TMC SPECIFICATION			NO. S 1268
REV: A			
COMPILED:	CHECKED:	APPD:	SHEET 1 OF 29
TITLE:			

11/9/70 jb/

TEST PROCEDURE

FOR TMC

GPTM-10KLA

1.1 TABLE OF CONTENTS

SECTION	DESCRIPTION	PAGE
1.0	Title Sheet	1
1.1	Table of Contents	2
1.2	Introduction	3
1.3	Mechanical Inspection	4
1.4	Preliminary Electrical Inspection	4
2.1	Power Output and VSWR Procedure	5,6,7
2.2	Hum, Noise and Spurious Emission Procedure	8,9
2.3	CW Keying Procedure	10,11
2.4	FSK Distortion	12,13,14
2.5	ALDC Procedure	15,16
2.6	Harmonic Suppression Procedure	17,18,19
2.7	Frequency Allocation	20,21
	Appendix	22
	Test Data Forms: #2.1	23
	2.2	24
	2.3	25
	2.4	26
	2.5	27
	2.6	28
	2.7	29

1.2 INTRODUCTION

GENERAL:

The TMC series of GPTM-10KLA transmitters are general purpose Low Frequency Radio Transmitters capable of providing CW and FSK operation. The transmitter will supply 10 kW average power over the frequency range of 60 to 120 kHz.

OBJECTIVE:

The procedures 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.

1.3 Mechanical Inspection

1. Check all knobs and switches for proper operation.
2. Carefully check PA load switches for good mechanical condition, obvious miswiring and loose connections.
3. Carefully check harmonic filter bandswitch for proper alignment.
4. Check high voltage power supply for loose connections and correct value of circuit components.

1.4 Preliminary Electrical Inspection

1. With main wall breaker OFF, check all three input phases for possible shorts to ground.
2. Check high voltage power supply for possible shorts to ground.
3. Check complete unit for correct value of fuses.
4. Turn on main power and check PA blower, it must turn in same direction as arrow stamped on housing.

2.1 Power Output and VSWR Protection

A. Performance Criteria

1. Power Output - The linear power amplifier is capable of providing 10 kW average power 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	Required For Arrangement
1. Wattmeter	A	1	1.2
2. Dummy Load	B	2	1.2
3. Oscilloscope	C	8	1.2

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 the CW mode.
   c. Record the power output as indicated on the transmitter power meter. This reading must be within 7% of the calibrated RF volt meter,
   d. Repeat parts b and c at frequencies listed on Test Data Form #2.1

2.1 VSWR Protection

a. Connect the equipment as shown in Figure 2.1
b. Set the variable inductor on the dummy load for minimum inductance.
c. Tune the transmitter for rated average power output at the desired test frequency.
d. Slowly increase the inductance on the dummy load until the reflected power approaches a 3:1 SWR.
e. Adjust SWR overload control until high voltage is deactivated.
f. Repeat steps b to e at frequencies listed on Test Data Form #2.1

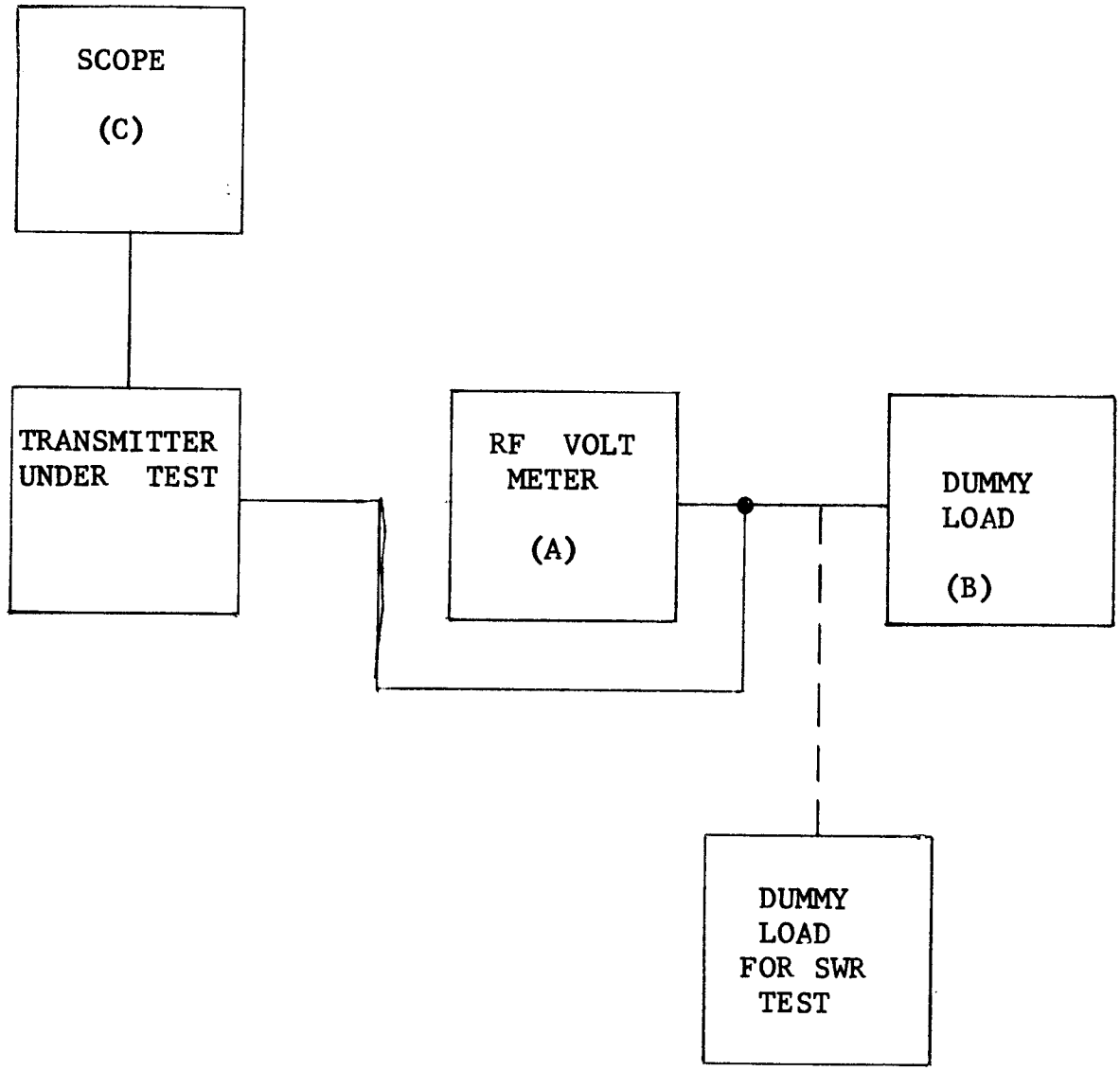


FIGURE 2.1

POWER OUTPUT
VSWR PROTECTION

2.2 Noise, Hum and Spurious Emissions

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
1. Spectrum Analyzer	A	4
2. Dummy Load	B	2
3. Oscilloscope	C	8

D. Test Procedure

a. Connect the equipment as shown in Figure 2.2
b. Tune the transmitter to 60 kHz 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 #2.2

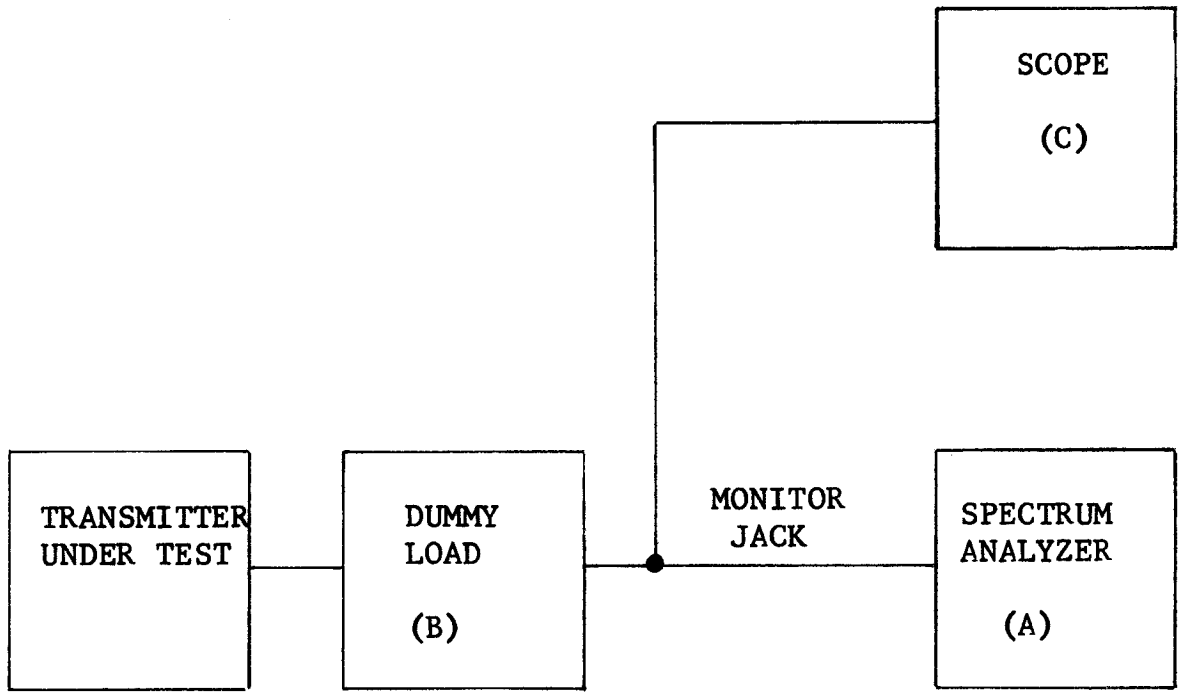


FIGURE 2.2

HUM AND NOISE LEVEL

2.3 CW Keying

A. Performance Criteria

1. Transmitter must be capable of transmitting a CW signal with no more than 5% keying distortion.

B. Test Arrangement

Test Arrangement	Relevant Figure
CW Keying	2.3

C. Test Equipment Required

Test Equipment Required	Schematic Reference	Item No. In Appendix
1. Dummy Load	B	2
2. Oscilloscope	C	8
3. Keyer	A	9

D. Test Procedure

a. Connect equipment as shown in Figure 2.3
b. Tune transmitter to rated output at 60 kHz in CW mode, with test key switch in up position.
c. Set keyer frequency at 12½ cycles. This is equivalent to 25 Bauds.
d. Using oscilloscope with TIME/CM Switch in 10 millisec position, record mark - space - pulse duration in millisec.
e. Mark - space deviation must not exceed 4 millisec.
f. Repeat steps b to e using keying frequencies listed on Test Data Form #2.3

Note: 25 cycles = 50 Bauds
50 cycles = 100 Bauds

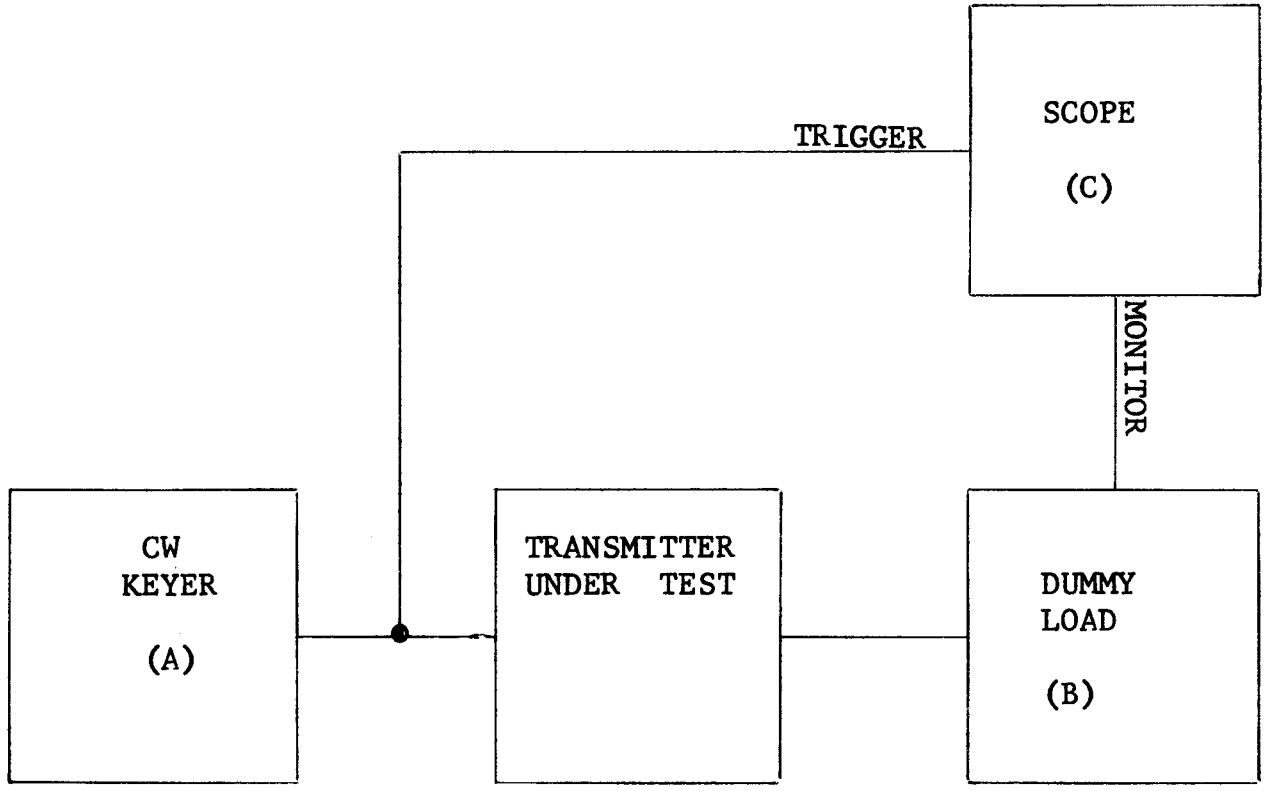


FIGURE 2.3

CW KEYING

2.4 FSK Distortion

A. Performance Criteria

1. Transmitter must be capable of transmitting an FSK signal with no more than 5% of distortion.

B.

Test Arrangement	Relevant Figure
FSK Distortion	2.4

C.

Test Equipment Required	Schematic Reference	Item No. In Appendix 1
1. Dummy Load	B	2
2. Telegrapn Character Gen.	A	11
3. Frequency Counter	C	10

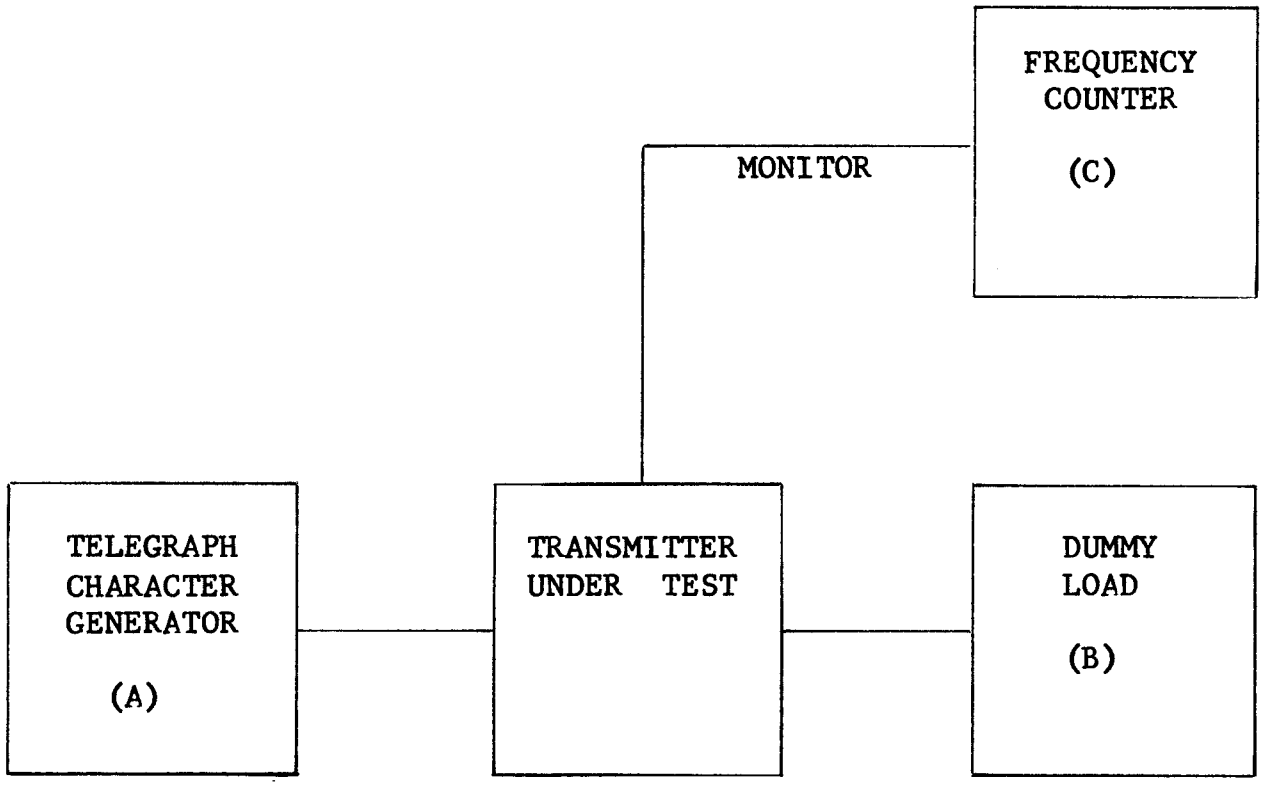
D. Test Procedure

a. Connect the equipment as shown in Figure 2.4
b. Place switch #S.110 in back of MMX in the ± 42½ cycle position. Also place switch #S111 in 20 M.A. position.
c. Place the output select switch on the character generator in the space position.
d. Tune the transmitter to full rated output in the FSK mode at 60 kHz. Record space frequency on Test Data Form #2.4
e. Place output select switch in mark position, record mark frequency on Test Data Form #2.4
f. Set the character generator output select switch to Dot cycle, set speed switch to 45.5 Bauds., set frequency counter time base to 10 sec., and record measured frequency on Test Data Form #2.4
g. Obtain the FSK distortion from the following equation.

$$\text{PERCENT DISTORTION} = \frac{\text{MEASURED FREQ.} - \text{CENTER FREQ.}}{1/2 \text{ TOTAL SHIFT}} \times 100$$

DISTORTION MUST NOT EXCEED 5%

h. Repeat steps e to g with speed switch set at 100 Bauds.
i. Place switch S110 on MMX in ± 425 position and repeat steps c to h.
j. Repeat entire procedure at 160 kHz.



FSK DISTORTION

FIGURE 2.4

2.5 ALDC Test

A. Performance Criteris

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
1. Dummy Load	A	2

D. Test Procedure

a. Connect the equipment as shown in Figure #2.5
b. Tune the transmitter to 60 kHz 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 #2.5

FIGURE 2.5

ALDC

2.6 Harmonic Suppression

A. Performance Criteria

1. The transmitter is capable of producting full rated average power output with the second harmonic suppressed at least 45 db below PEP, the third and higher harmonics suppressed at least 55 db below PEP.

B. Test Arrangement

	Relevant Figure
1. Harmonic Suppression	2.6

C. Test Equipment Required

	Schematic Reference	Item No. In Appendix 1
1. Dummy Load	A	2
2. Spectrum Analyzer	B	4
3. Coaxial RF Voltage Divider	C	7
4. Step Attenuator	D	5
5. RF Signal Generator	E	6

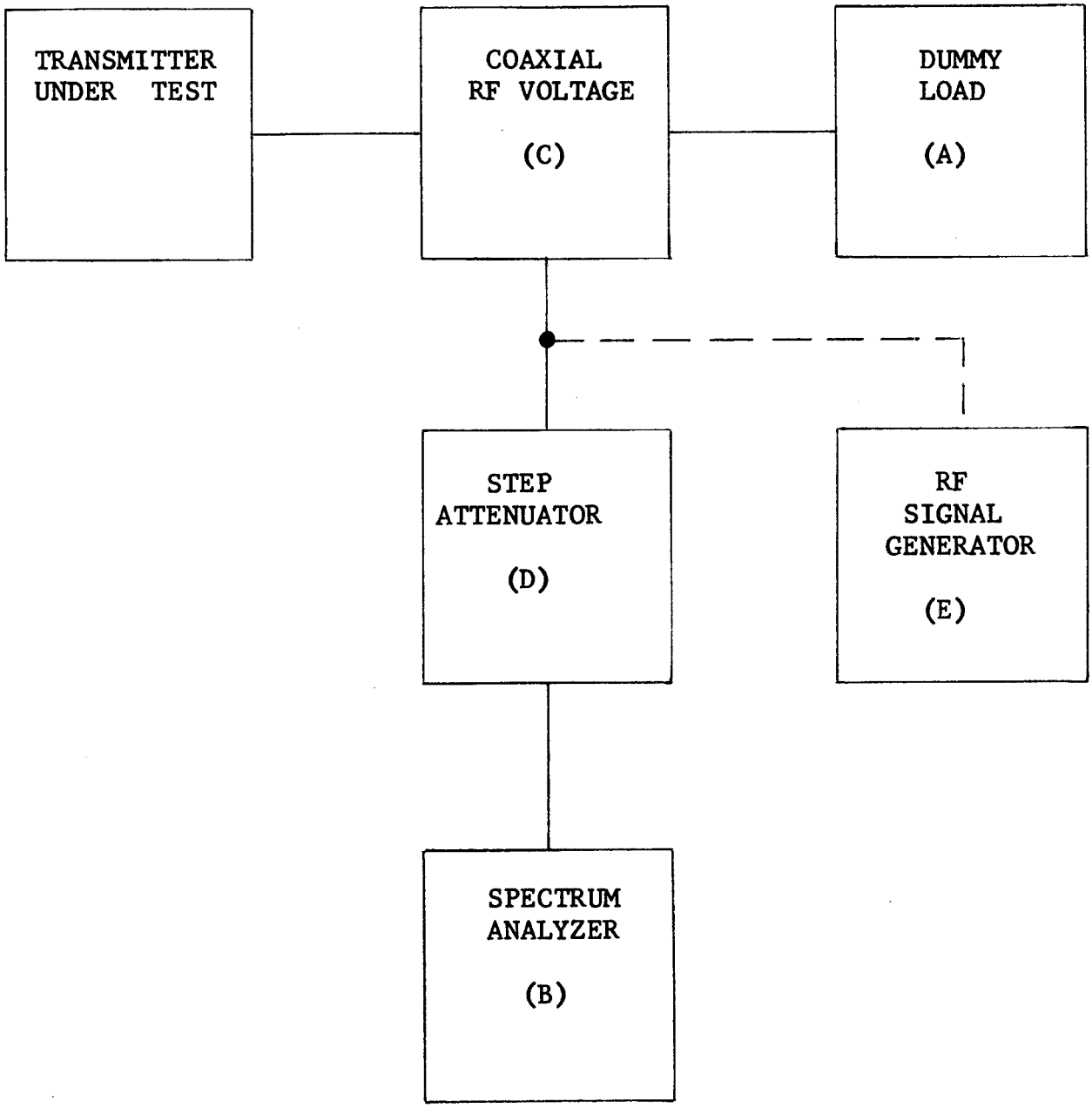
D. Test Procedure

a. Connect the equipment as shown in Figure 2.6
b. Tune the transmitter to 60 kHz at full rated average power output in the CW mode.
c. Tune the spectrum analyzer to the fundamental frequency and establish a 0 db reference level. Disconnect the step attenuator from the coaxial divider and correct the signal generator. Tuen 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 and signal generator to the frequency of the second harmonic. Set the signal generator input level to the level noted in part c and adjust the spectrum analyzer for full scale deflection. Disconnect the signal generator from the step attenuator and connect the step attenuator to the coaxial divider.

e. Remove 20 db 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 #2.6



DOTTED LINE INDICATES ALTERNATE CONNECTION

FIGURE 2.6

HARMONIC SUPPRESSION

2.7 Frequency Allocation

A. Test Arrangement — Relevant Figure

Frequency Allocation — 2.7

B. Test Equipment Required

	Schematic Reference	Item No. In Appendix 1
1. Frequency Counter	A	10

C. Test Procedure

a. Connect the equipment as shown in Figure 2.7
b. Allow MMX Exciter at least a one hour warmup before starting test.
c. Record exciter output frequency as listed on Test Data Form No. 2.7
d. Measured frequency must be within $\pm$ one cycle.

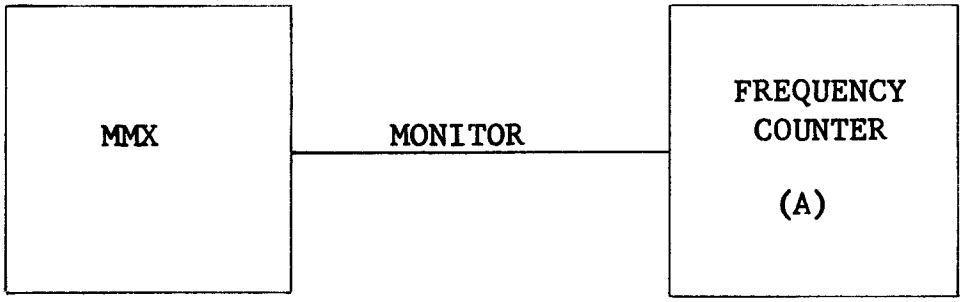


FIGURE 2.7
FREQUENCY ALLOCATION

APPENDIX 1

TEST EQUIPMENT LIST

ITEM NUMBER	DESCRIPTION	MANUFACTURER AND MODEL USED
1	RF Voltmeter	Hewlett-Packard Model 410-B
2	Dummy Load	TMC 18K/50 (modified) or equivalent
3	Audio Generator	General Radio Model 1304-B or equivalent
4	Spectrum Analyzer	Lavoie Labs Model LA-40A or equivalent
5	Step Attenuator	Telenic TG950 or equivalent
6	RF Signal Generator	Hewlett-Packard 606A or equivalent
7	Coaxial RF Voltage Divider	TMC Fabricated
8	Oscilloscope	Tektronix
9	CW Keyer	TMC
10	Frequency Counter	Hewlett Packard
11	Telegraph Character Generator	Digitech Inc.

TMC SPECIFICATION

NO. S 1268

REV: A

COMPILED: | CHECKED: | APPD: | SHEET 23 OF

TITLE: FACTORY TEST - TEST DATA SHEET FOR VSWR

TRANSMITTER SERIAL NO. _____ TEST DATA FORM #2.1

EXCITER SERIAL NO. _____ DATE _____

_____ _____

Signature (TMC) Signature (Page Europa)

_____

Signature C.E.I. OTAN

FILTER BAND	FREQUENCY kHz	DIRECT POWER KW	REFLECTED POWER	VSWR	Ia P.A.	I S2 P.A.	RETUNING
60-75	60						
60-75	75						
75-95	80						
75-95	95						
95-125	100						
95-125	125						
125-160	130						
125-160	160						

TMC SPECIFICATION

NO. S 1268

REV: A

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

TITLE: TEST DATA FOR NOISE AND HUM LEVEL AND SPURIOUS EMISSIONS WITH ALDC

TRANSMITTER SERIAL NO. _____

EXCITER SERIAL NO. _____

TEST DATA FORM #2.2

DATE _____

_____
Signature (TMC)

_____
Signature (Page Europa)

_____
Signature C.E.I. OTAN

FILTER BAND	TEST FREQUENCY kHz	HUM LEVEL	NOISE LEVEL	SPURIOUS EMISSION	
		db below reference level			
60-75	60				
60-75	75				
75-95	80				
75-95	95				
95-125	100				
95-125	125				
125-160	130				
125-160	160				

TMC SPECIFICATION

NO. S 1268

REV: A

COMPILED: | CHECKED: | APPD: | SHEET 25 OF

TITLE: FACTORY TEST - CW SPEED - TEST

TRANSMITTER SERIAL NO. _____ TEST DATA FORM #2.3

EXCITER SERIAL NO. _____ DATE _____

_____ Signature (TMC)

_____ Signature (Page Europa)

_____ Signature C.E.I. OTAN

FREQUENCY 60kHz (Test w/o ALDC)

	MARK	SPACE	
25 BAUDS			
50 BAUDS			
100 BAUDS			

FREQUENCY 60kHz (Test with ALDC)

	MARK	SPACE	
25 BAUDS			
50 BAUDS			
100 BAUDS			

TMC SPECIFICATION

NO. S 1268

REV: A

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

TITLE: FACTORY TEST FSK DISTORTION

TRANSMITTER SERIAL NO. _____ TEST DATA FORM #2.4

EXCITER SERIAL NO. _____ DATE _____

_____ Signature (TMC)

_____ Signature (Page Europa)

_____ Signature C.E.I. OTAN

± 42½ Hz		60 kHz			
BAUDS	MARK Hz FREQ.	SPACE (Hz) FREQUENCY	± FROM (Hz) CENTER FREQUENCY	MEASURED FREQUENCY	DISTORTION %
45.5					
110					

±425 Hz		60 kHz			
BAUDS	MARK Hz FREQ.	SPACE (Hz) FREQUENCY	± FROM(Hz) CENTER FREQUENCY	MEASURED FREQUENCY	DISTORTION %
45.5					
110					

± 42½ Hz		160 kHz			
BAUDS	MARK Hz FREQ.	SPACE(Hz) FREQUENCY	± FROM(Hz) CENTER FREQUENCY	MEASURED FREQUENCY	DISTORTION %
45.5					
110					

± 425 Hz		160 kHz			
BAUDS	MARK Hz FREQ.	SPACE(Hz) FREQUENCY	± FROM(Hz) CENTER FREQUENCY	MEASURED FREQUENCY	DISTORTION %
45.5					
110					

TITLE: ALDC TEST

10 KW OUTPUT

TRANSMITTER SERIAL NO. _____ TEST DATA FORM #2.5

EXCITER SERIAL NO. _____ DATE _____

_____ _____

Signature (TMC) Signature(Page Europa)

_____

Signature C.E.I. OTAN

FILTER BAND	FREQ. kHz	CW	FSK	PA Ip	PA Is
60-75	60				
60-75	75				
75-95	80				
75-95	95				
95-125	100				
95-125	125				
125-160	130				
125-160	160				

TITLE: TEST DATA FOR HARMONIC MEASUREMENTS

TRANSMITTER SERIAL NO. _____ TEST DATE FORM #2.6

EXCITER SERIAL NO. _____ DATE _____

_____
Signature (TMC)

_____
Signature (Page Europa)

_____
Signature C.E.I. OTAN

BAND	TEST FREQUENCY (MHz)	CARRIER REFERENCE (db)	HARMONIC LEVEL IN db BELOW CARRIER REFERENCE			
			2nd	3rd	4th	5th
95 - 125	110					
95 - 125	120					
125 - 160	130					
125 - 160	140					
125 - 160	153					
125 - 160	160					

TMC SPECIFICATION

NO. S 1268

REV: A

COMPILED: | CHECKED: | APPD: | SHEET 29 OF 29

TITLE: FREQUENCY ALLOCATION

TRANSMITTER SERIAL NO. _____ TEST DATA FORM #2.7

EXCITER SERIAL NO. _____ DATE _____

_____ _____

Signature (TMC) Signature (Page Europa)

_____

Signature C.E.I. OTAN

FREQ. SET AT kHz	MEASURED FREQ. Hz ± 1 Hz	UNIT	
60			
65			
70			
75			
80			
85			
90			
95			
100			
105			
110			
115			
120			
125			
130			
135			
140			
145			
150			
155			
160			

REVISION SHEET

THE TECHNICAL MATERIEL CORP.
MAMARONECK NEW YORK

S 1268
LIST NO.

DATE	REV.	SHEET	EMN #	DESCRIPTION	APP.
3/11/71	Ø			ORIGINAL RELEASE FOR PRODUCTION	