FURUNO

OPERATOR'S MANUAL

取扱説明書

Wave Analyzer

波浪解析ソフトウェア

Model **WV-100**
WV-100ST

FURUNO ELECTRIC CO., LTD.

www.furuno.com

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FOREWORD

Congratulations on your choice of the FURUNO Wave Analyzer WV-100/WV-100ST. 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 innovative and dependable marine electronics equipment. This dedication to excellence is furthered by our extensive global network of agents and dealers.

Please carefully read and follow the recommended procedures for operation and maintenance.

Features

This software, installed in a PC, analyzes and displays the wave radar data obtained from the FURUNO model chart radar FAR-3xx0 or marine radar FAR-2xx8 series.

- Automatic wave height adjustment.
- Wave analysis for both X-band and S-band radars.
- Equipped with sea trial mode (WV-100ST only).
- Always connect the PC to the Navigation network via a firewall device, as shown in the System Configuration diagram.

Usage Precautions

To prevent potential damage to your radar, follow the below precautions:

- Only connect the analysis PC for wave analysis. Do not connect the PC for any other purpose.
- Do not install any other software on the PC, other than this analysis software.
- Always connect the PC to the Navigation network via a firewall device, as shown in the System Configuration diagram.
- Do not connect the analysis PC to the ship-board network, or other networks, directly. Always perform updates to Windows and anti-virus software while offline.
- Before connecting a USB Flash Memory or other USB storage device to the PC, preform a virus check on the device and confirm that the storage can safely be connected to the PC.
- Only authorized personnel (PC administrator or users with administrative privileges) should use this software.
- Anti-virus and security software can prevent this software from working correctly. Adjust your anti-virus and security settings so that this software is white-listed. This software is designed to be compatible with Windows Defender.
- Before using the PC for a purpose other than wave analysis, or before discarding the PC, uninstall this software.

Restrictions on wave analysis

The following restrictions apply to wave analysis.

Radar settings

- Pulse width: Must be set between S1 and M1 (S1 has the highest measurement accuracy.)
- The wave analysis is not available when using the interswitch function. (The slave echo for the interswitch is used for the wave analysis. The wave setting is canceled at the interswitch.)

Operational specification of wave radar

- This software analyzes wave data using the radars specified beforehand.
- To enable wave analysis, access the settings on the connected radar and switch [WAVE MODE] to [ON].

In both cases, an error display appears when the analysis results are outside the capabilities of this software.

Program version no.

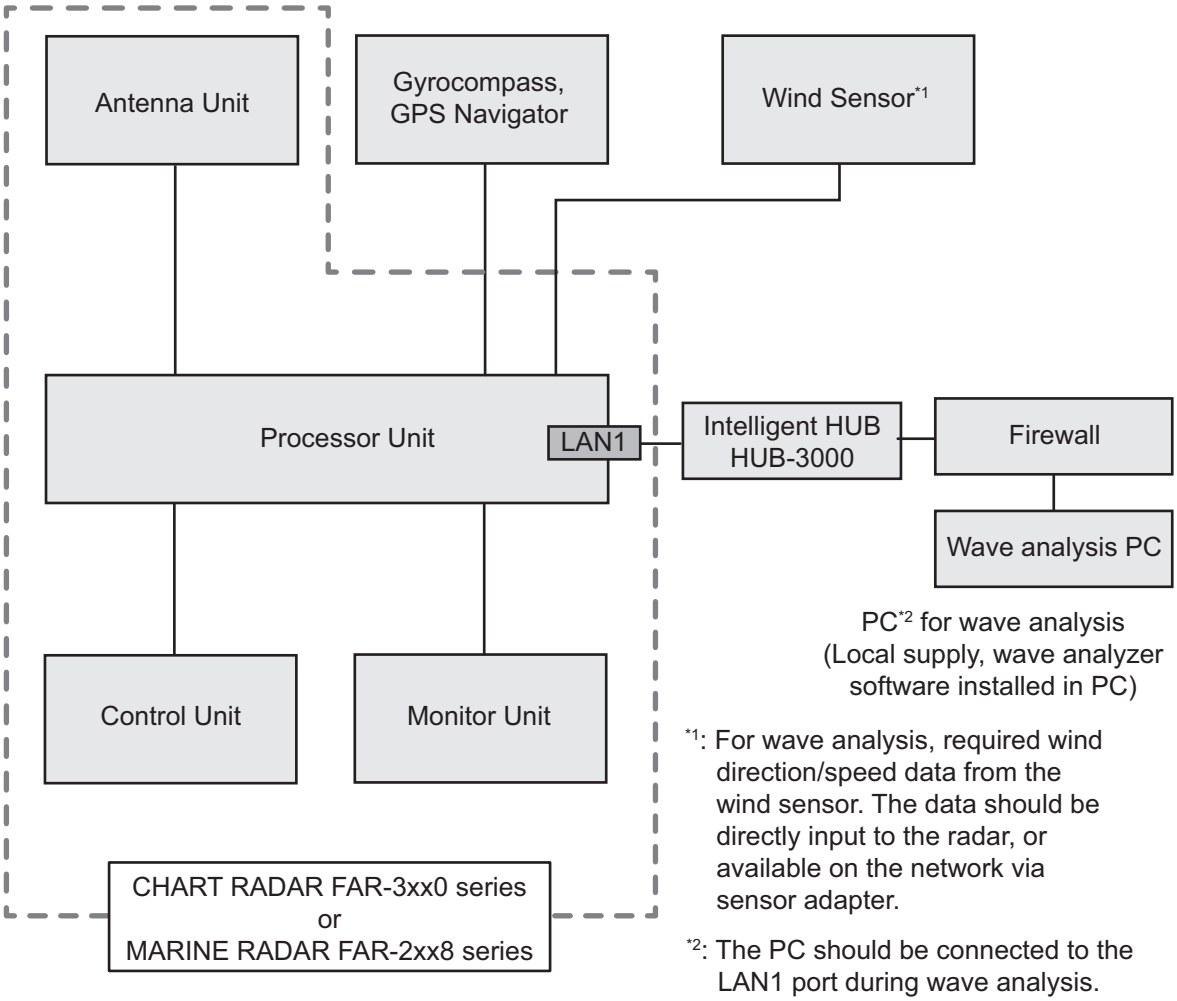
0359495-01.**

* denotes minor modifications.

Software used in this product

This product includes software to be licensed under BSD, MIT, zlib, FTL, NVIDIA CUDA Toolkit License Agreement. Please refer to the OSS directory in the supplied CD-ROM for details on the terms of the software.

SYSTEM CONFIGURATION



PC*2 for wave analysis
(Local supply, wave analyzer
software installed in PC)

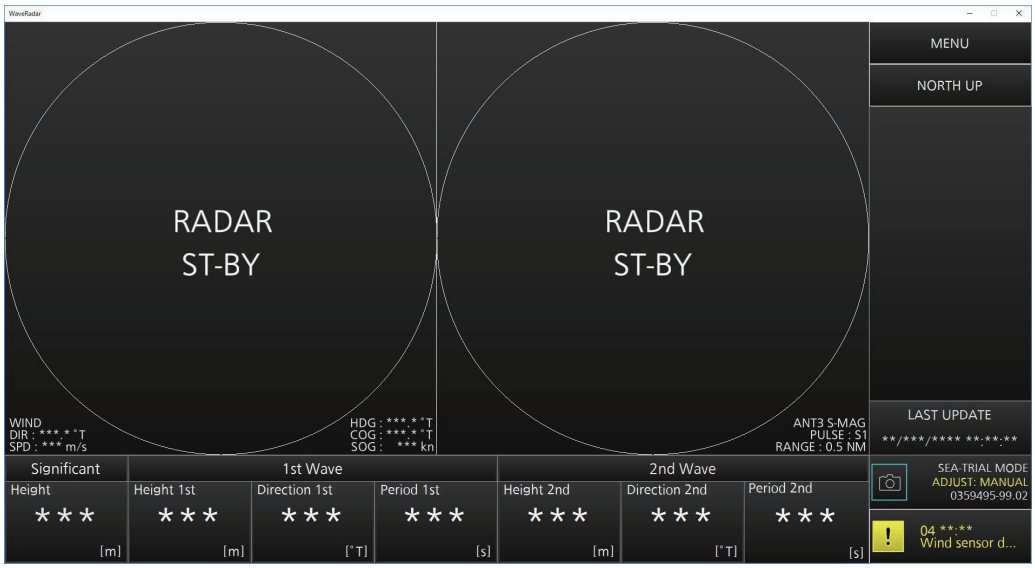
*1: For wave analysis, required wind direction/speed data from the wind sensor. The data should be directly input to the radar, or available on the network via sensor adapter.

*2: The PC should be connected to the LAN1 port during wave analysis.

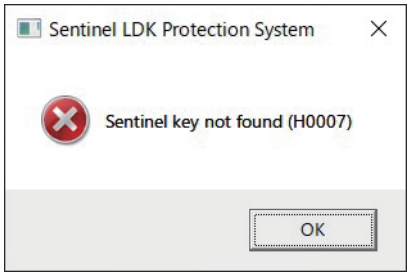
1. OPERATIONAL OVERVIEW

1.1 How to Start and Quit the Software

1. Power the FAR-3xx0 or FAR-2xx8 series.
2. Insert the USB dongle into a USB port on the PC. The LED in the dongle lights red.
   Note: The USB dongle is required to use this software. Take care not to lose it.
3. Power the PC. The software automatically starts up and the following screen appears.



Note 1: If the message shown to the right figure appears, click [OK] to delete the message and then re-insert the USB dongle.

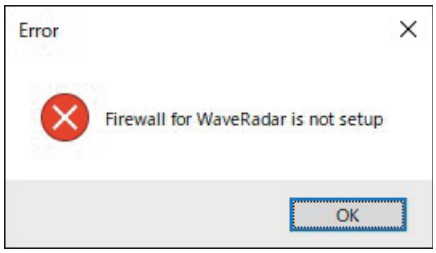


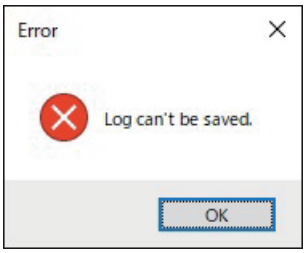
Note 2: If the message for software error appears, click [OK] to delete the message and then re-insert the USB dongle. Double-click the shortcut icon for the software on the desktop to start up the software.

Note 3: If the USB dongle is removed after starting the software, the following message appears.

Click [Cancel] to quit the software. Insert the USB dongle and double-click the shortcut icon for the software on the desktop to restart the software.

Note 4: If the firewall is not configured, the error message to the below-left appears. Click [OK], the message to the below-right then appears.



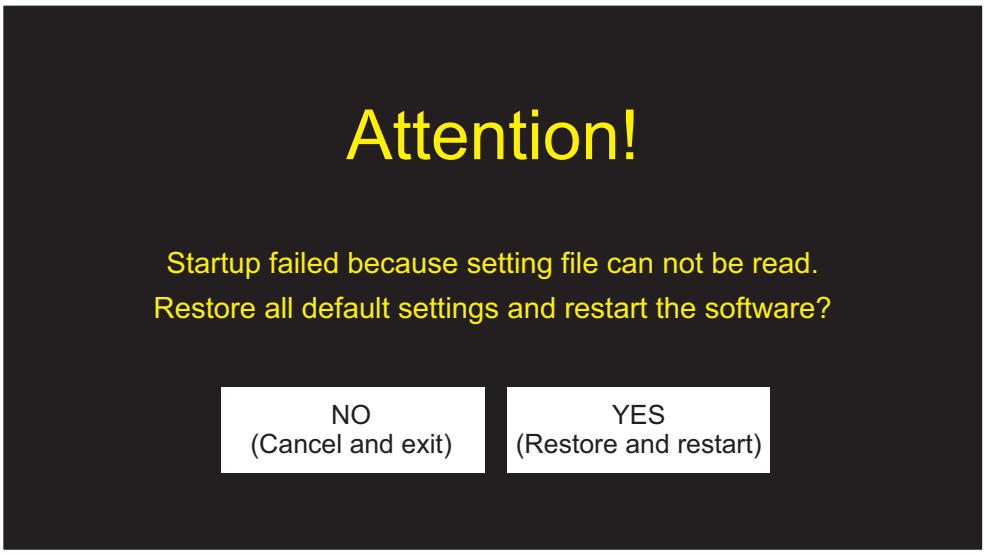


Click [OK] to delete the message, then open the [Enable Firewall for Wave Analyzer] shortcut on your desktop. If the [User Account Control] dialog appears, click [Yes].

4. To quit the software, click the close button (x) at the upper right corner of the screen. The confirmation message "Are you sure you want to exit?" appears.
5. Click [YES] to quit the software.

Check of the setting file at startup

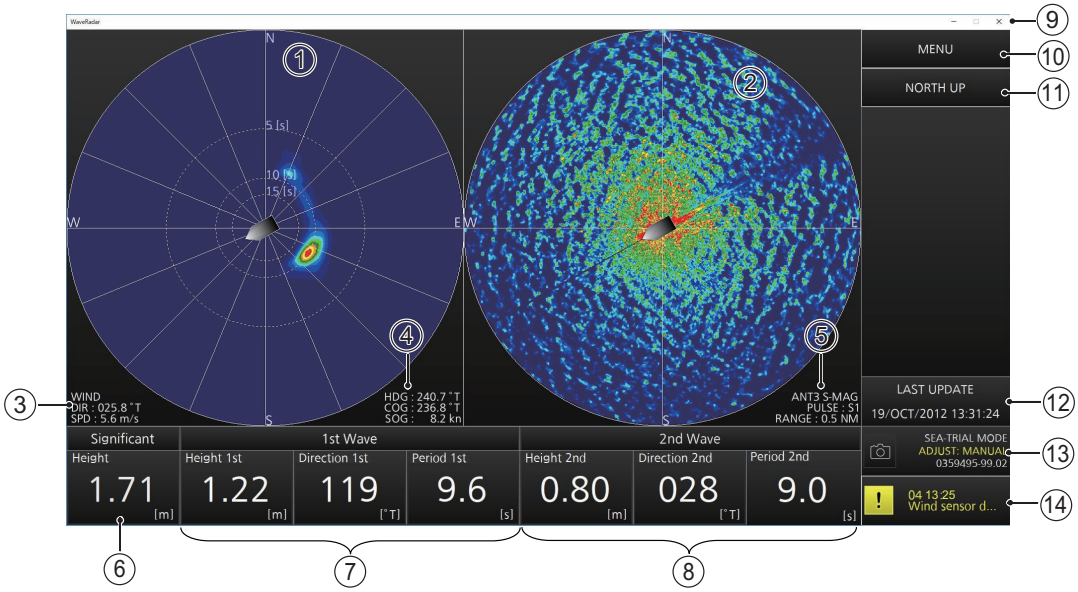
This software checks if the setting file can be read at startup. If the setting file is corrupted, the following message appears.



- Click [YES] to restore the default settings, then start up the software. The saved settings are deleted.
- Click [NO] to cancel and close the software.

1.2 Display Screen Overview

The screen looks something like the one shown below when the radar is transmitting pulses and waves are being analyzed.



No.	Name	Description
1	Wave spectrum display area	Shows 2D wave spectrum.
2	Radar echo display area	Shows radar echo for wave analysis from the specified radar.
3	Wind sensor information	Shows wind direction and wind speed.
4	Own ship information	Shows HDG (heading), COG (Course Over Ground), and SOG (Speed Over Ground).
5	Radar information	Shows antenna ID, band width, transceiver type, pulse width, display range of the connected radar.
6	Significant wave height	Shows significant wave height.
7	First wave information	Shows wave height, wave direction and wave period for first wave.
8	Second wave information	Shows wave height, wave direction and wave period for second wave.
9	Software display state	Selects the software display state. (Minimize, Maximize (grayed out, no use), Close from the left)
10	[MENU]	Opens/closes the menu.
11	Orientation mode box	Selects the orientation mode.
12	Update time box	Shows the time of the most recent wave analysis.
13	Camera icon/System information box	• Camera icon: Takes a screenshot. • System information: Shows sea-trial mode*, manual adjustment mode of wave height, and software version. *: No indication for normal mode.
14	Alert information box	Shows active alerts (alert icon and alert message).

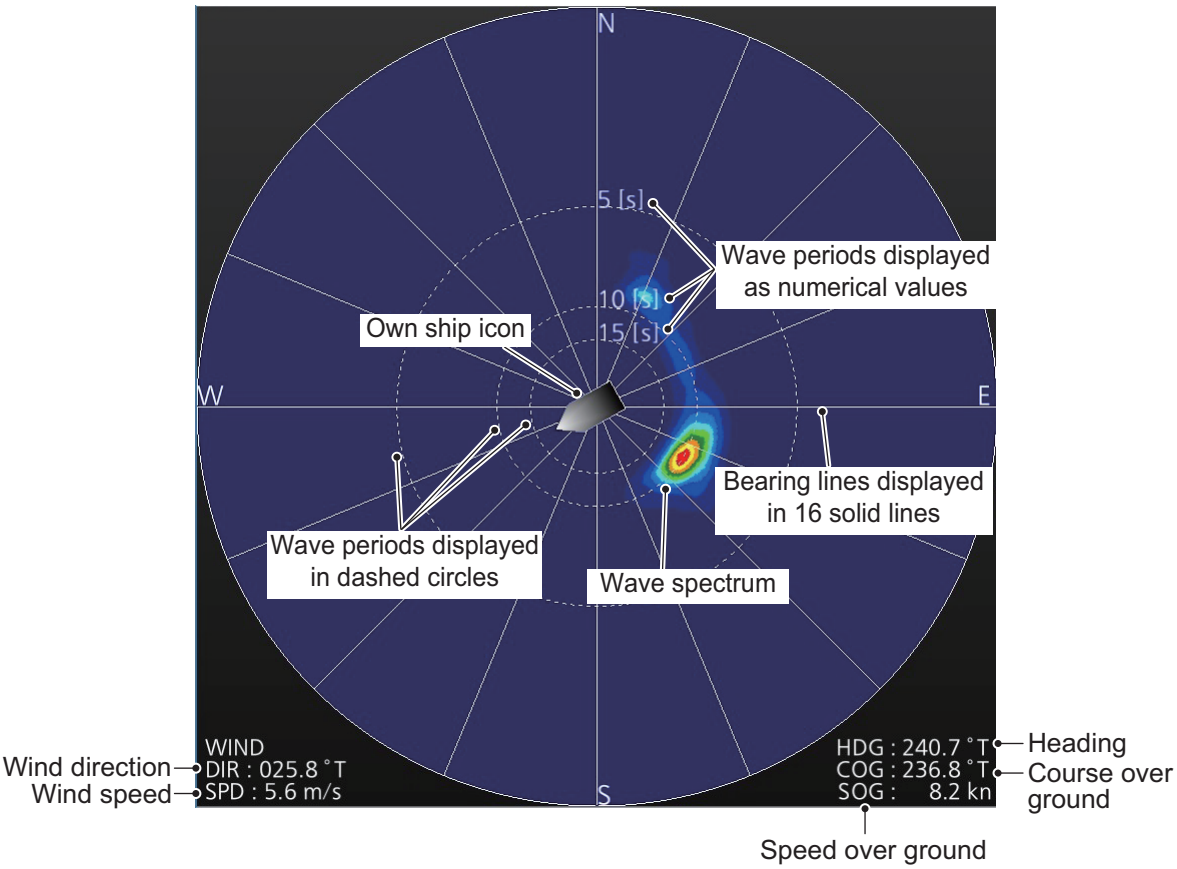
While wave analysis is stopped, the PC screen looks like the following depending on the radar state.

- Radar is in stand-by: "RADAR ST-BY" is displayed at the center of the left and right screens.
- Radar is disconnected: "NO RADAR" is displayed at the center of the left and right screens.

When the wave analysis contains an error, the message "Wave analysis is not available." appears at the center of the left screen.

1.2.1 Wave spectrum display area

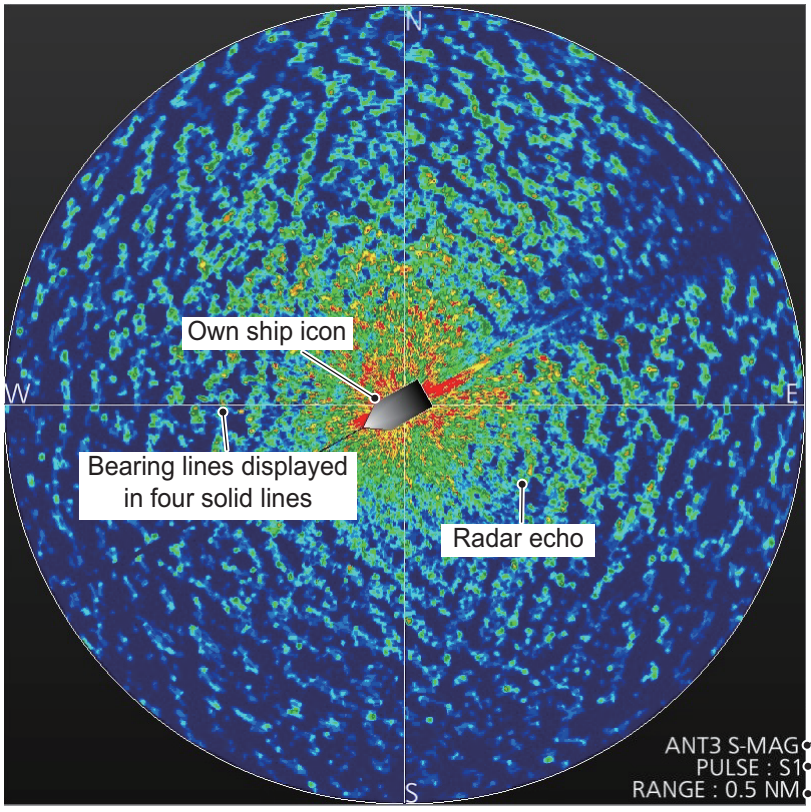
The 2D analyzed wave spectrum is displayed on the left side of the screen.



- Wave period: The wave periods, or time between waves, appear in the wave spectrum display area as dashed circles and numerical values (numerical positions are fixed). The wave period is 15 seconds, 10 seconds, 5 seconds in order of increasing distance to own ship. The farther away from own ship, the shorter the waves (wind waves), the closer to own ship, the longer the waves (swells). The periods displayed on the screen are not proportionally displayed due to frequency being used as a distance substitute.
  - Wind waves: Waves generated by the wind blowing on the sea.
  - Swells: Waves that remain after the waves developed by the wind disappears, or waves that are detected from a distance and attenuate as they approach.
- Bearing line: The 360° azimuth is divided into 16 with solid lines at 22.5° intervals to make the waves' approach easier to understand.
- Wave spectrum: The color of the wave spectrum indicates the relative intensity of the wave on the wave spectrum display. The intensity of the wave increases in order of dark blue, light blue, light green, dark green, orange, yellow, red.
- Own ship icon: The own ship icon is displayed at the center of the screen.

1.2.2 Radar echo display area

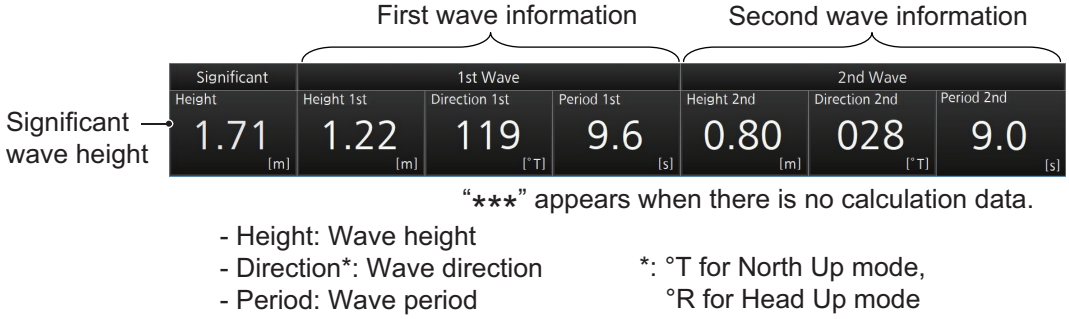
The radar echo for wave analysis from the specified radar is displayed on the right side of the screen.



- Bearing line: The 360° azimuth is divided into four with solid lines at 90° intervals to make the direction easier to understand.
- Radar echo (for the wave analysis): The absolute intensity of the radar reflection from the wave increases in order of dark blue, light blue, light green, dark green, orange, yellow, red.
- Own ship icon: The own ship icon is displayed at the center of the screen.

1.2.3 Significant wave height, wave information

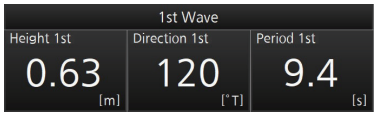
The significant wave height and wave information are displayed at the bottom of the screen.



- [Significant]: Shows the significant wave height. The significant wave height is a statistical value obtained by averaging the top 1/3 highest waves when observing the specified area. Although its value is different from the maximum value or the simple average value, it is the closest value to the wave height visually observed by a skilled observer.
- [1st Wave], [2nd Wave]: Among the observed waves, the two most outstanding waves are selected and assigned as [1st Wave] and [2nd Wave] for reference. There is no distinction made between wind waves and swells for this selection.

The reliability (degree of trust) of the analysis result of the first or second wave is indicated with a numerical index of 0 to 100. The character color changes according to the degree of trust.

Note: It is recommended to use the analysis result with a reliability of “High” or “Middle”. For “Middle”, take care of the precision.

Reliability	Index* (default)	Color/display example	Description
High	70 or more	White 	The sea weather condition is suitable for wave analysis. The precision and accuracy of the analysis result is high.
Middle	45 or more and less than 70	Yellow 	The sea weather condition is slightly unsuitable for wave analysis. The precision of the analysis result is low and there is variation, but the accuracy is great.
Low	Less than 45	Orange 	The sea weather condition is not suitable for wave analysis. The precision and accuracy of the analysis result is low.

*: Set these values in the [INITIAL SETTINGS] menu at installation.

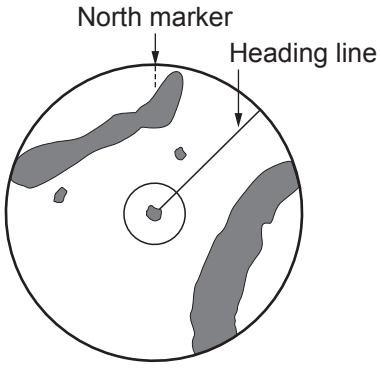
1.3 Keyboard Operations

This software uses the **Tab** key, **Enter** key and **Space** key in the following manner:

- **Tab**: Cycles through [MENU] → Orientation mode box → Camera icon → Alert information box → … in order.
- **Enter**/**Space**: Confirm selection.

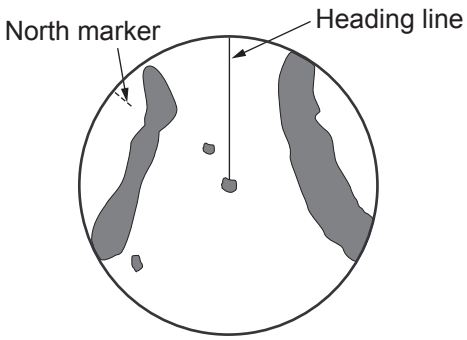
1.4 Orientation Mode

Click the orientation mode box at the top right position of the screen to switch between North UP mode and Head UP mode.



North UP

North bearing is maintained at the top of the screen. The heading line changes its direction according to the ship's heading.

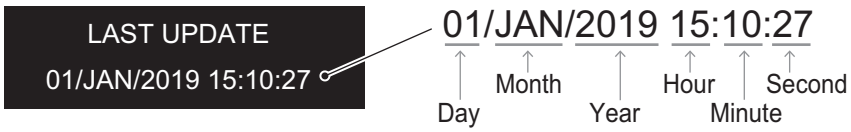


Head UP

The head-up mode is a display in which the line connecting own ship and the top of the display indicates own ship's heading.

1.5 Analysis Update Time

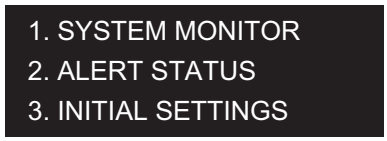
The time (UTC) of the most recent wave analysis is displayed at the bottom right of the screen.



When wave analysis is not done immediately after software startup or date and time information is not input, the indication appears as "**/***/**** **:**:**".

1.6 Menu Overview

1. Click [MENU] to open the menu.



2. Click the desired menu item to highlight it.

Menu item	Description
[1. SYSTEM MONITOR]	Opens the system monitor window.
[2. ALERT STATUS]	Opens the alert status window.
[3. INITIAL SETTINGS]	Opens the initial settings window (for qualified technician, required the password).

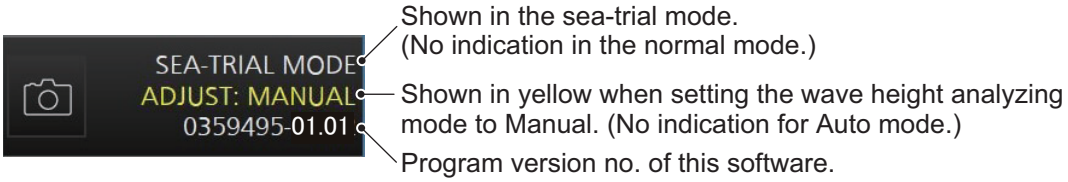
3. Click [MENU] to close the menu.

1.7 How to Take a Screenshot of a Display Screen

Click the camera icon at the bottom right of the screen to take a screenshot. Screenshots are saved in the folder “C: \ Users \ User name \ Documents \ FURUNO \ WaveAnalyzer \ screenshot”. When the folder becomes full, the message "Storage size is full." appears. Delete unnecessary data to make room. Also, you can not take a screenshot while the menu is open.

1.8 System Information

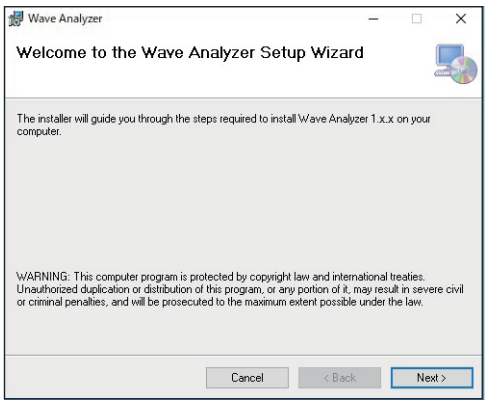
The system information is displayed at the bottom right of the screen.



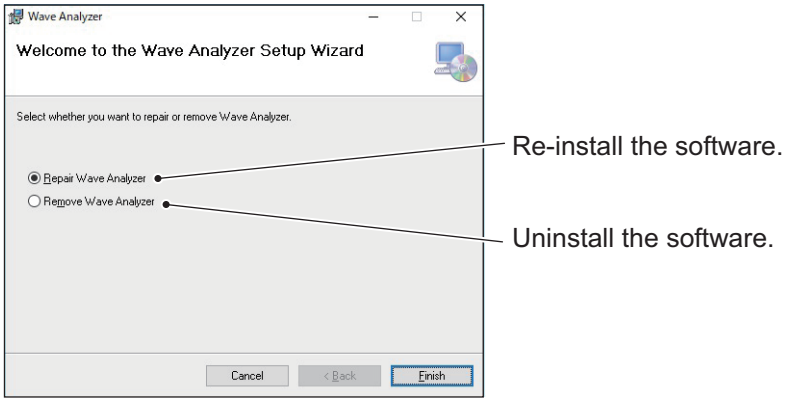
1.9 How to Update the Software

Make sure the software is closed before attempting to update the software. Also, log into the PC with administrator privileges before updating the software.

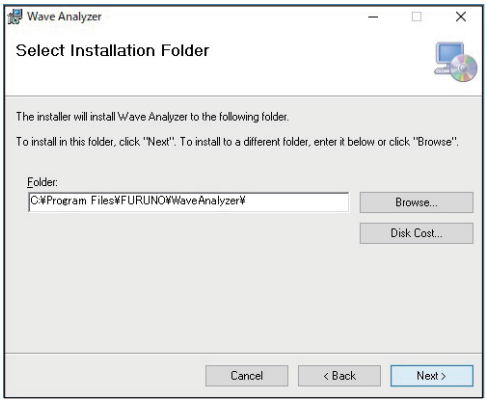
1. Turn the PC on.
2. Insert or connect the update media to the PC. Consult your local dealer regarding the media.
3. Double-click [WaveAnalyzer_setup].
4. Double-click [WaveAnalyzerInstaller msi]. The following screen appears.



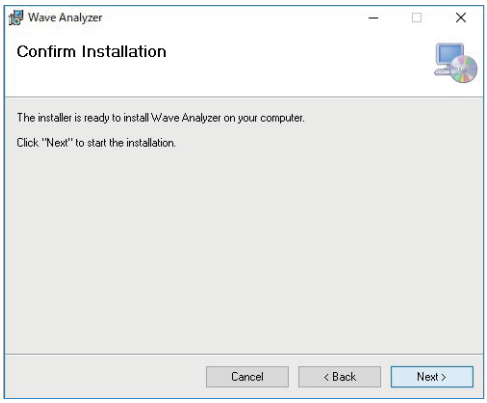
Note: When running the installer with the same version as the current software, the following screen appears. Click [Cancel] to finish the installer and then install the new version software.



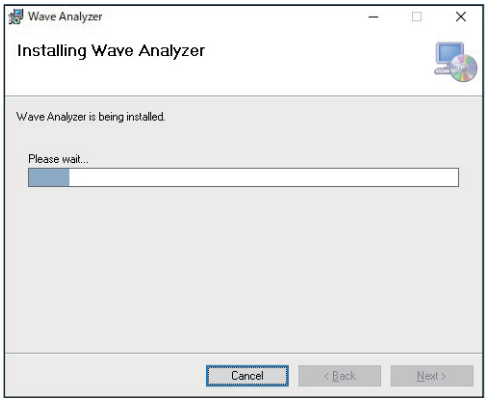
5. Click [Next].



6. Click [Next]. To change the installation folder, click [Browse] and select the folder before clicking [Next].

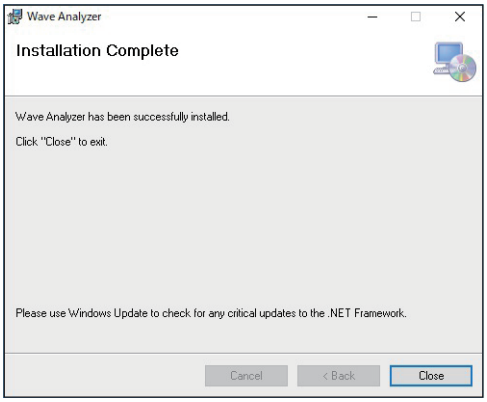


7. Click [Next] to start the installation.

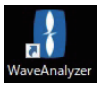


Note: If the dialog box [UserAccountControlSettings] appears, click [Yes] to start the installation.

When the installation is completed, the dialog box shown below appears.

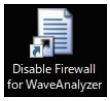


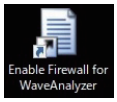
8. Click [Close] to finish. The shortcut icons for the manual and related software are created on your desktop.



Software for wave analyzer

Operator's manual





Firewall-related software

2. PRINCIPLE OF OPERATION, HOW TO INTERPRET THE DISPLAY

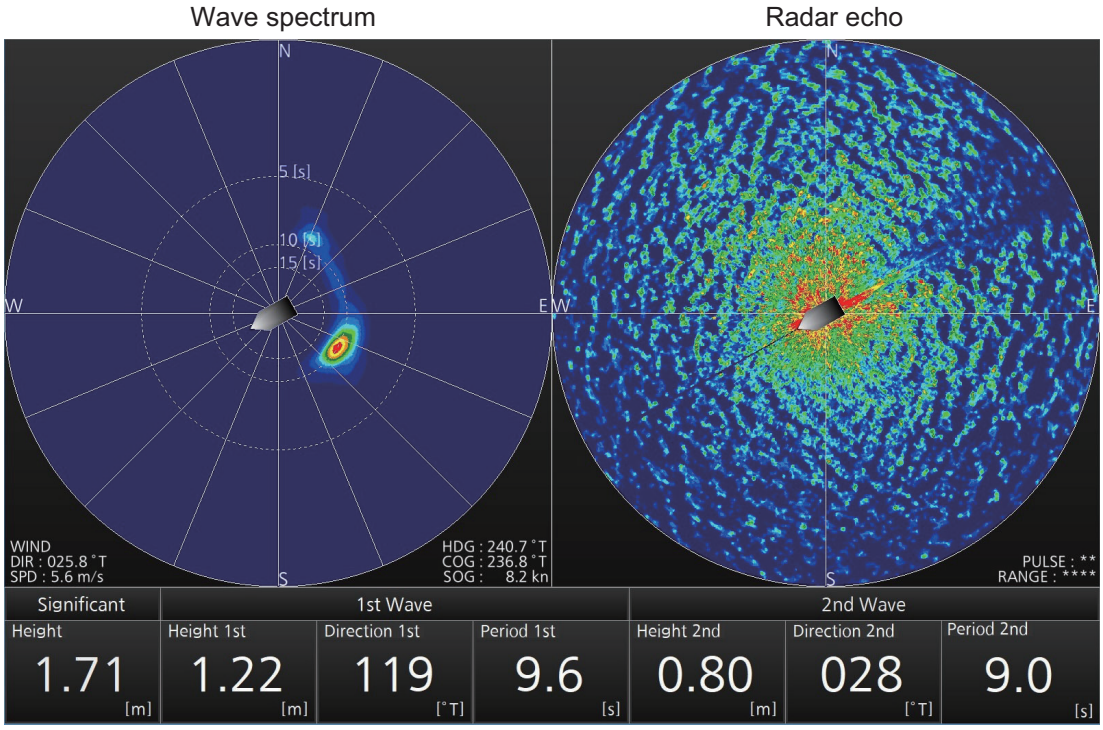
2.1 Principle of Measurement

This software analyzes sea waves by using the received radar signal. When observing the waves with the radar, sea clutter echoes appear as stripes.

The amplitude of the sea reflection echo depends on the roughness caused by the wind acting on the sea reflection. (It is not the height of the wave.) This software obtains multiple echoes, processes the data, and calculates the wave spectrum, wave height, wave direction, and wave period.

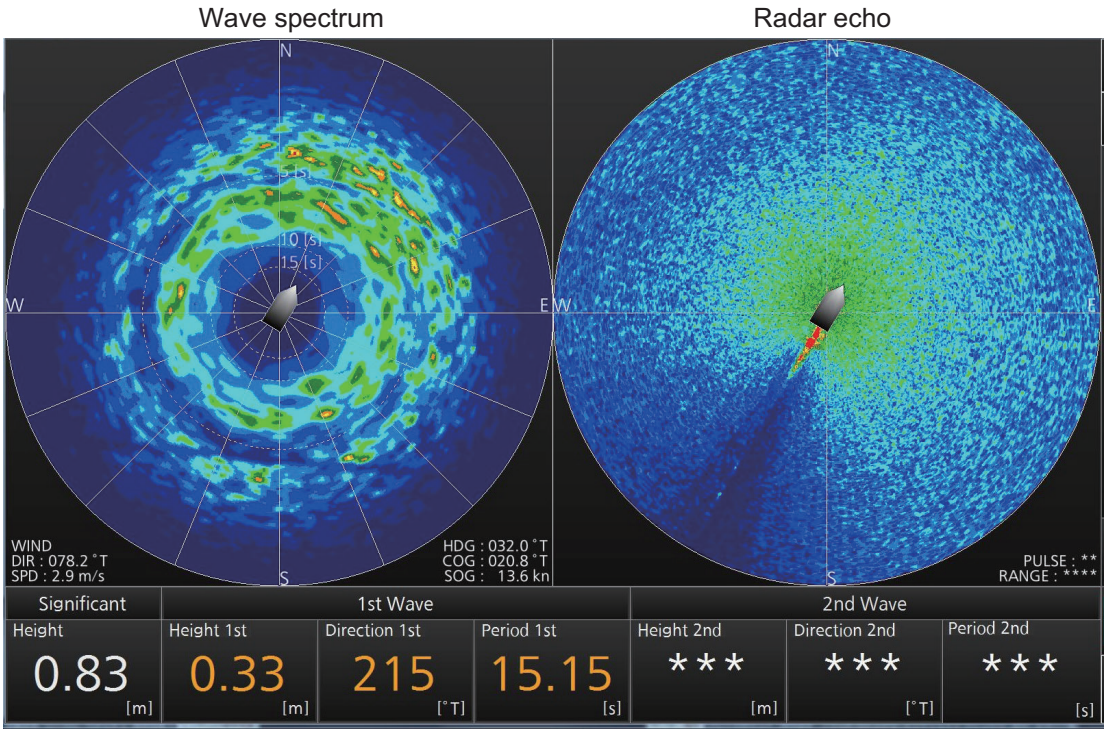
2.2 Reliability of Analysis Results

When the sea reflection echoes are displayed with stripes, the analysis results are more reliable. When the sea reflection echoes are not displayed in stripes (lull, rain), the analysis results are less reliable.



Example image for high reliability

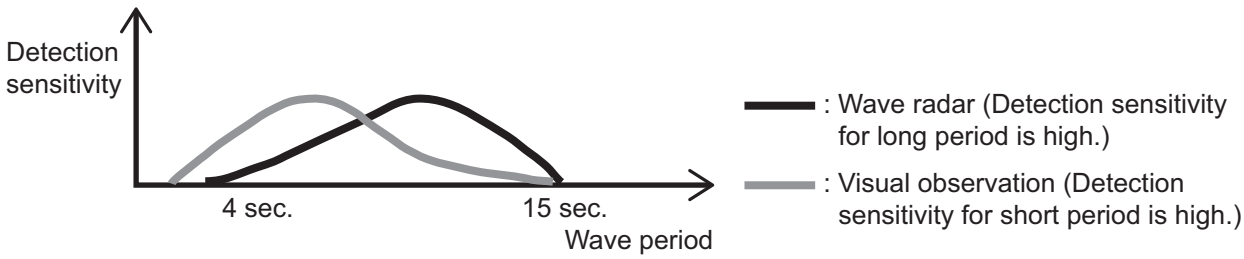
The figure below is an example of echo during rainfall. This image is less reliable because no stripes are visible, that is, the spectrum is broadened and there are no outstanding waves.



Example image for low reliability

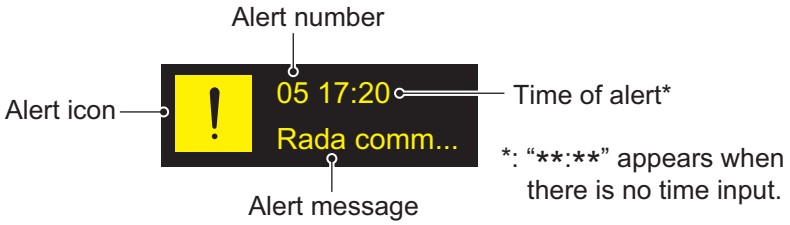
Difference for the wave result between this software and visual observation

The waves that can be detected by this software are gravity waves with a wave period of 4 seconds or more. The waves with a short period, that is, the waves blown by the wind may not be observed. Therefore, the visual wave direction and the analysis result may be different (see the figure below).



3. ALERTS

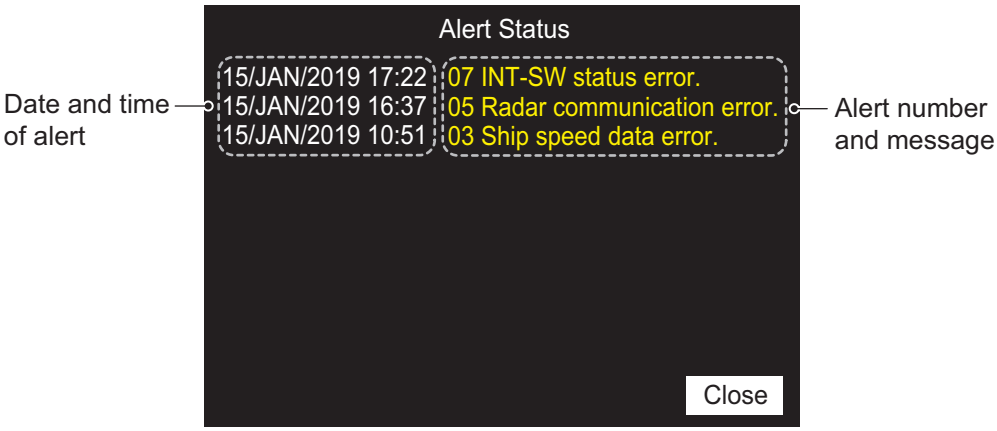
Alerts are displayed at the bottom right of the screen, with the alert icon, alert number, alert message, and time of alert.



The [Alert Status] displays the number and message of triggered alerts, including the time and date triggered.

How to display the [Alert Status] screen

1. Click the alert icon to display the [Alert Status] screen. You can also display the [Alert Status] screen by clicking [MENU] – [2 ALERT STATUS].



   The alerts currently active are shown on the screen. When there is no alert, "No Alert" appears at the center of the screen.

2. Click [Close] to close the [Alert Status] screen.

For details, see "ALERT LIST" on page AP-2.

4. TROUBLESHOOTING

4.1 Troubleshooting

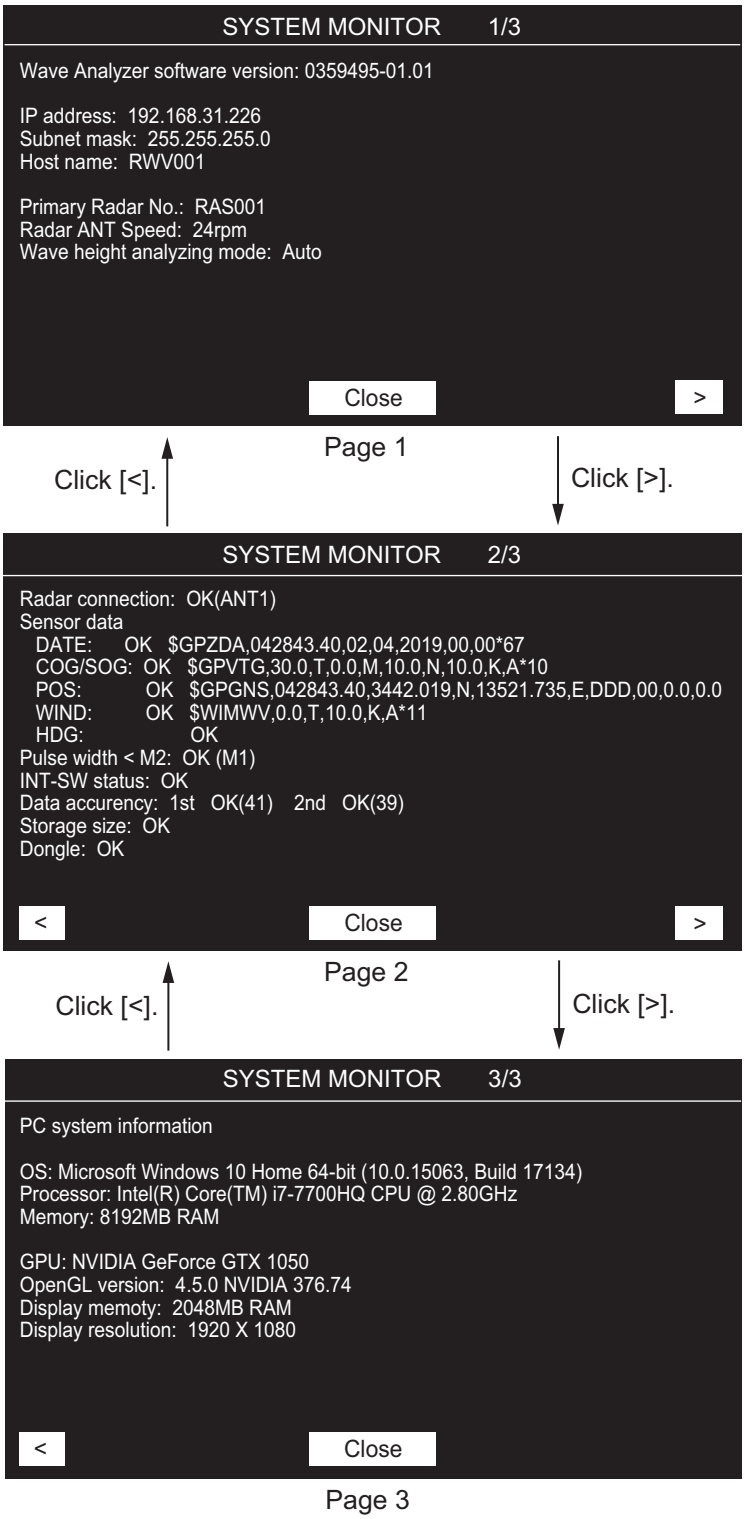
This section provides simple troubleshooting procedures which the user can follow to restore normal operation. If you cannot restore normal operation, contact your dealer.

Problem	Possible cause	Remedy
Software does not start.	The components (VisualC++ runtime) are not installed.	Install the supplied file “setup.exe”.
	The USB dongle is not inserted.	Check if the USB dongle is firmly inserted. The LED in the dongle lights red when the dongle is recognized correctly.
	Software is already open.	Since this software can not start multiple times, quit the software that is already activated.
Pictures are not updated or freeze.	The memory for CPU or GPU is insufficient.	• Restart the software. • If there is software running other than this software, exit it.
Reliability of analysis result remains “low”.	The sea weather conditions do not meet the measurement conditions of the wave radar.	In case of rainfall, switch to an S-band radar.
	GPU is highly loaded (high temperature, power saving mode).	• Check if power is supplied to the PC (the battery is not running). • Check if the vents on the PC are blocked.
	The radar pulse width is not appropriate.	Change the radar pulse width to S1 since S1 is the highest in measurement accuracy.
The software does not start if you click [Retry] after a USB dongle authentication error occurs.	The USB dongle is not recognized.	Restart the software.
The COM port does not open.	The PC does not recognize the COM port.	• Check if the port is recognized by the device manager. • Check the COM port driver.
	The COM port is in use by other software.	• Close if the COM port is opend by another software. • Quit the other software. • Restart the PC.

4.2 System Information

The system information is displayed from the menu.

1. Click [MENU] to open the menu.
2. Click [1 SYSTEM MONITOR].



The results for items which fail the system monitor test appear in yellow text with the indication "NG" (No Good).

The following table lists descriptions for each item.

Item	Description
Wave Analyzer software version	Shows program number for this software.
IP address	Shows the IP address for the wave analysis PC.
Subnet mask	Shows the subnet mask for the wave analysis PC.
Host name	Shows the host name for the wave analysis PC.
Primary Radar No.	Shows the host name for the primary connected radar. See the installation manual for how to set this item.
Radar ANT Speed	Shows the antenna speed of the connected radar.
Wave height analyzing mode	Shows the wave height adjustment mode.
Radar connection	Shows the radar connection status (OK or NG) and the number of the connected radar.
DATE	Shows the input status of the date information (OK or NG) and sentence used.
COG/SOG	Shows the input status of the speed information (OK or NG) and sentence used.
POS	Shows the input status of the position information (OK or NG) and sentence used.
WIND	Shows the input status of the wind information (OK or NG) and sentence used.
HDG	Shows the input status of the heading information (OK or NG).
Pulse width < M2	Shows the pulse width of the connected radar and if it is less than M2 (OK or NG).
INT-SW status	Shows the interswitch status of the connected radar (OK or NG). For NG, shows the number of the slave radar.
Data accurency	Shows the degree of trust for the wave analysis result for the first or second wave. Reliability / Indication (Range) / Character color High / OK（70 to 100） / White Middle / OK（45 to 69） / Yellow Low / NG（0 to 44） / Orange It is recommended to use analysis results with the indication “OK” (see subsection 1.2.3).
Storage size	Shows if there is enough free space in the PC for wave analysis (OK or NG).
Dongle	Shows if the dongle has errors (OK or NG). • Normal mode: OK • Sea-trial mode: OK (SEA-TRIAL MODE)
OS*	Shows the OS information for the wave analysis PC.
Processor*	Shows the CPU information for the wave analysis PC.
Memory*	Shows the memory information for the wave analysis PC.
GPU*	Shows the GPU information for the wave analysis PC.
OpenGL version*	Shows the OpenGL information for the wave analysis PC.
Display memory*	Shows the video memory information for the wave analysis PC.
Display resolution*	Shows the display resolution for the wave analysis PC.

*: "****" appears when there is no data input.

3. Click [Close] to close the menu.

APPENDIX 1 MENU TREE

Click [MENU].

- 1. SYSTEM MONITOR (Opens the system monitor window.)
- 2. ALERT STATUS (Opens the alert status window.)
- 3. INITIAL SETTINGS (For a qualified technician)

APPENDIX 2 ALERT LIST

The following table shows the alerts in this software.

No.	Text	Meaning	Remedy
01	Date and Time data error.	No data for the date and time.	Check if the date and time signal is input.
02	GPS data error.	No positioning data.	Check if the GPS signal is input.
03	Ship speed data error.	No speed data.	Check if the speed signal is input.
04	Wind sensor data error.	No wind data.	Check if the wind signal is input.
05	Radar communication error.	Can not connect the radar.	Check the network connection.
06	Pulse width error.	The pulse width of the connected radar is more than M2.	Set the pulse width from S1 to M1.
07	INT-SW status error.	The interswitch of the connected radar is set to ON.	Set the interswitch to OFF.
08	Storage size is full.	The capacity for the result file is full. The space is less than 10 GB. Or, can not recognize the destination where to save data.	Delete unnecessary data from the folder to make room.
09	COM Open error.	Can not open the COM port for the serial output.	Check the connection of the COM port.
10	GYRO data error.	Gyrocompass data is unavailable.	Check if the Gyrocompass data is input.

APPENDIX 3 SERIAL OUTPUT DATA

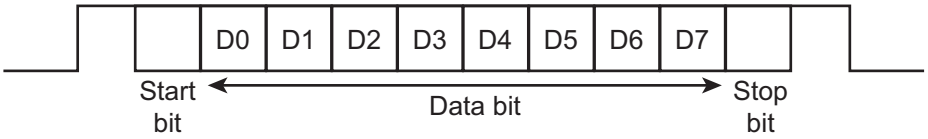
The wave analyzer outputs the data of the wave analysis result by serial communication.

- RAwv1 and RAwv2 are output as one data block. The number of RAwv2 contained in the same block is determined by the number of waves analyzed. For example, if significant wave, 1st wave, and 2nd wave were analyzed, the number of RAwv2 would be three.
- The data output cycle is shown in the table below.

Radar antena rotation	Cycle
24 rpm	80 seconds
36 rpn	54 seconds
42 rpm	46 seconds

Serial output setting

Setting items	Port	Remarks
Baud rate	4800, 9600, 19200, 38400 (bps)	Set in the [3. INITIAL SETTINGS] menu.
Start bit	1 bit	–
Data bit	8 bit	–
Stop bit	1 bit	–
Parity	none	–
Flow control	none	–



Data sentences

PFEC, RAwv1 – Wave Analyzer setting information

$PFEC,RAwv1,x,hhmmss.ss,xx,xx,xxxx,x,x,x,x.x,x,x.x,a,x.x,hhhh,a,x.x,x.x*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

1. Block number (0 to 9)
2. Wave analysis last update time (UTC) (000000 to 235959)
3. Wave analysis last update day (UTC) (01 to 31)
4. Wave analysis last update month (UTC) (01 to 12)
5. Wave analysis last update year (UTC) (0000 to 9999)
6. Radar number (1 to 8)
7. Radar type (0=Xband Magnetron 2=Sband Magnetron 3=Sband SSD)
8. Pulse type (0=S1 1=S2 2=M1 3=M2 4=M3 5=L)
9. Antenna rotation (RPM) (0 to 99.9)
10. Wave analysis mode (0=Normal 1=Sea Trial)
11. Average time of wave results (sec) (0 to 9999)
12. Orientation reference (N=North)
13. Number of RAwv2 in the same block (0 to 10)
14. System error status (0000 to FFFF)
15. Wave height measurement mode (A =auto mode M=manual mode)
16. Wave calculation parameter 1 (0 to 100)
17. Wave calculation parameter 2 (0 to 100)

PFEC, RAwv2 – Wave analysis results

$PFEC,RAwv2,x,x,x.x,x.x,x.x,x.x,A,x.x,A*hh<CR><LF>
1 2 3 4 5 6 7 8 9

1. Block number (0 to 9)
2. Wave number (0=Significant wave 1 to 9=1st to 9th wave)
3. Wave height (m) (0 to 99.99)
4. Wave direction (degree) (0 to 359.99)
5. Wave period (sec) (0 to 99.99)
6. Wave height reliability (0 to 100)
7. Wave height status (A=data valid V=data invalid)
8. Wave direction and period reliability (0 to 100)
9. Wave direction and period status (A=data valid V=data invalid)

APPENDIX 4 SEA-TRIAL MODE (For WV-100ST)

For sea-trial mode, the result and spectrum files can be output.

Result file

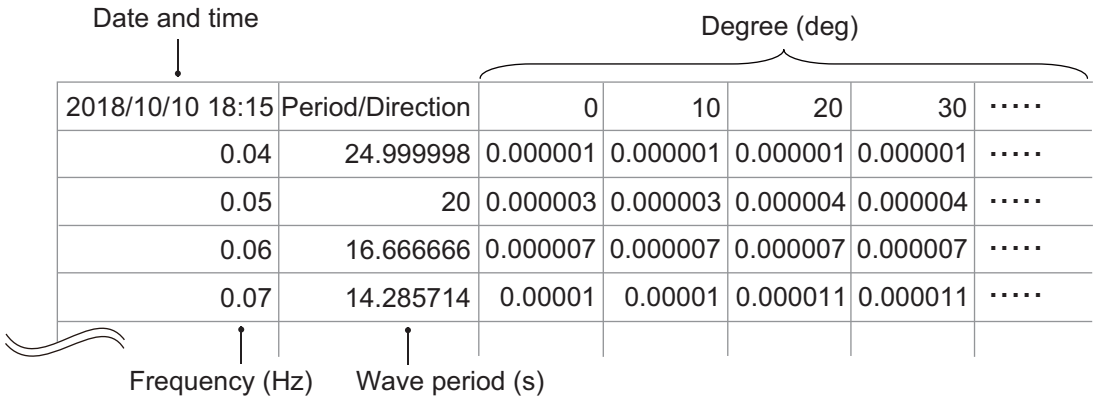
The file size is a maximum of 1 MB. When the size is over 1 MB, a new file is created. Approximately 56 hours of data can be saved per 1 MB, in the folder “C: \ Users \ User name \ Documents \ FURUNO \ WaveAnalyzer \ result \ YYYYMMDD”. The following data are saved for each analysis:

Item	Unit	Description
DATE_TIME	–	ZDA sentence time
LATITUDE	deg	Latitude, instantaneous value, south latitude (-90 to +90), north latitude
LONGITUDE	deg	Longitude, instantaneous value, west longitude (-180 to +180), east longitude
HEADING	deg	Heading, instantaneous value
COG	deg	COG, instantaneous value
SOG	deg	SOG, instantaneous value
TRUE_WIND_DIRECTION	deg	True wind direction (Nup), average for one scan
TRUE_WIND_SPEED	m/s	True wind speed, average for one scan
MEAN_TRUE_WIND_DIRECTION	deg	True wind direction (Nup), average for one analysis
MEAN_TRUE_WIND_SPEED	m/s	True wind speed, average for one analysis
ANT_NUM	–	Antenna number
ANT_MODEL	–	Antenna model
ANT_ROTATION	RPM	Antenna rotation speed
PULSE_INFO	–	Pulse information
RANGE_INFO	–	Range information with unit
WAVE_HEIGHT	m	Total wave, wave height, instantaneous value
M0_TOTALWAVE	m^2	Total wave, zero moment, instantaneous value
DIRECTION_TOTALWAVE	deg	Total wave, wave direction, instantaneous value
PERIOD_T01_TOTALWAVE	sec	Total wave, wave period T01, instantaneous value
PERIOD_T02_TOTALWAVE	sec	Total wave, wave period T02, instantaneous value
SIGNIFICANT_WAVE_HEIGHT	m	Significant wave height
MEAN_M0_TOTALWAVE	m^2	Total wave, zero moment, instantaneous value
MEAN_DIRECTION_TOTALWAVE	deg	Total wave, wave direction, average
SIGNIFICANT_WAVE_PERIOD	sec	Significant wave period
MEAN_PERIOD_T01_TOTALWAVE	sec	Total wave, wave period T01, average
MEAN_PERIOD_T02_TOTALWAVE	sec	Total wave, wave period T02, average
WAVE_HEIGHT_1stWAVE	m	First wave, wave height, instantaneous value
M0_1stWAVE	m^2	First wave, zero moment, instantaneous value
DIRECTION_1stWAVE	deg	First wave, wave direction, instantaneous value
PERIOD_1stWAVE	sec	First wave, wave period, instantaneous value
PERIOD_T01_1stWAVE	sec	First wave, wave period T01, instantaneous value
PERIOD_T02_1stWAVE	sec	First wave, wave period T02, instantaneous value

Item	Unit	Description
RELIABILITY_1stWAVE	–	First wave, reliability, instantaneous value
MEAN_WAVE_HEIGHT_1stWAVE	m	First wave, wave height, average
MEAN_M0_1stWAVE	m^2	First wave, zero moment, average
MEAN_DIRECTION_1stWAVE	deg	First wave, wave direction, average
MEAN_PERIOD_1stWAVE	sec	First wave, wave period, average
MEAN_PERIOD_T01_1stWAVE	sec	First wave, wave period T01, average
MEAN_PERIOD_T02_1stWAVE	sec	First wave, wave period T02, average
MEAN_RELIABILITY_1stWAVE	–	First wave, reliability, average
WAVE_HEIGHT_2ndWAVE	m	Second wave, wave height, instantaneous value
M0_2ndWAVE	m^2	Second wave, zero moment, instantaneous value
DIRECTION_2ndWAVE	deg	Second wave, wave direction, instantaneous value
PERIOD_2ndWAVE	sec	Second wave, wave period, instantaneous value
PERIOD_T01_2ndWAVE	sec	Second wave, wave period T01, instantaneous value
PERIOD_T02_2ndWAVE	sec	Second wave, wave period T02, instantaneous value
RELIABILITY_2ndWAVE	–	Second wave, reliability, instantaneous value
MEAN_WAVE_HEIGHT_2ndWAVE	m	Second wave, wave height, average
MEAN_M0_2ndWAVE	m^2	Second wave, zero moment, average
MEAN_DIRECTION_2ndWAVE	deg	Second wave, wave direction, average
MEAN_PERIOD_2ndWAVE	sec	Second wave, wave period, average
MEAN_PERIOD_T01_2ndWAVE	sec	Second wave, wave period T01, average
MEAN_PERIOD_T02_2ndWAVE	sec	Second wave, wave period T02, average
MEAN_RELIABILITY_2ndWAVE	–	Second wave, reliability, average

Spectrum file

The file size is a maximum of 1 MB. When the size is over 1 MB, a new file is created. Approximately 2.5 hours of data can be saved per 1 MB, in the folder “C: \ Users \ User name \ Documents \ FURUNO \ WaveAnalyzer \ spectrum \ YYYYMMDD”.



File example

SPECIFICATIONS OF WAVE ANALYZER
WV-100/100ST

1 SYSTEM REQUIREMENT

1.1	OS	Windows® 10 Pro/Home
1.2	CPU	Intel Core i5 or later
1.3	GPU	NVIDIA GeForce GTX1050, 384 cores, VRAM 2GB or more
1.4	SSD/HDD	128 GB or more
1.5	Memory capacity	4 GB or more
1.6	Interface	LAN, USB 2 ports or more (for dongle and serial communication)

2 MONITOR (USER SUPPLY)

2.1	Display resolution	SXGA/UXGA/FHD
2.2	Language	UK/USA

3 MEASURING RANGE

3.1	Wave height	0.10 to 15.0 m
3.2	Wave period	4.00 to 16.00 s
3.3	Wave direction	0.00 to 359.99°
3.4	Wave component	2 max.
3.5	Bearing	-140 to +140° (from the bow)
3.6	Distance	150 to 1200 m

4 SEA WEATHER CONDITIONS

4.1	Sea state code	3 min. (wave height: 0.5 m or above)*
4.2	Beaufort scale	3 min. (wind speed: 3.4 m/s or above)*
4.3	Precipitation	1 mm/h or less for X-band
		5 mm/h or less for S-band
4.4	Sea depth	0.5 times or more of the measured wavelength

*: The measurement may be lowered when the conditions are not enough.

**: The calculable rainfall changes with wave height and wind speed.

5 INTERFACE

5.1	Number of port	
	LAN	1 port: Ethernet 100Base-TX
	RS-232C	1 port: USB/RS-232C converter available
5.2	Data sentences	
	LAN (input)	WMV
	PFEC (output)	RAwv1, RAwv2
5.3	Sea trial mode	Analysis data file output (WV-100ST only)

ECF
(Elemental Chlorine Free)

The paper used in this manual
is elemental chlorine free.

・ 機器の修理・使用方法等に関するお問い合わせは、お買い上げの販売店・代理店、最寄りの
当社支店・営業所あてへお願いします。

FURUNO ELECTRIC CO., LTD.
古野電気株式会社

・FURUNO Authorized Distributor/Dealer お問い合わせは

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