ELITE ELECTRONIC ENGINEERING COMPANY
1516 CENTRE CIRCLE
DOWNERS GROVE, ILLINOIS 60515-1082

ELITE PROJECT: 27474 DATES TESTED: July 1 - 13, 1999

TEST PERSONNEL: Daniel E. Crowder

TEST SPECIFICATION: Federal Communication Commission (FCC) Parts 22, 24, 90 and Industry Canada (IC) RSS-131 Issue 1

ENGINEERING TEST REPORT NO. 21851

MEASUREMENT OF RF INTERFERENCE FROM

A 900MHz CHANNELIZED PAGING REPEATER

MODEL SELECTAMP NBPCS-900-3

FOR: Andrew Corp.
Richardson, Texas

PURCHASE ORDER NO: 86860

Report By:
Daniel E. Crowder

Approved By:
Raymond J. Klouda
Registered Professional
Engineer of Illinois - 44894

ENGINEERING TEST REPORT NO. 21851

ADMINISTRATIVE DATA AND SUMMARY OF TESTS

DESCRIPTION OF TEST ITEM: 900MHz Channelized Paging Repeater

MODEL NO: Selectamp NBPCS-900-3 **PART NO:** 650937-5949-310

SERIAL NO: None Assigned

FCC ID: KUWNBPCS-9002W

MANUFACTURER: Andrew Corp.

APPLICABLE SPECIFICATIONS: FCC Parts 2, 22, 24 and 90
IC RSS-131, Issue 1

QUANTITY OF ITEMS TESTED: One (1)

TEST PERFORMED BY: ELITE ELECTRONIC ENGINEERING COMPANY
Downers Grove, Illinois 60515

DATES TESTED: July 1 through 13, 1999

PERSONNEL (OPERATORS, OBSERVERS, AND CO-ORDINATORS):
CUSTOMER: No Andrew Corp. personnel were present.
ELITE ELECTRONIC: Daniel E. Crowder

ELITE JOB NO.: 27474

ABSTRACT: The Model Selectamp NBPCS-900-3, P/N 650937-5949-310, 900 MHz Channelized Paging Repeater complies with the technical requirements in FCC Parts 22, 24 & 90 and the IC RSS-131, Issue 1. See test results and data pages for more details.

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1.0 INTRODUCTION:

1.1 DESCRIPTION OF TEST ITEM: This report present the results of the radio interference measurements were performed on a 900MHz Channelized Paging Repeater, Model SelectAmp NBPCS-900-3, P/N 650937-5949-310, (hereinafter referred to as the test item). No serial number was assigned to the test item. The tests were performed for Andrew Corp. of Richardson, Texas.

The SelectAmp NBPCS-900-3 is a bi-directional channelized paging repeater which provides selective frequency amplification of user specified frequencies in the 901-902, 929-931, and 940-941 MHz paging bands. The unit can be configured with up to three channelizers allowing the user to configure the unit to suit their needs. The channelizers are available in two versions: A 930MHz, 12.5kHz bandwidth version intended for POCSAG/FLEX and a 940MHz, 50kHz bandwidth version intended for ReFLEX. Frequency selection, gain adjustment and fault monitoring is accomplished with monitor and control circuity and firmware.

For the Forward channels, the test item has a maximum rated gain of 95dB and a rated output power of 1 watt composite.

For the Reverse channels, the test item has a maximum rated gain of 85dB and a rated output power of 500 milliwatts composite.

1.2 PURPOSE: The test series was performed to determine if the test item meets the technical requirements of the FCC Parts 22, 24, & 90 and IC RSS-131, Issue 1.

1.3 DEVIATIONS, ADDITIONS AND EXCLUSIONS: There were no

deviations, additions to, or exclusions from the test specification during this test series.

1.4 APPLICABLE DOCUMENTS: The following documents of the exact issue designated form part of this document to the extent specified herein:

- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 22, dated 1 October 1998
- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 24, dated 1 October 1998
- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 90, dated 1 October 1998
- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 2, dated 1 October 1998
- ANSI C63.4-1992, "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"
- IC RSS-131, Issue 1, "Radio Signal Enhancers for the Mobile Telephone Service"

1.5 SUBCONTRACTOR IDENTIFICATION: This series of tests was performed by the Elite Electronic Engineering Company, radio interference consultants of Downers Grove, Illinois.

2.0 TEST ITEM SETUP AND OPERATION:

2.1 SETUP: The test item was powered with 115VAC, 60Hz power. The test item was grounded only through the third wire of its input power cord.

2.2 RF OUTPUT: The test item was operated at its rated output level of 1 watt composite power for the Forward channels and 500 milliwatts composite power for the Reverse channels.

2.3 GAIN SETTINGS: The test item was operated with the gain adjusted for the maximum level.

2.4 FREQUENCY SELECTION: For the RF output, occupied bandwidth, radiated emissions measurements, and frequency stability test the frequency in the center of the band was selected. For the Forward channels, 929.5MHz, 930.5MHz, and 940.0MHz were used, and for the Reverse channel, 900.0MHz was used.

For the intermodulation and spurious emissions measurements, three inband frequencies were selected for the Forward channels, two inband frequencies were selected for the Reverse channels. For the Forward path, the frequencies were 929.5MHz, 930.5MHz, and 940.0MHz. For the Reverse path, the frequencies were 900.0MHz and 900.05MHz.

2.5 MODULATION: The test signal was modulated with a typical modulation for 900MHz digital paging services. The external modulation function of Rohde & Schwarz M/N SMHU Signal Generator was used in conjunction with a LeCroy LW420 waveform generator. The digital modulation was generated with the aid of Rohde & Schwarz IQSIM ver 4.04 software package installed on a PC. The software generates the digital modulation protocols per the industry standards.

3.0 TEST EQUIPMENT:

A list of the test equipment used can be found on Table I. All equipment was calibrated per the instruction manuals supplied by the manufacturer.

4.0 REQUIREMENTS, PROCEDURES AND RESULTS:

4.1 POWER OUTPUT AND GAIN MEASUREMENTS:

4.1.1 REQUIREMENTS:

In accordance with paragraph 22.535(f), the effective radiated power (ERP) of signal boosters must not exceed 5 watts ERP under any normal operating condition.

In accordance with paragraphs 24.132(a) & (c), Stations transmitting in the 901-902MHz band are limited to 7 watts ERP. Base stations transmitting in the 930-931MHz and 940-941MHz bands are limited to 3500 watts ERP per authorized channel.

In accordance with paragraph 90.493(c), Paging operations on the exclusive channels in the 929-930MHz band are subject to the transmitting power limits set forth in part 22 of this chapter for paging stations operating in the 930-931MHz band, instead of power limits elsewhere in this part. In accordance with paragraph 22.535(f), the effective radiated power (ERP) of signal boosters must not exceed 5 watts ERP under any normal operating condition.

IC RSS-131: In accordance with paragraph 6.1, the passband gain shall not exceed the nominal gain by more than 1 dB. The 20 dB bandwidth shall not exceed the nominal bandwidth that is stated by the manufacturer. Outside of the 20 dB bandwidth, the gain shall not exceed that at the 20 dB point.

4.1.2 PROCEDURES:

(a) The test item was setup for the Forward direction. The gain was set to its maximum.

(b) The input signal was set to 940.0MHz and unmodulated.

(c) A spectrum analyzer was connected to the output of the test item. The bandwidth was set to 100 kHz bandwidth.

(d) The amplitude of the input signal was adjusted until the test item reached rated output. The output power level was measured and recorded.

(e) With the input signal connected directly to the spectrum analyzer. The input signal level was then measured and recorded.

(f) The gain was calculated by subtracting the input level from the output level and recorded.

(g) Steps (a) through (f) were repeated with the input signal set to 929.5MHz and 930.5MHz.

(h) The input and output were reversed to measure the Reverse direction. Steps (b) through (f) were repeated with the input signal set to 900.0MHz.

(i) The input signal was switched to the tracking generator. The frequency versus gain was plotted with 1dB/div resolution for the passband response curve. The spectrum analyzer bandwidth was reduced to increase resolution. Since the amplifier is channelized, a family of gain curves was created for each band. The channel frequency was incremented in 500kHz steps starting with fisrt frequency in the band.

(j) The frequency versus gain curve was plotted with 10dB/div resolution to measure the 20 dB bandwidth of the amplifier.

(k) The frequency versus gain curve was expanded to show the out-of-band gain response. The gain was plotted for the midband frequency to at least +/- 250% of the 20 dB bandwidth of the amplifier.

4.1.3 RESULTS: The input power, output power and calculated gain are presented on data page 101. The response curve plots are included as data pages 102 through 110. The test data shows that the amplifier is capable of operating at its rated output power. All other tests were performed at this power level.

Power output complies with the FCC requirements. The maximum Forward power output is rated at 1 watt (30dBm) composite which is below the 100 watt maximum limit for mobile station. The maximum Reverse power output is rated at 500 milliwatts (27dBm) composite which is also below

the 100 watt maximum limit for mobile station. The EIRP limit does not apply to the power output alone, but the combination of the power output and the antenna. Compliance to the power output will be based on the system configuration. Therefore, the EIRP requirement cannot be applied to a repeater.

Since the amplifier is channelized, a family of gain curves were plotted. The center frequency of the channel was adjusted in 500kHz increments starting at the first channel for each diplexer. The maximum gain varies from 91.0dB to 94.8dB. The gain complies with the IC RSS-131 requirements.

4.2 OCCUPIED BANDWIDTH MEASUREMENTS:

4.2.1 REQUIREMENTS: In accordance with paragraph 22.359, For transmitters that operate in the frequency range 929MHz to 932MHz, the power of any emission shall be attenuated below the transmitter power (P), as measured in accordance with the following schedule:

(1) On any frequency removed from the center of the assigned channel by a displacement frequency of more than 5.0 kHz, but no more than 10.0 kHz: At least 83 log (f/5) dB;

(2) On any frequency removed from the center of the assigned channel by a displacement frequency of more than 10.0 kHz, but no more than 250 percent of the authorized bandwidth: At least 116 log (f/6.1) dB, or 50 + 10 log (P) dB, or 70 dB, whichever is the lesser attenuation;

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

In accordance with Paragraph 24.131, the authorized bandwidth of narrowband PCS channels will be 45kHz for 50kHz channels.

In accordance with paragraph 24.133, the power of any emission shall be attenuated below the transmitter power (P), as measured in

accordance with the following schedule:

(1) On any frequency outside the authorized bandwidth by a displacement frequency (fd in kHz) of up to and including 40kHz: at least 116 log ((fd+10)/6.1) or 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation;

(2) On any frequency outside the authorized bandwidth by a displacement frequency (fd in kHz) of more than 40kHz: at least 43 + 10 log (P) dB or 80 dB, whichever is the lesser attenuation;

In accordance with Paragraph 90.209(b)(5), the maximum authorized bandwidth shall be 20kHz for operations in the bands of 929MHz to 930MHz.

In accordance with paragraph 90.210, Mask G was selected since it represents the worse case of Mask B and G. For Mask G, the peak power of any emission shall be attenuated below the unmodulated carrier power (P) in accordance with the following schedule:

(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency of more than 5.0 kHz, but no more than 10.0 kHz: At least 83 log (f/5) dB;

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency of more than 10.0 kHz, but no more than 250 percent of the authorized bandwidth: At least 116 log (f/6.1) dB, or 50 + 10 log (P) dB, or 70 dB, whichever is the lesser attenuation;

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

4.2.2 PROCEDURES:

(a) The test item was setup to measure the Forward direction. The gain was set to its maximum level. The input signal was set to 929.5MHz. The input signal level was adjusted for the rated output.

(b) With the spectrum analyzer bandwidth set to 300 Hz and the span set to 50 kHz. The output signal was measured and plotted.

(c) The input signal was modulated. The measurement was repeated.

(d) The analyzer was connected to the output of the signal generator to measure the input signal.

(e) Steps (b) through (d) were repeated with the input signal set to 930.5MHz and 940.0MHz.

(e) Steps (b) through (d) were repeated for the test item setup in the Reverse direction. The input signal set to 900.0MHz.

4.2.3 RESULTS: The plots of the occupied bandwidth measured with the modulation of the carrier are presented on data pages 111 through 122.

The limits, shown on the plots, are referenced to the power measured from the unmodulated carrier.

As can be seen from the data, the test item output met the occupied bandwidth requirements with the typical modulated carrier. The sideband emissions measured at the test item output were similar to the sideband emissions measured from the input signals.

4.3 SPURIOUS EMISSIONS AND INTERMODULATION PRODUCTS AT ANTENNA TERMINAL:

4.3.1 REQUIREMENTS: This test determines whether the test item produces excessive spurious emissions or intermodulation products.

In accordance with FCC paragraphs 22.359, 24.133, and 90.210 and IC 6.3, 6.4 and 6.5, the spurious emissions and intermodulation products shall be attenuated below the unmodulated carrier power (P) by at least 43 + 10 log(P)dB. For the Forward output power of 1 watt composite (30dBm), the spurious emissions shall be attenuated by a minimum of 43 dB. For the Reverse output power of 500 milliwatts composite (27dBm), the spurious emissions shall be attenuated by a minimum of 40 dB. These requirement translates to a limit of -13dBm. The peak power of the

emissions shall be measured at the antenna terminal from 30MHz up to the 10th harmonic of the fundamental frequency.

4.3.2 PROCEDURES:

In general, this test will measure spurious emissions and intermodulation products when three inband signals are introduced at the input.

(a) The test item was setup to measure in the Forward direction. The gain was set to its maximum level.

(b) Three frequencies, 929.5MHz, 930.5MHz, and 940.0MHz were combined and input to the test item. The level of each signal was adjusted so that each signal was at the composite rated output level.

(c) With the BW of the analyzer set at 1kHz, the passband signal levels were measured and plotted.

(d) The BW was increased to 100 kHz. The out-of-band signal levels were measured and plotted over the frequency range from 30MHz to 1GHz.

(e) The measurement BW was increased to 1 MHz. The emissions were measured over the frequency range from 1 to 10 GHz.

(f) With the analyzer connected to the input signal, the input to the test item was measured and plotted using the same BW used for the output measurements.

(g) Steps (b) through (f) were repeated with the input signal modulated.

(i) Steps (b) through (h) were repeated with the test item set to measure the Reverse direction. The two input frequencies used were 900.0MHz and 900.05MHz.

4.3.3 RESULTS: The plots of the intermodulation and antenna conducted output measurements are presented on data pages 123 through

158. The limit lines have been adjusted to include the cable loss factors. As can be seen from the data, the test item did not produce spurious emissions or intermodulation products in excess of the -13 dBm limit when operated at the rated output power.

4.4 FIELD STRENGTH OF SPURIOUS EMISSIONS:

4.4.1 PRELIMINARY RADIATED MEASUREMENTS:

4.4.1.1 REQUIREMENTS: Because emission levels in the open field may be masked by interference from sources other than the test item, preliminary radiated measurements are first performed in the low ambient environment of a shielded enclosure. The radiated emissions from the test item were first measured using peak detection. This data was then automatically plotted. The frequencies with significant emission levels were measured in the open field.

4.4.1.2 PROCEDURES: All preliminary tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. The walls and ceiling of the shielded chamber are lined with ferrite tiles. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4 1992 for site attenuation.

The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads.

(a) The preliminary measurements were performed with the test item operating with an input signal at 900.0MHz, with CW modulation and

maximum gain. The broadband measuring antenna was positioned at a 3 meter distance from the test item. The frequency range from 30MHz to 10GHz was investigated. The readings were taken with a peak detector function.

(b) Step (a) was repeated separately with the input signals at 929.5MHz, 930.5MHz and 940.0MHz.

(c) Steps (a) and (b) were repeated with the input signals modulated.

4.4.1.3 RESULTS: The preliminary plots are presented on data pages 159 through 174. Factors for the antenna and distance correction were added to the data before it was plotted.

This data is only presented for a reference, and is not used as official data. All significant radiated emissions were subsequently measured at an open field test site. From this data, the test mode and frequency range for the open field measurements was selected.

4.4.2 FINAL RADIATED EMISSIONS:

4.4.2.1 REQUIREMENTS: In accordance with FCC Paragraphs 22.354, 24.133, and 90.210, the spurious on any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth, the emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log(P)dB. This requirement translates to a limit of -13dBm. The emissions shall be measured from 30MHz up to the 10th harmonic of the fundamental frequency.

4.4.2.2 PROCEDURES: Final radiated emissions were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. The walls and ceiling of the shielded chamber are lined with ferrite tiles. Anechoic absorber material is

installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4 1992 for site attenuation.

(a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.

(b) The antenna output was terminated in 50 ohms.

(c) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded.

(d) Measurement BW was 100kHz below 1000 MHz and 1MHz above 1000 MHz. Peak reading were recorded. No averaging methods or corrections were applied.

(e) The equivalent power into a dipole antenna was calculated from the field intensity levels measured at 3 meters using the equation shown below:

$$Pg = E^2 4\pi d^2/120\pi = E^2 d^2/30$$

where P = power in watts
g = arithmetic gain of transmitting antenna over isotropic radiator.
E = maximum field strength in volts/meter
d = measurement distance in meter

Using a dipole gain of 1.67 or 2.2 dB and a test distance of 3 meters, this equation reduces to:

$$P(dBm) = E(dBuV/m) - 97.2dB$$

4.4.2.3 RESULTS OF OPEN FIELD RADIATED TEST: The final open field radiated levels are presented on data pages 175 through 182. The radiated emissions were measured through the 10th harmonic. Ambient level were recorded if the harmonic signals were not detected above the ambient.

4.5 FREQUENCY STABILITY:

4.5.1 REQUIREMENTS: In accordance with Paragraph 22.355, the frequency stability shall within +/- 1.5 parts per million (0.00015%) for base, fixed systems.

In accordance with Paragraph 24.135, the frequency stability of the transmitter shall be maintained within +/- 0.0001% (1 ppm).

In accordance with Paragraph 90.213, the frequency stability shall within +/- 1.5 parts per million (0.00015%) for base, fixed systems.

IC RSS-131: In accordance with Paragraph 6.8, the frequency stability shall be within +/- 1.5 parts per million (0.00015%).

4.5.2 PROCEDURES: Two separate procedures were performed for each of the two tests which are as follows:

(a) Frequency Stability vs. Temperature

(1) The test item was placed in a Thermotron temperature chamber. The test item was powered up.

(2) The measurement equipment was connected to the test item's antenna port.

(3) The ambient room temperature was recorded and a reference frequency was recorded.

(4) The temperature was varied from -30 to +50 degrees centigrade in 10 degree increments. The test item was allowed to soak from 30 to 45 minutes at each temperature. After this time period the unit was set to transmit and the frequency recorded.

(b) Frequency Stability vs. Voltage:

(1) The measurement equipment was connected to the test item's antenna port.

(2) The nominal voltage to the test item is 115 Volts 60Hz. The test item was set to transmit and a reference frequency was recorded.

(3) The input voltage was adjusted to 85 percent of the nominal voltage or 97.75 Volts 60Hz and the test item set to transmit. This frequency was recorded.

(4) The input voltage was adjusted to 115 percent of the nominal voltage or 132.25 Volts 60Hz and the test item set to transmit. This frequency was recorded.

4.5.3 RESULTS OF TESTS: The results of the frequency stability vs. temperature tests can be found on data pages 183 and 184. As can be seen from the data, the frequency stability of the test item is within +/- 1.0 ppm (worst case limit).

The results of the frequency stability vs. voltage variation tests can be seen on data page 185. As can be seen from the data, the frequency stability of the test item is within +/- 1.0 ppm (worst case limit).

5.0 CONCLUSION:

The 900MHz Channelized Paging Repeater, Model SelectAmp NBPCS-900-3, P/N 650937-5949-310, complies with the RF output, the occupied bandwidth, the intermodulation products and spurious emissions at antenna terminal, and the field strength of spurious emissions, and frequency stability requirements of the FCC Parts 2, 22, 24 and 90 and IC RSS-131, Issue 1.

6.0 CERTIFICATION:

Elite Electronic Engineering Company certifies that the information contained in this report was obtained under conditions which meet or

exceed those specified in the test specification.

The data presented in this test report pertains to the test item at the test date. Any electrical or mechanical modification made to the test item subsequent to the specified test date will serve to invalidate the data and void this certification.

This report must not be used to claim product endorsement by NVLAP or any agency of the US Government.

7.0 ENDORSEMENT DISCLAIMER:

This report must not be used to claim product endorsement by NVLAP or any agency of the US Government.

TABLE I: TEST EQUIPMENT LIST

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Cal Inv	Due Date
Equipment Type: ACCESSORIES, MISCELLANEOUS								
XYF2	POWER SPLITTER	HEWLETT PACKARD	11667A	11047	DC-18GHZ		N/A	
XYF3	POWER SPLITTER	HEWLETT PACKARD	11667A	11052	DC-18GHZ		N/A	
XZG0	ATTENUATOR/SWITCH DRIVER	HEWLETT PACKARD	11713A	3439A02724	---	01/29/99	N/A	
Equipment Type: AMPLIFIERS								
APK0	PRE-AMPLIFIER	HEWLETT PACKARD	8449B	3008A00662	1-26.5GHZ	01/29/99	12	01/29/00
Equipment Type: ANTENNAS								
NTA0	BILOG ANTENNA	CHASE EMC LTD.	BILOG CBL611	2057	.03-2GHZ	04/10/99	12	04/10/00
NWF1	DOUBLE RIDGED WAVEGUIDE	EMCO	3105	2041	1-12.4GHGZ	08/26/98	12	08/26/99
Equipment Type: ATTENUATORS								
T1E1	10DB, 25W ATTENUATOR	WEINSCHEL	46-10-43	AU1883	DC-18GHZ	02/10/99	12	02/10/00
T2D1	20DB, 25W ATTENUATOR	WEINSCHEL	46-20-43	AV5814	DC-18GHZ	03/09/99	12	03/09/00
T2D8	20DB, 25W ATTENUATOR	WEINSCHEL	46-20-43	AY9247	DC-18GHZ	02/10/99	12	02/10/00
Equipment Type: CONTROLLERS								
CDG3	COMPUTER	HEWLETT PACKARD	D7949T	US91605918	---		N/A	
CTI0	TEMP. RECORDER/CONTR.	HONEYWELL	Y455X21-B	862268144100	-68 TO 177C	03/01/99	6	09/01/99
Equipment Type: METERS								
MFC0	MICROWAVE FREQ. COUNTER	HEWLETT PACKARD	5343A	2133A00591	10HZ-26GHZ	06/15/99	12	06/15/00
MPA0	POWER METER	HEWLETT PACKARD	432A	1141A08696	0.01-40GHZ	12/31/98	12	07/23/99
MPAA	THERMISTOR MOUNT	HEWLETT PACKARD	8478B	1144A08340	0.01-18GHZ	07/21/98	12	07/21/99
Equipment Type: PRINTERS AND PLOTTERS								
HRG2	LASERJET 2100XI	HEWLETT PACKARD	C4170A	USCD047796	---		N/A	
Equipment Type: RECEIVERS								
RAC1	SPECTRUM ANALYZER	HEWLETT PACKARD	85660B	3407A08369	100HZ-22GHZ	01/26/99	12	01/26/00
RACB	RF PRESELECTOR	HEWLETT PACKARD	85685A	3506A01491	20HZ-2GHZ	01/28/99	12	01/28/00
RAF3	QUASIPEAK ADAPTER	HEWLETT PACKARD	85650A	3303A01775	0.01-1000MHZ	01/28/99	12	01/28/00
Equipment Type: SIGNAL GENERATORS								
GBN2	SIGNAL GENERATOR	ROHDE & SCHWARZ	SMY 02	DE14046	9KHZ-2.080GHZ	04/23/99	12	04/23/00
GBN3	SIGNAL GENERATOR	ROHDE & SCHWARZ	SMY 02	DE12441	9KHZ-2.080GHZ	04/28/99	12	04/28/00
GBQ0	SIGNAL GENERATOR WITH I/Q	ROHDE & SCHWARZ	SMHU-58	843558/039	1KHZ-4320MHZ	07/02/99	12	07/02/00
GWG0	ARBITRARY WAVEFORM GENERAT	LECROY	LW420A	U3093	---		NOTE 1	

Cal. Interval: Listed in Months I/O: Initial Only N/A: Not Applicable

Note 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.