

FURUNO

OPERATOR'S MANUAL

VOYAGE DATA RECORDER (VDR)

Model **VR-7000**

IMPORTANT NOTICES

General

- This manual has been authored with simplified grammar, to meet the needs of international users.
- The operator of this equipment must read and follow the descriptions in this manual. Wrong operation or maintenance can cancel the warranty or cause injury.
- Do not copy any part of this manual without written permission from FURUNO.
- If this manual is lost or worn, contact your dealer about replacement.
- The contents of this manual and equipment specifications can change without notice.
- The example screens (or illustrations) shown in this manual can be different from the screens you see on your display. The screens you see depend on your system configuration and equipment settings.
- Save this manual for future reference.
- Any modification of the equipment (including software) by persons not authorized by FURUNO will cancel the warranty.
- All brand and product names are trademarks, registered trademarks or service marks of their respective holders.

How to discard this product

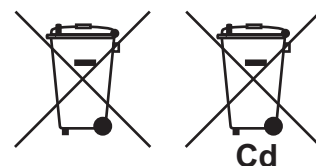
Discard this product according to local regulations for the disposal of industrial waste. For disposal in the USA, see the homepage of the Electronics Industries Alliance (<http://www.eiae.org/>) for the correct method of disposal.

How to discard a used battery

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

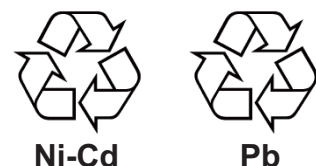
In the European Union

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



In the USA

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



In the other countries

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



SAFETY INSTRUCTIONS



WARNING

Indicates a condition that can cause death or serious injury if not avoided.



CAUTION

Indicates a condition that can cause minor or moderate injury if not avoided.



Warning, Caution



Prohibitive Action



Mandatory Action



WARNING



ELECTRICAL SHOCK HAZARD Do not open the equipment.

Only qualified personnel should work inside the equipment.



Do not disassemble or modify the equipment.

Fire, electrical shock or serious injury can result.



Immediately turn off the power (BATTERY and AC switches in that order) at the DCU and also turn off the power at the ship's mains switchboard if water leaks into the equipment or the equipment is emitting smoke or fire.

Continued use can cause fatal damage to the equipment.



Only authorized personnel shall disassemble the DRU.

Pressure may build up inside the unit when it is subjected to fire or is retrieved from a great depth.



Do not allow rain or water splash to contact the equipment.

Fire or electrical shock can result.



WARNING



Do not disassemble the battery.

Battery fluid is harmful to the eyes and skin, particularly the eyes. If the fluid contacts skin or eyes, flush area with fresh water and contact a physician immediately.



Do not dispose of the battery or acoustic beacon in fire.

Those components may burst if disposed of in fire. Further, dispose of the battery in accordance with appropriate regulations.



Do not touch any electrically conductive parts.

Touching electrically conductive parts can result in electrical shock. Use rubber gloves, etc. when conducting inspection or maintenance work.



Do not short battery terminals.

Short can lead to bursting or fire.



Use the correct fuse.

A wrong fuse can cause fire or serious damage to the equipment.

 **WARNING**



Do not wet the EPIRB of the Float-free DRU.

The wetted EPIRB may accidentally transmit a signal.

 **CAUTION**



Do not:

- use batteries of different capacities
- mix old batteries with new
- mix batteries of different makes

Batteries themselves may become damaged or damage to electrical parts may result.



Do not connect/disconnect the cable while turning the power on.

The unit may be damaged.

About the TFT LCD

The TFT LCD is constructed using the latest LCD techniques, and displays 99.99% of its pixels. The remaining 0.01% of the pixels may drop out or blink, however this is not an indication of malfunction.

WARNING LABELS

Warning labels are attached to the DCU.

Do not remove the labels. If the label is missing or damaged, contact a FURUNO agent or dealer about replacement.

 **WARNING** 

To avoid electrical shock, do not remove cover. No user-serviceable parts inside.

 **警告** 

感電の恐れあり。
サービスマン以外の方はカバーを開けないで下さい。内部には高電圧部分が多いので、万一さわると危険です。

Name: Warning Label 1
 Type: 86-003-1011-3
 Code No.: 100-236-233-10

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FOREWORD

A Word to the Owner of the VR-7000

Congratulations on your choice of the FURUNO Voyage Data Recorder (VDR) VR-7000. 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.

Your equipment is designed and constructed to meet the rigorous demands of the marine environment. However, no machine can perform its intended function unless properly installed and maintained. Please carefully read and follow the operation and maintenance procedures set forth in this manual.

We would appreciate feedback from you, the end-user, about where we are achieving our purposes.

Thank you for considering and purchasing FURUNO equipment.

What is a VDR?

A VDR records various data and events encountered aboard ship. The purpose of the VDR is to help investigators locate the causes of marine incidents.

The revised SOLAS Chapter V requires the installation of VDRs on passenger ships of 150 GT and above on all voyages and other ships of 3000 GT and above on international voyages and for newly built ships on and after 1 July, 2002.

The basic VR-7000 consists of a Data Collecting Unit (DCU), a Data Recording Unit (DRU), a Remote Alarm Panel (RAP), a video LAN converter, a sensor adapter and microphones to record bridge audio. A Junction Box (JB) is optional. The DCU contains the Data Processor Unit, interface modules and backup batteries. It collects data from sensors as required by the IMO and IEC standards. The DCU processes the incoming data and information in the order of occurrence while old data is overwritten with new data for storage in the DRU for 48 hours. The batteries supply power to the DCU to record bridge audio for two hours in case of a ship's mains power failure.

The flash memory in the DRU stores the data coming from the DCU. All essential navigation and status data including bridge conversation, VHF communications, and radar images are recorded. The data can be retrieved by using playback software for investigation after an incident.

The Fixed DRU components are embodied in a protective capsule. The capsule ensures survival and recovery of the recorded data after an incident. An acoustical pinger helps locate the Fixed DRU underwater.

The Float-free DRU components are embodied in the bracket. When the Float-free DRU sinks to depths of up to four meters, the capsule automatically comes off from the bracket then floats on the sea surface. A signal helps locate the Float-free DRU.

Features

The main features of the VR-7000 are as shown below.

- Color LCD with remote alarm panel.
- Meets IEC 61996-1 Ed.2, IEC 61162-1 Ed.4 2010-11, IEC 61162-2 Ed.1, IEC 61162-450 Ed.1, IEC 60945 Ed.4.
- Reliable and fast data exchange between DCU and DRU via Ethernet.
- Fixed DRU and Float-free DRU with 48 hours recording.
- Compatible with remote maintenance.
- Recorded data can be analyzed and monitored on shore.
- Software updating from a PC connected to Ethernet.
- Long term device for storage (720 hours recording) and retrieval of data.

Program No.

VR-7010 DCU: 2450102-01.XX

VR-7017 RAP: 2450103-01.XX

XX: Minor change

Fonts

The “iwata open type” font is used for the Remote Alarm Panel VR-7017.

Open Source Software

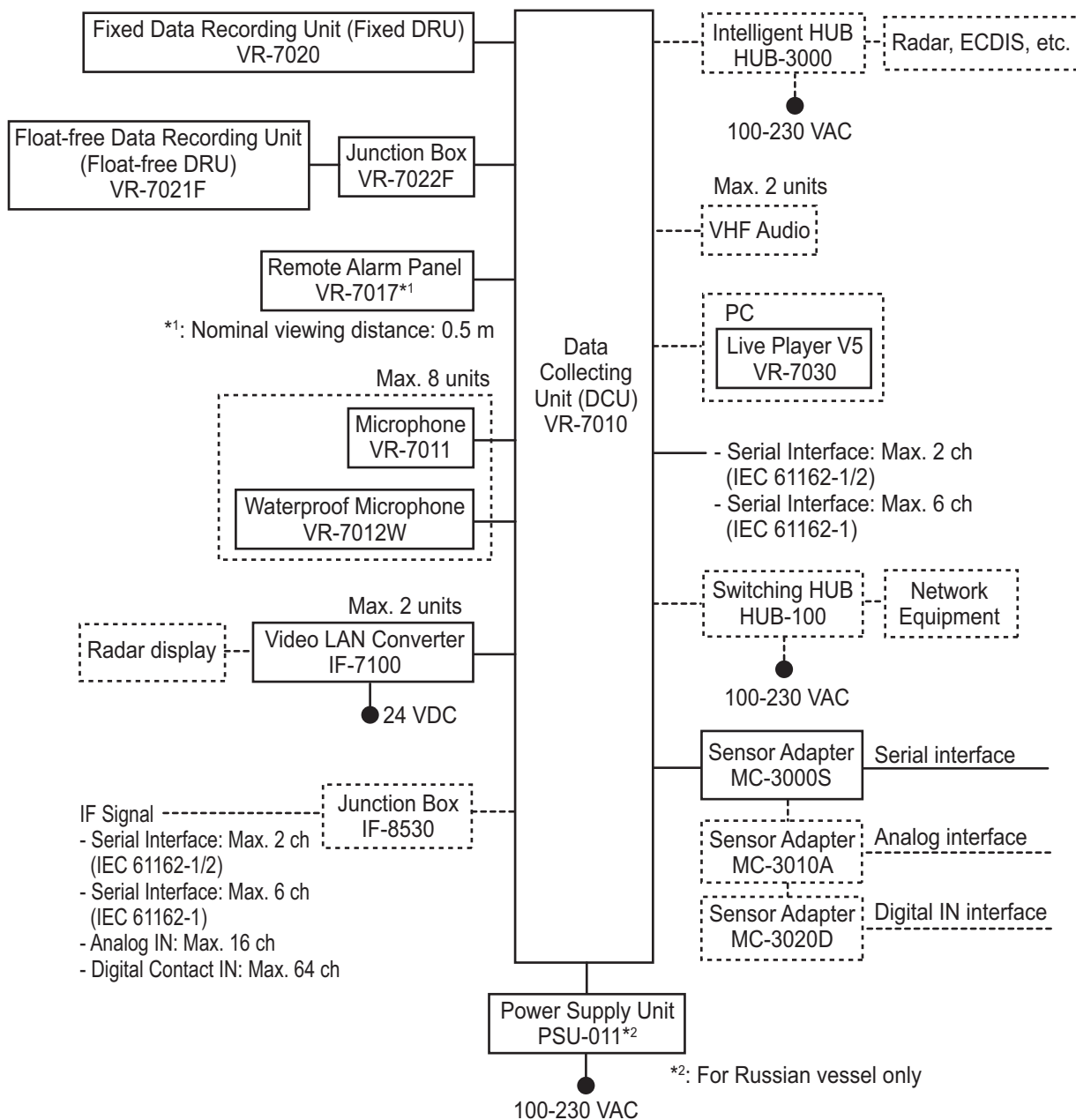
This product includes software to be licensed under the GNU General Public License (GPL), GNU Lesser General Public License (LGPL), BSD, Apache, MIT and others. The program(s) is/are free software(s), and you can copy it and/or redistribute it and/or modify it under the terms of the GPL or LGPL as published by the Free Software Foundation. Please access to the following URL if you need source codes: https://www.furuno.co.jp/cgi/cnt_oss_e01.cgi

Reverse engineering

Reverse engineering (reverse assemble, reverse compiler) of the software of this equipment is strictly prohibited.

SYSTEM CONFIGURATION

Basic configuration is shown with solid line.



Environmental category

All units (other than VR-7021F, VR-7022F, VR-7012W and VR-7020)	Protected from the weather
VR-7021F	Portable
VR-7022F, VR-7012W, VR-7020	Exposed to the weather

1. OPERATION

1.1 Overview

The VR-7000 consists of a Data Collecting Unit (DCU), Data Recording Units (Fixed DRU and Float-free DRU), Remote Alarm Panel (RAP), Video LAN Converter, Sensor Adapter and bridge microphone units. The VDR system continuously stores data for at least the last 48 hours onto the Flash Memory in the capsule, erasing the oldest data stored as new data is recorded. The data to be recorded includes the following:

Data to be recorded	IEC 61162 formatter
Date and time	ZDA
Ship's position and datum used	GNS and DTM
Speed (water and/or ground)	VBW
Heading (true)	HDT
Heading (magnetic)	HDG
AIS-VHF data-link message	VDM
AIS-VHF data-link own-vessel message	VDO
Depth (echo sounder)	DPT
Alerts and Alarms	ACN, ALC, ALF, ALR
Rudder sensor angle	RSA
Rudder order status	ROR
Heading/track control command	HTC
Heading/track control data	HTD
Engine order/response	RPM, XDR
Hull openings, watertight doors	XDR
Accelerations and hull stress	HSS, XDR
Wind speed and direction	MWV
VDR alert output	ALF, ALC
Heartbeat supervision sentence	HBT

Power supply precaution

If ship's mains power source (100-230 VAC) and emergency source fail, the VR-7000 continues to record bridge audio for two hours from backup batteries.

Continuity of storing data

The VDR should be provided with power to store data for over 48 hours (for Fixed DRU and Float-free DRU) or over 720 hours (for long term device of the DCU) on a first-in, first-out basis. Recording is terminated only under the following conditions:

- During essential maintenance while the vessel is in port.
- When the vessel is laid-up.

Data Collecting Unit

The DCU mainly consists of a Data Processor Unit and Power Control Panel. The DCU includes batteries with a lifetime of approximately four years. The DCU collects the data from various sensors radar/ECDIS and records them in the Fixed DRU, Float-free DRU and internal long term device.

1. OPERATION

Recording interval of data and audio is as follows:

- Radar/ECDIS video signal: every 15 seconds
- Bridge and VHF audio: real time
- IEC sentences: when received
- Analog and digital data: every second

You can select one or two 512-GB SSD(s) as internal long term device(s). When selecting one SSD, you can add another one using an optional SSD kit later.

No. of pcs	Storage time	Video signal channels recorded at the same time
1 SSD	720 hours	Up to 3 channels
2 SSDs		Up to 4 channels

Data Recording Unit

Fixed DRU

The Fixed Data Recording Unit is housed in a highly visible protective capsule which can withstand a fire of 1,100°C for one hour and deep-sea pressure of 6,000 m.

The underwater acoustic beacon (pinger) on the capsule automatically transmits 10 ms pulses at 37.5 kHz for at least 90 days when it is submerged in water. The expected life of the beacon is three years. The Fixed DRU is connected to the Data Collecting Unit (DCU) with a non-halogen Ethernet cable.

Float-free DRU

The Float-free Data Recording Unit has the same functionality and shape of an EPIRB (Emergency Position-Indicating Radio Beacon).

The Float-free DRU rests in a bracket. When the Float-free DRU sinks to depths of up to four meters, the capsule is automatically released from the bracket then floats on the sea surface. At the same time, the Float-free DRU transmits 406 or 121.5 MHz signal. The Float-free DRU is connected to the Data Collecting Unit (DCU) with a non-halogen Ethernet cable.

Data items to be recorded

Date and time: Date and time are obtained from an external GPS navigator referenced to UTC. Time information is recorded at intervals of a second. When an external GPS navigator is not available, a signal is recorded with a built-in clock in the DCU.

Ship's position and datum used: Latitude, longitude and datum are obtained from a GPS navigator, Loran-C receiver or other EPFS or INS available on standard digital interface. The source of data is identifiable on playback.

Speed (water and/or ground): Speed through the water (STW) or speed over the ground (SOG) is recorded at intervals of 1 s. The resolution is 0.1 kn. Transverse speed is also indicated when available on board.

Heading (true, magnetic): Heading is recorded at intervals of 1 s to a resolution of 0.1°. The data is labeled G (gyrocompass), GPS, GLONASS, MAG. If heading information is not available in IEC 61162 format, an appropriate interface may be necessary.

Depth (echo sounder): Depth under keel up to a resolution of 0.1 m as available on the ship is recorded.

Alarms: The status of all IMO mandatory alarms is recorded individually with ID number and time stamp. Audible alarms from the alarm units are stored simultaneously by the bridge audio microphones.

Rudder order/response: Rudder order and response angles are recorded up to a resolution of 1° as available on the ship. The rudder information is recorded. If more than one rudder is provided, the circuitry can be duplicated.

Engine order/response: The DCU obtains the engine order and response from the engine telegraph or direct engine control. The signal level is normally 0-10 V. The engine parameters with shaft revolution and ahead/astern indicators are recorded to a resolution of 1 rpm. All order and response from bow, stern, thruster, tunnel thrusters and controllable pitch propellers shall be recorded.

Hull openings, watertight doors: Inputs digital or RS-422 serial can be connected individually. The data is received at intervals of 1 s and stored with time stamps. Serial data sentence XDR is received at a data rate of 1,200-9,600 bps.

Accelerations and hull stresses: The DCU obtains signals from appropriate hull stress and response monitoring devices. The inputs are recorded individually and stored with time stamps. Serial data sentence XDR is received at a data rate of 1,200-9,600 bps.

Wind speed and direction: The DCU obtains the signal from appropriate wind speed and direction sensor. The inputs are recorded individually and stored with time stamps. Serial data sentence XDR is received at the data rate of 1,200-9,600 bps.

VDR alarm output: If, as an option, such messages are sent then the appropriate sentence formats are ALF and ALC.

Radar/ECDIS data: Radar/ECDIS image is recorded in the Fixed DRU, Float-free DRU and long term device via the LAN or the video LAN converter. Range rings, EBLs, VRMs, plotting symbols, radar maps, parts of SENC, voyage plan, and other essential navigational indications are included in the recorded radar image. Own ship's mark and position (latitude and longitude), course, speed, voyage plan, and other essential navigational indications are included in the recorded ECDIS image. One complete picture frame is captured at intervals of 15 s.

The radar display complying with IEC 60936-1 should have a buffered output (VESA DMTS compatible) with resolutions between 640×480 and 1600×1200. The ECDIS display complying with IEC 61174 should have a buffered output with resolutions between 1280×1024 and 1600×1200. Radar/ECDIS display can be directly connected with the video LAN converter. Radar/ECDIS display complying with IEC 61162-450 can be directly recorded to the VDR with the LAN connection. Scanning may be interlaced or non-interlaced.

Bridge audio: Up to eight microphones are supplied as standard to record conversation at conning station, radar display and chart table. If possible, the microphones should be positioned to capture the audio from the intercom, public address system, and audible alarms on the bridge. Microphone captures conversation in the bridge, audio signals from equipment and sound from machinery. The microphone generates a test beep every 12 hours which is also recorded. The microphone picks up audio signals ranging from 150 to 6000 Hz.

Communications audio: A maximum of two VHF communications are recorded for both transmitted and received audio signals.

1.2 Operating Procedure

The VDR comes with a key to lock the DCU to protect against any unauthorized access. The key must be kept securely after installation.

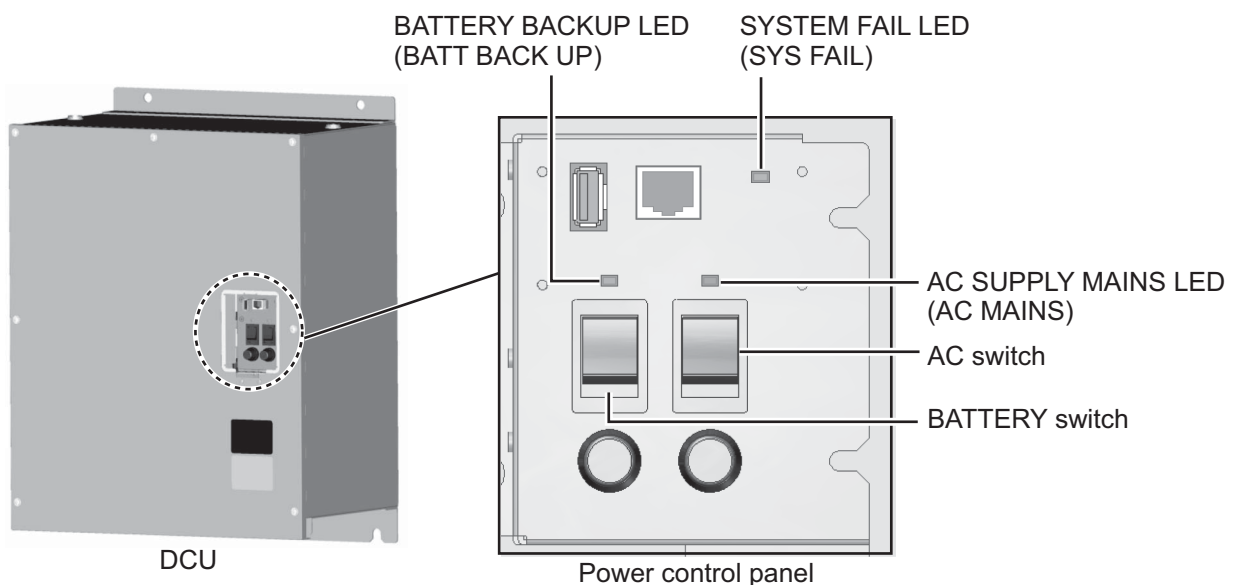
Note 1: Do not exert force on the opened DCU door. Force can damage the door.

Note 2: After the power to the DCU is turned off, wait at least 10 seconds before reapplying the power.

1.2.1 How to turn the power on then record the data

DCU

On the power control panel in the DCU, turn on the AC and BATTERY switches in that order. Confirm that the AC SUPPLY MAINS LED and BATTERY BACKUP LED on the power control panel light. Data is automatically recorded in the Fixed DRU, Float-free DRU and long term device.



Note 1: When turning the power on at temperatures of 0 °C or lower, the DCU must be warmed before it can be operated, which takes a maximum of 30 minutes. The error message may appear on the screen of the VR-7017, however, this is not abnormal.

Note 2: If the VR-7000 system fails to start, it may be restarted.

IF-7100

The video LAN converter converts the radar video signal to the LAN signal.

Turn the power on/off for the IF-7100 and the equipment connected to the IF-7100 (i.e. processor unit for radar or ECDIS) in the following order. Otherwise the IF-7100 may not function properly.

Power-on: Turn on the IF-7100 and the connected equipment in that order.

Power-off: Turn off the connected equipment and the IF-7100 in that order.

1.2.2 How to stop recording

Recording is terminated only under the following conditions:

- During essential maintenance while the vessel is in port.
- When the vessel is laid-up.

To stop recording, turn off the BATTERY and AC switches in that order. DO NOT turn off the system by the main breaker while the BATTERY switch is on. If this is done, the system operates on the batteries. The system stops after running on batteries after two hours.

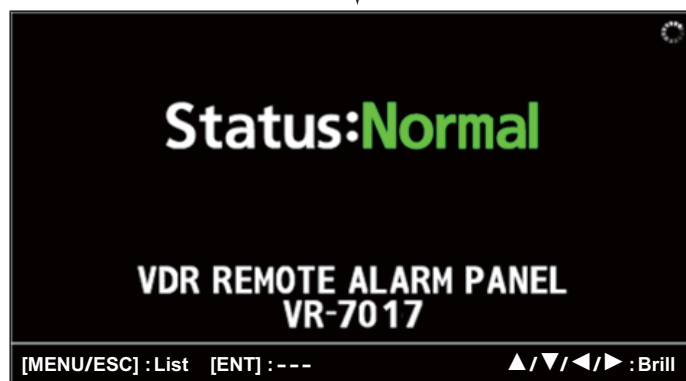
1.3 Operation on Remote Alarm Panel

1.3.1 Start screen and base screen

No power switch is provided on the Remote Alarm Panel; it is turned on and off by the power switch on the DCU. After the boot program screen appears, the start screen appears followed by the base screen.



Start screen



Base screen

Note: When the DCU does not boot normally, it takes a maximum of 10 minutes to display the base screen. The error message "DCU No Connection" appears on the screen.

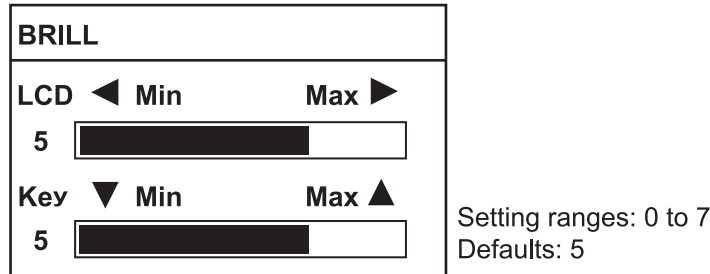
1.3.2 Controls



Control	Function
 BRILL	Short press: Displays the [BRILL] setting window. Long press: Restores the brilliance of the LCD and keys to default.
 ACK	• Stops the flashing of the alert list. • Silences the alert buzzer.
 TEST	Opens the test menu.
 Extract	Extracts the recorded data to the external media.
 MENU/ESC	Short press: Opens/closes the menu, returns one layer in menu operation. Long press: Returns to the base screen except in pop-up displays (e.g. key beep, extraction related, etc.) and tests.
 ENT	• Confirms a selection. • Silences the alert buzzer when there are unacknowledged alerts. (The alert buzzer sounds again in 30 seconds after the buzzer stops.)
 Cursorpad	Short press: Selects a menu item, switches the page, adjusts the brilliance of the LCD and keys when the [BRILL] setting window opens. Long press: Moves the cursor continuously.

1.3.3 How to adjust the brilliance of the LCD and keys

1. Press the **BRILL** key to show the [BRILL] setting window.



2. To adjust the brilliance, use the cursorpad; ◀ or ▶ for the LCD, ▲ or ▼ for the keys.
3. Press the **ENT** or **MENU/ESC** key to close the setting window.

1.3.4 Alert list

The alert list provides information about active alerts.

Alert List			
			1/ 2
	Alert ID	Alert Name	Time of last change
!	412324	No.08 Sensor(LAN	15:24:37
!	412323	No.07 Sensor(LAN	15:24:37
!	412322	No.06 Sensor(LAN	15:24:37
!	412321	No.05 Sensor(LAN	15:24:37
!	412320	No.04 Sensor(LAN	15:24:37
[MENU/ESC] : List [ENT] : Input ◀/▶ : Page ▲/▼ : Select			

The list has multiple pages when more than five alerts are active. To view other alerts, use the cursorpad (◀ or ▶). The flashing cycle is 0.5 seconds.

To see the detailed information for an alert, use the cursorpad (▲ or ▼) to select the alert then press the **ENT** key.

Alert Detail		
Alert ID	Alert Name	Description
412324	No.02 Sensor(LAN	02 sensor(LAN) channel has not received correct format data from a connected sensor (LAN) device. Reconnect sensor(LAN) data. Check failed device.
[MENU/ESC] : Back ▲/▼ : Scroll		

Use the cursorpad (▲ or ▼) to scroll the screen to see the hidden information.

Press the **MENU/ESC** key to close the detailed information screen.

All alerts are rectified, the base screen appears.

1.3.5 Main menu overview

1. Press the **MENU/ESC** key to open the main menu on the base screen.
2. Use the cursorpad (▲ or ▼) to select a menu item then press the **ENT** key.

Serial Monitor Sensor(LAN) Monitor Analog Monitor Digital Monitor Image Capture Status Audio Monitor Life Parts List Status Monitor Key Beep

1. OPERATION

[Serial Monitor]

You can monitor the sensor information input to the serial channels.

Serial Channel Select			◀ 1 (SI01 - SI30) ▶
SI01:GPS	SI11:XXXXX	SI21:XXXXX	
SI02:XXXXX	SI12:XXXXX	SI22:XXXXX	
SI03:XXXXX	SI13:XXXXX	SI23:XXXXX	
SI04:XXXXX	SI14:XXXXX	SI24:XXXXX	
SI05:XXXXX	SI15:XXXXX	SI25:XXXXX	
SI06:XXXXX	SI16:XXXXX	SI26:XXXXX	
SI07:XXXXX	SI17:XXXXX	SI27:XXXXX	
SI08:XXXXX	SI18:XXXXX	SI28:XXXXX	
SI09:XXXXX	SI19:XXXXX	SI29:XXXXX	
SI10:XXXXX	SI20:XXXXX	SI30:XXXXX	
[MENU/ESC] : Back [ENT] : Input ▲/▼/◀/▶ : Select			

To shift the page,
use the cursorpad
(◀ or ▶).

To see the information for a serial channel, use the cursorpad to select a serial channel (SI01 to SI72) then press the **ENT** key to show the serial monitor screen. The latest received data is displayed on the top of the screen.

Serial Monitor		◀ SI01 ▶
\$GPZDA.104523.4582.23.12.2012.09.00+54		
\$GPGNS.104523.477.3434.000.N.13510222.E.N.01.1.1.5.0.-2.3.4.1.0+3A		
\$GPDTM.W84.0.0.1.N.1.0.W.2.0.W72+46		
\$GPVTG.176.T.180.0.M.1.0.N.1.8.K.A+3C		
[MENU/ESC] : Back [ENT] : Stop ◀/▶ : Select		

To switch the channel,
use the cursorpad
(◀ or ▶).

Press the **ENT** key to stop the serial display. To restart the serial display, press the **ENT** key again.

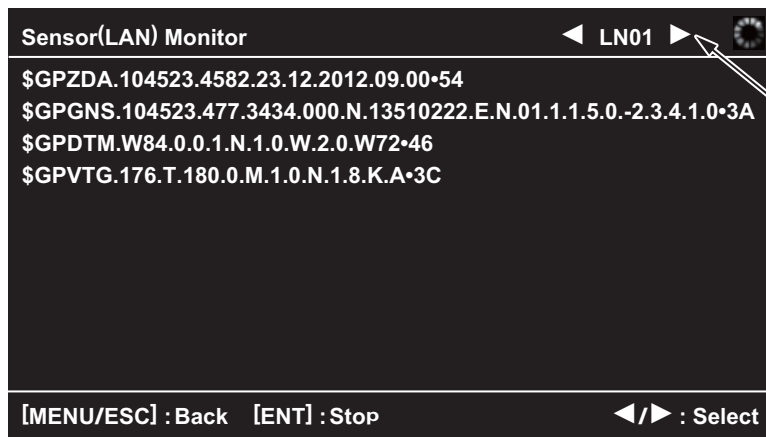
[Sensor(LAN) Monitor]

You can monitor the sensor information input to the LAN channels.

Sensor(LAN) Channel Select			◀ 1 (LN01 - LN30) ▶
LN01:GPS	LN11:XXXXX	LN21:XXXXX	
LN02:XXXXX	LN12:XXXXX	LN22:XXXXX	
LN03:XXXXX	LN13:XXXXX	LN23:XXXXX	
LN04:XXXXX	LN14:XXXXX	LN24:XXXXX	
LN05:XXXXX	LN15:XXXXX	LN25:XXXXX	
LN06:XXXXX	LN16:XXXXX	LN26:XXXXX	
LN07:XXXXX	LN17:XXXXX	LN27:XXXXX	
LN08:XXXXX	LN18:XXXXX	LN28:XXXXX	
LN09:XXXXX	LN19:XXXXX	LN29:XXXXX	
LN10:XXXXX	LN20:XXXXX	LN30:XXXXX	
[MENU/ESC] : Back [ENT] : Input ▲/▼/◀/▶ : Select			

To shift the page,
use the cursorpad
(◀ or ▶).

To see the information for a sensor(LAN) channel, use the cursorpad to select a sensor(LAN) channel (LN01 to LN64) then press the **ENT** key to show the sensor (LAN) monitor screen. The latest received data is displayed on the top of the screen.

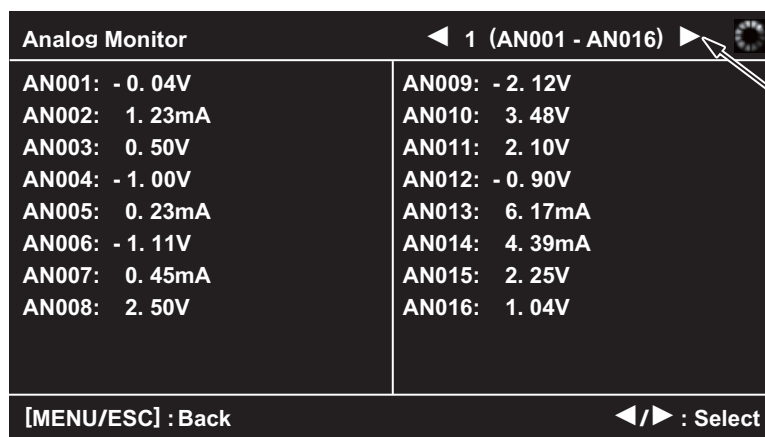


To switch the channel, use the cursorpad (◀ or ▶).

Press the **ENT** key to stop the sensor display. To restart the sensor display, press the **ENT** key again.

[Analog Monitor]

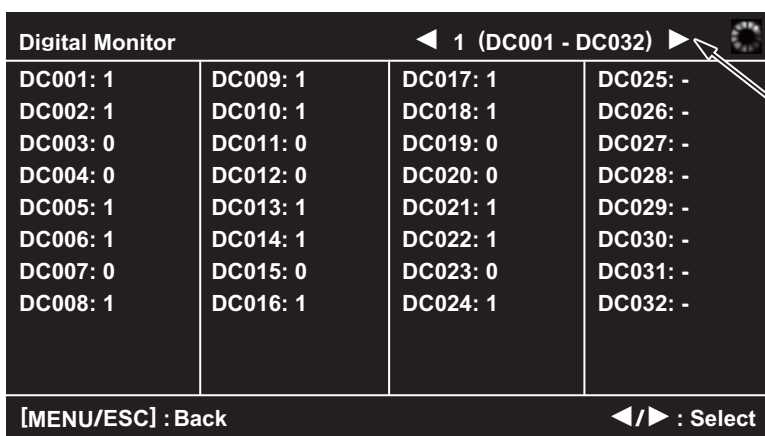
You can monitor the sensor information input to the analog channels (AN001 to AN120).



To switch the channel, use the cursorpad (◀ or ▶).

[Digital Monitor]

You can monitor the sensor information input to the digital channels (DC001 to DC640).



To switch the channel, use the cursorpad (◀ or ▶).

1. OPERATION

[Image Capture Status]

You can monitor the information of the images recorded in the DCU. The information for the image captures (the time and date when the image is captured to the VDR, captured image size, etc.) are updated.

Image Capture Status			
RADAR1	RADAR2	ECDIS	CH4
Captured Time: 01/09/2014 10:30:20	Captured Time: 01/09/2014 10:30:20	Captured Time: 01/09/2014 10:30:20	Captured Time: 01/09/2014 10:30:20
Source: Xband.1	Source: Sband.1	Source: ECDIS.1	Source: ECDIS.1
Location: MFD0	Location: MFD0	Location: MFD0	Location: MFD0
Active: Yes	Active: Yes	Active: Yes	Active: Yes
Resolution: 1280x1024	Resolution: 1280x1024	Resolution: 1280x1024	Resolution: 1280x1024
[MENU/ESC] : Back			

[Audio Monitor]

You can check the status of the microphones and communications equipment (VHF, etc.).

Audio Monitor				
VHF1	VHF2	MIC1	MIC2	MIC3
Status: ---	Status: ---	Status: MIC TestOK	Status: MIC TestNG	Status: Not Connected
Level: □□□□□	Level: □□□□□	Level: ■■■■■	Level: ■■■■□	Level: □□□□□
MIC4	MIC5	MIC6	MIC7	MIC8
Status: MIC TestOK	Status: MIC TestNG	Status: MIC TestNG	Status: Not Connected	Status: MIC TestOK
Level: ■■■■□	Level: ■■■■□	Level: ■■■■□	Level: □□□□□	Level: ■■■■□
[MENU/ESC] : Back				

← Microphone/VHF volume level

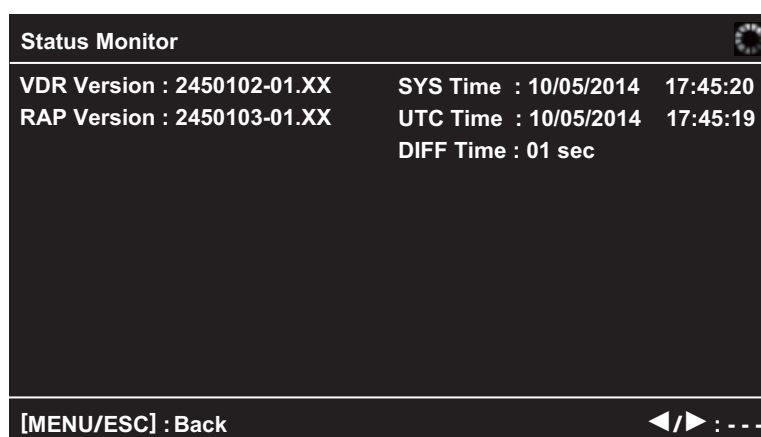
[Life Parts List]

You can check the lifetimes of the parts.

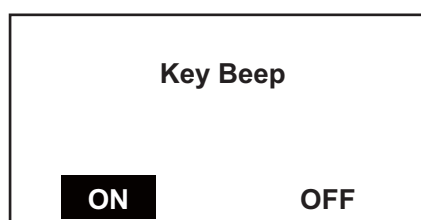
Life Parts List			◀ 1 / 1 ▶
Type No.	Status	Expiry Date	
VR-7020 Acoustic B	OK	2014/08	When there are multiple pages, use the cursorpad (◀ or ▶) to shift the page.
VR-7021F HRU	OK	2014/08	
VR-7021F Battery M	OK	2014/08	
VR-7010 Battery	OK	2014/08	
[MENU/ESC] : Back			◀/▶ : ---

[Status Monitor]

You can see the status of the system.

**[Key Beep]**

When you operate a key, a single beep sounds. If you do not need the key beep, you can deactivate the beep sound. Use the cursorpad (◀ or ▶) to select [OFF] then press the **ENT** key.

**1.3.6 How to extract the recorded data to an external media**

Do the following to extract data to a USB flash memory.

Note 1: Do not remove the long term device(s) from the DCU unless authorized to do so. Extract the recorded data to the external media (a USB, etc.).

Note 2: To ensure smooth extraction of data to a USB flash memory, do the extraction when the ship is stopped. Vibration, pitching, rolling, etc. can prevent smooth extraction.

Note 3: All data in a USB flash memory is deleted.

Note 4: Use a USB flash memory formatted with FAT32. The USB flash memories in the table below have been tested:

Maker	Type	Capacity
Silicon Power	MARVELMO116GB	16 GB
HIDISK	HDFU101S128G3	128 GB
TOSHIBA	UHYBS-032GH	32 GB
SanDisk	SDCZ33-064G-J57	64 GB
I/O DATA	U3-AL16G/DS	16 GB
ELECOM	MF-MSU3A04GBK	4 GB
UNISERB	PEUSB2-32G	32 GB

1. OPERATION

Note 5: Remove the USB flash memory only after the extraction is completed. Removing it during extraction may corrupt data in the next extraction. Further, abnormal data is played back.

1. Open the DCU door with its key.
2. Insert a USB flash memory to the USB port.
3. Press the **Extract** key on the RAP.

Source Select
Long Term Device
Float DRU

4. Use the cursorpad (▲ or ▼) to select the data source from [Long Term Device] or [Float DRU] then press the **ENT** key.

[Long Term Device]: Long term device(s) in the DCU

[Float DRU]: Float-free DRU

Note 1: This function is not available for a Fixed DRU.

Note 2: Select [Long Term Device] unless extracting the data from the long term device(s) in the DCU.

The setting window shown in the right figure appears.

Period Select
▲
1 hour
▼
(1~12) hour

5. Use the cursorpad (▲ or ▼) to set the extraction time* (1 to 12 hour(s)) then press the **ENT** key.

*: Backdated data is extracted, starting from the moment the **ENT** key was pressed.

The following window that indicates the extraction data size and disk space appears.

Extract Size/Disk Space	
xxx, xxx, xxx, xxx byte/	
xxx, xxx, xxx, xxx byte	← Disk space is displayed in red when it is smaller than extraction data size.

Note: If the following window appears, check that the USB flash memory is properly inserted and is formatted to FAT32. Then press the **ENT** key and restart the procedure from step 4.

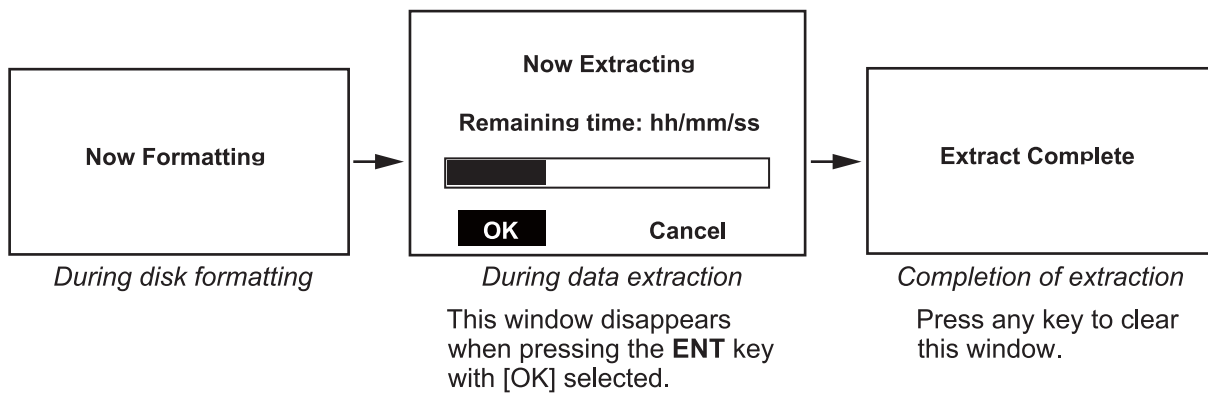
Medium Error!
Check xxxxx Medium

xxxxx: recording or user

6. Press the **ENT** key. The confirmation window appears.

User Disk Format?
Yes
No

7. Use the cursorpad (◀ or ▶) to select [Yes] then press the **ENT** key. The window changes as follow.



Note 1: If an error occurs during disk formatting, the message "Format Error! Extract Canceled" appears. Press any key to clear the message then check the USB flash memory.

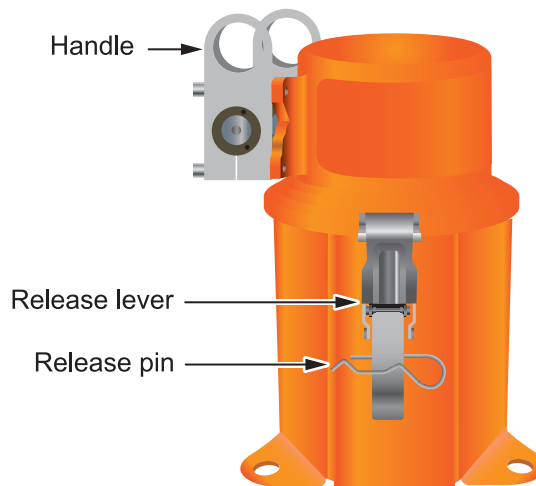
Note 2: If an error occurs during data extraction, the message "Extract Error! Extract Canceled" appears. Press any key to clear the message then check the USB flash memory.

8. Lock the DCU door after the data is extracted.

1.4 How to Release the Fixed DRU

To release the Fixed DRU from its bracket (cradle), do the following:

1. Turn off the BATTERY and AC switches in that order to turn off the DCU power.
2. Remove the release pin.
3. Lift the release lever.
4. Lift the handle to separate the top of the DRU from the bottom of the DRU.
5. Cut the cable connected between the top and bottom of the DRU.



2. MAINTENANCE

Regular maintenance is important to maintain performance. This chapter contains maintenance instructions to be followed to obtain optimum performance and the longest possible life of the equipment. Any maintenance must be executed by a suitably qualified technician.

 WARNING	NOTICE
 ELECTRICAL SHOCK HAZARD Do not open the equipment. Only qualified personnel should work inside the equipment.	Do not apply paint, anti-corrosive sealant or contact spray to coating or plastic parts of the equipment. Those items contain organic solvents that can damage coating and plastic parts, especially plastic connectors.
 Do not disassemble or modify the equipment. Fire, electrical shock or serious injury can result.	

2.1 Annual Recertification

The VDR must undergo an annual performance test to precertify suitability. This test is conducted by a test engineer authorized by the manufacturer and certified by a relevant ship classification society, the content and procedure of the test in accordance with the regulations of that society. For further details about the VDR performance test, contact your ship classification society.

2.2 Cleaning

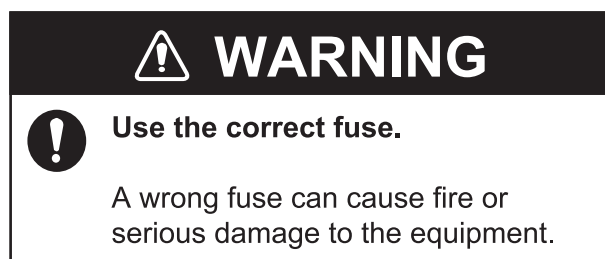
Dirt or dust may be removed from units with a soft cloth. Fresh water-moistened cloth may be used to remove stubborn dirt. DO NOT use any commercial cleaning agents to clean any unit. They can remove paint and markings.

Remote Alarm Panel VR-7017: Wipe the LCD of VR-7017 carefully to prevent scratching, using tissue paper and an LCD cleaner. To remove dirt or salt deposits, use an LCD cleaner, wiping slowly with tissue paper so as to dissolve the dirt or salt. Change paper frequently so the salt or dirt will not scratch the LCD. Do not use solvents such as thinner, acetone or benzene for cleaning. Also, do not use degreaser or anti-fog solution, as they can strip the coating from the LCD.

Waterproof Microphone VR-7012W: The watertight integrity of the microphone will be compromised if water contacts the ventilation sheet behind the MIC cover.

2.3 Fuse Replacement

The DCU VR-7010, Video LAN Converter IF-7100 and Sensor Adapter MC-3000S have fuses that protect them from high electric current and equipment fault. If you cannot turn on the power to a unit, check its fuse to see if it has blown. If the fuses for the DCU have blown, replace them with the specified fuses (see page AP-3 for the fuse location). If the fuses blow again after replacement, contact a FURUNO agent or dealer. Have a qualified technician replace the fuse for Video LAN Converter and Sensor Adapter.



Unit	Name	Type	Code No.	Remarks
VR-7010	Glass Tube Fuse	FGBO 250V 10A PBF	000-155-839-10	For battery
				For AC power
IF-7100	Glass Tube Fuse	FGMB 125V 2A PBF	000-157-479-10	
MC-3000S	Glass Tube Fuse	FGMB 125V 3A PBF	000-157-481-10	

2.4 Consumable Parts

You can check the lifetimes of the consumable parts on the RAP screen (see "[Life Parts List]" on page 10).

Unit	Name	Type	Interval	Remarks
VR-7010	Battery	CY1-1487-01	4 years	
VR-7020	Beacon	PT9 NINETY or DKM-502/90	3 years	
VR-7021F	Battery	E87457 (X-89340)	5 years	For EPIRB
	Hydrostatic Release Unit	X-86218	2 years	

Beacon and hydrostatic release unit replacement

To replace a beacon for VR-7020 or a hydrostatic release unit for VR-7021F, contact a qualified service technician.

Battery replacement

To replace a battery, contact a qualified service technician.

Note 1: Dispose of the battery in accordance with local regulations.

Note 2: When replacing the battery, disconnect the AC power cable because it may create interference.



WARNING

Battery handling precautions

- Do not attempt to disassemble the battery. If accidental skin/eye contact is made with the battery fluid, wash the affected area/part immediately with liberal amounts of clean fresh water and seek IMMEDIATE medical attention.
- DO NOT INCINERATE batteries as they are liable to rupture if placed into a fire. Batteries that have reached the end of their service life must be disposed of in accordance with appropriate regulations.
- Do not short battery terminals. Short can lead to bursting or fire.



CAUTION

Do not:

- use batteries of different capacities
- mix old batteries with new
- mix batteries of different makes

Batteries themselves may become damaged or damage to electrical parts may result.

2.5 Self Test

The self test checks the ROM, RAM, connection, program no., keyboard, LCD performance and buzzer. The user can do the tests to help the service technician in troubleshooting.

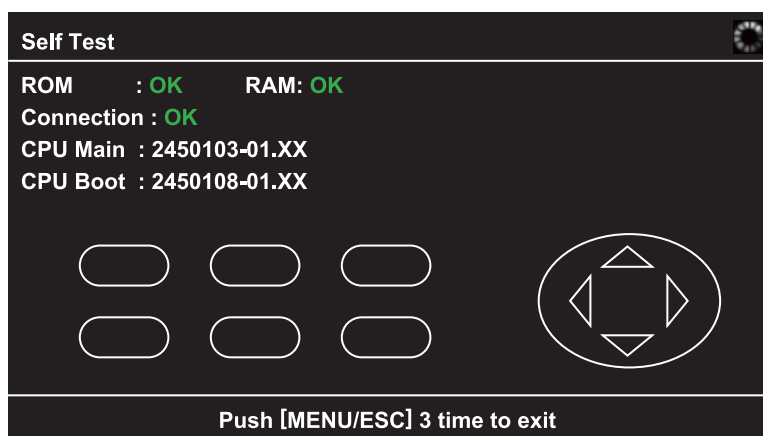
How to open the test menu

Press the **TEST** key on the RAP to show the test menu.

Self Test
LCD Test
Buzzer Test

Self test

1. Open the test menu.
2. Use the cursorpad (▲ or ▼) to select [Self Test] then press the **ENT** key.

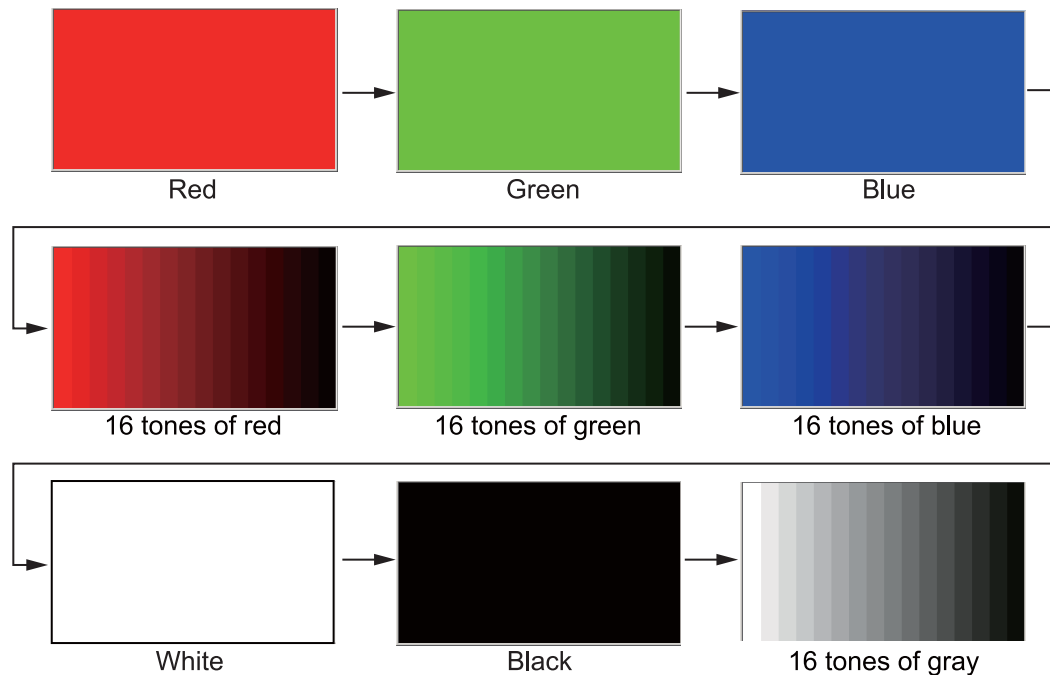


Note: The self test screen closes automatically when there is no menu operation for 60 seconds.

- Press each key one by one. A key's corresponding location on the display is colored if the key is normal.
- Press the **MENU** key three times to close the self test screen.

LCD test

- Open the test menu.
- Use the cursorpad (▲ or ▼) to select [LCD Test] then press the **ENT** key. Each press of the **ENT** key changes the LCD pattern in the sequence shown below.



Note 1: The LCD test screen closes automatically when there is no menu operation for 60 seconds.

Note 2: You can cancel the test at any time by pressing the **MENU** key.

- Press the **MENU** key to close the LCD test screen.

Buzzer test

- Open the test menu.
- Use the cursorpad (▲ or ▼) to select [Buzzer Test] then press the **ENT** key. The buzzer test window appears then a buzzer sounds for 60 seconds.

Buzzer Test
A buzzer is sounded for 60 seconds.

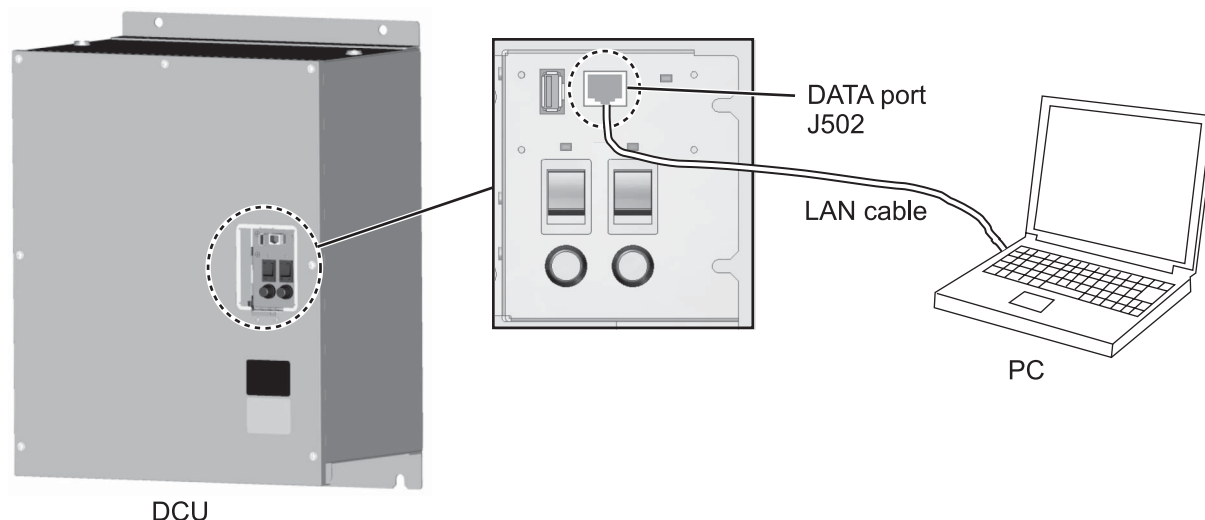
Note 1: The buzzer test window closes automatically when there is no menu operation for 60 seconds.

Note 2: You can cancel the test at any time by pressing any key.

2.6 Verification of Recording Function of the Long Term Device

Verify the long term device recording function at the annual inspection and when repairing or maintaining the VDR or sensors connected to the VDR. The verification requires the Live Player V5. Refer to its Operator's Manual for the operating procedure. Note that data cannot be extracted during recording.

1. Start the Live Player V5 on the PC.
2. Connect the LAN cable between J502 port on the DCU and the PC.



3. Open the [Tool] menu and select [Source Select].
4. Select [Long Term Device (LAN)] from the menu.
5. Click the [Analyze Track] button.
6. Click the [Connect] button.
7. Select [Extract] from the [Tool] menu to show the [Extraction] dialog box.
8. Select the track to extract.
9. Click the [Select] button and select the location where to save data.
10. Click the [Start] button.
11. After the extraction* is completed, click [OK], [Close] and [Close] in that order. Then, disconnect the cable between the PC and J502 in the DCU.

*: The time required for the extraction depends on the VDR environment and specifications of the PC to be extracted. See the table below.

Amount of extraction data	Time required for extraction	File size on the PC
1 hour	1 to 2.5 minutes	300 to 900 MB
12 hours	15 to 22 minutes	3.5 to 8 GB

3. TROUBLESHOOTING

This chapter provides information on possible causes of problems you may experience with your VDR. If you still have a problem after referring to the table, contact your dealer for further advice. Always provide the product serial number.

3.1 General Troubleshooting

Use the table below to identify the problem, cause and remedy.

Problem	Cause	Remedy
AC LED does not light.	No power from the ship's mains.	Check the breaker switches on ship's mains switchboard.
BATTERY LED does not light.	No power from the battery.	Contact your dealer.
SYSTEM FAIL LED lights in red.	System malfunction.	- Restart the system. If the problem still remains, contact your dealer. - Check integrity of DRU connection.

3.2 Alert Numbers

Below is a list of alert numbers that appear on the alert list in the RAP (see paragraph 1.3.4). Only no. 412439 alert "Fatal System Error" corresponds to warning priority and all other alerts to caution priority.

Alert no.	Alert name	Description	Action
412026	GPS Large Time Difference	This indicates that the time difference between system time and time supplied by UTC source is more than 10 seconds.	Remove the DCU cover then connect the keyboard to the monitor. Turn on the PC then open the BIOS screen. Set the BIOS time so that the time lag from the GPS receiver is within 10 seconds.
412082	RAP No Connection (DCU No Connection)	DCU: RAP is missing. Connection to RAP is lost. RAP: DCU is missing. Connection to DCU is lost.	DCU: Check cable connected to RAP. Reconnect RAP. RAP: Check cable connected to DCU. Reconnect DCU.
412083	AMS1 No Connection	AMS1 is missing. Connection to AMS1 is lost.	Check cable connected to AMS1. Reconnect AMS1.
412085	AMS2 No Connection	AMS2 is missing. Connection to AMS2 is lost.	Check cable connected to AMS2. Reconnect AMS2.
412088	JB No Connection	Indicates that Junction Box is missing.	Check cable and IP-address setting.
412170	VDR Configuration Failure	Data cannot be stored because of abnormal VDR configuration.	Restore VDR config data. If not, request service.
412171	Recording Buffer Overflow	A image exceeding a recording buffer is input.	Check or reduce the radar channels or video resolutions.

3. TROUBLESHOOTING

Alert no.	Alert name	Description	Action
412173	Fatal System Failure	Fatal system error. Reboot automatically after an error occurred.	If the error reoccurs, request service.
412175	LongTermDevice is stopped from recovering	The data cannot be recorded to the long term device more than ten minutes.	Restart VDR. If the error reoccurs, request service.
412176	FixedDRU is stopped from recovering.	The data cannot be recorded to the Fixed DRU more than ten minutes.	Restart VDR. If the error reoccurs, request service.
412177	FloatDRU is stopped from recovering.	The data cannot be recorded to the Float DRU more than ten minutes.	Restart VDR. If the error reoccurs, request service.
412214	Battery Running	AC power is down.	Reconnect AC power.
412218	MIC Test Failure	This ALERT is issued when the microphone test fails. This test can be run from Audio tab into the VDR Maintenance Viewer, and is run every 12-hours during normal operation.	Check if microphones mounted are disabled in the VDR Maintenance Viewer. If this is OK, locate the faulty microphone and check/replace it.
412234	GPS No Connection	System has not received UTC information.	Check that a valid UTC source is connected to the serial port defined as UTC source.
412246	PDU Failure	The cable between PDU and CPU block is not connected.	Reconnect cable between PDU and CPU block in DCU.
412254	Self Test Failure	System failed by the self test.	Request service.
4123xx (xx: 01 - 16)	No.xx Serial No Connection	xx serial channel has not received correct format data from a connected serial device.	Reconnect serial data. Check failed device.
4123xx (xx: 17 - 80)	No.** Sensor(LAN) No Connection (**: 01 - 64; When xx is 17, ** is 01. Both numbers for xx and ** increase one by one from here.)	** sensor(LAN) channel has not received correct format data from a connected sensor(LAN) device.	Reconnect sensor(LAN) data. Check failed device.
412401	Battery No Connection or Battery Voltage Low	No battery input or voltage is too low.	Confirm that the battery switch is turned on. If ok, recharge or replace the battery.
412431	Serial Buffer Overflow	Serial data from DCU serial channel (1 - 8ch) are not recorded to Fixed DRU, Float-free DRU and Long Term Device.	Restart VDR. If it occurs again, request service.
412432	JB Buffer Overflow	Serial, analog and digital data from Junction Box are not recorded to Fixed DRU, Float-free DRU and Long Term Device.	
412437	Fatal System Failure	Fatal system error. This indicates that VDR can not be rebooted automatically.	Restart VDR. If it does not recover, request service.
412438	System Information Error (VDR System Information Error)	VDR system information can not be acquired. Usually, this error is recovered automatically.	If error is not recovered automatically, restart VDR. If it does not recover, request service.

Alert no.	Alert name	Description	Action
412439	Fatal System Error	Temperature of CPU system is high (over 70°C).	Restart VDR. If it does not recover, request service.
412451	CPU Core Temperature High	Temperature of CPU core is high.	
412452	CPU System Temperature High (CPU Board System Temperature High)	Temperature of CPU board is high.	
412453	CPU +3.3V Voltage Error (CPU Board +3.3V Voltage Error)	Voltage error on CPU board. (+3.3 V line)	
412454	CPU +5V Voltage Error (CPU Board +5V Voltage Error)	Voltage error on CPU board. (+5 V line)	Restart VDR. If it does not recover, request service.
412455	CPU +12V Voltage Error (CPU Board +12V Voltage Error)	Voltage error on CPU board. (+12 V line)	
412456	CPU VCORE Voltage Error (CPU Board VCORE Voltage Error)	Voltage error on CPU board. (VCORE line)	
412457	CPU Battery Voltage Lower (CPU Board Battery Voltage Lower)	Voltage of battery on CPU board is low.	
412458	CPU FAN Rotation Speed Lowering	Rotation speed of CPU FAN is low.	
412459	CPU FAN No Rotation	CPU FAN stopped.	
412460	External FAN1 Rotation Speed Lowering	Rotation speed of external FAN1 is low.	
412461	External FAN1 No Rotation	External FAN1 stopped.	
412462	External FAN2 Rotation Speed Lowering	Rotation speed of external FAN2 is low.	
412463	External FAN2 No Rotation	External FAN2 stopped.	
412501	FixedDRU No Connection	Fixed DRU has been disconnected more than 600 seconds.	Connect Fixed DRU or check LOG and repair/replace.
412502	FloatDRU No Connection	Float-free DRU has been disconnected more than 600 seconds.	Connect Float-free DRU or check LOG and repair/replace.
412503	LongTermDevice No Connection	Long Term Device has been disconnected more than 600 seconds.	Connect Long Term Device or check LOG and repair/replace.

3. TROUBLESHOOTING

Alert no.	Alert name	Description	Action
412511	FixedDRU Recording Failure	Fixed DRU is unable to write.	Restart VDR.
412512	FloatDRU Recording Failure	Float-free DRU is unable to write.	
412513	LongTermDevice Recording Failure	Long Term Device is unable to write.	
412515	FixedDRU Exchanged	Fixed DRU is replaced.	
412516	FloatDRU Exchanged	Float-free DRU is replaced.	
412517	LongTermDevice Exchanged	Long Term Device is replaced.	
412518	No.1 LongTermDevice Error	No.1 Long Term Device is error.	
412519	No.2 LongTermDevice Error	No.2 Long Term Device is error.	
412521	FixedDRU Memory Shortage	Data cannot be recorded more than 48 hours.	Modify RADAR/ECDIS input image resolution.
412522	FloatDRU Memory Shortage	Data cannot be recorded more than 48 hours.	
412523	LongTermDevice Memory Shortage	Data cannot be recorded more than 720 hours.	
412525	Sensor(LAN) Buffer Overflow	Serial, analog and digital data from Sensor Adapter are not recorded to Fixed DRU, Float-free DRU and Long Term Device.	Restart VDR. If it occurs again, request service.
412527	Image(LAN) Buffer Overflow	Image data from RADAR/ECDIS are not recorded to Fixed DRU, Float-free DRU and Long Term Device.	
41253x (x: 1 - 8)	No.x Sensor Adapter No Connection (Sensor Adapter No Connection(1 - 8))	Sensor Adapter (no.x) is missing.	Check Cable and SFID setting.
412541	No.1 VIDEO LAN Converter No Connection	No.1 VIDEO LAN Converter is missing.	Check Cable and VDR Maintenance Viewer setting.
412542	No.2 VIDEO LAN Converter No Connection	No.2 VIDEO LAN Converter is missing.	
412545	Audio IF Board No Connection	Audio IF Board is missing.	
41255x (x: 1 - 4)	No.x Radar No Input Image(No.1 - No.4)	No.x Radar has been disconnected more than 150 seconds or if the stand-by 31 minutes.	Connect No.x Radar or VDR Maintenance Viewer setting and repair/replace.
41255x (x: 5 - 7)	No.* ECDIS No Input Image(No.1 - No.3) (*: 1 - 3; When x is 5, * is 1. When x is 6, * is 2. When x is 7, * is 3.)	No.* ECDIS has been disconnected more than 150 seconds or if the stand-by 31 minutes.	Connect No.* ECDIS or VDR Maintenance Viewer setting and repair/replace.
41258x (x: 1 - 3)	No.x ECDIS Attached information No Input(No.1 - No.3)	No.x ECDIS has been disconnected more than 150 seconds or if the stand-by 31 minutes. Attached information cannot be received.	Connect No.x ECDIS or VDR Maintenance Viewer setting and repair/replace.

Alert no.	Alert name	Description	Action
412601	Radar1 Recording Image No Input	Image input channel that is not valid for No.1 Radar setting is set.	VDR Maintenance Viewer setting and repair/replace.
412602	Radar2 Recording Image No Input	Image input channel that is not valid for No.2 Radar setting is set.	
412603	ECDIS Recording Image No Input	Image input channel that is not valid for ECDIS setting is set.	
412604	Additional Recording Image No Input	Image input channel that is not valid for Additional setting is set.	

APPENDIX 1 MENU ITEMS

Below are the menu items for the Remote Alarm Panel (RAP). To open this menu, press the **MENU/ESC** key.

Menu item	Function
Serial Monitor	Displays the sensor information input to the serial channels on the Serial Monitor screen.
Sensor(LAN) Monitor	Displays the sensor information input to the LAN channels on the Sensor(LAN) Monitor screen.
Analog Monitor	Displays the sensor information input to the analog channels on the Analog Monitor screen.
Digital Monitor	Displays the sensor information input to the digital channels on the Digital Monitor screen.
Image Capture Status	Displays the information of the images recorded in the DCU on the Image Capture Status screen.
Audio Monitor	Displays the status of the microphones and communications equipment (VHF, etc.) on the Audio Monitor screen.
Life Parts List	Displays the lifetimes of the parts on the Life Parts List screen.
Status Monitor	Displays the status of the system on the Status Monitor screen.
Key Beep	Turns key beep on or off. (ON, OFF)

APPENDIX 2 PARTS LIST/LOCATION

Parts list

This equipment contains complex modules in which fault diagnosis and repair down to component level are not practical (IMO A.694(17)/8.3.1). Only some discrete components are used. FURUNO Electric Co., Ltd. believes identifying these components is of no value for shipboard maintenance; therefore, they are not listed in this manual. Major modules can be located on the parts location photos on the next page.

ELECTRICAL PARTS LIST		Unit	Data Collecting Unit VR-7010
		Code No.	
PRINTED CIRCUIT BOARD			
ADP-586-31, CPU		—	
24P0135, PDU		—	
24P0137, HUB		—	
24P0137A, HUB		—	
24P0133, TB		—	
24P0141, FIL		—	
24P0138, LED		—	
24P0134, AUDIO		—	

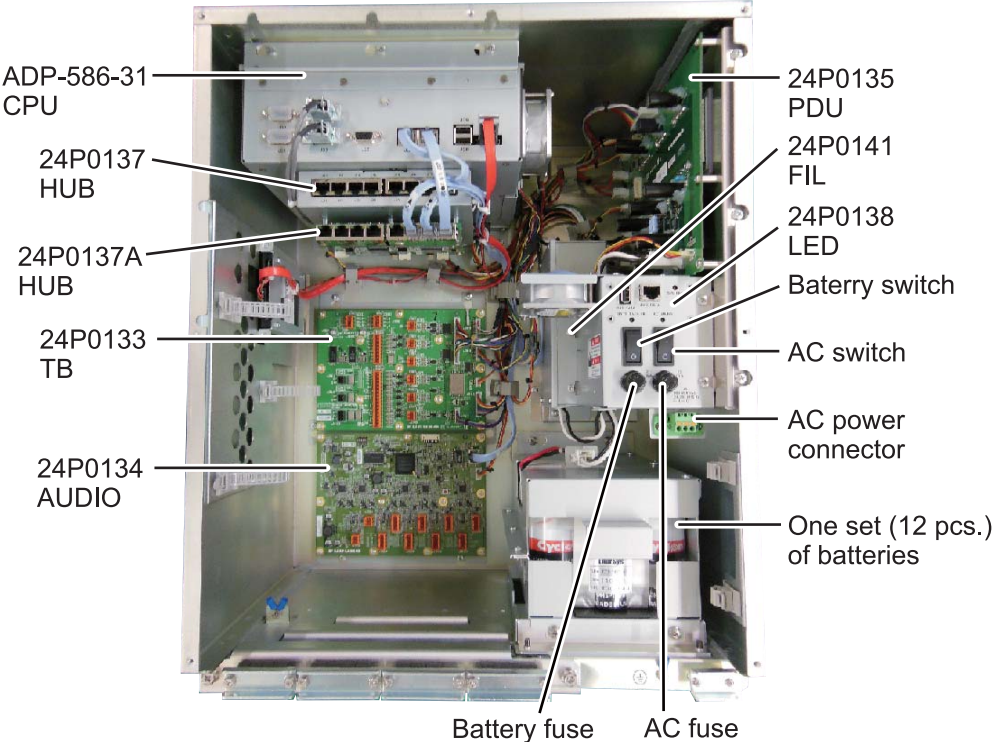
ELECTRICAL PARTS LIST		Unit	Video LAN Converter IF-7100
		Code No.	
PRINTED CIRCUIT BOARD			
24P0132, VLC		—	

ELECTRICAL PARTS LIST		Unit	Remote Alarm Panel VR-7017
		Code No.	
PRINTED CIRCUIT BOARD			
24P0139, PWR		—	
20P8200C, MAIN		—	

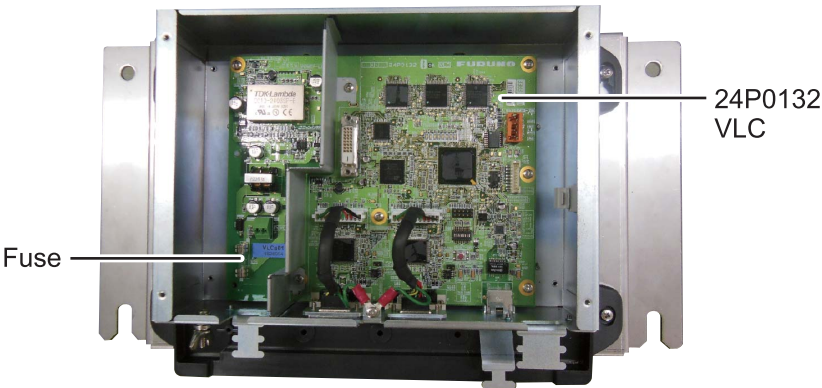
ELECTRICAL PARTS LIST		Unit	Microphone VR-7011
			Waterproof Microphone VR-7012W
		Code No.	
PRINTED CIRCUIT BOARD			
24P0136, MIC		—	

Parts location

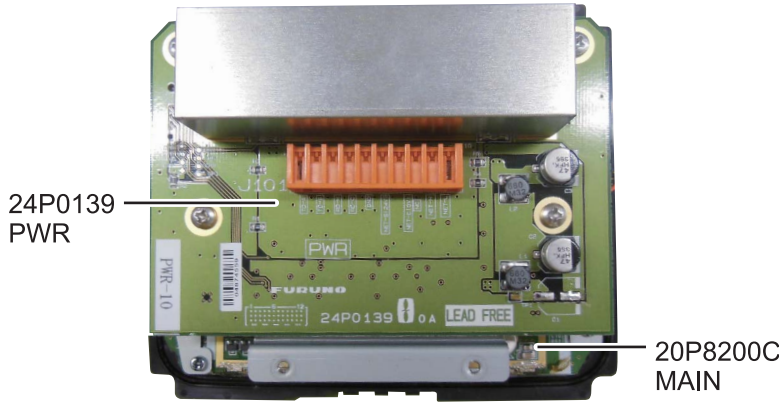
Data Collecting Unit (VR-7010)



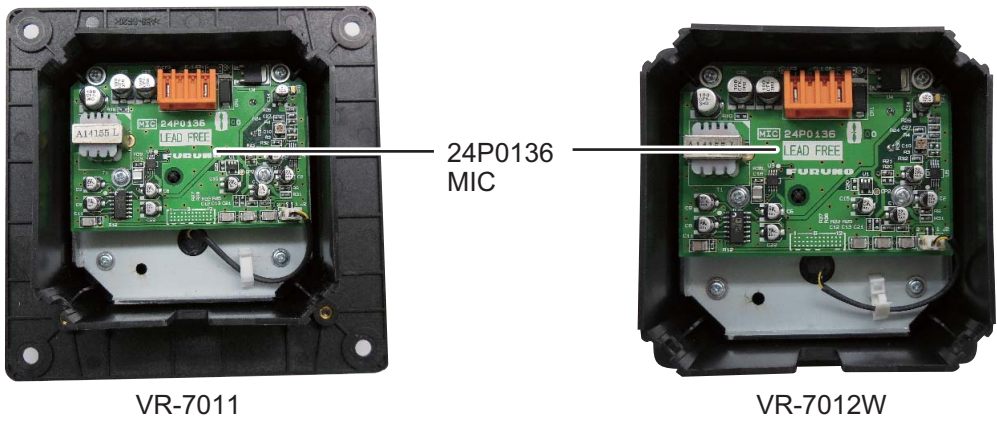
Video LAN Converter (IF-7100)



Remote Alarm Panel (VR-7017)



Microphone (VR-7011), Waterproof Microphone (VR-7012W)



APPENDIX 3 LIST OF TERMS AND ABBREVIATIONS/SYMBOLS

The following table shows the terms, abbreviations and symbols used in the VR-7000.

Terms and abbreviations

Term	Abbreviation	Term	Abbreviation
Alternate current	AC	Local Area Network	LAN
Additional	ADD	Liquid Crystal Display	LCD
Alert	ALERT	Light Emitting Diode	LED
Alarm Management System	AMS	LAN	LN
Analog Channel	AN	Main	MAIN
Audio	AUDIO	Menu	MENU
Brilliance	BRILL	Microphone	MIC
Complementary Metal-Oxide Semiconductor	CMOS	Power Distribution Unit	PDU
Central Processing Unit	CPU	Power	PWR
Digital Channel	DC	Radar	RADAR
Data Collecting Unit	DCU	Random Access Memory	RAM
Difference	DIFF	Remote Alarm Panel	RAP
Data Recording Unit	DRU	Read Only Memory	ROM
Electronic Chart Display and Information System	ECDIS	Serial	SI
Enter	ENT	Solid State Drive	SSD
Emergency Position-Indicating Radio Beacon	EPIRB	System	SYS
Escape	ESC	Terminal	TERMINAL
Fan	FAN	Universal Serial Bus	USB
Filter	FIL	Universal Time Coordinated	UTC
Global Positioning System	GPS	Voltage of Core	VCORE
Hub	HUB	Voyage Data Recorder	VDR
Identification	ID	Very High Frequency	VHF
Interface	IF	Video	VIDEO
Junction Box	JB	Video LAN Converter	VLC

Symbols

Symbols	Meaning
	Active unacknowledged warning (A flashing yellowish orange circle)
	Active acknowledged warning (A yellowish orange circle)
	Caution (A yellow square)

APPENDIX 4 PLAYING BACK RECORDED DATA

IMO Circular MSC.214(81) recommends that all VDR systems installed on or after 1 June 2008 carry software to playback data on a PC, the manual for data extraction, and the cable necessary to connect the PC to the Data Collecting Unit (DCU). Attach the supplied card holder to the front door of the DCU to store the items listed in the table below.

Items to store in the card holder

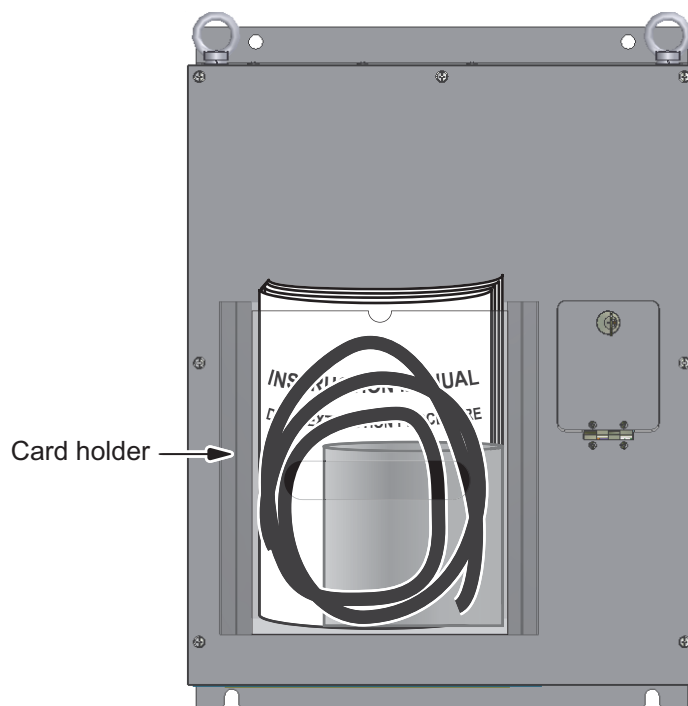
Name	Type	Code No.	Remarks
CD-ROM (For Live Player)	2450104/05-	001-279-090	With Accessories FP24-01110
Data Extraction Procedure	E42-01402	000-179-354-10	
LAN Cable Assembly	MOD-Z072-020+	001-167-880-10	

See the data extraction procedure for how to play back data.

How to attach the card holder

Use the supplied accessories to attach the card holder to the DCU.

Remove the paper from the double-sided tape on the card holder. Attach the card holder to the location in the DCU shown below.



APPENDIX 5 FLOAT-FREE DRU

This appendix provides important excerpts from the Jotron USERS MANUAL. For detailed information, see the Jotron USERS MANUAL.



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1 GENERAL DESCRIPTION

The Tron 40VDR is emergency equipment consisting of:

- Tron 40VDR Cospas-Sarsat emergency EPIRB.
- FB-40 - Automatic float free bracket.
- VDR storage module.

The Tron 40VDR EPIRB is developed to meet the regulations and rules for use on vessels and life rafts in the maritime service. Tron 40VDR meets the following specifications for 406 MHz EPIRBs for use in search and rescue operations at sea.

See "Declaration of Conformity" document at www.Jotron.com for information of required standards.

1.1 TRON 40VDR

The Tron 40VDR is buoyant and have water activated contacts which will start DISTRESS transmission if deployed into water. Tron 40VDR are currently available with one float free bracket. The bracket prevents DISTRESS transmission if water spray are applied to the EPIRB.

The Float free bracket, FB-40 is a covered bracket with an hydrostatic release unit (HRU) which will release the Tron 40VDR if the bracket is submerged to a depth of 2-4 meters if the ship are about to sink.

The purpose of the Tron 40VDR is to give a primary alarm to the search and rescue authorities. The EPIRB gives an immediate alarm when activated, transmitting the ID of the ship in distress. Care must be taken not to activate the EPIRB unless in an emergency situation, in such cases the user will be held responsible. For periodic testing a test function is implemented. During the test cycle the EPIRB does a self-test on the transmitters and on the battery status. No emergency signal is transmitted during the self-test.

The battery of the EPIRB will last for at least 168 hours from activation of the EPIRB.



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2.6 BATTERY SAFETY DATA SHEET

PRODUCT NAME:	SAFT BATTERIES
TYPE NO.:	LSH 14 LIGHT
LITHIUM METAL CONTENT:	BELOW 1g/CELL
APPROXIMATE WEIGHT:	51g
CHEMICAL SYSTEM:	Primary lithium-thionyl chloride (Li-SOCl ₂)
DESIGNED FOR RECHARGE:	No

2.6.1 HAZARDS IDENTIFICATION

Do not short circuit, recharge, puncture, incinerate, crush, immerse, force discharge or expose to temperatures above the declared operating temperature range of the product. Risk of fire or explosion. The Lithium-Thionyl chloride batteries described in this Safety Data Sheet are sealed units which are not hazardous when used according to the recommendations of the manufacturer



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Under normal conditions of use, the battery is hermetically sealed.

Ingestion: Swallowing a battery can be harmful.

Inhalation: Contents of an open battery can cause respiratory irritation.

Skin Contact: Contents of an open battery can cause skin irritation.

Eye Contact: Contents of an open battery can cause severe irritation.

2.6.2 FIRST AID MEASURES

Ingestion: Do not induce vomiting or give food or drink. Seek medical attention immediately. CALL NATIONAL BATTERY INGESTION HOTLINE for advice and follow-up (202-625-3333) collect day or night.

Inhalation: Provide fresh air and seek medical attention.

Skin Contact: Remove contaminated clothing and wash skin with soap and water.

Eye Contact: Immediately flush eyes thoroughly with water for at least 15 minutes, lifting upper and lower lids, until no evidence of the chemical remains. Seek medical attention.

Note: Carbon black is listed as a possible carcinogen by International Agency for Research on Cancer (IARC).

2.6.3 FIRE FIGHTING MEASURES

In case of fire where lithium batteries are present, flood area with water or smother with a Class D fire extinguishant appropriate for lithium metal, such as Lith-X. Water may not extinguish burning batteries but will cool the adjacent batteries and control the spread of fire. Burning batteries will burn themselves out. Virtually all fires involving lithium batteries can be controlled by flooding with water. However, the contents of the battery will react with water and form hydrogen gas. In a confined space, hydrogen gas can form an explosive mixture. In this situation, smothering agents are recommended. A smothering agent will extinguish burning lithium batteries.

Emergency Responders should wear self-contained breathing apparatus. Burning lithium-iron disulfide batteries produce toxic and corrosive lithium hydroxide fumes and sulfur dioxide gas.



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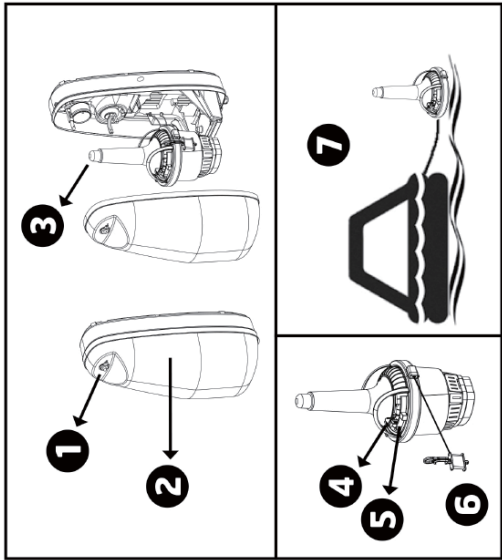
5 OPERATION INSTRUCTIONS

WARNING

- USE ONLY DURING SITUATIONS OF GRAVE AND IMMINENT DANGER
- REPLACE THE BATTERY AFTER THE SATELLITE EPIRB IS OPERATED FOR ANY PURPOSE OTHER THAN A TEST

Tron 40VDR is designed to be operated either manually or automatically. The EPIRB is always armed when located in the bracket. The EPIRB will automatically start to transmit when removed or ejected from the bracket and deployed into water. The EPIRB has an internal safety switch which prevents inadvertent activation through moisture, sea spray etc when located in the bracket.

5.1 MANUAL OPERATION



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5.1.1 OUT OF BRACKET

For operation of the beacon out of the bracket follow instructions from 4-5 in chapter 5.1.2

5.1.2 IN THE FLOAT FREE BRACKET FB-40

For operation of the beacon in the bracket please follow instructions 1 to 7.

It is not recommended to operate the beacon inside a life raft or under a cover or canopy. Do NOT tie the lanyard to the ship in distress, as this will prevent the unit to functioning if the ship sinks.

1. Remove the cotter pin from the bracket (FB-40)
2. Remove the FB-40 cover
3. Take out the EPIRB from the bracket
4. Pull the locking pin holding the main switch.
5. Push and move main switch to the left, to ON position. The LED indicator, located at the top of the antenna, will start to flash, indicating that the EPIRB is operating.
6. Tie the beacon lanyard to you or to the survival craft
7. If possible keep the EPIRB in an open area, away from any metal objects (ship construction etc.) that may limit the satellite coverage. This is especially important for Tron 40VDR, since it needs good reception to obtain a GPS position.

NOTE: To stop transmission, take Tron 40VDR out of the water and move the main switch to READY position.



5.2 AUTOMATIC OPERATION - FLOAT FREE BRACKET FB-40



1. The Tron 40VDR will automatically release from the bracket, float to the surface and start to transmit when the EPIRB, in its bracket is deployed into water at a depth of app. 2-4 meters (6 - 13 feet).
2. Transmission will continue until the EPIRB is lifted out of the water, and dried off. The transmission can also be stopped by placing the EPIRB in the bracket.



6 TESTING AND PERIODICAL CONTROL

6.1 TESTING

There are two different kinds of tests that can be performed:

1. Normal self-test
2. Extended self-test including the GPS.

Jotron AS recommends the Tron 40VDR Float Free Capsule to be tested every month. This test involves both the self-test and GPS-test. Note: The extended self-test are initiated to 60 for a period of 5-year.

6.1.1 NORMAL SELF-TEST

To perform the self-test, the EPIRB has to be removed from the FB-40 bracket.

1. Release FB-40 top cover by removing the cotter pin.
2. Take Tron 40VDR out of the bracket.
3. Push and hold switch in TEST position for 15 seconds. Keep hands and other objects away from the antenna.
4. Test passed after one single flash only!
5. Release the switch and put the EPIRB back into the bracket

See Cha.p 6.1.3 below for error messages.

6.1.2 EXTENDED SELF-TEST INCLUDING GPS-TEST

To perform the extended self-test, the EPIRB has to be removed from the FB-40 bracket.

NOTE 1: The GPS-test might take up to 2 minutes to be successful. Limit this test to max. once/month as this test will reduce lifetime of EPIRB battery!

NOTE 2: This test include the self-test(Chap. 6.1.1) and therefore only one of them are necessary.



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1. Release FB-40 top cover by removing the cotter pin.
2. Take Tron 40VDR out of the bracket.
3. Move Switch to TEST-position twice within 3 seconds and release back to READY-position
4. EPIRB will BEEP shortly every 3 seconds until GPS position acquired
5. OK = 2 BEEPS (see chap 6.1.3 if Not OK)
6. Normal SELF-TEST is performed after successful GPS TEST and position transmitted on 406.037 MHz. GPS position may also be received on an EPIRB Tester for verification

6.1.3 EPIRB ERROR MESSAGES

If the self test detects a fault in the EPIRB module, one or more of the following indications are shown:

Number of flashes:	Fault indication:
1	NONE
2	Low power on 406 MHz transmitter
3	Low battery voltage
4	Low power on 121.5 MHz transmitter
5	PLL on 406 MHz transmitter out of lock
6	PLL on 121.5 MHz transmitter out of lock
7	EPIRB module not programmed or programming not complete

GPS-test error messages:

- a) 5 BEEPS = Did not acquire GPS position
- b) 10 "-" = Number of GPS TEST above limit (>60)



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6.2 PERIODICAL CONTROL

6.2.1 EVERY MONTH:

- Self-test (see chap. 6.1.1 and 6.1.2)
What the self-test actually does is to send out a short test signal on 121.5 and 406.037MHz, testing the output of the transmitter. While transmitting the test signal, the battery voltage, output power and phase lock is tested. During the test of the 406MHz transmitter a test message is transmitted, this test message is coded with a special synchronization code and will not be recognized as real alert by the Cospas-Sarsat satellites.
- Visual Inspection
 - The Tron 40VDR should be easily removed and replaced in the Bracket
 - Check for defects on the EPIRB or brackets
 - Make sure that the Tron 40VDR and Bracket are not painted or otherwise covered with chemicals, oil, etc
 - Is the lanyard firmly attached to the Tron 40VDR? (and not tied to the vessel)
- Check the expiry dates on:
 - EPIRB Battery
 - Hydrostatic Release Unit (HRU)

6.2.2 EVERY 12TH MONTH:

The Tron 40VDR Float Free Capsule is under the regulation of the IMO MSC.1/Circ 1040 rev.1 annual test performed by authorized radio-surveyor or authorized personal trained and certified by Jotron AS.

Additional requirement for testing Tron 40VDR Float Free Capsule is IMO MSC.1/Circ.1222.

Important to clean the surface on the docking-module, fitted on the FB-40 bracket and the Tron 40VDR Float Free Capsule lower part, so to obtain secure and safe data transmission.

GPS Test (see chap. 6.1.2.)



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6.2.3 EVERY 2ND YEAR:

Replace Hydrostatic Release Unit (HUR)including Plastic Bolt
(Check expiry date on label)

6.2.4 EVERY 4TH OR 5TH YEAR:

The Tron 40VDR Float Free Capsule is under the regulation according to SOLAS Chap.IV reg.15.9.2 and IMO MSC.Circ 1039 guideline. The Tron 40VDR Float Free Capsule will comply to this guideline, either by fulfilling the complete service or be replaced by an exchange unit.

- There is only Authorized, trained and certified personnel, made by Jotron AS who can carry out the SBM-service on the Tron 40VDR Float Free Capsule. The interval is dependent on the flag-state administration.SBM (see 7.1)

6.2.5 EVERY 10TH YEAR:

Jotron advice to replace both the Tron 40VDR Float-Free Capsule and float free bracket.

6.3 TEST AND MAINTENANCE RECORD

DATE	N/T/B	SIGN	INSP
N= New EPIRB installed, T= Test, B= New battery			



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6.4 FALSE ALERT

False alerts transmitted by EPIRB

False alerts are a serious problem for the rescue service. Nearly 90% of EPIRB initiated distress alerts turn out to be false alarms.

If for any reason, your EPIRB should cause a false alarm, it is most important that you contact the nearest search and rescue authority and tell them it was a false alarm. They can then stand down any rescue service (coast radio station or appropriate CES or RCC). Use any means at your disposal to make contact. Switch off the distress alarm by de-activating your EPIRB, as soon as possible.

If your beacon is activated in a non-distress situation or a distress situation which has been resolved and you no longer require assistance, contact the nearest search and rescue authorities via the most expeditious means available with the following information:

- Beacon ID number (15 character UIN):
- Position (At time of activation):
- Date of Activation:
- Time of Activation (Time zone):
- Duration of Activation:
- Beacon make and model:
- Vessel Name/ID:
- Circumstances/cause (if known):

USA

The United States search and rescue authority is the U.S. Coast Guard. The primary points of contact are:

Pacific Ocean Area
USCG Pacific Area Command Centre
Tel: +1 (510)-437-3701

Atlantic Ocean / Gulf of Mexico Area
USCG Atlantic Area Command Centre
Tel: +1 (757)-398-6231

From Any Location
USCG Headquarters Command Centre
Tel: +1 (800)-323-7233

SPECIFICATIONS OF VOYAGE DATA RECORDER VR-7000

The Voyage Data Recorder (VDR) is a recording system required on certain categories of ships from 1st July 2002 by the revised SOLAS Chapter V. VR-7000 fully complies with the IMO Resolution MSC.333 (90) and IEC 61996-1 testing standard.

1 GENERAL

- 1.1 Recording period
 - Fixed DRU/ Float-free DRU 48 hrs
 - Long term device (long-term recording medium) 720 hrs
- 1.2 Battery backup More than two hours after loss of ship's mains

2 DATA COLLECTING UNIT (DCU)

- 2.1 CPU Intel Celeron P4505 1.86 GHz
- 2.2 Memory capacity
 - Main memory 1 GB
 - Long term device (long-term recording medium) 512 GB or 1 TB

3 REMOTE ALARM PANEL

- 3.1 Display 4.3-inch color LCD, 480 x 272 (WQVGA)
- 3.2 Picture color 256 colors
- 3.3 Brilliance 0.2 to 700 cd/m²
- 3.4 Visible distance 0.5 m nominal

4 DATA RECORDING UNIT (DRU)

- 4.1 Fixed DRU
 - Chassis Protective capsule
 - Memory capacity 32 GB
 - Shock resistance 50G x 11 ms
 - Penetration resistance 100mm diameter pin with 250 kg weight, dropped from 3 m height
 - Fire resistant 1100°C for 1 hour, 260°C for 10 hours
 - Submersible 6000 m (60MPa)
 - Acoustic beacon Battery life: 3 years from the date of manufacture,
37.5kHz, 10ms pulse transmission,
Maximum depth: 6000m, 90 days
- 4.2 Float-free DRU
 - Chassis Auto-float capsule
 - Memory capacity 64 GB
 - Battery Lithium, Metal, 7.2 V/ 18 Ah (2S5P),
5 year's service life (6.5 years from the date of manufacture)
 - Operating life Minimum 168 hrs at -20°C
 - Release mechanism Hydrostatic release unit

COSPAS-SARSAT Transmitter

Antenna type	Built-in, omnidirectional
Frequency	406.037 MHz $\pm$ 2 ppm
Protocols	MMSI and Serial Location Protocols
Modulation	Phase modulation 1.1 $\pm$ 1 radian
Data encoding	Bi-phase L
Bit rate	400 bps

Homing Transmitter

Frequency	121.500 MHz
Output power	Up to 100 mW
Modulation	A9, AM sweep tone between 300 Hz and 1600 Hz
Sweep range	700 Hz (sweep rate: 2.5 Hz)
Stability	10 ppm over temperature

5 MICROPHONE

5.1	Reference signal level	0 dBm/600 ohm at 91 dBA
5.2	Frequency response	Within 12 dB at 150Hz to 6 kHz
5.3	Audio coverage	Hemisphere area of 3.5 m approx. in radius
5.4	Test beeper	3s in 12 hours period (built in)

6 HUB (OPTION)

6.1	Switching HUB (HUB-100)	
	Number of ports	8 ports (10Base-T/100Base-TX), Auto-MDI/MDI-X compliant
	Switching Method	Store and forward
	Buffer memory	SRAM
6.2	Intelligent HUB (HUB-3000)	
	Number of ports	8 ports (10/100/1000Base-T) , Auto-MDI/MDI-X compliant
	Switching Method	Store and forward, non-blocking L2 switching
	Capacitance of switching	16 Gbps
	VLAN	Port-base VLAN, IEEE802.1Q Tag VLAN supported
	Multiple VLAN	Communication between isolated ports is disabled

7 INTERFACE

7.1	Data collecting unit	
	Number of port	
	LAN	6 ports, Ethernet 100Base-TX, RJ45 connector
	Bridge audio (input)	8 ch (0 dBm/600 ohm)
	VHF audio (input)	2 ch (0 dBm/600 ohm)
	Serial	IEC61162-1/2: 2 ports, IEC61162-1: 6 ports
	Serial I/O for AMS	IEC61162-1: 1 ch
	USB	1 port for data extraction
	Alarm (output)	3 ch, contact signal, load current 250 mA
		System fail, Power fail, Local ACK

	Remote ACK (input)	1 ch
	Buzzer stop (input)	1 ch
	IEC61162-450 transmission group	
	Input	MISC, SATD, NAVD, VDRD, RCOM, TIME, PROP, USR1 to USR8
	Output	MISC
	Other Network Function (except IEC61162-450)	
		HTTP; *.*.*:80
		VR-7000 replies on PC's ARP command and ping command
		Live player, Maintenance viewer
		- UDP multicast: 239.255.0.1
		Port: 20001-20004, 21001-21004, 22001-22007, 23001-23007
		27001-27010, 28001-28010
		- TCP: *.*.*, Port: 20, 21, 10106, 24001, 24004
	I/O Sentences	
	Input	All incoming
	Output	ALC, ALF, HBT
7.2	Sensor adapter	
	MC-3000S (serial)	8 ports: I/O, IEC61162-1/2: 4 ports, IEC61162-1: 4 ports
	MC-3010A (analog, option)	3 ports: Input, -10 to +10V, 0 to 10V or 4 to 20 mA
	MC-3020D (digital-in, option)	8 ports: relay contact, logics set from program
7.3	Junction box (IF-8530, option)	
	Serial	IEC61162-1/2: 2 ch, IEC61162-1: 6 ch
	Analog	16 ch ($\pm 10V$, 4-20 mA)
	Digital (a/b)	64 ch
7.4	Video signal input	
	Video LAN converter	2 ch, DVI-D, VESA DDC, SXGA, UXGA, Full HD (1920x1080) or WUXGA (1920x1200)
	IEC 61162-450	1 ch, Binary image: PNG 24bit only, TXT (ECDIS display source information)
8	POWER SUPPLY	
8.1	Data collecting unit	100-230 VAC: 1.6-0.7 A, 1 phase, 50/60 Hz
8.2	Sensor adapters	24 VDC: 1.4 A max.(11 units), fed from DCU
8.3	Junction box (IF-8530)	24 VDC: 0.9 A, fed from DCU
8.4	Video LAN converter	24 VDC: 0.7 A
8.5	HUB (option)	
	HUB-3000	100-230 VAC: 0.1 A, 1 phase, 50-60 Hz
	HUB-100	100-230 VAC: 0.1 A, 1 phase, 50-60 Hz
9	ENVIRONMENTAL CONDITIONS	
9.1	Ambient temperature	
	Data collecting unit	-15°C to +55°C
	Fixed DRU	-25°C to +55°C

	Float-free DRU	-20°C to +55°C
	Waterproof microphone	-25°C to +55°C
	Others	-15°C to +55°C
9.2	Relative humidity	93% or less at +40°C
9.3	Degree of protection	
	Data collecting unit	IP20
	Fixed DRU	IP56 equivalent
	Float-free DRU	IP67 equivalent
	Remote alarm panel	IP22 (front panel), IP20 (chassis)
	Sensor adapter	IP20 (IP22: option)
	Junction box (IF-8530)	IP20
	Video LAN converter	IP22
	Microphone	IP22 (panel), IP20 (chassis)
	Waterproof microphone	IP56
	HUB-3000	IP20 (IP22: option)
	HUB-100	IPX0
	Junction box (VR-7022F)	IP56
9.4	Vibration	IEC 60945 Ed.4

10 UNIT COLOR

10.1	Data collecting unit	N2.5 (standard)
10.2	Fixed DRU	Fluorescent orange (fixed)
10.3	Float-free DRU	Fluorescent orange (chassis), White (bracket)
10.4	Remote alarm panel/ Video LAN converter/ Sensor adapter	N2.5 (fixed)
10.5	Junction box (VR-7022F)	7.5BG7/2
10.6	Microphone/ Waterproof microphone	N2.5 (fixed)
10.7	HUB	N2.5 (HUB-3000), N3.0 (HUB-100)
10.8	Junction box (IF-8530)	N3.0 (standard)



Declaration of Conformity



0735

We **FURUNO ELECTRIC CO., LTD.**

(Manufacturer)

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

(Address)

declare under our sole responsibility that the product

VOYAGE DATA RECORDER VR-7000

(Model name, type number)

to which this declaration relates conforms to the following standard(s) or normative document(s)

IMO Resolution A.694(17)	IEC 61996-1 Ed.2.0: 2013
IMO Resolution MSC.191(79)	IEC 61162-1 Ed.4.0: 2010
IMO Resolution MSC.333(90)	IEC 61162-2 Ed.1.0: 1998
2000 HSC Code 13	IEC 61162-450 Ed.1.0: 2011
IMO Resolution MSC.302(87)	IEC 62288 Ed.2.0: 2014
	IEC 60945 Ed.4.0: 2002
	IEC 61924-2 Ed.1.0: 2012 Annex K and M

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

For assessment, see

- EC type examination (Module B) certificate No.MED-B-9205 issued by Det Norske Veritas Germanischer Lloyd (DNV GL), Norway.
- EC quality system (Module D) certificate No. BSH/4613/02208/2345/12 issued by Federal Maritime and Hydrographic Agency (BSH), The Federal Republic of Germany.

This declaration is issued according to the provisions of European Council Directive 96/98/EC on marine equipment modified by Commission Directive 2012/32/EU, 2013/52/EU and 2014/93/EU.

On behalf of Furuno Electric Co., Ltd.

Nishinomiya City, Japan
October 08, 2014

(Place and date of issue)

Yoshitaka Shogaki
Department General Manager
Quality Assurance Department

(name and signature or equivalent marking of authorized person)



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