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TEST PROCEDURE

FOR TMC

GPTM-10KLA

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1.1

TABLE OF CONTENTS

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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 $10~\mathrm{kW}$ average power over the frequency range of $60~\mathrm{to}~120~\mathrm{kHz}$.

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.

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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.

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2.1 Power Output and VSWR Protection

A. <u>Performance Criteria</u>

Test Arrangement

- 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.

Relevant Figure

•		<u>-</u>	WC TO	vanc rigure
	 Power Outpu VSWR Protec 			2.1 2.1
C.	Test Equipment <u>Required</u>		Item No. In Appendix 1	Required For Arrangement
	 Wattmeter Dummy Load Oscilloscope 	A B C	1 2 8	1.2 1.2 1.2

D. Test Procedure

В.

- 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.
 - 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

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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

TMC FORM SPEC 1

-

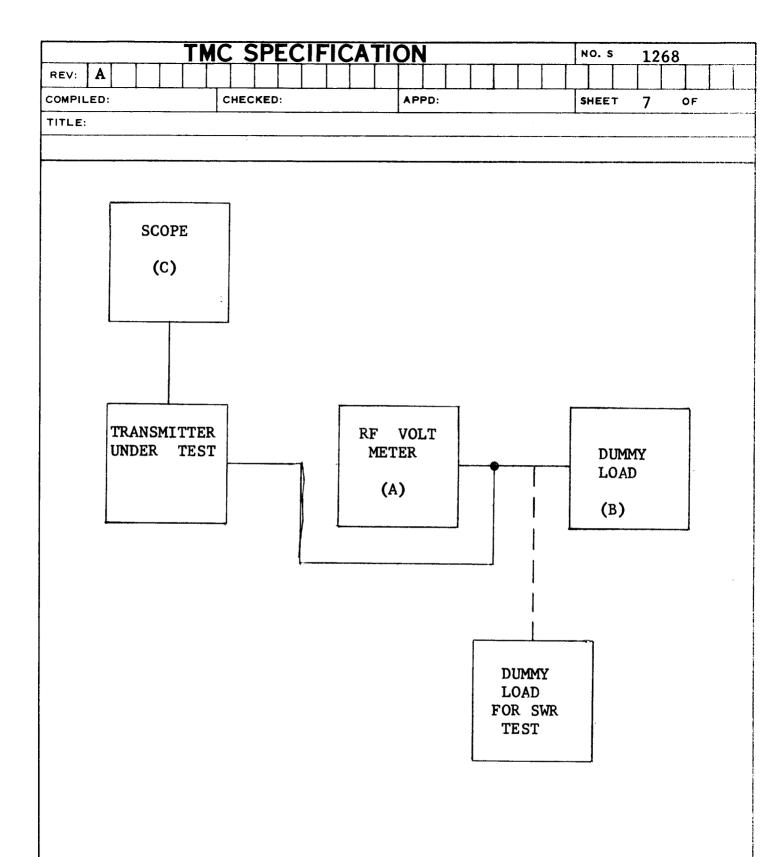


FIGURE 2.1

POWER OUTPUT VSWR PROTECTION

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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. <u>Test Arrangement</u>

Relevant Figure

1. Noise, hum and spurious emission levels

2.2

C.	Tes	st Equipment Required	Schematic <u>Reference</u>	Item No. In Appendix 1
	1.	Spectrum Analyzer	A	4
	2.	Dummy Load	В	2
	3.	Oscilloscope	С	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

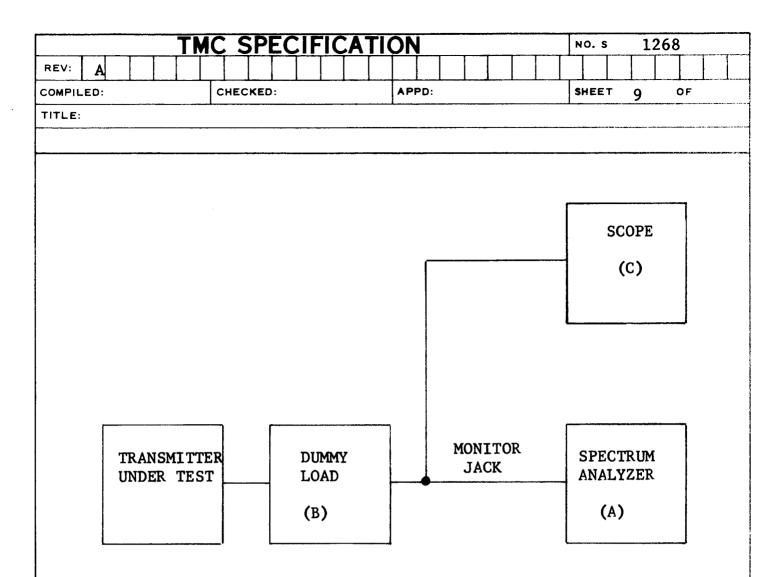


FIGURE 2.2
HUM AND NOISE LEVEL

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2.3 CW Keying

A. Performance Criteria

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

B. <u>Test Arrangement</u>

Relevant Figure

CW Keying

2.3

C.	Test Equipment <u>Required</u>	Schematic <u>Reference</u>	Item No. In <u>Appendix</u>				
	1. Dummy Load	В	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

TMC FORM SPEC 1

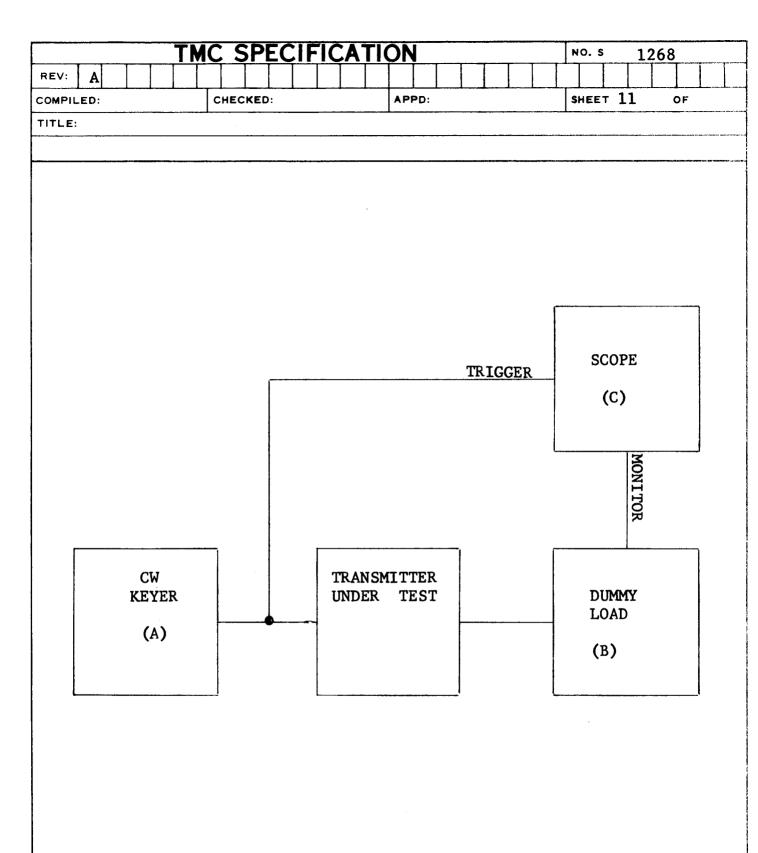


FIGURE 2.3

CW KEYING

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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.	Tes	t Equipment Required		Item No. In Appendix 1
	1.	Dummy Load	В	2
	2.	Telegraph Character (Gen. A	11
	3.	Frequency Counter	С	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 $\#42\frac{1}{2}$ 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.

PERCENT DISTORTION = $\frac{\text{MEASURED FREQ.} - \text{CENTER FREQ.}}{1/2 \text{ TOTAL SHIFT}}$ X100

DISTORTION MUST NOT EXCEED 5%

TMC FORM SPEC 1

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- 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.

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FSK DISTORTION

FIGURE 2.4

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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 Schematic Item No. In Required Reference Appendix 1

1. Dummy Load

Α

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

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FIGURE 2.5

ALDC

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Harmonic Suppression 2.6

Performance Criteria

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.

Relevant Figure

В.	Test Arrangement	Relevan	t Figure
	1. Harmonic Suppression	2.	6
c.	Test Equipment Required		Item No. In Appendix 1
	1. Dummy Load	A	2
	2. Spectrum Analyzer	В	4
	3. Coaxial RF Voltage Divi	der C	7
	4. Step Attenuator	D	5

Test Procedure D.

RF Signal Generator

- Connect the equipment as shown in Figure 2.6
- Tune the transmitter to 60 kHz at full rated average power output in the CW mode.
- Tune the spectrum analyzer to the fundamental frec. quency 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.
- Tune the spectrum analyzer and signal generator to d. 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.

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- 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

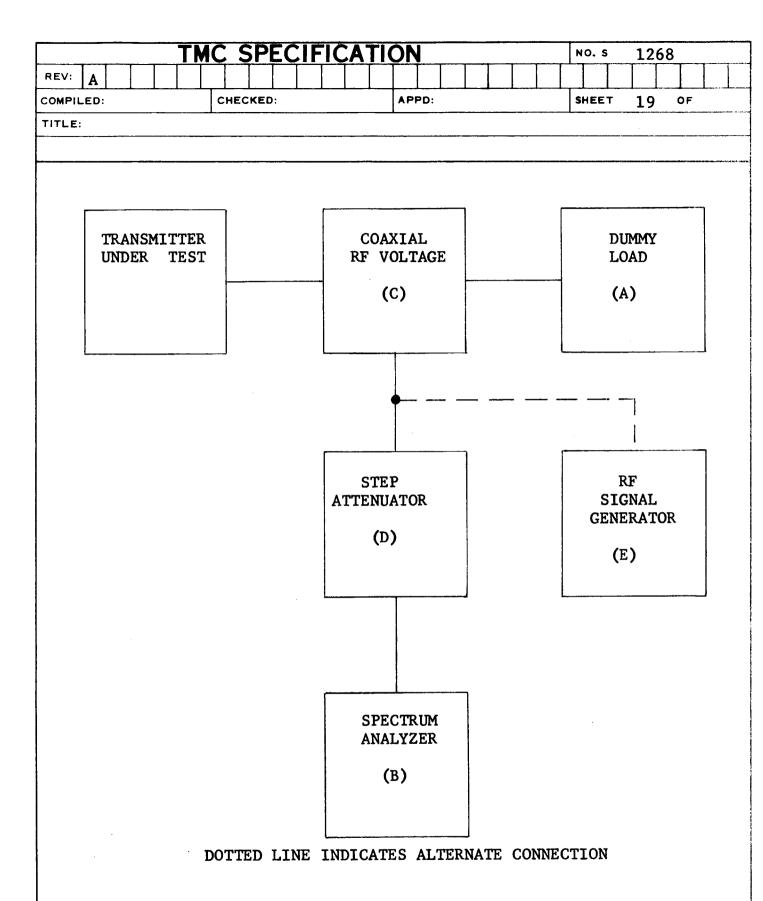


FIGURE 2.6

HARMONIC SUPPRESSION

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2.7 Frequency Allocation

A. Test Arrangement

Relevant Figure

Frequency Allocation

2.7

B. Test Equipment Required

Schematic Item No. In Reference Appendix 1

1. Frequency Counter

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 + one cycle.

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FIGURE 2.7
FREQUENCY ALLOCATION

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APPENDIX 1

TEST EQUIPMENT LIST

ITEM		MANUFACTURER AND
NUMBER	DESCRIPTION	MODEL USED
1	RF Voltmeter	Hewlett-Packerd 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.

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