Vessel Monitoring System – Quick Start Guide

Prototype

(Version 0.99 Draft)

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Introduction

The Vessel Monitoring System (VMS) monitors a battery, bilge pump and two float switches. Sensor data is fed to a central server on the Internet, where the user can view the data using a web browser.
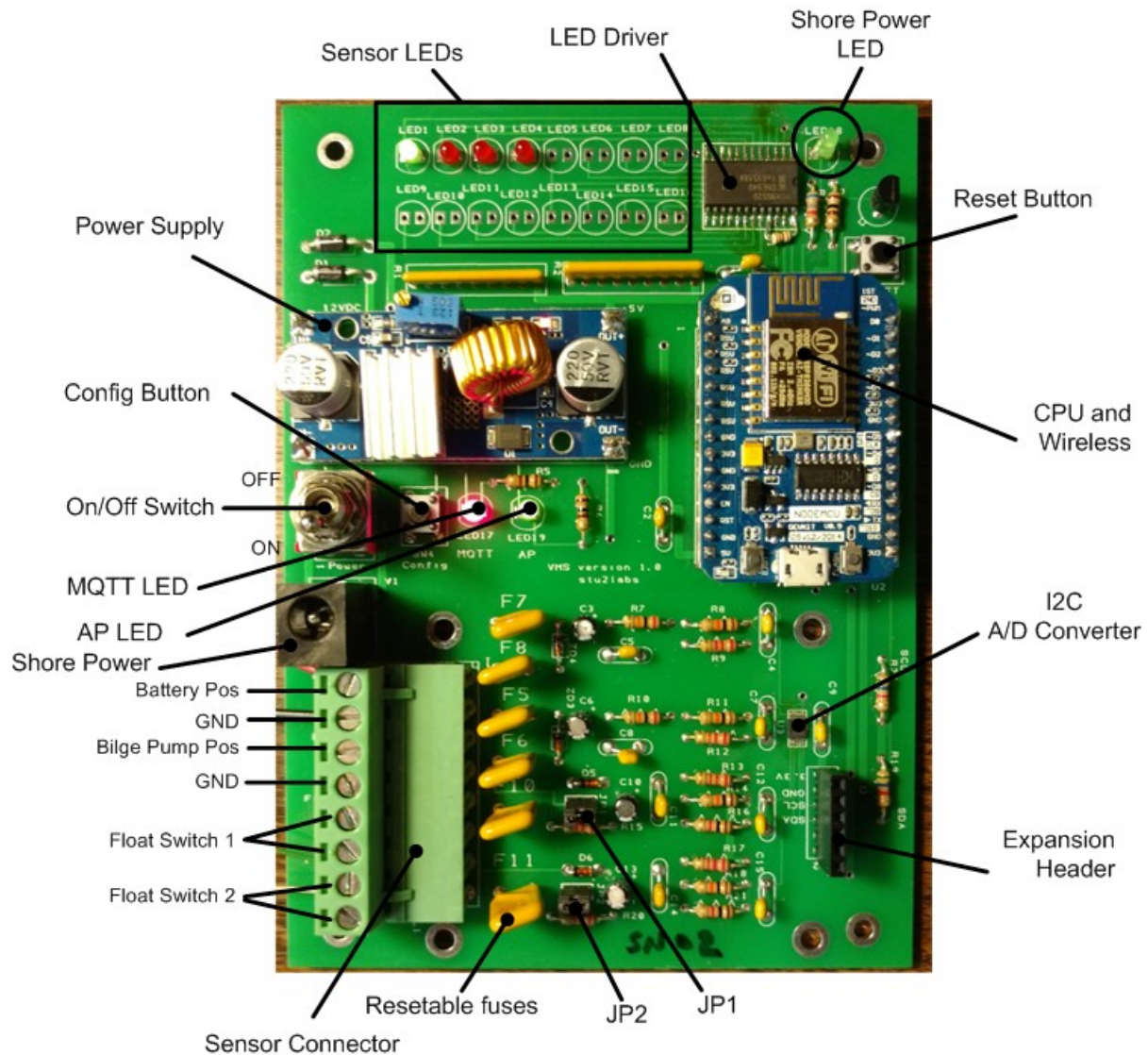

Illustration 1: System Board

Connecting the Sensors

The following table provides the pin outs for the sensor connector. Pin 1 is the closest to the black shore power connector.

Pin #	Function
1	Connect to the positive (+) terminal of the battery.
2	Connect to the negative (-) terminal of the battery.
3	Connect to the positive(+) terminal of the bilge pump.
4	Connect to the negative(-) terminal of the bilge pump.
5	Connect to one side of a normally open float switch. (Float Switch 1)
6	Connect to the other side of a normally open float switch (Float Switch 1)
7	Connect to one side of a normally open float switch. (Float Switch 2)
8	Connect to one side of a normally open float switch. (Float Switch 2)
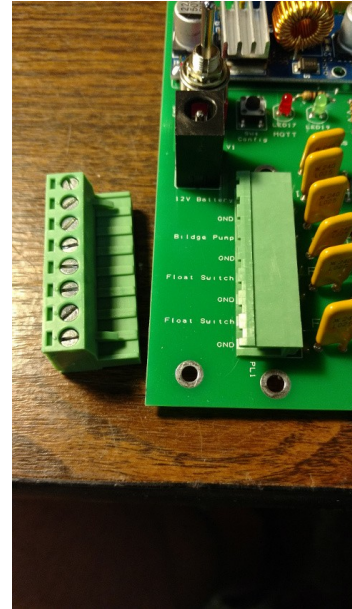
A 2.2K ohm resistor can be placed across the float switch at the float switch to allow current to flow in the flow switch loop. If the wire is cut, the current will drop and the unit will send a message to the Internet server. If a resistor is used at the float switch, remove jumper JP1 or JP2. If a resistor is NOT used, leave the jumpers in place. In this case, a cut wire will not be detected.

Powering the Unit

The unit requires 12 VDC, which can be supplied from the shore power connector, the battery (pins 1 and 2 of the Sensor Connector) or both. If the shore power is disconnected, the unit will run from the battery. If there is no battery, the unit will run from the shore power.

Apply shore power using a 12VDC wall adapter, which converts 110VAC to 12VDC.

The power switch must be in the ON position to operate. If the switch is in the OFF position, it will disconnect both the shore power and the battery from the system board.

Status Indicators

The VMS unit has several visual indicators (lights) to provide the user with status. The indicators are Light Emitting Diodes (LEDs).

Sensors

The sensor LEDs are located near the top edge of the system board. They are arranged in two rows of 8 LEDs and they correspond to the sensor positions (aka slot). LED1 is board 1, sensor 1. LED2 is board 1, sensor 2 and so on. On start up, each LED will light in sequence to ensure the LEDs work.

The prototype board only has 4 LEDs mounted because the board only has 4 sensors for testing. The sensors correspond to the following table:

LED	Function
1	GREEN - ON: battery exceeds 12.2 VDC OFF: battery is less than 12.2 VDC
2	RED: ON: bilge pump is running. OFF: bilge pump is not running.
3	RED: ON: Float switch closed. OFF: Float switch open.
4	RED: ON: Float switch closed. OFF: Float switch open.

Shore Power (LED18 - GREEN)

LED18, which is mounted in the upper right, near the circuit board edge indicates the shore power status. ON means shore power is present and OFF means there is no shore power.

Access Point (LED19 - GREEN)

This LED shows the status of the VMS WiFi connection. After booting, if the LED is on solid, the VMS unit is connected to the local access point (AP). If the LED blinks slowly, then the VMS Unit is in Access Point mode, meaning you can connect your laptop or WiFi phone to the VMS unit and complete the unit configuration process.

MQTT (LED17 - RED)

This LED shows the status of the Internet connection. When it's OFF, the VMS unit is connected to the dashboard on the Internet. When it's OFF, the VMS unit is NOT connected to the dashboard.

WiFi Modes

The unit has two wireless modes. One mode allows the user to configure the device, the other mode instructs the device to connect to the on board WiFi access point. The modes are:

- Access Point (AP) mode: The unit functions as an access point, which allows the user to connect to the device and enter the necessary configuration information. The device functions just like a normal access point. The SSID is VMS and the unit IP address is 192.168.4.1.

- Station Mode (STA): The unit functions as a wireless client and will connect to the access point set in the configuration.

Booting Sequence

When the unit is reset or power is first applied, the user can set the wireless mode of the device by holding down the CONFIG (SW4) button. If the user presses and holds the CONFIG button during boot, the unit will enter Access Point mode. If the user doesn't press and hold the CONFIG button, the unit will enter Wifi Station (STA) mode and connect to the Internet access point.

Configuring the Vessel Monitoring System (VMS)

Brief Overview:

To configure the VMS Unit, you must access the unit via WiFi from a computer.

Before you start:

- Obtain your unique account user name and password, which matches your unit.
- Obtain the SSID and password for your WiFi access point. This is the same SSID and password you use to connect your laptop to the Internet.
- The VMS unit will only connect to a WiFi access point using WPA2 encryption, which is normally the default security setting on your access point.
- Disconnect the debug cable from the ESP8266 board. (Blue board with minu USB connector.)
- Connect either shore power or house batteries to the VMS unit.

Configuration Instructions:

Step 1 – Put the VMS unit into AP mode and connect

- Turn off the VMS unit with the power switch. (Switch points towards the power supply.)
- Hold down the config button (SW4) and keep it pressed.
- Turn on the VMS unit with the power switch, keeping the config button pressed. (Switch points towards the Black Shore Power connector.)
- Continue to hold the config button until the GREEN AP LED blinks fast followed by slow blinks, then release the config button.
- The VMS unit is now an Access Point (AP) mode.
- Use your laptop WiFi to connect to the VMS Unit. (SSID is "VMS" and Security Key is 'vmsadmin' – don't type the quotes). This is like connecting to any other access point in Windows.

Step 2 – Configure the VMS Unit WiFi Connection

- Use a web browser to navigate to http://192.168.4.1 to configure the VMS Unit.
- The VMS Configuration page will open and the WiFi Configuration tab will be displayed. A list of available access points will be shown.
- Select your local WiFi SSID by clicking in the circle next to the SSID. Enter the WiFi

password and press "Save". You will get a notification box indicating the password was saved.
- See the following section for screen shots of the configuration pages.

Step 3 – Enter the Account information

Note – this is the user name and password provided to you by the company, which is associated with the Unit ID.

- Select the "Account" tab. Note the Unit ID. If the VMS Server name is something other than "mqtt.cruiseemail.com", change it to "mqtt.cruiseemail.com" (no quotes).
- Enter the Account username and password associated with the Unit id. Press "Save". You will get a notification box indicating the information was saved.

Step 4 – Set up Friendly Names

Note – this step allows you to provide friendly labels for each sensor so you can easily identify them in the dashboard.

- Select the "Hardware" tab and under "Friendly Name" enter the description of each sensor. Press "Save". You will get a notification box indicating the information was saved.

Step 5 – View the Sensor Status

Note – the sensor status will update in real time.

- Select the "Status" tab to display status of each sensor.

Step 6 – Reset the VMS Unit

- Switch the VMS Unit power OFF and ON. (Or – press the Reset button (SW2)
- The GREEN AP LED will blink, then turn ON if the WifI connection is successful.
- The RED MQTT LED will turn OFF if the VMS unit successful connects to the Internet.
- Data should start flowing to the VMS Server on the Internet.

Connect to the Internet Dashboard

- Reconnect your laptop to your local WiFi or router to resume normal operations.
- Open a browser and navigate to https:// mqtt.cruiseemail.com:3000/.

- At the Login Page enter the Account Username & Password for your VMS unit.
- The current sensor and recent alert data will be visible.
- The data in the browser updates in real time.

Configuration Web Pages – Screen Shots

The first screen shot shows a list of available access points. Click the circle next to the AP you want to use, then enter the WPA2 password. Click on Save. This will store the SSID and access point password in the unit. The next time the unit is powered on and put in the STA mode, the unit will attempt to connect to this SSID using the WPA2 password you entered.
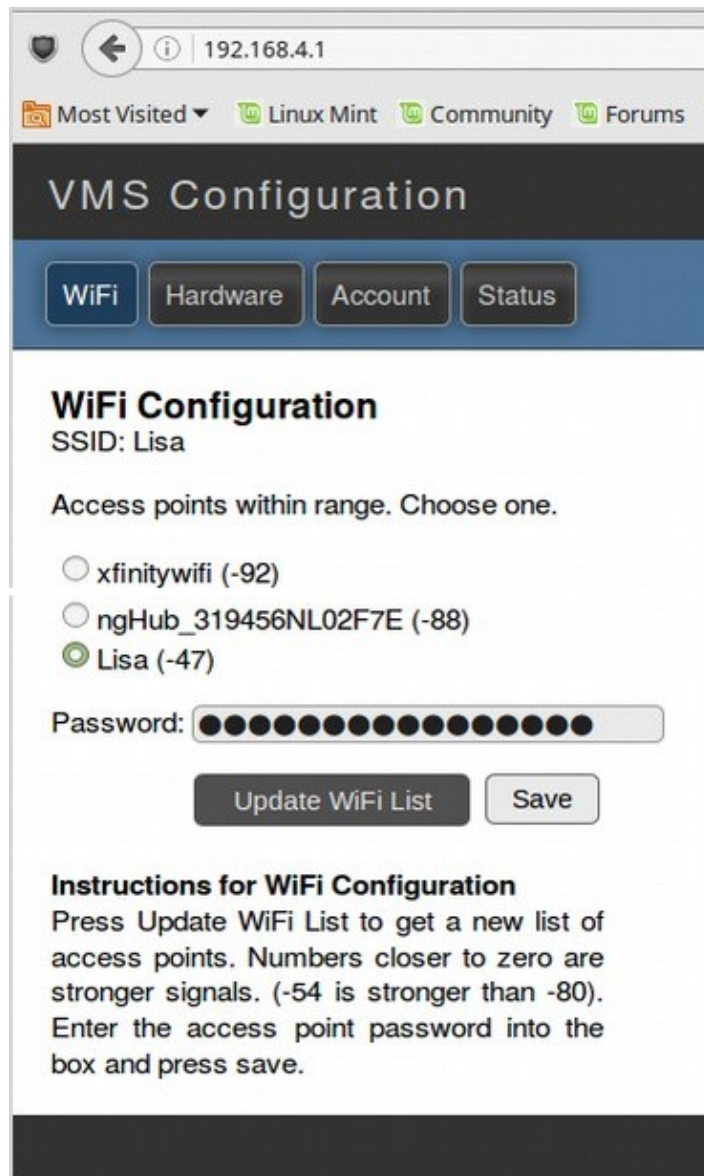

Illustration 2: VMS WiFi Configuration

This next screen shot shows the 'Hardware' configuration screen. Click on 'Hardware' to show. Here, you can enter the 'Friendly Name' of the sensors. The sensor types are hard coded into the unit, but you can name them anything you like. These 'friendly names' will appear on the Internet dashboard. Press 'Save' when you're done.

Illustration 3: Unit Hardware Configuration

The next screen shot shows the account information. Press 'Account' button to access. On this screen, you will see the unique Unit ID for the unit. In the picture below, the Unit ID is 3361e034fe1. Data from this device is stored on the Internet server using this Unit ID, which is tied to your account. Enter the username and password of your account, The username/password combination allows data messages to flow to the Internet server and allows you to access the dashboard. [Prototype: The username/password combination is fixed and we currently use unencrytped protocols to send data messages to the system. This will change in the future to use TLS1.2, which will require unique certificates.]
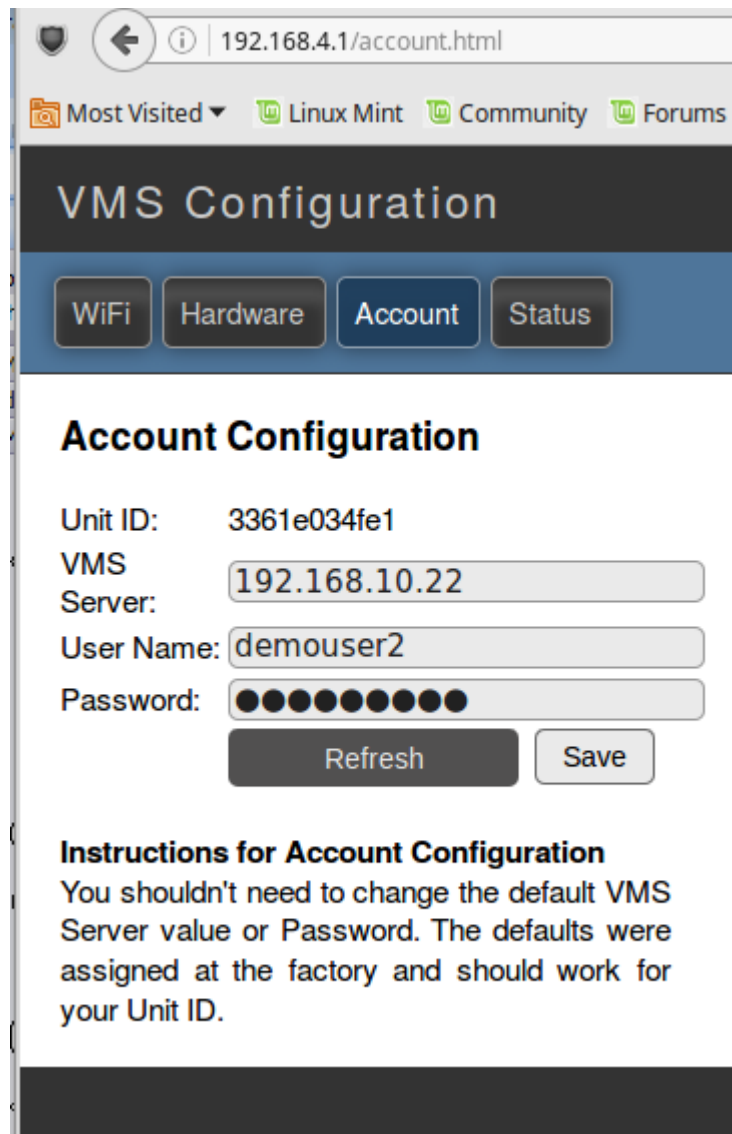

Illustration 4: Unit Account Configuration

The last screen shows the actual sensor status. Click on 'Status' button to access the screen. The real time values are displayed on the web page. Note, if your cell phone or tablet has WiFi capabilities, you can connect to the VMS unit AP like you would connect to any other AP. Use the browser in the cell phone to display the status. This allows you to move about the vessel to actuate the various switches and observe the real time data.
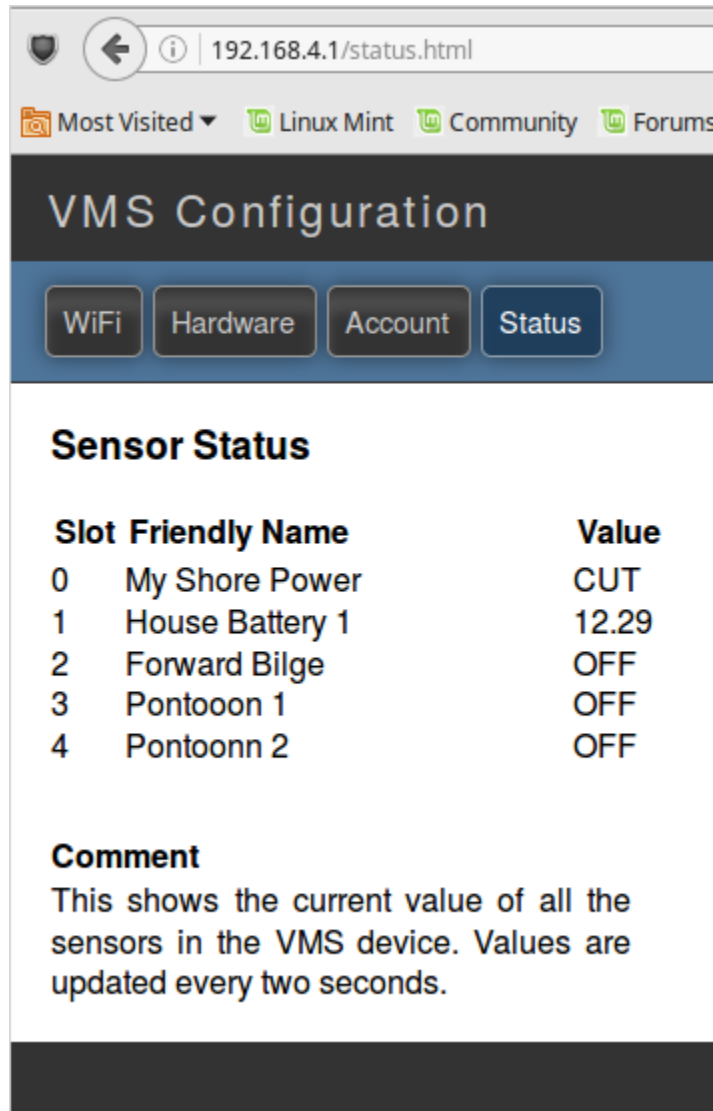

Illustration 5: Unit Status

After the unit is configured, either power off the unit using the ON/OFF switch or press the reset button. Let the unit go back to the STA mode (don't press and hold the CONFIG button). It should connect to the WiFi access point. After about 30 seconds, the AP LED should light. If the device was able to connect to the Internet server, the MQTT light will go OFF.

Specifications:

Items	Specification
Battery Sensor	0 – 15 VDC, protected by resettable fuse if exceeds 15VDC
Bilge Pump Sensor	Max 15VDC, 0 volts = OFF, > 11VDC is on.
Float Switch	Senses dry contacts for a normally open switch. Open is OFF and Close is ON
Power Consumption	60 mA average at 12.4 VDC
Input Voltage	12VDC nominal. Runs from Shore Power or House Battery on Sensor 1
Messages Reporting	MQTT messages are sent to the Internet server every 10 minutes or when a 5% deviation is detected.
Acquisition period	Sensors are scanned every 1 second.