

**Matsutec<sup>®</sup>**

**CLASS B AIS TRANSPONDER**

**HA-102**

**OPERATOR'S MANUAL**

CLASS B AIS TRANSPONDER HA-102 **INSTRUCTION MANUAL**

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## **1. General s**

This manual covers all information about interface, electrical and mechanical data related to research and design, so as to make users have more overall understanding about product's performance and make good use and maintenance of the product.

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## **2. PRODUCT INTRODUCTION**

### **2.1 APPLICATION**

Class B "CS" AIS can make ships have effective voyage and improve safety and operation of Vessel Transportation Management System.

Class B AIS can provide correct and latest datum automatically and continuously between ships.

- Collision Avoidance
- Method for getting ships datum
- VTS tool

Class B AIS transponder can be interoperable or compatible with Class A or Class B mobile equipment on VHF Data Link of AIS Channel. And Class B AIS transponder can receive datum from other equipment or be received, but no damage to the completion of VHF Data Link on AIS channel.

### **2.2 Operation Principle**

Using TDMA Technology, auto-transmit for ship' s statistic and dynamic datum to others (ships or base stations), receiving and dealing calls and safety datum. Consist of one transmitter, two receivers and one inner GNSS receiver.

AIS Class-B system block diagram see Figure 1.

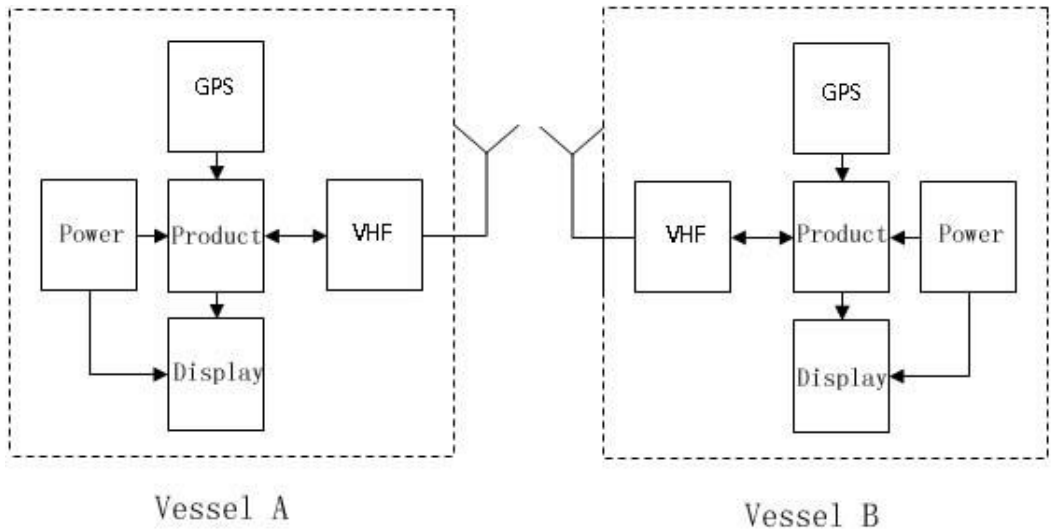


Figure 1 AIS Class-B AIS system Block Diagram

### 3. Functions and Features

#### 3.1 Main Functions:

1. Power supply:

Power supply: Rated Voltage: +12VDC

Extreme Voltage: +9.6VDC, +15.6VDC

2. Electrical functions are in accordance with IEC 62297-1
3. Dual Channel function: Two TDMA receivers are receiving datum in two independent channels at the same time and one TDMA transmitter is transmitting in two independent channels alternately
4. CSTDMA function can avoid and solve communication conflict.

5. Transponder has external serial data interface (RS-232).
6. Transmit and receive safety message
7. Support two operation mode, Carrier-sense mode, assigned mode.
8. Internal GPS receiver, as data source for positioning, COG and SOG.
9. Led indication for power, transmit, receive channel.
10. Transmitter power:2W

## **3.2 Technical features**

1. Using first-class single-board solution with optimized hardware and software.
2. Use cast aluminum cabinet structure to meet the relevant requirements of IEC 60945-2002 standard to ensure normal work in harsh environments.
3. Can be connected to all devices compatible to GPS and PC, PDA with reasonable configuration, fully compatible with General-purpose ECDIS.
4. SRM button in the front panel, in emergency situation, send safety message to around AIS ships and base stations by press it.

## **4. Installation**

### **4.1 Safety**

Before install and operate the device, anyone in connection with the installation, operation and maintenance should know the following points:

- 1) In order to ensure safe operation, please operate the device in allowance working environment, if you have any special requests, please contact our service center, we will try our best to meet your requirements. (Please don't make changes without authorization, otherwise there can be dangerous).

2) This device uses 12V supply voltage. Before put through device power supply, confirm DC supply voltage in normal state, don't hot-plug device, otherwise internal circuits and chips might be burned out.

3) This device is a power radio transmitter, 20cm above from users and other personnel to the installation location of transmitting antenna to avoid device's radiation. During device running, do not use any part of the body to touch transmitting antenna directly, so as to avoid burns.

4)The installation and working temperature range of this device is -20°C~+55°C. During the usage, don't exceed that range.

5)This transponder has waterproof function, but it should not be used inside water.

6)Since it's possible for ship's body to be electrified, please don't touch ship's metal frame or metal shell during installation and use.

7) Prevent installing and testing this device during thunderstorm weather. In frequent thunderstorm area, need to use lightning rod, arrester and other equipment to avoid the device being struck by lightning.

## **4.2 Installation**

### **Before installation, read safety 4.1 carefully.**

AIS product includes AIS transponder, GPS antenna, VHF antenna and cables.

Connection diagram is as Figure 2.

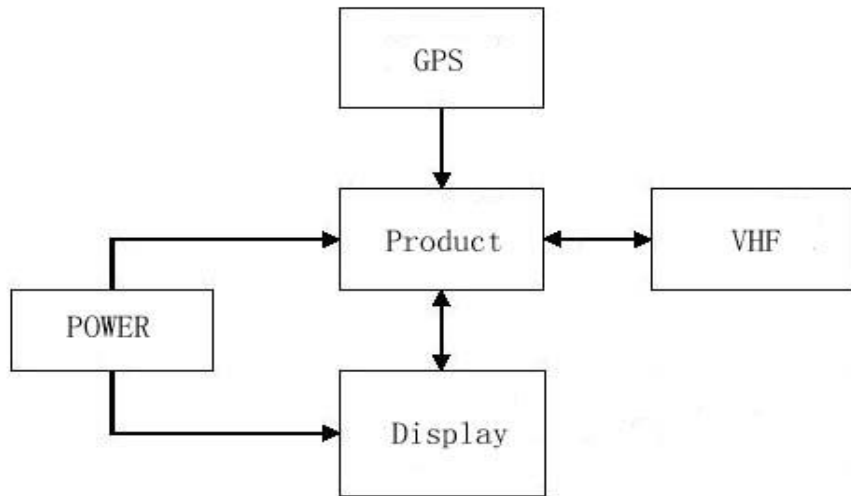


Figure 2 Connection Diagram

Installation steps are as follows:

During the installation of GPS antenna, after fixing the GPS antenna, connect TNC plug of GPS feed cable to transponder's TNC socket. Pay attention to the following points during the installation of GPS antenna:

- ① Each GPS antenna can only connect to one AIS device, cannot be shared with other devices.
- ② GPS antenna should be fixed to railing of platform above bridge, and ensure no block by other buildings or metal things to avoid affecting normal reception of GPS signal
- ③ GPS antenna is a 360° omni-directional one, the angle with horizon is 5°~90°.  
Since GPS signals are very sensitive to noise and interference, so GPS antenna should be as far away as possible from radar, laser and other transmitting facilities and antenna.
- ④ The distance between GPS antenna, VHF antenna and other antennas should be 3M above.

1. During the installation of VHF antenna, after fixing the VHF antenna, connect N plug of VHF feed cable to transponder's N socket. Pay attention to the following points during the installation of VHF antenna:

① Each VHF antenna can only connect one AIS device, can not be shared VHF antenna with other devices.

② VHF antenna should be fixed to railing of platform above bridge, should ensure VHF antenna as high as possible(no over mast height) and ensure no block by other buildings or metal things to avoid affecting normal reception of VHF signal

③ VHF antenna should be placed vertically with horizon.

④ The distance between VHF antenna and other antennas should be 2M above.

⑤ When install the VHF antenna, first connect VHF antenna with feed cable, then set waterproof sleeve in bottom connection of VHF antenna, finally wrap connection seamless with waterproof adhesive tape.

⑥ Put insulation plastic sleeve on a fixed pole(Don't scratch the insulation plastic sleeve), due to the fishing vessels is possible to be electrified, so the insulation plastic sleeve play insulation role with ship body.

⑦ Using metal clamp to fix antenna vertically at a fixed rod, clamp fixed location should be on the metal parts at antenna bottom, prevent fixing on upper part of white glass fiber VHF antenna installation diagram shown in Figure 3.

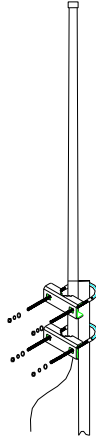


Figure 3 VHF antenna installation diagram

2. Installation steps are as follows:

① Using self-tapping screws to fix the transponder on bridge table or waterproof wall of wooden boat.

② Make good connection with transponder according to first GPS antenna, VHF feed cable afterwards, finally power/data cable plugs.

4. Connect the power/data cable plug to 12V DC power supply, the red wire to the power positive, black wire to power negative.

Now all the installations are completed.

## 5. Structural characteristics、 Configuration、 Interface descriptions and electrical performance specification

### 5.1 Structural characteristics

Volume and Quality

- ① Dimension: 205.5 mm×170mm×49.5mm (L×W×H);
- ② Weight: 1.1kg。

### 5.2 Configuration

Table 5-1: AIS transponder configuration

No	Item	Quan
1	Transponder	1 set
2	Power/Data Cable	1 pc
3	User' s manual	1 pc
4	Accessory Part	1 pc

\*GPS antenna, VHF antenna and cables are optional.

### 5.3 Panel and Interface Descriptions

#### 5.3.1 Led Indication

- 1 — Green: Work state indication
- 2 — Yellow: Receive indication of Channel A
- 3 — Blue: Receive indication of Channel B
- 4 — Red: Transmit indication

### 5.3.2 Detailed description of interfaces

- DC interface (Figure 4)

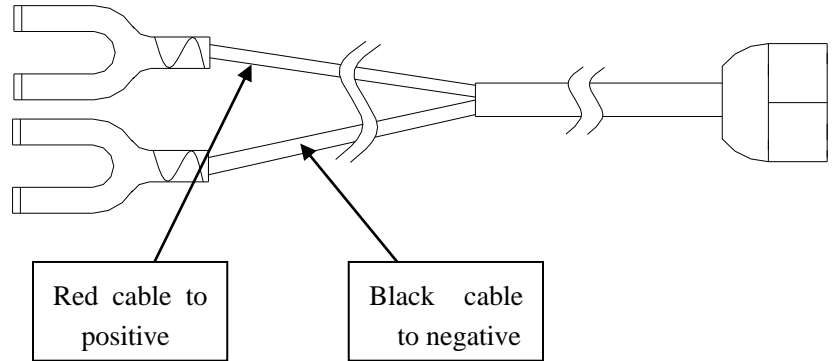
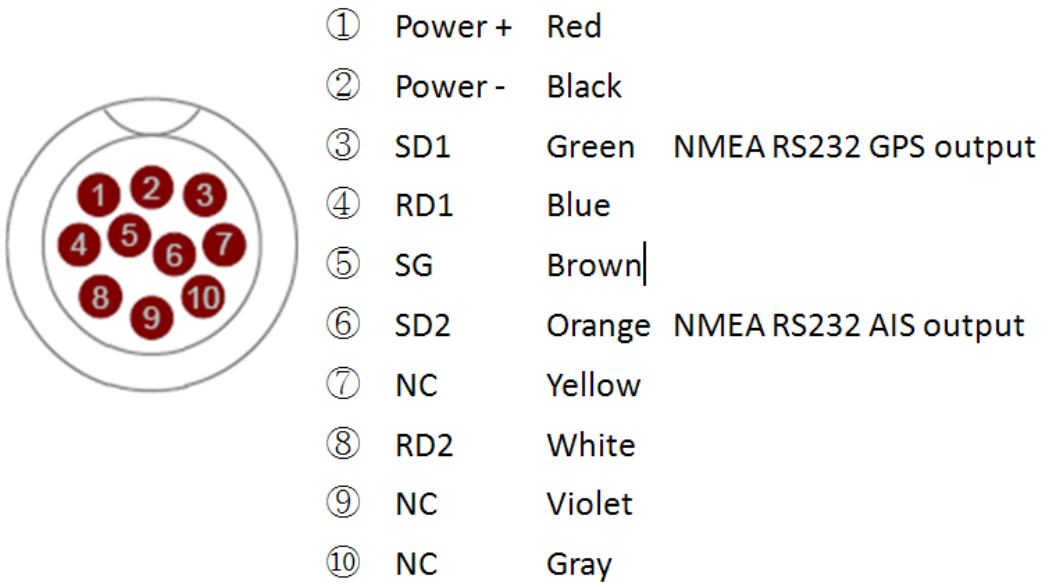


Figure 4 DC interface diagram

- GPS antenna interface TNC
- RF interface N-J
- Data/Power interface



## 5.4 Electrical performance specifications

- Modulation mode: GMSK, FSK
- Data speed: 9600b/s  $\pm$  50ppm(GMSK) , 1200b/s  $\pm$  30ppm(FSK)
- Channel interval: 25kHz
- Working frequency: 156.025MHz~162.025MHz (AIS)
- Antenna Impedance: 50  $\Omega$
- Rated working voltage: +12VDC
- Extreme Working Voltage: +9.6 VDC ~+15.6VDC

Table 5-3: Class-B main specifications

Item name	Specification
Transmitting power	33 $\pm$ 1.5dBm
Working Frequency	156.025-162.025MHz
Channel bandwidth	25KHz
Channel interval	25KHz
Modulation mode	25KHz GMSK(AIS RX 和 TX) 25KHz AFSK(DSC RX)
Bit rate	9600b/s $\pm$ 50ppm(GMSK) 1200b/s $\pm$ 30ppm(FSK)
RX Sensitivity	<-107dBm
Error rate	<20%
Co-channel rejection	>10dB
Pro channel anti-interference	>70dB
Inter-modulation anti-interference	>65dB
Block	>84dB
Electrical Interfaces	Dual channel RS232 interface, 38.4K bit rate Dual channel RS422 interface, 38.4K bit rate

## **6 Working condition and using method**

### **6.1 Working Condition**

According to the requirements of 4.2, connect device and turn on the power supply, red, yellow, blue, green LED on device flash twice, then yellow and green LED will keep constant light, and other LED go out. At this time, the device state at the initialization and GPS positioning.

When GPS positioning is completed, the yellow LED is off, the green LED is constant light, at this time the device is in normal working condition. If you find the red LED is in constant light, that indicates the equipment is working un-properly, you need to check if the power supply voltage, GPS, VHF antennas connected correctly.

### **6.2 Using method**

#### **6.2.1 Normal working**

The transponder needs to be connected with display terminal, in normal situation, users only need to make various operations and settings to the display terminal, no need to operate the transponder.

#### **6.2.2 Emergency Call**

When meet emergency situation, press down the red “Safety Alarm” button on the front up panel, Safety signal will be sent out.

## **7 Equipment maintenance and common troubleshooting**

### **7.1 Equipment maintenance**

- 1、 At all time keep the device clean to make the equipment work in ventilated, dry, stable temperature conditions.
- 2、 Don' t move or vibrate the device when electricity is on.
- 3、 Do not place acid, alkaline materials on equipment surface.
- 4、 Do not use the device when flammable and explosive gases exist.
- 5、 Operate the device correctly according to the Manual and try to avoid unconventional operation.
- 6、 Turn off power when the device is in abnormal situation, so as to avoid even greater damage to the device or cause other unexpected events.
- 7、 After turning on the device, ensure that the RF port has been properly connected to the antenna or cable. Under any circumstances, not allow to remove the RF frequency cable during working process, so as to avoid damaging amplifier module inside the device.

## **8. Transport and Storage**

### **8.1 Transport Requirement**

- a) Operate strictly in accordance with transport marks on package box.
- b) Packaging parts should be stacked neatly, reliably and placed in a balance and not be biased towards one side.
- c) Not allow to ship the device with flammable, explosive, corrosive items in the same car.

### **8.2 Storage Requirement**

- a) Packages storage environment should be good ventilated, indoor temperature is  $-10 \sim +40$  °C . Relative humidity is not more than 75%.
- b) Packaging parts should be placed off the ground 30cm, away from the wall 40cm.

## **9. Device Warranty**

The products will have free warranty within one year, except for failures caused by human activity.