FURUNO

OPERATOR'S MANUAL

VOYAGE DATA RECORDER

MODEL   VR-5000

(Serial number 1001 or greater)

FURUNO ELECTRIC CO., LTD.

NISHINOMIYA, JAPAN

SAFETY INSTRUCTIONS

⚠ 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, 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 equip-
ment is emitting smoke or fire.**

Continued use can cause fatal damage to
the equipment.

⚠ WARNING

Keep heater away from equipment.

Heat can alter equipment shape and melt
the power cord, which can cause fire or
electrical shock.

**Do not place liquid-filled containers
near the equipment.**

Fire or electrical shock can result if a liquid
spills into the equipment.

**Do not operate the equipment with wet
hands.**

Electrical shock can result.

Batteries should be recycled.
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.

	SYS1	SYS2	SYS3		DCU OK
Normal Operation	ORG	ORG	ORG		GRN
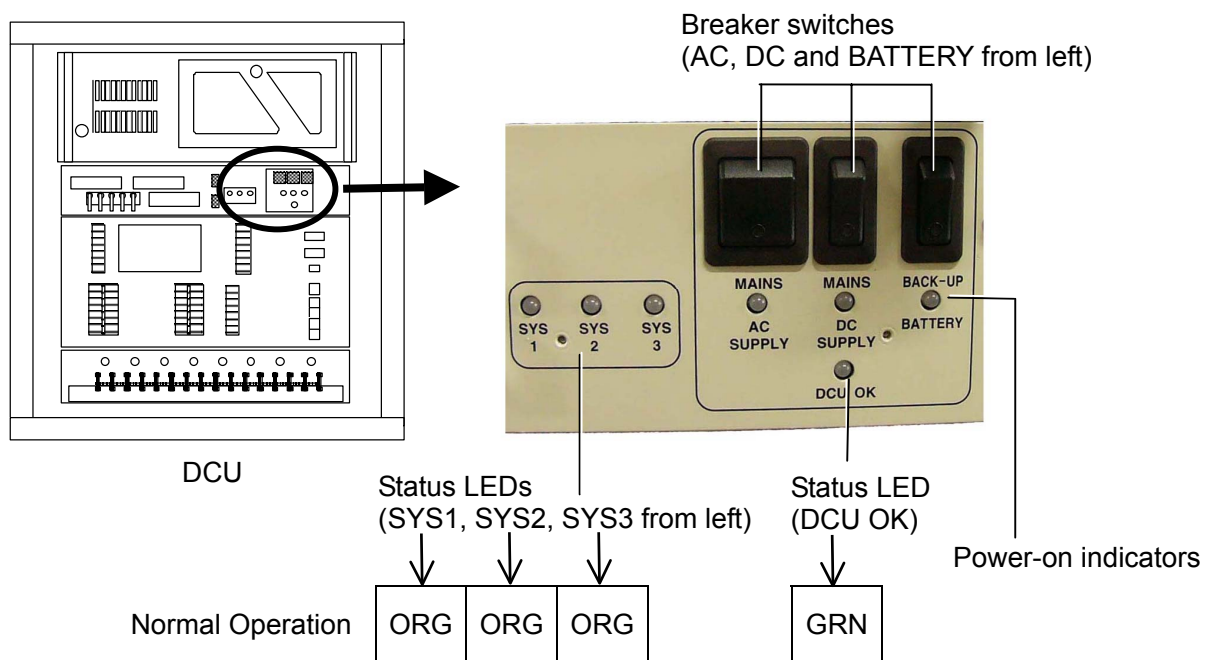
Error indication on Remote Alarm Panel (RAP)

If the ERROR LED (red) lights on the RAP, check the LEDs on the DCU.

CONTENTS

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

Standards		IMO A.861(20), IEC 61996, A.694, IEC 60945, IEC 61162, etc.

Data collecting unit (DCU)

.1	Structure of DCU	Deck mounted, containing status LEDs, interface, processor unit, power supply for all VDR operation, and backup batteries.
.2	Processor	CPU: Intel Pentium III in PGA 370 socket
		Memory: 512 MB (256 MBx2 PC-100/133 SDRAM)
.3	Interface	Serial data interface: 8 (16) channels
		Ethernet (10/100Base-T): 2 channels
		Analog: -10 to 10 V, 4 to 20 mA on 16 (24) channels
		Digital: 3 to 32 V and contact-closure on 64 (288) channels
		Audio: 8 channels including as standard 6 bridge audio channels and 2 VHF channels
		Video: 1 (4) radar input (from most commercial radars, resolution up to 1280 x 1024 pixels)
		Number in parentheses shows the maximum channel number.
.4	Data rate	Recording intervals: 1 second except radar image (at 15 s intervals), adjustable rate for replay
.5	Data retrieval	Data in the hard disk is retrieved, using Extract & Replay software.
.6	Backup	Hard disk
.7	Power supply	100-230 VAC (3.0-1.3 A), 50-60 Hz, 1ϕ
		24 VDC (10A)
		Dedicated reserve power supply (batteries in DCU) for 2 h of bridge audio recording on AC power failure

Data Recording Unit (DRU)

.1	Structure of DRU	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.
		Outer capsule Stainless steel
		Insulator Nonflammable
		Inner capsule Stainless steel
.2	Memory	Final recording media: Flash memory (Standard 6 GB), first-in first-out basis. Retains data for 2 years under no external power.

.3	Environmental tests for protective capsule	Fire: 1100°C for 1 h, 260°C for 10 h (complies with ED 56A)
		Shock: 50 G, duration 11 ms
		Penetration: 250 kg with a pin ø100 mm dropped from 3 m (ED 56A)
		Deep sea immersion: 6,000 m (60 Mpa)

	Ambient temperature
	Class of equipment
		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
.4	Acoustical beacon	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
.5	Data retrieval	By playback equipment (not part of standard VR-5000)
.6	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

.1	Function	Download the data in the DRU to an external medium.
.2	Audio reproducing	Requires quality audio system with loudspeakers. With audio card per channel.
.3	Facilities required	Commercial PC, desktop or laptop
.4	Minimum specifications	1 GHz Pentium III 256 MHz or better, 128 MB RAM, 32 MB video RAM, CD ROM drive
		OS: Windows 2000 and XP
.5	Monitor	12.1/14/17", Resolution 1280 x 1024, 1024 x 768, 800 x 600, 640 x 480

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

Pub No.	Software (Prog No.)	Outline of changes in Operator's manual
OME-44180-A	V0.99.06	First edition
OME-44180-B	V0.99.06	Part of installation is separated.
OME-44180-C	V0.99.16	Changed battery. Changed mounting base of DRU.
OME-44180-C1	V2.07.00	Software updated
OME-44180-E	V3.00.00	Software updated

SYSTEM CONFIGURATION
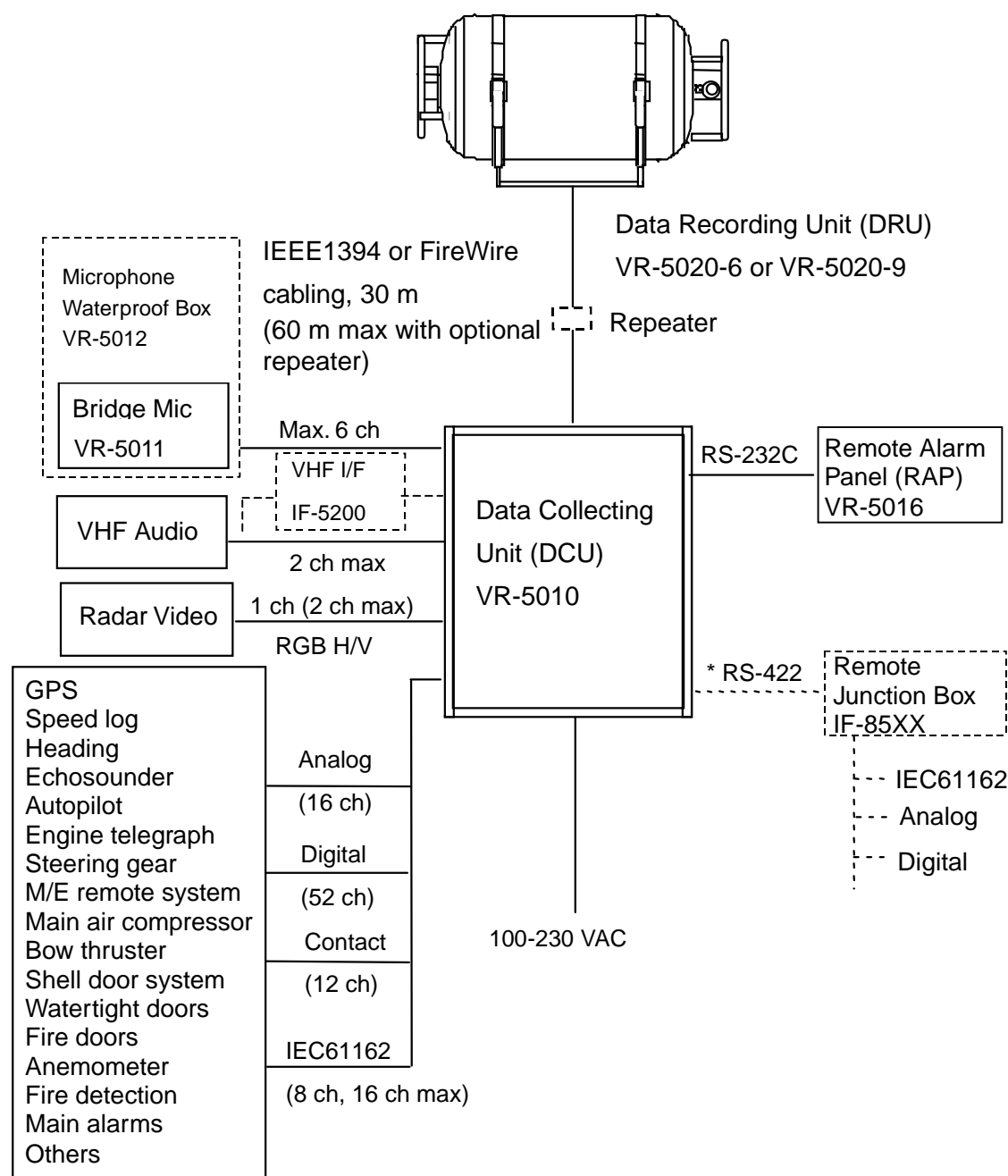
Fig. A   System Configuration of VR-5000

Environmental category

DCU, RAP	Protected from weather
DRU	Exposed to weather
Microphone	Protected from weather
VHF I/F unit	Protected from weather

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;

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

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.
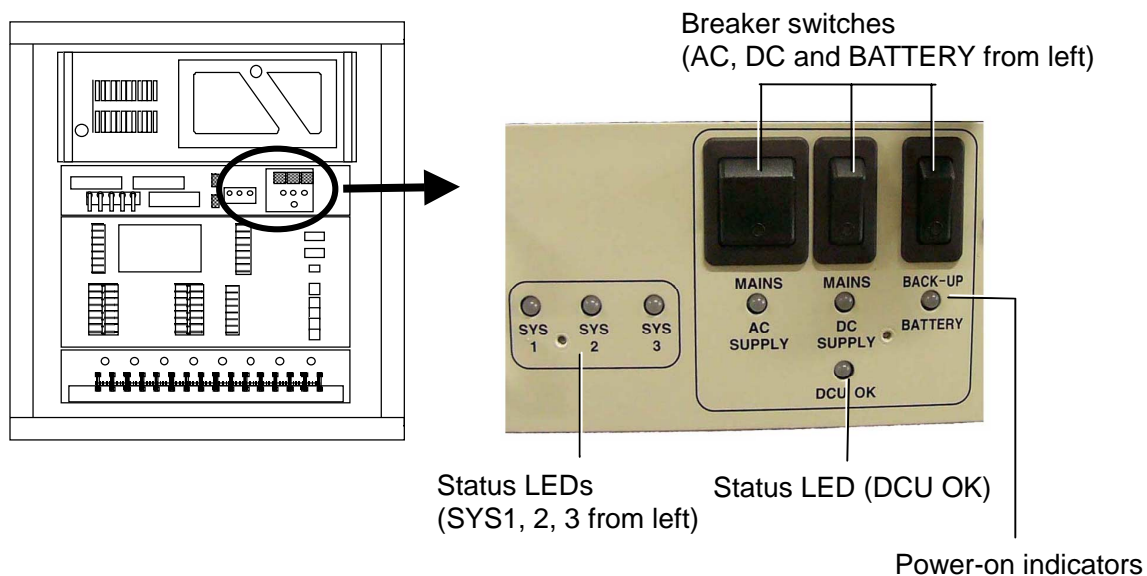
Breakers on Power Distribution Unit in DCU

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. **DO NOT turn off the system by the main breaker** on the switch panel while BATTERY switch is on. If do so, 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 err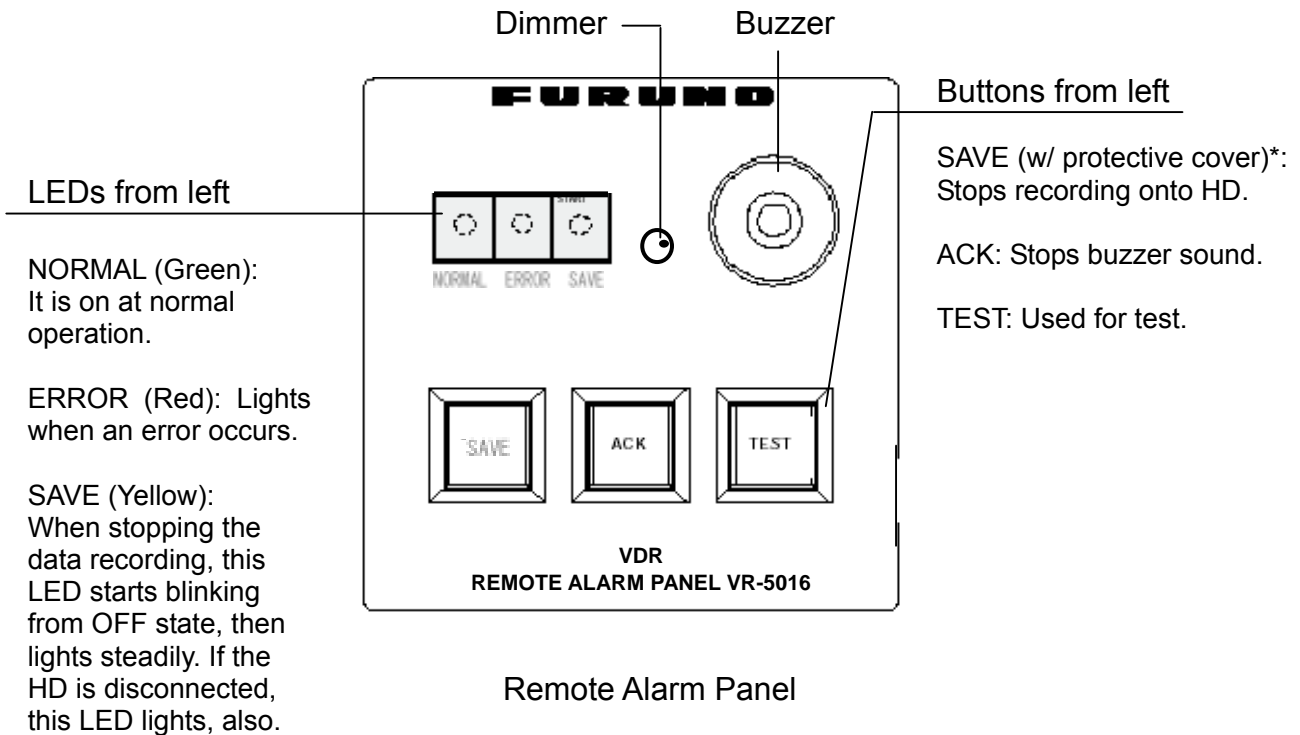or by checking status LEDs on the Power Distribution Unit in the DCU. See to Chapter 3. The buttons on the remote alarm panel work as described in the figure below.

Dimmer

Buzzer

Buttons from left

SAVE (w/ protective cover)*:
Stops recording onto HD.

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, this LED starts blinking from OFF state, then lights steadily. If the HD is disconnected, this LED lights, also.

FURUNO

START

NORMAL ERROR SAVE

SAVE ACK TEST

VDR
REMOTE ALARM PANEL VR-5016

Remote Alarm Panel

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, 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 1.1 Status of LEDs

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

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.

HD
(behind this cover)

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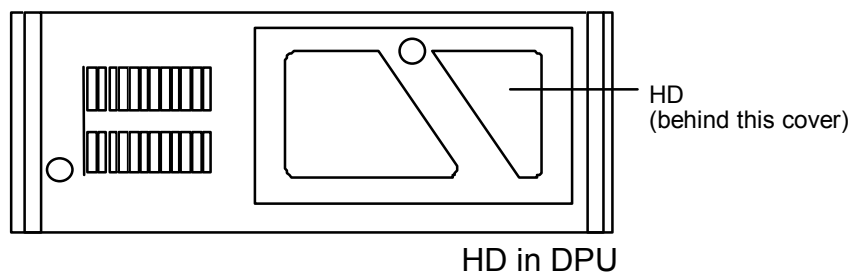
The HD is locked to avoid unauthorized access. The key must be used to open the HD and select the function as below:

Key position	Power status	Security status
A	ON	Locked, irremovable
B	OFF	Locked, irremovable
C	OFF	Unlocked, removable

Key positions
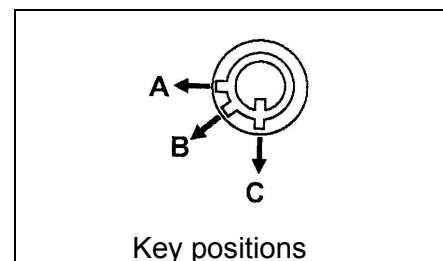
The green LED (right) on the panel is "Power" indicator and the amber one (left) is HD access indicator.
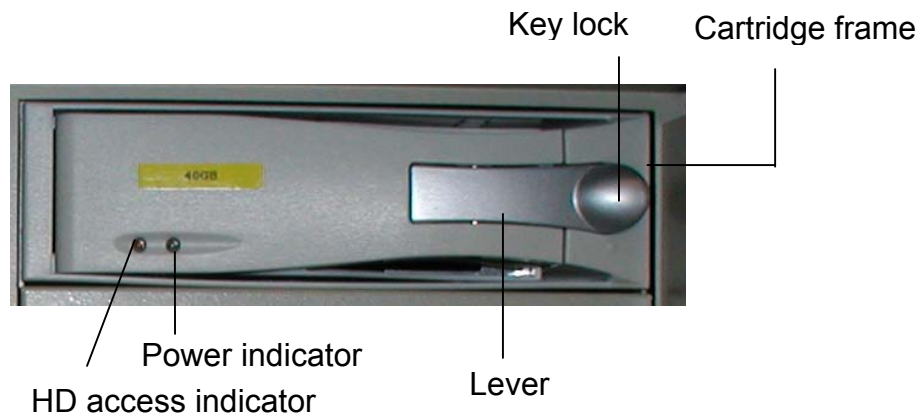
Front panel of removable hard disk

To remove the HD, carry out the following procedure.

.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 Turn off VR-5000 by pressing BATTERY, DC, and AC switch in this order.

.4 Pull the lever outward and then unlock the key on the HD. (Position C, downward)

.5 Pull the lever to remove the HD.

.6 Insert the HD into the cartridge by reversing above procedures.

.7 Look the key on the HD. (Position A)

.8 Turn on VR-5000.

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.
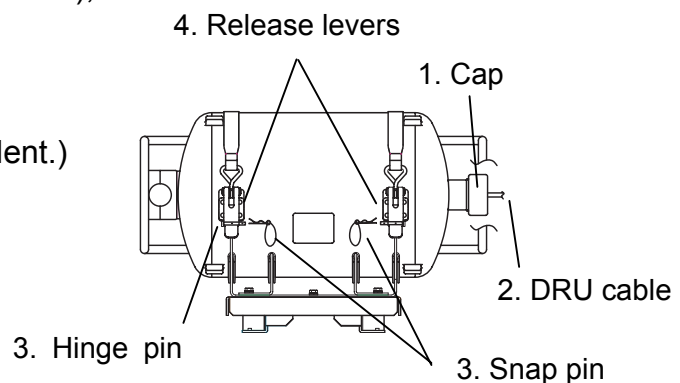
Chapter 2   MAINTENANCE

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.

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⚠ 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.
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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.

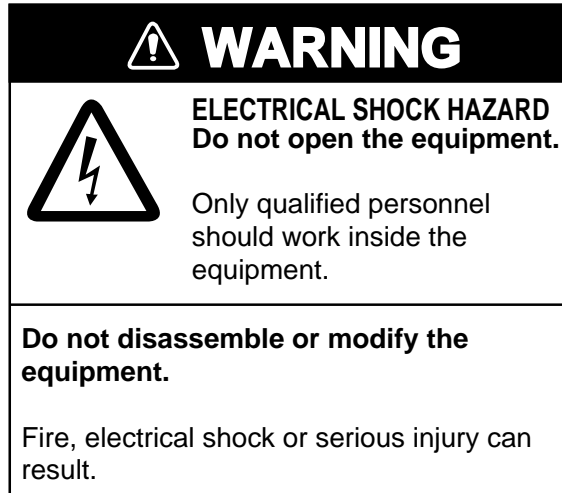Battery Type: VR-5015, requiring 2 pcs.

Code Number: 004-379-620

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.

Power distribution unit

Upset screw   Pan head screw
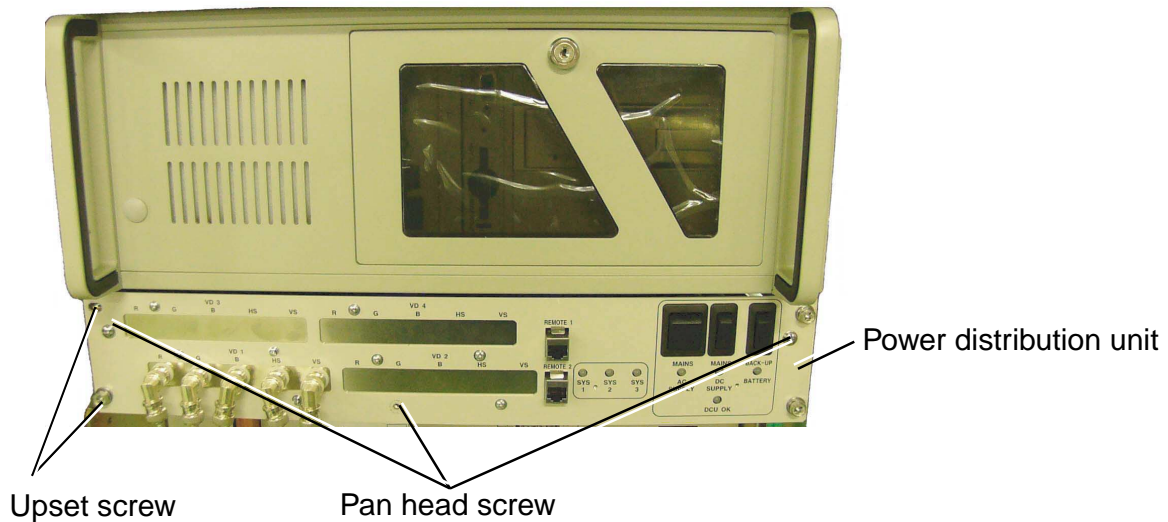
.3   Remove three pan head screws on the power distribution unit and pull out its panel slightly.

.4   Remove the battery connections at the battery terminals.

.5   Dismount the battery cover by removing four screws.

Batteries (cover removed)

Battery terminal
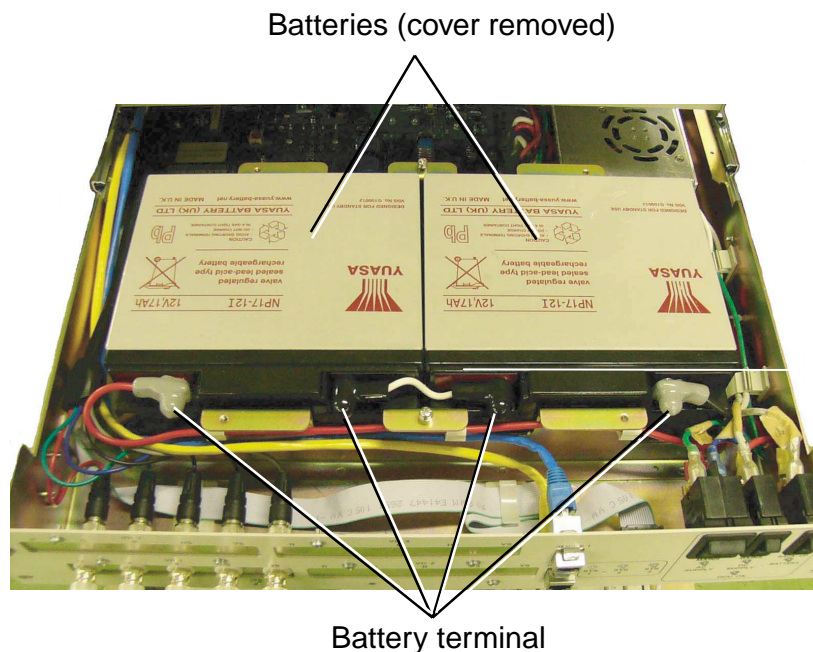
.6   Replace two batteries with new ones.

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.

Necessary tool: M5 Allen wrench

Validity is marked here.

Underwater acoustic beacon (VR-5021)

Use M5 Allen wrench to loosen bolts.
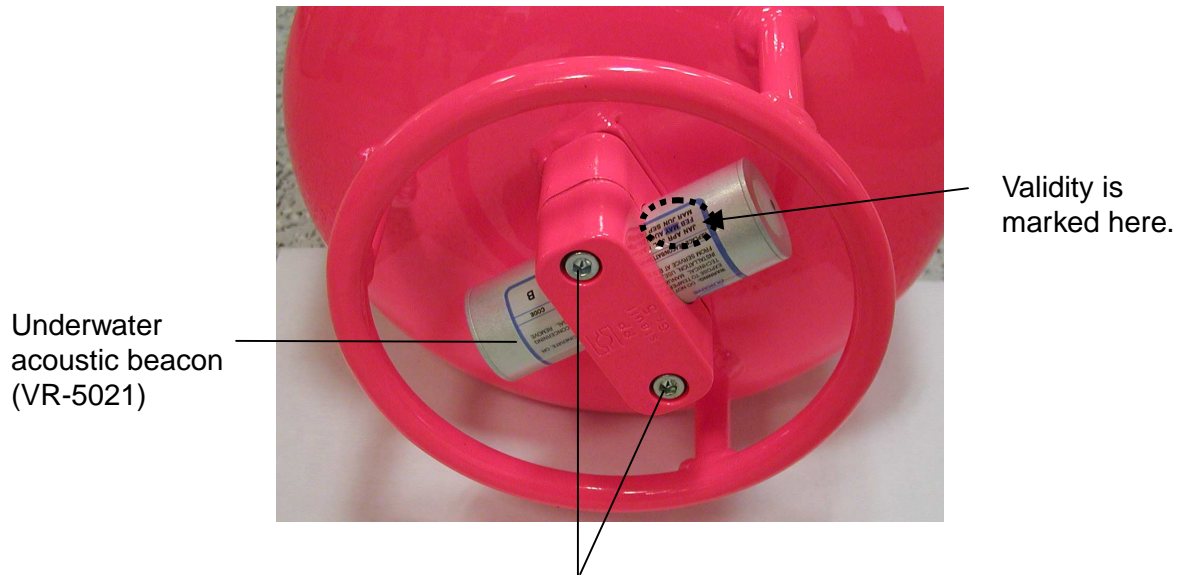
Fig.2.2   Underwater Acoustic Beacon on DRU

Caution

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

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 3.1 Troubleshooting table

Symptom	Possible causes	Possible solutions
AC and/or DC LED not llit	No power supply	Check the breaker switches.
BAT LED not lighting	No power from the battery	Call for service.
DCU OK LED lighting in red.	Malfunction of the system	Restart the system. If the problem still remains, call for service. Check integrity of DRU connection.

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 3.2 Status code

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

VR-5000 error codes (3.0)

SYS 1	SYS 2	SYS 3	DCU OK	Code	Name
YELLOW	YELLOW	YELLOW	GREEN	253	PRC_STATUS_OK_INDICATION
				Description:	System is running normally with no errors pending.
				Action:	None.

SYS 1	SYS 2	SYS 3	DCU OK	Code	Name
YELLOW	YELLOW	YELLOW	YELLOW		
				Description:	VR-5000 has been turned on. Wait for 2 minutes to watch LEDs start 'roll-flash'.
				Action:	If LEDs do not flash after 2-3 minutes, system is unable to start normally. Call for service.

SYS 1	SYS 2	SYS 3	DCU OK	Code	Name
RED	RED	RED	RED	170	PRC_STATUS_FATAL_FAILURE_INDICATION
				Description:	FATAL SYSTEM ERROR
				Action:	Request service.

SYS 1	SYS 2	SYS 3	DCU OK	Code	Name
RED	OFF	OFF	RED	010	PRC_STATUS_DRU_FAILURE_INDICATION
				Description:	System is experiencing trouble communicating with the DRU.
				Action:	Trouble-shoot connection from VR-5000 to the DRU(cable, repeaters and possible IEEE1394/Firewire - board in the PDU.)

SYS 1	SYS 2	SYS 3	DCU OK	Code	Name
YELLOW	OFF	OFF	RED	014	PRC_STATUS_BACKUP_DEVICE_FAILURE
				Description:	Backup device is either faulty or not set up correctly.
				Action:	Replace or reconfigure backup device.

SYS 1	SYS 2	SYS 3	DCU OK	Code	Name
OFF	RED	OFF	RED	034	PRC_STATUS_STORAGE_FAILURE_INDICATION
				Description:	Problem with storing data on storage devices.
				Action:	Investigate LOG and repair/replace.

SYS 1	SYS 2	SYS 3	DCU OK	Code	Name
YELLOW	RED	OFF	RED	046	PRC_STATUS_DRU_INDEX_ERROR
				Description:	Problem with INDEX in DRU.
				Action:	Investigate LOG and clear INDEX.

SYS 1	SYS 2	SYS 3	DCU OK	Code	Name
GREEN	GREEN	OFF	RED	022	PRC_STATUS_STORAGE_DRU_CONNECTION_TIMEOUT
				Description:	DRU has been disconnected more than 90 seconds.
				Action:	Connect DRU again or investigate LOG and repair/replace.

SYS 1	SYS 2	SYS 3	DCU OK	Code	Name
YELLOW	YELLOW	OFF	RED	062	PRC_STATUS_STORAGE_LAST_BUFFER_NOT_SAVED
				Description:	Storage problem with DRU/BACKUP.
				Action:	Investigate LOG(if possible) or contact supplier for repair.

SYS 1	SYS 2	SYS 3	DCU OK		Code	Name
OFF	OFF	RED	RED		130	**PRC_STATUS_DATAIO_FAILURE_INDICATION**
				Description:	Problem with ANALOG/DIGITAL interface board inside DPU. Selftest program run during boot should indicate which board.	
				Action:	Replace faulty board.	

SYS 1	SYS 2	SYS 3	DCU OK		Code	Name
RED	RED	OFF	RED		042	**PRC_STATUS_GRABBER_FAILURE_INDICATION**
				Description:	One of the active/enabled video-channels can't grab from the channel. This can be either because radar is 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.	

SYS 1	SYS 2	SYS 3	DCU OK		Code	Name
RED	YELLOW	RED	RED		186	**PRC_STATUS_GRABBER_IMAGE_TOO_BIG**
				Description:	Video image captured from radar is large than expected.	
				Action:	Check quality of captured image, colormask(video-channels) and re-adjust framegrabber.	

SYS 1	SYS 2	SYS 3	DCU OK		Code	Name
RED	OFF	RED	RED		138	**PRC_STATUS_CONFIG_FAILURE_INDICATION**
				Description:	Unexpected error when trying to read CONFIG.	
				Action:	Check that installed firmware version is correct for connected DRU. If this is a new DRU, CONFIG_area needs to be 'Cleared'.	

SYS 1	SYS 2	SYS 3	DCU OK		Code	Name
RED	GREEN	RED	RED		154	**PRC_STATUS_CONFIG_INVALID_START_TAG**
				Description:	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 sec with SYS1/SYS2/SYS3 off and this code.	
				Action:	Restart VR-5000.	

SYS 1	SYS 2	SYS 3	DCU OK		Code	Name
GREEN	GREEN	RED	RED		150	**PRC_STATUS_CONFIG_INVALID_SIZE**
				Description:	Size of CONFIG_area in the DRU is different from expected one. This should only happen during installation/service and upgrade of the system software.	
				Action:	Clear CONFIG_area and restart VR-5000. This will install a 'default' minimum configuration.	

SYS 1	SYS 2	SYS 3	DCU OK		Code	Name
RED	GREEN	GREEN	RED		090	**PRC_STATUS_CONFIG_INVALID_FLASH_HANDLE**
				Description:	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.	
				Action:	Clear CONFIG_area and restart VR-5000. This will install a 'default' minimum configuration.	

SYS 1	SYS 2	SYS 3	DCU OK		Code	Name
OFF	RED	RED	RED		162	PRC_STATUS_CONFIG_MISSING_IN_FLASH
				Description:	CONFIG_area in DRU is corrupt/wrong/un-initialized. This should only happen during installation/service and if using a DRU not initialized by VR-5000 it is connected to.	
				Action:	Clear CONFIG_area and restart VR-5000. This will install a 'default' minimum configuration.	

SYS 1	SYS 2	SYS 3	DCU OK		Code	Name
GREEN	GREEN	GREEN	RED		086	PRC_STATUS_CONFIG_VDRDEFAULT_ERROR
				Description:	Built-in configuration in VR-5000 system software failed to load into the DRU. Reason can be the firmware itself or a problem with the DRU.	
				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).	

SYS 1	SYS 2	SYS 3	DCU OK		Code	Name
GREEN	RED	GREEN	RED		102	PRC_STATUS_CONFIG_UNABLE_TO_SAVE
				Description:	VR-5000 could not save configuration to the DRU/BACKUPDRIVE.	
				Action:	1. Check DRU connected. 2. BACKUPDRIVE O.K. 3. For other call for service.	

SYS 1	SYS 2	SYS 3	DCU OK		Code	Name
RED	GREEN	OFF	RED		026	PRC_STATUS_TIMEDIFF_TOO_BIG
				Description:	Communication-port defined to deliver UTC time information delivered a UTC time that is more than 1 hour different from the VR-5000 system clock. This normally happens if GPS or time source sending the information is out of sync, or the system clock wasn't set to UTC time before starting.	
				Action:	Try to see if the CMOS clock is set correctly. If not, set it and restart VR-5000. If yes, find out why the time source-device defined in the WEB-configurator is delivering 'out of bands' time information.	

SYS 1	SYS 2	SYS 3	DCU OK		Code	Name
RED	GREEN	YELLOW	RED		218	PRC_STATUS_MIC_TEST_FAILED
				Description:	Microphone test failed 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 system start up).	
				Action:	Check if microphones mounted are disabled in the WEB-configurator. (AUDIO section->channels(3,4,5)). If this is o.k., locate the faulty microphone and check/replace it.	

SYS 1	SYS 2	SYS 3	DCU OK		Code	Name
RED	YELLOW	YELLOW	RED		301-316	PRC_SERIAL_TIMEOUT (250)
				Description:	A serial channel has not delivered data within the specified timeout period.	
				Action:	Reconnect serial data. Check failed device.	

SYS 1	SYS 2	SYS 3	DCU OK	Code	Name
GREEN	GREEN	YELLOW	RED	214	PRC_STATUS_RUNNING_ON_BATTERY
				Description:	Both AC and DC power are down. Audible alarms will only be generated for max 2 min.
				Action:	Reconnect AC or DC power.

SYS 1	SYS 2	SYS 3	DCU OK	Code	Name
GREEN	YELLOW	YELLOW	RED	246	PRC_STATUS_PDU_NO_CONNECTION
				Description:	The cable between the PDU and DPU is not connected.
				Action:	Reconnect the cable between the PDU and DPU.

SYS 1	SYS 2	SYS 3	DCU OK	Code	Name
OFF	GREEN	GREEN	RED	082	PRC_STATUS_RAP_MISSING
				Description:	Remote alarm panel is missing. Connection to R.A.P. is lost.
				Action:	Check Cable to R.A.P. Reconnect R.A.P.

SYS 1	SYS 2	SYS 3	DCU OK	Code	Name
YELLOW	OFF	YELLOW	RED	206	PRC_RECORDING_STOPPED_INDICATION
				Description:	VR-5000 has stopped recording. System has been running on BATTERY only for more than 2 hours, or index has been cleared and system has not been rebooted.
				Action:	Reconnect AC or DC. The system will start recording after 30 sec.

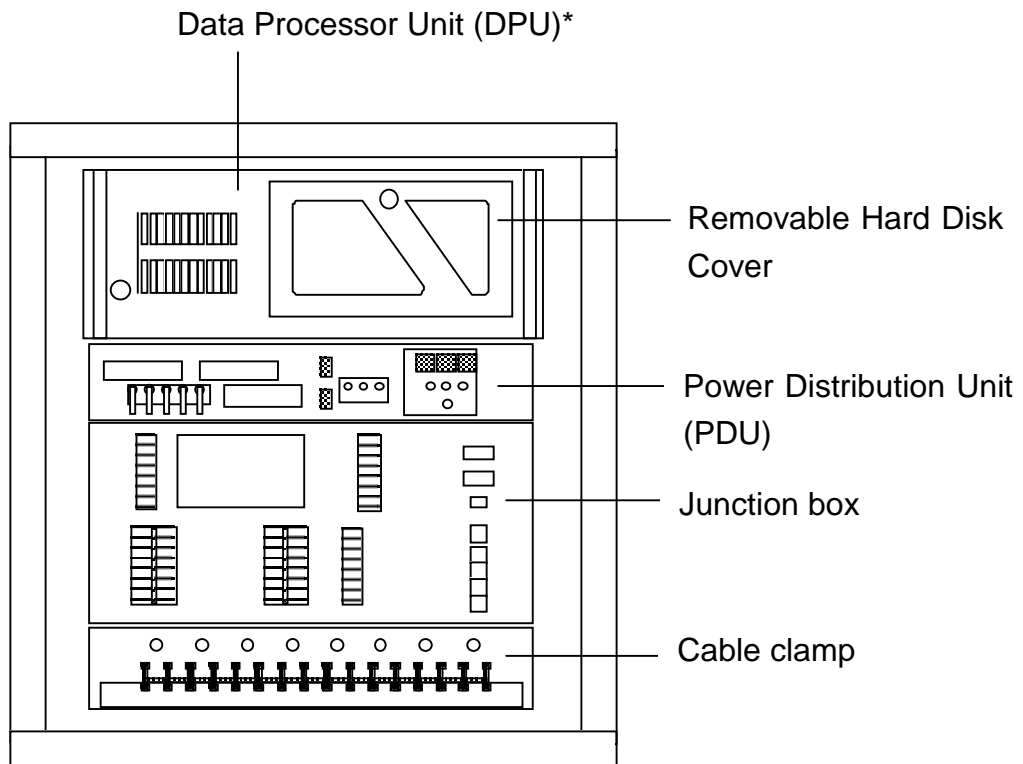| SYS 1	SYS 2	SYS 3	DCU OK	Code	Name
RED	RED	GREEN	RED	106	PRC_STATUS_SYSTEM_STOPPED
				Description:	SYSTEM_STOP - request has been completed (system has stopped collecting data).
				Action:	Turn OFF POWER to power down, or recycle POWER to restart

SYS 1	SYS 2	SYS 3	DCU OK	Code	Name
RED	YELLOW	RED	RED	238	PRC_SYSTEM_DRIVE_FAILURE
				Description:	System did not find valid System drive(DRU).
				Action:	Check that a valid DRU is connected(Validated flashdrives installed).

SYS 1	SYS 2	SYS 3	DCU OK	Code	Name
RED	RED	YELLOW	RED	234	PRC_UTC_TIMEOUT
				Description:	System has not received UTC information within 2 minutes after system start up.
				Action:	Check that a valid UTC source is connected to the serial port defined as UTC source.

SYS 1	SYS 2	SYS 3	DCU OK	Code	Name
YELLOW	GREEN	YELLOW	RED	254	PRC_SELFTEST_FAILED
				Description:	System failed the SELFTEST.
				Action:	Connect via webbrowser or VGA screen to see reason for failure.

SYS 1	SYS 2	SYS 3	DCU OK	Code	Name
OFF	RED	YELLOW	RED	226	PRC_NUM_FLASH_DRU_ERROR
				Description:	System failed to find correct number of Flash drives in DRU.
				Action:	Check communication with DRU.

Chapter 4 LOCATION OF PARTS

Data Processor Unit (DPU)*

Removable Hard Disk Cover

Power Distribution Unit (PDU)

Junction box

Cable clamp

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

Data Collecting Unit (DCU)

Digital IF Board

Analog IF Board

Audio Analog Board

Frame Grabber Board (w/ Multiplexer)

Video Board

LED Control Board

Fire Wire Board

Power Supply Unit

256 MB RAM Card (2 pcs)

Mother Board

Removable Hard Disk

DPU Processor Board

Data Processor Unit (DPU)
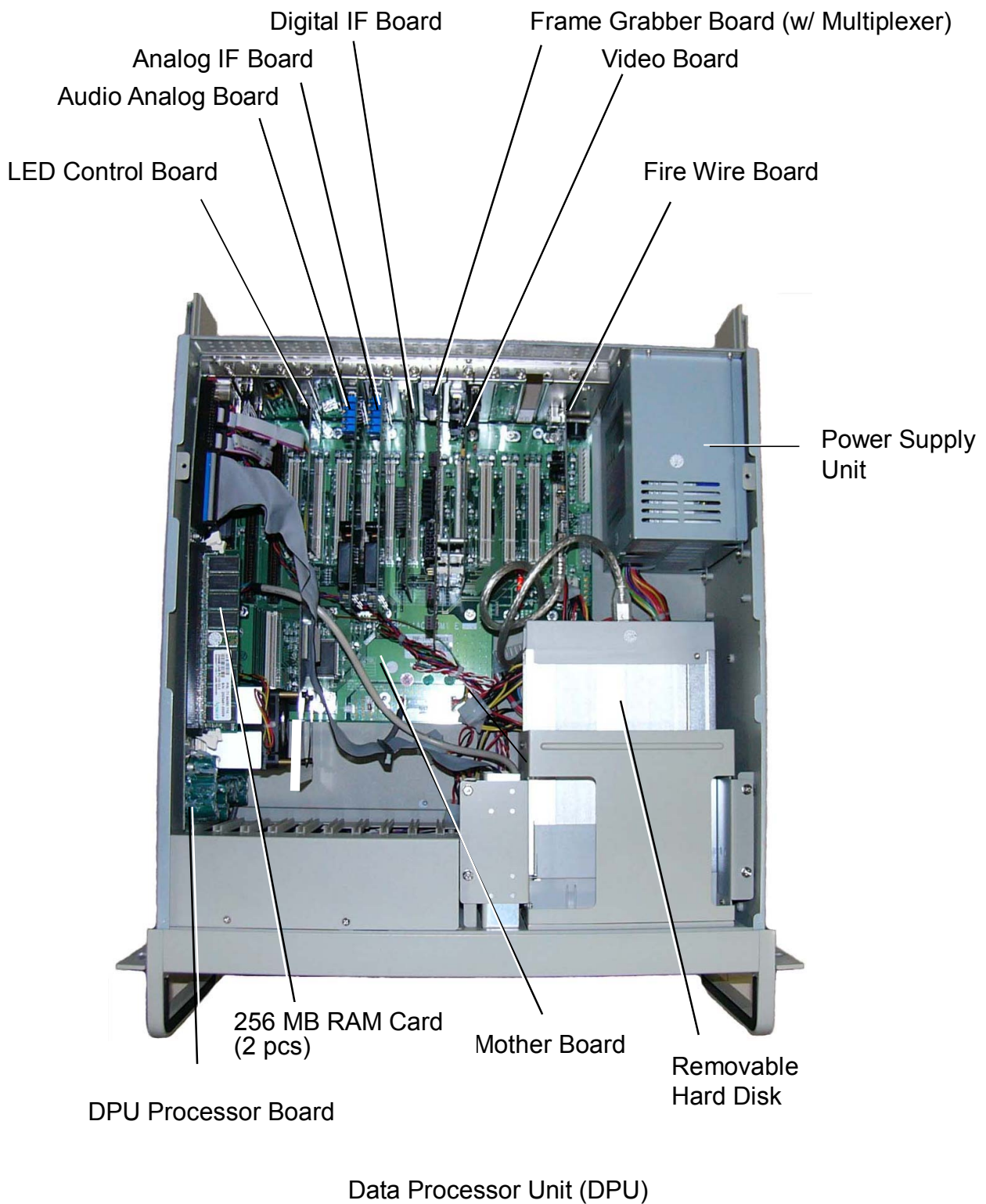
Note: Lithium battery CR2032 is installed on the DPU Processor Board. If it is necessary to adjust the system time frequently, it is time to replace the battery.

FIREWIRE
Hard disk (top) and
DRU (bottom)

VIDEO
(VD1, VD2, VD3 and
VD4 from bottom)

DIGITAL

AUDIO
LED INTF

24 VDC

ANALOG

VGA

CPU

SERIAL 1

COM 1, COM 2 (top)

SERIAL 2 (to add extra serial 8 channels)
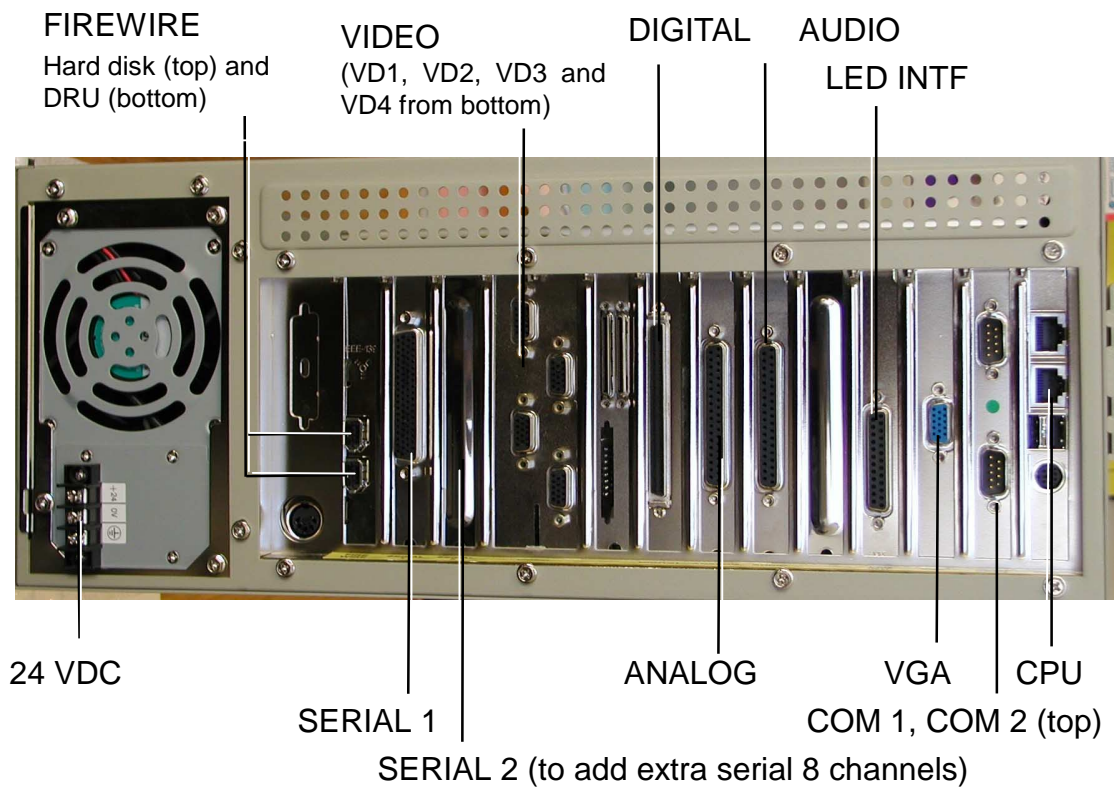
Main Control Unit, Rear view

PDU Board

AC/DC power pack

BNC connectors
for radar video

Batteries

LED Board

Breaker switches
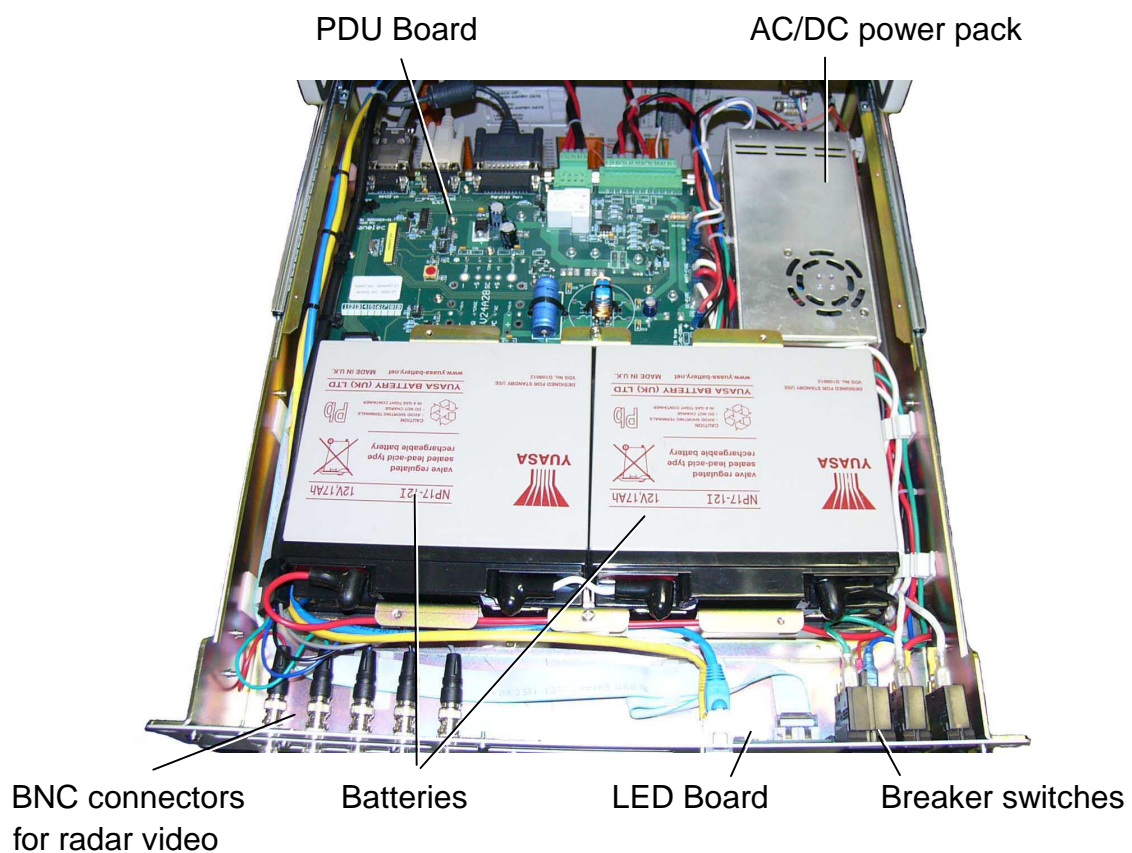
Power Distribution Unit (PDU) with cover removed

MAIN JB Board

J35 (Digital)

J46 (RS422) J47 (RS422, optional)

J51

J49

J53

SUB JB Board

J2 (Analog)

J3 (Audio)
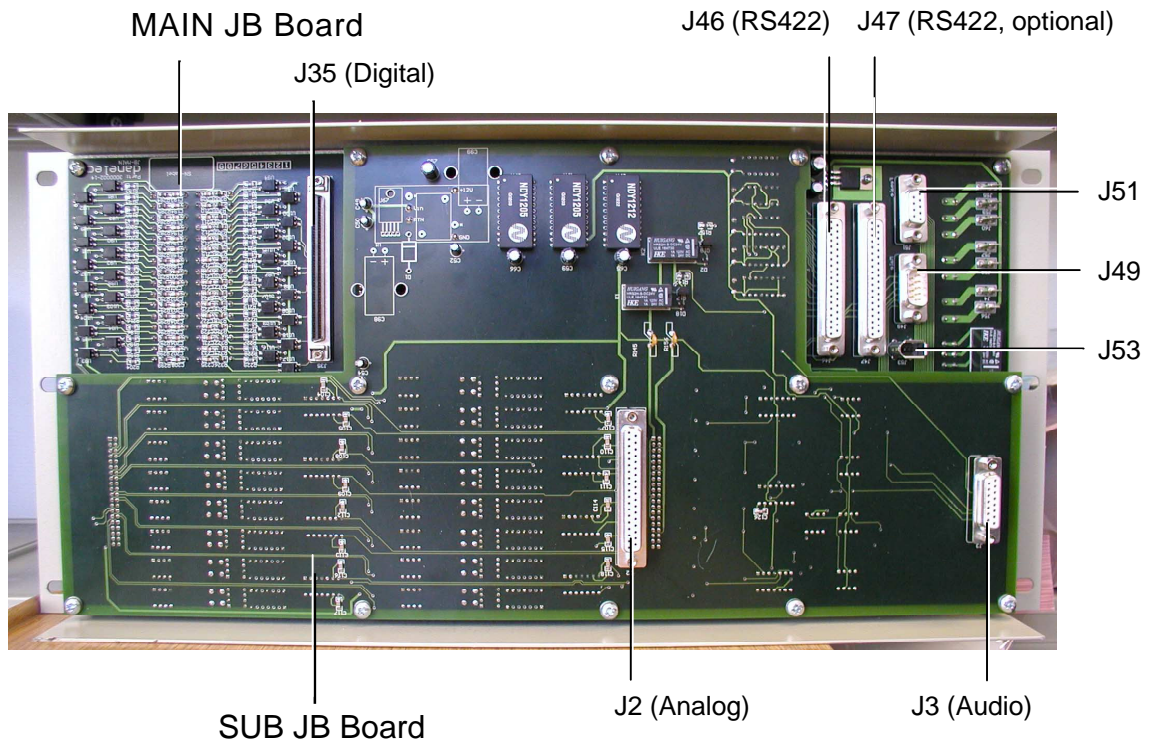
Junction Box (JB), Rear view

Underwater acoustic beacon

(Pinger)

FireWire connecting tube

Capsule rleasing latches
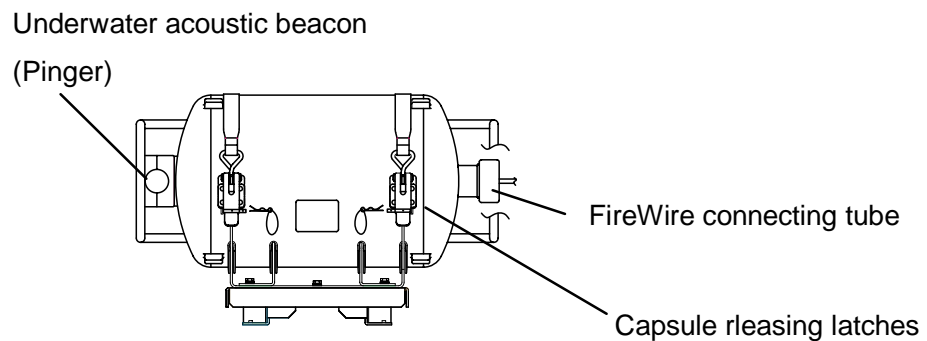
Data Recording Unit (DRU)

Flash Memory Boards in DRU, out of protective cylinder

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.

Module	Type	Code No.	Remarks
Data Processor Unit			
Power Distribution Unit			
Terminal Board			
Removable Hard Disk	FR-MDK1		
Battery	VR-5015		2/set
Acoustic beacon	VR-5011		
Data Processor Unit (DPU)			
Mother Board	PBP-14C		
Power Supply Unit	ORION-300DX/24		
Processor Board	ROBO-678		
256 MB RAM Board	256MB PC133		
OS Flash Memory Card			64 MB
Adapter Board	CFDISK.IB		
LED Control Board	PCI-1284		
Audio Analog Board	PCI-9111DG		
Analog IF Board	PCI-9111HR		
Digital IF board	PCI-7396		
FG (Frame Grabber) Board	FAST FRAME 1300		include Multiplexer PCB
RS-422 IF Board	PCI-422		
DRU IF Board (IEEE 1394 adapter)	IOI-1394LPA		
Fan	AD0812HB-A70GL		
Fan	AD1212HB-A71GL		
Removable hard disk	VR-5014		40 BG
Power Distribution Unit (PDU)			
PDU Board	2000016		
AC/DC converter	SP-200-27		
LED Board	2000009		

Module	Type	Code No.	Remarks
Breaker	III-FII2-PIMI-16A		DC and BAT
Breaker	III-FII2-PIMI-3A		AC
Junction Box			
JB MAIN Board	2000018		
JB SUB Board	2000019		
Photocoupler assy	SFH6286-2		
Relay	HRS2H-S-DC24V		
Data Recording Unit			
Flash Memory	VR-5023-6		6 GB
Flash Memory	VR-5023-9		9 GB
Mounting Base	VR-5022		
Cable gland			
Washer			
Beacon fixture			

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.
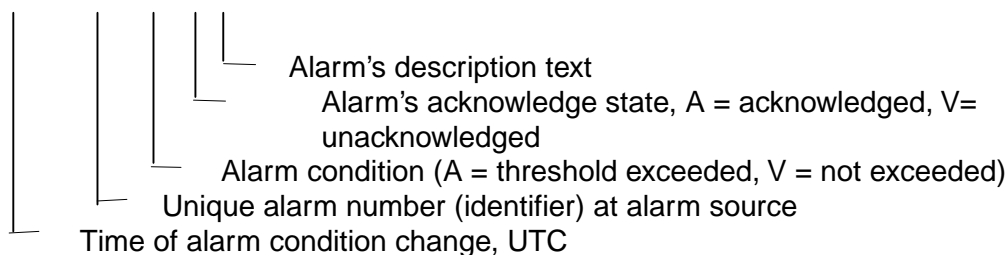
ALA - Set detail alarm condition

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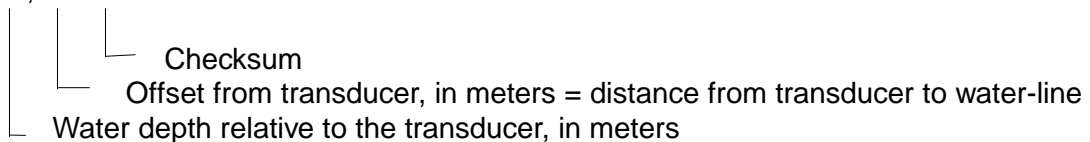
$--ALR,hhmmss.ss,xxx,A,A,c--c*hh<CR><LF>

                            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>

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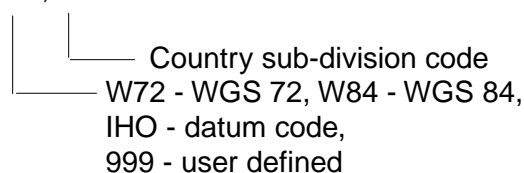   Water depth relative to the transducer, in meters

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)

```
0        1  2           3   4    5    6    7 8 9     10
$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,
              1          2    3     4      5
      xx, x.x, x.x, x.x, x.x, x.x *hh<CR><LF>
       5   6    7    8    9    10
```

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   F=Float RTK
    A=Autonomous   E=Dead reckoning mode
    D=Differential   M=Manual input mode
    P=Precise   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)

```
0        1     2    3  4
$xxHSS, c--c, x.x, A, *hh<cr><lf>
```

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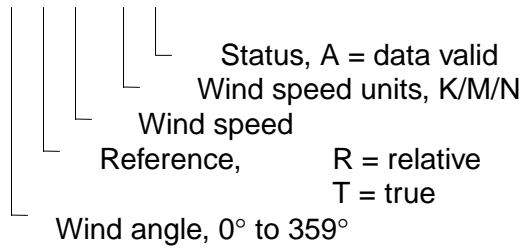3: Data status, A = data valid, V = data invalid   4: Check-sum

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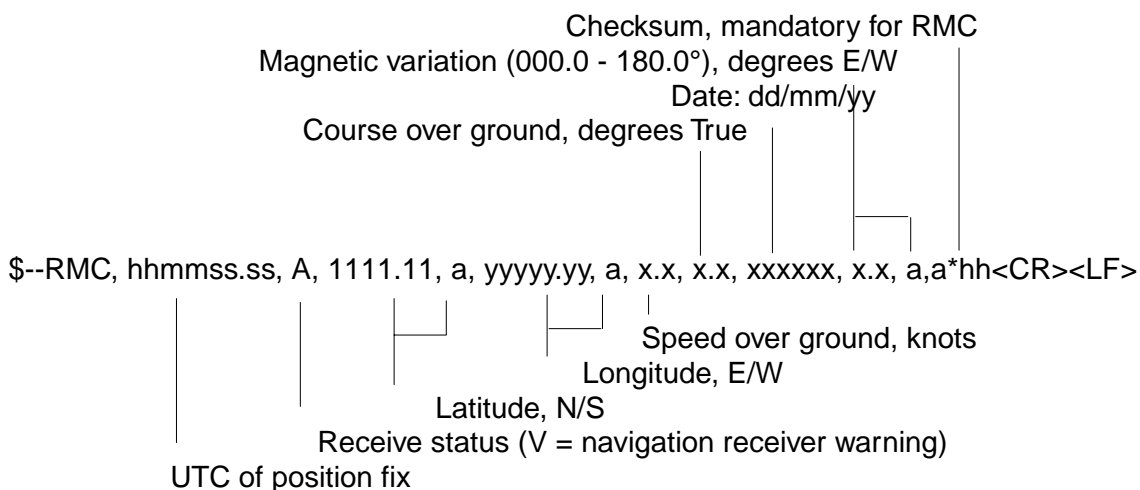
MWV - Wind speed and angle   (PAS 102)

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*hh<CR><LF>
          │ │ │  │
          │ │ │  └─────── Status, A = data valid
          │ │ └───────── Wind speed units, K/M/N
          │ └────────── Wind speed
          │      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>

                                                 Speed over ground, knots
                                       Longitude, E/W
                         Latitude, N/S
                    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
```
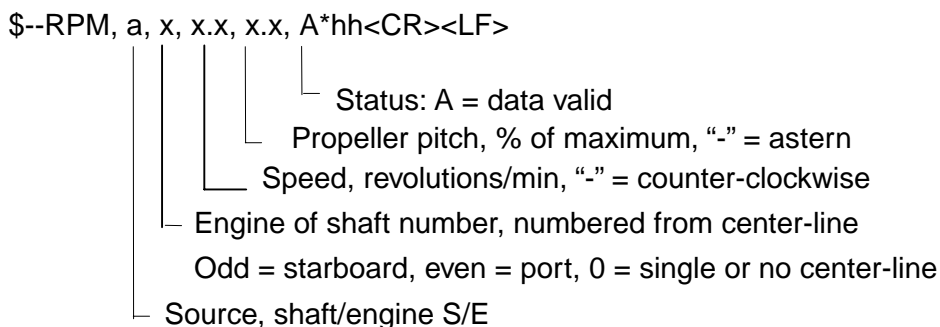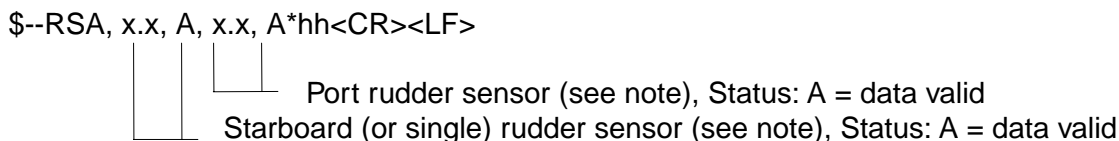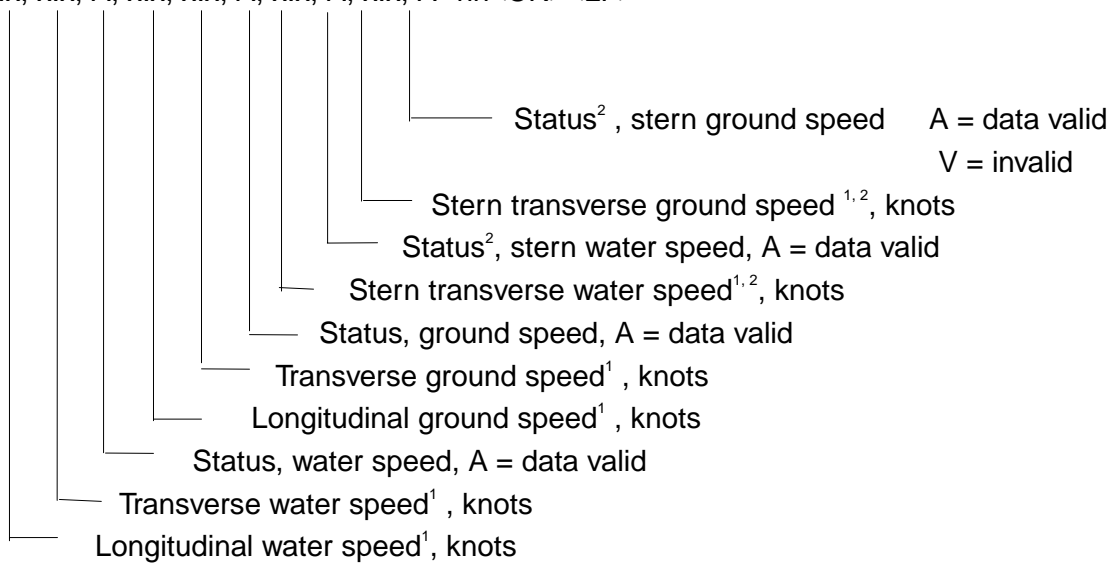
NOTE - Relative measurement of rudder angle without units, "-" = turn to port. Sensor output is proportional to rudder angle but not necessarily 1 : 1.

VBW - Dual ground/water speed: This sentence to be expanded as shown below:

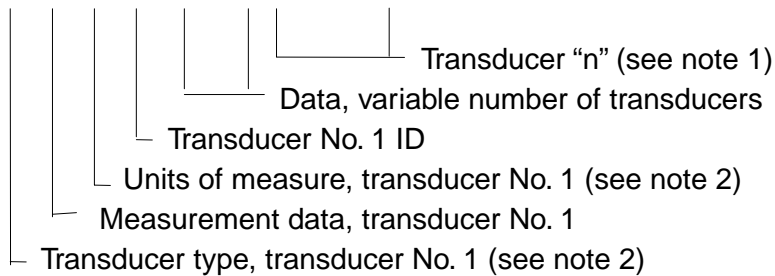$--VBW, x.x, x.x, A, x.x, x.x, A, x.x, A, x.x, A *hh<CR><LF>

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 of 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

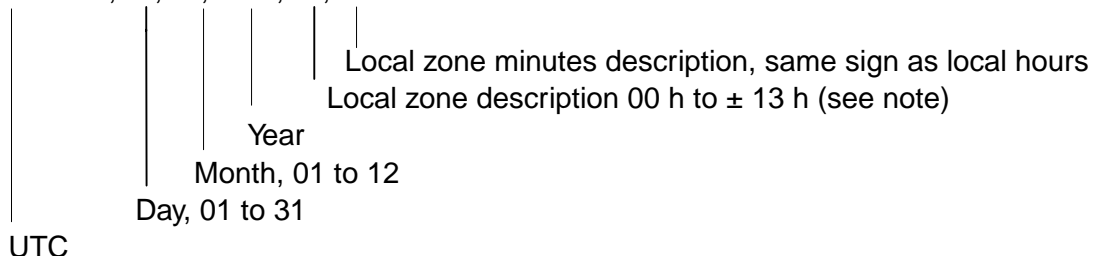   Transducer type, transducer No. 1 (see note 2)

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
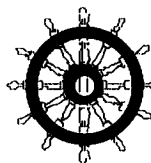
        Month, 01 to 12

      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.

FURUNO®

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Pub NO. DOC-739

Declaration of conformity 🎡 0735

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

(Manufacturer)

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

(Address)

hereby declare under our sole responsibility that the product

Voyage Data Recorder (VDR) model VR-5000

(Model names, type numbers)

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

IMO Resolution A.861(20)   EN 61996: 2001 (IEC 61996 First edition: 2000-07)
IMO Resolution A.694(17)   EN 60945: 1997 (IEC 60945 Third edition: 1996-11)
                              EN 61162 (IEC 61162-1 Second edition: 2000-07)

(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. 6543 / 080 220 / 2003 of 13 May 2003 and EC quality system (Module D) certificate No. BSH-022-05-2003 of 27 May 2003 issued by Federal Maritime and Hydrographic Agency (BSH), The Federal Republic of Germany

- Test Report No. 6543/080 220/2003 of 3 June 2003 prepared 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 reports – "TESTING OF THREE VOYAGE DATA RECORDERS", "Penetration test of cradle/anti-vibration kit of 2003-04-22", "Low-temperature fire test – DRU#4 of 2003-04-28", "Deep-sea immersion test – IEC 61996 DRU#3, 26/3-2003 of 2003-04-01" and "Deep-sea immersion test – DRU#4 of 2003-04-29" prepared by Danish Technological Institute, Denmark

- Test Report PG11186 of 9 April 2003 prepared by Danish Institute of Fire and Security Technology, Denmark

- Test reports – FLI 12-02-057 of 12 December 2002, FLI 12-03-001 of 18 January 2003, FLI 12-03-002 of 20 January 2003, FLI 12-03-012 of 14 March 2003, FLI 12-03-19 of 21 April 2003 and FLI 12-03-022 of 6 May 2003 issued by Furuno Labotech International Co., Ltd, Japan

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.

Hiroaki Komatsu
Manager,
International Rules and Regulations

Nishinomiya City, Japan
November 23, 2004

(Place and date of issue)   (name and signature or equivalent marking of authorized person)

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