TEST REPORT

Report Number: 30667831
Project Number: 3066783
October 25, 2004

Testing performed on the
Multi Trunk-Tracking Handheld Scanner
Model Number: PRO-97
FCC ID:ADV2000527
to

FCC Part 15, Subpart B
ICES 003

CLASS: B
For
General Research of Electronics, Inc.

A2LA Certificate Number: 1755-01

Test Performed by:	Test Authorized by:
Intertek	General Research of Electronics, Inc.
1365 Adams Court	425 Harbor Blvd. Suit B
Menlo Park, CA 94025	CA, 94002, USA

Prepared by: _____ **Date:** October 21, 2004
Bruce Gordon

Reviewed by: _____ **Date:** October 22, 2004
Ollie Moyrong

CERTIFICATION OF COMPLIANCE
Report No. 30667831

Verification is hereby issued to the named APPLICANT and is VALID ONLY for the equipment identified hereon for use under the rules and regulations listed below.

Equipment Under Test:	Multi Trunk-Tracking Handheld Scanner
Trade Name:	General Research of Electronics, Inc.
Model No.:	PRO-97
Serial No.:	Several
Applicant:	General Research of Electronics, Inc.
Contact:	Mr. Mr. Teru Takahashi
Address:	425 Harbor Blvd. Suite B CA, 94002
Country	USA
Tel. number:	650-591-1400
Fax number:	650-591-2001
Applicable Regulation:	FCC Part 15, Subpart B Industry Canada ICES-003
Equipment Class:	Class B
Date of Test:	October 12 -25, 2004

We attest to the accuracy of this report:

Bruce Gordon
Test Engineer

Ollie Moyrong
EMC Manager

TABLE OF CONTENTS

1.0 General Description

1.1 Product Description

The Equipment under Test (EUT) is Multi Trunk-Tracking Handheld Scanning Receiver, model PRO-97

Please refer to the attached specifications sheets in Appendix A for more details.

A pre-production version of the sample was received on October 8, 2004 in good condition. As declared by the Applicant, it is identical to production units.

1.2 Related Submittal(s) Grants

This is a single Application for Certification of a scanning receiver.

1.3 Test Methodology

Both conducted (if applicable) and radiated emission measurements were performed according to the procedures in ANSI C63.4 (1992). All radiated measurements were performed in a semi-anechoic chamber. Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **"Data Section"** of this Application.

1.4 Test Facility

The test site and conducted measurement facility used to collect the radiated data is Site 1 (10-m semi-anechoic chamber). This test facility and site measurement data have been fully placed on file with the FCC and A2LA accredited.

1.5 Summary of Test Results

Model: PRO-97
FCC ID: ADV2000527

TEST	REFERENCE	RESULTS
Radiated Emission	15.109	Complies
AC Line Conducted Emission	15.107	Complies
Antenna Conducted Emission	15.111	Complies
FCC Part 15. 121 Requirement	15.121	Complies *

* See File "Report for FCC Rule Part 15.121"

2.0 System Test Configuration

2.1 Justification

The tests were performed according to the test procedure as outlined in CFR47 Part 15.31 and in ANSI C63.4.

For emission testing, the equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). During testing, all cables were manipulated to produce worst-case emissions.

For the measurements, the EUT is placed on top of a non-conductive table. If the EUT attaches to peripherals, they are connected and operational (as typical as possible).

For radiated emission measurements, the signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent three-meter reading using inverse scaling with distance if measured at a closer distance.

2.2 EUT Exercising Software

The unit was setup to receive continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing.

2.3 Mode of Operation

The EUT was tested in two modes:

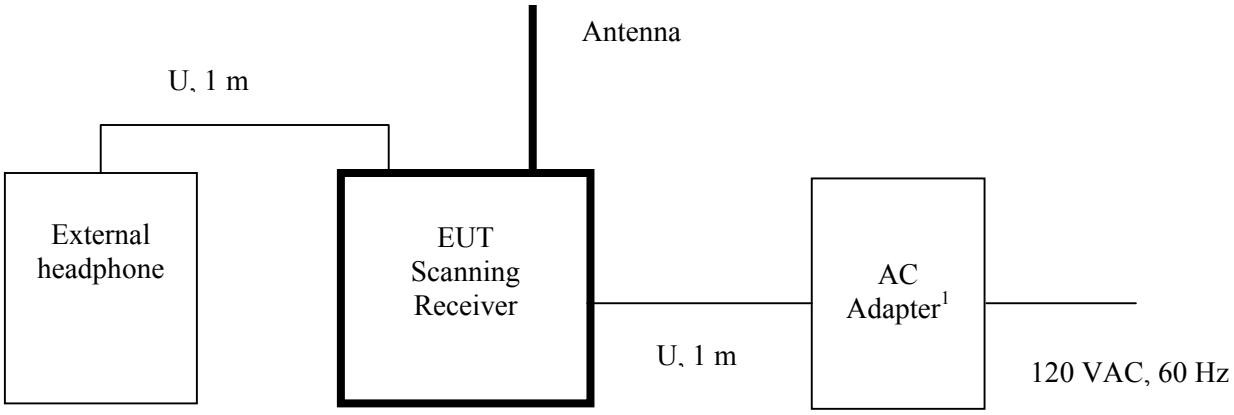
Test Mode 1: The EUT was set to constantly receive at the low, middle and high channels of each band.

Test Mode 2: The EUT was set to constantly scan a particular band.

2.4 Support Equipment List and Description

Item #	Description	Model No.	Serial No.
1	External headphone	Avid	Not Labeled

2.5 Equipment Setup Block Diagram



[1] The AC adapter is manufactured by RadioShack®, Part number JOD(M)-48-A641

2.6 Equipment Modification

Any modifications installed previous to testing by GRE will be incorporated in each production model sold/leased in the United States.

Intertek Testing Services installed no modifications.

3.0 Emission Test Results

AC line conducted emission measurements were performed from 0.15 MHz to 30 MHz. Analyzer resolution is 10 kHz or greater.

Radiated emission measurements and antenna conducted emission measurements were performed from 30 MHz to 5000 MHz. Analyzer resolution is 100 kHz or greater for frequencies from 30 MHz to 1000 MHz, 1 MHz - for frequencies above 1000 MHz.

Preliminary tests were performed to determine the worst-case emission with the EUT tuned to the low, middle and high channels of each band. From these preliminary measurements the EUT was tuned to the frequency with the highest emission and the final scan was performed using the automated test software.

The same procedure was used to determine the worst-case emission level with the EUT setup in scanning mode for each band.

The final recorded data reflects the worst-case result.

A sample calculation, and data tables of the emissions are included.

All measurements were performed with peak detection unless otherwise specified.

3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG + DF

Where FS = Field Strength in dB(μV/m)
RA = Receiver Amplitude (including preamplifier) in dB(μV)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB(1/m)
AG = Amplifier Gain in dB
DF = Distance Factor in dB

Assume a receiver reading of 52.0 dB(μV) is obtained. The antennas factor of 7.4 dB(1/m) and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving field strength of 32 dB(μV/m). This value in dB(μV/m) was converted to its corresponding level in μV/m.

RA = 52.0 dB(μV)
AF = 7.4 dB(1/m)
CF = 1.6 dB
AG = 29.0 dB
DF = 0 dB
FS = 52 +7.4 +1.6 –29.0 + 0 = 32 dB(μV/m)
Level in μV/m = Common Antilogarithm [(32 dBμV/m)/20] = 39.8 μV/m

3.2 Radiated Emission Data

Tested By:	Bruce Gordon
Test Date:	October 12, 2004

Temperature	**(°C)**	20^0C
Relative Humidity	**(%)**	50%

The results on the following page(s) were obtained when the device was tested in the condition described in Sections 2 and 3.

Results:	**Complies** by 14.9 dB at 786.75 MHz

Model: PRO-97
Test Mode: Receiving
Test distance: 3 m

FCC Part 15.109 Class B Radiated Emissions Data

Tuned Frequency	L.O. Frequency	Antenna Polarization	SA Reading	Antenna Factor	Preamp gain	Cable Loss	Corrected Reading	Limit at 3 m	Margin
MHz	MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB(uV/m)	dB(uV/m)	dB
25.000	405.75	V	35.7	15.5	32.3	6.0	24.9	46.0	-21.1
40.000	420.75	V	34.2	16.3	32.3	6.1	24.2	46.0	-21.8
54.000	434.78	V	35.3	15.8	32.3	6.1	24.9	46.0	-21.1
108.000	488.80	V	30.3	17.2	32.4	6.3	21.4	46.0	-24.6
122.500	503.25	V	28.3	17.1	32.4	6.4	19.4	46.0	-26.6
136.988	517.73	V	25.4	17.5	32.4	6.5	16.9	46.0	-29.1
137.000	517.80	V	29.7	17.5	32.4	6.5	21.2	46.0	-24.8
155.500	536.25	V	30.8	17.2	32.4	6.5	22.1	46.0	-23.9
174.000	554.78	V	30.3	18.2	32.5	6.6	22.7	46.0	-23.3
216.003	596.77	V	29.9	18.7	32.5	6.8	22.9	46.0	-23.1
258.000	638.78	V	24.1	19.1	32.5	6.9	17.6	46.0	-28.4
299.975	680.77	V	24.6	19.2	32.6	7.1	18.4	46.0	-27.6
300.000	680.78	V	26.6	19.2	32.6	7.1	20.3	46.0	-25.7
353.000	733.80	V	30.5	20.2	32.5	7.1	25.2	46.0	-20.8
405.975	786.68	V	34.8	20.3	32.5	7.3	29.9	46.0	-16.1
406.000	786.75	V	33.6	20.3	32.5	7.3	28.7	46.0	-14.9
459.000	839.78	V	29.6	21.0	32.3	7.6	26.0	46.0	-20.0
512.000	892.80	V	30.6	22.0	32	7.8	28.4	46.0	-17.6
806.000	425.17	V	35.0	16.0	32.3	6.1	24.8	46.0	-21.2
960.000	579.15	V	29.6	18.1	32.5	6.7	21.9	46.0	-24.1
1240.000	859.20	V	30.5	21.4	32.2	7.8	27.5	46.0	-18.5
1270.000	889.20	V	30.8	21.8	32.0	7.8	28.4	46.0	-17.6
1300.000	919.20	V	30.0	22.1	31.8	7.9	28.2	46.0	-17.8

Notes:
1. Negative signs (-) in the Margin column signify levels below the limit.
2. All readings below 1 GHz are quasi-peak, above 1 GHz – average.
3. Cable Loss includes a 3dB external attenuator.
4. All other readings not reported are at least 20 dB below the limit.
5. For LO frequencies calculation, see Appendix B

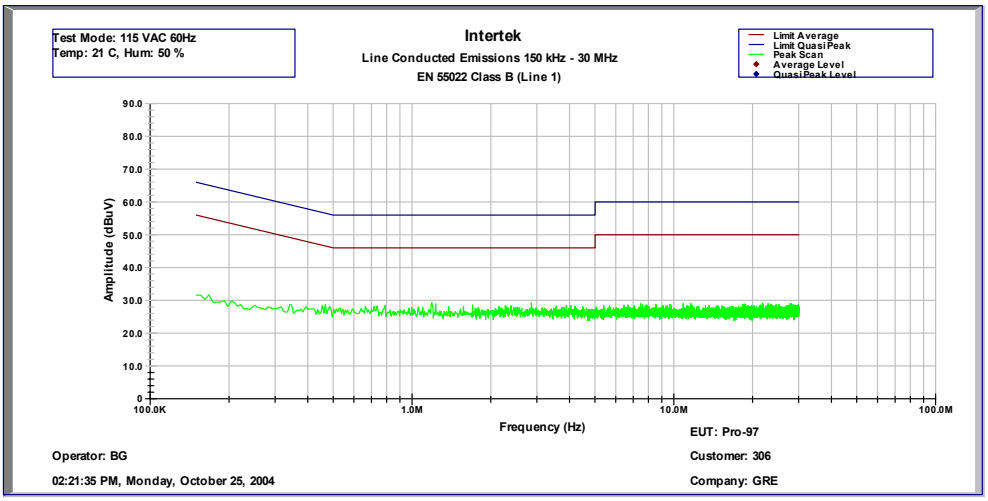
3.3 AC Line Conducted Emission Data

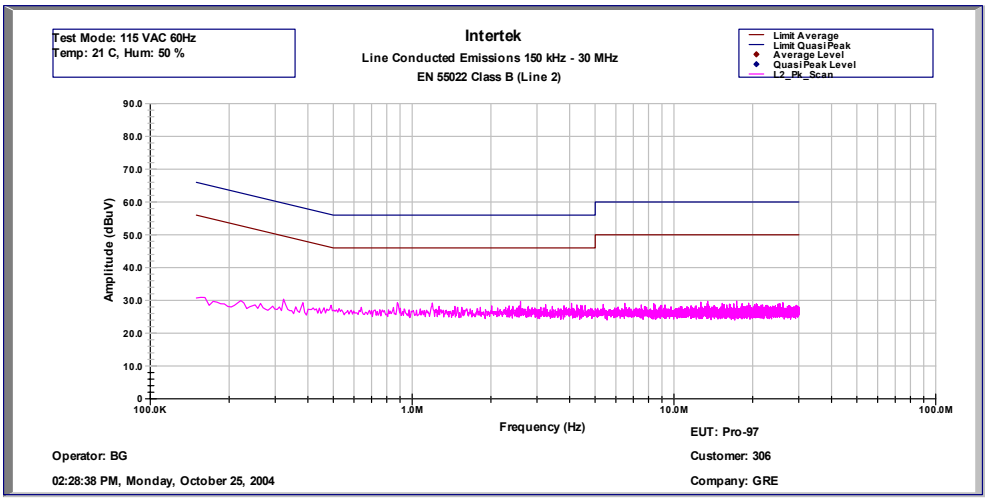
Tested By:	Bruce Gordon
Test Date:	October 25, 2004

Temperature	**(°C)**	21^0C
Relative Humidity	**(%)**	50%

The results on the following page(s) were obtained when the device was tested in the condition described in Sections 2 and 3.

Results:	**Complies** by more than 15 dB


Test Mode: 115 VAC 60Hz
Temp: 21 C, Hum: 50 %
Intertek
Line Conducted Emissions 150 kHz - 30 MHz
EN 55022 Class B (Line 1)
Limit Average
Limit QuasiPeak
Peak Scan
Average Level
QuasiPeak Level
Amplitude (dBuV)
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
100.0K
1.0M
10.0M
100.0M
Frequency (Hz)
Operator: BG
02:21:35 PM, Monday, October 25, 2004
EUT: Pro-97
Customer: 306
Company: GRE


Test Mode: 115 VAC 60Hz
Temp: 21 C, Hum: 50 %
Intertek
Line Conducted Emissions 150 kHz - 30 MHz
EN 55022 Class B (Line 2)
Limit Average
Limit QuasiPeak
Average Level
QuasiPeak Level
L2_Pk_Scan
Amplitude (dBuV)
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
100.0K
1.0M
10.0M
100.0M
Frequency (Hz)
Operator: BG
02:28:38 PM, Monday, October 25, 2004
EUT: Pro-97
Customer: 306
Company: GRE

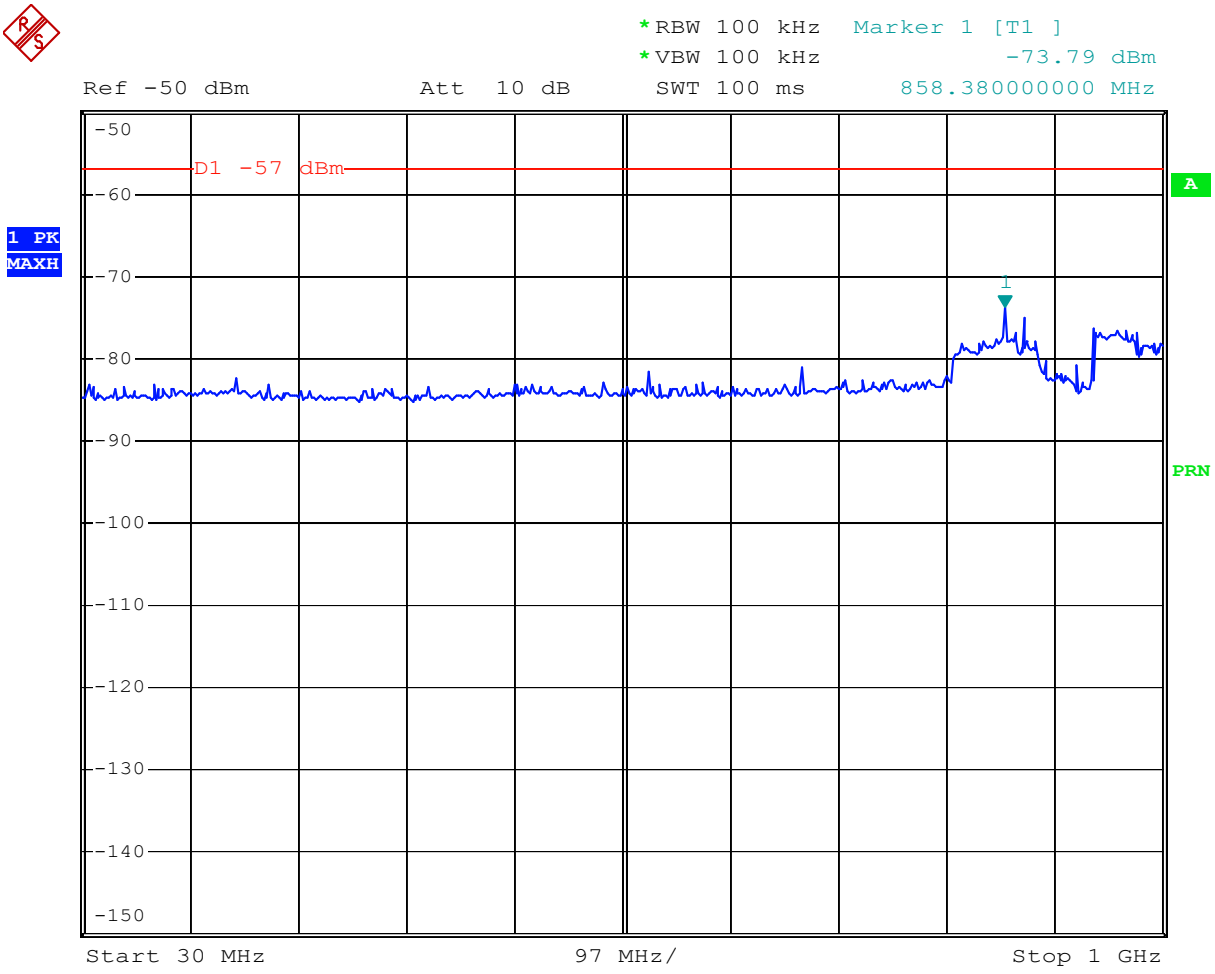
3.4 Antenna Conducted Emission Data

Tested By:	Bruce Gordon
Test Date:	October 25, 2004

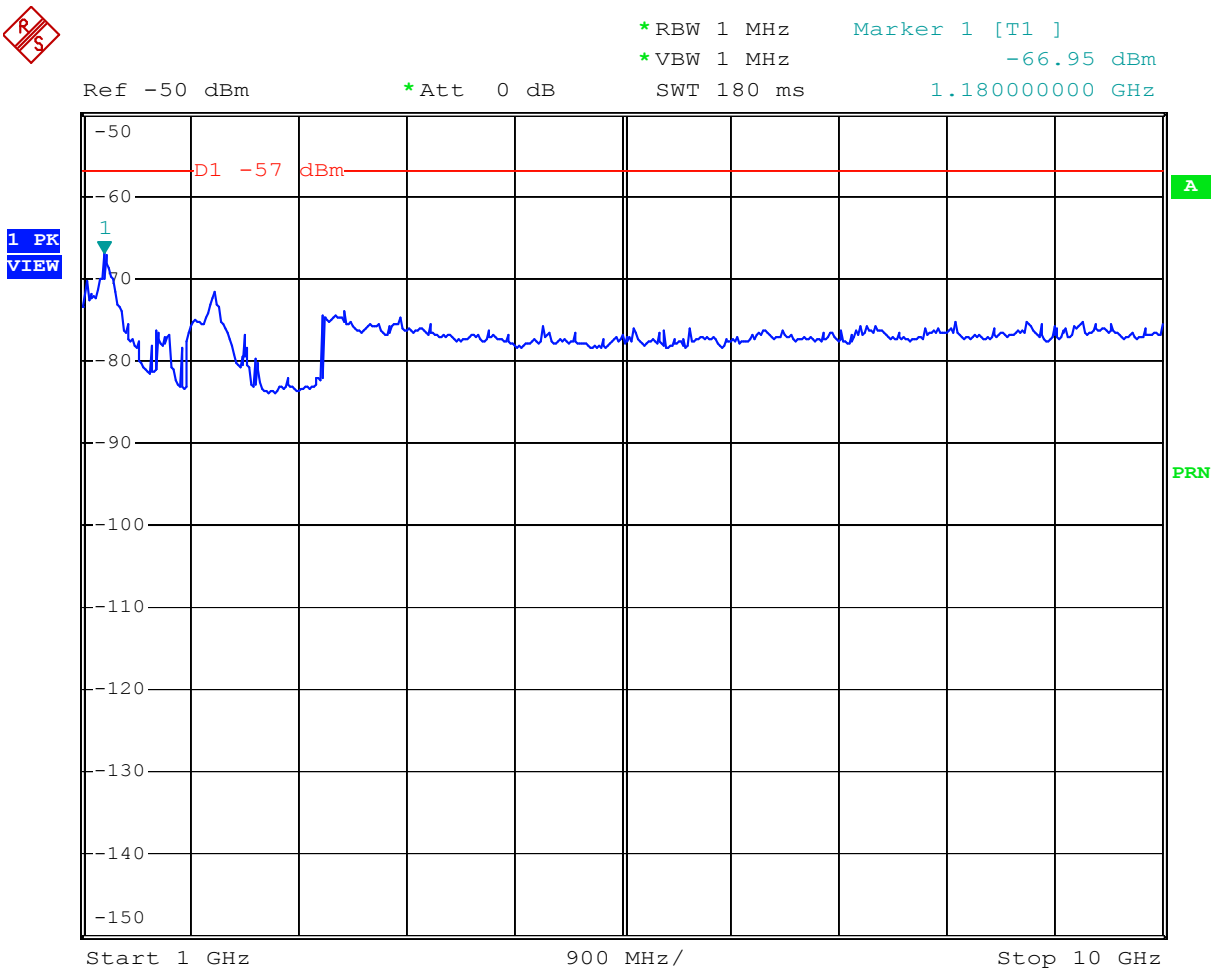
Temperature	**(°C)**	20.5^0C
Relative Humidity	**(%)**	49%

The results on the following page(s) were obtained when the device was tested in the condition described in Sections 2 and 3.

Results:	**Complies** by 10 dB



Comment: Scanning mode
Date: 25.OCT.2004 13:17:14



Comment: Scanning mode
Date: 25.OCT.2004 13:41:27

4.0 List of Test Equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list.

Equipment	Manufacturer	Model/Type	Serial #	Cal Int	Cal Due
BI-Log Antenna	EMCO	3143	9509-1160	12	6/04/05
Horn Antenna	EMCO	3115	8812-3049	12	4/14/05
Pre-Amplifier	Sonoma Inst.	310	185634	12	3/25/05
Pre-Amplifier	Miteq	AMF-4D-001180-24-10P	799159	12	3/25/05
RF Filter Section	Hewlett Packard	85460A	3448A00267	12	8/15/05
EMI Receiver	Hewlett Packard	8546A	3710A00373	12	8/15/05
EMI Receiver	Rhode-Schwarz	FSP	1093.4495.40	12	2/04/05
LISN	FCC	FCC-LISN-50-50-M-H	2011	12	2/10/05

Appendix A – EUT Specification

GENERAL RESEARCH OF ELECTRONICS, INC.
Phone: +813-5439-3611
Fax: +813-5439-3644
SHIBA NO.3 AMEREX BLDG.
No. 12-17 MITA 3-CHOME, MINATO-KU
TOKYO 108-0073, JAPAN

Rev'd: Sep. 22, 2004
Tokyo: JUN. 10, 2004
Reference No. 04002

SPECIFICATIONS

SUBJECT: 1000 CHANNEL FREQUENCY MEMORIES WITH 1500 ID MEMORIES TRUNKING SYSTEM, VHF/UHF PROGRAMMABLE WITH SIGNAL STARKER AND SKYWARN AM/FM SCANNING RECEIVER PRO-97 CAT. NO. 20-527

1. GENERAL

1.1 Programmable channel : 1000 channels (100 channels x 10 banks)
1500 ID memories (30 location x 5 sub-banks x 10 banks)
1 Limit search bank
1 Priority channel
7 WX frequencies
WX alert and SAME receiving with 10 FIPS (Federal information Processing Standard) area code memories
155 preprogrammed frequencies

1.2 Receiving mode : AM, FM, FM-MOT (Motorola), EDACS (GE/Ericsson/MA-COM), LTR (EF Johnson), CTCSS and DCS

1.3 Receiving system : Triple conversion PLL superheterodyne

1^{st} IF 380.8 MHz: The 1^{st} Local OSC frequency for VHF and UHF Low/T band employs upper side of receiving frequency range.

: The 1^{st} Local OSC frequency for UHF High band employs lower side of receiving frequency range

2^{nd} IF 21.4 MHz : The 2^{nd} Local OSC frequency employs lower side of 1^{st} IF

3^{rd} IF 455 kHz : The 3^{rd} Local OSC frequency employs lower side of 2^{nd} IF.

– Continued –

1.4 Frequency range	:	VHF Low	25 – 54 MHz
		VHF Aircraft	108 – 136.99166 MHz
		VHF High	137 – 174 MHz
			216.0025 – 225.000 MHz
		Military Air	225.025 – 405.975 MHz
		UHF Low	406 – 512 MHz
		UHF High	806 – 960 MHz
			1240 – 1300 MHz

Except cellular band: 824.000 – 848.9875 MHz and 869.000 – 893.9875 MHz

1.5 Pre-Programmed band search: Marine
CB
FRS/GRMS/MURS
Fire/Police
Aircraft
Ham

1.6 WX frequencies : 162.400, 162.425, 162.450, 162.475, 162.500, 162.525, 162.550 MHz

1.7 Scanning rate : 60 channels/sec.

1.8 Search rate : 75 steps/sec.

1.9 Display : LED back-light LCD with 16 characters and 4 lines

1.10 Zeromatic : Activates during search mode

1.11 Audio output : 250 mWatts

1.12 Signal Starker band : Police/Fire band
All frequencies range divided to 8 groups
Group 1 (25 – 54 MHz)
Group 2 (108 – 137 MHz)
Group 3 (137 – 174 MHz)
Group 4 (216 – 300 MHz)
Group 5 (300 – 406 MHz)
Group 6 (406 – 512 MHz)
Group 7 (806 – 960 MHz)
Group 8 (1240 – 1300 MHz)

1.13 Speaker : Built-in 36 mm 8 Ohms dynamic speaker

1.14 Operating voltage : DC 6 Volts "AA" cell x 4 pcs.

1.15 Ext. power and charge voltage: DC 9 Volts (regulated)

1.16 Dimension	:	Approx. 65 (W) x 42 (D) x 145 (H) mm
1.17 Weight	:	Approx. 240 g without antenna and batteries
1.18 Accessory	:	Rubber antenna, Owner's manual, Freq. guide, Normal Batt. holder, Re-charge Batt. holder and Belt clip
1.19 Memory backup	:	No battery back-up required, EEPROM used

2. ELECTRICAL

Standard Test Condition

(1)	Power source voltage	:	6 Volts DC (Battery)
(2)	Antenna impedance	:	50 Ohms
(3)	Test temperature	:	25 degrees C
(4)	Standard signal level	:	100 μV
(5)	Modulation frequency	:	1 kHz
(6)	Reference FM deviation	:	3.0 kHz
(7)	Reference AM modulation	:	60%
(8)	Reference audio output	:	75 mWatts
(9)	Audio output load	:	8 Ohm resistive load

2.1 Frequency range :

Freq.	Step	Mode (Default)
25.000 – 27.995 MHz	5 kHz	AM
28.000 – 54.000 MHz	5 kHz	FM
108.000 – 136.99166 MHz	8.33 kHz	AM
137.000 – 137.995 MHz	5 kHz	FM
138.000 – 143.9875 MHz	12.5 kHz	FM
144.000 – 148.000 MHz	5 kHz	FM
148.0125 – 150.775 MHz	12.5 MHz	FM
150.7825 – 150.8125 MHz	7.5 kHz	FM
150.8150 – 154.4525 MHz	7.5 kHz	FM
154.45625 – 154.47875 MHz	7.5 kHz	FM
154.4825 – 154.5050 MHz	7.5 kHz	FM
154.5100 – 154.5250 MHz	5 kHz	FM
154.52750 – 154.54625 MHz	6.25 kHz	FM
154.5475 – 154.6075 MHz	7.5 kHz	FM
154.610 – 154.655 MHz	5 kHz	FM
154.6575 – 156.2475 MHz	7.5 kHz	FM
156.250 – 157.475 MHz	5 kHz	FM
157.4775 – 161.5650 MHz	7.5 kHz	FM
161.570 – 162.020 MHz	5 kHz	FM
162.025 – 173.200 MHz	12.5 kHz	FM
173.20375 – 173.22250 MHz	6.25 kHz	FM

173.22500 – 173.38750 MHz	6.25 kHz	FM
173.39000 – 173.40875 MHz	6.25 kHz	FM
173.4125 – 174.000 MHz	12.5 kHz	FM
216.0025 – 221.9975 MHz	5 kHz	FM
222.000 – 225.000 MHz	5 kHz	FM
225.025 – 405.975 MHz	25 kHz	AM
406.000 – 512.000 MHz	6.25 kHz	FM
806.000 – 960.000 MHz	6.25 kHz	FM
1240.000 – 1300.000 MHz	6.25 kHz	FM

Except cellular band: 824 – 848.9875 MHz and 869 – 893.9875 MHz

				Nominal	**Limit**
2.2	Sensitivity	:	VHF Low	0.3 μV	1 μV
	FM: (S+N)/N = 20 dB		VHF Aircraft	0.3 μV	1 μV
	Dev.: 3 kHz at 1 kHz		VHF High	0.5 μV	2 μV
			Military	1 μV	3 μV
			UHF Low/T	0.5 μV	2 μV
			UHF High 806 – 960 MHz	0.7 μV	3 μV
			1240 – 1300 MHz	0.7 μV	4 μV
	AM: (S+N)/N = 20 dB	:	VHF Low	1 μV	3 μV
	Mod.: 60% at 1 kHz		VHF Aircraft	1 μV	3 μV
			VHF High	1.5 μV	5 μV
			Military	3 μV	10 μV
			UHF Low/T	2 μV	6 μV
			UHF High 806 – 960 MHz	2 μV	6 μV
			1240 – 1300 MHz	3 μV	12 μV
2.3	Signal starker sensitivity	:	450 MHz	–60 dBm	–50 dBm
2.4	Data decode sensitivity				
	ED	:	ED (GE/Ericsson/MA-COM)	1 μV	4 μV
	4 kHz Dev. at 450, 860 MHz				
	MO (Voice channel)	:	MO (Motorola)	0.5 μV	2 μV
	350 Hz Dev. at 174, 450, 860 MHz				
	MO (Control channel)	:	MO (Motorola)	1 μV	4 μV
	4 kHz Dev. at 174, 450, 860 MHz				
	LTR	:	LTR (EF Johnson)	0.8 μV	3 μV
	800 Hz Dev. at 450, 860 MHz				
	WX Alert 1050 Hz tone	:		0.3 μV	1 μV
	3 kHz Dev. at 162.4 MHz				
	WX Digital Weather Alert	:		0.5 μV	2 μV
	4 kHz Dev. at 162.4 MHz				

			Nominal	Limit
2.5	CTCSS decode sensitivity : 350 Hz Dev. at 450, 860 MHz		1 μV	3 μV
2.6	DCS decode sensitivity : 350 Hz Dev. at 450, 860 MHz		1 μV	3 μV
2.7	WX alert tone decode range : 4 kHz Dev. 2 μV at 162.400 MHz		1050 ±25 Hz	±40 Hz
2.8	WX alert tone checking time : 4 kHz Dev. 2 μV at 162.400 MHz		2.2 sec.	2 – 5 sec.
	Note: When receiving WX alert in priority operation, the priority sampling time up to 2 sec. is added to this depending on Alert tone transmission timing.			
2.9	WX alert sound level at 1 ft. :		70 dB	60 dB
2.10	Image ratio 1st IF image :	VHF Low at 41 MHz	50 dB	40 dB
		VHF Aircraft at 124 MHz	50 dB	40 dB
		VHF High at 154.1 MHz	50 dB	40 dB
		Military Air at 310 MHz	40 dB	30 dB
		UHF Low/T at 450 MHz	50 dB	40 dB
		UHF High at 860 MHz	80 dB	60 dB
		1270 MHz	55 dB	40 dB
	2nd IF image :	VHF High at 154.1 MHz	50 dB	40 dB
2.11	Attenuator :	VHF Low	20 dB	17 – 24 dB
		VHF Aircraft	20 dB	17 – 24 dB
		VHF High	20 dB	17 – 24 dB
		UHF Low	15 dB	10 – 20 dB
		UHF High	13 dB	8 – 18 dB
2.12	Squelch sensitivity (Band center)			
	Threshold :	AM/FM	0.5 μV	2 μV
	Tight: (S+N)/N :	AM	20 dB	10 dB
		FM	25 dB	15 dB
2.13	Selectivity			
	AM 25 – 27.995 MHz :	–6 dB	±5 kHz	±7 kHz
		–50 dB	±6 kHz	±10 kHz
	Other frequency :	–6 dB	±10 kHz	±14 kHz
		–50 dB	±18 kHz	±25 kHz

			Nominal	Limit
2.14	Spurious rejection (Except Primary image) :	VHF High at 154.1 MHz	40 dB	30 dB
2.15	IF rejection ratio :	380.8 MHz at 154.1 MHz	60 dB	40 dB
		21.4 MHz at 154.1 MHz	100 dB	80 dB
		Fr 225 – 300 MHz	30 dB	not specified
		300 – 405.975 MHz	10 dB	not specified
2.16	Acceptable radio frequency displacement at EIA RS-204D :		±6 kHz	±3 kHz
2.17	Signal to noise ratio :	25 – 54 MHz	40 dB	30 dB
	AM/FM	108 – 136.9875 MHz	40 dB	30 dB
	RF: 100 μV	137 – 174 MHz	40 dB	30 dB
	Dev.: 3 kHz at 1 kHz	216.0025 – 225 MHz	40 dB	30 dB
	Mod. 60% at 1 kHz	225.025 – 405.975 MHz	35 dB	25 dB
		406 – 512 MHz	35 dB	25 dB
		806 – 960 MHz	35 dB	25 dB
		1240 – 1300 MHz	35 dB	25 dB
2.18	Residual noise Vol. min. and Squelched :		1 mV	3 mV
2.19	Scanning rate without trunking:	406 – 505 MHz (in 1 MHz: Intervals)	60 ch/sec.	33 – 66 ch/sec.
2.20	Search rate :	at 162.25 – 167.25 MHz	75 steps/sec.	60 – 95 steps/sec.
2.21	Signal Starker Time :	Police/Fire band	0.75 sec.	0.825 sec.
	One active signal	All band	5.8 sec.	6.38 sec.
	the Other no signal			
2.22	Scan and Search delay time :		2 sec.	1 – 3 sec.
2.23	Audio output (T.H.D. 10 %) :	RF input: 100 μV at 154.1 MHz		
	8 Ohms R Load, 1 kHz		170 mWatts	140 mWatts
2.24	T.H.D. at 50 mWatt :	RF input: 100 μV at 154.1 MHz	1 %	5 %
2.25	Audio max. power :	RF input: 100 μV at 154.1 MHz		
	8 Ohm internal speaker		250 mWatts	200 mWatts
	32 Ohm at headphone mono/stereo (each phone)		17/12.5 mWatts	25 mWatts

			Nominal	Limit
2.26	Audio frequency response at –6 dB :	RF input: 100 μV at 154.1 MHz	300 Hz 2.0 kHz	200 – 400 Hz 1.5 – 3.0 kHz
2.27	Intermediate frequency :	1st 380.8 MHz 2nd 21.4 MHz 3rd 455 kHz		
2.28	Current drain at 9 Volts : 8 Ohm internal speaker at 154.1 MHz	Vol. Max. Squelch	180 mA 90 mA	220 mA 110 mA
2.29	Charging current Ni-MH Battery (1600 mA/h)			
	1) AC adapter charging current :		150 mA	100 – 200 mA
	Note: This specification is obtained AC 120 V with model 273-1767A without the scanner on after ten hours.			
	2) DC adapter (regulated) : charging current (at 9 V)		150 mA	130 – 170 mA
	Note: This specification is obtained DC 9 V without the scanner on after ten hours.			
2.30	Battery life at continuous operation			
	Alkaline Battery :		22 Hours	Not specified
	Ni-MH Battery (1600 mA/h)		18 Hours	Not specified
	Note: Test condition EIAJ CP-2905 (1-4-4.1)			
2.31	Birdies and step frequency when search :	Under discussion		
2.32	Filter :	Saw filter for 380.8 MHz, Monolithic crystal filter for 21.4 MHz and ceramic filter for 455 kHz		
2.33	Antenna impedance :	50 Ohms		
2.34	Temperature range :	Test to specification between: +18°C – +35°C Operate (Need not meet spec.): -10°C – +60°C		
2.35	Low BATT indicator :		4.0 V	3.8 – 4.3 V

3. OPERATING CONTROLS AND CONNECTIONS

3.1 Volume control with power switch

3.2 Squelch control

3.3 Keyboard (30 keys): FUNCtion, PGM, WX/Skywarn, TRUNK, MANUAL, PRI, TUNE, TEXT, ATT, PAUSE, MODE, ▲, ▼, KEY LOCK/LIghT, SCAN/Signal stalker, SEARCH, L/OUT, ENTER, CL, 1, ABC/2, DEF/3, GHI/4, JKL/5, MNO/6, PQRS/7, TUV/8, WXYZ/9, 0, • and DELAY

3.4 LCD display: 16 characters and 4 lines
Frequency, Mode, ch, Bank, ... etc.

3.5 BNC type antenna connector

3.6 Earphone jack (D = 3.5 mm stereo)

3.7 External power jack and charge jack

3.8 PC Interface and Clone jack (D = 3.5 mm mono)

3.9 Battery compartment

4. FEATURES

4.1 10 bank and 1000 channel memories for trunking bank and channel combined with conventional mode memory

4.2 Multi trunking of Motorola (type Ⅰ, Ⅱ and hybrid analog system), EDACS and LTR

4.3 CTCSS and DCS Subaudible encoded squelch mode

4.4 Scan both trunking channels and conventional channels at same time

4.5 1500 ID memories in 10 ID banks, 5 sub-ID memories in each bank and each sub-ID memory has 30 ID locations.

4.6 Alphanumeric data entry

4.7 Clone the memory to other unit

4.8 Signal starker function (Total 200 lock out frequencies in signal starker, All Band 150, Police/Fire Band 50)

4.9 Pre-programmed Marine, CB, FRS/GRMS/MURS, Fire/Police, Aircraft, Ham and Weather frequencies

4.10 WX alert and SAME receiving with 10 FIPS (Federal Information Processing Standard) area code memories

4.11 Skywarn function

4.12 Attenuator control (Normal attenuator and Global attenuator)

4.13 Built-in power save circuit

4.14 Frequency tune mode (Frequency ▲ or ▼)

4.15 "Zeromatic" tuning system

4.16 Change the direction at the searching by ▲ (up) or ▼(down)

4.17 60 channels/sec. scanning rate and 75 steps/sec. searching rate

4.18 2 second scan and search delay

4.19 Manual selection for channel

4.20 Scan mode [Cleared channels (000.000 freq.) are not scan.]

4.21 Deleting a frequency from a channel

4.22 1 limit search bank

4.23 Key lock for safety

4.24 Key tone and alert tone

4.25 16 characters and 4 lines dot matrix LCD (Indicate channel numbers, Frequency, ID number and the data on the LCD)

4.26 Backlight LCD and key pads

4.27 Low battery indicator by LCD

4.28 Crystal filter for 2nd IF and Ceramic filter for 3rd IF section

4.29 Belt clip and two battery holder attached

4.30 50 lock out frequencies per search bank, Fire/Police, Aircraft, Ham, Limit search (Totaling 200 frequencies)

4.31 Frequency lock-out review and Channel lock-out review

4.32 155 preprogrammed frequencies

Appendix B – Local Oscillator Frequency calculation

MODEL NO. PRO-97

1 LOCAL OSC FREQUENCY CALCULATION

-1 MODEL NO. PRO-97 formula for 1st, 2nd and 3rd Local oscillation frequencies are as follow :

RECEIVING BAND (FR STEP)	FREQ. STEP (kHz)	RECEIVING FREQ. FR (MHz)	1st LOCAL PLL 1 /VCO 1 or VCO 2 (MHz)	2nd LOCAL PLL 2 /VCO 3 (MHz)	3rd LOCAL X' TAL (MHz)
VHF Low	5.0	25.0000 ~ 54.0000	A = (FR + 380.800) / 0.075	2nd Local = 1st IF - 21.4	20.9450
VHF High	8.33	108.0000 ~ 136.99166	= A.xxx (Cut away decimal)	2nd Local = 1st IF - 21.4	20.9450
	5.0	137.0000 ~ 137.9950	1st Local = A x 0.075	〃	〃
	12.5	138.0000 ~ 143.9875	1st IF = 1st Local - FR	〃	〃
	5	144.0000 ~ 148.0000		〃	〃
	12.5	148.0125 ~ 150.7750		〃	〃
	7.5	150.7825 ~ 150.8125		2nd Local = 1st IF - 21.4025	20.9475
	〃	150.8150 ~ 154.4525		2nd Local = 1st IF - 21.4	20.9450
	〃	154.45625 ~ 154.47875		〃	〃
	〃	154.4825 ~ 154.5050		〃	〃
	5.0	154.5100 ~ 154.5250		〃	〃
	6.25	154.52750 ~ 154.54625		2nd Local = 1st IF - 21.3975	20.9425
	7.5	154.5475 ~ 154.6075		2nd Local = 1st IF - 21.4025	20.9475
	5.0	154.6100 ~ 154.6550		2nd Local = 1st IF - 21.4	20.9450
	7.5	154.6575 ~ 156.2475		2nd Local = 1st IF - 21.3975	20.9425
	5.0	156.2500 ~ 157.4750		2nd Local = 1st IF - 21.4	20.9450
	7.5	157.4775 ~ 161.5650		2nd Local = 1st IF - 21.3975	20.9425
	5.0	161.5700 ~ 162.0200		2nd Local = 1st IF - 21.4	20.9450
	12.5	162.0250 ~ 173.2000		〃	〃
	6.25	173.20375 ~ 173.22250		2nd Local = 1st IF - 21.4025	20.9475
	〃	173.22500 ~ 173.38750		2nd Local = 1st IF - 21.4	20.9450
	〃	173.39000 ~ 173.40875		2nd Local = 1st IF - 21.3975	20.9425
	12.5	173.4125 ~ 174.0000		2nd Local = 1st IF - 21.4	20.9450
	5.0	216.0025 ~ 221.9975		2nd Local = 1st IF - 21.4025	20.9475
	〃	222.0000 ~ 225.0000		2nd Local = 1st IF - 21.4	20.9450
UHF Low	25.0	225.0250 ~ 316.5250		2nd Local = 1st IF - 21.4	20.9450
	〃	316.5500 ~ 316.6500	A = (FR + 380.700) / 0.075	〃	〃
	〃	316.6750 ~ 337.9475	A = (FR + 380.800) / 0.075	〃	〃
	〃	337.9500 ~ 338.0000	A = (FR + 380.700) / 0.075	〃	〃
	〃	338.0250 ~ 359.3250	A = (FR + 380.800) / 0.075	〃	〃
	〃	359.3500 ~ 359.4000	A = (FR + 380.700) / 0.075	〃	〃
	〃	359.4250 ~ 380.7000	A = (FR + 380.800) / 0.075	〃	〃
	〃	380.7250 ~ 380.8000	A = (FR + 380.700) / 0.075	〃	〃
	〃	380.8250 ~ 400.0000	A = (FR + 380.800) / 0.075	〃	〃
	〃	400.0250 ~ 405.9750	A = (FR + 380.700) / 0.075	〃	〃
	6.25	406.0000 ~ 512.0000	A = (FR + 380.800) / 0.075	〃	〃
UHF High	6.25	806.0000 ~ 823.9875	A = (FR - 380.800) / 0.075	2nd Local = 1st IF - 21.4	20.9450
	〃	849.0000 ~ 868.9875	= A.xxx (Cut away decimal)	〃	〃
	〃	894.0000 ~ 960.0000	1st Local = A x 0.075	〃	〃
	〃	1240.0000 ~ 1300.0000	1st IF = FR - 1st Local	〃	〃

FR DENOTES Frequency Received.

-2 IF FREQUENCY

1st IF : 380.6500 ~ 380.86875Hz

2nd IF : 21.3975MHz / 21.4000MHz / 21.4025MHz

3rd IF : 455kHZ

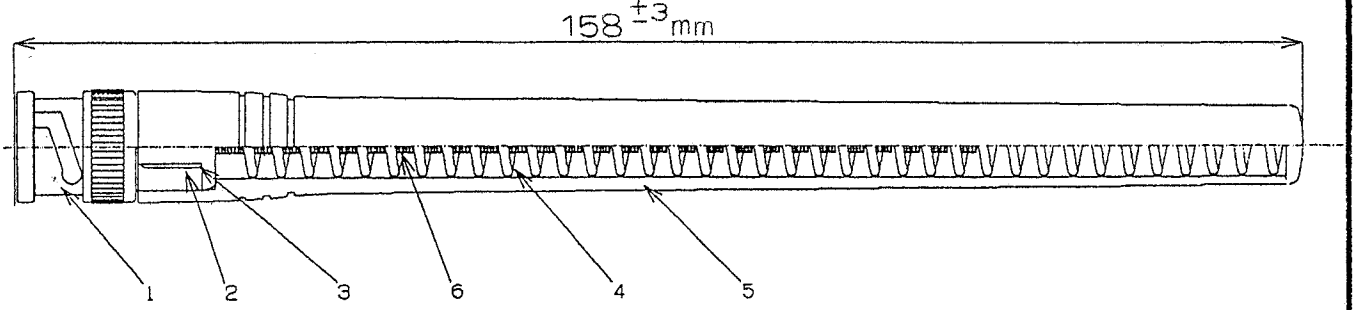
-3 Example

RECEIVING BAND (FR STEP)	FREQ. STEP (kHz)	RECEIVING FREQ. FR (MHz)	1st LOCAL PLL 1 /VCO 1 or VCO 2 (MHz)	2nd LOCAL PLL 2 /VCO 3 (MHz)	3rd LOCAL X' TAL (MHz)
VHF Low	5.0	25.0000	A : 5410.666 = (25.0000 + 380.800) / 0.075 = 5410.666 (Cut away decimal) 1st Local : 405.750 =5410 x 0.075 1st IF : 380.750 = 405.750 - 25.0000	359.350 = 380.750 - 21.4	20.9450
		40.0000	5610.666 = (40.0000 + 380.800) / 0.075 = 5610.666 (Cut away decimal) 420.750 =5610 x 0.075 380.750 = 420.750 - 40.0000	359.350 = 380.750 - 21.4	20.9450
		54.0000	5797.333 = (54.0000 + 380.800) / 0.075 = 5797.333 (Cut away decimal) 434.775 =5797 x 0.075 380.775 = 434.775 - 54.0000	359.375 = 380.775 - 21.4	20.9450
VHF High	8.33	108.0000	6517.333 = (108.0000 + 380.800) / 0.075 = 6517.333 (Cut away decimal) 488.775 =6517 x 0.075 380.775 = 488.775 - 108.0000	359.375 = 380.775 - 21.4	20.9450
	6.25	154.5275	7137.7 = (154.5275 + 380.800) / 0.075 = 7137.7 (Cut away decimal) 535.275 =7137 x 0.075 380.7475 = 535.275 - 154.5275	359.350 = 380.7475 - 21.3975	20.9425
	12.5	174.0000	7397.333 = (174.0000 + 380.800) / 0.075 = 7397.333 (Cut away decimal) 554.775 = 7397 x 0.075 380.775 = 554.775 - 174.0000	359.375 = 380.775 - 21.4	20.9450
	5.0	216.0025	7957.366 = (216.0025 + 380.800) / 0.075 = 7957.366 (Cut away decimal) 596.775 = 7957 x 0.075 380.7725 = 596.775 - 216.0025	359.370 = 380.7725 - 21.4025	20.9475
	5.0	225.0000	8077.333 = (225.0000 + 380.800) / 0.075 = 8077.333 (Cut away decimal) 605.775 =8077 x 0.075 380.775 = 605.775 - 225.0000	359.375 = 380.775 - 21.4	20.9450

RECEIVING BAND (FR STEP)	FREQ. STEP (kHz)	RECEIVING FREQ. FR (MHz)	1st LOCAL PLL 1 /VCO 1 or VCO 2 (MHz)	2nd LOCAL PLL 2 /VCO 3 (MHz)	3rd LOCAL X' TAL (MHz)
UHF Low	25.0	310.0000	9210.666 = (310.0000 + 380.800) / 0.075 = 9210.666 (Cut away decimal) 690.750 =9210 x 0.075 380.750 = 690.750 - 310.0000	359.350 = 380.750 - 21.4	20.9450
	6.25	406.0000	10490.666 = (406.0000 + 380.800) / 0.075 = 10490.666 (Cut away decimal) 786.750 =10490 x 0.075 380.750 = 786.750 - 406.0000	359.350 = 380.750 - 21.4	20.9450
		446.0000	11024.000 = (446.0000 + 380.800) / 0.075 = 11024.000 (Cut away decimal) 826.800 =11024 x 0.075 380.800 = 826.800 - 446.0000	359.400 = 380.800 - 21.4	20.9450
		512.0000	11904.000 = (512.0000 + 380.800) / 0.075 = 11904.000 (Cut away decimal) 892.800 =11904 x 0.075 380.800 = 892.800 - 512.0000	359.400 = 380.800 - 21.4	20.9450
UHF High	6.25	806.0000	5669.333 = (806.0000 - 380.800) / 0.075 = 5669.333 (Cut away decimal) 425.175 =5669 x 0.075 380.825 = 806.000 - 425.175	359.425 = 380.825 - 21.4	20.9450
		860.0000	6389.333 = (860.0000 - 380.800) / 0.075 = 6389.333 (Cut away decimal) 479.175 =6389 x 0.075 380.825 = 860.000 - 479.175	359.425 = 380.825 - 21.4	20.9450
		960.0000	7722.666 = (960.0000 - 380.800) / 0.075 = 7722.666 (Cut away decimal) 579.150 =7722 x 0.075 380.850 = 806.000 - 579.150	359.450 = 380.850 - 21.4	20.9450
		12400.0000	11456.000 = (1240.0000 - 380.800) / 0.075 = 11456.000 (Cut away decimal) 859.200 =11456 x 0.075 380.800 = 1240.000 - 859.200	359.400 = 380.800 - 21.4	20.9450
		1300.0000	12256.000 = (1300.0000 - 380.800) / 0.075 = 12256.000 (Cut away decimal) 919.200 =12256 x 0.075 380.800 = 1300.000 - 919.200	359.400 = 380.800 - 21.4	20.9450

Appendix C – Antenna Drawing

JIS A4



⚠

1) Wide Receives: 25 - 1300 MHz receive coverage for VHF-Lo, VHF-Hi, UHF.

2) Flexible antenna with BNC connector

3) Impedance: 50 Ohm

QTY	ITEM NO	PART OR DWG. NO	NOMENCLATURE OR DESCRIPTION	SPECIFICATION	CODE IDENT
1	6		Element Cable		
1	5		Element rubber case		
1	4		Element SP		
1	3		Element FT		
1	2		Insulater		
1	1		BNC Connecter		

DATE	SYM	REVISION	BY	APPROV
6.5'03	⚠			mJ

NUMBER	TITLE	QUANT	MATERIAL	REMARK

SCALE | TREAT | PAINT | ISSUED

DATE: DEC. 5.1991

DRAWING NO. GE-91 D-9447

DESIGN	ARE
DRAWN	T. Koga
CHECKED	K. Wakui
APPROV	S. Sato

TITLE: RUBBER ANTENNA

GENERAL RESEARCH OF ELECTRONICS INC.