

Installation Manual

GPS NAVIGATOR

Model GP-170

SAFETY INSTRUCTIONS	i
SYSTEM CONFIGURATIONS.....	ii
EQUIPMENT LISTS.....	iv
1. MOUNTING.....	1-1
1.1 Display Unit.....	1-1
1.2 Antenna Unit	1-3
2. WIRING.....	2-1
2.1 Grounding	2-1
2.2 External Equipment.....	2-2
2.3 MAIN Board	2-2
3. ADJUSTMENTS	3-1
3.1 Checking Operation	3-1
3.2 Beacon Setup	3-3
3.3 DGPS Operation Checking	3-7
3.4 Ethernet Setup	3-8
3.5 Input/Output Signal	3-10
3.6 Sound Test.....	3-19
3.7 How to Set Dual Configuration.....	3-19
APPENDIX 1 DIGITAL INTERFACE (IEC 61162-1 EDITION 4 (2010-11)).....	AP-1
PACKING LISTS	A-1
OUTLINE DRAWINGS	D-1
INTERCONNECTION DIAGRAMS.....	S-1

**FURUNO ELECTRIC CO., LTD.**www.furuno.com

All brand and product names are trademarks, registered trademarks or service marks of their respective holders.

ECF

(Elemental Chlorine Free)

The paper used in this manual
is elemental chlorine free.

FURUNO ELECTRIC CO., LTD.

9-52 Ashihara-cho,
Nishinomiya, 662-8580, JAPAN

• FURUNO Authorized Distributor/Dealer

All rights reserved. Printed in Japan

A : JUN. 2014

Pub. No. IME-44820-A

(TAHA) GP-170





0 0 0 1 7 7 7 3 7 1 0









SAFETY INSTRUCTIONS




The installer must read the appropriate safety instructions before attempting to install the equipment.

 WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

(Examples of symbols)

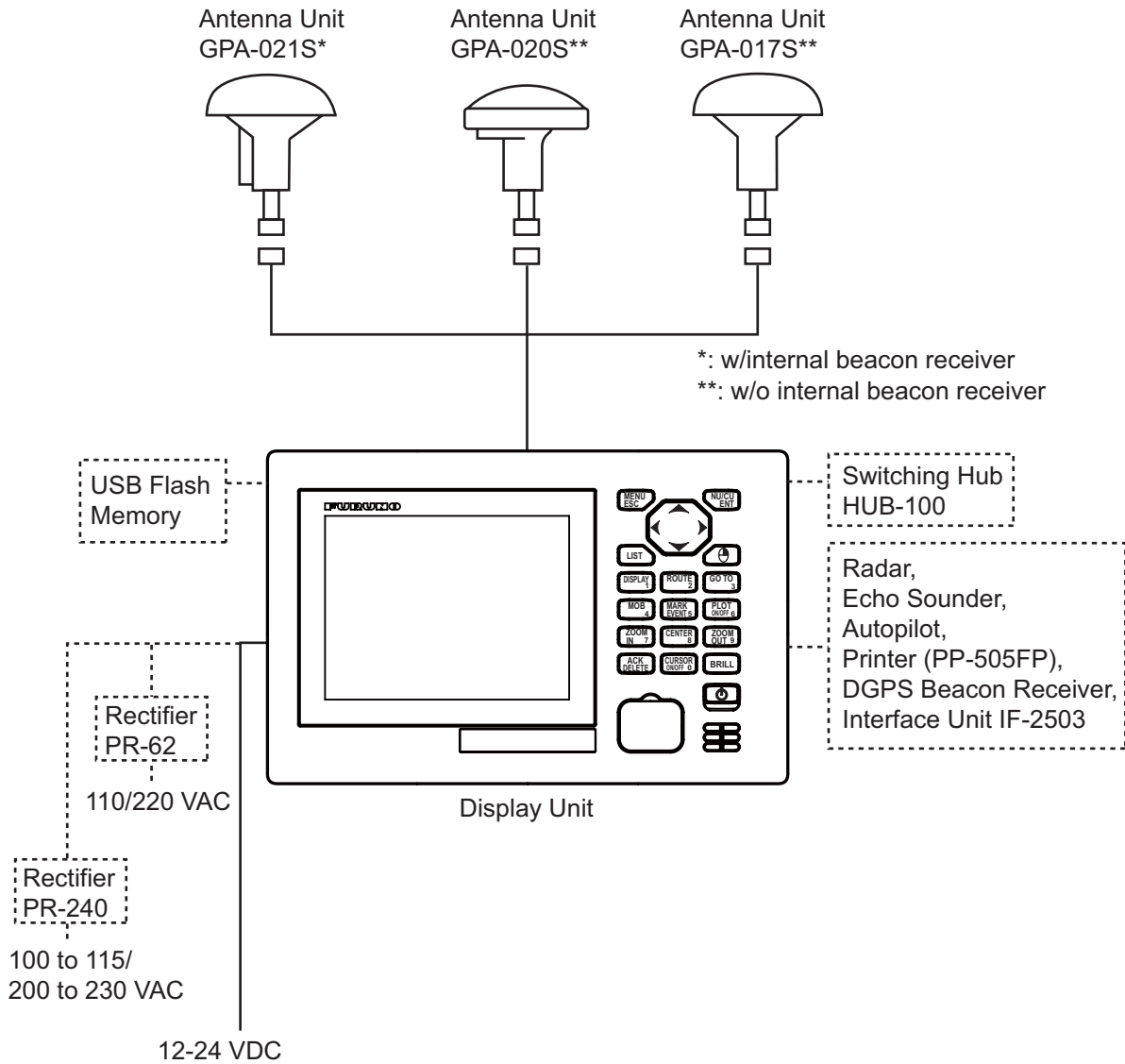
 Warning, Caution	 Prohibitive Action	 Mandatory Action
--	--	--

 WARNING	
	Do not disassemble or modify the equipment. Fire, electrical shock or serious injury can occur.
	Turn off the power at the switchboard before beginning the installation. Fire or electrical shock can result if the power is left on.
	Be sure that the power supply is compatible with the voltage rating of the equipment. Connection of an incorrect power supply can cause fire or damage the equipment.

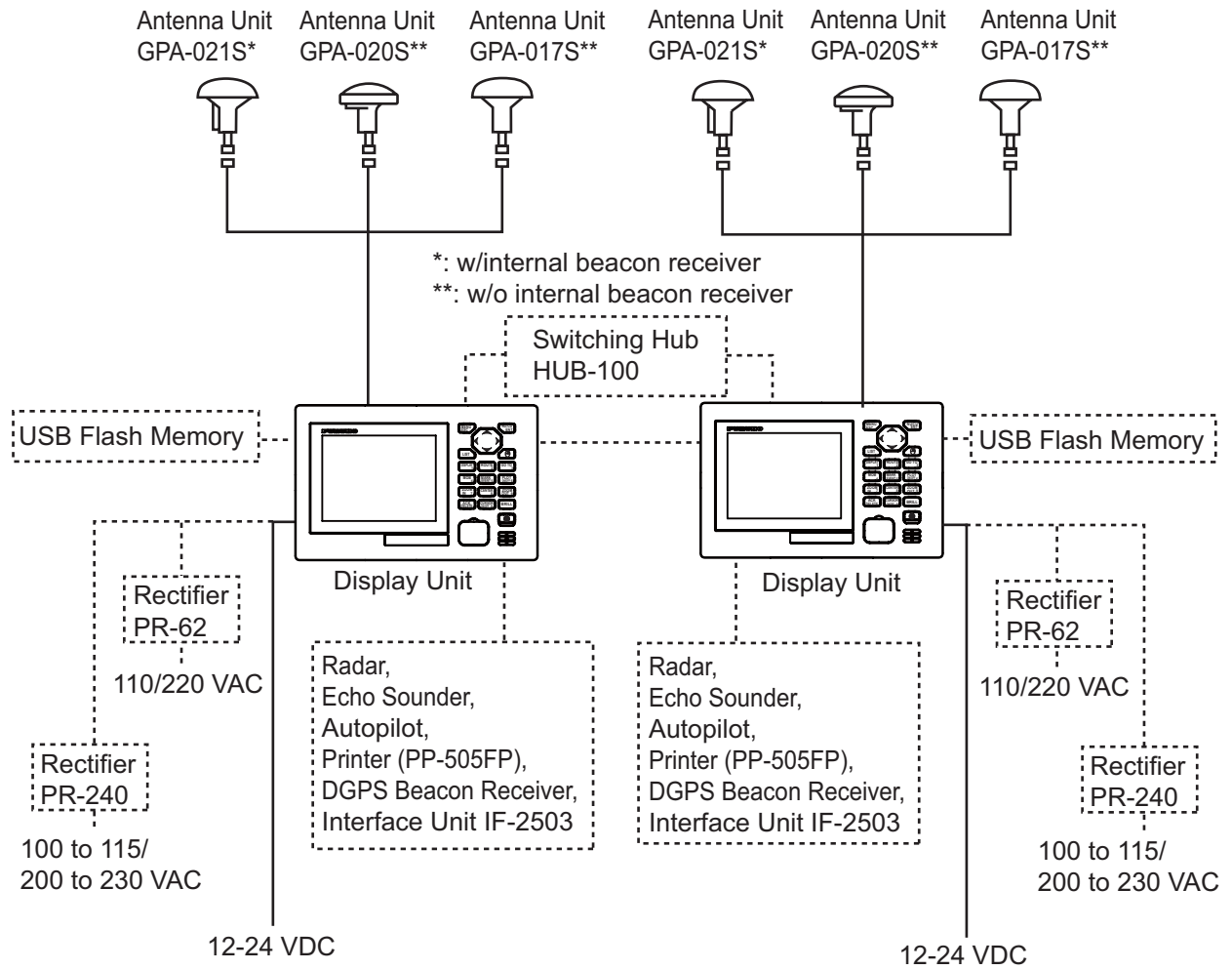
 CAUTION		
	Ground the equipment to prevent electrical shock and mutual interference.	
	Use the proper fuse. Use of an incorrect fuse may damage the equipment.	
Observe the following compass safe distances to prevent interference to a magnetic compass:		
	Standard compass	Steering compass
Display unit	0.60m	0.40m
GPA-021S	0.30m	0.30m
GPA-020S	0.30m	0.30m
GPA-017S	0.30m	0.30m

SYSTEM CONFIGURATIONS

Single configuration



Dual configuration



Environmental category

Units	Category
Antenna Unit	Exposed to the weather
Display Unit	Protected from the weather

EQUIPMENT LISTS

Standard Supply

Name	Type	Code No.	Qty	Remarks
Antenna Unit	GPA-017S	-	1	For GPS, $\phi 69$
	GPA-020S	-		For GPS, $\phi 156$, Improved resistance to multipath
	GPA-021S	-		For DGPS
Display Unit	GP170-EA	-	1	With Beacon RX
	GP170-EN	-		Without Beacon RX
Installation Materials	CP20-03400	000-023-633	1	With Mast Mount Kit With Antenna Cable Assy.
	CP20-03410	000-023-634		With Mast Mount Kit Without Antenna Cable Assy.
	CP20-03420	000-023-635		Without Mast Mount Kit With Antenna Cable Assy.
	CP20-03430	000-023-636		Without Mast Mount Kit Without Antenna Cable Assy.
Accessories	FP20-01100	000-042-239	1	LCD Cleaning Cloth (Code No.: 100-360-672-10, 19-028-3125-2)
Spare Parts	SP20-01401	001-243-840	1	Fuse (Code No.: 000-155-850-10, FGBO-A 125V 3A)

Optional Supply

Name	Type	Code No.	Qty	Remarks
Flush Mount Kit S	OP20-40	001-243-890	1	For display unit
Flush Mount Kit F	OP20-41	001-243-900	1	
Antenna Cable Set	CP20-01700	004-372-110	1	CP20-01701+30m cable Cable type: 8D-FB
	CP20-02700	004-381-160		CP20-02701+30m cable Cable type: 8D-FB
	CP20-01720	001-207-980		CP20-01701+40m cable Cable type: 8D-FB
	CP20-02720	001-207-990		CP20-02701+40m cable Cable type: 8D-FB
	CP20-01710	004-372-120		CP20-01701+50m cable Cable type: 8D-FB
	CP20-02710	004-381-170		CP20-02701+50m cable Cable type: 8D-FB
Antenna Cable Assy.	TNC-PS/PS-3D-L15M-R	001-173-110-10	1	15 m Cable type: 3D-2V

Name	Type	Code No.	Qty	Remarks
Right Angle Antenna Base	No.13-QA330	001-111-910-10	1	For antenna unit
L-Type Antenna Base	No.13-QA310	001-111-900-10		
Handrail Antenna Base	No.13-RC5160	001-111-920-10		
Mast Mount Kit	CP20-01111	004-365-780		
Cable Assy.	MJ-A6SPF0011-050C (03S9202)	000-159-690-10	1	Cross cable 5m, 6P-4P For DATA1, 2 or 3
	MJ-A6SPF0011-100C (03S9226)	000-159-691-10		Cross cable 10m, 6P-4P For DATA1, 2 or 3
	MJ-A6SPF0011-200C	001-244-120		Cross cable 20m, 6P-4P For DATA1, 2 or 3
	MJ-A7SPF0003-050C (20S0241)	000-159-688-11		w/connector, 5m, 7P For DATA4
	MJ-A6SPF0003-050C (20S0093)	000-154-054-10		w/connector, 5m, 6P For DATA1, 2 or 3
	MJ-A6SPF0012-050C (64S4073)	000-154-053-10		Cross cable 5m, 6p-6p For DATA1, 2 or 3
	MJ-A6SPF0012-100C (64S4071)	000-154-037-10		Cross cable 10m, 6p-6p For DATA1, 2 or 3
	MJ-A6SPF0012-200C	001-244-130	1	Cross cable 20m, 6p-6p For DATA1, 2 or 3
	MOD-WPAS0001-030+	000-164-609-10	1	3m, Waterproof
Beacon Receiver Set	OP20-42	000-023-637	1	
Rectifier	PR-62	-	1	For 100VAC
		-		For 220VAC
	PR-240	-		AC100-115V/AC200-230V
Printer	PP-505FP	-	1	
Data Switch Box	MD-200	-	1	
Interface Unit	IF-2503	-	1	

This page is intentionally left blank.

1. MOUNTING

NOTICE

Do not apply paint, anti-corrosive sealant or contact spray to coating or plastic parts of the equipment.

Those items contain organic solvents that can damage coating and plastic parts, especially plastic connectors.

1.1 Display Unit

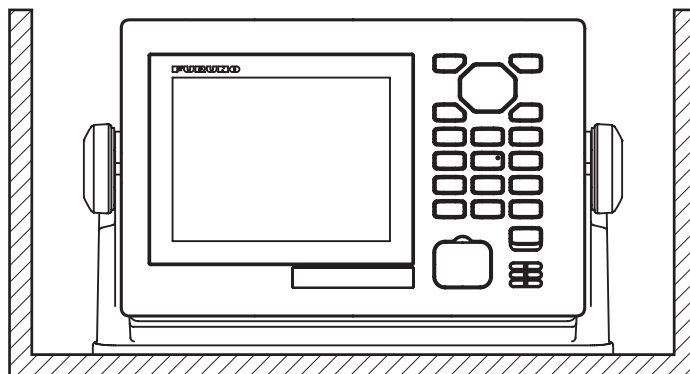
When selecting a mounting location for GP-170, keep in mind the following points.

- Keep the display unit out of direct sunlight.
- Locate the unit away from air-conditioner or heater.
- The temperature at the mounting location shall be between -15°C and $+55^{\circ}\text{C}$.
- Locate the unit away from exhaust pipes and vents.
- The mounting location should be well ventilated.
- Mount the unit where shock and vibration are minimal (comply with IEC 60945 Ed.4).
- Keep the display unit away from equipment that generates electromagnetic fields, such as motor, generator.
- For maintenance and checking purposes, leave sufficient space around the unit and leave slack in cables. Minimum recommended space is shown in the outline drawing for the display unit.

The GP-170 can be flush mounted in a console or panel, or mounted on a desktop. Refer to the outline drawing at the end of manual.

1.1.1 Table top mounting

Mount the display unit on a desktop using the hanger.



1. MOUNTING

1.1.2 Flush mounting, fixed at front

An optional flush mount kit type F is required. For details, see the outline drawing at end of this manual. (Name: Flush Mount Kit F, Type: OP20-41, Code No.:001-243-900)

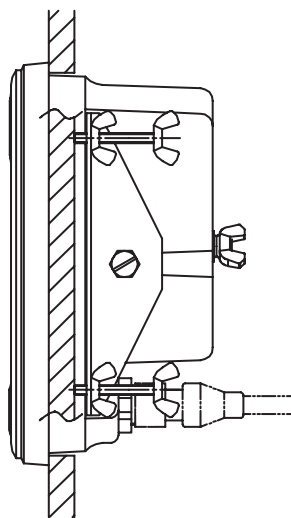
Name	Type	Code No	Qty
Self-tapping screw	5×20 SUS304	000-162-608-10	4
Hex.bolt	M6×12 SUS304	000-162-897-10	2
Spring washer	M6 SUS304	000-158-855-10	2
Cosmetic panel	20-035-1061	100-380-480-10	1

1.1.3 Flush mounting, fixed at rear

An optional flush mount kit type S is required. (Name: Flush Mount Kit S, Type: OP20-40, Code No.: 001-243-890)

Name	Type	Code No.	Qty
Wing bolt	M4×30 YBSC2	000-168-243-10	4
Hex. bolt	M6×12 SUS304	000-162-897-10	2
Wing nut	M4 YBCS2	000-168-239-10	4
Spring washer	M6 SUS304	000-158-855-10	2
Flush mount metal	20-035-1062	100-381-290-10	2

1. Prepare a cutout in the mounting location whose dimensions are 242 (W) X 152 (H) mm.
2. Insert the unit to the cutout.
3. Attach two flush mount metals to the unit with two hex bolts (M6×12) and two spring washers
4. Screw four wing bolts to wing nut.
5. Fasten the unit with wing bolts assembled at step 4, and then tighten nuts.



1.2 Antenna Unit

1.2.1 Mounting

Install the antenna unit referring to the "INSTALLATION PROCEDURE" at end of manual. When selecting a mounting location for the antenna unit, keep in mind the following points.

- Select a location out of the radar and inmarsat beams. Those beams will obstruct or prevent reception of the GPS satellite signal.
- The location should be well away from a VHF/UHF antenna. A GPS receiver is interfered by a harmonic wave of a VHF/UHF antenna.
- There should be no interfering object within the line-of-sight to the satellites. An object within line-of-sight to satellites, for example, a mast, may block reception or prolong acquisition time.
- Mount the antenna unit as high as possible to keep it free from interfering objects and water spray. Freezing water can interrupt reception of the GPS satellite signal.

1. MOUNTING

1.2.2 Extending antenna cable length

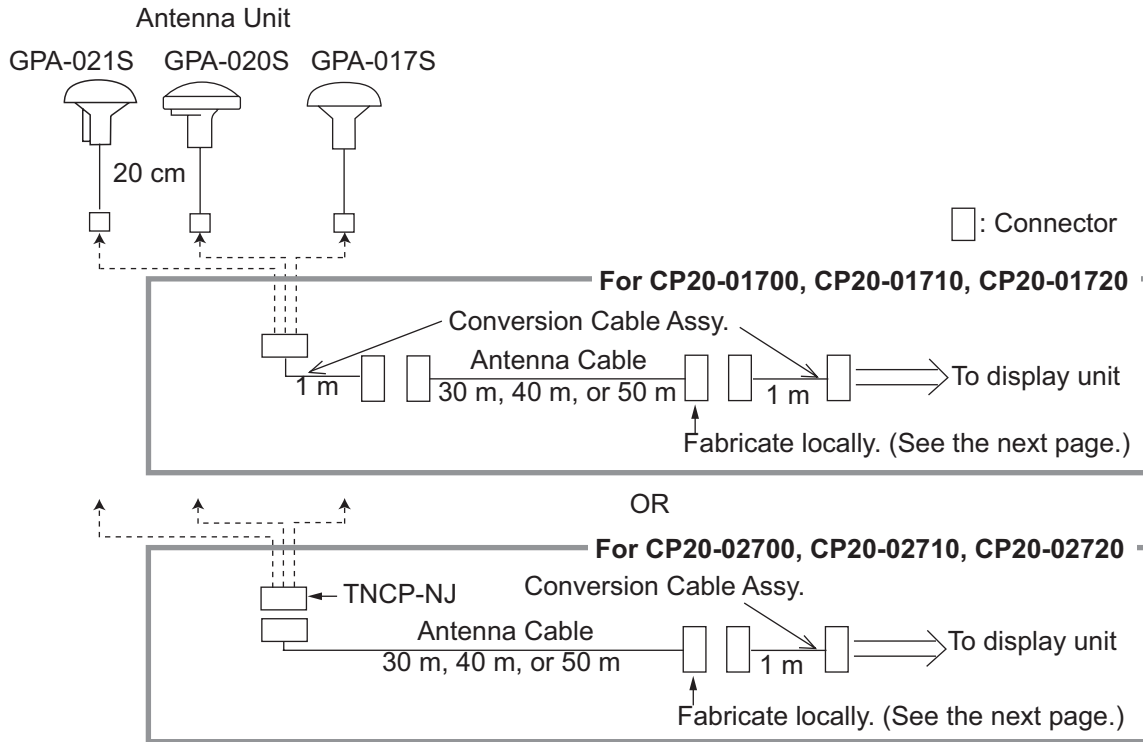
Extension cable line-up

The standard cable is 15 m long. 30 m, 40 m, and 50 m long extension cable sets are optionally available.

Cable length	Necessary parts	Code no.
30 m	CP20-01700	004-372-110
	CP20-02700	004-381-160
40 m	CP20-01720	001-207-980
	CP20-02720	001-207-990
50 m	CP20-01710	004-372-120
	CP20-02710	004-381-170

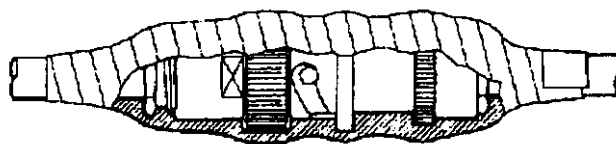
How to extend the antenna cable

Fabricate the end of antenna cable and attach the coaxial connector, then connect the antenna cable as shown below.



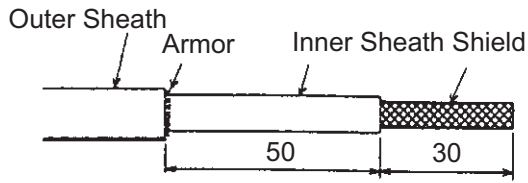
Waterproofing the connector

Wrap connector with vulcanizing tape and then vinyl tape. Bind the tape end with cable-tie.

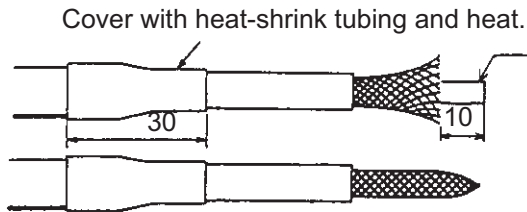


How to waterproof the connector of the antenna cable

How to attach the N-P-8DFB connector

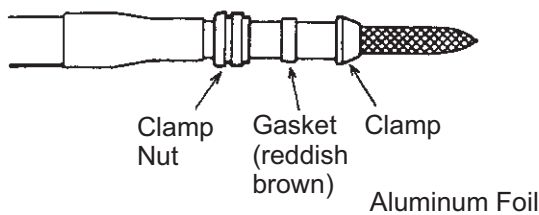


Remove outer sheath and armor by the dimensions shown left.
Expose inner sheath and shield by the dimensions shown left.

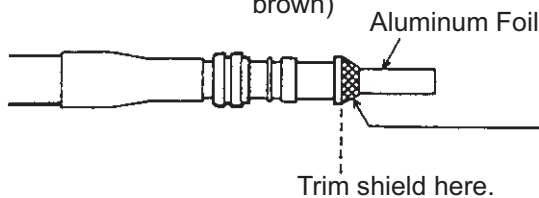


Cut off insulator and core by 10 mm.

Twist shield end.



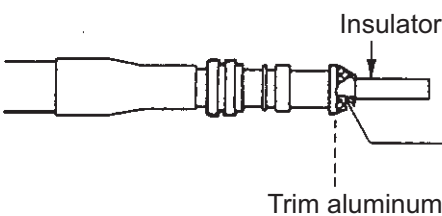
Slip on clamp nut, gasket and clamp as shown left.



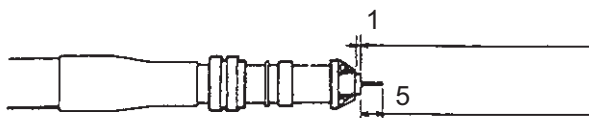
Fold back shield over clamp and trim.



Cut aluminum foil at four places, 90° from one another.

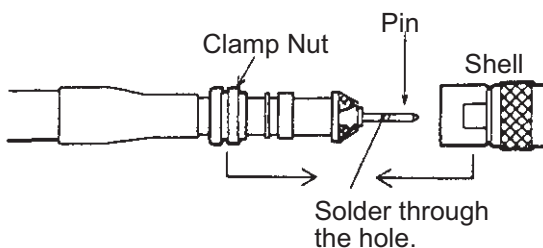


Fold back aluminum foil onto shield and trim.



Expose the insulator by 1 mm.

Expose the core by 5 mm.



Slip the pin onto the conductor. Solder them together through the hole on the pin.

Insert the pin into the shell. Screw the clamp nut into the shell. (Tighten by turning the clamp nut. Do not tighten by turning the shell.)

1. MOUNTING

This page is intentionally left blank.

2. WIRING

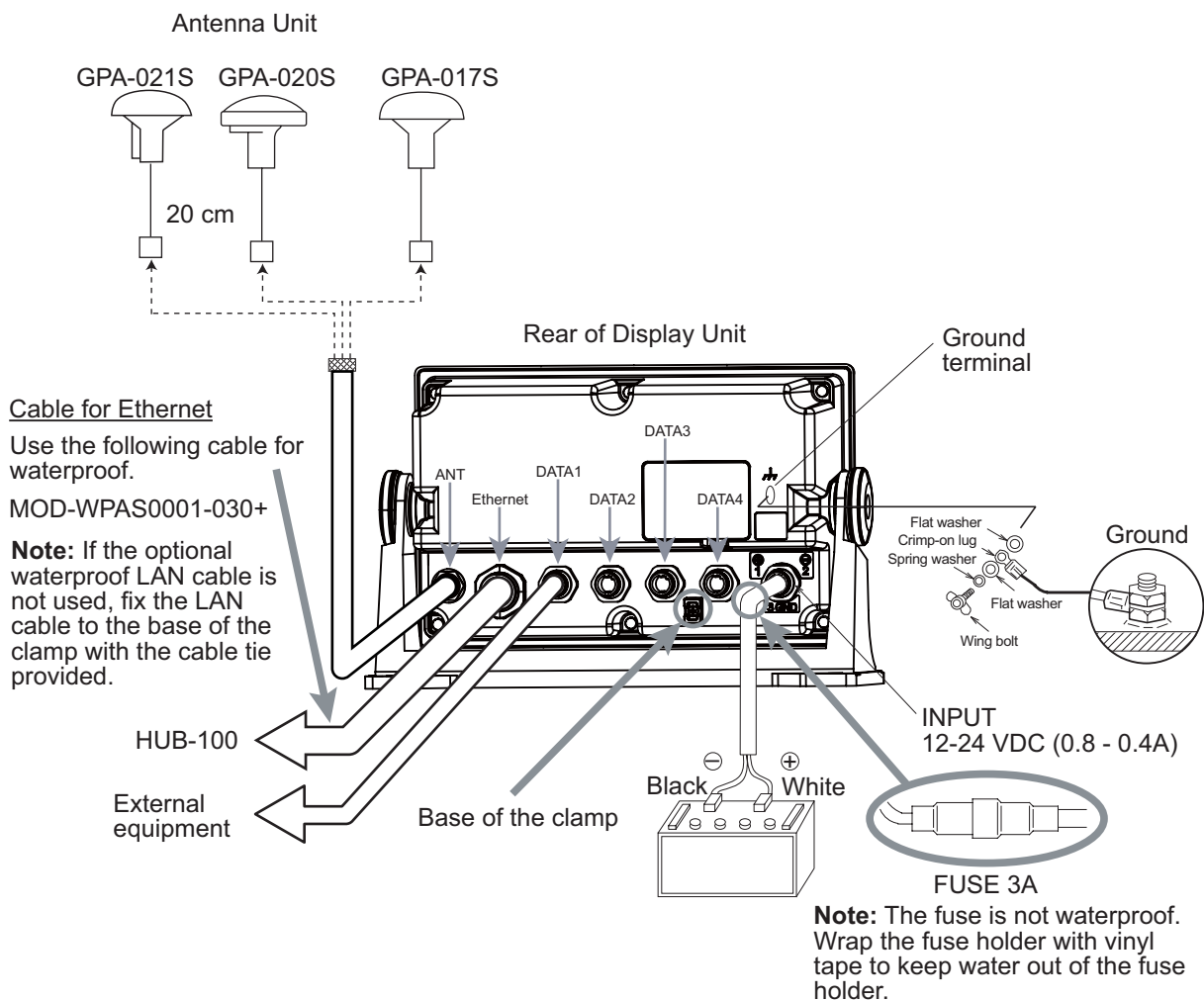


CAUTION



Ground the display unit to prevent loss of sensitivity and mutual interference.

Connect the equipment, referring to the figure below and the interconnection diagram at the back this manual.



2.1 Grounding

The display unit contains several CPUs. While they are operating, they radiate noise, which can interfere with other radio equipment. Ground the unit as follows to prevent it.

- The ground wire should be 1.25sq or larger.
- The ground wire should be as short as possible.

2.2 External Equipment

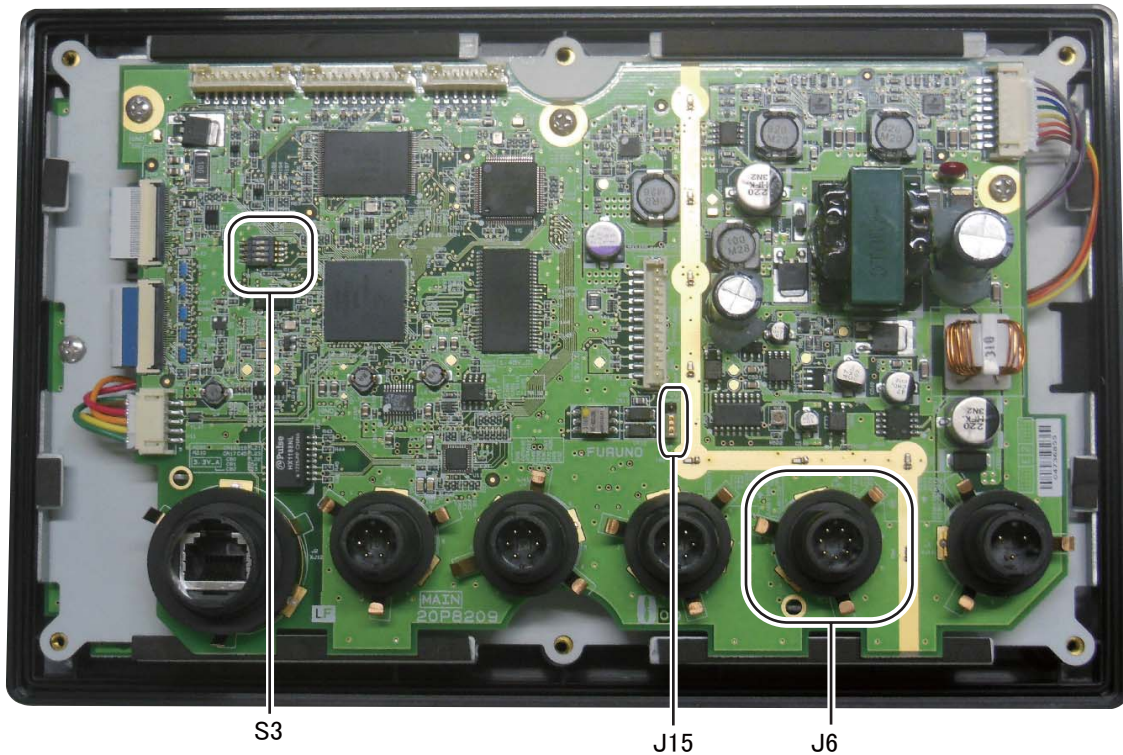
The DATA1, DATA2, DATA3, DATA4 and Ethernet ports are used to connect external equipment such as autopilot, remote display, navigation equipment, DGPS beacon receiver.

2.3 MAIN Board

How to set the termination resistors on jumper blocks

Use the jumper block J15 on the MAIN Board (20P8209) to set the termination resistor J6 on or off. The default setting is termination resistor: on.

- When setting the starting/ending terminal for the multipoint connection, or multipoint is not connected: termination resistor ON
- When not setting the starting/ending terminal for the multipoint connection: termination resistor OFF



MAIN BOARD 20P8209

Jumper block J15		Connector J6
1-2	SHORT	Termination resistor: ON (default setting)
2-3	SHORT	Termination resistor: OFF

Factory default setting on DIP switch

DIP switch S3				
No.	1	2	3	4
Factory default setting	ON	ON	OFF	OFF

3. ADJUSTMENTS

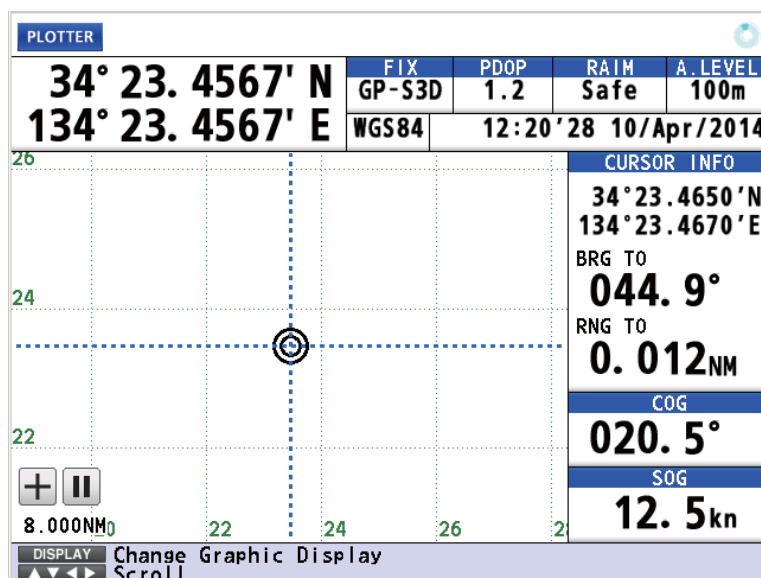
3.1 Checking Operation

1. Turn on GP-170.
The following display appears.



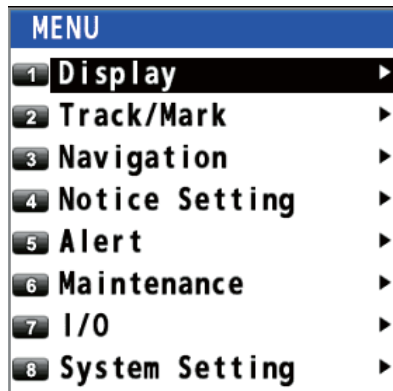
Self-test display at equipment start up

2. Confirm "OK" on the self-test display.
Note: The display related to BEACON appears at the bottom of the start-up screen when DGPS beacon receiver is built in the GP-170.
The following display appears. Your display may look slightly different from the one shown here depending on the devices connected to your product.

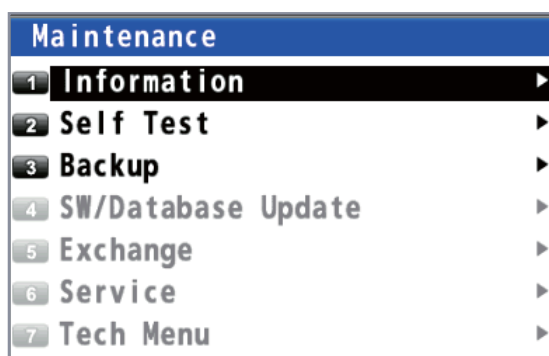


3. ADJUSTMENTS

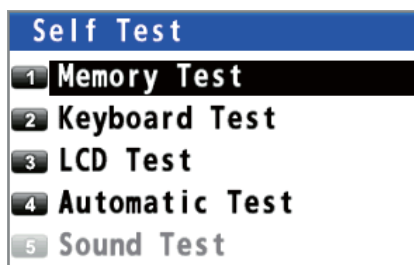
3. Press the **MENU/ESC** key to open the main menu.



4. Select [6 Maintenance].



5. Select [2 Self Test].



6. Select [1 Memory Test].
Confirm "OK" for all items except for Data1, Data2, Data3, Data4 and LAN on the self-test display.
Note 1: "BEACON" is displayed when DGPS function is provided.
Note 2: "OK" is displayed in the "USB" field when a USB flash memory is connected to the GP-170.

Self Test: memory, I/O. Data test					
Restart: Push "NU/CU ENT" or "方位モード 入力" Key					
Exit: Push "MENU ESC" or "メニュー 戻る" Key					
Start Time: 2013.11.01 01:35					
Main	OK	2013.11.01 01:35	GPS	OK	2013.11.01 01:35
ROM:	OK	2013.11.01 01:35	ROM:	OK	2013.11.01 01:35
RAM:	OK	2013.11.01 01:35	RAM:	OK	2013.11.01 01:35
USB:	OK	2013.11.01 01:35	Flash:	OK	2013.11.01 01:35
Data1:	OK	2013.11.01 01:35	Beacon	OK	2013.11.01 01:35
Data2:	OK	2013.11.01 01:35	ROM:	OK	2013.11.01 01:35
Data3:	OK	2013.11.01 01:35	RAM:	OK	2013.11.01 01:35
Data4:	OK	2013.11.01 01:35	Memory:	OK	2013.11.01 01:35
LAN:	OK	2013.11.01 01:35	ANT:	OK	2013.11.01 01:35

7. Press the **MENU/ESC** key to close the main menu.

3.2 Beacon Setup

The default setting is "automatic".

GP-170 can automatically select optimum DGPS station.

Note: Use the manual mode for the following cases.

- It takes more than five (5) minutes to fix DGPS position.
- The external beacon receiver cannot select a station automatically.

3.2.1 Manual beacon setup

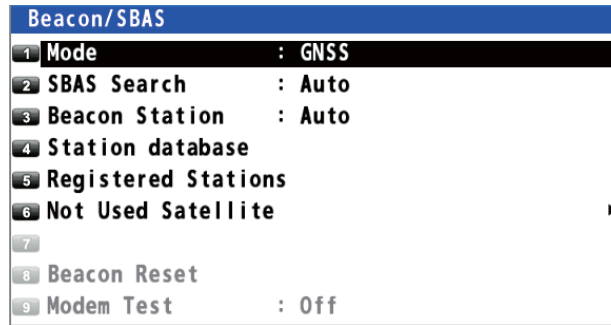
How to set the differential corrections to use

1. Press the **MENU/ESC** key open the main menu.
2. Select [8 System Setting].

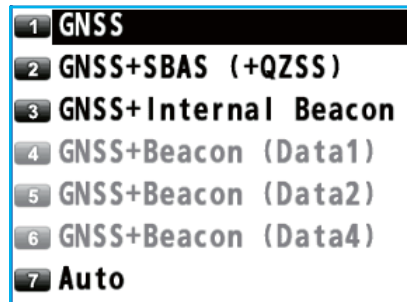
System Setting	
1	Language ▶
2	Plotter ▶
3	Unit Setup ▶
4	Correction, Offset ▶
5	GNSS ▶
6	Beacon/SBAS ▶
7	Network ▶
8	Demo ▶
9	Clear Memory ▶

3. ADJUSTMENTS

3. Select [6 Beacon/SBAS].



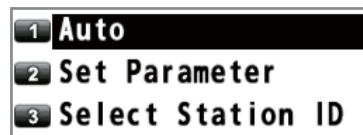
4. Select [1 Mode].



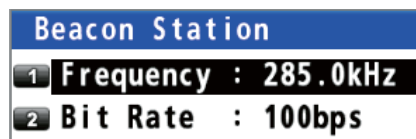
5. Select [3 GNSS+Internal Beacon].

How to set the beacon station

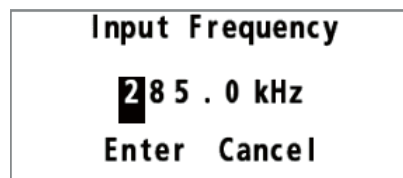
1. Press the **MENU/ESC** key open the main menu.
2. Select [8 System Setting] then [6 Beacon/SBAS].
3. Select [3 Beacon Station].



4. Select [2 Set Parameter].

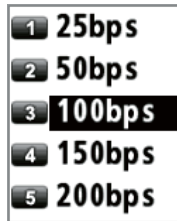


5. Select [1 Frequency].



6. Enter frequency in four digits (283.5 kHz to 325.0 kHz).
7. Move the cursor to select [Enter].
8. Press the **NU/CU ENT** key.

9. Select [2 Bit Rate].



10. Press the cursorpad (▲ or ▼) to select baud rate; 25, 50, 100, 150 or 200 bps.
11. Press the **NU/CU ENT** key.
12. Press the **MENU/ESC** key to close the main menu.

3.2.2 Automatic beacon setup

How to set the differential corrections to use

1. Press the **MENU/ESC** key open the main menu.
2. Select [8 System Setting] then [6 Beacon/SBAS].
3. Select [1 Mode].
4. Select [3 GNSS+Internal Beacon].

How to set the beacon station

1. Press the **MENU/ESC** key open the main menu.
2. Select [8 System Setting] then [6 Beacon/SBAS].
3. Select [3 Beacon Station].
4. Select [1 Auto].
5. Press the **MENU/ESC** key to close the main menu.

3. ADJUSTMENTS

3.2.3 Beacon station

The beacon station list shows the 10 closest beacon stations, including user-programmed stations. For user-programmed stations, see the Operator's Manual.

1. Press the **MENU/ESC** key open the main menu.
2. Select [8 System Setting] then [6 Beacon/SBAS].
3. Select [3 Beacon Station].
4. Select [3 Select Station ID].

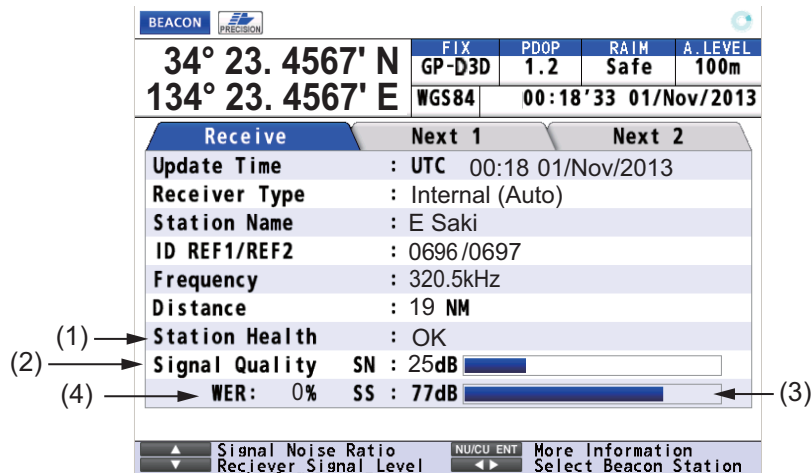
BEACON		PRECISION					
WGS84	34° 23. 4567'N	134° 23. 4567'E	GP-S3D	Safe			
Manual Input							
Station	DIST	Update		WER	Health		
1 E Saki	19 NM	09:35	09/ 17/ 2013	0%	OK		
2 Tango	60 NM	09:34	09/ 17/ 2013	3%	OK		
3 Nagoya	74 NM	09:34	09/ 17/ 2013	---%	--		
4 Daio Saki	81 NM	09:34	09/ 17/ 2013	---%	--		
5 Muroto Sa	108 NM	09:34	09/ 17/ 2013	---%	--		
6 Ohama	123 NM	09:35	09/ 17/ 2013	2%	OK		
7 Hamada	163 NM	09:35	09/ 17/ 2013	99%	--		
8 Seto	174 NM	09:35	09/ 17/ 2013	---%	--		
9 Hekura Sh	200 NM	09:35	09/ 17/ 2013	---%	--		
0 Tsurugi S	213 NM	--:--	--/ --/ ----	---%	--		

▲▼ Select an active Item
MENU/ESC Close

5. Press the cursorpad (▲ or ▼) to select a DGPS station.
6. Press the **NU/CU ENT** key.
7. Press the **MENU/ESC** key to close the main menu.

3.3 Beacon Operation Checking

1. Press the **DISPLAY 1** key several times to select the integrity display.
2. Press the cursorpad (**▲** or **▼**) to select the beacon mode.



(1) Station Health

The message "OK" is shown when beacon is working properly. If the correction data sent from the beacon reference station has an error, the message "Unmonitored" or "Don't use" is shown.

(2) Signal Quality SN (Signal Noise)

Shows the signal-to-noise ratio of the received beacon signal. This value is between 0 and 50. The higher the value the better the signal. The value is normally 25dB.

(3) SS (Signal Strength)

Shows the electric field intensity of the beacon signal. This value is between 0 and 100. The higher the value the stronger the signal.


(4) WER (Word Error Rate)

Shows error ratio. This value is between 0% and 100%. 0% indicates the correction data has no error. Note: When SN (Signal Noise) is less than 7 or WER (Word Error Rate) shows 100%, check the following:

- Check the grounding.
- Check for radar interference.
- Check for noise from the ship's mains.

3.4 Ethernet Setup

The settings described in this section are done at the service menu which the customer cannot access to. Do as follows to access it.

1. Change the display to the course display (see the Operator's Manual).
2. Press the cursorpad ▲, ▲, ▼, ▼, ◀, ▶, ◀, ▶ and then press . The color of the menus changes from gray to black.

3.4.1 How to Set the IP Address

1. Press the **MENU/ESC** key to open the main menu.
2. Select [8 System Setting] then [7 Network].

IP Address	172.031.018.011
Subnet Mask	255.255.000.000
Default Gateway	172.031.001.001
Enter Cancel	

3. Select [2 Ethernet].
4. Enter the IP addresses for your equipment (setting range: 172.16.0.1 to 172.31.255.254), subnet mask and default gateway with the numeric keys.
Note: Be sure the IP address is not the same as other equipment on the network.
5. Move the cursor to [Enter] then press the **NU/CU ENT** key.

3.4.2 SFI Setup

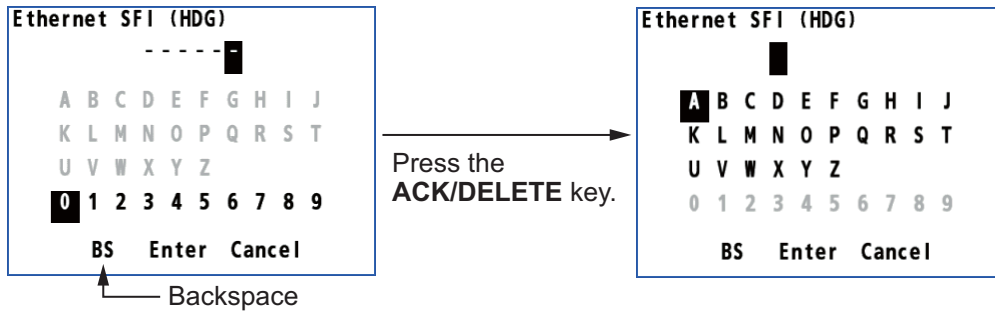
SFI (System Function ID) is an identification code used by the system.

1. Press the **MENU/ESC** key to open the main menu.
2. Select [8 System Setting] then [7 Network].
3. Select [4 SFI].

SFI(ccnnnn)									
GP0001									
A	B	C	D	E	F	G	H	I	J
K	L	M	N	O	P	Q	R	S	T
U	V	W	X	Y	Z				
0	1	2	3	4	5	6	7	8	9
BS Enter Cancel									

4. Do the following to set the Ethernet SFI:

- 1) Press the **ACK/DELETE** key to move the cursor to the leftmost of the input position.



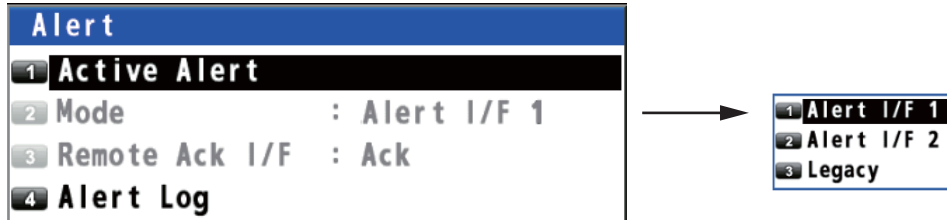
- 2) Enter the Ethernet SFI with the cursorpad and the numeric keys (combination of two alphabets and four numerals).

Note: Set the SFI to eliminate overlap with other ones.

5. Move the cursor to [Enter] then press the **NU/CU ENT** key.
6. Press the **MENU/ESC** key to close the main menu.

3.4.3 Alert Mode

1. Press the **MENU/ESC** key to open the main menu.
2. Select [5 Alert] then [2 Mode].



Note: [3 Remote Ack I/F] is available when selecting [3 Legacy] in [2 Mode].

3. Select what sentences to use to manage alerts. For [1 Alert I/F 1] or [2 Alert I/F 2], go to step 6. For [3 Legacy], go to step 4.
 - [1 Alert I/F 1]: Use ALR and ACK sentences.
 - [2 Alert I/F 2]: Use ALC, ALF and ACN sentences.
 - [3 Legacy]: Use Ilalr and Ilals sentences.
4. Select [3 Remote Ack I/F].



5. Select [1 Ack] or [2 BuzzerStop].
 - [Ack]: Acknowledge an alert and stop the buzzer.
 - [BuzzerStop]: Stop the buzzer.
6. Press the **MENU/ESC** key to close the main menu.

3.5 Input/Output Signal

The GP-170 can receive or output various navigation data.

Before selecting data to output, confirm what data the external equipment requires. Output necessary data only. Outputting unnecessary data can cause receiving problems at the external equipment.

3.5.1 Talker

All data transmitted by marine electronics equipment is prefixed with a two-character code which tells external equipment what equipment is transmitting data. This two-character code is called the talker. The GP-170 contains the talkers GP and GN.

3.5.2 Input/Output sentence

Output sentence of IEC 61162-1 Ed.3/4 and NMEA 0183 Ver. 1.5/2.0

Sentence	Description
AAM	Waypoint arrival alarm
ALC	Cyclic alert list
ALF	Alert sentence
ALR	Set alarm state
APA*	Autopilot sentence A Magnitude of cross track error, direction to steer, arrival alarm, bearing origin to destination
APB	Autopilot sentence B Magnitude of cross track error, direction to steer, arrival alarm, bearing to waypoint ("Heading to steer to destination waypoint data" not used)
ARC	Alert command refused
BOD	Bearing origin to destination
BWC	Bearing and distance to waypoint - great circle
BWR	Bearing and distance to waypoint - rhumb line
BWW	Bearing waypoint to waypoint
DTM	Datum reference
GBS	GNSS satellite fault detection
GGA	Global positioning system (GPS) fix data Time of fix, latitude, longitude, quality indicator, number of satellites in use, DOP, altitude, geoidal separation ("age of dgps data" and "differential reference station ID")
GLL	Geographic position - latitude/longitude
GNS	GNSS fix data
GRS	GNSS range residuals
GSA	GNSS DOP and active satellites
GST	GNSS pseudorange noise statistics
GSV	GNSS satellites in view
HBT	Heartbeat supervision sentence
MSK	MSK receiver interface
MSS	MSK receiver signal status
POS	Device position and ship dimensions report or configuration command

Sentence	Description
RMB	Recommended minimum navigation information cross track error, direction to steer, origin and destination waypoint ID, destination waypoint latitude and longitude, range and bearing of destination wayopint, destination closing velocity, arrival alarm
RMC	Recommended minimum specific GPS/TRANSIT data UTC of position fix, latitude and longitude, ground speed and course, date, magnetic variation
Rnn*	Routes
RTE	Routes
VDR	Set (direction towards which a current flows) and drift (speed of a current)
VTG	Course over ground and ground speed
WCV	Waypoint closure velocity
WNC	Distance waypoint to waypoint
WNR	Waypint-to-waypoint distance, rhumb line
WPL	Waypoint location
XTE	Cross-track error, measured (direction to steer to return to track)
ZDA	Time and date

*: not used on SOLAS shlps.

Output sentence of Furuno proprietary sentence

Sentence	Description
\$PFEC, llalr	Contact signal
\$PFEC, pidat	Product information
\$PFEC, GPals	Alarm status
\$PFEC, GPxfr	End code

Input sentence of IEC 61162-1 Ed.3/4 and NMEA 0183 Ver. 1.5/2.0

Checksum is checked if attached, and if any errors are found, the sentence becomes invalid. Talker ID is not distinguished.

Sentence	Description
ACK	Acknowledge alarm
ACN	Alert command
CRQ	Query sentence
DBT	Depth below transducer
DPT	Depth
HBT	Heartbeat supervision sentence
HDG	Heading, deviation and variation
HDM*	Heading, magnetic
HDT*	Heading true
MSK	MSK receiver interface
MSS	MSK receiver signal status
MTW	Water temperature
THS	True heading and status
TLL	Target latitude and longitude
VBW	Dual ground/water speed
VHW	Water speed and heading

*: not used on SOLAS shlps.

3. ADJUSTMENTS

Input sentence of Furuno proprietary sentence

Sentence	Description
\$PFEC, AGFPA	Autopilot information from FURUNO autopilot equipment
\$PFEC, GPatt	Pitch and roll
\$PFEC, GPhve	Heaving
\$PFEC, Ilals	Contact signal
\$PFEC, pireq	Product information

Others

Sentence	Description
RTCM sc104	Data for DGPS
GPX	Data for waypoint, route and track

Port	Input	Output
DATA1 DATA2	RTCM sc104 or the following sentence selected by menu <u>IEC 61162-1 Ed.3/4 and NMEA 0183 Ver. 1.5/2.0</u> ACK, ACN, CRQ, DBT, DPT, HBT, HDG, HDM*, HDT*, MSK, MSS, MTW, THS, TLL, VBW, VHW, \$PFEC, AGFPA, \$PFEC, GPatt, \$PFEC, GPhve, \$PFEC, Ilals, \$PFEC, pireq	RTCM sc104 or the following sentence selected by menu <u>IEC 61162-1 Ed.3/4 and NMEA 0183 Ver. 1.5/2.0</u> AAM, ALC, ALF, ALR, APA*, APB, ARC, BOD, BWC, BWR, BWB, DTM, GBS, GGA, GLL, GNS, GRS, GSA, GST, GSV, HBT, MSK, MSS, POS, RMB, RMC, Rnn*, RTE, VDR, VTG, WCV, WNC, WNR, WPL, XTE, ZDA, \$PFEC, Ilalr, \$PFEC, pidat, \$PFEC, GPals, \$PFEC, GPxfr
DATA3	External MOB	
DATA4**	RTCM sc104 or the following sentence selected by menu <u>IEC 61162-1 Ed.3/4 and NMEA 0183 Ver. 1.5/2.0</u> ACK, ACN, CRQ, DBT, DPT, HBT, HDG, HDM*, HDT*, MSK, MSS, MTW, THS, TLL, VBW, VHW, \$PFEC, AGFPA, \$PFEC, GPatt, \$PFEC, GPhve, \$PFEC, Ilals, \$PFEC, pireq	
Ethernet	RTCM sc104 or the following sentence selected by menu <u>IEC 61162-1 Ed.3/4 and NMEA 0183 Ver. 1.5/2.0</u> ACK, ACN, DBT, DPT, HBT, HDG, HDM*, HDT*, MTW, THS, TLL, VBW, VHW, \$PFEC, AGFPA, \$PFEC, GPatt, \$PFEC, GPhve, \$PFEC, Ilals, \$PFEC, pireq	RTCM sc104 or the following sentence selected by menu <u>IEC 61162-1 Ed.3/4 and NMEA 0183 Ver. 1.5/2.0</u> AAM, ALC, ALF, ALR, APB, ARC, BOD, BWC, BWR, BWB, DTM, GBS, GGA, GLL, GNS, GRS, GSA, GST, GSV, HBT, POS, RMB, RMC, RTE, VDR, VTG, WCV, WNC, WPL, XTE, ZDA, \$PFEC, Ilalr, \$PFEC, pidat, \$PFEC, GPals, \$PFEC, GPxfr
USB	GPX	GPX

*: not used on SOLAS ships.

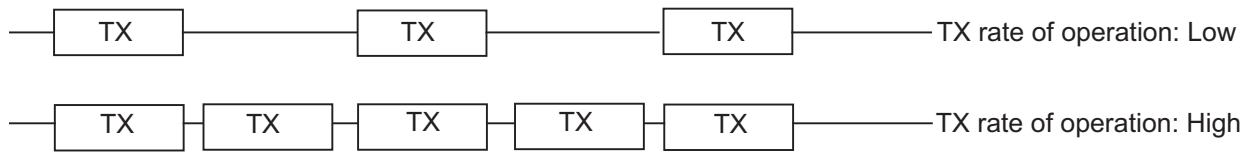
**.: for IEC61162-2 high speed transmission.

Note 1: BWC, BWR, GGA, GLL, RMB, RMC or WPL is required to output DTM.

Note 2: The settings and registered data can be saved to or loaded from a USB flash memory. For details, refer to the Operator's Manual. You can edit the settings and registered data with a text editor on your PC.

3.5.3 TX Rate of operation

The TX rate of operation is the percentage of data output in one second, and it appears on the screen. If short intervals are assigned to many sentences, the rate of operation increases as illustrated below.

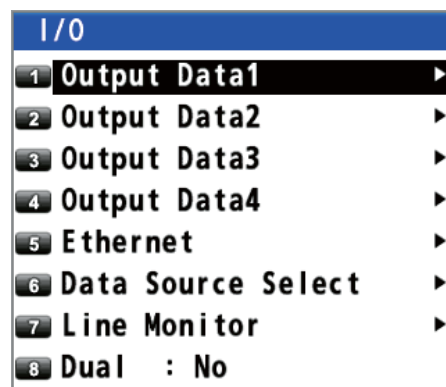


Note 1: When outputting data without rest intervals between data, TX rate of operation is 100%. In this case, wrong data may be shown on the receiver because it cannot recognize intervals between data. Thus, do not output unnecessary data or set TX interval to large value so that TX rate of operation becomes small.

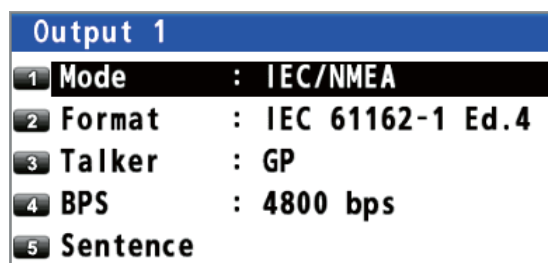
Note 2: The GP-170 may not be able to display data from external equipment correctly when the volume of TX data exceeds the GP-170's data handling capability. If this occurs, lower the TX rate. Set the TX rate to 60% for the Temperature Indicator TI-20 and other equipment. This will create a gap between each data transmission to compensate for occasions when data is not output regularly.

3.5.4 DATA1, 2, 3 or 4 output setting

1. Press the **MENU/ESC** key to open the main menu.
2. Select [7 I/O].



3. Select [1 Output Data1].

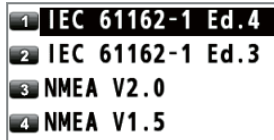


3. ADJUSTMENTS

4. Select [1 Mode].



5. Select [1 IEC/NMEA] or [2 RTCM].
[IEC/NMEA]: NMEA sentence output
[RTCM]: Binary output (It is for outputting the beacon binary information to external equipment.)
6. Select [2 Format].

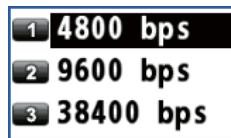


7. Select [1 IEC 61162-1 Ed.4], [2 IEC 61162-1 Ed.3], [NMEA V2.0] or [NMEA V1.5].
8. Select [3 Talker].



No. 2 and 3 are reserved for future use.

9. Select [1 GP] or [4 GN].
10. Select [4 BPS].



11. Select [1 4800 bps], [2 9600 bps] or [3 38400 bps].

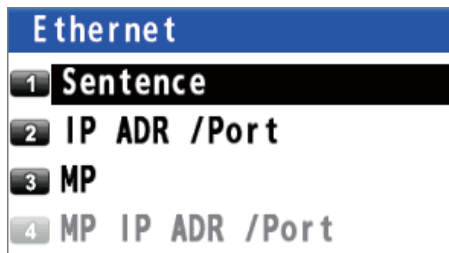
12. Select [5 Sentence].

MENU		PRECISION			
WGS84	35° 45. 6789'N	135° 45. 6789'E	GP-S3D	Safe	
Data1:Output Sentence Select 4800bps Load Rate: 96%					
AAM	APA	APB	BOD	BWC	BWR
---	---	---	---	---	---
BWW	GBS	GGA	GLL	GNS	GRS
---	---	1s	---	---	---
GSA	GST	GSV	RMB	RMC	Rnn
---	---	---	1s	---	---
RTE	VDR	VTG	WCV	WNC	WNR
---	---	1s	---	---	---
WPL	XTE	ZDA			
---	---	3s			
Waypoint Arrival Alarm For Autopilot etc.					
▲▼◀▶ Select an active Item MENU/ESC Close					

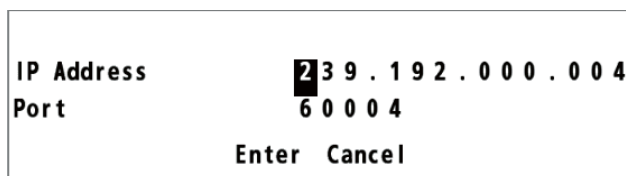
13. Press the cursorpad to select the sentence then press the **NU/CU ENT** key.
14. Press the cursorpad (◀ or ▶) to select the TX interval.
 TX interval: [---], [0.1s]*, [0.2s]*, [1s], [2s], [3s], [4s], [5s], [6s], [10s], [15s], [20s], [30s], [60s], [90s]
 *: Only for GGA, GLL, GNS, RMC and VTG when selecting [38400 bps] at step 11.
Note 1: Keep the "Load Rate" below 100% when setting the TX interval. The TX interval for other than the ZDA sentence cannot be guaranteed if the rate exceeds 100%.
Note 2: For the TX interval of [0.1s] or [0.2s], set the positioning cycle (Refer to the Operator's Manual) as follows:
- For [0.1s], set the positioning cycle at 10Hz.
 - For [0.2s], set the positioning cycle at 5Hz or 10Hz.
15. Press the **NU/CU ENT** key.
16. Set [2 Output Data2], [3 Output Data3] and [4 Output Data4] as well.
17. Press the **MENU/ESC** key to close the main menu.

3.5.5 Ethernet output setting

1. Press the **MENU/ESC** key to open the main menu.
2. Select [7 I/O] then [5 Ethernet].



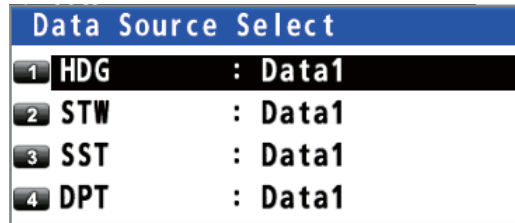
3. Select [1 Sentence].
4. Press the cursorpad to select the sentence then press the **NU/CU ENT** key.
5. Press the cursorpad (◀ or ▶) to select the TX interval. TX interval is available in [---], [0.1s]*, [0.2s]*, [1sec], [2sec], [3sec], [4sec], [5sec], [6sec], [10sec], [15sec], [20sec], [30sec], [60sec] and [90sec].
*: Only for GGA, GLL, GNS, RMC and VTG.
Note: For the TX interval of [0.1s] or [0.2s], set the positioning cycle (Refer to Operator's Manual) as follows:
 - For [0.1s], set the positioning cycle at 10Hz.
 - For [0.2s], set the positioning cycle at 5Hz or 10Hz.
6. Press the **NU/CU ENT** key.
7. Press the **MENU/ESC** key.
8. Select [2 IP ADR/Port].



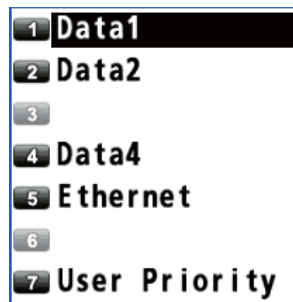
9. Enter the IP address and port (setting value: 49152 to 65535) for the output destination with the numeric keys. When setting dual configuration (see section 3.7), set "239.192.000.004" for IP address and "60004" for port.
10. Move the cursor to select [Enter] then press the **NU/CU ENT** key.
11. Press the **MENU/ESC** key to close the main menu.

3.5.6 DATA1, 2 or 4 input setting

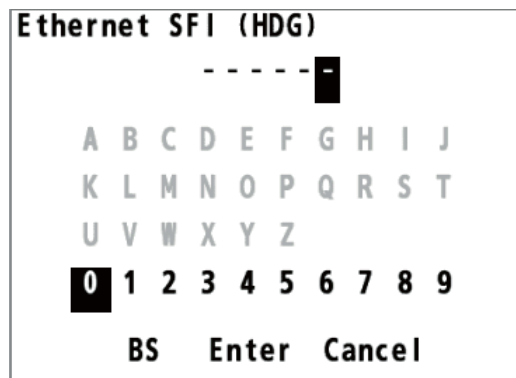
1. Press the **MENU/ESC** key to open the main menu.
2. Select [7 I/O] then [6 Data Source Select].



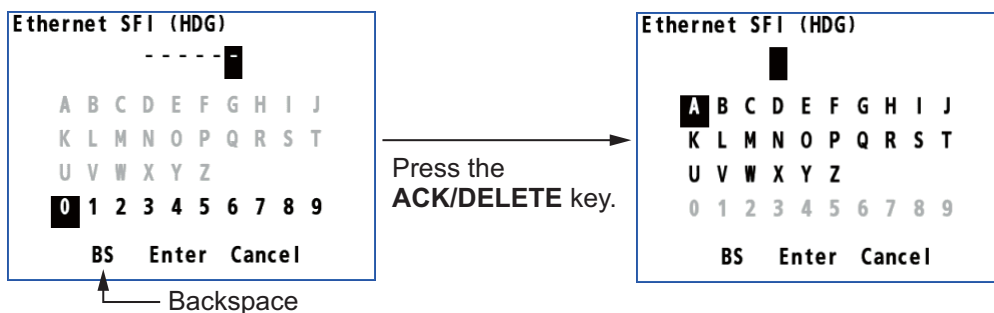
3. Select [1 HDG].



4. Select the port for heading data.
For [5 Ethernet], go to step 5. For [7 User Priority], go to step 6.



5. When selecting [5 Ethernet], do the following:
 - 1) Press the **ACK/DELETE** key to move the cursor to the leftmost of the input position.

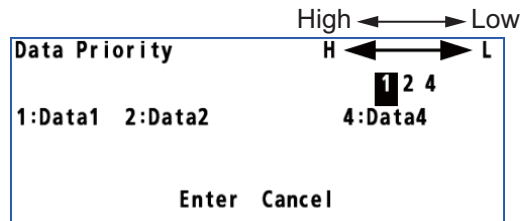


3. ADJUSTMENTS

- 2) Enter the Ethernet SFI with the cursorpad and the numeric keys (combination of two alphabets and four numerals). SFI (System Function ID) is an identification code used by the system.

Note: Set the SFI to eliminate overlap with other ones.

- 3) Move the cursor to [Enter] then press the **NU/CU ENT** key. Go to step 9.
6. Select [1 HDG].
7. Select [7 User Priority].

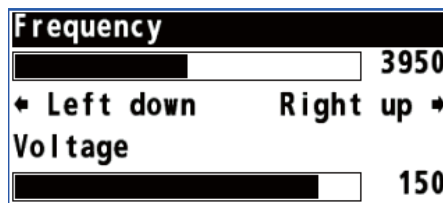


8. Enter the priority for heading data among [1] (Data1), [2] (Data2) or [4] (Data4) with the numeric keys.
9. Set the input data for [2 STW] (speed through water), [3 SST] (sea surface temperature) and [4 DPT] (water depth) as well.
10. Press the **MENU/ESC** key to close the main menu.

3.6 Sound Test

Note: It is recommended to keep the default setting. Do not change the setting unless absolutely necessary.

1. Access to the service menu (Refer to section 3.4).
2. Press the **MENU/ESC** key to open the main menu.
3. Select [6 Maintenance] then [2 Self Test].
4. Select [5 Sound Test].



5. Press the cursorpad (▲ or ▼) to select [Frequency] or [Voltage].
6. Press the cursorpad (◀ or ▶) to set the value.
7. Press the **MENU/ESC** key to close the main menu.

3.7 How to Set Dual Configuration

You can configurate two dual differential GPS navigator systems and an interface unit.

1. Press the **MENU/ESC** key to open the main menu.
2. Select [7 I/O] then [8 Dual].



3. Select [1 No], [2 Serial (Port2)] or [3 Ethernet].
 [No]: Not set dual configuration.
 [Serial (Data2)]: Sets dual configuration using data2.
 [Ethernet]: Sets dual configuration using Ethernet.
4. Press the **MENU/ESC** key to close the main menu.

3. ADJUSTMENTS

This page is intentionally left blank.

APPENDIX 1 DIGITAL INTERFACE (IEC 61162-1 EDITION 4 (2010-11))

Output sentences

DATA 1, DATA 2, DATA 3, DATA 4

AAM, ALC, ALF, ALR, APA*, APB, ARC, BOD, BWC, BWR, BWW, DTM, GBS, GGA, GLL, GNS, GRS, GSA, GST, GSV, HBT, MSK**, MSS***, POS, RMB, RMC, Rnn*, RTE, VDR, VTG, WCV, WNC, WNR, WPL, XTE, ZDA

*: Not used for SOLAS ships

** : When using an internal or external beacon

***: When using an internal beacon

Ethernet

AAM, ALC, ALF, ALR, APB, ARC, BOD, BWC, BWR, BWW, DTM, GBS, GGA, GLL, GNS, GRS, GSA, GST, GSV, HBT, POS, RMB, RMC, RTE, VDR, VTG, WCV, WNC, WPL, XTE, ZDA

Input sentences

DATA 1, DATA 2, DATA 4

ACK, ACN, CRQ, DBT, DPT, HBT, HDG, HDM*, HDT*, MSK**, MSS***, MTW, THS, TLL, VBW, VHW

*: Not used for SOLAS ships

** : When using an internal or external beacon

***: When using an internal beacon

Ethernet

ACK, ACN, DBT, DPT, HBT, HDG, HDM*, HDT*, MTW, THS, TLL, VBW, VHW

*: Not used for SOLAS ships

FURUNO proprietary sentences

DATA 1, DATA 2, DATA 4 Input

PFEC (AGFPA, llals, pireq, GPatt, GPhve)

DATA 1, DATA 2, DATA 3, DATA 4 Output

PFEC (llalr, pidat, GPals)

DATA 2 Input/Output (DUAL mode only)

PFEC (GPalm, GPasc, GPdst, GPmr2, GPmsk, GPreq, GPrt2, GPtrp, GPrai, GPxfr)

Ethernet Input

PFEC (AGFPA, pireq, GPatt, GPhve)

Ethernet Output

PFEC (pidat, rminf)

Ethernet Input/Output (DUAL mode only)

PFEC (GPasc, GPdst, GPmr2, GPmsk, GPreq, GPrt2, GPtrp, GPalm, GPrai)

Transmission interval

All sentences except ALR and HBT output at the interval selected (00 - 90 s).

Load requirements as listener

Isolation: Photo coupler

Input impedance: 470 ohms

Max. voltage: ±15V

Threshold: 3 mA (in case of connection of FURUNO device talker)

Data transmission

Data is transmitted in serial asynchronous form in accordance with the standard referenced in IEC 61162-1 and IEC 61162-2. The first bit is a start bit and is followed by data bits.

The following parameters are used:

Baud rate: 4800 for IEC61162-1, 38400 for IEC-61162-2

Data bits: 8 (D7 = 0), parity none

Stop bits: 1

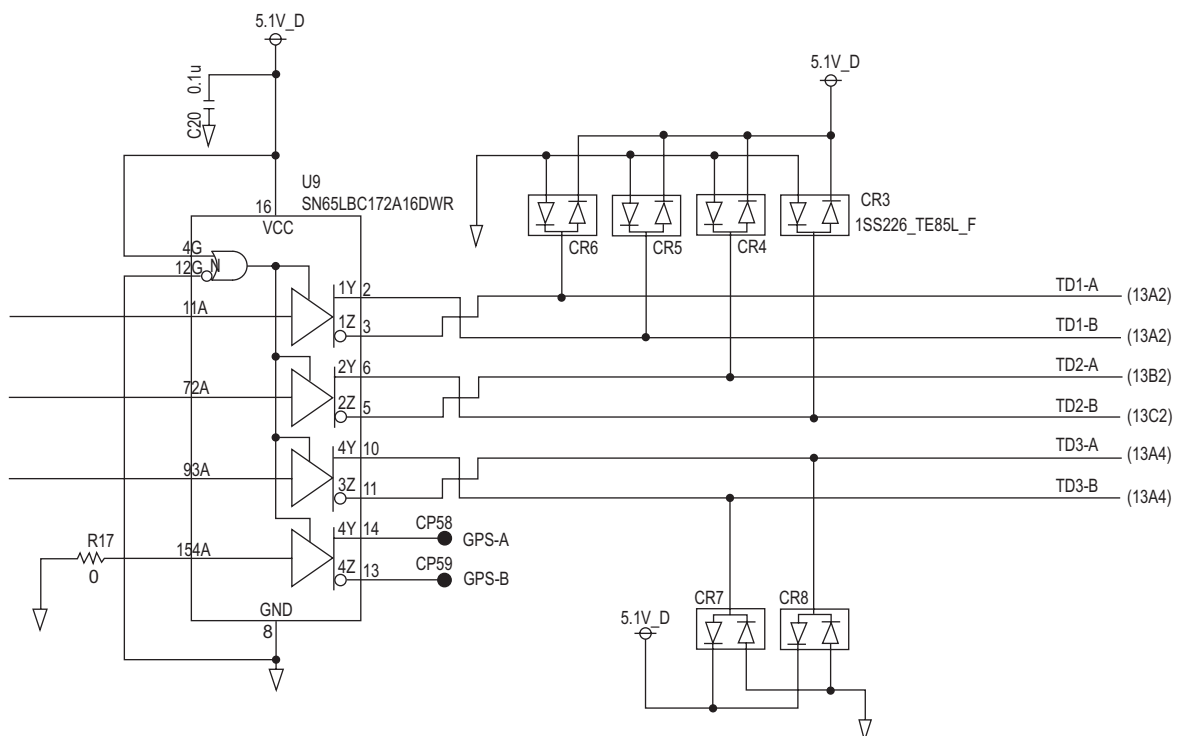
IEC61162-1: Edition 4.0 2010-11, Third edition 2007-04

IEC61162-2: First Edition 1998-09

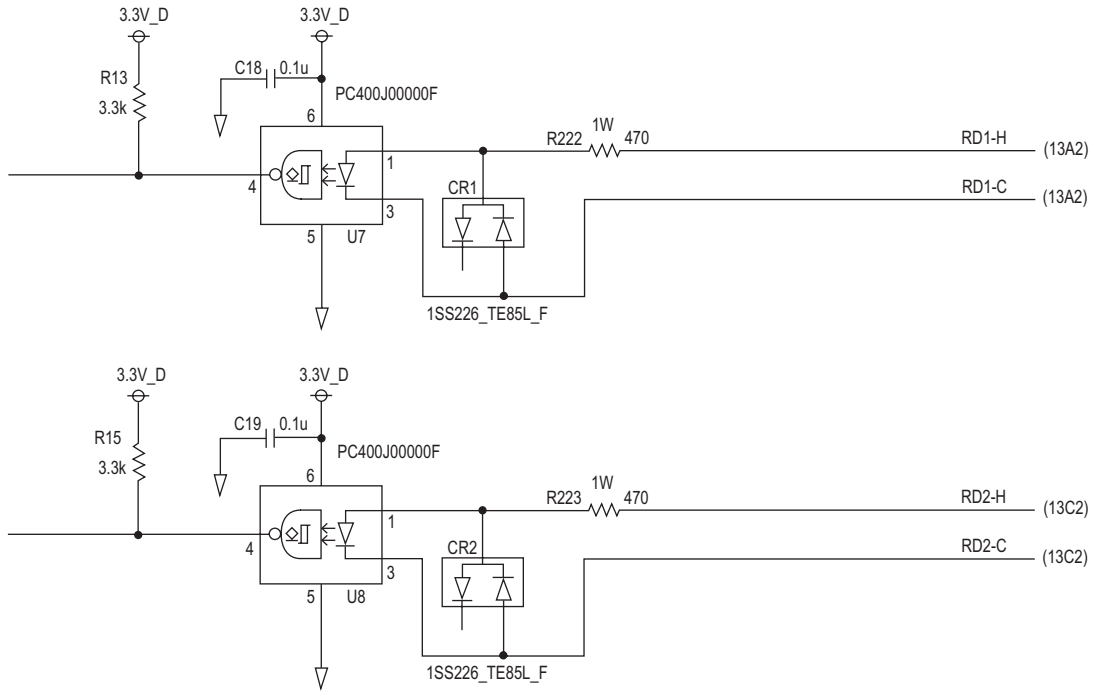
IEC61162-450: Edition 1.0 2011-06

Schematic diagrams

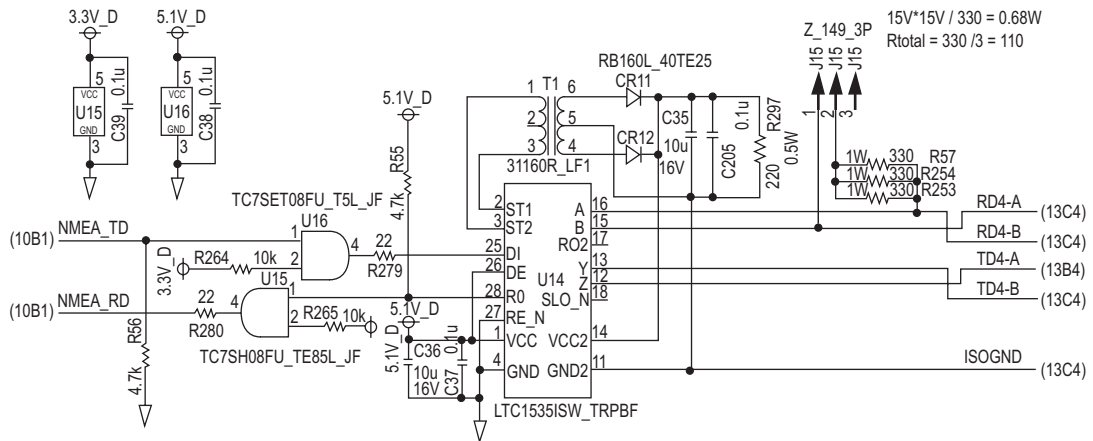
DATA 1, 2, or 3 port (output)



DATA 1 or 2 port (input)

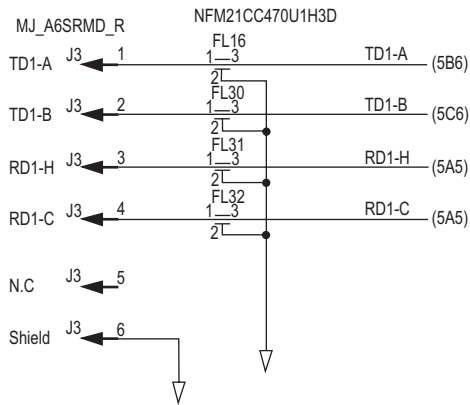


DATA 4 port

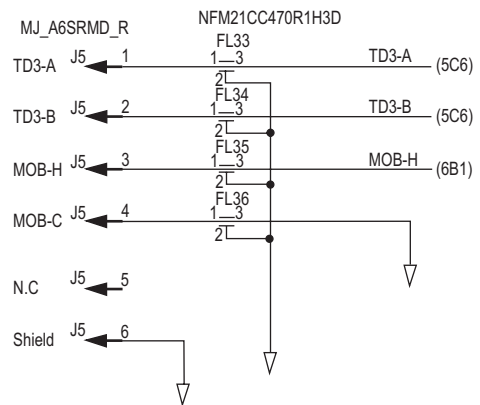


DATA 1, 2, 3 or 4 port (external output)

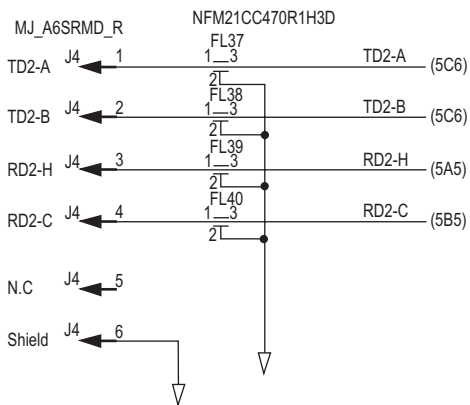
DATA1



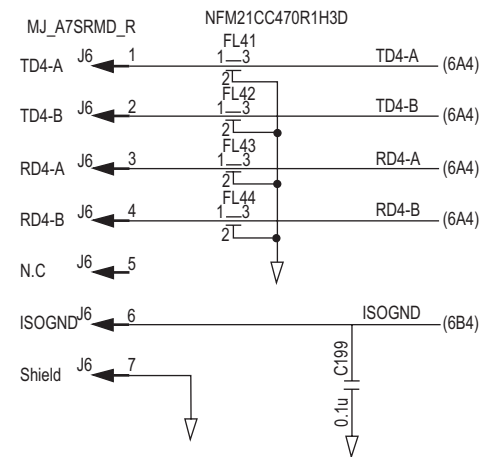
DATA3



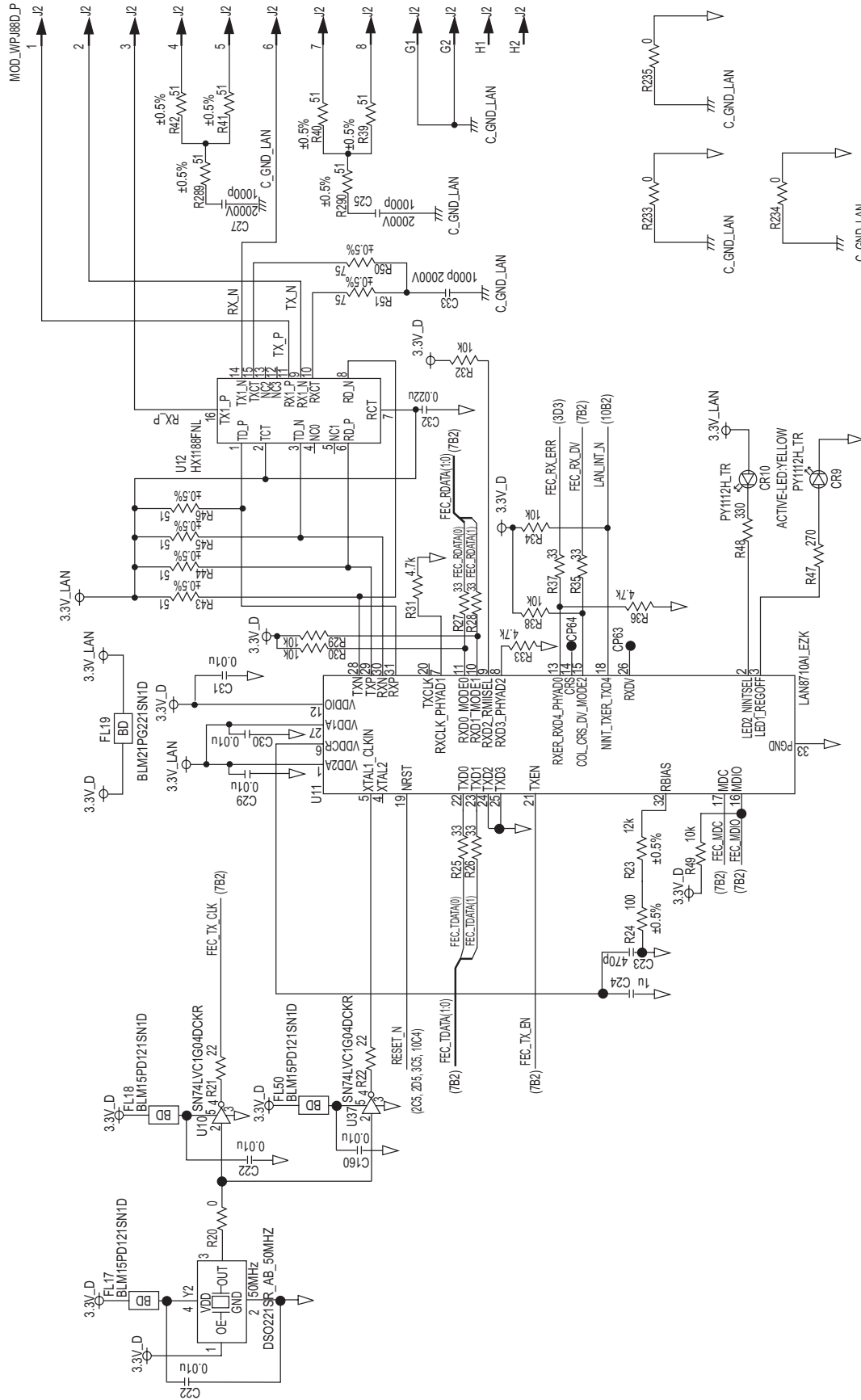
DATA2



DATA4



Ethernet



Note: For layout purposes and to prevent miswiring, the TX and RX lines on HX1188NLT are connected reversely of shown here. The TX and RX lines share the same transformer structure so there is no problem.

Sentence description

AAM-Waypoint arrival alarm

\$GPAAM,A,A,x.x,N,c--c,*hh<CR><LF>
1 2 3 4 5

1. Status (A=Arrival circle entered V=Not arrived)
2. Status (A=Perpendicular passed at waypoint, V=Not arrived)
3. Arrival circle radius, nm
4. Units of radius (nautical miles)
5. Waypoint ID

ACK-Acknowledge alarm

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

1. Local alarm number (identifier)

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 to 23, mm=00 to 59, ss.ss=00.00 to 59.99), null
2. Manufacturer mnemonic code (3 digit alphanumeric code), null
3. Alert identifier (0 to 10322)
4. Alert instance (1 to 999999), null
5. Alert command (A=ACK from ext. equipment, Q=Request from ext. equipment, O=Responsibility transfer, S=Silence from ext. equipment)
6. Sentence status flag (C should not be null field. Sentence without C is not a command.)

ALC-Cyclic alert list

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

1. Total number of sentences this message (01 to 99)
2. Sentence number (01 to 99)
3. Sequential message identifier (00 to 99)
4. Number of alert entries (0 to 3)
5. Manufacturer mnemonic code (FEC, null)
6. Alert identifier (999 or 10001 to 10999)
7. Alert instance (null)
8. Revision counter (1 to 99)
9. Additional alert entries (same as 5 and 8)

ALF-Alert sentence

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

1. Total number of ALF sentences this message (1, 2)
2. Sentence number (1, 2)
3. Sequential message identifier (0 to 9)
4. Time of last change (hh=00 to 23, mm=00 to 59, ss.ss=00.00 to 60.99), null
5. Alert category (A=Alert category A, B=Alert category B, C=Alert category C), null
6. Alert priority (A=Alarm, W=Warning, C=Caution), null when #2 is 2.
7. Alert state (V=Not ACKed, S=Silence, A=ACKed, O/U=Resolved, Not ACKed, N=Normal state), null when #2 is 2.
8. Manufacturer mnemonic code (FEC, null)
9. Alert identifier (999 or 10001 to 10999)
10. Alert instance (null)
11. Revision counter (1 to 99)
12. Escalation counter (0 to 2)
13. Alert text (max. 18 characters)

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
2. Unique alarm number (identifier) at alarm source
3. Alarm condition (A=threshold exceeded, V=not exceeded)
4. Alarm acknowledge state (A=acknowledged, V=not acknowledged)
5. Alarm description text (alphanumeric)

APA-Autopilot Sentence A

\$--APA,A,A,x.xx,L,N,A,A,xxx,M,c--c,*hh<CR><LF>
 1 2 3 4 5 6 7 8 9 10

1. - 2. A for correct position, V for error
3. XTD value
4. Direction to steer, L or R
5. XTD units, N=nautical miles
6. Status (A=arrival circle entered V=arrival circle not passed)
7. Status (A=perpendicular passed at waypoint V=perpendicular not entered)
8. Bearing origin to destination
9. M=Magnetic, T=True
10. Destination waypoint ID

APB-Heading/track controller (autopilot) sentence B

\$--APB,A,A,x.x,a,N,A,A,x.x,a,c--c,x.x,a,x.x,a,A,*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12131415

1. Status (A=Data valid V=LORAN-C blink or SNR warning
V=general warning flag for other navigation systems
when a reliable fix is not available)
2. Status (A=OK or no use V=LORAN-C cycle lock warning flag)
3. XTD (cross-track distance) Magnitude
4. Direction to steer, L or R
5. XTD units, N=nautical miles
6. Status (A=arrival circle entered V=arrival circle not passed)
7. Status (A=perpendicular passed at waypoint V=perpendicular not entered)
8. Bearing origin to destination
9. M=Magnetic, T=True
10. Destination waypoint ID
11. Bearing, present position to destination
12. M=Magnetic, T=True
13. Heading to steer to destination waypoint
14. M=Magnetic, T=True
15. Mode indicator (A=Autonomous mode D=differential mode S=Simulator mode)

ARC-Alert command refused

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

1. Release time of the Alert Command Refused(UTC)
2. Used for proprietary alerts, defined by the manufacturer
3. The alert identifier(1 - 9999999)
4. The alert instance(1 to -99)
5. Refused Alert Command(A, Q, O, S)
A=acknowledge: A
Q=request/repeat information
O=responsibility transfer
S=silence

BOD-Bearing origin to destination

\$**BOD,x.x,T,x.x,M,c--c,c--c,*hh<CR><LF>
1 2 3 4 5 6

1. Bearing, degrees
2. True
3. Bearing, degrees
4. Magnetic
5. Destination waypoint ID (Max. 13 characters)
6. Origin waypoint ID (Max. 13 characters)

BWC-Bearing and distance to waypoint - Great circle

```
$ GPBWC,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
2. Waypoint latitude
3. N/S
4. Waypoint longitude
5. E/W
6. Bearing, degrees true
7. Unit, True
8. Bearing, degrees
9. Unit, Magnetic
10. Distance, nautical miles
11. Unit , N
12. Waypoint ID (Max. 13 characters)
13. Mode Indicator (A=Autonomous D=Differential S=Simulator)

BWR-Bearing and distance to waypoint - Rhumb line

```
$ GPBWR,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
2. Waypoint latitude
3. N/S
4. Waypoint longitude
5. E/W
6. Bearing, degrees true
7. Unit, True
8. Bearing, degrees
9. Unit, Magnetic
10. Distance, nautical miles
11. Unit , N
12. Waypoint ID (Max. 13 characters)
13. Mode Indicator (A=Autonomous D=Differential S=Simulator)

BWW-Bearing waypoint to waypoint

```
$--BWW,x.x,T,x.x,M,c--c,c--c*hh<CR><LF>
```

```
1 2 3 4 5
```

1. Bearing, degrees true
2. Bearing, degrees magnetic
3. TO waypoint ID
4. FROM waypoint ID
5. Checksum

DBT-Depth below transducer

```
$**DBT,xxxx.x,f,xxxx.x,M,xxxx.x,F,*hh<CR><LF>
```

```
1 2 3 4 5 6
```

1. Water depth
2. feet
3. Water depth
4. Meters
5. Water depth
6. Fathoms

DPT-Depth

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

1 2 3

1. Water depth relative to the transducer, meters
2. Offset from transducer, meters
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
User defined=999, IHO datum code)
2. Local datum subdivision code (NULL or one character)
3. Lat offset, min
4. N/S
5. Lon offset, min (no use)
6. E/W
7. Altitude offset, meters (no use)
8. Reference datum (W84=WGS84 W72=WGS72 S85=SGS85, P90=PE90)

GBS-GNSS satellite fault detection

\$**GBS, hhmmss.ss, x.x, x.x, x.x, xx, x.x, x.x, x.x,h,*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
2. Expected error in latitude
3. Expected error in longitude
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 System ID
10. GNSS Signal ID

GGA-Global positioning system (GPS) 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
3. N/S
4. Longitude
5. E/W
6. GPS quality indicator
7. Number of satllite in use
8. Horizontal dilution of precision
9. Antenna altitude above/below mean sealevel
10. Unit, m
11. Geoidal separation
12. Unit, m
13. Age of differential GPS data
14. Differential reference station ID

GLL-Geographic position - Latitude/longitude

```
$**GLL,IIII.III,a,yyyyy.yyy,a,hhmmss.ss,a,x,*hh<CR><LF>
```

1 2 3 4 5 6 7

1. Latitude
2. N/S
3. Longitude
4. E/W
5. UTC of position (no use)
6. Status (A=data valid V=data invalid)
7. Mode indicator (A=Autonomous D=Differential S=Simulator)

GNS-GNSS fix data

```
$**GNS,hhmmss.ss,IIII.III,a,IIII.III,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
3. N/S
4. Longitude
5. E/W
6. Mode indicator
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
8. HDOP
9. Antenna altitude, meters
10. Geoidal separation
11. Age of differential data
12. Differential reference station ID
13. Navigational status indicator

GRS-GNSS range residuals

```
$**GRS,hhmmss.ss,x,x,x,x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,h,h*hh<CR><LF>
```

1 2 3 4 5

1. UTC time of the GGA or GNS fix associated with this sentence
2. Mode: 0=residuals were used to calculate the position given in the matching GGA or GNS sentence
1=residuals were re-computed after the GGA or GNS position was computed
3. Range residuals for satellites used in the navigation solution.
Order should match order of satellite ID numbers in GSA.
When GRS is used, GSA and GSV are generally required. Null for unused fields.
4. GNSS System ID
5. Signal ID

GSA-GNSS DOP and active satellites

```
$--GSA,a,x,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,x.x,x.x,x.x,h*hh<CR><LF>
```

1 2 3 4 5 6 7

1. Mode (M>manual, forced to operate in 2=2D 3=3D mode
A=automatic, allowed to automatically switch 2D/3D)
2. Mode (1=fix not available 2=2D 3=3D)
3. ID number of satellites used in solution
4. PDOP
5. HDOP
6. VDOP
7. GNSS System ID

GST-GNSS pseudorange noise statistics

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

1. UTC time of the GGA or GNS fix associated with this sentence
2. RMS value of the standard deviation of the range inputs to the navigation process.
 Range inputs include pseudoranges and DGPS corrections.
3. Standard deviation of semi-major axis of error ellipse, (m)
4. Standard deviation of semi-minor axis of error ellipse (m)
5. Orientation of semi-major axis of error ellipse (degrees from true north)
6. Standard deviation of latitude error, (m)
7. Standard deviation of longitude error, (m)
8. Standard deviation of altitude error, (m)

GSV-GNSS satellites in view

\$**GSV,x,x,xx,xx,xx,xxx,xx.....,xx,xx,xxx,xx,h*hh<CR><LF>
 1 2 3 4 5 6 7 8 9 10

1. Total number of messages (1 - 9)
2. Message number (1 - 9)
3. Total number of satellites in view
4. Satellite ID number
5. Elevation, degrees
6. Azimuth, degrees true
7. SNR(C/No) (NULL when not tracking)
8. Second and third SVs
9. Fourth SV
10. Signal ID

HBT-Heartbeat supervision sentence

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

1. Configured repeat interval (00.0 to 99.9(s))
2. Equipment status (A=Normal V=System fail)
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
2. Magnetic deviation, degrees
3. E/W
4. Magnetic variation, degrees
5. E/W

HDM-Heading, Magnetic

\$**HDM,x.x,M*hh<CR><LF>
 1 2

1. Heading, degrees
2. Magnetic (M)

HDT-Heading true

\$**HDT,xxx.x,T*hh<CR><LF>
 1 2

1. Heading, degrees
2. True (T)

MSK-MSK receiver interface

\$**MSK,x.x,a,x.x,a,x.x,x,a,*hh<CR><LF>
 1 2 3 4 5 6 7

1. Beacon frequency
2. Auto/manual frequency, A/M
3. Beacon bit rate, bits/s
4. Auto/manual bit rate A/M
5. Interval for sending \$**MSS (status) in seconds
6. Channel number
7. Sentence status Flag

MSS-MSK receiver signal status

\$CRMSS,32.1,43.2,312.5,100,1*hh<CR><LF>
 1 2 3 4 5

1. Signal strength
2. Signal-to-noise ratio (SN), db
3. Beacon frequency, kHz
4. Beacon bit rate, bits/s
5. Channel number (equal to "1" or NULL for single channel receivers)

MTW-Water temperature

\$**MTW,x.x,C<CR><LF>
 1

1. Water temperature, degrees C

POS-Device position and ship dimensions report or configuration command

\$**POS,cc,xx,a,x.x,x.x,x.x,a,x.x,x,x,a*hh<CR><LF>
 1 2 3 4 5 6 7 8 9 10

1. Equipment ID (IEC 61162-1 Ed.4)
2. Equipment number
3. Position validity flag (A=valid V=invalid)
4. Position X-coordinate
5. Position Y-coordinate
6. Position Z-coordinate
7. Ship's width and length (A=valid V=invalid)
8. Ship's width
9. Ship's length
10. Sentence status flag (R=sentence is status report of current settings
 C=sentence is a configuration command to change settings)

RMB-Recommended minimum navigation information

\$GPRMB,A,x.x,L,CCCC,CCCC,xxxx.xx,a,xxxxxx.xx,a,xxx.x,xxx,xx.x,A,a*hh <CR><LF>
 1 2 3 4 5 6 7 8 9 10 11 12 13 14

1. Data status (A=data valid, V=navigation receiver warning)
2. Cross track error (NM)
3. Direction to steer (L/R)
4. Origin waypoint ID
5. Destination waypoint ID
6. Destination waypoint latitude
7. N/S
8. Destination waypoint longitude
9. E/W
10. Range to destination, nautical miles
11. Bearing to destination, degrees true
12. Destination closing velocity, knots
13. Arrival status (A=Arrival circle entered or perpendicular passed, V=not entered/passed)
14. Mode indicator (A= Autonomous D=Differential mode E=Estimated (dead reckoning mode)
 M=Manual input mode S= Simulator N=Data not valid)

RMC-Recommended minimum specific GNSS data

\$GPRMC,hhmmss.ss,A,IIII.II,a,yyyyy.yy,a,x.x,x.x,ddmmyy,x.x,a,a*hh<CR><LF>
 1 2 3 4 5 6 7 8 9 10 11 12 13

1. UTC of position fix
2. Status (A=data valid, V=navigation receiver warning)
3. Latitude
4. N/S
5. Longitude
6. E/W
7. Speed over ground, knots
8. Course over ground, degrees true
9. Date
10. Magnetic variation, degrees E/W
11. E/W
12. Mode indicator (A= Autonomous D=Differential mode E=Estimated (dead reckoning) mode)
 M=Manual input mode S= Simulator N=Data not valid)
13. Navigational status indication

Rnn-Routes

\$**Rnn,c--c,c--c,c--c,• •,c--c*hh <CR><LF>
 1 2 3 4 • • 15

1. nn=route number
2. Origin waypoint identifier
3. Destination waypoint identifier
4. Waypoint identifier
- • Additional waypoint identifiers
15. Waypoint "n" identifier

RTE-Routes

\$**RTE,x.x,x.x,a,c--c,c--c,• •,c--c*hh <CR><LF>
 1 2 3 4 5 • • 6

1. Total number of messages being transmitted
2. Message number
3. Message mode (C=complete route w=working route, first listed)
4. Route identifier
5. Waypoint identifier
- • Additional waypoint identifiers
6. Waypoint "n" identifier

THS-True heading and status

\$**THS,xxx.x,a*hh<CR><LF>
 1 2

1. Heading, degrees True
2. Mode indicator (A=autonomous E=estimated M>manual input
 S=simulator V=data not valid)

TLL-Target latitude and longitude

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

1. Target number, NULL
2. Latitude
3. N/S
4. Longitude
5. E/W
6. Target name, NULL
7. UTC of data
8. Target status, NULL
 L=lost, tracked target has been lost Q=query, target in the process of acquisition
 T=tracking
9. Reference target=R, NULL otherwise

VBW-Dual ground/water speed

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

1. Longitudinal water speed, knots
2. Transverse water speed, knots
3. Status: water speed, A=data valid V=data invalid
4. Longitudinal ground speed, knots
5. Transverse ground speed, knots
6. Status: ground speed, A=data valid V=data invalid
7. Stern transverse water speed, knots
8. Status: stern water speed, A=data valid V=data invalid
9. Stern transverse ground speed, knots
10. Status: stern ground speed, A=data valid V=data invalid

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
2. T=True (fixed)
3. Direction, degrees
4. M=Magnetic (fixed)
5. Current speed
6. N=Knots (fixed)

VHW-Water speed and heading

\$GPVHW,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
2. T=True (fixed)
3. Heading, degrees
4. M=Magnetic (fixed)
5. Speed, knots
6. N=Knots (fixed)
7. Speed, knots
8. K=km/hr (fixed)

VTG-Course over ground and ground speed

\$GPVTG,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
2. T=True (fixed)
3. Course over ground, degrees
4. M=Magnetic (fixed)
5. Speed over ground, knots
6. N=Knots (fixed)
7. Speed over ground
8. K=km/h (fixed)
9. Mode indicator (A=Autonomous, D=Differential E = Estimated (dead reckoning)
 M=Manual input S=Simulator N=Data not valid)

WCV-Waypoint closure velocity

\$WCV,x,x,N,c--c,a*hh<CR><LF>
 1 2 3

1. Velocity component, knots
2. Waypoint identifier
3. Mode indicator (A=Autonomous, D=Differential, S=Simulator, N=Data not valid)

WNC-Distance waypoint to waypoint

\$WNC,x,x,N,x,x,K,c--c,c--c*hh<CR><LF>
 1 2 3 4

1. Distance, nautical miles
2. Distance, km
3. To waypoint identifier
4. FROM waypoint identifier

WNR-Waypoint to waypoint distance, Rhumb line

```
$**WNR,x.x,N,x.x,K,c--c,c--c*hh<CR><LF>
```

```
1 2 3 4 5 6
```

1. Distance, nautical miles
2. N (fixed)
3. Distance, km
4. K (fixed)
5. To waypoint identifier
6. FROM waypoint identifier

WPL-Waypoint location

```
$**WPL,III.II,a,yyyy.yy,a,c--c*hh<CR><LF>
```

```
1 2 3 4 5
```

1. Waypoint latitude
2. N/S
3. Waypoint longitude
4. E/W
5. Waypoint identifier (No use)

XTE-Cross-track error, measured

```
$GPXTE,A,A,x.x,a,N,a,*hh<CR><LF>
```

```
1 2 3 4 5 6
```

1. Status: A=data valid V=LORAN-C blink or SNR warning
V=general warning flag or other navigation systems
when a reliable fix is not available
2. Status: A=data valid
V=LORAN-C cycle lock warning flag
3. Magnitude of cross-track error
4. Direction to steer, L/R
5. Units, nautical miles (fixed)
6. Mode indicator (A=Autonomous mode D=Differential mode
S = Simulator mode N = Data not valid)

ZDA-Time and date

```
$GPZDA,hhmmss.ss,xx,xx,xxxx,xx,xx<CR><LF>
```

```
1 2 3 4 5 6
```

1. UTC
2. Day
3. Month
4. Year (UTC)
5. Local zone, hours
6. Local zone, minutes

PACKING LIST GP170-**-115***/HK

20BF-X-9851-0

1/1

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット			
空中線部		GPA-017S	1
ANTENNA UNIT		000-040-537-00	(*)
空中線部		GPA-020S	1
ANTENNA ASSEMBLY		000-023-619-00	(*)
空中線部		GPA-021S	1
ANTENNA ASSEMBLY		000-023-620-00	(*)
受信演算部		GP170-*	1
DISPLAY UNIT		000-023-621-00	**
予備品			
予備品		SP20-01401	1
SPARE PARTS		001-243-840-00	
付属品			
フィルターナー		19-028-3125-2	1
LCD CLEANING CLOTH		100-360-672-10	
工事材料			
ケーブル(クヒン)MJ		MJ-A3SPF0013A-035C	1
CABLE ASSEMBLY		000-176-666-10	

1.コード番号末尾の[**]は、選用品の代表コードを表します。

1.CODE NUMBER ENDING WITH "**" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

2.(*)の空中線部は仕様により決定されます。

2.ANTENNA UNIT HAS BEEN DETERMINED BY SPECIFICATION.

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

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ケーブル組品		TNC-PS/PS-3D-L15M-R	1
CABLE ASSEMBLY		001-173-110-10	
マスト取付金具袋詰品		CP20-01111	1
MAST MOUNTING KIT		004-368-920-00	
工事材料		CP20-03401	1
INSTALLATION MATERIALS		001-243-920-00	

図書 DOCUMENT

取扱説明書		OM*-44820-*	1
OPERATOR'S MANUAL		000-177-736-1*	
操作要領書		OS*-44820-*	1
OPERATOR'S GUIDE		000-177-911-1*	
装備要領書		IM*-44820-*	1
INSTALLATION MANUAL		000-177-737-1*	

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

20BF-X-9851

PACKING LIST GP170-**-1N***/HK

20BF-X-9852-0

1/1

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット			
空中線部		GPA-017S	1
ANTENNA UNIT		000-040-537-00	(*)
空中線部		GPA-020S	1
ANTENNA ASSEMBLY		000-023-619-00	(*)
空中線部		GPA-021S	1
ANTENNA ASSEMBLY		000-023-620-00	(*)
受信演算部		GP170-*	1
DISPLAY UNIT		000-023-621-00	**
予備品			
予備品		SP20-01401	1
SPARE PARTS		001-243-840-00	
付属品			
ACCESSORIES			
フィルタークリーナー		FP20-01100	1
LCD CLEANING CLOTH		19-028-3125-2	
		100-360-672-10	
工事材料			
INSTALLATION MATERIALS			
ケーブル(クミヒン)MJ		MJ-A3SPF0013A-035C	1
CABLE ASSEMBLY		000-176-666-10	

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
マウント付金具袋詰品		CP20-01111	1
MAST MOUNTING KIT		004-368-920-00	
工事材料		CP20-03401	1
INSTALLATION MATERIALS		001-243-920-00	
図書			
DOCUMENT			
取扱説明書		OM*-44820-*	1
OPERATOR'S MANUAL		000-177-736-1*	
操作要領書		OS*-44820-*	1
OPERATOR'S GUIDE		000-177-911-1*	
装備要領書		IM*-44820-*	1
INSTALLATION MANUAL		000-177-737-1*	

1.コード番号末尾の[**]は、選用品の代表コードを表します。

1.CODE NUMBER ENDING WITH “**” INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

2.(*)の空中線部は仕様により決定されます。

2.ANTENNA UNIT HAS BEEN DETERMINED BY SPECIFICATION.

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

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

20BF-X-9852

PACKING LIST GP170-**-015***/HK

20BF-X-9853-0

1/1

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット			
空中線部		GPA-017S	1
ANTENNA UNIT		000-040-537-00	(*)
空中線部		GPA-020S	1
ANTENNA ASSEMBLY		000-023-619-00	(*)
空中線部		GPA-021S	1
ANTENNA ASSEMBLY		000-023-620-00	(*)
受信演算部		GP170-*	1
DISPLAY UNIT		000-023-621-00	**
予備品			
予備品		SP20-01401	1
SPARE PARTS		001-243-840-00	
付属品			
ACCESSORIES			
フィルタークリーナー		19-028-3125-2	1
LCD CLEANING CLOTH		100-360-672-10	
工事材料			
INSTALLATION MATERIALS			
ケーブル(クヒビン)MJ		MJ-A3SPF0013A-035C	1
CABLE ASSEMBLY		000-176-666-10	

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ケーブル組品		TNC-PS/PS-3D-L15M-R	1
CABLE ASSEMBLY		001-173-110-10	
工事材料		CP20-03401	1
INSTALLATION MATERIALS		001-243-920-00	
図書			
DOCUMENT			
取扱説明書		OM*-44820-*	1
OPERATOR'S MANUAL		000-177-736-1*	
操作要領書		OS*-44820-*	1
OPERATOR'S GUIDE		000-177-911-1*	
装備要領書		IM*-44820-*	1
INSTALLATION MANUAL		000-177-737-1*	

1.コード番号末尾の[**]は、選用品の代表コードを表します。

1.CODE NUMBER ENDING WITH “**” INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

2.(*)の空中線部は仕様により決定されます。

2.ANTENNA UNIT HAS BEEN DETERMINED BY SPECIFICATION.

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

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

20BF-X-9853

PACKING LIST GP170-**0N***/HK

20BF-X-9854-0

1/1

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット			
空中線部		GPA-017S	1
ANTENNA UNIT		000-040-537-00	(*)
空中線部		GPA-020S	1
ANTENNA ASSEMBLY		000-023-619-00	(*)
空中線部		GPA-021S	1
ANTENNA ASSEMBLY		000-023-620-00	(*)
受信演算部		GP170-*	1
DISPLAY UNIT		000-023-621-00	**

予備品 SPARE PARTS

予備品		SP20-01401	1
SPARE PARTS		001-243-840-00	

付属品 ACCESSORIES

フィルタクリーナー			1
LCD CLEANING CLOTH		19-028-3125-2	
		100-360-672-10	

工事材料 INSTALLATION MATERIALS

ケーブル(クヒシン)MJ		MJ-A3SPF0013A-035C	1
CABLE ASSEMBLY		000-176-666-10	

1.コード番号末尾の[**]は、選用品の代表コードを表します。

1.CODE NUMBER ENDING WITH "**" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

2.(*)の空中線部は仕様により決定されます。

2.ANTENNA UNIT HAS BEEN DETERMINED BY SPECIFICATION.

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

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
工事材料		CP20-03401	1
INSTALLATION MATERIALS		001-243-920-00	
図書 DOCUMENT			
取扱説明書		OM*-44820-*	1
OPERATOR'S MANUAL		000-177-736-1*	
操作要領書		OS*-44820-*	1
OPERATOR'S GUIDE		000-177-911-1*	
装備要領書		IM*-44820-*	1
INSTALLATION MANUAL		000-177-737-1*	

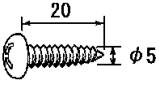
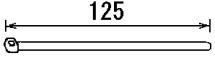
型式/コード番号が2段の場合、下段より上段に代わる過渡期品であり、どちらが入っています。なお、品質は変わりません。

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.

20BF-X-9854

FURUNO

CODE NO.	001-243-920-00	20BF-X-9401 -0 1/1
TYPE	CP20-03401	

工事材料表 INSTALLATION MATERIALS					
番号 NO.	名称 NAME	略図 OUTLINE	型名/規格 DESCRIPTIONS	数量 Q'TY	用途/備考 REMARKS
1	+トラスタツピ [®] シュ SELF-TAPPING SCREW		5X20 SUS304	4	
			CODE NO. 000-162-608-10		
2	コンベックス CONVEX		CV-125N	1	
			CODE NO. 000-172-164-10		

型式/コード番号が2段の場合、下段より上段に代わる過渡期品であり、どちらかが入っています。なお、品質は変わりません。

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.

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

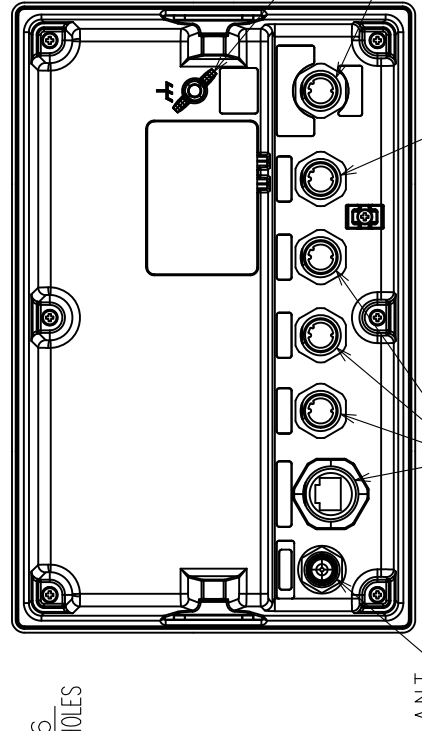
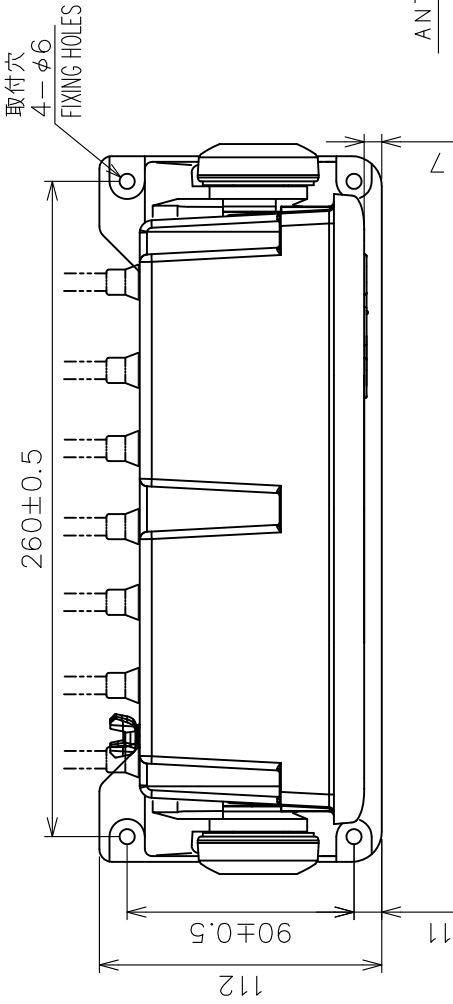
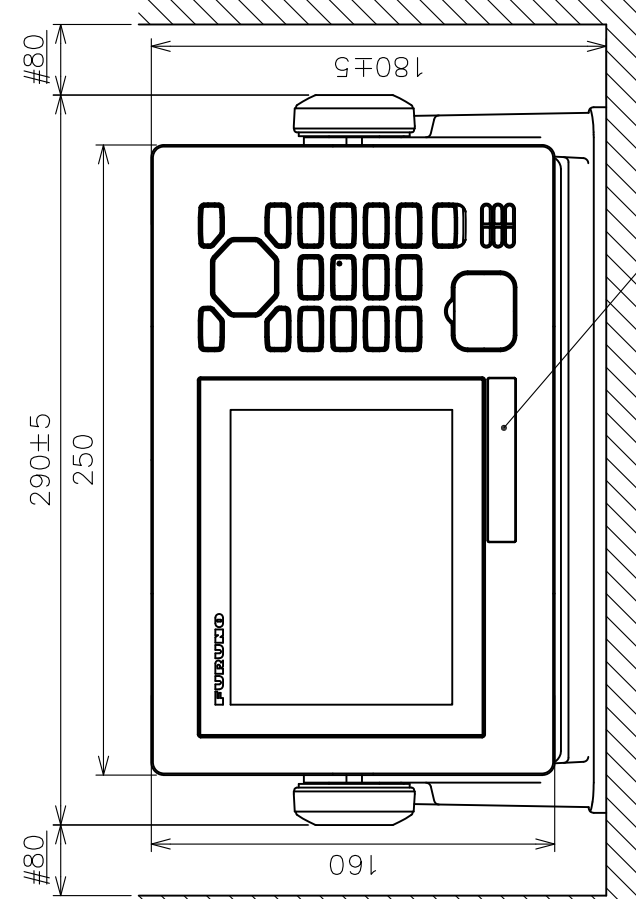
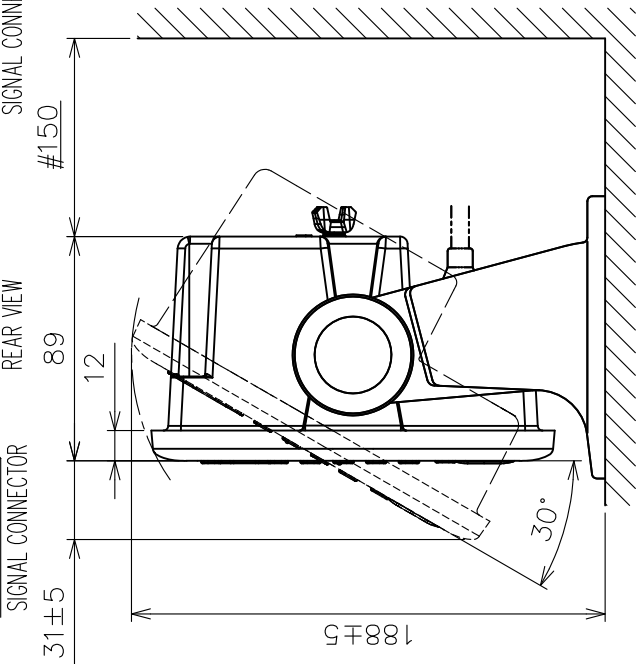


表1 TABLE 1

寸法区分 (mm)	公差 (mm)	TOLERANCE
L ≤ 50	±1.5	±1.5
50 < L ≤ 100	±2.5	±2.5
100 < L ≤ 500	±3	±3

表2 TABLE 2

DGPSビーコン	質量
DGPS BEACON	MASS (kg±10%)
あり YES	2.4
なし NO	2.2



- 注記 1) 指定外の寸法公差は表1による。
 2) #印寸法は最小サービス空間寸法とする。
 3) 取付用ネジはプラスタックピンネジ呼び径5×20を使用のこと。
 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
 2. #: MINIMUM SERVICE CLEARANCE.
 3. USE TAPPING SCREWS φ5x20 FOR FIXING THE UNIT.

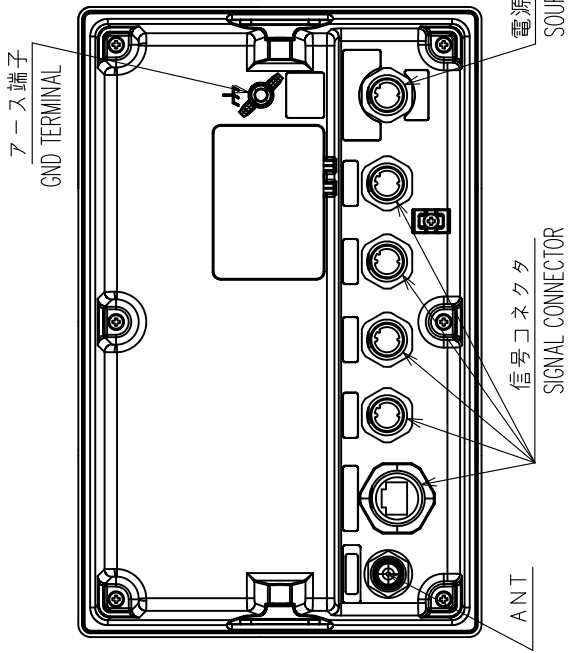
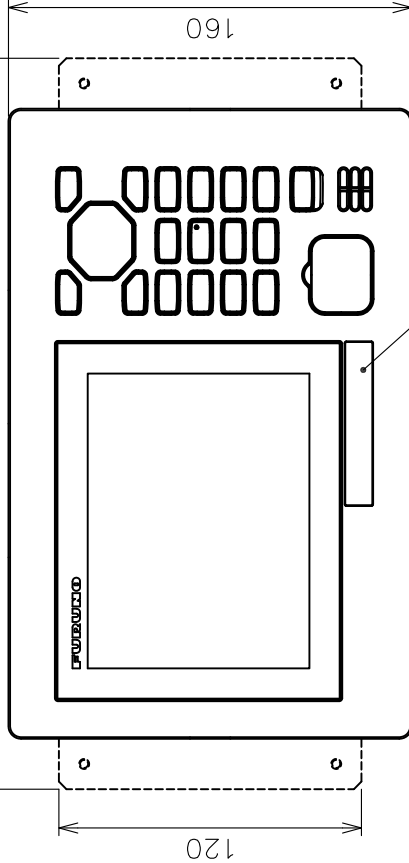
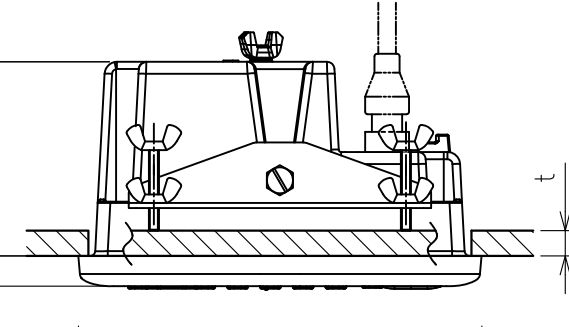
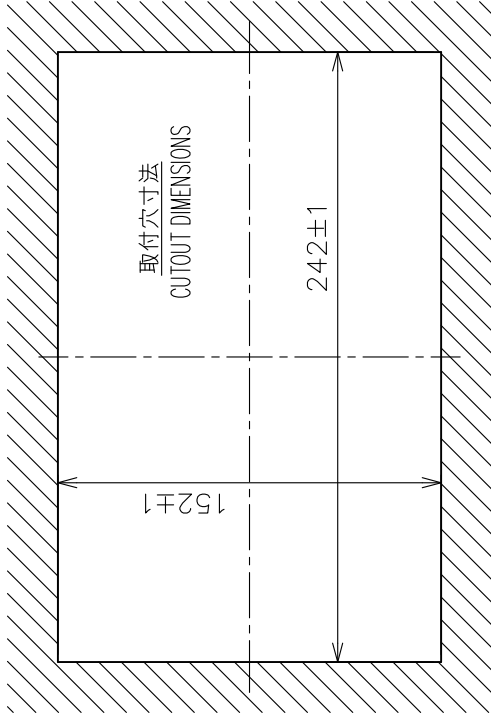
DRAWN	27/Mar/2013	T. YAMASAKI	TITLE	GP-170
CHECKED	27/Mar/2013	H. MAKI	名称	受信演算部 (卓上装備)
APPROVED	29/Mar/2013	Y. NISHIYAMA	外寸図	
SCALE	1/3	質量 表2参照 SEE TABLE 2	NAME	DISPLAY UNIT (TABLETOP MOUNT)
DWG.No.	C4482-G01-A	REF.No.	20-035-100G-1	OUTLINE DRAWING

表1 TABLE 1

寸法区分 (mm) DIMENSION	公差 (mm) TOLERANCE
L ≤ 50	±1.5
50 < L ≤ 100	±2.5
100 < L ≤ 500	±3

表2 TABLE 2

DGPSビーコン DGPS BEACON	質量 MASS (kg±10%)
あり YES	2.4
なし NO	2.2



- 注記 1) 指定外の寸法公差は表1による。
 2) #印寸法は最小サービス空間寸法とする。
 3) 壁の厚さ (t) は、3以上15以下とする。

- NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
 2. # MINIMUM SERVICE CLEARANCE.
 3. BULKHEAD THICKNESS (t): 3 ≤ t ≤ 15.

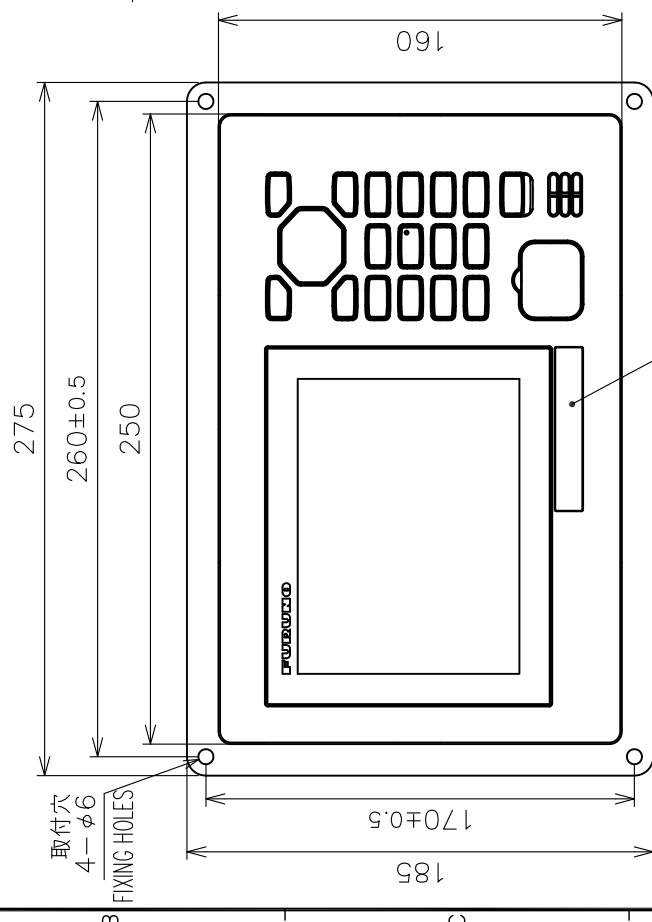
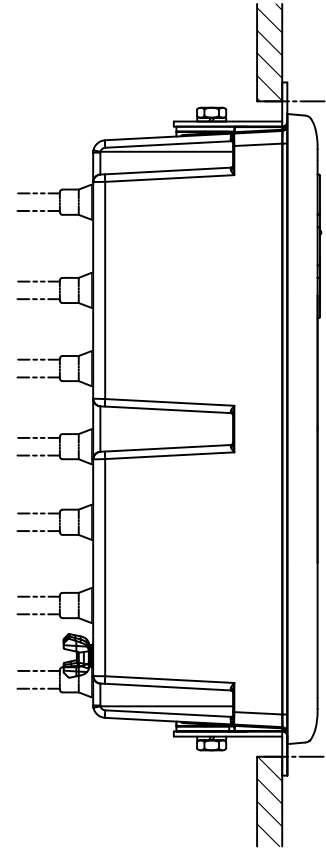
DRAWN	27/Mar/2013	T. YAMASAKI	TITLE	GP-170
CHECKED	27/Mar/2013	H. MAKI	名称	受信演算部 (埋込装備 S)
APPROVED	29/Mar/2013	Y. NISHIYAMA	外寸図	
SCALE	1/3	質量 表2参照 SEE TABLE 2	NAME	DISPLAY UNIT (FLUSH MOUNT S)
DWG.No.	C4482-G02-A	REF.No.	20-035-200G-2	OUTLINE DRAWING

表1 TABLE 1

寸法区分 (mm) DIMENSION	公差 (mm) TOLERANCE
L ≤ 50	±1.5
50 < L ≤ 100	±2.5
100 < L ≤ 500	±3

表2 TABLE 2

DGPSビコー DGPS BEACON	質量 MASS (kg±10%)
あり YES	2.4
なし NO	2.2



取付穴寸法
CUTOUT DIMENSIONS

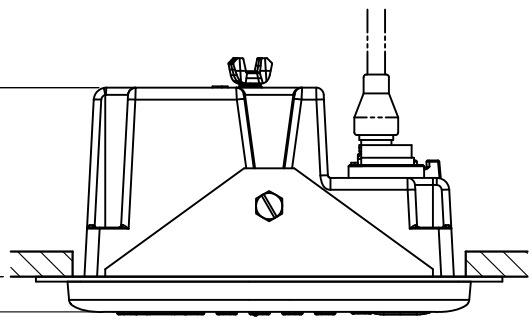
156±1

260±1

14

75

#100



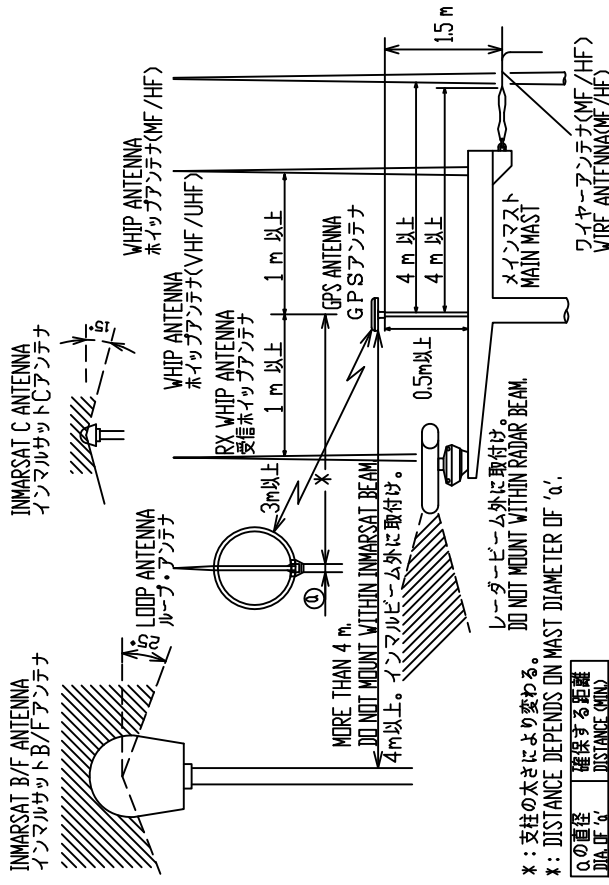
260±0.5

- 注記
- 1) 指定外の寸法公差は表1による。
 - 2) #印寸法は最小サービスマウント寸法とする。
 - 3) 取付用ネジはプラスタッピング呼び径5×2.0を使用のこと。
- NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
 2. #: MINIMUM SERVICE CLEARANCE.
 3. USE TAPPING SCREWS φ5x2.0 FOR FIXING THE UNIT.

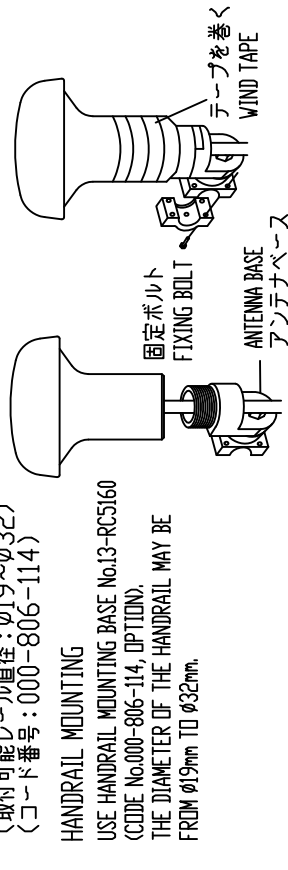
DRAWN	27/Mar/2013	I.YAMASAKI	TITLE	GP-170
CHECKED	27/Mar/2013	H.MAKI	名称	受信演算部 (埋込装備F)
APPROVED	29/Mar/2013	Y.NISHIYAMA	外寸図	
SCALE	1/3	質量 表2参照 SEE TABLE 2	NAME	DISPLAY UNIT (FLUSH MOUNT F)
DWG.No.	C4482-G03-A	REF.No.	20-035-300G-1	OUTLINE DRAWING

取付位置
MOUNTING LOCATION

他の機器のアンテナから下の図の距離以上離す。
THIS FIGURE SHOWS THE SEPARATION DISTANCES FROM OTHER ANTENNAS TO AVOID MUTUAL INTERFERENCE.



B) スタクションやパルピットにつけるとき
L型アンテナベース No.13-RC5160
(取付可能レール直径:φ19~φ32)
(コード番号: 000-806-114)



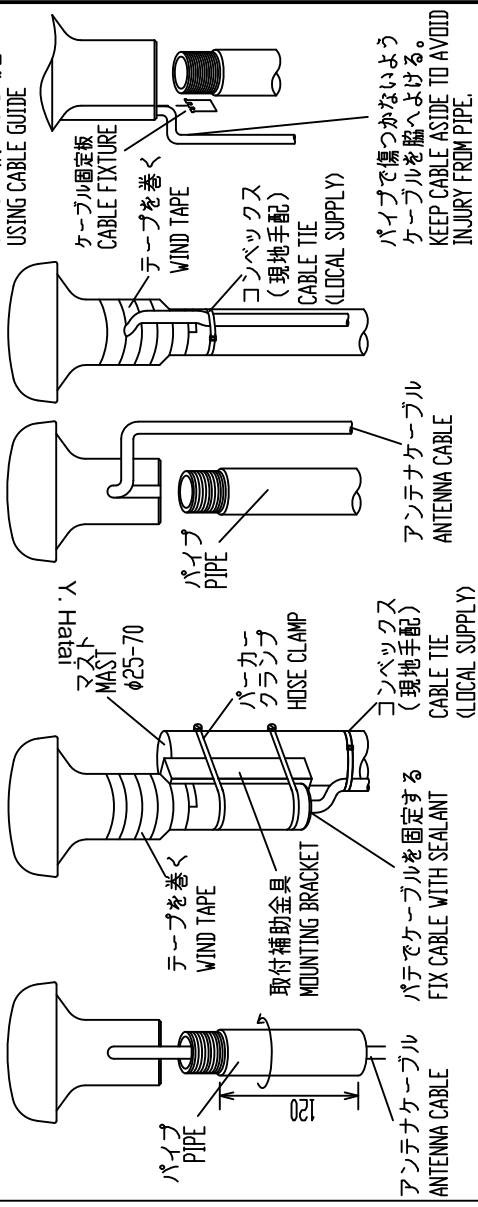
注記 1) パイプやアンテナベースはアンテナユニットにねじ込んだ後に固定する。
2) アンテナを固定するときはパイプ(アンテナベース)をアンテナにねじ込むこと。
アンテナ軸をねじるとコネクタ部やケーブルに無理がかかり、故障の原因となる。

NOTE 1. FASTEN PIPE(ANTENNA BASE) TO ANTENNA UNIT FIRST THEN FIX THEM TO MAST OR HANDRAIL.
2. WHEN FIXING ANTENNA, TURN PIPE OR ANTENNA BASE; NOT THE ANTENNA.
TURNING THE ANTENNA MAY TWIST THE CABLE AND PLACE STRESS ON CONNECTOR.

A) マストへの取付け
MAST MOUNTING

α) マスト取付金具CP20-0111(工事材料)でマストに固定する。
USE MAST MOUNTING KIT CP20-0111.

β) パイプのみを使うとき
USE A PIPE ONLY.

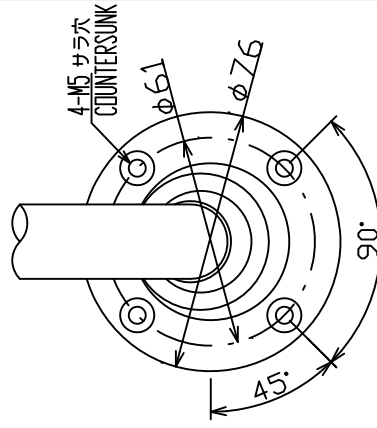


C) 取付ける場所が傾斜しているとき ANTENNA BASE MOUNTING

オプションのアンテナベースを使う。
USE OPTIONAL ANTENNA BASE.

傾斜 INCLINATION	5° - 33°	32° - 65°	65° - 98°
取付方法 MOUNTING METHOD			
アンテナベース型式 ANT. BASE TYPE	直型アンテナベース RIGHT ANGLE ANTENNA BASE No.13-QA330	L型アンテナベース L-TYPE ANTENNA BASE No.13-QA310	L型アンテナベース L-TYPE ANTENNA BASE No.13-QA310
コード番号 CODE No.	000-803-239	000-803-240	000-803-240

アンテナベース基部
MOUNTING DIMENSIONS OF ANTENNA BASE.

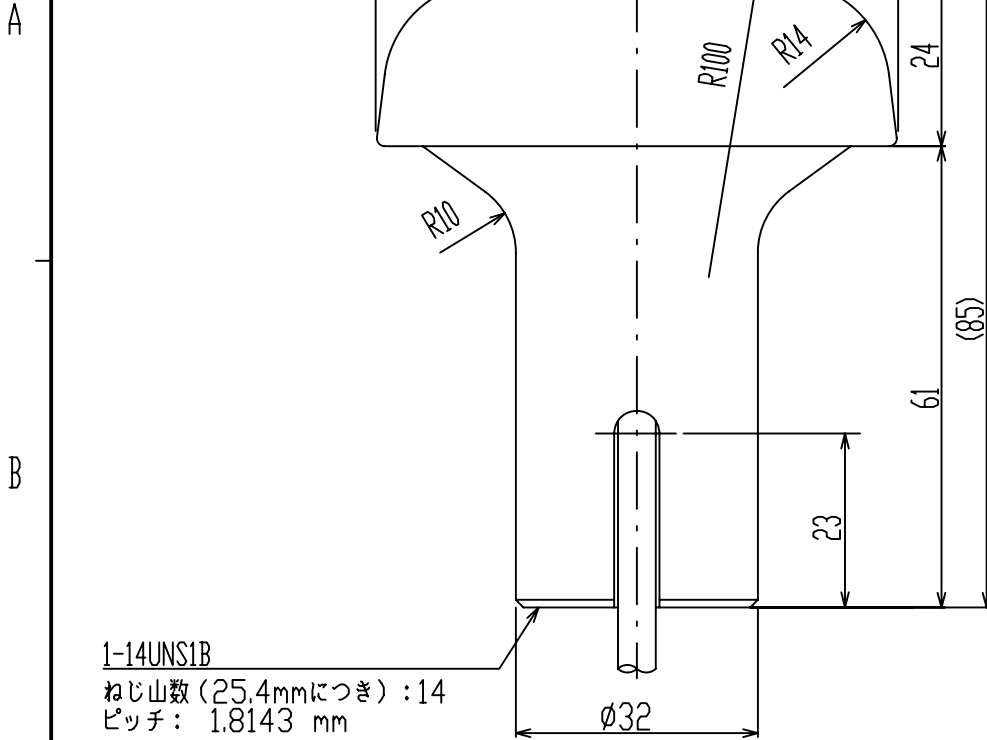


DRAWN 14/MAY/2014 T.YAMASAKI
CHECKED 14/MAY/2014 H.MAKI
APPROVED 15/May/2014 H.MAKI
SCALE MASS
Drawing No. C4384-Y01-F

TITLE GPA series
名称 空中線部
装備要領図
NAME ANTENNA UNIT
INSTALLATION PROCEDURE

表1 TABLE 1

寸法区分(mm) DIMENSION	公差(mm) TOLERANCE
$L \leq 50$	± 1.5
$50 < L \leq 100$	± 2.5
$100 < L \leq 500$	± 3



1-14UNS1B

ねじ山数 (25.4mmにつき) : 14
 ピッチ : 1.8143 mm
 オネジ有効長さ : 19 mm以上
 オネジ有効径 : 24.17mm

THREAD PER 25.4mm (1 INCH): 14
 PITCH: 1.8143 mm
 THREAD LENGTH: 19 mm OR MORE
 PITCH DIAMETER: 24.17mm

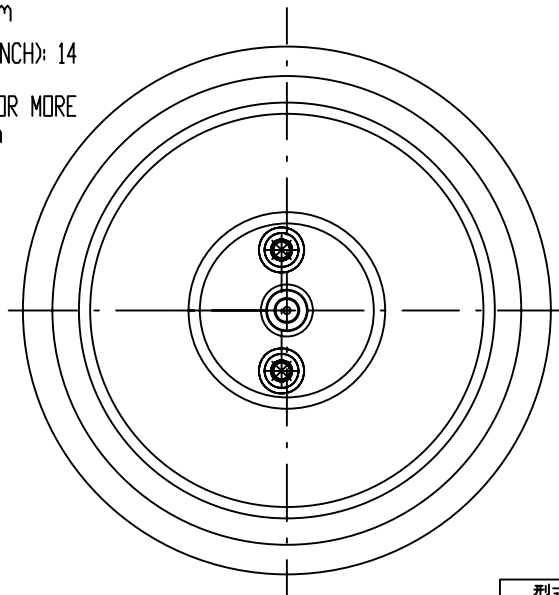


表2 TABLE 2

型式 TYPE	ケーブル長(m) CABLE LENGTH	プラグ PLUG	質量(kg $\pm 10\%$) MASS
GPA-017	10	TNC-P-3	0.6
GPA-017S	0.2	TNC-J-3	0.15

注記
 指定外の寸法公差は表1による。

NOTE
 TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.

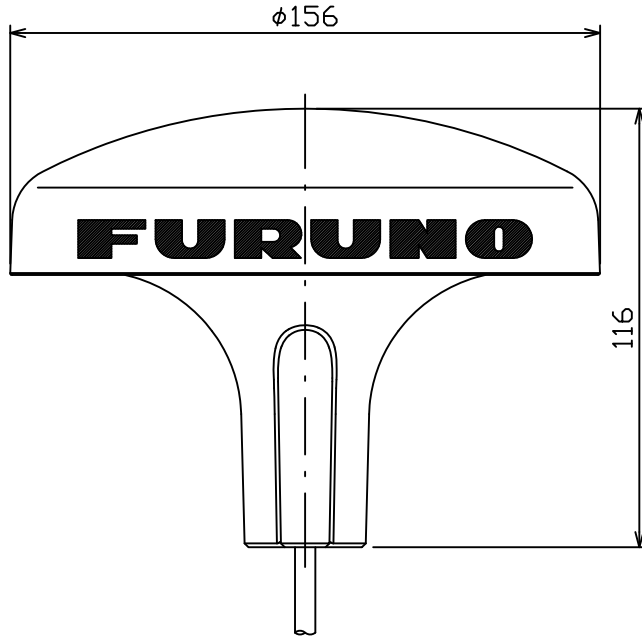
DRAWN Mar. 27 '07 T.YAMASAKI		TITLE GPA-017/017S
CHECKED Mar. 27 '07 T.TAKENO		名称 空中線部
APPROVED Mar. 27 '07 R.Esumi		外寸図
SCALE 1/1	MASS TABLE 2 表2参照	NAME ANTENNA UNIT
DWG.No. C4384-G04-L		OUTLINE DRAWING

A

B

C

D



1-14UNS1B

ねじ山数(25.4mmにつき): 14
 ピッチ: 1.8143 mm
 オネジ有効長さ: 15.17 mm
 オネジ有効径: 24.17 mm

THREAD PER 25.4mm (1 INCH): 14
 PITCH: 1.8143 mm
 THREAD LENGTH: 15.17 mm
 PITCH DIAMETER: 24.17 mm

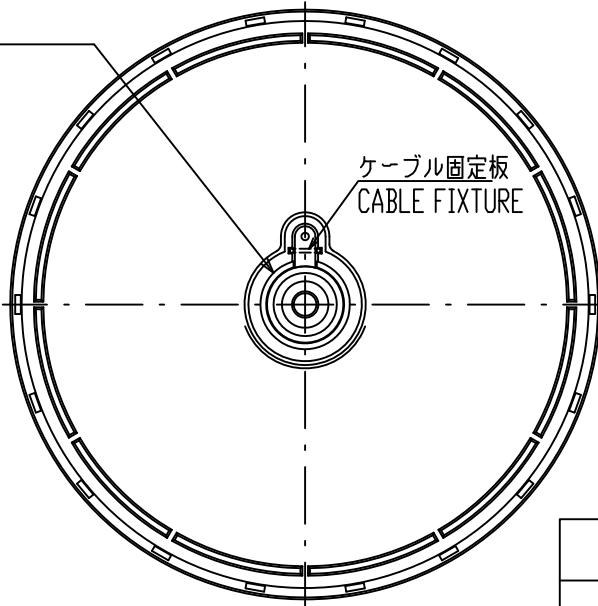


表1 TABLE 1

寸法区分(mm) DIMENSION	公差(mm) TOLERANCE
L ≤ 50	±1.5
50 < L ≤ 100	±2.5
100 < L ≤ 500	±3

表2 TABLE 2

型式 TYPE	ケーブル長(m) CABLE LENGTH	プラグ PLAG	質量 (kg±10%) MASS
GPA-019	10	TNC-P-3	0.98
GPA-019S	0.2	TNC-J-3	0.54
GPA-020S	0.2	TNC-J-3	0.32
GPA-021S	0.2	TNC-J-3	0.52

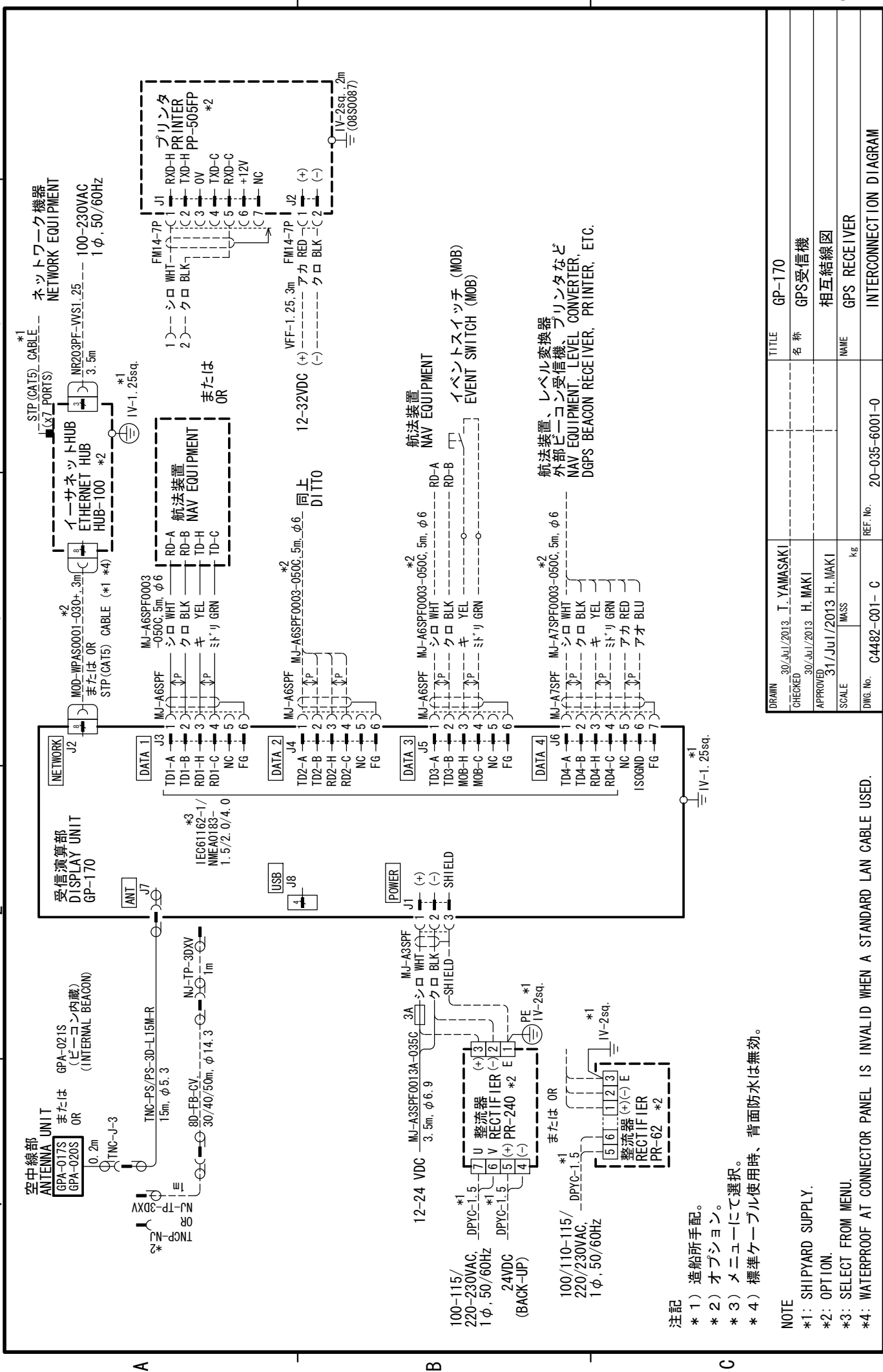
注記

1) 指定外の寸法公差は表1による。

NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.

DRAWN	14/May/2013 T.YAMASAKI	TITLE	GPA-019/019S/020S/021S
CHECKED	14/May/2013 H.MAKI	名称	空中線部
APPROVED	17/May/2013 H.MAKI		外寸図
SCALE	1/2	NAME	ANTENNA UNIT
DWG. No.	C4400-G01-G	REF. No.	20-016-210G-4
			OUTLINE DRAWING



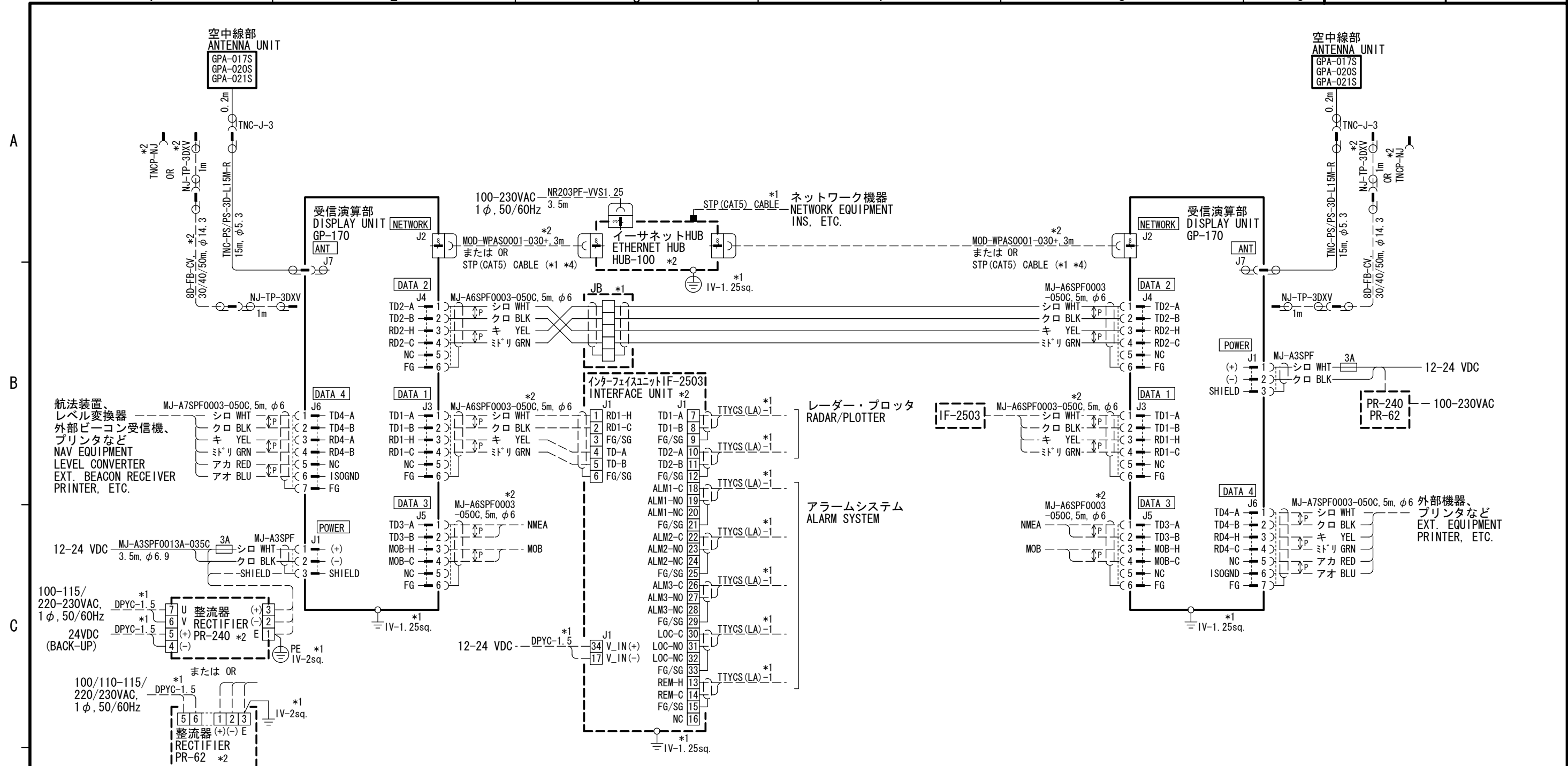
注記

- * 1) 造船所手配。
- * 2) オプション。
- * 3) メニューにて選択。
- * 4) 標準ケーブル使用時、背面防水は無効。

NOTE

- * 1: SHIPYARD SUPPLY.
- * 2: OPTION.
- * 3: SELECT FROM MENU.
- * 4: WATERPROOF AT CONNECTOR PANEL IS INVALID WHEN A STANDARD LAN CABLE USED.

DRAWN	30/JUL/2013 T. YAMASAKI	TITLE	GP-170
CHECKED	30/JUL/2013 H. MAKI	名称	GPS受信機
APPROVED	31/JUL/2013 H. MAKI	相互結線図	
SCALE	MASS kg	NAME	GPS RECEIVER
DWG. No.	C4482-001-C	REF. No.	20-035-6001-0
		INTERCONNECTION DIAGRAM	



注記
 * 1) 造船所手配。
 * 2) オプション。
 * 3) 損失が合計6dB以下になるようケーブル長を調節する。(8D-FB:0.165dB/m, 3D-2V:0.65dB/m)
 * 4) 標準ケーブル使用時、背面防水は無効。

NOTE
 *1: SHIPYARD SUPPLY.
 *2: OPTION.
 *3: ADJUST CABLE LENGTH FOR TOTAL LOSS WITHIN 6dB. (8D-FB:0.165dB/m, 3D-2V:0.65dB/m)
 *4: WATERPROOF AT CONNECTOR PANEL IS INVALID WHEN A STANDARD LAN CABLE USED.

DRAWN 4/Jun/2014 T. YAMASAKI	TITLE GP-170
CHECKED 4/Jun/2014 H. MAKI	名称 GPS航法装置 (DUAL)
APPROVED 5/Jun/2014 H. MAKI	相互結線図
SCALE MASS kg	NAME GPS NAVIGATOR (DUAL)
DWG No. C4482-C02- F	REF. No. INTERCONNECTION DIAGRAM