SRT Marine

Instruction Manual

# SRT-MTB© Marine Automatic Identification System

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Instruction Manual
# SRT-MTB© Class B Marine AIS

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## General Warnings

All marine Automatic Identification System (AIS) units utilise a satellite based system such as the Global Positioning Satellite (GPS) network or the Global Navigation Satellite System (GLONASS) network to determine position.

The accuracy of these networks is variable and is affected by factors such as the antenna positioning, how many satellites are used to determine a position and how long satellite information has been received for.

It is desirable wherever possible therefore to verify both your vessels AIS derived position data and other vessels AIS derived position data with visual or radar based observations.

The compass safe distance of this unit is 0.5m or greater for 0.3° deviation.

## FCC Compliance

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The SRT-MTB-OEM does not contain any user serviceable parts. Repairs should only be made by an authorized SRT service agent. Unauthorised repairs or modifications could result in permanent damage to the equipment and void your warranty and you're authority to operate this equipment under Part 15 regulations.

## RF Emissions Notice

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This device's antenna must be installed in accordance with provided instructions; and it must be operated with minimum 96 cm spacing between the antennas and all persons body (excluding extremities of hands, wrist and feet) during operation. Further, this transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

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Licensing

IMPORTANT: In most countries the operation of an AIS unit is included under the vessel's marine VHF licence provisions. The vessel on to which the AIS unit is to installed must therefore possess a current VHF radiotelephone licence which lists the AIS system and the vessel Call Sign and MMSI number.

Please contact the relevant authority in your country for more information.

In accordance with a policy of continual development and product improvement the SRT-MTB hardware and software may be upgraded from time to time and future versions of the SRT-MTB may therefore not correspond exactly with this manual.

When necessary upgrades to the product will be accompanied by updates or addenda to this manual.

Please take time to read this manual carefully and to understand its contents fully so that you can install and operate your AIS system correctly.

Information contained in this manual is liable to change without notice.

Software Radio Technology plc disclaims any liability for consequences arising from omissions or inaccuracies in this manual and any other documentation provided with this product.

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## Product Specification

| Parameter | Value |
|---|---|
| Dimensions | 190 x 135 x 83 mm (L x W x H) |
| Weight | 1450g |
| Power | DC (9.6-15.6V) |
| | Average power consumption 4W |
| | Peak current rating 2A |
| GPS Receiver (AIS Internal) | IEC 61108-1 compliant |
| Electrical Interfaces | RS232 38.4kBaud bi-directional |
| | RS422 NMEA 38.4kBaud bi-directional |
| Connectors | VHF antenna connector |
| | GPS antenna connector |
| | RS232/RS422/Power |
| VHF Transceiver | Transmitter x 1 |
| | Receiver x 2  (One receiver time shared between AIS and DSC) |
| | Frequency: 156.025 to 162.025 MHz in 25 kHz steps |
| Output Power | 33dBm ± 1.5 dB |
| Channel Bandwidth | 25kHz |
| Channel Step | 25kHz |
| Modulation Modes | 25kHz GMSK (AIS, TX and RX) |
| | 25kHz AFSK (DSC, RX only) |
| Bit rate | 9600 b/s ± 50 ppm (GMSK) |
| | 1200 b/s ± 30 ppm (FSK) |
| RX Sensitivity | Sensitivity - 107dBm 25kHz (Message Error Rate 20%) |
| | Co-channel 10dB |
| | Adjacent channel 70dB |
| | IMD 65dB |
| | Blocking 84dB |
| Environmental | IEC 60945 |
| | Operating temperature: -25ºC to +55ºC |
| | IEC 62287, Section 5, Cat c) exposed to the weather |

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| Parameter | Value |
|---|---|
| Indicators | Power, TX timeout, status, pre-set SRM sent. |
| Operator Controls | Optional pre-set safety related message (SRM) transmit button |

## Standards

This product complies to all the necessary standards under the European R&TTE directive for Article 3.1(a), 3.1(b), 3.2 and 3.3(e).  The following standards have been followed in pursuance of this:

- IEC62287-1: 2006-03 Maritime navigation and radiocommunication equipment and systems – Class B shipborne equipment of the automatic identification system (AIS) – Part 1: Carrier-sense time division multiple access (CSTDMA) techniques

- IEC60945: 2002-08 Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results

- IEC61162-1: Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 1: Single talker and multiple listeners

- IEC61108-1: GLOBAL NAVIGATION SATELLITE SYSTEMS (GNSS) – Part 1: Global positioning system (GPS) - Receiver equipment - Performance standards, methods of testing and required test results

- EN 301 843-1 v2.1: Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for marine radio equipment and services; Part 1: Common technical requirements

- EN 50383: 2002 Basic standard for calculation and measurement of electromagnetic field strength and SAR related to human exposure from radio base stations and fixed terminal stations for wireless telecommunications system (110MHz – 40GHz)

- EN60950-1:2002 Information technology equipment – Safety – Part 1: General requirements

## Declaration of Conformity

Software Radio Technology plc declares that this product is in compliance with the essential requirements and other provisions of the R&TTE directive 1995/5/EC.

The product carries the CE mark, notified body number and alert symbol as required by the R&TTE directive

The product is intended for sale in the following member states:

Intended Country of Use:

| | | | |
|---|---|---|---|
| GB | FR | ES | SE |
| AT | NL | PT | DK |
| NO | BE | IT | FI |
| IE | LU | GR | CH |

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# Introduction

## How AIS Works

The marine Automatic Identification System (AIS) is a location and vessel information reporting system. It allows vessels equipped with AIS to automatically and dynamically share and regularly update their position, speed, course and other information such as vessel identity with similarly equipped craft. Position is derived from a Global Navigation Satellite System (GNSS) network and communication between vessels is by Very High Frequency (VHF) digital transmissions. A sophisticated and automatic method of time sharing the radio channel is used to ensure that even where a large number of vessels are in one location blocking of individual transmissions is minimised, any degradation of the expected position reporting interval is indicated to the user and even if the unit suffers extreme channel overload conditions it will always recover to normal operation.

## AIS Classes

There are two classes of AIS unit fitted to vessels, Class A and Class B. In addition AIS base stations may be employed by the Coastguard, port authorities and other authorised bodies. AIS units acting as aids to navigation (A to Ns) can also be fitted to fixed and floating navigation markers such as channel markers and buoys.

Class A units are a mandatory fit under the safety of life at sea (SOLAS) convention to vessels above 300 gross tons or which carry more than 11 passengers in International waters. Many other commercial vessels and some leisure craft also fit Class A units.

Class B units are currently not a mandatory fit but authorities in several parts of the world are considering this. Class B units are designed for fitting in vessels which do not fall into the mandatory Class A fit category.

**The SRT - MTB is a Class B unit**

## Position Information Source

As noted above the marine AIS system uses position information derived from networks such as the Global Positioning Satellite (GPS) or the Global Navigation Satellite System (GLONASS) in order to determine the location of the AIS unit and thus the vessel to which it is fitted.

**The SRT- MTB utilises the GPS satellite network.**

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# Installing the SRT-MTB unit

**WARNING:** Do not connect the SRT-MTB unit to a mains (line) AC electrical supply, as an electric shock or fire hazard could result.

**CAUTION:** Do not connect the SRT-MTB unit to a DC supply exceeding 15.6 V or reverse the supply polarity. Damage to the unit may result.

**CAUTION:** The SRT-MTB unit is designed for operation in the temperature range -25 °C to +55 °C. Do not install (or use) the SRT-MTB unit in environments which exceed this range.

**CAUTION:** Do not install the SRT-MTB unit in an environment where it can be subject to excessive exposure to water.

## Electrical connections

**Warning:** Only the RF, data and power cables provided with the SRT-MTB unit should be used to connect antennas, power and display devices so as to maintain the integrity of the enclosure.

Please see the drawings section of this manual for details of the power, data and RF cables supplied.

Remove the top of the transponder unit (eight screws) as shown.

Using the two co-axial leads supplied connect the down-lead from a VHF antenna to the VHF antenna port and connect the down-lead of a GPS antenna to the GPS antenna port. Please see Appendix A for recommendations on antennas and antenna installation.

If an external display unit (chart plotter, PC etc) is to be used connect the supplied power and data interface cable to the Power / NMEA port.

If an external display unit is not to be used connect the supplied power only interface cable to the Power / NMEA port.

Locate the RF, power and/or data cables into the rubber grommets pushing them firmly to the base of each slit. Each cable is pushed into the grommet slit which lies directly in front of the connector the cable is connected to.

GPS Antenna Cable

VHF Antenna Cable

Power Cable (or Power and Data Cable)

Replace the top of the transponder unit taking care to seat the cable grommets and the lid seal correctly. Do not over-tighten the fixing screws.

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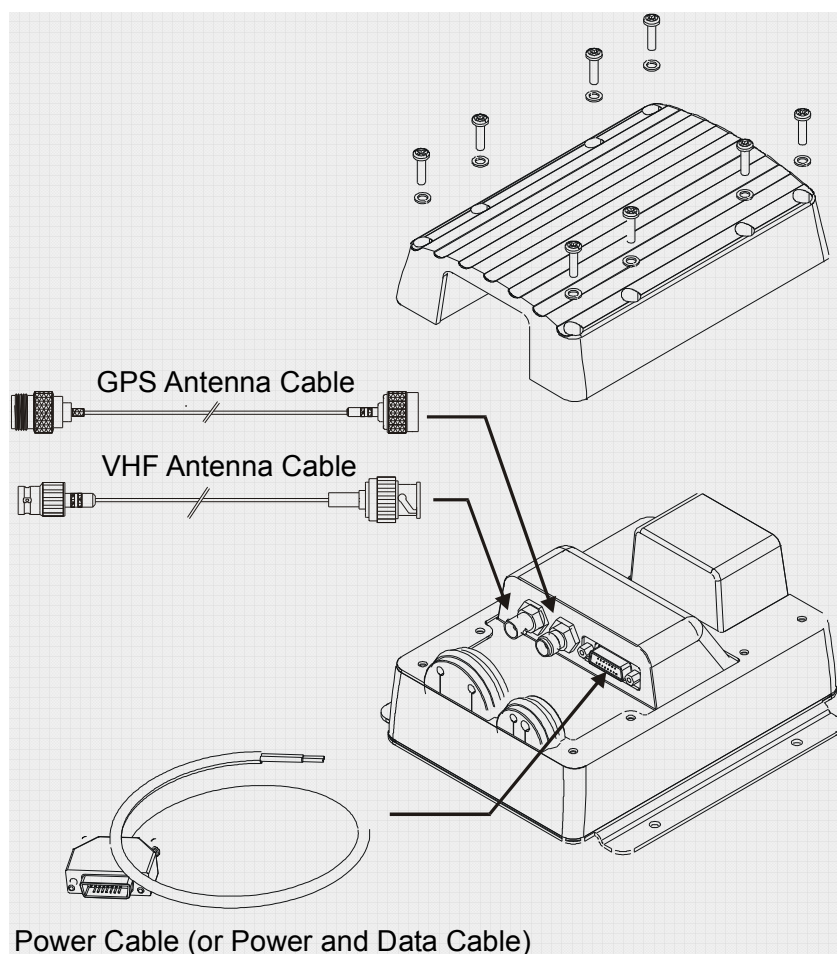
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If an external display unit is to be used (such as a chart plotter, PC serial terminal or other display device) connect the user end of the data interface cable to the display device. Note that the software in the display device must be configured for AIS operation AND to accept standard Class B operation NMEA sentences. This external display unit software is not part of the SRT-MTB transponder package.

Connect a 12V DC supply (9.6-15.6V) capable of supplying 2A peak to the DC power lead (brown/red = positive, black/blue=negative).

**The case of the unit is not isolated from the negative terminal of the supply and therefore it is recommended that the unit is not attached to metal parts of the vessel.**

## Physical Mounting

It is recommended that the unit is attached to a solid wooden surface with 20mm M3 self tapping screws.  A template for drilling pilot holes is shown on page 24.

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# Programming the transponder

## Field Programmer

Before the SRT-MTB can be used it requires 'personalisation'.

This is done via the SRT-MTB proAIS package which is supplied as an accessory.

This software is designed to be installed on a PC and to use the data lead provided as standard with the SRT-MTB unit. If the PC being used for programming does not have a 9-pin serial port then a commercially available USB to serial adaptor may be required. This connects between the supplied data lead and the PC.

The programming process operates as follows:

- A data record is created for an individual SRT-MTB.

- If required this data record is then edited.

- The data record is saved to a data base.

- The SRT-MTB unit is then programmed.

- If required the programming can then be checked by 'reading' the SRT-MTB.

## Data Creation

The SRT-MTB personalisation data required is the ship's MMSI, the ship's name, its dimensions, position reference, type and call sign. The Date Entry function is accessible via the dealer and engineer passwords and personalisation data can be created as follows.

**Direct Entry**         By entering the ship's MMSI, the ship's name, its dimensions, position reference, type and call sign directly into the programming software.

**Read Existing Data**   By reading an already programmed MMSI, ship's name, its dimensions, position reference, type and call sign.

**Read Database**        By reading from a previously created record in the data base the ship's MMSI, the ship's name, its dimensions, position reference, type and call sign.

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## Other features

### Help

There is a context based Help file which explains what each data entry field means and what sort of data is expected. Help is accessible via the dealer and engineer passwords.

### Print

The programmer will print out the information 'Read' from or 'Written' to an SRT-MTB Class B unit.
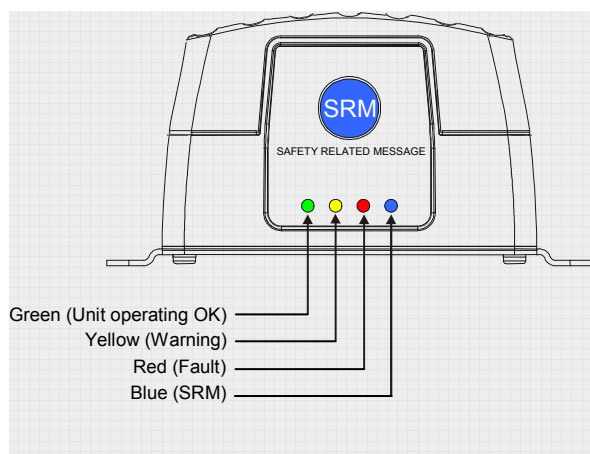
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# Using the transponder

## Switching on



When the 12V supply is switched on all four LEDs visible on the front panel of the unit will illuminate twice for a period of one second on each illumination. The red and blue LEDs will then go out. When the internal GPS starts outputting valid position information and the SRT MTB unit transmits its first position report (message 18) the yellow LED will go out; note that this process may take up to 30 minutes depending on the switch-on state of the GPS receiver. When the yellow LED goes out the green LED will illuminate indicating that the unit is now operating correctly.

## Warning and fault states

If the unit has not been able to transmit a position report during the last expected two reporting intervals (i.e. the nominal reporting interval cannot be maintained for operational reasons such as a Message 23 quiet period, high channel load conditions, etc) the yellow LED will illuminate. This is a warning condition only and indicates that your vessels position is not currently being reported to other vessels. Reception of other vessel AIS information by the SRT-MTB is not affected. When the unit is able to commence reporting the yellow LED goes out.

If a fault occurs the red LED will illuminate. This may illuminate briefly if the power supply is interrupted or if the VHF antenna characteristics are briefly affected.

If the Red LED illuminates continuously the unit should be assumed to be faulty and should either be switched off (power removed) or if this is not practical any other vessel position information derived from the unit should not be used and it should also be assumed that the unit is not transmitting valid position information for your vessel.

The unit should be examined by a competent equipment maintainer at the earliest opportunity.

More details on LED indications can be found in the Operation section of this manual.

## Data port messages

The data port will output the following:

- (At power-up) boot-loader and main application splash text screens including version numbers, and memory status

- Details of relevant AIS transmissions received

- Details of AIS transmissions sent

- Details of channel management messages received

- Alarm messages generated by the BIIT function

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The data port will accept the following inputs:

- Programming information

- Alarm acknowledgements

**Please see the 'Data Interface' section of this manual for more details of the data port messages.**

When in operation an AIS unit:

- Uses one of two VHF channels within the international marine band allocation (channel 87B; 161.975MHz, or channel 88B; 162.025MHz) to regularly transmit information such as the vessel position, Maritime Mobile Service Identity (MMSI), name, speed, course, etc.

- Receives similar information from other AIS equipped vessels within VHF range and outputs that information for use by an external display medium (AIS enabled chart plotter, PC using AIS enabled chart plotter software etc.)

## Information Transmitted and Received

A Class A unit will transmit its IMO number (if known), MMSI, Call sign and Name, length and beam, ship type, time, course over ground (COG), speed over ground (SOG), heading, navigational status, rate of turn, draught, cargo type, destination and safety related messages via a short message service (SMS) facility. Message lengths are variable with static and voyage related information being transmitted less often.

A Class B unit will transmit its MMSI, Call Sign and Name, length and beam, ship type, time, course over ground (COG), speed over ground (SOG) and heading.

## Built In Test

The SRT- MTB unit is equipped with Built In Integrity Testing (BIIT). BIIT tests run continuously or at appropriate intervals simultaneously with the standard functions of the equipment. The BIIT detects any failure or malfunction that will significantly reduce integrity or stop operation of the SRT- MTB unit.

The tests include:

- AIS TX malfunction (synthesiser not locked and TX time-out not exceeded)

- Antenna VSWR exceeds limit

- Rx channel 1 malfunction (synthesiser not locked)

- Rx channel 2 malfunction (synthesiser not locked)

- Internal GNSS not in use

- No valid SOG information

- No valid COG information

- Background noise > -77dBm

- GPS failure

- VSWR exceeding the maximum allowed level

- The input voltage is out of the specified range

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## LED Indicators

**Power**

This is a green LED which indicates, when lit, that power has been connected correctly to the transponder, that the transponder hardware has been configured, that the operating software is present, that the CPU has booted up, the application software is running.

**TX Timeout**

This is a yellow LED which indicates when lit that the CSTDMA transmitter is prevented from transmitting. Reasons for this include the following:

- The transponder's internal GPS receiver is not operating or is not yet ready. [1] requires that a class B CSTMA transponder shall not transmit if its internal position sensor is not operating

- The transponder was unable to transmit an AIS message due to the channel being already occupied, e.g. by transmissions from other AIS transponders

**Error**

This is a red LED which indicates, when lit, one of the following status conditions is possible:

- Transmitter lockout timer (1 second maximum) has operated

- GPS is unable to gain lock after 30 minutes

- VHF antenna VSWR is out of range

- Power supply is out of range

- Background noise level is above the threshold level (-77dBm)

**SRM Status**

This is a blue LED which indicates when lit that the Safety Related Message (SRM) button has been depressed for more than 2 seconds and the pre-set SRM has been sent. If the SRM LED is illuminated it is not possible to send another SRM. An SRM can be sent once a second. The payload within the message 14 transmission is the text string "MAYDAY" by default.

## Antennas

The SRT - MTB unit requires VHF and GPS antennae independent from those in use for other purposes. Please see Appendix A for details of the antennae required.

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## Maintenance

**WARNING:** Unauthorised opening of the SRT-MTB system will invalidate the warranty.

**CAUTION:** Avoid using chemical solvents to clean the SRT-MTB as some solvents can damage the case material.

**NOTE:** The SRT-MTB contains no user serviceable parts. Contact your Service Agent for repair if replacing the fuse fails to make the equipment serviceable.

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# Serial Data Interface

## Power Connection / Data Connection

There is a 15-way D-type male connector mounted under the transponder top cover.  The standard data or power and data cable assembly provided mates with this connector.

**Power**

12V DC (9.6-15.6V) is connected to the transponder power supply input via the cable assembly LD1873.

**Data**

A minimum keypad and display (MKD) unit, chart plotter or other display device may be connected to the SRT-MTB OEM unit via the appropriate cable assembly.  The default baud rate of the data link is 38.4kBaud with 8 data bits, one stop bit and no parity.  No handshaking is used.

The data interface conforms to IEC 61162-1.

VDM, VDO, ACA, ACS, ALR, TXT and ACK messages conform to NMEA 0183. Please refer to NMEA 0183 for full details of these AIS messages.

## Serial Port Input/Output

There are two serial ports, one presenting RS422 format and the other RS232 format. Data can be input from either or both ports.

The serial port interface(s) output:

- At power-up boot-loader and main application splash text screens including version numbers and memory status.

- As a VHF Data Link Message (VDM) all incoming VHF Data Link (VDL) data received by the SRT-MTB.

- The VHF data link own vessel (VDO) messages sent by the SRT-MTB over the VHF Data Link.

- AIS regional channel assignment messages (ACA) received. These are derived from an incoming VHF Data Link message (message 22) or a DSC message.

- AIS channel management information source (ACS) messages.

- Alarm messages (ALR, TXT).

The data interface will accept:

- Personality programming messages

- Alarm acknowledgement messages (ACK)

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## Power up messages

On power up the unit will report details of the firmware versions residing in the unit.

## VHF data link messages (NMEA 0183 VDM)

Receipt of a VHF Data Link (VDL) message on either AIS radio channel causes a VDM message to be output via the data port. Please see IEC 61193-2, Annex B for a list of messages.

**VDM Message Format**

    !--VDM,x1,x2,x3,a,s--s,x*hh<CR><LF>

Where:

- x1 = Total number of sentences needed to transfer the message , 1 to 9
- x2 = Sentence number, 1 to 9
- x3 = Sequential message identifier, 0 to 9
- a = AIS Channel, "A" or "B"
- s - - s = Encapsulated ITU-R M.1371 radio message
- x = Number of fill-bits , 0 to 5

**VDM Message Types**

For example, the information contained in the s - - s portion of the VDM = Encapsulated ITU-R M.1371 radio message. Note that messages 5 and 19 may be sent as multi part messages using the x1, x2 and x3 parameters for message sequence control.

| VDL Message number | VDM Message description |
|---|---|
| **AIS Target Display Information** | |
| 1, 2, 3, 9,18, 21 | position report |
| 4 | base station report |
| 5* | voyage related data |
| 19* | Class B – extended data |
| **Safety message handling** | |
| 12 | addressed safety related |
| 14 | broadcast safety related |
| **External Application handling** | |
| 6 | binary addressed |
| 8 | binary broadcast |

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| VDL Message number | VDM Message description |
|---|---|
| **System control** | |
| 7 | binary acknowledge (INFO) |
| 10 | UTC and data inquiry (INFO) |
| 11 | UTC and data response (INFO) |
| 13 | safety related ack (INFO) |
| 15 | interrogation (INFO) |
| 16 | assignment mode command (INFO) |
| 17 | DGNSS corrections (INFO) |
| 20 | data link management (INFO) |
| 22 | channel management (INFO) |

*Note that messages 5 and 19 may be sent as multi part messages.

## VHF data link own vessel messages (NMEA 0183 VDO)

This message describes the own vessel message being sent.

**VDO Message Format**

!--VDO,x1,x2,x3,a,s--s,x*hh<CR><LF>

Where

- x1 = Total number of sentences needed to transfer the message , 1 to 9
- x2 = Sentence number, 1 to 9
- x3 = Sequential message identifier, 0 to 9
- a = AIS Channel, "A" or "B"
- s - - s = Encapsulated ITU-R M.1371 radio message 4
- x = Number of fill-bits , 0 to 5

| VDO Message number | VDO Message description |
|---|---|
| **AIS Target Display Information** | |
| 13 | Safety Related Acknowledgement |
| 18 | Standard Class B position report (Includes MMSI, SOG, position accuracy, lat, long, COG, true heading,) |
| 24a | Class B "CS" Static data Part A (Includes MMSI and vessel name) |
| 24b | Class B "CS" Static data Part B (MMSI, ship type, cargo type, call sign, ship dimensions) |

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## Regional Assignment Channel Assignment Message (NMEA 0183 ACA)

An SRT-MTB unit can receive regional channel management information in two ways: ITU-R M.1371 message 22 or a DSC telecommand received on channel 70,

**ACA Message Format**

$--ACA,x,llll.ll,a,yyyyy.yy,a,llll.ll,a1,y1y1y1y1y.y1y1,a2,x1,x2x2x2x2,x3,x4x4x4x4,x5,x6,x7,a3,x8,hhmmss.ss*hh <CR><LF>

Where

- x = Sequence Number , 0 to 9

- llll, ll, a = Region Northeast corner latitude – N/S

- yyyyy.yy,a1 = Region Northeast corner longitude – E/W

- llll.ll,a  = Region Southwest corner latitude – N/S

- y1y1y1y1y1.y1y1,a2  = Region Southwest corner longitude – E/W

- x1 = Transition Zone Size

- x2x2x2x2  = Channel A

- x3 = Channel A bandwidth

- x4x4x4x4 = Channel B

- x5 = Channel B bandwidth

- x6 = Tx/Rx mode control

- x7 = Power level control

- a3 = Information source

- x8 = In-Use Flag

- hhmmss.ss  = Time of "in-use" change

## Channel management information source messages (NMEA 0183 ACS)

This sentence is used in conjunction with the ACA sentence and identifies the originator of an ACA message.

**ACS Message Format**

$--ACS,x,xxxxxxxxx, hhmmss.ss,xx,xx,xxxx*hh <CR><LF>

- x = Sequence Number , 0 to 9

- xxxxxxxxx =MMSI of originator

- hhmmss.ss = UTC of receipt of channel management information

- xx  = UTC Day, 01 -31

- xx  = UTC Month, 01 -12

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- xxxx = UTC Year

## AIS Alarm Messages (NMEA 0183 ALR, Text)

**ALR message format**

$--ALR,hhmmss.ss,xxx,A,A,c--c*hh<CR><LF>

Where

- hhmmss.ss = Time of alarm (UTC)

- xxx = Unique alarm number

- A = Alarm condition

- A = Alarm acknowledge state

- c--c = alarm description, text

Alarms descriptions presented are:

- AIS: TX malfunction

- AIS: Antenna VSWR exceeds limit

- AIS: Rx channel 1 malfunction

- AIS: Rx channel 2 malfunction

- AIS: general failure

- AIS: no sensor position in use

- AIS: no valid SOG information

- AIS: no valid COG information

- AIS: 12V alarm

- AIS: 5V alarm

- AIS: Loss of serial interface integrity

- AIS: Background noise above -77dBm

## ACK messages

Can be generated by a minimum keypad and display (MKD) unit, chart plotter or other display device connected to the SRT-MTB to acknowledge an alarm condition reported by the SRT-MTB.

**ACK message format**

$--ACK,xxx*hh <CR><LF>

Where

- xxx = unique alarm number

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# Antenna connections

## GPS Antenna

This is a TNC female bulkhead connector mounted under the unit top cover.  This port provides the 5V DC feed for the active GPS antenna required by the SRT-MTB unit.

## VHF Antenna

This is a BNC female bulkhead connector mounted under the unit top cover.

## Antenna types and mounting

Please see Appendix A for antenna details.

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# Drawings

## Packing list



THIRD ANGLE PROJECTION

| REVISION HISTORY | | | |
|---|---|---|---|
| REV | DESCRIPTION | DATE | APPROVED |
| 1 | PRODUCTION RELEASE | 23/2/06 | |
| 2 | MAGNET PACK REMOVED | 15/6/06 | |

| ITEM | SRT PART No. | DESCRIPTION | QTY |
|---|---|---|---|
| 1 | LD2095 | AIS CLASS B TRANSPONDER UNIT | 1 |
| 2 | NA | POLYTHENE BAG 300 x 300 mm | 1 |
| 3 | NA | SILICA GEL SACHET | 1 |
| 4 | LD2098 | OUTER PACKING CARTON | 1 |
| 5 | LD2099 | INNER PACKING (2 ITEMS) | 1 |
| 6 | NA | CARTON IDENTIFICATION LABEL | 1 |
| 7 | LD2103 | INSTRUCTION MANUAL | 1 |
| 8 | LD2104 | INSTALLATION TEMPLATE | 1 |
| 9 | LD2110 | INSTALLATION DIAGRAM | 1 |
| 10 | LD2111 | UNIT DIMENSIONS DRAWING | 1 |
| 11 | LD2121 | POWER CABLE ASSEMBLY, KIT3 (0.5m LONG) | 1 |
| 12 | LD2134 | MOUNTING SCREW KIT | 1 |

NA = NOT APPLICABLE

| MATERIAL REFER TO LIST | COPYRIGHT THIS DRAWING IS NOT TO BE REPRODUCED WITHOUT WRITTEN PERMISSION FROM SRT PLC | SOFTWARE RADIO TECHNOLOGY PLC WESTFIELD INDUSTRIAL ESTATE MIDSOMER NORTON, BATH, UK BA3 4BS |
|---|---|---|
| | NAME / DATE — DRAWN M. KENDALL 06/15/06 CHECKED | TITLE AIS CLASS B TRANSPONDER PACKED ASSEMBLY |
| FINISH ——— | UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS ANGLES ± 0.5° 0.0 ± 0.2  0.00 ± 0.1 | SIZE A1 / DWG NO LD 2114 / REV 2 |
| | | FILE NAME LD2114-2.dft |
| | | SCALE / SHEET 1 OF 1 |

# SRT Marine

Instruction Manual
## SRT-MTB© Class B Marine AIS

## Fixing Template (NOT TO SCALE)

| REVISION HISTORY | | | |
|---|---|---|---|
| REV | DESCRIPTION | DATE | APPROVED |
| 2 | ANTI-TAMPER DETAIL REMOVED | 16-6-06 | |

MOUNTING HOLES IN BASE PLATE ARE O5.5 TO SUIT M5 SCREWS

MOUNTING HOLE
FIXING CENTRES
TEMPLATE

100,0

FRONT OF UNIT

160,0

| | NAME | DATE | SOFTWARE RADIO TECHNOLOGY PLC |
|---|---|---|---|
| DRAWN | M.KENDALL | 24/2/06 | WESTFIELD INDUSTRIAL ESTATE |
| CHECKED | | | MIDSOMER NORTON, BATH, UK. BA3 4BS |

TITLE AIS CLASS B TRANSPONDER INSTALLATION TEMPLATE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS
ANGLES ± 0.5°
0.0 ± 0.2   0.00 ± 0.1

| SIZE A4 | DWG NO LD2104 | REV 2 |
|---|---|---|
| FILE NAME LD2104-2.dft | | |
| SCALE 1:1 | | SHEET 1 OF 1 |

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## General arrangement

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## Mechanical Breakdown



**REVISION HISTORY**

| REV | DESCRIPTION | DATE | APPROVED |
|---|---|---|---|
| 1 | PRODUCTION RELEASE | 23/02/06 | |
| 2 | ITEM 24 ADDED | 21/03/06 | |
| 3 | ITEM 25 ADDED | 18/04/06 | |
| 4 | MECHANICAL SWITCH DETAIL REMOVED | 15/6/06 | |

THIRD ANGLE PROJECTION

| ITEM | SRT PART No. | DESCRIPTION | QTY |
|---|---|---|---|
| 1 | Ld1999 | COVER | 1 |
| 2 | Ld2002 | COVER GASKET | 1 |
| 3 | Ld2000 | CHASSIS | 1 |
| 4 | LD2097 | PCB ASSEMBLY | 1 |
| 5 | Ld2003 | BASE PLATE GASKET | 1 |
| 6 | Ld2001 | BASE PLATE | 1 |
| 7 | Ld2073 | CABLE GLAND LARGE | 1 |
| 8 | Ld2074 | CABLE GLAND SMALL | 1 |
| — | — | — | — |
| 10 | Ld2039 | PRODUCT SPECIFICATION LABEL | 1 |
| — | — | — | — |
| 12 | NA | M4 x 16mm PAN HEAD CROSS DRIVE SCREW, STAINLESS STEEL 316 | 8 |
| 13 | NA | M4 x 10mm PAN HEAD CROSS DRIVE SCREW, STAINLESS STEEL 316 | 6 |
| 14 | NA | M4 SPRING WASHER, STAINLESS STEEL 316 | 14 |
| 15 | NA | M3 x 8mm PAN HEAD CROSS DRIVE SCREW, STEEL, ZINC PLATE | 6 |
| 16 | NA | M3 PLAIN WASHER, STEEL, ZINC PLATE | 6 |
| 17 | NA | M3 SPRING WASHER, STEEL, ZINC PLATE | 6 |
| 18 | LD2091 | INTERNAL GPS CABLE ASSEMBLY, TNC CONNECTOR | 1 |
| 19 | Ld2092 | INTERNAL VHF CABLE ASSEMBLY, BNC CONNECTOR | 1 |
| 20 | Ld2093 | INTERNAL PARALLEL RIBBON CABLE ASSEMBLY | 1 |
| — | — | — | — |
| — | — | — | — |
| 23 | NA | SUB D CONNECTOR M3 SCREW PILLAR FIXING KIT | 1 |
| 24 | Ld2116 | MEMBRANE SWITCH PANEL ASSEMBLY | 1 |
| 25 | Ld2107 | FRONT LABEL ASSEMBLY (WITHOUT SWITCH) | 1 |
| | | NA = NOT APPLICABLE | |

NOTE: THIS DRAWING SHOWS TWO BUILD VARIANTS.

1. FITTED WITH MEMBRANE ALERT SWITCH PANEL - USE ITEM 24.
2. NO ALERT SWITCH FITTED - USE ITEM 25.

| MATERIAL | COPYRIGHT | SOFTWARE RADIO TECHNOLOGY PLC |
|---|---|---|
| — | THIS DRAWING IS NOT TO BE REPRODUCED WRITTEN WITHOUT PRIOR WRITTEN PERMISSION | WESTFIELD INDUSTRIAL ESTATE MIDSOMER NORTON, BATH, UK. BA3 4BS |

DRAWN: N.V.SMITH 08/15/06

TITLE: AIS CLASS 'B' TRANSPONDER GENERAL ASSEMBLY

| SIZE A1 | DWG NO. LD 2007 | REV 4 |
|---|---|---|

FILE NAME LD2007-4.dft.

SCALE: 0.85:1    SHEET 1 OF 2

REFER TO NOTE

REFER TO NOTE

(COMPONENTS NOT SHOWN)

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## Cable Assemblies
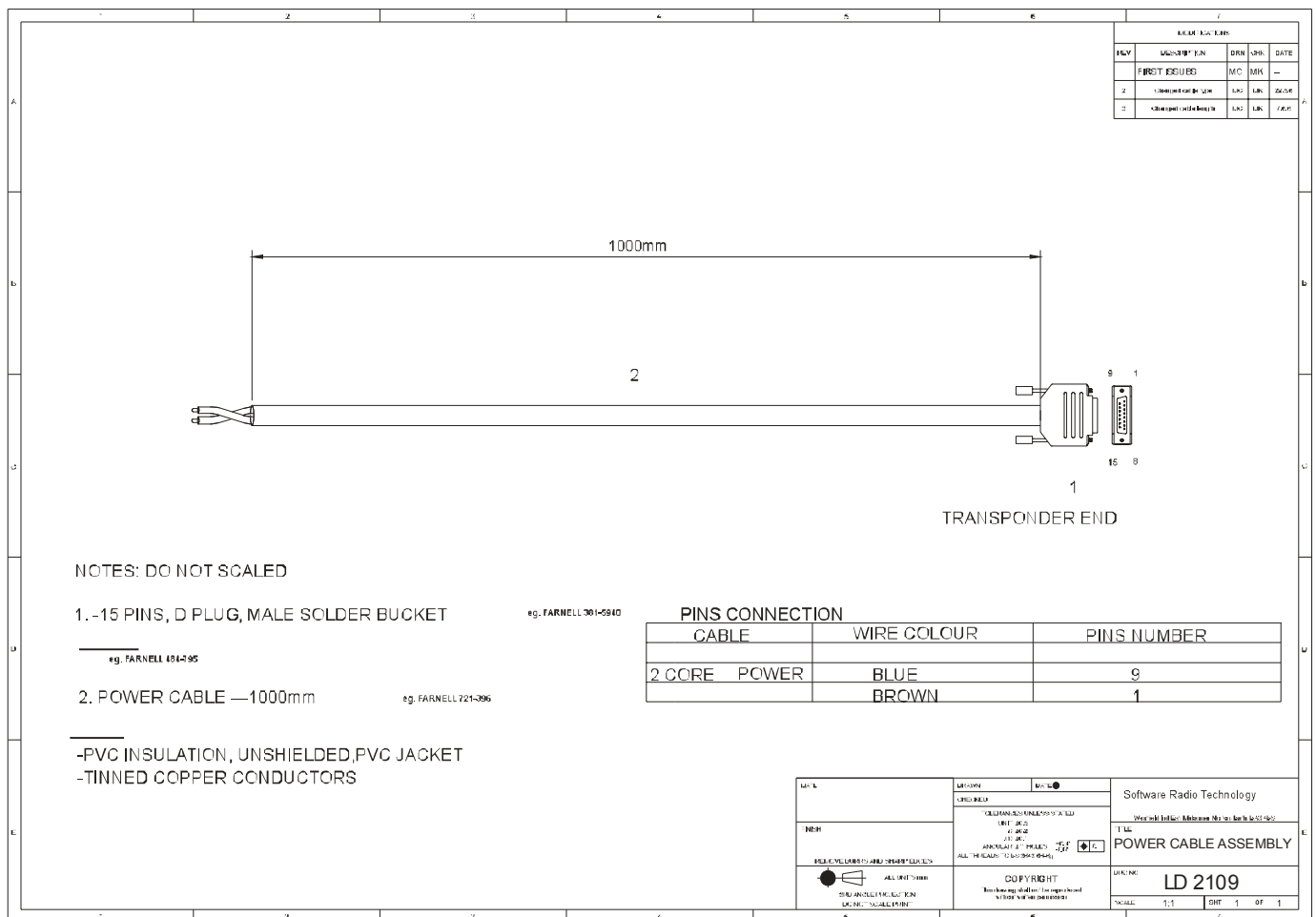
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**MODIFICATIONS**

| | DESCRIPTION | DR'N | CHK | DATE |
|---|---|---|---|---|
| 1 | FIRST ISSUES | | MK | 24-2-8 |
| 2 | ——— | | MK | 21-3-9 |
| 9 | ——— | | MK | 7-8-9 |

1000mm

1

3

4

2

300MM

USER END

TRANSPONDER END
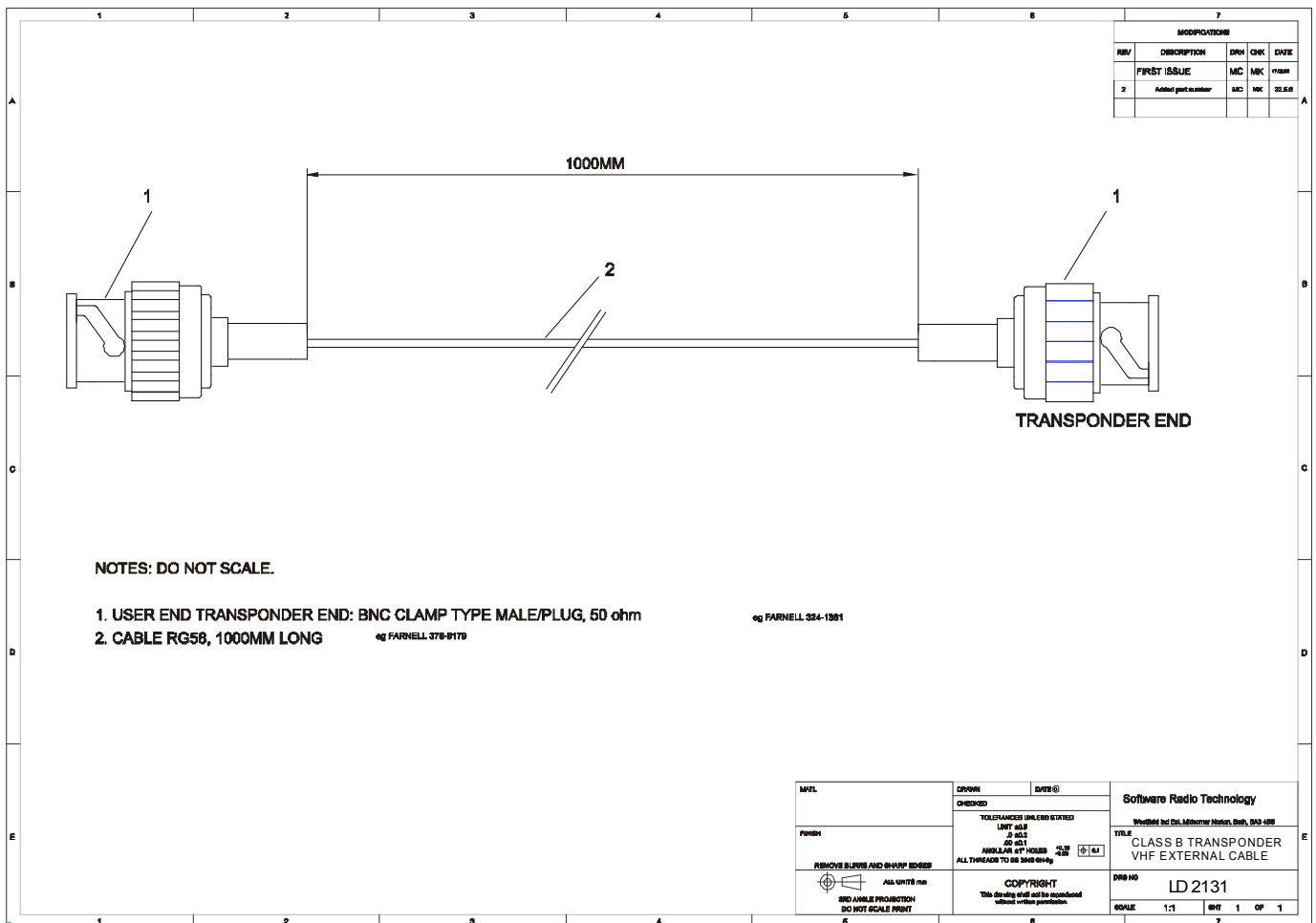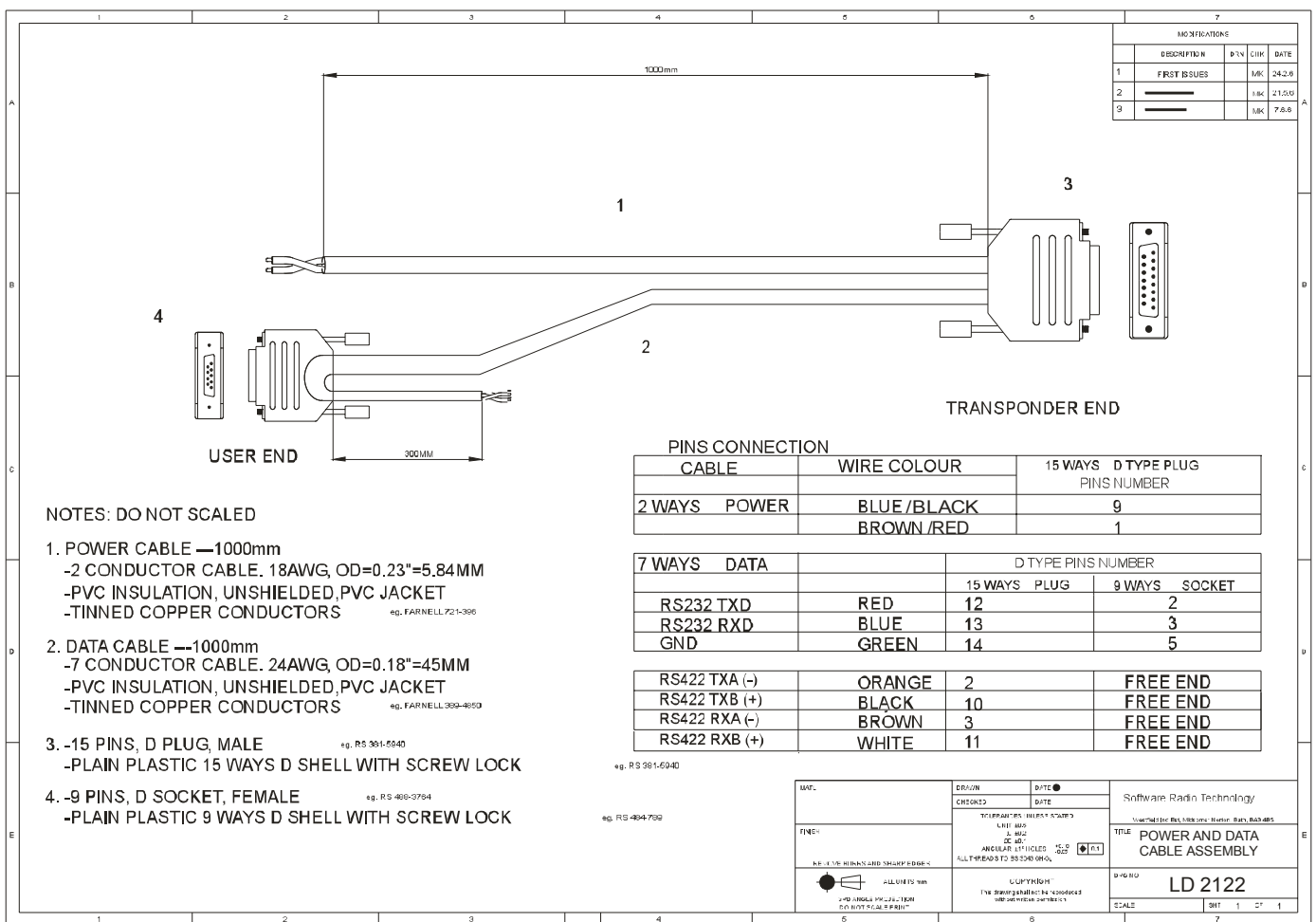
NOTES: DO NOT SCALED

1. POWER CABLE —1000mm
   -2 CONDUCTOR CABLE. 18AWG, OD=0.23"=5.84MM
   -PVC INSULATION, UNSHIELDED, PVC JACKET
   -TINNED COPPER CONDUCTORS      eg. FARNELL 721-396

2. DATA CABLE —-1000mm
   -7 CONDUCTOR CABLE. 24AWG, OD=0.18"=45MM
   -PVC INSULATION, UNSHIELDED, PVC JACKET
   -TINNED COPPER CONDUCTORS      eg. FARNELL 389-4850

3. -15 PINS, D PLUG, MALE      eg. RS 381-5940
   -PLAIN PLASTIC 15 WAYS D SHELL WITH SCREW LOCK

4. -9 PINS, D SOCKET, FEMALE      eg. RS 486-3764
   -PLAIN PLASTIC 9 WAYS D SHELL WITH SCREW LOCK

eg. RS 484-799

eg. RS 381-5940

### PINS CONNECTION

| CABLE | WIRE COLOUR | 15 WAYS D TYPE PLUG PINS NUMBER |
|---|---|---|
| 2 WAYS    POWER | BLUE / BLACK | 9 |
| | BROWN / RED | 1 |

| 7 WAYS    DATA | | D TYPE PINS NUMBER | | |
|---|---|---|---|---|
| | | | 15 WAYS    PLUG | 9 WAYS    SOCKET |
| RS232 TXD | RED | | 12 | 2 |
| RS232 RXD | BLUE | | 13 | 3 |
| GND | GREEN | | 14 | 5 |

| RS422 TXA (-) | ORANGE | 2 | FREE END |
|---|---|---|---|
| RS422 TXB (+) | BLACK | 10 | FREE END |
| RS422 RXA (-) | BROWN | 3 | FREE END |
| RS422 RXB (+) | WHITE | 11 | FREE END |

MAT'L-

FINISH-

REMOVE BURRS AND SHARP EDGES

ALL UNITS mm

3RD ANGLE PROJECTION
DO NOT SCALE PRINT

| DRAWN | DATE ● |
|---|---|
| CHECKED | DATE |

TOLERANCES UNLESS STATED
UNIT. mm
X  ±0.2
XX  ±0.1
ANGULAR ±1° UNLES    ±5' 0
ALL THREADS TO BS 3643 0HOL

**Software Radio Technology**

Wasthall Inc Est, Midsomer Norton, Bath, BA3 4BS

**TITLE** POWER AND DATA
CABLE ASSEMBLY

**DWG NO** LD 2122

| COPYRIGHT |
|---|
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| SCALE | SHT 1 OF 1 |
|---|---|

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## Block Schematics – Radio Frequency Block Diagram



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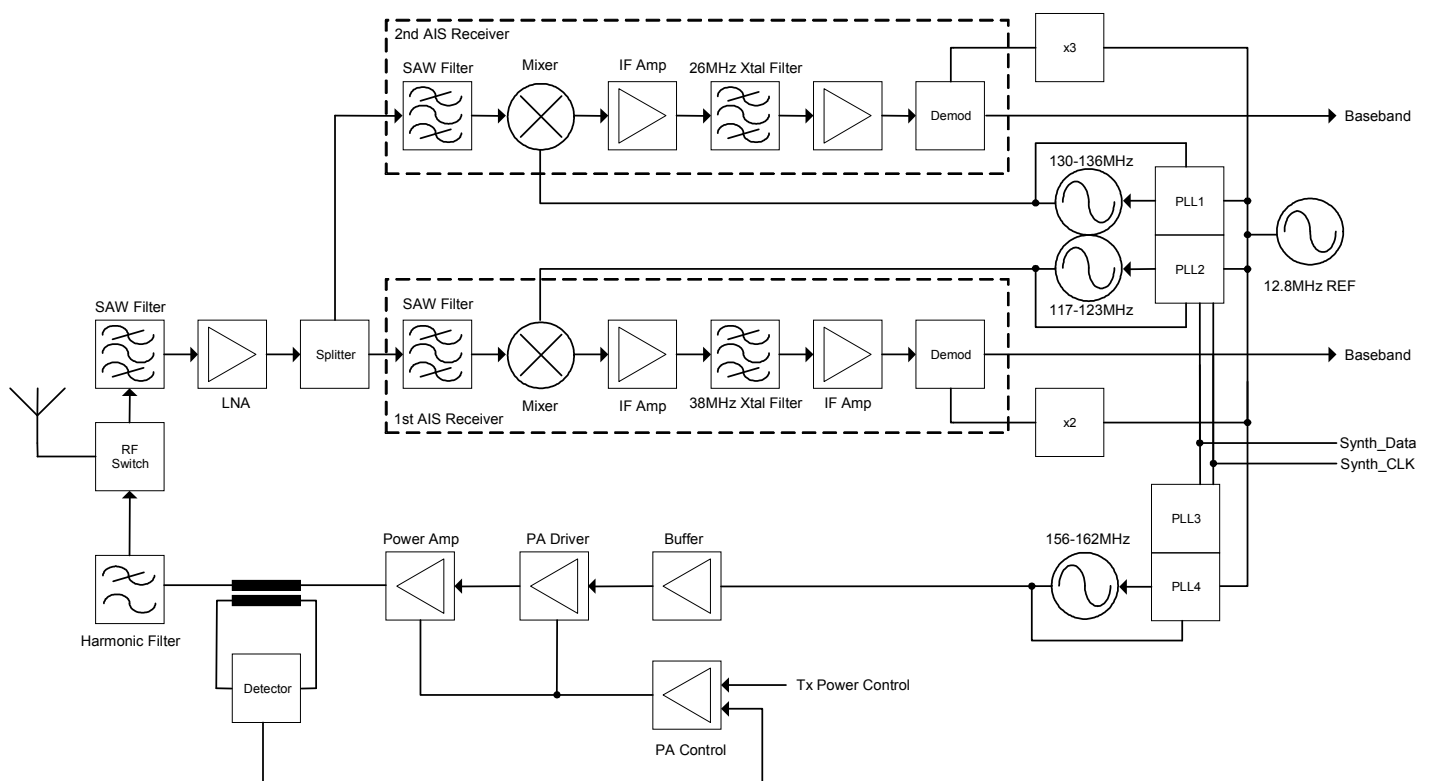
# SRT Marine

## Instruction Manual
## SRT-MTB© Class B Marine AIS

## Block Schematics – Baseband Block Diagram



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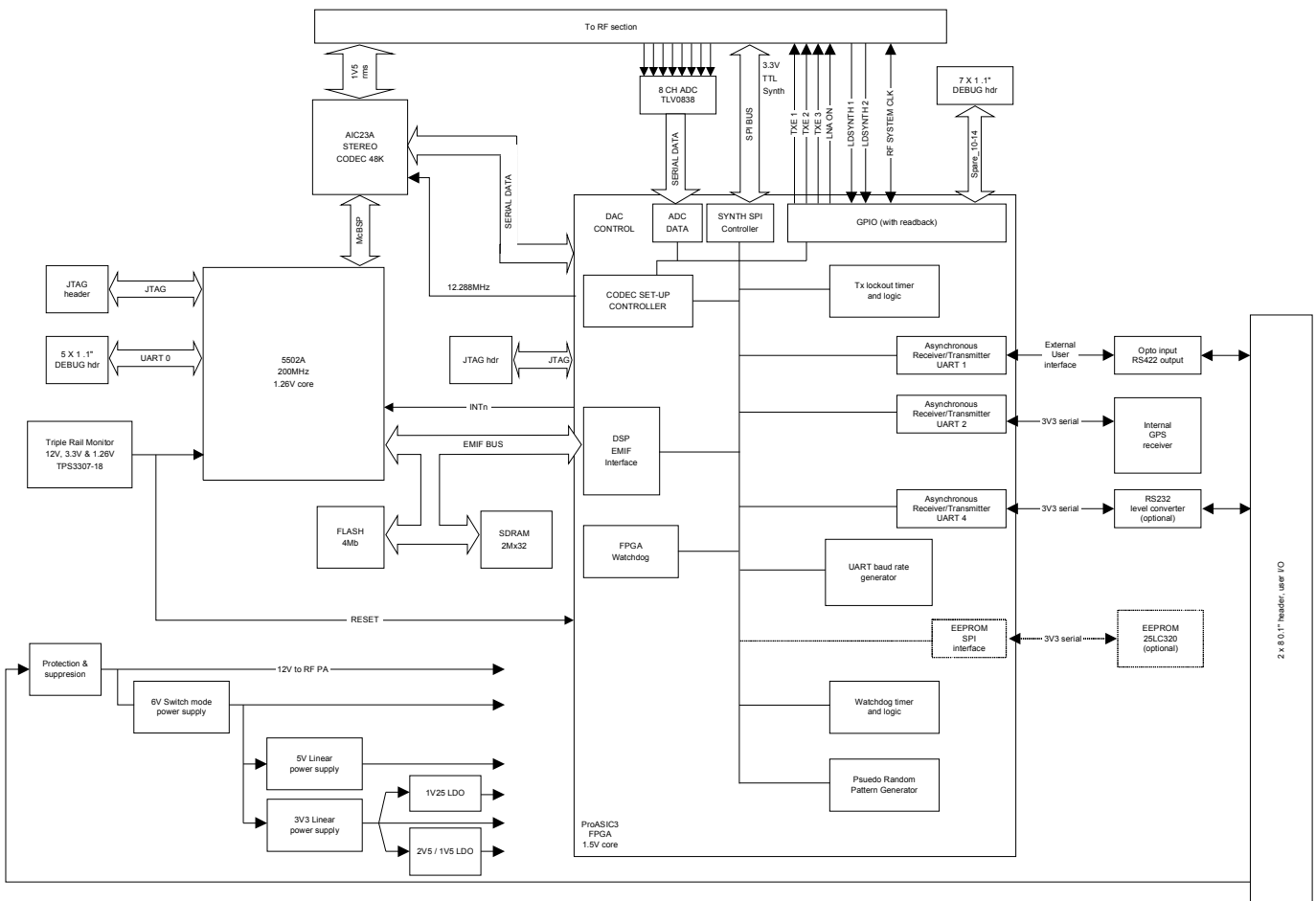
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# Glossary

| | |
|---|---|
| ACA | (AIS) Regional Assignment Channel Assignment Message |
| ACK | Acknowledgement |
| ACS | (AIS) Channel management information source messages |
| AFSK | Audio frequency-shift keying |
| ALR | (AIS) Alarm Message |
| A to N | Aid to Navigation |
| AIS | Automatic Identification System |
| BIIT | Built In Integrity Testing |
| BNC | Bayonet fitting type RF connector |
| CSTDMA | Carrier Sense Time Division Multiple Access |
| COG | Course over Ground |
| CR | Carriage Return |
| CS | Carrier Sense |
| CSTDMA | Carrier Sense TDMA |
| DC | Direct Current |
| DGNSS | Differential Global Navigation Satellite System |
| DSC | Digital Selective calling |
| GLONASS | Global Navigation Satellite System |
| GNSS | Global Navigation Satellite System |
| GMSK | Gaussian Minimum Shift Keying |
| GPS | Global Positioning Satellite / System |
| HF | High Frequency |
| IMO | International Maritime Organization |
| IEC | International Electrotechnical Commission |
| LED | Light Emitting Diode |
| LF | Line Feed |
| LNA | Low-noise amplifier |
| MF | Medium Frequency |
| MKD | Minimum Keypad and Display |
| MMSI | Maritime Mobile Service Identity |

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| | |
|---|---|
| MPE | Maximum Permissible Exposure |
| NMEA | National Marine Electronics Association |
| PC | Personal Computer |
| PI | Presentation Interface |
| RF | Radio Frequency |
| RTCM | Radio Technical Commission for Maritime Services Commission |
| RX | Receive or Receiver |
| RFI | Radio frequency interference |
| SAR | Specific Absorption Rate |
| SMS | Short Message System |
| SOG | Speed over Ground |
| SRM | Safety Related Message |
| SRT | Software Radio Technology |
| TDMA | Time-division Multiple Access |
| TNC | Threaded type BNC connector |
| TX | Transmit or transmitter |
| UTC | Universal Time Co-ordinated |
| VDM | (AIS) VHF Data Link Messages |
| VDO | (AIS) VHF data link own vessel messages |
| VHF | Very High Frequency |
| VSWR | Voltage Standing Wave Ratio |

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# Appendix A

# Antennas and Antenna Mounting

## GPS Antenna

The GPS antenna used must be of the active type (i.e. it should incorporate an LNA) and must be suitable for marine shipboard applications (index of protection, ruggedness, means of mounting, etc.). An antenna should be selected with a gain (in dB) depending on the length of cable between the antenna and the AIS unit; after subtraction of cable and connector losses a minimum total gain of 25 dB should be available at the SRT-MTB unit GPS antenna connector.

The GPS antenna to be used for AIS use must be a dedicated antenna, i.e. not shared with any other GPS receiver.

Installation of the GPS antenna is critical for the performance of the built in GPS receiver which is used for timing of the transmitted time slots and for the supply of navigational information should the main navigational GPS fail. We strongly recommend that:

- The GPS antenna is mounted in an elevated position and free of shadow effect from the ship's superstructure

- The GPS antenna has a free view through 360 degrees with a vertical angle of 5 to 90 degrees above the horizon.

- As the received GPS signal is very sensitive to noise and interference generated by other onboard transmitters, ensure that the GNSS antenna is placed as far away as possible from radar, Inmarsat and Iridium transmitters and ensure the GPS antenna is free from direct view of the radar and the Inmarsat beam.

- It is also important that the MF/HF and other VHF transmitter antennas are kept as far away as possible from the GNSS antenna. It is good practice never to install a GNSS antenna within a radius of 5 meters from these antennas.

## VHF antenna for AIS use

The VHF antenna employed for AIS use:

- Must be a dedicated antenna, i.e. not shared with any other VHF transmitter/receiver.

- Must be suitable for marine shipboard applications (index of protection, ruggedness, means of mounting, etc.)

- Should be omni-directional and vertically polarised with unity gain (0 dB) with a bandwidth sufficient to maintain VSWR <1.5 over the frequency range 156 – 163 MHz. As a minimum the 3dB bandwidth must cover the two AIS channels and the DSC Channel.

- Should be mounted with at least a two metre vertical separation distance from any other VHF antenna used for speech or DCS communication but see also the section "Radio Frequency Exposure Warning" below.

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## Warnings

**VHF Antenna Connection**

Connecting a badly mismatched VHF antenna, leaving the VHF antenna port disconnected, or shorting the VHF antenna port will activate the VSWR alarm, cause the unit to stop sending position reports or cause damage to the transponder.

**Radio Frequency Exposure**

To meet the requirements for Radio Frequency Exposure it is necessary to install the VHF antenna correctly and operate the AIS equipment according to the instructions.

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