



TELECOMMUNICATIONS TEST AND CERTIFICATION LABORATORY


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Jfr. § 5A.

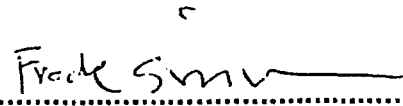
Pages : 35
Annexes : 5
Total no. of pages : 46
Copy Number : of 2

Test report : 97/0187/4
Item tested : TRON 40S
Equipment type : 406 MHz Cospas/Sarsat EPIRB
Client : Jotron Electronics A.S.

Tested according to :
ETS 300 066 - EPIRBs operating on 406,025 MHz - September 1996

Date of issue : 27.06.97

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.....
Arne Søliland
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.....
Frode Sveinsen
Technical Supervisor

The results detailed in this test report are valid only for the particular sample/s tested, with configuration as implemented during the test procedure.

This test report must not be reproduced, except in full, without the written approval of ComLab.

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1 GENERAL INFORMATION

1.1 Test Laboratory

Name : ComLab
Address : Instituttveien 23, Box 96
N-2007 Kjeller, Norway
Telephone : +47 2282 4900
Fax : +47 2282 4990
Test service manager : Arne Søliland

1.2 Client Information

Name : Jotron Electronics A/S
Address : Box 85
Kirkestien 1
N-3280 TJODALYNG
NORWAY
Telephone : +47 3312 4577
Fax : +47 3312 6780

Contact:

Name : Bjørn Allum

1.3 Manufacturer (if other than client)

Name : -
Address : -
Telephone : -
Fax : -

2 TEST INFORMATION

2.1 Test Item

2.1.1 EPIRB

Name : Jotron Electronics A.S.
Model/version : TRON 40S
Serial number : 7DA0015 (EPIRB with antenna) / P203 (EPIRB with 50 ohm connectors)
ID Code : A04A921C3484D1 (EPIRB with antenna) /
A03E4924870D211 (EPIRB with 50 ohm connectors)

Software identity and version :

Remarks

Two EPIRBs have been used for testing, one with antenna and one with 50 ohm connectors.

2.1.2 Battery

Name : Jotron Electronics A.S.
Model/version : X-97780 (Class 2)
Lithium, 4 pcs SAFT LSH20 connected in series, fuses in each cell.
Serial number : Not marked with serial number.

Remarks

2.2 Test Environment

2.2.1 Normal Test Conditions

Temperature : 20 - 26 °C
Relative humidity : 20 - 40 %
Normal test voltage : Internal Battery

The values for temperature and relative humidity are the limits registered during the test period.

2.2.2 Extreme Test Conditions

Temperature

T_{min} : -20 °C
 T_{max} : +55 °C

Voltage

Power Source : Lithium Battery, type X-97780
 V_{min} : -
 V_{max} : -

2.3 Test Period

Test item received date : 19 January 1997

Test period : from 19 January 1997 to 26 June 1997

2.4 Standards and Regulations

ETS 300 066 - September 1996:

Radio Equipment and Systems (RES);

Float-free maritime satellite Emergency Position Indicating Radio Beacons (EPIRBs)
operating on 406,025 MHz;

Technical characteristics and methods of measurement

2.5 Test Engineer/s

Frode Sveinsen / Egil Bredholt

2.6 Additional information**2.6.1 Test Methods****2.6.2 Selection Criteria****2.6.3 Test Equipment**

See annex no. 1.

3 TEST REPORT SUMMARY

3.1 Abbreviations

- P Pass, the equipment fulfils the requirement
- F Fail, the equipment does not fulfil the requirement
- I Inconclusive, the test does not give a clear verdict
- NA Not applicable, the requirement is not applicable
- NT Not tested, the test is not performed even though the requirement is relevant

3.2 Test Summary

Environmental tests

Dry heat test	(P)	
Damp heat test		(P)
Low temperature test		(P)
Vibration test		(P)
Ruggedness test		(P)
Corrosion test		(NT)
Drop test into water		(P)
Thermal shock test		(P)
Immersion test		(P)
Hose stream test		(NT)
Buoyancy test		(P)
Solar radiation test		(NT)
Oil resistance test		(NT)

Transmitter tests

Output power		(P)
Characteristic frequency		(P)
Short term frequency stability		(NT)
Medium term frequency stability		(NT)
Temperature gradient		(NT)
RF spectrum mask		(P)
Phase deviation and data encoding		(P)
Rise and fall times		(P)
Modulation symmetry		(P)

Signal format

Repetition period		(P)
Total transmission time		(P)
Carrier wave (CW) preamble		(P)
Bit rate		(P)

Satellite EPIRB coding	
System bit fields	(P)
Protected field	(P)
Error-correcting field	(I)
Emergency code field	(I)
Long message (optional)	(NA)
Other technical requirements	
Effective luminous intensity of the low duty cycle light	(NT)
Battery capacity	(P)
Homing device	
Class of emission	(P)
Modulation frequency	(P)
Transmitter duty cycle	(P)
Sweep repetition rate	(P)
Frequency error	(P)
Modulation duty cycle	(P)
Modulation factor	(P)
Peak effective radiated power	(P)
Spurious emissions	(P)
Radiation measurements	
Radiated power	(P)
Antenna characteristics	(P)
Release mechanism	
Automatic release of the EPIRB	(P ²)

¹The first EPIRB supplied failed this test.

²The release mechanism has not been fully tested.

3.3 Other Comments

ETS 300 066

4 GENERAL REQUIREMENTS

Clause 4

The manufacturer shall declare that compliance to the requirements of clause 4 is achieved and shall provide relevant documentation.

5 TEST RESULTS

5.1 ENVIRONMENTAL TESTS

5.1.1 Dry Heat Test

Clause 6.2.2

Visible damage or deterioration

NO

Observations: None

5.1.2 Damp Heat Test

Clause 6.2.3

Visible damage or deterioration

NO

Observations: None

5.1.3 Low Temperature Test

Clause 6.2.4

Visible damage or deterioration

NO

Observations: None

5.1.4 Vibration Test

Clause 6.3

Visible damage or deterioration

NO

Observations: The EPIRB was vibrated for two hours at 70 Hz.

5.1.5 Ruggedness Test

Clause 6.4

Visible damage or deterioration

NO

Observations: None

5.1.6 Corrosion Test

Clause 6.5

Visible damage or deterioration

-

Observations: The corrosion test has not been carried out.

5.1.7 Drop Test Into Water

Clause 6.6

Visible damage or deterioration

NO

Observations: None

5.1.8 Thermal Shock Test

Clause 6.7

Visible damage or deterioration

NO

Observations: The first EPIRB provided failed this test. Jotron then replaced the EPIRB. The manufacturers comment is given in Annex 4.

5.1.9 Immersion Test

Clause 6.8

Visible damage or deterioration

NO

Observations: None

5.1.10 Hose Stream Test

Clause 6.9

Visible damage or deterioration

-

Observations: The hose stream test has not been carried out.

5.1.11 Buoyancy Test**Clause 6.10**

Volume of the EPIRB above waterline	1.15 litres
Total volume of the EPIRB	3.35 litres
Calculated Buoyancy	34.33 %
Test verdict	PASS
Limit	≥ 5 %

Observations: None

5.1.12 Solar Radiation Test**Clause 6.11**

Visible damage or deterioration

-

Observations: The solar radiation test has not been carried out.

5.1.13 Oil Resistance Test**Clause 6.12**

Visible damage or deterioration

-

Observations: The oil resistance test has not been carried out.

5.2 TRANSMITTER MEASUREMENTS

ETS 300 066

5.2.1 Output Power, Conducted

Clause 7.1

Test conditions	Output Power dBm
Normal temperature	+38.4
Lower extreme (-20 °C)	+38.4
Upper extreme (+55 °C)	+38.4

Note:-.....

Test Equipment used:..... 2, 5, 8, 10

ETS 300 066

5.2.2 Characteristic Frequency

Clause 7.2

Test conditions	Characteristic Frequency MHz
Normal temperature	406.02522
Lower extreme (-20 °C)	406.02508
Upper extreme (+55 °C)	406.02519

Note:-.....

Test Equipment used:..... 2, 5, 8, 10

ETS 300 066

5.2.3 Short Term Frequency Stability

Clause 7.3

This test has not been carried out due to lack of suitable test facilities.

Note:-.....

Test Equipment used:..... -

ETS 300 066

Clause 7.4

5.2.4 Medium Term Frequency Stability

This test has not been carried out due to lack of suitable test facilities.

Note:-.....

Test Equipment used:..... -

ETS 300 066

Clause 7.5

5.2.5 Temperature Gradient

This test has not been carried out due to lack of suitable test facilities.

Note:-.....

Test Equipment used:..... -

ETS 300 066

5.2.6 RF Spectrum Mask

Clause 7.6

Frequency relative to Carrier Frequency kHz	Measured value dBc (dB relative to Carrier)		Limit dBc
	Lower extreme (-20 °C)	Upper extreme (+55 °C)	
$f < -24$	-44.0	-38.3	-40
$-24 < f < -12$	-35.4	-35.0	-35
$-12 < f < -7$	-34.0	-35.9	-30
$-7 < f < -3$	-27.2	-25.4	-20
$3 < f < 7$	-25.6	-23.3	-20
$7 < f < 12$	-29.1	-30.8	-30
$12 < f < 24$	-32.8	-33.1	-35
$24 < f$	-40.7	-42.4	-40

Note: The values which are above the limit are most likely the result of distortions in the spectrum analyser. The measurement has been carried out with the spectrum analyser in «Max Hold» mode until a transmission has been recorded over the whole span.

Test Equipment used:..... 2, 5, 8, 10

ETS 300 066

5.2.7 Phase Deviation and Data Encoding

Clause 7.7

	Measured deviation radians	
	$\phi 1$	$\phi 2$
Lower extreme (-20 °C)	+ 1.1	- 1.1
Upper extreme (+55 °C)	+ 1.1	- 1.1
Limit	+ 1.1 ± 0.1	- 1.1 ± 0.1

Note:-.....

Test Equipment used: 1, 3, 4, 5, 6, 7, 8, 9, 10

ETS 300 066

Clause 7.8

5.2.8 Rise and Fall Times

	Measured times μs	
	rise time T_R	fall time T_F
Lower extreme (-20 °C)	50	50
Upper extreme (+55 °C)	100	100
Limit	150 μs ± 100 μs	150 μs ± 100 μs

Note:-.....

Test Equipment used:..... 1, 3, 4, 5, 6, 7, 8, 9, 10

ETS 300 066

Clause 7.9

5.2.9 Modulation Symmetry

	Measured values		
	T ₁ ms	T ₂ ms	Modulation Symmetry
Lower extreme (-20 °C)	0.996	1.00	0.002
Upper extreme (+55 °C)	1.25	1.25	0
Limit	-	-	≤ 0.05

Note:-.....

Test Equipment used:..... 1, 3, 4, 5, 6, 7, 8, 9, 10

ETS 300 066

5.3 Signal Format

5.3.1 Repetition Period

Clause 8.2

	Repetition Period s		
	Minimum	Maximum	Difference
Lower extreme (-20 °C)	48.1	52.5	4.4
Upper extreme (+55 °C)	48.0	52.5	4.5
Limit	≥ 47.5	≤ 52.5	> 1

Note: 18 measurements have been performed at each frequency.

Test Equipment used:..... 1, 3, 4, 5, 6, 7, 8, 9, 10

ETS 300 066**5.3.2 Total Transmission Time****Clause 8.3**

	Total Transmission Time	
	s	
	Minimum	Maximum
Lower extreme (-20 °C)	441	442
Upper extreme (+55 °C)	441	442
Limit	≥ 435.6	≤ 444.4

Note:-.....

Test Equipment used:..... 1, 3, 4, 5, 6, 7, 8, 9, 10

ETS 300 066

5.3.3 Carrier Wave (CW) Preamble

Clause 8.4

	Carrier Wave Preambles	
	Minimum	Maximum
Lower extreme (-20 °C)	159.7	160.9
Upper extreme (+55 °C)	159.8	160.9
Limit	≥ 158.4	≤ 161.6

Note:-.....

Test Equipment used:..... 1, 3, 4, 5, 6, 7, 8, 9, 10

ETS 300 066

5.3.4 Bit Rate

Clause 8.5

	Bit Rate bits/s	
	Minimum	Maximum
Lower extreme (-20 °C)	396.8	398.9
Upper extreme (+55 °C)	396.8	397.9
Limit	≥ 396	≤ 404

Note:-.....

Test Equipment used:..... 1, 3, 4, 5, 6, 7, 8, 9, 10

ETS 300 066

5.4 Satellite EPIRB Coding**5.4.1 System Bit Fields**

Clause 9.2

Bit Field	Measured	Required	Verdict
Bit sync. (bit 1 - 15)	1111 1111 1111 111	1111 1111 1111 111	PASS
Frame sync. (bit 16 - 24)	0001 0111 1	0001 0111 1	PASS

Note: ..The bit patterns above have been checked under upper and lower extreme conditions.....

Test Equipment used:..... 1, 3, 4, 5, 6, 7, 8, 9, 10

ETS 300 066

5.4.2 Protected Field

Clause 9.3

Bit Field	Measured	Required	Verdict
Format flag (bit 25)	0	0 (short format)	PASS
Protocol flag (bit 26)	1	1 (Maritime)	PASS
MID code (bit 27 - 36)	0100 0000 01	(country of registration)	PASS
User protocol type (bit 37 - 39)	111	111 (Protocol Type, '111' is TEST protocol)	PASS
Trailing 6 digits of ship station identity (bit 40 - 75)	100100 100100 100100 100001 110000 110100	'space"space"space'TE S	PASS
Specific satellite EPIRB (bit 76 - 81)	100001	T	PASS
spare (bits 82 - 83)	00	00	PASS
Auxiliary radio locating device type (bit 84 - 85)	01		PASS

Note: ..The bit patterns above have been checked under upper and lower extreme conditions.....

Test Equipment used:..... 1, 3, 4, 5, 6, 7, 8, 9, 10

ETS 300 066

5.4.3 Error Correcting Field

Clause 9.4

Bit Field	Measured	Required	Verdict
Error correcting Field (bit 86 - 106)	0100 1001 0110 1010 1100 1	-	INCONCLUSIVE

Note: ...

Test Equipment used:..... 1, 3, 4, 5, 6, 7, 8, 9, 10

ETS 300 066

5.4.4 Emergency Code Field

Clause 9.5

Bit Field	Measured	Required	Verdict
Emergency Code Field (bit 107 - 112)	10 0000	01 0000 or 11 0000	INCONCLUSIVE

Note: ...

Test Equipment used:..... 1, 3, 4, 5, 6, 7, 8, 9, 10

ETS 300 066

5.4.5 Long Message (Optional)

Clause 9.6

Bit Field	Measured	Required	Verdict
Long message (bit 113 - 144)	-	-	NOT APPLICABLE

Note: The long message option is not implemented in the tested EPIRB.

Test Equipment used:..... -

ETS 300 066

5.5 Other Technical Requirements

5.5.1 Effective Luminous Intensity of the Low Duty Cycle Light Clause 10.1

Note: ..The effective luminous intensity of the low duty cycle light has not been measured..

Test Equipment used:..... -

ETS 300 066

5.5.2 Battery Capacity

Clause 10.2

The battery test has been carried out at -20 °C for 48 hours. The EPIRB was then tested and fulfilled subclause 7.1 (output power) and 7.2 (characteristic frequency).

Note: ...

Test Equipment used:..... 2, 5, 8, 10

ETS 300 066

5.5.3 Homing Device

Clause 10.3

	Measured value	Requirement
Class of emission	A3X	A3X
Modulation Frequency (f_m)	$382 \leq f_m \leq 1560$ Hz	Range ≥ 700 Hz $300 \text{ Hz} \leq f_m \leq 1600$ Hz
Transmitter Duty Cycle	Continuos, 960 ms interruption by 406 MHz transmission	Continuos, may be interrupted up to 2 s by 406 MHz transmission
Sweep repetition rate	2.61 Hz	between 2 and 4 Hz
Frequency error	+0.88 kHz	$121.5 \text{ MHz} \pm 50$ ppm
Modulation duty cycle	Start: 33% Midpoint: 43% End: 47%	between 33 and 55 %
Modulation factor	1.0	between 0.85 and 1.0
Peak effective radiated power Median value Max/Min ratio	31 mW 0.3 dB	Between 25 and 100 mW Less than 6 dB
Spurious emissions	All are below 25 μ W	$\leq 25 \mu\text{W}$ in the specified frequency bands

Note:

Test Equipment used:..... 1, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13

ETS 300 066

5.6 Radiation Measurements

5.6.1 Radiated Power

Clause 11.2

Radiated Power dBm					
Turntable Azimuth Angle	Measuring Antenna Elevation Angle				
	10°	20°	30°	40°	50°
0°	40.6	39.8	39.6	38.7	32.2
30°	40.8	40.0	39.9	38.8	31.9
60°	40.6	39.8	40.0	39.1	31.6
90°	40.5	39.8	40.0	39.1	31.8
120°	40.4	39.8	40.0	39.2	31.8
150°	40.1	39.8	39.7	39.2	31.7
180°	40.1	39.7	39.7	39.2	31.9
210°	40.1	39.8	39.6	38.9	32.1
240°	40.1	39.8	39.6	39.0	32.6
270°	40.1	40.0	39.5	38.9	32.7
300°	40.3	39.8	39.4	38.7	32.6
330°	40.6	39.7	39.2	38.7	32.4
Limit	≥ 31.0 dBm and ≤ 43.0 dBm (37.0 dBm +6 / -5 dB)				

Note: The values at 50° are to low, this is because there was a gap in the ground plane around the EPIRB during the measurement. This means that the result at 50° only contains the direct component from the antenna and not the reflected component from the ground plane. Theoretically this should amount to the measured value being about 6 dB to low. The gap in the ground plane can be seen in annex 5 which contains pictures of the test site.

Test Equipment used:..... 11, 12, 13

ETS 300 066

5.6.2 Antenna Characteristics

Clause 11.3

	Measured	Requirement
Pattern	Hemispherical	Hemispherical
Polarisation	Linear, Vertical	Right hand circular polarised (RHCP) or linear
Gain (vertical of the plane)	Max: + 2.6 dBi Min: + 0.5 dBi	Between -3 dBi and +4 dBi over 90% above region
Gain variation (Azimuth plane)	Less than 1.1 dB	Less than 3 dB
Antenna VSWR	Not measured	Not greater than 1.5:1
Power into the antenna (P_1)	38.2 dBm	-

Note: The values at 50° have been disregarded when calculating the Vertical Gain. This is due to the gap in the ground plane as described in subclause 5.6.1.

Test Equipment used:..... 2, 8, 10, 11, 12, 13

ETS 300 066

5.7 Release Mechanism**5.7.1 Automatic Release of the Satellite EPIRB**

Clause 12.2

	Release Depth
Test result	3 metres
Water temperature	approx. 4 °C (non freezing)
Limit	Less than 4 metres

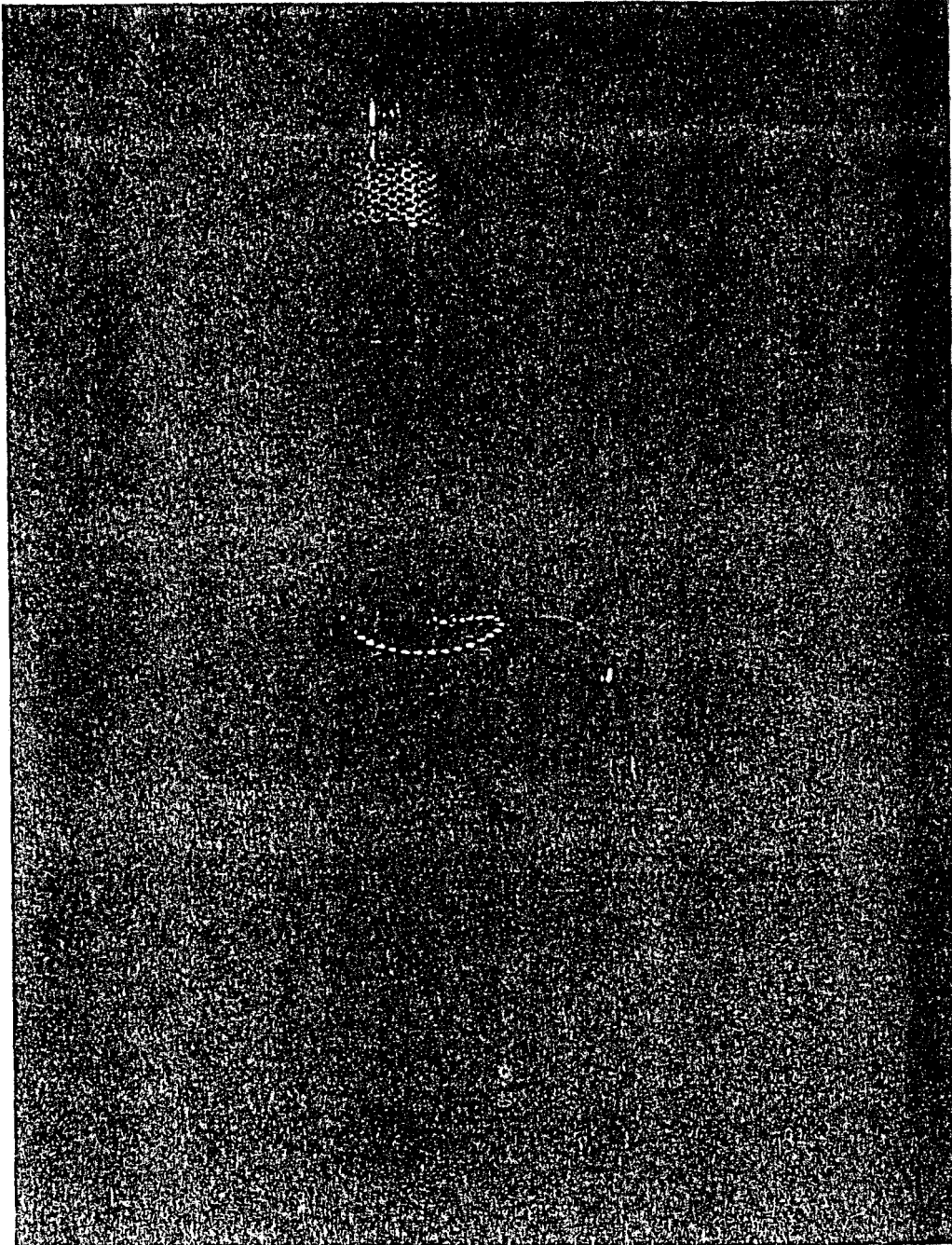
The release mechanism has only been tested in the normal mounting position and at normal test temperature.

Note: ...

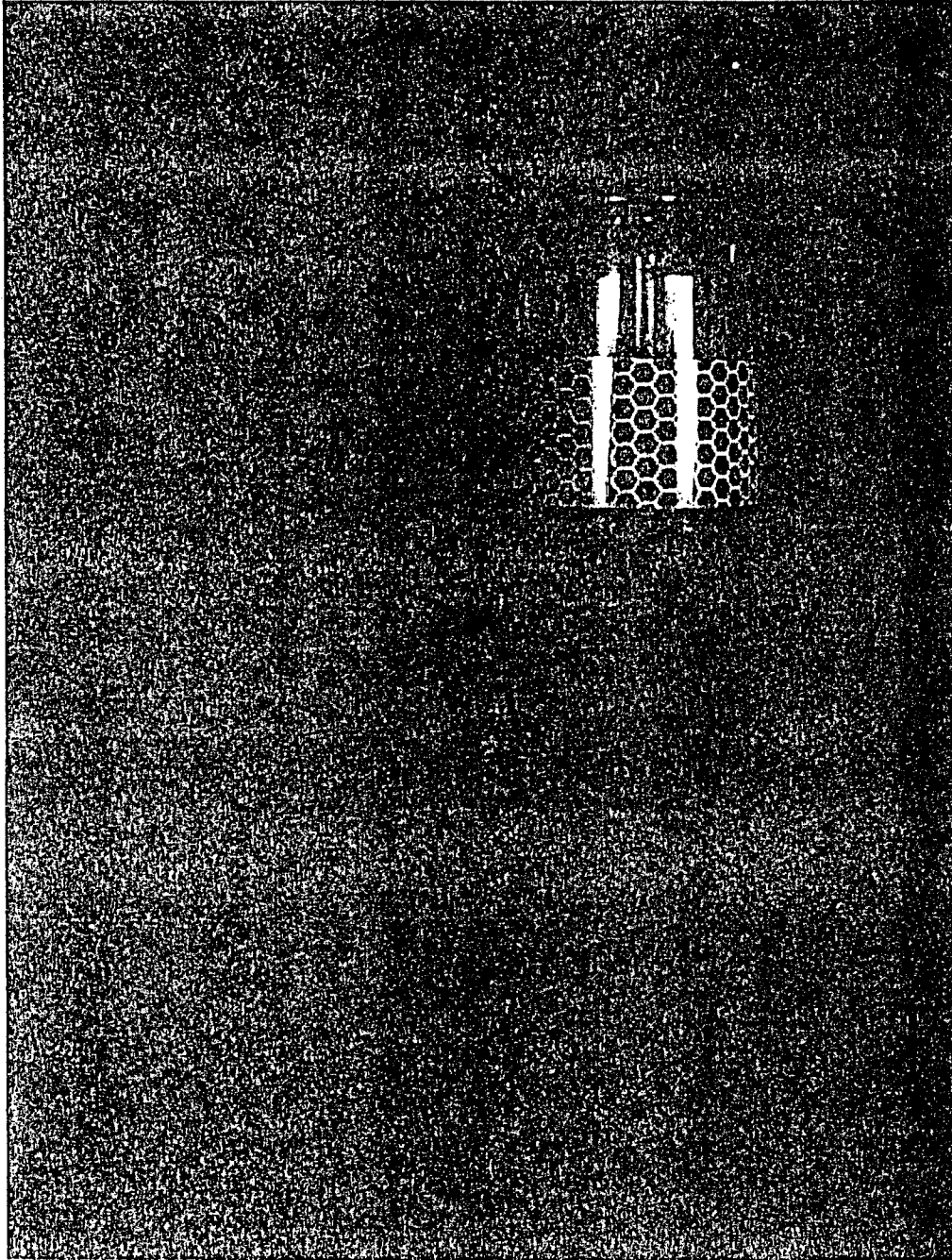
TEST EQUIPMENT AND ANCILLARIES

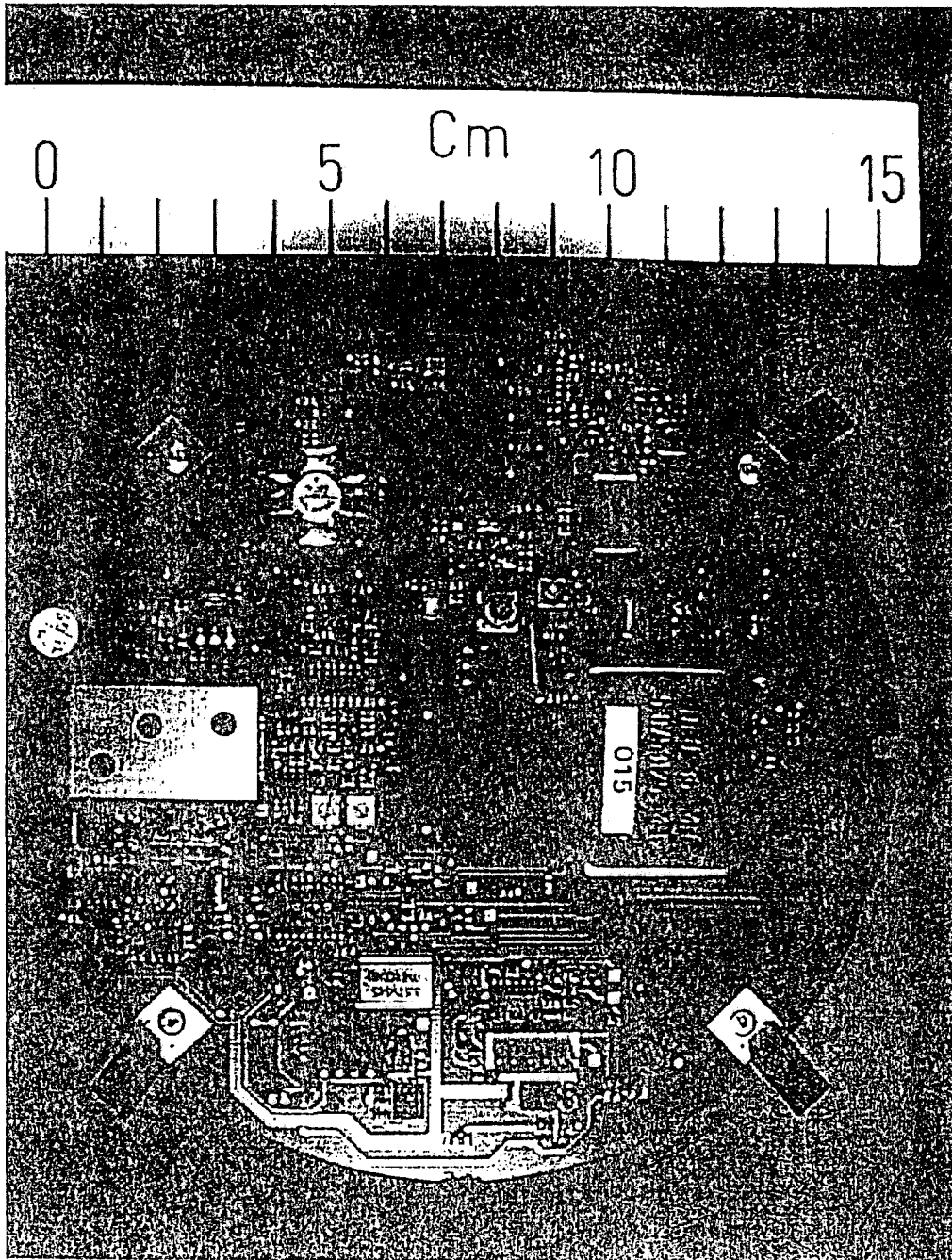
To simplify identification of the test equipment and ancillaries used, all item used are identified by the testhouse on each page of the test report. All numbers are referenced to the list given below.

No	Instrument/Ancillary	Type	Manufacturer	Ref. No.
1	Digital Storage Oscilloscope	PM 3392A	Philips	LR 1239
2	Spectrum Analyser	FSM	Rohde & Schwarz	LR 1284
3	Demodulator	HP 8901B	Hewlett Packard	LR 1255
4	RF Signal Generator	SMHU 56	Rohde & Schwarz	LR 1079
5	Climatic Chamber	-	Weiss Technik	LR 1048
6	Diode Detector	HP 8470B	Hewlett Packard	LR 1207
7	Combiner	H-9	Anzac	LR 257
8	Attenuator	768-20	Narda	LR 1200
9	Attenuator	765-10	Narda	LR 1006
10	Attenuator	6810.17A	Suhner	LR 1136
11	Spectrum Analyser	HP 8561A	Hewlett Packard	LR 1010
12	Dipole Antenna	DB 2	EMCO	LR 1119
13	Dipole Antenna	DB 4	EMCO	LR 1121

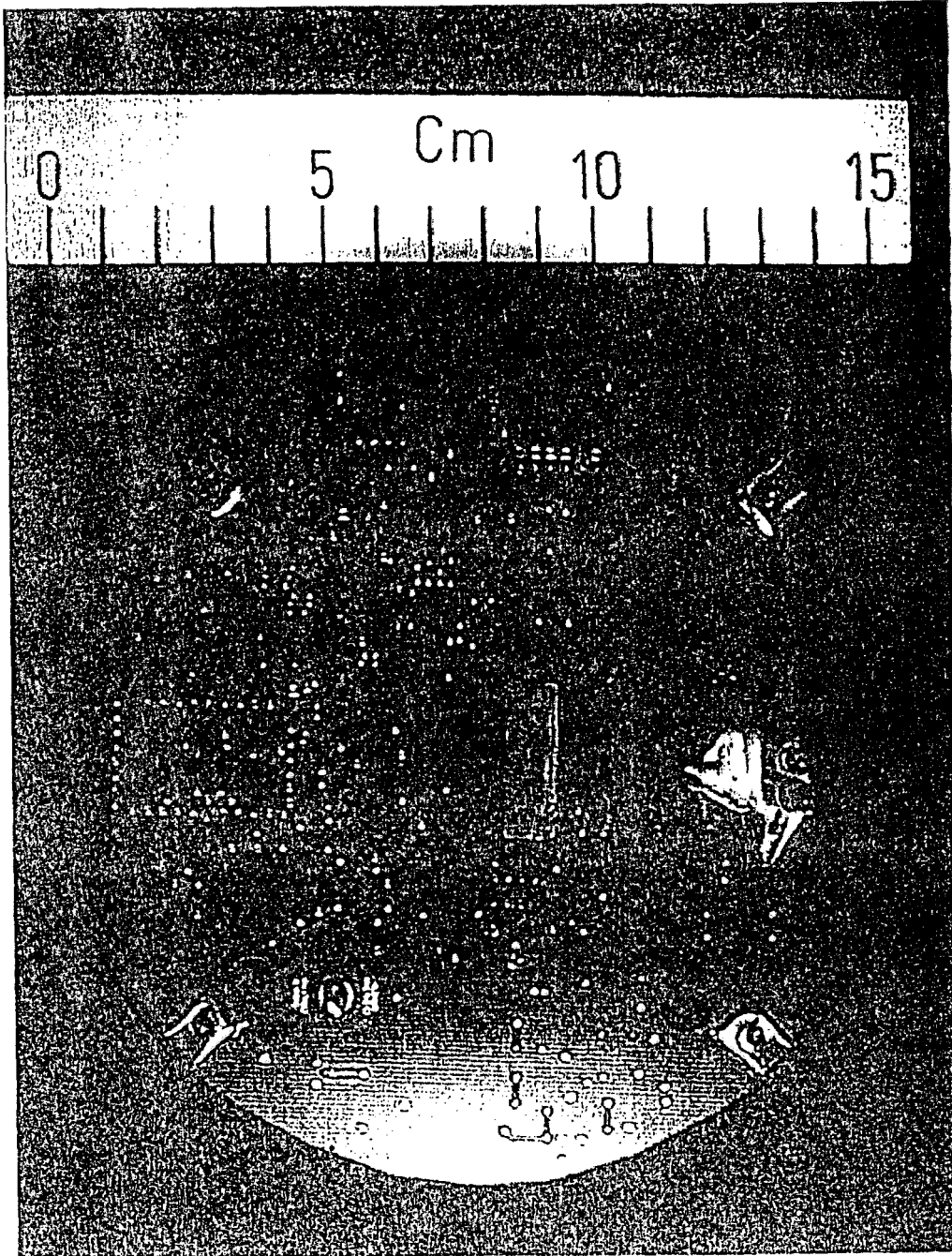


Outside View

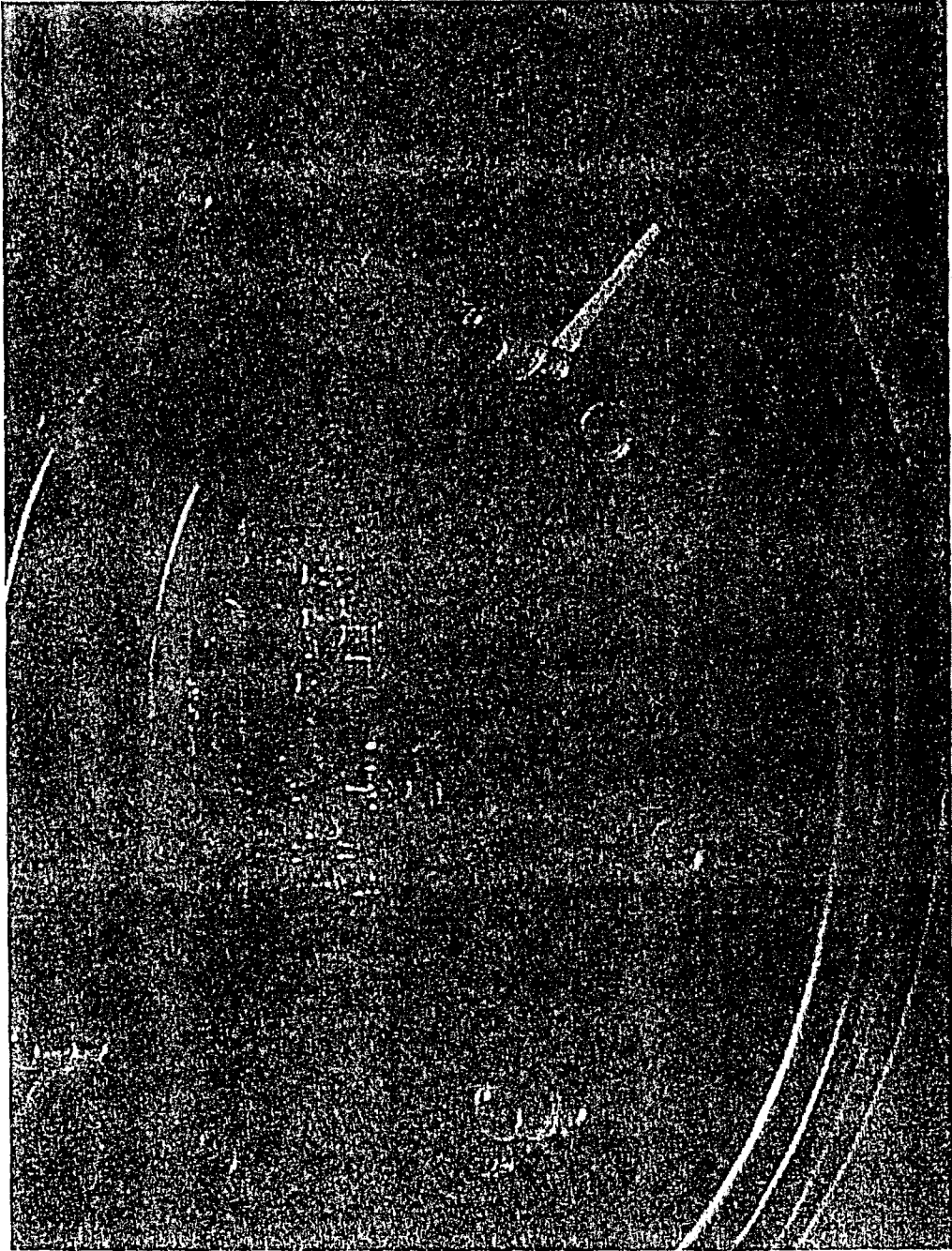




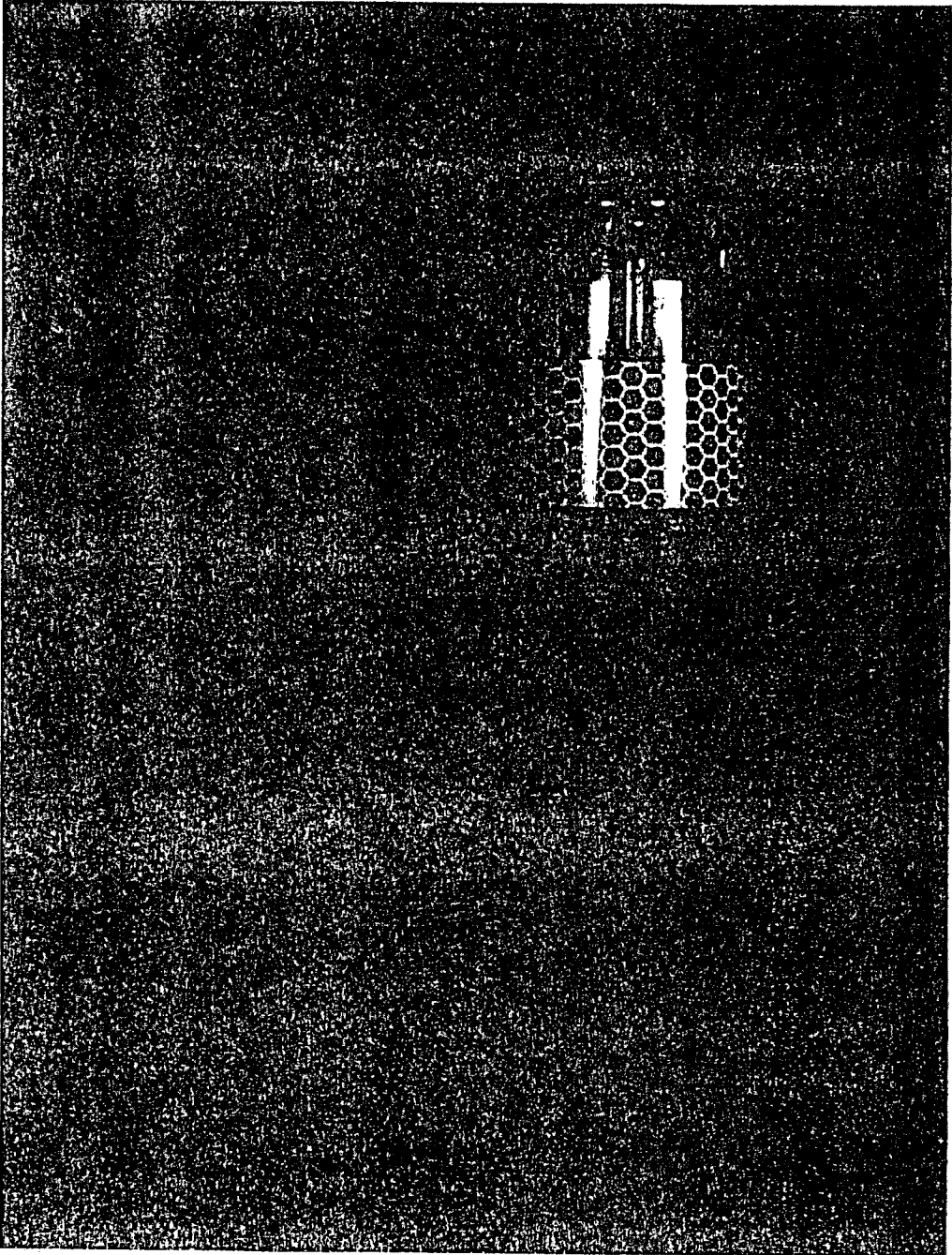
Inside View, Main Circuit Board



Main Circuit Board, Backside View



Inside View, Antenna Part



Marking of the EPIRB



ComLab

SAKSNR: 97/187, 3

10 APR 1997

ARKIVKODE: C-601

cm-FS

AVD./SAKSEH.: Arne Søyland

Company: ComLAB

Test report no. 97/0187
TELEFAX

UNNTATT FRA OFFENTLIGHET
Jfr. § 5A.

To: Frode Sveinsen

From: Bjørn Allum
JOTRON electronics a.s
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Date: 09.04.97
Number of Pages: 1
Our ref: BA971011

Tron40S

Vi har undersøkt enheten som har tatt inn vann, og kommet til følgende konklusjon :

Enheten har tatt inn vann i overgangen/o-ring mellom bøyehus og linse. Dette var forårsaket av at linsen ikke var montert med spesial verktøy. Uten bruk av dette verktøyet kan linsen bli utsatt for stor belastning under montering. Dette kan svekke linsen, med lekkasje som resultat. Ved bruk av spesial verktøyet vil ikke dette kunne skje.

Samme sammenføyningen har vært brukt på vårt lys AQ-4 gjennom flere år uten lignende problemer. Her blir det også brukt monterings verktøy for å styre linsen rett ved montasje.

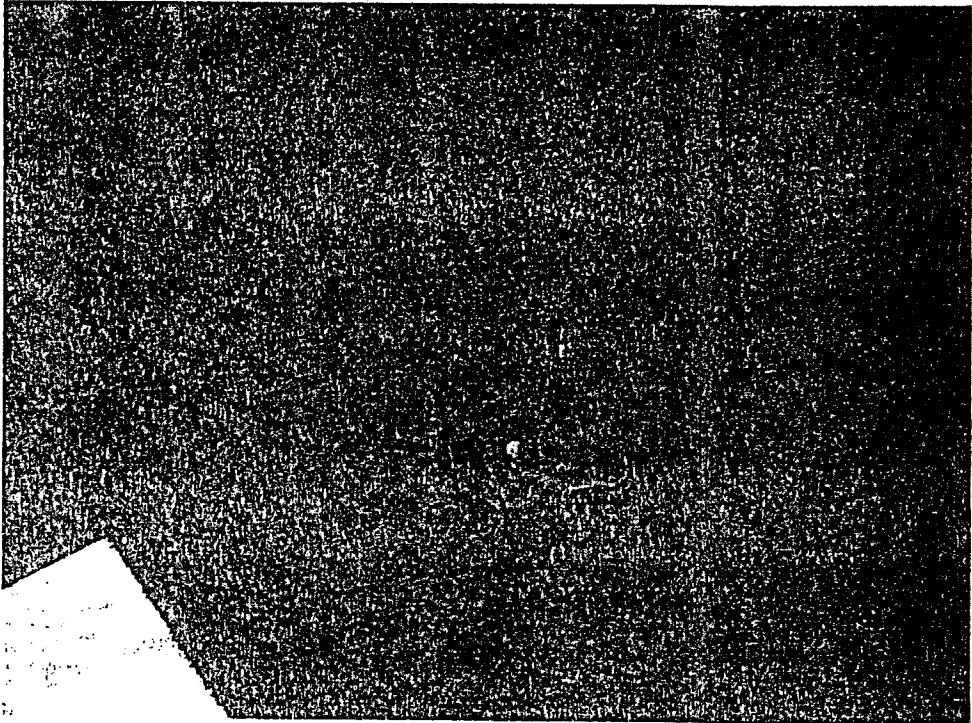
Grunnen til at den første enheten var montert uten dette verktøyet er at dette ikke var ferdig produsert på det tidspunktet.

Vi returnerer herved ny enhet for videre testing. Elektronikken er også byttet ut , da det var noen mindre vannskader på enheten. Batteriet er ikke byttet.

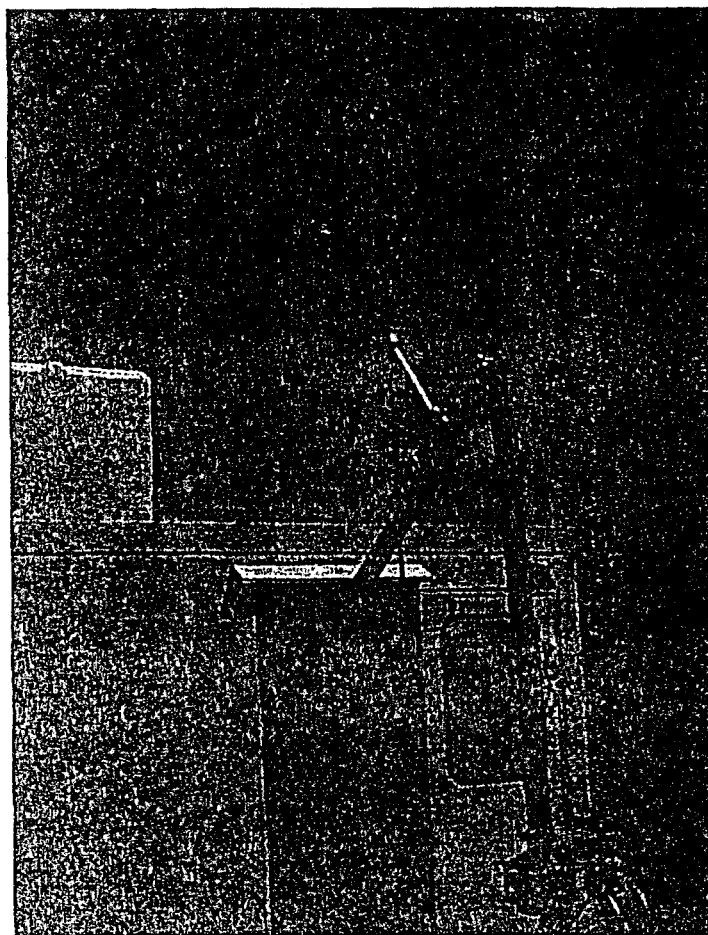
Den nye enheten har serie nummer 7DA0015, og blir sendt i dag.

Med vennlig hilsen

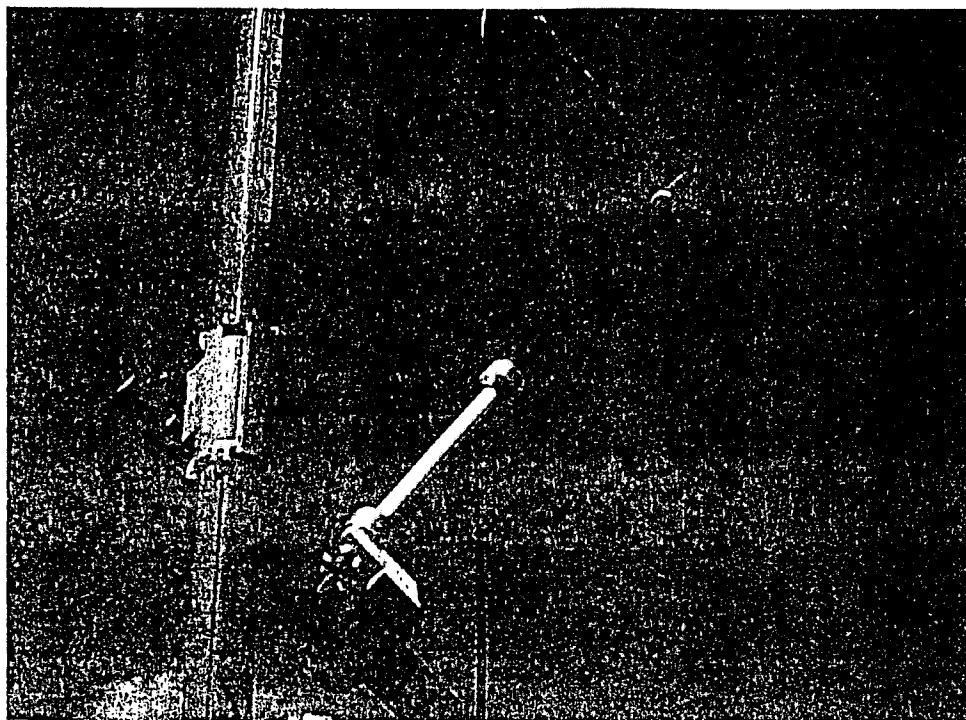
Bjørn Allum



EPIRB with Ground Plane



Antenna Mast



Antenna