

# MRT AU9-AIS / AU10 RTCM 11901.1:2012 Test Report

## Annex E - AIS Type MSLD System E.8 Link layer tests

11 February 2014

Product:	MRT AU9-AIS / AU10 dual-band personal Man Overboard (MOB) Alerting Unit (AU)
Manufacturer:	Marine Rescue Technology Marshall House Zarya Court, Grovehill Road Beverley, East Yorkshire HU17 0JG
Serial Number(s):	972418880, 972412430
Date tested:	21 February 2014
Standards Tested to:	RTCM Standard 11901.1:2012 "For Maritime Survivor Locating Devices (MSLD)" – Annex E : "AIS Type MSLD System"
Summary:	The sample tested met the requirements after software modification.
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Project: MT251-RP2

STATUS: Draft

## **1.1 Manufacturer Information**



### **MRT AU9-AIS / AU10**

The AU10 (formerly known as the AU9-AIS) is a dual-operation personal MOB Alerting Unit (AU) transmitting on 121.5 MHz SAR frequency, whilst simultaneously sending GPS position information on maritime AIS channels AIS1 & AIS2.

- (i) Ports: (1) Antenna cable (260+260mm).
- (ii) EUT Software version: V2.10-RTCM

## **1.2 Notes relating to the assessment**

Two receivers were used to compensate for occasional missed messages common to AIS.

## **1.3 Variations**

The test recording period was extended from 40 minutes to 1 hour 20 minutes in order to better check the randomness of slot selection for message bursts.

## **1.4 Summary of Compliance**

The sample met the requirements following software modification.

## **1.5 Modifications**

1 – Firmware update to V2.17-RTCM

## 1.6 Results Table

Clause	Test	Appendix /note	Mod State	Result
E.8.1	Synchronisation accuracy	NOTE <sup>[1]</sup>	1	PASS
E.8.2.1.2	Initialisation period	A	1	PASS
E.8.2.1.3	Message content of Message 1	B	1	PASS
E.8.2.1.4	Message content of Message 14	C	1	PASS
E.8.2.1.5	Transmission schedule for Message 1	D	1	PASS
E.8.2.1.6	Communication state of Message 1	E	1	PASS
E.8.2.1.7	Transmission schedule for Message 14	F	1	PASS
E.8.2.1.8	Transmission with lost EPFS	G	1	PASS
E.8.2.1.11	Test Transmission with EPFS data available	H	1	PASS
E.8.2.1.14	Test Transmission without EPFS data available		1	NOTE <sup>[2]</sup>

NOTE [1] – Measured indirectly.

NOTE [2] – The manufacturer declares that his equipment does not make unsynchronised test transmissions in accordance with ITU recommendations.

NOTE [3] – The abbreviation STO in the appendices refers to the Slot Time-Out value in received messages.

Signed 25 February 2014:



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## A Appendix: Initialisation Messages

The first message was received 2 seconds after activation.

- a) The Message ID received was 1.
- b) The Repeat indicator received was 0.
- c) The User ID received was 972000009
- d) The Navigational status received was 14.
- e) The Rate of turn received was -128.
- f) The SOG received was 102.3
- g) The Position accuracy received was 0.
- h) The Position received was latitude 91° & longitude 181° (default position).
- i) The COG received was 360.
- j) The True heading received was 511.
- k) The Time stamp received was 63 seconds (unsynchronised).

## B Appendix: Message content of Message 1

The first message with a valid position was received 60 seconds after activation.

- a) The Message ID received was 1.
- b) The Repeat indicator received was 0.
- c) The User ID received was 972000009
- d) The Navigational status received was 14.
- e) The Rate of turn received was -128.
- f) The SOG received was 0.
- g) The Position accuracy received was 0.
- h) The Position received was latitude 53.84417°, longitude -0.4038° and this was confirmed to be correct.
- i) The Position received was continuously updated in subsequent messages.
- j) The COG received was 360.
- k) The True heading received was 511.
- l) The Time stamp received was the seconds component of UTC time.
- m) The live incident indication was observed as per manufacturer's documentation<sup>[1]</sup>.

NOTE[1]: a live incident is indicated by SOS beep pattern and the red alerting LEDs also flashing using an SOS Morse-code pattern.

## C Appendix: Message content of Message 14

Two message 14's were received in every 4<sup>th</sup> message burst.

- a) The Message ID received was 14.
- b) The Repeat indicator received was 0.
- c) The Source ID received was 972000009.

d) The message text received was “MOB ACTIVE”.

## D Appendix: Transmission schedule for Message 1

- a) The Communication State Sync state received was 0.
- b) A burst of 8 messages every minute were received.
- c) The duration of each burst of received messages was 14 seconds.
- d) Every burst received consisted of 8 messages.
- e) Consecutive messages received were received on continuously alternating channels AIS 1 and AIS 2.
- f) Consecutive Messages received in a burst were 75 slots apart. Example: table D.1

Message Type	Burst	Slot Number	$\Delta$ (slots)
Message 1	2	1296	-
Message 1	2	1371	75
Message 1	2	1446	75
Message 1	2	1521	75
Message 1	2	1596	75
Message 1	2	1671	75
Message 1	2	1746	75
Message 1	2	1821	75

**Table D.1 – Received Message Burst Slot Timing Example**

- g) The use of the same set of slots were observed from burst 1 to 8 (STO 7 to 0).
- h) A new set of slots was chosen for the burst 1 in each new set of 8 (STO=7).
- i) During the period of observation each new set of slots differed from the previous set by  $1 \text{ min} \pm 6 \text{ s}$ , and the selection appeared to be random.
- j) The manufacturer declares the firmware uses entropy gathering to generate true randomness. A 32-bit variable is pre-loaded with the unique serial number of the microcontroller. This is used as a seed value. Entropy is gathered from three sources:
  - (i) The least significant bits of each analog to digital conversion
  - (ii) The least significant bits of the fast timer used to measure the RF synthesiser lock time.
  - (iii) The least significant bits of the battery saving sleep timer

## E Appendix: Communication state of Message 1

- a) The same communication state was received for all message 1's received.
- b) The Communication State Sync state received was 0.
- c) The time-out received was STO=7 for all 8 messages of burst 1 in a sequence of 8 burst and that burst 1 was received with a new, randomly chosen, slot sequence.
- d) Each subsequent burst received had STO decrement by one so that the last burst received had STO=0.
- e) The time-out received was reset to STO=7 in the burst received after burst 8 (with STO=0).

- f) The sub message received in messages with STO=3,5,7 was 0.
- g) The sub message received in messages with STO=2,4,6 was the slot number.
- h) The sub message received in messages with STO=1 was the UTC hour and minute respectively.
- i) The sub message received in messages with STO=0 was slot offset to the transmission slot in the next frame.

## **F Appendix: Transmission schedule for Message 14**

- a) Two consecutive message 14's were received every 4 minutes.
- b) Each pair of Message 14's received were received on alternating channels AIS 1 and AIS 2.
- c) Message 14's were received in bursts 1 and 5 in positions 5 and 6 and they replaced the message 1's received in these same positions in other bursts.
- e) No message 14's were received in burst 8 (STO=0).

## **G Appendix: Transmission with lost EPFS**

NOTE EFPS was inhibited after 1 hour and 15 minutes of recording and not the 40 minutes required by RTCM 11901.1:2012 (see section 1.3).

Following EFPS inhibition the following was recorded:

- a) Message burst continued to be received in the same manner as before EFPS inhibition.
- b) The same transmission schedule was observed as before EFPS inhibition.
- c) The Communication State Sync state received in all messages was 3.
- d) The SOG received was 0.
- e) The Position accuracy received was 0.
- f) The Position received was latitude 53.84424°, longitude -0.40372° and this was confirmed to be the last known good position and this did not subsequently vary.
- g) The COG received was 360.
- h) The Time stamp received was 63 seconds (unsynchronised).
- i) The Position accuracy received was 0.
- j) The manufacturer uses the audible alert pitch to indicate EFPS lock with a 2 KHz beep tone indicating locked and a 1 KHz beep tone indicating out of lock. The tone observed during the test decreased in pitch shortly after the EFPS was inhibited.

## **H Appendix: Test Transmission with EPFS data available**

- a) The message burst received during the test contained correct position data. From this it was inferred that the EUT waits until it has a position fix before it transmits a test message sequence.

- b) A single burst of 8 messages was received in the correct sequence.
- c) The User ID received was 972000009
- d) The Navigational status received was 15.
- e) The SOG received was 0.
- f) The Position accuracy received was 0.
- g) The Position received was latitude 53.84416°, longitude -0.40379° and this was confirmed to be correct.
- h) The COG received was 360.
- i) The Time stamp received was 0.
- j) The STO received in all message 1's was 0. The sub message received in all message 1's was 0.
- k) After one burst of 8 messages no further message were received during the test.
- l) The message text received in both Message 14's was "MOB TEST".
- m) The test indication was observed as per manufacturer's documentation<sup>[1]</sup>.

NOTE[1]: test is indicated by:

- (i) An occasional beep and no flashing of the alerting red LEDs.
- (ii) A green indicator whilst the test button is held depressed indicating that the internal battery is good.

## I Appendix: Test Equipment Used

	Item	Serial
1	Thrane & Thrane Sailor 6217 Radio	0455820055
2	Comar AIS-3R AIS Transponder	207644

**Table I.1 – Test equipment used**

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