

TMC SPECIFICATION

NO. S 987

REV:

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APPD:

17/11/65
8/6/65

SHEET COVER

OF

TITLE:

typed by vab 7/6/65

TEST PROCEDURE

FOR THE

CMRA-1

TMC SPECIFICATION

NO. S 987

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SHEET 1

OF 9

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PRELIMINARY:

This specification outlines the testing and checkout procedure for the CMRA-1 four channel single sideband exciter. The tester is cautioned that the checks and tests outlined below must be accomplished in the order given. If trouble is experienced at any step, it must be located and corrected before proceeding to the next step. During the alignment, all cards must be energized. Do not attempt alignment with a missing card.

TEST EQUIPMENT REQUIRED:

1. 1 Mc frequency standard set to 1.0V P/P output
2. Tektronix - 541A oscilloscope with type "L" preamplifier and vertical output jack.
3. Hewlett Packard frequency counter Model 5245L or Equiv.
4. Singer Metrics - Panoramic Spectrum Analyzer, Model SB-12A
5. Hewlett Packard Model 200 CD Audio Oscillator
6. Ballantine VTVM, Model 314A
7. 47 ohm load resistor

SYNTHESIZER A:

1. Mount Synthesizer A board on the test card and plug in to the CMRA-1.
2. Apply the 1 MC 1V P/P signal from the frequency standard to the 1 MC input jack on the rear panel of the CMRA-1, and place the 47 ohm load resistor on the output jack.
3. Turn the CMRA-1 power switch to the "ON" position.
4. Place oscilloscope probe on TP-1 and adjust L1 for maximum level (approximately 2.5 V P/P)

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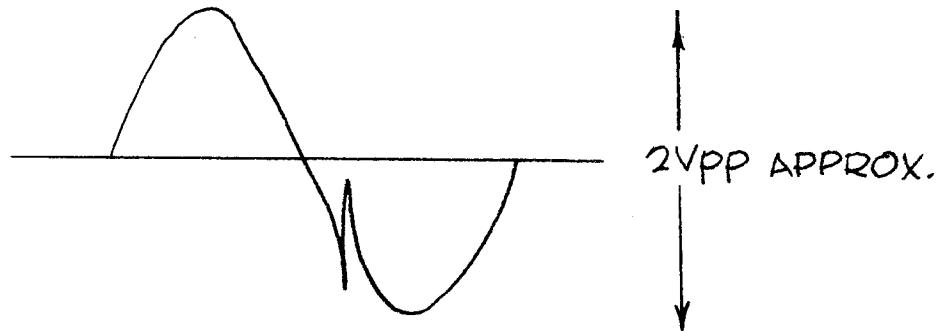
SHEET 2

OF 9

TITLE: TEST PROCEDURE FOR THE CMRA-1

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5. Place oscilloscope probe on TP-2. Apply an input to the frequency counter from the vertical output of the oscilloscope. Adjust L2 until the following waveform is obtained, and the the small pip on



the waveform is at the position shown, with the frequency counter indicating a 250,000 cps. locked condition. Adjust to approximate center of lock in range.

6. Place oscilloscope probe on TP-5. Adjust T-1 until frequency counter indicates a 1,750,000 CPS. locked condition. Adjust to approximate center lock of range. Signal level should be approximately 200 mv pp.
7. Place oscilloscope probe on TP-4. Signal level should be approximately 1 V pp.
8. Place oscilloscope probe on TP-5. Tune T2 for maximum signal level (approximately 1Vpp). Set R-64 for maximum signal. Place oscilloscope probe on Pin #16. Tune T3 for maximum signal level (approximately 1Vpp).
9. Place oscilloscope probe on TP-7. Adjust L3 until frequency counter indicates on 100,000 cps locked condition. Adjust to approximate center of lockin range. The signal level should be approximately 3 V pp.
10. Place oscilloscope probe on TP-8. Adjust L4 until frequency counter indicates a 20,000 cps locked condition. Adjust to approximate center of lockin range. The signal level should be approximately 24 V pp.
11. Place oscilloscope probe on TP-10. The frequency counter should indicate 10,000 cps. The oscilloscope should display a 5 V pp square wave.
12. Place oscilloscope probe on TP-13. Adjust L5 for maximum level of 6.29 mc signal. Then readjust L5 until level is approximately 250 mv pp.* *NOTE: This circuit has a resonance curve with a gradual slope and a sharp slope. The coil (L5) must be adjusted for about 3 db down on the gradual slope for proper operation.

TMC SPECIFICATION

NO. 5

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CHECKED:

APPD:

SHEET 3 OF 9

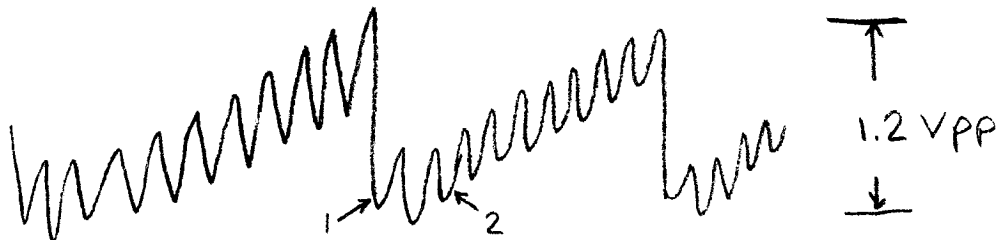
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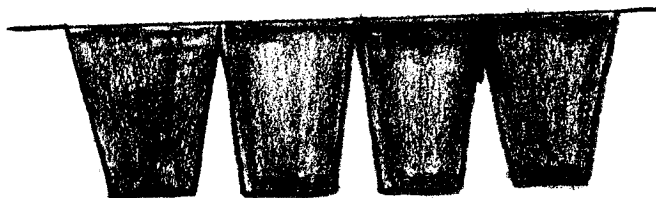
13. Ground TP-2 of SYN B. Place oscilloscope probe on TP-14. Adjust L6 for maximum signal level, (6.29 mc, approximately 1 V pp).

SYN-B

1. SYN-A card must be aligned properly before this card can be adjusted. Mount SYN-B on test card.
2. Place the oscilloscope probe on TP-1. Adjust L1 until the following waveform is displayed. The valley of dip 1 and the valley of dip 2 must be adjusted to the same level for proper operation.



3. Ground TP-3. Place oscilloscope probe on TP-2. The frequency counter should indicate 629,000 cps locked condition. Readjust L1 for approximate center of lockin range. The signal level should be approximately 2 V pp.
4. Ground TP-4. Place oscilloscope probe on TP-3. Adjust L2 until the frequency counter indicates a 62,900 cps locked condition. Adjust to approximate center of lockin range. The signal level should be approximately .4 Vpp.
5. Place oscilloscope probe on TP-4. Adjust T1 until the frequency counter indicates a 6,290 cps locked condition. Adjust to approximate center of lockin range. The signal level should be approximately 2 V pp.
6. Place oscilloscope probe on TP-7. Adjust T2 until the following waveform is obtained:



TMC SPECIFICATION

NO. S 987

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APPD:

SHEET 4

OF 9

TITLE: TEST PROCEDURE FOR THE CMRA-1

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7. Place oscilloscope probe on TP-8. Adjust T3 for maximum signal level. (Approximately 250 mv pp.) The signal frequency should be locked solid at 1743.710 Kc.
8. Place oscilloscope probe on TP-9. Adjust T4 for maximum signal level (Approximately 250 mv pp.) The signal frequency should be locked solid at 1756.290 Kc.

IF*

* SYN-A and SYN-B cards must be aligned prior to IF card alignment. When the word carrier is used, it means that frequency which is being used to drive the mixer. In the case of Channels A1 and B1, it is 1750.000 Kc; for channel A2, it is 1756.290 Kc, and for Channel B2 it is 1743.710 Kc.

1. Mount IF, Channel A1 on test card.
2. Place oscilloscope probe on TP-1 to check level. It should be approximately 300 mv pp.
3. Place oscilloscope probe on TP-2. Adjust T1 for maximum signal level. (approximately 8 V pp)
4. Adjust AGC control, R47, to fully clockwise position.
5. Apply a 50 mv audio signal at 2000 cps from the Hewlett-Packard Audio Generator to the audio input terminals of Channel A1 at the rear panel of the CMRA-1.
6. Place oscilloscope probe on TP-4 and adjust T-4, T-5 and T-6 for maximum output level.
7. Turn slug on T-7 until it is almost out of can. Place d-c VTVM at cathode end of CR-9. Adjust R-47 for +4.0V d-c level. Adjust T-7 for maximum indication on VTVM, (approximately 6V d-c).
8. Connect input of Spectrum Analyzer to TP-4. Adjust Spectrum Analyzer so that 14 kc of sweep width can be observed centered about the *Carrier frequency, and 60 db of dynamic range is available.
9. Alternately adjust R13 and R15 for maximum carrier suppression. Adjust T-4 for maximum carrier suppressions. Adjust C18 for maximum carrier suppression. Alternately repeat the above two adjustments until carrier suppression is at a maximum. Carrier suppression should be 40 db +10 db.

TMC SPECIFICATION

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APPD:

SHEET

5

OF

9

TITLE: TEST PROCEDURE FOR THE CMRA-1

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10. Connect Spectrum Analyzer to TP-4. Adjust audio input level from 78 mv to 1370 mv. Carrier suppression should remain 40 db +10 db. If not, repeat Step 9. All intermodulation and distortion products should be at least 55 db below the double sideband signal. Carriers of the other channels may be observed at this test point, but will be eliminated by the DCA filter.
11. Set the audio input frequency to 1500 cps and minimum output level. Slowly bring the input level to 38 mv. Adjust R58 so that the channel activity lamp comes on when the audio signal reaches 38 mv. Increase level to 1 volt. Lamp should remain on. Decrease audio signal level to 24 mv. Channel lamp should go out after approximately one second.
 - . Using a standard TTG with a Ballantine VTVM monitoring the output, apply 935 cps and 2805 cps signals into the audio input terminals Channel A1. Connect the Spectrum Analyzer to TP-5. Vary the total audio level from 44 mv to 1370 mv. All distortion and intermodulation products viewed on the panalyzer should be at least 55 db below the level of the two tones.
 - . Repeat steps 1 through 15 for each of the other channels changing inputs and IF boards accordingly.

OUTPUT AMPLIFIER

SYN-A, SYN-B, and all IF cards must be aligned before this card is aligned.

1. Mount Output Amplifier card on test card.
2. Be sure output jack at rear panel of CMRA-1 has a 47 ohm termination.
3. Place Ballantine probe on TP-12.
4. Apply a 1000 cps audio input signal to all channels at a level of 780 mv.
5. Set A2 front panel control to MAX clockwise position and A1, B1, B2 controls fully counterclockwise.
6. Peak T1, T2, and T3 alternately until maximum output is obtained (approximately 70 mv RMS).
7. Slightly adjust R47 on Channel A2 IF card for 70 mv output.
8. Set A1 front panel control to MAX clockwise position and A2, B1, B2 controls fully counterclockwise.

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SHEET 6 OF 9

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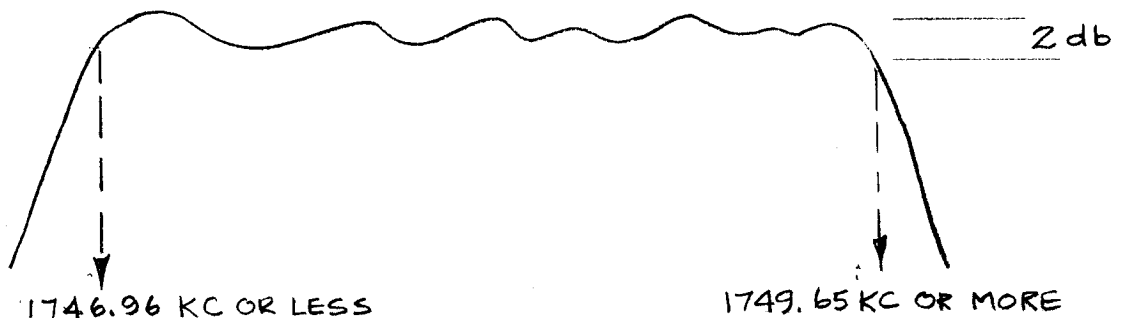
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9. Repeat step 7 for Channel A1 IF card.
10. Repeat steps 7 and 8 for Channels B1 and B2.
11. Set A1 front panel control at MAX clockwise position; set others to fully counterclockwise position.
12. Connect Spectrum Analyzer to TP-12.
13. Set carrier suppression switch in front panel to the 0 db position.
14. Adjust R64 on Output Amplifier card until the carrier is 36 mv.
15. Display output on analyzer and check other positions of switch.
16. Set carrier suppression switch to full. Carrier should not appear.
17. Set TEST NORMAL switch to NORMAL. Carrier should reappear.

BANDPASS CHECK

1. Connect Audio Signal Generator to channel under test. Set for 1 KC @-6db indication on front panel of CMRA.
2. Monitor frequency by connecting oscilloscope to dummy load at J-1014. Connect counter to vertical output of scope.
3. Connect AC Voltmeter to dummy load at J-1014.
4. Vary output frequency of Signal Generator. Observing AC Voltmeter, note that bandpass conforms to graph below.

a. CHANNEL A-1



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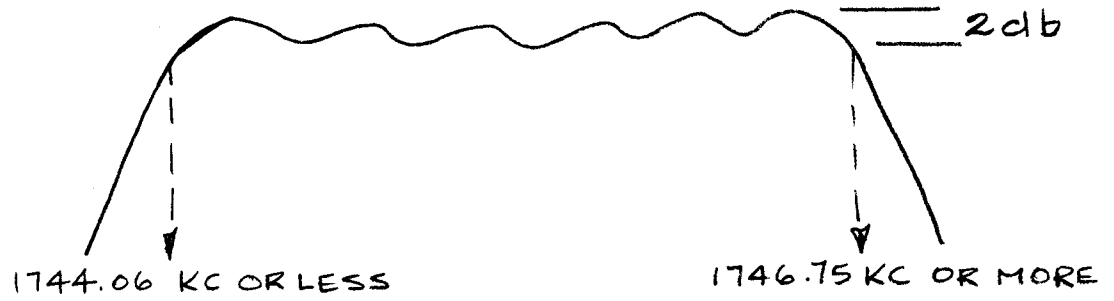
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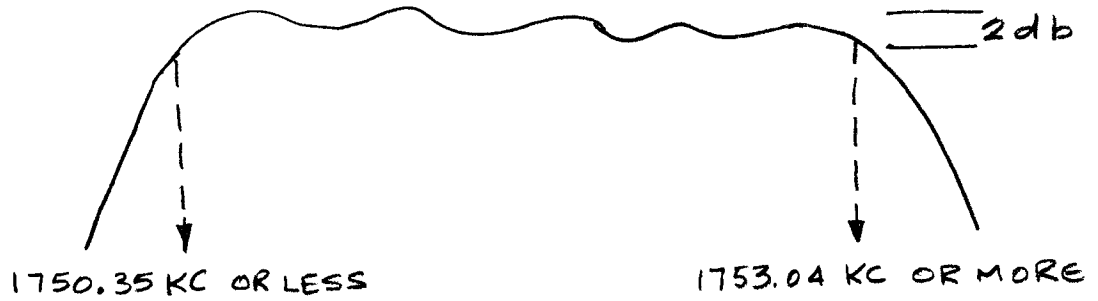
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TITLE: TEST PROCEDURE FOR THE CMRA-1

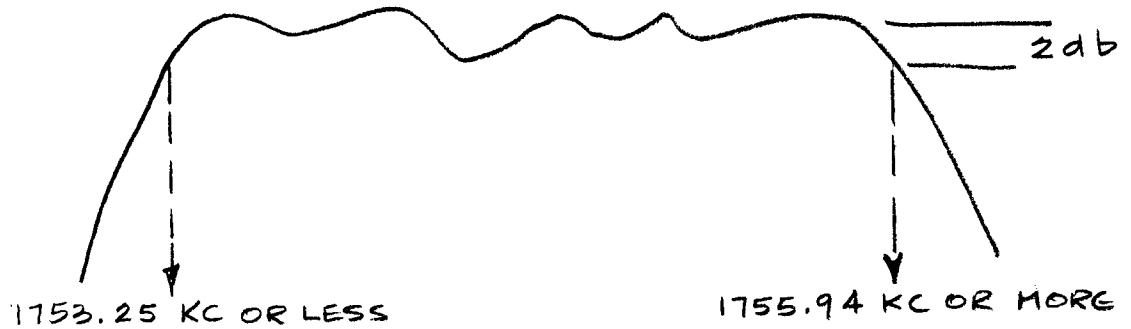
b. CHANNEL A-2



c. CHANNEL B-1



d. CHANNEL B-2



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SHEET 8 OF 9

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THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y.

TEST DATA SHEETCMRA-1

<u>STEPS</u>	<u>SECTION</u>	<u>TESTER INITIAL</u>
SYN A 1-6	1.75 mc oscillator	_____
SYN A 7-12	6.29 mc oscillator	_____
SYN B 1-5	6.29 kc divider	_____
SYN B 6-8	Sideband filters	_____
<u>Channel A1</u>		
IF 1-8	Amplifier	_____
IF 9-13	Carrier suppression	_____
IF 14	Channel activity lamp	_____
IF 15-16	Distortion check	_____
BP 1-4a	Bandpass Check	_____
<u>Channel B1</u>		
IF 1-8	Amplifier	_____
IF 9-13	Carrier suppression	_____
IF 14	Channel activity lamp	_____
IF 15-16	Distortion check	_____
BP 1-4c	Bandpass Check	_____
<u>Channel B2</u>		
IF 1-8	Amplifier	_____
IF 9-13	Carrier suppression	_____
IF 14	Channel activity lamp	_____
IF 15-16	Distortion check	_____
BP 1-4d	Bandpass Check	_____
<u>Channel A2</u>		
IF 1-8	Amplifier	_____
IF 9-13	Carrier suppression	_____
IF 14	Channel activity lamp	_____
IF 15	Distortion check	_____
BP 1-4b	Bandpass Check	_____
OA 1-11	Output Amplifier	_____
OA 12-15	Carrier suppression switch	_____

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SHEET

9 OF

9

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TEST DATA SHEET

CMRA-1

TESTED BY _____

SERIAL NO. _____

APPROVED BY _____

MFG. NO. _____

DATE _____

REMARKS: _____

