TMC SPECIFICATION			NO. S 1234
REV: A			
COMPILED: ES	CHECKED: PG	APPD:	SHEET COVER OF 34
TITLE:			

1/19/70 jb/

Production Test Procedure

for

MSAR-4, 5

Multiple Sideband Adaptor, Remote

The following procedure is meant for complete functional checkout of the MSAR, and the steps in the procedure should be followed sequentially. However, the procedures for any one card in the unit (topic headings II through VIII) may be used individually to check out a single card or a group of like cards. In order to check any card, a chassis (checked according to topic heading #1) should be available. The following chart indicates those cards that are necessary for individual checkout of a particular card. The "Required Cards" should be previously tested and aligned in accordance with their individual procedures.

Procedure	Card Under Test	Required Cards
II	A-1	None
III	A-3	A-1
IV	A-7	A-1
IV	A-9	A-1
IV	A-11	A-1
IV	A-13	A-1
V	A-5	A-1
VI	A-6	A-1,A-7,A-4,A-3
VI	A-8	A-1,A-9,A-4,A-3
VI	A-10	A-1,A-11,A-4,A-3
VI	A-12	A-1,A-13,A-4,A-3
VII	A-4	All cards except A-2
VIII	A-2	All Cards

NOTE: Indicate the completion and acceptance of the portions of this test procedure, preceded by (**), on the Test Data Sheet. Indications will be the recorded observed values or a check (✓), as required.

I. MSAR Chassis (CK1360)

A. Equipment Required

1. Simpson VOM, Model 260 or equivalent

** B. Preliminary (all cards removed from chassis)

1. Set the "Power" switch in the Off Position.
2. Check front panel controls for proper alignment and operation.
3. Check for proper wiring of T1, AC power transformer.
4. Check for proper value of line fuses, F1 and F2.
5. Check for primary AC shorts to ground by connecting Simpson meter (+DC, RX1 scale) between pin A of J2 and ground and then between pin C of J2 and ground. Meter should indicate infinity.
6. Check for secondary AC shorts to ground by connecting Simpson meter (+DC, RX1 scale) between ground and each secondary AC input pin on XA1 (pins B, H, L, M, N, 2, 7 and 12). Meter should read infinity.
7. Check for supply voltage shorts to ground by connecting Simpson meter (+DC, RX1 scale) between ground and each supply voltage pin on XA1 (pins A, C, D, E, P, R, 3, 9, 13, 14 and 15). Meter should indicate infinity.
8. Check for proper grounds by connecting Simpson meter (+DC, RX1 scale) between chassis ground and pin B of J2 and then between chassis ground and the following pins on XA1; 1, 5, and 11.

** C. Test and Alignment

1. Apply AC power (115 or 230 VAC) to J2 (as per customer requirement, i.e., wiring of T1).
2. Turn "Power" switch to On position. "Power" lamp should be illuminated.
3. Turn "Power" switch to Off position.

II. Power Supply - A-1 (CK1361 & A4627)

A. Equipment Required:

1. Simpson VOM, Model 260 or equivalent
2. Ballantine VTVM, Model 314A or equivalent

B. Preliminary:

1. Check to insure that:
   a. All cards are removed from the MSAR chassis.
   b. "Power" switch in off position.
   c. AC power is applied to MSAR at J2.

2. On the A-1 card preset the following controls to mid-range:
   a. R8
   b. R17
   c. R26
   d. R35

3. On the A-1 card preset the following controls fully CCW:
   a. R4
   b. R13
   c. R22
   d. R31

4. Insert extender card in A-1 socket of MSAR and insert A-1 card in the extender card socket.

5. Turn "power" switch to on position.

C. Test and Alignment:

1. Voltage adjustment
   a. On the Simpson meter select the "50V" scale and the proper "DC" function (- or +, as required).
   b. Connect the Simpson meter between ground and the indicated test points.

** *c. At each test point adjust the proper control for the indicated voltage as read on the Simpson meter.

TEST POINT	VOLTAGE CONTROL	VOLTAGE
TP-3	R8	+24 VDC
TP-6	R17	+15 VDC
TP-9	R26	+5 VDC
TP-12	R35	-24 VDC

* If the voltage cannot be set to its proper value, it may be necessary to turn the associated current limiting control (R4 - +24, R13 - +15, R22 - +5, R31 - -24) slightly CW and then attempt to set the voltage control.

2. Current limiting adjustment
   a. On the Simpson meter select the proper current scales ("500 MA" or "10 AMPS") and the proper "DC" function (- or +, as required).
   b. Using extreme care, connect the Simpson meter between ground and the indicated test points.
** c. At each test point adjust the proper control for the indicated current as read on the Simpson meter.

TEST POINT	CURRENT CONTROL	CURRENT
TP-3	R4	600 MA
TP-6	R13	230 MA
TP-9	R22	180 MA
TP-12	R31	50 MA

** 3. Output ripple voltage check
   a. On the Ballantine VTVM select the proper scale (" 1mV without probe") and the "meter" function.
   b. Connect test leads for Ballantine to the following test points and their associated grounds. Simultaneously connect the Simpson between chassis ground and the same test points as per "Current limiting adjustment" Steps 2a and 2b. (The Simpson will be used to load the power supply for the ripple voltage check.)

TEST POINT	GROUND
TP-3	TP-2
TP-6	TP-5
TP-9	TP-8
TP-12	TP-11

   *c. The output voltage ripple should be less than .3mV as read on the Ballantine meter.

* Extreme care should be used in the above measurement. The test should be performed in a shielded area, since background noise in an unshielded area may possibly be greater than the desired maximum ripple voltage. Before attempting this measurement in an unshielded area, connect test leads to a test point and turn the "Power" on the MSAR to the Off position. Background noise should be below the maximum desired ripple voltage level. If it is not, the measurement cannot be made in the unshielded area. Care should also be used to insure that the MSAR chassis and meter are at the same ground potential for this test.

   d. Remove Ballantine and Simpson meters.

D. Completion

1. Turn "Power" switch to the Off position.
2. Remove A-1 and extender card from chassis socket.
3. Place A-1 card in the MSAR A-1 socket.

III. Sub-Carrier Generator A-3 (CK1363 and A4629)

A. Equipment Required

1. 1 mcs. standard at 1 VRMS level
2. Oscilloscope, Tectronix 541A with high gain pre-amplifier (L type plug-in) or equivalent
3. Signal Generator, HP606A or equivalent
4. 50 ohm load
5. Frequency Counter, HP5245L or equivalent

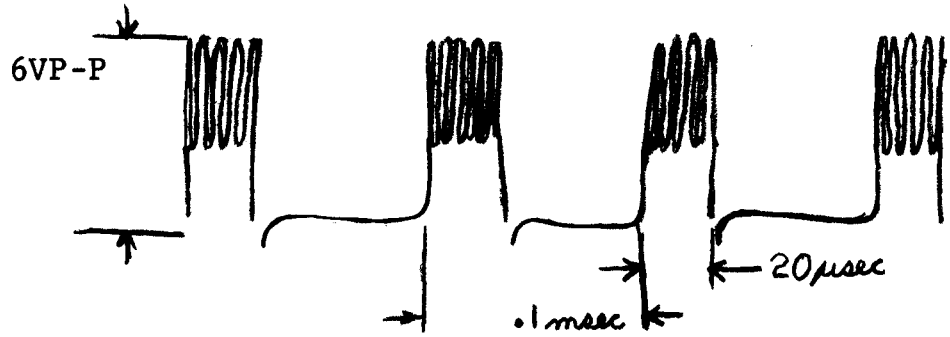
B. Preliminary

1. Insert extender card in the A-3 socket of the MSAR
2. Insert A-3 card in the extender card socket
3. Turn "Power" to the On position
4. Connect 1 mcs. standard to J7, 1 mcs. input
5. Connect "Vertical Sig. Out" of scope to "AC Signal Input" of counter.

C. Test and Alignment

** 1. Connect the scope probe between ground and TP-1 A 1 mcs. sine wave at approximately 2.8 VP-P should be displayed.

** 2. Connect the scope probe between ground and TP-2. A 20 usec pulse occuring at a 10 Kc rate should be displayed. The amplitude of the signal should be approximately 6VP-P.



3. Connect a low capacity scope probe between the junction of L5 and R21 and ground. Peak C11 for maximum level. The 6.29 mcs. signal displayed should be at approximately 10VP-P.

4. Once again connect scope probe between TP-2 and ground to verify that the pulse rate is still 10 Kc. (It may be necessary to readjust C11 slightly to insure the proper waveform at TP-2.

** 5. Connect scope probe between TP-4 and ground. A 6.29 Kc signal should be displayed at approximately 1 VP-P.

** 6. Connect scope probe between pin 8 and ground. A 250 Kc signal should be displayed at approximately 1 VP-P.

** 7. Connect scope probe between pin L and ground. A 250 Kc signal should be displayed at approximately 1 VP-P.

** 8. With scope probe still connected to pin L, connect jumper between pin A and ground. The 250 Kc signal display should disappear.

9. Set the HP606A signal generator for a frequency of 250 Kc.

10. Using a T- connect on the "RF output" of the signal generator, connect a 50 ohm load and an output cable.

11. Connect the signal generator output cable to the 250 Kc input, J-8 on the MSAR.

12. Set the signal generator output level for 130mV RMS.

** 13. A 250 Kc signal at approximately 1 VP-P should once again be displayed at pin L.

14. Remove jumper from pin A.

** 15. Connect scope probe between TP6 and ground. A 243.710 Kc signal should be displayed at a minimum level of .5 VP-P.

** 16. Connect scope probe between TP7 and ground. A 256.290 Kc signal should be displayed at a minimum of .5 VP-P. Remove scope probe and Signal Generator.

D. Completion

1. Turn "Power" switch to Off position.

2. Remove A-3 and extender card from chassis socket.

3. Place A-3 card in the MSAR A-3 socket.

IV. ISB IF Cards A-7, 9, 11 and 13 (CK1367 and A4633)

A. Equipment Required

1. Signal Generator, HP606A or equivalent
2. Ballantine VTVM, 314A or equivalent
3. 2 Oscilloscopes, Tektronix Model 541A with high gain preamplifier (L type plug-in) or equivalent
4. 50 ohm load
5. Simpson VOM, Model 260 or equivalent
6. 600 ohm load
7. Wave Tek function generator, Model 115 or equivalent

B. Preliminary

1. On the MSAR set the "AGC Source" switches to closed loop (i.e. A1 Source in A1 position, A2 Source in A2 position, etc.)
2. Place "Mode" switch to "ISB" position.
3. Place all "AGC Time Constant" switches in the "Medium" position.
4. On the A-7 card adjust R55 fully CW.
5. On the A7 card adjust the following controls to mid-range.
   a. R45
   b. R80
   c. R81
   d. R82
   e. R83
   f. R84
   g. R85
6. Insert extender card in the A7 socket of the MSAR.
7. Insert A7 card in the extender card socket.
8. On the Signal Generator connect a T-connector to the "RF Output" and connect a 50 ohm load and an output cable to the T-connector.
9. Connect Signal Generator output cable to "IF Input", J9 on the MSAR.
10. Turn the "Power" switch to on position.

** 11. Connect Simpson VOM (+50 VDC scale) between ground and TP14 of A-7. Meter should indicate +24 VDC $\pm$ 10%.

** 12. With Simpson VOM still connected place "Mode" switch in the following positions:
   a. AM 2.5 Kc
   b. AM 6 Kc

c. CW 2.5 Kc
d. CW 6 Kc

There should be no voltage indicated in these positions.

13. Place the "Mode" switch to the "ISB" position and disconnect Simpson meter.

C. Test and Alignment

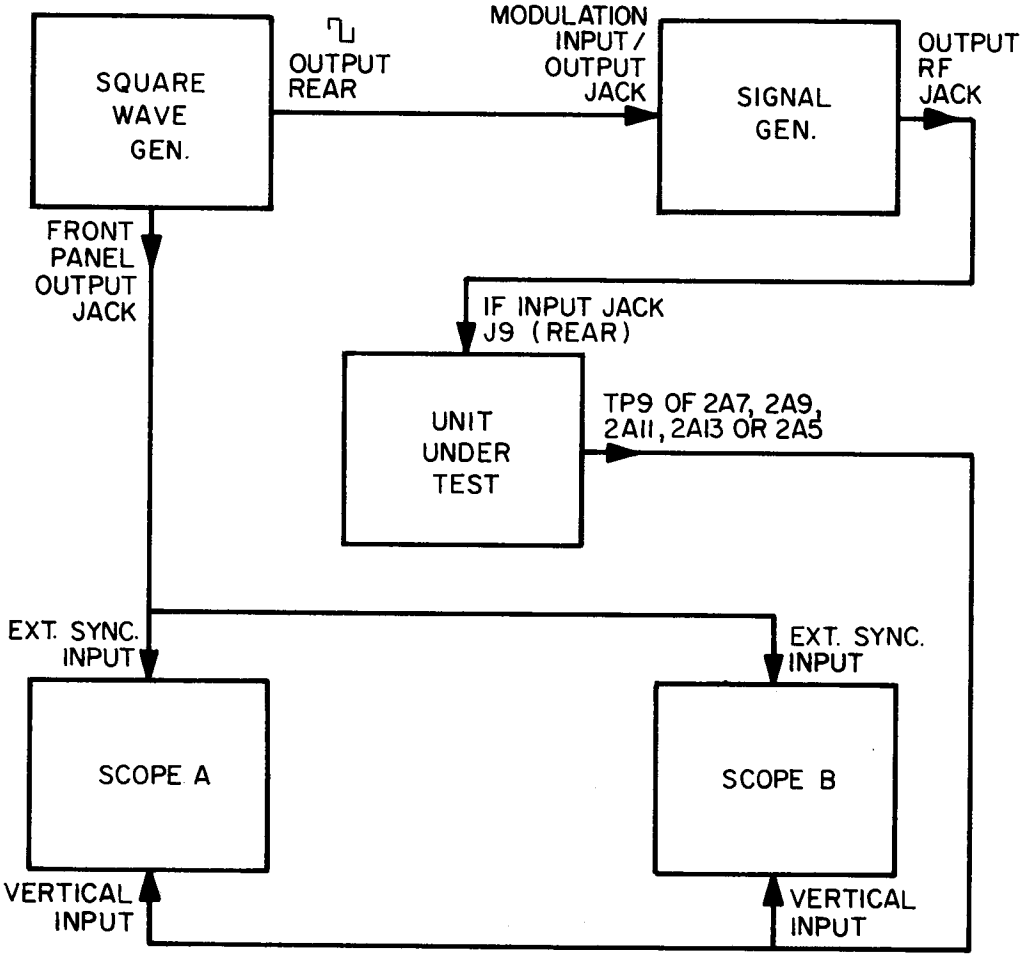
1. Connect Oscilloscope probe between TP5 and ground on A-7.
2. Set the signal generator output level for 30 mV RMS and at a frequency of approximately 250 Kc.
3. Tune the signal generator to the approximate center of the filter passband under test, as indicated by a sine wave display on the oscilloscope (level approximately .03 V P-P).
4. Remove scope probe from TP5.
5. Connect Ballantine VTVM probe between TP9 and ground (TP-10).
6. Adjust signal generator output level to 50 UVRMS, and adjust R45 for a level of 100 mV RMS as indicated on the Ballantine meter at TP9.

** 7. Set the AGC level by adjusting R55 to the point where the output level at TP9 decreases to 80 mV RMS, as indicated on the Ballantine meter.

** 8. Decrease the signal generator output level to 30 uV RMS. Gradually increase the signal generator output level. As the level is increased, the level at TP9 should also gradually increase. When the input level reaches 60 uV RMS, the level at TP-9 should be holding at 80 mV RMS. The level at TP-9 should remain within 2 db of 80 mV RMS, as the signal generator level is further increased to 100 mV RMS.

** 9. Repeat step #8 with "AGC Time Constant" switch in the "fast" position and also in the "slow" position.

10. Attack and Delay
    a. Connect equipment as shown below:



b. On the Function Generator: Set multiple switch to the "X1" position, the mode switch in "cont." position, the function selector switch to square wave output, the output Att. fully clockwise, the freq. selector to "X1" position, the "vernier" in CAL position and the freq. dial to "1".

c. On the HP606A Signal Generator: Adjust frequency to 250 Kc in the Ext. D.C. position. Adjust the "Modulation Amplitude" and the output "Vernier" until a swing on the output RF Meter is between .33 and 3.

d. Place all time constant switches in "fast" position, Mode Switch to "ISB" position, Line Level Meter to "0" position, Monitor Selector to proper channel (Ex. B2-A7) Gnd connect a 600 ohm load to proper "audio" output jack for channel under test. (Pins E and C)

e. Remove the external modulating signal from the Signal Generator.

f. Retune the Signal Generator until an audio output signal from the MSAR (approximately 2.7 Kc) is displayed on the scopes.

g. Reconnect the external modulating signal to the Signal Generator.

h. Adjust "Line Level Adjust" for channel under test to indicate "0 dbm" on the "Line-DBM" meter on the peaks of the signal.

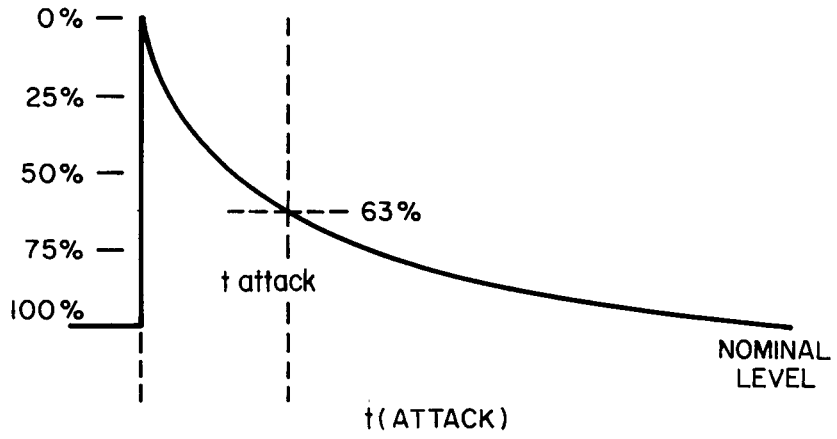
i. On the Function Generator use the "freq. Hz" selector and the Frequency Dial to adjust the Function Generator output to a frequency of 1/10 x the "release time constant".

TIME CONSTANT	ATTACK	RELEASE
fast	20 ms	20 ms
medium	20 ms	100 ms
slow	40 ms	2 seconds

(i.e. "fast" release time constant = 20 ms; therefore, Function Generator frequency should be 1/10 x 20 ms = 5 cps)

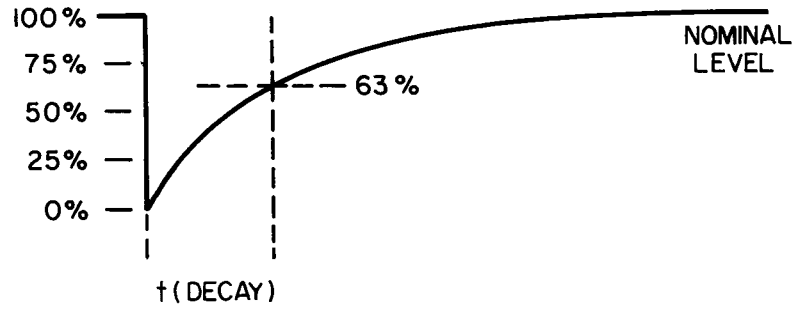
j. Scopes "A" and "B" should be hooked up to use the same sync signal, as per Figure 1; however, scope "A" trigger should be set to "+" and scope "B" trigger should be set to "-".

k. Adjust the controls on the "A" oscilloscope so that the following portion of the signal is displayed on the "A" scope screen.



Horizontal Time/cm at 5 ms

1. Adjust the controls on the "B" oscilloscope so that the following portion of the signal is displayed on the "B" scope screen.



Horizontal Time/cm Settings

m. CONTROLS:

TIME CONSTANT	ATTACK	RELEASE
fast	R80	R81
medium	R83	R82
slow	R85	R84

n. Adjust the Attack and Release controls (listed above, C.9) until the following conditons are met.
   1. Attack - Display - At the end of the attack time the amplitude of the signal should be 63% from the top line of scope screen "A".
   2. Release Display - At the end of the release time the amplitude of the signal should be 63% from the bottom line of scope screen "B".

o. Repeat entire test for "Med" and "Slow" time constant positions. (Note: Frequency of Function Generator must be reset as in step C.5.)

p. Repeat entire test for all IF/AGC cards (2A7, 2A9, 2A11, and 2A13).

q. Repeat entire test for SYM-2A5 Card. For this test put the "Mode" switch in the CW 6 Kc position. The Signal Generator frequency should remain set at 250 Kc and the BFO control should be adjusted for 3 Kc audio output.

11. Place 50 ohm load on J-3, "B-2 IF Output".
12. Connect Ballantine VTVM across 50 ohm load and ground.
** 13. Output level should be a minimum of 1 mV RMS as indicated on the Ballantine Meter. Disconnect Ballantine Meter.

D. Completion
   1. Turn "Power" switch to Off position.
   2. Remove A-7 and extender card from chassis socket.
   3. Place A-7 card in the A-7 socket of the MSAR.

** E. The complete alignment outlined for A-7 should now be performed for A-9, A-11, and A-13 cards. The appropriate channel output jacks are as follows:

Channel	Card	Jack
B1	A-9	J4
A1	A-11	J5
A2	A-13	J6

V. Symmetrical IF Card A-5 (CK1365 and A4631)

A. Equipment Required
1. Signal Generator, HP606A or equivalent
2. Ballantine VTVM, 314A or equivalent
3. Oscilloscope Tektronix, Model 541A with high gain preamplifier (L type plug-in) or equivalent
4. 50 ohm load
5. Simpson VOM, Model 260 or equivalent

B. Preliminary
1. On the MSAR set the "SYM-B2" "AGC Source" switch in the B2 position.
2. Place "Mode" switch to "AM 2.5KC" position.
3. Place SYM-B2" "AGC Time Constant" switch in the "Med" position.
4. On the A5 card adjust R68 fully CCW.
5. On the A5 card, adjust the following controls mid-range:
   a. R58
   b. R93
   c. R94
   d. R95
   e. R96
   f. R97
   g. R98
6. Insert the extender card in the A5 socket of the MSAR.
7. Insert A5 card in the extender card socket.
8. On the Signal Generator connect a T-connector to the "RF Output" and an output cable and a 50 ohm load to the T'connector.
9. Connect Signal Generator output cable to "IF Input", J9 on the MSAR.
10. "Mode" Switch Operation.
    a. Connect Simpson between ground and pin 13. (+DC, RX1).
    b. Turn the "Mode" switch through all of its positions.
** c. The following indications should be read on the Simpson meter:

Switch Position	Meter Reading
AM 2.5KC	infinity
AM 6 KC	0 ohms
CW 2.5KC	infinity
CW 6 KC	0 ohms
ISB	infinity

d. Connect Simpson meter between ground and TP3 (+DC, RX1)

e. Turn the "Mode" switch through all of its positions.

** f. The following indications should be read on the Simpson meter.

Switch Position	Meter Reading
AM 2.5 KC	0 ohms
AM 6 KC	infinity
CW 2.5KC	0 ohms
CW 6 KC	infinity
ISB	infinity

g. Connect Simpson Meter between ground and TP13 (+DC, 50V scale).

h. Turn "Power" switch to "On" position.

i. Turn the "Mode" switch through all of its positions.

** j. The following indications should be read of the Simpson Meter.

Switch Position	Meter Reading
AM 2.5 KC	+24 VDC ± 10%
AM 6 KC	+24 VDC ± 10%
CW 2.5KC	+24 VDC ± 10%
CW 6 KC	+24 VDC ± 10%
ISB	OVDC

k. Disconnect Simpson meter

11. Place "Mode" switch in "AM 2.5KC"position.

C. Test and Alignment

1. Connect Oscilloscope probe between TP4 and ground on A5.
2. Set the signal generator output level for 30 mV RMS and at a frequency of 250 Kc.
3. A sine wave at approximately .13V P-P should be displayed.
4. Remove scope probe from TP4.
5. Connect Ballantine VTVM probe between TP8 and ground (TP9).
6. Adjust signal generator output level to 50 UV RMS and adjust R-58 for a level of 100 mV RMS as indicated on the Ballantine meter at TP8.

** 7. Set the AGC level by adjusting R68 to the point where the output level at TP9 decreases to 80 mV RMS as indicated on the Ballantine meter.

** 8. Decrease the Signal Generator output level to 30 uV RMS. Gradually increase the Signal Generator output level. As the level is increased, the level at TP-8 should also gradually increase. When the input level reaches 60 uV RMS, the level at TP-8 should be holding at 80 mV RMS. The level at TP-8 should remain within 2 db of 80 mV RMS, as the Signal Generator level is further increased to 100 mV RMS.

** 9. Repeat step #8 with "SYM/B2", "AGC Time Constant" switch in both the "Fast" and "Slow" positions. Repeat step #8 with the "Mode" switch in the "CW 6 KC" position.

*10. AGC attack and decay times (R93 thru R98)

* Note: This test and alignment will be performed as part of the system's test procedure.

11. Place 50 ohm load on J-10, "SYM IF Output".

12. Connect Ballantine VTVM across 50 ohm load and ground.

** 13. Output level should be a minimum of 1 mV RMS as indicated on the Ballantine meter. Remove Ballantine meter.

D. Completion

1. Turn "Power" switch to Off position.
2. Remove A-5 and extender card from chassis socket
3. Place A-5 card in the A-5 socket of the MSAR.

VI. ISB Audio Cards A6, A8, A10, and A12 (CK1366 and A4632)

A. Equipment Required

1. Signal Generator, HP606A or equivalent
2. Ballantine VTVM, 314A or equivalent
3. Oscilloscope Tektronix, Model 541A with high gain preamplifier (L type plug-in) or equivalent
4. Simpson VOM, Model 260 or equivalent
5. 1 mcs. Standard
6. 50 ohm load
7. 600 ohm load

B. Preliminary

1. On the MSAR set the "Mode" switch to "ISB."
2. Set the "AGC Source" switches to closed loop (i.e., A1 Source in A1 position, A2 Source in A2 position).
3. Place all "AGC Time Constant" switches in "Fast" position.
4. Connect 1 mcs. Standard at 1 V RMS level to J7, "1 Mc. In."
5. Connect a T-connector to the RF output jack of the Signal Generator, and connect an output cable and a 50 ohm load to the T-connector.
6. Connect Signal Generator output to J9, "I.F. In", on MSAR.
7. Connect a 600 ohm load across pins E and C of the "Audio Out" jack for the channel card under test and connect pin D to chassis ground.

Channel	Card	Jack Number
B2/SYM	A6	J15
B1	A8	J16
A1	A10	J17
A2	A12	J18

8. Insert extender card in the proper socket of the MSAR chassis for the channel card under test, and insert the card under test in the extender card socket.

9. Insert an A4, Symmetrical Demodulator Card in the A4 socket of the MSAR.
10. Set "Meter Sensitivity" switch to "0" position.
11. Set all "Line Level Adjust" controls fully CCW.
12. Place "Monitor Selector" switch in proper position for channel card under test (A6 - B2 position, A8 - B1 position, A10 - A1 position, and A12 - A2 position).
13. Turn "Power" switch to the "On" position.

C. Test and Alignment

** 1. Connect Simpson meter (+DC, 50V scale) between ground and TP13. Meter should read +24 VDC ± 10%. Disconnect Simpson meter.
2. Set Signal Generator frequency to approximately 250 KC.
3. Set Signal Generator output level for 1 mV RMS.
4. Connect Oscilloscope probe between ground and TP3. Level should be at a minimum of .5V P-P as displayed on the scope.
5. Connect Oscilloscope probe between ground and TP-1. Tune Signal Generator to the approximate center of the filter passband being applied to the audio card under test. Level should be approximately .2V P-P as displayed on the scope.
6. Connect scope probe between ground and TP8, and tune the Signal Generator for a sine wave display of approximately 1 KC on the scope.
** 7. Adjust R26 so that the level at TP8 is 1V P-P as displayed on the scope. Disconnect probe.
8. Connect Ballantine VTVM probe across ground and one end of the 600 ohm load on the proper "Audio Out" jack.
9. Adjust the proper "Line Level Adjust" control for channel under test until a level of .39 V RMS is indicated on the Ballantine meter.

** 10. Adjust R48 so that the "Line DBM" meter on the MSAR reads 0 dbm.

** 11. Place "Meter Sensitivity" switch in the "+10" position.

** 12. Adjust the "Line Level Adjust" (for the channel under test) until a level of 1.2V RMS is indicated on the Ballantine meter. "Line DBM" meter on the MSAR should read 0.

** 13. Connect scope probe across TP14 and ground. A clean sine wave should be displayed on the scope.

** 14. Adjust "Line Level Adjust" (for channel under test) until a level of .12V RMS is indicated on the Ballantine meter.

** 15. Place "Meter Sensitivity" switch in the "-10" position. Meter should read 0.

16. Remove Ballantine probe.

17. Remove scope probe.

D. Completion

1. Turn "Power" switch to Off position.
2. Remove audio card under test and extender card from chassis socket.
3. Place tested audio card in the proper socket of the MSAR.

** E. Repeat the complete test for all audio cards (A6, A8, A10, and A12).

VII. Symmetrical Demodulator A-4 (CK1364 and A4630)

A. Equipment Required

1. Signal Generator, HP606A or equivalent
2. Oscilloscope Tektronix, Model 541A with high gain preamplifier (L type plug-in) or equivalent
3. Frequency Counter, HP5245L or equivalent
4. Simpson VOM, Model 260 or equivalent.
5. 50 ohm load
6. 1 mcs. Standard at 1V RMS level.

B. Preliminary

1. Remove the A4 card from the MSAR chassis
2. Insert extender card in the A4 socket of the MSAR
3. Insert A4 card in the extender card socket
4. Set the following controls to mid-range:
   a. R23
   b. R24
   c. R52
   d. R10
5. Connect a T-connector to the RF output of the Signal Generator and a 50 ohm load and output cable to the T-connector.
6. Connect Signal Generator output cable to J9, "I.F. In" on the MSAR.
7. For "SYM/B2" channel set the "AGC SOURCE" switch to "B2" position, the "AGC TIME CONSTANT" to "MED", and "LINE LEVEL ADJUST" control fully CCW.
8. Set "MODE" switch to "AM 2.5KC" position.
9. Select "SYM" with "Monitor Selector" switch.
10. Connect 1 mcs. Std to J7, "1 Mcs. In".
11. Connect "Vertical Signal Out" of scope to "AC Signal Input" of Counter.
12. Turn "Power" switch on MSAR to "On" position.

C. Test and Alignment

** 1. Connect Simpson meter (+DC,50V scale) between TP-18 on A4 and ground. Meter should read +24 VDC $\pm$ 10%.

** 2. Connect Simpson meter (+ DC, 50V scale) between TP15 and ground. Rotate the "MODE" switch through all positions. The meter should indicate as follows:

"MODE" Switch Position	Simpson Meter Indication
AM2.5 KC	+24 VDC ± 10%
AM6 KC	+24 VDC ± 10%
CW2.5 KC	+24 VDC ± 10%
CW6 KC	+24 VDC ± 10%
ISB	close to 0 VDC

** 3. Connect Simpson meter between ground and the cathode of CR9. Meter should indicate approximately +12 VDC.

4. Turn "Power" switch to Off Position.

** 5. Connect Simpson meter (+DC, RX1 scale) between ground and pin N. Rotate the "MODE" switch through all positions. The meter should indicate as follows:

"MODE" Switch Position	Simpson Meter Indication
AM2.5KC	0 ohms
AM6 KC	0 ohms
CW2.5KC	infinity
CW6 KC	infinity
ISB	infinity

** 6. Connect Simpson meter (+DC, RX1 scale) between ground and pin L. Rotate the "MODE" switch through all positions. The meter should indicate as follows:

"MODE" Switch Position	Simpson Meter Indication
AM 2.5 KC	infinity
AM 6 KC	infinity
CW 2.5 KC	0 ohms
CW 6 KC	0 ohms
ISB	infinity

7. Disconnect Simpson meter.
8. Turn "Power" switch to "On" position.
9. BFO Adjustment
   a. Connect scope probe to TP-8 (Counter should be connected to "Vertical Signal Out" of scope).
   b. Place "Mode" switch to "CW 2.5KC" position.
   c. Rotate "Sync BFO" control fully clockwise ("+ 3 KC") and adjust R23 for a Counter reading of 253.5 KC.
   d. Rotate "Sync BFO" control fully counter clockwise (" -3 KC") and adjust R24 for Counter reading of 246.5 KC.
** e. Repeat steps c and d alternately until both frequencies are on within a tolerance of ± 500 cps.
** f. The amplitude of the signal at TP-8 should be a minimum of 8.0 V P-P.
   g. Remove scope probe.
10. Set the Signal Generator for a frequency of 250 KC and at an amplitude of 30 mV RMS.
11. Connect scope probe between TP-1 and ground. A 250 KC sine wave should be displayed at an amplitude of approximately .2 V P-P.
12. Connect scope probe between TP-10 and ground. Adjust "Sync BFO" control for a signal of approximately 1 KC. Disconnect scope probe.
13. Connect Ballantine Meter between TP10 and ground and adjust R52 for a level of 420 mV RMS. Remove Ballantine meter.
14. Set "Meter Sensitivity" switch to "+10".
15. Adjust "Sync B2", "Line Level Adjust" CW until the "Line DBM" meter reads full scale (+2 dbm).
** 16. Connect Ballantine meter between TP13 and ground. The signal level should be 70 mV RMS ± 10%. Remove Ballantine meter.
17. Place "Mode" switch in "AM 6 KC" position.
18. Modulate the Signal Generator internally with the 1 KC tone at 75%.
** 19. Connect Ballantine meter between TP10 and ground. Adjust R10 for a level of 410 mV RMS.

20. "Line DBM" meter should be indicating close to full scale.
21. Turn "Sync B2", "Line Level Adjust" fully CCW.
22. Disconnect Ballantine meter.

D. Completion

1. Turn "Power" switch to Off position.
2. Remove A4 and extender card from chassis socket.
3. Place A4 card in the A4 socket of the MSAR.

VIII. Monitor, Diversity A2 (CK1362 and A4628)

A. Equipment Required

1. Signal Generator, HP606A or equivalent.
2. Oscilloscope Tektronix, Model 541A with high gain preamplifier (L type plug-in) or equivalent.
3. Simpson VOM, Model 260 or equivalent.
4. 50 ohm load
5. 1 Mcs Std. at 1 V RMS level
6. 4 ohm load
7. *Meter, MR205, HFRR RF/AFC "Level Meter"

*If an HFRR chassis is available, its meter may be utilized. Meter function switch on HFRR should be in "Low RF" position.

B. Preliminary

1. Preset the following controls on A2 to mid-range.
   R65
   R75
   R70

2. Insert extender card in the A2 socket of the MSAR and insert the A2 card in the extender card socket.

3. Connect a T-connector to the RF output of the Signal Generator, and a 50 ohm load and an output cable to the T-connector.
4. Connect Signal Generator output cable to J9, "I.F. In" on the MSAR.
5. Connect 1 mcs. Std. to J7, "1 Mcs In".
6. Connect 4 ohm load across pins B and E of J14, "Speaker".

7. On MSAR set all "AGC Source" switches to closed loop (i.e. A1 Source in A1 position, A2 Source in A2 position, etc.)

8. Place all "AGC Time Constant" switches in "Med" position.

9. Set "Local Gain" fully CCW.
10. Place "Mode" switch to "AM 2.5KC" position.
11. Place "Monitor Selector" switch to "Sym".
12. Set "Meter Sensitivity" switch to "+10" position.
13. Turn "Sym BFO" control maximum CW.
14. All "Line Level Adjust" controls should be set to mid-range.

C. Test and Alignment

1. Turn "Power" switch on MSAR to On position.
** 2. Connect Simpson meter (+DC, 50V scale) between TP21 and ground. Meter should read +24 VDC ± 10%.

** 3. Connect Simpson meter (+ DC, 50V scale) between TP17 and ground. Meter should read +12 VDC ± 10%.
** 4. Connect Simpson meter (+ DC, 50V scale) between TP18 and ground and then between TP18 and ground. Meter should read -12 VDC ± 10%.
** 5. Connect Simpton meter (-DC, 50V scale) between TP22 and ground. Meter should read -24 VDC ± 10%.

Disconnect Simpson meter.

6. Set Signal Generator to a frequency of 250 KC and internally modulate the Signal Generator with the 1000 cps tone at 75%.
7. Set Signal Generator output for an amplitude of 30 mV RMS.
8. Connect scope probe to TP-1 on A2 card and adjust "Local Gain" control for a signal at 500 mV P-P.

** 9. Connect scope probe between TP-2 and ground. A sine wave should be displayed at approximately 4.4 V P-P.

** 10. Connect scope probe between TP-4 and ground. A sine wave should be displayed at approximately 4.4 V P-P.

** 11. Connect scope probe across 4 ohm load (ground lead of probe on pin B of J14, "Speaker"). Adjust "Local Gain" control for an output of 5.6 V P-P (2 V RMS) on the scope. A clean, undistorted sine wave should be displayed.

12. Remove internal modulation from the Signal Generator by placing it in the CW mode.

13. On the MSAR place the "MODE" switch in the "CW 6 KC" position.

** 14. Adjust "Local Gain" for an output of 5.6 V P-P as displayed on the Scope. A clean, undistorted sine wave should be displayed.

15. Place "Mode" switch in "ISB" position and "Monitor Selector" in "B2" position.

16. Tune signal generator for an output signal as indicated on the scope (still connected across load on the speaker jack).

** 17. Adjust "Local Gain" for an output of 5.6 V P-P. A clean, undistorted sine wave should be displayed on the scope.

** 18. Repeat steps 15, 16 and 17 for channels B1, A1, and A2. Remove scope probe.

19. *Connect MR-205 across pins B and C of J11, "RF Meter", on the MSAR (B to positive meter terminal, C to negative meter terminal).

* If HFRR chassis is to be utilized for this test, the following interconnect should be made:

MSAR		HFRR
J11-B	to	J9-B
J11-C	to	J9-C

20. Set the Signal Generator level to 1 mV RMS and to an approximate frequency of 250 Kc.
21. With the "Mode" switch still set in "ISB" and the "Monitor Selector" in the "A-2" position, tune the Signal Generator for an output in the A-2 Channel by monitoring the "Line DBM" meter, on the MSAR. ("Line Level Adjust" and "Meter Sensitivity" switch should be used as required).
22. Adjust R75 on the A2 card so that MR-205, "RF Level Meter" reads slightly higher than mid-scale.
** 23. Increase the Signal Generator output 10 db. The "RF Level Meter" should indicate an increase of 10 db. R70 should be slightly adjusted and steps 20 through 23 repeated until the "RF Level Meter" does indicate a 10 db increase.
** 24. With the Signal Generator level set to 1 mV, adjust R75 so that the "RF Level Meter" reads 20 db above 1 uV.
25. Select "CW 2.5 Kc" with the "Mode" switch, select "Sym" with the "Monitor Selector" switch, and place "Sym BFO" mid-range.
26. Tune the Signal Generator for an output in the approximate center of the symmetrical channel, by monitoring the "Line DBM" meter on the MSAR ("Line Level Adjust" and "Meter Sensitivity" switch should be used as required).
** 27. Adjust R65 for 20 db above 1 uV as indicated on the "RF Level Meter".
28. Remove MR-205, "RF Level Meter" from J-11.
29. Prepare the 3V battery and potentiometer, with test leads, as shown:

D. Completion

1. Turn "Power" switch to Off position
2. Remove A2 card and extender card from chassis socket.
3. Place A2 card in A2 socket of MSAR.
4. Remove all test equipment.

TEST DATA SHEET

PRODUCTION TEST OF MSAR-4, 5

I. B & C MSAR Chassis checks and test completed _____(✓)

II. A1 Power Supply Adjustments

C.1.C Voltage Adjustment

TP-3	+24 VDC	_____(✓)
TP-6	+15 VDC	_____(✓)
TP-9	+ 5 VDC	_____(✓)
TP-12	-24 VDC	_____(✓)

C.2.C Current Limiting Adjustments

TP-3	600 ma	_____(✓)
TP-6	230 ma	_____(✓)
TP-9	180 ma	_____(✓)
TP-12	50 ma	_____(✓)

C.3 Output Ripple Voltage Checks (0.3 mV RMS Min.)

TP-3	_____mV RMS
TP-6	_____mV RMS
TP-9	_____mV RMS
TP-12	_____MV RMS

TEST DATA SHEET

III. A3 Sub-carrier Generator adjustments and tests

C.1.	1 Mc @ TP-1	_____(✓)
C.2.	TP-2 pulse measurement	_____V P-P _____u sec. _____Kc
C.5.	6.29000 Mc TP-4 Voltage	_____V P-P
C.6.	250Kc OUT PIN 8	_____V P-P
C.7.	250Kc OUT PIN L	_____V P-P
C.8.	250Kc Gating	_____(✓)
C13.	AFC 250Kc Gating	_____(✓)
C15.	TP-6 243.710Kc Output Voltage	_____V P-P
C16.	TP-7 256.290Kc Output Voltage	_____V P-P

TEST DATA SHEET

IV. A7, B2 ISB IF tests and adjustments

B.11	TP-14 B+ switching (ISB MODE)	_____(✓)
B.12	TP-14 B+ switching (other MODES)	_____(✓)
C.7	TP-9 IF output AGC Adjust	_____(✓)
C.8&9	TP-9 AGC DYNAMIC RANGE Test	_____DB Med.
		_____DB Fast
		_____DB Slow
C.13	IF output	_____mV RMS

E. A9 B1 ISB IF tests and adjustments

B.11	TP-14 B+ switching (ISB MODE)	_____(✓)
B.12	TP-14 B+ switching (other MODES)	_____(✓)
C.7	TP-9 IF output AGC Adjust	_____(✓)
C.8&9	TP-9 AGC DYNAMIC RANGE Test	_____DB Med.
		_____DB Fast
		_____DB Slow
C.13	IF output	_____mV RMS

E. A11 A1 ISB IF tests and adjustments

B.11	TP-14 B+ switching (ISB MODE)	_____(✓)
B.12	TP-14 B+ switching (other MODES)	_____(✓)
C.7	TP-9 IF output AGC Adjust	_____(✓)
C.8&9	TP-9 AGC DYNAMIC RANGE Test	_____DB Med.
		_____DB Fast
		_____DB Slow
C.13	IF output	_____mV RMS

E. A13 A2 ISB IF tests and adjustments

B.11	TP-14 B+ switching (ISB MODE)	_____(✓)
B.12	TP-14 B+ switching (other MODES)	_____(✓)
C.7	TP-9 IF output AGC Adjust	_____(✓)
C.8&9	TP-9 AGC DYNAMIC RANGE Test	_____DB Med.
		_____DB Fast
		_____DB Slow
C.13	IF output	_____mV RMS

TEST DATA SHEET

V. A5 Symmetrical IF tests and adjustments

B 10c mode switching operation Pin 13	_____(✓)
B 10f mode switching operation TP-3	_____(✓)
B 10J B+ switching TP-13	_____(✓)
C.7 TP-8 IF output AGC adjust	_____(✓)
C.8&9 TP-8 AGC DYNAMIC RANGE Test	_____DB Med.
	_____DB Slow
	_____DB Fast
C.13 SYM IF output	_____mV RMS

VI. A6 B2 ISB AUDIO CARD Tests and Adjustments

C.1. TP-13 B+ Voltage	_____VDC
C.7. TP-8 Audio Out Adjust	_____(✓)
C.10. Meter Calibration	_____(✓)
C.11 thru 15 Meter Calibration Check	_____(✓)

E. A8-B1-ISB AUDIO CARD Tests and Adjustments

C.1. TP-13 B+ Voltage	_____VDC
C.7. TP-8 Audio Out Adjust	_____(✓)
C.10. Meter Calibration	_____(✓)
C.11 thru 15 Meter Calibration Check	_____(✓)

E. A10-A1-ISB AUDIO CARD Tests and Adjustments

C.1. TP-13 B+ Voltage	_____VDC
C.7. TP-8 Audio Out Adjust	_____(✓)
C.10. Meter Calibration	_____(✓)
C.11 thru 15 Meter Calibration Check	_____(✓)

E. A12-A2-ISB AUDIO CARD Tests and Adjustments

C.1. TP-13 B+ Voltage	_____VDC
C.7. TP-8 Audio Out Adjust	_____(✓)
C.10. Meter Calibration	_____(✓)
C.11 thru 15 Meter Calibration Check	_____(✓)

TEST DATA SHEET

VII. A4 Symmetrical Demodulator Card Test and Adjust

C.1	TP-18 B+ Voltage	_____ VDC
C.2	TP-15 B+ Switching	_____ (✓)
C.3	CR-9 Voltage Regulations	_____ VDC
C.5	AM Demodulator Switching	_____ (✓)
C.6	CW Demodulator Switching	_____ (✓)
C.9.e	BFO High Frequency Adjustment	_____ Kc
	BFO Low Frequency Adjustment	_____ Kc
C.9.f	BFO Amplitude at TP-8	_____ V P-P
C.13.	CW Audio Level Adjustment	_____ (✓)
C.16.	Meter Amplifier Input Level	_____ mV RMS
C.19.	AM Audio Level Adjust	_____ (✓)

VIII. A2 Monitor, Diversity Card

C.2 thru 7	DC Voltage Checks	_____ (✓)
C.11	TP-2 Audio Gain	_____ V P-P
C.12	TP-4 Audio Gain	_____ V P-P
C.13	AM Audio Output Level, "Speaker"	_____ (✓)
C.16	CW Audio Output Level, "Speaker"	_____ (✓)
C.19 & 20	ISB Audio Output Level, "Speaker" B2	_____ (✓)
	B1	_____ (✓)
	A1	_____ (✓)
	A2	_____ (✓)
C.25 & 26	ISB "RF Level Meter" Calibration	_____ (✓)
C.29	SYM "RF Level Meter" Calibration	_____ (✓)
C.35	Diversity Qu	
	A1 - Pin 10 -	VDC
	A2 - Pin 11 -	VDC
	B1 - Pin 9 -	VDC
	B2 - Pin 8 -	VDC

Tested By: _____

Date: _____

Manufacturing No. _____

Serial No. _____

REVISION SHEET

THE TECHNICAL MATERIEL CORP.
MAMARONECK NEW YORK

S 1234
LIST NO.

DATE	REV.	SHEET	EMN #	DESCRIPTION	APP.
7/2/70	Ø			ORIGINAL RELEASE FOR PRODUCTION	
1/17/71	A		20202	REVISED PER EMN 20202	PEL

TMC FORM MLR-1 2-65—AINS.