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Rece	aiving Antenna Muticoupler, AM	C/LMC Series	
	:	Publication 25	3111/253107

FINAL ACCEPTANCE TEST PROCEDURE

Receiving Antenna Multicoupler

AMC-8/16/32 and LMC-8/16/32 Series

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Receiving Antenna Muticoupler, AMC/LMC Series					

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TMC FORM SPEC 1

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Receiving Antenna Muticoupler, AMC/LMC Series	

1.0 Introduction

The TMC Series of AMC and LMC Receiving Antenna Multicouplers are broadbanded antenna-to-receiver coupling devices which permit the simultaneous use of eight, sixteen or thirty-two communications receivers from a single antenna input. The multicouplers are capable of working with any receiver operating in the LF/MF range (LMC series) or the MF/HF range (AMC series).

This final acceptance test procedure is a sub-set of the Final Product Control procedure outlined in the TMC Quality Assurance Manual (QAM), Section 11-4ff. The procedure insures that outgoing products are in full conformance with all of the customer's requirements. The numerous tests and inspection procedures followed during the manufacturing process on both components and sub-assemblies of the multicouplers were performed in conformance with MIL-Q-9858, as amended and incorporated in the QAM. Reference to the QAM should be made in delineating these prior tests.

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2.0 Procedure A: Initialization and Set Up

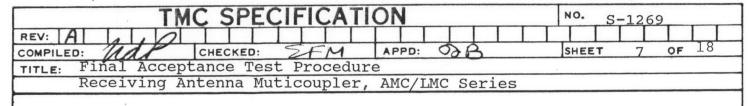
- 2.0.1 The multicouplers operate from a 115VAC, 50/60Hz power source with the input protected by two 0.5A fuses on each side of the line. Before applying power to the unit under test, make sure the fuses are firmly inserted in the front panel fuseholders. The front panel power toggle switch should be in the OFF (down) position.
- 2.0.2 Connect the primary power to the unit by plugging the power cable assembly provided into the power input connector socket on the rear panel. No further set-up is necessary to bring the multicouplers to a satisfactory readiness level.
- 2.0.3 Apply power to the unit by switching the front panel toggle switch to the ON (up) position. A steady incandescent lamp on the front panel indicates the successful application of primary power. Follow each step of this procedure in sequence, ending with the disconnect of the equipment as stated in Procedure F.
- 2.0.4 RF input/output connections are made at the rear panel to the female connectors on the chassis. No damage will result to the multicoupler if connections are made while power is applied although it is good practice to turn the unit off before making any adjustments. The RF input/output connections are made with a twisting or clockwise screwing motion depending on the type of output connector provided.

TMC FORM SPEC 1

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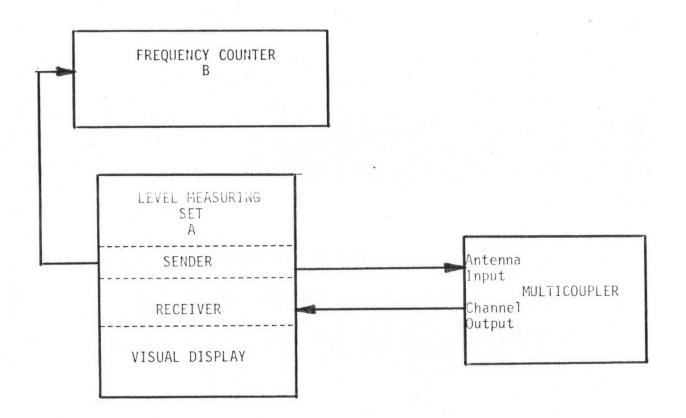
- 2.1 <u>Procedure B: Voltage Gain and Frequency Response</u>
- 2.1.1 Performance Criteria
- 2.1.1.1 Frequency Response Within +/-1.0dB over the frequency range of 2.0 to 30MHz for the AMC Series and 10KHz to 1.8MHz for the LMC Series.
- 2.1.1.2 Selectivity At 2.5MHz for the LMC Series, the out-of-band attenuation shall be 40dB or greater.
- 2.1.1.3 Gain The voltage gain between antenna input connector and any output connector with all unused outputs open-circuited shall be 2.0dB nominal gain throughout the frequency range of 100KHz to 32MHz for the AMC Series and 10KHz to 2MHz for the LMC Series. Filters shall not be installed for this test.
- 2.1.2 <u>Test Set-up Schematic</u> See Figure 2.0.
- 2.1.3 <u>Test equipment</u>
- 2.1.3.1 Level Measuring Set 1 unit required (Schematic reference A/Item 1 in Section 3.0)
- 2.1.3.2 Frequency Counter 1 unit required (Schematic reference B/Item 2 in Section 3.0)
- 2.1.4 Test Procedure
- 2.1.4.1 Connect the equipment as in Figure 2.0.
- 2.1.4.2 Adjust the Level Measuring Set to sweep the frequency range of 100KHz to 32MHz for the AMC Series or 10KHz to 2MHz for the LMC Series. Record the signal level output setting.
- 2.1.4.3 Expand the calibrated display on the Level Measuring Set to display 10dB full scale.
- 2.1.4.4 Observe the Level Measuring Set display throughout the frequency range, and record the following:
 - A. Maximum/minimum deviation of the output level;
 - B. Out-of-band attenuation at 2.5MHz (LMC Series);
 - C. Upper 3dB-point frequency
- 2.1.4.5 Repeat test for all channels.

TMC FORM SPEC 1 2M 9-85-AINS.



TEST SET-UP FOR PROCEDURE B

Voltage Gain and Frequency Response
Figure 2.0



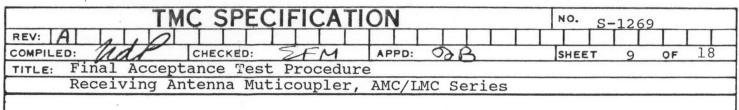
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2.2 <u>Procedure C: Isolation</u>

2.2.1 Performance Criteria

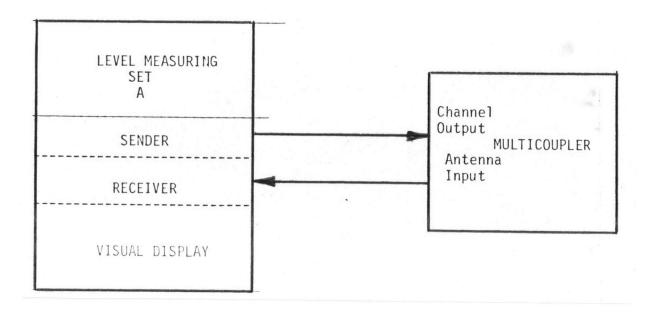
Signal Isolation - At least 40dB down output-to-output and at least 55dB down output-to-input over the frequency range 10KHz to 2MHz for the LMC Series and 100KHz to 32MHz for the AMC Series.

- 2.2.2 <u>Test Set-up Schematic</u> See Figures 2.1A/2.1B.
- 2.2.3 Test Equipment
- 2.2.3.1 Level Measuring Set 1 unit required (Schematic reference A/Item 1 in Section 3.0)
- 2.2.4 Test Procedure
- 2.2.4.1 Connect the equipment as in Figure 2.1A.
- 2.2.4.2 Adjust the Level Measuring Set to sweep the frequency range of 100KHz to 32MHz for the AMC Series or 10KHz to 2MHz for the LMC Series. Record the signal level output setting.
- 2.2.4.3 Adjust the calibrated display on the Level Measuring Set to display more than 60dB below the reference level and observe the display throughout the applicable frequency range. Record the output-to-input isolation.
- 2.2.4.4 Repeat 2.2.4.1 through 2.2.4.3 for all channels.
- 2.2.4.5 Connect the equipment as in Figure 2.1B.
- 2.2.4.6 Adjust the Level Measuring Set as in Step 2.2.4.2.
- 2.2.4.7 Adjust the calibrated display on the Level Measuring Set to display more than 50dB below the reference level and observe the display throughout the applicable frequency range. Record the output-to-output isolation.
- 2.2.4.8 Repeat 2.2.4.5 through 2.2.4.7 for all channels.

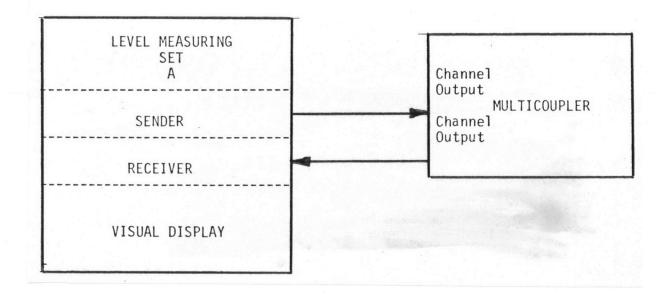


TEST SET-UP FOR PROCEDURE C

Output-to-Input Isolation
Figure 2.1A



Output-to-Output Isolation
Figure 2.1B



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2.3 <u>Procedure D: VSWR Measurement</u>

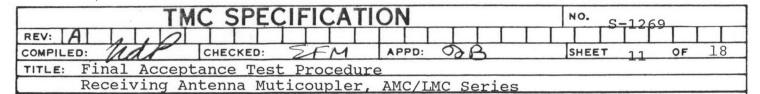
2.3.1 <u>Performance Criteria</u>

VSWR - When the multicoupler is terminated in its characteristic impedance, the VSWR over the frequency range of 10KHz to 1.8MHz for the LMC Series and 100KHz to 32MHz for the AMC Series shall be as follows:

VSWR Input: 1.5:1 maximum VSWR Output: 1.5:1 maximum

- 2.3.2 <u>Test Set-up Schematic</u> See Figure 2.2.
- 2.3.3 <u>Test Equipment</u>
- 2.3.3.1 Sweep Generator 1 unit required (Schematic reference A/Item 3 in Section 3.0)
- 2.3.3.2 Oscilliscope 1 unit required (Schematic reference B/Item 4 in Section 3.0)
- 2.3.3.3 VSWR Bridge 1 unit required (Schematic reference C/Item 5 in Section 3.0)
- 2.3.3.4 Terminating Load (1:1) 2 units required (Schematic reference D/Item 7A in Section 3.0)
- 2.3.3.5 Terminating Load (1.5:1) 1 unit required (Schematic reference E/Item 7B in Section 3.0)
- 2.3.4 <u>Test Procedure</u>
- 2.3.4.1 Connect the equipment as in Figure 2.2.
- 2.3.4.2 With both 1:1 loads connected, observe the output on the oscilliscope. There should be no deviation from a straight line. Record the signal level output setting.
- 2.3.4.3 Replace the 1:1 load at Z-1 with the 1.5:1 load and set the oscilliscope controls to conveniently display the deflection.
- 2.3.4.4 Remove the load at Z-1 and connect the VSWR bridge to the antenna input of the unit using a short 50-ohm cable.
- 2.3.4.5 Observe the sweep waveform on the oscilliscope. The VSWR should not exceed the calibrated line on the scope representing 1.5:1 VSWR. Record the VSWR.
- 2.3.4.6 Repeat 2.3.4.2 through 2.3.4.5 for all channels.

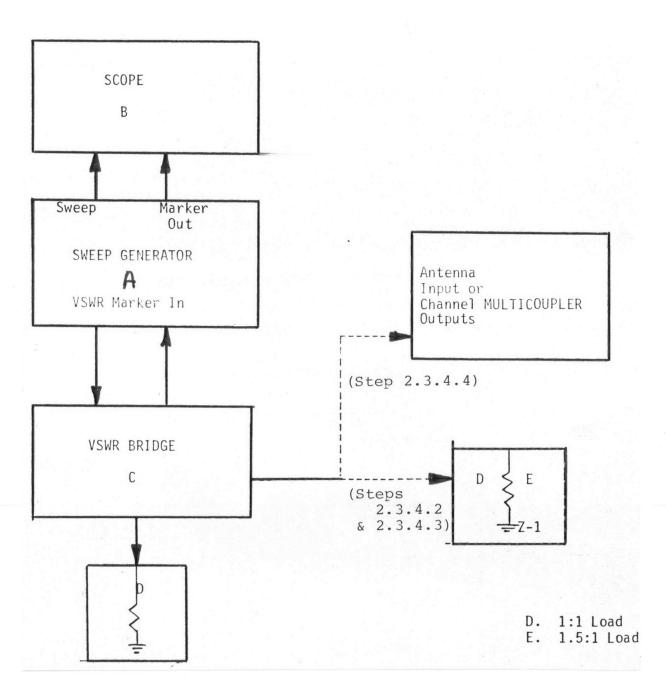
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TEST SET-UP FOR PROCEDURE D

VSWR

Figure 2.2



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- 2.4 <u>Procedure E: Intermodulation Distortion</u>
- 2.4.1 <u>Performance Criteria</u>

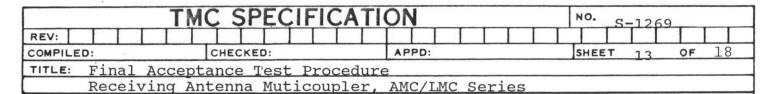
Second-Order Intermodulation Distortion - Second-order IMD products resulting from two 0.4 volt RMS input signals shall be at least 60dB below the level of either input signal.

Third-Order Intermodulation Distortion - Third-order IMD products shall be at least 65dB down for the same level of input signals.

- 2.4.2 <u>Test Set-up Schematic</u> See Figure 2.3.
- 2.4.3 <u>Test Equipment</u>
- 2.4.3.1 Level Measuring Set 1 unit required (Schematic reference D/Item 1 in Section 3.0)
- 2.4.3.2 Signal Generator 2 units required (Schematic references A, B/Item 6 in Section 3.0)
- 2.4.3.3 Signal Combining Network 1 unit required (Schematic reference C/Item 5 in Section 3.0)
- 2.4.4 Test Procedure
- 2.4.4.1 Connect the equipment as in Figure 2.3.
- 2.4.4.2 Set the Signal Generator A output to 10.3MHz for the AMC Series or 550KHz for the LMC Series at 0.25 volts RMS into the unit under test.
- 2.4.4.3 Set the Signal Generator B output to 3.9MHz for the AMC Series or 210KHz for the LMC Series at 0.25 volts RMS into the unit under test.
- 2.4.4.4 Tune the Level Measuring Set to the intermodulation frequency to be measured and observe the signal level. Record the intermodulation distortion level with respect to the fundamental frequency level.
- 2.4.4.5 Repeat 2.4.4.2 through 2.4.4.4 for all channels.

Note: Add filters only if inherent harmonics of the test equipment interfere with the actual test measurement.

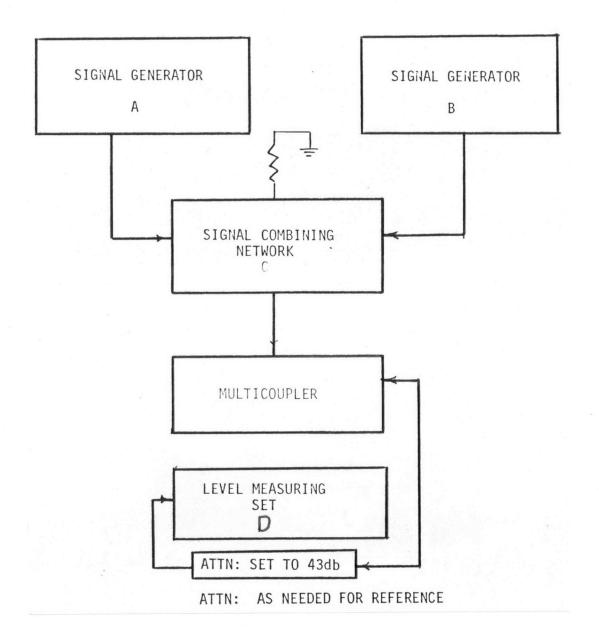
TMC FORM SPEC 1 2M 9-65-AINS



TEST SET-UP FOR PROCEDURE E

Intermodulation Distortion

Figure 2.3



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2.8 <u>Procedure F: Disconnect</u>

- 2.8.1 The disconnect process is essentially the reverse of Procedure A: Initialization and Set-up. The front-panel toggle switch is placed in the OFF (down) position, removing power from both the indicator lamp and the multicoupler. The power cable assembly connected to the rear panel connector is then removed with a twisting motion.
- 2.8.2 The RF input/output cables can be removed at any time without damage to the multicoupler. This procedure involves selecting the appropriate rear panel connector and removing the cable with a twisting or counter-clockwise unscrewing motion.

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3.0 <u>Test Equipment Required</u>

<u> Item</u>	<u>Equipment</u>	<u>Model</u>	<u>Serial</u> #
1	Level Measuring Set	Wandel-Golterman WM-50	TMC5658
2	Frequency Counter	Hewlett-Packard 5245L	TMC1530
3	Sweep Generator	Telonic HD7	TMC1860
4	Oscilliscope	Tektronic 545	1110822
5	VSWR Bridge	Anzac RB-3	n/a
6A 6B	Signal Generator Signal Generator	Hewlett-Packard 606A Hewlett-Packard 606A	TMC1861 TMC1886
7A 7B	Terminating Load Terminating Load	TMC DL-100-4-75 (1.5:1) TMC DL-100-4-50 (1:1)	n/a n/a

Note: Calibration data sheets are filed under the appropriate test equipment records in the Quality Assurance Department files and are available for review by the customer's representative upon request.

THE FORM SPEC 1

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3.1 <u>Comments</u>

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II V: 1	nput sign SWR (I/O) .5:1 .3.4.5		<u>VSWR</u>								1- 8] 9-16] 7-24] 5-32]

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	Test Engine	eer								·····		

Date Unit Tested

ENGINEERING MODICICATION NOTICE CONTINUATION SHEET

EMN NO. 25595

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AMC - 32

DESCRIPTION (CONT.) POWER SUPPLY

REV. POWER SUPPLY VOLTAGE REDUCTION -27 V TO -24 V

CHANGE : R8 ON A 10746-5 TO 4.7K FROM G. BK ADD NOTE FACTORY ADJUST

REASON FOR ENG. CHANGES

TO REDUCE POWER CONSUMPTION OF AMC-32 POWER SUPPLY.

CHANGE SCHEMATIC & MANUAL TO REFLECT THIS CHANGE

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	1.1	LIST OF FIGURES	
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2.1A Back-to-Front Isolation.....

2.3 Intermodulation.....

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1.2 INTRODUCTION

The TMC series of AMC-() and LMC-() Antenna Multicouplers are broadbanded antenna-to-receiver coupler devices which permit the use of 8, 16, 24 or 32 communication receivers from a single antenna input.

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2.0 VOLTAGE GAIN AND FREQUENCY RESPONSE

- A. Performance Criteria
 - *1. Voltage Gain and Frequency Response The voltage gain between the antenna input connector and any output connector with all unused outputs open circuited, shall be 2.0 db nominal gain. Throughout the frequency range from 0.1 to 32 MHz with-out filters. For LMC-() frequency range from 10KHz-2MHz.
- B. Test Arrangements
 - 1. Voltage Gain and Frequency Response
- C. Test Equipment Schematic Item No. in Required for Required Reference Appendix 1 Arrangement
 - Level Meas uring Set A 1 1
 Frequen cy Counter B 2 1
- D. Test Procedure
 - 1. Connect the equipment as indicated in Figure 2.0.
 - 2. Adjust the Level Measuring Set to sweep the frequency range of 100 kHz to 32 MHz.
 - 3. Expand the calibrated display on the Level Measuring Set to display 10 db full scale.
 - 4. Observe the Level Measuring Set display throughout the frequency range, and record the maximum/minimum deviation of the output level.
 - 5. Repeat test for all shannels.

*NOTE: If the Multicoupler is to be used in a system for the distribution of a single frequency, it will only be necessary to check its performance at that frequency.

Frequency range depends on filter used.

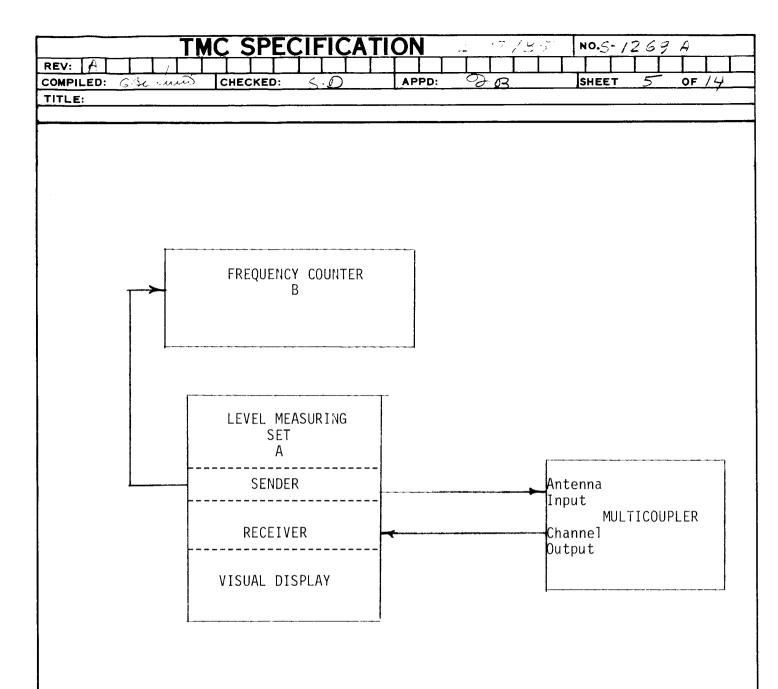


FIGURE 2.0 VOLTAGE GAIN AND FREQUENCY RANGE

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2.1 ISOLATION

A. Performance Criteria

- 1. The Multicoupler has a Back-to-Front Isolation of better than 55db.
- 2. The Multicoupler has an average Output-to-Output Isolation of 40db.

B. Test Arrangement

Relevant Figure

1.	Back-to-Front Is-	2.1A
2.	olation Output-to-Output Is- olation	2.1B

C. Test Equipment Required Schematic

Schematic Item No. in Required for Reference Appendix 1 Arrangement

1. Level Measuring A 1 1 and 2 Set

D. Test Procedure

- 1. Connect the equipment as indicated in Figure 2.1A.
- 2. Adjust the Level Measuring Set to sweep the frequency range of 100KHZ to 32 MHZ. (LMC-() 10KHz 2MHz)
- 3. Adjust the calibrated display on the Level Measuring Set to display more than 60 db below the reference level.
- 4. Observe the Level Measuring Set display throughout the frequency range, and record the Back-to-Front Isolation.
- Repeat steps 1-4 for all channels.
- 6. Connect the equipment as indicated in Figure 2.1B.
- 7. Adjust the Level Measuring Set to sweep the frequency range of 100KHZ to 32 MHZ. (LMC-() 10KHz 2MHz)
- 8. Adjust the calibrated display on the Level Measuring Set to display more than 50 db below the reference level.
- 9. Observe the Level Measuring Set display throughout the frequency range, and record the Output-to-Output Isolation.
- 10. Repeat steps 6-9 for all channels.

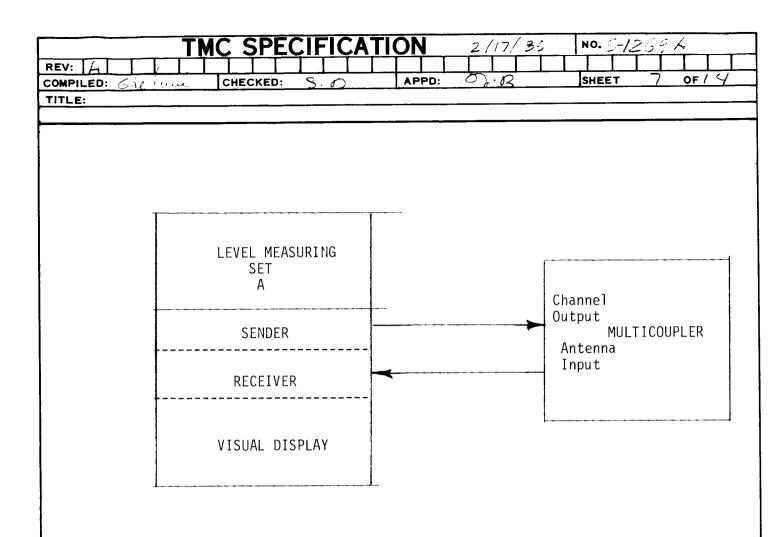


FIGURE 2.1A
BACK-TO-FRONT ISOLATION

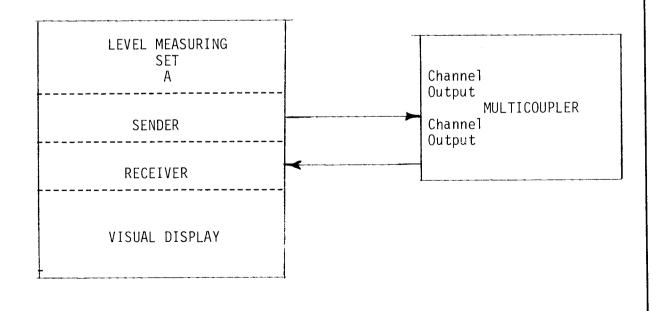


FIGURE 2.1B
OUTPUT -TO-OUTPUT ISOLATION

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2.2 VSWR

A. Performance Criteria

1. The Voltage Standing Wave Ratio of the Multicoupler is better than $1.5\ \text{to}\ 1.$

B. Test Arrangement

Relevant Figure

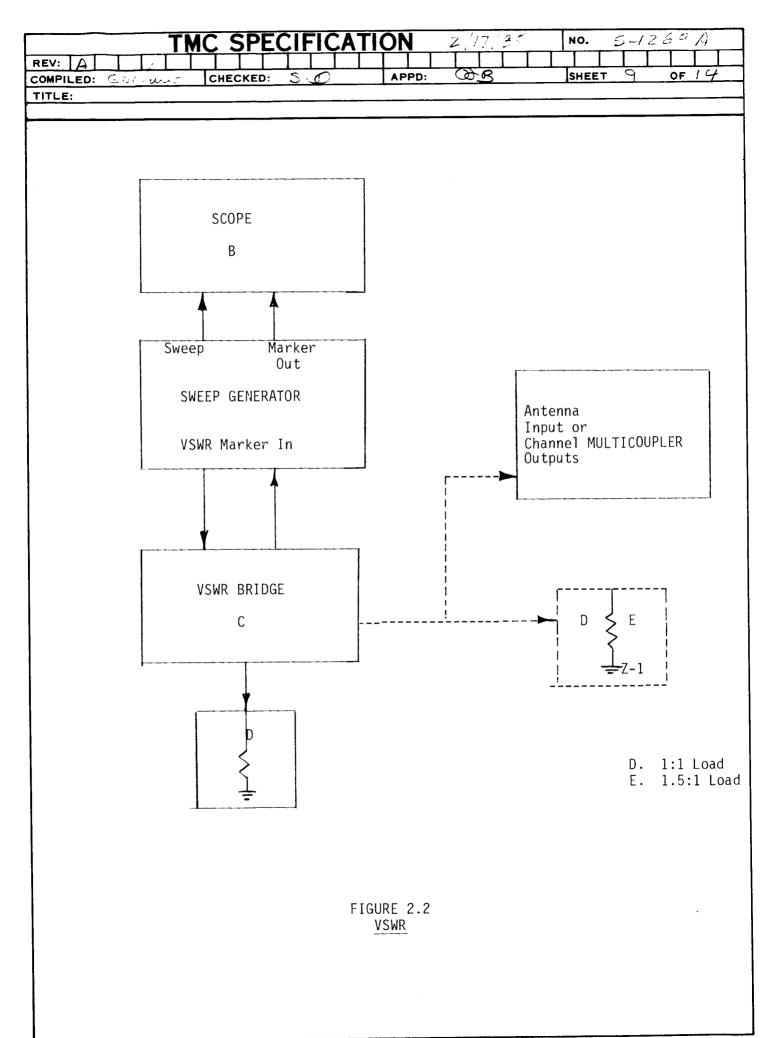
1. VSWR

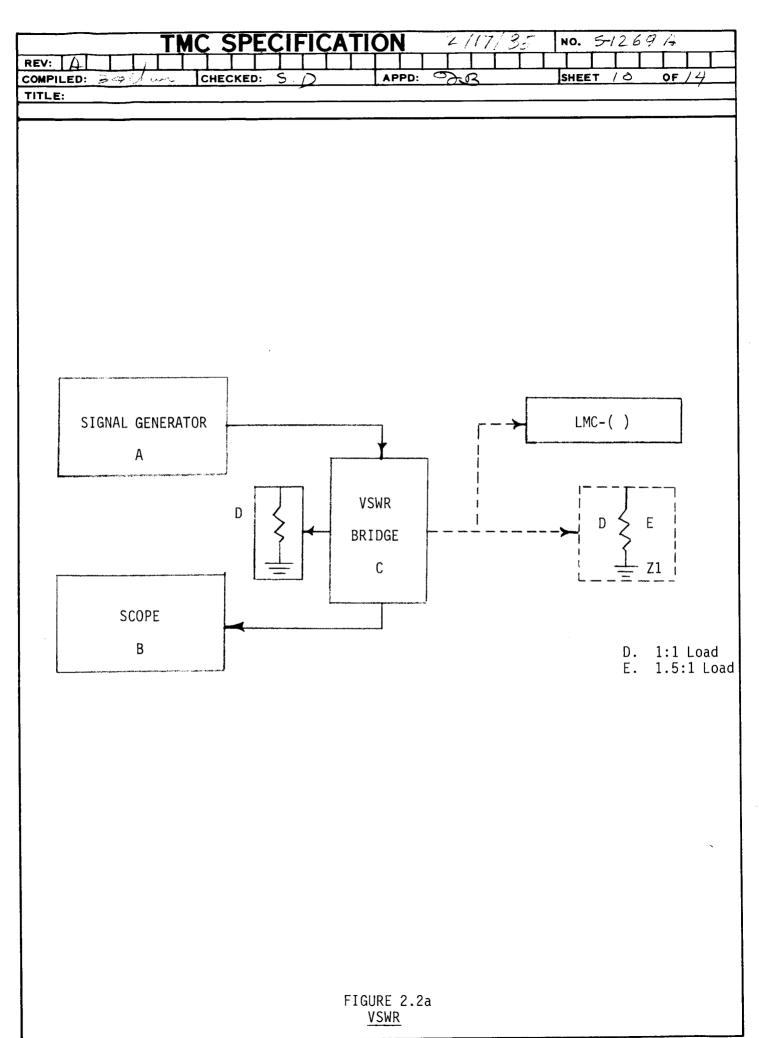
2.2

С.	Tes	t Equipment Required	Schematic	Item No. in	Required for
			Reference	Appendix 1	Arrangement
	1.	Sweep Generator	А	3	1
		Oscilloscope	В	4	1
		VSWR Bridge with	С	5	1
		Loads (1:1 and 1.5:1))		

D. Test Procedure

- 1. Connect the equipment as indicated in Figure 2.2.
- 2. With the 1:1 loads connected, observe the output on the Oscilloscope. There should be no deviation from a straight line.
- 3. Replace the Z-1 load on the VSWR Bridge with the 1.5:1 load.
- 4. Set the Oscilloscope controls to conveniently display the deflection.
- 5. Remove the Z-1 load and connect the VSWR Bridge to the antenna input of the Multicoupler using a short 50 ohm cable.
- 6. Observe the sweep waveform on the scope. The VSWR should not exceed the calibrated line on the scope representing 1.5:1 VSWR. Record the VSWR.
- 7. Repeat the same test on all channel output jacks.
- E. 1. For LMC-() connect equipment as shown, Figure 2.2a.
 - 2. Generator at 500 KHz.





2.3 INTERMODULATION DISTORTION

A. Performance Criteria

 Second order intermodulation distortion products of the Multicoupler shall be 65 db below two .25V RMS signals applied at the input.

B. Test Arrangement

Relevant Figure

1. Intermodulation Distortion

2.3

С.	Tes	t Equipment Required		Item No. in Appendix 1	
		2 Signal Generators Signal Combining	A and B C	6 5	1 1
	3.	Network Level Measuring Set	D	1	1

D. Test Procedure

- 1. Connect the equipment as indicated in Figure 2.3.
- 2. Set Signal Generator A output to 10.3MHZ at 0.25V RMS into Multicoupler. (LMC-() Set Generator to 550 KHz).
- 3. Set Signal Generator B output to 3.9MHZ at 0.25V RMS into Multicoupler. LMC-() Set Generator to 210 KHz.
- 4. Tune the Level Measuring Set to one of the fundamental frequencies, and observe the signal level.
- 5. Tune the Level Measuring Set to the intermodulation frequency to be measured, and observe the signal level.
- 6. Record the intermodulation distortion level with respect to the fundamental fequency level.

NOTE: Filters should be added to the Test Arrangement, if the inherent harmonics of the test equipment interfere with actual test measurement.

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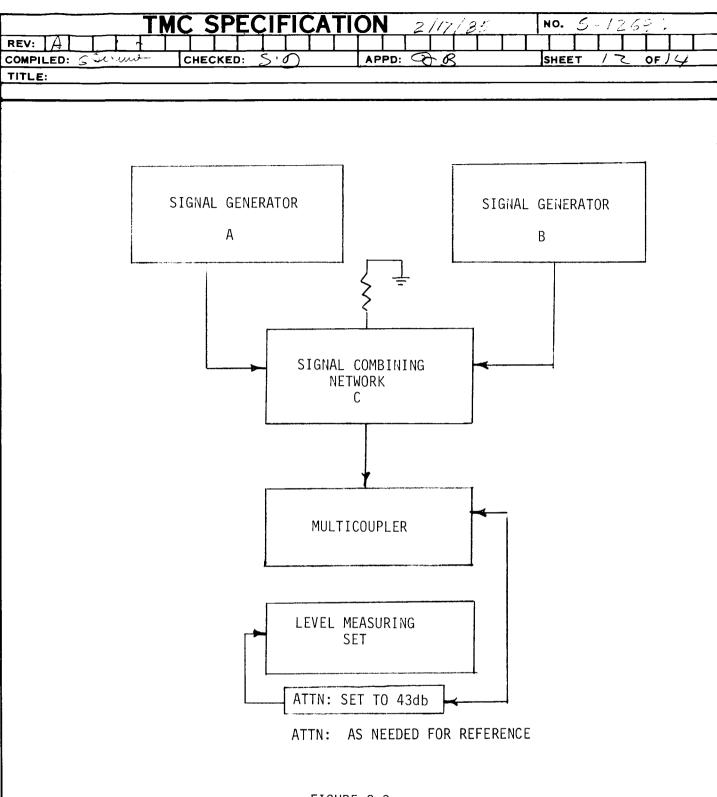


FIGURE 2.3
INTERMODULATION DISTORTION

TMC FORM SPEC 1

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TITLE:		

APPENDIX 1 TEST EQUIPMENT REQUIRED

Item No.	Equipment	ent Model	
1.	Level Measuring Set	Wandel and Goltermann WM-50 or equivalent	
2.	Frequency Counter	Hewlett-Packard 5245L or equivalent	
3.	Sweep Generator	Telonic HD7 or equivalent	
4.	Oscilloscope	Tckronix 545 or equivalent	
5.	VSWR Bridge / Signal Com- bining Network	Anzac RB-3 or equivalent	
6.	2 Signal Generators	Hewlett-Packard 606A or equivalent	
7.	Loads (2)	50 ohms	