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Report On

Digital Interface Testing of the Ocean Signal Class A Transceiver In accordance with IEC 61162-2

Document 75936860 Report 08 Issue 1 **January 2020**

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REPORT ON

Digital Interface Testing of the
Ocean Signal ATA100 Class A Transceiver
In accordance with IEC 61162-2

Document 75936860 Report 08 Issue 1

January 2020

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DATED

31 January 2020

CONTENTS

SECTION 1

REPORT SUMMARY

Digital Interface Testing of the
Ocean Signal ATA100 Class A Transceiver
In accordance with IEC 61162-2

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Digital Interface Testing of the Ocean Signal Class A to the requirements of IEC IEC 61162-2.

Objective	To perform Type Approval Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Ocean Signal
Model Number(s)	ATA100
Serial Number(s)	S/N TA008
Number of Samples Tested	1
Test Specification/Issue/Date	IEC 61162-2:1998
Declared Product Equipment Category	Protected Excluding GPS antenna which declared as Exposed
Date of Receipt of Test Samples	03 April 2017
Order Number Date	09046 03-November-2016
Start of Test	17-December-2019
End of Test	07-January-2020
Name of Engineer(s)	Finlay Orr

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with IEC 61162-2 is shown below.

Report Section	Specification Clause	Test Description	Result	Comments
2.1	8.4.1.1	Normal operation range	Pass	
2.2	8.4.1.2	Ability of input circuits to withstand maximum voltage on the bus	Pass	
2.3	8.4.2	Protocol test of input and output	Pass	
2.4	8.4.3	Test under maximum interface workload	Pass	

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

Equipment Under Test (EUT) was an Ocean Signal ATA100 Class A AIS transceiver. A full technical description can be found in the manufacturer's documentation.

1.4 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standard were made during testing.

1.5 MODIFICATION RECORD

The table below details modifications made to the EUT during the test programme. The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	As supplied.	-	-
1	Software change to fix intermittent incorrect Boot Up sequence.	Ocean Signal	Returned 18/6/19
2	Mounting bracket: Mounting bracket webbed areas filled with resin to increase rigidity	Ocean Signal	Returned 19/7/19
3	Firmware modification state 15 (see report 75936860 Report 01)	Ocean Signal	30/10/19
4	Software change, EUT updated to v0.2.17 firmware.	Finlay Orr	12/12/2019
5	A connection was soldered to the output of the DGPS data receiver. This was so that the binary state of the receiver could be monitored for §8.4.1.1.	Stefan Kennedy	07/01/2019

SECTION 2

TEST DETAILS

Digital Interface Testing of the
Ocean Signal ATA100 Class A
In accordance with IEC 61162-2

2.1 NORMAL OPERATION RANGE

2.1.1 Specification Reference

IEC 61162-2, Clause 8.4.1.1.

2.1.2 Equipment Under Test and Modification State

ATA100, S/N: TA008 – Modification State 1 - See section 1.5 for modification details.

2.1.3 Date of Test

07-January 2020

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

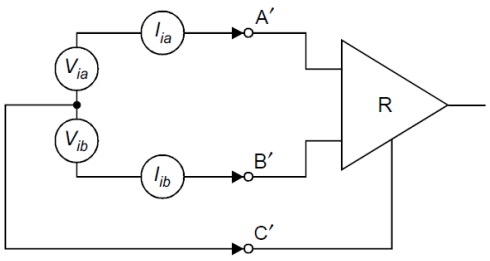
2.1.5 Test Requirements and Results

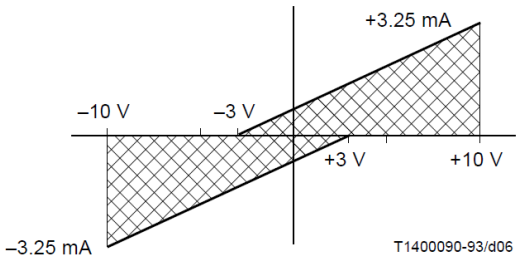
Test Requirements

For compatibility of the hardware, standard tests shall be used as defined in ITU-T V.11. The electrical isolation of input circuits shall be checked by inspection of the manufacturer's documentation and tests according to the values given in IEC 60945.

6.2 - Receiver Input Voltage

The EUT is connected according to the diagram below. While the voltage applied across V_{ia} (or V_{ib}) is varied between –10 volts and +10 volts, and V_{ib} (or V_{ia}) is held at 0 volts, the resultant input current I_{ia} (or I_{ib}) shall remain within the shaded range shown in the graph below. These measurements apply with the power supply of the receiver in both the power-on and power-off conditions.



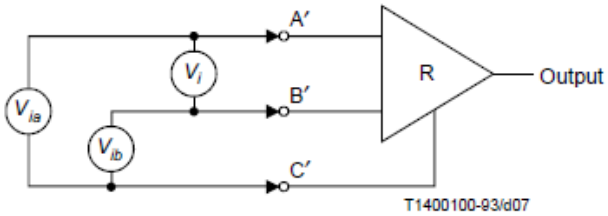


6.3 - D.C. Input Sensitivity Measurements

Over the entire common mode voltage (V_{cm}) range of +7V to –7V, the receiver shall not require a differential input voltage (V_i) of more than 300mV to assume correctly the intended binary state. Reversing the polarity of V_i shall cause the receiver to assume the opposite binary state.

The maximum voltage (signal plus common mode) present between either receiver input and receiver ground shall not exceed 10V nor cause the receiver to malfunction. The receiver shall tolerate a maximum differential voltage of 12V applied across its input terminals without being damaged.

In the presence of the combination of input voltages V_{ia} and V_{ib} specified in the test results section, the receiver shall maintain the specified output binary state and shall not be damaged.

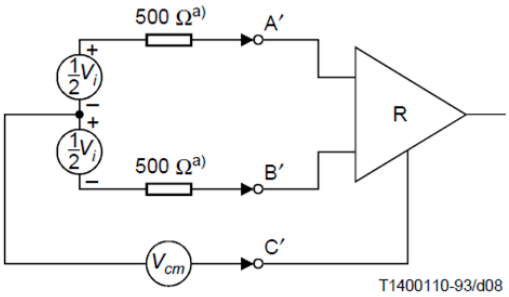


The circuit diagram for testing D.C. input sensitivity measurements, where **R** is the receiver under test

6.4 – Input Balance Test

The balance of the receiver input resistance and internal bias voltages shall be such that the receiver shall remain in the intended binary state under the conditions shown in the figure below and described as follows:

a) with V_i = +720mV and V_{cm} varied between –7V and +7V;
b) with V_i = –720mV and V_{cm} varied between –7V and +7V;
c) with V_i = +300mV and V_{cm} a 1.5V peak-to-peak square wave at the highest applicable data signalling rate (this condition is provisional and subject to further study);
d) with V_i = –300mV and V_{cm} a 1.5V peak-to-peak square wave at the highest applicable data signalling rate (this condition is provisional and subject to further study).



Test Results

The serial transmitter tests described in §5 - 'Generator' of ITU-T V.11, have already been completed within the 61162-1 report. As the hardware used in these reports is identical, these tests have not been repeated within this report. This report covers ITU-T V.11 §6 – 'Load', testing the receiver serial input.

6.2 – Receiver Input Voltage

V_{ib} = 0V										
V_{ia}	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1
I_{ia} (µA)	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1

V_{ib} = 0V										
V_{ia}	+10	+9	+8	+7	+6	+5	+4	+3	+2	+1
I_{ia} (µA)	152	137	122	93	91	75	60	45	29	14

Testing is repeated, with V_{ib} stepped from -10V to +10V in 1V steps, and V_{ia} held at 0V.

V_{ia} = 0V										
V_{ib}	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1
I_{ib} (µA)	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2

V_{ia} = 0V										
V_{ib}	+10	+9	+8	+7	+6	+5	+4	+3	+2	+1
I_{ib} (µA)	152	136	121	105	90	74	60	44	29	13

6.3 – D.C Input Sensitivity Measurements

The output of the receiver is monitored by an oscilloscope. Using 2 power supplies the input voltages are adjusted according to the table below and the voltage V_i is measured with a multi-meter, while the output from the receiver is observed on the oscilloscope.

Applied Voltages		Resulting Input Voltage (V_i)	Output Binary State	Requirement
V_{ia}	V_{ib}			
-12	0	-11.98	-	No damage
0	-12	11.98	-	No damage
+12	0	11.98	-	No damage
0	+12	-11.98	-	No damage
+10	+4	5.99	0	0
+4	+10	-5.95	1	1
-10	-4	-5.99	1	1
-4	+10	5.99	0	0
+0.3	0	0.299	0	0
0	+0.3	-0.3	1	1
+7.15	+6.85	0.3	0	0
+6.85	+7.15	-0.299	1	1
-7.15	-6.85	-0.3	1	1
-6.85	-7.15	0.299	0	0

6.4 - Input Balance Test

Three power supplies are used: two generate V_i (1/2 each) and one generates V_{cm}. The following voltages are applied the EUT successfully does not change binary state.

V_i (mV)	V_{cm} (V)	Expected Binary State	Measured Binary State
+720	-7	0	0
	-5	0	0
	-3	0	0
	-1	0	0
	+1	0	0
	+3	0	0
	+5	0	0
	+7	0	0
-720	-7	1	1
	-5	1	1
	-3	1	1
	-1	1	1
	+1	1	1
	+3	1	1
	+5	1	1
	+7	1	1
+300	1.5 pk to pk 40 kHz square wave	0	0
-300	1.5 pk to pk 40 kHz square wave	1	1

2.2 ABILITY OF INPUT CIRCUITS TO WITHSTAND MAXIMUM VOLTAGE ON THE BUS

2.2.1 Specification Reference

IEC 61162-2, Clause 8.4.1.2

2.2.2 Equipment Under Test and Modification State

ATA100, S/N: TA008 – Modification State 0 - See section 1.5 for modification details.

2.2.3 Date of Test

17-December 2019

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Test Requirements and Results

Test Requirements

Between the connectors ‘A’ and ‘B’ of the interface a voltage of 15 V shall be applied for at least 1 min. This test shall be carried out with both polarities of applied test voltage. After all tests the function of the interface shall be checked for any malfunction or damage.

Test Results

This clause was previously tested to an equivalent test in IEC 61162-1, see TÜV Document 75936860 Report 03.

2.3 PROTOCOL TEST OF INPUT AND OUTPUT

2.3.1 Specification Reference

IEC 61162-2, Clause 8.4.2

2.3.2 Equipment Under Test and Modification State

ATA100, S/N: TA008 – Modification State 0 - See section 1.5 for modification details.

2.3.3 Date of Test

17-December 2019

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.5 Test Requirements and Results

Test Requirements

The transmitting output of the EUT shall be checked for conformity with the coding methods of data as specified in this standard and the proprietary sentences of the manufacturer by inspection of the manufacturer's documentation.

The receiver of the EUT shall be tested, by connecting it to a source which transmits all sentences which the EUT is able to receive. All sentences shall be detected, and no error shall occur.

Test Results

As all sentences have previously been checked for conformity with 61162-1 when receiving and transmitting data, a random sample of sentences have selected and validated against 61162-2.

The following sentences were tested for conformity with IEC 61162-2 when transmitting: ACA, ALR, RMC, TXT, VDO and VDM. The sentences were tested for conformity with IEC 61162-2 when receiving are: HDT, EPV, ROT, SSD.

ACA – AIS Channel Assignment Message

Transmitted Message:				
$AIACA,5(1),5100.00(2),N(3),00100.00(4),W(5),5000.00(6),N(7),00200.00(8),W(9),5(10),2087(11),0(12),2067(13),0(14),0(14),0(15),C(16),0(17),000000.00(18)*36(19)				
Field	Field Label	Expected Result	Actual Result	Verdict
1	Sequence number	5	5	Pass
2	Region northeast corner latitude	5100.00	5100.00	Pass
3	Region northeast corner N/W hemisphere	N	N	Pass
4	Region northeast corner longitude	00100.00	00100.00	Pass
5	Region northeast corner E/W hemisphere	W	W	Pass
6	Region southwest corner latitude	5000.00	5000.00	Pass
7	Region southwest corner N/S hemisphere	N	N	Pass
8	Region southwest corner longitude	00200.00	00200.00	Pass
9	Region southwest corner E/W hemisphere	W	W	Pass
10	Transition zone size	5	5	Pass
11	Channel A	2087	2087	Pass
12	Channel A bandwidth	0	0	Pass
13	Channel B	2067	2067	Pass
14	Channel B bandwidth	0	0	Pass
15	Tx/Tx mode control	0	0	Pass

Transmitted Message:				
$AIACA,5[1],5100.00[2],N[3],00100.00[4],W[5],5000.00[6],N[7],00200.00[8],W[9],5[10],2087[11],0[12],2067[13],0[14],0[14],0[15],C[16],0[17],000000.00[18]*36[19]				
Field	Field Label	Expected Result	Actual Result	Verdict
16	Power level control	0	0	Pass
17	Information source	C	C	Pass
18	In-use flag	0	0	Pass
19	Time of “in use” change	000000.00	000000.00	Pass
20	Checksum	36	360	Pass

ALR - Set Alarm State

Transmitted Message				
$AIALR,112246.00[1],053[2],A[3],V[4],AIS: CPA Collision Warning[5]*71[6]				
Field	Field Label	Expected Result	Actual Result	Verdict
1	Time of alarm condition change, UTC	112157.00	112157.00	Pass
2	Unique alarm identifier at alarm source	053	053	Pass
3	Alarm condition (A = threshold exceeded, V = not exceeded)	A	A	Pass
4	Alarm’s acknowledge state (A = acknowledged, V = unacknowledged)	V	V	Pass
5	Alarm’s description text	AIS: CPA Collision Warning	AIS: CPA Collision Warning	Pass
6	Checksum	71	71	Pass

RMC - Recommended Minimum Specific GNSS Data

Transmitted Message				
$GPRMC,120030.000[1],A[2],5052.1728[3],N[4],00114.6416[5],W[6],0.00[7],[8],191219[9],[10],[11],A[12],V[13]*14[14]				
Field	Field Label	Expected Result	Actual Result	Verdict
1	UTC of position fix	120030.000	120030.000	Pass
2	Status (A = data valid, V = navigation receiver warning)	A	A	Pass
3	Latitude	5052.1728	5052.1728	Pass
4	Northern/southern hemisphere	N	N	Pass
5	Longitude	00114.6416	00114.6416	Pass
6	Eastern/western hemisphere	W	W	Pass
7	Speed over ground (knots)	0.00	0.00	Pass
8	Course over ground (degrees true)	NULL	NULL	Pass
9	Date (DDMMYY)	191219	191219	Pass
10	Magnetic variation (degrees)	NULL	NULL	Pass
11	Magnetic variation (east/west)	NULL	NULL	Pass
12	Mode indicator	A	A	Pass
13	Navigational status	V	V	Pass
14	Checksum	14	14	Pass

TXT – Text Transmission

Transmitted Message				
$AITXT,01[1],01[2],34[3],AIS: Other ROT source in use[4]*62[5]				
Field	Field Label	Expected Result	Actual Result	Verdict
1	Total number of sentences	01	01	Pass
2	Sentence number	01	01	Pass
3	Text identifier	34	34	Pass
4	Text message	AIS: Other ROT source in use	AIS: Other ROT source in use	Pass
5	Checksum	62	62	Pass

VDO – AIS VHF Data-Link

Transmitted Message				
!AIVDO,1[1],1[2],[3],A[4],16WuQTP000OrCQ>M6qRv40G408DS[5],0[6]*33[7]				
Field	Field Label	Expected Result	Actual Result	Verdict
1	Total number of sentences needed to transfer the message	1	1	Pass
2	Sentence number	1	1	Pass
3	Sequential message identifier	NULL	NULL	Pass
4	AIS channel	A	A	Pass
5	Encapsulated ITU-R M.1371 message, see table below for message decode	16WuQTP000OrCQ> M6qRv40G408DS	16WuQTP000OrCQ> M6qRv40G408DS	Pass
6	Number of fill bits	0	0	Pass
7	Checksum	33	33	Pass

VDO – AIS VHF Data-Link Own Vessel Report Message Decode

Transmitted Message	
!AIVDO,1,1,,A,16WuQTP000OrCQ>M6qRv40G408DS,0*33	
Parameter	Decoded Value
Message ID	1 - Position report
Repeat Indicator	0
MMSI	444555666
Navigational Status	0 - under way using engine
Rate Of Turn	0 (Turning Right)
Speed Over Ground	0
Position Accuracy	0 - low (>10 m)
Longitude	1 14.6457 W
Latitude	50 52.1739 N
Course Over Ground	not available
True Heading	11
Time Stamp	34
Special Manoeuvre Indicator	0 - not available
Spare	0
RAIM Flag	0 - RAIM not in use
Communication State - Sync State	0
Communication State - Slot Timeout	2
Communication State - Sub Message	Slot Number = 1315

VDM – AIS VHF Data-Link Message

Transmitted Message				
!AIVDM,1(1),1(2),(3),A(4),4027`SQv?9d=WwrCR2M6qDG00@GL(5),0(6)*5F(7)				
Field	Field Label	Expected Result	Actual Result	Verdict
1	Total number of sentences needed to transfer the message	1	1	Pass
2	Sentence number	1	1	Pass
3	Sequential message identifier	NULL	NULL	Pass
4	AIS channel	A	A	Pass
5	Encapsulated ITU-R M.1371 message, see table below for full decode	4027`SQv?9d=Ww rCR2M6qDG00@GL	4027`SQv?9d=Ww rCR2M6qDG00@GL	Pass
6	Number of fill-bits	0	0	Pass
7	Checksum	5F	5F	Pass

VDM – AIS VHF Data-Link Message Decode

Transmitted Message	
!AIVDM,1,1,,A,4027`SQv?9d=WwrCR2M6qDG00@GL,0*5F	
Parameter	Decoded Value
Message ID	4 - Base station report
Repeat Indicator	0
MMSI	2222222
Year	2019
Month	12
Day	19
Hour	12
Minute	13
Second	39
Position Accuracy	1 - high (> 10 m)
Longitude	1 14.6431 W
Latitude	50 52.1681 N
Type of electronic position fixing device	7 - Surveyed
Transmission control for long-range broadcast message	0 - Class-A station stops transmission of Message 27 within base station coverage area
Spare	0
RAIM Flag	0 - RAIM not in use
Communication State - Sync State	0
Communication State - Slot Timeout	4
Communication State - Sub Message	Slot Number = 1500

HDT – Heading True

Received Message				
$HEHDT,11.1(1),T(2)*1E(3)				
Field	Field Label	Expected Result	Actual Result	Verdict
1	Heading, Degrees	11.1	11.1	Pass
2	Degrees true	T	T	Pass
3	Checksum	1E	1E	Pass

EPV – Command or report equipment property value

Received Message				
$AIEPV,C(1),AI(2),444555666(3),101(4),38400(5)*14(6)				
Field	Field Label	Expected Result	Actual Result	Verdict
1	Sentence status flag	C	C	Pass
2	Equipment type	AI	AI	Pass
3	Unique identifier	444555666	444555666	Pass
4	Property identifier for the property to be set	101 (sensor 1 baud rate)	101 (sensor 1 baud rate)	Pass
5	Value of the property to be set	9600	9600	Pass
6	Checksum	34	34	Pass

ROT – Rate of Turn Indicator

Received Message				
$TIROT,3.2(1),A(2)*3A(3)				
Field	Field Label	Expected Result	Actual Result	Verdict
1	Rate of turn (°/min)	3.2	3.2	Pass
2	Data valid	A	A	Pass
3	Checksum	3A	3A	Pass

SSD – AIS Ship Static Data

Received Message				
$AISSD,TUVSUD(1),TUV SUD A(2),35(3),25(4),15(5),5(6),1(7),AI(8)*04(9)				
Field	Field Label	Expected Result	Actual Result	Verdict
1	Ship's call sign	TUVSUD	TUVSUD	Pass
2	Ship's name	TUV SUD A	TUV SUD A	Pass
3	Position reference point "A": distance from bow	35	35	Pass
4	Position reference point "B": distance from stern	25	25	Pass
5	Position reference point "C": distance from port beam	15	15	Pass
6	Position reference point "D": distance from stern beam	5	5	Pass
7	DTE indicator flag	1	1	Pass
8	Source identifier	AI	AI	Pass
9	Checksum	04	04	Pass

2.4 TEST UNDER MAXIMUM INFERACE WORKLOAD

2.4.1 Specification Reference

IEC 61162-2, Clause 8.4.3

2.4.2 Equipment Under Test and Modification State

ATA100, S/N: TA008 – Modification State 0 - See section 1.5 for modification details.

2.4.3 Date of Test

19-December 2019

2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.5 Test Requirements and Results

Test Requirements

After activating all ports of the EUT with the maximum number of sentences to be transmitted and/or received the data repetition rate(s) shall not decrease under the value specified by the manufacturer, and the data transmission time for one sentence shall not exceed 100 ms.

For input circuits no data-reading errors shall be detected under maximum interface workload.

Test Results

No data-reading errors were detected over a period of 15 minutes of testing. The sensor ports were verified by comparing the contents of the position reports with the sensor input values. All position reports generated by the EUT are confirmed to use the correct sensor input data.

Long-range data request sentences were repeatedly applied to the long-range port. The EUT responded to each of these with the correct data and no sentences were missed in the replies.

For each VDO sentence output on the presentation interface, a corresponding message was transmitted over VDL. The contents of the transmitted VDM sentences were all verified as being correct.

The transmission times of all observed sentences did not exceed 100 ms.

SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument Description	Manufacturer	Model Type	TE Number	Cal Period (months)	Calibration Due Date
Function Generator	Thurlby Thandar Instruments	TG315	003240	-	TU
Multimeter	White Gold	WG022	190	12	16-May-2020
Oscilloscope	Agilent Technologies	DSO9104A	4142	12	22-Aug-2020
Power Supply	Iso-tech	IPS 2010	2440	-	TU
Power Supply	Rhode & Schwarz	HMP2020	4735	-	TU
Power Supply	Farnell	ET30/2	003423	-	TU

Test Software

Testing of NMEA sentences carried out using TUV test software: 'AIS Test Data Suite' v1.40, and Tera Term v4.98.

TU – Traceability Unscheduled

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).