



# GARNET T-DP0301-B Data Portal and Remote Display User Manual

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**GARNET**

GARNET T-DP0301-B Data Portal and Remote Display



## INTRODUCTION

Congratulations on purchasing EVE the EE EGarnet VE Instruments SEE LEVEL EE AccessEVE™Annihilator™ 806-B, 806-Bi, or S L L Special™ 808-P2 and SeeLevelL ProSeries II 810-PS2 gauges by providing an additional

volume readout in the cab of your truck. In addition to providing a readout of the tank level, the SEE LEVEL Access™ provides a 4-20 mA analog output proportional to the fluid volume displayed. This analog output can be used to communicate the tank level to other pieces of equipment such as fleet management systems or Electronic Logging Devices (ELD).

The full-scale value of the analog output can be set using the buttons on the back of the display, no additional equipment is required for calibration. The SEE LEVEL Access™ also contains a serial RS-485 interface which allows fleet management or ELD systems to gather fluid volume data from the gauge. The interface is a full duplex and contains security features to prevent unauthorized access. The SEE LEVEL Access™ display has been designed to withstand the vibration and shock encountered in mobile applications. While the 808-P2 and 810-PS2 operate on internal batteries, (12-volt truck power is used to operate the backlight and external alarms), the SEE LEVEL Access display operates on 12V truck power.

### Remote Display & Data Portal



with 4-20 mA Output and RS-485 Serial Interface

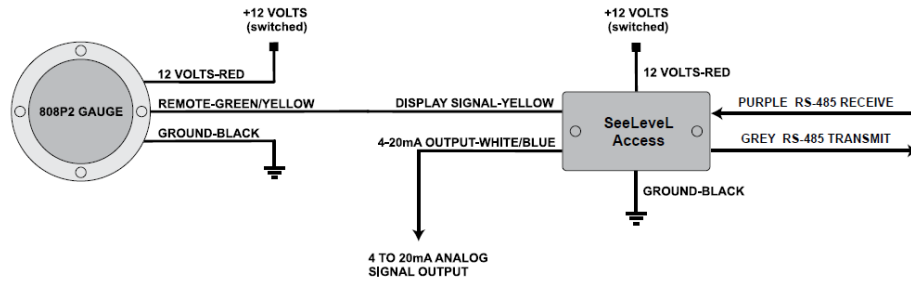
### FEATURES

The SEE LEVEL Access™ has been uniquely designed for specific Standard SEE LEVEL Access Features

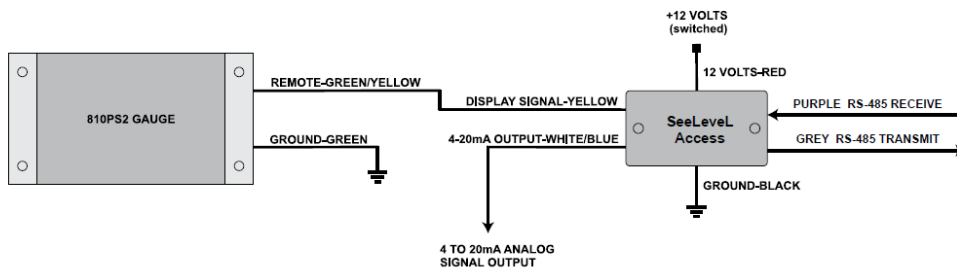
1. The signal between the 806-B, 806-Bi, 808-P2, or 810-PS2 display and the SEE LEVEL Access™ is digitally encoded so the signal line can be connected using a standard 7-pin trailer plug.
2. The display operates on 12-volt truck power and draws less than 200 mA.
3. The all-digital design eliminates reading drift or degradation, ensuring long-term accuracy under all operating conditions.
4. Operation from -40 °C to +60 °C (-40 °F to +140 °F) ambient temperature.
5. Easy installation and service with a one-year limited warranty. Additional SEE LEVEL Access T-DP0301-B Features
6. An analog 4-20 mA output, with 4 mA corresponding to zero displayed volume, and 20 mA corresponding to the full-scale displayed volume programmed into the remote display.
7. An RS-485 serial interface is available to connect to a variety of ELD or fleet management systems.
8. The model SEE LEVEL Access™ provides an easy-to-read LED display inside a compact, edge-view enclosure, optimized for top-of-dash or overhead console mounting. The display is housed in an aluminum enclosure 2.7" wide x 1.1" high x 3.4" deep (68 mm wide x 29 mm high x 87 mm. deep).
9. A dimmer button switch enables the operator to control brightness.
10. Simple 6-wire electrical installation – 12V power (red), ground (black), gauge signal (yellow), analog output (white/blue), RS-485 positive data (purple), and RS-485 negative data (grey).

### WIRING DIAGRAMS

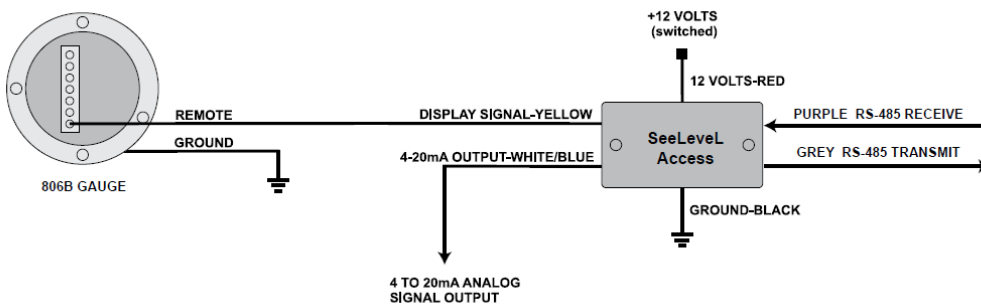
THE 806-SEE LEVEL Access™ EE has been designed for easy installation with your instructions for the gauge were supplied with the equipment, and are available online at [www.garnetinstrument.com](http://www.garnetinstrument.com). The SEE LEVEL Access™ Remote Display is easy to install: 808-P2 Wiring Diagram



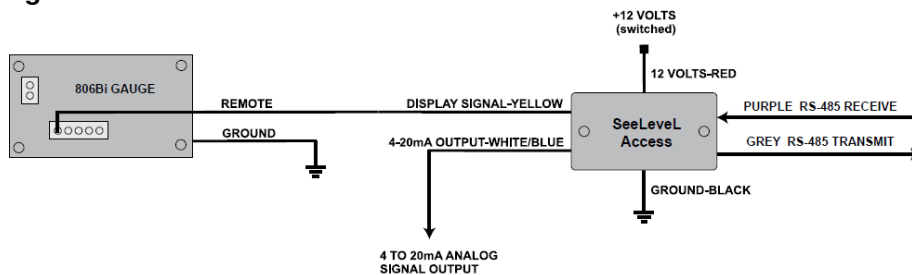
## 810-PS2 Wiring Diagram



## 806-B Wiring Diagram



## 806-Bi Wiring Diagram



## DISPLAY PROGRAMMING

The SEE LEVEL Access™ display shows the tank level by repeating the information shown on the 806-B, 806-Bi, 808-P2 or 810-PS2 gauge. The 4-20 mA analog output is calculated from the display level with a 4 mA output corresponding to a display level of zero, and a 20 mA output corresponding to the full-scale level programmed into the SEE LEVEL Access™ display.

For example, if the full scale is programmed to be 500.0, then a display value of 400.0 will result in an analog output of 16.80 mA. The display will recognize the decimal location and adjust the output accordingly, so in this example, a display value of 400 will also result in an analog output of 16.80 mA. To set the full-scale level:

1. Determine the maximum volume that can be displayed and pick a full-scale amount that is equal to or greater than this volume.
2. Press both the NEXT MENU and UP/ENTER buttons on the back panel, and the display will show ACAL. Release both buttons.
3. The display will show the existing calibration with the left digit bright. Press the UP/ENTER button to change the bright digit. Press the NEXT MENU button to go to the next digit.
4. Set all 4 digits, then press NEXT MENU again to set the decimal point, it will be bright to indicate that it is selected. Press the UP/ENTER button to select either x.xxx, xx. xx, xxx.x or no decimal. For the best accuracy of the analog output, try to use all digits such as 500.0 instead of just 500.
5. After the decimal as been set, press NEXT MENU again, the display will show Stor. Press UP/ENTER to store the calibration and exit the setting menu. The display will continue to show Stor for a moment and then will show do for a second. Then normal operation resumes.
6. If you do not want to store the calibration, press NEXT MENU again and the display will show About. Press UP/ENTER to abort which exits the calibration menu without saving.
7. If you press NEXT MENU again from the Abrt display, the menu will return to the beginning with the left digit selected by being bright.
8. If the full-scale calibration is below 103, the display will be unable to calculate a valid calibration and will show color (calibration error) after a few seconds. The existing calibration will be retained, and the display will return to normal operation.

#### **To view the existing calibration:**

1. Press either the NEXT MENU or UP/ENTER button (but not both) on the back panel, the display will show the existing full-scale analog calibration while the button is held down. Release the button to return to normal operation.

#### **To test the analog output**

1. While either the NEXT MENU or UP/ENTER button on the back panel is pressed, the display will show the full scale calibration and the analog output will go to full scale (20 mA). This can be used to test or calibrate the equipment connected to the analog output.
2. While the display is in the calibration mode (entered by pressing both the NEXT MENU and UP/ENTER buttons) the analog output will be at 4mA.

## **SERIAL INTERFACE**

Sealevel ELD Link Format and Signal Format-RS-485

- This documents the supported data exchange format between the SEE LEVEL Access™ In Cab Display and a vehicle's ELD / Fleet Management unit.
- Version 1.2, January 3, 2019. Initial Release, plus two revisions.

- The supported signal format is half duplex serial, RS485 voltage levels, 9600 baud, 8 bit, no parity, 1 stop bit.
- Sealevel hardware will act as a slave with an address of 0x19.
- Sealevel hardware will have a 120-ohm termination resistor installed but not bus bias resistors.
- All messages (ELD MASTER -> SeeLevelL Slave) obey the following format: [Destination: SeeLevelL address = 0x19] [Originator: Master address = 0x00] [total number of bytes in message] [message ID][payload – optional depending on message] [Checksum (16 bit: 2 bytes)]
- All messages (SeeLevelL Slave -> ELD MASTER) obey the following format: [Destination: Master address = 0x00] [Originator: Garnet address = 0x19] [total number of bytes in message] [message ID][payload – optional depending on message] [Checksum (16 bit: 2 bytes)]
- All multi-byte parameters are transferred big-endian (MSB first)
- Total number of bytes in the message (1 byte)
- Message ID (1 byte)
- Payload (optional depending on the message)
- Checksum (2 bytes) = direct sum of all preceding bytes, truncated to 2 bytes
- Allow for a 50ms timeout for replies (SeeLevelL Slave -> ELD Master)
- The master must respond to handshake requests within 500ms.
- There must be a minimum of 5ms dead-band (bus inactivity) between messages on the bus. Any data between these dead bands will be considered as one message and will be parsed as such.

#### **Sealevel Query Message (ELD Master-> SeeLevelL Slave)**

- Value: 0x00
- Allows the ELD to query the SeeLevelL device
- [0x19][0x00][0x06][0x00][ 0x00][0x1F]
- Value: 0x01
- Sealevel responds with model ID (1 byte), H/W Rev (1 byte), S/W Rev (2 bytes), alarm capability (1 byte), and SN support (1 byte). If the sea level device supports a unique serial number, it will follow (8 bytes in length).
- Example: SeeLevelL model ID = 0x01, hardware rev = 'E' (0x45), software major rev = 0x05, minor rev = 0x14, no alarm capability = 0x00 (0x01 = alarm capable), serial number supported = 0x01 (serial number not supported = 0x00), and a serial number = 0x0102030405060708:
- [0x00][0x19][0x14][0x01][0x02][0x45][0x05][0x14][0x00][0x01][0x01][0x02][0x03][0x04][0x05][0x06][0x07][0x08][0x00][0xB3]
- Value: 0x02, 1 byte payload
- ELD must respond with the proper coded response in order to either begin or continue the transfer or broadcast of liquid levels from the SeeLevelL device. Handshake demands will be broadcast at random times.
- Example:
- [0x00][0x19][0x07][0x02][0x3E][ 0x00][0x60]

#### **ELD Handshake Response (ELD Master -> SeeLevelL Slave)**

- Value: 0x03, 1 byte payload
- To calculate the response, the payload from the SeeLevelL Handshake Demand Message is used as an address/offset to fetch the contents of the lookup table.
- Response to the

- Value: 0x04, no payload
- This message exists to preserve the Master/Slave communication arrangement.
- No response at all implies that the handshake was wrong.
- This is not used during the normal commands here, it is just in place for future applications.
- [0x00][0x19][0x06][0x04][ 0x00][0x23]
- Value: 0x05, no payload
- Sealevel responds with a single liquid level or a handshake demand message.
- [0x19][0x00][0x06][0x05][ 0x00][0x24]
- Value: 0x07, no payload
- Sealevel will either respond with a liquid alarm level response or an error response if the alarm function is not supported
- [0x19][0x00][0x06][0x07][ 0x00][0x26]example above:
- [0x19][0x00][0x07][0x03][0x85][ 0x00][0xA8]

### **Sealevel Liquid Alarm Level Response (SeeLevelL Slave -> ELD Master)**

- Value: 0x08, 7 byte payload
- Sealevel responds with liquid alarm level (4 bytes = unsigned int32), a number of digits to the right of the decimal (1 byte), alarm type (1 byte; high = 0x01, low = 0x00), and whether the liquid level is currently in alarm (1 byte; alarm active = 0x01, no alarm = 0x00).
- Example: liquid alarm level = 347.56, alarm type = low level, alarm active:
- [0x00][0x19][0x0D][0x08][0x00][0x00][0x87][0xC4][0x02][0x00][0x01][0x01][0x7C]

### **Sealevel Query Alarm Status Message (ELD Master -> SeeLevelL Slave)**

- Value: 0x09, no payload
- Sealevel will either respond with the
- Value: 0x0A, 1 byte payload
- Sealevel responds with current alarm status (1 byte; alarm active = 0x01, not active = 0x00)
- Example: alarm active:
- [0x00][0x19][0x07][0x0A][0x01][ 0x00][0x2B]
- Value: 0x0F, 1 byte payload
- Sealevel issues this response if a command/message is not supported. Payload = unsupported message code.
- Example: ELD has previously issued a SeeLevelL Query Alarm Liquid Level Message (0x07) to a SeeLevelL device that does not support alarms:
- [0x00][0x19][0x07][0x0F][0x07][ 0x00][0x36]
- Value: 0x10, 6 or 7-byte payload, depending on whether alarms are supported
- Sealevel Slave transmits liquid level (4 bytes = unsigned int32), a number of digits to the right of the decimal (1 byte), optical error status (1 byte), and alarm status (currently active = 0x01, not in alarm state = 0x00). The alarm status field is optional and is not transmitted by a SeeLevelL device that does not support alarms. Optical error status: no light = 0x00, low light level = 0x01, sunlight = 0x02, no error = 0x10. In the event that the optical error status is in an error condition, the liquid level and the number of digits to the right of the decimal is

ignored.

- For the liquid level, the first 4 bytes of the payload represent the hex value of the level, not the BCD value.
- Example: liquid level = 1,083.1, no optical error, alarms not supported.
- [0x00][0x19][0x0C][0x10][0x00][0x00][0x2A][0x4F][0x01][0x10][ 0x00][0xBF]current alarm status or an error response if the alarm function is not supported
- [0x19][0x00][0x06][0x09][ 0x00][0x28]

## NOTES

- ELD request needing handshake confirmation:
- Send liquid level.
- The handshake request is done every 25th time one of these requests is received. The handshake must be responded to within 500ms, or else the response is considered invalid. If no handshake is received, is late, or is incorrect, then no response is sent. This helps prevent “brute force” codebreaking attempts.

## Handshake format

- Request from ELD is received by SeeLevelL
- Sealevel responds with a handshake request if more than 25 requests have occurred since the last handshake. Otherwise, SeeLevelL sends replies to ELD requests.
- ELD sends a handshake response
- Sealevel sends a reply to the original ELD request if the handshake response is correct and on time.
- The “handshake accepted acknowledge” message is not used here.
- Upon power-up of the display, the “20 requests” is reset so a handshake is needed for the first liquid-level request.

## The alarms are not currently supported. In the future, if they are

- The content of Message \$08 is the alarm set point, high or low-level alarm, and current alarm status.
- The content of Message \$0A is just a short form of Message \$08, alarm status only.

The sea level will respond to source addresses of 0x00 (ELD) only. The See LevelL will not respond at all to any message that has errors, has an invalid message, is not addressed to SeeLevelL, does not come from 0x00 (ELD), and does not follow the handshake protocol. This avoids unnecessary bus activity and possible contention and makes it harder to break the code with repeated attempts using different values. The query of Handshake Frequency (ELD Master-> SeeLevelL Slave)

- Value: 0x2D, no payload
- This asks for the handshake frequency, the response is shown below.
- Message format:
- [0x19][0x00][0x06][0x2D][0x56][0x56]
- Value: 0x2E, 1 byte payload
- The handshake frequency number occupies 1 byte in EEPROM in the SeeLevelL gauge. The frequency can range from 1 to 255 broadcasts per handshake request. The number is stored in hex from 0x01 to 0xFF.
- The message format, and frequency is 25 (0x19):

- [0x00][0x19][0x07][0x2E][0x19][0x6C][0x56]

## TROUBLESHOOTING GUIDE

Error Code	Cause	Solution
no 5	<p>The display is not receiving any signal from the 806-B, 806-Bi, 808-P2 or 810-PS2 gauge.</p> <p>The analog output will go to 0 mA. This differentiates the error condition from the zero display condition of 4 mA.</p>	<p>Check the wiring and grounding for errors or bad connections.</p> <p>Also ensure that the 806-B, 806-Bi, 808-P2 or the 810-PS2 is working properly.</p>
Err	The display is receiving corrupted data and the analog output will go to 0 mA.	The display will need to be serviced or replaced.
EErr	The display cannot communicate with its own memory,	
SErr	The display cannot communicate with its own digital to analog convertor.	

### Accuracy

The analog output has an accuracy of  $\pm 0.25\%$  of the full-scale value, so any output value should be within 0.05 mA of the “ideal” value. There are no user adjustments that can be made to alter the accuracy. As with any digital system, there are round-off and truncation errors inherent in the mathematical process. However, since the SEE LEVEL Access™ utilizes a 10 bit digital to analog converter, it has sufficient accuracy to allow the full resolution of the truck gauge to be realized. Note that the truck gauge sending the data has a resolution of only 8 bits (1/3” systems).

## SPECIFICATIONS

- Analog output accuracy: “0.25% of full-scale value  $\pm 0.05$  mA”
- Minimum input supply voltage: +10.0 V
- Minimum difference between the input supply voltage and voltage on analog 4-20 mA
- output: 4.0 V
- Current drain: 200 mA or less
- Temperature range: -40°C to +60°C (-40°F to +140°F)
- Material: Aluminum
- Size: 68 mm wide x 29 mm high x 87 mm
- deep (2.7” wide x 1.1” high x 3.4” deep)
- Display type: LED 4-digit, 7 segments 10 mm (0.4”) high digits
- Display power: Operates on 12 V truck power
- Wiring: 6 wire electrical installation: 12 V power (red), ground (black), gauge signal (yellow), analog output (white/blue), RS-485 serial positive data (purple), and RS-485 negative data (grey)
- RS-485 output voltage level: +/- 2.0 V minimum
- RS-485 serial format: 9600 baud
- Standard mark/space NRZ format
- The model is 8 bits Non-inverted tx



- No parity No breaking character
- One start bit
- One stop bit

## **SERVICE & WARRANTY INFORMATION**

The warranty will only apply if the warranty has been registered online from the Garnet Instruments registration web page. Go online to [garnetinstruments.com/support/](http://garnetinstruments.com/support/) and select "Register Warranty".

### **DISCLAIMER OF WARRANTY ON HARDWARE**

Garnet Instruments warrants equipment manufactured by Garnet to be free from defects in material and workmanship under normal use and service for a period of three years from the date of sale from Garnet or an Authorized Dealer. The warranty period will start from the date of purchase or installation as indicated on the warranty card. Under these warranties, Garnet shall be responsible only for actual loss or damage suffered and then only to the extent of Garnet's invoiced price of the product. Garnet shall not be liable in any case for labor charges for indirect, special, or consequential damages. Garnet shall not be liable in any case for the removal and/or reinstallation of defective Garnet equipment.

These warranties shall not apply to any defects or other damages to any Garnet equipment that has been altered or tampered with by anyone other than Garnet factory representatives. In all cases, Garnet will warrant only Garnet products that are being used for applications acceptable to Garnet and within the technical specifications of the particular product. In addition, Garnet will warrant only those products which have been installed and maintained according to Garnet factory specifications.

### **LIMITATION ON WARRANTIES**

These warranties are the only warranties, expressed or implied, upon which products are sold by Garnet and Garnet makes no warranty of merchantability or fitness for any particular purpose in respect to the products sold. Garnet products or parts thereof assumed to be defective by the purchaser within the stipulated warranty period should be returned to the seller, local distributor, or directly to Garnet for evaluation and service. Whenever direct factory evaluation, service or replacement is necessary, the customer must first, by either letter or phone, obtain a Returned Material Authorization (RMA) from Garnet Instruments directly. No material may be returned to Garnet without an RMA number assigned to it or without proper factory authorization. Any returns must be returned freight prepaid to Garnet Instruments, 286 Kaska Road, Sherwood Park, Alberta, T8A 4G7.

Returned warranted items will be repaired or replaced at the discretion of Garnet Instruments. Any Garnet items under the Garnet Warranty Policy that are deemed irreparable by Garnet Instruments will be replaced at no charge or a credit will be issued for that item subject to the customer's request. If you do have a warranty claim or if the equipment needs to be serviced, contact the installation dealer. If you do need to contact Garnet, we can be reached as follows:

#### **CANADA**

Garnet Instruments  
286 Kaska Road  
Sherwood Park, AB T8A 4G7 CANADA  
[email: info@garnetinstruments.com](mailto:info@garnetinstruments.com)

#### **UNITED STATES**

Garnet US Inc.  
5360 Granbury Road  
Granbury, TX 76049  
USA  
[email: infous@garnetinstruments.com](mailto:infous@garnetinstruments.com)

## **Documents / Resources**



[GARNET T-DP0301-B Data Portal and Remote Display](#) [pdf] User Manual  
T-DP0301-B Data Portal and Remote Display, T-DP0301-B, Data Portal and Remote Display, Remote Display, Display, Data Portal, Portal

References

- [Support - Garnet Instruments](#)
- [Home - Garnet Instruments](#)