



Iridium GMDSS

Design & Installation Guidelines

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Table of Contents

Revision History	3
Publication History	3
1 Foreword	6
1.1 References.....	6
Part A – Design Guidelines	8
1 Introduction	8
2 Technical Requirements	8
2.1 General Requirements	8
2.2 Functional Requirements	9
2.3 Integrated Systems and Equipment Interfaces.....	9
3 Operation	11
3.1 Primary Human-Machine Interface (HMI).....	11
3.2 Ship Earth Station Identity.....	11
3.3 Transmission of Distress Alerts/Calls.....	12
3.4 Test Facilities.....	13
3.5 Reception of Distress, Urgency and Safety Alerts/Calls.....	13
3.6 Audible Signals and Visual Indications:.....	13
3.7 Iridium SafetyCast Messages, including Maritime Safety Information (MSI)	15
3.8 Position Updating.....	16
4 Cyber Security	16
Part B – Installation Guidelines	18
1 Introduction	18
2 Power Supply & Sources of Energy	18
3 Antenna Siting	18
4 Radio Frequency Radiation Hazards	19
5 Information To Be Provided in Equipment Manuals	19
Annex A	20
1 System-Specific Guidelines: Omnidirectional Antenna	20

1.1	Antenna Unit.....	20
1.2	Mounting and Installation Considerations.....	20
1.3	Bracket Mount Installation Procedure	22
1.4	Pole Mount Installation Procedure	22
1.5	DC Input.....	22
1.6	Chassis Ground.....	23
1.7	Antenna.....	23
1.8	Maintenance.....	23
1.9	Disposal / End of Life	23
Cross Index between IMO Performance Standards and Iridium Design & Installation Guidelines		24
References.....		26
1	Glossary.....	26
2	Contact Information.....	27

Table of Figures

Table 1:	IEC 61162-1 Sentences Received by the Ship Earth Station Equipment	9
Table 2:	IEC 61162-1 Sentences Transmitted by the Ship Earth Station Equipment.....	10
Table 3:	Alert Titles & Text	10
Table 4:	Definition of Audible Signals.....	14
Table 5:	Bridge Alert Management (BAM).....	14
Table 6:	IMO-Iridium Performance Standard Cross-Index.....	24
Table 7:	Glossary / Abbreviated Terms	26

1 Foreword

International Maritime Organization (IMO) resolution MSC.434(98) specifies performance standards for ship earth stations for use in the Global Maritime Distress and Safety System (GMDSS). The resolution also invites the International Mobile Satellite Organization (IMSO) to coordinate with the recognized GMDSS service providers, with a view to ensuring consistency between their ship earth station designs and installation guidelines and with the specified performance standards.

Mandatory and optional specifications for all Iridium[®] GMDSS equipment installed on board SOLAS ships are defined in the appropriate system and service manuals, and other technical requirements documents, for the relevant Iridium systems. Those internal and proprietary documents are made available by Iridium Communications Inc. and its affiliates (Iridium) only to those value-added manufacturers (VAMs) with agreements to manufacture Iridium GMDSS equipment, to ensure that ship earth stations will perform adequately and will not endanger the integrity of the Iridium system. A general summary of mandatory requirements appears in section 2.1 below.

These “Design and Installation Guidelines” provide general information on the design and installation of Iridium ship earth stations operating within the Global Maritime Distress and Safety System, GMDSS. These guidelines are arranged in two parts, Part A containing guidelines for design according to the IMO’s performance standards for ship earth stations for use in the GMDSS, and Part B containing general guidelines for installation of ship earth stations.

This first edition of the guidelines contains Annex A, which contains specific guidelines for the installation of a ship earth station using an omnidirectional antenna. These guidelines will be reissued as subsequent editions with additional annexes as and when additional antenna types may enter production.

1.1 References

The following International Electrotechnical Commission (IEC) standards and International Maritime Organisation (IMO) documents are relevant to the design, installation and operation of ship earth stations within the GMDSS:

IEC 60945, Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results

IEC 61097-16, Global Maritime Distress and Safety System (GMDSS) – Part 16: Ship earth stations operating in mobile-satellite systems recognized for use in the GMDSS – Operational and performance requirements, methods of testing and required test results

IEC 61162-1, Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 1: Single talker and multiple listeners

IEC 61162-450, Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 450: Multiple talkers and multiple listeners – Ethernet interconnection

IEC 61162-460, Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 460: Multiple talkers and multiple listeners – Ethernet interconnection – Safety and security

IEC 62288, Maritime navigation and radiocommunication equipment and systems – Presentation of navigation-related information on shipborne navigational displays – General requirements, methods of testing and required test results



IEC 62923-1, Maritime navigation and radiocommunication equipment and systems – Bridge alert management – Part 1: Operational and performance requirements, methods of testing and required test results

IMO Resolution A.1001(25), Criteria for the provision of mobile satellite communication systems in the Global Maritime Distress and Safety System (GMDSS)

IMO Resolution MSC.191(79), Performance standards for the presentation of navigation related information on shipborne navigational displays

IMO Resolution MSC.434(98), Recommendation on performance standards for ship earth stations for use in the GMDSS

IMO Resolution MSC.451(99), Statement of recognition of maritime mobile satellite services provided by Iridium Satellite LLC

System-specific proprietary documentation provided by Iridium as internal standards, testing and certification materials, and guidance for manufacturers and developers.

Part A – Design Guidelines

1 Introduction

The Iridium ship earth station installation capable of two-way GMDSS radiocommunications should comply with the general requirements set out in resolutions A.694(17), A.813(19), MSC.191(79), and with the following minimum requirements.

2 Technical Requirements

2.1 General Requirements

- 2.1.1 The ship earth station should operate using a recognized mobile-satellite service and meet the functional requirements of resolution A.1001(25). The ship earth station should comply with the technical standard provided by the recognized mobile-satellite service provider and be certified by this provider for operation in the GMDSS, in order to ensure operational reliability.
- 2.1.2 Iridium will test the ship earth station against Iridium's own specifications, to ensure the integrity of the Iridium satellite system, to avoid harmful interference to the spaceborne equipment and to exclude unauthorized transmissions. The Iridium GMDSS services are subject to access control mechanisms to ensure their integrity and to protect against unauthorised access, so Iridium will also test the ship earth station against the applicable international standard, IEC 61097-16. If the ship earth station passes these tests, then Iridium will issue a certificate to the manufacturer. This documentation will form part of the manufacturer's application for national type approval.
- 2.1.3 System-specific proprietary documentation is provided by Iridium including internal standards, testing and certification materials, and guidance for manufacturers and developers of Iridium GMDSS ship earth stations. In summary, all Iridium GMDSS ship earth stations must:
 - 2.1.3.1 Be capable of using all three GMDSS services (Distress Voice, Distress Alert and Iridium SafetyCastSM (MSI) Reception).
 - 2.1.3.2 Have a single button for the initiation of Distress Alert and Distress Voice.
 - 2.1.3.3 Where Sequential Operation is required, the button will initiate the Distress Alert first and once the Distress Alert has been acknowledged then the ship earth station will initiate the Distress Voice call.
 - 2.1.3.4 For Sequential Operation being able to initiate Distress Alert and then Distress Voice will be the default setting, but it may be possible for the user to be able to modify the settings to only initiate Distress Alert (therefore Distress Voice can be initiated through the ship earth station GUI). This may be subject to national legislation or requirements.
 - 2.1.3.5 Have the ability to automatically select the RCC to which the Distress Alert and Distress Voice connects to, based on the location of the terminal and the global dataset for Search and Rescue Responsibility Areas. It will also be able to manually select the preferred RCC from a global list of RCCs (as required). The Distress Alert and Distress Voice location will always be the same RCC. The RCC does not change once a Distress has been initiated.
 - 2.1.3.6 Have the ability to initiate the test function in the Iridium GMDSS Gateway. This will initiate an automated test reply to the ship earth station via the MMSI recorded in the Iridium GMDSS Database. This will validate connectivity for Distress Alerting, Distress Calling and the MSI data. See also sections 3.4.2 and 3.4.3 of this Part.

- 2.1.3.7 Clearly indicate when the ship earth station is not able to perform GMDSS functions (for example, incomplete service-activation, malfunction or interference from peripheral devices, or circumstances when a ship earth station is not installed primarily to meet the GMDSS carriage requirements of SOLAS chapter IV and may be capable of performing other functions such as fisheries VMS, or LRIT).
- 2.1.3.8 Have training manuals that clearly demonstrate how to install a ship earth station but also what actions to take when problems occur. For example, when incomplete service-activations occur (and as a result GMDSS services may not work correctly) the ship earth station is clearly marked by the installer as “Non-Operational” until the problem is corrected.
- NOTE – Alternative means to assist or ensure correct service-activation and user familiarization, such as activation wizards, may also be provided in the ship earth station.
- 2.1.3.9 Any ship earth station that does not comply with these requirements may not be approved for use by Iridium.
- 2.1.4 The ship earth station should comply with ITU Radio Regulations.

2.2 Functional Requirements

- 2.2.1 The ship earth station should be capable of automatically recognizing the priority of ship-to-ship, ship-to-shore and shore-to-ship communications and should process them in accordance with the message priorities defined in Article 53 of the ITU Radio Regulations. The order of processing these communications should be:
- 2.2.1.1 Distress;
- 2.2.1.2 Urgency;
- 2.2.1.3 Safety; and
- 2.2.1.4 Other communications
- 2.2.2 The ship earth station should provide a specific visual indication when unable to detect or otherwise make contact with the satellites of the mobile satellite system for a period of one minute or more, as referred to in Table 5.

2.3 Integrated Systems and Equipment Interfaces

- 2.3.1 The ship earth station equipment should be capable of at least transmitting and receiving data using the IEC 61162-1 sentences specified in Table 1 and Table 2. IEC 61162-460 should be applied wherever reference to use of IEC 61162-450 interfaces is specified (see also the supplemental information in section 4 of this Part).

For systems that do not have an integral electronic position fixing system, the interface for the external device is mandatory.

Table 1: IEC 61162-1 Sentences Received by the Ship Earth Station Equipment

Mnemonic	Interface	Name	Comment
ACN	CAM	Alert command	Alert command for instance acknowledge
HBT	CAM	Heartbeat	Support reliable after related communication
GLL, GGA, GNS, RMC	External position information equipment	Position	If position not internally provided

Table 2: IEC 61162-1 Sentences Transmitted by the Ship Earth Station Equipment

Mnemonic	Interface	Name	Comment
SM1, SM2, SM3, SM4, SMB and SMV	Navigation display systems	Maritime Safety Information	For SMV, see Annex C of IEC 61097-16 ¹
ARC, ALC, ALF, HBT	CAM	Alert information	

2.3.2 The equipment should meet the requirements for Bridge Alert Management (BAM) system². Equipment interfaces should comply with recognized international standards. Where the ship earth station is part of an Integrated Communication System (ICS), Integrated Navigation System (INS), Integrated Bridge System (IBS) or connected to a navigation system, this should not impair any of the GMDSS functions of these systems or the ship earth station itself.

2.3.3 In the BAM concept, the ship earth station acts as the alert source and the CAM acts as the target of alert reporting by alert sources.

2.3.4 For bridge alert management, the classification of alerts should be as given in Table 5.

2.3.5 The ship earth station should be provided with a data interface for communications compliant with the BAM concept capable of transmitting the sentences ALC, ALF, ARC and HBT and receiving the sentences ACN and HBT in accordance with IEC 61162-1 or IEC 61162-450 and IEC 62923-1. The text information used in the ALF sentence should be as given in the table below.

Table 3: Alert Titles & Text

Alert ID	Alert text	Alert ID
3116	Lost connection	Check GMDSS satellite terminal
3122	Distress Rx	Incoming distress. Check GMDSS display
3122	Urgency Rx	Incoming urgency warning. Check GMDSS display
3123	MSI Rx	Check new received maritime safety information
3079	Paper low	Check GMDSS printer paper
3079	Storage low	Check GMDSS storage medium
3016	Lost position	Check GMDSS terminal for lost position
3013	Doubtful pos	GMDSS update manual position

2.3.6 The ship earth station should provide an interface from which data from Iridium

¹ SMV is a new sentence currently described in IEC 61097-16, Annex C. That includes a note to refer to IEC 61162-1 for a possible later version of that message. The message has not yet been included in IEC 61162-1, but it is expected to be included in the next edition. See also 2.3.11.

² Resolutions A.811(19), MSC.252(83) and MSC.302(87); guideline SN.1/Circ.288; international standards IEC 62940, IEC 61924-2 and IEC 62923.

SafetyCast communications, including Maritime Safety Information (MSI), can be provided to navigation display systems, in accordance with recognized international standards.

- 2.3.7 The ship earth station should be provided with a data interface for communication with navigation display systems capable of transmitting the sentences SM1, SM2, SM3, SM4 and SMB in accordance with IEC 61162-1 or IEC 61162-450.
- 2.3.8 The ship earth station should provide either an integral electronic position fixing equipment or have an interface for position updating conforming to the recognized international standards.
- 2.3.9 The ship earth station should be provided with a data interface for updating position information capable of receiving the sentences GLL, GGA, GNS, RMC in accordance with IEC 61162-1 or IEC 61162-450, unless an integral electronic position fixing equipment is provided.
- 2.3.10 Formatting and transmission of distress alert position information should be clearly and unambiguously labelled as such and presented in the format of degrees, minutes and decimal fraction of minutes.

NOTE: The format is specified in Volume II of the IAMSAR Manual. The position format is degrees-minutes.decimal minutes hemisphere (N,S,E,W, no preceding space as in dd-mm.mmmH ddd-mm.mmmH), leading zeros optional (because the "-" and "." remove the ambiguity that would result otherwise, latitude first, longitude second, space separating latitude and longitude.)

- 2.3.11 The ship earth station should provide an interface in accordance with recognized international standards to report a ship's identifier and location data from a received distress alert relay to navigation display systems in order to enable graphical display and possible linking to available target information.
- 2.3.12 The ship earth station should be provided with a data interface to report a ship's identifier and location data from a received distress alert relay capable of transmitting the sentence SMV in accordance with IEC 61162-1 or IEC 61162-450. The SMV sentence should not be transmitted if the latitude and longitude information is not present or is invalid.

3 Operation

3.1 Primary Human-Machine Interface (HMI)

- 3.1.1 The primary HMI should provide all functions necessary to carry out all communication procedures including those required by the GMDSS.

3.2 Ship Earth Station Identity

- 3.2.1 No control external to the equipment should be available for alteration of the ship station identity.
- 3.2.2 Changes may only be carried out by authorised authorities or the manufacturer's representative.
- 3.2.3 The Vessel name, MMSI, IMO number, and (where appropriate) designation as SES1 or SES2 can only be changed over the air. Changes can only be made by updating

the registration form. The updated information is sent to the ship earth station, and the user must confirm and accept the updated information. It is not possible to change the identity of the ship earth station directly on the Control Unit.

3.3 Transmission of Distress Alerts/Calls

- 3.3.1 It should be possible to initiate transmission of distress alerts/calls at any time. It should be possible to initiate transmission of distress alerts/calls whilst the ship earth station is transmitting lower priority communications, and whilst it is receiving communications of any priority, if necessary by pre-emption of those communications.
- 3.3.2 It should be possible to initiate and make distress alerts/calls from the position at which the ship is normally navigated. The equipment should include an option making it possible to initiate transmission of distress alerts/calls at a position remote from the primary HMI of the equipment.
- 3.3.3 The HMI should include a dedicated distress button that has no other function than activating distress transmissions.
- 3.3.4 A distress alert/call should be activated only by means of a dedicated distress button (a physical button, not a touchscreen button). The dedicated distress button³ should not be any key of a digital input panel or a keyboard provided on the equipment. The distress button should be clearly identified and protected against inadvertent activation, requiring at least two independent actions. Lifting of the protective lid or cover is considered as the first action. Pressing the distress button as specified above is considered as the second independent action.
- 3.3.5 The distress button should be red in colour and marked "DISTRESS". Where a non-transparent protective lid or cover is used, it should be also be red in colour and marked "DISTRESS".
- 3.3.6 The required protection of the distress button should consist of a spring-loaded lid or cover permanently attached to the equipment by, e.g. hinges. It should not be necessary for the user to remove additional seals or to break the lid or cover in order to operate the distress button.
- 3.3.7 The equipment should indicate the status of the distress alert/call. The operation of the distress button should generate a visible and audible indication. The distress button should be kept pressed for at least 3 seconds. A flashing light and an intermittent audible signal should start immediately. After the transmission of the distress alert/call is initiated, the visual indication should become steady and the audible signal should cease.
- 3.3.8 The equipment should automatically initiate repetitive initial distress alerts/calls, which are repeated until cancelled on the ship or until appropriately acknowledged. It should be possible to interrupt repetitive initial distress alerts/calls. Such operation should not interrupt the transmission of a distress alert/call in progress but should prevent repetitive transmissions of a distress alert/call.
- 3.3.9 The distress alert should contain identification of the station in distress, its position and the time of the position fix.

³ MSC/Circ.862.

- 3.3.10 The equipment should be capable of transmitting and receiving subsequent distress communication.
- 3.3.11 After initiating a false distress alert/call, it should be possible to send a cancellation of the alert/call. This cancellation should not be initiated by cutting the power supply to the ship earth station nor by the operator switching the ship earth station off.

3.4 Test Facilities

- 3.4.1 It should be possible to test the distress capability of the ship earth station without initiating a distress alert/call.
- 3.4.2 During installation and service-activation of the ship earth station the user will be asked to initiate a Distress Alert Test and a Distress Call Test. Both functions must be successful before the ship earth station can be commissioned and used as a GMDSS terminal.
 - 3.4.2.1 **Distress Call Test:** The ship earth station will set up a call to the GMDSS Gateway and a voice machine answer the call.
 - 3.4.2.2 **Distress Alert Test:** The ship earth station will send a Distress Alert Test and the Gateway will return the received test message as approved/confirmed through the MSI inbox folder.
- 3.4.3 Both Call and Alert test function can be initiated manually at any time.

3.5 Reception of Distress, Urgency and Safety Alerts/Calls

- 3.5.1 It should be possible for the ship earth station to receive distress, urgency and safety priority alerts/calls whilst it is being used for communications of a lower priority than that being received.
- 3.5.2 Provision should be made for an audible signal and visual indication at the position from which the ship is normally navigated, to indicate receipt of a distress or urgency enhanced group call message. It should not be possible to disable this indication and it should only be possible to reset it manually and only from the position where the message is displayed or printed. The audible signals for distress, urgency and their acknowledgements should be continuously repeated until manually terminated.
- 3.5.3 For the presentation of received distress and urgency alerts/calls intended as text to be read, the equipment should include or interface to either:
 - 3.5.3.1 An integrated printing device; or
 - 3.5.3.2 A dedicated display device⁴, printer output port and a non-volatile message memory; or
 - 3.5.3.3 A connection to a navigation system and a non-volatile message memory.

3.6 Audible Signals and Visual Indications:

- 3.6.1 The audible signals should be activated in relation to:
 - 3.6.1.1 Distress alerts/calls or distress relay alerts/calls; and
 - 3.6.1.2 Urgency calls and messages.

⁴ Where there is no printer, the display device should be located in the position from which the ship is normally navigated.

Table 4: Definition of Audible Signals

Fixed Alarm Sounds	Tone 1 Frequency (Hz)	Tone 2 Frequency (Hz)	Tone 1 Duration (ms)	Tone 2 Duration (Hz)
Distress Ack (see note)	2 200	1 300	500	500
Urgency (see note)	2 200	Silence	250	250
Urgency Ack (see note)	2 200	Silence	500	500
Count	2 200	Silence	500	500
The Distress Ack, Urgency and Urgency Ack alarms shall not be able to be customized. These alarms shall be continuously repeated until manually terminated.				

3.6.2 For visual indication the ship earth station should conform to MSC 191(79).

3.6.3 BAM classification⁵ of priorities and categories is as follows.

Table 5: Bridge Alert Management (BAM)

Cause	Alarm	Warning	Caution	Cat. A	Cat. B
No contact with satellites (para 2.2.2)			X		X
Received distress communications (para 3.6)		X		X	
Received urgency message (para 3.6)		X		X	
Received safety message (para 3.7.4.2)			X		X
Paper low (para 3.7.5.5)			X		X
Loss of position (para 3.8.2.2)			X		X
Manual position older than 4h (para 3.8.2.4)			X		X

⁵ As referred to in resolution MSC.302(87).

Note: A simplified description of the terms in accordance with IMO Resolution MSC.302(87):

- Alarm: Audible announcement until acknowledged by the operator
- Warning: Short audible announcement repeated every 5 minutes until acknowledged by the operator
- Caution: Silent
- Category A: Acknowledge possible only at source or when full source information is available. Audible announcement only at location at which acknowledge is possible.
- Category B: Acknowledge possible both at source and at CAM. Audible announcement in every location at which acknowledge is possible.

3.7 Iridium SafetyCast messages, including Maritime Safety Information (MSI)

3.7.1 Facilities should be provided for the ship earth station to receive maritime safety information (MSI) for the NAVAREA/METAREA and the coastal warning areas and different classes of messages:

3.7.1.1 Where the ship is sailing and 300 NM beyond the limits of the NAVAREA/METAREA;

3.7.1.2 For the planned voyage; and

3.7.1.3 For a fixed position.

Additional means should be provided to filter received MSI based on NAVAREA/METAREA and the coastal warning area codes and different classes of messages.

3.7.2 The station should be able to receive and filter distress relay and urgency messages in accordance with area defined within the EGC message and the ship's position.

3.7.3 For the presentation of received EGC communications intended as text to be read, the equipment should include or interface to either:

3.7.3.1 An integrated printing device; or

3.7.3.2 A dedicated display device⁶, printer output port and a non-volatile message memory; or

3.7.3.3 A connection to a navigation system and a non-volatile message memory.

3.7.4 If a dedicated display device or a connection to a navigation system is used, it should meet the general requirements of the Organization for such devices⁷ and the following additional requirements:

3.7.4.1 The capability of showing at least 16 lines by 40 characters, with a non-volatile memory of at least 255 messages of 1,023 characters;

3.7.4.2 An indication of newly received unsuppressed messages should be immediately displayed until acknowledged, as referred to in Table 5; and

3.7.4.3 The design and size of the display device should be such that displayed information is easily read under all conditions, by observers at normal working distances and viewing angles.

3.7.5 If a printing device is used, it should meet the general requirements of the Organization for such devices and the following additional requirements:

3.7.5.1 The printing device should be capable of printing at least the standard International Reference

⁶ Where there is no printer, the dedicated display device should be located in the position from which the ship is normally navigated.

⁷ Resolution MSC.191(79).

Alphabet (IRA) character set. Other character sets can be optionally used according to ISO 2022⁸ standards and ITU-T Recommendations T.50;

- 3.7.5.2 The printing device should be able to print at least 40 characters per line;
- 3.7.5.3 Means should be provided to prevent the re-printing of a message once it has been received without error;
- 3.7.5.4 Any messages should be displayed or printed regardless of the character error rate of its reception. The equipment should use an asterisk (the "*" character) or a low line (the "_" character) if a corrupted character is received; and
- 3.7.5.5 A "paper low" condition should generate a caution, as referred to in Table 5.
- 3.7.6 For the presentation of received group call messages intended as text to be read, or intended as imagery to be viewed, on another connected device or an integrated system, paragraph 2.3.2 also applies.

3.8 Position Updating

- 3.8.1 Facilities should be provided to automatically update the ship's position and the time at which the position was determined from a suitable electronic position fixing equipment which may be an integral part of the equipment.
- 3.8.2 To enable updating of the position:
 - 3.8.2.1 The status of the position update should be visible to the operator (e.g. , offline, manual or automatic);
 - 3.8.2.2 If position data is being updated automatically, a caution should be raised if no update has been performed for a period of 10 minutes, as referred to in Table 5. The caution should be removed by receiving new position data;
 - 3.8.2.3 The equipment should have facilities for manually entering the ship's position and the time of the position fix;
 - 3.8.2.4 If the ship's manually set position is older than 4 hours, a caution should be raised, as referred to in Table 5. The caution should be removed by inputting or receiving new position data; and
 - 3.8.2.5 If the ship's position is older than 24 hours, the position is clearly identified with date and time of the fix in UTC for distress alerting purposes.

4 Cyber Security

- 4.1 General guidelines on means to isolate GMDSS-related functions from an optional internet connection and general guidelines on how to reduce the possibility of illicit access to GMDSS functions via local interfaces are as follows.
- 4.2 The ship earth station may optionally have an interface to provide an internet connection for the ship's office equipment. When this interface is provided, appropriate provisions should be made to isolate the interface and functions from the interfaces and functions related to GMDSS.

NOTE: It is assumed that interfaces that are used to connect the ship earth station to the CAM and to navigation/communication equipment are primarily secured by means of installation techniques whereas the interface for office equipment may not be isolated to

⁸ ISO/IEC 2022:1994, Information technology – Character code structure and extension techniques.

a similar level.

4.3 The minimum precautions to be taken are:

- 4.3.1 The operating system of the ship earth station should not be directly accessible from the internet;
- 4.3.2 The interfaces of the ship earth station that are used for GMDSS should be protected from access from the internet;
- 4.3.3 Measures should be taken to protect any local interface for threats related to data files, autorun of executables, user authentication, system defence, network access, access to the operating system, booting environment, configuration management, protection against unintentional crash caused by user input, USB interfaces for other than storage purposes, USB ports and interfaces for REDS, other interfaces, software maintenance and remote maintenance.

Reference architecture that can fulfil the requirements set out above is shown in IEC 61097-16, clause 4.11, Figure 2.

Part B – Installation Guidelines

1 Introduction

This Part describes the requirements for installations generally. Annex A of these Guidelines describes the particular requirements for an omnidirectional antenna. Future editions of the Design and Installation Guidelines can have additional Annexes describing installation guidelines for other types of antenna if necessary.

2 Power Supply & Sources of Energy

- 2.1 The ship earth station should normally be powered from the ship's main source of electrical energy. In addition, it should be possible to operate the ship earth station and all equipment necessary for its normal functioning, from an alternative source of electrical energy.
- 2.2 Changing from one source of supply to another or any interruption of up to 60 seconds duration of the supply of electrical energy should not require the equipment to be manually re-initialized, should not result in loss of received communications stored in the memory and should not render the equipment inoperative when power is restored.

3 Antenna Siting

- 3.1 Where an omni-directional antenna is used, it is desirable that the antenna be sited in such a position that no obstacle is likely to degrade significantly the performance of the equipment. The manufacturer should provide information, in the installation manual, on the required free line of sight and the angles in the fore and aft directions and in the port and starboard directions that are required for reliable operation, taking into account ship movements in heavy seas.
- 3.2 Where a stabilized directional antenna is used, it is desirable that the antenna be sited in such a position that no obstacle is likely to degrade significantly the performance of the equipment. The manufacturer should provide information in the installation manual on the required free line of sight and the angles of elevation required for reliable operation, taking into account ship movement in heavy seas.
- 3.3 For omni-directional antennas, the manufacturer should specify sizes and critical distances of objects related to the antenna which cause a shadow sector, likely to degrade significantly the performance of the equipment, taking into account ship movement in heavy seas. This information should be documented in the installation manual.
- 3.4 For directional antennas, the manufacturer should specify sizes and critical distances of objects to the antenna, which cause shadow sectors, likely to degrade significantly the performance of the equipment, taking into account ship movement in heavy seas. This information should be documented in the installation manual.
- 3.5 To ensure reliable and continuous operation of the satellite communication system, the manufacturer should specify the necessary distances required between the satellite antenna and marine radar in the installation manual.
- 3.6 In case of multiple ship earth stations operating on adjacent frequency bands, the



antenna should be installed such as to ensure electromagnetic compatibility.

4 Radio Frequency Radiation Hazards

A warning of potential radiation hazards should be displayed in appropriate locations. A label should be attached external to a radome or antenna indicating the distances at which radiation levels of 100 W/m², 25 W/m² and 10 W/m² exist. These distances should be noted in the user manual.

5 Information to be Provided in Equipment Manuals

- 5.1** The equipment manual(s) should include all information necessary to ensure that the ship earth station complies with the IMO installation requirements.
- 5.2** This information should include siting requirements for the ship earth stations and IMO recognized global navigation satellite system shipborne receivers operating on frequency bands adjacent to the equipment.
- 5.3** If the operation (system connectivity) of the ship earth station is in any way dependent upon the proper reception of any global navigation satellite system (GNSS) signal for communications connectivity, for instance for system timing or antenna positioning, that dependency should be stated in the manual.

Annex A

1 System-Specific Guidelines: Omnidirectional Antenna

Personnel installing or servicing the system should be professionals with technical expertise, properly trained, and likewise authorized. All safety instructions and guidelines in the manufacturer's manual must be observed.

1.1 Antenna Unit

The Antenna Unit is designed for outdoor mounting and connected to the Control Unit via a coaxial cable. The Antenna Unit specifications are available in the manufacturer's manual. The Antenna Unit has an N connector (female) mounted, centered at the bottom of the antenna.

1.2 Mounting and Installation Considerations

- 1.2.1 Mount the unit vertically (with the N connector pointing down)
- 1.2.2 Mount the unit with free line of sight to the Iridium® and GNSS satellites. Make sure that the unit can receive signals from the Iridium and GNSS satellites (satellite reception information is available in the Control Unit user interface display)
- 1.2.3 Mount the unit on a rigid structure with a minimum of exposure to vibration and shock
- 1.2.4 Mount the unit using either the Bracket Mount or Pole Mount provided by the manufacturer
- 1.2.5 Mount the unit outdoor with an ambient temperature between -40°C to +55°C (-40°F to +131°F)
- 1.2.6 Mount the unit with a minimum angle of 20 degrees towards a radar antenna (above or below) and keep a minimum distance of 2.5 m (8 ft)
- 1.2.7 Mount the unit at least 1 m. (3 ft.) away from radio transmitting antennas (VHF, UHF, MF-HF)
- 1.2.8 Mount the unit away from Inmarsat and transmitting VSAT antennas

WARNING: The safety distances from the Antenna Unit are:

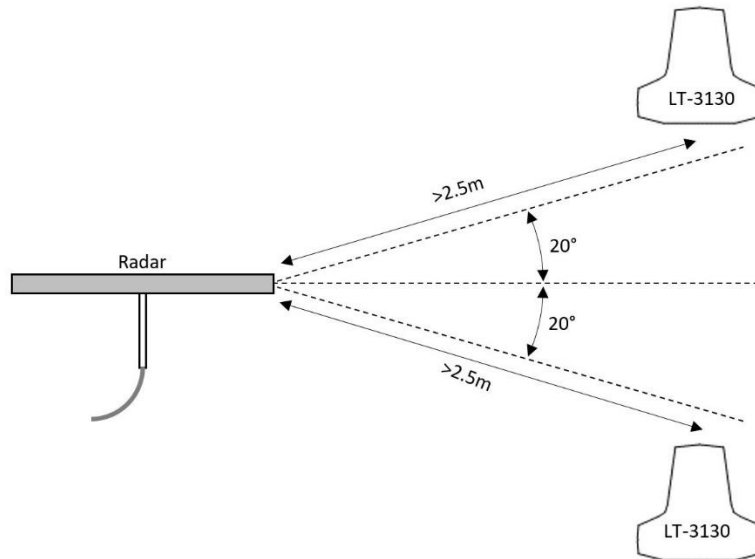
100 W/m ²	2.0 cm
25 W/m ²	4.0 cm
10 W/m ²	6.0 cm

WARNING - Compass safe distance: The compass safe distance for standard and steering compasses is 0.85 m (2.8 ft) and 0.65 m (2.1 ft) respectively. Observe these distances to prevent interference to a magnetic compass.

IMPORTANT: Due to the adjacency of the Iridium and Inmarsat frequency bands, the Satellite Communications System may not co-operate in the proximity of active Inmarsat equipment.

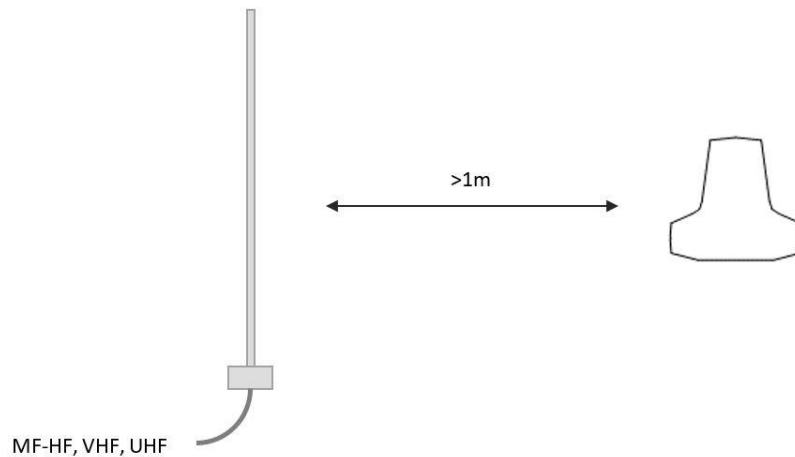
The Antenna Unit must be installed outside the radar main beam. Typically, this is in the order of 20 degrees. To avoid near field antenna coupling, a minimum distance of 2.5 m (8 ft)

between the radar antenna and the Antenna Unit must be obeyed. The figure below is illustrating how the Antenna Unit should be mounted to avoid interference from radars.

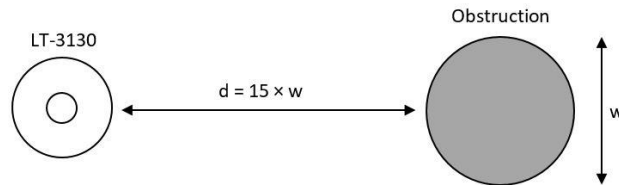


IMPORTANT: Failing to obey the specified installation conditions will void the warranty. However, depending on the specific radar frequency and power level, the separation distance between the radar and the Antenna Unit may be reduced, with no impact on the antenna performance. The performance of the Antenna Unit should be validated when the system is installed.

The Antenna Unit shall be mounted minimum 1 m from MF-HF, VHF, and UHF antennas.



The Antenna Unit must be installed with a 360° clear view of the sky. However, minor obstructions such as a mast will not degrade the antenna performance severely, if a separation distance larger than 15 times the diameter of the obstruction is kept.



1.3 Bracket Mount Installation Procedure

- 1.3.1 Fasten the bracket mount to a tube (max. 2.5" tube) by using the two V-bolts and the M8 prevailing nuts
- 1.3.2 Screw on the Antenna Unit and secure the antenna lock pinot
- 1.3.3 Fasten the coaxial cable to the Antenna Unit (N connector)
- 1.3.4 Apply self-volcanic tape on the N connector and cable to protect against saltwater and corrosion

1.4 Pole Mount Installation Procedure

- 1.4.1 Feed the coaxial cable through the pole mount
- 1.4.2 Fasten the coaxial cable to the Antenna Unit (N connector)
- 1.4.3 Apply self-volcanic tape on the N connector and cable to protect against saltwater and corrosion
- 1.4.4 Screw the pole mount (clockwise) on the Antenna Unit, and fasten the antenna lock pinot screw, as illustrated in the manufacturer's manual
- 1.4.5 The Antenna Unit and pole mount can now be mounted on the 1.5" tube. Fasten the three pole lock pinot screws, as illustrated in the manufacturer's manual

1.5 DC Input

The system is designed to be used on 12 VDC and 24 VDC power buses (nominal). External DC power to the system is provided by connecting the proprietary power cable, 3m - delivered by the manufacturer. The power connector is mounted on the back side of the Control Unit and marked 'PWR', see the illustration in the manufacturer's manual.

The input voltage range is: 9.6 – 31.2 VDC. The Control Unit DC input connector and circuit is protected and certified for Reverse Polarity Protection. Use only the power cable, 3m delivered by the manufacturer.

WARNING – Power supply protection: Make sure that the power supply is adequately protected by a fuse or an automatic circuit breaker when installing the equipment.

Control Unit: 15 A

Interface Unit (for extended ship interfaces): 5 A

1.6 Chassis Ground

The chassis ground connector is placed on the back side of the Control Unit and marked with 'GNDC', see the illustration in the manufacturer's manual.

1.7 Antenna

WARNING: The Control Unit must be powered off when connecting or disconnecting the Antenna Unit.

The Control Unit and the Antenna Unit must be connected using a coaxial cable. Both the control unit and the antenna unit have a N connector (female) mounted. In most cases it will be the DC resistance that will determine the maximum length of the coaxial cable. It is important to note that the input voltage of the control unit is important for the length of the coaxial cable that can be used.

Use only the supplied cable: Use only the supplied power and communication cable for connecting the equipment. If using a coaxial cable that is different to what is specified in the manufacturer's manual or supplied by the manufacturer, then verify that the coaxial cable maximum signal loss (according to the manufacturer's manual) is respected and calculate the maximum cable length as a function of the input voltage and the total DC resistance. Contact the manufacturer to get assistance on selection and acceptance of a specific coaxial cable.

For further details on the cable and connectors, please contact the manufacturer. A coaxial cable up to a length of 500 meters can be used for connecting the Control Unit and the Antenna Unit. Details about the coaxial cable, specification and cable lengths, are described in the "Antenna" section of the manufacturer's manual.

1.8 Maintenance

The system does not require any scheduled maintenance or service. Make sure that the product is installed, as described in this manual, before making contact to the distributor or dealer for further assistance.

If the system for some reason does not work as described in the manual, make contact with the distributor or dealer, from where the product was originally bought. The distributor or dealer will have experience and know-how to assist with further technical support and troubleshooting.

1.9 Disposal / End of Life



Old electrical and electronic equipment marked with this symbol can contain substances hazardous to human beings and the environment. Never dispose these items together with unsorted municipal waste (household waste). In order to protect the environment and ensure the correct recycling of old equipment as well as the re-utilization of individual components, use either public collection or private collection by the local distributor of old electrical and electronic equipment marked with this symbol. Contact the local distributor or dealer for information about what type of return system to use.

Cross Index Between IMO Performance Standards and Iridium Design & Installation Guidelines

IMO Resolution MSC.434(98), Performance Standards for a Ship Earth Station for use in the GMDSS.

The table below enables each paragraph of the IMO Performance Standard to be related to the corresponding paragraph of these Iridium Design and Installation Guidelines:

Table 6: IMO-Iridium Performance Standard Cross-Index

MSC.434(98), Annex	Iridium DIGs
1	Part A, 1
2.1.1	Part A, 2.1.1
2.1.2	Part A, 2.1.4
2.2.1	Part A, 2.2.1
2.2.2	Part A, 2.2.2
2.3.1	Part A, 2.3.2
2.3.2	Part A, 2.3.6
2.3.3	Part A, 2.3.8
2.3.4	Part A, 2.3.11
3.1.1	Part A, 3.1.1
3.2.1	Part A, 3.2.1
3.3.1	Part A, 3.3.1
3.3.2	Part A, 3.3.2
3.3.3	Part A, 3.3.3
3.3.4	Part A, 3.3.4
3.3.5	Part A, 3.3.5
3.3.6	Part A, 3.3.6
3.3.7	Part A, 3.3.7
3.3.8	Part A, 3.3.8
3.3.9	Part A, 3.3.9
3.3.10	Part A, 3.3.10
3.3.11	Part A, 3.3.11
3.4.1	Part A, 3.4.1
3.5.1	Part A, 3.5.1

3.5.2	Part A, 3.5.2
3.5.3	Part A, 3.5.3
3.6.1	Part A, 3.6.1
3.6.2	Part A, 3.6.2
3.6.3	Part A, 3.6.3
3.7.1	Part A, 3.7.1
3.7.2	Part A, 3.7.2
3.7.3	Part A, 3.7.3
3.7.4	Part A, 3.7.4
3.7.5	Part A, 3.7.5
3.7.6	Part A, 3.7.6
3.8.1	Part A, 3.8.1
3.8.2	Part A, 3.8.2
4.1	Part B, 2.1
4.2	Part B, 2.2
5.1	Part B, 3.1
5.2	Part B, 3.2
5.3	Part B, 3.3
5.4	Part B, 3.4
5.5	Part B, 3.5
5.6	Part B, 3.6
6	Part B, 4

References

1 Glossary

1.1 Databases

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

IEC Electropedia: available at <http://www.electropedia.org/>

ISO Online browsing platform: available at <http://www.iso.org/ob>

1.2 Abbreviated Terms

Table 7: Glossary / Abbreviated Terms

Abbreviation	Definition
BAM	Bridge Alert Management
CAM	Central Alert Management
EGC	Enhanced Group Call
GMDSS	Global Maritime Distress and Safety System
GUI	Graphical User Interface
HMI	Human Machine Interface
IEC	International Electrotechnical Commission
IMO	International Maritime Organization
IMSO	International Mobile Satellite Organization
ISO	International Organization for Standardization
ITU	International Telecommunication Union
MSI	Maritime Safety Information
REDS	Removable External Data Source
RCC	Rescue Coordination Centre
SES	Ship Earth Station
SIM	Subscriber Identity Module



2 Contact Information

Questions about this document should be addressed to:

Maritime Safety Services

Iridium Satellite LLC

1750 Tysons Boulevard, Suite 1400

McLean, VA 22102

USA

Email: maritime.safety@iridium.com

Questions concerning the installation and operation of a particular ship earth station should be addressed to the manufacturer of the ship earth station, or to the qualified installer.