TMC SPECIFICATION	NO. S1392
REV:	
COMPILED: A.A.	CHECKED: [illegible] APPD: 28 SHEET OF
TITLE:	

INSPECTION AND FACTORY

ACCEPTANCE SPECIFICATIONS

FOR MODEL HFTM-10K

TMC SPECIFICATION

NO. S1392

REV:

COMPILED: | CHECKED: | APPD: | SHEET 1 OF

TITLE:

GENERAL:

The TMC series of HFTM-10K Transmitters are High Frequency Radio Transmitters capable of providing SSB, ISB, CW, AM FSK and FAX operation. The Transmitter will supply 10KW average or PEP power. The HFTM-10K operates over the frequency range of 2 to 29,9999 MHZ.

OBJECTIVE:

The inspection procedure outlined herein are intended to serve as verification of system operation and to insure the compatability and performance of the various individual modular assemblies which have been completely tested and inspected on an individual basis prior to system integration.

2.1 POWER OUTPUT AND VSWR PROTECTION

A. Performance Criteria

1. Power Output - The linear power amplifier is capable of providing 10kW Average and PEP in continuous keydown service.

2. VSWR Protection - The transmitter has a nominal RF output impedance of 50 ohms and has sufficient tuning range to operate into a load whose impedance can have any phase producing a maximum VSWR of 3 to 1. The transmitter is equipped with an adjustable trip that will automatically disable the transmitter HV when a selected VSWR is exceeded.

B.

Test Arrangement	Relevant Figure
1. Power Output	2.1
2. VSWR Protection	2.1

C.

Test Equipment Required	Schematic Reference	Item No. In Appendix 1	Test Data Form
1. Dummy Load	B	1	2.1
2. Audio Generator	C	2	

D. Test Procedure

1. Power Output

a. Connect the equipment as shown in Figure 2.1
b. Tune the transmitter to the desired test frequency and load it to rated average power output in CW mode.
c. Record the power output as indicated on the transmitter power meter.
d. Reverse reflected power meter diode for this test. Meter overload should remove High Voltage from transmitter when overload point is reached. After test is complete restore diode to moniter reflected power.

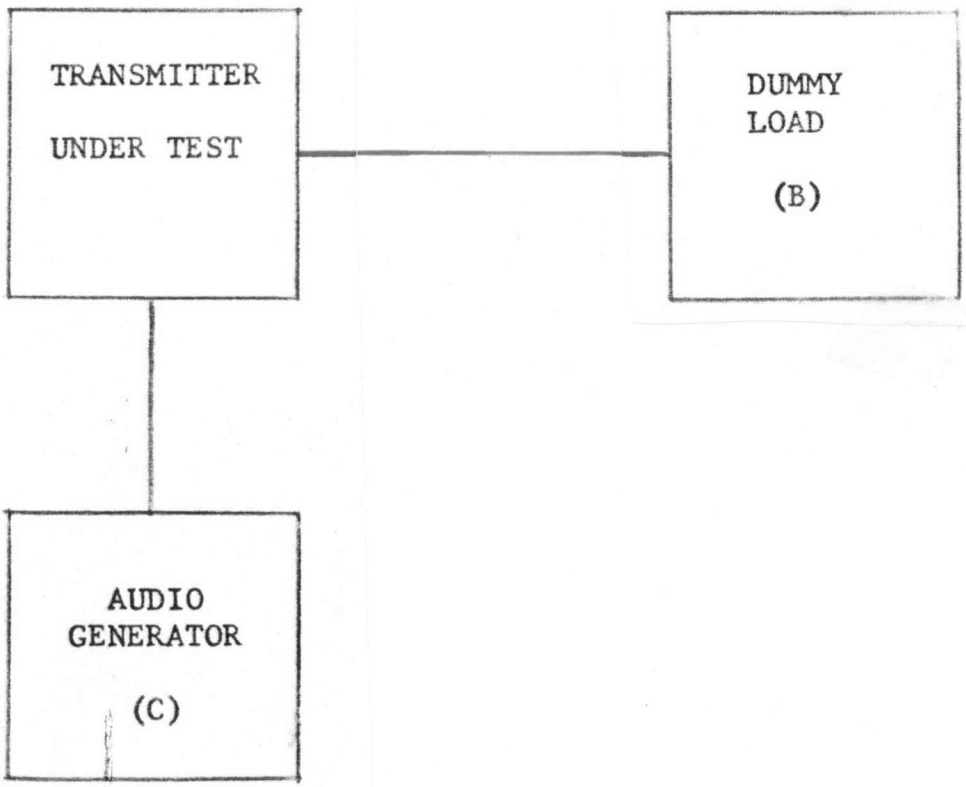

FIGURE 2.1

POWER OUTPUT
VSWR PROTECTION

2.2 NOISE, HUM AND SPURIOUS EMISSION

A. Performance Criteria

1. Noise, hum and spurious emission output levels shall be at least 50 db below PEP.

B.

Test Arrangement	Relevant Figure
1. Noise, hum and spurious emission levels	2.2

C.

Test Equipment Required	Schematic Reference	Item No. In Appendix 1	Test Data Form
1. Spectrum Analyzer	A	3	2.2
2. Dummy Load	B	1	

D. Test Procedure

a. Connect the equipment as shown in Figure 2.2
b. Tune the transmitter to 3 MHz at rated average power output in the CW mode.
c. Adjust the spectrum analyzer for a full scale presentation of the carrier and establish a 0 db reference level.
d. Remove 20 db of attenuation from the spectrum analyzer expanding the calibrated display from 0 thru -40db to -20 thru -60 db.
e. Adjust the spectrum analyzer for a 500 Hz bandwidth and record the noise and hum level.
f. Increase the spectrum bandwidth to maximum and record the level of any spurious emissions.
g. Repeat parts b to f at frequency listed on test data form No. 2.2.

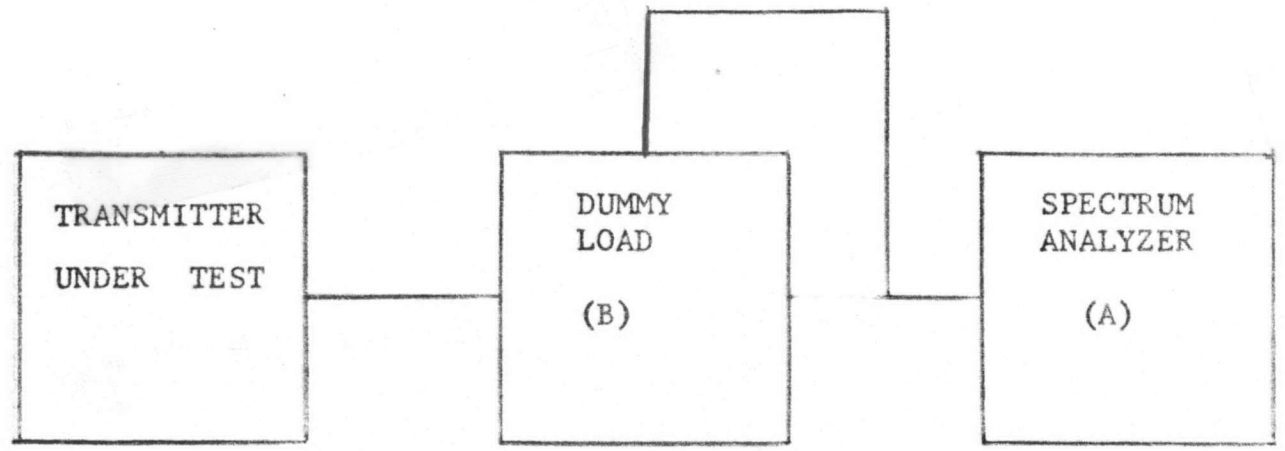

FIGURE 2.2

NOISE LEVEL AND
SPURIOUS EMISSIONS

2.3 INTERMODULATION

A. Performance Criteria

1. At rated PEP, third and higher order intermodulation distortion products shall be at least 35 db below PEP output

B. Test Arrangement — Relevant Figure

1. Intermodulation Distortion — 2.3

C. Test Equipment Required

	Schematic Reference	Item No. In Appendix 1	Test Data Form
1. Two Tone Generator	A	4	2.3
2. Spectrum Analyzer	B	3	
3. Dummy Load	C	1	

D. Test Procedure

1. Intermodulation Distortion:

a. Connect the equipment as indicated in Figure 2.3
b. Adjust the two tone input for a convenient level in the upper sideband channel. Set the carrier insert control for maximum carrier suppression.
c. Tune the transmitter for rated PEP power output at 2 MHz.
d. Adjust the spectrum analyzer for a full scale presentation, thus establishing a 0db reference level.
e. Remove 20db of attenuation from the spectrum analyzer expanding the calibrated display from 0 thru -40db to -20 thru -60db.
f. Record the third order intermodulation product level. Third and higher order intermodulation products must be at least 35db down.
g. Repeat steps b to f at frequency listed on test data form No. 2.3.

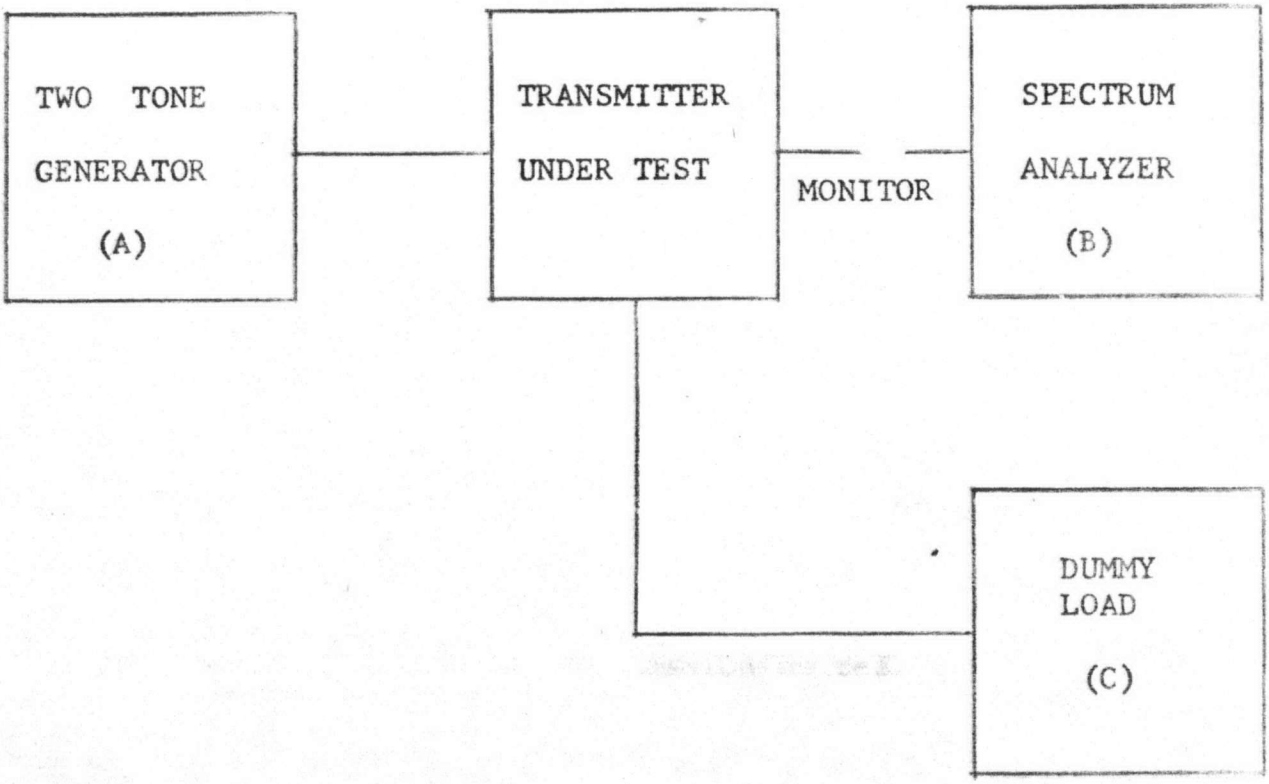

FIGURE 2.3

INTERMODULATION

2.4 SIDEBAND REJECTION AND CARRIER SUPPRESSION

A. Performance Criteria

1. Sideband Rejection - Unwanted sidebands shall be suppressed at least 50db below PEP.
2. Carrier Suppression - The carrier level must be 50db below PEP.

B.

Test Arrangement	Relevant Figure
1 and 2. Sideband Rejection	2.4

C.

Test Equipment Required	Schematic Reference	Item No. In Appendix 1	Test Data Form
1. Spectrum Analyzer	B	3	2.4
2. Audio Generator	C	2	
3. Dummy Load	A	1	

D. Test Procedure

a. Connect the equipment as shown in Figure 2.4.
b. Tune the transmitter to 6 MHz at rated average power output, in USB mode, with single tone (500 HZ).
c. Adjust the spectrum analyzer for full scale presentation of the signal to establish a 0 db reference level. Now remove 20 db of attenuation from spectrum analyzer.
d. Insert small amount of carrier. Reduce carrier to max suppression. Record carrier suppression on test data form No. 2.4.
e. Tune transmitter to full rated output at 6 MHz, using a 500 Hz in the USB.
f. Set up spectrum analyzer as in Step C.
g. Observe the display and record the level of 500 Hz tone in unwanted sideband, on test data form No. 2.4.

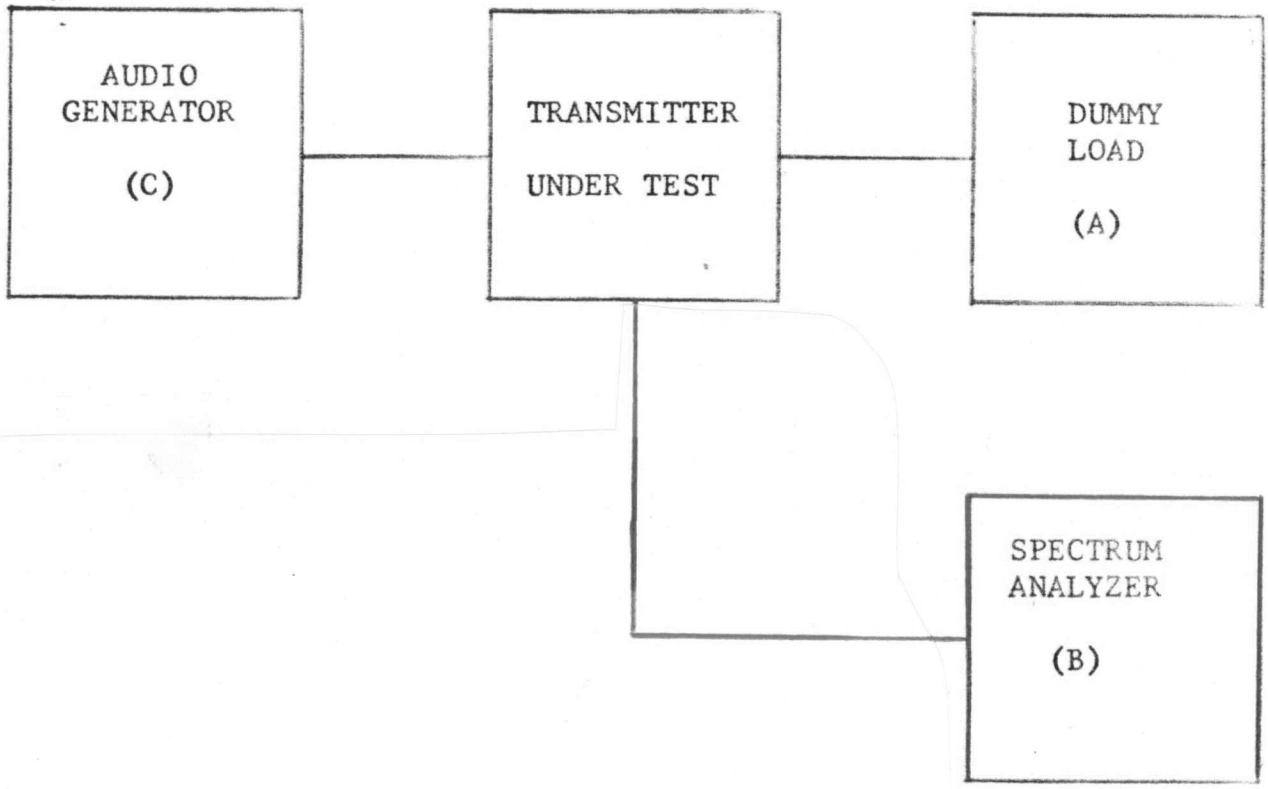

FIGURE 2.4

SIDEBAND REJECTION AND
CARRIER SUPPRESSION

2.5 A3-H DISTORTION

A. Performance Criteria

1. At rated PEP output, the 2nd and 3rd harmonics of the modulating signal shall be at least 40 db below the carrier level with 90% of modulation.

B. Test Arrangement — Relevant Figure

1. A3-H Distortion	2.5

C. Test Equipment Required

	Schematic Reference	Item No. In Appendix 1	Test Data Form
1. Two Tone Generator	A	4	2.5
2. Spectrum Analyzer	B	3	
3. Dummy Load	C	1	

D. Test Procedure

a. Connect the equipment as indicated in Figure 2.5.
b. Place MMX meter switch in carrier position and adjust the carrier level for an indication of "FULL" on MMX meter.
c. Connect the Spectrum Analyzer to MMX external monitor jack.
d. Increase the audio tone level in MMX until 90% of modulation.
e. Tune transmitter to full rated power output.
f. Connect the spectrum analyzer to transmitter monitor jack and adjust the meter for a full scale presentation, thus establishing 0 db level.
g. Remove 20 db of attenuation from the analyzer and read the 2nd and 3rd harmonics attenuation.

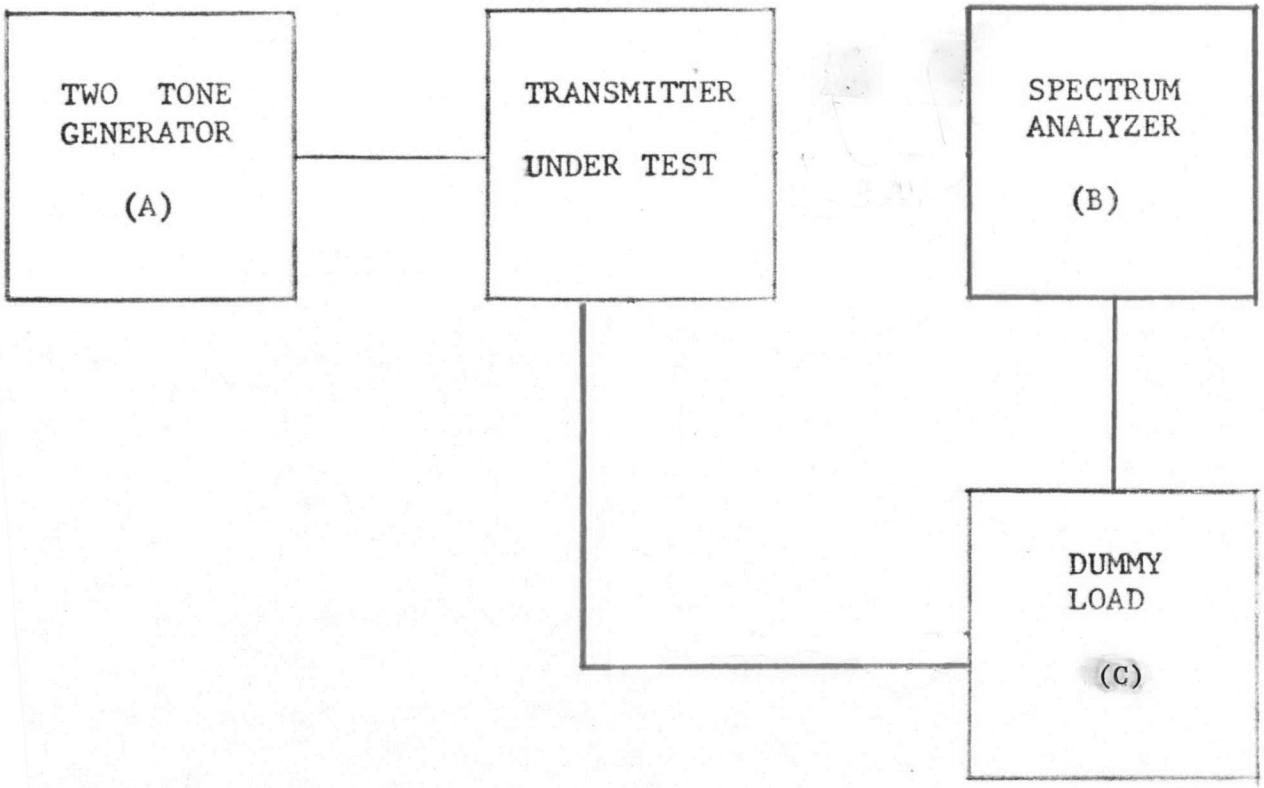

FIGURE 2.5
AM DISTORTION

2.6 ALDC TEST

A. Performance Criteria
1. With ALDC engaged, transmitter must maintain rated output within +20%.

B.

Test Arrangement	Relevant Figure
ALDC	2.6

C.

Test Equipment Required	Schematic Reference	Item No. In Appendix 1	Test Data Form
1. Dummy Load	A	1	2.6

D. Test Procedure

a. Connect the equipment as shown in Figure 2.6
b. Tune the transmitter to 2 MHz at 11 KW in CW mode.
c. Slowly engage ALDC until output drops to about 10 KW.
d. When increasing transmitter drive to maximum, output must remain within ±20%.
e. Record output.
f. Repeat steps b to e at frequencies listed on test data form No. 2.6.
g. Also check rated power on all modes.

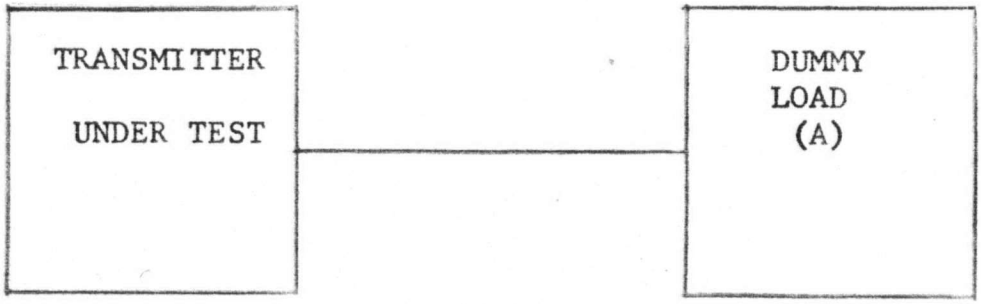

FIGURE 2.6

ALDC

2.9 AUDIO RESPONSE

A. Performance Criteria

1. Transmitter audio response must be ± 1.5db from 250 to 3040 cycles.

B. Test Arrangement — Relevant Figure

Audio Response — 2.7

C. Test Equipment Required

	Schematic Reference	Item No. In Appendix 1	Test Data Form
1. Dummy Load	B	1	2.7
2. Audio Generator	A	10	
3. High Frequency Counter	C	9	

D. Test Procedure

a. Connect Equipment as shown in Figure 2.7.
b. Tune transmitter for output of 1kW, at 2MHz, in CW mode.
c. Adjust audio generator for an output of Odb, at a frequency of 1 KHz.
d. Reduce transmitter drive to min., and place MMX in USB mode.
e. Increase drive until transmitter output indicates 1kW.
f. Slowly reduce frequency and record output as indicated on test data form No. 2.7.
g. Return generator frequency to 1KHz, now slowly increase frequency and record output as indicated on test data form.
h. Output should not deviate more than 3 db thru the range of 250-3040 cycles.
i. Repeat steps d to h on LSB.

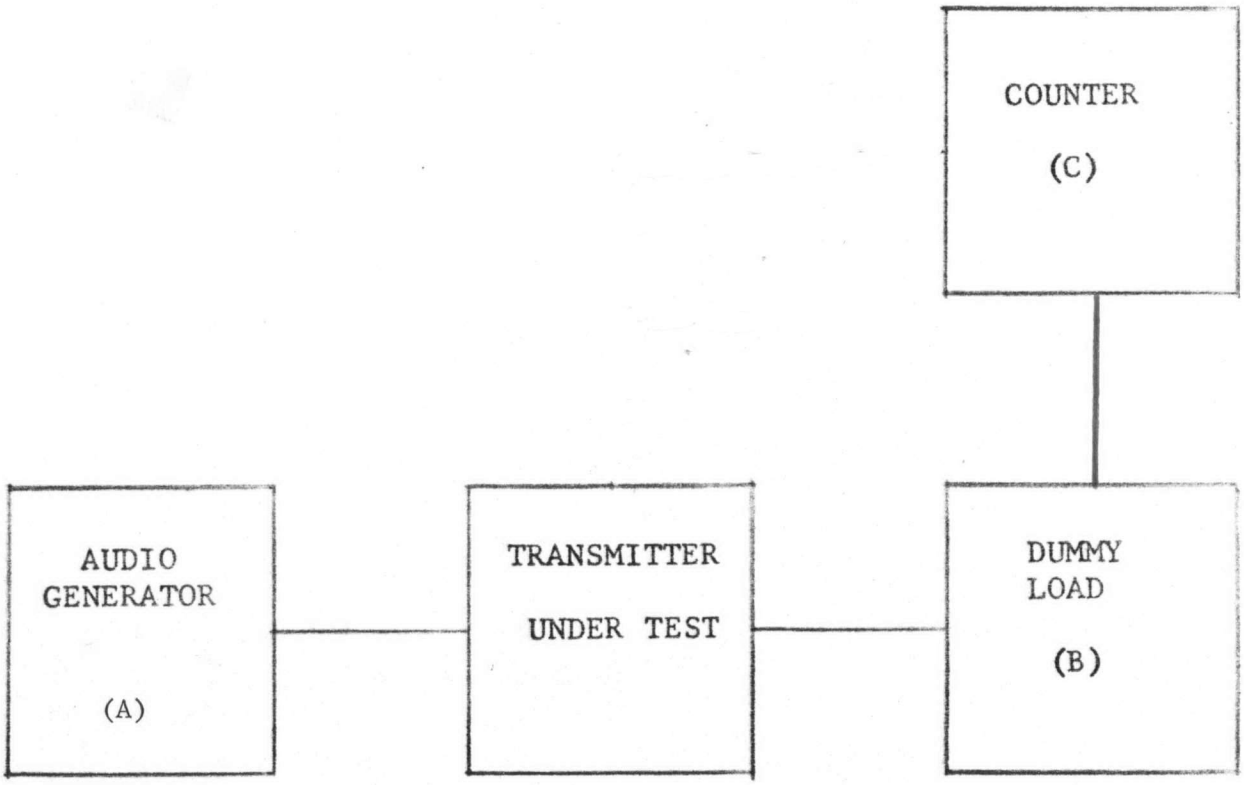

FIGURE 2.7

AUDIO RESPONSE

3.0 HARMONIC SUPPRESSION

A. Performance Criteria

1. The transmitter is capable of producing full rated average power output with harmonics suppressed at least 40db below PEP.

B. Test Arrangement	Relevant Figure	Test Data Form
1. Harmonic Suppression	2.8	2.8

C. Test Equipment Required	Schematic Reference	Item No. In Appendix 1
1. Dummy Load	A	1
2. Spectrum Analyzer	B	3
3. Coaxial RF Voltage Divider	C	7

D. Test Procedure

a. Connect the equipment as shown in Figure 2.5A.
b. Tune the transmitter to the center frequency of one of the RF bands and load it to full rated average power output in the CW mode.
c. Tune the spectrum analyzer to the fundamental frequency and establish a 0db reference level. Tune the signal generator to the test frequency and note the level required to produce a full scale deflection on the analyzer.
d. Tune the spectrum analyzer to the frequency of the second harmonic. Adjust the spectrum analyzer for full scale deflection.
e. Remove 20db of attenuation from the spectrum analyzer and note the level of the second harmonic. Add the attenuation correction factor for the coaxial divider and obtain the level of the second harmonic. Record this level.
f. Repeat parts d and e for the third and higher harmonics.
g. Repeat parts b to f at frequencies listed on test data form No. 2.8.

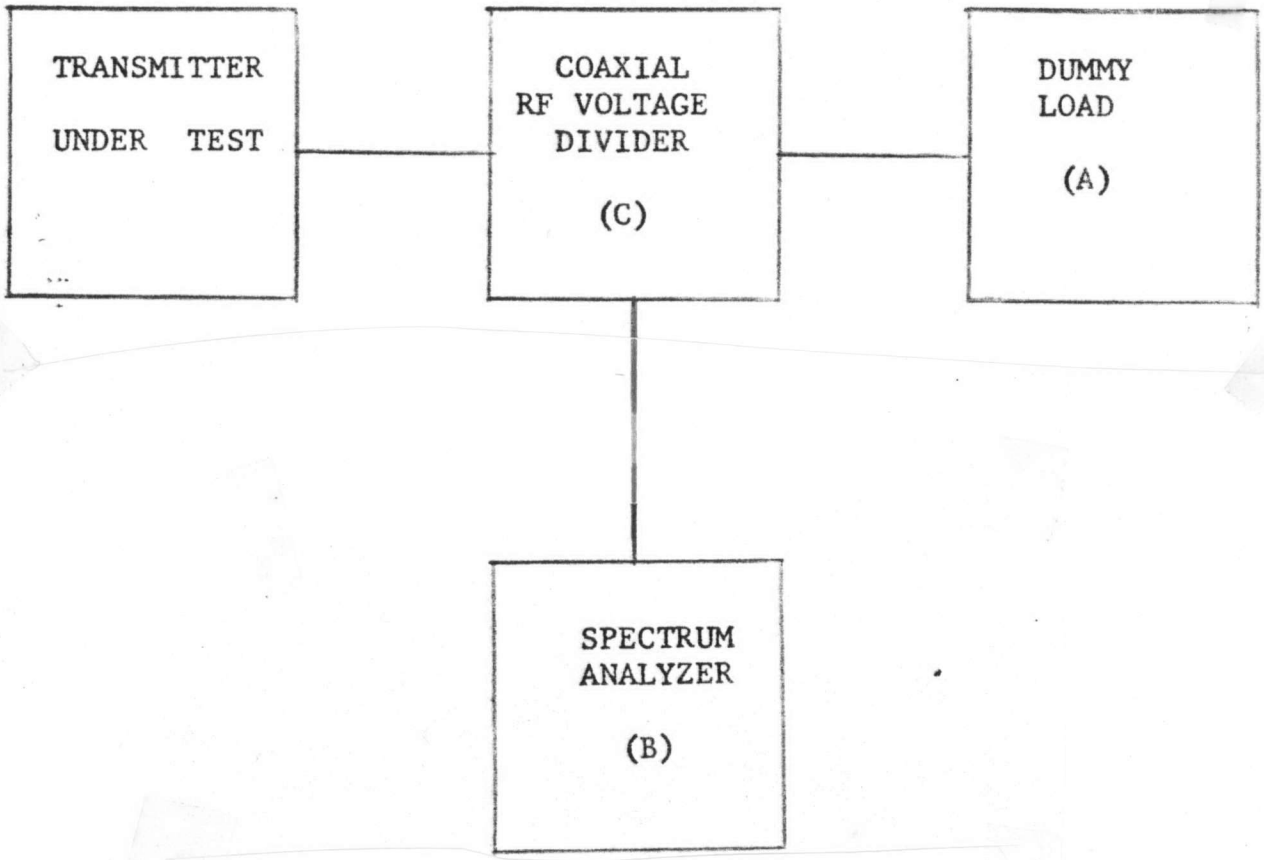

FIGURE 2.8

HARMONIC SUPPRESSION

3.1 FREQUENCY ALLOCATION

A. Test Arrangement — Relevant Figure

Frequency Allocation — 2.9

B. Test Equipment Required

	Schematic Reference	Item No. In Appendix 1	Test Data Form
1. Frequency Counter	A	19	2.9

C. Test Procedure

a. Connect the equipment as shown in Figure 2.9.
b. Allow MMX Exciter at least a one hour warm up before starting test.
c. Using test data form No. 2.9 record exciter output frequency.
d. Measured frequency must be within ± one cycle.

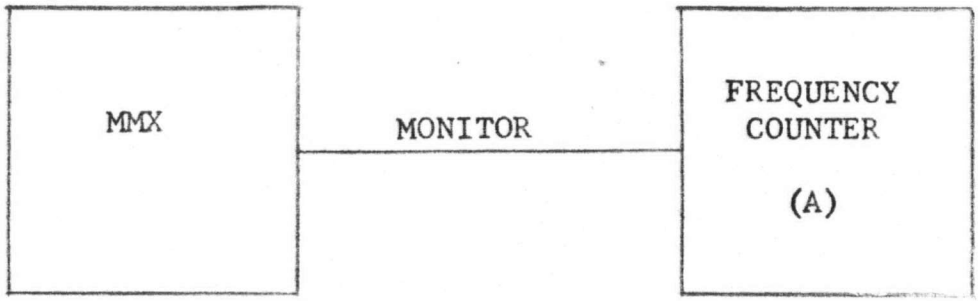

FIGURE 2.9

APPENDIX 1

TEST EQUIPMENT LIST

ITEM NUMBER	DESCRIPTION	MANUFACTURER & MODEL USED	TMC SERIAL #
1	Dummy Load	TMC 18K/50 (Modified) or equivalent.	5056
2	Audio Generator	General Radio Model 1304-B or equiv.	1855
3	Spectrum Analyzer	HP 141 or equiv.	5074
4	Two Tone Generator	TMC Model TTG-1 or equiv.	60820
5	Step Attenuator	Telonic TG950 or equiv.	5087
6	RF Signal Generator	Hewlett-Packard 606A or equiv.	1854
7	Coaxial RF Voltage Divider	p/o TMC 18K/50 (modified) or equiv.	5056
8	Oscilloscope	Tektronix	2226
9	Frequency Counter	Hewlett Packard	1543
10	Audio Generator	Hewlett Packard	1851

TMC SPECIFICATION

NO. S1392

REV:

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TITLE: FACTORY TEST - TEST DATA SHEET FOR VSWR

TRANSMITTER SERIAL NO._____ TEST DATA FORM #2.1

EXCITER SERIAL NO._____ DATE_____

_____ _____

Signature (TMC) Signature (Customer)

BAND	FREQUENCY mHz	DIRECT POWER KW	Ia. P.A.	S2 P.A.
2 - 2.3	2			
2.3 - 2.6	2.4			
2.6 - 3	2.7			
3 - 4	3.5			
4 - 5	4			
5 - 8	6			
8 - 12	9			
12 - 16	13			
16 - 24	18			
24 - 30	22			
24 - 30	26			

VSWR CHECK

BAND	FREQUENCY MHz	TRIP OUT POINT	NOTES
4-5	4	3 KW	
16-24	18	3 KW	

TMC SPECIFICATION

NO. S1392

REV:

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TITLE: FACTORY TEST - TEST DATA SHEET FOR VSWR

TEST DATA FOR NOISE AND HUM. LEVEL & SPURIOUS EMISSIONS

TRANSMITTER SERIAL NO._____ TEST DATA FORM #2.2

EXCITER SERIAL NO._____ DATE_____

_____ _____

Signature (TMC) Signature (Customer)

BAND	TEST FREQUENCY mHz	HUM LEVEL	NOISE LEVEL	SPURIOUS EMISSION	
		db below reference level			
3 - 4	3				
4 - 5	5				
8 - 12	9				
16 - 24	18				
16 - 24	20				
24 - 30	26				

TMC SPECIFICATION

NO. S1392

REV:

COMPILED: CHECKED: APPD: SHEET 23 OF

TITLE: INTERMODULATION TEST CON F1=935 F2=2805 DATE -

TRANSMITTER SERIAL NO. EXCITER SERIAL NO.

TEST DATA FORM #2.3

SIGNATURE (TMC) (Customer)

BAND	TEST FREQ. MHZ	IPA TUNE	LOAD	P.A. SCREEN	P.A. PLATE	SIDE-BAND
2-2.3.	2					USB
3 - 4	3.5					USB
5 - 8	6					USB
12-16	12					LSB
16-24	18					LSB
16-24	22					LSB
24-30	26					LSB

TMC SPECIFICATION

NO. S1392

REV:

COMPILED: | CHECKED: | APPD: | SHEET 24 OF

TITLE: FACTORY TEST - SIDEBAND REJECTION
CON F1=935 F2=2805

TEST DATA FORM #2.4

TRANSMITTER SERIAL NO._____ DATE_____

EXCITER SERIAL NO._____

_____ _____
SIGNATURE (TMC) (CUSTOMER)

FREQ. mHz	POWER OUTPUT kw	SIDE-BAND USED	SIDEBAND REJECTION db	NOTES
6	10KW	USB		
6	10KW	LSB		

TMC SPECIFICATION

NO. S1392

REV:

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TITLE: FACTORY TEST - A-3H DISTORTION

W/ALDC
MODULATION 90% 7 db

TEST DATA FORM #2.5

DATE_____

TRANSMITTER SERIAL NO._____

EXCITER SERIAL NO._____

_____
Signature (TMC)

_____
Signature (Customer)

FREQUENCY mHz	I (db)	II (db)	III (db)	NOTES
4				
8				
26				

TMC SPECIFICATION

NO. S1392

REV:

COMPILED: | CHECKED: | APPD: | SHEET 26 OF

TITLE: ALDC TEST
10KW OUTPUT

TEST DATA FORM #2.6

DATE:

TRANSMITTER SERIAL NO._____ EXCITER SERIAL NO._____

SIGNATURE_____ (TMC)

SIGNATURE_____ (Customer)

BAND	FREQ. MHZ	CW	Ip	Is	LOAD	TUNE	NOTES
2-2.3	2						
2.3-2.6	2.5						
5-8	6.0						
16-24	20.0						
24-30	26.0						

TEST DATA FORM #2.7

DATE _____

TRANSMITTER SERIAL NO. _____

EXCITER SERIAL NO. _____

_____ Signature (TMC)

_____ Signature (Customer)

AUDIO FREQ. Hz	USB BAND OUTPUT LIN.	USB BAND OUTPUT db	LSB-BAND OUTPUT LIN	LSB-BAND OUTPUT db	NOTES: 1KHz TONE db
200					
250					
300					
350					
400					
500					
600					
700					
800					
900					
1000					
2000					
3000					
3100					
3300					
3400					
3500					
3700					
3800					

TMC SPECIFICATION

NO. S1392

REV:

COMPILED: | CHECKED: | APPD: | SHEET 28 OF

TITLE: TRANSMITTER SERIAL NO. EXCITER SERIAL No.

Signature (TMC) Signature (Customer)

TEST DATA FOR HARMONIC MEASUREMENTS

TEST DATA FORM 2.8

DATE _____

BAND	TEST FREQUENCY (MHz)	CARRIER REFERENCE (db)	HARMONIC LEVEL IN db BELOW CARRIER REFERENCE			
			2nd	3rd	4th	5th
2.6-3.0	4.0					
8.0-12	10.0					
16-24	20.0					
24-30	26.0					

TITLE: FREQUENCY ALLOCATION

EXCITER ± 1 Hz

TEST DATA FORM 2.9

DATE _____

TRANSMITTER SERIAL NO. _____

EXCITER SERIAL NO. _____

_____ Signature (TMC)

_____ Signature (Customer)

FREQ. SET AT mHz	MEASURED FRDQ. HZ	UNIT
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
29.9999		