

KTL Test Report:

9R01480.1

Applicant:

Northern Airborne Technology Ltd.
1925 Kirscher Road
Kelowna, B.C.
V1Y 4N7

**Equipment Under Test:
(E.U.T.)**

NT030B VHF Transceiver

FCC ID:

G0LNT030

In Accordance With:

FCC Part 90, Subpart I
Private Land Mobile Transmitter

Tested By:

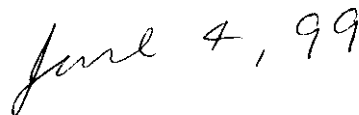
KTL Ottawa Inc.
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Authorized By:



R. Grant, RF Engineer

Date:



Total Number of Pages:

37

EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

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EQUIPMENT: NT030B VHF Transceiver
FCC ID: GOLNT030

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EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

Section 1. Summary of Test Results

Manufacturer: Northern Airborne Technology Ltd.

Model No.: NT030B

Serial No.: 1172

General: All measurements are traceable to national standards.

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 90, Subpart I.



New Submission



Production Unit



Class II Permissive Change



Pre-Production Unit



Equipment Code

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.
See "Summary of Test Data".

NVLAP

NVLAP LAB CODE: 100351-0

TESTED BY:

Wayne Clarke
Wayne Clarke, Technologist

DATE:

June 4/99

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EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	MEAS.	RESULT
RF Power Output	90.205	<300W	10W	Complies
Audio Frequency Response	TIA EIA-603.3.2.6		Graph	Complies
Audio Low-Pass Filter Response	TIA EIA-603.3.2.6		Graph	Complies
Modulation Limiting	TIA EIA-603.3.2.6		Graph	Complies
Occupied Bandwidth	90.210		Graph	Complies
Spurious Emissions at Antenna Terminals	90.210	-13 dBm	Graph	Complies
Field Strength of Spurious Emissions	90.210			Complies
Frequency Stability	90.213	20 ppm	1.3 ppm	Complies
Transient Frequency Behavior	90.214	N/A		Not Applicable

Footnotes For N/A's:**Indoor**

Temperature: 22 °C
Humidity: 30 %

Outdoor

Temperature: 20 °C
Humidity: 43 %

EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

Section 2. General Equipment Specification

Transmitter

Supply Voltage Input:	Nominal 28 Vdc										
Frequency Range:	34 – 49.995 MHz										
Tunable Bands:	One										
Necessary Bandwidth:	10.3 kHz										
Type(s) of Modulation:	<table><tbody><tr><td>F3E (Voice)</td><td>F1D</td><td>F2D</td><td>D7W (QAM)</td><td>Other</td></tr><tr><td>☒</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td></tr></tbody></table>	F3E (Voice)	F1D	F2D	D7W (QAM)	Other	☒	☐	☐	☐	☐
F3E (Voice)	F1D	F2D	D7W (QAM)	Other							
☒	☐	☐	☐	☐							
Data Rate(s)	Not Applicable										
Internal/External Data Source:	Not Applicable										
Emission Designator:	12K0F3E										
Output Impedance:	50 ohm										
RF Power Output (rated):	10W										
Duty Cycle:	Rx 100%, Tx 20 %										
Channel Spacing(s):	12.5 kHz										
Operator Selection of Operating Frequency:	Preset Channels										
Power Output Adjustment Capability:	None										

EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

Receiver

Frequency Range:	34 – 49.995 MHz
Tunable Bands:	One
Local Oscillator:	Not Applicable
1st IF:	20.8 MHz
2nd IF:	455 kHz
Operator Selection of Operating Frequency:	Preset Channels

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FCC PART 90, SUBPART I
PRIVATE LAND MOBILE TRANSMITTER
PROJECT NO.: 9R01480.1

EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

Description of Modifications For Class II Permissive Change

NOT APPLICABLE

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PRIVATE LAND MOBILE TRANSMITTER
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EQUIPMENT: NT030B VHF Transceiver
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Modifications Made During Testing

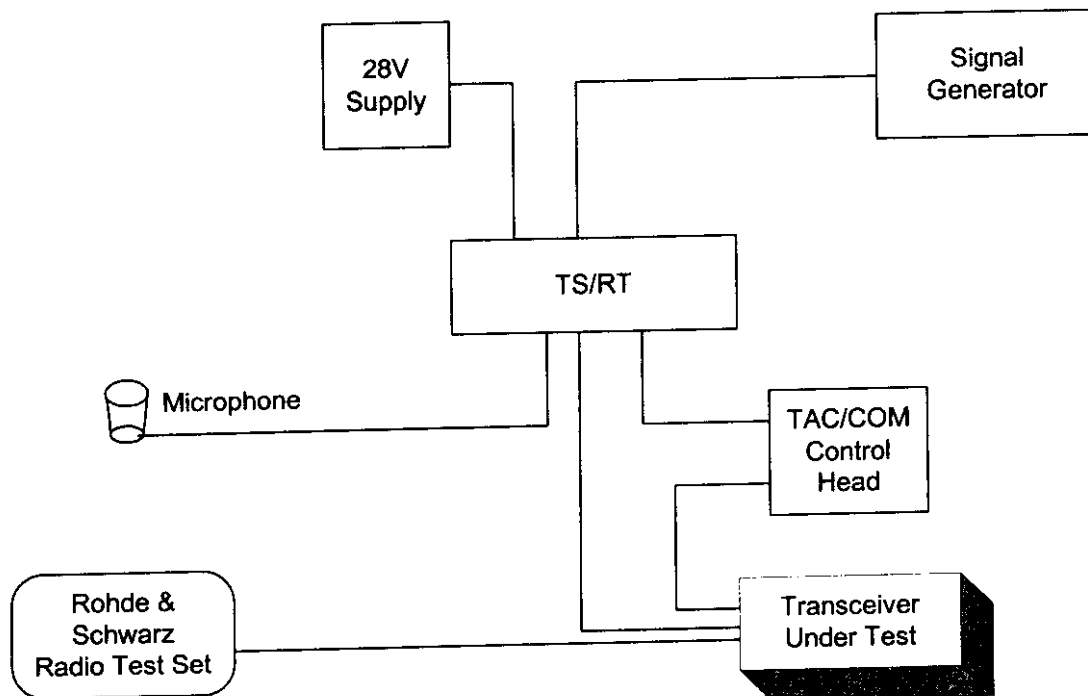
NOT APPLICABLE

EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

Theory of Operation

The E.U.T. is a fixed power output transceiver. It is operated by a TAC/COM control head.

System Diagram



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PRIVATE LAND MOBILE TRANSMITTER
PROJECT NO.: 9R01480.1

EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

Section 3. RF Power Output

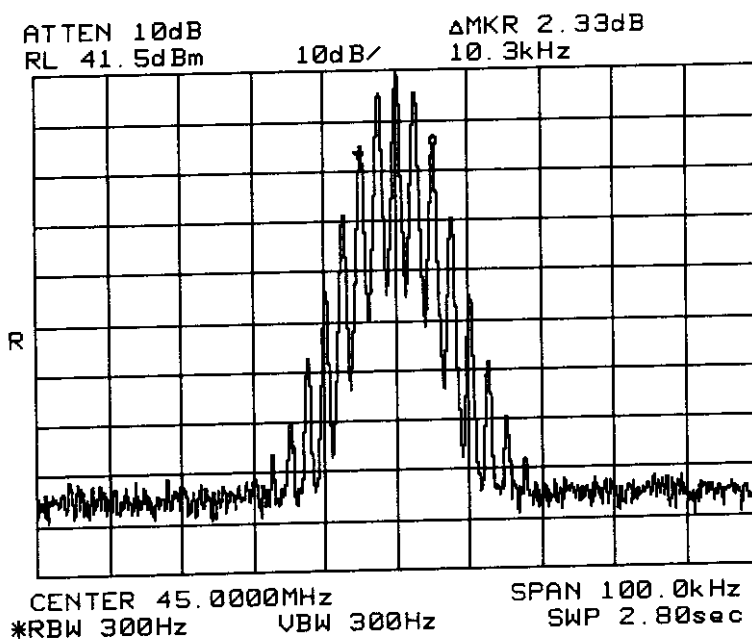
NAME OF TEST: RF Power Output	PARA. NO.: 2.985
TESTED BY: Wayne Clarke	DATE: May 4, 1999

Test Results: Complies.

Measurement Data:

Frequency (MHz)	Measured Power (dBm)	Rated Power (dBm)	Measured/Rated (dB)
45.00	39.97	40.0	-0.03

EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030



99% POWER
MEASUREMENT

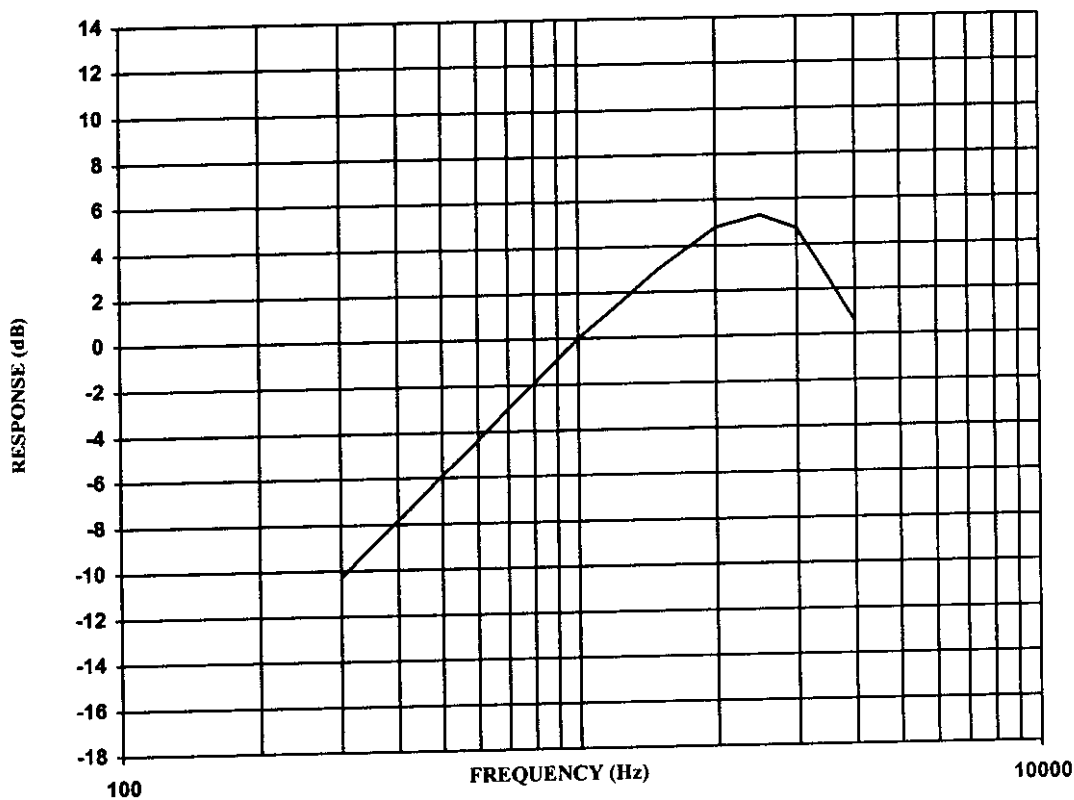
EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030**Section 4. Audio Frequency Response**

NAME OF TEST: Audio Frequency Response

PARA. NO.: 2.987(a)

TESTED BY: Wayne Clarke

DATE: May 6, 1999

**Audio Frequency Response**

Frequency	300	500	900	1.0 k	1.5 k	1.8 k	2.0k	2.3 k	2.5 k	3.0 k	3.5 k	4 k
	-10.3	-5.9		0	3.0		4.8		5.3	4.7		0.6

Frequency	4.5 k	5 k	5.5 k	6 k	6.5 k	7 k	7.5 k	8 k	8.5 k	9 k	9.5 k	10 k
		-4.7										

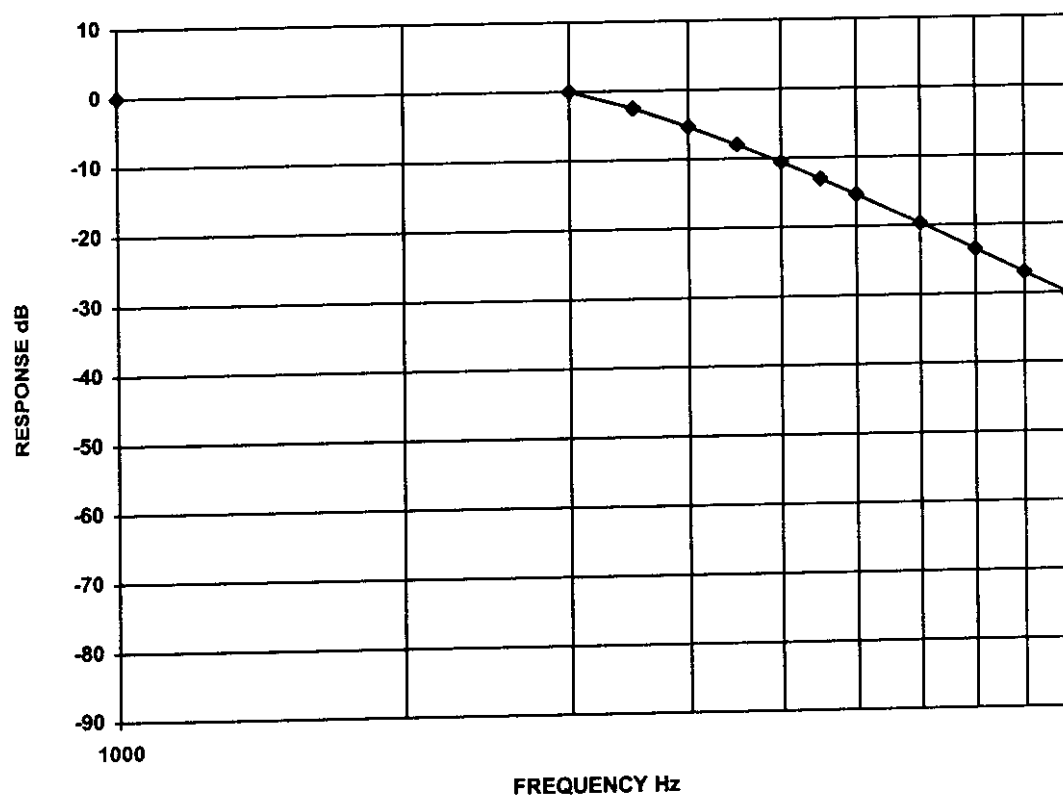
EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030**Section 5. Audio Low-Pass Filter Response**

NAME OF TEST: Audio Low-Pass Filter Response

PARA. NO.: 2.987(a)

TESTED BY: Wayne Clarke

DATE: May 6, 1999

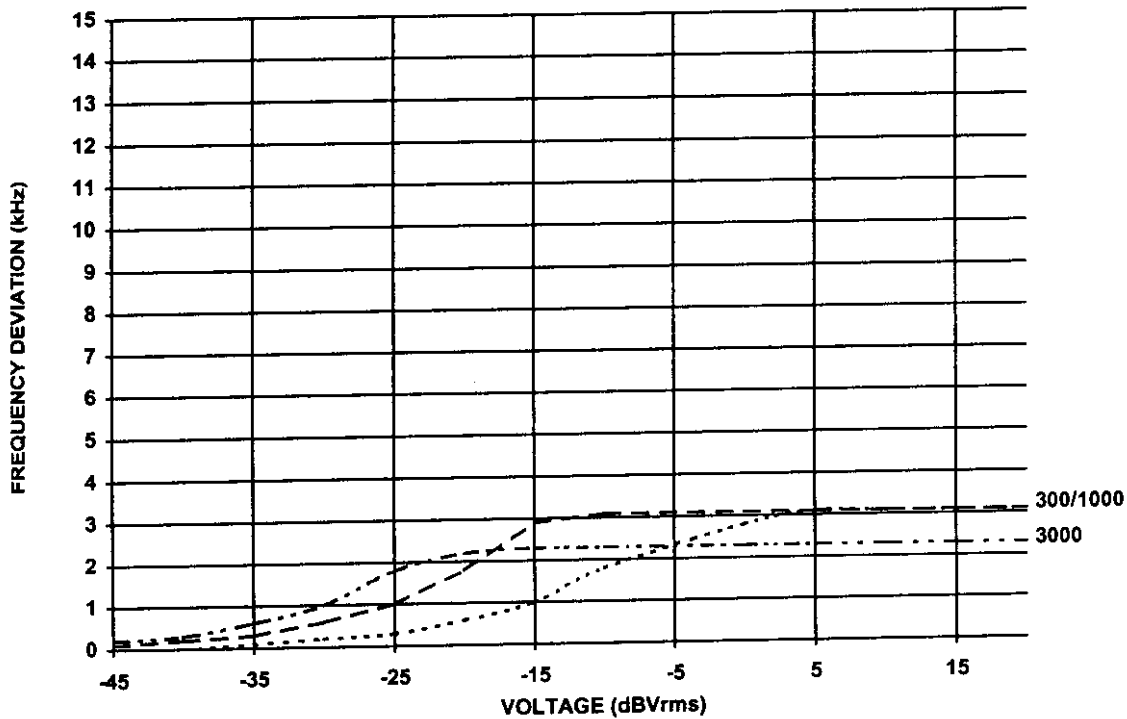
**Audio Low-Pass Filter Response**

Frequency	1k	3 k	3.5 k	4 k	4.5 k	5 k	5.5 k	6 k	7 k	8 k	9 k	10 k
		0	-2.5	-5.2	-7.9	-10.6	-13.1	-15.4	-19.7	-23.5	-26.9	-30.0

EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

Section 6. Modulation Limiting

NAME OF TEST: Modulation Limiting	PARA. NO.: 2.987(b)
TESTED BY: Wayne Clarke	DATE: May 6, 1999



Input	-45	-40	-35	-30	-25	-20	-15	-10	0	5	10	15	20
300 Hz	0.0	0.0	0.1	0.2	0.3	0.6	1.0	1.8	2.8	3.1	3.1	3.1	3.1
1 kHz	0.1	0.2	0.3	0.6	1.0	1.8	2.9	3.1	3.1	3.1	3.1	3.1	3.1
3 kHz	0.2	0.3	0.6	1.0	1.8	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3

Maximum deviation for non-voice modulation _____ kHz.

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EQUIPMENT: NT030B VHF Transceiver
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Section 7. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.989
TESTED BY: Wayne Clarke	DATE: May 6, 1999

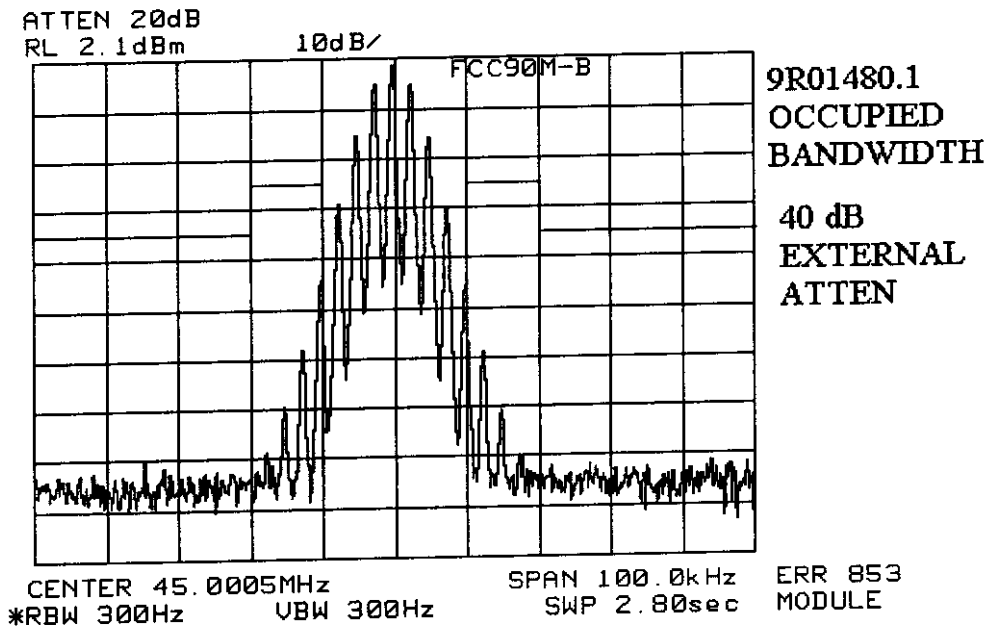
Test Results: Complies.

Test Data: See attached graph(s).

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EQUIPMENT: NT030B VHF Transceiver
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EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

Section 8. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.991
TESTED BY: Wayne Clarke	DATE: May 6, 1999

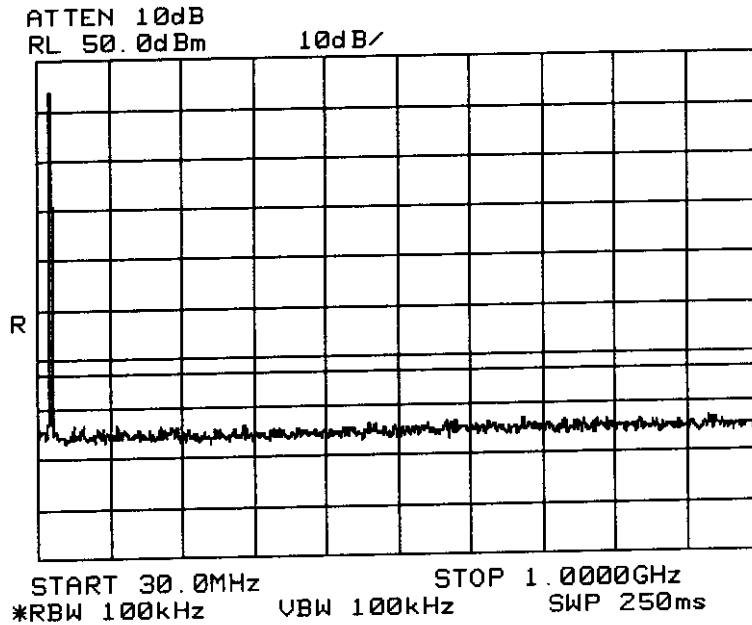
Test Results: Complies.

Test Data: See attached graph(s).

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PRIVATE LAND MOBILE TRANSMITTER
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EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030



**SPURIOUS
EMISSIONS AT
ANTENNA
TERMINAL**

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FCC PART 90, SUBPART I
PRIVATE LAND MOBILE TRANSMITTER
PROJECT NO.: 9R01480.1

EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

Section 9. Field Strength of Spurious Emissions

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.993
TESTED BY: Wayne Clarke	DATE: May 19, 1999

Test Results: Complies.

Test Data: There were no spurious emissions noted at 3 meters on the OATS.

FCC PART 90, SUBPART I
PRIVATE LAND MOBILE TRANSMITTER
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Test Data - Radiated Emissions

[illegible]

Notes:
The spectrum was search up to the 10th harmonic of the fundamental frequency.

* Includes cable loss when amplifier is not used.

** Includes cable loss.

() Denotes failing emission level.

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FCC PART 90, SUBPART I
PRIVATE LAND MOBILE TRANSMITTER
PROJECT NO.: 9R01480.1

EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

Section 10. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 2.1055
TESTED BY: Wayne Clarke	DATE: May 19, 1999

Test Results: Complies.

Measurement Data: See attached tables.

EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

Measurement Data

TIME (MIN)	FREQUENCY (MHz)			
	-30°C	-20°C	-10°C	0°C
0.0	45 000 024	45 000 021	45 000 028	45 000 035
0.5	45 000 024	45 000 021	45 000 030	45 000 037
1.0	45 000 024	45 000 021	45 000 030	45 000 037
1.5	45 000 022	45 000 021	45 000 029	45 000 037
2.0	45 000 020	45 000 020	45 000 030	45 000 037
2.5	45 000 018	45 000 020	45 000 030	45 000 037
3.0	45 000 017	45 000 020	45 000 030	45 000 037

TIME (MIN)	FREQUENCY (MHz)			
	+10°C	+30°C	+40°C	+50°C
0.0	45 000 017	45 000 035	44 999 986	44 999 947
0.5	45 000 018	45 000 035	44 999 985	44 999 945
1.0	45 000 018	45 000 034	44 999 984	44 999 945
1.5	45 000 018	45 000 033	44 999 982	44 999 944
2.0	45 000 018	45 000 031	44 999 981	44 999 943
2.5	45 000 018	45 000 028	44 999 980	44 999 941
3.0	45 000 018	45 000 025	44 999 979	44 999 940

Frequency Versus Supply Voltage

TIME (MIN)	23.8 VDC	28.0 VDC	32.2 VDC
0.0	45 000 017	45 000 004	44 999 993
0.5	45 000 017	45 000 004	44 999 993
1.0	45 000 016	45 000 003	44 999 993
1.5	45 000 015	45 000 002	44 999 992
2.0	45 000 014	45 000 000	44 999 992
2.5	45 000 013	44 999 999	44 999 991
3.0	45 000 012	44 999 998	44 999 990

EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

Section 11. Transient Frequency Behaviour

NAME OF TEST: Transient Frequency Behaviour	PARA. NO.: 90.214
TESTED BY:	DATE:

Test Results: Complies/Does Not Comply.

Measurement Data: See attached graphs.

NOT APPLICABLE

EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030**Section 12. Test Equipment List**

CAL CYCLE	EQUIPMENT	MANUFACTURER	MODEL	SERIAL	LAST CAL.	NEXT CAL.	
1 Year	Spectrum Analyzer	Hewlett Packard	8565E	FA000981	May 20/98	July 20/99	
	Plotter	Hewlett Packard	7470A	2308A30807	NCR	NCR	
1 Year	Spectrum Analyzer-1	Hewlett Packard	8566B	2311A02238	Oct. 22/98	Oct. 22/99	
1 Year	Spectrum Analyzer Display-1	Hewlett Packard	8566B	2314A04759	Oct. 22/98	Oct. 22/99	
1 Year	Quasi-peak adapter-1	Hewlett-Packard	85650A	2043A00302	Oct. 22/98	Oct. 22/99	
1 Year	Climate Chamber	Thermotron	SM-16C	15649-S	Aug. 7/98	Aug. 7/99	
1 Year	Attenuator	Narda	768-20	9507	July 24/98	July 24/99	
1 Year	Attenuator	Narda	765-20	9510	July 24/98	July 24/99	
1 Year	LISN	Tegam	95300-50	T-12855/56	July 24/98	July 24/99	
1 Year	LISN	Rohde & Schwarz	ESH2-Z5	890485/017	July 23/98	July 23/99	
	Biconilog Antenna	EMCO	3143	1038	NCR	NCR	
2 Year	Horn Antenna	EMCO #2	3115	4336	Oct. 30/97	Oct. 30/99	
2 Year	Horn Antenna	EMCO #1	3115	3132	Feb. 9/98	Feb. 9/00	
1 Year	Dipole Antenna Set	EMCO	3121C	1029	Nov. 18/98	Nov. 18/99	
1 Year	Dipole Antenna	Roberts Inst.	N/A	FA000747	June 8/98	June 8/99	
1 Year	Signal Generator	Hewlett Packard	8673B	2332A00378	July 22/98	July 22/99	
1 Year	Frequency Counter	Hewlett Packard	HP5350A	2444A00135	Apr. 24/99	Apr. 24/00	
1 Year	Radio Communicator	R&S	CMTASY	840343/0B	Dec. 14/99	Dec. 14/00	
	HP Power Supply	Hewlett Packard	6274B	2713A-10106	NCR	NCR	

NA: Not Applicable
NCR: No Cal Required
COU: CAL On Use

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FCC PART 90, SUBPART I
PRIVATE LAND MOBILE TRANSMITTER
PROJECT NO.: 9R01480.1
ANNEX A

EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

ANNEX A
TEST METHODOLOGIES

EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

NAME OF TEST: RF Power Output	PARA. NO.: 2.985
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Minimum Standard: Para. No. 90.205(a). The maximum allowable station ERP is dependent upon the stations HAAT and required service area and will be authorized in accordance with Table 1 of 90.205(d).

Method Of Measurement:

Detachable Antenna:

The peak power at antenna terminals is measured using an in-line peak power meter. Power output is measured with the maximum rated input level.

Integral Antenna:

If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation $GP/4\pi R^2 = E^2/120\pi$ and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts

E = the maximum measured field strength in V/m

R = the measurement range (3 meters)

G = the numeric gain of the transmit antenna in relation to an isotropic radiator

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FCC PART 90, SUBPART I
PRIVATE LAND MOBILE TRANSMITTER
PROJECT NO.: 9R01480.1
ANNEX A

EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

NAME OF TEST: Audio Frequency Response	PARA. NO.: 2.987(a)
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Test Method: TIA/EIA-603

Minimum Standard: TIA/EIA-603, Para. 3.2.6 from 300 Hz to 3000 Hz. The transmitter audio frequency response shall have a nominal 6 dB per octave pre-emphasis characteristic.

NAME OF TEST: Audio Low-Pass Filter Frequency Response	PARA. NO.: 2.987(a)
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Test Method: TIA/EIA-603

Minimum Standard: TIA/EIA-603

NAME OF TEST: Modulation Limiting	PARA. NO.: 2.987(a)
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Test Method: TIA/EIA-603

Minimum Standard: TIA/EIA-603

EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

NAME OF TEST: Occupied Bandwidth

PARA. NO.: 2.989

Minimum Standard: Para. No. 90.210, see table 1 below for applicable mask.

Table 1

Frequency Band (MHz)	Mask for equipment with Low Pass Filter	Mask for equipment without Low Pass Filter
Below 25	A or B	A or C
25 - 50	B	C
72 - 76	B	C
150 - 174	B, D or E	C, D or E
150 Paging only	B	C
220 - 222	F	F
421 - 512	B, D or E	C, D or E
450 paging only	B	H
806 - 821/ 851 - 866	B	G
821 - 824/ 866 - 869	B	H
896 - 901/ 935 - 940	I	J
902 - 928	K	K
929 - 930	B	G
Above 940	B	C
All other bands	B	C

Test Method:

RBW: 1% of emission bandwidth in 0 - 1 GHz range. 1 MHz at frequencies above 1 GHz.
VBW: $\Rightarrow$ RBW

The spectrum is search up to 10 times the fundamental frequency.

EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 2.993
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Minimum Standard: Para. No. 90.210, see table 1 for applicable mask.

Calculation of Field Strength Limit

An example of attenuation requirement of $50 + 10 \log P$ is equivalent to -20 dBm (1×10^{-5} Watts) at the antenna terminal. We determine the field strength limit by using the plane wave relation.

$$GP/4\pi R^2 = E^2/120\pi$$

For emissions ≤ 1 GHz:

$G = 1.64$ (Dipole Gain)

$P = 10^{-5}$ Watts (Maximum spurious output power)

$R = 3m$ (Measurement Distance)

$$E = \frac{\sqrt{30GP}}{R} = E = \frac{\sqrt{30 \times 1.64 \times 10^{-5}}}{3} = 0.00739 \text{ V/m} = 77.4 \text{ dB}\mu\text{V/m}$$

For emissions > 1 GHz:

$G = 1$ (Isotropic Gain)

$P = 1 \times 10^{-5}$ Watts (Maximum spurious output power)

$R = 3m$ (Measurement Distance)

$$E = 77.4 - 20 \log \sqrt{1.64} = 75.2 \text{ dB}\mu\text{V/m@3m}$$

MASK	Spurious Limit	FS Limit Below 1 GHz	FS Limit Above 1 GHz
A,B,C,G,H,I	-13dBm	84.4 dB μ V/m@3m	82.2 dB μ V/m@3m
D,J	-20dBm	77.4 dB μ V/m@3m	75.2 dB μ V/m@3m
E,F,K	-25dBm	72.4 dB μ V/m@3m	70.2 dB μ V/m@3m

EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

NAME OF TEST: Frequency Stability

PARA. NO.: 2.995

Minimum Standard: Para. No. 990.213. The transmitter carrier frequency shall remain within the assigned frequency below in ppm.

Table 2

Frequency Band (MHz)	Fixed And Base Stations	Mobile Stations	
		> 2 Watts o/p pwr	< 2 Watts o/p pwr
Below 25	100	100	200
25 - 50	20	20	50
72 - 76	5	-	50
150 - 174	5	5	5
220 - 222	0.1	1.5	1.5
421 - 512	2.5	5	5
806 - 821	1.5	2.5	2.5
821 - 824	1.0	1.5	15
851 - 866	1.5	2.5	2.5
866 - 869	1.0	1.5	1.5
869 - 901	0.1	1.5	1.5
902 - 928	2.5	2.5	2.5
929 - 930	1.5	-	-
935 - 940	0.1	1.5	1.5
1427 - 1435	300	300	300
Above 2450	-	-	-

NAME OF TEST: Transient Frequency Behaviour

PARA. NO.: 2.214

Minimum Standard:

Transient Frequency Behaviour for Equipment Designed to Operate on 25 kHz Channels

Time intervals ^{1,2}	Maximum Frequency difference ³ (kHz)	Frequency ranges (MHz) All equipment					
		Base station and portable radios			Mobile Radios		
		150 - 174 (ms)	450 - 500 (ms)	500 - 512 (ms)	150 - 174 (ms)	450 - 500 (ms)	500 - 512 (ms)
t ₁ ⁴	± 25	5.0	10.0	20.0	5.0	10.0	5.0
t ₂	± 12	20.0	25.0	50.0	20.0	25.0	20.0
t ₃ ⁴	± 25	5.0	10.0	10.0	5.0	10.0	5.0

Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz & 6.25 kHz Channels

Time intervals ^{1,2}	Maximum Frequency difference ³ (kHz)	Frequency ranges (MHz) All equipment		
		150 - 174 (ms)	450 - 500 (ms)	500 - 512 (ms)
t ₁ ⁴	± 12.5 / ± 6.25	5.0	10.0	20.0
t ₂	± 6.25 / ± 3.125	20.0	25.0	50.0
t ₃ ⁴	± 12.5 / ± 6.25	5.0	10.0	10.0

KTL Ottawa

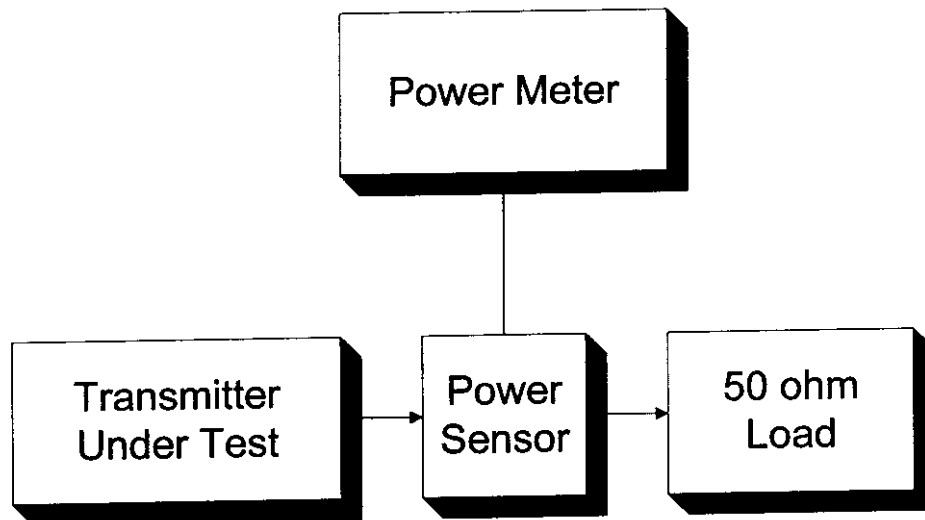
FCC PART 90, SUBPART I
PRIVATE LAND MOBILE TRANSMITTER
PROJECT NO.: 9R01480.1
ANNEX B

EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

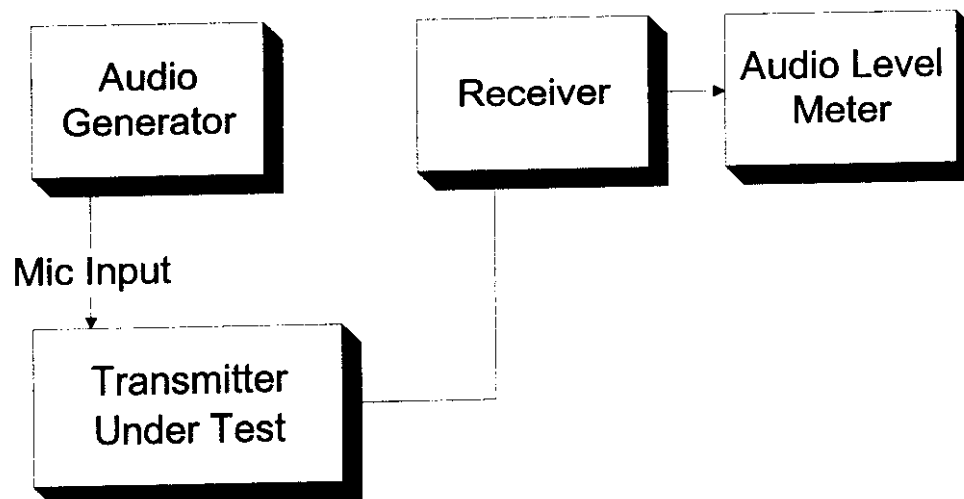
ANNEX B
TEST DIAGRAMS

EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

Para. No. 2.985 - R.F. Power Output

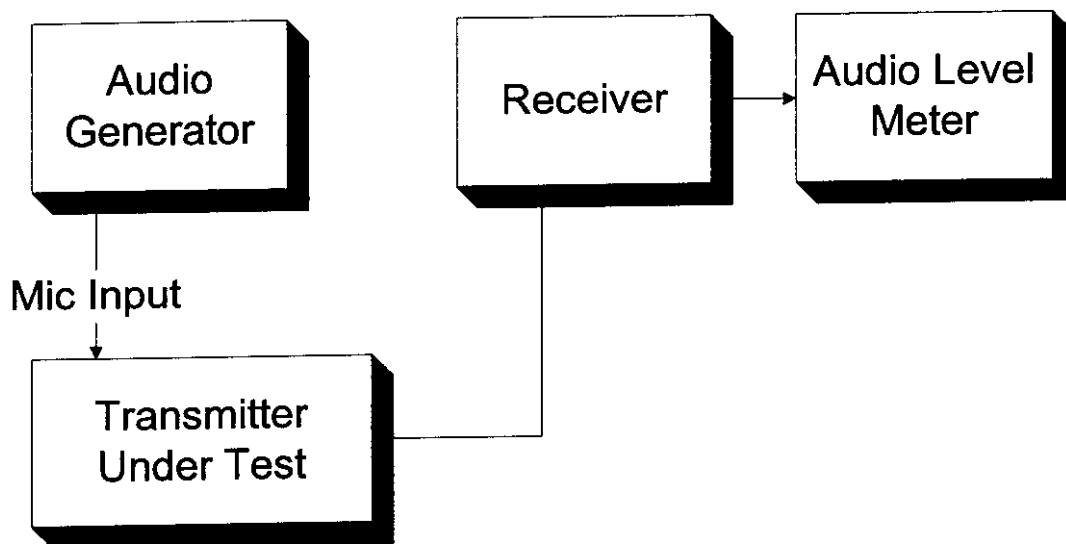


Para. No. 2.987(a) - Audio Frequency Response

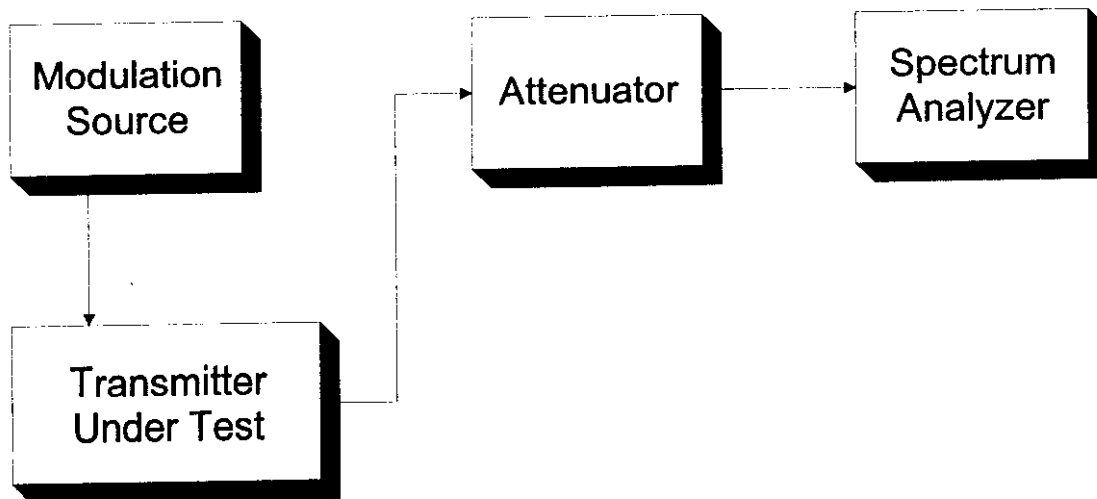


EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

Para. No. 2.987(b) - Modulation Limiting

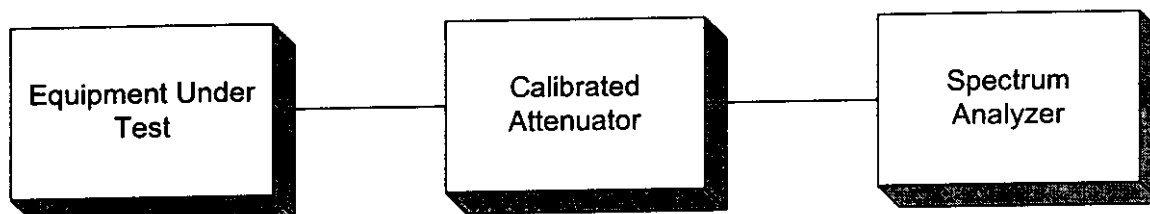


Para. No. 2.989 - Occupied Bandwidth

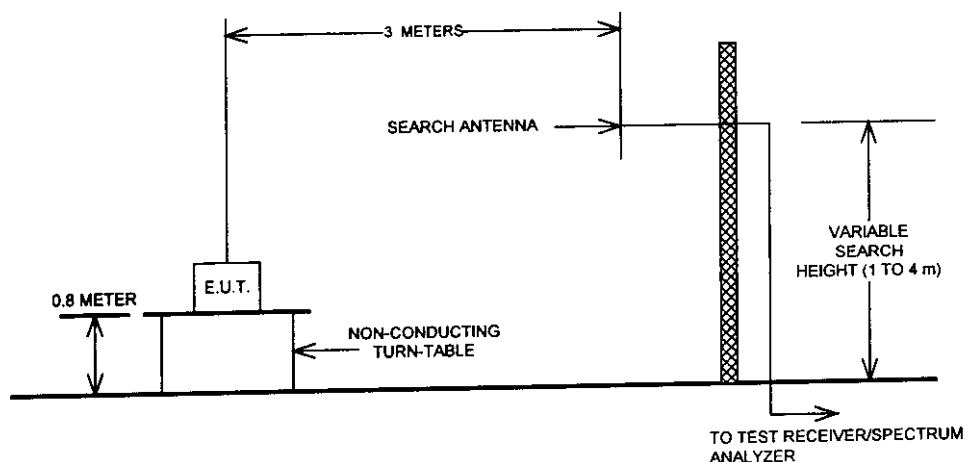


EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

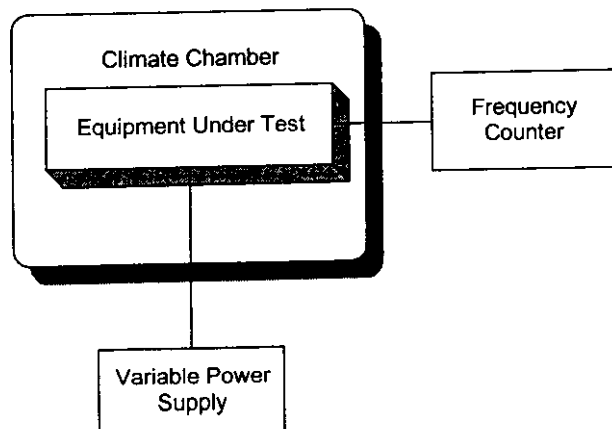
Para. No. 2.991 - Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation

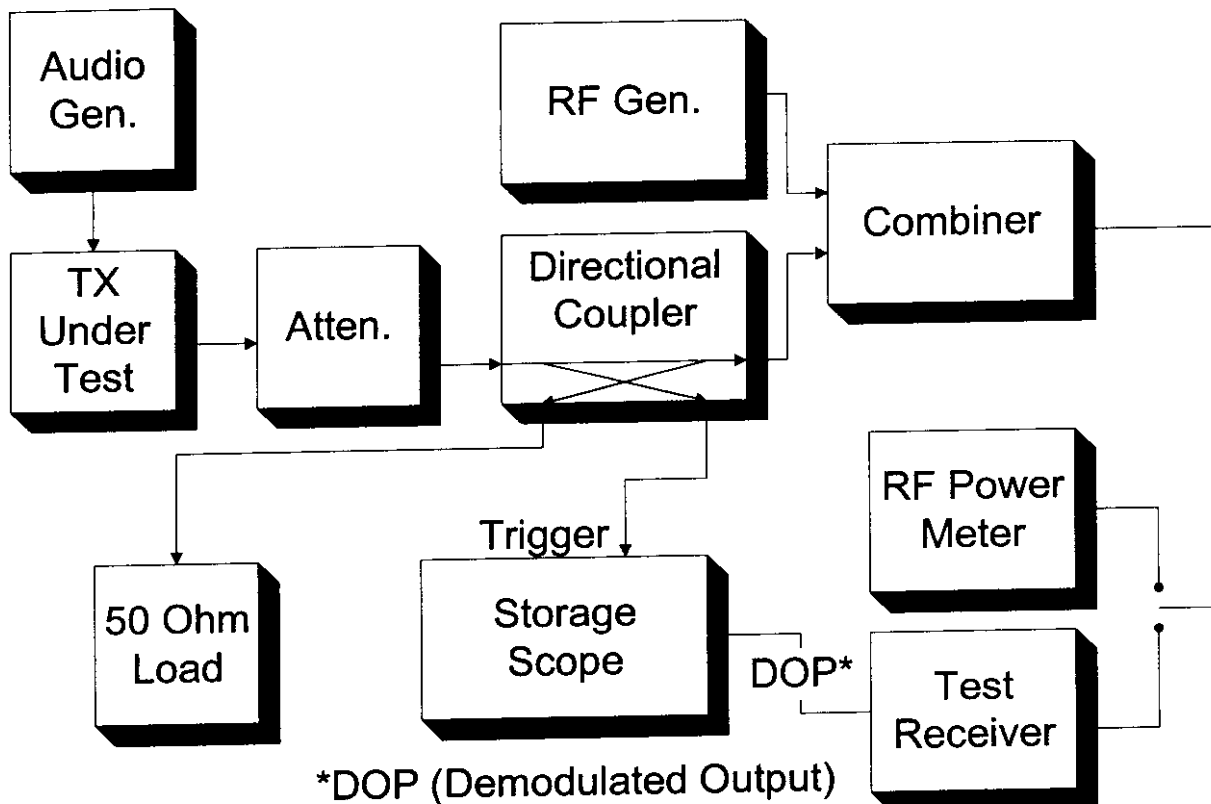


Para. No. 2.995 - Frequency Stability



EQUIPMENT: NT030B VHF Transceiver
FCC ID: G0LNT030

Para. No. 90.214 - Transient Frequency Behaviour



Voice

This measurement was made using measurement procedure TIA/EIA Land Mobile FM or PM Communications Equipment Measurement and Performance Standards TIA/EIA-603 February 1993 Telecommunications Industry Association (American National Standard ANSI/TIA/EIA-603-1992 Approved: October 27, 1992) Para. no. 2.2 Methods of Measurement for Transmitters Para. no. 2.2.19 Transient Frequency Behaviour (page no. 83).

Data

This measurement was made using measurement procedure TIA/EIA Digital C4FM/CQPSK Transceiver Measurement Methods TSB102.CAAA Para. no. 2.2.17 Transient Frequency Behaviour (page no. 74).