REPORT ON

Environmental Testing of the McMurdo Limited 406 MHz Fastfind Plus PLB with internal GPS position encoded data and 121.5 MHz Radio locating device

Report No: SX608213 December 2001

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REPORT ON: Environmental Testing of the McMurdo Limited 406 MHz Fastfind Plus PLB with internal GPS position encoded data and 121.5 MHz Radio locating device

Report No: SX608213
December 2001

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DATED: 4th December 2001

DISTRIBUTION:

Mr Richard Read McMurdo Ltd	Copies 1, 2
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EXECUTIVE SUMMARY

Environmental Testing of the McMurdo Limited 406 MHz Fastfind Plus PLB with internal GPS position encoded data and 121.5 MHz Radio locating device

Project Manager : M J Osborne

1.1 STATUS

MANUFACTURING DESCRIPTION	Personal Locator Beacon (PLB)
OBJECTIVE	To assess the performance of the McMurdo Limited 406 MHz Fastfind Plus PLB with internal GPS position encoded data and 121.5 MHz Radio locating device when subjected to the specified levels of climatic and mechanical stress
MANUFACTURER	McMurdo Limited
SPECIFICATIONS	ETSI EN 300 066 V1.3.1 (2001-01) RTCM 5-97/SC110-STD Version 1.0 (1997-02) BS EN 60945 : 1997 MIL-STD-810F (1997-04)
ASSESSMENT SERVICES REGISTRATION NUMBER	SX608213
QUANTITY OF ITEMS	Three
SECURITY CLASSIFICATION	Unclassified
INCOMING RELEASE	Not released
DISPOSAL	Returned to Customer
DATE	16th October 2001
ORDER NUMBER	702907
START OF TEST	6th June 2001
FINISH OF TEST	16th October 2001

1.2 **BRIEF SUMMARY OF RESULTS**

Report Section	Test	Brief Result Summary
2.1	Dry Heat	Performance checks completed satisfactorily.
2.2	Damp Heat	Performance checks completed satisfactorily.
2.3	Low Temperature	Unit failed to operate correctly during, retest carried out and performance checks completed satisfactorily.
2.4	Vibration	Performance checks completed satisfactorily.
2.5	Ruggedness	Performance checks completed satisfactorily.
2.6	Drop	Self-test failure on both units tested, damage to battery packs noted. Performance checks completed satisfactorily after re-test.
2.7 & 2.10	Temporary Immersion	Malfunction during test. Re-test performed successfully.
2.8 & 2.9	Thermal Shock	Malfunction during test. Test repeated satisfactorily.
2.11	Altitude	Performance checks completed satisfactorily.

1.3 TEST OBSERVATIONS

The McMurdo Limited Personal Locator Beacon was subjected to various climatic and mechanical test conditions specified in McMurdo Limited Type Approval Specification 85-901V, Issue C. The tests were performed in accordance with the following specifications:

ETSI EN 300 066 V1.3.1 (2001-01)
RTCM 5-97/SC110-STD Version 1.0 (1997-02)
BS EN 60945 : 1997
MIL-STD-810F (1997-04)

Performance checks were carried out by TUV Product Service Ltd personnel.

Three separate samples were provided for testing. One sample for climatic testing, which was modified to have an external connector in place of the antenna, to allow conducted measurements to be performed during testing. Two samples were provided for mechanical and immersion testing. One sample fitted with a Class 1 battery pack (allowing usage to -40°C), the other fitted with a Class 2 battery pack (allowing usage to -20°C).

Climatic Test Samples
The PLB functioned satisfactorily during the Dry Heat and Damp Heat testing and the required performance checks were within the specified limits. The unit failed to operate correctly during the Low Temperature test and testing was halted. The fault was found to be caused by a faulty component and the PLB was successfully re-tested.

Mechanical Test Samples
No damage or deterioration was observed after the Vibration and Ruggedness testing and the required performance checks were successfully carried out. After the Drop test the performance check did not meet the specification requirements. Both the Class 1 and Class 2 battery packs had split during the test. Both units were pre-production models and were found to be faulty. The Self-test failure was caused by a circuit board modification on the pre-production samples tested, causing a component to become detached. The customer advised that production models will not be affected by this, as the circuit boards have been re-designed to incorporate the required modification. The battery packs were also pre-production models using temporary sealing methods. Final production battery packs will be ultrasonically welded, the test was repeated with ultrasonically welded battery packs. The repeated Drop test was successful.

During the Temporary Immersion test the units malfunctioned. The Thermal Shock test was performed, after an additional Drop test. It was thought the Drop test may have damaged the units and caused the Temporary Immersion failure, a further malfunction was recorded. A fault with the manufacture of the PLB sealing gasket was diagnosed and rectified, therefore it was not considered necessary to perform the Drop test prior to the re-tests. Both Thermal Shock and Temporary Immersion tests were successfully repeated. The Immersion and Altitude tests were completed satisfactorily and the performance checks completed successfully.

TEST DETAILS

Environmental Testing of
The Personal Locator Beacon (PLB)

Test Engineer : C Hedley
A Douglas
L Spencer

2. TEST DETAILS

2.1 DRY HEAT

2.1.1 Specification Reference

ETSI EN 300 066 Clause 6.2.2

2.1.2 Date of Test

6th – 7th June 2001

2.1.3 Test Equipment Used

Instrument	Model	Inv No	Calibration Due Date
Chamber	Rel A	0030	13.8.01
Data Logger	Anville	2569	13.8.01
Frequency & Time Interval Analyser	5372A	EMC 1766	08.03.02
Logic Analyser	1613D	EMC 1767	-
Signal Generator	SMX	EMC 1765	10.01.02
10dB Attenuator	47-10-34	4482	26.07.01
10dB Attenuator	HFP-50N	EMC 1601	07.04.02
3dB Attenuator	HFP-50N	EMC 1605	07.04.02
Crystal Detector	8470B	4209	18.10.01
Mixer	M2TC	EMC 1570	09.02.02
Low Pass Filter	WLJ 1.4C9EF	-	-
Spectrum Analyser	8566A	EMC 772	05.09.01

2.1.4 Equipment Under Test

406 MHz Fastfind Plus PLB with -40°C Battery Pack. The sample was modified to provide an external connector to allow the performance checks to be carried out.

2.1.5 Test Conditions

The PLB was installed in the climatic chamber and connected to the test equipment required to carry out the performance check. The PLB was not operational.

1) Ambient to +70°C in 1 h
2) +70°C for 14 h
3) +70°C to +55°C within 30 minutes
4) The PLB was switched on and remained operational for 2 h 30 minutes at +55°C
5) During the last 30 minutes at +55°C performance checks were carried out.
6) +55°C to ambient in 1 h.
7) PLB exposed to ambient temperature for 3 hours prior to performance of next test.

2.1.6 Results of Test

The temperature monitored in the chamber during this test are shown in Appendix 1.

The results of the performance checks at +55°C are as follows:

	Parameter	Measurement	Limit
406 MHz Signal	Characteristic Frequency	406.027479 MHz	Between 406.027 – 406.029 MHz
	Output Power	36.946 dBm	37 dBm ± 2dB
121.5 MHz Signal	Carrier Frequency	121.497404 MHz	121.5 MHz ± 3.5 kHz
	Output Power	19.35 dBm	17 dBm ± 3dB

2.2 DAMP HEAT

2.2.1 Specification Reference

ETSI EN 300 066 Clause 6.2.3

2.2.2 Date of Test

7th – 8th June 2001

2.2.3 Test Equipment Used

Instrument	Model	Inv No	Calibration Due Date
Chamber	Fisons 5	0643	03.07.01
Data Logger	Anville	2569	03.07.01
Frequency & Time Interval Analyser	5372A	EMC 1766	08.03.02
Logic Analyser	1613D	EMC 1767	-
Signal Generator	SMX	EMC 1765	10.01.02
10dB Attenuator	47-10-34	4482	26.07.01
10dB Attenuator	HFP-50N	EMC 1601	07.04.02
3dB Attenuator	HFP-50N	EMC 1605	07.04.02
Crystal Detector	8470B	4209	18.10.01
Mixer	M2TC	EMC 1570	09.02.02
Low Pass Filter	WLJ 1.4C9EF	-	-
Spectrum Analyser	8566A	EMC 772	05.09.01

2.2.4 Equipment Under Test

406 MHz Fastfind Plus PLB with -40°C Battery Pack. The sample was modified to provide an external connector to allow the performance checks to be carried out.

2.2.5 Test Conditions

The PLB was installed in the climatic chamber and connected to the test equipment required to carry out the performance check. The PLB was not operational.

1) Ambient to +40°C with 93% relative humidity (rh), over 3 h
2) +40°C with 93% rh for 16 h
3) The PLB was switched on and remained operational for 2 h 30 minutes at +40°C with 93% rh
4) During the last 30 minutes at +40°C and 93% rh performance checks were carried out.
5) Returned to ambient in 1 h.
6) PLB exposed to ambient temperature and humidity until any moisture had dispersed.

2.2.6 Results of Test

The temperature and humidity monitored in the chamber during this test are shown in Appendix 2.

The results of the performance checks at +40°C and 93% rh are as follows:

	Parameter	Measurement	Limit
406 MHz Signal	Characteristic Frequency	406.027411 MHz	Between 406.027 – 406.029 MHz
	Output Power	37.21 dBm	37 dBm ± 2dB
121.5 MHz Signal	Carrier Frequency	121.498041 MHz	121.5 MHz ± 3.5 kHz
	Output Power	19.30 dBm	17 dBm ± 3dB

2.3 LOW TEMPERATURE

2.3.1 Specification Reference

ETSI EN 300 066 Clause 6.2.4

2.3.2 Date of Test

10th – 12th June 2001

2.3.3 Test Equipment Used

Instrument	Model	Inv No	Calibration Due Date
Chamber	Rel A	0030	13.08.01
Data Logger	Anville	2569	13.08.01
Chamber	VM04/100	1755	25.09.01
Frequency & Time Interval Analyser	5372A	EMC 1766	08.03.02
Logic Analyser	1613D	EMC 1767	-
Signal Generator	SMX	EMC 1765	10.01.02
10dB Attenuator	47-10-34	4482	26.07.01
10dB Attenuator	HFP-50N	EMC 1601	07.04.02
3dB Attenuator	HFP-50N	EMC 1605	07.04.02
Crystal Detector	8470B	4209	18.10.01
Mixer	M2TC	EMC 1570	09.02.02
Low Pass Filter	WLJ 1.4C9EF	-	-
Spectrum Analyser	8566A	EMC 772	05.09.01

2.3.4 Equipment Under Test

406 MHz Fastfind Plus PLB with -40°C Battery Pack. The sample was modified to provide an external connector to allow the performance checks to be carried out.

2.3.5 Test Conditions

The PLB was installed in the climatic chamber and connected to the test equipment required to carry out the performance check. The PLB was not operational.

1) Ambient to -40°C in 1 h
2) -40°C for 15 h
3) The PLB was switched on but ceased to operate soon afterwards.
4) -40°C to ambient

2.3.6 Results of Test

The temperature monitored in the chamber during this test are shown in Appendix 3.

The PLB failed to operate correctly at -40°C so the test was aborted. The unit was returned to the customers representative for investigation. See Incident Report SX608213/01 in Appendix 7.

2.3.7 Repeat Test Conditions

The PLB, with the faulty component replaced, was installed in the climatic chamber and connected to the test equipment required to carry out the performance check.

1) Ambient to -40°C
2) -40°C for 13.5 h
3) The PLB was switched on and remained operational for 2 h 30 minutes at -40°C
4) Performance checks carried out during final 30 minutes at -40°C
5) -40°C to ambient in 1 hour
6) PLB exposed to normal room temperature for 3 hours.

2.3.8 Results of Retest

The results of the performance checks at -40°C are as follows:

	Parameter	Measurement	Limit
406 MHz Signal	Characteristic Frequency	406.027544 MHz	Between 406.027 – 406.029 MHz
	Output Power	36.924 dBm	37 dBm ± 2dB
121.5 MHz Signal	Carrier Frequency	121.500900 MHz	121.5 MHz ± 3.5 kHz
	Output Power	14.34 dBm	17 dBm ± 3dB

2.4 VIBRATION

2.4.1 Specification Reference

RTCM 5-97/SC110 Appendix 5

2.4.2 Date of Test

7th June 2001

2.4.3 Test Equipment Used

Instrument	Model	Inv No	Calibration Due Date
Shaker	VP85	1149	08.07.01
Accelerometer	224C	1533	09.10.01
Controller	DVC 40005	2583	15.08.01
Accelerometer	224C	1610	03.07.01
Shaker	824	821	23.11.01
Charge Amplifier	2626	4393	06.11.01
Controller	MP VXI	4264	30.09.01

2.4.4 Equipment Under Test

406 MHz Fastfind Plus PLB with -40°C Battery Pack and
406 MHz Fastfind Plus PLB with -20°C Battery Pack.

2.4.5 Test Conditions

The units were fixed to the vibration table using a clamp ring.
The units was subjected to the following sinusoidal vibration levels in each of their three orthogonal axes:

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

The units were subjected to vibration for 30 minutes in each axis. Upon completion of the test a visual inspection was carried out along with the Self-Test (Referred to in the specification as the 'Aliveness Test').

2.4.6 Results of Test

A typical vibration plot is included in Appendix 4.

No damage to the units was found during the inspection. The Self-Test was also completed successfully. Neither PLB was activated during the vibration test.

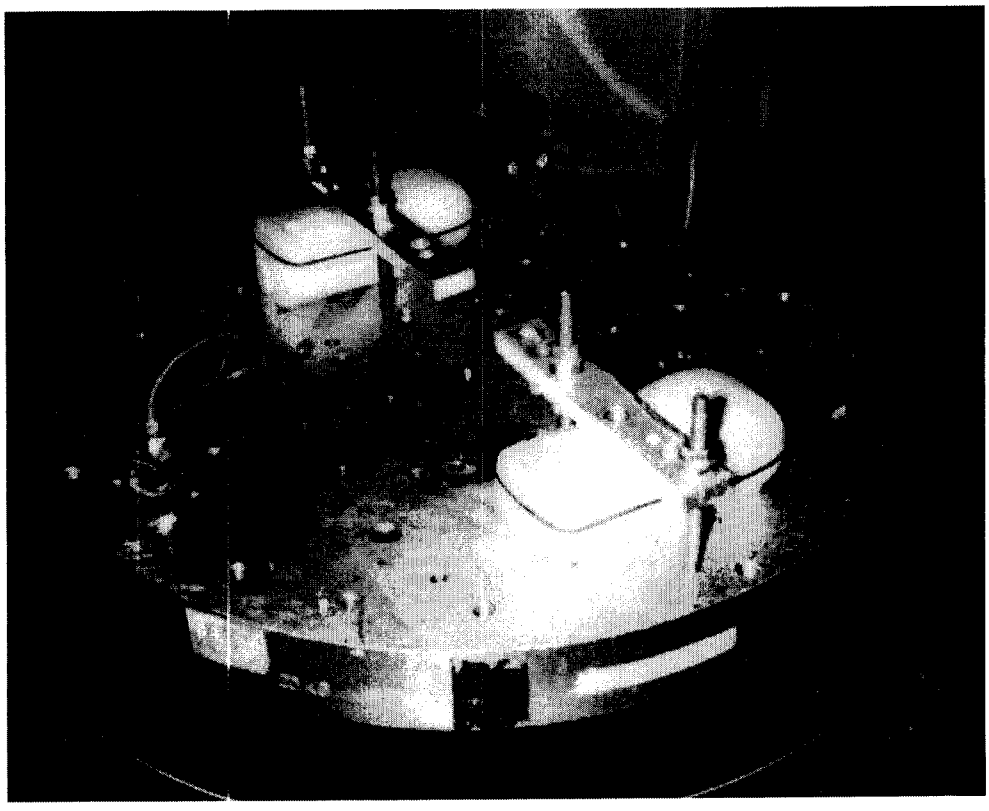


Figure 1 - Personal Locator Beacons mounted for vibration in the vertical axis

2.5 RUGGEDNESS

2.5.1 Specification Reference

ETSI EN 300 066 Clause 6.4

2.5.2 Date of Test

8th June 2001

2.5.3 Test Equipment Used

Instrument	Model	Inv No	Calibration Due Date
Shaker	824	0821	23.11.01
Accelerometer	224C	1610	03.07.01
Charge Amplifier	2620	4393	06.11.01
Controller	MP VXI	4264	30.09.01

2.5.4 Equipment Under Test

406 MHz Fastfind Plus PLB with -40°C Battery Pack and
406 MHz Fastfind Plus PLB with -20°C Battery Pack.

2.5.5 Test Conditions

The units were fixed to the shaker using a clamp ring, with the battery pack flat to the shaker. The following profile was applied to the test samples:

Peak acceleration	98 m/s^2 ± 10 %
Pulse duration	18 ms ± 20 %
Wave shape	Half-cycle sine wave
Test axis	Vertical
Number of bumps	4000

Upon completion of the ruggedness test the units were examined for signs of damage and the Self-test performed

2.5.6 Results of Test

A plot of the input for the Ruggedness test is included in Appendix 5.

The units did not automatically activate during the test. No damage or mechanical deterioration was observed. The Self-test was successfully performed on both units.

2.6 DROP TEST

2.6.1 Specification Reference

BS EN 60945 Clause 8.6.1

2.6.2 Date(s) of Test

13th June 2001
15th June 2001

2.6.3 Test Equipment Used

Instrument	Model	Inv No	Calibration Due Date
Tape Measure	RS 5M	3239	-
Test Surface	Wooden Surface	2047	-

2.6.4 Equipment Under Test

406 MHz Fastfind Plus PLB with -40°C Battery Pack and
406 MHz Fastfind Plus PLB with -20°C Battery Pack.

2.6.5 Test Conditions

Each PLB was subjected to a series of 6 drops, one on each face of the unit, from a height of 1 m. On completion of the Drop test the units were examined for signs of damage and the Self-Test was performed.

2.6.6 Results of Test

Both units failed to display the 'Test OK' light on completion of the Self-Test. The battery pack of each unit had split during the drop test.
The test samples were returned to the customer's representative to investigate the fault. See Incident Report SX608213/02 in Appendix 7.

2.6.7 Retest Conditions

Each PLB (with the detached component fixed in place and using an ultrasonically welded battery pack) was subjected to a series of 6 drops, one on each face of the unit, from a height of 1 m.

2.6.8 Results of Retest

Both units were examined after the drop test and no visible damage was found. The Self-Test was successfully performed on each unit.

2.7 TEMPORARY IMMERSION

2.7.1 Specification Reference

BS EN 60945 Clause 8.9.3

2.7.2 Date of Test

19th June 2001

2.7.3 Test Equipment Used

Instrument	Model	Inv No	Calibration Due Date
Immersion Tank	940 Litre	-	-
Thermocouple	T-Type	4599	01.11.01
Thermometer	Digitron	4057	22.02.02
Hygrometer	Rotronic	2129	17.08.01
Barometer	Druck	1091	21.06.01
Tape	RS	2017	-
Timer	RS	3913	01.07.01

2.7.4 Equipment Under Test

406 MHz Fastfind Plus PLB with -40°C Battery Pack (Class 1) and
406 MHz Fastfind Plus PLB with -20°C Battery Pack (Class 2).

2.7.5 Test Conditions

Both test samples were strapped to a weighted fixture and completely immersed in water for 5 minutes so that:

1) The highest point of the PLB was 1 m below the surface of the water.
2) The water temperature did not differ from that of the equipment by more than 5 K.

2.7.6 Results of Test

After 5 minutes of submersion it was noted that the red LED on the Class 1 PLB had lit , the test samples were removed from the water. The red LED went out and the green LED lit up. A high pitched tone was also emitted from the Class 1 unit. The attempt to switch off the unit was unsuccessful so the battery was removed from the unit.

The Class 2 sample was inspected, this unit had not operated automatically. It was not possible to perform the Self-Test, nor would the unit switch on. The battery was removed from the test sample.

The test samples were returned to the customer for inspection. See Incident Report SX608213/03 in Appendix 7.

2.8 THERMAL SHOCK

2.8.1 Specification Reference

ETSI EN 300 066 Clause 6.7

2.8.2 Date of Test

19th June 2001

2.8.3 Test Equipment Used

Instrument	Model	Inv No	Calibration Due Date
Chamber	Gallenkamp	1483	27.11.01
Chamber	Ministrat	1086	15.08.01
Measure	RS 5M	2017	-
Thermocouple	T-Type	4598	01.11.01
Thermometer	Digitron	4058	22.02.02

2.8.4 Equipment Under Test

406 MHz Fastfind Plus PLB with -40°C Battery Pack (Class 1) and
406 MHz Fastfind Plus PLB with -20°C Battery Pack (Class 2).

2.8.5 Test Conditions

It was thought that the Drop test performed, prior to the Temporary Immersion test failure, may have affected the PLB's ability to remain watertight. Therefore a Drop test was carried out prior to the Thermal Shock test. The units remained fully operational after this Drop test.

Both units were strapped to a weighted fixture. The test samples were placed in a climatic chamber at a temperature of +65°C for 1 hour. The test samples were then submerged in water at a temperature of +20°C, at a depth of 10 cm ± 10 mm, measured from the highest point of the PLB's. The test samples were submerged for 1 hour.

2.8.6 Results of Retest

Once removed from the water it was observed that the red LED on each sample was lit, denoting a failure of the test. The customer's representatives took the samples away for investigation.

2.9 THERMAL SHOCK (Repeat)

2.9.1 Specification Reference

ETSI EN 300 066 Clause 6.7

2.9.2 Date of Test

15th October 2001

2.9.3 Test Equipment Used

Instrument	Model	Inv No	Calibration Due Date
Chamber	Gallenkamp	1483	27.12.01
Data Logger	Anville	2569	27.12.01
Thermometer	Digitron	4057	22.02.02
Thermocouple	T-Type	4595	01.11.01
Hygrometer	Rotronic	2565	21.11.01
Barometer	Druck	1091	10.07.02
Timer	RS	3722	07.05.02
Tape	Stanley	4672	-
Immersion Tank	Glass Tank	-	-

2.9.4 Equipment Under Test

406 MHz Fastfind Plus PLB with -40°C Battery Pack (Class 1) and
406 MHz Fastfind Plus PLB with -20°C Battery Pack (Class 2).

2.9.5 Test Conditions

The previous failure of the PLB's during Temporary Immersion and Thermal Shock testing was found to be due to a faulty seal gasket. As the Drop test had not caused the test failure a repeat was not carried out prior to this test.

Both units were strapped to a weighted fixture. The test samples were placed in a climatic chamber at a temperature of +65°C for 1 hour. The test samples were then submerged in water at a temperature of +20°C, at a depth of 10 cm, measured from the highest point of the PLB's. The units were submerged for 1 hour and them removed from the water tank.

2.9.6 Results of Test

The Self-Test was satisfactorily completed on both Class 1 and Class 2 PLB.

2.10 TEMPORARY IMMERSION (Repeat)

2.10.1 Specification Reference

BS EN 60945 Clause 8.9.3

2.10.2 Date of Test

15th October 2001

2.10.3 Test Equipment Used

Instrument	Model	Inv No	Calibration Due Date
Immersion Tank	940 Litre	-	-
Thermocouple	T-Type	4595	01.11.01
Thermometer	Digitron	4057	22.02.02
Hygrometer	Rotronic	2129	16.05.02
Barometer	Druck	1091	10.04.02
Tape	Stanley	4672	-
Timer	RS	3913	07.05.02

2.10.4 Equipment Under Test

406 MHz Fastfind Plus PLB with -40°C Battery Pack (Class 1) and
406 MHz Fastfind Plus PLB with -20°C Battery Pack (Class 2).

2.10.5 Test Conditions

Both test samples were strapped to a weighted fixture and completely immersed in water for 5 minutes so that:

1) The highest point of the PLB was 1 m below the surface of the water.
2) The water temperature did not differ from that of the equipment by more than 5 K.

2.10.6 Results of Test

There was no evidence of unwanted water ingress to either unit during the post test inspection. Both test samples successfully performed the Self-Test.

2.11 ALTITUDE

2.11.1 Specification Reference

MIL-STD-810F Method 500.4

2.11.2 Date of Test

16th October 2001

2.11.3 Test Equipment Used

Instrument	Model	Inv No	Calibration Due Date
Chamber	Ministrat	1086	13.02.02
Data Logger	Anville	2569	13.02.02

2.11.4 Equipment Under Test

406 MHz Fastfind Plus PLB with -40°C Battery Pack (Class 1) and
406 MHz Fastfind Plus PLB with -20°C Battery Pack (Class 2).

2.11.5 Test Conditions

Both test samples were placed in the chamber at ambient temperature. No fixture was supplied.

1) Air pressure in chamber set to correspond to an altitude of 4572 m.
2) Air pressure maintained for 1 h.
3) Chamber returned to standard ambient conditions at 10 m/s.

2.11.6 Results of Test

The pressure monitored during this test are shown in Appendix 6.

No damage was visible following the test. The Self-Test was successfully performed on both PLB's.

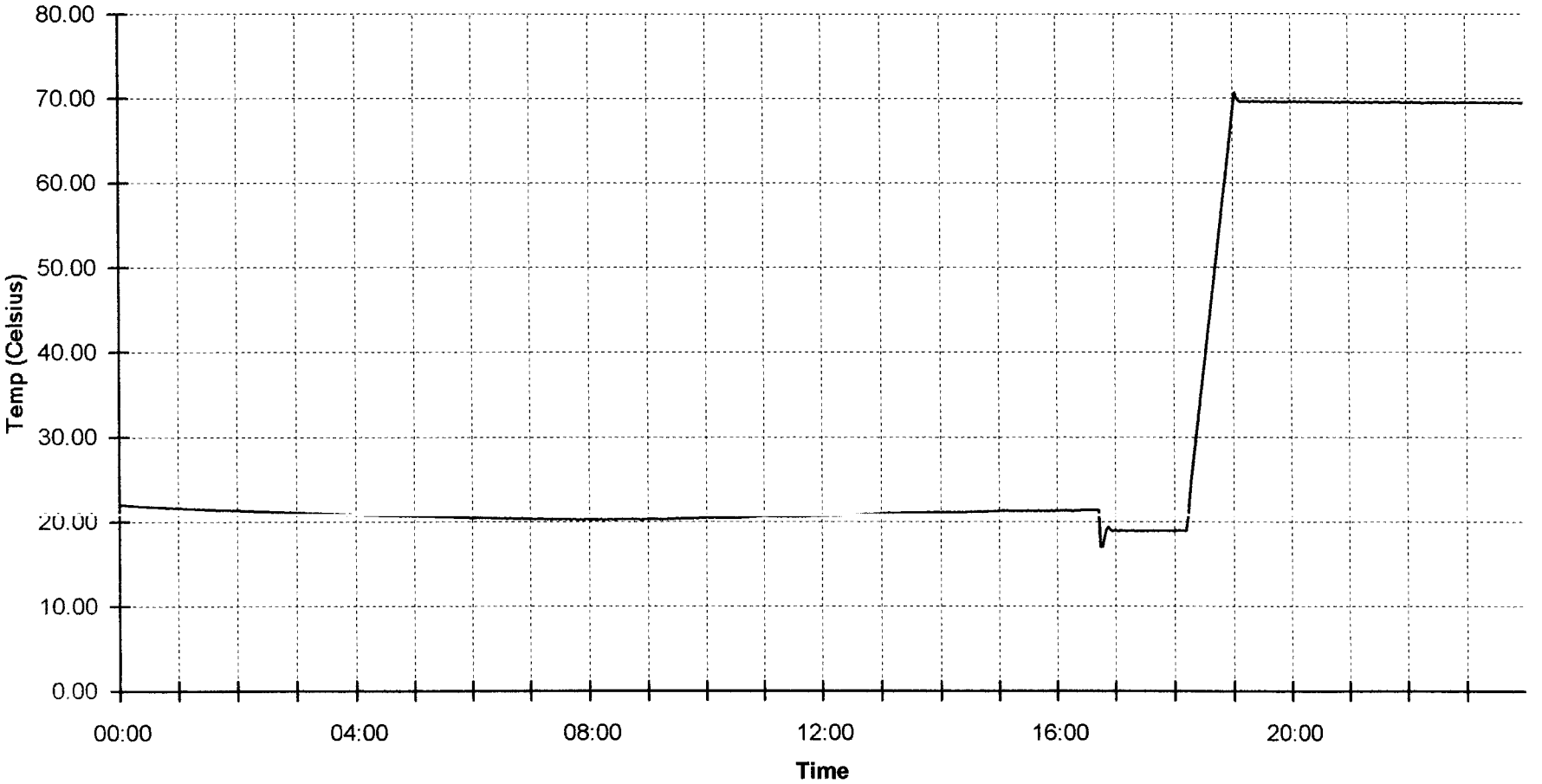
APPENDIX 1

Temperatures monitored during Dry Heat Test

Pages 1-2 Chamber temperature recording

06/06/01

REL A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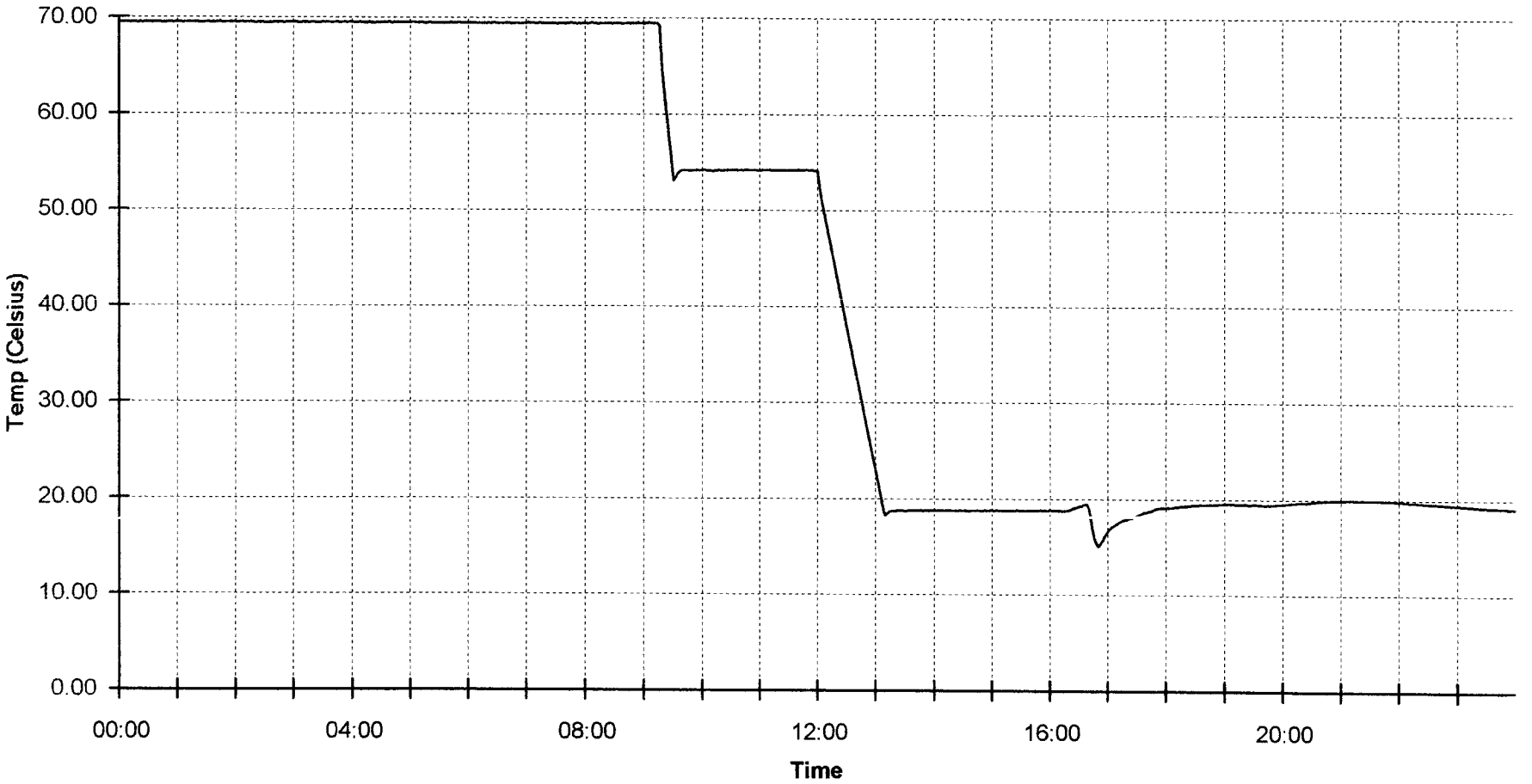
Time

07/06/01

REL A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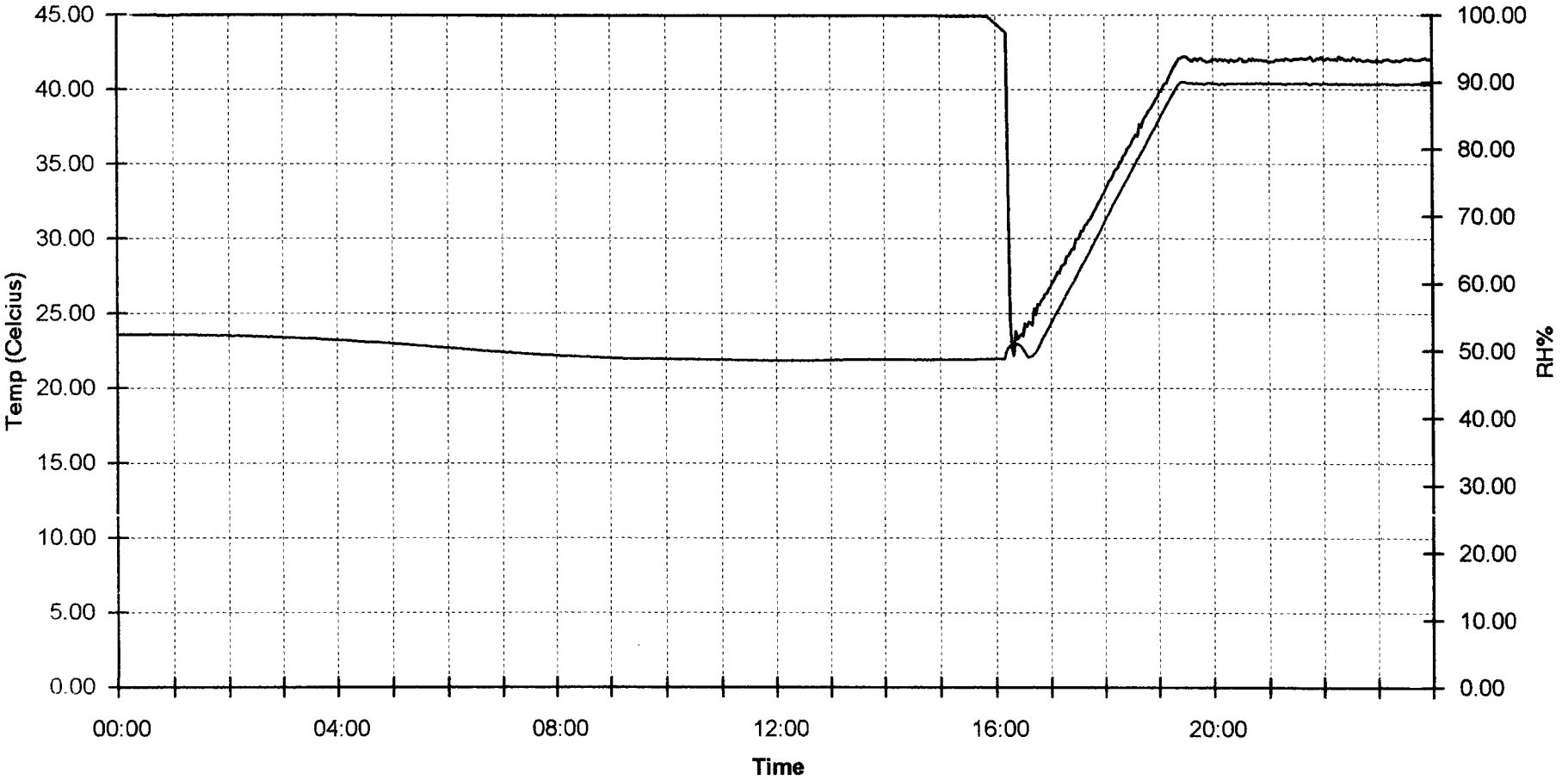
APPENDIX 2

Temperature and Humidity monitored during Damp Heat Test

Pages 1-3 Chamber temperature and humidity recording

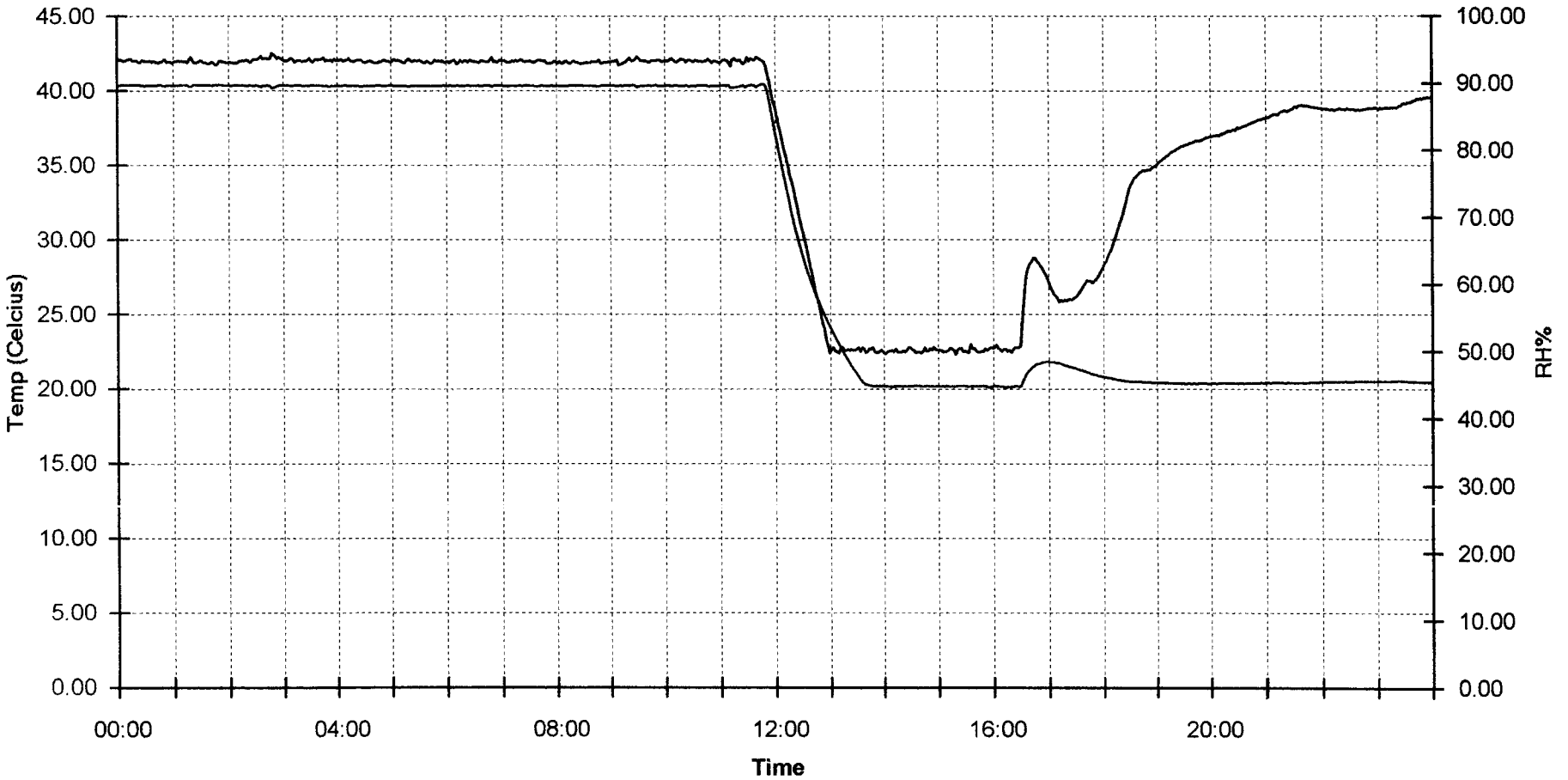
07/06/01

Fisons 5



08/06/01

Fisons 5



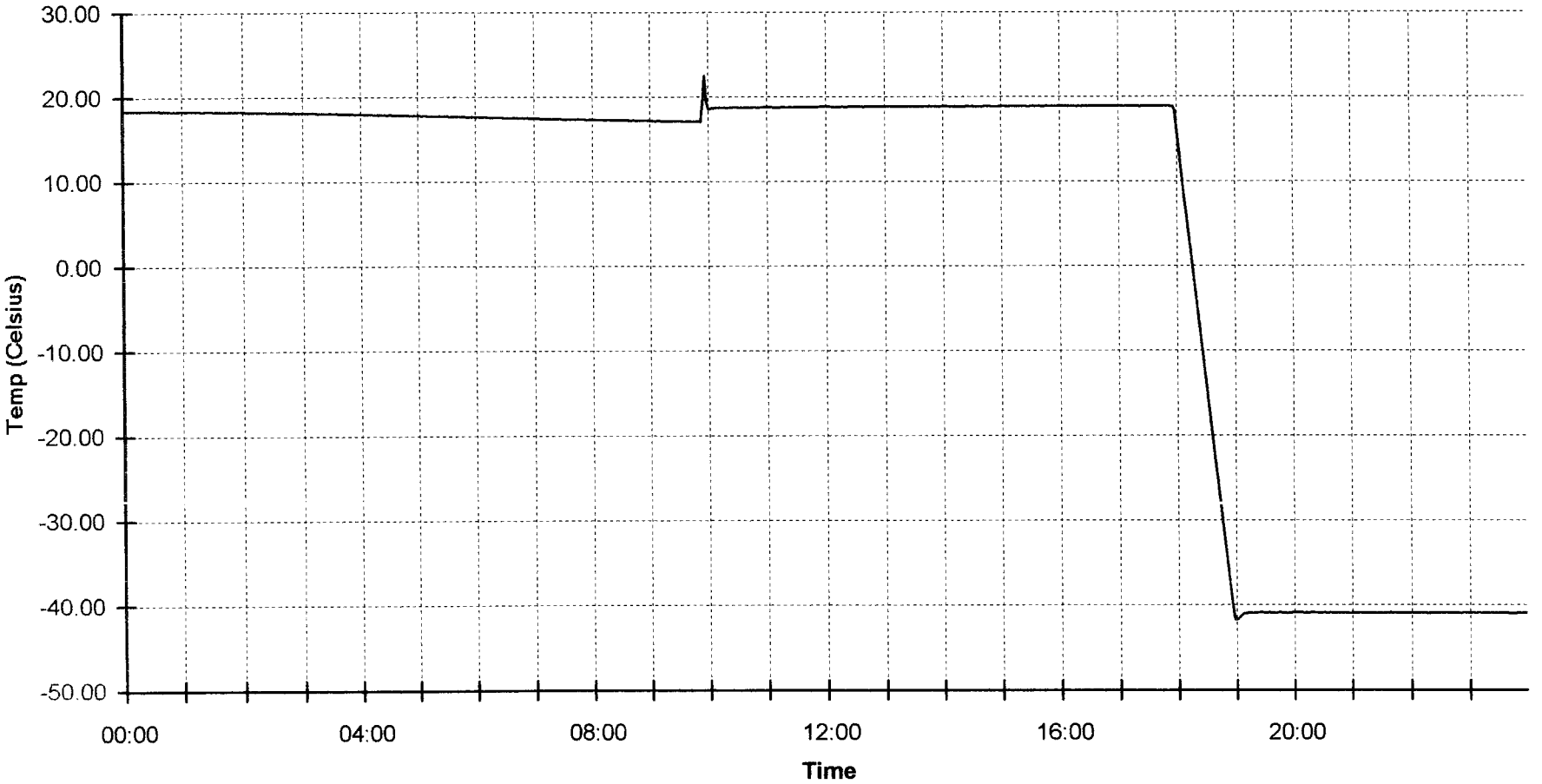
APPENDIX 3

Temperatures monitored during Low Temperature Test

Pages 1-2 Chamber temperature recording

10/06/01

REL A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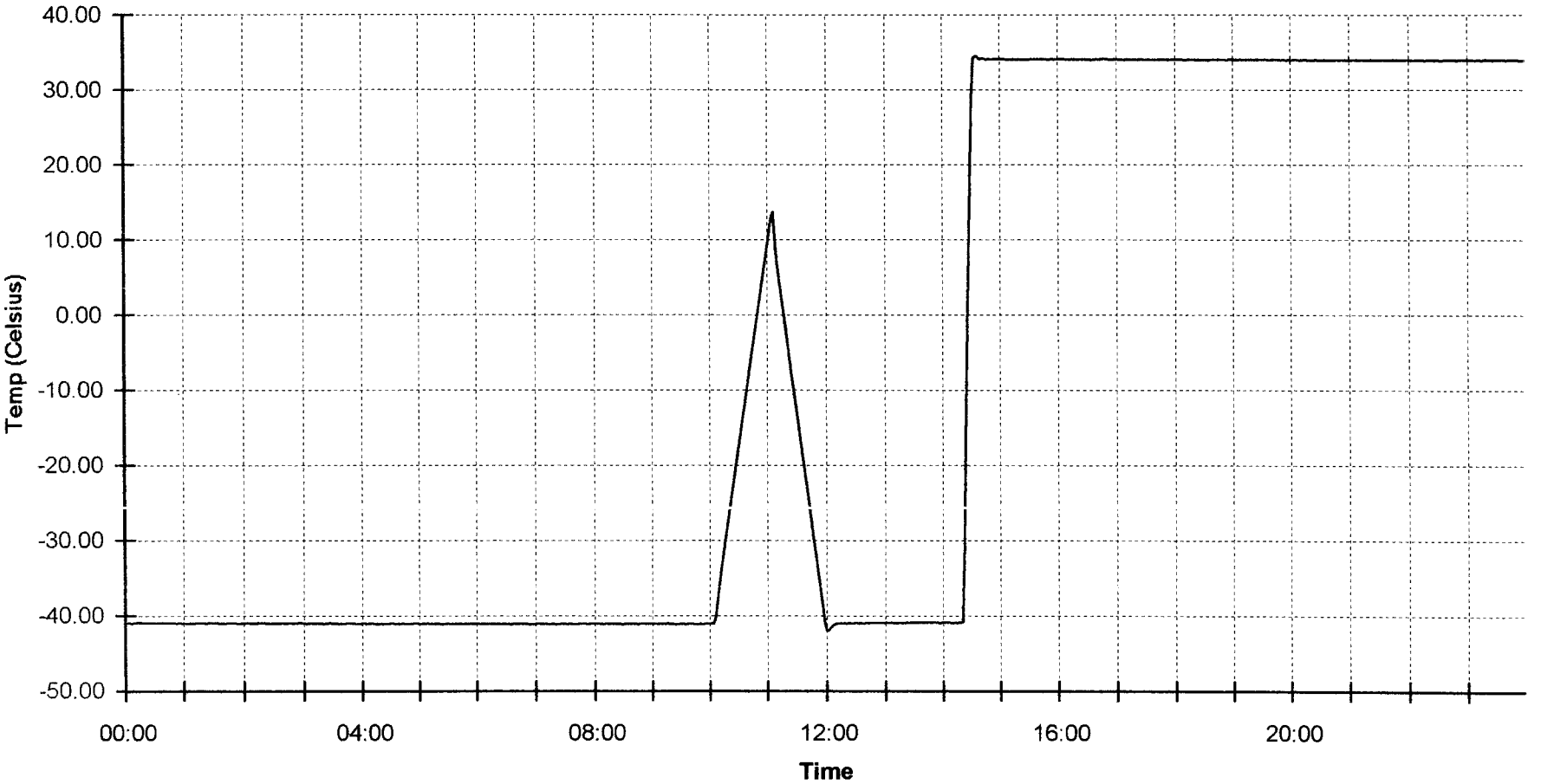
Time

11/06/01

REL A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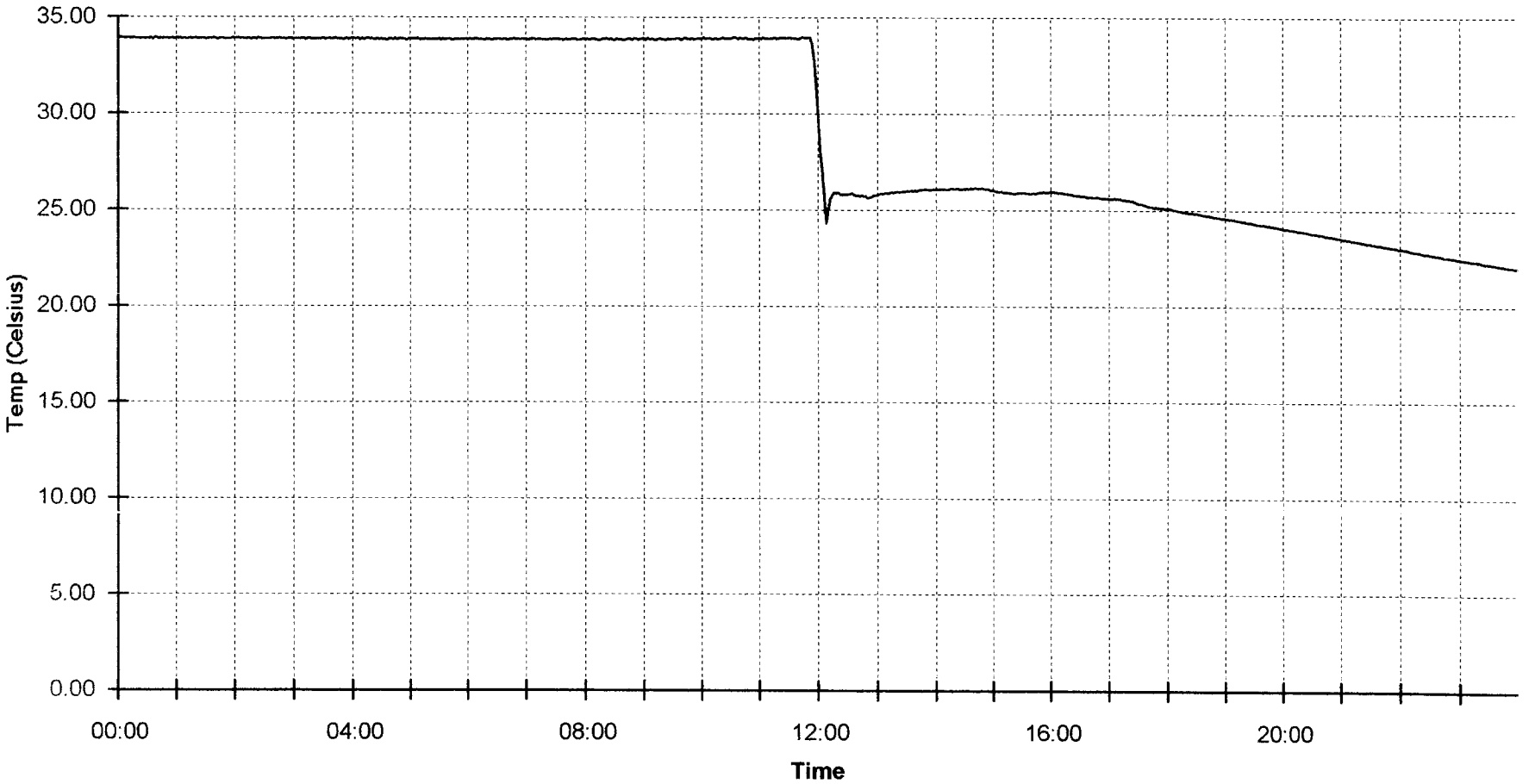
Time

12/06/01

REL A


35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Temp (Celsius)
00:00
04:00
08:00
12:00
16:00
20:00
Time

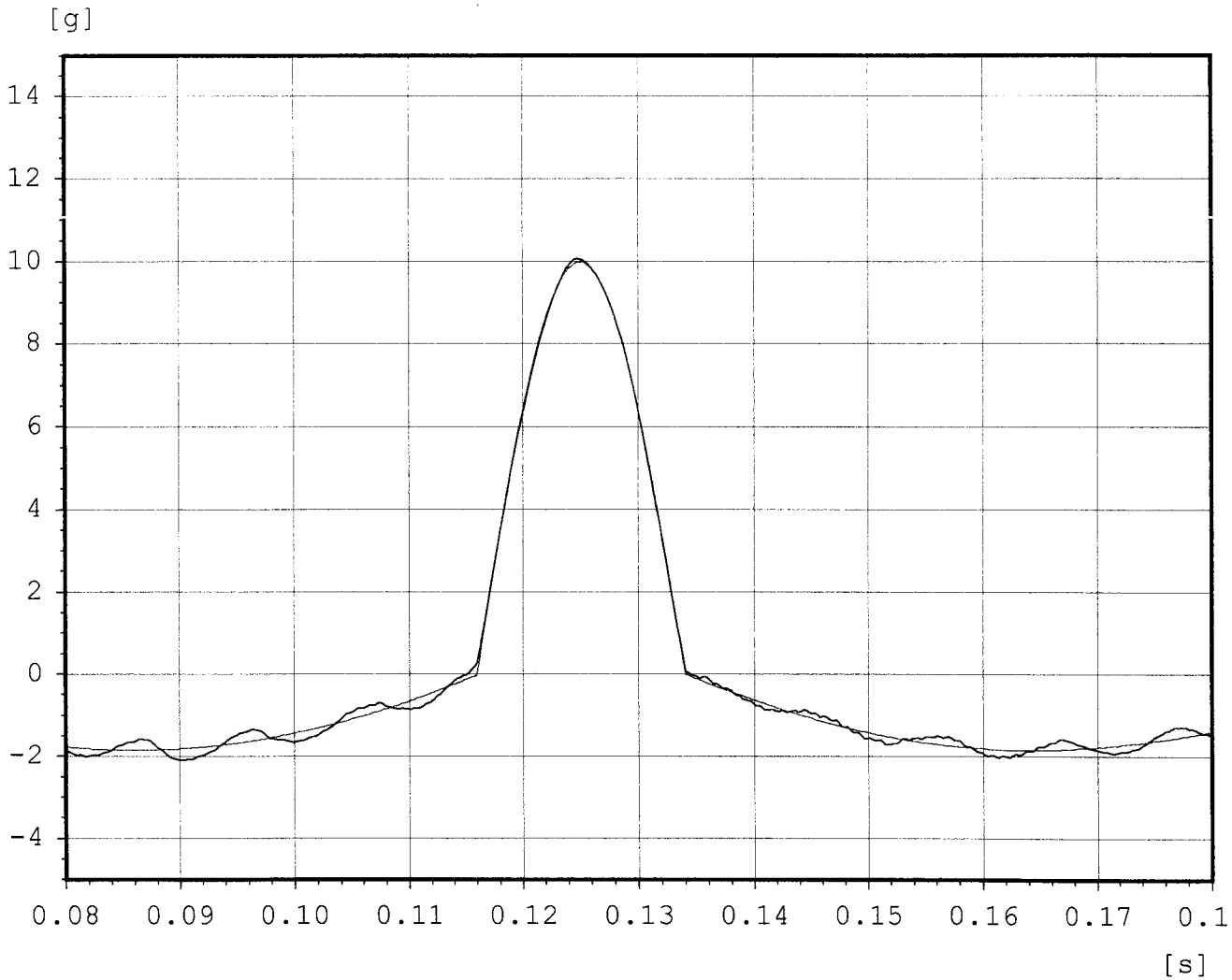
APPENDIX 4

Typical vibration input plot

(comprising 1 page)

Classical Shock

Control



Chan.no:	1
Chan.type:	C
Level:	0.0 dB
Resolution:	2.44e-004 s
Unit:	g
RMS (act.):	3.268 g
RMS (req.):	3.269 g
-- Pulses on act. level --	
done:	4000
remaining:	0
-- Pulses total --	
done:	4040
remaining:	0
Date:	08.06.01
Time:	09:42:06

SX 608213/05
McMurdo EPIRBS
P.E. Michelle Osborne
T.E.Alan Douglas
Vertical Axis

C:\VcpNT\Daten\m+p\10g 16ms Bump_008.rcs

APPENDIX 5

Ruggedness input plot

(comprising 1 page)

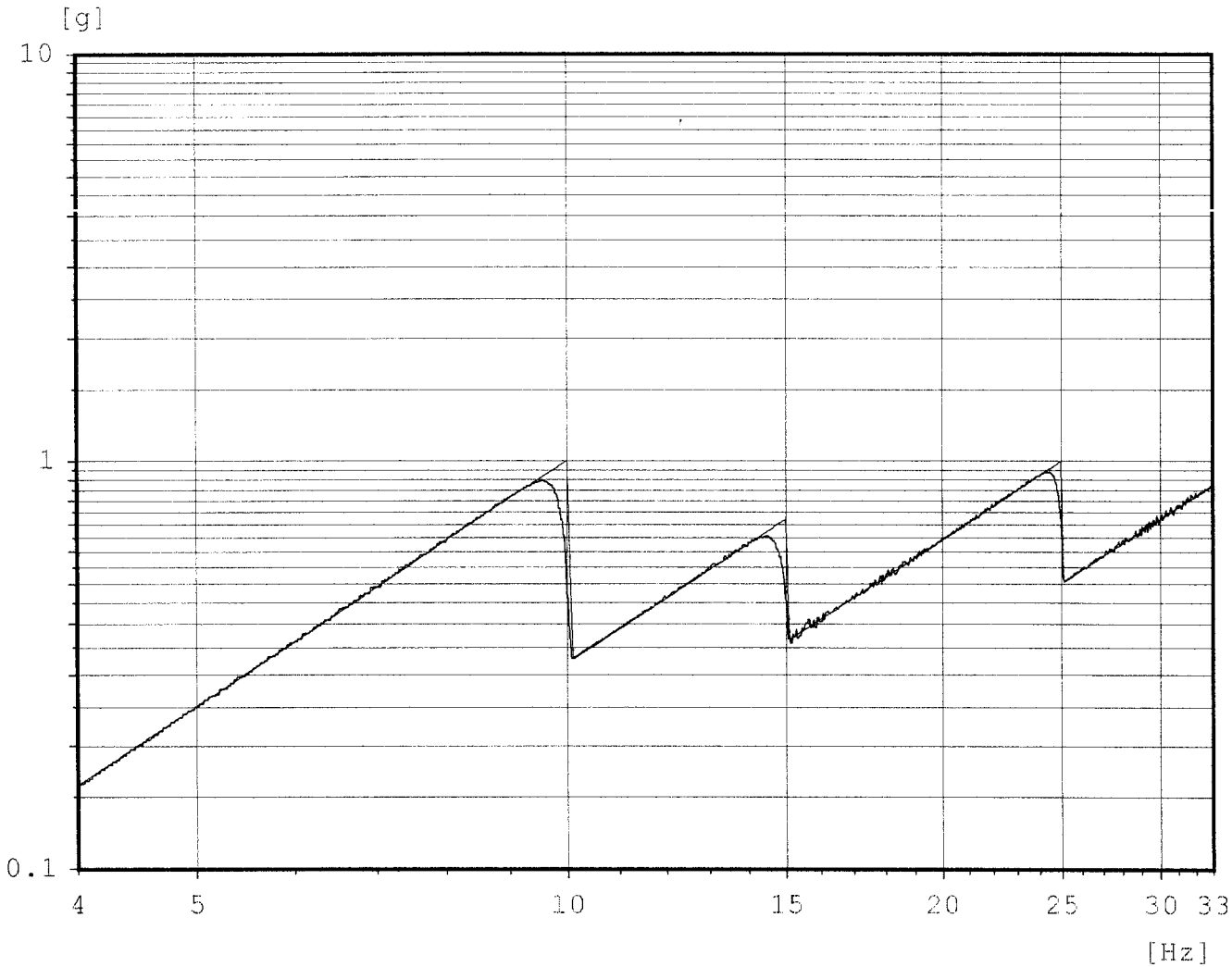
Sine

Run 1

Vertical Axis

Control

TÜV PRODUCT SERVICE



Chan.no:	1
Chan.type:	CW
Sweep type:	logarithmic
Sweeps done:	12
Sweeps req.:	12
Sweep direct.:	down
Sweep rate:	1.22 Oct/min
Contr.strat.:	Average
Unit:	g
Contr.strat.:	Closed loop

-- Testing time --

elapsed:	000:29:59
remaining:	000:00:00

Date:	07.06.01
Time:	15:00:15

SX608213/C4

Customer : Mc Murdo

U.U.T.: EPIRB

P.E.: M. Osborne

T.E.: A. Douglas

C:\VcpNT\Daten\m+p\McMurdo\SX608213 EPIRB_003.zsn

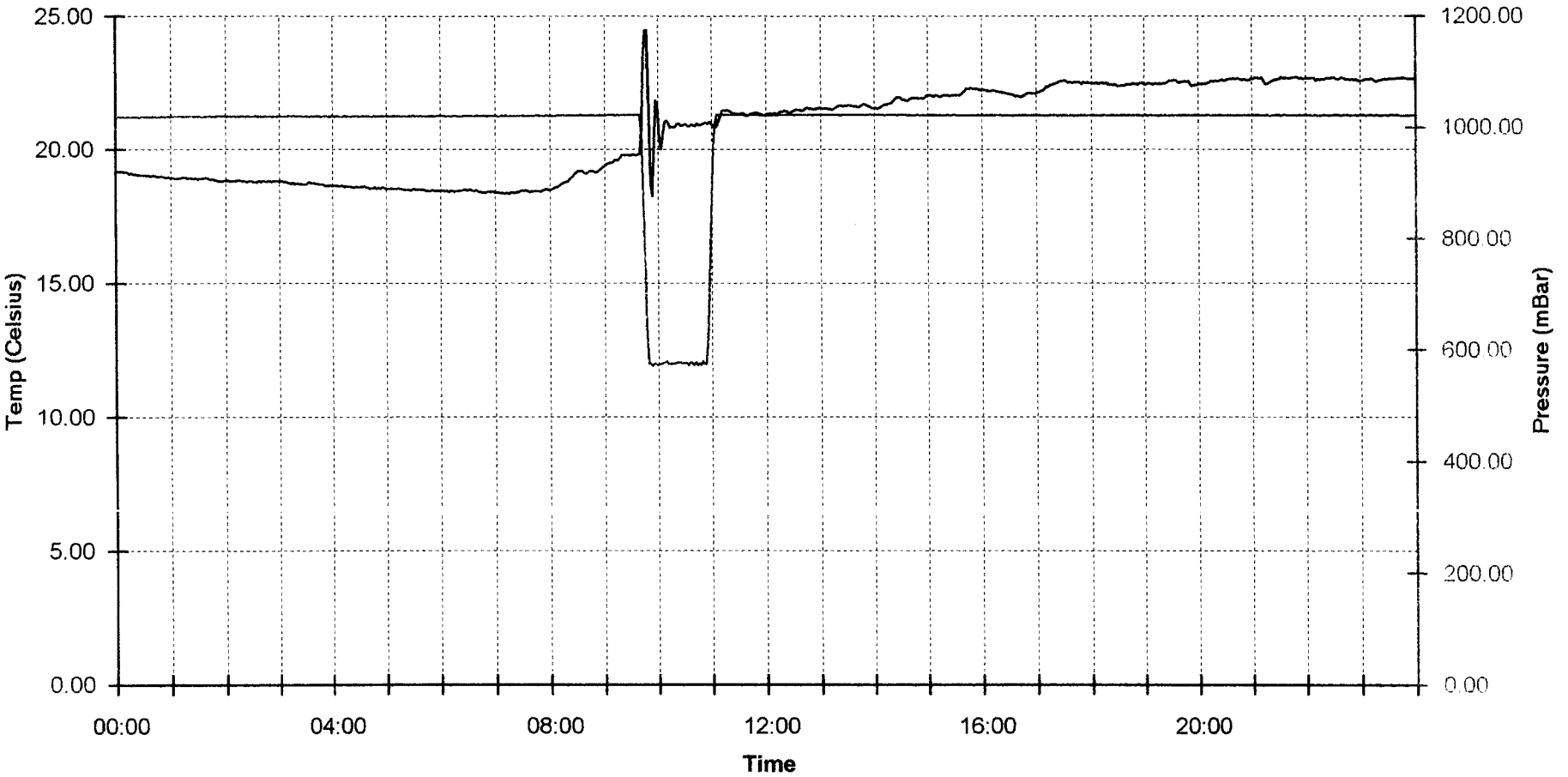
APPENDIX 6

Pressure and temperature monitored during Altitude Test

(comprising 1 page)

16/10/01

Ministra



APPENDIX 7

Incident Reports

(comprising 14 pages)

Incident Report SX608213/01-Malfunction during Low Temperature Test
Incident Report SX608213/02-Damage and Malfunction after Drop Test
Incident Report SX608213/03-Malfunction during Temporary Immersion Test

TÜV PRODUCT SERVICE
ASSESSMENT SERVICE

TÜV Product Service Ltd
Segensworth Road
Fareham Hampshire
United Kingdom PO15 5RH

Tel: +44 (0)1329 443322
Fax: +44 (0)1329 443421

INCIDENT REPORT

Job Title: McMurdo Ltd

Report Serial No: SX608213/01

Date: 13 June 2001

Equipment: Personal Locator Beacon

Serial No Not serialised

Test Spec: ETS 300 066

CL No: 6.2.4

Description of Incident

The temperature was of the chamber was stabilised at -40°C. After a soak period of 14 hours the unit was switched on. The unit would operate for only a few seconds and then cease to operate. The unit would not operate continuously.

Operating Conditions: Chamber temperature being maintained at -40°C.

Probable Cause: Unknown

Originator: R.A.Blagg

Person Notified: Richard Read (McMurdo)

By Test Engineer: R.A.Blagg

Date: 11 June 2001

Local Corrective Action: None

Inspected: R.ABlagg

Authorised: Not applicable

Actioned: Not applicable

Date: Not applicable

Testing to Continue: No. Test sample was returned to customer for investigation.

Authorised: Richard Read (McMurdo)

Date: 11 June 2001

DISTRIBUTION
1 Copy to Test Department Manager
1 Copy to Quality Manager
1 Copy to Customer/QAR/Quality Manager
1 Copy to nominated Quality Authority

NAMAS Registration No. 0141, 0141SI & 1377
BS9000/BS/CECC/IECQ, BABT and CAA approvals
Registered in England and Wales at Segensworth Road
Titchfield, Fareham, Hampshire, PO15 5RH. Number 560225

Note to Customer: *Please complete this report by typing your comments on the reverse of this form, then sign and return to TÜV Assessment Service for inclusion in the final report*

McMurdo Investigation report

The unit was returned to McMurdo and soaked at -40°C for 1 hour. When switched on, the unit powered down after 5 seconds.
The unit was stripped down and visually inspected. No obvious defects were observed.
The battery voltage is switched to the main sub-circuits via a series pass power transistor. Monitor wires were attached to the base and collector of this transistor and the unit was re-soaked at -40°C. At switch on, normal battery rail was available at the collector with the base drawing around 0.5mA Within a second, the base current started to rise until it reached a point where the base-emitter voltage was not sufficient to keep the transistor in saturation. (This is indicative of the h_{FE} of the transistor falling after initial switch on). The transistor was replaced and the test repeated. The circuit operated correctly.
Four other units have been tested at -40°C and all operated correctly so this phenomenon is not perceived as a design issue.
It can only be concluded that the original component was damaged in some subtle way.
No further investigation is intended to determine the exact failure mechanism.

Richard Read

Richard Read (Senior Engineer)

McMurdo Ltd.

TÜV
PRODUCT SERVICE
ASSESSMENT SERVICE

TÜV Product Service Ltd
Segensworth Road
Fareham Hampshire
United Kingdom PO15 5RH

Tel: +44 (0)1329 443322
Fax: +44 (0)1329 443421

INCIDENT REPORT

Job Title:	McMurdo Ltd	**Report Serial No:**	SX608213/02
		Date:	13 June 2001
Equipment:	Personal Locator Beacon	**Serial No:**	Not serialised
Test Spec:	EN60945	**CL No:**	8.6.1

Description of Incident

The Self Test was performed on both Class 1 and Class 2 Personal Locator Beacons on completion of the Drop Test . Neither unit passed this test. On inspection the battery packs for both units also appeared to have been damaged by the drop test. The seal on each battery pack was broken.

Operating Conditions: A series of six drops, one on each face of the unit under test.

Probable Cause: Not known

Originator: M.Osborne

Person Notified: Richard Read (McMurdo)

By Project Engineer: M. Osborne

Date: 13 June 2001

Local Corrective Action: None

Inspected: M.Osborne

Authorised: Not applicable

Actioned: Not applicable

Date: Not applicable

Testing to Continue: No. Test samples were returned to customer for investigation.

Authorised: Richard Read (McMurdo)

Date: 13 June 2001

DISTRIBUTION
1 Copy to Test Department Manager
1 Copy to Quality Manager
1 Copy to Customer/QAR/Quality Manager
1 Copy to nominated Quality Authority

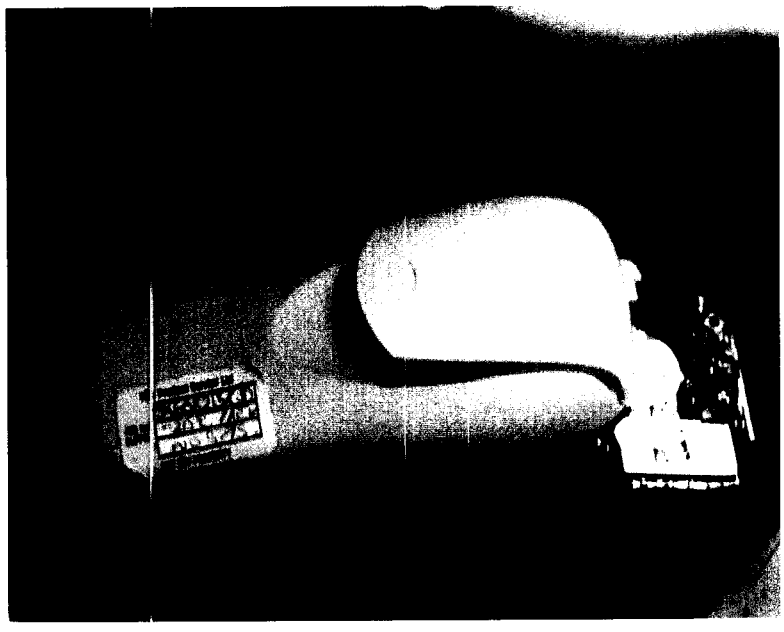
NAMAS Registration No. 0141, 0141SI & 1377
BS9000/BS/CECC/IECQ, BABT and CAA approvals
Registered in England and Wales at Segensworth Road
Titchfield, Fareham, Hampshire, PO15 5RH. Number 560225

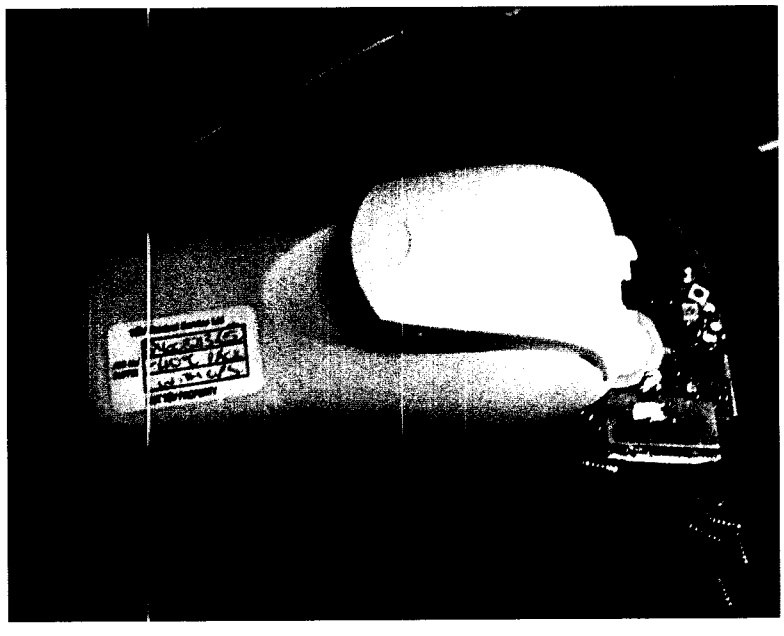
Note to Customer: *Please complete this report by typing your comments on the reverse of this form, then sign and return to TÜV Assessment Service for inclusion in the final report*

INVESTIGATION REPORT

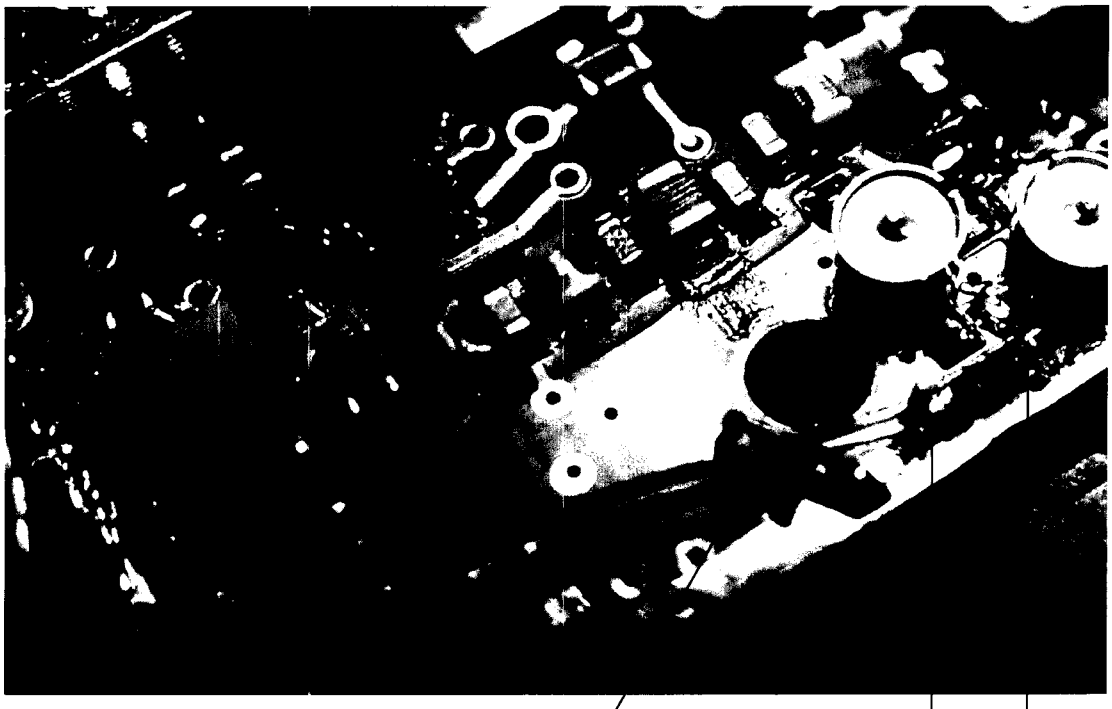
1) SELF-TEST FAILURE:

The units were confirmed to be defective by McMurdo engineers at TUV and brought back to McMurdo for investigation.
A check on the radiated emissions during self-test showed that both the 406MHz and the 121MHz transmission were correctly made.
Both failed units were stripped down for visual inspection, (photos below).

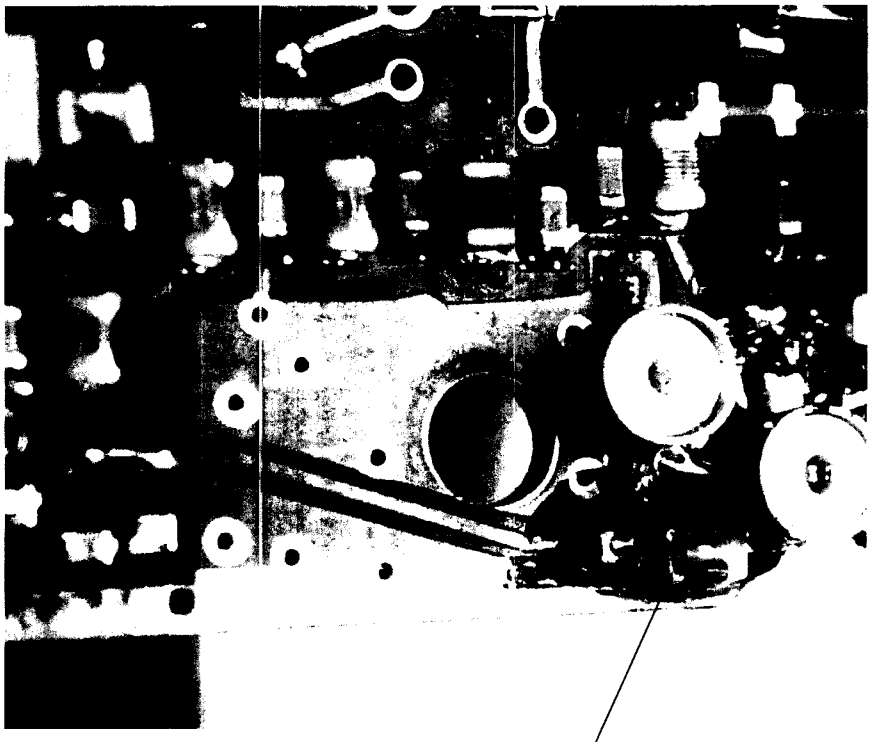




These units are pre-production units. Electrically they function exactly as the production standard. There is one wire link salvage to a resistor and a cut track salvage.
On both units, it was found that the cut track 'salvage scheme' had mechanically failed, with components becoming detached.
This can be seen in the photo below.

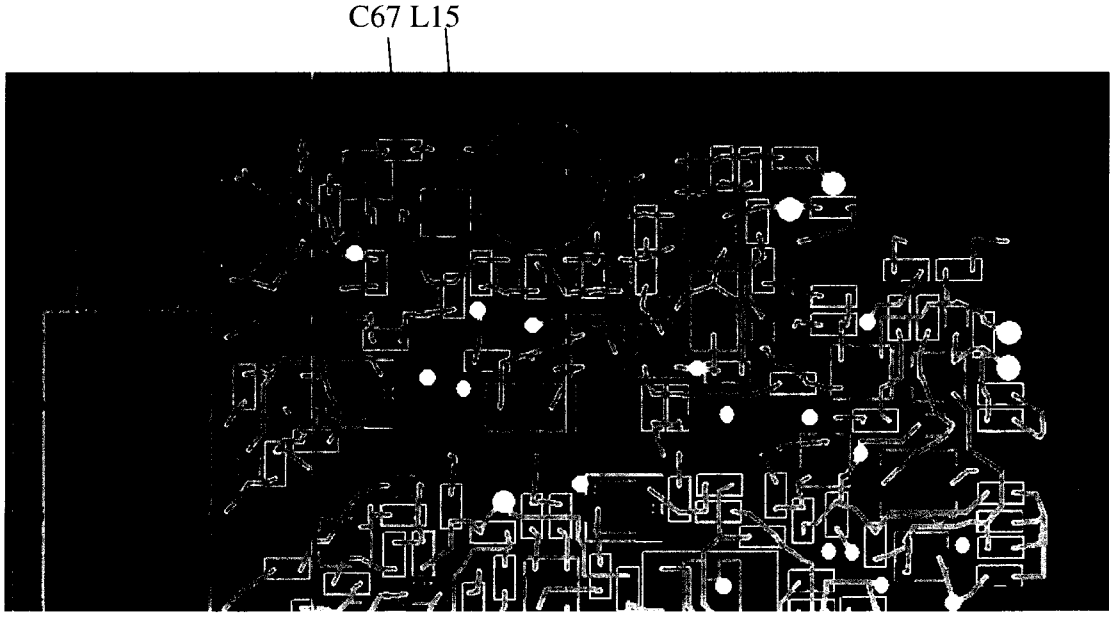


The affected components are part of the RF detector stage. The rectified output provides an indication of correct transmitted power to the microcontroller. Hence the units fail self-test. No other faults were found with either unit.
As can be seen from the above photo, the components had been fitted on a cut thin track. This obviously did not provide enough solder area to mechanically support the components when drop tested. As can be seen from the photograph, other components, with correct size solder pads, are all firmly in position.
The units were re-built with the components secured with a small fillet of araldite, as shown in the photo below.



Components araldited in place

The production issue artwork has these components fitted to 0805/0603 component pads, so this problem will not occur in production units. A detail from the production release PCB artwork is shown below, illustrating the placement of the affected components.



2) BATTERY PACKS:

Both battery packs showed signs of the RTV seal splitting where the battery case screw is fitted. This obviously due to the force on the seal when the units were dropped face down.
The battery pack sealing method is a pre-production solution. The production units will be ultrasonically welded packs. We do not currently have the facility to do this. Our proposed solution to enable test to proceed is to have more packs built up and ultrasonically welded by a sub-contractor.
We do not envisage any problems with the production battery packs.

Richard Read

Richard Read (Senior Engineer)
McMurdo Ltd.

mcmurdo
PAINS WESSEX

Fastfind/Fastfind +
406MHz PLB

Additional Report on Battery Pack Drop Test Failure at TüV.

Test: BS EN 60945 Clause 8.6.1 Drop Test
Results: Mechanical failure of Battery Packs

The 406 PLB battery pack plastics were designed to be joined and sealed by ultrasonic welding. At the time of submission to test at TüV, there were difficulties with the supply of ultrasonically welded battery packs from the welding sub-contractor. In order to allow the testing programme to proceed, the decision was taken to use development battery packs which had been assembled with adhesive. It was considered that these would have similar mechanical performance to ultrasonically welded units.

The test units failed drop test, with the battery pack lids separating from the pack bodies. Investigation showed poor bonding between the adhesive and the plastic material (ABS/Polycarbonate blend).

Replacement units were supplied to TüV. These were assembled using the intended ultrasonic welding production process. Battery packs on all further test units supplied to TüV were built using the correct ultrasonic welding process.

Conclusions:

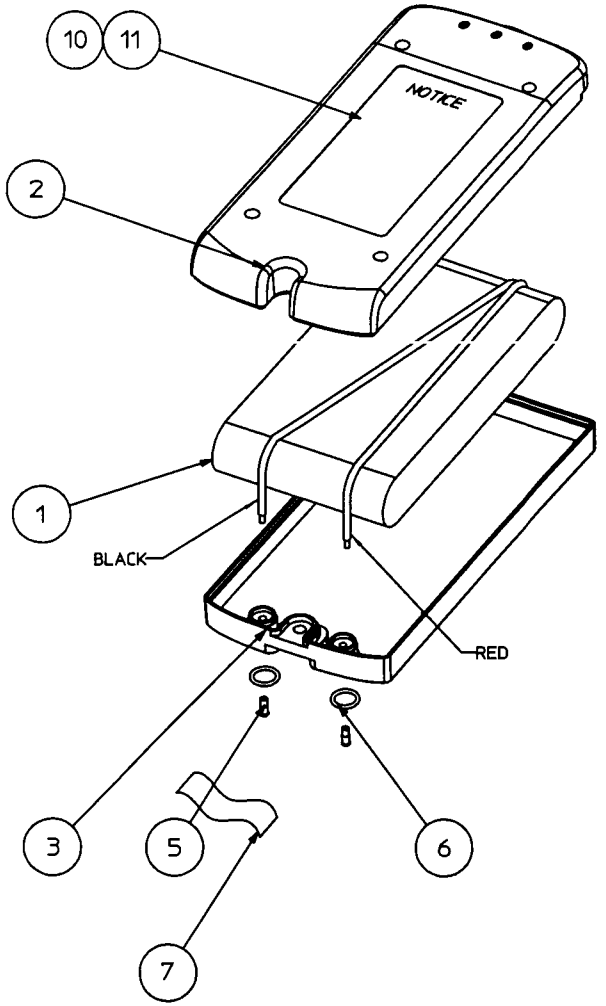
- The battery pack units which failed had not been built using the intended production build process.
- Units submitted for retest were fitted with battery packs built using the production build process.
- All other units submitted for testing were fitted with battery packs built using the production build process.
- The production drawings 85-720 and 85-740 call for the parts to be ultrasonically welded. There are no alternative assembly methods for manufacturing.
- The ultrasonic welding process is now carried out in-house, in the McMurdo manufacturing area, and will be subject to the normal McMurdo process quality monitoring during volume production.

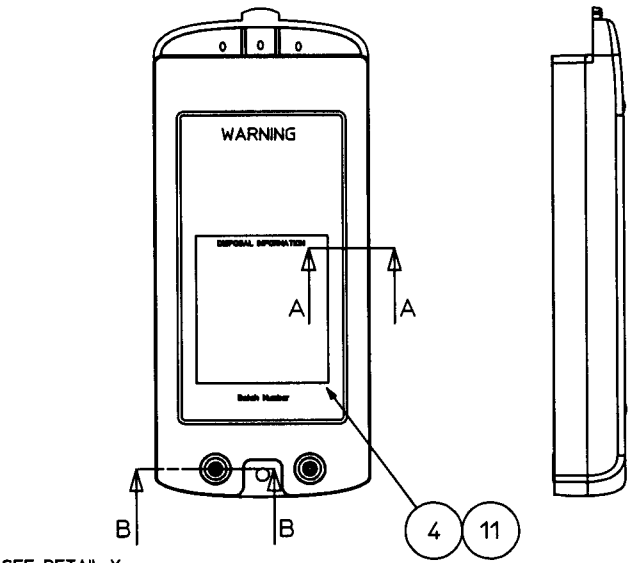
Barry Sims
Development Manager (Beacons)
30-November-2001

DO NOT SHORT CIRCUIT BATTERY WIRING OR CONNECTORS DURING ASSY.

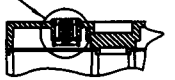
ITEM No.	NON PWSS	PW YELLOW	QUANTITY	DESCRIPTION
VARIABLES	85-720-001	85-720-004		
1	85-722	85-722	1	-20 CELL PACK
2	85-721-001	85-721-004	1	-20 BATTERY CASE
3	85-718-001	85-718-004	1	TOP COVER
4	85-732	85-732	1	LABEL INNER
5	85-724	85-724	2	BATTERY PACK SOCKET
6	85-725	85-725	2	O RING
7	74-7006	74-7006	0.05m	TAPE 45mm X 12mm
8	74-7018	74-7018	A/R	SOLDER
9	82-242	82-242	A/R	SILICONE ADHESIVE
10	85-731-021	85-731-024	1	LABEL OUTER
11	90-9012	90-9012	A/R	IPA

VARIANTS SHOWN IN HATCHED AREA ARE FOR DESIGN REFERENCE ONLY.
NOT FOR PROCUREMENT.



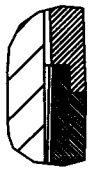


SEE DETAIL X

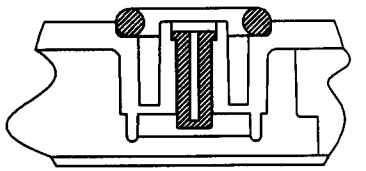


PART SECTION B-B

SONIC WELD ITEMS 2 AND 3 TO ACHIEVE A WATERTIGHT SEAL AFTER ASSEMBLY OF INTERNAL COMPONENTS



SECTION A-A
SCALE 5:1



DETAIL X
SCALE 5:1

NOTE.
1. SOCKETS (ITEM 5) TO BE FITTED TO TOP COVER (ITEM 3).
2. WIRES ON CELL PACK (ITEM 1)SHOULD BE POSITIONED AS SHOWN ABOVE, AND THEN SOLDERED (ITEM 8) ONTO THE TOPS OF THE SOCKETS .
3. THEN THE SOLDERED JOINT IS POTTED INTO THE RECESS OF THE ROUND SECTION USING SILICONE ADHESIVE (ITEM 9).
4. CLEAN LABEL RECESS WITH IPA BEFOREAPPLYING LABEL.
5. ENSURE BATTERY PACK SOCKETS (ITEM 6) URE FULLY INSERTED AS SHOWN IN DETAIL X.

USED ON
85-520
85-620

REMOVE ALL BURRS AND SHARP EDGES. (UNLESS OTHERWISE STATED)

DO NOT SCALE.

TOLERANCES UNLESS OTHERWISE STATED.
WHOLE No. ±0.5 ANGULAR DIMS ±
1 DEC PLACE ±0.1
2 DEC PLACE ±0.05 DRILLED HOLES ±

MATERIAL :-.
FINISH :-.
DIMENSIONS IN :-
3RD ANGLE PROJECTION B.S.308

ISSUE	CHG.No.	DATE.	APPD
1	C1958	12/10/2001	BQS

DRAWN PG | APPROVED BQS | RELEASED JU | SCALE

TITLE. -20 BATTERY COMPLETE

McMURDO LIMITED
PORTSMOUTH - HAMPSHIRE - ENGLAND

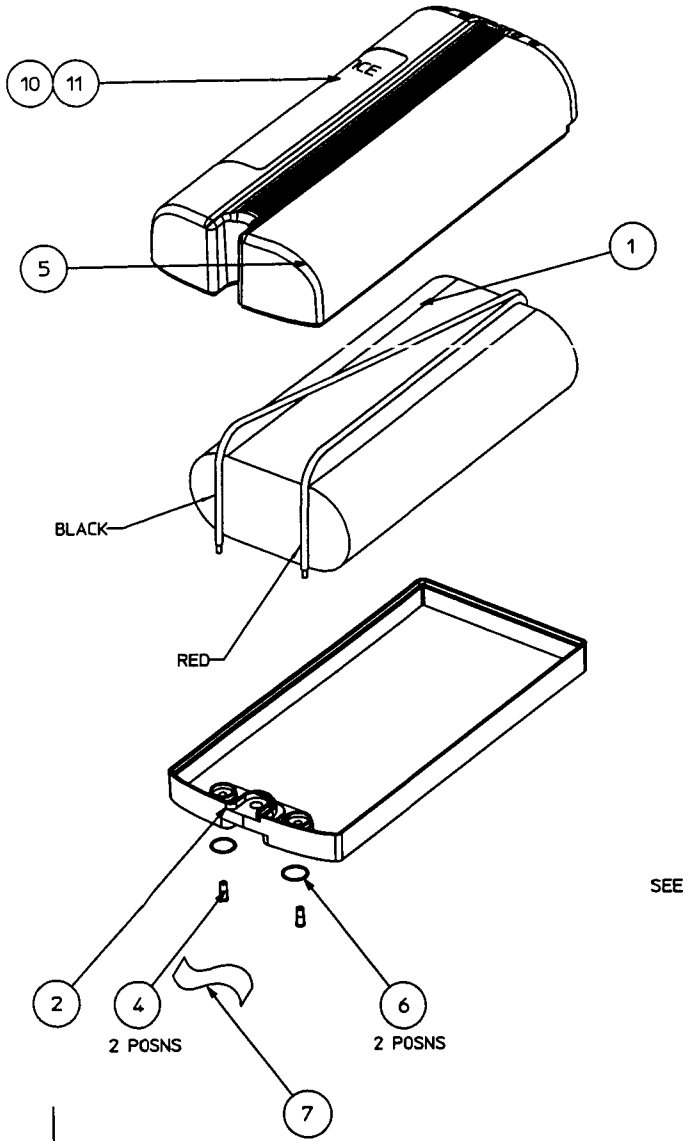
DRAWING No. 85-720A

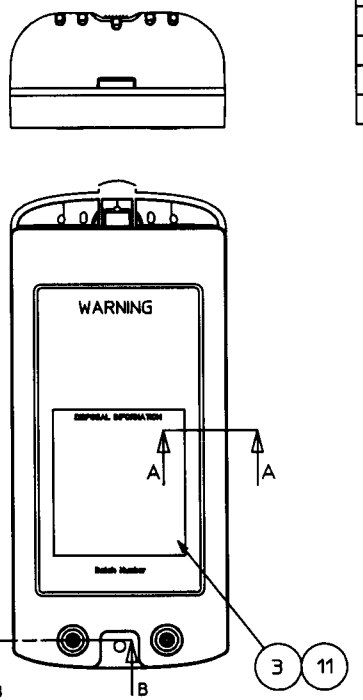
SHT1 OF SHT1 A2

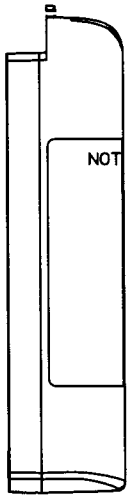
DO NOT SHORT CIRCUIT BATTERY WIRING OR CONNECTORS DURING ASSY.

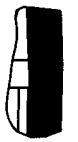
ITEM No.	NON-PWSS	PW YELLOW	QUANTITY	DESCRIPTION
VARIABLES	85-740-001	85-740-004		
1	85-744	85-744	1	-40 CELL PACK
2	85-718-001	85-718-004	1	TOP COVER
3	85-732	85-732	1	LABEL INNER
4	85-724	85-724	2	BATTERY PACK SOCKET
5	85-741-001	85-741-004	2	-40 BATTERY CASE
6	85-725	85-725	2	O RING
7	74-7006	74-7006	0.05m	TAPE BLACK 19mm PVC
8	74-7018	74-7018	A/R	SOLDER
9	82-242	82-242	A/R	SILICONE ADHESIVE
10	85-731-041	85-731-044	1	LABEL OUTER
11	90-9012	90-9012	A/R	IPA

VARIANTS SHOWN IN HATCHED AREA ARE FOR DESIGN REFERENCE ONLY.
NOT FOR PROCUREMENT.



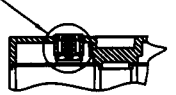




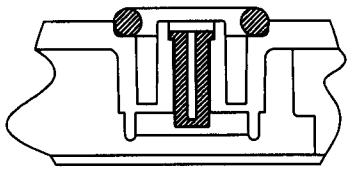


SECTION A-A
SCALE 5:1

SEE DETAIL X



PART SECTION B-B



DETAIL X
SCALE 5:1

SONIC WELD ITEMS 2 AND 5
TO ACHIEVE A WATERTIGHT SEAL
AFTER ASSEMBLY OF
INTERNAL COMPONENTS.

NOTE.
1. SOCKETS (ITEM 4) TO BE FITTED TO TOP COVER (ITEM 2).
2. WIRES ON CELL PACK (ITEM 1)SHOULD BE POSITIONED AS SHOWN ABOVE, AND THEN SOLDERED (ITEM 8) ONTO THE TOPS OF THE SOCKETS .
3. THEN THE SOLDERED JOINT IS POTTED INTO THE RECESS OF THE ROUND SECTION USING SILICONE ADHESIVE (ITEM 9).
4. CLEAN LABEL RECESS WITH IPA BEFORE APPLYING LABEL.
5. ENSURE BATTERY PACK SOCKETS (ITEM 4) ARE FULLY INSERTED AS SHOWN IN DETAIL X.

ISSUE	CHG.No.	DATE.	APPD	ISSUE	CHG.No.	DATE.	APPD
				1	C1958	12/10/2001	BQS

REMOVE ALL BURRS AND SHARP EDGES. (UNLESS OTHERWISE STATED)

USED ON: 85-540, 85-640

DO NOT SCALE.

TOLERANCES UNLESS OTHERWISE STATED.
WHOLE No. ±0.5 ANGULAR DIMS ±
1 DEC PLACE ±0.1
2 DEC PLACE ±0.05 DRILLED HOLES ±

MATERIAL :-.
FINISH :-.
DIMENSIONS IN :-
3RD ANGLE PROJECTION BS 308

DRAWN PG | APPROVED BQS | RELEASED JU | SCALE

TITLE. -40 BATTERY COMPLETE

McMURDO LIMITED
PORTSMOUTH - HAMPSHIRE - ENGLAND

DRAWING No. 85-740-xxxA

SHT1 OF SHT2 | A2

TÜV
PRODUCT SERVICE
ASSESSMENT SERVICE

TÜV Product Service Ltd
Segensworth Road
Fareham Hampshire
United Kingdom PO15 5RH

Tel: +44 (0)1329 443322
Fax: +44 (0)1329 443421

INCIDENT REPORT

Job Title:	McMurdo Ltd	**Report Serial No:**	SX608213/03
		Date:	19 June 2001
Equipment:	Personal Locator Beacon	**Serial No:**	Not serialised
Test Spec:	EN60945	**CL No:**	8.9.3

Description of Incident

Two units were undergoing the Temporary Immersion Test, a Class 1 and Class 2 sample. As the required 5 minute duration of the test was nearing completion the red LED lit up on the Class 1 unit indicating that it was operating. The red LED then went out and the green LED flashed on and off. The "OFF" button was pressed but the red LED was still dimly lit, the battery pack was removed to cease operation of the unit.

A Self Test on the Class 2 sample was attempted, the red LED did not light to show that the test was in progress. The battery pack was disconnected.

The batteries were reconnected on both samples approximately 15 minutes after the initial incident, both red and green LED's were illuminated on each sample. Each unit was emitting a high pitch tone.

Operating Conditions: Immersed in water 1 metre below the surface.

Probable Cause: Unknown

Originator: C Hedley

Person Notified: Richard Read (McMurdo)

By Project Engineer: M Osborne

Date: 19 June 2001

Local Corrective Action: None

Inspected: M Osborne

Authorised: Not applicable

Actioned: Not applicable

Date: Not applicable

Testing to Continue: No. Further investigation required.

Authorised: Richard Read (McMurdo)

Date: 20 June 2001

DISTRIBUTION

1 Copy to Test Department Manager
1 Copy to Quality Manager
1 Copy to Customer/QAR/Quality Manager
1 Copy to nominated Quality Authority

Note to Customer: *Please complete this report by typing your comments on the reverse of this form, then sign and return to TÜV Assessment Service for inclusion in the final report*

mcmurdo
PAINS WESSEX

Fastfind/Fastfind +
406MHz PLB

Report on Water Ingress Incidents at TüV.

Test: ETSI EN 300 066 Clause 6.7 Thermal Shock
BS EN 60945 Clause 8.9.3 Temporary Immersion
Results: Water ingress.

The units under test malfunctioned due to water ingress into the main PLB body during the test process. These units were built from pre-production parts, using the assembly methods intended for production. Similar development builds had been subjected to thermal shock and immersion tests during in-house development testing, with no evidence of water ingress.

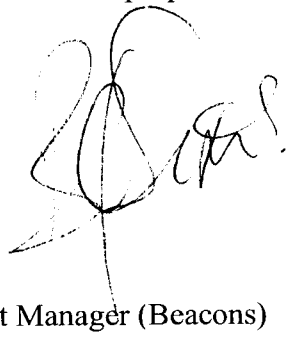
Investigations showed that the pre-production sealing gaskets were not of uniform manufacture, and in some cases did not meet the drawing requirements in areas which could compromise the ability to make a watertight seal. It was confirmed by testing that poorly manufactured gaskets could cause the failures exhibited by the units at TüV.

The problem was discussed with the gasket manufacturer, resulting in modifications to the gasket tooling to correct for moulding process variations, and clarification of the dimensional requirements on the production drawing.

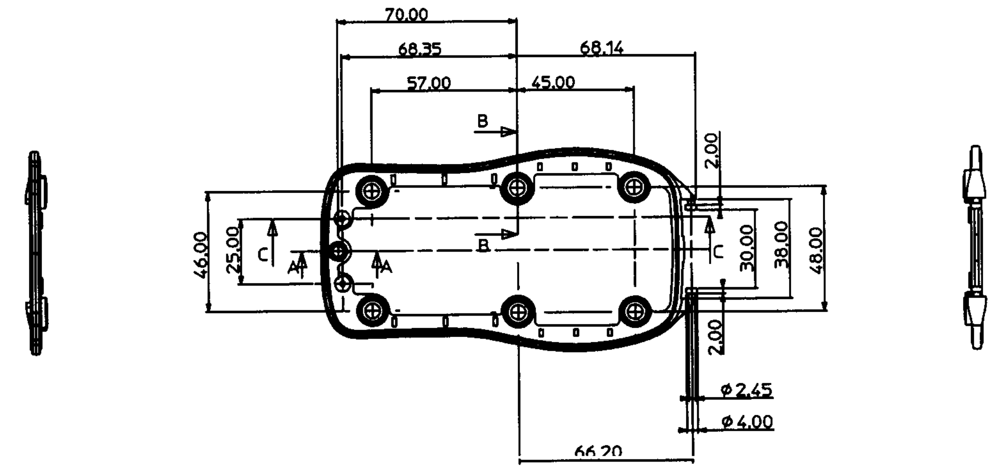
Units were subsequently built with new gaskets, and were successfully subjected to in-house thermal shock and 0.5 bar pressure test. Two new PLBs built to this standard were submitted to TüV for retest.

Conclusions:

- The development gaskets were not of uniform manufacture, and did not all meet the drawing requirements.
- The gasket tooling was modified to correct for process variabilities.
- Dimensional requirements were clarified on gasket production drawing 85-711.
- Production drawing 85-501 calls for each complete PLB to undergo a pressure test. Manufacturing are acquiring non-destructive air displacement leak test equipment for this purpose.



Barry Sims
Development Manager (Beacons)
30-November-2001

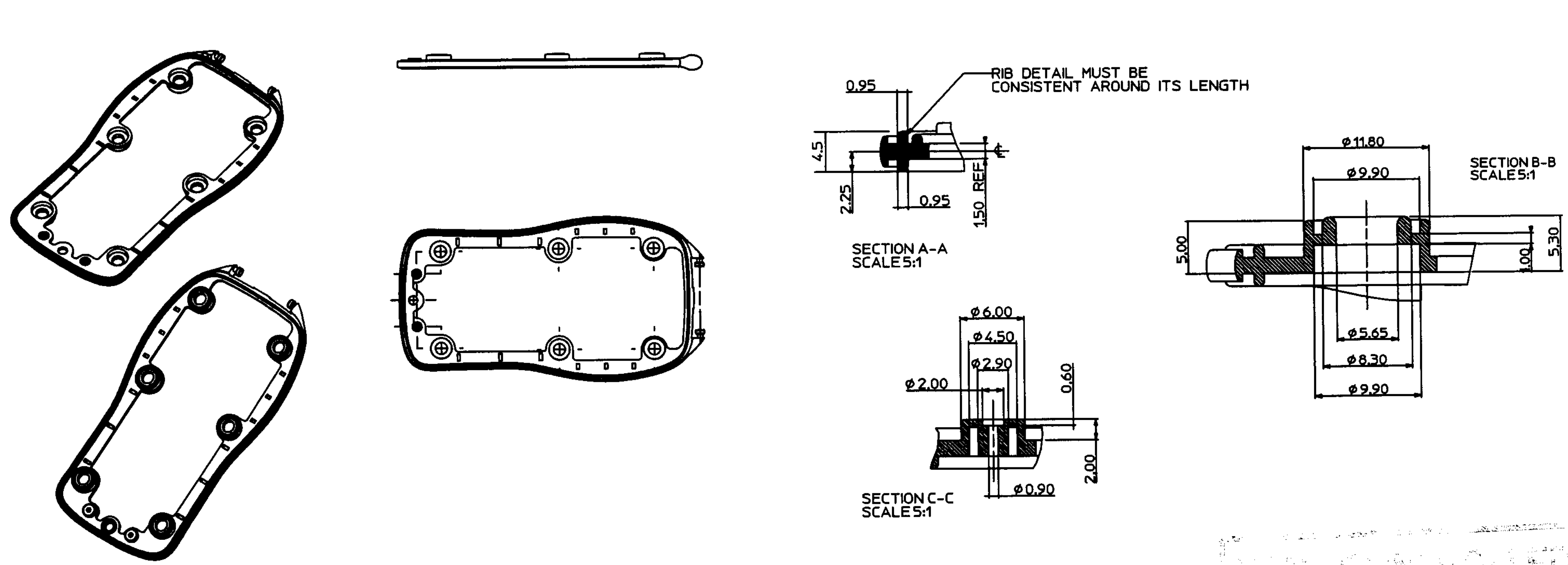


NOTES

1. ALL OUTER SURFACES ARE DRAFTED AS INTENDED FOR FINAL MOULDING.
2. INNER SURFACES WILL CARRY DRAFT WHERE THEY ARE FORMED BY A SHELL OF THE OUTER SURFACE - AS A WALL SECTION NON-SHELL INNER SURFACES THAT ARE MOULDED WITH DRAFT SHOULD BE ADHERED TO.
   INNER SURFACES WHICH ARE SHOWN WITHOUT DRAFT MAY BE MODIFIED AS REQUIRED FOR TOOLING/EJECTION PURPOSES, WITH McMURDO APPROVAL. IF A SITUATION ARISES WHERE ADDING TOOL DRAFT ALTERS THE FUNCTIONAL OR AESTHETIC DETAIL, THIS MUST BE DISCUSSED WITH McMURDO.

GENERAL NOTES

1. GENERAL DRAFT TO BE 1.0° UNLESS OTHERWISE STATED. DRAFT ON INNER FACES TO BE DISCUSSED.
2. GENERAL WALL THICKNESS 1.5MM
3. TOLERANCES AND SIZES APPLY TO FINISHED MOULDING.
4. SPLIT LINES, INJECTION POINT(S), SPRUE/EJECTOR POSITIONS SHOULD BE APPROVED PRIOR TO TOOL MANUFACTURE.
5. SURFACE TEXTURE: GOOD TOOL FINISH ON ALL EXTERNAL & INTERNAL SURFACES
6. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH: 85-707D 85-706D
7. ALL SURFACES SHOULD BE PRODUCED USING CAD MODEL 85-711H.
8. DIMENSIONS SHOWN ON THIS DRAWING ARE FOR INSPECTION ONLY.



VARIANTS TABLE		
PART No.	COLOUR / PANTONE	MATERIAL
85-711-500	BLUE 281C / UNS5160	SILICONE RTC110 - 50
85-711-600	GREY 432C / UN7029	

USED ON: 85-517, 85-617

COMMERCIAL IN CONFIDENCE

TOLERANCES UNLESS OTHERWISE STATED.	
WHOLE No.	+/-0.5
ONE PLACE OF DEC.	+/-0.25
TWO PLACE OF DEC.	+/-0.1
THREE PLACE OF DEC.	+/-0.05
ANGULAR.	+/-0.25

DO NOT SCALE.

REMOVE ALL BURRS AND SHARP EDGES. (UNLESS OTHERWISE STATED)

ISSUE	CHG.No.	DATE.	APPD
2	C1958	12/10/2001	BOS
1	C1948	23/07/2001	BOS

MATERIAL: SEE TABLE

FINISH: CLEAN

DIMENSIONS IN: MM

3RD ANGLE PROJECTION

TITLE: GASKET

McMURDO LIMITED

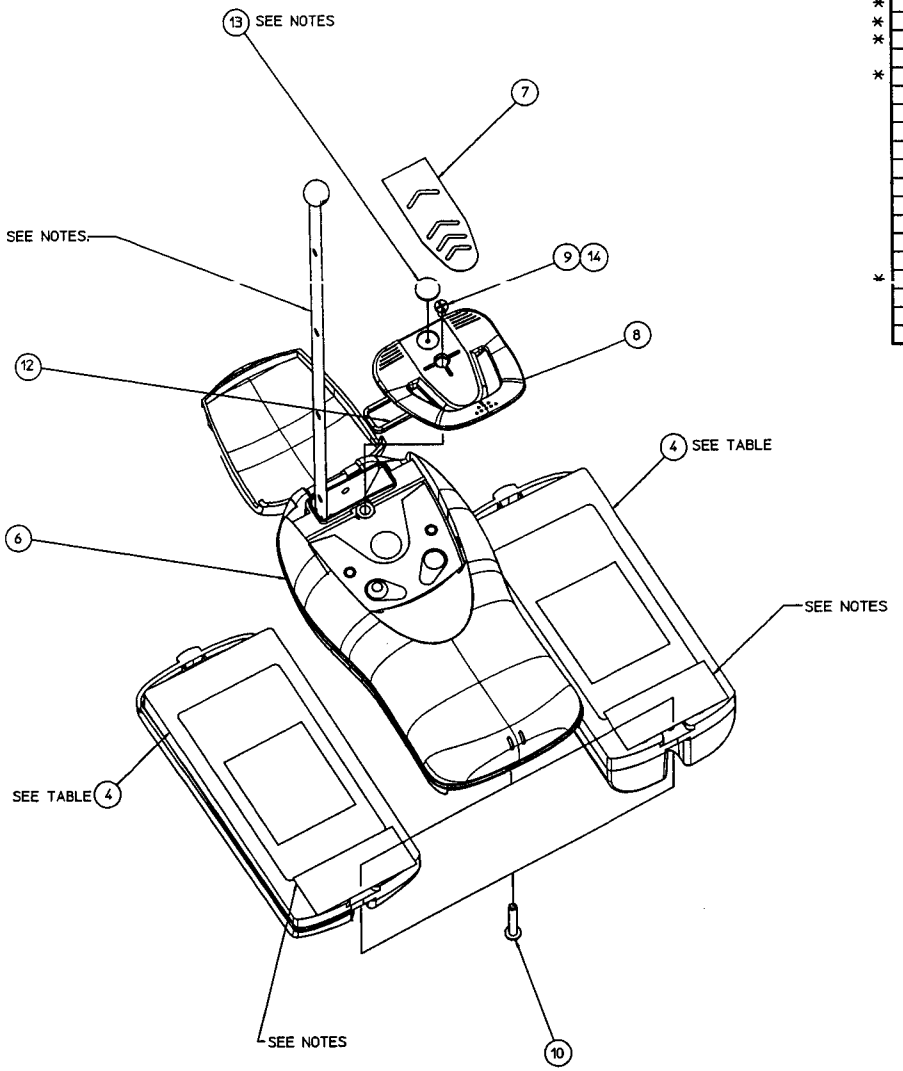
PORTSMOUTH - HAMPSHIRE - ENGLAND

DRAWING No. 85-711-xxxD SHT 1 OF 1

ITEMS MARKED * NOT SHOWN IN THE ASSY.

	ITEM No.	GPS PLB NON PWSS CLASS 2	GPS PLB NON PWSS CLASS 1	GPS PLB PWSS FASTFIND + CLASS 2	GPS PLB PWSS FASTFIND + CLASS 1	QTY	ITEM DESCRIPTION	NON GPS PLB QTY	NON GPS PLB NON PWSS CLASS 2	NON GPS PLB NON PWSS CLASS 1	NON GPS PLB PWSS FASTFIND CLASS 2	NON GPS PLB PWSS FASTFIND CLASS 1
*	1	85-705-521	85-705-541	85-705-524	85-705-544	1	LABEL BARCODE	1	85-702-621	85-702-641	85-702-624	85-702-644
*	2	85-703-001	85-703-001	85-703-004	85-703-004	1	BOX	1	85-703-001	85-703-001	85-703-004	85-703-004
*	3	85-902-001	85-902-001	85-902-004	85-902-004	1	USER MANUAL	1	85-902-001	85-902-001	85-902-004	85-902-004
	4	85-720-001	85-720-001	85-720-004	85-720-004	1	BATTERY PACK	1	85-720-001	85-720-001	85-720-004	85-720-004
*	5	85-736-001	85-736-001	85-736-004	85-736-004	1	BAG					
	6	85-517-001	85-517-001	85-517-004	85-517-004	1	GENERIC PLB	1	85-617-001	85-617-001	85-617-004	85-617-004
	7	85-726	85-726	85-726	85-726	1	TAMPER LABEL	1	85-726	85-726	85-726	85-726
	8	85-727	85-727	85-727	85-727	1	TAMPER COVER	1	85-727	85-727	85-727	85-727
	9	85-743	85-743	85-743	85-743	1	SCREW M3X6 Csk POZI	1	85-743	85-743	85-743	85-743
	10	85-728	85-728	85-728	85-728	1	SCREW M3X20 PAN HD SLOTTED	1	85-728	85-728	85-728	85-728
	11	85-730	85-730	85-730	85-730	1	WRIST STRAP	1	85-730	85-730	85-730	85-730
	12	85-733	85-733	85-733	85-733	1	TAMPER COVER SEAL	1	85-733	85-733	85-733	85-733
	13	85-739	85-739	85-739	85-739	1	ANTENNA RETAINING PIN	1	85-739	85-739	85-739	85-739
	14	81-8086	81-8086	81-8086	81-8086	A/R	THREADLOCK	A/R	81-8086	81-8086	81-8086	81-8086
	15	90-9012	90-9012	90-9012	90-9012	A/R	IPA	A/R	90-9012	90-9012	90-9012	90-9012
*	16	85-753	85-753	85-753	85-753	1	ANTENNA KEY ASSY	1	85-753	85-753	85-753	85-753

VARIANTS SHOWN IN HATCHED AREA ARE FOR DESIGN REFERENCE ONLY.
NOT FOR PROCUREMENT.



NOTES.

1. ANTENNA MUST BE WOUND SO THAT HOLES ARE IN ALIGNMENT. TO ALLOW THE RETAINING PIN ITEM 13 TO BE FITTED WHEN THE TAMPER COVER ITEM 8 IS IN PLACE.
2. CLEAN THE RECESSED LABEL AREA OF THE TAMPER COVER AND THE FRONT OUTER WALL OF THE ANTENNA CAVITY WITH IPA BEFORE APPLYING THE TAMPER COVER LABEL ITEM 7.
3. PRESSURE TEST THE PLB ASSY TO A PRESSURE 0.5 bar. CONFIRM THAT THE LEAKAGE RATE IS EQUIVALENT TO LESS THAN 1cc PER 24 HOURS.
4. PROGRAMME THE UNIT WITH THE REQUIRED PROTOCOL AND SERIALISATION. THE PROGRAMMED ID LABEL PRINTED BY THE PROGRAMMING SOFTWARE IS APPLIED IN THE SPACE RESERVED FOR THIS PURPOSE ON THE LABEL INNER, ON THE UNDERSIDE OF THE PLB BODY.
5. BATTERY PACK ITEM 4 REMOVE BLACK TAPE OVER THE 'O' RING. ENSURING THE 'O' RING IS STILL IN POSITION AND SCREW PACK INTO POSITION USING SCREW M3 ITEM 10 AND COVERED IN THREADLOCK ITEM 14.

ISSUE	CHG.No.	DATE.	APPD	ISSUE	CHG.No.	DATE.	APPD
				1	C1958	12/10/2001	BOS

REMOVE ALL BURRS AND SHARP EDGES. (UNLESS OTHERWISE STATED)

DO NOT SCALE.

TOLERANCES UNLESS OTHERWISE STATED.
WHOLE No. ±0.5 ANGULAR DIMS ±
1 DEC PLACE ±0.1
2 DEC PLACE ±0.05 DRILLED HOLES ±

MATERIAL :-.
FINISH :-.
DIMENSIONS IN :- mm
3RD ANGLE PROJECTION BS 308

DRAWN PB | APPROVED BOS | RELEASED JU | SCALE

TITLE: PLB GPS & NON GPS

McMURDO LIMITED
PORTSMOUTH - HAMPSHIRE - ENGLAND

DRAWING No. 85-501A

SHTS OF SHTS A 1

USED ON