# VDR100
# Vessel Data Recorder

## User's Manual

**Revision 1.1**



**Maretron, LLP**
**9014 N. 23rd Ave #10**
**Phoenix, AZ 85021**
**http://www.maretron.com**

**Maretron Manual Part #: M003025**

# Revision History

| Revision | Description |
|---|---|
| 1.0 | Original document |
| 1.1 | Added information on USB flash drive shipped with product |

# Table of Contents

# Table of Figures

# 1 General

## 1.1 Introduction

Congratulations on your purchase of the Maretron Vessel Data Recorder (VDR100). Maretron has designed and built your vessel data recorder to the highest standards for years of reliable, dependable, and accurate service.

The Vessel Data Recorder (VDR100) records all NMEA 2000® network activity onto a user-supplied USB flash drive. The USB flash drive can be removed and inserted into a Windows PC running Maretron's N2KExtractor™ program, which lets you view graphs of the collected data, maps of the course traveled during data collection, and lets you export selected parameters into comma delimited (.CSV) files for detailed statistical analysis with Microsoft Excel or other programs which accept the comma-delimited format.

The VDR100 has an NMEA 2000® port for recording information from the attached NMEA 2000® network and a USB port for connecting the USB flash drive.

The Maretron VDR100 is designed to operate within the harsh demands of the marine environment. However, no piece of marine electronic equipment can function properly unless installed, calibrated, and maintained in the correct manner. Please read carefully and follow these instructions for installation, calibration, and usage of the Maretron VDR100 in order to ensure optimal performance.

## 1.2 Firmware Revision

This manual corresponds to VDR100 firmware revision 1.0.0.

## 1.3 Features

The Maretron VDR100 has the following features:

- NMEA 2000® interface
- Records all NMEA 2000® Network Activity for System Diagnosis and Performance Analysis
- Can be used along with Maretron's N2KExtractor™ software to perform basic graphical analysis and detailed statistical analysis using Microsoft Excel of similar software
- Data Recorded on Solid State Memory via Removable USB Flash Drive
- Circular Buffer Preserves Latest Recorded Data while Oldest Data Overwritten when Memory is Full
- Recorded Data Available for Performance Analysis, Vessel Tracking, Preventive Maintenance, and More
- Optional Waterproof USB Flash Drive Cover
- Free Data Extraction Software (N2KExtractor™) allows you to view voyages on a map, perform graphing of up to four parameters, and builds Comma Delimited Files for detailed data analysis using Microsoft Excel or other spreadsheet software

## 1.4 VDR100 Accessories

Maretron offers the following accessories for the VDR100:

- PX0852 USB Waterproof Cover
- M003029 Corsair Voyager GT 16GB USB Flash Drive

## 1.5 Quick Install

Installing the Maretron VDR100 involves the following steps. Please refer to the individual sections for additional details.

1. Unpacking the Box (Section 2.1)
2. Choosing a Mounting Location (Section 2.2)
3. Mounting the VDR100 (Section 2.3)
4. Connecting the VDR100 (Section 2.4)
5. Configuring the VDR100 (Section 3)

## 1.6 Theory of Operation

The VDR100 records every frame of NMEA 2000® network activity onto the attached USB flash drive.

## 1.7 General Concepts

### 1.7.1 Data Recording

The VDR100 records every single frame of data on the NMEA 2000® network.

In order to perform performance analysis, the time at which each event occurs must be accurately recorded. To this end, there must be a source of time information on the NMEA 2000® network; e.g., a Maretron GPS or equivalent.

**WARNING**

At least one device transmitting valid data in the NMEA 2000® System Time (126992) message, e.g., a GPS receiver, must be operating on the network in order for the VDR100 and the N2KExtractor™ program to be able to correlate the data with the time when it was present on the network.

The VDR100 records data to a circular buffer on the USB flash drive. When the USB flash drive becomes near full, the oldest data on the device is deleted in order to make room for newer data.

You may monitor the available space on a USB flash drive using N2KView® software or a Maretron DSM150/DSM250 display. If you wish to keep all recorded data on the USB flash drive, simply remove the USB flash drive from the VDR100 and replace it with an empty USB flash drive before the first USB flash drive becomes full.

### 1.7.2 Flash File System

The USB flash drive will be re-formatted the first time it is used in the VDR100. This is done in order to ensure filesystem integrity of the USB flash drive in the cases of removal of the device from the VDR100 and also in cases of power removal from the VDR100,

**WARNING**

When you plug a new USB flash drive (one which has never been used before in a VDR100) into the VDR100, ALL DATA ON THE MEMORY DRIVE WILL BE DESTROYED. If your USB flash drive has data you wish to save, please archive it before plugging the USB flash drive into the VDR100.

The filesystem that is created on the USB flash drive is not compatible with Microsoft Windows. Drivers for the filesystem used by the VDR100 are included with the Maretron N2KExtractor software.

## 1.8 Data Analysis

In order to retrieve data from the VDR100, remove the USB flash drive from the VDR100 and plug into a Windows PC on which N2KExtractor™ software has been installed. Please refer to the *N2KExtractor™ User's Manual* for details.

**WARNING**

Do not plug a USB flash drive that has been used in a VDR100 into a Windows PC without first installing the Maretron N2KExtractor software. Failure to install the N2KExtractor software before plugging in the USB flash drive may result in the data on the flash memory device being destroyed.

**WARNING**

If a USB flash drive that has been used in the VDR100 is plugged into a Windows PC that has not had the N2KExtractor™ software installed, then Windows will not recognize the format of the USB flash drive and will ask you to format it. DO NOT FORMAT THE USB FLASH drive, as this WILL result in all of the data on the USB flash memory drive being destroyed.

# 2 Installation

## 2.1 Unpacking the Box

When unpacking the box containing the Maretron VDR100, you should find the following items:

- 1 – VDR100 Vessel Data Recorder
- 1 – Parts Bag containing 4 Stainless Steel Mounting Screws
- 1 – VDR100 User's Manual
- 1 – Warranty Registration Card
- 1 – USB Flash Drive (preformatted for the VDR100)

If any of these items are missing or damaged, please contact Maretron.

## 2.2 Choosing a Mounting Location

Please consider the following when choosing a mounting location.

1. The VDR100 is waterproof, so it can be mounted in a damp or dry location. Note that the USB Waterproof Cover accessory must be purchased to waterproof all of the connections to the VDR100. The NMEA 2000® network interface is already waterproof.
2. The orientation is not important, so the VDR100 can be mounted on a horizontal deck, vertical bulkhead, or upside down if desired.
3. The VDR100 is temperature-rated to 55°C (130°F), so it should be mounted away from engines or engine rooms where the operating temperature exceeds the specified limit.

## 2.3 Mounting the VDR100

Attach the VDR100 securely to the vessel using the included stainless steel mounting screws or other fasteners as shown in Figure 1 below. Do not use threadlocking compounds containing methacrylate ester, such as Loctite Red (271), as they will cause stress cracking of the plastic enclosure.

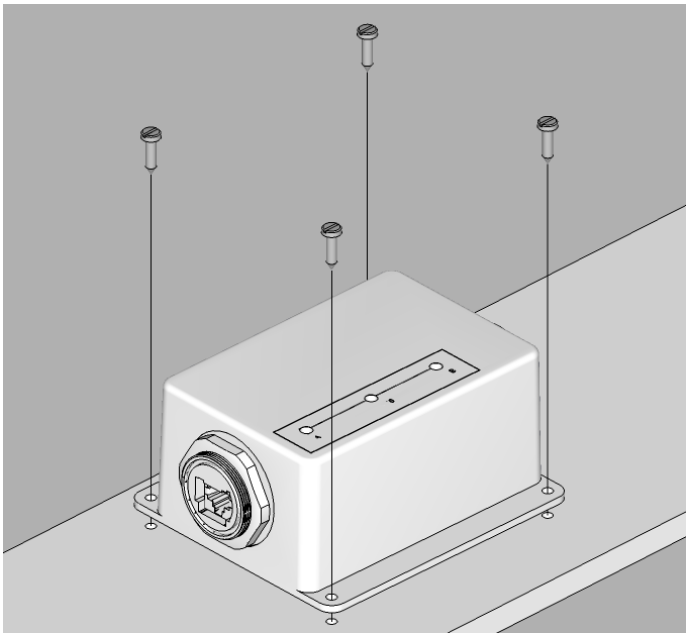

***Figure 1 – Mounting the VDR100***

## 2.4 Connecting the VDR100

### 2.4.1 NMEA 2000® Connection

The NMEA 2000® connector can be found on the side of the enclosure. The NMEA 2000® connector is a round five pin male connector (see Figure 2). You connect the VDR100 to an NMEA 2000® network using a Maretron NMEA 2000® cable (or an NMEA 2000® compatible cable) by connecting the female end of the cable to the VDR100 (note the key on the male connector and keyway on the female connector). Be sure the cable is connected securely and that the collar on the cable connector is tightened firmly. Connect the other end of the cable (male) to the NMEA 2000® network in the same manner. The VDR100 is designed such that you can plug or unplug it from an NMEA 2000® network while the power to the network is connected or disconnected. Please follow recommended practices for installing NMEA 2000® network products.

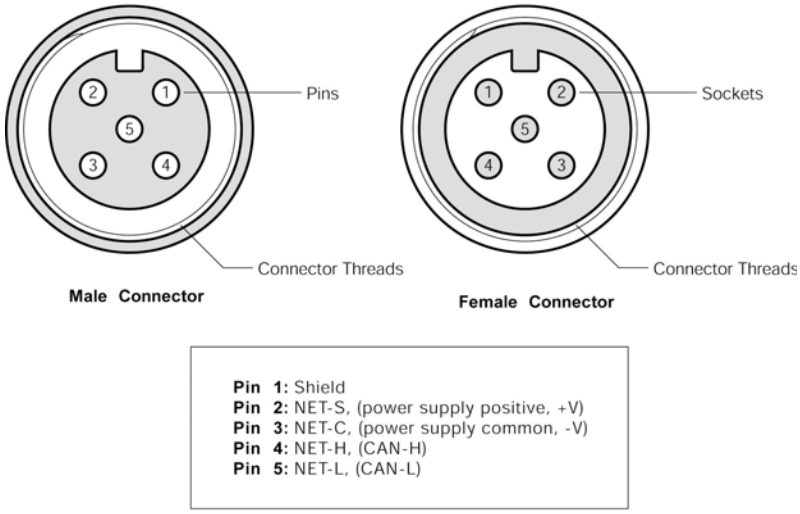


***Figure 2 – NMEA 2000® Connector Face Views***

### 2.4.2 LAN Connection

The VDR100 has one external RJ-45 LAN connector, which will be supported in future firmware revisions of the VDR100. The VDR100 is shipped with a waterproof cover on the RJ-45 LAN connector. Please leave this cover on the LAN connector.

# 3 Configuring the VDR100

The VDR100 has several configurable parameters, which are shown below including the default values. If you are not using the default values, then you will need to refer to the corresponding section for configuring the VDR100 appropriately. You may configure the VDR100 using a Maretron DSM250 display or Maretron N2KAnalyzer® software.

## 3.1 Device Label

Program this parameter with a text string which identifies this device. Maretron display products will display this label text when you are selecting data to display. The default device label is blank.

## 3.2 Device Instance

Program this parameter to the desired instance number for this device. You can program this parameter to any value between 0 and 252. The default device instance is 0

## 3.3 Installation Description

This entry allows you to modify the NMEA 2000® installation description text strings. You can enter any information you like here, such as the date the unit was installed, or the location in which it was installed, for later reference. Tools such as Maretron N2KAnalyzer® allow you to view these values later. The default installation description is blank text.

## 3.4 Restore Factory Defaults

This option restores all settings on the VDR100 device to their factory default states.

# 4 Usage

## 4.1 Recording Data

To record data, plug a USB flash drive into the Type A USB connector on the VDR100.
A waterproof cover accessory is available that will allow the USB port to be made waterproof with a USB flash drive installed, although this cover will not fit all USB flash drives, so please check the dimensions of the USB flash drive to be sure that the waterproof cover accessory will fit over the drive.

## 4.2 USB Flash Drive Selection

### 4.2.1 USB Flash Drives

**WARNING**

Because of the methods that the VDR100 records every frame of network data for quick retrieval and analysis, the VDR100 must only be used with a high performance USB flash drive from the list of supported USB flash drives.

The VDR100 is supported ONLY with the following list of USB flash drives (more will be added in the future):

| USB Flash Drive Model | Capacities (GB) |
|---|---|
| Corsair Flash Survivor USB 3.0 32GB | 32 |
| Corsair Flash Survivor Stealth USB 3.0 32GB | 32 |
| Corsair Flash Survivor USB 3.0 64GB | 64 |
| Corsair Flash Survivor Stealth USB 3.0 64GB | 64 |
| Corsair Flash Voyager GT USB 3.0 | 16,32,64 |
| Hama “Probo” FlashPen, USB 3.0 | 8, 16, 32 |
| Kingston DataTraveler Elite 3.0 | 16, 32, 64 |
| Kingston DataTraveler HyperX 3.0 | 64, 128, 256 |
| Kingston DataTraveler R3.0 | 16,32,64 |
| Kingston DataTraveler Ultimate 3.0 Generation 2 | 16, 32, 64 |
| LaCie FastKey USB 3.0 | 30, 60, 120 |
| Lexar JumpDrive Triton | 16,32,64 |
| Mushkin Ventura Pro | 32,64 |
| Patriot Supersonic | 64 |
| Patriot Supersonic Rage XT | 32,64 |
| Patriot Supersonic Boost XT | 8,16,32,64 |
| Patriot Supersonic Magnum | 64, 128 |
| Sandisk Extreme USB 3.0 | 16,32,64 |

| USB Flash Drive Model | Capacities (GB) |
|---|---|
| Sony Micro Vault Mach | 8,16,32,64 |
| SuperTalent SuperCrypt | 16,32,64,128,256 |
| SuperTalent Express RC-8 | 25,50,100 |
| SuperTalent Express Ram Cache | 16,32,64 |
| SuperTalent Express ST4 | 16,32,64 |
| SuperTalent RAIDDrive | 32,64,128 |
| SuperTalent DataGuardian USB 3.0 | 8,16,32 |
| Transcend JetFlash 780 | 16 |

### 4.2.2 USB Flash Drive Size

The VDR100 uses a circular buffer, which means that if the USB flash drive becomes full, then the oldest data will be erased to make room for new data. Depending on how much data you wish to record without overwriting older data, the following table can be used to determine the capacity of the USB Flash Drive you need. These figures are estimated assuming a 25% loaded system (approx 463 frames/second).

| Recording Period | Media Storage Capacity |
|---|---|
| 1 second | 7862 bytes |
| 1 minute | 471,750 bytes |
| 1 hour | 29 MBytes |
| 1 day | 680 MBytes |
| 1 week | 5 GBytes |
| 1 month (30 days) | 21 GBytes |
| 1 year (365.25 days) | 248 GBytes |

## 4.3 Monitoring the VDR100

### 4.3.1 Indicators

The VDR100 has three green LED indicators on its top surface:

**NMEA 2000**: This light will be red for several seconds after powerup while the VDR100 is initializing itself. Once this process is complete, this light will be lit a steady green to indicate that the main processor is active. The light will blink on and off to indicate data being transferred over the NMEA 2000® connection. If this light is lit red after the initialization has completed, it indicates that a problem has been detected.

**LAN**: This light will be supported in future version of VDR100 firmware.

**USB**: This light will be on to indicate that the USB port is active and a USB flash drive has been detected.

### 4.3.2 From a Display Device or Software

The Maretron N2KView® software as well as the DSM150 and DSM250 display units have a Vessel Recorder category that allows you to monitor or set alerts on various operating parameters of the VDR100. Parameters that can be monitored include:

- State – this is the operating state of the VDR100. It can take the following values:
  - *No Flash Drive* – the VDR100 has not detected a USB flash drive. Please refer to the "Troubleshooting" section for details.
  - *Formatting* – the USB flash drive is being formatted for use with the VDR100. This can take up to approximately 45 minutes for the largest USB flash drives.
  - *Initializing* – the USB flash drive is being initialized for data recording. This will be seen when a USB flash drive which has already been used for the VDR100 is first plugged in, or when the VDR100 is first powered up.
  - *Recording* – the VDR100 is recording data to the USB flash drive.
  - *Error* – there is a problem with the USB flash drive. Please refer to the "Troubleshooting" section for details.
- Memory Used – amount of data (in GB) that has been used on the USB flash drive
- Memory Available – amount of data (in GB) that can still be stored on the USB flash drive
- Memory Capacity – the total amount of data that the USB flash drive is capable of storing.
- Percent Used – the percent of the capacity of the USB flash drive that has been used for storing data
- Percent Available – the percent of the capacity of the USB flash drive that is still available for storing data

Please refer to the user's manual for the appropriate software or display product for details.

# 5 Maintenance

Regular maintenance is not required; however, an occasional inspection will ensure continued proper operation of the Maretron VDR100. Perform the following tasks periodically:

- Clean the unit with a soft cloth. Do not use chemical cleaners as they may remove paint or markings or may corrode the VDR100 enclosure or seals. Do not use any cleaners containing acetone, as they will deteriorate the plastic enclosure.
- Ensure that the unit is mounted securely and cannot be moved relative to the mounting surface. If the unit is loose, tighten the mounting screws.
- Check the security of all cable connections and tighten if necessary.

# 6 Troubleshooting

If you notice unexpected operation of the Maretron VDR100, follow the troubleshooting procedures in this section to remedy simple problems.

| Symptom | Troubleshooting Procedure |
|---|---|
| USB indicator not lit | 1. Ensure that the USB flash drive is properly plugged into the USB connector |
| NMEA 2000® indicator not lit | 1. Ensure that power is supplied to the NMEA 2000® indicator via the NMEA 2000® cable, and that the NMEA 2000® connection is secure. |
| VDR100 reports an "Error" state | 1. Ensure that the USB flash drive is properly plugged into the USB connector<br>2. Try using a different USB flash drive<br>3. Cycle the power to the VDR100 |
| VDR100 reports a "No Flash Drive" state | 1. Ensure that the USB flash drive is properly plugged into the USB connector |

***Figure 3 – Troubleshooting Guide***

If these steps do not solve your problem, please contact Maretron Technical Support (refer to Section 8 for contact information).

# 7 Technical Specifications

**Specifications**

| Parameter | Value | Comment |
|---|---|---|
| NMEA 2000® Connector | DeviceNet Micro-C | Industry Standard Waterproof |
| NMEA 2000® Isolation | Opto-Isolated | No Electrical Connection Across Bridge |
| USB Standard | USB 1.1 | |
| USB Connector | USB Type A | Industry Standard Waterproof, for Connection of N2KView® Hardware License Key Only |
| USB Supported Signals | D+, D-, +5V, GND | Bi-directional Gateway |
| USB Auxiliary Power | +5 Volts < 200 mA | |
| USB Baud Rate | Up to 12 Mb/s | Full Speed USB Data Rate |
| Ethernet Interface | 100 Mb/s | Not used in initial firmware revision |
| Ethernet Connector | RJ-45 | Industry Standard Waterproof |

**Certifications**

| Parameter | Comment |
|---|---|
| NMEA 2000® Standard | Level A |
| Maritime Navigation and Radiocommunication Equipment & Systems | IEC 61162-3 |
| Maritime Navigation and Radiocommunication Equipment & Systems | IEC 60945 |
| FCC and CE Mark | Electromagnetic Compatibility |

## NMEA 2000® Parameter Group Numbers (PGNs)

| Description | PGN # | PGN Name | Default Rate |
|---|---|---|---|
| Response to Requested PGNs | 126464 | PGN List (Transmit and Receive) | N/A |
| | 126996 | Product Information | N/A |
| | 126998 | Configuration Information | N/A |
| Protocol PGNs | 059392 | ISO Acknowledge | N/A |
| | 059904 | ISO Request | N/A |
| | 060416 | ISO Transport Protocol, Connection Management | N/A |
| | 060160 | ISO Transport Protocol, Data Transfer | N/A |
| | 060928 | ISO Address Claim | N/A |
| | 065240 | ISO Address Command | N/A |
| | 126208 | NMEA Request/Command/Acknowledge | N/A |
| Periodic PGNs | 130833 | Vessel Data Recorder Status (Maretron Proprietary) | 10 seconds |
| PGNs Recorded | All | All | N/A |

## Electrical

| Parameter | Value | Comment |
|---|---|---|
| Operating Voltage | 9 to 32 Volts | DC Voltage |
| Power Consumption | <200mA | Average Current Drain |
| Load Equivalence Number (LEN) | 4 | NMEA 2000® Spec. (1LEN = 50 mA) |
| Reverse Battery Protection | Yes | Indefinitely |
| Load Dump Protection | Yes | Energy Rated per SAE J1113 |

## Mechanical

| Parameter | Value | Comment |
|---|---|---|
| Size | 5.000” x 4.500” x 2.375” 127mm x 114mm x 60 mm) | Including Flanges for Mounting |
| Weight | 12 oz. (340 g) | |

## Environmental

| Parameter | Value |
|---|---|
| IEC 60945 Classification | Exposed |
| Degree of Protection | IP67 |
| Operating Temperature | -25°C to 55°C |
| Storage Temperature | -40°C to 70°C |
| Relative Humidity | 93%RH @40° per IEC60945-8.2 |
| Vibration | 2-13.2Hz @ ±1mm, 13.2-100Hz @ 7m/s$^2$ per IEC 60945-8.7 |
| Rain and Spray | 12.5mm Nozzle @ 100liters/min from 3m for 30min per IEC 60945-8.8 |
| Solar Radiation | Ultraviolet B, A, Visible, and Infrared per IEC 60945-8.10 |
| Corrosion (Salt Mist) | 4 times 7days @ 40°C, 95%RH after 2 hour Salt Spray Per IEC 60945-8.12 |
| Electromagnetic Immunity | Conducted, Radiated, Supply, and ESD per IEC 60945-10 |
| Safety Precautions | Dangerous Voltage, Electromagnetic Radio Frequency per IEC 60945-12 |

# 8 Technical Support

If you require technical support for Maretron products, you can reach us in any of the following ways:


| | |
|---|---|
| Telephone: | 1-866-550-9100 |
| Fax: | 1-602-861-1777 |
| E-mail: | support@maretron.com |
| World Wide Web: | http://www.maretron.com |
| Mail: | Maretron, LLP<br>Attn: Technical Support<br>9014 N. 23rd Ave Suite 10<br>Phoenix, AZ 85021 USA |

# 9 Installation Template

Please check the dimensions before using the following diagram as a template for drilling the mounting holes because the printing process may have distorted the dimensions.

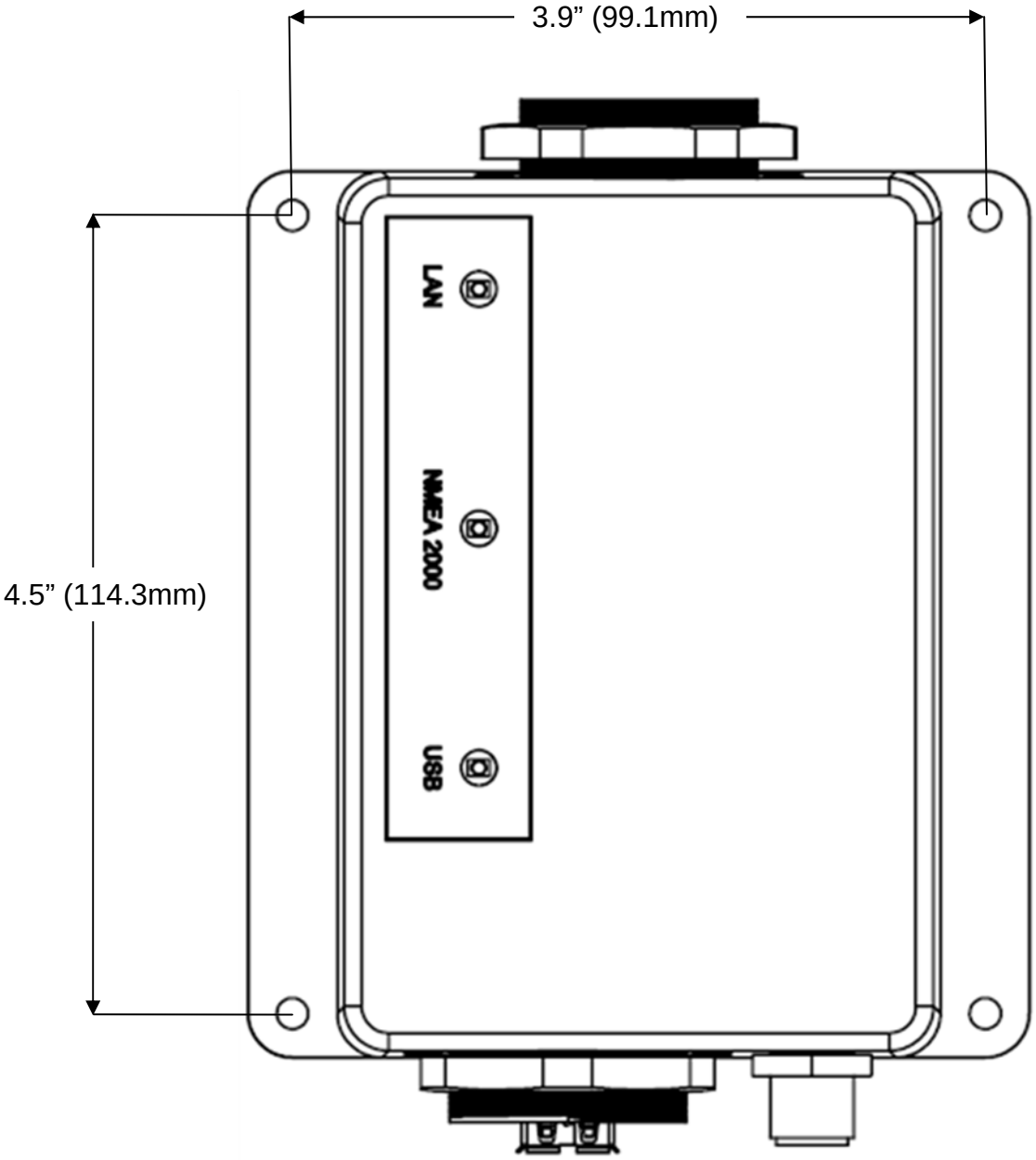


***Figure 4 – Mounting Surface Template***

# 10 Maretron (2 Year) Limited Warranty

Maretron warrants the VDR100 to be free from defects in materials and workmanship for **two (2) years** from the date of original purchase. If within the applicable period any such products shall be proved to Maretron's satisfaction to fail to meet the above limited warranty, such products shall be repaired or replaced at Maretron's option. Purchaser's exclusive remedy and Maretron's sole obligation hereunder, provided product is returned pursuant to the return requirements below, shall be limited to the repair or replacement, at Maretron's option, of any product not meeting the above limited warranty and which is returned to Maretron; or if Maretron is unable to deliver a replacement that is free from defects in materials or workmanship, Purchaser's payment for such product will be refunded. Maretron assumes no liability whatsoever for expenses of removing any defective product or part or for installing the repaired product or part or a replacement therefore or for any loss or damage to equipment in connection with which Maretron's products or parts shall be used. With respect to products not manufactured by Maretron, Maretron's warranty obligation shall in all respects conform to and be limited to the warranty actually extended to Maretron by its supplier. The foregoing warranties shall not apply with respect to products subjected to negligence, misuse, misapplication, accident, damages by circumstances beyond Maretron's control, to improper installation, operation, maintenance, or storage, or to other than normal use or service.

THE FOREGOING WARRANTIES ARE EXPRESSLY IN LIEU OF AND EXCLUDES ALL OTHER EXPRESS OR IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND OF FITNESS FOR A PARTICULAR PURPOSE.

Statements made by any person, including representatives of Maretron, which are inconsistent or in conflict with the terms of this Limited Warranty, shall not be binding upon Maretron unless reduced to writing and approved by an officer of Maretron.

IN NO CASE WILL MARETRON BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, DAMAGES FOR LOSS OF USE, LOSS OF ANTICIPATED PROFITS OR SAVINGS, OR ANY OTHER LOSS INCURRED BECAUSE OF INTERRUPTION OF SERVICE. IN NO EVENT SHALL MARETRON'S AGGREGATE LIABILITY EXCEED THE PURCHASE PRICE OF THE PRODUCT(S) INVOLVED. MARETRON SHALL NOT BE SUBJECT TO ANY OTHER OBLIGATIONS OR LIABILITIES, WHETHER ARISING OUT OF BREACH OF CONTRACT OR WARRANTY, TORT (INCLUDING NEGLIGENCE), OR OTHER THEORIES OF LAW WITH RESPECT TO PRODUCTS SOLD OR SERVICES RENDERED BY MARETRON, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATING THERETO.

Maretron does not warrant that the functions contained in any software programs or products will meet purchaser's requirements or that the operation of the software programs or products will be uninterrupted or error free. Purchaser assumes responsibility for the selection of the software programs or products to achieve the intended results, and for the installation, use and results obtained from said programs or products. No specifications, samples, descriptions, or illustrations provided Maretron to Purchaser, whether directly, in trade literature, brochures or other documentation shall be construed as warranties of any kind, and any failure to conform with such specifications, samples, descriptions, or illustrations shall not constitute any breach of Maretron's limited warranty.

**Warranty Return Procedure:**

To apply for warranty claims, contact Maretron or one of its dealers to describe the problem and determine the appropriate course of action. If a return is necessary, place the product in its original packaging together with proof of purchase and send to an Authorized Maretron Service Location. You are responsible for all shipping and insurance charges. Maretron will return the replaced or repaired product with all shipping and handling prepaid except for requests requiring expedited shipping (i.e. overnight shipments). Failure to follow this warranty return procedure could result in the product's warranty becoming null and void.

Maretron reserves the right to modify or replace, at its sole discretion, without prior notification, the warranty listed above. To obtain a copy of the then current warranty policy, please go to the following web page:

http://www.maretron.com/company/warranty.php