TMC SPECIFICATION			NO. S -844
REV: 0			
COMPILED: RDeV	CHECKED: REL	APPD: RDC	SHEET 1 OF 12
TITLE:			
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TEST PROCEDURE

for

STE-1

A. TEST EQUIPMENT REQUIRED

1. Simpson 260 VOM.
2. Line cord - TMC Model CA-555-4.
3. Resistors - 22K1/2W; 47 ohm 1/2W; 47 ohms and 3.3 ohms 1W - All 5%. Two 560 ohm 1/2W and 39 ohm 1/2W.
4. TMC Model PTE-3 - Spectrum Analyzer.
5. Schematic Diagram CK754; S-809.
6. Ballantine A-C VTVM - Model 314.
7. Heathkit Model AG-8 - Audio Oscillator or equivalent.
8. Hewlett-Packard Model 524C - Frequency Counter.
9. Hewlett-Packard Model 606A - Signal Generator.
10. Hewlett-Packard - 410 A-C VTVM.
11. Extension Module AX436.
12. GPR-90 with loudspeaker.
13. Handsets: HS-100-3C; HS-100-3D and MK-102.
14. Tektronix 541A "L" head.

B. WARNING

This unit is a solid state device. Any indiscriminate resistance measurement may harm this unit. Make resistance measurements only where and when so indicated.

C. PRELIMINARY

1. All RF modules should be pre-tested per TMC S-809 before being installed into this unit. Do not install the RF module into the unit at this time.

2. Inspect the unit for mechanical imperfections such as loose screws, printed circuit boards, cold solder joints, etc.

3. With the ohmmeter D-C setting in the + position, measure 3000 ohms ±10% from Pin #21 on the audio board to GND; 600 ohms ±10% from Pin #16 on the audio board to GND; and 700 ohms ±10% from the emitter of Q902 to GND.

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D. POWER

1. Set VOX/PTT switch to PTT.

2. Connect the unit to an a-c outlet.

3. Set the power switch to ON. The white light should go on.

4. With the Hewlett-Packard VTVM, measure ±12V ±5% from Pin #21 on the audio board to GND; -12V ±5% from Pin #16 on the audio board to GND; and -36V ±5% from the emitter of Q902 to GND.

5. Connect the Ballantine A-C VTVM between Pin #21 on the AF board and GND. The a-c noise measured should not exceed 1 mv.

6. Repeat Step #5 for Pin #16 on the audio board and the emitter of Q902.

7. Connect the VTVM to Pin #1 on the RF module and GND. A ±12V ±5% should appear on the Pin #1 when Pin #8 on TB1502 or Pin #2 on J1515 (handset) is shorted to GND.

8. Repeat Step #7 for Pin #5 on the IF board.

9. Connect the VTVM to Pin #8 on the RF module and GND. A -12V ±5% should appear on Pin #8 when Pins #8 on TB1502 or #2 on J1515 (handset) are shorted to GND.

10. Repeat Step #9 for Pin #7 on IF module.

11. Connect the VTVM to Pin #7 on the RF module and GND. A -36V ±5% should appear on Pin #7 when Pin #8 on TB1502 or Pin #2 on J1515 (handset), is shorted to GND.

12. Make sure that no voltage exists on Pins #1, 7, and 8 on the RF module; and Pins #5 & 7 on the IF module when both Pin #8 on TB1502 and Pin #2 on J1515 (handset) are not shorted to GND at the same time.

13. Measure 115V with the Simpson between Pins #9 and #10 on RF module.

14. Short Terminal #8 on TB1502 to GND.

15. Make sure that the removal of the a-c line fuse causes voltages to disappear.

16. Measure ZERO resistance (short) between Pins #15 and 16 on TB1502, and infinite resistance between Pins #13 & #14. Remove the short from Pins #15 & #16 on TB1502, and measure ZERO resistance between Pins #13 & #14 on TB1502.

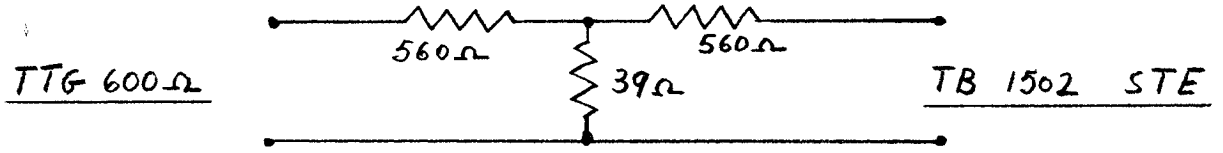
E. TRANSMITTER AUDIO ALIGNMENT

1. Set the MODE switch on the front panel to SSB position.

E. TRANSMITTER AUDIO ALIGNMENT - Cont'd

2. Check to see that S1518 on the rear of the unit is in the LINE position.

3. Connect the output ot TTG two-tone generator within the PTE through an attenuation pad (as shown below) between Terminal 6 on TB1502 and GND.



4. Set the TTG AUDIO TONE SELECTOR to Tone 1.

5. Connect the Ballantine A-C Voltmeter between Terminal 6 of TB1502 and GND. Set the AUDIO OUTPUT control on the TTG for a deflection of 1 mv.

6. Move the Ballantine to Terminal 1 and GND on the TRANSMITTER AUDIO printed circuit board. The deflection should be 100 mv with the AF GAIN control maximum clockwise. Rotating the AF GAIN control maximum counter-clockwise should reduce the signal to approximately 8 mv.

7. Rotate the AF GAIN control maximum clockwise.

8. Connect the output of the TTG without attenuation pad between Terminals 1 and 3 on TB1502. Using the Ballantine A-C Voltmeter, set the output of the TTG at 77.5 mv.

9. Connect the Ballantine between Terminal 1 and GND on the XMTR IF printed circuit board.

10. Adjust R1718 for a deflection of 46 mv. Remove meter.

11. Connect the TTG output through the attenuation pad between Terminal 6 of TB1502 and GND. Set the TTG to obtain a 1 mv input at Terminal #6 on TB1502.

12. Connect the Ballantine between Terminal 3 on the XMTR AF printed circuit board.

13. Rotate the VOX GAIN control on the front panel maximum counter-clockwise, and the AUDIO fully clockwise.

14. Set the PTT/VOX switch to VOX.

15. Turn the VOX control slowly clockwise until the TRANSMIT/RECEIVE relay (K1500) trips. The value of audio voltage required to trip the relay should be approximately 20 mv as indicated on the Ballantine.

16. Rotate the VOX GAIN control maximum counter-clockwise. The TRANSMIT/RECEIVE relay should de-energize.

E. TRANSMITTER AUDIO ALIGNMENT - Cont'd

17. Set HANDSET LINE switch S1518 to HANDSET, and PTT/VOX to PTT. Connect the A-C Ballantine to Pin #6 on TB1502.

18. Connect the scope to Pin #1 on the audio board & GND. Set AF GAIN and R1719 on the audio board fully clockwise.

19. Observe the following sine wave. ~ .05 PTP.

20. Increase the TTG input until the sine wave on the scope begins to clip. ~ .07. Clipping should begin when the A-C Ballantine reaches 2 mv.

21. Set R1719 fully counter-clockwise. The clipped sine wave on the scope should turn into a pure sine wave and increase to .8V. ~

22. Disconnect the TTG and set HANDSET LINE to LINE.

F. TRANSMITTER IF ALIGNMENT

1. Short Pin #8 on TB1502 to GND.

2. Connect the frequency counter to one side of C1740 on the XMTR IF printed circuit board. The counter should register a frequency of 250KC ±50 cps. Remove counter.

3. Set XMTR sideband switch to USB.

4. Connect counter to the emitter lead of Q1715 and adjust C1749 for a frequency of 2 mc ±2 cps as registered on the counter.

5. Set the XMTR sideband switch to LSB.

6. Leave counter connected to the emitter lead of Q1715, and adjust C1749 for a frequency of 1.5 mc ±2 cps as registered on counter.

7. Set the Ballantine to the 1V scale and measure the voltages between the R1742 side of C1718 and GND, and also between the R1742 side of C1719 and GND. If the two voltages are not equal, adjust R1742 to obtain the closest reading to equality.

8. Rack a 47 ohm, 1/2 watt, 5% resistor across Terminals 9 & 10 of the XMTR IF printed circuit board.

9. Connect the Ballantine between the collector of Q1711 and GND (terminal 10 on printed circuit board.

10. Adjust R1748 for a null reading on the 100 mv scale.

F. TRANSMITTER IF ALIGNMENT - Cont'd

11. Connect the Ballantine A-C VTVM across the 47 ohm resistor with the ground lead at Terminal 10. Use 1V scale.

12. Set the MODE switch on the front panel to AM position.

13. Adjust C1725 and C1730 for a peak indication on the meter.

14. Set the MODE switch on the front panel to SSB position.

15. Connect the TTG through attenuation pad between Terminal 6 on TB1502 and GND.

16. Connect the Ballantine between Terminal 6 on TB1502 and GND, and adjust the TTG output for a reading of 1 mv on the meter.

17. Connect the Ballantine across the 47 ohm resistor with the ground lead at Terminal 10.

18. Adjust C1762 and C1763 for a peak indication on the meter. The maximum voltage reading on the meter should be approximately 100 mv. Remove meter.

19. Connect the SIGNAL INPUT jack on the PTE-3 analyzer across the 47 ohm resistor on the printed circuit board.

20. Set the PTE-3 to accept an input of 1.75 mc. A single tone should appear on the screen with possible distortion products not higher than 40 db below tone level.

21. Adjust capacitor C1715 for minimum distortion level. Minimum distortion level should fall between -45 and -50 db below tone level.

22. Locate the carrier by increasing the analyzer gain 20 db. The carrier signal should appear to the left of the audio tone in the LSB position of the XMTR sideband switch, and to the right of the audio tone in the USB/REMOTE position. Reducing the audio input from the TTG to ZERO will leave only the carrier signal on the screen.

23. Disconnect TTG. Re-adjust R1742 for a minimum carrier amplitude on the analyzer screen.

24. Re-apply signal at Pin #6 of TB1502. The carrier level should be a least 50 db below the audio tone level.

25. Set the transmitter mode switch to the -20DB CARRIER position. The carrier signal should re-appear on the screen 25 db $\pm$2 db below the audio tone level.

26. Set the transmitter mode switch to the CW position. The audio tone and carrier signal should disappear from the analyzer screen. Reduce TTG output to ZERO.

F. TANSMITTER IF ALIGNMENT - Cont'd

27. Connect a short jumper between Terminals 9 and 10 on TB1502. A single tone should appear on the screen. Distortion products will appear also.

28. Connect the Ballantine A-C Voltmeter between Terminal 10 on the CW OSC. printed circuit board and GND.

29. Adjust R1533 on the CW OSC. board for a reading of 14 mv on the meter. Remove meter.

30. A second harmonic distortion signal should appear in addition to the audio tone from the CW OSCILLATOR. This distortion level should be more than 30 db below the audio oscillator tone.

31. Set the transmitter mode switch on the front panel to the MCW position. A carrier signal should appear on the analyzer screen in addition to audio tone from the CW OSCILLATOR. The carrier signal should be 8 db $\pm$2 db above the audio tone. The second harmonic of the audio tone should be 42 db below the carrier signal level.

32. Set the transmitter mode switch to the "SSB position. The audio tone and carrier signals, including distortion, should disappear from the analyzer screen.

33. Increase the TTG output to obtain 1 mv at Terminal 6 of TB1502 as measured on the Ballantine A-C Voltmeter. Audio tone should appear on analyzer screen.

34. Check the TTG on TONE 2. The meter should still read 1 mv at Terminal 6, TB1502. Remove meter.

35. Set the TTG AUDIO TONE SELECTOR to the TWO TONE position. Two tones should appear on the analyzer screen. Third order distortion should be more than 45 db below the level of each tone.

36. Disconnect analyzer and TTG.

G. TRANSMITTER AUDIO AND IF BANDWIDTH CHECK

1. Using the frequency counter, adjust the variable audio oscillator output for 1 kc.

2. Connect the variable audio oscillator to Terminal 6 on TB1502.

3. Connect the Ballantine A-C Voltmeter across the 47 ohm resistor with the ground lead on Terminal 10.

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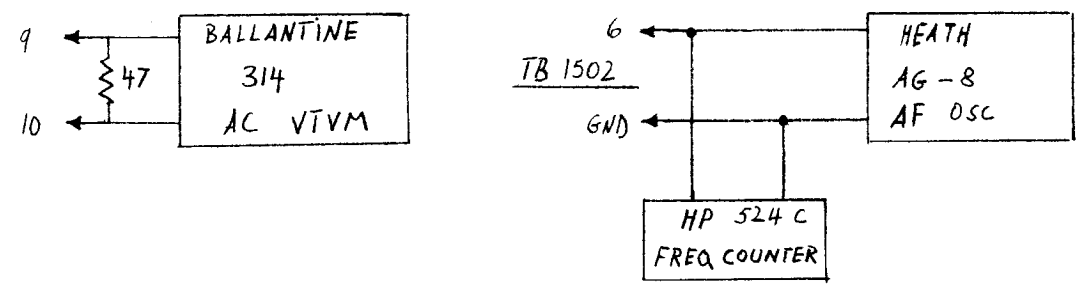
G. TRANSMITTER AUDIO AND IF BANDWIDTH CHECK

4. Set the variable audio oscillator output for a reading of 315 mv across the 47 ohm resistor as read on the Ballantine meter.

5. Using the graph on Sheet 9 as a guide, and the 315 mv indicated on the meter as the 0 db reference, vary the frequency of the audio oscillator. Compare the output change in db with the graph. The overall response must be better than ±3 db from 300 to 3300 cps above and below 1.75 mc.

6. Shut off the power.

7. Disconnect the 47 ohm resistor from Terminals 9 and 10 on the IF board.



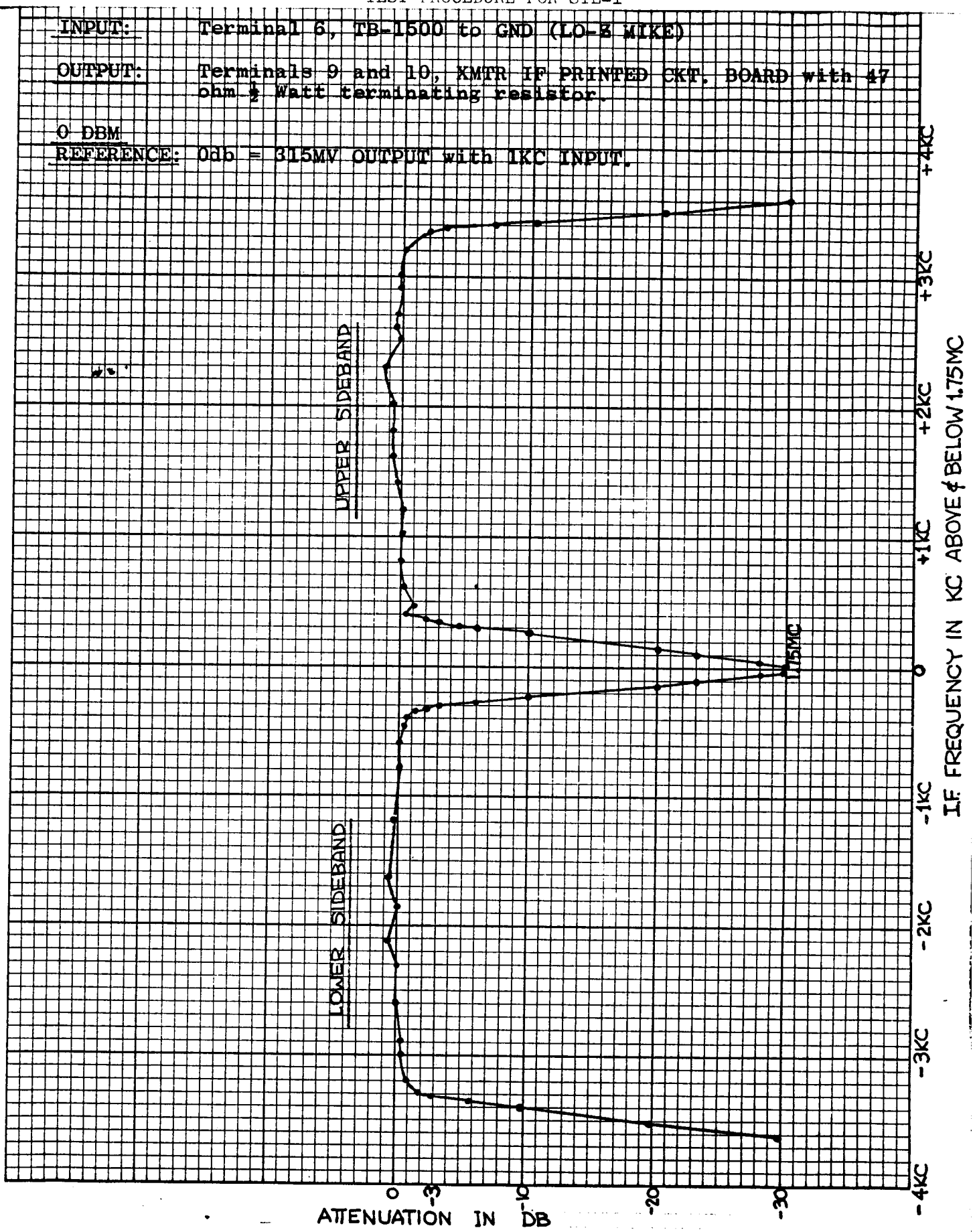
TEST PROCEDURE FOR STE-1

INPUT: Terminal 6, TB-1500 to GND (LO-Z MIKE)

OUTPUT: Terminals 9 and 10, XMTR IF PRINTED CKT. BOARD with 47 ohm ½ Watt terminating resistor.

0 DBM

REFERENCE: 0db = 315MV OUTPUT with 1KC INPUT.



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H. OVERALL TRANSMITTER TESTING

1. Install the AX-436 extension module into the unit.

2. Insatll the TTRT-1( ), specified specifically for this unit, into the AX-436.

3. Set AF GAIN fully clockwise, VOX/PTT, HANDSET LINE to LINE, MODE switch to single sideband, USB/LSB to USB.

4. Connect the 43 and 3.3 ohm 1 watt load resistors across the RF output, J1516, as shown below:

5. Set control "D" on the TTRT-( ) maximum counter-clockwise.

6. Connect the Hewlett-Packard VTVM across the 3.3 ohm load resistor.

7. Ground Terminal #8 on TB1502.

8. Connect the TTG through the attenuation pad between Terminal 6 on TB1502 & GND, and set it to two tone output at 1 mv.

9. Turn power ON.

10. Advance control "D" on the RF module until the VTVM across the load indicates 3.5V RF.

11. Adjust controls "B", "C", and "E" on the RF module for a peak reading on the VTVM. Reduce input as necessary to limit output voltage to 3.5V RF.

12. Connect the spectrum analyzer across the 3.3 ohm load resistor and observe the inter-modulation distortion products to be -35 db. Improvement of the distortion figure may be obtained by re-adjusting control "A" on the RF module.

13. When either setting sideband switch (S1502) to LSB, or shorting Terminal #18 on TB1502 to GND, the sideband on the analyzer should change from upper to lower sideband.

14. Remove the TTG from the unit and disconnect the short from Pin #8 on TB1502. Set HANDSET LINE switch to HANDSET.

15. Using handsets HS-100-3C (carbon), HS-100-3D (LO "Z"), and MK-102 (HI "Z"), check the operation pf PTT function, microphone inputs and VOX operation at the handset jack on the front panel of the STE-1. With a normal voice into the respective microphone, adjust R1719 on the audio board to obtain 3.5V RF on the meter. Raising the voice to a much higher level should not increase the reading by more than .3V.

H. OVERALL TRANSMITTER TESTING - Cont'd

16. Repeat Step 15 by connecting the handsets to TB1502 on the rear of unit.

17. Set the VOX and anti-VOX controls counter-clockwise, and the AF GAIN maximum clockwise.

18. Connect the 600 ohm line of the GPT-90 to Terminal 11 and GND on TB1502.

19. Adjust the reciever to obtain a normal voice level out of the loudspeaker.

20. Locate the loudspeaker two feet away from the handset, and adjust the VOX GAIN to energize the TRANSMIT/RECEIVE relay.

21. Adjust the anti-VOX GAIN until the relay de-energizes. Now talk into the microphone in a normal voice. The TRANSMIT/RECEIVE relay should energize. When stop talking, the relay should de-energize, although voice emanating from the loudspeaker is still on.

TMC SPECIFICATION			NO. S-844
REV: 0			
COMPILED: RDeV	CHECKED:	APPD:	SHEET 12 OF 12
TITLE:			

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THE TECHNICAL MATERIEL CORP.

MAMARONECK, N.Y.

TEST DATA SHEET FOR STE-1

SERIAL NO.: _____

MFG. NO.: _____

Mechanical	_____	OK
Wiring	_____	OK
D-C Power	_____	OK

Audio

-20 DBM 600 ohm line input	_____	OK

IF

CW, SSB, -20DB AME, MCW	_____	OK
Audio and IF bandwidth	_____	OK

Overall Transmitter

Intermodulation	-35 db	OK
USB/LSB Change	_____	OK
PTT and VOX Operation	_____	OK
Clipper Operation	_____	OK
Anti-VOX Operation	_____	OK

DATE: _____

TESTER: _____

REVISION SHEET

THE TECHNICAL MATERIEL CORP.
MAMARONECK NEW YORK

S-844 O
LIST NO.

DATE	REV.	SHEET	EMN #	DESCRIPTION	APP.
12/11/64		1 of	12	O= ORIGINAL RELEASE FOR PRODUCTION.	