Maritime & Coastguard Agency

INSTRUCTIONS FOR THE GUIDANCE OF SURVEYORS ON

MANDATORY RADIO INSTALLATIONS ON SHIPS

MSIS05

Rev 10.21

PREFACE

0.1 These Marine Survey Instructions for the Guidance of Surveyors (MSIS) are not legal requirements in themselves. They may refer to statutory requirements elsewhere. They do represent the MCA policy for MCA surveyors to follow.

0.2 If for reasons of practicality, for instance, these cannot be followed then the surveyor must seek at least an equivalent arrangement, based on information from the owner/operator. Whenever possible guidance should be sought from either Principal Consultant Surveyors or Survey Operation Branch, in order to maintain consistency between Marine Offices.

Maritime and Coastguard Agency,
UK Technical Services Navigation Branch,
Spring Place,
105 Commercial Road,
Southampton
SO15 1EG

RECENT AMENDMENTS

The amendments made in the most recent publication are shown below, amendments made in previous publications are shown in the document Amendment History.

Version Number	Status / Change	Date	Author Reviewer	Content Approver	Next Review Date/Expiry Date
10.21	• Update with latest IMO, MGN, BSI standards / policies • Update with guidance on Iridium GMDSS on vessels	07/10/21	**Nick Hirst** Senior Policy Lead (Navigation Equipment Technical Standards)	**Richard Bell** Assistant Director – Technical Services Navigation	07/10/2023

MAIN CONTENTS

MSIS05 Chapter 1

1 GENERAL

These guidelines are issued by the Maritime and Coastguard Agency for the guidance of radio surveyors in the survey and inspection of 'GMDSS' radio installations on ships for the purpose of ensuring compliance with the various Statutory Instruments covering merchant shipping. They also indicate to ship-owners, ship-owners' representatives, masters and crew, shipbuilders and radio installation companies the procedure adopted for the survey and acceptance of radio installations. These instructions should be read in conjunction with the instructions issued by the 'MCA' relating to passenger ships, load-line, fire protection, navigational equipment, lifesaving appliances and oil prevention.

The guidelines do not include SOLAS Chapter V radio equipment such as 'AIS', 'SSAS' and 'LRIT', nor 'VMS' for fishing vessels.

1.1 STATUTORY PROVISIONS

The principal statutory provisions concerning radio installations are contained in:

- The Merchant Shipping Act 1995;
- The Wireless Telegraphy Act 2006;
- The Merchant Shipping (Life-Saving Appliances and Arrangements) Regulations 2020 (SI 2020 No. 0501) as amended;
- The Merchant Shipping (Life-Saving Appliances for Passenger Ships of Classes III to VI(A)) (SI 1999 No. 2723) as amended;
- The Merchant Shipping (Radio Installations) Regulations 1998 (SI 1998 No. 2070) as amended;
- The Merchant Shipping (Categorisation of Waters) Regulations 1992 (SI 1992 No. 2356) as amended;
- The Merchant Shipping (Survey and Certification) Regulations 2015 (SI 2015 No. 0508) as amended;
- The Merchant Shipping (High Speed Craft) Regulations 2004 (SI 2004 No. 302) as amended;
- The Merchant Shipping (Passenger Ships on Domestic Voyages)) Regulations 2000 (SI 2000 No. 2687) as amended.

A comprehensive list of current Merchant Shipping acts and Regulations is issued at regular intervals and published by the MCA in the form of a Marine Guidance Note.
They can be downloaded from the MCA website: www.mcga.gov.uk

1.2 DEFINITIONS

1.2.1 In these instructions the following definitions apply:

1.2.2 AIS
Automatic Identification System

1.2.3 Authorised Person
Organisation appointed by the Secretary of State to perform Radio Surveys, Inspections on behalf of the 'MCA', as per MGN 608.

1.2.4 Basic Equipment
Equipment forming part of the radio installations provided on a ship to comply with regulation 8, 9, 10, 11 and 12, as appropriate, of the 'Radio Installation Regulations'.

1.2.5 Certifying Body
Organisation authorised or recognised by the Secretary of State to perform the survey of radio installations on United Kingdom ships and, as appropriate, issue certification.

1.2.6 Convention Ship
Ship granted a certificate or certificates in accordance with the provisions of the "Safety of Life at Sea (SOLAS) Convention".

1.2.7 DSC
Digital Selective Calling

1.2.8 Duplicated Equipment
Equipment, additional to 'Basic Equipment', forming part of radio installations provided on a ship to comply with regulation 22 of the 'Radio Installation Regulations'.

1.2.9 EGC
Enhanced Group Calling

1.2.10 EPFS
Electronic Position Fixing System

1.2.11 EPIRB
Emergency Position-Indicating Radio Beacon, the emissions of which are intended to facilitate search and rescue operations.

1.2.12 Functional Requirements
The 'Functional Requirements' of the 'GMDSS' as specified in regulation 4 of SOLAS, chapter IV.

1.2.13 GISIS
IMO Global Integrated Shipping Information System

1.2.14 GMDSS
Global Maritime Distress and Safety System.

1.2.15 GOC
General Operator's Certificate for a radio operator.

1.2.16 HF
Radio frequencies between 4 and 30 MHz allocated by the 'ITU' to maritime mobile services.

1.2.17 IMO
International Maritime Organization,

4 Albert Embankment,
London,
SE1 7SR
Tel +44 (0)20 7735 7611

1.2.18 Initial Survey
Complete inspection, before a ship is put into service, of all the items relating to a particular certificate to ensure that the relevant requirements are complied with and that these items are satisfactory for the service for which the ship is intended.

1.2.19 INMARSAT
Organization established by the convention of the International Maritime Satellite Organization ('INMARSAT') adopted on 3rd September 1976.

INMARSAT PLC,

99 City Road, London, EC1Y 1AX

Tel +44 (0)20 7728 1000

1.2.20 IRIDIUM

Maritime Safety Services

Iridium Satellite LLC

1750 Tysons Boulevard, Suite 1400

McLean, VA 22102

USA

1.2.21 ITU
International Telecommunication Union

Places des Nations,
1211, Geneva 20,
Switzerland

Tel +41 22 730 5111

1.2.22 LRIT
Long Range identification and Tracking, a satellite system for tracking SOLAS vessels that may make use of ‘GMDSS’ satellite equipment to send information.

1.2.23 MCA
Maritime and Coastguard Agency, an Executive Agency of the Department for Transport.

1.2.24 MF
Radio frequencies less than 4 MHz allocated by the ‘ITU’ to the maritime mobile services.

1.2.25 MGN
Marine Guidance Notice, a notice described as such and issued by the Maritime and Coastguard Agency.

1.2.26 MODU Code
Code for the Construction and Equipment of Mobile Offshore Drilling Units, 1989, as amended, or Code for the Construction and Equipment of Mobile Offshore Drilling Units, 2009, as amended, as applicable.

1.2.27 MSI
Maritime Safety Information comprising navigational and meteorological warnings, meteorological forecasts and other urgent safety related messages broadcast to ships.

1.2.28 MSN
Merchant Shipping Notice, a notice described as such and issued by the Maritime and Coastguard Agency; and any reference to a particular Merchant Shipping Notice includes a reference to any document amending or replacing that Notice which is considered by the Secretary of State to be relevant from time to time and is specified in a Merchant Shipping Notice.

1.2.29 NAVTEX
Navigational Telex is an international system for the broadcast, and automatic reception of maritime safety information in the English language on 518 kHz by means of narrow-band direct-printing telegraphy.

1.2.30 NBDP
Narrow Band Direct Printing.

1.2.31 Periodical Survey
An inspection of the items relating to a particular certificate to ensure that they are in a satisfactory condition, and that they are fit for the service for which the ship is intended.

1.2.32 Radio Installations Regulations
The Merchant Shipping (Radio Installations) Regulations 1998, as may be amended from time to time.

1.2.33 Radio Operator
Person holding a certificate specified in the ‘Radio Regulations’ ‘ITU’, as appropriate.

1.2.34 Radio Regulations
ITU Radio Regulations annexed to, or regarded as being annexed to, the most recent International Telecommunication Convention which may be in force at any time.

1.2.35 Regulations
Collectively or individually, those regulations regarding radio matters that are applicable to the vessel involved.

1.2.36 Renewal Survey
The same as a ‘Periodical Survey’ but leading to the issue of a new certificate.

1.2.37 RMSS
Recognized Mobile Satellite Service

1.2.38 ROC
Restricted Operator's Certificate, for a radio operator

1.2.39 SART
Search And Rescue Transponders, e.g. radar transponders and AIS SART.

1.2.40 SOLAS
Safety of Life at Sea Convention 1974 as amended.

1.2.41 SSAS
Ship Security Alert System, a system for alerting a competent authority that a ship’s security is threatened or has been compromised.

1.2.42 STCW
Convention on Standards of Training, Certification and Watch-keeping

1.2.43 UK Technical Services Navigation Branch
Branch of the Maritime Services Directorate of the ‘MCA’.

1.2.44 VDR
Voyage Data Recorder

1.2.45 VHF
Radio channels in the 156.0125 to 162.0375 MHz range assigned to maritime use.

1.2.46 VMS
Vessel Monitoring System, a satellite based tracking system for fishing vessels.

1.3 APPLICATION OF THE RADIO INSTALLATIONS REGULATIONS

1.3.1 The ‘Radio Installations Regulations’ apply to:

- Sea-going United Kingdom ships
- Other seagoing ships while they are in the United Kingdom or the territorial waters thereof

1.3.2 Ships to which the ‘Radio Installations Regulations’ do not apply

The ‘Radio Installations Regulations’ do not apply to:

- Troopships not registered in the United Kingdom
- Ships not propelled by mechanical means
- Pleasure craft
- Fishing vessels
- Cargo ships of less than 300 tons
- United Kingdom ships while they are being navigated within the Great lakes of North America and their connecting and tributary waters as far east as the lower exit of the St. Lambert Lock at Montreal in the Province of Quebec, Canada
- High Speed Craft to which the Merchant Shipping (High-Speed Craft) Regulations 2004 apply
- Ships which are passenger ships of Class A, B, C or D as defined in the Merchant Shipping (Passenger Ships on Domestic Voyages) Regulations 2000 which are new ships, engaged on domestic voyages, for the purposes of those Regulations

Note: Fishing vessels, high speed craft and certain other vessels engaged on commercial operations may be subject to separate requirements relating to the provision of radio installations. These instructions may be referred to when performing surveys or inspections of these radio installations.

1.3.3 Recommended practices

Recommended practices concerning radio installations for merchant ships are contained in:

- Code of Safe Working Practices for Merchant Seafarers (COSWP);
- Code of Practice for Controlling Risks due to Noise on Ships;
- The IET ‘Code of Practice for Installation of Electrical & Electronic Equipment on ships’;
- Merchant Shipping Notices;
- Marine Guidance Notices;
- Marine Information Notes;
- Electrical & Electronic Installations in Ships. Electromagnetic compatibility (EMC). Ships with a metallic hull (BS IEC 60533:2015);

- Electrical Installations in Ships - Part 101: Definitions and General Requirements (IEC 60092-101:2018);
- British Standard Specification for Limits and methods electromagnetic interference generated by marine equipment and installations. (BS 1597:1985); and
- Code of practice for radio interference suppression on marine installations (BS 5260)

1.4 POWERS OF SURVEYORS

Powers of surveyors are derived from the Merchant Shipping Act 1995 (section 256)

1.5 SURVEYORS - TERMS OF REFERENCE

A 'Certifying Body' or 'Authorised Person' appointed by the Secretary of State for Transport may under sections 256 of the Merchant Shipping act 1995, inspect a vessel and, where appropriate, confirm that it is properly provided with radio installations and satisfies the other requirements in conformity with the Regulations. A 'Certifying Body' or 'Authorised Person', whilst undertaking work on behalf of the Maritime and Coastguard Agency **shall not:**

- offer comments concerning individual suppliers of marine radio equipment or their capabilities in respect of repairs nor be personally involved in any repairs which may need to be carried out in connection with that survey;
- undertake any sales activity whatsoever, whether at a Regional office or Main Office, in connection with any survey or inspection performed;
- pass any information whatsoever regarding a potential sale or sales connected with any survey or inspection performed, to any third party (except the 'MCA' for monitoring purposes) or to any person or Department within the surveyor's parent company.

1.5.1 Referral to Maritime and Coastguard Agency

Should a difficulty arise in an area covered by the 'Radio Installation Regulations', 'MSN's, 'MGN's or these Instructions the matter should be referred to the:

Maritime and Coastguard Agency,
UK Technical Services Navigation Branch,
Spring Place,
105 Commercial Road,
Southampton
SO15 1EG

Tel: +44 (0)203 817 2000
E-mail: navigationsafety@mcga.gov.uk

1.6 DETENTION, IMPROVEMENT AND PROHIBITION NOTICES

1.6.1 General

Detention is effective if the ship is about to go to sea, and is mainly used to prevent departure of a ship until defects affecting her safety have been remedied. It is not appropriate for stopping unsafe practices or preventing dangerous activities in port, and in some cases it is too severe a course of action to deal with some infringements of statutory requirements. An alternative course of action is available under the Merchant Shipping Act 1995, section 261 to 266, which allows the serving of Improvement and Prohibition Notices. MSIS 38 (Part C ch.2).

1.6.2 In cases where a ship to which the regulations apply, does not comply with the relevant Regulations, the ship shall be liable to be detained (SI 1998 #2070 Radio Regs Part IV – Enforcement). Section 95 of the Merchant Shipping Act 1995 as amended provides for the detention of an unsafe ship. Guidance on detention is contained in 'MCA' Instructions to Surveyors, MSIS 38 (Part A ch.1,2,3, Part B ch.9, Part C ch.3). In the event of a ship not complying with the regulations, the Radio Surveyor must consult with the local 'MCA' Technical Manager who will determine whether the vessel should be detained and what further action should be taken against the vessel.

1.7 EXCEPTIONS AND EXEMPTIONS

1.7.1 Application for exemptions

The Secretary of State for Transport is empowered to exempt any merchant ship from any of the requirements of the Regulations. Applications for exemption may be sent by the owners or their representatives to the Maritime and Coastguard Agency's UK Technical Services Navigation Branch, or through the Technical Manager at the Local marine Office. Any such application should contain detailed reasons for regarding the statutory requirements as unnecessary or unreasonable. Applications received by Marine Office Surveyors should be forwarded to the Technical Manager(s) for a decision.

1.7.2 Issue of exemption certificate

If complete, partial, or conditional exemption is granted by the MCA, an Exemption Certificate will be issued to the applicant stating the extent of the exemption, and where appropriate, the conditions upon which it has been granted. Exemption Certificates will not normally be valid for more than 5 years, and where possible, will remain in force for the same period as any certificate relating to the Radio Installation. A copy of any Exemption Certificate shall be retained aboard the vessel to which it is granted and must be made available to the Surveyor at any Survey or Inspection of the Radio station.

1.8 FEES

The fees charged by the MCA are contained in the current The Merchant Shipping (Fees) Regulations 2018 (SI 2018 No. 1104) Fees charged by Authorised Person's or Regional Offices operate under their own fee regime.

1.9 SAFETY

To confirm that personnel are not placed at risk or equipment is not inadvertently damaged during survey, a responsible person representing the owners, capable of operating the equipment should be present during survey or other inspection of radio installations. If the owner is not so represented the Surveyor should not proceed unless he is satisfied that it is safe to do so and has the agreement of the Master or representative of the ship-owner (see 12 Warnings and Caution below).56

2 SURVEY ARRANGEMENTS

2.1 APPLICATION FOR RADIO SURVEY

Application for a survey should be made in accordance with MGN 608. For classed vessels (except passenger ships and fishing vessels), radio surveys must be arranged through the classification society of the vessel. For unclassed vessels, passenger ships and fishing vessels, the survey must be arranged with an Authorised Person. The Survey Guidelines under the Harmonised System of Survey and Certification (HSSC), 2015, IMO define several types of survey (see **Error! Reference source not found. Error! Reference source not found.**). The ap plication of these surveys is tabulated below:

Vessel	Initial Survey	Periodical Survey	Renewal Survey
Passenger	✓		✓
Cargo	✓	✓	✓

In an application for an Initial Survey, the instructions to the Certifying Body should state clearly the GMDSS sea area or areas through which the ship will pass during its intended voyage(s). Where any change to the equipment and other items covered by the survey is to be made or has been made prior to a Renewal Survey, or where it is intended to amend the area or area(s) of operation on the certificate, this information should be brought to the attention of the Certifying Body at the time of application.

2.2 LOCATION OF SURVEY

Radio surveyors may be required, as necessary; to perform a survey of the radio installations on a UK registered ship overseas. Initial Surveys of UK registered ships are to be performed by the UK recognised organisations unless alternative arrangements have been approved by the UK Technical Services Navigation Branch.

2.3 PERFORMANCE OF SURVEY

Radio surveyors performing surveys for statutory purposes should confirm that all the equipment required under the Regulations is carried and is fit and ready for use, that the installation is in accordance with the Regulations and Instructions and that all radio operators are appropriately qualified.

The satisfactory performance of survey shall be confirmed by issuing declaration of survey to MCA or equivalent document as required by UKRO internal procedure.

2.4 SUBMISSION OF DRAWINGS (PLANS & DESIGNS)

Ship-owners and shipbuilders should submit plans and particulars of the proposed radio installations for new ships to the lead surveyor of the local marine office who will consult with the Authorised Person agreed between the Owner and MCA concerning the surveys of radio installations at the design stage. This will provide an early opportunity to determine; as far as possible, whether the proposals comply with the Regulations; they should cover the layout of equipment, wiring and antenna arrangements. These plans will be treated in confidence.

2.5 ISSUE OF CERTIFICATES

If entirely satisfied that the applicable Regulations are being met and all fees due have been paid, the Radio Surveyor should complete and forward a Declaration of Radio Survey as follows:

- in the case of a passenger ship, to the MCA Lead Surveyor for use in connection with the issue of a Passenger Certificate;
- in the case of a cargo ship, the classification society will issue the Safety Radio Certificate
- in the case of a fishing vessel, to the Fishing Vessel Surveyor of the MCA
- in the case of a Passenger High Speed Craft, to the MCA Lead Surveyor for use in connection with the issue of a High-Speed Craft Safety Certificate;

2.6 DEFICIENT INSTALLATIONS

When a Radio Surveyor considers an installation deficient or defective the owner or his representative is to be handed or sent a notice in writing that indicates the defect or deficiency and what is required to remedy it.

All defects and deficiencies must be made good to the satisfaction of the Radio Surveyor. If a Declaration of Survey cannot be issued by reason of non-compliance, or it is considered necessary to invoke further enforcement action, the Technical Manager of the local marine office and the certifying authority responsible for the issuance of the certificate must be informed.

3 GUIDELINES FOR SURVEY

3.1 APPLICATION

Radio equipment installed on a SOLAS ships should meet the relevant IMO requirements and ITU recommendations and should be of a type approved by the administration.

These guidelines are applicable when installing GMDSS radio equipment on board SOLAS ships.

These guidelines also apply to radio installations on mobile offshore drilling units as prescribed in the MODU Code (*see section* 11 *for GMDSS requirements offshore).*

Cargo ships of less than 300 gross tonnage (GT) and fishing/catching vessels are as a general rule not covered by SOLAS requirements. However, if such ships / vessels are going to install GMDSS radio equipment on a voluntary basis or mandatory basis according to national laws, these guidelines should be followed as far as practicable. These guidelines, to a large extent, reflect unambiguous requirements in accordance with the relevant Rules and regulations, see subsection 3.2 below. Other practical installation solutions than the ones emerging from these guidelines may be accepted as long as the international requirements as laid down in the SOLAS Convention are met and the installation is considered to be equivalent.

Note: The marine electronics company which installs the radio equipment should be responsible for giving the radio operators proper familiarisation in the use of the installed radio equipment before it is put into operation.

3.2 RULES AND REGULATIONS

These guidelines are prepared in accordance with the following conventions, regulations, instructions and guidelines:

- SOLAS
- MODU Code
- IMO Resolutions (Performance standards) and IMO Circulars, ITU (International Telecommunication Union) Radio Regulations (RR), and International Standards
- BS ISO 8468:2007 ‘Ships and marine technology. Ship's bridge layout and associated equipment. Requirements and guidelines’
- STCW Convention

3.3 DRAWINGS (PLANS AND DESIGNS)

For the radio installations, including those used in lifesaving appliances, the examination of plans and designs should consist of establishing:

- the sea areas declared for operation
- the equipment installed to fulfil the functional requirements for the sea areas
- the methods used to confirm the availability of the functional requirements
- the arrangements for supply of an emergency source of energy (if any)
- where practicable, the guidance in MSC/Circ.982 for communications workstations is followed

Declarations are required from the owner, the owner's representative or the shipyard as appropriate relating to the following:

- The sea area or sea areas through which the ship will operate
- The radio installations fulfilling the functional requirement
- The method or methods adopted to ensure the radio equipment required by the Radio Installations Regulations complies with the serviceability and maintenance requirements of these regulations
- The availability, or otherwise, of an emergency supply conforming with the Merchant Shipping (Passenger Ship Construction: Ships of Classes I, II and II(A)) Regulations 1998, or the Merchant Shipping (Passenger Ship Construction: Ships of Classes III to VI(A)) Regulations1998, or the Merchant Shipping (Cargo Ship Construction) Regulations 1997, as amended; and the appropriate requirements in the Radio Installations Regulations 1998

3.3.1 General

Specified drawings (plans of the radio installation) should be available well before the work on a new building or reconstruction of ships or offshore units is started. Insufficient or missing drawings may result in deficiencies during radio survey. For the radio installation the following drawings should be available:

- Antenna drawing
- Radio arrangement drawing
- Wiring diagram

For new buildings, the drawings of the antennae and radio arrangements should at least be of scale 1:50.

Approved **“as installed”** wiring diagram, radio arrangement and antenna drawings should be kept available on board the ship for presentation during radio survey.

3.3.2 Antenna drawings

Antenna drawings should show all antennae seen from fore or aft position, the port or starboard position and from above. This applies to the following antennas:

- All transmitting antennae including the location of any antenna tuner
- All receiving antennas including electronic position fixing system (EPFS) antennae
- Radar antennae
- Satellite communication antennae
- The location of float-free EPIRB's
- AIS antennae

Note: AIS is not part of GMDSS, but the location is required to check safe separation from recognized mobile satellite service antennae.

3.3.3 Changes in the antenna arrangement

Drawings must represent installed equipment.

3.3.4 Radio arrangement drawings (Lay-out of bridge and the communication room if such exists)

These drawings should show the location of the following equipment:

- Controllers for transmitting distress alerts
- VHF radio installations, including any control units
- MF or MF / HF installation, including any control units, NBDP printers etc.
- Satellite communication equipment, including terminals, printers etc.
- Watch-keeping receivers for VHF channel 70, 2187.5 kHz , and HF distress channels in the 4 MHz, 6 MHz, 8 MHz, 12 MHz and 16 MHz bands
- NAVTEX and EGC receivers
- SART's, AIS SART's and EPIRB's (if located on the navigating bridge)
- Portable (two-way) GMDSS VHF transceivers and their chargers
- Emergency light powered from a reserve source of energy to illuminate the mandatory radio equipment
- Battery charger (for the reserve source of energy)
- Fuse box

3.3.5 Wiring diagram

These drawings should show the following connections etc.:

- Antenna connections
- Any connections to ship's internal communications networks (Ethernet, Wi-Fi, WiMax, LTE, UMTS, GSM, VoIP, PBX, fax machine etc.) and GMDSS radio equipment

- Connections to the ship's mains, emergency source of energy, and the reserve source of energy (batteries), and switching systems for all radio- and radio navigation equipment
- Which radio equipment (including emergency light) being connected to each power unit / source
- Fuses for all radio equipment
- Uninterruptible Power Supply (UPS) with all connections and fuses; if installed as power for mandatory radio equipment (block diagram showing how the UPS operates, showing the fuses and switchover connections to alternative power supplies, by-pass switch etc.)
- Any connections (interface connections) between EPFS and the GMDSS radio equipment
- Battery chargers for the reserve source of energy
- Connections to gyro (if applicable)
- Type of cables used in the installation
- Connections to VDR

3.4 INSTRUCTION MANUALS AND PUBLICATIONS

3.4.1 The following up-to-date instruction manuals and publications should be available on board:

- User's manual (in English) for all radio equipment and battery chargers
- Specifications and battery capacity calculations for the installed batteries
- ITU (International Telecommunication Union) publications according to requirements in the Radio Regulations
- Publications as required by UK flag authorities
- The Radio Log Book
- Certificates of Competence of the Radio operators
- Shore Based Maintenance agreement (if appropriate)

3.5 TOOLS AND SPARE PARTS

As a minimum requirement the ship should have the following tools and spare parts readily available on board:

- Spare fuses for all radio equipment, battery circuit and main fuses where safety fuse ("melting" fuse) are used
- Reserve emergency lamps
- Tools necessary for simple servicing
- Acid specific density meter if the ship is fitted with lead acid accumulators
- Multi-meter

Where a ship makes use of the "on board maintenance" method, it should be equipped with extensive test equipment and spare parts which enable maintenance and repairs of all mandatory radio equipment while at sea.

3.6 MAINTENANCE REQUIREMENTS

Ships equipped with GMDSS radio installation should meet specific requirements as to maintenance methods for the radio installation. Irrespective of sea areas, the ship should not leave harbour without being able to transmit distress alert ship-to-shore by at least two separate and independent radio communication systems *(SOLAS, chapter IV/4.1).* SOLAS ships in sea areas A1 and A2 are required to use at least one of the three specific maintenance methods, whereas Convention Ship's in areas A3 and A4 should use a combination of two methods

(SOLAS, chapter IV/15).

3.6.1 Shore based maintenance

- The shipping company (or ship) may have a written agreement with a marine electronic company or be able to present a written declaration/plan showing how shore-based maintenance is to be carried out

  (IMO resolution A.702(17), Annex, item. 3)
- A Radio Safety Certificate issued by an Administration should, in general, be a sufficient proof that satisfied adequate maintenance arrangement has been made

  (*IMO resolution A.702(17))*

3.6.2 At sea electronic maintenance

If the ship-owner chooses at sea electronic maintenance, personnel with necessary qualifications and authorisation for servicing the equipment must be present on board. All necessary technical documentation, tools, instruments and spare parts to enable the maintainer to test, localise and repair all radio equipment must also be available when the ship is at sea *(IMO resolution. A.702(17)).*

3.6.3 Duplication of equipment

The following additional equipment should be installed in sea areas A3 and A4:

- VHF with DSC controller
- Approved satellite ship earth station or complete MF / HF radio telephony station with DSC and NBDP (see notes, IMO resolution A.702(17))

Note: Ships in the A3 sea areas may choose between duplication with either complete MF / HF transceiver or approved satellite ship earth station. Ships in regular trade in sea areas A4 must duplicate with a complete MF / HF installation.

Under SOLAS, ships in sea area A4 which are not in regular trade in that area may duplicate with an approved satellite ship earth station, provided a MF / HF installation is used as main station. This has not been carried into UK legislation and therefore an exemption will be required (see section 1.8)

3.7 SHIP STATION RADIO LICENCE

3.7.1 A ship station radio licence in accordance with the Radio Regulations should be issued to the ship

3.7.2 The licensee (normally the ship-owner) is responsible for applying for a radio licence in due time before the installation takes place

(ITU Radio Regulations, and APPENDIX 18)

3.7.3 Applications should be made directly to the Spectrum Licencing Centre:

http://licensing.ofcom.org.uk/radiocommunication-licences/ships-radio/

Tel: 020 7981 3181 or 0300 123 1000

Fax: 020 7981 3235

Textphone: 020 7981 3043 or 0300 123 2024 –

Please note these numbers will only work with special equipment used by people who are deaf or hard of hearing

Email: spectrum.licensing@ofcom.org.uk

Note: - The Maritime Mobile Service Identity (MMSI) number stipulated in the radio licence should be coded into the DSC equipment.

3.7.4 If a satellite EPIRB is fitted or Personal Locator Beacon carried then it must be coded and registered, see MSN 1816. Accepted UK protocols are:

- UK serialised – where the beacon has a unique serial number;
- UK Maritime Mobile Service Indicator (MMSI) – allocated to the vessel; and
- UK location protocols – for GPS models.

3.7.5 All these identities must be changed when a ship is transferred from another flag, and appropriate steps taken to ensure databases held ashore are kept current.

UK Beacon registry is at MRCC Falmouth:
Tel. +44 1326 211 569 Fax +44 1326 319264

Guidance on UK Beacon registration is contained in MSN 1816.

Note: The Maritime Mobile Service Identity (MMSI) number stipulated in the radio licence should be coded into the DSC equipment, and if appropriate into the satellite EPIRB. If the national authority accepts serial number or call sign for identification of satellite EPIRB's, the correct serial number or call sign must be coded into the satellite EPIRB.

3.8 APPLICATION FOR ACTIVATION OF SATELLITE EQUIPMENT

The licensee is also responsible for registration and service activation of satellite ship earth station(s).

3.9 DE-ACTIVATION OF SATELLITE EQUIPMENT WHEN TRANSFERRING A SHIP TO FOREIGN FLAG

When transferring a ship to a foreign flag, the licensee / ship-owner must inform the appropriate licensing authority immediately concerning de-activation of satellite equipment.

3.10 PERFORMANCE OF SURVEY

Survey of radio installation on SOLAS ships should be carried out in accordance with the rules laid down in SOLAS, chapter I, part B and IMO Res. A. 1140(31) “Survey guidelines under the harmonized system of survey and certification (HSSC)”.

It is important to note the following text in this resolution:

“The survey of the radio installations, including those used in life-saving appliances, should always be carried out by a qualified radio surveyor who has necessary knowledge of the requirements of SOLAS 74, the International Telecommunication Union's Radio Regulations and the associated performance standards for radio equipment. The radio survey should be carried out using suitable test equipment capable of performing all the relevant measurements required by these guidelines.”

It is considered as very important that the responsible radio operators (holding a General Operators Certificate (GOC) or Restricted Operators Certificate (ROC) certificate) are properly instructed and trained in how to use the GMDSS radio equipment on board. The International Convention of Training, Certification and watch-keeping of Seafarers (STCW 2010) requires that the radio operator performing watch-keeping duties should:

- ensure that watch is maintained on the frequencies specified in the Radio Regulations and SOLAS Convention; and
- while on duty, regularly check the operation of the radio equipment and its sources of energy and report to the master any failure of this equipment
- The radio licence, certificate for the radio operator / operators and radio log books, should be checked during the survey.

4 FUNCTIONAL REQUIREMENTS

4.1 GENERAL

4.1.1 SOLAS chapter IV/4.details the Functional Requirements of the GMDSS. The most important requirement is that:
"Every ship, while at sea, shall be capable (except as provided in regulations 8.1.1 and 10.1.4.3), of transmitting ship-to-shore distress alerts by at least two separate and independent means, each using a different radio communication service". It should be possible to initiate such alerts from the position from which the ship is normally navigated.

4.1.2 The satellite EPIRB may be used to meet this requirement if installed close to the navigation bridge or if it can be remotely activated from the bridge

In addition to the above mentioned requirements, it should be possible to initiate the transmission of DSC distress alerts from the navigation bridge on VHF, and also on MF or HF, provided that the MF or HF equipment is obligatory in the trade area(s) of the ship

(SOLAS chapter IV/7 to 11).

4.1.3 All ships should keep continuous watch on VHF channel 70 by use of a DSC receiver.

4.1.4 Ships with MF requirements, see 4.2 and 4.3, should in addition keep continuous watch on MF DSC 2187.5 kHz.

4.1.5 Ships with HF requirements, see 4.2 and 4.3, should in addition keep continuous watch on HF DSC distress and safety channels.

4.1.6 IMO resolution MSC.131(75) requires all vessels to maintain, when practicable, a continuous listening watch on VHF channel 16 until such time as the Maritime Safety Committee may determine the cessation of this requirement.

4.1.7 Watch should also be kept with NAVTEX and / or with an EGC receiver.

4.2 SEA AREAS (DEFINITIONS)

4.2.1 A1 means an area within the radiotelephone coverage of at least one VHF coast station in which continuous DSC alerting is available, as may be defined by a Contracting Government.

4.2.2 A2 means an area, excluding sea area A1, within the radiotelephone coverage of at least one MF coast station in which continuous DSC alerting is available, as may be defined by a Contracting Government.

4.2.3 A3 means an area, excluding sea areas A1 and A2, within the coverage of a recognized mobile satellite service (RMSS) supported by the ship earth in which continuous alerting is available.

4.2.4 A4 means an area outside sea areas A1, A2 and A3.

4.3 EQUIPMENT REQUIREMENTS (INCLUDING DUPLICATION OF EQUIPMENT) FOR SOLAS SHIPS

GMDSS equipment requirements in force for all passenger ship in international trade as well as cargo ships of 300 gt. and upwards in international trade:

(SOLAS IV and IMO resolution A.702(17).

	A1	A2	A3 INMARSAT	A3 HF	A4
VHF with DSC	X	X	X	X	X
DSC watch receiver channel 70	X	X	X	X	X
MF telephony with MF DSC		X	X		
DSC watch receiver MF 2187.5 kHz		X	X		
Ship earth station providing RMSS with EGC receiver			X		
MF / HF telephony with DSC and NBDP				X	X
DSC watch receiver MF / HF				X	X
Duplicated VHF with DSC			X	X	X
Duplicated' Ship to Earth Station (SES) providing RMSS			X	X	
Duplicated MF / HF telephony with DSC and NBDP					X
NAVTEX receiver 518 kHz	X	X	X	X	X
EGC receiver	X[1]	X[1]		X	X
Float-free satellite EPIRB	X	X	X	X	X
SART	X[2]	X[2]	X[2]	X[2]	X[2]
Portable GMDSS VHF transceivers	X[3]	X[3]	X[3]	X[3]	X[3]
For passenger ships the following applies from 1st July 1997					
"Distress panel" (SOLAS chapters IV/6.4 & 6.6)	X	X	X	X	X
Automatic updating of position to all relevant radiocommunication equipment.	X	X	X	X	X
Two-way-on-scene radiocommunication on 121.5 MHz or 123.1 MHz from the navigating bridge (SOLAS chapter IV/7.2)	X	X	X	X	X

1 Outside NAVTEX coverage area.
2 Cargo ships between 300 and 500 gt.: 1 set. Cargo ships of 500 gt. and upwards and passenger ships: 2 sets.
3 Cargo ships between 300 and 500 gt.: 2 sets. Cargo ships of 500 gt. and upwards and passenger ships: 3 sets.

4.3.1 The International Maritime Organization (IMO) has recognised Iridium as meeting the necessary technical criteria of a GMDSS Satellite Service. Iridium has a public Service Agreement (PSA) with the International Mobile Satellite Organisation (IMSO) for GMDSS Satellite Services.

4.3.2 Use of Iridium GMDSS Satellite Services needs an appropriate Iridium GMDSS Satellite Services terminal.

4.3.3 The service has been launched but the Maritime Safety Information (MSI) Services may only be relied upon for safety purposes when declared fully operational by the information provider, that is the NAVAREA or METAREA coordinator. This information will be published by IMO in Global Integrated Shipping Information System (GISIS) or in the interim in a circular where the area service will be declared ‘operational’.

4.3.4 Where the Iridium MSI service is not fully operational, an Iridium GMDSS terminal is not an equivalent for regulatory compliance to an Inmarsat GMDSS terminal capable of receiving MSI via SafetyNet. See MIN 636 as amended.

5 BASIC EQUIPMENT - SUPPLEMENTARY REQUIREMENTS

5.1 GENERAL REQUIREMENTS

5.1.1 Every radio installation should:

- be so located that no harmful interference of mechanical, electrical or other origin affects its proper use

  (SOLAS IV/6.2.1 and MCA Safety Bulletin No.8)
- be so located as to ensure electromagnetic compatibility (EMC) and avoid harmful interference to other equipment and systems
- be so located as to ensure the greatest possible degree of safety and operational availability, with warning notice when appropriate
- be protected against the harmful effects of water, extremes of temperature and other adverse environmental conditions
- be provided with reliable, permanent electrical lighting, which is independent of the main and emergency sources of electrical power for the adequate illumination of the radio controls;
- be clearly marked with the ship's call sign, MMSI number and other identities as appropriate; and
- be so located that no magnetic compass lies within the stated Compass Safe Distance of the equipment

  (IMO resolution A.694(17) item 6.3, and BS EN 60945 item 4.5.3)

5.2 NAVIGATIONAL SAFETY VHF

5.2.1 Control of the VHF used for navigational safety must be available at the conning position (in the front of the navigation bridge), and where necessary, from the wings of the bridge.

5.2.2 Portable VHF equipment may be used to provide navigational safety from the wings of the bridge.

(SOLAS chapter IV/6.3).

5.3 MARKING OF RADIO EQUIPMENT AND NOTICES

5.3.1 All radio equipment should be duly marked with type designation. The marking should be clearly visible when the equipment has been installed.

5.3.2 The radio installation should be duly marked with the ship's call sign, the ship's station identity and other codes applicable for the use of the radio equipment.

5.3.3 DSC operation procedures should be posted near the DSC equipment on the navigation bridge. Emergency procedures should be posted near the relevant equipment on the bridge.

5.3.4 "GMDSS operating guidance for masters of ships in distress situations" and the procedure on "False alerts", both drawn up by IMO, should be posted on the navigation bridge.

(I969E, and I971E)

5.4 EMERGENCY LIGHTS

5.4.1 All mandatory radio equipment should have reliable emergency lighting powered from a reserve source of energy; this is normally the radio batteries. This light should give adequate illumination of the controls for safe operation of the radio equipment, and a working table for reading and writing.

Means should be provided for dimming any light source on the equipment which is capable of interfering with navigation, i.e. by adjustable light or by use of a curtain etc. during night time.

(IMO resolution A.694 (17), item 3.3)

5.4.2 For VHF transceivers located openly in the front of the bridge, a screened light concentrating on each single piece of equipment, should be used. Scale illumination (powered from a reserve source of energy) may be accepted provided it is sufficient for the operation of call control devices both on the VHF transceivers and the DSC controllers.

5.4.3 Ceiling lights may be used for equipment located in a separate radio workstation, providing it is not dazzling the navigator on watch.

5.4.4 The emergency light should have its own fuse circuit and fuses in each circuit. These fuses should be connected before the main fuses in order to prevent a blown main fuse interrupting the emergency light.

5.4.5 Switches for emergency lights must be properly marked.

5.5 RECOMMENDED INSTALLATION

In order to meet all requirements and recommendations concerning the location of all units included in a GMDSS radio installation, it is recommended to establish either a “Communication workstation” in connection with the navigating bridge, or a separate “Communication office” outside the navigation bridge with remote controls on the bridge. It must be emphasised, however, that the suggestions in subsections 5.6 ~ 5.8 below are to be considered as guidelines only. Other solutions and combinations are equally acceptable as long as the general requirements and recommendations outlined are fulfilled.

(SOLAS chapter IV, and ISO 8468: 2007).

5.6 RADIO WORKSTATION

5.6.1 The workstation should be located in the aft of the navigation bridge so that the navigator has an overall view of the navigation while operating the radio equipment. If the workstation and the rest of the navigation on bridge are separated by a wall it must be made of glass or fitted with windows and any door between the workstation and the navigation bridge shall not be lockable

5.6.2 When the workstation is being used during night time, a curtain must be provided in order to avoid dazzle from the lights

5.6.3 All mandatory radio equipment, except mandatory VHF (see section 6.1 item 6.1.1) and Watch Receivers, should be located in the radio work station. Watch receivers may be located elsewhere on the navigation bridge

Note: It is essential that a satisfactory watch using clearly audible signals and visual alarms can be maintained at the position from which the ship is normally navigated. If it is not possible to maintain satisfactory watch, alarm indicators on MF or MF / HF and recognized mobile satellite service equipment, including the EGC printer, equipment must be located outside the workstation area

5.6.4 Acrylic shades (or similar) may be fitted to equipment to aid in maintaining a satisfactory watch provided they do not impede the usability of the equipment.

*(IMO resolution A.664(16) regarding EGC, A.807(19) Annex item 3.2, A.806(19) part D item 8 regarding DSC requirements, and SOLAS 1997 chapter IV/12 regarding watch-keeping requirements).*MF / HF RF power amplifiers should be located in a separate and screened room. Antenna tuners should, as a general rule, be located outdoors below the antenna

5.7 COMMUNICATION OFFICE

5.7.1 The communication office may be located as required by the ship's company, e.g. in connection to the captain's office

5.7.2 It should be possible to make public calls and perform general radiocommunications on MF or HF and / or through satellite from the communication office, if such calls cannot be made from a suitable location elsewhere on the ship

5.7.3 All equipment for written correspondence, as well as telephone services for MF / HF and recognized mobile satellite service, should be located in the communication office

5.7.4 The remote operation panels for the mandatory equipment must be located in a central position on the navigation bridge, in order to fulfil the requirements for transmitting distress alerts from the navigation bridge

5.7.5 Watch receivers and NAVTEX / EGC receivers should be located on the navigation bridge

5.7.6 VHF transceivers with DSC used for navigational safety should be located in the front of the navigation bridge

5.7.7 Note: Consideration should also be given to the requirements for navigational safety communication and subsequent distress communications on MF or HF. When MF / HF DSC is included in the mandatory basic or duplicated radio equipment, it must be possible to conduct distress and safety communications from the navigating position, and the MF / HF DSC controller must be installed in this position

(IMO resolutions A.804(19) and A.806 (19)).

5.8 SHIPS WITH INTEGRATED BRIDGE

5.8.1 Ships constructed with an integrated bridge designed for single manned navigation, should have the control panels for mandatory GMDSS equipment installed as close to the conning position as possible

5.8.2 Equipment for the transfer of radiotelephone calls via radio (VHF, MF or MF / HF) or satellite to other areas of the ship should be placed close to the other GMDSS equipment near the conning position

5.8.3 It should be possible also to operate printed communications (data communications via radio and / or recognized mobile satellite service) from other areas of the ship

5.9 SHIPS WITH INTEGRATED RADIOCOMMUNICATION SYSTEMS (IRCS)

5.9.1 The IRCS is a system in which individual radiocommunication equipment and installations are used as sensors, i.e. without the need for their own control units, providing outputs to and accepting inputs from the operator's position, called workstations. Such workstations are called "GMDSS workstations" if they include control and monitoring of all equipment and installations provided on a ship for the GMDSS which are also suitable for general radiocommunications. The "IRCS workstation" should be installed in a console located in a central position on the navigation bridge. Transmitting and receiving equipment may be located outside the navigation bridge

5.9.2 The IRCS should comprise;

- at least two GMDSS' workstation" each connected to each GMDSS radiocommunication sensor over a network or connection system, and;
- at least two printers should be installed

The IRCS shall conform to all requirements laid down in SOLAS chapter IV

(IMO resolutions A.811(19))

6 GMDSS RADIO EQUIPMENT

6.1 LOCATION OF VHF TRANSCEIVERS AND VHF DSC CONTROLLERS

6.1.1 VHF with DSC, forming part of the mandatory VHF communication equipment for safety of navigation, should be located near the conning position. This equipment may be connected to several remote control units, i.e. on the wings of the navigation bridge, provided that the navigating bridge has priority. Where such “combined” equipment is chosen, it should be possible to transmit DSC distress alert from the conning position

An extra non DSC VHF transceiver with the necessary navigational safety channels, may be located at the “conning position”; when there is a DSC VHF transceiver fulfilling the mandatory requirements centrally located at the “navigation position”

(SOLAS chapters IV/6.3)

Note: The same requirements for the location of equipment apply to the duplicated DSC VHF equipment for ships in sea areas A3 and A4. The duplicated VHF transceiver can; however, be located in the “navigating position” instead of in the conning position

(IMO resolution A.702 (17), Annex item 2.1).

6.1.2 Easy access to the antenna output of each equipment should be provided to facilitate power measurements.

(SOLAS chapter IV/15.2 and IMO resolution A.1104(29)).

6.2 CONTINUOUS WATCH ON DSC VHF CHANNEL 70

6.2.1 Continuous watch on DSC VHF channel 70 can be achieved by:

- a separate VHF channel 70 watch receiver which should not be muted or interrupted when using other radio equipment, or
- a dedicated watch receiver combined with the VHF transceiver which should be installed so as to maintain watch even when the VHF equipment is used for telephony, or
- a VHF transceiver with DSC, permanently locked on channel 70 for reception and transmission of DSC calls only

Note: To deal with other correspondence on other channels for bullet point 3 an additional VHF - transceiver, with or without DSC function, must be installed

(IMO resolution A.694(17) and A.803(19)).

6.3 LOCATION OF MF / HF TRANSCEIVERS

6.3.1 For the MF or MF / HF transceivers chosen to satisfy the mandatory GMDSS requirement;

It must be possible to activate the distress alert from where the ship is normally navigated from; either main or Duplicated Equipment on the mandatory DSC frequencies, for the band(s) covered

(SOLAS chapter IV/9.2)

6.3.2 Where the equipment can be remotely operated from other positions on board the ship, priority should be given to the unit on the navigation bridge

Note: With regard to an MF installation, the requirement for DSC distress alerts on 2187.5 kHz can also be fulfilled by a remote-activated MF control unit locked on 2187.5 kHz with alert activated from the navigation bridge.

Where MF / HF installation is chosen as Duplicated Equipment (MF / HF option) on a ship within A3, there is no requirement for an extra DSC watch receiver

(SOLAS chapter IV/10.3)

6.3.3 RF power amplifiers should not be located in the navigation bridge area unless it can be granted that the EMC requirements are fulfilled

The antenna tuner should be located in an outdoor position below and close to the antenna

(IMO resolution A.813(19))

MF or MF / HF transmitters should be equipped with an instrument or other provisions indicating antenna current or power delivered to the antenna

(IMO resolutions A.804(19) and A.806(19) Annex part B item 6.1)

6.3.4 If the transmitter antenna is not permanently connected to the transmitter then it should be connected automatically before the distress alert is transmitted

6.4 WATCH-KEEPING RECEIVERS FOR DSC

Depending on the operating area and mandatory radio equipment of the ship. A continuous watch is required with dedicated receivers for DSC channel 70 and MF DSC 2187.5kHz; as well as a scanning receiver for MF DSC 2187.5kHz, HF DSC 8414.5 kHz and at least one of the following frequencies, 4207.5 kHz, 6312 kHz, 12577 kHz and 16804.5 kHz

(SOLAS chapter IV/2.1.2, chapter IV/12)

The watch receivers for VHF DSC channel 70, MF DSC 2187.5 kHz and HF DSC scanning receiver must be located so that the alarm is clearly audible and visible all over the navigation bridge

(IMO resolutions A.804(19))

6.4.1 It must be possible to read the DSC alert messages on the navigation bridge

Where the printer (if any) or display is common for all DSC watch receivers the messages coming in simultaneously must be arranged in a queue and printed as soon as the printer / display is ready

(IMO resolutions A.803(19), A804(19) and A.806(19))

6.4.2 The installation should provide easy access to the antenna connector in order to conduct test of the equipment by means of measuring instruments

Note: There is no requirement for a duplicated MF / HF DSC watch receiver for ships in sea areas A3 or A4 when maintenance method “duplication of equipment” is used

(IMO resolution A.702(17) Annex item 2.1).

6.5 WATCH-KEEPING ON MF OR MF / HF DSC

6.5.1 Continuous watch on the MF DSC distress frequency 2187.5 kHz to be achieved by:

- A separate DSC watch receiver locked on 2187.5 kHz, or
- A dedicated watch receiver that is only capable of operation on 2187.5 kHz combined with the MF radiotelephone

Note: If DSC operation is desirable on other frequencies, an additional scanning receiver should be provided. A single DSC decoder may be used to serve both the DSC watch and the additional scanning receiver.

(COM/Circ.105)

6.5.2 Continuous watch on MF / HF DSC distress and safety frequencies to be achieved by:

- A separate DSC MF / HF DSC scanning receiver for distress and safety frequencies only; or
- A dedicated MF / HF DSC scanning watch receiver for distress and safety DSC frequencies only combined with the MF / HF radiotelephone.

(COM/Circ.105)

Note : If DSC operation is desirable on other frequencies, an additional scanning receiver should be provided. The receiver may be combined with the watch receiver for MF DSC. A single DSC decoder may be used to serve both the DSC distress and safety frequency scanning receiver and the additional scanning receiver only if continuous watch for distress and safety calls can be maintained.

(SOLAS chapter IV/10.2.2, 12.1.3).

6.5.3 Watch-keeping on DSC calling frequencies

For watch-keeping on other frequencies than distress and safety frequencies (national and international DSC calling frequencies), a separate scanning receiver should be provided.

6.6 GENERAL RADIOCOMMUNICATIONS

There is a requirement for transmitting and receiving “general radiocommunications”

(SOLAS chapter IV/4.1.8).

6.6.1 Sea area - A2

- Ships in sea area A2 should be able to transmit and receive general radiocommunications on MF or MF / HF telephony or NBDP or via a ship earth station providing a recognized mobile satellite service
- Where a ship relies upon MF telephony to fulfil the “general” and “public” correspondence requirements the installed equipment should be able to call and listen on national and international MF DSC calling frequencies

Note: According to IMOs Performance Standards, Resolution A.804(19) as amended and A.806(19) as amended, DSC equipment should have possibilities as to be used also for “public correspondence”.

6.6.2 Sea areas - A3 and A4

The installed MF / HF or recognized mobile satellite service equipment should also be used for common radiocommunications. In these sea areas the requirements for general radiocommunications or public correspondence are normally fulfilled either by using HF or recognized mobile satellite service equipment.

(SOLAS chapter IV/10.2.4 and 11.1).

6.7 SATELLITE SHIP EARTH STATIONS (SES)

If the equipment is the main station or Duplicated Equipment, it must be possible to activate the distress alert from the navigation bridge.

(SOLAS chapter IV/10.3)

6.7.1 The terminal and telephone, if any, may be placed in a “communication workstation” in connection with the navigation bridge or in a separate “communication office”.

6.7.2 The satellite terminal and / or external printers may also be located elsewhere in the ship.

Note: IMO resolution MSC/434(98) as amended, annex, paragraph 3.3.2 regarding new installations, which has the following text: “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.” is only a requirement for ships which have defined an additional place / room on board to be such “other position”. Normally it will be accepted that recognized mobile satellite service equipment is installed at the communication workstation if it is provided with facilities for conducting distress alerts from the navigation bridge. It is, however, recommended that the recognized mobile satellite service terminal, including additional equipment, should be located on the navigation bridge in order to make it possible to conduct follow-up distress communication from this position.

6.8 CONNECTION OF EXTERNAL LOCATED DATA TERMINAL TO MANDATORY SHIP EARTH STATION PROVIDING A RECOGNIZED MOBILE SATELLITE SERVICE IN THE GMDSS

6.8.1 Where the licensee / ship-owner connects the mandatory recognized mobile satellite service terminal to external non mandatory equipment, i.e. to the ship’s PC-network or to an outside located data terminal.

6.8.2 All mandatory GMDSS requirements in accordance with SOLAS, should always be satisfied.

6.8.3 The dedicated printer should be permanently connected to the output of the mandatory recognized mobile satellite service terminal's printer output.

6.8.4 A manually operated and duly marked switch, located near the recognized mobile satellite service terminal, should be installed to disconnect the recognized mobile satellite service terminal from the external non mandatory equipment.

6.9 EXTRA REQUIREMENTS FOR PASSENGER SHIPS

6.9.1 A distress panel should be installed at the conning position, i.e. within the range of the manoeuvring console in the front of the navigating bridge.

6.9.2 This panel should contain;

- a single button which, when pressed, sends a distress alert using all radiocommunication installation required on board for that purpose, or;
- one button for each individual radio installation
- the alarm should not activate until the button (or buttons) has been pressed continuously for at least 3 seconds.

6.9.3 Means should be provided to prevent inadvertent activation of the button (or buttons) and the transmission of a distress alert should require at least two independent actions; IMO requirements in force from 23rd November 1996.

Note: The use of a spring loaded lid or cover permanently attached by hinges fulfils this requirement.

6.9.4 The Distress Alert panel should clearly and visually indicate whenever any button or buttons have been pressed.

6.9.5 If the installed satellite EPIRB is used as the secondary (mandatory) means of distress alerting and is not remotely activated, it should be acceptable to have an additional EPIRB (406 MHz float-free or manual) installed on the navigation bridge near the conning position.

6.9.6 Information on the ship's position should be continuously and automatically provided to all relevant radiocommunication equipment to be included in the initial distress alert when the button or buttons on the distress panel is pressed. I.e. interface connection from the ship's EPFS receiver should be provided, where EPFS is not integrated.

(SOLAS chapter IV/6.5)

6.9.7 The Distress Alert panel is normally included in the distress panel and should provide visual and aural indication of any distress alert or alerts received on board and should also indicate through which radiocommunication service the distress alerts have been received.

(SOLAS chapter IV/6.6)

Note: The following guidelines (table) should apply with regards to the connection of equipment to the distress panel in order to fulfil the IMO requirements concerning ship-to shore distress alerts by at least two separate and independent means.

Sea areas	**Equipment**
A1	VHF DSC, satellite EPIRB
A1+A2	VHF DSC, MF DSC, satellite EPIRB
A1+A2+A3 (alternative 1)	VHF DSC, MF DSC, RMSS,satellite EPIRB
A1+A2+A3 (alternative 2)	VHF DSC, MF / HF DSC, satellite EPIRB
A1+A2+A3+A4	VHF DSC, MF/HF DSC, RMSS, satellite EPIRB

Note: Only radio equipment according to SOLAS chapter IV are required to be connected to this distress panel to fulfil the requirement for ship-to-shore distress alerts by means of at least two separate and independent means. The Duplicated Equipment, as required by IMO Resolution A.702(17) ships in sea areas A3 and A4, are not required to be connected to the distress panel if it is granted that distress alerts can be transmitted from the Duplicated Equipment in a position close to the installed distress panel.

6.10 NAVTEX AND EGC RECEIVER

6.10.1 The printer for NAVTEX and INMARSAT EGC receiver should be located on the navigation bridge.

6.10.2 In general these receivers should have their own permanent installed power supplies with fuse circuits / fuses, (cf). subsection 9.1 as for other permanent installed mandatory equipment.

6.10.3 Antennae and antennae cable should also be permanently installed.

Note: The mandatory EGC receiver may be combined with INMARSAT equipment. It is recommended that a dedicated EGC receiver is used, enabling continuous reception of MSI (Maritime Safety Information) messages independent of whether the INMARSAT equipment is being used or not. INMARSAT-C includes Class 3 EGC, but the EGC receiver only shares the antenna, otherwise it functions

in parallel with and separate from the INMARSAT-C equipment

(SOLAS chapter IV/7.1.4 and 7.1.5, and IMO Resolution A.701(17)).

6.11 SATELLITE FLOAT-FREE EPIRB

6.11.1 The satellite float-free EPIRB should be located / installed so that the following requirements are fulfilled:

- The EPIRB should - with greatest possible probability - float free and avoid being caught in railings, superstructure etc., if the ship sinks
- The EPIRB should be located so that it may be easily released manually and brought to the survival craft by one person
- The EPIRB should not be located on a radar mast or where it can only be reached by vertical ladder

  (SOLAS chapter IV/7.1.6, 8.1.5.2, 9.1.3.1, 10.1.4.1, 10.2.3.1 and IMO Resolutions A.763(18), A.810(19), and A.812(19))

6.11.2 Where a float-free EPIRB is used to meet the requirement of one of the two pieces of equipment which is capable of transmitting distress alert to shore from or near the navigating bridge of the ship then it must also fulfil the following additional requirements with regards to location / installation:

- The EPIRB should be installed in the vicinity of the navigation bridge, i.e. on the wings of the navigation bridge. A location on the top of the wheelhouse may fulfil the requirement if accessible by stairs

  (SOLAS chapter IV/6). or,
- The EPIRB should be installed so that it has unobstructed hemispherical line of sight to the satellites and be activated remotely

Note: It should be considered that the main function of the EPIRB is float-free activation. If the additional requirements mentioned above cannot be met without reducing the reliability of float-free activation, priority must be given to float-free activation. Alternatively, two float-free EPIRB's should be installed.

- The EPIRB should be equipped with a buoyant lanyard suitable for use as a tether to life raft etc. Such buoyant lanyard should be so arranged as to prevent it being trapped in the ship's structure

  (IMO Resolution A.810(19))
- The EPIRB should be marked with the ship's call sign, serial number of EPIRB, MMSI number (if applicable), 15 Hex ID, and battery expiry date

6.11.3 Guidance on maintenance procedures is contained in MSN 1810

6.12 SEARCH AND RESCUE TRANSPONDERS (RADAR OR AIS)

6.12.1 All SART's should have waterproof marking with operational instructions, battery expiry date and the ship's name and call sign.

6.12.2 All SART's should be provided with a pole or other arrangement compatible with the antenna pocket in the survival craft in order to fulfil the required height of at least 1 meter above sea level.

6.12.3 On ships equipped with free-fall lifeboats and carrying at least two SART's; one of the SART's should be stowed in a free-fall lifeboat and the other located in the immediate vicinity of the navigation bridge so it can be used on board and ready for transfer to any of the other survival craft.

(SOLAS chapter III/6.2.2 and IMO Resolution A.802(19))

6.12.4 In all other cases the SART's should be;

- located on both sides of the ship (preferably visible from the navigation bridge), and attached to wall mounted brackets that permit easy release. It must be easy to take the transponders to the lifeboats or life-rafts, or
- located within all survival craft (normally covered lifeboats), and attached in a location and way permitting the rapid replacement of the transponders into any other survival craft, which may be used in emergency situations

Note: For the bridge location, a visible location inside the navigation bridge, close to the outer doors, is recommended.

6.13 PORTABLE (TWO-WAY) GMDSS VHF TRANSCEIVERS

6.13.1 Obligatory portable VHF transceivers including their emergency batteries (normally primary batteries of Lithium type) should be located in a central and easily accessible position on the navigation bridge.

6.13.2 Where such equipment is placed in a lockable cabinet, it must be possible to get easy access to the portable VHF transceivers without the use of tools.

6.13.3 Primary batteries must be sealed for use only in emergency situations and marked by the supplier with battery expiry date. Note: The battery will be considered as exhausted if its seal is broken, and a new battery will be requested during radio survey, cf. the IMO requirement for 8-hours operation in emergency situations.

6.13.4 Where portable VHF with re-chargeable NiCad batteries (secondary batteries) are used for on-board communications, the chargers for these batteries should be provided *(SOLAS chapter III/6.2.1 and IMO Resolutions A.762(18) and A.809(19)).*

6.13.5 The transceivers should have waterproof marking with the ship's name and call sign.

6.13.6 Channel numbers must be stated on the equipment.

6.14 PORTABLE VHF TRANSCEIVERS AND COMMUNICATIONS FROM THE WINGS OF THE NAVIGATION BRIDGE

6.14.1 Requirements for radiocommunications from the wings of the navigation bridge are laid down in SOLAS. This requirement should be fulfilled by:

- mandatory portable GMDSS VHF (see subsection 6.1), or
- a simplex VHF transceiver (single frequency only), or
- remote controlled units with channel selector, loudspeaker and microphone installed in these positions. These remote controlled units must be controlled by the VHF equipment installed on the navigation bridge

(SOLAS chapter IV/6.3)

6.15 AERONAUTICAL MOBILE EMERGENCY RADIOCOMMUNICATION EQUIPMENT

6.15.1 All passenger ships should be provided with means for two-way, on-scene radiocommunications for search and rescue purposes using the aeronautical frequencies 121.5 MHz and 123.1 MHz from the navigation bridge.

(SOLAS chapter IV/7.2).

- Such equipment should be marked with the ship's name and call sign
- Approved equipment may be of a fixed type or a portable type. The equipment should be provided with the frequencies 121.5 MHz and 123.1 MHz only
- This equipment must be provided with a headset and microphone
- For portable equipment, a primary battery must be marked with expiry date

6.16 EPFS – ELECTRONIC POSITION FIXING SYSTEM

6.16.1 In passenger ships, information on the ship's position should be continuously and automatically provided to all relevant radiocommunication equipment. With such connections the ship's position will be included in the initial distress alerts.

(SOLAS chapters IV/6.5 and V/19)

6.16.2 In cargo ships, where a GMDSS equipment is installed on or after 1st January 2000, automatic updating of the ship's position into the DSC equipment and INMARSAT equipment should be continuously and automatically provided. If such automatic updating is not possible, it is required to enter the ship's position manually into relevant GMDSS equipment at intervals not exceeding 4 hours whenever the ship is under way (SOLAS chapter IV/18).

6.16.3 If the EPFS is connected to the GMDSS equipment, it should (similar to the mandatory GMDSS equipment) be supplied with energy from the reserve source of energy / batteries.

(SOLAS chapter IV/13.8)

6.17 CONNECTIONS OF NAVIGATIONAL SENSORS

6.17.1 EPFS - receiver

- A EPFS receiver must be connected to the relevant radio communication equipment (DSC controller, GMDSS satellite equipment) in order to provide information on the ship's position continuously and automatically to the radio equipment
- This EPFS receiver must (similar to the mandatory GMDSS equipment) also be supplied from the reserve source of energy / batteries

6.17.2 Heading sensor

- If the GMDSS satellite equipment requires automatic antenna adjustment according to the ship's heading, the heading sensor (Gyro) should be connected
- In this case the Gyro should also be supplied with energy from the reserve source of energy / batteries

7 ANTENNA INSTALLATION

7.1 GENERAL

Special attention should be paid to the location and installation of the different antennae on a ship in order to ensure effective and efficient communication. Incorrect installed antennas will degrade the performance of the radio equipment and will reduce the range of radiocommunications.

7.2 RECEIVING ANTENNAS

7.2.1 As a general rule, all receivers including watch-keeping receivers should have their own separate antenna.

7.2.2 Antennae for watch-keeping receivers should be located as far away as possible from MF / HF transmitting antennae in order to minimize receiver blocking.

7.3 LOCATION OF VHF ANTENNAE

7.3.1 VHF antennae should be placed in a position which is as **elevated and free as possible**, with at least 2 metres horizontal separation from constructions made by conductive materials.

7.3.2 VHF antennae should have a vertical polarization.

7.3.3 It is recommended to use double screened cable with a maximum loss of 3 dB.

7.3.4 All outdoor installed connectors on the coaxial cables should be watertight by design in order to give protection against water penetration into the antenna cable.

7.3.5 Ideally there should not be more than one antenna on the same level.

7.3.6 The AIS VHF antenna should be mounted directly above or below the ship's primary VHF radiotelephone antenna, with no horizontal separation and with minimum 2 metres vertical separation. If it is located on the same level as other antennae, the distance apart should be at least 5 metres.

7.3.7 VHF antenna should be installed safely away from interfering high power energy sources like radar, other transmitting radio antennae, e.g. a vertical separation of at least 3 metres from a radar beam.

7.3.8 VHF antennae should be installed a safe distance away from lighting systems using Light Emitting Diodes (LEDs) such as navigation lights, or noisy power supplies and cabling.

7.3.9 The location of mandatory VHF antennae should be given priority compared with mobile telephone equipment antennae. If they are located on the same level, the distance between them should be at least 5 meters.

Note: VHF & AIS reception should not be degraded by the use of navigation lights using LEDs systems. To minimise any potential risk of receiver desensitisation (or

blocking), care needs to be taken when considering the appropriate separation distance between VHF antennae and LED lights and cabling. Additionally the use of shielded LED cabling and EMC power supply filters, should be considered to minimise the separation distance required for good VHF / AIS reception at the edge of coverage.

7.4 LOCATION AND CHOICE OF MF / HF ANTENNAE

7.4.1 The mounting arrangement of the antenna or pedestal must be constructed in order to withstand the strain from swaying and vibration.

7.4.2 Whip antennae should be installed as vertical as possible.

7.4.3 Whip antennae should be located in an elevated position on the ship at least 1 metre away from conductive structures.

7.4.4 Attention must be paid to self-supportive vertical antennae and their swaying radius.

7.4.5 The recommended minimum length of the antenna is 8 metres.

7.4.6 Wire antennae should be protected against breakage by having a weak link installed.

7.4.7 The down lead from the base of the antenna to the antenna tuner should be insulated and run as vertically as possible and not less than 45 degrees towards the horizontal plane.

7.4.8 The transmitting antenna should have an insulation resistance to earth which is recommended to be of more than 50 MΩ in dry weather and of no less than 5 MΩ in humid weather (transmitter to be disconnected when measuring).

7.5 LOCATION OF ANTENNA TUNER FOR MF / HF TRANSCEIVER

7.5.1 The antenna tuner should normally be located externally (out-door) and as close to the antenna as possible, and so that the down lead wire / cable from the antenna should be as vertical as possible.

7.6 SATELLITE COMMUNICATION ANTENNAE

The installation requirements of recognized mobile satellite service antennas are included in appendices 1 and 2.

7.7 ANTENNAE FOR VOLUNTARY RADIO EQUIPMENT

7.7.1 Antennae for voluntary radio equipment may be located on deck, provided its use does not interfere with (or reduce the performance of) the mandatory radio equipment.

Note: When mobile telephone equipment is installed on board ships, special attention should be made to the facts that some types of mobile telephone equipment (e.g. GSM, UMTS & LTE) may interfere with the ship's navigational equipment (especially S band radar, and EPFS) and other electronic equipment.

7.8 INSTALLATION OF COAXIAL CABLES

7.8.1 Coaxial cables should be installed in separate ducting and at least 10 cm away from power supply cables (e.g. power supplies for LED lighting systems).

7.8.2 Incorrect installation of cables may change their characteristic impedance resulting in power reflections, which will attenuate the RF signal and reduce the efficiency of the radio equipment. The following guidelines should be applied to coaxial cables installation:

- Cables should be crossed at right angles
- Where there is one bend in a permanent fixture the bending radius should be 5 times the cables outside diameter
- Where there are several bends, the bending radius should be 10 times the outside diameter of the cable
- When using flexible cable the bending radius should be 20 times the outside diameter of the cable
- For VHF antennae the reflected power should not be greater than 10% of the measured output power

8 ELECTROMAGNETIC COMPATIBILITY (EMC) & SCREENING AND EARTHING

8.1 EMC

8.1.1 General

All reasonable and practical steps should be taken to ensure EMC compatibility between radio communication equipment, navigation equipment and other electrical systems; such as computer equipment, switch mode power supplies and LED lighting systems. All electrical equipment must be installed to ensure compliance with the relevant requirements of chapter IV and V of the SOLAS convention as amended.

In order to avoid interference the following rules apply:

- Radio installations must not cause harmful interference to the ships navigation systems or other electrical equipment
- Navigation lights or other on board lighting systems using Light Emitting Diodes (LEDs) must not degrade radio receiver performance. LED lights can only be located in positions that do not cause harmful interference

  (IMO Resolution A.694(17) and A.813(19)) In order to avoid electromagnetic noise interference it is essential that manufacturers' guidelines relating to EMC, screening and earthing are correctly followed

8.1.2 Voluntary radio equipment

Voluntarily carried non GMDSS radio equipment; such as mobile telephones, radio amateur stations and satellite stations are operated at the discretion of the master. They may be used/installed on the bridge provided that the EMC requirements are fulfilled and navigation and radio communication is not degraded.

8.1.3 Navigation lights and other lighting systems using Light Emitting Diodes (LEDs) have been shown to block VHF / AIS reception.

VHF / AIS coverage should be checked when changes are made to the radio installations to ensure the radio equipment has not become desensitised by low level interference from the vessels electrical systems; particularly after LED lamps are replaced, or changed. Potential interference from LED lighting systems varies greatly between different LED lighting systems; but can also vary between the same models of LEDs (from the same manufacturer). Low level desensitisation of VHF / AIS receivers may not be immediately apparent to the ships radio operator, so it is important that VHF / AIS range is checked after LED lamps are replaced (or changed).

During the radio survey this should be checked by switching on and off the LED lighting system while tuned to a VHF station at the edge of coverage.

Observation of AIS information is more difficult because of the time delay to remove displayed information if no further update is received.

(MCA Safety Bulletin No.8)

8.2 SCREENING OF CABLES

8.2.1 In order to avoid interference the following guidelines should apply with regards to screening of cables:

- Co-axial down leads must be used for all receiving antennae and the coax screen should be connected to ground on at least one end
- All cables within a distance of 2 metres from a transmitting antenna must be screened and the screen properly earthed in a metal tube or duct
- LED cables may need to be shielded and power supplies fitted with noise suppression EMC filters, to ensure radio receiver performance is not degraded. Running RF cables and LED cables in parallel should be avoided where possible.

8.3 EARTHING

8.3.1 Earthing of radio equipment should be carried out in accordance with appropriate guidelines for earthing in maritime installations required in international standards. Confirm the following:

- Each unit of radio equipment must have a separate earth connection
- MF / HF antenna tuners must be earthed with either a copper bar or copper band
- The earthing bar or strap must be as short as possible, should not be more than one metre in length, and should be at least 60 mm in width
- For earthing straps up to 5 metres in length the width should be at least 100 mm (may be relevant on board vessels made of wood or synthetic materials)
- It should be noted that a long earthing strap or bar will act as an antenna and radiate energy
- Copper bars and straps should be brazed to the steel bulkhead in order to eliminate corrosion and vibration and make a good earth connection
- Great care should be taken when earthing radio equipment on ships with aluminium superstructures in order to avoid galvanic corrosion. An approved and acceptable method of earthing should be used on such vessels

Note: Insufficient earthing of the power amplifier may lead to capacitive and inductive connections between power cables etc. and cause interference to fire alarms, navigational equipment, intercom. and other equipment. The transmitter output power may also be reduced.

9 SOURCES OF ENERGY

9.1 MAIN SOURCE OF ELECTRICAL POWER

9.1.1 The main source of electrical power is defined as the ship's mains. All the basic and Duplicated Equipment must have an independent power supply from the ship's mains.

9.1.2 The battery charging arrangement used to charge any batteries associated with the reserve source of energy must also have an independent supply from the ship's mains.

Note: It is not advisable to provide the main source of electrical power to the GMDSS communications equipment through the battery charger. If a fault occurs in the battery charger, which renders it defective, it may not be possible to operate the equipment from the ship's mains. Batteries used in the reserve source of energy will become discharged eventually leading to loss of all power supplies.

(SOLAS chapter II and IMO Resolution A.702(17) Annex item. 2.3).

9.2 EMERGENCY SOURCE OF ELECTRICAL POWER

The emergency source of electrical power is defined as the emergency supply and is usually taken from the ship's emergency generator. SOLAS requirements for the emergency source do not apply to cargo ships of less than 500 gross tonnage (gt). All other SOLAS ships constructed on or after 1 July 1986 are required to have an emergency source of electrical power. It should be observed that the GMDSS requirements concerning the emergency source have been made compulsory only for ships constructed later than 1 February 1995. The emergency source must be adequate to operate both the basic and Duplicated Equipment (if applicable) for the duration as specified in SOLAS chapter II, i.e. 18 hours on cargo ship and for 36 hours on passenger ships.

(SOLAS chapter II-1/42 and 43).

9.3 RESERVE SOURCE OF ENERGY

9.3.1 The reserve source of energy is used to supply the communication equipment in the event of failure of the ship's mains and emergency source of electrical power. It usually consists of rechargeable batteries.

9.3.2 All passenger ships irrespective of size and cargo ships of 300 gt. and upwards should have a reserve source or sources of energy for the operation of the Basic Equipment, and the 'Duplicated Equipment if such equipment is required.

9.3.3 The radio reserve source or sources of energy should meet the requirements set out in regulation SOLAS chapter IV/13, and in IMO Resolutions A.694(17) and A.702(17), as applicable.

9.3.4 The change-over from the ship's mains or emergency supply to the reserve source of energy should be done automatically and in such a manner that both the basic and duplicated communications equipment will be connected simultaneously. Where the change-over is done manually, the switch should be readily accessible to the radio operator, clearly labelled and located on the navigation bridge.

9.3.5 The change-over from one supply to another should not result in the loss of data, stored in memory; or loss of equipment state.

9.3.6 One bank of batteries may be acceptable if the capacity is sufficient to operate both the basic and duplicated radio equipment simultaneously and the gyro (if applicable), EPFS, and emergency lights.

9.3.7 Any fault in the radio batteries or the battery charger should not affect both the basic and duplicated radio equipment and should not prevent the operation of the radio equipment from the ship's mains or emergency supply.

9.3.8 The reserve source of energy must be capable of operating the radio installation for:

- at least 1 hours on ships provided with an emergency supply as outlined in (9.2), which is adequate to operate the radiocommunications equipment for a period of 18 hours on cargo ships and 36 hours on passenger ships; and
- at least 6 hours on other ships

Note: SOLAS, as amended, chapters IV/13.2, 13.4, 13.5, 13.8 and IMO Resolutions A.694(17), A.702(17) – Annex item 2.3

9.4 RESERVE SOURCE OF ENERGY, RADIO BATTERY CAPACITY

9.4.1 When defining the minimum required battery capacity, consideration should be given to the expected extreme temperatures for the location of the battery and reduction of its capacity during its lifetime in addition to the loads which are to be connected to it. The load should also include the gyro, if applicable, EPFS and emergency lights.

9.4.2 The batteries should have enough capacity to operate all the GMDSS radio equipment for the specific times outlined in 9.3.8 above.

9.4.3 Where the basic and duplicated radio equipment cannot be operated simultaneously, the battery capacity should be sufficient to operate the equipment with the highest power consumption for the required period.

9.4.4 Where the basic and duplicated radio equipment are connected simultaneously the battery capacity should be sufficient to meet the average consumption of all connected equipment including any additional loads such as printers, VDU’s etc.

9.4.5 For the capacity requirement of radio batteries to be maintained over their normal life, an extra 40% capacity should be added to the minimum calculated capacity.

9.4.6 When calculating discharge time the following guidelines may be of assistance:

For a lead acid battery:

- the capacity is normally quoted at 20 hours of discharge at an operational temperature of 20 degrees C
- the capacity at 1 hour discharge is approximately 50% of the capacity at 20 hours discharge
- the capacity at 6 hours discharge is approximately 80% of the capacity at 20 hours discharge

For batteries other than the lead acid type:

- the capacity at 1 hour discharge is approximately 60% of the capacity at 10 hours discharge
- the capacity at 6 hours discharge will be approximately 92% of the capacity at 10 hours discharge

9.4.7 The capacity of the radio batteries should be checked at intervals not exceeding 12 months when the ship is not at sea.

Note: One method of checking the capacity is to fully discharge and recharge the batteries using normal operation current over a period of 10 hours. Assessment of the charge condition can be made at any time, but when the ship is at sea it should be done without significant discharge of the battery. Another method could be to check the capacity by means of a battery tester, e.g. in connection with a radio survey (SOLAS chapter IV/13 and IMO resolution A.702(17)).

When determining the battery capacity the following must also be taken into consideration: the battery is normally not fully charged, reduction of capacity due

to ageing, reduction of capacity due to high or low temperatures, reduction of capacity due to rapid discharge.

9.5 RESERVE SOURCE OF ENERGY, RADIO BATTERIES AND INSTALLATION

9.5.1 The batteries should be properly marked with type or construction, rated capacity, and installation date.

9.5.2 The marking must still be visible when the batteries have been installed and during their lifetime.

9.5.3 A label warning of explosion danger should be displayed near the installed batteries.

9.5.4 Any type or construction of batteries (e.g. lead acid, alkaline, maintenance free, traction, semi-traction, etc.) may be used as reserve source or sources of energy, taking into consideration the environmental conditions of the location where they are installed.

9.5.5 The battery should maintain its rated capacity when inclined at any angle up to 22½ degrees in any orientation.

9.5.6 All battery units should be securely braced so that they will not be dislocated by movement of the ship.

9.5.7 An instruction manual which contains all necessary specifications of the batteries should be available on board. The information should include at least:

- capacity and temperature range within which the stated capacity is maintained for the specific operation period i.e. 1 hour or 6 hours;
- charging voltage and current limits in order to keep batteries fully charged while preventing overcharging;
- actual specific gravity of the electrolyte and / or cell voltages or the voltage of the fully charged battery;
- guidelines on how to carry out a controlled discharge test;
- methods of determining the condition of charge of the battery, e.g. check of specific gravity of electrolyte (acid density) or check of battery cell voltage/battery voltages by using an accurate measuring instrument in according with the battery manufacturer’s specifications;
- requirement for ventilation; and
- requirement for maintenance

9.5.8 Equipment requiring a lower voltage than the total voltage of the battery bank should not be connected to a part of the battery bank.

9.5.9 The batteries should be installed in the upper part of the ship, in an elevated position and as close to the radio equipment as possible.

9.5.10 The location of the battery case should in general satisfy the manufacturers' specifications with regards to temperature tolerance and environmental strain in accordance with IEC 60945 or other equivalent standards.

9.5.11 An outdoor battery case location should be avoided because of the considerable temperature variation.

Note: Ideal location for the radio batteries is in a battery room with a constant temperature of approx. 20 degrees C.

9.5.12 Batteries of different types, different cell constructions, different capacities or different manufacturers should not be mixed in a battery bank.

9.5.13 Batteries of different types and different cell construction should not be installed in the same location if they can affect each other.

Note: Exceptionally, to enable the vessel to sail when correct batteries are not available, a mix is permissible (see 1

9.5.14 Warnings and Caution below).

9.5.15 Sufficient ventilation for batteries should be provided, as required by the battery manufacturer.

9.5.16 Electrical installations including battery chargers, located in the battery room should be intrinsically safe.

9.5.17 Sufficient space between batteries or battery banks should be provided in order to enable inspections and maintenance.

9.5.18 The cabling from the batteries should be protected against earth- and short-circuits and be appropriately fused and installed according to recognised international standards (IEC 60092-101 and IEC 60533). Battery cables should have sufficient dimensions to prevent voltage reduction at peak current consumption.

(SOLAS chapter V/13)

9.6 UNINTERRUPTIBLE POWER SUPPLIES (UPS)

9.6.1 A UPS is defined as a device which for a specific period of time supplies continuous power to radio equipment independent of any power failures in the ship's main or emergency source of electric energy. The UPS, installed as the reserve source or sources of energy, should meet the general requirements set out in SOLAS chapter IV/13, and in resolution A.694(17), as applicable, and should also comply with the following requirements:

- Comprise an automatic charger, complying with requirements set out in SOLAS chapter IV/13 and,
- Comprise rechargeable accumulator batteries, complying with the guidelines regarding accumulator batteries
- Provisions should be made for an aural alarm and visual indication at the position from which the ship is normally navigated, indicating any failure in the UPS which is not monitored by the alarm and indicators required by the guidelines regarding automatic chargers
- The UPS should be operational within 5 seconds of switching on
- The UPS should be so designed and constructed that it is protected against damage resulting from disconnecting the batteries or, with the battery disconnected, short-circuiting the UPS battery connections. If this protection is provided by electronic means it should automatically reset following removal of the open or short-circuit conditions

Note: If the UPS does not fulfil the requirements in accordance with SOLAS chapter IV/13 and IMO Resolution A.702(17), two separate UPS systems should be installed; one for the basic radio equipment and one for the Duplicated Equipment.

The capacity of batteries used in the UPS systems is normally stated at a discharge time of 10 hours. When discharging such batteries at shorter time, i.e. 1 hour in accordance with the GMDSS requirements, it will only be possible to utilise approximately 60% of the battery capacity. It is therefore recommended to dimension such batteries to be one and a half times larger than the total load.

9.7 AUTOMATIC BATTERY CHARGERS

9.7.1 Automatic chargers for radio batteries should meet the general requirements set out in SOLAS chapter IV/13 and IMO Resolution A.694(17) and should also comply with the following requirements:

- The charger should be capable of recharging the completely discharged accumulator batteries to the minimum required capacity within 10 hours
- The charger should be capable of keeping the batteries appropriately charged as prescribed by the manufacturer for permanent charging
- The supplied voltage and current should always be within the tolerance limits prescribed by the battery manufacturer, taking into account the environmental temperature of the battery likely to be experienced in a ship
- A protection should be provided against overcharging or discharging of batteries from a possible fault in the charger
- The charger should be provided with a visual indication that it is switched on. An indication of the battery voltage and charge / discharge current should be available on the navigation bridge
- Provisions should be made for an aural alarm and visual indication at the position from which the ship is normally navigated, indicating when the charging voltage or current is outside the limits given by the manufacturer and indicating failure of the mains supply and / or charger
- It should not be possible to disable this alarm and indication and it should only be possible to acknowledge and silence the alarm manually
- Both the alarm condition and indication should reset automatically when normal charging condition has been restored. Failure of the alarm system should not interrupt the charging or discharging of batteries
- The automatic charger should be operational within five seconds of switching on or after a power supply interruption
- The automatic charger should be so designed and constructed that it is protected against damage resulting from disconnection the batteries or, with the battery disconnected, short-circuiting the battery connection. If this protection is provided by electronic means it should automatically reset following removal of the open or short-circuit conditions

(SOLAS chapter IV/13.6.1)

Note: As said in item 9.1 above it is not advisable to provide the main source of energy to the GMDSS equipment through the battery charger. However, if the battery charger is used to supply parts of the GMDSS installation directly, i.e. the MF / HF transceiver, the capacity of the charger should be dimensioned for

simultaneous supply of connected equipment and maintaining a sufficient charging of the batteries in accordance with SOLAS chapter IV/13.2.

9.8 PROTECTION OF CIRCUITS FOR ACCUMULATOR BATTERIES

9.8.1 Battery circuits (i.e. the cables from battery case / room) should be protected against short-circuit and overload. The protection device is to be installed as near as possible to the batteries.

9.8.2 When conductors from the batteries are not protected against short-circuit and overload, they are to be installed so as to be proof against short circuit and earth faults. The requirements for short-circuit protection also apply to charge current circuits.

Note: For certain applications it may be necessary to establish measures which may conflict with these requirements in which case equivalent solutions may be accepted. As an example, screening of battery cables to avoid electro-magnetic interference, e.g. by using single-core insulated cables without screening installed in separate metal pipes which are properly earthed. Special measures should then be established to reduce the possibility of mechanical damage to the cables.

Equivalent solutions may be accepted, e.g. by using double-screened cables in the battery room with explosion-proof fuses. The inner screen should be treated according to Ex-rules, but the outer screen may be treated according to what is necessary to achieve good EMC screening. For example, the outer screen may be earthed at both ends to protect against High Frequency EMC fields.

10 CABLING AND WIRING

10.1.1 All cabling and wiring should be of a type approved and suitable for use on board ships.

10.2 BATTERY CIRCUITS – FUSES AND BREAKERS

10.2.1 Each radio system should have separate fuses for both AC and DC voltages to which it is connected.

10.2.2 AC and DC fuse boards should be located on the bridge or in close proximity to the bridge.

10.2.3 A single fault in one of the power units must not affect both the basic and duplicated radio equipment.

10.2.4 All fuses and breakers must be clearly marked and labelled to clearly indicate which equipment is being protected.

Note: A VHF with DSC, a MF / HF DSC transceiver, a NBDP with printer, and recognized mobile satellite service equipment with a VDU and printer are each considered as a radio system.

Where the radio system requires information from separate navigational sensors, see 6.17, then they should also be considered as part of the system.

11 INSTALLATION OF GMDSS RADIO EQUIPMENT ON BOARD MOBILE OFFSHORE DRILLING UNITS (MODU)

11.1.1 Mobile offshore drilling units should fulfil the GMDSS requirements laid down in IMO's 2009 MODU Code. This revision introduced provisions based on the GMDSS requirements. As a general rule, all GMDSS requirements should be fulfilled. However, for drilling units the requirement for duplication may be considered as fulfilled if the radio installation complies with regulation 11.5.2 of the MODU Code as follows:

- Each unit while stationary at the site, including when engaged in drilling operations, should comply with all requirements prescribed in chapter IV of the SOLAS amendments that are applicable to ship sailing through the same area
- Taking into account the different types of accident which may occur on the MODU, additional radio equipment should be installed in a room or position, which could be the bridge or an emergency control room, situated as far as practical from the radio equipment fitted in compliance with section 11.5.1, so that a single accident in any part of the MODU could not deprive the MODU of all facilities for radiocommunications
- The additional radio equipment should comply with the following regulations of the 1988 SOLAS amendment for MODUs drilling in:

  i sea area A1, the equipment prescribed in regulation IV/7.1.1;

  ii sea area A2, the equipment prescribed by regulations IV/7.1.1 and IV/9.1.1; and

  iii sea area A3, the equipment prescribed by regulations IV/7.1.1 and IV/10.1.1, plus 10.2; or alternatively, as required by regulations IV/7.1.1 and 10.2.1;

  iv sea area A4, the equipment prescribed by regulations IV/7.1.1 and IV/10.2.1

- If the acoustic noise level in a room fitted with operating controls for radio equipment is so high or could be so high, during particular operating conditions, that it may disturb or prevent proper use of the radio equipment then adequate noise protection should be provided by mechanical or other means, in association with the operating controls for the radio equipment

Note: All requirements for chapter IV of the 1988 SOLAS amendments referring to "from the position the ship is normally navigated" should be applied as meaning from a position (or from the positions), which is continuously manned and which is controlling the MODU.

Watch-keeping on DSC and other emergency and calling channels should be kept from a position which is continuously manned.

Watch-keeping and the operation of all radio equipment which are required on board should be carried out by a person holding an ROC / GMDSS radio operator certificate for an A1 installation or a GOC / GMDSS in all other sea areas.

12 WARNINGS AND CAUTION

WARNING

The antennae of operational radio transmitters can pose a serious health risk. If working in the vicinity of any transmitter antenna, adequate precautions should be taken to prevent activation of any equipment noting that an automatic over-ride of the antenna earthing arrangements may well be provided on the ship.

RADIO FREQUENCY HAZARDS

Signs warning of potential hazards from non-ionising radiation shall be prominently displayed at appropriate positions, at safe distances from radio transmitters e.g. satellite earth station radomes, radars and radiocommunications antennas.

WARNING

Use of MF / HF transmitting equipment is prohibited in some locations and when handling some types of cargo. Before any transmitter is used it is essential to obtain confirmation that it is safe and permitted to do so under the prevailing conditions at the time.

WARNING

Before any MF / HF transmitter is used, establish that the antennae are in place and that no hazard is presented to personnel who may be working in the vicinity of the antennae.

CAUTION

Lead acid and alkaline batteries should not be installed in the same compartment, unless the lead acid battery is the sealed type. Exceptionally, to enable the vessel to sail when correct batteries are not available, a mix is permissible. When this exception is exercised, confirm that clear warnings are posted highlighting the need to use separate hydrometers for each type of battery.

Battery compartments / lockers are extremely hazardous and care must be taken when entering or egressing them. Correct PPE must be worn (danger of acid exposure) and ventilation prior to entry must be in place. Refer to section 9.5 for further information.

13 APPENDIX 1
INMARSAT RECOGNIZED MOBILE SATELLITE SERVICE

13.1 GENERAL

13.1.1 In general, satellite antennae should be located so that they have a 360 degrees view of the horizon free of obstructions; ensuring line of sight to the satellite at all times. In practise this can be difficult to achieve due to shadowing from nearby structures. Attention should be paid to the device installation guides provided by Inmarsat.

13.1.2 It is recommended, for INMARSAT-C that communication should be maintained with a satellite elevation of less than **minus** 5 degrees in the fore and aft direction and less than **minus** 15 degrees in the port and starboard direction (relative to the ship's roll, yaw and pitch, and assuming an omni-directional antenna).

13.2 SATELLITE COMMUNICATION ANTENNA INSTALLATION

The following guidelines should be observed in order to fulfil the above recommendations:

13.2.1 The antenna should be located at the top of the radar mast; or

13.2.2 On a pedestal, in the radar mast, or on the top deck so that:

- for directive antennae; shadows from constructions, especially within a distance of 10 metres, is a maximum of 6 degrees;
- for omni-directional antennae; shadows from constructions, especially within a distance of 1 metre, is a maximum of 2 degrees

13.2.3 Antennae must be installed in a readily accessible location.

13.2.4 They should not be located in an area where they can be damaged by heat and smoke.

13.2.5 The satellite antenna must not be located on the same plane as the ship's radar antenna.

13.2.6 GNSS antennae should not be located close to or on the same plane as INMARSAT antennae.

13.2.7 Consideration should be given to installing the INMARSAT antenna on a suitable pedestal.

(IMO Resolutions A.808(19), A.663(16) and A.807(19))

Note: The mast / or pedestal must be constructed so that vibrations are reduced as much as possible.

13.3 SAFE ANTENNA DISTANCES

13.3.1 There is a recommended minimum safe distance between INMARSAT antennae and other antennae and between INMARSAT antennae and the compass:

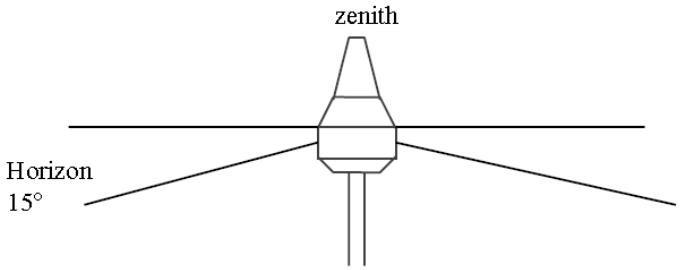
- Distance to the HF antenna should be more than 5 metres
- Distance to VHF and AIS antennae should be more than 4 metres
- Distance to the magnetic compass should be more than 3 metres
- The vertical distance between two INMARSAT-C antennae should be at least 1 meter to eliminate interference

13.4 INMARSAT-C ANTENNA

13.4.1 The antenna should be constructed so as to function up to 15 degrees pitch and roll. In order to obtain this result, the antenna should be located so that no objects or constructions down to 15 degrees below the horizon are degrading the performance of the equipment.

Note: As it may be difficult to fulfil this recommendation fore-and-aft, the free area in this direction may be reduced to 5 below the horizon.

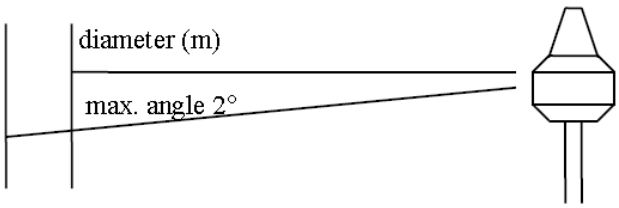
(IMO Resolutions A663(16) and A.807(19)).



13.4.2 Calculation of distance to obstructions.

Where obstructions such as mast, funnel, etc., are unavoidable, the distance to the obstruction should be such that the obstruction only covers a 2 degrees sector.

Note: In such case the safe distance will be the following: 20 x the diameter of the obstruction (in metres).



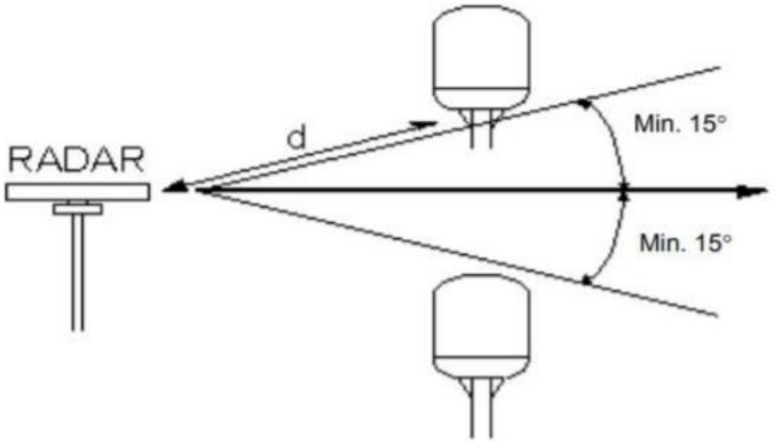
13.5 FLEET SAFETY ANTENNA

13.5.1 Fleet Safety antennas are 2-axis stabilized BGAN antennas varying in size and throughput: FleetBroadband 150, FleetBroadband 250, FleetBroadband 500 and Fleet One.

All FleetBroadband antennas rotate 360° and down to -25° in pitch and roll, to allow for continuous pointing even in heavy sea conditions. Any obstructions within this volume can cause signal degradation.

13.5.2 Obstructions

The antenna should be mounted as far away as possible from the ship's radar and high-power radio transmitters (including other Inmarsat-based systems), because they may compromise the antenna performance. RF emission from radars might actually damage the antenna. Since a radar radiates a fan beam with a horizontal beam width of a few degrees and a vertical beam width of up to +/- 15°, the worst interference can be avoided by mounting the antenna at a different level, i.e. the antenna is installed minimum 15° above or below the radar antenna.



The FleetBroadband antenna itself may also interfere with other radio systems. Other Inmarsat systems and GNSS receivers with poor frequency discrimination are especially vulnerable to the radiation generated by the FleetBroadband antennas.

13.6 ANTENNA CABLE

A coaxial cable for connection between the antenna and terminal is delivered with the system. The manufacturer’s specifications regarding total attenuation and maximum DC resistance (short-circuit in one end) should be complied with. The maximum allowed RF-loss in the antenna cable is 20 dB at 1660 MHz. This is to ensure the performance of the system.

14 APPENDIX 2
IRIDIUM RECOGNIZED MOBILE SATELLITE SERVICE
SYSTEM-SPECIFIC GUIDELINES – OMNIDIRECTIONAL ANTENNA

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

14.1 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, centred at the bottom of the antenna.

14.2 MOUNTING AND INSTALLATION CONSIDERATIONS:

14.2.1 Mount the unit vertically (with the N connector pointing down).

14.2.2 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).

14.2.3 Mount the unit on a rigid structure with a minimum of exposure to vibration and shock.

14.2.4 Mount the unit using either the Bracket Mount or Pole Mount provided by the manufacturer.

14.2.5 Mount the unit outdoor with an ambient temperature between -40°C to +55°C (-40°F to +131°F).

14.2.6 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).

14.2.7 Mount the unit at least 1 m. (3 ft.) away from radio transmitting antennas (VHF, UHF, MF-HF).

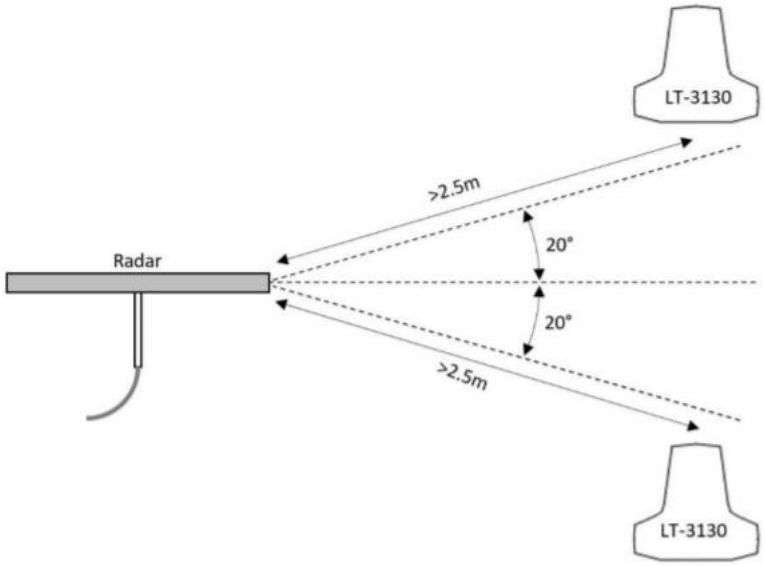
14.2.8 Mount the unit away from Inmarsat and transmitting VSAT antennas.

WARNING: The safety distances from the Antenna Unit are:

100 W/m2	2.0 cm
25 W/m2	4.0 cm
10 W/m2	6.0 cm

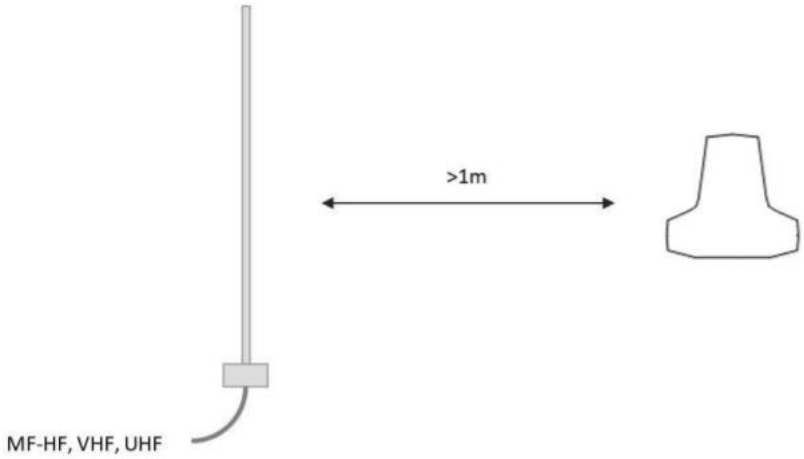
WARNING - Compass safe distance: The compass safe distance f or standard and steering compasses is 0.85 m (2.8 ft) and 0.65 m (2.1 ft) respectively. Observe these distances to prevent interference to a magnetic compass.

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.

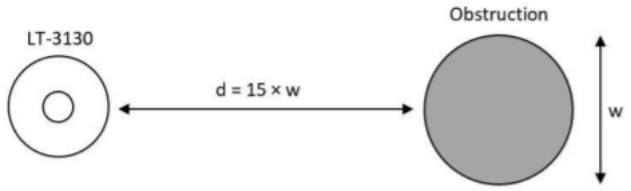


IMPORTANT: Failing to obey the specified installation conditions will void the warranty. However, depending on the specific radar frequency and power level, the separation distance between the radar and the Antenna Unit may be reduced, with no impact on the antenna performance. The performance of the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



14.3 BRACKET MOUNT INSTALLATION PROCEDURE

14.3.1 Fasten the bracket mount to a tube (max. 2.5” tube) by using the two V-bolts and the M8 prevailing nuts.

14.3.2 Screw on the Antenna Unit and secure the antenna lock pinot.

14.3.3 Fasten the coaxial cable to the Antenna Unit (N connector).

14.3.4 Apply self-volcanic tape on the N connector and cable to protect against saltwater and corrosion.

14.4 POLE MOUNT INSTALLATION PROCEDURE

14.4.1 Feed the coaxial cable through the pole mount.

14.4.2 Fasten the coaxial cable to the Antenna Unit (N connector).

14.4.3 Apply self-volcanic tape on the N connector and cable to protect against saltwater and corrosion.

14.4.4 Screw the pole mount (clockwise) on the Antenna Unit, and fasten the antenna lock pinot screw, as illustrated in the manufacturer’s manual.

14.4.5 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.

14.5 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

14.6 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.

14.7 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.

14.8 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.

14.9 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.

DOCUMENT AMENDMENT HISTORY

Version Number	Status / Change	Date	Author Reviewer	Content Approver	Next Review Date/Expiry Date
10.21	• Update with latest IMO, MGN, BSI standards / policies • Update with guidance on Iridium GMDSS on vessels	07/10/21	**Nick Hirst** Senior Policy Lead (Navigation Equipment Technical Standards)	**Richard Bell** Assistant Director – Technical Services Navigation	07/10/2023