GLENAYRE ELECTRONICS FCC ID: BFLGL-T8200

Wireless Messaging Group
One Glenayre Way
Quincy, IL 62301 USA
217.221.6251

June 2, 1999

Federal Communications Commission
Authorization and Evaluation Division
7435 Oakland Mills Road
Columbia, MD 21046

Dear Sirs/Madam;

Please find enclosed the application and technical exhibits for Type Certification of Glenayre Electronics' transmitter, FCC ID: BFLGL-T8200. This transmitter is a FM land mobile base unit for use in the 924 to 960 MHertz frequency range with a RF power output of 25 Watts.

Digital processing (DSP) and direct digital synthesis (DDS) techniques are used at low signal levels for processing, modulation, and RF generation.

This application demonstrates FCC compliance for digital modulation to 9600 bps.

Glenayre requests that this transmitter be authorized to operate with three optional devices.

1. TX control (TXC) which houses a 10 MHz reference oscillator and replaces the internal 10 MHz reference oscillator in the transmitter. This optional unit has been approved for use with other Glenayre transmitters using the same exciter by the FCC under model: GL-T8600, GL-T8500, and others.

2. The GL-C2000 is also an external 10 MHz reference source and controller. The GL-C2000 uses Global Positioning Satellite (GPS) receivers for precision frequency control of the 10 MHz oven-controlled crystal oscillator and timing synchronism of the system. This optional unit has been approved for use with other Glenayre transmitters using the same exciter by the FCC under model: GL-T8600, GL-T8500, and others.

3. The Motorola C-NET™ Platinum Series controller. This controller houses the 10 MHz oscillator, which is the RF reference for the transmitter. Glenayre has characterized the performance of this oscillator over the temperature range of -30 to + 50 degrees Centigrade. The Model Number for this controller: C-NET™ Platinum. This optional unit has been approved for use with other Glenayre transmitters using the same exciter by the FCC under model: GL-T8600, GL-T8500, and others.

The use of the optional external 10 MHz reference oscillators in no way degrade the spectral characteristics of the BFLGL-T8200 as presented in this Type Certification submission.

Sincerely,

Ronald E. Lile
Member Technical Staff - Compliance
TEL: 217.221.6251 or ron.lile@glenarye.com

TYPE CERTIFICATION APPLICATION
FOR
MODEL: GL – T8200

FCC ID: BFLGL-T8200

TEST DATES: MAY 10, 1999 THROUGH MAY 18, 1999

TEST REPORT PREPARED BY:

. . . .

Ronald E. Lile
Member Technical Staff – Compliance

APPROVED BY:

. . . .

Joseph E. Jones Jr., PE, NCE
Director, Compliance Group

Certification of test data

I hereby certify that the test data identified below were taken by myself, or under my direct supervision; that the tests were conducted according to accepted good engineering practice; and that the data are true and correct, according to my knowledge and belief.

Standards used for measurements for the transmitter is TIA/EIA-603

Signed ______ Date_____7 June, 1999___________

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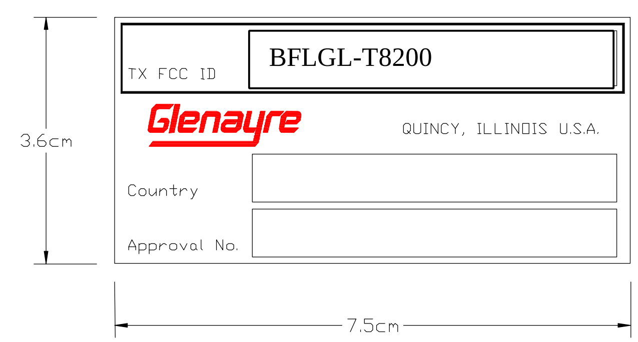
Exhibit 7	Technical Manuals
Exhibit 8	Schematics

Exhibit 1: Equipment Identification Label (FCC 2.1003)

AFFIXED TO REAR OF RF POWER AMPLIFIER CHASSIS



NOTES:

1. Color - Background Black. Blocks (3 Plcs) & lettering to be natural aluminum color.
2. Pressure sensitive adhesive backing to be 3m#467 or equivalent.
3. Positioned vertically on std. strip.
4. Block Sizes - (A) 0.6cm X 5.4cm (B) 0.6cm X 4.0cm
5. Label must have manufacturer's Identifier Mark.

Exhibit 2: Technical Description

1	Type of emission	16K0F3E, 14K4FID, 9K6FID
2	Frequency Range	924 to 960 MHz
3	Operating Power Range	1 to 25 Watts; The power output is maintained by means of an automatic gain control circuit that continually monitors the power output of the transmitter and automatically adjusts the gain to hold power level.
4	Maximum occupied bandwidth	16 kHz [22.359 (b)(2), 90.210(g)]
5	Maximum Deviation	+/- 4.8 kHz
6	Maximum Digital Information Rate (Bits per second)	2 level modulation - 4800 bps 4 level modulation - 9600 bps
7	Final amplifier voltage and current	Powered by 28 volt power supply and draws 3 amperes
8	Function of each active circuit	See Technical Manual / Instruction Book
9	Complete circuit diagram	See EXHIBIT 8
10	Technical manual	See EXHIBIT 7
11	Tune up procedure	See Technical Manual
12	Frequency stabilizing device	The carrier frequency is controlled by a temperature controlled crystal oscillator in all modulation modes
13a	Spurious suppression device	In all modes of operation the transmitter uses two local oscillators to convert a 100 kHz signal to the output frequency. Frequency stability is derived directly from the temperature controlled crystal oscillator. The first intermediate frequency and the second intermediate frequency (carrier frequency) are filtered to remove mixing products. A low-pass filter to remove harmonics that may be produced follows the power amplifier.
13b	Modulating limiting circuits	Analog and digital modulation is accomplished by digital processing. For any audio signal within the specified audio range, deviation is monitored by the DSP circuits and not allowed to exceed the set limit. Digital modulation is determined by the data state of the TTL/RS-232 compatible input. The input only recognizes two data states (1 and 0) and cannot be overdriven to cause over-modulation.
13c	Power limiting circuits	An automatic gain control circuit controls power generated by the final amplifier. This circuit maintains a constant power output under all conditions.
14	Identification label	EXHIBIT 1

Exhibit 3: Test Procedures and Results

CONTENTS:

DESCRIPTION	REF. FCC #	PAGE
Test Equipment List		3.2
RF Power Output	2.1046	3.3
Modulation Characteristics	2.1047	3.4-3.8
Occupied Bandwidth	2.1049	3.9-3.26
Spurious Emissions	2.1051	3.27-3.28
Field Strength	2.1053	3.29-3.33
Frequency Stability (Temperature)	2.1055 (a)(1)	3.34-3.35
Frequency Stability (warm-up)	2.1055 (c)	3.36
Frequency Stability (line voltage)	2.1055 (d)	3.37
Test Setups		3.38-3.42

TEST EQUIPMENT LIST

Bird Model 4421	Power Meter
Hewlett Packard Model 8901A	Modulation Monitor
Bird Model 8325	Power Attenuator
Hewlett Packard Model 8653E	Spectrum Analyzer
Hewlett Packard Model 5335A	Frequency Counter
Fluke Model 77	Voltmeter
Hewlett Packard HP 8546A	EMI Receiver
Audio Precision ATS-1	Audio Analyzer
EMC Test Systems Horn Antenna 3115	Broadband Antenna
EMC Test Systems Biconilog Antenna 3141	Broadband Antenna
Associated Environmental Systems Model SK-3108	Environmental Chamber
Tektronix Model 2465	Oscilloscope

RF POWER OUTPUT DATA (FCC 2.1046)

Tune transmitter according to procedure in operator's manual. Terminate transmitter antenna terminal into a 50-ohm resistive load. Monitor transmitter RF power output with a calibrated RF Wattmeter.

Measure dc voltage and current applied to final RF amplifying device(s).

Record RF power output and dc current and voltage input at the various RF power levels for which the transmitter is rated.

Frequency Range: 924-960 MHz

Power Rating: 25 Watts

At	25	Watts	Measured RF Output	25.1	Watts
			Measured dc voltage	28.05	Volts
			Calculated dc power input	63.4	Watts

Power Rating: 1 Watt

At	1	Watt	Measured RF Output	1.2	Watts
			Measured dc voltage	28.07	Volts
			Calculated dc power input	5.1	Watts

EXHIBIT 3-1

MODULATION CHARACTERISTICS - ANALOG (FCC 2.1047)

Frequency Response

Connect audio generator with variable output level to the transmitter audio input terminals. Meter audio level at input terminals. Terminate the transmitter antenna terminal with a 50-ohm resistive load. Sample transmitter RF power output with a deviation monitor.

Hold constant audio input level required producing ±1.5 KHz frequency deviation at 1000 Hz. Record demodulated output level.

Repeat at audio frequencies of 100, 200, 300, 500, 2000, 2500, 3000, 3500, 4000, and 5000 Hz.

Results: Reference EXHIBIT 3-2 for standard audio board.

Deviation Limiter Operation

Connect audio generator, with variable output level to transmitter audio input terminals. Terminate the transmitter antenna terminal with a 50-ohm resistive load. Sample RF output with a deviation monitor.

Record the frequency deviation at each audio input level and frequency.

Repeat at audio input levels of -6,0, +3, +6, +10, and +16 dB. Use as 0-dB reference level the input required to produce 50% modulation (+2.5kHz deviation) at 1000 Hz.

Repeat each set of measurement for audio frequencies of 300, 600, 1000, and 2500 Hz.

Results: Reference EXHIBIT 3-3 for standard audio board.

FREQUENCY RESPONSE

Audio Board: Standard

Audio Frequency (Hz)	Audio Output Level	
	Voice Input	Flat Input
100	-27.5	-0.1
300	-10.3	0.0
500	-5.9	0
1000	0	0
2000	+6	-0.2
2500	+8.2	-0.2
3000	+9.0	-0.8
3500	+6.3	-3.2
4000	-4.6	-8.6
4500	-28.5	-20.0
5000	-32	-31.8

EXHIBIT 3-2

DEVIATION LIMITER OPERATION

Audio Board: Standard

Audio Input Level	Frequency Deviation (kHz)			
	300 Hz	600 Hz	1000 Hz	2500 Hz
-6 dB	0.48	0.85	1.30	3.40
0 dB	0.83	1.60	2.50	4.90
+3 dB	1.20	2.20	3.60	5.00
+6 dB	1.60	3.10	4.90	5.00
+10 dB	2.50	4.80	4.90	5.00
+16 dB	4.80	4.90	4.90	5.00

EXHIBIT 3-3

Analog modulation is generated and shaped by digital-signal processing techniques (DSP). The filter does not exist in a conventional analog sense. The frequency response plots for the analog filter is shown in the EXHIBIT 3-4a. All data complies with 22.359(a) for occupied bandwidth submissions.

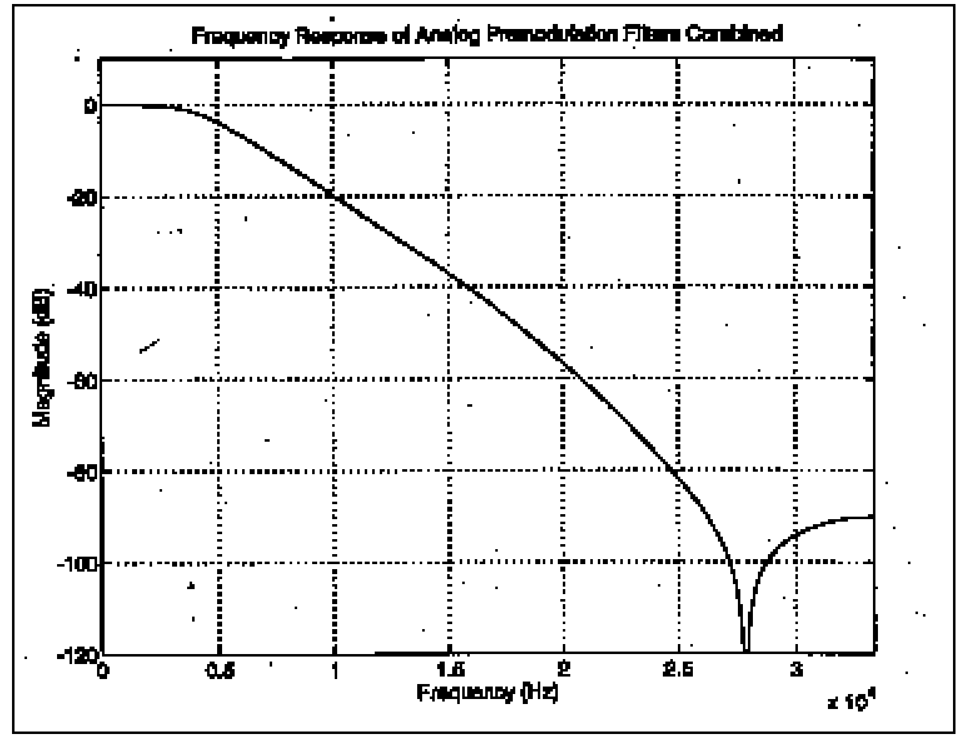


EXHIBIT 3-4a

MODULATION CHARACTERISTICS - DIGITAL (FCC 2.1047)

Digital modulation is generated and shaped by digital signal processing techniques (DSP). The filter does not exist in a conventional analog sense. The frequency response plots for the digital filter is shown in EXHIBIT 3-4b for the rise times which are selectable for 88 microsecond filter (Filter #1) and 150 (Filter #2) microseconds. All data complies with 22.359(b)(2) and 90.210(g) for occupied bandwidth submissions.

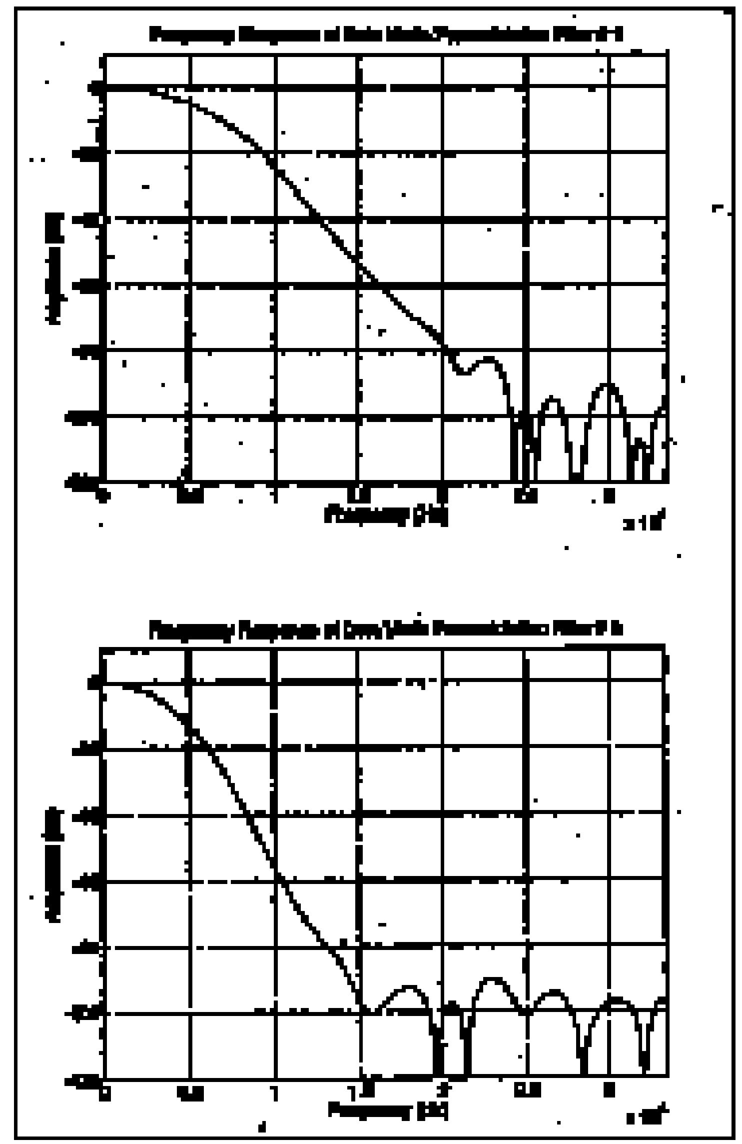


EXHIBIT 3-4b

OCCUPIED BANDWIDTH ANALOG (FCC 2.1049)

Per FCC Rule 22.359(a)

Modulate the transmitter with a 2500 Hz tone at an input level 16 dB greater that that required to produce 50% modulation at 1 kHz at rated RF power output. Terminate the transmitter antenna terminal with a 50-ohm resistive load. Sample the RF output with a spectrum analyzer.

Record the relative amplitude referenced to the unmodulated carrier, of each modulation sideband 10 kHz or more removed from the carrier frequency. Calculate the power contained in each of the recorded sidebands. Total the sideband power above and below the authorized bandwidth, and compare to the total power in the load.

Refer to EXHIBIT 3-5.

Test results meet or exceed Part 22.359(a)

The bandwidth calculation for 16K0F3E, the direct frequency modulation of the carrier in the analog mode is:

Bn = 2M + 2D

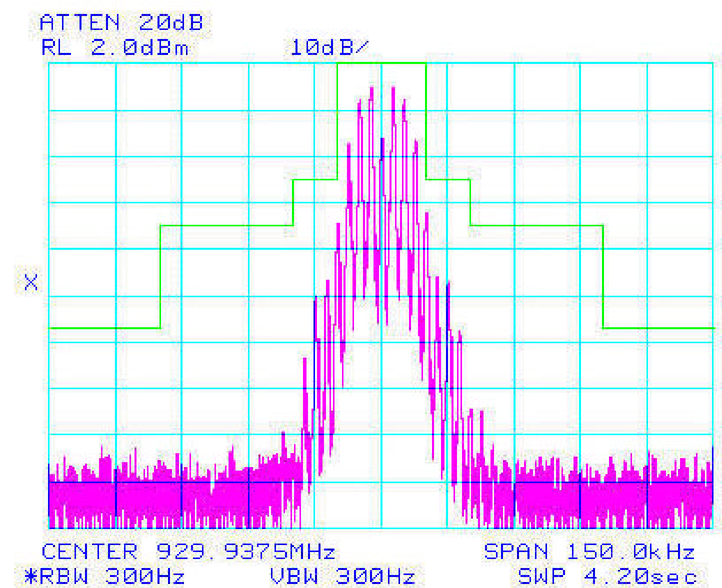
Where M = 3.0 kHz and D = 5.0 kHz

Bn = 2(3.0 kHz) + 2(5.0 kHz)

Bn = 16.0 kHz

Occupied Bandwidth (analog) 25 Watt Maximum Output Power

22.359(a) 25 Watts

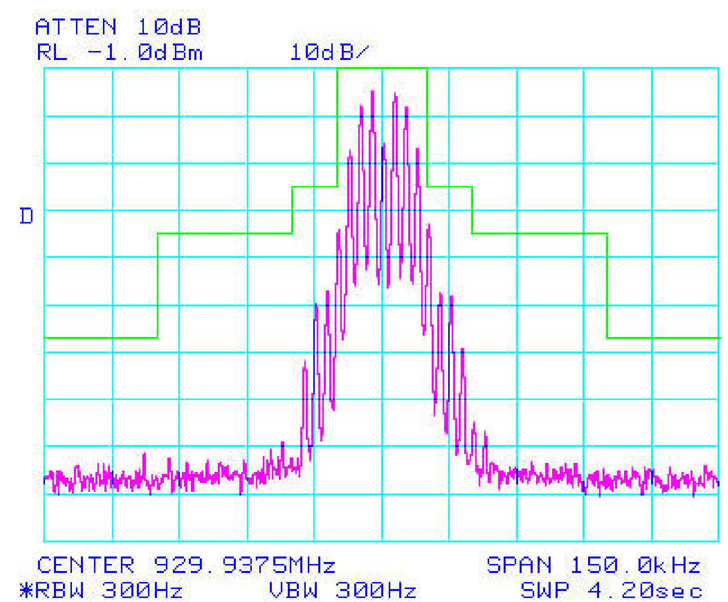


22.359(a)
25Watts
Analog Mode
+/-4.8KHz dev
2.5KHz AF

EXHIBIT 3-5a

<u>Occupied Bandwidth (analog)</u> <u>1 Watt Maximum Output Power</u>

22.359(a) 1 Watt



22.359(a)
1Watt
Analog Mode
+/-4.8KHz dev
2.5KHz AF

EXHIBIT <u>3-5b</u>

OCCUPIED BANDWIDTH - DIGITAL MODE

Per FCC Rule 22.359(b) and 90.210 (g)

Test procedure: A digital signal is fed into the data input of the transmitter to simulate data. The transmitter is placed in the digital modulation mode and its RF output observed on a spectrum analyzer. The transmitter is set for a maximum deviation of 4.8 kHz. The spectrum is observed at both the maximum and minimum power output levels.

Refer to spectrum displays on following pages: EXHIBIT 3-6

Results: Spectrum bandwidth limitations meet or exceed FCC requirements as defined by Part 22.359(b)(2), and Part 90.210(g)

The bandwidth calculations for 14K4F1D, the direct frequency modulation of the carrier in the digital mode is:

Carson's bandwidth rule…

Bn = 2(M + D) (Where M = the highest modulation frequency)

M = [4800 symbols / (2 symbols /cycle)]

M = 2400 Hz

or

M = (9600 bits / second) / FSK level

M = 9600 / 4

M = 2400 Hz

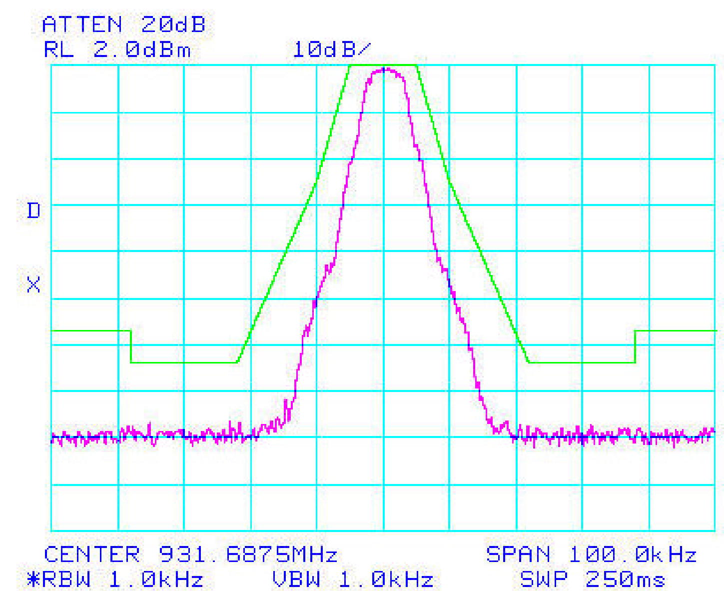
D = Highest Deviation rate. +/- 4.8 kHz

Bn = 2 (2400 + 4800)

Bn = 14.4 kHz

Occupied Bandwidth (digital)* 25 Watts Maximum Power Output

22.359(b)



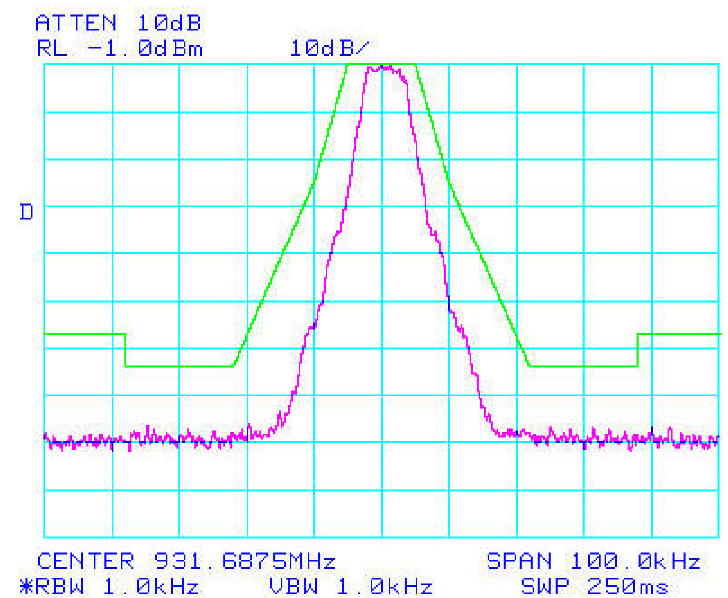
22.359(b)/90.210(g)
25Watts
Digital Mode
+/-2.4KHz dev
9600bps

* 9600 bits/second,
4 Level modulation with
88 microseconds rise time filter (highest rise time)

EXHIBIT 3-6a

Occupied Bandwidth (digital)* 1 Watt Maximum Power Output

22.359(b)



22.359(b)/90.210(g)
1Watt
Digital Mode
+/-2.4KHz dev
9600bps

* 9600 bits/second,
4 Level modulation with
88 microseconds rise time filter (highest rise time)

EXHIBIT 3-6b

PER FCC RULE 90-210(j)

Test procedure: A digital signal is fed into the data input of the transmitter to simulate data. The transmitter is placed in the digital modulation mode and its RF output observed on a spectrum analyzer. The transmitter is set for a maximum deviation of +/-2.4 kHz. The spectrum is observed at 1 and 25 Watt power output levels.

Refer to spectrum displays on following pages: Exhibit 3-7

Results: Spectrum bandwidth limitations meet or exceed FCC requirements as defined by Part 90.210(j)

The bandwidth calculations for 9K6F1D, the direct frequency modulation of the carrier in the digital mode is:

Carson's bandwidth rule…

Bn = 2(M + D) (Where M = the highest modulation frequency)

M = [4800 symbols / (2 symbols /cycle)]

M = 2400 Hz

or

M = (9600 bits / second) / FSK level

M = 9600 / 4

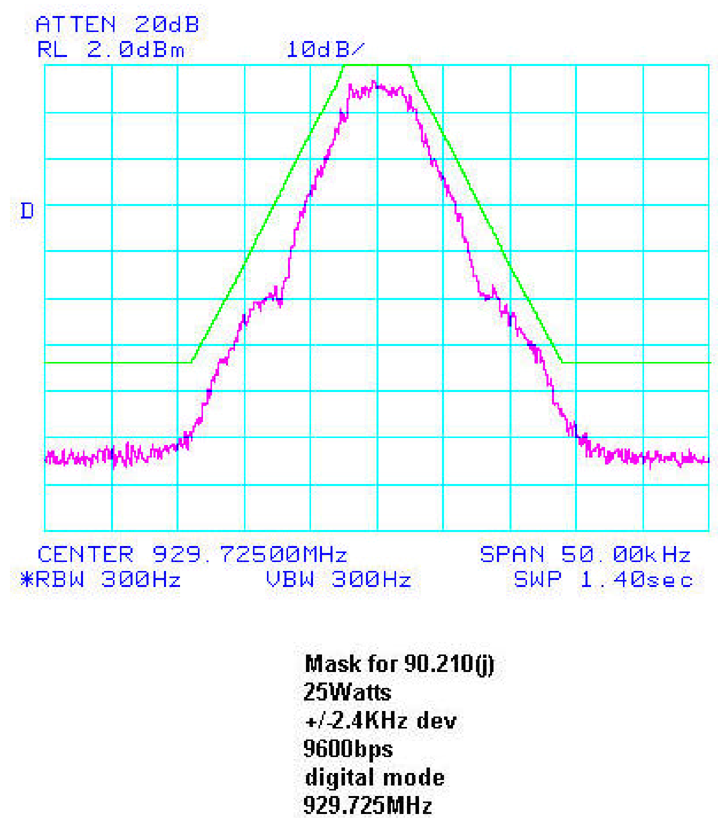
M = 2400 Hz

D = Highest Deviation rate. +/- 2.4 kHz

Bn = 2 (2400 + 2400)

Bn = 9.6 kHz

Occupied Bandwidth (digital)* 25 Watts Maximum Power Output
90.210(j)

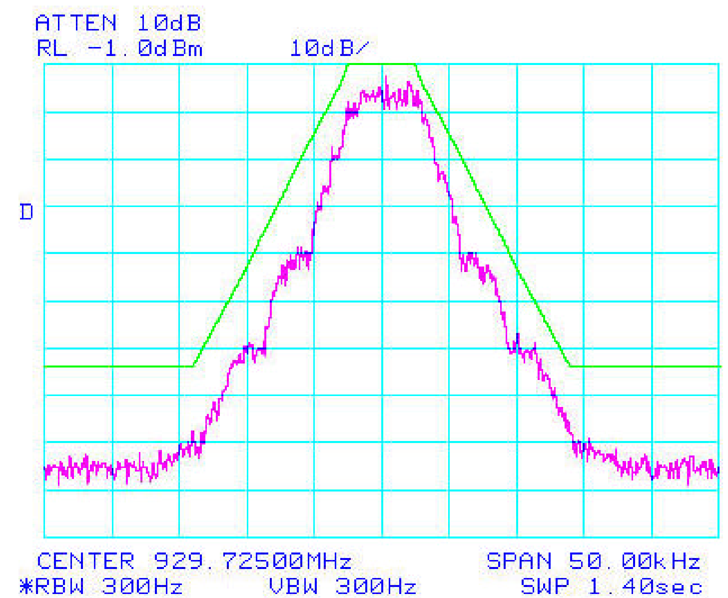


* 9600 bits/second,
4 Level modulation with
88 microseconds rise time filter (highest rise time)

EXHIBIT 3-7a

Occupied Bandwidth (digital)* 1 Watt Maximum Power Output

90.210(j)



90.210(j)
1Watt
Digital Mode
+/-2.4KHz dev
9600bps

* 9600 bits/second,
4 Level modulation with
88 microseconds rise time filter (highest rise time)

EXHIBIT 3-7b

It is the intent of the following EXHIBITS 3-8a & 3-8b to apply for operation in the SMR band of 935 to 940 MHz in accordance with Part 90.804 using two licensee/operator contiguous 12.5 kHz channels. The emission designators 16K0F3E and 14K4F1D will be utilized. The test procedures are the same as shown on pages 3.9 and 3.12 of this EXHIBIT.

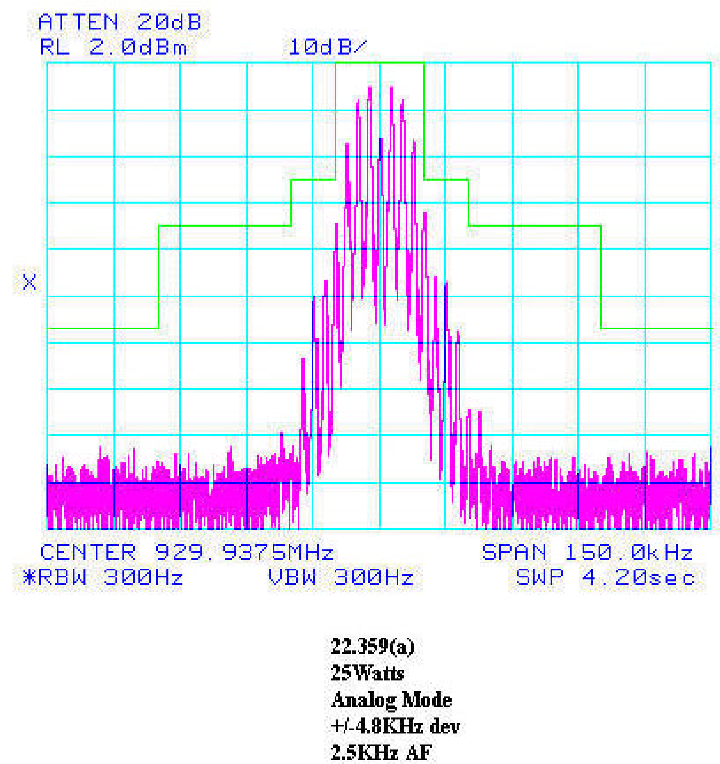
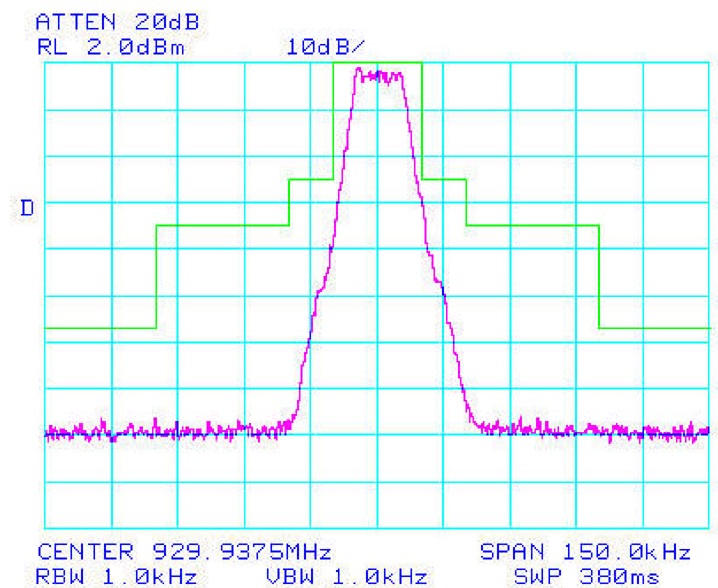

ATTEN 20dB
RL 2.0dBm
10dB/
CENTER 929.9375MHz
SPAN 150.0kHz
*RBW 300Hz
VBW 300Hz
SWP 4.20sec
22.359(a)
25Watts
Analog Mode
+/-4.8KHz dev
2.5KHz AF

EXHIBIT 3-8a

Occupied Bandwidth (digital)* 25 Watts Maximum Power Output



22.359(a)
25Watts
Digital Mode
+/-4.8KHz dev
9600bps

* 9600 bits/second,
4 Level modulation with
88 microseconds rise time filter (highest rise time)

EXHIBIT 3-8b

Per FCC Rule 24.133(i)

Test procedure: A digital signal is fed into the data input of the transmitter to simulate data. The transmitter is placed in the digital modulation mode and its RF output observed on a spectrum analyzer. The transmitter is set for a maximum deviation of 4.8 kHz. The spectrum is observed at both the maximum and then minimum power output levels.

Refer to spectrum displays on following pages: EXHIBIT 3-9

Results: Spectrum bandwidth limitations meet or exceed FCC requirements as defined by Part 24.133(a)(1)

The bandwidth calculations for 14K4F1D, the direct frequency modulation of the carrier in the digital mode is:

Carson's bandwidth rule…

Bn = 2(M + D) (Where M = the highest modulation frequency)

M = [4800 symbols / (2 symbols /cycle)]

M = 2400 Hz

or

M = (9600 bits / second) / FSK level

M = 9600 / 4

M = 2400 Hz

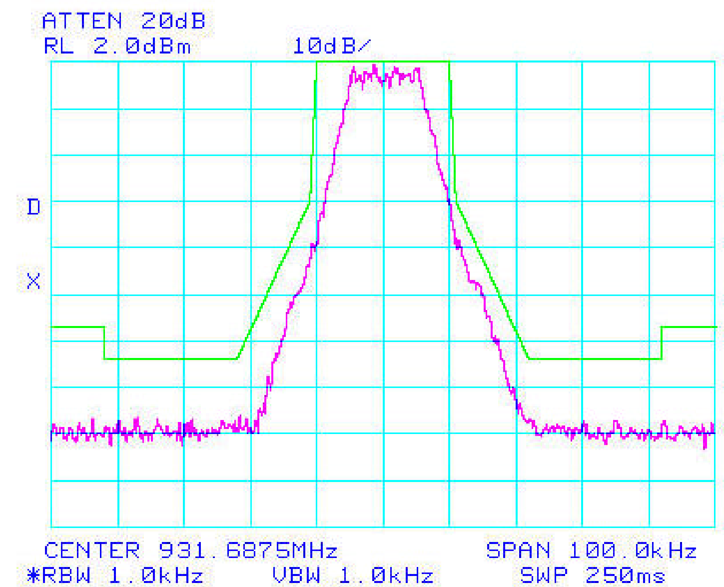
D = Highest Deviation rate. +/- 4.8 kHz

Bn = 2 (2400 + 4800)

Bn = 14.4 kHz

Occupied Bandwidth (digital)* 25 Watts Maximum Power Output

24.133(i)



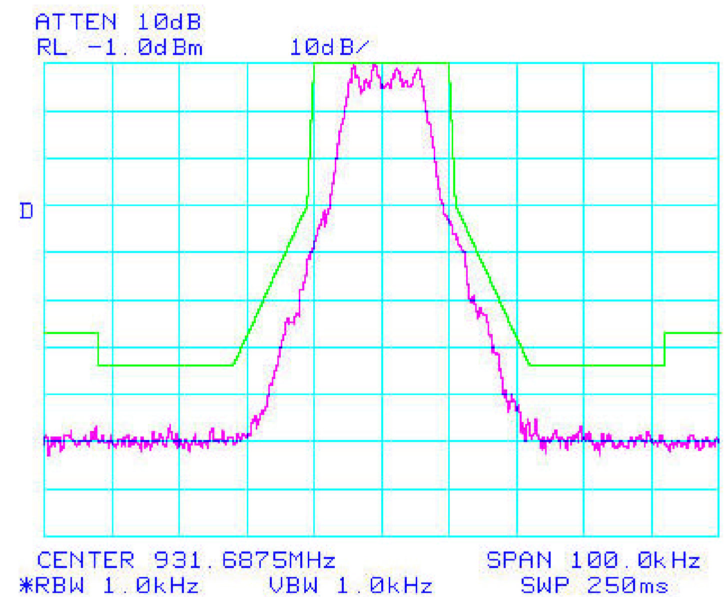
24.133
25Watts
Digital Mode
+/-4.8KHz dev
9600bps

* 9600 bits/second,
4 Level modulation with
88 microseconds rise time filter (highest rise time)

EXHIBIT 3-9a

Occupied Bandwidth (digital)* 1 Watt Maximum Power Output

24.133(1)



24.133
1Watt
Digital Mode
+/-4.8KHz dev
9600bps

* 9600 bits/second,
4 Level modulation with
88 microseconds rise time filter (highest rise time)

EXHIBIT 3-9b

Per FCC Rule 101.111(a)(2)(i)

Test procedure: A digital signal is fed into the data input of the transmitter to simulate data. The transmitter is placed in the digital modulation mode and its RF output observed on a spectrum analyzer. The transmitter is set for a maximum deviation of 4.8 kHz. The spectrum is observed at both the maximum and then minimum power output levels.

Refer to spectrum displays on following pages: EXHIBIT 3-10

Results: Spectrum bandwidth limitations meet or exceed FCC requirements as defined by Part 101.111(a)(2)(i)

The bandwidth calculations for 14K4F1D, the direct frequency modulation of the carrier in the digital mode is:

Carson's bandwidth rule…

Bn = 2(M + D) (Where M = the highest modulation frequency)

M = [4800 symbols / (2 symbols /cycle)]
M = 2400 Hz

or

M = (9600 bits / second) / FSK level
M = 9600 / 4
M = 2400 Hz

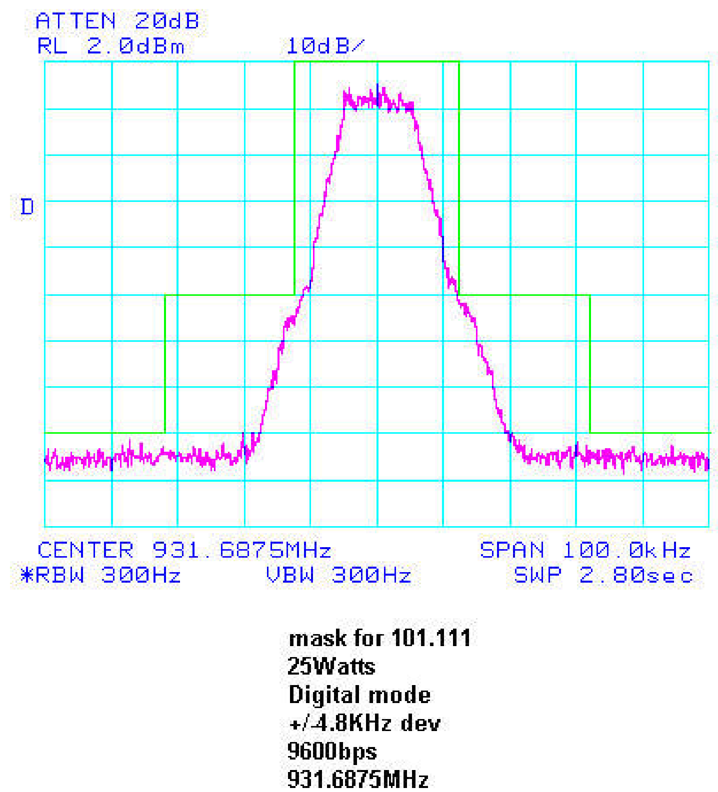
D = Highest Deviation rate. +/- 4.8 kHz

Bn = 2 (2400 + 4800)

Bn = 14.4 kHz

Occupied Bandwidth (digital)* 25 Watts Maximum Power Output

101.111(a)(2)(i)

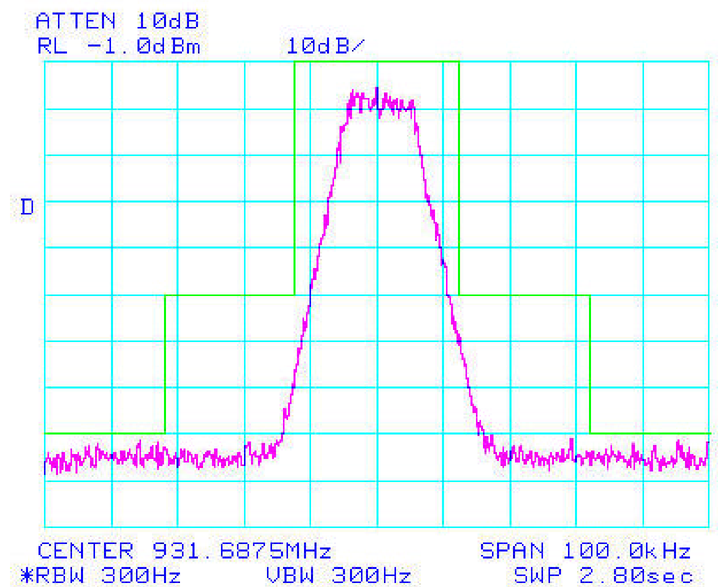


* 9600 bits/second,
4 Level modulation with
88 microseconds rise time filter (highest rise time)

EXHIBIT 3-10a

Occupied Bandwidth (digital)* 1 Watt Maximum Power Output

101.111(a)(2)(i)



101.111
1Watt
Digital Mode
+/-4.8KHz dev
9600bps

* 9600 bits/second,
4 Level modulation with
88 microseconds rise time filter (highest rise time)

EXHIBIT 3-10b

SPURIOUS EMISSIONS (FCC 2.1051)

Analog Test Procedure

Modulate the transmitter in analog mode with a 2500 Hz tone at an input level 16 dB greater than that required producing 50% modulation at 1 kHz and at maximum rated power output. Terminate the transmitter antenna terminal with a 50-ohm resistive load. Provide a sample of RF output that is independent of frequency. Apply RF sample to spectrum analyzer input.

Record the frequency and relative amplitude of each spurious response.

Fc = 929.9375 MHz

Analyzer Settings:	Ref. Level	0dBm
	Res. Bandwidth	30 kHz
	Video Filter	30 kHz
	Detector:	Peak

Device Under Test:
Model: GL-T8200
Test Freq.: 929.9375 MHz

Method of calculation:
Measured level dBm = Spectrum analyzer reading + cable + Attenuator losses (dB)

Frequency (MHz)	Measured reading (dBm)	Limit dBm	Remarks/ Margin
1859.875	-58	-20	Passed
2789.812	-47	-20	Passed
3719.975	-52	-20	Passed
4649.687	-53	-20	Passed
5579.625	-51	-20	Passed
6509.562	-42	-20	Passed

Note: There were no other detectable signals in the frequency range of 30-10,000 MHz

Exhibit 3-11

Digital Test Procedure

Modulate the transmitter in digital mode at a maximum 9600 bit rate with a test signal (square wave) for +/- 4.8 kHz deviation to simulate data transmission. Operate at maximum output power rating. Terminate transmitter antenna terminal with a 50-ohm resistive load. Provide a sample of RF output that is frequency independent.

Apply RF sample to spectrum analyzer input through a notch filter tuned to transmitter carrier frequency.

Record the frequency and relative amplitude of each spurious response. The worst case emissions are recorded in this exhibit. The spurious emissions were scanned in all tests as indicated in Occupied Bandwidth measurement tests.

Results are recorded in exhibit 3-12

Fc = 929.9375 MHz

Analyzer Settings: Ref. Level 0dBm
Res. Bandwidth 30 kHz
Video Filter 30 kHz

Device Under Test:
Model: GL-T8100
Test Freq.: 929.9375 MHz

Method of calculation:
Measured level dBm = Spectrum analyzer reading + cable + Attenuator losses (dB)

Frequency (MHz)	Measured reading (dBm)	Limit dBm	Remarks/ Margin
1859.875	-58	-20	Passed
2789.812	-47	-20	Passed
3719.975	-52	-20	Passed
4649.687	-53	-20	Passed
5579.625	-51	-20	Passed
6509.562	-42	-20	Passed

Note: There were no other detectable signals in the frequency range of 30-10,000 MHz

Exhibit 3-12

FIELD STRENGTH (FCC 2.1053)

Description of test site: 3-Meter Anechoic test Chamber, on file with Commission November 15, 1996. The receiver antenna is located 1 meter from the transmitter.

Test Procedure: Modulate the transmitter with a 2500 Hz tone at an input level 16 dB greater that that required to produce 50% modulation. Operate transmitter at maximum rated power output. Repeat tests at minimum rated power output.

If transmitter is to operate in digital mode, use the same modulation test setup as in spurious emissions (digital) tests, Page 3.12. Perform field strength test at both maximum and minimum rated power output.

Calibrated antennas are used as the receive antenna.

Final stage Power amplifier output $\mathbf{P_t}$ = 25 Watts
Theoretical Numerical gain of a dipole antenna = 1.64

The following formula can be used to compute a field strength at a known distance **d** (meters):

$$\mathbf{E(v/m) = \frac{\sqrt{30 P_t G_A}}{d}}$$

$$\mathbf{E(v/m) = 35.1\ v/m}$$

$$\mathbf{E(dB\mu v/m) = 20\log(E \times 1 \times 10^{6})}$$

$$\mathbf{E(dB\mu v/m) = 150.9\ dB\mu v/m}$$

FCC limit for harmonics:

$$\mathbf{Limit(min) = 43 + 10\log(Pt)} \qquad \mathbf{Pt\ (Watts)}$$

$$\mathbf{Limit(min) = 43 + 10\log(25)}$$

$$\mathbf{Limit(min) = 57dB}$$

FCC limit (*) 150.9-57= 93.9 dBμV/m …..Limit at 1 m test distance
FCC limit (**) 150.9-57-9.5= 84.4 dBμV/m …..Limit at 3 m test distance

Calculation:

Total Measured Value E (dBmV /m) = Receiver/ analyzer reading dBmV -Pre Amp. Gain + Cable Loss (dB) + AF (dB)

Note: there was no external pre amplifier used, so Pre- amp gain = 0 dB

Test distance = 1 meter for frequency range 1-10 GHz and 3.0 meters for 30-1000 MHz

Results: Device under test meets FCC requirements of Field Strength (FCC 2.1053)

Fundamental Freq. = 929.9375 MHz.

Analyzer Settings:

Resolution BW	120 kHz
Video BW	1 MHz
Span/	auto/50 MHz
Sweep	914 msec.
Detector:	Peak

Mode of Operation: Digital Modulation

S/N	**Frequency MHz**	**Total Measured Value dBmV/m**	**FCC Limit (*) dBmV/m**
2	1860	62.2	93.9
3	2790	59.7	93.9
4	3720	60.6	93.9
5	4650	56.7	93.9
6	5580	51.2	93.9
7	6510	66.9	93.9
8	7439.5	<NF	93.9
9	8369.0	<NF	93.9
10	9293.7	<NF	93.9
		NF=Noise Floor of S.A., 68.	

Note: All data taken is worst case as transmitter is rotated 360 degrees and receiving antenna polarization is changed (H and V) and height was varied from 1-4 m. Frequency spectrum was checked for radiated spurious and harmonic emissions out to tenth harmonic. The range of spectrum scanned; 30 MHz to 10 GHz. The S/N 8 through 10 levels are the analyzer base line levels. All other spurious emissions <<20 dB below the permissible level as calculated above.

ANTENNA FACTOR CHART

Manufacturer: EMCO
Antenna: Biconilog
Model: 3141 – 3.0 Meter Calibration
S/N: 1081

FREQUENCY MHz	ANTENNA FACTOR dB
26	13.8
28	13.1
30	12.4
40	9.0
50	7.3
60	7.7
70	8.8
80	9.8
90	10.2
100	10.1
110	9.8
120	9.4
130	9.3
140	9.9
150	10.4
160	10.7
170	11.0
180	10.9
190	10.9
200	11.1
225	12.3
250	13.1
275	14.0
300	15.4
325	15.4
350	15.8
375	16.4
400	16.7
425	16.9
450	17.4
475	17.9
500	18.4
525	19.1
550	19.6
575	20.3
600	20.9
625	21.0
650	21.0
675	21.5

FREQUENCY MHz	ANTENNA FACTOR dB
700	21.9
725	21.9
750	22.0
775	22.3
800	22.4
825	22.7
850	23.1
875	23.8
900	24.1
925	24.1
950	24.1
975	24.3
1000	24.6
1050	24.8
1100	25.2
1150	26.2
1200	26.8
1250	26.2
1300	26.5
1350	27.5
1400	27.4
1450	27.2
1500	27.8
1550	29.0
1600	28.7
1650	28.4
1700	28.7
1750	29.8
1800	29.8
1850	30.2
1900	30.0
1950	30.3
2000	30.6

Exhibit 3-14

Manufacturer: EMCO

Antenna: Double Ridged Guide
Model: 3115 – 1.0 Meter Calibration
S/N: 1081

FREQUENCY MHz	ANTENNA FACTOR dB
1000	25.1
1500	25.2
2000	27.5
2500	28.7
3000	30.6
3500	32.7
4000	32.1
4500	32.2
5000	33.9
5500	34.6
6000	35.0
6500	35.3
7000	36.1
7500	36.7
8000	37.1
8500	37.9
9000	38.4
9500	38.1
10000	38.2
10500	38.2
11000	38.4
11500	39.0
12000	39.2
12500	39.3
13000	40.8
13500	41.8
14000	41.5
14500	41.5
15000	39.9
15500	38.4
16000	38.3
16500	39.9
17000	41.9
17500	43.7
18000	48.3

Exhibit 3-15

FREQUENCY STABILITY (FCC 2.1055)

Frequency Stability (Temperature)

Operate oscillator and other frequency determining circuit in a temperature chamber. Measure the oscillator frequency with a frequency counter capable of at least 1 Hz resolution. Record the oscillator frequency after the temperature within the temperature chamber has stabilized for 1 hour at each test temperatures of -30, -20, -10, 0, +10, +20, +30, +40, +50^{o} C.

Refer to EXHIBIT 3-16 for test results.

Frequency Stability (Warm-up)

Operate oscillator and other frequency determining circuit in a temperature chamber. Measure the oscillator frequency with a frequency counter capable of at least 1 Hz resolution. Record the oscillator frequency at regular intervals until the frequency is within the published tolerance. Start each series of reading from a cold start at the beginning ambient room temperature. Repeat for beginning ambient temperature of -30, 0 and +50^{o} C.

Refer to EXHIBIT 3-17for test results.

Frequency Stability (Supply Voltage)

Operate transmitter into a 50-ohm load. Provide a sample of RF output to a frequency counter. Power the transmitter from a variable voltage, primary power source. Record transmitter frequency at each value of primary power source voltage. Repeat at voltages equal to 85%, 90%, 100%, 110%, and 115% of rated primary power source voltage.

Refer to EXHIBIT 3-18 for test results.

Oscillator Model: CPN 6624.00002 (High Stability)

Temperature (Degrees C)	Time (Hours)	Frequency (Hz)	Delta Frequency (Hz)
25 (room temp)	0	10,000,000.03	Ref
-30	1	10,000,000.04	+0.01
-20	2	10,000,000.04	+0.01
-10	3	10,000,000.04	+0.01
0	4	10,000,000.04	+0.01
+10	5	10,000,000.03	0.00
+20	6	10,000,000.03	0.00
+30	7	10,000,000.01	-0.02
+40	8	10,000,000.01	-0.02
+50	9	10,000,000.02	-0.01

EXHIBIT 3-16

Oscillator Model: CPN 6624.00002 (High Stability)

Time (minutes)	10,000,000.03 Hz Ref Frequency (25^{o}C)		
From Turn-On	-30^{o}C Start	0^{o}C Start	+50^{o}C Start
1	10,000,395.84	10,000,247.59	10,000,070.71
2	10,000,377.86	10,000,203.35	10,000,024.64
3	10,000,449.63	10,000,156.09	10,000,001.71
4	10,000,314.14	10,000,114.15	9,999,987.61
5	10,000,275.39	10,000,078.65	9,999,996.72
6	10,000,232.38	10,000,052.15	9,999,999.15
7	10,000,191.16	10,000,031.05	9,999,997.61
8	10,000,156.50	10,000,015.15	9,999,999.77
9	10,000,125.16	10,000,003.30	9,999,999.78
10	10,000,094.90	9,999,997.16	9,999,999.80
11	10,000,071.31	9,999,997.25	9,999,999.84
12	10,000,051.42	9,999,998.61	9,999,999.86
13	10,000,033.63	9,999,999.91	9,999,999.88
14	10,000,019.82	9,999,999.93	9,999,999.92
15	10,000,011.21	9,999,999.95	9,999,999.94
16	10,000,003.64	9,999,999.96	9,999,999.96
18	9,999,999.87	9.999,999.97	9,999,999.98
20	9,999,999.83	9,999,999.98	9,999,999.98
22	9,999,999.92	9,999,999.99	10,000,000.00
24	9,999,999.94	10,000,000.00	10,000,000.03
26	9,999,999.96	10,000,000.01	10,000,000.03
28	9,999,999.97	10,000,000.01	10,000,000.03
32	9,999,999.99	10,000,000.02	10,000,000.03
36	10,000,000.00	10,000,000.02	10,000,000.03
40	10,000,000.01	10,000,000.03	10,000,000.03
44	10,000,000.01	10,000,000.04	10,000,000.03
48	10,000,000.03	10,000,000.04	
52	10,000,000.03		
56	10,000,000.04		
Stabilized	10,000,000.04	10,000,000.04	10,000,000.04

EXHIBIT 3-17

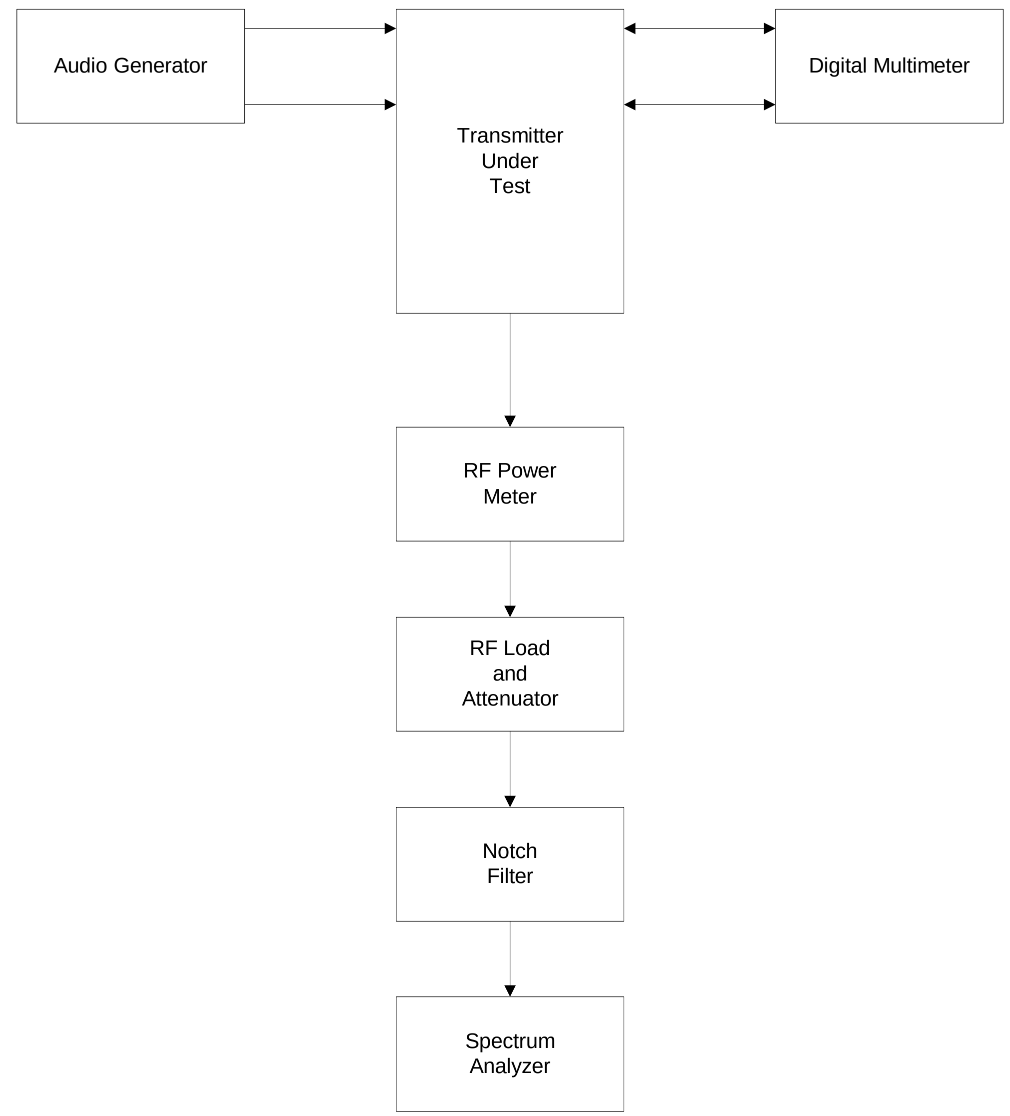
Oscillator Model: CPN 6624.00002 (High Stability)

Supply Voltage (%)	Volts (dc)	Frequency (Hz)	Delta Frequency (Hz)
77	20	9,999,999.75	0
100	26	9,999,999.75	0
115	30	9,999,999.75	0

The unit is designed for operation from a dc power source with an operating range of 20 to 30 volts, nominal 26 volts.

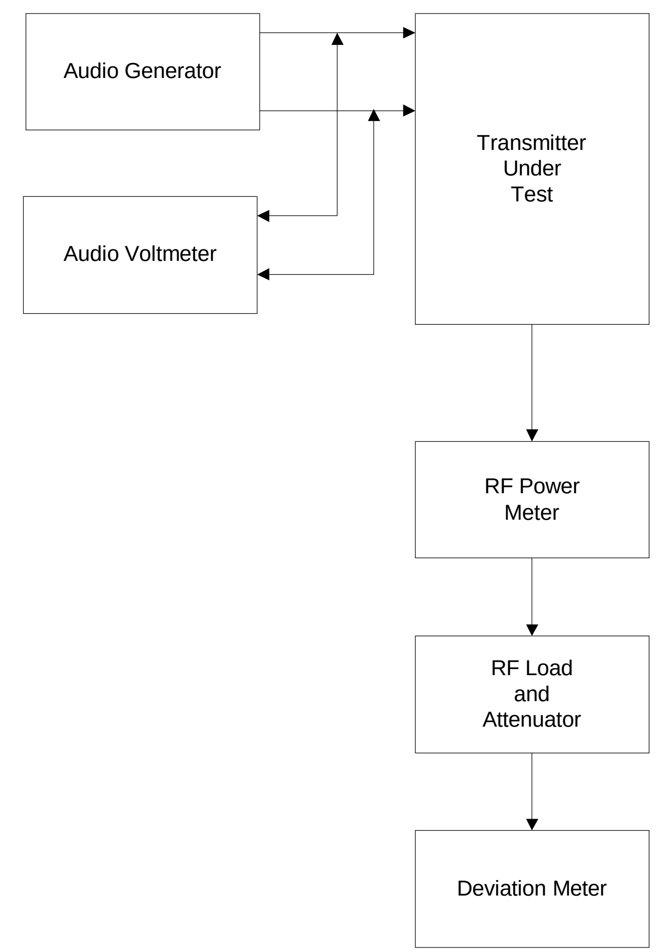
EXHIBIT 3-18

RF Power Output, Occupied Bandwith, and Spurious Emissions
Test Setup

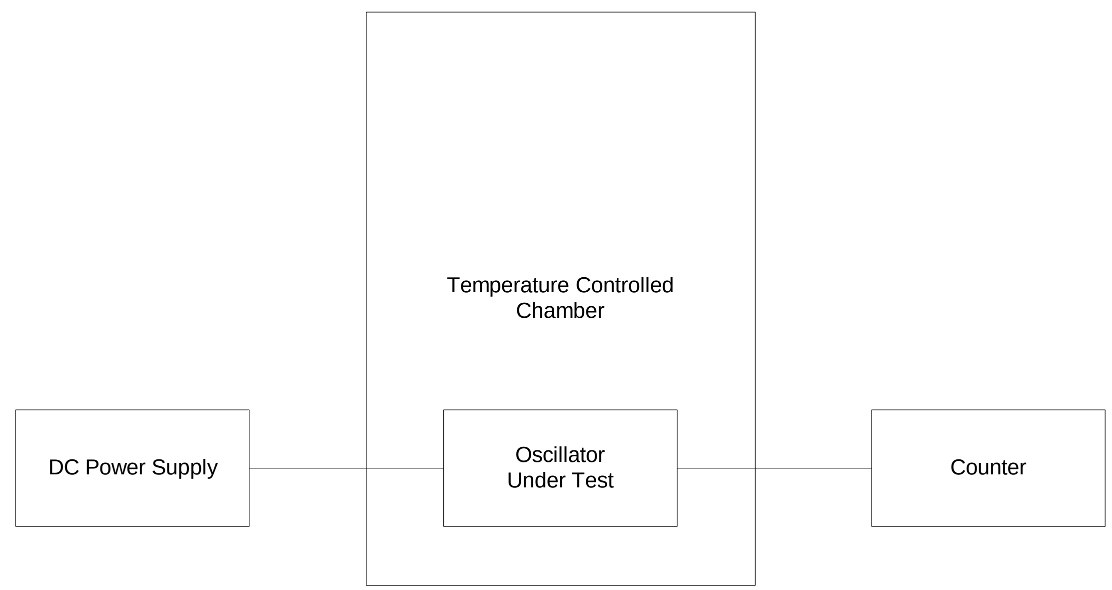


BFLGL-T8200 a1

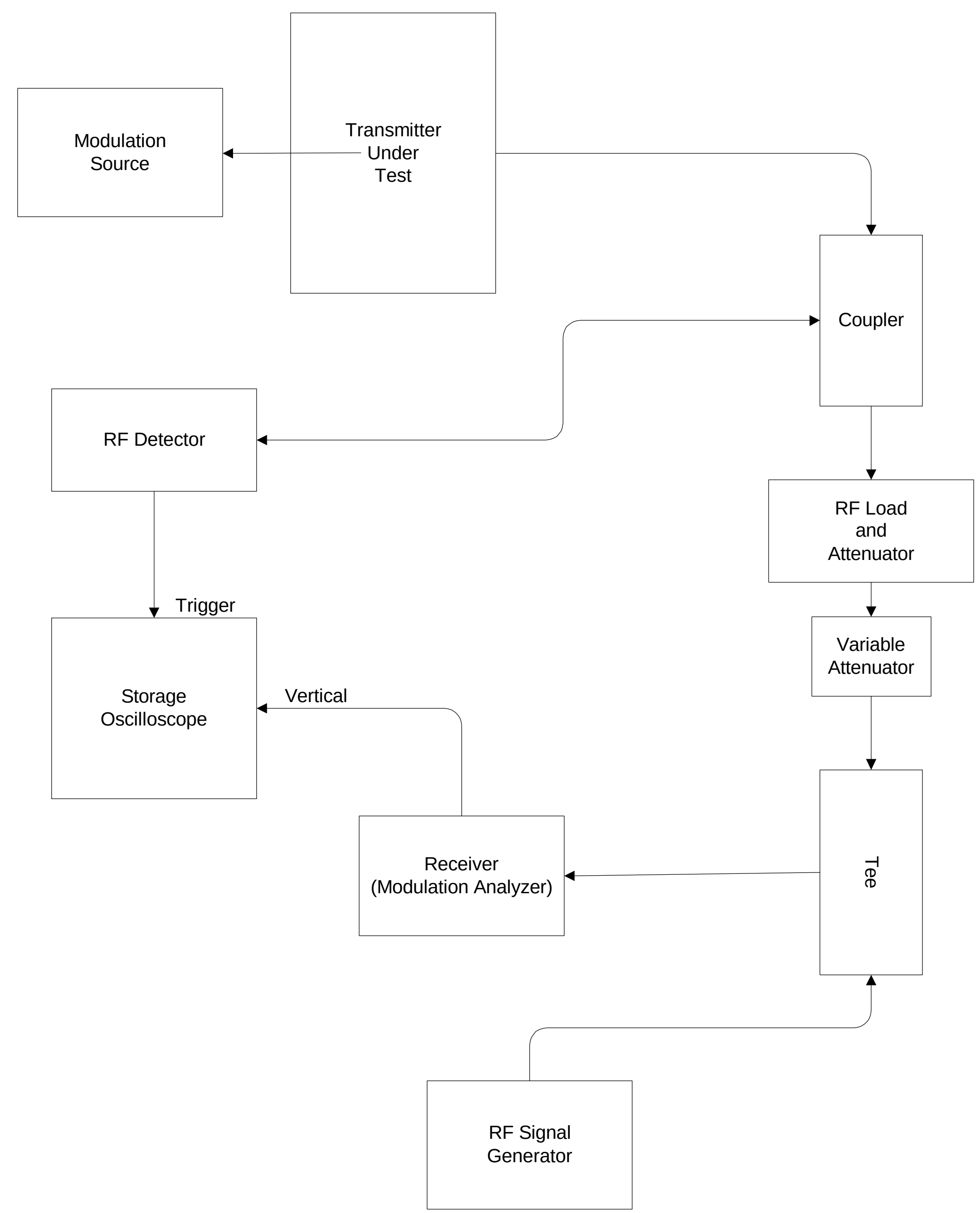
Frequency Response and Deviation Limiter Operation
Test Setup



Oscillator Teperature Stability and Warm-Up Time
Test Setup



Keying Transient Test Setup



BFLGL-T8200 a4

Oscillator Line Voltage Sability
Test Setup

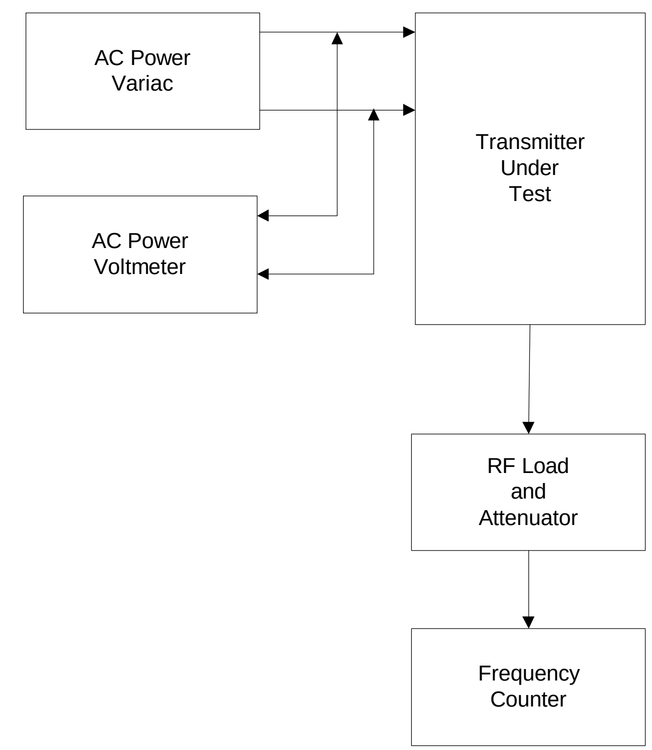


EXHIBIT 4 -- CONSTRUCTION PHOTOGRAPHS

THE CONSTRUCTION PHOTOGRAPHS ARE SUPPLIED AS SEPARATE DOCUMENTS DUE TO THE SIZE OF FILE REQUIRED.

The file names are:

1) 8200ext.pdf
2) 8200int.pdf

EXHIBIT 5 -- Glenayre TXC

FREQUENCY STABILITY (FCC 2.1055)

Frequency Stability (Temperature)

Operate oscillator and other frequency determining circuits in a temperature chamber. Measure the oscillator frequency with a frequency counter capable of at least 1 Hz resolution. Record the oscillator frequency after the temperature within the chamber has stabilized for one hour at each test temperature of –30, -20, -10, 0, +10, +20, +30, +40, and +50°C.

Refer to Exhibit 5-1 for test results.

Frequency Stability (Warm-up)

Operate oscillator and other frequency determining circuits in a temperature chamber. Measure the oscillator frequency with a frequency counter capable of at least 1 Hz resolution. Record the oscillator frequency at regular intervals until the frequency is within the published tolerance. Start each series of readings from a cold start at the beginning ambient temperature. Repeat for beginning ambient temperatures of –30, 0 and +50°C.

Refer to Exhibit 5-2 for test results.

Frequency Stability (Supply Voltage)

Operate transmitter into a 50-ohm load. Provide a sample of RF output to a frequency counter. Power the transmitter from a variable voltage, primary power source. Record transmitter frequency at each value of primary power source voltage. Repeat at voltages equal to 85%, 90%, 100%, 110%, and 115% of rated primary power source voltage.

Refer to Exhibit 5-3 for test results

OSCILLATOR TEMPERATURE STABILITY

Oscillator Model: 6624.00002

Temperature	Time	Frequency (Hertz)	Delta F (Hertz)
+25C (room)	0 hrs	10,000,000.1	Ref
-30C	1 hrs	10,000,000.1	0.0
-20C	2 hrs	10,000,000.1	0.0
-10C	3 hrs	10,000,000.1	0.0
0C	4 hrs	10,000,000.1	0.0
+10C	5 hrs	10,000,000.1	0.0
+20C	6 hrs	10,000,000.1	0.0
+30C	7 hrs	10,000,000.1	0.0
+40C	8 hrs	10,000,000.1	0.0
+50C	9 hrs	10,000,000.1	0.0

Exhibit 5-1

Time from Turn On	10,000,000.03 Hz – REF Frequency (25ºC)		
	-30ºC Start	0ºC Start	+50ºCStart
1 minute	10,000,509.16	10,000,405.95	10,000,241.18
2 minutes	10,000,477.40	10,000,347.41	10,000,153.20
3 minutes	10,000,430.81	10,000,277.74	10,000,098.76
4 minutes	10,000,375.25	10,000,208.20	10,000,041.20
5 minutes	10,000,315.59	10,000,143.87	9,999,993.52
6 minutes	10,000,255.15	10,000,088.66	9,999,997.03
7 minutes	10,000,196.76	10,000,043.40	9,999,999.06
8 minutes	10,000,142.73	10,000,011.35	9,999,999.76
9 minutes	10,000,093.02	9,999,995.13	9,999,999.93
10 minutes	10,000,055.19	9,999,997.51	10,000,000.00
12 minutes	10,000,024.35	9,999,999.33	10,000,000.04
14 minutes	9,999,995.62	9,999,999.99	10,000,000.214
16 minutes	9,999,999.61	10,000,000.04	10,000,000.05
18 minutes	10,000,000.00	10,000,000.04	10,000,000.05
20 minutes	10,000,000.04	10,000,000.05	10,000,000.05
22 minutes	10,000,000.06	10,000,000.05	
24 minutes	10,000,000.06	10,000,000.06	
26 minutes	10,000,000.05	10,000,000.05	
28 minutes	10,000,000.06	10,000,000.05	
30 minutes	10,000,000.06	10,000,000.06	
32 minutes	10,000,000.05	10,000,000.06	
34 minutes	10,000,000.06	10,000,000.06	
36 minutes	10,000,000.06		
38 minutes	10,000,000.06		
Stabilized	10,000,000.06	10,000,000.06	10,000,000.05

Exhibit 5-2

OSCILLATOR LINE VOLTAGE STABILITY

Supply Voltage (%)	Volts (dc)	Frequency (Hz)	Delta F (Hz)
77	+20	10,000,000.14	0
100	+26	10,000,000.14	0
115	+30	10,000,000.14	0

The unit is designed for operation form a dc power source; range of 20 to 29 volts, nominal 26 Vdc.

Exhibit 5-3

EXHIBIT 6 -- Motorola C-NET™

FREQUENCY STABILITY (FCC 2.1055)

Frequency Stability (Temperature)

Operate oscillator and other frequency determining circuits in a temperature chamber. Measure the oscillator frequency with a frequency counter capable of at least 1 Hz resolution. Record the oscillator frequency after the temperature within the chamber has stabilized for one hour at each test temperature of –30, -20, -10, 0, +10, +20, +30, +40, and +50°C.

Refer to Exhibit 6-1 for test results.

Frequency Stability (Warm-up)

Operate oscillator and other frequency determining circuits in a temperature chamber. Measure the oscillator frequency with a frequency counter capable of at least 1 Hz resolution. Record the oscillator frequency at regular intervals until the frequency is within the published tolerance. Start each series of readings from a cold start at the beginning ambient temperature. Repeat for beginning ambient temperatures of –30, 0 and +50°C.

Refer to Exhibit 6-2 for test results.

Frequency Stability (Supply Voltage)

Operate transmitter into a 50-ohm load. Provide a sample of RF output to a frequency counter. Power the transmitter from a variable voltage, primary power source. Record transmitter frequency at each value of primary power source voltage. Repeat at voltages equal to 85%, 100%, and 115% of rated primary power source voltage.

Refer to Exhibit 6-3 for test results

OSCILLATOR TEMPERATURE STABILITY

Oscillator Model: Motorola C-NET™

Temperature (Degrees C)	Time (Hours)	Frequency (Hertz)	Delta F (Hertz)
+25C (room)	0 hrs	10,000,000.004	Ref
-30C	1 hrs	9,999,999.983	-0.021
-20C	2 hrs	10,000,000.043	+.039
-10C	3 hrs	10,000,000.102	+.098
0C	4 hrs	10,000,000.125	+.121
+10C	5 hrs	10,000,000.090	+0.086
+20C	6 hrs	10,000,000.048	+0.044
+30C	7 hrs	9,999,999.922	-0.082
+40C	8 hrs	9,999,999.816	-0.188
+50C	9 hrs	9,999,999.899	-0.105

Exhibit 6-1

Time from Turn On	10,000,000.48 Hz – REF Frequency (25ºC)		
	-30ºC Start	0ºC Start	+50ºCStart
1 minute	10,000,591.87	10,000,355.62	10,000,005.73
2 minutes	10,000,322.90	10,000,112.19	9,999,999.53
3 minutes	10,000,144.32	10,000,010.17	10,000,000.25
4 minutes	10,000,050.90	9,999,999.66	10,000,,000.106
5 minutes	10,000,010.13	10,000,000.276	10,000,000.146
6 minutes	9,999,997.10	10,000,000.307	10,000,000.176
7 minutes	9,999,999.88	10,000,000.320	10,000,000.190
8 minutes	9,999,999.94	10,000,000.345	10,000,000.175
9 minutes	9,999,999.99	10,000,000.358	10,000,000.175
10 minutes	10,000,000.03	10,000,000.368	10,000,000.216
11 minutes	10,000,000.057	10,000,000.370	10,000,000.213
12 minutes	10,000,000.073	10,000,000.379	10,000,000.198
13 minutes	10,000,000.095	10,000,000.377	10,000,000.221
14 minutes	10,000,000.102	10,000,000.381	10,000,000.214
15 minutes	10,000,000.126	10,000,000.382	10,000,000.217
16 minutes	10,000,000.136	10,000,000.384	10,000,000.226
18 minutes	10,000,000.157	10,000,000.386	10,000,000.230
20 minutes	10,000,000.176	10,000,000.389	10,000,000.222
22 minutes	10,000,000.194	10,000,000.391	10,000,000.207
24 minutes	10,000,000.203	10,000,000.391	10,000,000.204
26 minutes	10,000,000.216	10,000,000.395	10,000,000.209
28 minutes	10,000,000.227	10,000,000.398	10,000,000.206
32 minutes	10,000,000.246	10,000,000.399	10,000,000.206
36 minutes	10,000,000.259	10,000,000.403	10,000,000.219
40 minutes	10,000,000.028	10,000,000.408	10,000,000.224
44 minutes	10,000,000.028	10,000,000.409	10,000,000.224
48 minutes	10,000,000.299	10,000,000.413	10,000,000.222
52 minutes	10,000,000.301	10,000,000.418	10,000,000.227
56 minutes	10,000,000.309	10,000,000.422	10,000,000.222

Exhibit 6-2

OSCILLATOR LINE VOLTAGE STABILITY

Supply Voltage (%)	Volts (dc)	Frequency (Hz)	Delta F (Hz)
77	+20	10,000,000.409	0
100	+26	10,000,000.410	0
115	+30	10,000,000.410	0

*The unit is designed for operation form a dc power source; range of 20 to 30 volts, nominal 26 Vdc.

Exhibit 6-3