

KTL Ottawa

Safety - EMI - Telecom - ISO Guide 25

ENGINEERING TEST REPORT

**ON:
THE SQUARE PEG COMMUNICATIONS INC.
"BASE STATION REPEATER"**

FCC ID: NRA002TER98RX

**IN ACCORDANCE WITH:
FCC PART 15, SUBPART B
RADIO RECEIVERS**

PROJECT NO.: 8R00873

TESTED FOR:

SQUARE PEG COMMUNICATIONS INC.
3701 CARLING AVENUE
BUILDING 6
OTTAWA, ONTARIO K2H 8S2

TESTED BY:

KTL OTTAWA INC.
3325 RIVER ROAD, R.R. 5
OTTAWA, ONTARIO K1V 1H2



NVLAP LAB CODE: 100351-0

SEPTEMBER 1998

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This report applies only to the items tested.

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EQUIPMENT: Base Station Repeater

FCC ID: NRA002TER98RX

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*EQUIPMENT: Base Station Repeater*FCC ID: NRA002TER98RX**Section 1. Summary of Test Results****General:****All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 15, Subpart B. Measurement procedure ANSI C63.4-1992 was used for all tests. Radiated Emissions were measured on an open area test site.

Abstract:

Name Of Test	Para. No.	Results
Antenna Conducted Emissions	15.111	Not Applicable
Radiated Emissions	15.109	Complies
Powerline Conducted Emissions	15.107	Complies

THIS REPORT APPLIES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.

Antenna Conducted Emissions were not performed because the unit has a non-detachable antenna.



NVLAP Lab Code: 100351-0

It is recommended that the margin of compliance be improved to allow for manufacturing tolerances.

TESTED BY: _____ DATE: _____
Kevin Carr, Technologist

TECHNICAL REVIEW: _____ DATE: _____
Tom Tidwell, Senior Technologist

APPROVED BY: _____ DATE: _____
W. Waterhouse, RF Engineering Lab Manager

*EQUIPMENT: Base Station Repeater*FCC ID: NRA002TER98RX**Section 2. Equipment Under Test (E.U.T.)**

Manufacturer: Square Peg Communications Inc.

Model No.: B101

Serial No.: G002

<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Class II	New Submission	Production Unit	Pre-Production Unit
Permissive Change			

Equipment Details

Frequency Range: 318 MHz (Fixed)

Number of Channels: 1

Operating Frequency(ies) of Sample: 318 MHz

Crystal Frequency(ies): 20.00 MHz

Primary Power Requirement: 9 VAC via AC to AC plug in power supply.

Bandwidth and Emission Designator: Not Applicable

Intermediate Frequency(ies): Not Applicable

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RADIO RECEIVERS
PROJECT NO.: 8R00873

EQUIPMENT: Base Station Repeater

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Description of E.U.T.

The E.U.T. is a base station receiver for the Turtle Transmitter.

Modifications Incorporated in E.U.T.

The EUT has not been modified from what is described by the brand name and unique type identification stated above.

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Theory of Operation

The base station sounds an audible alarm upon receiving a signal from the transmitter. The unit is a super regenerative receiver with a 315 MHz SAW resonator.

EQUIPMENT: Base Station Repeater

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Justification

The E.U.T. was configured for testing as per typical installation. Position and bundling of cables were investigated to establish maximum amplitude of emissions.

The following combinations were investigated to establish worst case configuration:

- (1) Normal operating orientation.

Exercise Program

The E.U.T. exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to typical use.

Exercise mode:

- (1) Normal operating configuration.

EQUIPMENT: Base Station Repeater

FCC ID: NRA002TER98RX

Section 3. Equipment Configuration

Equipment Configuration List:

Item	Description	Model No.	Serial.	Rev.
(A)	Base Station Receiver	B101	G002	
(B)	AC to AC Adaptor	CH-93001	N/A	

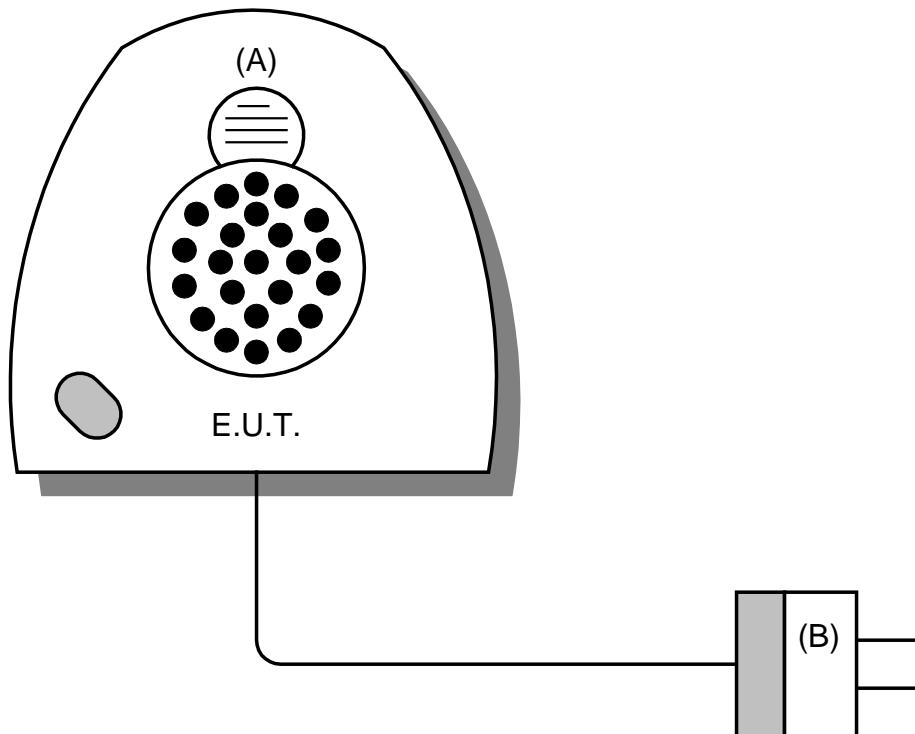
Inter-connection Cables:

Item	Description	Length (m)
(1)	Power Cord	3.0

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Configuration of the Equipment Under Test (E.U.T.)



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Section 4. Receiver Antenna Conducted Emissions

NAME OF TEST: Receiver Antenna Conducted Emissions	PARA. NO.: 15.111
TESTED BY:	DATE:

Test Conditions: Test Voltage: _____ VAC
Temperature: _____ °C
Humidity: _____ %

Test Results: Complies/Does Not Comply. See attached graphs and table.

Measurement Data: See attached graphs and table.

NOT APPLICABLE

*EQUIPMENT: Base Station Repeater*FCC ID: NRA002TER98RX**Section 5(A). Radiated Emissions**

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.109(a)
TESTED BY: Kevin Carr	DATE: September 8, 1998

Test Conditions: Test Voltage: 9 VAC via 120 VAC adaptor
Temperature: 23 °C
Humidity: 40 %

Minimum Standard:

Frequency(MHz)	Field Strength (dB μ V/m @ 3m)
30 - 88	40.0
88 - 216	43.5
216 - 960	46.0
Above 960	54.0

Test Results: Complies. The worst-case emission level is 51.7 dB μ V/m @ 3m at 1260 MHz. This is 2.3 dB below the specification limit.

Measurement Data: See attached table.

For super-regenerative receivers the receiver is cohersed using a signal generator and dipole antenna.

Handheld equipment and equipment not designed to be mounted in any fixed orientation, the E.U.T. is tested in three orthogonal axis to obtain worst case results.

*EQUIPMENT: Base Station Repeater*FCC ID: NRA002TER98RX**Test Data - Radiated Emissions**

Distance: 3m		A tower		Receiver: ESVP		RBW: 120 kHz		Detector: Q-Peak			
Freq. (MHz)	Ant. *	Pol. (V/H)	Ant. HGT. (m)	Table (deg.)	RCVD Signal (dB μ V/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Dist. Corr. (dB)	Field Strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
315.0	L/P	V			8.3	18.9			27.2	46.0	18.8
315.0	L/P	H			17.6	18.9			36.5	46.0	9.5
630.0	L/P	V			9.5	25.7			35.2	46.0	10.8
630.0	L/P	H			-2.9	25.7			22.8	46.0	23.2
945.0	L/P	V			2.0	31.0			33.0	46.0	13.0
945.0	L/P	H			-2.8	31.0			28.2	46.0	17.8
1260.0	Hrn2	V			21.4	29.0			50.4	54.0	3.6
1260.0	Hrn2	H			22.7	29.0			51.7	54.0	2.3
1575.0	Hrn2	V			47.2	29.4	-42.2		34.4	54.0	19.6
1575.0	Hrn2	H			48.8	29.4	-42.2		36.0	54.0	18.0
1890.0	Hrn2	V			49.5	31.5	-45.9		35.1	54.0	18.9
1890.0	Hrn2	H			50.6	31.5	-45.9		36.2	54.0	17.8
2205.0	Hrn2	V			48.5	32.3	-46.6		34.2	54.0	19.8
2205.0	Hrn2	H			49.0	32.3	-46.6		34.7	54.0	19.3
2520.0	Hrn2	V			49.7	33.2	-46.4		36.5	54.0	17.5
2520.0	Hrn2	H			49.0	33.2	-46.4		35.8	54.0	18.2
2835.0	Hrn2	V			49.6	34.6	-45.8		38.4	54.0	15.6
2835.0	Hrn2	H			50.2	34.6	-45.8		39.0	54.0	15.0
3150.0	Hrn2	V			48.9	37.6	-45.5		41.0	54.0	13.0
3150.0	Hrn2	H			47.8	37.6	-45.5		39.9	54.0	14.1

Notes:

B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole

* Re-measured using dipole antenna. () Denotes failing emission level.

(1) 120 kHz, Q-Peak, (2) 10 kHz, Peak, (3) 100 kHz RGW, 300 kHz VBW, Peak,

(4) 300 kHz RBW, 1 MHz VBW, Peak, (5) 1 MHz RBW, 3 MHz VBW, Peak, (6) 1 MHz RBW, 10 Hz VBW, Peak

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Radiated Photographs (Worst Case Configuration)

FRONT VIEW

REAR VIEW

*EQUIPMENT: Base Station Repeater*FCC ID: NRA002TER98RX**Section 5(B). Radiated Emissions**

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.109(b)
TESTED BY:	DATE:

Test Conditions: Test Voltage: _____ VAC
Temperature: _____ °C
Humidity: _____ %

Minimum Standard: Equipment manufactured or imported before June 23, 1999 is permitted the following limits

Frequency (MHz)	Field Strength (dB μ V/m @ 3m)
30-50	320 (50.1 dB μ V/m)
50-130	500 (54.0 dB μ V/m)
130-174	500 - 1500 dB μ V/m)
174-260	1500 (63.5 dB μ V/m)
260-470	1500 - 5000 (linear interpolation)
Above 470	5000 (74.0 dB μ V/m)

Test Results: Complies / Does Not Comply. The worst-case emission level is _____ dB μ V/m @ 3m at _____ MHz. This is _____ dB above/below the specification limit.

Measurement Data: See attached table.

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FCC PART 15, SUBPART B

RADIO RECEIVERS

PROJECT NO.: 8R00873

EQUIPMENT: Base Station Repeater

FCC ID: NRA002TER98RX

Test Data - Radiated Emissions

Notes:

B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole

* Re-measured using dipole antenna. () Denotes failing emission level.

(1) 120 kHz, Q-Peak, (2) 10 kHz, Peak, (3) 100 kHz RGW, 300 kHz VBW, Peak,

(4) 200 kHz, Q Peak, (2) 1 kHz, Peak, (3) 100 kHz, R, 300 kHz, B, Peak, (4) 300 kHz RBW, 1 MHz VBW, Peak, (5) 1 MHz RBW, 3 MHz VBW, Peak, (6) 1 MHz RBW, 10 Hz VBW, Peak

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RADIO RECEIVERS
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EQUIPMENT: Base Station Repeater

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Radiated Photographs (Worst Case Configuration)

FRONT VIEW

NOT APPLICABLE

REAR VIEW

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RADIO RECEIVERS
PROJECT NO.: 8R00873

EQUIPMENT: Base Station Repeater

FCC ID: NRA002TER98RX

Section 6. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.107
TESTED BY: Kevin Carr	DATE: September 8, 1998

Test Conditions: Test Voltage: 9 VAC via 120 VAC adaptor
Temperature: 23 °C
Humidity: 40%

Minimum Standard: The RF energy feed back into the power lines shall not exceed 48 dB μ V on any frequency between 0.45 MHz and 30 MHz inclusive.

Test Results: Complies. See attached graphs.

Measurement Data: See attached graphs.

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FCC PART 15, SUBPART B
RADIO RECEIVERS
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EQUIPMENT: Base Station Repeater

FCC ID: NRA002TER98RX

Powerline Conducted Photographs (Worst Case Configuration)

FRONT VIEW

REAR VIEW

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RADIO RECEIVERS
PROJECT NO.: 8R00873

EQUIPMENT: Base Station Repeater

FCC ID: NRA002TER98RX

INSERT GRAPHS

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RADIO RECEIVERS
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*EQUIPMENT: Base Station Repeater*FCC ID: NRA002TER98RX

Section 7. Sample Calculations

Conducted Emissions:

If the Quasi-Peak to Average ratio is greater than 6 dB, then the emission is classified as broadband and its Quasi-Peak level is reduced by 13 dB for comparison to the limit.

i.e. Quasi-Peak level = 40 dB μ V
Average level = 34 dB μ V
Corrected level = $40 - 13 = 27$ dB μ V

Radiated Emissions

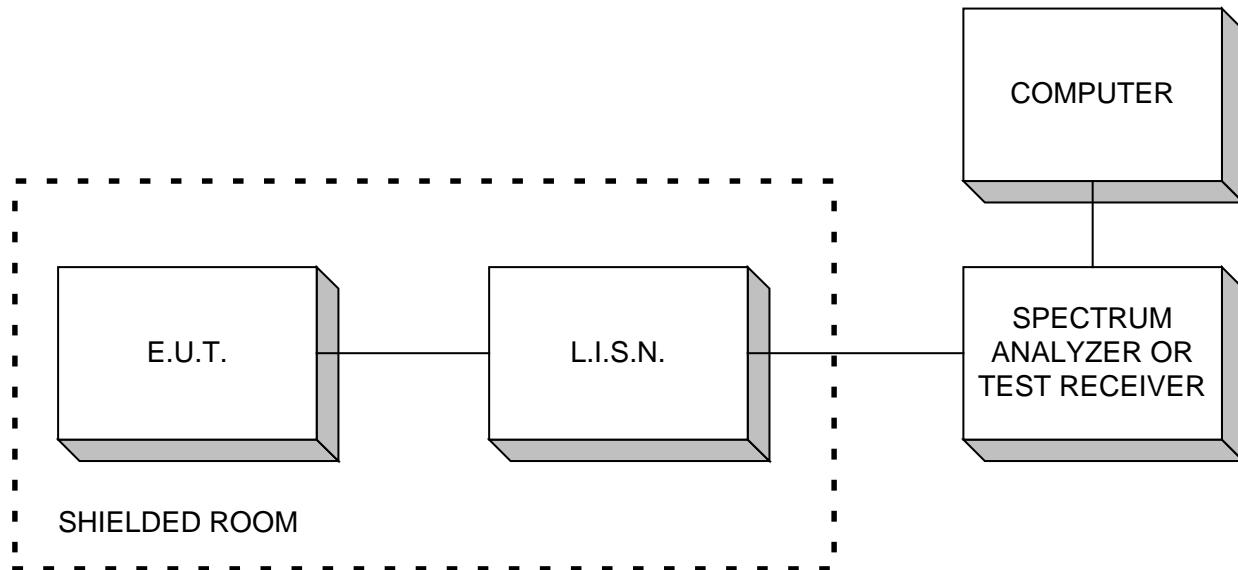
Emissions are measured at a distance of 3 meters and corrected for antenna factor and cable loss.

i.e. Received Signal = 25 dB μ V @ 100 MHz
Antenna Factor & Cable Loss = 9.8 dB
Field Intensity = $25 + 9.8 = 34.8$ dB μ V/m @ 3 m

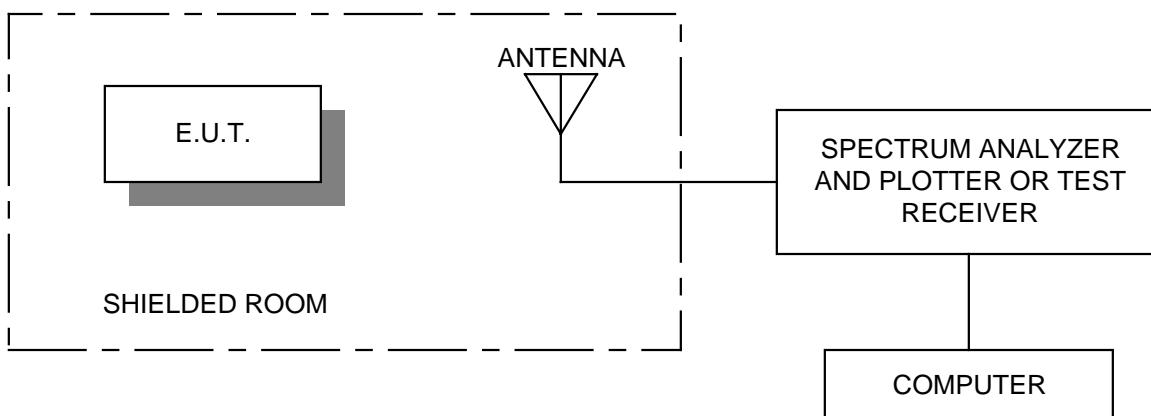
EQUIPMENT: Base Station Repeater
FCC ID: NRA002TER98RX

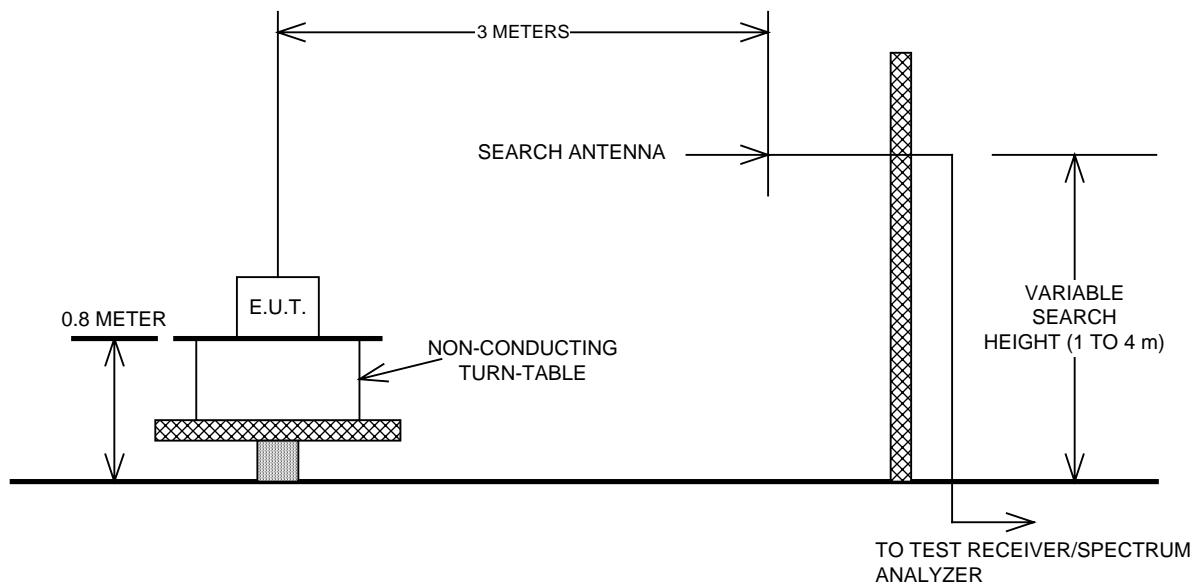
Section 8. Block Diagrams

Conducted Emissions



Radiated Prescan



*EQUIPMENT: Base Station Repeater*FCC ID: NRA002TER98RX**Outdoor Test Site For Radiated Emissions**

The spectrum was searched up to the 10th harmonic of the fundamental frequency of operation.

*EQUIPMENT: Base Station Repeater*FCC ID: NRA002TER98RX

Section 9. Test Equipment List

Equipment List - Conducted Emissions - Shielded Room #1

CAL Cycle	Equipment	Manufacturer	Model #	Serial/Asset #	Last Cal.	Next Cal.
1 Year	LISN	Rohde & Schwarz	ESH2-Z5	890485/017	July 23/98	July 23/99
1 Year	Spectrum analyzer	Hewlett-Packard	8566B	2311A02238	Sept. 30/97	Sept. 30/98
1 Year	Spectrum analyzer display	Hewlett-Packard	8566B	2314A04759	Sept. 30/97	Sept. 30/98
1 Year	Quasi-peak adapter	Hewlett-Packard	85650A	2043A00302	Sept. 30/97	Sept. 30/98
	Plotter	Hewlett-Packard	7470A	2210A08836	N/A	N/A
1 Year	Transient Limiter	Hewlett-Packard	1194 7A	3107A01766	July 21/98	July 21/99

Equipment List - Radiated Emissions

CAL Cycle	Equipment	Manufacturer	Model #	Serial/Asset #	Last Cal.	Next Cal.
	Biconilog Antenna	EMCO	3143	9404-1039	NCR	NCR
1 Year	Dipole Antenna Set	EMCO	3121C	1029	Oct. 28/97	Oct. 28/98
1 Year	Receiver	Rohde & Schwarz	ESVS-30	843710/002	Oct. 21/97	Oct. 21/98
1 Year	Spectrum Analyzer	Hewlett-Packard	8566B	2311A02238	Sept. 30/97	Sept. 30/98
1 Year	Spectrum Analyzer Display	Hewlett-Packard	8566B	2314A04759	Sept. 30/97	Sept. 30/98
1 Year	Quasi-Peak Adapter	Hewlett Packard	85650A	2043A00302	Sept. 30/97	Sept. 30/98
2 Year	Horn Antenna	EMCO	3115	3132	Feb. 9/98	Feb. 9/00
1 Year	Log Periodic Antenna	EMCO	LPA-25	1141	July 27/98	July 27/99
1 Year	Low Noise Amplifier	Avantek	AWT-8035	1005	Oct. 24/97	Oct. 24/98
1 Year	Low Noise Amplifier	DBS Microwave	DWT-13035	9623	Oct. 24/97	Oct. 24/98

Note: N/A = Not Applicable

NCR = No Cal Required