Maritime Systems VIMMS User Manual

Issue: **V1.04**

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Document Revisions

V1.01	15-03-2023 Original Release
V1.02	14-07-2023 Limitation of 12v only from initial batch removed
V1.03	06-10-23 Additional features added (inc. download data, data stream)
V1.04	27-10-23 Download instructions updated

Cautions

GPS

The GPS system is operated by the government of the United States, which is solely responsible for its accuracy and maintenance. Although the Garmin GPS 18 is a precision electronic Navigation Aid (NAVAID), any NAVAID can be misused or misinterpreted, and therefore become unsafe. Use these products at your own risk. To reduce the risk, carefully review and understand all aspects of these Technical Specifications. When in actual use, carefully compare indications from the GPS to all available navigation sources including the information from other NAVAIDs, visual sightings, charts, etc.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Consult the dealer or an experienced technician for help.

VIMMS does not contain any user-serviceable parts. Unauthorized repairs or modifications could result in permanent damage to the equipment, and void your warranty.

Errors

Every attempt is made to ensure that the information in this document is correct, however mistakes or changes may occur.

IMPORTANT NOTICE

Any warnings, coloured zones or threshold markers in the default configuration files are for initial information purposes only and are **NOT** based on medical tests or accepted levels.

It is the responsibility of the user to set these reporting levels based upon their own criteria.

Dyena or its affiliated companies do not make any claim that default values are appropriate for health or vehicle monitoring.

Dyena or its affiliated companies accepts no responsibility for any injury or other outcome that resulted from the user relying upon the reported values.

IMPORTANT NOTICE

Do to the operating nature of electrical systems and the possibility of external interference or power fluctuations causing a system interruption, it is the users responsibility to ensure that the system is recording correctly by routinely checking the status of the LED indicators.

Dyena or its affiliated companies accepts no responsibility for any loss or corruption of data.

VIMMS overview

The Vessel Impact and Motion Monitoring System (VIMMS) is designed as a direct response to the maritime industry's requirement to monitor crew and vessel levels of shock and vibration on both crew and vessels during operations in waves and at high speeds.

VIMMS includes a helm unit and two remote sensors for measuring accelerations on the vessel structure and at the helmsman's seat. The twin LED display provides simultaneous information on the impacts received by the vessel and crew. Configurable settings allow the operator to set relevant thresholds to match LEDs response to the vessels expected operating conditions.

Real time feedback allows the helmsman to adjust their speed or course before limits are exceeded, reducing repeated shock and whole-body vibration exposure to the crew or damaging shock impacts to the vessel and equipment.

Network

The VMU and sensors are connected via the Maritime Systems Canbus network.
This network provides the power for the remote sensors and the VMU.
The network uses the same hardware as a standard NMEA 2000 canbus network, but must be kept separate from any other network on the boat.

Installing VIMMS

The supplied network hub and cables are assembled as shown in the image below.
Connect the orange cable to an appropriate power source.

Cable	Connection
Solid Red	+12 volts
Black	-ve / Ground
Bare / Shield	

Helm Unit

Installing Sensors

The sensors are labelled for Vessel and Seat. Mount them securely in the position required.

Mounting Position

The VIMMS helm unit is mounted in a position viewable by the helmsman.
The GPS antenna is contained behind the fascia label. Whilst it is unlikely that the vessel structure will impair the signal, this should be considered if there are problems obtaining a position fix.

The sensors are mounted to the required positions to display accelerations on the helm unit.

If a particular crew position is deemed the most vulnerable, or for other operational reasons then the sensor unit may be placed nearest to that location.

If your primary purpose is to limit the exposure of the crew and passengers to shock and vibrations, then the VMU should be mounted near to the position where crew or passengers will be most vulnerable to Whole Body Vibration. On a boat this will normally be the furthest forward seated position.

The vessel sensor must be mounted to a rigid location on the vehicle. Any flex in the mounting location will introduce false readings.

You should conduct your own Health and Safety Assessment to decide upon the best place to mount the VMU. If necessary seek professional advice.

Mounting Orientation

The sensors must be mounted parallel with a principle plane of the vehicle so that the internal sensors are correctly aligned.

For example, facing up, forwards or to the side.

Electrical Power

VIMMS is powered via the Network Hub.

The operators of VIMMS are responsible for determining the correct power supply methodology for VIMMS to ensure the required operation of the monitoring system. Normally VIMMS should be connected to the boats main battery system to receive power whenever the engine(s) are running or the vehicle is underway. To ensure that data is correctly logged there should NOT be an individual switch for control of the power to the unit.

Power input range:	9V to 28V DC
Operating current:	Dependant on connected devices. Command Unit max power requirements: 12V 2 Amps

The device has its own internal self resetting fuse, however it is recommended that the supply is fused at 3A at the source of the power in the event of a wiring insulation fault.

IMPORTANT NOTICE

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Dyena or its affiliated companies accepts no responsibility for any loss or corruption of data.

GPS Receiver

VIMMS uses an internal GPS antenna to provide position, speed and course data.

Battery Power

When the power input is lost the base unit automatically switches to using battery power. For the next 30 seconds it will continue to record data, but the LEDs will not be lit. If the power input returns it will switch back to normal power mode. If the power input does not return after 30 seconds (or if the backup battery level is becoming low in the case of repeated power lost events) it will switch to shutdown mode.

When power is present the base unit will re-charge the backup batteries automatically.

VIMMS Installation and Login

VIMMS is simple to set up.

1: Chose appropriate position for the VMU.

2: Secure the **VMU** to the mounting position.

3: Connect the VMU to the Network Hub using the supplied cable.

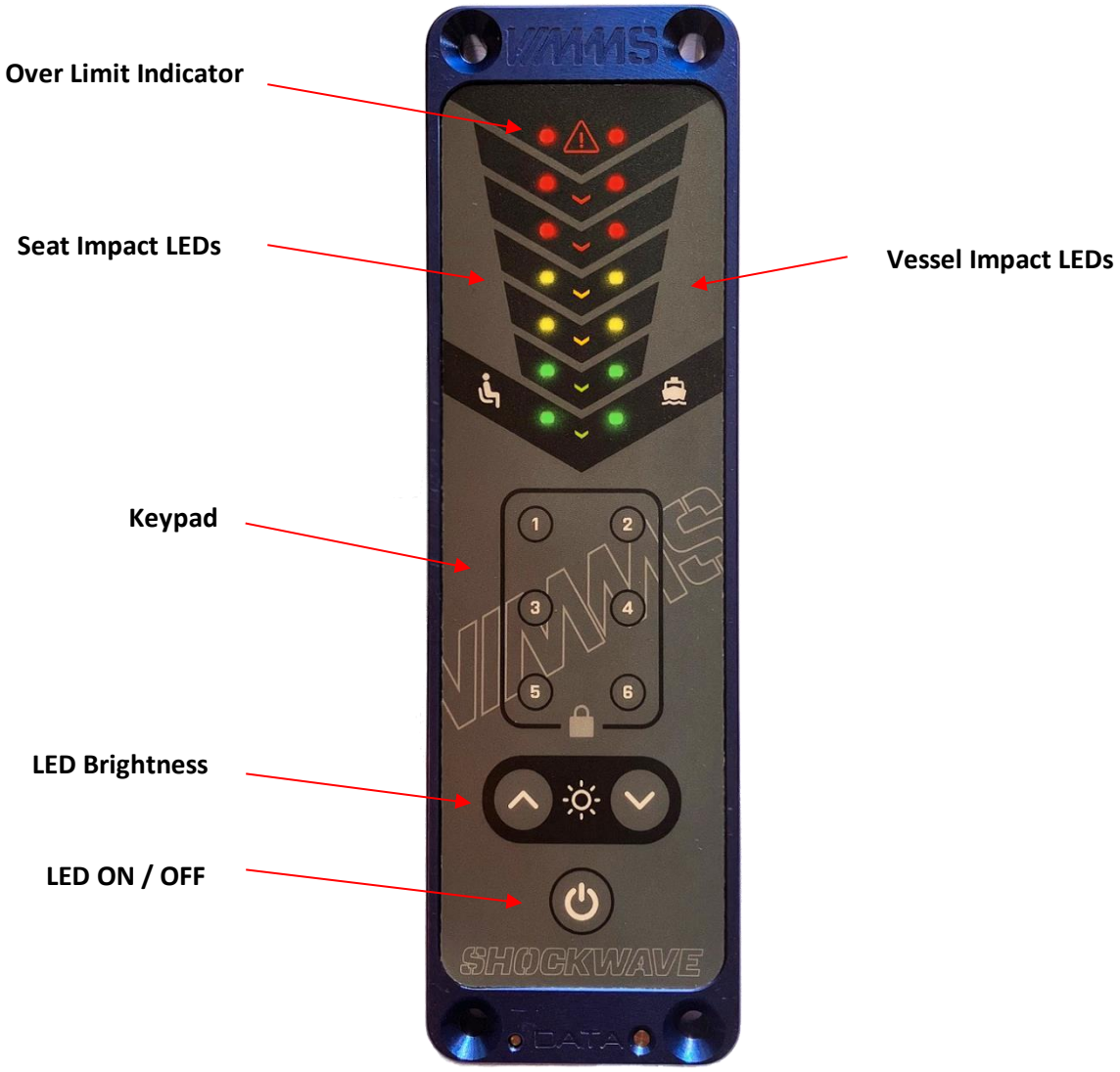
4: Mount the remote sensors and connect to the Network Hub.

5: Connect the network to hub.

6: On initial fitting, it may take the internal GPS 10 minutes to acquire a satellite lock.

Operation and PIN

The LEDs on the front panel react to the impact settings in the configuration file.
If the over limit threshold is exceeded, the top LED will remain lit until the PIN is entered on the keypad.
Default PIN: 5454



Data Sampling

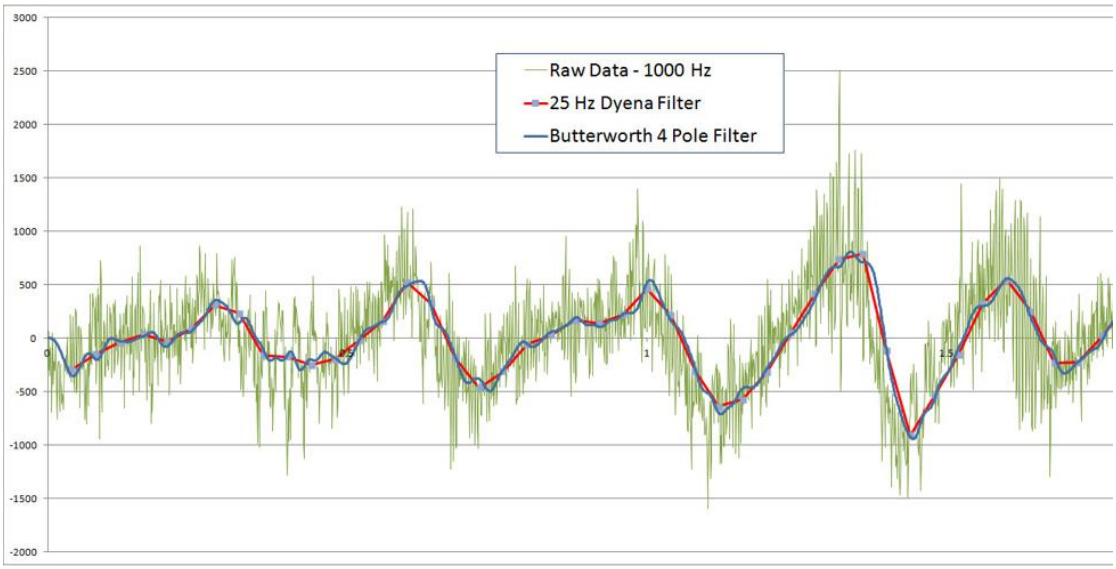
The Maritime Systems VIMMS system is required to store data over a long period of time for future analysis. The accelerations are sampled in 3 axes at 1000 hz, but to store all the raw data would require very large data storage and more processing power to maintain continuous real time recording whilst writing the memory. Also, Uploading and post processing the data will take a long time.

The raw data requires filtering to remove noise and become more manageable. One of the accepted standards for analysis of vessel motion is using a four pole Butterworth low pass filter. This requires high resolution data of at least 500 Hz and a relative amount of processing power, needing greater data storage and upload time.

Maritime Systems uses a filtering algorithm to record the data with results that closely match the four pole Butterworth low pass filter with only a small loss in data fidelity. This allows the data to be easily processed in real time and saved at 25 Hz for efficient upload and storage.

Data specification	
Sampling Rate	1000 hz
Low pass filter Cut off	250 hz
Recording rate	1 hz
Data stored	Peaks of filtered data

The graph below compares the results.



Downloading data via USB

By default the VIMMS is configured to store all data to the internal memory card.

Data logging can be suspended in the configuration settings. (see separate section)

When a USB-C memory stick containing a text file with the download settings is inserted into VIMMS unit, a CSV data file will be copied to the memory stick.

This text file must be copied to the USB memory stick in the root directory, not in a sub directory.

Create a text file named: download.txt

Copy the lines below into the file.

#This line must be present at the start of the file:
DownloadAuthValue=dcx3zbxsb2fetzqh

UtcHoursShift=0
# Valid range -23 to 23. The time stamp of each row will be adjusted from UTC by the requested hours to match users local time.

FromDateTime=2023-09-23 01:01
# FromDateTime=YYYY-MM-DD HH:MM - The local time to download log data from (inclusive)

ToDateTime=2023-10-24 01:01
# ToDateTime=YYYY-MM-DD HH:MM - The local time to download log data until (inclusive)

Blank lines and lines beginning with # are ignored.
The Download Authorisation value must be present to permit data download.
Set the UTC time offset for your location to get data in local time.
Set the time start and end date for the data range to download.

When the USB-C memory stick is inserted the LEDs will chase downwards while the download of log data is in progress.

When download is complete the LEDs will stop chasing downwards.
Do not remove the USB memory stick while the download is in progress.
Pressing any of the number buttons will abort a download.

The download.txt file can be downloaded from: www.maritimesys.com/files

Configuration settings

VIMMS operating settings are configured by altering the config file and copying it to the root directory of a USB-C memory stick.
When this is inserted into the VIMMS it will alter the settings and the lights will flash to confirm that the Memory stick can be removed.

This file should contain 1 configuration setting per line.
Blank lines and lines beginning with a # character are ignored.
Not all configuration values need to be included, the VIMMS Lite setting of those found in the file will be stored., others will remain unchanged.

The download.txt file can be downloaded from: www.maritimesys.com/files

CANBUS livestream (Optional)

An optional Add on. Contact Maritime Systems to enable this feature.

The VIMMS Lite can be configured to transmit a CAN bus livestream of sensor data for receive by your own CAN equipment.

Data Connection

Connect CANBUS cable to the spare socket on the CANBUS Network hub.
Pin allocation:

- Pin 1 Shield,
- Pin 2 +V,
- Pin 3 CAN_GND,
- pin 4 CAN_H,
- pin 5 CAN_L.

Addressing

11bit CAN bus addressing is used.
The address packets are transmitted to 0x400, with bits 0 to 5 used to indicate the packet contents.

Important Notes

The VIMMS Lite CAN bus connection is used for passing of VIMMS Lite data from the VIMMS Lite its remote sensors. The connection of a third-party device must be **RECEIVE ONLY** to avoid interfering with the VIMMS Lite sensor data packets.

Live Streamed Data

The following packets are transmitted once per second:

ID: 0x401

Data6: 0=DateTime and GPS invalid, 1=DateTime valid, 2= DateTime and GPS valid.
Data5: Date year 0-99
Data4: Date month 1-12
Data3: Date day of month 1-31
Data2: Time hours 0-23
Data1: Time mins 0-59
Data0: Time seconds 0-59

ID: 0x402

Data7: GPS latitude Byte 3
Data6: GPS latitude Byte 2
Data5: GPS latitude Byte 1
Data4: GPS latitude Byte 0

Data3: GPS longitude Byte 3
Data2: GPS longitude Byte 2
Data1: GPS longitude Byte 1
Data0: GPS longitude Byte 0

Each value is a int32 which represents the Latitude or Longitude multiplied by 1000000. Divide each int32 by 1000000 to obtain the actual floating point value.

ID: 0x403

Data3: GPS speed over ground Byte 1
Data2: GPS speed over ground Byte 0
Data1: GPS course over ground Byte 1
Data0: GPS course over ground Byte 0
Each value is a uint16 which represents the SOG or COG 10. Divide each uint16 by 10 to obtain the actual floating point value.

ID: 0x404 to 0x415

0x404 = VIMMS Lite main sensor (NOT USED)
0x405 = Remote sensor 1,
0x414 = Remote sensor 16,
0x415 = Hull sensor.

Packets are only sent for those remote sensors that are present.

Data7: Seat distance total movement. Uint16 Byte1 (0 if unused)
Data6: Seat distance total movement Uint16 Byte0 (0 if unused)
Data5: Accelerometer Z peak_1sec. Int16 Byte1
Data4: Accelerometer Z peak_1sec. Int16 Byte0
Data3: Accelerometer Y peak_1sec. Int16 Byte1
Data2: Accelerometer Y peak_1sec. Int16 Byte0
Data1: Accelerometer X peak_1sec. Int16 Byte1
Data0: Accelerometer X peak_1sec. Int16 Byte0

Acceleration is int16 integers with the MSB =1 if negative.

Units and direction

Latitude / longitude	decimal degrees
Distance	mm
Acceleration values	mg (0.00981 m/s2)