STATEMENT OF ATTESTATION

RFI00001 Radio Transceiver

FCC ID: EF4 RFI00001

This device is a radio transceiver to be used as a wireless intercom in a residential or commercial installation. It is compatible with any of the Linear Family Radio System (FRS) transceivers. The device is to be used in ordinary indoor environments and is not intended for harsh weather conditions, i.e. rain expose or outdoor temperature extremes.

This equipment has been tested in accordance with the requirements contained in the appropriate Commission regulations. To the best of my knowledge, these tests were performed using measurement procedures consistent with industry or commission standards and demonstrate that the equipment complies with the appropriate standards. Each unit manufactured, imported or marketed, as defined in the Commission's regulations, will conform to the sample(s) tested within the variations that can be expected due to quantity production and testing on a statistical basis.

I further certify that the necessary measurements were made by Linear Corporation, 2055 Corte Del Nogal, Carlsbad, CA., 92009.

Certified by:

REGISTERED PROFESSIONAL ENGINEER
JOHN W. KUIVINEN
No. E013909
Exp. 6/04
ELECTRICAL
STATE OF CALIFORNIA

_____ ___May 24, 2001 ___

John W. Kuivinen, P.E. Date

Regulatory Compliance Engineer

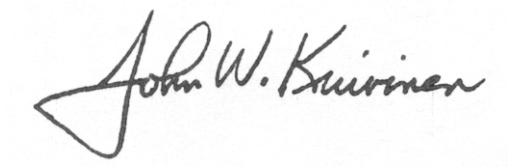
Summary of Test Results
in accord with FCC Part 15, Subpart B

Equipment Model:	RFI00001 Transceiver
Transceiver Tested to 15.101(b):	Complies
Test Conditions:	Radiated Section 15.109(a)
Receiver Spurious at 3 meters: (Highest Emission)	8.1 uV (-21 dB below limit)
Frequency:	35.4 MHz

Attestation:

The radio apparatus identified in the application has been subject to all the applicable test conditions specified in Parts 2 and 15 of the FCC Rules and Regulations and all of the requirements of the Rules and Regulations have been met.

Regulatory Compliance Engineer



John W. Kuivinen, P.E. _____ Date:_ May 24, 2001_

Radio Standard Specification
Family Radio Service

FCC Rules Part 95, Subpart B, FRS Radios

and

FCC Rules Part 15, Unintentional Radiators

1.0 General:

1.2, Exclusions to TV Broadcast Freq.	N/A

2.0 Related Documents:

Reference Documents for Application:	CFR 47, Parts 2, 15 and 95 ANSI/IEEE C63.4-1992

3.0 Test Equipment:

Supply Voltage:	120 VAC, Line Operated Device
Test Equipment List	See Report of Measurements
Signal Detector:	Peak Signal Reported

4.0 Notification and Test Results:

Summary of Results	See Page 1 of this section

5.0 General Technical Requirements:

5.1 Testing Methods:	Peak Signal
5.1 Reference Standard:	C63.4-1992 (IEEE Procedure)
5.3 External Controls:	No user serviceable parts
5.4 Accessories:	None Required
5.5 Detector Bandwidth:	< 1 GHz = 100 KHz (minimum) > = 1 GHz = 1 MHz (minimum)
5.6 Equipment Labels:	See Label Facsimile
5.7 Manual Disclaimer:	Complies

5.9 Usage Restrictions:	Voice or Digital Control Codes Only
6.0 Receiver Characteristics and Tests:	
7.1 Freq. of Operation:	467.6875 or 467.5625 MHz
7.3 Receiver Radiated Spurious:	Complies - See Report of Emissions
7.4 Conducted Emissions:	Complies - See Report of Emissions
8.0 Self Notification:	N/A
9.0 AC Wireline Conducted Emissions:	Complies - See Report of Emissions
10.0 Terminated Measurement Method:	Complies - See Report of Emissions
11.0 Radiated Measurement Method:	C63.4-1992
11.1 Measuring Distance:	3 meters
11.2 Open Field Test Site:	Complies, FCC Site Acceptance dated 4/2001
11.3 Equipment Test Platform:	0.8 meters, rotary turntable
12.0 DC Power Consumption Methods:	N/A
13.0 Near Field Measurement for < 30 MHz:	N/A
14.0 Test Report Submission:	See Attached

REPORT OF MEASUREMENTS

RFI00001 Radio Transceiver

PRODUCT ID: RFI00001

The enclosed documents reflect the requirements contained generally within the code of Federal Regulations, Title 47, Parts 2, 15 and 95 as most recently published October 1, 2000 and all other applicable revisions made by the Commission since that time.

Statement relating to 15.37(b) "Transition provision for compliance with the rules".

> This device has a Declaration of Conformity under the current rules for a Class B digital device under Subpart B of Unintentional Radiators utilizing sections 15.107 conducted limits of 250 uV maximum and 15.109(a) radiated limits.

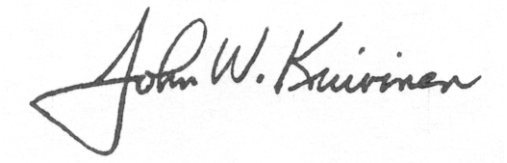
The specific rule sections for which the enclosed documents demonstrate compliance or rely upon to demonstrate compliance with the Commission's application and technical standards are as follows:

15.101-15.111	Subpart B, Unintentional Radiators.
95.191-96.653	Subpart B, Family Radio System (FRS)

Test Procedure C63.4-1992 was used for all receiver and transmitter measurement techniques.

In accord with Section 2.948 of the Commission's Rules, a Test Site submittal is on file with the commission and a Letter of Acceptance dated March 23, 2001 (File 90767) is a portion of the Commission's records.

All of the information contained within this documentation is true, correct, and complete to the best of my knowledge.



_____ ___ May 24, 2001 ___

John W. Kuivinen, P.E. Date

Regulatory Compliance Engineer

TESTING INSTRUMENTATION AND EQUIPMENT LIST

SPECTRUM ANALYZERS:

H.P. HP8562A 1KHz to 22GHz
S/N 2913A03742 Calibrated 11/00
Due 11/01

ANTENNAS:

(2) Ailtech DM105A T1 20-200 MHz Tuned Dipole
S/N 93412-105 and 93412-114 Calibrated 3/01 Due: 3/02
(2) Ailtech DM105A T2 140-400 MHz Tuned Dipole
S/N 93413-113 and 93413-117 Calibrated 3/01 Due: 3/02
(2) Ailtech DM105A T3 400-1000 MHz Tuned Dipole
S/N 93413-105 and 93414-111 Calibrated 3/01 Due 3/02
(2) AH Systems SAS-200/511 1-12.4 GHz Log Periodic
S/N 118 and 124, P/Ns 2069
(1) AH Systems SAS-200/540 20-330 MHz Biconical
S/N 367 P/N 2052

INSTRUMENTATION:

H.P. HP8656B RF Generator 100 KHz - 99O MHz
S/N A4229590 Calibrated 3/01
Due 3/02

IFR 1200/S Service Monitor, 250 KHz - 1 GHz
Audio Generator, RF Monitor, Signal Generator, Spectrum analyzer.
S/N 4148, Used as audio signal source and Bench indicator, deviation measurement made via HP8562A spectrum analyzer

Iwatsu, SS-5710 Oscilloscope DC - 60 MHz bandwidth
S/N 52455775, Used for audio signal strength measurements and general indications, calibrated by using output of HP8656B RF signal generator into a 50 ohm load.

Solar Electronics Line Impedance Stabilization Network, Type
8012-50-R-24-BNC Calibrated: 3/01
S/N 8379585 Due: 3/02
HP 8447D Broadband preamplifier, 0.1-1300 MHz
S/N 2443A03660 Calibrated: 3/01
Due: 3/02
Mini-Circuits ZFL-2000 broadband preamplifier, 10-3000 MHz
S/N Lin 001 Calibrated: 3/01
Due: 3/02

ACCESSORIES:

(2) Ailtech Rulers calibrated in MHz
4 Meter ABS Antenna Mast and Trolley
Tektronix C5C Scope Camera
Eighty Centimeter Tall, Motorized Wooden Turntable
BNC to BNC Cables - as-required

(2) 25' RG-214/U Low-loss Coaxial Cable
S/N- LIN001 & LIN002 Calibrated: 3/01
Due: 3/02

(2) 3' RG-55/U Low-loss Coaxial Cable, calibarated as part of the preamplifiers. Automatically taken into account when used with the above itemized range preamplifiers.

MEASUREMENT OF RADIO FREQUENCY EMISSION OF CONTROL AND SECURITY ALARM DEVICES FCC RULES PART 15, C63.4-1992 TEST PROCEDURE

I. INTRODUCTION

As part of a continuing series of quality control tests to ensure compliance with all applicable Rules and Regulations, this enclosure details the test procedures for certain radio control devices. Testing was performed at a test site located on the property of Linear Corporation, 2055 Corte del Nogal, Carlsbad, CA., 92009.

II. MEASUREMENT FACILITY DESCRIPTION

The test facility is a specially prepared area adequately combining the desirability of an interference free location with the convenience of nearby 120 volt power outlets, thus completely eliminating the incidence of inverter hash, so often a problem with field measurements.

III. DESCRIPTION OF SUPPORTING STRUCTURES

For Measuring Equipment - The antenna is supported on a trolley that can be raised and lowered on a mast by means of remote control to any level between 1 meter and 4 meters above the ground. For measurements at 3 meters, an antenna height (center of dipole) of about 1 meter generally yields the greatest field strength. For measurements at 1 meter, an antenna height equal to the device under test generally yields the greatest field strength. Usually, horizontal polarization yields the greatest field strength for both 1 and 3 meter measurements.

For Equipment Under Test (EUT): The equipment to be tested is supported by a wooden turntable at a height of eighty centimeters. A two-axis swivel at the top of the turntable permits the unit under test to be manually oriented in the position of maximum received signal strength. The turntable can be rotated by remote control.

Test Configuration - All transmitters were located eighty centimeters above ground, at a distance of three meters from the antenna. They were each oriented for maximum radiation by rotating the turntable. The antenna was then moved vertically along the mast for optimum reception in both horizontal and vertical planes. Where no emissions were found, the antenna was also moved to one-meter distance to improve system sensitivity.

All test units were located eighty centimeters above ground, at a distance of three meters from the antenna. They were each oriented for maximum radiation by rotating the turntable. The antenna was then moved vertically along the mast for optimum reception in both horizontal and vertical planes. Generally, emissions were very close to the observed spectrum analyzer noise floor, making accurate measurement difficult

because of the analyzer detector's characteristic of adding signal and noise. To better observe and measure emissions well above the noise floor, the antenna was moved in to one meter. This provides a theoretical 9.54 dB improvement in received field strength, but a possible shift from far field to near field antenna characteristics may introduce an unknown error in measurement.

All transmitters and receivers tested are typical of production units.

A Hewlett-Packard spectrum analyzer consisting of an 8562A mainframe is used for the field strength meter. A set of Ailtech DM-105 series dipoles are used for the receiving antennas up to 1 GHz. An A.H. Systems model SAS-200/511 log periodic antenna is used from 1 to 5 GHz. Since the published antenna factor includes the small amount of balun loss, this factor is not included in the equations for correcting measured values. The cable loss is added to the raw data. For measurements up to 1 GHz, a Hewlett-Packard 8447D broadband RF preamplifier is inserted between the antenna cable and spectrum analyzer input to ensure adequate system sensitivity while measuring.

From 1 GHz to 3 GHz, a Mini-Circuits ZFL-2000 broadband RF preamplifier is used instead of the HP 8447D. In many cases, the antenna is moved in to a distance of 1 meter to enhance test range sensitivity after the 3-meter data is observed. A theoretical 9.54dB improvement is realized. Please see Excel data spreadsheet for details. For a particular device and frequency, the EUT to antenna distance is specified in the Report of Measurements.

Correction of Measured Values - The spectrum analyzer calibration is in units of dBm absolute. Published antenna factor, measured cable loss and preamplifier gain are in units of dB. All equipment is referenced to a 50-ohm characteristic impedance; therefore, any impedance terms will factor out of any calculations. Also, balun loss is included in the antenna factor, so this term will not appear in any calculation.

To obtain field strength, the reference (50 ohm system) 1 uV = 0 dBuV = -107 dBm is used.

For a given frequency: antenna factor, cable loss, preamplifier gain (if used) and a 9.54 dB gain factor (3 meters to 1 meter field strength conversion) when required are factored into the spectrum analyzer reading, resulting in a field strength in units of dBm.

Field strength reading (dBm) + 107 dB = dBuV, using 0 dBuV = 1 uV/meter at a specified distance as reference.

All of the equipment was calibrated to NBS-traceable factory specifications prior to the date of measurement.

IV MEASUREMENT PROCEDURE

Receivers

1. Place receiver on test stand, apply power.

2. Tune the antenna to the operating frequency to be measured.

3. Tune the spectrum analyzer.

4. Cohere the receiver (Superregenerative receivers only)

   Tune the RF Generator to the center frequency of the receiver under test. Apply a signal level of -20 dBm at a distance of approximately two meters. Use an Ailtech antenna of the correct tuned frequency to radiate the cohering signal. Vary the signal frequency to insure that the maximum spurious emissions are recorded.

   While radiating a signal, monitor the output levels at the analyzer looking for the largest peak from the unintentional radiator's spurious output.

   Record the highest levels near the center frequency but be careful not to record the signal generator as an emission from the receiver.

5. Record the Emission Levels

   Retune the antenna to the exact frequency of measurement. Adjust the antenna height and polarization for peak field strength. Rotate the turntable to orient the receiver for maximum emissions and record the frequency and level on the Report of Measurements.

   Record an image of spectrum analyzer display for the Report of Measurements, if required.

Spectrum Analyzer Control Settings:

Tuning:	As required
Bandwidth:	100 KHz
Scan Width:	100 KHz/div (may be different when tuning or adjusting display for photographs)
Input Attenuator:	10 dB
Scan Time:	50 mSec. sweep
IF Mode:	Log 10 dB/division
Reference Level:	-10 dBm
Video Filter:	OFF
Scan Mode:	Internal

Scan Trigger: Auto

Transmitters

1. Set the DIP-switch rockers of the transmitter (if needed) to all ON, jam the button in the ON position, and place the transmitter on the test stand.

2. Tune the antenna (if required).

3. Tune the spectrum analyzer.

4. Adjust the antenna height and polarization for peak field strength.

5. Rotate the turntable to orient the transmitter for the highest reading.

6. Record the observed peak emission.

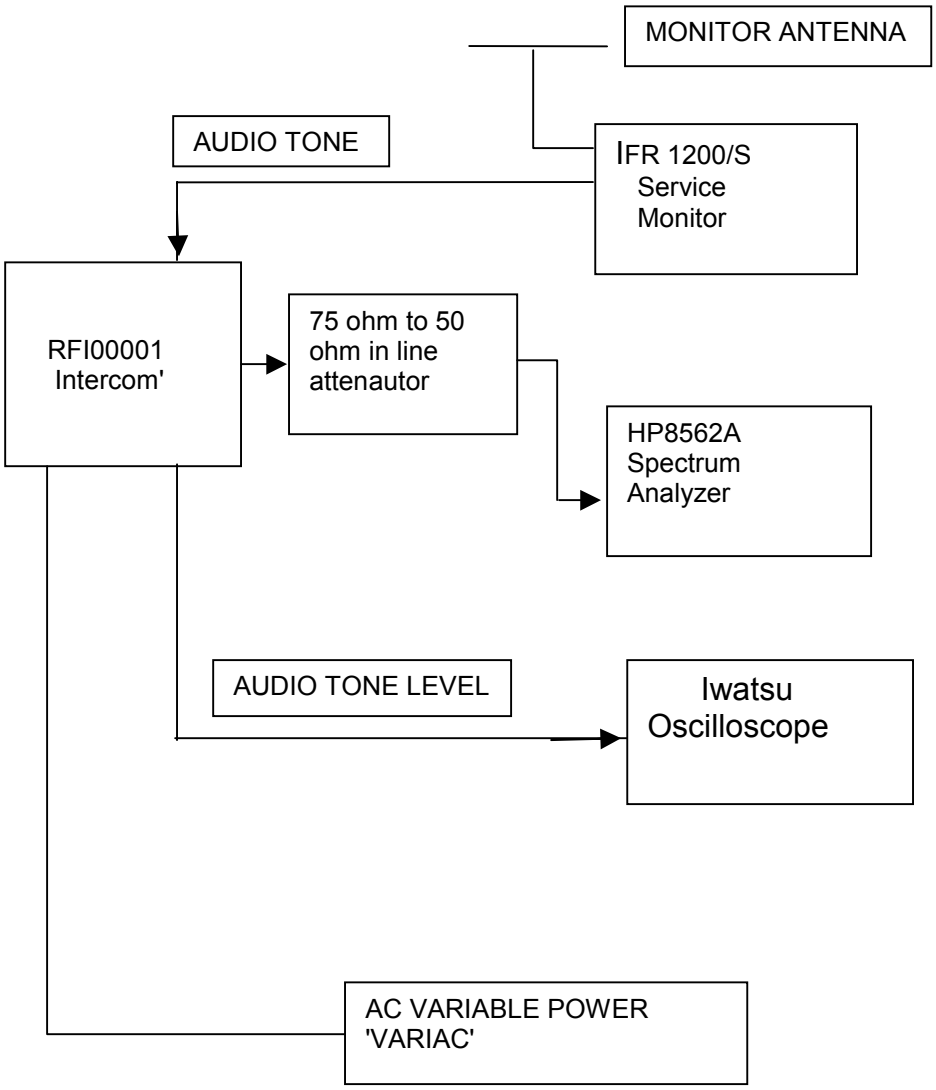
7. Record the screen image (if required).

Spectrum Analyzer Control Settings:

Tuning:	As required
Bandwidth	100 KHz for Field Strength,
Scan Width:	100 KHz/div (may be different when tuning or adjusting display for photographs)
Input Attenuator:	10 dB
Scan Time:	50 msec sweep
Reference Level:	0 dBm
Display Mode:	Log 10 dB/division
Video Filter:	OFF
Scan Mode:	Internal
Scan Trigger:	Auto

FRS Family Radio System - Technical and Regulatory Requirements
John W. Kuivinen, Engineering
Linear Corporation
05/25/2001

Test Equipment Set Up



2.1047 Modulation Characteristics.

(a) Voice modulated communications equipment. A curve or equivalent data showing the frequency response of the audio modulation circuit over the range of 100 to 5000 Hz shall be submitted. For equipment required to have a low pass filter curve showing the frequency response of the filter or of all circuitry installed between the modulation limited and the modulated stage shall be submitted.

Modulation Freq.	Amplitude P-P	Deviation (50%)	Roll Off
100 Hz	130 mV	1.25KHz	-14.3 dB
200 Hz	100 mV	1.25KHz	-12 dB
400 Hz	50 mV	1.25 KHz	-6 dB
800 Hz	30 mV	1.25 KHz	-1.6 dB
1000 Hz	30 mV	1.25 KHz	-1.6 dB
1500 Hz	25 mV	1.25 KHz	0 dB
1850 Hz	25 mV	1.25 KHz	0 dB Reference *
2000 Hz	25 mV	1.25 KHz	0 dB
2500 Hz	25 mV	1.25 KHz	0 dB
2650 Hz	25 mV	1.20 KHz	0 dB
2900 Hz	25 mV	1.00 KHz	-0.97 dB
3125 Hz	25 mV	900 Hz	-1.5 dB
3500 Hz	50 mV	1.25 KHz	-6 dB
4000 Hz	70 mV	1.25 KHz	-8.9 dB
5000 Hz	600 mV	1.25 KHz	-27.5 dB
	TABLE 1		

2.1049 Occupied Bandwidth

Occupied bandwidth, that is the frequency bandwidth such that below its lower and above its upper frequency limits the mean powers radiated are each equal to 0.5 percent (-26dB) of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

(1) Other than single side band or independent side band transmitters - when modulated by a 2500 Hz tone at an input level 16 dB (X 6.3 V input) greater than that necessary to produce 50% modulation. The input level shall be established at the frequency of maximum response of the audio modulating circuit.

Complies,

1850 Hz modulation	25 mV p-p	7.83 KHz	deviation at -26 dBc down
	200mVp-p	11.83 KHz	deviation at -26 dBc down

Modulation Bandwidth is less than 12.5 KHz at 0.5 % (-26 dB) total carrier power.

2.1051 Spurious emission at the antenna terminals.

The radio frequency voltage or powers generated within the equipment and appearing on the spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in 2.1049 as appropriate. The magnitude of spurious emissions that are attenuated more than 20 dB below the permissible value need not be specified.

Complies, See Tables 4 (radiated), 5-A and 5-B (conducted) Emissions

2.1053 Field strength of spurious radiation.

(a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet , control circuits, power leads or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. ...

(b) The measurements specified in paragraph (a) of this sections shall be made for the following equipment:

(1) N/A
(2) All equipment on a frequency higher than 25 MHz.
(3) All equipment where the antenna is an integral part of and attached directly to the transmitter.
(4) N/A

Complies, See Table 4. No significant emissions from transmitter except for harmonics of the carrier frequency.

2.1055 Frequency stability

(a) The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From -30 to +50 C for all equipment except that specified in paragraphs (a) (2) and (3) of this section (N/A).

(b) Frequency measurement shall be made at the extremes of the specified temperature range and the intervals of not more than 10 degrees centigrade though out the range.

(c) N/A

(2) Beginning at each temperature level specified in paragraph (c) (1) of this section shall be measure within one minute under application of primary power to the transmitter and at intervals of not more than one minute thereafter until ten minutes have elapsed or until sufficient measurements are obtained to indicate clearly that the frequency has stabilized within the applicable tolerance whichever time period is greater. During each test, the ambient temperature shall not be allowed to rise more than 10 degrees C above the respective beginning ambient temperature level.

Complies, see Figures 1 and 2. Unit is AC operated and is designed for indoor usage. Restricted temperature usage is identified in user instruction manual.

(3) N/A Push to talk

(4) N/A Entire unit is tested.

(d) The frequency stability shall be measure with variation of primary supply voltage as follows:

(1) Vary the primary power supply voltage from 85 to 115% of the nominal value for other than hand carried battery equipment.

Complies, unit has a regulated +9 volt supply that does not change voltage when the AC power is adjusted from 85 to 115% of nominal. Internally, the +9v is re-regulated down to +5 volts for the frequency synthesizer section.

2.1057 Frequency spectrum to be investigated.

(1) If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz whichever is lower.

Complies, See Tables 4, 5A and 5B.

Part 95.193 (FRS Rule 3) Types of communications

(a) 2-way voice permitted

(b) The FRS unit may transmit tones to make contact or continue communications with a particular FRS unit. If the tone is audible (more than 300 Hz), it must last no longer than 15 seconds at one time. If the tone is sub-audible (300 Hz or less), it may be transmitted continuously only when talking.

Complies, the sequence of control tones lasts no longer than 2 seconds.

(e) No FRS unit may be interconnected to the public switched network (POTS).

Complies, there are no external inputs to this FRS unit.

(c) You may not attach any antenna power amplifier or other apparatus to an FRS unit that has not been FCC certified as part of the FRS unit. There are no exceptions to this rule and attaching any such apparatus to a FRS unit cancels the FCC certification and voids everyone's authority to operate the unit in the FRS.

Complies, integral antenna only in this RFI00001 transceiver.

Subpart E - Technical regulations

95.601 Certification required for the transmitter

95.603 (d) Each FRS unit (a transmitter that operates or is intended to operated in the FRS) must be certified for use in the FRS in accordance with Subpart J of Part 2 of this chapter.

95.605 Certification procedures

Any entity may request certification for its transmitter when the transmitted is used in the GMRS, R/C CB, IVDS, LPRS or FRS following the procedures in part two of this chapter.

95.627 FRS unit channel frequencies
(a) 1-14 authorized in the 463 - 467 MHz region

Complies, this unit operates on Channels 8 or 13 of the FRS assigned frequencies.

(b) Each FRS unit must be maintained within a frequency tolerance of 0.00025 %. (+/- 1.2 KHz, 2.5 PPM).

Complies, see Figures 1 and 2.

95.631 Emission types

(d) An FRS unit may transmit only emission type F3E. A non-voice emission is limited to selective calling or tone-operated squelch to establish or continue voice communications.

95.633 Emission bandwidth

(c) The authorized bandwidth for emission F3E transmitted by an FRS unit is 12.5 KHz. (-26 dBc or 0.5% of maximum power on each side of the carrier).

Complies, the maximum bandwidth when modulated by a 1850 Hz +16 dB input signal is 11.8 KHz total bandwidth.

95.635 Unwanted radiation

(a) In addition to the procedure in part 2, the following requirements

FRS - F3E with filtering per 95.635 (b) R/C and paragraphs (1), (3) and (7)

(ii) Emissions more than 135 KHz away from the channel center frequency at least 43+10 log (carrier power in watts) dB.

Compiles, 43 +10(log) of 0.5 watts is 43 + (-3) = 40 dB. The maximum power output of this design is 100 mW (+20 dBm) power output. Measured output is less than +20 dBm.

95.637 Modulation standards.

(a) A GMRS... A FRS unit that transmits emission type F3E must not exceed a peak frequency deviation of plus or minus 2.5 KHz and the audio frequency response must not exceed 3.125 KHz.

Complies, frequency rolls off above 2900 Hz. Signal limiters do not exceed +/- 2.5 KHz deviation under any conditions of audio tone input.

95.639 Maximum transmitter power

(d) No FRS unit under any condition of modulation shall exceed 0.500 watts effective radiated power (ERP).

Complies, this unit has a maximum power output of 100 mW.

95.653 Instructions and Warnings

(a) Disclaimers will be complied with

See label sketch in Section 1.