APPENDIX
6

COSPAS SARSAT
TEST REPORT
T.001/T.007

FCC ID: B66-ACR-PLB100

Type acceptance under Part 95 Subpart K

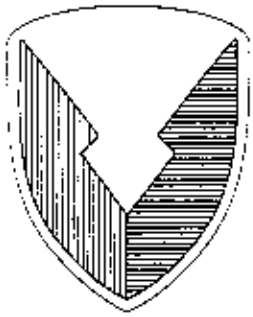
ACR ELECTRONICS INC
5757 Ravenswood Road
FT. Lauderdale Fl.
(954) 981-3333

DRAWN. Bill Cox	DATE. 4/9/2003
CHECKED.	DATE.
ENG Bill Cox	DATE. 4/9/2003
APVD	DATE.

A	18560	Cover Sheet

Cospas Sarsat PLB-100

DRAWING NO	REV
APPENDIX 6	A



TECOM Project No. 6-ES-075-SAR-002
EPG Publication No. R-99-03-002

Type Approval Certification Test Report for the

ACR Electronics, Inc. Cospas-Sarsat Beacon

March 1999

by Karen L. Anthony and Edwin H. Iriye

Communications Branch, C4I Test Division
Electronic Proving Ground, Fort Huachuca, Arizona 85613-7110

Prepared for ACR Electronics, Inc., 5757 Ravenswood Road, Fort Lauderdale, Florida 33312-6645

Other requests for this document must be referred to ACR Electronics, Inc.

US Army Test and Evaluation Command
Aberdeen Proving Ground, MD 21005-5055

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SECTION 1. EXECUTIVE DIGEST

1.1 EXECUTIVE SUMMARY

This document represents the results of a type approval certification test of a Personal Location Beacon (PLB), Model 100, manufactured by ACR Electronics, Inc. The tests were conducted at the Electronic Proving Ground's Environmental Test Facility (ETF) and Electromagnetic Interference/Electromagnetic Compatibility (EMI/EMC) Test Facility at Fort Huachuca, Arizona. The test period was from 5 January to 25 February 1999.

Electrical and Functional Tests at Constant Temperature

The following electrical and functional tests were conducted at ambient temperature [25° Celsius (C)], low temperature (-40° C), and high temperature (55° C) conditions:

a. Transmitter power output.

b. Message format and structure.

c. Modulation.

d. Transmitted frequency.

e. Spurious output.

f. Voltage Standing Wave Ratio (VSWR) check.

g. Self-test mode.

Test Results at Ambient Temperature (25° C)

The unit under test (UUT) passed all ambient temperature tests.

Test Results at Low Temperature (-40° C)

The UUT passed all low temperature tests.

Test Results at High Temperature (55° C)

The UUT passed all maximum temperature tests.

Thermal Shock Test

The following electrical and functional tests were conducted during the thermal shock test:

a. Transmitted frequency

b. Transmitted power output

c. Message format and structure

Test Results

The UUT passed all thermal shock tests.

Operating Lifetime at Minimum Temperature

Test Results

The UUT passed the operating lifetime test.

Frequency Stability of Temperature Gradient Test

The following electrical and functional tests were conducted during the frequency stability of temperature gradient test:

a. Transmitted frequency

b. Transmitted power output

c. Message format and structure

Test Results

The UUT met all frequency stability requirements of the temperature gradient test.

Satellite Qualitative Tests

Test Results

The UUT met all requirements for the satellite qualitative tests.

Beacon Antenna Test

Test Results

The antenna characteristics of the UUT were measured at the EMI/EMC Test Facility.

A listing of the Effective Radiated Power (ERP) calculated for each elevation and azimuthal angle is provided in Annex F, page F-1 of Appendix I. The raw data, with the 120 measurements, are provided on page F-2. A sample calculation of an ERP is provided on page F-3.

All the ERP data listed in Annex F, page F-1, are within the test criteria of 32 to 43 decibel with reference to 1 milliwatt (dBm) when the ±3 dB tolerance is considered and applied to several of the ERPs.

The gain variation, which is directly proportional to the ERP, at the 40-degree elevation angle was calculated to be 1.47 dB (page F-1), which is less than 3 dB.

From reviewing page F-2, the majority of the vertical polarization measurements were at least 10 dB greater than the horizontal polarization measurements, so the ACR beacon antenna would be classified as a linear vertically polarized antenna.

The UUT passed all antenna characteristics requirements.

Navigation System Test

Test Results

The UUT met all requirements for the navigation system test.

Beacon Self-Test Mode

Test Results

The UUT met the requirements for the beacon self-test mode.

Conclusion

The UUT met the certification requirements for type approval.

SUPPORTING TEST DATA (APPENDIX I)

1. Electrical and Functional Tests at Constant Temperature

   a. Ambient Temperature (See Annex A of Appendix I, page A-1.)

   b. Minimum Temperature: -40° C (See Annex A of Appendix I, page A-15.)

   c. Maximum Temperature: 55° C (See Annex A of Appendix I, page A-23.)

2. Thermal Shock Test (See Annex B of Appendix I.)

3. Operating Lifetime at Minimum Temperature (See Annex C of Appendix I.)

4. Frequency Stability Test with Temperature Gradient (See Annex D of Appendix I.)

5. Satellite Qualitative Tests (See Annex E of Appendix I.)

6. Antenna Characteristics (See Annex F of Appendix I.)

7. Navigation System (See Annex G of Appendix I.)

8. Self-Test Mode (See Annex H of Appendix I.)

1.2 REFERENCE DOCUMENTS

- Cospas-Sarsat Document C/S T.001, Specification for Cospas-Sarsat 406 MHz Distress Beacon, Issue 3, Revision 2, October 1998.

- Cospas-Sarsat Document C/S T.007, Cospas-Sarsat 406 MHz Distress Beacon Type Approval standard, Issue 3, Revision 3, October 1998.

- EPG Document, Cospas-Sarsat 406 MHz Distress Beacon Type Approval Certification Detailed Test Procedures.

1.3 PURPOSE

The purpose of this document is to present detailed test procedures to implement type approval test methods delineated in C/S T.007.

1.4 SCOPE

The detailed test procedures for the following tests are presented in Section 2:

a. Electrical and Functional Tests at Constant Temperature

b. Thermal Shock Test

c. Operating Lifetime at Minimum Temperature

d. Frequency Stability Test with Temperature Gradient

e. Satellite Qualitative Tests

f. Antenna Characteristics

g. Navigation System

h. Self-Test Mode

A distribution list is provided in Appendix II.

SECTION 2. TESTS REQUIRED

2.1 ELECTRICAL AND FUNCTIONAL TESTS AT CONSTANT TEMPERATURE

The following electrical and functional tests were conducted at ambient temperature, low temperature, and high temperature conditions. The UUT, while turned off, was allowed to stabilize for 2 hours at the test temperature and was then turned on and allowed a 15-minute warm-up period before conducting the following tests:

a. Transmitter power output

b. Message format and structure

c. Modulation

d. Transmitted Frequency

e. Spurious output

f. VSWR check

g. Self-test mode

2.2 THERMAL SHOCK TEST

The UUT, while turned off, was allowed to stabilize for 2 hours at a selected temperature in its operating range. The UUT was then placed in an environment held at 30° C offset from the initial temperature and turned on. The UUT was then allowed to operate for 15 minutes before the following electrical and functional tests were conducted:

a. Transmitted frequency

b. Transmitted power output

c. Message format and structure

2.3 OPERATING LIFETIME AT MINIMUM TEMPERATURE

The operational lifetime test is intended to establish, with reasonable confidence, that the UUT will function at its minimum operating temperature for its rated life using a battery that has reached its expiration date. The life test was performed with a fresh battery pack that has been discharged to take into account:

a. The average current drain resulting from constant operation of the GPS interface and memory over the rated life of the battery pack (see A3.9.5).

b. The number of self-tests, as recommended by the beacon manufacturer over the rated life of the battery pack (the beacon manufacturer should substantiate the method used to determine the corresponding current drain).

c. A correction coefficient of 1.65 [applied to (a + b)] to account for differences between battery to battery, beacon to beacon and the possibility of exceeding the battery replacement time.

After the battery pack was appropriately discharged, the UUT was operated at its minimum operating temperature for its rated life. During this period, the following parameters were measured on each transmission:

- Transmitted frequency
- Transmitter power output
- Message format and structure

The 18-sample analysis window of the stability calculations is advanced in time through the period such that each succeeding data set includes the latest frequency sample and drops the earliest one.

This test was performed with a long format message.

2.4 FREQUENCY STABILITY TEST WITH TEMPERATURE GRADIENT

A temperature chamber was programmed to execute the temperature gradient profile defined by Figure 2-1. The UUT was placed in the chamber, and the following electrical and functional tests were conducted continuously throughout the temperature gradient test:

a. Transmitted frequency

b. Transmitted power output

c. Message format and structure

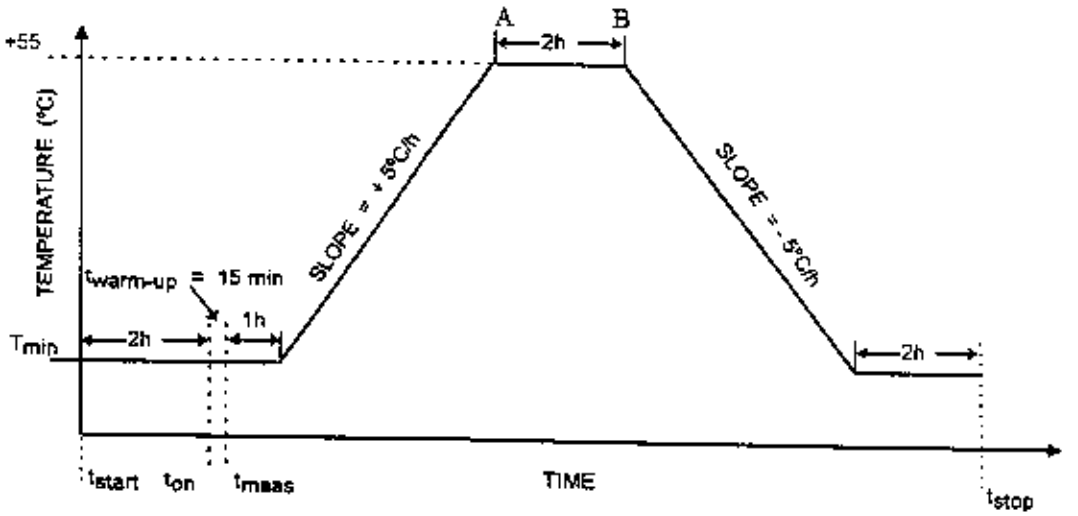


Figure 2-1. Temperature Gradient.

2.5 SATELLITE QUALITATIVE TESTS

This test was performed in coordination with the U.S. Mission Control Centre (MCC) and local authorities. This test was performed in an environment that approximated, as closely as possible, the intended use of the beacon.

The UUT operated in the open during at least three satellite passes, and downlink data were checked for correctness of:

Location data computed by the local user terminal (LUT)
Message format and structure

The UUT was successfully located and identified by a Cospas-Sarsat Low Earth Orbit (LEO) LUT. A summary of the results is located in Annex E of Appendix I.

2.6 ANTENNA CHARACTERISTICS

The beacon antenna test was performed as described in Section 3.4, at the ambient temperature of the test facility, and a correction factor was applied to the data to calculate the radiated power at -20° C at the end of the operating lifetime. This test was performed using the non-modified UUT.

2.7 NAVIGATION SYSTEM

The UUT was tested as described in Section 3.5 to verify the beacon output message, including the correct position data, Bose-Chaudhuri-Hocquenhem (BCH) error-correcting code(s), default values, and update rates. The navigation-input system was operating for the duration of all tests to ensure that it did not affect the 406-MHz signal and that the UUT could operate for the required operating lifetime. The message format and structure were monitored during all tests.

2.8 SELF-TEST MODE

The duration of the radio frequency (RF) energy burst of the UUT was measured, the frame synchronization pattern was checked, and the encoded location was checked for the correct default code. The format flag bit was reported.

SECTION 3. TYPE APPROVAL CERTIFICATION TEST PROCEDURES FOR COSPAS-SARSAT BEACONS

The following are the detailed electrical and functional test procedures for the tests required.

3.1 MESSAGE FORMAT AND STRUCTURE

The following parameters were measured in accordance with the procedure prescribed in this section:

3.1.1 Repetition Period

3.1.2 Continuous wave (CW) Preamble (Duration of the Unmodulated Carrier)

3.1.3 Total Transmission Time

3.1.4 Bit Rate and Stability

3.1.5 Message Coding

3.1.1 Repetition Period

3.1.1.1 Scope.

a. References:

(1) C/S T.001, paragraph 2.2.1.

(2) C/S T.001 Annex B, paragraph B.3.1.1.

b. The objective was to measure the randomized repetition period T_r of the beacon transmissions.

c. *Repetition Period*, T_r, is the period between two successive beacon transmissions.

3.1.1.2 Facilities and Instrumentation.

- Environmental Test Facility

  - Cospas-Sarsat Measurement System (see Figure 3-1).
  - IBM Compatible Computer System
  - HP-1631D Logic Analyzer
  - HP-423B Crystal Detector w/50-ohm Termination
  - 20-decibel (dB) Attenuator
  - 3-dB Attenuator
  - HP-11667A Power Splitter

3.1.1.3 Test Conditions.

a. Normal ambient or any other specified environmental condition.

b. Performed these measurements on the unmodulated portion of the carrier.

c. Nominal operating voltage.

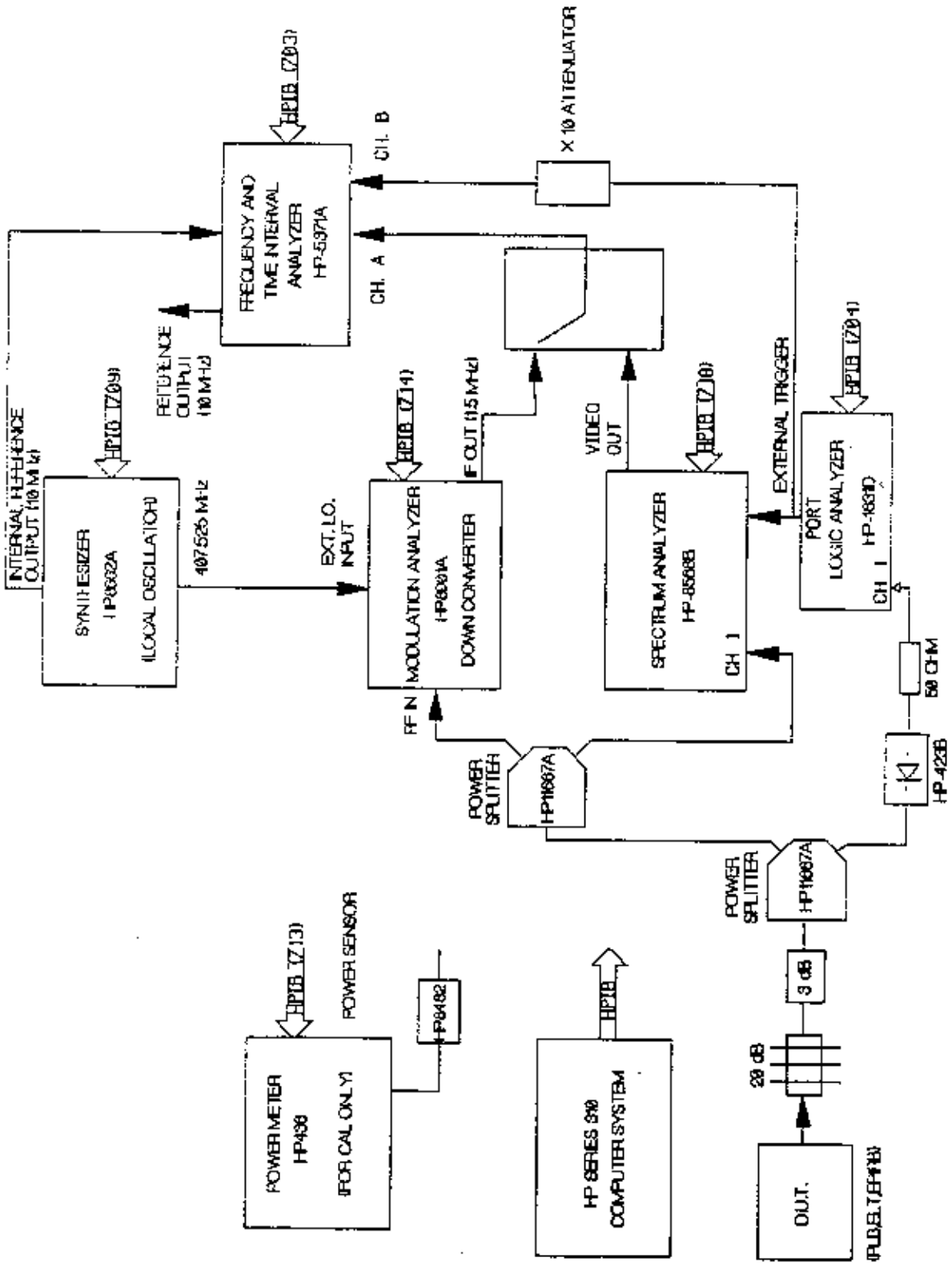


Figure 3-1. Cospas-Sarsat measurement system.

3.1.1.4 Test Procedure.

a. The power of the beacon radio output was derived from the crystal detector output applied to the analog input of the HP-1631D Logic Analyzer.

b. The HP-1631D was programmed to capture the rising edge of the burst waveform. Each voltage data point was converted into a power data point using the crystal detector power transfer equation and the attenuator/ power splitter attenuation value. The peak envelope voltage (100% power point) was then calculated by averaging 100 power data points, 6 milliseconds (ms) after the trigger (-0.3 volt falling edge). The time between the 10% and 90% power points was found by counting the number of samples between these two points. Each sample was 10 microseconds (μs). At the end of the rise time measurement, the Logic Analyzer was then programmed to trigger at the 10% power point level.

c. Captured and recorded the time interval measurements for 18 successive transmissions.

d. Calculated the mean repetition period and the standard deviation.

e. Recorded any repetition period that fell outside of specified limits.

3.1.1.5 Data Reduction and Presentation.

Presented the recorded data in tabular form and annotated those readings which exceeded the specified limits.

3.1.2 CW Preamble (Duration of the Unmodulated Carrier)

3.1.2.1 Scope.

a. References:

(1) C/S T.001, paragraph 2.2.2.

(2) C/S T.001, paragraph 2.2.3.

(3) C/S T.001 Annex B, paragraph B3.1.2.

b. The objective was to measure the unmodulated carrier duration between the beginning of a transmission and the beginning of the data modulation.

c. *Unmodulated carrier duration,* T_1, is the period between the beginning of transmission and the beginning of data modulation (see Figure 3-2).

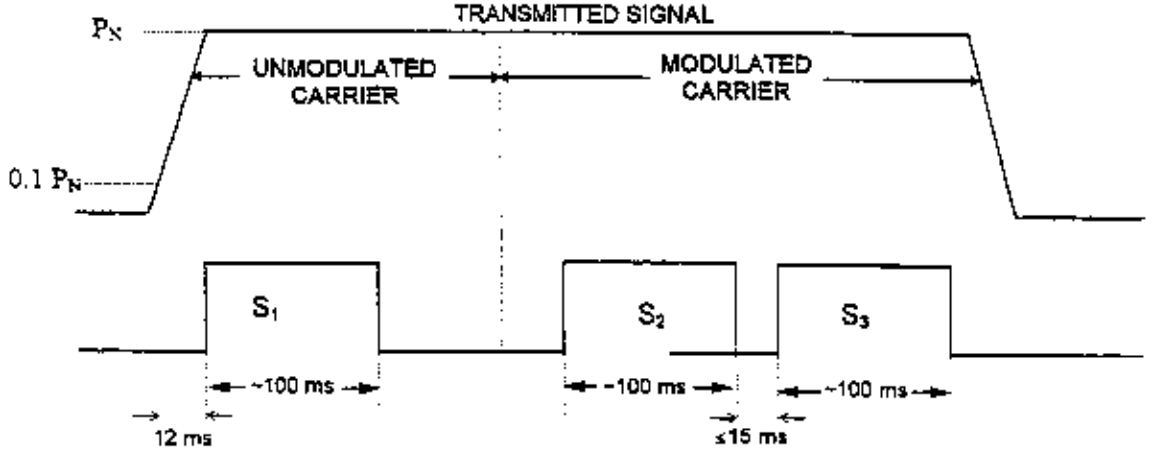


Figure 3-2. Definition of measurement intervals.

3.1.2.2 Facilities and Instrumentation.

- Environmental Test Facility

    - Cospas-Sarsat Measurement System (see Figure 3-1).
    - IBM Compatible Computer System
    - HP-1631D Logic Analyzer
    - HP-5371A Frequency and Time Interval Analyzer
    - HP-423B Crystal Detector w/50-ohm Termination
    - 20-dB Attenuator
    - 3-dB Attenuator
    - HP-1667A Power Splitter (2 each)

3.1.2.3 Test Conditions.

a. Normal ambient or any other specified environmental condition.

b. Performed these measurements on the unmodulated portion of the carrier.

c. Nominal operating voltage.

3.1.2.4 Test Procedure.

a. While the total transmission time was measured by the Logic Analyzer, the CW preamble was measured using the Frequency and Time Interval Analyzer. The Frequency and Time Interval Analyzer was programmed to acquire event versus time data after being triggered by Channel B signal (Logic Analyzer trigger out at 10% of P_n). The first phase transition of the modulated portion of the waveform was detected, and the time interval from that point to the trigger point on the rising edge of the waveform was measured.

b. Repeated the above measurements for 18 successive transmissions.

3.1.2.5 Data Reduction and Presentation.

Presented the recorded data in tabular form and annotated those readings which exceeded the specified limits.

3.1.3 Total Transmission Time

3.1.3.1 Scope.

a. References:

(1) C/S T.001, paragraph 2.2.2.

(2) C/S T.001, paragraph 2.2.3.

(3) C/S T.001 Annex B, paragraph B.3.1.2.

b. The objective was to measure the unmodulated carrier duration between the beginning of a transmission and the beginning of the data modulation and to measure the total transmission time of the transmitted waveform.

c. *Unmodulated carrier duration*, T_1, is the period between the beginning of transmission and the beginning of data modulation (see Figure 3-2, definition of measurement intervals).

d. *Total transmission time* is the period between the 10% power point on the rising edge of the waveform to 10% power point of the falling edge of the waveform.

3.1.3.2 Facilities and Instrumentation.

- Environmental Test Facility

  - Cospas-Sarsat Measurement System (see Figure 3-1).
  - IBM Compatible Computer System
  - HP-1631D Logic Analyzer
  - HP-423B Crystal Detector w/50-ohm Termination
  - 20-dB Attenuator
  - 3-dB Attenuator
  - HP-11667A Power Splitter

3.1.3.3 Test Conditions.

a. Normal ambient or any other specified environmental condition.

b. Performed these measurements on the unmodulated portion of the carrier.

c. Nominal operating voltage.

3.1.3.4 Test Procedure.

a. The power of the beacon radio output was derived from the crystal detector output applied to the analog input of the HP-1631D Logic Analyzer.

b. The HP-1631D was programmed to capture the rising edge of the burst waveform. Each voltage data point was converted into a power data point using the crystal detector power transfer equation and the attenuator/ power splitter attenuation value. The peak envelope voltage (100% power points) was then calculated by averaging 100 power data points, 6 ms after the trigger (-0.3-volt falling edge). The time between 10% power point levels of the rising and falling edges was measured.

c. Captured and recorded the total transmission times for 18 successive transmissions.

d. Recorded any total transmission time that fell outside of specified limits.

3.1.3.5 Data Reduction and Presentation.

Presented the recorded data in tabular form and annotated those readings which exceeded the specified limits.

3.1.4 Bit Rate and Stability

3.1.4.1 Scope.

a. Reference: C/S T.001, paragraph 2.2.1.

b. The objective was to measure the bit rate and stability of the baseband digital data.

c. *Bit Rate*, f_b, in bits per second (bps) is measured over at least the first 50 bits of one transmission.

d. *Stability* is the variation in bit rate measured over 18 transmissions.

3.1.4.2 Facilities and Instrumentation.

- Environmental Test Facility

  - Cospas-Sarsat Measurement System (see Figure 3-1).
  - IBM Compatible Computer System
  - HP-1631D Logic Analyzer
  - HP-8901 Modulation Analyzer/Down Converter
  - HP-5371A Frequency and Time Interval Analyzer
  - HP-8662A Frequency Synthesizer
  - HP-11667A Power Splitter (2 each)
  - 20-dB Attenuator
  - 10-dB Attenuator
  - 3-dB Attenuator

3.1.4.3 Test Conditions.

a. Normal ambient or any other specified environmental condition.

b. Performed these measurements on the modulated portion of the carrier.

c. Nominal operating voltage.

3.1.4.4 Test Procedure.

a. The bit rate, f_b, in bps was derived by measuring the period T_n encompassed by the first 50 bits of the modulated waveform. The bit rate is then $f_b = 50/T_n$.

b. The trigger marking the 0.1 P_n of the start of the burst waveform was generated by the Logic Analyzer. The phase information marking the start of the modulated waveform was obtained from the event versus time data acquired by the Frequency and Time Interval Analyzer. The event versus time data were acquired after a holdoff delay of 159 ms from the Logic Analyzer trigger event. Frequency and interval measurements started slightly before the start of the first bit. The sampling interval was 31.7 μs. A total acquisition time of 130 ms was used to encompass the first 50 bits of the modulated portion of the burst waveform.

c. The above measurement was repeated 18 times.

3.1.4.5 Data Reduction and Presentation.

a. Calculated the bit rate for each of the 18 measurements. The bit rate was equal to the measured time interval encompassing 50 bits divided by 50.

b. Presented the bit rate data in tabular form.

c. Presented the maximum and minimum bit rates and determined whether the values satisfy the requirement that:

$$396 \text{ bps} < f_b < 404 \text{ bps}$$

3.1.5 Message Coding

3.1.5.1 Scope.

a. References:

(1) C/S T.001, paragraph 3.

(2) C/S T.001 Annex A.

b. The objective was to check the content of the digital message for validity and compliance with the format for each data field, bit by bit.

3.1.5.2 Facilities and Instrumentation.

- Environmental Test Facility

- Cospas-Sarsat Measurement System (see Figure 3-1).
- IBM Compatible Computer System
- HP-1631D Logic Analyzer
- HP5371A Frequency and Time Interval Analyzer
- HP-423B Crystal Detector w/50 Ohm termination
- 20-dB Attenuator
- 3-dB Attenuator
- HP-1667A Power Splitter (2 each)

3.1.5.3 Test Conditions.

a. Normal ambient or any other specified environmental condition.

b. Performed these measurements on the modulated portion of the carrier.

c. Nominal operating voltage.

3.1.5.4 Test Procedure.

a. The modulated portion of the transmitted signal was demodulated.

b. The message data contained in bit positions 25-85 were decoded using the BCH error-correcting code in positions 86-106 (short message format). The message data in bit positions 25-85 and 107-132 (long message format) were decoded using the BCH error-correcting codes in bit positions 86-106 and 133-144, respectively.

3.1.5.5 Data Reduction and Presentation.

a. Processed the bit sequence captured by the measurement system.

b. Presented the decoded message by field and checked the result for validity and compliance with the format for each field.

c. Verified that the decoded message was in agreement with that provided by the manufacturer.

3.2 MODULATOR AND 406-MHz TRANSMITTER

The following parameters were measured in accordance with the procedures prescribed in this section:

3.2.1 Transmitted Frequency

3.2.2 Transmitter Power Output

3.2.2.1 Transmitter Power Output Level

3.2.2.2 Transmitter Power Output Rise Time

3.2.2.3 Spurious Output

3.2.3 Data Encoding and Modulation

3.2.1 Transmitted Frequency

3.2.1.1 Scope.

a. Reference: C/S T.001, paragraph 2.3.1.

b. The objective was to measure the deviation of the transmitter's RF from the selected frequency versus operating time after switch-on, under specified conditions of power supply and temperature.

c. This test procedure applies to 406-MHz beacon transmitters.

d. Frequency accuracy is the maximum allowable relative difference between the measured frequency and the selected frequency during the measurement period.

3.2.1.2 Facilities and Instrumentation.

- Environmental Test Facility

  - Cospas-Sarsat Measurement System (see Figure 3-1).
  - IBM Compatible Computer System
  - HP-1631D Logic Analyzer
  - HP-8901A Modulation Analyzer/Down Converter
  - HP-5371A Frequency and Time Interval Analyzer
  - HP-8662A Frequency Synthesizer
  - HP11667A Power Splitter (2 each)
  - 20-dB Attenuator
  - 10-dB Attenuator
  - 3-dB Attenuator

3.2.1.3 Test Conditions.

a. Normal ambient conditions or any other specified environmental condition.

b. Performed these measurements in the designated measurement intervals S_1, S_2, and S_3.

c. Nominal operating voltage.

3.2.1.4 Test Procedure.

a. Before starting this test, the UUT was stabilized at the laboratory ambient temperature in a non-operating condition. The UUT was then allowed to operate for 15 minutes before measurements were started.

b. The measurement system was triggered by the transmitter burst. Measurement commenced 12 ms after the start of the carrier relative to 0.1 P_n. Three sampling periods were defined where frequency measurements were made (see Figure 3-2, definition of measurement intervals).

c. Turned the beacon transmitter on and measured the frequency of the transmitter during the three 100-ms sampling intervals of the carrier.

d. Repeated the above measurement 18 times.

3.2.1.5 Data Reduction and Presentation.

a. The mean transmission frequency f_0, was determined from 18 successive measurements of $f_i^{(1)}$ as follows:

$$f_0 = f^{(1)} = \frac{1}{n} \sum_{i=1}^{n} f_i(1)$$

where n=18

b. The short-term frequency stability was derived from measurements of $f_i^{(2)}$ and $f_i^{(3)}$ made during the intervals S2 and S3 during 18 successive transmissions, as follows:

$$\sigma_{100ms} = \left\{ \frac{1}{2n} \sum_{i=1}^{n} \left(\frac{f_i^{(2)} - f_i^{(3)}}{f_i^{(2)}} \right)^2 \right\}^{1/2}$$

where n=18

c. The medium-term frequency stability was derived from measurements of $f_i^{(2)}$ made over 18 successive transmissions at instants t_i (refer to Figure 3-3.).

$$A = \frac{n \sum_{i=1}^{n} t_i f_i - \sum_{i=1}^{n} t_i \sum_{i=1}^{n} f_i}{n \sum_{i=1}^{n} t_i^2 - \left(\sum_{i=1}^{n} t_i \right)^2}$$

d. The ordinate at the origin of the least-squares straight line was given by:

$$B = \frac{\sum_{i=1}^{n} f_i \sum_{i=1}^{n} t_i^2 - \sum_{i=1}^{n} t_i \sum_{i=1}^{n} t_i f_i}{n \sum_{i=1}^{n} t_i^2 - \left(\sum_{i=1}^{n} t_i \right)^2}$$

where n=18

e. The residual frequency variation was given by:

$$\sigma = \left\{ \frac{1}{n} \sum_{i=1}^{n} \left(f_i - A t_i - B \right)^2 \right\}^{1/2}$$

where n=18

f. Plotted the transmitter frequency error (E) as a function of the operating time.

g. Plotted the transmitter frequency error (E) as a function of temperature (for data collected during temperature tests).

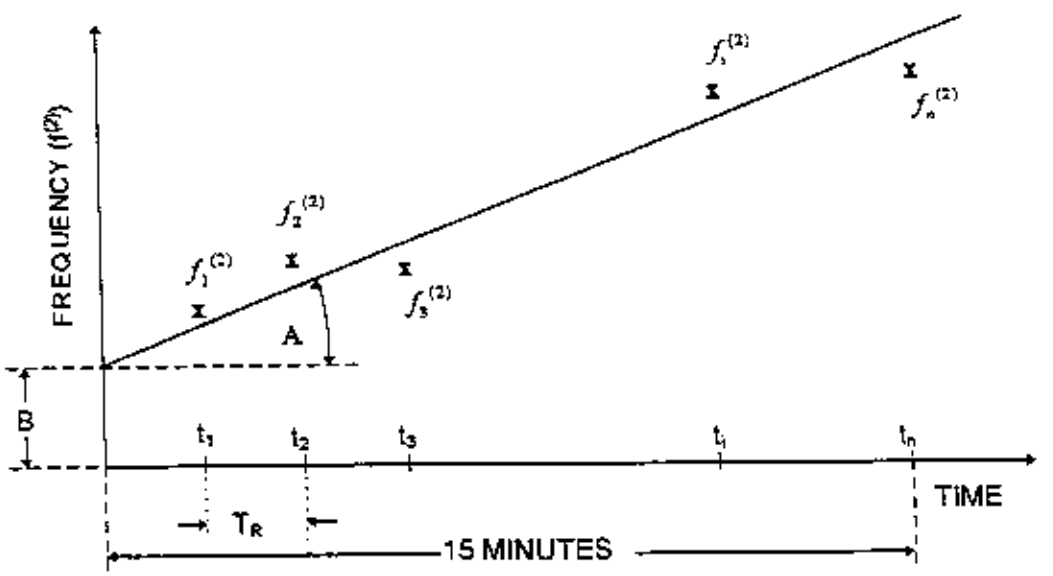


Figure 3-3. Medium-term frequency stability measurement.

3.2.2 Transmitter Power Output

3.2.2.1 Transmitter Power Output Level

3.2.2.1.1 Scope.

a. Reference: C/S T.001, paragraph 2.3.2.

b. The objective was to measure the transmitter RF output power.

c. RF output power is the power that the beacon transmitter delivers to the antenna or to a load with the same VSWR as the antenna at the operational frequency. This power is defined for the unmodulated carrier-on condition.

3.2.2.1.2 Facilities and Instrumentation.

- Environmental Test Facility

  - Cospas-Sarsat Measurement System (see Figure 3-1).
  - IBM Compatible Computer System
  - HP-1631D Logic Analyzer
  - HP-423B Crystal Detector w/50 Ohm Termination
  - HP-11667A Power Splitter
  - 20-dB Attenuator
  - 3-dB Attenuator

3.2.2.1.3 Test Conditions.

a. Normal ambient or any other specified environmental condition.

b. Performed these measurements on the unmodulated portion of the waveform.

3.2.2.1.4 Test Procedure for RF Power Output.

a. The RF output of the transmitter was applied to the HP-423B crystal detector. The output of the detector was applied to the analog input of the HP-1631D analog input. The HP-1631D was programmed to capture the burst envelope.

b. Ensured that the battery in the UUT was at full capacity.

c. Measured the VSWR of the antenna and replaced the antenna with a dummy load with a VSWR equal to that of the antenna under normal operational conditions.

d. Keyed the transmitter and measured the RF power (P_1), in watts, into the dummy load at the transmission frequency. The Logic Analyzer captured the waveform to measure the transmitted power.

e. Measured the RF power (P_1) during the 100-ms period following a 12-ms offset measured from the 10% power point of the transmitted signal envelope rise time.

3.2.2.1.5 Data Reduction and Presentation.

a. Recorded the measured transmitter power and noted any anomalies such as irregularity in amplitude during the 100-ms unmodulated carrier portion of the carrier.

b. Peak envelope voltage was obtained by averaging 800 voltage data points during 400 ms of the burst. (See Figure 3-4.) The peak envelope voltage was then converted into transmitter output power by using the crystal detector polynomial power transfer equation and the attenuators/power splitter attenuation value. The polynomials and the attenuation value were stored on disk files during the calibration subprogram.

c. Presented the measured power output in tabular form.

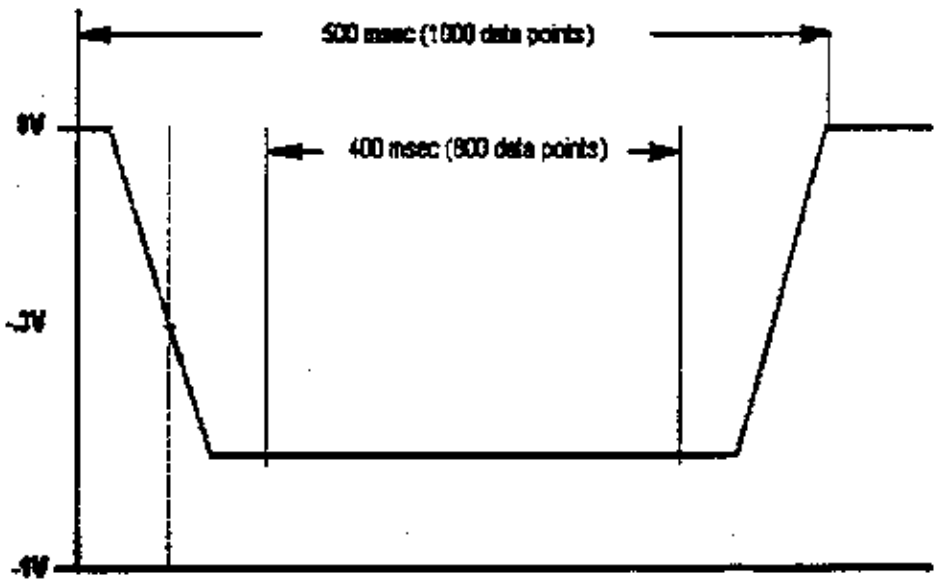


Figure 3-4. Burst envelope data acquisition.

3.2.2.2 Transmitter Power Output Rise Time

3.2.2.2.1 Scope.

a. Reference: C/S T.001 paragraph 2.3.2

b. The objective was to measure the power output rise time.

c. Rise Time is the time required for power to increase from 10% to 90% of its steady-state value (see Figure 3-2, definition of measurement intervals).

3.2.2.2.2 Facilities and Instrumentation.

- Environmental Test Facility

  - COSPAS-SARSAT Measurement System (see Figure 3-1.)
  - IBM Compatible Computer System
  - HP-1631D Logic Analyzer
  - HP-423B Crystal Detector w/50 Ohm Termination
  - 3 dB Attenuator
  - 20 dB Attenuator
  - HP-1667A Power Splitter (2 each)

3.2.2.2.3 Test Conditions.

a. Normal ambient or any other specified environmental condition.

b. Performed these measurements on the unmodulated portion of the carrier.

c. Nominal operating voltage.

3.2.2.2.4 Test Procedure.

a. The HP-1631D was programmed to capture the rising edge of the burst waveform. Each voltage data point was converted into a power data point using the crystal detector power transfer equation and the attenuator/power splitter attenuation value. The time between the 10% and 90% power points was found by counting the number of samples between these two points. Each sample was 10 (μs).

b. Repeated the above measurements for 18 successive transmissions.

3.2.2.2.5 Data Reduction and Presentation.

Presented the recorded data in tabular form and annotated those readings which exceeded the specified limits.

3.2.2.3 Spurious Output

3.2.2.3.1 Scope.

a. References: C/S T.001, paragraph 2.3.4.

b. The objective was to determine the level of the transmitter harmonic and spurious signals. These are unwanted signals at discrete frequencies due to frequency synthesis or to non-linearities at the output stages of the transmitter.

c. A *harmonic* is a signal with a frequency which is an integer multiple of the transmitter frequency.

d. A *spurious signal* is an unwanted signal with a frequency that is not an integer multiple of the transmitter frequency.

e. Harmonic and spurious signal powers are expressed as levels in decibels with reference to the carrier (dBc), related to the transmitter power.

3.2.2.3.2 Facilities and Instrumentation.

- Environmental Test Facility

    - Cospas-Sarsat Measurement System (see Figure 3-1).
    - IBM Compatible Computer System
    - HP-8568B Spectrum Analyzer
    - HP-8662A Synthesizer
    - HP-1631D Logic Analyzer
    - 20-dB Attenuator
    - 3-dB Attenuator
    - 2 each HP-11667A Power Splitter

3.2.2.3.3 Test Conditions.

a. Normal ambient conditions or any other specified environmental conditions.

b. Nominal operating voltage.

3.2.2.3.4 Test Procedures.

a. The Spectrum Analyzer was programmed with the following settings:

Center frequency:	406.025 MHz
Frequency span:	50.000 kHz
Resolution Bandwidth:	100.000 Hz
Sweep time:	10 seconds
Trace mode:	maximum hold

b. The "maximum hold" mode displayed and held on the cathode ray tube (CRT), the maximum response of the input signal. In order to capture the spectral characteristics of the 406-MHz signal, the Spectrum Analyzer sweep was allowed to freely run continuously until the full spectral response was integrated without gaps. The integration period could take up to 5 hours. In order to facilitate expeditious completion of this process, the trigger of the Spectrum Analyzer was dithered under program control to randomize over a small period, the start of the sweep.

c. When the spectral response was fully integrated or after 5 hours (whichever came first), the marker peak function found the unmodulated carrier amplitude that was the 0-dB carrier reference. The marker function of the Spectrum Analyzer and the computer verified that the spurious response was lower than the allowable limits as indicated in Figure 3-5.

3.2.2.3.5 Data Reduction and Presentation.

a. Presented the computer plots of the spectral response with the limit mask superimposed on the spectral response.

b. Presented the recorded data in tabulated form with the frequency and amplitude of those spurs, which exceeded the specified limits.

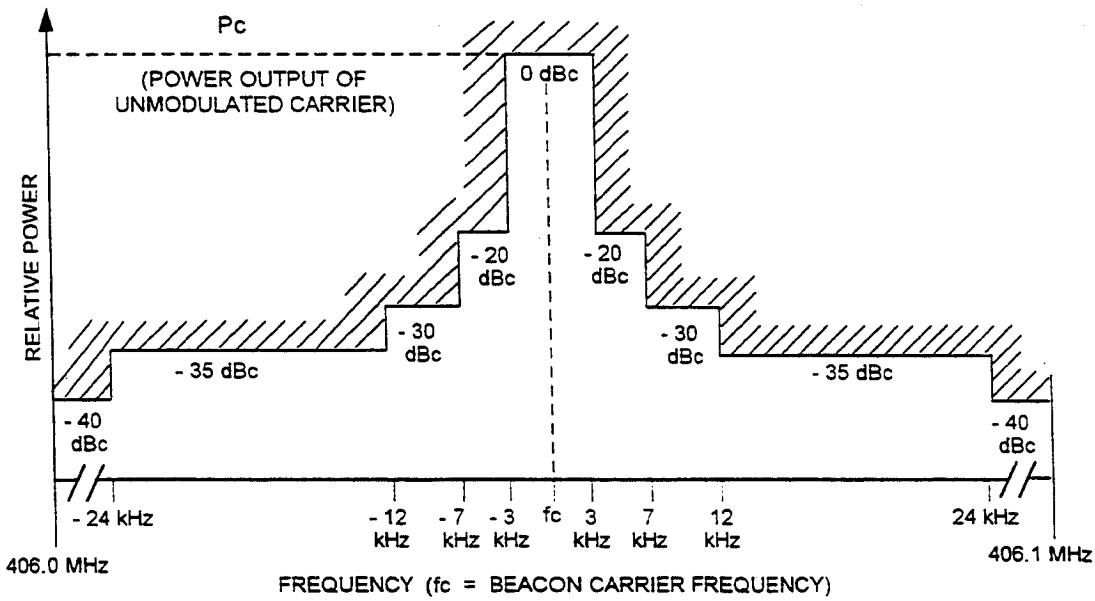


Figure 3-5. In-band spurious emission mask.

3.2.3 Data Encoding and Modulation

3.2.3.1 Scope.

a. References:

(1) C/S T.001, paragraph 2.3.5.

(2) C/S T.001, paragraph 2.3.6.

b. The objective was to measure data encoding, modulation sense, modulation phase deviation, modulation rise and fall times, and modulation symmetry of the bi-phase demodulated signal were measured.

3.2.3.2 Facilities and Instrumentation.

- Environmental Test Facility

  - Cospas-Sarsat Measurement System (see Figure 3-1.)
  - IBM Compatible Computer System
  - HP-1631D Logic Analyzer
  - HP-8901A Modulation Analyzer/Down Converter
  - HP-5371A Frequency and Time Interval Analyzer
  - HP-8662A Frequency Synthesizer
  - HP-11667A Power Splitter (2 each)
  - 20-dB Attenuator
  - 10-dB Attenuator
  - 3-dB Attenuator

3.2.3.3 Test Conditions.

a. Normal ambient conditions or any other specified environmental conditions.

b. Nominal operating voltage.

3.2.3.4 Test Procedure.

a. The Frequency and Time Interval Analyzer captured time versus event data of the down converted modulated burst waveform.

b. Following capture of the time versus event data, the data were processed to remove the effect of the difference between the actual carrier frequency and the estimated carrier frequency represented by the downconverter frequency. This removed the increasing phase versus time offset, which would compromise the accuracy of the measurement of the demodulated waveform characteristics.

c. Modulation rise and fall times, modulation symmetry, and phase deviation were then derived from the processed waveform.

3.2.3.5 Data Reduction and Presentation.

a. Presented a printout of the modulation waveform and tabulated data on the measure modulation parameters.

b. Annotated those readings which exceeded specified limits.

3.3 VOLTAGE STANDING WAVE RATIO

3.3.1 Scope.

a. References:

(1) C/S T.001, paragraph 2.3.7.

(2) C/S T.007 Annex A, paragraph A3.3.

b. The objective was to determine if the transmitter would be damaged by any load from open circuit to short circuit. For the purpose of this test, the test loads were:

(1) Open circuit

(2) Short circuit

(3) 3:1 VSWR load

3.3.2 Facilities and Instrumentation.

- Environmental Test Facility

- Cospas-Sarsat Measurement System (see Figure 3-1).
- IBM Compatible Computer System
- HP-1631D Logic Analyzer
- HP-5371A Frequency and Time Interval Analyzer
- 20-dB Attenuator
- 3-dB Attenuator w/shorting plug
- 3-dB Attenuator
- HP-1667A Power Splitter (2 each)

3.3.3 Test Conditions.

a. Normal ambient conditions or any other environmental conditions.

b. Nominal operating voltage.

3.3.4 Test Procedure.

3.3.4.1 Mismatched Load Simulation.

a. Short circuit condition was achieved with a shorting connector attached to the end of the transmission cable.

b. A 3:1 VSWR was achieved by using a 3-dB attenuator with a shorting connector attached to one end of the attenuator. This configuration presented a load to the transmitter with 6-dB return loss. The shorted attenuator was then attached to the end of the transmission cable.

3.3.4.2 Measurement Procedure.

a. With the transmitter on, a short circuit condition was applied to the transmitter output for 5 minutes.

b. An open circuit condition was then applied to the transmitter output for 5 minutes.

c. A 3:1 VSWR load was then applied to the transmitter output for 5 minutes.

d. Measured the transmitter nominal frequency, digital message content, and modulation parameters to verify that transmitter performance had not been degraded.

3.3.5 Data Reduction and Presentation.

Presented the recorded data in tabular form and annotated those readings which exceeded the specified limits.

3.4 ANTENNA CHARACTERISTICS

3.4.1 Scope.

a. Reference: C/S T.001, Annex B.

b. The objective was to measure the radiation characteristics of the beacon.

c. The beacon shall radiate in such a manner that the Effective Radiated Power (ERP) measured at elevation angles between 10° and 50° in all directions around the beacon shall be in the range of 1.6 to 20 Watts (32 to 43 dBm).

d. The gain variation in the 40° azimuth measurements shall not exceed 3 dB.

e. Determine if the polarization of the beacon antenna is linear or circular.

3.4.2 Facilities and Instrumentation.

- EMI/EMC Test Facility

    - HP 8566B Spectrum Analyzer.
    - Stoddard Dipole (370 – 1000 MHz)
    - Coaxial Cable
    - Non-conductive Vertical Antenna Mast
    - Turntable (138 cm radius)

3.4.3 Test Conditions.

a. Normal ambient conditions or any other environmental conditions.

b. Nominal operating voltage.

3.4.4 Test Procedures.

a. The antenna characteristics of the beacon were measured in a shielded semi-anechoic (anechoic material on all surfaces, except floor) chamber (44'x22'x18'). For this test, the floor of the chamber, from front to back, was covered with wire mesh and aluminum foil that was all electrically connected and terminated to the chamber ground.

b. As seen in Figure 3-6, the UUT was centered on a circular ground plane (aluminum) (radius = 138 cm) that was positioned approximately in the middle of the anechoic chamber and elevated about 0.75 meters above the chamber floor. The circular ground plane was supported by a wooden frame that was constructed without nails, screws, or metallic

braces. Also, a Stoddart dipole antenna was calibrated (gain = 1.01 dB @ 406 MHz) and used as the measuring antenna. The dipole was mounted on a non-conductive mast that facilitated the positioning of the dipole at the required elevation angles. The mast was located far enough away from the UUT so that horizontal distance (elevation angle = 0°) between the center of the dipole and the UUT was precisely 3 meters.

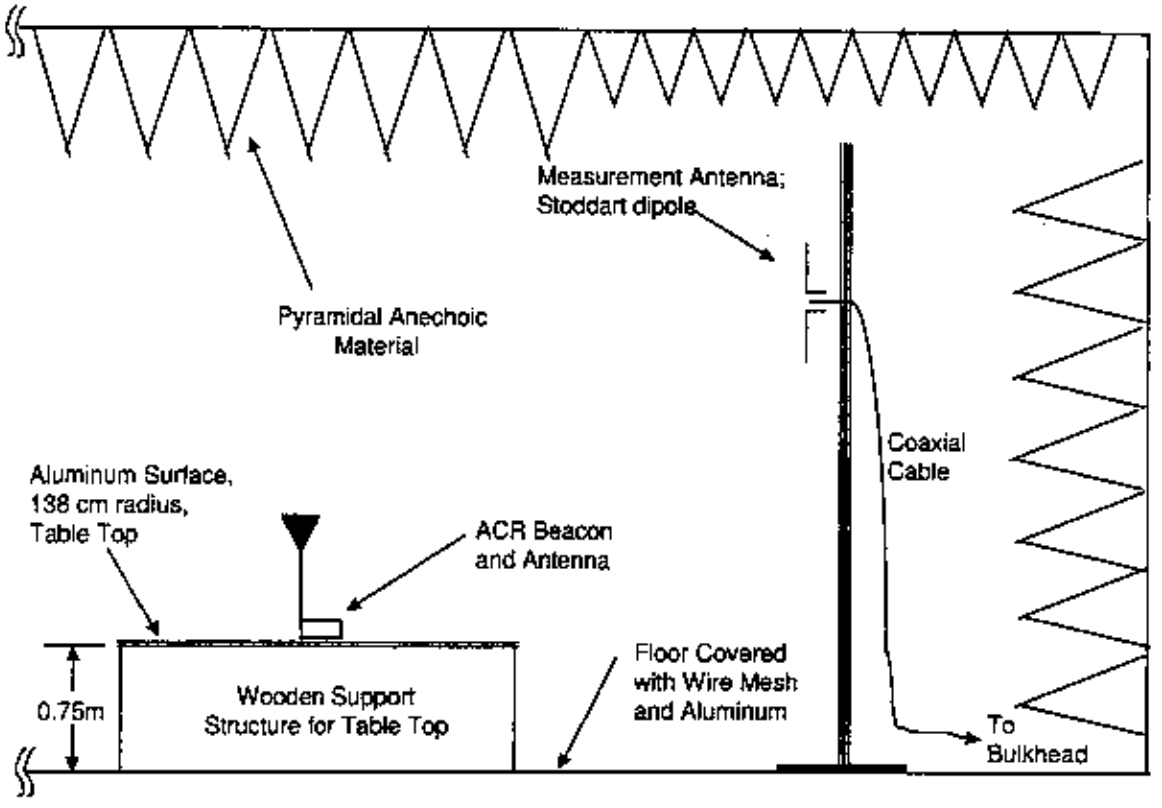


Figure 3-6. Antenna test configuration.

c. The output of the Stoddart dipole was connected to an HP8566B Spectrum Analyzer, located outside of the anechoic chamber, via approximately 50' of RG-223 coaxial cable. With the UUT antenna centered on the circular ground plane and activated for emergency transmissions (burst RF transmissions, at 406.025 MHz, approximately every 50 seconds), the received power at the Stoddart dipole was measured and recorded at 12 different azimuthal angles of the UUT and five different elevation angles of the dipole.

d. The UUT was rotated on the circular ground plane in 30-degree increments from 0 to 330 degrees, while maintaining UUT antenna at the center of the ground plane, for each elevation angle of the dipole. The initial test elevation angle was 10 degrees, and it was increased to a maximum of 50 degrees in 10-degree increments. A total of 120 received power measurements were made; 60 with the dipole vertically polarized and 60 with the dipole horizontally polarized.

3.4.5 Data Reduction and Presentation.

Presented the recorded data in tabular form and annotated those readings which exceeded the specified limits.

3.5 NAVIGATION SYSTEM

3.5.1 Scope.

a. References: C/S T.001, paragraphs 4.5.5, 4.5.5.1, 4.5.5.2, 4.5.5.3, C/S T.007, Annex A, paragraph 3.8, and Specific Test Procedure for C/S Type Approval Testing of ACR PLB-100 and RLB-33 beacons, paragraph A3.9.

b. The objective was to test the ability of the beacon to handle and process all appropriate navigation system requirements and accept/process data from an external navigation device.

3.5.2 Facilities and Instrumentation.

- Environmental Test Facility

    - Cospas-Sarsat Measurement System (see Figure 3-1).
    - IBM Compatible Computer System
    - HP-1631D Logic Analyzer
    - HP-5371A Frequency and Time Interval Analyzer
    - 20-dB Attenuator
    - 3-dB Attenuator w/shorting plug
    - 3-dB Attenuator
    - HP-1667A Power Splitter (2 each)

3.5.3 Test Conditions.

a. Normal ambient conditions or any other environmental conditions.

b. Nominal operating voltage.

3.5.4 Test Procedures.

a. The UUT stored data within 30 minutes to allow for the UUT to produce a digital message with properly encoded position data and BCH code(s) according to document C/S T.001, when the beacon is activated. Turned UUT ON with no simulated GPS message. Confirmed default values were encoded in message. Applied simulated GPS input after 30 minutes, and confirmed correct encoded output message was contained in the next message burst. Verified after the UUT was activated for 15 minutes, that a correct digital message was transmitted, including valid position data encoding, positive or negative direction delta offset, and correctly calculated BCH code(s).

b. The actual location (ETF) and 14 simulated worldwide locations were provided via laptop serial output using protocol NMEA Version 2.0. The UUT was first turned OFF, then ON with no input provided to clear any previous location contents. The UUT was then turned OFF and then ON again, this time with simulated locations as shown in Table 3-1. In each case, the beacon message was captured approximately 5 minutes after turn-on to confirm correct message encoding.

TABLE 3-1. SIMULATED LOCATIONS

Message Number	Location	
1	N90° 0'	E0° 0'
2	S90° 0'	W0° 0'
3	N78° 18'	E104° 0'
4	S31° 46'	E18° 18'
5	N0° 0'	W21° 28'
6	N0° 0'	E0° 0'
7	N0° 0'	W180° 0'
8	N77° 30'	W44° 50'
9	N64° 0'	W154° 34'
10	N19° 41'	W104° 27'
11	N18° 45'	W157° 10'
12	N53° 45'	E21° 28'
13	N38° 08'	W101° 0'
14	N51° 0'	E0° 0'

c. If no navigation signals or data input has ever been stored in the test beacon, or the beacon has been activated and then turned off, subsequent activation of the beacon with no navigation signals or data input having been present, should transmit a message which contains default values for position data bits as specified in C/S T.001. This was tested by the UUT not activated and navigation signals or data input

recently stored in the beacon, disconnecting the navigation signals or data input and turning the beacon ON and then OFF. The beacon was then activated and operated at ambient temperatures for 30 minutes. It was verified that after the UUT had been activated for 15 minutes, the default values for position data were present in the digital message and the BCH code(s) was correct for the remainder of this 30-minute period. This was accomplished throughout the conduct of the parametric tests when no external input was applied.

d. The UUT was first turned ON with an input simulating a location in Alaska and verified. The UUT was then turned OFF (while in sleep mode, the beacon still attempts to acquire current position, if available) and an input simulating Hawaii was provided. After 20 minutes, the beacon was turned back ON and the original Alaska location was verified. This ensured the beacon did not update the digital message in less than 20 minutes after the time of the last update.

e. Following the initial 2-hour cold soak prior to start of the 24-hour Operating Lifetime test, the UUT was provided with a simulated position during power-ON. (This occurred 15 minutes prior to beginning the 24-hour data collection process). The encoded message was confirmed and then the input removed. Part of the Operating Lifetime test is to confirm that the encoded message bit pattern does not change throughout the test. At the completion of the test, the message was once again verified and documented. Cycled power to verify return to default. This was tested by the UUT not activated and with valid navigation data recently stored in the UUT, disconnected the navigation signals or input data and waited for 25 hours to go by (the Operating Lifetime test). After 25 hours, activated and operated the UUT for 30 minutes. Verified that after being activated for 15 minutes, valid position data were present in the digital message and checked for correct BCH code(s) for the remainder of this 30-minute period.

f. Since this type of external GPS involves circuits active prior to beacon activation, the Operating Lifetime at Minimum Temperature test (2.3) must involve UUT lifetime at the battery replacement time. Therefore, the beacon manufacturer provided the data necessary to discharge a fresh battery pack at room temperature to account for GPS current drain over the battery pack rated 5-year life time. The external GPS battery discharge figures provided by the beacon manufacturer were verified, using an integrating charge meter which measured the total charge delivered to the inactivated UUT in conjunction with an active GPS interface, over a sufficient period of time. This total measured charge, divided by the time recorded for the charge measurement, was the average current drain on the battery over the measurement time period which was prorated to the rated 5-year life of the battery pack.

3.5.5 Data Reduction and Presentation.

a. Processed the bit sequence captured by the measurement system.

b. Presented the decoded message by field and checked the result for validity and compliance with the format for each field.

c. Presented the recorded data in tabular form and annotated those readings which exceeded the specified limits.

3.6 SELF-TEST MODE

3.6.1 Scope.

a. Reference: C/S T.001, paragraph 2.3.7

b. The objective was to test the built-in self-test capability of the UUT.

3.6.2 Facilities and Instrumentation.

- Environmental Test Facility

  - Cospas-Sarsat Measurement System (see Figure 3-1).
  - IBM Compatible Computer System
  - HP-1631D Logic Analyzer
  - HP-5371A Frequency and Time Interval Analyzer
  - 20-dB Attenuator
  - 3-dB Attenuator w/shorting plug
  - 3-dB Attenuator
  - HP-1667A Power Splitter (2 each)

3.6.3 Test Conditions.

a. Normal ambient conditions or any other specified environmental conditions.

b. Perform these tests on the modulated portion of the carrier.

c. Nominal operating voltage.

3.6.4 Test Procedure.

a. Activated the self-test mode on the UUT.

b. The modulated portion of the transmitted signal was demodulated.

c. The message data were decoded and the encoded location was checked for the correct default code. The format flag bit was reported.

d. Checked the frame synchronization pattern and encoded location for the default code.

3.6.5 Data Reduction and Presentation.

a. Processed the bit sequence captured by the measurement system.

c. Presented the decoded message by field and checked the results for validity and compliance with the format for each field. Verified that the decoded message complied with the test user protocol.

APPENDIX I. DATA SHEETS

ANNEX A. ELECTRICAL AND FUNCTIONAL TESTS AT CONSTANT TEMPERATURE

AMBIENT TEMPERATURE

WSMR ELECTRONIC PROVING GROUND, US ARMY, PORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - FULL PARAMETER AMBIENT
MEASUREMENT DATE: 5 Jan 1999 TIME: 13:58:00

TESTED BY: _____ **APPROVED BY:** _____

BEACON DIGITAL MESSAGE VERIFICATION

SYNCHRONIZATION BIT #: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Should be:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Decoded:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

*** BIT SYNCHRONIZATION OK ***

FRAME SYNCHRONIZATION BIT #: 16 17 18 19 20 21 22 23 24

Should be:	0	0	0	1	0	1	1	1	1
Decoded:	0	0	0	1	0	1	1	1	1

*** FRAME SYNCHONIZATION OK ***

MESSAGE TYPE: LONG MESSAGE (bit 25 = 1)

DIGITAL MESSAGE IN HEXADECIMAL: 2 D D C 0 4 8 0 0 6 F F B F F 1 1 C E B 6 B 0 7 C 1 F 5 5

BCH CODE BIT #: 86 87 88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06

Should be:	0	0	0	1	0	0	0	1	1	1	0	0	1	1	1	0	1	0	1	1	0
Decoded:	0	0	0	1	0	0	0	1	1	1	0	0	1	1	1	0	1	0	1	1	0

*** BCH CODE OK ***

BCH CODE BIT #: 33 34 35 36 37 38 39 40 41 42 43 44

Should be:	1	0	1	0	1	0	1	0	1	0	0	0
Decoded:	1	0	1	0	1	0	1	0	1	0	0	0

*** BCH CODE OK ***

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - FULL PARAMETER AMBIENT
MEASUREMENT DATE: 5 Jan 1999 TIME: 14:17:22

TESTED BY: _____ APPROVED BY: _____

DIGITAL MESSAGE IN BINARY:

BIT NUMBER:

1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9
1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 1 0 1 1 1 1 1 0 0 1 0 1 1 0 1 1 1 0 1 1 1

BIT NUMBER:

4 4 4 4 4 4 4 4 4 4 5 5 5 5 5 5 5 5 5 5 6 6 6 6 6 6 6 6 6 6 7 7 7 7 7 7 7 7 7 7
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9
0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 1 1 1 1 1 1 1 1 1 0 1 1 1 1

BIT NUMBER:

8 8 8 8 8 8 8 8 8 8 9 9 9 9 9 9 9 9 9 9 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9
1 1 1 1 1 1 0 0 0 1 0 0 0 1 1 1 0 0 1 1 1 0 1 0 1 1 0 1 1 0 1 0 1 1 0 0 0 0 0 1

BIT NUMBER:

1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 4 4 4 4 4
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4
1 1 1 1 0 0 0 0 0 1 1 1 1 1 0 1 0 1 0 1 0 1 0 0 0

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - FULL PARAMETER AMBIENT
MEASUREMENT DATE: 5 Jan 1999 TIME: 14:17:23

TESTED BY: _____ **APPROVED BY:** _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 000000100100000000000011
Reported Latitude: N127.75
Reported Longitude: E255.75
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

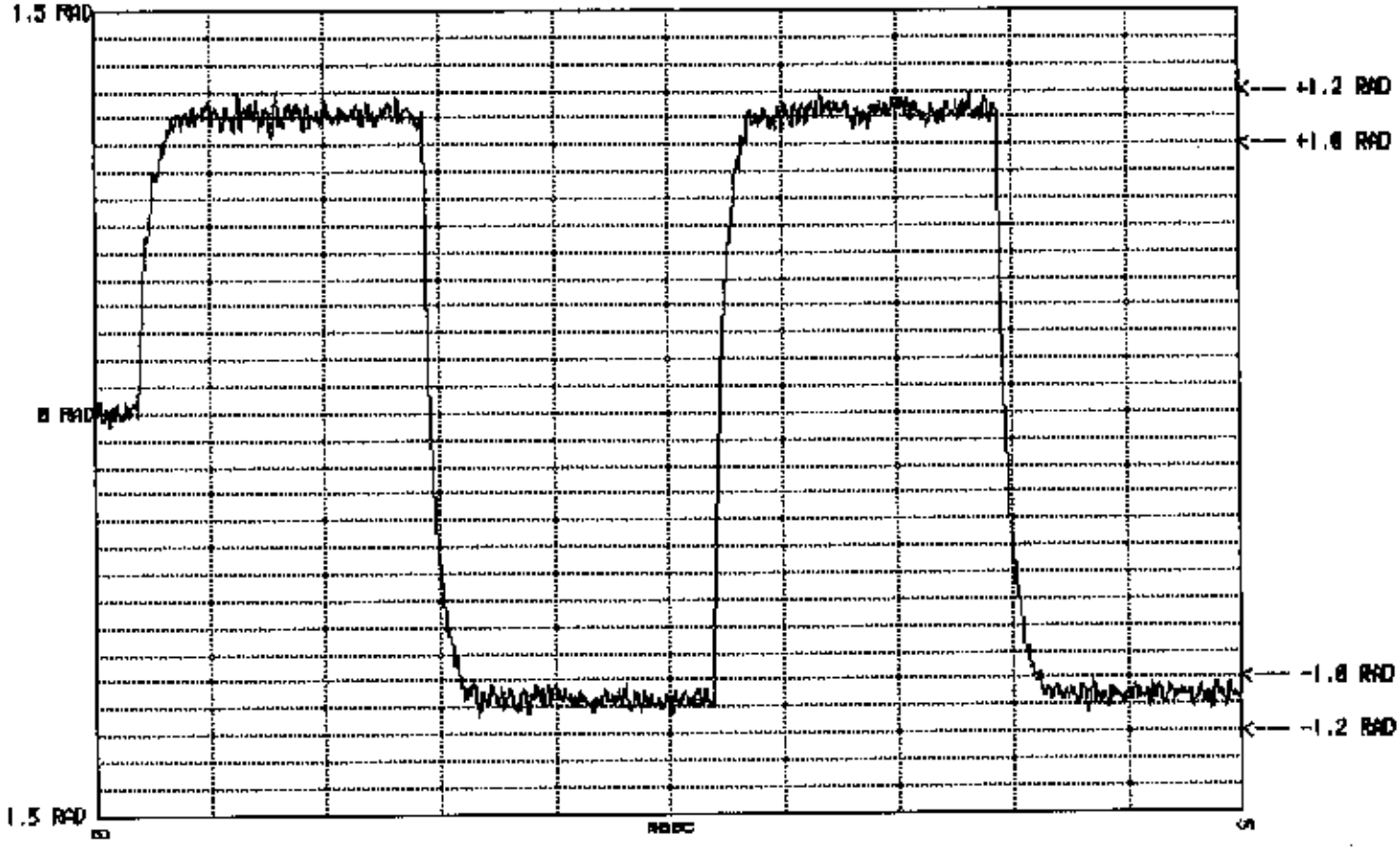
Delta Latitude (min): 0
Delta Latitude (sec): 60
Delta Longitude (min): 0
Delta Longitude (sec): 60

Corrected latitude: N127.75 1 0
Corrected longitude: E255.75 1 0

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - FULL PARAMETER AMBIENT
MEASUREMENT DATE: 5 Jan 1999 TIME: 14:17:24

TESTED BY: _____ APPROVED BY: _____

PHASE MODULATION vs TIME

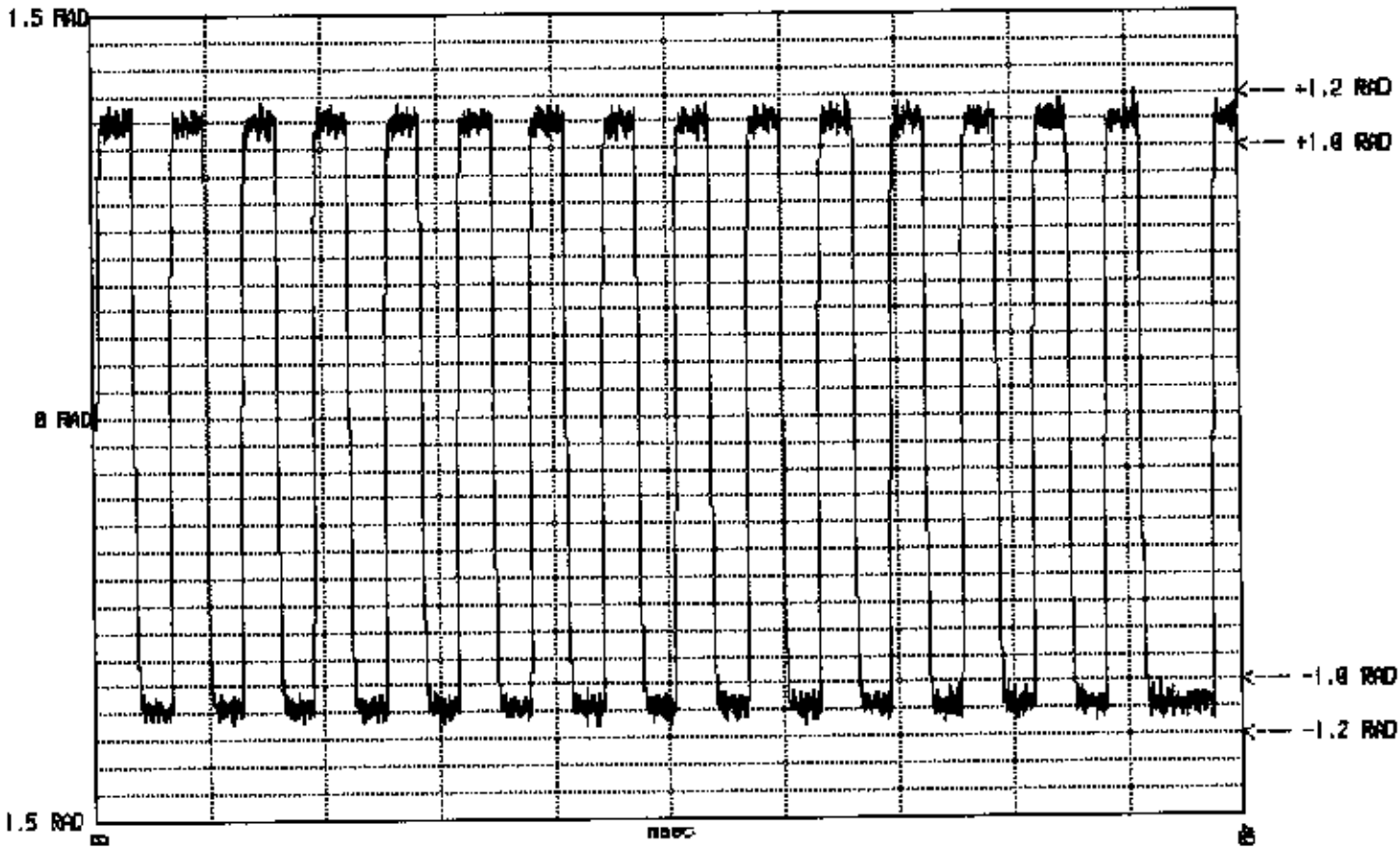


SPECIFICATIONS TESTED	LIMITS	RESULTS	UNITS	COMMENTS
Modulation: symmetry	< 0.05	.0048		passed
Modulation: rise time	150 ±100	128.2	us	passed
fall time	150 ±100	151.8	us	passed

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - FULL PARAMETER AMBIENT
MEASUREMENT DATE: 5 Jan 1999 TIME: 14:19:03

TESTED BY: _____ APPROVED BY: _____

PHASE MODULATION vs TIME



SPECIFICATIONS TESTED		LIMITS	RESULTS	UNITS	COMMENTS
Phase modulation:	+ AVG	+1.1 ±0.1	1.10	rad	passed
	- AVG	-1.1 ±0.1	-1.08	rad	passed

Peak positive phase modulation: 1.21 rad
Peak negative phase modulation: -1.15 rad

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - FULL PARAMETER AMBIENT
MEASUREMENT DATE: 5 Jan 1999 TIME: 14:20:44

TESTED BY: _____ **APPROVED BY:** _____

SPECIFICATIONS TESTED	LIMITS	RESULTS	UNITS	COMMENTS
Nominal transmitted frequency	406.025 ±.002	406.025184	MHz	passed
Short term frequency stability	< 2.0E-9	1.19E-10		passed
Medium term: mean slope	< 1.0E-9	-1.13E-10	/min	passed
residual deviation	< 3.0E-9	2.95E-10		passed
Tx ouput power level	3.15 TO 7.93	6.00	W	passed
Burst envelope: rise time	< 5	.29	ms	passed
fall time	< 5	.05	ms	passed
Phase modulation: + AVG	+1.1 ±0.1	1.10	rad	passed
- AVG	-1.1 ±0.1	-1.08	rad	passed
Modulation: symmetry	< 0.05	.0048		passed
Modulation: rise time	150 ±100	128.2	us	passed
fall time	150 ±100	151.8	us	passed
Repetition period minimum	47.5 TO 52.5	48.4	s	passed
Repetition period maximum	47.5 TO 52.5	52.1	s	passed
Repetition period (max - min)	>1	3.6	s	passed
Total transmission time minimum	514.8 TO 525.2	520.4	ms	passed
Total transmission time maximum	514.8 TO 525.2	520.5	ms	passed
Cw preamble minimum	158.4 TO 161.6	159.2	ms	passed
Cw preamble maximum	158.4 TO 161.6	159.3	ms	passed
Message bit rate minimum	396.0 TO 404.0	398.7	bps	passed
Message bit rate maximum	396.0 TO 404.0	398.9	bps	passed

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - OPEN / SHORT / 3:1 VSWR PERFORMANCE
MEASUREMENT DATE: 5 Jan 1999 TIME: 18:38:55

TESTED BY: _____ **APPROVED BY:** _____

BEACON DIGITAL MESSAGE VERIFICATION

SYNCHRONIZATION BIT #:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Should be:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Decoded:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

*** BIT SYNCHRONIZATION OK ***

FRAME SYNCHRONIZATION BIT #:	16	17	18	19	20	21	22	23	24
Should be:	0	0	0	1	0	1	1	1	1
Decoded:	0	0	0	1	0	1	1	1	1

*** FRAME SYNCHONIZATION OK ***

MESSAGE TYPE: LONG MESSAGE (bit 25 = 1)

DIGITAL MESSAGE IN HEXADECIMAL: 2 D D C 0 4 8 0 0 6 F F B F F 1 1 C E B 6 B 0 7 C 1 F 5 5

BCH CODE BIT #:	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06
Should be:	0	0	0	1	0	0	0	1	1	1	0	0	1	1	1	0	1	0	1	1	0
Decoded:	0	0	0	1	0	0	0	1	1	1	0	0	1	1	1	0	1	0	1	1	0

*** BCH CODE OK ***

BCH CODE BIT #:	1 33	1 34	1 35	1 36	1 37	1 38	1 39	1 40	1 41	1 42	1 43	1 44
Should be:	1	0	1	0	1	0	1	0	1	0	0	0
Decoded:	1	0	1	0	1	0	1	0	1	0	0	0

*** BCH CODE OK ***

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - OPEN / SHORT / 3:1 VSWR PERFORMANCE
MEASUREMENT DATE: 5 Jan 1999 TIME: 19:13:04

TESTED BY: _____ APPROVED BY: _____

DIGITAL MESSAGE IN BINARY:

BIT NUMBER:

1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	1	1	1	1	1	0	0	1	0	1	1	0	1	1	1

BIT NUMBER:

4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7	7
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1

BIT NUMBER:

8	8	8	8	8	8	8	8	8	9	9	9	9	9	9	9	9	9	9	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1	1	1	1	1	1	0	0	0	1	0	0	0	1	1	1	0	0	1	1	1	0	1	0	1	1	0	1	1	0	1	0	1	1	0	0	0	0	0	1

BIT NUMBER:

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6
1	1	1	1	0	0	0	0	0	1	1	1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	0	0	0

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - OPEN / SHORT / 3:1 VSWR PERFORMANCE
MEASUREMENT DATE: 5 Jan 1999 TIME: 19:13:05

TESTED BY: _____ **APPROVED BY:** _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 000000100100000000000011
Reported Latitude: N127.75
Reported Longitude: E255.75
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

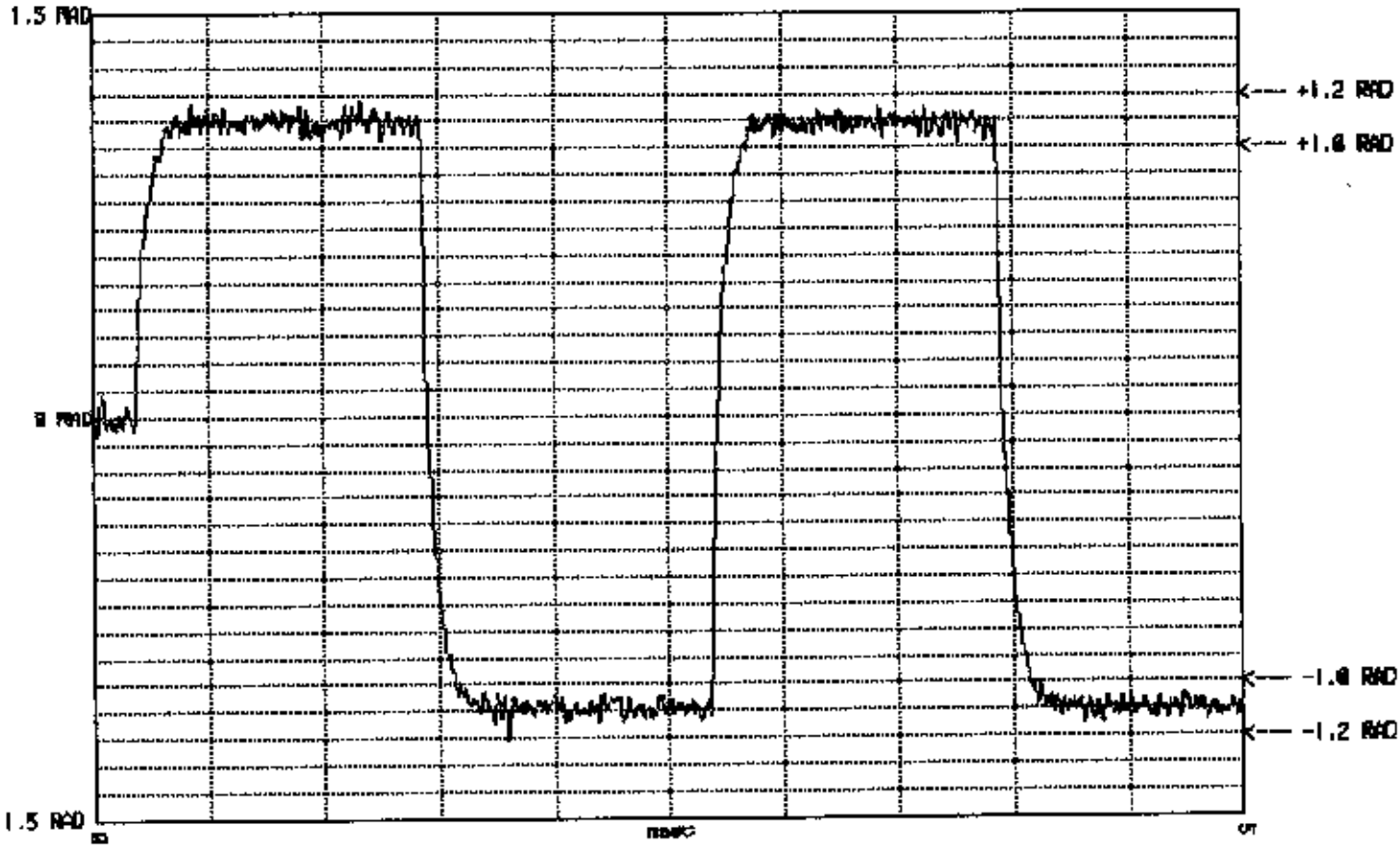
Delta Latitude (min): 0
Delta Latitude (sec): 60
Delta Longitude (min): 0
Delta Longitude (sec): 60

Corrected latitude: N127.75 1 0
Corrected longitude: E255.75 1 0

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - OPEN / SHORT / 3:1 VSWR PERFORMANCE
MEASUREMENT DATE: 5 Jan 1999 TIME: 19:13:06

TESTED BY: _____ APPROVED BY: _____

PHASE MODULATION vs TIME



SPECIFICATIONS TESTED	LIMITS	RESULTS	UNITS	COMMENTS
Modulation: symmetry	< 0.05	.0072		passed
Modulation: rise time	150 ±100	140.2	us	passed
fall time	150 ±100	141.8	us	passed

MSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA

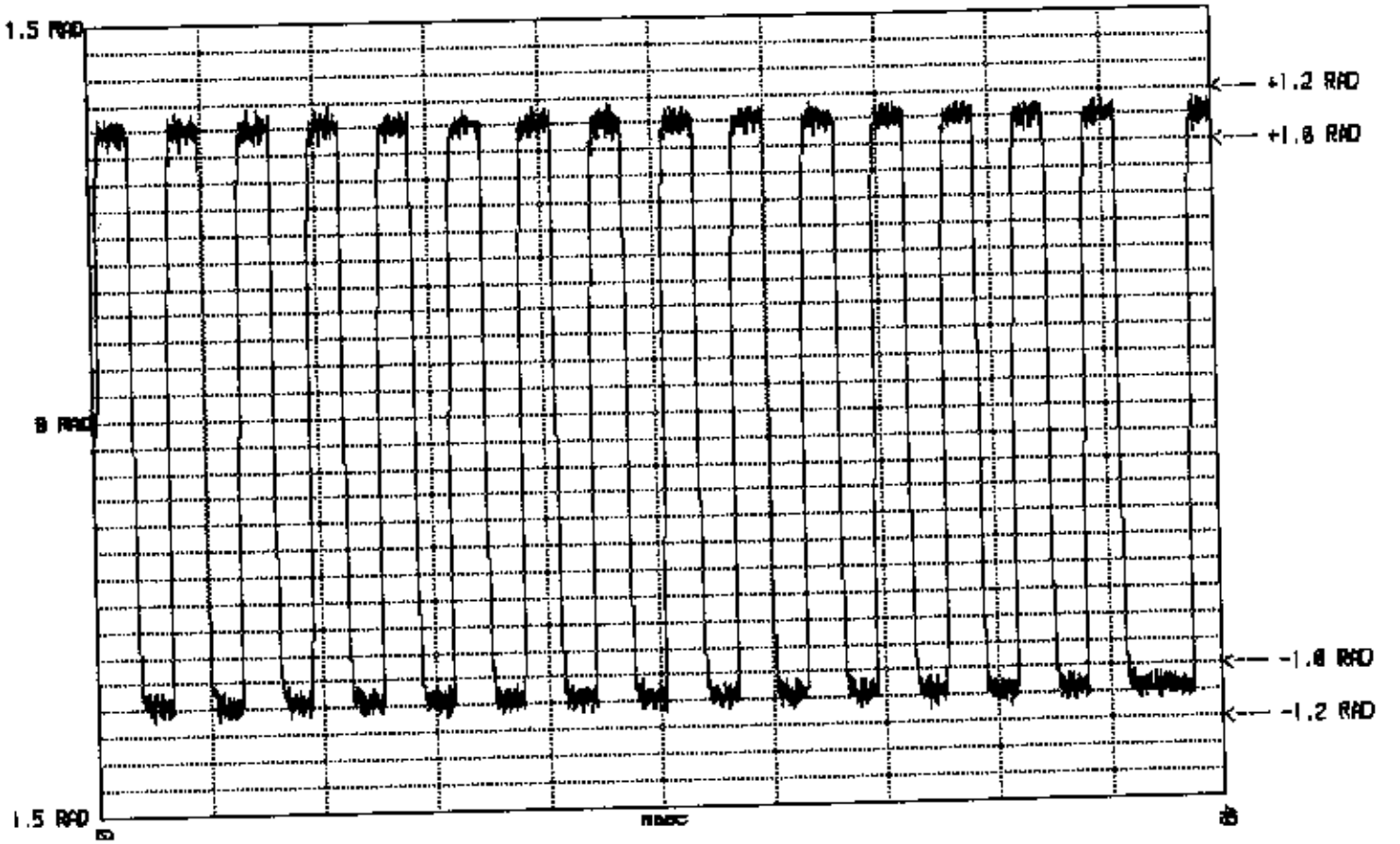
~~MFG: ACR — MODEL NO: PLB100 — SERIAL NO: 3~~

BEACON CERTIFICATION TEST RESULTS - OPEN / SHORT / 3:1 VSWR PERFORMANCE

~~MEASUREMENT DATA: 3 JUN 1999 TIME: 19:18:42~~

TESTED BY: _____ APPROVED BY: _____

PHASE MODULATION vs TIME



SPECIFICATIONS TESTED		LIMITS	RESULTS	UNITS	COMMENTS
Phase modulation:	+ AVG	+1.1 ±0.1	1.11	rad	passed
	- AVG	-1.1 ±0.1	-1.08	rad	passed

Peak positive phase modulation: 1.19 rad
Peak negative phase modulation: -1.15 rad

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - OPEN / SHORT / 3:1 VSWR PERFORMANCE
MEASUREMENT DATE: 5 Jan 1999 TIME: 19:16:28

TESTED BY: _____ APPROVED BY: _____

SPECIFICATIONS TESTED	LIMITS	RESULTS	UNITS	COMMENTS
Nominal transmitted frequency	406.025 ±.002	406.025180	MHz	passed
Short term frequency stability	< 2.0E-9	1.74E-10		passed
Medium term: mean slope	< 1.0E-9	+1.56E-11	/min	passed
residual deviation	< 3.0E-9	3.66E-10		passed
Tx ouput power level	3.15 TO 7.93	6.05	W	passed
Burst envelope: rise time	< 5	.29	ms	passed
fall time	< 5	.04	ms	passed
Phase modulation: + AVG	+1.1 ±0.1	1.11	rad	passed
- AVG	-1.1 ±0.1	-1.08	rad	passed
Modulation: symmetry	< 0.05	.0072		passed
Modulation: rise time	150 ±100	140.2	us	passed
fall time	150 ±100	141.8	us	passed
Repetition period minimum	47.5 TO 52.5	48.5	s	passed
Repetition period maximum	47.5 TO 52.5	52.1	s	passed
Repetition period (max - min)	>1	3.6	s	passed
Total transmission time minimum	514.8 TO 525.2	520.5	ms	passed
Total transmission time maximum	514.8 TO 525.2	520.5	ms	passed
Cw preamble minimum	158.4 TO 161.6	159.1	ms	passed
Cw preamble maximum	158.4 TO 161.6	159.3	ms	passed
Message bit rate minimum	396.0 TO 404.0	398.7	bps	passed
Message bit rate maximum	396.0 TO 404.0	398.9	bps	passed

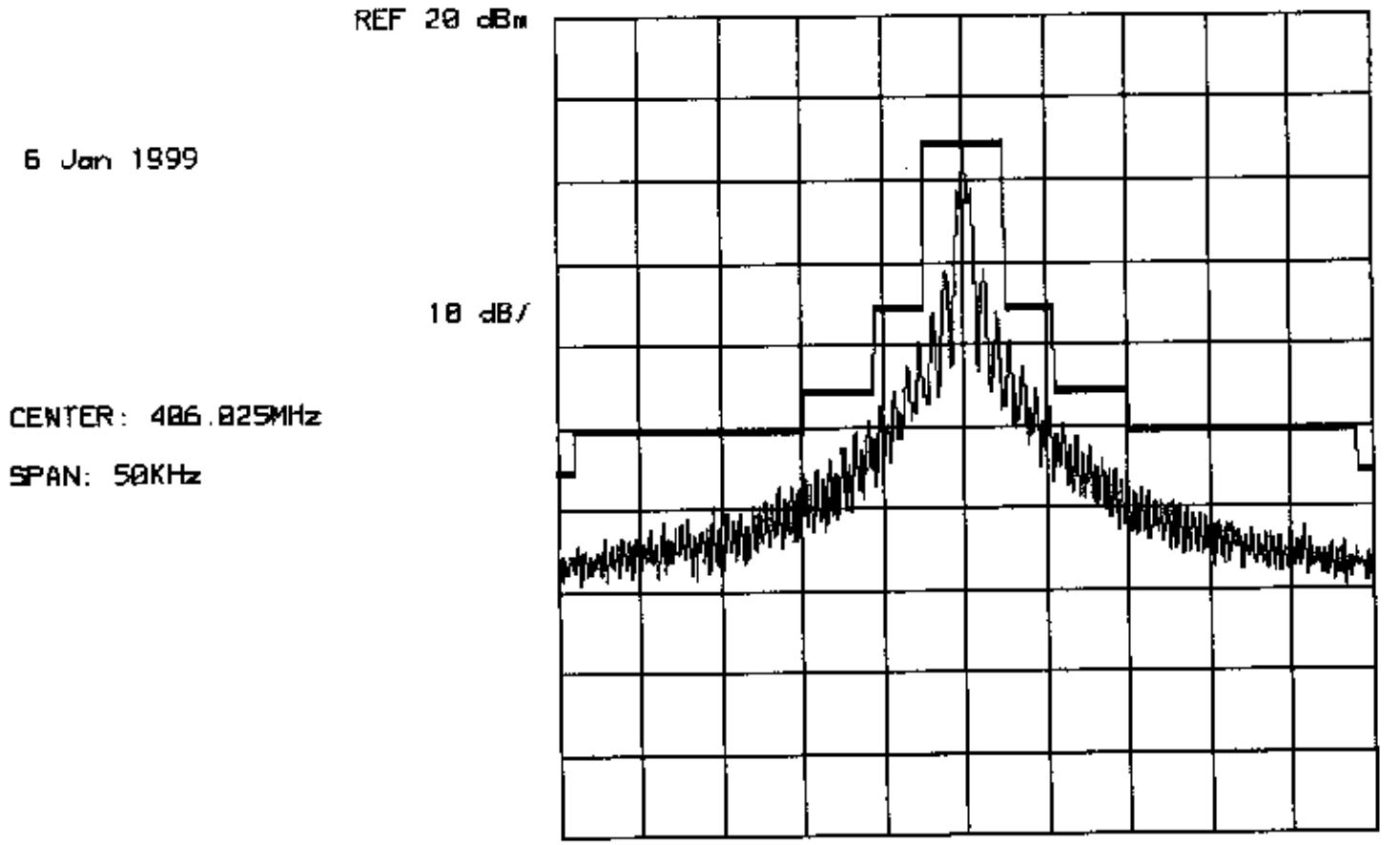
SPURIOUS EMISSIONS

FREQUENCY (MHz)	RESULTS (dBc)	LIMITS (dBc)

*** SPURIOUS TEST OK ***

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - OPEN / SHORT / 3:1 VSWR PERFORMANCE
MEASUREMENT DATE: 6 Jan 1999 TIME: 06:54:40

TESTED BY: _____ APPROVED BY: _____



SPURIOUS EMISSIONS SPECTRUM

MINIMUM TEMPERATURE

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - 406 SIGNAL SPURIOUS EMISSIONS AT MINIMUM TEMP
MEASUREMENT DATE: 6 Jan 1999 TIME: 13:23:41

TESTED BY: _____ APPROVED BY: _____

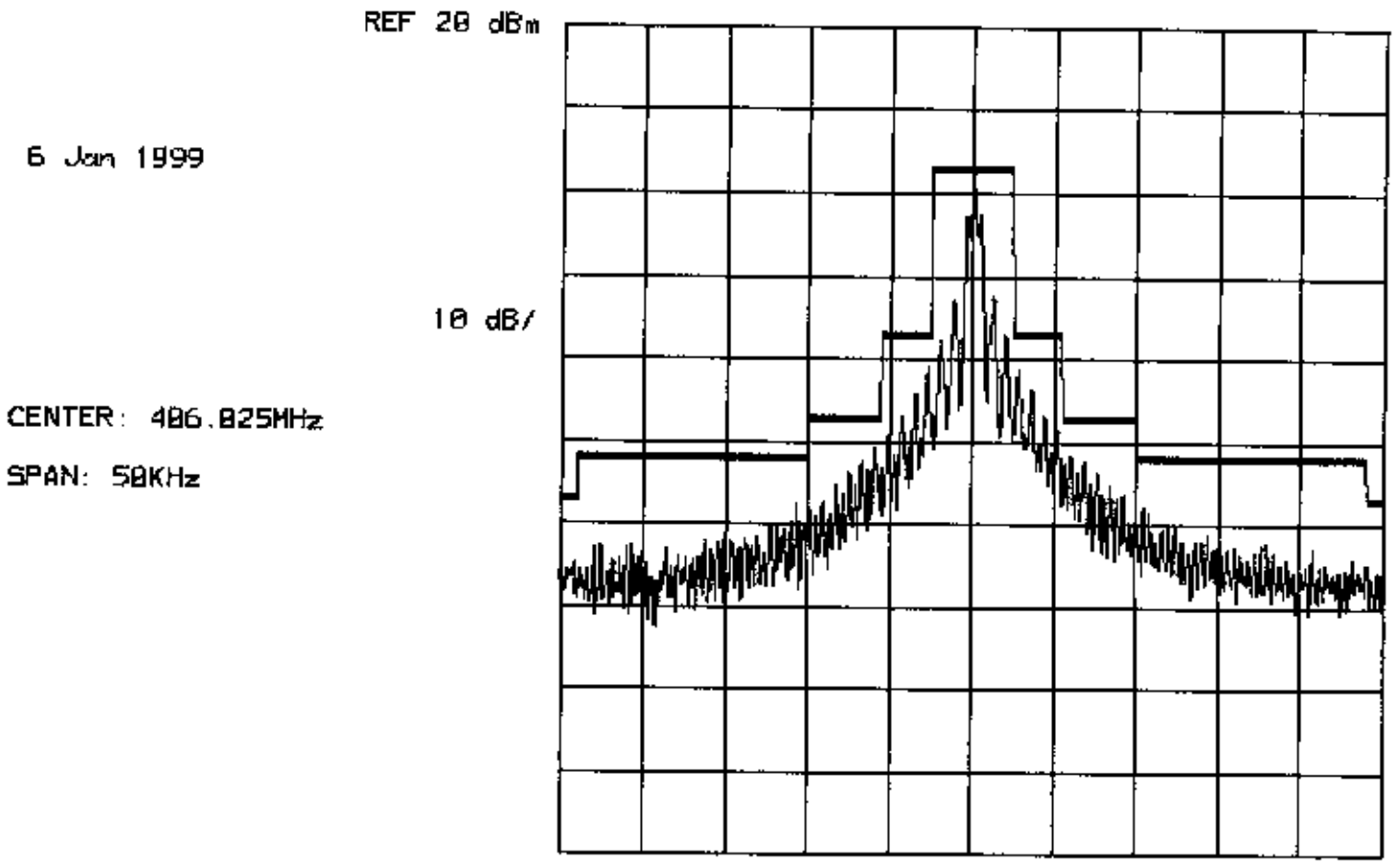
SPURIOUS EMISSIONS

FREQUENCY (MHz)	RESULTS (dBc)	LIMITS (dBc)

*** SPURIOUS TEST OK ***

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - 406 SIGNAL SPURIOUS EMISSIONS AT MINIMUM TEMP
MEASUREMENT DATE: 6 Jan 1999 TIME: 16:43:26

TESTED BY: _____ APPROVED BY: _____



SPURIOUS EMISSIONS SPECTRUM

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - OPEN / SHORT / 3:1 VSWR PERFORMANCE
MEASUREMENT DATE: 6 Jan 1999 TIME: 16:44:24

TESTED BY: _____ APPROVED BY: _____

BEACON DIGITAL MESSAGE VERIFICATION

SYNCHRONIZATION BIT #:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Should be:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Decoded:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

*** BIT SYNCHRONIZATION OK ***

FRAME SYNCHRONIZATION BIT #:	16	17	18	19	20	21	22	23	24
Should be:	0	0	0	1	0	1	1	1	1
Decoded:	0	0	0	1	0	1	1	1	1

*** FRAME SYNCHONIZATION OK ***

MESSAGE TYPE: LONG MESSAGE (bit 25 = 1)

DIGITAL MESSAGE IN HEXADECIMAL: 2 D D C 0 4 8 0 0 6 F F B F F 1 1 C E B 6 B 0 7 C 1 F 5 5

BCH CODE BIT #:	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06
Should be:	0	0	0	1	0	0	0	1	1	1	0	0	1	1	1	0	1	0	1	1	0
Decoded:	0	0	0	1	0	0	0	1	1	1	0	0	1	1	1	0	1	0	1	1	0

*** BCH CODE OK ***

BCH CODE BIT #:	33	34	35	36	37	38	39	40	41	42	43	44
	1	1	1	1	1	1	1	1	1	1	1	1
Should be:	1	0	1	0	1	0	1	0	1	0	0	0
Decoded:	1	0	1	0	1	0	1	0	1	0	0	0

*** BCH CODE OK ***

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - OPEN / SHORT / 3:1 VSWR PERFORMANCE
MEASUREMENT DATE: 6 Jan 1999 TIME: 17:18:22

TESTED BY: _____ APPROVED BY: _____

DIGITAL MESSAGE IN BINARY:

BIT NUMBER:

1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	1	1	1	1	1	0	0	1	0	1	1	0	1	1	1

BIT NUMBER:

4	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7	7
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1

BIT NUMBER:

8	8	8	8	8	8	8	8	8	8	9	9	9	9	9	9	9	9	9	9	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1	1	1	1	1	1	0	0	0	1	0	0	0	1	1	1	0	0	1	1	1	0	1	0	1	1	0	1	1	0	1	0	1	1	0	0	0	0	0	1

BIT NUMBER:

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	4	4	4	4	4	
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4
1	1	1	1	0	0	0	0	0	1	1	1	1	1	0	1	0	1	0	1	0	1	0	0	0

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - OPEN / SHORT / 3:1 VSWR PERFORMANCE
MEASUREMENT DATE: 6 Jan 1999 TIME: 17:18:23

TESTED BY: _____ APPROVED BY: _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 000000100100000000000011
Reported Latitude: N127.75
Reported Longitude: E255.75
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

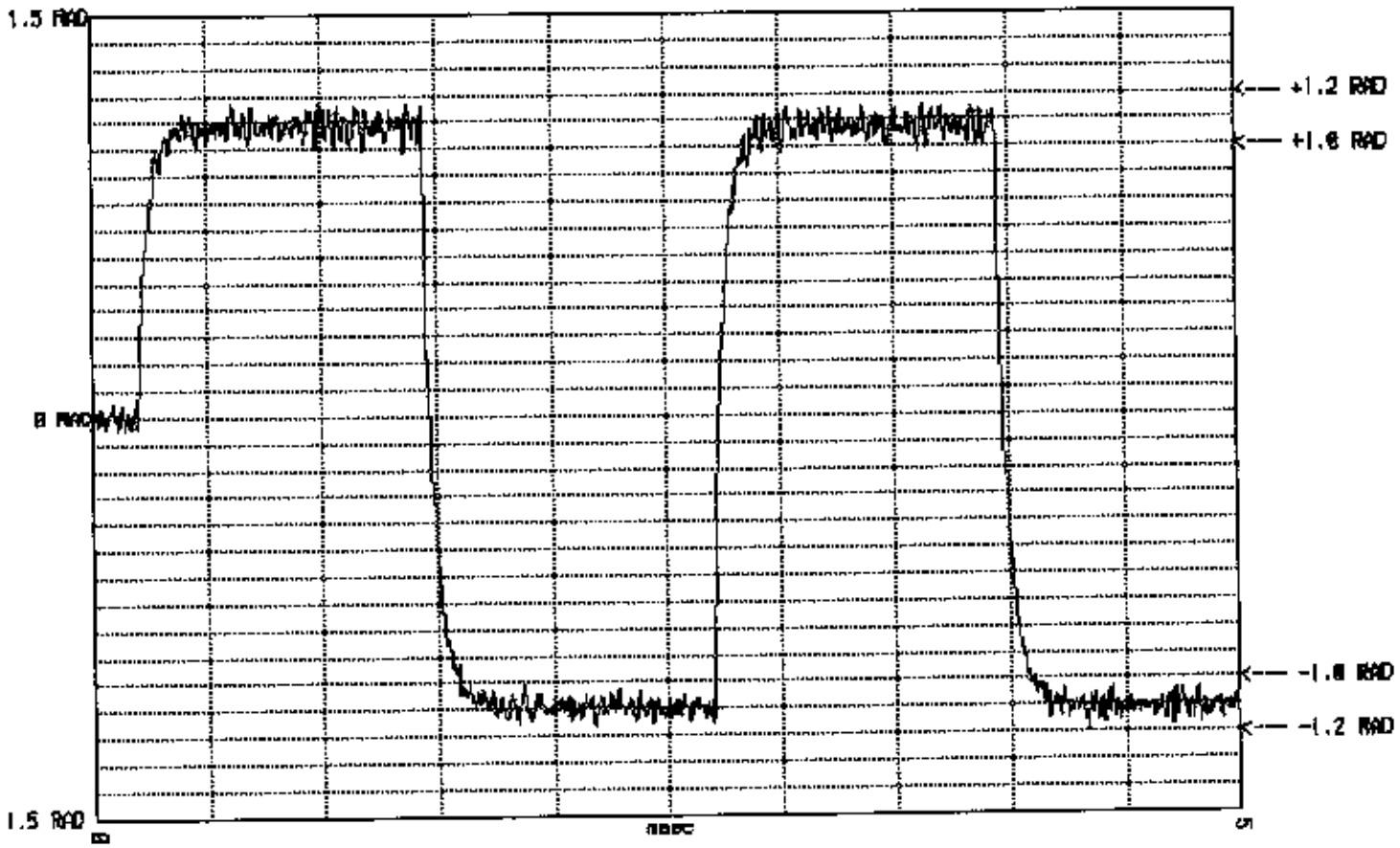
Delta Latitude (min): 0
Delta Latitude (sec): 60
Delta Longitude (min): 0
Delta Longitude (sec): 60

Corrected latitude: N127.75 1 0
Corrected longitude: E255.75 1 0

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - OPEN / SHORT / 3:1 VSWR PERFORMANCE
MEASUREMENT DATE: 6 Jan 1999 TIME: 17:18:24

TESTED BY: _____ APPROVED BY: _____

PHASE MODULATION vs TIME

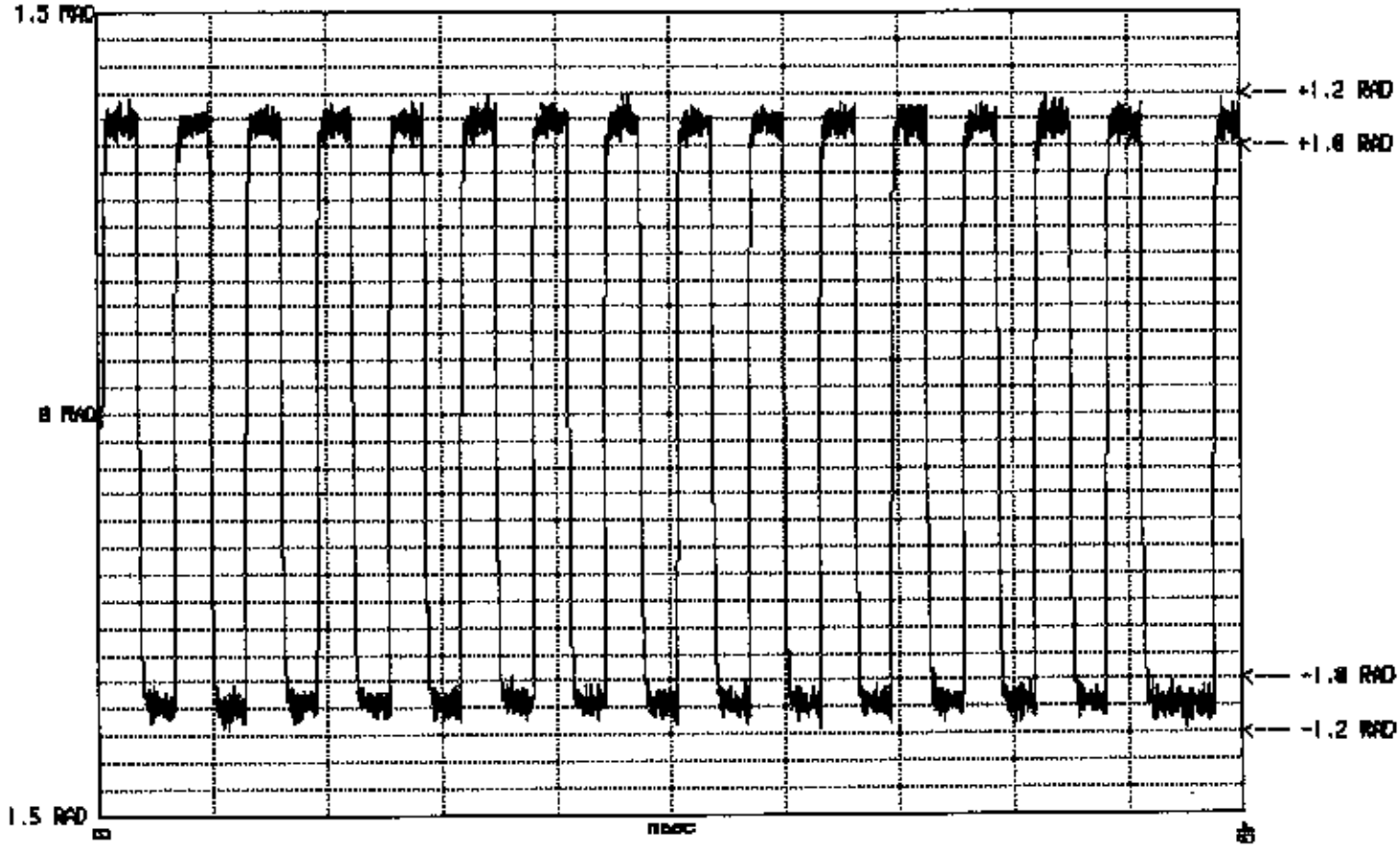


SPECIFICATIONS TESTED	LIMITS	RESULTS	UNITS	COMMENTS
Modulation: symmetry	< 0.05	.0054		passed
Modulation: rise time	150 ±100	141.6	us	passed
fall time	150 ±100	148.5	us	passed

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - OPEN / SHORT / 3:1 VSWR PERFORMANCE
MEASUREMENT DATE: 6 Jan 1999 TIME: 17:20:03

TESTED BY: _____ APPROVED BY: _____

PHASE MODULATION vs TIME



SPECIFICATIONS TESTED		LIMITS	RESULTS	UNITS	COMMENTS
Phase modulation:	+ AVG	+1.1 ±0.1	1.09	rad	passed
	- AVG	-1.1 ±0.1	-1.08	rad	passed

Peak positive phase modulation: 1.20 rad
Peak negative phase modulation: -1.18 rad

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - OPEN / SHORT / 3:1 VSWR PERFORMANCE
MEASUREMENT DATE: 6 Jan 1999 / TIME: 17:21:42

TESTED BY: _____ **APPROVED BY:** _____

SPECIFICATIONS TESTED	LIMITS	RESULTS	UNITS	COMMENTS
Nominal transmitted frequency	406.025 ±.002	406.025205	MHz	passed
Short term frequency stability	< 2.0E-9	2.75E-10		passed
Medium term: mean slope	< 1.0E-9	-1.34E-10	/min	passed
residual deviation	< 3.0E-9	4.29E-10		passed
Tx ouput power level	3.15 TO 7.93	4.27	W	passed
Burst envelope: rise time	< 5	.45	ms	passed
fall time	< 5	.03	ms	passed
Phase modulation: + AVG	+1.1 ±0.1	1.09	rad	passed
- AVG	-1.1 ±0.1	-1.08	rad	passed
Modulation: symmetry	< 0.05	.0054		passed
Modulation: rise time	150 ±100	141.6	us	passed
fall time	150 ±100	148.5	us	passed
Repetition period minimum	47.5 TO 52.5	48.5	s	passed
Repetition period maximum	47.5 TO 52.5	52.0	s	passed
Repetition period (max - min)	>1	3.5	s	passed
Total transmission time minimum	514.8 TO 525.2	520.2	ms	passed
Total transmission time maximum	514.8 TO 525.2	520.2	ms	passed
Cw preamble minimum	158.4 TO 161.6	158.8	ms	passed
Cw preamble maximum	158.4 TO 161.6	159.0	ms	passed
Message bit rate minimum	396.0 TO 404.0	398.6	bps	passed
Message bit rate maximum	396.0 TO 404.0	399.0	bps	passed

MAXIMUM TEMPERATURE

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - 406 SIGNAL SPURIOUS EMISSIONS AT MAXIMUM TEMP
MEASUREMENT DATE: 6 Jan 1999 TIME: 07:58:02

TESTED BY: _____ APPROVED BY: _____

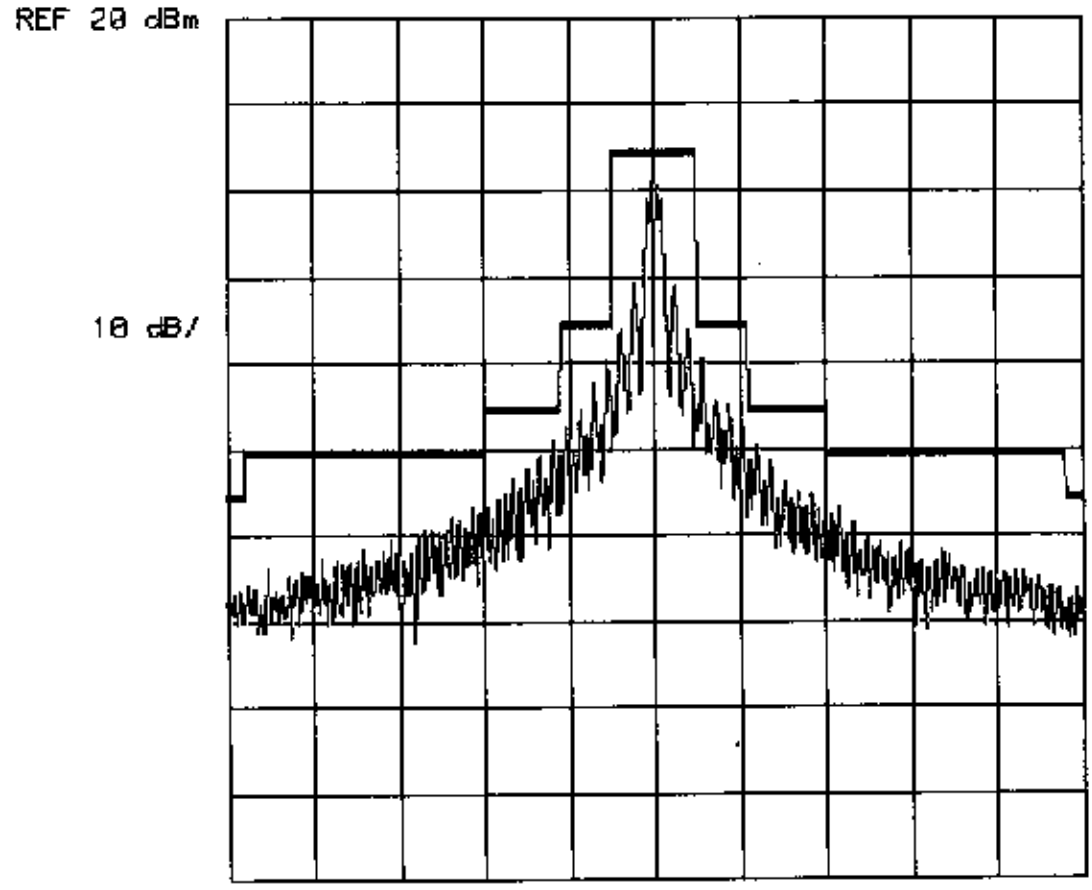
SPURIOUS EMISSIONS

FREQUENCY (MHz)	RESULTS (dBc)	LIMITS (dBc)

*** SPURIOUS TEST OK ***

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - 406 SIGNAL SPURIOUS EMISSIONS AT MAXIMUM TEMP
MEASUREMENT DATE: 6 Jan 1999 TIME: 11:03:48

TESTED BY: _____ APPROVED BY: _____



SPURIOUS EMISSIONS SPECTRUM

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - OPEN / SHORT / 3:1 VSWR PERFORMNACE AT MAXIMUM TEMP
MEASUREMENT DATE: 6 Jan 1999 TIME: 11:04:49

TESTED BY: _____ APPROVED BY: _____

BEACON DIGITAL MESSAGE VERIFICATION

SYNCHRONIZATION BIT #:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Should be:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Decoded:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

*** BIT SYNCHRONIZATION OK ***

FRAME SYNCHRONIZATION BIT #:	16	17	18	19	20	21	22	23	24
Should be:	0	0	0	1	0	1	1	1	1
Decoded:	0	0	0	1	0	1	1	1	1

*** FRAME SYNCHONIZATION OK ***

MESSAGE TYPE: LONG MESSAGE (bit 25 = 1)

DIGITAL MESSAGE IN HEXADECIMAL: 2 D D C 0 4 8 0 0 6 F F B F F 1 1 C E B 6 B 0 7 C 1 F 5 5

BCH CODE BIT #:	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06
Should be:	0	0	0	1	0	0	0	1	1	1	0	0	1	1	1	0	1	0	1	1	0
Decoded:	0	0	0	1	0	0	0	1	1	1	0	0	1	1	1	0	1	0	1	1	0

*** BCH CODE OK ***

BCH CODE BIT #:	33	34	35	36	37	38	39	40	41	42	43	44
Should be:	1	0	1	0	1	0	1	0	1	0	0	0
Decoded:	1	0	1	0	1	0	1	0	1	0	0	0

*** BCH CODE OK ***

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - OPEN / SHORT / 3:1 VSWR PERFORMNACE AT MAXIMUM TEMP
MEASUREMENT DATE: 6 Jan 1999 TIME: 11:39:35

TESTED BY: _____ APPROVED BY: _____

DIGITAL MESSAGE IN BINARY:

BIT NUMBER:

1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	1	1	1	1	0	0	1	0	1	1	0	1	1	1	1

BIT NUMBER:

4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7	7
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1

BIT NUMBER:

8	8	8	8	8	8	8	8	8	8	9	9	9	9	9	9	9	9	9	9	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
1	1	1	1	1	1	0	0	0	1	0	0	0	1	1	1	0	0	1	1	1	0	1	0	1	1	0	1	1	0	1	0	1	1	0	0	0	0	0	1

BIT NUMBER:

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	4	4	4	4	4			
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4
1	1	1	1	0	0	0	0	0	1	1	1	1	1	0	1	0	1	0	1	0	1	0	0	0

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - OPEN / SHORT / 3:1 VSWR PERFORMNACE AT MAXIMUM TEMP
MEASUREMENT DATE: 6 Jan 1999 TIME: 11:39:36

TESTED BY: _____ **APPROVED BY:** _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 000000100100000000000011
Reported Latitude: N127.75
Reported Longitude: E255.75
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

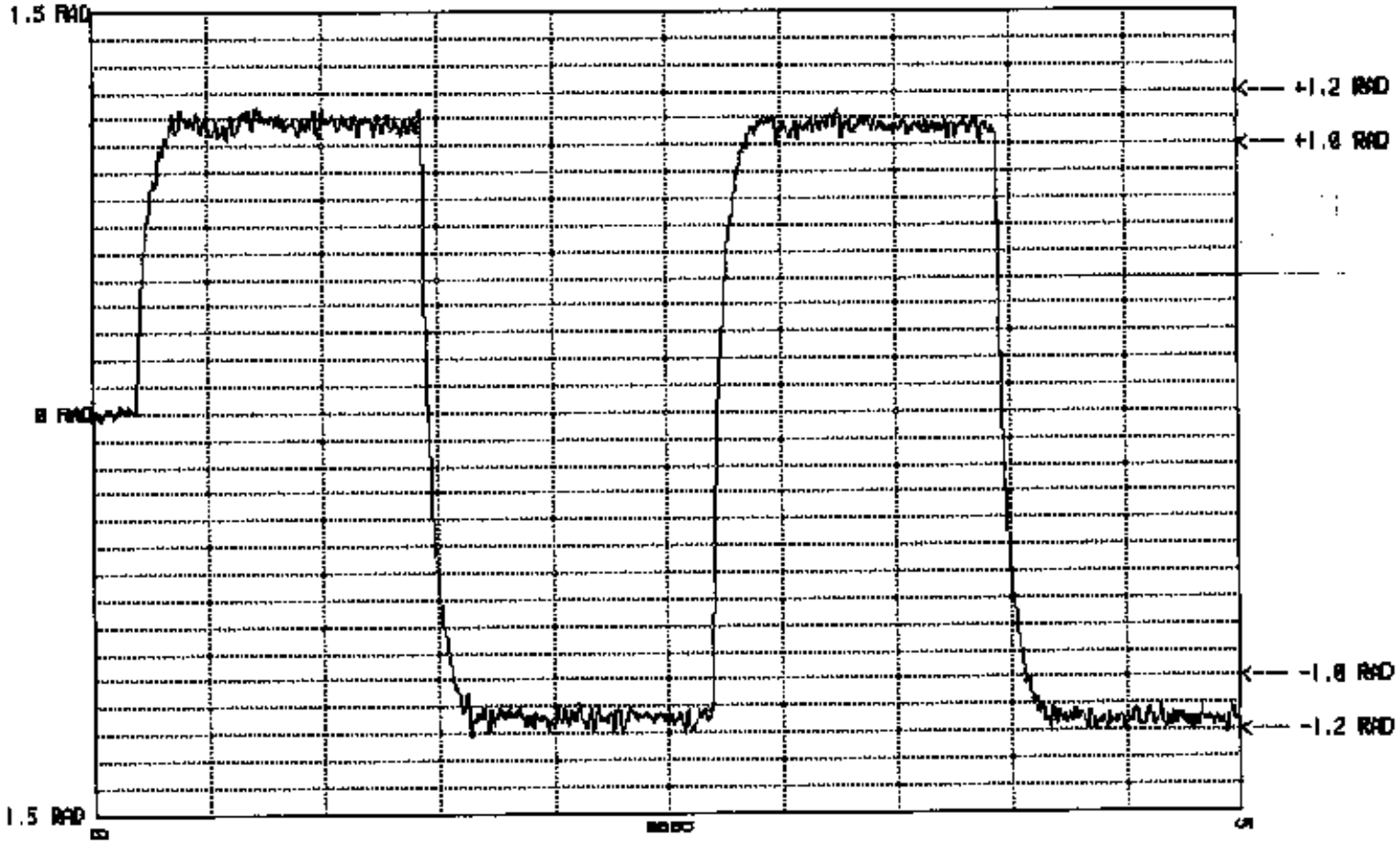
Delta Latitude (min): 0
Delta Latitude (sec): 60
Delta Longitude (min): 0
Delta Longitude (sec): 60

Corrected latitude: N127.75 1 0
Corrected longitude: E255.75 1 0

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - OPEN / SHORT / 3:1 VSWR PERFORMNACE AT MAXIMUM TEMP
MEASUREMENT DATE: 6 Jan 1999 TIME: 11:39:37

TESTED BY: _____ APPROVED BY: _____

PHASE MODULATION vs TIME



SPECIFICATIONS TESTED	LIMITS	RESULTS	UNITS	COMMENTS
Modulation: symmetry	< 0.05	.0024		passed
Modulation: rise time	150 ±100	130.2	us	passed
fall time	150 ±100	139.8	us	passed

WEBB ELECTRONIC PROVING [illegible] AREA, FORT HUACHUCA, ARIZONA

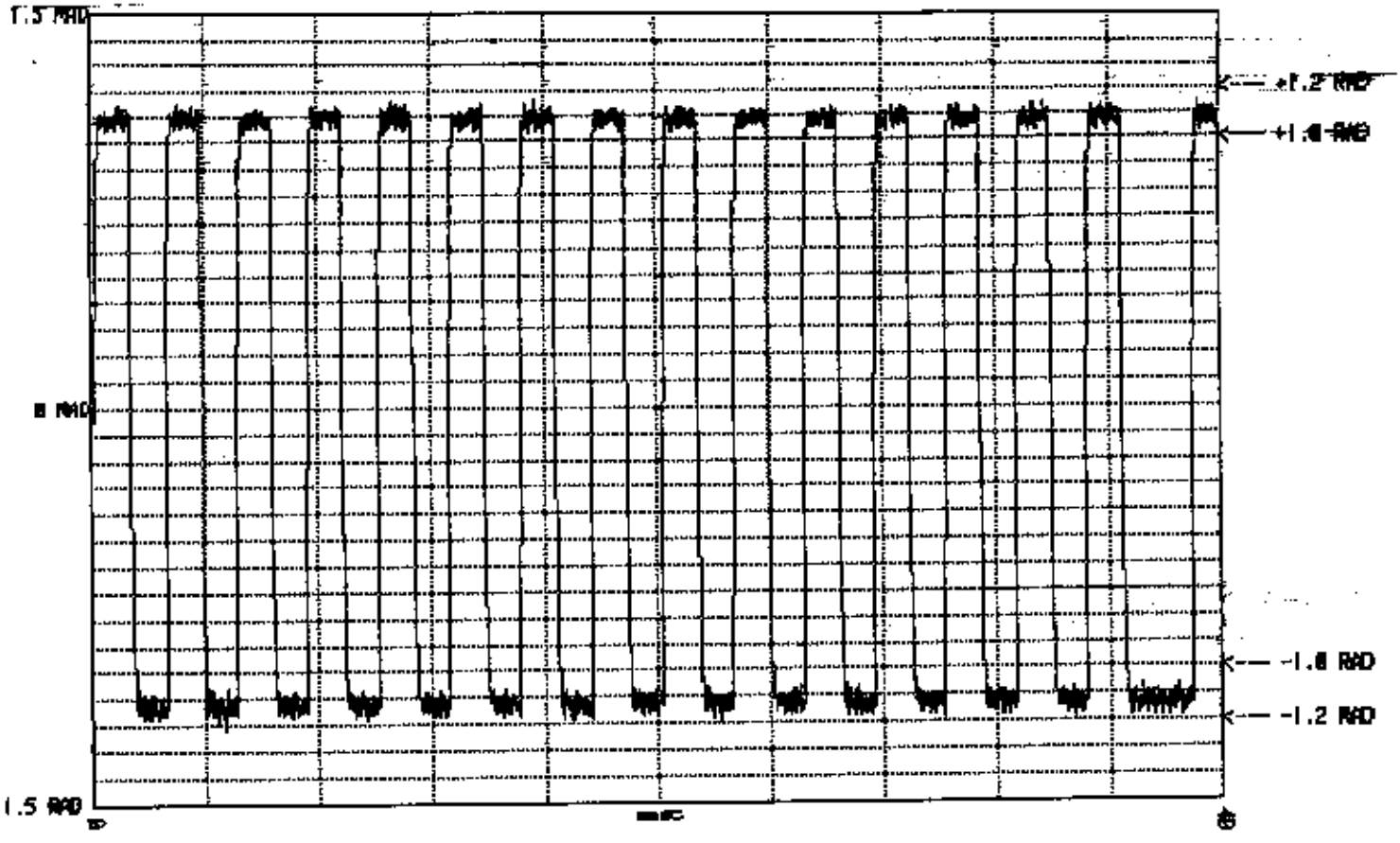
MANU: ACR [illegible] SERIAL NO: 3

BEACON CERTIFICATION TEST RESULTS - OPEN / [illegible] / 3:1 VSWR BEHIND/BACK AT MAXIMUM T[illegible]

MEASUREMENT DATE: 6 Jan 1999 TIME: 11:4[illegible]

TESTED BY: _____ APPROVED BY: _____

PHASE MODULATION vs TIME



SPECIFICATIONS TESTED		LIMITS	RESULTS	UNITS	COMMENTS
Phase modulation:	+ AVG	+1.1 ±0.1	1.09	rad	passed
	- AVG	-1.1 ±0.1	-1.13	rad	passed

Peak positive phase modulation: 1.17 rad
Peak negative phase modulation: -1.22 rad

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - OPEN / SHORT / 3:1 VSWR PERFORMNACE AT MAXIMUM TEMP
MEASUREMENT DATE: 6 Jan 1999 TIME: 11:42:56

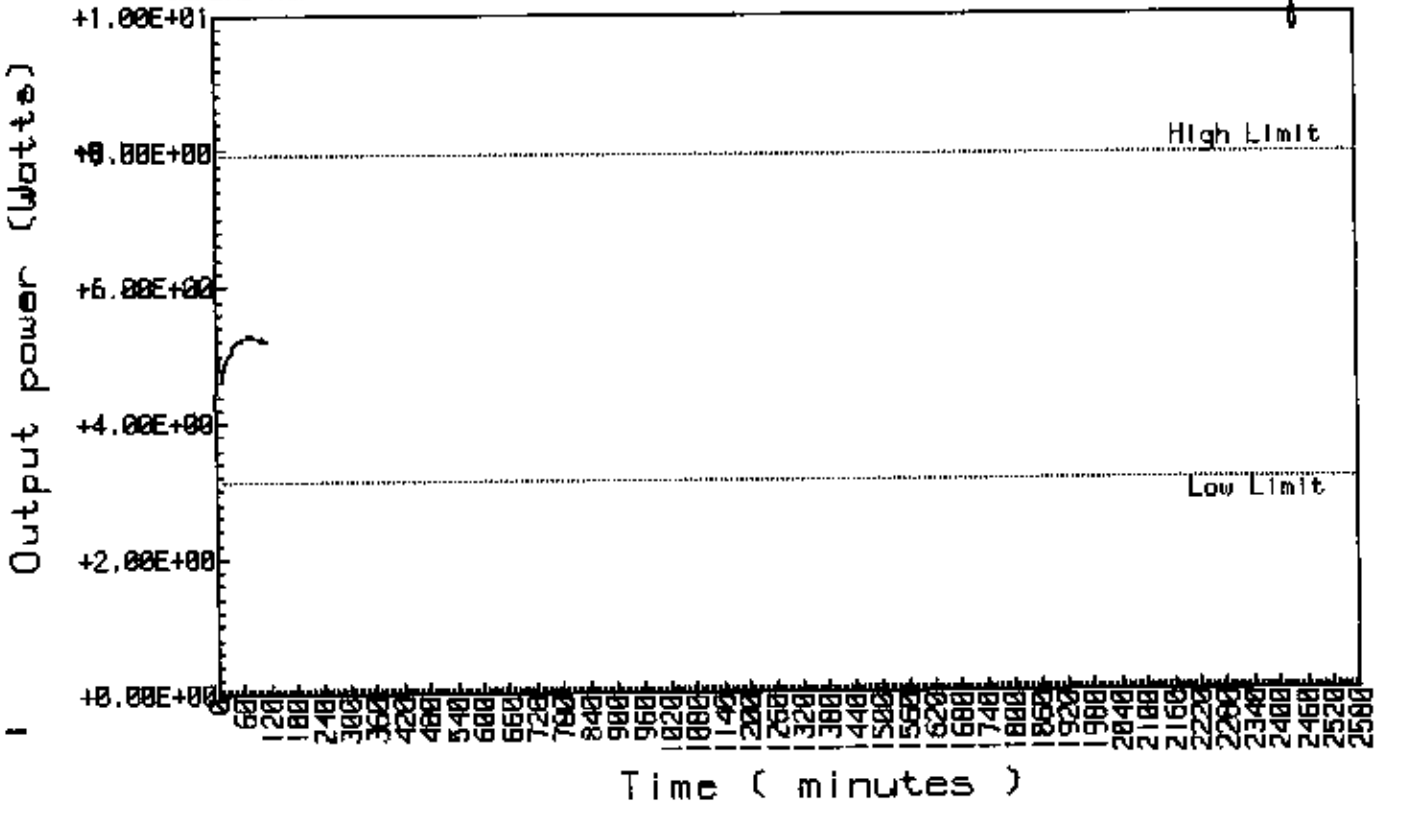
TESTED BY: _____ **APPROVED BY:** _____

SPECIFICATIONS TESTED	LIMITS	RESULTS	UNITS	COMMENTS
Nominal transmitted frequency	406.025 ±.002	406.025173	MHz	passed
Short term frequency stability	< 2.0E-9	1.70E-10		passed
Medium term: mean slope	< 1.0E-9	-9.02E-11	/min	passed
residual deviation	< 3.0E-9	5.69E-10		passed
Tx ouput power level	3.15 TO 7.93	5.91	W	passed
Burst envelope: rise time	< 5	.14	ms	passed
fall time	< 5	.05	ms	passed
Phase modulation: + AVG	+1.1 ±0.1	1.09	rad	passed
- AVG	-1.1 ±0.1	-1.13	rad	passed
Modulation: symmetry	< 0.05	.0024		passed
Modulation: rise time	150 ±100	130.2	us	passed
fall time	150 ±100	139.8	us	passed
Repetition period minimum	47.5 TO 52.5	48.4	s	passed
Repetition period maximum	47.5 TO 52.5	52.1	s	passed
Repetition period (max - min)	>1	3.6	s	passed
Total transmission time minimum	514.8 TO 525.2	521.4	ms	passed
Total transmission time maximum	514.8 TO 525.2	521.5	ms	passed
Cw preamble minimum	158.4 TO 161.6	160.2	ms	passed
Cw preamble maximum	158.4 TO 161.6	160.2	ms	passed
Message bit rate minimum	396.0 TO 404.0	398.9	bps	passed
Message bit rate maximum	396.0 TO 404.0	399.0	bps	passed

THERMAL SHOCK TEST
406 SIGNAL OUTPUT POWER

MANUFACTURER: ACR
MODEL NUMBER: PLB100
SERIAL NUMBER: 3

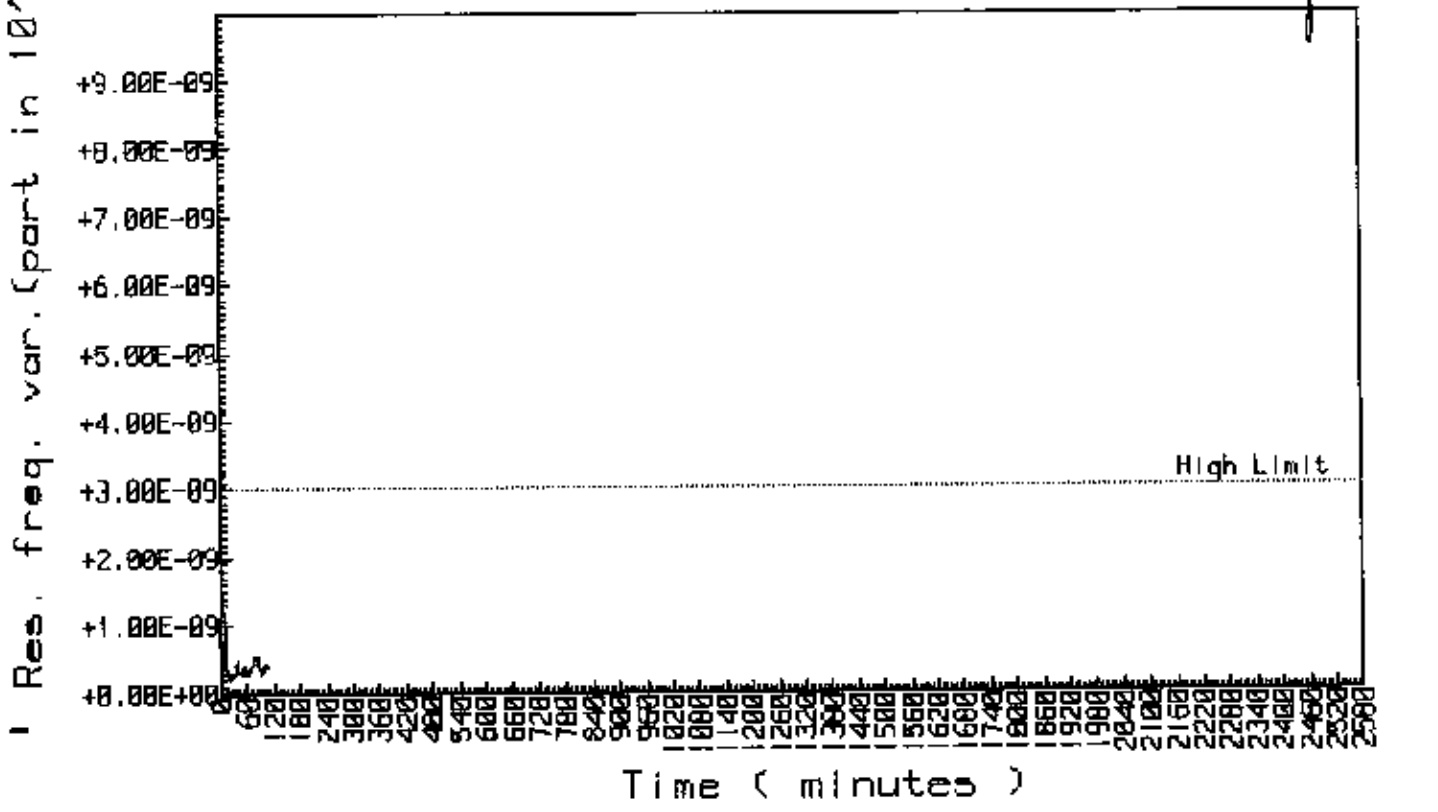
DATE: 9 Jan 1999
TESTED BY:
APPROVED :



THERMAL SHOCK TEST
BEACON MEDIUM TERM STABILITY

MANUFACTURER: ACR
MODEL NUMBER: PLB100
SERIAL NUMBER: 3

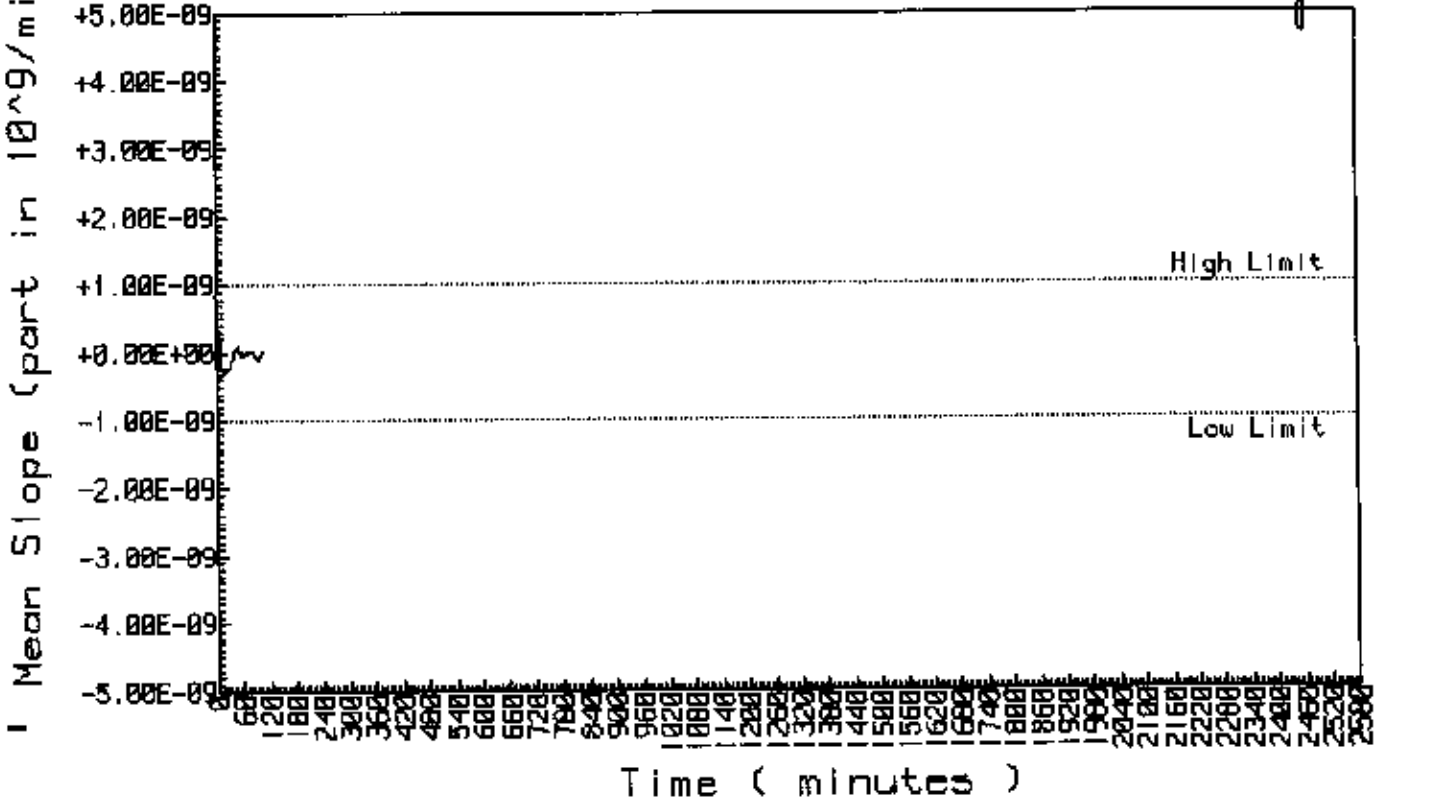
DATE: 9 Jan 1999
TESTED BY: _____
APPROVED : _____



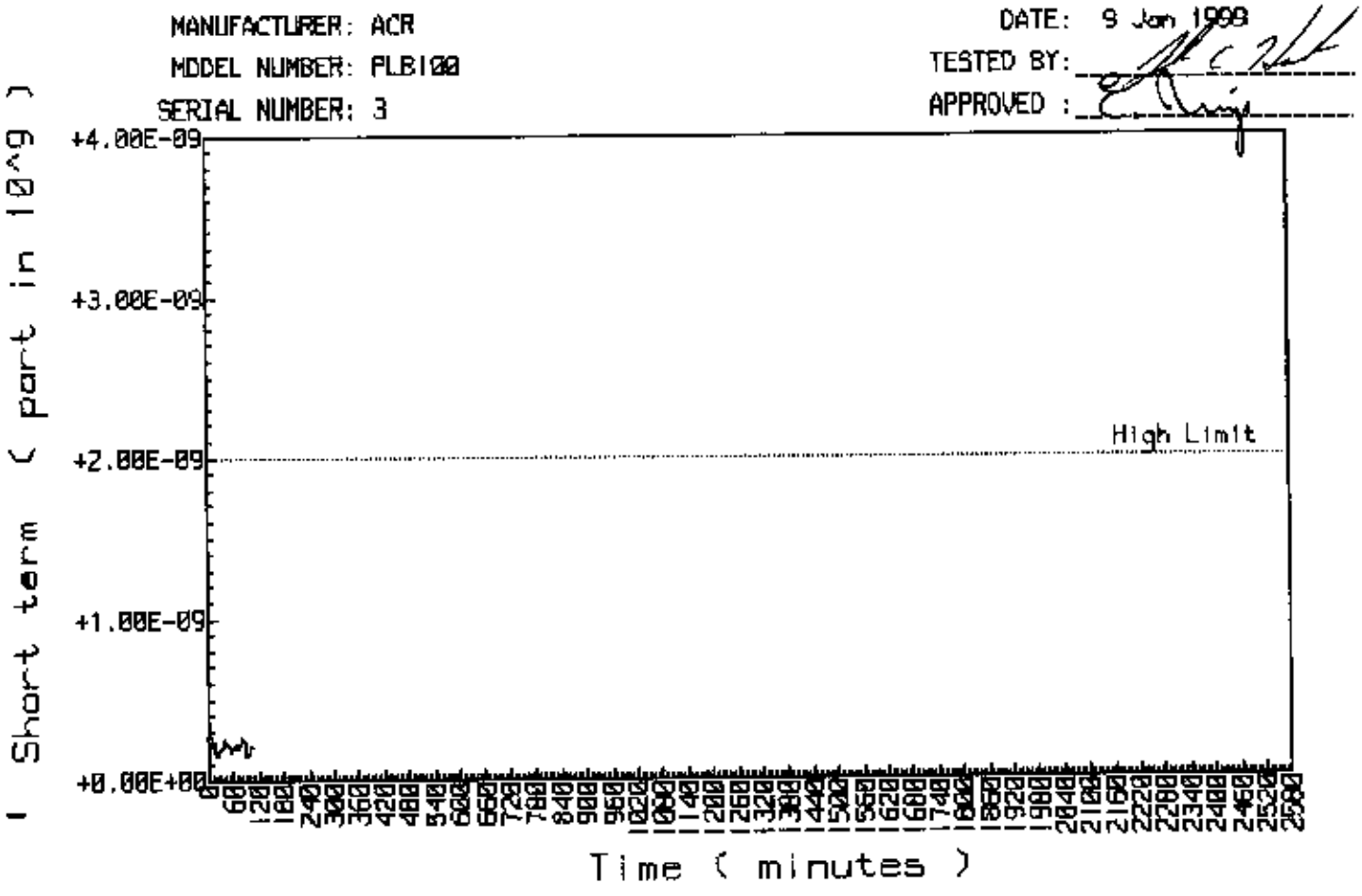
THERMAL SHOCK TEST
BEACON MEDIUM TERM STABILITY

MANUFACTURER: ACR
MODEL NUMBER: PLB100
SERIAL NUMBER: 3

DATE: 9 Jan 1999
TESTED BY:
APPROVED :



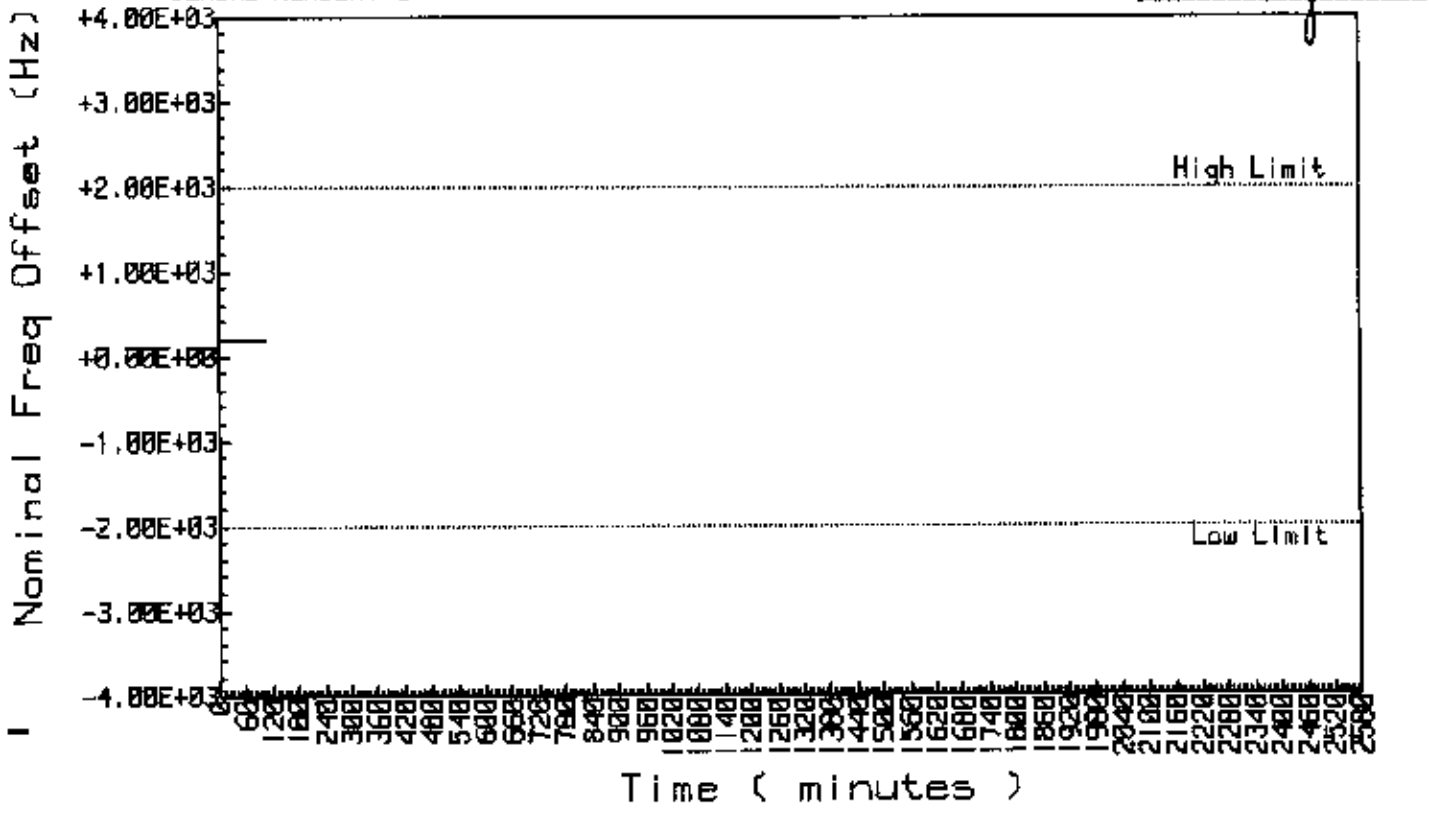
THERMAL SHOCK TEST
BEACON SHORT TERM STABILITY



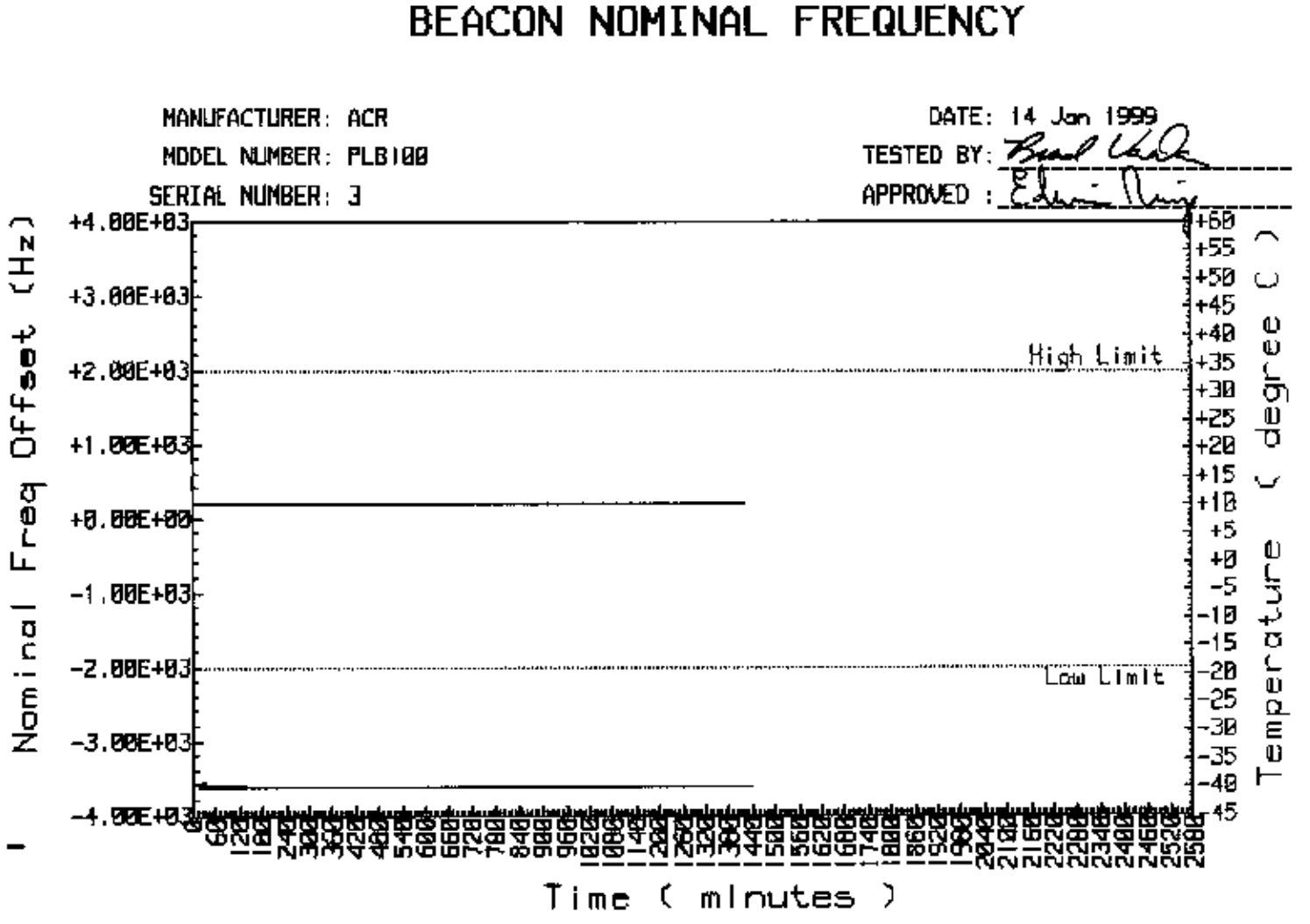
THERMAL SHOCK TEST
BEACON NOMINAL FREQUENCY

MANUFACTURER: ACR
MODEL NUMBER: PLB100
SERIAL NUMBER: 3

DATE: 9 Jan 1999
TESTED BY:
APPROVED :



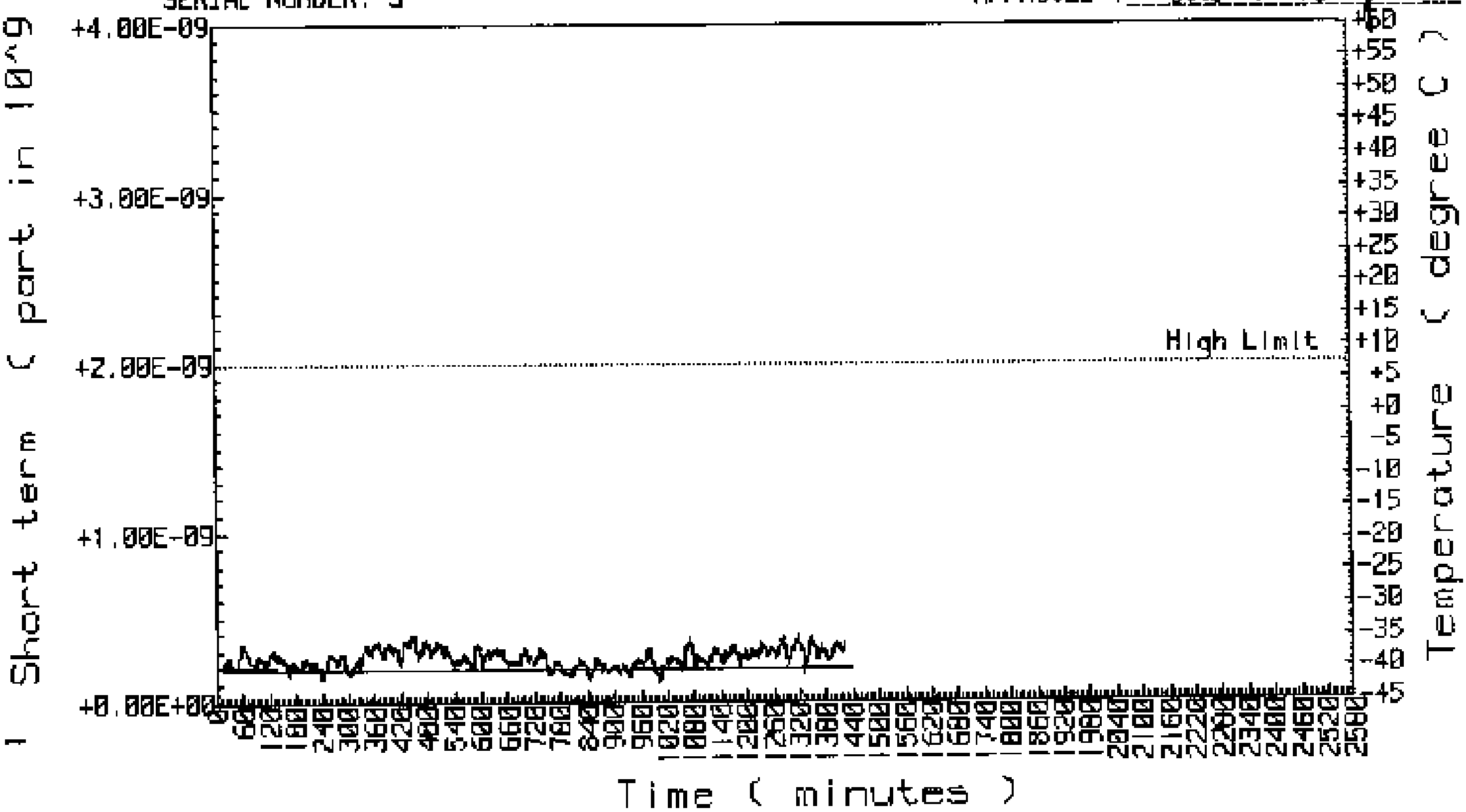
ANNEX C. OPERATING LIFETIME AT MINIMUM TEMPERATURE



BEACON SHORT TERM STABILITY

MANUFACTURER: ACR
MODEL NUMBER: PLB100
SERIAL NUMBER: 3

DATE: 14 Jan 1999
TESTED BY: ____________
APPROVED : ____________



BEACON MEDIUM TERM STABILITY

MANUFACTURER: ACR

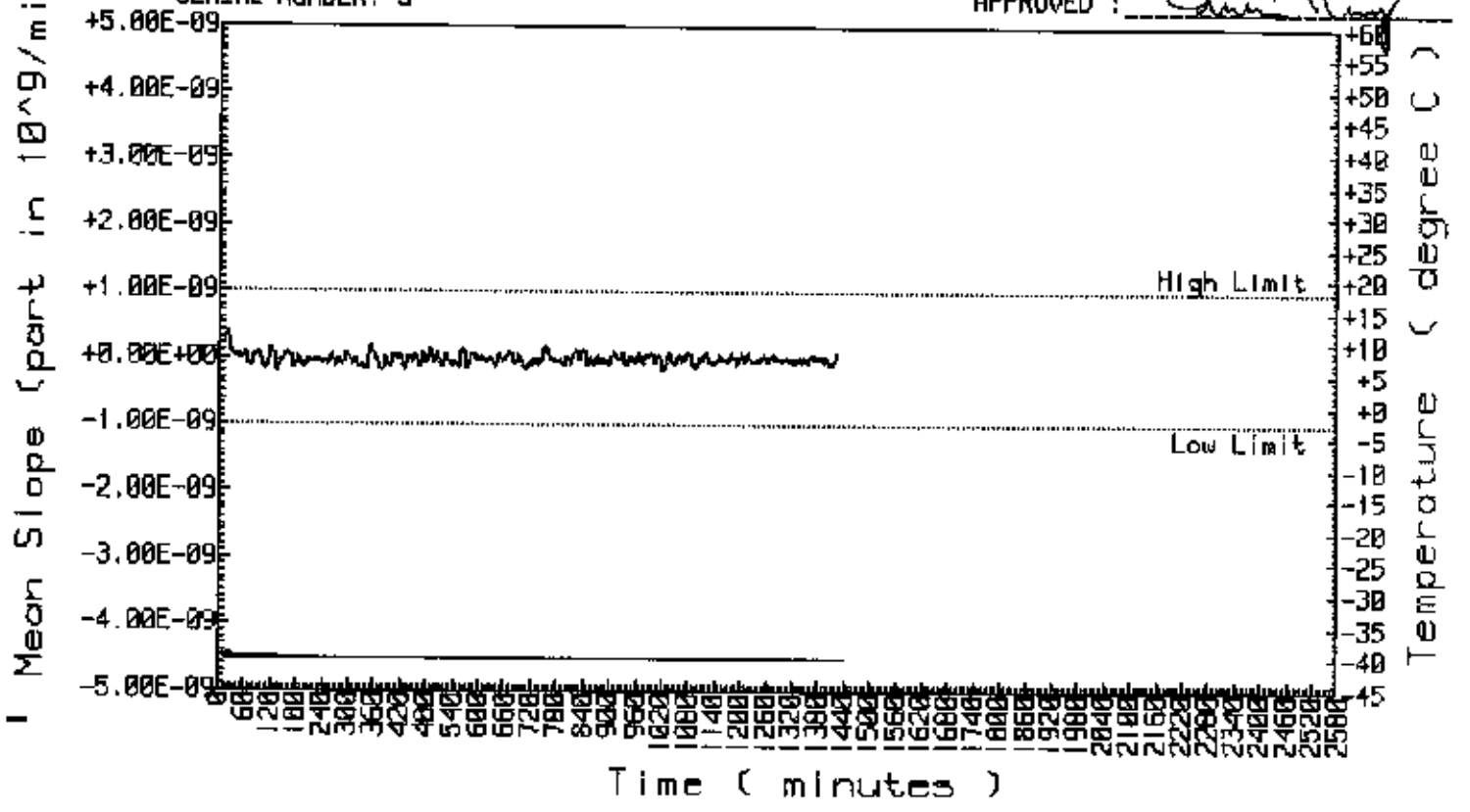
MODEL NUMBER: PLB100

SERIAL NUMBER: 3

DATE: 14 Jan 1999

TESTED BY: Brad Ward

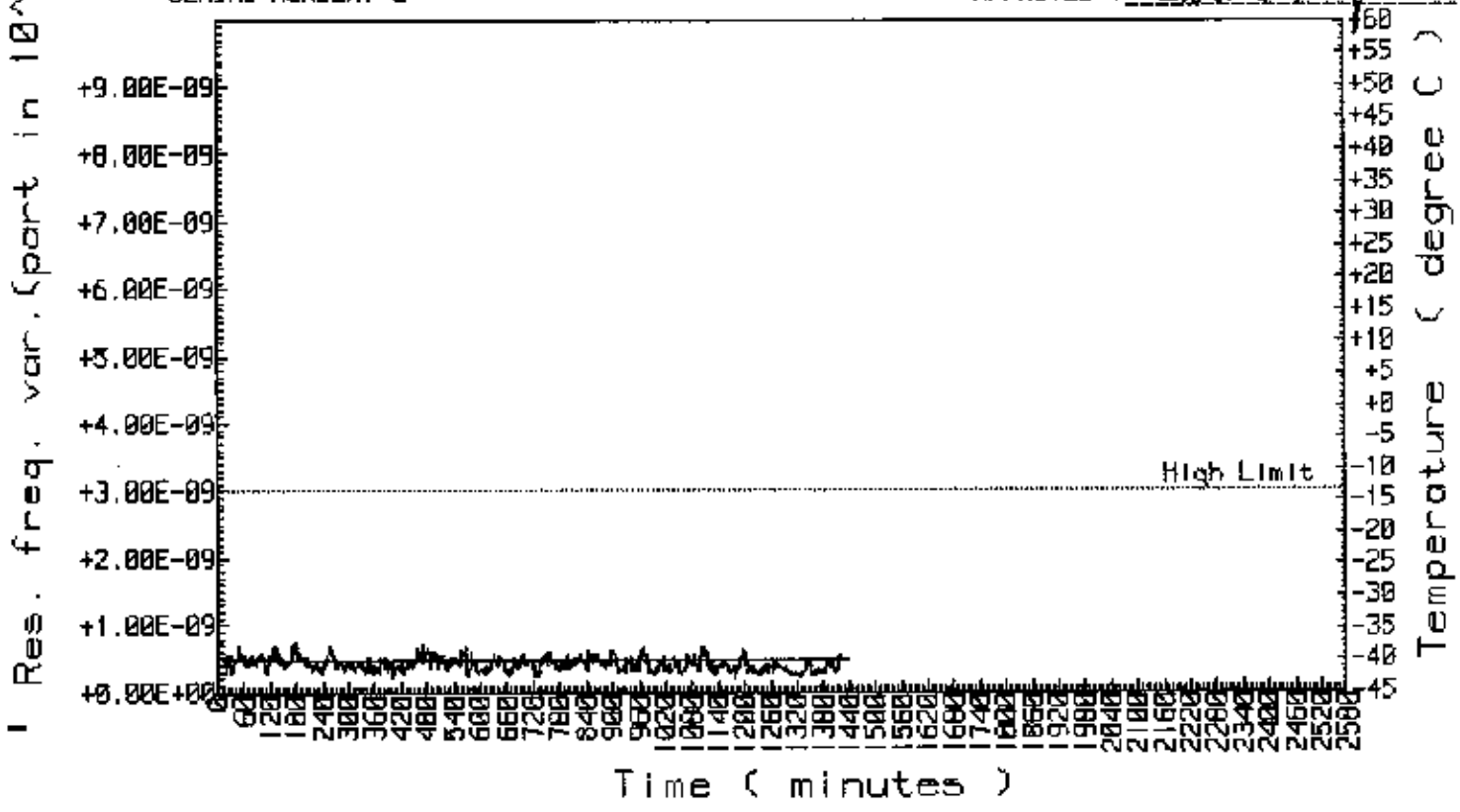
APPROVED : Edwin Ivey



BEACON MEDIUM TERM STABILITY

MANUFACTURER: ACR
MODEL NUMBER: PLB100
SERIAL NUMBER: 3

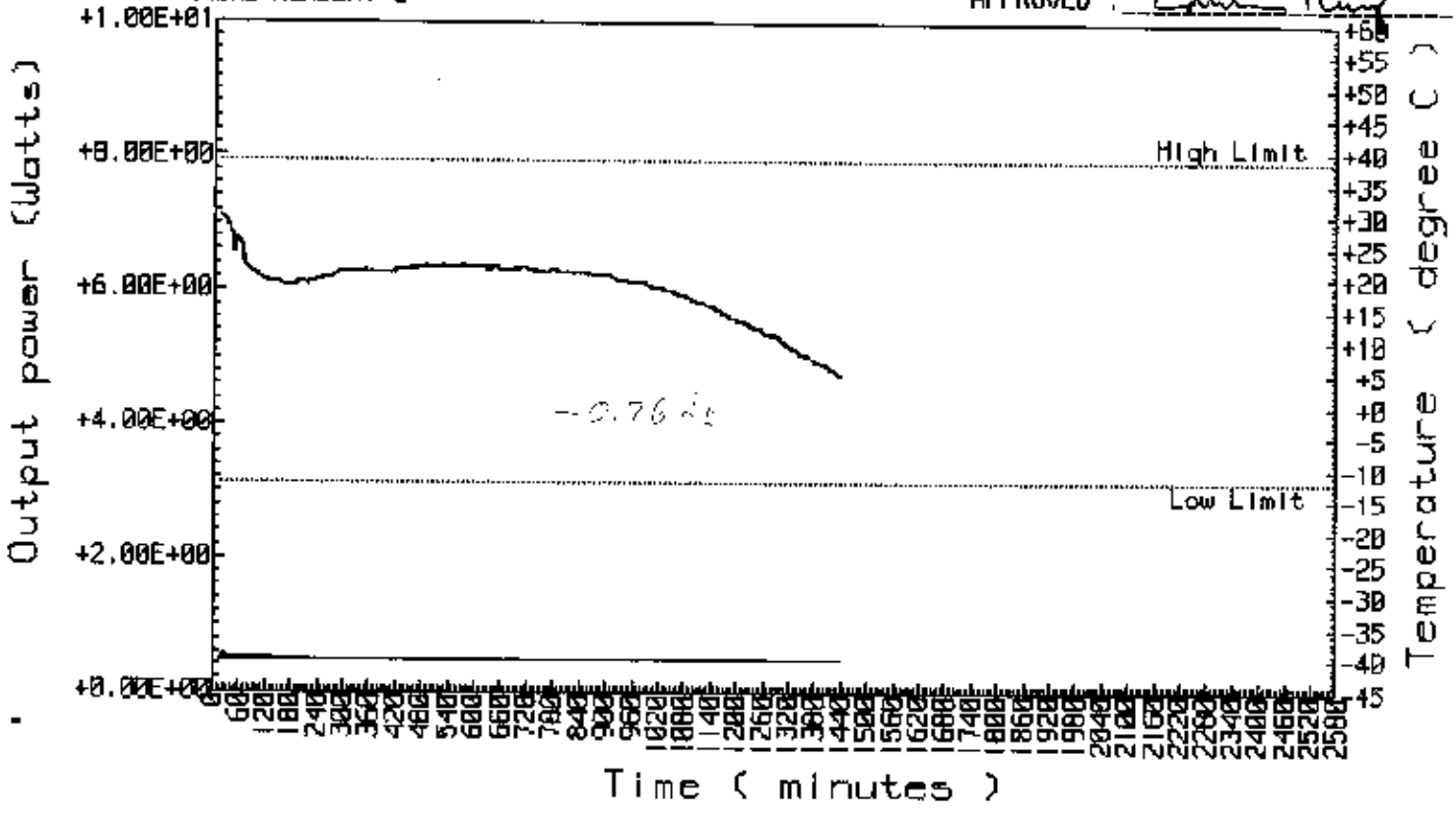
DATE: 14 Jan 1999
TESTED BY: Brad Van Dyke
APPROVED : Edwin Kuntz



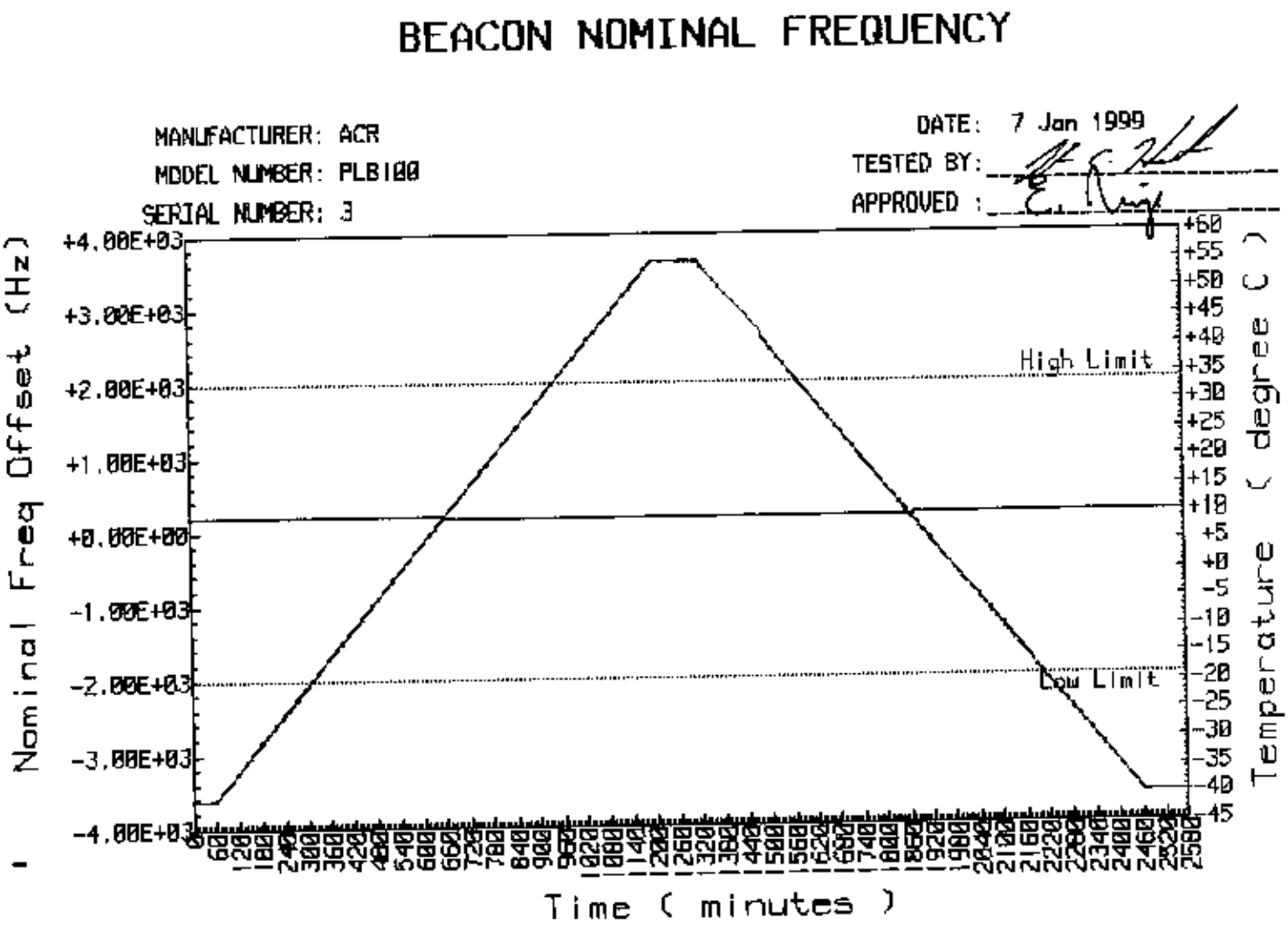
406 SIGNAL OUTPUT POWER

MANUFACTURER: ACR
MODEL NUMBER: PLB100
SERIAL NUMBER: 3

DATE: 14 Jan 1999
TESTED BY: Brad VanDa
APPROVED: Edwin Thiel



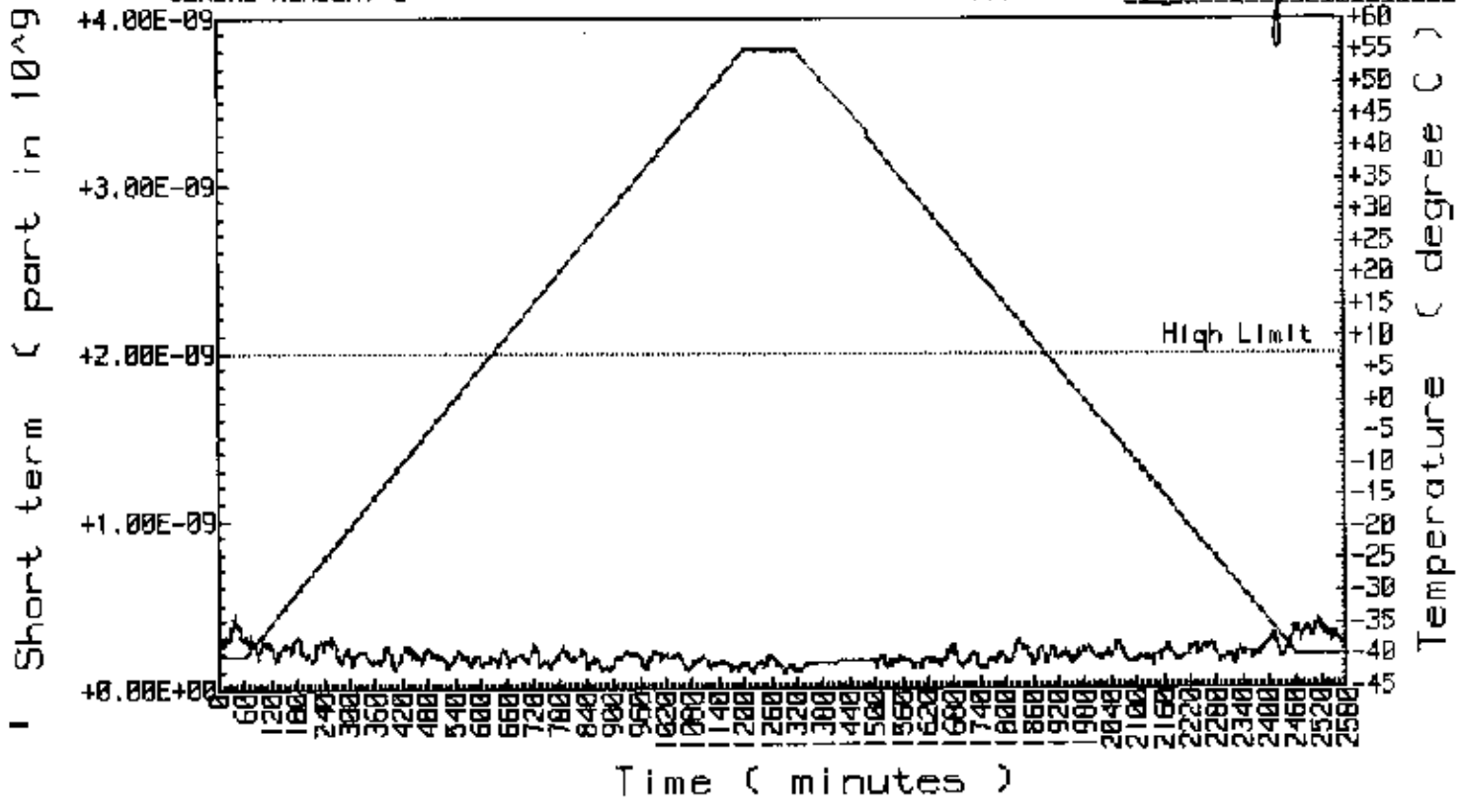
ANNEX D. FREQUENCY STABILITY OF TEMPERATURE GRADIENT TEST



BEACON SHORT TERM STABILITY

MANUFACTURER: ACR
MODEL NUMBER: PLB100
SERIAL NUMBER: 3

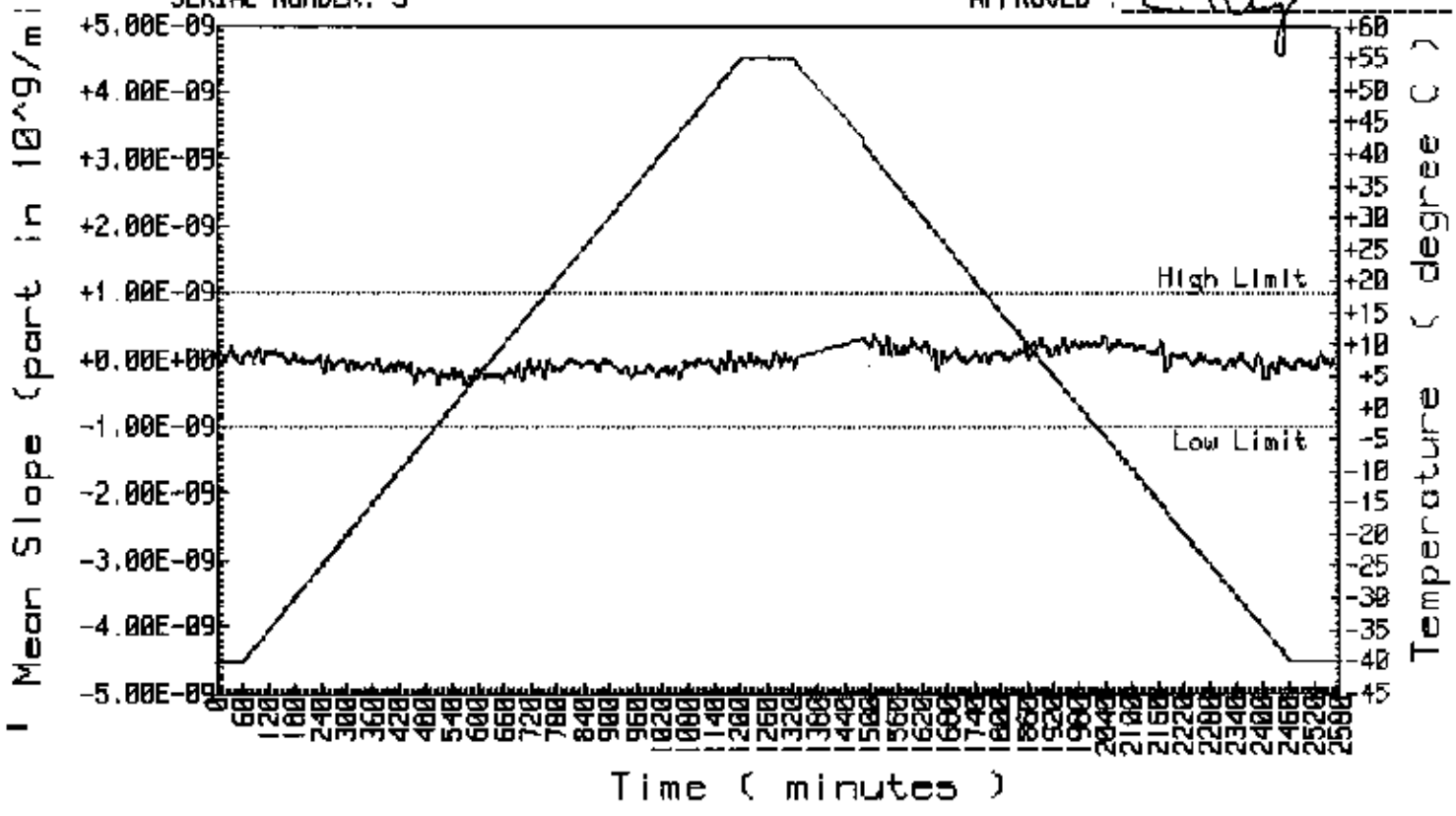
DATE: 7 Jan 1999
TESTED BY:
APPROVED :



BEACON MEDIUM TERM STABILITY

MANUFACTURER: ACR
MODEL NUMBER: PLB100
SERIAL NUMBER: 3

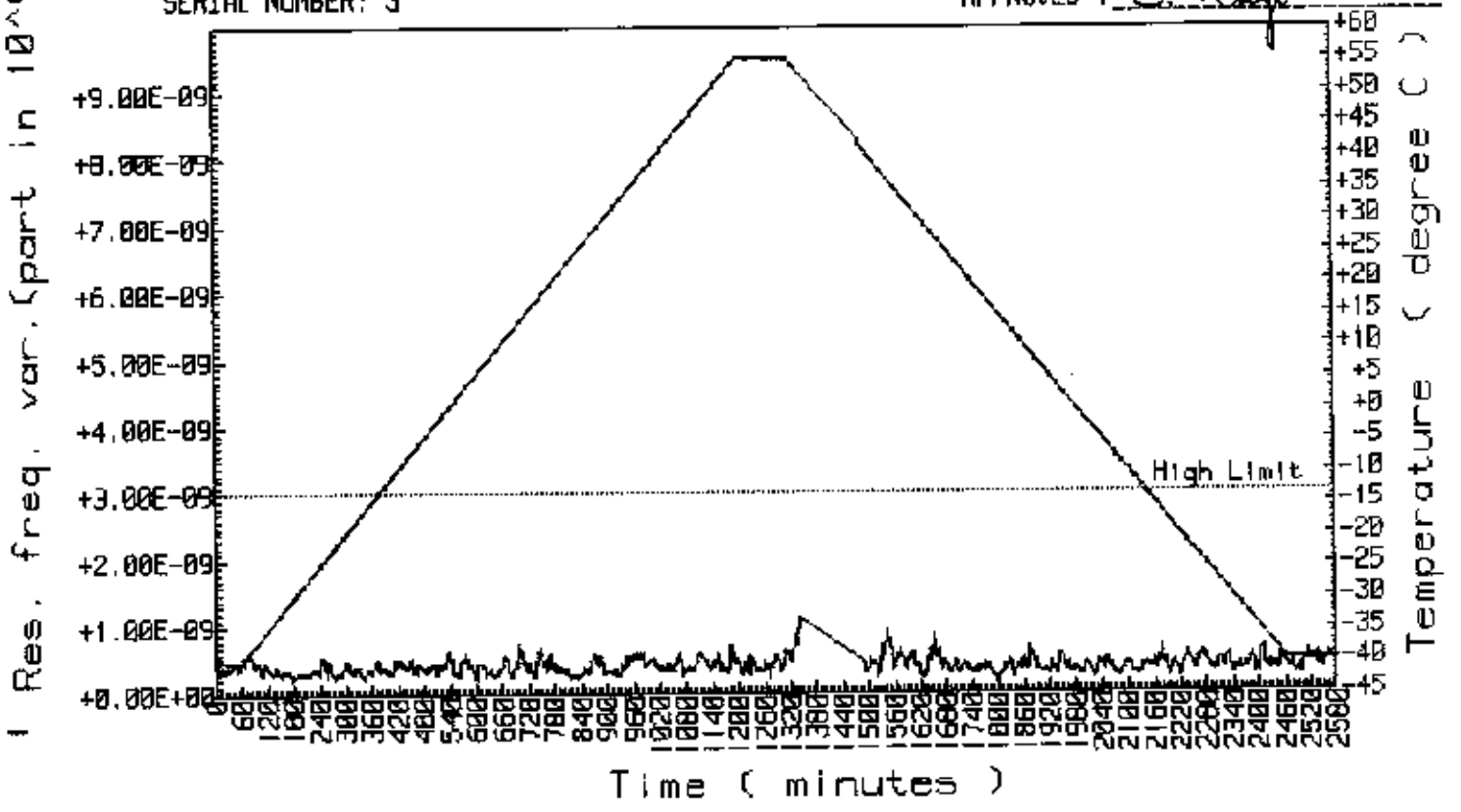
DATE: 7 Jan 1999
TESTED BY:
APPROVED :



BEACON MEDIUM TERM STABILITY

MANUFACTURER: ACR
MODEL NUMBER: PLB100
SERIAL NUMBER: 3

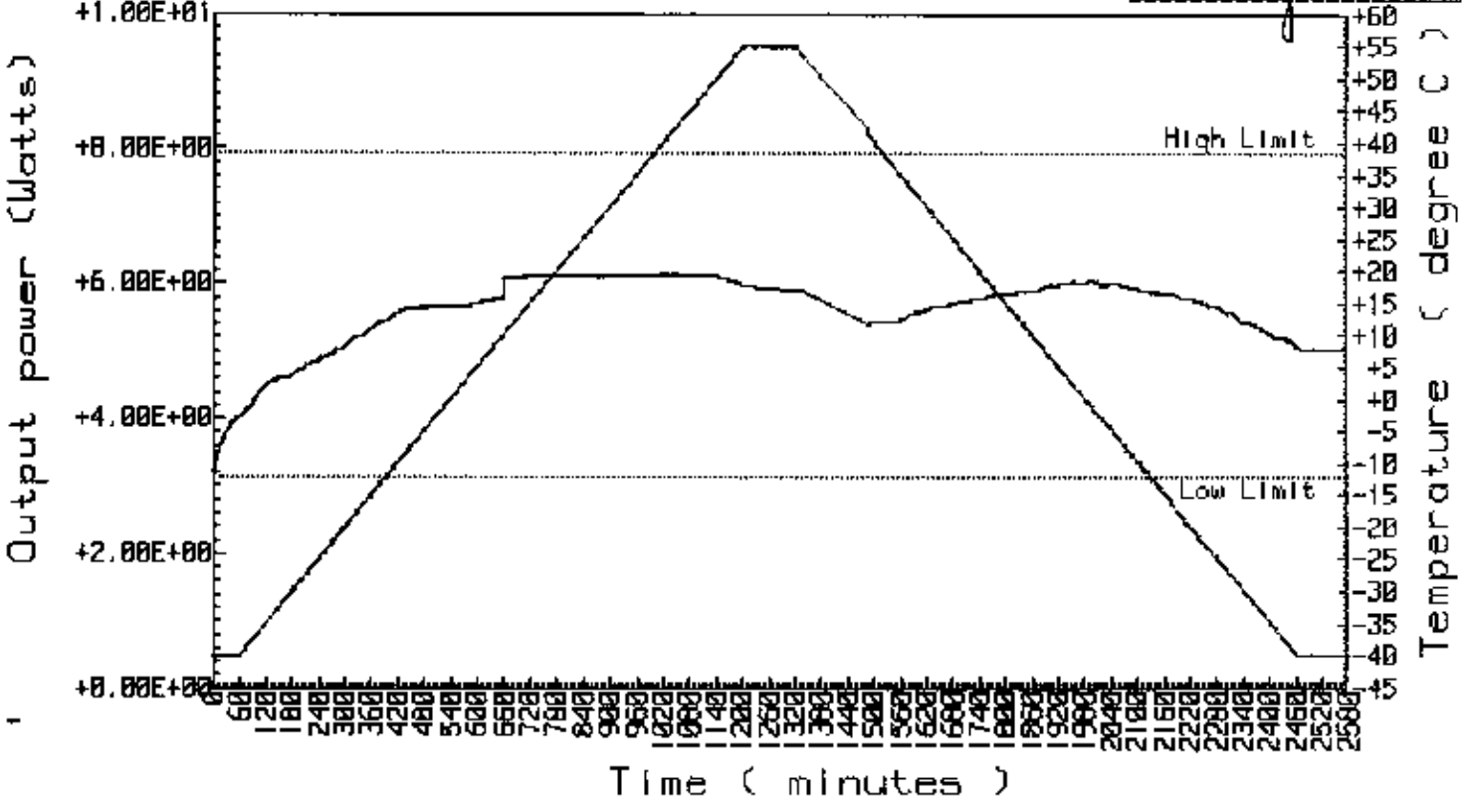
DATE: 7 Jan 1999
TESTED BY:
APPROVED :



406 SIGNAL OUTPUT POWER

MANUFACTURER: ACR
MODEL NUMBER: PLB100
SERIAL NUMBER: 3

DATE: 7 Jan 1999
TESTED BY:
APPROVED :



ANNEX E. SATELLITE QUALITATIVE TEST

```
/02534 00000/3660/99 020 1627
/161/366X

**********  406 BEACON LOCATED FIRST ALERT (AMBIGUITY UNRESOLVED)  **********

BEACON ID: 2DDC0 48008 FFBFF      SITE ID: 09559

*****************  DETECTION TIME AND POSITIONS FOR THE BEACON  *************

PROB  SOL  LATITUDE LONGITUDE  DETECT TIME  SAT  SOURCE SRR   /BUFFER
97    A    31 35.5N 110 16.4W  20 1608 JAN  S4   CA2    AfRcc /MexiSp
 3    B    27 51.2N 093 24.4W  20 1608 JAN  S4   CA2    CGD08

************  BEACON ID CONTAINS THE FOLLOWING ENCODED INFORMATION **********

COUNTRY      : USA              CRAFT ID    :
MID CODE     : 366              HOMING      : 121.5 MHZ
MANUFACTURER:                   MODEL       :
SERIAL NUM   :                  BEACON TYPE: STANDARD TEST-LOCATION

*****************  USMCC REGISTRATION DATABASE INFORMATION  ****************

REGISTRATION DATA IS NOT AVAILABLE


************************  SUPPORTING INFORMATION  ****************************

USMCC PROCESSING TIME: 20 1626 JAN

THIS ALERT MESSAGE IS BEING SENT TO:
        NoaaRcc

ALERT MESSAGES FOR THIS SIGNAL PREVIOUSLY SENT TO: N/A

PREVIOUS PASS INFORMATION: N/A

NEXT TIME SIGNAL SHOULD BE DETECTED:

SOL  DETECT TIME  SAT  SOURCE  VISIBILITY
A    20 1659 JAN  S7   CA1     LOW (WILL NOT COUNT AS MISSED PASS)
A    20 1754 JAN  S4   CA1     HIGH
B    20 1711 JAN  C4   AK2     HIGH
B    20 1901 JAN  C4   AK1     HIGH

***** INCIDENT FEEDBACK REPORT FOR 406 ALERT,  FAX BACK TO 301-457-5406 *****

BEACON ID: 2DDC0 48008 FFBFF  DETECT TIME: 20 1608 JAN        SITE ID: 09559
CALCULATED A LAT: 31 35.5N    LONG: 110 16.4W
CALCULATED B LAT: 27 51.2N    LONG: 093 24.4W
CALCULATED E LAT: NIL         LONG: NIL

CEASED / DISTRESS / NON-DISTRESS

INCIDENT/MISSION/ CASE NUMBER:

INCIDENT/MISSION/ CASE START TIME:

COSPAS-SARSAT ONLY NOTIFICATION?  YES / NO
```

COSPAS-SARSAT FIRST NOTIFICATION? YES / NO

COSPAS-SARSAT USED FOR LOCATION ONLY? YES / NO

STATE OR GENERAL LOCATION:

TIME RESCUE FORCES ARRIVED (GMT):
____/____/____/____:____ (YY/MM/DD/HH:MM)

RESCUED: TOTAL INVOLVED:

ACTUAL LOCATION LAT: LONG:

HOW DETERMINED:
LORAN / OMEGA / VOR / VOR-DME / TACAN / SATNAV / GPS / CHART / OTHER

HOW ACTIVATED:
AUTOMATIC / MANUAL / USER-ERROR / BEACON-PROBLEM / BRACKET FAILURE

WHY ACTIVATED: DISTRESS / TEST / OTHER

VESSEL/AIRCRAFT TYPE AND NAME:

HOURS OF RESOURCE ALLOCATED:
BOAT____ CUTTER____ HELO____ FIXED WING____ CAP____ OTHER____

TIME ALERT DETERMINED TO BE A FALSE ALARM OR RESOURCE LAUNCHED (GMT):
____/____/____/____:____ (YY/MM/DD/HH:MM)

GEOSAR DATA USED TO RESOLVE INCIDENT? YES / NO

BEACON MANUFACTURER:

BEACON MODEL:

BEACON TYPE: STANDARD TEST-LOCATION

WAS 406 BEACON REGISTRATION DATA USED TO RESOLVE INCIDENT: YES / NO

REMARKS:

QQQQ
/LASSIT
/ENDMSG

```
/02540 00000/3660/99 020 1701
/164/366X

*************** 406 BEACON NOTIFICATION OF AMBIGUITY RESOLUTION  ************

BEACON ID: 2DDC0 48008 FFBFF      SITE ID: 09559

***************  AMBIGUITY RESOLVED TO THE FOLLOWING POSITION  ***************

LATITUDE LONGITUDE  DURATION   PASSES  SRR   /BUFFER
31 35.3N 110 15.3W  000.8 HRS  002     AfRcc /MexiSp

***********  AMBIGUITY RESOLVED FROM THE FOLLOWING NEW INFORMATION **********

PROB  SOL  LATITUDE LONGITUDE  DETECT TIME  SAT  SOURCE
70    A    31 34.4N 110 11.9W  20 1653 JAN  S7   AK1

************  BEACON ID CONTAINS THE FOLLOWING ENCODED INFORMATION **********

COUNTRY      : USA              CRAFT ID   :
MID CODE     : 366              HOMING     : 121.5 MHZ
MANUFACTURER:                   MODEL      :
SERIAL NUM   :                  BEACON TYPE: STANDARD TEST-LOCATION

******************  USMCC REGISTRATION DATABASE INFORMATION  *****************

REGISTRATION DATA IS NOT AVAILABLE


************************  SUPPORTING INFORMATION  ****************************

USMCC PROCESSING TIME: 20 1701 JAN

THIS ALERT MESSAGE IS BEING SENT TO:
        NoaaRcc

ALERT MESSAGES FOR THIS SIGNAL PREVIOUSLY SENT TO:
        NoaaRcc

PREVIOUS PASS INFORMATION:

PROB  SOL  LATITUDE LONGITUDE  DETECT TIME  SAT  SOURCE
97    A    31 35.5N 110 16.5W  20 1608 JAN  S4   MULT

NEXT TIME SIGNAL SHOULD BE DETECTED:

SOL  DETECT TIME  SAT  SOURCE  VISIBILITY
C    20 1754 JAN  S4   CA1     HIGH
C    20 1901 JAN  S4   AK1     HIGH

QQQQ
/LASSIT
/ENDMSG
```

```
/02549 00000/3660/99 020 1743
/165/366X

********************  406 BEACON COMPOSITE POSITION UPDATE  ******************

BEACON ID: 2DDC0 48008 FFBFF      SITE ID: 09559

********************   POSITION UPDATED TO THE FOLLOWING  ********************

LATITUDE LONGITUDE  DURATION   PASSES  SRR   /BUFFER
31 35.5N 110 16.5W  001.2 HRS  003     AfRcc /MexiSp

*****************  POSITION UPDATED FROM THE FOLLOWING ALERT  ***************

PROB  SOL  LATITUDE LONGITUDE  DETECT TIME  SAT  SOURCE
99    A    31 35.3N 110 16.9W  20 1720 JAN  C4   TX1
 1    B    35 54.2N 037 59.6W  20 1720 JAN  C4   TX1

************  BEACON ID CONTAINS THE FOLLOWING ENCODED INFORMATION **********

COUNTRY      : USA              CRAFT ID   :
MID CODE     : 366              HOMING     : 121.5 MHZ
MANUFACTURER:                   MODEL      :
SERIAL NUM   :                  BEACON TYPE: STANDARD TEST-LOCATION


************************  SUPPORTING INFORMATION  ****************************

USMCC PROCESSING TIME: 20 1740 JAN

THIS ALERT MESSAGE IS BEING SENT TO:
        NoaaRcc

ALERT MESSAGES FOR THIS SIGNAL PREVIOUSLY SENT TO:
        NoaaRcc

PREVIOUS PASS INFORMATION:

PROB  SOL  LATITUDE LONGITUDE  DETECT TIME  SAT  SOURCE
70    A    31 35.5N 110 16.5W  20 1653 JAN  S7   MULT
97    A    31 35.5N 110 16.5W  20 1608 JAN  S4   MULT

NEXT TIME SIGNAL SHOULD BE DETECTED:

SOL  DETECT TIME  SAT  SOURCE  VISIBILITY
C    20 1901 JAN  C4   AK1     HIGH
C    20 2049 JAN  C4   AK1     HIGH

QQQQ
/LASSIT
/ENDMSG
```

```
/02553 00000/3660/99 020 1852
/165/366X

********************  406 BEACON COMPOSITE POSITION UPDATE  ******************

BEACON ID: 2DDC0 48008 FFBFF       SITE ID: 09559

********************  POSITION UPDATED TO THE FOLLOWING  ********************

LATITUDE LONGITUDE  DURATION   PASSES  SRR    /BUFFER
31 35.4N 110 16.5W  001.7 HRS  004     PacAre

******************  POSITION UPDATED FROM THE FOLLOWING ALERT  ***************

PROB  SOL  LATITUDE LONGITUDE  DETECT TIME  SAT  SOURCE
53    A    38 23.7N 142 02.2W  20 1748 JAN  S4   AK1
47    B    31 34.5N 110 15.8W  20 1748 JAN  S4   AK1

************  BEACON ID CONTAINS THE FOLLOWING ENCODED INFORMATION **********

COUNTRY      : USA                 CRAFT ID    :
MID CODE     : 366                 HOMING      : 121.5 MHZ
MANUFACTURER:                      MODEL       :
SERIAL NUM   :                     BEACON TYPE: STANDARD TEST-LOCATION

*************************  SUPPORTING INFORMATION  ****************************

USMCC PROCESSING TIME: 20 1755 JAN

THIS ALERT MESSAGE IS BEING SENT TO:
        NoaaRcc

ALERT MESSAGES FOR THIS SIGNAL PREVIOUSLY SENT TO:
        NoaaRcc

PREVIOUS PASS INFORMATION:

PROB  SOL  LATITUDE LONGITUDE  DETECT TIME  SAT  SOURCE
99    A    31 35.4N 110 17.0W  20 1720 JAN  C4   MULT
70    A    31 35.5N 110 16.5W  20 1653 JAN  S7   MULT
97    A    31 35.5N 110 16.5W  20 1608 JAN  S4   MULT

NEXT TIME SIGNAL SHOULD BE DETECTED:

SOL  DETECT TIME  SAT  SOURCE  VISIBILITY
C    20 1901 JAN  C4   AK1     HIGH
C    20 2049 JAN  C4   AK1     HIGH

QQQQ
/LASSIT
/ENDMSG
```

ANNEX F. ANTENNA CHARACTERISTICS

Total Effective Radiated Power (ERP) (in dBm)

Azimuth Angles (deg)	ELEVATION ANGLES (degrees)				
	10	20	30	40	50
0	41.81	44.80	39.99	32.93	30.48
30	41.70	44.79	39.99	33.08	30.26
60	41.50	44.88	39.95	33.44	31.06
90	41.19	44.78	39.82	33.92	32.88
120	41.09	44.78	39.72	34.10	33.82
150	40.89	44.78	39.73	34.14	34.40
180	41.00	44.69	39.89	34.12	34.96
210	41.11	44.70	39.95	33.97	35.19
240	41.31	44.81	40.00	33.98	35.02
270	41.42	44.82	40.13	33.27	34.38
300	41.52	44.82	40.15	33.22	33.24
330	41.62	44.82	40.15	32.67	31.96
Delta(dB)	0.92	0.19	0.44	1.47	4.93

NOTE: All ERP values are accurate to within ±3 dB.

Tabulation of Measured Data

Stoddart Dipole Received Power Measurement Data (dBm)

Azim. Angle (deg)	Elevation Angles (degrees, polarization)									
	10H	10V	20H	20V	30H	30V	40H	40V	50H	50V
0	-18.9	3.8	-16.9	5.8	-12	-0.9	-16	-10.8	-26.5	-16.2
30	-21.1	3.7	-18.9	5.8	-14.5	-0.8	-19.7	-10.3	-21.7	-16.7
60	-23	3.5	-22.8	5.9	-16.4	-0.8	-22.8	-9.8	-18.7	-16.2
90	-25.7	3.2	-27.2	5.8	-18.7	-0.9	-23.6	-9.3	-16.2	-14.5
120	-28.1	3.1	-26.3	5.8	-19.2	-1	-20.2	-9.2	-15.1	-13.6
150	-26.6	2.9	-23.7	5.8	-18.3	-1	-19.4	-9.2	-14.6	-13
180	-22.2	3	-20.1	5.7	-14.6	-0.9	-17.9	-9.3	-17	-12
210	-20.5	3.1	-16.7	5.7	-12.9	-0.9	-16.3	-9.6	-17.6	-11.7
240	-19.2	3.3	-15.7	5.8	-11.8	-0.9	-14.6	-9.8	-18.7	-11.8
270	-17.4	3.4	-14.2	5.8	-11.1	-0.8	-15.4	-10.5	-20.1	-12.4
300	-17	3.5	-13.8	5.8	-10.8	-0.8	-13.3	-11	-21.9	-13.5
330	-17.4	3.6	-14.2	5.8	-10.9	-0.8	-16	-11.1	-25.7	-14.7

Cables Loss = 4.5 dB
Stoddart Dipole Antenna Factor = 21.4 dB/m
Test Frequency = 406.025 MHz
Dipole Gain = 1.01 dB (numerical Gain = 1.263)
Date Data Collected = 24 Feb 1999

Sample Calculation of an Effective Radiated Power for Data at the 0°Azimuth and 10° Elevation Angle

A. Data from page F-2 (Elevation = 10°, Azimuth = 0°):

1) $V_v = ([(10^{(3.8/10)})/1000]*50)^{1/2} = 0.346326$ volts
2) $V_h = ([(10^{(-18.9/10)})/1000]*50)^{1/2} = 0.0253796$ volts

B. Corrected Vertical and Horizontal induced voltages for Elevation Angle (all measurements were made with the dipole antenna elements either in parallel with the vertical mast or perpendicular to the mast):

1) $(V_v)_{CORR} = (V_v)/P$,

where $P = \frac{\cos(90 * \sin[\text{elevation angle}])}{\cos(\text{elevation angle})} = \frac{\cos(90 * \sin[10])}{\cos(10)} = 0.9778857$

and $(V_v)_{CORR} = 0.346326 / 0.9778857 = 0.354158$ volts

2) $(V_h)_{CORR} = (V_h) = 0.0253796$ volts

C. Calculation of total received voltage:

$V_{rec}(dBV) = 20\log([(V_v)_{CORR}^2 + (V_h)^2]^{1/2})$
$= -8.9938$ dBV

D. Calculation of Electric Field Strength E in dBV/m at the Stoddart dipole:

E = V_{rec} + Dipole Antenna Factor + Cable Loss
= -8.9938 + 21.4 + 4.5
= 16.906 dBV/m
= 7.00326 V/m

E. Calculation of ERP:

$ERP(watts) = (E^2 * R^2)/30$,

where R = Distance between dipole center-feed point and beacon antenna
R = 3.0/cos(elevation angle)
R = 3.0/cos(10°) = 3.04628 meters,

and $ERP = [(7.00326)^2 * (3.04628)^2]/30$
= 15.17 Watts
= **41.81 dBm**

ANNEX G. NAVIGATION SYSTEM TEST

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS -
MEASUREMENT DATE: 11 Jan 1999 TIME: 09:31:52

TESTED BY: _____ **APPROVED BY:** _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 000000100100000000000011
Reported Latitude: N32
Reported Longitude: E110
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

Delta Latitude (min): -25
Delta Latitude (sec): -60
Delta Longitude (min): 20
Delta Longitude (sec): 0

Corrected latitude: N31 34 0
Corrected longitude: E110 20 0

Location Message Number/Input: INITIAL N31° 34' E110° 20'

Time Message Sent: 09:30

WSMR ELECTRONIC PROVING GROUND, US ARMY, PORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS -
MEASUREMENT DATE: 11 Jan 1999 TIME: 09:47:53

TESTED BY: _____ **APPROVED BY:** _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 000000100100000000000011
Reported Latitude: N90
Reported Longitude: E0
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

Delta Latitude (min): 0
Delta Latitude (sec): 0
Delta Longitude (min): 0
Delta Longitude (sec): 0

Corrected latitude: N90 0 0
Corrected longitude: E0 0 0

Location Message Number/Input: 1 N 90° 0' E 0° 0'

Time Message Sent: 0942

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS -
MEASUREMENT DATE: 11 Jan 1999 TIME: 10:04:57

TESTED BY: _____ APPROVED BY: _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 000000100100000000000011
Reported Latitude: S90
Reported Longitude: W0
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

Delta Latitude (min): 0
Delta Latitude (sec): 0
Delta Longitude (min): 0
Delta Longitude (sec): 0

Corrected latitude: S90 0 0
Corrected longitude: W0 0 0

Location Message Number/Input: 2 S90° 0' W0°0'

Time Message Sent: 10:00

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS -
MEASUREMENT DATE: 11 Jan 1999 TIME: 10:13:05

TESTED BY: _____ **APPROVED BY:** _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 00000010010000000000011
Reported Latitude: N78
Reported Longitude: E104
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

Delta Latitude (min): 18
Delta Latitude (sec): 0
Delta Longitude (min): 0
Delta Longitude (sec): 0

Corrected latitude: N78 18 0
Corrected longitude: E104 0 0

Location Message Number/Input: 3 N 78° 18' E 104° 0'

Time Message Sent: 1008

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS -
MEASUREMENT DATE: 11 Jan 1999 TIME: 10:20:47

TESTED BY: _____ **APPROVED BY:** _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 000000100100000000000011
Reported Latitude: S32
Reported Longitude: E18
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

Delta Latitude (min): -13
Delta Latitude (sec): -60
Delta Longitude (min): 18
Delta Longitude (sec): 0

Corrected latitude: S31 46 0
Corrected longitude: E18 18 0

Location Message Number/Input: 4 Escd S31° 46' E18° 18'

Time Message Sent: 1015

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS -
MEASUREMENT DATE: 11 Jan 1999 TIME: 10:28:22

TESTED BY: _____ APPROVED BY: _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 000000100100000000000011
Reported Latitude: N0
Reported Longitude: W21
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

Delta Latitude (min): 0
Delta Latitude (sec): 0
Delta Longitude (min): 28
Delta Longitude (sec): 0

Corrected latitude: N0 0 0
Corrected longitude: W21 28 0

Location Message Number/Input: 5 N0°0' W21°28'

Time Message Sent: 1022

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS -
MEASUREMENT DATE: 11 Jan 1999 TIME: 10:34:52

TESTED BY: _____ **APPROVED BY:** _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 000000100100000000000011
Reported Latitude: S0
Reported Longitude: E0
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

Delta Latitude (min): 0
Delta Latitude (sec): 0
Delta Longitude (min): 0
Delta Longitude (sec): 0

Corrected latitude: S0 0 0
Corrected longitude: E0 0 0

Location Message Number/Input: 6 N0° 0' E 0° 0'
SCH

Time Message Sent: 1030

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS -
MEASUREMENT DATE: 11 Jan 1999 TIME: 10:41:08

TESTED BY: _____ **APPROVED BY:** _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 000000100100000000000011
Reported Latitude: N0
Reported Longitude: W180
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

Delta Latitude (min): 0
Delta Latitude (sec): 0
Delta Longitude (min): 0
Delta Longitude (sec): 0

Corrected latitude: N0 0 0
Corrected longitude: W180 0 0

Location Message Number/Input: 7 N0° 0' W180° 0'

Time Message Sent: 1036

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS -
MEASUREMENT DATE: 11 Jan 1999 TIME: 10:46:49

TESTED BY: _____ **APPROVED BY:** _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 000000100100000000000011
Reported Latitude: N78
Reported Longitude: W45
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

Delta Latitude (min): -29
Delta Latitude (sec): -60
Delta Longitude (min): -9
Delta Longitude (sec): -60

Corrected latitude: N77 30 0
Corrected longitude: W44 50 0

Location Message Number/Input: 8 N77°30' W44° 50'

Time Message Sent: 1042

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS -
MEASUREMENT DATE: 11 Jan 1999 TIME: 11:01:09

TESTED BY: _____ **APPROVED BY:** _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 00000010010000000000011
Reported Latitude: N64
Reported Longitude: W155
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

Delta Latitude (min): 0
Delta Latitude (sec): 0
Delta Longitude (min): -25
Delta Longitude (sec): -60

Corrected latitude: N64 0 0
Corrected longitude: W154 34 0

Location Message Number/Input: 9 N64° 0' W154° 34'

Time Message Sent: 1056

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS -
MEASUREMENT DATE: 11 Jan 1999 TIME: 11:06:43

TESTED BY: _____ **APPROVED BY:** _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 000000100100000000000011
Reported Latitude: N20
Reported Longitude: W104
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

Delta Latitude (min): -18
Delta Latitude (sec): -60
Delta Longitude (min): 27
Delta Longitude (sec): 0

Corrected latitude: N19 41 0
Corrected longitude: W104 27 0

Location Message Number/Input: 10 N19°41' W104°27'

Time Message Sent: 1102

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS -
MEASUREMENT DATE: 11 Jan 1999 TIME: 11:24:43

TESTED BY: _____ **APPROVED BY:** _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 000000100100000000000011
Reported Latitude: N19
Reported Longitude: W157
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

Delta Latitude (min): -14
Delta Latitude (sec): -60
Delta Longitude (min): 10
Delta Longitude (sec): 0

Corrected latitude: N18 45 0
Corrected longitude: W157 10 0

Location Message Number/Input: 11 N18°45' W157°10'

Time Message Sent: 1119

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS -
MEASUREMENT DATE: 11 Jan 1999 TIME: 12:52:49

TESTED BY: _____ **APPROVED BY:** _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 00000010010000000000011
Reported Latitude: N54
Reported Longitude: E21
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

Delta Latitude (min): -14
Delta Latitude (sec): -60
Delta Longitude (min): 28
Delta Longitude (sec): 0

Corrected latitude: N53 45 0
Corrected longitude: E21 28 0

Location Message Number/Input: 12 N53° 45' E21° 28'

Time Message Sent: 1248

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS -
MEASUREMENT DATE: 11 Jan 1999 TIME: 13:03:45

TESTED BY: _____ **APPROVED BY:** _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 00000010010000000000011
Reported Latitude: N38
Reported Longitude: W101
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

Delta Latitude (min): 8
Delta Latitude (sec): 0
Delta Longitude (min): 0
Delta Longitude (sec): 0

Corrected latitude: N38 8 0
Corrected longitude: W101 0 0

Location Message Number/Input: 13 N38°08' W101°0'

Time Message Sent: 1259

WSMR ELECTRONIC PROVING GROUND, US ARMY, PORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS -
MEASUREMENT DATE: 11 Jan 1999 TIME: 13:10:42

TESTED BY: _____ **APPROVED BY:** _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 00000010010000000000011
Reported Latitude: N51
Reported Longitude: E0
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

Delta Latitude (min): 0
Delta Latitude (sec): 0
Delta Longitude (min): 0
Delta Longitude (sec): 0

Corrected latitude: N51 0 0
Corrected longitude: E0 0 0

Location Message Number/Input: 14 N51°0' E0°0'

Time Message Sent: 1306

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS -
MEASUREMENT DATE: 14 Jan 1999 TIME: 13:16:52

TESTED BY: _____ APPROVED BY: _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 00000010010000000000100
Reported Latitude: N51
Reported Longitude: E0
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

Delta Latitude (min): 0
Delta Latitude (sec): 0
Delta Longitude (min): 0
Delta Longitude (sec): 0

Corrected latitude: N51 0 0
Corrected longitude: E0 0 0

Location Message Number/Input: 25 HR HOLD TEST N51°0' E0°0'

Time Message Sent: 1600 on 1-12-99

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS -
MEASUREMENT DATE: 11 Jan 1999 TIME: 13:23:14

TESTED BY: _____ APPROVED BY: _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 000000100100000000000011
Reported Latitude: N127.75
Reported Longitude: E255.75
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

Delta Latitude (min): 0
Delta Latitude (sec): 60
Delta Longitude (min): 0
Delta Longitude (sec): 60

Corrected latitude: N127.75 1 0
Corrected longitude: E255.75 1 0

Location Message Number/Input: RETURN TO DEFAULT CONFIRMATION

Time Message Sent: NA

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS -
MEASUREMENT DATE: 11 Jan 1999 TIME: 13:59:22

TESTED BY: _____ **APPROVED BY:** _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 000000100100000000000011
Reported Latitude: N51
Reported Longitude: E0
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

Delta Latitude (min): 0
Delta Latitude (sec): 0
Delta Longitude (min): 0
Delta Longitude (sec): 0

Corrected latitude: N51 0 0
Corrected longitude: E0 0 0

Location Message Number/Input: 30 minute AUTO UPDATE VERIFICATION

Time Message Sent: 1328

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - SELF TEST VERIFICATION
MEASUREMENT DATE: 15 Jan 1999 TIME: 12:56:12

TESTED BY: _____ APPROVED BY: _____

MESSAGE DATA:

Message Format: 1
Protocol Flag: 0
Country Code: 0101101110
Protocol Code: 1110
Identification Data: 000000100100000000000011
Reported Latitude: N64
Reported Longitude: W155
Supplemental Data: 1101
Position Data Source Flag: 0
Homing Device Flag: 1

Delta Latitude (min): 0
Delta Latitude (sec): 0
Delta Longitude (min): -25
Delta Longitude (sec): -60

Corrected latitude: N64 0 0
Corrected longitude: W154 34 0

Location Message Number/Input: N18°45' W157°10'

Time Message Sent: 12:36

ANNEX H. SELF-TEST MODE

WSMR ELECTRONIC PROVING GROUND, US ARMY, FORT HUACHUCA, ARIZONA
MANU: ACR MODEL NO: PLB100 SERIAL NO: 3
BEACON CERTIFICATION TEST RESULTS - SELF TEST VERIFICATION
MEASUREMENT DATE: 11 Jan 1999 TIME: 14:14:47

TESTED BY: _____ **APPROVED BY:** _____

FRAME SYNCHRONIZATION BIT #:	16	17	18	19	20	21	22	23	24
Should be:	0	1	1	0	1	0	0	0	0
Decoded:	0	1	1	0	1	0	0	0	0

NUMBER OF BURST DURING SELF TEST CYCLE: 1

APPENDIX II. DISTRIBUTION LIST

ACR Electronics, Inc.
ATTN: Mr. Bill Cox
5757 Ravenswood Road
Fort Lauderdale, FL 33312

Cospas-Sarsat Secretariat
Inmarsat, 99 City Road
London, EC1Y 1AX
United Kingdom

Commander
WSMR Electronic Proving Ground
ATTN: STEWS-EPG-EC (Mrs. Anthony)
Fort Huachuca, AZ 85613-7110