

## 2.10 LAN Signal Converter

The LAN Signal Converter allows the use of existing antenna cable RW-9600/6895/4873 for TR-UP radar.

If the LAN Signal Converter is not attached in the antenna and processor units, the required LAN Signal Converter Kit (available as an optional extra) is listed below.

For X-band radar only, you can select a specification with the LAN Signal Converter pre-installed at the factory.

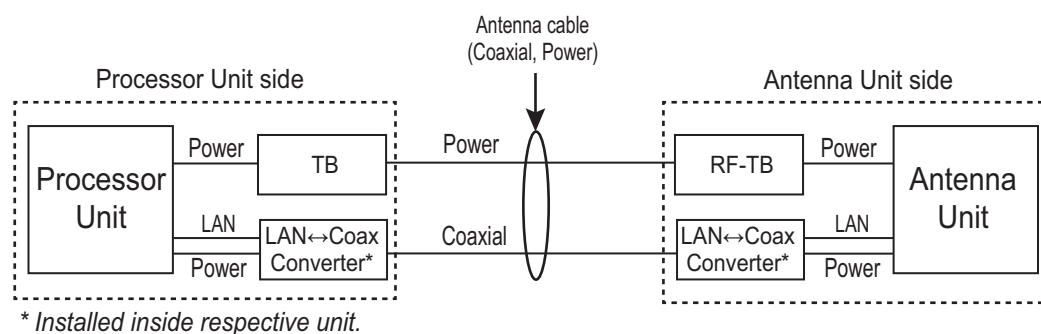
LAN Signal Converter Kit

| Radar                    | Type       | Code No.    |
|--------------------------|------------|-------------|
| X-band radar             | OP03-247-3 | 001-496-580 |
| S-band magnetron radar   | OP03-247-2 | 001-496-570 |
| S-band solid state radar | OP03-247-1 | 001-496-560 |

### 2.10.1 Application overview

The LAN Signal Converter has two applications.

#### **Application 1: Use with existing antenna cable (retrofit)**



#### *Method 1: Using existing antenna cable (RW-9600/6895/4873)*

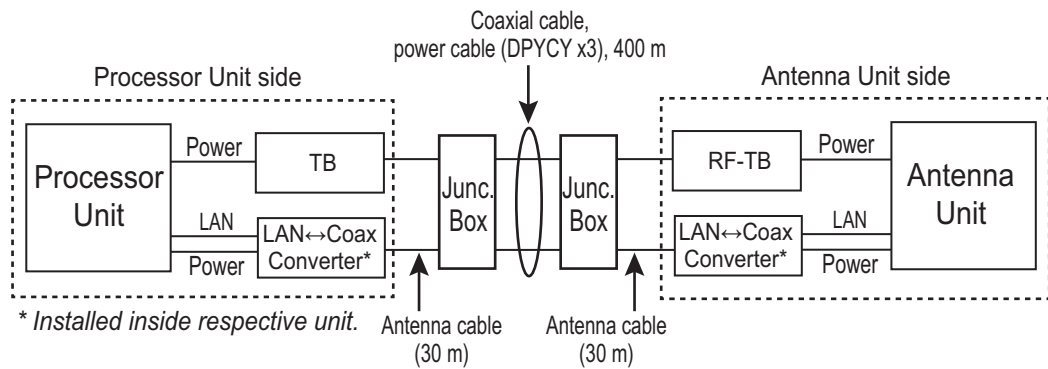
**Note:** Use with existing antenna cable (RW-9600/6895/4873) in case of retrofit. The maximum length of the antenna cable is 100 m for RW-9600, 50 m For RW-6895/4873.

#### **Application 2: Foremast installation (for X-band radar only)**

Foremast installation, where the distance between the antenna unit and the processor unit is more than 100 m (max. 460 m). In this case, two Junction Boxes RJB-001 are required (for antenna and processor units). See section 2.11 and the interconnection diagram for connections in the junction box.

The Cable Extension Kit (Type: OP03-224-3, Code No.: 001-254-410), comprised of two junctions boxes, one LAN Signal Converters and necessary hardware, is available as an optional extra.

**Note:** Only the RW-9600 cable can be used for foremast installation. The RW-6895/4873 cables are not available.



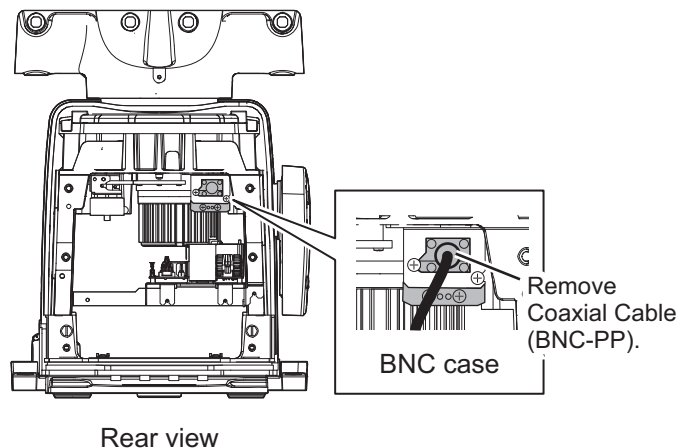
Method 2: Using antenna cable RW-9600

### 2.10.2 Wiring in the antenna unit with LAN Signal Converter pre-installed (X-band radar only)

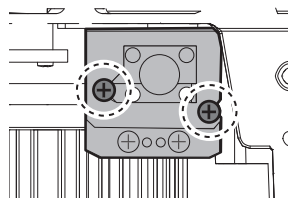
**Note:** If the antenna unit does not include the LAN Signal Converter, the converter kit (available as an optional extra) is required. See "LAN Signal Converter Kit" on page 2-68.

Dismount the transceiver unit in the antenna unit. See section 2.2.2, for details.

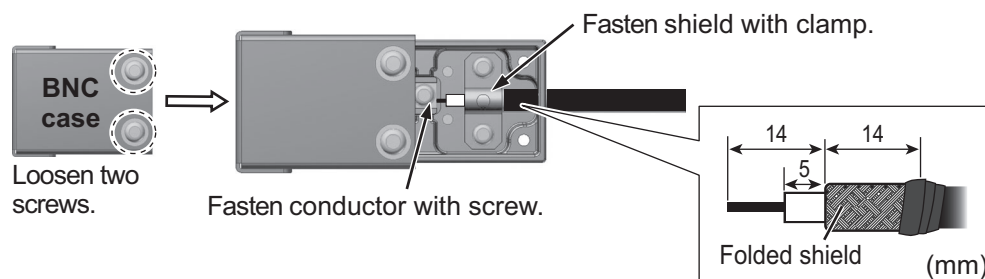
1. Unfasten the coaxial cable from the converter in the antenna unit.



2. Unfasten two screws to detach the BNC case from the antenna unit.



3. Loosen two screws on the BNC case. Attach the coaxial cable from the antenna unit then close the case.



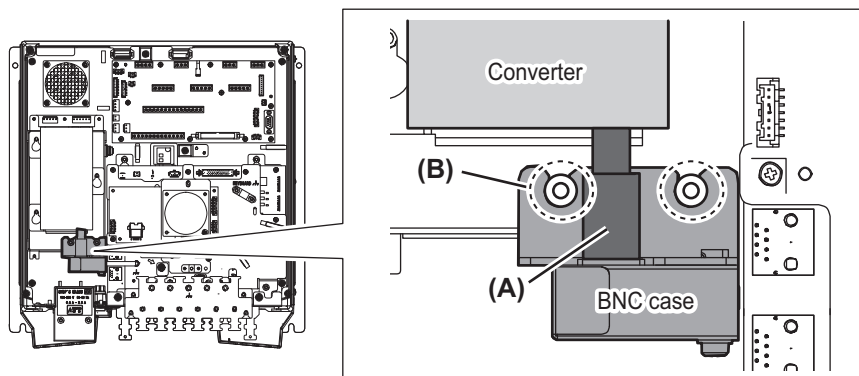
## 2. WIRING

4. Fasten the BNC case to the original position in the antenna unit with original two screws, referring to step 2.
5. Mount the transceiver unit to the antenna unit.
6. Re-connect the coaxial cable (disconnected at step 1).

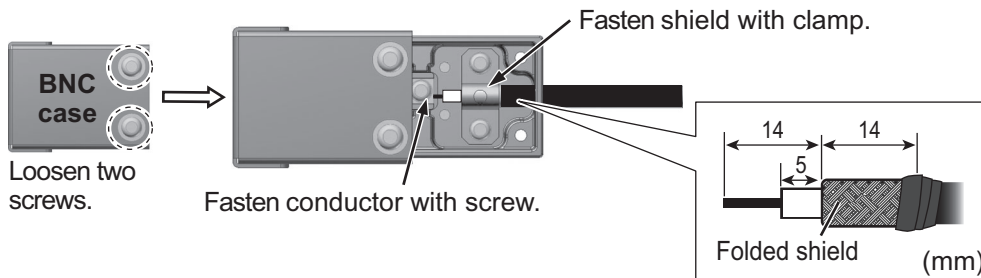
### 2.10.3 Wiring in the processor unit installed the LAN Signal Converter already (X-band radar only)

Some parts or wiring may have been omitted from the illustrations of the processor unit for clarity.

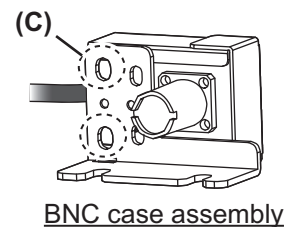
1. Disconnect the connection (A) between the converter and BNC case. Unfasten two screws (B) on the BNC case assembly to remove the BNC case assembly from the processor unit.



2. Loosen two screws on the BNC case. Attach the coaxial cable from the antenna unit.



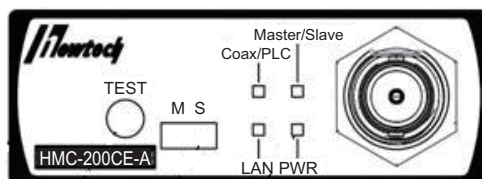
3. Loosen the screws (C) on the BNC case assembly, then attach the BNC case assembly to the original position in the processor unit.



4. After attaching, adjust the position of the BNC case, then fasten the two loose screws (C) tightly.

### 2.10.4 How to check the installation

Observe the LEDs on the converter to check for proper operation and troubleshooting.



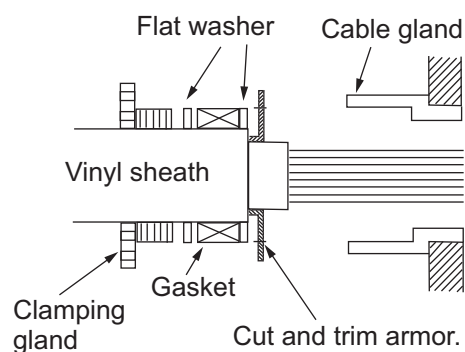
| LED          | State           | Meaning       |
|--------------|-----------------|---------------|
| PWR          | OFF             | Power OFF     |
|              | Lighting green  | Power ON      |
|              | Flashing orange | Test mode     |
| LAN          | OFF             | Link down     |
|              | Lighting green  | 100 M link up |
|              | Flashing green  | 100 M active  |
|              | Lighting orange | 10 M link up  |
|              | Flashing orange | 10 M active   |
| Coax/PLC     | OFF             | Link down     |
|              | Lighting green  | Link up       |
| Master/Slave | Lighting green  | Master mode   |
|              | Lighting orange | Slave mode    |

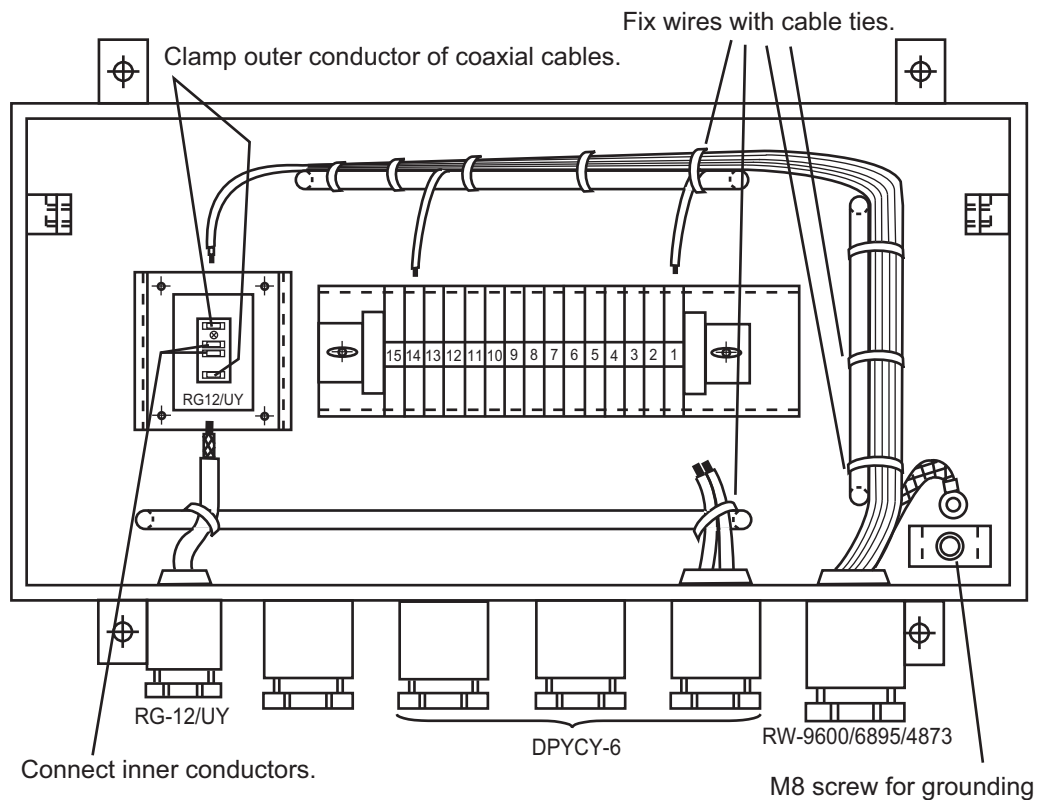
**Note:** The **TEST** button is for factory use. Do not operate the button.

## 2.11 Junction Box (option)

For X-band radar of FAR-2x18/2x28/2x38 radars, the Junction boxes are required when the distance between the antenna unit and processor unit is greater than 100 meters (max. 460 meters); for example, the antenna unit is installed on the foremast. Use signal cable RW-9600 (×2), power cable DPYCY-6 (×3), and coaxial cable RG-12/UY(×3).

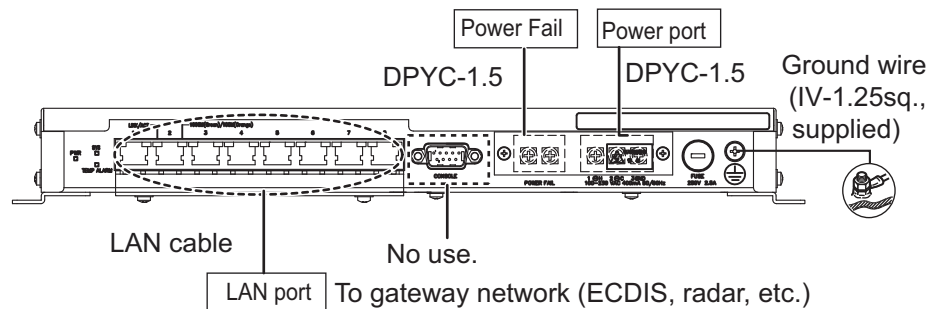
Pass each cable through its cable gland as shown to the right.



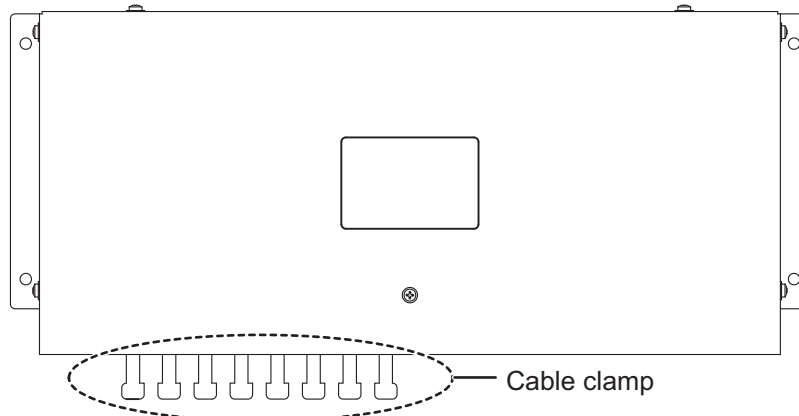


## 2.12 Intelligent HUB (option)

Secure the LAN cables to the cable clamps on the HUB-3000 with cable ties (supplied).



Attach the supplied LAN caps to unused connector holes to comply with waterproofing standard IPX2.



## 2.13 VDR Connection

The processor unit has the DVI-I port or the LAN port for connection of a VDR.

### 2.13.1 DVI-I (Analog RGB) port connection

- Use the optional RGB cable (DVI-BNCX5+GND-L2.0) to connect the VDR.
- The DVI-D port and DVI-I port have their own circuits. This prevents interruption of the radar picture shown on the main monitor connected to the DVI-D port, if a fault condition occurs at the DVI-I port.
- The processor unit continuously outputs video signals from its DVI-D and DVI-I ports. The operator cannot stop the output.

### 2.13.2 LAN2 port connection

- Connect a VDR complied to IEC-61162-450 standards to the LAN2 port.
- If the [VDR LAN OUTPUT] setting is set to [ON], the screenshot (JPEG-format) is output every 15 seconds through LAN2 port. See "[VDR LAN OUTPUT]" on page 3-24.
- The output image at the same resolution as the DVI-D port.
- The LAN2 port and DVI-D port have their own circuits. This prevents interruption of DVI-D port, if a fault condition occurs at the LAN2 port.

## 2. WIRING

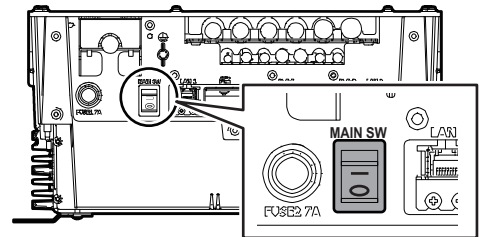
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### 3. ADJUSTMENTS

**Note:** After completing the settings and adjustments, copy the setting data to a SD-card\* (USB flash memory\* for C-type radars), referring to the Operator's Manual. This will allow easy restoration of setting data after the MAIN Board is replaced, etc.

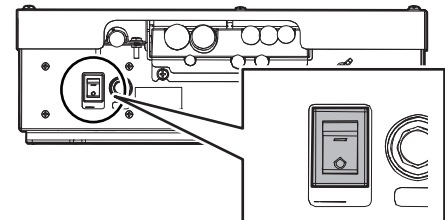
\*: The SD card slot is in front of the processor unit, and the USB flash memory slot is connected to the RP board 03P9657.

At the first start-up after installation, turn on the processor unit with the main switch. Open the protected menus to adjust the radar. Follow the procedures in this chapter to complete the adjustment.



Main switch

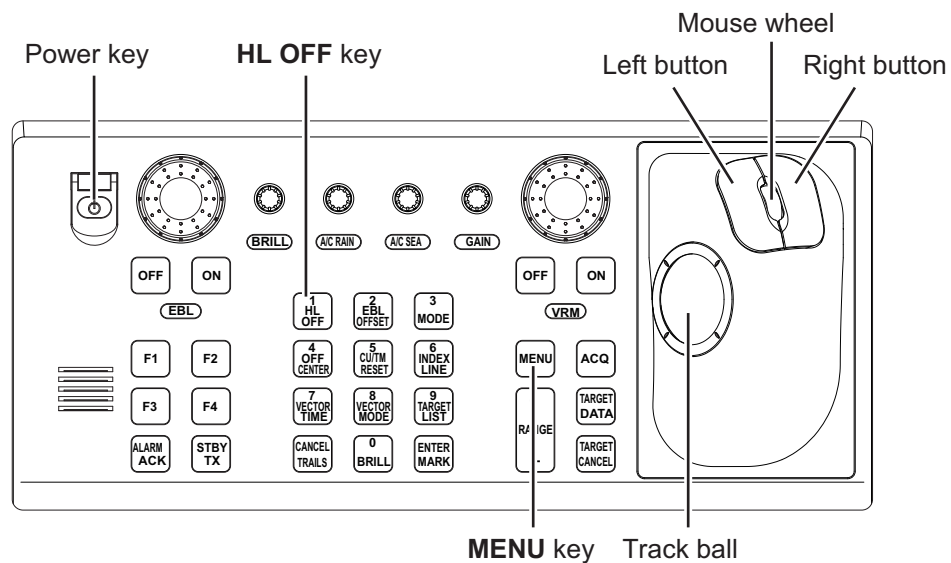
For FAR-2x58 radars, turn on the power supply unit also with the main switch.



Main switch

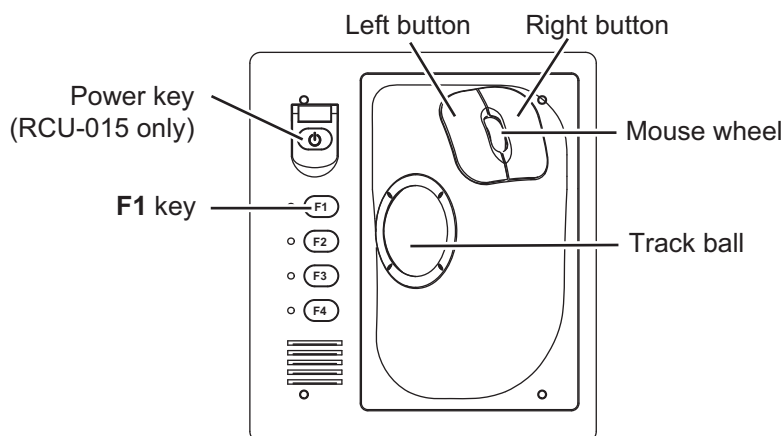
Below are the controls on the control unit RCU-014/015(or optional RCU-016) that are used to make the adjustments.

#### RCU-014

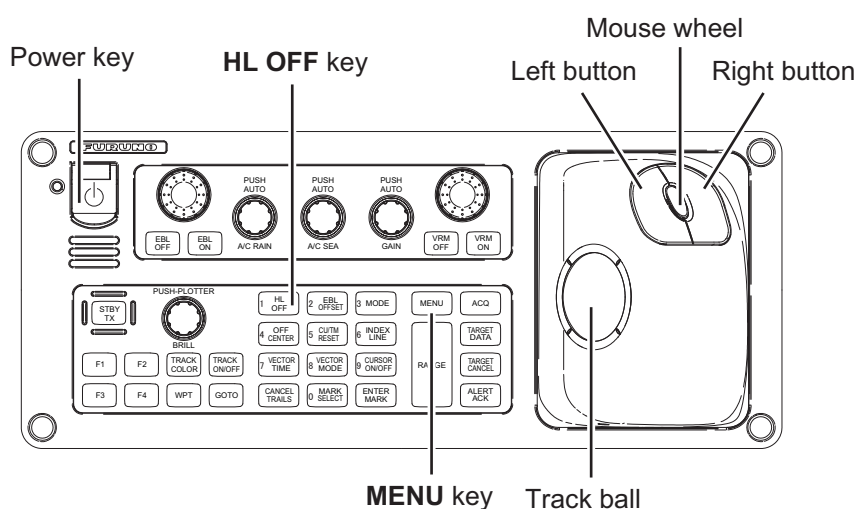


### 3. ADJUSTMENTS

#### **RCU-015/016**



#### **RCU-031**



#### **How to Use the Menu**

1. Press the Power key to turn on the unit.
2. Press the **MENU** key or click the [MENU] box to open the main menu.  
The [RADAR INSTALLATION] menu does not appear when the unit is first turned on. It appears on the main menu after displaying it by following the procedures on the section 3.1 and is displayed until the unit is turned off.
3. Operate the track ball or the mouse wheel to select a menu item then click the left button.
4. Operate the track ball or the mouse wheel to select a menu option then click the left button. To return to above layer, select [BACK] then click the left button or right button.

| MAIN MENU |                  |
|-----------|------------------|
| 1         | ECHO             |
| 2         | MARKS·CHARTS     |
| 3         | NAV TOOLS        |
| 4         | ALERTS           |
| 5         | TT·AIS           |
| 6         | FILES            |
| 7         | INFORMATION BOX  |
| 8         | NAV LINE·WPT     |
| 9         | INITIAL SETTINGS |

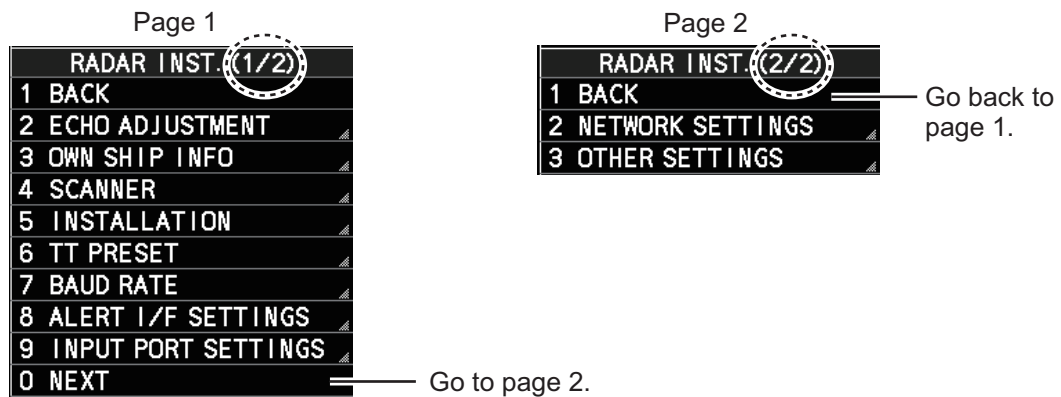
5. If the menu option requires entry of numeric data, rotate the mouse wheel to set the value, then click the left button.
6. Close the menu by pressing the **MENU** key once or click the right button few times.

### 3.1 How to Open the Radar Installation Menu

The [RADAR INSTALLATION] menu has various items through two pages for adjustment of the radar. To show this menu;

For RCU-014: Press and hold the **HL OFF** key, then press the **MENU** key five times.

For RCU-015/016: Put the cursor on the [MENU] box. Press and hold the **F1** key, then right-click five times.



#### Tuning initialization

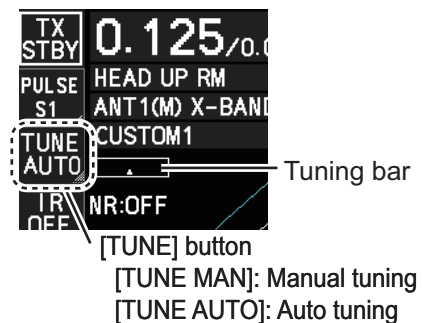
Tuning initialization is required before setting up the radar.

Open the main menu then select [ECHO]→[TUNING INITIALIZE] to start initialization. "TUNE INIT" appears on the top of the display during the initialization.

After tuning is completed, right-click twice to close the menu.

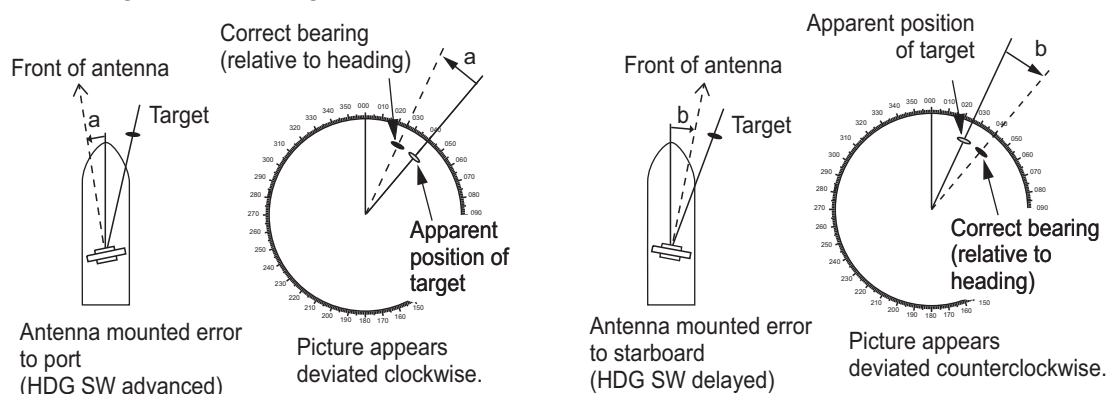
**Note 1:** In STBY, this menu is not available.

**Note 2:** For solid-state device radar, this menu is invalid.



## 3.2 How to Align the Heading

You have mounted the antenna unit facing straight ahead in the direction of the bow. Therefore, a small but conspicuous target dead ahead visually must appear on the heading line (zero degrees).



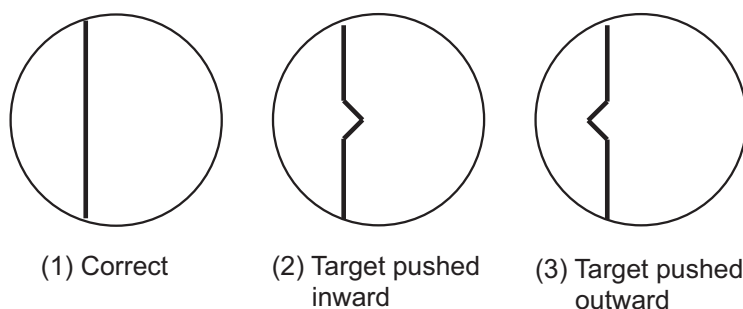
In practice, you will probably observe some small bearing error on the display because of the difficulty in achieving accurate initial positioning of the antenna unit. The following adjustment will compensate for this error.

1. Select a stationary target echo at a range between 0.125 and 0.25 NM, preferably near the heading line.
2. Operate the EBL control to bisect the target echo.
3. Read the target bearing.
4. Measure the bearing of the stationary target on a navigation chart and calculate the difference between the actual bearing and apparent bearing on the radar screen.
5. Show the [RADAR INSTALLATION] menu.
6. Select [ECHO ADJUSTMENT] followed by [HD ALIGN].
7. Key in the bearing difference. The setting range is 0° to 359.9° (default: 000.0°).
8. Confirm that the target echo is displayed at the correct bearing on the screen.

## 3.3 How to Adjust the Sweep Timing

Sweep timing differs with respect to the length of the signal cable between the antenna unit and the processor unit. Adjust sweep timing at installation to prevent the following symptoms:

- The echo of a "straight" target (for example, pier), on the 0.25 NM range, appears on the display as being pulled inward or pushed outward. See the figure below.



- The range of target echoes is incorrect.
1. Set the GAIN, A/C SEA and A/C RAIN controls shown below.  
 GAIN: 80  
 A/C SEA: Fully counterclockwise (OFF)  
 A/C RAIN: Fully counterclockwise (OFF)
  2. Open the [RADAR INSTALLATION] menu, then select [ECHO ADJUSTMENT] menu.
  3. Select [TIMING ADJ VALUE] to set the value for adjustment timing manually. The setting range is 0000 to 4095. The default setting for solid state radars (FAR-2238S NXT(BB)/FAR-2338S NXT) is 43, for all other radars of this series, the default setting is 325
  4. After the adjustment is completed, set the radar to the minimum range. Confirm that no echoes are "missing" at the center of the radar screen. If echoes are missing, do step 3 again.

### 3.4 How to Suppress Main Bang

Main bang is the clutter at the center of the screen that you typically see on the radar display, and it may mask close-in targets. If main bang appears at the screen center, suppress it as follows.

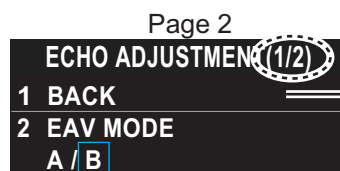
1. Transmit the radar on a long range and then wait ten minutes.
2. Adjust the gain to show a slight amount of noise on the display.
3. Select the 0.125 NM range, and turn off the **A/C SEA** and **A/C RAIN** controls.
4. Show the [RADAR INSTALLATION] menu, then select [ECHO ADJUSTMENT].
5. Select [MBS LEVEL], then set a value that causes the main bang to faintly disappear. The setting range is 0 to 255 (default: 0).

## 3.5 Other Settings

This section describes the menu items not previously described.

### 3.5.1 [ECHO ADJUSTMENT] menu

Open the main menu then select [RADAR INSTALLATION]→[ECHO ADJUSTMENT] to open the [ECHO ADJUSTMENT] menu.



Go back to page 1.

Go to page 2.

#### [VIDEO ADJUST VALUE]

Adjust the video level manually to remove noise.

Preset the radar as follows:

- Interference Rejector (IR): 2
- Gain: 80
- Echo Stretch (ES): OFF
- Echo Averaging (EAV): OFF
- Range: 24 NM
- Pulse Length: Long

Set the value so that noise just disappears from the screen. The setting range is -32 to +32 (default: +32).

**Note:** The setting range is 0 to +31 (default: +12) when the [MODEL] setting is set to [50], see "[MODEL]" on page 3-12.

When using the number keys, the indication is first selected as a whole. At this time, you can toggle between plus "+" or minus "-". Press the **8** key for "-", press the **2** key for "+". If single digits are highlighted, toggle is not possible. In this case, press the **CANCEL/TRAILS** key to re-highlight the whole indication.

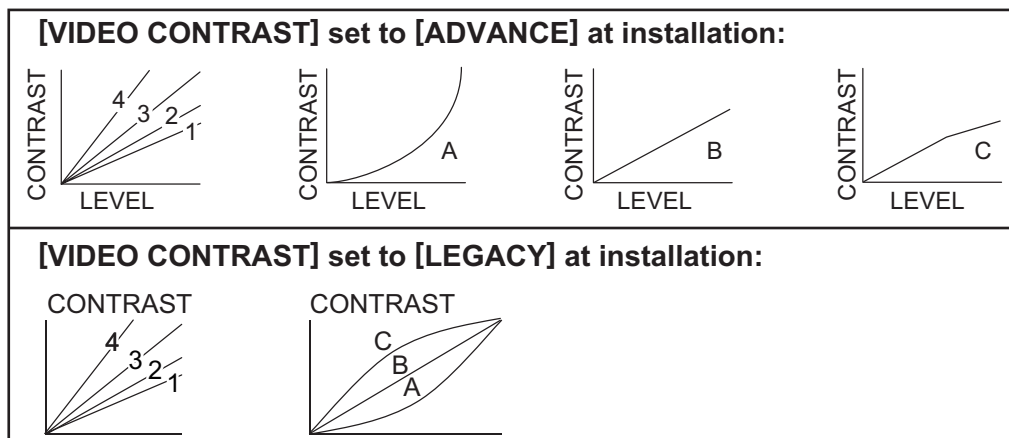
#### [RING SUPPRESSION]

Remove "ring" noise which appears with the waveguide type radars. Adjust so the rings disappear at the range of 0.125 m. The setting range is 0 to 255 (default: 1).

**Note:** This menu is **NOT** available when the [MODEL] setting is set to [50] (see "[MODEL]" on page 3-12).

**[VIDEO CONTRAST]**

Select [ADVANCE] to clarify the echo image difference (default: [ADVANCE]).

**[CLOSE TGT ES MODE]. [CLOSE TGT ES LEVEL]**

Not used, for future use.

**[EAV MODE]**

Select the method of echo average, [A] or [B].

[A]: Suppress surface reflections, set to assist in detecting other ships clearly.

[B]: Normal use, set to detect small targets or fishing equipments in sea clutter.

**Note:** This function is available only for IMO/C-type radars installed with software version "50.\*\*".

**3.5.2 [OWN SHIP INFO] menu**

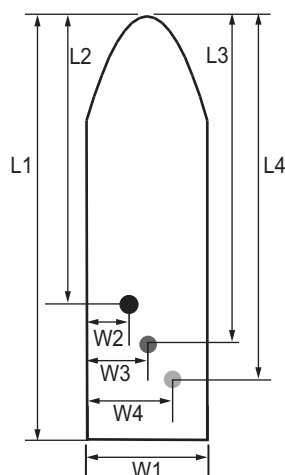
Enter the length and width of the ship, and scanner, GPS antenna and conning positions, referring to the description and figure below.

**Note:** This radar uses [CONNING POSITION] for CCRP and [SCANNER POSITION] for ANT as reference points for measurements and calculations. The commissioning engineer should understand this point, and enter own ship information accordingly.

Open the main menu then select [RADAR INSTALLATION]→ [OWN SHIP INFO] to open the [OWN SHIP INFO] menu.

### 3. ADJUSTMENTS

#### Example



L1: Ship length  
W1: Ship width  
L2: Conning position (from bow)  
W2: Conning position (from port)  
L3: Scanner position (from bow)  
W3: Scanner position (from port)  
L4: GPS antenna position (from bow)  
W4: GPS antenna position (from port)

| OWN SHIP INFO |                    |
|---------------|--------------------|
| 1             | BACK               |
| 2             | LENGTH/WIDTH       |
|               | LENGTH 0m          |
|               | WIDTH 0m           |
| 3             | SCANNER POSITION   |
|               | BOW 0m             |
|               | PORT 0m            |
| 4             | EPFS1 ANT POSITION |
|               | BOW 0m             |
|               | PORT 0m            |
| 5             | EPFS2 ANT POSITION |
|               | BOW 0m             |
|               | PORT 0m            |
| 6             | CONNING POSITION   |
|               | BOW 0m             |
|               | PORT 0m            |

#### [LENGTH/WIDTH]

Enter the ship's length and width (0 to 999, default: 0).

#### [SCANNER POSITION]

Enter the distance from the scanner to both bow and port (0 to 999, default: 0).

#### [EPFS1(2) ANT POSITION]

Enter the distance from the GPS antenna to both bow and port (0 to 999, default: 0).  
If a 2nd GPS antenna is installed, enter its position in [EPFS2 ANT POSITION].

#### [CONNING POSITION]

Enter the distance from the conning position to both bow and port (0 to 999, default: 0).

### 3.5.3 [SCANNER] menu

Open the main menu then select [RADAR INSTALLATION]→[SCANNER] to open the [SCANNER] menu.

**Note:** [SCANNER] menu items differ depending on the software version, as shown in the figures to the right.

#### [SECTOR BLANK1(2)]

Set area(s) where to prevent transmission. Heading must be properly aligned (see section 3.2) before setting any blind sector.

For example, set the area where an interfering object at the rear of the antenna would produce a

dead sector (area where no echoes appear) on the display. To enter an area, enter start bearing relative to the heading and dead sector angle. To erase the area, enter

| SCANNER |                     |
|---------|---------------------|
| 1       | BACK                |
| 2       | SECTOR BLANK1       |
|         | START 000°          |
|         | ANGLE 000°          |
| 3       | SECTOR BLANK2       |
|         | START 000°          |
|         | ANGLE 000°          |
| 4       | HSC                 |
|         | OFF/ON              |
| 5       | ANTENNA ROTATION    |
|         | LO/HI/AUTO          |
| 7       | ANTENNA SWITCH      |
|         | OFF/ON/EXT          |
| 8       | ANT STOPPED         |
|         | STBY/TX             |
| 9       | DUAL RADAR SETTINGS |

For the radars  
(software version "01.\*\*")

| SCANNER |                  |
|---------|------------------|
| 1       | BACK             |
| 2       | SECTOR BLANK1    |
|         | START 000°       |
|         | ANGLE 000°       |
| 3       | SECTOR BLANK2    |
|         | START 000°       |
|         | ANGLE 000°       |
| 4       | HSC              |
|         | OFF/ON           |
| 5       | ANTENNA ROTATION |
|         | LO/HI/AUTO       |
| 7       | ANTENNA SWITCH   |
|         | OFF/ON/EXT       |
| 8       | ANT STOPPED      |
|         | STBY/TX          |

For the radars  
(software version "50.\*\*")

0 for both the [START] and [ANGLE] sections. The setting range of [START] is 0° to 359° (default: 000°) and [ANGLE] is 0° to 180° (default: 000°).

**Note 1:** Turn off a stern blind sector when adjusting the PM gain, to display the echo from the performance monitor properly.

**Note 2:** If the PM is active, these menus are **NOT** available on FAR-2x58 radars.

### **[HSC]**

Select [ON] for HSC only.

**Note:** This menu is **NOT** available when the [MODEL] setting is set to [50] (see "[MODEL]" on page 3-12).

### **[ANTENNA ROTATION]**

This menu is available when [HSC] is set to [ON].

**Note 1:** When this menu appears in gray, it is not available. The antenna rotation speed is fixed at 24 rpm.

**Note 2:** For 42 rpm S-band radars, the High Speed Kit (type: OP03-248, available as an optional extra) is required.

Select [LO] for 36 rpm, [HI] for 42 rpm. [AUTO] sets the normal rotation speed to 36 rpm and switches the rotation speed to 42 rpm when the short pulse is selected (default: [AUTO]).

5 ANTENNA ROTATION  
LO/HI/AUTO

### **[ANTENNA SWITCH]**

Select [OFF] at [ANTENNA SWITCH] to prevent antenna rotation. For [EXT], set on/off from an external device (default: [ON]).

### **[ANT STOPPED]**

For qualified technician. [ANT STOPPED] prevents transmission while the antenna is stopped in STBY (default: [STBY]).

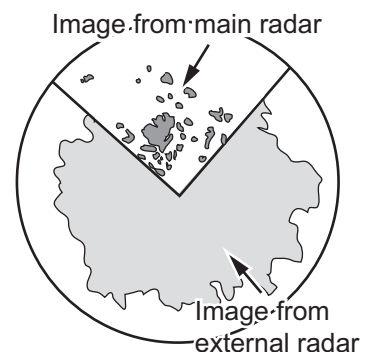
### **[DUAL RADAR SETTINGS]**

When installing two FAR-2xx8 series radars, the image from both radars (main radar and external radar) may be shown together on one radar display.

**Note 1:** This function is NOT available between the FAR-2xx8 radar and other radars.

**Note 2:** This function is available only for A/B type radars installed with software version "01.\*\*".

**Note 3:** When [COMBINE] is selected, some functions are unavailable. The following table shows the available menus in the [RADAR INSTALLATION] menu when [COMBINE] is selected. For menu operations, see the Operator's manual (OME-36520). The unavailable menus are displayed in gray.

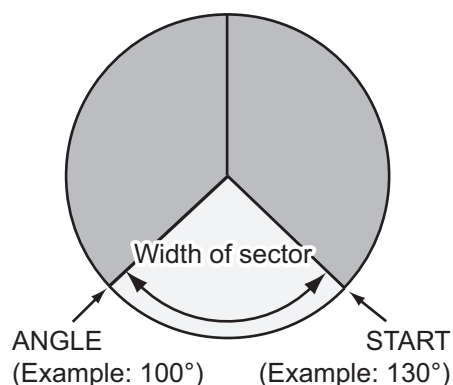


### 3. ADJUSTMENTS

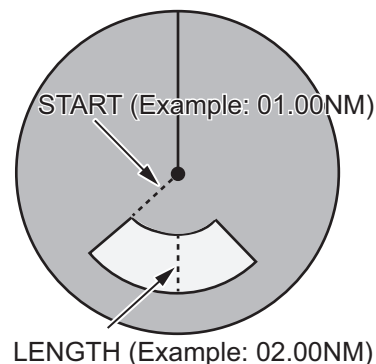
| [RADAR INSTALLATION]<br>menu                  | Available menus                                                      |
|-----------------------------------------------|----------------------------------------------------------------------|
| [ECHO ADJUSTMENT]<br>[OWN SHIP INFO]          | — (All menus are not available.)                                     |
| [SCANNER]                                     | [DUAL RADAR SETTINGS] except for [EXT RADAR]                         |
| [INSTALLATION]                                | [REMOTE MAINTENANCE], [SYSTEM MONITOR] and [ANT CABLE].              |
| [TT PRESET]                                   | — (All menus are not available.)                                     |
| [BAUD RATE]                                   | All menus are available.                                             |
| [ALERT I/F SETTINGS]<br>[INPUT PORT SETTINGS] | All menus are available.                                             |
| [NETWORK SETTINGS]                            | [VDR SETTINGS], [RX SETTINGS]                                        |
| [OTHER SETTINGS]                              | [OVERLAY1], [OVERLAY2], [EAV W/O GYRO], [ECDIS], [EXT BRILL CONTROL] |

- [DUAL RADAR]: Select [COMBINE] to enable the dual radar display. If the radars other than FAR-2xx8 series radars are on the network, select [OFF].
- [COMBINE MODE]: Select the reference of the antenna position, own radar or external radar.  
[OWN]: Set own radar's antenna as the reference point and set display area of own radar. The area outside that set here is where the image from the external radar is displayed.  
[EXT]: Set the external radar's antenna as the reference point and set the display area of the external radar. The area outside that set here is where the image from own radar is displayed.
- [COMBINE SECTOR]: Set the start position and angle of the sector, referring to the example to the right.  
[START]: Start point of the sector (default: 000°, 000°to 359°)  
[ANGLE]: Horizontal width of the sector (default: 001°, 001°to 360°)

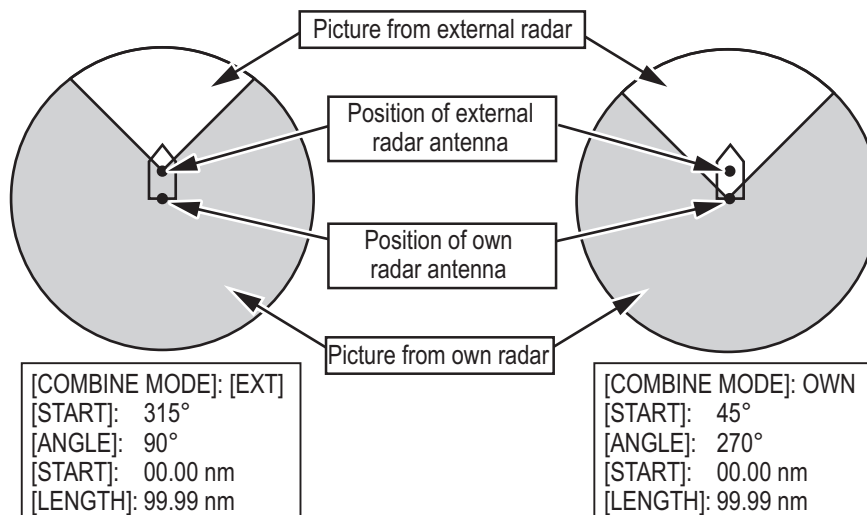
| DUAL RADAR SETTINGS |                                                  |
|---------------------|--------------------------------------------------|
| 1                   | BACK                                             |
| 2                   | DUAL RADAR<br>OFF/ COMBINE                       |
| 3                   | COMBINE MODE<br>OWN/EXT                          |
| 4                   | COMBINE SECTOR<br>START 000°<br>ANGLE 001°       |
| 5                   | COMBINE RANGE<br>START 00.00NM<br>LENGTH 00.01NM |
| 6                   | EXT RADAR<br>1/2/3/4                             |



- [COMBINE RANGE]: Set the vertical width of sector.  
[START]: Distance from reference point to sector (default: 00.00, 00.00 to 99.99)  
[LENGTH]: Vertical length of sector (default: 00.01, 00.01 to 99.99)



The setting example is shown in the figure below.



- [EXT RADAR]: Select the external radar for dual radar display. The available radar numbers are FAR-2xx8 series radars set on the [RADAR INSTALLATION] menu are valid.

**Note 1:** On dual radar display, this setting is not operative. To change this setting, first set [DUAL RADAR] to [OFF].

**Note 2:** The invalid radar numbers (Own radar, Other radars or radars not on the network) are displayed in gray.

### 3.5.4 [INSTALLATION] menu

Open the main menu then select [RADAR INSTALLATION]→[INSTALLATION] to open the [INSTALLATION] menu through two pages. On the page 1, select [NEXT] to open the page 2.

| Page 1                                                                         |                        | Page 2                                                                                      |                             |
|--------------------------------------------------------------------------------|------------------------|---------------------------------------------------------------------------------------------|-----------------------------|
| INSTALLATION (1/2)                                                             |                        | INSTALLATION (2/2)                                                                          |                             |
| 1 BACK                                                                         |                        | 1 BACK                                                                                      | Go back to page 1.          |
| 2 RANGE UNIT<br>NM/km/SM/kyd                                                   | For B/C/W-type radars. | 2 PM GAIN ADJ<br>MAN/AUTO<br>0                                                              |                             |
| 3 RADAR No.<br>1/2/3/4/5/6/7/8                                                 |                        | 3 PM GRAPH RESET<br>NO/YES                                                                  |                             |
| 4 RADAR POSITION<br>FORE/MAIN-TOP/<br>MAIN-2ND/MAIN-3RD/<br>AFT/PORT/STARBOARD |                        | 4 MONITOR TYPE<br>MU-190·231/MU-270W/<br>MU-231CR/OTHER/<br>OTHER(W)/MU-231(W)/<br>MU-201CR |                             |
| 5 MODEL<br>12/25UP/25DOWN/30UP/<br>30DOWN/S-NXT/50                             |                        | 5 REMOTE MAINTENANCE                                                                        |                             |
| 6 TYPE<br>IMO/A/B/R/W                                                          |                        | 6 SYSTEM MONITOR                                                                            |                             |
| 7 ON TIME<br>000000.0H                                                         |                        | 7 ANT CABLE<br>LAN/LAN+COAXIAL                                                              |                             |
| 8 TX TIME<br>000000.0H                                                         |                        | 8 ICE MODE SETTINGS                                                                         | For software version "01.** |
| 0 NEXT                                                                         | Go to page 2.          | 9 RADAR<br>MAIN / SUB                                                                       |                             |

### 3. ADJUSTMENTS

#### **[RANGE UNIT]**

For B/C/W-type radars, select the range unit, [NM], [SM], [KM] or [kyd] then push the left button. For the all other radar types, the range unit is fixed at [NM] so this menu is not shown.

#### **[RADAR No.]**

For multiple radar system using the network hub, set number (name) and antenna position for each system to easily distinguish the radar configuration.

- [1] to [4]: For main radar
- [5] to [8]: For sub radar

#### **[RADAR POSITION]**

Select the radar position. The choices are [FORE],[MAIN-TOP], [MAIN-2ND], [MAIN-3RD], [AFT], [PORT], and [STARBOARD].

#### **[MODEL]**

Confirm the model of your radar. This menu is set automatically according to the antenna. If this setting is different from your model, the radar will not function properly.

**Note:** This menu is not restored after [FACTORY DEFAULT] is run.

- [12]: For FAR-2218(-BB)/2318
- [25UP]: For FAR-2228(-BB)/2328
- [25DOWN]: For FAR-2328W
- [30UP]: For FAR-2238S(-BB)/2338S
- [30DOWN]: For FAR-2338SW
- [S-NXT]: For FAR-2238S-NXT(-BB)/2338S-NXT
- [50]: For FAR-2258(-BB)/2358

#### **[TYPE]**

Select the type of radar.

| Type  | Contents                                   | Software version |       |
|-------|--------------------------------------------|------------------|-------|
|       |                                            | 01.**            | 50.** |
| [IMO] | IMO specifications                         | ✓                | ✓     |
| [A]   | Near-IMO specifications                    | ✓                | —     |
| [B]   | Non-Japanese fishing vessel specifications | ✓                | —     |
| [C]   | Japanese fishing vessel specifications     | —                | ✓     |
| [R]   | Russian specifications                     | ✓                | —     |
| [W]   | Washington Ferry specifications            | ✓                | —     |

(✓: Available, —: Not available)

#### **[ON TIME]. [TX TIME]**

These items show the number of hours the radar has been turned on and transmitted, respectively. Value can be changed; for example, after replacing the magnetron. [TX TIME] can be reset to 0 for the magnetron radar. The setting range is [000000.0] to [999999.9] H (default: [000000.0]).

**[PM GAIN ADJ]**

Adjust the performance monitor, automatically or manually, whenever the magnetron is replaced. For automatic adjustment, no further operation is required; close the menu at the completion of the adjustment. For manual do as follows to adjust the performance monitor gain.

**Note:** This menu is **NOT** available when the [RADAR] setting is set to [SUB] for FAR-2x58 (see "[RADAR]" on page 3-14).

Preset the radar as follows:

- Range: 24 NM
- Pulse Length: Long
- A/C SEA: OFF (turn off manually)
- A/C RAIN: OFF (turn off manually)
- Echo Averaging (EAV): OFF
- Video Contrast: 2-B

1. Adjust the **GAIN** control so that a slight amount of white noise appears on the screen. Arcs for the performance monitor appear on the screen.
2. Select [PM GAIN ADJ] then spin the scrollwheel so that the outer arc faintly appears. The setting range is 0 to 255 (default: 255). Wait at least eight scans then right click to set.

**Note:** Turn off a stern blind sector before adjusting the PM gain, to display the echo from the performance monitor properly.

**[PM GRAPH RESET]**

This menu is active only when the PM graph is shown.

Select [YES] to reset all PM graphs, after replacing the magnetron.

**Note:** This menu is **NOT** available when the [RADAR] setting is set to [SUB] for FAR-2x58 (see "[RADAR]" on page 3-14).

**[MONITOR TYPE]**

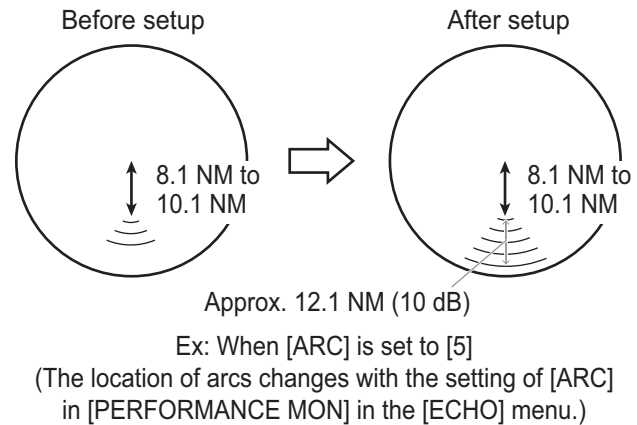
The monitor type is preset at factory according to the radar type. For BB type radar, [MU-190•231] is set in advance. For other wide monitor, select [OTHER(W)].

```

4 MONITOR TYPE
[MU-190 • 231/MU-270W/
MU-231CR/OTHER/
OTHER(W)/MU-231(W)/
MU-201CR

```

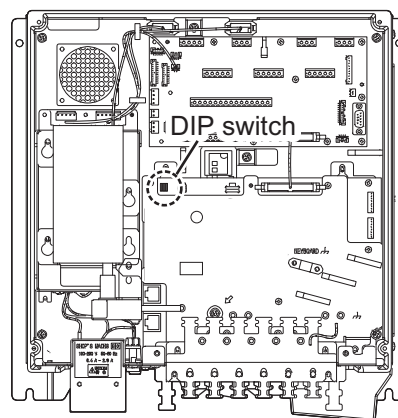
**Note 1:** [MU-231(W)] and [MU-201CR] are available only on the radars installed with software version "01.\*\*"



### 3. ADJUSTMENTS

**Note 2:** Select the monitor type correctly. If this menu is set to a wide monitor ([MU-270W], [OTHER(W)] or [MU-231(W)]) and no wide monitor is connected, the screen blacks out. In this case, set DIP switch SW2 to ON, in order to change the monitor type to MU-190/231.

**Note 3:** For A/B/C/W-type radars with Radar Plotter functionality, the [MU-231CR] setting is not used.



#### **[REMOTE MAINTENANCE]**

Adjust setting for remote maintenance.

[MAINTENANCE PROFILE]: Select [ON] to output the equipment profile for remote maintenance.



#### **[SYSTEM MONITOR]**

[DISP SYSTEM MONITOR]: Shows the system monitor data through three pages. The following operations are enabled:



**F1** key: Goes to next page. After the last page, the system monitor window is not shown.

**F3** key: Saves the text data for the displayed page to an SD card.

**F4** key: Saves the screen shot for the displayed page to an SD card.

#### **[ANT CABLE]**

Select the method of connection between the radar sensor and the processor unit. [LAN] (LAN cable only) or [LAN+COAXIAL] (LAN and coaxial cables). Select [LAN+COAXIAL] when the optional LAN Signal Converter is installed.



#### **[ICE MODE SETTINGS]**

For the radars installed with software version \*01.\*\*\*. To activate this settings, the password is required. For the password, contact your dealer.

#### **[RADAR]**

Select radar from [MAIN] or [SUB] to activate the menu setting (default: [MAIN]).

**Note:** This menu is available only for the [MODEL] setting is set to [50] (see "[MODEL]" on page 3-12).

### 3.5.5 [TT PRESET] menu

Open the main menu then select [RADAR INSTALLATION]→[TT PRESET] to open the [TT PRESET] menu.

| TT PRESET |                             |
|-----------|-----------------------------|
| 1         | BACK                        |
| 2         | TT DATA OUTPUT              |
| 3         | MAX RANGE<br>24NM/32NM/48NM |
| 4         | TT ECHO LEVEL<br>00         |
| 5         | QV DISPLAY<br>OFF/ON        |
| 6         | TT W/O GYRO<br>OFF/ON       |
| 7         | ACQ PRESET                  |
| 8         | TRACK PRESET                |
| 0         | DEFAULT<br>NO/YES           |

#### [TT DATA OUTPUT]

Show the [TT DATA OUTPUT] menu.

**Note:** Confirm the data input configuration for the equipment which will receive the TT (target tracking) sentence BEFORE setting this menu.

- [SELECT SENTENCE]: Select the sentence that is output the TT target data. (default: [TTM])  
[OFF]: For no output of the TT data.  
[TTM]: For connected equipment which can receive the TTM sentence.  
[TTD]: For connected equipment which can receive the TTD sentence.
- [TTM/TTD REFERENCE]: Set the output format for tracked target's bearing (default: [REL]).  
[REL] (Target bearing from own ship, degree relative, target course, degree relative)  
[TRUE] (Target bearing, degree true, target course, degree true).

| TT DATA OUTPUT |                                |
|----------------|--------------------------------|
| 1              | BACK                           |
| 2              | SELECT SENTENCE<br>OFF/TTM/TTD |
| 3              | TTM/TTD REFERENCE<br>REL/TRUE  |

#### [MAX RANGE]

Select the maximum target tracking range, 24, 32 or 48 NM (default: [24NM]).

**Note:** [48NM] is available only for the [MODEL] setting is set to [50] (see "[MODEL]" on page 3-12).

#### [TT ECHO LEVEL]

Set the detection level of echoes. The setting range is 1 to 31 (default: 13).

#### [QV DISPLAY]

This function is used for diagnostic purposes.

- [OFF]: Normal picture (default)
- [ON]: Quantized video. Default setting is restored when the power is turned off.

**[TT W/O GYRO]**

Select [ON] to use TT without a gyro (default: [OFF]). If [OFF] is selected, TT can not used without gyro.

**[ACQ PRESET]**

Show the [ACQ PRESET] menu.

- **[LAND SIZE]:** Set the land size in units of 100 m. The setting range is 100 to 3000 m (default: 1600 m). A target whose length is equal to or greater than the length set here is judged as a land target.
- **[ANT SELECT]:** Set the antenna radiator type of your radar. The size of the echo changes with radiator size. Select the correct radiator type to ensure proper performance.  
**Note 1:** [SN24CF] and [SN30CF] are **NOT** available on IMO-type radars.  
**Note 2:** [XN24AF] and [XN30AF] are available only for the [MODEL] setting is set to [50] (see "[MODEL]" on page 3-12).
- **[AUTO ACQ CORRE]:** Set the correlation count of automatic acquisition. The setting range is [3] to [10] (default: [5]).
- **[AUTO ACQ WEED]:** Set the cancel count of automatic acquisition. The setting range is 1 to 5 scans (default: [1SCAN]).
- **[TT No.]:** Select how to enter TT No, [LOOP] or [FILL] (default: [LOOP]).  
**Note 1:** This menu is available on the radars installed with software version "50.\*\*". For C-type radars, this menu is selectable. For IMO-type radars, this setting is fixed at [LOOP].  
**Note 2:** This menu is not displayed on the radars installed with software version "01.\*\*".

| ACQ PRESET |                                                                                  |
|------------|----------------------------------------------------------------------------------|
| 1          | BACK                                                                             |
| 2          | LAND SIZE<br>0m                                                                  |
| 3          | ANT SELECT<br>XN12CF/XN20CF/<br>XN24CF/SN24CF/<br>SN30CF/SN36CF<br>XN24AF/XN30AF |
| 4          | AUTO ACQ CORRE<br>0                                                              |
| 5          | AUTO ACQ WEED<br>0SCAN                                                           |
| 7          | TT NO.<br>LOOP/FILL                                                              |

**[TRACK PRESET]**

- **[GATE SIZE]:** Set the gate size among [S], [M], [L] or [LL] (default: [M])
- **[FILTER RESPONSE]:** Set the filter response function. The setting range is 1 to 4.  
 [1]: Filter response is improved (default).  
 [4]: Filter stability is improved.
- **[LOST COUNT]:** Set the number of scans to allow before a target is declared a lost target. The setting range is 1 to 20 scans (default: [9SCAN]).
- **[MAX SPEED]:** Set the maximum tracking speed. The setting range is 40 to 150 kn (default: [150kn]).

| TRACK PRESET |                                                   |
|--------------|---------------------------------------------------|
| 1            | BACK                                              |
| 2            | GATE SIZE<br>S/M/L/LL                             |
| 3            | FILTER RESPONSE<br>1/2/3/4                        |
| 4            | LOST COUNT<br>0SCAN                               |
| 5            | MAX SPEED<br>0kn                                  |
| 6            | START TIME TGT VECT<br>TIME/SCAN<br>0sec<br>0SCAN |
| 7            | NUMBER OF TT<br>100/MAX                           |

- **[START TIME TGT VECT]**: Set the number of seconds or number of scans to wait before showing the vector for a newly acquired target. Select [TIME] or [SCAN] then enter value.  
 [TIME]: The setting range is 0 to 100 sec (default [0sec]).  
 [SCAN]: The setting range is 0 to 40 scans (default [0SCAN]).
- **[NUMBER OF TT]**: The setting [100] can not be changed.

### **[DEFAULT]**

Select [YES] to restore the default settings for the [TT PRESET] menu.

## **3.5.6 [BAUD RATE] menu**

Set the baud rate, 4800 or 38400 (bps), for connected equipment - heading sensor, AIS transponder, GPS navigator, Log, AMS, and ECDIS.

**Note:** For IMO-type radars, [HDG] and [AIS] is fixed to [38400].

| BAUD RATE |                     |
|-----------|---------------------|
| 1         | BACK                |
| 2         | HDG<br>4800/38400   |
| 3         | AIS<br>4800/38400   |
| 4         | GPS<br>4800/38400   |
| 5         | LOG<br>4800/38400   |
| 6         | AMS<br>4800/38400   |
| 7         | ECDIS<br>4800/38400 |

## **3.5.7 [ALERT I/F SETTINGS] menu**

Four alert contact outputs are available, [ALERT OUT1] to [ALERT OUT4].

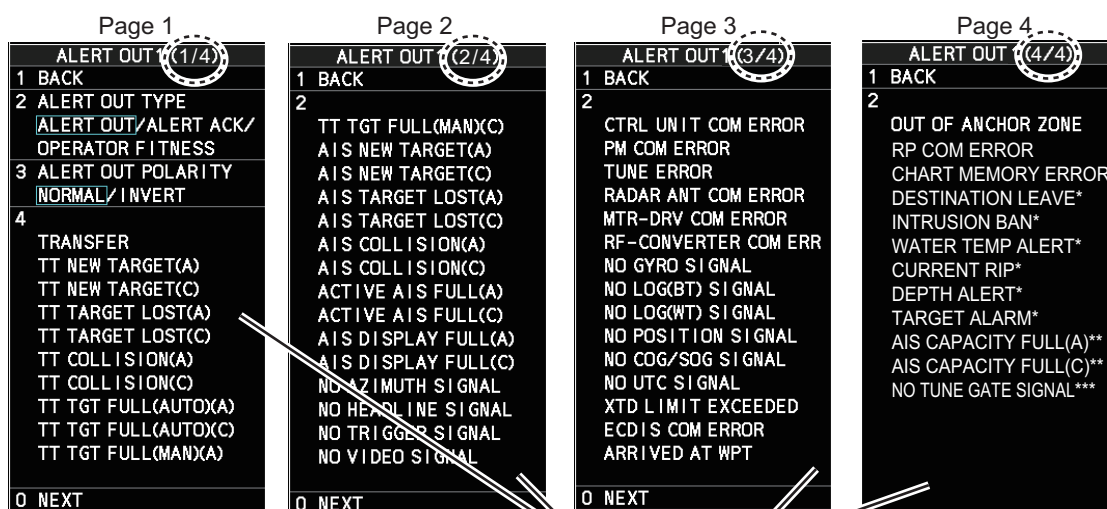
| ALERT I/F SETTINGS |                                 |
|--------------------|---------------------------------|
| 1                  | BACK                            |
| 2                  | ALERT OUT1                      |
| 3                  | ALERT OUT2                      |
| 4                  | ALERT OUT3                      |
| 5                  | ALERT OUT4                      |
| 6                  | ALERT DATA OUT<br>ALR/ALF       |
| 7                  | AIS ALERT I/F<br>OFF/LEGACY/IF1 |
| 8                  | LOG(BT) ALERT<br>OFF/ON         |
| 9                  | LOG(WT) ALERT<br>OFF/ON         |

### 3. ADJUSTMENTS

#### [ALERT OUT 1] to [ALERT OUT 4]

Select the alert to output for each alert out number through four pages. To monitor for unit failure if and when it occurs, set the alert contact outputs referring to the table below.

| Unit                             | Alert                                                                                                                                                                                                                                                                                                         |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Antenna unit<br>Transceiver Unit | <ul style="list-style-type: none"> <li>• NO AZIMUTH SIGNAL</li> <li>• NO HEADLINE SIGNAL</li> <li>• NO TRIGGER SIGNAL</li> <li>• NO VIDEO SIGNAL</li> <li>• NO TUNE GATE SIGNAL</li> <li>• TUNE ERROR</li> <li>• RADAR SENSOR COM ERR</li> <li>• MTR-DRV COM ERROR</li> <li>• RF-CONVERTER COM ERR</li> </ul> |
| Performance monitor              | PM COM ERROR                                                                                                                                                                                                                                                                                                  |
| Control unit                     | CTRL UNIT COM ERR                                                                                                                                                                                                                                                                                             |



[NEXT]: Go to next page.

[BACK]: Go back to previous page.

Setting alert list

\*: For C-type radars only  
 \*\*: For R-type radars only  
 \*\*\*: For FAR-2x58

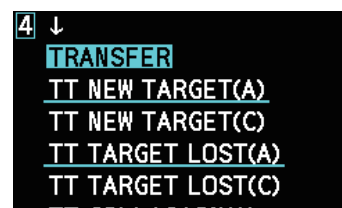
To monitor for processor unit failure, connect SYS\_FAIL and PWR\_FAIL from terminal J613 in the processor unit to the AMS.

- [ALERT OUT TYPE]: Select the alert out type.  
 [ALERT OUT]: Alert out when the alert occurs (default).  
 [ALERT ACK]: Alert out when the alert is acknowledged.  
 [OPERATER FITNESS]: Alert out until the alert is acknowledged by the ACK operation.
- [ALERT OUT POLARITY]: Select the alert out polarity, [NORMAL] (default) or [INVERT].  
**Note:** For category A alert, there are two types of output operations, "A" and "C". To inform the AMS of category A alerts via contact signal, connect both "A" and "C" signals.  
 (A): Alert sound is output when the corresponding item is an unacknowledged alert. Output is stopped when the item is acknowledged.

(C): Alert sound is output when the corresponding item becomes an alert condition. Output is stopped when the alert condition is removed. The table below shows the operational status of the alert outputs based on the output type.

| Output type | Status |                         |                                  |                                                |
|-------------|--------|-------------------------|----------------------------------|------------------------------------------------|
|             | Normal | A new alert is occurred | An existing alert is acknowledge | An existing alert condition becomes non-active |
| A           | Off    | On                      | Off                              | Off                                            |
| C           | Off    | On                      | On                               | Off                                            |

- [TRANSFER]: For category A alert, when the 60 seconds have passed under unsolved or unacknowledged condition after the alert occurs, transfer the alert to contact output for AMS. If the alert is removed or acknowledged, the contact output is inactive.
- Setting alert list: Select the alert to activate. The activated alerts are indicated with an underline. For example shown in the right figure, [TT NEW TARGET(A)] and [TT TARGET LOST(A)] are activated.



The available alerts are as follows:

- |                        |                        |                          |
|------------------------|------------------------|--------------------------|
| • TT NEW TARGET(A)     | • ACTIVE AIS FULL(C)   | • NO COG/SOG SIGNAL      |
| • TT NEW TARGET(C)     | • AIS DISPLAY FULL(A)  | • NO UTC SIGNAL          |
| • TT TARGET LOST(A)    | • AIS DISPLAY FULL(C)  | • XTD LIMIT EXCEEDED     |
| • TT TARGET LOST(C)    | • NO AZIMUTH SIGNAL    | • ECDIS COM ERROR        |
| • TT COLLISION(A)      | • NO HEADLINE SIGNAL   | • ARRIVED AT WPT         |
| • TT COLLISION(C)      | • NO TRIGGER SIGNAL    | • OUT OF ANCHOR ZONE     |
| • TT TGT FULL(AUTO)(A) | • NO VIDEO SIGNAL      | • RP COM ERROR           |
| • TT TGT FULL(AUTO)(C) | • CTRL UNIT COM ERROR  | • CHART MEMORY ERROR     |
| • TT TGT FULL(MAN)(A)  | • PM COM ERROR         | • DESTINATION LEAVE*     |
| • TT TGT FULL(MAN)(C)  | • TUNE ERROR           | • INTRUSION BAN*         |
| • AIS NEW TARGET(A)    | • RADAR ANT COM ERROR  | • WATER TEMP ALERT*      |
| • AIS NEW TARGET(C)    | • MTR-DRV COM ERROR    | • CURRENT RIP*           |
| • AIS TARGET LOST(A)   | • RF-CONVERTER COM ERR | • DEPTH ALERT*           |
| • AIS TARGET LOST(C)   | • NO GYRO SIGNAL       | • TARGET ALARM*          |
| • AIS COLLISION(A)     | • NO LOG(BT) SIGNAL    | • AIS CAPACITY FULL(A)** |
| • AIS COLLISION(C)     | • NO LOG(WT) SIGNAL    | • AIS CAPACITY FULL(C)** |
| • ACTIVE AIS FULL(A)   | • NO POSITION SIGNAL   | • NO TUNE GATE SIGNAL*** |

\*: For C-type radars

\*\*: For R-type radars

\*\*\*: For FAR-2x58

### **ALERT DATA OUT**

Select the alert output format, [ALR] (Set Alarm State) or [ALF] (Alert Sentence, default).

### **AIS ALERT I/F**

Set the AIS alert interface.

[OFF] does not output AIS alerts (default).

[LEGACY]: For connection to FA-100, FA-150 or FA-170 where the AIS mode is [LEGACY].

[IF1]: For connection to FA-150 or FA-170 where the AMS mode is [AlertIF1].

### 3. ADJUSTMENTS

#### **LOG(BT) ALERT**

Select [ON] to activate alert "NO LOG(BT) SIGNAL" for signal loss of speed over ground.

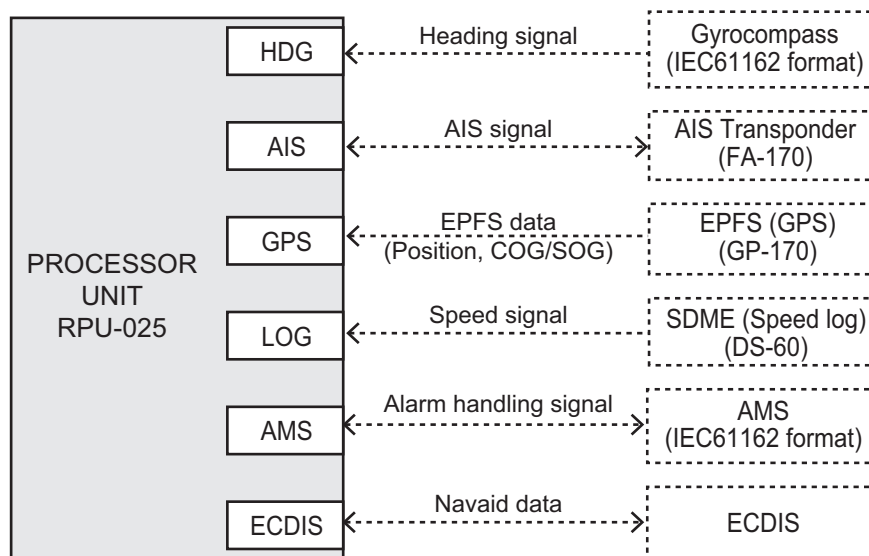
#### **LOG(WT) ALERT**

Select [ON] to activate alert "NO LOG(WT) SIGNAL" for signal loss of speed through water.

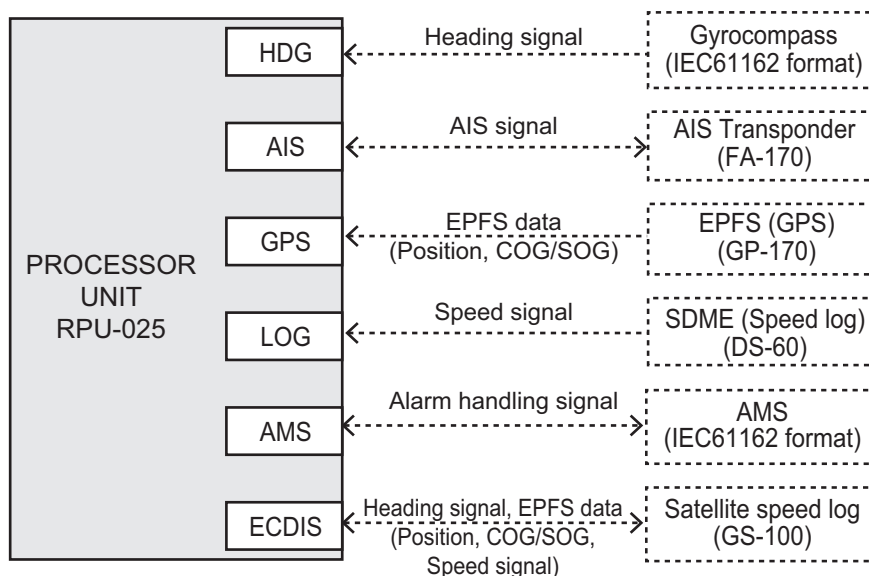
### 3.5.8 [INPUT PORT SETTINGS] menu

The input signals to the ports on the processor unit are shown below.

#### Default setting



#### Setting for multiple sensors



The input signal setting for each port can be set in the [INPUT PORT SETTINGS] menu.

Open the main menu then select [RADAR INSTALLATION]→[INPUT PORT SETTINGS] to open the [INPUT PORT SETTINGS] menu.

| INPUT PORT SETTINGS |            |
|---------------------|------------|
| 1                   | BACK       |
| 2                   | EPFS       |
| 3                   | LOG        |
| 4                   | HEADING    |
| 5                   | AIS        |
| 6                   | WIND       |
| 7                   | CURRENT    |
| 8                   | WATER TEMP |
| 9                   | DEPTH      |

#### How to set the port setting of each data;

1. Select the data for port setting in the [INPUT PORT SETTING] menu.
2. Select the port setting, [SERIAL] or [LAN2].
3. For serial port connections, select the source in [SERIAL SETTING].  
**Note:** [AMS] is not available for IMO-type radars.
4. For LAN2 port connections, enter the connected equipment ID at [LAN2 SETTING] with the software keyboard.
5. To give the GLL sentence priority, set [PRIORITIZE GLL] to [ON].

Set the port setting of each data shown below according to the above procedure.

#### [EPFS]

The GPS navigator data has two ports to input the source data shown in the following figure. The GPS navigator is set to [EPFS1] and [EPFS2] ports in [EPFS]. For multiple signal input, set the ports as follows:

[EPFS1 SERIAL SETTINGS]→[GPS]  
[EPFS2 SERIAL SETTINGS]→[ECDIS]

| EPFS (1/2)                                          | EPFS (2/2)                             |
|-----------------------------------------------------|----------------------------------------|
| 1 BACK                                              | 1 BACK                                 |
| 2 EPFS1 PORT SETTING<br>SERIAL/LAN2                 | 2 EPFS1 INPUT DTM SEL.<br>WGS-84/TOKYO |
| 3 EPFS1 SERIAL SETTING<br>GPS/LOG/ECDIS/HDG/<br>AMS | 3 EPFS2 INPUT DTM SEL.<br>WGS-84/TOKYO |
| 4 EPFS1 LAN2 SETTING<br>GP0001                      |                                        |
| 5 EPFS2 PORT SETTING<br>SERIAL/LAN2                 |                                        |
| 6 EPFS2 SERIAL SETTING<br>GPS/LOG/ECDIS/HDG/<br>AMS |                                        |
| 7 EPFS2 LAN2 SETTING<br>GP0002                      |                                        |
| 8 PRIORITIZE GLL<br>OFF/ON                          |                                        |
| 0 NEXT                                              |                                        |

**Note:** Do not set the same value for port1 and port 2. For example, where [EPFS1] is set as [GPS], [EPFS2] must be set to other than [GPS].

- [PRIORITIZE GLL]: Select [ON] to give priority to GLL data.
- [EPFS1(2) INPUT DTM SEL.]: For C-type radars, select the datum for sensor data input.

### 3. ADJUSTMENTS

#### [LOG]. [HEADING]

The speed data and heading data have two ports to input the source data shown in the following figure.

| LOG                                                |
|----------------------------------------------------|
| 1 BACK                                             |
| 2 LOG1 PORT SETTING<br>SERIAL/LAN2                 |
| 3 LOG1 SERIAL SETTING<br>GPS/LOG/ECDIS/HDG/<br>AMS |
| 4 LOG1 LAN2 SETTING<br>VD0001                      |
| 5 LOG2 PORT SETTING<br>SERIAL/LAN2                 |
| 6 LOG2 SERIAL SETTING<br>GPS/LOG/ECDIS/HDG/<br>AMS |
| 7 LOG2 LAN2 SETTING<br>VD0002                      |

For speed data

| HEADING                                             |
|-----------------------------------------------------|
| 1 BACK                                              |
| 2 GYRO1 PORT SETTING<br>SERIAL/LAN2/AD-10           |
| 3 GYRO1 SERIAL SETTING<br>GPS/LOG/ECDIS/HDG/<br>AMS |
| 4 GYRO1 LAN2 SETTING<br>HE0001                      |
| 5 GYRO2 PORT SETTING<br>SERIAL/LAN2/AD-10           |
| 6 GYRO2 SERIAL SETTING<br>GPS/LOG/ECDIS/HDG/<br>AMS |
| 7 GYRO2 LAN2 SETTING<br>HE0002                      |

For heading data

- **Speed data:** [LOG1] and [LOG2] ports in [LOG].  
For multiple signal input, set the ports as follows:  
[LOG1 SERIAL SETTINGS]→ [LOG]  
[LOG2 SERIAL SETTINGS]→ [ECDIS]
- **Heading data:** [HDG1] and [HDG2] ports in [HEADING]  
For multiple signal input, set the ports as follows:  
[GYRO1 SERIAL SETTINGS]→ [HDG]  
[GYRO2 SERIAL SETTINGS]→ [ECDIS]

**Note:** Do not set the same value for port1 and port 2. For example, where [LOG1] is set as [LOG], [LOG2] must be set to other than [LOG].

#### [AIS]. [WIND]. [CURRENT]. [WATER TEMP]. [DEPTH]

Select the input source for each data type; AIS, wind data, current data, water temperature and depth data. These data have only one input port.

| AIS                               |
|-----------------------------------|
| 1 BACK                            |
| 2 AIS PORT SETTING<br>SERIAL/LAN2 |
| 3 AIS LAN2 SETTING<br>AI0001      |

For AIS

| WIND                                               |
|----------------------------------------------------|
| 1 BACK                                             |
| 2 WIND PORT SETTING<br>SERIAL/LAN2                 |
| 3 WIND SERIAL SETTING<br>GPS/LOG/ECDIS/HDG/<br>AMS |
| 4 WIND LAN2 SETTING<br>WI0001                      |

For wind data

| CURRENT                                           |
|---------------------------------------------------|
| 1 BACK                                            |
| 2 CUR PORT SETTING<br>SERIAL/LAN2                 |
| 3 CUR SERIAL SETTING<br>GPS/LOG/ECDIS/HDG/<br>AMS |
| 4 CUR LAN2 SETTING<br>VW0001                      |

For current data

| WATER TEMP                                         |
|----------------------------------------------------|
| 1 BACK                                             |
| 2 TEMP PORT SETTING<br>SERIAL/LAN2                 |
| 3 TEMP SERIAL SETTING<br>GPS/LOG/ECDIS/HDG/<br>AMS |
| 4 TEMP LAN2 SETTING<br>II0051                      |

For water temperature

| DEPTH                                             |
|---------------------------------------------------|
| 1 BACK                                            |
| 2 DPT PORT SETTING<br>SERIAL/LAN2                 |
| 3 DPT SERIAL SETTING<br>GPS/LOG/ECDIS/HDG/<br>AMS |
| 4 DPT LAN2 SETTING<br>SD0001                      |

For depth data

### 3.5.9 [NET WORK SETTINGS] menu

Open the main menu then select [RADAR INSTALLATION]→[NEXT]→[NETWORK SETTINGS] to open the [NETWORK SETTINGS] menu.

**Note 1:** Network settings should be done while the radar is disconnected from the LAN network, as a stand-alone radar.

**Note 2:** The system restarts automatically after the network settings are changed.

**Note 3:** When you change the radar number, this equipment restarts automatically. After restarting, confirm the IP address in [NETWORK SETTINGS].

| NETWORK SETTINGS |                                                                                                          |
|------------------|----------------------------------------------------------------------------------------------------------|
| 1                | BACK                                                                                                     |
| 2                | LAN1-3 IP ADDRESS<br>CLASS: B/C<br>LAN1-3:192.168.025.025<br>SCAN:192.168.031.101<br>RP: 192.168.031.121 |
| 3                | LAN2 IP ADDRESS<br>172. 031. 016. 021                                                                    |
| 4                | MULTICAST ADDRESS<br>239. 192. 000. 002                                                                  |
| 5                | VDR SETTINGS                                                                                             |
| 6                | RX SETTINGS                                                                                              |

#### [LAN1-3 IP ADDRESS]

For multiple radar systems using the network hub, the IP address is assigned according to the radar No (See "[RADAR No.]" on page 3-12). Set the IP address as shown in the following table. For C-type and A/B-type radars with Radar Plotter functionality, a dedicated IP address is assigned.

Also, select the network type, CLASS C or B. When FAR-2xx8 radar is connected to FEA-2xx7 series (ECDIS), set CLASS B.

**Note:** Do not set an IP address other than the address that corresponds to your radar number and class in the following table.

| CLASS C   |                                    |                | CLASS B   |                               |            |
|-----------|------------------------------------|----------------|-----------|-------------------------------|------------|
| Radar No. | LAN1                               | LAN3           | Radar No. | LAN1                          | LAN3       |
| No.1      | 192.168.31.21<br>(192.168.31.121*) | 192.168.31.101 | No.1      | 172.31.3.35<br>(172.31.3.43*) | 172.31.3.6 |
| No.2      | 192.168.31.22<br>(192.168.31.122*) | 192.168.31.102 | No.2      | 172.31.3.36<br>(172.31.3.44*) | 172.31.3.7 |
| No.3      | 192.168.31.23<br>(192.168.31.123*) | 192.168.31.103 | No.3      | 172.31.3.37<br>(172.31.3.45*) | 172.31.3.8 |
| No.4      | 192.168.31.24<br>(192.168.31.124*) | 192.168.31.104 | No.4      | 172.31.3.38<br>(172.31.3.46*) | 172.31.3.9 |
| No.5      | 192.168.31.25<br>(192.168.31.125*) | —              | No.5      | 172.31.3.39<br>(172.31.3.47*) | —          |
| No.6      | 192.168.31.26<br>(192.168.31.126*) | —              | No.6      | 172.31.3.40<br>(172.31.3.48*) | —          |
| No.7      | 192.168.31.27<br>(192.168.31.127*) | —              | No.7      | 172.31.3.41<br>(172.31.3.49*) | —          |
| No.8      | 192.168.31.28<br>(192.168.31.128*) | —              | No.8      | 172.31.3.42<br>(172.31.3.50*) | —          |

\*: For C-type and A/B-type radars with Radar Plotter functionality

### 3. ADJUSTMENTS

#### [LAN2 IP ADDRESS]

The IP address is assigned according to the radar No (See "[RADAR No.]" on page 3-12). Set the IP address as shown below. This IP address can be changed as required.

| Radar No. | LAN2         | SFID   |
|-----------|--------------|--------|
| No.1      | 172.31.16.11 | RA0011 |
| No.2      | 172.31.17.11 | RA0012 |
| No.3      | 172.31.16.12 | RA0013 |
| No.4      | 172.31.17.12 | RA0014 |
| No.5      | 172.31.16.13 | RA0015 |
| No.6      | 172.31.17.13 | RA0016 |
| No.7      | 172.31.16.14 | RA0017 |
| No.8      | 172.31.17.14 | RA0018 |

#### [MULTICAST ADDRESS]

Set the multicast address with the cursor and the keypad.

#### [VDR SETTINGS]

**Note:** This menu is **NOT** available for C-type radars.

- [VDR LAN OUTPUT]: Select [ON] to output the VDR signal through LAN connection.  
For [ON], set the multicast port with the software keyboard.
- [SOURCE]: Set the status and information text, max 16 characters with the software keyboard (Example: "Xband.1").
- [LOCATION]: Set the status and information text, max 32 characters with the software keyboard (Example: "No1").
- [SFI]: Set the SFI. The talker of the device is alphanumeric, two characters followed by four numerals.

| VDR SETTINGS |                                   |
|--------------|-----------------------------------|
| 1            | BACK                              |
| 2            | VDR LAN OUTPUT<br>OFF/ON<br>60026 |
| 3            | SOURCE                            |
| 4            | LOCATION                          |
| 5            | SFI<br>VR0001                     |

The device and channel information to be transmitted to VDR are shown below.

| Radar No. | Device | Channel | Radar No. | Device | Channel |
|-----------|--------|---------|-----------|--------|---------|
| No.1      | 75     | 1       | No.5      | 79     | 1       |
| No.2      | 76     | 1       | No.6      | 80     | 1       |
| No.3      | 77     | 1       | No.7      | 81     | 1       |
| No.4      | 78     | 1       | No.8      | 82     | 1       |

**[RX SETTINGS]**

Select [ON] to receive the following data signals:

- [MISC]: Other equipment data (sensor of engine etc.)
- [TGTD]: Target data
- [SATD]: Satellite data
- [NAVD]: Navigation data
- [TIME]: Time
- [PROP]: Specified data by manufacturer or user

| RX SETTINGS |                |
|-------------|----------------|
| 1           | BACK           |
| 2           | MISC<br>OFF/ON |
| 3           | TGTD<br>OFF/ON |
| 4           | SATD<br>OFF/ON |
| 5           | NAVD<br>OFF/ON |
| 6           | TIME<br>OFF/ON |
| 7           | PROP<br>OFF/ON |

**3.5.10 [OTHER SETTINGS] menu**

Open the main menu then select [RADAR INSTALLATION]→[NEXT]→[OTHER SETTINGS] to open the [OTHER SETTINGS] menu.

**[DEMO ECHO]**

Select the type of simulated echo to use. [EG-3000] (Echo Generator), [TT-TEST], [PC] or [EG-4000]. Select [OFF] to deactivate this feature (default: [OFF]).

**[EAV W/O GYRO]**

The echo averaging feature can be used without a gyrocompass. Select [ON] to use the feature without a gyrocompass (default: [OFF]).

**[ECDIS]**

Select the ECDIS communication method, [SERIAL] or [LAN]. Select [OFF] for no ECDIS connection (default: [OFF]).

**[EXT BRILL CONTROL]**

Select [ON] to adjust the brilliance of the monitor unit from external equipment.

**[SSD SUB OUTPUT]**

**Note:** Not used with magnetron radars.

For solid state radars (FAR-2238S-NXT(-BB)/FAR-2338S-NXT), if the digital signal can be output in analog format to a sub monitor, select [ON].

| OTHER SETTINGS |                                                                           |
|----------------|---------------------------------------------------------------------------|
| 1              | BACK                                                                      |
| 2              | DEMO ECHO<br>OFF/EG-3000/<br>TT-TEST/PC/EG-4000<br>IP: 192. 168. 031. 101 |
| 3              | EAV W/O GYRO<br>OFF/ON                                                    |
| 4              | ECDIS<br>OFF/SERIAL/LAN                                                   |
| 5              | EXT BRILL CONTROL<br>OFF/ON                                               |
| 6              | SSD SUB OUTPUT<br>OFF/ON                                                  |
| 7              | OVERLAY1                                                                  |
| 8              | OVERLAY2                                                                  |
| 0              | RP UPDATE                                                                 |

**[OVERLAY1 (2)]**

**Note:** This menu is **NOT** available for C-type radars.

When an ECDIS is connected, the radar picture can be overlaid on the ECDIS. Set the items on this menu to correctly overlay the radar picture on ECDIS.

**Note:** The overlay output is less accurate than the sub monitor output from the antenna unit, especially in the areas mentioned below. Therefore, only use the overlay with an ECDIS.

- Distance accuracy/resolution
- Bearing accuracy/resolution
- Sweep
- Echo picture
- Range

When the echo image is **NOT** used with ECDIS, use the signal from the antenna unit.

| OVERLAY1 |                           |
|----------|---------------------------|
| 1        | BACK                      |
| 2        | HDG ALIGNMENT<br>000.0°   |
| 3        | BEARING PULSE<br>360/8192 |
| 4        | HDG POLARITY<br>LOW/HIGH  |
| 5        | TRIG WIDTH<br>SHORT/LONG  |

**[RP UPDATE]**

**For C-type and A/B/W radars with Radar Plotter functionality**, conduct updates for the RP board (CC6).

- [APPLICATION]: Update the RP board (CC6) software.
- [OS]: Update the RP board (CC6) OS (operating system).
- [CHART SYMBOL]: Update the RP board (CC6) chart symbols.
- [REMOVE USB MEMORY]: Remove a USB flash memory from the RP board (CC6).

| RP UPDATE |                   |
|-----------|-------------------|
| 1         | BACK              |
| 2         | APPLICATION       |
| 3         | OS                |
| 4         | CHART SYMBOL      |
| 5         | REMOVE USB MEMORY |

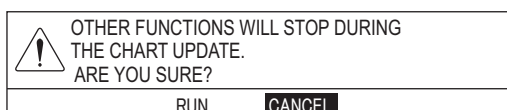
## 3.6 How to Control Charts

This section shows you how to install or update charts for C-type and A/B/W radars with Radar Plotter functionality.

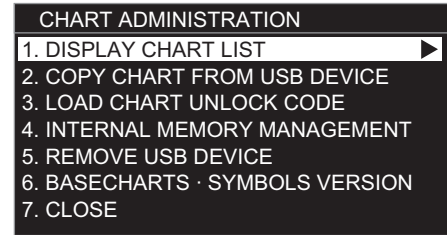
### 3.6.1 How to install charts

**Note:** Save the chart data to a USB flash memory first. You do not need to create a folder.

1. Connect the USB flash memory with chart data to the USB drive from the RP board.
2. Press the **MENU** key to open the main menu.
3. Select [INITIAL SETTINGS].
4. Select [UPDATE CHART]. The following message appears.



5. Select [RUN]. The message "PROCESSING. PLEASE WAIT." appears, then the [CHART ADMINISTRATION] menu appears.



6. Select [COPY CHART FROM USB DEVICE] to display the list for data in the USB flash memory.
7. Select the chart data to copy.
8. Select [SELECT CHART TO COPY]. The confirmation message appears.
9. Select [RUN] to copy the chart data.
10. Click the left button.
11. Do one of the following methods to unlock the chart data.

How to unlock the chart data automatically

**Note:** Save the unlock code to the USB flash memory first. The file extension is "uc".

- 1) Select [LOAD CHART UNLOCK CODE] in the [CHART ADMINISTRATION] menu to display the list for data in the USB flash memory.
- 2) Select the file for the unlock code. The confirmation message appears.
- 3) Select [RUN]. The message "UNLOCK CODE VERIFIED." appears.
- 4) Click the left button.

How to unlock the chart data manually

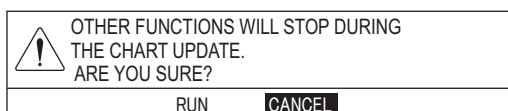
- 1) Select [1. DISPLAY CHART LIST] in the [CHART ADMINISTRATION] menu to display the chart list.
- 2) Select the locked chart data (displayed with yellow letters), then click the left button to display the character entry window.
- 3) Set the unlock code as described below.  
Operate the trackball or the wheel to select a character, then click the left button to confirm selection. Repeat this step to select all other characters. Select [ENTER] then click the left button.  
The message "UNLOCK CODE VERIFIED." appears.
- 4) Click the left button.
12. When unlocking the chart data automatically, select [5. REMOVE USB DEVICE]. The message "USB DEVICE CAN BE SAFELY REMOVED." appears. Click the left button then remove the USB device.
13. Select [CLOSE]. The confirmation message appears.
14. Select [RUN]. The system restarts.

### 3.6.2 How to update charts

**Note 1:** Save the chart data to a USB flash memory first. You do not need to create a folder.

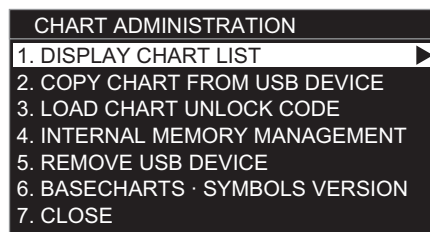
**Note 2:** Before updating charts, delete the old chart data. If needed, take backups for an unlock code.

1. Connect the USB flash memory with chart data on it in the USB drive from the RP board.
2. Press the **MENU** key to open the main menu.
3. Select [INITIAL SETTINGS].
4. Select [UPDATE CHART]. The following message appears.



5. Select [RUN]. The message "PROCESSING. PLEASE WAIT." appears, then the [CHART ADMINISTRATION] menu appears.

After restarting, the unlock code is saved in the USM flash memory. The file name is 20 characters of this system ID, file extension: uc.



6. Select [DISPLAY CHART LIST] to display the chart list.
7. Select the chart data to delete then press the **F1** key.
8. Select [RUN]. The message "CHART DELETION COMPLETE" appears.
9. Click the left button.
10. Follow steps 6 to 14 in paragraph 3.6.1.

## 4. INPUT/OUTPUT DATA

### NOTICE

IMO-type radar(s) must be interconnected to the following type approved sensors.

For other radar types, it is recommended to connect the following type approved sensors:

- EPFS meeting the requirements of the IMO resolution MSC.112(73).
- Gyrocompass (or equivalent devices) meeting the requirements of the IMO resolution A.424(XI).
- SDME meeting the requirements of IMO resolution MSC.96(72).

The radar may be interconnected via HUB-3000 to other FURUNO processing units having approved LAN ports.

### 4.1 Processor Unit

Input and output data are shown in the table below.

**Note:** This radar accepts position data fixed by WGS-84 geodetic datum only. Set the datum to WGS-84 on the EPFS (GPS, etc.) connected to this radar. If other type of datum is input, the error message "DATUM" appears and the AIS feature is inoperative.

#### Input

| Data                  | Specification               | Contents                                                                                                 | Remarks                                                   |
|-----------------------|-----------------------------|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| Heading signal        | AD-10 format                | External AD-100                                                                                          | AD-10 and IEC 61162 are switched by menu setting.         |
|                       | IEC 61162-2*, IEC 61162-450 |                                                                                                          |                                                           |
| Speed signal          | IEC 61162-1, IEC 61162-450  |                                                                                                          |                                                           |
| Navaid data           | IEC 61162-1                 | Position, course, speed, waypoint, route, time, wind data, current data, depth, temperature, roll, pitch | For IMO-type, IEC-61162-1 Edition 5 is required.          |
|                       | IEC 61162-450               |                                                                                                          |                                                           |
| Alarm handling signal | Contact closure             |                                                                                                          | Input from bridge alert management system (BAMS)          |
|                       | IEC 61162-1, IEC 61924-2    | ACK, ACM, HBT                                                                                            | Input from BAMS ACK and ACM are switched by menu setting. |
| AIS signal            | IEC 61162-2, IEC 61162-450  |                                                                                                          |                                                           |
| Consort signal**      | NMEA0183                    |                                                                                                          |                                                           |
| GPS buoy signal**     | NMEA0183                    |                                                                                                          |                                                           |

\*: Data input cycle must be more than 40 Hz (high speed craft) or 20 Hz (conventional ships).

\*\* : For C-type radars only

#### 4. INPUT/OUTPUT DATA

##### **Output**

| Data                        | Specification                           | Contents                                    | Remarks                                               |
|-----------------------------|-----------------------------------------|---------------------------------------------|-------------------------------------------------------|
| Radar system data           | IEC 61162-1, RS-232C, IEC 61162-450     | RSD, OSD, TLL                               | For ECDIS, PC plotter                                 |
| TT data**                   | IEC 61162-1, IEC 61162-450              | TTD, TTM, TLB                               | For ECDIS                                             |
| Alert handling signal       | IEC 61162-1, IEC 61924-2, IEC 61162-450 | ALR, ALF, ALC, ARC, HBT, EVE                | For BAMS<br>ALR and ALF are switched by menu setting. |
| Sub monitor signal          | HD, BP Trigger, Video                   |                                             | 1 port for radar<br>2 ports for ECDIS                 |
| External LCD monitor signal | DVI                                     | Same as main display unit                   | 2 systems in total                                    |
| VDR                         | R, G, B, H, V, IEC 61162-450            | Same as main display unit                   | 1 port                                                |
| Alert signal                | Contact closure                         | Output to alarm system by using photo-relay | 4 systems, Output contents are selected by menu.      |

\*\* : These sentences are output in order of targets close to the own ship. The output sentence and mode can be set at the [TT PRESET] menu (See section 3.5.5). The baudrate can be set at the [BAUD RATE] menu (See section 3.5.6).

##### **IEC 61162 input sentence and priority**

| Contents                                 | Sentence and priority                 |
|------------------------------------------|---------------------------------------|
| Heading (True)*1                         | THS>HDT*1*2>VHW*4>HDG*5               |
| Heading (Magnetic)*5                     | HDG*5>HDM*5>VHW*4                     |
| Magnetic deviation*5                     | HDG*5>RMC                             |
| AIS target message, alert                | VDM, VDO, VSD, ABK, ALR               |
| Date, Time                               | ZDA                                   |
| Position*3                               | GNS>GGA>RMC>GLL<br>or GLL>GNS>GGA>RMC |
| Datum                                    | DTM                                   |
| Course over the ground                   | VTG>RMC                               |
| Speed over the ground (SOG)(GPS)         | VTG>RMC                               |
| Speed over the ground (LOG (BT))         | VBW                                   |
| Speed through the water (STW)            | VBW>VHW                               |
| Alert handling                           | ACK, ACN, HBT                         |
| Waypoint                                 | RMB>BWR>BWC                           |
| Route                                    | WPL, RTE                              |
| Wind Speed and angle (Theoretical, True) | MWV>VWT*2                             |
| Wind Speed and angle (relative)          | MWV>VWR*2                             |
| Depth                                    | DPT >DBT>DBS*2>DBK*2                  |
| Water Temperature                        | MTW                                   |
| Current                                  | VDR, CUR                              |
| Rate of turn                             | ROT                                   |
| Monitor Setting                          | DDC, RAQ                              |

\*1: THS and HDT are IEC 61162-2. All other sentences are IEC 61162-1 ed5.

\*2: For retrofit.

\*3: To priority of GLL data, see "[PRIORITIZE GLL]" on page 3-21.

\*4: This is **NOT** available for IMO-type radars installed with software version "01.\*\*".

\*5: For C-type radars.

### IEC 61162 output sentence

| Contents                  | Sentence and priority   |
|---------------------------|-------------------------|
| Target L/L                | TLL * <sup>6</sup>      |
| Radar system data         | RSD                     |
| Own ship data             | OSD                     |
| TT target data            | TTD, TLB, TTM           |
| Alert handling            | ALR, ALF, ALC, ARC, HBT |
| Activity information      | EVE                     |
| AIS target message, alert | ABM, BBM, ACK, VSD      |
| Monitor Setting           | DDC                     |

\*<sup>6</sup>: This is **NOT** available for IMO/A/R-type radars installed with software version "01.\*\*".

## 4.2 Sub Monitor

The specifications and timing of sub monitor signals are shown below.

| Signal Name  | Specification                                                                                                                                                                                                                                                                                                                                              | Signal and timing |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| OP_HD_OUT    | <ul style="list-style-type: none"> <li>Voltage (V): 0 to 12 V</li> <li>Impedance: 110 <math>\Omega</math></li> <li>Pulse width (PW): 150 to 500 <math>\mu</math>s</li> <li>Pulse interval (PI): <ul style="list-style-type: none"> <li>2.5 s (24 rpm)</li> <li>1.4 s (42 rpm)</li> <li>1/4 (ECDIS overlay)</li> </ul> </li> <li>Logic: Negative</li> </ul> |                   |
| OP_BP_OUT    | <ul style="list-style-type: none"> <li>Voltage (V): 0 to 12 V</li> <li>Impedance: 110 <math>\Omega</math></li> <li>Interval (t): <ul style="list-style-type: none"> <li>6.9 ms (24 rpm)</li> <li>4.0 ms (42 rpm)</li> </ul> </li> </ul>                                                                                                                    |                   |
| OP_TRIG_OUT  | <ul style="list-style-type: none"> <li>Voltage (V): 0 to 12 V</li> <li>Impedance: 110 <math>\Omega</math></li> <li>Pulse width (PW): <ul style="list-style-type: none"> <li>5 to 15 <math>\mu</math>s (magnetron radar)</li> <li>8 <math>\mu</math>s (solid state radar)</li> <li>5 <math>\mu</math>s (ECDIS overlay)</li> </ul> </li> </ul>               |                   |
| OP_VIDEO_OUT | <ul style="list-style-type: none"> <li>Video: 4 Vp-p/100 dB</li> <li>Impedance: 75 <math>\Omega</math></li> </ul>                                                                                                                                                                                                                                          |                   |

#### 4. INPUT/OUTPUT DATA

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# APPENDIX 1 JIS CABLE GUIDE

Cables listed in the manual are usually shown as Japanese Industrial Standard (JIS). Use the following guide to locate an equivalent cable locally.

JIS cable names may have up to 6 alphabetical characters, followed by a dash and a numerical value (example: DPYC-2.5).

For core types D and T, the numerical designation indicates the *cross-sectional Area (mm<sup>2</sup>)* of the core wire(s) in the cable.

For core types M and TT, the numerical designation indicates the *number of core wires* in the cable.

## 1. Core Type

D: Double core power line

T: Triple core power line

M: Multi core

TT: Twisted pair communications  
(1Q=quad cable)

## 2. Insulation Type

P: Ethylene Propylene Rubber

## 3. Sheath Type

Y: PVC (Vinyl)

## 4. Armor Type

C: Steel

## 5. Sheath Type

Y: Anticorrosive vinyl sheath

## 6. Shielding Type

SLA: All cores in one shield, plastic tape w/aluminum tape

-SLA: Individually shielded cores, plastic tape w/aluminum tape



DPYC



TPYC



MPYC-4



TTYCSLA-4

EX: <sup>1 2 3 4 5 6</sup> TTYCSLA - 4  
Designation type      # of twisted pairs

<sup>1 2 3 4</sup> MPYC - 4  
Designation type      # of cores

The following reference table lists gives the measurements of JIS cables commonly used with Furuno products:

| Type      | Area                | Core Diameter | Cable Diameter | Type       | Area                | Core Diameter | Cable Diameter |
|-----------|---------------------|---------------|----------------|------------|---------------------|---------------|----------------|
| DPYC-1.5  | 1.5mm <sup>2</sup>  | 1.56mm        | 11.7mm         | TTYCSLA-1  | 0.75mm <sup>2</sup> | 1.11mm        | 9.4mm          |
| DPYC-2.5  | 2.5mm <sup>2</sup>  | 2.01mm        | 12.8mm         | TTYCSLA-1T | 0.75mm <sup>2</sup> | 1.11mm        | 10.1mm         |
| DPYC-4    | 4.0mm <sup>2</sup>  | 2.55mm        | 13.9mm         | TTYCSLA-1Q | 0.75mm <sup>2</sup> | 1.11mm        | 10.8mm         |
| DPYC-6    | 6.0mm <sup>2</sup>  | 3.12mm        | 15.2mm         | TTYCSLA-4  | 0.75mm <sup>2</sup> | 1.11mm        | 15.7mm         |
| DPYC-10   | 10.0mm <sup>2</sup> | 4.05mm        | 17.1mm         | TTYCY-1    | 0.75mm <sup>2</sup> | 1.11mm        | 11.0mm         |
| DPYCY-1.5 | 1.5mm <sup>2</sup>  | 1.56mm        | 13.7mm         | TTYCY-1T   | 0.75mm <sup>2</sup> | 1.11mm        | 11.7mm         |
| DPYCY-2.5 | 2.5mm <sup>2</sup>  | 2.01mm        | 14.8mm         | TTYCY-1Q   | 0.75mm <sup>2</sup> | 1.11mm        | 12.6mm         |
| DPYCY-4   | 4.0mm <sup>2</sup>  | 2.55mm        | 15.9mm         | TTYCY-4    | 0.75mm <sup>2</sup> | 1.11mm        | 17.7mm         |
| MPYC-2    | 1.0mm <sup>2</sup>  | 1.29mm        | 10.0mm         | TTYCY-4SLA | 0.75mm <sup>2</sup> | 1.11mm        | 19.5mm         |
| MPYC-4    | 1.0mm <sup>2</sup>  | 1.29mm        | 11.2mm         | TTYCYSLA-1 | 0.75mm <sup>2</sup> | 1.11mm        | 11.2mm         |
| MPYC-7    | 1.0mm <sup>2</sup>  | 1.29mm        | 13.2mm         | TTYCYSLA-4 | 0.75mm <sup>2</sup> | 1.11mm        | 17.9mm         |
| MPYC-12   | 1.0mm <sup>2</sup>  | 1.29mm        | 16.8mm         |            |                     |               |                |
| TPYC-1.5  | 1.5mm <sup>2</sup>  | 1.56mm        | 12.5mm         |            |                     |               |                |
| TPYC-2.5  | 2.5mm <sup>2</sup>  | 2.01mm        | 13.5mm         |            |                     |               |                |
| TPYC-4    | 4.0mm <sup>2</sup>  | 2.55mm        | 14.7mm         |            |                     |               |                |
| TPYCY-1.5 | 1.5mm <sup>2</sup>  | 1.56mm        | 14.5mm         |            |                     |               |                |
| TPYCY-2.5 | 2.5mm <sup>2</sup>  | 2.01mm        | 15.5mm         |            |                     |               |                |
| TPYCY-4   | 4.0mm <sup>2</sup>  | 2.55mm        | 16.9mm         |            |                     |               |                |

# APPENDIX 2 DIGITAL INTERFACE

## Digital Interface

### • Input sentence

ABK, ACK, ACN, ALR, BWC, BWR, CUR, DBK\*<sup>1</sup>, DBS\*<sup>1</sup>, DBT, DDC, DPT, DTM, GGA, GLL, GNS, HBT, HDG\*<sup>2</sup>, HDM\*<sup>2</sup>, HDT\*<sup>1</sup>, MTW, MWV, OSD, RAQ, RMB, RMC, ROT, RTE, THS, TLL\*<sup>3</sup>, TTM\*<sup>2</sup>, VBW, VDM, VDO, VDR, VHW, VSD, VTG, VWR\*<sup>1</sup>, VWT\*<sup>1</sup>, WPL, ZDA

### • Output sentences

ABM, ACK, AIQ, ALC, ALF, ALR, ARC, BBM, DDC, EVE, HBT, OSD, RSD, TLB, TLL\*<sup>3</sup>, TTD, TTM, VSD

\*<sup>1</sup>: For retrofit.

\*<sup>2</sup>: For C-type radars.

\*<sup>3</sup>: NOT for IMO/A-type radars installed with software version "01.\*\*".

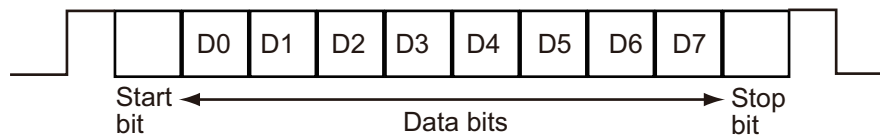
## Data reception

Data is received in serial asynchronous form in accordance with the standard referenced in IEC 61162-2 or IEC 61162-1 Ed.5.

The following parameters are used:

Baud rate: 38,400 bps (HDT, THS, !AIVDM, !AIVDO, !AIABK, \$AIALR). The baud rate of all other sentences is 4800 bps

Data bits: 8 (D7 = 0), Parity: none, Stop bits: 1



## Data Sentences

### Input sentences

ABK - AIS addressed and binary broadcast acknowledgement

\$\*\*ABK,xxxxxxxx,x,x,x,x,x,\*hh<CR><LF>  
1 2 3 4 5

1. MMSI of the addressed AIS unit (No use)
2. AIS channel of reception (No use)
3. Message ID (No use)
4. Message sequence number (No use)
5. Type of acknowledgement (See below.)

0 = Message (6 or 12) successfully received by the addressed AIS unit

1 = Message (6 or 12) was broadcast, but no acknowledgement by the addressed AIS unit

2 = Message could not be broadcast (i.e. quantity of encapsulated data exceeds five slots)

3 = Requested broadcast of message (8, 14, or 15) has been successfully completed.

4 = Late reception of a message 7 or 13 acknowledgement that was addressed to this AIS unit (own-ship) and referenced a valid transaction.

5 = Message has been read and acknowledged on a display unit.

**ACK - Acknowledge alarm**

\$\*\*ACK,xxx,\*hh<CR><LF>  
                   1

1. Unique alarm number (identifier) at alarm source (000 to 999)

**ACN - Alert command**

\$\*\*ACN,hhmmss.ss,aaa,x.x,x.x,c,a\*hh<CR><LF>  
                   1          2  3  4  5 6

1. Time (No use)
2. Manufacturer mnemonic code (3 digit alphanumeric code, null)
3. Alert identifier (0 to 999999)
4. Alert instance (1 to 999999, null)
5. Alert command (A=Acknowledge, Q=Request /Repeat information, O=Responsibility transfer, S=Silence)
6. Sentence status flag (C)

**ALR - Set alarm state**

\$\*\*ALR,hhmmss.ss,xxx,A,A,c—c,\*hh<CR><LF>  
                   1          2 3 4  5

1. Time of alarm condition change, UTC (No use)
2. Unique alarm number (identifier) at alarm source (000 to 999, null)
3. Alarm condition (A=threshold exceeded, V=not exceeded)
4. Alarm acknowledge state (A=acknowledged, V=not acknowledged)
5. Alarm description text (alphanumeric)

**BWC - Bearing and distance to waypoint – Great circle**

\$\*\*BWC,hhmmss.ss,llll.ll, a,yyyyy.yy,a,x.x,T,x.x,M,x.x,N,c--c,a\*hh<CR><LF>  
                   1          2 3      4  5  6 7 8  9 10 11 12 13

1. UTC of observation (No use)
2. Waypoint latitude (0000.0000 to 9000.0000)
3. N/S
4. Waypoint longitude (00000.0000 to 18000.0000)
5. E/W
6. Bearing, degrees true (No use)
7. Unit, True (No use)
8. Bearing, degrees magnetic (No use)
9. Unit, Magnetic (No use)
10. Distance, nautical miles (No use)
11. Unit, N (No use)
12. Waypoint ID (Max. 15 characters)
13. Mode Indicator (A=Autonomous, D=Differential, null\*)  
     \*: For IMO-type or R-type radar, null is invalid.

## APPENDIX 2 DIGITAL INTERFACE

### BWR - Bearing and distance to waypoint – Rhumb line

\$\*\*BWR,hhmmss.ss,lll.ll,a,yyyy.yy,a.x.x,T,x.x,M,x.x,N,c--c,a,\*hh<CR><LF>  
1 2 3 4 5 6 7 8 9 10 11 12 13

1. UTC of observation (No use)
2. Waypoint latitude (0000.0000 to 9000.0000)
3. N/S
4. Waypoint longitude (00000.0000 to 18000.0000)
5. E/W
6. Bearing, degrees true (No use)
7. Unit, True (No use)
8. Bearing, degrees magnetic (No use)
9. Unit, Magnetic (No use)
10. Distance, nautical miles (No use)
11. Unit, N (No use)
12. Waypoint ID (Max. 15 characters)
13. Mode Indicator (A=Autonomous, D=Differential, null\*)

\*: For IMO-type or R-type radar, null is invalid.

### CUR - Water current layer – Multi-layer water current data

\$\*\*CUR,A,x.x,x.x,x.x,x.x,a,x.x,x.x,x.x,a,a,\*hh<CR><LF>  
1 2 3 4 5 6 7 8 9 10 11

1. Validity of data (A=Valid)
2. Data set number (No use)
3. Layer number (1 to 5)
4. Current depth in meters (No use)
5. Current direction in degrees (0.0 to 359.9)
6. Direction reference in use (true or relative)
7. Current speed in knots (0.0 to 99.9)
8. Reference layer depth in meters (No use)
9. Heading (No use)
10. Heading reference in use (No use)
11. Speed reference (No use)

### DBK - Depth below keel

\$\*\*DBK,x.x,f,x.x,M,x.x,F,\*hh<CR><LF>  
1 2 3 4 5 6

1. Water depth (0.00 to 99999.99)
2. feet
3. Water depth (0.00 to 99999.99)
4. Meters
5. Water depth (0.00 to 99999.99)
6. Fathom

### DBS - Depth below surface

\$\*\*DBS,x.x,f,x.x,M,x.x,F,\*hh<CR><LF>  
1 2 3 4 5 6

1. Water depth (0.00 to 99999.99)
2. feet
3. Water depth (0.00 to 99999.99)
4. Meters
5. Water depth (0.00 to 99999.99)
6. Fathom

**DBT - Depth below transducer**

\$\*\*DBT,x,x,f,x,x,M,x,x,F,\*hh<CR><LF>  
 1 2 3 4 5 6

1. Water depth (0.00 to 99999.99)
2. feet
3. Water depth (0.00 to 99999.99)
4. Meters
5. Water depth (0.00 to 99999.99)
6. Fathoms

**DDC - Display dimming control**

\$\*\*DDC,a,xx,a,a\*hh<CR><LF>  
 1 2 3 4

1. Display dimming preset (D=Daytime, K=Dusk, N=Nighttime, null)
2. Brightness percentage (00 to 99, null)
3. Color palette (No use)
4. Sentences status flag (C)

**DPT - Depth**

\$\*\*DPT,x,x,x,x,x,\*hh<CR><LF>  
 1 2 3

1. Water depth relative to the transducer, meters (0.00 to 99999.99)
2. Offset from transducer, meters (-99.99 to 99.99)
3. Minimum range scale in use (No use)

**DTM - Datum reference**

\$\*\*DTM,ccc,a,x,x,a,x,x,a,x,x,ccc,\*hh<CR><LF>  
 1 2 3 4 5 6 7 8

1. Local datum (W84=WGS84, W72=WGS72, S85=SGS85, P90=PE90, three characters)
2. Local datum subdivision code (No use)
3. Lat offset, min (No use)
4. N/S (No use)
5. Lon offset, min (No use)
6. E/W (No use)
7. Altitude offset, meters (No use)
8. Reference datum (No use)

**GGA - Global positioning system fix data**

\$\*\*GGA,hhmmss.ss,lll.lll,a,yyyyy.yyy,a,x,xx,x,x,x,M,x,x,M,x,x,xxxx,\*hh<CR><LF>  
 1 2 3 4 5 6 7 8 9 10 11 12 13 14

1. UTC of position (No use)
2. Latitude (0000.0000 to 9000.0000)
3. N/S
4. Longitude (00000.0000 to 18000.0000)
5. E/W
6. GPS quality indicator (1 to 8)
7. Number of satellite in use (No use)
8. Horizontal dilution of precision (0.00 to 999.99)
9. Antenna altitude above/below mean sealevel (No use)
10. Unit, m (No use)
11. Geoidal separation (No use)
12. Unit, m (No use)
13. Age of differential GPS data (0 to 999, null)
14. Differential reference station ID (No use)

## APPENDIX 2 DIGITAL INTERFACE

### GLL - Geographic position, latitude/longitude

\$\*\*GLL,llll.ll,a,yyyy.yy,a,hhmmss.ss,A,a,\*hh<CR><LF>  
1 2 3 4 5 6 7

1. Latitude (0000.0000 to 9000.0000)
2. N/S
3. Longitude (00000.0000 to 18000.0000)
4. E/W
5. UTC of position (No use)
6. Status (A=data valid, V=data not valid)
7. Mode indicator (A=Autonomous, D=Differential, E=Estimated, M=Manual input, S=Simulator)

### GLL - Future position

\$\*\*GLL,llll.ll,a,yyyy.yy,a,hhmmss.ss,A,x.x,\*hh<CR><LF>  
1 2 3 4 5 6 7

1. Future Latitude (0000.0000 to 9000.0000)
2. N/S
3. Future Longitude (00000.0000 to 18000.0000)
4. E/W
5. UTC of Future position (No use)
6. Display Status (A=Display, V=Hide)
7. Future Heading (0.0 to 360.0)

### GNS - GNSS fix data

\$\*\*GNS,hhmmss.ss,llll.ll,a,yyyy.yy,a,c--c,xx,x.x,x.x,x.x,x.x,x.x,x.x,a\*hh<CR><LF>  
1 2 3 4 5 6 7 8 9 10 11 12 13

1. UTC of position (No use)
2. Latitude (0000.0000 to 9000.0000)
3. N/S
4. Longitude (00000.0000 to 18000.0000)
5. E/W
6. Mode indicator (A, D, E, F, M, N, P, R, S)  
A=Autonomous, D=Differential, E=Estimated Mode, F=Float RTK, M=Manual Input Mode, N=No fix, P=Precise, R=Real Time Kinematic, S=Simulator Mode
7. Total number of satellites in use (No use)
8. HDOP (0.00 - 999.99)
9. Antenna altitude, meters (No use)
10. Geoidal separation, meters (No use)
11. Age of differential data (0 to 999, null)
12. Differential reference station ID (No use)
13. Navigational status indicator (S=Safe, C=Caution, U=Unsafe, V=Not valid, null)

### HBT - Heartbeat supervision sentence

\$\*\*HBT,x.x,A,x\*hh<CR><LF>  
1 2 3

1. Configured repeat interval (1 to 999(s))
2. Equipment status (No use)
3. Sequential sequence identifier (0 to 9)

### HDG - Heading, Deviation and Variation

\$\*\*HDG,x.x,x.x,a,x.x,a\*hh<CR><LF>  
1 2 3 4 5

1. Magnetic sensor heading, degrees (0.0 to 359.9)
2. Magnetic deviation, degrees (0.00 to 180.00)
3. E/W
4. Magnetic variation, degrees (0.00 to 180.00)
5. E/W

**HDM - Heading, Magnetic**

\$\*\*HDM,x.x,M\*hh<CR><LF>

1 2

1. Heading, degrees (0.0 to 359.9)
2. Magnetic (M)

**HDT - Heading, true**

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

1 2

1. Heading, degrees (0.0 to 359.9)
2. True (T)

**MTW - Water temperature**

\$\*\*MTW,x.x,C<CR><LF>

1 2

1. Water temperature (-9.99 to 99.99)
2. Degrees C

**MWV - Wind speed and angle**

\$\*\*MWV,x.x,a,x.x,a\*hh<CR><LF>

1 2 3 4 5

1. Wind angle, degrees (0.0 to 359.9)
2. Reference (R/T)
3. Wind speed (0.0 to 999.9)
4. Wind speed units (K=km/h, M=m/s, N=knots, S=SM/h)
5. Status (A)

**OSD - Own ship data**

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

1 2 3 4 5 6 7 8 9

1. Heading, degrees true (No use)
2. Heading status (No use)
3. Vessel course, degrees true (0.0 to 359.9)
4. Course reference (B=Bottom tracking log, M=Manually entered, W=Water referenced, P=Positioning system ground reference)
5. Vessel speed (0.0 to 999.9)
6. Speed reference (B=Bottom tracking log, W=Water referenced, P=Positioning system ground reference)
7. Vessel set, degrees true, manually entered (No use)
8. Vessel drift (speed), manually entered (No use)
9. Speed units (K=km/h, N=knots, S=statute mile/h)

**RAQ - Query sentence**

\$\*\*RAQ,ccc\*hh<CR><LF>

1

1. Request sentence (DDC)

## APPENDIX 2 DIGITAL INTERFACE

### RMB - Recommended minimum navigation information.

```
$**RMB,A,x,x,a,CCCC,CCCC,lll.ll,a,yyyy.yy,a,x,x,x,x,x,A,a*hh <CR><LF>
  1  2  3  4      5   6  7   8   9 10 11 121314
```

1. Data status (A=Data valid)
2. Cross track error (NM) (No use)
3. Direction to steer (No use)
4. Origin waypoint ID (No use)
5. Destination waypoint ID (Max. 15 characters)
6. Destination waypoint latitude (0000.0000 to 9000.0000)
7. N/S
8. Destination waypoint longitude (00000.0000 to 18000.0000)
9. E/W
10. Range to destination, nautical miles (No use)
11. Bearing to destination, degrees true (No use)
12. Destination closing velocity, knots (No use)
13. Arrival status (No use)
14. Mode indicator (A= Autonomous, D= Differential mode, E=Estimated (dead reckoning mode), M=Manual input mode, S= Simulator)

### RMC - Recommended minimum specific GNSS data

```
$**RMC,hhmmss.ss,A,lll.ll,a,yyyy.yy,a,x,x,x,xxxxxx,x,x,a,a*hh<CR><LF>
      1   2  3  4   5   6  7  8   9   10111213
```

1. UTC of position fix (No use)
2. Status (A=data valid)
3. Latitude (0000.0000 to 9000.0000)
4. N/S
5. Longitude (00000.0000 to 18000.0000)
6. E/W
7. Speed over ground, knots (0.0 to 999.9)
8. Course over ground, degrees true (0.0 to 359.9)
9. Date (No use)
10. Magnetic variation, degrees E/W (No use)
11. E/W (No use)
12. Mode indicator (A= Autonomous mode, D= Differential mode, E=Estimated (DR), F=Float RTK, M=Manual, P=Precise, R=Real time kinematic, S= Simulator)
13. Navigational status indication (S=Safe, C=Caution, U=Unsafe, V=Navigational status not valid, null)

### ROT- Rate of turn

```
$**ROT,x.x,A*hh<CR><LF>
  1  2
```

1. Rate of turn, deg/min, "-"=bow turns to port (No use)
2. Status (No use)

### RTE - Routes

```
$**RTE,x,x,x,x,a,c--c,c--c, . . ,c--c*hh <CR><LF>
  1  2  3  4   5   . .  n
```

1. Total number of sentences being transmitted (1 to 50, null)
2. Sentence number (1 to 50, null)
3. Sentence mode (c:complete route, all waypoints, w:working route, first listed waypoint is "FROM", second is "TO" and remaining are rest of route)
4. Route identifier (Max. 15 characters, null)
5. Waypoint "n" identifier (Max. 15 characters, null)
  - • Additional waypoint indentifiers

**THS - True heading and status**

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

1 2

1. Heading, degrees True (0.0 to 359.9)
2. Mode indicator (A=Autonomous, E=Estimated (dead reckoning))

**TLL - Target Latitude and Longitude**

\$\*\*TLL,x.x,IIII,II,a,yyyy.yy,a,c--c,hhmmss.ss,a\*hh<CR><LF>

1 2 3 4 5 6 7 8 9

1. Target number (No use)
2. Target latitude (0000.0000 to 9000.0000)
3. N/S
4. Target longitude (00000.0000 to 18000.0000)
5. E/W
6. Target name (No use)
7. UTC of data (No use)
8. Target status (No use)
9. Reference target (No use)

**TTM - Tracked Target Message**

\$\*\*TTM,xx,x.x,x.x,a,x.x,x.x,a,x.x,x.x,a,c--c,a,a,hhmmss.ss,a\*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

1. Target number (00 to 99)
2. Target distance from own ship (0.000 to 99.999)
3. Bearing from own ship, degrees true/relative (0.0 to 359.9)
4. True or Relative (T, R)
5. Target speed (0.00 to 102.00, null)
6. Target course, degrees true/relative (0.0 to 359.9, null)
7. T=True or R=Relative
8. Distance of closest point of approach (0.00 to 99.99)
9. Time to CPA, min., "-" increasing (-99.99 to 99.99, null)
10. Speed/distance units (K=km, km/h, N=NM, kn, S= SM, mph)
11. Target name (other than null)
12. Target status (L=Lost, tracked target has been lost , Q=Query, target in the process of acquisition, T=Tracking)
13. Reference target (No use)
14. UTC of data (numeric in six digits, null)
15. Type of acquisition (other than null)

**VBW - Dual ground/water speed**

\$\*\*VBW,x.x,x.x,a,x.x,x.x,a,x.x,a,x.x,a\*hh<CR><LF>

1 2 3 4 5 6 7 8 9 10

1. Longitudinal water speed, knots (-999.9 to 999.9)
2. Transverse water speed, knots (-999.9 to 999.9, null)
3. Status: water speed (A=data valid)
4. Longitudinal ground speed, knots (-999.9 to 999.9)
5. Transverse ground speed, knots (-999.9 to 999.9, null is invalid for IMO/R-Type radars)
6. Status: ground speed (A=data valid)
7. Stern transverse water speed, knots (No use)
8. Status: stern water speed (No use)
9. Stern transverse ground speed, knots (No use)
10. Status: stern ground speed (No use)

## APPENDIX 2 DIGITAL INTERFACE

### VDM - AIS VHF data-link message

!\*\*VDM,x,x,x,a,s--s,x,\*hh<CR><LF>  
1 2 3 4 5 6

1. Total number of sentences needed to transfer the message (1 to 9)
2. Sentence number (1 to 9)
3. Sequential message identifier (0 to 9, null)
4. AIS channel Number (A, B, null)
5. Encapsulated ITU-R M.1371 radio message (1 to 63 bytes)
6. Number of fill-bits (0 to 5)

### VDO - AIS VHF data-link own-vessel report

!\*\*VDO,x,x,x,a,s--s,x,\*hh<CR><LF>  
1 2 3 4 5 6

1. Total number of sentences needed to transfer the message (1 to 9)
2. Sentence number (1 to 9)
3. Sequential message identifier (0 to 9, null)
4. AIS channel Number (A, B, C, D, null)
5. Encapsulated ITU-R M.1371 radio message (1 to 63 bytes)
6. Number of fill-bits (0 to 5)

### VDR - Set and drift

\$\*\*VDR,x.x,T,x.x,M,x.x,N,\*hh <CR><LF>  
1 2 3 4 5 6

1. Direction, degrees (0.0 to 359.9, null)
2. T=True (fixed)
3. Direction, degrees (No use)
4. M=Magnetic (No use)
5. Current speed (0.0 to 99.9)
6. N=Knots (fixed)

### VHW - Water speed and heading

\$\*\*VHW,x.x,T,x.x,M,x.x,N,x.x,K,\*hh <CR><LF>  
1 2 3 4 5 6 7 8

1. Heading, degrees (0.0 to 359.9)
2. T=True (fixed, No use)
3. Heading, degrees (No use)
4. M=Magnetic (fixed, No use)
5. Speed, knots (-999.9 to 999.9)
6. N=Knots (fixed)
7. Speed, km/hr (-999.9 to 999.9)
8. K=km/hr (fixed)

### VSD - AIS voyage static data

\$\*\*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 (No use)
2. Maximum present static draught (No use)
3. Persons on-board (0 to 8191)
4. Destination (No use)
5. Estimated UTC of arrival at destination (No use)
6. Estimated day of arrival at destination (No use)
7. Estimated month of arrival at destination (No use)
8. Navigational status (No use)
9. Regional application flags (No use)

**VTG - Course over ground and ground speed**

\$\*\*VTG,x.x,T,x.x,M,x.x,N,x.x,K,a,\*hh <CR><LF>  
 1 2 3 4 5 6 7 8 9

1. Course over ground, degrees (0.0 to 359.9)
2. T=True (fixed)
3. Course over ground, degrees (No use)
4. M=Magnetic (No Use)
5. Speed over ground, knots (0.0 to 999.9)
6. N=Knots (fixed)
7. Speed over ground (0.0 to 999.9)
8. K=km/h (fixed)
9. Mode indicator (A=Autonomous, D=Differential, E=Estimated (dead reckoning), M=Manual input, P=Precision, S=Simulator )

**VWR - Wind relative Bearing and Velocity**

\$\*\*VWR,x.x,a,x.x,N,x.x,M,x.x,K<CR><LF>  
 1 2 3 4 5 6 7 8

1. Measured wind angle relative to the vessel, degrees (0.0 to 180.0)
2. L=Left semicircle, R=Right semicircle
3. Velocity, knots (0.0 to 999.9)
4. Unit (N, fixed)
5. Velocity (0.0 to 999.9)
6. Unit (M, fixed)
7. Velocity, km/h (0.0 to 999.9)
8. Unit (K, fixed)

**VWT - True wind speed and angle**

\$\*\*VWT,xxx,a,xx.x,N,xx.x,M,xxx.x,K<CR><LF>  
 1 2 3 4 5 6 7 8

1. Calculated wind angle, degrees (0.0 to 180.0)
2. L=Left semicircle, R=Right semicircle
3. Calculated with speed, knots (0.0 to 999.9)
4. Unit (N, fixed)
5. Wind speed (0.0 to 999.9)
6. Unit (M, fixed)
7. Wind speed, km/h (0.0 to 999.9)
8. Unit (K, fixed)

**WPL - Waypoint location**

\$\*\*WPL,lll.ll,a,yyyy.yy,a,c--c\*hh<CR><LF>  
 1 2 3 4 5

1. Waypoint latitude (0000.0000 to 9000.0000)
2. N/S
3. Waypoint longitude (00000.0000 to 18000.0000)
4. E/W
5. Waypoint identifier (Max. 15 characters)

**ZDA - Time and date**

\$\*\*ZDA,hhmmss.ss,xx,xx,xxxx,xx,xx,\*hh<CR><LF>  
 1 2 3 4 5 6

1. UTC (000000.00 to 235959.99, 235960.00 to 235960.99, 240000.00 to 240000.99, 240001.00 to 240001.99)
2. Day (01 to 31)
3. Month (01 to 12)
4. Year (UTC) (0000 to 9999)
5. Local zone, hours (No use)
6. Local zone, minutes (No use)

## Output sentences

### ABM - AIS addressed binary and safety related message

! \*\*ABM,x,x,x,xxxxxxxx,x,xx,s--s,x,\*hh<CR><LF>  
 1 2 3 4 5 6 7 8

1. Total number of sentences needed to transfer the message (1 to 9)
2. Message sentence number (1 to 9)
3. Message sequence identifier (0 to 3)
4. The MMSI of destination AIS unit for the ITU-R M.1371 message (9 digits, null)
5. AIS channel for broadcast of the radio message (0 to 3, null)
6. VDL message number (6 or 12, null), see ITU-R M.1371
7. Encapsulated data (1 to 63 bytes)
8. Number of fill-bits (0 to 5)

### ACK - Acknowledge alarm

\$ \*\*ACK,xxx,\*hh<CR><LF>  
 1

1. Unique alarm number (identifier) at alarm source (000 to 999)

### AIQ - Query sentence

\$ \*\*AIQ,ccc,\*hh<CR><LF>  
 1

1. Requested sentence (VSD)

### ALC - Cyclic alert list

\$ \*\*ALC,xx,xx,xx,xx,aaa,x.x,x.x,x.x, " ",\*hh<CR><LF>  
 1 2 3 4 5 6 7 8 9

1. Total number of sentences this message (01 to 16)
2. Sentence number (01 to 16)
3. Sequential message identifier (00 to 99)
4. Number of alert entries (0 to 3)
5. Manufacturer mnemonic code (FEC, null) \_\_\_\_\_
6. Alert identifier (0 to 999999) \_\_\_\_\_
7. Alert instance (1 to 999999, null) \_\_\_\_\_
8. Revision counter (1 to 99) \_\_\_\_\_
9. Additional alert entries (see Note)

Alert entry 1  
 See Note

Note: Alert entry 0 - n: Each alert entry consists of

- Manufacturer Identifier (see ALF Manufacturer)
- Alert Identifier (see ALF Alert identifier)
- Alert instance (see ALF instance)
- Revision counter (see ALF revision counter)

Each entry identifies a certain alert with a certain state.

It is not allowed that an alert entry is split between two ALC sentences.

**ALF - Alert sentence**

\$\*\*ALF,x,x,x,hmmss.ss,a,a,a,aaa,x,x,x,x,x,c--c,\*hh<CR><LF>  
           1 2 3      4      5 6 7 8 9 10 11 12 13

1. Total number of ALF sentences this message (1, 2)
2. Sentence number (1, 2)
3. Sequential message identifier (0 to 9)
4. Time of last change (000000.00 to 235959.99, 235960.00 to 235960.99, 240000.00 to 240000.99, 240001.00 to 240001.99, null)
5. Alert category (A=Alert category A, B=Alert category B, null)
6. Alert priority (A=Alarm, W=Warning, C=Caution, null)
7. Alert state (A=active-acknowledged or active, S=active-silenced, O=active-responsibility transferred, U=rectified-unacknowledged, V=active-unacknowledged, N=normal, null)
8. Manufacturer mnemonic code (FEC, null)
9. Alert identifier (0 to 999999)
10. Alert instance (1 to 999999, null)
11. Revision counter (1 to 99)
12. Escalation counter (0 to 9)
13. Alert text (max. 16 characters)

**ALR - Set alarm state**

\$\*\*ALR,hmmss.ss,xxx,A,A,c—c,\*hh<CR><LF>  
                   1      2 3 4 5

1. Time of alarm condition change, UTC (000000.00 to 235959.99, 235960.00 to 235960.99, 240000.00 to 240000.99, 240001.00 to 240001.99, null)
2. Unique alarm number (identifier) at alarm source (000 to 999, null)
3. Alarm condition (A=threshold exceeded, V=not exceeded)
4. Alarm acknowledge state (A=acknowledged, V=not acknowledged)
5. Alarm description text (alphanumeric)

**ARC - Alert command refused**

\$\*\*ARC,hmmss.ss,aaa,x,x,x,x,c\*hh<CR><LF>  
                   1      2 3 4 5

1. Release time of the alert command refused (000000.00 to 235959.99, 235960.00 to 235960.99, 240000.00 to 240000.99, 240001.00 to 240001.99, null)
2. Used for proprietary alerts, defined by the manufacturer (FEC, null)
3. The alert identifier (0 to 999999)
4. The alert instance (1 to 999999, null)
5. Refused alert command (A=acknowledge, O=responsibility transfer)

**BBM - AIS broadcast binary message**

\$\*\*BBM,x,x,x,x,xx,s--s,x,\*hh<CR><LF>  
           12 3 4 5 6 7

1. Total number of sentences needed to transfer the message (1 to 9)
2. Sentence number (1 to 9)
3. Sequential message identifier (0 to 9)
4. AIS channel for broadcast of the radio message (0 to 3, null)
5. VDL message number, see ITU-R M.1371 (8 or 14, null)
6. Encapsulated data (1 to 63 bytes)
7. Number of fill-bits (0 to 5)

**DDC - Display dimming control**

\$\*\*DDC,a,xx,a,a\*hh<CR><LF>  
           1 2 3 4

1. Display dimming preset (D=Daytime, K=Dusk, N=Nighttime)
2. Brightness percentage (00 to 99)
3. Color palette preset (null)
4. Sentences status flag (R)

## APPENDIX 2 DIGITAL INTERFACE

### EVE - General event message

\$\*\*EVE,hhmmss.ss,c--c,c--c\*hh<CR><LF>  
1 2 3

1. Event time (000000.00 to 235959.99, 235960.00 to 235960.99, 240000.00 to 240000.99, 240001.00 to 240001.99, null)
2. Tag code used for identification of source of event (six alphanumeric characters, two English characters, four digits)
3. Event description (OPERATION)

### HBT - Heartbeat supervision sentence

\$\*\*HBT,x.x,A,x\*hh<CR><LF>  
1 2 3

1. Configured repeat interval (60.0(s))
2. Equipment status (A=Normal)
3. Sequential sequence identifier (0 to 9)

### OSD- Own ship data

\$\*\*OSD,x.x,A,x.x,a,x.x,a,x.x,x.x,a\*hh<CR><LF>  
1 2 3 4 5 6 7 8 9

1. Heading, degrees true (0.0 to 359.9, null)
2. Heading status (A:data valid, V:data invalid)
3. Vessel course, degrees true (0.0 to 359.9, null)
4. Course reference (B=Bottom tracking log, M=Manually entered, W=Water referenced, R=Radar tracking (of fixed target), P=Positioning system ground reference, null)
5. Vessel speed (0.0 to 99.9, null)
6. Speed reference (B=Bottom tracking log, M=Manually entered, W=Water referenced, R=Radar tracking (of fixed target), P=Positioning system ground reference, null)
7. Vessel set, degrees true, manually entered (0.0 to 359.9, null)
8. Vessel drift (speed), manually entered (0.0 to 19.9, null)
9. Speed units (K=km/h, N=knots, S=statute mile/h, null)

### RSD - Radar system data

\$\*\*RSD,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,a\*hh <CR><LF>  
1 2 3 4 5 6 7 8 9 10 11 12 13

1. Origin 1 range, from own ship (0.000 to 9.999, 10.00 to 99.99, 100.0 to 999.9, 1000 to 9999, null) (see note)
2. Origin 1 bearing, degrees from 0 (0.0 to 359.9, null) (see note)
3. Variable range marker 1 (VRM1), range (0.000 to 9.999, 10.00 to 99.99, 100.0 to 999.9, null)
4. Bearing line 1 (EBL1), degrees from 0 (0.0 to 359.9, null)
5. Origin 2 range (0.000 to 9.999, 10.00 to 99.99, 100.0 to 999.9, 1000 to 9999, null) (see note)
6. Origin 2 bearing (0.0 to 359.9, null) (see note)
7. VRM2,.9 range (0.000 to 9.999, 10.00 to 99.99, 100.0 to 999.9, null)
8. EBL2, degrees (0.0 to 359.9, null)
9. Cursor range, from own ship (0.000 to 9.999, 10.00 to 99.99, 100.0 to 999.9, null)
10. Cursor bearing, degrees clockwise from 0 (0.0 to 359.9, null)
11. Range scale in use (0.125 to 120.0)
12. Range units (K=km, N=NM, S=statute miles, null)
13. Display rotation (C, H, N, null)  
C=Course-up, course-over-ground up, degrees true  
H=Head-up, ship's heading(center-line) 0 up  
N=North-up, true north is 0 up

NOTE: Origin 1 and origin 2 are located at the stated range and bearing from own ship and provide for two independent sets of variable range markers (VRM) and electronic bearing lines (EBL) originating away from own ship position.

**TLB - Target label**

\$\*\*TLB,x,x,c--c,x,x,c--c,...,x,x,c--c\*hh<CR><LF>  
           1  2      3                  3

1. Target number "n" reported by the device (1 to 1023)
2. Label assigned to target "n" (TT=000 to 999, AIS= 000000001 to 999999999)
3. Additional label pairs

**TLL - Target latitude and longitude**

\$\*\*TLL,xx,lll.ll,a,yyyy.yy,a,c--c,hhmmss.ss,a\*hh<CR><LF>  
           1  2  3  4      5  6          7      8  9

1. Target number (null)
2. Target Latitude (0000.0000 to 9000.0000)
3. Target N/S (N/S)
4. Target Longitude (00000.0000 to 18000.0000)
5. Target E/W (E/W)
6. Target name (null)
7. UTC of data (000000.00 to 235959.99, 235960.00 to 235960.99, 240000.00 to 240000.99, 240001.00 to 240001.99, null)
8. Target status (null)
9. Reference target (null)

**TTD - Tracked target data**

!\*\*TTD,hh,hh,x,s--s,x\*hh<CR><LF>  
           1  2  3  4  5

1. Total hex number of sentences need to transfer the message (h'01)
2. Hex sentence number (h'01)
3. Sequential message identifier (null)
4. Encapsulated trancked target data (6 bit binary-converted data)
5. Number of fill bits (0 to 5)

**TTM - Tracked target message**

\$\*\*TTM,xxx,x,x,x,x,a,x,x,x,x,a,x,x,x,a,c--c,a,a,hhmmss.ss,a\*hh<CR><LF>  
           1  2  3  4  5  6  7  8  9  10 11 1213      14     15

1. Target number (000 to 999)
2. Target distance from own ship (0.000 to 99.999)
3. Bearing from own ship,degrees (0.0 to 359.9)
4. True or Relative (T)
5. Target speed (0.00 to 999.99, null)
6. Target course, degrees (0.0 to 359.9, null)
7. T=True or R=Relative
8. Distance of closest point of approach (0.00 to 99.99, null)
9. Time to CPA, min., "-" increasing (-99.99 to 99.99, null)
10. Speed/distance units (N=NM, kn)
11. Target name (null)
12. Target status (L: Lost, tracked target has been lost, Q: Query, target in the process of acquisition, T: Tracking)
13. Reference target (R, null)
14. UTC of data (null)
15. Type of acquisition (A=Automatic, M=Manual )

## APPENDIX 2 DIGITAL INTERFACE

### VSD - AIS voyage static data

\$\*\*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 (null)
2. Maximum present static draught (0 to 25.5 meters, null)
3. Persons on-board (0 to 8191, null)
4. Destination (1 to 20 characters, null)
5. Estimated UTC of arrival at destination (000000.00 to 235959.99, 246000.00, null)
6. Estimated day of arrival at destination (UTC) (00 to 31, null)
7. Estimated month of arrival at destination (UTC) (00 to 12, null)
8. Navigational status (0 to 15, null)
9. Regional application flags (null)

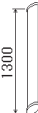
PACKING LIST

XN120F/-HK

03HL-X-9851 -1

1/1

A-1

| N A M E                           | O U T L I N E                                                                       | DESCRIPTION/CODE No. | Q'TY |
|-----------------------------------|-------------------------------------------------------------------------------------|----------------------|------|
| ユニット UNIT                         |                                                                                     |                      |      |
| アンテナ<br>ANTENNA RADIATOR ASSEMBLY |  | XN120F*              | 1    |
|                                   |                                                                                     | 001-252-640-00 **    |      |
|                                   |                                                                                     |                      |      |
| 工事材料 INSTALLATION MATERIALS       |                                                                                     |                      |      |
| 工事材料<br>INSTALLATION MATERIALS    |  | CP03-35201           | 1    |
|                                   |                                                                                     | 001-249-860-00       |      |
|                                   |                                                                                     |                      |      |

コード番号末尾の[\*]は、選択品の代表コードを表します。  
CODE NUMBER ENDING WITH “\*” INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

C3616-Z01-B

PACKING LIST

XN200F/-HK

03HL-X-9852 -0

1/1

A-2

| NAME                              | OUTLINE                                                                           | DESCRIPTION/CODE No. | Q'TY |
|-----------------------------------|-----------------------------------------------------------------------------------|----------------------|------|
| ユニット UNIT                         |                                                                                   |                      |      |
| アンテナ<br>ANTENNA RADIATOR ASSEMBLY |  | XN200F               | 1    |
|                                   |                                                                                   | 001-252-650-00 **    |      |
|                                   |                                                                                   |                      |      |
| 工事材料 INSTALLATION MATERIALS       |                                                                                   |                      |      |
| 工事材料<br>INSTALLATION MATERIALS    |  | CP03-35201           | 1    |
|                                   |                                                                                   | 001-249-860-00       |      |
|                                   |                                                                                   |                      |      |

コード番号末尾の[\*]は、選択品の代表コードを表します。  
CODE NUMBER ENDING WITH “\*” INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

型式/コード番号が2段の場合、下段より上段に代わる過渡期品であり、どちらが入っています。なお、品質は変わりません。  
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

C3616-Z02-A

PACKING LIST

XN24CF/-HK

03HL-X-9853 -0

1/1

A-3

| N A M E                   | O U T L I N E                                                                       | D E S C R I P T I O N / C O D E N o. | Q ' T Y |
|---------------------------|-------------------------------------------------------------------------------------|--------------------------------------|---------|
| ユ ニ ッ ト                   |                                                                                     |                                      |         |
| アンテナ                      |  | XN24CF                               | 1       |
| ANTENNA RADIATOR ASSEMBLY |                                                                                     | 001-252-660-00                       | **      |
|                           |                                                                                     |                                      |         |
| 工 事 材 料                   |                                                                                     |                                      |         |
| INSTALLATION MATERIALS    |                                                                                     |                                      |         |
| 工事材料                      |  | CP03-35201                           | 1       |
| INSTALLATION MATERIALS    |                                                                                     | 001-249-860-00                       |         |
|                           |                                                                                     |                                      |         |

コード番号末尾の[\*\*]は、選択品の代表コードを表します。  
CODE NUMBER ENDING WITH “\*\*” INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL

型式/コード番号が2段の場合、下段より上段に代わる過渡期品であり、どちらかが入っています。なお、品質は変わりません。  
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.  
(略図の寸法は、参考値です。DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

C3616-Z03-A

PACKING LIST

XN24AF

03FS-X-9856 -0

1/1

A-4

| NAME                           | OUTLINE                                                                           | DESCRIPTION/CODE No. | QTY |
|--------------------------------|-----------------------------------------------------------------------------------|----------------------|-----|
| ユニット                           |                                                                                   |                      |     |
| アンテナ                           |  | XN24AF               | 1   |
| ANTENNA                        |                                                                                   | 008-487-120          |     |
| アンテナ工材                         |                                                                                   |                      |     |
| ANTENNA INSTALLATION MATERIALS |                                                                                   |                      |     |
| 工事材料                           |  | CP03-19101           | 1   |
| INSTALLATION MATERIALS         |                                                                                   | 008-487-130          |     |

(略図の寸法は、参考値です。DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

C3464-Z05-A

PACKING LIST

031C-X-9864 -0 1/1

SN24CF

A-5

| NAME |  | OUTLINE                                                                                     | DESCRIPTION/CODE No.         | Q'TY |
|------|--|---------------------------------------------------------------------------------------------|------------------------------|------|
| ユニット |  | UNIT                                                                                        |                              |      |
| アンテナ |  | 2547<br> | SN24CF<br>001-505-800-00     | 1    |
| 工事材料 |  | INSTALLATION MATERIALS                                                                      |                              |      |
| 工事材料 |  |          | CP03-35202<br>001-249-880-00 | 1    |

(略図の寸法は、参考値です。DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

C3656-Z03-A

PACKING LIST

031C-X-9865 -0 1/1

SN30CF

A-6

| NAME |  | OUTLINE                                                                                   | DESCRIPTION/CODE No.         | Q'TY |
|------|--|-------------------------------------------------------------------------------------------|------------------------------|------|
| ユニット |  | UNIT                                                                                      |                              |      |
| アンテナ |  | 3072<br> | SN30CF<br>001-505-810-00     | 1    |
| 工事材料 |  | INSTALLATION MATERIALS                                                                    |                              |      |
| 工事材料 |  |          | CP03-35202<br>001-249-880-00 | 1    |

(略図の寸法は、参考値です。DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

C3656-Z04-A

PACKING LIST

SN36CF/-HK

03HL-X-9854 -0

1/1

A-7

| N A M E                                                                  | O U T L I N E                                                                       | D E S C R I P T I O N / C O D E N o.   | Q ' T Y |
|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------|---------|
| ユ ニ ャ ッ ト                      U N I T                                   |                                                                                     |                                        |         |
| アンテナ<br>ANTENNA RADIATOR ASSEMBLY                                        |  | SN36CF                                 | 1       |
|                                                                          |                                                                                     | 001-252-670-00                      ** |         |
|                                                                          |                                                                                     |                                        |         |
| 工 事 材 料                      I N S T A L L A T I O N   M A T E R I A L S |                                                                                     |                                        |         |
| 工事材料<br>INSTALLATION MATERIALS                                           |  | CP03-35202                             | 1       |
|                                                                          |                                                                                     | 001-249-880-00                         |         |
|                                                                          |                                                                                     |                                        |         |

コード番号末尾の[\*\*]は、選択品の代表コードを表します。  
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型式/コード番号が2段の場合、下段より上段に代わる過渡期品であり、どちらが入っています。なお、品質は変わりません。  
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.  
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY)

C3618-Z01-A

PACKING LIST

RSB-128-105N\* , RSB-128-105N\*HK , RSB-128-106N\* , RSB-128-106N\*HK

03HL-X-9867 -3

1/1

A-8

| N A M E                                                                  | O U T L I N E                                                                     | D E S C R I P T I O N / C O D E N o. | Q ' T Y |
|--------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------|---------|
| ユ ニ ッ ト                      U N I T                                     |                                                                                   |                                      |         |
| 空中線本体部<br>SCANNER UNIT                                                   |  | .....<br>RSB-128*H*                  | 1       |
|                                                                          |                                                                                   | 000-024-105-00 **                    |         |
|                                                                          |                                                                                   |                                      |         |
| 工 事 材 料                      I N S T A L L A T I O N   M A T E R I A L S |                                                                                   |                                      |         |
| 工事材料<br>INSTALLATION MATERIALS                                           |  | CP03-35401                           | 1       |
|                                                                          |                                                                                   | 001-507-920-00                       |         |
|                                                                          |                                                                                   |                                      |         |
| 図 書                      D O C U M E N T                                 |                                                                                   |                                      |         |
| 吊下締付要領<br>HOIST X-BAND, TIGHTEN BOLSTS                                   |  | C32-01302-*                          | 1       |
|                                                                          |                                                                                   | 000-178-042-1 *                      |         |
|                                                                          |                                                                                   |                                      |         |

コード番号末尾の[\*\*]は、選択品の代表コードを表します。  
CODE NUMBER ENDING WITH " \*\*" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY)

C3616-Z08-D

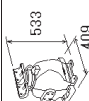
PACKING LIST

RSB-128-105I\* , RSB-128-105I\*HK , RSB-128-106I\* , RSB-128-106I\*HK

A-9

03HL-X-9855 -5

1/1

| N A M E                                | O U T L I N E                                                                       | DESCRIPTION/ CODE No. | Q'TY |
|----------------------------------------|-------------------------------------------------------------------------------------|-----------------------|------|
| ユニット UNIT                              |                                                                                     |                       |      |
| 空中線本体部<br>SCANNER UNIT                 |  | RSB-128*1*            | 1    |
|                                        |                                                                                     | 000-024-106-00 **     |      |
| 予備品 SPARE PARTS                        |                                                                                     |                       |      |
| 予備品<br>SPARE PARTS                     |  | SP03-19701            | 1    |
|                                        |                                                                                     | 001-531-630-00        |      |
| 工事材料 INSTALLATION MATERIALS            |                                                                                     |                       |      |
| 工事材料<br>INSTALLATION MATERIALS         |  | CP03-35403            | 1    |
|                                        |                                                                                     | 001-507-930-00        |      |
| 図書 DOCUMENT                            |                                                                                     |                       |      |
| 吊下締付要領<br>HOIST X-BAND, TIGHTEN BOLSTS |  | C32-01302-*           | 1    |
|                                        |                                                                                     | 000-178-042-1*        |      |

コード番号末尾の[\*]\*\*]は、選択品の代表コードを表します。  
CODE NUMBER ENDING WITH "[]" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

C3616-Z04-F

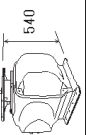
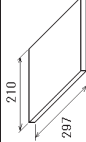
PACKING LIST

RSB-129-107N\* , RSB-129-107NHK, RSB-133-111N\* , RSB-133-111NHK

A-10

03HL-X-9856 -2

1/1

| N A M E                        | O U T L I N E                                                                     | DESCRIPTION/ CODE No. | Q ' T Y |
|--------------------------------|-----------------------------------------------------------------------------------|-----------------------|---------|
| ユニット UNIT                      |                                                                                   |                       |         |
| 空中線本体部<br>SCANNER UNIT         |  | RSB-129/133*N*        | 1       |
|                                |                                                                                   | 000-024-113-00 **     |         |
|                                |                                                                                   |                       |         |
| 工事材料 INSTALLATION MATERIALS    |                                                                                   |                       |         |
| 工事材料<br>INSTALLATION MATERIALS |  | CP03-35402            | 1       |
|                                |                                                                                   | 001-255-430-00        |         |
|                                |                                                                                   |                       |         |
| 図書 DOCUMENT                    |                                                                                   |                       |         |
| 吊下要領<br>HOIST S-BAND ANTENNA   |  | C32-01303-*           | 1       |
|                                |                                                                                   | 000-178-043-1 *       |         |
|                                |                                                                                   |                       |         |

コード番号末尾の[\*]\*\*]は、選択品の代表コードを表します。  
CODE NUMBER ENDING WITH "[]" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

C3618-Z02-C

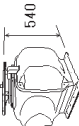
PACKING LIST

RSB-129-1071\* , RSB-129-1071HK , RSB-133-1111\* , RSB-133-1111HK

03HL-X-9866 -2

1/1

A-11

| NAME                           | OUTLINE                                                                             | DESCRIPTION/CODE No. | Q'TY |
|--------------------------------|-------------------------------------------------------------------------------------|----------------------|------|
| ユニット UNIT                      |                                                                                     |                      |      |
| 空中線本体<br>SCANNER UNIT          |  | RSB-129/133*1*       | 1    |
|                                |                                                                                     | 000-024-114-00 **    |      |
|                                |                                                                                     |                      |      |
| 予備品 SPARE PARTS                |                                                                                     |                      |      |
| 予備品<br>SPARE PARTS             |  | SP03-19701           | 1    |
|                                |                                                                                     | 001-531-630-00       |      |
|                                |                                                                                     |                      |      |
| 工事材料 INSTALLATION MATERIALS    |                                                                                     |                      |      |
| 工事材料<br>INSTALLATION MATERIALS |  | CP03-35404           | 1    |
|                                |                                                                                     | 001-270-080-00       |      |
|                                |                                                                                     |                      |      |
| 図書 DOCUMENT                    |                                                                                     |                      |      |
| 吊下要領<br>HOIST S-BAND ANTENNA   |  | C32-01303-*          | 1    |
|                                |                                                                                     | 000-178-043-1*       |      |
|                                |                                                                                     |                      |      |

コード番号末尾の[\*]\*\*は、選択品の代表コードを表します。  
CODE NUMBER ENDING WITH “\*\*” INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

C3619-Z03-C

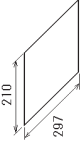
PACKING LIST

RSB-130N

03HO-X-9851 -1

1/1

A-12

| NAME                                   | OUTLINE                                                                           | DESCRIPTION/CODE No. | Q'TY |
|----------------------------------------|-----------------------------------------------------------------------------------|----------------------|------|
| ユニット UNIT                              |                                                                                   |                      |      |
| 空中線本体部<br>SCANNER UNIT                 |  | RSB-130N             | 1    |
|                                        |                                                                                   | 000-025-517-00       |      |
|                                        |                                                                                   |                      |      |
| 工事材料 INSTALLATION MATERIALS            |                                                                                   |                      |      |
| 工事材料<br>INSTALLATION MATERIALS         |  | CP03-35901           | 1    |
|                                        |                                                                                   | 001-507-940-00       |      |
|                                        |                                                                                   |                      |      |
| 図書 DOCUMENT                            |                                                                                   |                      |      |
| 吊下締付要領<br>HOIST X-BAND, TIGHTEN BOLSTS |  | C32-01302-*          | 1    |
|                                        |                                                                                   | 000-178-042-1 *      |      |
|                                        |                                                                                   |                      |      |

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

C3624-Z01-B