Instruction Manual

Class A AIS Transceiver

SI-70A
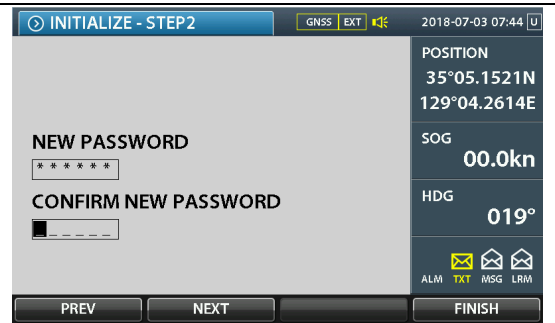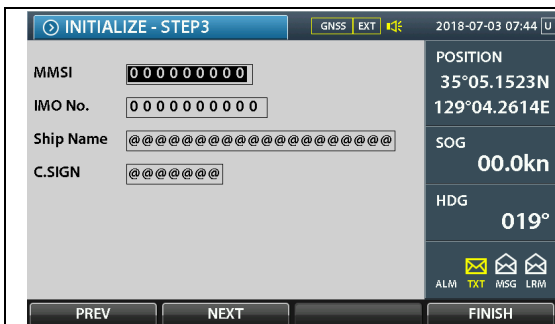
== Quick Start Guide==

◆ Inquire **administrator password** of Samyung ENC A/S center or authorized distributor.

◆ The device will start from INITIALIZE screen when you turn it on without MMSI number.

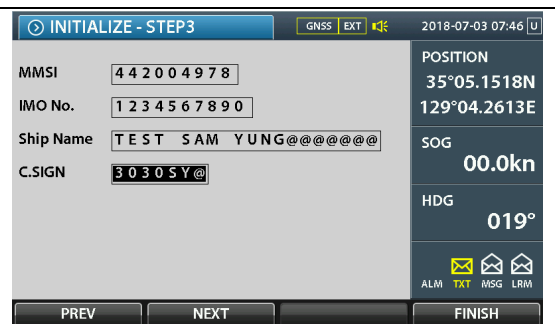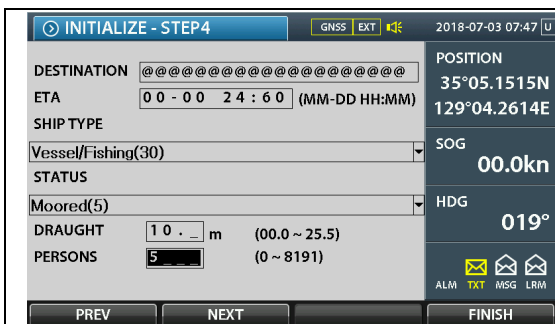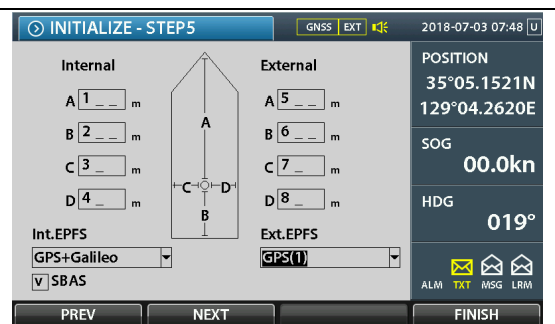|	
Step 1: Set the language	Step 2: Set the password

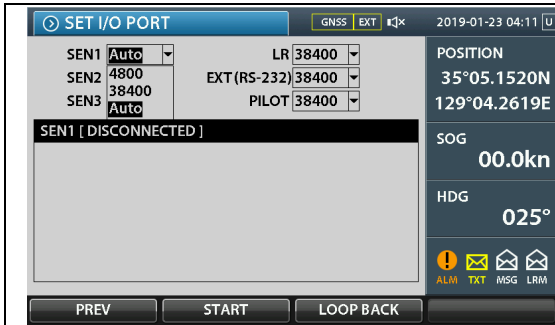|	
Step 3: Input MMSI and other static data	Step 3 example screen for your reference

Step 4: Set the ship type and status	Step 5: Set the GNSS type and position

◆ Set the Input/Output port

- MENU → 3 System setting → 1 Set I/O Port → Put the administrator password

⊙ SET I/O PORT GNSS EXT 🔇 2019-01-23 04:11 U SEN1 Auto ▼ LR 38400 ▼ SEN2 4800 EXT(RS-232) 38400 ▼ 38400 SEN3 Auto PILOT 38400 ▼ SEN1 [DISCONNECTED] POSITION 35°05.1520N 129°04.2619E SOG 00.0kn HDG 025° ⚠ ✉ ✉ ✉ ALM TXT MSG LRM PREV START LOOP BACK	⊙ SET I/O PORT GNSS EXT 🔇 2019-01-23 04:12 U SEN1 4800 ▼ LR 38400 ▼ SEN2 4800 ▼ EXT(RS-232) 38400 ▼ SEN3 4800 ▼ PILOT 38400 ▼ SEN1 [DISCONNECTED] Success to detect speed automatically! POSITION 35°05.1519N 129°04.2618E SOG 00.0kn HDG 025° ⚠ ✉ ✉ ✉ ALM TXT MSG LRM PREV START LOOP BACK
Set AUTO to select 4800/38400bps automatically.	If it succeeds in connection, **Success to detect speed automatically!** will appear.

◆ Inquire **administrator password** of Samyung ENC A/S center or authorized distributor.

⊙ SET I/O PORT GNSS EXT 🔇 2019-01-23 04:12 U SEN1 4800 ▼ LR 38400 ▼ SEN2 4800 ▼ EXT(RS-232) 38400 ▼ SEN3 4800 ▼ PILOT 38400 ▼ SEN1 [CONNECTED] $HCHDT,025.4,T*2A, $HCHDT,025.4,T*2A, $HCHDT,025.4,T*2A, $HCHDT,025.4,T*2A, $HCHDT,025.4,T*2A, $HCHDT,025.4,T*2A, $HCHDT,025.4,T*2A, POSITION 35°05.1518N 129°04.2618E SOG 00.0kn HDG 025° ⚠ ✉ ✉ ✉ ALM TXT MSG LRM PREV PAUSE	⊙ SET I/O PORT GNSS INT 🔇 2019-01-23 04:11 U SEN1 4800 ▼ LR 38400 ▼ SEN2 4800 ▼ EXT(RS-232) 38400 ▼ SEN3 4800 ▼ PILOT 38400 ▼ SEN1 [DISCONNECTED] Fail to detect speed automatically! POSITION 35°05.1519N 129°04.2613E SOG 00.0kn HDG ___° ⚠ ✉ ✉ ✉ ALM TXT MSG LRM PREV START LOOP BACK
Press "F2" start key to see input DATA.	If it fails in connection, **Fail to detect speed automatically!** will appear.

◆ If it fails to detect speed:

- Reverse the polarity of interface line
- Check the cable condition
- Check the BB-PCB

GENERAL INFORMATION

The information and pictures contained in this manual are accurate at the time of release. Specifications, equipment, installation and maintenance instructions can be changed without notice as part of continuous product development and improvement policy.

◆ **SAFETY INFORMATION**

It is important to know that AIS is designed to prevent collision and serves to complement the navigation. It is not the absolute navigation equipment and does not replace any navigation system installed in the cabin.

The coastline map in this transponder is neither verified nor approved by International Hydrographic Organization (IHO). It is not an Electronic Chart System and therefore never be used in navigation. The information provided in the coastline map is for reference only and should be used together with other navigation sources and devices.

ELECTRICAL SHOCK HAZARD

Improper disassembly or modification may cause electrical shock, fire or injury. No user-serviceable parts available.

RADIO FREQUENCY RADIATION RISK

The AIS transponder emits a low level of radio frequency radiation when transmitting. To avoid health hazard caused by excessive exposure to RF energy, everyone should be away at least 3 meters radius/horizontal or 1 meter from the antenna.

CORRECT POWER SOURCE

An incorrect power source will damage the equipment and this could result in a fire. Ensure that the correct power source is always provided.

AVOID DIRECT CONTACT WITH RAIN OR SPLASHING WATER

If water leaks into the equipment it can cause electric shock or fire.

DO NOT USE CHEMICAL SUBSTANCES TO CLEAN THE CASE

Some solvents may damage the case material.

◆   Compass Safety Distance

A safe distance with the transponder (and junction box) device:

Standard compass: 0.65 m

Steering compass: 0.40 m

TABLE OF CONTENTS

1. COMPONENTS

◆ This equipment consists of the following components.

1.1 BASIC COMPONENTS (SI-70A-E-SPAK / S59685)

No.	Code	Name of item	Remark	Quantity	Check
1	**S59169**	**SI-70A-E-UPAK**	**SI-70A Unit package**	**1**	
1-1	S58553	SI-70A-E	SI-70A Unit	1	
1-2	S58319	SI-70A-A	Grounding cable / Power cable / Screw 4*16/ 7A/250V[20mmX5mm]	1	
2	**S59164**	**GNSS-70-15M-E-UPAK**	**GNSS-70-15M Unit package**	**1**	
2-1	S58320	GNSS-70-15M-E	GNSS ANTENNA, RG-58 Cable 15M	1	
2-2	S59953	GNSS-70-A	S/P ALL 65*205L*SUS	1	
3	**S59167**	**TB-70A-E-UPAK**	**TB-70A Unit package**	**1**	
3-1	S58190	TB-70A-E	TERMINAL BOX	1	
3-2	S59952	TB-70A-A	WASHER HEAD SCRWES M4 X 20	1	
4	**S20871**	**SAN-150**	**VHF ANTENNA**	**1**	
5	**S18541**	**SAN-150-B**	**Bracket 78X200 X1EA / U-bolt: Ø63 X 80mm X2EA**	**1**	
6	**S18489**	**RG-8U-15M-V**	**RG-8U-15M, PL-259 connector**	**1**	
7	**S60617**	**SI-70A-ME**	**Instruction Manual (M03-0261-01)**	**1**	

1.2 OPTIONAL COMPONENTS (SI-70A-E-OPAK / S59687)

No.	Code	Name of item	Remark	Quantity	Check
1	**S59166**	**PB-70-E-UPAK**	**PB-70 Unit package**	**1**	
1-1	S58313	PB-70-E	AIS PILOT PLUG	1	
1-2	S58443	PB-70-A	Data cable / Screw	1	
2	**S59168**	**TB-70S-E-UPAK**	**TB-70S Unit package**	**1**	
2-1	S58197	TB-70S-E	TERMINAL BOX	1	
2-2	S58832	TB-70S-A	Data cable / Screw	1	
3	**S59165**	**GNSS-70-30M-E-UPAK**	**GNSS-70-30M Unit package**	**1**	
3-1	S58323	GNSS-70-30M-E	GNSS ANTENNA, RG-58 Cable 30M	1	
3-2	S59953	GNSS-70-A	S/P ALL 65*205L*SUS	1	
4	**S59163**	**SP-70AD-E-UPAK**	**SP-70AD Unit package**	**1**	
4-1	S58117	SP-70AD-E	AC/DC POWER SUPPLY	1	

4-2	S58444	SP-70AD-A	AC/DC Power cable/ Fuse / Screw	1	
5	**S18490**	**RG-8U-30M-V**	**RG-8U-30M, PL-259 connector**	**1**	
6	**S18543**	**SAN-240**	**VHF ANTENNA 2.4M**	**1**	
7	**S59115**	**SI-70A FLUSH MOUNTING INSTALLER-A**	**MOUNTING INSTALLER / Bolt / Screw**	**1**	

2. TECHNICAL SPECIFICATIONS

2.1 APPLICABLE EQUIPMENT STANDARDS

- IEC61993-2 Ed.2.0 (2012-10) ....IEC standard, Class A shipborne equipment
- IEC61162-1 Ed.5.0 (2016-08)................IEC standards, digital interfaces
- IEC62288 Ed.2.0 (2014-07).....................IEC standards, display
- ITU-RM.1371-5 (2014-02).......................Universal AIS Technical Characteristics
- ITU-RM.493-14 (2015-09).......................Digital selective-calling system
- ITU-RM.825-3 (1998) ....vessel traffic services and ship-on-ship identification
- IMO Resolution MSC.74(69)..................AIS Standards
- IEC60945 Ed 4.0 ....IEC standard, environmental requirements
- IEC61108-1, IEC61108-2..........................IEC standard, GPS (GLONASS) receiver equipment

2.2 SI-70A S/W VERSION (RS)

- Transponder Main.....................................0.89d
- Transponder Sub......................................0.85
- MKD..0.80o

2.3 CLASS A AIS TRANSCEIVER

- TX/RX Frequency range...........................156.025 ~ 162.025 MHz
- Default Frequencies ....AIS1 (CH 87B)　: 161.975 MHz(F1D)

　　　　　　　　　　　　　　　　　　　AIS2 (CH 88B)　: 162.025 MHz(F1D)

　　　　　　　　　　　　　　　　　　　DSC (CH70 fixed): 156.525 MHz(G2B)

- Power output ....12.5W (41dBm±1.5dB / 8.91W~17.78W) or

　　　　　　　　　　　　　　　　　　　1.0W (30dBm±1.5dB / 0.7W~1.41W)

- Antenna impedance...................................50 ohms(SO-239)
- AIS Modulation ....GMSK
- Channel spacing 25kHz
- Data rate ....9600 bits/s
- Frequency error..<±0.5 kHz
- Spurious emissions.....................................<-36dBm at 9KHz ~ 1GHz

  <-30dBm at 1GHz ~ 4GHz
- Sensitivity (AIS RX).....................................(PER) < 20% at −107 dBm
- Co-Channel (AIS RX)................................10dB
- Adjacent Channel (AIS RX)....................70dB
- Blocking (AIS RX)..84 dB
- Sensitivity (DSC RX)..................................BER $<10^{-4}$ at -107 dBm
- Channel spacing (DSC RX).....................25 kHz
- Modulation (DSC RX) ....FSK (1300 Hz/2100 Hz)
- Frequency stability (DSC RX)................<±1 ppm
- Co-Channel (DSC RX)..............................10dB
- Adjacent Channel (DSC RX)...................70dB

2.4   DISPLAY UNIT

- LCD ....7 inch TFT color, 800 x 3(RGB) x 480
- CPU 800MHz
- Brilliance control.......................................10 steps
- INTERFACE...SD Card

2.5   SERIAL INPUTS/OUTPUTS

- SENS1/2/3..IEC61162-1/2 (input only)
- LONG/AUX/PILOT/RTCM ....IEC61162-1/2 (input & output)

2.6   GNSS RECEIVER

- Antenna ....PATCH ANTENNA / TNC (RG-58U)
- Gain 17dB (GNSS-70)
- Receiver type...72-channel u-blox engine

  GPS/QZSS L1 C/A, GLONASS L10F

  BeiDou B1I, Galileo E1B/C

  SBAS L1 C/A: WAAS, EGNOS, MSAS

SAMYUNG ENC

- Receiver type..72-channel u-blox engine
- DGPS data receiving.................................RTCM SC-104
- Position accuracy.......................................Autonomous 2.5 m CEP
- Position update interval...........................1 second typical
- Start-up Times...Cold start = 26sec
- Sensitivity..Tracking: –167 dBm

  Cold starts: –148 dBm

  Hot starts: –157 dBm

2.7   VHF ANTENNA

- Type...SAN-150 / SAN-240
- Connector type ....UHF female is standard
- Frequency range ....156-162 MHz, VSWR < 1.5:1
- Nominal impedance ....50 ohm
- Power rating ....100 W
- Gain ....2 dBi / 5 dBi
- Polarization ....Vertical

2.8   POWER SUPPLY

- AIS unit ....DC IN : 24V (RX :0.5A / TX : 2.5A)

  DC IN : 12V (RX: 0.9A/ TX:5.2A)
- AC/DC unit (SP-70AD)............................AC IN : 100~230VAC, 47~63 Hz

  DC OUT : DC24V

2.9   ENVIRONMENT

- Operation temperature (antenna).......-30°C to + 70°C
- Operation temperature ....-15°C to +55°C
- Storage temperature ....-25°C to +75°C
- Relative humidity.......................................95% at 40°C (without dew condensation)
- Vibration..IEC 60945

3. AIS OVERVIEW

The Automatic Identification System (AIS) is a Very High Frequency (VHF) radio broadcasting system that transmits packets of data through the VHF Data Link (VDL) and enables AIS equipped vessels and coast-based stations to exchange identification information and navigational data.

Vessels use AIS transponders to continually transmit their ID, position, course, speed and other data to all nearby vessels and coast-based stations. Such information can greatly assist in situational awareness and provide means to help in collision avoidance.

AIS equipment is standardized by ITU, IEC, IALA and IMO and is subject to approval by a certification body. The following AIS devices have been developed for variant applications.

◆ AIS Class A

In accordance with the Regulation 19 of Chapter 5 SOLAS-74 (with the amendments) installation of AIS Class A is required on all ships with a gross tonnage of 300 tons and more, engaged in international voyages, cargo ships of 500 tons gross tonnage and more, not engaged in international voyages, as well as passenger ships regardless of their size. Typically the transmitter output power is 12.5W.

◆ Inland AIS

It provides all the functions of a Class A transceiver with the addition of required functions for inland waterway.

◆ AIS Class B

It provides limited capabilities and is intended for commercial and recreational vessels not belonging to SOLAS. Typically the transmitter output power is 2W/5W.

◆ AIS Base Station:

It is provided by aids-to-navigation authorities to enable the ship-to-shore / shore-to-ship transmission of information. Networked AIS Base Stations can assist in providing overall maritime domain awareness.

◆ AIS AtoN (Aids to Navigation):

It provides the opportunity to transmit location and status of buoys and lights through the same VDL, this range can be displayed on AIS-ready device.

◆ AIS SART:

It is a transmitter using Search and Rescue AIS. It can help in determining the location of a ship in distress. It is typically used in lifeboats.

◆ AIS on Search and Rescue (SAR) Aircraft:

It is used in aircraft to assist in search and rescue operations.

3.1 DATA USED IN AIS

◆ Static data: International Maritime Organization Number, MMSI, Call Sign and Ship's name, Length and Width of the ship, Ship/Cargo Type, Location of the ship positioning system (ship's bow, ship's stern, left and right sides). Static data is transmitted every 6 minutes or when the data is changed or on request.

◆ Dynamic data: Correct indication and overall status of the ship position, Coordinated Universal Time (UTC), Ship's Course, Ship's Speed, Heading, Navigational Status, rate of turn, sensor. It is updated with intervals as shown in the following table according to the change of speed and direction.

◆ Voyage data: Ship's Draught, Dangerous cargo, Destination and Estimated time of arrival, Route plan and the number of people on board. It is transmitted every 6 minutes or when the information is changed or on request.

◆ Safety related message: It shall be in accordance with the request of the message including voyage data or weather alert.

3.2 INTERVAL OF SI-70A DYNAMIC INFORMATION TRANSMISSION

Navigational terms	Interval of dynamic information transmission
The vessel is anchored or during the mooring, moving at a speed of not more than 3 knots	3 min
The vessel is anchored or during the mooring, moving at a speed of more than 3 knots	10 sec

The vessel is under way (0-14 knots)	10 sec
The vessel is under way (0-14 knots) and the course change is more than 10 deg / min.	3⅓ sec
The vessel is under way (14-23 knots)	6 sec
The vessel is under way (14-23 knots) and the course change is more than 10 deg / min.	2 sec
The vessel is under way (more than 23 knots)	2 sec
The vessel is under way (more than 23 knots) and the course change is more than 10 deg / min.	2 sec

3.3 TRANSMISSION INTERVAL FOR THE OTHER EQUIPMENT, NONE CLASS A OF MARINE EQUIPMENT.

Conditions of the AIS station	Interval of Normal transmission
Ship equipment of AIS class B (SO) moving no faster than 2 knots	3 min.
Ship equipment of AIS class B (SO) moving at a speed of 2-14 knots	30 sec
Ship equipment of AIS class B (SO) moving at a speed of 14-23 knots	15 sec
Ship equipment of AIS class B (SO) moving at a speed of more than 23 knots	5 sec
Ship equipment AIS class B (CS) moving no faster than 2 knots	3 min
Ship equipment of AIS class B (CS) moving faster than 2 knots	30 seconds
Search and Rescue aircraft (mobile aircraft equipment)	10 seconds
Aids to Navigation (AtoN)	3 min.
AIS base station	10 sec

Data	A Class	B Class
STATIC STATION DATA		
- MMSI	�↗	✓
- SHIP'S NAME	✓	✓
- SHIP/CARGO TYPE	✓	✓
- CALL SIGN	✓	✓
- INTERNATIONAL MARITIME ORGANIZATION NUMBER	✓	
- ANTENNA POSITION	✓	✓
- LENGTH AND WIDTH	✓	✓
VOYAGE DATA		
- SHIP'S DRAUGHT	✓	
- NUMBER OF PEOPLE ON BOARD	✓	
- DANGEROUS CARGO	✓	
- DESTINATION AND ESTIMATED ARRIVAL TIME	✓	
DYNAMIC STATION INFORMATION		
- COORDINATED UNIVERSAL TIME (UTC)	✓	✓
- SHIP'S POSITION	✓	✓
- SHIP'S COURSE (COG)	✓	✓
- SHIP'S SPEED (SOG)	✓	✓
- HEADING	✓	✓
- SPEED OF TURN	✓	
- NAVIGATIONAL STATUS	✓	
- STATUS	✓	
MESSAGE		
- WARNING	✓	
- SAFETY	✓	✓

4. OPERATION

4.1   DISPLAY OPERATION

4.1.1   KEYS DESCRIPTION

◆   There are various alphabetic, numeric, special characters input keys. Each time you press
the key, each corresponding characters and number is displayed.
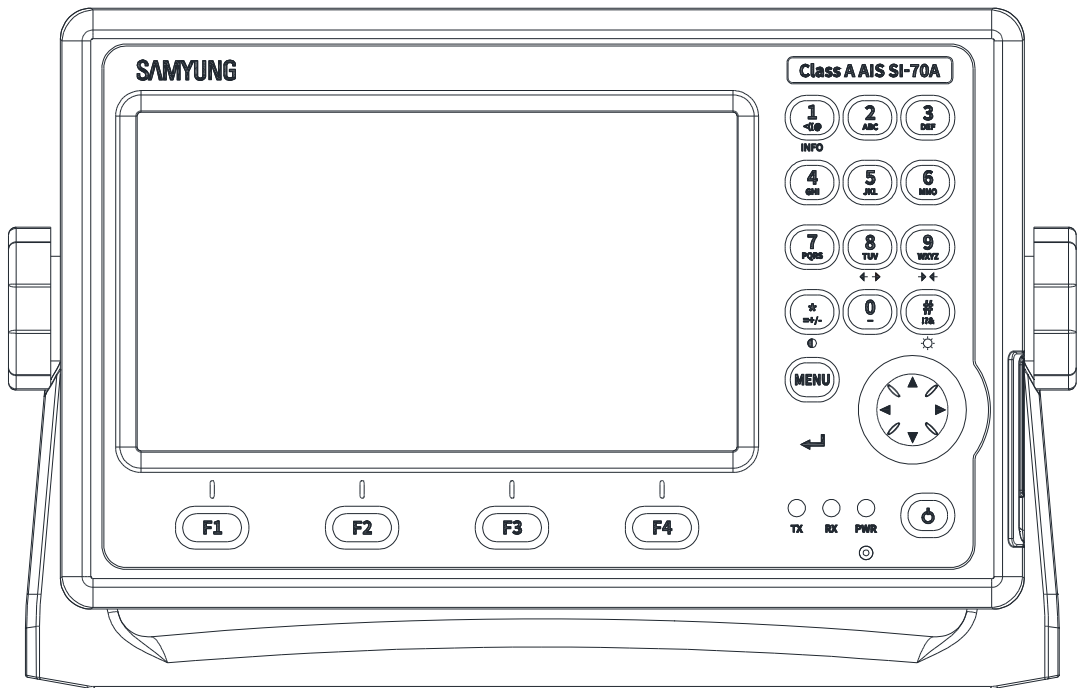
No.	Key name	Function(s) when pressed
1	**1** ◁((@ INFO	- List Screen : Move to Ship name/MMSI searching screen. - Map Screen : ON/OFF the selected ship's information indication. - Input numbers and characters : 1 → < → (→ [→ @
2	2 ABC	- Map Screen : ON/OFF the place name, depth indication. - Input numbers and characters : 2 → A → B → C
3	3 DEF	- Map Screen : ON/OFF the Range Ring indication. - Input numbers and characters: 3 → D → E → F
4	4 GHI	- ON/OFF the map indication. - Input numbers and characters: 4 → G → H → I
5	5 JKL	- Select other ship or move the map.(ON/OFF)

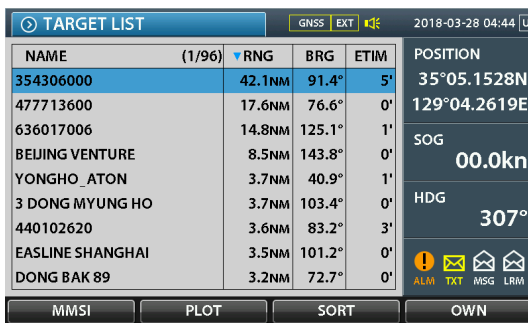|		
		- Input numbers and characters: 5 → J → K → L
6	**6** MNO	- Set the ship position or cursor position to the center of the screen. - Input numbers and characters: 6 → M → N → O
7	**7** PQRS	- Move the cursor. (ON/OFF) - Input numbers and characters: 7 → P → Q → R → S
8	**8** TUV ← →	- Zoom in the map. - Input numbers and characters: 8 → T → U → V
9	**9** WXYZ → ←	- Zoon out the map. - Input numbers and characters: 9 → W → X → Y → Z
10	**∗** =+/- ◑	- Darken the screen. (Screen brightness: 10 levels) - Input numbers and characters: . → ∗ → = → + → / → -
11	**#** !?& ☼	- Brighten the screen. (Screen brightness: 10 levels) - Input numbers and characters: , → # → ! → ? → & → \ →] → ^ → _ → " → $ → % → ' →) → : → ; → >
12	**0** _	- Switch the display mode to day/night screen. - Input numbers and characters: 0 → blank
13	(direction key)	- Direction key: Used to move up, down, left, and right.
14	(power key)	- Power key: Used to turn on/off the power of the indicator. When you turn off the power, only the indicator turns off.
15	MENU	- Menu key: Move to the Menu screen
16	↵	- Enter Key: Select items or confirm input
17	F1 F2 F3 F4	- Function: There are 4 function keys applicable to the Indicator. Press key and then corresponding function will be performed.

4.1.2 LED

◆ Each function is as follows.

LED	Function
TX	This indicates transmission and displays when the MKD display unit inputs information and transfers it to the transponder.
RX	This indicates reception and displays when the MKD display receives the information transmitted by the transponder.
PWR	This indicates when power is applied to the MKD display unit.

4.1.3 BUZZER FUNCTION

Buzzer function in MKD display gives "BEEP" sound when each keys in MKD display is pressed. It enables user to operate the unit efficiently. It is also designed to easily detect the alarm related matters, in case when the alarm occurs, the buzzer performs the alarm function.
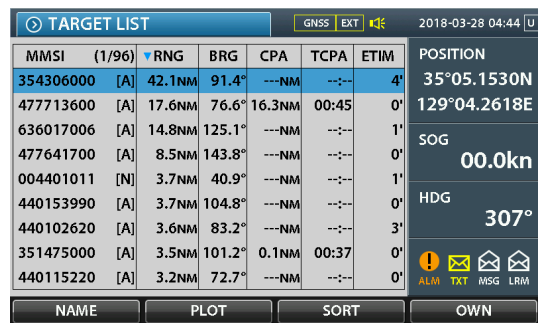
4.2 LIST DISPLAY

4.2.1 LIST DISPLAY DESCRIPTION

① GNSS EXT : GNSS condition of receiving

② ALARM sound

③ 2018-03-28 04:44 U : Universal Time (UTC)

④ MMSI : Maritime Mobile Services Identity number / NAME

⑤ RNG : Distance between the own ship and the target

⑥ BRG : Azimuth (direction from current location to destination).

⑦ CPA : Closest Point Approach

⑧ TCPA :Time to CPA

⑨ ETIM : The Elapsed Time since the message was received.

⑩ POSITION : Own ship position (vessel's position), speed, bearing

⑪ [F1] NAME / MMSI : NAME and MMSI changing key

⑫ [F2] PLOT : Move to the chart screen

⑬ [F3] SORT : Sort key

⑭ [F4] OWN : See information of the own ship

4.2.2 HOW TO SET SHIP'S NAME AND MMSI

◆ After selecting the vessel with the direction keys, press the ENT key to display the relevant vessel information.

◆ The meaning of the symbols next to the MMSI number is as follows.

[A] : A class

[B] : B class

[BS] : Base Station

[N] : AtoN

[T] : AIS SART

4.2.3 DISPLAYING MESSAGE ICONS

◆ Four icons on the bottom right corner of the screen indicate sending and receiving messages.

Icon/Symbol	Contents	Remarks
TXT MSG LRM	There is a message received	
TXT MSG LRM	There is no message received or all received messages have been read.	
ALM ALM ALM	Indicates alarm generated by the transponder.	
TXT	Indicates transponder's status message	
MSG	Indicates safety or other received message	
LRM	Indicates Long Range message	

4.2.4 ALARM STATUS ICONS

Active Status	Ack Status	Alarm Sound		Pop-up	Flash	Status
		ON	OFF			
Active	No Ack	🔊 ALM	🔇 ALM	YES	🔊 🔇 ALM ALM	Alarm generated
Active	Ack	❗ ALM	❗ ALM	NO	NO	Alarm acknowledged
No Active	No Ack	✔ ALM	✔ ALM	NO	✔ ALM	Rectify Status (Check Alarm List)
No Active	Ack	ALM	ALM	NO	NO	Normal Status

4.2.5 OWN SHIP DATA VIEW

◆ Press "OWN [F4]" on the list screen.

◆ Move to page 1, 2 or 3 with the direction key.

- Has DTE (Data Terminal Equipment) : Whether the data terminal device is connected.

- EPFS : Electric Positioning Fixing System in use (Ex. GPS, Internal GNSS, and etc.).

- EXT.NAME : Use when add extensible name to AtoN.

- Position Status : Position error distance, RAIM usage and etc.

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- TIME STAMP : Position update time.

- PA : Position Accuracy.

- RAIM : Receiver Autonomous Integrity Monitoring.

  ROT : Rate Of Turn.

4.2.6 TARGET SHIP DATA VIEW

◆ Select a ship with the direction key and press ENT KEY.

◆ Move to page 1, 2 or 3 with the direction key.

TARGET SHIP DATA	GNSS EXT	2018-07-03 08:04 U
MMSI	256380000	POSITION
AIS TYPE	CLASS A [A]	35°05.1515N
NAME	CALIDA	129°04.2619E
IMO	0009522128	
C.SIGN	9HA2853	SOG 00.0kn
Has DTE	YES	
EPFS	GPS	HDG 046°
EXT.NAME	[N/A]	

ALM TXT MSG LRM ⬍ 1/4

EXIT LIST PLOT MSG

TARGET SHIP DATA	GNSS EXT	2018-07-03 08:04 U
S/C TYPE	(81)	POSITION
- Tanker(s)		35°05.1516N
- Carrying DG,HS or MP(X)		129°04.2619E
DRAUGHT	9.3m	
DESTINATION	ONSAN S.KOREA	SOG 00.0kn
ETA	6-19 05:30	
NAV STATUS	Under way using engine	HDG 046°

ALM TXT MSG LRM ⬍ 2/4

EXIT LIST PLOT MSG

TARGET SHIP DATA	GNSS EXT	2018-07-03 08:04 U
LAT	35°13.8085N	POSITION
LON	129°30.9848E	35°05.1515N
Position Status	Position <= 10m	129°04.2619E
TIME STAMP	12s	
PA	high (<= 10m)	SOG 00.0kn
RAIM	UNUSED	
COG	280.1° SOG 02.3kn	HDG 046°
HDG	170° ROT 1.1°/min (◀)	
ALTITUDE	[N/A]	
OFF-POSITION	[N/A]	

ALM TXT MSG LRM ⬍ 3/4

EXIT LIST PLOT MSG

TARGET SHIP DATA	GNSS EXT	2018-07-03 08:04 U
GNSS Antenna Position		POSITION
		35°05.1515N
		129°04.2619E
A 208 m		SOG 00.0kn
B 41 m		
C 26 m		HDG 046°
D 18 m		

ALM TXT MSG LRM ⬍ 4/4

EXIT LIST PLOT MSG

4.2.7 SEARCH TARGET

◆ Press the " [1 INFO] " key on the target list screen.

◆ It is able to search by MMSI or Name

◆ Press the left direction key to go backward.

SEARCH TARGET		GNSS EXT	2018-03-28 05:22 U
MMSI ⬛_____			POSITION
▲MMSI	(1/96) RNG BRG ETIM		35°05.1525N
004401011	[N] 3.7NM 40.9° 0'		129°04.2608E
004403102	[BS] 4.0NM 318.6° 0'		
212358000	[A] 1.2NM 22.8° 2'		SOG 00.0kn
218834000	[A] 1.3NM 66.9° 1'		
273351740	[A] 1.0NM 330.2° 1'		HDG 308°
273370490	[A] 1.0NM 328.9° 0'		
273377520	[A] 0.8NM 339.0° 0'		
273384570	[A] 0.8NM 338.2° 6'		

ALM TXT MSG LRM

NAME PLOT EXIT

SEARCH TARGET		GNSS EXT	2018-03-28 05:22 U
MMSI 44002_____			POSITION
▲MMSI	(1/2) RNG BRG ETIM		35°05.1525N
440022000	[A] 1.0NM 129.4° 0'		129°04.2608E
440028270	[A] 1.5NM 355.9° 0'		
			SOG 00.0kn
			HDG 308°

ALM TXT MSG LRM

NAME PLOT EXIT

4.2.8   PLOTTER SCREEN

◆ Press the "[F2] PLOT" key on the target list screen.
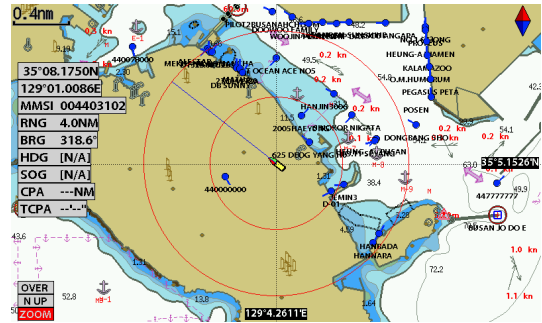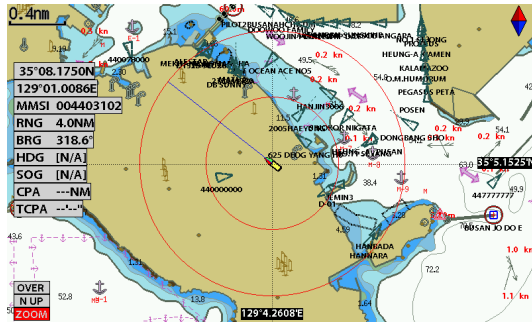
5. MENU CONFIGURATION

■ Press **[MENU Key]** to display the main menu.

1 MESSAGE & LOG	**1. NEW MESSAGE**
	2. FAVORITE MESSAGE
	3. LONG RANGE MESSAGE LIST
	4. RxD MESSAGE LIST
	5. TxD MESSAGE LIST
	6. ALARM LIST
	7. STATUS LIST
2 INIT SETUP	**1. SET VOYAGE DATA**
	2. SET STATIC DATA
	3. SET REGIONAL AREAS
	4. SET LONG RANGE
	5. SET GNSS ANTENNA POSITION
3 SYSTEM SETUP	**1. SET I/O PORT**
	2. SET DISPLAY
	3. SET BUZZER
	4. SET PASSWORD
	5. SET ETC
	6. SET ADVANCED
4 MAINTENANCE	**1. PROGRAM VERSION**
	2. KEY TEST
	3. LCD TEST
	4. COM MONITORING
	5. SECURITY LOG
	6. TRANSPONDER TEST
	7. UPDATE MKD S/W
	8. UPDATE TRANSPONDER S/W

5.1 MESSAGE & LOG

5.1.1 NEW MESSAGE
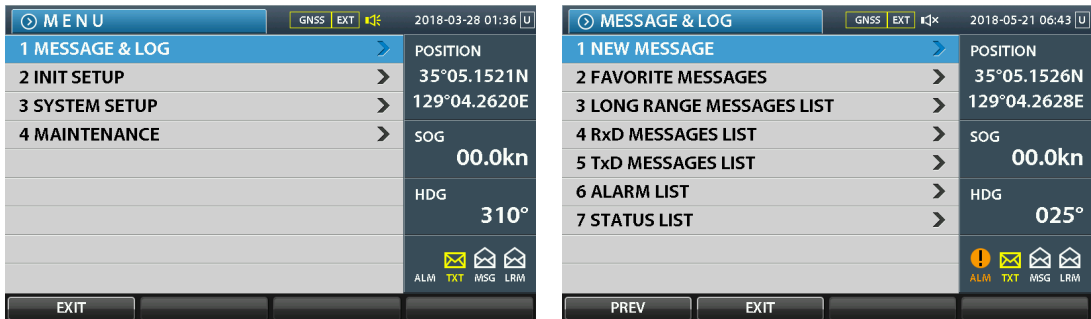
[MENU Key] → [1 MESSAGE & LOG] → [1 NEW MESSAGE]

◆ Send New message by selecting destination (broadcasting, or MMSI number for the individual transmission), channel (auto, Ch A, Ch B, Ch A & B), the number of retry and writing a message.
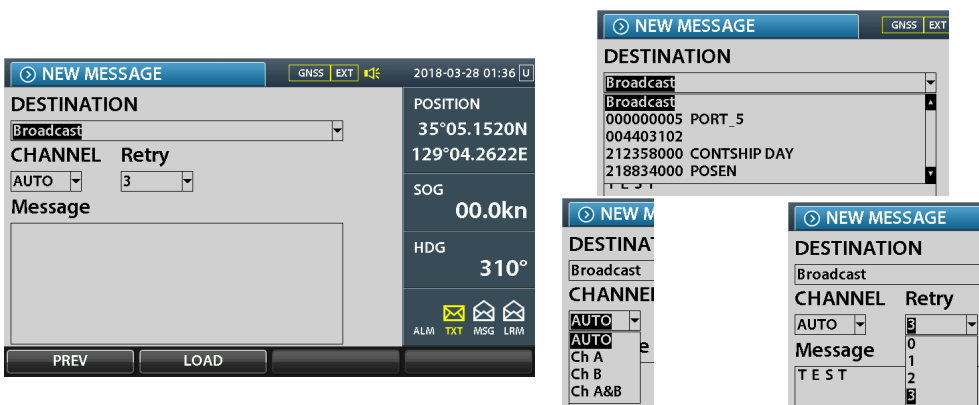
◆ Destination: Select Broadcast, MMSI number or Ship's Name.

◆ Channel: Select the Type of Channel.

◆ Retry: Select the number of retransmissions if transmission fails.

◆ Message: Write a message.

◆ "LOAD (F2)" key: Switch to the [Favorite Messages] screen and select one among the favorite messages or messages used in the past.

◆ "SAVE (F3)"key: Press to save the writing message in [Favorite messages]. You can save up to 12 messages.

◆ "SEND(F4)" key: Send the Message
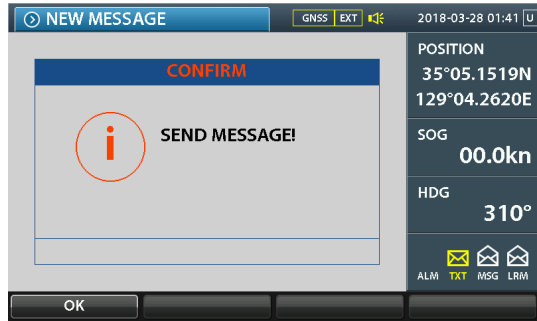
◆ Select the ship on the list and press "MSG (F4)" to move directly to the [1 NEW MESSAGE] screen.
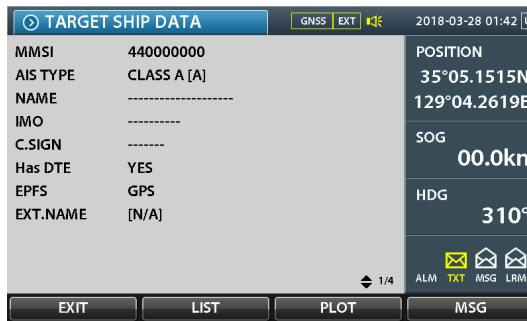
◆ Refer

When select Destination as Broadcast, it is transmitted as a broadcast message (Message Type 14, Safety-Related Broadcast Message), and when select MMSI, it is transmitted as (Message Type 12, Addressed Safety-Related Message). If the message is normally transmitted, a notification of "BROADCAST SAFETY MESSAGE SUCCESSFUL" is displayed for the broadcast message, and a message of "ADDRESSED SAFETY MESSAGE SUCCESSFUL" is displayed for the MMSI message. Transmission of Message Types 4, 9, 16, 17, 18, 19, 20, 21, 22, 23 on MKD is not allowed. Predefined messages ("MAYDAY", "DISTRESS", "PAN PAN") cannot be entered when writing a message.

5.1.2   FAVORITE MESSAGES

[MENU Key]   → [1 MESSAGE & LOG] → [2 FAVORITE MESSAGES]
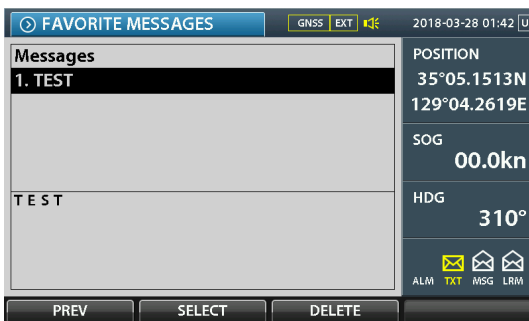
◆ Transmit the saved massage by using the favorite message function.

5.1.3   LONG RANGE MESSAGE LIST

[MENU Key]   → [1 MESSAGE & LOG] → [3 LONG RANGE MESSAGE LIST]

◆ The date, time, requester and other information with regarding to the received long range message are indicated.
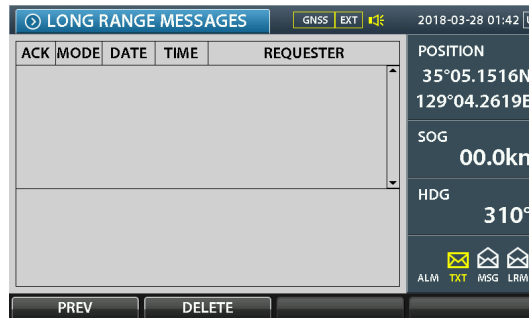
5.1.4   RXD MESSAGE LIST

[MENU Key]   → [1 MESSAGE & LOG] → [4 RxD MESSAGE LIST]

◆ The arrived date, message type (broadcast, individual), time requester and the received message are indicated.
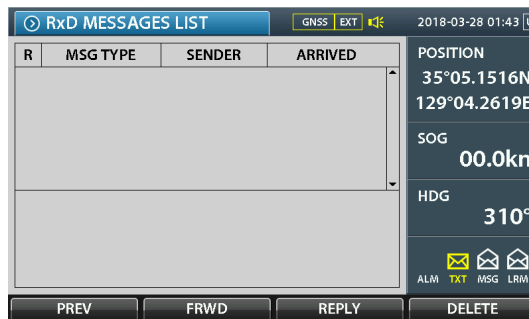
5.1.5   TXD MESSAGE LIST

[MENU Key]   → [1 MESSAGE & LOG] → [5 TxD MESSAGE LIST]

◆ The sent time and date, message type and the transmitted message are indicated.

5.1.6 ALARM LIST

[MENU Key] → [1 MESSAGE & LOG] → [6 ALARM LIST]

◆ The time when the alarm ganerated, whether acknowledged, and the alarm description are indicated.

◆ A : Status that the user acknowledged the alarm.

◆ V : Status that the user doesn't acknowledge the alarm.

5.1.7 STATUS LIST

[MENU Key] → [1 MESSAGE & LOG] → [7 STATUS LIST]

◆ Information related to the status change of the device is indicated in real time.

5.2 INITIAL SETUP

◆ The initial setup needs the password.

◆ Inquire **administrator password** of Samyung ENC A/S center or authorized distributor.

5.2.1 SET VOYAGE DATA

5.2.1.1 SET BASIC VOYAGE DATA

[MENU Key] → [2 INIT SETUP] → [1 SET VOYAGE DATA] → [1 SET BASIC VOYAGE DATA]

Input the destination (max 20 characters), estimated time and date of arrival, the number of people on board, ship's draught, ship type, navigational status and etc.- all information, which is related to voyage.
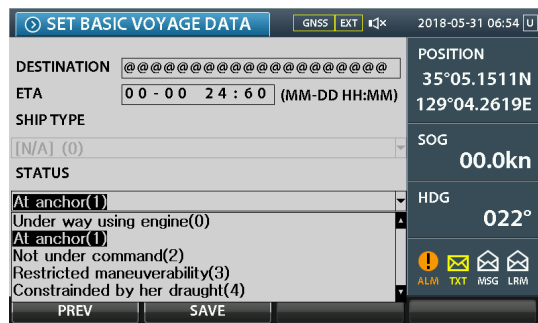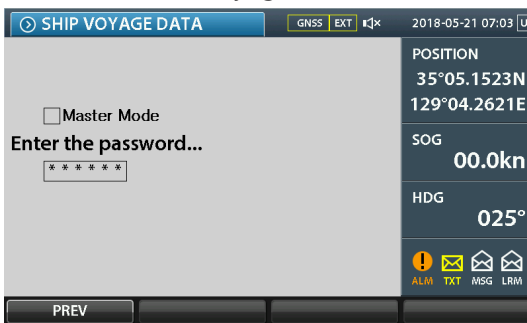
◆ STATUS

00	"Under way using engine(0)"	01	"At anchor(1)"
02	"Not under command(2)"	03	"Restricted maneuverability(3)"
04	"Constrained by her draught(4)"	05	"Moored(5)"
06	"Aground(6)"	07	"Engaged in Fishing(7)"
08	"Underway sailing(8)"	09	"Reserved for HSC(9)"
10	"Reserved for WIG(10)"	11	"pwr-drvn vessel towing astern(11)"
12	"pwr-drvn vessel pushing ahead,towing along...(12)"	13	"Reserved(13)"
14	"AIS-SART(14)"	15	"Undefined(15)"

5.2.1.2 SHIP TYPE

[MENU Key] → [2 INIT SETUP] → [1 SET VOYAGE DATA] → [1 SET BASIC VOYAGE DATA]

◆ Select the master mode and then enter the administrator password.

SHIP VOYAGE DATA GNSS EXT 🔇 2018-05-31 08:20 U ☑ Master Mode **Enter the password…** ■ _ _ _ _ _ PREV	**POSITION** 35°05.1520N 129°04.2608E **SOG** 00.0kn **HDG** 022° ⚠ ✉ ✉ ✉ ALM TXT MSG LRM
SET BASIC VOYAGE DATA GNSS EXT 🔇 2018-05-31 08:21 U **DESTINATION** @@@@@@@@@@@@@@@@@@@@ **ETA** 00-00 24:60 (MM-DD HH:MM) **SHIP TYPE** Vessel (30~39) Preserved (9) Reserved for future use (10~19) WIG (20~29) Vessel (30~39) HSC (40~49) **PERSONS** 0000 (0~8191) PREV SAVE	**POSITION** 35°05.1523N 129°04.2613E **SOG** 00.0kn **HDG** 022° ⚠ ✉ ✉ ✉ ALM TXT MSG LRM

5.2.1.3 SET CARGO TYPE

[MENU Key] → [2 INIT SETUP] → [1 SET VOYAGE DATA] → [2 SET CARGO TYPE]

◆ Select cargo type.

SET CARGO TYPE GNSS EXT 🔇 2018-03-28 01:49 U **SHIP TYPE (80)** - Tanker(s) **Select cargo type** All ships of this type(0) All ships of this type(0) Carrying DG,HS or MP(X)(1) Carrying DG,HS or MP(Y)(2) Carrying DG,HS or MP(Z)(3) Carrying DG,HS or MP(OS)(4) PREV SAVE	**POSITION** 35°05.1521N 129°04.2614E **SOG** 00.0kn **HDG** 310° ✉ ✉ ✉ ALM TXT MSG LRM
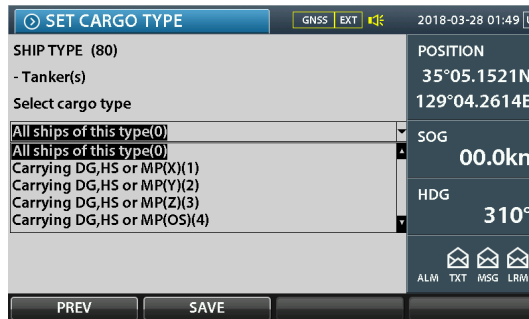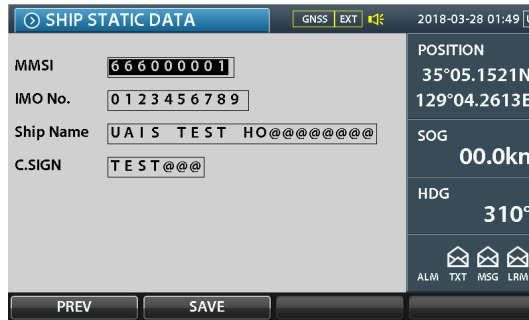
◆ TYPE

No.	Type	No.	Type
10	"Reserved for future use/All ships of this type"	11	"Reserved for future use/Carrying DG,HS or MP(X)"
12	"Reserved for future use/Carrying DG,HS or MP(Y)"	13	"Reserved for future use/Carrying DG,HS or MP(Z)"
14	"Reserved for future use/Carrying DG,HS or MP(OS)"	15	"Reserved for future use/Reserved for future use"
16	"Reserved for future use/Reserved for future use"	17	"Reserved for future use/Reserved for future use"
18	"Reserved for future use/Reserved for future use"	19	"Reserved for future use/No additional information"
20	"WIG/All ships of this type"	21	"WIG/Carrying DG,HS or MP(X)"
22	"WIG/Carrying DG,HS or MP(Y)"	23	"WIG/Carrying DG,HS or MP(Z)"
24	"WIG/Carrying DG,HS or MP(OS)"	25	"WIG/Reserved for future use"
26	"WIG/Reserved for future use"	27	"WIG/Reserved for future use"
28	"WIG/Reserved for future use"	29	"WIG/Reserved for future use"
30	"Vessel/Fishing"	31	"Vessel/Towing"

32	"Vessel/Towing >200m or Breadth >25m"	33	"Vessel/Engaged in dredging or underwater operations"
34	"Vessel/Engaged in diving operations"	35	"Vessel/Engaged in military operations"
36	"Vessel/Sailing"	37	"Vessel/Pleasure craft"
38	"Vessel/Reserved for future use"	39	"Vessel/Reserved for future use"
40	"HSC/All ships of this type"	41	"HSC/Carrying DG,HS or MP(X)"
42	"HSC/Carrying DG,HS or MP(Y)"	43	"HSC/Carrying DG,HS or MP(Z)"
44	"HSC/Carrying DG,HS or MP(OS)"	45	"HSC/Reserved for future use"
46	"HSC/Reserved for future use"	47	"HSC/Reserved for future use"
48	"HSC/Reserved for future use"	49	"HSC/Reserved for future use"
50	"Pilot vessel"	51	"Search and rescue vessels"
52	"Tugs"	53	"Port tenders"
54	"Vessels with anti-pollution facilities or equipment"	55	"Law enforcement vessels"
56	"Spare – for assignments to local vessels"	57	"Spare – for assignments to local vessels"
58	"Medical transports (as defined in the 1949 Geneva Conventions and Additional Protocols)"	59	"Ships and aircraft of States not parties to an armed conflict"
60	"Passenger ships/All ships of this type"	61	"Passenger ships/Carrying DG,HS or MP(X)"
62	"Passenger ships/Carrying DG,HS or MP(Y)"	63	"Passenger ships/Carrying DG,HS or MP(Z)"
64	"Passenger ships/Carrying DG,HS or MP(OS)"	65	"Passenger ships/Reserved for future use"
66	"Passenger ships/Reserved for future use"	67	"Passenger ships/Reserved for future use"
68	"Passenger ships/Reserved for future use"	69	"Passenger ships/Reserved for future use"
70	"Cargo ships/All ships of this type"	71	"Cargo ships/Carrying DG,HS or MP(X)"
72	"Cargo ships/Carrying DG,HS or MP(Y)"	73	"Cargo ships/Carrying DG,HS or MP(Z)"
74	"Cargo/Carrying DG,HS or MP(OS)"	75	"Cargo ships/Reserved for future use"
76	"Cargo ships/Reserved for future use"	77	"Cargo ships/Reserved for future use"
78	"Cargo ships/Reserved for future use"	79	"Cargo ships/Reserved for future use"
80	"Tanker(s)/All ships of this type"	81	"Tanker(s)/Carrying DG,HS or MP(X)"
82	"Tanker(s)/Carrying DG,HS or MP(Y)"	83	"Tanker(s)/Carrying DG,HS or MP(Z)"
84	"Tanker(s)/Carrying DG,HS or MP(OS)"	85	"Tanker(s)/Reserved for future use"
86	"Tanker(s)/Reserved for future use"	87	"Tanker(s)/Reserved for future use"
88	"Tanker(s)/Reserved for future use"	89	"Tanker(s)/Reserved for future use"
90	"Other types of ship/All ships of this type"	91	"Other types of ship/Carrying DG,HS or MP(X)"
92	"Other types of ship/Carrying DG,HS or MP(Y)"	93	"Other types of ship/Carrying DG,HS or MP(Z)"
94	"Other types of ship/Carrying DG,HS or MP(OS)"	95	"Other types of ship/Reserved for future use"
96	"Other types of ship/Reserved for future use"	97	"Other types of ship/Reserved for future use"
98	"Other types of ship/Reserved for future use"	99	"Other types of ship/Reserved for future use"
WIG: Wing in ground	HSC: High speed craft	DG: Dangerous goods	
HS: Harmful substances	MP: Marine pollutants	0-9: Undefined	

5.2.2   SET STATIC DATA
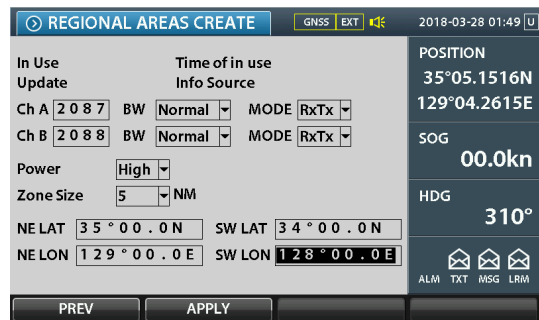
[MENU Key]   → [2 INIT SETUP] → [2 SET STATIC DATA]

◆ MMSI : 200000000-799999999, 982000000-987999999, 000000000

◆ IMO NO.   : 000 000 0000 to 107 374 1823

◆ Ship Name : Maximum 20 characters (including spacing / @ = null character)

◆ CALL SIGN : Maximum 7 characters (including spacing / @ = null character)

◆ Note: MMSI can be modified only when it is "000 0000 00" and it cannot be changed after modification. In case of "000 000 000", it does not transmit.

◆ @ is a null character. It can be in a sentence, however if you put two consecutive @ at the front or end of the sentence, @ will be recognized as a null character.

5.2.3   SET REGIONAL AREAS

[MENU Key]   → [2 INIT SETUP] → [3 SET REGIONAL AREAS]

◆ When the distance of 2 areas are more than 8 NM

◆ Regional area 20NM ~ 200NM

◆ Zone size is 5NM ~ 8NM.

5.2.4   SET LONG RANGE

[MENU Key]   → [2 INIT SETUP] → [4 SET LONG RANGE]

◆ Set long range mode to automatically or manually respond to requests for own ship data from a long range telecommunication terminal such as an INMARSAT-C ship earth station.
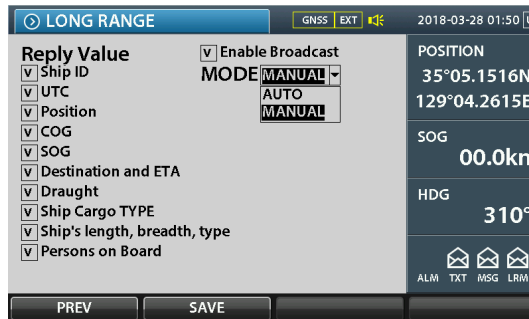
5.2.5   SET GNSS ANTENNA POSITION

[MENU Key]   → [2 INIT SETUP] → [5 SET GNSS ANTENNA POSITION]
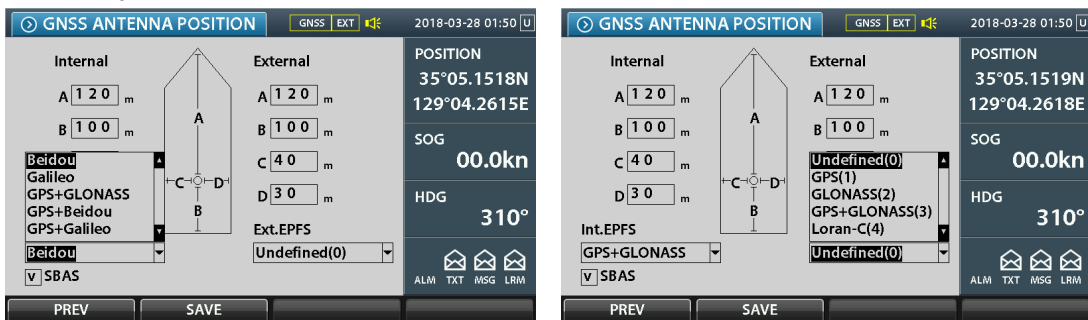
◆ GNSS : Global Navigation Satellite System. A navigation satellite system that uses a satellite network to accurately track the location of target on the ground.

◆ GPS : The Global Positioning System owned by the U.S.. It provides positioning, navigation, and timing (PNT) services.

◆ GLONASS : The Global Navigation Satellite System developed by the former Soviet Union.

◆ Beidou : The Beidou Navigation Satellite System (BDS) or Compass. The satellite navigation system developed and owned by China.

◆ Galileo : The GNSS that is developed by the European Union (EU) and the European Space Agency (ESA). It is the world's first civil satellite positioning system.

◆ Russian GLONASS, Chinese BeiDou and etc. are available.

◆ More precise location information can be transmitted with SBAS.

5.3 SYSTEM SETUP

◆ Inquire **administrator password** of Samyung ENC A/S center or authorized distributor.
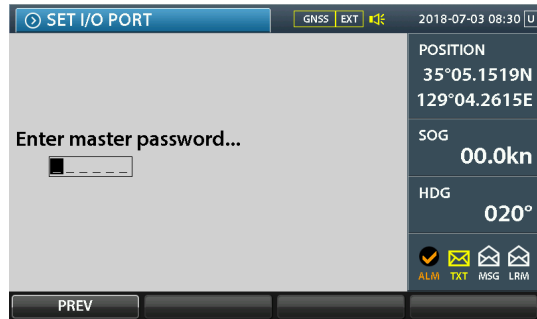
5.3.1 SET INPUT/OUTPUT (I/O) PORT

[MENU Key] → **[3 SYSTEM SETUP]** → **[1 SET I/O PORT]**

5.3.1.1 PRIORITY OF SENSOR PORT

Priority	Identification	Transmission speed (bps) (Baud Rate)	Port direction
1 (Top priority)	Sensor 1	**4800** / 38400 / Auto	input
2	Sensor 2	**4800** / 38400 / Auto	input
3	Sensor 3	**4800** / 38400 / Auto	input

◆ The transponder automatically determines the priority of the external sensor input ports.

◆ The transponder has three dedicated ports for sensor input. You can input the location, COG, SOG, heading and ROT information to each port. If one information is input to multiple ports, the transponder automatically determines the priority of each port and information.

◆ If no corresponding information is input for 30 seconds, the information of the next priority is automatically determined.

5.3.1.2 SENTENCE PRIORITY

◆ When the DTM is not input to WGS84, the input of that port cannot be adopted as position information.

◆ When input DTM sentence to WGS84, external position information is adopted with following priority.

Priority	Position	COG / SOG	HDG	ROT
1(High priority)	RMC	RMC	THS	ROT
2	GGA	VTG	HDT	
3	GNS	VBW		
4	GLL			

◆ RMC, GGA, GNS, GLL are applied only when DTM is input to WGS84

5.3.2 SET DISPLAY

[MENU Key] → [3 SYSTEM SETUP] → [2 SET DISPLAY]
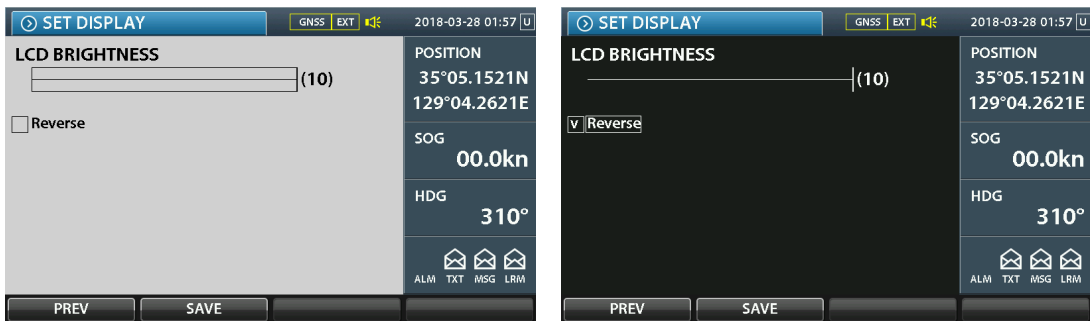
◆ Up to 10 levels of LCD brightness can be set with the directions keys. (Front TX/RX LED are reversed.)

◆ The Reverse function switches the display color to the opposite. It is necessary mostly for the navigation at night.

5.3.3 SET BUZZER

[MENU Key] → [3 SYSTEM SETUP] → [3 SET BUZZER]
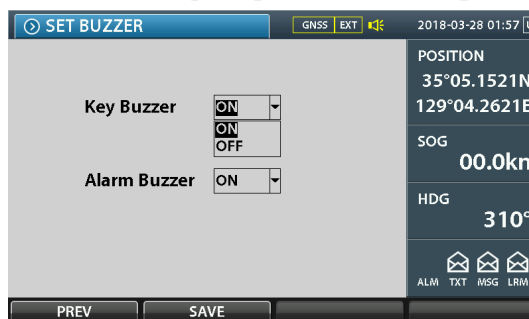
◆ Key Buzzer: Turn ON/OFF the keypad operation sound.

◆ Alarm Buzzer: Turn ON/OFF the alarm sound.

5.3.4   SET PASSWORD (000000)

[MENU Key]   → [3 SYSTEM SETUP] → [4 SET PASSWORD]

◆ You must be careful because the setting information may be changed when the password is exposed

5.3.5   SET ETC

[MENU KEY]   → [3 SYSTEM SETUP] → [5 SET ETC]
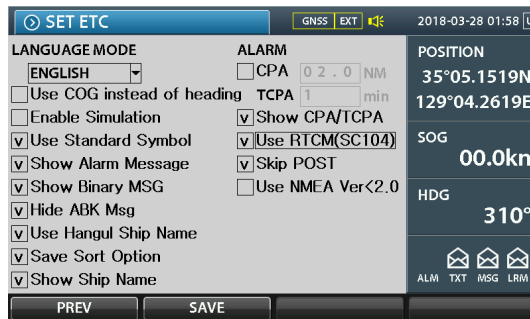
◆ LANGUAGE MODE : ENGLISH, KOREAN, CHINESE, RUSSIAN

◆ Use COG instead of heading : If there is no HDG input signal then COG value is indicated as HDG.

◆ Enable Simulation : Execute simulation with AIS file stored in SD-CARD.

◆ Use Standard Symbol : Display AIS target symbol as standard symbol on the chart/map.

◆ Show Alarm Message : Alarm window will pop-up to show alarm contents.

◆ Show Binary MSG : Display pop-up window when receiving Binary message.

◆ Hide ABK Msg : It will not display the response screen for Broadcast Binary Message (BBM).

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◆ Save Sort Option : Save the sorting method of the table target to use when Power is On.

◆ ALARM CPA, TCPA : Use CPA, TCPA alarm.

◆ Show CPA/TCPA : Set CPA/TCPA view on the list of targets at screen.

◆ Use RTCM(SC104) : Set to use RTCM, a GPS calibration signal.

◆ Skip POST : Skip Self-Test process when Power On

◆ Show Ship Name : Display the name of the target on the chart/map under the symbol.

◆ Use NMEA Ver<2.0 : Allow sentence without Check-sum to be input from external source.

5.3.6   SET ADVANCED

[MENU KEY]   → [3 SYSTEM SETUP] → [6 SET ADVANCED]
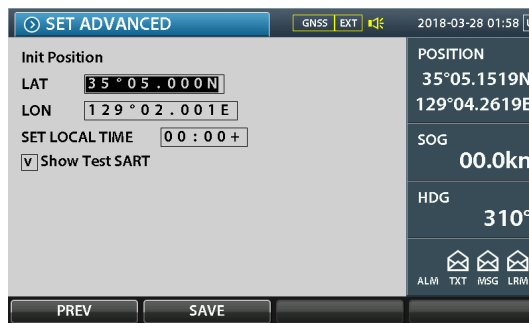
◆ Init Position : If there is no information of position then input initial coordinate of chart/map screen manually.

◆ SET LOCAL TIME : Local Time setting by countries.

◆ Show Test SART : When AIS SART test is sent to Message 15, the received test SART MMSI is arranged on the screen.

(When a distress is sent by AIS SART then it is received as Message 14 and brought it to the top of the target list to notify the distress condition)

5.4　MAINTENANCE

5.4.1　PROGRAM VERSION

[MENU Key]　→ [4 MAINTENANCE] → [1 PROGRAM VERSION]

⊙ MAINTENANCE	GNSS EXT	2018-07-03 08:47 U
1 PROGRAM VERSION	→	POSITION
2 KEY TEST	→	35°05.1515N
3 LCD TEST	→	129°04.2615E
4 COM MONITORING	→	SOG
5 SECURITY LOG	→	00.0kn
6 TRANSPONDER TEST	→	HDG
7 UPDATE MKD S/W	→	019°
8 UPDATE TRANSPONDER S/W	→	✓ ⊠ ⊠ ⊠ ALM TXT MSG LRM
PREV	EXIT	

⊙ PROGRAM VERSION	GNSS EXT	2018-07-03 08:47 U
Transponder Main		POSITION
Program Version	TM20180702/1.0/0.89d	35°05.1516N
		129°04.2615E
Transponder Sub		SOG
Program Version	TS20180515/1.0/0.85	00.0kn
MKD		HDG
Program Version	MK20180703/1.0/0.80o	019°
Map	MP-kr-V-1.0	✓ ⊠ ⊠ ⊠ ALM TXT MSG LRM
PREV		

5.4.2　KEY TEST

[MENU Key]　→ [4 MAINTENANCE] → [2 KEY TEST]

◆　Press the keypad key, then the related item on the screen turns to black.
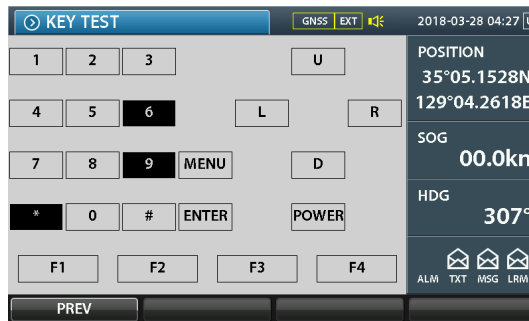
5.4.3　LCD TEST

[MENU Key]　→ [4 MAINTENANCE] → [3 LCD TEST]

◆　Press the "ENT" key and then the LCD turns to 5 kinds of color.
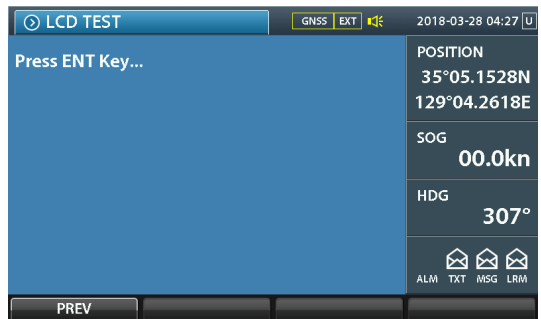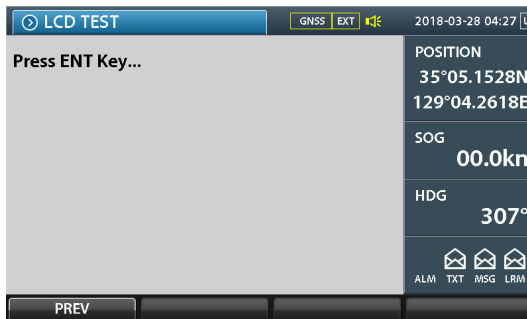
◆　Use 🔅 and ☼ keys to adjust the LCD brightness.

5.4.4   COM MONITORING

[MENU Key]   → [4 MAINTENANCE] → [4 COM MONITORING]

◆ Check the information transmission between the transponder and the indicator.
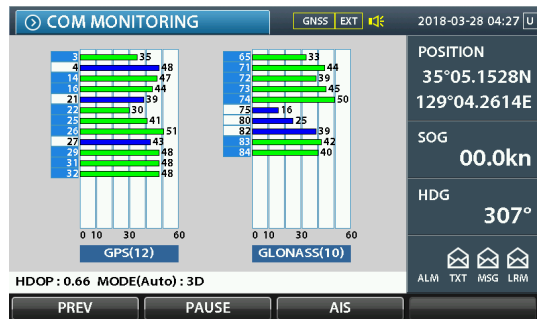
5.4.5   SECURITY LOG

[MENU Key]   → [4 MAINTENANCE] → [5 SECURITY LOG]

◆ Record ON / OFF of the system.

◆ Storage time: 10 pieces which are OFF for minimum 15 minutes. (Store in memory)

5.4.6   TRANSPONDER TEST

[MENU Key]   → [4 MAINTENANCE] → [6 TRANSPONDER TEST]
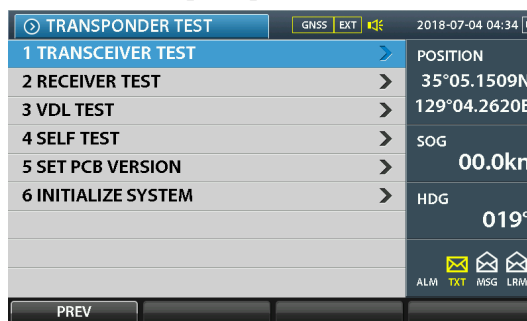
5.4.6.1 TRANSCEIVER TEST
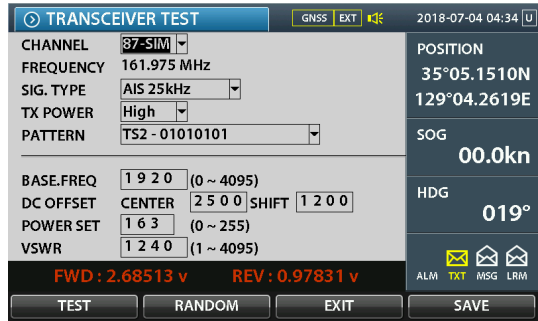
5.4.6.2 RECEIVER TEST
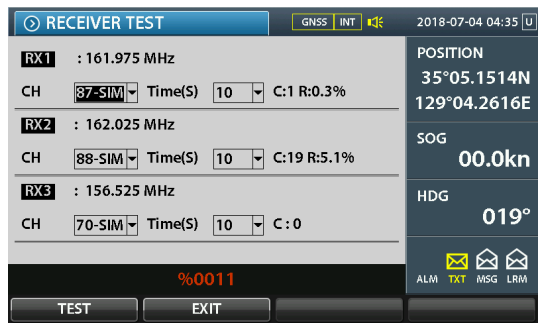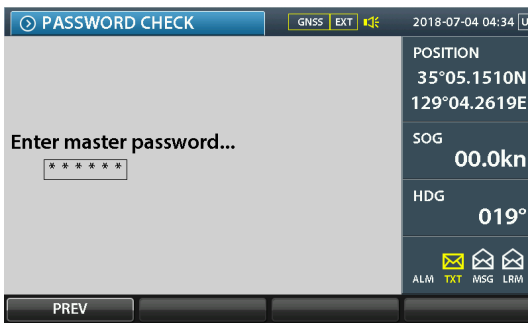
5.4.6.3 VHF COMMUNICATION TEST (VDL TEST)

[MENU Key] → [4 MAINTENANCE] → [6 TRANSPONDER TEST] → [3 VDL TEST]

◆ The VDL test checks the communication status of own vessel and other vessels by sending Message Type 10 to the target MMSI and receiving Message Type 11 from the target ship.

◆ The list shows Class A vessels that have a distance of 50 NM or less from own vessel.

◆ Use the Up and Down keys to move the cursor on the target vessel which will be tested, and press the TEST key. Then wait for a response from the target vessel for 20 seconds.

◆ TEST (F1) runs the VDL Test to the target vessel. If there is no Target MMSI selected, the test will not run. If the test runs normally then this key will be changed to Stop (F1).

40

◆ SORT (F2) shows the list of sorted target vessel alternately in ascending and descending order on the screen.

◆ EXIT (F3) returns to the previous menu.

Number	Reason	Measures
1	No response. The message was not acknowledged by the test target.	Change targets, then repeat the test.
2	Own vessel MMSI is not set.	Refer to the installation manual for this equipment and input the MMSI.
3	Less than one minute interval between messages sent.	Wait for more than one minute, then repeat the test.
4	Failed for an unknown reason. (Other than those above.)	There may be an obstacle (land mass, etc.) between your vessel and the test vessel. Manually input a different test target MMSI then repeat the test.

5.4.6.4 SELF TEST

[MENU Key] → [4 MAINTENANCE] → [6 TRANSPONDER TEST] → [4 SELF TEST]

5.4.6.5 SET PCB VER

5.4.6.6 INITALIZE SYSTEM
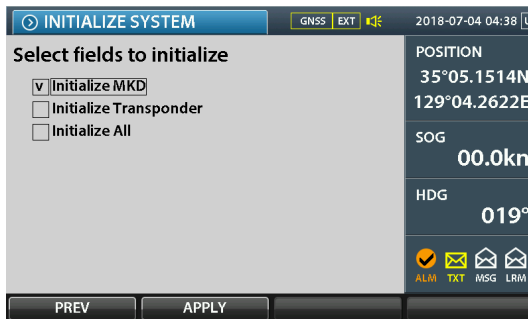
5.4.7   UPDATE MKD S/W

[MENU Key]   → [4 MAINTENANCE] → [7 UPDATE MKD S/W]

◆ Hold the SD-CARD as face the label of the SD-CARD.

◆ Open the cover and insert the SD-CARD until it clicks into the slot.

5.4.8   UPDATE TRANSPONDER S/W

[MENU Key]   → [4 MAINTENANCE] → [8 UPDATE TRANSPONDER S/W]

◆ Hold the SD-CARD as face the label of the SD-CARD.

◆ Open the cover and insert the SD-CARD until it clicks into the slot.
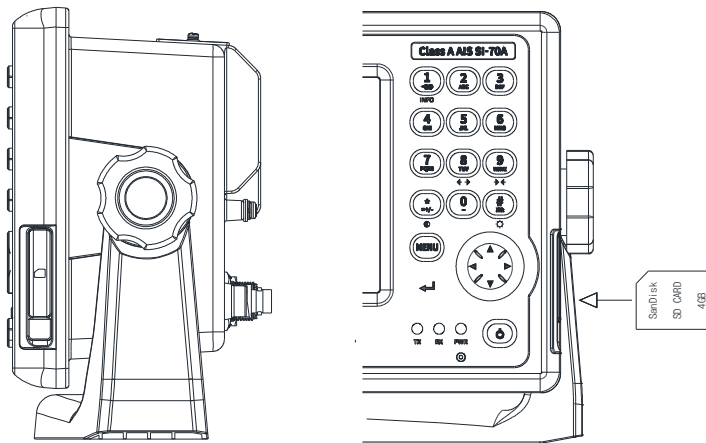
6. INSTALLATION

6.1 BACK SIDE EXPLANATION
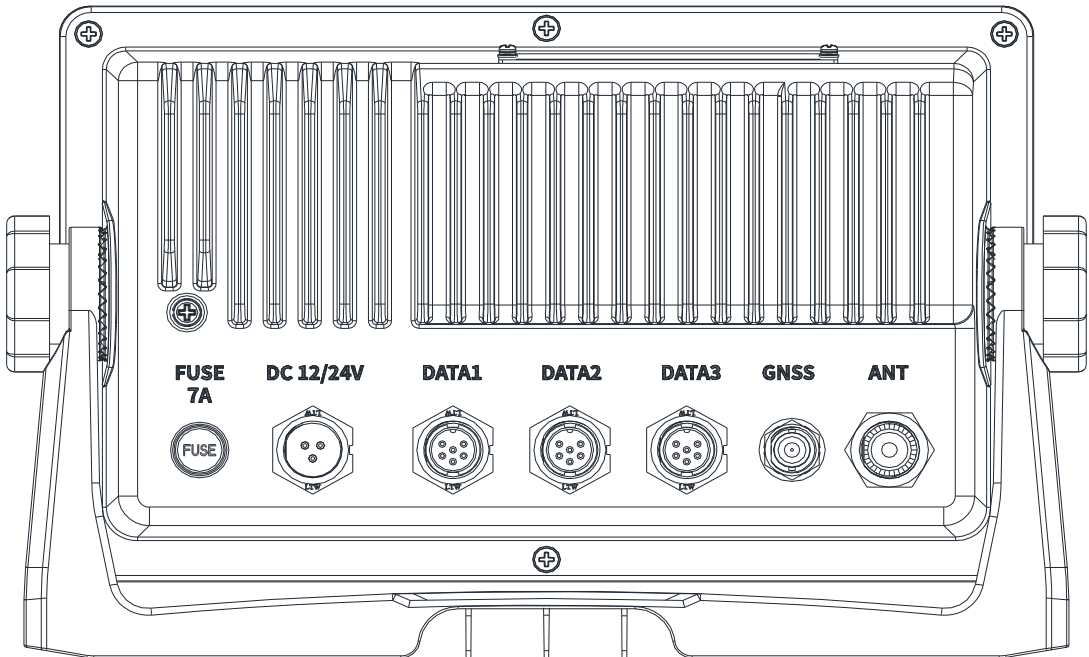
◆ SI-70A AIS should be installed considering easy access location with the other external equipment.

◆ The 3P connector located on the back side of this unit should be connected to the power supply as 1 (+) and 3 (-).

◆ Connect the IEC / NMEA DATA cable to the data port on the back side of the body (see the external wiring diagram in the Appendix of SI-70A AIS).

DATA1 (Z108-6B)		
1	SN1-RXB	Sensor Inputs
2	SN1-RXA	
3	232-TX1	Output of AIS Data
4	EXK-GND	
5	232-TX2	
6	GND	

DATA2 (Z108-10B)		
1	SN2-RXB	Sensor Inputs
2	SN2-RXA	
3	RELAY-A	BIIT Output Port
4	RELAY-B	
5	RELAY-C	
6	EXK-TXB	External Display
7	EXK-TXA	Output of AIS Data
8	EXK-GND	
9	EXK-RXA	External Display
10	EXK-RXB	Input of AIS Data

DATA3 (Z108-12B)		
1	SN3-RXB	Sensor Inputs
2	SN3-RXA	
3	PLT-TXB	Pilot port
4	PLT-TXA	Output of AIS Data
5	PLT-GND	
6	PLT-RXA	Pilot port
7	PLT-RXB	Input of AIS Data
8	LON-TXB	Long-range Port
9	LON-TXA	Output of AIS Data
10	LON-GND	
11	LON-RXA	Long-range Port
12	LON-RXB	Input of AIS Data

6.2   POSITION

◆ According to the international law IEC60945, the radiation characteristic will be very small at 156MHz ~ 165MHz as shown below. The reason is the VHF (156MHz ~ 165MHz) band generated by the equipment greatly affects the reception sensitivity of the AIS.

SAMYUNG ENC

◆ When installing the equipment, make sure that peripheral equipment are designed according to IEC60945.

◆ It is necessary to pay careful attention to the installation of the land equipment such as land CCTV, land TV, DC / AC power unit, solar charger, land LED lighting fixture and … etc. which are manufactured without regard to maritime regulations.

6.3   VHF AND GPS ANTENNA INSTALLATION

6.3.1   POSITION

◆ The purpose of the VHF antenna is stable communication of the AIS. There are some important matters on the antenna installation as follows.

◆ Generally, VHF Antenna should be installed on a high position as far away from other equipment as possible.

◆ VHF antenna should be installed on a high place. It should be installed at least 2M away from the structure made of conductive material. Further, it should be installed far away from large vertical objects, and should have a 360 degree view horizontally. VHF antenna should be installed at least 2M away from high pressure energy sources such as a radar, other TX radar and TX radio antenna. It also should be out of the TX beam.

◆ Do not install more than one antenna at the same height. If there is another antenna at the same height, the distance between those antennas should be 2 meters minimum.

◆ GPS antenna should be installed where the sky can be seen. If there is a metal object on the top of the antenna, it affects GPS sensitivity and the antenna will not receive position information.
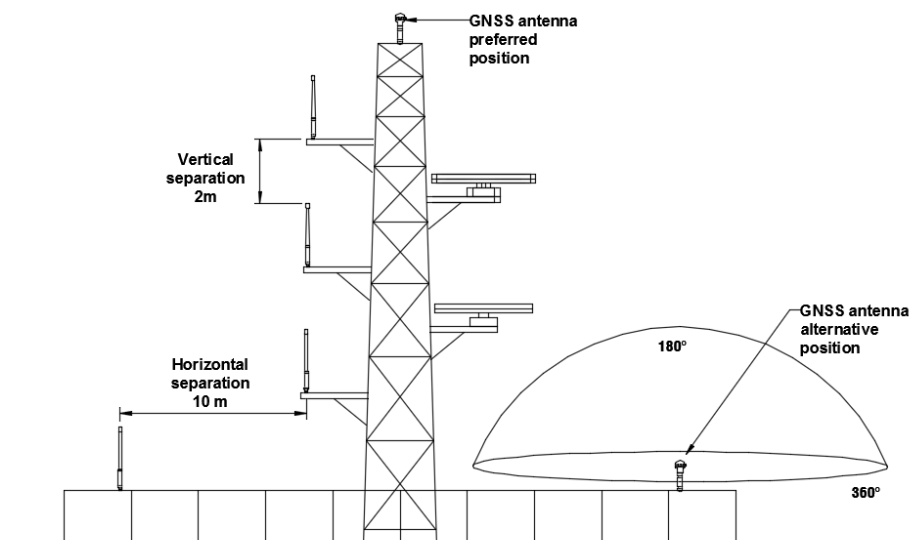
6.3.2 LINE OF SIGHT DISTANCE
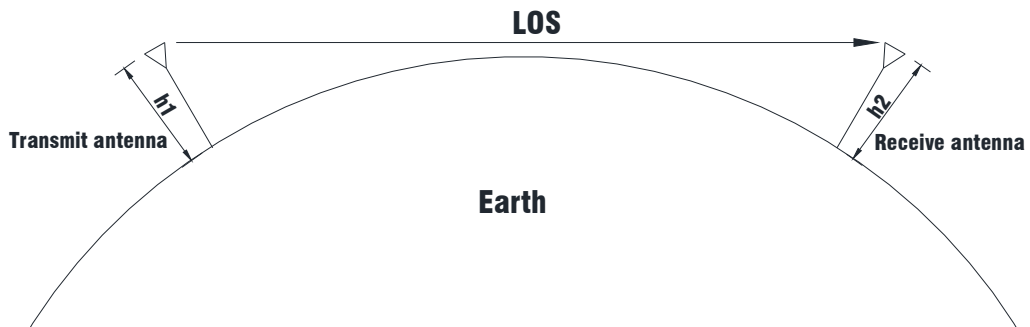
- ◆ VHF is Line Of Sight Communication (LOSC). It needs to be installed as high as possible, so the communication range can be far.
- ◆ SSB is able to do a long distance communication even there is a mountain or a building.
- ◆ Radio visual distance formula (Earth radius:6370km)
  - – $D = 4.11 (\sqrt{h1} + \sqrt{h2})$ (km)
- ◆ Example : when h1 = 9m / h2 = 9m
  - – $D = 4.11 (\sqrt{9} + \sqrt{9})$ (km) = 24.66km
- ◆ Above formula is mathematical figure so it can be changed depending on weather and environment.

6.3.3   ANTENNA CABLE

- ◆ The cable should be as short as possible to minimize attenuation of the signal.
- ◆ The loss of **3dB** means **half-reduction** of signal strength. When you install the cable, consider how to minimize the cable attenuation.

6.3.4 CONNECTION METHOD OF ANTENNA CABLE AND CONNECTOR

- ◆ Antenna cable uses RG-8/U or RG-10/U wire. The cable should be installed solidly in the place where is completely waterproofed with low mechanic vibration, and easy to replace and repair.
- ◆ If the connecting is bad, it reduces transmission output, damages output components, and reception sensitivity are significantly degraded as well. It will make enormous troubles to communication.
- ◆ Therefore, you should follow instruction and all the details below.
  - ① Remove the Cable sheath about 30mm.

② Leave the 'Braided shield' about 5mm and strip out the shielding wire with a knife. Be careful not to damage the internal 'Insulator'. (put a lead on the shielding wire).

③ Leave the 'Insulator' about 2 mm from the 'Braided shield' and cut off with a knife. Be careful not to damage the inside 'Conductor'.

④ Separate the cable connector and fit 'Coupling ring' into cable. Then insert the 'Plug assembly'.

⑤ Solder the parts 'Solder both sides of hole' and 'Solder here' to the Plug assembly.

⑥ Cut at the part 'Cut conductor here'.

⑦ Turn the 'Coupling ring' inside the 'Plug assembly' and assemble.
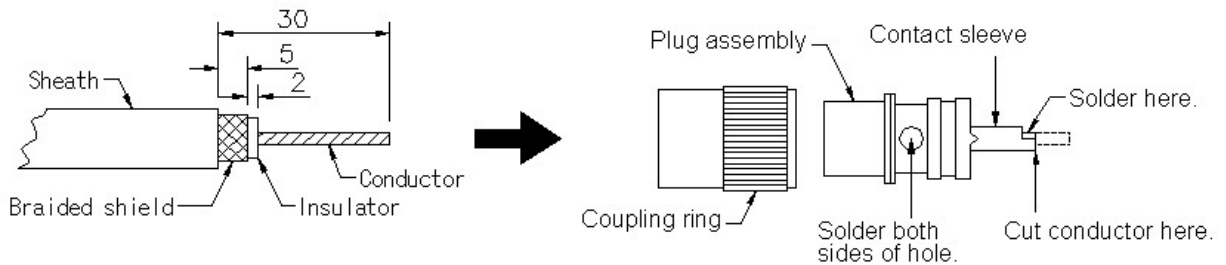
6.3.5 GROUND CONNECTION

Coaxial down-lead must be used for all receiving antennas, and the coaxial screen must be connected to the ground at one end.

7. SYSTEM MAINTENANCE AND TROUBLESHOOTING

7.1   SYSTEM MAINTENANCE

It is necessary to do regular maintenance for keeping performance of equipment in a good condition. Regular maintenance means regular equipment check, software upgrade, and etc., including at least the items listed below.

ITEM	CONTENT
Connector and Terminal	Check the connector and terminal are properly connected to the back side of the equipment.
Cable	Check the status of various cables. If the cable is damaged or broken, replace it immediately
Ground port and Ground cable	Check the status of the ground terminal. Replace or clean it if it is decayed or rusted. Check the connection of the ground wire.
Cleaning	If the equipment has salt-sediment or dirt, remove it with a cleaning tissue or soft patch. The use of chemicals is prohibited because the surface of the equipment may be peeled off or various display characters may be erased.

7.2   TROUBLESHOOTING

The following table shows general defective symptoms and solutions for the defects.

Even though users cannot restore the equipment with general methods, don't even try to disassemble the equipment and check the inside of it. Whatever the issue is, the equipment must be checked by technical specialists.

A/S POC ☎ : +82-1577-0198 (ARS)

SYMPTOM	MEASURES
Power doesn't turn on	Check if the power connector is fixed well. Check the power supply and fuse.
Satellite information is not received.	Check if the GPS antenna, antenna wire, and connector are properly connected.
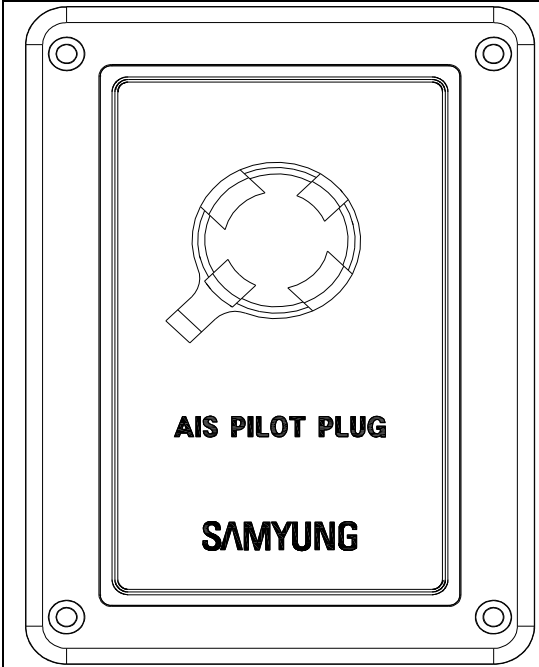
8. APPENDIX

8.1 AIS INTERFACE OVERVIEW

| CH1 | → | IEC61162-1 IEC61162-2 |

Sensor Inputs

Minimum required input sentences:
Position	GNS, , RMC, DTM	int/ext*
SOG	RMC, VBW, VTG	int/ext*
COG	RMC, VBW, VTG	int/ext*
Heading	HDT, THS	ext
Rotation Rate	ROT	ext
RAIM	GBS	ext

* priorities

| CH2 | → | IEC61162-1 IEC61162-2 |

| CH3 | → | IEC61162-1 IEC61162-2 |

Input/output of AIS Data

INPUT

Manual data input:
Voyage   VSD
Static   SSD

VDL messages:
ABM
BBM
ABK   handshake
AIR   interrogation

Other:
ACA   channel ass.
ACK   alarm ack.
HBT   remote MKD
LRF   LR ackn

OUTPUT

VDL messages:
VDM (representing binary data contents of VDL messages)

Other:
VDO   own ship data
ALR   alarm status
ABK   VDL ack.
TXT   sensor status
ACA   channel management information
LRI/LRF LR interrogation
SSD/VSD/VER system query

| CH4 | ⇄ | External Display 61162-2 |

| CH5 | ⇄ | Aux. Display/ pilot port 61162-2 |

| CH8 | ⇄ | Long-range 61162-2 |

Long-range Port

INPUT
LRI, LRF

| CH10 | ← | BIIT NC relay |

BIIT Output Port

8.2   AIS PILOT PLUG (PB-70, OPTION)

The pilot plug is connected between the AIS and the PC, and must supply the AIS information to the PC. This plug is required for the ships passing through the Panama Canal and the Saint Lawrence Seaway. The specifications of the pilot plug are as follows.

Connector for AIS	Connector for PC
AMP 206486-1 (9-pin, male)	AMP 206485-1
TX-A: Pin 1 TX-B: Pin 4 RX-A: Pin 5 RX-B: Pin 6 SHIELD: Pin 9	

8.3   ALARM MESSAGES

The transponder generates various alarms that categorized as "alarms" and shows information messages. It appears as pop-ups on the display and may generate an audible or visual alarm (depending on the installation). In order to clear the alarm, it must be acknowledged on the display unit.

Error Code	Alarm's description text	Cause	System Reaction
001	AIS: Tx malfunction	VHF Antenna cable installation	. Stop transmission . Input MMSI
002	AIS: Antenna VSWR exceeds limit	VHF Antenna installation	. Continue operation . Check the antenna and its cable (Use 75Ω cable, instead of 50Ω)
003	AIS: Rx channel 1(CH87) malfunction	Internal error VCO failure	. Stop transmission on affected channel . The transponder should be replaced
004	AIS: Rx channel 2(CH88) malfunction		
005	AIS: Rx channel 3(CH70) malfunction		
006	AIS: general failure	Internal error	. Stop transmission . The transponder should be replaced
007	AIS: UTC sync invalid	GPS receiving error	. Check the GPS antenna . Check the receiver
008	AIS: MKD connection lost	Operating, indicating equipment is not connected	. Continue operation . The display unit and the transponder are disconnected . Check the connection of main display and its cable . Check operation of the display unit
009	AIS: internal / external GNSS position mismatch		. Continue operation
010	AIS: NavStatus incorrect		. Continue operation
011	Heading sensor offset		. Continue operation
014	AIS: active AIS-SART	Receiving SART	Receive AIS SART (Continue operation)
025	AIS: external GNSS lost	Invalid position data is input	. Continue operation with internal GNSS . NMEA data of GLL, GNS, GGA, RMC are not received . Check the sensor and its cable . Check sensor input rate setting
026	AIS: no position sensor in use	Internal GNSS error	. Continue operation . Check the internal GPS sensor antenna and its cable
029	AIS: no valid SOG information	No data from external sensor or Internal position sensor	. Continue operation . NMEA data of VTG, RMC, HD, ROT are not received . Check the sensor and its cable . Check sensor input rate setting
030	AIS: no valid COG information		
032	AIS: Heading lost/invalid		
035	AIS: no valid ROT information		

Integrity alarm conditions signaled using ALR sentence formatter

■ AIS : Tx Malfunction (ID 001)

This alarm is generated when there is a problem with the transponder. This alarm is occasionally generated may be caused by transient conditions and does not indicate a permanent problem. However, if this alarm occurs periodically, you have your installation checking by an authorized service agent.

- The "LOCK" signal is not received from the PLL chip on the RF board.
- The RF board may malfunction because of hardware problem or software problem causing a continuous transmission that exceeds 250 msec.

  Note: The hardware stops automatically when transmitting continuously.
- Invalid MMSI.
- Voltage Standing Wave Ratio (VSWR) of the AIS antenna is excessively high.

■ AIS : Antenna VSWR Exceeds limits (ID 002)

The Voltage Standing Wave Ratio (VSWR) of the antenna is checked for every transmission. When it exceeds a given ratio, this alarm is generated. When the VSWR goes below the allowed threshold, the alarm is cleared.

■ AIS: Rx Ch 1(CH87) Malfunction (ID 003)
■ AIS: Rx Ch 2(CH88) Malfunction (ID 004)
■ AIS: Rx Ch 3(CH70) Malfunction (ID 005)

Each message indicates that there is a problem with AIS receiving channel 1, 2 or 3 respectively. These messages are occasionally generated may be caused by transient conditions and there is no alarm sounding, however, the periodical occurrence of these messages is likely to indicate a permanent problem which should be investigated by an authorized service agent.

PLL chip on RF board generates signal of synthesizer locking or unlocking.

MPU monitors and sets status flag which reflects data of ALR sentence.

A DSC error will be generated when the AIS cannot detect correct signal strength from the DSC receiving circuit for 120 seconds.

■ AIS: General Failure (ID 006)

This alarm is generated when the AIS cannot radio communicate or a serious hardware failure has occurred. If this alarm is generated, please contact with your retailer.

■ **AIS: UTC Sync Invalid (ID 007)**

This alarm is generated when the AIS loses UTC direct synchronization (The internal GPS receiver cannot synchronize).

■ **AIS: MKD connection lost (ID 008)**

This alarm is generated when the connection between the control unit and the AIS display unit is lost.

■ **AIS: Internal/External GNSS position mismatch (ID 009)**

This alarm is generated when the difference in the distance between the internal and external GNSS position is more than 100m for more than 15 minutes.

■ **AIS: NavStatus incorrect (ID 010)**

This alarm is generated when the navigational status is incorrect. For example, the navigational status is set to "At Anchor" but the ship is moving faster than 3 knots, this NavStatus incorrect alarm will be generated.

■ **Heading sensor offset (ID 011)**

This alarm is generated when Speed Over Ground (SOG) is faster than 5 knots and the difference between Course Over Ground (COG) and True Heading (HDT) is more than 45˚ for more than 5 minutes.

■ **Active AIS SART (ID 014)**

This alarm is generated when the AIS has received an active AIS SART position signal.

■ **External EPFS Lost (ID 025)**

This alarm is generated when the position of the external Electronic Position Fixing System is invalid (i.e. no external GNSS). Due to the fallback arrangement for the positioning sensor, this alarm can be inactive up to 30 seconds (during which the internal GNSS is used).

■ **No Position Sensor In Use (ID 026)**

This alarm is generated when the AIS does not receive any valid position (latitude/longitude) from the sensor.

■ **AIS: No Valid SOG Information (ID 029)**

■ **AIS: No Valid COG Information (ID 030)**

These alarms are generated when the AIS does not receive any valid Speed Over Ground (SOG) or valid Course Over Ground (COG) from the sensor. The SOG and COG is based on the speed log (when external GNSS is used and a valid heading is available) or current GNSS in use.

■ **AIS: Heading Lost/Invalid (ID 032)**

This alarm is generated when the heading information is lost or invalid (from external sensors) or when the heading is undefined.

■ **AIS: No Valid ROT Information (ID 035)**

This alarm is generated when Rate of Turn (ROT) is undefined or there is no valid ROT information from external sensor or internal calculations.

8.4 MESSAGE STRUCTURES

Message structures are shown in the format used in IEC 61162-1

8.4.1 ABK - AIS ADDRESSED AND BINARY BROADCAST ACKNOWLEDGEMENT

The ABK sentence is output by the transponder on the presentation ports in response to the receipt of an ABM, AIR or BBM sentence. Its purpose is to inform the requesting device about the success or failure of its request.

$--ABK ,xxxxxxxxx ,x ,x.x ,x ,x *hh<CR><LF>

       ①   ②③ ④⑤

① MMSI of the addressed AIS unit   ② AIS channel of reception

③ M.1371 Message ID   ④ Message sequence number

⑤ Type of acknowledgement

8.4.2   ABM – AIS ADDRESSED BINARY AND SAFETY RELATED MESSAGE

This sentence is used to transmit M.1371 messages 6 (binary addressed) or 12 (addressed safety related) via the AIS system by encapsulating the M.1371 message within one or more AIS sentences.

$--ABM ,x ,x ,x ,xxxxxxxxx ,x ,xx ,s—s,x *hh<CR><LF>

        ① ② ③ ④   ⑤⑥ ⑦   ⑧

① total number of sentences	② sentence number
③ sequential message identifier	④ MMSI of the destination AIS unit
⑤ AIS channel	⑥ M.1371 Message ID (6 or 12)
⑦ encapsulated data	⑧ number of fill-bits

When the transponder receives an ABM sentence from an external device, it will return an ABK sentence to indicate the success or failure of the transmission attempt.

8.4.3   ACA – AIS CHANNEL ASSIGNMENT MESSAGE

$--ACA ,x ,llll.ll,a ,yyyyy.yy,a   ,llll.ll,a,yyyyy.yy,a ,x ,xxxx,x ,xxxx,x ,x ,x ,a ,x ,hhmmss.ss *hh<CR><L

    ① ②   ③   ④   ⑤   ⑥⑦   ⑧⑨   ⑩ ⑪ ⑫ ⑬ ⑭ ⑮

① sequence number	② region northeast corner latitude, N/S
③ region northeast corner longitude, E/W	④ region southwest corner latitude, N/S
⑤ region southwest corner longitude, E/W	⑥ transition zone size
⑦ channel A	⑧ channel A bandwidth
⑨ channel B	⑩ channel B bandwidth
⑪ Tx/Rx mode control	⑫ power level control
⑬ information source	⑭ in-use Flag
⑮ time of "in use" change	

The ACA sentence is used both to send channel management information to the transponder and to obtain channel management information from it.

8.4.4   ACK – ACKNOWLEDGE ALARM

This sentence is used to acknowledge an alarm condition.

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

       ①

① alarm ID

8.4.5 ACS - AIS CHANNEL MANAGEMENT INFORMATION SOURCE

This sentence is used in conjunction with the ACA sentence. It identifies the originator of the information contained in the ACA sentence and the date and time when the transponder received that information.

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

①② ③ ④ ⑤ ⑥

① sequence number   ② MMSI of originator

③ UTC of receipt of information   ④, ⑤, ⑥ day, month, year

8.4.6 AIR – AIS INTERROGATION REQUEST

The interrogation request sentence allows an external to request certain M.1371 messages from other remote devices via the AIS system.

$--AIR ,xxxxxxxxx ,x.x ,x ,x.x ,x ,xxxxxxxxx,x.x ,x *hh<CR><LF>

① ② ③④ ⑤⑥ ⑦ ⑧

① MMSI of interrogated station   ② M.1371 message requested from station-1

③ message sub-section

④ number of second message requested from station-1

⑤ message sub-section   ⑥ MMSI of interrogated station-2

⑦ number of messages requested from station-2

⑧ message sub-section

When the transponder receives an AIR sentence, it sends M.1371 interrogation messages (type 15) to the addressed station(s) and returns an ABK sentence to the requesting device indicating that the transmission is complete.

8.4.7 ALR – ALARM CONDITION AND STATUS

This sentence is sent by the transponder to all presentation ports order to report an alarm condition on a device. It identifies the source of the alarm, whether it has been acknowledged or not and the time at which the condition changed.

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

① ② ③④⑤

① time of condition change   ② alarm source

③ alarm condition   ④ acknowledge state

⑤ descriptive text

This sentence is sent by the transponder whenever a new alarm is generated or its condition changes state. It is also sent periodically even when there are no active alarms in order to provide a positive indication of the current status of each alarm.

8.4.8   BBM - AIS BROADCAST BINARY MESSAGE

The BBM sentence allows an external device to instruct the transponder to broadcast a block of binary data in an M.1371 binary broadcast message (type 8) or a safety related broadcast message (type 14).

  !--BBM ,x ,x ,x ,x ,x.x ,s—s ,x *hh<CR><LF>

           ①②③④⑤　⑥　　⑦

① total number of sentences needed to transfer message

② sentence number　　　　　　　　　③ sequential message identifier

④ AIS channel for broadcast of the radio message

⑤ M.1371 message ID　　　　　　　　⑥ encapsulated data

⑦ number of fill-bits

When the transponder receives one or more BBM sentences from an external device, it is de-encapsulates the encoded data and re-assembles an M.1371 message of type 8 or 14 and then 34 Issue 1 AIS Installation Manual transmits it over the VDL (if possible). It then sends an ABK sentence back to the requesting device to indicate whether the transmission of the message succeeded or failed.

8.4.9   DTM – DATUM REFERENCE

Local geodetic datum and datum offsets from a reference datum.

  $--DTM,ccc,a ,x.x,a,x.x,a,x.x ,ccc*hh<CR><LF>

          ①　②③　　④　　⑤　⑥

① Local datum　　　　　　　　　　　② Local datum subdivision code

③ Lat offset, min, N/S　　　　　　　④ Lon offset, min, E/W

⑤ Altitude offset, m　　　　　　　　⑥ Reference datum

Note that the only datum supported by AIS is WGS84. The DTM sentence must be sent to the transponder at a frequency of more than once every 30 seconds otherwise any positional information sentences (eg GLL, GNS. RMC and GGA) will be ignored.

8.4.10 GBS – GNS SATELLITE FAULT DETECTION

This message is used to support Receiver Autonomous Integrity Monitoring (RAIM).

$--GBS ,hhmmss.ss ,x.x ,x.x ,x.x ,xx ,x.x ,x.x ,x.x ,*hh<CR><LF>

        ①   ② ③ ④ ⑤ ⑥ ⑦ ⑧

① UTC time of GGA or GNS fix associated with this sentence

② Expected error in latitude   ③ Expected error in longitude

④ Expected error in altitude   ⑤ ID number of most likely failed satellite

⑥ Probability of missed detection for most likely failed satellite

⑦ Estimate of bias on most likely failed satellite

⑧ Standard deviation of bias estimate

8.4.11 GGA – GLOBAL POSITIONING SYSTEM (GPS) FIX DATA

Time, position and fix-related data for a GPS receiver.

$--GGA ,hhmmss.ss ,llll.ll,a ,yyyyy.yy,a ,x ,xx ,x.x ,x.x ,M ,x.x ,M ,x.x ,xxxx*hh<CR><LF>

          ①   ②   ③   ④⑤ ⑥ ⑦   ⑧ ⑨   ⑩ ⑪ ⑫

① UTC of position   ② Latitude N/S

③ Longitude E/W   ④ GPS quality indicator

⑤ Number of satellites in use   ⑥ Horizontal dilution of precision

⑦ Antenna altitude above/below mean sea level (geoid)

⑧ Units of antenna altitude, m   ⑨ Geoidal separation

⑩ Units of geoidal separation, m   ⑪ Age of differential GPS data

⑫ Differential reference station ID

8.4.12 GLL – GEOGRAPHIC POSITION

This sentence is a primary source of position information for the transponder when connected to a functional GNSS system. In the absence of GNS sentences, longitude and latitude information may also be obtained from GNS, GGA or RMC sentences.

$--GLL ,llll.ll,a ,yyyyy.yy,a ,hhmmss.ss ,A ,a *hh<CR><LF>

          ①   ②   ③   ④⑤

① latitude, N/S   ② longitude, E/W

③ UTC of position   ④ status ('A' -> use mode flag; 'V' -> use position as default)

⑤ mode indicator ('A', 'D', 'E', 'M' -> used; 'N' -> invalid)

Note that DTM sentences must be received by the transponder at least once every 30 seconds in order for the GLL sentence to be accepted.

8.4.13 GNS – GNSS FIX DATA

The transponder may receive this sentence from other sensors and uses the information in its own calculations of the ship's current position.

$--GNS ,hhmmss.ss ,lllll.ll,a ,yyyyy.yy,a ,c—c,xx ,x.x ,x.x ,x.x ,x.x ,x.x *hh<CR><LF>

     ①   ②   ③   ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

① UTC of position   ② latitude, N/S

③ longitude, E/W

④ mode indicator ('A', D', 'E', 'M' - used; 'N' - default value)

⑤ number of satellites in use (ignored) ⑥ HDOP (ignored)

⑦ antenna altitude (ignored)   ⑧ geoidal separation (ignored)

⑨ age of differential data (ignored)   ⑩ differential station ID (ignored)

8.4.14 HDT – HEADING TRUE

This sentence provides the actual vessel heading and may be sent by any system or device that calculates true headings.

$--HDT ,x.x,T *hh<CR><LF>

     ①

① heading, degrees true

8.4.15 LR1 - AIS LONG-RANGE REPLY 1

The LR1 sentence identifies the destination for the reply and contains the information items requested by the function identification character in the LRF sentence that requested the information.

$--LR1 ,x ,xxxxxxxxx,xxxxxxxxx ,c—c,c—c,xxxxxxxxx *hh<CR><LF>

    ①②   ③   ④ ⑤ ⑥

① sequence number   ② MMSI of responder

③ MMSI of requestor (reply destination) ④ ship's name

⑤ call sign   ⑥ IMO number

8.4.16 LR2 - AIS LONG-RANGE REPLY 2

The LR2 sentence contains further information items that can be requested in an LRF sentence.

$--LR2 ,x ,xxxxxxxxx,xxxxxxxx ,hhmmss.ss ,lllll.ll,a ,yyyyy.yy,a ,x.x,T,x.x,N *hh<CR><LF>

    ①②   ③   ④   ⑤   ⑥   ⑦   ⑧

① sequence number   ② MMSI of responder

③ date   ④ UTC time of position

⑤ latitude, N/S   ⑥ longitude, E/W

⑦ True   ⑧ speed over ground, Knots course over ground, deg

8.4.17 LR3 - AIS LONG-RANGE REPLY 3

The LR3 sentence contains further information items that can be requested in an LRF sentence.

$--LR3 ,x ,xxxxxxxxx,c—c,xxxxxx ,hhmmss.ss ,x.x ,x.x ,x.x ,x.x ,x.x ,x.x *hh<CR><LF>

       ① ②   ③   ④   ⑤   ⑥ ⑦ ⑧ ⑨ ⑩ ⑪

① sequence number   ② MMSI of responder   ③ voyage destination

④ ETA date   ⑤ ETA time   ⑥ draught

⑦ ship/cargo   ⑧ ship length   ⑨ ship breadth

⑩ ship type   ⑪ persons

8.4.18 LRF - AIS LONG-RANGE FUNCTION

This sentence is used in both long-range interrogation requests and long-range interrogation replies. The LRF-sentence is the second sentence of the long-range interrogation request pair LRI and LRF. The LRF sentence is also the first sentence of the long-range interrogation reply. The minimum reply consists of an LRF sentence followed by a LR1 sentence. The LR2 sentence and/or the LR3 sentences follow the LR1 sentence if information provided in these sentences was requested by the interrogation.

$--LRF,x ,xxxxxxxxx,c—c,c—c,c—c*hh<CR><LF>

     ① ②   ③   ④   ⑤

① sequence number   ② MMSI of requestor   ③ name of requestor

④ function request   ⑤ function reply status

8.4.19 LRI - AIS LONG-RANGE INTERROGATION

Long-range interrogation is a mechanism that allows one AIS unit to request certain data from another AIS unit through the use of a number of interrogation and reply sentences. When the transponder receives an LRI and LRF sentence pair on its Long Range port, it forwards them on to all the presentation ports. If the transponder has been configured to provide and automatic response to the interrogation then it does so; otherwise it waits for the sentences to be returned to it (on any presentation port) before responding.

$--LRI ,x ,a ,xxxxxxxxx ,xxxxxxxxx ,llll.ll,a ,yyyyy.yy,a ,llll.ll,a ,yyyyy.yy,a *hh<CR><LF>

     ① ② ③   ④   ⑤   ⑥   ⑦   ⑧

① sequence number   ② control flag

③ MMSI of requestor   ④ MMSI of destination

⑤ latitude, N/S (NE co-ordinate)   ⑥ longitude, E/W (NE co-ordinate)

⑦ latitude, N/S (SW coordinate)   ⑧ longitude, E/W (SW coordinate)

8.4.20 OSD – OWN SHIP DATA

Heading, course, speed, set and drift summary. Useful for, but not limited to radar/ARPA applications. OSD gives the movement vector of the ship based on the sensors and parameters in use.

$--OSD, x.x,A,x.x,a ,x.x,a ,x.x,x.x,a *hh<CR><LF>

          ①   ②③ ④⑤ ⑥⑦ ⑧ ⑨

① Heading, degrees true   ② Heading status: A = data valid, V = data invalid

③ Vessel course, degrees true   ④ Course reference, B/M/W/R/P (see Note)

⑤ Vessel speed   ⑥ Speed reference, B/M/W/R/P (see Note)

⑦ Vessel set, degrees true   ⑧ Vessel drift (speed)

⑨ Speed units, K = km/h; N = knots; S = statute miles/h

NOTE Reference systems on which the calculation of vessel course and speed is based. The values of course and speed are derived directly from the referenced system and do not additionally include the effects of data in the set and drift fields.

B = bottom tracking log   M = manually entered   W = water referenced

R = radar tracking (of fixed target)   P = positioning system ground reference

8.4.21 RMC – RECOMMENDED MINIMUM SPECIFIC GNSS DATA

This sentence is used to transmit the time, data, position, course and speed data from a GNSS navigation receiver. The sentence is transmitted at least once every two seconds from GNSS device(s) and is always accompanied by an RMB sentence when a destination waypoint is active.

$--RMC,hhmmss.ss ,A ,llll.ll,a ,yyyyy.yy,a ,x.x ,x.x ,xxxxxx ,x.x,a,a *hh<CR><LF>

             ①   ②③   ④   ⑤ ⑥ ⑦   ⑧   ⑨

① UTC of position fix

② status ('A' -> use mode field; 'V' -> use fields as default values)

③ latitude, N/S   ④ longitude, E/W

⑤ speed over ground   ⑥ course over ground

⑦ date   ⑧ magnetic variation

⑨ mode indicator ('A', 'D', 'E', 'M' -> used; 'N' -> invalid)

Note that RMC has priority over VTG.

8.4.22 ROT – RATE OF TURN

This sentence provides the rate and direction of turn.

$--ROT ,x.x ,A *hh<CR><LF>

      ① ②

① rate of turn   ② status ('A' -> rate of turn is valid)

8.4.23 SSD – SHIP STATIC DATA

This sentence is used to enter static parameters into a shipboard AIS. The parameters in this sentence support a number of the ITU-R M.1371 messages.

$--SSD,c--c,c--c,xxx,xxx,xx,xx,c ,aa*hh<CR><LF>

        ① ② ③ ④ ⑤⑥⑦⑧

① Ship's Call Sign, 1 to 7 characters   ② Ship's Name, 1 to 20 characters

③ Pos. ref., "A," distance from bow, 0 to 511 metres

④ Pos. ref., "B," distance from stern, 0 to 511 metres

⑤ Pos. ref., "C," distance from port beam, 0 to 63 metres

⑥ Pos. ref., "D," distance from starboard beam, 0 to 63 metres

⑦ DTE indicator flag   ⑧ Source identifier

8.4.24 THS – TRUE HEADING AND STATUS

Actual vessel heading in degrees true produced by any device or system producing true heading. This sentence includes a "mode indicator" field providing critical safety related information about the heading data, and replaces the deprecated HDT sentence.

$--THS ,x.x,a *hh<CR><LF>

      ① ②

① Heading, degrees true   ②Mode indicator (see Note)

NOTE Mode indicator. This field should not be null.

A = Autonomous

E = Estimated (dead reckoning)

M = Manual input

S = Simulator mode

V = Data not valid (including standby)

8.4.25 TXT – TEXT TRANSMISSION

This sentence is used for transmitting text messages such as alarm messages from a sensor or the transponder to any presentation display device such as the SI-70A Display unit.

$--TXT ,xx ,xx ,xx ,c--c *hh<CR><LF>

        ① ② ③ ④

① total number of messages   ② message number

③ text identifier   ④ text message

8.4.26 VBW – DUAL GROUND/WATER SPEED

S—VBW ,x.x ,x.x ,A ,x.x ,x.x ,A ,x.x ,A ,x.x ,A *hh<CR><LF>

        ① ② ③④ ⑤ ⑥⑦ ⑧⑨ ⑩

① Longitudinal water speed   ② Traverse water speed

③ Status: water speed   ④ Longitudinal ground speed

⑤ Traverse ground speed   ⑥ Status: ground speed

⑦ Stern traverse water speed   ⑧ Status: stern water speed

⑨ Stern traverse ground speed   ⑩ Status: stern ground speed

Longitudinal ground speed – used   Transverse ground speed – used

Status of ground speed – used   Other fields ignored

8.4.27 VDM – VHF DATA LINK MESSAGE

This sentence is output by the transponder each time it receives an incoming message over the VHF data link. The VDM sentence encapsulates a part of an M.1371 message, and several VDM sentences may need to be decoded and re-assembled in order to re-construct the original M.1371 message.

!--VDM ,x ,x ,x ,a ,s—s ,x *hh<CR><LF>

        ①②③④⑤   ⑥

① total number of sentences needed to transfer message

② sentence number   ③ sequential message identifier

④ AIS Channel   ⑤ encapsulated ITU-R M.1371 radio message

⑥ number of fill-bits

8.4.28 VDO - AIS VHF DATA-LINK OWN-VESSEL REPORT

This sentence is output to all the presentation ports at regular intervals and contains the contents of the transponders own-vessel report. Each time the transponder transmits an own-

vessel report, it encapsulates the M.1371 message in one or more VDO sentences and outputs them on its presentation ports.

!--VDO ,x ,x ,x ,a ,s—s ,x *hh<CR><LF>

①②③④⑤　⑥

① total number of sentences needed to transfer message

② sentence number   ③ sequential message identifier

④ AIS Channel ('A' or 'B')

⑤ encapsulated ITU-R M.1371 radio message ⑥ number of fill-bits

The transponder outputs one VDO sentence every second in addition to echoing all transmitted VDO sentences as they are transmitted in order to provide frequent updates to all connected presentation devices. VDO sentences which have also been transmitted contain the appropriate AIS channel indicator whereas VDO sentences that have not been transmitted contain a NULL field for the channel indicator.

8.4.29 VSD – AIS VOYAGE STATIC DATA

This sentence may be output by the transponder in response to a query.

$--VSD ,x.x ,x.x ,x.x ,c—c ,hhmmss.ss ,xx ,xx ,x.x ,x.x *hh<CR><LF>

①　②　③　④　　⑤　　　　　⑥ ⑦ ⑧　⑨

① type of ship and cargo category ② maximum present static draught

③ persons on-board   ④ destination

⑤ estimated UTC of arrival at destination ⑥ estimated day of arrival at destination

⑦ estimated month of arrival at destination ⑧ navigational status

⑨ regional application flags

8.4.30 VTG–COURSE OVER GROUND AND GROUND SPEED

This sentence contains the actual course and speed relative to the ground.

$--VTG ,x.x,T,x.x,M ,x.x,N ,x.x,K,a *hh<CR><LF>

①　　②　　　③　　④　　⑤

① course over ground, degrees true ② course over ground, degrees magnetic (ignored)

③ speed over ground, knots   ④ speed over ground, km/h (ignored)
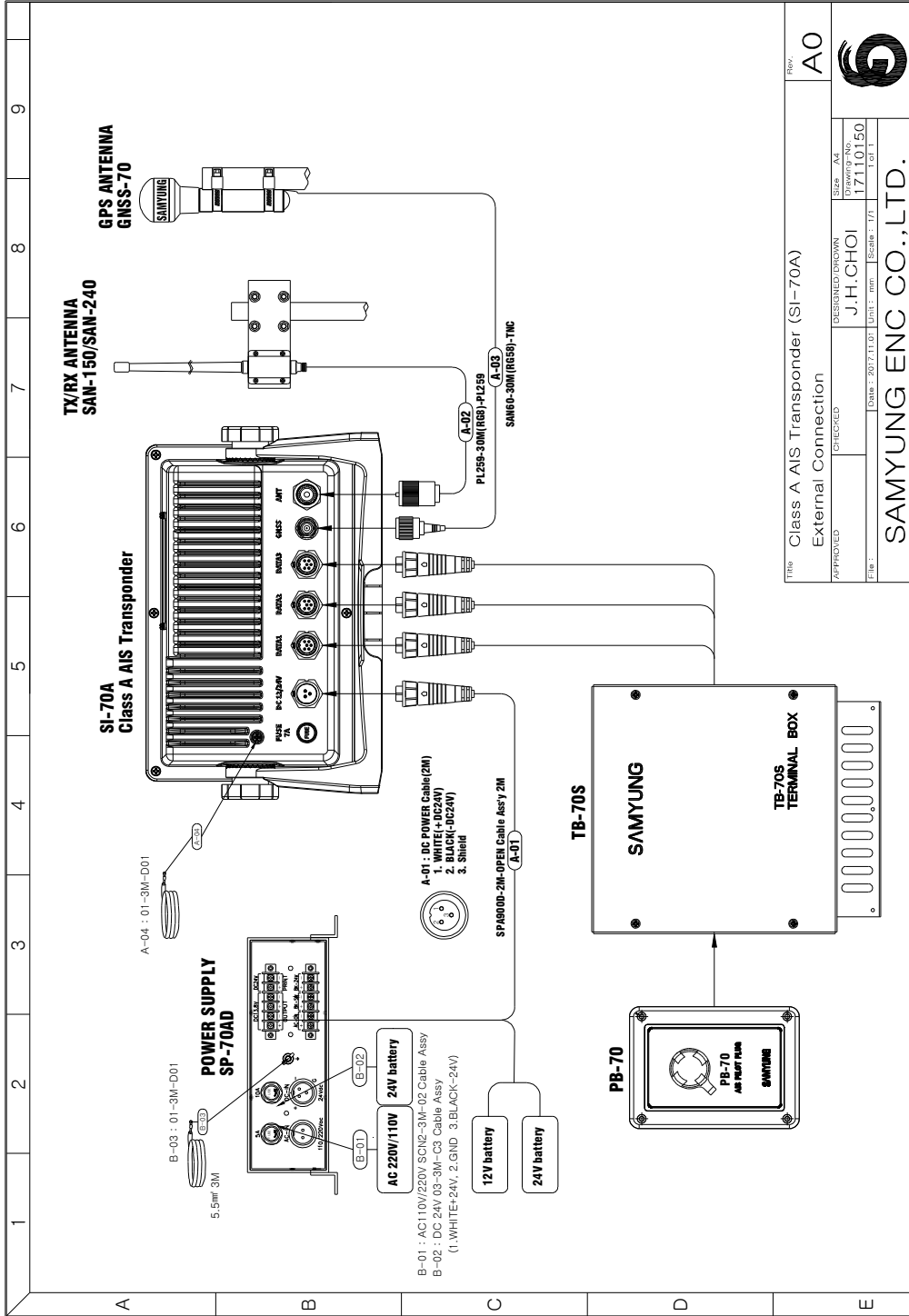
⑤ mode indicator

Note that RMC has priority over VTG.

8.5   ABBREVIATIONS

AIS	Automatic Identification System
BIIT	Built-In Integrity Test
CTS	Clear To Send
DGPS	Differential GPS
ECDIS	Electronic Chart Display and Information System
ECS	Electronic Chart System
EGNOS	European Geostationary Navigation Overlay System
EMC	Electromagnetic Compatibility
GPS	Global Positioning System
IALA	International Association of Lighthouse Authorities
IEC	International Electro technical Committee
IMO	International Maritime Organization
LED	Light Emitting Diode
LGND	Logic ground
LNA	Low noise signal amplifier
MIB	Management Information Base
MKD	Minimum Keyboard Display
NDS	Not Detected Serial port
NMEA	National Marine Electronics Association. NMEA 0183 (reference IEC 61162) is a standard for interchange of information between navigation equipment.
PGND	Power Ground
PI	Presentation Interface
PPS	Pulse Per Second
PRN	Pseudorandom Noise
PSS	Physical Shore Station
QA	Quality Assurance
RTS	Request To Send
RTCM	Radio Technical Commission of Maritime Services

SA	Selective Availability
SBAS	Satellite Based Augmentation System
SNMP	Simple Network Management Protocol
SNR	Signal/Noise Ratio
SOTDMA	Self-Organized TDMA
SPS	Standard Positioning Service
SW	Software
TDMA	Time Division Multiple Access
UI	User Interface
UTM	Universal Transverse Mercator
VDL	VHF Data Link
VHF	Very High Frequency
WAAS	Wide Area Augmentation System
WEEE	Waste Electrical and Electronic Equipment
WGS84	World Geodetic System of 1984

9. DRAWINGS

9.1   EXTERNAL CONNECTION (3 TERMINAL)

GPS ANTENNA
GNSS-70

TX/RX ANTENNA
SAN-240

SI-70A
Class A AIS Transponder

A-02
PL259-30M(RG8)-PL259

A-03
SAN60-30M(RG58)-TNC

ANT
GNSS
DATA3
DATA2
DATA1
DC12/24V
FUSE
7A

A-04 : 01-3M-D01

A-01 : DC POWER Cable(2M)
1. WHITE(+DC24V)
2. BLACK(-DC24V)
3. Shield

A-01
SPA900D-2M-OPEN Cable Assy 2M

TB-70A (1 TERMINAL)

TB-70A
TERMINAL BOX

SAMYUNG

12V battery

24V battery

Sensor Inputs 1
RS-422

PLOT/RADAR
RS-232 OUT

PLOT/RADAR
RS-232 OUT

Title Class A AIS Transponder (SI-70A)
External Connection (TB-70A)

APPROVED | CHECKED | DESIGNED/DROWN J.H.CHOI
File : | Date : 2017.11.01 | Unit : mm | Scale : 1/1

SAMYUNG ENC CO.,LTD.

Rev. A0
Size A4
Drawing-No. 17110151
1 of 1

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9.3 PORT CONNECTION

9.4   SI-70A OUTLINE DRAWING
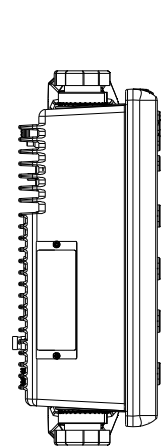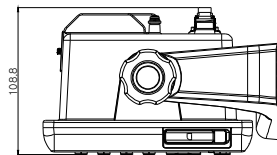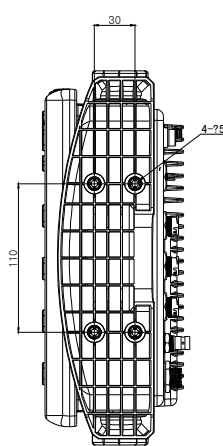
Note

1. Water Ingress Rating : IPx0
2. Material : SECC
3. Color : BLACK
4. Weight : 0.5kg

87.58
60
4-?5
170
158

TB-70A
TERMINAL BOX

SAMYUNG

31.82
28.2

List of component

SAMYUNG ENC
TB-70A

9.6 TB-70S (3 TERMINAL) OUTLINE DRAWING

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Note

1. Water Ingress Rating : IPx3
2. Material : FRONT – ABS, REAR – SECC
3. Color : BLACK
4. Weight : 0.2kg

Revision History

No.	Loc.	Description	Modifier	Approval	Date

SAMYUNG ENC

PB-70
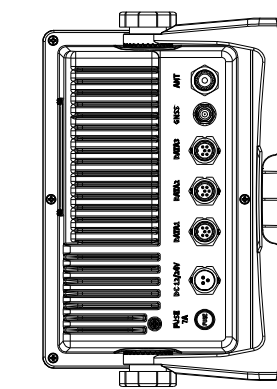
List of component

No.	Part Name	Q'ty	PART No.	Remark

Date 05/18/2018
Department R&D
Approved J.S.PARK
Checked K.M.KU
Designed

Q'ty 1 EA/SET Unit mm kg
Scale 1:1

DWG No. E04-6000-00
Size A2

52.4

126.1
108

4–?3.5

90.6
76

PB-70
ABS PILOT PLUG
SAMYUNG

E04-6000-00
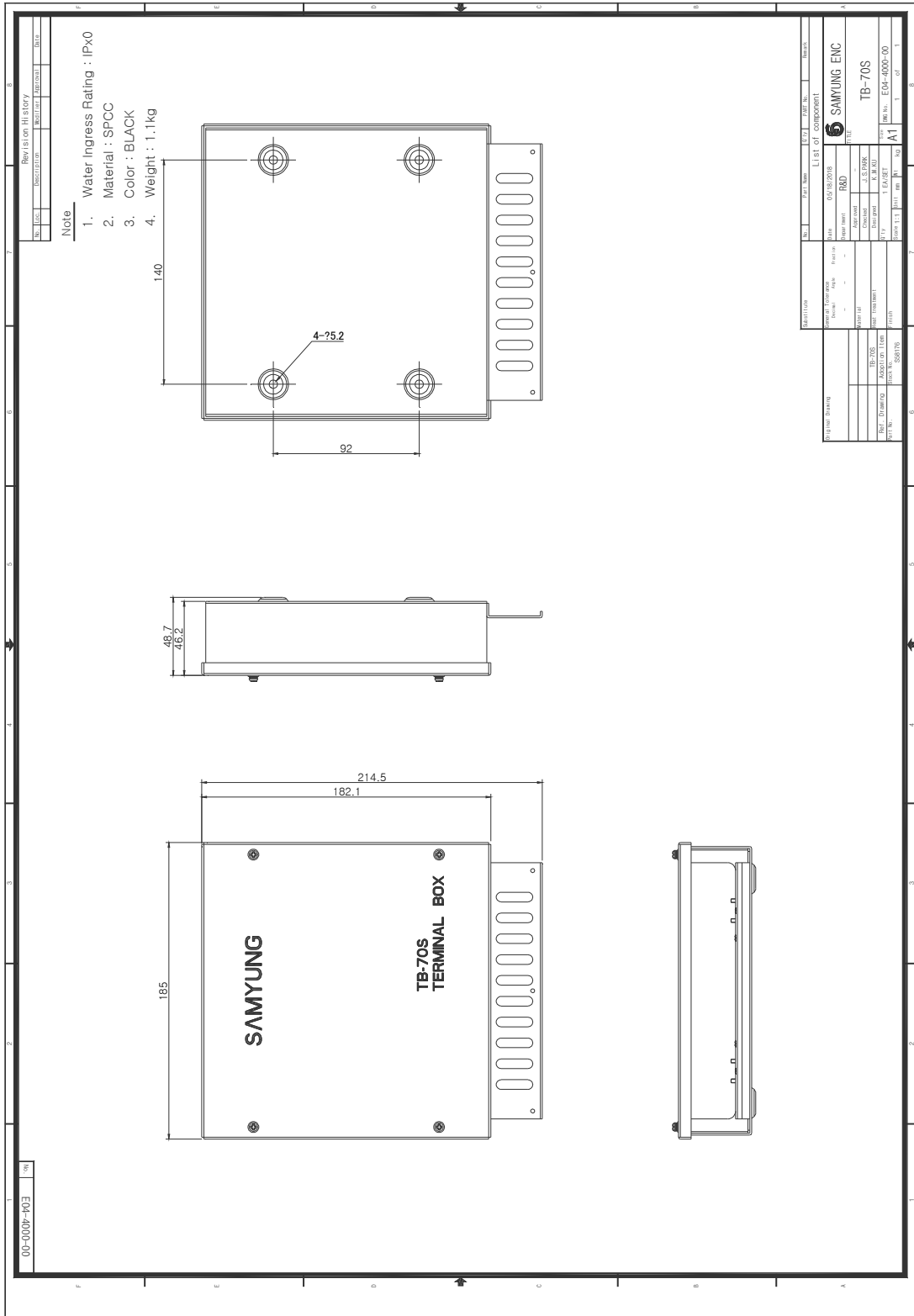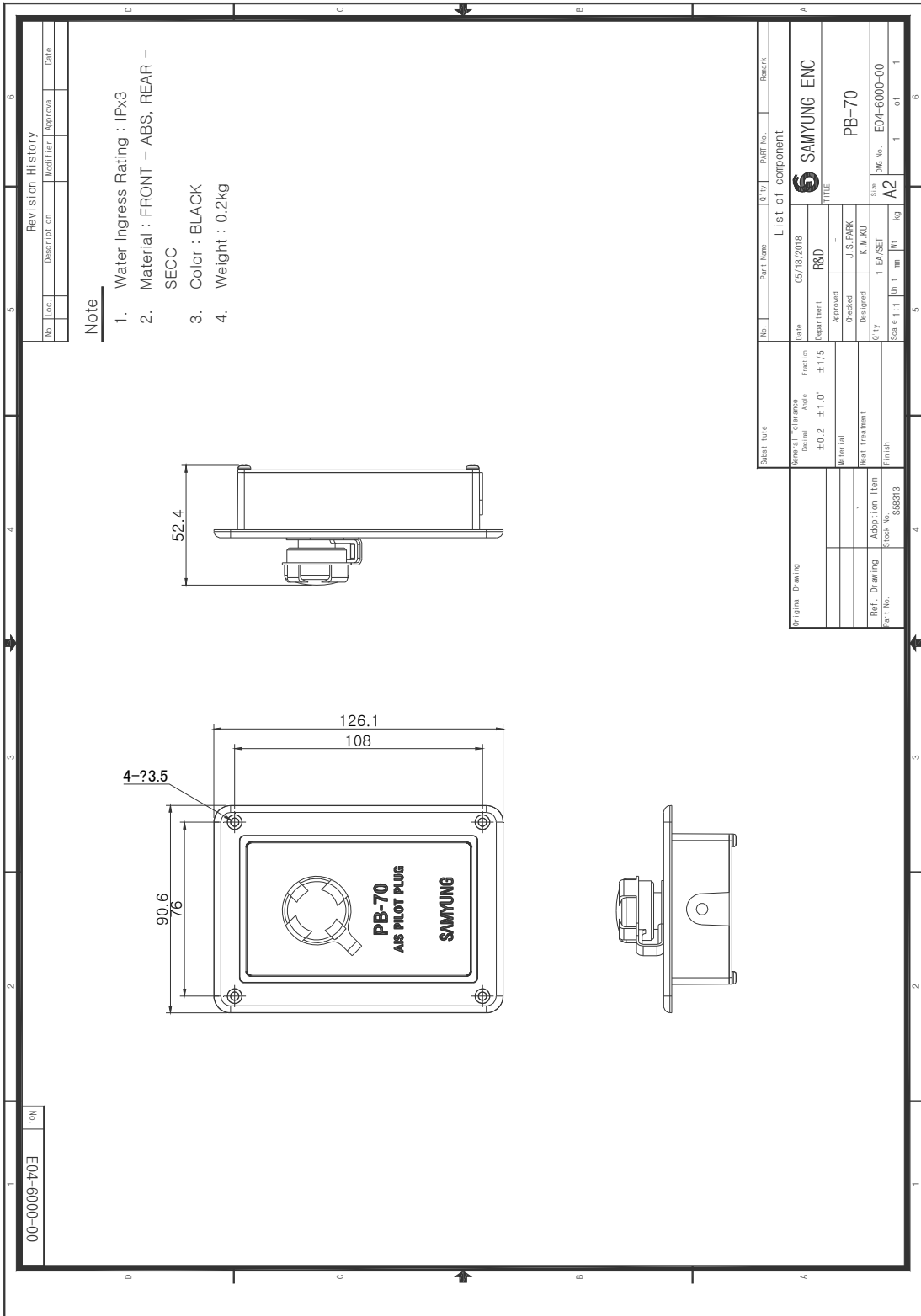
9.8 SP-70AD OUTLINE DRAWING

1. **Input**
   - AC Input Range : 100~230VAC
   - AC Current : 1.6A@115VAC, 0.8A@230VAC
   - AC Frequency : 47~63Hz
   - DC Voltage : 10~36VDC
   - DC Current : 7A

2. **Output**
   - DC Voltage : 24VDC
   - Rated Current : 6.3A
   - Rated Power : 151.2W
   - Ripple&Noise : Maximum 150mVp-p

Note
1. Water Ingress Rating : IP20
2. Material : SECC
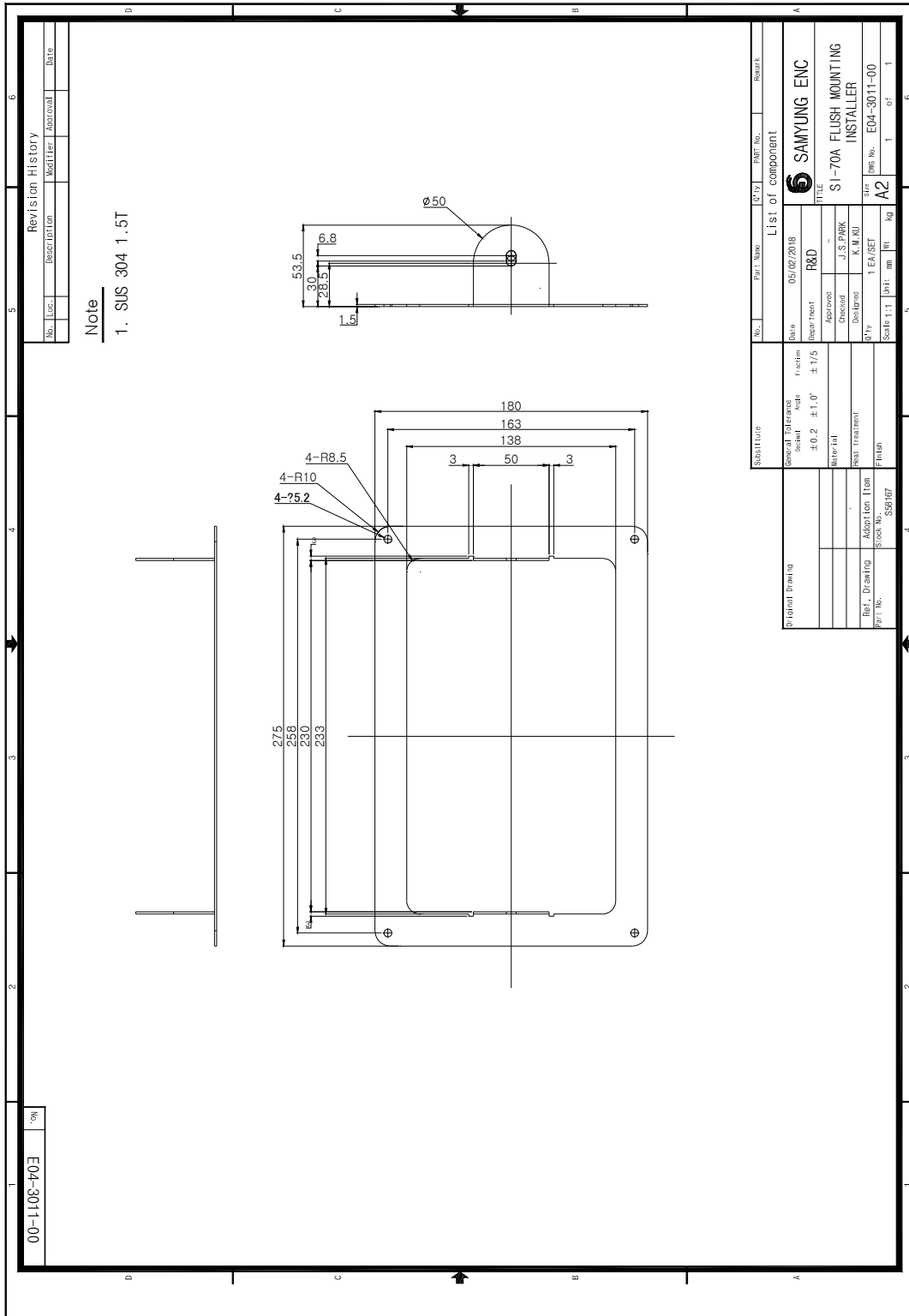3. Color : BLACK
4. Weight : 2.8 kg
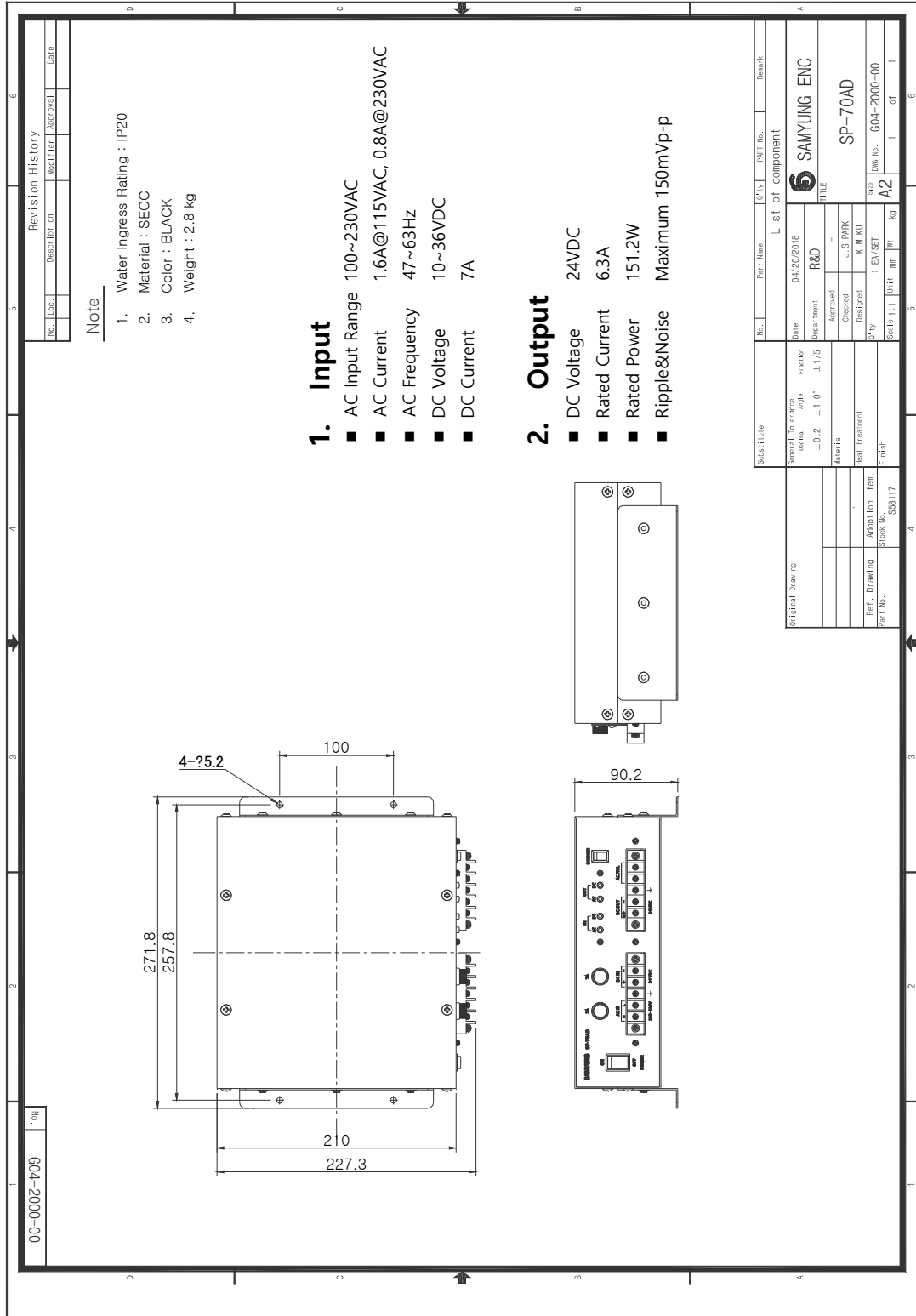
9.10 GNSS-70 ANTENNA OUTLINE DRAWING
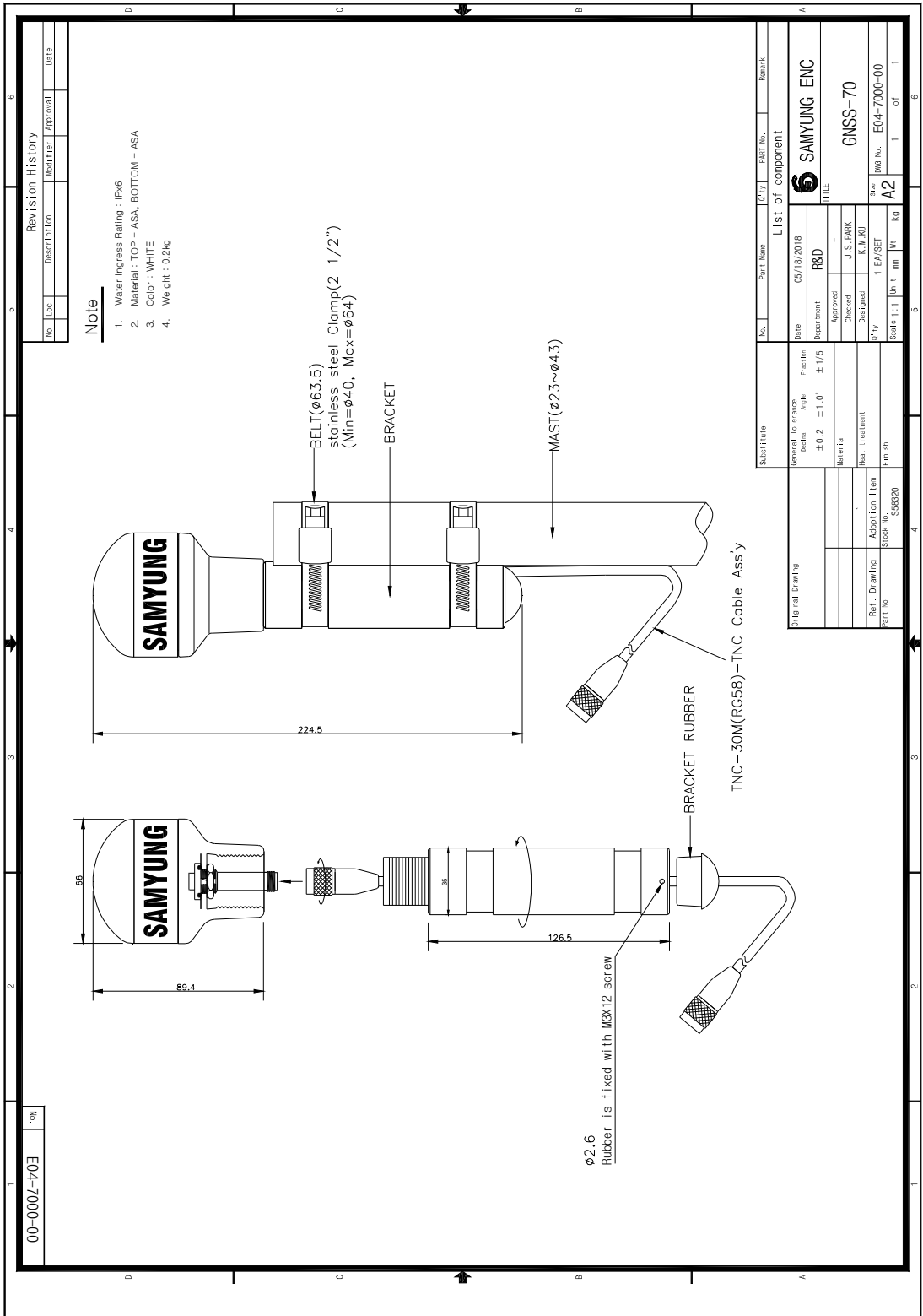
9.11   SI-70A FLUSH MOUNTING
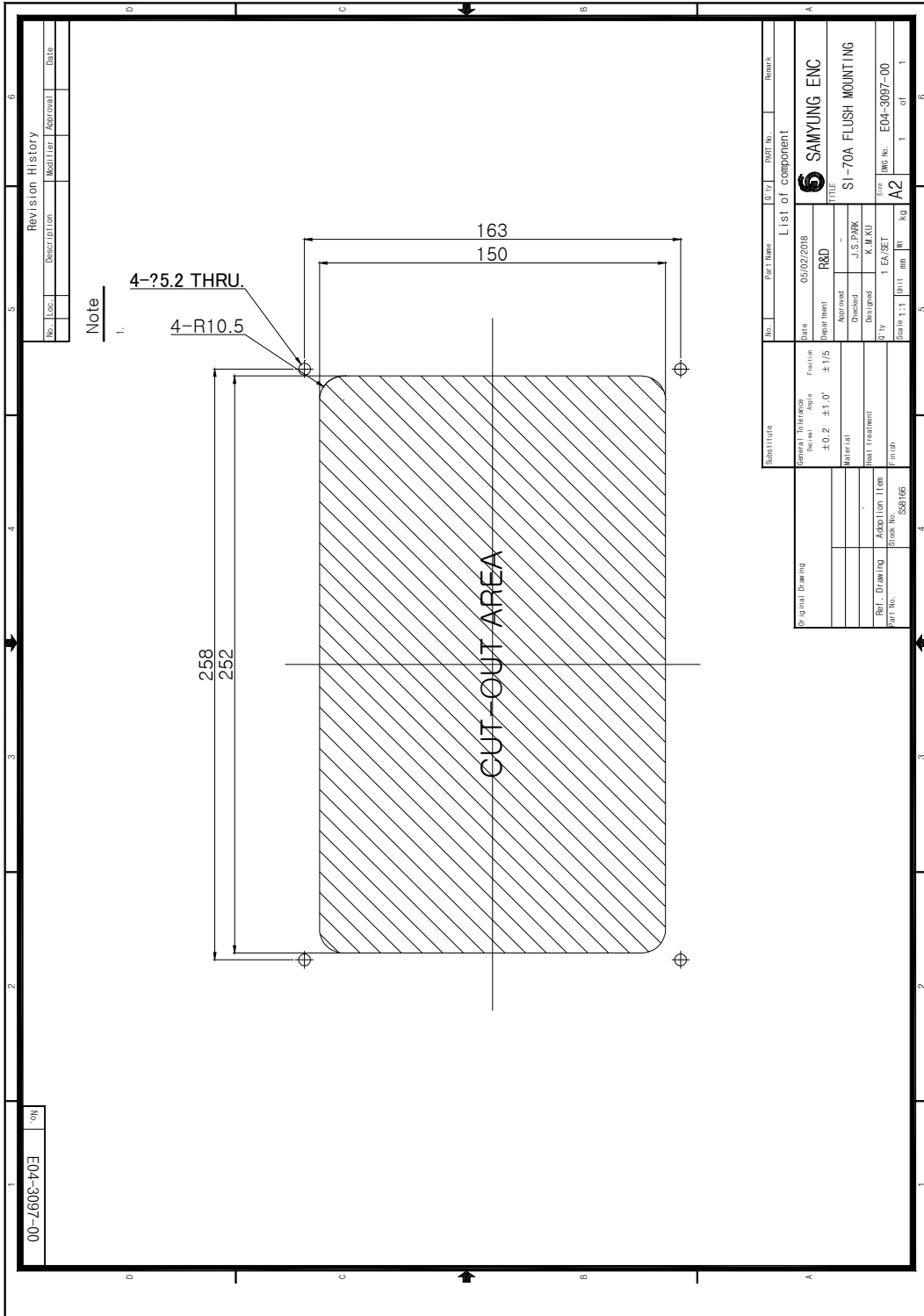
9.12　SI-70A FLUSH MOUNTING INSTALLER

10. WARRANTY

10.1 WARRANTY PERIOD – 1 YEAR

Thank you for the purchasing Samyung ENC product. This product has passed the strict quality/operation inspection. If you have encountered any problem with this product, please contact Samyung ENC A/S center or authorized distributor. Samyung ENC will provide free after service for the warranty period only when the product installed and operated in accordance with the instruction provided. The warranty period is one year from the date of purchase.

The warranty does not cover any and all defect due to customer's intention, carelessness, negligence (falling, breakage, flooding, etc.), improper installation and use or other external causes.

Please send the defective product to Samyung ENC A/S center or authorized distributor.

Samyung ENC Head Office A/S center	
Address	69, Sangni-Ro, Youngdo-Gu, Busan, Kore
Department	**Samyung ENC C/S Team**
Contact	**TEL : +82-1577-0198 (ARS)**
	FAX : +82 (0)51-416-5515

Inform us the product name, serial number, operation status by phone or FAX will help to process A/S promptly.

Distributor A/S	
Dealer	
Contact	**TEL :**
	Mobile :
Note your dealer and contact information when you purchase the product.	

This manual describes the proper installation, operation and precautions of the product. Please keep this manual in a certain place to prevent loss or damage.

If you sell or hand over the device, please hand this document to the new owner.