APPENDIX
7

USCG Approved Lab Test Report
to
RTCM Specification 76-2002/SC110-STD

Dated 3/17/1999

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

RTCM Test Report PLB-100

DRAWING NO	REV
APPENDIX 7	A

METALLURGICAL, INC.
Testing & Consulting Services

2870 Stirling Road Hollywood FL 33020-1199 (954) 925-0499

ENVIRONMENTAL AND OPERATIONAL PERFORMANCE TEST PLAN FOR PLB-100

Test Conducted for
ACR Electronics
5757 Ravenswood Rd.
Ft Lauderdale, Fl. 33312
PH (954) 981-3333 Fax (954) 983-5087

Test Conducted by:
QC Metallurgical, Inc

QCM Job No 0KM-2035

1.0	**SEQUENCE OF TESTS**
	All environmental tests were conducted in the sequence in which the tests are listed herein. The performance parameters at room ambient temperature (25° ± 5°) was measured before beginning the environmental tests.
2.0	General Test Conditions/Initial Aliveness Test
A3.0	Vibration Test, Frequency
A4.0	Bump Test
A5.0	Salt Fog Test
A6.0	Drop Test
A7.0	Leakage and Immersion Tests
A8.0	Spurious Emissions Test
A11.0	Buoyancy Test (Category 1 only)
3.0	Performance Measurements/Extensive Aliveness Test

Fax (954) 925-5851 • Miami (305) 949-3166 • Email: qclabs@bellsouth.net

2.0 GENERAL TEST CONDITIONS / INITIAL ALIVENESS TEST

The EUT was stabilized at ambient temperature and a measurement made of the carrier frequency, the power output, and the data message.

No adjustments were made to the unit under test throughout the complete test program except for removal and application of primary power as required by the detailed test procedure. All testing, wherever possible, was conducted in a manner that did not emit radiation from the test site. Unless otherwise stated, the tests were conducted at a temperature of 25°C ± 5°C, except for unavoidable seasonal temperatures for any outdoor tests.

A log of battery on time was maintained for the PLB being tested. Batteries were not be replaced during a test unless it was probable that the battery on time would exceed the prescribed operating lifetime before the test was completed. The test would be terminated in the case of critical failure.

A3.0 VIBRATION TEST, FREQUENCY

The EUT was secured to the vibration table. The EUT was mounted in the same position (with respect tot the direction of gravity) for all vibration tests and was subjected to the sinusoidal motion in each of its three orthogonal axes according to the following profile.

Procedure

The PLB was secured to the vibration table through its normal attachments or the mounting intended for use in service conditions, with vibration isolators, if any, in place. Additional straps or other holding means was not used. The PLB was mounted in the same position (with respect to the direction of gravity) for all vibration tests. Sinusoidal vibratory motion was applied to each of the three perpendicular axes of the equipment, i.e., lateral, vertical or longitudinal in any sequence under the following conditions:

(a)

Frequency (Hz)	Peak Amplitude (mm)
4-10	2.5
10-15	0.8
15-25	0.4
25-33	0.2

(b) The frequency changed either linearly or logarithmically with time between 4 and 33 Hz such that a complete cycle (4-33-4 Hz) would take approximately 5 minutes.

(c) The PLB was vibrated in each orthogonal axes for a period of at least 30 minutes.

(d) The unit did not activate during the vibration tests.

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A4.0 BUMP TEST

The EUT was secured to the testing equipment through its normal attachments or mounting intended for use in service conditions and mounted in the normal operating position(s). Additional straps or other holding means were not used.

The EUT was subjected to the bump test according to the following profile:

Peak Acceleration	98 m/s^2
Pulse Duration	16 ms
Waveshape	Half-cycle Sinewave
Test Axis	Vertical
Number of Bumps	4000

The Bump test was conducted in three orientations; once with the EUT mounted in each of its three axis. Upon completion of the bump test, an exterior mechanical inspection was performed and an aliveness test conducted.

Unit did not activate during test.

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A5.0 SALT FOG TEST

The salt fog test was conducted on a complete Category 1 satellite PLB.
The EUT was turned OFF during the test.

The salt fog was prepared from a 5% ± 1% salt (sodium chloride) solution. For detailed guidance on the preparation of the solution and the apparatus for generating salt fog, reference should be made to MIL-STD-810D (19 July 1983), method 509.2.
Before exposing the EUT to salt fog, it was conditioned for a duration of at least 2 hours at a temperature of 35°C ± 2°C. After this conditioning and with the ambient temperature maintained at 35°C, salt fog was added and maintained at the saturation point for 48 hours.

After exposure to salt fog, the EUT was permitted to dry at room temperature (20°C ± 5°C) for 24 hours before being exposed to another period of 12 hours of salt fog exposure at 35°C.

Upon completion of this exposure and after a 12-hour drying period at room temperature, the exterior of the unit was inspected for corrosion, peeling paint, and other signs of deterioration and the aliveness test conducted.

After the test, salt deposits and water stains were washed off with clean warm water not exceeding a temperature of 38°C

ALIVENESS TEST is the successful completion of the units built in self-test.

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A6.0 DROP TEST

Drop Test on Hard Surface

The EUT was soaked at minimum stowage temperature (-55°C) for 2 hours. Then the unit was soaked for an additional 2 hours at -40°C. The drop test was then performed within five minutes after removal from a temperature chamber.

The height of the lowest part of the EUT relative to the test surface at the moment of release was 1000± 10mm. The EUT was dropped six times onto the test surface. It was released once with each surface of the EUT facing downwards. The antenna was secured in its normal stowage position for the test. The Satellite PLB was removed from pouch before conducting the drop test.

The test surface consisted of a piece of solid wood with a thickness of at least 150 mm and a mass of 30 kg or more.

Upon completion of the test an exterior and interior mechanical inspection and aliveness test was performed. The interior mechanical inspection was deferred until the conclusion of the leakage and immersion tests.

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A7.0 LEAKAGE AND IMMERSION TESTS

The EUT was turned OFF during the leakage and immersion tests and the tests performed in the following sequence.

1. The equipment was placed in an atmosphere of +65 ± 3°C for one hour. It was then immediately immersed in water at +20 ± 3°C to a depth of 100mm ± 5 mm, measured from the highest point of the equipment to the surface of the water, for a period of 48 hours.

2. The EUT was then completely submerged at a depth of 1 meter for one hour.

3. At the end of the test period the equipment was removed from the water, wiped dry and then subjected to an aliveness test.

4. The EUT was opened up and inspected for damage and visible ingress of water viewed with the unaided eye.

A8.0 SPURIOUS EMISSIONS TEST

The spurious and harmonic emissions measurements for the 406 MHz and 121.5MHz was performed with the EUT at the Minimum and maximum and ambient temperatures. These emissions did not exceed the limits given in figures 2-1 and 2-5, respectively, when measured in a nominal 100Hz bandwidth. Measurements of the 121,5Mhz signal were performed during the testing of the Auxiliary Radio Locating Device Transmitter test.

A11.0 BUOYANCY TEST (Category 1 only)

The satellite PLB was allowed to float in calm fresh water. The satellite PLB was removed from pouch before conducting test.

Please submit picture of unit floating with test report.

3.0 PERFROMANCE MEASUREMENTS / EXTENSIVE ALIVENESS TEST.

Upon Completion of the environmental test the EUT was subjected to the following performance measurements. Tests were conducted by ACR and witnessed by QC Metallurgical, Inc.

1.) 406 RF output power
2.) 406 Frequency stability, Short Medium and long term stabilities.
3.) Message format
4.) Data encoding
5.) Modulation (including rise and fall times).

Procedure: The above measurements were taken on the ACR Beacon automated test system that measures all of the above parameters. Testing was monitored by QC Metallurgical, Inc. at the ACR Facility.

A sample data sheet can be seen below.

SUMMARY OF RTCM TEST RESULTS

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			$T_{min.}$ (_____°C)	$T_{amb.}$ (_____°C)	$T_{max.}$ (_____°C)	
1. N/A						
2 Initial Aliveness Test						
• Carrier Frequency	406.025 ± 0.002	MHz		406.02496		
• Power Output	35 – 39	dBm		38.23		
• Data Message	278E368854FFBFF (attach Data Sheet Fig # 1)	[		278E368854FFBFF		
A 3.0 Vibration Test						
• Mechanical Inspection	No Damage.	[		PASS		
• Activation	Unit did not activate.	[		PASS		
A4.0 Bump Test						
Peak Acceleration	98 m/s^2					
Pulse Duration	16 ms					
Waveshape	Half-cycle Sinewave					
Number of Bumps	4000					
Activation	Unit did not activate	[		PASS		

SUMMARY OF RTCM TEST RESULTS

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			$T_{min.}$ (_____°C)	$T_{amb.}$ (_____°C)	$T_{max.}$ (_____°C)	
A5.0 Salt Fog Test • Exterior Mechanical Inspection • Aliveness Test: - Self Test	No Damage	[[		PASS PASS		
A 6.0 Drop Test (122 cm x 6) ***On Hard Surface 6 drops each surface @ -40 °C.*** • Exterior Mechanical Inspection (nothing loose) • Aliveness Test - Self Test ***INTERIOR INSPECTION DEFERRED UNITL AFTER A 7.0 LEAKAGE and IMMERSION TEST.***	No Damage	[[		PASS PASS		

SUMMARY OF RTCM TEST RESULTS

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			$T_{min.}$ (_____°C)	$T_{amb.}$ (_____°C)	$T_{max.}$ (_____°C)	
-						
A 7.0 Leakage & Immersion Test • Aliveness Test - SELF TEST		[		PASS		
• Interior Inspection	No visible ingress of water or damage	[		PASS		
A 8.0 Spurious Emissions Test • 121.5 MHz • Amb, -40 & +55°C	(attach graphs) Figure 2, 3 & 4.	[	See Fig 2	See Fig 3	See Fig 4	
A 11.0 Buoyancy Test (Cat 1 only) • Aliveness Test - SELF TEST		[		PASS		
- FLOATS		[		PASS		

SUMMARY OF RTCM TEST RESULTS

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			$T_{min.}$ (_____°C)	$T_{amb.}$ (_____°C)	$T_{max.}$ (_____°C)	
3.0 Extensive Aliveness Test						
• Power Output	35 – 39	dBm		37.85		
• Frequency Stability	406.025 ± 0.002	MHz		406.025		
- Medium - Short Term	(See attach Data Sheet Fig 5)					
- • Message Format	Long STD serialized					
• Data Message	278E368854FFBFF	[				
• Modulation Index		[		1.078		
• Modulation Rise time		[		150µS		
• Modulation Fall Time				150µS		
• ACR Data sheet	(See attach Data Sheet Fig 5)					

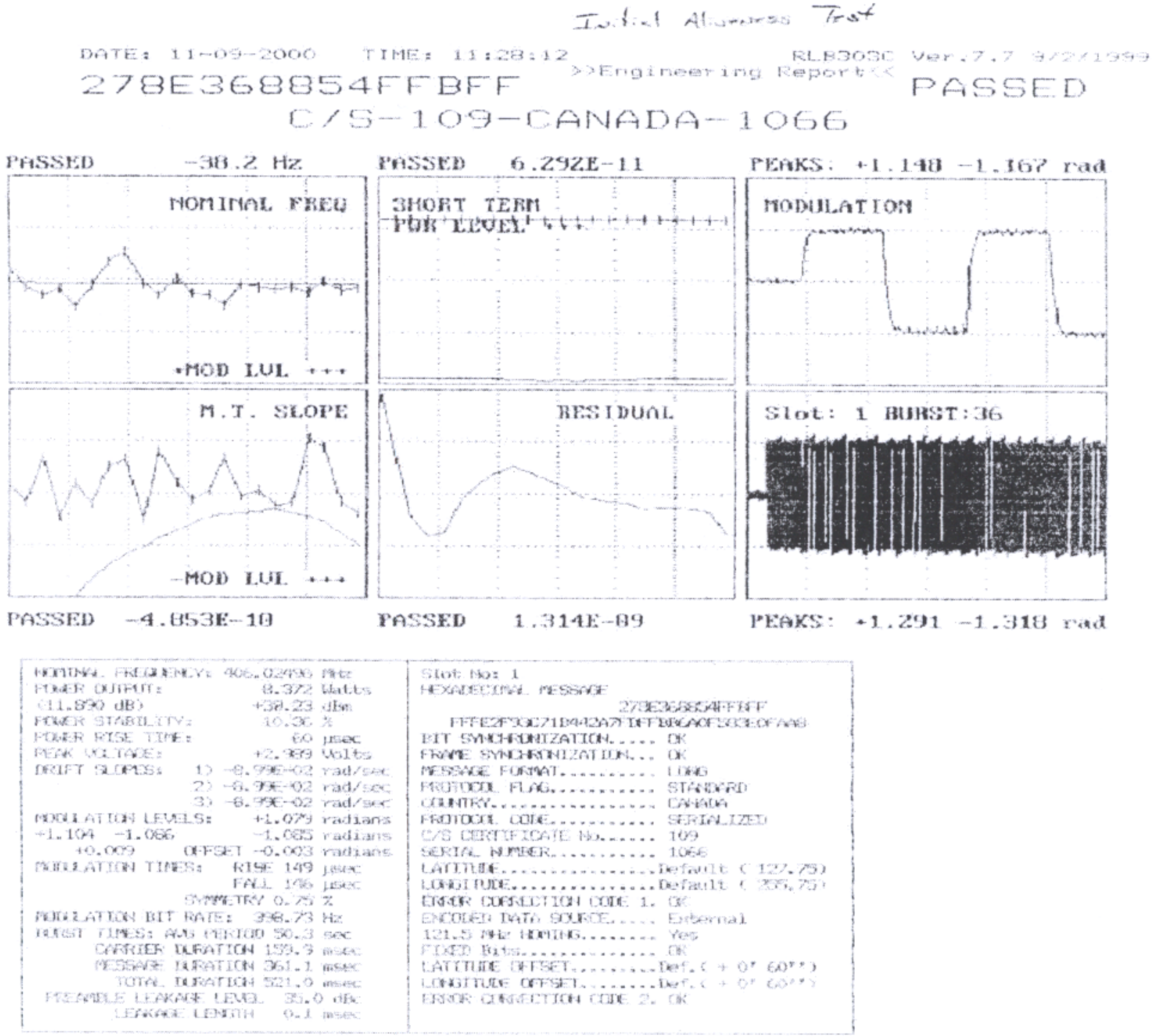
DATE: 11-09-2000 TIME: 11:28:12
>>Engineering Report<<
278E368854FFBFF
PASSED
C/S-109-CANADA-1066
PASSED -38.2 Hz
NOMINAL FREQ
+MOD LVL +++
PASSED 6.292E-11
SHORT TERM
PWR LEVEL
PEAKS: +1.148 -1.167 rad
MODULATION
M.T. SLOPE
-MOD LVL +++
RESIDUAL
Slot: 1 BURST:36
PASSED -4.853E-10
PASSED 1.314E-09
PEAKS: +1.291 -1.318 rad
NOMINAL FREQUENCY: 406.02496 MHz
POWER OUTPUT: 8.372 Watts
(11.890 dB) +38.23 dBm
POWER STABILITY: 10.36 %
POWER RISE TIME: 60 µsec
PEAK VOLTAGE: +2.389 Volts
DRIFT SLOPES: 1) -8.99E-02 rad/sec
2) -8.99E-02 rad/sec
3) -8.99E-02 rad/sec
MODULATION LEVELS: +1.079 radians
+1.104 -1.066 -1.085 radians
+0.009 OFFSET -0.003 radians
MODULATION TIMES: RISE 149 µsec
FALL 146 µsec
SYMMETRY 0.75 %
MODULATION BIT RATE: 398.73 Hz
BURST TIMES: AVG PERIOD 50.3 sec
CARRIER DURATION 159.9 msec
MESSAGE DURATION 361.1 msec
TOTAL DURATION 521.0 msec
PREAMBLE LEAKAGE LEVEL 35.0 dBc
LEAKAGE LENGTH 0.1 msec
Slot No: 1
HEXADECIMAL MESSAGE
278E368854FFBFF
BIT SYNCHRONIZATION..... OK
FRAME SYNCHRONIZATION... OK
MESSAGE FORMAT.......... LONG
PROTOCOL FLAG........... STANDARD
COUNTRY................. CANADA
PROTOCOL CODE........... SERIALIZED
C/S CERTIFICATE No...... 109
SERIAL NUMBER........... 1066
LATITUDE.................Default (127.75)
LONGITUDE................Default (255.75)
ERROR CORRECTION CODE 1. OK
ENCODED DATA SOURCE..... External
121.5 MHz HOMING........ Yes
FIXED Bits.............. OK
LATITUDE OFFSET.........Def.(+ 0' 60'')
LONGITUDE OFFSET........Def.(+ 0' 60'')
ERROR CORRECTION CODE 2. OK

FIGURE 1.

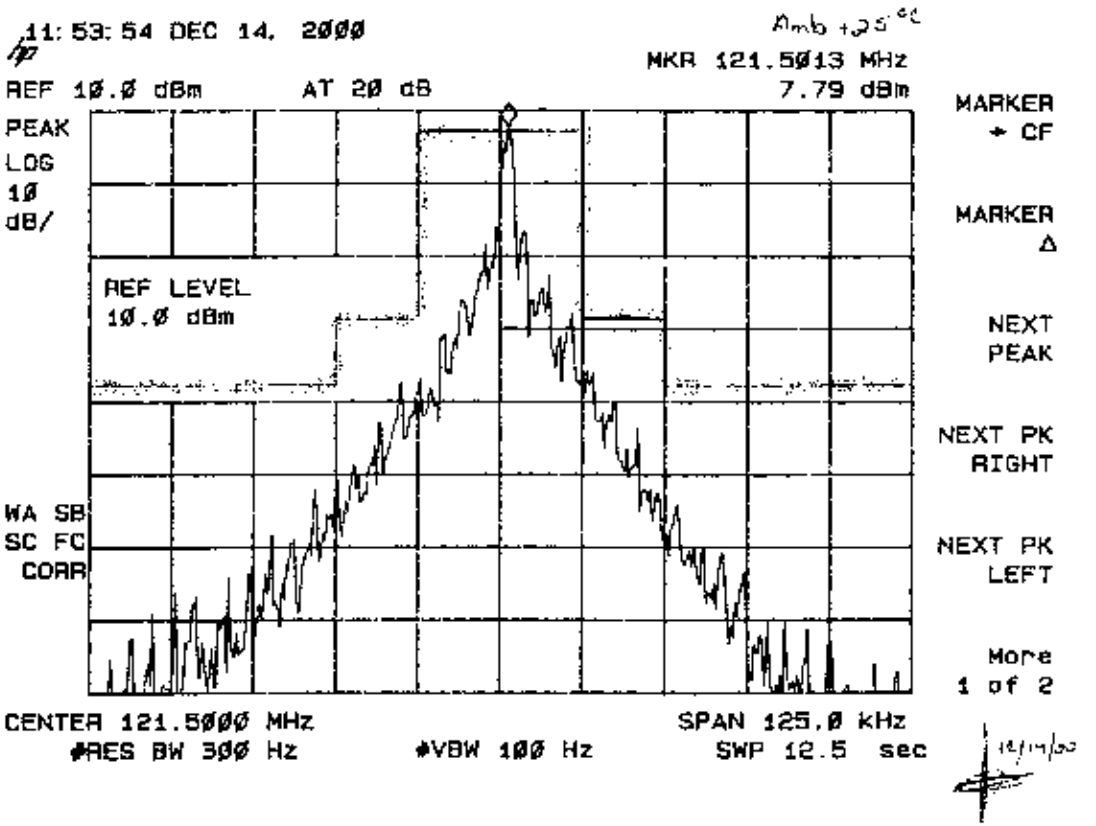
11: 53: 54 DEC 14, 2000
Amb +25°C
MKR 121.5013 MHz
REF 10.0 dBm
AT 20 dB
7.79 dBm
PEAK
LOG
10
dB/
REF LEVEL
10.0 dBm
MARKER
→ CF
MARKER
Δ
NEXT
PEAK
NEXT PK
RIGHT
NEXT PK
LEFT
More
1 of 2
WA SB
SC FC
CORR
CENTER 121.5000 MHz
#RES BW 300 Hz
#VBW 100 Hz
SPAN 125.0 kHz
SWP 12.5 sec

FIGURE 2

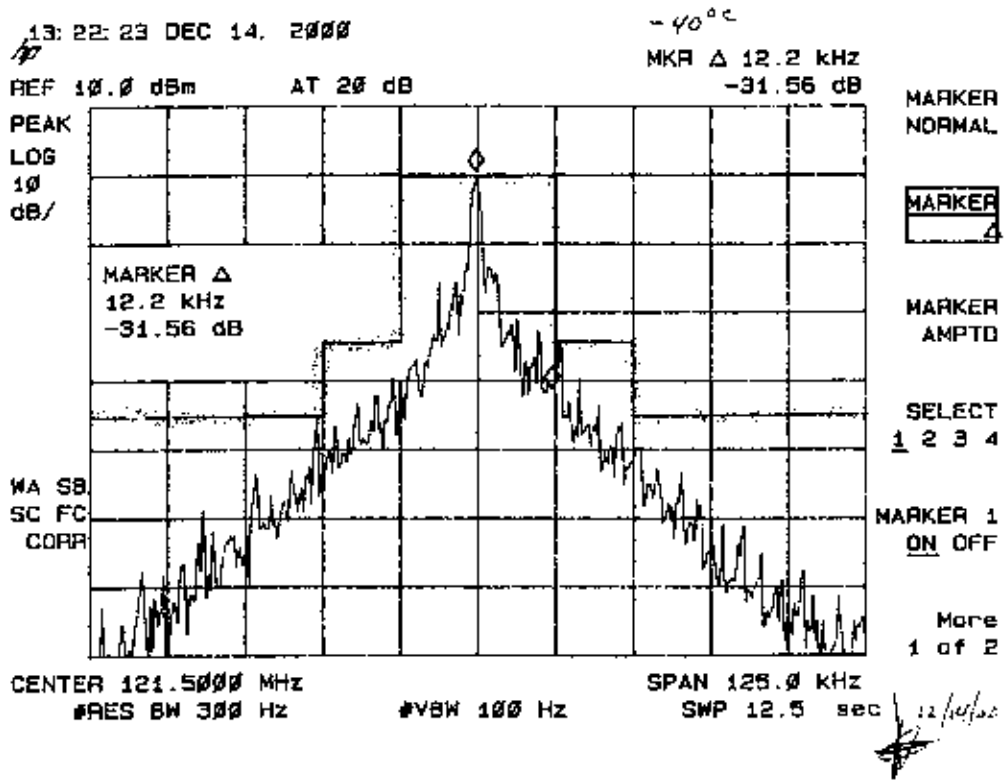
13: 22: 23 DEC 14, 2000
-40°C
MKR Δ 12.2 kHz
-31.56 dB
REF 10.0 dBm
AT 20 dB
PEAK
LOG
10
dB/
MARKER Δ
12.2 kHz
-31.56 dB
MARKER
NORMAL
MARKER
Δ
MARKER
AMPTD
SELECT
1 2 3 4
MARKER 1
ON OFF
More
1 of 2
WA SB
SC FC
CORR
CENTER 121.5000 MHz
#RES BW 300 Hz
#VBW 100 Hz
SPAN 126.0 kHz
SWP 12.5 sec

FIGURE 3

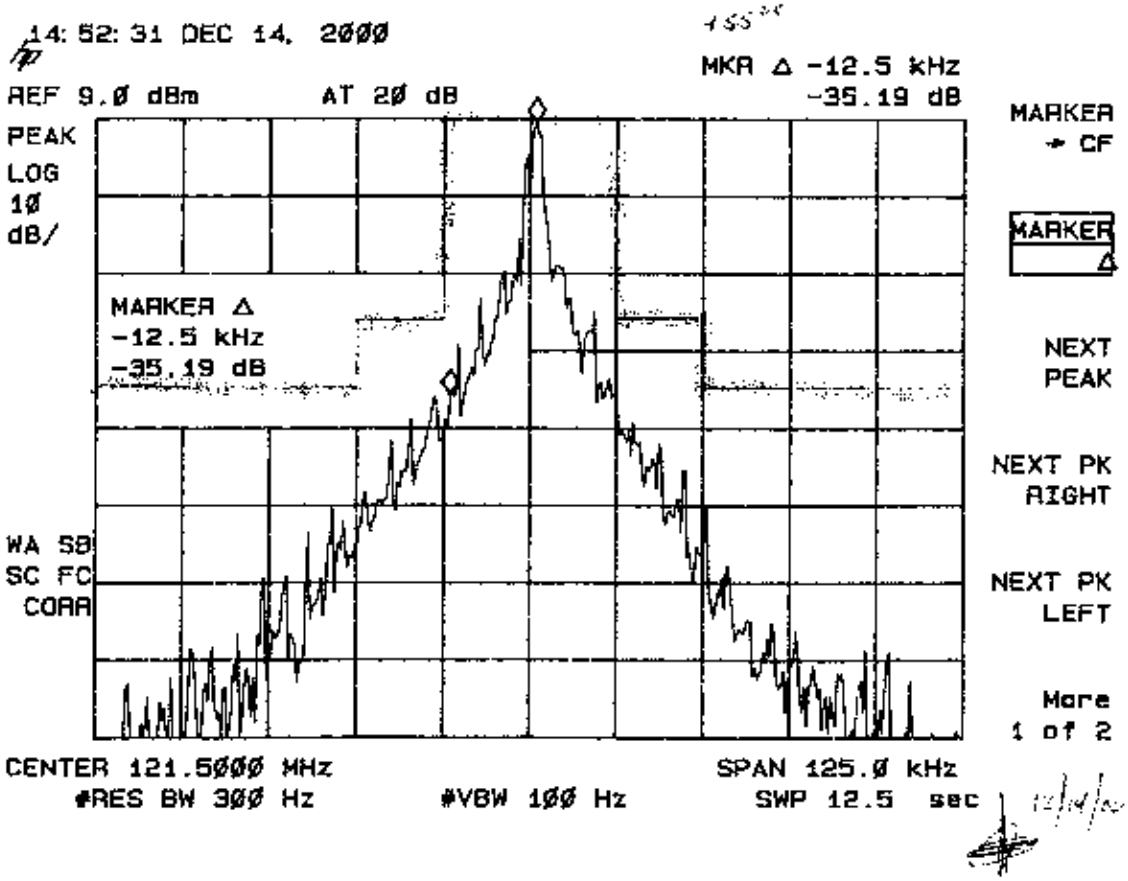
14: 52: 31 DEC 14, 2000
MKR Δ -12.5 kHz
-35.19 dB
REF 9.0 dBm
AT 20 dB
PEAK
LOG
10
dB/
MARKER Δ
-12.5 kHz
-35.19 dB
WA SB
SC FC
CORR
MARKER → CF
MARKER Δ
NEXT PEAK
NEXT PK RIGHT
NEXT PK LEFT
More 1 of 2
CENTER 121.5000 MHz
#RES BW 300 Hz
#VBW 100 Hz
SPAN 125.0 kHz
SWP 12.5 sec

FIGURE 4

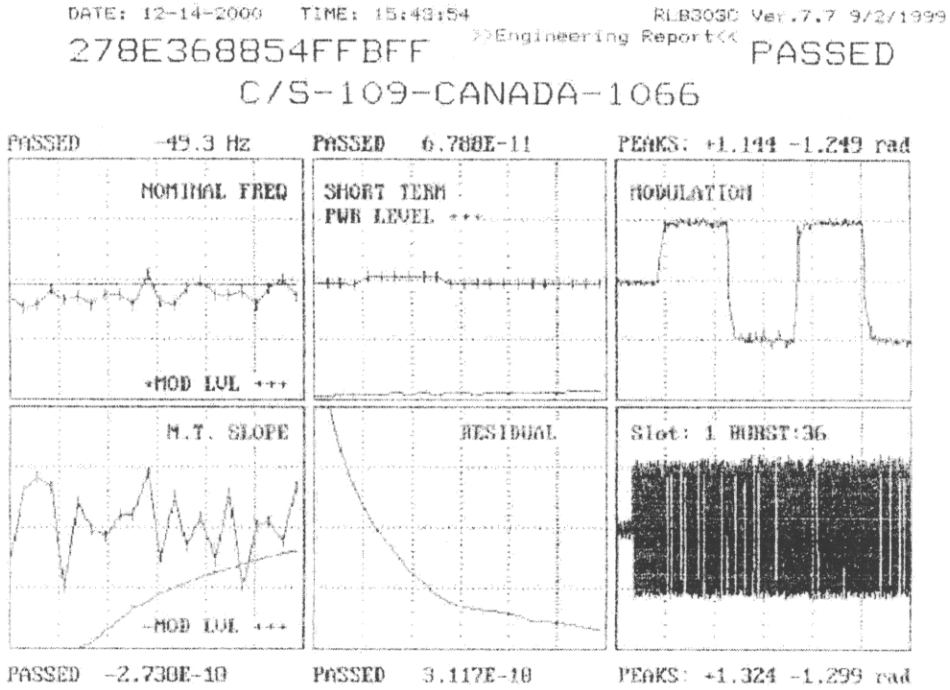
DATE: 12-14-2000 TIME: 15:43:54
RLB30SC Ver.7.7 9/2/1999
278E368854FFBFF
>>Engineering Report<<
PASSED
C/S-109-CANADA-1066
PASSED -49.3 Hz
PASSED 6.788E-11
PEAKS: +1.144 -1.249 rad
NOMINAL FREQ
SHORT TERM PWR LEVEL
MODULATION
M.T. SLOPE
RESIDUAL
Slot: 1 BURST:36
PASSED -2.730E-10
PASSED 3.117E-10
PEAKS: +1.324 -1.299 rad
NOMINAL FREQUENCY: 406.02495 MHz
POWER OUTPUT: 4.734 Watts
(11.990 dB) +36.75 dBm
POWER STABILITY: 12.02 %
POWER RISE TIME: 50 µsec
PEAK VOLTAGE: +2.256 Volts
DRIFT SLOPES: 1) +6.38E-02 rad/sec
2) +6.38E-02 rad/sec
3) +6.38E-02 rad/sec
MODULATION LEVELS: +1.076 radians
+1.079 -1.100 -1.083 radians
-0.011 OFFSET -0.002 radians
MODULATION TIMES: RISE 150 µsec
FALL 150 µsec
SYMMETRY 0.23 %
MODULATION BIT RATE: 398.73 Hz
BURST TIMES: AVG PERIOD 50.3 sec
CARRIER DURATION 159.9 msec
MESSAGE DURATION 361.1 msec
TOTAL DURATION 521.1 msec
PREAMBLE LEAKAGE LEVEL 35.0 dBc
LEAKAGE LENGTH 0.1 msec
Slot No: 1
HEXADECIMAL MESSAGE
278E368854FFBFF
FFFE2F93C71D442A7FFF8B7A0F3B0E0FA40
BIT SYNCHRONIZATION..... OK
FRAME SYNCHRONIZATION... OK
MESSAGE FORMAT..... LONG
PROTOCOL FLAG..... STANDARD
COUNTRY..... CANADA
PROTOCOL CODE..... SERIALIZED
C/S CERTIFICATE No..... 109
SERIAL NUMBER..... 1066
LATITUDE.....Default (127.75)
LONGITUDE.....Default (255.75)
ERROR CORRECTION CODE 1. OK
ENCODED DATA SOURCE..... External
121.5 MHz HOMING..... Yes
FIXED Bits..... OK
LATITUDE OFFSET.....Def.(+ 0' 60'')
LONGITUDE OFFSET.....Def.(+ 0' 60'')
ERROR CORRECTION CODE 2. OK

FIGURE 5.

SUMMARY

All tests were conducted in accordance with special procedures as identified at the beginning of each sequential procedure.

Results indicate that unit PLB-100 successfully met all minimum requirements as established in each test procedure.

1.0	Sequence of tests
2.0	General Test Conditions/Initial Aliveness Test
A3.0	Vibration Test, Frequency
A4.0	Bump Test
A5.0	Salt Fog Test
A6.0	Drop Test
A7.0	Leakage and Immersion Tests
A8.0	Spurious Emissions Test
A11.0	Buoyancy Test (Category 1 only)
3.0	Performance Measurements/Extensive Aliveness Test

This concludes the Testing of the ACR Electronics PLB-100 testing to meet the performance standard of the RTCM Standard for 406 MHz Satellite Personal Locator BEACONS (PLB), RTCM PAPER 5-97/SC110-STD.

METALLURGICAL, INC.
Testing & Consulting Services

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SIGNATURE PAGE

Test conducted for:

ACR Electronics, Inc.
5757 Ravenswood Road
Ft. Lauderdale, Fl 33312-6645

Test conducted by:

Q.C. Metallurgical, Inc.
2870 Stirling Road
Hollywood, Fl 33020

Test Program Directed By:
Q.C. Metallurgical, Inc.

Robert Kelly
12/14/00

Test Witnessed By:
ACR Electronics, Inc.

William Cox
12/14/00

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