CORTEX

VHF | AIS | MONITOR

M1 HUB - USA & CANADA

M1 HUB - REST OF WORLD

vesper

Index

Introduction

The Vesper Marine Cortex M1 hub is an AIS Class-B SO-TDMA transponder with integrated on board and remote vessel monitoring and control.

When paired with a Vesper Marine Cortex H1 or H1P handset, the M1 hub becomes a fully-featured 25W VHF radio with complete Class D DSC functionality.

The M1 hub features integrated WiFi providing configuration and control via a Cortex app or handset.

The M1 hub uses two dedicated AIS channels to transmit and receive vessel position and other data to and from all other AIS equipped vessels within range.

The M1 hub uses received AIS data by sharing it with other devices on board your vessel (e.g. chart plotters, laptops, phones) over NMEA 2000, NMEA 0183 and WiFi.

For flexibility, the M1 hub includes an integrated AIS/VHF splitter which allows an existing or secondary VHF radio to share the VHF Antenna with the M1 hub (the M1 uses a single antenna for VHF and AIS).

The M1 hub also features an integrated GNSS receiver (supporting GPS, GLONASS, BeiDou, Galilleo), fully isolated NMEA ports and a high-power external speaker driver. Internal antennas for cellular and WiFi are included with the option to attach external antennas as required.

Off-boat vessel monitoring and control is supported via a built-in cellular modem and the Cortex Monitor App on your phone.

Integrated sensors provide vessel position, battery voltage, heading and barometric pressure, while NMEA 2000 or NMEA 0183 provides information from sensors connected to the NMEA network.

Optional external sensors can be installed and connected to the M1 hub to monitor information such as bilge level, shore power and vessel security. Optional output relays can be installed to remotely control lighting, air conditioning, refrigeration, bilge pump, battery charging and more.

Questions and FAQs

Visit www.vespermarine.com/faqs for answers to frequently asked questions, technical support, downloads, local dealer contacts and more…

Register Your Cortex

Vesper Marine releases product updates from time to time. These updates often add new features.

To be notified when an update is available please register your Cortex at www.vespermarine.com/register.

Items you need for installation and configuring

Required components (included)

- M1 hub
- GPS Antenna
- Power cable
- WiFi antenna
- Audio cable
- Input / Output cable

Required components (not included)

- AIS/VHF antenna
- Fuse or circuit breaker
- Fastenings of your choice

Mobile device running the Cortex Onboard App or a Cortex H1 or H1P handset for configuring.

Optional accessories

- Cortex H1 or H1P handset(s)
- External speaker
- External cellular antenna
- NMEA 2000 cable
- NMEA 2000 T connector
- NMEA 2000 network extension cable
- External sensors for Monitoring and Control

M1 hub	GPS antenna (included)
External WiFi antenna (included)	**External cellular antenna (optional)**
Cortex H1 or H1P handset (optional)	**External speaker (optional)**

Onboard App Introduction

Cortex Onboard is a free Android and Apple iOS app that connects your phone or tablet to the WiFi of the M1.

Use the Cortex Onboard App to configure, manage and display M1 data. The Configuration Menu is used for initial configuration, AIS programming, network settings, firmware updates and input / output sensor setup.

Once the M1 is configured, the Cortex Onboard App provides access to all M1 status and smartAIS display screens in a similar layout to a Cortex handset.

See **To update M1 firmware** (pg24).

Cortex Onboard App Main Menu options
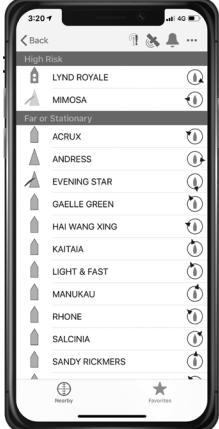
Select the Main Menu icon (☰)

Plotter	Plotter view of AIS targets
Directory	AIS targets and manual DSC contacts
Instruments	GPS, integrated sensors and NMEA data
Anchor watch	Monitor the vessel at anchor
Collision avoidance	Manage a potential collision scenario
MOB	Man Overboard monitoring
Settings	Configure and manage the M1

Plotter
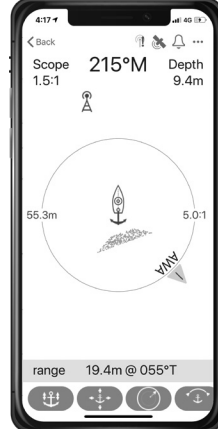
Directory
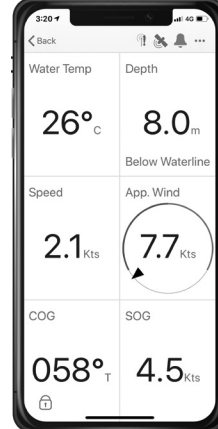
Instruments
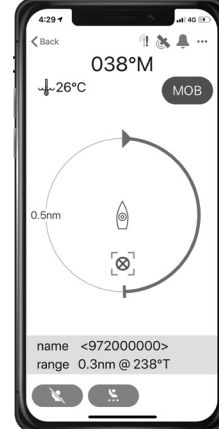
Anchor watch

Collision avoidance

MOB

The Cortex network

AIS / VHF Antenna

Cellular Antenna

GPS (10 Hz) Antenna (included)

Secondary VHF

Power 12/24V

WiFi Antenna (included)

Cortex Handsets

WiFi data

External Speaker

NMEA 2000

NMEA 0183

MFD

Wind

Chart plotter

Heading

Depth

Others

Remote monitoring Input and Output examples

High water

Hatch sensor

Lighting

Motion sensor

Bilge pump

LED indicator panel

The M1 indicator panel provides system status via orange, green and red illumination in various stages of solid or flashing.

eg. The GPS icon flashes green momentarily when a fix is acquired and returns to solid green after a few seconds.

The VHF icon indicates VHF, AIS and DSC as these functions are all connected to the same AIS/VHF antenna.

Power ON is indicated with white light.

See **M1 LED icon troubleshooting** (pg36).
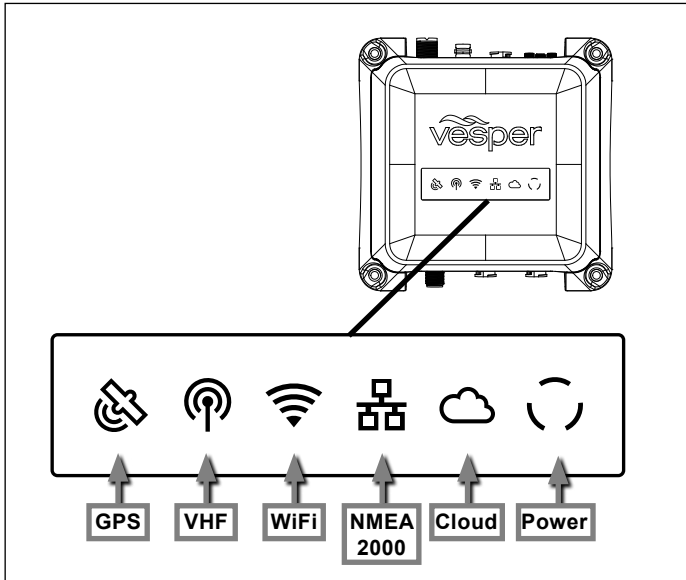
M1 port locations

1 **WiFi Antenna port**
2 **GPS Antenna port**
3 **Cellular Antenna port**

4 **DC Power Supply** (12V or 24V DC)
5 **Auxiliary VHF port**
6 **VHF Antenna**
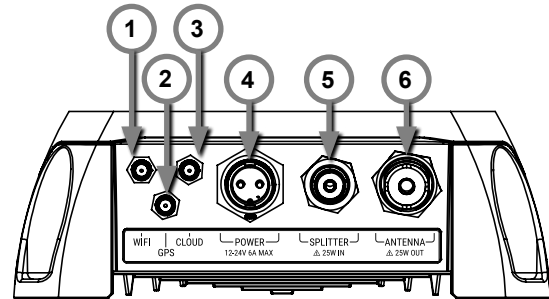
7 **NMEA 2000 port**
8 **Input / Output port** (NMEA 0183 and GPIO sensors)

9 **Audio port** (External Speaker)

M1 positioning

Allow at least 2"/ 50mm at each connector row to give sufficient room for cable clearance and connection.

Allow at least 8" / 200mm for the external WiFi antenna to be positioned in a vertical position to increase WiFi range.

For optimal Heading Sensor performance, do not mount on or near ferrous materials. See **Heading Sensor introduction** (pg24)

CAUTION - Ensure that the minimum safe compass distance is maintained.
Standard: 0.8 m, Steering: 0.4 m.

WiFi Antenna Allow 8"/200mm

Cables Allow 2"/50mm

Cables Allow 2"/50mm

M1 mounting

1. Use the M1 as a template for mounting holes.

2. Mark the holes on the mounting surface and drill them

3. Align the M1 to the mounting holes and secure with fastenings of your choice. (not included)

   Recommended screws: 316 Stainless Self Tapping 8G/1" (4.2/25.4mm) or 10G/1" (4.8/25.4mm) Pan/Round Head.

To connect power

M1 DC power requirements:

Nominal	0.5A @ 12V
VHF High Power Transmit (Max)	6.0A @ 12V

Note - Each handset requires 12W of power (1A@12V)

HINT - To provide sufficient power, consider the total system requirements in terms of adequate cable gauge and fuse rating with capacity for future expansion (ie, adding an H1 or H1P handset to the same circuit).

The 2M (6.5ft) power cable (supplied) is terminated with a 2 pin socket. This cable may be extended or shortened as necessary.

> Check that the VHF antenna is connected before connecting to live DC power.

> Connect the positive (+ve red) and negative (-ve black) leads of the power cable to the vessel.

> Connect a fuse or circuit breaker to the positive cable of the appropriate rating for the system. (ie 10A for the M1, 2A for each handset)

> Connect the power cable to the M1. Tighten the power cable lock ring clockwise to ensure a secure connection and watertight seal.

> Turn the vessel's batteries (and/or switch or circuit breaker) on to apply power to the M1.

> Confirm the M1 is powered on with a visual check on the M1 indicator lights.

HINT - Connect the M1 to a power supply that will remain on even when the vessel's batteries may be turned off. (eg, connected to the 24hr circuit)

This is important for monitoring to ensure the M1 remains on even when the main DC power of the vessel is switched off.

M1 wiring diagram

Black ——— Negative -ve

Red — FUSE — Power +ve
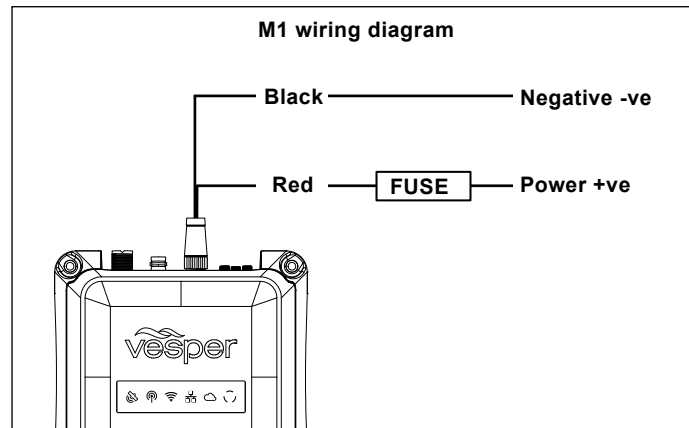
Wiring color codes

Red   DC positive (+ve) (12/24 volts).

Black   DC negative (-ve)

Always use a fuse or circuit breaker installed near the battery end or bus bar end.
Do not connect directly to a battery.
If you must extend the power connections use quality tinned marine grade wire at least 16 AWG (1.5mm²).

AIS / VHF Antenna (required)

The M1 shares one antenna for both AIS and VHF functions. A dedicated VHF antenna is required.

Choose a high quality omni-directional VHF antenna designed for the marine band (156-162MHz) and ensure it is well tuned at the AIS end of the band (VSWR 2:1 or less at 162MHz).

See Part Number VA159 (AIS/VHF Antenna).

Mount the antenna vertically, as high as possible (at least 2-3 meters (6-10 ft) above the waterline). It is not recommended to place the VHF antenna near a mast or other metal structures

CAUTION - Install the antenna a minimum of 3m (10ft) from any other VHF or HF antennas and not within the beam path of a radar. Inadequate separation may damage the Cortex transponder and void your warranty.

CAUTION - Never operate the M1 unless it is connected directly to a suitable VHF antenna.

HINT - The VHF indicator light will display red when a problem is detected with the antenna system (ie, the VSWR is above the acceptable level).

What does VSWR mean ?

VSWR stands for Voltage Standing Wave Ratio and is a measure of the how well matched a transmission line (e.g. the antenna cable connected to the VHF output of your the M1) is to its termination impedance (e.g. your antenna).

VSWR can be thought of as a comparative measure of how much power, generated from your M1 AIS transponder, is delivered to the antenna and how much of it is reflected back and lost in the poorly matched transmission line.

A high VSWR will reduce your effective transmission range and may also lead to other problems.

Internal AIS / VHF splitter

The M1 incorporates an AIS/VHF splitter to share one AIS/VHF antenna and to allow connection to an external VHF radio via the auxiliary port.

The auxiliary port protects the transponder while an external VHF is transmitting (up to 25W) and also isolates the external VHF radio when the M1 is transmitting.

The auxiliary port will still provide a path to the antenna for the external VHF radio in the event of an M1 power failure.

AIS / VHF Antenna connection
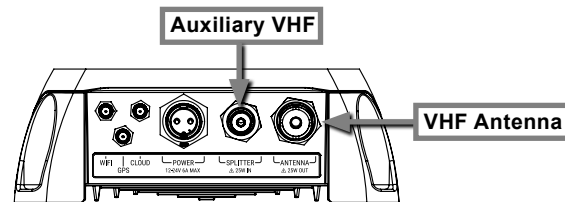
> Connect the AIS/VHF Antenna plug (PL259) to the M1 port labeled ANTENNA.

> Tighten clockwise.

> (If applicable) Connect the auxiliary VHF antenna cable (BNC) to the auxiliary VHF port labeled SPLITTER.

External GPS Antenna (required)

Consider the following location and connection requirements:

- The GPS antenna should be positioned with an unobstructed view of the sky.
- The GPS antenna is rated IP67 and UV stable for external installation.
- Do not place the GPS antenna near or in the path of radar, HF and/or high power satellite communication (such as Iridium Go) antennas.
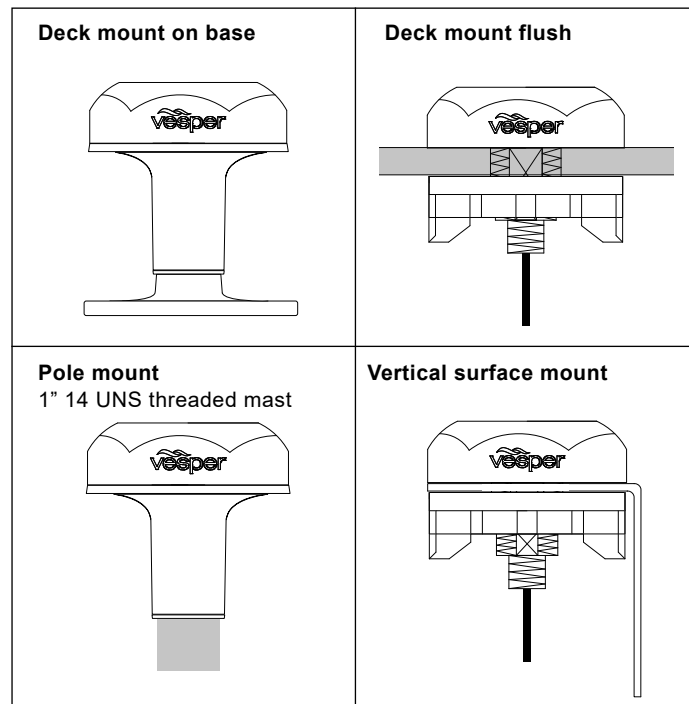- You cannot use another GPS or any other NMEA device to provide a GPS position to the M1. Class B AIS SO-TDMA transponders are required by international regulations to use their own GPS.
- You may use the M1 to share GPS position data to other devices over NMEA 2000, 0183 or WiFi.
- The antenna cable is terminated with an SMA connector to facilitate easy routing through holes and openings. Do not cut the cable without the correct tools to crimp on a new connector.

HINT - Use the GPS Status screen in the Onboard App or handset to view the satellite signal strengths and determine the best location for mounting the external GPS antenna.

CAUTION - The Vesper Marine GPS antenna is specifically designed for use with Vesper Marine devices. Use of a different GPS antenna may damage the M1 hub and void the warranty.

External GPS Antenna mounting

Deck mount on base

Deck mount flush

Pole mount
1" 14 UNS threaded mast

Vertical surface mount

> After installing the GPS Antenna, connect the SMA connector of the GPS Antenna cable to the M1 port labeled GPS.

> Tighten clockwise.
Do not over torque.

GPS Antenna
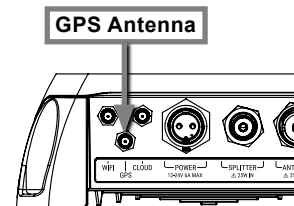
External WiFi Antenna (recommended)

Consider these WiFi requirements when choosing a position:

-   Allow enough clearance space when installing the M1 for the External WiFi Antenna to be positioned in a vertical position to increase WiFi range.

-   Do not place the External WiFi Antenna near or in the path of radar, HF and/or high power satellite communication (such as Iridium Go) antennas.

-   Consider the distance between the handset and M1 onboard. Some objects and materials such as steel, aluminum and carbon composites may provide interference to degrade the WiFi signal strength.

External Wifi Antenna Configuration

Cortex Onboard App:
>   Menu (☰) > Settings
>   > Device Settings > Networks > WiFi...
>   > Use external antenna (select on/off)

Cortex handset:
>   Main Menu (☰). Touch on the wrench icon (🔧) to open the Configuration Menu.
>   > Networks > WiFi...
>   > External Antenna (select on/off)

WiFi signal strength is checked via the WiFi icon on the handset status bar or the WiFi signal on your device.

Note - The M1 includes an internal WiFi antenna for installations where the external antenna is not required.

External WiFi Antenna installation
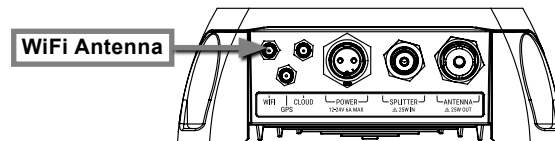
WiFi Antenna

>   Connect the WiFi Antenna to the M1 port labeled WiFi.
>   Tighten clockwise. Do not over torque.
>   Adjust the angle of the WiFi antenna to be as close to vertical as practical.

HINT - Install the WiFi Antenna last to allow sufficient room for fingers to first access and install the other SMA size connectors attached to the External GPS and optional cellular antenna for cloud connectivity.

HINT - Installations where an M1 is mounted in close proximity to an H1 (with little or no interference to the WiFi signal) may not require fitment of the External WiFi Antenna.
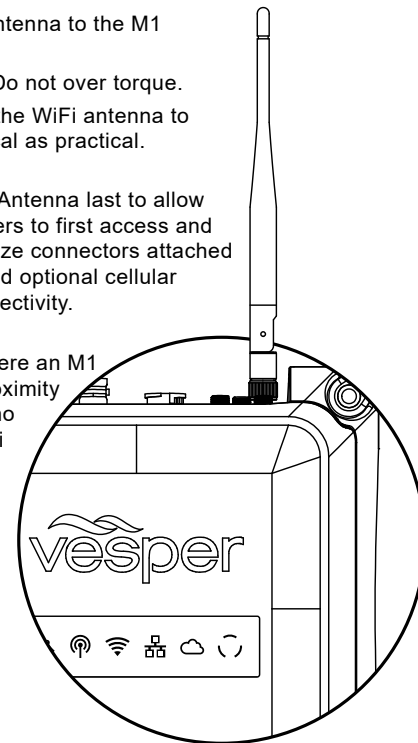
NMEA 2000 Gateway

The M1 incorporates an NMEA Gateway to allow different brands and generations of electronics on NMEA 0183 or 2000 networks to talk to each other automatically and transfer data without extra multiplexing devices or configuring.

The Gateway translates selected NMEA 2000 sensor data for compatibility with mobile apps. Monitor navigation data on your Cortex Onboard App on your phone or tablet or use it with third party apps of your choice.

Data is made available to NMEA 0183 and 2000 plotters. The Gateway supports a range of wind, depth, speed, heading, temperature, barometric pressure and autopilot PGNs.

See PGNs sent and received by the gateway (pg26).

Example Case #1:
Sailing and navigation apps cannot talk directly to an NMEA 2000 network as the apps use the 0183 protocol. We need to translate data from NMEA 2000 to 0183.

Gateway: The M1 receives NMEA 2000 PGNs and automatically converts these to 0183 sentences and sends to devices running the sailing and navigation apps via WiFi.

Example Case #2:
A vessel has an older chart plotter (NMEA 0183 only) with new NMEA 2000 sailing instruments.

Gateway: The M1 receives the new instrument data from the vessel's NMEA 2000 network and automatically converts the data to 0183 sentences for the chart plotter. The chart plotter 0183 wires are connected to the 0183 wires on the M1's input/output cable.

NMEA 2000 Gateway example

WiFi data

NMEA 2000

NMEA 0183

Wind

MFD

Depth

Heading   Depth   Wind

Chart plotter
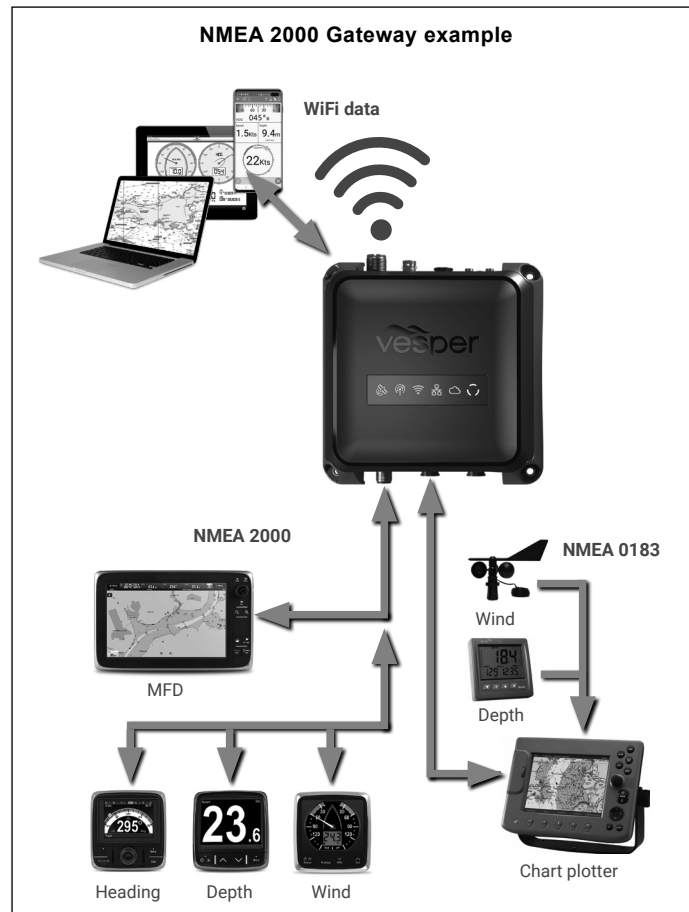
To connect to NMEA 2000

The M1 can be connected to an NMEA 2000 network to enable AIS and Navigation data, including GPS to be sent to other NMEA 2000 devices.

- The NMEA sentences (PGNs) supported are listed on page 26.

- A NMEA 2000 drop cable and T connector are required to connect the M1 to a vessel's NMEA 2000 network.

- Modifying the Instance or System Identification can be done via the Cortex Onboard App or from the H1 handset.

Cortex Onboard App:

> Menu (☰) > Settings > Device Settings > Networks

   > NMEA 2000...

      > Device Instance (0-255) (select to enter value)

      > System Instance (0-255) (select to enter value)

Cortex handset:

> Main Menu (☰). Touch on the wrench icon (🔧) to open the Configuration Menu.

   > Networks

         > N2000 (NMEA 2000)

            > Device Instance

            > System Instance

To change the Device or System instance select the field and use the touchscreen menu to key a number between 0-255

NMEA 2000 network connection example

Chart plotter

Drop cable →

Network extension cable

Network power →

T Connection

Terminating Resistor

NMEA 2000 port
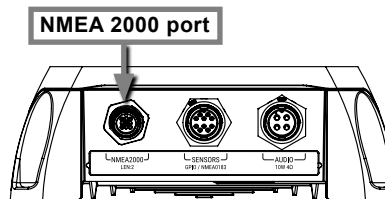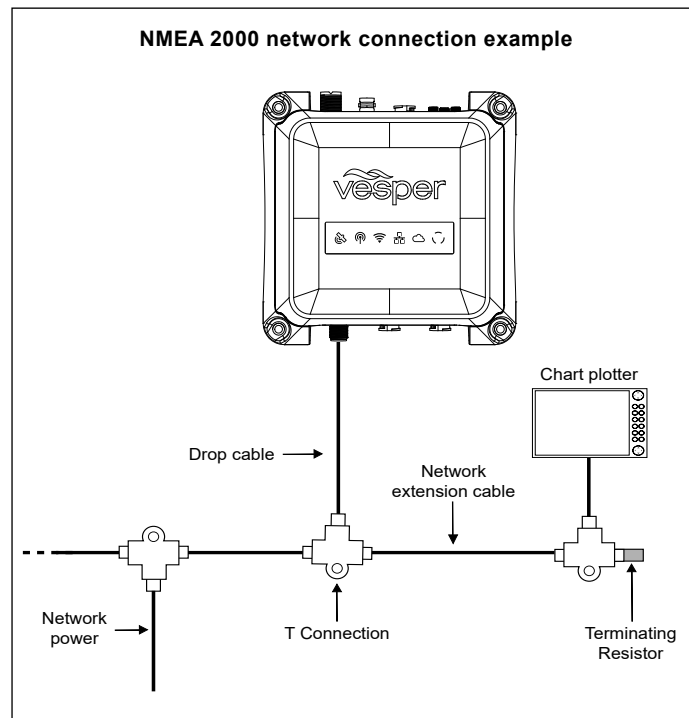
To connect to NMEA 0183

NMEA 0183 devices can receive AIS data when connected to the M1 I/O (Sensors GPIO / NMEA 0183) expansion port.

- The NMEA sentences supported are included on page 26.

The NMEA Baud rate can be changed via the Cortex Onboard App or from the H1 handset.

Cortex Onboard App:

> Menu ( ) > Settings > Device Settings
> > Networks > NMEA 0183... > Baud rate (select)

Cortex handset:

> Main Menu ( ). Touch on the wrench icon ( ) to open the Configuration Menu.
> > Networks
>
> > 0183 (NMEA 0183)
>   > Baud In >
>   > Baud out >

HINT - AIS output requires a minimum of 38400 Baud rate.

Note - When connecting the M1 to NMEA 0183 devices, connect 0183 Common (Black) to the vessel's negative bus. This is to ensure a satisfactory grounding as the NMEA 0183 network of the M1 is isolated.

NMEA 0183 network connection diagram

NMEA TX (+) A ◄——————— ORANGE

NMEA TX (-) B ◄——————— WHITE

NMEA RX (+) A ——————► DARK GREEN

NMEA RX (-) B ——————► YELLOW

NMEA 0183 COMMON ——— BLACK
(Shared with GPIO Ground)

NMEA 0183 port

NMEA2000 LEN2   SENSORS GPIO / NMEA0183   AUDIO 10W 4Ω
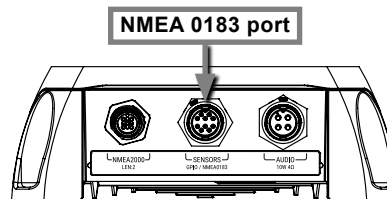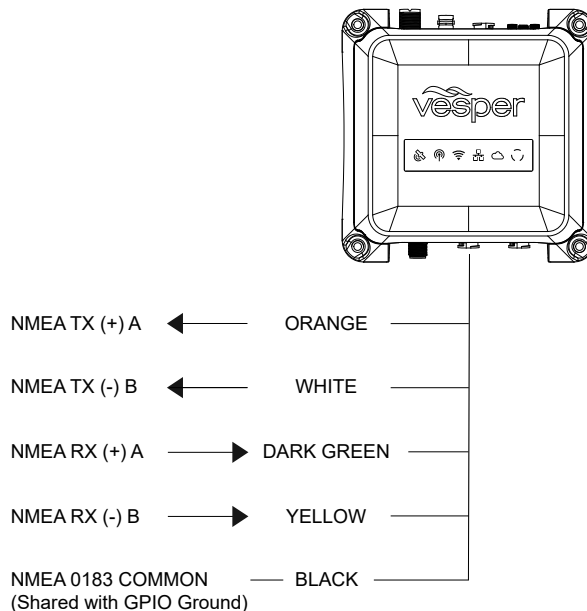
External Cellular Antenna (optional)

The Vesper Marine External Cellular Antenna may be connected for enhanced cellular coverage. Consider the following location and connection requirements:

- The external cellular antenna is rated IP67 and UV stable for external installation.

- Do not place the external cellular antenna near or in the path of radar, HF and/or high power satellite communication (such as Iridium Go) antennas.

- The antenna cable is terminated with an SMA connector to facilitate easy routing through holes and openings. Do not cut the cable without the correct tools to crimp on a new connector.

- Do not extend the antenna cable beyond the supplied length of 5M (16').

HINT - A solid orange light on the LED indicator panel indicates an attempt to connect to a cell tower, green indicates connection. See **LED icon troubleshooting** (pg36) for further information.

External Antenna Configuration

Cortex Onboard App:

> Menu (≡) > Settings
>> > Device Settings > Networks > Cloud...
>>> > Use external antenna (select on/off)

Cortex handset:

> Main Menu (≡). Touch the wrench icon (🔧) to open the Configuration Menu.
>> > Networks > Cloud
>>> > Use external antenna (select on/off)

Note - The M1 includes an internal Cellular antenna for installations where the external antenna is not required.

External Cellular Antenna mounting

Deck mount on base

Deck mount flush

Pole mount
1" 14 UNS threaded mast

Vertical surface mount
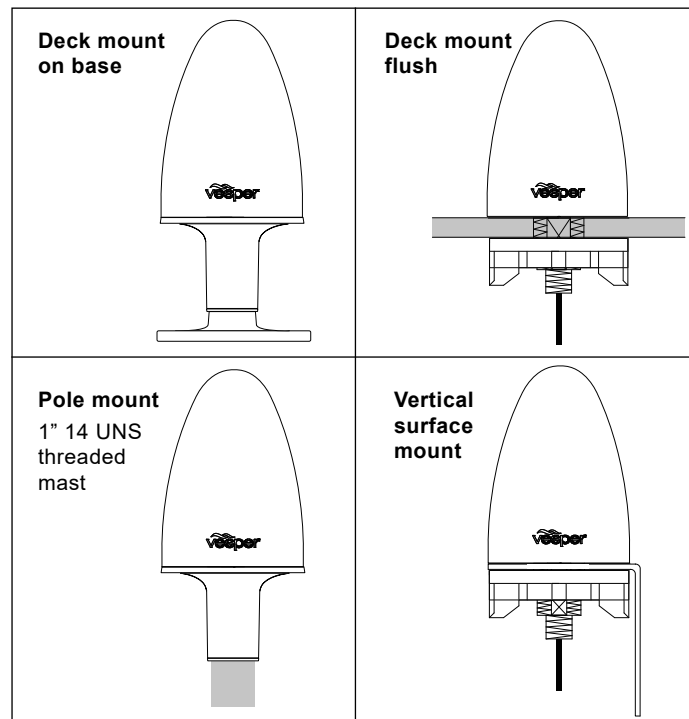
> After installing the Cellular Antenna, connect the SMA connector of the Cellular Antenna cable to the M1 port labeled Cloud.

> Tighten clockwise. Do not over torque.

Cellular Antenna
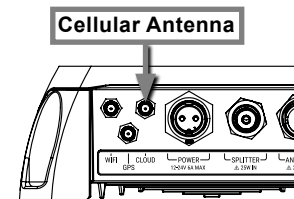
External Speaker (optional)

An optional external speaker can be connected to the M1 for audio alarms or voice alarms using the Audio cable.

In addition, the speaker also broadcasts VHF voice when the M1 is connected to an H1 or H1P handset.

Make sure that the external speaker is installed at least 3ft / 1M from any magnetic compass or flux gate sensor.

External Speaker wiring color codes

Orange   Audio positive (+ve)

Black   Audio negative (-ve)

HINT - For best audio performance, choose a speaker with a minimum 10W audio power rating and 4 ohm impedance.

External Speaker Wiring Diagram

Orange — Audio positive (+ve)

Black — Audio negative (-ve)
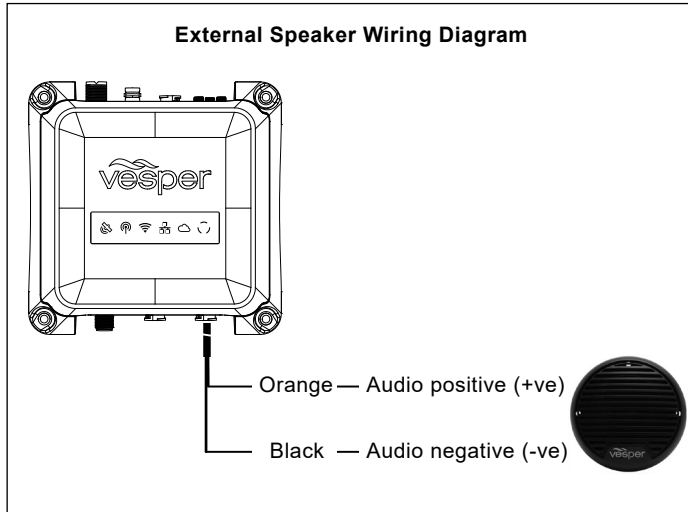
Vesper Marine External Speaker

The Vesper Marine External Speaker (Part Number 111210) is purpose designed for the marine environment.
Featuring IP66 ingress protection this speaker is suitable for installing almost anywhere on board.

- 3" 70 Watt Speaker
- Frequency response of 80Hz-18kHz
- 4 ohm impedance
- IP66 water resistant for marine applications
- UV resistant polymer housing / Polypropylene cone
- Heavy duty molded ABS plastic basket and grill
- Pre-wired with 2m (6.5ft) of cable

External Speaker Dimensions

Side   Front

86mm (3 3/8")

93.5mm (3 11/16")
74.5mm (2 15/16")

86mm (3 3/8")
93.5mm (3 11/16")

55.6mm (2 3/16")

DRILL / CUT
ø 74.5mm (2 15/16")

DRILL X 4
ø 4mm (5/32")
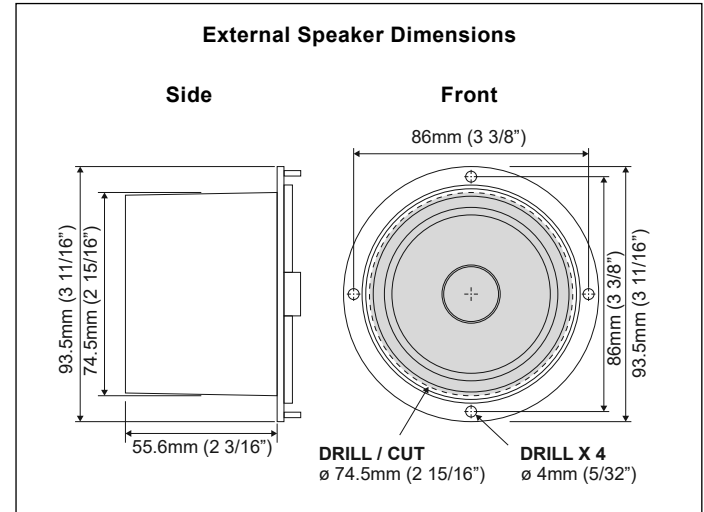
Connecting devices to an M1

Once installation of the M1, cables and antennas are complete, the M1 is configured using the Cortex On board App on a mobile device (iOS or Android) or via a Cortex H1 or H1P handset.

Prior to the configuration steps, a WiFi connection must be made between the M1 and the device used for configuration.

The M1 WiFi network will connect with up to 10 devices.

Note - The Cortex V1 package (M1+H1) ships with the handset pre-configured to the M1.

Place supplied WiFi label here

Caution - The WiFi SSID or password cannot be changed, please ensure the labels do not get lost.

www.vespermarine.com

CORTEX M13G
Serial No. A1000101
Wifi SSID:
CORTEX - 31040101
WiFi Password:
MNOPQRSTUV

Scan QR - code to connect to M1 HUB
Check installation guide for further details.

To connect a mobile device

1 **Turn Cortex M1 and device ON**
   Switch the vessel's batteries ON to power the M1.

2 **Select WiFi in the settings of the device**

   > From the list of available WiFi, identify and select the M1 WiFi SSID.

      Note - The WiFi SSID is identified by the M1 serial number eg: CORTEX-95211616

   > Key the WiFi password found on the label supplied with the M1.

      Alternatively scan the QR code of the M1 (found on the WiFi label) to be automatically connected.

   > Join and save to connect.

   > Close the WiFi setting on the device.

Note - If the supplied label is lost, the WiFi password is found underneath the M1 on the serial label. For further assistance please contact Vesper Marine via support@vespermarine.com.

To connect a handset

1 Turn M1 ON
Switch the vessel's batteries ON to power the M1.

2 Turn the handset ON
Press and hold the Power button for 2 seconds.

3 Select WiFi from the Status Bar

> From the list of available WiFi, identify and select the M1 WiFi SSID.

    Note - The WiFi SSID is identified by the M1 serial number eg: CORTEX-95211616

    Note - The Cortex V1 package (M1+H1) ships with the handset pre-configured to the M1.

> Key the WiFi Password found on the label supplied with the M1.

> Select CONNECT to save.
Text '*connected*' will confirm the connection.

> Select the Back key to close the WiFi status

Note - To connect additional handsets to a configured M1 network follow the **To connect a handset** steps above.

Device connection FAQs

If the device (handset or mobile device) displays '**Trying to connect...**' for a long period, it has not made a WiFi connection to the M1.

> Confirm the M1 is ON

> Check the WiFi signal strength on the mobile device or in the Status Bar of the handset.

> Check the M1 WiFi External Antenna is attached.

> Consider the distance between the device and M1 on board. Some objects and materials may provide interference to degrade the WiFi signal strength.

> See '**Connecting to an M1**' (pg18).
Follow the steps to identify and connect to the WiFi.

Note - The WiFi status icon on the M1 will illuminate green when a handset or app makes a connection.

If the device displays '**No GPS connection!**' while beeping an alarm, touch the screen (or any key) to silence the alarm and close this notification.
The device will then display '**Waiting for GPS...**' , the M1 has not acquired GPS position.

> Check GPS Status in the Status Bar of the handset (select GPS icon in the On board App).

> Check the M1 external GPS installation.

> Check the GPS icon on the M1 indicator panel.

MMSI programming Introduction

Before an M1 can transmit your position over AIS you must configure your vessel details and enter a valid MMSI number.

You can configure your MMSI using the Cortex Onboard App or a Cortex handset.

Your MMSI may have been entered by your dealer. You must have an assigned MMSI for your vessel.

If you do not have an assigned MMSI, contact the relevant authority in your country.

Once you save the MMSI number you cannot change it. If you need to change the MMSI, please contact an authorized dealer or Vesper Marine.

MMSI Programming Warning

For Customers in the USA: This device must be programmed with data corresponding to the vessel on which it will be installed.

Programming must be carried out by a Vesper Marine dealer. The included instructions contain information on how to verify the correct programming.

WARNING: It is a violation of the rules of the Federal Communications Commission to input an MMSI that has not been properly assigned to the end user, or to otherwise input any inaccurate data in this device.

To program an MMSI with the Onboard App

1 **Download the Cortex Onboard App**
   Free download from the Apple or Google Play stores

2 **Turn Cortex M1 and device ON**
   Switch the vessel's batteries ON to power the M1

2 **Connect the device to the M1 via WiFi**
   See **Connecting to an M1** section

4 **Open the app and program as follows;**
   > Select the Main Menu icon (≡) to open the Settings Menu.

    > Device Settings...

       > Vessel...

          > Identification...

            > MMSI (Enter MMSI number)

            > Name (Enter the vessel's name)

            > Callsign (Enter the vessel's callsign)

            > ATIS ID* (Enter the vessel's ATIS ID)

*A vessel ID for inland waterways in some European countries.

            > Vessel Type (Select from the list)

To program your vessel dimensions with the Onboard App
   > Select the Menu icon (≡) to open the Settings Menu.

    > Device Settings...

       > Vessel...

          > Dimensions

            > Length (Enter length overall)

            > Beam (Enter beam overall)

            > GPS from stern (Enter measurement)

            > GPS from starboard (Enter measurement)

To program an MMSI with a handset

1 Turn Cortex M1 and handset ON
Switch the vessel's batteries ON to power the M1

2 Connect the handset to the M1 via WiFi
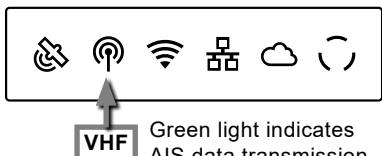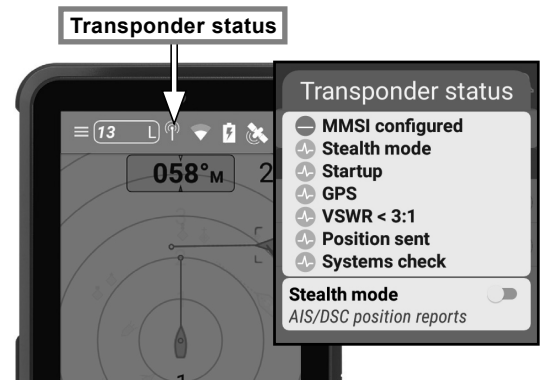See **Connecting to an M1** section

3 Select the handset Main Menu and program as follows;

> Main Menu. (▤) Select the wrench icon (🔧) to open the Configuration Menu.

> Vessel

> Vessel Identification

> MMSI (Enter MMSI number)

> Name (Enter the vessel's name)

> Callsign (Enter the vessel's callsign)

> Vessel Type (Select from the list)

To program your vessel dimensions with a handset

> Main Menu. (▤) Select the wrench icon (🔧) to open the Configuration Menu.

> Vessel

> Dimensions

> Length (Enter length overall)

> Beam (Enter beam overall)

> GPS from stern (Enter measurement)

> GPS from starboard (Enter measurement)

To confirm AIS operation

LED indicator panel	
	VHF Green light indicates AIS data transmission
Handset	> Main Menu. (▤) Select the wrench icon (🔧) to open the Configuration Menu. > Systems > AIS (View RX and TX data counter)
Onboard App	> Main Menu (▤) to open the Settings Menu. > Device Settings > Systems... >AIS... (View RX and TX data counter)

Onboard App (or handset Status Bar pictured)

Transponder receive only mode (Stealth mode) is controlled (on/off) from within this menu.

Transponder status

058°M

Transponder status
- MMSI configured
- Stealth mode
- Startup
- GPS
- VSWR < 3:1
- Position sent
- Systems check

Stealth mode
AIS/DSC position reports

Monitoring and control

Off-boat vessel monitoring and control is supported via a built-in cellular modem and the Cortex Monitor App on your phone.

Once the M1 is installed and operating, data from the M1's integrated sensors, from external sensors wired into the GPIO port and data from an NMEA bus will be displayed and controlled on the Cortex Monitor App.

M1 integrated sensors

GPS position

System voltage

Vessel heading (refer **Heading Sensor Calibration** pg24)

Barometric pressure

M1 GPIO sensors and connections

The M1 can monitor up to three general purpose inputs and an additional two may be configured either as an input or output.

Note - When connecting GPIO sensors to the M1, a Pullup voltage connection is recommended.
Pullup voltage provides an active high/low voltage reference for the GPIO input when sensors do not provide sufficient voltage.

NMEA 2000 sensors

When the M1 is connected to an NMEA 2000 bus, data from applicable NMEA 2000 and 0183 devices will display on the handset and Onboard App Instruments screen, and on the Cortex Monitor App.

See page 26 for the NMEA PGNs received and transmitted and Monitoring Instruments received.

Cortex Monitor App Introduction

Cortex Monitor is a free Apple iOS and Android app that allows your phone to monitor and control the sensors of your Cortex M1 via a cellular connection.

Use the Cortex Monitor App to monitor and control your boat when you are ashore provided your Cortex M1 and phone are within cellular coverage.

Note - Use the Cortex Onboard App or a handset to configure and test GPIO sensors and relays.

After the inputs and outputs have been configured and tested, download the Cortex Monitor App onto your device.

Enter your login details and the Cortex Product Serial number or scan the QR code to activate monitoring for your Cortex M1. Once activated it can take a few minutes for your Cortex M1 to connect for the first time. You can now view the status of M1 sensors on the Monitor app.

Tracking   Instruments   Power
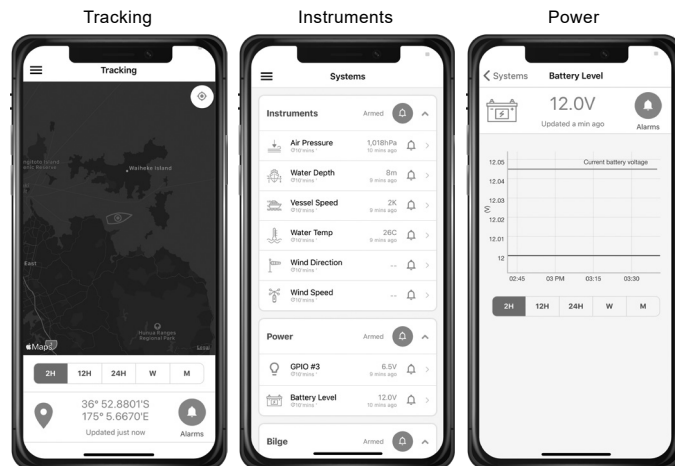
To program GPIO sensors with the Cortex Onboard App

Name and configure up to 5 general purpose sensors, 2 x input/output, 3 x input.

1 Download the Cortex Onboard App
Free download from the iOS or Google Play stores

2 Turn Cortex M1 and device ON
Switch the vessels batteries ON to power the M1

2 Connect the device to the M1 via WiFi
See **Connecting to an M1** section

4 Open the app and program as follows;
>   Select the Main Menu icon (▤) to open the Settings Menu.

> Device Settings...

> Sensors...

> GPIO...

> Sensor / control name

> Sensor / control type (select from list)

> Default input high

> Pullup active (select Enabled or Disabled)

> Active when high (select Yes for Normally Closed
select No for Normally Open)

To program GPIO sensors with a handset

Name and configure up to 5 general purpose sensors, 3 x input, 2 x input/output.

1 Turn Cortex M1 and handset ON
Switch the vessels batteries ON to power the M1

2 Connect the handset to the M1 via WiFi
See **Connecting to an M1** section

3 Select the handset Main Menu and program as follows;
> Main Menu. (▤) Select the wrench icon (🔧) to open the Configuration Menu.

> Sensors

> GPIO

> Sensor / control name

> Sensor / control type (select from list)

> Default input high

> Pullup active (select Enabled or Disabled)

> Active when high (select Yes for Normally Closed
select No for Normally Open)

Note - An external Pullup voltage connection is recommended when connecting GPIO sensors to the M1.
When a sensor does not provide more than 2V, the Pullup provides an appropriate high level reference for the M1's input.

Heading Sensor introduction

The M1 includes an internal heading sensor to display an accurately orientated AIS icon of your vessel on another vessels AIS system. The heading sensor also determines the direction to the bow for Anchor Watch.

Note - If an external heading sensor exists on the NMEA 0183 or 2000 network, M1 heading sensor calibration is not required. The M1 will automatically receive the heading PGN from the networked device.

The Cortex Onboard App

1 **Turn Cortex M1 and device ON**
   Switch the vessel's batteries ON to power the M1

2 **Connect the device to the M1 via WiFi**
   See **Connecting to an M1** section

3 **Open the app and program as follows;**

   >   Select the Main Menu icon (≡) to open the Settings Menu.

      > Device Settings...

         > Sensors...

            > Heading...

With a handset

1 **Turn Cortex M1 and handset ON**
   Switch the vessel's batteries ON to power the M1

2 **Connect the handset to the M1 via WiFi**
   See **Connecting to an M1** section

3 **Select the handset Main Menu and program as follows;**

   >   Main Menu. (≡) Select the wrench icon (🔧) to open the Configuration Menu.

      > Sensors

         > Heading

To update M1 firmware

Firmware updates for the M1 hub and H1/H1P handsets are bundled with Cortex Onboard App releases.

Check the Apple IOS App Store or Google Play Store for updates to Cortex Onboard, select UPDATE as required.

Once downloaded to your mobile device, connect it to the M1 WiFi on the vessel.

The M1 will automatically recognize updated firmware.

The Onboard App will ask if you would like to perform the firmware update. Select Yes to update.

Note - If you have registered your Cortex, emails will advise when a firmware update is available.

M1 Wiring color codes

	RED	POWER +VE
	BLACK	POWER -VE

NMEA TX (+) A	ORANGE	
NMEA TX (-) B	WHITE	
NMEA RX (+) A	DARK GREEN	
NMEA RX (-) B	YELLOW	
NMEA 0183 COMMON and GPIO GROUND	BLACK	

ORANGE	AUDIO +VE	
BLACK	AUDIO -VE	
RED	Reserved - Do not connect	
BROWN	Reserved - Do not connect	

RED	PULLUP VOLTAGE	
LIGHT GREEN	INPUT / OUTPUT 2	
BROWN	INPUT / OUTPUT 1	
GRAY	INPUT 3	
VIOLET	INPUT 2	
BLUE	INPUT 1	
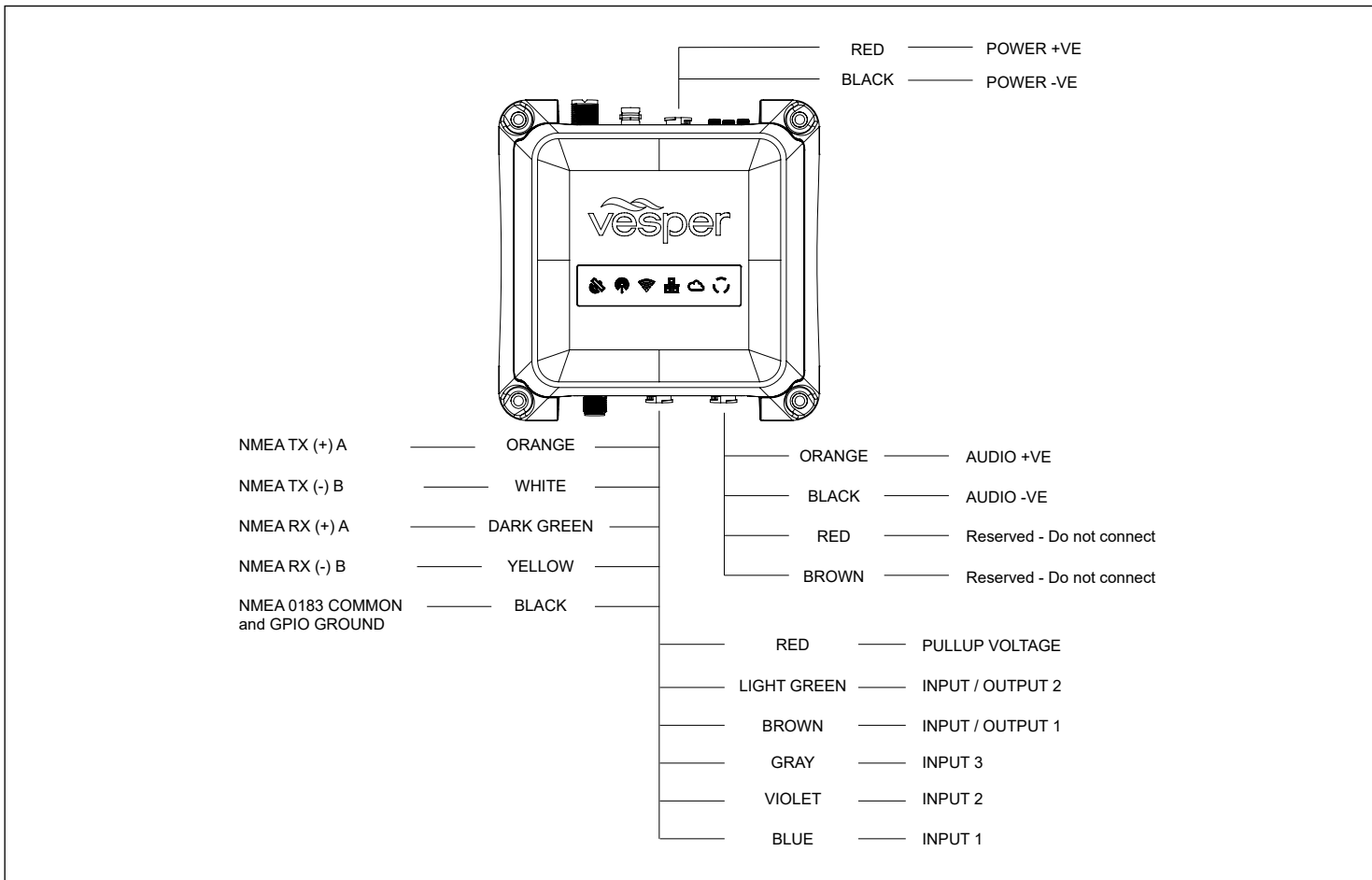
NMEA PGNs and Monitoring Instruments

Received PGNs

Received PGNs are translated and outputted over NMEA 0183 and WiFi. See www.vespermarine.com for an up to date list.

PGN	Description	0183 Translation
127250	Vessel Heading	HDG
128259	Speed, water referenced	VHW
128267	Water depth	DPT
128275	Distance log	VLW
129283	Cross track error	XTE
129284	Navigation data	BOD APB RMB
129285	Navigation, route/waypoint info	WPL RMB
129810	Wind data	MDW MWV
129284	Actual Pressure	XDR MDA
130314	Air Pressure	MTW

Sent PGNs

PGN	Description
127233	Man Overboard
127250	Vessel Heading
127267	Water depth
129025	Position (Rapid)
129026	COG & SOG (Rapid)
129029	GNSS Position
129038	Class A Position
129039	AIS Class B position
129040	AIS Class B position extended
129041	AIS Aids to Navigation
129539	GNSS DOP's
129540	GNSS satellites in view
129794	AIS Class A Static Voyage
129798	AIS SAR Aircraft Position
129801	AIS Addressed Safety
129802	AIS Safety Related Broadcast
129809	AIS Class B "CS" Static, Part A
129810	AIS Class B "CS" Static, Part B
130306	Wind data

Monitoring Instruments

Description
Vessel Heading
Speed, water referenced
Water depth
Wind data
Actual Pressure
Air Pressure

GPIO sensor wiring - Lighting remote control

GPIO sensor configuration example

Sensor / control name	Anchor light
Sensor / control type	On/Off switch

Note - Lighting on/off remote control is one example of what an output relay may switch and control.
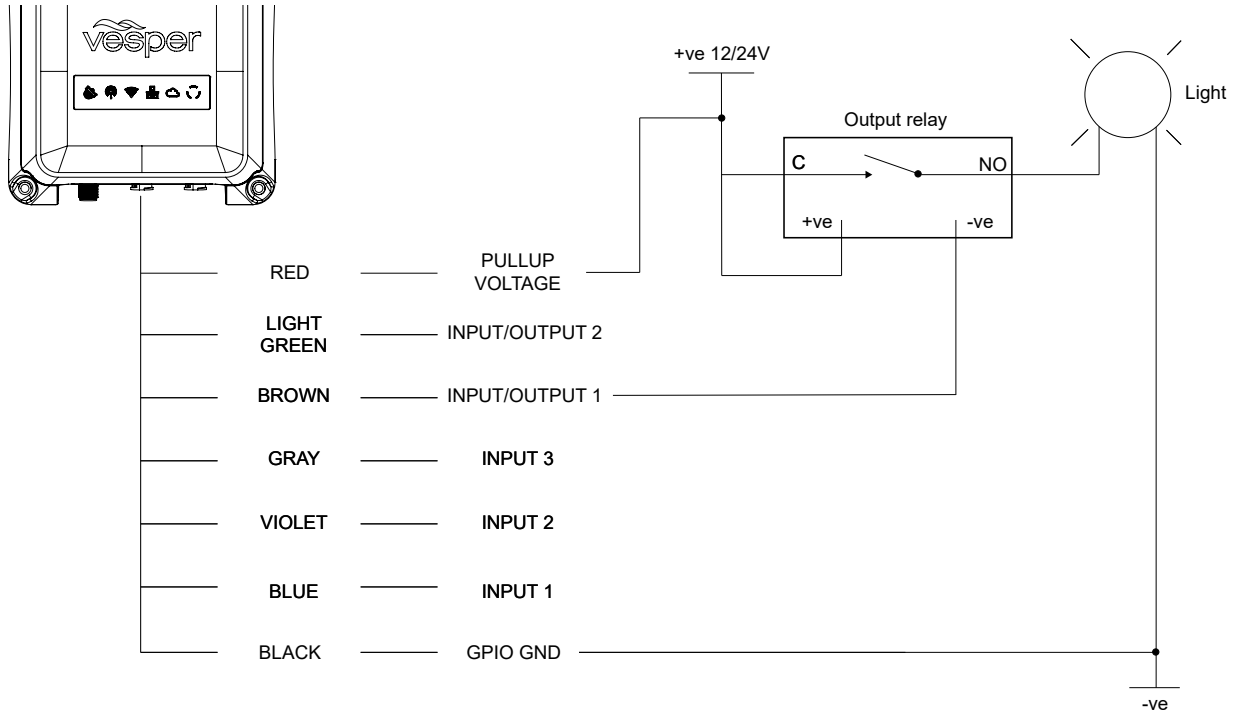
RED — PULLUP VOLTAGE

LIGHT GREEN — INPUT/OUTPUT 2

BROWN — INPUT/OUTPUT 1

GRAY — INPUT 3

VIOLET — INPUT 2

BLUE — INPUT 1

BLACK — GPIO GND

+ve 12/24V

Output relay

C   NO

+ve   -ve

Light

-ve

Note - An external Pullup voltage connection is recommended when connecting GPIO sensors to the M1.
When a sensor does not provide more than 2V, the Pullup provides an appropriate high level reference for the M1's input.

GPIO sensor wiring - Motion sensor

GPIO sensor configuration example

Sensor / control name	Cockpit Motion 1
Sensor / control type	Security sensor
Default input high	Pullup enabled
Active when high	Yes, normally closed

RED — PULLUP VOLTAGE

+ve 12/24V

LIGHT GREEN — INPUT/OUTPUT 2

BROWN — INPUT/OUTPUT 1

GRAY — INPUT 3

VIOLET — INPUT 2
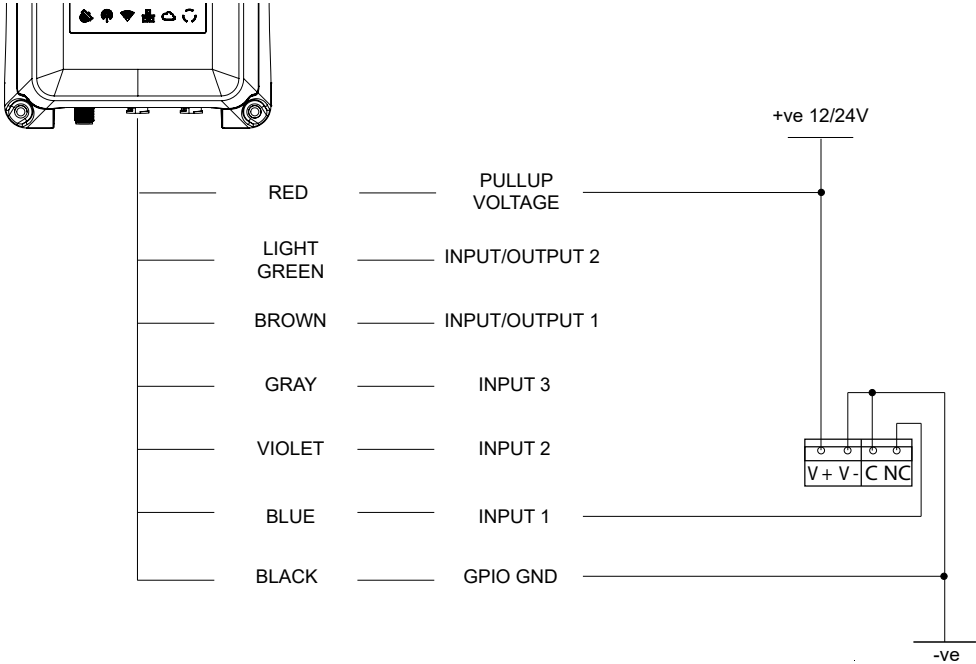
BLUE — INPUT 1

BLACK — GPIO GND

V + V - C NC

-ve

Note - An external Pullup voltage connection is recommended when connecting GPIO sensors to the M1.
When a sensor does not provide more than 2V, the Pullup provides an appropriate high level reference for the M1's input.

GPIO sensor wiring - High water sensor

GPIO sensor configuration example

Sensor / control name	Bilge high water
Sensor / control type	High water sensor
Default input high	Pullup enabled
Active when high	No, normally open

+ve 12/24V

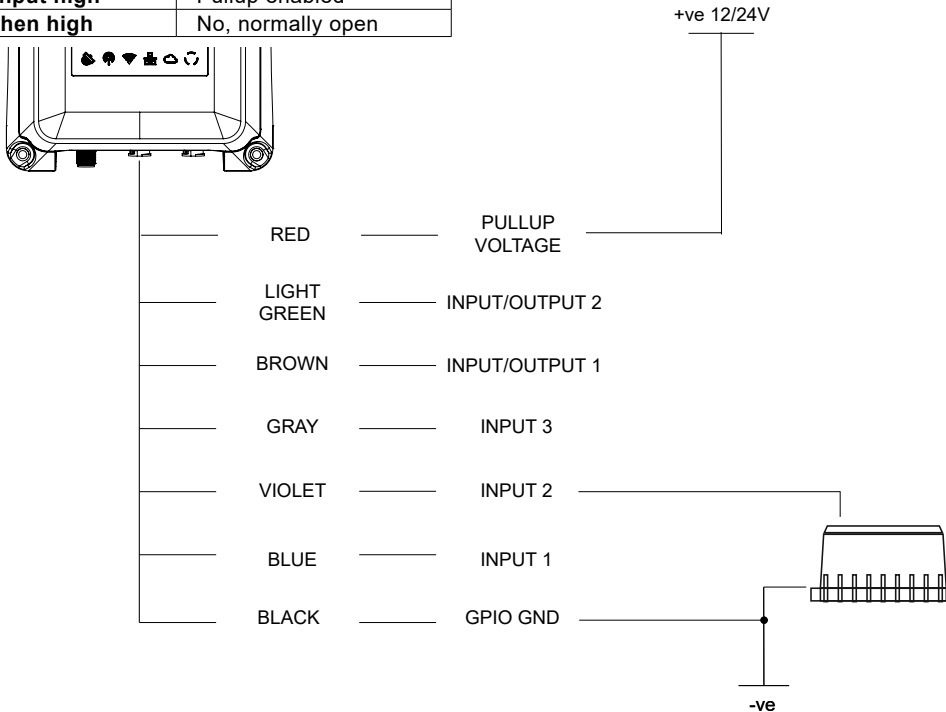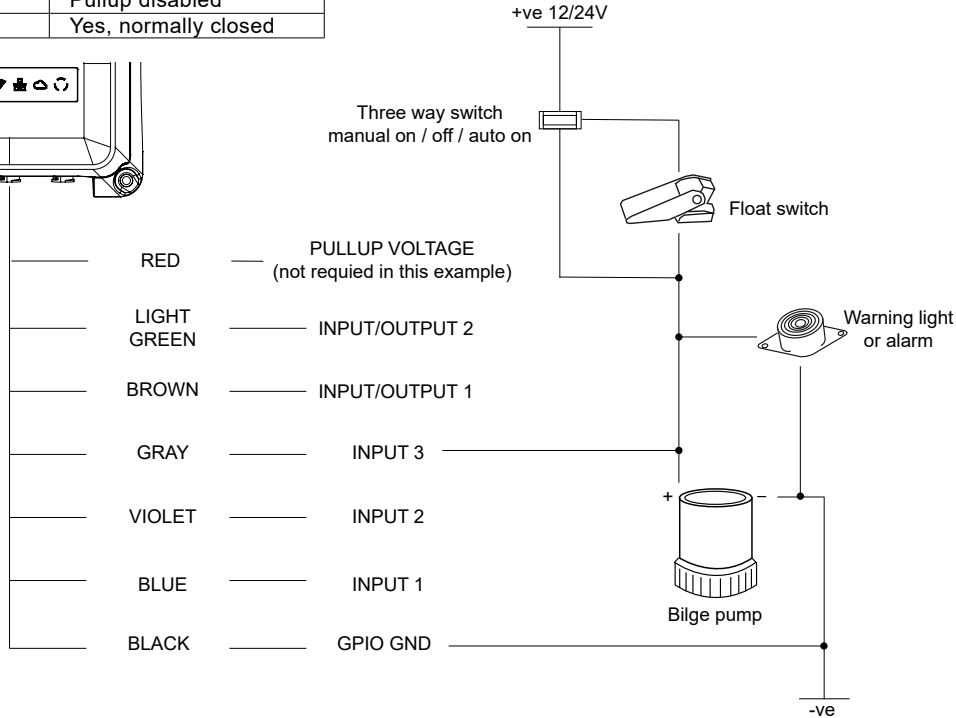|	
RED	PULLUP VOLTAGE
LIGHT GREEN	INPUT/OUTPUT 2
BROWN	INPUT/OUTPUT 1
GRAY	INPUT 3
VIOLET	INPUT 2
BLUE	INPUT 1
BLACK	GPIO GND

-ve

Note - An external Pullup voltage connection is recommended when connecting GPIO sensors to the M1.
When a sensor does not provide more than 2V, the Pullup provides an appropriate high level reference for the M1's input.

GPIO sensor wiring - Bilge pump activation sensor

GPIO sensor configuration example

Sensor / control name	Engine room bilge
Sensor / control type	Bilge pump
Default input high	Pullup disabled
Active when high	Yes, normally closed

+ve 12/24V

Three way switch
manual on / off / auto on

Float switch

RED — PULLUP VOLTAGE
(not requied in this example)

LIGHT GREEN — INPUT/OUTPUT 2

BROWN — INPUT/OUTPUT 1

Warning light
or alarm

GRAY — INPUT 3

VIOLET — INPUT 2

+ −
BLUE — INPUT 1

Bilge pump

BLACK — GPIO GND

-ve

Note - A Pullup connection is not required in this example as it is driven high.

GPIO sensor wiring - Hatch / door open sensor

GPIO sensor configuration example

Sensor / control name	Forward Hatch 1
Sensor / control type	Security sensor
Default input high	Pullup enabled
Active when high	No, normally open

+ve 12/24V

Magnetic reed switch

RED — PULLUP VOLTAGE

LIGHT GREEN — INPUT/OUTPUT 2

BROWN — INPUT/OUTPUT 1

GRAY — INPUT 3

VIOLET — INPUT 2
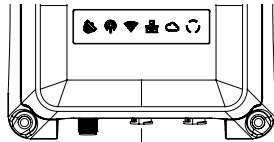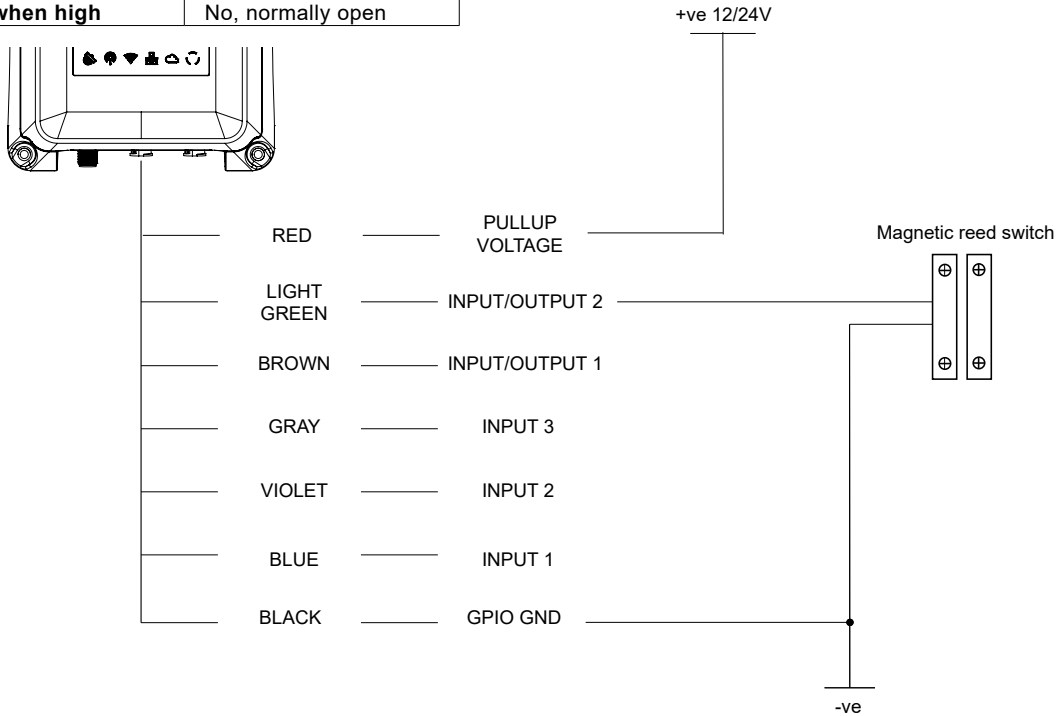
BLUE — INPUT 1

BLACK — GPIO GND

-ve

Note - An external Pullup voltage connection is recommended when connecting GPIO sensors to the M1.
When a sensor does not provide more than 2V, the Pullup provides an appropriate high level reference for the M1's input.

GPIO sensor wiring - Smoke / Heat sensor

GPIO sensor configuration example

Sensor / control name	Engine room smoke
Sensor / control type	Smoke sensor
Default input high	Pullup enabled
Active when high	No, normally open

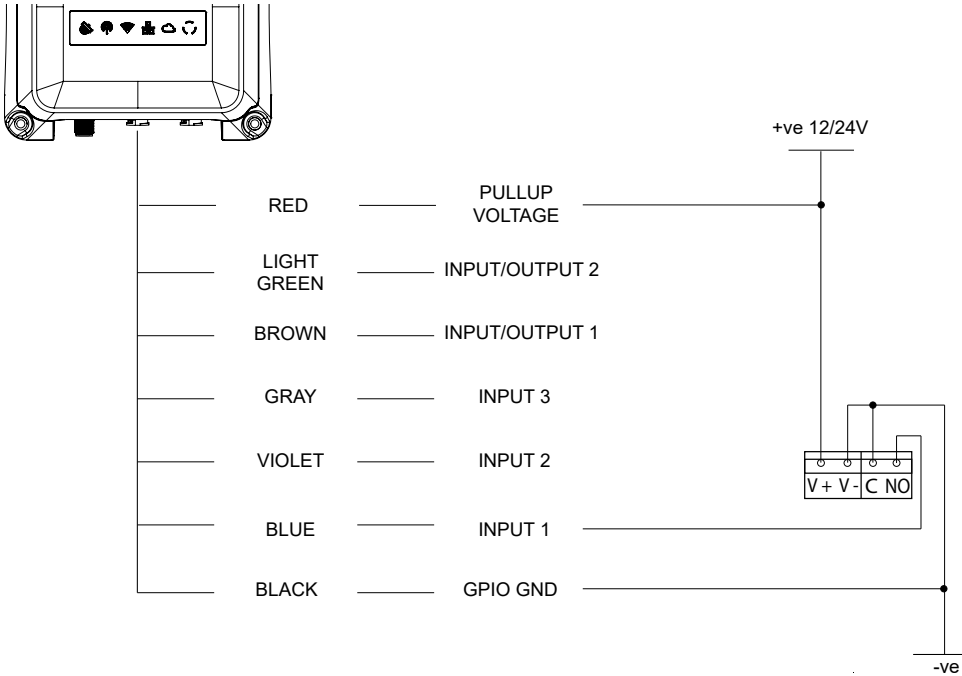| Wire color	Connection
RED	PULLUP VOLTAGE
LIGHT GREEN	INPUT/OUTPUT 2
BROWN	INPUT/OUTPUT 1
GRAY	INPUT 3
VIOLET	INPUT 2
BLUE	INPUT 1
BLACK	GPIO GND

+ve 12/24V

V + V - C NO

-ve

Note - An external Pullup voltage connection is recommended when connecting GPIO sensors to the M1.
When a sensor does not provide more than 2V, the Pullup provides an appropriate high level reference for the M1's input.

Specifications

M1 GENERAL

HUB SIZE	168 x 168 x 58.7mm (6 5/8" x 6 5/8" x 2 5/16")
POWER SUPPLY	9-33V. 12V: 6A max, 500mA nom
WEIGHT	770g (1.7lb)
ENVIRONMENTAL	Waterproof (IPx7)
OPERATING TEMPERATURE	-25°C to +55°C (-13°F to +131°F)
SUPPORTED PROTOCOLS	AIS Class B SOTDMA, VHF Voice, Class D DSC, ATIS (user configurable, EU region) NOAA Weather (US region)
TRANSMITTER FREQUENCY ERROR	Less than 300Hz
ANT CONNECTOR	SO239
SPLITTER	Max input power 25W, Insertion Loss RX 0dB, TX < 2dB
SPLITTER CONNECTOR	BNC

SOTDMA CLASS B AIS

DEDICATED RX CHANNELS	2
FREQUENCY RANGE	156.025 – 162.025 MHz
POWER OUTPUT	5W, 1W (High, Low)
AIS SENSITIVITY (20% PER)	-113 dBm
ADJACENT CHANNEL SELECTIVITY	80 dB
SPURIOUS RESPONSE	70 dB
INTER-MODULATION	67 dB

VHF VOICE

VHF FREQUENCY RANGE TX RX	156.025–161.600 MHz 156.050–163.275 MHz
DEDICATED RX CHANNELS	3
POWER OUTPUT	25W, 1W (High, Low)
REGIONS	USA, CAN, INT
SENSITIVITY (12 DB SINAD)	-116 dBm
ADJACENT CHANNEL SELECTIVITY	80 dB
SPURIOUS RESPONSE	70 dB
INTERMODULATION	70 dB
SPURIOUS EMISSIONS	Less than –80 dBc (at 25 W)
MAX AUDIO OUTPUT POWER	10W, < 1% THD

CLASS D DSC

DEDICATED RX CHANNELS	1
SENSITIVITY (1% BER)	-115 dBm
ADJACENT CHANNEL SELECTIVITY	80 dB
SPURIOUS RESPONSE	70 dB
INTERMODULATION	70 dB

AUDIO

SUPPORTED FUNCTIONS	VHF RX, Alarms
AMPLIFIER	10W Class D, THD < 1%
SPEAKER	4 ohm

M1 NETWORKING

NMEA 2000 GATEWAY	1 x Isolated Micro-C male port, AIS, GPS & MOB PGN output, Gateway Translations to/from NMEA 0183
NMEA 0183	1 x Isolated NMEA 0183 port, AIS and GPS sentences, Gateway Translations to/from NMEA 2000, 4800 / 38400 baud
WIRELESS	Access Point for up to 10 devices, 2.4GHz, 802.11b/g/n, Integrated Antenna, SMA-RP external antenna port (optional)
WIRELESS SECURITY	WPA2 Personal
CLOUD CONNECTIVITY	LTE-Cat1 with 3G fallback (USA, Canada), 3G (EU, Asia), Integrated SIM, Integrated Antenna, SMA-RP external antenna port.
CONTROL OUTPUTS	2 Outputs, Low side driven (max 200mA)

M1 GNSS

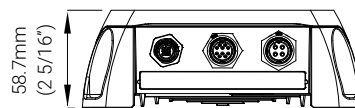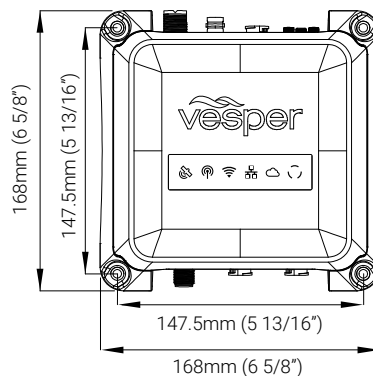|	
SENSITIVITY	-167dBm
CONSTELLATIONS	GPS, GLONASS, Bei Dou, Galileo
CHANNELS	72
DIFFERENTIAL SUPPORT	SBAS, WAAS, EGNOS
NAVIGATION RATE	10Hz
CONNECTOR	SMA
CERTIFICATIONS	IEC 61108
FEATURES	Anti-jamming, Anti-spoofing

Dimensions

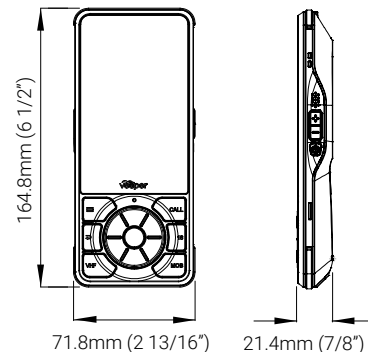| M1 SENSORS	
HEADING	9-Axial, Internal use only, Accuracy: +/- 1 deg, Update rate: 10Hz (max)
BAROMETER	Update rate 1Hz max (averaged)
BATTERY VOLTAGE	Measured at power input
EXTERNAL SENSORS INPUTS	5 Inputs, Digital (0-24V)

H1 AND H1P HANDSET SPECIFICATIONS	
HANDSET SIZE	164.8 x 71.8 x 21.4mm (6 1/2" x 2 13/16" x 7/8")
POWER SUPPLY	12V, 1A max, 200mA nom 12/24V DC compatible
BATTERY	Lithium Polymer 2 hour full charge, >10 hours operation
WEIGHT	H1 285g (0.63lb), H1P 235g (0.52lb)
ENVIRONMENTAL	Waterproof (IPX8)
OPERATING TEMP	-25°C to +55°C (-13°F to +131°F)
AUDIO	3W Class D amplifier, THD < 5% @ 85dBA

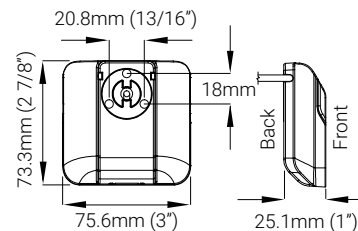| H1 AND H1P HANDSET DISPLAY	
SCREEN	LCD TFT Si, 640 x 800, 24bit color
TOUCH	Capacitive, optically bonded, LCD, glove and salt water operable
BACKLIGHT	600 cd/m2, Ambient Light sensor for auto dimming

M1

147.5mm (5 13/16")
168mm (6 5/8")
147.5mm (5 13/16")
168mm (6 5/8")
58.7mm (2 5/16")

H1 / H1P Handset

164.8mm (6 1/2")
71.8mm (2 13/16")
21.4mm (7/8")

H1 and H1P Cradle

20.8mm (13/16")
18mm
73.3mm (2 7/8")
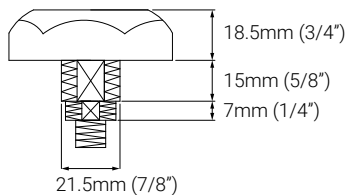75.6mm (3")
25.1mm (1")
Back
Front

All stated specifications are subject to change without notice or obligation.
Dimensional measurements based on metric.

Dimensions

External GPS Antenna

Side
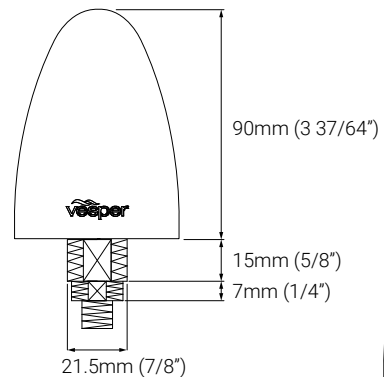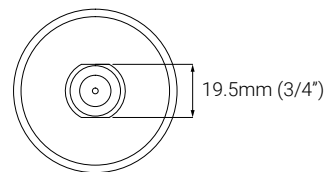
18.5mm (3/4″)
15mm (5/8″)
7mm (1/4″)

21.5mm (7/8″)

Bottom

19.5mm (3/4″)

Diameter

Ø60mm (2 3/8″)

Ø42mm (1 5/8″)

External Cellular Antenna

Side

90mm (3 37/64″)

vesper

15mm (5/8″)
7mm (1/4″)

21.5mm (7/8″)

Bottom

19.5mm (3/4″)

Diameter

Ø60mm (2 3/8″)

Ø42mm (1 5/8″)

All stated specifications are subject to change without notice or obligation.
Dimensional measurements based on metric.

LED icon troubleshooting
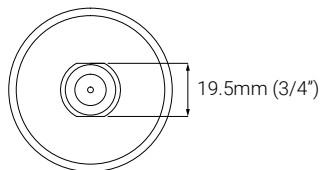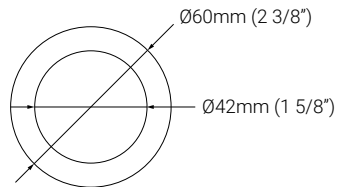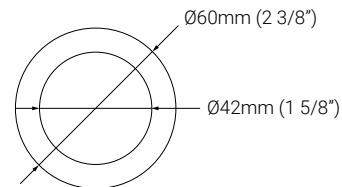
FUNCTION	COLOR	STATE	DESCRIPTION
GPS	Orange	Solid	Acquiring a GPS fix.
GPS	Green	Solid	Flashes green momentarily when a fix is acquired; returns to solid after a few seconds.
GPS	Red	Solid	GPS Antenna short detected. It may also indicate a GPS system error, contact Vesper marine technical support if this state persists.

FUNCTION	COLOR	STATE	DESCRIPTION
VHF	Orange	Solid	**Initializing** Before the M1 can transmit it requires 1 minute to initialize.
			MMSI not programmed A valid MMSI must be programmed before you may transmit your position. (see **To program your MMSI number** section)
			Stealth mode Stealth mode is on.
			Last position report not sent This may happen from time to time in very busy areas with lots of AIS traffic. This is normal behaviour for a Class B AIS device.
VHF	Orange	Flashing	AUX VHF is transmitting.
VHF	Green	Solid	Normal AIS + VHF Operation.
VHF	Red	Solid	A VHF/DSC/AIS System Check has failed. Contact Vesper Marine technical support.
VHF	Red	Flashing	Antenna short circuit or open circuit detected - may also indicate a high VSWR.

LED icon troubleshooting

FUNCTION	COLOR	STATE	DESCRIPTION
WiFi	Orange	Solid	WiFi ready and waiting for connections.
WiFi	Green	Solid	At least one device is attempting to join or has joined the network.
WiFi	Red	Solid	WiFi not operational. Contact Vesper Marine technical support.

FUNCTION	COLOR	STATE	DESCRIPTION
NMEA 2000	Orange	Solid	NMEA 2000 bus network is not connected or not powered on.
NMEA 2000	Green	Solid	NMEA bus connected and exchanging information with the M1.
NMEA 2000	Red	Solid	NMEA 2000 bus error detected. Check the integrity of the NMEA network cable and terminating resistors.

FUNCTION	COLOR	STATE	DESCRIPTION
Cloud	Orange	Solid	Attempting to connect or connected to a cellular network.
Cloud	Orange	Flashing	Flashes when attempting to connect to the Vesper Cloud.
Cloud	Green	Solid	Connected to the Vesper Cloud. Note - on the Lite plan it will only connect every 12 hours for 10 minutes.
Cloud	Red	Solid	An unexpected Vesper Cloud connection error has occurred. Contact Vesper Marine technical support if this state persists.

Warnings

The Cortex AIS Transponder works in conjunction with other vessels and systems such as other AIS transponders and GPS devices. The accuracy of this device and the AIS system can be affected by many factors, including equipment failure or defects, environmental conditions and incorrect installation, handling or use. Vesper Marine does not warrant that this product is error-free. It is the user's responsibility to exercise common prudence and navigational judgement. This device should not be relied upon as a substitute for such prudence and judgement. Always maintain a permanent watch so that you can respond to situations as they develop. The prudent mariner will not rely on a single aid to navigation. The user should verify that the information obtained from this AIS Transponder is in accordance with expected situations and conditions. The information is not guaranteed to be accurate or reliable and this AIS Transponder is not a substitute for proper seamanship. Vesper Marine Limited cannot be held liable for any injury, damage or loss, caused by, during, or because of the installation, use or inability to use this device. This AIS Transponder is to be installed and used entirely at your own risk. By installing and/or using this AIS Transponder you fully accept this risk and agree to hold Vesper Marine Limited harmless. If you do not agree to accept all risk, return this product unused in its original factory condition to your dealer for a full refund.

Intended Use
This product is intended to be used on leisure or commercial vessels (excluding IMO/SOLAS class). Vesper Marine has designed and manufactured this product to be used only aboard vessels.

Warranty Void
Do not disassemble the unit or remove the screws which hold it together. The unit is sealed and disassembly will void the warranty.

FCC Warning
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Warning

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Warnings

This device complies with RSS-310 of Industry Canada. Operation is subject to the condition that this device does not cause harmful interference.
To satisfy RF exposure requirements for mobile transmitting devices, a separation distance of 2 metre or more should be maintained between the antenna of this device and persons during device operation. To ensure compliance, operations at closer than this distance is not recommended.
The antenna used for this transmitter must not be co-located in conjunction with any other antenna or transmitter.
This device has been designed to operate with an antenna having a maximum gain of 3dBi. Antennas having a gain greater than 3dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.
To reduce potential radio interference to other users, the antenna type and its gain should be chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication.

Pour satisfaire aux exigences d'exposition aux frequencies radio pour les appareils mobiles de transmission, une distance de 2 mètre ou plus doit être maintenue entre l'antenne de ce dispositif et les personnes pendant son fonctionnement. Pour assurer la sécurité, les opérations plus près de cette distance ne sont pas recommandées.
L'antenne utilisée pour ce transmetteur ne doit pas être co-localisés avec toute autre antenne ou transmetteur.
Ce dispositif a été conçu pour fonctionner avec une antenne ayant un gain maximalde 3dBi. Les antennes ayant un gain supérieur à 3dBi sont strictement interdits pour une utilisation avec cet appareil. L'impédance d'antenne requise est de 50 ohms.
Pour réduire le risque d'interférence aux autres utilisateurs, le type d'antenne et son gain doivent être choisis pour que la puissance isotrope rayonnée équivalente (PIRE) ne soit pas supérieure à celle requise pour une communication réussie.

CAUTION - This device generates and radiates electromagnetic energy. This device must be installed and operated according to the instructions contained in this manual. Failure to do so may result in product malfunction and / or exposure to potentially harmful levels of radio frequency radiation. Changes or modifications to the unit not expressly approved by Vesper Marine Ltd will void the user's authority to operate this equipment.

CAUTION - The system has a Maximum Permissible Exposure (MPE) radius of 2m from the antenna. This has been determined assuming the maximum power of the transmitter and using a standard half-wave monopole VHF antenna with a maximum gain of 3dBi and termination impedance of 50 ohms.

Warnings

When installing the antenna and operating the equipment consider the following:

  The antenna should be mounted as high above deck as possible.

  Higher gain VHF antennas will require a larger MPE radius.

  Do not operate the unit when anyone is within the MPE radius of the antenna.

  The antenna should not be collocated or operated in conjunction with any other transmitting antenna.

MMSI Programming Warning

IMPORTANT: In most countries the operation of a VHF unit may require the possession of a current VHF radiotelephone license which lists the AIS system and the vessel Call Sign and MMSI number.

An MMSI number is required in order for this device to operate DSC or as an AIS transmitter. Please contact the relevant authority in your country for more information.

For Customers in the USA

This device must be programmed with data corresponding to the vessel on which it will be installed. Programming must be carried out by a Vesper Marine dealer. The included instructions contain information on how to verify the correct programming.

WARNING: It is a violation of the rules of the Federal Communications Commission to input an MMSI that has not been properly assigned to the end user, or to otherwise input any inaccurate data in this device.

Electronic Waste Recycling
Various regional and national regulations exist regarding the recycling of certain electronics.
Please consult your local authorities or contact Vesper Marine for recycling information.

Warranty

Your Vesper Marine product is warranted, when properly installed and used, to be free from defects in materials or workmanship for two years from the date the product was purchased by the first retail customer. This warranty applies to the original retail purchaser only and is not transferable. This warranty only applies to products purchased from Vesper Marine or from an authorized Vesper Marine reseller. Within this period, Vesper Marine will, at its discretion, repair or replace any components which fail in normal use. Repairs or replacement will be made at no charge for parts or labor, provided that the customer shall be responsible for any transportation costs. This warranty does not cover failures due to abuse, misuse, accident, improper installation, unauthorized alterations or repairs, shipping damage, wear and tear, or corrosion.

This warranty does not cover defects or damage caused if the product's external housing has been opened, the serial number or other labels have been removed or altered, or the specified input voltage has been exceeded. This warranty does not cover defects or damage caused if the product has been operated with an incompatible GPS antenna or without a suitable VHF antenna, or with an incompatible antenna splitter, where applicable to the product.

Vesper Marine retains the exclusive right to repair or replace the unit at its sole discretion. In the event Vesper Marine chooses to replace the unit it may be replaced with a factory reconditioned unit or a new unit at its sole discretion. Where a replacement is provided the original product becomes the property of Vesper Marine and the warranty will remain from the original purchase date.

THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING ANY LIABILITY ARISING UNDER ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, STATUTORY OR OTHERWISE. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, WHICH MAY VARY FROM STATE TO STATE.

IN NO EVENT SHALL VESPER MARINE BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE OR INABILITY TO USE THE PRODUCT OR FROM DEFECTS IN THE PRODUCT. SOME STATES DO NOT ALLOW THE EXCLUSION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.

Vesper Marine retains the exclusive right to repair or replace the product or offer a full refund of the purchase price at its sole discretion. SUCH REMEDY SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY.

*These warranty terms and conditions are provided as a summary and the specific terms and conditions of your warranty may vary by region. Please see www.vespermarine.com/warranty for details of the warranty terms and conditions specific to your region.

Vesper Marine declares that this product is in compliance with Directive 2014/53/EU.

The full text of the EU Declaration of Conformity is available at the following internet address: www.vespermarine.com/compliance

This product is for use worldwide, including the following countries:

AT	BE	BG	CH	CY	CZ	DE	DK	EE	ES
FI	FR	GR	HU	IE	IS	IT	LT	LU	LV
MT	NO	NL	PL	PT	RO	SE	SI	SK	UK

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