

# TMC SPECIFICATION

NO. S - 381

REV: A B C D E F

COMPILED: VA

CHECKED: *Hg*APPD: *[Signature]*

SHEET 1 OF 10

TITLE: MSR-4 TEST PROCEDURE

## I. PURPOSE:

The MSR-4, 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 provide an audio output of 2 watts.

## 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  $\pm 3$  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. Audio Gain varies input to audio output amplifier.

F. Power switch connects or removes MSR-4 from AC power mains.

G. 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 - MEASUREMENTS CORP. MODEL 82 or EQUIVALENT.

B. Audio generator - HEWLETT PACKARD MODEL 200 D or EQUIVALENT.

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- C. VTVM - HEWLETT PACKARD 410B or EQUIVALENT.
- D. AC VTVM - BALLANTINE or EQUIVALENT.
- E. Battery 0 -  $\pm$  10V.
- F. 600 ohm - 10 watt resistor, 1 each.  
600 ohm - 1 watt resistor, 1 each.
- G. .01 mfd 400 V capacitor.
- H. 8 ohm Speaker.
- I. Frequency Counter, Computer Measurements Corp. Model 203 BN or Equivalent.
- J. Multimeter, Simpson Model 260 or Equivalent.
- K. Headphone set.

## TEST SET-UP

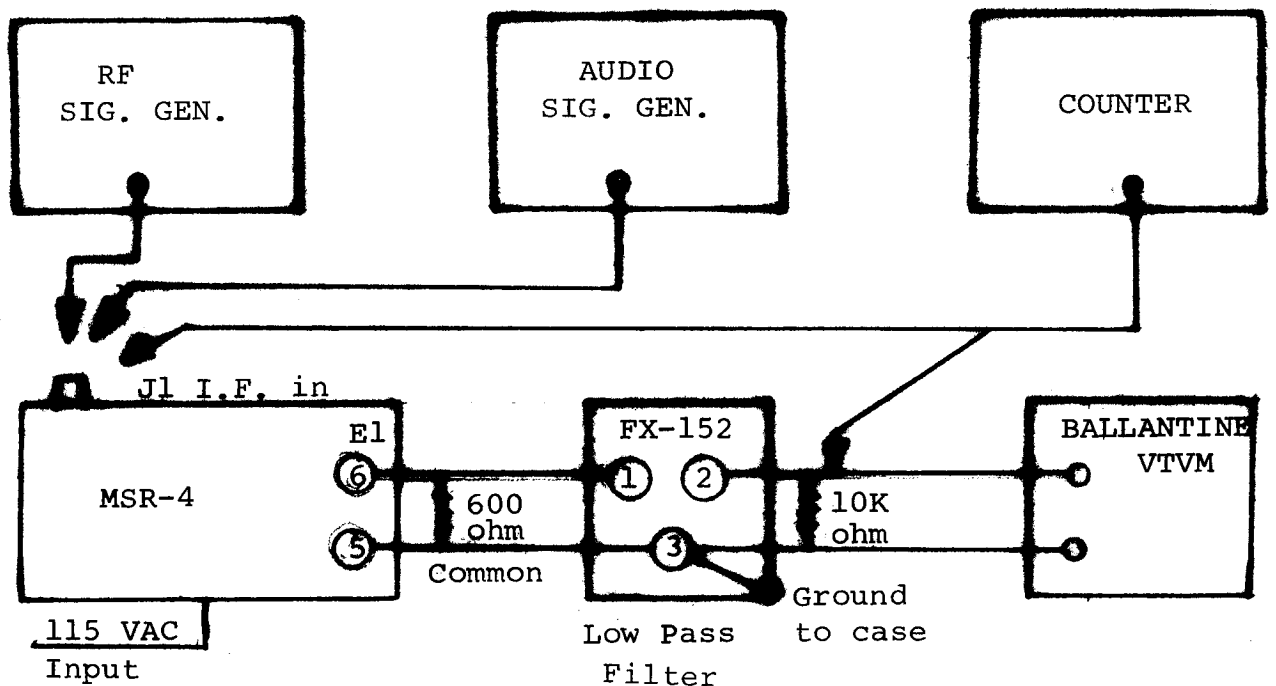


FIGURE 1

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## IV PROCEDURE

### A. POWER SUPPLY VOLTAGES:

1. With line voltage adjusted to 115 VAC, connect MSR-4 power cord, turn POWER ON and measure and record the following:
  - a. DC voltage from terminal 7 of E2 to ground shall be 300 VDC  $\pm 10\%$ .
  - b. DC voltage from terminal 8 of E2 to ground shall be between 142.5 and 157.5 VDC.

### B. 2ND OSCILLATOR AND SIDEBAND TONE FREQUENCY ADJUSTMENT:

1. Initial Settings:

Connect the Audio signal generator to the set up as in figure 1.

Adjust the generator to 18 KC  $\pm 2$  cps.

AVC - OFF

BFO - ON

AUDIO GAIN - Maximum

OUTPUT LEVEL - HIGH

SIDEBAND - LOWER

TONE THRESHOLD (R-60) - Maximum clockwise

RELAY THRESHOLD (R-54) - Maximum clockwise

2. Adjust Z4 (starting from the CCW extreme) until the counter indicates 1000  $\pm 2$  cps and record this frequency.
3. Remove the Audio generator from the input and adjust the TONE THRESHOLD (R-60) in a counter clockwise direction until the sideband tone generator operates (as evidenced by an audible output). Adjust trimmer Z5 until a counter reading of 500 to 550 cps is obtained. Record this frequency. Shift the sideband to UPPER. The output frequency shall now increase to 2400 cps or more. Record this frequency.

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4. Readjust TONE THRESHOLD (R-60) to it's maximum clockwise position. The sideband Tone Generator shall cease to function.
5. With AUDIO GAIN at maximum, measure and record the voltage (17 KC component) across the 600 ohm load. It shall be no greater than 6 volts.

NOTE: The Ballantine VTVM shall be connected ahead of the lowpass filter FX-152 for this reading.

6. Reconnect the Ballantine VTVM to the output side of the filter.

## C. 1ST OSCILLATOR FREQUENCY ADJUSTMENT:

### 1. Initial Settings:

Connect RF signal generator to set up as in figure 1. Adjust signal generator frequency to 454 KC  $\pm$  10 cps - (unmodulated).  
Adjust the signal generator output level to 100 K microvolts.  
MANUAL - XTAL switch in XTAL.  
AVC - OFF  
BFO - ON  
AUDIO GAIN - Maximum  
OUTPUT LEVEL - HIGH  
SIDE BAND - UPPER  
BANDSPREAD - ZERO  
Connect 50 ohm terminal at J1.

2. With the counter connected at the output of the lowpass filter (FX-152), observe and record the frequency. It shall be between 950 and 1050 cps.
3. Shift to MANUAL and starting from the extreme CCW position, adjust Z3 for an output frequency between 900 and 1100 cps.

NOTE: 1. The first beat note from the CCW position of the screw is the correct setting.  
2. Make Z3 adjusting screw snug but do not lock. Final adjustment will be made in later steps.

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4. Shift to LOWER sideband and XTAL. Readjust signal generator to  $456 \text{ KC} \pm 10 \text{ cps}$ . Observe and record the output frequency. It shall be between 950 and 1050 cps.
5. Shift to MANUAL and adjust C-29 for an output frequency between 900 and 1100 cps.  
NOTE: Steps 3 and 5 are not final settings.

## D. SENSITIVITY AND AVC:

### 1. Initial Settings:

Connect RF signal generator to set-up as in figure 1. Adjust signal generator frequency to  $454 \text{ KC} \pm 100 \text{ cps}$  - (unmodulated).

AUDIO GAIN - Maximum

AVC - OFF

BFO - ON

OUTPUT LEVEL - HIGH

SIDEBAND - UPPER

MANUAL - XTAL switch to XTAL

Ballantine VTVM connected at the output of the lowpass filter.

2. Adjust signal generator level to obtain 36 VAC at the output. Record signal generator level at J1. It shall be 100 K microvolts or less.
3. Repeat step 2 for MANUAL UPPER.
4. Change RF signal generator  $456 \text{ KC} \pm 100 \text{ cps}$  sideband to LOWER and repeat step 2 for XTAL LOWER.
5. Repeat step 2 for MANUAL - LOWER.
6. Place the AVC switch to OFF and FAST. Adjust the RF signal generator for an input to J1 of 1 volt. Adjust the generator frequency to obtain a peak in the output. Place AVC to ON and FAST and adjust AUDIO GAIN for a reference setting of 10 DB on the 100 volt scale of the Ballantine. Decrease the generator level from 1 to 0.5 volt, readjust the frequency for a peak and note the level at the VTVM. It shall not change more than 3 DB from the reference setting. Record this difference.

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7. Place AVC switch to OFF then ON and note the rate of AVC action. Place AVC switch to OFF and SLOW then AVC switch to ON. The rate of AVC action in the latter case shall be slower than the first case. Place AVC switch to OFF.
8. With AUDIO GAIN at maximum, adjust the generator input level for an output level of 36 volts. Place the OUTPUT LEVEL switch to LOW. The output level shall drop to a point between 7 and 12 volts. Record this voltage.
9. Measure and record the output level at terminals 2 and 3 on E1. It shall be between 0.7 and 1.2 volts. Return High-Low Output switch to HIGH.
10. Adjust the AUDIO GAIN for a convenient reference level at pins 5 and 6 of E1. Connect headphones (or other 600 ohm load) into the "PHONES" jack. The output shall drop no more than 2 DB. Record this drop. Place AUDIO GAIN to maximum.

## E. FREQUENCY RESPONSE AND REJECTION:

### 1. Initial Settings:

Connect RF signal generator to set-up as in figure 1.  
Adjust RF signal generator output to 100 K microvolts.

AUDIO GAIN - Maximum

AVC - OFF

BFO - ON

OUTPUT LEVEL - HIGH

SIDEBAND - UPPER

MANUAL - XTAL switch to XTAL

Ballantine VTVM connected across the 600 ohm load.

2. Holding the signal generator output constant, find the maximum audio output in the range 451 to 454 KC. Establish a reference 11 DB mark on the 100 volt scale on the VTVM at the point of maximum output by adjusting the AUDIO GAIN level.
3. Sweep upward from the reference frequency until the audio level drops 3 db and record this frequency.
4. Sweep downward past the reference until the level drops 3 db and record this frequency. The difference between this frequency and that obtained in step 3 shall not be less than 3200 cps.
5. Connect the VTVM to the Low Pass filter output and continue downward in frequency until the output level drops to -45 DB from the reference level and record the frequency. This frequency shall be no less than 450.10 KC.

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6. Proceed upward in frequency until the output level drops to -45 DB from the reference level and record the frequency. This frequency shall be no greater than 455.60 KC.

## F. REACTANCE SHIFT:

### 1. Initial Settings:

Connect RF signal generator to set-up as in figure 1. Adjust RF generator to  $454 \text{ KC} \pm 5 \text{ cps}$  (unmodulated) at 100 K microvolts.  
Connect DC variable supply to pins 11 and 12 on E1, but turned OFF.

AUDIO GAIN - Maximum

AVC - OFF

BFO - ON

OUTPUT LEVEL - HIGH

MANUAL - XTAL switch to MANUAL

SIDEBAND - UPPER

REACTANCE BALANCE (R-48) - Mid-position

BANDSPREAD - ZERO

2. With the DC supply OFF, the output frequency across the output should be  $1000 \pm 10 \text{ cps}$ . Adjust Z3 to obtain this condition. Lock the adjustment.
3. With the DC supply at OFF, place the sideband switch to LOWER and adjust the RF signal generator  $456.0 \text{ KC}$  (unmodulated at 100 K microvolts). The frequency across the output should be  $1000 \pm 10 \text{ cps}$ . If it is not, adjust C-29 to obtain this condition.
4. Readjust RF generator  $455 \text{ KC} \pm 10 \text{ cps}$  and increase the DC supply to 4.5 volts (negative at pins 12 of E1) and record the frequency at the output of the Low Pass filter. It shall be between 3200 cps and 5500 cps.
5. Reduce the RF signal generator frequency to  $421 \text{ KC} \pm 10 \text{ cps}$ . Reverse the DC supply polarity on pin 12 of E1 and increase to 4.5 volts (positive at pin 12 on E1). Record the frequency across the 600 ohm load. It shall be between 3200 cps and 5500 cps. Reduce the DC supply to zero.

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## G. BANDSPREAD CONTROL:

### 1. Initial Settings:

Connect RF signal generator to set-up as in figure 1.  
Adjust signal generator to 455 KC  $\pm$  10 cps (unmodulated).  
Adjust signal generator output level to 100 K microvolts.  
AUDIO GAIN - Maximum  
AVC - OFF  
BFO - ON  
OUTPUT LEVEL - HIGH  
MANUAL - XTAL switch on MANUAL  
SIDEBAND - UPPER  
BANDSPREAD - ZERO

2. Increase bandspread to +3 and record the frequency at the output. It shall be 2900 cps or greater.
3. Shift sideband to LOWER and with bandspread control at -3, record the frequency at the output. It shall be 2500 cps or greater.
4. Readjust RF signal generator to 421 KC  $\pm$  10 cps and bandspread control to +3. Record the frequency at the output. It shall be 2200 cps or greater.
5. Readjust RF signal generator to 489 KC  $\pm$  10 cps and sideband switch to UPPER (bandspread at -3). Record the frequency. It shall be 2900 cps or greater. Remove the signal generator from J1.

## H. SIDEBAND SWITCHING REMOTELY AND THE TONE THRESHOLD ADJUST:

### 1. Initial Settings:

BFO - ON  
SIDEBAND - LOWER  
MANUAL - XTAL switch to XTAL  
TONE THRESHOLD - Maximum clockwise  
DC supply (variable) connected to pins 7 and 8 of E1.

2. Connect D.C. source to 7 and 8 of E1, with negative side to terminal 8.



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3. Vary voltage from zero to minus 9 volts.
4. Adjust relay threshold (R-54) on rear panel so switching occurs between -7.5 and -8.0 volts. Record the level of voltage at which switching occurs.
5. With the DC voltage set at minus 5 volts, adjust TONE THRESHOLD (R-60), while in LOWER sideband, in a counter clockwise direction until the Sideband Tone Generator starts to oscillate. This will be evidenced by an audible 500 cycle tone at the output of the Low Pass filter. Indicate presence of this tone on the Data Sheet. The final adjustment is obtained when the Sideband Tone Generator starts to oscillate with minus 5 volts applied to 7 and 8 of E1.  
  
NOTE: The oscillator will start at two positions of the control. The correct position produces an increased output as the control voltage goes more negative.
6. Increase the DC control voltage to minus 9.0 volts and the sideband shall shift to UPPER. An audible 2500 cycle tone shall be heard. Indicate presence of this tone on the Data Sheet. Reducing the control voltage to minus 5 volts shall cause the Sideband Tone Generator to cease oscillation.
7. Increase the control voltage so the tone is present, place BFO OFF and the tone shall disappear. Ground pin 10 on E1 and the tone shall return. Remove the ground on pin 10 and reduce the DC supply to zero.

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TITLE: MSR-4 TEST DATA SHEET

DATE \_\_\_\_\_ SPEC NO. \_\_\_\_\_

MFG. NO. \_\_\_\_\_ SERIAL NO. \_\_\_\_\_

A. POWER SUPPLY VOLTAGES:

A-1(a) \_\_\_\_\_ VDC, A-1(b) \_\_\_\_\_ VDC

B. 2ND OSCILLATOR AND SIDEBAND TONE FREQUENCY:

B 2 \_\_\_\_\_ cps, B 3 \_\_\_\_\_ cps, B 3 \_\_\_\_\_ cps, B 5 \_\_\_\_\_ VAC

C. 1ST OSCILLATOR:

C 2 \_\_\_\_\_ cps, C 4 \_\_\_\_\_ cps

D. SENSITIVITY AND AVC:

D 2 \_\_\_\_\_ u/v D 3 \_\_\_\_\_ u/v D 4 \_\_\_\_\_ u/v

D 5 \_\_\_\_\_ u/v D 6 \_\_\_\_\_ u/v D 8 \_\_\_\_\_ VAC

D 9 \_\_\_\_\_ VAC D 10 \_\_\_\_\_ DB

E. FREQUENCY RESPONSE AND REJECTION:

E 3 (-3DB) \_\_\_\_\_ KC, E 4 (-3DB) \_\_\_\_\_ KC,

E 5 (-45DB) \_\_\_\_\_ KC, E 6 (-45DB) \_\_\_\_\_ KC

F. REACTANCE SHIFT:

F 4 (-4.5) \_\_\_\_\_ cps, F 5 (+4.5) \_\_\_\_\_ cps

G. BANDSPREAD:

+3 UPPER \_\_\_\_\_ cps, -3 LOWER \_\_\_\_\_ cps,

+3 LOWER \_\_\_\_\_ cps, -3 UPPER \_\_\_\_\_ cps

H. SIDEBAND SWITCHING REMOTELY AND TONE THRESHOLD ADJUST:SB Switch \_\_\_\_\_ VDC, Lower SB Tone \_\_\_\_\_ Tone, Upper SB Tone \_\_\_\_\_ Tone  
Low High

TESTED BY: \_\_\_\_\_ STAMP \_\_\_\_\_

