TMC SPECIFICATION NO. S 771 A

N.P.
COMPILED

NP
CHECKED

APPROVED

TITLE:

GPR-91 RXD TEST PROCEDURE

DATE 8/19/63 SHEET 2 OF 12	TMC SPECIFICATION NO. S 771	A
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A. TEST EQUIPMENT REQUIRED

1. AC VTVM Heathkit Model AV-2 or equivalent.
2. VTVM Heathkit Model V-7A or equivalent.
3. AUDIO GENERATOR Hewlett Packard Model 200C or equivalent.
4. SWEEP GENERATOR Harvey Radio Labs Model 46 or equivalent.
5. RF GENERATOR Measurements Model 82 or equivalent.
6. OSCILLOSCOPE Dumont Model 304 or equivalent.
7. 2-1200 ohm 2 watt resistors in parallel.
8. AUDIO FREQUENCY METER Heathkit Model AF-1 or equivalent.
9. XTAL CALIBRATOR Measurements Model 11B or equivalent.
10. Earphones and Speaker (4 ohms).

B. PRELIMINARY

1. Check unit for mechanical defects.
2. Check for wiring defects.
3. Check B+ lines for shorts to ground.
4. Turn set on and measure B+ lines (250VDC ± 10% and 150VDC ± 5%).
5. SSB switch to OFF position. AUDIO GAIN control to full CW position. RF GAIN control to full CCW position.
6. Connect 600 ohm load across 600 ohms output of E1. Connect AC VTVM across load and adjust HUM BAL control for minimum output which should be 0.03 volts or less.

C. AUDIO AMPLIFIER

1. Radio-Phono switch in Phono position.
2. Connect Audio Generator to Phono input jack and note readings below on output meter.

AUDIO SELECTOR	INPUT	OUTPUT
Normal	0.3V.	34.6V.
Low-Pass	0.3V.	31.0V.
1200 cps peak	0.3V.	28-50V. (Vary the Audio Spread Control)

3. Set AUDIO SELECTOR switch to NORMAL position.

D. IF ALIGNMENT

1. Set RANGE SELECTOR switch to .54-1.4 position and RF GAIN control to full CW position.
2. Connect VTVM to pin 2 of V6 and adjust IF GAIN control for 1.8 volts on the meter.
3. Set the following switches as shown below. BANDWIDTH to 15KC; RF gain full CW; HFO to EXT; and AVC to MANUAL.

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4. Turn slugs all the way out on T8,T7,T6,L20,T5,and T4. Connect AC VTVM to the detector load. Connect RF generator to pin 1 of V8. Adjust generator for 455KC with no modulation. Set generator attenuator for an indication on the VTVM. Adjust top and bottom slugs of T8 for maximum output.

a. Connect signal generator to stator terminal of mixerganged capacitor on top of chassis(grey wire). Connect AC-VTVM to #5 of V5. Connect short jumper between green and black dots of T5.

b. Peak top of T5,remove shorting jumper, dip bottomslug of T5.

c. Connect AC-VTVM to #5 of V6. Connect shorting jumper between green and black dots of T6.

d. Peak bottom slug of T6,remove jumper,dip top slug of T6.

e. Connect AC-VTVM to #5 of V7. Connect jumper from green to black dots of T7.

f. Peak bottom slug of T7,remove jumper,dip top slug of T7.

g. With AC-VTVM connected as in previous step,peak top slug of T4.

h. Connect AC-VTVM to IF output jack. Check bandwidth at 3db points,should be at least 15KC.

i. Connect AC-VTVM to #7 of V9,peak top and bottom of T8.

j. Connect scope to detector load (R58-R60 junction).

5. Connect the 455 KC output of the sweep generator to pin 1 of V3. Connect oscilloscope to detector load. Set RF SELECTIVITY switch to 2.0KC position. Vary the XTAL PHASE control clockwise and counter-clockwise about the zero position and observe waveform on the scope. The rejection notch should move above and below the frequency of the series resonance peak. Compare with response curves (See MANUAL).
6. Set XTAL PHASE control in the zero position and observe the waveforms for all positions of the RF SELECTIVITY switch.
7. Disconnect scope and connect VTVM in its place. (VTVM remains connected throughout test of the receiver).
8. Connect RF generator to P1 of V3, set at 455 KC and 1000 cps. at 30% modulation. XTAL PHASE control at zero. The following results should be obtained.

RF SELEC. SWITCH	MODULATION VTVM OUTPUT	ATTENUATOR
NON XTAL	1000 cps @ 30% 0.35V.	80-100 uv.
2.0 KC	1000 cps @ 30% 0.35V.	160-200 uv.
.5 KC	100 cps @ 30% 0.35V.	50-70 uv.

Turn off modulation on RF generator.

E. BFO OPERATION

1. Set BFO PITCH control to zero (condenser should be half open).
2. With BFO switch on BFO adjust L22 so that the BFO zero beats with the incoming 455KC signal. The zero beating may be heard on earphones or a speaker. Connect Audio Frequency Meter across 600 ohm load and observe 3KC swing each side of "0" setting of the BFO PITCH control.

F. 3.955 KC IF ALIGNMENT

1. Set RANGE SELECTOR to 5.4-9.6 position. Adjust RF generator for 3.955KC. and 1000 cps modulation.
2. Adjust L19, T2 (top and bottom slugs), and T3 for peak on VTVM.
3. Sensitivity: For 15 uv into Pin 1 of V3 at 3.955KC should produce .35V at the detector load.

G. RF ALIGNMENT

1. Set BAND SPREAD and ANT. TUNE capacitors at minimum capacity and oscillator trimmers to ½ open position. RF SELECTIVITY switch to NON XTAL position.
2. Set the MAIN TUNING capacitor and dial at the top end of the band. (See alignment chart below.)

BAND	HIGH END	LOW END	MIN. SENS.
1	1450 KC	540 KC	2.5 uv
2	3.3 MC	1.43 MC	1.0 uv
3	5.6 MC	3.2 MC	2.5 uv
4	9.0 MC	5.8 MC	1.0 uv
5	17.0 MC	10.0 MC	1.0 uv
6	31.0 MC	18.0 MC	1.0 uv

3. Connect RF generator through an appropriate matching network to the ANT 75 ohm connector on the receiver. Set RF generator to the high end of the band as per alignment chart. Tune oscillator slug for maximum audio output and adjust corresponding RF trimmer for maximum output.
4. Set the MAIN TUNING capacitor and dial, at the low end of the band. Set RF generator to the low end of the band as per alignment chart. Adjust oscillator, R.F., and Antenna tuning slugs for maximum output.
5. Repeat step 3 and 4 as many times as necessary for optimum output. In repeating step 3 adjust the oscillator trimmer instead of the tuning slug. (Adjust trimmers at high end of band and slugs at low end of band).

*6. Measure the RF input at the low, middle and high nd of the band for .35V. across detector load.

*7. Check the dial calibration at the low, middle and high end of the band.

*8. Check the 10db noise figure at the low, middle and high end of the band.
*9. Check the image rejection at the low, middle and high end of the band, it must be no less than 60db.
10. Repeat steps 2 to 9 for all bands.

* NOTE: PEAK ANT. TUNE CONTROL BEFORE EACH MEASUREMENT.

H. SEND-REC SWITCH OPERATION

1. Switch in SEND position. The receiver is disabled and B+ is removed from V1 through V7.
2. Switch in REC position. The receiver should operate.

I. AVC SWITCH OPERATION

1. Connect AC VTVM across 600 ohm load and switch to 0db range. With AVC switch on AVC adjust RF generator attenuator for 1uv input and AUDIO GAIN control for 0db on output meter. Turn RF generator attenuator to 10,000uv. The output should remain constant within 12db.
2. With AVC switch on MANUAL the volume will decrease.

J. LIMITER SWITCH OPERATION

1. With LIMITER switch in the OFF position, connect the oscilloscope across the 600 ohm load. Radiate a source of noise pulses (buzzer or vibrator) into the receiver. Observe noise pulses in output waveform. Set the LIMITER switch to LIMITER position, the noise pulses should disappear.

K. RELAY TERMINALS

1. With SEND-REC switch on SEND, reception should take place only when the RELAY TERMINALS are shorted.

L. METER CALIBRATION

1. Tune receiver and RF Generator (50 uv output) to 9MC. AVC switch to AVC position. BFO switch to OFF position. Adjust R50 (S METER ADJ) for a meter reading of S9.
2. Reduce RF generator to zero output and adjust IF GAIN (R106) control to 0 reading on S meter.
3. Repeat steps 1 and 2 to have S meter remain on 0 and S9.

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M. 100KC CALIBRATOR

Connect XTAL CALIBRATOR to ANT input of receiver and switch to 100KC range. Set CAL switch to CAL and adjust CAL ADJ trimmer for zero beat with standard. When this is correct the S meter will pulse.

N. PHONE JACK

Plug in earphones in PHONE jack. The phones will work and the speaker will not.

O. AUDIO OUTPUT TERMINALS AND PHONO INPUT JACK

1. Set RADIO-PHONO switch to PHONO, AUDIO SELECTOR switch to NORMAL, AUDIO GAIN control to full CW position.
2. Connect Audio Generator to PHONO input jack. Set generator to 1000 cps and for 34.6V. across the 600 ohm load. Read the voltage on the following terminals:

16 ohms - 6.65 volts
8 ohms - 4.8 volts
4 ohms - 3.0 volts

P. SSB SWITCH AND I.F. JACK

Connect RF generator to ANT. jack and adjust for 14.5MC at 10uv. Set SSB switch to ON position the audio will cease. Measure voltage at IF output jack it should be .5 volts AC.

Q. RXD SECTION

1. Check continuity between xtal sockets and HFO switch positions.
2. Insert crystal in sockets as shown on chart.
3. Tuning:
   a. Select crystal.
   b. Tune receiver to desired signal frequency.
   c. Tune RF generator to obtain maximum output at the receiver.
   d. Set HFO switch in VAR position and tune receiver to obtain maximum output.
   e. Set HFO switch in XTAL position and take sensitivity and signal to noise ratio.
   f. Set HFO switch in EXT position. Connect another RF generator to EXT. HFO jack. Set input to 1 volt and tune it to the HF oscillator frequency. Take sensitivity and signal to noise ratio.
   g. Feed a 3.5MC signal to the IFO input jack on rear apron. (This test valid only on the EXT. position).

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R. TYPICAL PERFORMANCE DATA IN XTAL POSITION

Sensitivity must be less than 1uv. on bands 2, 4, 5, and 6. Less than 2.5uv. on bands 1 and 3.

SIGNAL FREQUENCY	XTAL SOCKET	XTAL FREQUENCY	MODE	SENSITIVITY
30.045	3	17	Xtal	.35
			Ext.	
16.045	4	20	Xtal	.20
			Ext.	
9.045	5	13	Xtal	.20
			Ext.	
4.545	8	5	Xtal	.20
			Ext.	
3.045	9	3.5	Xtal	.25
			Ext.	
0.995	10	1.35	Xtal	.50
			Ext.	

S. TYPICAL BAND SPREAD TEST

AMATEUR BAND	MAIN TUNING DIAL CHECK POINTS	BANDSPREAD DIAL CHECK POINTS	MAX. DIVISION ERROR
160 M	2.0 MC	Every 100 KC	1/4 Div.
80 M	4.1 MC	Every 100 KC	1/4 Div.
40 M	7.4 MC	Every 100 KC	1/2 Div.
20 M	14.5 MC	Every 100 KC	1/4 Div.
15 M	21.8 MC	Every 100 KC	1/2 Div.
10-11 M	30.0 MC	Every 100 KC	1/2 Div.

T. TYPICAL I.F. BAND WIDTH RESPONSE

IF BANDWIDTH - MIXER GRID

Signal Generator Connected to Pin #1 of V3

BAND 1 455 KC Mod. 30% at 1,000 cycles.
400 cycles. *
100 cycles. **

BANDWIDTH CONTROL SETTING	6 DB
** .25 KC (Xtal Phase-0)	.15 - .35 KC
** .5 KC (Xtal Phase-0)	.4 - .6 KC
* 1.0 KC (Xtal Phase-0)	.7 - 1.1 KC
* 1.5 KC (Xtal Phase-0)	.9 - 1.6 KC
2.0 KC (Xtal Phase-0)	1.5 - 2.3 KC
Non-Xtal	14 - 16 KC

U. FINAL TEST OF RECEIVER PERFORMANCE

SPURIOUS BEATS

Ground ANT. connector. Set BFO switch to ON position. RF GAIN and AUDIO GAIN controls should be at maximum. Tune through each band listening for spurious beats. There should be no beats of appreciable magnitude which are audible.

LISTENING TEST

Connect an outside antenna to the ANT. input of the receiver and listen in on all bands throughout the range.

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THE TECHNICAL MATERIEL CORPORATION
MAMARONECK, N.Y.

GPR-91RXD TEST DATA SHEET #1

SERIAL NO._____
MFG. NO._____

IF SENSITIVITY AT MIXER GRID FOR .35VAC ACROSS DETECTOR LOAD.

BAND 1	455 KC	30% Mod. at 1,000 cycles	Non-Xtal_____uv.
BAND 1	455 KC	30% Mod. at 1,000 cycles	2 KC XTAL_____uv.
BAND 1	455 KC	30% Mod. at 100 cycles	.5 KC Xtal_____uv.
BAND 4	3.955 MC	30% Mod. at 1,000 cycles	Non-Xtal_____uv.

IF BANDWIDTH - MIXER GRID

BAND L	455 KC	Mod. 30% at 1,000 cycles. 400 cycles. * 100 cycles. **

BANDWIDTH CONTROL SETTING	6DB
** .25 KC (Xtal Phase-0)	
** .5 KC (Xtal Phase-0)	
* 1.0 KC (Xtal Phase-0)	
* 1.5 KC (Xtal Phase-0)	
2.0 KC (Xtal Phase-0)	
Non-Xtal	

BFO

\+ _____cps

\- _____cps

SSB OUTPUT _____VOLTS

SSB SWITCH _____OK

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GPR-91RXD TEST DATA SHEET #2

AVC _____OK

S-METER ADJ _____OK

SEND-RECEIVE _____OK

RELAY _____OK

NOISE LIMITER _____OK

PHONES _____OK

HUM-RADIO _____PHONO _____VOLTS

SPEAKER 4 OHM (.4v) ____8 OHMS (.6V) ____16 OHMS (.8V) ____600 OHMS (.4V)____

UTILITY SOCKET _____OK

B+ _____VOLTS

REG. B+ _____VOLTS

PHONO _____ 2 watts Power Output: Audio Input_____volts.

AUDIO SELECTOR Normal_____volts

Low Pass_____volts

1200 Cycles Peak_____volts

AUDIO SPREAD

NARROW 10 DB BW _____OK

BROAD 10 DB BW _____OK

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GPR-91RXD TEST DATA SHEET #3

BAND	FREQ. MCS.	MICROVOLT INPUT FOR .35 ACROSS DET. LOAD	MICROVOLT INPUT FOR 10DB SIGNAL TO NOISE RATIO	IMAGE RATIO	MAX. FREQ. ERROR
1	.56				
	1.00				
	1.40				
2	1.50				
	2.40				
	3.20				
3	3.30				
	4.40				
	5.50				
4	5.60				
	7.40				
	9.50				
5	9.80				
	13.50				
	17.5				
6	18.0				
	24.0				
	31.0				

Check for Beats at 7.0 MC and 10.5 MC _____ OK.

Check for Beats at 1.82 MC, 2.275 MC, 2.73 MC, 3.18 MC, 3.64 MC. _____ OK

Intermodulation at 5.0 MC + .880 MC = 5.88 MC. _____ DB.

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GPR-91RXD TEST DATA SHEET #4

BANDSPREAD

AMATEUR BAND	MAIN TUNING DIAL CHECK POINTS	BANDSPREAD DIAL CHECK POINTS	MAX. FREQUENCY ERROR
160 M	2.0 MC	Every 100 KC	
80 M	4.1 MC	Every 100 KC	
40 M	7.4 MC	Every 100 KC	
20 M	14.5 MC	Every 100 KC	
15 M	21.8 MC	Every 100 KC	
10-11 M			

RXD SECTION

SIGNAL FREQUENCY	XTAL SOCKET	XTAL FREQUENCY	MODE	SENSITIVITY	S/N
30.045	3	17	Xtal		
			Ext.		
16.045	4	20	Xtal		
			Ext.		
9.045	5	13	Xtal		
			Ext.		
4.545	8	5	Xtal		
			Ext.		
3.045	9	3.5	Xtal		
			Ext.		
0.995	10	1.35	Xtal		
			Ext.		

AIR TEST _____ OK

DATE _____

TESTER _____

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