MDR290
Paper-less Course Recorder
User's Manual

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MDR290　Paper-less Course Recorder
User's Manual

Contents

Foreword

Thank you for purchasing the YOKOGAWA Denshikiki MDR290 Paper-less Course Recorder.
This manual describes the functions, installation and wiring procedures, operating procedures, and lists the handling precautions of the MDR290 Course Recorder. To ensure correct use, please read this manual thoroughly before beginning operation.

■ Notes

・ The contents of this manual are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functions.
・ Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA Denshikiki dealer.
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■ Safety Precautions

The general safety precautions described here must be observed during all phases of operation.

● Safety Standards and EMC Standards

This Course recorder conforms to IEC safety class I (provided with terminal for protective grounding), Installation Category II, Measurement category II (CAT II), and EN61326-1 (EMC standard), class A (use in a commercial, industrial, or business environment).
This Course recorder is designed for indoor use

● About This Manual

・ This manual should be read by the end user.
・ Read this manual thoroughly and have a clear understanding of the product before operation.
・ This manual explains the functions of the product. YOKOGAWA Denshikiki does not guarantee that the product will suit a particular purpose of the user.
・ Under absolutely no circumstances may the contents of this manual be transcribed or copied, in part or in whole, without permission.
・ The contents of this manual are subject to change without prior notice.
・ Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors or omissions, please contact your nearest YOKOGAWA Denshikiki dealer.

● **Precautions Related to the Protection, Safety, and Alteration of the Product**

The following safety symbols are used on the product and in this manual.

"Handle with care." To avoid injury and damage to the instrument, the operator must refer to the explanation in the manual.

"Risk of Electric Shock"

Protective ground terminal

AC

"High temperature." To avoid injury caused by hot surface, do not touch locations where this symbol appears.

・ For the protection and safe use of the product and the system controlled by it, be sure to follow the instructions and precautions on safety that are stated in this manual whenever you handle the product. Take special note that if you handle the product in a manner that violates these instructions, the protection functionality of the product may be damaged or impaired. In such cases, YOKOGAWA Denshikiki does not guarantee the quality, performance, function, and safety of the product.

・ When installing protection and/or safety circuits such as lightning protection devices and equipment for the product and control system or designing or installing separate protection and/or safety circuits for fool-proof design and fail-safe design of the processes and lines that use the product and the control system, the user should implement these using additional devices and equipment.

・ If you are replacing parts or consumable items of the product, make sure to use parts specified by YOKOGAWA Denshikiki.

・ Do not modify this product.

⚠

● **Power Supply**
Ensure that the source voltage matches the voltage of the power supply before turning ON the power.

● **Protective Grounding**
Make sure to connect the protective grounding to prevent electric shock before turning ON the power.

● **Necessity of Protective Grounding**
Never cut off the internal or external protective earth wire or disconnect the wiring of the protective earth terminal. Doing so invalidates the protective functions of the instrument and poses a potential shock hazard.

● **Defect of Protective Grounding**
Do not operate the instrument if the protective earth or fuse might be defective. Make sure to check them before operation.

● **Do Not Operate in an Explosive Atmosphere**
Do not operate the instrument in the presence of flammable liquids or vapors. Operation in such environments constitutes a safety hazard.

● **Do Not Remove Covers**
The cover should be removed by YOKOGAWA Denshikiki's qualified personnel only. Opening the cover is dangerous, because some areas inside the instrument have high voltages.

● **External Connection**
Connect the protective grounding before connecting to the item under measurement or to an external control unit.

● **Damage to the Protective Structure**
Operating the Course recorder in a manner not described in this manual may damage its protective structure.

● **Do not allow this device to get wet**
Do not operate with wet hands. Doing so might cause electric shock. Do not allow water to enter inside this device. Doing so might cause fire or malfunction.

■ Exemption from Responsibility

· YOKOGAWA Denshikiki makes no warranties regarding the product except those stated in the WARRANTY that is provided separately.
· YOKOGAWA Denshikiki assumes no liability to any party for any loss or damage, direct or indirect, caused by the user or any unpredictable defect of the product.

■ Handling Precautions

· Use care when cleaning the recorder, especially any plastic parts. When cleaning, wipe using a dry soft cloth. Do not use chemicals such as benzene or thinner, since these may cause discoloring and deformation.
· Keep electrically charged objects away from the signal terminals. This may damage the recorder.
· Do not apply volatile chemicals to the door glass, display, panel keys, etc. Do not allow rubber and vinyl products to remain in contact with the recorder for long periods of time. This may damage the recorder.
· When not in use, make sure to turn OFF the power switch.
· If there are any symptoms of trouble such as strange odors or smoke coming from the recorder, immediately turn OFF the power switch and the power supply source. Then, contact your nearest YOKOGAWA Denshikiki dealer.
· Do not perform an insulation resistance test using a mega ohmmeter. Doing so causes malfunction.

■ How to Use This Manual

The following markings are used in this manual.
Improper handling or use can lead to injury to the user or damage to the instrument. This symbol appears on the instrument to indicate that the user must refer to the user's manual for special instructions. The same symbol appears in the corresponding place in the user's manual to identify those instructions. In the manual, the symbol is used in conjunction with the word "WARNING" or "CAUTION".

WARNING

Calls attention to actions or conditions that could cause serious or fatal injury to the user, and precautions that can be taken to prevent such occurrences.

CAUTION

Calls attentions to actions or conditions that could cause light injury to the user or damage to the instrument or user's data, and precautions that can be taken to prevent such occurrences.

Note

Calls attention to information that is important for proper operation of the instrument.

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1. Outline

1.1 Outline

Paper-less Course Recorder instantaneously logs Gyro, Pilot and GPS data, and displays them on the touch panel LCD display.

There are following functions; Chart indication, Scroll, and Hand writing by stylus. So you can use this Paper-less Course Recorder as if you use the existing Paper Course Recorder.
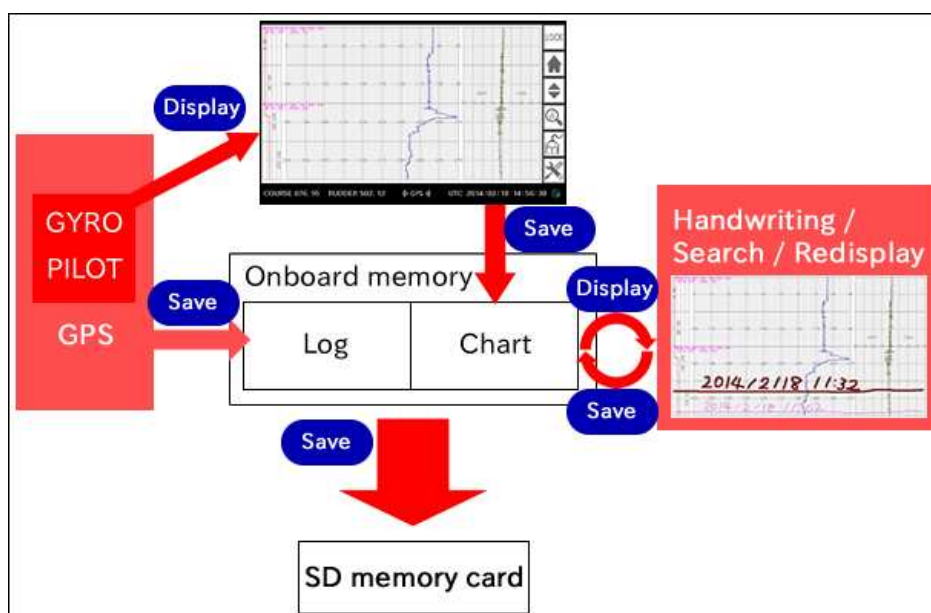

1.2 Introduction of Main Function

・Logging function

- Data received at COM ports is saved to onboard memory.

・Chart function

- Displays Heading (Gyro) and Rudder angle information (Pilot) on chart.
- Displayed chart is recorded as image file, and recorded data can be redisplayed.
- Any comments and information can be added on chart by handwriting function.
- Recorded data can be searched and redisplayed by specifying time or the point of handwritten notes.

・SD memory card.

- Recorded data inside onboard memory can be stored in SD memory card.

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2. Index to Parts and Display Structure

2.1   Index to Parts

Overview
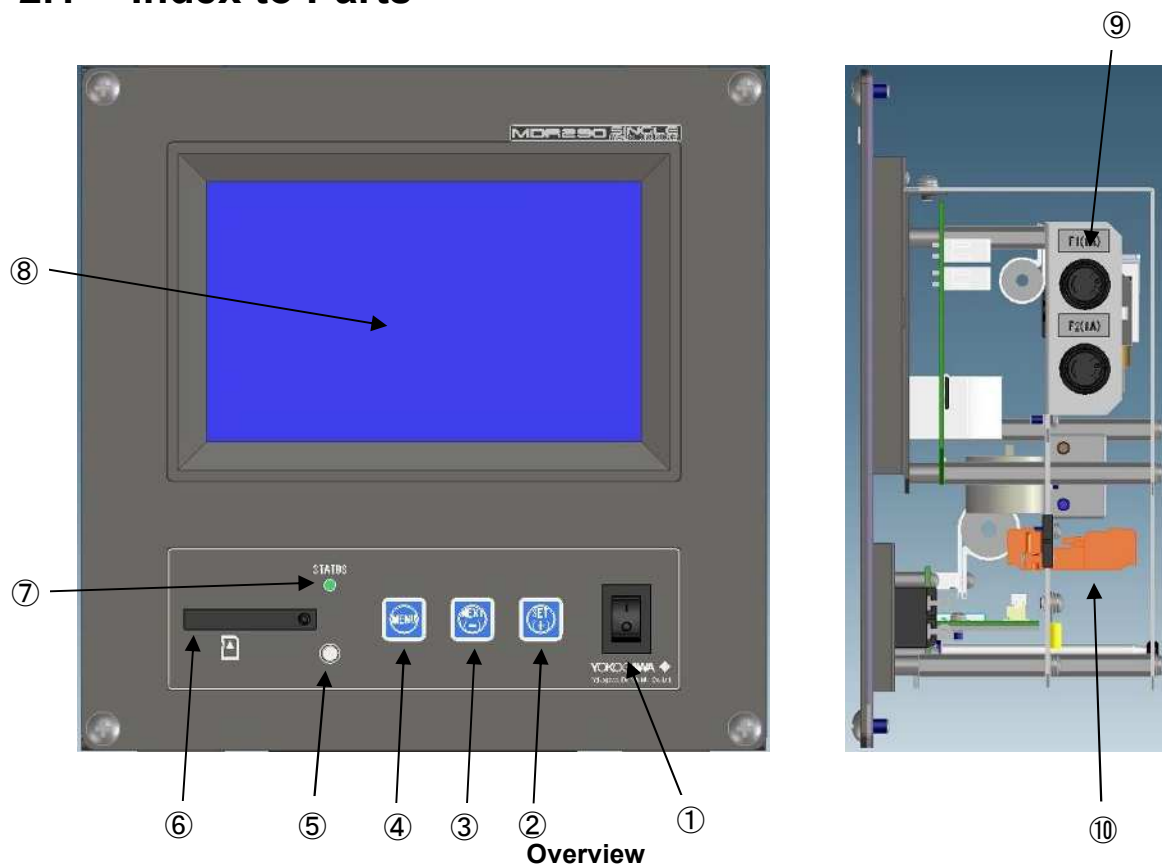
Items and Function

No	Items	Function
①	Power switch	Turns the power on and off
②	SET switch	Is used for various settings.
③	NEXT switch	Is used for various settings.
④	MENU switch	Is used for various settings.
⑤	Touch pen (Stylus)	For writing notes on screen.
⑥	SD memory card slot	Accepts SD memory card
⑦	Status display LED	Normal: Green, Alarm: Red
⑧	LCD with touch panel	Displays data, and is used for operations.
⑨	Fuse	Protection element
⑩	Connector	Port for providing signal or power supply

2.2   Display Structure

The screen of recorder is composed by 3 parts: Main Function Display Area, Data and Status display Area, and Margin Display Area.

① Main Function Display Area ：Displays the received data with charts, lines, and values. Notes can be added to this area with stylus.

② Icon Display Area   ：Displays icons representing functions. Different icons are displayed on different screens.

③ Margin Display Area   ：Displays COURSE, RUDDER, GPS／ALARM, time, and spinner.

2.2.1　Function of Margin Display Area

2.2.1.1　COURSE, RUDDER Angle display

Indicates course and rudder values. Both values are updated every 1.2 seconds.

If the data is not received, ***.** is displayed. (See 3.2.1.5 Pen up)

2.2.1.2　GPS display / Alarm display

GPS data is logged to onboard memory, but it is not displayed on the screen.

While receiving the GPS signal, (((GPS))) is displayed.

When the GPS signal is interrupted for 3 seconds or longer, this field turns blank.

Also, this field preferentially indicates alarms: onboard memory alarm (OM_ALM：xxx)

and SD memory card alarm (SD_ALM：xxx).

So, if alarm is issued, alarm indication overrides (((GPS))) in this field.

2.2.1.3　Spinner

Spinner indicates chart speed, and the blue line makes one turn
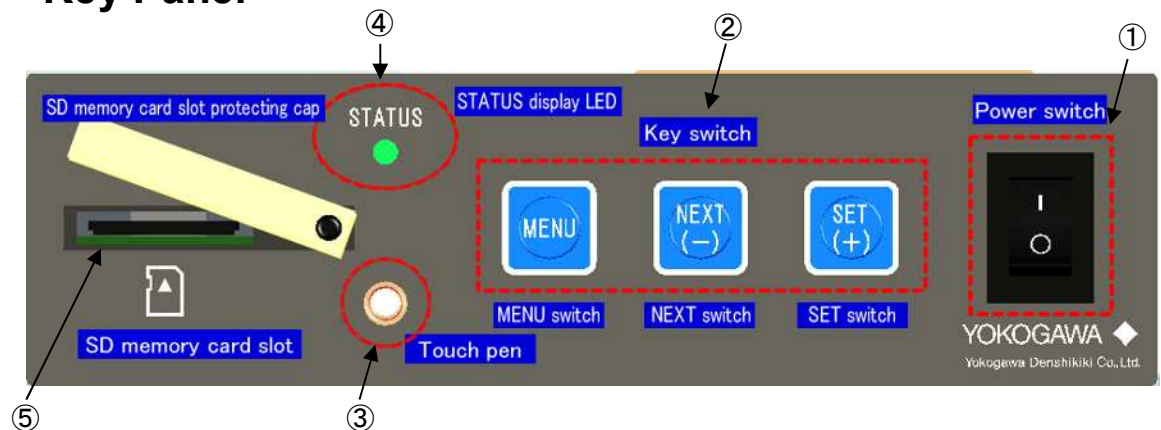
every 1.2 seconds.

Symbol "N" = Chart speed is normal.

Symbol "F" = Chart speed is fast.

If system failure occurs, spinner will stop or make a random

movement.

2.3 Key Panel

①	Power Switch	: Turns power ON/OFF.
②	Key Switch	: Key switches for operations. Upon power on, these switches are illuminated by backlight.
③	Touch pen	: Touch pen and its slot. Touch pen is used to write notes on the touch panel LCD.
④	Status display LED	: Displays the system status by two different colors. - Green light: Normal status. - Red light: Alarm status If an alarm is issued or sensor signal is interrupted for 3 seconds, the LED turns red.
⑤	SD memory card slot	: Accepts SD memory card drive. Specified SD memory card supplied by Yokogawa Denshikiki must be used for proper operation.

Note

・ Inserting an SD memory card
Insert an SD memory card only when you export the recorded data into the card.
If SD memory card is left in the slot for a long period of time, the card may slide out or the slot may be damaged due to vibration etc.

・ Please close the memory card slot cover during normal use.

3. Display Introduction and Operation

You can switch displays by touching icons or key switch operation as per below diagram.
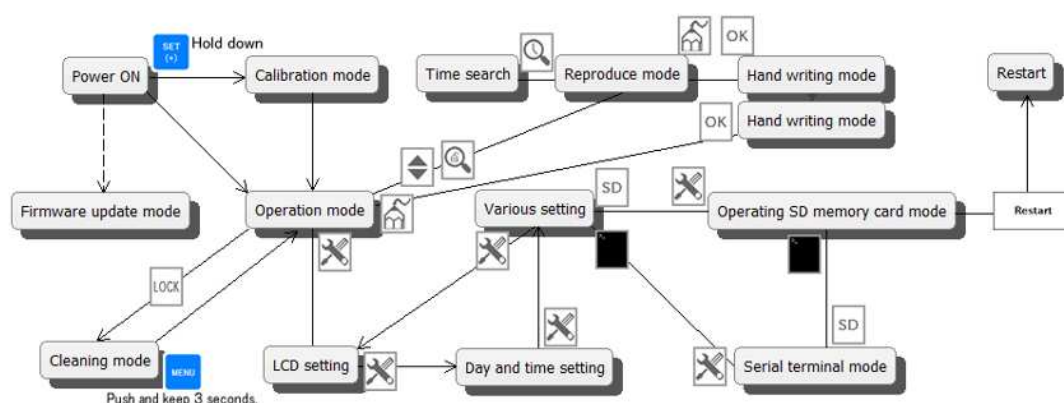
Operation flowchart

	Name of mode	Function	Page
1	Operation mode	Displays the recording chart.	3-3
2	Reproduce mode	Redisplays the recorded chart.	3-7
3	Handwriting mode	Adds information to the chart with stylus.	3-9
4	Cleaning mode	Disables the touch panel for cleaning the LCD.	3-10
5	Time search	Searches the chart by specifying the time.	3-8
6	Calibration mode	Adjusts the position of the touch panel.	4-5
7	Operating SD memory card mode	Copies the logged data from onboard memory to SD memory card. Buffer clears the logged data.	3-11
8	Serial terminal mode	Displays the received serial data.	3-13
9	LCD setting	Sets the backlight's brilliance and contrast.	4-2
10	Date and time setting	Sets time.	4-5
11	Various setting	Setting feed speed and etc.	4-6

Note

MDR290 has two types, one is single channel type, and the other is dual channel type. Operation mode screen of single channel type shows Heading and Quadrant. And, the same of dual channel type shows Heading, Quadrant, and rudder angle. In this manual, the screen image of dual channel type is used.

3.1　Startup and Shutdown
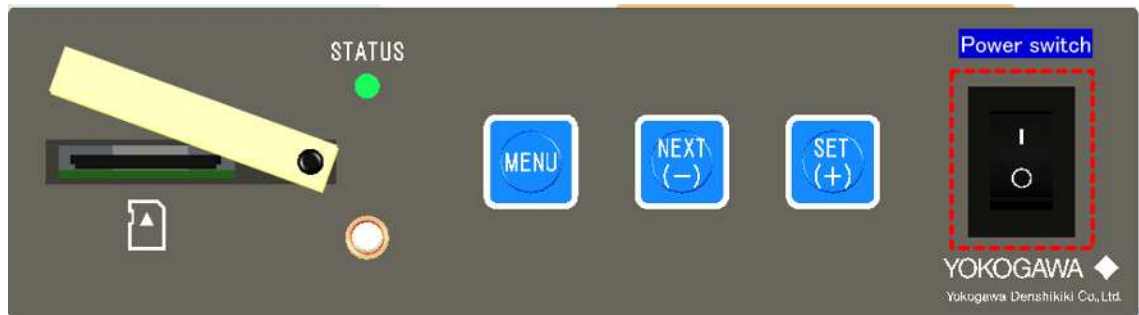
3.1.1　Startup

When the power switch is turned ON (I), the recorder will start up.

If launched normally, the boot screen is displayed first. And it changes to operation mode screen, and starts logging the data.

3.1.2　Shutdown

The recorder will shut down by turning OFF(o) the power switch.

Also, "Operating SD memory card mode" has shut down function, as well as reboot function.

3.1.3　Other startup function

・Starting up with Calibration mode

Hold down the "SET" key, and turn on the power switch. Recorder will start up in Calibration mode directly. (See 4.2.2 Calibration mode)

・Starting up with Backlight Default

Hold down the "NEXT" key, and turn on the power switch. Backlight's brilliance and contrast will return to default setting.

3.2   Operation mode

Operation mode is basic screen with this recorder. Touch panel operation is available with most functions. When exiting Cleaning mode, you can only use the key switch.

3.2.1   Operation mode

This screen displays heading and rudder angle by chart.

You can move to other modes by touching icons.
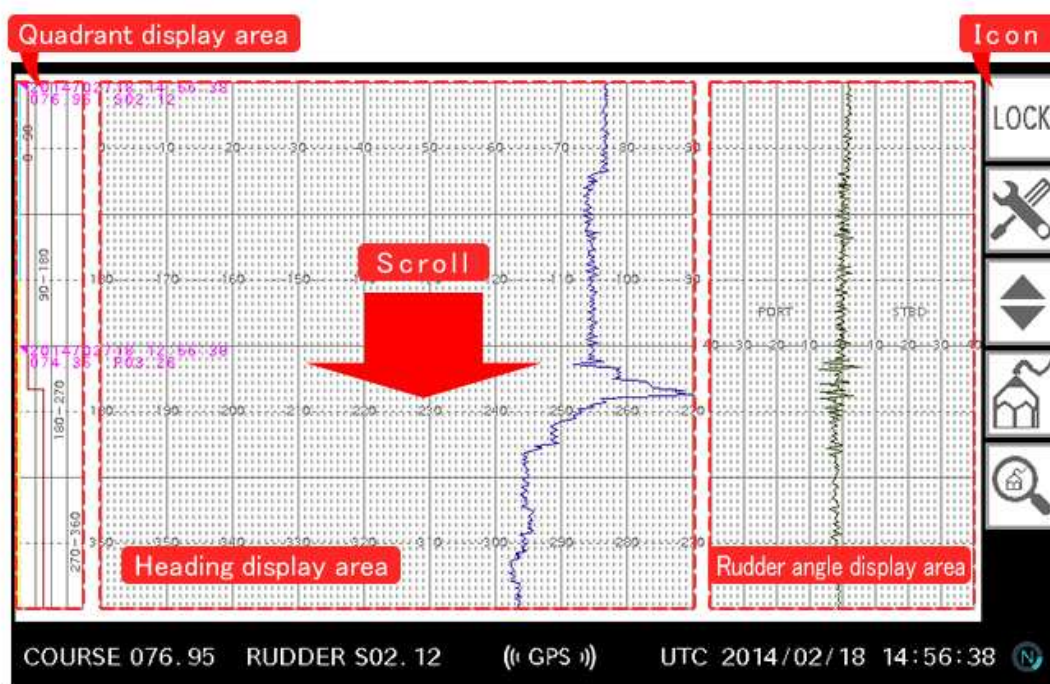
・Quadrant display area, Heading display area, Rudder display area
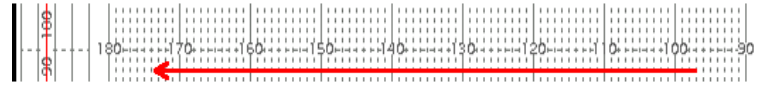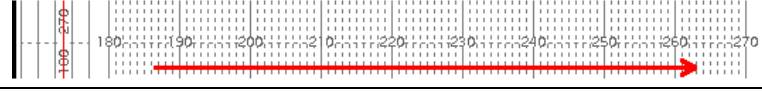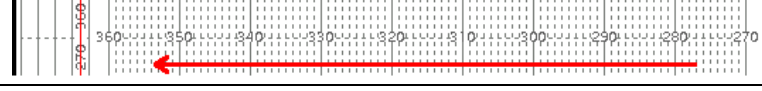
  Received data is recorded and displayed in these areas.

 Latest data is displayed at the top of the screen, and the screen scrolls downwards.

・List of icons

LOCK	LOCK	Moves to Cleaning mode
✕	Setting	Moves to LCD setting display
⬍	Redisplay	Move to Reproduce mode
⌂	Pen	Move to Handwriting mode
🔍	Handwriting search	Moves to Reproduce mode, and displays the latest point of handwritten note.

3.2.1.1 Quadrant display area (ZONE)・Heading display area (COURSE)

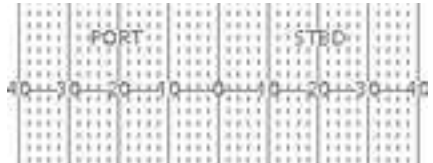Displays the heading in 4 quadrants, each representing 90-deg.

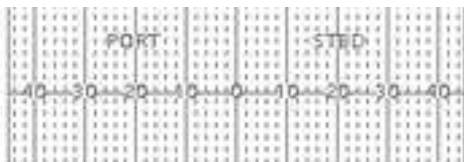| ZONE	COURSE	Arrowed line indicates the direction of increment.
1	0°< 90°	
2	90°< 180°	
3	180°< 270°	
4	270°< 360°	
1	360°＝0°	Restarts from zone 1
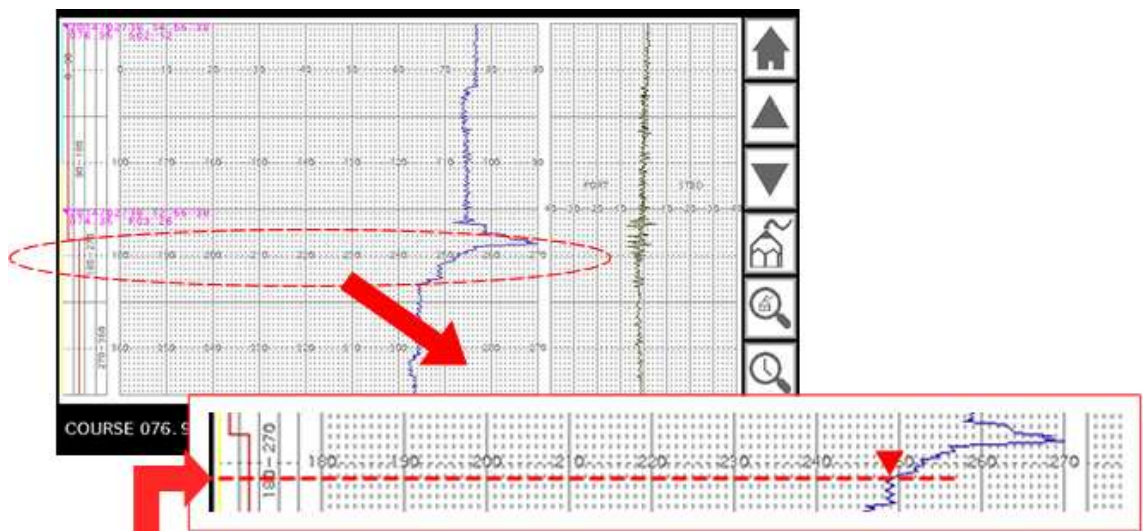
Heading read from 180deg to 90 deg by red line on the
second quadrant by Quadrant display area.
In this case, Heading display area's ▼ position is indicate
111 degree by blue line.

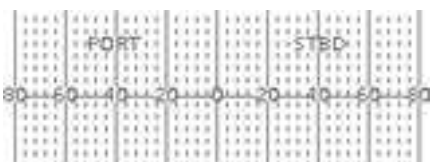### 3.2.1.2 Rudder angle display area

RUDDER(40° model)

Rudder angle	RUDDER
PORT 0 ～ 40°	0～-40DEGREE
MIDSHIP	0DEGREE
STARBORD 0 ～ 40°	0～40DEGREE

RUDDER (45° model)

Rudder angle	RUDDER
PORT 0 ～ 45°	0～, -45DEGREE
MIDSHIP	0DEGREE
STARBORD 0 ～ 45°	0～45DEGREE

RUDDER (80° model)

| Rudder angle	RUDDER
PORT 0 ～ 80°	0～-80DEGREE
MIDSHIP	0DEGREE
STARBORD 0 ～ 80°	0～80DEGREE

3.2.1.3 Scroll speed (NORMAL/FAST)

・Chart scroll speed

 Scroll speed can be confirmed by the spinner

 (See pictures on the right).

 Normal: Scrolls one dot every 36 seconds.

 First: Scrolls one dot every 3.6 seconds.

 Scroll speed can be changed during operation. In Reproduce mode, blue line is

 displayed for NORMAL scroll speed, and yellow line for FAST scroll speed.
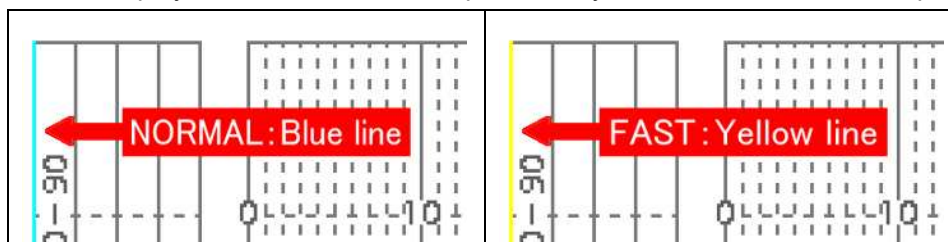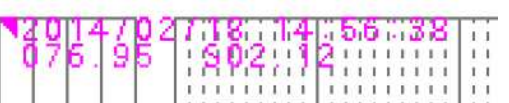
3.2.1.4 Time Stamp

Time stamp is added to the chart when power is turned on and also every half-page is scrolled.

To have half-page scrolled, it takes the time below.

NORMAL: 2 hours, FAST: 12 minutes

system power on	START YYYY/MM/DD HH:MM:SS
scrolled half page	YYYY/MM/DD HH:MM:SS XXX.XX YXX.XX COURSE RUDDER

3.2.1.5 Pen up (Data input timeout)

If the receiving data is interrupted for 3 seconds or more, the recorder gets into the Pen up.

In case of GYRO or PILOT signal time-out, data field changes to ***.**, and it stops plotting the chart lines. While GPS signal is interrupted, ((GPS)) mark will not be displayed in this field.
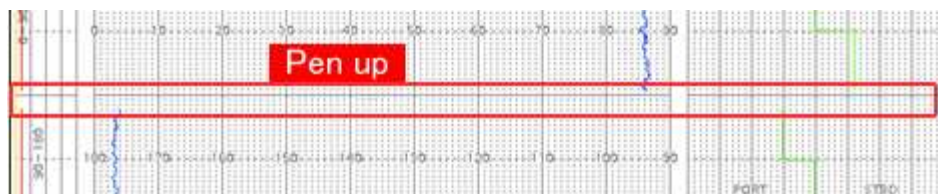
3.2.2　Reproduce mode
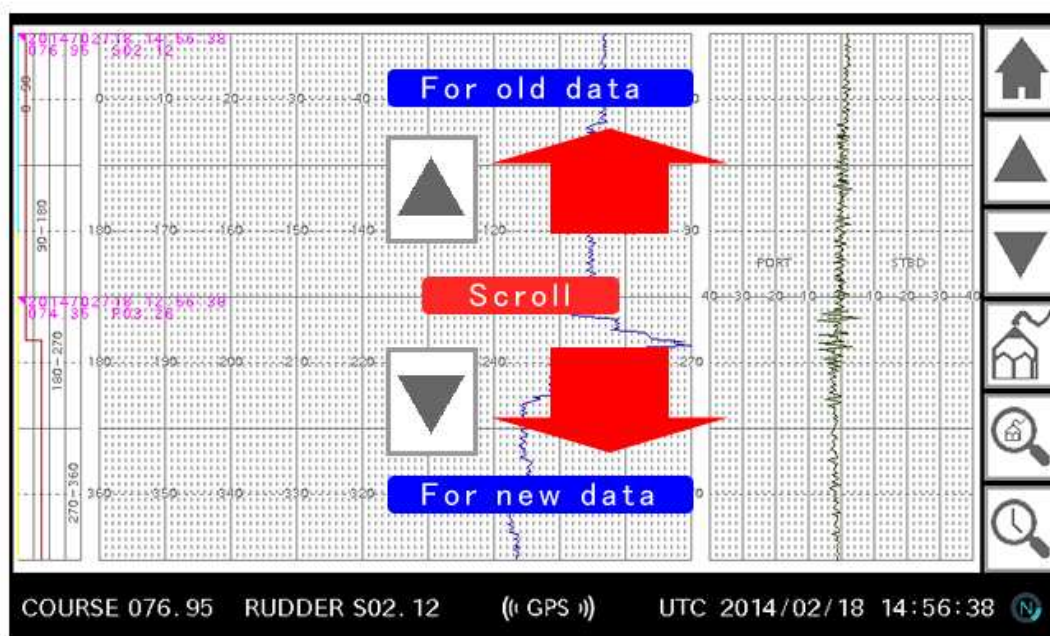
Recorder chart can be redisplayed in this mode.

Data logging continues in the background during this mode.

・List of icons

🏠	HOME	Moves to Operation mode
🔺	Previous	Scrolls and displays the older data.
🔻	Next	Scrolls and displays the newer data.
	Handwriting mode	Moves to handwriting mode
	Handwrite search	Moves to the latest point of handwritten note.
	Time search	Moves to the Time search display.

3.2.3 Search function

Recorded data can be searched in two ways as below.

3.2.3.1 Handwriting search
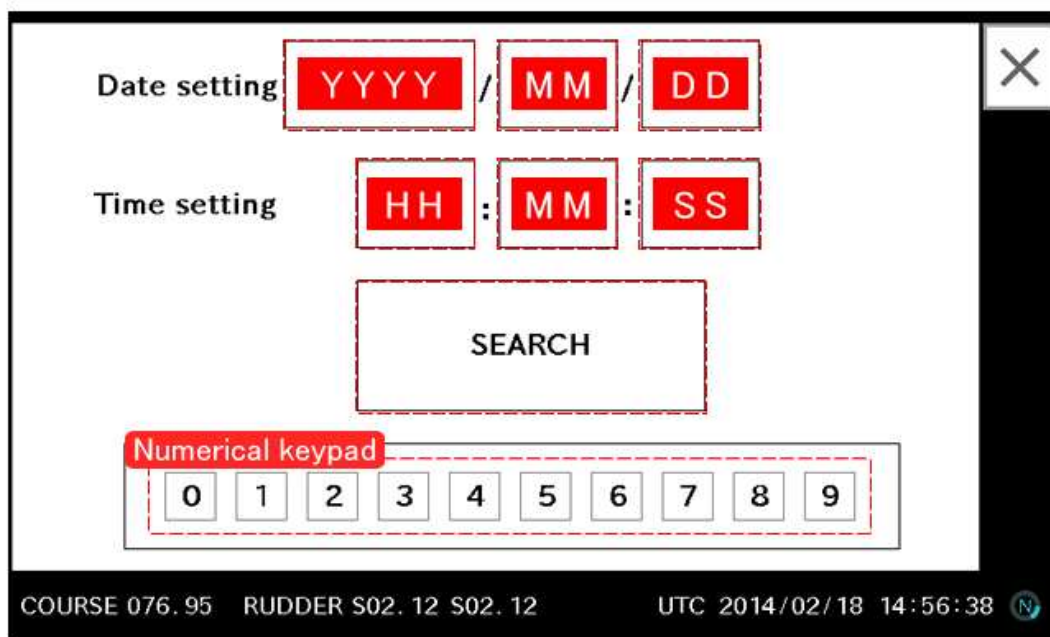
The latest point of handwritten note can be searched by touching the 🔍 Handwriting search icon. By touching the icon, previous handwritten notes are displayed one by one.

3.2.3.2 Time search

Touch the 🔍 Time search icon to enter this mode.

<How to search the chart by Time>

1) Touch the data input field. ("YYYY", "MM", "DD", "HH", "MM", "SS")

2) Touch the Numerical keypad, and enter time and date.

3) Touch the SERCH icon. Then you move to the target recorded data.

・List of icons

☒	CANCEL	Moves to Reproduce mode

・Input range

YYYY	2000〜2099	MM	1〜12	DD	1〜31
HH	0〜23	MM	0〜59	SS	0〜59

3.2.4 Handwriting mode

In Operation mode and Reproduce mode, you can add notes by using the stylus.

Touch the 🏠 pen icon to enter Handwriting mode.

Handwritten data can be added and saved on the chart, and it can be searched in Reproduce mode.
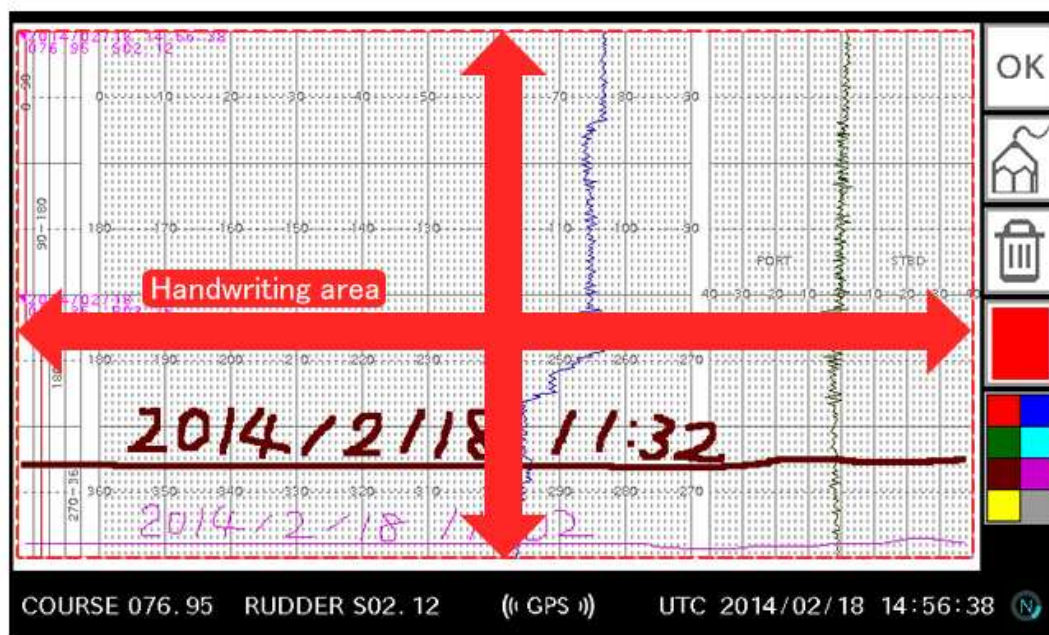
・List of icons

OK	OK		Saves the added handwritten data, and returns to Operation mode or Reproduce mode.
🏠 🏠		Pen	Changes the pen's diameter (thickness).
🗑	Trash		Cancels the added data, which is not saved yet.
🟥	Color		Displays the selected pen color.
▦	Color palette		Selects the pen color.

Note

・ After touching the OK OK icon, you cannot delete the added data from the saved chart.

3.2.5   Cleaning mode

Touch panel can be disabled to clean the LCD display.

Holding [LOCK] LOCK icon to enter the Cleaning mode.

<Exit Cleaning mode >

Press and hold down "MENU" key for 3 seconds to return to the Operation mode.

[PUSH MENU SW] PUSH MENU SW icon is not valid in this mode.
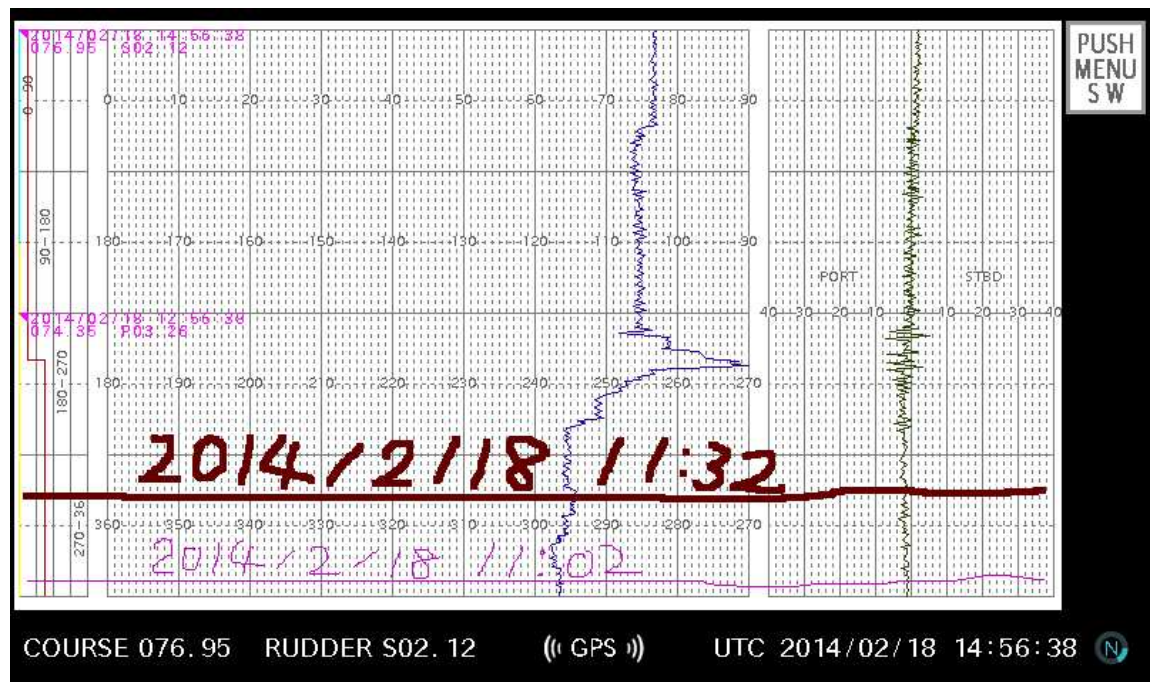
3.2.6　Operating SD memory card mode

Exports the logged data from onboard memory to SD memory card.

You can move to Operating SD memory card mode by Touching [SD] SD memory card icon in various setting modes and serial terminal mode.
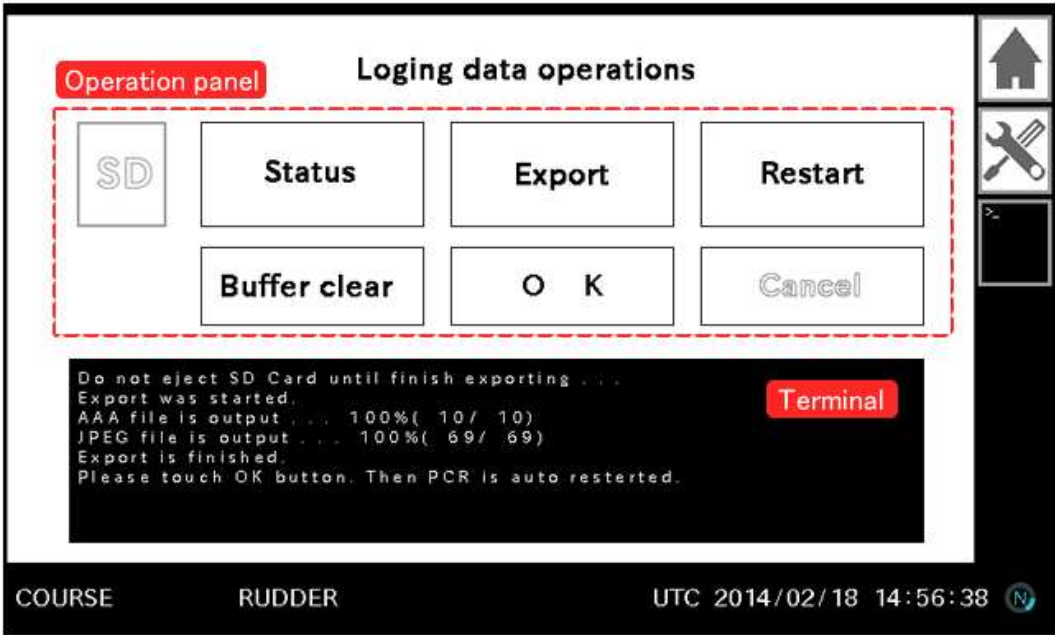
・List of icons

🏠	HOME	Moves to Operation mode	
✖	Setting	Moves to various setting modes	
■	Serial terminal	Moves to Serial terminal mode	

Note

・ Inserting an SD memory card
  Insert an SD memory card only when you export the recorded data into the card.
  If SD memory card is left in the slot for a long period of time, the card may slide out or the slot may be damaged due to vibration etc.
・ Please close the memory card slot cover during normal use.

3.2.6.1 Operation panel

SD / X-SD	Indicates if the SD memory card is present or absent. 1) X mark indicates the SD memory card is not inserted. 2) Insert the SD memory card. Then X mark disappears, and it becomes ready to export the data. <To eject the SD memory card> 1) Touch the [SD] SD memory card icon. 2) [SD] SD memory card icon changes to [X] icon. 3) And it becomes ready to eject SD memory card from the slot.
Status	Displays the available free space in the SD memory card.
Export	Exports the logged data from onboard memory to SD memory card. Touching this icon will display the size of the logged data. Prepare the SD memory card having free space larger than the logged data size. To start recording into the SD memory card, choose OK at the prompt ("OK/CANCEL"). Touching OK will start exporting the data. The data logging will stop during the export.
Buffer clear	Starts clearing the onboard memory buffer. During the buffer clear data logging is stopped.
Restart	Restarts the system.

3.2.6.2 Terminal

Displays the functional message on the terminal.

Note

・ When the onboard memory becomes full, recorder will stop data logging.
・ For regular maintenance, export and backup the data into SD memory card and clear the buffer, every month.

Note

・ The data logging stops during "export data" or "buffer clear".

3.2.7　Serial terminal mode

Serial terminal mode displays the serial data received at three ports by ASCII format.

Touching ■ serial terminal icon in Operating SD memory card mode will move you to this mode.

<Following functions are disabled in this mode>

　・Main Function Display Area: Stops displaying the received data and saving the chart image into the onboard memory.

　・Margin Display Area: COURSE, RUDDER, GPS, and UTC Spinner are not displayed.

・List of icons

🏠	HOME	Moves to the Operation mode	
✖	Setting	Moves to the Various setting	
⏸ ▶	Pause / Start	⏸ Pause : Stops receiving the signal.	
		▶ Start : Starts receiving the signal.	
SD	Operating SD memory card mode	Moves to the Operating SD memory card mode	
1 2 3		Selects COM port.	
		1 :GYRO　2 :PILOT　3 :GPS	
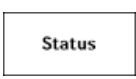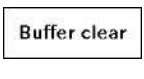
Note

Received data is not logged in this mode. After checking the serial signal, make sure to return to Operation mode.

3.3 External SD memory card operations

The followings are the SD memory card operations.

Please refer to "6.2 Safekeeping the logging data" for operation order.

①	[SD icon with red X]	[SD icon]	
	Insert the SD memory card to SD memory card slot. Then X mark disappears.		
②	Status	`Normal mode : Making file are counts = 35Days` `Fast mode : Making file are counts = 32Days`	
	Displays the SD memory card's free space.		
	If SD memory card does not have enough free space, save the files in SD memory to PC,		
	and make sufficient room to backup logged date from MDR290.		

③	Export	`File Export.`
		`If all files are expoted. Then PLR is auto restarted`
		`Total Export size are xxx MBytes`
		`(OK/Cancel)`	

	SD memory card does not have enough free space.	`Total Export size are xxxx MBytes.` `External SD card don't have enough space.`	
③	O K	Starts exporting the logged data to SD memory card.	
		Note) Data logging will stop during the export.	

	`Export was started.`
	`AAA file is output ... 100%( 74/ 74)`
	`JPEG file is output ... 88%( 238/ 270)`
		`Export was started.`
		`AAA file is output ... 100%( 74/ 74)`
		`JPEG file is output ... 100%( 270/ 270)`
		`Export is finished.`
		`Please touch OK button. Then PLR is auto reseted.`	

④	O K	When the export is finished, system will request to restart the system.	
		Touch "OK" and restart the system.	
	After exporting the logged data into SD memory card, check the data on PC.		
	And, clear the buffer on the onboard memory.		
	Note) When the onboard memory becomes full, recorder will stops data logging.		

⑥	Buffer clear	`Buffer clear.`
		`All files are removed. Next Disk is formated.`
		`Then PLR is auto reseted.`	

	O K	Starts clearing the buffer in the onboard memory.	
		Note) Stops logging the data.	
⑦	O K	After the buffer clear, system will request to restart the system.	
		Touch "OK," and restart the system.	

Note

・ When the onboard memory becomes full, recorder will stop data logging.
・ For regular maintenance, export and backup the data into SD memory card and clear the buffer every month.

Note

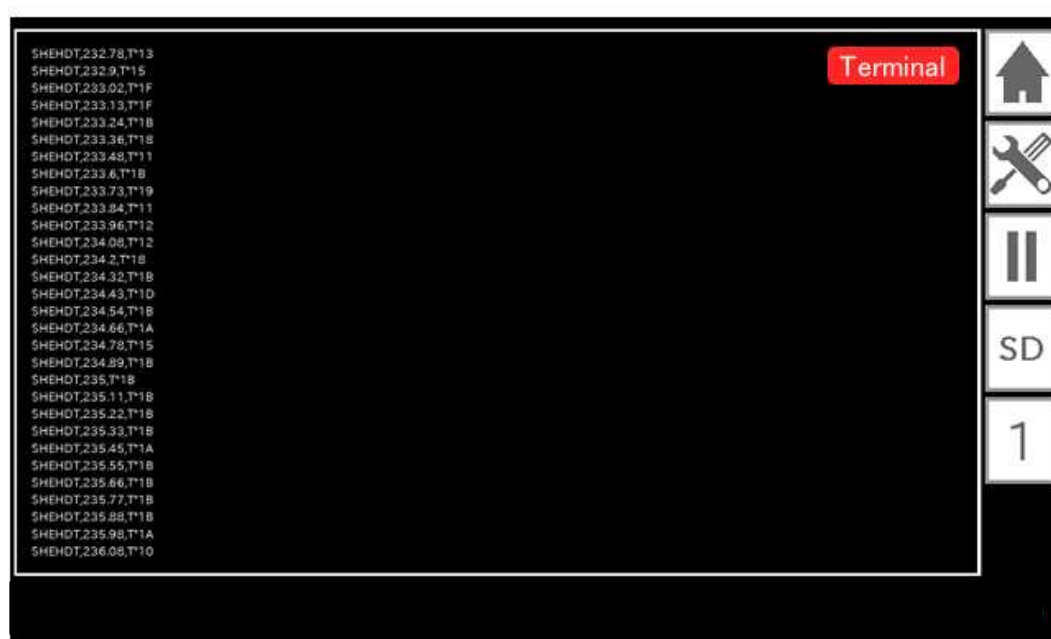・ The data logging stops during "export data" or "buffer clear".

3.4 SD memory card PC operation

Exported data ("3.3 External SD memory card operations") can be displayed on PC monitor.

3.4.1 Chart data

Exported chart with handwritings can be saved on SD card as JPEG image file. And, the file can be displayed on PC monitor.

3.4.2 Logging data

Exported logging data is saved in SD memory card in MDR290 ordinal format (.AAA).

Keep this file together with JPEG image file on PC.

Note
_____

Each ".AAA" file is exported by cryptogram. You cannot open the file on PC.
These files should be kept in SD memory card or on PC for analysis of any accident.
_____

3.4.3 Folder arrangement in SD memory card

Exported chart and logging data are stored in the folders like the below.

EXPORT data composition

20140314183559   EXPORT start time (yyyymmddhhmmss)

40 / 45 / 80 → JPG → Chart Image

AAA → Enciphered data

0001.AAA~8192.AAA

<Information for Logging data (.AAA file) >
1) Size of .AAA file
   This recorder makes logging file (.AAA file) every time it's powered ON.
   If the recorder is powered on with no signal received, the .AAA file of 0KB is made and saved in the onboard memory.
2) Maximum size of .AAA file
   One .AAA file can hold one million serial sentences. When it has reached one million serial sentences, MDR290 will make a new .AAA file. .AAA file filled with one million serial sentences will be approx. 40MB size.

4. Setting

Paper-less Course Recorder MDR290 has 3 setting screens.

You can move to the next setting screen by touching the ⚒ setting icon.

● Setting 1: LCD setting
  - LCD backlight adjustment
  - LCD brilliance adjustment
  - LCD contrast adjustment.

● Setting 2: Date and time setting
  - Date, Time setting
  - Touch screen calibration

● Setting 3: Various setting
  - Day / Night mode select
  - Feed speed setting
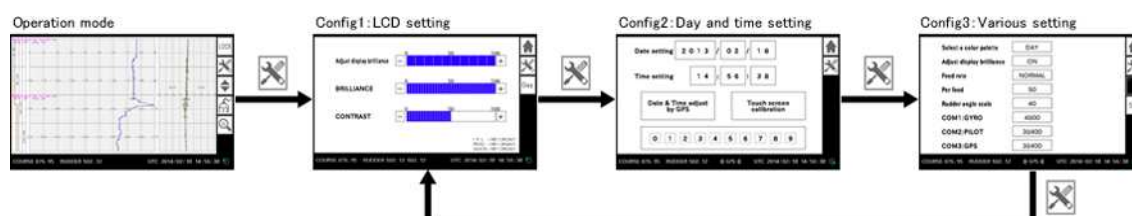
4.1 Setting 1: LCD setting

LCD setting has 10 levels LCD backlight adjustment and 32 levels brilliance and contrast adjustment.
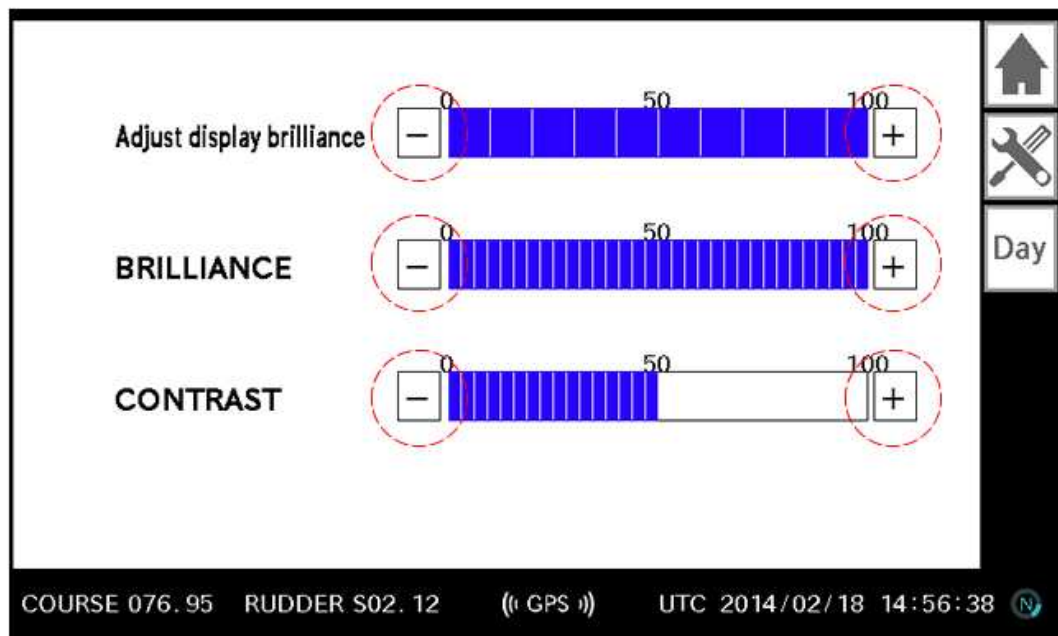
・List of icons

🏠	HOME	Saves the setting, and moves to the Operation mode.	
🛠	Setting	Saves the setting, and moves to the Setting 2: Date and time setting.	
Day Night	Day / Night	Change the Day / Night display on the Operation mode.	

4.1.1 LCD level control

Blue bar indicates the level of LCD's brilliance and contrast.

☐ ─ ☐ ＋		LCD level control button. [─] : Reduces LCD level, [＋] : Increases LCD level.
Adjust display brilliance ▮		Adjusts LCD backlight with status LED, key switch's dimmer level.
BRILLIANCE ▮		Adjusts the LCD's brilliance level.
CONTRAST ▮		Adjusts the LCD's contrast level.

Note

<Blackout, Whiteout the screen, and default dimmer setting>
Maximum LCD level will make the display "blackout" or "whiteout".
In this case, please reset to the default dimmer setting.
Default dimmer setting : Hold down the "NEXT" key, and power OFF and ON.

4.1.2　Day / Night mode select
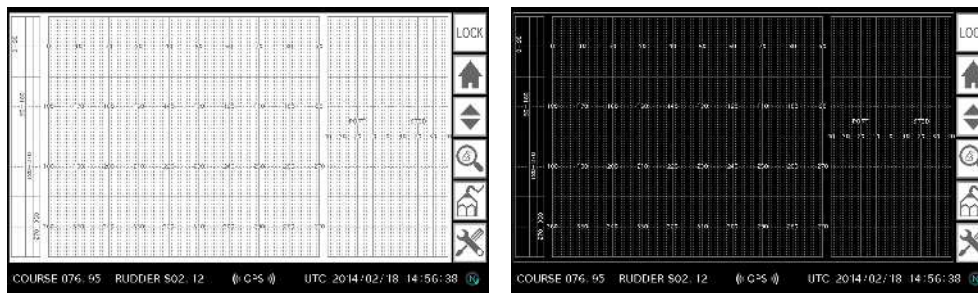
Select ⌈Day⌉ ⌈Night⌉ DAY/NIGHT icons, and touch the HOME icon. Operation mode display changes to "DAY" or "NIGHT" mode.

Backlight, and brilliance and contrast levels will also change to "DAY" or "NIGHT" setting.

4.2　Setting 2: Date and time setting

Date and time setting screen has the following 2 functions.

- Date and time setting

- Touch screen calibration
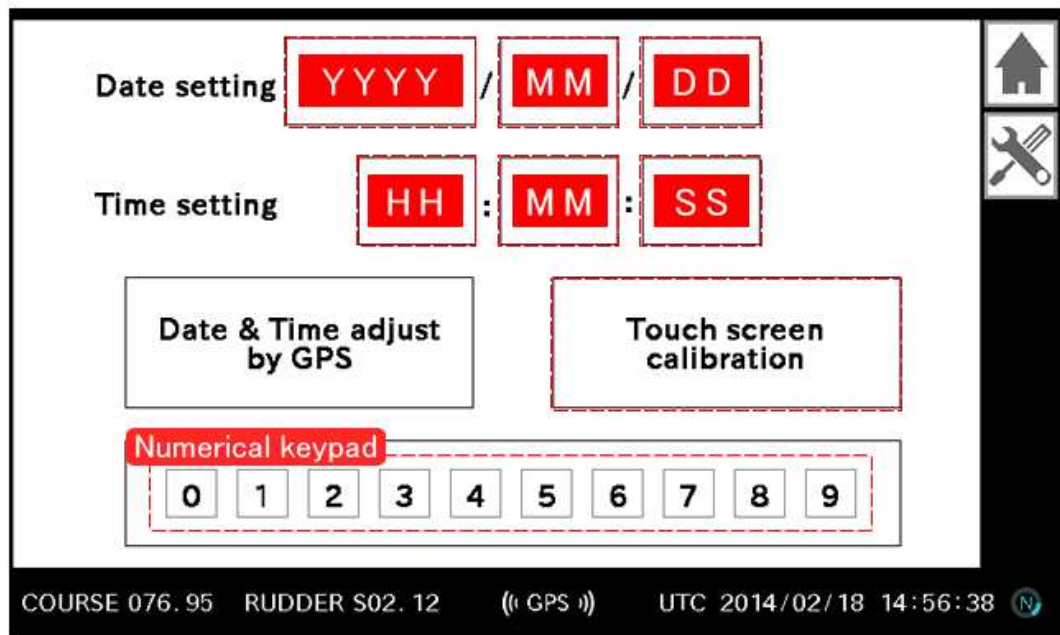
・List of icons

🏠	HOME	Moves to the Operation mode
⚒	Setting	Moves to the Setting 3: Various setting

4.2.1 Date and time setting

・GPS input

Date & Time adjust by GPS	Adjusts the time data by GPS clock data.
	This icon is valid when GPS signal input is available.

Recorder's internal clock is independent from GPS clock.

Adjust the recorder's clock to match the GPS clock. (Recommend once every week)

・Manual input

Touch the each date and time's frame and input the value by numerical keyboard.

New time count shall start once the value input is complete.

・Input range

YYYY	2000～2099	MM	1～12	DD	1～31
HH	0～23	MM	0～59	SS	0～59

If an invalid value is entered, the recorder will automatically display a valid value.

Example) 2/31 (Feb 31) -> 3/1 (Mar 1)

After adjusting the recorder's clock, reboot the recorder so that a time stamp is added to the chart data.

4.2.2 Touch screen calibration

Touch screen calibration	Adjust the touch panel's position
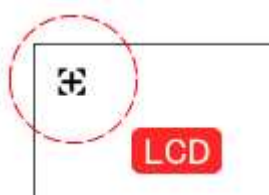
[+] targets are displayed on all four corners of the screen. Touch and hold the targets at the center with touch pen (in the order of left top, right top, left bottom, and right bottom) until they disappear. After all targets disappear, it moves to the Operation mode.

Hold down the "SET" key with turn on the power switch. Recorder will start up Calibration mode directly.

4.3   Setting 3: Various setting

Various setting display has DAY/NIGHT mode, Feed rate, and Per feed.

Each setting can be changed by touching the frame. And the set value can be saved by touching the Home or Setting icon. COM1 to COM3's baud rate are for indication only (these cannot be changed).
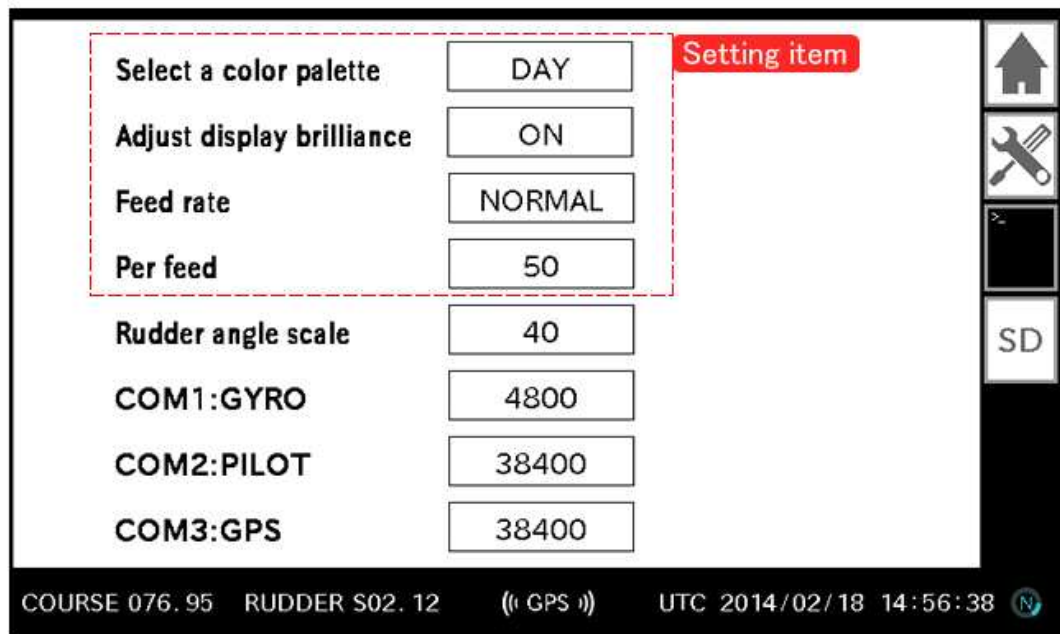
・List of icons

🏠	HOME	Moves to the Operation mode	
✖	Setting	Moves to the Setting 1: LCD setting	
■	Serial terminal		Moves to the Serial terminal mode
SD	Operating SD memory card mode		Moves to the Operating SD memory card mode

4.3.1   Select a color palette (DAY/NIGHT mode)

DAY/NIGHT mode can be selected by touching the frame. This is same as 4.1.2

Day / Night mode select.

4.3.2   Adjustment of display brilliance (Lighting time of the screen)

Setting the lighting time of the LCD backlight, key switch and status LED.

ON: Backlight is on all the time

OFF: Backlight is turned off after 10 seconds.

Can be turned on again by touching the screen or key switch operation

3/5/10: Backlight is turned off after 3 minutes, 5 minutes or 10 minutes.

Can be turned on again by touching the screen or key switch operation

Extinction area of LCD back light
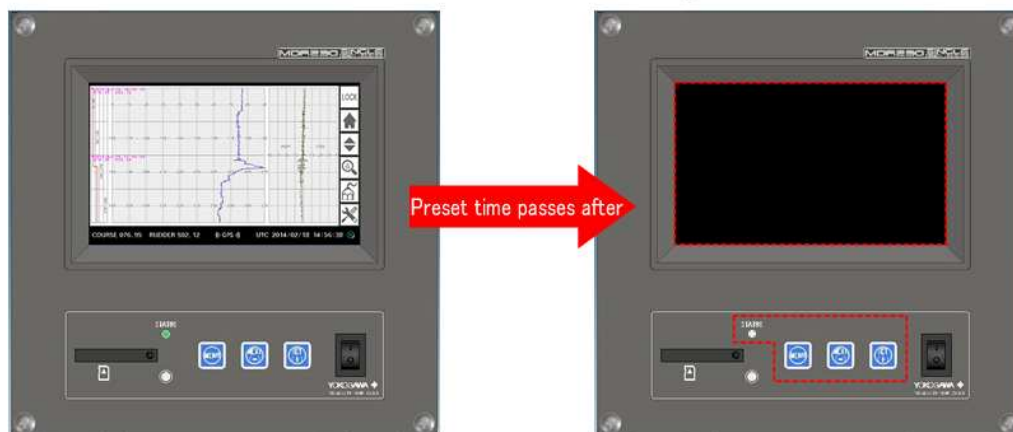
4.3.3   Feed rate (Chart scroll speed)

Setting of the chart scroll speed on Operation mode display.

Normal: Scrolls one dot every 36 seconds. 1 screen / 4 hours.

First: Scrolls one dot every 3.6 seconds. 1 screen / 24 minutes.

4.3.4   Per feed (Scroll value on the Reproduce mode)

Setting of the chart scroll value on the Reproduce

mode.

50   : 1/8 page

100：1/4 page

200：1/2 page

400：1 page
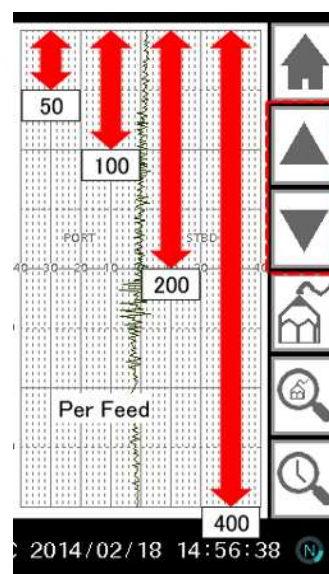
4.4   Key switches operation

Key switch operation is activated by pressing the MENU key on the Operation mode.

Touch panel operation is unavailable during the key switch operation.

You can change the key switch operation to touch panel operation by touching the

HOME icon.

Key switch operation can be used on 2 modes, as below.

Setting 1: LCD setting

Setting 3: Various setting

Note) "Setting 2: Date and time setting" can only be used by Touch panel operation.
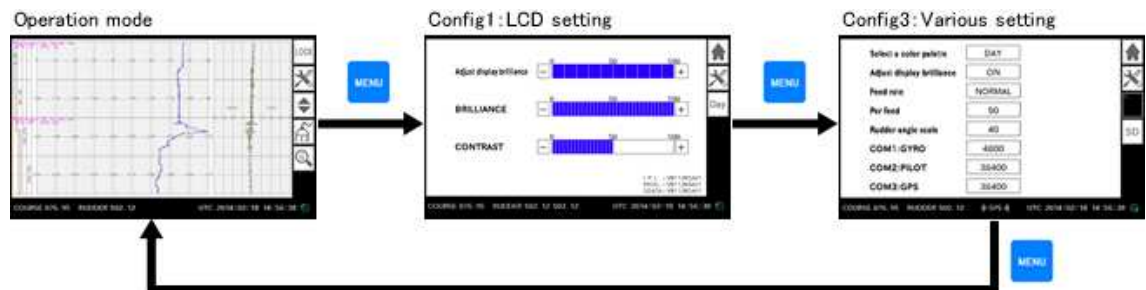
4.4.1   Setting 1: LCD setting (Key switches operation)
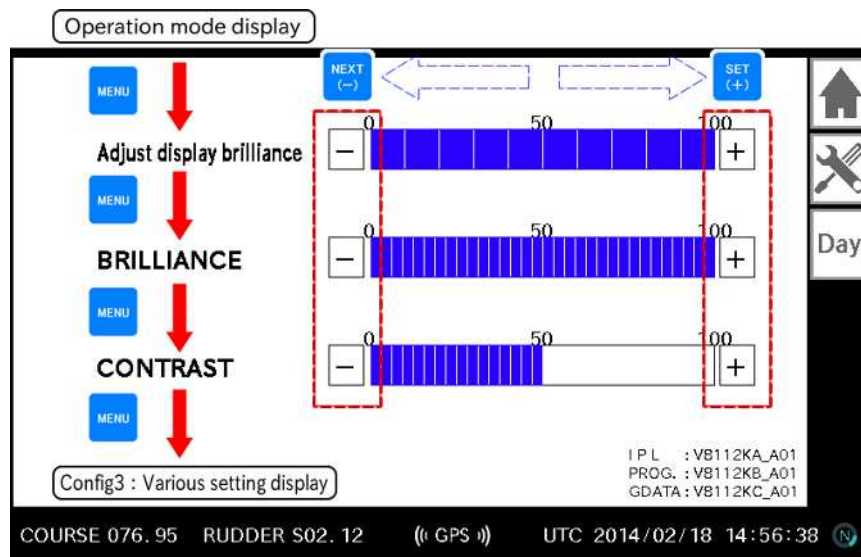
MENU key: Selects the items to adjust.

SET(+), NEXT(-) key: Adjusts the value on each item.

4.4.2　　Setting 3: Various setting (Key switches operation)
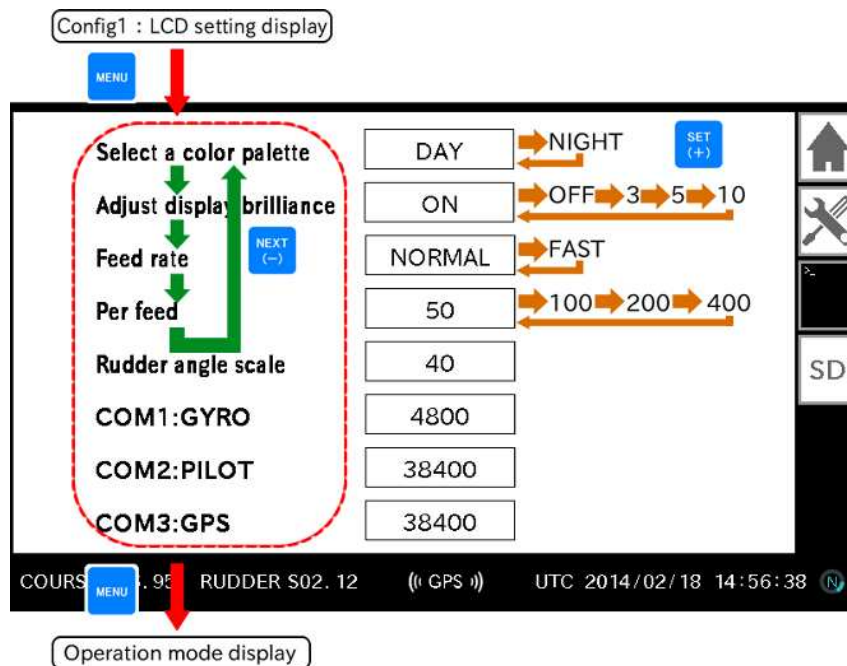
MENU key: Selects the items to adjust

SET(+), NEXT(-) key: Adjusts value on each item

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5. Specifications

5.1   Power supply, Power consumption

Power supply	100 V~240V AC ±10% 50/60 Hz ±5 % 1φ
Power consumption	Lower than 25 VA

5.2   Environmental Specification

Temperature range	Operating	-15 to +55 ℃
	Storage	-20 to +60 ℃
Humidity	95 [%] RH (no condensation)	
Vibration	±[1 mm] ±10 [%] (5 [Hz] to 13.2[Hz])	
	Max. acceleration	7[m/s2] (13.2[Hz]から100[Hz])
IP level	Appropriate IP22	
Insulation resistance	More than 10MΩ by 500V megger	

5.3   Storage media

Onboard memory	Micro SD memory card	
	Capacity	About 1 month
SD memory card	SD memory card (Max. 2GB)	
	Format	FAT32

5.4 Input signal Specifications and Circuits

Connection	Circuit / signal Specification	
Circuit		
Hardware setting	IEC61162-1, IEC61162-2	
	Transmission rate:	4800bps / 38400bps
	Data bit:	8bit
	Parity	None
	Stop bit	1
Format	Gyro compass input	$xxHDT / $HEHRC, $HCHRC / $xxTHS (Talker ID：EI, GA, GP, HE, HC, HN, II, IN)
	Autopilot input	$AGRSA
	GPS (IEC61162-1)	$GPZDA

See Appendix-3 Serial Signal Format for the details of each signal format.

5.5   Dip Switch settings

SW1-1	SW1-2	GYRO NMEA0183 header select
OFF	OFF	$xxHDT
ON	OFF	$HEHRC,$HCHRC
OFF	ON	$xxTHS

SW1-7	SW1-8	Operation mode (Boot mode select)
OFF	OFF	PLR normal operation boot
OFF	ON	Firmware Update boot
ON	OFF	Test mode boot

SW2-1	COM1:GYRO baud rate
OFF	4800bps
ON	38400bps

SW2-2	COM2:PILOT baud rate
OFF	4800bps
ON	38400bps

SW2-3	COM3:GPS baud rate
OFF	4800bps
ON	38400bps

SW2-4	SW2-5	Rudder angle range select
OFF	OFF	40
ON	OFF	45
OFF	ON	80
ON	ON	OFF

SW2-6	LCD display operation
OFF	LCD normal direction
ON	LCD reverse direction

SW2-7	SW2-8	Normal / Demo mode select
OFF	OFF	PLR normal operation
OFF	ON	DEMO: Replay mode 1 (normal)
ON	OFF	DEMO: Replay mode 2

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6. Maintenance, Inspection

6.1   Daily inspection, Regular inspection

Implement the following procedures in the daily and regular inspection, for safekeeping the data and maintain the Paper-less Course Recorder in a state of normal working Inspection item and recommended inspection interval is as below.

	Inspection item	Inspection Contents and Procedure	Recommended Inspection Interval
1	Continuation of the recording	Check if "Pen up" occurred or not in the Operation mode display. (See 3.2.1.5 Pen up (Data input timeout))	Once/day (at an arrival)
2	Operation of LCD with touch panel	Touch the ⚒ Setting icon, and check if the screen changes properly. (See 4. Setting)	Once/week
3	Clean the LCD with touch panel	Move to the Cleaning mode, and clean the LCD with touch panel (stylus) by soft cloth. (3.2.5 Cleaning mode)	Once/week
4	Time correction (UTC)	Check the difference between recorder clock and GPS clock, and if any difference, correct it by Setting the Date/Time. (See 4.2.1 Date and time setting)	Once/week
5	Touch pen Calibration	Adjust the touch pen position. (See 4.2.2 Touch screen calibration)	As needed
6	Safekeeping the logging data	Every one calendar month, transfer the logging data from onboard memory to SD memory card.(See 6.2 Safekeeping the logging data)	Once/month

6.2   Safekeeping the logged data

Once every calendar month, transfer the logged data from onboard memory to SD memory card. (See 3.3 External SD memory card operations)

1) Move from Operation mode display to various setting display by touching the ⚒ Setting icon.

2) Move from Various setting display to External SD memory card operation mode by touching the [SD] SD memory card icon.
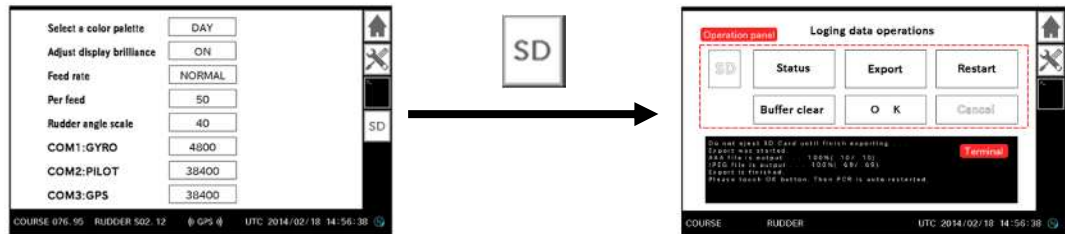
3) Insert SD memory card into SD memory card slot.

4) Check the SD card space by touching the [Status] icon.

```
Normal mode : Making file are counts = 35Days
Fast mode : Making file are counts = 32Days
```
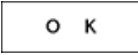
5) Load the File Export by touching the [Export] icon. Then, it becomes ready to start writing.

```
File Export.
If all files are expoted. Then PLR is auto restarted
Total Export size are xxx MBytes
(OK/Cancel)
```

6) Touch the [O K] icon, and start writing to the SD memory card.

```
Export was started.
AAA file is output ... 100%( 74/ 74)
JPEG file is output ... 88%( 238/ 270)
```
```
Export was started.
AAA file is output ... 100%( 74/ 74)
JPEG file is output ... 100%( 270/ 270)
Export is finished.
Please touch OK button. Then PLR is auto reseted.
```

7) After the export, touch the [O K] icon, and restart the system.

6.3　Delete the logged data

Delete the onboard memory and make free space for 1 month recording.

See 3.2.6 Operating SD memory card mode

Note

・　When the onboard memory becomes full, the recorder will stop logging the data.
・　Export the data and clear the buffer once every month.

Note
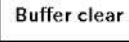
・When the onboard memory becomes full, error code 030 or 040 appears in (((GPS))) area.

・If these codes appear, export the data and clear the buffer..

1) Move from Operation mode display to Various setting display by touching the ✂ Setting icon.
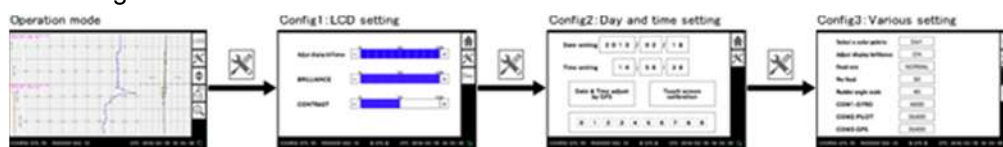
2) Move from Various setting display to External SD memory card operation mode by touching the SD SD memory card icon.
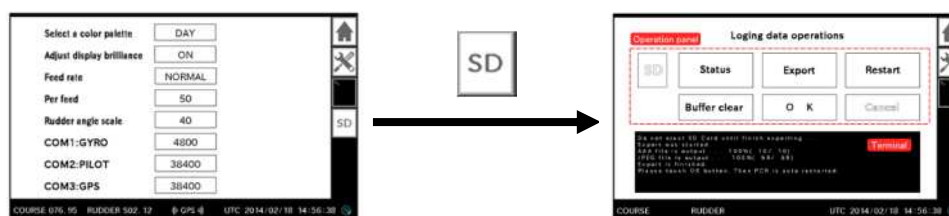
3) Start clearing the buffer by touching the Buffer clear icon.

Buffer clear.
All files are removed. Next Disk is formated.
Then PLR is auto reseted.

4) After clearing the buffer, touch the O K icon, and restart the system.

6.4   Formatting SD memory card

To format your SD memory card, use SD Formatter by SD Association.

Download

https://www.sdcard.org/downloads/formatter_4/

Output setting of SD Formatter

Format type   : Full(Overwrite)

Format size adjustment   : ON

Note

Select the file system FAT32.
Paper-less Course Recorder cannot read NTFS, exFAT format.
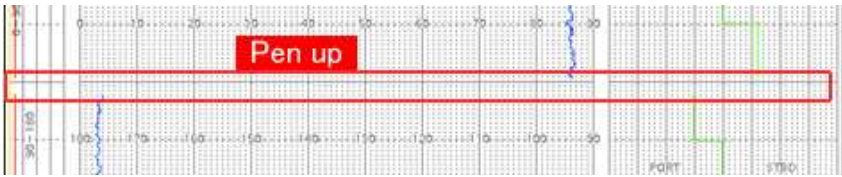
Note

Use only specified SD memory card by Yokogawa Denshikiki.
Using other SD memory card may cause the logging data being lost.

7. Troubleshooting

7.1   Error contents and countermeasure

	Error Contents	Presumption Cause	Countermeasure
1	After power is ON, Status display LED and LCD with touch panel are not power ON	Power supply fail	Check the voltage of U,V terminal by tester
		Fuse element is cut down	Check the Fuse element
		LCD display automatically power off	Touch the LCD display Or, make power OFF and ON
2	After power is ON, Status display LED is lit but LCD with touch panel is not power ON	Touch panel fail	Please contact service dept.
3	Key switch is available but LCD with touch panel is not activated.	Touch panel fail	・Turn power OFF and ON ・Please contact service dept.
4	After power is ON, "Onboard memory: Not detect" appears and the chart is not displayed.	Onboard memory failure	・Turn power OFF and ON ・If the problem persists, please contact service dept.
5	Touch ✖ Setting icon but display does not change	Touch panel fail	・Turn power OFF and ON ・Startup with Calibration mode by pressing "SET" key with power ON. ・If the problem persists, please contact service dept.

	Error Contents	Presumption Cause	Countermeasure
6	COURSE ***.** RUDDER ***.** UTC 2014/02/18 14:56:38 Ⓕ		
	Pen up the Course COURSE ***.**	Heading signal input fail	・Check the cable connection (Signal polarity) ・Check the signal output from Gyro compass.
	Pen up the Rudder RUDDER ***.**	Rudder signal input fail	・Check the cable connection (Signal polarity) ・Check the signal output from Auto pilot.
	Pen up the GPS ((GPS))	GPS signal input fail	・Check the cable connection (Signal polarity) ・Check the signal output from GPS.
7	COURSE 076.95 RUDDER S02.12 ((GPS)) UTC 2014/02/18 14:56:38 Ⓕ COURSE 076.95 RUDDER S02.12 SD_ALM:001 UTC 2014/02/18 14:56:38 Ⓝ		
	Ⓝ Ⓕ Spinner is stopped.	・Hung-up the unit ・CPU error	・Power off and restart the unit ・Please contact to service dept.
	SD_ALM:001 Alarm informed	・Onboard memory error ・SD memory card error	Check the 7.2 Error message
8	Push any switch but not active. ・SET Switch ・NEXT Switch ・MENU Switch	Switch error	Please contact service dept.
9	Blackout or Whiteout the display.	Set the dimmer to maximum or minimum level. (See 4.1 Setting 1: LCD setting)	Startup with Backlight Default by pressing "NEXT" key with power ON.

7.2   Error message

List of error messages and countermeasures. If the error is occurred, check the 7.2.2
Error code list.

7.2.1   Outline of error message

Error messages are indicated at the center of Margin display area. Almost alarms occur
from onboard memory and SD memory card error.

COURSE 234.75 RUDDER P09.50   SD_ALM:001   UTC 2013/05/20 12:34:56

Error display

Any error is indicated with three-digit number, Ex "001".

1) Alarm is not indicated on Calibration mode and serial terminal mode.

2) "SD_ALM" is indicated with three-digit number.

If three-digit number as "0" then onboard memory error and "1" as SD memory card
error.

Example 1) "OM_ALM:013" : Onboard memory error

Example 2) "SD_ALM:163" : SD memory card error

7.2.2   Error code list

Error code	Error Contents	Presumption Cause	Countermeasure
003	Memory buffer full data (Information)	Reached the end of chart paper	Copy the logging data to SD memory card, after clean up the onboard memory
010	Plot file open error	Onboard memory failure	Please contact to service dept.
011	Plot file seek error		
012	Plot file write error (For 1st making)		
013	Plot file write error (For usual)		
014	Plot file write error (manual write)		
015	Plot file load error		
020	Search file open error		
021	Search file write error (For 1st making)		
022	Search file seek error		
023	Search file write error		
024	Search file load error		

Error code	Error Contents	Presumption Cause	Countermeasure
040	Maximum file No. on the onboard memory (Information)	Reached the maximum file No.	Copy the logging data to SD memory card, after clean up the onboard memory
041	Logging file open error	Onboard memory failure	Please contact service dept.
042	Next logging file open (Information)	One logging file reach the one million data	Create new file automatically and continue the logging
043	Clock data making error	Onboard memory failure	Please contact service dept.
044	Logging file write error		
050	line.dat file open error		
051	line.dat file seek error		
052	line.dat file write error		
053	line.dat file load error		

Error code	Error Contents	Presumption Cause	Countermeasure
080 180	Export operation : logging file open error	AAA encryption data output operation ・SD memory card failure	Use the new SD memory card In case of the SD card slot failure, please contact service dept.
081 181	Export operation : file output error		
082 182	Export operation : file write error		
083 183	Export operation : plot.bin file open error	JPEG image file output operation ・SD memory card failure	Use the new SD memory card In case of the SD card slot failure, please contact service dept.
084 184	Export operation : file output error		
085 185	Export operation : file write error		

Error code	Error Contents	Presumption Cause	Countermeasure
086	Delete plot.bin under Buffer Clear	System failure	Please contact to service dept.
087	Delete search.dat under Buffer Clear		
088	Delete Rudder chat folder under Buffer Clear		
089	Delete logging file under Buffer Clear		
090	Delete logging file folder under Buffer Clear		
091	Delete line.dat under Buffer Clear		

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8. Installation

8.1 Installation

8.1.1 Installation

● **Install the recorder indoors in a location that meets the following conditions.**

・ **Minimum Mechanical Vibrations**

Choose an installation location with the minimal mechanical vibration.

Installing the recorder in a location with large mechanical vibration not only causes adverse effects on the equipment, but may also hinder normal recording.

・ **Horizontal installation**

Install the recorder horizontally (However, the recorder can be inclined reclined up to 30 degrees for panel mounting).

Note

・ Condensation may occur if the recorder is moved to another place where both the ambient temperature and humidity are higher, or if the temperature changes rapidly. In addition, measurement errors will occur, when using thermocouples. In this case, let the recorder adjust to the new environment for at least one hour before using it.

● **Do not install the recorder in the following places.**

・ **Outdoors**

・ **In Direct Sunlight or Near Heat Sources**
Install the recorder in a place with small temperature fluctuations near room temperature (23℃). Placing the recorder in direct sunlight or near heat appliances can cause adverse effects on the internal circuitry.

・ **Where an Excessive Amount of Soot, Steam, Moisture, Dust, or Corrosive Gases are present.**
Soot, steam, moisture, dust, and corrosive gases will adversely affect the recorder. Avoid such locations.

・ **Near Strong Magnetic Field Sources**
Do not bring magnets or instruments that produce electromagnetic fields close to the recorder.
Operating the recorder in strong magnetic fields can cause errors in the measurements.

8.1.2   Installation Procedure

Mount the recorder on a steel panel between 2 mm and 26 mm thick.

[Panel-mount type]

    1. Install the course recorder on the front of the panel.

    2. Insert four M5 screws into the bezel on the panel.

[Wall-mount type]

    1. Insert four M8 screws into the bezel on the panel.

8.2   Wiring

Before wiring the instrument, be sure to read the following.

8.2.1   Power Supply Wiring

(1) Turn the power off and remove the course recorder from panel or recorder's body first.

(2) Connect the power cable to the power supply terminals.

- To prevent the possibility of electric shock, ensure that the main power supply switch is turned off.
- Before switching on the power, be sure to ground the protective ground terminal using a ground resistance of 100 Ω or less.
- Install a switch in the power supply line to enable the instrument to be isolated from the main power supply.

Switch specifications	
Steady-state current rating:	More than 0.5 A
Rush current rating:	More than 10 A

- Connect a fuse in the power supply line.
  2 A to 15 A

8.2.2 Input Signal Wiring

(1) Turn the power switch off and remove the course recorder from panel or body first.
(2) Connect the input wires to the input terminals.

■Take steps to ensure that noise does not get into the measurement circuit.

TERMINAL CONNECTIONS

U	V		+	−	COM	+	−	+	−
U	V		S1 RA	S1 RB	S1 RC	S2 RA	S2 RB	S3 RA	S3 RB
1	2	3	4	5	6	7	8	9	10

POWER SUPPLY

GYRO SIGNAL INPUT

SIGNAL GRAND

AUTO PILOT SIGNAL INPUT

GPS SIGNAL INPUT
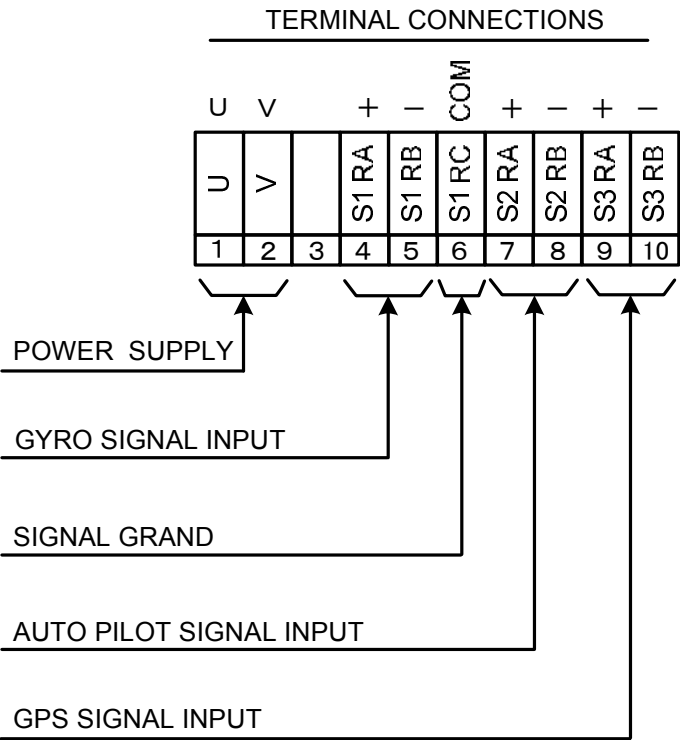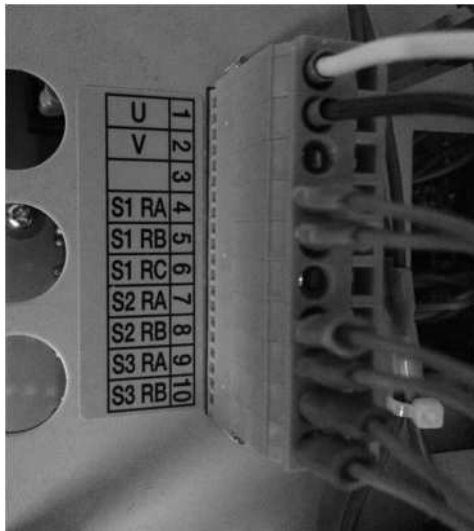
⚠ To prevent the risk of an electric shock, insure that the main power supply switch is turned off.

■The method of wiring

 (1) Insert a tool into the driver hole and push the spring inside.

 (2) Insert a cable into the cable hole and remove the tool.

  (do not clamp the covering of cable)

 (3) Make sure cables are connected securely.
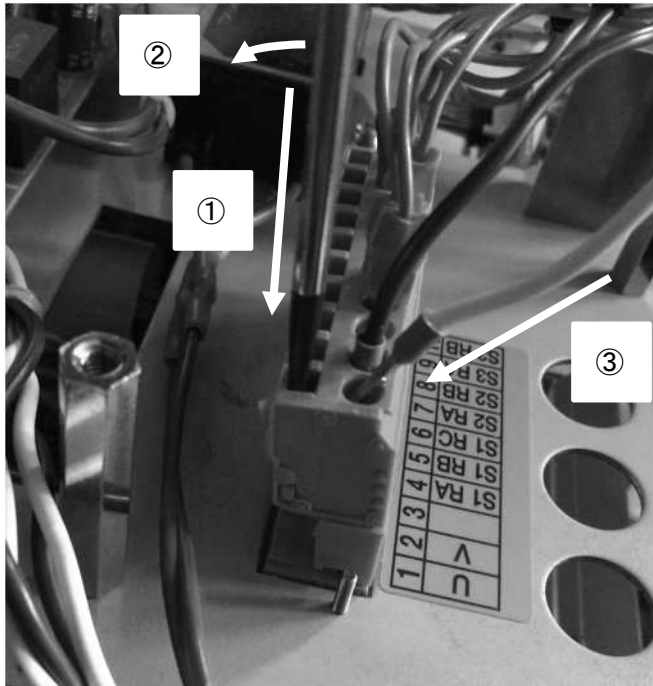
8.3 Installation Procedure（First Start Up Procedure）

Set Dip switch according to the specification

Check the working condition of connected devices (i.e. Gyro, Autopilot, GPS)

Setting the Dip switch

5.5 Dip Switch setting

Dip switch

Open the back cover, and set the switch.

Connect the power supply and signal cable.

8.2 Wiring

Cable connecting terminal

Unit power ON.

3.1 Startup and Shutdown

Input signal setting.

4.3 Setting 3: Various setting

Power switch

Checking the start recording.

3.2 Operation mode

Setting icon

By touching the setting icon, various settings and Date/Time can be set.

Day, Time setting

4.2.1 Date and time setting

Blank Page

Appendix-1 Block Diagram
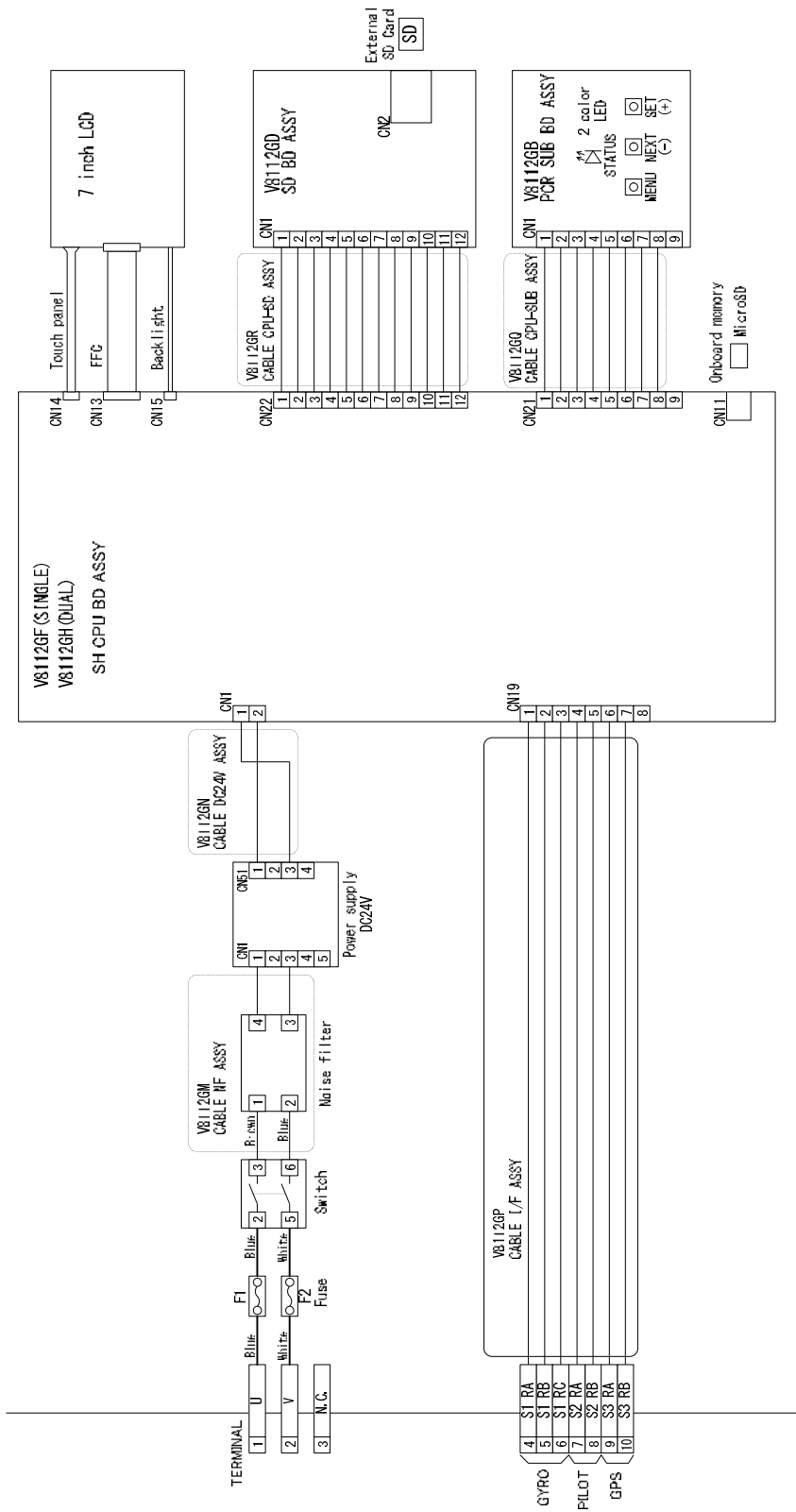
Appendix-2 Components List
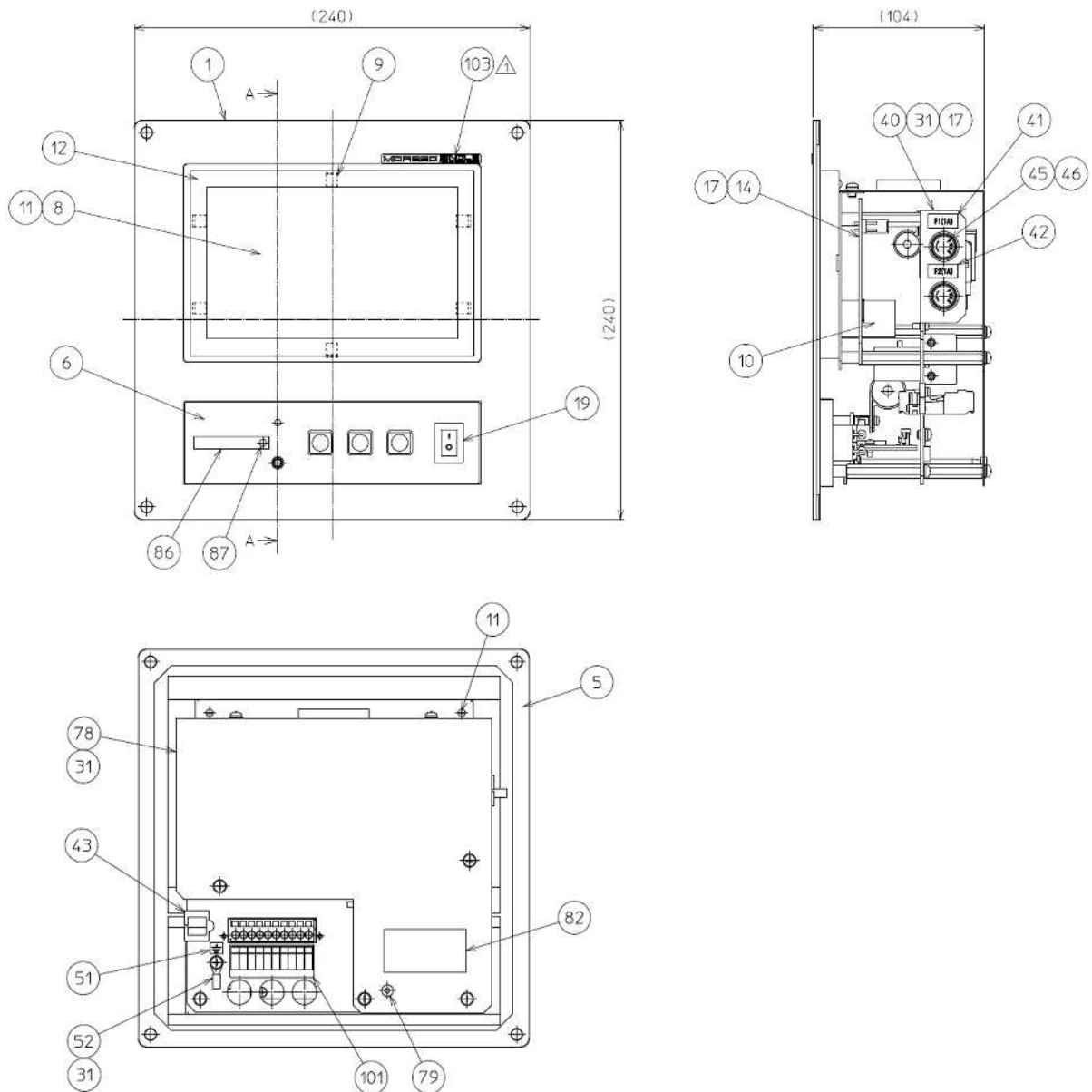
No	PARTS NAME	PART NO.	No	PARTS NAME	PART NO.
1	BEZEL (CC24)	V8112HA	14	CPU BD (SINGLE)	V8112GF
1	BEZEL (2.5G7/2)	V8112HB	14	CPU BD (DUAL)	V8112GH
1	BEZEL (7.5BG7/2)	V8112HC	45	FUSE (AGB 250V 1A)	A1288EF
8	LCD	V8817JU	85	PEN	V8112HU
11	TAPPING SCREW	Y9005TS	86	CAP	V8112HS
12	LCD FRAME ASSY	V8225SB	87	NYLON RIVBET	V8810UP

SECTION D-D
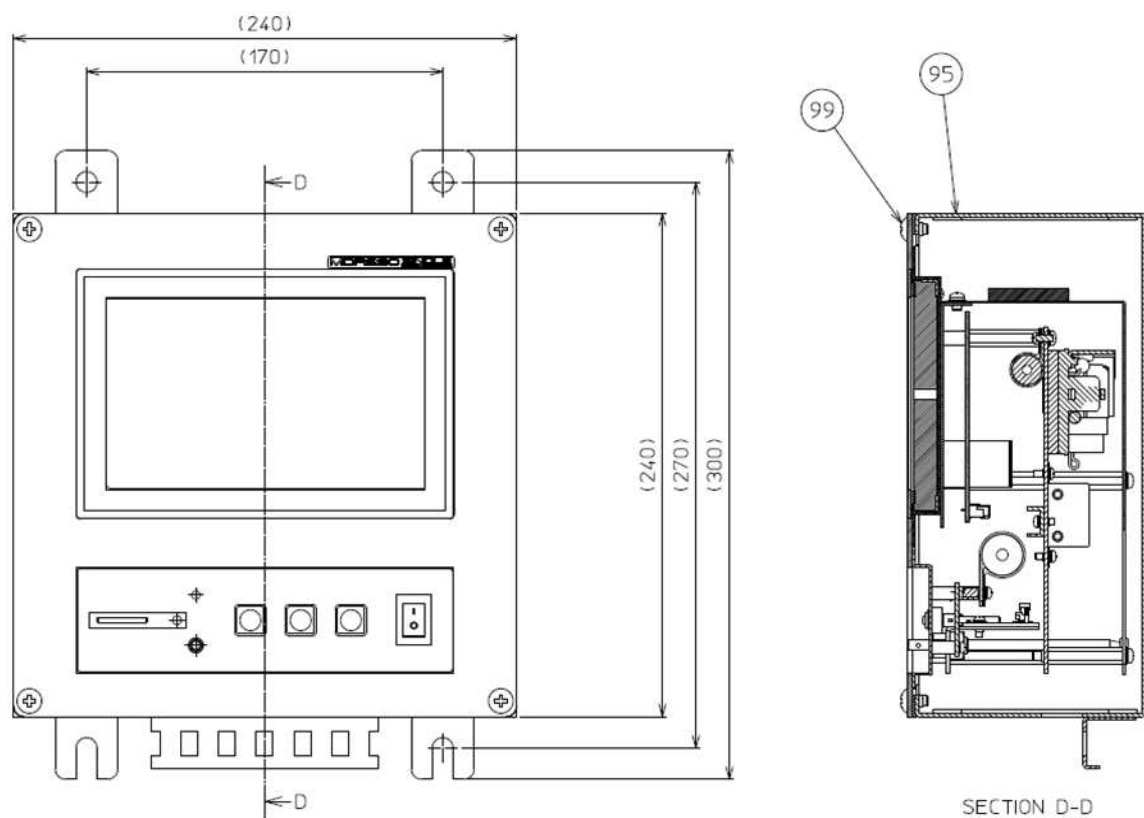
No	PARTS NAME	PART NO.	No	PARTS NAME	PART NO.
99	SCREW	V8813BT	95	BOX (CC24)	V8112JA
			95	BOX (2.5G7/2)	V8112JB
			95	BOX (7.5BG7/2)	V8112JC

Front   Back
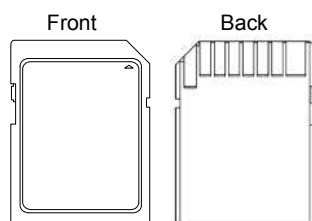
No	PARTS NAME	PART NO.	No	PARTS NAME	PART NO.
93	SD MEMORY CARD (IC MEDIA)	A1005NL			

Appendix-3 Serial Signal Format

■ Paper-less Course Recorder regular data format

Data Type	Input
Heading (Gyro input)	$xxHDT / $HEHRC, $HCHRC / $xxTHS (Talker ID：EI, GA, GP, HE, HC, HN. II, IN)
Rudder angle (Pilot input)	$AGRSA
Time (GPS input (IEC61162-1))	$GPZDA

■ IEC61162-1 (NMEA) sentence

● HDT

Data field Number

| Character | $ | x x | H D T | , | x x | , | T | * | hh | < CR > | < LF > |

Header — Talker ID — Data ID — Heading, degrees true — Checksum identifier — Checksum — Terminator

● HRC

Offset from "$" 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

| Character | $ | H | E | H | R | C | x | x | x | x | x | , | -/ | x | x | x | * | h | h | < CR > | < LF > |

Header — Talker ID — Data ID — Heading xxx.xx[°] — Rate of Turn -/x.xx [degrees/second] — Checksum identifier — Checksum — Terminator

● THS

Data field Number

| Character | $ | x x | T H S | , | x x | , | T | * | hh | < CR > | < LF > |

Header — Talker ID — Data ID — Heading, degrees true — Mode indicator — Checksum identifier — Checksum — Terminator

Mode indicator
A = Autonomous
E = Estimated (dead reckoning)
M = Manual input
S = Simulator mode
V = Data not valid (including standby)

● RSA

Data field Number | 1 | 2 | 3 | 4

| Character | $ | x x | R S A | , | x.x | , | A | , | x.x | , | A | * | hh | <CR> | <LF> |

- Header
- Talker ID
- Data ID
- Starboard (or single) rudder sensor (see Notes 1 and 2)
  A = data valid,
  V = data invalid
- Port rudder sensor (see Notes 1 and 2)
  A = data valid,
  V = data invalid
- Checksum identifier
- Checksum
- Terminator
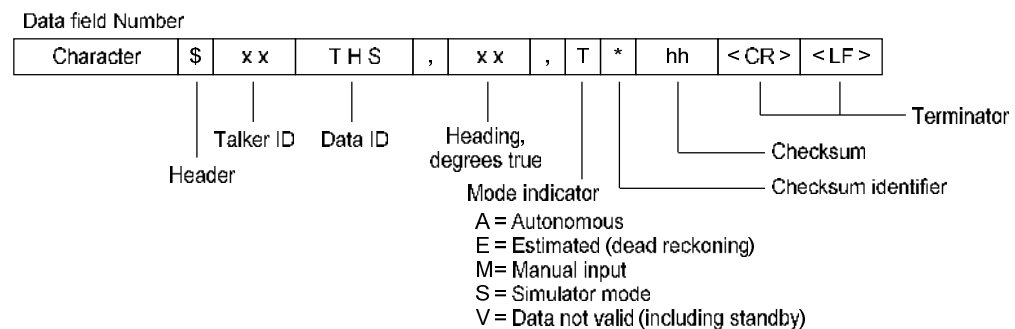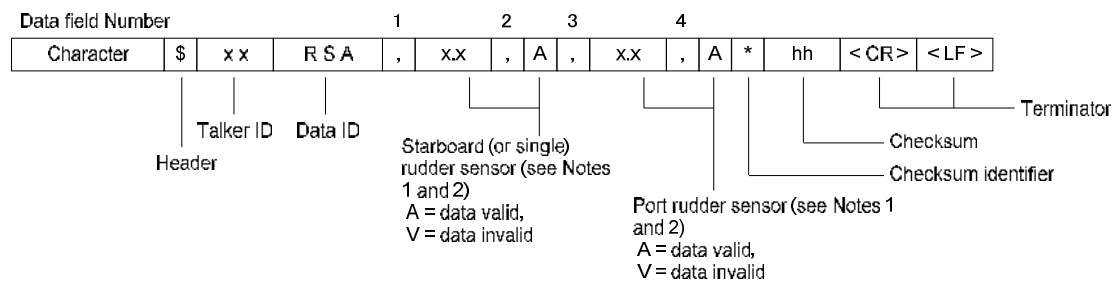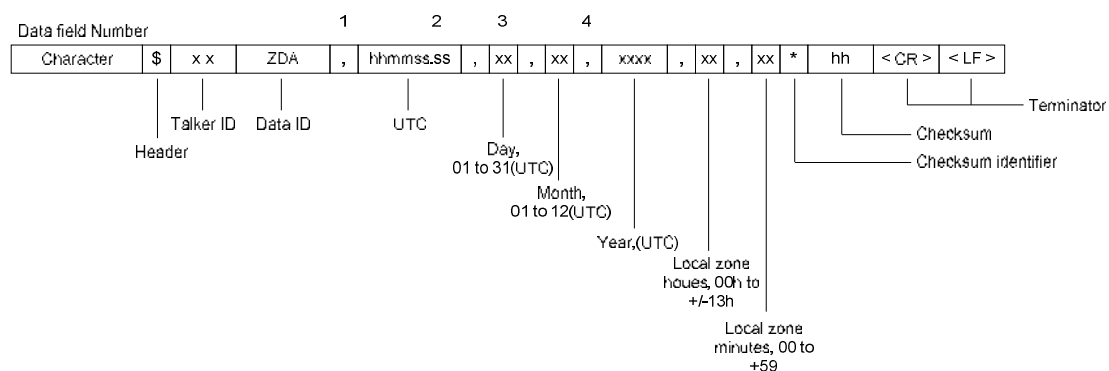
NOTE 1 Relative measurement of rudder angle without units, "-" = bow turns to port. Sensor output is proportional to rudder angle but not necessarily 1:1.

NOTE 2 The status field should not be a null field.

● ZDA

Data field Number | 1 | 2 | 3 | 4

| Character | $ | x x | ZDA | , | hhmmss.ss | , | xx | , | xx | , | xxxx | , | xx | , | xx | * | hh | <CR> | <LF> |

- Header
- Talker ID
- Data ID
- UTC
- Day, 01 to 31(UTC)
- Month, 01 to 12(UTC)
- Year,(UTC)
- Local zone houes, 00h to +/-13h
- Local zone minutes, 00 to +59
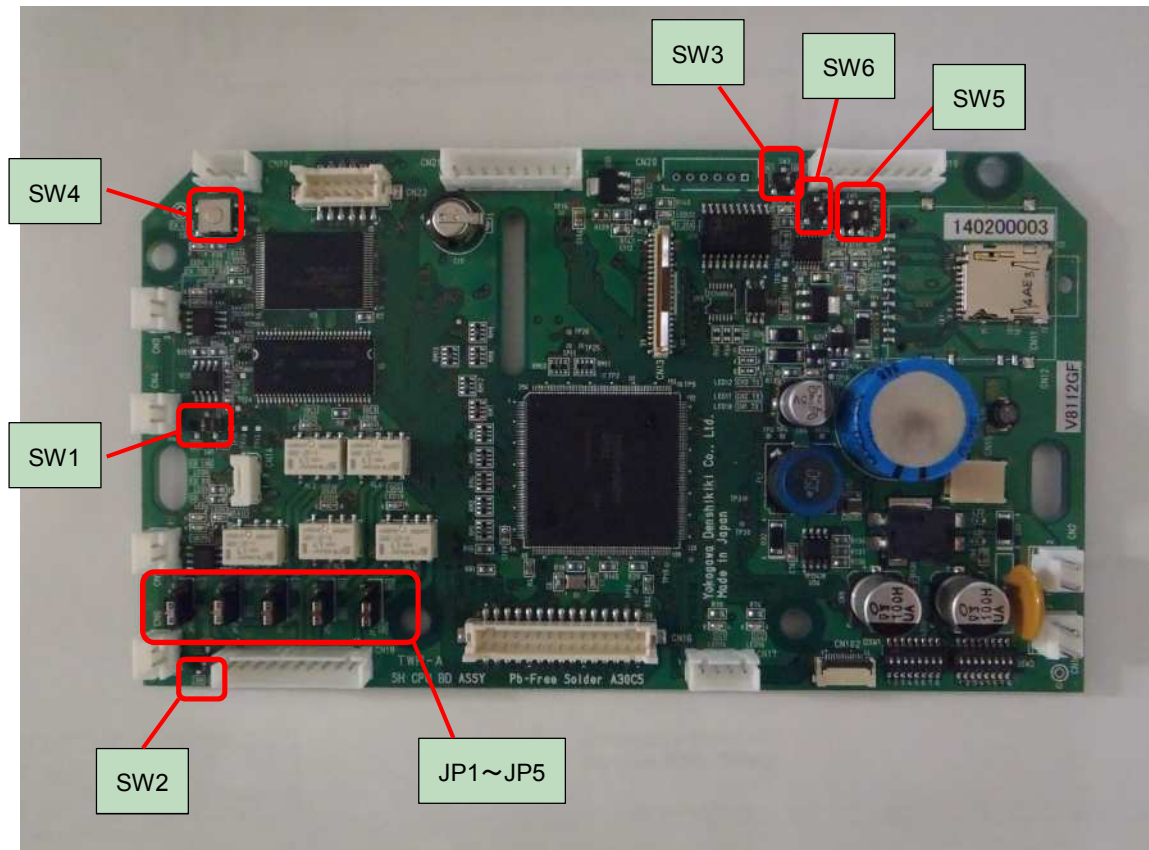- Checksum identifier
- Checksum
- Terminator

Appendix-4 Switch setting V8112GF(V8112GH)

Gyro input port has circuits selectable between IEC61162-1 and IEC61162-2.
IEC61162-1 or IEC61162-2 can be set by SW3, SW5, SW6 switch positions on the
V8112GF SH CPU BD ASSY(SINGLE), V8112GH SH CPU BD ASSY(DUAL).
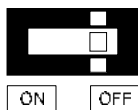
■ **PCB (V8112GF or V8112GH)**

● SW1, SW2 (Unused)

SW1	CAN A Terminator (Unused)
OFF	Not use the terminator
ON	Use the terminator

SW2	CAN B Terminator (Unused)
OFF	Not use the terminator
ON	Use the terminator

● SW3 (Effective the SW5, SW6 on -2 position)

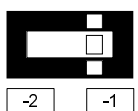| SW3	Terminator of gyro input port for
OFF	Not use the terminator (default)
ON	Use the terminator

● SW4

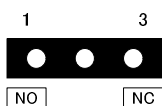| SW4	Reset switch(Hardware reset)

● SW5 (Arrange same setting both SW5 and SW6)
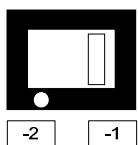
SW5	GYRO input port arrange
-1	IEC61162-1
-2	IEC61162-2

● SW6 (Arrange same setting both SW5 and SW6)

SW6	GYRO input port arrange
-1	IEC61162-1
-2	IEC61162-2

● JP1

JP1	CPU FAIL
1-2	Normal open output (default)
2-3	Normal close output

● JP2～JP5 (JP2～JP5 are spares)
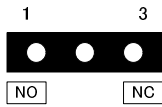
JP2	Spare
1-2	Normal open output (default)
2-3	Normal close output

JP3	Spare
1-2	Normal open output (default)
2-3	Normal close output

JP4	Spare
1-2	Normal open output (default)
2-3	Normal close output

JP5	Spare
1-2	Normal open output (default)
2-3	Normal close output

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