TABLE OF CONTENTS LIST

APPLICANT: KP ELECTRONICS, INC.

FCC ID: H78KPIATSU100

TEST REPORT CONTENTS:

PAGE 1.....COVER SHEET - GENERAL INFORMATION & TECHNICAL DESCR.
PAGE 2.....TECHNICAL DESCRIPTION CONTINUED
PAGE 3.....RF POWER OUTPUT AND MODULATION CHARACTERISTICS
PAGE 4-5....OCCUPIED BANDWIDTH
PAGE 6.....SPURIOUS EMISSIONS AT ANTENNA TERMINALS
PAGE 7.....FIELD STRENGTH OF SPURIOUS EMISSIONS
PAGE 8.....METHOD OF MEASURING RADIATED SPURIOUS EMISSIONS
PAGE 9.....FREQUENCY STABILITY
PAGE 10-11...TRANSIENT FREQUENCY STABILITY
PAGE 12.....CERTIFICATION OF TECHNICAL DATA
PAGE 13.....LIST OF TEST EQUIPMENT

EXHIBITS CONTENTS:

EXHIBIT 1.....POWER OF ATTORNEY LETTER
EXHIBIT 2.....FCC ID LABEL SAMPLE AND SKETCH OF LOCATION
EXHIBIT 3A-3B.....USER'S MANUAL
EXHIBIT 4.....SCHEMATIC - TX MODULE ENCODER
EXHIBIT 5.....SCHEMATIC - TX MODULE SYNTHESIZER
EXHIBIT 6.....SCHEMATIC - TX MODULE RF TRANSMITTER
EXHIBIT 7.....SCHEMATIC - TX MODULE POWER SUPPLY
EXHIBIT 8.....TX MODULE BLOCK DIAGRAM
EXHIBIT 9A-9E.....CIRCUIT DESCRIPTION
EXHIBIT 10A-10D...CALIBRATION PROCEDURE
EXHIBIT 11A-11G...PARTS LIST
EXHIBIT 12.....TOP VIEW EXTERNAL PHOTOGRAPH
EXHIBIT 13.....BOTTOM VIEW EXTERNAL PHOTOGRAPH
EXHIBIT 14-15.....COMPONENT SIDE INTERNAL PHOTOGRAPHS
EXHIBIT 16.....COPPER SIDE INTERNAL PHOTOGRAPH
EXHIBIT 17.....AUDIO FREQUENCY RESPONSE GRAPH
EXHIBIT 18.....AUDIO INPUT VS DEVIATION GRAPH
EXHIBIT 19.....AUDIO LOW PASS FILTER GRAPH
EXHIBIT 20.....OCCUPIED BANDWIDTH PLOT - CW
EXHIBIT 21.....OCCUPIED BANDWIDTH PLOT - 2500 Hz
EXHIBIT 22A-22B...TRANSIENT FREQUENCY RESPONSE PLOTS

GENERAL INFORMATION REQUIRED
FOR TYPE ACCEPTANCE

2.983 (a,b,c) KP ELECTRONICS, INC. will sell the FCCID: H78KPIATSU100 UHF transmitter in quantity, for use under FCC RULES PART 90.

2.983 (d) TECHNICAL DESCRIPTION

(1) ALLOWED AUTHORIZED BANDWIDTH = 11.25KHz. 90.209(b)(5)

Bn = 2M + 2DK
M = 4800/2 = 2400
D = 2.0KHz (Peak Deviation)
K = 1
Bn = 2(2.4K) + 2(2.0K)(1) = 4.8K + 4.0K = 8.8K

Type of Emission: 8K8F2D

M = 3000 = 3000
D = 2.5KHz (Peak Deviation)
K = 1
Bn = 2(3.0K) + 2(2.5K)(1) = 6.0K + 5.0K = 11.0K

Type of Emission: 11K0F3E

(2) Frequency Range: 421-512 MHz

(3) Power Range and Controls:This UUT cannot be switched.

(4) Maximum Output Power Rating: 3.1Watts into a 50 ohm resistive load.

(5) DC Voltages and Current into Final Amplifier:

POWER INPUT	FINAL AMPLIFIER ONLY
POWER OUT	3.1
Vce Volts	13.6
Ice Amps	0.65
Pin Watts	8.84

2.983 (d)(6) Function of each electron tube or semiconductor device or other active circuit device:

See attached list as EXHIBIT 11

2.983(d) (7) Complete Circuit Diagrams: The circuit diagram is included as EXHIBIT 4-7. The block diagram is included as EXHIBIT 8.

(8) Instruction book. The instruction manual is included as EXHIBIT 3A-3B.

(9) Tune-up procedure. The tune-up procedure is given in EXHIBIT 10A-10D.

(10) Description of all circuitry and devices provided for determining and stabilizing frequency is included in the circuit description in EXHIBIT 9A-9E.

2.983 (11) Description of any circuits or devices employed for suppression of spurious radiation, for limiting modulation, and for limiting power.

In addition to the interstage filtering the multisection low pass filter is described in paragraph 6.3.5 of the instruction manuel.

Limiting Modulaton:
The transmitter audio limiting circuitry is contained in the loop filter U501, U502, & U503.

Limiting Power: The power is preset at the factory for either high or low. There is no provision for limiting power.

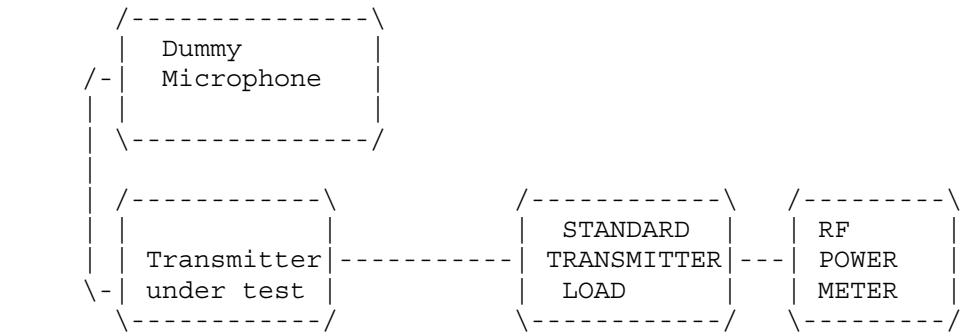
(12) Digital modulation. This unit does NOT use digital modulation.

2.983(e) The data required by 2.985 through 2.997 is submitted below.

2.985(a) RF power output. The test procedure used was TIA/EIA-603 S2.2.1. RF power is measured by connecting a 50 ohm, resistive wattmeter to the RF output connector. With a nominal battery voltage of 7.2V, and the transmitter properly adjusted the RF output measures:

INPUT POWER: (13.6V)(0.55A) = 7.48Watts
OUTPUT POWER: 3.1 Watts Efficiency: 41%

2.985(a) RF power output. The test procedure used was TIA/EIA-603 S2.2.1.

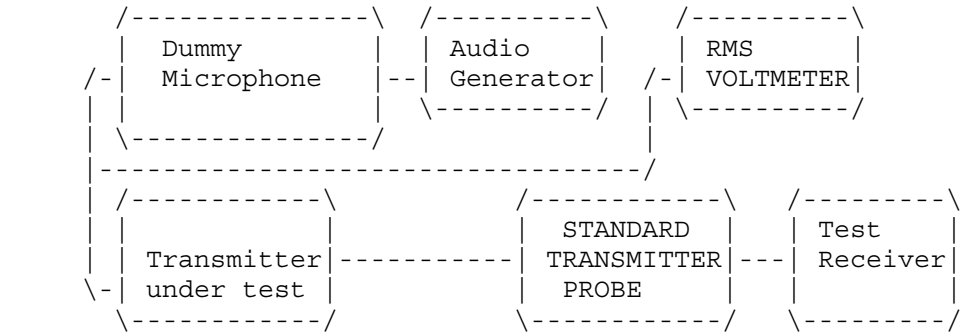


2.987(a) Modulation characteristics:

AUDIO FREQUENCY RESPONSE The audio frequency response was measured in accordance with TIA/EIA Specification TIA/EIA-603 S2.2.6.2.1. The audio frequency response curve is shown in EXHIBIT 20.

2.987(b) AUDIO LOW PASS FILTER Transmitters utilizing analog emissions that are equipped with an audio low-pass filter must meet the requirements in S90.210. See EXHIBIT 22.

2.987(b) AUDIO INPUT VERSUS MODULATION The audio frequency input versus deviation was measured in accordance with TIA/EIA Specification 603 S2.2.6.2.1. with the following exceptions; starting with 1000Hz the input was increased well beyond the deviation changing. This measurement was repeated for the band limits and any frequency deemed appropriate.



1.The test receiver audio bandwidth was <50Hz to >20,000Hz.

A plot of the audio input versus deviation is shown in EXHIBIT 21.

2.989(c) Occupied bandwidth:

90.210 (b)

(1) On any frequency removed from the assigned frequency by more than 50% of the authorized bandwidth: At least 25 dB.
(2) On any frequency removed from the assigned frequency by more than 100%, but not more than 250% of the authorized bandwidth: At least 35dB.
(3) On any frequency removed from the assigned frequency by more than 250% of the authorized bandwidth: At least 43 + 10 log(P) dB.

90.210 (d) 2

Requirement For 12.5KHz channel bandwidth equipment, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows;
(1) On any frequency from the center of the authorized bandwidth f0: Zero dB.
(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency(fdd kHz) of more than 5.625kHz but no more than 12.5kHz: At least 7.27(fd-2.88kHz)dB
(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency(fdd kHz) of more than 12.5kHz: At least 50 + 10 log(P) dB or 70dB, whichever is the lesser attenuation.

See plots in Exhibits 23-24.

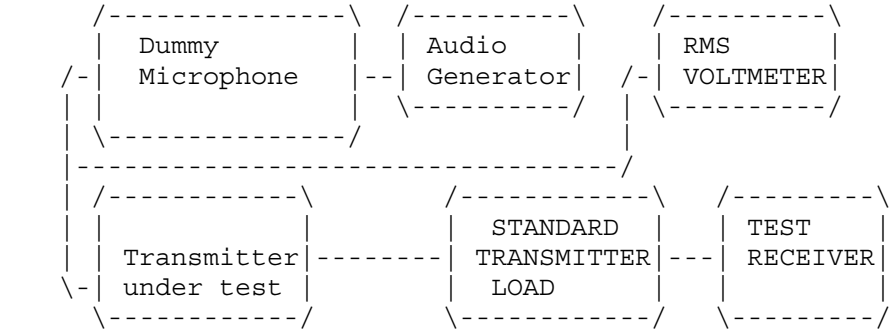
2.989(c) Occupied bandwidth: Using TIA/EIA 2.2.11 sideband Spectrum TIA/EIA-603 S2.2.11 was used to measure the occupied bandwidth. Plots were made of the highest frequency and at 2500Hz. Data in the plots show that all sidebands beyond the authorized bandwidth are less than 0.5% of the unmodulated carrier. The plots show the transmitter modulation with;

For 12.5KHz spacing no modulation, 4800Bits per Second

At each of the tone input was adjusted for 50% modulation plus 16 dB. The spectrum analyzer was set with the unmodulated carrier at the top of the screen. The test procedure diagram and occupied bandwidth plots follow.

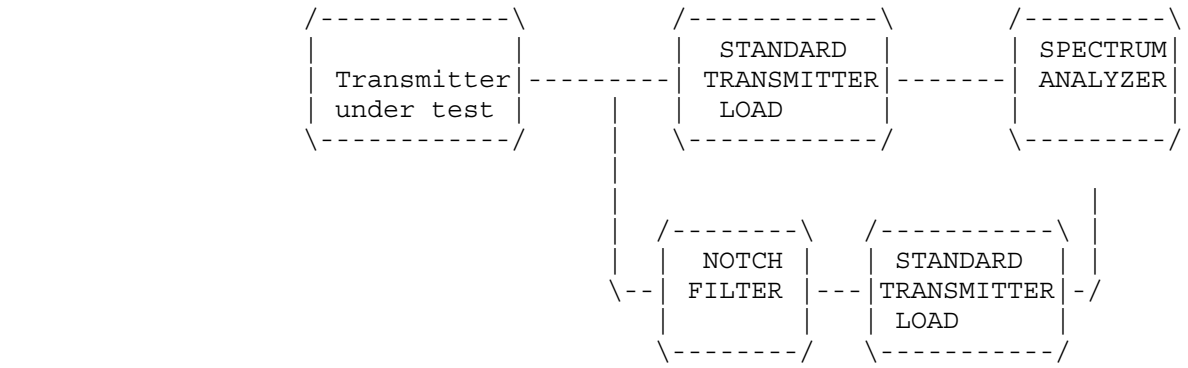
Test procedure diagram

OCCUPIED BANDWIDTH MEASUREMENT



2.991 Spurious emissions at antenna terminals(conducted):

The following data shows the level of conducted spurious responses at the antenna terminal. The test procedure used was TIA/EIA 603 S2.2.13 with the exception that the emissions were recorded in dBc. The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental.



Method of Measuring Conducted Spurious Emissions

NAME OF TEST: SPURIOUS EMISSIONS AT ANTENNA TERMINALS

REQUIREMENTS: Emissions must be 43 +10log(Po) dB below the mean power output of the transmitter.

43 + 10log(3.1) = 48.0dB
At least 70dBc

EMISSION FREQUENCY ___MHz___	dB BELOW CARRIER _____
465.00	00.0
930.00	-68.3
1395.00	-70.9
1860.00	-72.6
2325.00	-81.7
2790.00	-80.1
3255.00	-91.5
4650.00	-92.8

2.993(a)(b) Field strength of spurious emissions:

The tabulated Data shows the results of the radiated field strength emissions test. The spectrum was scanned from 30 to 4.7 GHz. This test was conducted per ANSI C63.4-1992 with the exception of briefly connecting the transmitter to a half wave dipole for the purpose of establishing a reference.

NAME OF TEST: RADIATED SPURIOUS EMISSIONS

REQUIREMENTS: Emissions must be 43 +10log(Po) dB below the mean power output of the transmitter.

50 + 10log(3.1) = 48.0 dB or
70dBc, whichever is the lessor.
NOTE: FOR THE MARGIN CALCULATION BELOW 70dB WAS USED.

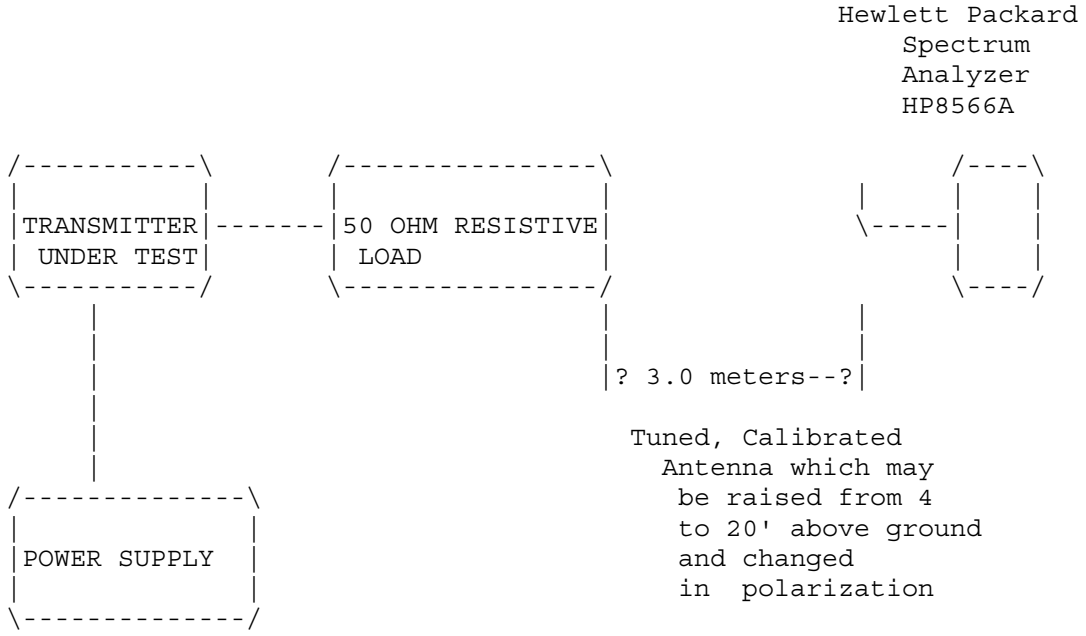
TEST DATA:

EMISSION FREQUENCY MHz	METER READING @ 3m dBuV	COAX LOSS dB	ACF dB	FIELD STRENGTH dBuV/m	ATT. LEVEL dB	MARGIN dB	ANT.
465.00	111.20	1.60	18.49	131.29	0.00	0.00	H
930.00	33.20	2.90	24.14	60.24	71.05	1.05	H
1395.00	33.10	1.00	25.58	59.68	71.61	1.61	H
1860.00	22.10	1.01	27.44	50.55	80.75	10.75	H
2325.00	21.60	1.08	28.81	51.49	79.80	9.80	H
2790.00	20.40	1.15	29.98	51.52	79.77	9.77	H
3255.00	18.10	1.22	31.14	50.46	80.84	10.84	H
4650.00	14.60	1.43	33.73	49.76	81.54	11.54	H

2.993(a)(b) CONTINUED: Field strength of spurious emissions:

METHOD OF MEASUREMENT: The procedure used was ANSI STANDARD C63.4-1992 with the following exception: the unit was operated into a dipole antenna with the antenna at a height of 1.5 meters in order to establish a reference, then connected to a dummy load. The spectrum was scanned from 30MHz to at least the tenth harmonic of the fundamental using a HP model 8566B spectrum analyzer, an Eaton model 94455-1 Biconical Antenna, a ElectroMetrics antennas models TDA, TDS-25-1, TDS-25-2, RGA-180. Measurements were made at the open field test site of TIMCO ENGINEERING INC. located at 6051 N.W. 19th LANE, GAINESVILLE, FL 32605.

Method of Measuring Radiated Spurious Emissions



Equipment placed 4' above ground
on a rotatable platform.

2.995(a)(b)(d) Frequency stability:
90.213

Temperature and voltage tests were performed to verify that the frequency remains within the .00025%, 2.5 ppm specification limit. The test was conducted as follows: The transmitter was placed in the temperature chamber at 25 degrees C and allowed to stabilize for one hour. The transmitter was keyed ON for one minute during which four frequency readings were recorded at 15 second intervals. The worse case number was taken for temperature plotting. The assigned channel frequency was considered to be the reference frequency. The temperature was then reduced to -30 degrees C after which the transmitter was again allowed to stabilize for one hour. The transmitter was keyed ON for one minute, and again frequency readings were noted at 15 second intervals. The worst case number was recorded for temperature plotting. This procedure was repeated in 10 degree increments up to + 50 degrees C.

Readings were also taken at plus & minus 15% of the supply voltage of 13.6VDC.

MEASUREMENT DATA:

Assigned Frequency (Ref. Frequency): 465.000 000MHz

TEMPERATURE_C	FREQUENCY_MHz	PPM
REFERENCE_____	465.000 000	00.0
-30_____	464.999 880	-0.25
-20_____	465.000 170	+0.37
-10_____	465.000 280	+0.60
0_____	465.000 360	+0.77
+10_____	465.000 290	+0.62
+20_____	465.000 080	0.17
+30_____	464.999 830	-0.37
+40_____	464.999 740	-0.56
+50_____	464.999 620	-0.81
-15% Supply Voltage 11.56VDC	464.999 850	0.32
+15% Supply Voltage 15.64VDC	465.000 040	0.10

RESULTS OF MEASUREMENTS: The maximum frequency variation over the emperature range was +0.77 to -0.81ppm. The maximum frequency variation over the voltage range was -0.32 ppm.

2.995(a)(b)(d) Frequency stability:

90.214 Transient Frequency Behavior

REQUIREMENTS:In the 450-500MHz frequency band, transient frequencies must be within the maximum frequency difference limits during the time interval indicated below for 25kHz Channels:

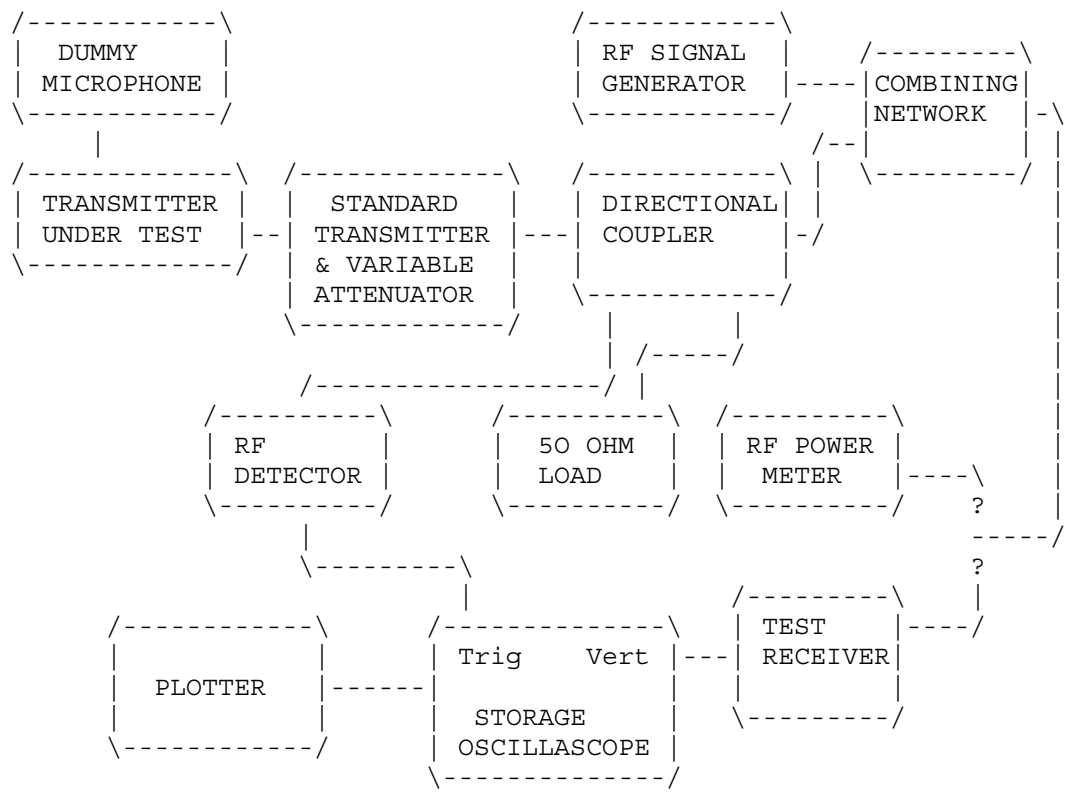
Time Interval	Maximum Frequency	Portable Radios 450-500Mhz
t1	+25kHz	10.0ms
t2	+12.5kHz	25.0ms
t3	+25.0kHz	10.0ms

TEST PROCEEDURE: TIA/EIA TS603 PARA 2.2.19, the levels were set as follows;

1. Using the varible attenuator the transmitter level was set to 40dB below the test recievers maximum input level, then the transmitter was turned off.
2. With the Transmitter off the signal generator was set 20dB below the level of the transmitter in the above step, this level will be maintained with the signal generator through-out the test.
3. Reduce the attenuation between the transmitter and the RF detector by 30dB.
4. With the levels set as above the transient frequency behavior was observed & recorded.

2.995(a)(b)(d) Frequency stability:

90.214 Transient Frequency Behavior
(Continued)



2.983(f) Photo or Drawing of Label:
See Exhibit 2.

2.983(g) Photos of Equipment:
See Exhibits 12 through 16.

2.999 Measurement Procedures for Type Acceptance:

Measurement techniques have been in accordance with TIA/EIA specifications and the FCC requirements.

2.909 Certification of Technical Data by Engineers

We, the undersigned, certify that the enclosed measurements and enclosed data are true and correct.

_____
S.S. Sanders
Engineer

LIST OF TEST EQUIPMENT

1. Frequency Counter - Hewlett Packard Model 5383A
   S/N 2338A06071

2. SPECTRUM ANALYZER - HP Model 8566B

3. RF PRE-SELECTOR - HP Model 85685A

4. QUASI-PEAK ADAPTER - HP 85650A

5. RF Power Meter - Bird Model 43 Serial 81398

6. RF Attenuators - Narda MOD 766-20

7. Audio Oscillator - Hewlett Packard Model 201C
   Serial 351-06107

8. Modulation meter - IFR MODEL AM/FM 500A.

9. Voltmeter - Hewlett Packard Model 427A
   Serial Number 731-0751

10. HP Distortion Analyzer Model No. 334A
    Serial Number 822-01817

11. Tenney Jr. Temperature Chamber

11. Eaton Biconical antenna Model 94455-1 antenna kit 20-200 MHz

12. Electro-Metric Dipole Kit 20-1000MHz, Model TDA 25

13. Electro-Metrics RGA-180 antenna kit 1- 18 GHz

14. HP broadband preamplifier model 8447D, serial no.
    1644A00978, 30 - 1000 MHz.

15. Avaatek AFT-2032 broadband preamplifier, serial no.
    8606SN01, 1 - 2 GHz.