TMC SPECIFICATION			NO. S 1266
REV:			
COMPILED: L. K	CHECKED: E.R.	APPD:	SHEET 1 OF 22
TITLE:			

1.0

TEST PROCEDURE

FOR TMC

HFTM-1KJ(S)

1.1

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1.2 INTRODUCTION

GENERAL:

The TMC series of HFTM-1KJ(S) transmitters are general purpose High Frequency Radio Transmitters capable of providing CW,AM, SSB, ISB, FAX and FSK operation. The transmitter will supply 1KW average or PEP power. The HFTM-1KJS operates over the frequency range of 1.5 to 28 MHz and the HFTM-1KJ operates over the frequency range of 2 to 30 MHz.

OBJECTIVE:

The procedures outlined herein are intended to serve as varification 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 bases 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 1.0KW Average and PEP in continuous key-down 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 equiped 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. Audio Generator	C	3	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 with a 1KHZ audio tone in the A3H mode.
   c. Record the power output as indicated on the transmitter power meter. This reading must be within 7% of the calibrated wattmeter.
   d. Record the audio input level. This level must be within -20 to +10 dbm.
   e. Repeat parts b to d at the low and high end of each RF frequency band.

2.1 VSWR Protection

a. Connect the equipment as shown in Figure 2.2A
b. Set the variable capacitor on the dummy load for minimum capacitance.
c. Tune the transmitter for rated average power output at the desired test frequency.
d. Set the transmitter overload pointer to correspond to a 3:1 VSWR.
e. Slowly increase the capacitance on the dummy load until the reflected power approaches the overload trip needle.
f. Verify proper operation of the overload circuits by increasing the capacitance until the overload circuits deactivate the transmitter. Record the trip setting and reflected power at the time of deactivation.
g. Return the reflected power meter overload pointer to its nominal position of 2:1

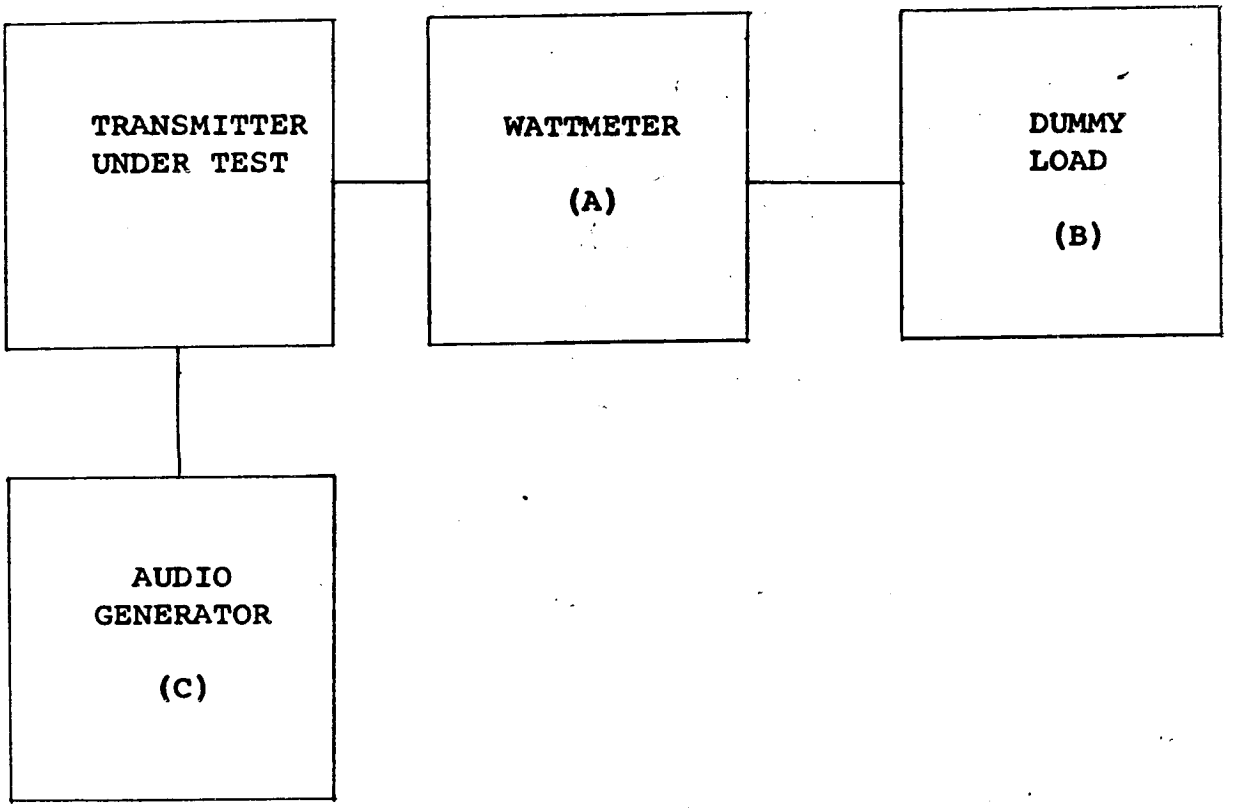


FIGURE 2.1

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

D. Test Procedure

a. Connect the equipment as shown in Figure 2.2.
b. Tune the transmitter to the center frequency of the low frequency RF band and load it to full 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 -40 db 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 the mid and high frequency RF bands.

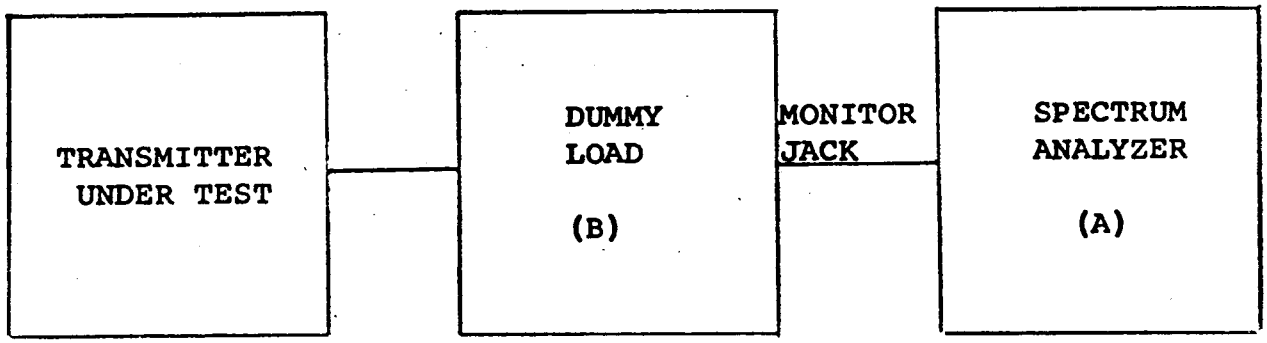


FIGURE 2.2

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 35db below either tone of two tones of equal amplitude.

B. Test Arrangement	Relevant Figure
1. Intermodulation Distortion	2.3

C. Test Equipment Required	Schematic Reference	Item No. In Appendix 1
1. Two Tone Generator	A	5
2. Spectrum Analyzer	B	4
3. Dummy Load	C	2

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 lev 1 in the upper sideband channel . Set the carrier insert control for maximum carrier suppression.
c. Tune the transmitter for rated average power output at the desired test frequency.
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 from either tone.
g. Repeat Steps b to f at the center frequency in each RF band (Alternate the sideband channel used to assure each channel has been tested at least once).

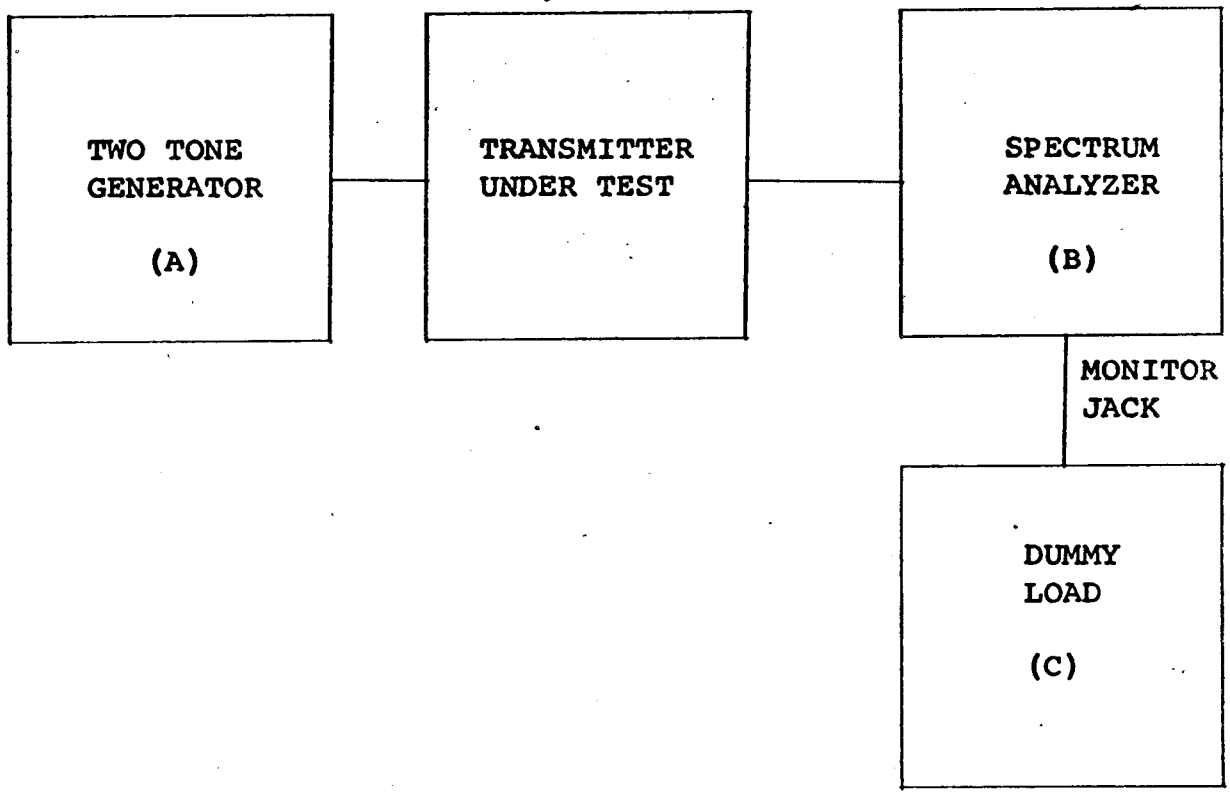


FIGURE 2.3

INTERMODULATION

2.4 SIDEBAND REJECTION AND CARRIER SUPPRESSION

A. Performance Criteria

1. Sideband Rejection - Unwanted sidebands shall be suppressed at least 50 db below PEP.
2. Carrier Suppression - The carrier level must be continuously adjustable from full output to at least -55db below PEP.

B. Test Arrangement

	Relevant Figure
1&2. Sideband Rejection and Carrier Suppression	2.4.

C. Test Equipment Required

	Schematic Reference	Item No. In Appendix 1	Required For Arrangement
1. Dummy Load	A	2	1 & 2
2. Spectrum Analyzer	B	4	1 & 2
3. Audio Generator	C	3	1 & 2

D. Test Procedure

a. Connect the equipment as shown in Figure 2.4.
b. Tune the transmitter to the desired test frequency and load it to rated average power output in the CW mode.
c. Adjust the spectrum analyzer for a full scale presentation of the carrier signal to establish a 0db reference level. (The carrier signal should be centered on the analyzer display)
d. Reduce the carrier insertion to maximum suppression and load the transmitter to rated average power using a 500 Hz tone in one of the sideband channels.
e. Remove 20 db of attenuation from the spectrum analyzer expanding the calibrated display from 0 thru -40 db to -20 thru -60 db.
f. Observe the display and record the level of the carrier and the 500 Hz tone level in the unwanted sideband.
g. Repeat parts d to f using the remaining sideband channel.

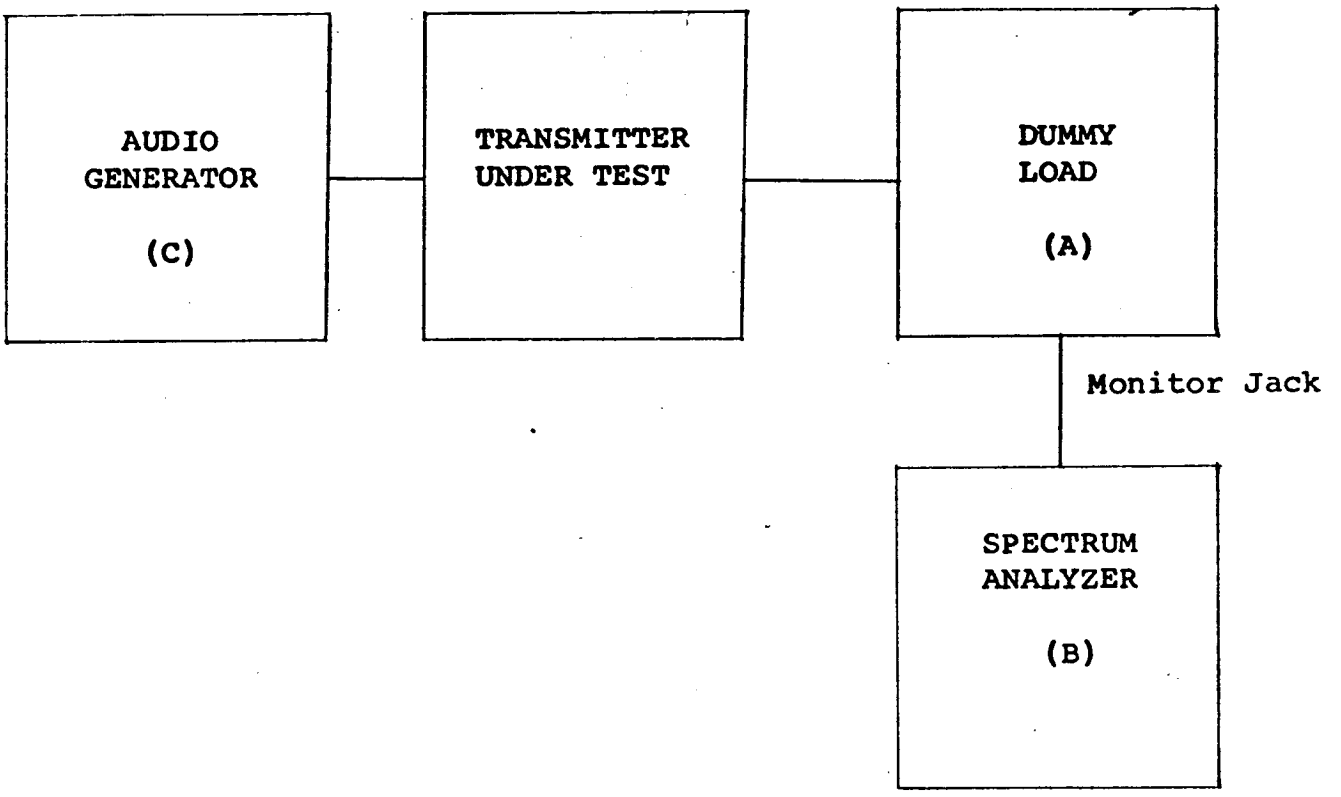


FIGURE 2.4

SIDEBAND REJECTION AND
CARRIER SUPPRESSION

2.5 HARMONIC SUPPRESSION

A. Performance Criteria

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

B. Test Arrangement

	Relevant Figure
1. Harmonic Suppression	2.5A

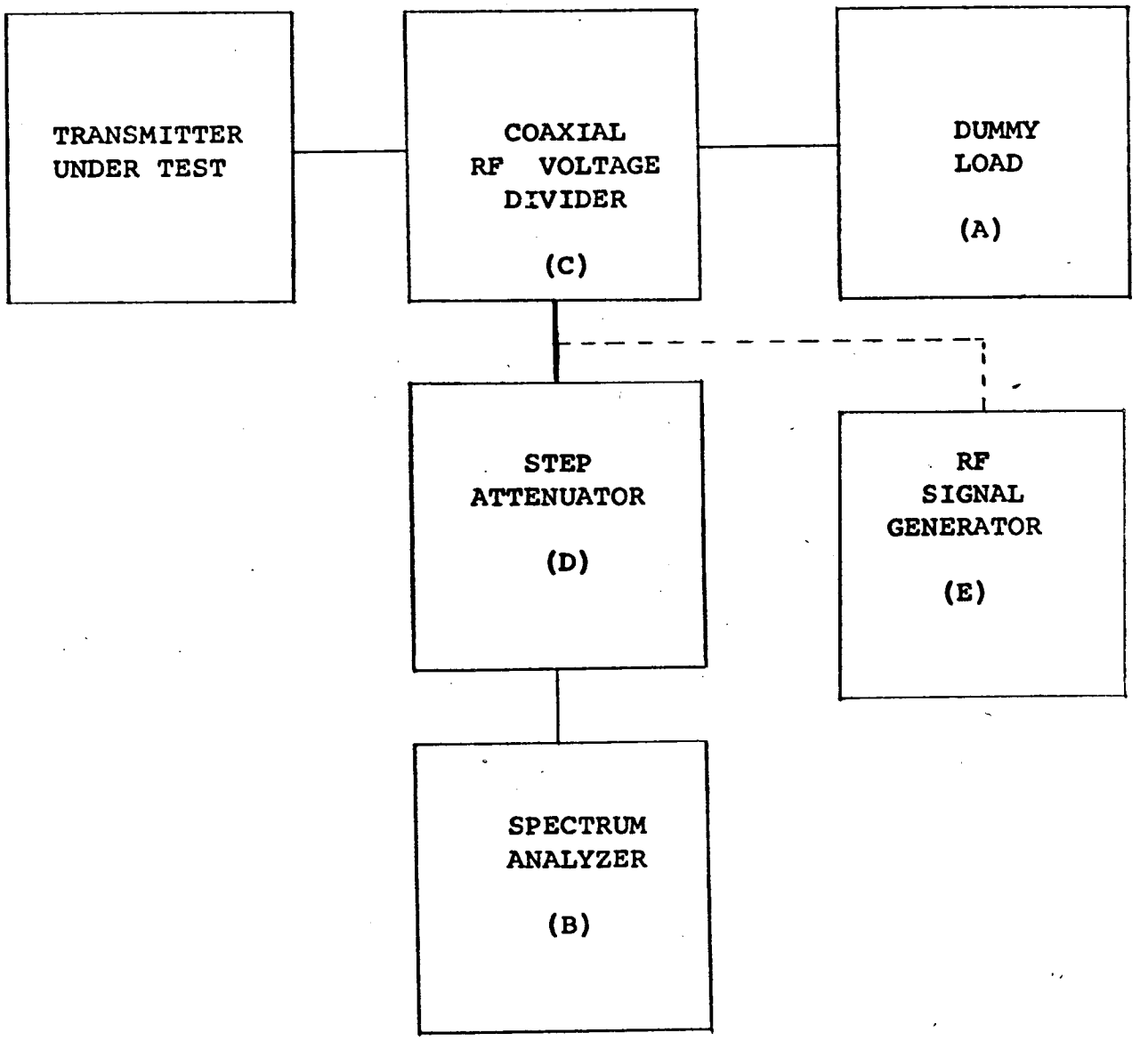
C. Test Equipment Required

	Schematic Reference	Item No. In Appendix 1
1. Dummy Load	A	2
2. Spectrum Analyzer	B	4
3. Coaxial RF Voltage Divider	C	8
4. Step Attenuator	D	6
5. RF Signal Generator	E	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 0 db reference level. Disconnect the step attenuator from the coaxial divider and correct the signal generator. 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 and signal generator to the frequency of the second harmonic. Set the signal generator imput 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.
. Remove 20 db of attenuator 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 the center frequency of each RF band



Dotted line indicates alternate connection

FIGURE 2.5

HARMONIC SUPPRESSION

3.0

APPENDIX 1
TEST EQUIPMENT LIST

ITEM NUMBER	DESCRIPTION	MANUFACTURER AND MODEL USED
1	Wattmeter	Bird Electronics Model 3127 Or equivalent
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	Two Tone Generator	TMC Model TTG-1 Or equivalent
6	Step Attenuator	Telonic TG950 Or equivalent
7	RF Signal Generator	Hawlett-Packard 606A Or equivalent
8	Coaxial RF Voltage Divider	TMC Fabricated

4.0

CONTRACT NO. _____

REPORT OF TEST ON: _____

TEST FOR: _____

TEST PERFORMED BY: _____

TEST INITIATED: _____

TEST COMPLETED: _____

TEST ENGINEER: _____

SUPERVISOR: _____

GOVERNMENT REPRESENTATIVE: _____

FINAL RELEASE: _____

4.1 TEST DATA SHEET FOR POWER OUTPUT AND VSWR PROTECTION

BAND	TEST FREQUENCY (MHz)	POWER OUTPUT (KW)	INPUT DRIVE LEVEL (dbm)

VSWR PROTECTION

(CHECK FOR SATISFACTORY OPERATION)

OVERLOAD ENERGIZES WHEN VSWR ≥ 3.00:1 _____

4.2 TEST DATA FOR NOISE AND HUM LEVEL AND SPURIOUS EMISSIONS

TEST FREQUENCY (MHz)	HUM LEVEL	NOISE LEVEL	SPURIOUS EMISSION
	(db below reference level)		

4.3 TEST DATA FOR INTERMODULATION

BAND	TEST FREQUENCY (MHz)	INTERMODULATION LEVEL (db)

4.4 TEST DATA FOR SIDEBAND REJECTION AND CARRIER SUPPRESSION

TEST FREQUENCY (MHz)	SIDEBAND USED	UNWANTED SIDEBAND REJECTION (db)	CARRIER SUPPRESSION (db)

4.5 TEST DATA FOR HARMONIC MEASUREMENTS

BAND	TEST FREQUENCY (MHz)	CARRIER REFERENCE (db)	HARMONIC LEVEL IN db BELOW CARRIER REFERENCE			
			2nd	3rd	4th	5th

REVISION SHEET

THE TECHNICAL MATERIEL CORP.
MAMARONECK NEW YORK

S 1266
LIST NO.

DATE	REV.	SHEET	EMN #	DESCRIPTION	APP.
6/22/70	Ø			ORIGINAL RELEASE FOR PRODUCTION	