

DATE 2/5/58
SH. 1 OF 11

TMC SPECIFICATION NO. S-355

COMPILED BY
P. L. K.

TITLE: MSR-3 TEST PROCEDURE

JOB

APPROVED

P.L.K. *J.R.*

I. PURPOSE:

The MSR-3, a filter type adapter, when used with any receiver which provides a nominal 200 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 217 KC, in the Lower position it is 183 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.

E. Noise limiter switch in ON position filters pulse noise from both peaks of the audio signal.

F. Audio Gain varies input to Audio Amplifier.

G. Power switch connects or removes MSR-3 from AC power mains.

H. Rear Deck Output Level switch S-8 reduces gain of Audio Amplifier and connects pad to output transformer.

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III. TEST EQUIPMENT REQUIRED:

- A. R.F. signal generator - 200 KC
- B. Audio generator
- C. VTVM - Hewlett Packard 410 B
- D. AC VTVM - Daven or Heath
- E. Battery 0 - ~~1~~ 10 V
- F. 600 ohm - 10 watt resistor
- 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 - open
 - 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.

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- 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

Noise Limiter - 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.
4. Measure AC voltage at pin 7 of V₇. Should be between 6.5 and 7.5 volts.
5. Measure voltage at pin 7 of V₆. Should be between .2 and .25 volts.
6. Switch noise limiter to ON position. Voltage at output load should drop no more than 6 db.
7. Measure input voltage at pin 7 of V₄. Should be between .03 and .04 volts.
8. Check frequency response of low pass filter through audio amplifier E input constant at .04 volt at pin 7 of V₄.
9. Adjust Audio Gain for AC voltage of 36.0 across 600 Ω load.
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.

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10. Set generator for 36.0 volts across Terminals 2 and 3.

Place Output Level switch in Low Position. Output should drop to between 8 and 9 volts.

11. Connect another 600 Ω 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:

V6 pin 2 - 30 VDC

V4 pin 1 - 10 VDC

V4 pin 7 - 0

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

3. Tune generator to 17.00 KC. Correct generator to pin 7 of V4
E in = 5.0 volt.

4. Correct oscilloscope to terminal 2 to Z2 low pass filter.

5. Tune Z4 trimmer to obtain a zero beat pattern on the scope.

6. Remove generator. Measure 17 KC across 600 Ω load with Audio Gain fully on. Should be less than 6.0 volts.

7. Turn BFO switch to OFF.

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).

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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 .
5. Vary generator frequency checking output drop of filter as follows:

<u>FREQUENCY KC'S</u>	<u>OUTPUT DROP \pm 1 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 217.00 KC. When lower sideband indicator is ON, the oscillator frequency should be 183.00 KC.

1. Sideband switch set for Lower.
2. Measure bias on pin 1 of V8 should be approximately - 11.0 \pm 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, Bandsread control at 0.
5. Tune generator to 183.00 KC. Tune core of Z3 to obtain zero beat on CRO.
6. Switch sideband to Upper position.
7. Tune trimmer C29 to frequency of 217.00 KC
8. Repeat 5, 6 and 7.

F. 1ST OSCILLATOR (CRYSTAL)

1. Place correct crystals in sockets.

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Y₁ - 183.00 KC

Y₂ - 217.00 KC

2. Turn Manual/XTAL switch to XTAL position.
3. Bias on pin 1 of V₈ should be between 5.0 V. and 5.5 V. in Upper and Lower positions.
4. Measure crystal frequency by zero beat method.
Upper - 217000 ± 50 cps
Lower - 183000 ± 50 cps

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 - 210 KC

<u>E IN</u>	<u>E OUT ± 10%</u>
0.20	.8
0.50	1.8
1.0	4.2
2.0	

4. Flip AVC switch ON and FAST. Set signal generator as follows at 210 KC:

<u>E IN</u>	<u>E OUT ± 10%</u>
0.20	.76
0.50	1.0
1.0	1.2
2.0	1.4

5. AVC Check:
 - a. Increase generator input to 1 volt.
 - b. Switch AVC ON in FAST position. Note rate of output drop.

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- 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 199 KC to produce a 1 KC note at output. (5 and 6)
- 4. Check sensitivity. Manual/XTAL, Upper/Lower
 E IN - less than 0.1
 E Out at 600 ohm load - 36.0

I. REACTANCE SHIFT

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

FREQUENCY SHIFT $\pm 10\%$

<u>CONTROL VOLTAGE</u>	<u>UPPER KC.</u>	<u>LOWER KC.</u>
+4.5	+3.3	+3.6
+2.0	+1.5	+1.5
0	0	0
-2.0	-1.6	-1.6
-4.5	-3.1	-3.5

- 2. Retune oscillator for 183.00 KC in Lower position and 217.00 KC in Upper position with reactance control voltage set to zero.

J. BANDSPREAD CONTROL

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

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<u>DIAL</u>	<u>UPPER KC</u>	<u>LOWER KC</u>
-3	-2.6 to 3.2	-3.2 to 3.8
-2	-2.0 to 2.4	-2.4 to 2.6
-1	-1.0 to 1.2	-1.2 to 1.4
0	0	
+1	+0.9 to 1.1	+1.0 to 1.2
+2	+1.9 to 2.3	+2.2 to 2.6
+3	+2.6 to 3.2	+3.1 to 3.7

K. SIDEBAND SWITCHING REMOTELY

1. Connect D.C. source to 7 and 8 of E_1 , with negative lead on 8.
2. Vary voltage from zero to minus 9 volts.
3. Adjust relay threshold ($R54$) on rear panel so switching occurs between - 7.5 and - 8.0 volts.

L. SIDEBAND TONE GENERATOR

1. Turn BFO switch to ON.
2. Place AC VTVM on pin 7 of V_4 .
3. Set D.C. voltage in at pin 7 and 8 of E_1 to - 5.0 volts.
4. Adjust tone threshold ($R60$) so that Sidetone Oscillator just starts.

NOTE: Oscillator will start at two positions of threshold.

Correct position produces increased output of oscillator when control voltage goes more negative.

5. Decrease control voltage to maximum of - 9.0. Oscillator output should increase to 2.5 volts.
6. Connect counter on 600 ohm output load.
7. Set sideband to Upper position.
8. Tune trimmer on Z5 for 2 KC output frequency. Be careful with screwdriver on trimmer screws lot.

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NOTE: As trimmer is turned clockwise, beat note should rise in pitch.

9. Set sideband to Lower position.
10. Output frequency should be approximately 500 cps. If below 500 adjust trimmer to obtain 500 cps. Check step (8) again - should now be above 2 KC. If the output frequency is higher in Lower position than in Upper, then the leads are reversed on relay.

M. PHONE JACK

Plug headset into phone jack. Output should be audible with drop of 2 db across load.

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. SIDE BAND ON UPPER/MANUAL
 1. Tune bandsread control to + position and note audio tone.
 2. Tune bandsread control to - position and note audio tone.
- F. SIDE BAND ON LOWER/MANUAL
 1. Tune bandsread control to + position and note audio tone.
 2. Tune bandsread control to - position and note audio tone.
- G. Switch sideband to Upper/XTAL
 1. Tune signal generator 200 KC + audio note.
 2. Tune signal generator 200 KC - audio note.

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H. Switch sideband to Lower/XTAL

1. Tune signal generator to 200 KC + audio note.
2. Tune signal generator to 200 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 _____

TONE

MANUAL - UPPER _____

UPPER _____

- LOWER _____

LOWER _____

REMOTE TUNING - UPPER _____

- LOWER _____

AVC

- SLOW

- FAST

NOISE LIMITER _____

AUDIO GAIN _____

AUDIO OUTPUT _____

OUTPUT LEVEL _____

PAD _____

DATE _____

TESTED BY _____