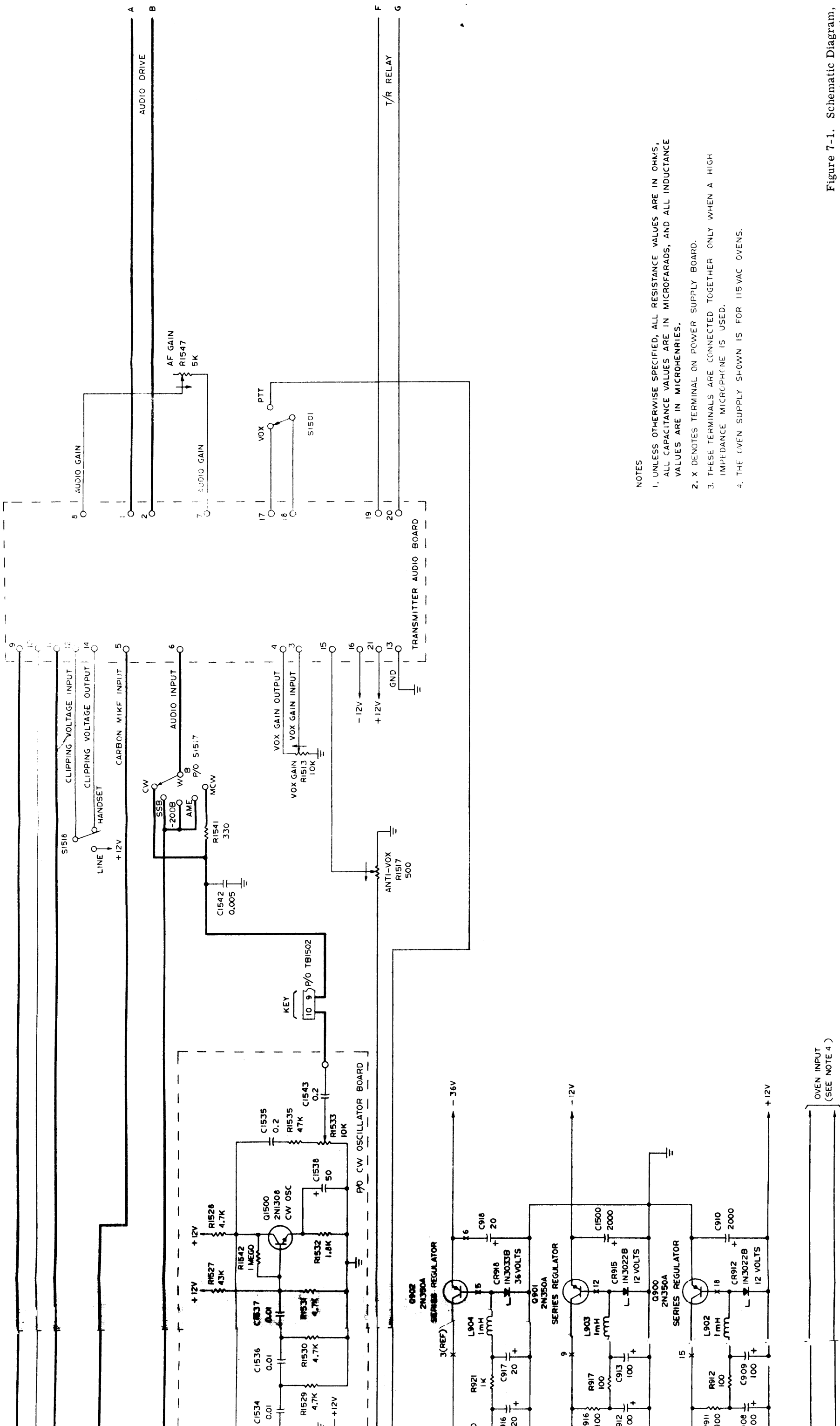
IF AND AUDIO TRANSMITTER BOARDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R1740	RESISTOR, FIXED, COMPOSITION: 330 ohms, $\pm 5\%$; 1/2 watt.	RC20GF331J
R1741	Same as R1740.	
R1742	RESISTOR, VARIABLE, COMPOSITION: 10,000 ohms, $\pm 10\%$; nom. power rating 0.25 watt at 70°C; linear taper.	RV111U103A
R1743	RESISTOR, FIXED, COMPOSITION: 30,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF303J
R1744	Same as R1717.	
R1745	Same as R1717.	
R1746	Same as R1702.	
R1747	Same as R1702.	
R1748	Same as R1742.	
R1749	Same as R1702.	
R1750	Same as R1717.	
R1751	Same as R1704.	
R1752	Same as R1717.	
R1753	NOT USED	
R1754	Same as R1717.	
R1755	Same as R1704.	
R1756	Same as R1717.	
R1757	Same as R1717.	
R1758	Same as R1702.	
R1759	RESISTOR, FIXED, COMPOSITION: 22 ohms, $\pm 5\%$; 1/2 watt.	RC20GF220J
R1760	Same as R1704.	
R1761	Same as R1710.	
R1762	Same as R1717.	
R1763	Same as R1717.	
R1764	Same as R1759.	
R1765	Same as R1704.	
R1766	Same as R1717.	
R1767	Same as R1704.	
R1768	Same as R1717.	
R1769	Same as R1704.	

IF AND AUDIO TRANSMITTER BOARDS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R1770	Same as R1702.	
R1771	Same as R1717.	
R1772	Same as R1704.	
R1773	Same as R1702.	
R1774	RESISTOR, FIXED, COMPOSITION: 100 ohms, $\pm 5\%$; 1/2 watt.	RC20GF101J
T1701	TRANSFORMER, AUDIO FREQUENCY: fixed; primary impedance 25,000 ohms, CT; DC resistance 1,550 ohms, $\pm 20\%$; secondary impedance 1,200 ohms, CT; DC resistance 88 ohms, $\pm 20\%$; operating frequency range 200 to 15,000 cps; frequency response ± 3 db at 250 to 3,500 cps.	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 cps to 20 KC; miniature open frame type, lacquer coated.	TF246-17Z
T1703	TRANSFORMER, INTERMEDIATE FREQUENCY: fixed; operating frequency 1.75 mc; nom. primary inductance 5.5 uh, ± 0.300 uh; 5 terminals, wire lead type.	TZ124
T1704	TRANSFORMER, INTERMEDIATE FREQUENCY: fixed; operating frequency 1.75 mc; nom. primary inductance 5.0 uh, ± 0.250 uh; 4 terminals, wire lead type.	TZ125
XY1701	SOCKET, CRYSTAL: 2 silver plated beryllium copper contacts; for crystals having a 0.050 pin dia. and 0.486 spacing between pins.	TS104-2
XY1702	Same as XY1701.	
XY1703	Same as XY1701.	
Y1701	CRYSTAL UNIT, QUARTZ: 250 KC, $\pm 0.002\%$; operating temperature range 75°C , $+5^{\circ}\text{C}$; parallel resonance; load capacitance 20 uuf, ± 0.5 uuf; HC-6/U type holder.	CU47A/U250.000 KC
Y1702	CRYSTAL UNIT, QUARTZ: 2 MC, $\pm 0.005\%$; operating temperature range -55°C to $+30^{\circ}\text{C}$; max. capacitance 7.0 uuf; parallel resonance; load capacitance 32.0 uuf, ± 0.5 uuf; HC-6/U type holder.	CR18A/U2.000 000 MC
Y1703	CRYSTAL UNIT, QUARTZ: 1.5 MC, $\pm 0.005\%$; operating temperature range -55°C to $+30^{\circ}\text{C}$; max. capacitance 7.0 uuf; parallel resonance; load capacitance 32.0 uuf, ± 0.5 uuf; HC-6/U type holder.	CR18A/U1.500 000 MC

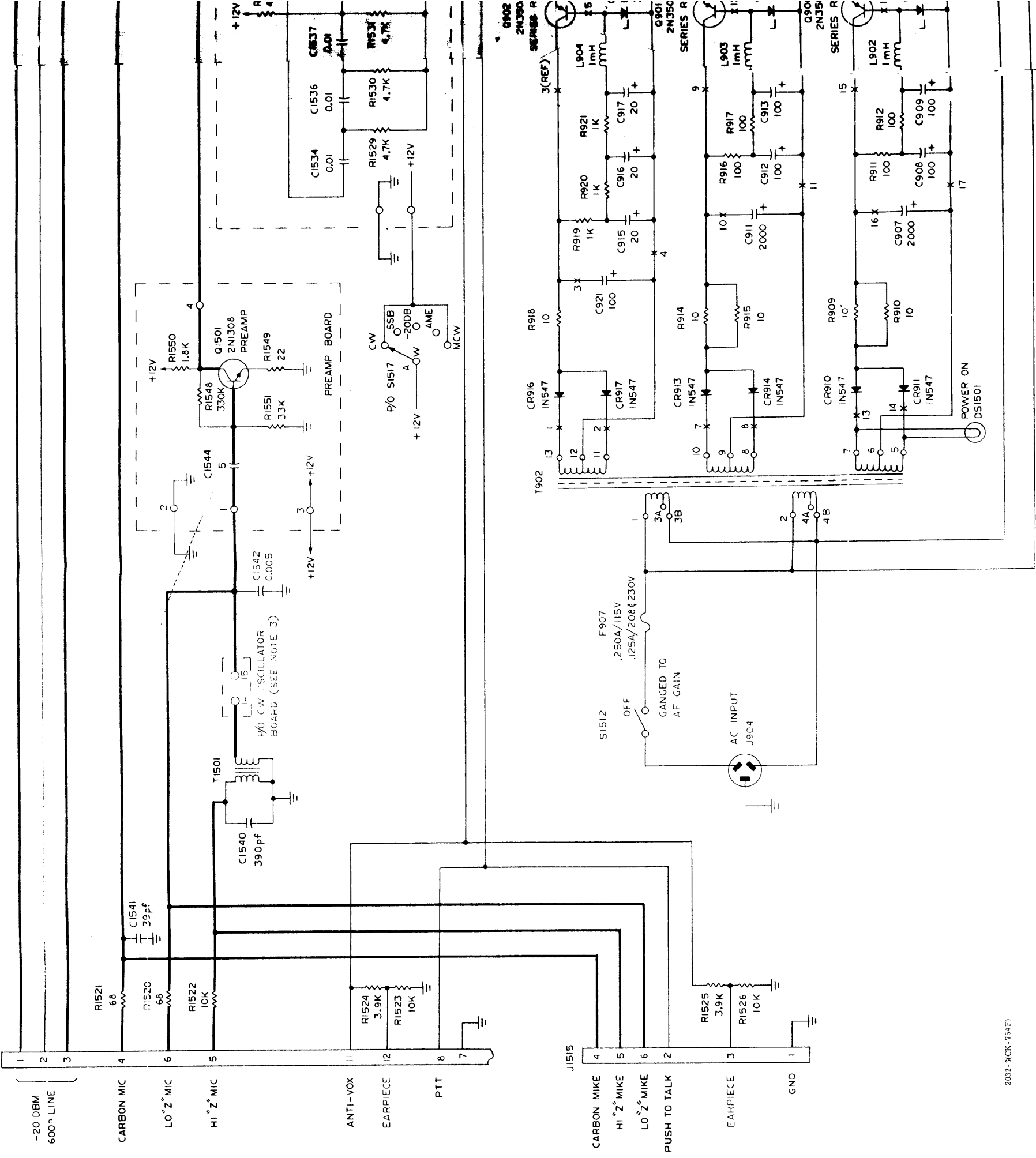
SECTION 7
SCHEMATIC DIAGRAMS



- NOTES
1. UNLESS OTHERWISE SPECIFIED, ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN MICROFARADS, AND ALL INDUCTANCE VALUES ARE IN MICRONHENRIES.
 2. X DENOTES TERMINAL ON POWER SUPPLY BOARD.
 3. THESE TERMINALS ARE CONNECTED TOGETHER ONLY WHEN A HIGH IMPEDANCE MICROPHONE IS USED.
 4. THE OVEN SUPPLY SHOWN IS FOR 115VAC OVENS.

Figure 7-1. Schematic Diagram, STE (Sheet 1 of 4)

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2032-3(CK-754F)

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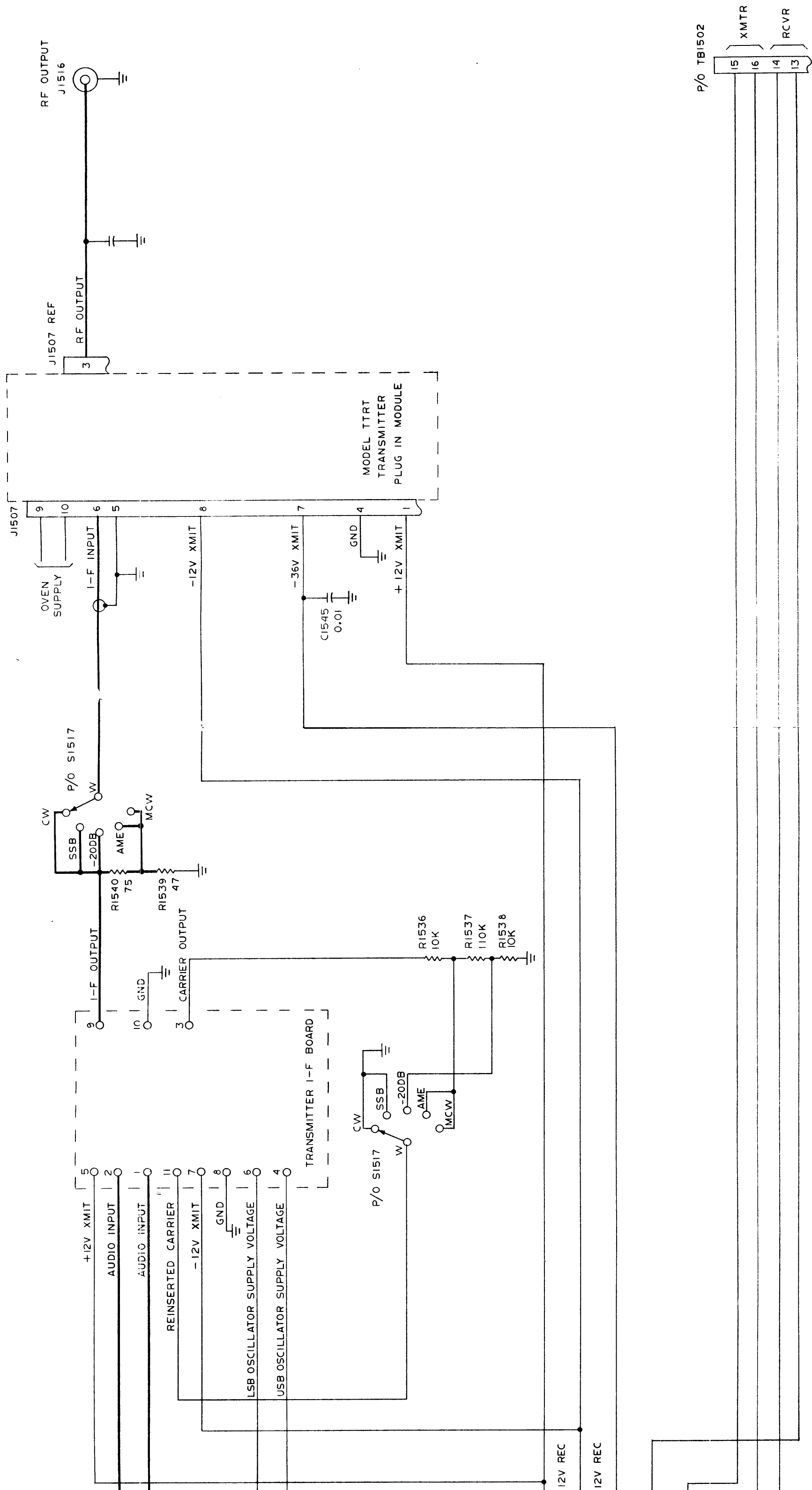
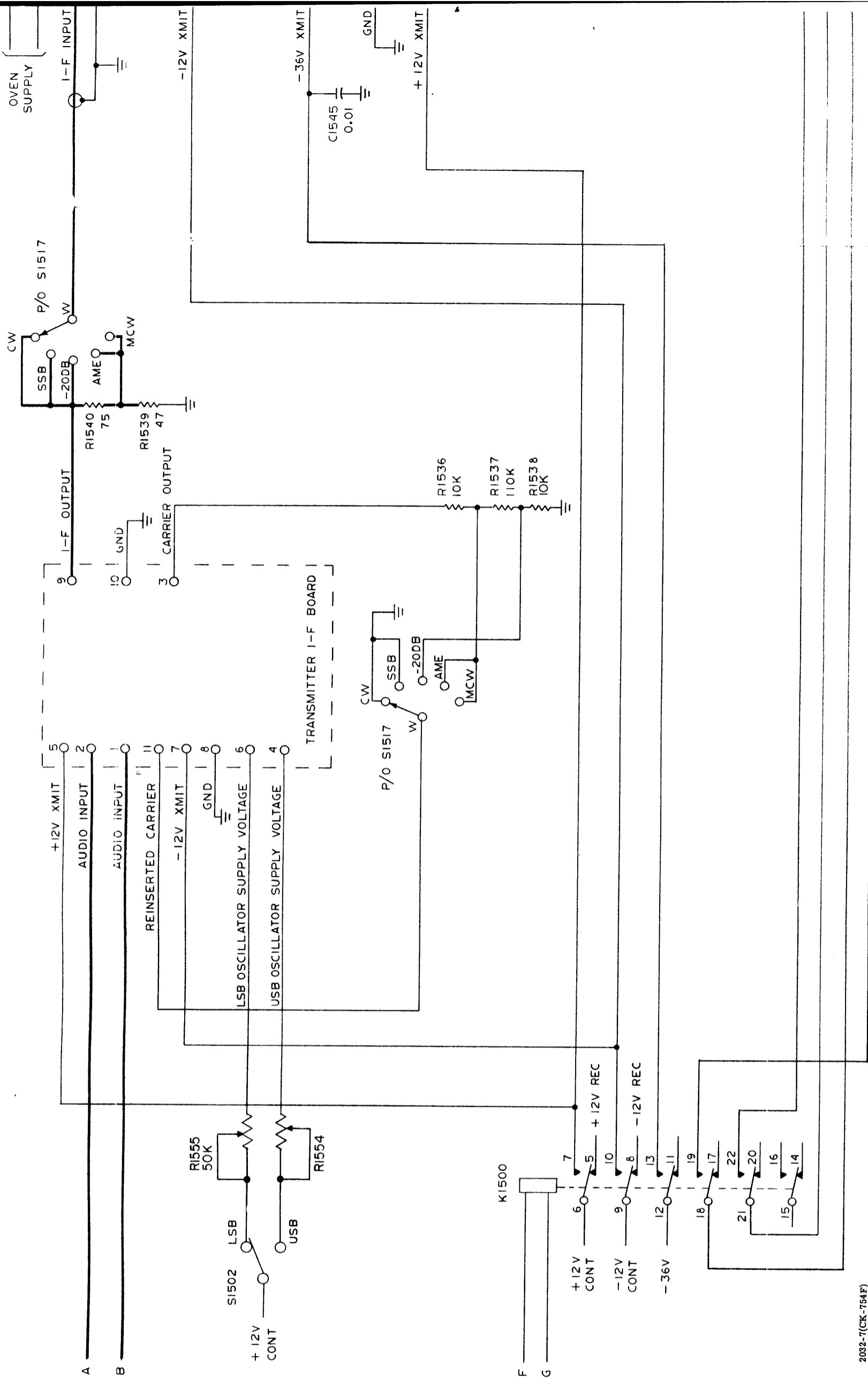


Figure 7-2. Schematic Diagram, STE (Sheet 2 of 4)



2082-7(CK-754F)

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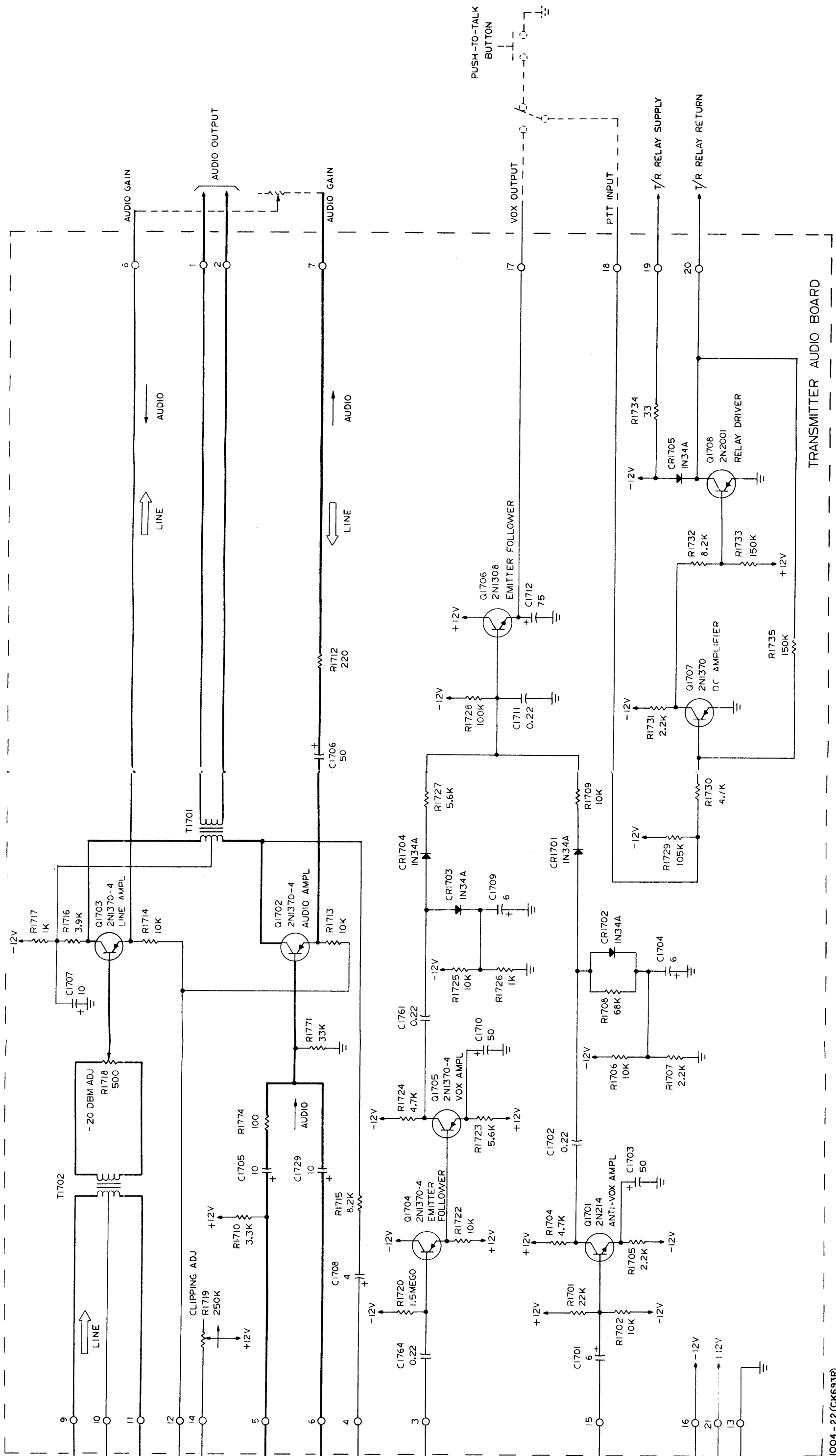
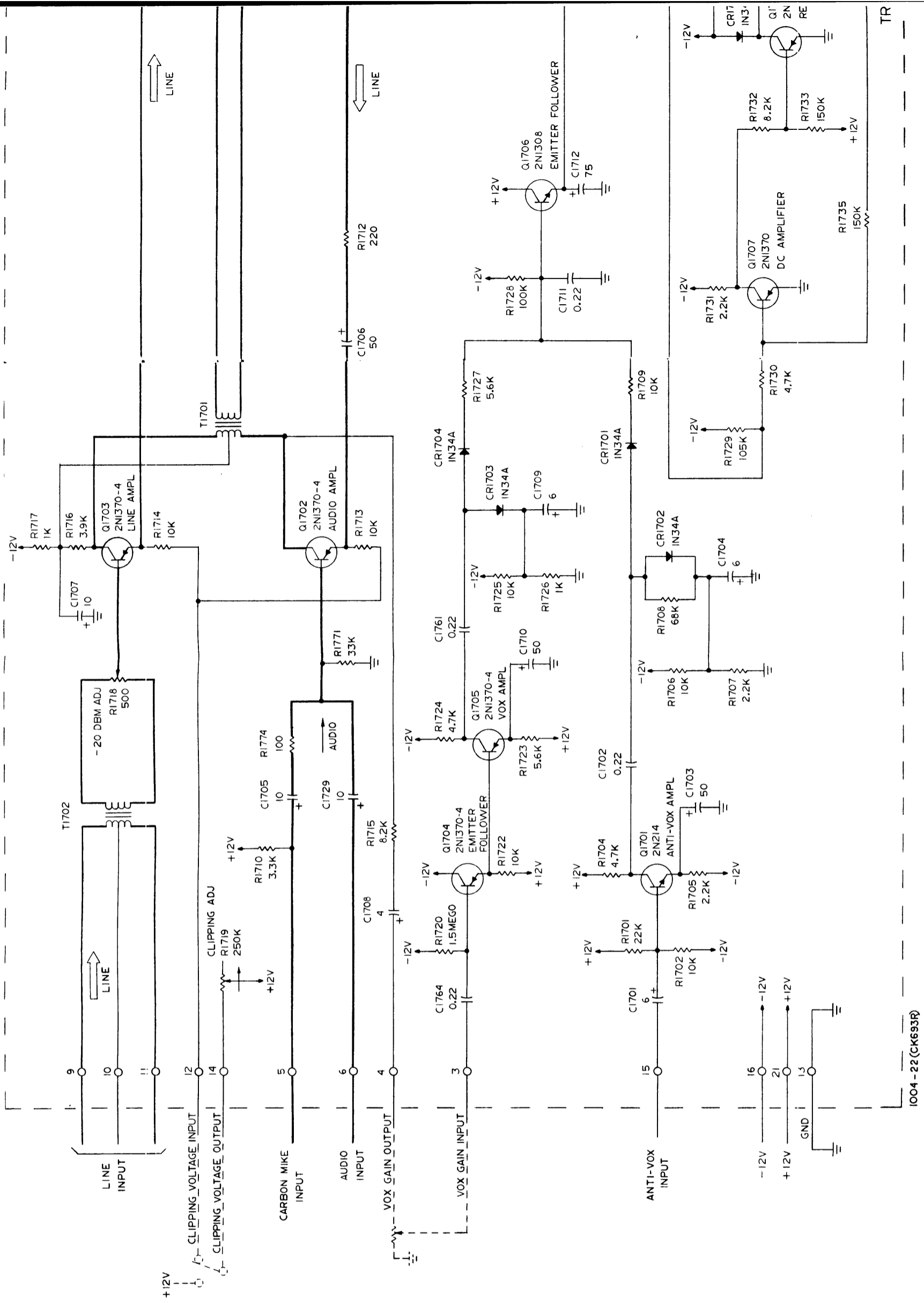
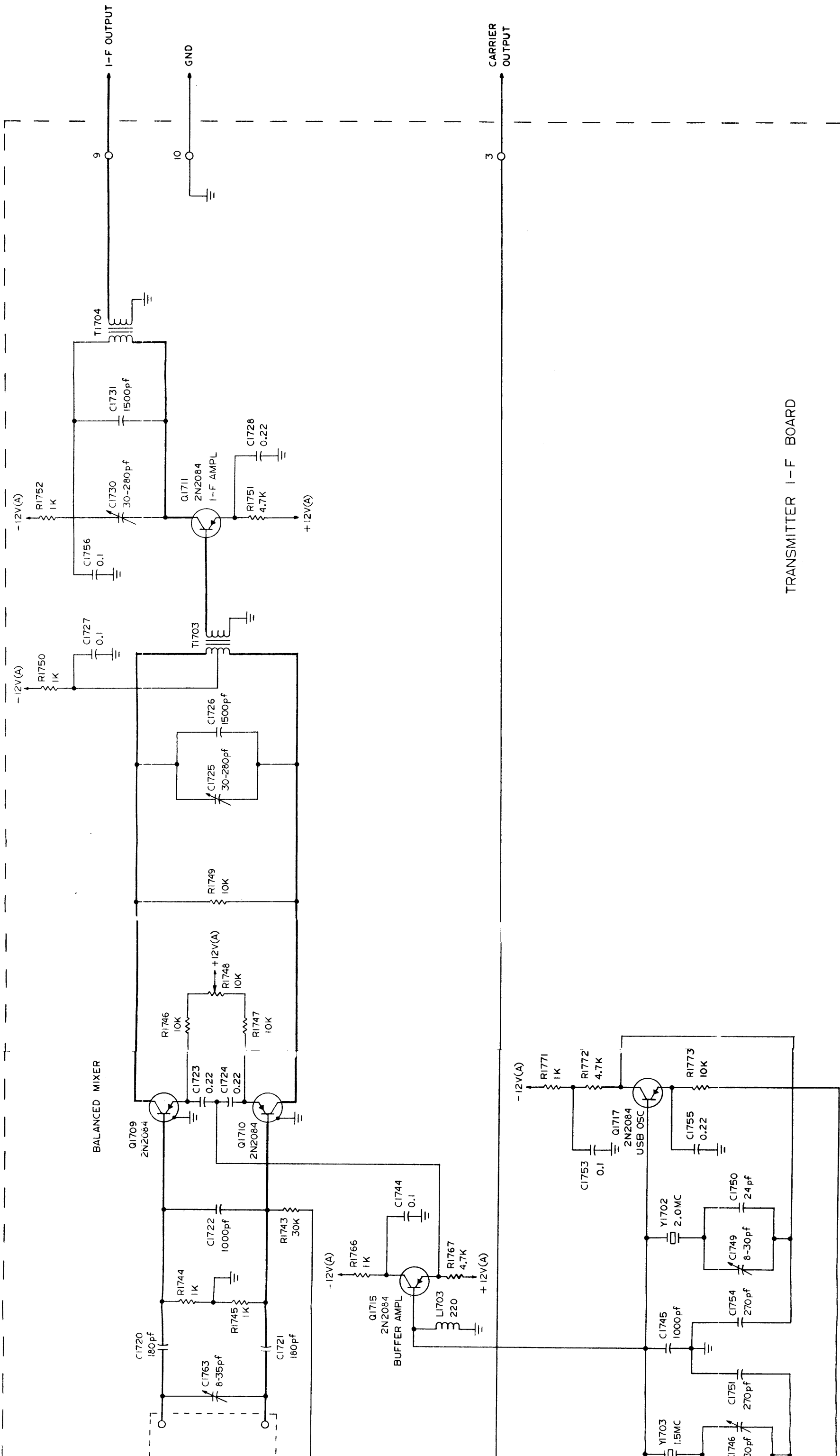


Figure 7-1. Schematic Diagram, STE (Sheet 3 of 4)



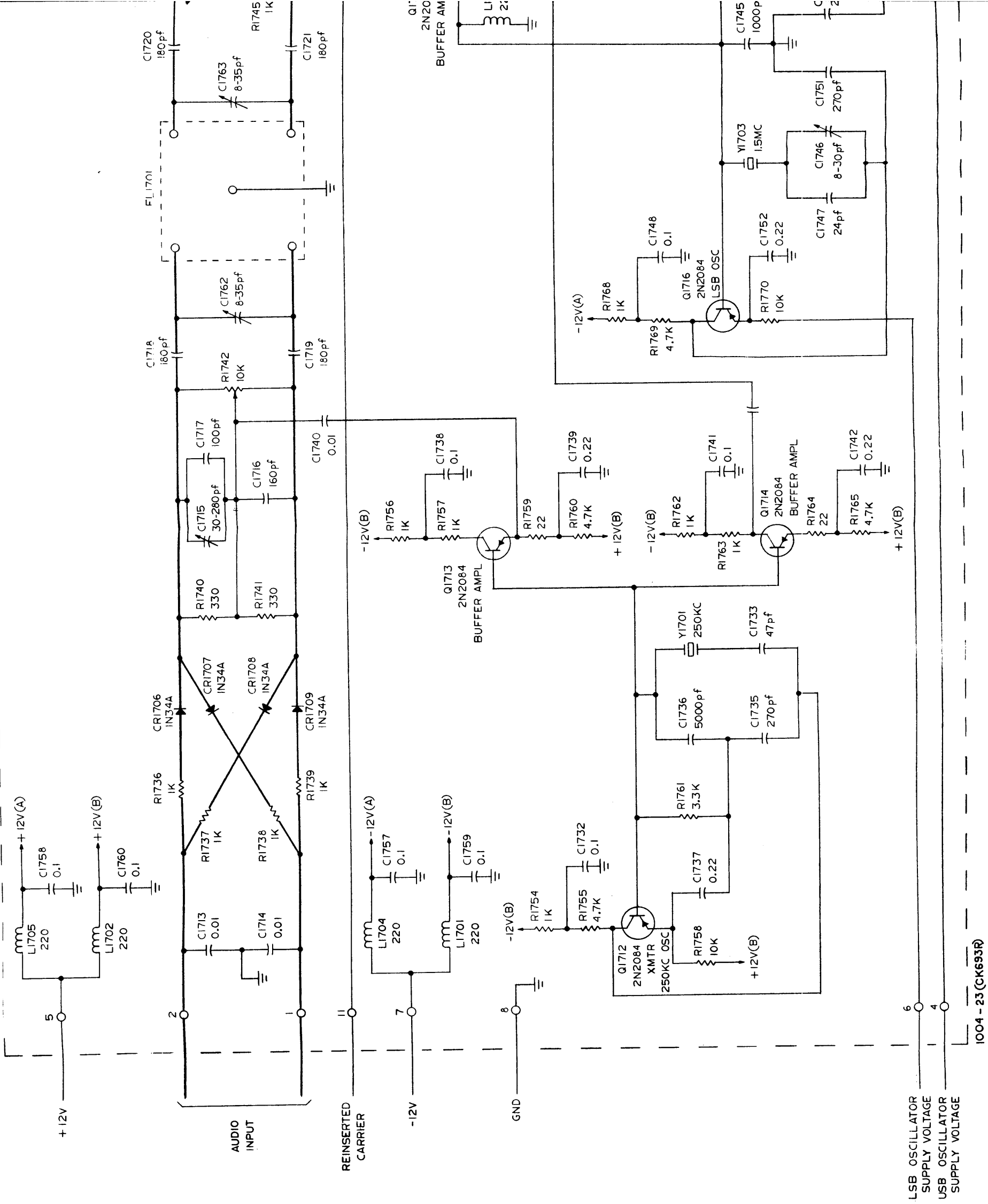
1004-22 (CK693F)

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TRANSMITTER I-F BOARD

Figure 7-1. Schematic Diagram, STE (Sheet 4 of 4)



1004-23 (CK693R)

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