

# INSTRUCTION MANUAL

## DRAKE MODEL **TC-2** 2M TRANSMITTING CONVERTER



PRICE OF INSTRUCTION MANUAL.....\$2.00

R. L. DRAKE COMPANY • MIAMISBURG, OHIO

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## 1. GENERAL DESCRIPTION

### 1.1 FEATURES

The TC-2 is a transmitting converter which converts the low level output (14.0-18.0 MHz) from an H.F. exciter to the two meter band (144.0-148.0 MHz) by mixing with the third harmonic of the crystal oscillator output (43.333 or 43.667 MHz) of the Drake SC-2 receiving converter.

All switching between two meters and normal low-frequency operation of the exciter and receiver is accomplished by the function switch. When used with any Drake exciter, no additional power supply is needed. However, the TC-2 may be powered by an AC-3 or AC-4 power supply when the TC-2 is used with other exciters.

### 1.2 SPECIFICATIONS

#### 1.2.1 General Specifications

Frequency Coverage: 143.9 - 148 MHz.

Modes of Operation: SSB, CW, AM and RTTY: determined by exciter.

Average Distortion Products: The odd order are typically 25 dB below PEP.

Input Power: 180 watts on CW and RTTY. 180 watts PEP on SSB and AM.

Output Impedance: Nominal 52 ohms (SWR less than 2:1).

Injection Required: 0.25 V. at 43.333 and 43.667 MHz.

Excitation Required: 0.25 V. at 14.0 to 18.0 MHz.

#### 1.2.2 Controls

Front: Plate, load, function switch, range switch and meter control.

Side: Bias adjustment.

Rear: 1) Type SO-239 antenna connector.

1) Type N connector, receiving converter antenna out.

1) Male power connector for power supply.

1) Female power connector for power cable to H.F. exciter.

14) Phono jacks for all other necessary interconnections between various station equipment.

Inside: 14 MHz drive adjustment, AGC threshold adjustment.

#### 1.2.3 Power Requirements

12.6 VAC @ 1.8 A

250 VDC @ 100 mA, no more than 1/4% ripple

650 VDC @ 340 mA max., 200 mA avg., less than 1% ripple

All voltages are obtained automatically when the TC-2 is used with a T-4XB, TR-3/4 or TR-6, with an AC-3 or AC-4 power supply.

#### 1.2.4 DIMENSIONS

5-1/2" high, 11-5/8" deep, 7-5/8" wide. Weight - 9 lb.

#### 1.2.5 TUBE AND SEMICONDUCTOR COMPLEMENT

TYPE	FUNCTION
1 - 2N3663	Frequency Tripler
1 - 6EJ7	Mixer
1 - 6EJ7	Driver
1 - 7558	Driver
1 - 8643	Final Amplifier
2 - 1N4148	Relative Output
1 - 1N714	Voltage Regulator
1 - 2N3877	AGC Amplifier
2 - 2N4125	Bias Supply
3 - B5G5	Bias Supply
1 - 1N270	Bias Supply
1 - 1N4148	Bias Supply

## 2. INSTALLATION

### 2.1 UNPACKING

Carefully remove the TC-2 from the packing carton and examine it for signs of shipping damage. Should any be apparent, notify the delivering carrier immediately.

Fill out and mail the enclosed registration card so that the warranty will be effective.

Save the packing material. It may be needed later for reshipment or storage. Inspect the packing material closely to be sure that no accessory hardware has been overlooked.

### 2.2 LOCATION

The location of the TC-2 is not critical. However, care should be taken to insure that space is provided around the unit to allow adequate air circulation. Extremely hot locations, such as near radiators or heating units should be avoided. Do not cover the top of the cabinet with books, paper, or other equipment or over heating may result.

### 2.3 CABLING

The location of jacks provided for external connections are shown in Fig. 1. Basic input-output functions and requirements are as follows:

1. J1 connects to the jumper cable which supplies power to the exciter.
2. P1 connects to the AC-3, AC-4, DC-3, DC-4, or DC-24 power supply cable.
3. RCVR ANT, J6, mates with the N connector on the cable which connects to SC-2 ANT connector.
4. ANT, J7, connects to the 2 meter antenna.
5. Ry, J8, connects to a relay contact in the exciter which supplies a ground connection on transmit. This connection is made automatically when the TC-2 and any Drake transmitter are used with a single power supply. When separate AC-4 power supplies are used, a cable must be used to connect the VOX RLY connectors on the power supplies together.
6. AUX Ry, J9, provides a ground connection on transmit for controlling a linear amplifier.
7. AGC, J10, provides AGC output for controlling the HF transmitter gain. When the TC-2 and a Drake transmitter are used with a single power supply this connection is made automatically through the power cable.

If separate AC-4 power supplies are used, the AGC jack on the transmitter power supply must be connected to the TC-2 AGC jack with a phono cable. A connector is available for AC-3 power supplies that brings out the vox contacts and a transmitting AGC connector from the transmitter that the AC-3 is powering.

8. INJ, J11, connects to the 43 MHz oscillator in the SC-2 converter.
9. PA DIS B, J12, connects to the screen grid supply voltage of the exciter.
10. PA DIS A, J13, connects to the screen grid of the exciter. If the TC-2 is used with a TR-4 corresponding PA DIS JACKS must be connected so that screen grid modulation will be obtained for A.M. operation.
11. EXC. Out, J15, provides 14 MHz output to drive another transmitting converter such as the TC-6 when the TC-2 function switch is in the off position.
12. EXC. IN, J14, connects to low level drive from the transmitter.
13. Cal, J5, connects to the external switch jack of the SCC-1 VHF calibrator.
14. AUX, J16, connects to external accessories such as a coax relay J16 and J17 are connected together in all positions of the function switch except the off position. Switch contacts are rated at 23 V. - 1A. or 120 V. - 1/2 A.
15. AUX, J17, is the same as J16.
16. CONV IF, J4, connects to the IF jack of the SC-2 converter.
17. HF RCVR, J3, connects to the antenna jack of the HF receiver.
18. HF ANT, J2, connects to the receiver antenna terminal on the HF transmitter.

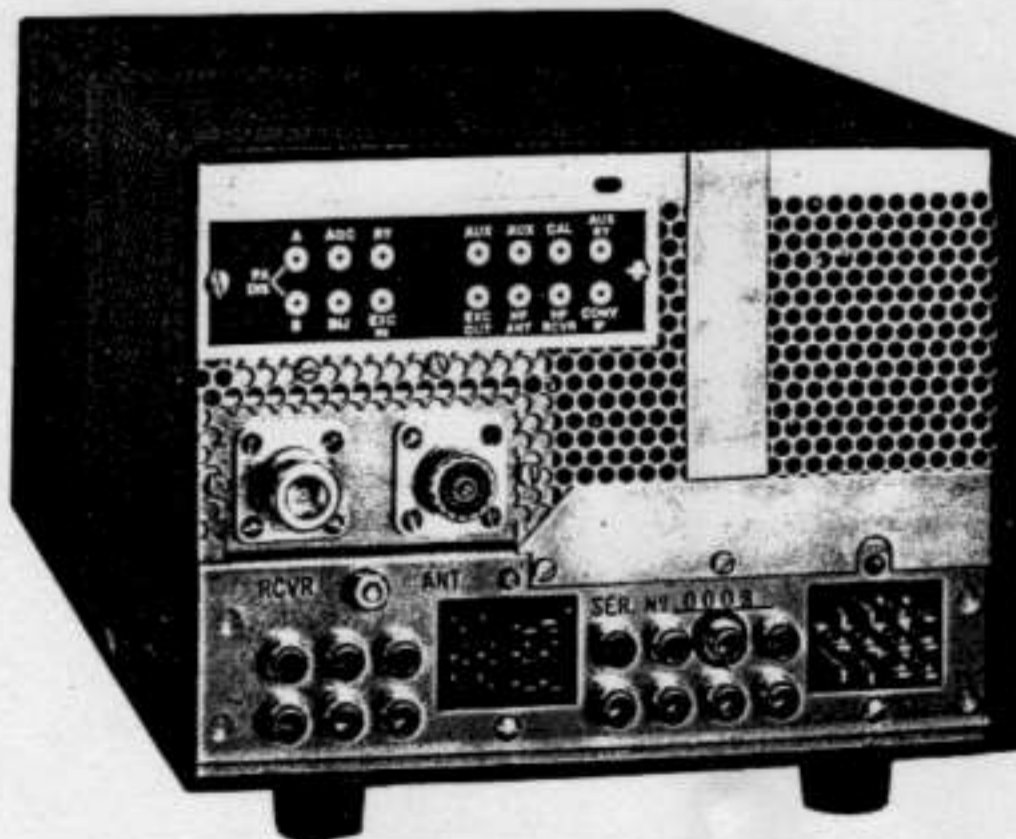


FIG. 1  
REAR VIEW TC-2

## 2.4 TRANSMITTER MODIFICATIONS

Some simple modification must be made in the transmitter so that the TC-2 may be integrated into the station. First, the screen grid circuit of the final amplifier must be disabled for VHF operation. In addition, low level output (0.25 V) must be added. Equipment manufactured by the R.L. Drake Company may be returned to the factory where it will be modified for a nominal charge.

### 2.4.1 T-4X Modifications

Although the following instructions are intended for the T-4 series of transmitters, the principles should be applicable to other transmitters.

Carefully drill three 1/4 inch holes in the rear of the chassis in the location shown in Fig. 2. Three holes are provided in the T-4B and T-4XB chassis and need not be added. Mount the phono fittings in the holes with nuts, lockwashers, and lugs.

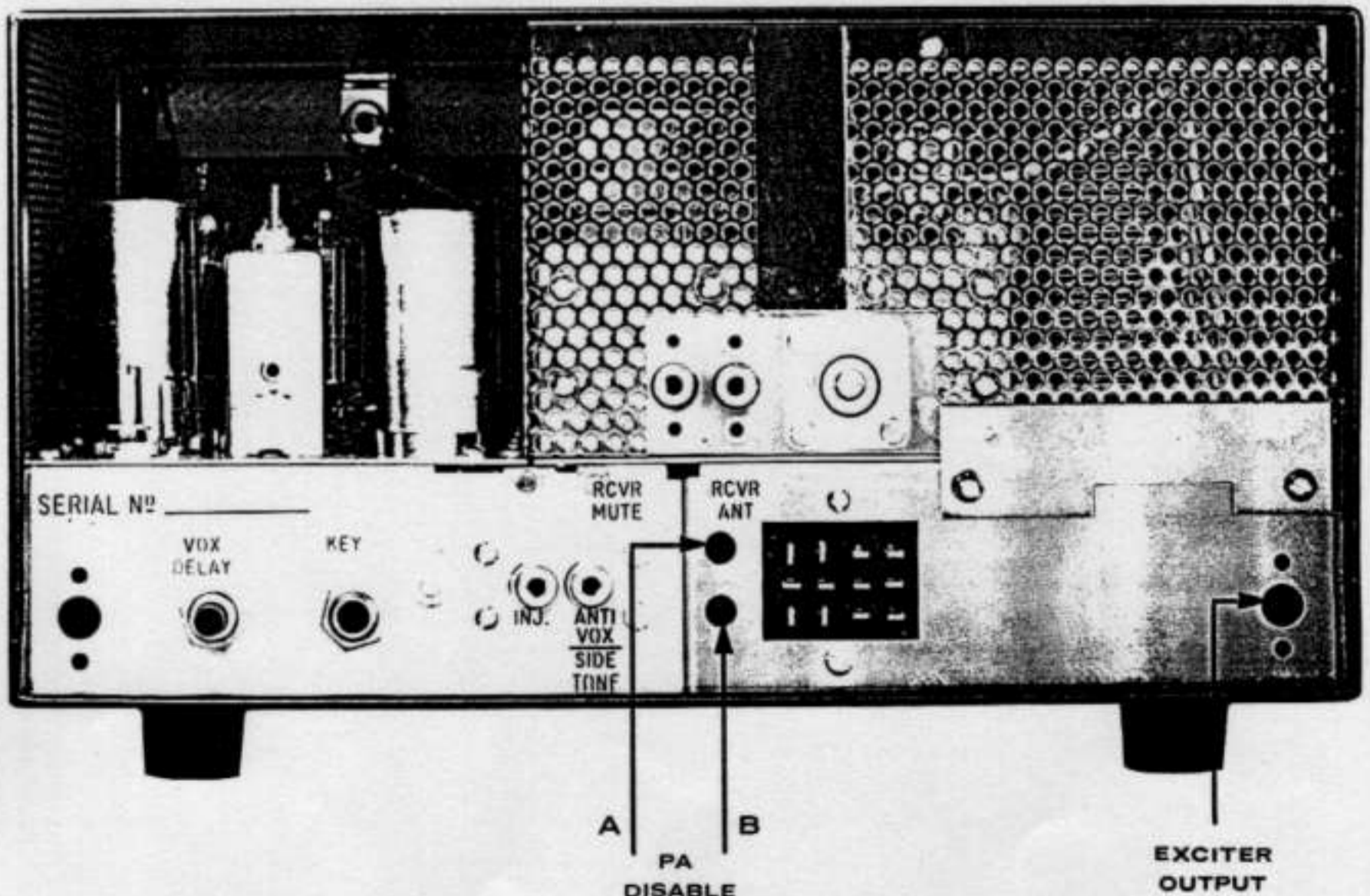


FIG.2

HOLE LOCATIONS FOR VHF MODIFICATIONS



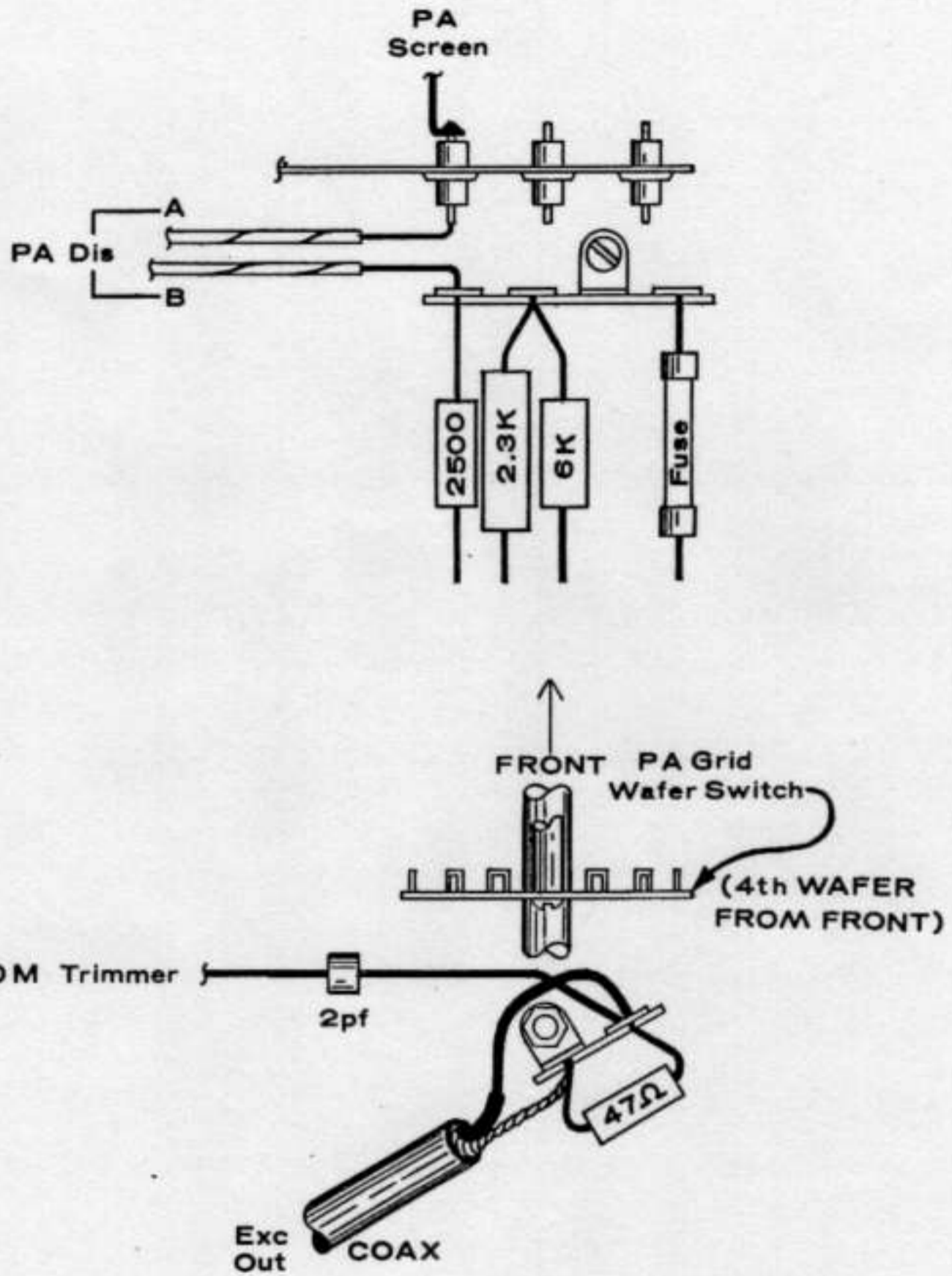


FIG.3

PICTORIAL DIAGRAM OF T-4 MODIFICATIONS

Replace the two lug terminal strip adjacent to the P.A. Grid compartment with a three lug terminal strip as shown in Fig. 3. The correct terminal strip is already installed in T-4B and T-4XB exciters. Disconnect the wires from the feed-thru capacitor which supplies screen voltage to the P.A. and connect them to the rear lug of the terminal strip. Also, connect a wire from the rear lug to a phono jack (P.A. disable B). Install a .001 uF disc capacitor from the phono jack to ground. Similarly, connect a wire from the screen voltage feed-thru capacitor to the "P. A. disable A" phono jack. Install a .001 uF disc capacitor from the phono jack to ground. Reconnect the wires to the two remaining lugs on the terminal strip.

Locate the nut under the bandswitch shaft near the P.A. grid wafer switch. Install a two lug terminal strip (one lug grounded) under this nut. Connect a 2.0 pF capacitor from the twenty meter driver plate trimmer capacitor to the ungrounded lug of the terminal strip.

Connect a 47 ohm 1/2 W resistor between the two lugs of the terminal strip. Connect a length of coax cable between the terminal strip and the remaining phono jack. The braid should be grounded at both ends of the cable. Retune the twenty meter trimmer according to the instructions in the transmitter manual.

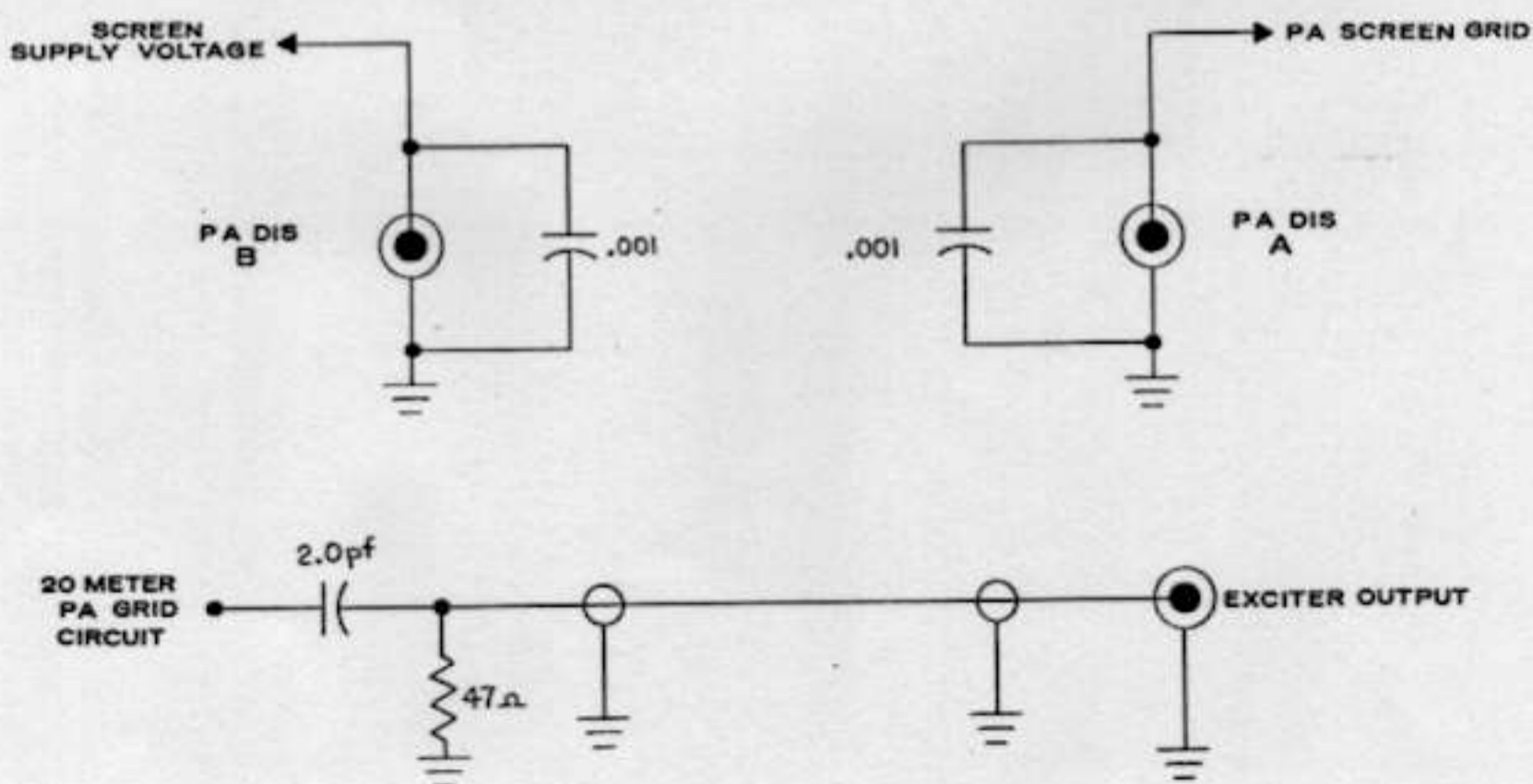


FIG.4 T-4 MODIFICATIONS

## 2.4.2 L-4 Modifications

When an L-4 is connected to the T-4 transmitter, the relay of the TC-2 will be energized by current flowing through the bleeder resistor in the L-4 relay power supply. However, when the L-4B AGC/STANDBY switch is placed in STANDBY the connection to the bleeder resistor is opened and the TC-2 will operate normally. Late model L-4B amplifiers have been modified to eliminate this difficulty.

Older model L-4B and L-4 amplifiers may be modified by the following procedure. Mount a two lug terminal strip (one lug grounded) with one of the screws which mounts the VOX RELAY SOCKET. Disconnect the wire from the ungrounded terminal of the vox relay socket and connect it to the ungrounded lug of the terminal strip. Connect a 1/2 A. 400 PIV silicon diode between the ungrounded lug of the vox relay socket and the ungrounded lug of the terminal strip. The cathode of the diode should be connected to the vox relay socket.

## 2.5 TRANSCEIVER MODIFICATIONS

Although the following instructions are intended for the TR-3/4 transceiver, the principles should be applicable to other transceivers. In addition to the transmitter modifications already described, the receiver section of the transceiver will have to be modified so that the SC-2 may be used. Do not connect the IF output of the receiving converter directly to the antenna connector of the transceiver because the converter will be damaged if the transceiver accidentally goes into transmit.

- A kit (TR-3/4 VHF Mod Kit) for modifying the TR-3/4 is available from the factory for \$6.50 plus postage. This kit consists of a mounting plate which is fastened on the rear of the TR-3/4 and all other necessary parts. All switching between VHF and normal HF operation is accomplished by the TC-2 function switch.

The required modifications of the receiving section of the TR-3/4 are shown in Fig. 5. Because the receiver antenna coil is used as a driver coil on transmit, the diode switch is necessary to prevent transmitter drive power from being lost in the cable connected to the HF RCV jack.

In transceivers employing separate coils the diode switch is not required. Simply open the lead between the antenna relay and the receiver input and connect these two points with coax cables to phono jacks.

Some transceivers may not have a D.C. path for the switching diode, and it will be necessary to connect a 4.7 K 1/2 W resistor between the cathode of the 1N4148 diode and ground.

## 2.6 SC-2 MODIFICATIONS

SC-2 receiving converters with serial numbers less than 497 must be modified as follows:

Remove the 1.5 pF ceramic capacitor which is connected to the injection output jack. Connect one lead of a 7.5 pF disc capacitor to the injection output jack. Locate the 560 ohm resistor which is connected across the oscillator coil. Connect the other end of the 7.5 pF capacitor to the lead of the 560 ohm resistor (component side of the P.C. board) farthest from the chassis.

Connect a 50 ohm load or the TC-2 to the injection jack. Tune L3, C18, and C22 for maximum noise from the station receiver. Adjust C 18 and C22 so that the noise is equal when the crystal switch is in the 144 and 145 position.

## 2.7 DC-4 MODIFICATIONS

If the TC-2 is to be used with a DC-4 power supply, both the DC-4 and TC-2 must be modified so that the proper bias will be supplied to the power amplifier. Add a phono fitting, a 36V 10 W zener diode and two 3.9K 2 W resistors to the DC-4 as shown in Fig. 6A.

Also add a jumper wire from the junction of C51 and R17 to one of the AUX Jacks in the TC-2 as shown in Fig. 6B. Connect the phono fitting on the DC-4 to one of the AUX Jacks on the TC-2 with a phono cable.

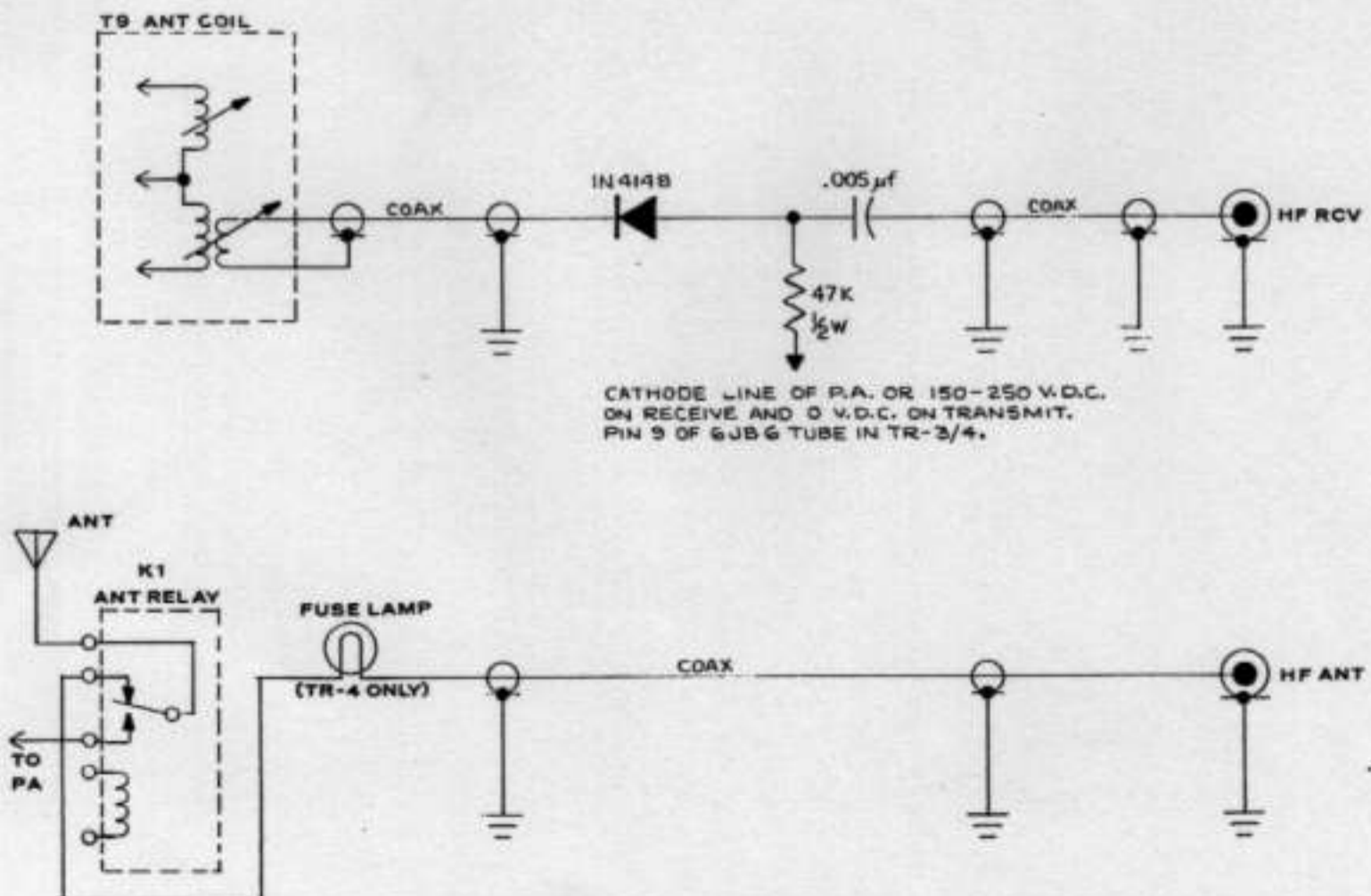
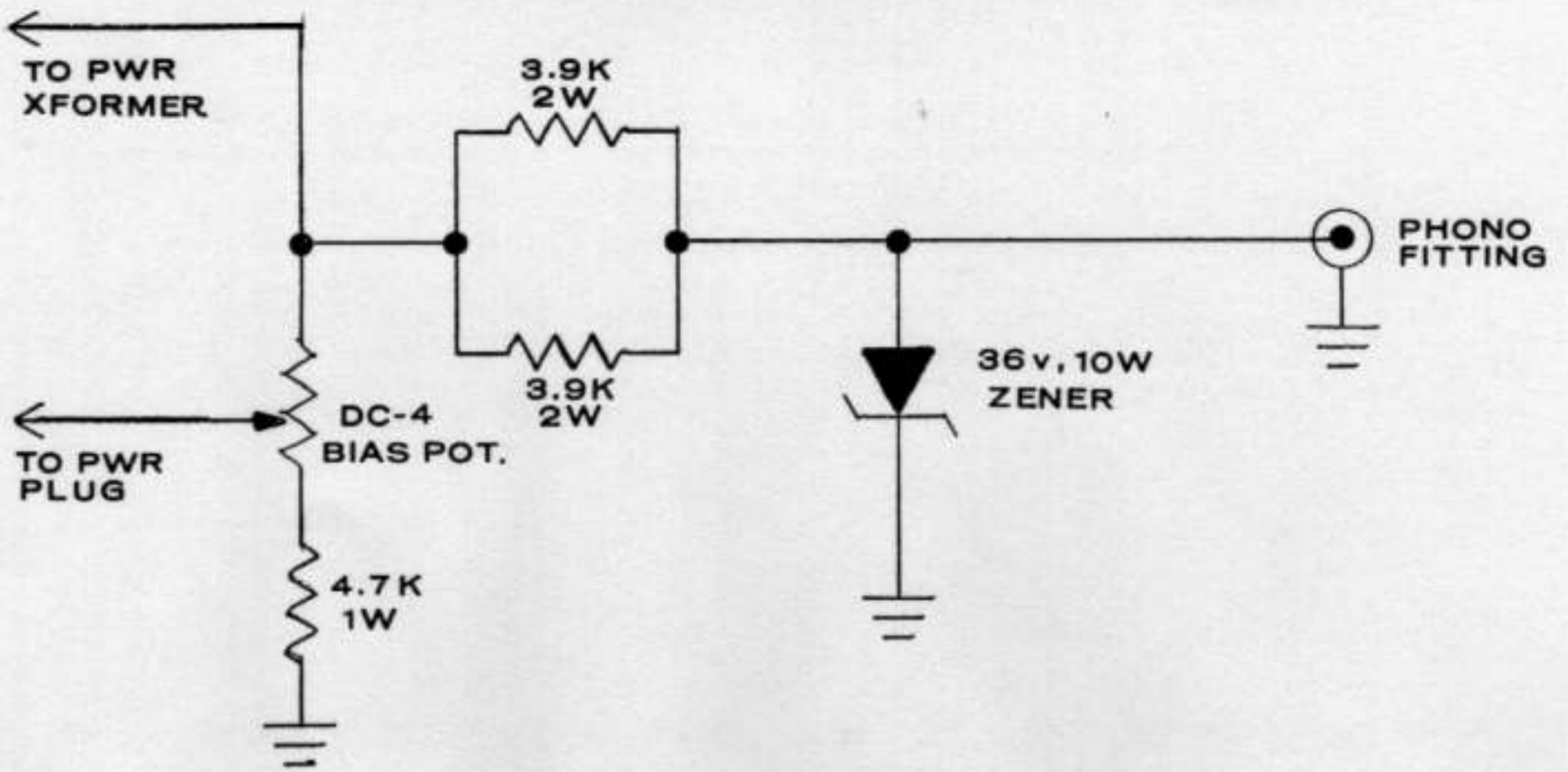
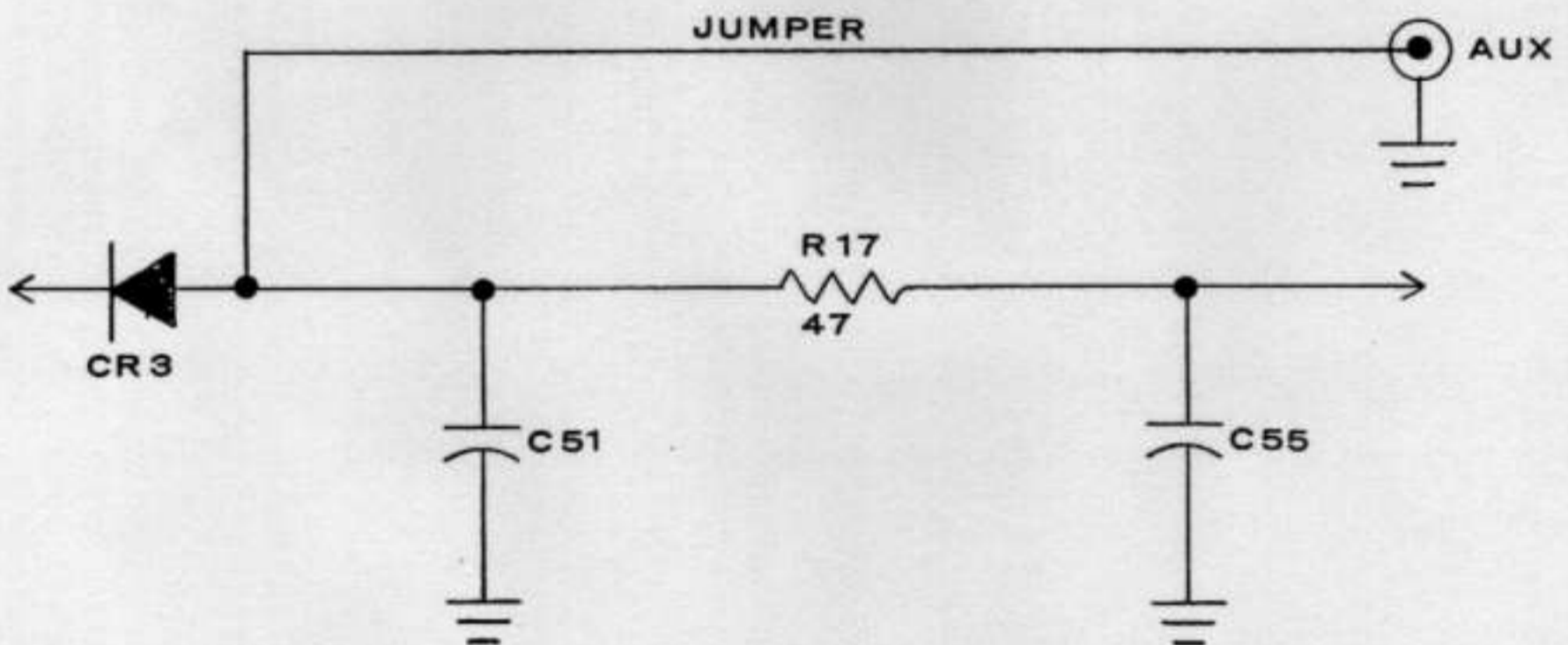


FIG. 5 TR-3/4 MODIFICATIONS



a) DC-4 MODIFICATION



b) TC-2 MODIFICATION

FIGURE 6  
DC-4/TC-2 MODIFICATION

## 2.8 INTERCONNECTION WITH OTHER EQUIPMENT

The required interconnections with a T-4XB transmitter, R-4B receiver, and an SC-2 receiving converter are shown in Fig. 7 while the interconnections with a TR-3 or TR-4 are shown in Fig. 8. The CC-1 converter console will simplify the interconnection somewhat, especially when the TC-6, six meter transmitting converter, and the SC-6, six meter receiving converter, are also used. When the CC-1 is installed, J2, J3, J4, and J5 on the TC-2 need not be used.

Fig. 9 shows the interconnections with a TR-6 and an SC-2. Fig. 10 shows interconnections for using both the TC-2 and TC-6 with the 4-line station. Fig. 11 shows interconnection for using both the TC-2 and TC-6 with a TR-3 or TR-4 transceiver.

Always be sure that the power supply cable is disconnected when connecting or disconnecting any cables. The high voltage which is present is a shock hazard.

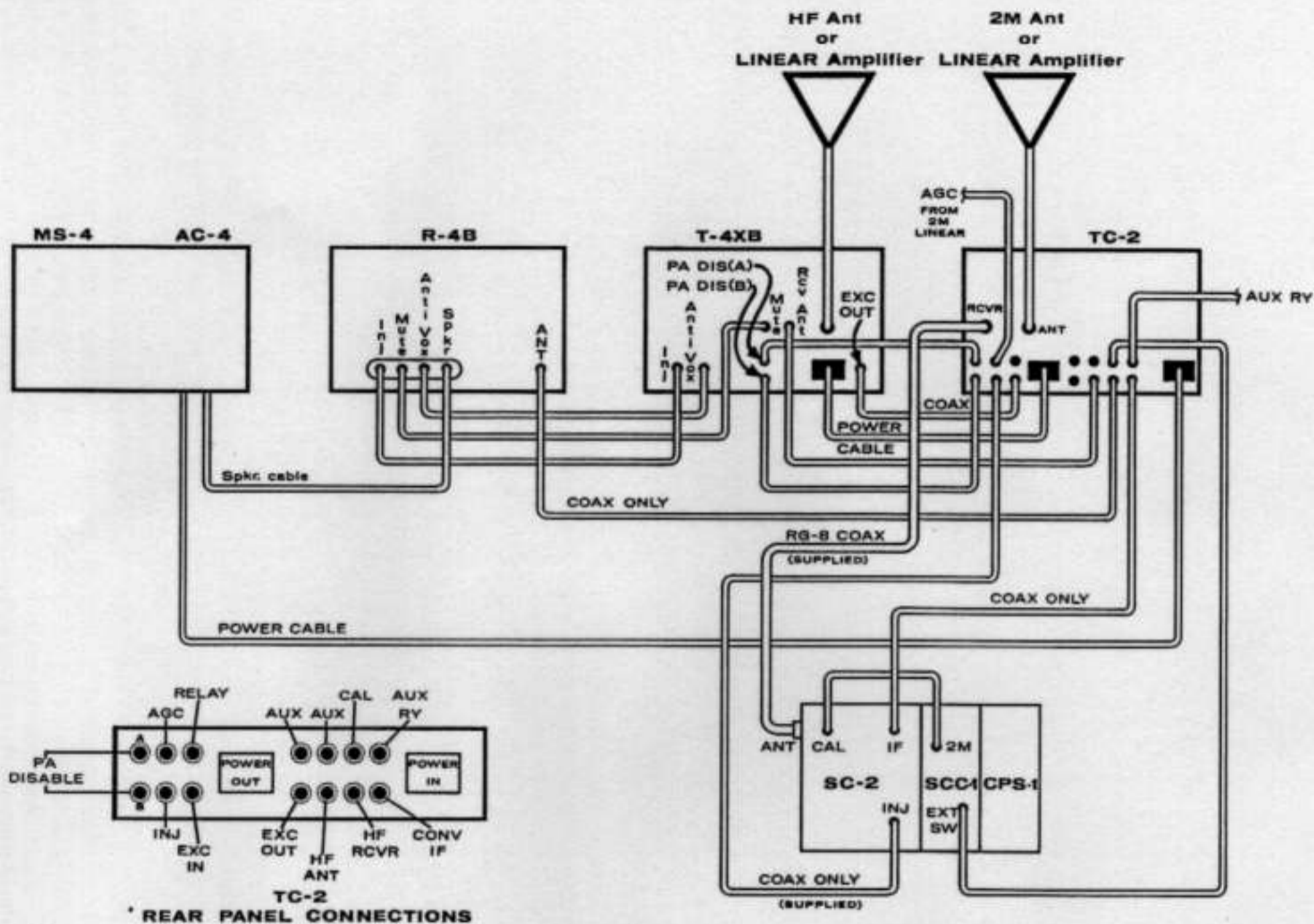


Fig-7

INTERCONNECTION WITH T-4XB, R-4B AND SC-2

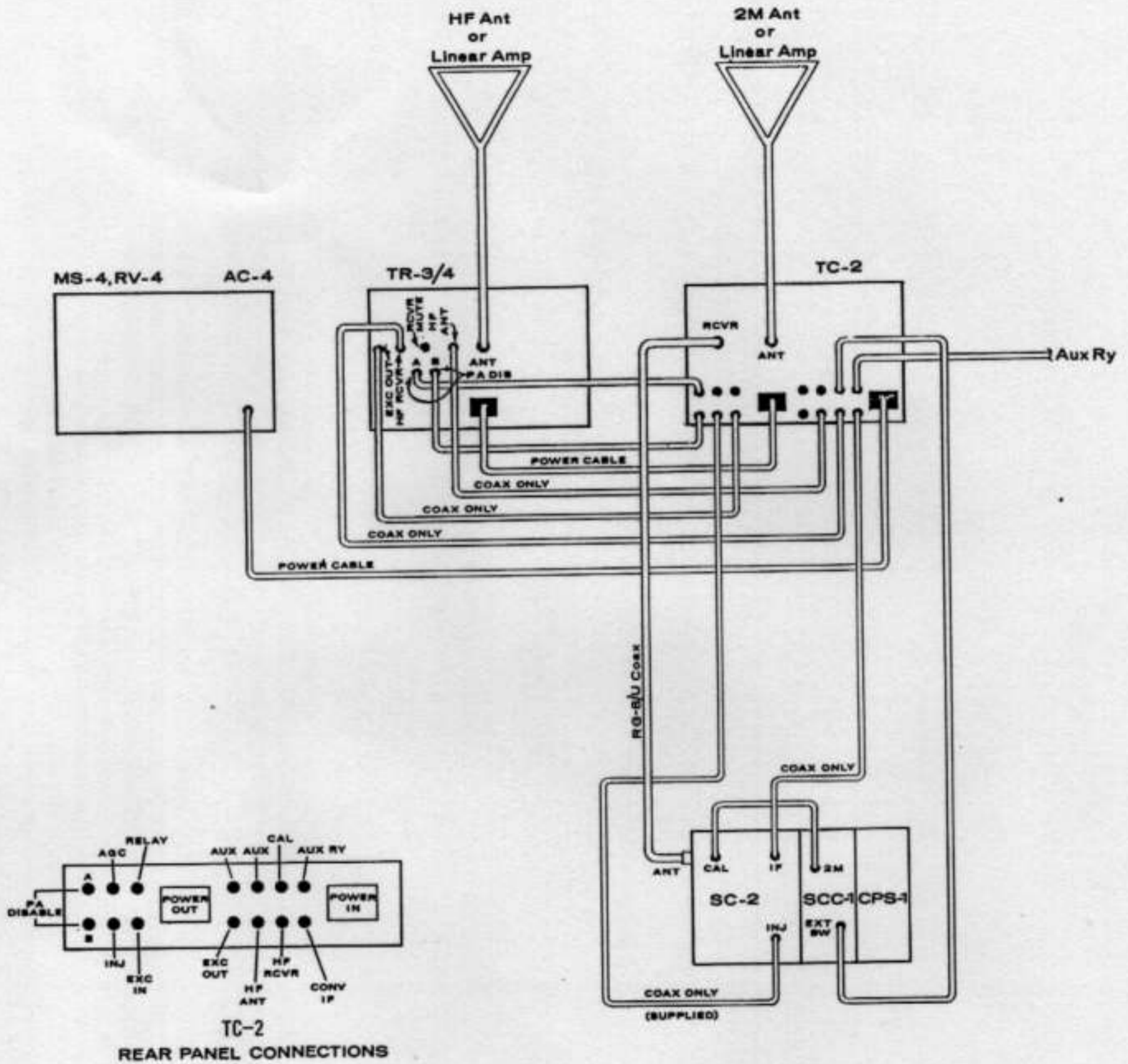


Fig. 8  
INTERCONNECTION WITH TR-3/4 AND SC-2



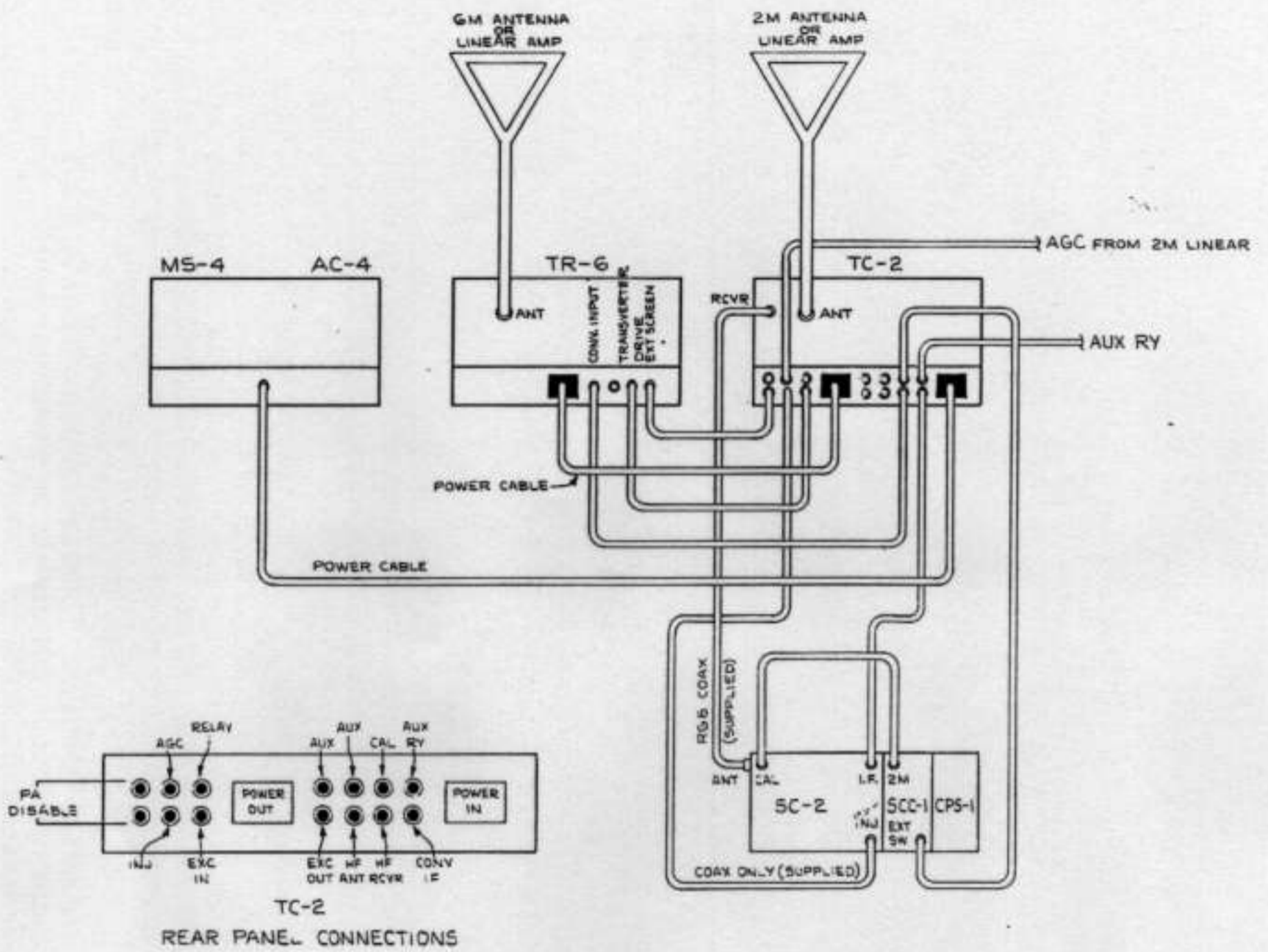


FIGURE 9  
INTERCONNECTION WITH TR-6 AND 5C-2



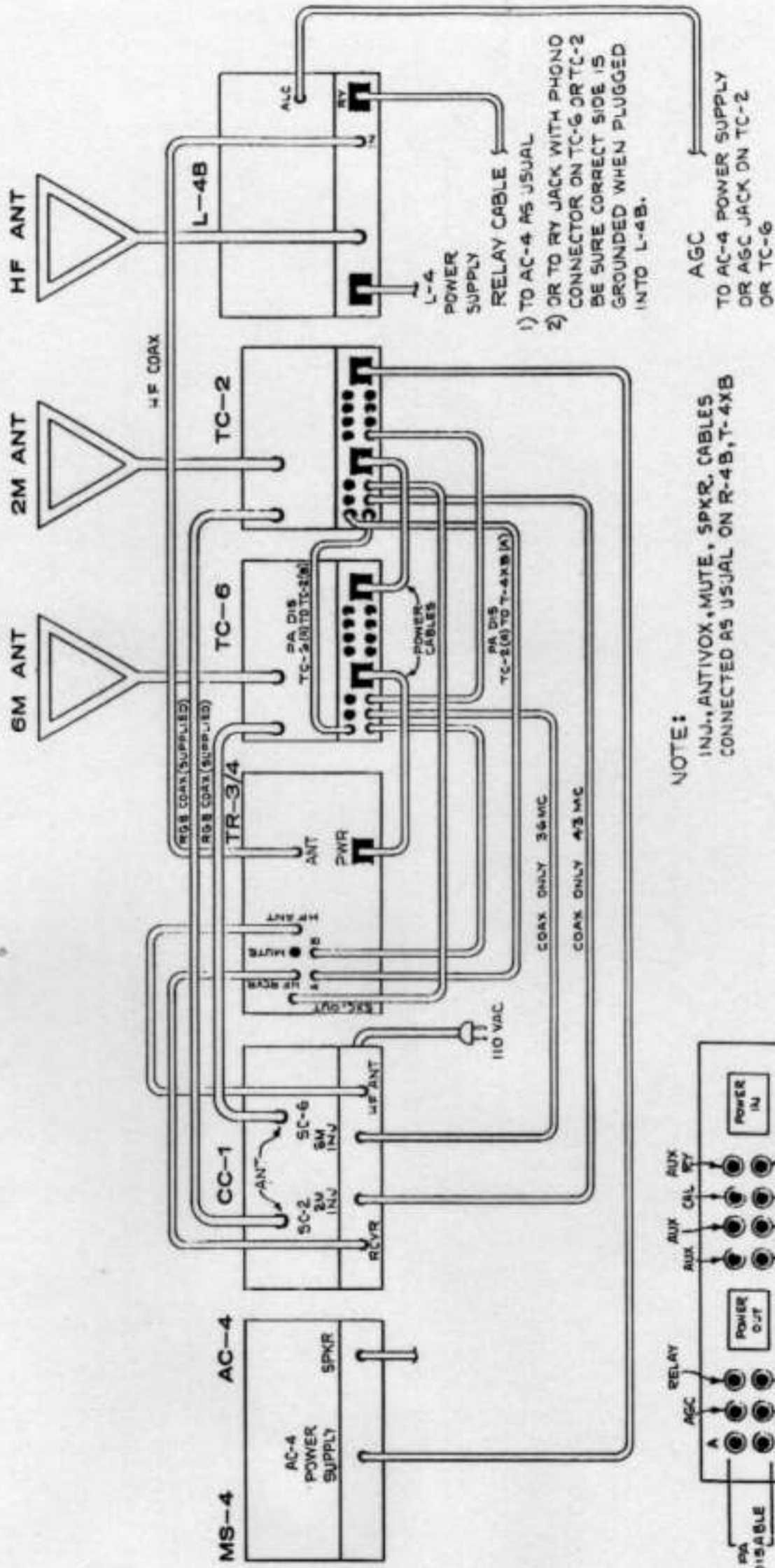


FIGURE 11  
 INTERCONNECTION WITH TR-4 AND TC-6  
 REAR PANEL CONNECTIONS

### 3. OPERATION

#### 3.1 BIAS ADJUSTMENT

Before any type of operation is attempted, it will be necessary to set the bias to the correct value. Proceed as follows:

1. With the TC-2 FUNCTION switch in the OFF-HF ON position, turn on the exciter and adjust the bias control on the power supply for normal exciter idle current. If a TC-6 is also used follow bias adjustment instructions in the TC-6 manual.
2. Turn the TC-2 FUNCTION switch to XMIT FIL, and allow at least two minutes for warm-up.
3. Set the exciter GAIN to zero and place the exciter FUNCTION switch in the TUNE position.
4. Turn the TC-2 FUNCTION switch to the OPERATE position and adjust the bias control on the TC-2 for a reading of 80 mA. on the TC-2 plate meter.

#### 3.2 TUNE UP

1. Preset the exciter controls for normal 20 meter operation, with the exception of the PLATE and LOAD controls. Set both PLATE and LOAD controls to 0 (maximum capacity). This will prevent any undesired transmission on 20 meters.
2. Preset TC-2 controls as follows:  
RANGE - to band segment in which operation is desired. The frequency indicated is the lower edge of this segment.  
PLATE and LOAD - to "0".  
FUNCTION - to XMIT FIL.
3. Set the exciter gain to minimum and the exciter FUNCTION switch to the TUNE or CW position.
4. Set the TC-2 FUNCTION switch to the TUNE position.
5. Advance the exciter GAIN control and peak the exciter RF TUNE for maximum TC-2 plate current. Reduce the exciter GAIN whenever the TC-2 plate current exceeds 120 mA.
6. Now advance the GAIN control on the exciter for maximum drive. Then quickly tune the TC-2 PLATE control for a dip in plate current.
7. Depress the OUTPUT METER control and observe the relative output, or observe the output on an RF wattmeter, or SWR bridge. Alternately tune the TC-2 LOAD and PLATE controls in small increments for maximum RF output.
8. Turn the FUNCTION switch to the OPERATE and touch up the PLATE and LOAD controls for maximum output with enough drive applied to keep TC-2 plate current as near 300 mA as possible.
9. In some installations it may be possible to obtain maximum power output at two settings of the load control. Always use the setting which is more counter-clockwise.

The TC-2 is now tuned and ready for operation. When changing frequency more than 200 KHz, it is recommended that the tuning be rechecked. The exciter RF TUNE will need repeaking with even smaller frequency changes.

### 3.3 AM OPERATION

If the TC-2 is to be operated on AM with a TR-3, TR-4, or TR-6, the screen jumper wire, which is located on the terminal strip behind the TC-2 FUNCTION switch, must be connected between terminals 1 and 3. The TC-2 is shipped with the jumper connected between terminals 1 and 2. When this change is made, the screen voltage of the TC-2 will be lowered due to the dropping resistor in the TR-3/4 or TR-6 screen circuit in both the TUNE and OPERATE position of the TC-2 FUNCTION switch. However, this resistor is in the circuit only when the TR-3/4 or TR-6 FUNCTION switch is the X-CW position and the TC-2 will have full output power in all other modes. Adjust the TC-2 BIAS CONTROL with the TR-3/4 or TR-6 FUNCTION switch in SSB position. It will be necessary to activate the push-to-talk circuit.

If the TC-2 is to be used on AM with a T-4XB transmitter, the TC-2 DRIVE LEVEL control must be adjusted according to the service instructions. When frequency spotting with a T-4XB, place the TC-2 FUNCTION switch in the XMTR FIL position so that the TC-2 does not transmit.

When operating AM, modulation peaks should never exceed 180 mA on the TC-2 plate meter or flat topping will result. Transmitting AGC does not operate on AM.

### 3.4 SSB OPERATION

On SSB the exciter should be operated as it is on the H.F. Bands (mike gain settings, etc.). The transmitting AGC fed back to the exciter from TC-2 will prevent flat topping due to overdrive. If the TC-2 is driven by an exciter which has no transmitting AGC, adjust the audio gain until TC-2 plate current never exceeds 150 mA on voice peaks.

#### 4. PRINCIPLES OF OPERATION

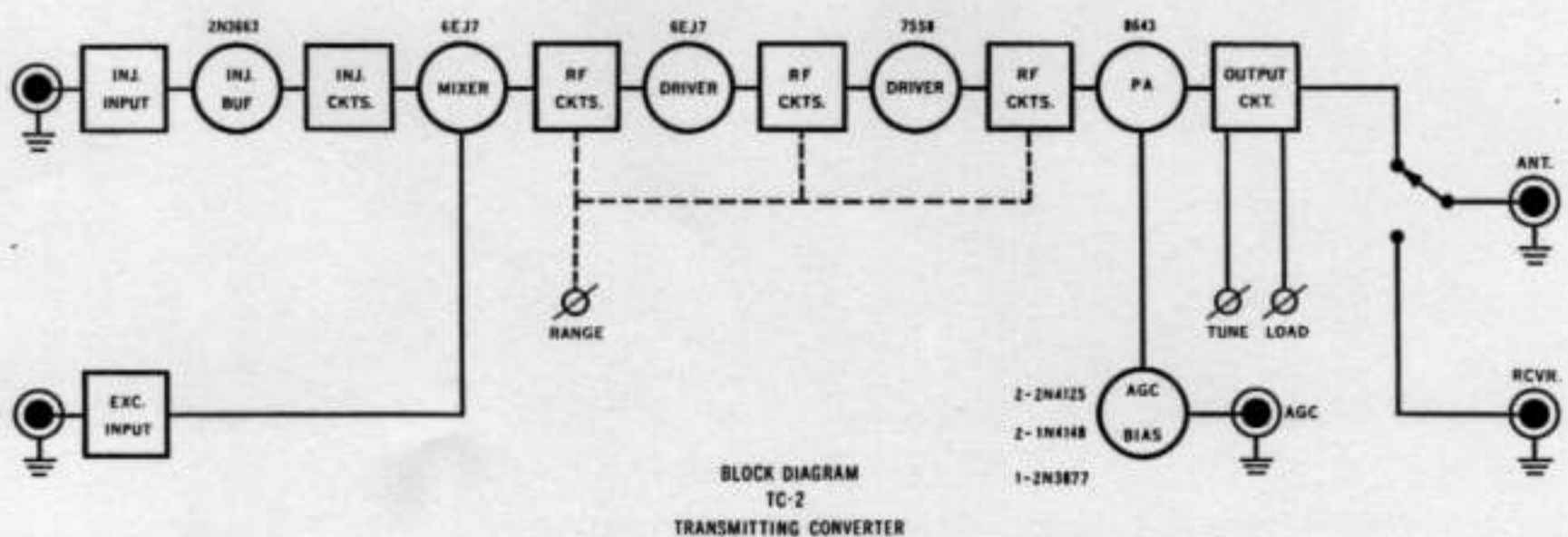
The TC-2 is a transmitting converter which converts the low level output (14.0 - 18.0 MHz) from an H.F. exciter to the two meter band (144 - 148 MHz) by mixing with the third harmonic crystal oscillator output (43.337 or 43.667 MHz) of the Drake SC-2 receiving converter. The output frequency of the TC-2 is the sum of the exciter output frequency and the third harmonic of the crystal frequency of the SC-2.

The low level output from the exciter is coupled into the control grid of the 6EJ7 mixer by a 14.0 - 18.0 MHz bandpass network consisting of L4, L7, and associated capacitors. The injection (43.333 or 43.669 MHz) from the receiving converter is multiplied by the tripler (2N3663) and coupled into the control grid of the 6EJ7 mixer.

The 144.0 to 148.0 signal generated in the mixer is coupled through the tuned circuit consisting of L8, C34, and L9 to the grid of the 6EJ7 pre-driver. The 6EJ7 pre-driver amplifies the signal to a level necessary to drive the 7558 driver. Tuning between the 6EJ7 and 7558 stages is achieved with the tuned circuit consisting of L10, C46, and L11. The output of the 7558 driver is coupled to the push-pull grid circuit of the 8643 final amplifier through L12, C62, L13, and L14.

The output of the 8643 push-pull final amplifier is matched to the load by the matching network consisting of L17, C74, L18, and C78.

Amplified AGC which is derived from a 2N3877 AGC amplifier transistor, is available for controlling the gain of the exciter to prevent overdrive on SSB. Diodes CR5 and CR6 rectify a small sample of the output to provide relative output indication. Transistors Q2 and Q3, and diodes CR1, CR2, and CR3 supply regulated bias for the 8643. Diodes CR7, CR8 and CR9 protect the bias supply from short circuits.



## 5. SERVICE INSTRUCTIONS

If you have technical questions or wish factory service, write to the R.L. Drake Company, Customer Service Department. Before returning equipment, please write for authorization.

### 5.1 TOP COVER REMOVAL

Extreme caution should be exercised when the top and bottom covers of the TC-2 are removed. High voltage which is present at several points can cause a lethal electrical shock. Remove the three top screws on each side of the TC-2 and remove the cover by first pulling up on the rear and then on the front of the cabinet.

### 5.2 BOTTOM COVER REMOVAL

Remove the six bottom screws from the sides of the TC-2 and lift the chassis out of the bottom cover.

### 5.3 TUBE REPLACEMENT

In general, most trouble in electronic equipment of good design is due to tube failure. The best method of finding defective tubes is by direct substitution. It is best not to rely on tube checkers. In most cases replacement of tubes will require realignment.

To obtain access to the 7558 driver and 8643 final amplifier tubes, it will be necessary to remove only the top of the final amplifier cage. This can be accomplished by removing the front and rear sheet metal screws holding the top of the cage and then lifting the top out of the two side clips. To replace the cage simply reverse the process. Be sure that the 8643 plate caps are completely on the plate pins and do not short to the top of the cage.

### 5.4 TROUBLE-SHOOTING

If some problem arises which cannot be cured by tube substitution, it is suggested that the TC-2 be either returned to the dealer or you may write to the Customer Service Department. Be sure to describe the problem in detail. Include full information concerning external connections, control settings, etc. Always include the serial number when requesting service information. Before returning equipment, it is advisable to get prior authorization.

In case of malfunction, first check the power supply fuse and TC-2 filament fuse (a short piece of 26 gauge wire located on the front circuit board) in the TC-2. The voltage and resistance charts, which are shown on the following pages, should be valuable in isolating

minor problems. However, no attempt should be made to service the TC-2 unless you are thoroughly familiar with electronic circuitry and service techniques. Care should be taken not to disturb the lead dress in the TC-2 since some circuits are critical in this regard.

## 5.5 ALIGNMENT

### 5.5.1 130 MHz INJECTION Alignment

1. Tune up on any output frequency using 43.667 MHz oscillator injection.
2. Reduce the exciter drive level until power output is reduced to about 50% of full output.
3. Tune C6 and L6 for maximum output.
4. Connect a signal generator with about 0.5 volts output at 144.0 MHz to the injection jack. With no exciter drive and the TC-2 tuned for maximum output at 144 MHz, adjust L1 for minimum output.
5. Repeat steps 1 through 4 until no further improvement can be made.

### 5.5.2 14.0 - 18.0 MHz Bandpass Alignment

1. Tune up the TC-2 with exciter drive at 15.5 MHz.
2. Reduce exciter drive level until power output is reduced to about 75% of full output. Connect a swamping tool (a 1K resistor and a .001 disc capacitor in series) across L7 and tune L4 for maximum output.
3. Connect the swamping tool across L4 and tune L7 for maximum output.

### 5.5.3 144.0 - 148.0 MHz Alignment

1. Remove the PA grid shield. Remove L13 and tune L14 for resonance at 146.0 MHz with a grid dip meter. Replace L13.
2. Tune up the TC-2 at 144.250 with the range switch in the 144.5 MHz position. Adjust L8, L11, and the coupling between L12 and L14 for maximum output.
3. Tune up the TC-2 at 146.750 MHz with the range switch in the 147.500 MHz position. Adjust L9, L10, and L12 for maximum output.
4. Repeat steps 2 and 3 until no further improvement can be made.
5. Adjust C94 for minimum voltage at J6.
6. Replace the PA grid shield and adjust the coupling between L13 and L14 for maximum output at 144.250 MHz with the range switch in the 144.0 MHz position. The coupling may be adjusted with a soldering aid inserted into one of the perforated holes. Do not short the PA grid coil to ground.



#### 5.5.4 Drive Level

1. If the TC-2 is not used on AM with a T-4X, adjust the drive level control for maximum output (full clockwise). See Fig. 14
2. If the TC-2 is used on AM with a T-4X, tune up normally with the T-4X FUNCTION SWITCH in the TUNE position. With the T-4X FUNCTION SWITCH in the AM position and the T-4X GAIN control at minimum, activate the T-4X push-to-talk circuit and adjust the DRIVE LEVEL control until the TC-2 plate current is 125 mA. This control need not be reset for SSB operation.

#### 5.5.5 AGC Threshold

Set up the TC-2 for SSB. Connect a two tone generator to the mike jack of the exciter. Adjust the AGC threshold control so that the TC-2 plate current does not exceed 180 mA with full audio gain.

VOLTAGE CHART

TUBE NUMBER	TYPE	TUBE PIN NUMBERS								
		1	2	3	4	5	6	7	8	9
V1	6EJ7	2.0	0	2.0	0	6.3 VAC	0	240	135	0
V2	6EJ7	3.25	0	3.25	0	6.3 VAC	0	250	245	0
V3	7558	0	-20	250	6.3 VAC	12.6 VAC	250	0	250	0
V4	8643	0	-30	250	0	6.3 VAC	-30	12.6 VAC	---	---

**NOTE:**

FUNCTION switch in Operate position. Idle current set at 80 mA., relay energized, and no excitation.

RESISTANCE CHART

TUBE NUMBER	TYPE	1	2	3	4	5	6	7	8	9
V1	6EJ7	$\infty$	3 ohms	$\infty$	0	.8 ohms	0	75 K	100 K	0
V2	6EJ7	$\infty$	10 K	$\infty$	0	.8 ohms	0	75 K	78 K	0
V3	7558	$\infty$	3 K	75 K	.8 ohms	1.0 ohms	75 K	0	75 K	$\infty$
V4	8643	0	2.7 K	75 K *		.6 ohms	2.7 K	1.0 ohm	----	----

NOTES:

All measurements were made from ground with the TC-2 disconnected from the power supply and the FUNCTION switch in the OFF position except for values marked \* which were measured with the FUNCTION switch in the OPR position.

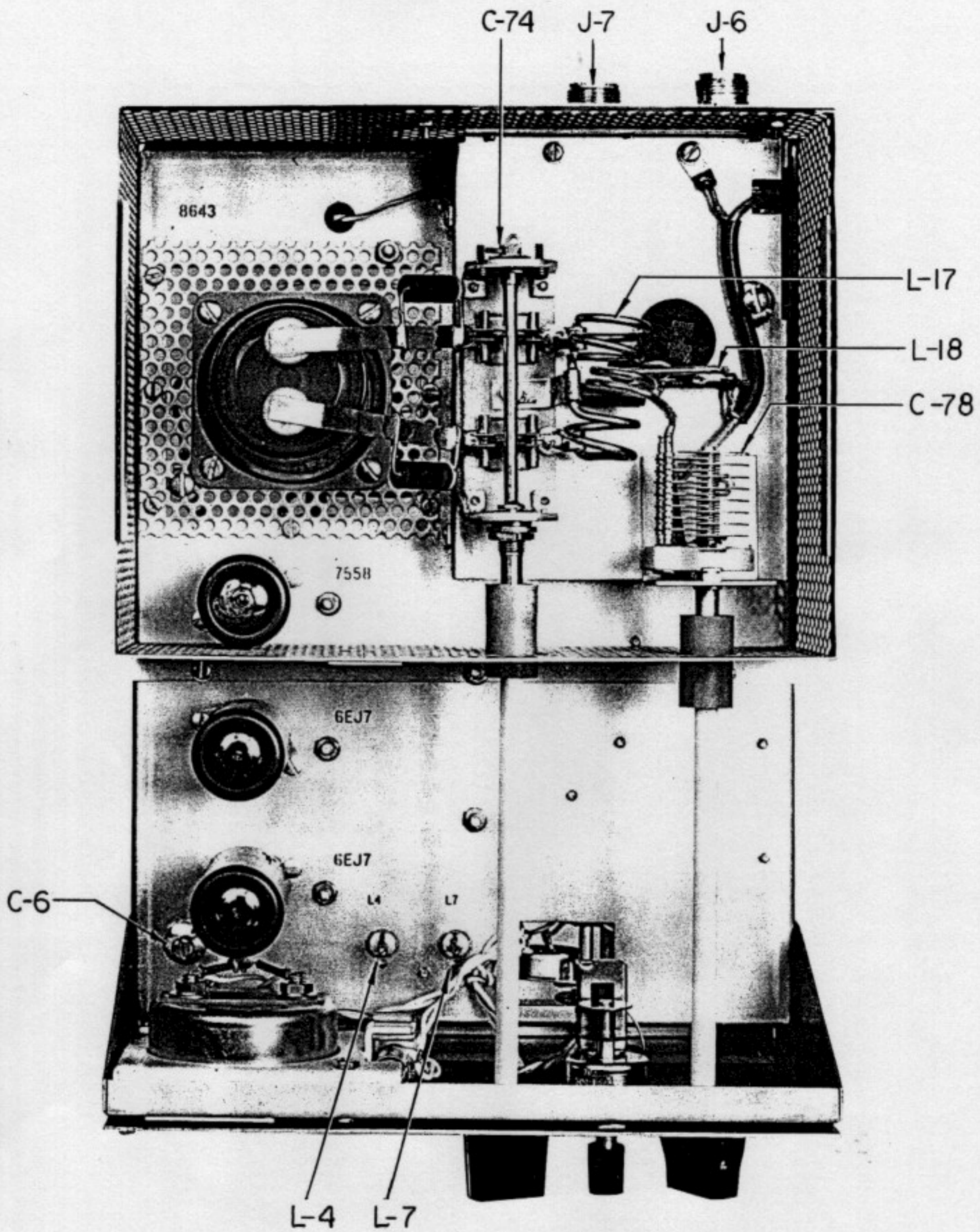


Fig. 13  
 TC-2 Top View

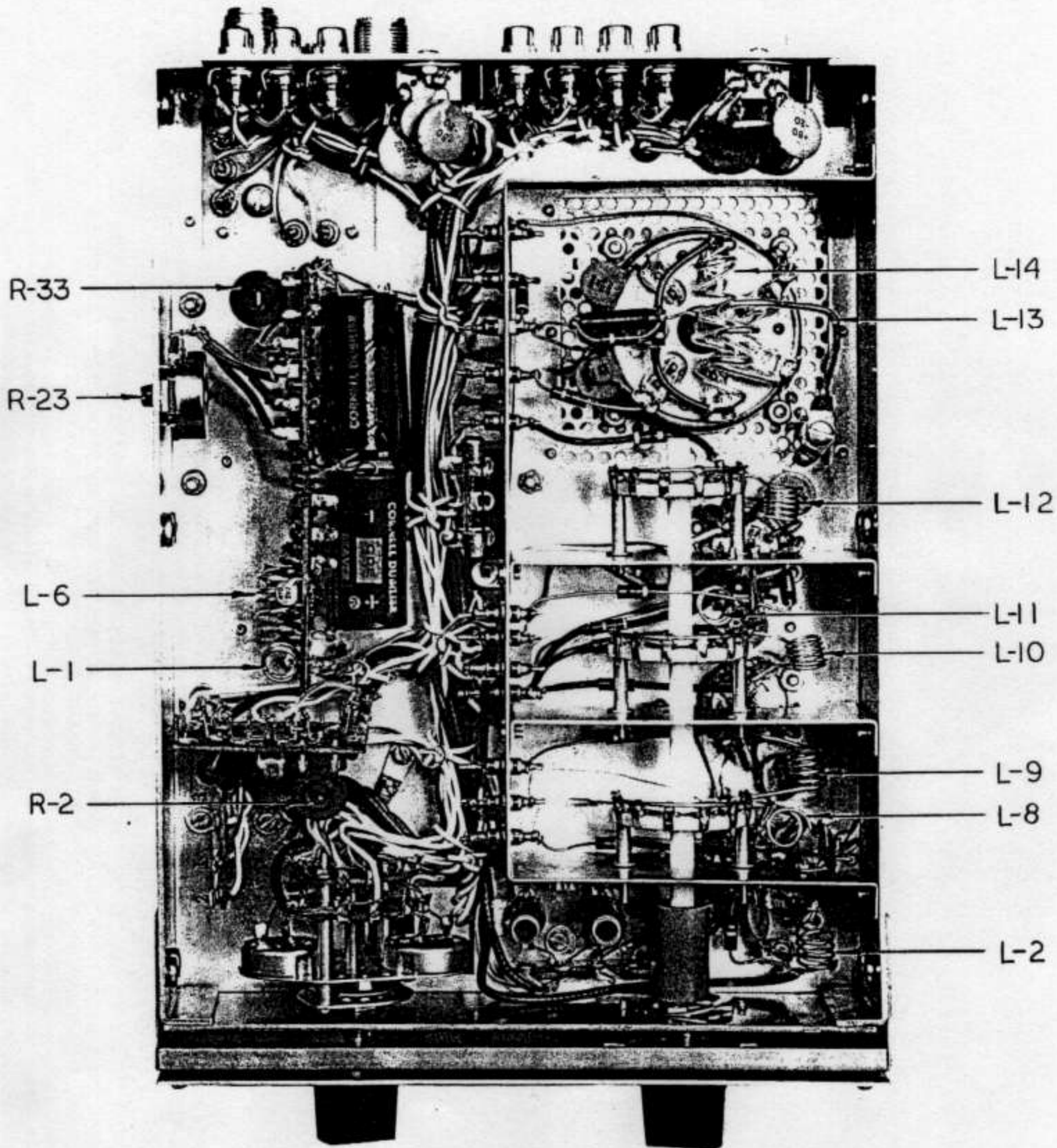
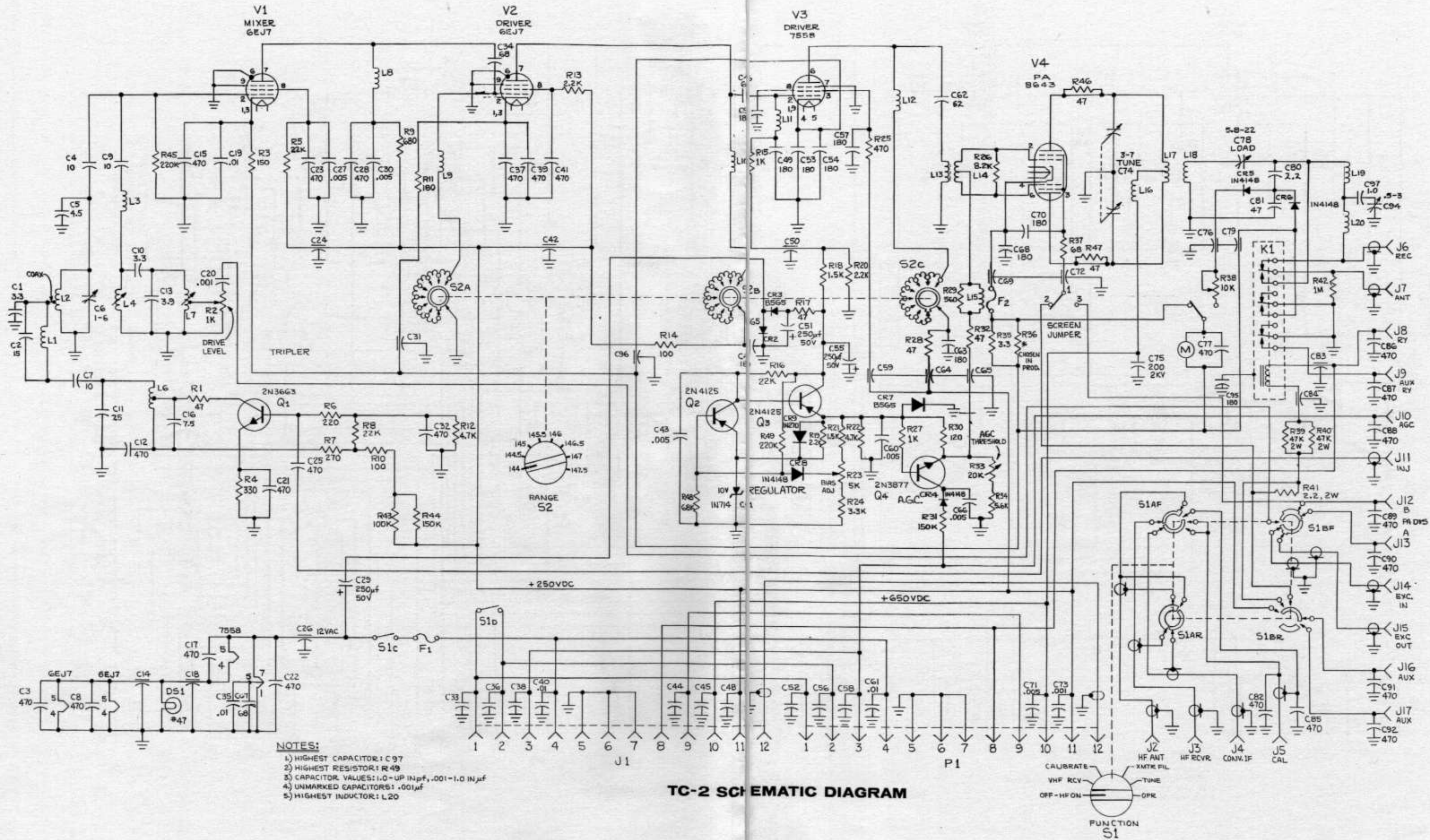


Fig. 14  
TC-2 Bottom View



- NOTES:**
- 1) HIGHEST CAPACITOR: C97
  - 2) HIGHEST RESISTOR: R49
  - 3) CAPACITOR VALUES: 1.0-UP IN pf, .001-1.0 IN  $\mu$ f
  - 4) UNMARKED CAPACITORS: .001  $\mu$ f
  - 5) HIGHEST INDUCTOR: L20

**TC-2 SCHEMATIC DIAGRAM**

