

DATE 7/27/60
SH. 1 OF 12
COMPILED BY

TMC SPECIFICATION NO. S-501

B

TITLE: MSR-5 TEST PROCEDURE

JOB

APPROVED *J. ANGER*

I. PURPOSE:

The MSR-5, a filter type adapter, when used with any receiver which provides a nominal 455 KC I.F. output, will demodulate AM, SSB, CW and FS signals.

II. DESCRIPTION OF CONTROLS:

A. SIDEBAND

1. Manual/Xtal places the 1st oscillator in either crystal or variable operation.
2. Lower/Upper pilot lights indicate when MSR is set for reception of lower or upper sideband. In the Upper position the 1st oscillator frequency is 472 KC, in the Lower position it is 438 KC.

B. Bandsread varies the 1st oscillator when on manual over nominal + 3 KC from its mid frequency.

C. B.F.O. turns on 2nd oscillator which is at a fixed 17 KC.

D. AVC:

1. On/Off switch removes AVC control voltage from 1st I.F. amplifier of MSR.
2. Slow/Fast switch changes time constant of AVC circuit.

F. Audio Gain varies input to audio output amplifier.

G. Power switch connects or removes MSR-5 from AC power mains.

H. Rear deck output level switch S-8 reduces gain of Audio Amplifier and connects pad to output transformer.

III. TEST EQUIPMENT REQUIRED:

- A. R.F. signal generator - 455 KC
- B. Audio generator
- C. VTVM - Hewlett Packard 410 B
- D. AC VTVM - Daven or Heath
- E. Battery 0 - + 10 V
- F. 600 ohm - 10 watt resistor

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G. .01 mfd 400 V capacitor

H. Oscilloscope

I. Eput Counter Mod.

IV. PROCEDURE:

A. POWER SUPPLY:

1. Continuity check to ground, line cord disconnected. Power switch ON.
 - a. Terminal 2 and 3 of E₂ should be open. Push sideband switch - should be open.
 - b. Terminal 7 of E₂ - approximately 40 K
 - c. Terminal 8 of E₂ - approximately 40 K
 - d. Terminal 8 of E₁ - 1 megohm
 - e. Terminal 12 of E₁ - approximately 1.5 Meg.
 - f. Terminal 10 of E₁
BFO - ON - short
BFO - OFF - 150 K
2. Voltage check - line cord connected to 115 V AC mains. Power ON.
 - a. AC voltage-terminal 2 to 3 of E₂ - 115 VAC.
 - b. DC voltage-terminal 7 of E₂ to ground, + 320 V.
 - c. DC voltage-terminal 8 of E₂ to ground, + 150 V.

B. AUDIO CHANNEL CHECK:

1. CONTROLS:

BFO - OFF
Audio Gain - Maximum clockwise
Output Level - High
600 ohm 10 watt resistor across terminals 5 and 6 of E₁
AC VTVM across 600 ohm output load.

2. Connect audio generator to pin 7 of V₄. Set frequency to 1 KC.
3. Adjust input voltage for an output voltage of 36.0 - output waveform should just start to clip.

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4. Measure AC voltage at pin 7 of V6. Should be between 6.5 and 7.5 volts.
5. Measure voltage at pin 7 of V12. Should be between .2 and .25 volts.
6. Measure input voltage at pin 7 of V4. Should be between .03 and .04 volts.
7. Check frequency response of low pass filter through audio amplifier, E input constant at .07 volt, 1000 cps at pin 7 of V4.
8. Adjust Audio Gain for AC voltage across 600 ohm load of 36.0 volt. Change generator frequency to 17 KC. Output drop across 600 ohm load with constant input should be 55 db or greater. If drop is less, then filter requires retuning.
9. Set generator for 36.0 volts across Terminals 5 and 6. Place Output Level switch in Low Position. Output should drop to between 8 and 9 volts.
10. Connect another 600 ohm resistor across terminals 2 and 3. Voltage across this load should be between 0.7 and 0.8 volts. Place Output Level switch in High position. Voltage should drop to zero. Leave switch in High position for shipping.

C. 2nd MIXER OPERATION:

1. Turn BFO switch ON.
2. Measure D.C. bias - should be approximately:
V5 pin 2 - 7 VDC
V4 pin 1 - 11 VDC (10V AC)
V4 pin 7 - 0

If bias is present on pin 7 of V4, adjust tone threshold (R60) until bias becomes zero.

3. Connect counter to 17 KC 2nd oscillator test point. Tune 17 KC Adj. for 17,000.0 on counter (after 15 min. warmup)
4. Measure output across 600 ohm load with Audio Gain fully on. Should be less than 6.0 volts.
5. Turn BFO switch to OFF.

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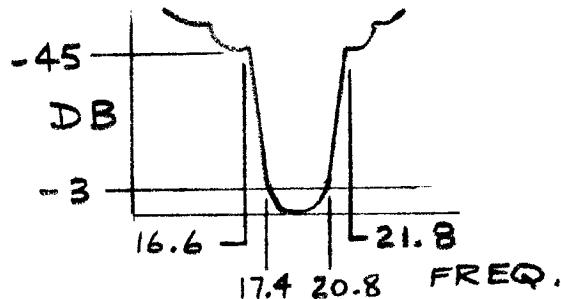
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D. FIRST MIXER OPERATION (AS AMPLIFIER)

1. Connect Audio Generator through .01 mfd capacitor to pin 7 of V3 (1st mixer).
2. Connect AC VTVM to pin 1 of V4 (2nd mixer).
3. Tune generator for peak on meter within range of 17 KC to 21 KC. Adjust output to obtain 1.0 volt on meter.
4. Generator input should be approximately .5 to .6 (.46V).
5. Vary generator frequency checking output drop of filter (Z1) as follows:

<u>FREQUENCY KC'S</u>	<u>OUTPUT DROP + L DB</u>
17.4	3 db
20.5	3
17.2	6
20.8	6
16.6	45
21.85	45



- E. 1st oscillator (variable) - When upper sideband indicator is ON - the oscillator center frequency should be 472.00 KC. When lower sideband indicator is ON, the oscillator frequency should be 438.00 KC:

1. Sideband switch set for Upper.
2. Measure bias on pin 1 of V7 should be approximately - 11.0 + 1.0 in both Upper and Lower sideband positions.
3. Connect R.F. signal to pin 7 of V3. Connect CRO to pin 5 of V3.
4. Place reactance balance control in its mid position

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- 5. Tune generator to 472.00 KC. Tune core of Z3 to obtain zero beat on CRO.
- 6. Switch sideband to lower position.
- 7. Tune trimmer C29 to frequency of 438.00 KC.

F. 1st Oscillator (crystal)

- 1. Place correct crystals in sockets.
Y1 - 438.00 KC
Y2 - 472.00 KC
- 2. Turn manual/Xtal switch to Xtal position.
- 3. Bias on pin 1 of V7 should be:

LSB	-3.4 V
USB	-2.8 V
MAN.	-5.4 V

- 4. Measure crystal frequency by counter.
Upper - 472000 } Adjust after a minimum of 15 min. warmup
Lower - 438000 } to exact frequency.

G. I.F. AMPLIFIER AND 1st MIXER:

- 1. Connect signal generator to I.F. input jack, J1.
- 2. Connect VTVM HP - 410B AC probe to pin 7 of V₃ (1st mixer).
- 3. Set signal generator as follows with unmodulated signal.
AVC - OFF. Check output on pin 7.

Frequency - 450 KC

<u>E In</u>	<u>E Out ± 10%</u>
0.20	1.55 V
0.50	2.9 V
1.0	5.4 V

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4. Flip AVC switch ON and FAST. Set signal generator as follows at 450 KC:

<u>E In</u>	<u>E Out ± 10%</u>
0.20	1.2V
0.50	1.5V
1.0	1.8V

5. AVC Check:

- a. Increase generator input to 1. volt.
- b. Switch AVC ON in FAST position. Note rate of output drop.
- c. Switch AVC OFF in SLOW position.
- d. Switch AVC ON in SLOW position. Note rate of output drop should be slower than step (b).

H. SENSITIVITY:

1. Turn BFO ON.
2. AVC - OFF
3. Set signal generator unmodulated to 454 KC to produce a 1 KC note at output.
4. Check sensitivity. Manual/Xtal, Upper/Lower

INPUT	MODE	E IN
454 KC	MAN.	.09V
454 KC	USB	.09V
456 KC	LSB	.095V
456 KC	MAN.	.10

I. REACTANCE SHIFT:

1. Apply DC supply across 11 and 12 of E₁, set voltage as follows and check frequency of oscillator by counter. Adjust reactance balance control to obtain results.

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<u>CONTROL VOLTAGE</u>	<u>FREQUENCY SHIFT</u>	
	<u>MIN.</u>	<u>MAX</u>
+4.5	+3200	+5500
0	0	0
-4.5	-3200	-5500

2. Retune oscillator for 438.00 KC in Lower position and 472.00 KC in Upper position with reactance control voltage set to zero.

J. BANDSPREAD CONTROL:

Check shift of oscillator with Bandsread control at each mark on panel. Reactance control voltage set to zero.

<u>DIAL</u>	<u>UPPER KC</u>	<u>LOWER KC</u>
-3	-2.9 to 3.5	-2.2 to 2.8
-2	-2.1 to 2.5	-1.6 to 3.0
-1	-1.0 to 1.2	-0.8 to 1.0
0	0	0
+1	+1.1 to 1.3	+0.9 to 1.1
+2	+2.2 to 2.6	+1.8 to 2.2
+3	+2.9 to 3.3	+2.5 to 3.1

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1. RELAY THRESHOLD ADJUSTMENT (K3)

Apply negative supply as shown to grid, pin 2, Vary voltage 0 to -10 V back and forth while adjusting R54 relay threshold until K3 trips (which in turn trips K2 sideband selector) regularly at -9 volts, K3 pulls in at -3.5 to -4V drops out at -9 to -9.5 V.

2. tone GENERATOR THRESHOLD ADJUSTMENT (R60)

Apply -5V to grid pin 2, then turn tone threshold adj. until oscillator just starts on both lower and upper sideband operating position.

3. tone GENERATOR FREQUENCY ADJUSTMENT (C55 in Z5)

Connect eput meter through a 100 mmf capacitor to plate pin 6 to observe frequency of tone generator.

Select lower sideband operating position with push button. Adjust C55 in Z5 until eput reads 16,500 cps exactly. Select upper sideband position and eput should read 14,500 cps \pm 200 cps.

Observe AC voltage on 2nd mixer grid pin 7 V4. It should be:
For Lower Sideband = .25 Volts Approx
For Upper Sideband = .09 Volts Approx If its less readj. tone threshold.

NOTE: The use of a speaker or phones is recommended for output tone identification.

Reconnect eput meter across 600 ohm load on output terminals and observe resultant output frequency - It should be:
For Lower Sideband = 500 cps Exactly. If not touch up C55, Z5
For Upper Sideband = 2500 cps \pm 200 cps

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D.C. VOLTAGES ON V9 AFTER ALL ADJUSTMENTS MADE
(Filaments Omitted)

APPLIED CONTROL VOLTAGES TO PIN 2	1	2	3	6	7	8
0 Volts	+ 66	0	+ 1.4	+ 150	+ 33	+ 55
-5 Volts	+ 105	-5	+ .6	+ 145	+ 53	+ 59
-9 Volts	+ 128	-9	+ .14	+ 128	+ 60	+ 66

TONE GENERATOR OUTPUT AT GRID OF 6BE6 PIN 7 V4

APPLIED CONTROL VOLTAGE TO PIN 2	LOWER SIDEBAND (16.5 KC)	UPPER SIDEBAND (14.5 KC)
-0 Volts	OFF	OFF
-5 Volts	.25 Volts	.09 Volts
-9 Volts	.45 Volts	.28 Volts

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V. FINAL CHECK:

- A. Connect speaker across terminal 4 and 5 of E₁.
- B. BFO- - ON.
- C. Audio Gain as desired.
- D. Signal generator into I.F. input jack J₁ - tuned to 455.00 KC.
- E. Sideband on Upper/Manual
 - 1. Tune bandspread control to + position and note audio tone.
 - 2. Tune bandspread control to - position and note audio tone.
- F. Sideband on Lower/Manual
 - 1. Tune bandspread control to + position and note audio tone.
 - 2. Tune bandspread control to - position and note audio tone.
- G. Switch sideband to Upper/Xtal
 - 1. Tune signal generator 455 KC + audio note
 - 2. Tune signal generator 455 KC - audio note
- H. Switch sideband to Lower/Xtal
 - 1. Tune signal generator to 455 KC + audio note
 - 2. Tune signal generator to 455 KC - audio note
- I. Switch sideband to Upper/Manual
 - 1. Tune signal generator to obtain zero beat
 - 2. Switch sideband to Lower.
 - 3. No change of zero beat should occur.

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SENSITIVITY _____

REMOTE SELECTION UPPER/LOWER _____

SIDEBAND

SIDEBAND INDICATION LAMPS

XTAL - UPPER _____

UPPER _____

- LOWER _____

LOWER _____

MANUAL - UPPER _____

UPPER _____

- LOWER _____

LOWER _____

REMOTE TUNING - UPPER _____

- LOWER _____

AVC

- SLOW _____

- FAST _____

NOISE LIMITER _____

AUDIO GAIN _____

AUDIO OUTPUT _____

PAD _____

DATE _____

TESTED BY _____

