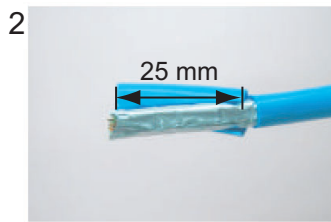


LAN cable

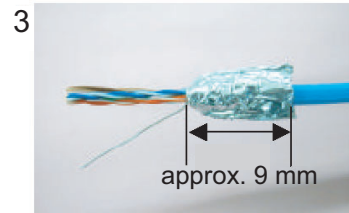
If the LAN cable is not fitted with an RJ-45 connector, attach one as shown below. Connect the cable to J202 (on the outside of the processor unit.)



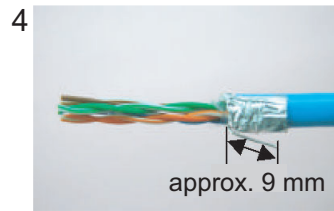
Expose inner vinyl sheath.



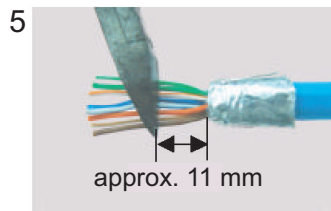
Remove the outer sheath by approx 25 mm. Be careful not to damage inner shield and cores.



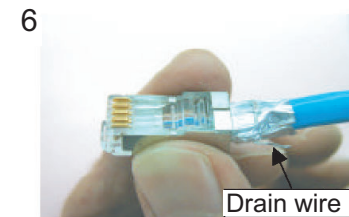
Fold back the shield, wrap it onto the outer sheath and cut it, leaving 9 mm.



Fold back drain wire and cut it, leaving 9 mm.



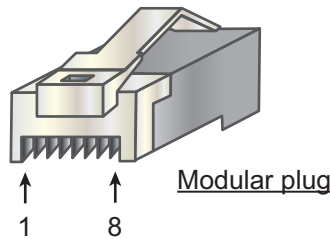
Straighten and flatten the core in order and cut them, leaving 11 mm.



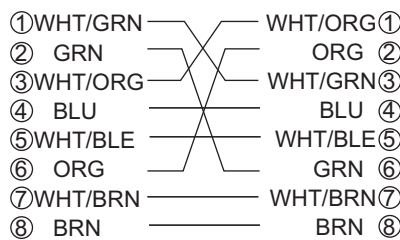
Insert the cable into the modular plug so that the folded part of the shield enters the modular plug. The drain wire must be on the tab side of the jack.



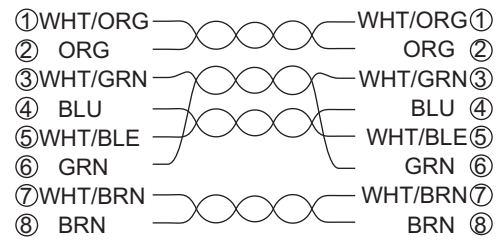
Using special crimping tool MPT5-8AS (PANDUIT CORP.), crimp the modular plug. Finally check the plug visually.



[Crossover cable]



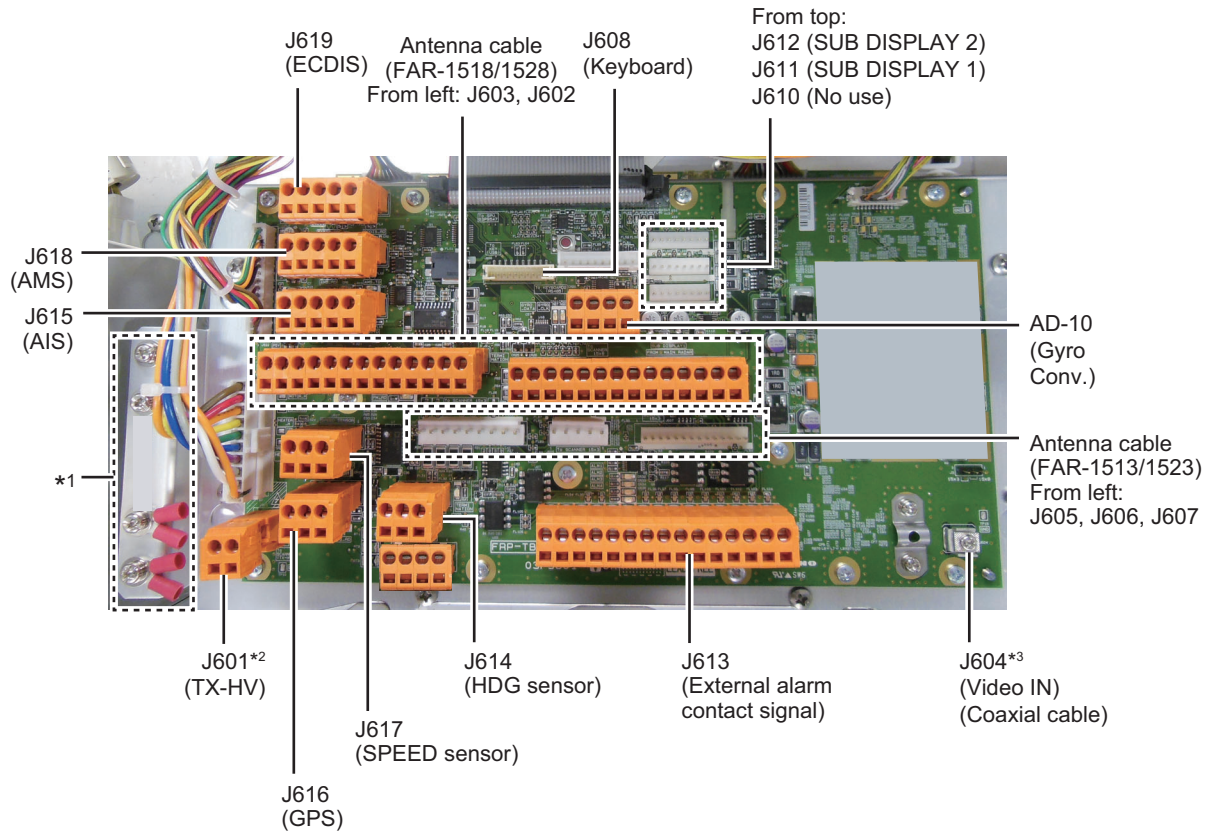
[Straight cable]



2. WIRING

2.4.3 Where to connect cables inside the processor unit

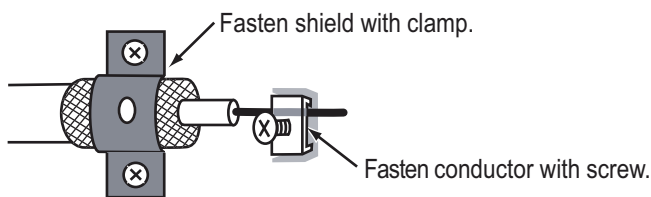
Connect the antenna cable and the cables of optional equipment to the FRP_TB board (03P9601) inside the processor unit as shown below.



*1 Attach these crimp-on lugs to drain wire of TTYCLSA cables and fasten drain wires here.

*2 Connect the TX HV line here. For the FAR-1513, FAR-1523, cut the TX-HV lines at the base of the connector and connect them here.

*3 Fasten the bare conductor. Do not use a crimp-on lug to make the connection, to prevent contact resistance from increasing.



2.4.4 How to install the optional processor unit IPX2 kit

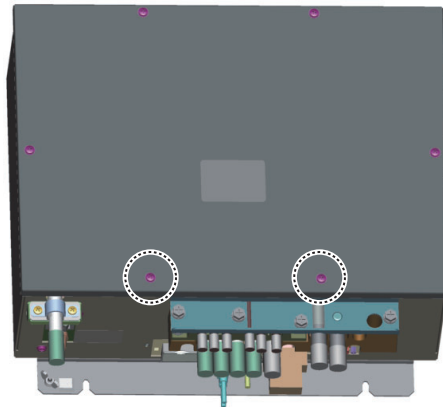
The optional processor unit IPX2 kit (OP03-238) has two rainproofing covers that protect the cables and connectors of the processor unit to waterproofing standard IPX2.

Name	Type	Code no.	Qty
Rainproof Cover 2	03-186-1104	100-401-840-10	1
Rainproof Cover	03-186-1105	100-401-850-10	1

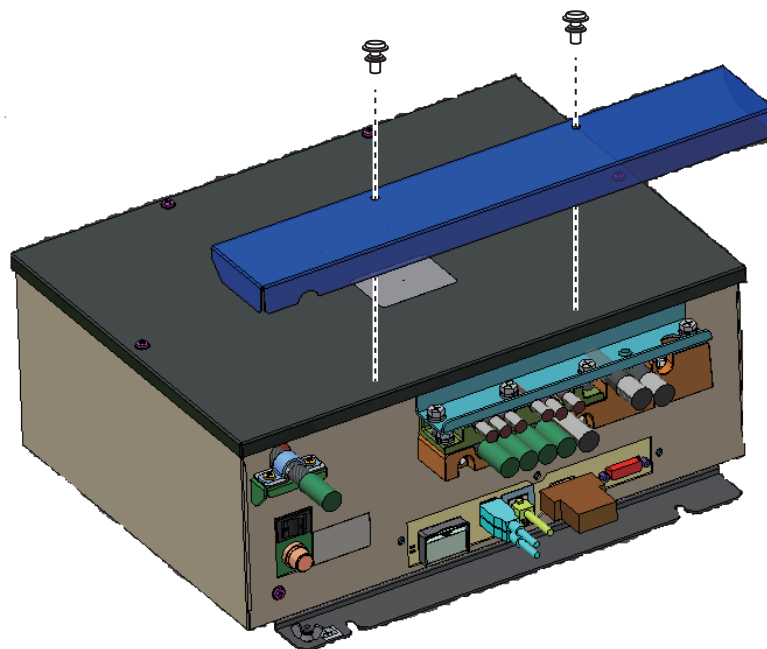
Note: The installation also uses the blind seal that is supplied with the processor unit installation materials (CP03-36501).

Rainproof Cover 2

1. Unfasten the two screws circled in the figure below.



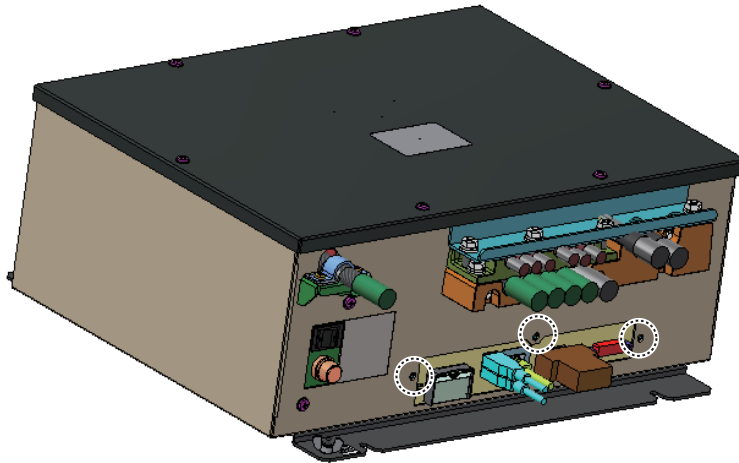
2. Fasten the Rainproof Cover 2 (03-186-1104) with the two screws unfastened at step 1.



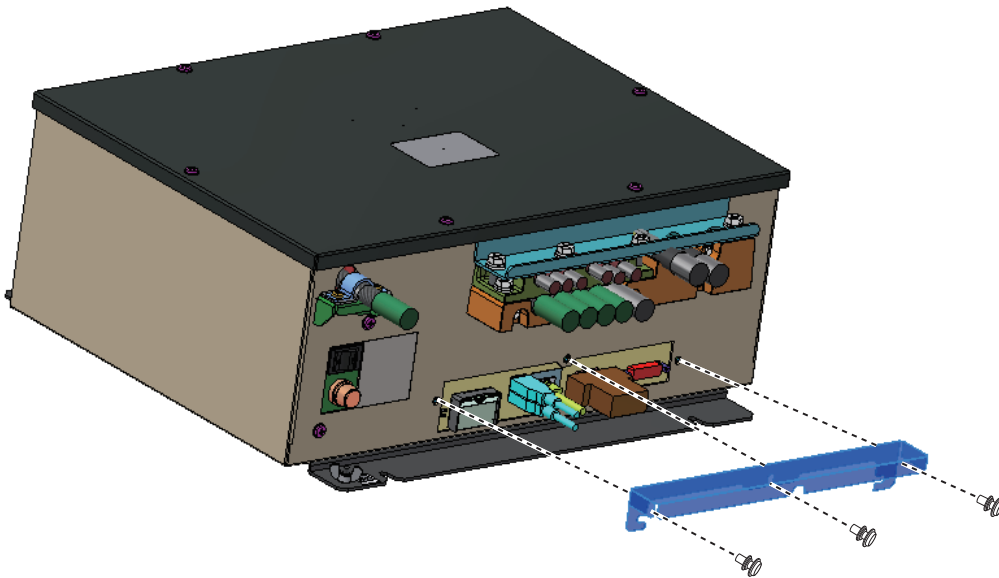
2. WIRING

Rainproof Cover

1. Unfasten the three screws circled in the figure below.

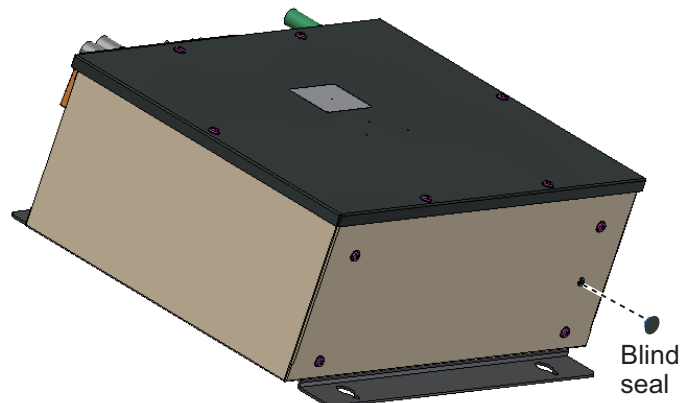


2. Fasten the Rainproof Cover (03-186-1105) with the three screws unfastened at step 1.



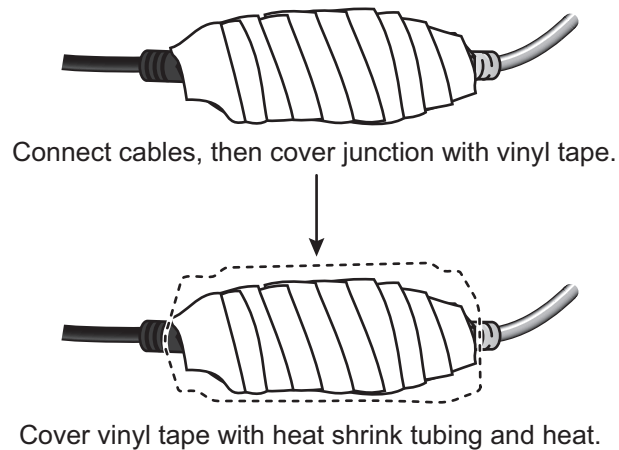
Blind seal

Attach the blind seal over the hole on the rear side of the unit.



2.5 Trackball Control Unit

Connect the cable from the control unit to the port cable on the trackball control unit. Cover the junction with vinyl tape. Cover the vinyl tape with heat shrink tubing and heat.



2.6 VDR Connection

The processor unit has an RGB port for connection of a VDR. Use the optional RGB cable (3COX-2P-6C 5m/10m) to connect the VDR.

About the RGB port

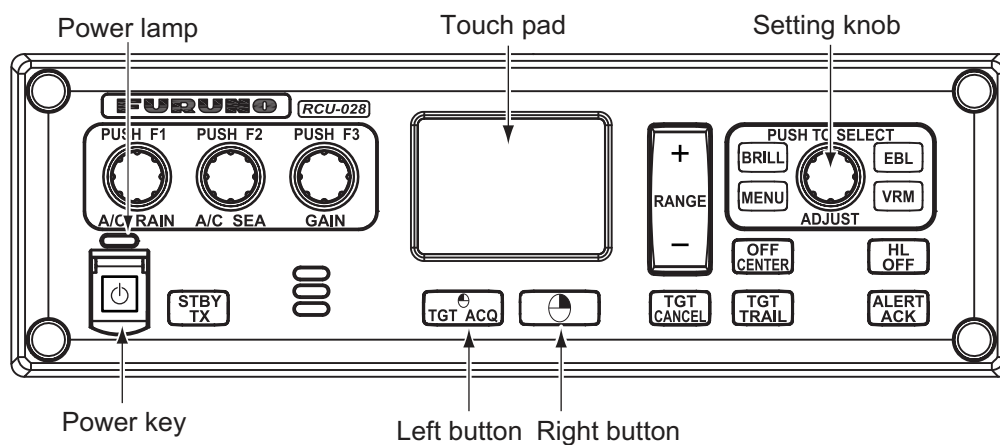
- The RGB port and DVI port have their own circuits. This prevents interruption of the radar picture shown on the main monitor connected to the DVI port, if a fault condition occurs at the RGB port.
- The processor unit continuously outputs video signals from its DVI and RGB ports. The operator cannot stop the output.

3. ADJUSTMENTS

Note: After completing the settings and adjustments, copy the setting data to a SD-card (SD card slot is at the back of the processor unit), referring to section 1.51 in the Operator's Manual. This will allow easy restoration of setting data after the SPU Board is replaced, etc.

At the first power up after installation, open the protected menus to adjust the radar. Follow the procedures in this chapter, in the order shown, to complete the adjustment.

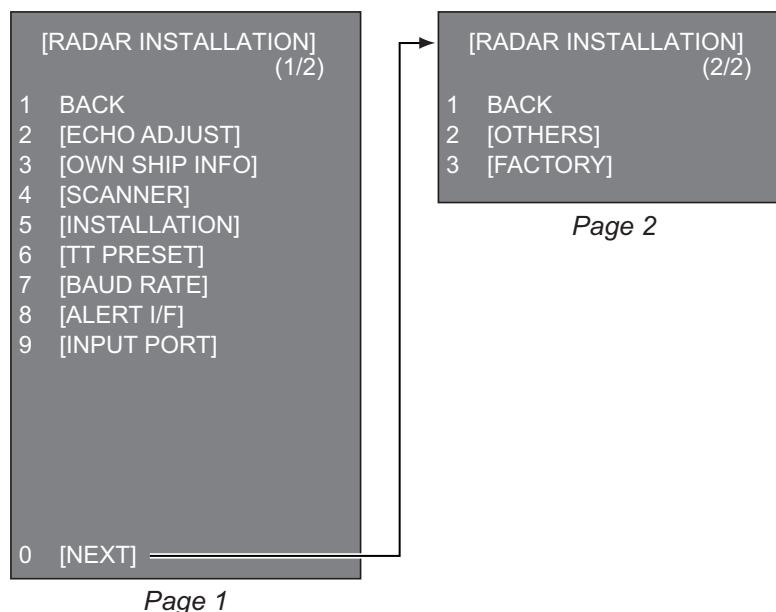
Below are the controls on the control unit that are used to make the adjustments.



3.1 How to Open the Radar Installation Menu

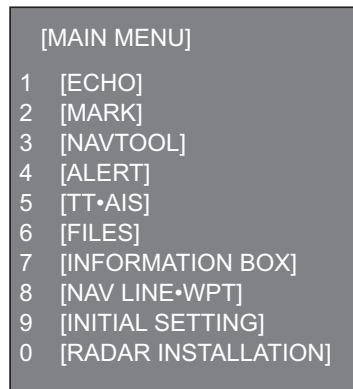
The [RADAR INSTALLATION] menu has the items for adjustment of the radar. Do the following to access the menu.

1. Open the cover of the power switch and press the switch to turn on the radar.
2. Press the **MENU** key five times while pressing the **HL OFF** key to open the [RADAR INSTALLATION] menu.



3.2 How to Use the Menu

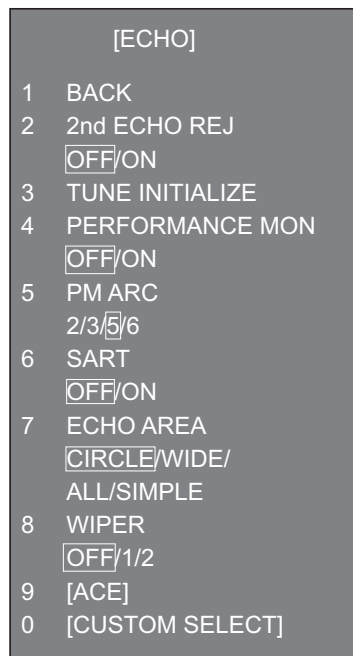
1. Press the **MENU** key to open the main menu.



2. Operate the Setting knob to select a menu then push the knob.
3. Operate the Setting knob to select a menu item then push the knob.
4. Operate the Setting knob to select a menu option then push the knob.
5. If the menu option requires entry of numeric data, rotate the setting knob to set then push the knob.

3.3 How to Initialize Tuning

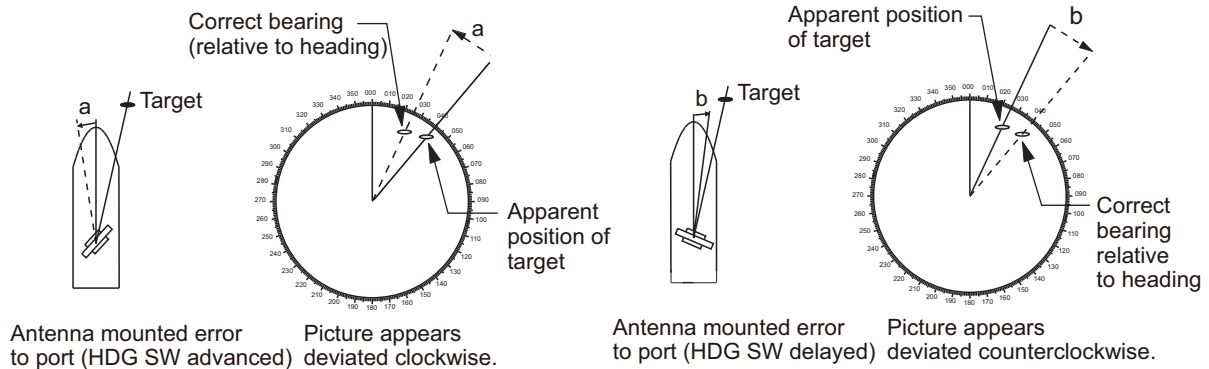
1. Open the main menu.
2. Open the [ECHO] menu.



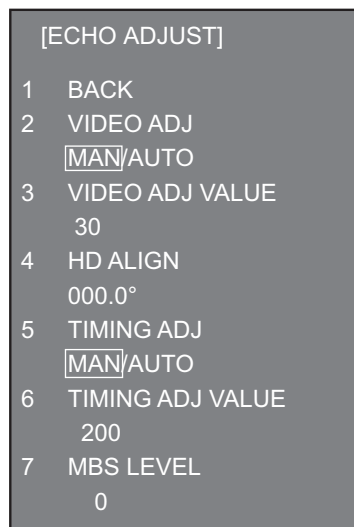
3. Select [TUNE INITIALIZE], then press the Left button.
The indication "TUNE INITIALIZE" appears on the screen during the initialization.
4. After the tuning is completed, press the Right button twice to close the menu.

3.4 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 should 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. Press the **EBL** key to turn on the EBL. Rotate the Setting knob to pass the EBL through the center of the target echo.
3. Read the target bearing.
4. Measure the bearing of the stationary target on the navigation chart and calculate the difference between the actual bearing and apparent bearing on the radar screen.
5. Open the [RADAR INSTALLATION] menu, then open the [ECHO ADJUST] menu.

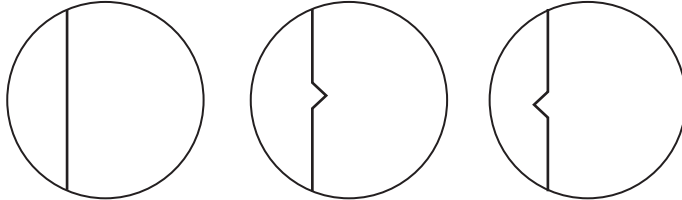


6. Select [HD ALIGN], then enter the bearing difference measured at step 4. The setting range is 0 to 359.9 degrees.
7. Confirm that the target echo is displayed at the correct bearing on the screen.

3.5 How to Adjust 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, will appear on the display as being pulled inward or pushed outward. See the figures below.
- The range of target echoes is incorrect.



(1) Correct (2) Target pushed inward (3) Target pushed outward

1. Set the **GAIN**, **A/C SEA** and **A/C RAIN** controls as shown below.
GAIN: 80
A/C SEA: Fully counterclockwise (OFF)
A/C RAIN: Fully counterclockwise (OFF)
2. Open the [RADAR INSTALLATION] menu, then open the [ECHO ADJUST] menu.
3. Set [TIMING ADJ] to [AUTO] to activate the automatic adjustment, which takes approx. two minutes.
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, set [TIMING ADJ] to [MAN]. Select [TIMING ADJ VALUE], then use the Setting knob to adjust the timing manually.

3.6 How to Suppress Main Bang

If main bang appears (a red ring at the screen center), suppress it as follows.

1. Transmit the radar on a long range and then wait 10 minutes.
2. Adjust the gain to show a slight amount of noise on the display.
3. Select the 0.125 NM range, then adjust the **A/C SEA** and **A/C RAIN** controls.
4. Go to the [RADAR INSTALLATION] menu, then open the [ECHO ADJUST] menu.
5. Select [MBS LEVEL], then use the Setting knob to enter a value that causes the main bang to faintly disappear. The setting range is 0 to 255.

3.7 RADAR INSTALLATION Menu

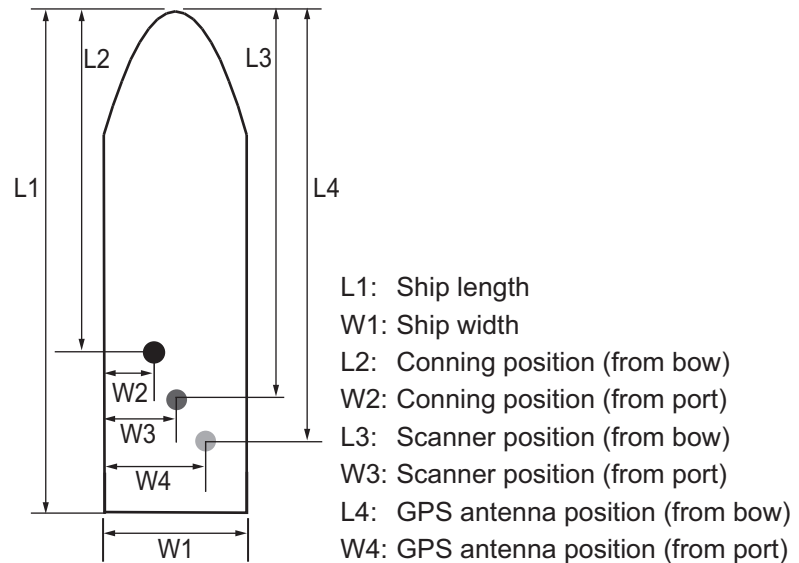
This section provides descriptions of the [RADAR INSTALLATION] menu items not previously mentioned.

3.7.1 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.

[OWN SHIP INFO]	
1	BACK
2	LENGTH/WIDTH
	LENGTH 0m
	WIDTH 0m
3	SCANNER POSITION
	BOW 0m
	PORT 0m
4	GPS1 ANT POSITION
	BOW 0m
	PORT 0m
5	GPS2 ANT POSITION
	BOW 0m
	PORT 0m
6	CONNING POSITION
	BOW 0m
	PORT 0m

Example



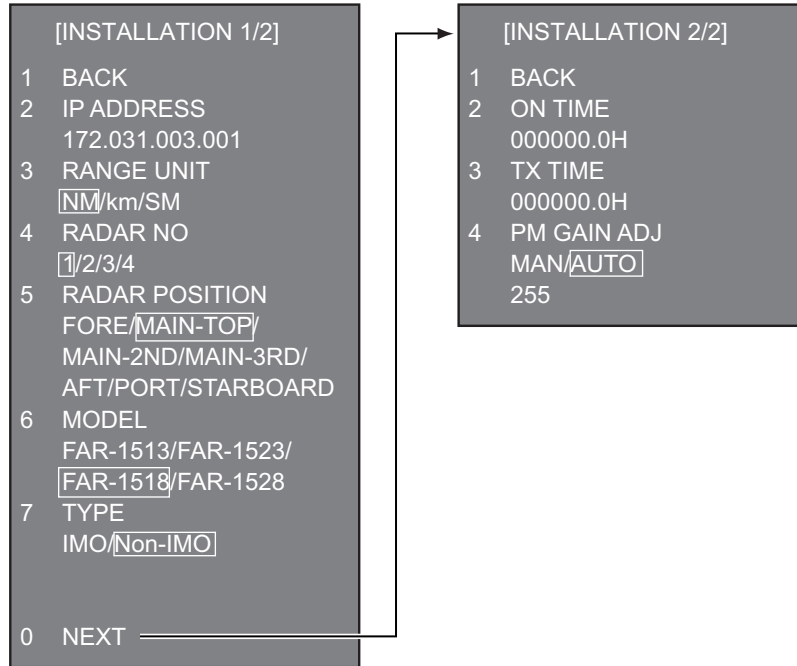
[LENGTH/WIDTH]: Enter the ship's length and width.

[SCANNER POSITION]: Enter the distance from the scanner to both bow and port.

[GPS 1 ANT POSITION]: Enter the distance from the GPS antenna to both bow and port. If a 2nd GPS antenna is installed, enter its position in [GPS 2 ANT POSITION].

[CONNING POSITION]: Enter the distance from the conning position to both bow and port.

3.7.2 INSTALLATION menu



[IP ADDRESS]: Enter IP address. The default address is 172.031.003.001.

[RANGE UNIT]: Select the unit of range measurement, among [NM], [km], and [SM].

[RADAR NO]: Select the radar number, among 1, 2, 3, and 4.

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

[MODEL]: Select the model name, among [FAR-1513], [FAR-1523], [FAR-1518], and [FAR-1528].

[TYPE]: Select the type of radar, [IMO] or [Non-IMO].

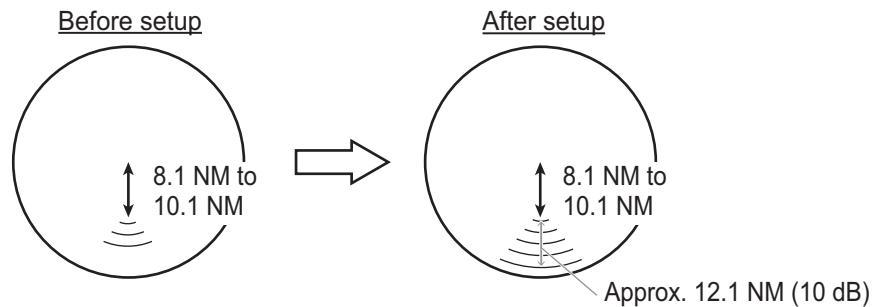
[ON TIME], [TX TIME]: These items show the number of hours the radar has been turned on and transmitted, respectively. Value can be changed; for example, after replacing the magnetron. [TX TIME] can be reset to 0.

[PM GAIN ADJ]: Adjust the performance monitor gain, automatically or manually, whenever the magnetron is replaced.

To adjust the performance monitor gain, do as follows:

1. Select automatic or manual adjustment. For automatic adjustment, no further operation is required; close the menu at the completion of the adjustment. For manual go to the next step.
2. Set the radar controls as shown below.
 - 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

3. 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.
4. Select [PM GAIN ADJ]. Operate the Setting knob so that the outer arc faintly appears. The setting range is 0 to 255. Wait at least eight scans then right click to set.



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

3.7.3 ECHO ADJUST menu

[VIDEO LEVEL ADJ]: Adjust the video level, automatically or manually. Set the radar as follows:

Interference Rejector (IR): 2

Echo Stretch (ES): OFF

Echo Averaging (EAV): OFF

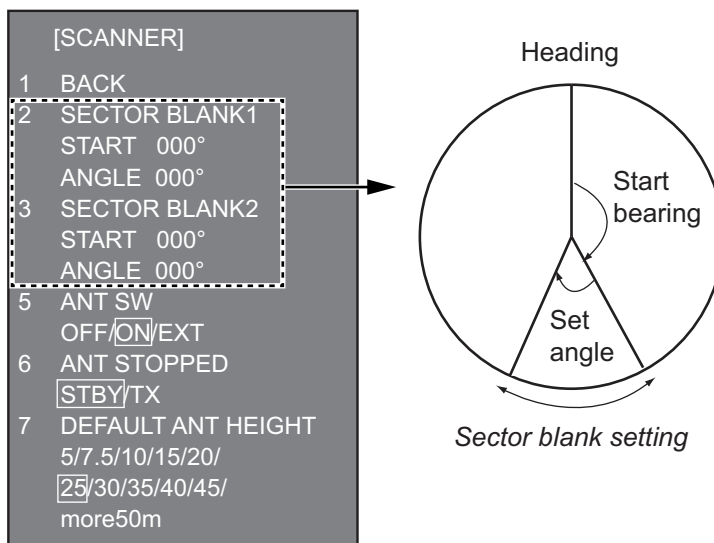
Gain: 80

Range: 24 NM

Pulse Length: Long

For manual adjustment, select [VIDEO ADJ VALUE]. Rotate the Setting knob so that noise just disappears from the screen. The setting range is 0 to 99. After completion of the adjustment the radar goes into standby.

3.7.4 SCANNER menu



[SECTOR BLANK1], [SECTOR BLANK2]: Set area(s) where to prevent transmission. Heading must be properly aligned (see section 3.4) before setting any blind sec-

3. ADJUSTMENTS

tor. 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 0 for both the [START] and [ANGLE] sections. The setting range of [START] is 0° to 359° and [ANGLE] is 0° to 180°.

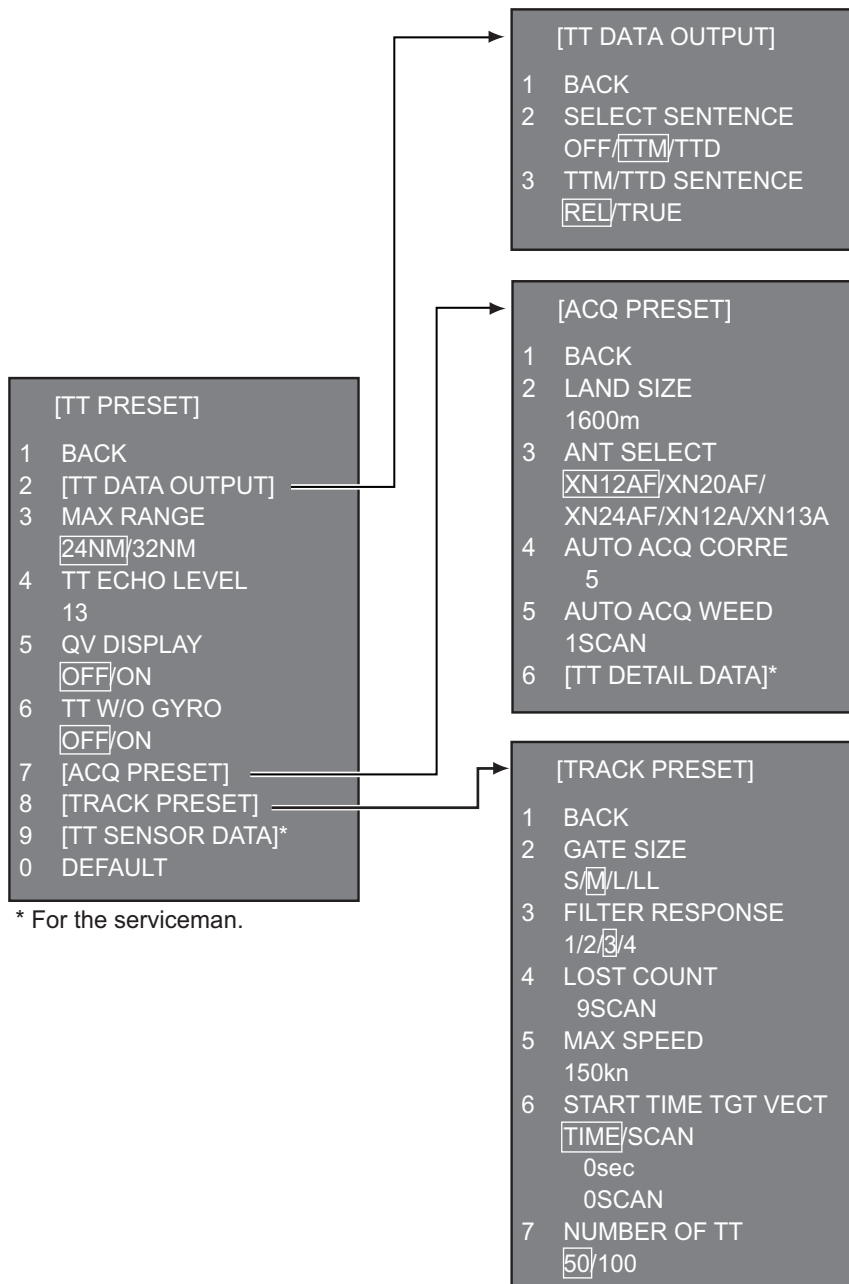
Note: Turn off a stern blind sector when adjusting the gain of the performance monitor, in order to display the echo from the performance monitor properly.

[ANT STOPPED]: For serviceman.

Note: Select [OFF] at [ANT SW] to prevent antenna rotation. [ANT STOPPED] prevents transmission while the antenna is stopped in STBY.

[DEFAULT ANT HEIGHT]: Select the height of the radar antenna above the waterline.

3.7.5 TT PRESET menu



[MAX RANGE]: Select the maximum TT (target tracking) range, 24 or 32 NM.

[TT ECHO LEVEL]: Set the detection level of TT echoes.

[QV DISPLAY]: [OFF]: Normal picture, [ON]: Quantized video. The normal picture is in effect whenever the power is turned on regardless of this setting.

[TT W/O GYRO]: Select [ON] to use TT without a gyro.

[DEFAULT]: Restore default settings for this menu.

TT DATA OUTPUT menu

[SELECT SENTENCE]: Select the target data sentence (TTM or TTD) to output. Select [OFF] for no output.

[TTM/TTD REFERENCE]: Select the output format (bearing) for the TTM/TTD sentence.

[REL] (Target bearing from own ship, degree relative, target course, degree relative), or **[TRUE]** (Target bearing, degree true, target course, degree true).

ACQ PRESET menu

[LAND SIZE]: Set the land size in units of 100 m. The setting range is 100 to 3000 m. A target whose length is equal to or greater than the length set here is judged as a land target.

[ANT SELECT]: Select 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.

[AUTO ACQ CORRE]: Set the correlation count of automatic acquisition. The setting range is 3 to 10.

[AUTO ACQ WEED]: Set the cancel count of automatic acquisition. The setting range is 1 to 5.

[TT DETAIL DATA]: For the service technician.

TRACK PRESET menu

[GATE SIZE]: Select the gate size, among [S], [M], [L], and [LL].

[FILTER RESPONSE]: Set the filter response function. The setting range is 1 to 4.

1: Filter response is improved.

4: Filter stability is improved.

[LOST COUNT]: Set the number of scans to allow between the time a target is lost and is declared a lost target. The setting range is 1 to 20.

[MAX SPEED]: No use.

[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.

[NUMBER OF TT]: Select the maximum number of TT to track, 50 or 100.

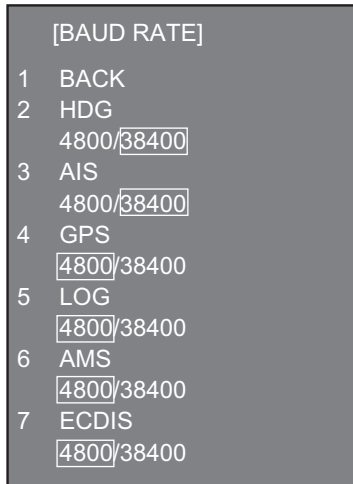
TT SENSOR DATA menu

For the service technician.

3. ADJUSTMENTS

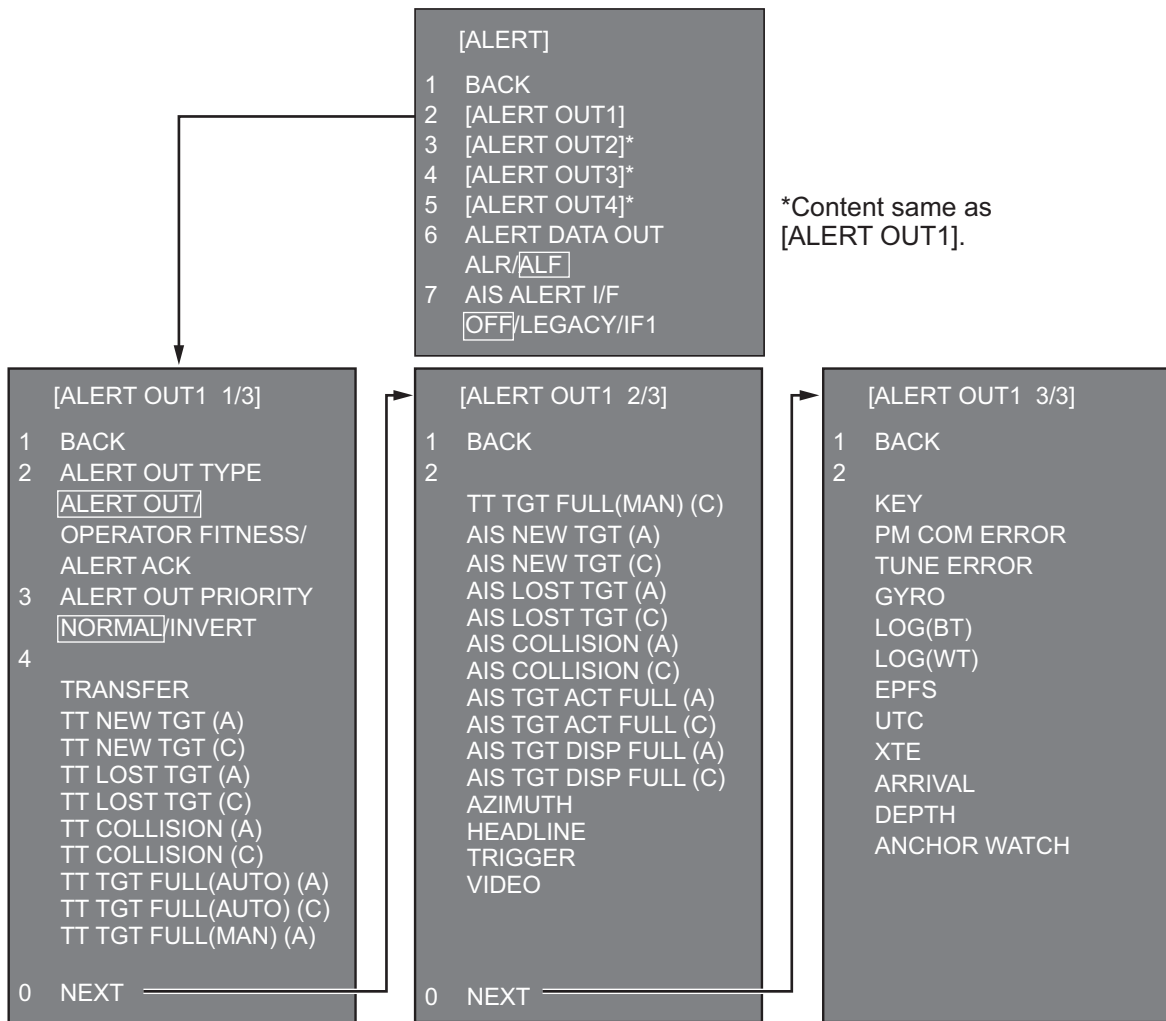
3.7.6 BAUD RATE menu

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



3.7.7 ALERT I/F menu

Four alert outputs are available, [ALERT OUT1] - [ALERT OUT4]. Set each alert out referring to the description below.



ALERT menu (main)

[ALERT OUT 1] - [ALERT OUT 4]: Select the alert to output for each alert out number.

[ALERT DATA OUT]: Select the alert output format, [ALR] (Set Alarm State) or [ALF] (Alert Sentence).

[AIS ALERT I/F]: Set the AIS alert interface. [OFF] does not output AIS alert.

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

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

ALERT OUT sub menus

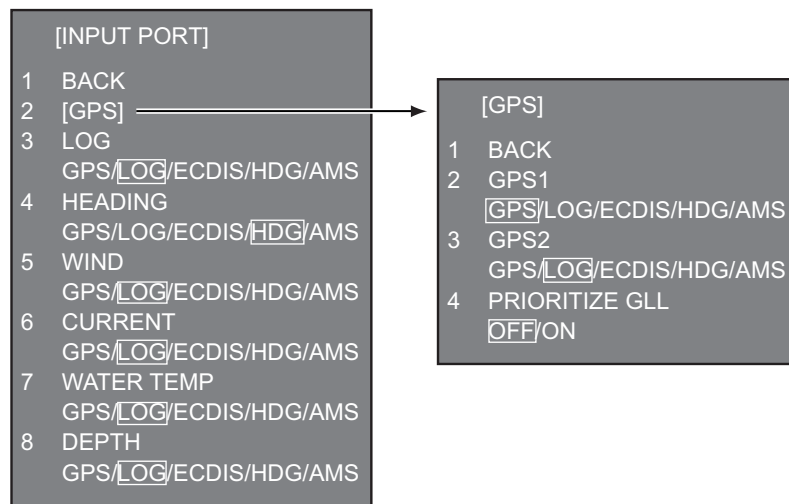
[ALERT OUT TYPE]: Select the alert out format, [ALERT OUT], [OPERATOR FITNESS] or [ALERT ACK].

[ALERT OUT POLARITY]: Select the alert out polarity, [NORMAL] or [INVERT].

Meaning of “(A)”, “(C)” suffixed items:

“(A)”: Outputs the alert when the corresponding item is an unacknowledged alert.-

“(C)”: Outputs the alert when the corresponding alert condition is found.

3.7.8 INPUT PORT menu**INPUT PORT menu**

Select the source for LOG, GPS, HEADING, WIND, CURRENT, WATER TEMP, and DEPTH..

[GPS] menu: Select the source for GPS navigator GPS1 and GPS2. [PRIORITIZE GLL], when turned on, gives priority to the GLL sentence.

[LOG]: Select the source for speed data.

[HEADING]: Select the source for heading data.

[WIND]: Select the source for wind data.

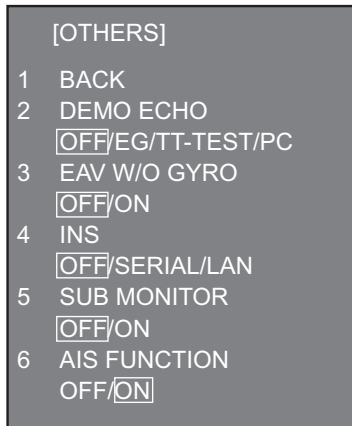
[CURRENT]: Select the source for current (tide) for data.

[WATER TEMP]: Select the source for water temperature data.

[DEPTH]: Select the source for depth data.

3. ADJUSTMENTS

3.7.9 OTHERS menu



[DEMO ECHO]: Select the source for the demonstration echo, [EG] (Echo Generator), [TT-TEST] or [PC]. Select [OFF] to deactivate the demonstration echo feature.

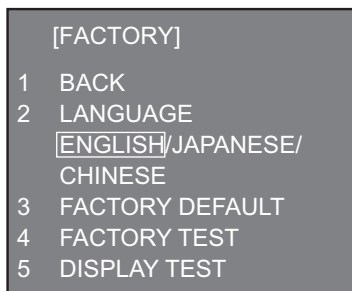
[EAV W/O GYRO]: The each averaging feature can be used without a gyrocompass. Select [ON] to use the feature without a gyrocompass.

[INS]: Select the INS communication method, [SERIAL] or [LAN]. Select [OFF] for no INS connection.

[SUB MONITOR]: No use.

[AIS FUNCTION]: Enable or disable the AIS function. (Available with non-IMO type only.)

3.7.10 FACTORY menu



[LANGUAGE]: Select the language to use.

[FACTORY DEFAULT]: Restore factory default settings.

[FACTORY TEST]: Factory use.

[DISPLAY TEST]: Factory use.

4. INPUT/OUTPUT DATA

Notice for FAR-1518(-BB)/FAR-1528(-BB)

These radars must be interconnected to the following type approved sensors:

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

4.1 Processor Unit

Input and output data are shown in the table below.

Input

Data	Specification	Contents	Remarks
Heading signal	IEC 61162-2*		
Speed signal	IEC 61162-1 Ed.4		
Navaid data	IEC 61162-1 Ed.4	Position, time and date, datum, course, speed, wind, current, depth, temperature, Navtex, etc.	
AIS signal	IEC 61162-2		
Alarm handling signal	Contact closure		Input from alarm system
	IEC 61162-1 Ed.4		Input from alarm system

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

Output

Data	Specification	Contents	Remarks
Radar system data	IEC 61162-1 Ed.4	RSD, OSD	
TT data**	IEC 61162-1 Ed.4	TTD, TTM, TLB	
Alarm signal	IEC 61162-1 Ed.4		Four systems, output contents are selected on the [ALARM] menu.
	Contact closure		

** The output sentence can be set on the [TT DATA OUTPUT] menu (see page 3-9).

4.2 IEC 61162 Sentences

Input sentence and sentence priority

Data	Sentence priority
Heading (true)	THS>HDT>HDG*>VHW*
Heading (magnetic)*	HDG>HDM>VHW
Magnetic deviation*	HDG
AIS target message, alert	VDM, VDO, ABK, ALR
Time and date	ZDA
Position	GNS>GGA>RMC>GLL
Datum	DTM
GNSS satellite malfunction detection	GBS
Course over the ground (COG)	VTG>RMC>VBW
Speed over the ground (SOG) (GPS)	VTG>RMC
Speed over the ground (LOG (BT))	VBW
Speed through the water (STW)	VBW>VHW
Alert	ACK, ACN, HBT
Waypoint	RMB>BWR>BWC>WPL
Route data	RTE+WPL
Wind speed and angle (true)	MWV>VWT
Wind speed and angle (relative)	MWV>VWR
Depth	DPT>DBT>DBS>DBK
Water temperature	MTW
Current	CUR, VDR

* No use with IMO-type radar.

Output sentences

Data	Sentence
AIS message, alert	ABM, BBM, ACK, VSD
Alert sentence	ALR, ALC, ALF, ARC, HBT
Operator fitness	EVE
Own ship data	OSD
Radar system data	RSD
Target data	TTM, TLB, TTD
Target L/L position	TLL

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 (mm²)* 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

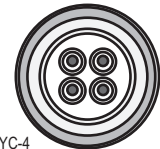
S: All cores in one sheath
 -S: Individually sheathed cores
 SLA: All cores in one shield, plastic
 tape w/aluminum tape
 -SLA: Individually shielded cores,
 plastic tape w/aluminum tape



DPYCY



TPYCY



MPYC-4



TTYCSLA-4

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

1 2 3 4
MPYC - 4
 Designation type # of cores

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

Type	Core		Cable Diameter	Type	Core		Cable Diameter
	Area	Diameter			Area	Diameter	
DPYC-1.5	1.5mm ²	1.56mm	11.7mm	TTYCS-1	0.75mm ²	1.11mm	10.1mm
DPYC-2.5	2.5mm ²	2.01mm	12.8mm	TTYCS-1T	0.75mm ²	1.11mm	10.6mm
DPYC-4	4.0mm ²	2.55mm	13.9mm	TTYCS-1Q	0.75mm ²	1.11mm	11.3mm
DPYC-6	6.0mm ²	3.12mm	15.2mm	TTYCS-4	0.75mm ²	1.11mm	16.3mm
DPYC-10	10.0mm ²	4.05mm	17.1mm	TTYCSLA-1	0.75mm ²	1.11mm	9.4mm
DPYCY-1.5	1.5mm ²	1.56mm	13.7mm	TTYCSLA-1T	0.75mm ²	1.11mm	10.1mm
DPYCY-2.5	2.5mm ²	2.01mm	14.8mm	TTYCSLA-1Q	0.75mm ²	1.11mm	10.8mm
DPYCY-4	4.0mm ²	2.55mm	15.9mm	TTYCSLA-4	0.75mm ²	1.11mm	15.7mm
MPYC-2	1.0mm ²	1.29mm	10.0mm	TTYCY-1	0.75mm ²	1.11mm	11.0mm
MPYC-4	1.0mm ²	1.29mm	11.2mm	TTYCY-1T	0.75mm ²	1.11mm	11.7mm
MPYC-7	1.0mm ²	1.29mm	13.2mm	TTYCY-1Q	0.75mm ²	1.11mm	12.6mm
MPYC-12	1.0mm ²	1.29mm	16.8mm	TTYCY-4	0.75mm ²	1.11mm	17.7mm
TPYC-1.5	1.5mm ²	1.56mm	12.5mm	TTYCY-4S	0.75mm ²	1.11mm	21.1mm
TPYC-2.5	2.5mm ²	2.01mm	13.5mm	TTYCY-4SLA	0.75mm ²	1.11mm	19.5mm
TPYC-4	4.0mm ²	2.55mm	14.7mm	TTYCYS-1	0.75mm ²	1.11mm	12.1mm
TPYCY-1.5	1.5mm ²	1.56mm	14.5mm	TTYCYS-4	0.75mm ²	1.11mm	18.5mm
TPYCY-2.5	2.5mm ²	2.01mm	15.5mm	TTYCYSLA-1	0.75mm ²	1.11mm	11.2mm
TPYCY-4	4.0mm ²	2.55mm	16.9mm	TTYCYSLA-4	0.75mm ²	1.11mm	17.9mm

APPENDIX 2 DIGITAL INTERFACE

Digital Interface

Input sentence

ABK, ACK, ACN, ALR, BWC, BWR, CUR, DBK, DBS, DBT, DPT, DTM, GBS, GGA, GLL, GNS, HBT, HDG, HDM, HDT, MTW, MWV, RMB, RMC, RTE, THS, VBW, VDM, VDO, VDR, VHW, VSD, VTG, VWR, VWT, WPL, ZDA

Output sentences

ABM, ACK, ALC, ALF, ALR, ARC, BBM, EVE, HBT, OSD, RSD, TLB, TLL, TTD, TTM, VSD

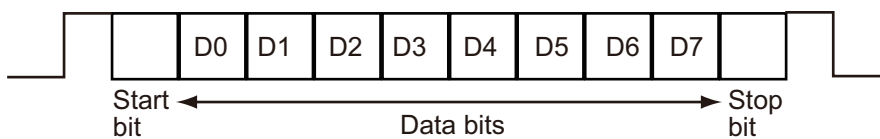
Data reception

Data is received in serial asynchronous form in accordance with the standard referenced in IEC 61162-2 or IEC 61162-1 Ed.4.

The following parameters are used:

Baud rate: 38,400 bps (HDT, THS, !AIVDM, !AIVDO, !AIABK, \$IALR. 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 - UAIS Addressed and binary broadcast acknowledgment

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

1. MMSI of the addressed AIS unit (9 digits) (No use)
2. AIS channel of reception (No use)
3. Message ID (6, 8, 12, 14) (No use)
4. Message sequence number (0 - 9) (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 not ACK by addressed AIS unit
 - 2 = message could not be broadcast (quantity of encapsulated data exceeds five slots)
 - 3 = requested broadcast of message (8, 14 or 15) has been successfully completed
 - 4 = late reception of message (7 or 13) ACK 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. Local alarm number (identifier) (001 - 999)

ACN - Alert command

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

1. Time (hh=00 - 23, mm=00 - 59, ss.ss=00.00 - 60.99) (No use)
2. Manufacturer mnemonic code (3 digit alphanumeric code), null
3. Alert identifier (10001 - 10999)
4. Alert instance (null)
5. Alert command (A/Q/O/S)
 A=ACK from ext. equipment,
 Q=Request from ext. equipment
 O=Responsibility transfer
 S=Silence from ext. equipment
6. Sentence status flag (C)
 (C should not be null field. Sentence without C is not a command.)

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 (001 - 999)
3. Alarm condition (A/V)
 A=threshold exceeded V=not exceeded
4. Alarm acknowledge state (A/V)
 A=acknowledged V=not acknowledged
5. Alarm description text (alphanumeric characters, max. 32)

BWC - Bearing and distance to waypoint - great circle

\$**BWC,hhmmss.ss,IIII.II, a,IIII.II,a,yyy.y,T, yyy.y,M,yyy.y,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 (0000.00000 - 9000.00000)
3. N/S (N/S)
4. Waypoint longitude (00000.00000 - 18000.00000)
5. E/W (E/W)
6. Bearing, degrees true (No use)
7. Unit, True (No use)
8. Bearing, degrees (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/D)
 A=Autonomous
 D=Differential
 E=Estimated (dead reckoning) mode
 S=Simulator
 N=Data not valid

APPENDIX 2 DIGITAL INTERFACE

BWR - Bearing and distance to waypoint - rhumb line

\$ **BWR,hhmmss.ss,IIII.II,a,IIII.II,a,yyy.y,T,yyy.y,M,yyy.y,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 (0000.00000 - 9000.00000)
3. N/S (N/S)
4. Waypoint longitude (00000.00000 - 18000.00000)
5. E/W (E/W)
6. Bearing, degrees true (0.00 - 360.00) (No use)
7. Unit, True (No use)
8. Bearing, degrees magnetic (No use)
9. Unit (No use)
10. Distance, nautical miles (No use)
11. Unit (No use)
12. Waypoint ID (Max. 15 characters)
13. Mode Indicator (A/D)
 - A=Autonomous
 - D=Differential
 - E=Estimated (dead reckoning) mode
 - S=Simulator
 - N=Data not valid

CUR - Current

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

1. Validity of data (A)
 - A=valid, V=not valid
2. Data set number (No use)
3. Layer number (1 - 3)
4. Current depth in meters (No use)
5. Current direction in degrees (0.00 - 360.00)
6. Direction reference in use (No use)
7. Current speed in knots (0.00 - 99.94)
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<CR><LF>
1 2 3 4 5 6

1. Water depth (0.00 - 99999.994)
2. f = feet (fixed)
3. Water depth (0.00 - 99999.994)
4. M = Meters (fixed)
5. Water depth (0.00 - 99999.994)
6. F = Fathom (fixed)

DBS - Depth below surface

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

1. Water depth (0.00 - 99999.994)
2. f = feet (fixed)
3. Water depth (0.00 - 99999.994)
4. M = Meters (fixed)
5. Water depth (0.00 - 99999.994)
6. F = Fathom (fixed)

DBT - Depth below transducer

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

1. Water depth (0.00 - 99999.994)
2. f = feet (fixed)
3. Water depth (0.00 - 99999.994)
4. M = Meters (fixed)
5. Water depth (0.00 - 99999.994)
6. F = Fathom (fixed)

DPT - Depth

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

1. Water depth relative to the transducer, meters (0.00-99999.994)
2. Offset from transducer, meters (IMO: -99.994 - 99.994,
 Other than IMO: -99.994 - 99.994, null)
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/W72/S85/P90)
 W84=WGS84 W72=WGS72 S85=SGS85 P90=PE90
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)

GBS - GNSS satellite fault detection

\$**GBS, hhmmss.ss, x.x, x.x, x.x, xx, x.x, x.x, x.x,hh*hh<CR><LF>
 1 2 3 4 5 6 7 8 9 10

1. UTC time of GGA or GNS fix associated with this sentence (No use)
2. Expected error in latitude (0.0 - 999.9)
3. Expected error in longitude (0.0 - 999.9)
4. Expected error in altitude (No use)
5. ID number of most likely failed satellite (No use)
6. Probability of missed detection for most likely failed satellite (No use)
7. Estimate of bias in meters on most likely failed satellite (No use)
8. Standard deviation of bias estimate (No use)
9. GNSS Signal ID (No use)
10. GNSS System ID (No use)

APPENDIX 2 DIGITAL INTERFACE

GGA - Global positioning system fix data

```
$**GGA,hhmmss.ss,lll.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 (0000.00000 - 9000.00000)
3. N/S (N/S)
4. Longitude (0000.00000 - 18000.00000)
5. E/W (E/W)
6. GPS quality indicator (1 - 8)
 - 0 = fix not available or invalid
 - 1 = GPS SPS mode
 - 2 = differential GPS, SPS mode
 - 3 = GPS PPS mode
 - 4 = Real Time Kinematic. Satellite system used in RTK mode with fixed integers
 - 5 = Float RTK. Satellite system used in RTK mode with floating solution
 - 6 = Estimated (dead reckoning) mode
 - 7 = Manual input mode
 - 8 = Simulator mode
7. Number of satellite in use (No use)
8. Horizontal dilution of precision (0.0 - 999.9)
9. Antenna altitude above/below mean sea level (No use)
10. Unit, m (No use)
11. Geoidal separation (No use)
12. Unit, m (No use)
13. Age of differential GPS data (0 - 999, null)
14. Differential reference station ID (No use)

GLL - Geographic position, latitude/longitude

```
$**GLL,lll.lll,a,yyyyy.yyy,a,hhmmss.ss,A,a,*hh<CR><LF>  
      1 2      3      4      5      6 7
```

1. Latitude (0000.00000 - 9000.00000)
2. N/S (N/S)
3. Longitude (0000.00000 - 18000.00000)
4. E/W (E/W)
5. UTC of position (No use)
6. Status (A)
 - A=data valid V=data invalid
7. Mode indicator (A/D/E/M/S)
 - A=Autonomous D=Differential E=Estimated M=Manual input S=Simulator N=Data not valid

GNS - GNSS fix data

```
$**GNS,hhmmss.ss,lll.lll,a,llll.lll,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 (0000.00000 - 9000.00000)
3. N/S (N/S)
4. Longitude (0000.00000 - 18000.00000)
5. E/W (E/W)
6. Mode indicator (A/D/P/R/F/E/M/S)
 - N=No fix A=Autonomous D=Differential P=Precise R=Real Time Kinematic
 - F=Float RTK E=Estimated Mode M=Manual Input Mode 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 - 999)
12. Differential reference station ID (No use)
13. Navigational status indicator(S/C/U/V, null)
 - S=Safe, C=Caution, U=Unsafe, V=Not valid