

DATE 9-28-60

SH. 1 OF 9

COMPILED BY

E.F.M.

# TMC SPECIFICATION NO. S-512

TITLE:

MSR-6 TEST PROCEDURE

JOB

APPROVED

*SAM*

## I. PURPOSE:

The MSR-6, 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 and is controlled by the AFC-1 for suppressed carrier operation.

## 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-4 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 410B
- 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. 555B

IV. PROCEDURE:

A. POWER SUPPLY:

1. Continuity check to ground. line cord disconnected. Power switch ON.
  - a. Terminal 2 and 3 of E<sub>2</sub> should be open. Push sideband switch - should be open.
  - b. Terminal 7 of E<sub>2</sub> - approximately 40 K
  - c. Terminal 8 of E<sub>2</sub> - approximately 40 K
  - d. Terminal 8 of E<sub>1</sub> - open
  - e. Terminal 12 of E<sub>1</sub> - approximately 1.5 Meg.
  - f. Terminal 10 of E<sub>1</sub>  
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 E<sub>2</sub> - 115 VAC.
  - b. DC voltage-terminal 7 of E<sub>2</sub> to ground + 320 V.
  - c. DC voltage-terminal 8 of E<sub>2</sub> 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 E<sub>1</sub>

AC VTVM across 600 ohm output load.

2. Connect audio generator to pin 7 of V<sub>4</sub>. 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 8.0 volts.
5. Measure voltage at pin 7 of V5. 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 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 2 and 3. 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 - 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. Connect generator to pin 7 of V4  
E in = 5.0 volt.
4. Connect 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 ohm load with Audio Gain fully on. Should be less than 6.0 volts.
7. Measure 17 KC at J7. Should be more than .15 volts.
8. Turn BFO switch to OFF.

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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.
5. Vary generator frequency checking output drop of filter 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.
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

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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 -  $472000 \pm 50$  cps.  
Lower -  $438000 \pm 50$  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 - 450 KC

| <u>E In</u> | <u>E Out + 10%</u> |
|-------------|--------------------|
| 0.20        | 1.1                |
| 0.50        | 3.4                |
| 1.0         | 7.0                |
| 2.0         | 13.0               |

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        | .8                 |
| 0.50        | 1.8                |
| 1.0         | 3.7                |
| 2.0         |                    |

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).

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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  
E in - less than 0.1  
E out at 600 ohm load - 36.0  
E out at J8 - more than .1 V.A.C.

I. REACTANCE SHIFT:

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

| <u>CONTROL VOLTAGE</u> | <u>FREQUENCY SHIFT + 10%</u> |                  |
|------------------------|------------------------------|------------------|
|                        | <u>UPPER KC.</u>             | <u>LOWER KC.</u> |
| + 1.5                  | + 4.6                        | + 4.0            |
| 0                      |                              |                  |
| - 1.5                  | - 4.8                        | - 4.1            |

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 Bandspread 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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## 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 V4.
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 Lower position.
  8. Tune trimmer on Z5 for 500 cps output frequency. Be careful with screwdriver on trimmer screw slot.
- NOTE: As trimmer is turned clockwise, beat note should drop in pitch.
9. Set sideband to Upper position.
  10. Output frequency should be above 2.5 KC. If the output frequency is higher in Lower position than in Upper, then the leads are reversed on relay.

## M. PHONE JACK

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

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V. FINAL CHECK:

- A. Connect speaker across terminal 4 and 5 of E<sub>1</sub>.
- B. BFO - ON.
- C. Audio Gain as desired.
- D. Signal generator into I.F. input jack J<sub>1</sub> - tuned to 455.00 KC.
- E. Sideband on Upper/Manual
  1. Tune bandsread control to + position and note audio tone.
  2. Tune bandsread control to - position and note audio tone.
- F. Sideband 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 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 \_\_\_\_\_

TONE  
UPPER \_\_\_\_\_

- LOWER \_\_\_\_\_

LOWER \_\_\_\_\_

REMOTE TUNING - UPPER \_\_\_\_\_

- LOWER \_\_\_\_\_

AVC

- SLOW \_\_\_\_\_

- FAST \_\_\_\_\_

NOISE LIMITER \_\_\_\_\_

AUDIO GAIN \_\_\_\_\_

AUDIO OUTPUT \_\_\_\_\_

PAD \_\_\_\_\_

DATE \_\_\_\_\_

TESTED BY \_\_\_\_\_