

CHAPTER 6

A6.0 – BUMP TEST

6.1. ADMINISTRATIVE INFORMATION

6.1.1. CLIENT

JOTRON Electronics a.s.

6.1.2. REPRESENTATIVES PRESENT

For the Client : G. PEYROU ITS/AP/ET
For the Test Laboratory : J. M. BUCHMAN

6.1.3. DATES

Start of test : June 8th, 2000
End of test : June 8th, 2000

6.1.4. INTESPACE FILE REFERENCE : M2393-RTCM

6.2. UNIT UNDER TEST (UUT)

EUT : 2/2
Name : JOTRON
Type : TRON 40GPS
Number : 7001

6.3. PURPOSE OF THE TEST

Functional checkout of hardware after vibration testing.

6.4. TEST EQUIPMENT

6.4.1. TEST DEVICES

Electrodynamic vibration table, type 80 kN-2 -GR3
Spectral Dynamics SD2225 digital control panel

6.4.2. METROLOGICAL EQUIPMENT

Control : accelerometer (analysis and processing)
Measurements : Spectral Dynamics SD2225

6.5. TEST PROCEDURE

6.5.1. AXIS (See photograph in § 6.7 page 6.4)

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 »

6.5.2. 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.

6.5.3. TEST SPECIFICATIONS AND SEQUENCE

Bumps following Section A6.0 of RTCM Recommended Standards for 406 MHz Satellite EPIRBs (Version 2.0 Feb 5, 1997)

- Profile of bump test :

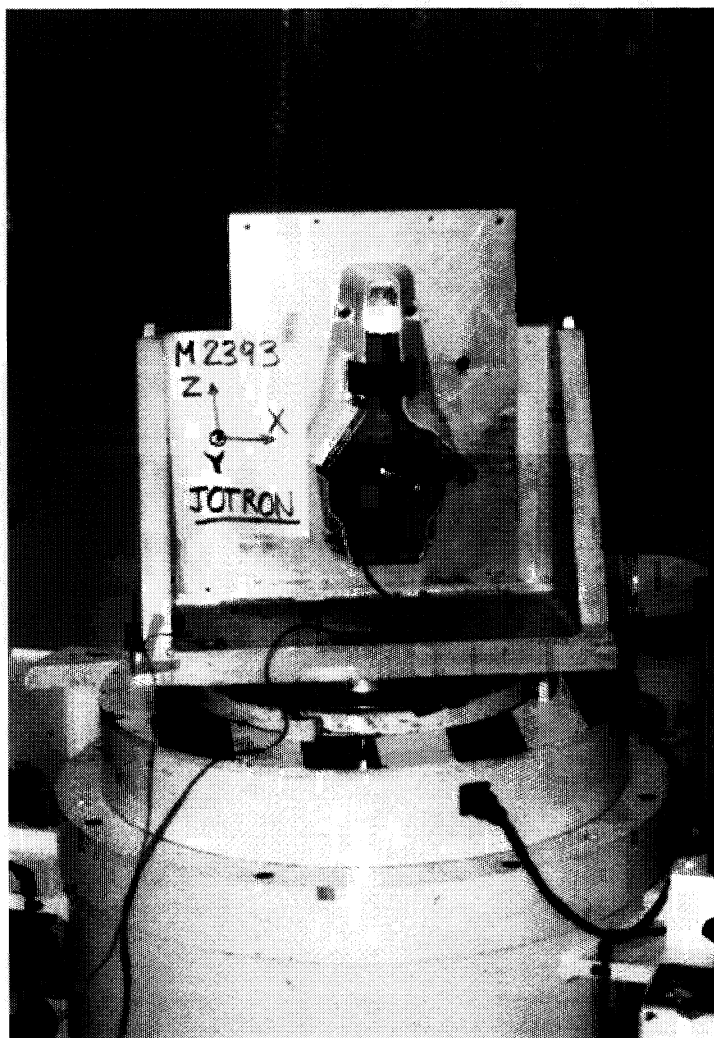
Peak acceleration	98 m/s ²
Pulse duration	16 ms
Waveshape	Half-cycle Sinewave
Test axis	Vertical (Z)
Number of Bumps	4000

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

6.6. LIST OF SERVO AND CONTROL SENSORS

Sensor	Location	N° acc.	Cable	Sensitivity pC/g
P (control)	Screwed on test holder sheet	CP91	-/1	9.28
1X (auxiliary)	Glued on Beacon Necklace	10122	12/2	8.31
1Y (auxiliary)	Glued on Beacon Necklace	3748	11/3	8.31
1Z (auxiliary)	Glued on Beacon Necklace	5326	13/4	8.31

6.7. PHOTOGRAPH



6.8. TEST SCHEDULE

Date / Test n°	Specifications	Paragraph	Events - Observations	
			Test equipment	Unit under test
8 June 2000 PREL	Half-cycle sinewave Bump Peak acceleration 98 m/s ² Pulse duration 16 ms Test axis Vertical (+Z) Number of Bumps 1		Preliminary testing without the equipment	
8 June 2000 005ZA	Half-cycle sinewave Bump Peak acceleration 98 m/s ² Pulse duration 16 ms Test axis Vertical (+Z) Number of Bumps 2000 Test duration : 50 min.	6.9.1	Nominal	Set up the beacon on test table on Zaxis (80 kN) . Functional testing : nominal.
8 June 2000 005ZB	Half-cycle sinewave Bump Peak acceleration 98 m/s ² Pulse duration 16 ms Test axis Vertical (-Z) Number of Bumps 2000 Test duration : 50 min.	6.9.2	Nominal End of the bump test	Functional testing : nominal. Removal of Beacon
8 June 2000	Visual inspection	6.9.4.1		Nothing abnormal to note
8 June 2000	EPIRB Aliveness Test	6.9.4.2	Cospas Sarsat Test Bench	Nominal

6.9. TEST RESULTS

6.9.1. RESULTS OF +Z BUMP AXIS (2000 bumps)



File Name:

/user/client/m2393/shock/test/10g18ms

Current Date:

Thu Jun 08 2000 14:51:09

CONTROL PARAMETERS:

DURATION -

Number of Full Level Pulses: 2000
Delay between Pulses: 1000.0 ms

CONTROL STRATEGY -

Drive Update: On
Pulse Output Polarity: + positive
Weighting for Averaging: 0.125
Feedback Gain: 0.750
Waveform Trend Removal: Enable

OPERATION MODE -

Mode: Semi-Automatic

EQUALIZATION & SYSTEM IDENTIFICATION-

Start Level: -15.0 dB
Initial Excitation: Pulse
Prestored Drive: Off

STARTUP -

Initial Test Level: -11.0 dB
Level Increment: 3.0 dB
Delay between Pulses: 1000.0 ms

REFERENCE PARAMETERS:

REFERENCE PULSE -

Pulse Type: Half Sine
Pulse Amplitude: 10.00 g
Pulse Duration: 18.00 ms
Specify Buffer Duration: No
Buffer Duration: 200.00 ms
Center Pulse in Buffer: Yes
Sample Rate Multiplier: 5.12
Units for Accel, Vel, and Displ: g, m/s, mm

PULSE COMPENSATION -

Type: Pre- and Post-Pulse
Optimization: Single Sided Displacement
Pre-Pulse Amplitude: 15.0 %
Post-Pulse Amplitude: 15.0 %

PULSE DISPLAY TOLERANCE BANDS -

Type: None

PULSE DYNAMIC LIMITS -

Input Volts: 0.93 V
Acceleration: 9.98 g -1.50 g
Velocity: 0.56 m/s -0.56 m/s
Displacement: 0.04 mm -19.80 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

SAFETY PARAMETERS:

ALARM/ABORTS -

Maximum Average Error -
Alarm: 10.00 %
Abort: 20.00 %
Maximum Peak Error -
Alarm: 20.00 %
Abort: 50.00 %

LOOP CHECK -

Noise Threshold: 30.00 mV RMS
Maximum Drive: 100.00 mV RMS

Pause after Loop Check: Yes
 DRIVE SIGNAL -
 Maximum Drive: 6.00 Vpeak

CHANNEL TABLE:

Channel Nuxnber	Channel Type	Loop Check	Sensitivity (mV/ g	Channel Label 1	Label 2
1	Control	Yes	92.8	Pilote P	
2	Auxiliary	No	88.55	1X SENSOR	
3	Auxiliary	No	62.7	1Y SENSOR	
4	Auxiliary	No	69	1Z SENSOR	

DOCUMENTATION:

Display Text -
 Title 1: 005ZA TEST : BUMP TEST POSITIVE DIRECTION
 Title 2: M2393 - JOTRON TRON 40 GPS N/S 7001
 List Only Text -
 Title 3:
 Prompt before Test : Yes
 Data Storage -
 Mode : Manual
 Message Log -
 Mode : Use Run Number
 Printing -
 Auto Plot after Test : No

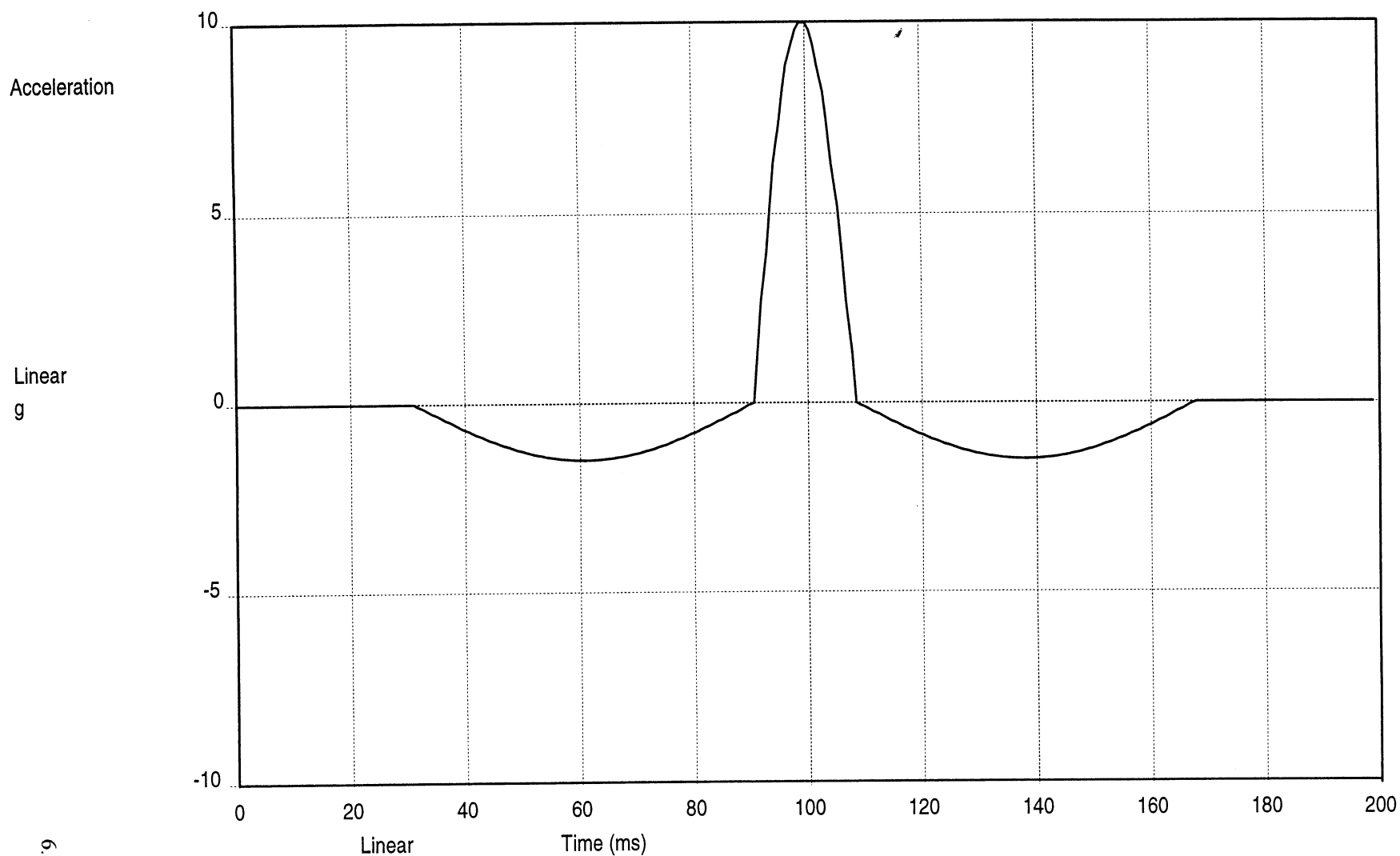
REMOTE COMMUNICATION TABLE :

Enable Remote Communication : No

SHAKER LIMITS :

Enable Shaker Limits : Yes
 File Name : 80 kN
 Shaker Description : Shaker 80kN Limits
 Symmetric Value : No
 Acceleration (+g) : 100.000 (-g) : -100.000
 Velocity (+m/s) : 2.000 (-m/s) : -2.000
 Displacement (+mm) : 25.400 (-mm) : -25.400
 Voltage (+V) : 10.000 (-V) : -10.000

End of Classical Shock Test List



6.11

14:51:11
08-Jun-2000

005ZA TEST : BUMP TEST POSITIVE DIRECTION

M2393 - JOTRON TRON 40 GPS N/S 200 A

Classical Shock Test Name: /user/client/m2393/shock/test/10g18ms



Test Name:

10g18ms.002

Current Date:

Thu Jun 08 2000 15:34:07

DOCUMENTATION:

Title 1: 005ZA TEST : BUMP TEST POSITIVE DIRECTION

Title 2: M2393 - JOTRON TRON 40 GPS N/S2000

Title 3:

TEST RESULTS:

Time at Shutdown:	15:33:54	
Date at Shutdown:	08-Jun-2000	
Test Completed Normally		
Last Pulse Output		
Pulse Amplitude:	9.87 g	
Test Level:	0.00 dB	
Polarity:	+	
Average Error (Time Domain):	0.52 %	
Peak Error (Time Domain):	1.26 %	
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:	18.00 ms

PULSE DYNAMIC LIMITS -

Acceleration:	9.98 g	-1.50 g
Velocity:	0.56 m/s	-0.56 m/s
Displacement:	0.04 mm	-19.80 mm
Sample Rate:	1280.00 Hz	

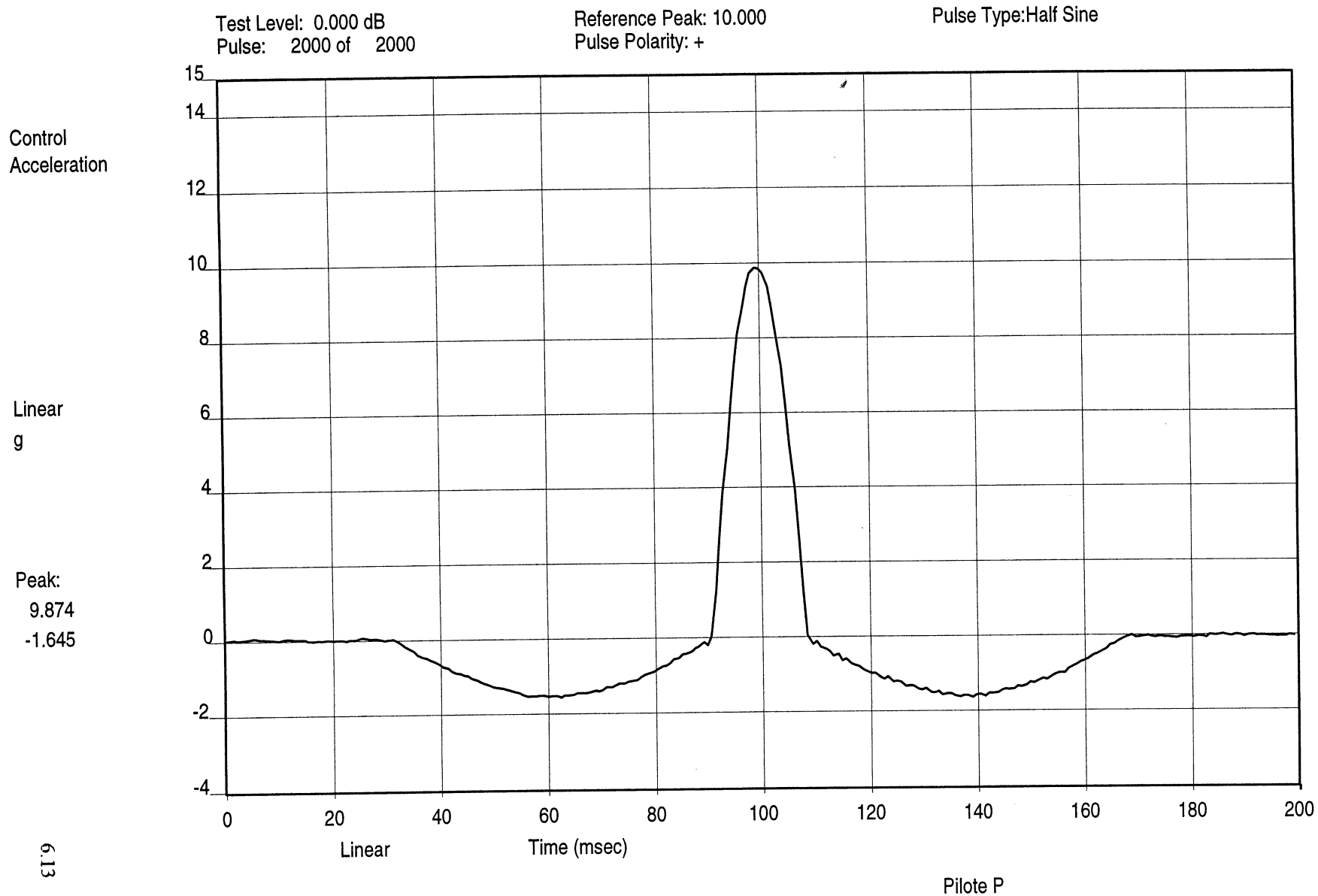
SRS ANALYSIS PARAMETERS -

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

CHANNEL TABLE:

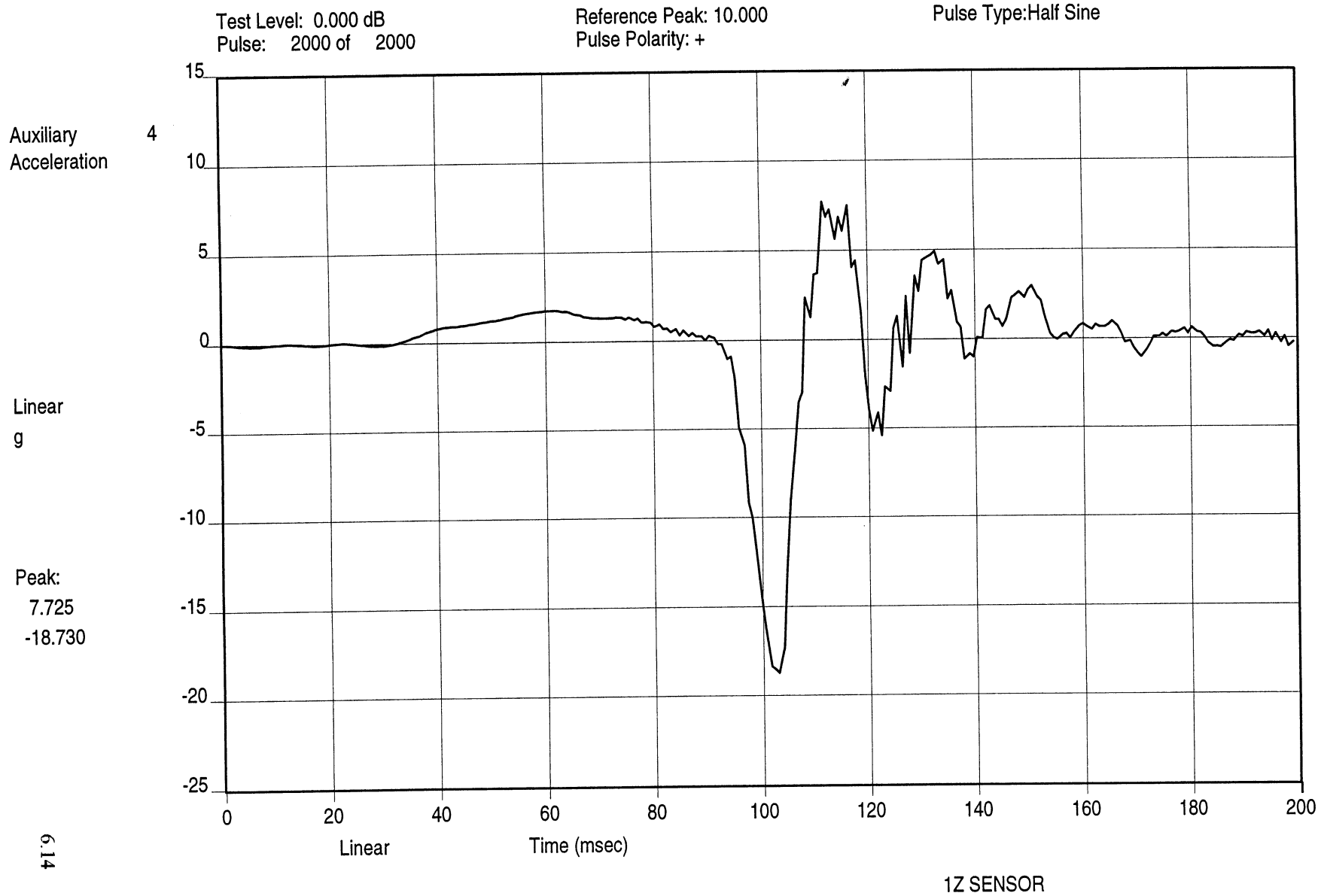
Channel Number	Channel Type	Loop Check	Sensitivity (mV/g)	Channel Label 1	Label 2
1	Control	Yes	92.8	Pilote P	
2	Auxiliary	No	88.55	1X SENSOR	
3	Auxiliary	No	62.7	1Y SENSOR	
4	Auxiliary	No	69	1Z SENSOR	

End of Classical Shock Test Summary List



15:30:49.1
 Thu Jun 08 2000

005ZA TEST : BUMP TEST POSITIVE DIRECTION
 M2393 - JOTRON TRON 40 GPS N/S: 7 00 1
 Classical Shock Test Name: 10g18ms.002



15:30:49.1
Thu Jun 08 2000

005ZA TEST : BUMP TEST POSITIVE DIRECTION
M2393 - JOTRON TRON 40 GPS N/S 7-001
Classical Shock Test Name: 10g18ms.002

6.9.1. RESULTS OF -Z BUMP AXIS (2000 bumps)



File Name:

/user/client/m2393/shock/test/10gneg

Current Date:

Thu Jun 08 2000 15:39:32

CONTROL PARAMETERS:

DURATION -

Number of Full Level Pulses: 2000 *negatives*
Delay between Pulses: 1000.0 ms

CONTROL STRATEGY -

Drive Update: On
Pulse Output Polarity: -
Weighting for Averaging: 0.125
Feedback Gain: 0.750
Waveform Trend Removal: Enable

OPERATION MODE -

Mode: Semi-Automatic

EQUALIZATION & SYSTEM IDENTIFICATION-

Start Level: -15.0 dB
Initial Excitation: Pulse
Prestored Drive: Off

STARTUP -

Initial Test Level: -11.0 dB
Level Increment: 3.0 dB
Delay between Pulses: 1000.0 ms

REFERENCE PARAMETERS:

REFERENCE PULSE -

Pulse Type: Half Sine
Pulse Amplitude: 10.00 g
Pulse Duration: 18.00 ms
Specify Buffer Duration: No
Buffer Duration: 200.00 ms
Center Pulse in Buffer: Yes
Sample Rate Multiplier: 5.12
Units for Accel, Vel, and Displ: g, m/s, mm

PULSE COMPENSATION -

Type: Pre- and Post-Pulse
Optimization: Single Sided Displacement
Pre-Pulse Amplitude: 20.0 %
Post-Pulse Amplitude: 20.0 %

PULSE DISPLAY TOLERANCE BANDS -

Type: None

PULSE DYNAMIC LIMITS -

Input Volts: 0.93 V
Acceleration: 9.98 g -2.00 g
Velocity: 0.56 m/s -0.56 m/s
Displacement: 0.04 mm -15.68 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

SAFETY PARAMETERS:

ALARM/ABORTS -

Maximum Average Error -
Alarm: 10.00 %
Abort: 20.00 %
Maximum Peak Error -
Alarm: 20.00 %
Abort: 50.00 %

LOOP CHECK -

Noise Threshold: 30.00 mV RMS
Maximum Drive: 100.00 mV RMS



intespace

L'Intelligence de l'Environnement

Pause after Loop Check:

Yes

DRIVE SIGNAL

Maximum Drive:

6.00 Vpeak

ITS: M2393-RTCM & CNES: DSO/RC//AS 2000-224

CHANNEL TABLE:

Channel Number	Channel Type	Loop Check	Sensitivity (mV/g)	Channel Label 1	Label 2
1	Control	Yes	92.8	Pilote P	
2	Auxiliary	No	88.55	1X SENSOR	
3	Auxiliary	No	62.7	1Y SENSOR	
4	Auxiliary	No	69	1Z SENSOR	

DOCUMENTATION:

Display Text -

Title 1: 005ZB TEST : BUMP TEST NEGATIVE DIRECTION

Title 2: M2393 - JOTRON TRON 40 GPS N/S2000

List Only Text -

Title 3:

Prompt before Test: Yes

Data Storage -

Mode: Manual

Message Log -

Mode: Use Run Number

Printing -

Auto Plot after Test: No

REMOTE COMMUNICATION TABLE:

Enable Remote Communication: No

SHAKER LIMITS:

Enable Shaker Limits: Yes

File Name: 80kN

Shaker Description: Shaker 80kN Limits

Symmetric Values: NO

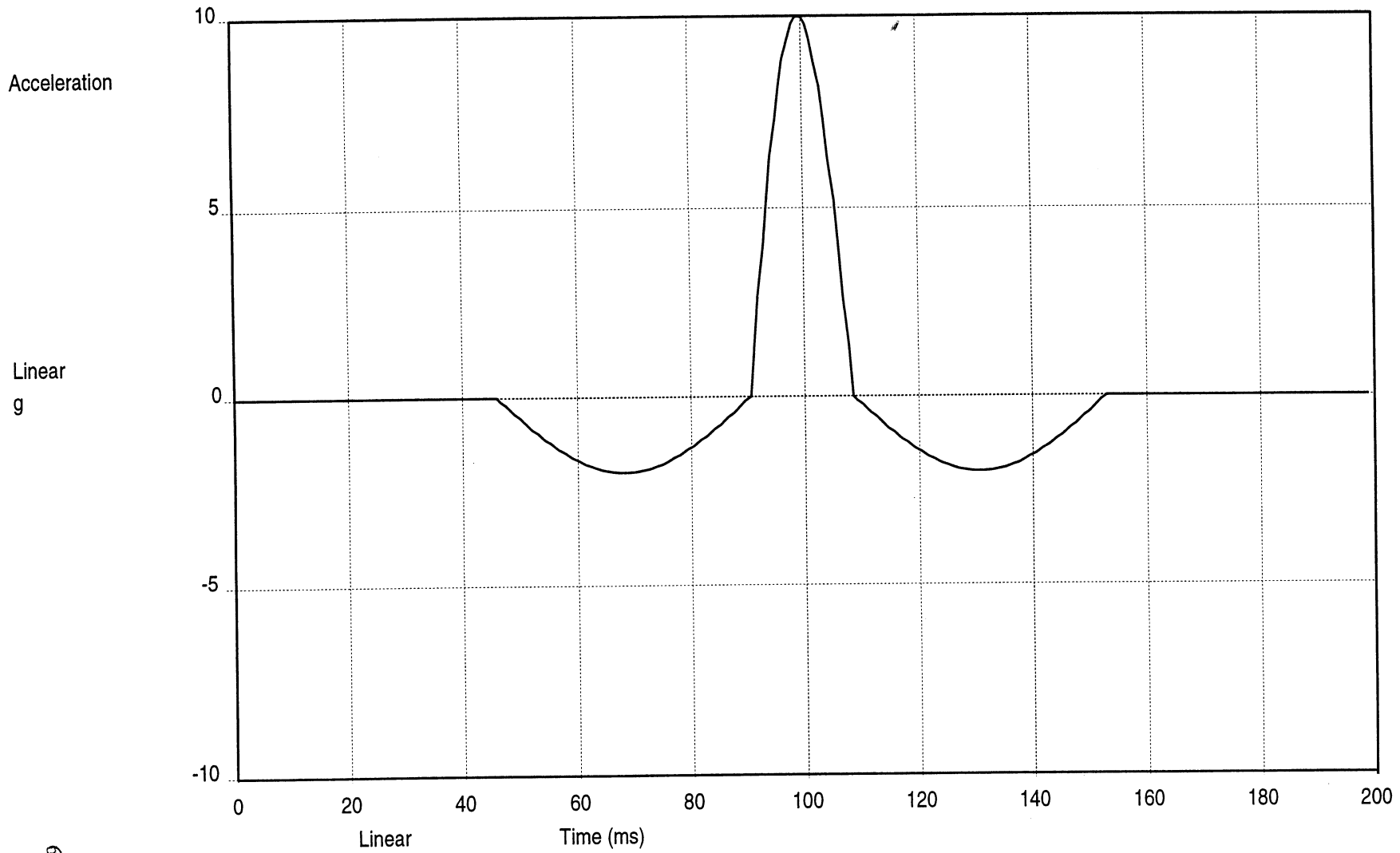
Acceleration (+g): 100.000 (-g): -100.000

Velocity (+m/s): 2.000 (-m/s): -2.000

Displacement (+mm): 25.400 (-mm): -25.400

Voltage (+v): 10.000 (-v): -10.000

End of Classical Shock Test List



6.18
 15:41:43
 08-Jun-2000

005ZB TEST : BUMP TEST NEGATIVE DIRECTION
 M2393 - JOTRON TRON 40 GPS N/S2000
 Classical Shock Test Name: /user/client/m2393/shock/test/10gneg



Test Name:

10gneg.002

Current Date:

Thu Jun 08 2000 16:28:01

DOCUMENTATION:

Title 1: 005ZB TEST : BUMP TEST NEGATIVE DIRECTION

Title 2: M2393 - JOTRON TRON 40 GPS N/S2000

Title 3:

TEST RESULTS:

Time at Shutdown:	16:24:57	
Date at Shutdown:	08-Jun-2000	
Test Completed Normally		
Last Pulse Output		
Pulse Amplitude:	-9.95 g	
Test Level:	0.00 dB	
Polarity:	-	
Average Error (Time Domain):	0.37 %	
Peak Error (Time Domain):	0.46 %	
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:	18.00 ms

PULSE DYNAMIC LIMITS -

Acceleration:	9.98 g	-2.00 g
Velocity:	0.56 m/s	-0.56 m/s
Displacement:	0.04 mm	-15.68 mm
Sample Rate:	1280.00 Hz	

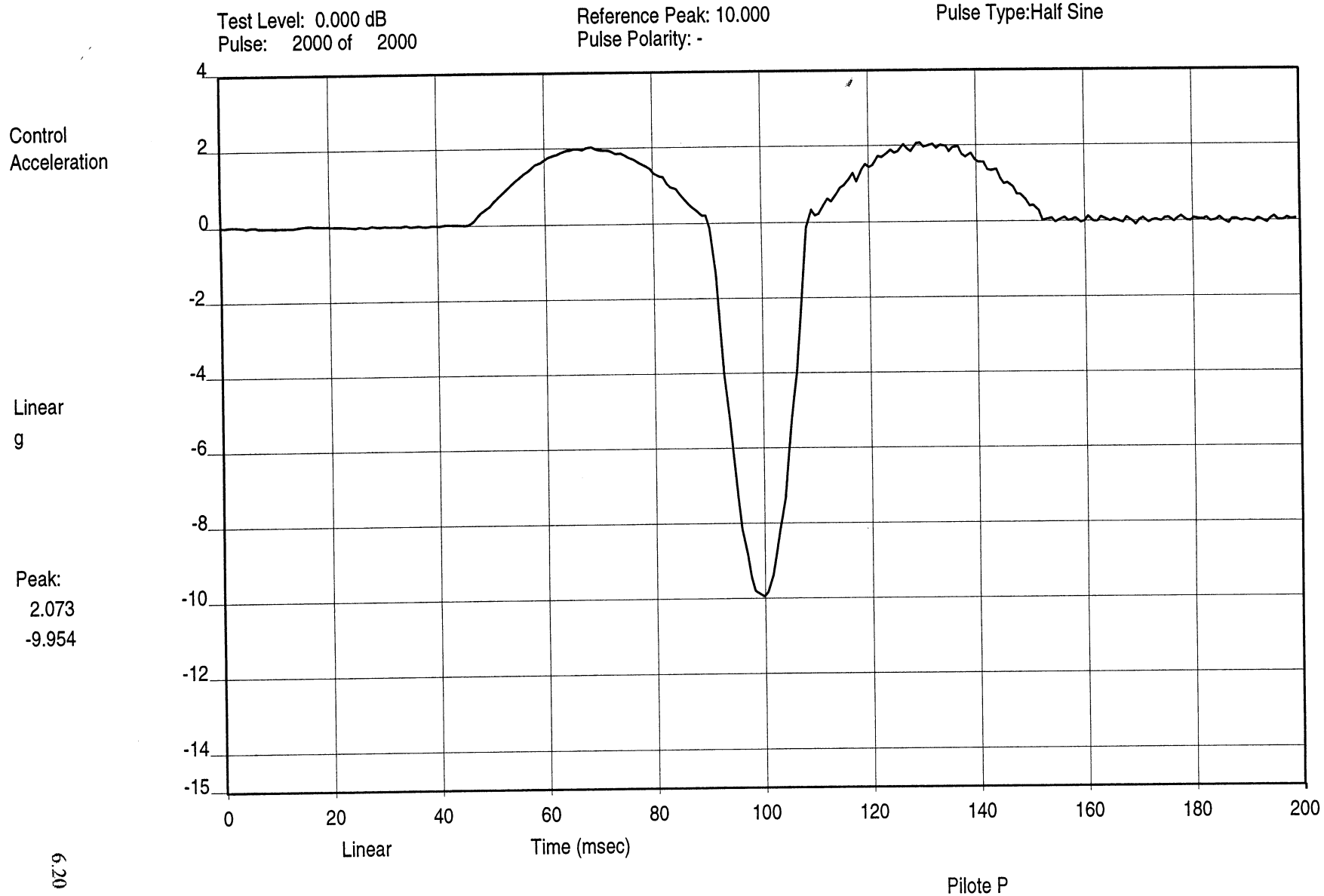
SRS ANALYSIS PARAMETERS -

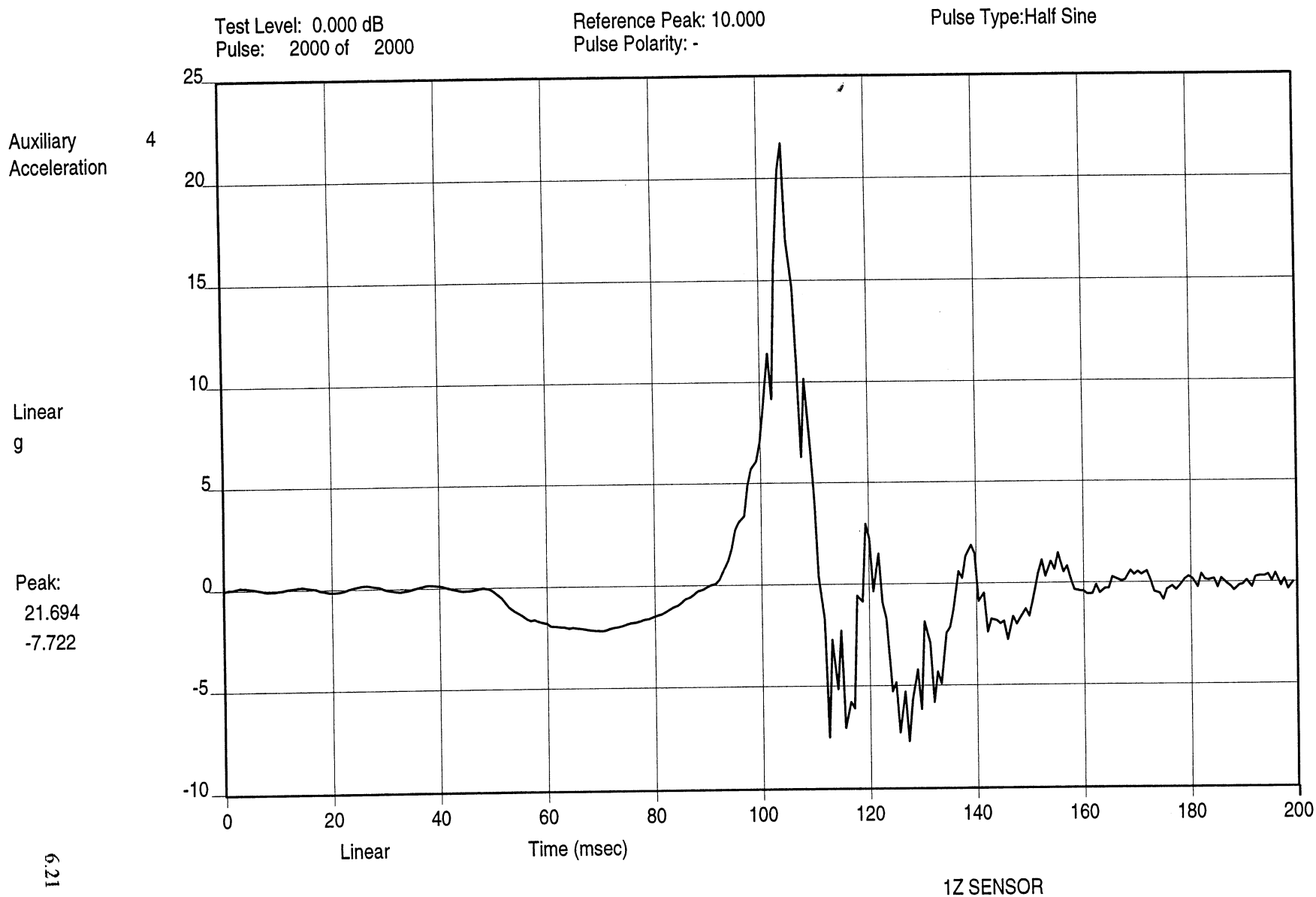
SRS Spacing:	1/3 octave
SRS Filter Definition:	Absolute Acceleration
SRS Damping:	5.00 %
SRS Q:	10.00

CHANNEL TABLE:

Channel Number	Channel Type	Loop Check	Sensitivity (mV/g)	Channel Label 1	Label 2
1	Control	Yes	92.8	Pilote P	
2	Auxiliary	No	88.55	1X SENSOR	
3	Auxiliary	No	62.7	1Y SENSOR	
4	Auxiliary	No	69	1Z SENSOR	

End of Classical Shock Test Summary List





6.9.3. 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.

6.9.4. FINAL CONTROL

6.9.4.1.External mechanical inspection.

A visual inspection was done on all external mechanical parts.

Result : nominal.

6.9.4.2.Aliveness test results

Result : nominal.

Data and graphs are reported next page

CERTIFICATION CENTER MEASUREMENTS
BUMP ALIVENESS TEST RESULTS

E UT : 2/2
 Name : JOTRON
 Type : TRON 40GPS
 Number : 7001
 Date : 8 June 2000

406 MHz Measurements

1 - Environmental Temperature (° C)			+ 22° C
2 - POWER OUTPUT			
- Transmission power	dBm	37 ± 2	37.2
- Power risetime	ms	< 5	0.60
- Power falltime	ms	< 5	-
3 - SPURIOUS OUTPUT *			-
- In band			
- Carrier harmonics			
4 - DIGITAL MESSAGE GENERATOR *			-
- Repetition rate			398.9
- Bit rate	bits/S	400 ± 4	522.1
- Transmission time	ms	440 ± 4.4 / 520 ± 5.2	160.3
- CW preamble	ms	160 ± 1.6	
5 - DIGITAL MESSAGE *			FFFE2F
- Bit and frame sync	bits	1-24	1
- Format flag	bit	25	0
- Protocol flag	bit	26	0257
- Country code	bits	27-36	1110
- Protocol	bits	37-40	1
- Encoded Position Data Source	bits	111	1
- Homing	bits	112	105685 / 105685
- BCH 1 code read / calculated	bits	86-106 / 25-85	66C / 66C
- BCH 2 code read / calculated	bits	133-144 / 107-132	
6 - FREQUENCY			
- Nominal value	KHz	406 025 ± 2	+ 0.0957
- Short term stability		< 2x10 ⁻⁹ /100 ms	1.5 x 10 ⁻¹⁰

* See data and graphs next pages

Laboratoire de certification
Contrôle balise ARGOS/SARSAT

Constructeur	JOTRON
Modele	TRON 40GPS
Numero de serie	OCA07001
Reference	M2393
Type	SARSAT

Date de l'essai 8 Jun 2000 17:22:54

Message balise

Message reçu	(1-144):	FFFE2F901E1E24007FDFFC15A17783E0F66C
Format flag	(25):	1
Protocole flag	(26):	0
Code pays	(27-36):	0257
Pays	:	NORWAY
Code protocole	(37-40):	1110
Protocole utilise	:	Standard - Test
Identification	:	
Numero	:	
BCH 1 lu/calculé	(86-106/25-85):	105685/105685
BCH 2 lu/calculé	(133-144/107-132):	66C/66C
Pos. Data Source	(111):	Internal
121.5 MHz Homing	(112):	Yes
Position GPS de reference	:	N 43°33'34'' E 1°28'48
Position GPS	:	Yes
Position GPS par défaut	:	Yes

Contrôle message

Duree de la porteuse pure	160.26ms +- 0
Duree de l'emission	522.11 ms
Frequence de modulation	398.86Hz +- 0

Stabilité de fréquence

Frequence moyenne	F2	406025095.73 Hz
SIGMA2	F2-F1	8.760E-10
SIGMA3	F3-F2	1.533E-10

Mesures d'indice

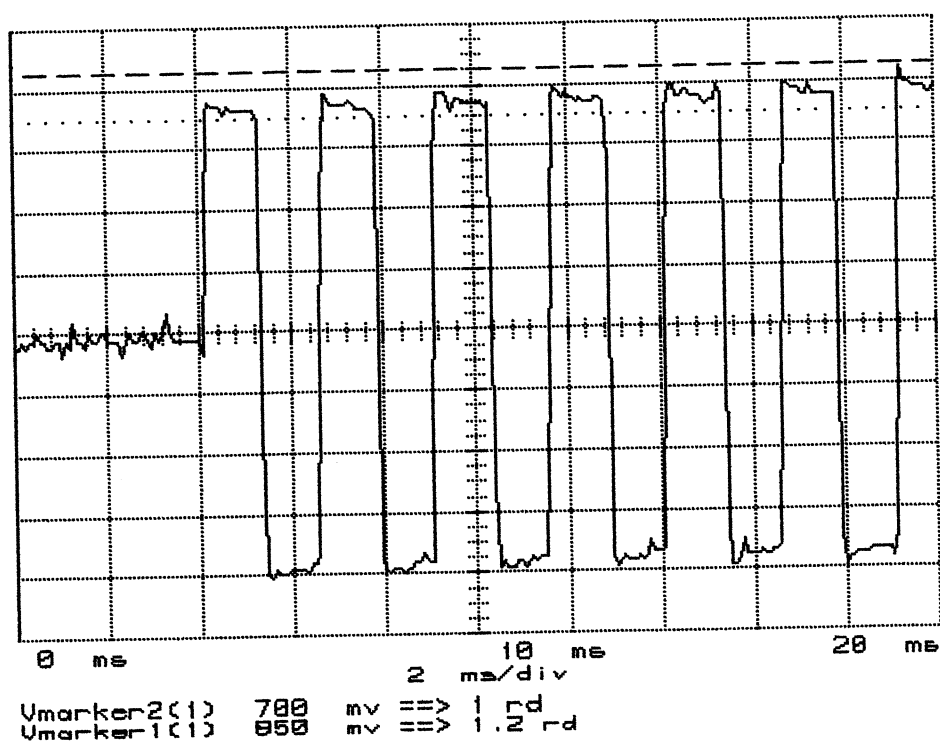
F	F1	G1
50095.78	232	63
50095.21	212	63

Excursion de phase totale	rd	<= 2.48	2.21
Excursion de phase positive	rd	0.96< <1.24	.94
Excursion de phase negative	rd	-1.24< <-0.96	-1.26
Symetrie de l'excursion	%	<= 5	14.47

6.24

Mesures de puissance

Puissance	dBm	37.18
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Spectre de frequence

