ENGINEERING STATEMENT

For Certification of

COBRA ELECTRONICS CORPORATION

Model No. PR950DX
FCC ID: BBOPR950DXD

I am an Electronics Engineer, a principal in the firm of Hyak Laboratories, Inc., Springfield, Virginia. My education and experience are a matter of record with the Federal Communications Commission.

Hyak Laboratories, Inc. has been authorized by Cobra Electronics Corporation to make certification measurements on the PR950DX transceiver. These tests were made by me or under my supervision in our Springfield laboratory.

Test data and documentation required by the FCC for certification are included in this report. The data verifies that the above mentioned transceiver meets FCC requirements and certification is requested.

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Rowland S. Johnson

Dated: November 20, 2001

A. INTRODUCTION

The following data are submitted in connection with this request for type certification of the PR950DX transceiver in

accordance with Part 2, Subpart J of the FCC Rules.

The PR950DX is a hand-held, battery operated, UHF, frequency modulated, transceiver intended for voice communications applications under Part 95 GMRS (channels 1-7 or 15-22)* or Part 95 FRS (channels 8-14)*.

*See Appendix A for frequency assignment.

1. The unit's antenna meets 95.647, (i.e. is integral to the transmitter.

2. Except for power, the technical parameters for operating on all the channels (both FRS and GMRS) are the same as those for FRS, (i.e. 12.5 kHz bandwidth, 2.5 ppm frequency tolerance, maximum 2.5 kHz deviation, etc).

3. An informational insert is included inside the box (product package) that clearly informs the consumer (buyer/owner) when the radio is transmitting on GMRS frequencies, that operation on GMRS frequencies requires an FCC license and such operation is subject to additional rules specified in 47 CFR Part 95. (See Appendix B)

B. GENERAL INFORMATION REQUIRED FOR TYPE CERTIFICATION (Paragraph 2.983 of the Rules)

1. Name of applicant: Cobra Electronics Corporation

2. Identification of equipment: FCC ID: BBOPR950DXD

   a. The equipment identification label is submitted as a separate exhibit.
   b. Photographs of the equipment are submitted as separate exhibits.

3. Quantity production is planned.

4. Technical description:

   a. 11k0F3E emission (FRS and GMRS)
   b. Frequency range: 462.5500-467.7125 MHz.
   c. Operating power ERP(d):
      FRS .478 W
      GMRS .831 W

B. GENERAL INFORMATION (Cont.)

   d. Maximum power permitted under FCC Part 95 (interstitial) is 5 watts ERP. The PR950DX fully complied with that power limitation.
   e. The dc voltage and dc currents at final amplifier:

	GMRS	FRS

Collector voltage:	5.9	5.9 Vdc
Collector current:	0.51	0.37 A

f. Function of each active semiconductor device: See Appendix 1.
g. Complete circuit diagram is submitted as a separate exhibit.
h. A draft instruction book is submitted as a separate exhibit.
i. The transmitter tune-up procedure is submitted as a separate exhibit.
j. A description of circuits for stabilizing frequency is included in Appendix 2.
k. A description of circuits and devices employed for suppression of spurious radiation and for limiting modulation is included in Appendix 3.
l. Not applicable.

5. Data for 2.985 through 2.997 follow this section.

C. RF POWER OUTPUT (Paragraph 2.985(a) of the Rules)

ERP(d) by substitution: FRS 0.478 W
GMRS 0.831 W

D. MODULATION CHARACTERISTICS

1. A curve showing frequency response of the transmitter is shown in Figure 1. Reference level was audio signal output from a Boonton 8220 modulation meter with one kHz deviation. Audio output was measured with an Audio Precision System One TRMS voltmeter and tracking generator.

2. Modulation limiting curves are shown in Figure 2, using a Boonton 8220 modulation meter. Signal level was established with an Audio Precision System One. The curves show compliance with paragraphs 2.987(b) and 95.633(b).

D. MODULATION CHARACTERISTICS (Cont.)

3. Figure 3 is a graph of the post-limiter low pass filter which meets the requirements of paragraph 95.633(b) in providing a roll-off of 60Logf/3 dB where f is audio frequency in kHz. Measurements were made following EIA RS-152B with an Audio Precision System One on the Boonton 8220 modulation meter audio output.

4. Occupied Bandwidth (Paragraphs 2.989(c), 90.209(b)(4), and 95.629(a) of the Rules)

Figure 4a is a plot of the sideband envelope of the

transmitter output taken with a Tektronix 494P spectrum analyzer on GMRS Channel 1. Modulation corresponded to conditions of 2.989(c)(1) and consisted of 2500 Hz tone at an input level 16 dB greater than that necessary to produce 50% modulation at 2659 Hz, the frequency of maximum response.

Figure 4b is a plot under the same conditions for FRS Channel 8.

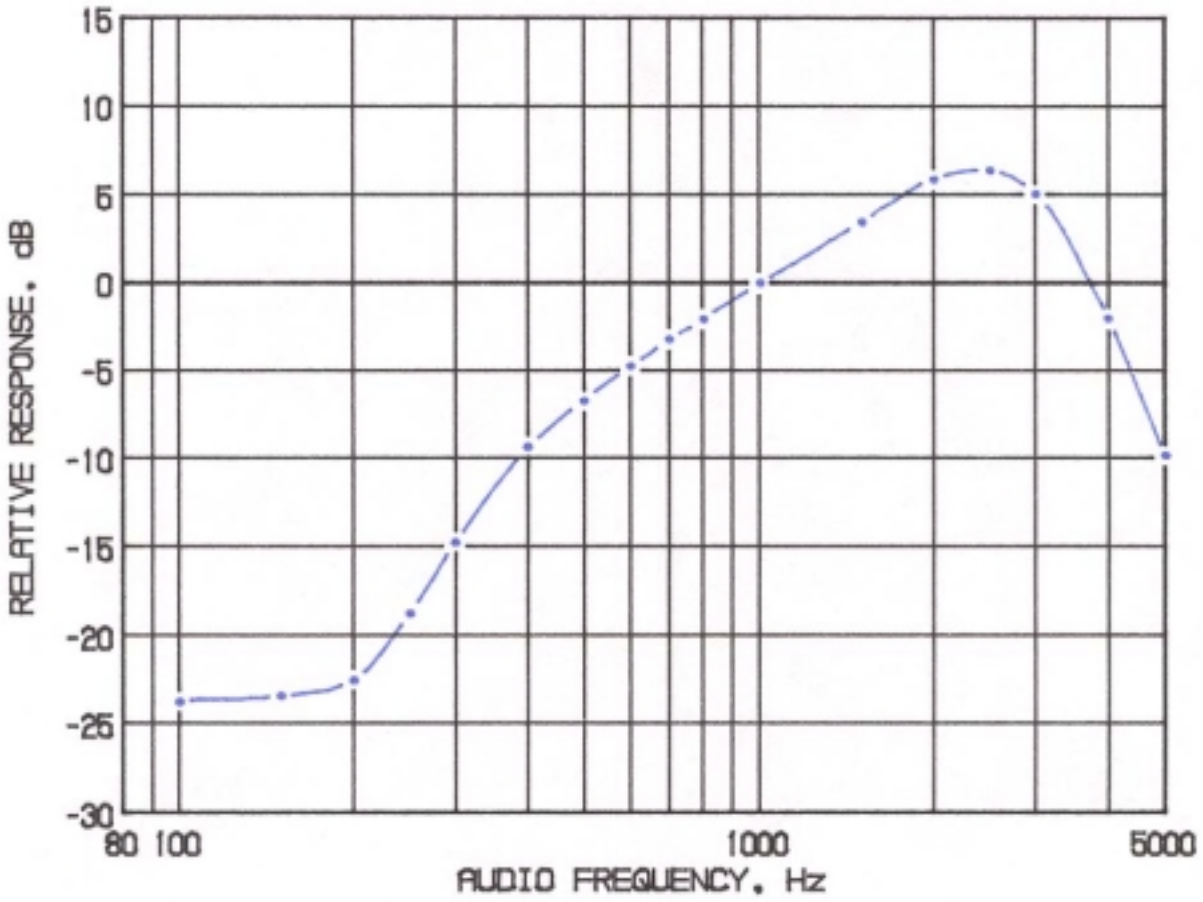
The plots are within the limits imposed by Part 95 for frequency modulation. The horizontal scale (frequency) is 10 kHz per division and the vertical scale (amplitude) is a logarithmic presentation equal to 10 dB per division.

5. Emission Designator Calculation:

(2D + 2F) 2x2.5 + 2x3.0 = 11k0F3E

FIGURE 1

MODULATION FREQUENCY RESPONSE

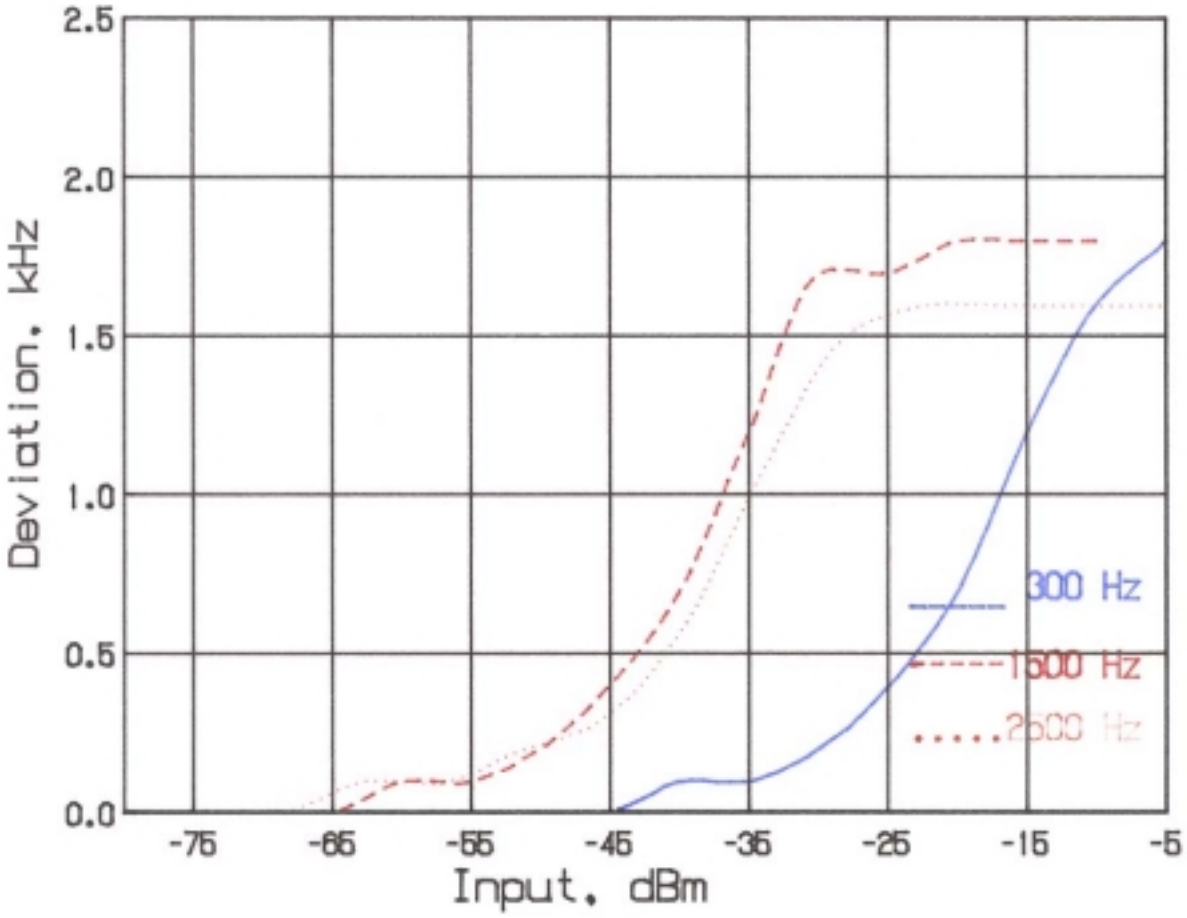


MODULATION FREQUENCY RESPONSE
FCC ID: BBOPR950DXD

FIGURE 1

FIGURE 2

AUDIO LIMITER CHARACTERISTICS

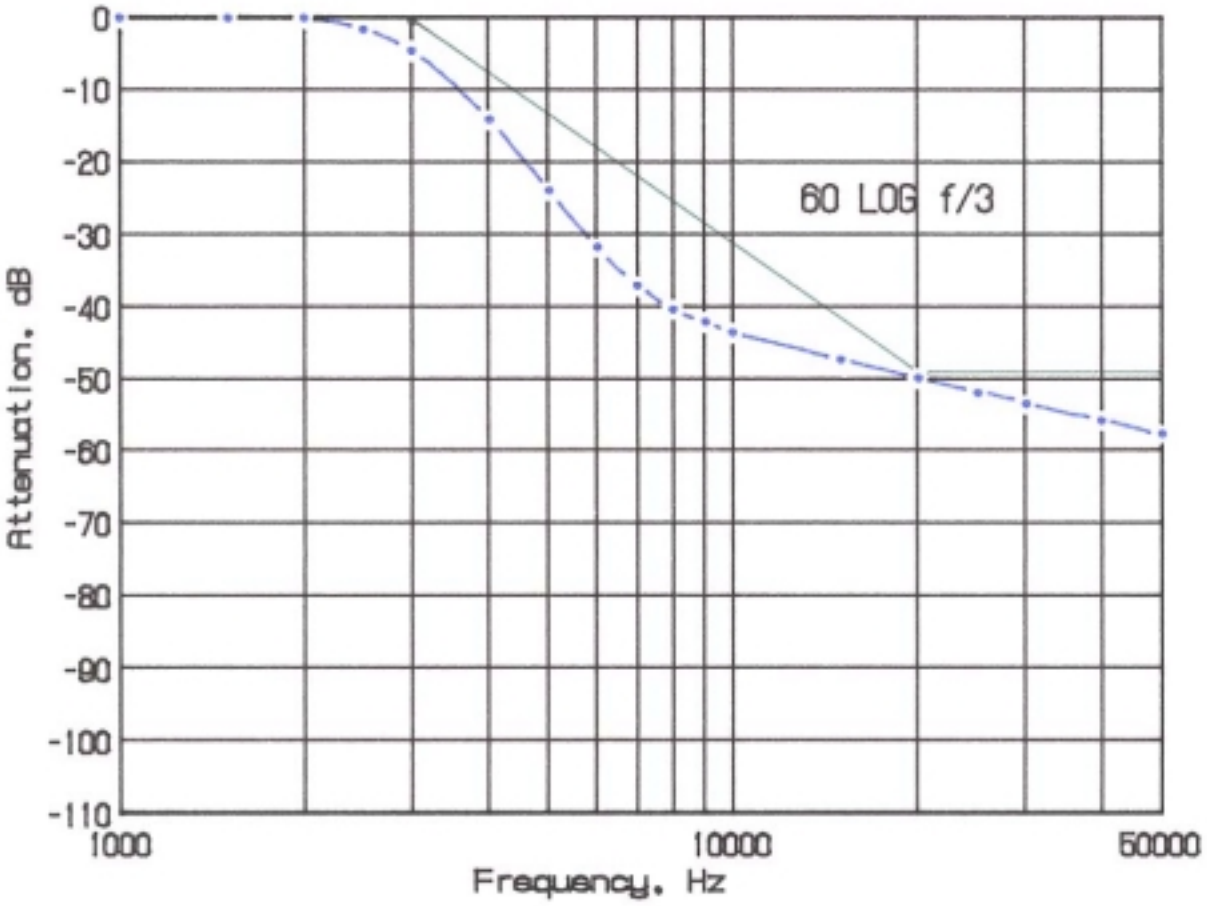


AUDIO LIMITER CHARACTERISTICS
FCC ID: BBOPR950DXD

FIGURE 2

FIGURE 3

AUDIO LOW PASS FILTER RESPONSE

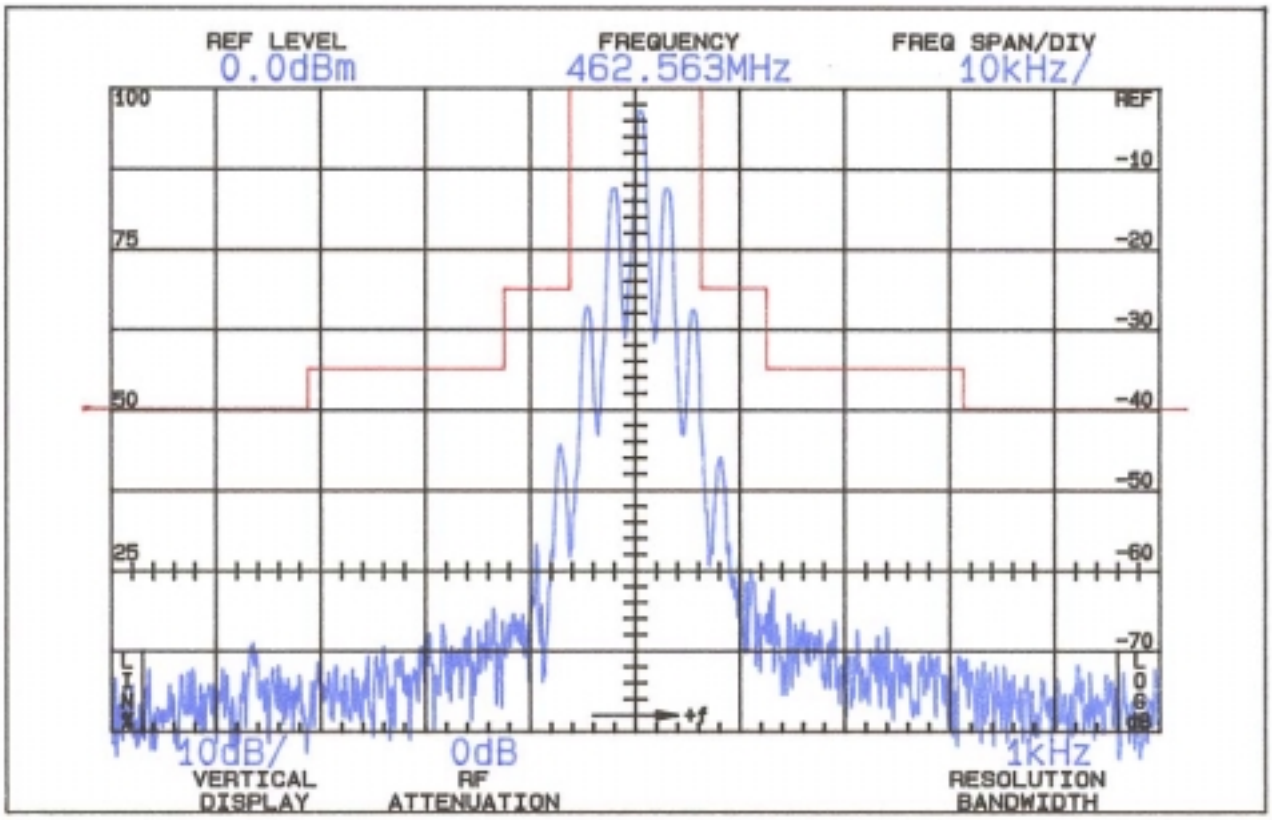


AUDIO LOW PASS FILTER RESPONSE
FCC ID: BBOPR950DXD

FIGURE 3

FIGURE 4a

OCCUPIED BANDWIDTH



ATTENUATION IN dB BELOW
MEAN OUTPUT POWER
Required

On any frequency more than 50%
up to and including 100% of the 25
authorized bandwidth, 20 kHz
(10-20 kHz)

On any frequency more than 100%,
up to and including 250% of the 35
authorized bandwidth (20-50 kHz)

On any frequency removed from
the assigned frequency by more
than 250% of the authorized
bandwidth (over 50 kHz)

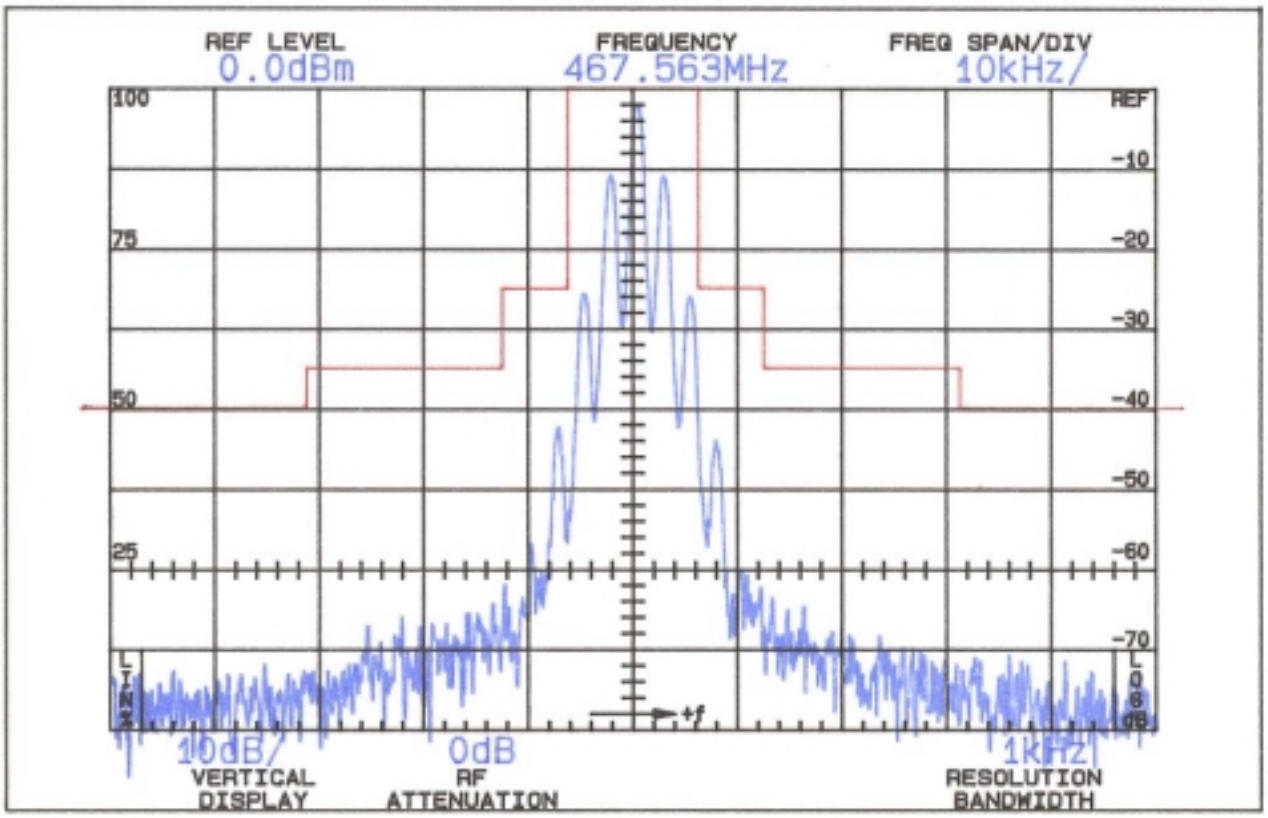
43+10LogP = 42
(P = 0.831 W)

OCCUPIED BANDWIDTH
FCC ID: BBOPR950DXD

FIGURE 4a, (GMRS)

FIGURE 4b

OCCUPIED BANDWIDTH



ATTENUATION IN dB BELOW
MEAN OUTPUT POWER
Required

On any frequency more than 50% up to and including 100% of the 25 authorized bandwidth, 20 kHz (10-20 kHz)

On any frequency more than 100%, up to and including 250% of the 35 authorized bandwidth (20-50 kHz)

On any frequency removed from the assigned frequency by more than 250% of the authorized bandwidth (over 50 kHz)

43+10LogP = 40
(P = 0.478 W)

OCCUPIED BANDWIDTH
FCC ID: BBOPR950DXD

FIGURE 4b, (FRS)

E. SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS
(Paragraph 2.991 of the Rules)

Not Applicable, integral antenna.

F. MEASUREMENTS OF SPURIOUS RADIATION

Measurement of radiated spurious emissions from the PR950DX were made by substitution with a Tektronix 494P spectrum analyzer using Singer DM-105A calibrated test antennae for the measurements to l GHz, Polarad CA-L, CA-S, CA-M and/or EMCO 3115. The transmitter and dummy load were located in an open field 3 meters from the test antenna. Supply voltage was a power supply with a terminal voltage under load of 6 Vdc. The transmitter and test antennae were arranged to maximize pickup. Both vertical and horizontal test antenna polarization were employed.

TABLE 2a
TRANSMITTER RADIATED SPURIOUS
462.5625 MHz, 6.0 Vdc, GMRS, Channel 1

Frequency MHz	dB Below Carrier Reference[1]
462.565	0
2337.817	59V
2805.379	62H

Required: 43+10Log(0.831) = 42

TABLE 2b
TRANSMITTER RADIATED SPURIOUS
467.5625 MHz, 6.0 Vdc, FRS, Channel 8

Frequency MHz	dB Below Carrier Reference[1]
467.563	0
925.127	58V
2312.815	57V

Required: 43+Log(0.478) = 40

[1]Worst-case polarization, H-Horizontal, V-Vertical.

All other spurious from 21.5 MHz to 4.7 GHz were 20 dB or more below FCC limit.

G. FREQUENCY STABILITY
(Paragraph 2.995(a)(2) and 95.621(b) of the Rules)

Measurement of frequency stability versus temperature was made at temperatures from -30°C to +50°C. At each temperature, the unit was exposed to test chamber ambient a minimum of 60 minutes after indicated chamber temperature ambient had stabilized to within ±2° of the desired test temperature. Following the 1 hour soak at each temperature, the unit was turned on, keyed and frequency

measured within 2 minutes. Test temperature was sequenced in the order shown in Table 3, starting with -30°C.

A Thermotron S1.2 temperature chamber was used. Temperature was monitored with a Keithley 871 digital temperature probe. Primary supply was 6.0 volts. Frequency was measured with a HP 5385A digital frequency counter. Measurements were made at 462.5625 MHz. No transient keying effects were observed.

TABLE 3

462.5625 MHz, 6.0 V Nominal

Temperature, °C	Output Frequency, MHz	p.p.m.
-29.4	462.562094	-0.9
-19.7	462.562708	0.4
-10.1	462.563232	1.6
0.4	462.563175	1.5
9.8	462.562816	0.7
20.4	462.562957	1.0
29.8	462.562128	-0.8
39.7	462.561577	-2.0
50.2	462.561597	-2.0

Maximum frequency error: 462.561577
462.562500

\- .000923 MHz

FCC Part 95 specifies .00025% or a maximum of ± .001156 MHz, which corresponds to:

High Limit	462.563656 MHz
Low Limit	462.561344 MHz

H. FREQUENCY STABILITY AS A FUNCTION OF SUPPLY VOLTAGE
(Paragraph 2.995(d)(2) of the Rules)

Oscillator frequency as a function of power supply voltage was measured with a HP 5385A digital frequency counter as supply voltage provided by an HP 6264B variable dc power supply was varied from ±15% above the nominal 6.0 volt rating to below the battery end point. A Keithley 197 digital voltmeter was used to measure supply voltage at transmitter primary input terminals. Measurements were

made at 20 °C ambient.

TABLE 4

462.5625 MHz, 20°C, 6.0 V Nominal

%	Supply_Voltage	Output_Frequency,_MHz	p.p.m.
115	6.9	462.562772	0.6
110	6.6	462.562900	0.9
105	6.3	462.562982	1.0
100	6.0	462.562957	1.0
95	5.7	462.562928	0.9
90	5.4	462.562904	0.9
85	5.1	462.562888	0.8
*	4.8	462.562885	0.8

Maximum frequency error: 462.562982
462.562500

*MFR rated battery endpoint. + .000482 MHz

FCC Part 95 specifies .00025% or a maximum of ±.001156 MHz, corresponding to:

High Limit 462.563656 MHz
Low Limit 462.561344 MHz

APPENDIX A

CHANNEL ASSIGNMENT

GMRS Channels:

CH1: 462.5625 MHz
CH2: 462.5875 MHz

CH3: 462.6125 MHz
CH4: 462.6375 MHz
CH5: 462.6625 MHz
CH6: 462.6875 MHz
CH7: 462.7125 MHz

CH15: 462.5500 MHz
CH16: 462.5750 MHz
CH17: 462.6000 MHz
CH18: 462.6250 MHz
CH19: 462.6500 MHz
CH20: 462.6750 MHz
CH21: 462.7000 MHz
CH22: 462.7250 MHz

FRS Channels:

CH8: 467.5625 MHz
CH9: 467.5875 MHz
CH10: 467.6125 MHz
CH11: 467.6375 MHz
CH12: 467.6625 MHz
CH13: 467.6875 MHz
CH14: 467.7125 MHz

APPENDIX B

FCC LICENCE REQUIREMENT

IMPORTANT NOTICE
FCC LICENCE REQUIRED

The PR 950 DX operates on GMRS (General Mobile Radio Service) frequencies which require an FCC (Federal Communications Commission) license. Information on how to apply for a license is included in the owner's manual. A user must be licensed prior to operating on channels 1 – 7 or 15 –22, which comprise the GMRS channels of the PR 950 DX. Serious penalties could result for unlicensed use of GMRS channels, in violation of FCC rules, as stipulated in the Communications Act's Sections 501 and 502 (amended).

Licensed users will be issued a call sign by the FCC which should be used for station identification when operating the PR 950 DX. GMRS users should also cooperate by engaging in permissible transmissions only, avoiding channel interference with other GMRS users, and being prudent with the length of their transmission time.

Questions regarding the license application should be directed to the FCC at 1-888-CALL FCC. Additional information is available on the FCC's website at www.fcc.gov

APPENDIX 1

FUNCTION OF DEVICES

Θ2	ΚΤΑ1504	Κ.Ε.Χ	ΜΟΤΟΡ ΧΟΝΤΡΟΛ
Θ3	ΚΤΧ3875	Κ.Ε.Χ	ΜΟΤΟΡ ΧΟΝΤΡΟΛ
ΘΡ1	2ΣΧ4226	Ν.Ε.Χ	ΡΞ ΡΦ ΑΜΠ
ΘΡ2	2ΣΧ4226	Ν.Ε.Χ	ΡΞ $1^{\Sigma\tau}$ μιξερ
ΘΡ3	ΣΤΧ2059Ψ	ΑΥΚ	ΡΞ ΙΦ ΑΜΠ
ΘΡ4	ΣΤΑ1037Γ	ΑΥΚ	ΑΥΔΙΟ ΠΑΤΗ
ΘΡ5	ΣΤΑ1037Γ	ΑΥΚ	ΑΥΔΙΟ ΜΥΤΕ
ΘΡ6	ΣΡΧ1204	ΑΥΚ	ΑΥΔΙΟ ΜΥΤΕ
ΘΠ1	ΣΡΑ2201	ΑΥΚ	Π.ΣΑςΕ ΣΩΙΤΧΗΙΝΓ
ΘΡΣ1	ΣΡΑ2201	ΑΥΚ	ΡΞ Β+ ΣΩΙΤΧΗΙΝΓ
ΘΧΣ1	ΣΡΧ1204	ΑΥΚ	ΡΞ ΧΑΛΛ ΔΕΧΤ
ΘΧΣ2	ΣΡΧ1204	ΑΥΚ	ΡΞ ΧΤΧΣΣ ΔΕΤ
ΘΧΣ3	ΣΡΧ1204	ΑΥΚ	ΧΑΛΛ ΜΥΤΕ
ΘΗΛ1	ΚΡΧ114Σ	Κ.Ε.Χ	ΗΙ/ΛΟΩ ΧΟΝΤΡΟΛ
ΘΤΣ3	ΣΡΧ1204	ΑΥΚ	ΤΞ ΣΩΙΤΧΗΙΝΓ
ΘΤΣ4	ΚΡΧ110Σ	ΚΕΧ	ΤΞ ΣΩΙΤΧΗΙΝΓ
ΘΤΣ5	ΣΡΑ2205	ΑΥΚ	ΤΞ Β+ ΣΩΙΤΧΗΙΝΓ
ΘΤΣ6	ΚΡΧ110Σ	Κ.Ε.Χ	ΤΞ Β+ ΣΩΙΤΧΗΙΝΓ
ΘΤΣ7	ΣΡΑ2201	ΑΥΚ	ΜΙΧ ΑΜΠ Β+ ΣΩΙΤΧΗΙΝΓ
ΘΤΣ8	ΣΡΑ2205	ΑΥΚ	ΠΤΤ ΣΩΙΤΧΗΙΝΓ
ΘΤ1	2ΣΧ4226	Ν.Ε.Χ	ΤΞ ΒΥΤΤΕΡ
ΘΤ2	2ΣΧ4226	Ν.Ε. Χ	ΤΞ ΔΡΙςΕΡ
ΘΤ3	ΝΕ5510279Α	Ν.Ε.Χ	ΤΞ ΑΜΠ
ΘΤ4	ΣΡΧ1204	ΑΥΚ	ΡΞ Β+ ΣΩ ΑΤ ΤΞ ΜΟΔΕ
ΘΒ1	ΚΡΑ110Σ	ΚΕΧ	ΛΑΜΠ ΣΩΙΤΧΗΙΝΓ
Θ1	2ΣΧ4226	ΝΕΧ	Ρ/ΤΞ ΒΥΤΤΕΡ
Θ31	ΚΡΧ104Σ	ΚΕΧ	ςΧΟ
Θ32	2ΣΧ4226	ΝΕΧ	ςΧΟ
Θ33	2ΣΧ4226	ΝΕΧ	ςΧΟ

ΙΧ1	ΤΒ31202ΦΝ	ΤΟΣΗΙΒΑ	ΠΛΛ ΙΧ
ΙΧ2	ΔΒΛ 5019	ΔΑΕ ΩΟΟ	ΦΜ ΙΦ ΙΧ
ΙΧ4	ΙΛ 324Φ	ΙΝΤΕΡΓΡΑΛ	ΧΤΧΣΣ ΤΟΝΕ ΔΕΤ.(300Ηζ ΛΠΦ)
ΙΧ5	ΙΛ 358Φ	ΙΝΤΕΡΓΡΑΛ	ΧΑΛΛ ΔΕΤ
ΙΧ6	ΙΛ 324Φ	ΙΝΤΕΡΓΡΑΛ	ΔΕ–ΕΜΠΗΑΣΙΣ ΑΝΔ 300Ηζ ΗΠΦ
ΙΧ7	ΙΛ 386	ΙΝΤΕΡΓΡΑΛ	ΑΥΔΙΟ ΠΟΩΕΡ ΑΜΠ
ΙΧ8	ΕΛΜ9836	Ε.Λ.Μ	ΡΕΓΥΛΑΤΟΡ
ΙΧ10	ΤΜΠ87Χ21ΔΦ	Κ.Ε.Χ	ΧΠΥ
ΙΧ11	ΙΛ 324Φ	ΙΝΤΕΡΓΡΑΛ	ΤΞ ΠΡΕ–ΕΜΠΗΑΣΙΣ ΑΝΔ 300Ηζ ΗΠΦ
ΙΧ20	24Χ02	ΗΟΛΤΕΚ	ΕΕ–ΠΡΟΜ

APPENDIX 2

CIRCUITS AND DEVICES TO STABILIZE FREQUENCY

The PLL synthesizer of the signal loop PLL circuit with the reference of 6.25 kHz. The IC2 PLL includes all the functions such as the reference oscillator, the driver, the phase detector, the lock detector, and the programmable divider.

At the reference oscillator, the 21.250 MHz TCXO of the TCXO is connected to the pin 10, 11 of the IC2 to oscillate the frequency of 21.250 MHz. The TCXO (21.250 MHz) is the temperature compensation circuit to maintain the frequency within the allowable error range even under a low temperature of –30.

The phase detector sends out the output power to the loop filter through 3 pin of the IC2. If the oscillation frequency of the VCO is low compared to the referenced frequency, the phase detector sends out the output power in positive pulse. If the oscillation frequency of the VCO is high, phase detector send out can maintain the frequency set.

CIRCUITS AND DEVICES TO
SUPPRESS SPURIOUS EMISSIONS, ETC.

The transmitted signal of approximately 7 mW, combined at the driver TR is supplied to the base of the QT3 amplifier. The transmitted signal, amplified, here passes the TX LPF of the 2nd characteristic of the LT5 and the LT6, and RX/TX switching takes place by the DT2. After this, the signal is provided to the antenna the TX LPF of the 1st characteristics, consisted of the LT7.

CIRCUITS AND DEVICES TO
SUPPRESS SPURIOUS EMISSIONS, etc.
FCC ID: BBOPR950DXD

APPENDIX 3