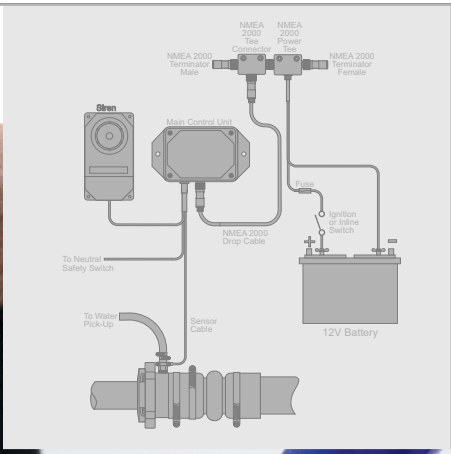


SmartSeal[®]

Temperature Sensor System

Installation Manual



TIDESMARINE

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Introduction

This manual will describe how the SmartSeal system works, what the various system components are and how to install them.

System Overview

The SmartSeal Temperature Sensor System is designed to compliment Tides Marine's SureSeal Shaft Seal Systems on vessels with single or twin engines. Its purpose is to detect and warn of various vessel conditions which could potentially lead to shaft seal damage or failure. It is compatible with vessels which utilize the NMEA 2000 communication protocol for connecting marine electronics, sensors and display units to a backbone network for centralized monitoring of various types of vessel information. It is also designed to operate on non-NMEA 2000 equipped vessels as well on vessels with certain other networks via a converter (e.g. NMEA 01830).

Functional Overview

The SmartSeal System is comprised of a number of components designed to work with a wide range of vessel types and installation needs. At the heart of the system is a Main Control Unit which is located in the engine compartment. Connected to this unit are temperature sensors for each shaft seal in use. Remote Monitoring Units can be connected and placed in other areas of the vessel as can a remote external siren. In operation, temperature status data is displayed on both the Main and Remote unit's control panels. When connected to a vessel's NMEA 2000 onboard network, temperature data is also sent to the main or auxiliary computer display. In the event that the temperature of the shaft seal(s) or the engine compartment exceeds the normal operating range limit, visible and audible alerts are initiated so that corrective action can be taken.

Installation Overview

This manual describes the installation procedures for the various Smart Seal system components. There are many different types of installations possible. Six system configurations are illustrated and should be reviewed prior to beginning.

System Components / Features:

Main Control Unit

*Main Control Unit,
Bulkhead Mount
Twin Engine
P/N TPS-BH-TE*

Ambient Temp. Sensor

Temp. Status Indicators

Alarm/Siren Control

Onboard Alarm Speaker

STBD. Side Harness Connector

Remote Unit / NMEA 2000 Connector

PORT Side Harness Connector

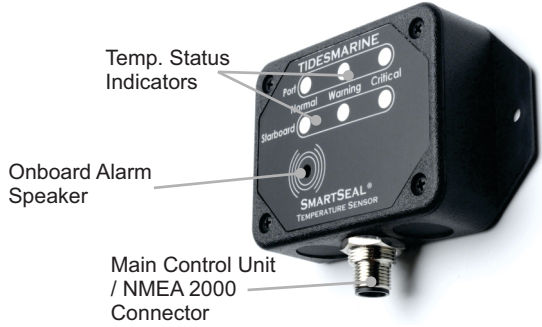
*Main Control Unit,
Bulkhead Mount
Single Engine
P/N TPS-BH-SE*

External Siren

Siren
P/N SP-SS-SIREN

Remote Monitoring Unit

*Remote Unit,
Bulkhead Mount
Twin Engine
P/N TPS-RDBH*



Temp. Status Indicators

Onboard Alarm Speaker

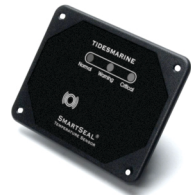
Main Control Unit / NMEA 2000 Connector



*Remote Monitoring Unit,
Bulkhead Mount
Single Engine
P/N TPS-RSBH*



*Remote Monitoring Unit,
Panel Mount
Twin Engine
P/N TPS-RDPN*



*Remote Unit Monitoring,
Panel Mount
Single Engine
P/N TPS-RSPN*

SmartSeal Cabling



*Harness- (Sensor,
Siren, NSS)
Length 10M
P/N TPS-SC*



*Sensor Cable
Extension,
Length 10M
P/N TPS-SCE*

System Components:

Network Hardware

N2K Drop Cable,
Length 10M
P/N TPS-DC-10M



N2K Drop Cable,
Length 1M
P/N TPS-DC-1M



N2K Power Tee
P/N TPS-PC



N2K Tee Connector
P/N TPS-T-CONN



N2K Terminator, Male
P/N TPS-TERM-MALE



N2K Terminator, Female
P/N TPS-TERM-FEMALE

Installation

The following outlines the recommended installation procedure for the SmartSeal system.

Step One: Installing the Main Control Unit

The Main Control Unit (MCU) is to be located in the engine compartment mounted on a bulkhead / vertical surface where the front panel is both visually and physically accessible. Placement should also allow for the most direct routing of wires/cables.

The unit has two types of connectors on the bottom of its enclosure. The first is used to connect the SmartSeal wiring harness for connecting the shaft seal sensor(s), neutral safety switch (non NMEA vessels) and optional remote siren. The second is used for connecting the Remote Monitoring Unit (RMU) and 12VDC power source or to connect to an existing NMEA 2000 network.

Using the mounting flanges on the enclosure, the unit should be leveled and affixed with SS pan head screws. A full size template is included for hole placement.



Cable / Harness Connectors



Mounted MCU

Step Two: Smart Seal Harness- Connecting the Temperature Sensor(s)

The shaft seal temperature sensor is pre-attached to the black SmartSeal harness cable. It needs to be connected to the water injection fitting on the SureSeal being used. Connect the harness connector to the MCU then route the sensor cable to the shaft seal. Twin engine systems have two harnesses included, one for each SureSeal.

To connect the sensor to the injection fitting, remove one of the clamp screws (philips head screw driver and 5/16 wrench required) and open the clamp. Reassemble the sensor clamp around the shoulder of the fitting just below the water pick-up hose attached to the fitting. Tighten fully and check that the sensor is secure. Dress the cable(s) back to the MCU to avoid snagging/accidental damage. Screw-mount zip ties are recommended for wire management. If additional wire is needed, a 10M extension cable is available. Excess wire should be bundled and secured. Sensor cables *CANNOT BE SHORTENED*.



Temperature Sensor



*Attaching Sensor to fitting
(water hose removed for photo)*



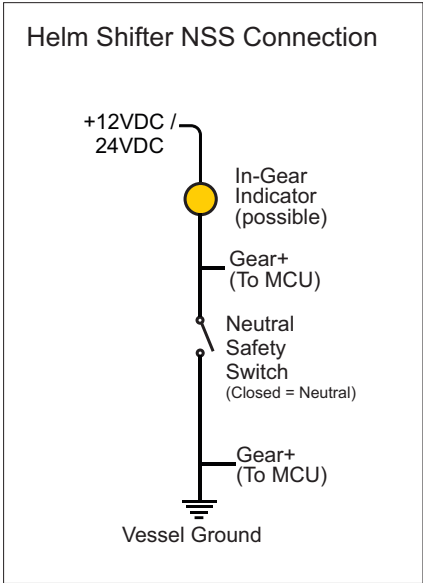
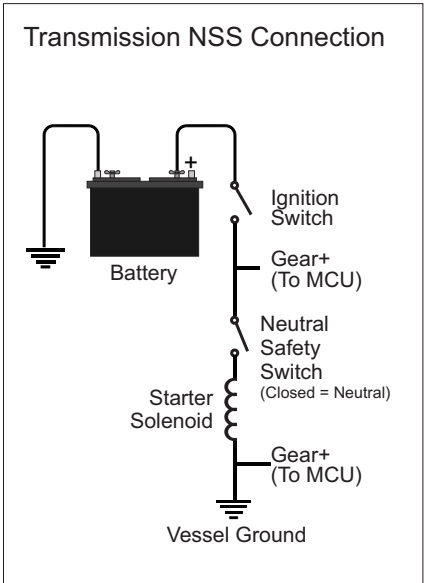
Finished connection

Step Three: Connecting The Neutral Safety Switch

(For Non- NMEA 2000 Vessels)

An In-Gear connection is required on vessels not equipped with a NMEA 2000 network. For a twin engine vessel, both in-gear connections must be made, one for each transmission. Typically, the connection is made using the Neutral Safety Switch (NSS) installed in the transmission but, if necessary, the connection can also be made at the helm shifter control. See following diagrams for both types of connections.

The grey harness cable is used for the NSS. Connect the white wire to the NSS switch + and the brown wire to the NSS - terminal. Route and dress the NSS cable to the MCU. NSS cables can be shortened as necessary. Unused NSS cables (NMEA 2000 applications) can be cut but should be properly capped and not left exposed.



Step Four: Connecting The External Siren (Optional)

The Siren is a recommended accessory due to typically noisy engine rooms. Several different types of sounds can be selected depending on how the unit is wired. The brown harness cable is for the external siren. Connect the *brown (+)* wire to the siren terminal marked 12V and the *white (-)* wire to the sound terminal of your choice. Mount the siren to a surface where it will not be exposed to moisture as they are not waterproof. Route and dress the siren cable to the MCU. Siren cables can be shortened as necessary. Unused siren cables (twin engine installations use only one siren) can be cut but should be properly capped and not left exposed.



Step Five: Connecting Remote Monitoring Unit(s)

The Remote Monitoring Units (RMU) are display extensions of the Main Control Unit. On larger vessels, one or more RMUs are typically installed in locations where they can be easily monitored.

Two mounting configurations are offered: Surface / Bulkhead mount (identical to the Main Control Unit), and a panel mount design for installing into Consoles or Helm Stations. A full size template is included for panel mounting. Panel mount units have an integral gasket on the underside of the flange to seal against moisture ingress in wet locations. Both configurations are IP 66 Rated.

Surface mount remote units have their connector on the bottom like the MCU and Panel mount versions have their connector on the back.



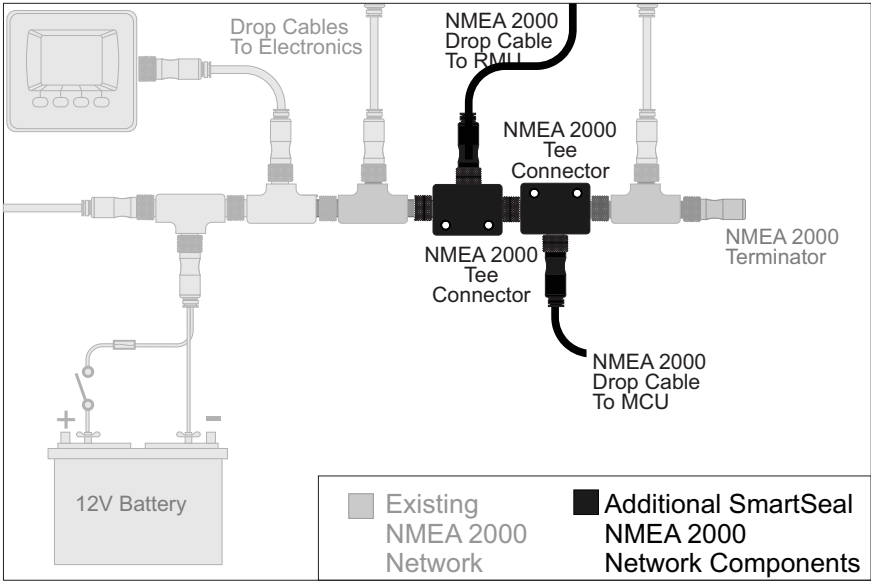
NOTE*

This part of the installation involves connecting to an existing NMEA 2000 network or (in the absence of a NMEA 2000 network), creating a private SmartSeal system network. If not familiar with these types of networks please read the Fundamental Network Tips pp.xx before beginning.

For NMEA 2000 Installations:

Locate the point of the NMEA 2000 network where tie in will be easiest. Ideally this will be centrally located and relatively close to the 12V power source connection. If there are unused/ terminated tee connectors available, run drop cables from them to the MCU and RMU units. If there are no unused connections available, you must add them by inserting tees to the existing network as follows:

Connect two N2K tee connectors together using the mating side legs. Insert this tee assembly into the backbone run such that both remaining side connectors are connected to their mating counterparts of the existing network. Use the two new tee connections to connect the MCU and RMU(s).

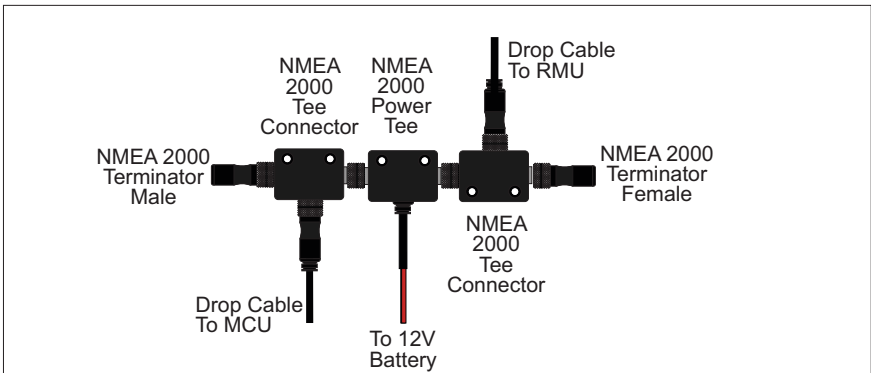


For Non-NMEA Installations:

Plan the mounting location for the RMU so that it can be connected to the MCU directly using network drop cable(s). Tides offers several cable length options. (10M, 4M, 2M, 1M plus bulk wire)

Connect a N2K tee connector to each side of a Power Tee. Add both Male and Female terminators to the remaining two side legs.

Connect the drop cable from the RMU to one of the N2K connectors. Connect the Drop Cable from the MCU to the other N2K connector. The Power Tee cable is used to connect to the 12VDC power supply.

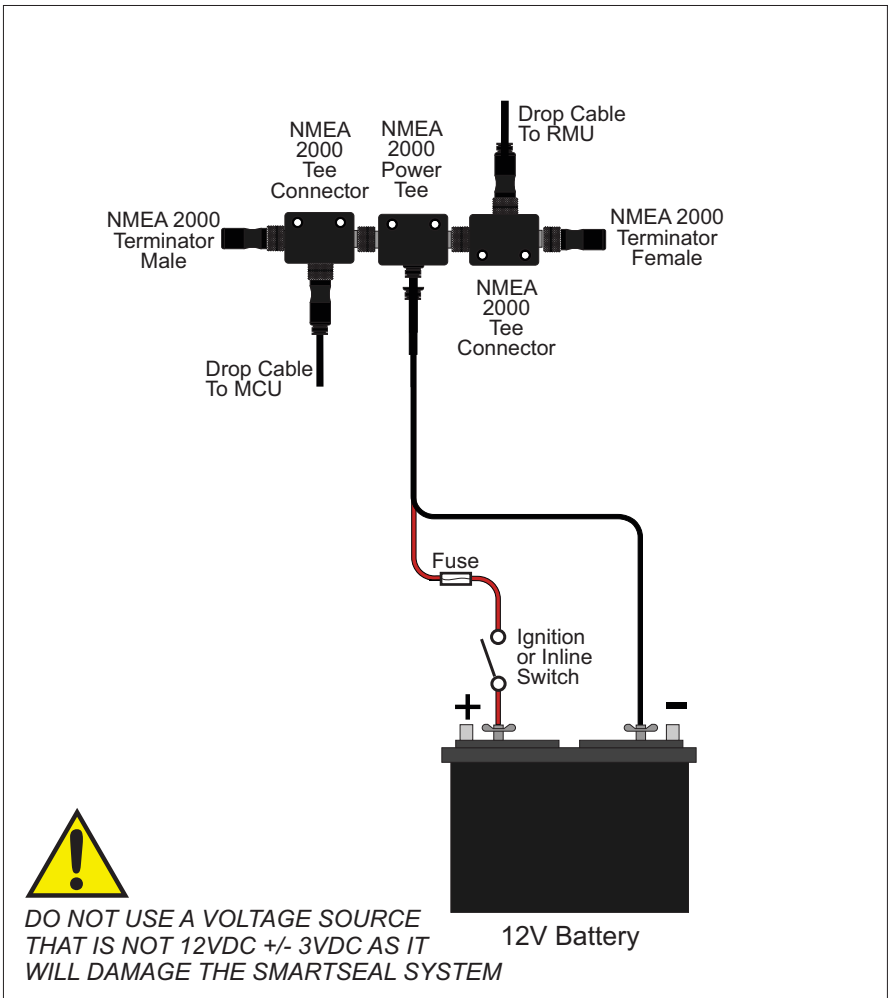


Step Six: Connecting To Power

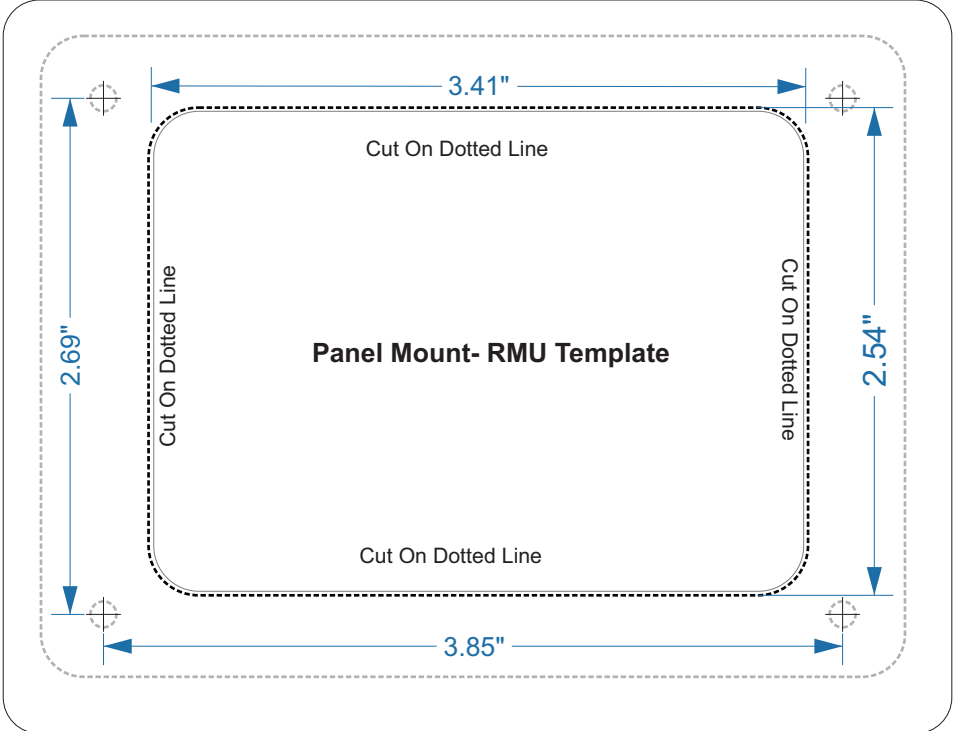
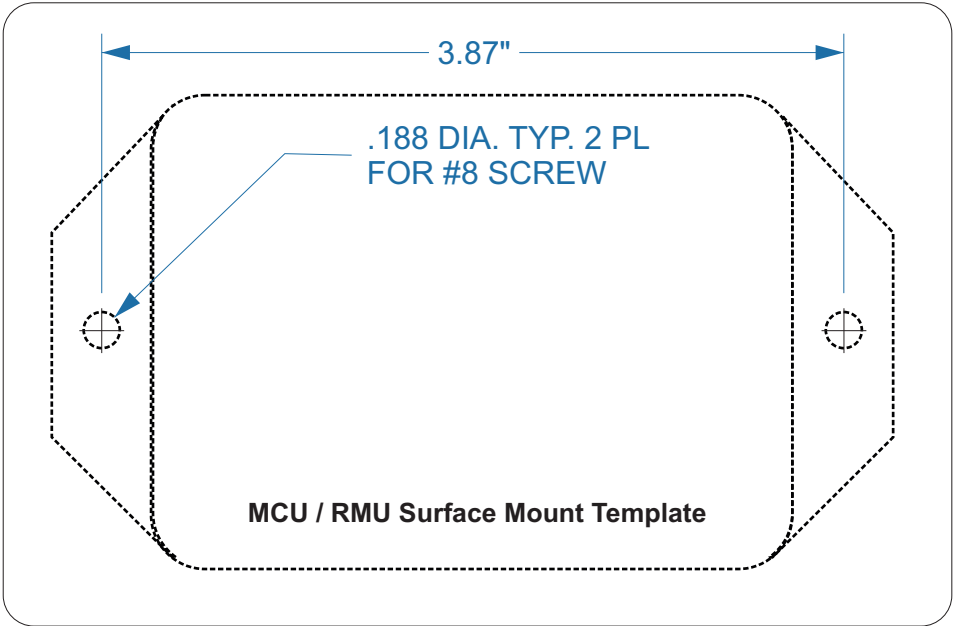
(For Non-NMEA 2000 Vessels)

SmartSeal Systems which are connected to NMEA 2000 networks, do not need to be separately connected to the power source as the network is already connected and provides the necessary operating power

Connect the Power Tee cable to a 12VDC Battery as shown below. Make sure the + wire is fused.

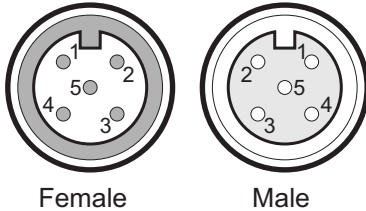


Mounting / Cutout Templates



NMEA 2000

Connector Pin-Outs



- Pin 1:** Shield
- Pin 2:** NET-S. (Power Supply +)
- Pin 3:** NET-C. (Power Supply -)
- Pin 4:** NET-H. (CAN-H)
- Pin 5:** NET-L. (CAN-L)

NMEA Network Fundamentals / Tips

NMEA 2000 plug-and-play components make it easier than ever to integrate marine electronics, allowing you to view, control and share functions and information across a network of displays. Yet there are some do's and don'ts that ensure that your NMEA 2000 cable and connections function properly. Here are six Network Fundamentals tips: *(courtesy of Garmin)*

1 Power Up the Network

Remember that an NMEA 2000 network requires 12-volt DC power. Special connectors with positive and ground wires (with inline fuses for the positive wire) let you supply onboard power to the so-called backbone – the main communication channel for the system. These power cables should be connected near the center of the backbone in order for the system to function properly.

2 Use 12 Volts DC Only

Make sure any power source you choose is 12 volts DC; do not connect your NMEA 2000 network to any other power source such as 24 volts DC.

3 Avoid Long Strings of T-Connectors

As you add NMEA 2000-compatible electronics and sensors to the backbone, there's a tendency to string a number of T-connectors while tying into the system. This is a mistake, as a long series of T-connectors is prone to damage and broken connections. Replace these long strings with T-junctions – two to four unified T-connectors. These are more robust and compact; a four-way T-junction is 25 percent shorter than a string of four connectors.

4 Keep Drop Cables Short

Avoid using long drop cables (the cables that connect your electronics to the backbone). NMEA 2000 signals can be hampered by resistance, which causes a reduction in voltage. The maximum length for a single drop cable is 20 feet. If you require a longer cable run to connect an item such as a transducer or sea-surface temperature sensor, use a T-junction to either at the end or the middle of the run to tie in 12-volt power. Augmenting the power in this manner helps prevent an excessive drop in voltage.

5 Use the Sides of T-Connectors to Build a Backbone

By using only the sides of the T-connectors to assemble an NMEA 2000 backbone, you create a linear format. Also, use only the top of the T-connector to attach devices and sensors.

6 Don't Forget the Terminators

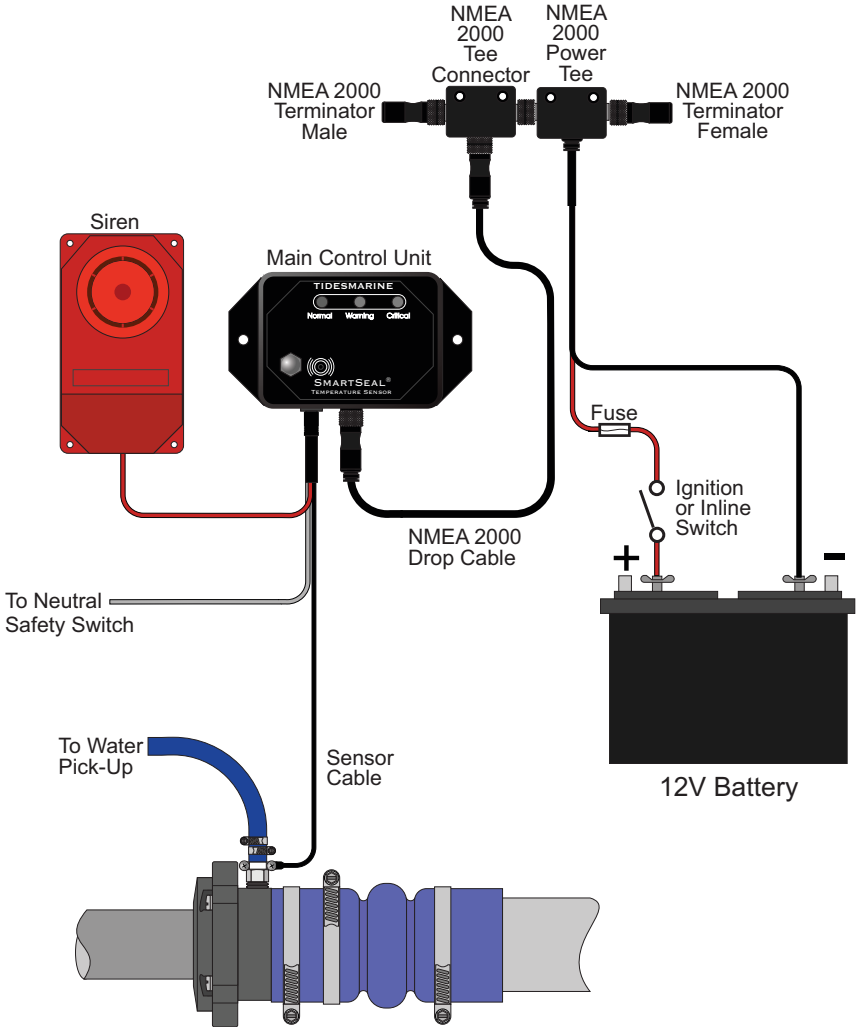
An NMEA 2000 backbone requires terminators at each end. You need to use one female terminator and one male terminator at opposite ends of your NMEA 2000 linear backbone.

Schematic System Diagram 1

Single Engine Vessel, Without Remote

NOTE*

Tee connectors may be connected directly to each other or with Drop Cables depending on installation.

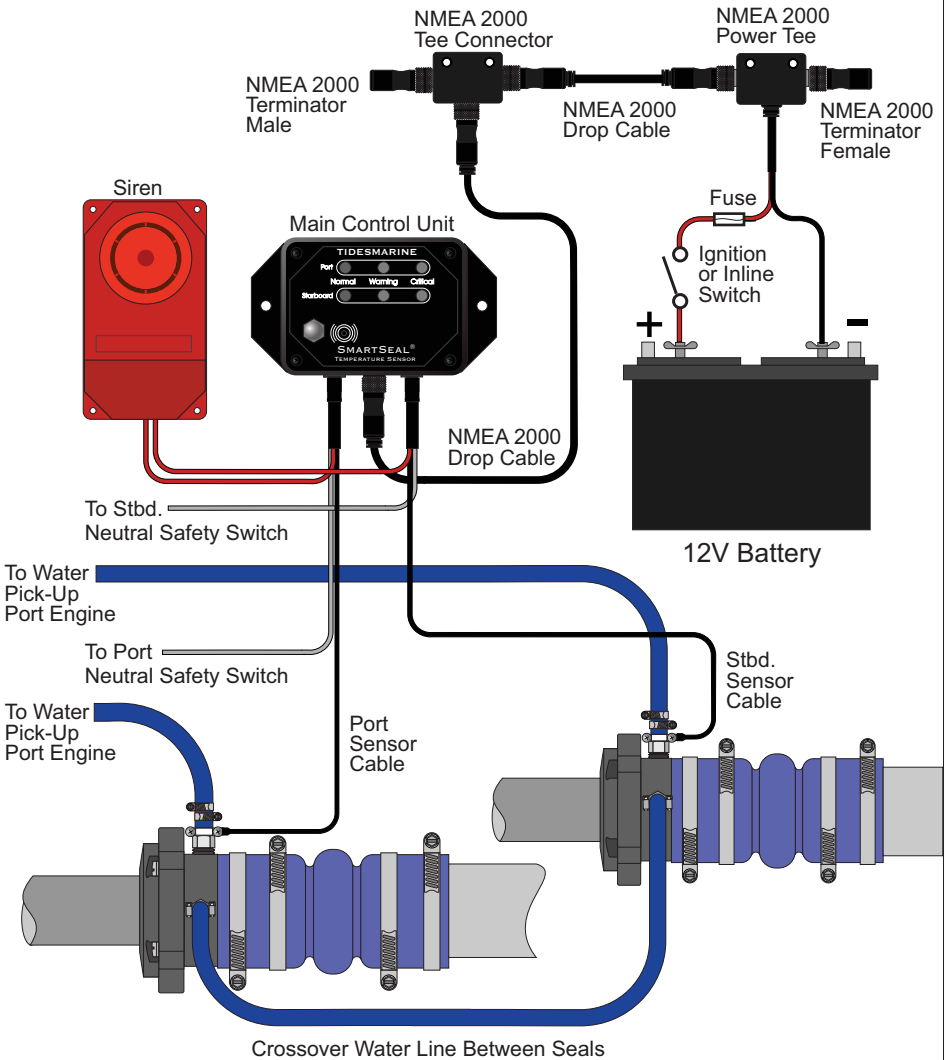


Schematic System Diagram 2

Twin Engine Vessel, Without Remote

NOTE*

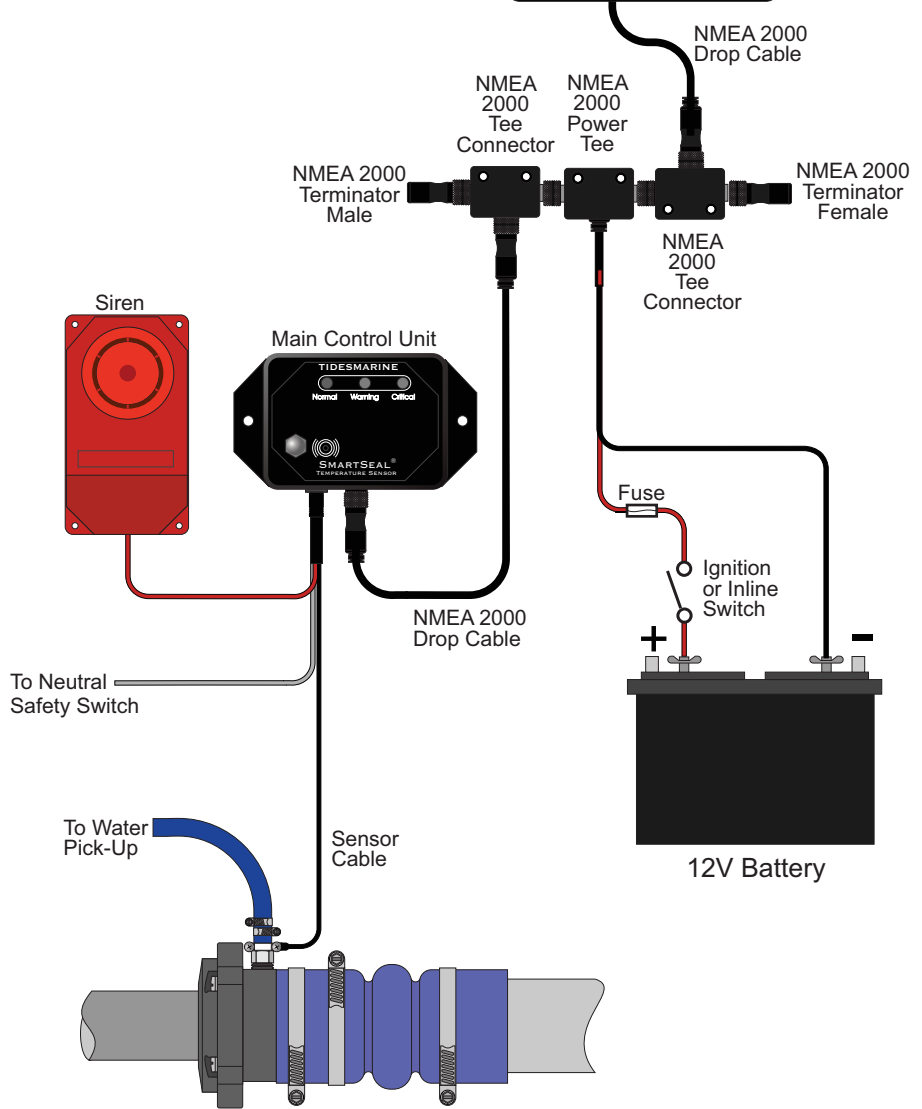
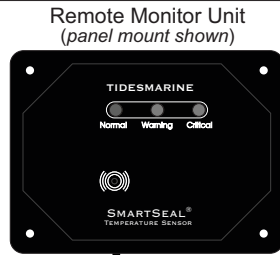
Tee connectors may be connected directly to each other or with Drop Cables depending on installation.



Schematic System Diagram 3

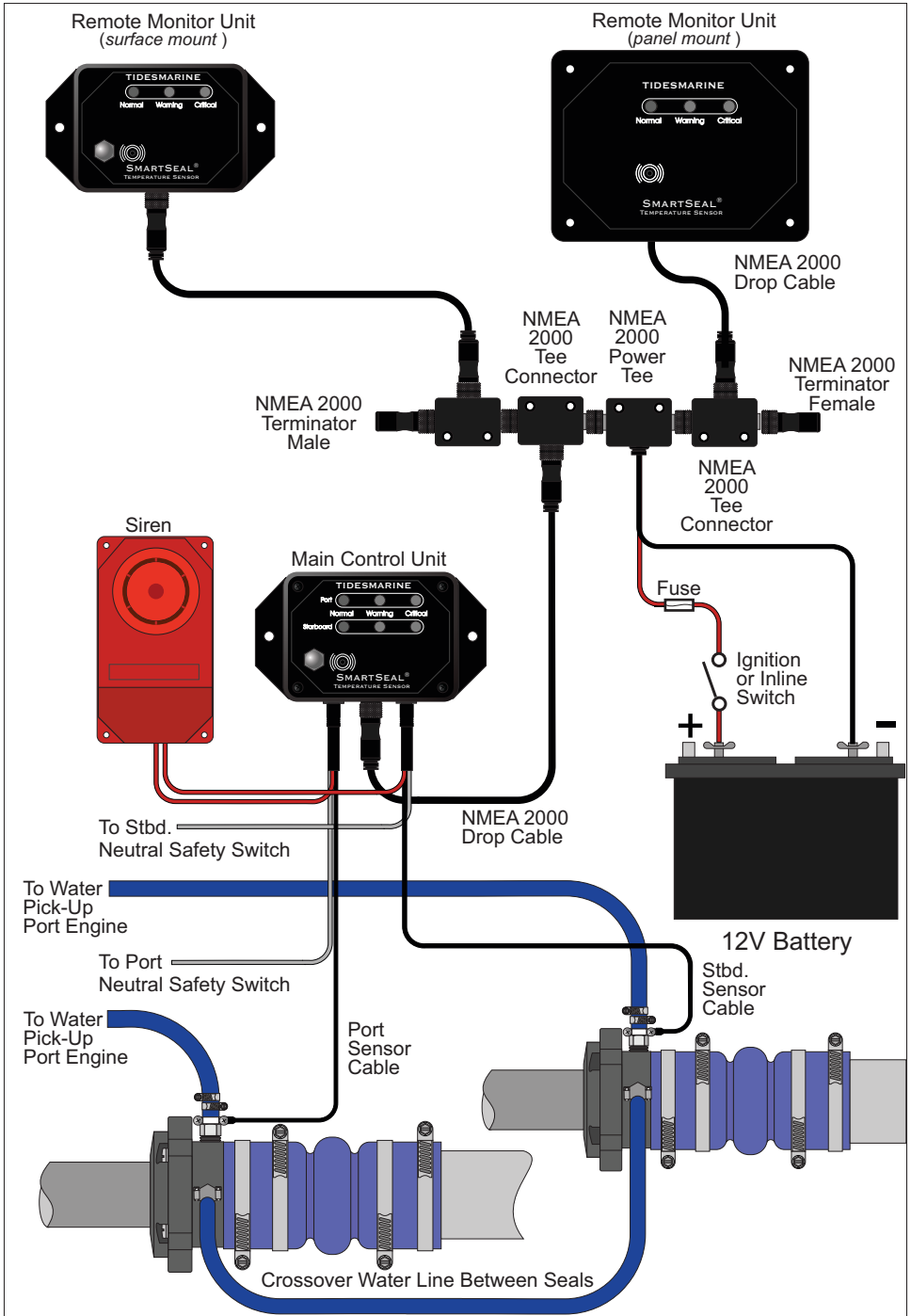
Single Engine Vessel, With Remote

*NOTE**
Additional Remote Units may be added to the system through the use of additional Tees



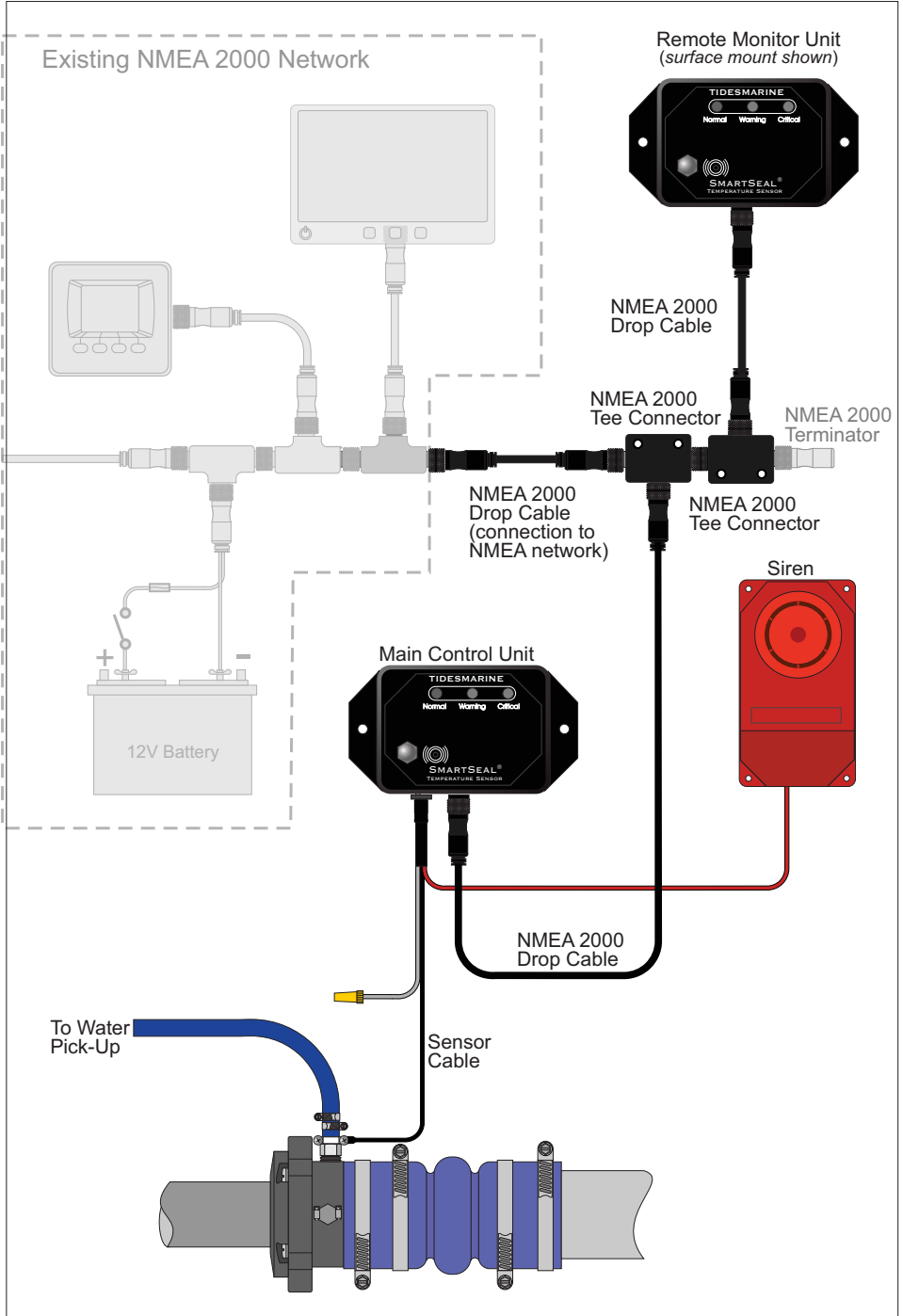
Schematic System Diagram 4

Twin Engine Vessel, With 2 Remotes



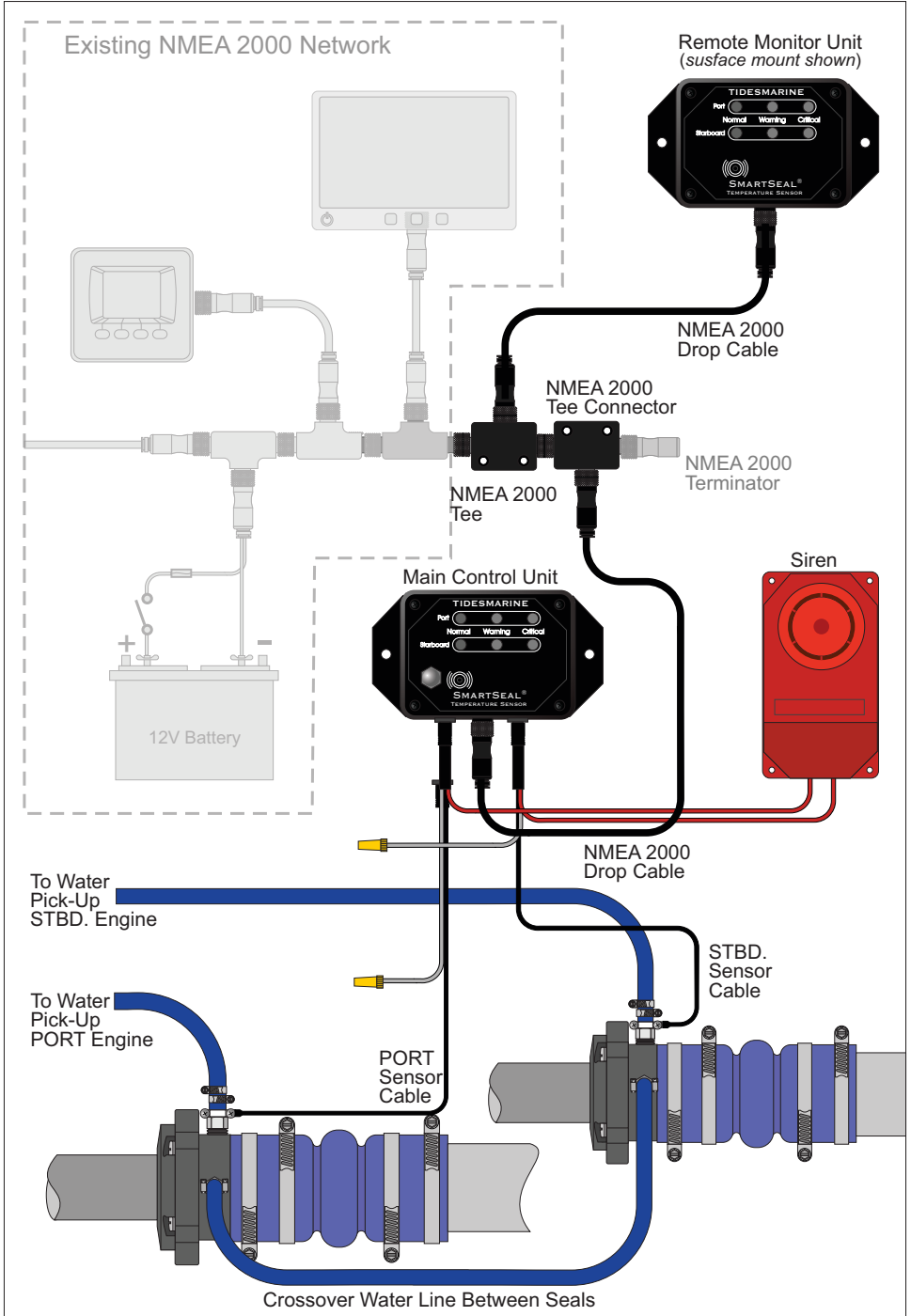
Schematic System Diagram 5

NMEA 2000 Network Equipped, Single Engine Vessel, With Remote



Schematic System Diagram 6

NMEA 2000 Network Equipped, Twin Engine Vessel, With Remote



Specifications

Electrical

Parameter	Value	Comment
Operating Voltage	12VDC +/- 3VDC	
Power Consumption	< 100 mA	NMEA 2000 Interface (Main and Remote)
Load Equivalence Number (LEN)	2	NMEA 2000 Specification. (1LEN = 50 mA)
Reverse Battery Protection	Yes	Indefinitely

Mechanical

Parameter	Unit	Value	Comment
Size	Main	4.38" x 2.47" x 1.56"	With Flanges & Engine Room Sensor
	Remote - Bulkhead	4.38" x 2.47" x 1.11"	With Flanges
	Remote - Panel	4.50" x 3.33" x 1.11"	Including Panel Front Cover
Weight	Main	3.8 oz.	
	Remote - Bulkhead	3.2 oz.	
	Remote - Panel	3.6 oz.	

Environmental

Parameter	Value
IEC 60945 Classification	Exposed
Degree Of Protection	IP66+ (Waterproof for Heavy Spray and Brief Submersion)
Operating Temperature	-20°C (-4°F) To 70°C (158°F)
Storage Temperature	-40°C (-40°F) To 85°C (185°F)

Regulatory

Parameter	Value
NMEA2000®	Certification
FCC/ISED Canada	Class A Conducted and Radiated Emissions
CE Mark	EMC Directive 2014/30/EU
Compass Safe Distance	EN 60945-2002, Section 11.2
RoHS (Restriction of Hazardous Substances)	Directive 2002/95/EC

NMEA 2000 Parameter Group Numbers (PGNs)

Parameter	PGN #	PGN Name	Default Rate
Periodic Data PGNs	130312	Temperature	Once Per Second
	130316	Extended Temperature	Once Per Second
Response To Requested	126464	PGN List (Transmit and Receive)	N/A
	126996	Product Information	N/A
	126998	Configuration Information	N/A
Protocol PGNs	059392	ISO Acknowledgement	N/A
	059904	ISO Request	N/A
	060928	ISO Address Claim	N/A
	065240	ISO Address Command	N/A
	126208	Request Group Function	N/A
	126993	Heartbeat	Once Per Minute

Specifications

NMEA Codes

Parameter	Value
Tides Marine Manufacturer Code	797
Main Control Unit- Product Code	23843
Remote Monitoring Unit- Product Code	5753

Certifications

Federal Communication Commission

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference. This equipment generates, uses, and can radiate, radio frequency energy, and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

Canada

This Class A digital apparatus complies with Canadian ICES-003.

CE Declaration of Conformity

Tides Marine, Inc. is compliant with the essential requirements and other relevant provisions of Standard IEC 60065:2001 and Amendment 1:2005 / EN 60065:2002 and Directive 2004/108/ EC; 2006/95/EC, 89/336/EEC, 92/21/ EC, 93/68/EEC. Before putting the device into operation, please observe the respective country specific regulations.

Warranty

Tides Marine Limited Warranty

Tides Marine, Inc. provides a limited warranty for the SmartSeal Temperature Sensor products for 2 years from the date of purchase. If the product is not purchased directly from Tides Marine, a copy of the original dated bill of sale must be presented whenever warranty service is requested.

Except as specified below, the Tides Marine warranty covers all defects in material and workmanship. The following are NOT covered: Damage caused by accident, misuse, abuse, product modification, or neglect; damage occurring during shipment; damage from failure to follow instructions contained the Installation Manual and User's Manuals; damage resulting from the performance of repairs by someone not authorized by Tides Marine; damage caused by installation of parts that do not conform to Tides Marine specifications.

Tides Marine liability is limited to the repair or replacement, at our option, of any defective product and shall not include incidental or consequential damages. Tides Marine reserves the right to replace a discontinued model with a comparable model. Any replacement units or parts may be new or rebuilt.

TIDESMARINE

innovative products for the marine industry

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