

GRE GENERAL RESEARCH OF ELECTRONICS, INC.

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SHIBA NO.3 AMEREX BLDG.
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TOKYO, JAPAN 108

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Tokyo: DEC. 16, 1997

Reference No. 97029

S P E C I F I C A T I O N S

SUBJECT : VHF/UHF PROGRAMMABLE AM/FM HAND-HELD SCANNING RECEIVER
RP-6140

1. GENERAL

- 1 Programmable channel: 400 channels (40 channels x 10 banks)
 - 10 Limit search banks
 - 40 Monitor channels
 - 10 Priority channels
 - 7 WX frequencies
 - 17 Pre-programmed bands search
- 2 Receiving system : PLL synthesizer triple conversion superheterodyne
 - 1st IF 257.5MHz: The 1st Local OSC frequency for VHF and UHF Low/T Band employs upper side of receiving frequency range
 - : The 1st Local OSC frequency for UHF High Band employs lower side of receiving frequency range
 - 2nd IF 21.4MHz : The 2nd Local OSC frequency employs upper side of 1st IF
 - 3rd IF 455kHz : The 3rd Local OSC frequency employs lower side of 2nd IF
- 3 Receiving wave mode : Narrow FM (Business, communication, ham radio)
AM (Aircraft)
- 4 Frequency range

	<u>Freq.</u>	<u>Step</u>	<u>Mode (Default)</u>
4-1) Frequency step: and mode	29.0000- 54.0000MHz	5.0kHz	FM
	108.0000-136.9750MHz	25.0kHz	AM
	137.0000-174.0000MHz	5.0kHz	FM
	380.0000-512.0000MHz	12.5kHz	FM
	806.0000-824.0000MHz	12.5kHz	FM
	849.0000-869.0000MHz	12.5kHz	FM
	894.0000-960.0000MHz	12.5kHz	FM
4-2) Band search	: 29-30, 30-50, 50-54, 108-136, 144-148, 148-174, 380-384, 406-420, 420-450, 450-470, 851-856, 856-866, 866-869, 935-940, 940-941, 941-952, 952-960MHz Except cellular band		
4-3) WX	: 162.400, 162.425, 162.450, 162.475, 162.500, 162.525, 162.550MHz		

- cont'd -

PRODUCT DEVELOPMENT & MANUFACTURING

- 5 Scanning rate : 25 channels/sec.
- 6 Search rate : 50 steps/sec.
- 7 Frequency and mode : LCD with back-lighting display
- 8 Zeromatic : Activates during search mode
- 9 Audio output : 240mW nominal
- 10 Speaker : Built-in 36mm. 8 ohms Dynamic speaker
- 11 Operating voltage : 9V DC, 6 "AA" cells
- 12 External power and charge voltage : 9V DC (200mA)
- 13 Dimension : Approx. 63 (W) x 45 (D) x 150 (H) mm
- 14 Weight : Approx. 260g without antenna and batteries
- 15 Accessory : Rubber antenna, AC-DC adapter, Belt clip, Owner's manual and Frequencies guide
- 16 Memory backup : Capacitor

2. ELECTRICAL

	<u>Nominal</u>	<u>Limit</u>
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- | | | |
|-----------------------|--------------|----------------------|
| -1 Frequency coverage | : VHF Low | 29~ 54.0000MHz |
| | VHF Aircraft | 108~136.9750MHz |
| | VHF High | 137~174.0000MHz |
| | UHF Low/T | 380~512.0000MHz |
| | UHF High | 806~824.0000MHz |
| | UHF High | 849.0000~869.0000MHz |
| | UHF High | 894.0000~960.0000MHz |

Except cellular band: 824.0125-848.9875/869.0125-893.9875MHz

- | | | | |
|--------------------|--------------|-----------|------------|
| -2 Sensitivity | : VHF Low | 1 μ V | 2 μ V |
| FM : (S+N)/N=20dB | VHF Aircraft | 1 μ V | 2 μ V |
| DEV.: 3kHz at 1kHz | VHF High | 1 μ V | 2 μ V |
| | UHF Low/T | 1 μ V | 2 μ V |
| | UHF High | 2 μ V | 4 μ V |
| AM : (S+N)/N=20dB | VHF Low | 2 μ V | 5 μ V |
| MOD.: 60% at 1kHz | VHF Aircraft | 2 μ V | 5 μ V |
| | VHF High | 2 μ V | 5 μ V |
| | UHF Low/T | 2 μ V | 5 μ V |
| | UHF High | 4 μ V | 10 μ V |

		<u>Nominal</u>	<u>Limit</u>
-3	Image ratio		
	1st IF image:		
	VHF Low at 40MHz	50dB	
	Aircraft at 124MHz	50dB	
	VHF High at 154MHz	50dB	Not Specified
	UHF Low at 450MHz	60dB	
	UHF High at 860MHz	40dB	
	2nd IF image:		
	VHF High at 154MHz	60dB	
-4	Squelch sensitivity (Band center)		
	Threshold	1 μ V	10 μ V
	Tight (S+N)/N : FM	25dB	15dB
	Tight (S+N)/N : AM	20dB	10dB
-5	Selectivity		
	: -6dB	± 10 kHz	± 14 kHz
	: -50dB	± 18 kHz	± 25 kHz
-6	Spurious rejection		
	(Except primary image) : at 154MHz (FM)	40dB	30dB
-7	IF rejection		
	: 257.5MHz at 154MHz	50dB	40dB
	: 21.4MHz at 154MHz	100dB	80dB
-8	Acceptable radio frequency displacement	± 6 kHz	± 3 kHz
-9	Signal to noise ratio		
	AM and FM : 29.000- 54.000MHz	40dB	30dB
	: 108.000-136.975MHz	40dB	30dB
	RF input 100 μ V : 137.000-174.000MHz	40dB	30dB
	DEV. 3kHz at 1kHz : 380.000-512.000MHz	35dB	25dB
	MOD. 60% at 1kHz : 806.000-960.000MHz	35dB	25dB
-10	Residual noise	1mV	3mV
	(Vol. Min., Squelched)		
-11	Scanning rate	25 channels/sec. 22~28 channels/sec.	
-12	Search rate	50 steps/sec. 45~55 steps/sec.	
-13	Priority sampling	2sec.	1~3sec.
-14	Scan delay time	2sec.	1~3sec.
-15	Audio max. power	RF input 100 μ V at 154MHz	300mW
			220mW
-16	Audio output (T.H.D. 10%)	RF input 100 μ V at 154MHz	240mW
	(8 ohms R Load, 1kHz)		180mW
-17	T.H.D. at 50mW	RF input 100 μ V at 154MHz	3%
			8%
-18	Audio frequency response	RF input 100 μ V at 154MHz	300Hz
	at -6dB		2.0kHz
			1.5k-3kHz

		<u>Nominal</u>	<u>Limit</u>
-19	Birdies and step frequency : Under discussion when search		
-20	Current drain at 9 Volts : Squelched at 154MHz	80mA	100mA
-21	Charging current :	65mA	50mA
	Note: This specification is obtained AC 120V with model 5-2413A power supply without the scanner on after ten hours.		
-22	Memory hold time :	10 Hours	1 Hour
-23	Intermediate frequency : 1st 257.5MHz 2nd 21.4MHz 3rd 455kHz		
-24	Filter : Monolithic crystal filter for 21.4MHz Ceramic filter for 455kHz		
-25	Antenna impedance : 50 ohms		
-26	Temperature range : Test to specification between : +18°C~+35°C Operate (Need not meet spec.) : -10°C~+60°C		
-27	LOW BATT indicator :	5.5V	5.5 ± 0.5V

3. OPERATING CONTROLS AND CONNECTIONS

- 1 Volume control with power switch
- 2 Squelch control
- 3 Keyboard (30 Keys)
- 4 7 digits frequency display by LCD
- 5 3 digits channel indicator by LCD
- 6 Indicator : ►, ◄, SCAN, MAN (MANUAL), SRCH, BANK, PROG, CH, DLY, AM, FM,
L/O (LOCK-OUT), PRI (PRIORITY), MEM, Weather Icon, AUTO, Key Icon,
P (PRIORITY), duPL (duplicate), chFuLL, ALL-OFF, AC (ACTIVE),
-d- (direct), L (LIMIT), b (band) and Error by LCD with back light
- 7 BNC type antenna connector
- 8 Earphone jack (D=3.5mm stereo)
- 9 External power jack and charge jack
- 10 Key lock (keyboard)
- 11 Battery compartment for 6 "AA" cells (User service)
- 12 Reset switch

4. FEATURES

- 1 400 memory channels
- 2 10 banks for channel grouping
- 3 10 Limit search banks
- 4 17 pre-programmed bands search
- 5 40 monitor temporary memories
- 6 400 channels automatic scanning for VHF to UHF band [cleared channels (000.000 freq.) are not scan]
- 7 Weather Icon calls the programmed weather frequencies
- 8 25 channels/sec. scanning rate and 50 steps/sec. searching rate
- 9 Automatic memory function of receiving frequencies
- 10 Shows alarm for preventing duplicate frequencies
- 11 Lock-out frequencies (maximum 200 frequencies on search mode)
- 12 Built-in 10 priority channels
- 13 Built-in electrical channel lock-out circuit
- 14 Lock out channel review and lock-out frequencies review
- 15 Built-in electrical scan delay circuit
- 16 Change the direction at the manual, scan and searching by ► (up) or ◄ (down)
- 17 Zeromatic tuning system
- 18 Direct access to over 32,000 frequencies
- 19 Manual selection for channel
- 20 Sort all the frequencies within the bank in the ascending or descending order
- 21 Moving frequencies from banks to monitor memory
- 22 Deleting a frequency from a channel or monitor memory
- 23 Deleting frequencies from locked-out within a bank
- 24 Deleting all frequencies form channels within a bank
- 25 10 digit display for channel and frequency with all function indicators
- 26 LCD back-lighting
- 27 Earphone jck (D=3.5mm stereo)
- 28 BNC antenna connector
- 29 Crystal filter for 21.4MHz 2nd IF and Ceramic filter for 455kHz 3rd IF section
- 30 Regulated DC power supply circuit
- 31 Built-in dynamic speaker
- 32 Automatic switching for AM or FM reception
- 33 Changeable for AM or FM reception
- 34 Built-in low BATT indicate circuit
- 35 Built-in power save circuit
- 36 Belt clip attached

GENERAL RESEARCH OF ELECTRONICS, INC.

2.0 System Test Configuration

2.1 Justification

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 attached to a cardboard box (if necessary) and placed on the wooden turntable. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). The EUT is wired to transmit full power without modulation.

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. Detector function is in peak mode. 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

For emissions testing, the units were setup to receive continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing.

Intertek Testing Services

General Research of Electronics Inc., Scanning Receiver

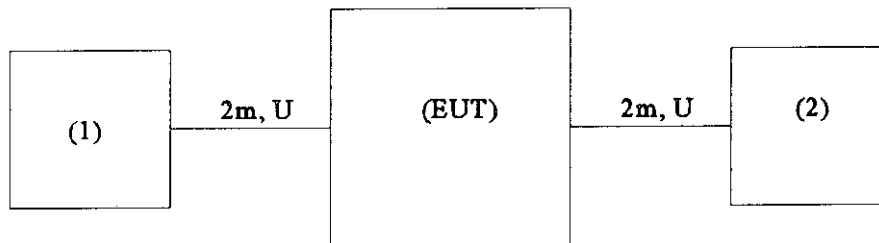
FCC ID: ADVRP-6140

2.3 Support Equipment List and Description

- a) The FCC ID's for all equipment used in the tested system (included inserted cards, which have grants) are:

Item #	Description	Model No.	Serial No.	FCC ID
1	Radio Shack AC Power Adapter	273-1662	9615	N/A
2	Sony Headphones	N/A	N/A	N/A

- b) Equipment Setup Block Diagram



* = EUT

** = No ferrites on video cable

S = Shielded;
U = Unshielded

F = With Ferrite

2.4 Equipment Modification

Any modifications installed previous to testing by General Research of Electronics Inc. will be incorporated in each production model sold/leased in the United States.

No modifications were installed by Incheape Testing Services.

3.0 **Emission Results**

AC line conducted emission measurements were performed from 0.45 MHz to 30 MHz. Analyzer resolution is 10 kHz or greater.

Radiated emission measurements were performed from 30 MHz to 5000 MHz. Analyzer resolution is 100 kHz or greater for 30 MHz to 1000 MHz, 1 MHz for > 1000 MHz.

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs 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 $\text{dB}\mu\text{V/m}$
- RA = Receiver Amplitude (including preamplifier) in $\text{dB}\mu\text{V}$
- CF = Cable Attenuation Factor in dB
- AF = Antenna Factor in dB
- AG = Amplifier Gain in dB
- DF = Distance Factor

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:-

$$FS = RR + LF$$

where

- FS = Field Strength in $\text{dB}\mu\text{V/m}$
- RR = RA - AG in $\text{dB}\mu\text{V}$
- LF = CF + AF + DF in dB

Assume a receiver reading of $52.0 \text{ dB}\mu\text{V}$ is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of $32 \text{ dB}\mu\text{V/m}$. This value in $\text{dB}\mu\text{V/m}$ was converted to its corresponding level in $\mu\text{V/m}$.

RA = $52.0 \text{ dB}\mu\text{V}$	DF = 0 dB
AF = 7.4 dB	RR = $23.0 \text{ dB}\mu\text{V}$
CF = 1.6 dB	LF = 9.0 dB
AG = 29.0 dB	
FS = RR + LF	
FS = $23 + 9 = 32 \text{ dB}\mu\text{V/m}$	

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$$

Intertek Testing Services

General Research of Electronics Inc., Scanning Receiver

FCC ID: ADVRP-6140

3.3 Radiated Emission Data

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Judgement : Passed by 5.6 dB

INTERTEK TESTING SERVICES

Company: General Research of Electronics, Inc.
 EUT: Portable Scanning Receiver
 Model: RP-6140
 Test Mode: Normal

Project #: J98016158
 Date of Test: 5/29/98
 Test Site #: 2
 Engineer: Ollie Moyrong *O.M.*

FCC Part 15.109 Class B Radiated Emissions

Tuned Frequency (MHz)	L.O. Frequency (MHz)	Antenna Location (m)	Antenna Polarization (H=0/V=1)	Reading (dBuV)	Antenna Factor (dB/m)	Preamplifier (dB)	Cable Loss (dB)	Corrected Reading dBuV/m	Limit At 3 m (dBuV/m)	Margin (dB)
29.000	286.500	3.0	1	39.5	14.1	-28.2	3.1	28.4	46.0	-17.6
39.500	297.000	3.0	0	37.1	14.6	-28.2	3.3	26.7	46.0	-19.3
54.000	311.500	3.0	1	38.2	15.5	-28.2	3.6	29.1	46.0	-16.9
108.000	365.500	3.0	1	48.7	15.1	-28.0	4.5	40.3	46.0	-5.7
122.500	380.000	3.0	1	48.6	15.4	-28.0	4.5	40.4	46.0	-5.6
136.975	394.475	3.0	1	43.5	15.8	-28.0	4.5	35.8	46.0	-10.2
137.000	394.500	3.0	1	43.4	15.8	-28.0	4.5	35.7	46.0	-10.3
154.000	411.500	3.0	0	44.7	16.5	-27.8	4.5	37.8	46.0	-8.2
174.000	431.500	3.0	1	46.5	16.2	-27.8	4.5	39.4	46.0	-6.6
380.000	637.500	3.0	1	36.0	21.6	-27.8	5.3	35.1	46.0	-10.9
440.000	697.500	3.0	1	38.8	22.5	-28.0	5.6	38.9	46.0	-7.1
512.000	769.500	3.0	0	39.2	22.2	-28.0	5.8	39.2	46.0	-6.8
806.000	552.000	3.0	1	38.9	17.7	-27.6	5.0	34.1	46.0	-11.9
815.000	557.500	3.0	1	39.1	17.9	-27.6	5.1	34.5	46.0	-11.5
824.000	564.000	3.0	1	39.0	18.2	-27.6	5.1	34.8	46.0	-11.2
849.000	591.515	3.0	1	38.0	19.2	-27.6	5.2	34.8	46.0	-11.2
859.000	601.500	3.0	1	37.7	19.4	-27.4	5.2	34.9	46.0	-11.1
869.000	611.500	3.0	1	37.8	19.6	-27.4	5.3	35.3	46.0	-10.7
894.000	636.500	3.0	1	35.2	21.6	-27.4	5.4	34.8	46.0	-11.2
926.000	668.500	3.0	0	35.2	20.8	-27.9	5.6	33.7	46.0	-12.3
960.000	702.500	3.0	1	35.9	22.7	-28.1	5.7	36.2	46.0	-9.8
29.000	278.900	3.0	1	46.1	13.9	-28.2	3.1	34.8	46.0	-11.2
806.000	275.400	3.0	1	45.6	13.7	-27.6	2.6	34.4	46.0	-11.6
815.300	236.100	3.0	1	44.4	11.9	-27.6	2.4	31.2	46.0	-14.8
820.750	238.600	3.0	1	46.2	12.0	-27.6	2.4	33.0	46.0	-13.0

Note: Negative signs (-) in the Margin column signify levels below the limit.

Readings preceded with a '*' are Quasi-Peak measurements.

All other readings are Peak measurements.

Intertek Testing Services

General Research of Electronics Inc., Scanning Receiver

FCC ID: ADVRP-6140

3.5 Conducted Emission Data

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Judgement : Passed by 14.0 dB

ITS, MENLO PARK, CA, USA
EMISSION LEVEL [dBuV]

29 May 1998 17:45:07

100

80

60

40

20

.45

1

10

30

FREQUENCY [MHz]

FCC, Pt 15 - AC LINE CONDUCTED
GENERAL RESEARCH OF ELECTRONICS
PORTABLE SCANNING RECEIVER
MODEL: RP-6140
[X] HOT, [] NEUTRAL, 120VAC

CLASS B

ITS, MENLO PARK, CA, USA
EMISSION LEVEL [dBuV]

29 May 1998 17:54:24

100

80

60

40

20

.45

1

10

30

FREQUENCY [MHz]

FCC, Pt 15 - AC LINE CONDUCTED
GENERAL RESEARCH OF ELECTRONICS
PORTABLE SCANNING RECEIVER
MODEL: RP-6140
[] HOT, [X] NEUTRAL, 120VAC

312, MEMLO PARK, CA, USA 20 MB, 1250 171.540"

7. FID CFF 47, 21.15

7.1 FID, F2 15 - AC LINE CONDUCTED

GENERAL RESEARCH OF ELECTRONICS

PORTABLE SCANNING ANALYZER

MODEL: RF-6140

1.1 H3, 1.2 NEUTRAL, 120VAC

PEAKS FOUND ABOVE 70 dBV

PEAK# FREQ MHz AMPL DBV

1 1.5612 33.8

2 1.6190 33.5

3 1.6201 33.5

4 1.6507 33.2

5 1.6802 33.4

6 1.7410 33.1

7 1.8018 33.7

8 4.9338 33.7

9 14.94 33.3

312, MEMLO PARK, CA, USA 20 MB, 1250 171.540"

7. FID CFF 47, 21.15

7.1 FID, F2 15 - AC LINE CONDUCTED

GENERAL RESEARCH OF ELECTRONICS

PORTABLE SCANNING ANALYZER

MODEL: RF-6140

1.1 H3, 1.2 NEUTRAL, 120VAC

PEAKS FOUND ABOVE 30 dBV

PEAK# FREQ MHz AMPL DBV

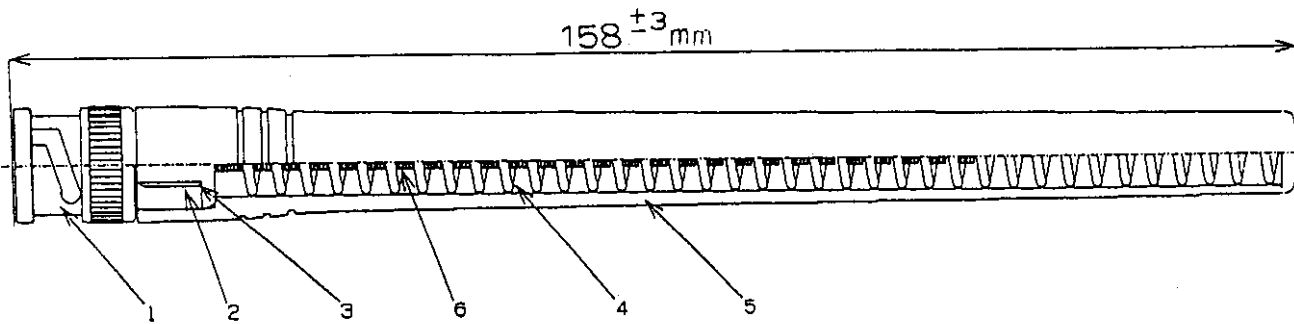
1 1.5337 33.0

2 1.7320 33.5

3 1.221 33.0

4 1.564 33.0

5 3.789 33.0



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

DATE	SYM	REVISION	BY	APPROV	NUMBER	TITLE	QUANT	MATERIAL	REMARK
SCALE	TREAT				TITLE RUBBER ANTENNA GENERAL RESEARCH OF ELECTRONICS INC.				
	PAINT								
DATE	DEC. 5, 1991		DESIGN	GRE	ISSUED				
DRAWING NO.		DRAWN	Z. KOGA						
GE-91 D-9447		CHECKED	K. WAKU						
		APPROV	S. HIRAI						

5.0 **Antenna Requirement**

The antenna is affixed to the EUT using a unique connector which allows for replacement of a broken antenna, EUT does use a standard antenna jack or electrical connector.

6.0 **Equipment Photographs**

Photographs of the EUT are attached.