

**KTL Ottawa**

*Safety - EMI - Telecom - ISO Guide 25*

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**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.

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

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*EQUIPMENT: Base Station Repeater*  
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## 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: \_\_\_\_\_  
Kevin Carr, Technologist

DATE: \_\_\_\_\_

TECHNICAL REVIEW: \_\_\_\_\_  
Tom Tidwell, Senior Technologist

DATE: \_\_\_\_\_

APPROVED BY: \_\_\_\_\_  
W. Waterhouse, RF Engineering Lab Manager

DATE: \_\_\_\_\_

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

Manufacturer: Square Peg Communications Inc.

Model No.: B101

Serial No.: G002

☐

Class II  
Permissive Change

☒

New  
Submission

☒

Production  
Unit

☐

Pre-Production  
Unit

### 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

*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.

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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.



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### **Section 3. Equipment Configuration**

#### **Equipment Configuration List:**

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

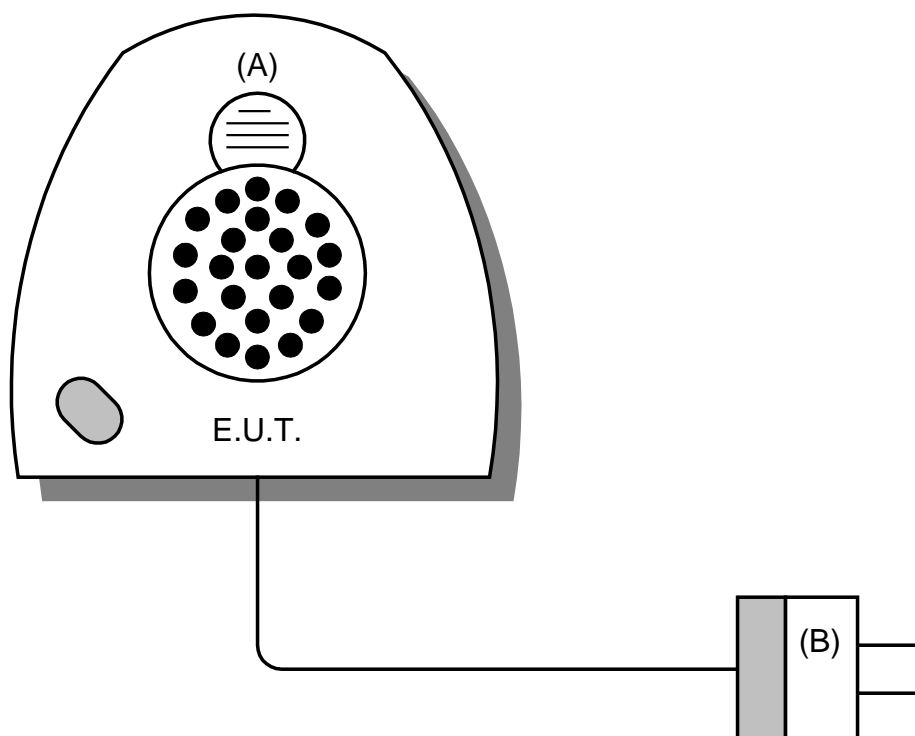
#### **Inter-connection Cables:**

<b>Item</b>	<b>Description</b>	<b>Length (m)</b>
(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*  
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**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 $\mu$ 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 $\mu$ 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 coerhered 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 (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Dist. Corr. (dB)	Field Strength (dBµV/m)	Limit (dBµV/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  
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**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 (dBµV/m @ 3m)
30-90	320 (50.1 dBµV/m)
90-130	500 (54.0 dBµV/m)
130-174	500 - 1500 dBµV/m
174-260	1500 (63.5 dBµV/m)
260-470	1500 - 5000 (linear interpolation)
Above 470	5000 (74.0 dBµV/m)

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

**Measurement Data:** See attached table.

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## Test Data - Radiated Emissions

**NOT APPLICABLE**



*EQUIPMENT: Base Station Repeater*  
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**Radiated Photographs (Worst Case Configuration)**

FRONT VIEW

**NOT APPLICABLE**

REAR VIEW

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

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**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 dBµV on any frequency between 0.45 MHz and 30 MHz inclusive.

**Test Results:** Complies. See attached graphs.

**Measurement Data:** See attached graphs.

*EQUIPMENT: Base Station Repeater*  
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**Powerline Conducted Photographs (Worst Case Configuration)**

FRONT VIEW

REAR VIEW

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FCC PART 15, SUBPART B  
RADIO RECEIVERS  
PROJECT NO.: 8R00873

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*INSERT GRAPHS*

**KTL Ottawa**

FCC PART 15, SUBPART B  
RADIO RECEIVERS  
PROJECT NO.: 8R00873

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*EQUIPMENT: Base Station Repeater*  
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## **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 $\mu$ V  
          Average level = 34 dB $\mu$ V  
          Corrected level = 40 - 13 = 27 dB $\mu$ V

### **Radiated Emissions**

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

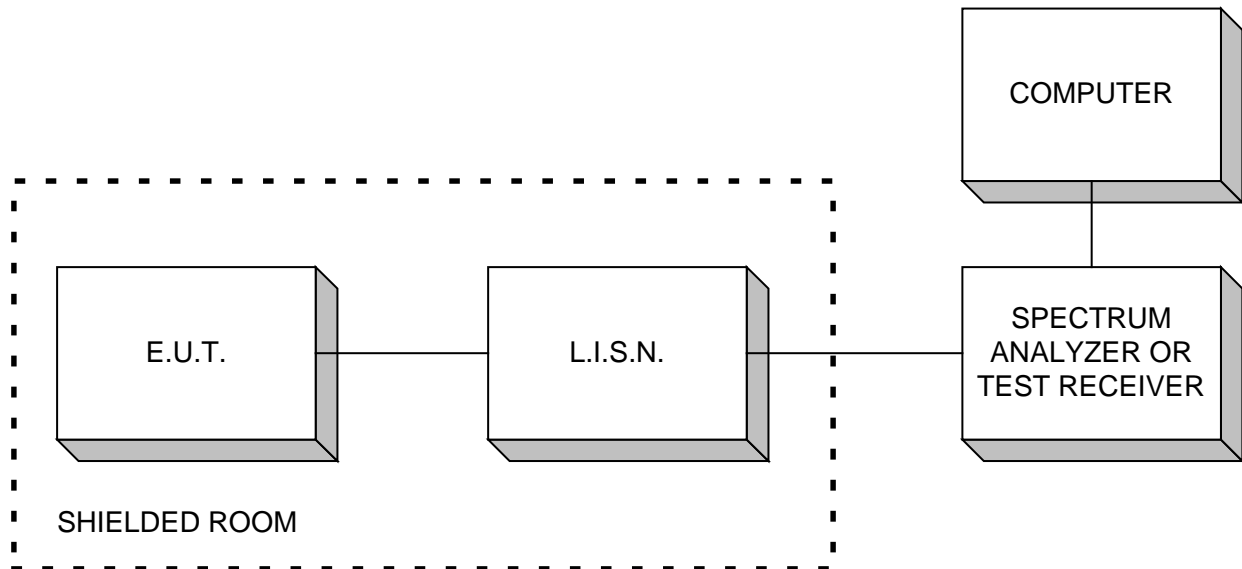
- i.e.     Received Signal = 25 dB $\mu$ V @ 100 MHz  
          Antenna Factor & Cable Loss = 9.8 dB  
          Field Intensity = 25 + 9.8 = 34.8 dB $\mu$ V/m @ 3 m

*EQUIPMENT: Base Station Repeater*  
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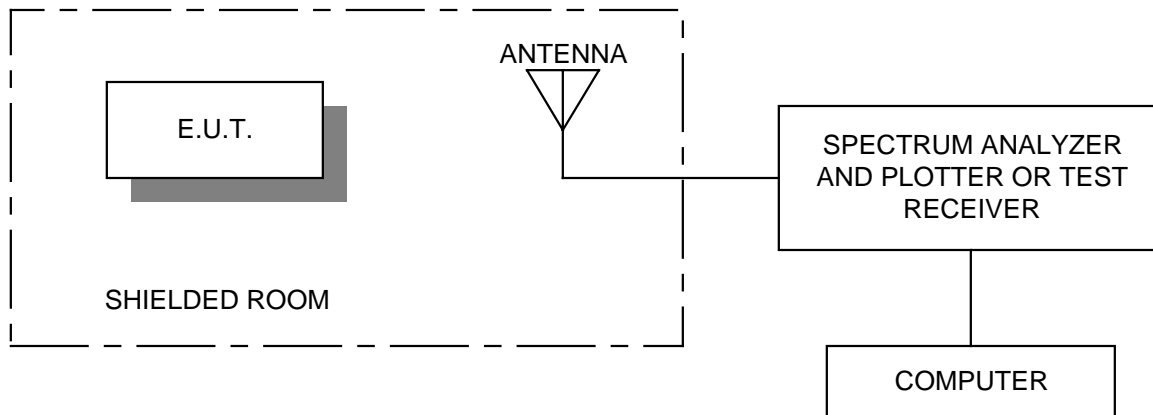
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## **Section 8. Block Diagrams**

### **Conducted Emissions**



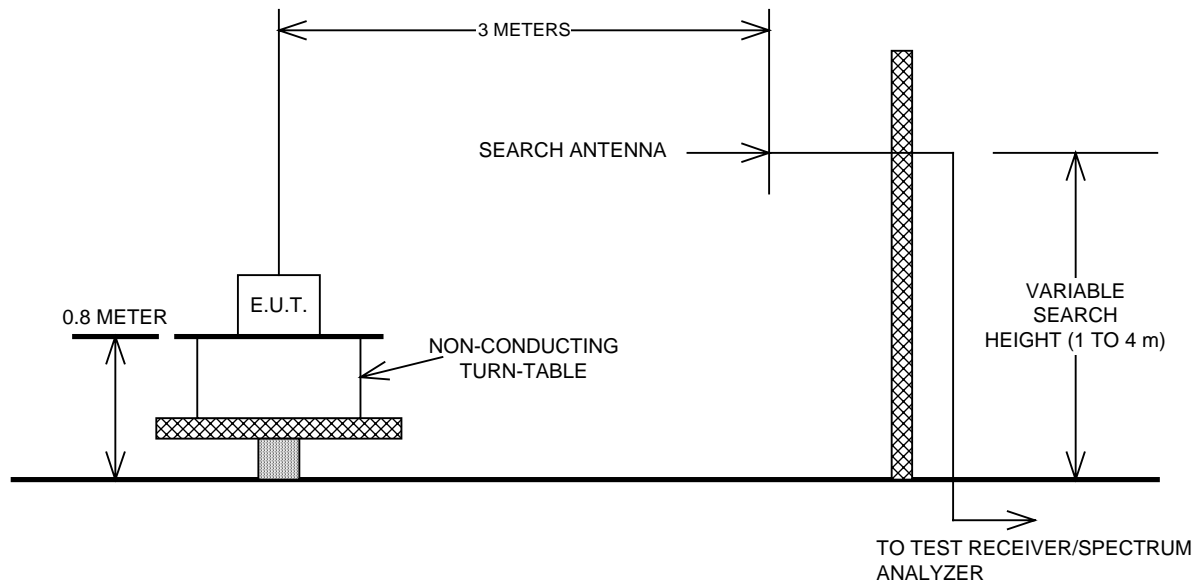
### **Radiated Prescan**



*EQUIPMENT: Base Station Repeater*  
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## 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