

# KENWOOD

LSB-0219REV.A

Land Mobile Division

## SERVICE BULLETIN

SUBJECT: UHF TRANSCEIVERS CAPABLE OF 406-406.1 MHz TX      DATE: 09/04/98

The United States Coast Guard and NOAA have reported to the FCC an occurrence of unauthorized transmissions in the 406-406.1 MHz band. This band is reserved for use by distress beacons.

The purpose of this Service Bulletin is to remind all Kenwood Authorized Dealers and Servicers not to program the 406-406.1 MHz frequency range into any Kenwood transceiver capable of transmitting in this frequency range.

NOTE:  
This bulletin has been revised to correct the frequency range.

Printed in U.S.A.

Kenwood Service Corporation 2201 E. Dominguez St. Long Beach, Ca. 90810

(310) 761-8275  
(310) 605-5045 BBS

(310) 761-8290 FAX  
(310) 761-4498 Direct FAX

SUPERVISED BY:

Morton Flom, P. Eng.



December 29, 1998

DATE OF REPORT

AS PER LABEL DRAWING(S)

LOCATION

ATTACHED, EXHIBIT 1.

NAMEPLATE DRAWING

FCC ID: ALH24593130

EQUIPMENT IDENTIFICATION

sub-part  
2.1033(c) :

**M. Flom Associates, Inc. - Global Compliance Center**  
3356 North San Marcos Place, Suite 107, Chandler, Arizona 85224-1571  
www.goodnet.com/~mflom, (602) 926-3100, FAX: 926-3598



Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer, without additional charge.

15.27(a) SPECIAL ACCESSORIES.

The users manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.21 INFORMATION TO USER.

THE APPLICANT HAS BEEN CAUTIONED AS TO THE FOLLOWING:

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Required information per ISO/IEC Guide 25-1990, paragraph 13.2:

TEST REPORT

a) Laboratory: M. Flom Associates, Inc.  
3356 N. San Marcos Place, Suite 107  
Chandler, AZ 85224  
(Canada: IC 2044)

b) Report Number: d98c0080

c) Client: Kenwood Communications Corporation  
P.O. Box 22745  
Long Beach, CA 90801-5745

d) Identification: TK-880-3  
FCC ID: ALH24593130  
UHF FM Transceiver

e) EUT Condition: Not required unless specified in individual tests.

f) Report Date: December 29, 1998  
EUT Received: December 7, 1998

g) h, j, k): As indicated in individual tests.

i) Sampling method: No sampling procedure used.

j) Uncertainty: In accordance with MFA internal quality manual.

k) Supervised by: *Morton Flom, P. Eng.*

l) Results: The results presented in this report relate only to the item tested.

m) Reproduction: This report must not be reproduced, except in full, without written permission from this laboratory.

LIST OF GENERAL INFORMATION REQUIRED FOR CERTIFICATION

IN ACCORDANCE WITH FCC RULES AND REGULATIONS,  
VOLUME II, PART 2 AND TO

90

Sub-part 2.1033

(c) (1) : NAME AND ADDRESS OF APPLICANT:

Kenwood Communications Corporation  
2201 E. Dominguez St  
P.O. Box 22745  
Long Beach, CA 90801-5745

MANUFACTURER:

Kenwood Electronics Technologies Pte. Ltd.  
1 Ang Mo Kio Street 63  
Singapore 569110

(c) (2) : FCC ID:

ALH24593130

MODEL NO:

TK-880-3

(c) (3) : INSTRUCTION MANUAL(S):

PLEASE SEE ATTACHED EXHIBITS

(c) (4) : TYPE OF EMISSION:

16K0F3E, 11K0F3E

(c) (5) : FREQUENCY RANGE, MHZ:

400 to 430  
EXCEPT 406 to 406.1

(c) (6) : POWER RATING, watts:

25

Switchable Variable x N/A

(c) (7) : MAXIMUM POWER RATING, watts: 500

Subpart 2.1033 (continued)  
(c) (8) : VOLTAGES & CURRENTS IN ALL ELEMENTS IN FINAL R. F. STAGE, INCLUDING FINAL TRANSISTOR OR SOLID STATE DEVICE:

COLLECTOR CURRENT, A = per manual  
COLLECTOR VOLTAGE, Vdc = per manual  
SUPPLY VOLTAGE, Vdc = 13.6

(c) (9) : TUNE-UP PROCEDURE:

PLEASE SEE ATTACHED EXHIBITS

(c) (10) : CIRCUIT DIAGRAM/CIRCUIT DESCRIPTION:  
Including description of circuitry & devices provided for determining and stabilizing frequency, for suppression of spurious radiation, for limiting modulation and limiting power.

PLEASE SEE ATTACHED EXHIBITS

(c) (11) : LABEL INFORMATION:

PLEASE SEE ATTACHED EXHIBITS

(c) (12) : PHOTOGRAPHS:

PLEASE SEE ATTACHED EXHIBITS

(c) (13) : DIGITAL MODULATION DESCRIPTION:

ATTACHED EXHIBITS  
x N/A

(c) (14) : TEST AND MEASUREMENT DATA:

FOLLOWS

Sub-part 2.1033(c) (14):

TEST AND MEASUREMENT DATA

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II; Part 2, Sub-part J, Sections 2.947, 2.1033(c), 2.1041, 2.1046, 2.1047, 2.1079, 2.1051, 2.1053, 2.1055, 2.1057 and the following individual Parts:

- 21 - Domestic Public Fixed Radio Services
- 22 - Public Mobile Services
- 22 Subpart H - Cellular Radiotelephone Service
- 22.901(d) - Alternative technologies and auxiliary services
- 23 - International Fixed Public Radiocommunication services
- 24 - Personal Communications Services
- 74 Subpart H - Low Power Auxiliary Stations
- 80 - Stations in the Maritime Services
- 80 Subpart E - General Technical Standards
- 80 Subpart F - Equipment Authorization for Compulsory Ships
- 80 Subpart K - Private Coast Stations and Marine Utility Stations
- 80 Subpart S - Compulsory Radiotelephone Installations for Small Passenger Boats
- 80 Subpart T - Radiotelephone Installation Required for Vessels on the Great Lakes
- 80 Subpart U - Radiotelephone Installations Required by the Bridge-to-Bridge Act
- 80 Subpart V - Emergency Position Indicating Radiobeacons (EPIRB'S)
- 80 Subpart W - Global Maritime Distress and Safety System (GMDSS)
- 80 Subpart X - Voluntary Radio Installations
- 87 - Aviation Services
- 90 - Private Land Mobile Radio Services x
- 94 - Private Operational-Fixed Microwave Service (GMRs)
- 95 Subpart A - General Mobile Radio Service (GMRs)
- 95 Subpart C - Radio Control (R/C) Radio Service
- 95 Subpart D - Citizens Band (CB) Radio Service
- 95 Subpart E - Family Radio Service
- 95 Subpart F - Interactive Video and Data Service (IVDS)
- 101 - Fixed Microwave Services



Measurement results, unless otherwise noted, are worst case measurements.

Prior to testing, the EUT was tuned up in accordance with the manufacturer's alignment procedures. All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing.

In accordance with ANSI C63.4-1992, section 6.1.9, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104 °F) unless the particular equipment requirements specify testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Except as noted herein, the following conditions and procedures were observed during the testing:

STANDARD TEST CONDITIONS  
and  
ENGINEERING PRACTICES

SUPERVISED BY:

Morton Flom, P. Eng.



POWER SETTING	High
R. F. POWER, WATTS	25

FREQUENCY OF CARRIER, MHZ = 418.1, 400.1, 429.9

MEASUREMENT RESULTS  
(Worst case)

1. The EUT was connected to a resistive coaxial attenuator of normal load impedance, and the unmodulated output power was measured by means of an R. F. Power Meter.
2. Measurement accuracy is  $\pm 3\%$ .

MEASUREMENT PROCEDURE

PAGE NO. 6 of 37.

NAME OF TEST: Carrier Output Power (Conducted)

SPECIFICATION: 47 CFR 2.1046(a)

GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.1

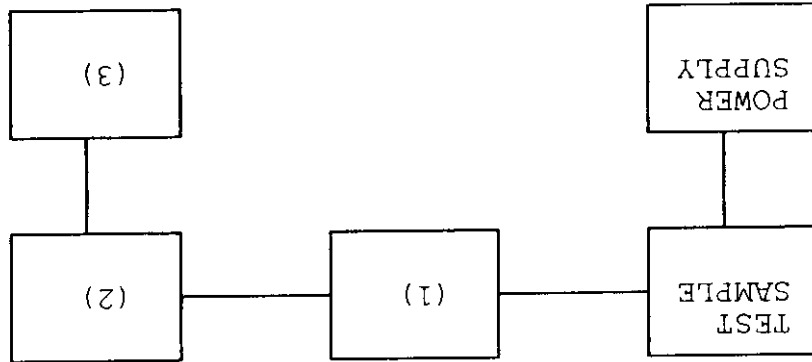
TEST EQUIPMENT: As per attached page

100020	HP 8901A	FREQUENCY MODE	2105A01087
100019	HP 5334B		2704A00347
100042	HP 5383A		1628A00959
<b>FREQUENCY COUNTER</b>			
			(3)

100020	HP 8901A	POWER MODE	2105A01087
100039	HP 436A		2709A26776
100014	HP 435A		1733A05836
<b>POWER METERS</b>			
			(2)

100113	Sierra	661A-3D	1059
100069	Bird	8329 (30 dB)	1006
100123	Narda	766-10	7802A
100122	Narda	766-10	7802
<b>COAXIAL ATTENUATOR</b>			
			(1)

Asset Description s/n



TEST 1: R. F. POWER OUTPUT  
 TEST 2: FREQUENCY STABILITY

**TRANSMITTER POWER CONDUCTED MEASUREMENTS**

SUPERVISED BY:

Morton Flom, P. Eng.



FREQUENCY OF CARRIER, MHZ = 418.1, 400.1, 429.9  
 SPECTRUM SEARCHED, GHZ = 0 to 10 x Fc  
 MAXIMUM RESPONSE, HZ = 3160  
 ALL OTHER EMISSIONS = ≥ 20 DB BELOW LIMIT  
 LIMIT(S), dBc = -(43+10xLOG P) = -57 (25 watts)

3. MEASUREMENT RESULTS: ATTACHED FOR WORST CASE

2. The magnitude of spurious emissions that are attenuated more than 20 db below the permissible value need not be specified.

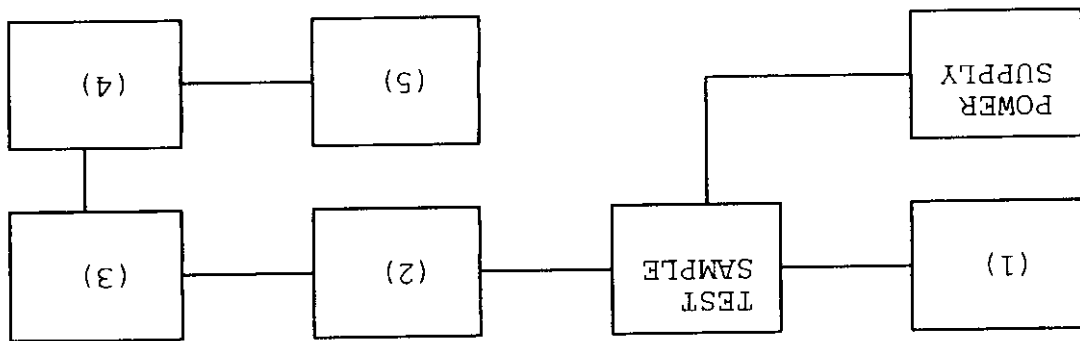
1. The emissions were measured for the worst case as follows:  
 (a): within a band of frequencies defined by the carrier frequency plus and minus one channel.  
 (b): from the lowest frequency generated in the EUT and to at least the 10th harmonic of the carrier frequency, or 40 GHz, whichever is lower.

MEASUREMENT PROCEDURE

PAGE NO. 8 of 37.  
 NAME OF TEST: Unwanted Emissions (Transmitter Conducted)  
 SPECIFICATION: 47 CFR 2.1051  
 GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.13  
 TEST EQUIPMENT: As per attached page

TEST A. OCCUPIED BANDWIDTH (IN-BAND SPURIOUS)  
 TEST B. OUT-OF-BAND SPURIOUS

TRANSMITTER SPURIOUS EMISSION



- (1) AUDIO OSCILLATOR/GENERATOR
  - 100010 HP 204D
  - 100017 HP 8903A
  - 100012 HP 3312A

1105A04683  
 2216A01753  
 1432A11250

- (2) COAXIAL ATTENUATOR
  - 100122 Narda 766-10
  - 100123 Narda 766-10
  - 100069 Bird 8329 (30 dB)
  - 100113 Sierra 661A-3D

7802  
 7802A  
 1006  
 1059

- (3) FILTERS; NOTCH, HP, LP, BP
  - 100126 Eagle TNF-1
  - 100125 Eagle TNF-1
  - 100124 Eagle TNF-1

100-250  
 50-60  
 250-850

- (4) SPECTRUM ANALYZER
  - 100048 HP 8566B
  - 100029 HP 8563E

2511A01467  
 3213A00104

- (5) SCOPE
  - 100058 HP 1741A
  - 100030 HP 54502A
  - 100071 Tektronix 935

2251A09356  
 2927A00209  
 1935-B011343

NAME OF TEST: Unwanted Emissions (Transmitter Conducted)  
 998c0195: 1998-Dec-16 Wed 11:53:00  
 STATE: 2: High Power

FREQUENCY TUNED, MHZ	EMISSION, MHZ	FREQUENCY LEVEL, dBm	LEVEL, dBc	MARGIN, dB
418.100000	836.260000	-21.3	-65.2	-8.3
418.100000	1254.351000	-21.4	-65.3	-8.4
418.100000	1672.371000	-19.4	-63.3	-6.4
418.100000	2090.832000	-20.3	-64.2	-7.3
418.100000	2508.534000	-22.4	-66.3	-9.4
418.100000	2926.866000	-23.8	-67.7	-10.8
418.100000	3345.234000	-23.3	-67.2	-10.3
418.100000	3762.766000	-22.4	-66.3	-9.4
418.100000	4181.187000	-23	-66.9	-10
418.100000	4599.026000	-22.3	-66.2	-9.3
418.100000	5017.223000	-22.6	-66.5	-9.6
418.100000	5435.586000	-21.5	-65.4	-8.5
418.100000	5853.652000	-17.3	-61.2	-4.3
418.100000	6271.312000	-17	-60.9	-4

1. A description of the measurement facilities was filed with the FCC and was found to be in compliance with the requirements of Section 15.38, by letter from the FCC dated March 3, 1997, FILE 31040/SIT. All pertinent changes will be reported to the Commission by up-date prior to March 2000.
2. At first, in order to locate all spurious frequencies and approximate amplitudes, and to determine proper equipment functioning, the test sample was set up at a distance of three meters from the test instrument. Valid spurious signals were determined by switching the power on and off.
3. In the field, the test sample was placed on a wooden turntable above ground at three (or thirty) meters away from the search antenna. Excess power leads were coiled near the power supply.
4. The cables were oriented in order to obtain the maximum response. At each emission frequency, the turntable was rotated and the search antennas were raised and lowered vertically.
5. The emission was observed with both a vertically polarized and a horizontally polarized search antenna and the worst case was used.
6. The field strength of each emission within 20 dB of the limit was recorded and corrected with the appropriate cable and transducer factors.
7. The worst case for all channels is shown.
8. Measurement results: ATTACHED FOR WORST CASE

MEASUREMENT PROCEDURE

PAGE NO. 11 of 37.

NAME OF TEST: Field Strength of Spurious Radiation

SPECIFICATION: 47 CFR 2.1053(a)

GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.12

TEST EQUIPMENT: As per attached page





SUPERVISED BY:

Morton Flom, P. Eng.



2nd to 10th

<-60

EMISSION, MHZ/HARMONIC

SPURIOUS LEVEL, dBc

ALL OTHER EMISSIONS

=  $\geq$  20 dB BELOW LIMIT

NAME OF TEST:

Field Strength of Spurious Radiation

PAGE NO.

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1. The EUT and test equipment were set up as shown on the following page, with the Spectrum Analyzer connected.
2. For EUTs supporting audio modulation, the audio signal generator was adjusted to the frequency of maximum response and with output level set for  $\pm 2.5$  KHz deviation (or 50% modulation). With level constant, the signal level was increased 16 db.
3. For EUTs supporting digital modulation, the digital modulation mode was operated to its maximum extent.
4. The Occupied Bandwidth was measured with the Spectrum Analyzer controls set as shown on the test results.
5. MEASUREMENT RESULTS: ATTACHED

MEASUREMENT PROCEDURE

14 of 37.	<u>PAGE NO.</u>
Emission Masks (Occupied Bandwidth)	<u>NAME OF TEST:</u>
47 CFR 2.1049(c) (1)	<u>SPECIFICATION:</u>
ANSI/TIA/EIA-603-1992, Paragraph 2.2.11	<u>GUIDE:</u>
As per previous page	<u>TEST EQUIPMENT:</u>

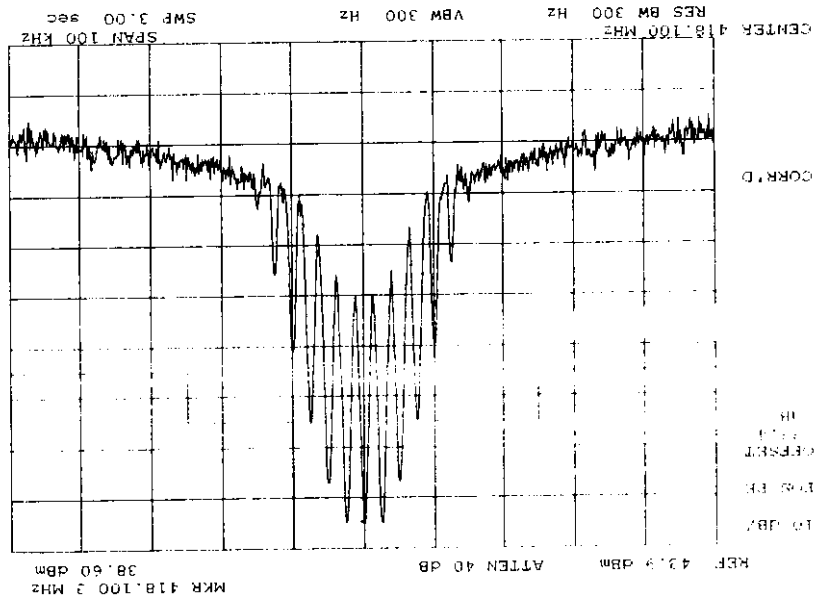


SUPERVISED BY:

Morton Flom, P. Eng.

*Morton Flom*

POWER: HIGH  
 MODULATION: HIGH  
 VOICE: 2500 HZ SINE WAVE  
 MASK: B, VHF/UHF 25KHZ,  
 W/LPF



NAME OF TEST: Emission Masks (Occupied Bandwidth)  
 STATE: 2: High Power  
 998c0193: 1998-Dec-16 wed 10:51:00

PAGE NO.

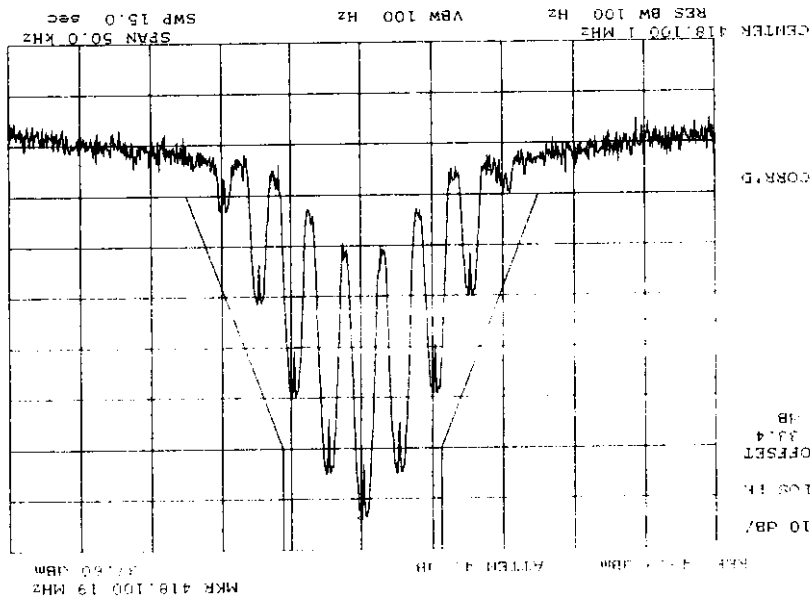
16 of 37.

SUPERVISED BY:

Morton Flom, P. Eng.

*M. Flom*

POWER: HIGH  
MODULATION: VOICE: 2500 HZ SINE WAVE  
MASK: D, VHF/UHF 12.5KHZ BW



NAME OF TEST: Emission Masks (Occupied Bandwidth)  
998C0194: 1998-Dec-16 Wed 11:31:00  
STATE: 2: High Power

PAGE NO.

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SUPERVISED BY:

Morton Flom, P. Eng.



step f, dbm  
step h, dbm  
step l, dbm

= -7.6  
= -27.6  
= 22.6

LEVELS MEASURED:

8. The carrier on-time as referenced in TIA/EIA-603 steps m, n, and o was captured and plotted. The carrier off-time as referenced in TIA/EIA-603 steps p, q, r, and s was captured and plotted.

recorded as step l.

7. The 30 dB attenuator was removed, the transmitter was turned on, and the level of the carrier at the output of the combiner was

6. The oscilloscope was setup using TIA/EIA-603 steps j and k as a guide, and to either 10 ms/div (UHF) or 5 ms/div (VHF).

5. An RF signal generator (1) modulated with a 1 kHz tone at either 25, 12.5, or 6.25 kHz deviation, and set to the same frequency as the assigned transmitter frequency, (2) was adjusted to a level -20 dB below the level recorded for step f, as measured at the output of the combiner. This level was then fixed for the remainder of the test and is recorded at step h.

4. The transmitter was turned off.

recorded as step f.

3. Sufficient attenuation was provided so that the transmitter carrier level measured at the output of the combiner was 40 dB below the maximum input level of the test receiver. This level was

2. The transmitter was turned on.

1. The EUT was setup as shown on the attached page, following TIA/EIA-603 steps a, b, and c as a guide.

MEASUREMENT PROCEDURE

TEST EQUIPMENT:

As per attached page

GUIDE:

ANSI/TIA/EIA-603-1992, Paragraph 2.2.19

SPECIFICATION:

47 CFR 90.214

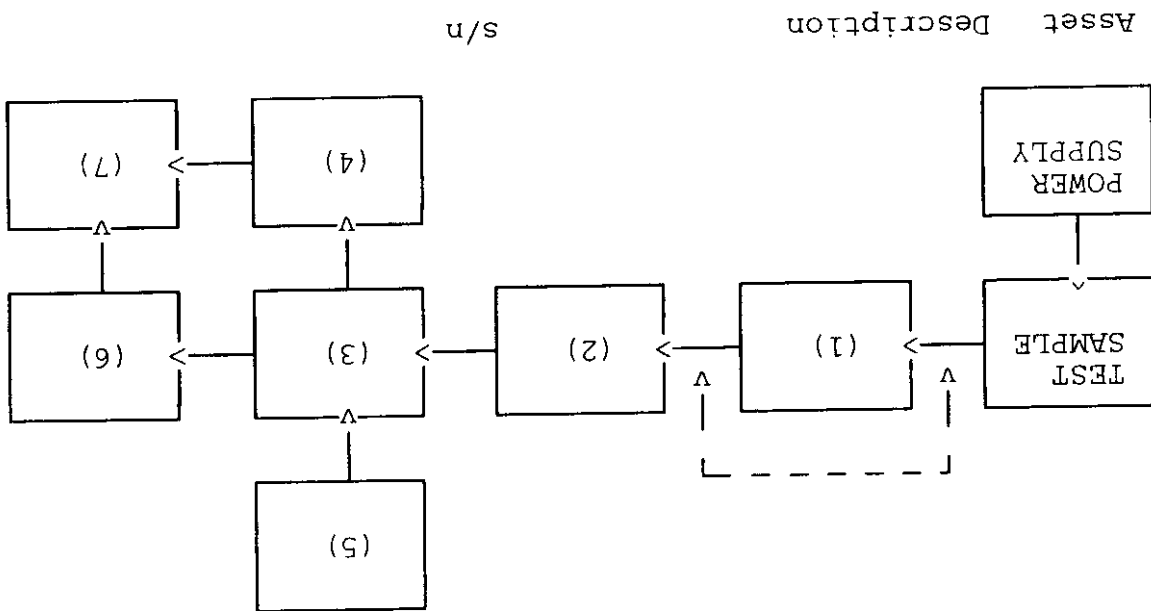
NAME OF TEST:

Transient Frequency Behavior

PAGE NO.

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TRANSIENT FREQUENCY BEHAVIOR



Asset Description s/n

(1)	ATTENUATOR (Removed after 1st step)	100112 Philco 30 dB	989
(2)	ATTENUATOR	100112 Philco 30 dB	989
		100172 Bird 30 dB	989
		100122 Narda 10 dB	7802
		100123 Narda 10 dB	7802A
		100110 Kay Variable	145-387
(3)	COMBINER	100154 4 x 25 Ω COMBINER	154
(4)	CRYSTAL DETECTOR	100159 HP 8470B	1822A10054
(5)	RF SIGNAL GENERATOR	100018 HP 8656A	2228A03472
		100031 HP 8656A	2402A06180
		100067 HP 8920A	3345U01242
(6)	MODULATION ANALYZER	100020 HP 8901A	2105A01087
(7)	SCOPE	100030 HP 54502A	2927A00209

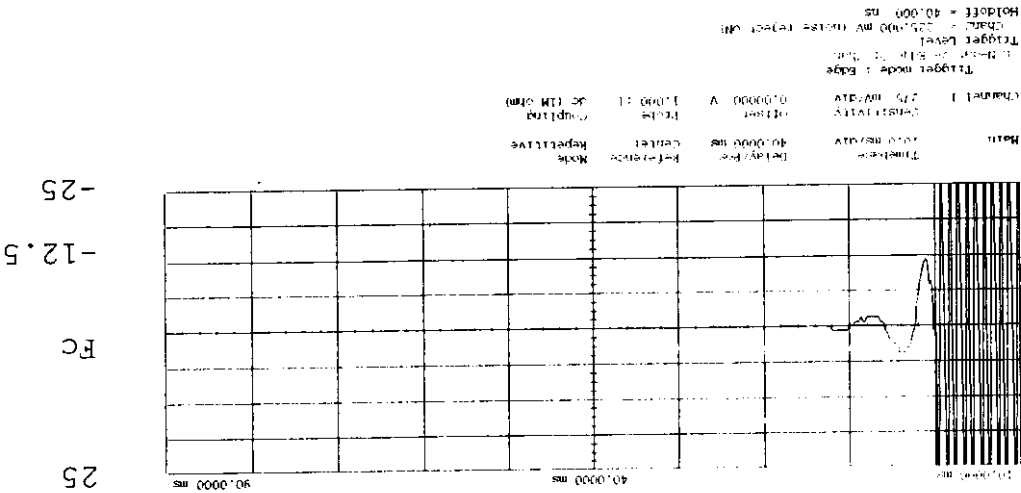
SUPERVISED BY:

Morton Flom, P. Eng.

*M. Flom P. Eng.*

n/a  
Ref Gen=25 KHZ Deviation  
CARRIER ON TIME

POWER:  
MODULATION:  
DESCRIPTION:



NAME OF TEST: Transient Frequency Behavior  
g98c0196: 1998-Dec-16 Wed 12:10:00  
STATE: 0:General



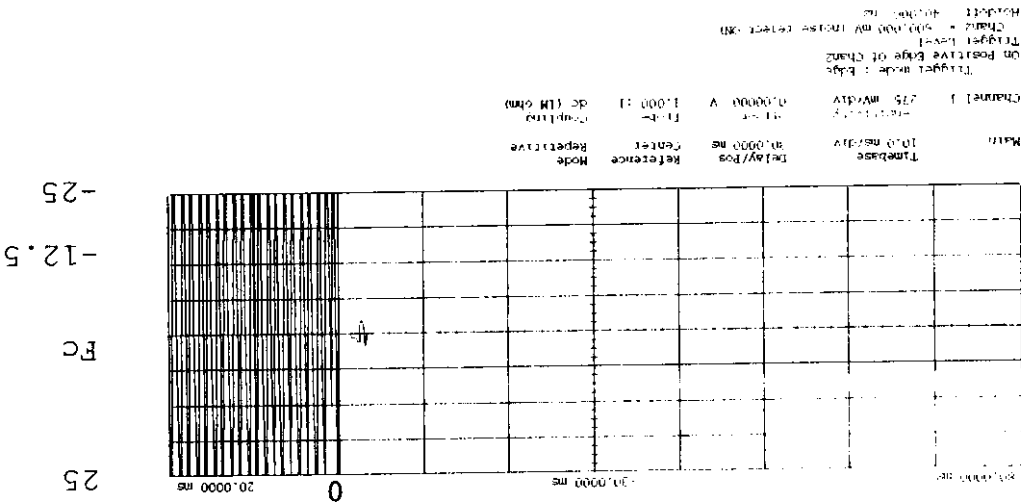
SUPERVISED BY:

Morton Flom, P. Eng.

*Morton Flom*

POWER: n/a  
MODULATION: Ref Gen=25 KHZ Deviation  
DESCRIPTION: CARRIER OFF TIME

POWER:  
MODULATION:  
DESCRIPTION:



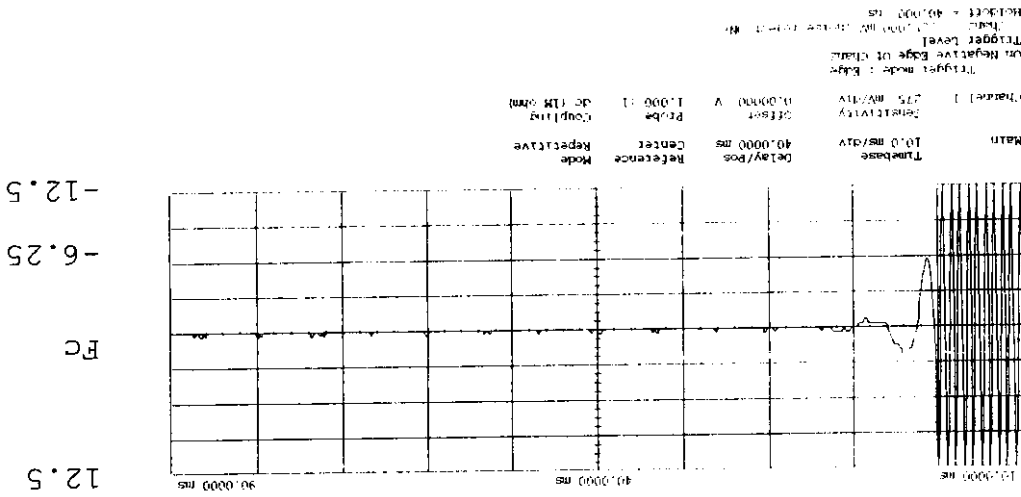
NAME OF TEST: Transient Frequency Behavior  
STATE: 0:General  
g98c0197: 1998-Dec-16 Wed 12:12:00

SUPERVISED BY:

Morton Flom, P. Eng.

*Morton Flom*

POWER: n/a  
MODULATION: Ref Gen=12.5 KHz Deviation  
DESCRIPTION: CARRIER ON TIME



NAME OF TEST: Transient Frequency Behavior  
998c0200: 1998-Dec-16 Wed 12:18:00  
STATE: 0:General



1. The EUT and test equipment were set up such that the audio input was connected at the input to the modulation limiter, and the modulated stage.
2. The audio output was connected at the output to the modulated stage.
3. MEASUREMENT RESULTS: ATTACHED

MEASUREMENT PROCEDURE

PAGE NO. 24 of 37.

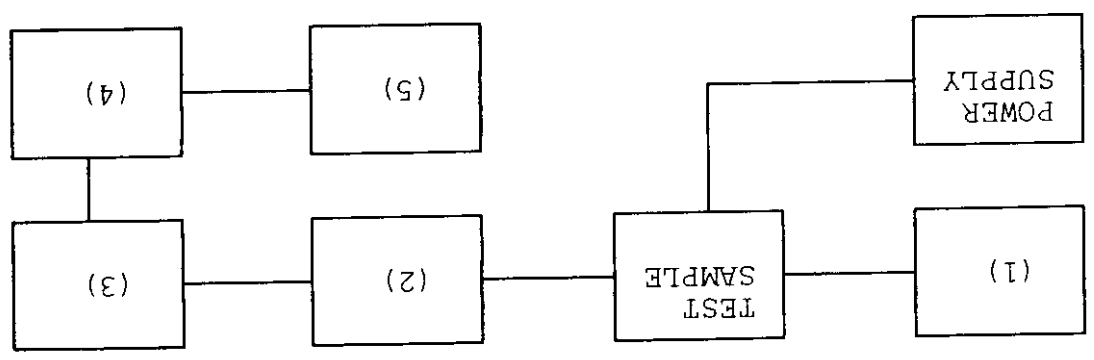
NAME OF TEST: Audio Low Pass Filter (Voice Input)

SPECIFICATION: 47 CFR 2.1047(a)

GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.15

TEST EQUIPMENT: As per attached page

Asset	Description	s/n
(1)	LINE IMPEDANCE STABILIZATION NETWORK	1105A04683
x	10010 HP 204D	2216A01753
x	10017 HP 8903A	US36002064
x	10018 HP 33120A	
(2)	COAXIAL ATTENUATOR	7802
	100122 NARDA 766-10	7802A
	100123 NARDA 766-10	1059
x	100113 SIERRA 661A-3D	10066
	100069 BIRD 8329 (30 dB)	
(3)	MODULATION ANALYZER	2105A01087
x	100020 HP 8901A	
(4)	AUDIO ANALYZER	2216A01753
x	100017 HP 8903A	
(5)	SCOPE	2215A09356
	100058 HP 1741A	
	100071 Tektronix 935	1935-B011343



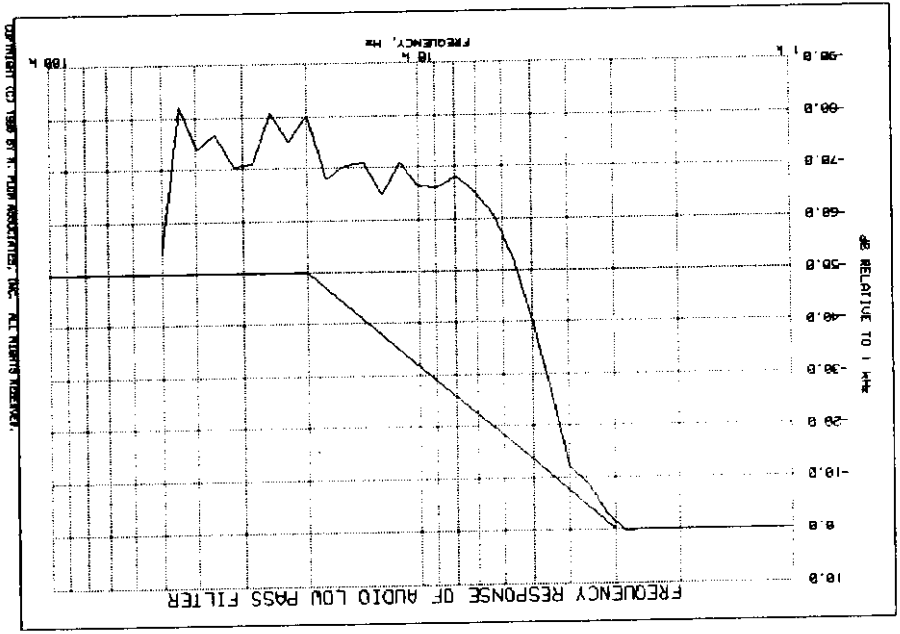
TEST A. MODULATION CAPABILITY/DISTORTION  
 TEST B. AUDIO FREQUENCY RESPONSE  
 TEST C. HUM AND NOISE LEVEL  
 TEST D. RESPONSE OF LOW PASS FILTER  
 TEST E. MODULATION LIMITING

TRANSMITTER TEST SET-UP

SUPERVISED BY:

Morton Flom, P. Eng.

*M. Flom P. Eng.*



NAME OF TEST: Audio Low Pass Filter (Voice Input)  
 98c0036: 1998-Dec-08 Tue 07:35:00  
 STATE: 0:General

1. The EUT and test equipment were set up as shown on the following page.
2. The audio signal generator was connected to the audio input circuit/microphone of the EUT.
3. The audio signal input was adjusted to obtain 20% modulation at 1 kHz, and this point was taken as the 0 dB reference level.
4. With input levels held constant and below limiting at all frequencies, the audio signal generator was varied from 100 Hz to 50 kHz.
5. The response in dB relative to 1 kHz was then measured, using the HP 8901A Modulation Analyzer.
6. MEASUREMENT RESULTS: ATTACHED

MEASUREMENT PROCEDURE

PAGE NO. 27 OF 37.

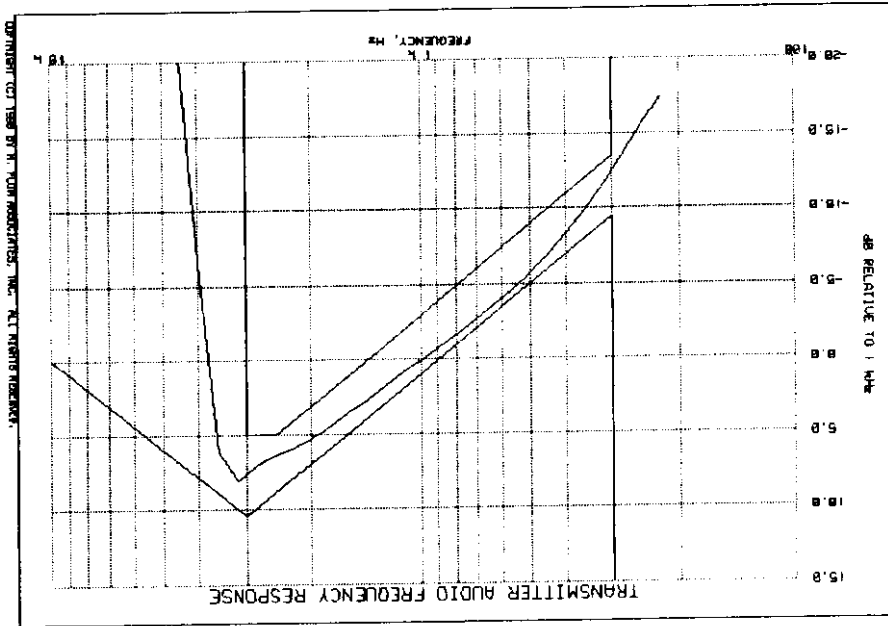
NAME OF TEST: Audio Frequency Response

SPECIFICATION: 47 CFR 2.1047(a)

GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.6

TEST EQUIPMENT: As per previous page

NAME OF TEST: Audio Frequency Response  
 g98c0037:1998-Dec-08 Tue 07:38:00  
 STATE: 0:General



Additional points:

FREQUENCY, Hz	LEVEL, dB
300	-12.51
20000	-27.11
30000	-27.45
50000	-27.38

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1. The signal generator was connected to the input of the EUT as for "Frequency Response of the Modulating Circuit."
2. The modulation response was measured for each of three frequencies (one of which was the frequency of maximum response), and the input voltage was varied and was observed on an HP 8901A Modulation Analyzer.
3. The input level was varied from 30% modulation ( $\pm 1.5$  KHZ deviation) to at least 20 dB higher than the saturation point.
4. Measurements were performed for both negative and positive modulation and the respective results were recorded.
5. MEASUREMENT RESULTS: ATTACHED

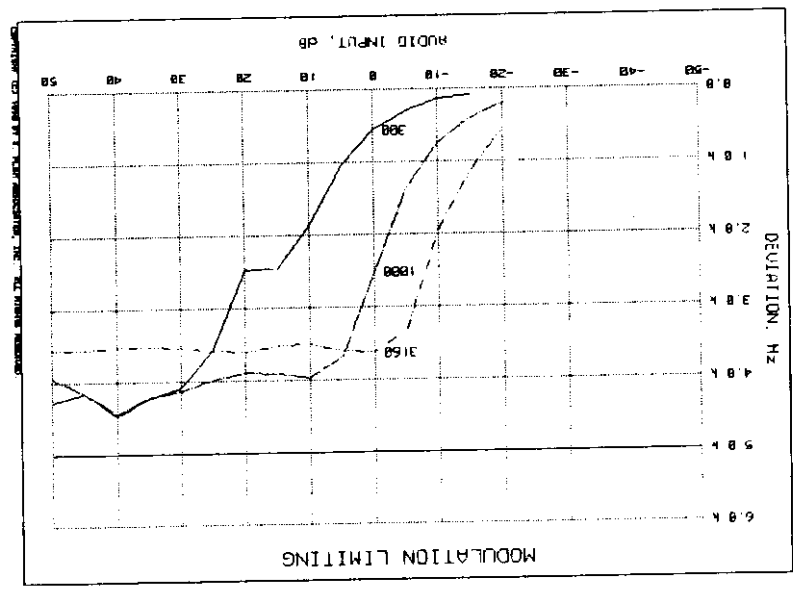
MEASUREMENT PROCEDURE

<p>NAME OF TEST: Modulation Limiting</p> <p>SPECIFICATION: 47 CFR 2.1047(b)</p> <p>GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.3</p> <p>TEST EQUIPMENT: As per previous page</p>	<p>PAGE NO. 29 of 37.</p>
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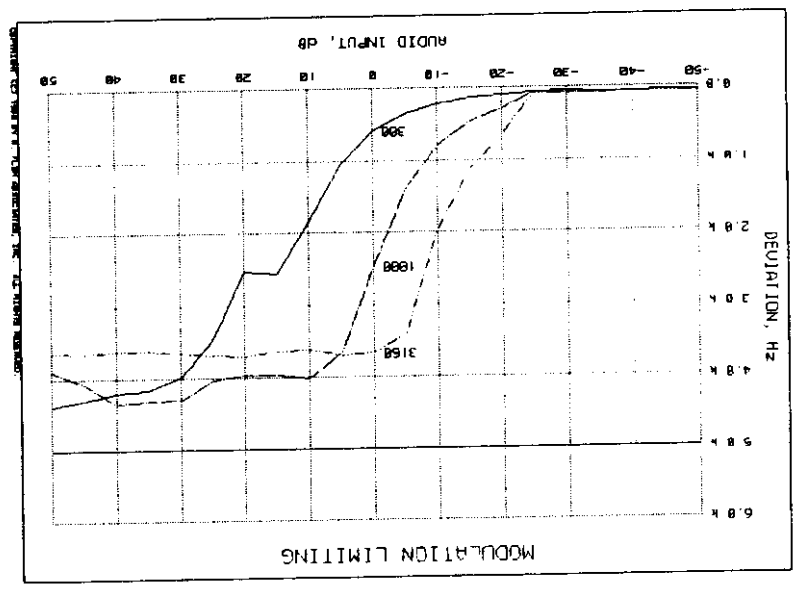
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*M. Flom P. Eng.*



Negative Peaks:



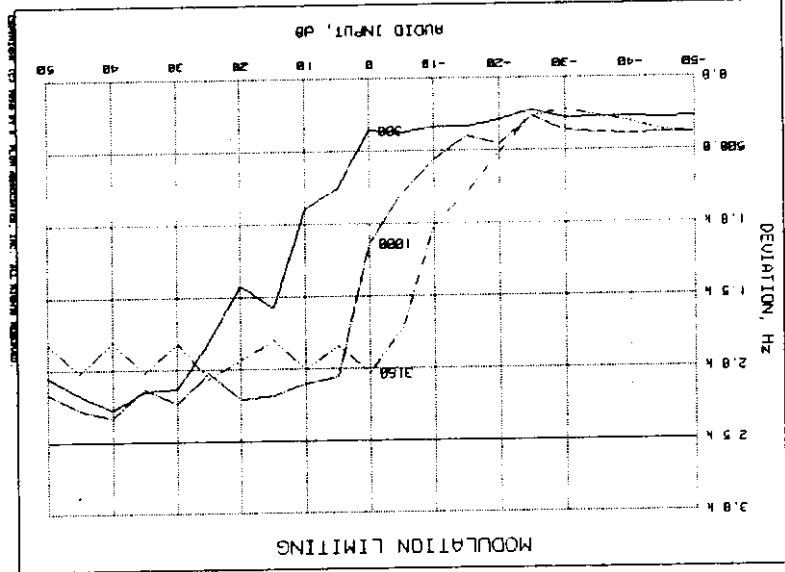
Positive Peaks:

NAME OF TEST: Modulation Limiting  
 988C0038: 1998-Dec-08 Tue 07:44:00  
 STATE: 0:General

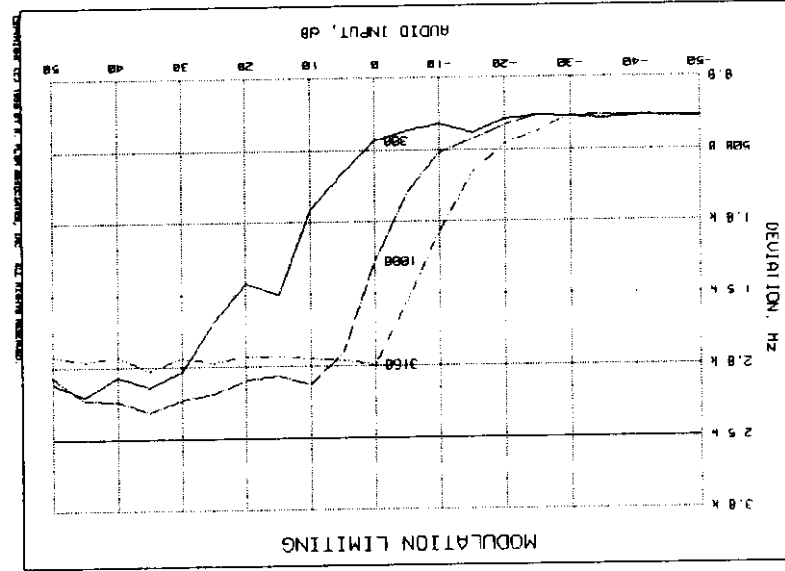
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Morton Flom, P. Eng.

*M. Flom*



Negative Peaks:



Positive Peaks:

NAME OF TEST: Modulation Limiting  
 98c0044: 1998-Dec-08 Tue 08:04:00  
 STATE: 0:General

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1. The EUT and test equipment were set up as shown on the following page.
2. With all power removed, the temperature was decreased to -30°C and permitted to stabilize for three hours. Power was applied and the maximum change in frequency was noted within one minute.
3. With power OFF, the temperature was raised in 10°C steps. The sample was permitted to stabilize at each step for at least one-half hour. Power was applied and the maximum frequency change was noted within one minute.
4. The temperature tests were performed for the worst case.
5. MEASUREMENT RESULTS: ATTACHED

MEASUREMENT PROCEDURE

PAGE NO. 32 of 37.

NAME OF TEST: Frequency Stability (Temperature Variation)

SPECIFICATION: 47 CFR 2.1055(a) (1)

GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.2

TEST CONDITIONS: As Indicated

TEST EQUIPMENT: As per previous page

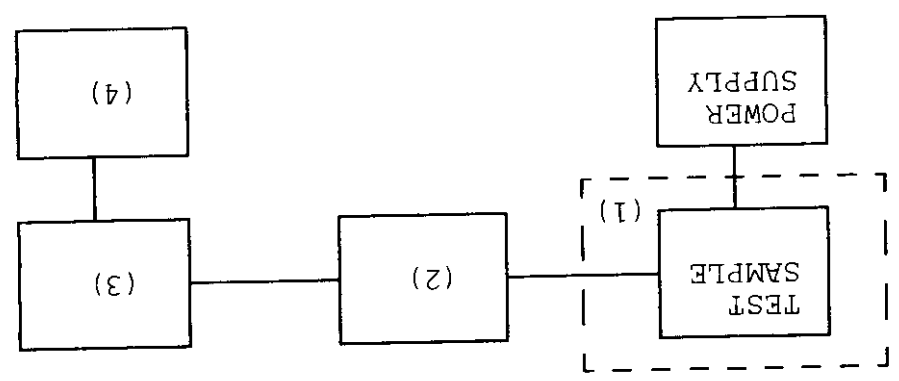
100042 HP 5383A	X	100020 HP 8901A	1628A00959
100019 HP 5334B	X		2704A00347
			2105A01087

100014 HP 435A POWER METER	X	100020 HP 8901A POWER MODE	1733A05839
100039 HP 436A POWER METER	X		2709A26776
			2105A01087

100122 NARDA 766-10		100069 BIRD 8329 (30 dB)	7802
100123 NARDA 766-10			7802A
100113 SIERRA 661A-3D	X		1059
			10066

100027 Tenny Temp. Chamber	X	100 Weber Humidity Chamber	9083-765-234
		100 L.A.B. RVH 18-100	

Asset Description s/n



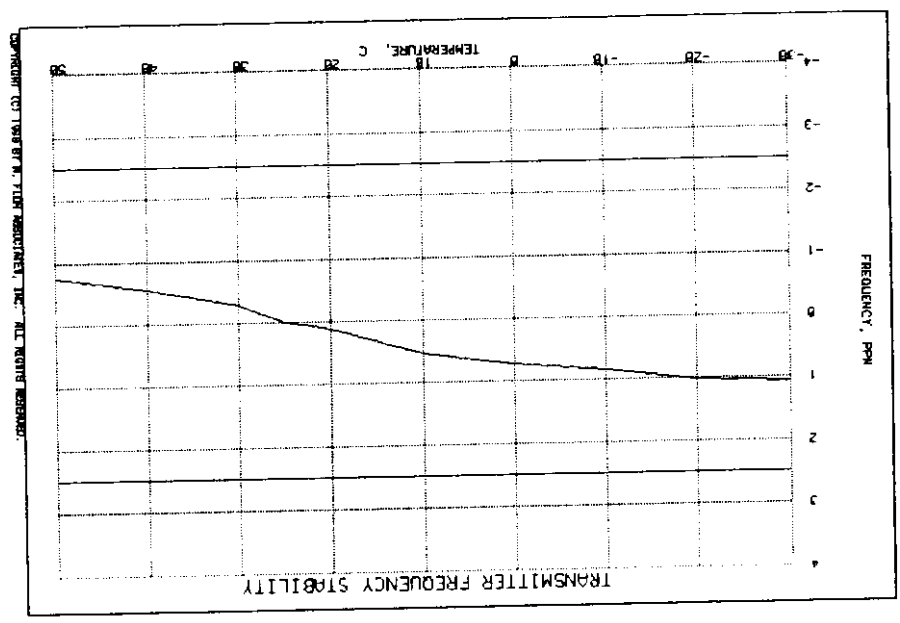
- TEST A. OPERATIONAL STABILITY
- TEST B. CARRIER FREQUENCY STABILITY
- TEST C. OPERATIONAL PERFORMANCE STABILITY
- TEST D. HUMIDITY
- TEST E. VIBRATION
- TEST F. ENVIRONMENTAL TEMPERATURE
- TEST G. FREQUENCY STABILITY: TEMPERATURE VARIATION
- TEST H. FREQUENCY STABILITY: VOLTAGE VARIATION

TRANSMITTER TEST SET-UP

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*M. Flom*



NAME OF TEST: Frequency Stability (Temperature Variation)  
 STATE: 0:General  
 g98c0165: 1998-Dec-17 Thu 13:34:00

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PAGE NO.

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% of STV	Voltage	Frequency, MHz	Change, Hz	Change, ppm
67	9.2	418.100000	0	0.00
115	15.87	418.100000	0	0.00
100	13.8	418.100000	0	0.00
85	11.73	418.100010	10	0.02

LIMIT, ppm = 2.5  
 LIMIT, Hz = 1045  
 BATTERY END POINT (Voltage) = 9.2

RESULTS: Frequency Stability (Voltage Variation)  
 998C0047: 1998-Dec-08 Tue 08:20:27  
 STATE: 0:General

1. The EUT was placed in a temperature chamber at 25±5°C and connected as for "Frequency Stability - Temperature Variation" test.
2. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.
3. The variation in frequency was measured for the worst case.

MEASUREMENT PROCEDURE

PAGE NO. \_\_\_\_\_  
 NAME OF TEST: Frequency Stability (Voltage Variation)  
 SPECIFICATION: 47 CFR 2.1055(b) (1)  
 GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.2  
 TEST EQUIPMENT: As per previous page



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MODULATION = 11K0F3E  
 NECESSARY BANDWIDTH CALCULATION:  
 $\frac{\text{MAXIMUM MODULATION (M), KHZ}}{\text{MAXIMUM DEVIATION (D), KHZ}}$  = 3  
 $\frac{\text{CONSTANT FACTOR (K)}}{\text{MAXIMUM DEVIATION (D), KHZ}}$  = 2.5  
 $\text{NECESSARY BANDWIDTH (BN), KHZ}$  = 1  
 $(2 \times M) + (2 \times D \times K)$  = 11.0

MODULATION = 16K0F3E  
 NECESSARY BANDWIDTH CALCULATION:  
 $\frac{\text{MAXIMUM MODULATION (M), KHZ}}{\text{MAXIMUM DEVIATION (D), KHZ}}$  = 3  
 $\frac{\text{CONSTANT FACTOR (K)}}{\text{MAXIMUM DEVIATION (D), KHZ}}$  = 5  
 $\text{NECESSARY BANDWIDTH (BN), KHZ}$  = 1  
 $(2 \times M) + (2 \times D \times K)$  = 16.0

PAGE NO. 37 of 37.  
 NAME OF TEST: Necessary Bandwidth and Emission Bandwidth  
 SPECIFICATION: 47 CFR 2.202 (g)

CERTIFYING ENGINEER:

Morton Flom, P. Eng.



1. THAT the application was prepared either by, or under the direct supervision of, the undersigned.
2. THAT the technical data supplied with the application was taken under my direction and supervision.
3. THAT the data was obtained on representative units, randomly selected.
4. THAT, to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct.

THIS IS TO CERTIFY THAT:

<p>TESTIMONIAL AND STATEMENT OF CERTIFICATION</p>
---

STATEMENT OF QUALIFICATIONS

EDUCATION:

1. B. ENG. in ENGINEERING PHYSICS, 1949, MCGILL University, Montreal, Canada.
2. Post Graduate Studies, McGill University & Sir George Williams University, Montreal.

PROFESSIONAL AFFILIATIONS:

1. ARIZONA SOCIETY OF PROFESSIONAL ENGINEERS (NSPE), #026 031 821.
2. ORDER OF ENGINEERS (QUEBEC) 1949. #45 34.
3. ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOPHYSICISTS & GEOLOGISTS OF ALBERTA #5916.
4. REGISTERED ENGINEERING CONSULTANT - GOVERNMENT OF CANADA, DEPARTMENT OF COMMUNICATIONS. Radio Equipment approvals.
5. IEEE, Lifetime member no. 041/204 (Member since 1947).

EXPERIENCE:

1. Research/Development/Senior Project Engineer. R.C.A. LIMITED (4 years).
2. Owner/Chief Engineer of Electronics. Design/Manufacturing & Cable TV Companies (10 years)
3. CONSULTING ENGINEER (over 25 years).

*Morton Flom*

MORTON FLOM, P. Eng.