

TLA100 Tank Level Adapter

User's Manual

Revision 1.3

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Maretron Manual Part #: M001001

Revision History

Revision	Description
1.0	Original document
1.1	Minor Updates
1.2	Corrected default values of transmitted PGN's
1.3	Clarified configuration options Added cautions about using red Loctite and acetone cleaners Added information on use of Type 2 (current source) analog gauges

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1 General

1.1 Introduction

Congratulations on your purchase of the Maretron Tank Level Adapter (TLA100). Maretron has designed and built your adapter to the highest standards for years of reliable, dependable, and accurate service.

The TLA100 is used to adapt commercially available tank senders to the NMEA 2000® network. This allows you to observe tank levels anywhere on the vessel where there is an NMEA 2000® compatible display such as the Maretron DSM200, DSM250, or computer or smartphone running Maretron's N2KView software. The TLA100 is compatible with both the American standard (240-33 ohm) and the European standard (10-180 ohm) resistive senders and in fact, the TLA100 can be calibrated for any resistive sender with resistance values between 0 and 300 ohms. Unlike most tank senders that only work with rectangular tanks, the TLA100 can be calibrated for irregular tank shapes so you know the true level of your tanks. You can also use the TLA100 with analog gauges so you don't have to get rid of existing gauges to enjoy the advantages of digitally networked information.

The Maretron TLA100 is designed to operate within the harsh demands of the marine environment. However, no piece of marine electronic equipment can function properly unless installed, calibrated, and maintained in the correct manner. Please read carefully and follow these instructions for installation, calibration, and usage of the Maretron TLA100 in order to ensure optimal performance.

1.2 Firmware Revision

This manual corresponds to TLA100 firmware revision 1.5.

1.3 Features

The Maretron TLA100 has the following features.

- NMEA 2000® Interface
- Adapts American standard (240-30 ohm) resistive senders to NMEA 2000® Network
- Adapts European standard (10-180 ohm) resistive senders to NMEA 2000® Network
- Can be Calibrated for any Resistive Sender Ranging from 0-300 Ohms or 300-0 Ohms
- Accommodates Irregularly Shaped Tanks with 16 Point Calibration
- 16 Programmable Tank Types Including Fuel, Fresh Water, Waste Water, Live Well
- Programmable Tank Number(s) Up to 16 per Tank Type
- Programmable Tank Capacity
- Works Alongside of Analog Gauges
- Can be Used Standalone Without Analog Gauges

1.4 Quick Install

Installing the Maretron TLA100 involves the following steps. Please refer to the individual sections for additional details.

1. Unpack the Box (Section 2.1)
2. Choose a Mounting Location (Section 2.2)
3. Connect the TLA100 (Section 2.3)
4. Configure or Program the Tank Type (Section 3.1)
5. Configure or Program the Tank Number (Section 3.2)
6. Configure or Program the Operating Mode (Section 3.3)
7. Configure or Program Tank Capacity (Section 3.4)
8. Configure or Program the Resistive Sender type: American or European (Section 3.5.1)
9. Optional – Custom Calibration (Section 3.5.2)

2 Installation

2.1 Unpacking the Box

When unpacking the box containing the Maretron TLA100, you should find the following items.

- 1 - TLA100 Tank Level Adapter
- 1 - TLA100 User's Manual
- 1 - Warranty Registration Card

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

2.2 Choosing a Mounting Location

The primary function of the TLA100 is to adapt commercially available resistive tank senders to an NMEA 2000[®] network so that tank level information can be viewed anywhere on the vessel where there is an NMEA 2000[®] compatible display. The TLA100 can be used together with an analog gauge(s) (referred to as *NMEA 2000[®] / Analog Gauge Mode*), or it can be used standalone to power and sense the resistive sender without an analog gauge(s) (referred to as *NMEA 2000[®] Mode*). If you are using the TLA100 with an analog gauge(s) then refer to Section 2.2.1 for determining an appropriate mounting location and skip Section 2.2.2. If you are using the TLA100 as a standalone adapter without attaching an analog gauge, then skip Section 2.2.1 and refer to Section 2.2.2 for determining an appropriate mounting location. Do not use threadlocking compounds containing methacrylate ester, such as Loctite Red (271), as they will cause stress cracking of the plastic enclosure.

2.2.1 Mounting Location When Used With Analog Gauge(s)

The TLA100 has two primary connections: 1) the NMEA 2000[®] network connection, and 2) the analog gauge connection. Therefore, the TLA100 should be located between the NMEA 2000[®] trunk line and the analog gauge(s). The reason for choosing this location is because you will be connecting some of the wires within the TLA100's permanently attached gray cable to the gauge and not the actual sender located at the tank. Maretron recommends placing the TLA100 within 15 feet of the gauge so the TLA100's permanently attached gray cable can be

directly connected to the gauge without any splices (see Figure 1). You may also consider placing the TLA100 as close as possible to the NMEA 2000® trunk line so you can purchase the shortest or lowest cost NMEA 2000® drop cable. In fact, you can hook the TLA100 directly to a tee attached to the NMEA 2000® trunk so you don't have to purchase any drop cable. The actual mounting of the TLA100 is not critical and the unit can be mounted in any orientation. The TLA100, NMEA 2000® connector, and cable are all waterproof (rated IP67 – protected against temporary immersion in water) so you can mount the unit virtually anywhere. Once you have located a suitable mounting location, you can secure the TLA100 by placing wire ties with screw eyes on the attached cables next to the TLA100.

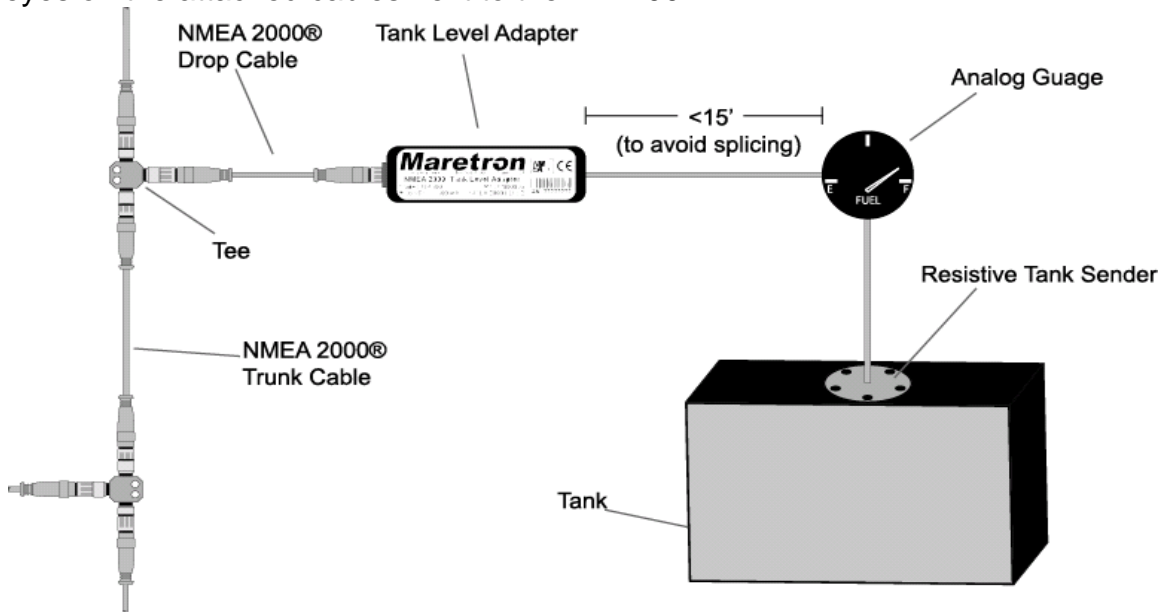


Figure 1– Mounting Location When Used with Analog Gauge

2.2.2 Mounting Location When Used Without Analog Gauge(s)

The TLA100 has two primary connections: 1) the NMEA 2000® network connection, and 2) the resistive tank sender connection. Therefore, the TLA100 should be located between the NMEA 2000® trunk line and the resistive tank sender. The reason for choosing this location is because you will be connecting some of the wires within the TLA100's permanently attached gray cable to the tank sender. Maretron recommends placing the TLA100 within 15 feet of the tank sender so the gray cable can be directly attached to the sender without any splices (see Figure 2). You may also consider placing the TLA100 as close as possible to the NMEA 2000® trunk line so you can purchase the shortest or lowest cost NMEA 2000® drop cable. In fact, you can hook the TLA100 directly to a tee attached to the NMEA 2000® trunk so you don't have to purchase any drop cable. The actual mounting of the TLA100 is not critical and the unit can be mounted in any orientation. The TLA100, NMEA 2000® connector, and cable are all waterproof (rated IP67 – protected against temporary immersion in water) so you can mount the unit virtually anywhere. Once you have located a suitable mounting location, you can secure the TLA100 by placing wire ties with screw eyes on the attached cables near the TLA100.

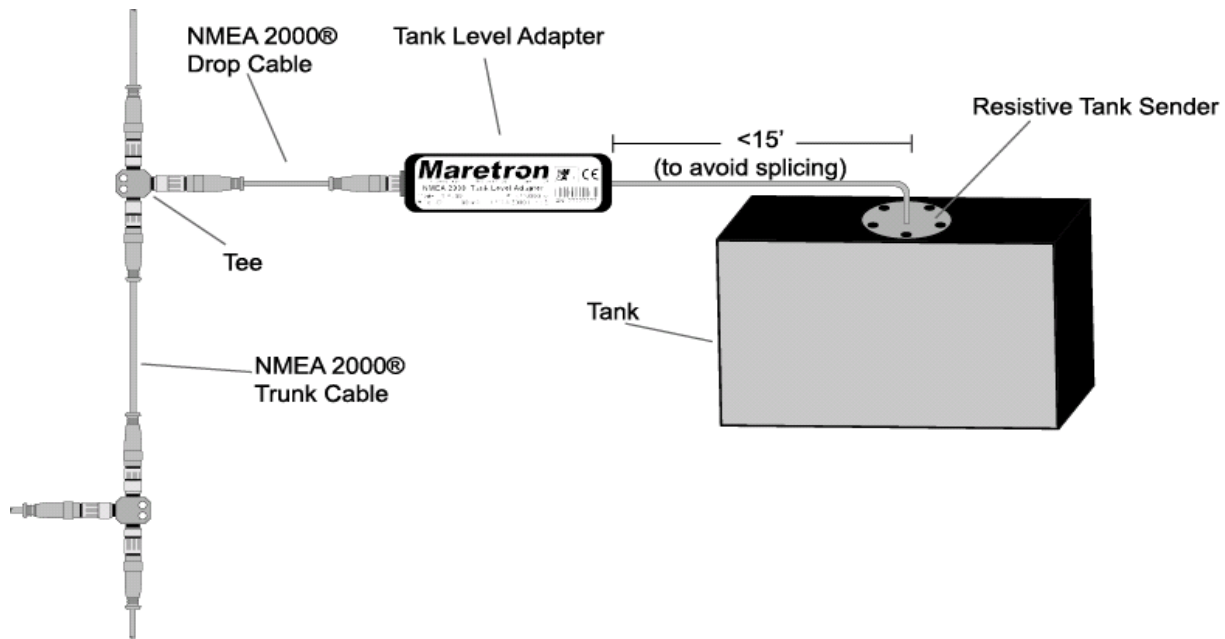


Figure 2 – Mounting Location When Used Without Analog Gauge

2.3 Connecting the TLA100

There are two connection points (see Figure 3) for the TLA100: 1) the permanently attached gray cable for connection to analog gauge or tank sender, and 2) the NMEA 2000[®] connection. Refer to Section 2.3.1 for making the gauge or tank sender connection and Section 2.3.2 for making NMEA 2000[®] connection.

Caution: Connect the TLA100's permanently attached gray cable to the gauge or tank sender before making the connection to the NMEA 2000[®] network as this reduces the risk of a stray spark when working around fuel tanks.



Figure 3 – TLA100 Connections

2.3.1 Connecting Attached Gray Cable to Analog Gauge or Tank Sender

The TLA100 can be used together with an analog gauge(s) (referred to as *NMEA 2000® / Analog Gauge Mode*), or it can be used stand-alone (referred to as *NMEA 2000® Mode*) to power and sense the resistive sender without an analog gauge(s). Connecting the TLA100's attached gray cable depends on how the TLA100 will be used. If you are using the TLA100 with an analog gauge(s) then refer to Section 2.3.1.1 and skip Section 2.3.1.2. If you are using the TLA100 as a stand-alone adapter without attaching an analog gauge, then skip Section 2.3.1.1 and refer to Section 2.3.1.2.

2.3.1.1 Connecting Attached Gray Cable to Analog Gauge

Connecting the TLA100's permanently attached gray cable to the analog gauge does not require the removal of any wires between the gauge and the tank. All connections normally made between the gauge and tank stay in place and the TLA100 is simply connected to the terminals on the back of the gauge. Not including the gauge light connections, analog gauges have three connection points or terminals: 1) power, 2) ground, and 3) sensor. The power connection may be marked with a plus sign "+", "+12V", or an "I" or "IGN", while the ground connection is usually marked with a minus sign "-", the earth ground symbol " \perp ", or a "G" for ground, and the sensor connection is generally marked with an "S" for sensor or "G" for gauge. You might have to refer to the gauge documentation or schematic to determine the exact function of the three gauge terminals but it is important to distinguish which terminals are the power, ground, and sensor. Once you have determined the terminals on the back of the gauge, connect the wires found within the TLA100's permanently attached gray cable as shown in Table 1 using recommended wiring practices (i.e., ABYC, Coast Guard, NMEA, ISO, etc.).

Gauge Terminals	Wire Color
Power (+, +12V, I, IGN)	Red
Ground (-, \perp , G)	Black
Sensor (S, G)	Green

Table 1 – TLA100 Gauge Connections

2.3.1.2 Connecting Attached Gray Cable to Tank Sender

Resistive tank senders have two terminals; 1) sensor terminal and 2) ground terminal. The sensor terminal is usually marked with an "S" for sensor or a "G" for gauge where the ground terminal is usually marked with a minus sign "-". A good way to determine which terminal is the ground is to observe which terminal is touching the metal housing; this will be the ground terminal. The sensor terminal will be insulated from the metal housing. Once you have determined the terminals on the resistive tank sender, connect the wires found within the TLA100's permanently attached gray cable as shown in Table 2 using recommended wiring practices (i.e., ABYC, Coast Guard, NMEA, ISO, etc.).

Sender Terminals	Wire Color
Sensor (S, G)	White
Ground (-)	Black

Table 2 – TLA100 Resistive Tank Sender Connections

2.3.2 Connecting to NMEA 2000® Interface

The Maretron TLA100 provides a connection to an NMEA 2000® interface through a five pin male connector (see Figure 4). You connect the TLA100 to an NMEA 2000® network using a Maretron NMEA 2000® cable (or an NMEA 2000® compatible cable) by connecting the female end of the cable to the TLA100 (note the key on the male connector and keyway on the female connector). Be sure the cable is connected securely and that the collar on the cable connector is tightened firmly. Connect the other end of the cable (male) to the NMEA 2000® network in the same manner. The TLA100 is designed such that you can plug or unplug it from an NMEA 2000® network while the power to the network is connected or disconnected. Please follow recommended practices for installing NMEA 2000® network products.

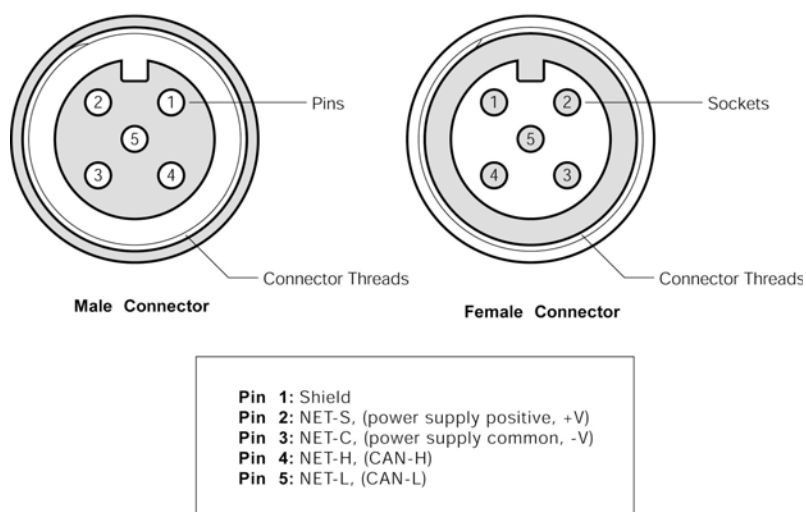


Figure 4 – NMEA 2000® Connector Face Views

3 Configuring the TLA100

The TLA100 has several configurable parameters, which are shown below including the default values. If you are not using the default values, then you will need to refer to the corresponding section for configuring the TLA100 appropriately.

1. Tank Type – Default is Fuel (Section 3.1)
2. Tank Number – Default is Tank 0 (Section 3.2)
3. Operating Mode – Default is *NMEA 2000® Mode* (Section 3.3)
4. Tank Capacity – Default is No Tank Capacity Transmitted (Section 3.4)
5. Resistive Sender – Default is American standard (Section 3.5)

In addition to configurable parameters, the TLA100 can be calibrated for standard resistive senders (i.e., American standard 240-30 ohm, European standard 10-180 ohms), the TLA100 can be calibrated for non-standard resistive senders (i.e., any resistance between 0 and 300 or 300 and 0 ohms), or the TLA100 can be custom calibrated for any shape tank. Refer to Section 3.5 for choosing a standard type resistive sender or custom calibrating the TLA100.

3.1 Configuring Tank Type

As shipped from the factory, the TLA100 transmits the tank type as “Fuel. You can reconfigure the TLA100 for any of these tank types:

1. Fuel
2. Fresh Water
3. Waste Water
4. Live Well
5. Oil
6. Black Water

3.2 Configuring Tank Number

As shipped from the factory, the TLA100 transmits the Tank Number as “0”. The TLA100 supports up to sixteen tanks (0 through 15) for a given type of tank, which means you can monitor up to 16 separate fuel tanks or 16 separate fresh water tanks. The TLA100 is configured or programmed by choosing a TLA100 tank number using a display product such as the Maretron DSM200, DSM250, or Maretron’s N2KAnalyzer software. Refer to the user’s manual of the display or software for configuring the TLA100 as the manual provides detailed instruction on configuration procedures.

3.3 Configuring Operating Mode

The TLA100 operates in one of three modes: 1) *NMEA 2000® Mode*, or 2) *NMEA 2000® / Analog Gauge Mode*, or *NMEA 2000®/Type 2 Analog Gauge Mode*. You configure or place the TLA100 into *NMEA 2000® Mode* when you are connecting the TLA100 directly to the resistive tank sender (see Figure 2) and you are not using an analog gauge. In *NMEA 2000® Mode*, the TLA100 supplies an electrical current to the resistive tank sender and monitors the changing voltage as the tank is filled or emptied. Whenever the TLA100 is used together with an analog dual-coil gauge, then you configure or place the TLA100 into *NMEA 2000® / Analog Gauge Mode*. In this mode, the analog gauge supplies the electrical current to the resistive tank sender while the TLA100 monitors the changing voltage. Placing the TLA100 into *NMEA 2000® / Analog Gauge Mode* requires you to configure or program the TLA100 with the analog gauge’s resistances, which are described in Section 3.3.1. Whenever the TLA is used together with an analog current-source gauge (such as some Faria gauges), then you configure or place the TLA100 into *NMEA 2000® / Type 2 Analog Gauge Mode*. Placing the TLA100 into *NMEA 2000® / Type 2 Analog Gauge Mode* requires you to configure or program the TLA100 with the amount of current sourced by the gauge, which is described in Section ???. You can configure or program a TLA100 operating mode through a display product such as the Maretron DSM200 or DSM250, or Maretron N2KAnalyzer software. Refer to the user’s manual for configuring the TLA100 as the manual provides detailed instruction on configuration procedures.

3.3.1 Configuring Analog Gauge Resistance

If you are using the TLA100 in the *NMEA 2000® / Analog Gauge Mode*, then two different analog gauge resistances need to be measured and programmed into the TLA100. You will

need an ohmmeter to make the two resistive measurements, which are 1) power terminal to sensor terminal resistance measurement (see Section 3.3.1.1), and 2) ground terminal to sensor terminal resistance measurement (see Section 3.3.1.2). Once you have made these measurements, you can enter the TLA100 gauge resistances through a display product such as the Maretron DSM200. Refer to the user's manual for configuring the TLA100 as the manual provides detailed instruction on configuration procedures.

3.3.1.1 Power Terminal to Sensor Terminal Resistance Measurement

The first resistance measurement is between the power terminal and the sensor terminal found on the back of the gauge. Before making the measurement, disconnect the power, ground, and sensor wires from the gauge. Then, measure and record the resistance between the power terminal and the sensor terminal (see Section 2.3.1.1 for help in determining which terminal is which). Make sure to adjust the ohmmeter scale to give you whole numbers without over ranging (sometimes indicated by blinking display or a 1 in the far left hand digit position). If you see only numbers right of the decimal point, keep adjusting the scale down (usually the highest ohm scale is indicated by a capital M for mega-ohms or 10^6 ohms while the next lower scale is indicated with a capital K for kilo-ohms or 10^3 ohms). Typical resistance values between the power terminal and the sensor terminal are between 100 and 200 ohms so you should be able to use the 200-ohm scale.

3.3.1.2 Ground Terminal to Sensor Terminal Resistance Measurement

The second resistance measurement is between the ground terminal and the sensor terminal found on the back of the gauge. Before making the measurement, disconnect the power, ground, and sensor wires from the gauge. Then, measure and record the resistance between the ground terminal and the sensor terminal (see Section 2.3.1.1 for help in determining which terminal is which). Typical resistance values between the ground terminal and the sensor terminal are between 100 and 400 ohms, however, some gauges have very high resistance (i.e., greater than 1000 ohms). A resistance value over 1000 ohms generally indicates a low cost, low accuracy gauge (i.e., gauge reading changes with battery voltage even though fluid level is not changing). If the resistance measurement is above 1000 ohms, don't worry about recording the exact reading, as the maximum programmable value in the TLA100 is 3000 ohms. Maretron recommends that you custom calibrate (see Section 3.5.2) your system whenever you are using a gauge with a reading of 3000 ohms or more. Also, you must be aware that these inexpensive gauges won't necessarily agree with the digital data available on the NMEA 2000[®] network as the gauges tend to be inaccurate.

3.3.2 Configuring Type 2 (Current Source) Analog Gauges

These gauges generally have a positive (supply voltage connection and a sender connection). To make this measurement, supply power to the gauge and then connect an ammeter between the sender terminal of the gauge and ground (this current may be in the tens or hundreds of milliamperes, so be sure and set the ammeter to the correct current range). The amount of current indicated on the ammeter is the value of the current source that should be programmed into the TLA100.

3.4 Configuring Tank Capacity

In addition to indicating the fluid level within a tank, the TLA100 also has the ability to be configured or programmed with the attached tank's capacity. This way, you will be able to view the tank's capacity as well as the amount of fuel remaining anywhere on the vessel where there is an NMEA 2000® compatible display. It is not required, but you can enter the TLA100 tank capacity using a display product such as the Maretron DSM200. Refer to the user's manual for configuring the TLA100 as the manual provides detailed instruction on configuration procedures.

3.5 Standard Sender Selection or Custom Calibration

The TLA100 is capable of accepting standard resistive values (see Section 3.5.1) or it can be calibrated for any resistance range between 0 and 300 or 300 and 0 ohms using the custom calibration procedure (see Section 3.5.2). In addition, the TLA100 can be calibrated for non-rectangular tank shapes for any resistive tank sender having resistance values from 0 to 300 ohms (see Section 3.5.2).

3.5.1 Standard Sender Selection

The TLA100 can be used with standard resistive tank senders such as the American Standard (240-30 ohms) or the European Standard (10-180 ohms). You can select which type of sender is attached to the TLA100 using a display product such as the Maretron DSM200. Refer to the user's manual for configuring the TLA100 as the manual provides detailed instruction on configuration procedures.

3.5.2 Custom Calibration

The TLA100 can be custom calibrated for one of several reasons:

1. A non-standard resistive tank sender is being used,
2. A standard resistive tank sender is used, but maximum accuracy is desired,
3. The tank shape is irregular or non-rectangular.

Regardless of the reason for custom calibrating the TLA100, you can calibrate the TLA100 using a display product such as the Maretron DSM200. Refer to the user's manual of the particular product that will be used for configuring the TLA100 as these manuals provide detailed instruction on configuration procedures.

4 Maintenance

Regular maintenance is not required, however, an occasional inspection will ensure continued proper operation of the Maretron TLA100. Perform the following tasks periodically:

- Clean the unit with a soft cloth. Do not use chemical cleaners as they may remove paint or markings or may corrode the DCR100 enclosure or seals. Do not use any cleaners containing acetone, as they will deteriorate the plastic enclosure.
- Ensure that the unit is mounted securely and cannot be moved relative to the mounting surface. If the unit is loose, tighten the screws holding the cable ties.

- Check the security of the cables connected to the NMEA 2000[®] interface and the connections to the gauge or sender and tighten if necessary.

5 Troubleshooting

If you notice unexpected operation of the Maretron TLA100, follow the troubleshooting procedures in this section to remedy simple problems.

Symptom	Troubleshooting Procedure
No tank level output	<ol style="list-style-type: none"> 1. If operating in the <i>NMEA 2000[®] Mode</i>, check the connections to the NMEA 2000[®] interface (see Section 2.3.2) and/or the connection to the resistive tank sender (see Section 2.3.1.2) and tighten if necessary. 2. If operating in the <i>NMEA 2000[®] / Analog Gauge Mode</i>, then check the connections to the NMEA 2000[®] interface (see Section 2.3.2) and/or the connection to the analog gauge (see Section 2.3.1.1) and tighten if necessary. 3. Ensure that power is supplied to the NMEA 2000[®] network. Proper network power can be checked by measuring the voltage at an open tee between NET-S and NET-C. The voltage should be between 9 and 16 volts. 4. Ensure that both trunk line terminators are in place. Proper network termination can be checked by removing network power and measuring the resistance at an open tee between NET-L and NET-H signals. The resistance should read approximately 60 ohms (two 120 ohm terminators in parallel equals 60 ohms).
Inaccurate tank level output	<ol style="list-style-type: none"> 1. Remember, the accuracy of most analog gauges/resistive tank senders is at best plus or minus 10%. The inaccuracies are due to both the analog gauge and the resistive tank senders. Although the TLA100 is a precision instrument, it is only as good as the resistive sender, which may not be as accurate as you like. Avoid low cost resistive tank senders if you desire good accuracy. 2. If using a standard resistive tank sender (American standard 240-30 ohm, European standard 10-180 ohms), make sure you have correctly configured the TLA100 for the appropriate standard (see Section 3.5.1). 3. If using a standard resistive tank sender (i.e., American or European), you may want to consider custom calibration (see Section 3.5.2). The standard sensor values assume that your tank is empty when the float is bottomed out (i.e., one end of the resistive range) and that the tank is full when the float is all the way up (i.e., the other end of the resistive range), which may not be the case if, for example, the tank drain is above the bottom of the tank. Custom calibration will use actual minimum and maximum resistive values instead of assuming that the tank is full and empty at the standard resistive extremes. 4. If using custom calibration, re-calibrate the TLA100 (see Section 3.5.2). 5. If operating in the <i>NMEA 2000[®] / Analog Gauge Mode</i>, ensure correct

Symptom	Troubleshooting Procedure
	analog gauge resistive values have been configured or programmed into the TLA100 (see Section 3.3.1)

Figure 5 – Troubleshooting Guide

If these steps do not solve your problem, please contact Maretron Technical Support (refer to Section 7 for contact information).

6 Technical Specifications

Specifications

Parameter	Value	Comment
Accuracy	+/-2%	Does Not Include Inaccuracies of Analog Gauge or Sender
Resolution	+/-1%	Worst Case (Resolution Better at High Resistance Values)
Number of Tank Types	254	Fuel, Fresh Water, Waste Water, Live Well, Oil, etc.
Number of Tanks per Tank Type	16	16 Tanks per Tank Type Numbered 0-15
American Standard Senders	240-30 ohms	Standard Sender Types are User Selectable
European Standard Senders	10-180 ohms	Standard Sender Types are User Selectable
Calibration Resistance Range	0-300 ohms	Non-Standard Sender Calibration
Support for Irregularly Shaped Tanks	Yes	Can be Calibrated for any Shape Tank
Programmable Tank Capacity	Yes	Allows Displays to Calculate Amount Remaining
Analog Gauge Support	Yes	Can be Used With or Without Analog Gauges

Certifications

Parameter	Comment
NMEA 2000	Level B+
Maritime Navigation and Radiocommunication Equipment & Systems	Tested to IEC 60945
FCC and CE Mark	Electromagnetic Compatibility

NMEA 2000® Parameter Group Numbers (PGNs) - See Appendix A for Details

Description	PGN #	PGN Name	Default Rate
Periodic Data PGNs	127250	Fluid Level	0.4 Times/Second
Response to Requested PGNs	126464	PGN List (Transmit and Receive)	N/A
	126996	Product Information	N/A
	126998	Configuration Information	N/A
Protocol PGNs	059392	ISO Acknowledge	N/A
	059904	ISO Request	N/A
	060928	ISO Address Claim	N/A
	065240	ISO Address Command	N/A
	126206	NMEA	N/A

Electrical

Parameter	Value	Comment
Operating Voltage	9 to 16 Volts	DC Voltage
Power Consumption	<100mA	Average Current Drain
Load Equivalence Number (LEN)	2	NMEA 2000® Spec. (1LEN = 50mA)
Reverse Battery Protection	Yes	Indefinitely
Load Dump Protection	Yes	Energy Rated per SAE J1113

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Mechanical

Parameter	Value	Comment
Size	3.9" x 1.2" x 1.0"	Excluding NMEA 2000 [®] Connector & Cable
Weight	9 oz.	
Mounting	Any Orientation	

Environmental

Parameter	Value
IEC 60954 Classification	Exposed
Degree of Protection	IP67
Operating Temperature	-25°C to 55°C
Storage Temperature	-40°C to 70°C
Relative Humidity	93%RH @40° per IEC60945-8.2
Vibration	2-13.2Hz @ ±1mm, 13.2-100Hz @ 7m/s ² per IEC 60945-8.7
Rain and Spray	12.5mm Nozzle @ 100liters/min from 3m for 30min per IEC 60945-8.8
Solar Radiation	Ultraviolet B, A, Visible, and Infrared per IEC 60945-8.10
Corrosion (Salt Mist)	4 times 7days @ 40°C, 95%RH after 2 hour Salt Spray Per IEC 60945-8.12
Electromagnet Emission	Conducted and Radiated Emission per IEC 60945-9
Electromagnetic Immunity	Conducted, Radiated, Supply, and ESD per IEC 60945-10
Safety Precautions	Dangerous Voltage, Electromagnetic Radio Frequency per IEC 60945-12

7 Technical Support

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

Telephone: 1-866-550-9100
Fax: 1-602-861-1777
E-mail: support@maretron.com
World Wide Web: <http://www.maretron.com>
Mail: Maretron, LLC
Attn: Technical Support
9034 N. 23rd Ave Suite 13
Phoenix, AZ 85021 USA

8 Maretron (2 Year) Limited Warranty

Maretron warrants the TLA100 to be free from defects in materials and workmanship for **two (2) years** from the date of original purchase. If within the applicable period any such products shall be proved to Maretron's satisfaction to fail to meet the above limited warranty, such products shall be repaired or replaced at Maretron's option. Purchaser's exclusive remedy and Maretron's sole obligation hereunder, provided product is returned pursuant to the return requirements below, shall be limited to the repair or replacement, at Maretron's option, of any product not meeting the above limited warranty and which is returned to Maretron; or if Maretron is unable to deliver a replacement that is free from defects in materials or workmanship, Purchaser's payment for such product will be refunded. Maretron assumes no liability whatsoever for expenses of removing any defective product or part or for installing the repaired product or part or a replacement therefore or for any loss or damage to equipment in connection with which Maretron's products or parts shall be used. With respect to products not manufactured by Maretron, Maretron's warranty obligation shall in all respects conform to and be limited to the warranty actually extended to Maretron by its supplier. The foregoing warranties shall not apply with respect to products subjected to negligence, misuse, misapplication, accident, damages by circumstances beyond Maretron's control, to improper installation, operation, maintenance, or storage, or to other than normal use or service.

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

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

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

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Warranty Return Procedure:

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

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

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

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Appendix A – NMEA 2000® Interfacing

TLA100 NMEA 2000® Periodic Data Transmitted PGNs

PGN 127505 – Fluid Level

The TLA100 uses this PGN to indicate the attached tank's fluid instance, fluid type, fluid level, and tank capacity.

- Field 1: Fluid Instance – This field is used to identify the tank number and ranges between 0 and 15. There can be up to 16 tanks of a given type as defined by the Fluid Type field. This field is programmable through the NMEA command PGN. The TLA100 ships from the factory with a default value of zero.
- 2: Fluid Type – This field identifies the type of fluid contained within the tank. Currently the defined fluid types are fuel, fresh water, wastewater, live well, oil, and black water. The TLA100 ships from the factory with a default value of 0x0 indicating "Fuel".
- 3: Fluid Level – This field is used to indicate the current fluid level in percentage. The value transmitted in this field depends on the sender resistance value..
- 4: Tank Capacity – This field is used to indicate the tank capacity. The TLA100 ships from the factory with a default value of 0xFFFFFFFF indicating "Data Not Available".
- 5: Reserved – This field is reserved by NMEA; therefore, the TLA100 sets all bits to a logic 1.