Appendix 9 – Safety Report

SeaTraceR S.827 AIS Class B Transponder

Safety Report

to IEC 60950-1:2001, EN 60950-1/A.11:2004

INTRODUCTION

The product has been reviewed and tested against the standard for IT equipment, Safety, Part 1 – General requirements

EQUIPMENT REVIEWED

SeaTraceR S.827 Marine AIS Class B Transponder, serial no.1005

DATE AND LOCATION OF TESTS & INSPECTIONS

8th to 10th January 2007 SevenStar premises, Wootton Bassett, UK

SUMMARY OF RESULTS

The equipment was seen to comply with these standards

TESTS PERFORMED BY: Mr Ed Mitchell, Production & Test Supervisor

REPORT COMPILED & APPROVED BY: Mr Colin Watts, Quality Manager

REPORT AUTHORISED BY:

DATE: …8.3.07

C.R.Watts

Managing Director

GENERIC PRODUCT TYPE

AIS Transponders, as specified in ITU-R M.1371-1, distribute identity, location and other static and dynamic data about vessels at sea. They operate in the marine VHF band, using GPS to provide the location, speed over ground and course over ground information. Class A transponders are mandatory fitment to 'deep-sea' and passenger vessels according to the rules referred to as the SOLAS convention. In 2006 an IEC specification was formally released to enable the use of a simplified transponder, applicable to smaller vessels and leisure craft. The specification number is IEC 62287-1; Technical Requirements for Class B AIS Transponders, Part 1, and the product under test has been designed to this specification. The major differences from the Class A units are reduced transmit power and use of simple carrier sense transmit collision avoidance, rather than the self-organising system used in Class A. Only a small number of messages are transmitted, but Class B units can receive all the Class A and Class B message types. Class B AIS is backward compatible with ITU-R M.1371-1.

SPECIFIC PRODUCT DESCRIPTION

The SeaTraceR S.827 Class B AIS Transponder has been designed for permanent fit onto leisure or professional vessels. It contains an internal GPS receiver, and requires an external GPS active antenna, a VHF antenna, and a +12v nominal DC power connection. Data received over the VHF data link (VDL) can be forwarded on to chart plotters or PCs running plotting or AIS viewing software using a 9-way data cable. Serial RS232 data and RS422/NMEA data is supported. The position of other vessels can be plotted and displayed using this data.

This unit consists of an extruded aluminium enclosure, with cast aluminium end panels, with integral silicone rubber seals to give protection to IP65 rating. LEDs are visible through a waterproof polyester label at one end, and the connectors are mounted through a similar waterproof label at the other end. The end panels are help in place with screws *outside* the sealed area. The bracket also attaches with screws *outside* the sealed area.

A single, multi-layer, double-sided surface mount PCB is held in place by integral guides in the extrusion.

RATINGS

+12Vdc, 4W, 2Apk
Protection: PTC fuse (F5), UL certified, complying with IEC 60950-1 clause 2.5, so the equipment is considered as a limited power source.
Compass safe distance: 0.5m
Rated as fixed equipment, continuous operation
Supply tolerance +30/-20%
Class III equipment
IP65 protected against moisture and dust ingress
Max ambient temperature: +55degC

INITIAL OBSERVATIONS, incl Ergonomics

The unit presented was free from sharp edges, loose items, or other mechanical hazards. No small parts were easily removable. All labels, connectors and fixings were firmly attached. Painted surfaces were sound and free from damage. Labels were clear and unambiguous. A simple test with a hose showed no water ingress into the electronics enclosure. General appearance was of a professional, robust unit. Instructions in the User Guide seemed clear to follow, and there were safety warnings for fitting items up the mast or in other areas where fitting may be unsafe if precautions are not taken. Installing the unit, and then using the unit, is not believed to present an undue risk of injury or damage to the installer/user, to other equipment, or to any other party.

RESULTS

CLAUSE	REQUIREMENT	REMARKS	RESULT
1	**General**		**PASS**
1.5	**Components**		**PASS**
1.5.1	General		PASS
	Comply with IEC 60950 or relevant comp std	F5 PTC fuse. See Appendices Table 1	PASS
1.5.2	Evaluation & testing of components		PASS
1.5.3	Thermal controls	None	N/A
1.5.4	Transformers	None	N/A
1.5.5	Interconnecting cables		N/A
1.5.6	Capacitors in primary circuits	All SELV circuits	N/A
1.5.7	Double insulation or reinforced insulation bridged by components		N/A
1.5.7.1	General		N/A
1.5.7.2	Bridging capacitors		N/A
1.5.7.3	Bridging resistors		N/A
1.5.7.4	Accessible parts		N/A
1.5.8	Components in IT power systems		N/A
1.6	**Power Interface**		**PASS**
1.6.1	AC power		N/A
1.6.2	Input current	See appendices, Table 2, for info only	PASS
1.6.3	Hand held equipment voltage limit		N/A
1.6.4	Neutral conductor		N/A
1.7	**Marking & Instructions**		**PASS**
1.7.1	Power rating		N/A
	Rated voltage		N/A
	Nature of supply		N/A
	Rated frequency		N/A
	Rated current		N/A
	Manufacturer's name	SevenStar Electronics Ltd	PASS
	Model/type number	SeaTraceR S.827	PASS
	Symbol for class 2 equipment		N/A
	Other symbols		N/A
	Certification marks		N/A
1.7.2	Safety instructions		PASS
1.7.3	Short duty cycles		N/A
1.7.4	Supply volts adjustment		N/A
	Method and means of adjustment		N/A
1.7.5	Power outputs		N/A
1.7.6	Fuse indications, anything special		N/A
1.7.7	Wiring terminals		N/A
1.7.7.1	Protective earthing & bonding		N/A
1.7.7.2	A.C. mains terminals		N/A
1.7.7.3	D.C. mains terminals		N/A
1.7.8	Controls & Indicators		N/A
1.7.8.1	Identification, location & marking		N/A
1.7.8.2	Colours		N/A
1.7.8.3	Symbols to IEC 60417		N/A
1.7.8.4	Markings using figures		N/A
1.7.9	Isolation of multiple power sources		N/A

1.7.10	IT power systems		N/A
1.7.11	Thermostats and other devices		N/A
1.7.12	Languages used	English	N/A
1.7.13	Durability		PASS
1.7.14	Removable parts		PASS
1.7.15	Replaceable batteries		N/A
	Languages used		N/A
1.7.16	Operator access with a tool		N/A
1.7.17	Equipment for restricted access		N/A
2	**PROTECTION FROM HAZARDS**		**PASS**
2.1	**Protection from electric shock / energy**		N/A
2.1.1	Operator access areas	All SELV circuits, no energy hazard	N/A
2.1.1.1	Access to energised parts		N/A
	Test by inspection		N/A
	Test with test finger		N/A
	Test with test pin		N/A
	Test with test probe		N/A
2.1.1.2	Battery compartments		N/A
2.1.1.3	Access to ELV wiring		N/A
	Working voltage, minimum distance		N/A
2.1.1.4	Access to hazardous cct voltages		N/A
2.1.1.5	Energy hazards		N/A
2.1.1.6	Manual controls		N/A
2.1.1.7	Discharge of capacitors in the equipment		N/A
2.2	**SELV circuits**		**PASS**
2.2.1	General requirements		PASS
2.2.2	Normal voltages	15.6Vdc	PASS
2.2.3	Fault voltages	15.6Vdc	PASS
2.2.3.1	Separation by double insulation		N/A
2.2.3.2	Separation by earthed screen		N/A
2.2.3.3	Protection by earthing SELV cct		N/A
2.2.4	Connection of SELV ccts to others	All SELV ccts used	N/A
2.3	**TNV circuits**	**None**	**N / A**
2.3.1	Limits		N/A
	TNV circuit types		N/A
2.3.2	Separation from circuits and accessible parts		N/A
	Insulation used		N/A
2.3.3	Separation from hazardous voltages		N/A
	Insulation used		N/A
2.3.4	Connection to other circuits		N/A
	Insulation used		N/A
2.3.5	Test for voltages generated externally		N/A
2.4	**Limited current circuits**		**N / A**
2.4.1	General		N/A
2.4.2	Limit values		N/A
	Frequency		N/A
	Current measured		N/A
	Voltage measured		N/A
	Capacitance measured		N/A
2.4.3	Connection to other circuits		N/A
2.5	**Limited power sources**		**PASS**

	Inherently limited	UL certified PTC device used	PASS
	Limited by impedance		N/A
	Limited by over-current protective device		N/A
	Limited by regulator for normal & single fault		N/A
	Limited by regulator and overcurrent		N/A
	Output volts and current, power in VA		N/A
2.6	**Provisions for earthing & bonding**		**N/A**
2.6.1	Protective earthing	Class III equipment	N/A
2.6.2	Functional earthing		N/A
2.6.3	Protective earthing and bonding conductors		N/A
2.6.3.1	General		N/A
2.6.3.2	Size of protective earthing conductors		N/A
	Rated current and cross section		N/A
2.6.3.3	Size of protective bonding conductors		N/A
	Rated current and cross section		N/A
2.6.3.4	Resistance of earthing conductors, test current		N/A
2.6.3.5	Colour of earth insulation		N/A
2.6.4	Terminals used		N/A
2.6.4.1	General		N/A
2.6.4.2	Protective earth & bond terminals		N/A
	Rated current, thread diameter		N/A
2.6.4.3	Separation of protective earthing conductor from protective bonding conductors		N/A
2.6.5	Integrity of protective earthing		N/A
2.6.5.1	Interconnection		N/A
2.6.5.2	Components in prot earth & bond conductors		N/A
2.6.5.3	Disconnection of protective earth		N/A
2.6.5.4	Operator-removable parts		N/A
2.6.5.5	Parts removed during servicing		N/A
2.6.5.6	Corrosion resistance		N/A
2.6.5.7	Screws for protective bonding		N/A
2.6.5.8	Reliance on telecom network/cable dist system		N/A
2.7	**Overcurrent/earth fault protection**		**N/A**
2.7.1	Basic requirements	No primary circuits	N/A
	Instructions when protection relies on building installation.		N/A
2.7.2	Faults not covered in 5.3		N/A
2.7.3	Short-circuit backup protection		N/A
2.7.4	Number/location of protective devices		N/A
2.7.5	Protection by several devices		N/A
2.7.6	Warning service staff		N/A
2.8	**Safety Interlocks**		**N/A**
2.8.1	General principle	No safety interlocks used	N/A
2.8.2	Protection requirements		N/A
2.8.3	Inadvertent reactivation		N/A
2.8.4	Fail-safe operation		N/A
2.8.5	Moving parts		N/A
2.8.6	Overriding		N/A
2.8.7	Switches & relays		N/A

2.8.7.1	Contact gaps		N/A
2.8.7.2	Overload test		N/A
2.8.7.3	Endurance test		N/A
2.8.7.4	Electric strength test		N/A
2.8.8	Mechanical actuators		N/A
2.9	**Electrical insulation**		**PASS**
2.9.1	Properties of insulating materials		PASS
2.9.2	Humidity conditioning		N/A
	Humidity, temperature		N/A
2.9.3	Grade of insulation	Functional	PASS
2.10	**Clearances, creepage etc**		**N/A**
2.10.1	General		N/A
2.10.2	Determination of working voltage		N/A
2.10.3	Clearances		N/A
2.10.3.1	General		N/A
2.10.3.2	Primary cct clearances		N/A
2.10.3.3	Secondary cct clearances		N/A
2.10.3.4	Measurement of transient voltages		N/A
2.10.4	Creepage distances		N/A
	CTI tests		N/A
2.10.5	Solid insulation		N/A
2.10.5.1	Min distance through insulation		N/A
2.10.5.2	Thin sheet material		N/A
	Number of layers		N/A
	Electric strength test		N/A
2.10.5.3	Printed boards		N/A
	Distance through insulation		N/A
	Electric strength test for thin sheet		N/A
	Number of layers		N/A
2.10.5.4	Wound components		N/A
	Number of layers		N/A
	Two wires in contact inside wound component, angle between 45 and 90deg		N/A
2.10.6	Coated printed boards		N/A
2.10.6.1	General		N/A
2.10.6.2	Sample prep and initial inspection		N/A
2.10.6.3	Thermal cycling		N/A
2.10.6.4	Thermal ageing		N/A
2.10.6.5	Electric strength test		N/A
2.10.6.6	Abrasion resistance		N/A
	Electric strength test		N/A
2.10.7	Enclosed and sealed parts		N/A
	Temp		N/A
2.10.8	Spaces filled by insulation		N/A
	Electric strength test		N/A
2.10.9	Component external terminations		N/A
2.10.10	Insulation with varying dimensions		N/A
3	**WIRING, CONNECTIONS & SUPPLIES**		**PASS**
3.1	**General**		**PASS**
3.1.1	Current rating & overcurrent protection		PASS
3.1.2	Protection against mechanical damage		PASS
3.1.3	Securing of internal wiring		PASS
3.1.4	Insulation of conductors		N/A
3.1.5	Beads & ceramic insulators		N/A
3.1.6	Screws for electrical contact pressure		N/A

3.1.7	Insulating materials in electrical connections		N/A
3.1.8	Self-tapped and spaced thread screws		N/A
3.1.9	Termination of conductors		N/A
	Pull test 10N		N/A
3.1.10	Sleeving		N/A
3.2	**Connection to AC or DC mains supplies**		**N/A**
3.2.1	Means of connection	SELV	N/A
3.2.1.1	AC mains		N/A
3.2.1.2	DC mains		N/A
3.2.2	Multiple supply connections		N/A
3.2.3	Permanent connections		N/A
	Number of wires, dia of cable etc		N/A
3.2.4	Appliance inlets		N/A
3.2.5	Power supply leads		N/A
3.2.5.1	AC supply leads		N/A
	Type		N/A
	Rated current, size		N/A
3.2.5.2	DC supply leads		N/A
3.2.6	Strain reliefs		N/A
	Mass of equipment, pull		N/A
	Displacement		N/A
3.2.7	Protection against mechanical damage		N/A
3.2.8	Cord protection		N/A
	D (mm), test mass (g)		N/A
	Curvature radius of cord		N/A
3.2.9	Supply wiring space		N/A
3.3	**Wiring terminals for external conductors**		**N/A**
3.3.1	Wiring terminals		N/A
3.3.2	Power lead connections		N/A
3.3.3	Screw terminals		N/A
3.3.4	Conductor sizes		N/A
	Rated current, cable type, size		N/A
3.3.5	Wiring terminal size		N/A
	Rated current, type, thread diameter		N/A
3.3.6	Wiring terminal design		N/A
3.3.7	Grouping of terminals		N/A
3.3.8	Stranded wire		N/A
3.4	**Disconnection from mains supply**		**N/A**
3.4.1	General		N/A
3.4.2	Disconnect devices		N/A
3.4.3	Permanently connected equipment		N/A
3.4.4	Parts which remain energised		N/A
3.4.5	Switches in flexible leads		N/A
3.4.6	Single phase and DC equipment		N/A
3.4.7	Three-phase equipment		N/A
3.4.8	Switched used to disconnect		N/A
3.4.9	Plugs used to disconnect		N/A
3.4.10	Interconnected equipment		N/A
3.4.11	Multiple power supplies		N/A
3.5	**Interconnection of equipment**		**PASS**
3.5.1	General		PASS
3.5.2	Types of interconnecting cct		PASS

3.5.3	ELV ccts as interconnecting ccts		N/A
4	**PHYSICAL REQUIREMENTS**		**PASS**
4.1	**Stability**		**N/A**
	10 deg angle	Fixed	N/A
	Test force		N/A
4.2	**Mechanical strength**		**PASS**
4.2.1	General		PASS
4.2.2	Steady force 10N		N/A
4.2.3	Steady force 30N		N/A
4.2.4	Steady force 250N		PASS
4.2.5	Impact test		PASS
	Fall test		PASS
	Swing test		N/A
4.2.6	Drop test		N/A
4.2.7	Stress relief test		N/A
4.2.8	CRTs		N/A
4.2.9	High pressure lamps		N/A
4.2.10	Wall or ceiling mounted equipment	50N force	PASS
4.3	**Design & Construction**		**PASS**
4.3.1	Edges and corners		PASS
4.3.2	Handles and controls		N/A
4.3.3	Adjustable controls		N/A
4.3.4	Securing of parts		PASS
4.3.5	Plugs and sockets		PASS
4.3.6	Directly plugged in equipment		N/A
	Mains plug size		N/A
	Pull test and torque test		N/A
4.3.7	Heating elements in earthed equipment		N/A
4.3.8	Batteries		N/A
4.3.9	Oil and grease		N/A
4.3.10	Liquids and gases, dust, etc		N/A
4.3.11	Containers for liquids and gases		N/A
4.3.12	Any flammable liquids		N/A
	Quantity		N/A
	Flash point		N/A
4.3.13	Radiation		PASS
4.3.13.1	General		PASS
4.3.13.2	Ionizing radiation		N/A
	Measured		N/A
	High voltage		N/A
	Focus voltage		N/A
	CRT markings		N/A
4.3.13.3	Effect of UV on materials		N/A
4.3.13.4	Human exposure to UV		N/A
4.3.13.5	Laser (incl LEDs)	LEDS are indicators only	PASS
4.3.13.6	Other		N/A
4.4	**Protection against moving parts**		**N/A**
4.4.1	General		N/A
4.4.2	Protection operator access		N/A
4.4.3	Restricted access		N/A
4.4.4	Service access		N/A
4.5	**Thermal Requirements**		**PASS**

4.5.1	Max temperatures	See Appendices, Table 3	PASS
	Normal load condition	As per annex L.7	PASS
4.5.2	Resistance to abnormal temperatures		N/A
4.6	**Enclosure openings**		**PASS**
4.6.1	Top or side openings		PASS
	Size	None	N/A
4.6.2	Fire enclosures		PASS
	Bottom construction	No opening	N/A
4.6.3	Doors, covers in fire enclosures		N/A
4.6.4	Openings in transportable equipment		N/A
4.6.5	Adhesives for construction		N/A
4.7	**Fire resistance**		**PASS**
4.7.1	Reducing risk of ignition and spread of fire		PASS
	Selection and application		PASS
	Application of simulated faults		N/A
4.7.2	Conditions for fire enclosure	Limited power equipment	N/A
4.7.2.1	Parts requiring fire enclosure		N/A
4.7.2.2	Parts not requiring fire enclosure		PASS
4.7.3	Materials		PASS
4.7.3.1	General		PASS
4.7.3.2	Materials for fire enclosures		N/A
4.7.3.3	Materials outside fire enclosures		N/A
4.7.3.4	Materials inside fire enclosures		N/A
4.7.3.5	Air filter materials		N/A
4.7.3.6	Materials used in high voltage components		N/A
5	**ELECTRICAL REQUIREMENTS AND SIMULATED ABNORMAL CONDITIONS**		**PASS**
5.1	**Touch current and protective conductor current**		N/A
5.1.1	General		N/A
5.1.2	Equipment under test		N/A
5.1.3	Test circuit		N/A
5.1.4	Measuring instrument		N/A
5.1.5	Test procedure		N/A
5.1.6	Measurements		N/A
	Voltage		N/A
	Measured touch current		N/A
	Max allowed current		N/A
	Measured protective conductor current		N/A
	Max allowed current		N/A
5.1.7	Touch current > 3.5mA		N/A
5.1.8	Touch currents/telecoms & cable networks		N/A
5.1.8.1	Current limit		N/A
	Test voltage		N/A
	Measured touch current		N/A
	Max allowed current		N/A
5.1.8.2	Summation of these telecom test currents		N/A
5.2	**Electric strength**		N/A
5.2.1	General		N/A
5.2.2	Test procedure		N/A
5.3	**Abnormal operating / fault conditions**		**PASS**

5.3.1	Protection	See Appendices, Table 4	PASS
5.3.2	Motors		N/A
5.3.3	Transformers		N/A
5.3.4	Insulation		PASS
5.3.5	Electromechanical components		N/A
5.3.6	Fault simulation		PASS
5.3.7	Unattended equipment		N/A
5.3.8	Compliance criteria for abnormal/fault conditions		PASS
6	**CONNECTION TO TELECOMS NETWORKS**		**N/A**
6.1	**Protection of telecoms network users/service staff from hazards**		N/A
6.1.1	Protection from hazardous voltages		N/A
6.1.2	Telecoms network earth separation		N/A
6.1.2.1	Requirements		N/A
	Test voltage		N/A
	Test cct current		N/A
6.1.2.2	Exclusions		N/A
6.2	**User protection from telecoms cct overvolt**		**N/A**
6.2.1	Separation requirements		N/A
6.2.2	Test procedure for electric strength		N/A
6.2.2.1	Impulse test		N/A
6.2.2.2	Steady state test		N/A
6.2.2.3	Compliance criteria		N/A
6.3	**Protection of telecoms wiring overheating**		**N/A**
	Max output current		N/A
	Current limit method		N/A
7	**CONNECTION TO CABLE DISTRIBUTION SYSTEMS**		**N/A**
7.1	**Protection of cable network users/service staff from hazards**		**N/A**
7.2	**User protection from cable system overvoltage**		**N/A**
7.3	**Insulation between primary ccts & cable system**		**N/A**
7.3.1	General		N/A
7.3.2	Voltage surge test		N/A
7.3.3	Impulse test		N/A

ANNEXS A THROUGH Y inclusive:

Not Applicable, with the exception of:

Annex L/L.7 Normal load conditions for some types of electrical business equipment (see 1.2.2.1 and 4.5.1)
Category: Other business equipment
Result:PASS

Annex T Guidance on protection against ingress of water (see 1.1.2)
Comment: Equipment is rated IP65
Result: PASS

CENELEC COMMON MODIFICATIONS, SPECIAL NATIONAL CONDITIONS, AND A-DEVIATIONS (EN 60950-1:2000, Annex ZB and ZC)

General: PASS

Otherwise Non Applicable with the exception of:

Clause 1.5.1 No components used contain free Mercury
Result: PASS

Annex P: PASS

Annex Q: PASS

Annex ZA: PASS

APPENDICES

TABLE 1: CRITICAL COMPONENTS, Ref 1.5.1

Result: PASS

PTC fuse Cct ref: F5 Manufacturer: Tyco or Raychem RUEF135 Spec: 30VDC, 1.35A, V-0 UL1434 marked 'UL' (e74889)

Printed Circuit Board, min flammability rating V-1, to UL 94 marked 'UL'

TABLE 2: ELECTRICAL DATA UNDER NORMAL CONDITIONS, Ref 1.6.2

Result: PASS

Cct ref: F5 Rated 2A peak, 9.6v min, 3.84W, 400mA; Normal operation
15.6v max, 4.06W, 260mA; Normal operation

TABLE 3: THERMAL MEASUREMENTS, Ref 4.5

Result: PASS

T(ambient) = 15.4 degC during tests, figures then converted to show max temps at an ambient of +55 degC

Component	Temp predicted with supply volts at:		Max Temp allowable (degC)
	Supply= +9.6 Vdc	Supply = +15.6Vdc	
L46	66.2	67.5	90
L45	66.0	69.6	90
IC18, processor	67.2	68.3	105
RF output block	66.7	66.9	105
IC26, regulator	65.3	69.5	105
IC27, regulator	74.0	75.4	105
IC8, processor	69.7	70.3	105
Enclosure	59.9	60.3	70

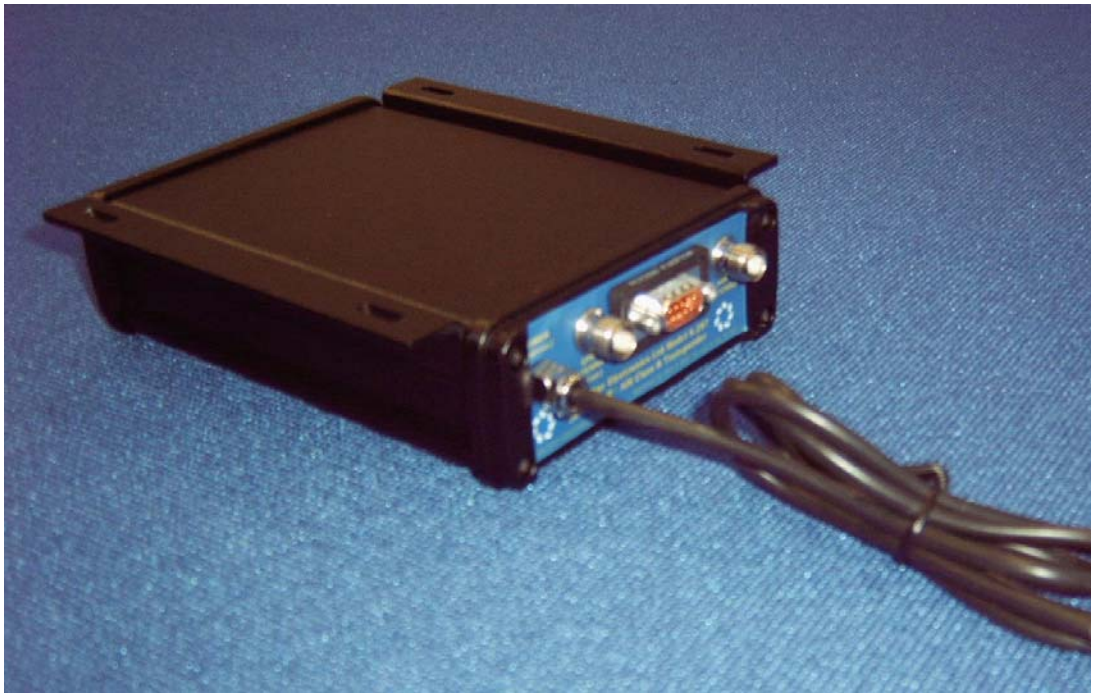
TABLE 4: FAULT CONDITION MEASUREMENTS, Ref 5.3

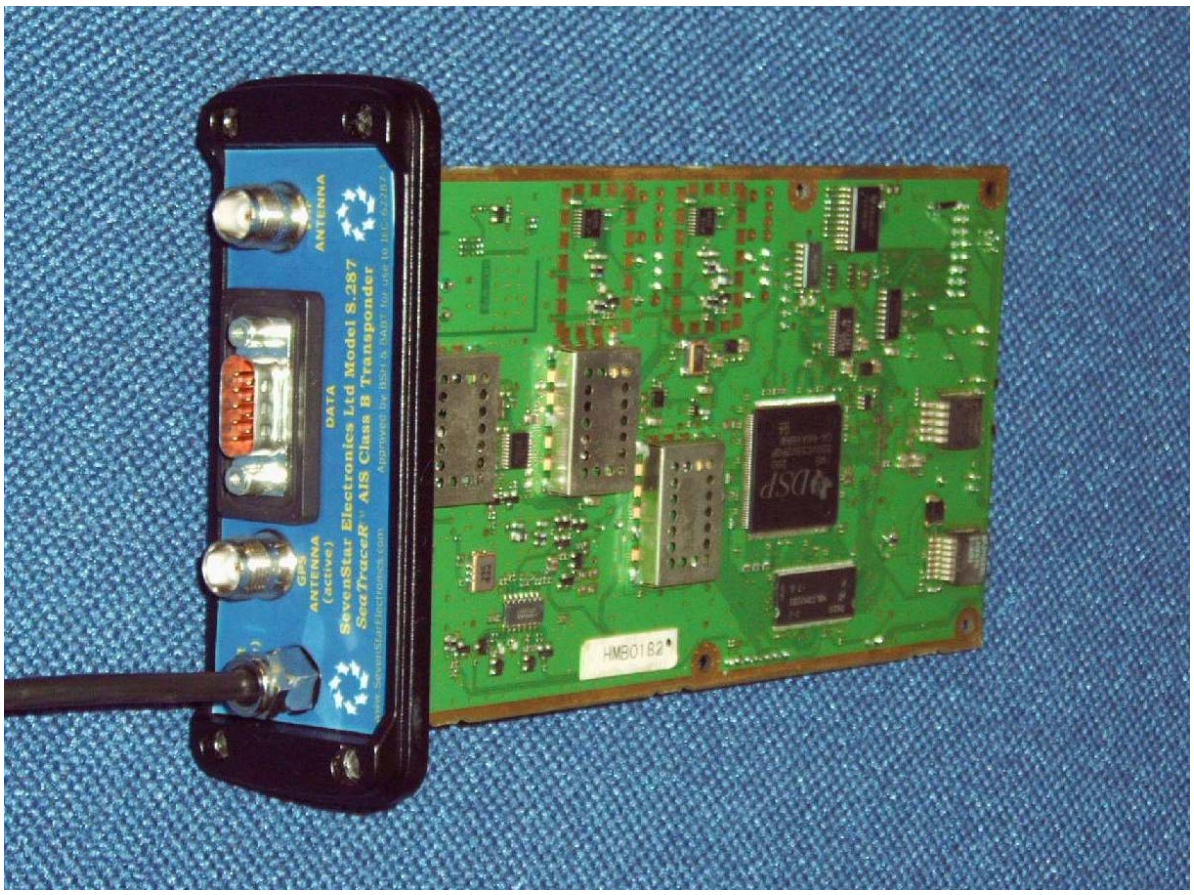
Result: PASS

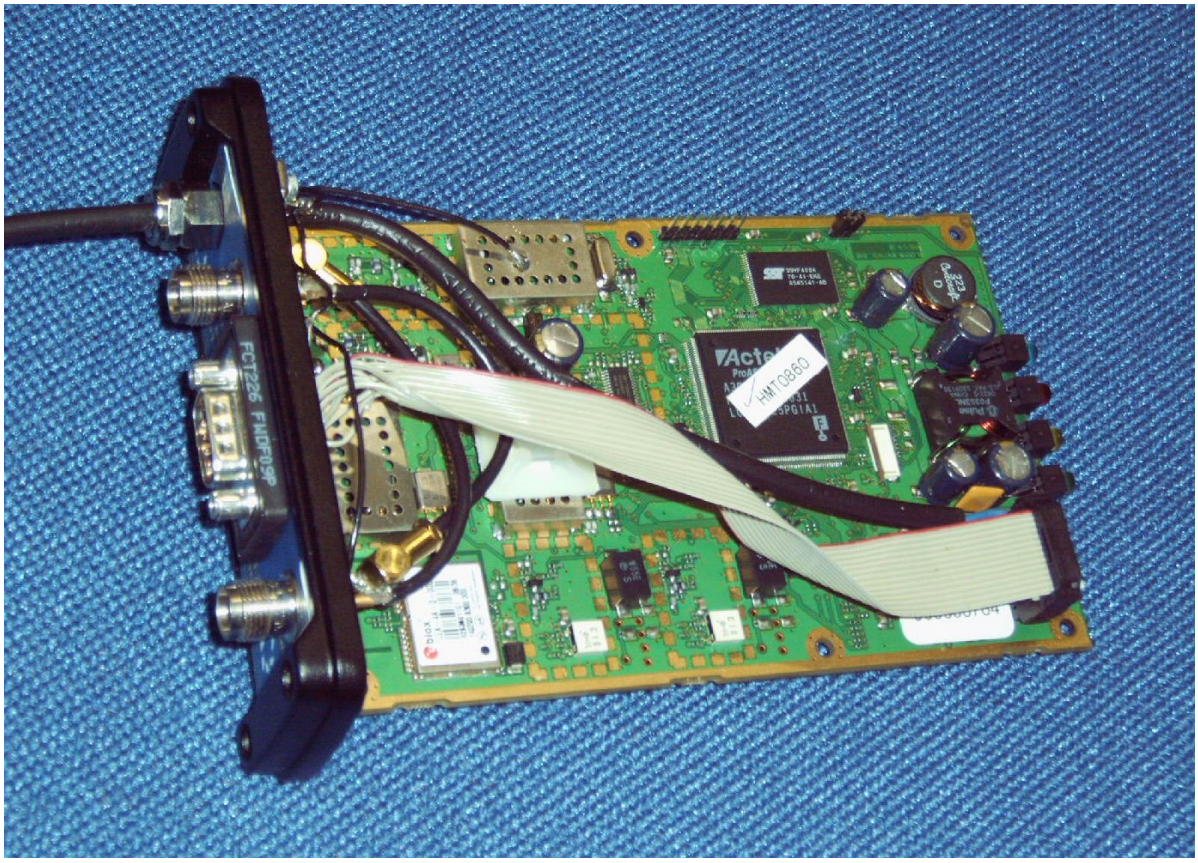
T(ambient) = 16.6 degC

Component	Fault	Voltage applied	Duration	Result
Supply	Wrong polarity	15.6Vdc	2 secs	F5 PTC fuse operated. No hazard
Supply	Overvoltage	26Vdc	5 secs	F5 PTC operated. No hazard
C506	Short-circuit	15.6Vdc	30 mins	No overheating, no hazard
C489	Short-circuit	15.6Vdc	45 mins	No overheating, no hazard

Equipment photographs




ANTENNA
DATA
SevenStar Electronics Ltd Model S.287
SeaTracer AIS Class B Transponder
GPS
ANTENNA
(active)
HMB0182


FCT226 FMDF05P
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