FURUNO

OPERATOR'S MANUAL

VOYAGE DATA RECORDER

MODEL VR-5000
(Serial number 1001 or greater)

FURUNO ELECTRIC CO., LTD.

www.furuno.co.jp
IMPORTANT NOTICES

• This manual is intended for use by native speakers of English.
• No part of this manual may be copied or reproduced without written permission.
• If this manual is lost or worn, contact your dealer about replacement.
• The contents of this manual and equipment specifications are subject to change without notice.
• The example screens (or illustrations) shown in this manual may not match the screens you see on your display. The screen you see depends on your system configuration and equipment settings.
• Store this manual in a convenient place for future reference.
• FURUNO will assume no responsibility for the damage caused by improper use or modification of the equipment (including software) by an unauthorized agent or a third party.
• When it is time to discard this product it must be done according to local regulations for disposal of industrial waste. For disposal in the USA, refer to the Electronics Industries Alliance (http://www.eiae.org/).
# SAFETY INSTRUCTIONS

<table>
<thead>
<tr>
<th>WARNING</th>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ELECTRICAL SHOCK HAZARD</strong>&lt;br&gt;Do not open the equipment.&lt;br&gt;Only qualified personnel should work inside the equipment.</td>
<td><strong>Keep heater away from equipment.</strong>&lt;br&gt;Heat can alter equipment shape and melt the power cord, which can cause fire or electrical shock.</td>
</tr>
<tr>
<td>Do not disassemble or modify the equipment.&lt;br&gt;Fire, electrical shock or serious injury can result.</td>
<td>Do not place liquid-filled containers near the equipment.&lt;br&gt;Fire or electrical shock can result if a liquid spills into the equipment.</td>
</tr>
<tr>
<td>Immediately turn off the power (BATTERY, DC and AC switches in that order) at the main unit 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.&lt;br&gt;Continued use can cause fatal damage to the equipment.</td>
<td>Do not operate the equipment with wet hands.&lt;br&gt;Electrical shock can result.</td>
</tr>
</tbody>
</table>

Batteries should be recycled.<br>Contact FURUNO dealer.
CAUTION AT POWER-ON

In the DCU, confirm that the LEDs SYS1, SYS2, and SYS3 light in orange and DCU OK in green after the power has been on two minutes. If not, see code tables in section 3.2.

Procedure for turning on power
1. Turn the AC breaker switch on.
2. Turn the DC breaker switch on if DC power is connected.
3. Turn the BATTERY breaker switch on.

Error indication on Remote Alarm Panel (RAP)
If the ERROR LED (red) lights on the RAP, check the LEDs on the DCU.
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Declaration of conformity
INTRODUCTION

Word to the Owner
Thank you for purchasing this FURUNO Voyage Data Recorder. We are confident you will discover why FURUNO has become synonymous with quality and reliability.

What is a VDR?
The VR-5000 is a Voyage Data Recorder (VDR) which 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 VDR’s 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.

Composition
The basic VR-5000 consists of a Data Collection Unit (DCU), a Data Recording Unit (DRU) and microphones to record bridge audio. 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 a 12 h period. The batteries supply power to the DCU to record bridge audio for 2 h in case of a main ship’s 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 DRU components are embodied in the protective capsule. The capsule ensures survival and recovery of the recorded data after an incident. An acoustical pinger helps locate the DRU underwater.

FEATURES
• Reliable and fast data exchange between DCU and DRU via a single IEEE1394 cable.
• Easy commissioning and maintenance by PC downloading/uploading
• 12-hour recording of normal sensor loading in standard memory
• UTC time tagged for system synchronization and easy data retrieval
• Choice of flash memory capacity in the data recording unit
• Removable hard disk (HD) for storage and retrieval of data
• Meets IMO A.861 (20), IEC 61996 and other relevant standards.
## SPECIFICATIONS

<table>
<thead>
<tr>
<th>Standards</th>
<th>IMO A.861(20), IEC 61996, A.694, IEC 60945, IEC 61162, etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data collecting unit (DCU)</td>
<td></td>
</tr>
<tr>
<td>.1 Structure of DCU</td>
<td>Deck mounted, containing status LEDs, interface, processor unit, power supply for all VDR operation, and backup batteries.</td>
</tr>
<tr>
<td>.2 Processor</td>
<td>CPU: Intel Pentium III in PGA 370 socket</td>
</tr>
<tr>
<td></td>
<td>Memory: 512 MB (256 MBx2 PC-100/133 SDRAM)</td>
</tr>
<tr>
<td>.3 Interface</td>
<td>Serial data interface: 8 (16) channels</td>
</tr>
<tr>
<td></td>
<td>Ethernet (10/100Base-T): 2 channels</td>
</tr>
<tr>
<td></td>
<td>Analog: -10 to 10 V, 4 to 20 mA on 16 (24) channels</td>
</tr>
<tr>
<td></td>
<td>Digital: 3 to 32 V and contact-closure on 64 (288) channels</td>
</tr>
<tr>
<td></td>
<td>Audio: 8 channels including as standard 6 bridge audio channels and 2 VHF channels</td>
</tr>
<tr>
<td></td>
<td>Video: 1 (4) radar input (from most commercial radars, resolution up to 1280 x 1024 pixels)</td>
</tr>
<tr>
<td></td>
<td><em>Number in parentheses shows the maximum channel number.</em></td>
</tr>
<tr>
<td>.4 Data rate</td>
<td>Recording intervals: 1 second except radar image (at 15 s intervals), adjustable rate for replay</td>
</tr>
<tr>
<td>.5 Data retrieval</td>
<td>Data in the hard disk is retrieved, using Extract &amp; Replay software.</td>
</tr>
<tr>
<td>.6 Backup</td>
<td>Hard disk</td>
</tr>
<tr>
<td>.7 Power supply</td>
<td>100-230 VAC (3.0-1.3 A), 50-60 Hz, 1φ</td>
</tr>
<tr>
<td></td>
<td>24 VDC (10A)</td>
</tr>
<tr>
<td></td>
<td>Dedicated reserve power supply (batteries in DCU) for 2 h of bridge audio recording on AC power failure</td>
</tr>
<tr>
<td>Data Recording Unit (DRU)</td>
<td></td>
</tr>
<tr>
<td>.1 Structure of DRU</td>
<td>Deck mounted. The protective capsule consists of a stainless steel outer capsule, insulator and inner capsule. The final recording media (flash memory) is protected in the inner capsule.</td>
</tr>
<tr>
<td></td>
<td>Outer capsule: Stainless steel</td>
</tr>
<tr>
<td></td>
<td>Insulator: Nonflammable</td>
</tr>
<tr>
<td></td>
<td>Inner capsule: Stainless steel</td>
</tr>
<tr>
<td>.2 Memory</td>
<td>Final recording media: Flash memory (Standard 6 GB), first-in first-out basis. Retains data for 2 years under no external power.</td>
</tr>
</tbody>
</table>
### Environmental tests for protective capsule

<table>
<thead>
<tr>
<th>Test</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire</td>
<td>1100°C for 1 h, 260°C for 10 h (complies with ED 56A)</td>
</tr>
<tr>
<td>Shock</td>
<td>50 G, duration 11 ms</td>
</tr>
<tr>
<td>Penetration</td>
<td>250 kg with a pin ø100 mm dropped from 3 m (ED 56A)</td>
</tr>
<tr>
<td>Deep sea immersion</td>
<td>6,000 m (60 Mpa)</td>
</tr>
</tbody>
</table>

### Ambient temperature

**DCU:** Equipment class: For installation in protected area
-15°C to +55°C

**DRU:** Equipment class: For installation in exposed area
-25°C to +55°C (+70°C storage IEC 60945)

### Relative humidity

95% at +40°C

### Waterproofing

IEC IPX6

### Vibration

IEC 60945

### Acoustical beacon

**Type:** DUKANE Type DK 120 pinger emitting 10 ms pulses at 37.5 kHz. Automatically switched on, working for 30 days. Battery life 6 years.

Maximum working depth: 6,000 m

### Data retrieval

By playback equipment (not part of standard VR-5000)

### Power supply

Normally taken from DCU. Integral batteries are capable of running the beacon for 30 days and the final recording medium for 2 years.

### Playback software

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>.1</td>
<td>Download the data in the DRU to an external medium.</td>
</tr>
<tr>
<td>.2</td>
<td>Requires quality audio system with loudspeakers. With audio card per channel.</td>
</tr>
<tr>
<td>.3</td>
<td>Commercial PC, desktop or laptop</td>
</tr>
<tr>
<td>.4</td>
<td>1 GHz Pentium III 256 MHz or better, 128 MB RAM, 32 MB video RAM, CD ROM drive</td>
</tr>
<tr>
<td></td>
<td>OS: Windows 2000 and XP</td>
</tr>
<tr>
<td>.5</td>
<td>12.1/14/17”, Resolution 1280 x 1024, 1024 x 768, 800 x 600, 640 x 480</td>
</tr>
</tbody>
</table>

### Physical data

See outline drawings in Installation manual.
MANUFACTURER’S DECLARATION

Quality assurance

Furuno Electric Co., Ltd. Markets a wide range of industrial equipment and systems for aviation electronics, land survey and factory controls, and comprehensive range of marine electronic equipment and systems. Furuno is certified to ISO 9001 by Lloyd’s Register Quality Assurance Limited.

X-Radiation

None of this equipment gives rise to a dose rate >5 µJ/kgh (0,5 mrem/h) at 50 mm.

RECORD OF MODIFICATIONS IN THIS OPERATOR’S MANUAL

<table>
<thead>
<tr>
<th>Pub No.</th>
<th>Software (Prog No.)</th>
<th>Outline of changes in Operator’s manual</th>
</tr>
</thead>
<tbody>
<tr>
<td>OME-44180-A</td>
<td>V0.99.06</td>
<td>First edition</td>
</tr>
<tr>
<td>OME-44180-B</td>
<td>V0.99.06</td>
<td>Part of installation is separated.</td>
</tr>
<tr>
<td>OME-44180-C</td>
<td>V0.99.16</td>
<td>Changed battery. Changed mounting base of DRU.</td>
</tr>
<tr>
<td>OME-44180-C1</td>
<td>V2.07.00</td>
<td>Software updated</td>
</tr>
<tr>
<td>OME-44180-E</td>
<td>V3.00.00</td>
<td>Software updated</td>
</tr>
<tr>
<td>OME-44180-F</td>
<td>V3.18.00</td>
<td>Software updated</td>
</tr>
<tr>
<td>OME-44180-J</td>
<td>V3.24.00</td>
<td>Software updated</td>
</tr>
</tbody>
</table>
SYSTEM CONFIGURATION

Fig. A  System Configuration of VR-5000

Environmental category

<table>
<thead>
<tr>
<th>Component</th>
<th>Weather Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCU, RAP</td>
<td>Protected from weather</td>
</tr>
<tr>
<td>DRU</td>
<td>Exposed to weather</td>
</tr>
<tr>
<td>Microphone</td>
<td>Protected from weather</td>
</tr>
<tr>
<td>VHF I/F unit</td>
<td>Protected from weather</td>
</tr>
</tbody>
</table>
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Chapter 1  OPERATION

1.1  OVERVIEW

The VR-5000 consists of Data Collecting Unit or DCU, Data Recording Unit or DRU, and bridge microphone units. The VDR system continuously store data from the past 12 hours onto the Flash Memory in the capsule, erasing the oldest data stored as new data is recorded. The data to be recorded includes:

<table>
<thead>
<tr>
<th>Parameters to be recorded</th>
<th>IEC 61162 formatter</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>.1 Date and time</td>
<td>ZDA or RMC</td>
<td></td>
</tr>
<tr>
<td>.2 Own ship position</td>
<td>GNS, DTM</td>
<td></td>
</tr>
<tr>
<td>.3 Speed</td>
<td>VBW</td>
<td></td>
</tr>
<tr>
<td>.4 Heading</td>
<td>HDT</td>
<td></td>
</tr>
<tr>
<td>.5 Bridge audio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.6 VHF communication audio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.7 Radar images</td>
<td></td>
<td>RGB H/V</td>
</tr>
<tr>
<td>.8 Echosounder</td>
<td>DPT</td>
<td></td>
</tr>
<tr>
<td>.9 IMO mandatory alarms</td>
<td>ALR</td>
<td></td>
</tr>
<tr>
<td>.10 Rudder order and response</td>
<td>RSA, HTM</td>
<td></td>
</tr>
<tr>
<td>.11 Engine order and response</td>
<td>RPM, XDR</td>
<td></td>
</tr>
<tr>
<td>.12 Hull (door) openings status</td>
<td>XDR</td>
<td></td>
</tr>
<tr>
<td>.13 Watertight and fire doors status</td>
<td>XDR</td>
<td></td>
</tr>
<tr>
<td>.14 Acceleration and hull stress if available</td>
<td>XDR, ALR</td>
<td></td>
</tr>
<tr>
<td>.15 Wind speed and direction if available</td>
<td>MWV</td>
<td></td>
</tr>
</tbody>
</table>

Power Supply precaution

If ship’s mains power source (100-230 VAC) and emergency source fail, the VR-5000 continues to record bridge audio for 2 h from backup batteries.

Continuity of storing data

The VR-5000 should be provided with power to store data for 12 h on first-in, first-out basis. Recording is only terminated with a key under the following circumstances:

a) During essential maintenance while the vessel is in port.

b) When the vessel is laid-up.

c) In case of emergency, when the HD is removed.

Data Recording Unit

The Data Recording Unit is housed in a highly visible protective capsule which can withstand a fire of 1100°C for 1 hour and deep-sea pressure of 6000 m.

The underwater acoustic beacon (pinger) on the capsule automatically transmits 10 ms pulses at 37.5 kHz for at least 30 days when it is submerged in water. The expected life of the beacon is 6 years. The DRU is connected to the Data Collecting Unit (DCU) with a
non-halogen Firewire cable or IEEE1394.

**Data Collecting Unit**

The Data Collecting Unit (DCU) mainly consists of Data Processor Unit, Power Distribution Unit and Junction Box. The DCU includes two 12 V backup batteries with a lifetime of approximately four years. The DCU collects the data from various sensors and radar and records them in the flash memory in the capsule (final recording medium).

Recording interval of data and audio is;
- Radar video signal: every 15 seconds
- Bridge and VHF audio: real time
- IEC sentences: when received
- Analog and digital data: every half seconds

**Integrity**

The recording integrity is ensured by continuous monitoring of power supply, record function, bit error rate, an microphone functionality. Visual alarm is generated for malfunction of any of these. Alarm status is also indicated by relay contacts.

**Data items to be recorded**

1. **Date and time**
   Date and time is obtained from an external GPS navigator referenced to UTC. Time information is recorded at intervals of 1 s. Without data and time data, no data except audio signal is recorded.

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

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

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

5. **Bridge audio**
   Six microphones are supplied as standard to record conversation at conning station, radar display, 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.
The microphones are labelled Mic1, Mic2, etc. 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.

.6 Communications audio

A maximum of two VHF communications are recorded for both transmitted and received audio signals. Audio will be compressed by MP3 or similar technique. The VHF radio connections are labeled VHF1 and VHF2.

.7 Radar data

Radar image including range rings, EBLs, VRMs, plotting symbols, radar maps, parts of SENC, voyage plan, and other essential navigational indications, is recorded in the DRU via the interface in the DCU which is connected to the buffered video output of the radar display unit. 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 x 480 and 1280 x 1024, and can be directly connected with the VDR. Scanning may be interlaced or non-interlaced.

Most type approved radars from different manufacturers can be interfaced with the DCU.

.8 Echo sounder

Depth under keel up to a resolution of 0.1 m as available on the ship is recorded.

.9 Main alarms

The status of all IMO mandatory alarms are recorded individually with ID number and time stamp.

Audible alarms from the alarm units is stored simultaneously by the bridge audio microphones.

.10 Rudder order and 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.

.11 Engine order and 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.

If a bow or stern thruster is fitted, the circuitry must be duplicated. If controllable pitch propellers are fitted, their order and response can be recorded.

.12 Hull openings (doors) status

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 baud.
.13 Watertight and fire door status
The DCU obtains the IMO mandatory watertight and fire door status signals. The inputs, digital or RS-422 serial data are recorded individually with time stamps. Serial data sentence XDR is received at a data rate of 1,200-9,600 baud.

.14 Acceleration 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 baud.

.15 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 a data rate of 1,200-9,600 baud.
1.2 OPERATING PROCEDURE

The VDR comes with three keys for the protection against any unauthorized access. The key must be kept securely after installation.

Three keys are used;
1) To open the front door of the Data Collecting Unit to gain access to the power switch,
2) To open the door of the removal hard disk (HD).
3) To turn on/off power to and remove the HD.

1.2.1 Recording

To start recording, press the AC, DC (if connected), and BATTERY switches in this order. These switches locate on the Power Distribution Unit in the Data Collecting Unit. The VDR records data automatically in the DRU and HD memories.

Confirm that status LEDs are in the condition as shown on the next page.

1.2.2 Stop recording

Note that the recording is terminated only:
- During essential maintenance purposes whilst the vessel is in port.
- When the vessel is laid-up.
- In case of emergency, when the hard disk is removed.

To stop recording, depress BATTERY, DC, and AC switches in this order. If only the BATTERY switch is on, the battery may discharge. **DO NOT turn off the system by the main breaker** on the switch panel while BATTERY switch is on. If this is done, the system operates on the batteries.

The system stops after 2 hour running on batteries.
1.3 OPERATION ON REMOTE ALARM PANEL

No power switch is provided on the Remote alarm panel. It is turned on and off by the power switch on the DCU. To silence the alarm, press ACK button. When the error LED (red) on the Remote Alarm Panel is on, identify the error by checking status LEDs on the Power Distribution Unit in the DCU. See to Chapter 3. The buttons on the remote alarm panel work as described in the figure below.

**Remote Alarm Panel**

- **Dimmer**
- **Buzzer**

**Buttons from left**
- **SAVE (w/ protective cover)**: Stops recording onto HD when an incident occurs.
- **ACK**: Stops buzzer sound.
- **TEST**: Used for test.

**LEDs from left**
- **NORMAL (Green)**: It is on at normal operation.
- **ERROR (Red)**: Lights when an error occurs.
- **SAVE (Yellow)**: When stopping the data recording onto HD, this LED starts blinking from OFF state, then lights steadily. If the HD is disconnected, this LED lights, also.

**Note**: Every time the radar connected to the VDR is turned off, the alarm sounds. Press ACK button to stop alarm sound.

*: If the HD is removed after stopping data recording onto HD, data can not be written to the same HD. To use the same HD, consult a FURUNO serviceman.
1.4 LED STATUS

The LEDs on the Power Distribution Unit (PDU) operates as follows.

<table>
<thead>
<tr>
<th>LEDs</th>
<th>Status</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>Green</td>
<td>Presence of AC mains</td>
</tr>
<tr>
<td>DC</td>
<td>Green</td>
<td>Presence of DC supply if connected</td>
</tr>
<tr>
<td>BATTERY</td>
<td>Green (Blinking)</td>
<td>Presence of DC from reserve battery (During charging)</td>
</tr>
<tr>
<td>DCU OK</td>
<td>Green</td>
<td>Normal operation of DCU processor (Red: NG)</td>
</tr>
<tr>
<td>SYS 1 to 3</td>
<td>Orange</td>
<td>No error</td>
</tr>
</tbody>
</table>

When the system diagnostic detects an error, the DCU OK lamp lights in red and SYS 1 to SYS 3 shows error details. See Chapter 3 for error codes.

1.5 COPY OF VDR INFORMATION

VDR information is copied automatically into the removable hard disk (HD) for 12 hours and is then automatically over-written with new data. Only an authorized personnel can operate the HD with a key. Bring the HD with you after an incident if possible.

The HD is locked to avoid unauthorized access. The key must be used to open the HD and select the function as below:

<table>
<thead>
<tr>
<th>Key position</th>
<th>Power status</th>
<th>Security status</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>ON</td>
<td>Locked, irremovable</td>
</tr>
<tr>
<td>B</td>
<td>OFF</td>
<td>Locked, irremovable</td>
</tr>
<tr>
<td>C</td>
<td>OFF</td>
<td>Unlocked, removable</td>
</tr>
</tbody>
</table>
The green LED (right) on the panel is “Power” indicator and the amber one (left) is HD access indicator.

Front panel of removable hard disk

To remove the HD when an incident occurs, carry out the following procedure.

Note: Pressing the SAVE button is permitted only when an incident occurs.

1. Press SAVE button (long press) on the RAP (Remote Alarm Panel). The yellow LED starts blinking, showing that recording is being terminated.
2. Wait until the LED comes on.
3. Pull the lever outward and then unlock the key on the HD. (Position C, downward)
4. Pull the lever to remove the HD.

1.6 HOW TO REMOVE DRU

To remove the DRU from the bracket (cradle):

1. Loosen the hand-tightened cap.
2. Pull the DRU cable straight out. (The cable may be cut after an incident.)
3. Remove two snap pins and then two hinge pins.
4. Lift the release levers.
Chapter 2  MAINTENANCE

Periodic checks and maintenance are important for proper operation of any electronic systems. This chapter contains maintenance instructions to be followed to obtain optimum performance and the longest possible life of the equipment. This chapter, except for 2.1 Routine check, is provided for a qualified personnel.

**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.

---

2.1  ROUTINE CHECK

Periodically, carry out the following checks.

1. Examine the cables for signs of damage, such as chafing, cuts or nicks.
2. Check that all connections are tight.

2.2  REPLACEMENT OF BATTERY

Every four years, the back-up battery must be replaced with new one by a qualified service engineer.

Battery Type: VR-5015 (Battery 2 pcs.)

Code Number: 004-381-310

**WARNING**

- Do not attempt to dismantle 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 in accordance with the local regulation.
- Touching electrically conductive parts might result in an electric shock. Be sure to wear rubber gloves before inspection or maintenance work.
- Mixing batteries with different capacity, different ages and different manufactures is liable to cause damage to the battery itself and/or the associated equipment.
- To obtain maximum life, batteries should never be shorted in a discharge state.
Note that the batteries should be recycled. Contact FURUNO dealer.

To replace the batteries:
1. Open the front cover with the key.
2. Remove four upset screws on the power distribution unit and pull out the unit.
3. Remove three pan head screws on the power distribution unit and pull out its panel slightly.
4. Remove the battery connections at the battery terminals.
5. Dismount the battery cover by removing four screws.
6. Replace two batteries with new ones.
2.3 REPLACING ACOUSTIC BEACON

The underwater acoustic beacon has a built-in battery with approx 6 year lifetime. The beacon must be replaced with new one (type: DK-120, P/No. 000-148-648) by a qualified service engineer before validity date marked on the beacon.

1. Unfasten two bolts and remove the beacon cover.
2. Use box screwdriver (7 mm) or slotted screwdriver to unfasten four bolts and then remove the beacon.
3. Attach a new beacon.

Caution

As the acoustic beacon contains a battery, it must be disposed in accordance with the local regulation.

2.4 REPLACING FUSES

The battery cable in the DCU contains two 10A fuses in fuse holders. If a fuse blows, the BACKUP BATTERY LED may not be lighting. Find the cause before replacing a fuse. Have a serviceman replace any fuse.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Code No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuse</td>
<td>FGBO 125 V 10 A</td>
<td>000-155-826-10</td>
</tr>
</tbody>
</table>
2.5 REPLACING HD

On some vessels several Removable Hard Disk (Type: VR-5014, Code No.:004-379-600, Option) are carried onboard, replacing one when it is necessary to transport it from the vessel for playback and extract.

A Removable Hard Disk may only be replaced in the follow situations:

1) When the equipment can be powered off; for example, maintenance while in port, etc.
2) An incident has occurred and the SAVE button on the RAP (VR-5016) was operated to stop recording.

The HD may not be re-used for recording once the SAVE button has been operated. Contact a FURUNO dealer for further details.

The HD records navigation data for more than past 12 hours. For longer recording, use Live Player Backup.

1. Open the DCU with its key. Turn off the VR-5000 by pressing BATTERY, DC, and AC switch in this order.
2. Pull the lever outward and then unlock the key on the HD. (Position C, downward)
3. Pull the lever to remove the HD.
4. Insert the HD into the cartridge by reversing above procedures.
5. Look the key on the HD. (Position A)
6. Turn on VR-5000.
7. Confirm that HDD is operating (DCU power is ON, SAVE LED is OFF) with no error.
8. Close the DCU and lock it with its key.
9. Refer to the operator’s manual of the Live Player for how to playback/extract recorded data from the HD.
Chapter 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 local dealer or national distributor for further advice. Always provide the product serial number.

3.1  GENERAL TROUBLE FINDING

Use table 3.1 to identify the trouble. The system provides the start-up selftest and the result is indicated by LEDs.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible causes</th>
<th>Possible solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC and/or DC LED not lit</td>
<td>No power supply</td>
<td>Check the breaker switches.</td>
</tr>
<tr>
<td>BAT LED not lighting</td>
<td>No power from the battery</td>
<td>Call for service.</td>
</tr>
<tr>
<td>DCU OK LED lighting in red.</td>
<td>Malfunction of the system</td>
<td>Restart the system. If the problem still remains, call for service. Check integrity of DRU connection.</td>
</tr>
</tbody>
</table>
### 3.2 OPERATING STATUS

The operating status is indicated by LEDs on the DCU. Table 3.2 shows red and orange LED status during normal operation of the VDR. When the system detects an error, LEDs on the PDU will show the details. See next page.

<table>
<thead>
<tr>
<th>SYS 1</th>
<th>SYS 2</th>
<th>SYS 3</th>
<th>DCU OK</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>YEL</td>
<td>YEL</td>
<td>YEL</td>
<td>GRN</td>
<td>This LED-indication is displayed when system is running o.k. without any errors pending.</td>
</tr>
<tr>
<td>GRN</td>
<td>GRN</td>
<td>GRN</td>
<td>GRN</td>
<td>This LED-indication is displayed during saving of the configuration to flash memory.</td>
</tr>
<tr>
<td>GRN</td>
<td>RED</td>
<td>RED</td>
<td>GRN</td>
<td>Indicates system is in IDLE-MODE.</td>
</tr>
<tr>
<td>RED</td>
<td>RED</td>
<td>GRN</td>
<td>GRN</td>
<td>Indicates system has been in IDLE and is now preparing to get running.</td>
</tr>
<tr>
<td>RED</td>
<td>OFF</td>
<td>YEL</td>
<td>GRN</td>
<td>Indicates MIC-TEST passed on the selected MICROPHONES.</td>
</tr>
<tr>
<td>YEL</td>
<td>RED</td>
<td>GRN</td>
<td>GRN</td>
<td>Indicates VR-5000 is rebooting.</td>
</tr>
<tr>
<td>RED</td>
<td>OFF</td>
<td>OFF</td>
<td>GRN</td>
<td>Indicates only 1 Backup-slot left on multi-incident BACKUPDRIVE.</td>
</tr>
<tr>
<td>OFF</td>
<td>RED</td>
<td>OFF</td>
<td>GRN</td>
<td>Indicates NO MORE ROOM on BACKUPDRIVE.</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>RED</td>
<td>GRN</td>
<td>Indicates Backup to BACKUPDRIVE is in progress.</td>
</tr>
<tr>
<td>YEL</td>
<td>OFF</td>
<td>OFF</td>
<td>GRN</td>
<td>Indicates we are no longer running on BATTERY-ONLY.</td>
</tr>
<tr>
<td>OFF</td>
<td>YEL</td>
<td>OFF</td>
<td>GRN</td>
<td>Indicates that IMAGE recovered from FRAMEGRABBER–error (radar turned on again).</td>
</tr>
<tr>
<td>YEL</td>
<td>GRN</td>
<td>GRN</td>
<td>GRN</td>
<td>Indicates that connection was re-established to PDU.</td>
</tr>
<tr>
<td>OFF</td>
<td>GRN</td>
<td>GRN</td>
<td>GRN</td>
<td>Indicates that connection was re-established to RAP.</td>
</tr>
<tr>
<td>YEL</td>
<td>RED</td>
<td>RED</td>
<td>GRN</td>
<td>Indicates that SERIAL_TIMEOUT_ERROR recovered.</td>
</tr>
<tr>
<td>GRN</td>
<td>RED</td>
<td>GRN</td>
<td>GRN</td>
<td>Previous STORAGE-error recovered automatically.</td>
</tr>
<tr>
<td>GRN</td>
<td>YEL</td>
<td>RED</td>
<td>GRN</td>
<td>Indicates that VGA-STATUS_DISPLAY update is being disabled.</td>
</tr>
<tr>
<td>RED</td>
<td>RED</td>
<td>YEL</td>
<td>GRN</td>
<td>Indicates system has received UTC information after a PRC_UTC_TIMEOUT.</td>
</tr>
<tr>
<td>GRN</td>
<td>RED</td>
<td>OFF</td>
<td>GRN</td>
<td>Indicates that DEBUG-LEVEL for framegrabber has been reset to ZERO.</td>
</tr>
</tbody>
</table>
# VR-5000 errorcodes (3.0)

<table>
<thead>
<tr>
<th>SYS 1</th>
<th>SYS 2</th>
<th>SYS 3</th>
<th>DCU OK</th>
<th>Code</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>YELLOW</td>
<td>YELLOW</td>
<td>YELLOW</td>
<td>YELLOW</td>
<td></td>
<td>Indicates VR-5000 has been turned on. Wait for 2 minutes to watch LED's start 'roll-flash'.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Action: If LED's does not change after 2-3 minutes, system is unable to start normally. Call for maintenance.</td>
</tr>
<tr>
<td>SYS 1</td>
<td>SYS 2</td>
<td>SYS 3</td>
<td>DCU OK</td>
<td>010</td>
<td>PRC_STATUS_DRU_FAILURE_INDICATION</td>
</tr>
<tr>
<td>RED</td>
<td>OFF</td>
<td>OFF</td>
<td>RED</td>
<td></td>
<td>Description: This LED-indication is displayed when system is having a problem communicating with the DRU.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Action: Trouble-shoot connection from VR-5000 to the DRU/cable, repeaters and possible EEE1394/Firewire - board in the PDU.</td>
</tr>
<tr>
<td>SYS 1</td>
<td>SYS 2</td>
<td>SYS 3</td>
<td>DCU OK</td>
<td>014</td>
<td>PRC_STATUS_BACKUP_DEVICE_FAILURE</td>
</tr>
<tr>
<td>YELLOW</td>
<td>OFF</td>
<td>OFF</td>
<td>RED</td>
<td></td>
<td>Description: Backup-device is either faulty or not set up correctly</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Action: Replace or reconfigure</td>
</tr>
<tr>
<td>SYS 1</td>
<td>SYS 2</td>
<td>SYS 3</td>
<td>DCU OK</td>
<td>018</td>
<td>PRC_STATUS_STORAGE_BACKUP_CONNECTION_TIMEOUT</td>
</tr>
<tr>
<td>OFF</td>
<td>GREEN</td>
<td>OFF</td>
<td>RED</td>
<td></td>
<td>Description: This indicates that the BACKUP-disk has been disconnected more than 90 seconds.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Action: Connect BACKUP again or investigate LOG and repair/replace</td>
</tr>
<tr>
<td>SYS 1</td>
<td>SYS 2</td>
<td>SYS 3</td>
<td>DCU OK</td>
<td>022</td>
<td>PRC_STATUS_STORAGE_DRU_CONNECTION_TIMEOUT</td>
</tr>
<tr>
<td>GREEN</td>
<td>GREEN</td>
<td>OFF</td>
<td>RED</td>
<td></td>
<td>Description: This indicates that the DRU has been disconnected more than 90 seconds.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Action: Connect DRU again or investigate LOG and repair/replace</td>
</tr>
<tr>
<td>SYS 1</td>
<td>SYS 2</td>
<td>SYS 3</td>
<td>DCU OK</td>
<td>034</td>
<td>PRC_STATUS_STORAGE_FAILURE_INDICATION</td>
</tr>
<tr>
<td>OFF</td>
<td>RED</td>
<td>OFF</td>
<td>RED</td>
<td></td>
<td>Description: This indicates a problem with storing data on storage-devices</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Action: Investigate LOG and repair/replace.</td>
</tr>
<tr>
<td>SYS 1</td>
<td>SYS 2</td>
<td>SYS 3</td>
<td>DCU OK</td>
<td>042</td>
<td>PRC_STATUS_GRABBER_FAILURE_INDICATION</td>
</tr>
<tr>
<td>RED</td>
<td>RED</td>
<td>OFF</td>
<td>RED</td>
<td></td>
<td>Description: This indicates, that one of the active/enabled video-channels can't grab from the channel. This can be either because of radar being turned OFF or wrong configuration</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Action: If radar is turned OFF, press ACK on RAP to stop alarm. Error will clear, when radar is turned ON again. If Radar is ON, check installation(cables) and configuration.</td>
</tr>
<tr>
<td>SYS 1</td>
<td>SYS 2</td>
<td>SYS 3</td>
<td>DCU OK</td>
<td>046</td>
<td>PRC_STATUS_DRU_INDEX_ERROR</td>
</tr>
<tr>
<td>YELLOW</td>
<td>RED</td>
<td>OFF</td>
<td>RED</td>
<td></td>
<td>Description: This indicates a problem with the INDEX in the DRU</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Action: Investigate LOG and clear INDEX</td>
</tr>
</tbody>
</table>

VR-5000 errorcodes(3.0)

Description:

Indicates VR-5000 has been turned on. Wait for 2 minutes to watch LED's start 'roll-flash'.

Action:

If LED's does not change after 2-3 minutes, system is unable to start normally. Call for maintenance.

Description:

This LED-indication is displayed when system is having a problem communicating with the DRU.

Action:

Trouble-shoot connection from VR-5000 to the DRU/cable, repeaters and possible EEE1394/Firewire - board in the PDU.

Description:

Backup-device is either faulty or not set up correctly

Action:

Replace or reconfigure

Description:

This indicates that the BACKUP-disk has been disconnected more than 90 seconds.

Action:

Connect BACKUP again or investigate LOG and repair/replace

Description:

This indicates that the DRU has been disconnected more than 90 seconds.

Action:

Connect DRU again or investigate LOG and repair/replace

Description:

This indicates a problem with storing data on storage-devices

Action:

Investigate LOG and repair/replace.

Description:

This indicates, that one of the active/enabled video-channels can't grab from the channel. This can be either because of radar being turned OFF or wrong configuration

Action:

If radar is turned OFF, press ACK on RAP to stop alarm. Error will clear, when radar is turned ON again. If Radar is ON, check installation(cables) and configuration.

Description:

This indicates a problem with the INDEX in the DRU

Action:

Investigate LOG and clear INDEX.
<table>
<thead>
<tr>
<th>SYS 1</th>
<th>SYS 2</th>
<th>SYS 3</th>
<th>DCU OK</th>
<th>Code</th>
<th>Name</th>
<th>Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>YELLOW</td>
<td>YELLOW</td>
<td>OFF</td>
<td>RED</td>
<td>062</td>
<td>PRC_STATUS_STORAGE_LAST_BUFFER_NOT_SAVED</td>
<td>This indicates a storage-problem with DRU/BACKUP.</td>
<td>Investigate LOG(if possible) or contact supplier for repair.</td>
</tr>
<tr>
<td>OFF</td>
<td>GREEN</td>
<td>GREEN</td>
<td>RED</td>
<td>082</td>
<td>PRC_STATUS_RAP_MISSING</td>
<td>Remote Alarm Panel is Missing. Connection to R.A.P. is lost</td>
<td>Reconnect R.A.P.</td>
</tr>
<tr>
<td>GREEN</td>
<td>GREEN</td>
<td>GREEN</td>
<td>RED</td>
<td>086</td>
<td>PRC_STATUS_CONFIG_VDRDEFAULT_ERROR</td>
<td>This LED-indication is displayed when the built-in configuration in the VR-5000 system-software fails to load into the DRU. It can be the firmware itself or a problem with the DRU.</td>
<td></td>
</tr>
<tr>
<td>RED</td>
<td>GREEN</td>
<td>GREEN</td>
<td>RED</td>
<td>090</td>
<td>PRC_STATUS_CONFIG_INVALID_FLASH_HANDLE</td>
<td>This LED-indication is displayed when the CONFIG_area in the DRU is corrupt/wrong/un-initialized. This should only happen during installation/service and if using a DRU not initialized by the VR-5000 it is connected to.</td>
<td>Clear CONFIG_area and restart VR-5000. This will install a default minimum - Configuration.</td>
</tr>
<tr>
<td>YELLOW</td>
<td>GREEN</td>
<td>GREEN</td>
<td>RED</td>
<td>094</td>
<td>PRC_RECORDING_BACKUP_INACTIVE</td>
<td>Indicates that the Backup is inactive - not storing data</td>
<td>Investigate communication to Backup disc</td>
</tr>
<tr>
<td>OFF</td>
<td>RED</td>
<td>GREEN</td>
<td>RED</td>
<td>098</td>
<td>PRC_RECORDING_DRU_INACTIVE</td>
<td>Indicate that the DRU is inactive - not storing data</td>
<td>Investigate communication to DRU</td>
</tr>
<tr>
<td>GREEN</td>
<td>RED</td>
<td>GREEN</td>
<td>RED</td>
<td>102</td>
<td>PRC_STATUS_CONFIG_UNABLE_TO_SAVE</td>
<td>This LED-indication is displayed when VR-5000 could not save configuration to the DRU/BACKUPDRIVE</td>
<td>1. Check DRU connected. 2. BACKUPDRIVE O.K. 3. Else call for maintenance.</td>
</tr>
<tr>
<td>RED</td>
<td>RED</td>
<td>GREEN</td>
<td>RED</td>
<td>106</td>
<td>PRC_STATUS_SYSTEM_STOPPED</td>
<td>Indicates SYSTEM_STOP - request has completed (system not collecting data anymore)</td>
<td>Turn OFF POWER to power down or recycle POWER to restart</td>
</tr>
<tr>
<td>SYS 1</td>
<td>SYS 2</td>
<td>SYS 3</td>
<td>DCU OK</td>
<td>Code</td>
<td>Name</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>--------</td>
<td>------</td>
<td>-------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>RED</td>
<td>RED</td>
<td>130</td>
<td>PRC_STATUS_DATAIO_FAILURE_INDICATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>This error indicates a problem with ANALOG/DIGITAL interface-board inside DPU. Selftest-program run during boot should indicate which board.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Action: Replace faulty board.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>138</td>
<td>PRC_STATUS_CONFIG_FAILURE_INDICATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>This indicates an unexpected error, trying to read CONFIG</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Action: Check that installed firmware-version is correct for connected DRU. If this is a new DRU, CONFIG-area needs to be ‘Cleared’</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>150</td>
<td>PRC_STATUS_CONFIG_INVALID_SIZE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>This LED-indication is displayed when the CONFIG_area in the DRU has Clear CONFIG_area and restart VR-5000. This will install a ‘default’ minimum - Configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>154</td>
<td>PRC_STATUS_CONFIG_INVALID_START_TAG</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>This LED-indication is displayed when the CONFIG_area in the DRU is clean. This should only happen during installation/service. This will also be displayed after first boot after clearing CONFIG-area. It will flash every 15 Secs with SYS1/SYS2/SYS3 off an</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Action: Restart VR-5000.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>162</td>
<td>PRC_STATUS_CONFIG_MISSING_IN_FLASH</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>This LED-indication is displayed when the CONFIG_area in the DRU is clear. This should only happen during installation/service. This will also be displayed after first boot after clearing CONFIG-area.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Action: Clear CONFIG_area and restart VR-5000. This will install a ‘default’ minimum - Configuration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>170</td>
<td>PRC_STATUS_FATAL_FAILURE_INDICATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>FATAL SYSTEM ERROR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Action: Request maintenance</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>186</td>
<td>PRC_STATUS_GRABBER_IMAGE_TOO_BIG</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>This indicates that grabbed video-image from radar is bigger than</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Action: Check quality of grabbed image, colormask(video-channels) and re-adjust framegrabber-settings.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Action: Clear CONFIG_area and restart VR-5000. This will install a ‘default’ minimum - Configuration. If the error still occurs, try to see if the DRU is set up correctly (partitions/partition-size)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>206</td>
<td>PRC_RECORDING_STOPPED_INDICATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The VR-5000 has stopped recording. The system has been running on BATTERY only, for more than 2 hours or the index has been cleared and system has not been rebooted.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Action: Reconnect AC or DC. And the system will start recording after 30 sec.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Description:
- **PRC_STATUS_RUNNING_ON_BATTERY**
  - Red-Green-Yellow
  - Code: 214
  - Both AC and DC power has been lost. Audible alarms will only be for max 2 min.
  - Action: Reconnect AC or DC power

### Description:
- **PRC_STATUS_MIC_TEST_FAILED**
  - Red-Green-Yellow
  - Code: 218
  - This LED-indication is displayed when the microphone-test fails to test the microphones defined in the WEB-configurator. This test can be run from MENU-13 in the WEB-configurator, and is run every 12-hours during normal operation (first time 12-hours after
  - Action: Check if microphones not mounted is disabled in the WEB-configurator (AUDIO-section->channels(3,4,5)). If this is o.k., locate the faulty microphone and check/replace it.

### Description:
- **PRC_NUM_FLASH_DRU_ERROR**
  - Off-Red-Yellow
  - Code: 226
  - Indicates system failed to find correct number of Flash-drives in DRU
  - Action: Investigate communication to DRU

### Description:
- **PRC_UTC_TIMEOUT**
  - Red-Red-Yellow
  - Code: 234
  - Indicates system has not received UTC information within 2 minutes after system-start.
  - Action: Check that a valid UTC-source is connected to the serial-port defined as UTC-source

### Description:
- **PRC_SYSTEM_DRIVE_FAILURE**
  - Yellow-Red-Yellow
  - Code: 238
  - Indicates system failed to find correct number of Flash-drives in DRU
  - Action: Check that a valid DRU is connected (Validated Flashdrives installed)

### Description:
- **PRC_STATUS_PDU_NO_CONNECTION**
  - Green-Yellow-Yellow
  - Code: 246
  - The cable between the PDU and DPU is not connected.
  - Action: Reconnect the cable between the PDU and DPU

### Description:
- **PRC_SELFTEST_FAILED**
  - Yellow-Green-Yellow
  - Code: 254
  - Indicates system failed the SELFTEST
  - Action: Connect via webbrowser or connect VGA-screen to see failure

### Description:
- **PRC_SERIAL_TIMEOUT**
  - Red-Yellow-Yellow
  - Code: 300-315
  - A serial channel has not delivered data within the specified timeout period.
  - Action: Reconnect Serial data.
Chapter 4  LOCATION OF PARTS

To pull out the PDU, first pull out the DPU.

*: To pull out the PDU, first pull out the DPU.

Data Collecting Unit (DCU)
Digital IF Board       Frame Grabber Board (w/ Multiplexer)
Analog IF Board                        Video Board
Audio Analog Board
LED Control Board                       Fire Wire Board

Note: Lithium battery CR2032 is installed on the DPU Processor Board. If it is necessary to adjust the system time frequently, it is time to replace the battery.
Main Control Unit, Rear view

- 24 VDC
- SERIAL 1
- SERIAL 2 (to add extra serial 8 channels)
- SERIAL 2
- ANALOG
- VGA
- CPU
- COM 1, COM 2 (top)
- AUDIO
- DIGITAL
- LED INTF
- VIDEO (VD1, VD2, VD3 and VD4 from bottom)
- FIREWIRE
- Hard disk (top) and DRU (bottom)

Power Distribution Unit (PDU) with cover removed

- Battery
- LED Board
- Breaker switches
- AC/DC power pack
- PDU Board
- BNC connectors for radar video
Junction Box (JB), Rear view

- MAIN JB Board
  - J35 (Digital)
  - J46 (RS422)
  - J47 (RS422, optional)

- SUB JB Board
  - J2 (Analog)
  - J3 (Audio)
  - J51
  - J49
  - J53

- Underwater Acoustic Beacon (DK-120)

- FLASH DISK Board (FW-ATA2501-1)

- CONNECTOR Board (24P0042)

- CONNECTION Board (24P0087)

- 2.5-inch FLASH DISK
  - (SLFLD25-8GM1U1 for 6G or DK0090G88TNO for 9G)

- REPEATER Board (24P0080)
  - (Firewire cable connects to CONNECTOR Board)

Components inside capsule
VR-5000 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 shipborne maintenance; therefore, they are not listed in this manual. Major modules can be located on the parts location on previous pages.

<table>
<thead>
<tr>
<th>Module</th>
<th>Type</th>
<th>Code No.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Processor Unit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Distribution Unit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal Board</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removable Hard Disk</td>
<td>FR-MDK1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Battery</td>
<td>VR-5015</td>
<td>2/set</td>
<td></td>
</tr>
<tr>
<td>Acoustic beacon</td>
<td>VR-5011</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Data Processor Unit (DPU)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother Board</td>
<td>PBP-14C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Supply Unit</td>
<td>ORION-300DX/24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processor Board</td>
<td>ROBO-678</td>
<td></td>
<td></td>
</tr>
<tr>
<td>256 MB RAM Board</td>
<td>256MB PC133</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OS Flash Memory Card</td>
<td></td>
<td>64 MB</td>
<td></td>
</tr>
<tr>
<td>Adapter Board</td>
<td>CFDISK.IB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LED Control Board</td>
<td>PCI-1284</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audio Analog Board</td>
<td>PCI-9111DG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analog IF Board</td>
<td>PCI-9111HR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital IF board</td>
<td>PCI-7396</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FG (Frame Grabber) Board</td>
<td>FAST FRAME 1300</td>
<td></td>
<td>include Multiplexer PCB</td>
</tr>
<tr>
<td>RS-422 IF Board</td>
<td>PCI-422</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DRU IF Board (IEEE 1394 adapter)</td>
<td>IOI-1394LPA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fan</td>
<td>AD0812HB-A70GL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fan</td>
<td>AD1212HB-A71GL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removable hard disk</td>
<td>VR-5014</td>
<td>40 BG</td>
<td></td>
</tr>
<tr>
<td><strong>Power Distribution Unit (PDU)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PDU Board</td>
<td>2000016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC/DC converter</td>
<td>SP-200-27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LED Board</td>
<td>2000009</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module</td>
<td>Type</td>
<td>Code No.</td>
<td>Remarks</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------</td>
<td>------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Breaker</td>
<td>III-FII2-PIMI-16A</td>
<td>DC and BAT</td>
<td></td>
</tr>
<tr>
<td>Breaker</td>
<td>III-FII2-PIMI-3A</td>
<td>AC</td>
<td></td>
</tr>
<tr>
<td>Junction Box</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JB MAIN Board</td>
<td>2000018</td>
<td></td>
<td></td>
</tr>
<tr>
<td>JB SUB Board</td>
<td>2000019</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Photocoupler assy</td>
<td>SFH6286-2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relay</td>
<td>HRS2H-S-DC24V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Data Recording Unit**

<table>
<thead>
<tr>
<th>Module</th>
<th>Type</th>
<th>Code No.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash Disk</td>
<td>SLFLD25-8GM1U1</td>
<td>6 GB</td>
<td></td>
</tr>
<tr>
<td>Flash Disk</td>
<td>DK0090G88TNO</td>
<td>9 GB</td>
<td></td>
</tr>
<tr>
<td>Mounting Base</td>
<td>VR-5022</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable gland</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beacon fixture</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chapter 5  SERIAL INTERFACE (IEC 61162-1)

Notes: Some sentences described here are proposed ones by the recent IEC TC80/WG6 (Digital Interface Working Group) at the time of this publication. They are marked with PAS 101, PAS 102, etc.

ALA - Set detail alarm condition

0  1      2    3    4    5    6   7   8        9
$xxALA, hhmmss.ss, aa, aa, xx, xxx, A, A, c—c *hh<CR><LF>

0: Header  1: Event time (Optional)  2: System indicator of alarm source
3: Sub-system/equipment/item indicator of alarm source  4: Number of equipment / units / items
5: Number of alarm source  6: Alarm condition  7: Alarm’s acknowledge state
8: Alarm’s description text  9: Check-sum

ALR – Set alarm status   (PAS 101)

Updated the text label of the alarm identification field to be the same as that field in the ACK sentence.

$--ALR, hhmmss.ss, xxx, A, A, c--c*hh<CR><LF>

Alarm’s description text
Alarm’s acknowledge state, A = acknowledged, V= unacknowledged
Alarm condition (A = threshold exceeded, V = not exceeded)
Unique alarm number (identifier) at alarm source
Time of alarm condition change, UTC

DPT - Depth

IMO Resolution A.224 (VII). Water depth relative to the transducer and offset of the measuring transducer. Positive offset numbers provide the distance from the transducer to the waterline. Negative offset numbers provide the distance from the transducer to the part of the keel of interest.

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

Offset from transducer, in meters = distance from transducer to water-line
Water depth relative to the transducer, in meters

DTM - Datum reference (to be further developed)

Local geodetic datum to which a position location is referenced.

$--DTM, ccc, a*hh<CR><LF>

Country sub-division code
W72 - WGS 72, W84 - WGS 84,
IHO - datum code,
999 - user defined
**FIR – Fire detection  (PAS 102)**

$xxFIR, A, hhmmss.ss, aa, xx, xxx, xxx, A, A, c--c, *hh<CR><LF>

0: Header   1: message type    3: System indicator of fire detection   4: Division indicator of
door allocation (1)  5: Division indicator of door allocation (2)   6: Fire detector number or
activation detection number count    7. Condition   8: Alarm’s acknowledge state   9: Alarm’s
description text   10: Check-sum

**GNS   GNSS fix data**

Fix data for single or combined satellite navigation systems (GNSS).

$--GNS, hhmmss.ss, llll.ll, a, yyyyy.yy, a, , c--c,
xx, x.x, x.x, x.x, x.x, x.x *hh<CR><LF>

1: UTC of position  
2: Latitude, N/S  
3: Longitude, E/W  
4: Mode indicator  1st char.=GPS, 2nd=GLONASS, 3rd=other satellite system  
   N=No fix  
   A=Autonomous  
   D=Differential  
   P=Precise  
   F=Float RTK  
   E=Dead reckoning mode  
   M=Manual input mode  
   S=Simulator mode  
   R=Real time Kinematic   
5: Total number of satellites in use, 00-99  
6: HDOP  
7: Antenna altitude, m, re: mean-sea-level(geoid)  
8: Geoidal separation, m  
9: Age of differential data  
10: Differential reference station ID

**HDT - Heading True**

$--HDT, x.x, T*hh<CR><LF>

  Checksum  
  Heading, degree true

**HSS - Hull stress surveillance systems   (PAS 102)**

$xxHSS, c--c, x.x, A, *hh<CR><LF>

0: Header   1: Measurement point ID   2: Measurement value   3: Data status, A = data valid, V = data invalid   4: Check-sum

Note :This must be verified by Ship Classification. VDR is required to log such data if HSS is fitted
on ship.
**MWV - Wind speed and angle  (PAS 102)**

When the reference field is set to relative, data is provided giving the wind angle in relation to the vessel's heading and wind speed, both relative to the moving vessel.

When the reference field is set to true, data is provided giving the wind angle relative to the vessel's heading and wind speed, both with reference to the moving water. True wind is the vector sum of the relative apparent wind vector and the vessel’s velocity vector along the heading line of the vessel. If represents the wind at the vessel if it were stationary relative to the water and heading in the same direction.

$--MWV, x.x, a, x.x, a, A^\text{hh}<\text{CR}><\text{LF}>$

- **Status, A** = data valid
- **Wind speed units, K/M/N**
- **Reference, R** = relative
- **T** = true
- **Wind angle, 0° to 359°**
RMC – Recommended Minimum Specific GPS Data

Checksum, mandatory for RMC
Magnetic variation (000.0 - 180.0°), degrees E/W
Date: dd/mm/yy
Course over ground, degrees True

$--RMC, hhmmss.ss, A, 1111.11, a, yyyyy.yy, a, x.x, x.x, xxxxxx, x.x, a,a*hh<CR><LF>

Latitude, N/S
Speed over ground, knots
Longitude, E/W
Receive status (V = navigation receiver warning)
UTC of position fix

RPM – Revolutions (PAS 102)

Shaft or engine revolution rate and propeller pitch.

$--RPM, a, x, x.x, x.x, A*hh<CR><LF>

Status: A = data valid
Propeller pitch, % of maximum, “-” = astern
Speed, revolutions/min, “-” = counter-clockwise
Engine of shaft number, numbered from center-line
Odd = starboard, even = port, 0 = single or no center-line
Source, shaft/engine S/E

RSA - Rudder sensor angle

$--RSA, x.x, A, x.x, A*hh<CR><LF>

Port rudder sensor (see note), Status: A = data valid
Starboard (or single) rudder sensor (see note), Status: A = data valid

NOTE - Relative measurement of rudder angle without units, “-” = turn to port. Sensor output is proportional to rudder angle but not necessarily 1 : 1.
VBW - Dual ground/water speed: This sentence to be expanded as shown below:

$--VBW, x.x, x.x, A, x.x, x.x, A, x.x, A, x.x, A *hh<CR><LF>

Status^2, stern ground speed A = data valid
V = invalid

Stern transverse ground speed^1,^2, knots

Status^2, stern water speed, A = data valid

Stern transverse water speed^1,^2, knots

Status, ground speed, A = data valid

Transverse ground speed^1, knots

Longitudinal ground speed^1, knots

Status, water speed, A = data valid

Transverse water speed^1, knots

Longitudinal water speed^1, knots

NOTES
1. Transverse speed: "-" = port, Longitudinal speed: "-"astern.

For vessels equipped with dual water and/or ground speed systems ; data for the equipment mounted towards the stern are reported in these fields.
**XDR - Transducer measurements**

Measurement data from transducers that measure physical quantities such as temperature, force, pressure, frequency, angular or linear displacement, etc. Data from a variable number of transducers measuring the same or different quantities can be mixed in the same sentence. This sentence is designed for use by integrated systems as well as transducers that may be connected in a “chain” where each transducer receives the sentence as an input and adds its own data fields on before retransmitting the sentence.

```$--XDR, a, x.x, a, c--c, ........ a, x.x, a, c--c*hh<CR><LF>
Transducer “n” (see note 1)
Data, variable number of transducers
Transducer No. 1 ID
Units of measure, transducer No. 1 (see note 2)
Measurement data, transducer No. 1
Transducer type, transducer No. 1 (see note 2)
```

**NOTES**

1. Sets of the four fields “type-data-units-ID” are allowed for an undefined number of transducers. Up to “n” transducers may be included within the limits of allowed sentence length, null fields are not required except where portions of the “type-data-units-ID” combination are not available.

**ZDA - Time and date**

UTC, day, month, year and local time zone.

```$--ZDA. hhmmss.ss, xx, xx, xxxx, xx, xx*hh<CR><LF>
Local zone minutes description, same sign as local hours
Local zone description 00 h to ± 13 h (see note)
Year
Month, 01 to 12
Day, 01 to 31
UTC
```

**NOTE** - Zone description if the number of whole hours added to local time to obtain GMT. Zone description is negative for east longitudes.
Declaration of conformity

We, FURUNO ELECTRIC CO., LTD.

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

hereby declare under our sole responsibility that the product

Voyage Data Recorder (VDR) model VR-5000

EN 61162 (IEC 61162-1 Second edition: 2000-07)

For assessment, see
- EC type examination (Module B) certificate BSH/4612/4290149/05 of 13 05 October 2005 and EC quality system (Module D) certificate No. BSH/4613/02202/0339/06 of 04 July 2006 and its Annex of 20 September 2006 issued by Federal Maritime and Hydrographic Agency (BSH), The Federal Republic of Germany
- Test report DANAK-196881 Project no.: E501123 of 10 April 2003 prepared by Danish Electronics, Light & Acoustics (DELTA), Denmark
- Test Report PG11186 of 9 April 2003 prepared by Danish Institute of Fire and Security Technology, Denmark

This declaration is issued according to the provisions of European Council Directive 96/98/EC on marine equipment modified by Commission Directive 2002/75/EC.

On behalf of Furuno Electric Co., Ltd.

Nishinomiya City, Japan
March 23, 2007

Hiroaki Komatsu
Manager,
International Rules and Regulations

(Place and date of issue)
(name and signature or equivalent marking of authorized person)
The paper used in this manual is elemental chlorine free.

FURUNO Authorized Distributor/Dealer

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