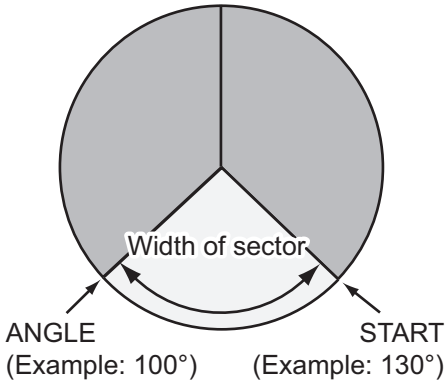
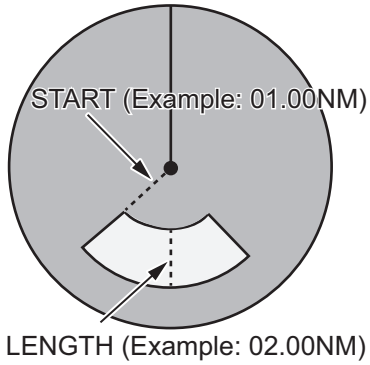
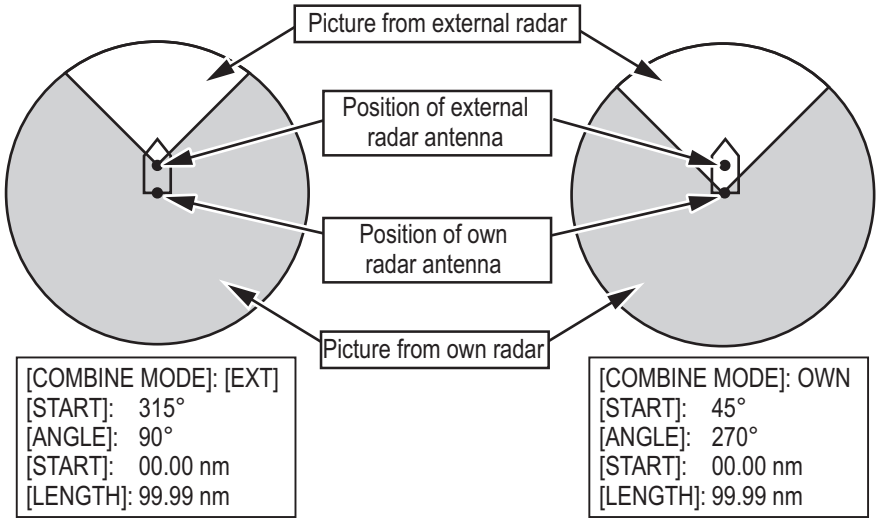
- [COMBINE SECTOR]: Set the start position and angle of the sector, referring to the example to the right.
  [START]: Start point of the sector (default: 000°, 000°to 359°)
  [ANGLE]: Horizontal width of the sector (default: 001°, 001°to 360°)




- [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.



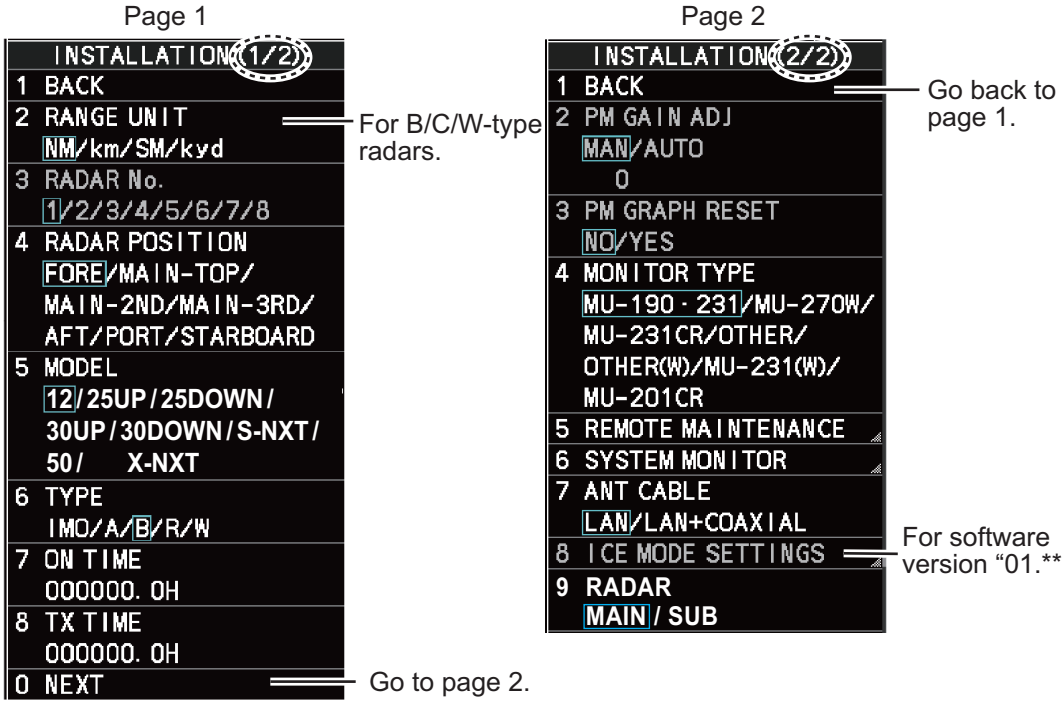

- [EXT RADAR]: Select the external radar for dual radar display. The available radar numbers are FAR-2xx8 series radars set on the [RADAR INSTALLATION] menu are valid.

  **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.




**[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.

- [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
- [X-NXT]: For FAR-2228-NXT(-BB)/2328-NXT

**[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 | ✓ | — |

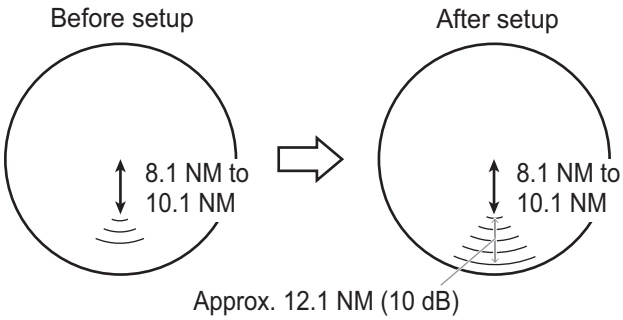
(✓: Available, —: Not available)

**[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.




Ex: When [ARC] is set to [5]
(The location of arcs changes with the setting of [ARC] in [PERFORMANCE MON] in the [ECHO] menu.)

**Note:** This menu is **NOT** available when the [RADAR] setting is set to [SUB] for FAR-2x58 (see "[RADAR]" on page 3-15).

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 is connected to the Antenna Unit.

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

**Note 1:** This menu is **NOT** available when the [RADAR] setting is set to [SUB] for FAR-2x58 (see "[RADAR]" on page 3-15).

**Note 2:** After the PM graphs are reset, adjust the [PM GAIN ADJ] setting on the radar.

## [MONITOR TYPE]

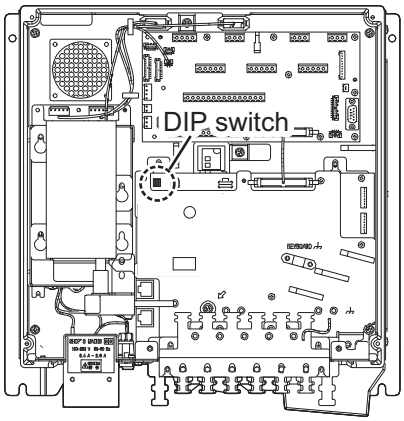
The monitor type is preset at factory according to the radar type. For BB type radar, [MU-190•231] is set in advance. For other wide monitor, select [OTHER(W)].

```
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.**”

**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.

```
  REMOTE MAINTENANCE
1 BACK
2 MAINTENANCE PROFILE
  OFF/ON
```

## [SYSTEM MONITOR]

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

```
  SYSTEM MONITOR
1 BACK
2 DISP SYSTEM MONITOR
```

**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.

```
7 ANT CABLE
  LAN/LAN+COAXIAL
```

**[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]).

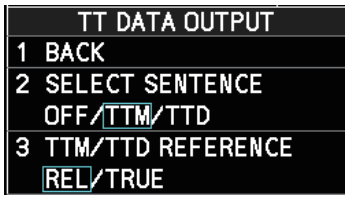
**Note:** This menu is available only for the [MODEL] setting is set to [50] (see "[MODEL]" on page 3-12).

## 3.5.5 [TT PRESET] menu

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

**[TT 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 the tracked target's bearing (default: [REL]).
  [REL]: Outputs bearing and speed relative to own ship (default setting).
  [TRUE]: Outputs bearing to the north and speed over ground.

**[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.

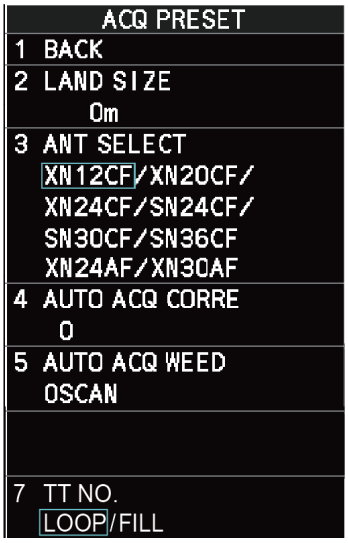
- [OFF]: Normal picture (default)
- [ON]: Quantized video. Default setting is restored when the power is turned off.

**[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.**”.

**[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]).
- **[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.

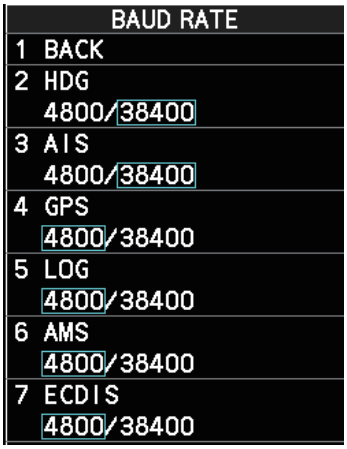
**[DEFAULT]**

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

## 3.5.6 [BAUD RATE] menu

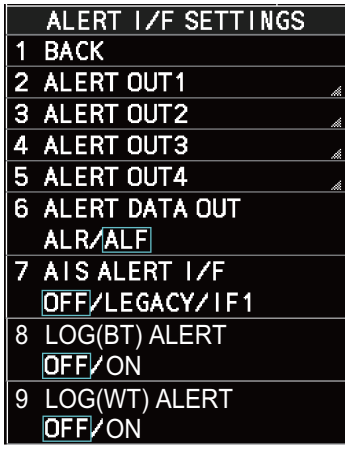
Set the baud rate, 4800 or 38400 (bps), for connected equipment - heading sensor, AIS transponder, GPS navigator, Log, AMS, and ECDIS.

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



## 3.5.7 [ALERT I/F SETTINGS] menu

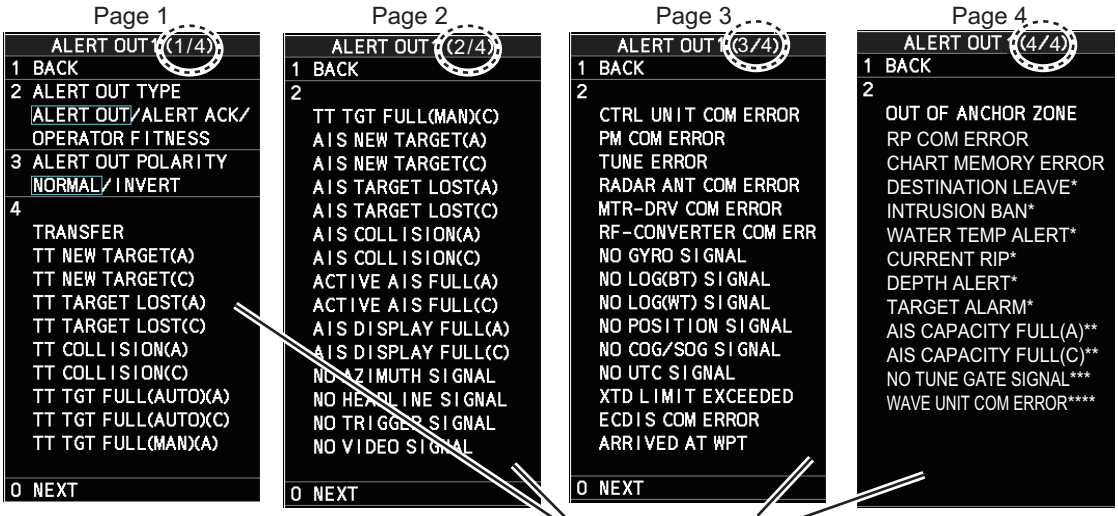
Four alert contact outputs are available, [ALERT OUT1] to [ALERT OUT4].




### [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 | • NO AZIMUTH SIGNAL<br>• NO HEADLINE SIGNAL<br>• NO TRIGGER SIGNAL<br>• NO VIDEO SIGNAL<br>• NO TUNE GATE SIGNAL<br>• TUNE ERROR<br>• RADAR SENSOR COM ERR<br>• MTR-DRV COM ERROR<br>• RF-CONVERTER COM ERR |
| 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
****: For other than C-type radar

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

*: For C-type radars **: For R-type radars ***: For FAR-2x58
****: For other than C/type radars

## 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].

**LOG(BT) ALERT**

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

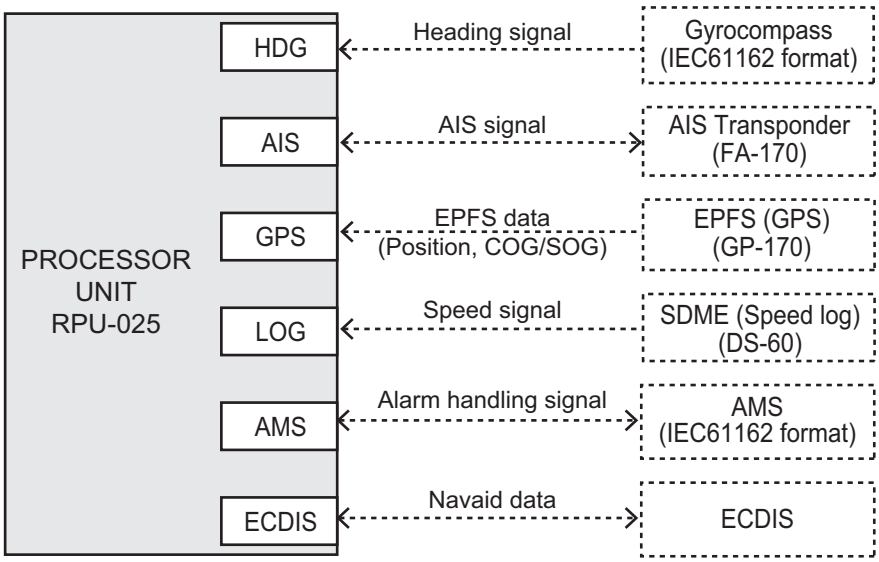
**LOG(WT) ALERT**

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

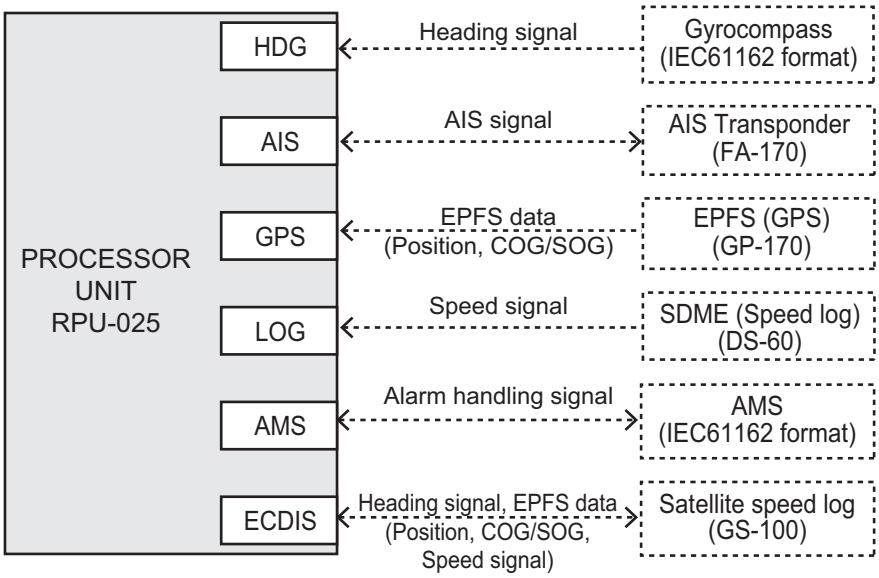
## 3.5.8 [INPUT PORT SETTINGS] menu

The input signals to the ports on the Processor Unit are shown below.

Default setting

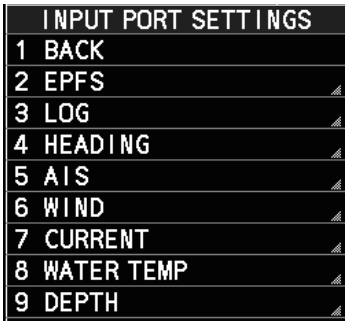


Setting for multiple sensors




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.




**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) |
|---|
| 1 BACK |
| 2 EPFS1 PORT SETTING<br>SERIAL/LAN2 |
| 3 EPFS1 SERIAL SETTING<br>GPS/LOG/ECDIS/HDG/<br>AMS |
| 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 |

| EPFS (2/2) |
|---|
| 1 BACK |
| 2 EPFS1 INPUT DTM SEL.<br>WGS-84/TOKYO |
| 3 EPFS2 INPUT DTM SEL.<br>WGS-84/TOKYO |

**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.

## [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 |

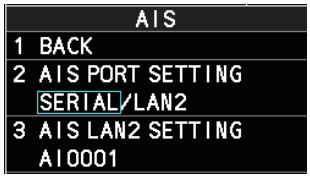
For heading data

- **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].

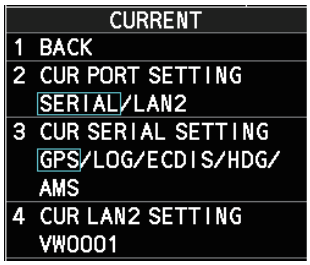
**[AIS], [WIND], [CURRENT], [WATER TEMP], [DEPTH]**

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.

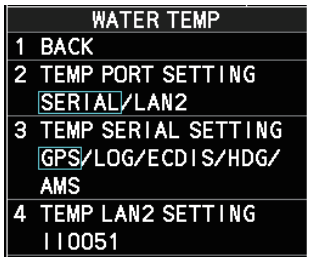


For AIS

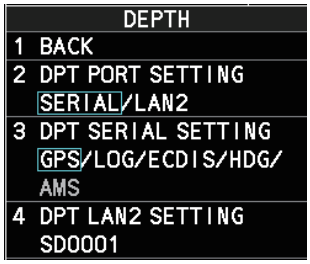
For wind data



For current data



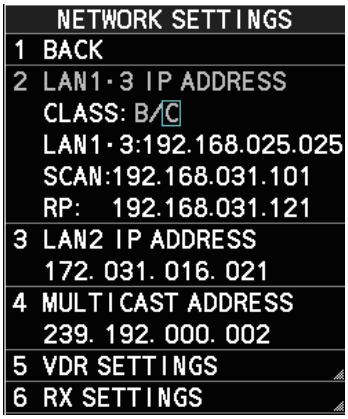
For water temperature



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].

**[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**

**[LAN2 IP ADDRESS]**

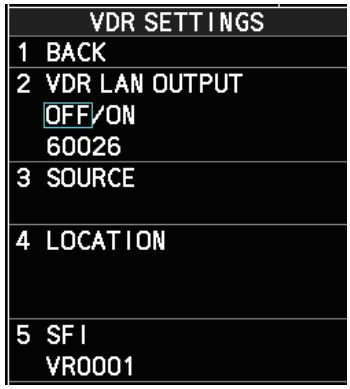
The IP address is assigned according to the radar No (See "[RADAR No.]" on page 3-12). Set the IP address as shown below. This IP address can be changed as required.

| 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.

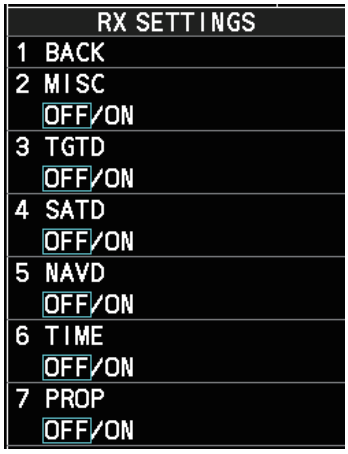
The device and channel information to be transmitted to VDR are shown below.

| 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:

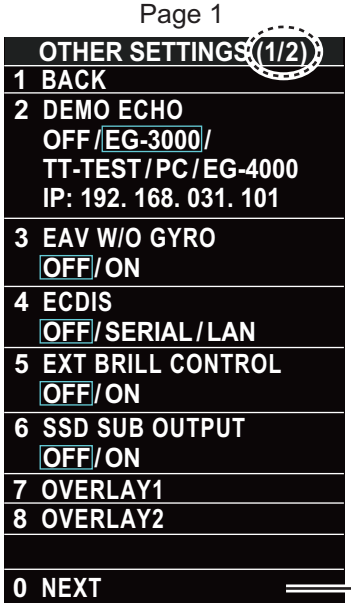
- [MISC]: Other equipment data (sensor of engine etc.)
- [TGTD]: Target data
- [SATD]: Satellite data
- [NAVD]: Navigation data
- [TIME]: Time
- [PROP]: Specified data by manufacturer or user




## 3.5.10 [OTHER SETTINGS] menu

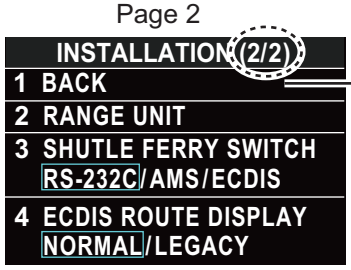
Open the main menu then select [RADAR INSTALLATION]→ [NEXT]→[OTHER SETTINGS] to open the [OTHER SETTINGS] menu through two pages. On the page 1, select NEXT to open the page 2..

Page 1




Go to page 2.

Page 2




Go back to page 1.

**[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].

### [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.

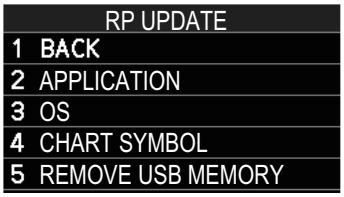
**Note:** The overlay output is less accurate than the sub monitor output from the Antenna Unit, especially in the areas mentioned below. Therefore, only use the overlay with an ECDIS.

- 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.

### [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).

**[SHUTTLE FERRY SWITCH]**

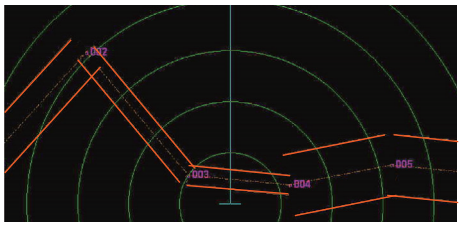
**Note:** This menu is **NOT** available for C-type radars.

Select a port to detect a navigation direction of a shuttle ferry (default: [RS-232C]).

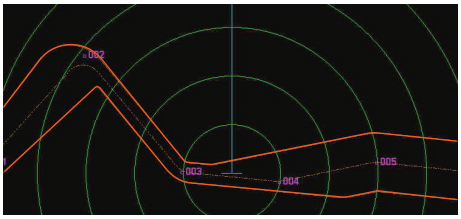
**[ECDIS ROUTE DISPLAY]**

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

Select [NORMAL] to show the routes with a straight lines, [LEGACY] to show the routes with a curve lines.



[NORMAL]
（Straight line）



[LEGACY]
（Curve line）

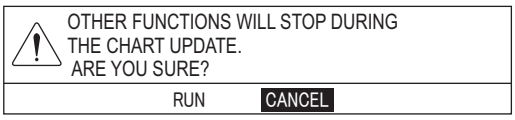
# 3.6 How to Control Charts

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

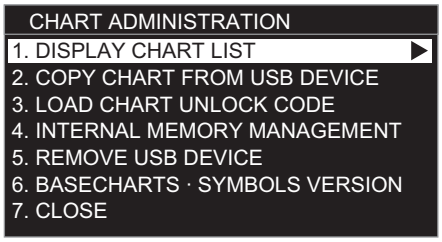
## 3.6.1 How to install charts

**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.

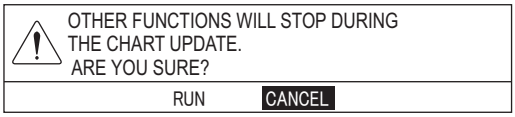
    How to unlock the chart data manually
    1) Select [1. DISPLAY CHART LIST] in the [CHART ADMINISTRATION] menu to display the chart list.
    2) Select the locked chart data (displayed with yellow letters), then click the left button to display the character entry window.
    3) Set the unlock code as 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

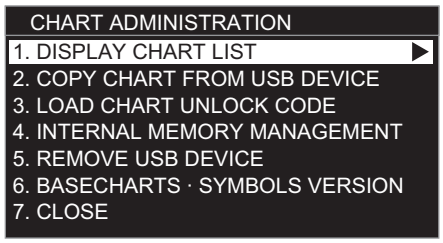
**Note 1:** Save the chart data to a USB flash memory first. You do not need to create a folder.

**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.

This page is intentionally left blank.

# 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

## 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 Trig-ger, 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 3-22.
*4: This is **NOT** available for IMO-type radars installed with software version “01.**”.
*5: For C-type radars.

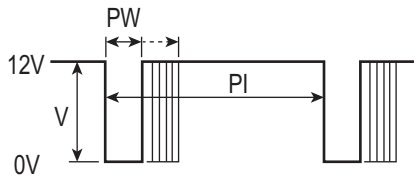
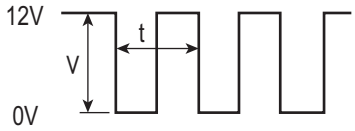
**IEC 61162 output sentence**

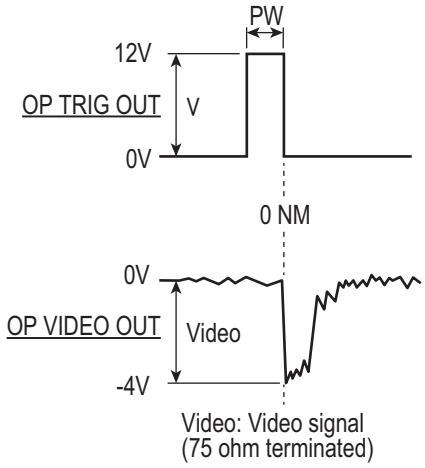
| Contents | Sentence and priority |
|---|---|
| Target L/L | TLL*6 |
| Radar system data | RSD |
| Own ship data | OSD |
| TT target data | TTD, TLB, TTM |
| Alert handling | ALR, ALF, ALC, ARC, HBT |
| Activity information | EVE |
| AIS target message, alert | ABM, BBM, ACK, VSD |
| Monitor Setting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

*6: 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 | • Voltage (V): 0 to 12 V<br>• Impedance: 110 Ω<br>• Pulse width (PW):<br>216 to 432 ms<br>0.625 s (24 rpm, ECDIS overlay)<br>0.357 s (42 rpm, ECDIS overlay)<br>• Pulse interval (PI):<br>2.5 s (24 rpm)<br>1.4 s (42 rpm)<br>• Logic: Negative |  |
| OP_BP_ OUT | • Voltage (V): 0 to 12 V<br>• Impedance: 110 Ω<br>• Interval (t):<br>6.9 ms (24 rpm)<br>4.0 ms (42 rpm) |  |

| Signal Name | Specification | Signal and timing |
|---|---|---|
| OP_TRIG_ OUT | • Voltage (V): 0 to 12 V<br>• Impedance: 110 Ω<br>• Pulse width (PW):<br>5 to 15 μs (magnetron radar)<br>8 μs (solid state radar)<br>5 μs (ECDIS overlay) |  |
| OP_VIDEO _OUT | • Video: 4 Vp-p/100 dB<br>• Impedance: 75 Ω | |

# 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 ($mm^2$)* 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

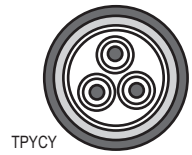
### 3. Sheath Type
Y: PVC (Vinyl)

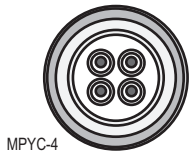
### 4. Armor Type
C: Steel

### 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

DPYCY


TPYCY


MPYC-4

TTYCSLA-4

EX: TTYCYSLA - 4
(1 2 3 4 5 6; Designation type: TTYCYSLA; # of twisted pairs: 4)

MPYC - 4
(1 2 3 4; Designation type: MPYC; # of cores: 4)

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

| Type | Core Area | Core Diameter | Cable Diameter | Type | Core Area | Core Diameter | Cable Diameter |
|---|---|---|---|---|---|---|---|
| DPYC-1.5 | 1.5mm² | 1.56mm | 11.7mm | TTYCSLA-1 | 0.75mm² | 1.11mm | 9.4mm |
| DPYC-2.5 | 2.5mm² | 2.01mm | 12.8mm | TTYCSLA-1T | 0.75mm² | 1.11mm | 10.1mm |
| DPYC-4 | 4.0mm² | 2.55mm | 13.9mm | TTYCSLA-1Q | 0.75mm² | 1.11mm | 10.8mm |
| DPYC-6 | 6.0mm² | 3.12mm | 15.2mm | TTYCSLA-4 | 0.75mm² | 1.11mm | 15.7mm |
| DPYC-10 | 10.0mm² | 4.05mm | 17.1mm | TTYCY-1 | 0.75mm² | 1.11mm | 11.0mm |
| DPYCY-1.5 | 1.5mm² | 1.56mm | 13.7mm | TTYCY-1T | 0.75mm² | 1.11mm | 11.7mm |
| DPYCY-2.5 | 2.5mm² | 2.01mm | 14.8mm | TTYCY-1Q | 0.75mm² | 1.11mm | 12.6mm |
| DPYCY-4 | 4.0mm² | 2.55mm | 15.9mm | TTYCY-4 | 0.75mm² | 1.11mm | 17.7mm |
| MPYC-2 | 1.0mm² | 1.29mm | 10.0mm | TTYCY-4SLA | 0.75mm² | 1.11mm | 19.5mm |
| MPYC-4 | 1.0mm² | 1.29mm | 11.2mm | TTYCYSLA-1 | 0.75mm² | 1.11mm | 11.2mm |
| MPYC-7 | 1.0mm² | 1.29mm | 13.2mm | TTYCYSLA-4 | 0.75mm² | 1.11mm | 17.9mm |
| MPYC-12 | 1.0mm² | 1.29mm | 16.8mm | | | | |
| TPYC-1.5 | 1.5mm² | 1.56mm | 12.5mm | | | | |
| TPYC-2.5 | 2.5mm² | 2.01mm | 13.5mm | | | | |
| TPYC-4 | 4.0mm² | 2.55mm | 14.7mm | | | | |
| TPYCY-1.5 | 1.5mm² | 1.56mm | 14.5mm | | | | |
| TPYCY-2.5 | 2.5mm² | 2.01mm | 15.5mm | | | | |
| TPYCY-4 | 4.0mm² | 2.55mm | 16.9mm | | | | |

# APPENDIX 2 DIGITAL INTERFACE

## Digital Interface

- **Input sentence**
  ABK, ACK, ACN, ALR, BWC, BWR, CUR, DBK*1, DBS*1, DBT, DDC, DPT, DTM, GGA, GLL, GNS, HBT, HDG*2, HDM*2, HDT*1, MTW, MWV, OSD, RAQ, RMB, RMC, ROT, RTE, THS, TLL*3, TTM*2, VBW, VDM, VDO, VDR, VHW, VSD, VTG, VWR*1, VWT*1, WPL, ZDA
- **Output sentences**
  ABM, ACK, AIQ, ALC, ALF, ALR, ARC, BBM, DDC, EVE, HBT, OSD, RSD, TLB, TLL*3, TTD, TTM, VSD

*1: For retrofit.

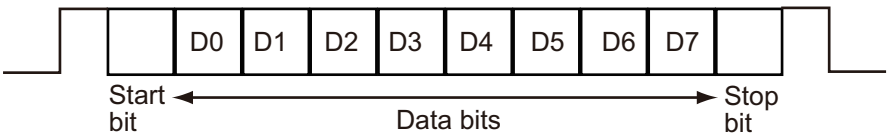
*2: For C-type radars.

*3: 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,xxxxxxxxx,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) sucessfully 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.

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

```
$ **BWR,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.

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

```
$**CUR,A,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  1011
```

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=Nightime, 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.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,llll.lll,a,yyyyy.yyy,a,x,xx,x.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 satllite 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)

## GLL - Geographic position, latitude/longitude

```
$**GLL,llll.ll,a,yyyyy.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,yyyyy.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,yyyyy.yy,a,c--c,xx,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. Naivgational  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,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)

## RMB - Recommended minimum navigation information.

```
$**RMB,A,x.x,a,CCCC,CCCC,llll.ll,a,yyyyy.yy,a,x.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,llll.ll,a,yyyyy.yy,a,x.x,x.x,xxxxxx,x.x,a,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,llll,ll,a,yyyy.yy,a,c--c,hhmmss.ss,a,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  1213        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)

## 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,llll.ll,a,yyyyy.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 to12)
4. Year (UTC) (0000 to 9999)
5. Local zone, hours (No use)
6. Loca zone, minutes (No use)