

GLB ELECTRONICS MODEL T144 TRANSMITTER KIT

NOTE: This unit is designed to be driven by a series 400 CHANNELIZER, programmed for X6 multiplication factor in the transmit mode. It is recommended that the output IC (7400) be replaced by a 74H00 or 74S00 to increase the output. The low-pass filter in the transmit output of the Channelizer must be removed. Note also that the Channelizer provides the means for modulating the transmitter, and audio from the processor is coupled to the Channelizer via the input coax. (See the Channelizer instruction book).

INTERCONNECTIONS.

Fig. 1 Shows a typical hookup for this transmitter for use in a transceiver application. Note that power is applied continuously to the audio processing circuits. This technique is necessary only when using the ATK system with the T144. For conventional operation B+ is applied to the transmitter circuits only when keyed, and B+ leads to the transmitter RF section and audio processing sections are simply paralleled.

MICROPHONE. The recommended microphone is a high-impedance dynamic type. Such a microphone, with response characteristics matched to the T144 is available from GLB. Ceramic or crystal units may be used, but if the ATK keying system is to be used, a 220K resistor must be placed in parallel with the element to provide the required DC return.

TONE PAD. A standard telephone-type tone pad may be interfaced directly as shown in fig. 2. With this connection the pad may be interconnected with a single-circuit jack and cable. No battery is required; power is supplied from the T144, and audio is sent down the same wire along with PTT information. With the ATK circuit, the transmitter keys automatically whenever any tone pad button is depressed, transmitting the tones. There is a 1/2 second delay between digits to prevent the transmitter from dropping out each time.

NOTE: The voltage applied to the pad is lower than that used in normal telephone service. Some pads may be slow to build up to full amplitude in this circuit. If you find this to be the case you can supplement the voltage with a series battery as shown in fig. 2

GLB T-144 and T-220 PC Assembly:

Use the parts layout and parts list as a guide for the installation of the components. Starting with the Audio section, install all of the horizontal components. Resistors and IC socket. Next install the capacitors and last the 3 trimmer pots. Use a piece of resistor lead for the short jumper next to C5. Check for proper component placement and soldering and proceed to the transmitter section. *NOTE:

Transmitter section:

It is important that all components are mounted as close to the board as possible. In the case of the disc ceramic capacitors it may be necessary to clean off the coating on the leads in order to bring the caps close to the board. When installing components, pull them down snugly to the board and bend the leads about 45 degrees on the trace side of the board. This will insure that the components will not loosen and lift up on the board. Solder the lead and cut off the excess lead.

Install the resistors and molded chokes first. Install Q1,2 &3. Q4 is installed on the trace side of the board. With a hot iron, solder the case of the transistor to the ground trace. The Base lead and the collector leads are pulled thru the adjacent holes on the top of the board, pulled thru and soldered. The Emitter lead can be cut off on the top side of the board. Install the 3 trimmer caps, C14,18&19. The next step will be winding and installing the coils.

COILS: Instructions on pages 5, 6.

Wind and install L1. Be sure it is inserted in the board according to the keyed layout on the board. C2 can be soldered to the pins on the coil form after it is soldered on the board. Wind and install L2,3,4&5. C6 is is soldered to the coil form pins after L3 is soldered on the board. Install L8,12&14.

A length of coil stock is supplied for the air wound coils. Cut the necessary number of turns for L9,10&13 and install.

Check the board for correct component placement and soldering. Proceed to the tuning procedure.

*NOTE: There are some discrepancies on the board silk screen. When installing components, go by the parts layout for placement.

GLB MODEL T144 TRANSMITTER KIT PARTS LIST 11-15-76

RESISTORS 1/4W CC 10% UNLESS OTHERWISE NOTED

R1 4.7K
 R2 1 K
 R3 330
 R4 470
 R5 4.7K
 R6 1 K
 R7 100
 R8 2.2K
 R9 1 K
 R10 47
 R11 47

CAPACITORS: ALL CERAMIC, STABLE CERAMIC, 10% TOL UNLESS OTHERWISE NOTED. GP=GENERAL PURPOSE; AE=ALUMINUM ELECTROLYTIC. VALUES IN UF UNLESS OTHERWISE LISTED.

C1 4.7 PF
 C2 22 PF
 C3 33 PF
 C4 47 PF
 C5 .001 UF C GP
 C6 2.2 PF
 C7 .001 UF C GP
 C8 6.8 PF
 C9 6.8 PF
 C10 .001 UF C GP
 C11 6.8 PF
 C12 .001 UF C GP
 C13 .001 UF GP
 C14 5-25 PF TRIMMER
 C15 .001 UF GP
 C16 100 PF
 C17 .001 GP
 C18 5-25 PF TRIMMER
 C19 5-25 PF TRIMMER
 C20 .001 GP
 C21 .001 GP
 C22 .001 GP
 C23 .001 GP
 C24 10 UF AE 16 V
 C25 33 PF
 C26
 C27 15 PF
 C28 .001 *ref.*

TRANSISTORS.

Q1 2N5130
 Q2 2N5179
 Q3 2N3866
 Q4 MRF 237

COILS: ID = DIAMETER OF FORM WIRE IS WOUND. CW = CLOCKWISE; A CCW COIL IS WOUND SO THAT IT FOLLOWS THE THREADS OF A R-H SCREW.

L1 5.5 T CW #26 WIRE (SLUG-TUNED FORM, WHITE SLUG)
 L2 5.5 T CCW #26 "
 L3 5.5 T CCW #24 "
 L4 5.5 T CCW #24 "
 L5 4.5 T CCW #24 "
 L6 .33 UH MOLDED } *Black*
 L7 .33 UH MOLDED }
 L8 4 T #24 0.2" ID; FERRITE BEAD ON THE B+ END LEAD.
 L9 1.75 T #18 .25" ID
 L10 5 T #18 CCW .25" ID
 L11 4 T #24 0.2" ID
 L12 #24 LOOP; TOTAL WIRE LENG = 1" ABOVE BOARD.
 L13 4 T #18 CCW .25" ID
 L14 #26 WIRE PULLED THRU FERRITE BEAD TWICE (IN-LOOP-OUT)

CIRCUIT BOARD

INSTRUCTIONS

TUNING LOOP. (.001C CAP, DIODE, 3" #24 SOLDEREZE)

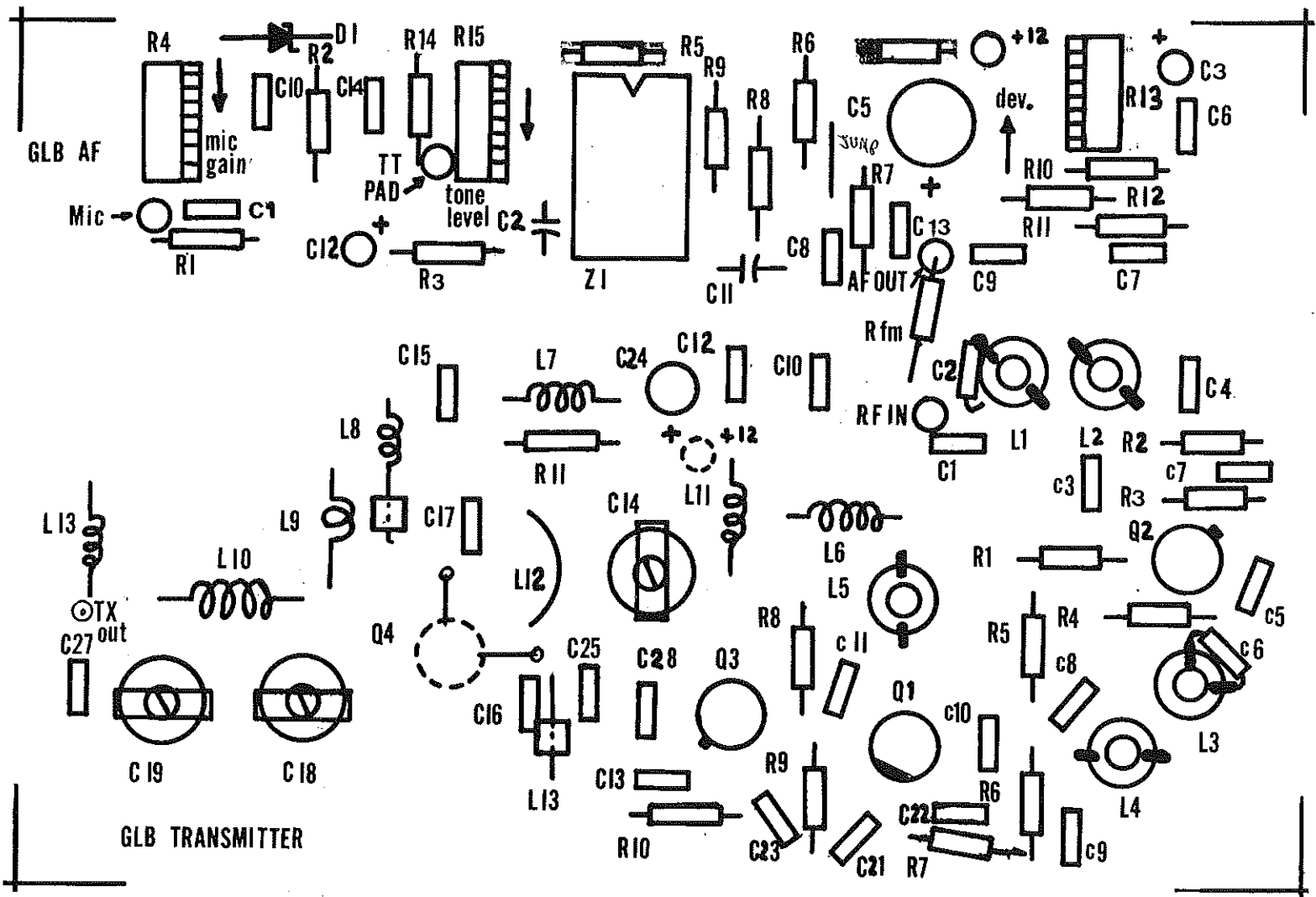
GLB ELECTRONICS T144 and T220 audio section parts list:

Resistors $\frac{1}{4}W$ 10% unless noted.

Capacitors: All ceramic unless noted:

R1	1 meg	C1	.01 uf <i>mylar</i>
R2	1 meg	C2	100 pf
R3	1 K	C3	1 uf Tantalum
R4	100 K pot	C4	
R5	1 K	C5	100 uf electrolytic
R6	180 K	C6	.001 uf
R7	220 K	C7	.005 uf Mylar
R8	10 K	C8	39 pf
R9	100 K	C9	.01 uf <i>mylar</i>
R10	82 K	C10	.05 uf <i>mylar</i>
R11	82 K	C11	.01 uf Mylar
R12	82 K	C12	1 uf TAN
R13	100 K pot	C13	.01 uf
R14	220 ohm	C14	.05 uf <i>mylar</i>
R15	100 K pot		
R16	100 ohm	Z1	4136
		"	14 pin socket

D1 Zener



FOLLOW THESE FIGURES CLOSELY. NOTE ESPECIALLY THAT L1 IS WOUND IN THE OPPOSITE DIRECTION FROM L2 THRU L5.

ALL COILS ARE CLOSE-WOUND EXCEPT FOR L9, L10 AND L13. STRETCH THE LATTER EVENLY UNTIL THE SPACES BETWEEN TURNS IS ABOUT THE SAME WIDTH AS THE WIRE.

L11 AND L8 ARE WOUND ON ONE OF THE COIL FORMS FOR SIZE; THEN REMOVED AS SELF-SUPPORTING COILS. COUNT TURNS IN THE SAME WAY AS IS SHOWN FOR L9, 10 AND 13.

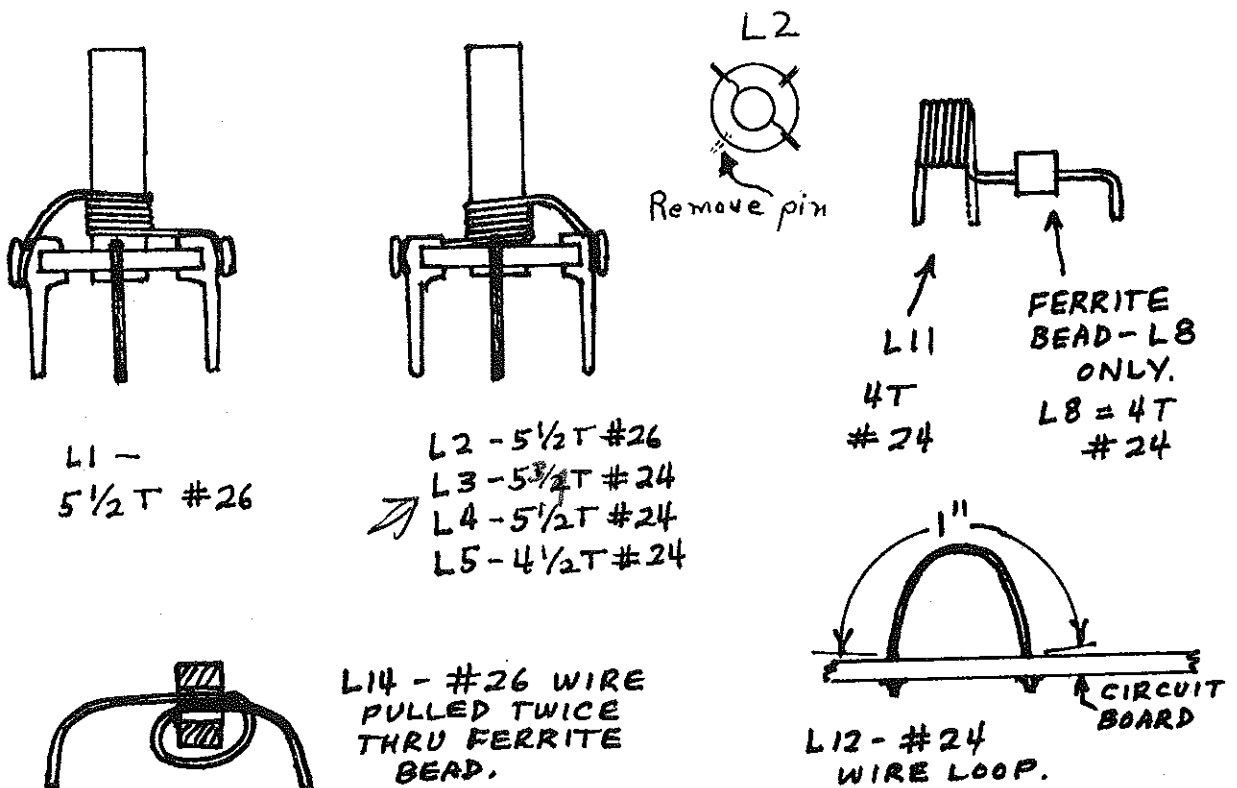
WHEN BENDING THE PIGTAIL LEADS TO MATCH THE BOARD HOLE SPACING TAKE CARE NOT TO DISTORT THE FORMED PART OF THE COIL ITSELF.

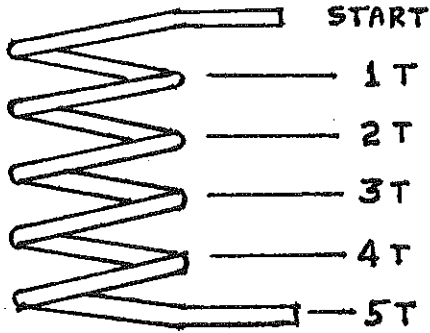
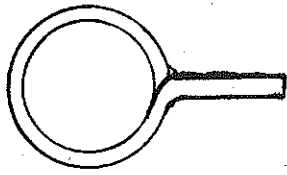
FOR L12, START WITH A 1.2" LENGTH OF #24 WIRE, TINNING EACH END ABOUT 0.1 INCH BACK. THEN FORM AND INSERT AS SHOWN.

PULL THE LOOP ON L14 SNUGLY AROUND THE FERRITE BEAD.

IN ALL CASES THE PIGTAILS SHOULD BE JUST LONG ENOUGH TO REACH THE BOARD MOUNTING HOLES WITH ENOUGH TINNED LENGTH TO SOLDER TO THE TRACE SIDE.

TO TIN "SOLDEREZE" JUST HEAT THE WIRE WITH A SOLDERING IRON. WHEN THE INSULATION MELTS YOU CAN SOLDER IT WITHOUT STRIPPING. JUST MAKE SURE YOU USE ENOUGH HEAT TO INSURE A GOOD JOINT.





L9 - 2T }
L10 - 5T } #18
L13 - 4T }

SPACING SHOWN
EXAGGERATED.
SPACES SHOULD
BE = WIRE DIA.

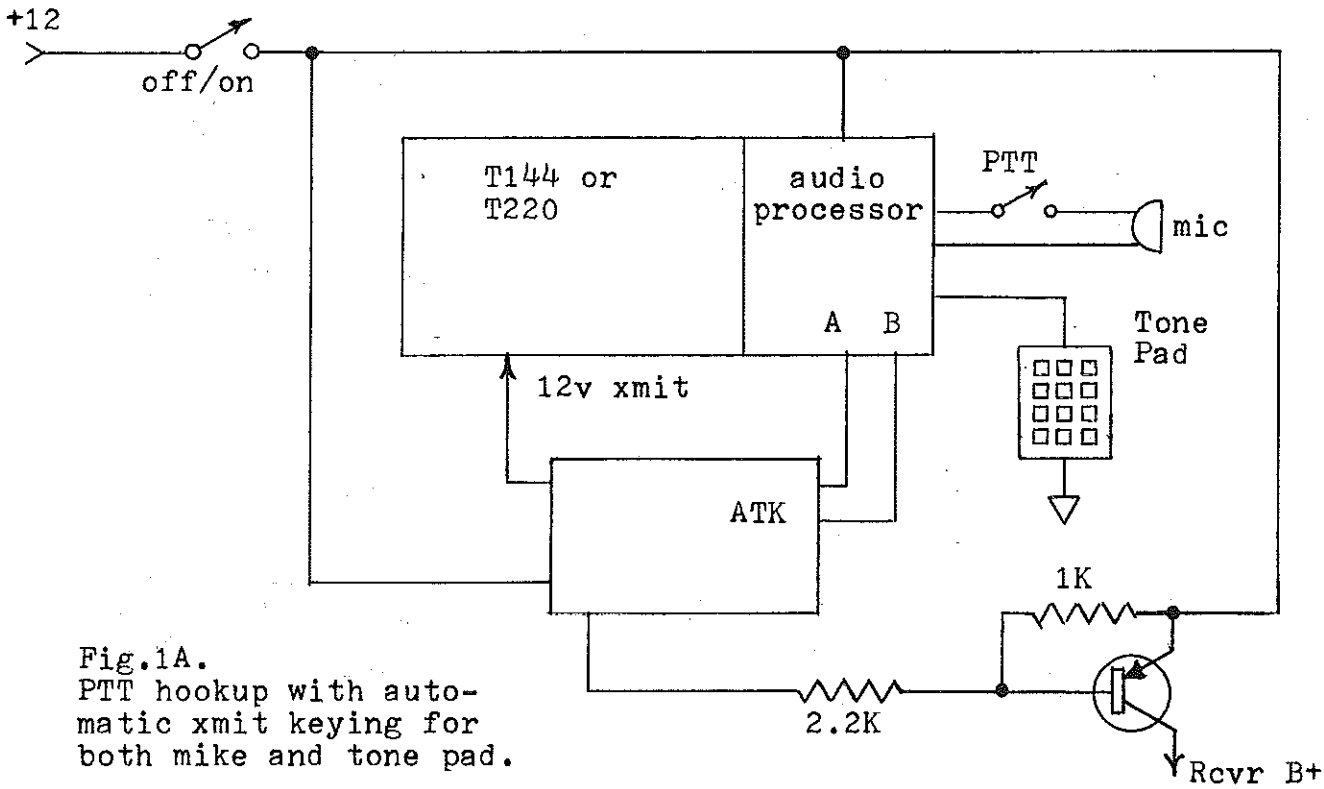


Fig.1A.
PTT hookup with auto-
matic xmit keying for
both mike and tone pad.

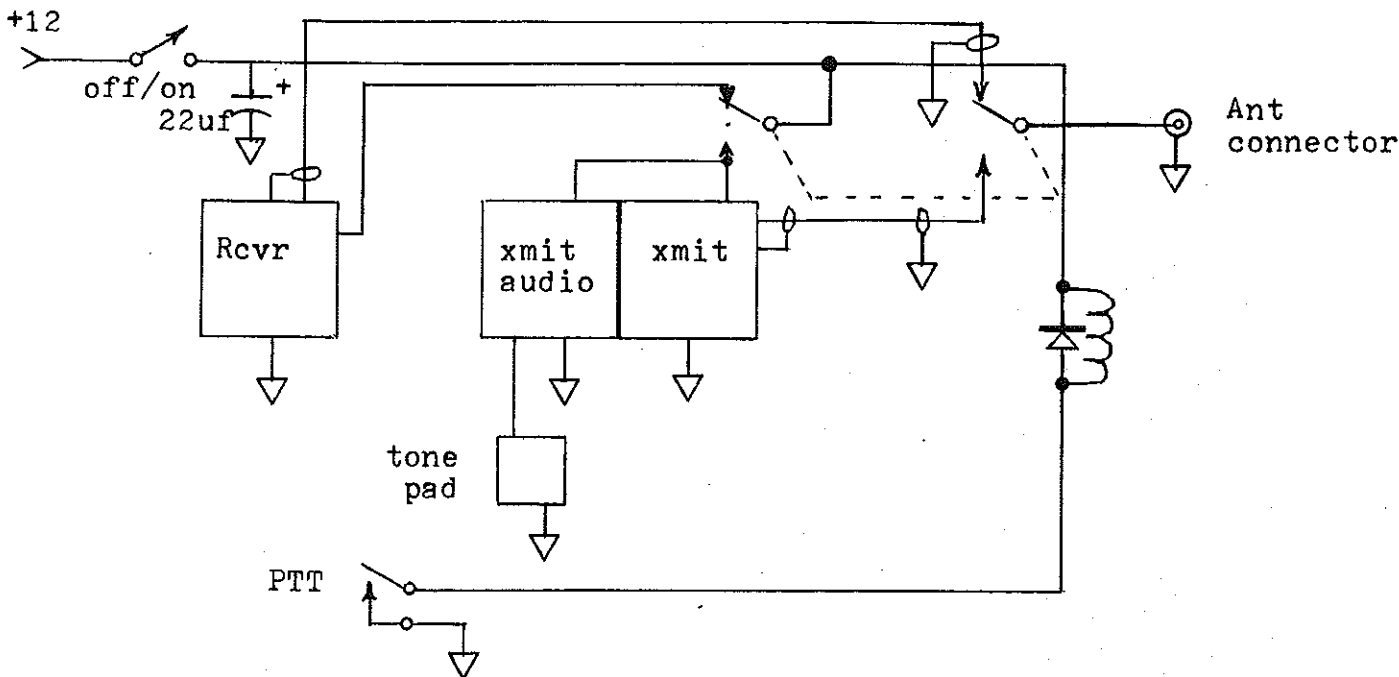


Fig. 1B.
 Conventional PTT circuit with separate PTT switch.
 Tone pad operation requires operating PTT switch.

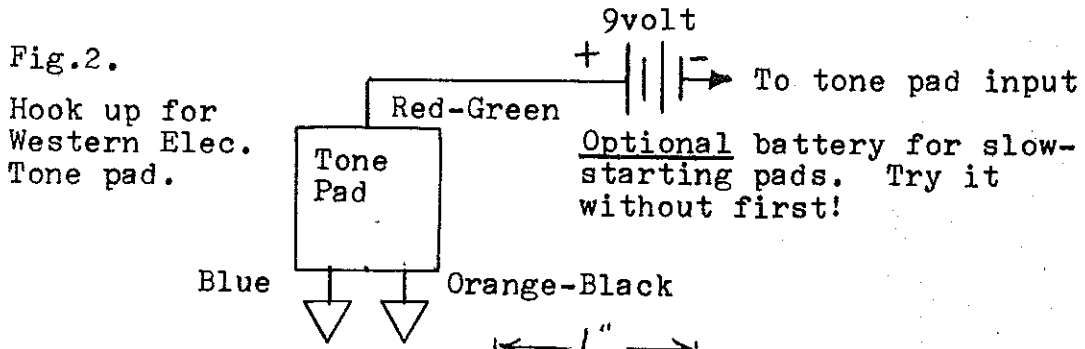


Fig.2.
 Hook up for
 Western Elec.
 Tone pad.

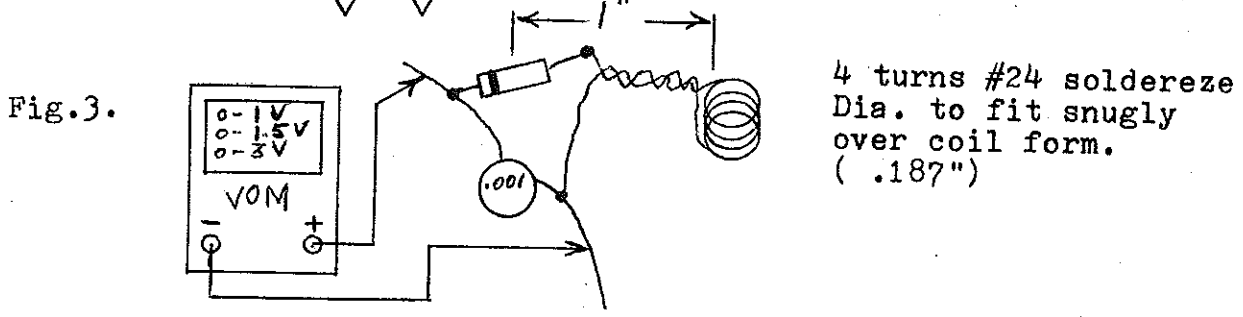


Fig.3.

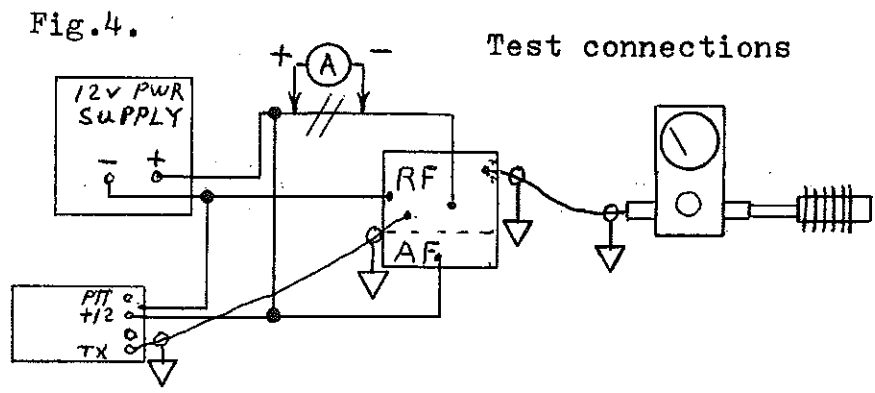


Fig.4.

GLB ELECTRONICS MODEL T144 TRANSMITTER KIT

TUNING PROCEDURE

EQUIPMENT REQUIRED.

1. A good 50 ohm dummy load
2. An RF detector. See fig. 3.
3. A DC volt-ohm-milliammeter (VOM) with 20K/V DC sensitivity.
4. A DC power supply, 1.5A And between 12 and 14 volts regulated output.

For proper modulation adjustments you should also have a microphone (the one to be used), a touch-tone pad (if you're going to use one), and at least an FM receiver having the correct bandwidth for the deviation desired. (Preferred, of course, would be a deviation meter and an audio oscillator)

I. RF ALIGNMENT.

1. Interconnect the equipment as shown in fig. 4. Set the Channelizer frequency to 147 MHz. (Transmit) Key the Channelizer PTT.
2. Turn the power on.
3. Slip the detector loop over L1, making sure that it is right around the coil winding itself. Switch the VOM to the lowest voltmeter scale available. Connect the meter leads to the detector as indicated in fig. 3.
3. Tune L1 for a sharp but very low-level peak. (Less than .1V)
4. Remove the detector from L1. Connect the voltmeter (-) probe to ground (foil area surrounding the mounting holes) and the (+) lead to the ungrounded side of R3. Observe a reading of approximately 1.25 Volts. Tune L2 for maximum, an increase of about 0.2 Volts. Now repeak L1 carefully.
5. Place the detector coil over L3, with the VOM connected as in step 2. Tune L3 for maximum voltage. (About a volt)
6. Connect the voltmeter (-) lead to ground, and (+) lead to the ungrounded side of R7.
7. Tune for maximum voltage- about 1.5 Volts. Peak L4, then re-peak L3 for maximum voltage at this same point.
8. Place the detector on L5, as before. Tune L5 for a maximum voltage (1 to 2 volts). Repeak L3 and L4 carefully.
9. Remove the detector and switch the VOM to a 0-1 or 0-2 ampere scale. Shut off the power supply and connect the (+) lead of the meter to the power supply (+) and the (-) lead to the the (+) terminal of the transmitter board.
10. Turn on the power supply. Tune C14 for maximum current indication.
11. Tune C18 and C19 for maximum power output. Then retune L5, C14, C18 and C19, in that order.
12. If you have an RF wattmeter you should get at least 2.5 Watts.* If power is low, check the current drain of the transmitter. It should draw at least 0.75 Amps for full power output. If it isn't drawing enough current check the board completely for errors, particularly in capacitor values and coil winding accuracy. Try repeating steps 1 to 9.

NOTE: Final adjustment of L1 and L2 is done in step 4. Do not touch these coils in later steps. Similarly, L3 and L4 should not be readjusted after step 8. If you think they need re-adjustment, go back and repeat those steps.

* At 13.6 Volts.

AUDIO ADJUSTMENTS.

9.

The audio processor section of the T144 requires an independent B+ connection (see section on INTERCONNECTIONS). Connect as shown in fig. 4 For these adjustments.

The three potentiometers on the audio section of the transmitter are:

- R4 Microphone gain
- R15 Tone level adjustment
- R13 Deviation limit adjustment

The deviation limit adjustment is just that - when properly set it is impossible to cause the transmitter to be overmodulated, regardless of the setting of the gain adjustment or how loudly the operator speaks. Once set, never disturb the setting without a good method of checking. Never use the deviation limit adjustment as a substitute for a gain adjustment. In many commercial transceivers proper deviation settings yield reports of "low audio" because there is insufficient gain built into the radio. Because of the generous amount of microphone gain built into the T144 it is possible to have too much gain, and you can afford to set the deviation limit properly.

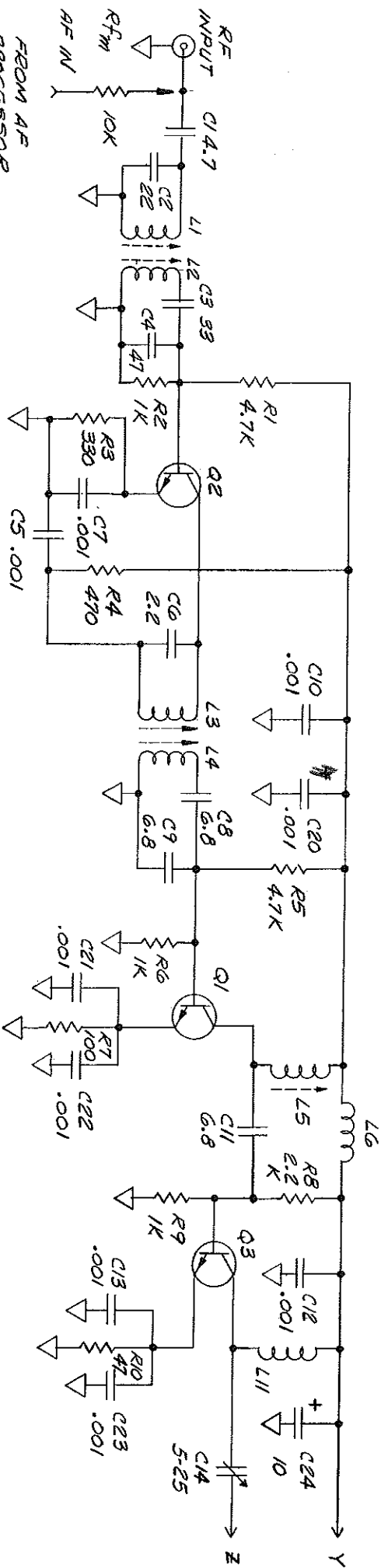
DEVIATION ADJUSTMENT.

1. Set R4 to maximum (direction of arrow on board).
2. Connect a microphone to the input. Tune a receiver or a deviation meter to the output frequency of the T144. With the transmitter keyed, make sure the receiver is exactly centered on the transmit frequency, preferably by metering the discriminator.
3. Speaking as closely as possible to the microphone and in a loud voice, adjust the deviation limit control, R13 to the highest setting possible before an increase in distortion is noted. If an audio oscillator is available, set it to 1KHZ and substitute it for the microphone. Output should be sufficient to overdrive the "mike" circuits, but it takes only a few millivolts.

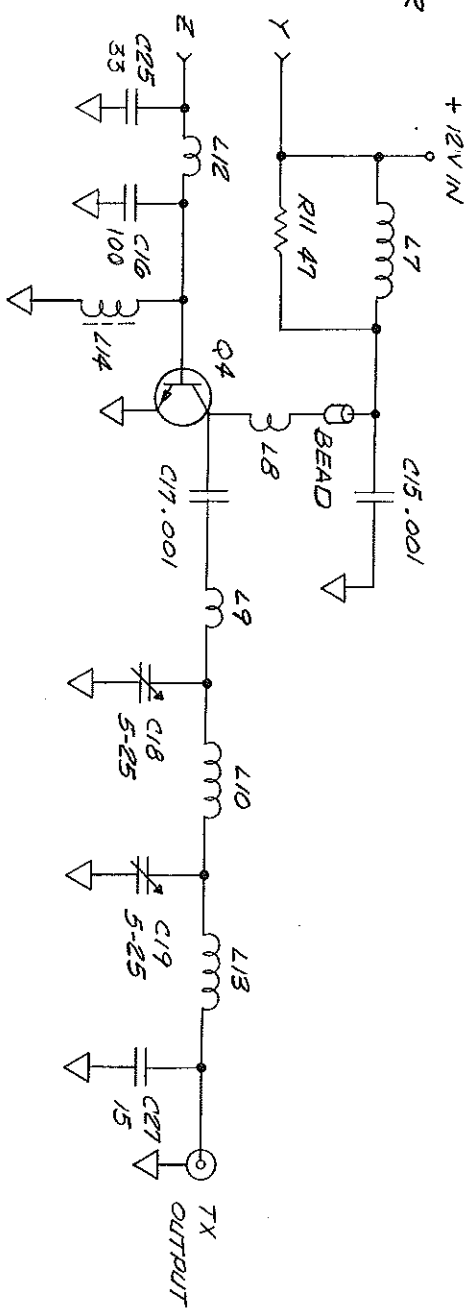
On a deviation meter, set R13 so that the desired bandwidth is not exceeded under these conditions.

4. Using the microphone, reduce the GAIN adjustment (R4) until the recovered audio is pleasing to the listener, as required. After this, adjust ONLY R4 for the "amount" of audio.

3. Tone pad adjustment. Connect a standard telephone-type tone pad to the tone input terminal and ground as shown in fig. 2. Adjust R15 for the highest level possible before audible distortion sets in. Either too high or too low a level may prevent the decoding system from responding properly.



FROM AF
PROCESSOR
OUTPUT TO
MODULATE
CHANNELIZER



- Q1 - 2N5130
- Q2 - 2N5179
- Q3 - 2N3866
- Q4 - MRF 237

GLB MODEL
7144
TRANSMITTER
STRIP
11-15-76

GLB ELECTRONICS

Model T144 Transmitter Kit Addendum

Page 3-C26-not used

add C28- .001 uf ceramic

Page 4-C12-1 uf tantalum

Page 4-Pictorial-line below C5 and above C8-wire jumper. *(audio)*

Page 5-L3 coil-

