FURUNO

OPERATOR'S MANUAL

ENVISION

AR NAVIGATION SYSTEM

Model **AR-100M**

FURUNO ELECTRIC CO., LTD.

www.furuno.com

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 : SEP. 2019
C1 : DEC. 02, 2020

Pub. No. OME-45080-C1

(REFU) AR-100M

0 0 0 1 9 7 3 4 1 1 2

IMPORTANT NOTICES

General

- This manual has been authored with simplified grammar, to meet the needs of international users.
- The operator of this equipment must read and follow the instructions in this manual. Wrong operation or maintenance can void the warranty or cause injury.
- Do not copy any part of this manual without written permission from FURUNO.
- If this manual is lost or worn, contact your dealer about replacement.
- The contents of this manual and the equipment specifications can change without notice.
- The example screens (or illustrations) shown in this manual can be different from the screens you see on your display. The screens you see depend on your system configuration and equipment settings.
- Save this manual for future reference.
- Any modification of the equipment (including software) by persons not authorized by FURUNO will void the warranty.
- The following concern acts as our importer in Europe, as defined in DECISION No 768/2008/EC.
  - Name: FURUNO EUROPE B.V.
  - Address: Ridderhaven 19B, 2984 BT Ridderkerk, The Netherlands
- All brand, product names, trademarks, registered trademarks, and service marks belong to their respective holders.
- Windows is either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

How to discard this product

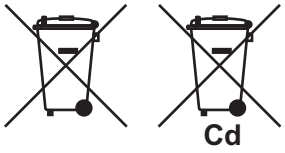
Discard this product according to local regulations for the disposal of industrial waste. For disposal in the USA, see the homepage of the Electronics Industries Alliance (http://www.eiae.org/) for the correct method of disposal.

How to discard a used battery

Some FURUNO products have a battery(ies). To see if your product has a battery, see the chapter on Maintenance. If a battery is used, tape the + and - terminals of the battery before disposal to prevent fire, heat generation caused by short circuit.

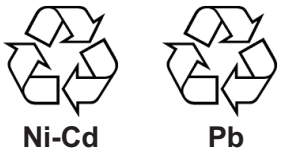
In the European Union

The crossed-out trash can symbol indicates that all types of batteries must not be discarded in standard trash, or at a trash site. Take the used batteries to a battery collection site according to your national legislation and the Batteries Directive 2006/66/EU.



In the USA

The Mobius loop symbol (three chasing arrows) indicates that Ni-Cd and lead-acid rechargeable batteries must be recycled. Take the used batteries to a battery collection site according to local laws.



In the other countries

There are no international standards for the battery recycle symbol. The number of symbols can increase when the other countries make their own recycle symbols in the future.

⚠ SAFETY INSTRUCTIONS

The operator and installer must read the applicable safety instructions before attempting to operate or 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.

⚠ Warning, Caution Prohibitive Action Mandatory Action

⚠ WARNING

Do not open the equipment unless totally familiar with electrical circuits.

Only qualified personnel can work inside the equipment.

Do not disassemble or modify the equipment.

Fire, electrical shock or serious injury can occur.

Turn the power off before beginning the installation.

Be sure both the system and all external devices are turned off. Sudden surge of power could damage the equipment.

Be sure to power each unit with proper voltage.

Connection of an improper power supply can cause fire or damage the equipment.

Turn the power off immediately if the equipment is emitting smoke or fire.

Fire or electrical shock can result if the power is left on.

Turn off the power immediately if you feel the equipment is acting abnormally.

If the equipment is hot to touch or is emitting strange noises, turn the power off immediately and contact your delaer for advice.

Turn the system off before cleaning and doing maintenance.

⚠ WARNING

The mounting location must satisfy the operating temperature range of the equipment.

Do not install the equipment where it may get wet from rain or water splash.

Water can cause fire or electrical shock, or damage the equipment.

Do not operate the equipment with wet hands.

Electrical shock can result.

⚠ CAUTION

Do not depend on one navigation device for the navigation of the vessel.

Always check your position against all available aids to navigation, for the safety of vessel and crew.

Do not connect/disconnect a cable from the main PC while turning the power on.

Observe the following compass safe distances to prevent deviation of a magnetic compass:

	Standard compass	Steering compass
Sensor Adapter (MC-3000S)	2.05 m	1.35 m

TABLE OF CONTENTS

FOREWORD

Congratulations on your choice of the FURUNO AR-100M AR Navigation System. We are confident you will see why the FURUNO name has become synonymous with quality and reliability.

Since 1948, FURUNO Electric Company has enjoyed an enviable reputation for quality marine electronics equipment. This dedication to excellence is furthered by our extensive global network of agents and dealers.

This equipment is designed and constructed to meet the rigorous demands of the marine environment. However, no machine can perform its intended function unless operated and maintained properly. Please carefully read and follow the recommended procedures for operation and maintenance.

We would appreciate hearing from you, the end-user, about whether we are achieving our goal. Thank you for considering and purchasing FURUNO equipment.

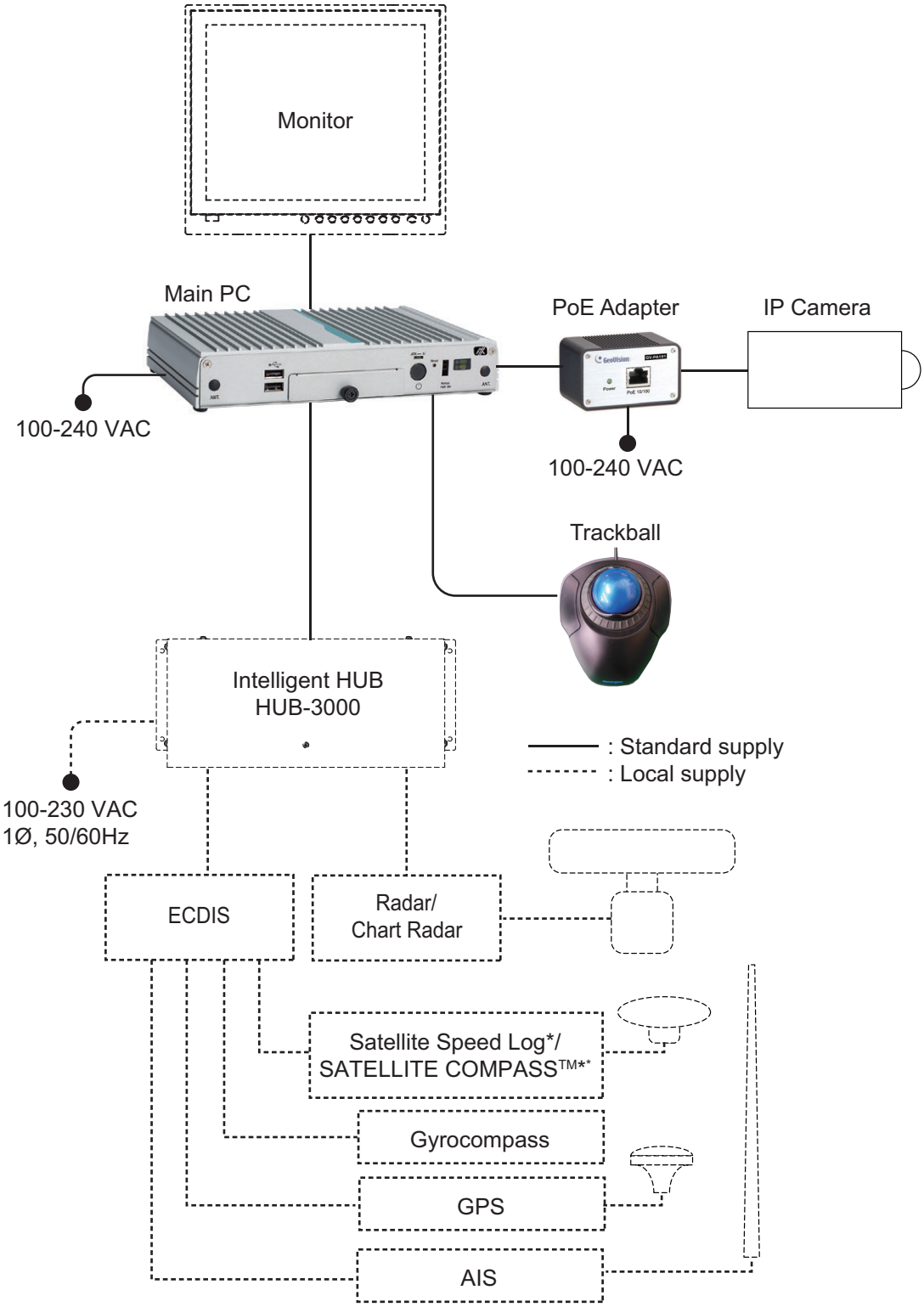
Cyber Security Notes

Keep in mind the following points to protect the AR navigation system from viruses.

- The AR navigation system is equipped with anti-virus software. The virus definitions and related files must be kept up-to-date. The operator is solely responsible for updating the virus definition. For how to update the virus definitions, see section 3.10.
- The PC and USB flash memory used to download and store an update file (for user chart file, virus definition, etc.) may be infected with a virus. Check the PC and the USB flash memory for viruses with a virus checker BEFORE you connect the USB flash memory to the AR navigation system.
- The main PC must be located in a high physical security area.
- DO NOT connect the AR navigation system and HUB-3000 to an external network, including other shipborne LAN.

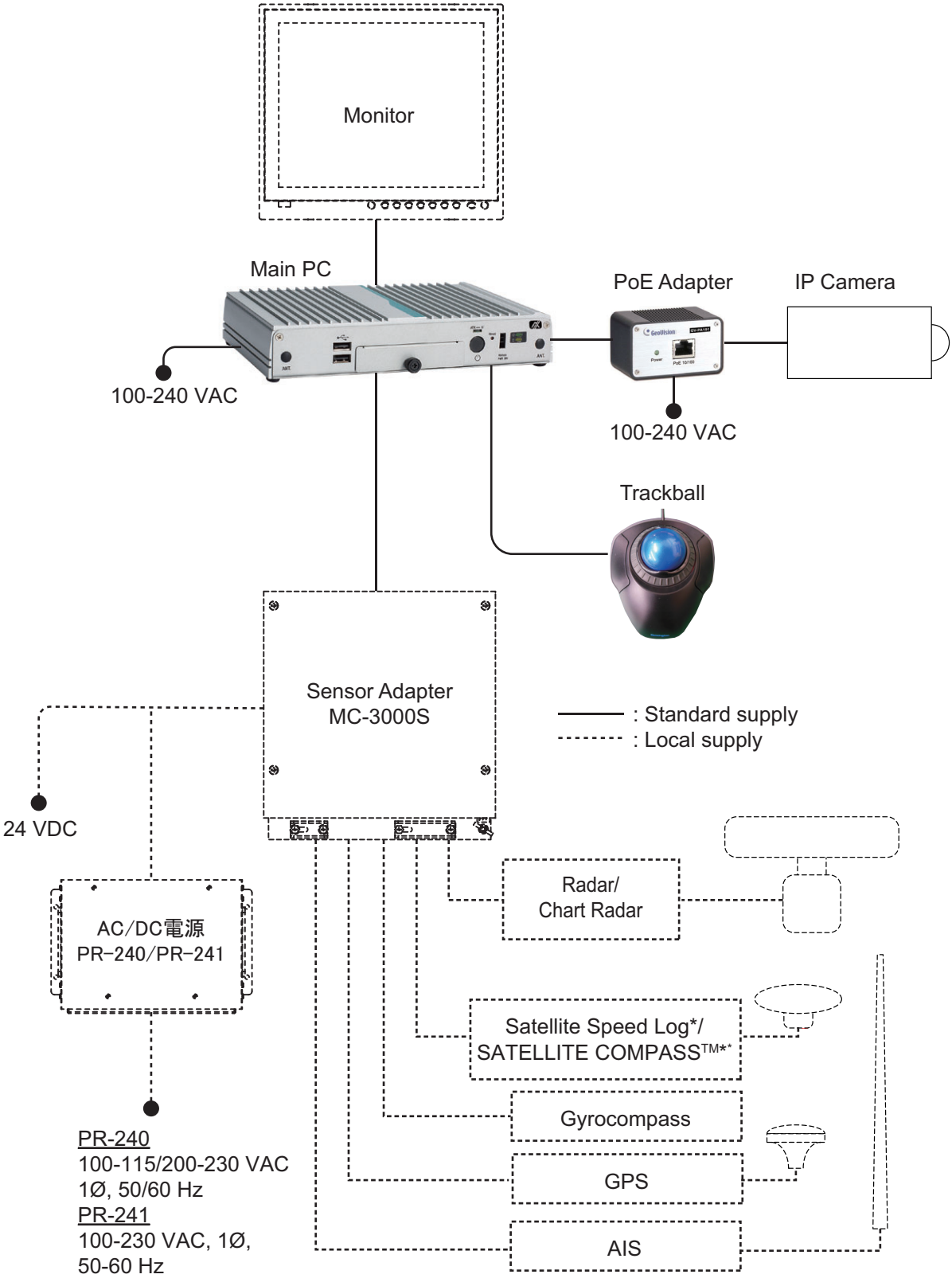
SYSTEM CONFIGURATION

System Configuration 1: The ECDIS is included in the system configuration



*: Performance after corrections to pitch, roll and yaw errors may vary, depending on the specifications of the connected equipment.

System Configuration 2: The ECDIS is not included in the system configuration



*: Performance after corrections to pitch, roll and yaw errors may vary, depending on the specifications of the connected equipment.

Compatible equipment

Category	Model	ENC Chart Sharing	Route Sharing
ECDIS	FMD-3200/3300	✓	✓
Category	Model	System Configuration 1	System Configuration 2
Radar	FAR-14×7	-	✓
	FAR-15×8	✓	✓
	FAR-2××7	✓	✓
	FAR-2××8	✓	✓
Chart Radar	FAR-3000	✓	✓
SATELLITE COMPASS™	SC-30	✓	✓
	SC-33	✓	✓
	SC-50	✓	✓
	SC-70	✓	✓
	SC-110	✓	✓
	SC-130	✓	✓
	SCX-21	✓	✓
Satellite Speed Log	GS-100	✓	✓
AIS	FA-30	✓	✓
	FA-40	✓	✓
	FA-50	✓	✓
	FA-60	✓	✓
	FA-70	✓	✓
	FA-150	✓	✓
	FA-170	✓	✓
GPS	GP-33	✓	✓
	GP-150	✓	✓
	GP-170	✓	✓
	GP-3500/F	✓	✓
	GP-3700/F	✓	✓

EQUIPMENT LIST

Standard supply

Name	Type	Code No.	Qty	Remarks
Main PC (Fanless Box PC)	eBOX100-312-FL-N3350	-	1	With AC adapter (3 m) and mounting kit
IP Camera	GV-EBX2100	-	1	
PoE Adapter	GV-PA191	-	1	With AC adapter (1.8 m)
Trackball	K72337JP	-	1	With 1.5 m USB cable
ENC Dongle*	ENC-KEY	-	1	
HDMI Cable	DH-HD14E50/RS	000-197-075-10	1	10 m cable between main PC and monitor
LAN Cable	P5E-4PTX-BL L=10M	000-164-637-10	2	10 m cable between: • HUB-3000 and main PC • IP camera and PoE adapter
	P5E-4PTX-BL L=2M	000-164-634-10	1	2 m cable between PoE adapter and main PC
USB Cable	KU-EN5K	000-197-073-10	2	5 m cable between: • USB flash memory and main PC • Trackball and main PC
Bracket	TB-109	000-197-072-10	1	For installing IP camera
Adhesive Rubber	QL-53CL	000-197-074-10	1	For installing PoE adapter

*: Supplied for the configuration connecting with the ECDIS.

Option

Name	Type	Code No.	Remarks
Sensor Adapter	MC-3000S	-	
AC/DC Power Supply Unit	PR-240	-	
	PR-241	-	
LAN Cable	FR-FTPC-CY *10M*	001-240-510	10m
	FR-FTPC-CY *20M*	001-240-520	20m
	FR-FTPC-CY *30M*	001-240-530	30m
Crimping Tool	CRIMPFOX10S	001-206-920	For ferrule

This page is intentionally left blank.

1. OPERATION

1.1 What is AR Navigation System?

The AR (Augmented Reality) navigation system is designed to assist in collision avoidance and increase safety of life at sea by giving the operator an increased level of situational awareness around the vessel.

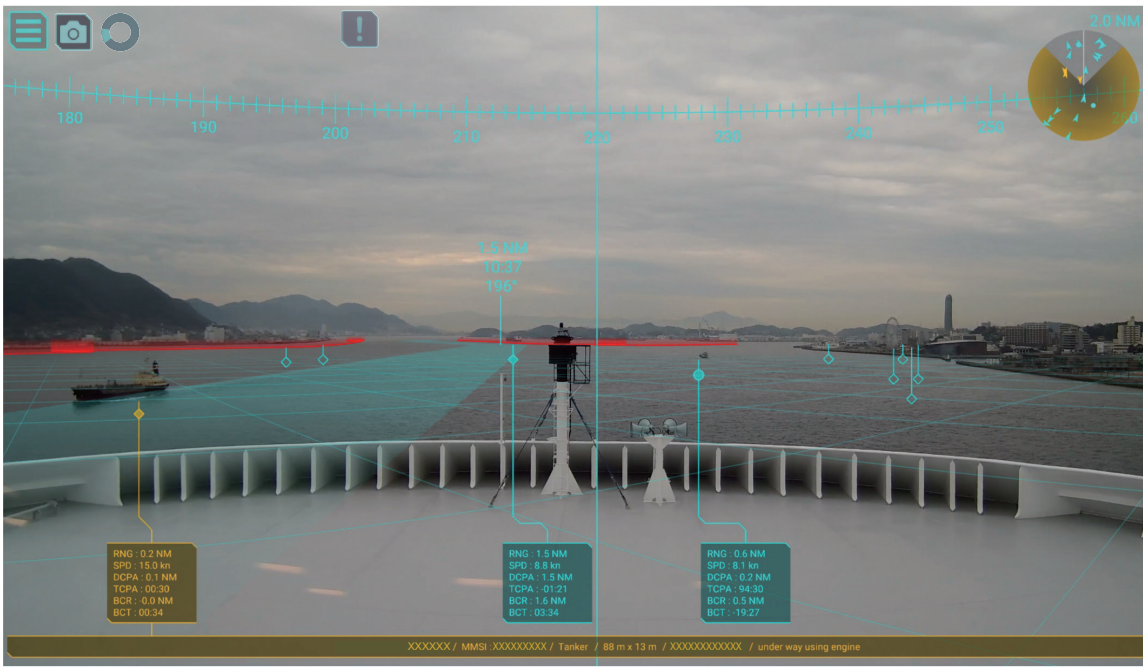
The AR navigation system can overlay the following navigation data on the actual video image in front of a vessel captured by the IP camera.

- Azimuth information from gyrocompass
- AIS data from AIS transponder
- TT data from radar
- Route, To waypoint, user chart and ENC chart symbols from ECDIS

The system keeps the AR objects aligned with the actual targets, compensating for roll, pitch and yaw.

For the video introducing the AR-100M, scan to visit our YouTube channel.

For the video of the AR stabilization, scan to visit our YouTube channel.



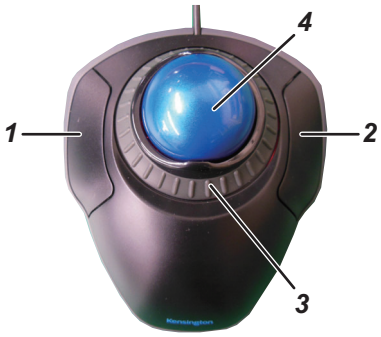
Display example for the AR navigation system

Note 1: Do not solely rely on the AR navigation system to navigate the vessel. Always check your position against all available aids to navigation, for the safety of vessel and crew.

Note 2: An ENC dongle is necessary to share the ENC charts from the ECDIS. Keep the ENC dongle connected to one of the USB ports on the main PC while using the AR navigation system.

1.2 Controls Overview

You can control almost all aspects of your AR navigation system from the trackball. The figure to the right and the table below show an overview of the trackball with a brief description of the controls.



No.	Name	Description
1	Left button	Select a highlighted object or menu item.
2	Right button	No function.
3	Scroll ring	• Scrolls the menu. • Zooms in/out at cursor location.
4	Trackball	Moves the cursor.

Standards used in this manual

Unless noted otherwise, “click” means to put the cursor on a object and press the left button on the trackball.

1.3 How to Turn the System On/Off

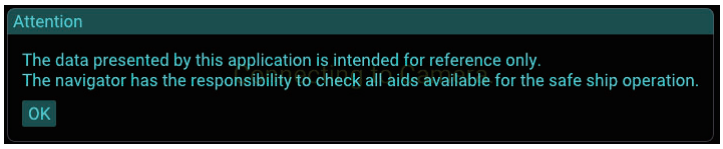
The power button for the system is located on the front panel of the main PC.

Note: When you turn the system on/off, keep in mind the following points:

- Supply power to the IP camera BEFORE turning on the AR navigation system. The video image may not appear if the IP camera is not powered first. If the video image does not appear, restart the AR navigation system.
- Lightly press the power button. If the power button is pressed too firmly, the button may get caught on the chassis.
- Do not turn the system off at the switchboard or breaker. The unit may be damaged.

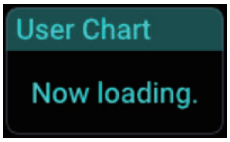
How to turn the system on

To turn the system on, press the power button. After pressing the power button, the LED on the main PC lights up and the system begins its startup process. When the startup process is completed, the following message appears. Confirm the message, then click the [OK] button to close the message.



When connecting to the IP camera, the following message appears at the center of the screen. Connecting process can take up to approximately one minute. After connecting with the IP camera, the AR navigation system screen appears automatically on the display.

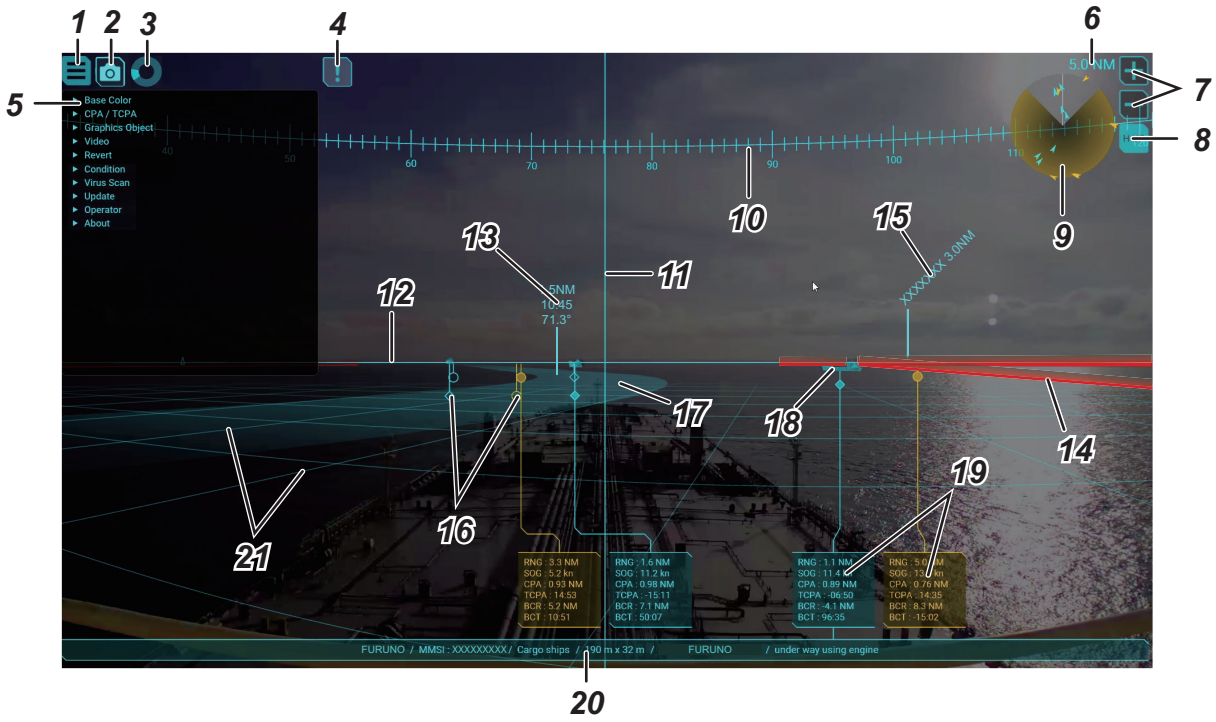
Note: When the user chart file has be imported, the message shown in the figure to the right appears. For how to import the user chart file, see subsection 1.9.1.



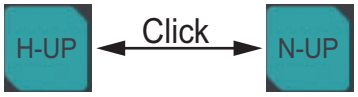
How to turn the system off

To turn the system off, press the power button again.

1.4 Display Overview



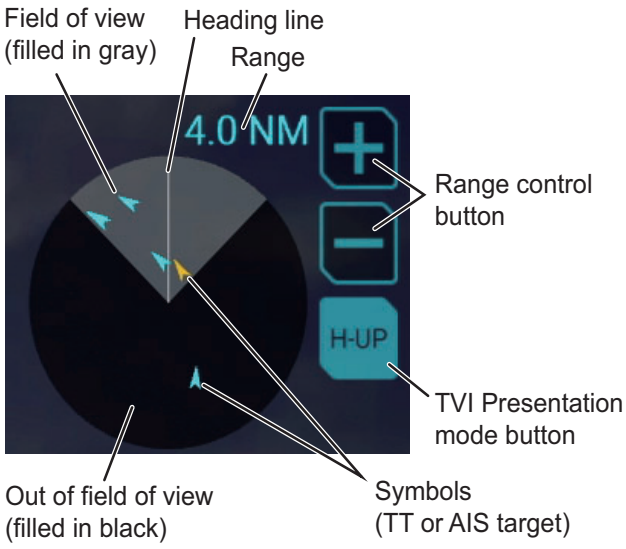
No.	Name	Description
1	Menu button	Opens/closes the main menu.
2	Screenshot button	Takes a screenshot of the current display.

No.	Name	Description
3	Working indicator	Rotates clockwise when the system is working correctly. Stops rotating when the system is frozen or malfunctioning.
4	Error button	Opens/closes the error frame. When a minor error occurs, the color of the button changes to yellow. Click the button to open the error frame, then confirm the error message. When no error occurs, the button is displayed in the base color selected at section 1.6.
5	Main menu	The main menu contains customizing options for this equipment. To open/close the menu, click the menu button. You can also close the main menu by clicking the video image.
6	Range	Shows the current display range in use for the AR navigation system.
7	Range control button	Adjusts the display range in use for the AR navigation system. The symbols on the AR navigation screen and TVI (Top View Indicator) change according to the display range. Click the ⊞ button to increase the range, or click the ⊟ button to reduce the range.
8	TVI Presentation mode button	Toggles between head-up and north-up presentation modes for the TVI. The indication on the button changes according to the presentation mode.  • [H-UP] (Head Up): Displays the symbols with the heading line of own ship at the top of the TVI. The heading line and the direction of the field of view are fixed, and the symbols rotate according to the heading. • [N-UP] (North Up): True north (0°) is at the top of the TVI. The heading line and the direction of the field of view rotate according to the heading.
9	TVI (Top View Indicator)	Displays the TT and AIS target's location in a circle about own ship. For details, see section 1.5.
10	Azimuth scale	Provides an estimate of the bearing to a target.
11	Heading guide	You can estimate the heading of own ship, by reading the point at which the heading guide intersects the azimuth scale. **Note:** When the IP camera position is offset from the ship's center, the heading guide is not aligned with the ship's bow on the video image.
12	Horizon line	Indicates the horizon, and is used to adjust the video image position. Normally, hide the horizon line. For how to show/hide the horizon line, see subsection 1.8.3.
13	Waypoint information	Display the information (course to the next waypoint, time to go, distance) for the To waypoint on the route.
14	No-go area	Indicates the area where the vessel is not allowed to go. You can show or hide the visible wall for the no-go area. See subsection 1.9.4. When you hide the visible wall, the no-go area is drawn only with a line.
15	User chart label	Indicates the user chart input from ECDIS.
16	Selective marker	Click the marker to show the TT or AIS target information. The figure below shows the appearance of the AIS and TT symbols.  When a AIS or TT target is evaluated to be an attentional target, its symbol is shown in the designated color (yellow, orange or red). For how to change the color, see section 1.7.
17	Route leg	Shows the monitored route leg that is shared with the ECDIS.

No.	Name	Description
18	Target shape	The target shape function overlays a ship graphic and buoy graphic on respective AIS targets and buoys. This is useful when AIS targets and buoys are not visible to the eye because of darkness or fog. For how to show/hide the target shape, see subsection 1.8.5.
19	Main target information frame	Shows navigation information for the target chosen with the selective marker. To close the frame, click the selective marker again to deselect the marker. You can customize the information to be shown in the frame. See subsection 1.8.6
20	Appended target information frame	Click the main target information frame to show the appended target information frame. To close the frame, click the main target information frame again. You can customize the information to be shown in the frame. See subsection 1.8.6.
21	Grid	Grid lines can be shown on the display, and are available in two types. • [Own]: Shows the grid lines based on the current IP camera position. Grid lines are fixed. • [World]: Shows the grid lines based on the IP camera position when the AR-100M application is started. Grid lines move according to the ship's movement. For how to change the mode or hide the grid, see subsection 1.8.4.

1.5 TVI (Top View Indicator)

The TVI displays the TT and AIS target's location in a circle about own ship. The field of view on the AR navigation system is filled in gray. The area out of the field of view is filled in black. When you zoom in/out the screen (by the scroll ring), the field of view on the TVI also changes.



The AIS or TT target that is within the range of the CPA/TCPA threshold is shown in the designated color (yellow, orange or red). If there is an attentional target in the out of field of view area, the area flashes in the designated color. The color can be changed from the menu. See section 1.7.

For the attentional target indication in the out-of-view area, scan to visit our YouTube channel.

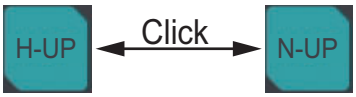
Range control

You can adjust the display range for the AR navigation system from the range control button. The symbols on the AR navigation screen and TVI change according to the display range. Click the ⊞ button to increase the range, or click the ⊟ button to reduce the range.

For the change of the AR navivation screen due to the range switching, scan to visit our YouTube channel.

Presentation mode

To change the presentation mode, click the TVI presentation mode button at the top right of the screen.



The following presentation modes are available with the TVI:

- [H-UP] (Head Up): Displays the symbols with the heading line of own ship at the top of the TVI. The heading line and the direction of the field of view are fixed, and the symbols rotate according to the heading.
- [N-UP] (North Up): True north (0°) is at the top of the TVI. The heading line and the direction of the field of view rotate according to the heading.

Symbols

The following table shows the symbols used in the TVI.

	Without HDG/COG	With HDG/COG
AIS	●	(HDG > COG)
TT	●	(COG)

Note 1: The normal target color depends on the base color setting. See section 1.6.

Note 2: The attentional target color can be changed from the menu. See section 1.7.

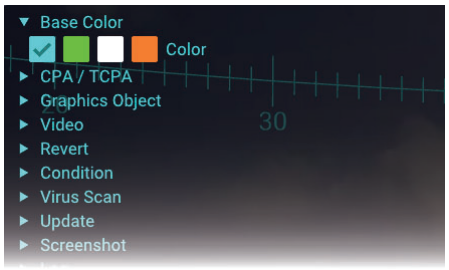
1.6 How to Change the Base Color

You can change the base color for the AR navigation system screen. The base color is applied to the following items:

- Main menu text and buttons
- Target information text and frame*
- Grid
- Symbols* and buttons for TVI
- Heading guide
- Waypoint text
- Route leg
- ENC chart
- Working indicator
- Screenshot button
- User chart (other than no-go area)
- Horizon line
- Azimuth scale
- Target shape*
- Error button (when no error occurs)

*: Does not include attentional targets.

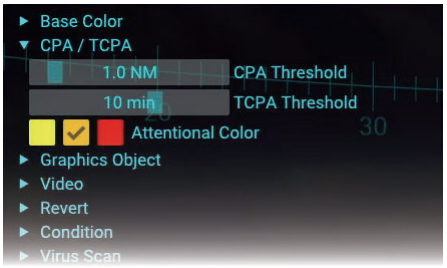
1. Click the menu button to open the main menu.
2. Click [Base Color].
3. Click an appropriate checkbox to select the base color.
4. Close the main menu.



1.7 How to Set the CPA and TCPA Thresholds

The AR navigation system continuously monitors the predicted range at the Closest Point of Approach (CPA) and predicted time to CPA (TCPA) of each AIS and TT target. When the predicted CPA of any AIS or TT becomes smaller than the preset CPA threshold and its predicted TCPA less than the preset TCPA threshold, the symbol and target information color are changed to the designated color (yellow, orange or red).

1. Click the menu button to open the main menu.
2. Click [CPA/TCPA].
3. Adjust the slider bar for [CPA Threshold] to change the CPA threshold.
4. Adjust the slider bar for [TCPA Threshold] to change the TCPA threshold.

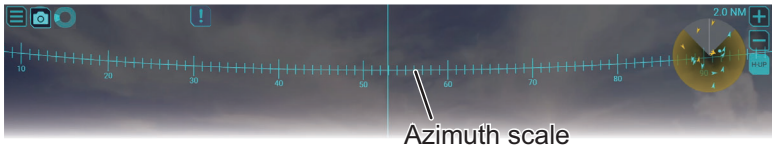


5. Click an appropriate checkbox of [Attentional Color] to select the color for the attentional target.
6. Close the main menu.

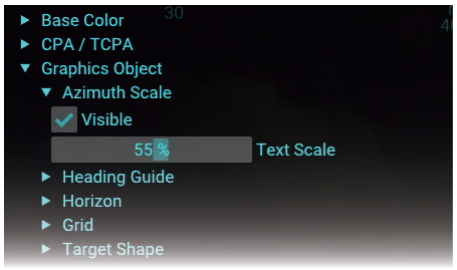
1.8 How to Customize the Graphics Object

1.8.1 How to show/hide the azimuth scale

The azimuth scale is shown at the top of the screen. You can use the scale to estimate the bearing of ship's heading or a target. The azimuth scale rotates according to the ship's movement.



1. Click the menu button to open the main menu.
2. Click [Graphics Object].
3. Click [Azimuth Scale].
4. Check the checkbox for [Visible] to show the azimuth scale. If you want to hide the scale, remove the check mark from the checkbox.

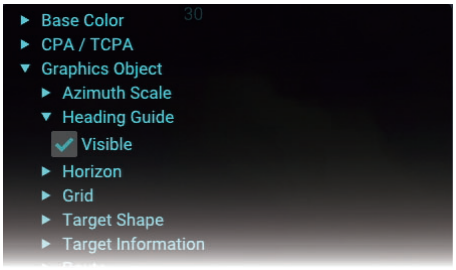


5. Adjust the slider bar for [Text Scale] to change the size of the text on the azimuth scale.
6. Close the main menu.

1.8.2 How to show/hide the heading guide

You can estimate the heading of own ship, by reading the point at which the heading guide intersects the azimuth scale.

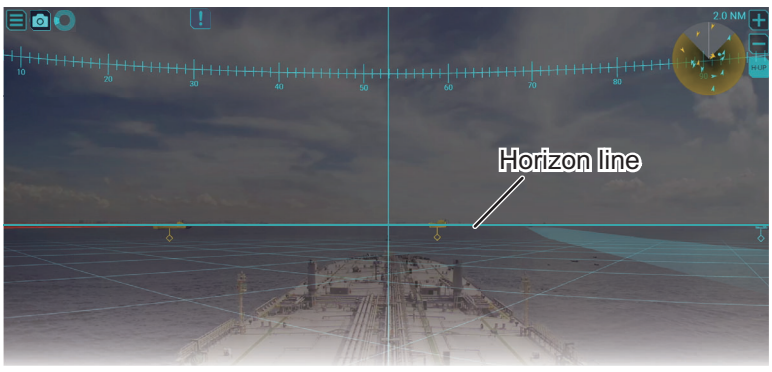
1. Click the menu button to open the main menu.
2. Click [Graphics Object].
3. Click [Heading Guide].
4. Check the checkbox for [Visible] to show the heading guide. If you want to hide the heading guide, remove the check mark from the checkbox.
5. Close the main menu.



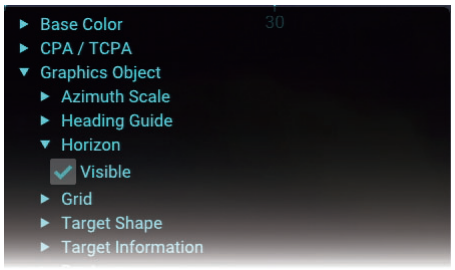
1.8.3 How to show/hide the horizon line

You can show the horizon line on the AR navigation system. If the horizon line is not aligned with the horizon on the screen, adjust the position of the video image. See section 1.11.

Note: The horizon line is used to adjust the video image position. Normally, hide the horizon line.



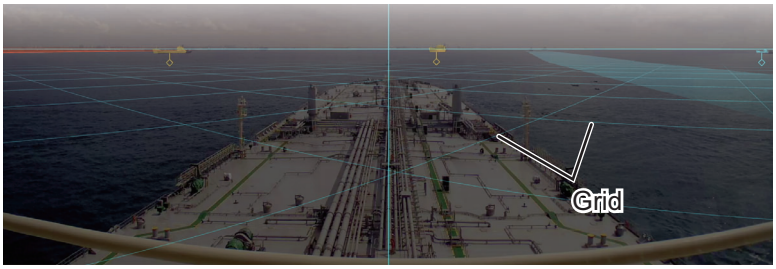
1. Click the menu button to open the main menu.
2. Click [Graphics Object].
3. Click [Horizon].
4. Check the checkbox for [Visible] to show the horizon line. If you want to hide horizon line, remove the check mark from the checkbox.
5. Close the main menu.



1.8.4 How to customize the grid lines

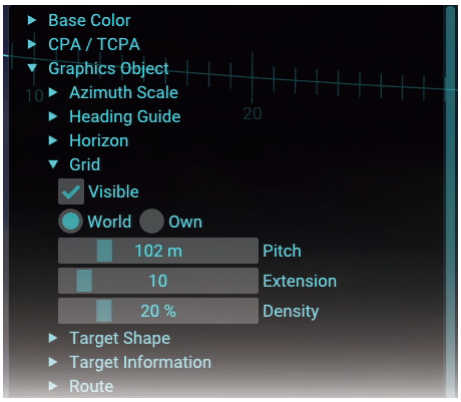
Grid lines can be shown in one of two methods.

- [Own]: Shows the grid lines based on the current IP camera position. Grid lines are fixed.
- [World]: Shows the grid lines based on the IP camera position when the AR-100M application is started. Grid lines move according to the ship's movement.



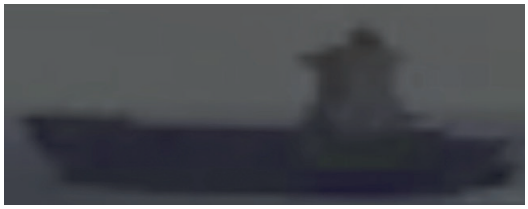
Also, you can customize the grid pitch, number of grid cells and the transparency of the grid lines.

1. Click the menu button to open the main menu.
2. Click [Graphics Object].
3. Click [Grid].
4. Check the checkbox for [Visible] to show the grid. If you want to hide the grid, remove the check mark from the checkbox.
5. Check the radio button for [World] or [Own].
6. Adjust the slider bar for [Pitch], [Extension] and [Density] as appropriate.
   - [Pitch]: Adjust the pitch for the grid lines.
   - [Extension]: Adjust the number of the grid cells.
   - [Density]: Adjust the transparency of the grid lines.
7. Close the main menu.

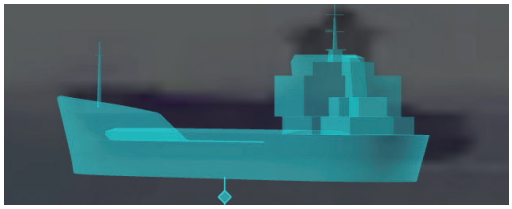


1.8.5 How to show/hide the target shape

You can overlay the applicable target shape (graphic) on AIS targets and buoys. This feature is useful for showing the AIS targets and buoys on the screen that are not completely visible because of darkness or fog.



Target shape = OFF



Target shape = ON

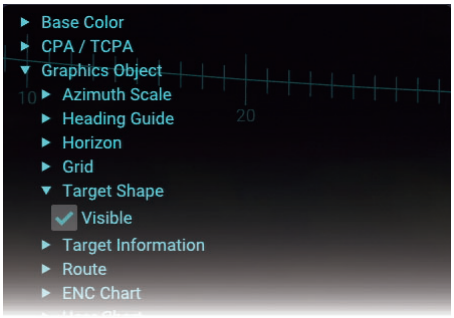
The AR navigation system overlays the following target shapes according to the target size and type.

Buoy/Virtual buoy

AIS target (boat)

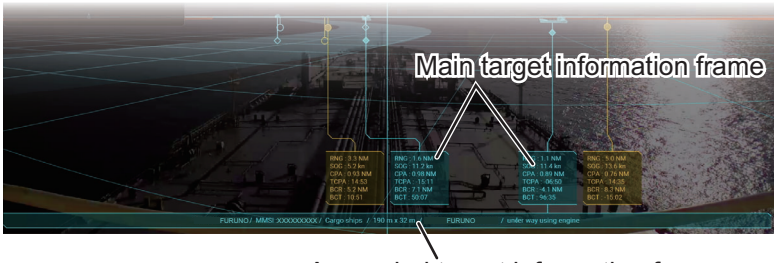
AIS target (tanker)

1. Click the menu button to open the main menu.
2. Click [Graphics Object].
3. Click [Target Shape].
4. Check the checkbox for [Visible] to show the target shape. If you want to hide the target shape, remove the check mark from the checkbox.
5. Close the main menu.



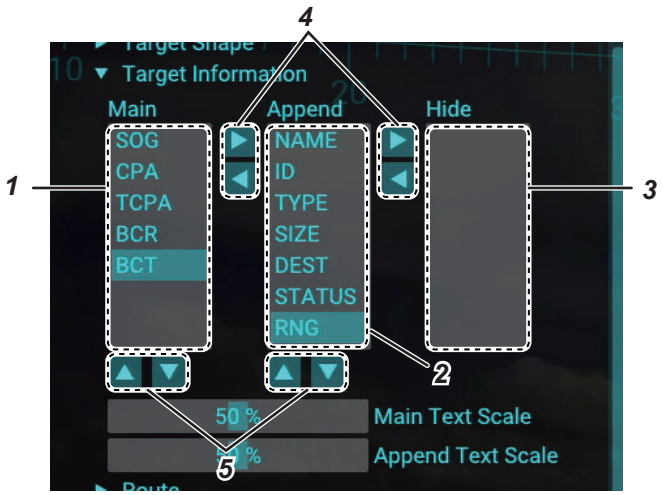
1.8.6 How to customize target information

You can customize the contents in the main target information frame and appended target information frame.



1. Click the menu button to open the main menu.
2. Click [Graphics Object].

3. Click [Target Information].



4. Customize the data referring to the following table.

No.	Name	Description
1	[Main] box	Data displayed in the main target information frame.
2	[Append] box	Data displayed in the appended target information frame.
3	[Hide] box	The data registered in the [Hide] box is not shown in either the main or appended target information frames.
4	Frame change button	Moves the data selected with the cursor to other setting box.
5	Order change button	Changes the order of the data selected with the cursor.

Available target data

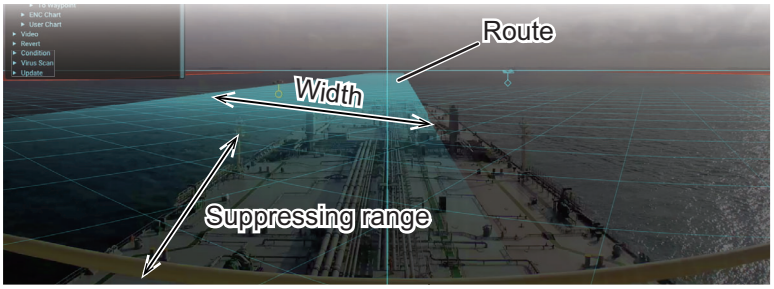
The following data is available for the target information:

Item	Description
[NAME]	Vessel name. For targets whose vessel name data is not available, "<No Name>" appears.
[ID]	• TT target: When the data source can be specified, radar ID and target ID are shown. • AIS target: MMSI is shown.
[SIZE]	Vessel size of the AIS target. For the TT target and AIS target whose vessel size data is not available, "---- m × --- m" appears.
[DEST]	Destination (max. 20 characters). For the target whose destination data is not available, "<No Destination>" appears.
[STATUS]	Navigational status for the AIS target. For targets whose navigational data is not available, "<No Navigational Status>" appears.
[TYPE]	Vessel type for the AIS target. For TT/AIS targets whose vessel type data is not available, "<No Type>" appears.
[RNG]	Distance to the target.
[CPA]	Target's CPA.
[TCPA]	Target's TCPA.
[BCR]	Target's bow cross range.
[BCT]	Target's bow cross time.
[SOG]	Target's speed over the ground.

5. Adjust the slider bar for [Main Text Scale] to change the size of the text in the main target information frame.
6. Adjust the slider bar for [Append Text Scale] to change the size of the text in the appended target information frame.
7. Close the main menu.

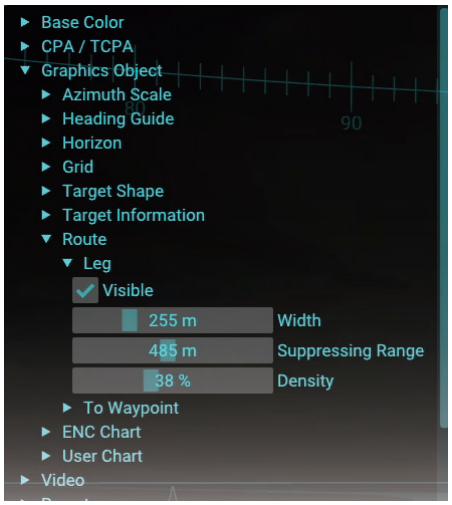
1.8.7 How to customize the route display

The monitored route can be shown on the AR navigation system screen. The route becomes darker with distance from own ship.



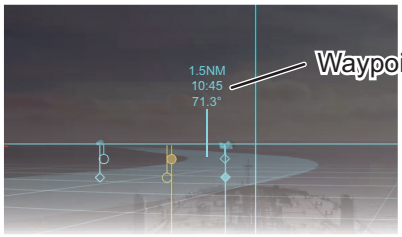
You can customize the width, transparency and suppressing range for the route display.

1. Click the menu button to open the main menu.
2. Click [Graphics Object].
3. Click [Route].
4. Click [Leg].
5. Check the checkbox for [Visible] to show the route. If you want to hide the route, remove the check mark from the checkbox.
6. Adjust the slider bar for [Width], [Suppressing Range] and [Density] as appropriate.
   - [Width]: Adjust the width of the route display, colored base color.
   - [Suppressing Range]: Adjust the range to suppress the transparency of the route display near the vessel. Adjust this value to improve the visibility of the targets near the vessel.
   - [Density]: Adjust the transparency of the route display.
7. Close the main menu.

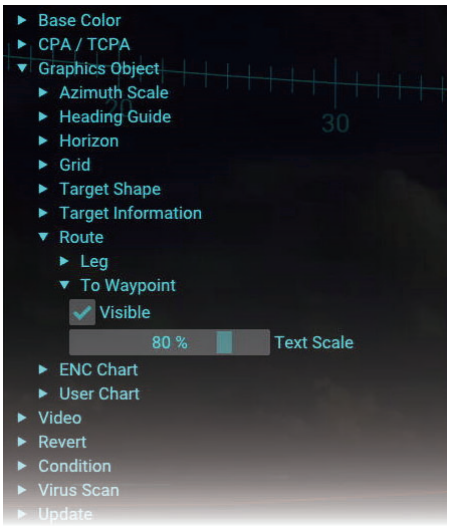


1.8.8 How to show/hide the waypoint information

You can show/hide the information (course to the next waypoint, time to go, distance) for the To waypoint on the route.



1. Click the menu button to open the main menu.
2. Click [Graphics Object].
3. Click [Route].
4. Click [To Waypoint].
5. Check the checkbox for [Visible] to show the waypoint information. If you want to hide the information, remove the check mark from the checkbox.
6. Adjust the slider bar for [Text Scale] to change the size of the text for the waypoint information.
7. Close the main menu.

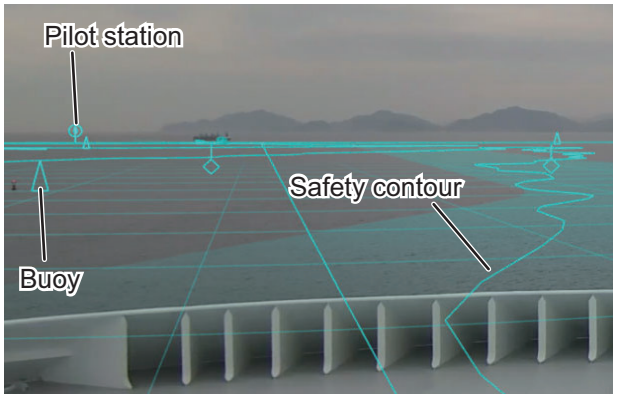


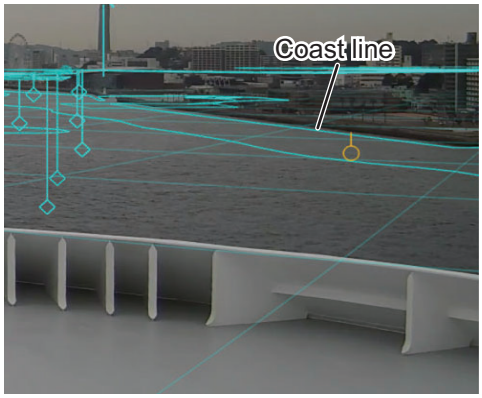
1.8.9 How to show/hide the ENC chart objects

The following ENC chart objects can be displayed on the AR navigation system screen:

- Buoy
- Coast line
- Pilot station
- Safety contour*

*: The safety contour may or may not be visible depending on the safety contour settings at the ECDIS.

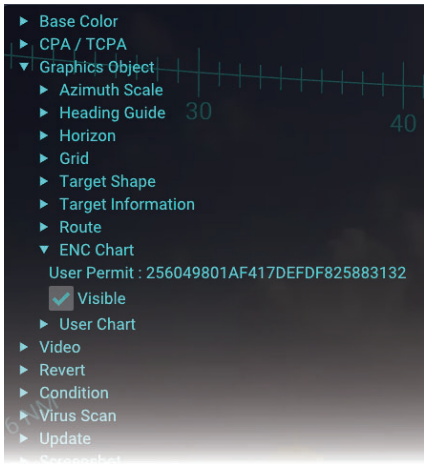




Note 1: The AR navigation system cannot overlay ENC chart objects from the ECDIS if the ECDIS has C-MAP charts installed. Uninstall C-MAP charts to use ENC chart objects.

Note 2: The most detailed ENC chart objects at current position are displayed on the AR navigation system. Therefore, ENC chart objects on the AR navigation system may be different from the objects on the ECDIS.

1. Click the menu button to open the main menu.
2. Click [Graphics Object].
3. Click [ENC Chart].
4. Check the checkbox for [Visible] to show the ENC chart objects. If you want to hide the objects, remove the check mark from the checkbox.
5. Close the main menu.



1.9 User Charts

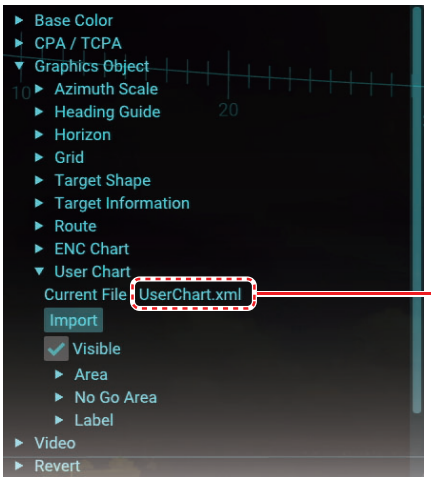
User charts are overlays that the user creates to indicate safety-related objects and areas. The AR navigation system can display the user chart objects created on the ECDIS.

To show the user chart objects, import user charts created on the ECDIS.

1.9.1 How to import user charts created on the ECDIS

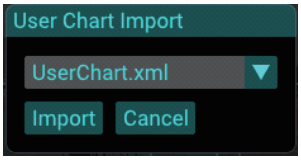
Do as follows to import user charts created on the ECDIS.

1. Copy the user chart (file extension: xml) to a USB flash memory then insert the flash memory to the USB port on the main PC.
   Note: The user chart must be saved to the root directory of the USB flash memory.
2. Click the menu button to open the main menu.
3. Click [Graphics Object].
4. Click [User Chart].

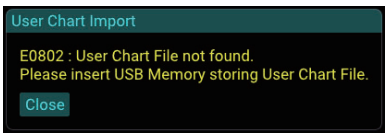


Current user chart file name that is used on the AR navigation system appears here.

5. Click the [Import] button.
   The window as shown in the figure to the right appears.

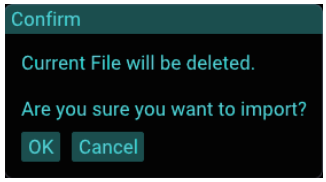


Note: If the user chart file is not saved in the USB flash memory, the message shown in the figure to the right appears. Confirm that the user chart file is saved correctly in the flash memory.

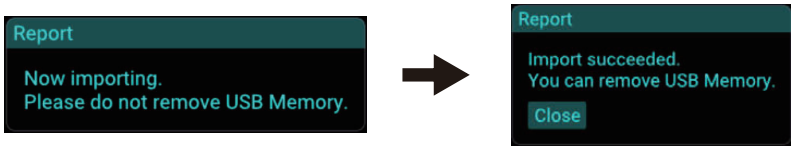


6. Select a user chart file from the drop-down list.
   Note: The following characters and symbols are available for the file name. Do not use other characters and symbols.
   - Allowed characters: Alphanumeric characters
   - Allowed symbols: ! #* $ % & ' ( ) + , - . ; = @ [ ] ^ _ ` { } ~ °
     *: Multiple same characters (example: ##) cannot be used.

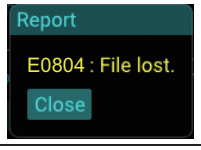
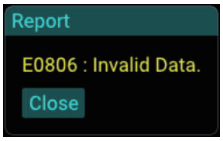
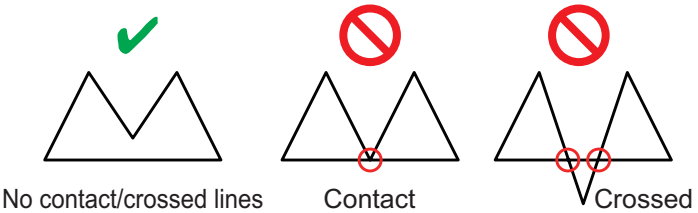
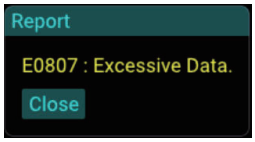
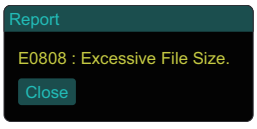
7. Click the [Import] button.
   The confirmation message shown in the figure to the right appears.



8. Click the [OK] button.
   The message shown below-left appears during the import. After completing the import, the confirmation message shown below-right appears.



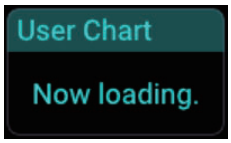
Note: If an error message appears while importing a user chart file, see the table below to rectify the error.

Error message	Meaning/Remedy
	The flash memory was removed while importing a user chart file. Close the message and insert the flash memory, then re-try importing the user charts.
	Invalid user chart file is used. Use the user chart file created on the ECDIS. Also, if the user chart file contains an area type object(s) which has lines that cross or contact one another, the AR-100M cannot import the user chart file. 
	There are too many data in the user chart file. This system cannot use the user chart file that contains 10,000 or more data.
	The capacity of the user char file exceeds 10 MB. Use the user chart file whose capacity is less than 10 MB.

9. Remove the USB flash memory.
10. Click the [Close] button to close the message.

11. Close the main menu.

When the user chart file has be imported, the message shown in the figure to the right appears.

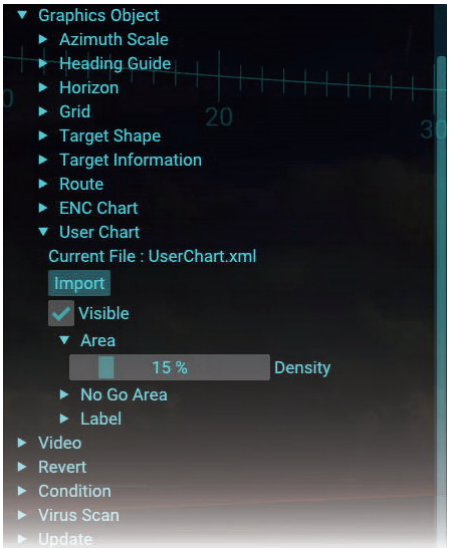


1.9.2 How to show/hide the user charts

1. Click the menu button to open the main menu.
2. Click [Graphics Object].
3. Click [User Chart].
4. Check the checkbox for [Visible] to show the user chart objects. If you want to hide the objects, remove the check mark from the checkbox.
5. Close the main menu.

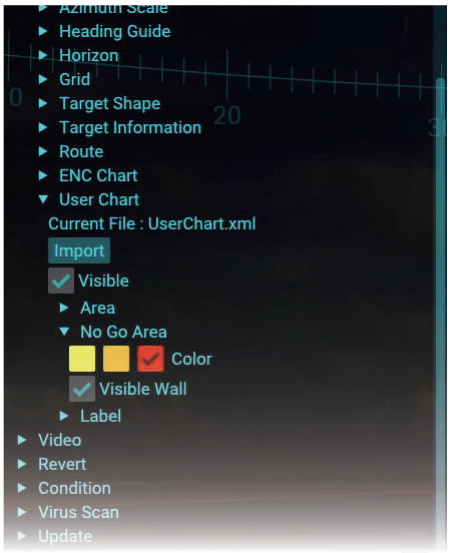
1.9.3 How to adjust area object transparency

1. Click the menu button to open the main menu.
2. Click [Graphics Object].
3. Click [User Chart].
4. Click [Area].
5. Adjust the slider bar for [Density] to adjust the transparency of the area object.
6. Close the main menu.



1.9.4 How to customize no-go area objects

1. Click the menu button to open the main menu.
2. Click [Graphics Object].
3. Click [User Chart].
4. Click [No Go Area].
5. Select the color for the no-go area objects. The AR navigation system recognizes the user chart objects whose line style is “Coast” or “Depth” as no-go area objects. No-go areas are drawn with the color selected here. The color for other line objects depends on the base color.



6. Check the checkbox for [Visible Wall] to show the visible wall for the no-go area. If you want to hide the visible wall, remove the check mark from the checkbox. When you hide the visible wall, the no go-area is drawn only with a line.

7. Close the main menu.

1.9.5 How to adjust the text size for label objects

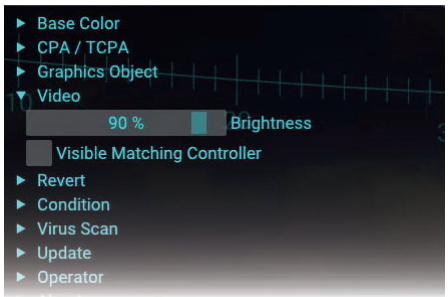
1. Click the menu button to open the main menu.
2. Click [Graphics Object].
3. Click [User Chart].
4. Click [Label].
5. Adjust the slider bar for [Text Scale] to change the size of the text for the label objects.
6. Close the main menu.

1.10 How to Adjust the Video Image Brilliance

You can adjust the brilliance of the video image from the IP camera. If you want to emphasize the AR navigation objects on the screen, decrease the brilliance.

Note: This function does not adjust the display brilliance. To adjust the display brilliance, see the operator's manual of the monitor unit.

1. Click the menu button to open the main menu.
2. Click [Video].
3. Adjust the slider bar for [Brightness] to adjust the video image brilliance.
4. Close the main menu.



1.11 How to Adjust the Video Image Position

When an AR object is not aligned with the target (AIS target, buoy, etc.) on the screen, adjust the video image position to overlay correctly the object on the target.

Note: Do not move the IP camera after installation. When you want to adjust the video image position, do as follows.

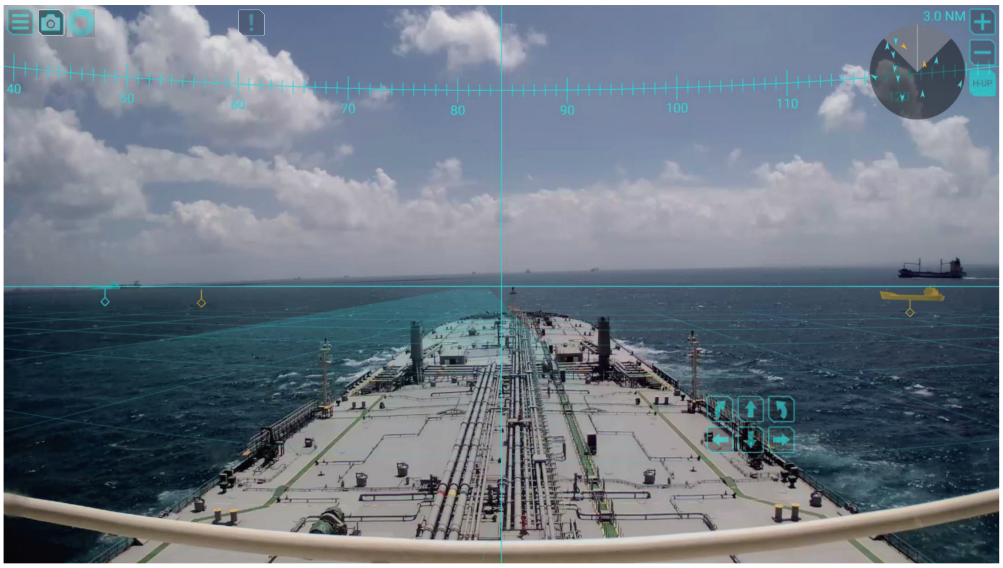
1. Click the menu button to open the main menu.
2. Click [Video].
3. Check the checkbox for [Visible Matching Controller] to show the visible matching controller.
4. Show the horizon line and target shape, referring to subsection 1.8.3 and subsection 1.8.8.

Visible matching controller

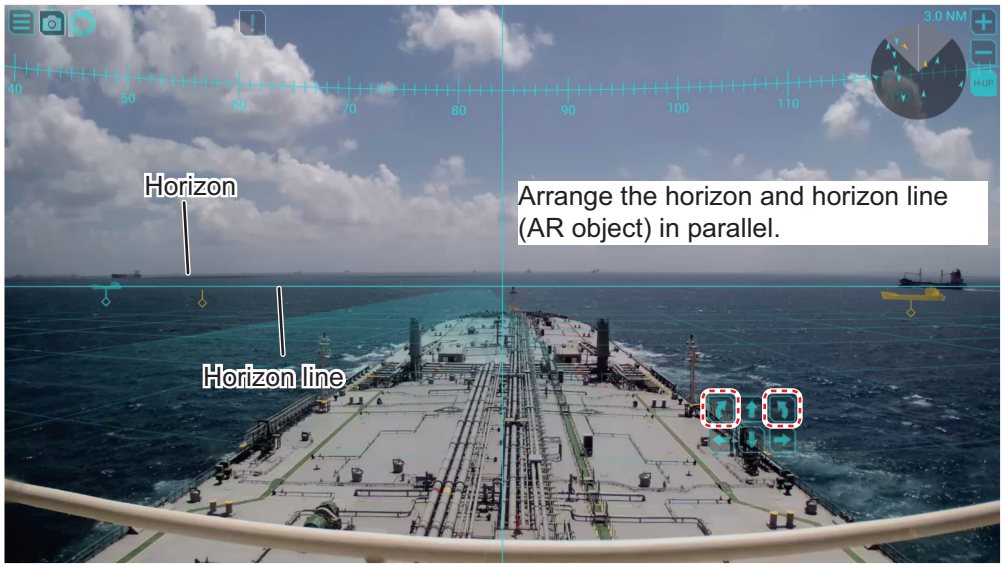
5. Click the buttons on the visible matching controller to adjust video image position, considering the following points.
   - The horizon line must be aligned with the horizon on the screen.
   - The target shape must be aligned with the actual AIS target. It is recommended to select an AIS target that is stationary.
   - The selective marker for the TT target must be aligned with the actual TT target.

   Note: When the IP camera position is offset from the ship's center, the heading guide is not aligned with the ship's bow on the video image, due to the offset applied.

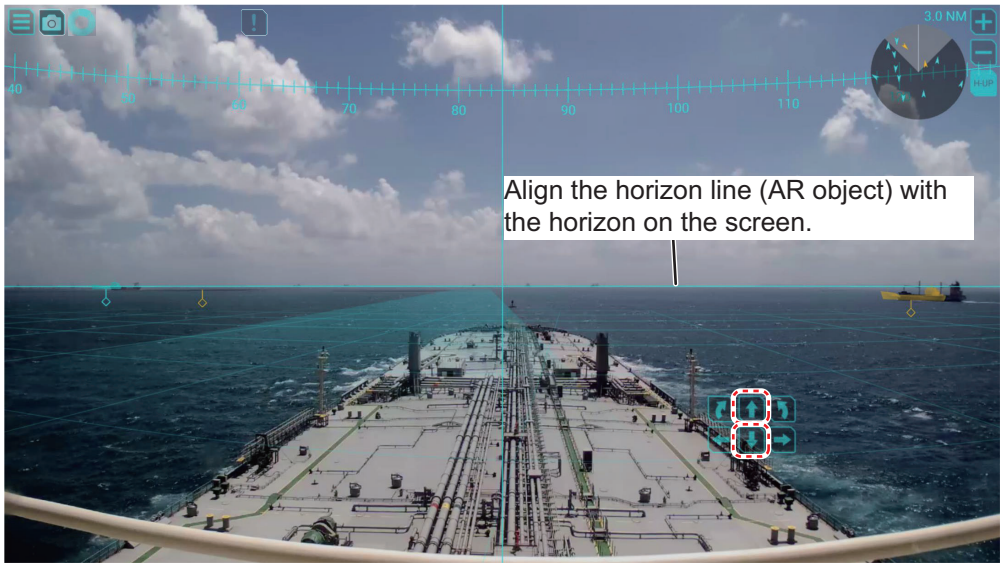
   Adjusting example
   1 Before adjusting



2 Roll adjusting



3 Pitch adjusting



4 Yaw adjusting

6. Hide the horizon line and matching controller. The target shape feature may be kept on if its use is necessary.
   To hide the matching controller, uncheck the checkbox for [Visible Matching Controller].

Note: It takes approx. five seconds to save the configuration. When you adjust the video image position for initial settings, restart the AR navigation system. After restarting the AR navigation system, confirm that the AR navigation objects are correctly aligned with their respective targets on the screen.

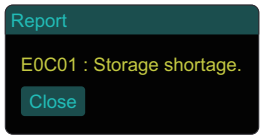
1.12 Screenshots

You can save a screenshot of the on-screen display and play it back at any time.

1.12.1 How to take a screenshot

To take a screenshot, click the screenshot button on the top-left of the display. The screenshot is saved in the main PC. The file format for saved screenshots is PNG. The date and time the file was saved are used for the file name. For example, when the screenshot is saved at 03:04:05, February 1, 2020, the file name is “20200102_030405.png”.

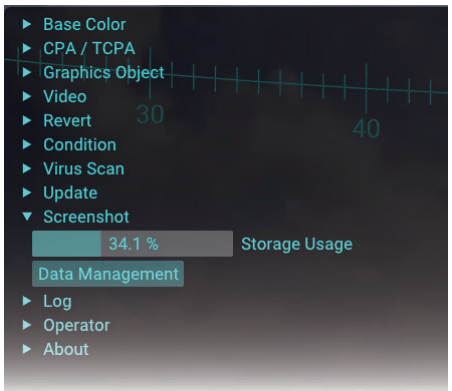
Note: If the disk capacity is insufficient to take a screenshot, the error message shown in the figure to the right appears. Delete unnecessary screenshots referring to subsection 1.12.3. You can confirm the disk capacity status in the main PC from the main menu → [Screenshot].



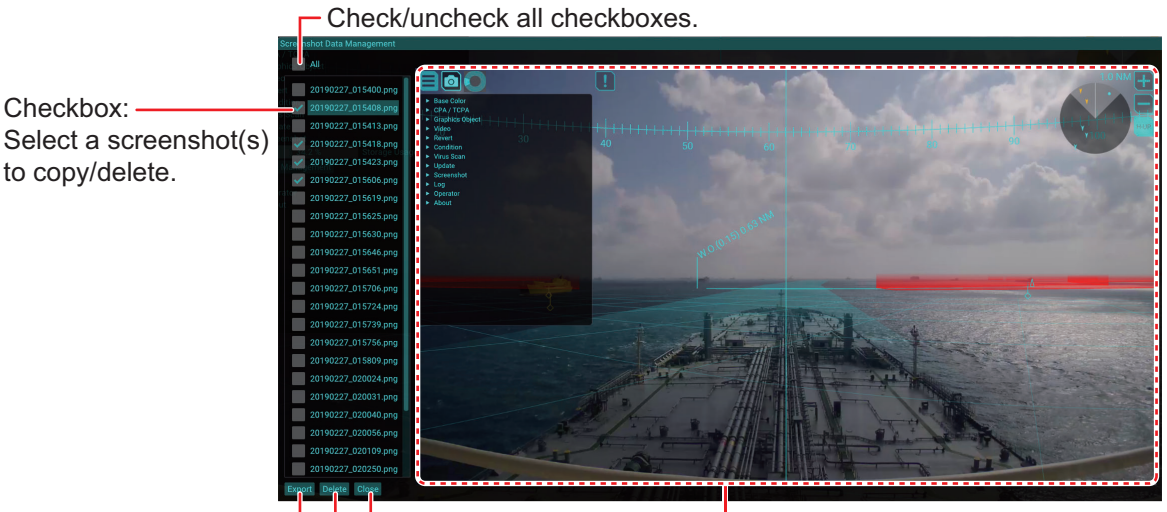
1.12.2 How to copy screenshots to a USB flash memory

You can copy screenshot files to a USB flash memory.

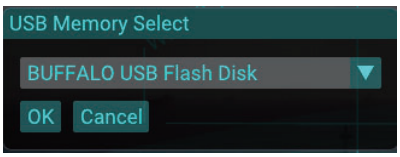
1. Insert a USB flash memory to the USB port on the main PC.
2. Click the menu button to open the main menu.
3. Click [Screenshot].



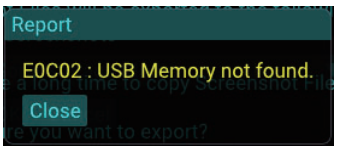
4. Click [Data Management].



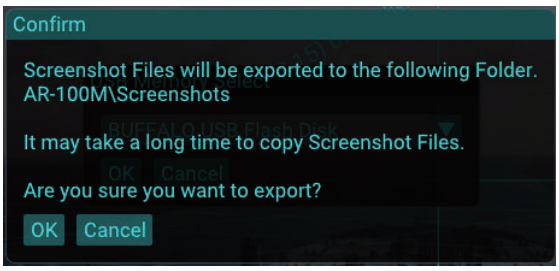
5. Check the checkbox(es) to copy the screenshot(s).
6. Click the [Export] button.



Note: If the USB flash memory cannot be detected, the error message shown in the figure to the right appears. Insert the USB flash memory to the main PC.

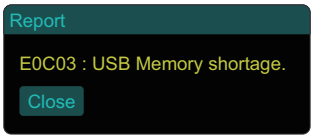


7. Select the USB flash memory as saving destination from the drop-down list.
8. Click the [OK] button.
The message shown in the figure to the right appears.

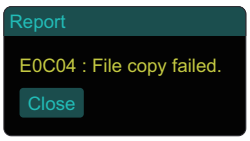


9. Click the [OK] button to start copying screenshots.
The message shown below-left appears while copying screenshots. After completing the file copy, the confirmation message shown below-right appears.

Note 1: If the disk capacity of the USB flash memory is insufficient to copy screenshots, the error message shown in the figure to the right appears. Make sure that there is enough space in the USB flash memory.



Note 2: Do not remove the USB flash memory during the copying. If the flash memory is removed, the message shown in the figure to the right appears. Close the message and retry copying screenshots after inserting the USB flash memory.

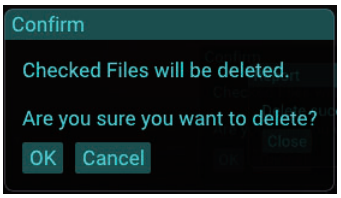


10. Click the [Close] button.

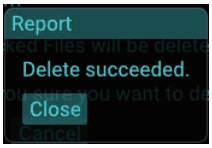
1.12.3 How to delete screenshot files

You can delete screenshot files as follows.

1. Click the menu button to open the main menu.
2. Click [Screenshot].
3. Click [Data Management].
4. Check the checkbox(es) to delete screenshot file(s).
5. Click the [Delete] button.
   The message shown in the figure to the right appears.



6. Click the [OK] button.
7. Click the [Close] button.



2. INSTALLATION AND INITIAL SETTINGS

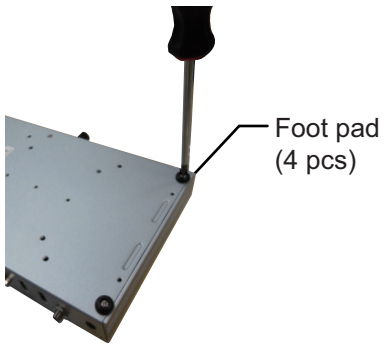
The procedure for the installation of the AR navigation system is as follows.

1) Mount and wire each unit, referring to section 2.1 and section 2.2.
2) Login as a service technician and enter the initial settings, referring to section 2.3.
3) Confirm the system operation, referring to section 2.4.

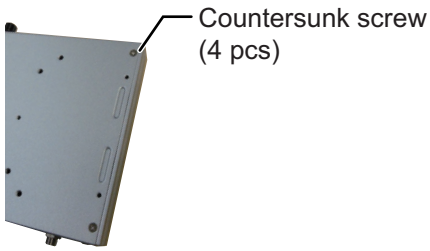
2.1 Mounting

2.1.1 Main PC

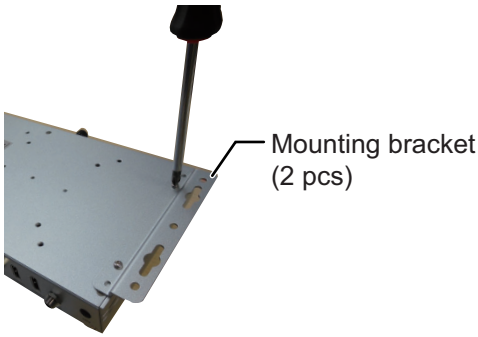
1. Unfasten four screws to remove the four foot pads at the bottom of the main PC.



2. Insert the supplied four countersunk screws to the screw hole for the foot pad.



3. Attach two mounting brackets to the main PC, using the supplied screws.



4. Drill four pilot holes in the mounting location for the mounting screws.
5. Secure the unit using the four supplied self-tapping screws and flat washers.

2.1.2 PoE adapter

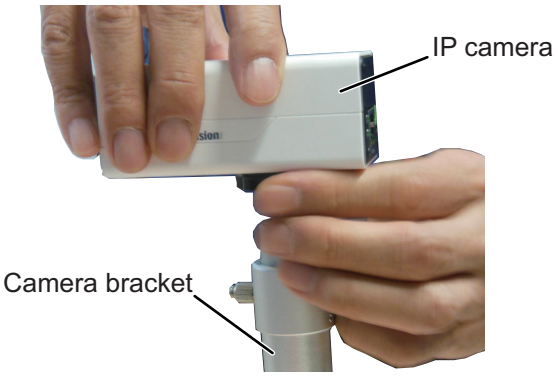
1. Clean the bottom of the PoE adapter and mounting location.
2. Attach the supplied four adhesive rubbers to the bottom of the PoE adapter, referring to the following illustration.

3. Set the PoE adapter to the mounting location.

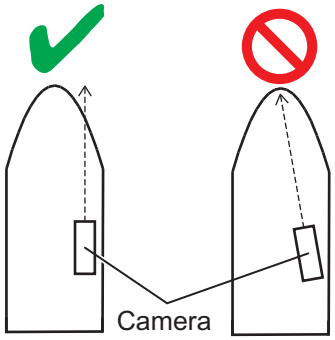
2.1.3 IP camera

Note: Select the mounting location which gives the shortest distance between the IP camera and the monitor unit. When the IP camera is far from the monitor unit, the parallax error between the view from the monitor unit position and IP camera increases.

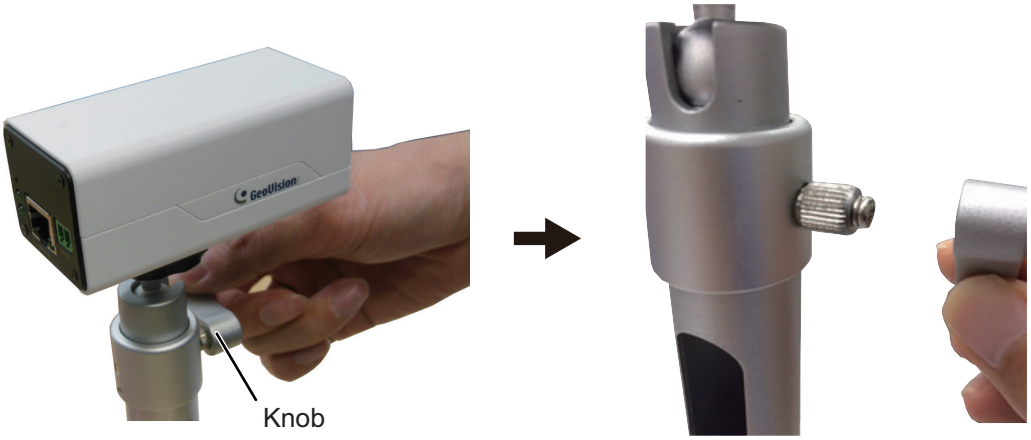
1. Drill four pilot holes in the mounting location for the mounting screws.
2. Secure the camera bracket using the four supplied self-tapping screws.
3. Mount the IP camera to the top of the camera bracket.



4. Face the IP camera to the ship's bow direction, then fasten the bolt, using the supplied knob, to lock the IP camera.



5. After locking the IP camera, remove the knob from the camera bracket.



Fasten the bolt using the knob to lock the IP camera.

Remove the knob after fastening the bolt and locking the IP camera.

Note 1: Retain the knob to unfasten/fasten the bolt on the camera bracket.

Note 2: Do not move the IP camera after installation. When you want to adjust the video position, see section 1.11.

2.1.4 Trackball

You can control almost all aspects of your AR navigation system from the trackball. Locate the unit where it can easily be operated, and easily connected to the main PC.

2.1.5 Sensor adapter (option)

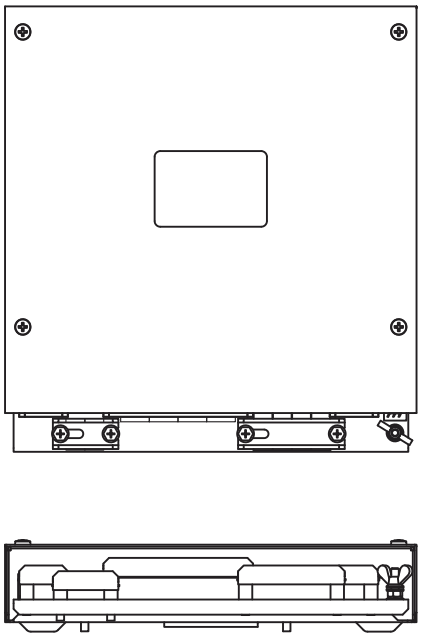
Mounting considerations

When you select a mounting location, keep in mind the following points:

- Locate the adapter away from heat sources because of heat that can build up inside the cabinet.
- The vibration should be minimal.
- Locate the equipment away from places subject to water splash and rain.
- Make sure that the ground wire is connected between the earth terminal on chassis and the ship's earth.
- Leave sufficient space at the sides and rear of the unit to facilitate maintenance.
- A magnetic compass will be affected if the adapter is placed too close to the magnetic compass. Observe the compass safe distances at the front of this manual to prevent interference to a magnetic compass.

How to mount the sensor adapter

1. Unfasten four binding screws to remove the cover from the sensor adapter.
2. Fasten four self-tapping screws (ϕ4×20, supplied) to fix the sensor adapter.
3. Reattach the cover.

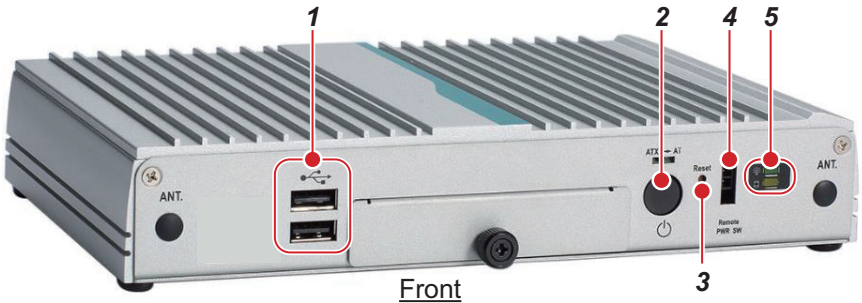


MC-3000S

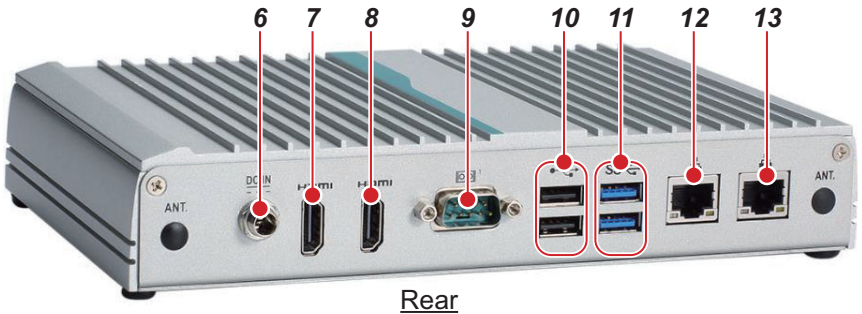
2.2 Wiring

2.2.1 Main PC

Interface



Front



Rear

No.	Name	Description
1	USB2.0 Port	2 × USB2.0, used for connecting the trackball, ENC dongle, USB flash memory and USB keyboard*. **Note:** Do not connect a USB device other than the above-mentioned devices.
2	Power Button	Turns the system on/off.
3	Reset Button	Resets the system.
4	Remote PWR Switch Port	Connect a remote switch (locally supplied), using the supplied remote switch cable, to turn the system on/off from the remote switch.
5	LED Indicator	Upper is for power, lower is for SSD.
6	12 VDC Power Input Port	Connect the supplied AC adapter.
7	HDMI 2 Port	Not used.
8	HDMI 1 Port	Connect a monitor unit (locally supplied), using the supplied HDMI cable. It is recommended to use a monitor whose resolution is full HD (1920 × 1080).
9	Serial Port	RS-232C port, Not used.
10	USB2.0 Port	2 × USB2.0, used for connecting the trackball, ENC dongle, USB flash memory and USB keyboard*. **Note:** Do not connect a USB device other than the above-mentioned devices.
11	USB3.0 Port	2 × USB3.0, used for connecting the trackball, ENC dongle, USB flash memory and USB keyboard*. **Note:** Do not connect a USB device other than the above-mentioned devices.

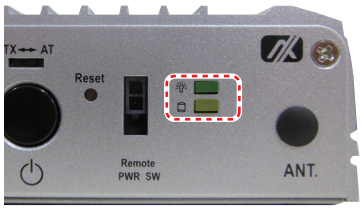
No.	Name	Description
12	LAN2 Port	Connect the IP camera through the PoE adapter.
13	LAN1 Port	Connect the HUB-3000 to communicate with the bridge navigational equipment.

*: The USB keyboard is used only for adjusting the initial settings menu. To prevent unintended operation, do not connect the USB keyboard during normal use of the system.

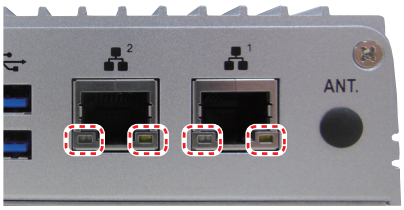
Note: An ENC dongle is necessary to share the ENC charts from the ECDIS. Keep the ENC dongle connected to one of the USB ports on the main PC while using the AR navigation system.

Hiding the LED indicators

If the LED indicators on the main PC and the ENC dongle are too bright at night, cover them with vinyl tape. The location of the LED indicator is shown in the following figure.



Front

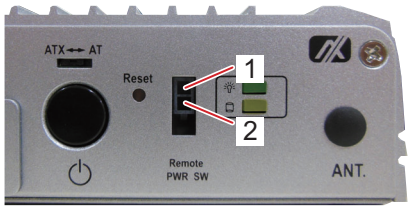


Rear

ENC dongle

Remote PWR switch

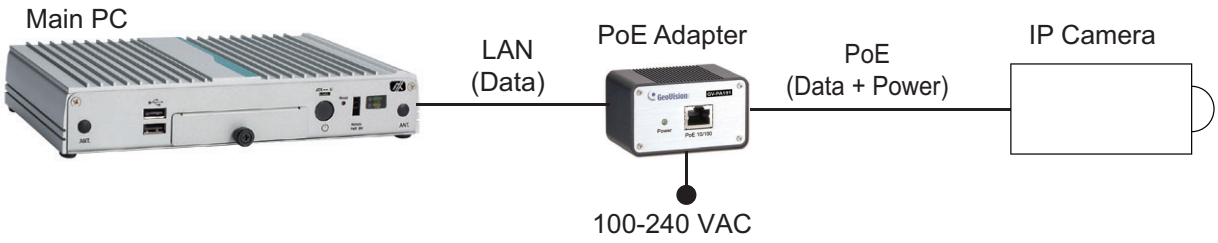
Connect a remote switch (supplied locally) to the Remote PWR switch port, to turn the system on/off from a remote switch.



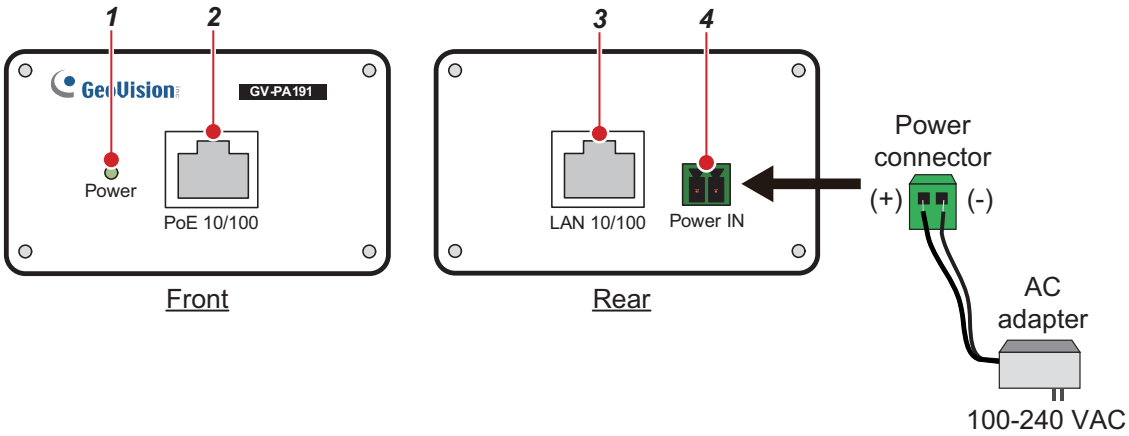
Status	Description
Short 1 and 2.	Turn the system on/off.
Open	-

2.2.2 PoE adapter

The PoE adapter supplies the power to the IP camera through the LAN cable and interfaces the data between the main PC and IP camera.



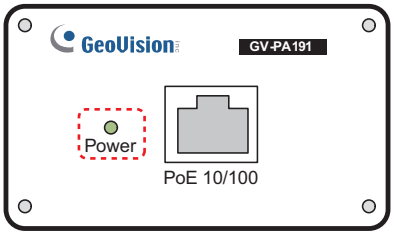
Interface



No.	Name	Description
1	Power Indicator	The LED (green) lights when the power is supplied to the PoE adapter.
2	PoE 10/100	Output the PoE power (48 VDC). Connect with the IP camera, using the LAN cable.
3	LAN 10/100	Connect with the main PC, using the LAN cable.
4	Power IN	Connect with the ship's supply (100-240 VAC), using the supplied AC adapter and power connector.

Hiding the LED indicator

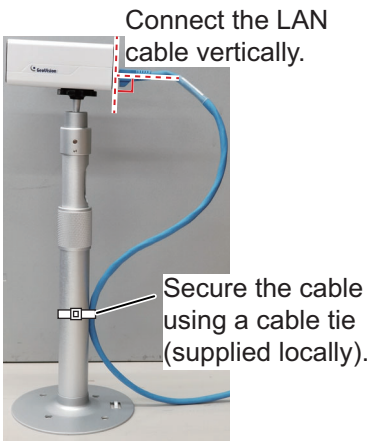
If the LED indicator is too bright at night, cover it with vinyl tape. The location of the LED indicator is shown in the figure to the right.



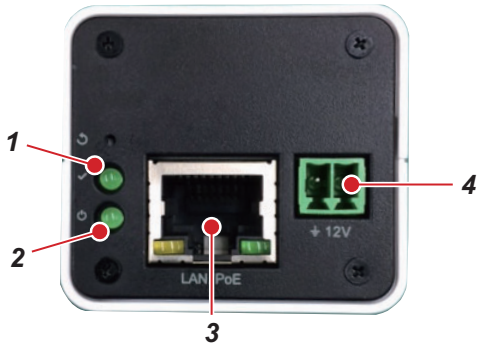
2.2.3 IP camera

The IP camera is powered from the PoE adapter through the Ethernet interface using PoE (Power over Ethernet). Connect the IP camera to the PoE adapter, using the supplied LAN cable.

Note: Be sure to connect the LAN cable vertically. After the connection, secure the LAN cable to the bracket, using a cable tie (supplied locally).



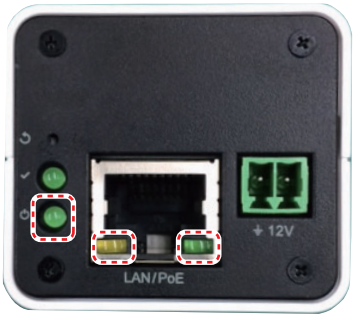
Interface (GV-EBX2100)



No.	Name	Description
1	Status Indicator	The LED (green) lights when the IP camera works correctly. In the default setting, the status indicator LED stays off regardless of the IP camera working status.
2	Power Indicator	The LED (green) lights when the power is supplied to the IP camera.
3	LAN/PoE	Connect with the PoE adapter, using the supplied LAN cable.
4	DC IN (12 V)	Not used.

Hiding the LED indicators

If the LED indicators are too bright at night, cover them with vinyl tape. The LEDs which are active (lit) when the camera is turned on have their locations indicated with dashed lines in the figure to the right.

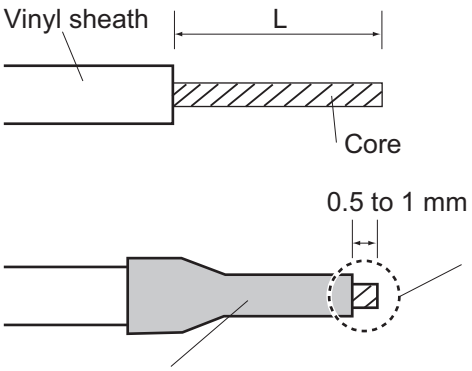


GV-EBX2100

2.2.4 Sensor adapter (option)

Use the ferrule-type terminals (supplied) to connect the cables to the terminals in the sensor adapters. This connection requires a crimping tool (CRIMPFOX10S, option). For the relations between the connectors and rod terminals, see page AP-2. Also, the stickers attached on the reverse side of the covers show the detailed connections.

How to attach ferrule-type lug



Ferrule-type lug	Length of "L"
AI 1.5-6 BK (BLK)	6 mm
AI 0.34-6 TQ (BLU)	
AI 0.75-6 GY (GREY)	
AI 1-6 RD (RED)	
AI 0.14-8 GY(GREY)	8 mm

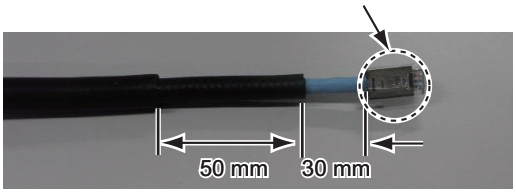
Rod terminal (ferrule type):
The core must protrude 0.5 to 1 mm past the rod terminal.

Rod terminal (ferrule type):
After attaching the rod terminal, use the optional crimping tool CRIMPFOX 10S to crimp.

Fabrications

- LAN cable

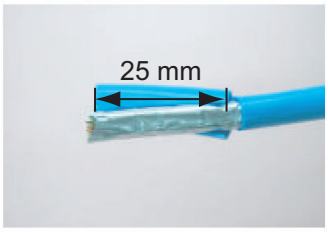
Attach the modular plug as shown in the following figure.



1

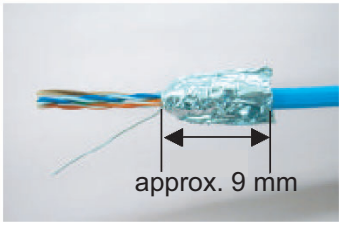
Expose inner vinyl sheath.

2



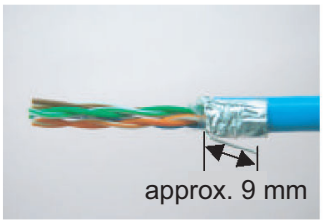
Remove the inner vinyl sheath by approx 25 mm. Be careful not to damage inner shield and cores.

3



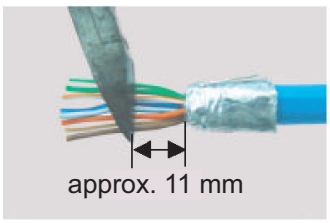
Fold back the shield, wrap it onto the inner vinyl sheath and cut it, leaving 9 mm.

4



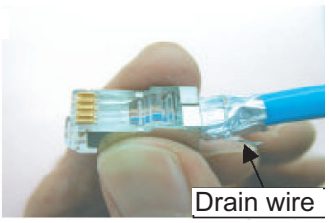
Fold back drain wire and cut it, leaving 9 mm.

5



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

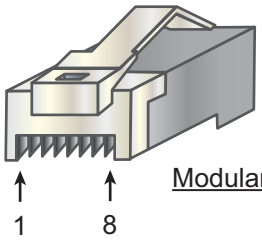
6



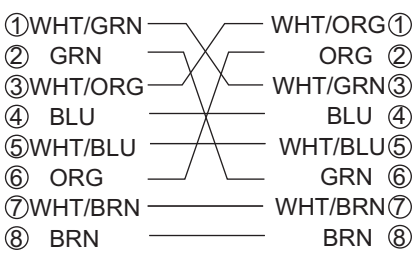
Insert the cable into the modular plug so that the folded part of the shield enters into the plug housing. The drain wire should be located on the tab side of the jack.

7

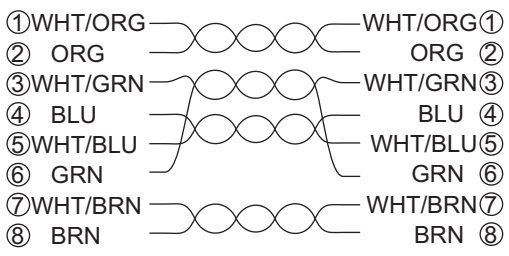
Using special crimping tool MPT5-8AS (PANDUIT CORP.), crimp the modular plug. Finally check the plug visually.



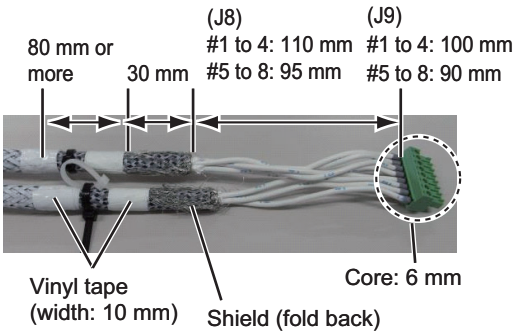
[Cross cable]



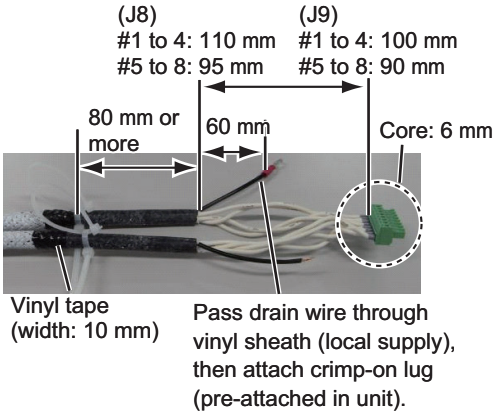
[Straight cable]



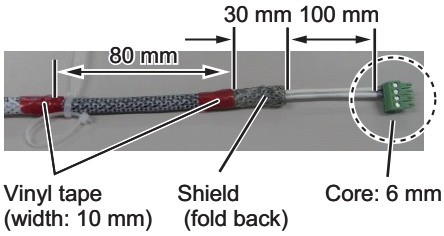
• TTYCS-1Q cable



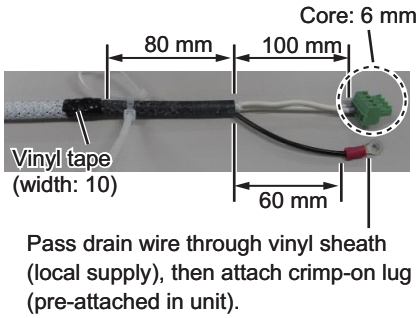
• TTYCSLA-1Q cable



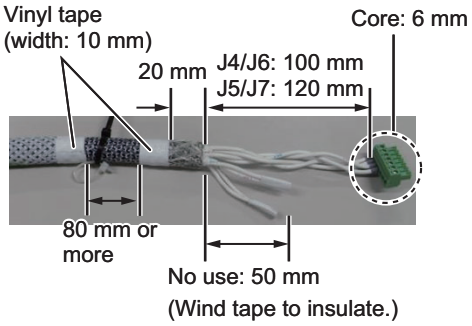
• TTYCS-1 cable



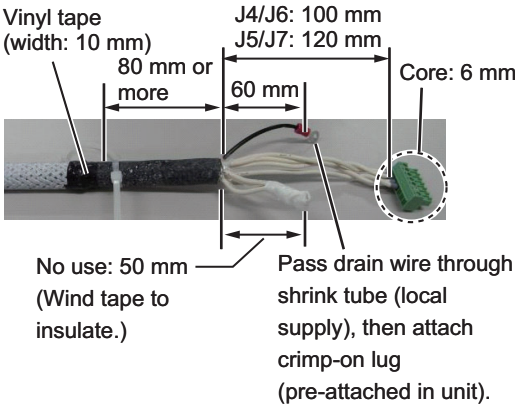
• TTYCSLA-1 cable



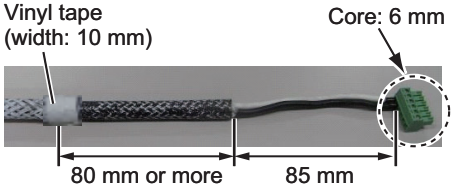
• TTYCS-4 cable



• TTYCSLA-4 cable

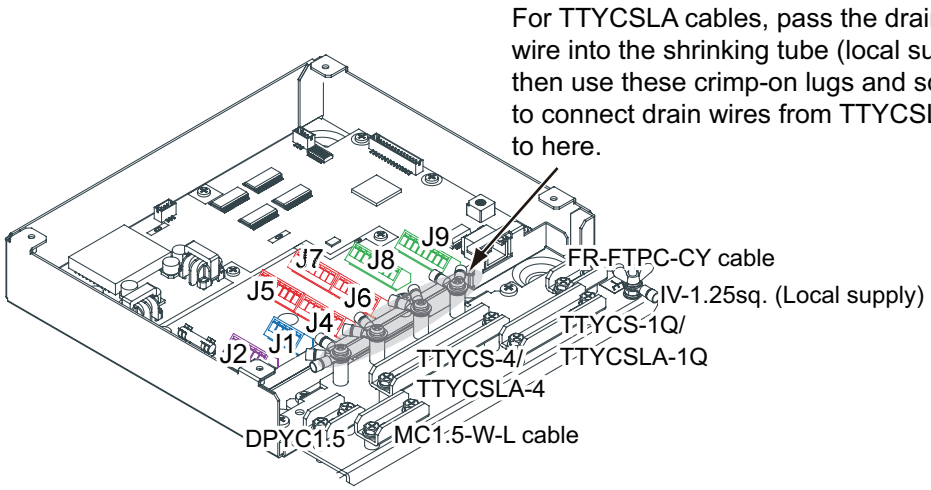


• DPYC-1.5 cable



Connections

Unfasten four screws to remove the cover, pass the cables through the clamps and attach the cables to respective connectors. The shield part of the cable (or drain wire) must be fastened by (connected to) the clamp.



Note: Fasten the cable shield with the cable clamp.

How to set NC/NO output (J2)

The POWER FAIL signal on the connector J2 can be set to NC (normal close) output or NO (normal open) output as shown in the table below.

Connector J2

Pin #	Signal name	In/Out	Description	NO	NC
1	24V_IN	-	24 VDC	DPYC-1.5	
2	24V_GND	-	GND (24 VDC)		
3	PWR_FAIL_A	Out	Power fail output	TTYCS(LA)-1	No connection
4	PWR_FAIL_COM	Out	Power fail output		TTYCS(LA)-1
5	PWR_FAIL_B	Out	Power fail output	No connection	

How to set input specification (J4 to J9)

For connectors J4 to J7, the connections are different depending on the input specifications as shown below.

Connector J4

Pin #	Signal name	In/ Out	Description	IEC 61162-2	IEC 61162-1	Modbus*
1	TD1-A	Out	Serial CH1, output IEC 61162-1/2/modbus	TTYCS(LA)-4	TTYCS(LA)-4	TTYCS(LA)-4
2	TD1-B	Out	Serial CH1, output IEC 61162-1/2/modbus			
3	RD1-A	In	Serial CH1, input IEC 61162-2/modbus		No connection	No connection
4	RD1-B	In	Serial CH1, input IEC 61162-2/modbus			
5	ISOGND1	-	Isolation, GND (CH1)			
6	RD1-H	In	Serial CH1, input IEC 61162-1	No connection	TTYCS(LA)-4	
7	RD1-C	In	Serial CH1, input IEC 61162-1			

*: Set the jumpers J20/J21 to Modbus.

Connector J5

Pin #	Signal name	In/ Out	Description	IEC 61162-2	IEC 61162-1	Modbus*
1	TD2-A	Out	Serial CH2, output IEC 61162-1/2/modbus	TTYCS(LA)-4	TTYCS(LA)-4	TTYCS(LA)-4
2	TD2-B	Out	Serial CH2, output IEC 61162-1/2/modbus			
3	RD2-A	In	Serial CH2, input IEC 61162-2/modbus		No connection	No connection
4	RD2-B	In	Serial CH2, input IEC 61162-2/modbus			
5	ISOGND2	-	Isolation, GND (CH2)			
6	RD2-H	In	Serial CH2, input IEC 61162-1	No connection	TTYCS(LA)-4	
7	RD2-C	In	Serial CH2, input IEC 61162-1			

*: Set the jumpers J20/J21 to Modbus.

Connector J6

Pin #	Signal name	In/Out	Description	IEC 61162-2	IEC 61162-1
1	TD3-A	Out	Serial CH3, output IEC 61162-1/2	TTYCS(LA)-4	TTYCS(LA)-4
2	TD3-B	Out	Serial CH3, output IEC 61162-1/2		
3	RD3-A	In	Serial CH3, input IEC 61162-2		No connection
4	RD3-B	In	Serial CH3, input IEC 61162-2		
5	ISOGND3	-	Isolation, GND (CH3)		
6	RD3-H	In	Serial CH3, input IEC 61162-1	No connection	TTYCS(LA)-4
7	RD3-C	In	Serial CH3, input IEC 61162-1		

Connector J7

Pin #	Signal name	In/Out	Description	IEC 61162-2	IEC 61162-1
1	TD4-A	Out	Serial CH4, output IEC 61162-1/2	TTYCS(LA)-4	TTYCS(LA)-4
2	TD4-B	Out	Serial CH4, output IEC 61162-1/2		
3	RD4-A	In	Serial CH4, input IEC 61162-2		No connection
4	RD4-B	In	Serial CH4, input IEC 61162-2		
5	ISOGND4	-	Isolation, GND (CH4)		
6	RD4-H	In	Serial CH4, input IEC 61162-1	No connection	TTYCS(LA)-4
7	RD4-C	In	Serial CH4, input IEC 61162-1		

Connector J8

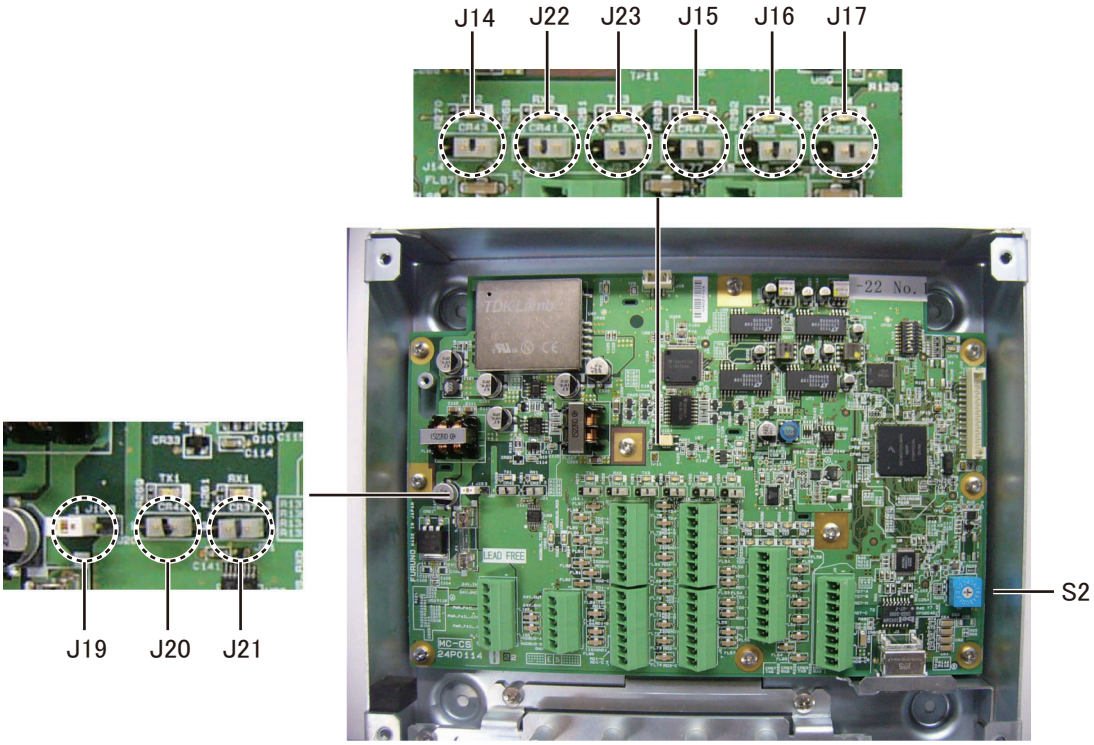
Pin#	Signal name	In/Out	Description	Used cable
1	TD5-A	Out	Serial CH5, output IEC 61162-1	TTYCS-1Q or TTYCSLA-1Q
2	TD5-B	Out	Serial CH5, output IEC 61162-1	
3	RD5-H	In	Serial CH5, input IEC 61162-1	
4	RD5-C	In	Serial CH5, input IEC 61162-1	
5	TD6-A	Out	Serial CH6, output IEC 61162-1	
6	TD6-B	Out	Serial CH6, output IEC 61162-1	
7	RD6-H	In	Serial CH6, input IEC 61162-1	
8	RD6-C	In	Serial CH6, input IEC 61162-1	

Connector J9

Pin#	Signal name	In/Out	Description	Used cable
1	TD7-A	Out	Serial CH7, output IEC 61162-1	TTYCS-1Q or TTYCSLA-1Q
2	TD7-B	Out	Serial CH7, output IEC 61162-1	
3	RD7-H	In	Serial CH7, input IEC 61162-1	
4	RD7-C	In	Serial CH7, input IEC 61162-1	
5	TD8-A	Out	Serial CH8, output IEC 61162-1	
6	TD8-B	Out	Serial CH8, output IEC 61162-1	
7	RD8-H	In	Serial CH8, input IEC 61162-1	
8	RD8-C	In	Serial CH8, input IEC 61162-1	

Jumper settings

Set the jumper blocks in the MC-CS Board (24P0114) referring to the tables that follow.



MC-CS Board (24P0114)

Rotary switch: Use the rotary switch (S2) to set the Modbus address when setting connectors J4/J5 to Modbus. The Modbus address set at J4/J5 in the network is not used. When setting J4/J5 to IEC 61162-1/2, use the default setting ("0").

Jumper block:
Use the jumper block J19 to set the termination resistor on/off for the MODBUS communication on the connector J1. For the first and last sensor adapter in a series, their termination resistors should be set to ON. Use the MC-CS Board with the default setting because it becomes the "first" adapter in a series.

Jumper block J19		Connector J1
1-2	SHORT	Termination resistor: ON (default setting)
2-3	OPEN	
1-2	OPEN	Termination resistor: OFF
2-3	SHORT	

Set the jumper blocks J14 through J17 to turn the termination resistors on connectors J4 through J7 respectively.

(Termination resistor ON)

- When setting the starting/ending terminal for the multipoint, or the multipoint is not connected (CH1 to 4).
- When setting the starting/ending terminal for Modbus (CH1, CH2)

(Terminal resistor OFF)

- When setting the terminal other than starting/ending for the multipoint (CH1 to 4).
- When setting the terminal other than starting/ending for Modbus (CH1/CH2)

Jumper block J14		Connector J4 (CH1)
1-2	SHORT	Termination resistor: ON (default setting)
2-3	OPEN	
1-2	OPEN	Termination resistor: OFF
2-3	SHORT	

Jumper block J15		Connector J5 (CH2)
1-2	SHORT	Termination resistor: ON (default setting)
2-3	OPEN	
1-2	OPEN	Termination resistor: OFF
2-3	SHORT	

Jumper block J16		Connector J6 (CH3)
1-2	SHORT	Termination resistor: ON (default setting)
2-3	OPEN	
1-2	OPEN	Termination resistor: OFF
2-3	SHORT	

Jumper block J17		Connector J7 (CH4)
1-2	SHORT	Termination resistor: ON (default setting)
2-3	OPEN	
1-2	OPEN	Termination resistor: OFF
2-3	SHORT	

Set the jumper blocks J20 and J21 to choose the communication type (IEC-61162-1/2 or MODBUS) of the connector J4 (CH1).
The setting of the jumper block JP20 and JP21 must be identical.

Jumper block J20/J21		Communication type of J4 (between RD1 and TD1)
1-2	OPEN	IEC-61162-1/2 (default setting)
2-3	SHORT	
1-2	SHORT	MODBUS (The setting of J14 is different depending on the unit position (starting/ending terminal).)
2-3	OPEN	

The jumper blocks J22 and J23 are used to set the communication type of the connector J5 (CH2).

Jumper block J22/J23		Communication type of J5 (between RD2 and TD2)
1-2	OPEN	IEC-61162-1/2 (default setting)
2-3	SHORT	
1-2	SHORT	MODBUS (The setting of J15 is different depending on the unit position (starting/ending terminal).)
2-3	OPEN	

2.3 Initial Settings

Note 1: A USB keyboard is required for initial settings. Because the main PC recognizes the US English keyboard layout, connect a US English keyboard.

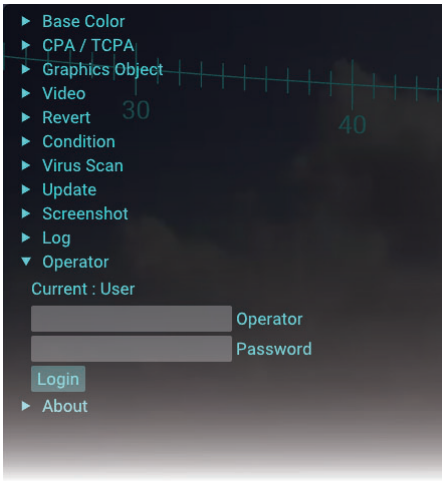
Note 2: USB keyboard operation is required for some initial setting menu items. To edit the value, press and hold the **Ctrl** key, then click the setting value.

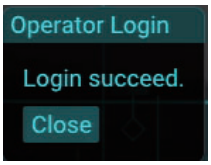
2.3.1 How to login as a service technician

Login as a service technician, to access the menu items for initial settings. Do as follows to login as a service technician.

Note: Contact FURUNO for the operator name and password for login.

1. Connect a USB keyboard to the main PC.
   Note: The USB keyboard is used only for adjusting the initial settings menu. To prevent unintended operation, do not connect the USB keyboard during normal use of the system.
2. Click the menu button to open the main menu.
3. Click [Operator].
4. Input the operator name in the [Operator] field.
5. Input the password in the [Password] field.
6. Click the [Login] button.
   When you login successfully, the message to the right appears.
7. Click the [Close] button to close the message.





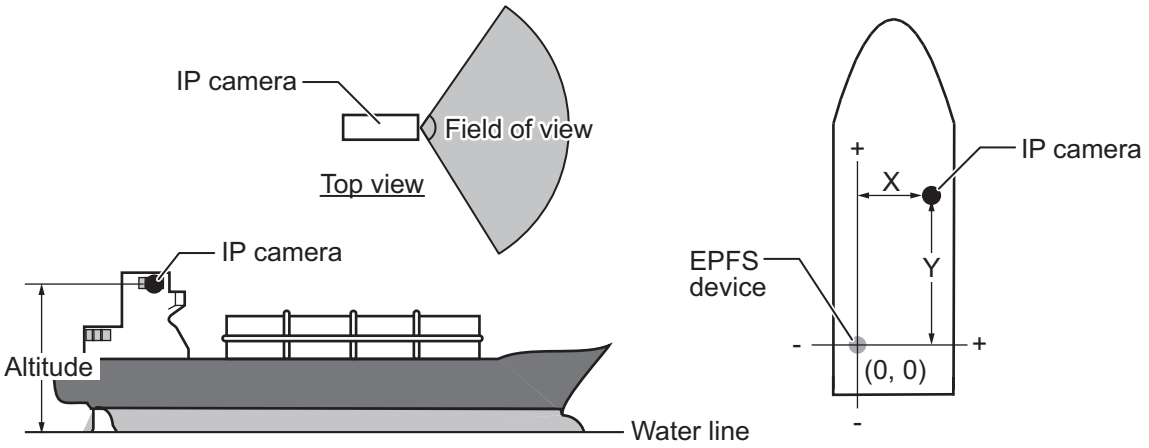
The following section explains the operation on the premise that you login as a service technician. Click the [Logout] button to logout after completing all settings.

2.3.2 Initial settings for the IP camera

Adjust the field of view of the video image and enter the position of the IP camera.

Note: Before adjusting the field of view of the IP camera, confirm that the IP camera faces the bow direction and adjust the video image position, referring to section 1.11. If the limit line of the video image appears on the screen after adjusting the video image position, adjust the field of view so that the limit line is not shown on the display. When you adjust the field of view for the IP camera, the viewing range decreases. Therefore, keep the default field of view when feasible.

1. Click the menu button to open the main menu.
2. Click [Service Setting].
3. Click [Camera].
4. Adjust the slider bar for [Field of View] to adjust the field of view for the IP camera.
5. Adjust the slider bar for [Altitude] to adjust the distance between average water line and IP camera location.
6. Adjust the slider bar for [Position] to set the IP camera location calculated from the location of the EPFS device to use as a reference.
   - [X]: Set the port-starboard (lateral) location of the IP camera, which is calculated from the location of the EPFS device.
   - [Y]: Set the bow-stern (longitudinal) location of the IP camera, which is calculated from the location of the EPFS device.



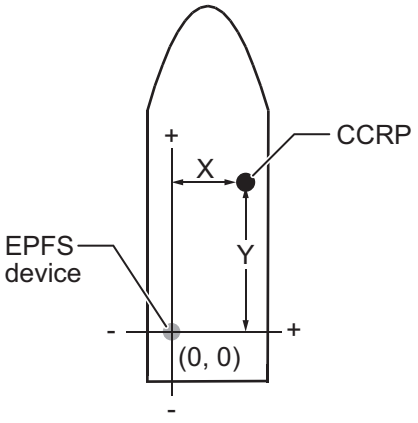
7. Close the main menu.

2.3.3 How to setup the CCRP

Do as follows to setup the CCRP (Consistent Common Reference Position). The AR navigation system uses CCRP as reference points for CPA/TCPA calculations.

1. Click the menu button to open the main menu.
2. Click [Service Setting].

3. Click [CCRP].

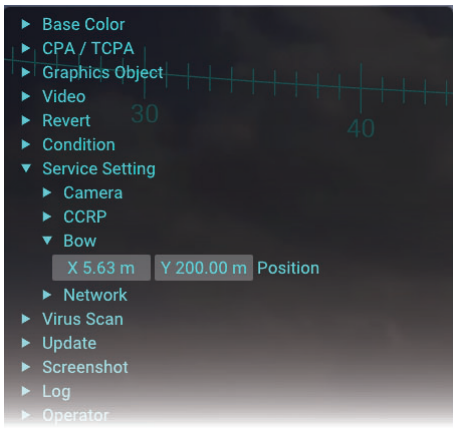


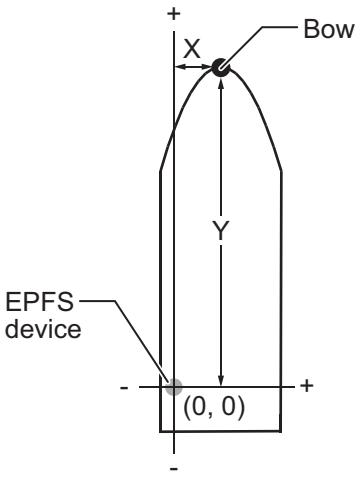
4. Adjust the slider bar for [Position] to set the CCRP calculated from the location of the EPFS device to use as a reference.
   - [X]: Set the port-starboard (lateral) location of the CCRP, which is calculated from the location of the EPFS device.
   - [Y]: Set the bow-stern (longitudinal) location of the CCRP, which is calculated from the location of the EPFS device.
5. Close the main menu.

2.3.4 How to setup the bow position

Do as follows to setup the bow position. The AR navigation system uses bow position as reference points for BCR/BCT calculations.

1. Click the menu button to open the main menu.
2. Click [Service Setting].
3. Click [Bow].

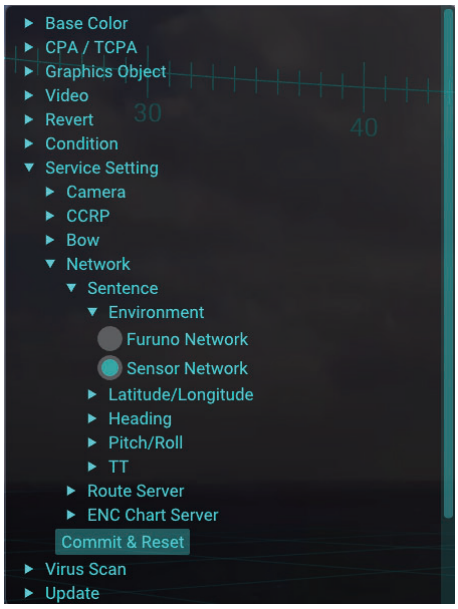




4. Adjust the slider bar for [Position] to set the bow position calculated from the location of the EPFS device to use as a reference.
   - [X]: Set the port-starboard (lateral) location of the bow, which is calculated from the location of the EPFS device.
   - [Y]: Set the bow-stern (longitudinal) location of the bow, which is calculated from the location of the EPFS device.
5. Close the main menu.

2.3.5 How to select the network connected with AR navigation system

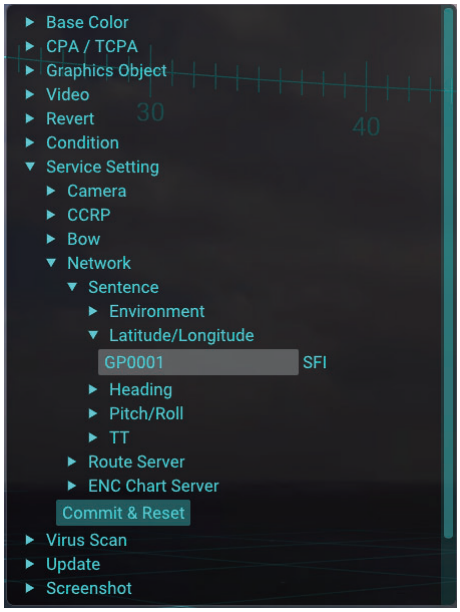
Select an appropriate network that the AR navigation system is connected to.



1. Click the menu button to open the main menu.
2. Click [Service Setting].
3. Click [Network].
4. Click [Sentence].
5. Click [Environment].
6. Activate the [Furuno Network] or [Sensor Network] radio button.
   - [Furuno Network]: Select when the ECDIS is included in the system configuration.
   - [Sensor Network]: Select when the ECDIS is not included in the system configuration.
     Note: When you activate the [Sensor Network] radio button, the data source setting for TT data must be set to [TTM (TAG Block)] or [TTD/TLB/OSD (TAG Block)]. For details about the TT data source setting, see subsection 2.3.9.
7. Click the [Commit & Reset] button to apply the setting.
   All menu settings on the [Network] menu are applied by clicking the [Commit & Reset] button. Also, the AR navigation system application is automatically reset.

2.3.6 How to setup the data source for the position data

Do as follows to setup the data source for the position data.

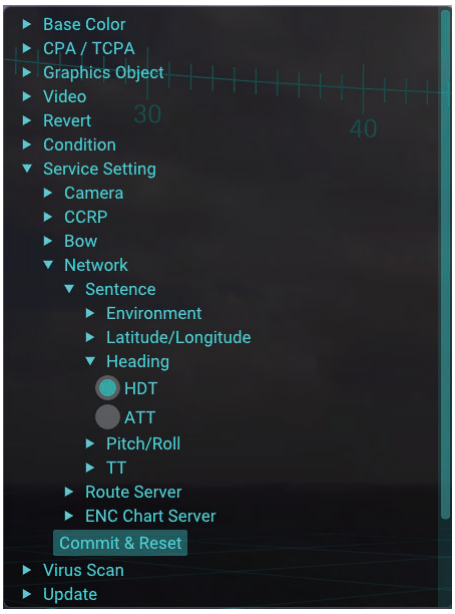


1. Click the menu button to open the main menu.
2. Click [Service Setting].
3. Click [Network].
4. Click [Sentence].
5. Click [Latitude/Longitude].
6. Enter the SFI (System Function ID) of the equipment that outputs the latitude/longitude sentence in the [SFI] field.
7. Click the [Commit & Reset] button to apply the settings.
   All menu settings on the [Network] menu are applied by clicking the [Commit & Reset] button. Also, the AR navigation system application is automatically reset.

2.3.7 How to setup the data source for the heading data

Do as follows to setup the data source for the heading data.

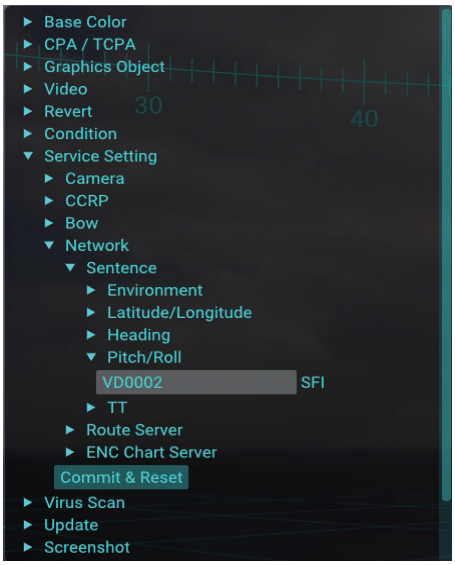
1. Click the menu button to open the main menu.
2. Click [Service Setting].
3. Click [Network].
4. Click [Sentence].
5. Click [Heading].
6. Activate the [HDT] or [ATT] radio button, depending on the sentence to use.
   Note: Select the sentence that data accuracy is high.
7. Click the [Commit & Reset] button to apply the settings.
   All menu settings on the [Network] menu are applied by clicking the [Commit & Reset] button. Also, the AR navigation system application is automatically reset.



2.3.8 How to setup the data source for the pitch/roll data

Do as follows to setup the data source for the pitch/roll data.

1. Click the menu button to open the main menu.
2. Click [Service Setting].
3. Click [Network].
4. Click [Sentence].
5. Click [Pitch/Roll].
6. Enter the SFI (System Function ID) of the equipment that outputs the GPatt sentence in the [SFI] field.
   The AR navigation system is also compatible with the following SFI talkers:
   - GP
   - GL
   - GA
   - GN
   - HE
   - HN
   - HC
   - VD
7. Click the [Commit & Reset] button to apply the settings.
   All menu settings on the [Network] menu are applied by clicking the [Commit & Reset] button. Also, the AR navigation system application is automatically reset.

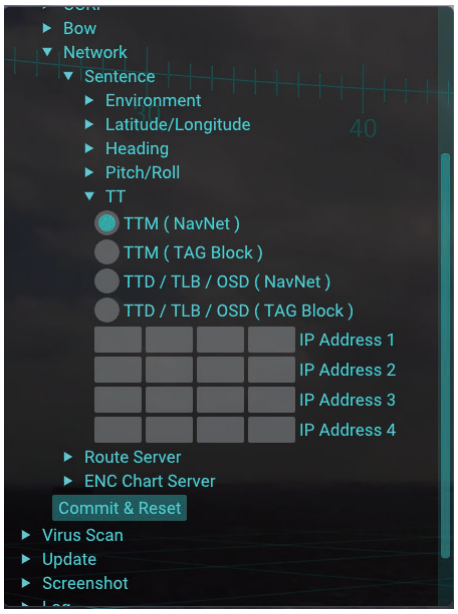


2.3.9 How to setup the data source for the TT data

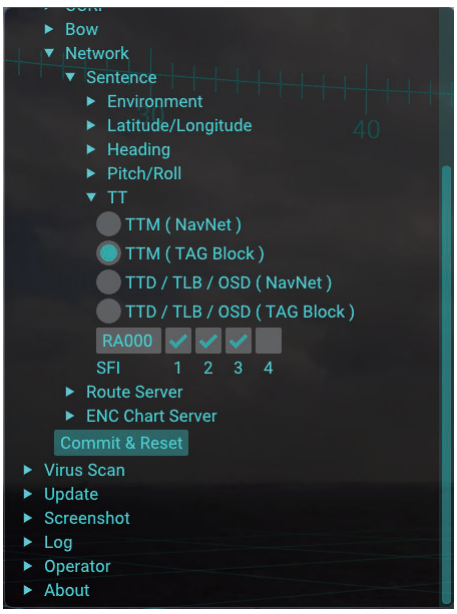
Do as follows to setup the data source for the TT data.

1. Click the menu button to open the main menu.
2. Click [Service Setting].

3. Click [Network].
4. Click [Sentence].
5. Click [TT].



For [TTM (NavNet)] or [TTD/TLB/OSD (NavNet)]



For [TTM (TAG Block)] or [TTD/TLB/OSD (TAG Block)]

6. Check the appropriate radio button depending on the sentence for the data source.

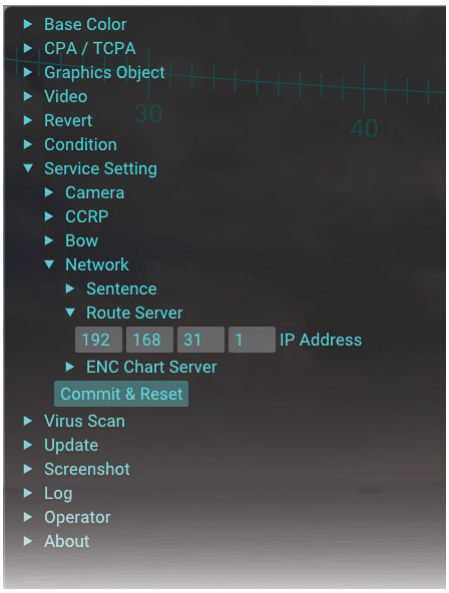
Model	ECDIS is included in the system configuration		ECDIS is not included in the system configuration	
	TTM	TTD	TTM	TTD
FAR-14×7	Unconnectable	Unconnectable	[TTM (TAG Block)]	Unavailable
FAR-15×8	[TTM (NavNet)]	[TTD/TLB/OSD (NavNet)]		[TTD/TLB/OSD (TAG Block)]
FAR-2××7				
FAR-2××8				
FAR-3000	[TTM (TAG Block)]	[TTD/TLB/OSD (TAG Block)]		

7. Do as follows according to the radio button that is checked at step 6.
   - For [TTM (NavNet)] or [TTD/TLB/OSD (NavNet)]:
     Enter the IP address(es) for the radar. Be sure to enter all IP addresses for the radar to be assigned as the data source.
     Note: All octets for each IP address must be entered. The IP address that has one or more empty strings is invalid.
   - For [TTM (TAG Block)] or [TTD/TLB/OSD (TAG Block)]:
     Check the checkbox(es) for radar SFI (System Function ID). Be sure to check all checkboxes for the radar to be assigned as the data source.
8. Click the [Commit & Reset] button to apply the settings.
   All menu settings on the [Network] menu are applied by clicking the [Commit & Reset] button. Also, the AR navigation system application is automatically reset.

2.3.10 How to enter the IP address of the route server

Do as follows to enter the IP address of the route server.

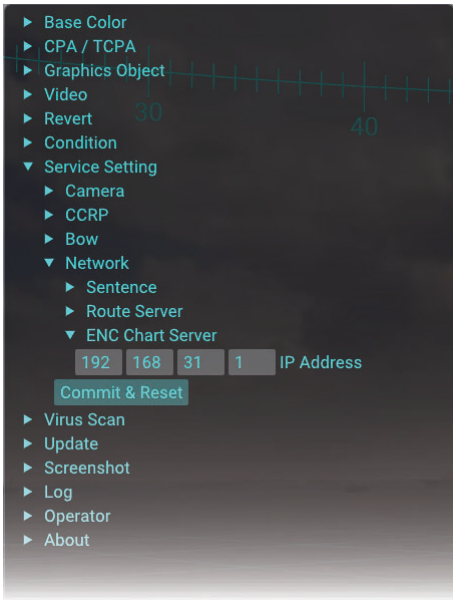
1. Click the menu button to open the main menu.
2. Click [Service Setting].
3. Click [Network].
4. Click [Route Server].
5. Enter the IP address of the ECDIS that outputs the route monitoring data.
6. Click the [Commit & Reset] button to apply the settings.
   All menu settings on the [Network] menu are applied by clicking the [Commit & Reset] button. Also, the AR navigation system application is automatically reset.



2.3.11 How to enter the IP address of the ENC chart server

Do as follows to enter the IP address of the ENC chart server.

1. Click the menu button to open the main menu.
2. Click [Service Setting].
3. Click [Network].
4. Click [ENC Chart Server].
5. Enter the IP address of the ECDIS that outputs the ENC chart data.
6. Click the [Commit & Reset] button to apply the settings.
   All menu settings on the [Network] menu are applied by clicking the [Commit & Reset] button. Also, the AR navigation system application is automatically reset.



2.3.12 Settings for connected equipment

For the satellite speed log, SATELLITE COMPASS™ and ECDIS, set them as shown below to connect with the AR navigation system.

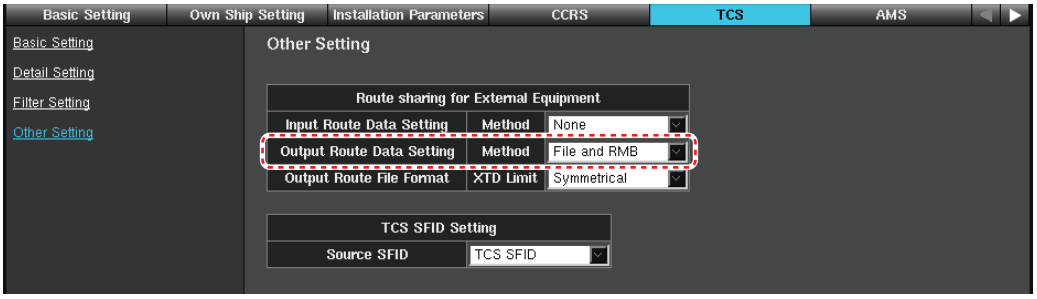
Satellite speed log/SATELLITE COMPASS™

Set the transmission rate of the GPatt sentence as short as possible.

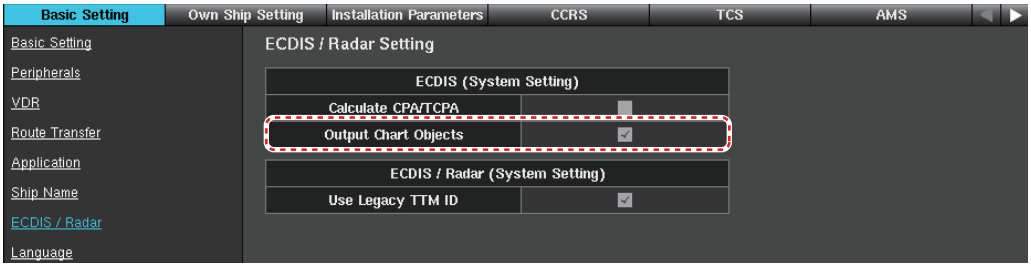
Note: If the communication load is high, reduce the transmission rate for other sentences or turn some sentences off to reduce the communication load.

ECDIS

- Set [Output Route Data Setting] to [File and RMB] on the [TCS] tab of the [Common Installation Setting] menu.

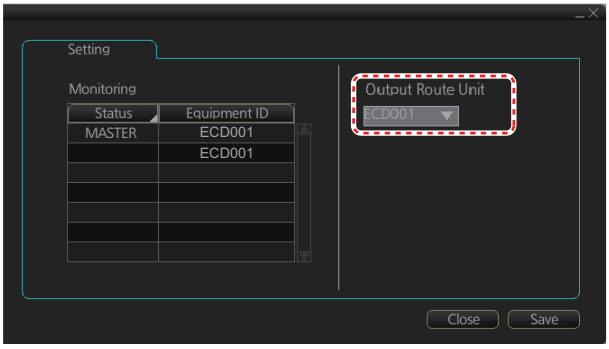


- Check the checkbox for [Output Chart Objects] on the [Basic Setting] tab of the [Common Installation Setting] menu.



Note: The AR navigation system cannot overlay ENC chart objects despite the setting for the [Output Chart Objects] checkbox, if the ECDIS has C-MAP charts installed. Uninstall C-MAP charts to use ENC chart objects.

- Select the equipment ID of the ECDIS that outputs the route data, on the ECDIS menu.



2.3.13 MC-3000S settings

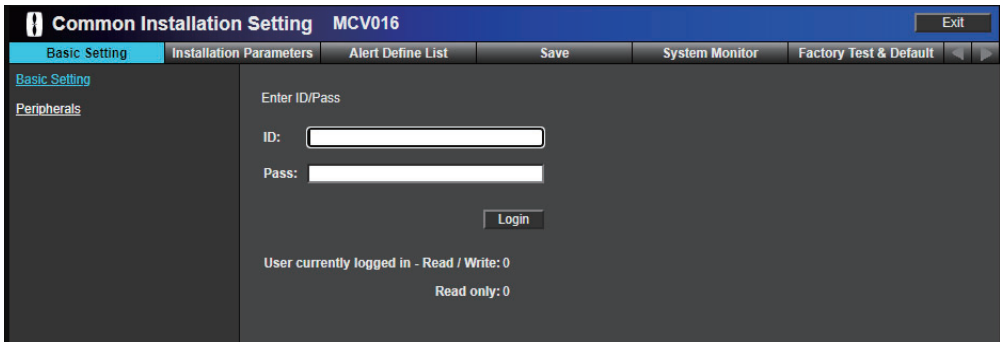
When the MC-3000S is included in the system configuration, connect a laptop PC to the MC-3000S via LAN cable to setup the MC-3000S.

Preparation

- Laptop PC
  - The web browser must be installed. When the Firefox is used. the version must be “ver. 12.0” or later.
  - The IP address and subnet mask of the port connected with the MC-3000S must be set as follows:
    IP address: 172.31.16.200
    Subnet mask: 255.255.0.0
- LAN cable

How to access the [Common Installation Setting] menu

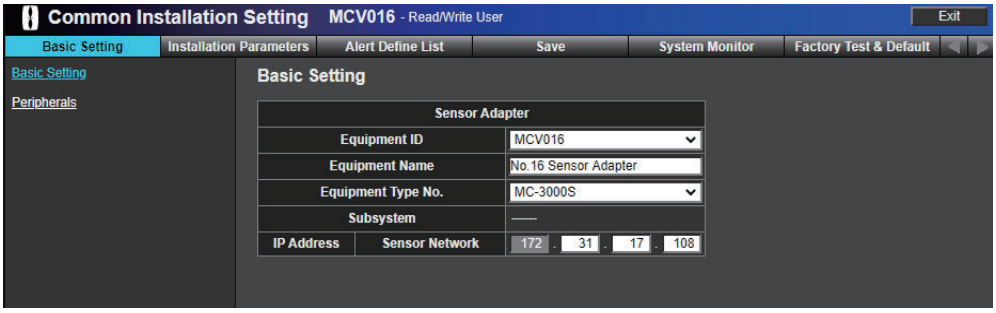
1. Connect a laptop PC to the MC-3000S using the LAN cable.
2. Supply the power to the MC-3000S.
3. Activate the web browser on the PC, then enter “172.31.17.108” on the address bar.
   The following screen appears.



Note: “172.31.17.108” is the URL for the factory default. If the Equipment ID for the MC-3000S has changed, enter the URL depending on the Equipment ID, referring to the following table.

Equipment ID	URL	Equipment ID	URL
MCV001	172.31.16.101	MCV009	172.31.16.105
MCV002	172.31.17.101	MCV010	172.31.17.105
MCV003	172.31.16.102	MCV011	172.31.16.106
MCV004	172.31.17.102	MCV012	172.31.17.106
MCV005	172.31.16.103	MCV013	172.31.16.107
MCV006	172.31.17.103	MCV014	172.31.17.107
MCV007	172.31.16.104	MCV015	172.31.16.108
MCV008	172.31.17.104	MCV016 (Factory default)	172.31.17.108

4. Enter the ID and password correctly then click the [Login] button.
   The [Common Installation Setting] menu appears.

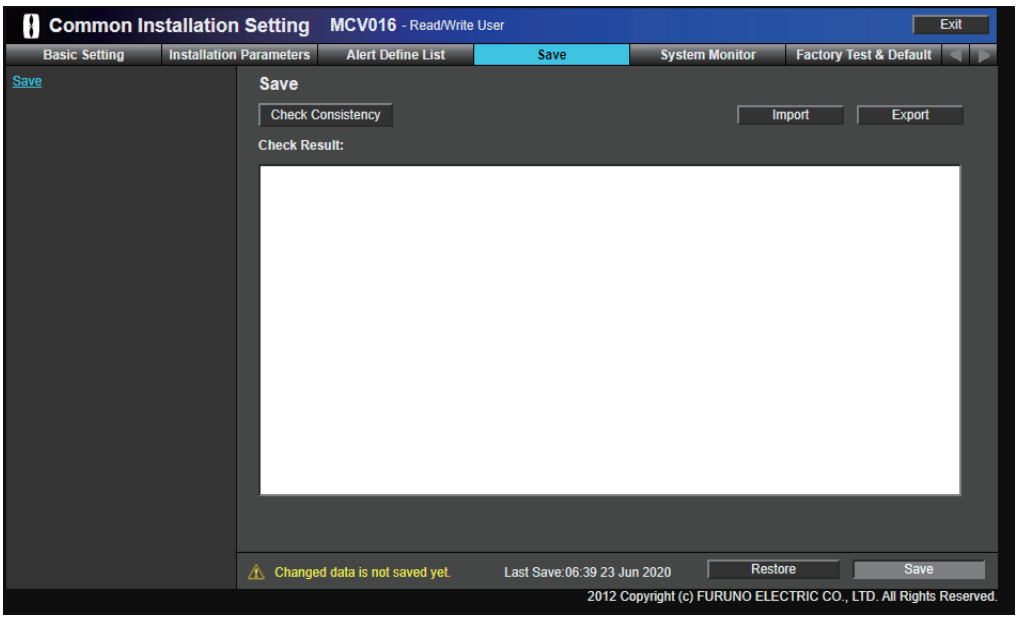


Note: After completing the setup on the [Common Installation Setting] menu, click the [Exit] button to logout from the menu, then close the web browser.

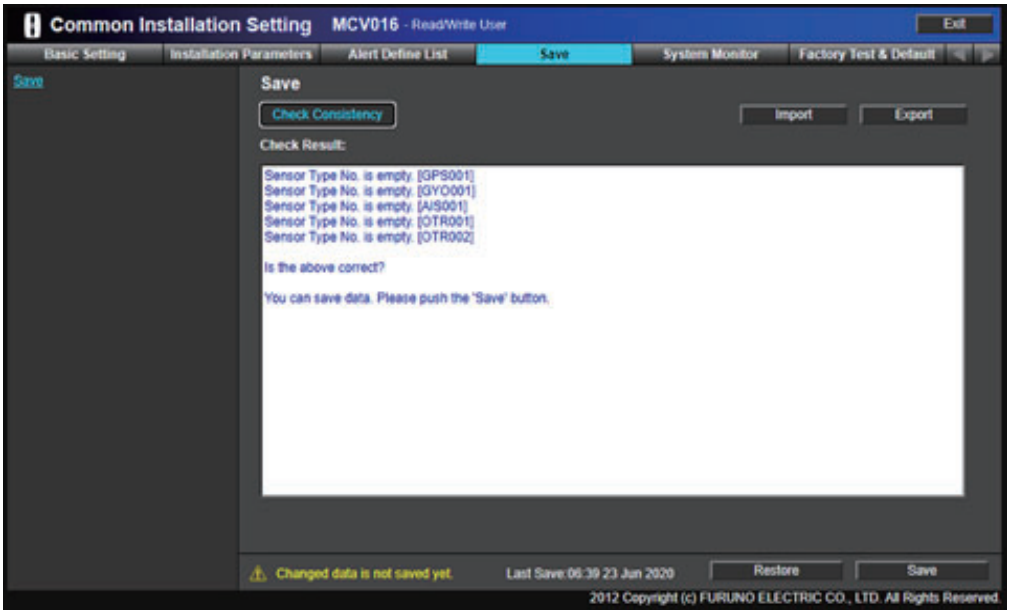
How to save the configuration

If no operating time continues for a while, all settings that are not saved are discarded and the [Common Installation Setting] menu changes to login window. Be sure to save the configuration before aborting the setup.

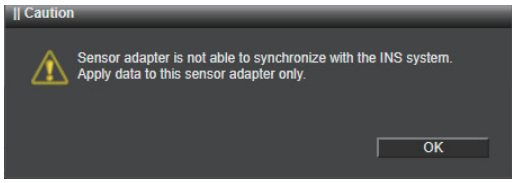
1. Click [Save] on the tab bar.
   When there are some changed menu items that are not saved, “Changed data is not saved yet.” appears on the bottom of the screen.



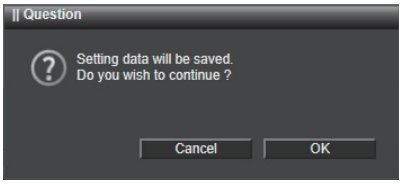
2. Click the [Check Consistency] button.
   When there is no inconsistency, the [Save] button becomes enabled.



3. Click the [Save] button.
   The following message appears.



4. Click the [OK] button.

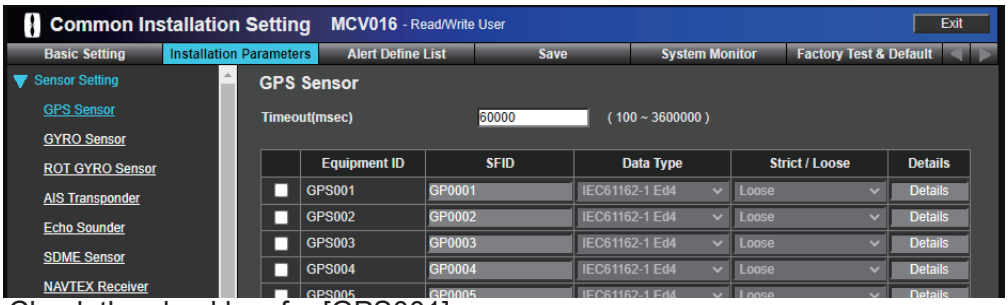


5. Click the [OK] button.
   After completing the saving process, the confirmation message appears.
6. Click the [OK] button to close the message.

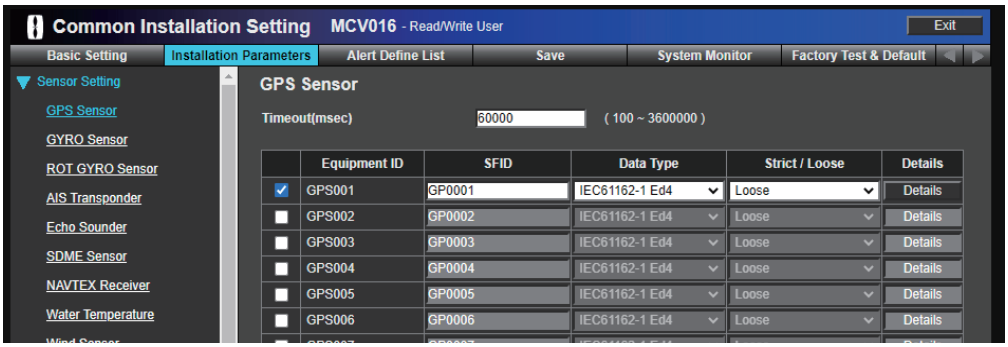
Activating external navigation equipment

Activate external navigation equipment connected through MC-3000S to input the sentences to the AR-100M.

1. Click [Installation Parameters] on the tab bar, then select [Sensor Setting] - [GPS Sensor] from menu on the left of the screen.



2. Check the checkbox for [GPS001].



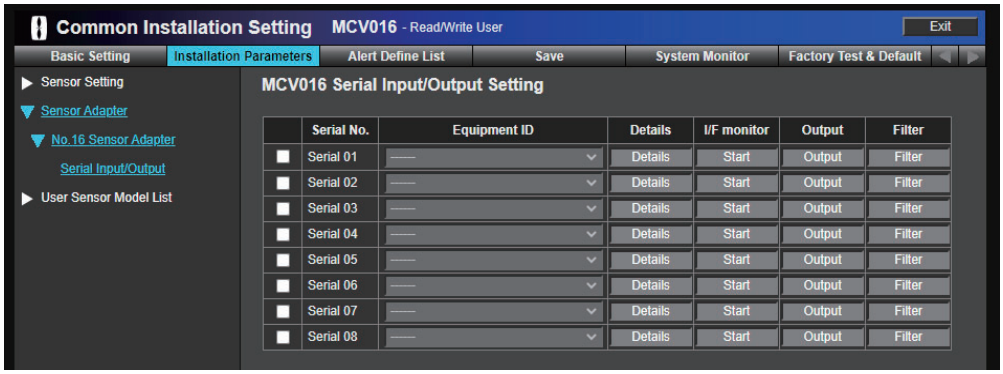
3. Check the checkboxes for the following sensors in a similar manner. For Other Sensor, change the SFID referring to the following table.

Sensor Name	Equipment ID	SFID	Remarks
GPS Sensor	GPS001	GP0001	
GYRO Sensor	GYO001	HE0001	Only when mechanical gyrocompass is connected.
AIS Transponder	AIS001	AI0001	
Other Sensor	OTR001	VD0002	
	OTR002	RA0001	Check applicable checkboxes according to the number of radar connected.
	OTR003	RA0002	
	OTR004	RA0003	
	OTR005	RA0004	

4. Save the configuration, referring to "How to save the configuration" on page 2-26.

Selecting the port where the sensor is connected

1. Click [Installation Parameters] on the tab bar, then select [Sensor Adapter] - [No.16 Sensor Adapter] - [Serial Input/Output] from menu on the left of the screen.

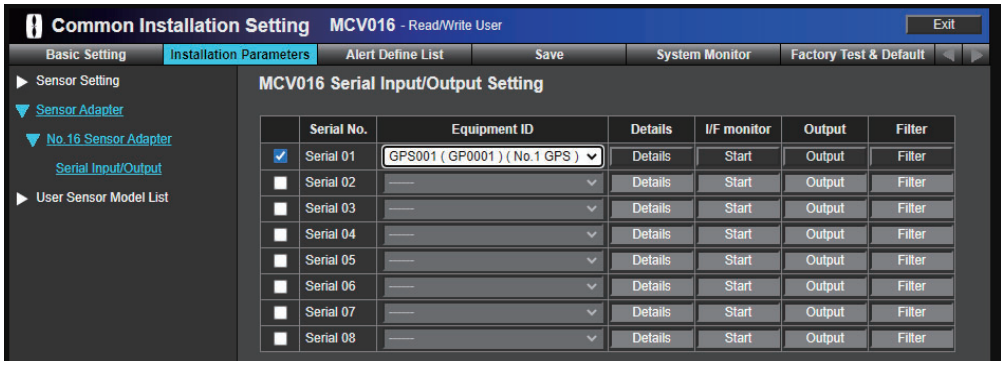


2. Check the checkboxes for the serial port where the sensor is connected ([Serial No.]), then select the Equipment ID of the sensor from the [Equipment ID] drop-down list.

   Note: The following sensors must be connected to either one of [Serial 01] to [Serial 04], and the baud rate of the serial port must be set to “38400 bps”. Also, the baud rate of the sensor must be set to “38,400 bps”.

   - Mechanical gyrocompass
   - SATELLITE COMPASS™/Satellite speed log
   - AIS

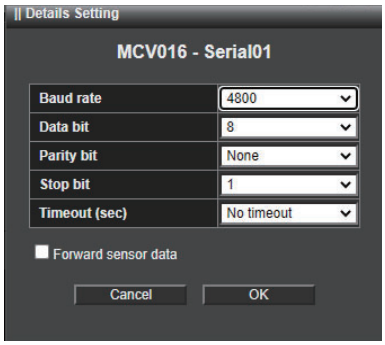
   The following example indicates that the position sensor is connected to “Serial 01” of the MC-3000S.



The connector number of the MC-3000S and the corresponding serial port number are shown in the following table.

Connector No.	Serial Port No.	Connector No.	Serial Port No.
J4	Serial 01	J8	Serial 05
J5	Serial 02		Serial 06
J6	Serial 03	J9	Serial 07
J7	Serial 04		Serial 08

3. Click the [Details] button for the activated serial port.



4. Set the items referring to the following table, then click the [OK] button.

Menu item	Remarks
[Baud rate]	Sets the baud rate. **Note:** The maximum baud rate of the serial port is as follows: • [Serial 01] to [Serial 04]: 38,400 bps • [Serial 05] to [Serial 08]: 4,800 bps However you can select the baud rate more than “4,800 bps” on the menu for [Serial 05] to [Serial 08], the baud rate for [Serial 05] to [Serial 08] must be set to “4800 bps”.
[Data bit]	Sets the number of the data bit.
[Parity bit]	Select [Odd] or [Even] for the parity bit. The parity bit is used in parity error checking to find errors during data transmission. For no parity bit, select [None].
[Stop bit]	Sets the stop bit (last data bit location).
[Timeout (sec)]	When the data is not input during the time set here, time-out alert occurs.
[Forward sensor data]	Check the checkbox to forward data input from the serial port to the sensor adapter. Normally keep the default setting (unchecked).

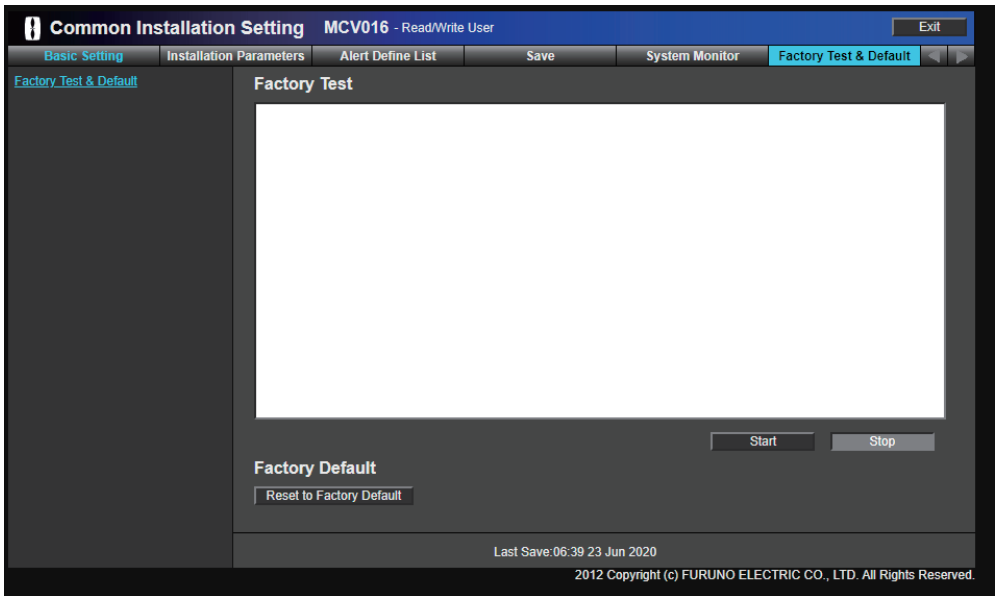
5. Setup all serial ports, then save the configuration, referring to "How to save the configuration" on page 2-26.

6. After saving the configuration, open the [Serial Input/Output] menu again, then click the [I/F Monitor] button for each serial port to open the serial input/output monitor window.
   Confirm that the MC-3000S receives the sentence from the sensor correctly.

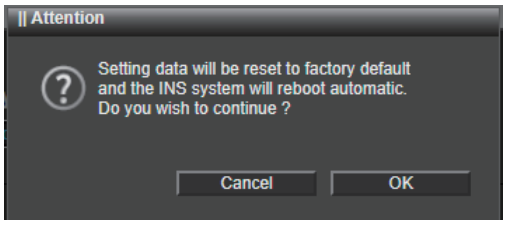
Factory default

To restore the factory default setting, do as follows.

1. Click [Factory Test & Default] on the tab bar.



2. Click the [Reset to Factory Default] button on the bottom of the screen.
   The following message appears.



3. Click the [OK] button.
   The MC-3000S restores the factory default. After completing the load of the factory default, the URL for the default Equipment ID appears on the screen.

4. Enter “172.31.17.108” on the address bar of the web browser to go back to the login screen of the [Common Installation Setting] menu.

2.4 Operation Check

After installing the system and entering initial settings, check the following points to confirm the system operation.

Check point	Details

Error indication	• Confirm that there is no error message (in yellow characters) on the main screen.
	• Confirm that there is no error message (in yellow characters) on the following menus.
	  • Main menu → [Graphics Object] → [Route]
	  • Main menu → [Graphics Object] → [ENC Chart]
	When an error message appears, rectify the error referring to section 3.5.

Sentence	Open the sentence monitor window referring to subsection 3.7.2, and check that the sentences are updated properly. **Note 1:** Acquire a target on the radar to check the sentence for TT data. **Note 2:** Start route monitoring on the ECDIS to check the sentence for waypoint data.
Video image from the IP camera	Check that the video image on the AR navigation system is updated correctly. If a video image error (ex. video freeze) occurs, restart the AR navigation system.
Power operation	Press the power button on the main PC to turn the power off, then press the power button again to turn the power on. After system reboot, the system automatically logs you out from the service technician mode.

This page is intentionally left blank.

3. MAINTENANCE

3.1 Service and Repair

When you need the service and repair for the AR navigation system, read the following information.

1) If an abnormality, system error or malfunction occurs in the AR navigation system, be sure to specify the equipment related to the problem before requesting service. The following units are covered by the product warranty.
   - Main PC
   - IP Camera
   - PoE Adapter

   The failure of any other unit or accessories (ex. cables, trackball) are not covered by the warranty.
2) When the unit that is covered by the warranty has problems, report the detailed information about the problem along with update date and version of the virus definition to the ship's management company. FURUNO receives this information from the ship's management company.
3) After receiving problem information, FURUNO sends the replacement unit to the ship's management company. The ship's technicians replace the unit. The replacement by a FURUNO engineer is not covered by the warranty. FURUNO can replace the unit for a fee. However, this service is limited to Japan and Singapore.

3.2 Warranty Period

The AR navigation application software, main PC, IP camera and PoE adapter are covered by a one-year warranty from the date that the product is delivered to the place specified by the ship's management company.

The only part of the AR navigation system that is developed by FURUNO is the software application. We install the software application to the commercial product selected by FURUNO and check the software performance before shipment. All units used in the AR navigation system are commercial products. Therefore, the warranty policy for those products is different from other FURUNO products.

When a failure caused by a unit under warranty occurs, we send a replacement unit. Replacement of a unit by a FURUNO engineer is not covered by the warranty. FURUNO can replace the unit for a fee. However, this service is limited to Japan and Singapore.

3.3 Recommended Replacement Period

All units used in the AR navigation system are commercial products whose manufacturer's warranty period is one year. We recommend replacement of all units at least every three years to maintain proper performance. Earlier replacement may be necessary depending on use and environment.

3.4 Troubleshooting

This section provides simple troubleshooting procedures which the user can follow to restore normal operation. If you cannot restore normal operation, do not attempt to check inside the unit. Any trouble should be referred to a qualified service technician.

Problem	Possible cause	Remedy
You cannot turn the power on.	The power cable is disconnected or damaged.	• Check that the power cable is connected correctly. • Check for damaged power cable.
	Low power voltage	Check battery for proper voltage output.
The [Recovery] screen appears.	The main PC is forcefully terminated while the system is working.	Click the [Restart my PC] button.
	The main PC is forcefully terminated during the shutdown process.	1) Press the power button on the main PC to turn the system off. 2) After the main PC is turned off, press the power button again to turn the system on.
The [Automatic Repair] screen appears.	The main PC is forcefully terminated during the startup process.	Click the [Restart] button.
The power LED on the main PC lights but nothing appears on the monitor.	Display brilliance is too low.	Adjust the display brilliance, referring to the operator's manual of the monitor unit. Restart the main PC.
	The video source of the monitor is not correct.	The video source of the monitor should be the video input port that is connected with the main PC.
	SSD cannot be recognized.	1) Press the reset button on the main PC to reset the system. The [EFI shell] screen appears after system reset. 2) Press the power button on the main PC to turn the system off. 3) After the main PC is turned off, press the power button again to turn the system on.
The [EFI shell] screen appears.	SSD is not recognized.	1) Press the power button on the main PC to turn the system off. 2) After the main PC is turned off, press the power button again to turn the system on.
AR navigation objects appear but video image is not shown.	Video image brilliance is too low.	Adjust the video image brilliance, referring to section 1.10.

Problem	Possible cause	Remedy
The video image from the IP camera is abnormal.	The IP camera is not started correctly.	1) Press the power button on the main PC to turn the system off. 2) After the main PC is turned off, press the power button again to turn the system on.
		1) Press the power button on the main PC to turn the system off. 2) Disconnect the LAN cable from the IP camera to stop the power supply. 3) Reconnect the LAN cable to the IP camera. 4) Press the power button again to turn the system on.
The USB device cannot be recognized.	Failure of the main PC may occur.	Restart the main PC.

3.5 Error Code/Error Message

When a system error occurs, the corresponding error code and message appear on the center of the display.

The following table shows the error code, message, meaning and remedy for each error.

Error code	Error message	Meaning/Remedy
E0000	License Error.	Failed to authenticate the license. Restart the system. If the error is not rectified, contact your dealer.
E0100	Login failed.	Login failed because the operator name/password combination is incorrect. Re-enter the operator name and password. If not rectified, confirm that your keyboard is US English keyboard layout, and turn “Caps Lock” off.
E0200	Update File not found. Please insert USB Memory storing Update File.	The system cannot find the update file. Confirm that the update file is saved to the root directory of the USB flash memory, and the file name or extension is correct: • Virus definition update file name must be “mpam-fe.exe”. • OS update file extension must be “msu”.
E0202	File copy failed.	File copy failed. Confirm that the USB flash memory is connected correctly.
E0203	Update failed.	Update failed. Confirm that the update file is valid. Check whether the update file is already applied.
E041×	Sensor Network Error	Network binding error occurs. “×” in the error code indicates the socket number. Confirm the connection between the LAN1 port of the main PC and network hub that relays sensor data.

Error code	Error message	Meaning/Remedy
E0421	No Sensor Data. (TO WPT)	No waypoint ID data received. Confirm the connection between the LAN1 port of the main PC and network hub that relays sensor data, and the equipment that outputs waypoint ID data is turned on and works correctly. When the error is not rectified even if the network status is normal, restart the system.
E0422	No Sensor Data. (AIS)	No AIS data received. Confirm the connection between the LAN1 port of the main PC and network hub that relays sensor data, and the equipment that outputs AIS data is turned on and works correctly. When the error is not rectified even if the network status is normal, restart the system.
E0423	No Sensor Data. (L/L)	No position data received. Confirm the connection between the LAN1 port of the main PC and network hub that relays sensor data, and the equipment that outputs position data is turned on and works correctly. When the error is not rectified even if the network status is normal, restart the system.
E0424	No Sensor Data. (HDG)	No heading data received. Confirm the connection between the LAN1 port of the main PC and network hub that relays sensor data, and the equipment that outputs heading data is turned on and works correctly. When the error is not rectified even if the network status is normal, restart the system.
E0425	No Sensor Data. (PITCH/ROLL)	No pitch/roll data received. • Confirm the connection between the LAN1 port of the main PC and network hub that relays sensor data, and the equipment that outputs pitch/roll data is turned on and works correctly. When the error is not rectified even if the network status is normal, restart the system. • Check that the SFI of the data source for the pitch/roll data, referring to subsection 2.3.8.
E0426	No Sensor Data. (COG/SOG)	No COG/SOG data received. Confirm the connection between the LAN1 port of the main PC and network hub that relays sensor data, and the equipment that outputs COG/SOG data is turned on and works correctly. When the error is not rectified even if the network status is normal, restart the system.

Error code	Error message	Meaning/Remedy
E0427*	No Sensor Data. (CTW/STW1)	No CTW/STW data received. The number in the brackets indicates radar number. Confirm the connection between the LAN1 port of the main PC and network hub that relays sensor data, and the equipment that outputs CTW/STW data is turned on and works correctly. When the error is not rectified even if the network status is normal, restart the system.
E0428*	No Sensor Data. (CTW/STW2)	
E0429*	No Sensor Data. (CTW/STW3)	
E042A*	No Sensor Data. (CTW/STW4)	
E042F	No Sensor Data. (UTC)	No date data received. Confirm the connection between the LAN1 port of the main PC and network hub that relays sensor data, and the equipment that outputs time data is turned on and works correctly. When the error is not rectified even if the network status is normal, restart the system.
E0431	No Sensor Data. (TO WPT)	Waypoint ID data without the specified format data received. Confirm that the equipment that outputs waypoint ID data is turned on and works correctly.
E0432	No Sensor Data. (AIS)	AIS data without the specified format data received. Confirm that the equipment that outputs AIS data is turned on and works correctly.
E0433	No Sensor Data. (L/L)	Position data without the specified format data received. Confirm that the equipments that outputs position data is turned on and works correctly.
E0434	No Sensor Data. (HDG)	Heading data without the specified format data received. Confirm that the equipment that outputs heading data is turned on and works correctly.
E0435	No Sensor Data. (PITCH/ROLL)	Pitch/roll data without the specified format data received. Confirm that the equipment that outputs pitch/roll data is turned on and works correctly.
E0436	No Sensor Data. (COG/SOG)	COG/SOG data without the specified format data received. Confirm that the equipment that outputs COG/SOG data is turned on and works correctly.
E0437*	No Sensor Data. (CTW/STW1)	CTW/STW data without the specified format data received. The number in the brackets indicates radar number. Confirm that the equipment that outputs CTW/STW data is turned on and works correctly.
E0438*	No Sensor Data. (CTW/STW2)	
E0439*	No Sensor Data. (CTW/STW3)	
E043A*	No Sensor Data. (CTW/STW4)	
E043F	No Sensor Data. (UTC)	Date data without the specified format data received. Confirm that the equipment that outputs date data is turned on and works correctly.
E0441	No Sensor Data. (TO WPT)	Invalid waypoint ID data received. Confirm that the equipment that outputs waypoint ID data works correctly.

Error code	Error message	Meaning/Remedy
E0443	No Sensor Data. (L/L)	Invalid position data received. Confirm that the equipment that outputs position data works correctly.
E0444	No Sensor Data. (HDG)	Invalid heading data received. Confirm that the equipment that outputs heading data works correctly.
E0445	No Sensor Data. (PITCH/ROLL)	Invalid pitch/roll data received. Confirm that the equipment that outputs pitch/roll data works correctly.
E0446	No Sensor Data. (COG/SOG)	Invalid COG/SOG data received. Confirm that the equipment that outputs COG/SOG data works correctly.
E0447*	No Sensor Data. (CTW/STW1)	Invalid CTW/STW data received. The number in the brackets indicates radar number. Confirm that the equipment that outputs CTW/STW data works correctly.
E0448*	No Sensor Data. (CTW/STW2)	
E0449*	No Sensor Data. (CTW/STW3)	
E044A*	No Sensor Data. (CTW/STW4)	
E044F	No Sensor Data. (UTC)	Invalid date data received. Confirm that the equipment that outputs date data works correctly.
E0520	No Camera Data	No camera data received. Check the connection between the LAN 2 port on the main PC and PoE adapter and IP camera. Confirm that power is supplied to the PoE adapter.
E0530	No Camera Data	Communication timeout with the IP camera. Check the connection between the LAN 2 port on the main PC and PoE adapter and IP camera. Confirm that power is supplied to the PoE adapter.
E0601	Network Error.	The system cannot connect with the route data server. Check the connection between the LAN1 port on the main PC and ECDIS.
E0602	Excessive Data.	More than 200 waypoints are included in a route. Use the route data where the number of waypoints is 200 or less.
E0701	Network Error.	The system cannot connect with the ENC chart server. Check the connection between the LAN1 port on the main PC and ECDIS.
E0702	Network Error.	The ENC chart file does not exist on the server. Check that the position data is input to the ECDIS.
E0703	User Permit not found.	The system cannot find the ENC user permit. Check that the ENC dongle is inserted to the main PC. When the error keeps occurring for one minute or more after checking the ENC dongle connection, restart the system.

Error code	Error message	Meaning/Remedy
E0704	Decode Error.	Decode error occurs. Confirm that the user permit is the same as the one on the ECDIS connected to this system and the one stored to the ENC dongle. You can confirm the user permit that is used in this system from the main menu → [Graphics Object] → [ENC Chart].
E0705	Excessive Data.	There are too many data in the ENC chart. This system cannot show the ENC chart objects while this error occurs.
E0802	User Chart File not found. Please insert USB Memory storing User Chart File.	The system cannot find the user chart file. Confirm that the file is saved to the root directory of the USB flash memory.
E0804	File lost.	User chart file is lost. Confirm that the USB flash memory is inserted to the main PC.
E0806	Invalid Data.	Invalid user chart file is used. Use the user chart file created on the ECDIS.
E0807	Excessive Data.	There are too many data in the user chart file. This system cannot use the user chart file that contains 10,000 or more data.
E0808	Excessive File Size	The capacity of the user char file exceeds 10 MB. Use the user chart file whose capacity is less than 10 MB.
E0900	Update File not found. Please insert USB Memory storing Update File.	The system cannot find the application update file. Confirm that the update file is saved to the root directory of the USB flash memory.
E0901	Not newer version.	The software version of the application update file is same as current version, or older than the current version. Use the latest update file.
E0903	File copy failed.	File copy failed. Confirm that the USB flash memory is connected correctly and update file name is not changed from the original file name.
E0B00	Low Memory. Please restart the system.	The remaining capacity of the memory is insufficient. Restart the system.
E0C01	Storage shortage.	The disk capacity is insufficient to take a screenshot. Delete unnecessary screenshots referring to subsection 1.12.3. You can confirm the disk capacity status from the main menu → [Screenshot].
E0C02	USB Memory not found.	The USB flash memory to save screenshot files cannot be detected. Insert the USB flash memory to the main PC.
E0C03	USB Memory shortage.	The disk capacity of the USB flash memory is insufficient to copy screenshots. Make sure that there is enough space in the USB flash memory.
E0C04	File copy failed.	File copy of screenshots failed. Insert the USB flash memory to the main PC.

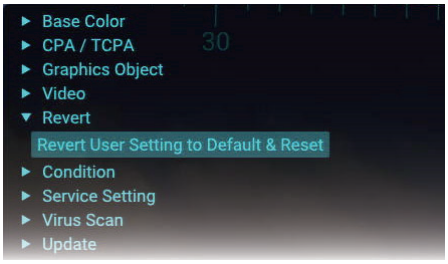
Error code	Error message	Meaning/Remedy
E0D01	USB Memory not found.	The USB flash memory to save log files cannot be detected. Insert the USB flash memory to the main PC.
E0D02	USB Memory shortage.	The disk capacity of the USB flash memory is insufficient to copy log files. Make sure that there is enough space in the USB flash memory.
E0D03	File copy failed.	File copy of log files failed. Insert the USB flash memory to the main PC.

*: Not occurred when the [TTM (NavNet)] or [TTM (TAG Block)] radio button is checked at subsection 2.3.9.

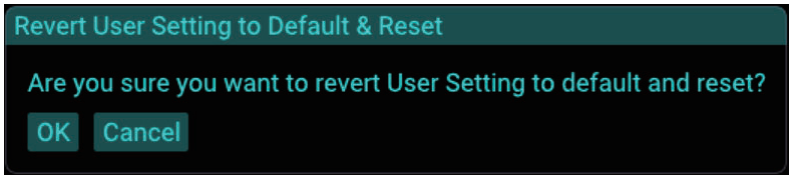
3.6 How to Restore Default Settings

Do as follows to restore all default user settings.

1. Click the menu button to open the main menu.
2. Click [Revert].



3. Click the [Revert User Setting to Default & Reset] button.
   The following confirmation message appears.



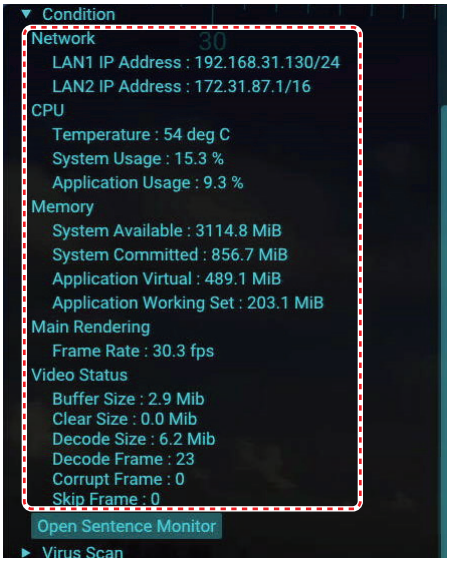
4. Click the [OK] button to restore all default user settings.

3.7 System Information

3.7.1 How to show the system information

Do as follows to show the system information.

1. Click the menu button to open the main menu.
2. Click [Condition].
   The system information is shown on the main menu.



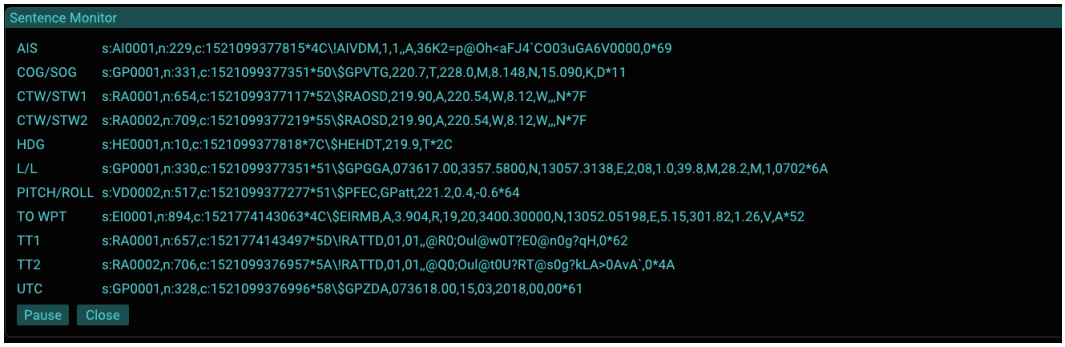
Item	Remarks
Network	
LAN1 IP Address	IP address for the LAN 1 port
LAN2 IP Address	IP address for the LAN 2 port
CPU	
Temperature	CPU temperature
System Usage	CPU usage for the system
Application Usage	CPU usage for the AR navigation system application
Memory	
System Available	Memory capacity available with the system
System Committed	Memory usage for the system
Application Virtual	Virtual memory usage for the AR navigation system application
Application Working Set	Physical memory usage for the AR navigation system application
Main Rendering	
Frame Rate	Frame rate for AR display
Video Status	
Buffer Size	Buffer data amount for the video image received from the IP camera
Clear Size	Buffer data amount that is cleared in one second.
Decode Size	Data amount that is decoded in one second
Decode Frame	The number of decoded frames per one second
Corrupt Frame	The number of corrupted frames during one second decoding
Skip Frame	The number of skipped frames during one second decoding

3. Close the main menu.

3.7.2 Sentence monitor window

You can check if the AR navigation system is properly receiving sentence information. Do as follows to open the sentence monitor window.

1. Click the menu button to open the main menu.
2. Click [Condition].
3. Click the [Open Sentence Monitor] button.
   The sentence monitor window appears. The sentences on the window are updated in real time. To pause the window and confirm the contents, click the [Pause] button. The [Pause] button is changed to [Play] button while pausing the window. To restart the sentence monitor, click the [Play] button.



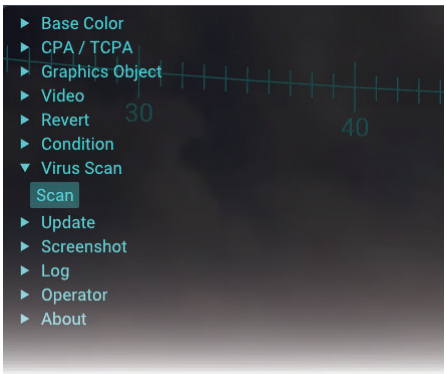
4. Click the [Close] button to close the sentence monitor window.
5. Close the main menu.

3.8 How to Perform the Virus Scan

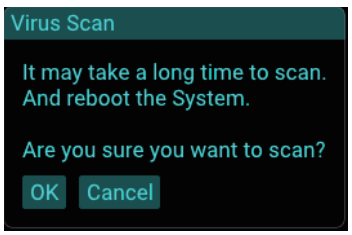
You can perform the virus scan using the equipped anti-virus software.The virus definitions and related files must be kept up-to-date. For how to update the virus definitions, see section 3.10.

Note: The virus scan may take more than 30 minutes, and the scan cannot be aborted. Also, the system reboot is needed after completing the scan.

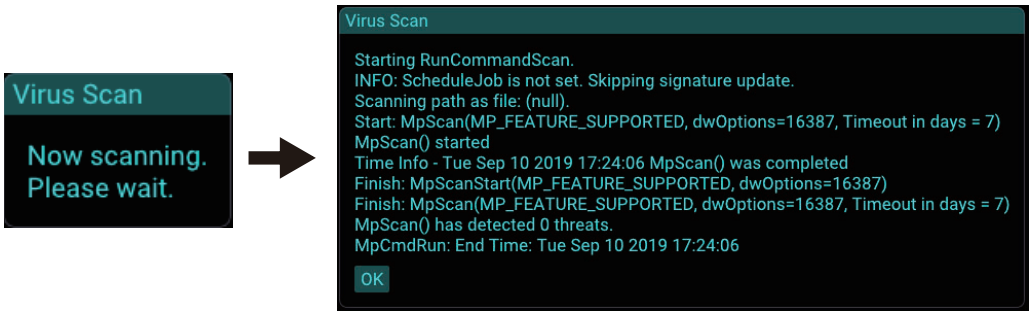
1. Click the menu button to open the main menu.
2. Click [Virus Scan].



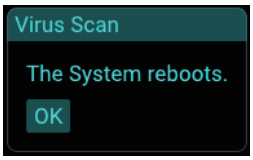
3. Click the [Scan] button.
   The message shown in the figure to the right appears.



4. Click the [OK] button to start the virus scan.
   The message shown below-left appears during the virus scan. After completing the scan, the result window shown below-right appears.



5. Click the [OK] button to close the result window.
   The message shown in the figure to the right appears.



6. Click the [OK] button to restart the system.
   The system is restarted and the normal startup screen appears.

Note: If the anti-virus software cannot remove a detected threat(s) (virus(es)), do as follows:

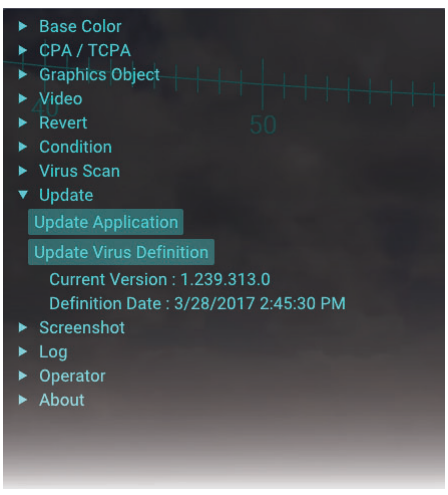
1) Press the power button to turn the power off.
2) Disconnect the power and LAN cables from the main PC.
3) Contact your dealer to request service.

3.9 How to Update the AR Navigation System Application

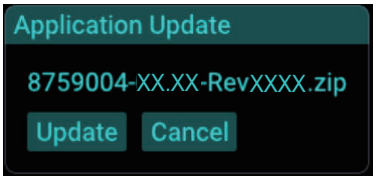
Do as follows to update the AR navigation system application.

Note: The system keeps previous settings after updating the application. However, menu items whose setting range or unit is changed due to the application update are reverted to their default settings.

1. Copy the application update file (file name: 8759004-××.××-Rev××××.zip) to a USB flash memory then insert the flash memory to the USB port on the main PC.
   Note: The application update file must be saved to the root directory of the USB flash memory.
2. Click the menu button to open the main menu.
3. Click [Update].

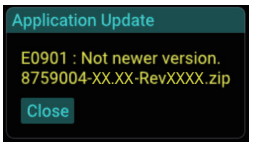


4. Click the [Application Update] button.
   The following message appears.

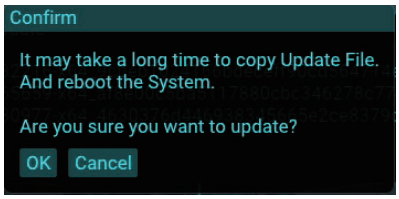


Note 1: If the application update file is not saved in the USB flash memory, the message shown in the figure to the right appears. Confirm that the application update file is saved correctly in the flash memory.

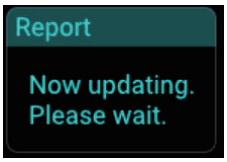
Note 2: If the software version of the application update file is same as current version, or older than the current version, the message shown in the figure to the right appears. Use the latest update file.

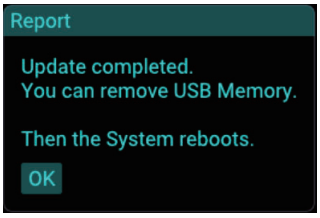


5. Click the [Update] button.
   The confirmation message as shown in the figure to the right appears.

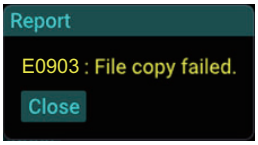


6. Click the [OK] button.
   The message shown below-left appears during the update. After completing the update, the confirmation message shown below-right appears.





Note: Do not remove the USB flash memory during the update. If the flash memory is removed, the message shown in the figure to the right appears. Close the message and retry updating after inserting the USB flash memory.



7. Disconnect the USB flash memory, then click the [OK] button to reboot the system.
   The system is restarted automatically to launch the updated application.

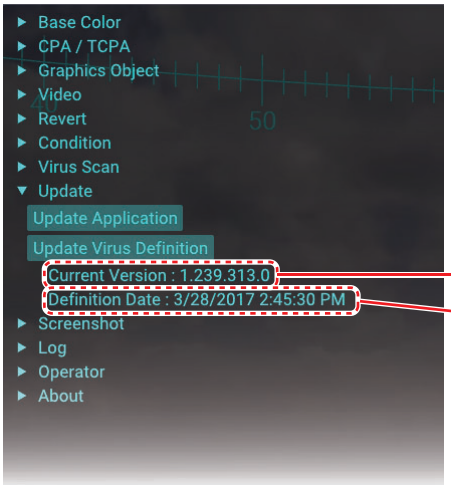
3.10 How to Update Virus Definition

Do as follows to update the virus definition.

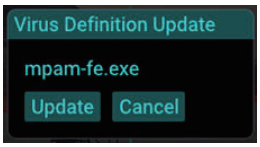
Note: When you update the virus definition, record the version of the virus definition file and date that the update is completed. This information will be required if a system failure occurs and you ask for service.

1. Download the latest virus definition file for Microsoft Defender Antivirus for Windows 10 and Windows 8.1 (64 bit) from the following web site.
   - https://www.microsoft.com/en-us/wdsi/definitions

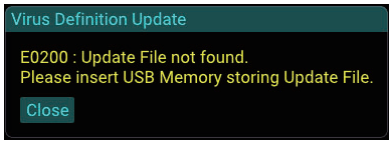
2. Copy the virus definition (file name: mpam-fe.exe) to a USB flash memory then insert the flash memory to the USB port on the main PC.
   Note: The virus definition must be saved to the root directory of the USB flash memory.
3. Click the menu button to open the main menu.
4. Click [Update].



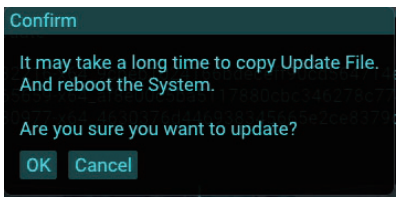
5. Click the [Update Virus Definition] button.
   The window as shown in the figure to the right appears.



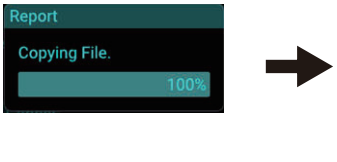
   Note: If the virus definition file is not saved in the USB flash memory, the message shown in the figure to the right appears. Confirm that the virus definition file is saved correctly in the flash memory.

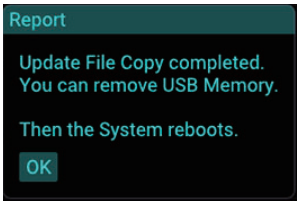


6. Click the [Update] button.
   The confirmation message as shown in the figure to the right appears.

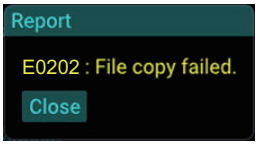


7. Click the [OK] button.
   The progress bar is shown while copying the definition file. After completing the file copy, the confirmation message shown below-right appears.

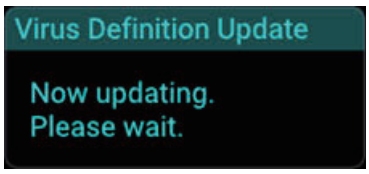




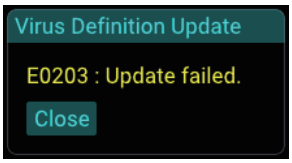
   Note: Do not remove the USB flash memory during the copying. If the flash memory is removed, the message shown in the figure to the right appears. Close the message and retry updating the virus definition after inserting the USB flash memory.



8. Disconnect the USB flash memory, then click the [OK] button to reboot the system.
   The system is restarted automatically to update the virus definition. The message shown in the figure to the right appears while updating the definition. After the updating is completed, the system is restarted automatically, then the normal startup screen appears.



   Note: If the updating fails, the message shown in the figure to the right appears. Close the message and retry updating the virus definition.

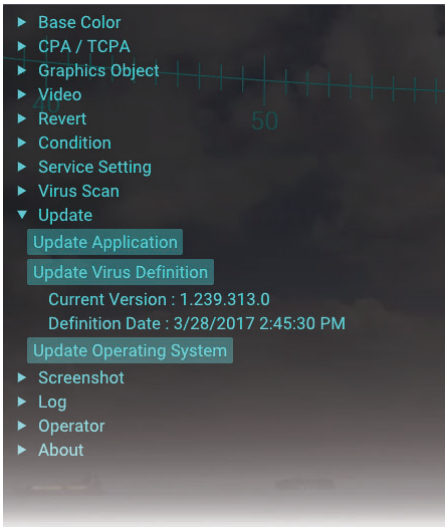


3.11 How to Update the Operating System

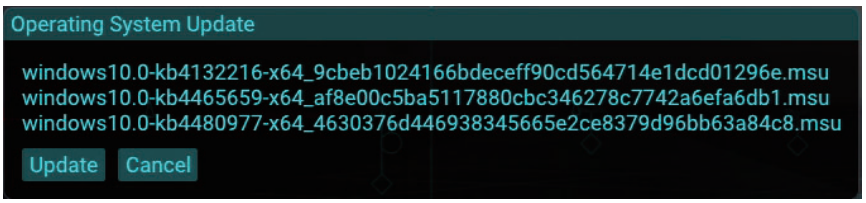
Do as follows to update the operating system.

1. Copy the operating system update file (file extension: msu) to a USB flash memory then insert the flash memory to the USB port on the main PC.
   Note 1: The operating system update file must be saved to the root directory of the USB flash memory.
   Note 2: The following characters and symbols are available for the file name. Do not use other characters and symbols.
   - Allowed characters: Alphanumeric characters
   - Allowed symbols: ! #* $ % & ’ ( ) + , - . ; = @ [ ] ^ _ ` { } ~ °
     *: Multiple same characters (example: ##) cannot be used.

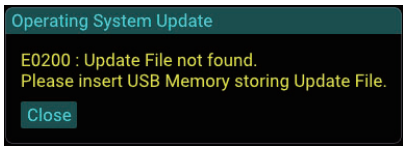
2. Login as a service technician, referring to subsection 2.3.1.
3. Click [Update].



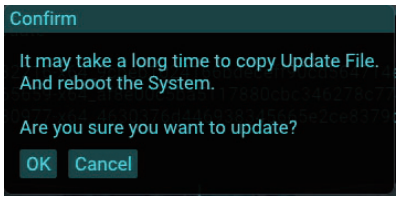
4. Click the [Update Operating System] button.
   The following message appears.



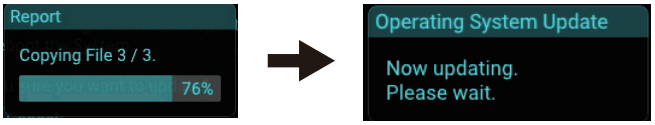
Note: If the operating system update file is not saved in the USB flash memory, the message shown in the figure to the right appears. Confirm that the operating system update file is saved correctly in the flash memory.



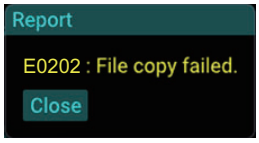
5. Click the [Update] button.
   The confirmation message as shown in the figure to the right appears.



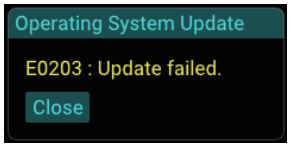
6. Click the [OK] button.
   The progress bar is shown while copying the update file. After completing the file copy, the system is restarted automatically to update the operating system. The message shown below-right appears while updating the operating system. After the updating is completed, the system is restarted automatically, then the normal startup screen appears.



Note 1: Do not remove the USB flash memory during the file copying. If the flash memory is removed, the message shown in the figure to the right appears. Close the message and retry updating the operating system.



Note 2: If the update fails, the message shown in the figure to the right appears. Close the message and retry updating the operating system.



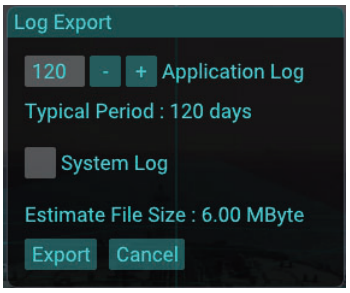
7. Disconnect the USB flash memory.

3.12 How to Copy Log Files

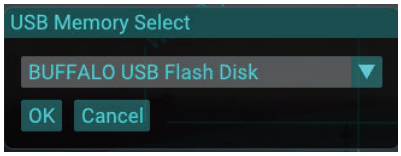
You can copy log files that are saved in the main PC to a USB flash memory.

1. Insert a USB flash memory to the USB port on the main PC.
2. Click the menu button to open the main menu.
3. Click [Log].

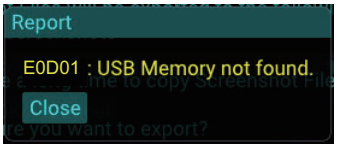
4. Click the [Export] button.
   The [Log Export] window appears.



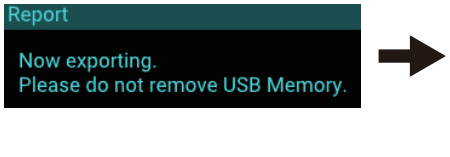
5. Select the number of the application log file at the [Application Log] field.
   Typical Period changes according to the setting of [Application Log] and indicates the number of days for log files.
6. Check the checkbox of [System Log] to copy the system log file.
   [Estimate File Size] indicates the estimated file size of the compressed log file.
7. Click the [Export] button.

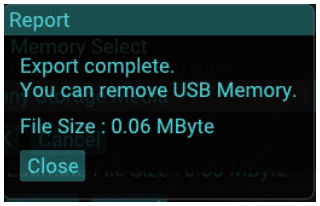


Note: If the USB flash memory cannot be detected, the error message shown in the figure to the right appears. Insert the USB flash memory to the main PC.

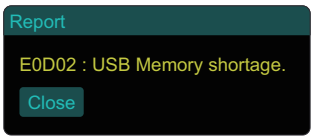


8. Select the USB flash memory as saving destination from the drop-down list.
9. Click the [OK] button to start the copy of the log files.
   The message shown below-left appears while copying log files. After completing the file copy, the confirmation message shown below-right appears.

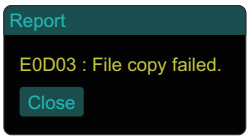




Note 1: If the disk capacity of the USB flash memory is insufficient to copy log files, the error message shown in the figure to the right appears. Make sure that there is enough space in the USB flash memory.



Note 2: Do not remove the USB flash memory during the copying. If the flash memory is removed, the message shown in the figure to the right appears. Close the message and retry copying log files after inserting the USB flash memory.



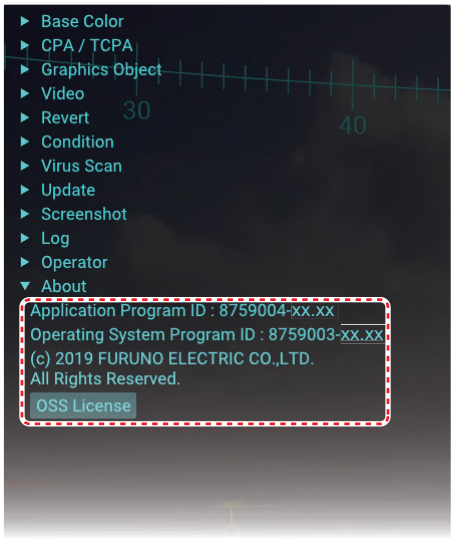
10. Click the [Close] button.

3.13 How to Show Software Information

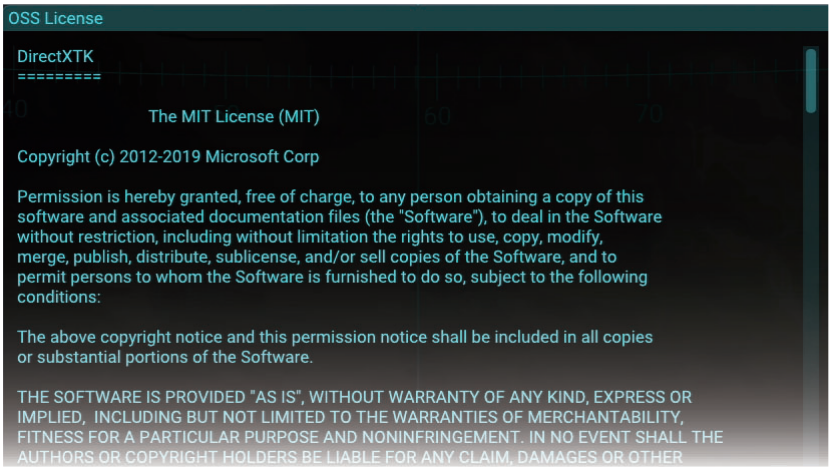
You can show the following software information:

- Application program ID
- Copyright notation
- Operating system program ID
- Open source software information

1. Click the menu button to open the main menu.
2. Click [About].
   Software information is shown on the menu area.



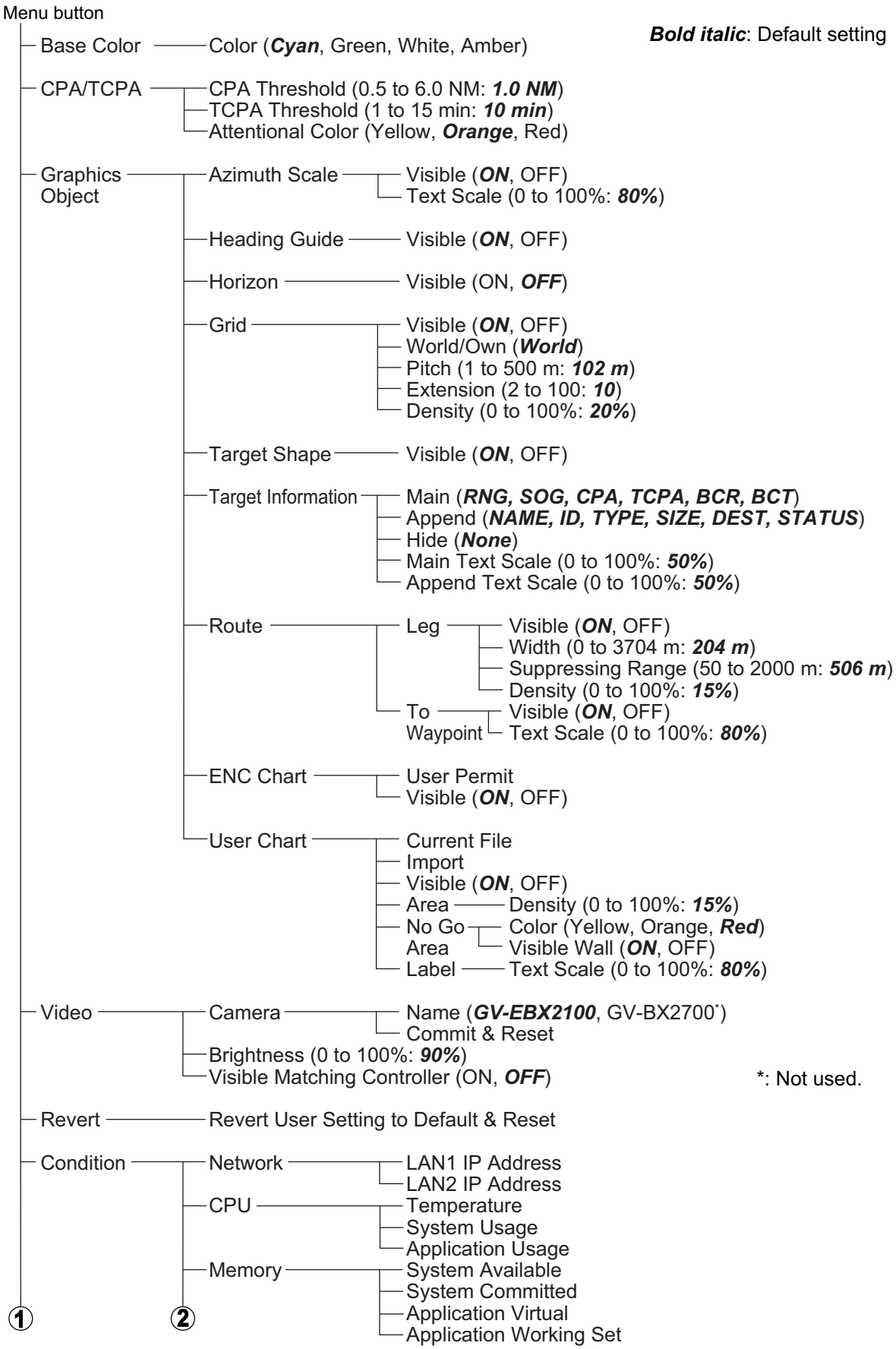
3. Click the [OSS License] button to show the open source software license information.

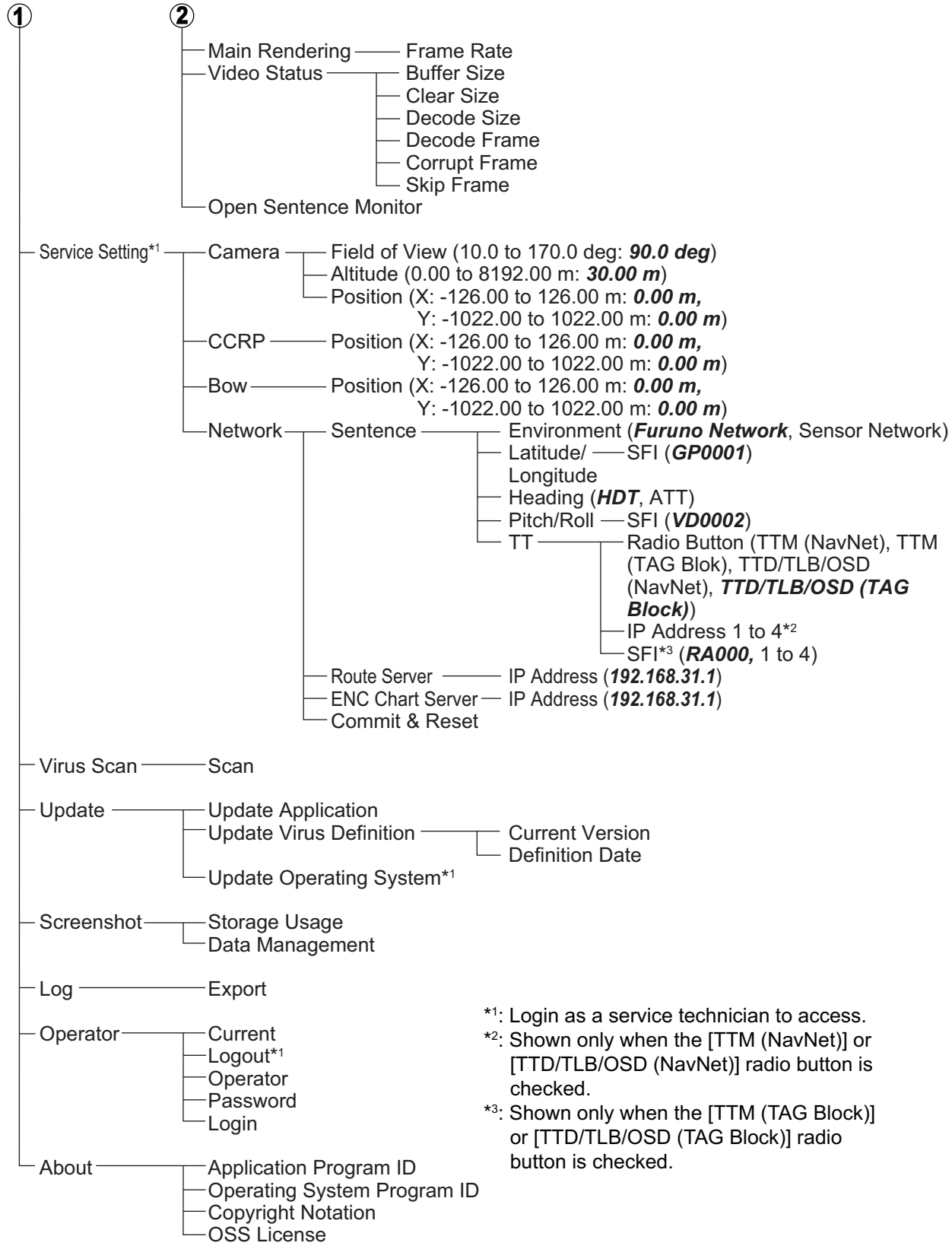


4. Click the [Close] button to close the [OSS License] window.
5. Close the main menu.

This page is intentionally left blank.

APPENDIX 1 MENU TREE





*1: Login as a service technician to access.
*2: Shown only when the [TTM (NavNet)] or [TTD/TLB/OSD (NavNet)] radio button is checked.
*3: Shown only when the [TTM (TAG Block)] or [TTD/TLB/OSD (TAG Block)] radio button is checked.

APPENDIX 2 ROD TERMINALS

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J1	1	24V_VOUT	AI 0.34-6 TQ (blue)	MC1.5-W-Lxxx
	2	24V_GND		
	3	MODBUS-A	AI 0.14-8 GY (gray)	
	4	MODBUS-B		
	5	GND		

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J2	1	24V_IN	AI 1.5-6 BK (black)	DPYC-1.5
	2	24V_GND		
	3	PWR_FAIL-A	AI 0.75-6 GY (Gray)	TTYCS-4 TTYCSLA-4
	4	PWR_FAIL-COM		
	5	PWR_FAIL-B		
	6	NC	-	-

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J4	1	TD1-A	AI 0.75-6 GY (Gray)	TTYCS-4 TTYCSLA-4
	2	TD1-B		
	3	RD1-A		
	4	RD1-B		
	5	ISOGND1		
	6	RD1-H		
	7	RD1-C		

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J5	1	TD2-A	AI 0.75-6 GY (gray)	TTYCS-4 TTYCSLA-4
	2	TD2-B		
	3	RD2-A		
	4	RD2-B		
	5	ISOGND2		
	6	RD2-H		
	7	RD2-C		

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J6	1	TD3-A	AI 0.75-6 GY (gray)	TTYCS-4 TTYCSLA-4
	2	TD3-B		
	3	RD3-A		
	4	RD3-B		
	5	ISOGND3		
	6	RD3-H		
	7	RD3-C		

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J7	1	TD4-A	AI 0.75-6 GY (gray)	TTYCS-4 TTYCSLA-4
	2	TD4-B		
	3	RD4-A		
	4	RD4-B		
	5	ISOGND4		
	6	RD4-H		
	7	RD4-C		

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J8	1	TD5-A	AI 0.75-6 GY (gray)	TTYCS-1Q TTYCSLA-1Q
	2	TD5-B		
	3	RD5-H		
	4	RD5-C		
	5	TD6-A		TTYCS-1Q TTYCSLA-1Q
	6	TD6-B		
	7	RD6-H		
	8	RD6-C		

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J9	1	TD7-A	AI 0.75-6 GY (gray)	TTYCS-1Q TTYCSLA-1Q
	2	TD7-B		
	3	RD7-H		
	4	RD7-C		
	5	TD8-A		TTYCS-1Q TTYCSLA-1Q
	6	TD8-B		
	7	RD8-H		
	8	RD8-C		

SPECIFICATIONS OF AR NAVIGATION SYSTEM
AR-100M

1 MAIN PC

1.1	CPU	Intel® Celeron® N3350 2.4 GHz
1.2	System memory	4 GB
1.3	Display information	Azimuth, AIS, TT for radar, Route, User chart, ENC chart symbol
1.4	Language	UK/USA

2 IP CAMERA

2.1	Resolution	1920 x 1080 (Full-HD)
2.2	Frame rate	25 fps
2.3	Video compression	H.264
2.4	Source	PoE

3 INTERFACE

3.1	Number of port	
	Video	1 ch, HDMI
	LAN	2 ch, Ethernet, GbE
	USB	USB 2.0: 4 ch, USB3.0: 2 ch
3.2	Data sentences (IEC61162-1/2)	
	Input	GGA, GNS, HDT, OSD, RMB, TLB, TTD, TTM, VDM, VDO, VTG, ZDA

4 POWER SUPPLY

4.1	Main PC	100-240 VAC: 0.9-0.4 A, 1 phase, 50-60 Hz
4.2	PoE adapter	100-240 VAC: 0.2-0.08 A, 1 phase, 50/60 Hz

5 ENVIRONMENTAL CONDITIONS

5.1	Ambient temperature	
	Main PC	-5°C to +60°C
	IP camera	0°C to +50°C
	PoE adapter	-10°C to +50°C
5.2	Relative humidity	90% or less at +40°C
5.3	Degree of protection	IPX0
5.4	Vibration	Equivalent to standards outlined in IEC 60945 Ed.4 Clause 8.7

6 UNIT COLOR

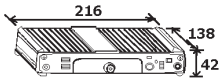
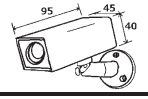
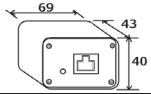
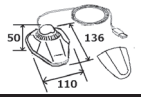
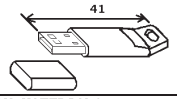
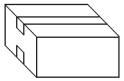
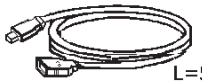
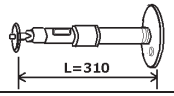
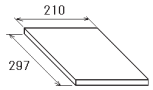
6.1	Main PC	Silver
6.2	IP camera	White
6.3	PoE adapter	Black

PACKING LIST

03IO-X-9851 -3 1/1

AR-100M-N/-B

A-1

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
制御部(PC) FANLESS BOX PC		eBOX100-312-FL-N3350 000-197-271-10	1
IPｶﾒﾗ IP CAMERA		GV-EBX2100 000-196-795-10	1
POEｱﾀﾞﾌﾟﾀ POE ADAPTER		GV-PA191 000-197-272-10	1
ﾄﾗｯｸﾎﾞｰﾙ TRACK BALL		K72337JP 000-197-232-10	1
電子ﾁｬｰﾄ用ﾄﾞﾝｸﾞﾙ ENC DONGLE		ENC-KEY-B 000-037-604-00	1 (*1)
工事材料 INSTALLATION MATERIALS			
(箱)工事材料 INSTALLATION MATERIALS		CP03-40001 001-572-900-00	1
USBｹｰﾌﾞﾙ USB CABLE		KU-EN5K 000-197-073-10	2
伸縮ﾌﾞﾗｹｯﾄ BRACKET		TB-109 000-197-072-10	1
図書 DOCUMENT			
取扱説明書(英) OPERATOR'S MANUAL(EN)		OME-45080-* 000-197-341-1*	1

(*1)はAR-100M-B用で
す。(*1):FOR AR-100M-B.

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

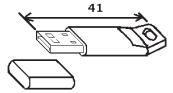
C4508-Z01-C

PACKING LIST

03IO-X-9852 -0 1/1

AR-100M-N

A-2

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
電子ﾁｬｰﾄ用ﾄﾞﾝｸﾞﾙ ENC DONGLE		ENC-KEY-A 000-036-775-00	1

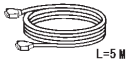
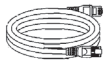
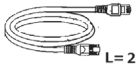
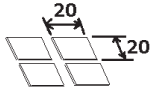
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

C4508-Z02-A

FURUNO

CODE NO.	001-572-900-00	03IO-X-9401 -2
TYPE	CP03-40001	1/1

工事材料表
INSTALLATION MATERIALS

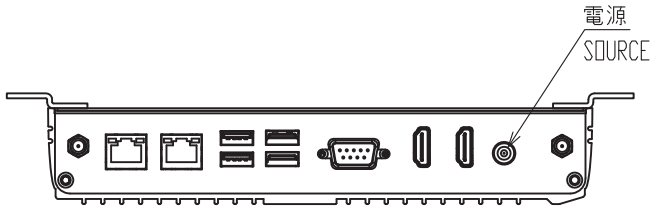
番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	HDMIｹｰﾌﾞﾙ HDMI CABLE		DH-HD14E50/RS CODE NO. 000-197-075-10	1	
2	ｹｰﾌﾞﾙ(組品)LAN LAN CABLE ASSEMBLY		P5E-4PTX-BL L=10M CODE NO. 001-592-640-00	2	
3	ｹｰﾌﾞﾙ(組品)LAN LAN CABLE ASSEMBLY		P5E-4PTX-BL L=2M CODE NO. 000-164-634-10	1	
4	両面粘着ｺﾞﾑ ADHESIVE RUBBER		QL-53CL CODE NO. 000-197-074-10	1	

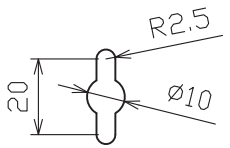
（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO ELECTRIC CO ., LTD.

C4508-M01-C

FURUNO

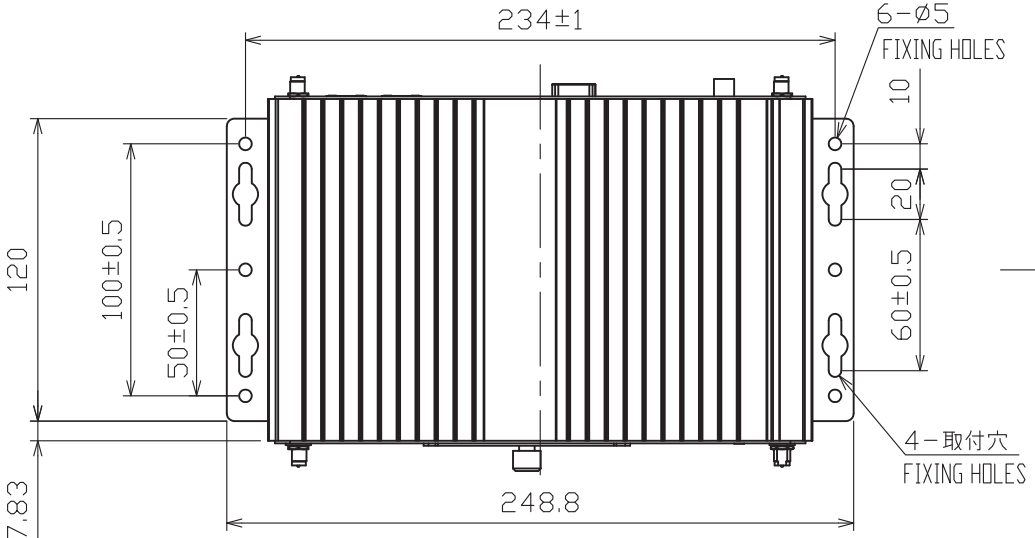


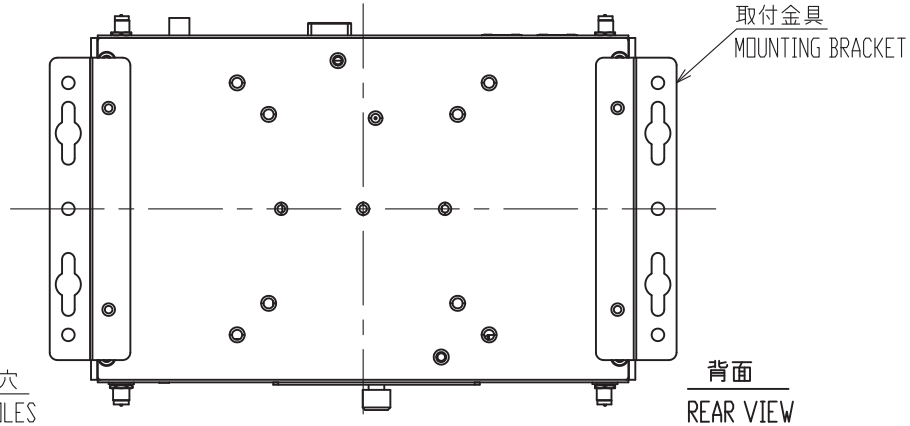


取付穴詳細（尺度：1/2）
DETAIL FOR FIXING (SCALE: 1/2)

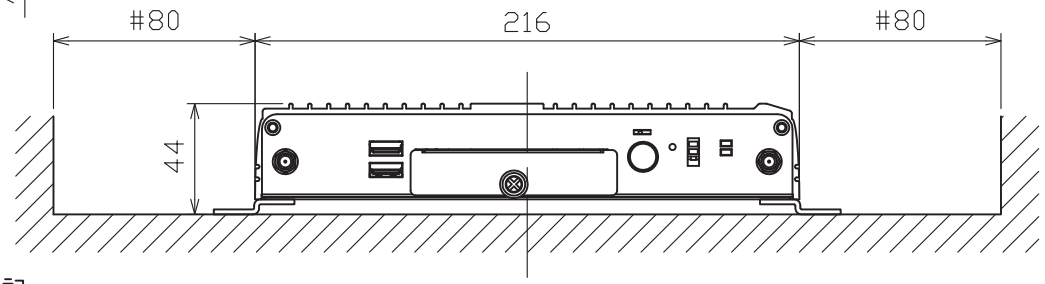
表1 TABLE 1

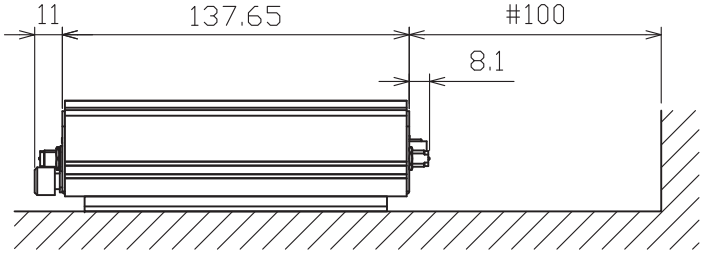
寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3





背面
REAR VIEW





注　記

1）指定なき寸法公差は表1による。
2）#印寸法は最小サービス空間寸法とする。
3）取付はタッピンネジ呼び径4を使用のこと。

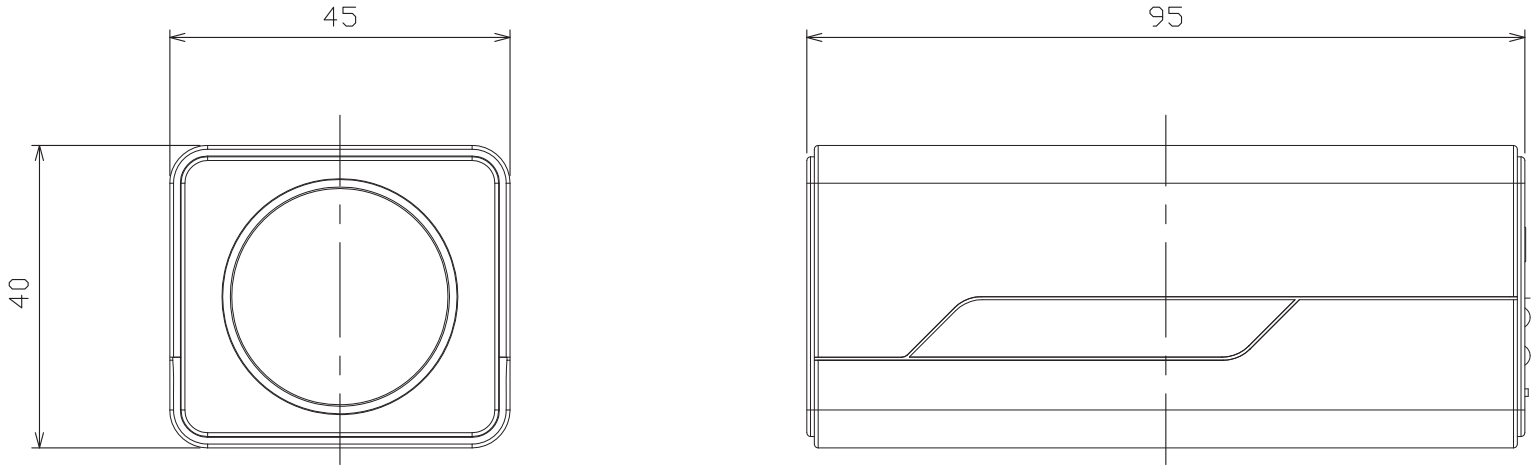
NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS ø4 FOR FIXING THE UNIT.

DRAWN 6/Nov/2020 T.YAMASAKI			TITLE eBOX100-312-FL-N3350
CHECKED 6/Nov/2020 H.MAKI			名称 制御部(卓上・壁掛装備)
APPROVED 13/Nov/2020 H.MAKI		AR-100M	外寸図
SCALE 1/3	MASS 1.15 ±10% kg	質量は取付金具を含まず。 MASS DOES NOT INCLUDE BRACKET.	NAME MAIN PC (TABLETOP/BULKHEAD MOUNT)
DWG.No. C4508-G02-A		REF.No. eBOX100-312	OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO

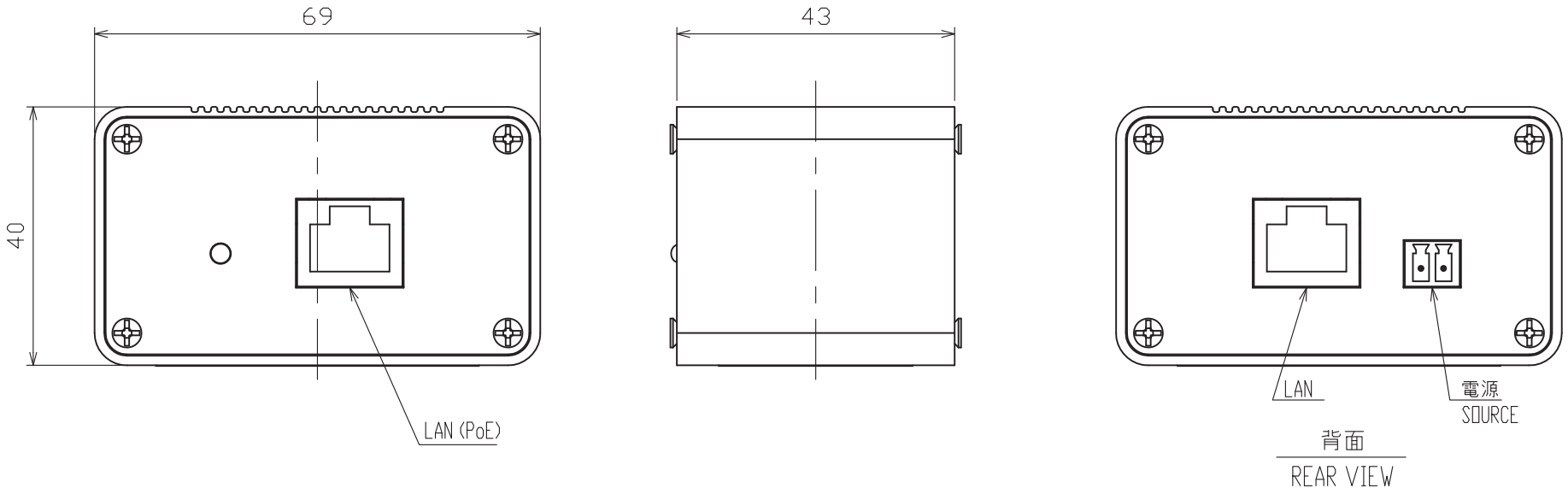


DRAWN 12/Nov/2020 T.YAMASAKI			TITLE GV-EBX2100
CHECKED 12/Nov/2020 H.MAKI			名称 IPカメラ
APPROVED 13/Nov/2020 H.MAKI		AR-100M	外寸図
SCALE 1/1	MASS 0.12 ±10% kg		NAME IP CAMERA
DWG.No. C4508-G03- A		REF.No.	OUTLINE DRAWING

D-2

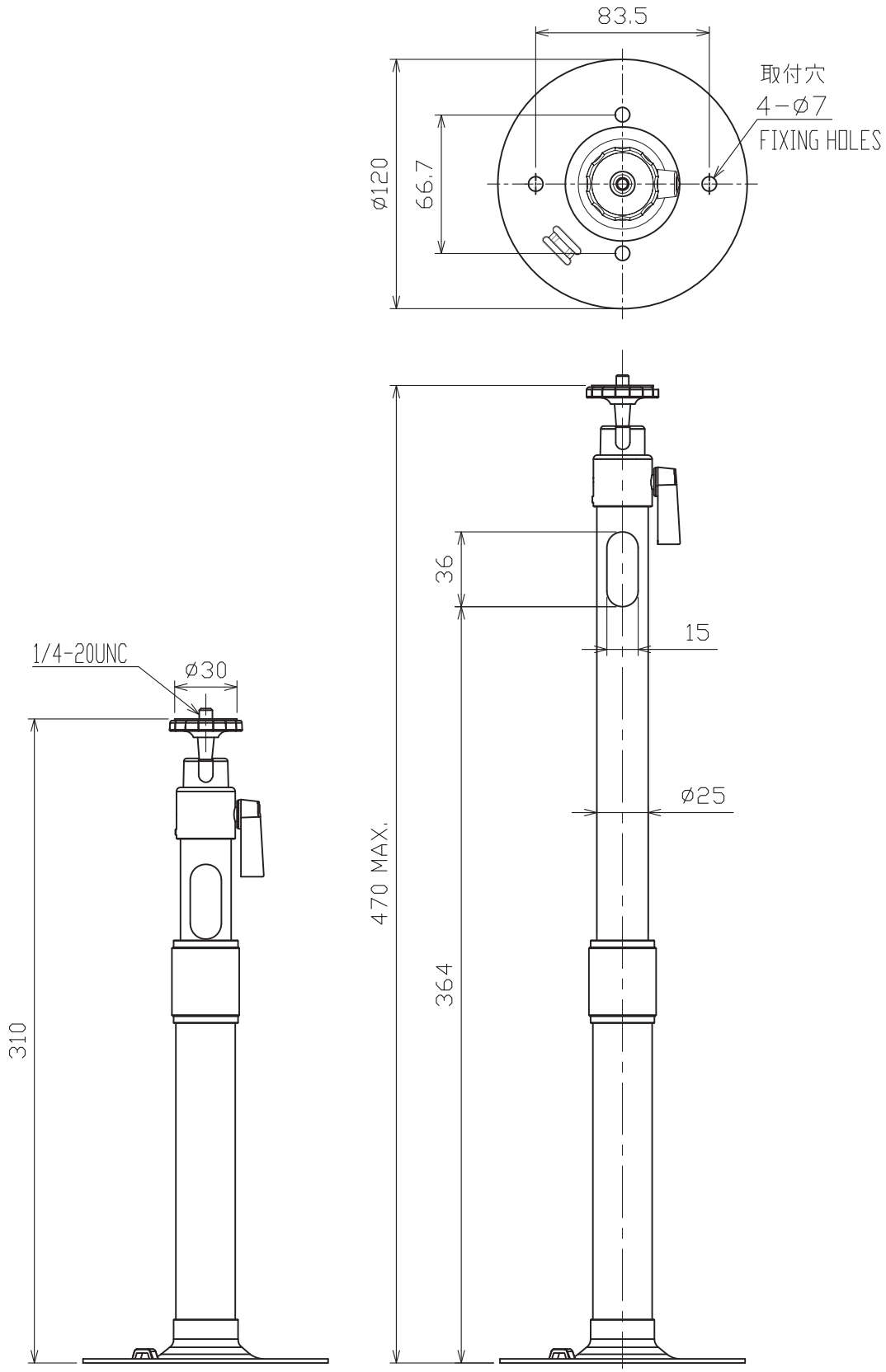
FURUNO ELECTRIC CO., LTD.

FURUNO



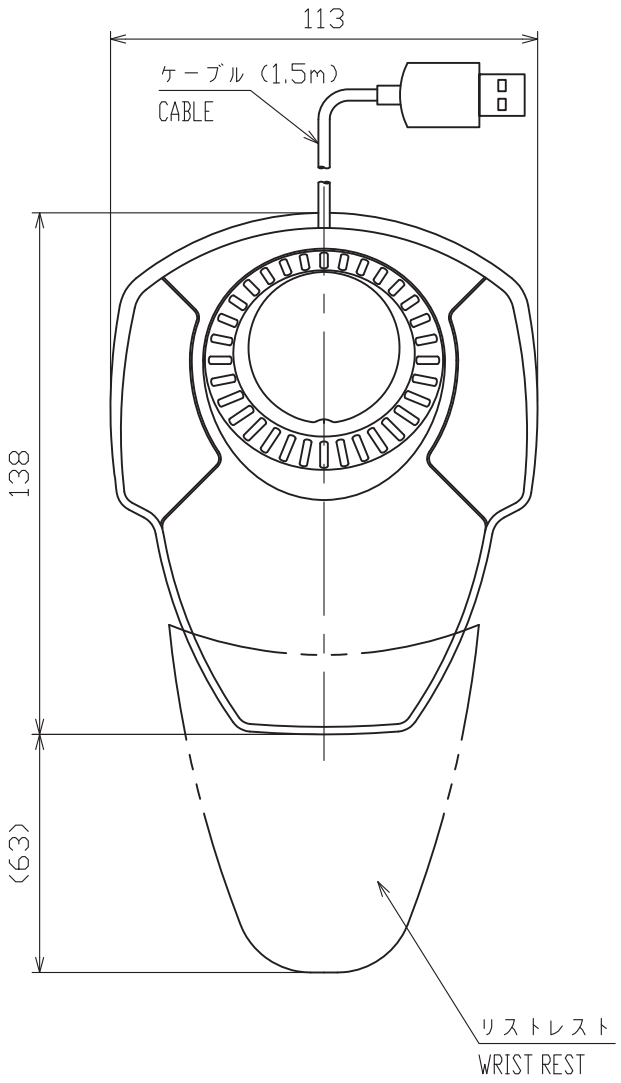
DRAWN 12/Nov/2020 T.YAMASAKI		TITLE	GV-PA191
CHECKED 12/Nov/2020 H.MAKI		名称	PoEアダプタ
APPROVED 13/Nov/2020 H.MAKI	AR-100M		外寸図
SCALE 1/1 MASS 0.13 ±10% kg		NAME	PoE ADAPTER
DWG.No. C4508-G04- A	REF.No.		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.



DRAWN 12/Nov/2020 T.YAMASAKI		TITLE	TB-109
CHECKED 12/Nov/2020 H.MAKI		名称	伸縮ブラケット
APPROVED 13/Nov/2020 H.MAKI	AR-100M		外寸図
SCALE 1/3 MASS 0.4 ±10% kg		NAME	CAMERA BRACKET
DWG. No. C4508-G05- A	REF. No.		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.



DRAWN 27/Oct/2020 T.YAMASAKI		TITLE	K72337JP
CHECKED 27/Oct/2020 H.MAKI		名称	トラックボール
APPROVED 27/Oct/2020 H.MAKI	AR-100M		外寸図
SCALE 1/2 / MASS 0.16 ±10% kg	質量はリストレストを含まず。 MASS DOES NOT INCLUDE WRIST REST.	NAME	TRACKBALL
DWG.No. C4508-G01- A	REF.No.		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

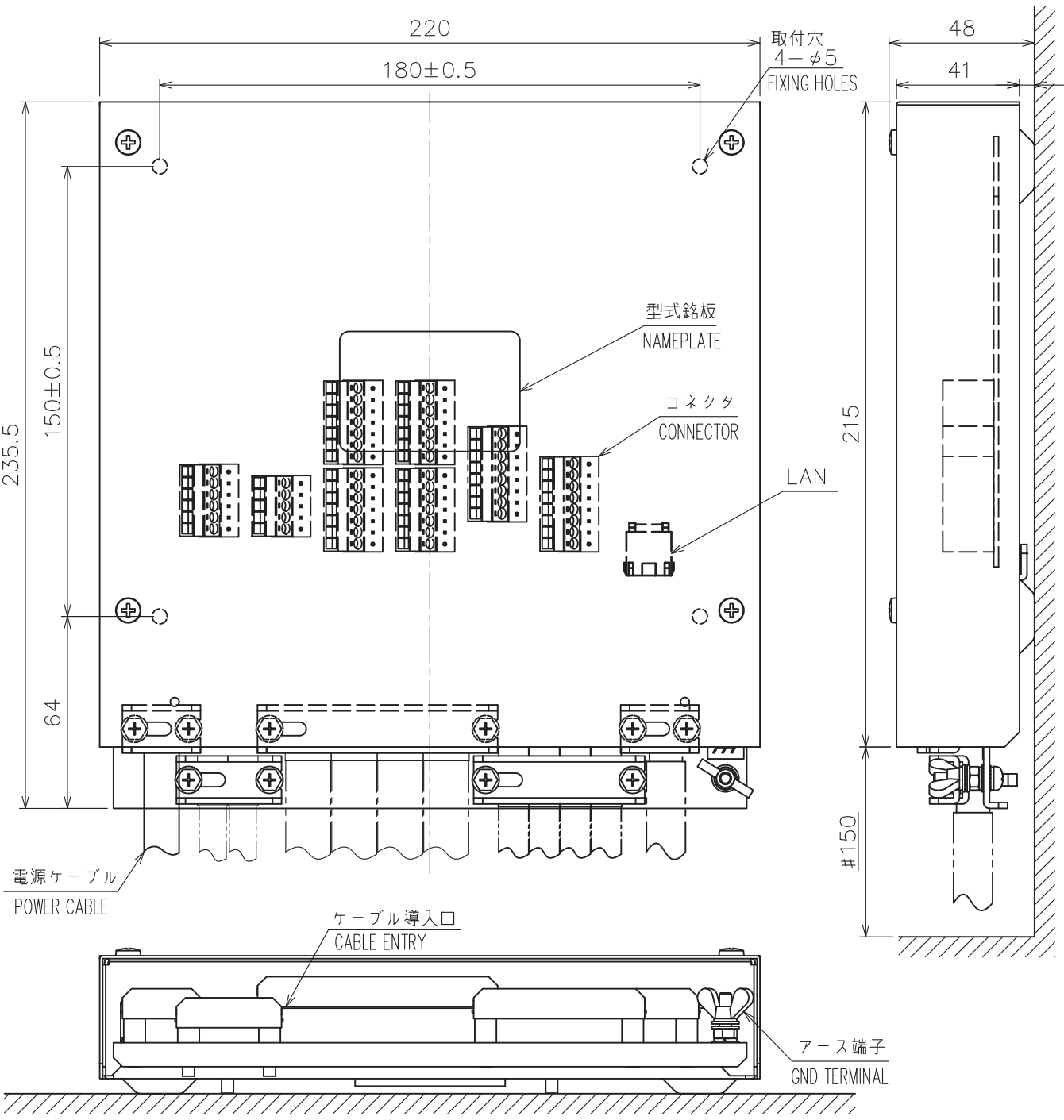


表1 TABLE 1

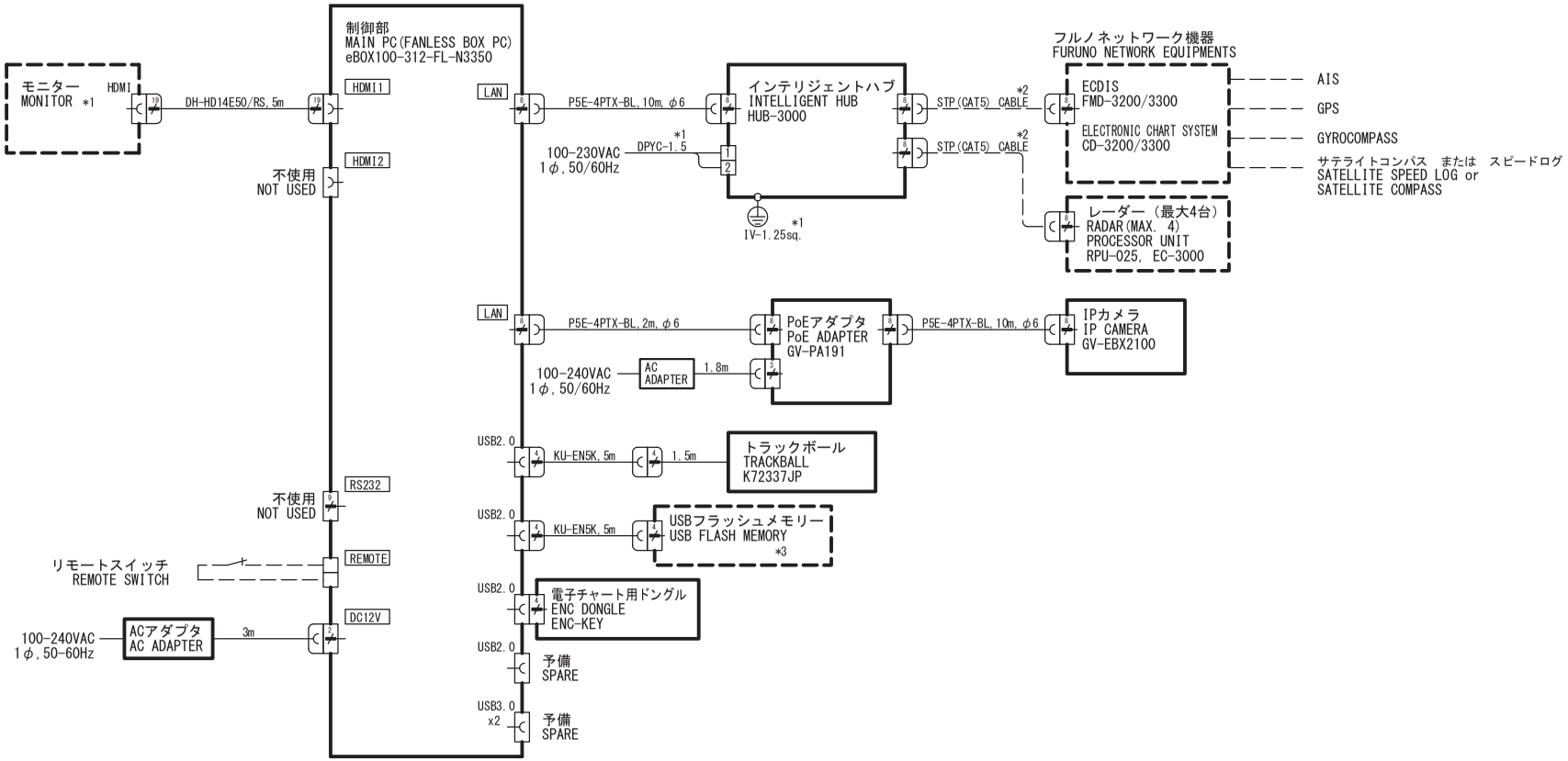
寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3

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） 取付用ネジはトラスタッピンネジ呼び径４×２０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 ø4x20 FOR FIXING THE UNIT.

DRAWN 11/Jan/2012 T.YAMASAKI		TITLE	MC-3000S
CHECKED 11/Jan/2012 H.MAKI		名称	センサーアダプター（シリアル）
APPROVED 13/Jan/2012 Y.NISHIYAMA	FMD-3200		外寸図
SCALE 1/2 MASS 1.5 ±10% kg	質量はケーブルを含まず。 MASS DOES NOT INCLUDE CABLE.	NAME	SENSOR ADAPTER (SERIAL)
DWG. No. C4473-G08- A	REF. No. 24-014-200G-1		OUTLINE DRAWING

FURUNO



注記

＊１）造船所手配。
＊２）オプション。
＊３）ユーザー手配。

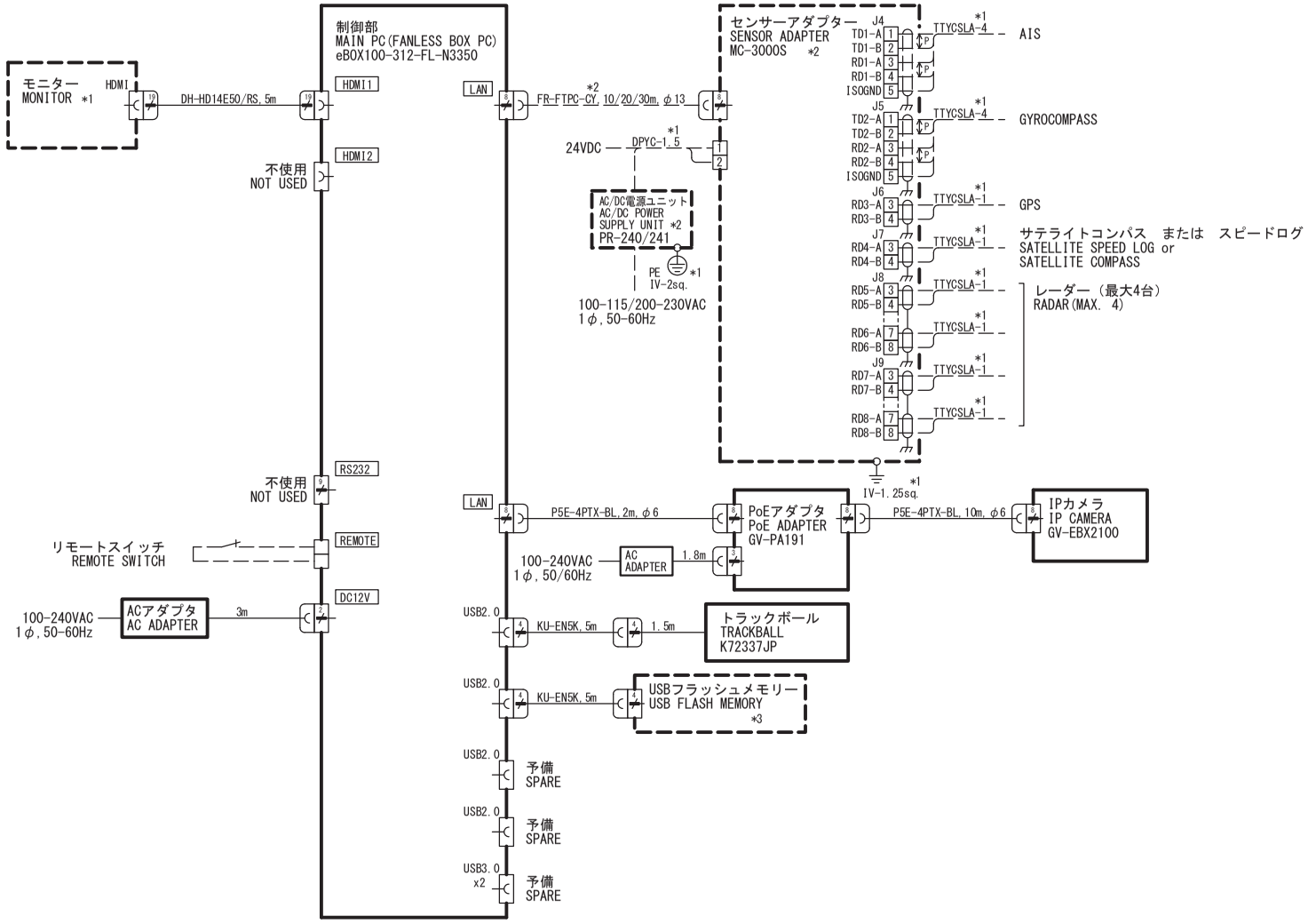
NOTE

*1: SHIPYARD SUPPLY.
*2: OPTION.
*3: USER SUPPLY.

DRAWN 2/Oct/2020 T. YAMASAKI		TITLE	AR-100M
CHECKED 2/Oct/2020 H. MAKI		名称	AR航海情報表示システム
APPROVED 5/Oct/2020 H. MAKI			相互結線図
SCALE / MASS kg		NAME	AR NAVIGATION SYSTEM
DWG No. C4508-C01- D	REF. No.		INTERCONNECTION DIAGRAM

FURUNO ELECTRIC CO., LTD.

FURUNO



注記

＊１）造船所手配。
＊２）オプション。
＊３）ユーザー手配。

NOTE

*1: SHIPYARD SUPPLY.
*2: OPTION.
*3: USER SUPPLY.

DRAWN 5/Oct/2020 T. YAMASAKI		TITLE	AR-100M(MC-3000S)
CHECKED 5/Oct/2020 H. MAKI		名称	AR航海情報表示システム
APPROVED 5/Oct/2020 H. MAKI			相互結線図
SCALE / MASS kg		NAME	AR NAVIGATION SYSTEM
DWG No. C4508-C02- B	REF. No.		INTERCONNECTION DIAGRAM

FURUNO ELECTRIC CO., LTD.

INDEX

FURUNO ELECTRIC CO., LTD.
9-52 Ashihara-cho, Nishinomiya, 662-8580, Japan
Tel: +81 (798) 65-2111 Fax: +81 (798) 65-1020
www.furuno.com

Publication No. DOCQA1244

EC Declaration of Conformity

CE

We FURUNO ELECTRIC CO., LTD.

(Manufacturer)

9-52 Ashihara-Cho, Nishinomiya City, 662-8580, Hyogo, Japan

(Address)

declare under our sole responsibility that the product

PC
eBOX100-312-FL-N3350

(Model name, type number)

to which this declaration relates is in conformity with the following standard(s) or other normative document(s)

CISPR 16-2-1 Ed.3.0 A1: 2017
CISPR 16-2-3 Ed.4.0 A1: 2019
EN 55032: 2015/ AC:2016
CISPR 32 Ed.2: 2015/ C1:2016
EN 61000-3-2: 2014
EN 61000-3-3: 2013
EN 55024: 2010, EN 55024 A1: 2015
IEC 60945 Ed.4.0: 2002, clauses 9.2 and 9.3, incl. Corr. 1: 2008

(title and/or number and date of issue of the standard(s) or other normative document(s))

For assessment, see

- EMC Test Report T170704D07-E, July 7, 2017 prepared by Compliance Certification Services Inc. and LIC 12-19-174, September 24, 2019 prepared by Labotech International Co., Ltd..

This declaration is issued according to the Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.

On behalf of Furuno Electric Co., Ltd.

Nishinomiya City, Japan
September 25, 2019

(Place and date of issue)

Yoshitaka Shogaki
Department General Manager
Quality Assurance Department

Y. Shogaki

(name and signature or equivalent marking of authorized person)

FURUNO ELECTRIC CO., LTD.
9-52 Ashihara-cho, Nishinomiya, 662-8580, Japan
Tel: +81 (798) 65-2111 Fax: +81 (798) 65-1020
www.furuno.com

Publication No. DOCQA1288

EC Declaration of Conformity

CE

We FURUNO ELECTRIC CO., LTD.

(Manufacturer)

9-52 Ashihara-Cho, Nishinomiya City, 662-8580, Hyogo, Japan

(Address)

declare under our sole responsibility that the product

AR NAVIGATION SYSTEM

AR-100M

(Model name, type number)

to which this declaration relates is in conformity with the following standard(s) or other normative document(s)

EN 61000-3-2: 2006/ A1: 2009/ A2: 2009/ 2014
EN 61000-3-3: 1995/ A1: 2001/ A2: 2005/ 2008/ 2013
EN 55022: 2006/ A1: 2007/ 2010/ AC: 2011
EN 55024: 1998/ A1: 2001/ A2: 2003/ 2010/ A1: 2015
EN 55032: 2015/ AC: 2016
CISPR 32 Ed.2.0: 2015/ C1: 2016
IEC 60945 Ed.4.0: 2002, clauses 9.2 and 9.3, incl. Corr. 1: 2008

(title and/or number and date of issue of the standard(s) or other normative document(s))

For assessment, see

- EMC certificate T170704D07-E, July 7, 2017 prepared by Compliance Certification Services Inc., EC420670, March 1, 2014 prepared by SPORTON International Inc. and NEI-EMC-1-E1006064, August 2, 2010 prepared by Neutron Engineering Inc..
- EMC Test Report LIC 12-19-174, September 24, 2019 prepared by Labotech International Co., Ltd..

This declaration is issued according to the Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.

On behalf of Furuno Electric Co., Ltd.

Nishinomiya City, Japan
January 23, 2020

(Place and date of issue)

Yoshitaka Shogaki
Department General Manager
Quality Assurance Department

Y. Shogaki

(name and signature or equivalent marking of authorized person)