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| **US Radiocommunications Sector****Fact Sheet** |
| **Working Party:** WP 5B | **Document No:** USWP5B27-25-FD |
| **Ref:** Annex 17 to Document 5B/355-E | **Date:** 14 September 2021 |
| **Document Title:** WORKING DOCUMENT TOWARDS A PRELIMINARY DRAFT REVISION OF RECOMMENDATION ITU-R M.2135-0 Technical characteristics of autonomous maritime radio devices operating in the frequency band 156-162.05 MHz |
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| **Purpose/Objective:** The purpose of this document is to provide additional details on how an AMRD Group B that implements AIS technology operates on channel 2006 (160.9 MHz) in Appendix 18 of the RR. |
| **Abstract:** This document provides additional details on the transmission message structure, and the numbering scheme used to identify the AMRD Group B device, by defining a new AIS message that contains extended identity information, dynamic position and static information associated with the AMRD Group B device. |

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| **Radiocommunication Study Groups** |  |
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| United States of America |
| WORKING DOCUMENT TOWARDS A PRELIMINARY DRAFT REVISION OF RECOMMENDATION ITU-R M.2135-0 |
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1. **Introduction**

This contribution provides the editorial changes and technical content to Recommendation ITU-R M.2135-0. This Recommendation was published to support the work of the WRC-19. This Recommendation lacks sufficient details to define how an AMRD Group B shares information. This contribution provides the technical details for a messaging scheme for the AMRD Group B devices that implement AIS technology.

1. **Proposal**

This document proposes revisions to Recommendation ITU-R M.2135-0, including both editorial and technical changes. The primary goal of this proposal is to define the message content for AMRD Group B devices. These messages are segregated into dynamic information, static information, and proprietary information. These messages allow for future growth and attempt to cover many of the applications envisioned for AMRD Group B devices that implement AIS technology.

1. **Attachments**

The following attachment contains the proposed changes to Annex 17 of the chairman’s report with track changes, highlighted in blue.

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| **Radiocommunication Study Groups** |  |
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| Annex 17 to Working Party 5B Chairman’s Report |
| WORKING DOCUMENT TOWARDS A PRELIMINARY DRAFT REVISION OF RECOMMENDATION ITU-R M.2135-0 |
| Technical characteristics of autonomous maritime radio devices operating in the frequency band 156-162.05 MHz |

(2019-202X)

Summary of Revision

[TBD]

Scope

This Recommendation describes autonomous maritime radio devices (AMRD) for use in the maritime environment. The definition and categorization of AMRD are included in Annex 1. The technical and operational characteristics of AMRD Group B using automatic identification system (AIS) technology are detailed in Annex 2. The technical and operational characteristics of AMRD Group B using other than AIS technology are detailed in Annex 3.

Keywords

Automatic identification system (AIS), autonomous maritime radio devices (AMRD), digital selective calling (DSC), Maritime

Abbreviations/Glossary

AIS: Automatic identification system

AMRD: Autonomous maritime radio devices

DSC: Digital selective calling

e.i.r.p.: Equivalent isotropically radiated power

GMDSS: Global maritime distress and safety system

IMO: International Maritime Organization

RR: Radio regulations

SOLAS: International Convention for the Safety of Life at Sea

VHF: Very high frequency

Related ITU Recommendations and Report

*Recommendations*

[ITU-R M.493](http://www.itu.int/rec/R-REC-M.493/en) Digital selective-calling system for use in the maritime mobile service

[ITU-R [M.585](http://www.itu.int/rec/R-REC-M.585/en)](http://www.itu.int/rec/R-REC-M.585/en) Assignment and use of identities in the maritime mobile service

[ITU-R M.541](https://www.itu.int/rec/R-REC-M.541/en) Operational procedures for the use of digital selective-calling equipment in the maritime mobile service

[ITU-R [M.1371](http://www.itu.int/rec/R-REC-M.1375/en)](http://www.itu.int/rec/R-REC-M.1375/en) Technical characteristics for an automatic identification system using time-division multiple access in the VHF maritime mobile band

[ITU-R [RA.769](https://www.itu.int/rec/R-REC-RA.769/en)](https://www.itu.int/rec/R-REC-RA.769/en) Protection criteria used for radio astronomical measurements

*Report*

[ITU-R [M.2285](https://www.itu.int/pub/R-REP-M.2285)](https://www.itu.int/pub/R-REP-M.2285) Maritime survivor locating systems and devices (man overboard systems) – An overview of systems and their mode of operation

The ITU Radiocommunication Assembly,

considering

*a)* that the maritime mobile service is a defined service for the operation of specific types of stations, as defined in RR No. **1.28**;

*b)* that the global maritime distress and safety system (GMDSS) is a maritime mobile service application;

*c)* that the automatic identification system (AIS) is a technology for maritime safety related applications, providing identification functions, safety of navigation functions, aids to navigation, locating signals and data communications;

*d)* that autonomous maritime radio devices (AMRD) reflect a new development in the maritime environment;

*e)* that due to the rapid technical progress, more and more AMRD applications in the maritime environment will be operated;

*f)* that, in order to enhance safety of navigation, there is a need to identify and categorize AMRD which operate autonomously in the maritime environment;

*g)* that the operation of AMRD may be for safety-related purposes;

*h)* that relevant characteristics for the operation of AMRD are also contained in the most recent version of Recommendations ITU-R M.493, ITU-R M.585 and ITU-R M.1371;

*i)* that AMRD is categorized into Group A and Group B, which are described in Annex 1;

*j)* that the International Maritime Organization (IMO), International Electrotechnical Commission and the International Association of Marine Aids to Navigation and Lighthouse Authorities publish technical documents related to the design and usage of aids to navigation,

*k)* that World Radiocommunication Conference 2019 allocated channel 2006 (160.9 MHz) in Appendix **18** of the RR for AMRD Group B,

recognizing

*a)* that AMRD operate with maritime radio technology such as AIS and digital selective calling (DSC),

*b)*  that the use of AMRD should not compromise the integrity of the GMDSS and the AIS data link;

recommends

**1** that the technical and operational characteristics of AMRD Group A should be in accordance with the most recent version of Recommendation ITU-R M.1371 or ITU-R M.493;

**2** that the technical and operational characteristics of AMRD Group B using AIS technology should be in accordance with Annex 2;

**3** that the technical and operational characteristics of AMRD Group B using other than AIS technology should be in accordance with Annex 3.

Annex 1

Categorization of autonomous maritime radio devices

An AMRD station is mobile or stationary in nature, operating at sea, and transmitting independently of a ship station or a coast station; and, divided into two groups:

Group A AMRD that enhance the safety of navigation,

Group B AMRD that do not enhance the safety of navigation (AMRD which deliver signals or information which do not concern the navigation of the vessel or do not complement vessel traffic safety in waterways).

The term ‘enhance safety of navigation’ is derived from the International Convention for the Safety of Life at Sea (SOLAS), as amended by IMO. Within SOLAS, Chapter V is titled “Safety of navigation” and contains the relevant IMO regulations. Consequently, the criterion for distinguishing AMRD Group A from AMRD Group B is their influence on the safety of navigation. Any signal or information originated by an AMRD that reaches the navigator, can impact the navigation of the vessel. This includes AIS (signals which may be shown on radar and navigational displays) and VHF (channel 70 and working channels). The navigator decides how to act on this information. This information may enhance the safety of navigation. However, signals or information which do not concern the navigation of a vessel can distract or mislead the navigator and degrade the safety of navigation.

AMRD that enhance the safety of navigation should be subject to IMO SOLAS regulations for the presentation of information to the navigators on board vessels.

IMO is the responsible organization for the designation of AMRD Group A. AMRD Group A consists of man overboard-AIS class M and Mobile aids to navigation.

Annex 2

Technical and operational characteristics of group B autonomous maritime radio devices using automatic identification system technology

## 1 Introduction

AMRD Group B stations may be mobile or stationary in nature and operating at sea, transmitting independently of a ship station or a coast station. They are not intended to enhance the safety of navigation or to deliver signals or information which is relevant for the navigator of general shipping. These devices operate on channel 2006 (160.9 MHz); and should not be permitted to use the designated frequencies for DSC and AIS 1 and AIS 2. This Annex specifies general requirements, characteristics, and how their data should be formatted and transmitted.

## 2 Technical characteristics

a) The identity (MMSI) of AMRD Group B devices should be in accordance with Recommendation ITU-R M.585.

b) These devices operate on a non-interference basis, i.e. they should not interfere with nor claim protection from other existing services.

c) These devices operate on channel2006 (160.9 MHz).

d) These devices should have an integrated antenna. The height of the antenna should not exceed 1 m above the surface of the sea.

e) These devices should have a protected external power switch and transmit indicator.

## 3 General characteristics

AMRD Group B should operate autonomously and determine its own schedule for transmission of its messages based on a random selection of it transmit slots. The station may transmit messages in ither a single transmission or a burst of 4 identical messages no more than once per minute. If so, the increment between transmission slots within a burst should be 75 slots. See Figure 1.

Burst transmission behaviour will increase the probability of reception for units that operate on the surface of the sea transmitting at low power levels. Burst behaviour should conform with Recommendation ITU-R M.1371 Annex 9 “Requirements for stations using burst transmissions” with the minor modifications in the following sections:

## 4 Transceiver requirements

TABLE 1

Required parameter settings

| Parameter name | Setting |
| --- | --- |
| Channel (2006) | 160.900 MHz |
| Bit rate  | 9 600 bps |
| Training sequence  | 24 bits |
| Transmitter settling time (transmit power within 20% of final value. Frequency stable to within ±1 kHz of final value). Tested at manufacturers declared transmit power | ≤ 1.0 ms |
| Ramp down time | ≤ 832 µs |
| Transmission duration | ≤ 26.6 ms |
| Transmitter output power | Nominal 100 mW/20 dBm rms e.i.r.p. |

## 5 Transmitter characteristics

The technical characteristics as specified in Table 2 should apply to the transmitter.

TABLE 2

Minimum required transmitter characteristics

| Transmitter parameters | Requirements |
| --- | --- |
| Carrier power  | Nominal 100 mW/20 dBm rms e.i.r.p. (measured over the burst duration) |
| Carrier frequency error | ±500 Hz (normal). ±1 000 Hz (extreme) |
| Transmitter burst duration | < 26.67 ms |
| Slotted modulation mask | ∆*fc* < ±10 kHz: 0 dBc±10 kHz < ∆*fc* < ±25 kHz: below the straight line between –20 dBc at ±10 kHz and –36 dBm at ±25 kHz±25 kHz < ∆*fc* < ±62.5 kHz: –36 dBm |
| Transmitter test sequence and modulation accuracy | < 3 400 Hz for Bit 0, 1 (normal and extreme)2 400 Hz ± 480 Hz for Bit 2, 3 (normal and extreme)2 400 Hz ± 240 Hz for Bit 4 ... 31 (normal, 2 400 ± 480 Hz extreme)For Bits 32 … 199 1 740 ± 175 Hz (normal, 1 740 ± 350 Hz extreme) for a bit pattern of 01012 400 Hz ± 240 Hz (normal, 2 400 ± 480 Hz extreme) for a bit pattern of 00001111 |
|  |  |
| Transmitter spurious emissions | < −36 dBm 9 kHz to 1 GHz< −30 dBm 1 GHz to 4 GHz |

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## 6 Synchronization accuracy

There is no requirement for UTC synchronization.

## 7 Channel access scheme

Figure 1

Burst transmissions



## 8 AMRD Group B reports (AIS) Messaging

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An AMRD Group B device should transmit the AIS Message 30 as defined below. The AIS Message 30 is segregated into two parts with part A providing dynamic positioning information, and part B providing identity information. This message is a single-slot message and may use burst mode channel access scheme described in section 7. This message may use the addressed form for closed loop implementation, with the destination ID being the Parent Ship that deployed the AMRD.

### 8.1 AMRD Group B position report

The dynamic position report (AIS Message 30 part A) should be transmitted periodically by the AMRD Group B device no less than once a minute as described in section 3 above.

TABLE 3

AIS Message 30A

| Parameter | Number of bits | Description |
| --- | --- | --- |
| Message ID | 6 | Identifier for Message 30; always 30 |
| Repeat indicator | 2 | The repeat indicator should always be 0 |
| Source ID | 30 | Identifier for the transmitting station per Recommendation ITU-M.585 |
| Part number | 2 | Identifier for the message part number; always 0 for Part A |
| Destination indicator | 1 | 0 = Broadcast (no Destination ID field used)1 = Addressed (Destination ID uses 30 data bits for Parent MMSI) |
| Destination ID | 0/30 | Identifier for the receiving station per Recommendation ITU-M.585 (if used). This should be the Parent MMSI of the AMRD. |
| Longitude | 28 | Longitude in 1/10 000 min (±180°, East = positive (as per 2’s complement), West = negative (as per 2’s complement); 181° (6791AC0h) = not available = default) |
| Latitude | 27 | Latitude in 1/10 000 min (±90°, North = positive (as per 2’s complement), South = negative (as per 2’s complement); 91 = (3412140h) = not available = default) |
| Time stamp | 6 | UTC second when the report was generated by the EPFS (0-59 or 60) if time stamp is not available, which should also be the default value or 61 if positioning system is in manual input mode or 62 if electronic position fixing system operates in estimated (dead reckoning) mode or 63 if the positioning system is inoperative) |
| Nature of the AMRD Device Code | 4 | Nature of the AMRD Group B Device Code per Table 4. |
| Mobile flag | 1 | 0 = anchored, fixed, or unknown, default 1 = mobile (as defined by Extended Data page XX |
| Battery Status | 2 | 0 = No battery information1 = Battery Good2 = Battery Low3 = Battery Critical |
| Extended Data 1 page ID | 3 | specifies one of the eight Extended Data Pages |
| Extended Data 1 | 10 | Refer to Table 5 – Table 12 |
| Extended Data 2 page ID | 3 | specifies one of the eight Extended Data Pages |
| Extended Data 2 | 10 | Refer to Table 5 – Table 12 |
| Reserved | 3 | Reserved for future use |
| Unused bits | 30/0 | These bits are not available for use |
| Number of bits | 168 | Occupies one-time period |

#### 8.1.1 Type of AMRD Group B device

This table is used to specify the AMRD Code Name and Code Number according to the type of application the device is used for. This information is provided using both the AIS Message 30 Part A and Part B messages.

TABLE 4

Type of AMRD Group B device

| **AMRD Code Name** | **Code Number** | **Nature Description** |
| --- | --- | --- |
| UNKNOWN | 0 | Default, not specified |
| FISHNET | 1 | Fishnet marker |
| STATIC MK | 2 | Static position marker |
| DYNMIC-MK | 3 | Dynamic / mobile position marker |
| DIVER | 4 | Diver tracker |
| RENTAL | 5 | Rental boat tracker |
| AUTONOMY | 6 | Unmanned Autonomous Vehicle |
| HYDRO STA | 7 | Meteorological-hydrological station |
| SURVEYOR | 8 | Survey station |
| TBD | 9 | TBD |
| REGATTA | 9 | Regatta participant tracker |
| BARGE | 10 | Barge locator |
| FISH POT | 11 | Fish pot marker |
| FISH AREA | 12 | Fish area |
| CABLE END | 13 | Marker of the terminus of a cable or pipe |
|   | 14-15 | Reserved for future use. |

#### 8.1.2 Extended data pages

The extended data pages are used to provide additional information about the AMRD Group B device. The AIS Message 30 Part A support two simultaneous pages for a single transmission. The device will provide these pages as required, dependent on the application the device is used for. It is possible to provide more than two pages by alternating pages between transmission.

Note that Page ID 3 – 6 are reserved for future use.

TABLE 5

Extended Data, Page ID 0 – health status

| Parameter | Number of bits | Description |
| --- | --- | --- |
| Sensor 1 | 3 | 0 = No information or sensor1 = Sensor Trending Up2 = Sensor Trending Down3 = Sensor no change4 = TBD5 = TBD6 = Sensor Degraded7 = Sensor Inoperative |
| Sensor 2 | 3 | 0 = No information or sensor1 = Sensor Trending Up2 = Sensor Trending Down3 = Sensor no change4 = TBD5 = TBD6 = Sensor Degraded7 = Sensor Inoperative |
| Sensor 3 | 3 | 0 = No information or sensor1 = Sensor Trending Up2 = Sensor Trending Down3 = Sensor no change4 = TBD5 = TBD6 = Sensor Degraded7 = Sensor Inoperative |
| Reserved | 1 | Reserved for future use |

TABLE 6

Extended Data, Page ID 1 – dynamic status

| Parameter | Number of bits | Description |
| --- | --- | --- |
| Operational status | 1 | 0 = operating properly, default1 = operating improperly or erratically |
| Propulsion mode | 3 | 0 = Propelled no further information, default1 = Propelled autonomously, under 3 kts, on set parameters 2 = Propelled autonomously, under 3 kts, variably 3 = Propelled autonomously, over 3 kts, variably 4 = Propelled autonomously, over 3 kts, on set parameters 5 = Operated remotely, under 3 kts6 = Operated remotely, over 3 kts7 = Tethered from a watercraft (e.g., cable, pipe, net) |
| Direction Status | 1 | 0 = Unavailable or unknown, default1 = Direction provided |
| Direction | 3 | 0 = 000° ± 22.5°1 = 045° ± 22.5°2 = 090° ± 22.5°3 = 135° ± 22.5°4 = 180° ± 22.5°5 = 225° ± 22.5°6 = 270° ± 22.5°7 = 315° ± 22.5° |
| Reserved | 2 | Reserved for future use |

TABLE 7

Extended Data, Page ID 2 – unit ID

| Parameter | Number of bits | Description |
| --- | --- | --- |
| Unit ID | 6 | Used to identify a specific unit with a range of 1 - 63 |
| Reserved | 4 | Reserved for future use |

TABLE 8

Extended Data, Page ID 7 – proprietary data

| Parameter | Number of bits | Description |
| --- | --- | --- |
| Proprietary | 10 | User defined data |

### 8.2 AMRD Group B identity report

The static information report (AIS Message 30 part B) should be transmitted periodically no less than 6 minutes as described in section 3 above.

TABLE 9

AIS Message 30B

| Parameter | Number of bits | Description |
| --- | --- | --- |
| Message ID | 6 | Identifier for Message 30; always 30 |
| Repeat indicator | 2 | Used by the repeater to indicate how many times a message has been repeated. 0 = default; 3 = do not repeat any more |
| Source ID | 30 | Identifier for the transmitting station per Recommendation ITU-M.585 |
| Part number | 2 | Identifier for the message part number; always 1 for Part B |
| Destination indicator | 1 | 0 = Broadcast (no Destination ID field used)1 = Addressed (Destination ID uses 30 data bits for Parent MMSI) |
| Destination ID | 0/30 | Identifier for the receiving station per Recommendation ITU-M.585 (if used).This should be the Parent MMSI of the AMRD. |
| AMRD Group and Owner Identity | 120/54 | Unique identifier for each AMRD Group B device composed of the Nature of the AMRD Group B Type Code B=Name (Table 4), followed by a space then, the Parent MMSI of the AMRD, and ending in a single sequential alpha-character suffix, A-Z to denote an individual device, i.e. FISHNET MID123456A, FISHNET MID123456B, etc. If an addressed message, Parent MMSI is then omitted, i.e., FISHNET A, FISHNET B, etc. |
| Reserved | 7 | Reserved for future use |
| Unused bits | 0/36 | These bits are not available for use |
| Number of bits | 168 | Occupies one-time period |

### 8.3 AMRD Group B proprietary information report

The proprietary information report (AIS Message 30 part C) may be transmitted periodically no less than 6 minutes as described in section 3 above; may be broadcasted interleaved with AIS Message part B or D.

TABLE 10

AIS Message 30C

| Parameter | Number of bits | Description |
| --- | --- | --- |
| Message ID | 6 | Identifier for Message 30; always 30 |
| Repeat indicator | 2 | Used by the repeater to indicate how many times a message has been repeated. 0 = default; 3 = do not repeat any more |
| Source ID | 30 | Identifier for the transmitting station per Recommendation ITU-M.585 |
| Part number | 2 | Identifier for the message part number; always 2 for Part C |
| Destination indicator | 1 | 0 = Broadcast (no Destination ID field used)1 = Addressed (Destination ID uses 30 data bits for MMSI) |
| Destination ID | 0/30 | Identifier for the receiving station per Recommendation ITU-M.585 (if used).This should be the Parent MMSI of the AMRD. |
| Proprietary data | 127/97 | For proprietary use |
| Number of bits | 168 | Occupies one-time period |

### 8.4 AMRD Group B [TBD] report

The report (AIS Message 30 part D) is reserved for future use to be transmitted periodically no less than 6 minutes as described in section 3 above; may be broadcasted interleaved with AIS Message part B or C.

TABLE 11

AIS Message 30D

| Parameter | Number of bits | Description |
| --- | --- | --- |
| Message ID | 6 | Identifier for Message 30; always 30 |
| Repeat indicator | 2 | Used by the repeater to indicate how many times a message has been repeated. 0 = default; 3 = do not repeat any more |
| Source ID | 30 | Identifier for the transmitting station per Recommendation ITU-M.585 |
| Part number | 2 | Identifier for the message part number; always 3 for Part D |
| Destination indicator | 1 | 0 = Broadcast (no Destination ID field used)1 = Addressed (Destination ID uses 30 data bits for MMSI) |
| Destination ID | 0/30 | Identifier for the receiving station per Recommendation ITU-M.585 (if used).This should be the Parent MMSI of the AMRD. |
| Reserved | 127/97 | Reserved for future use |
| Number of bits | 168 | Occupies one-time period |

Annex 3

Technical and operational characteristics of group B autonomous
maritime radio devices using other than automatic
identification system technology

## 1 Introduction

These AMRD Group B that use other than AIS technology should not be permitted to use the designated frequencies for AIS, including channels AIS 1 and AIS 2, or for DSC.

## 2 Technical characteristics

a) The transmitter e.i.r.p. should be limited to 100 mW.

b) The transmitting duty cycle should be as low as possible and not to exceed 0.2%.

c) Duration of any single transmission should not exceed 108 ms.

d) These devices operate on a non-interference basis, i.e. they should not interfere with nor claim protection from other existing radio communications.

e) Where authorized by administrations for experimental use, these devices may operate on channel 2006 (160.9 MHz).

f) These devices should have an integrated antenna. The height of the antenna should not exceed 1 m above the surface of the sea.

g) These devices should have a protected external power switch and transmit indicator.

TABLE 12

Minimum required transmitter characteristics

| Transmitter parameters | Requirements |
| --- | --- |
| Carrier power  | Nominal 100 mW/20 dBm rms e.i.r.p. (measured over the burst duration) |
| Carrier frequency error | ±500 Hz (normal). ±1 000 Hz (extreme) |
| Transmitter burst duration | < 108 ms |
| Slotted modulation mask | ∆*fc* < ±12 kHz: 0 dBc±12 kHz < ∆*fc* < ±25 kHz: below the straight line between –20 dBc at ±12 kHz and –36 dBm at ±25 kHz±25 kHz < ∆*fc* < ±62.5 kHz: –36 dBm |
| Transmitter spurious emissions | < −36 dBm 9 kHz to 1 GHz< −30 dBm 1 GHz to 4 GHz |