

CHAPTER 4

BUMP TEST

4.1. ADMINISTRATIVE INFORMATION**4.1.1. CLIENT**

ACR Electronics Inc

4.1.2. REPRESENTATIVES PRESENT

For the Client : C. HAVENS ACR & G. PEYROU ITS/EQ
For the Test Laboratory : J. M. BUCHMAN

4.1.3. DATES

Start of test : 25 June 2004
End of test : 28 June 2004

4.1.4. INTESPACE FILE REFERENCE : E5503-RTCM**4.2. UNIT UNDER TEST (UUT)**

Beacon Unit : 1/3
Name : ACR / TeraFixTM 406GPS I/O PLB
Type : PLB200
Number : 07

4.3. PURPOSE OF THE TEST

Functional checkout of hardware after bump testing.

4.4. TEST EQUIPMENT**4.4.1. TEST DEVICES**

Electrodynamic vibration table, type 27 kN -GR3
Spectral Dynamics SD2225 digital control panel

4.4.2. METROLOGICAL EQUIPMENT

Control : accelerometer (analysis and processing)
Measurements : Spectral Dynamics SD2225
Electrical Beacon Checking : Argos - Cospas/Sarsat Test Bench

4.5. TEST PROCEDURE

4.5.1. AXIS (See draw § 4.7)

X-axis : parallel to the Beacon Bracket fixing plane and Beacon « widthways »

Y-axis : perpendicular to the Beacon Bracket fixing plane and Beacon « widthways »

Z-axis : parallel to the Beacon Bracket fixing plane and Beacon « lengthways » (vertical axis : normal mounting)

4.5.2. MOUNTING

The beacon is secured to a light-alloy supporting square.

The complete assembly is firmly attached to the moving part of the vibration table according to the required axis.

4.5.3. TEST SPECIFICATIONS AND SEQUENCE

Bumps following Section A4.0 of RTCM Recommended Standards for 406 MHz Satellite PLBs (Version 1.1 Feb 4, 2003)

- Profile of bump test :

Peak acceleration	98 m/s ²
Pulse duration	16 ms
Waveshape	Half-cycle Sinewave
Test axis	On three axis
Number of Bumps	4000

- Beacon control : Visual inspection and Aliveness test after the Bump Tests

4.6. LIST OF SERVO AND CONTROL SENSORS

Sensor	Location	N° acc.	Cable	Sensitivity pC/g
P (servo)	Screwed on test holder sheet	CP91	BU03	9.24
1X (control)	Glued on the Beacon	12889	BU13	2.97
1Y (control)	Glued on the Beacon	5368	Rge	6.44
1Z (control)	Glued on the Beacon	2574	BU11	6.435

4.7. PHOTOGRAPH



4.8. TEST SCHEDULE

Date / Test n°	Specifications	Paragraph	Events - Observations	
			Test equipment	Unit under test
June 25 th , 2004 Axe Y+ & Axe Y-	Half-cycle sinewave Bump Peak acceleration 98 m/s ² Pulse duration 16 ms Test axis Y Number of Bumps : 2000 pos + 2000 neg Test duration : 100 min.	4.9.1	Nominal	Set up the beacon on test table on Y axis (27 kN) . Functional testing : nominal.
June 28 th , 2004 Axe X+ & Axe X-	Half-cycle sinewave Bump Peak acceleration 98 m/s ² Pulse duration 16 ms Test axis X Number of Bumps : 2000 pos + 2000 neg Test duration : 100 min.	4.9.2	Nominal	Set up the beacon on test table on X axis (27 kN) Functional testing : nominal.
June 28 th , 2004 Axe Z+ & Axe Z-	Half-cycle sinewave Bump Peak acceleration 98 m/s ² Pulse duration 16 ms Test axis Y Number of Bumps : 2000 pos + 2000 neg Test duration : 100 min.	4.9.3	Nominal End of the bump test	Set up the beacon on test table on Z axis (27 kN) Functional testing : nominal. Removal of Beacon
June 29 th , 2004	Visual inspection	4.9.4.1		Nothing abnormal to note
June 29 th , 2004	EPIRB Aliveness Test	4.9.4.2	Cospas Sarsat Test Bench	Nominal

4.9. TEST RESULTS

4.9.1. BUMP TEST RESULTS ON Y DIRECTION (4000 bumps)

Test Name: 10gpos.002
Current Date: Fri Jun 25 2004 09:28:37

DOCUMENTATION:

Title 1: BUMP TEST POSITIVE DIRECTION - RTCM/ETSI _ Axe Y+
Title 2: E5503 - Beacon ACR PLB 200/201 - S/N : 07
Title 3:

TEST RESULTS:

Time at Shutdown: 09:28:24
Date at Shutdown: 25-Jun-2004
Test Completed Normally
Last Pulse Output
Pulse Amplitude: 9.96 g
Test Level: 0.00 dB
Polarity: +
Average Error (Time Domain): 0.30 %
Peak Error (Time Domain): 0.39 %
Pulses Requested: 2000
Pulses Remaining: 0
Table of Alarms Occurrences Maximum Value
Average Error: 0
Peak Error: 0
Maximum Drive: 0
Input Overload: 0

TABLE OF OUTPUTS:

Level	Number of Outputs	
	Positive	Negative
0.00	2000	
-2.00	1	
-5.00	1	
-8.00	1	
-11.00	1	
-15.00	11	

REFERENCE PARAMETERS:

REFERENCE PULSE -

Pulse Type: Half Sine
Pulse Amplitude: 10.00 g
Pulse Duration: 16.00 ms

PULSE DYNAMIC LIMITS -

Acceleration: 10.00 g -1.50 g
Velocity: 0.49 m/s -0.49 m/s
Displacement: 0.01 mm -15.17 mm
Sample Rate: 1280.00 Hz

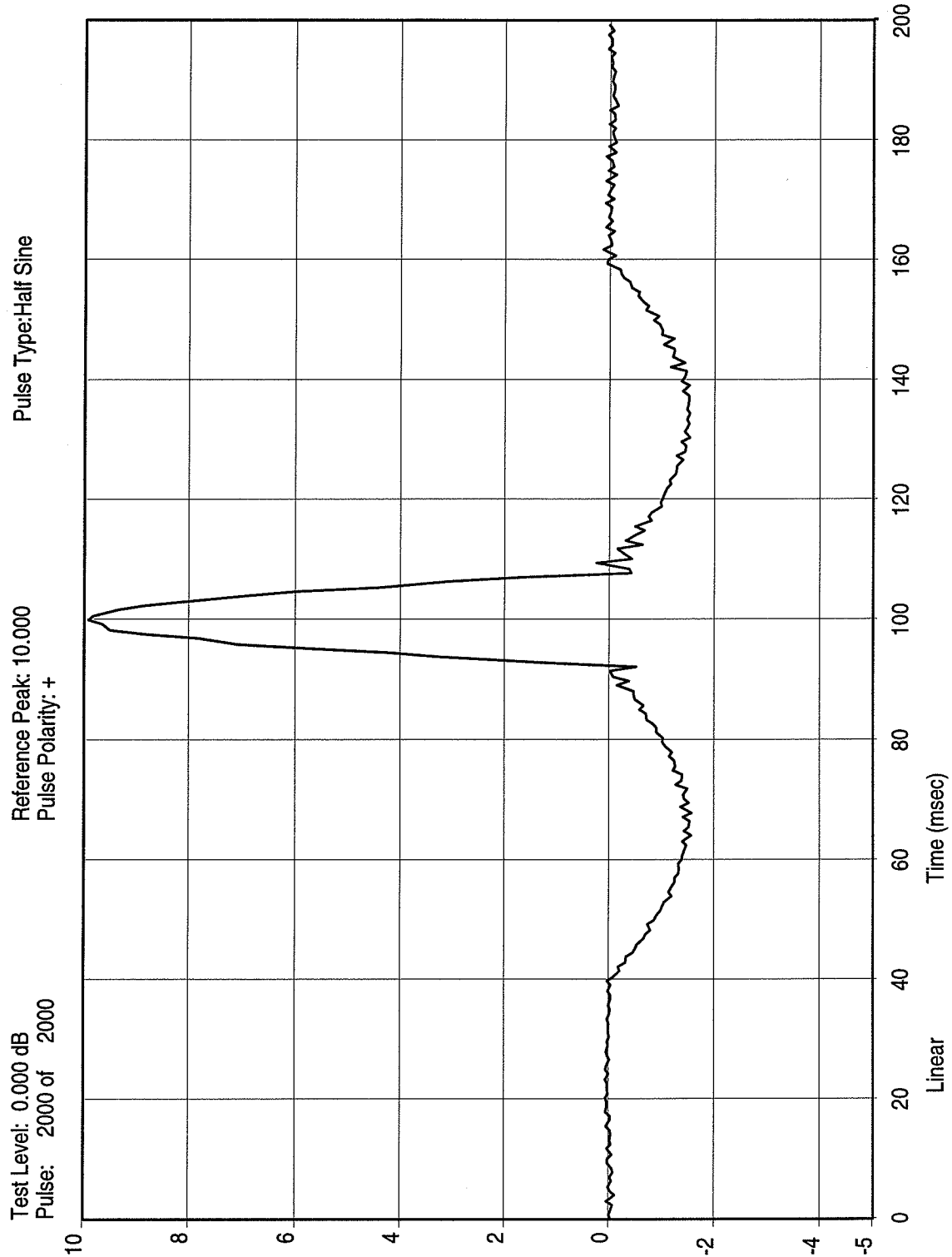
SRS ANALYSIS PARAMETERS -

SRS Spacing: 1/3 octave
SRS Filter Definition: Absolute Acceleration
SRS Damping: 5.00 %
SRS Q: 10.00

CHANNEL TABLE:

Channel Number	Channel Type	Loop Check	Sensitivity (mV/g)	Channel Label 1	Label 2
1	Control	Yes	100	Pilote P	
2	Auxiliary	No	100	1X SENSOR	
3	Auxiliary	No	100	1Y SENSOR	
4	Auxiliary	No	100	1Z SENSOR	

End of Classical Shock Test Summary List



Auxiliary
Acceleration

Linear
g

Peak:
9.903
-1.575

Test Name: 10gneg.001
Current Date: Fri Jun 25 2004 10:21:42

DOCUMENTATION:

Title 1: BUMP TEST NEGATIVE DIRECTION - RTCM/ETSI _ Axe Y-
Title 2: E5503 - Beacon ACR PLB 200/201 - S/N : 07
Title 3:

TEST RESULTS:

Time at Shutdown: 10:21:30
Date at Shutdown: 25-Jun-2004
Test Completed Normally
Last Pulse Output
Pulse Amplitude: -9.97 g
Test Level: 0.00 dB
Polarity: -
Average Error (Time Domain): 0.27 %
Peak Error (Time Domain): 0.28 %
Pulses Requested: 2000
Pulses Remaining: 0
Table of Alarms Occurrences Maximum Value
Average Error: 0
Peak Error: 0
Maximum Drive: 0
Input Overload: 0

TABLE OF OUTPUTS:

Level	Number of Outputs	
	Positive	Negative
0.00		2000
-2.00		1
-5.00		1
-8.00		1
-11.00		1
-15.00		11

REFERENCE PARAMETERS:

REFERENCE PULSE -

Pulse Type: Half Sine
Pulse Amplitude: 10.00 g
Pulse Duration: 16.00 ms

PULSE DYNAMIC LIMITS -

Acceleration: 10.00 g -1.50 g
Velocity: 0.49 m/s -0.49 m/s
Displacement: 0.01 mm -15.17 mm
Sample Rate: 1280.00 Hz

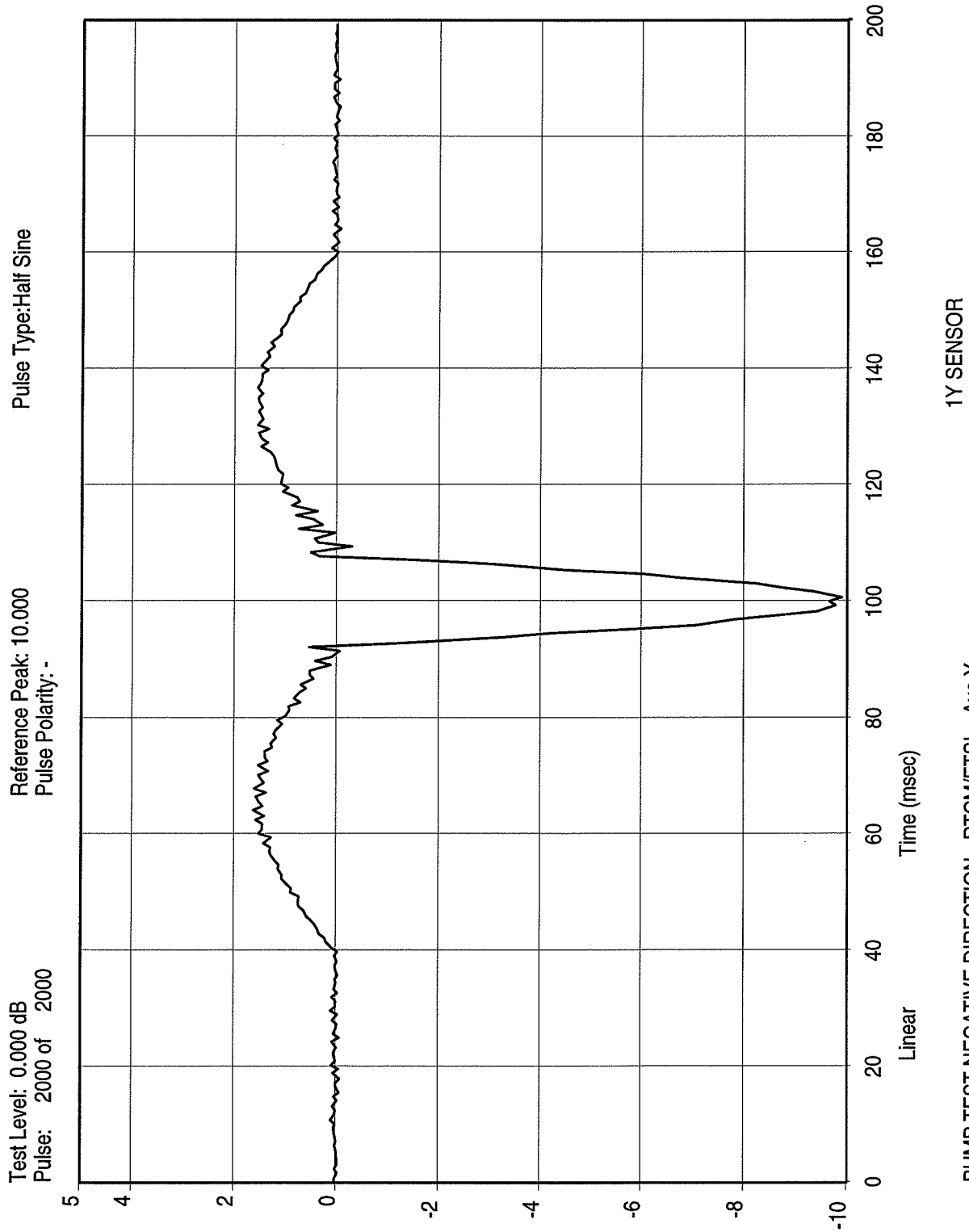
SRS ANALYSIS PARAMETERS -

SRS Spacing: 1/3 octave
SRS Filter Definition: Absolute Acceleration
SRS Damping: 5.00 %
SRS Q: 10.00

CHANNEL TABLE:

Channel Number	Channel Type	Loop Check	Sensitivity (mV/g)	Channel Label 1	Label 2
1	Control	Yes	100	Pilote P	
2	Auxiliary	No	100	1X SENSOR	
3	Auxiliary	No	100	1Y SENSOR	
4	Auxiliary	No	100	1Z SENSOR	

End of Classical Shock Test Summary List



BUMP TEST NEGATIVE DIRECTION - RTCM/ETSI _ Axe Y-
E5503 - Beacon ACR PLB 200/201 - S/N : 07
Classical Shock Test Name: 10gneg.001

Auxiliary
Acceleration

Linear
g

Peak:
1.619
-9.915

4.9.2. BUMP TEST RESULTS ON X DIRECTION (4000 bumps)

Test Name: 10gpos.003
Current Date: Mon Jun 28 2004 14:10:42

DOCUMENTATION:

Title 1: BUMP TEST POSITIVE DIRECTION - RTCM/ETSI _ Axe X+
Title 2: E5503 - Beacon ACR PLB 200/201 - S/N : 07
Title 3:

TEST RESULTS:

Time at Shutdown: 14:10:27
Date at Shutdown: 28-Jun-2004
Test Completed Normally
Last Pulse Output
Pulse Amplitude: 9.97 g
Test Level: 0.00 dB
Polarity: +
Average Error (Time Domain): 0.82 %
Peak Error (Time Domain): 0.31 %
Pulses Requested: 2000
Pulses Remaining: 0
Table of Alarms Occurrences Maximum Value
Average Error: 0
Peak Error: 0
Maximum Drive: 0
Input Overload: 0

TABLE OF OUTPUTS:

Level	Number of Outputs	
	Positive	Negative
0.00	2000	
-2.00	1	
-5.00	1	
-8.00	1	
-11.00	1	
-15.00	11	

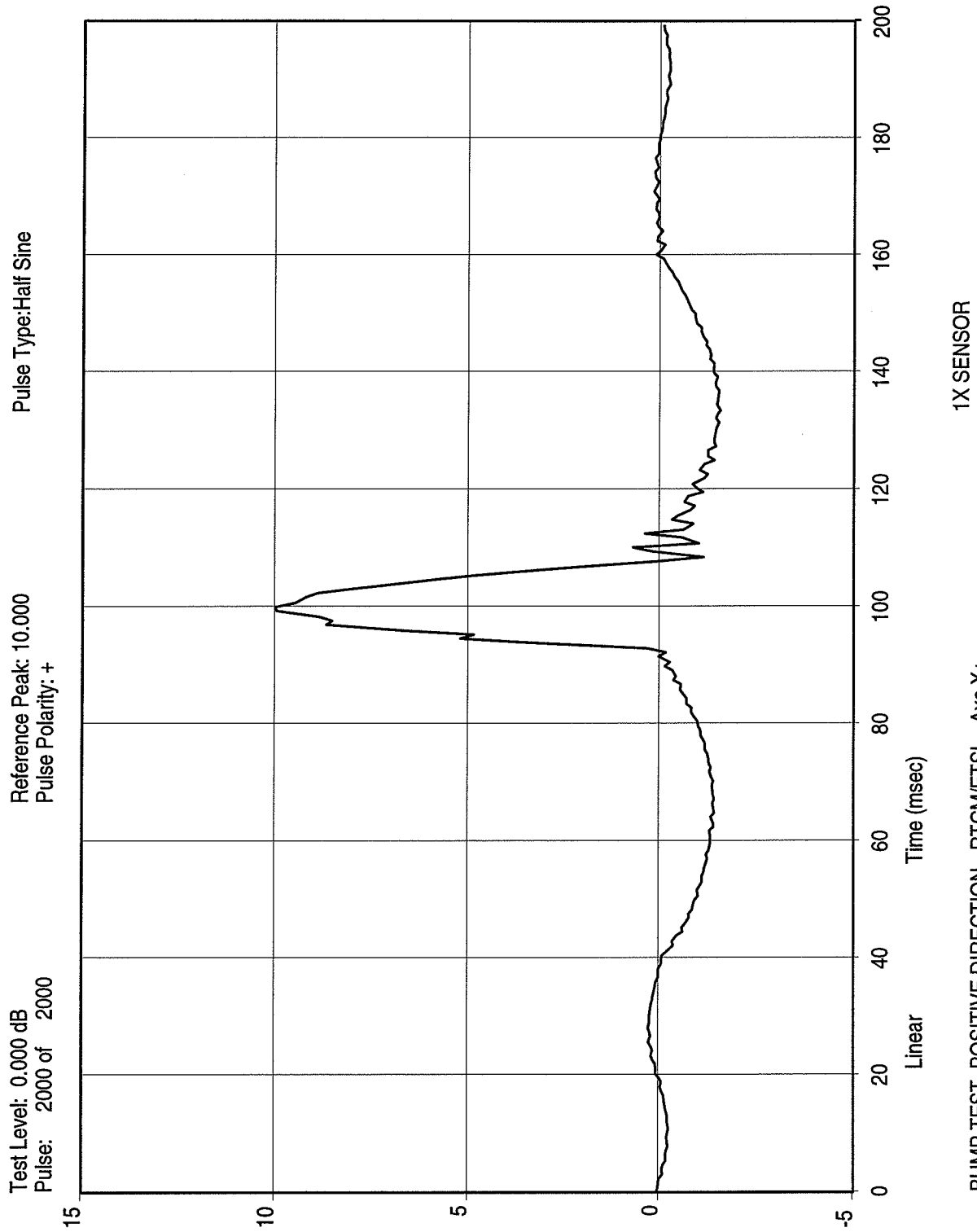
REFERENCE PARAMETERS:

REFERENCE PULSE -
Pulse Type: Half Sine
Pulse Amplitude: 10.00 g
Pulse Duration: 16.00 ms
PULSE DYNAMIC LIMITS -
Acceleration: 10.00 g -1.50 g
Velocity: 0.49 m/s -0.49 m/s
Displacement: 0.01 mm -15.17 mm
Sample Rate: 1280.00 Hz
SRS ANALYSIS PARAMETERS -
SRS Spacing: 1/3 octave
SRS Filter Definition: Absolute Acceleration
SRS Damping: 5.00 %
SRS Q: 10.00

CHANNEL TABLE:

Channel Number	Channel Type	Loop Check	Sensitivity (mV/g)	Channel Label 1	Label 2
1	Control	Yes	100	Pilote P	
2	Auxiliary	No	100	1X SENSOR	
3	Auxiliary	No	100	1Y SENSOR	
4	Auxiliary	No	100	1Z SENSOR	

End of Classical Shock Test Summary List



BUMP TEST POSITIVE DIRECTION - RTCM/ETSI _Axe X+
E5503 - Beacon ACR PLB 200/201 - S/N : 07
Classical Shock Test Name: 10gpos.003

Auxiliary
Acceleration

Linear
g

Peak:
9.986
-1.581

Test Name: 10gneg.004
Current Date: Mon Jun 28 2004 15:02:19

DOCUMENTATION:

Title 1: BUMP TEST NEGATIVE DIRECTION - RTCM/ETSI _ Axe X-
Title 2: E5503 - Beacon ACR PLB 200/201 - S/N : 07
Title 3:

TEST RESULTS:

Time at Shutdown: 15:02:06
Date at Shutdown: 28-Jun-2004
Test Completed Normally
Last Pulse Output
Pulse Amplitude: -9.99 g
Test Level: 0.00 dB
Polarity: -
Average Error (Time Domain): 0.59 %
Peak Error (Time Domain): 0.05 %
Pulses Requested: 2000
Pulses Remaining: 0
Table of Alarms Occurrences Maximum Value
Average Error: 0
Peak Error: 0
Maximum Drive: 0
Input Overload: 0

TABLE OF OUTPUTS:

Level	Number of Outputs	
	Positive	Negative
0.00		2000
-2.00		1
-5.00		1
-8.00		1
-11.00		1
-15.00		11

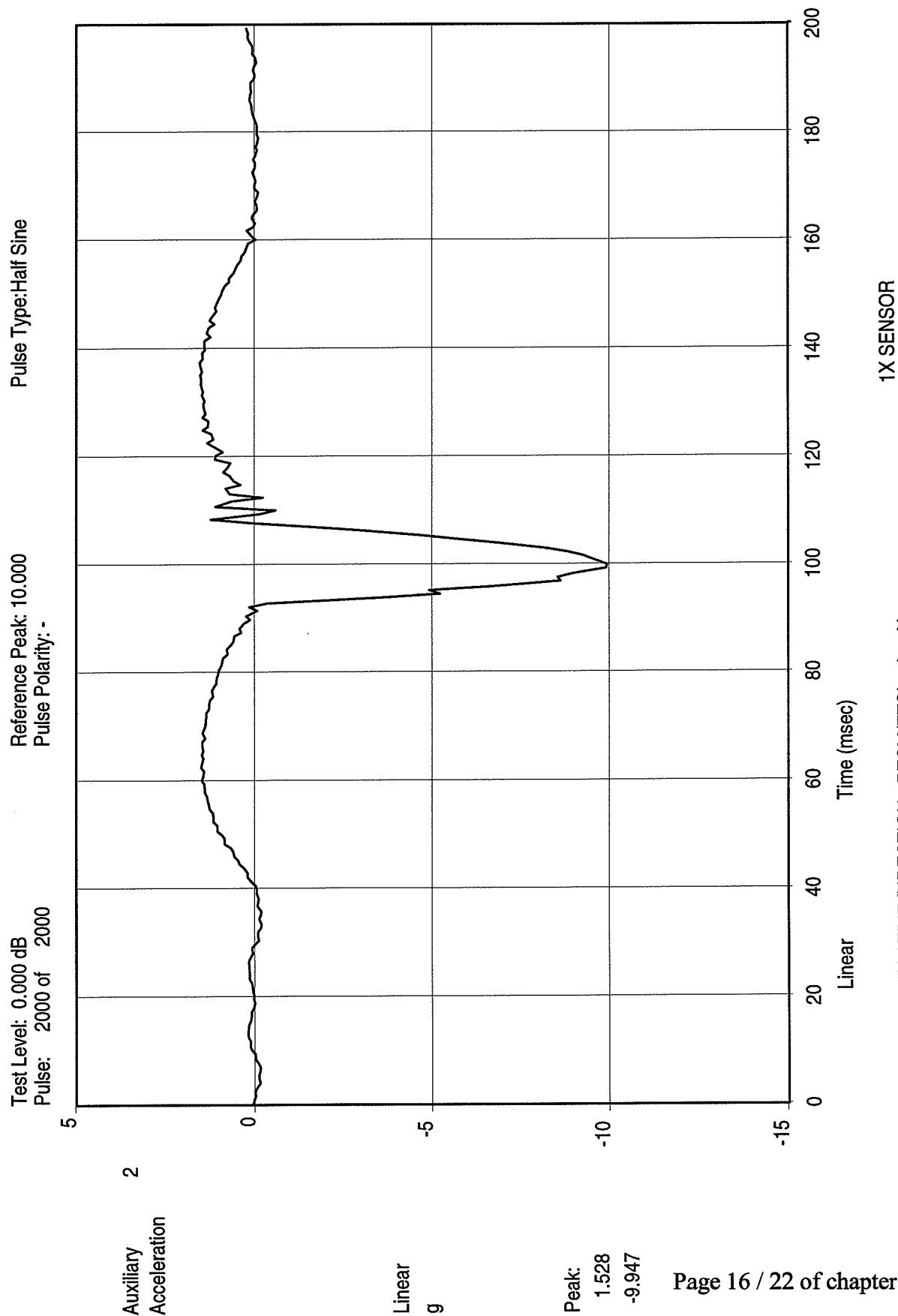
REFERENCE PARAMETERS:

REFERENCE PULSE -
Pulse Type: Half Sine
Pulse Amplitude: 10.00 g
Pulse Duration: 16.00 ms
PULSE DYNAMIC LIMITS -
Acceleration: 10.00 g -1.50 g
Velocity: 0.49 m/s -0.49 m/s
Displacement: 0.01 mm -15.17 mm
Sample Rate: 1280.00 Hz
SRS ANALYSIS PARAMETERS -
SRS Spacing: 1/3 octave
SRS Filter Definition: Absolute Acceleration
SRS Damping: 5.00 %
SRS Q: 10.00

CHANNEL TABLE:

Channel Number	Channel Type	Loop Check	Sensitivity (mV/g)	Channel Label 1	Label 2
1	Control	Yes	100	Pilote P	
2	Auxiliary	No	100	1X SENSOR	
3	Auxiliary	No	100	1Y SENSOR	
4	Auxiliary	No	100	1Z SENSOR	

End of Classical Shock Test Summary List



4.9.3. BUMP TEST RESULTS ON Z DIRECTION (4000 bumps)

Test Name: 10gpos.004
Current Date: Mon Jun 28 2004 17:28:02

DOCUMENTATION:

Title 1: BUMP TEST POSITIVE DIRECTION - RTCM/ETSI -- Axe Z+
Title 2: E5503 - Beacon ACR PLB 200/201 - S/N : 07
Title 3:

TEST RESULTS:

Time at Shutdown: 17:27:48
Date at Shutdown: 28-Jun-2004
Test Completed Normally
Last Pulse Output
Pulse Amplitude: 9.98 g
Test Level: 0.00 dB
Polarity: +
Average Error (Time Domain): 0.74 %
Peak Error (Time Domain): 0.21 %
Pulses Requested: 2000
Pulses Remaining: 0
Table of Alarms Occurrences Maximum Value
Average Error: 0
Peak Error: 0
Maximum Drive: 0
Input Overload: 0

TABLE OF OUTPUTS:

Level	Number of Outputs	
	Positive	Negative
0.00	2000	
-2.00	1	
-5.00	1	
-8.00	1	
-11.00	1	
-15.00	11	

REFERENCE PARAMETERS:

REFERENCE PULSE -

Pulse Type: Half Sine
Pulse Amplitude: 10.00 g
Pulse Duration: 16.00 ms

PULSE DYNAMIC LIMITS -

Acceleration: 10.00 g -1.50 g
Velocity: 0.49 m/s -0.49 m/s
Displacement: 0.01 mm -15.17 mm
Sample Rate: 1280.00 Hz

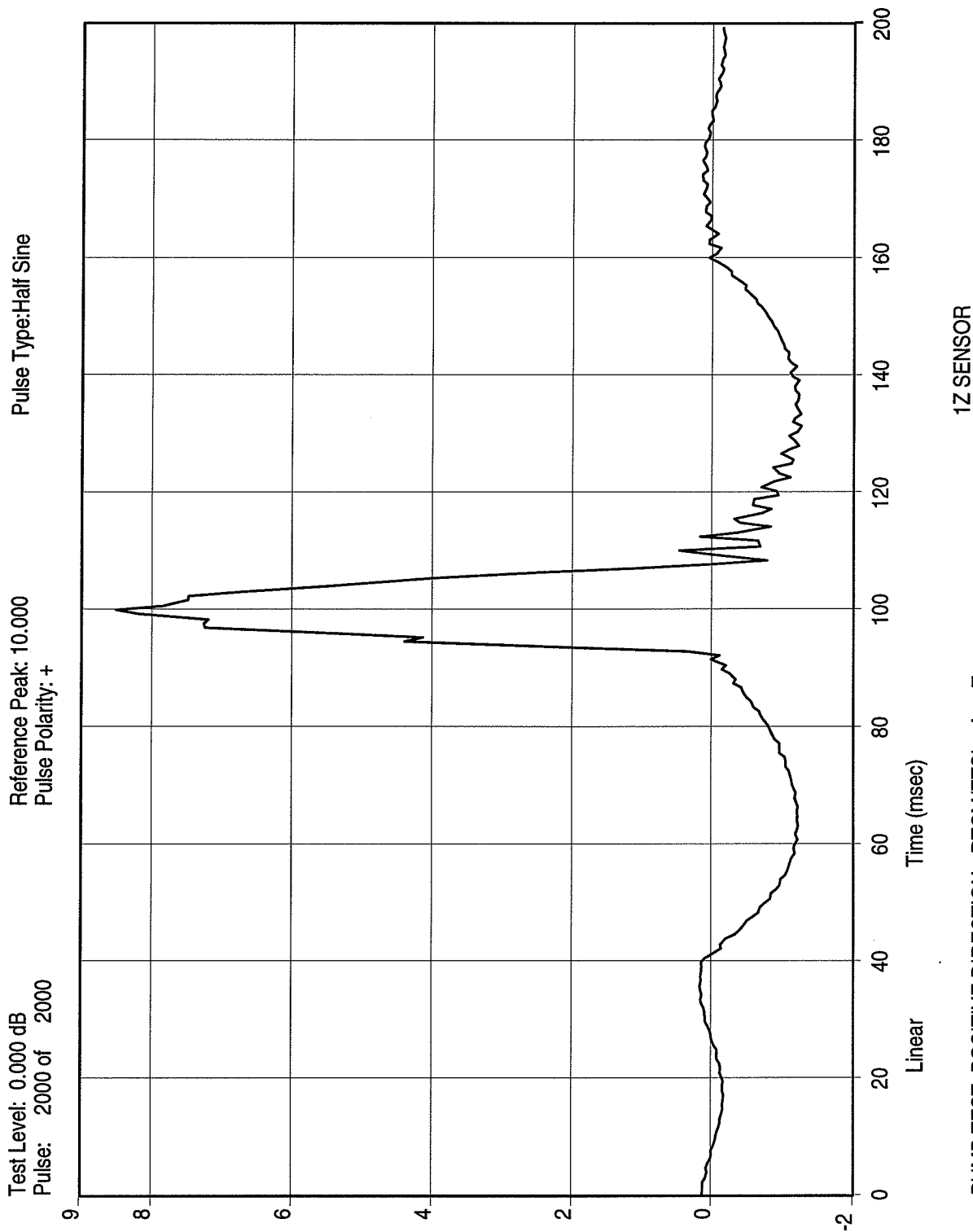
SRS ANALYSIS PARAMETERS -

SRS Spacing: 1/3 octave
SRS Filter Definition: Absolute Acceleration
SRS Damping: 5.00 %
SRS Q: 10.00

CHANNEL TABLE:

Channel Number	Channel Type	Loop Check	Sensitivity (mV/g)	Channel Label 1	Label 2
1	Control	Yes	100	Pilote P	
2	Auxiliary	No	100	1X SENSOR	
3	Auxiliary	No	100	1Y SENSOR	
4	Auxiliary	No	100	1Z SENSOR	

End of Classical Shock Test Summary List



BUMP TEST POSITIVE DIRECTION - RTCM/ETSI _Axe Z+
E5503 - Beacon ACR PLB 200/201 - S/N : 07
Classical Shock Test Name: 10gpos.004

Auxiliary
Acceleration

Linear
g

Peak:
8.500
-1.271

Test Name: 10gneg.005
Current Date: Mon Jun 28 2004 18:23:44

DOCUMENTATION:

Title 1: BUMP TEST NEGATIVE DIRECTION - RTCM/ETSI _ Axe Z-
Title 2: E5503 - Beacon ACR PLB 200/201 - S/N : 07
Title 3:

TEST RESULTS:

Time at Shutdown: 18:20:25
Date at Shutdown: 28-Jun-2004
Test Completed Normally
Last Pulse Output
Pulse Amplitude: -10.01 g
Test Level: 0.00 dB
Polarity: -
Average Error (Time Domain): 0.35 %
Peak Error (Time Domain): 0.13 %
Pulses Requested: 2000
Pulses Remaining: 0
Table of Alarms Occurrences Maximum Value
Average Error: 0
Peak Error: 0
Maximum Drive: 0
Input Overload: 0

TABLE OF OUTPUTS:

Level	Number of Outputs	
	Positive	Negative
0.00		2000
-2.00		1
-5.00		1
-8.00		1
-11.00		1
-15.00		11

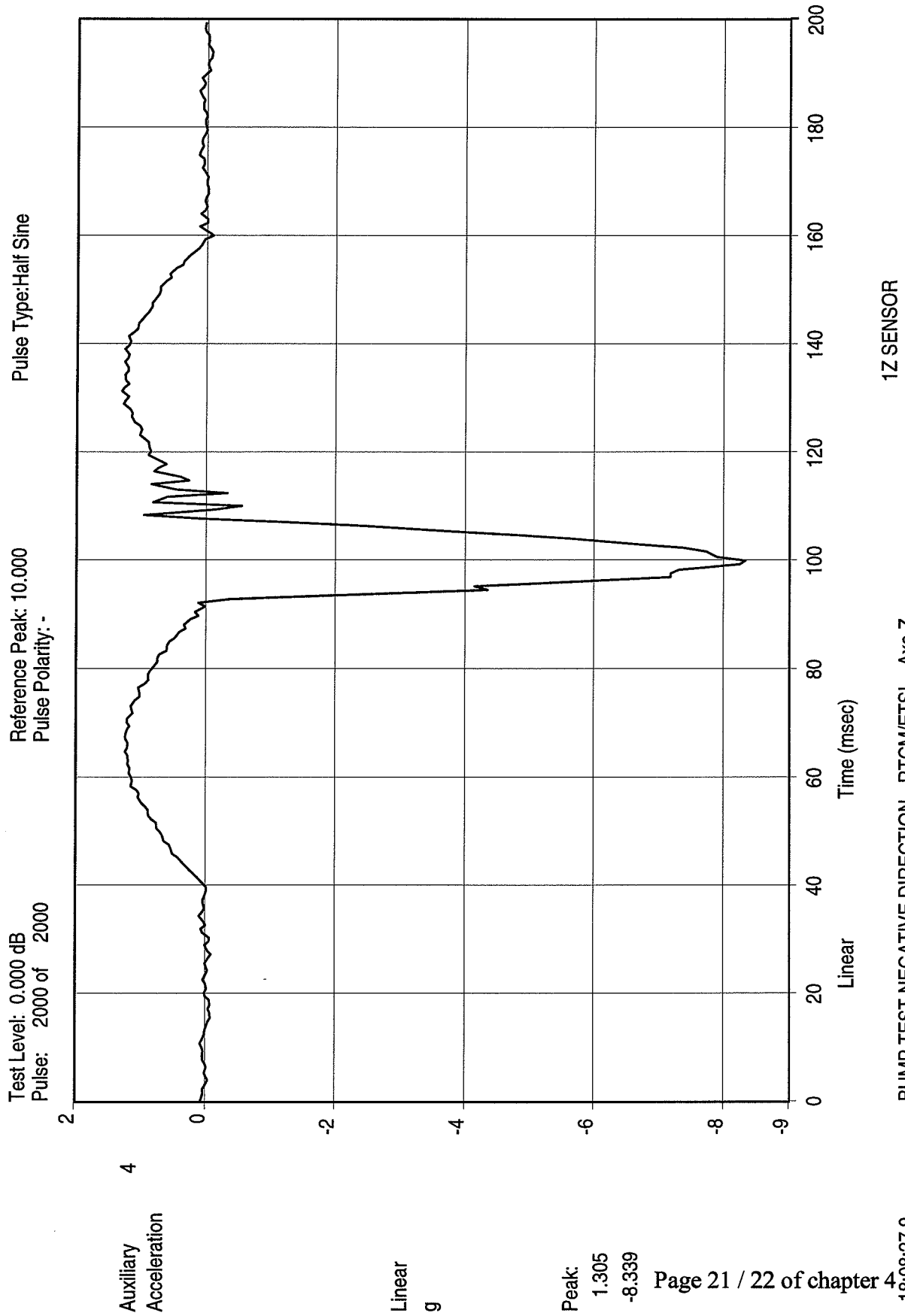
REFERENCE PARAMETERS:

REFERENCE PULSE -
Pulse Type: Half Sine
Pulse Amplitude: 10.00 g
Pulse Duration: 16.00 ms
PULSE DYNAMIC LIMITS -
Acceleration: 10.00 g -1.50 g
Velocity: 0.49 m/s -0.49 m/s
Displacement: 0.01 mm -15.17 mm
Sample Rate: 1280.00 Hz
SRS ANALYSIS PARAMETERS -
SRS Spacing: 1/3 octave
SRS Filter Definition: Absolute Acceleration
SRS Damping: 5.00 %
SRS Q: 10.00

CHANNEL TABLE:

Channel Number	Channel Type	Loop Check	Sensitivity (mV/g)	Channel Label 1	Label 2
1	Control	Yes	100	Pilote P	
2	Auxiliary	No	100	1X SENSOR	
3	Auxiliary	No	100	1Y SENSOR	
4	Auxiliary	No	100	1Z SENSOR	

End of Classical Shock Test Summary List



4.9.4. BEACON CHECKOUT

Test using a portable test bench and visual inspection confirmed that the beacon does not activate in an untimely manner during vibration testing.

4.9.5. FINAL CONTROL

4.9.5.1.External mechanical inspection.

A visual inspection was done on all external mechanical parts.

Result : nominal.

4.9.5.2.Aliveness test results

BUMP ALIVENESS TEST RESULTS

Note : Same Aliveness Test after Vibration Test

Beacon Unit : 1/3
 Name : ACR / TeraFixTM 406GPS I/O PLB
 Type : PLB200
 Number : 07

Date : June 29th, 2004

406 MHz Measurements

1 - Environmental Temperature (° C)			+ 22° C
2 - POWER OUTPUT			
- Transmission power	dBm	37 ± 2	37.17
- Power risetime	ms	< 5	-
- Power falltime	ms	< 5	-
3 - SPURIOUS OUTPUT			
- In band			OK
- Carrier harmonics			
4 -DIGITAL MESSAGE GENERATOR			
- Repetition rate			-
- Bit rate	bits/S	400 ± 4	398.35
- Transmission time	ms	440 ± 4.4 / 520 ± 5.2	522.43
- CW preamble	ms	160 ± 1.6	160.70
5 - DIGITAL MESSAGE			
- Bit and frame sync	bits	1-24	FFFE2F
- Format flag	bit	25	1
- Protocol flag	bit	26	0
- Country code	bits	27-36	0366
- Protocol	bits	37-40	1110
- Encoded Position Data Source	bits	111	1
- Homing	bits	112	1
- BCH 1 code read / calculated	bits	86-106 / 25-85	00B717 / 00B717
- BCH 2 code read / calculated	bits	133-144 / 107-132	9E3 / 9E3
6 - FREQUENCY			
- Nominal value	KHz	406 025 ± 2 or 406 028 ± 1	406 027.875
- Short term stability		< 210 ⁻⁹ /100 ms	3.5 x 10 ⁻¹⁰