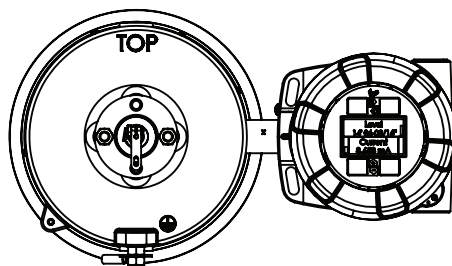




# 8920 Loop Powered Transmitter

Signal transmission for accurate level measurement in storage tanks





---

## Copyright

© 2023, All rights reserved. Printed in the United States of America.

Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, mechanical, photocopying, recording, or otherwise – without the prior written permission of the Publisher:

Varec, Inc.  
5834 Peachtree Corners East  
Peachtree Corners, Georgia 30092  
Phone: (770) 447–9202  
Fax: (770) 662–8939

## Trademarks Acknowledged

Varec, Inc. recognizes all other trademarks. Trademarks of other products mentioned in this manual are held by the companies producing them.

FuelsManager®, TankView®, and, Varec® are registered trademarks of Varec, Inc.

All other product and service names mentioned are the trademarks of their respective companies.

## Documentation Control

This document and the information provided within are controlled by the approvals agency(s) listed below. All changes to this document must be submitted to and approved by the agency(s) before public release.

- FM Approvals (FM)
- ATEX
- IECEX
- UKCA

## FCC (US)

This device complies with Part 18 of the FCC Rules.

Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

---

## **ICES-003 Class A Notice**

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

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada

## **Disclaimer of Warranties**

The contract between the Seller and the Buyer states the entire obligation of the Seller. The contents of this instruction manual shall not become part of or modify any prior or existing agreement, commitment, or relationship between the Seller and Buyer. There are no express or implied warranties set out in this instruction manual. The only warranties that apply are those in the existing contract between the Seller and Buyer.

The 8920 Loop Powered Transmitter (LPT) has not been tested by Varec under all possible operational conditions, and Varec may not have all the data relative to your application. The information in this instruction manual is not all inclusive and does not and cannot take into account all unique situations. Consequently, the user should review this product literature in view of his or her application. If you have any further questions, please contact Varec for assistance.

## **Limitations of Seller's Liability**

In the event that a court holds that this instruction manual created some new warranties, Seller's liability shall be limited to repair or replacement under the standard warranty clause. In no case shall the Seller's liability exceed that stated as Limitations of Remedy in the contract between the Seller and Buyer.

Use of parts that are not manufactured or supplied by Varec voids any warranty and relieves Varec of any obligation to service the product under warranty. Varec recommends the use of only Varec manufactured or supplied parts to maintain or service Varec 8920 Loop Powered Transmitters.

---

## Terms of Use

The information provided in this document is provided "as is" without warranty of any kind. Varec, Inc. disclaim all warranties, either express or implied, including the warranties of merchantability and fitness for a particular purpose. In no event shall Varec, Inc. or its suppliers be liable for any damages whatsoever including direct, indirect, incidental, consequential, loss of business profits or special damages, even if Varec, Inc. or its suppliers have been advised of the possibility of such damages.

This manual is solely intended to describe product installation, operation, calibration, and maintenance and should not be used for any other purpose. It is subject to change without prior notice. This manual was prepared with the highest degree of care. However, should you find any errors or have any questions, contact one of our service offices or your local sales agent.

## Safety Precaution Definitions

**Caution!** Damage to equipment may result if this precaution is disregarded.

**Warning!** Direct injury to personnel or damage to equipment which can cause injury to personnel may result if this precaution is not followed.

**Note** Qualified personnel are required for installation of this product in a hazardous environment.

## Safety Precautions

Read this manual carefully and make sure you understand its contents before using this product. Follow all instructions and safety guidelines presented in this manual when using this product. If the user does not follow these instructions properly, Varec cannot guarantee the safety of the system.

**Note** Comply with all applicable regulations, codes, and standards. For safety precautions, the user should refer to the appropriate industry or military standards.

**Caution! Electrical Hazard!** Read and understand static and lightning electrical protection and grounding described in API 2003. Make certain that the tank installation, operation, and maintenance conforms with the practice set forth therein.

**Warning! Striking the transmitter or gaugehead with a metal object could cause a spark to occur.** When removing or replacing the transmitter or gaugehead in flammable or hazardous liquid storage areas, take necessary measures to protect it from impact.

**Warning! Volatile fumes may be present!** Ensure that the tank has been leak and pressure tested as appropriate for the liquid to be stored. Observe appropriate safety precautions in flammable or hazardous liquid storage areas. Do not enter a tank that has contained hydrocarbons, vapors, or toxic materials, until a gas-free environment is certified. Carry breathing equipment when entering a tank where oxygen may be displaced by carbon dioxide,



# Table of Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
	Features and Specifications	1
	General	1
	Transmitter Features	1
	Getting Acquainted with the 8920 Loop Powered Transmitter	2
<b>2</b>	<b>Installation</b>	<b>9</b>
	Unpacking	9
	Storage Prior to Installation	9
	Mounting on Varec Gaugeheads	9
	Mounting on Alternate Gaugeheads	11
	Water and Dust Ingress Protection	12
	Field Wiring	12
	AC Electrical Connections	14
	User-Furnished DC Power (Loop Powered)	14
	Junction Boxes and Limit Switches	15
	Initial Calibration	18
	Installation Checkout	18
	Resistance Curve	19
<b>3</b>	<b>Display and Configuration Interface</b>	<b>21</b>
	Configuration	22
	System Data	23
	To Access the System Data	23
	PIN Codes	25
	Setup	26
	To Access the Setup	26
	Encoder Data	27
		28
	To Access Encoder Data	28
	Analog Out	29
	To Access Analog Out	30
	Analog Output User Calibration	31
		31
	Calibration	32
	Calibrate Level Shortcut	32
	Calibration Steps	33

---

<b>4</b>	<b>Configuration</b>	35
	Initial Checkout and Power-up	35
	Limit Switch Operational Setup	35
<b>5</b>	<b>Maintenance</b>	37
	Major System Assemblies and Components	37
<b>6</b>	<b>Specifications</b>	41
	General	41
	Available Level Ranges	41
	Environmental	42
	Options and Accessories	43
<b>7</b>	<b>Order Codes</b>	45
<b>8</b>	<b>Identification</b>	47
	Device Designation	47
	Warning	47
	Nameplate	47



## Table of Figures

Figure 1-1:	8920 LPT Transmitter Dimensions with Internal Display . . . . .	2
Figure 1-2:	8920 LPT with a Junction Box for an External Display . . . . .	3
Figure 1-3:	8920 LPT Exploded View with External Display (Transmitter Side) . . . . .	4
Figure 1-4:	8920 LPT Exploded View with External Display (Junction Box side) . . . . .	5
Figure 1-5:	8920 LPT Exploded View – Loop Powered with Internal Display . . . . .	6
Figure 1-6:	8920 LPT Exploded View – AC Powered with Internal Display . . . . .	6
Figure 2-1:	Typical Transmitter Mounting . . . . .	10
Figure 2-2:	Mounting on Alternate Gaugeheads . . . . .	12
Figure 2-3:	Typical Field Wiring for Back of Display Board . . . . .	13
Figure 2-4:	Field Wiring the 8920 LPT to an 8818 Analog Input Module . . . . .	14
Figure 2-5:	8920 LPT Exploded View – Loop Powered with Internal Display . . . . .	15
Figure 2-6:	8920 LPT Exploded View with External Display (Junction Box Side) . . . . .	16
Figure 2-7:	Junction Box DC Connectors . . . . .	17
Figure 2-8:	Loop Resistance . . . . .	19
Figure 3-1:	The 8920 LPT Display and Configuration Interface . . . . .	21
Figure 3-2:	Calibration Test Setup . . . . .	31
Figure 5-1:	8920 LPT Exploded View with External Display (Transmitter Side) . . . . .	38
Figure 5-2:	8920 LPT Exploded View with External Display (Junction Box Side) . . . . .	39
Figure 5-3:	8920 LPT Exploded View – Loop Powered with Internal Display . . . . .	40
Figure 5-4:	8920 LPT Exploded View – AC Powered with External Display . . . . .	40
Figure 8-1:	8920 LPT Warning . . . . .	47
Figure 8-2:	8920 LPT Nameplate - 16-08920AC 47	
Figure 8-3:	8920 LPT Nameplate - 16-08920FC . . . . .	47
Figure 8-4:	8920 LPT Nameplate - 16-08920FM . . . . .	48



Tables

Table 2-1: Junction Box Terminals . . . . . 17

Table 2-2: Junction Box Terminals (cont.) . . . . . 18

Table 5-1: Major System Components . . . . . 37

Table 6-1: General Specifications . . . . . 41

Table 6-2: Available Level Ranges . . . . . 41

Table 6-3: Environmental Specifications . . . . . 42

Table 6-4: Options and Accessories . . . . . 43



## Change History

Major Revision	Minor Revision	Date	Author	Approved By	Description of Change
A		10/23/2023	Charlyn Lez Moss	Dirk Holcomb	Initial version
B		12/11/2023	Charlyn Lez Moss	Nick Wilson	Deleted N2920AT order code, updated label markings and ambient temperatures



# 1 Introduction

This manual is designed to assist the user in the installation, operation, calibration, and maintenance of the Varec 8920 Loop Powered Transmitter (8920 LPT).

## Features and Specifications

### General

- Loop Powered Transmitter (LPT) with an accuracy up to 1 / 16th of an inch
- LCD display with a user interface to configure and retrieve level information
- Secondary 4–20 mA loop output for temperature data
- Single housing structure
- Three options:
  - Level only
  - Two channel version with 4–20 mA output for level and temperature
  - (Future release) HART version (with level and temperature through digital HART protocol)

### Transmitter Features

- Capacitive encoder
- LCD and touch buttons
  - LCD to display tank data
  - Entry buttons for configuring the transmitter and interfacing with displayed data
- Resistance Temperature Detector (RTD)
  - Based on a resistance measurement
  - Uses precision A/D converter in the microcontroller

# Getting Acquainted with the 8920 Loop Powered Transmitter

The 8920 LPT is an electromechanical device that is mechanically coupled to the sprocket drive sheave of a Varec 2500 Automatic Tank Gauge (2500 ATG) gaugehead or other liquid level indicating gaugehead. [\(see Figure 1-2\)](#)

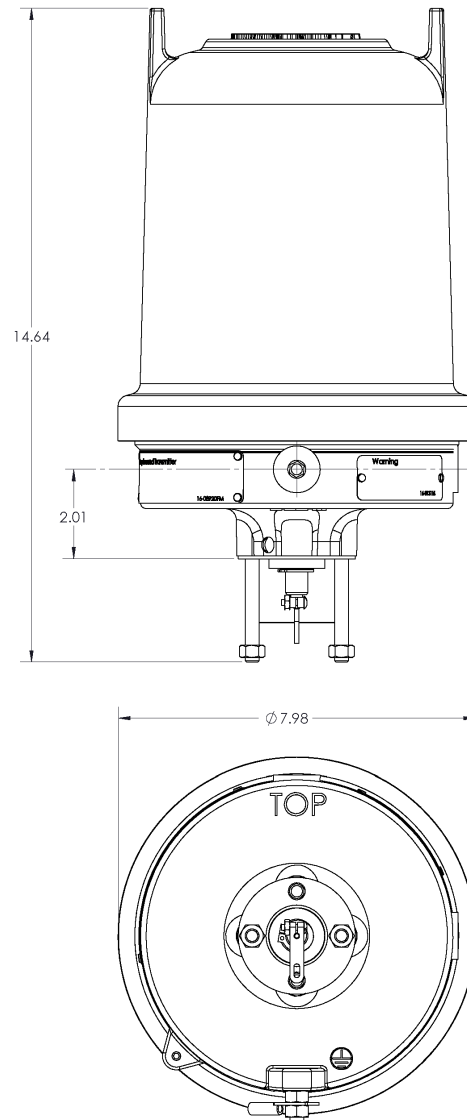


Figure 1-1: 8920 LPT Transmitter Dimensions with Internal Display



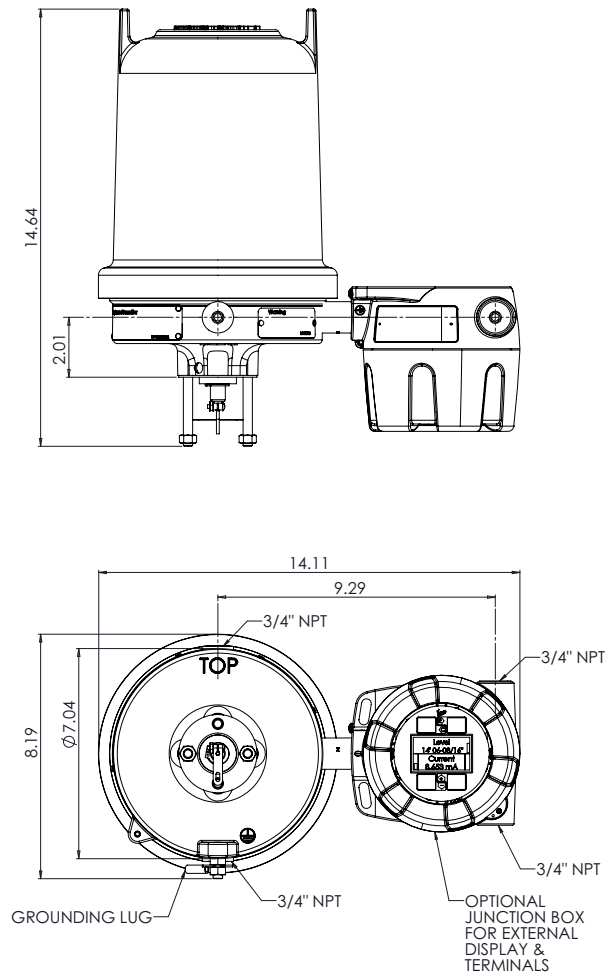
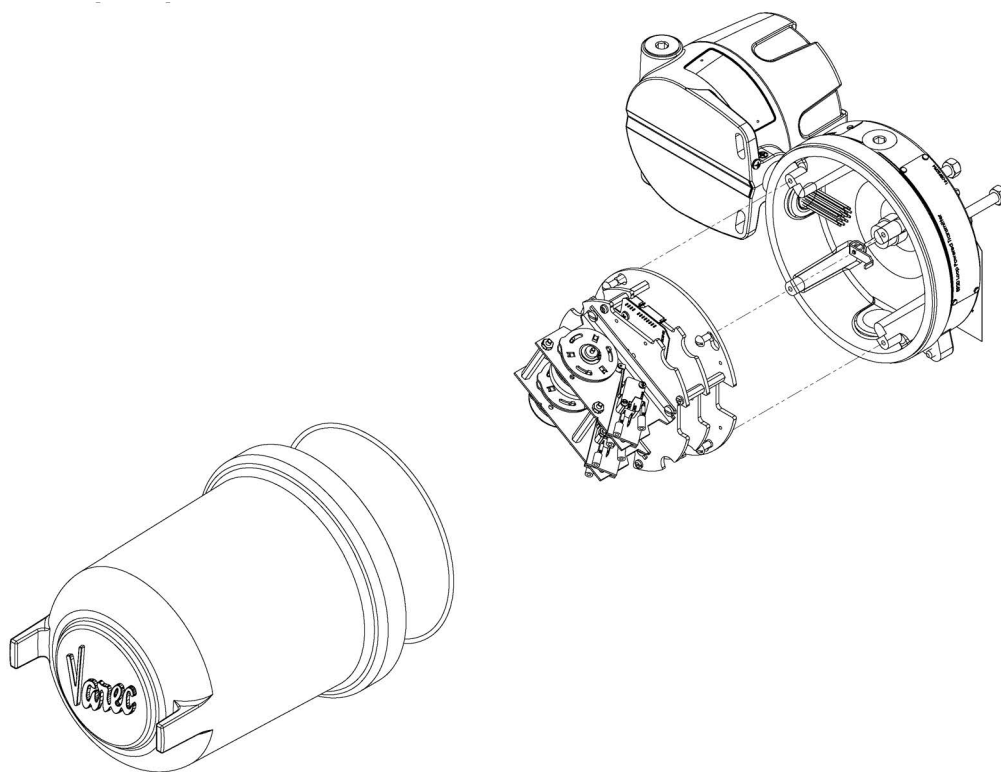


Figure 1-2: 8920 LPT with a Junction Box for an External Display



*Figure 1-3: 8920 LPT Exploded View with External Display (Transmitter Side)*

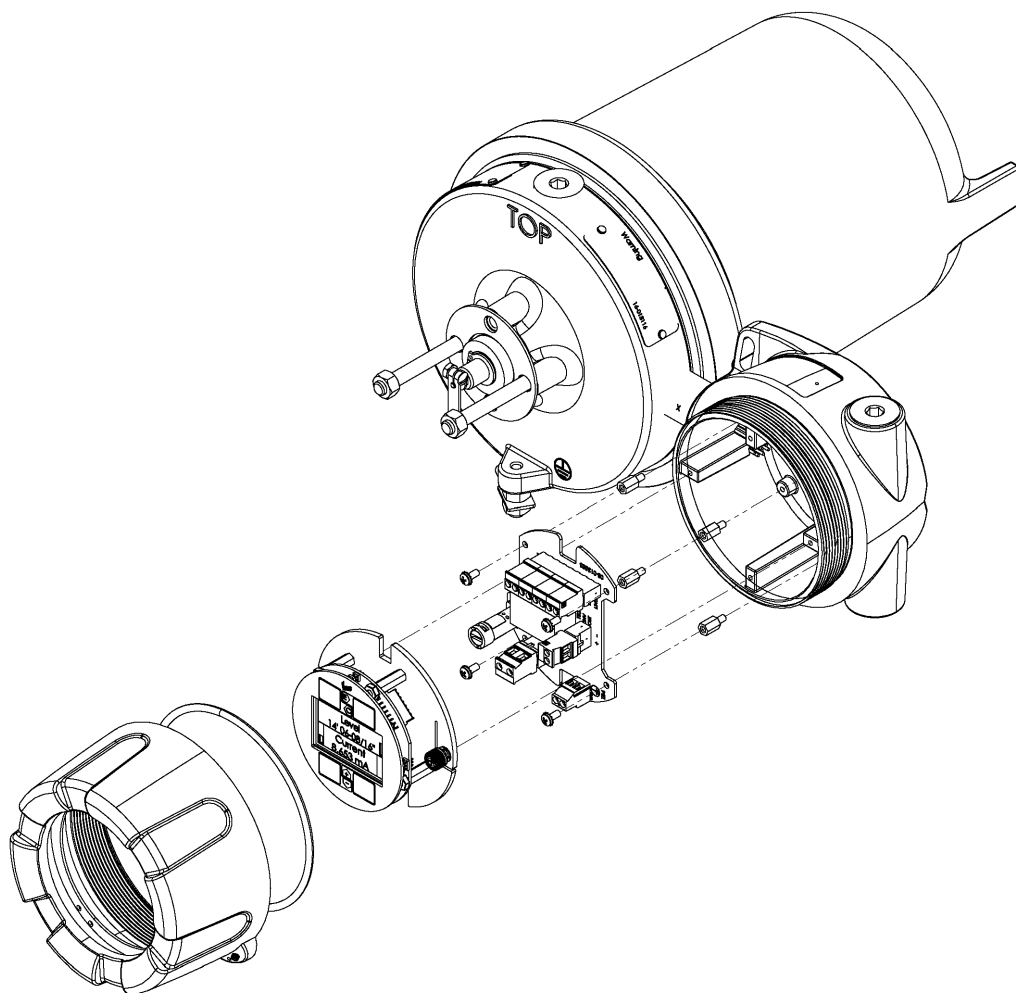
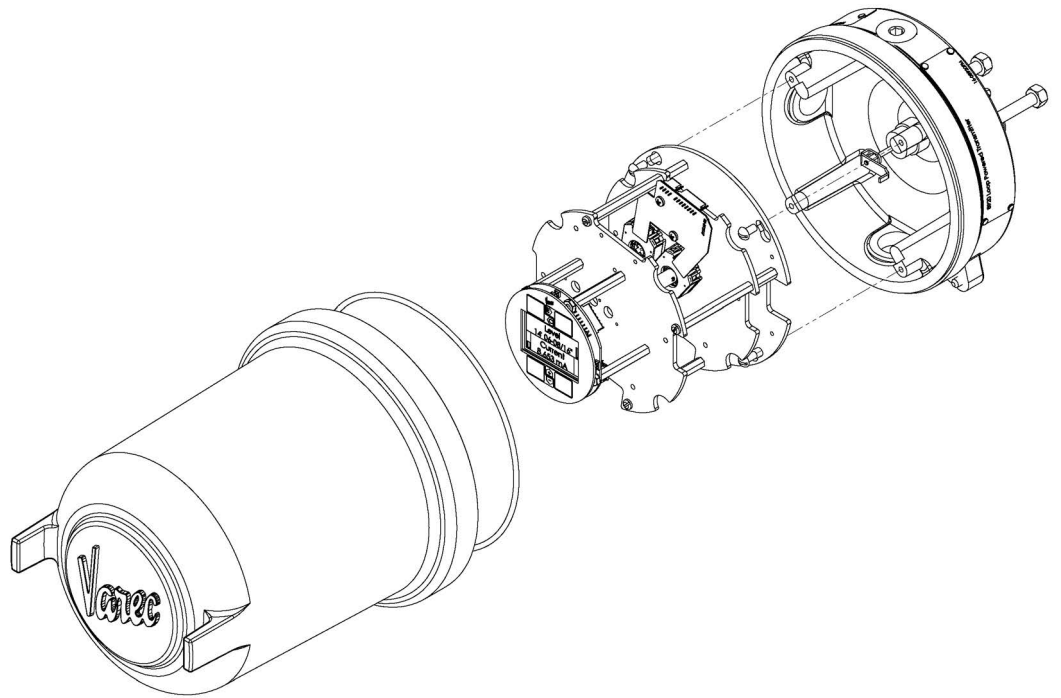
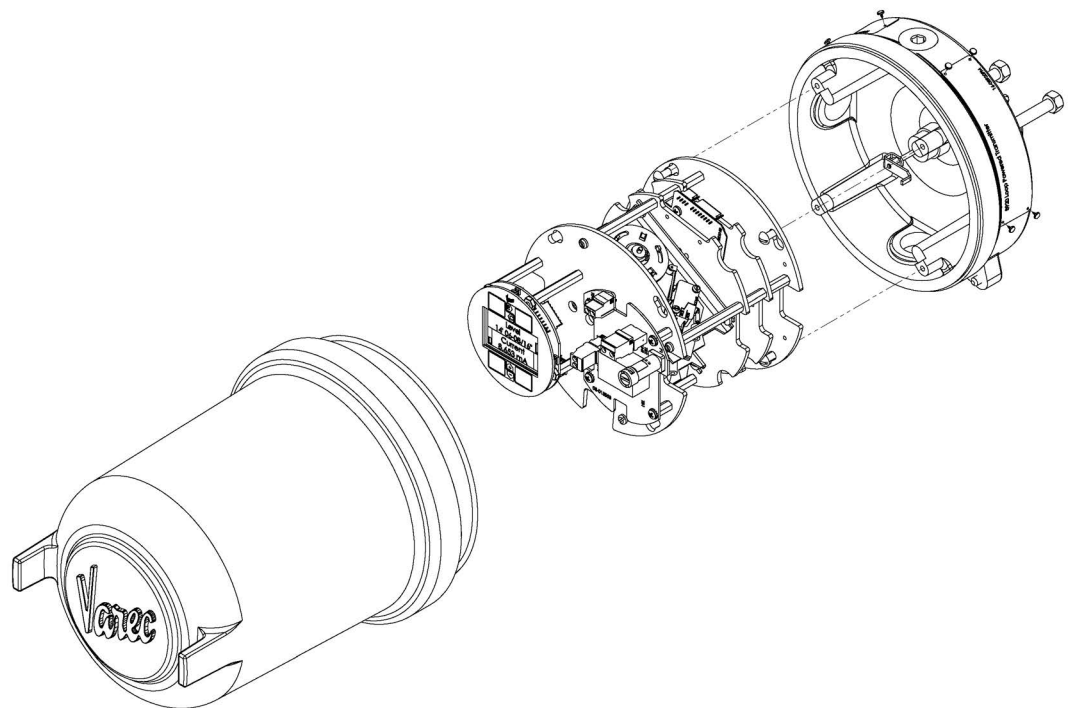


Figure 1-4: 8920 LPT Exploded View with External Display (Junction Box side)



*Figure 1-5: 8920 LPT Exploded View – Loop Powered with Internal Display*



*Figure 1-6: 8920 LPT Exploded View – AC Powered with Internal Display*

As the liquid level gauge sprocket drive sheave rotates with liquid level changes, the motion turns the transmitter drive shaft. The drive shaft rotates electromechanical encoders, which records the absolute level and outputs a varying current. An increase in current normally indicates a rising liquid level. An outage (reverse) reading current output option is available.

A typical installation of the 8920 LPT consists of directly mounting it onto a 2500 ATG gaugehead. It may also be mounted onto a gaugehead of other manufacturers.

The transmitter requires nominal electrical input of 20 – 48 VDC, 2 W of regulated direct current, or an optional 85–305 VAC, 50/60 Hz, 4.5 W alternating current. The level transmitter outputs level data in the range of 4–20 mA on an analog loop.



## 2 Installation

### Unpacking

The 8920 LPT is shipped fully assembled and ready for installation.

Place the shipping container on a secure bench before unpacking. Open the shipping container, taking care not to damage the contents. Carefully remove transmitter from the shipping container and place it on top of the bench. Inspect it for shipping damage and report any damage to the carrier.

### Storage Prior to Installation

If the transmitter is to be stored prior to installation, it should be repacked in its shipping container and stored in a temperature and humidity-controlled environment.

**Caution!** This equipment should be installed only by qualified personnel familiar with the installation instructions in this manual and in the *2500 Automatic Tank Gauge Installation and Operations Manual*.

### Mounting on Varec Gaugeheads

This procedure provides instructions to mount the transmitter on a 2500 ATG gaugehead.

Instructions applicable to other tank gauges follow in later paragraphs. To install the gaugehead, refer to the *2500 Automatic Tank Gauge Installation and Operations Manual*. The exploded view in that manual shows the mechanical relationship between this accessory and the gaugehead.

**Warning!** Whenever the back cover of the gaugehead is removed, stand to one side as the last bolt is removed. If the negator motor spring is broken, the broken pieces may cause injury when the cover is removed.

**Warning!** The mechanical connections between the gauge float guide cables, the float, the tape, and the gaugehead provide an adequate ground connection for the safe drain of electrostatic charges that may accumulate in the tank and the product. Worker activity and worker clothing may accumulate electrostatic charges on the body of a worker. Care should be used in flammable environments to avoid the hazard.

Make certain grounding straps are fastened properly to the case of each unit. Ground connections via mounting clamps and bolts are not sufficient to ensure proper ground.

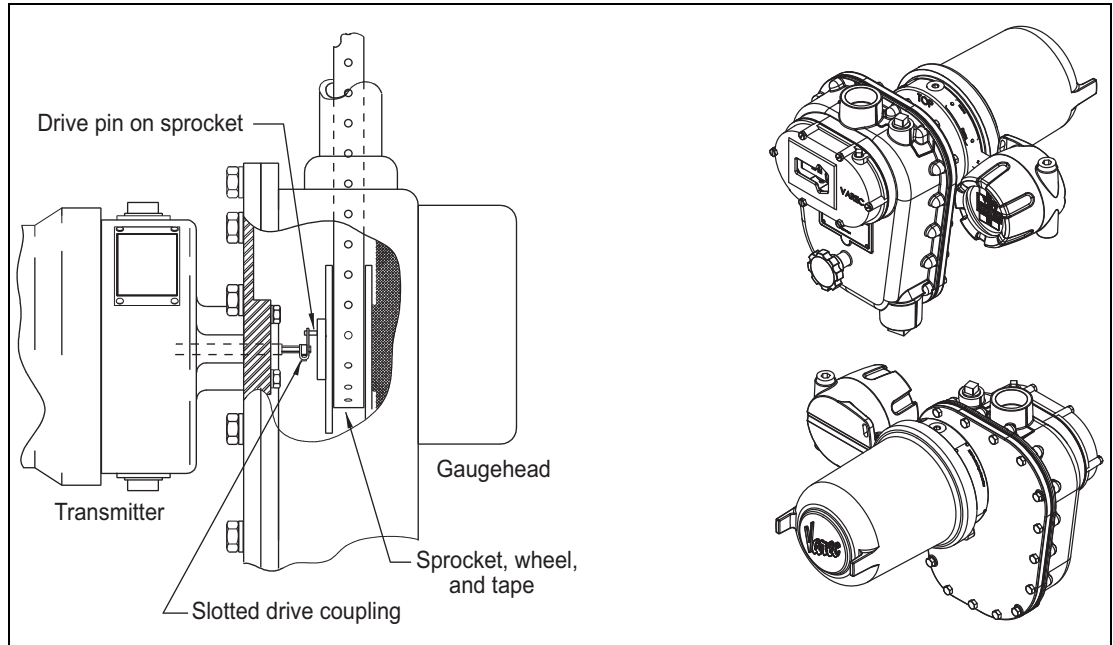
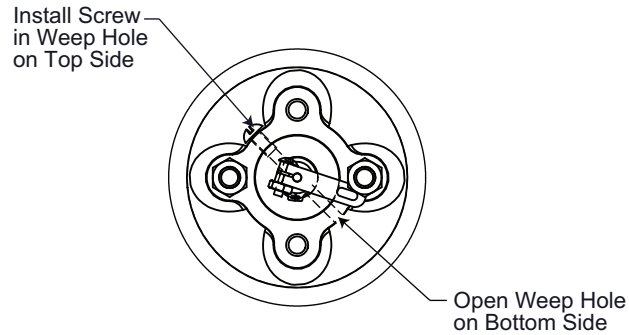


Figure 2-1: Typical Transmitter Mounting

Follow the steps below to mount:

1. Remove the back cover of the gaugehead (see the *2500 Automatic Tank Gauge Installation and Operations Manual*).
2. Remove the access cap from the back cover of the gaugehead (see the *2500 Automatic Tank Gauge Installation and Operations Manual*). Remove and discard the four fiber washers.
3. The preferred mounting of the transmitter is to secure the transmitter onto the back cover of the gaugehead, using the four hex head cap screws that are attached to the access cap. Make sure that the top of the 8920 LPT housing (marked with "TOP") lines up with the top of the back cover. Position the circular gasket with the four bolt holes between the transmitter and back cover.
4. Position the back cover and transmitter so that the drive pin on the gaugehead sprocket passes through the slotted drive coupling on the transmitter drive shaft.
5. Ensure the top side weep hole is plugged with the included screw as shown in the following figure to prevent ingress of water into the transmitter.





6. Fasten the back cover to the gaugehead.
7. Proceed with field wiring. See the [“Field Wiring”](#) section.

## Mounting on Alternate Gaugeheads

The following steps describe the typical tasks required for mounting the transmitter on other manufacturers' gaugeheads. An adapter is required.

The gaugehead is assumed to be installed on the tank. See the next figure on [“Mounting on Alternate Gaugeheads”](#) and perform the following steps.

1. Remove the mounting plate (back cover) from the gaugehead.
2. Remove the access cap from the mounting plate of the gaugehead. Keep the original gasket and bolts.
3. Mount the transmitter to the adapter, using the included gasket.
4. Install the transmitter with adapter on the gaugehead mounting plate, using the four hex head cap screws that are included with the adapter kit. Use the manufacturer's original gaugehead gasket between the mounting plate and the adapter. Make sure that the top of the 8920 LPT housing (marked with “TOP”) lines up with the top of the mounting plate.
5. Position the mounting plate and transmitter so that the drive pin on the gaugehead sprocket passes through the slotted drive coupling on the transmitter drive shaft.
6. Fasten the mounting plate to the gaugehead.
7. Proceed with field wiring. See the [“Field Wiring”](#) section.

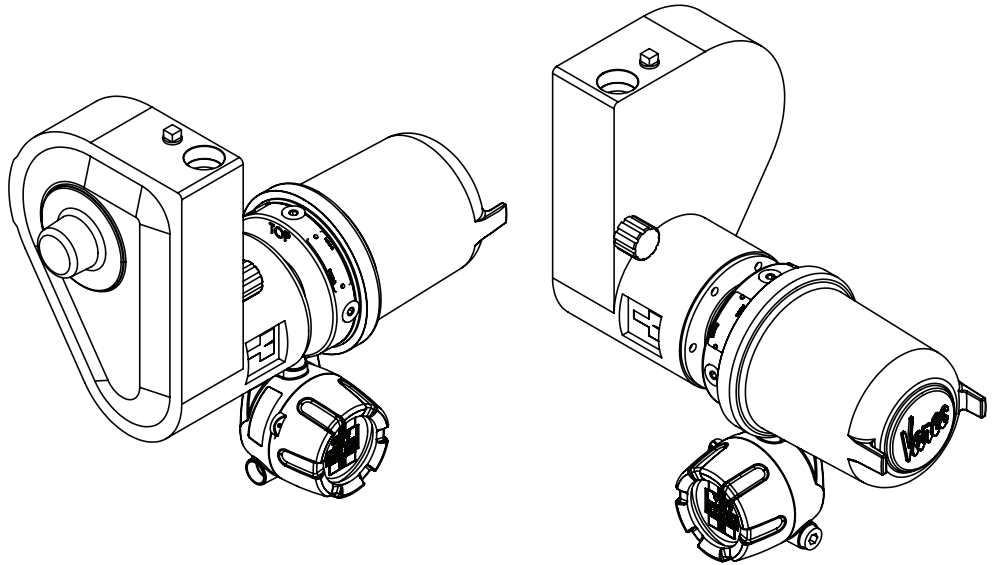


Figure 2-2: Mounting on Alternate Gaugeheads

## Water and Dust Ingress Protection

The enclosure and junction boxes have been designed and tested to IP66 and NEMA 4 for water and dust ingress. To ensure that the unit is protected against water and dust ingress and that the explosion proof/flameproof integrity of the enclosure is not compromised, ensure the following:

1. Cover o-rings are installed, undamaged, and properly seated prior to tightening.
2. The metal, explosion proof/flameproof conduit entry plugs provided with the transmitter are properly installed.
3. Conduit seals are installed per the local code. Varec recommends that a potting compound be used that will not absorb water. Varec also recommends a drain on vertical conduit runs with an explosion proof/flameproof flame arrestor.
4. Seal all pipe threads (e.g., conduit and plugs) with a pipe sealant or Teflon tape.

The cover set screws are backed out enough to allow the covers to be fully tightened and the covers are fully tightened. The covers may be locked, if desired, with the set screws after the covers are tight.

## Field Wiring

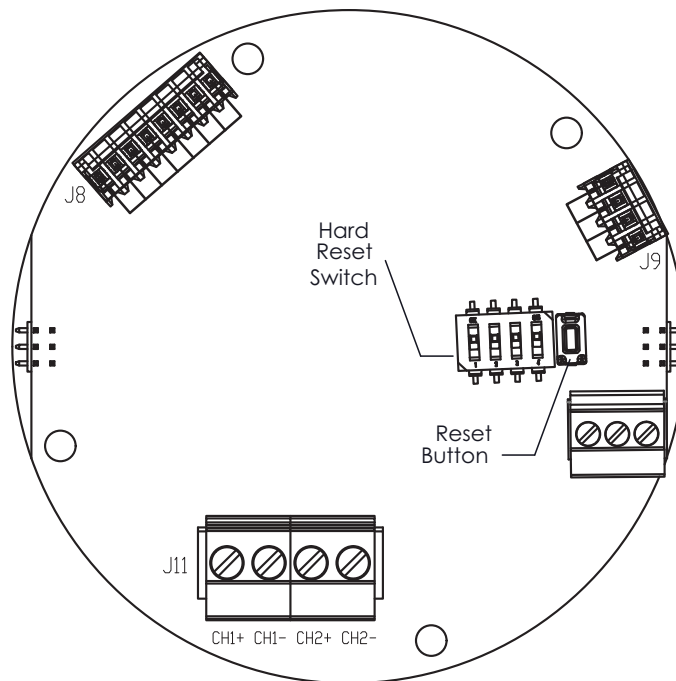
**Warning!** Do not apply power to the transmitter until all wiring connections have been made and the cover of the transmitter has been replaced.

**Warning!** Do not apply power until the jumper settings have been checked and the instrumentation current loop rechecked. Do not apply power in a hazardous environment until the explosion proof case is closed.

**Caution!** Incorrect field wiring connections can damage the transmitter electronics and cause system malfunctions. Note difference between user-furnished and on-board power.

[Figure 2-4 on page 14](#) illustrates typical field wiring for a transmitter installation with an on-board power supply.

Each transmitter has a two-conductor signal cable back to the control room. If AC power is required, an additional three-conductor cable is wired to the 8920 LPT for 85–305 VAC. Follow national and local codes for wiring of power and signal cables.



*Figure 2-3: Typical Field Wiring for Back of Display Board*

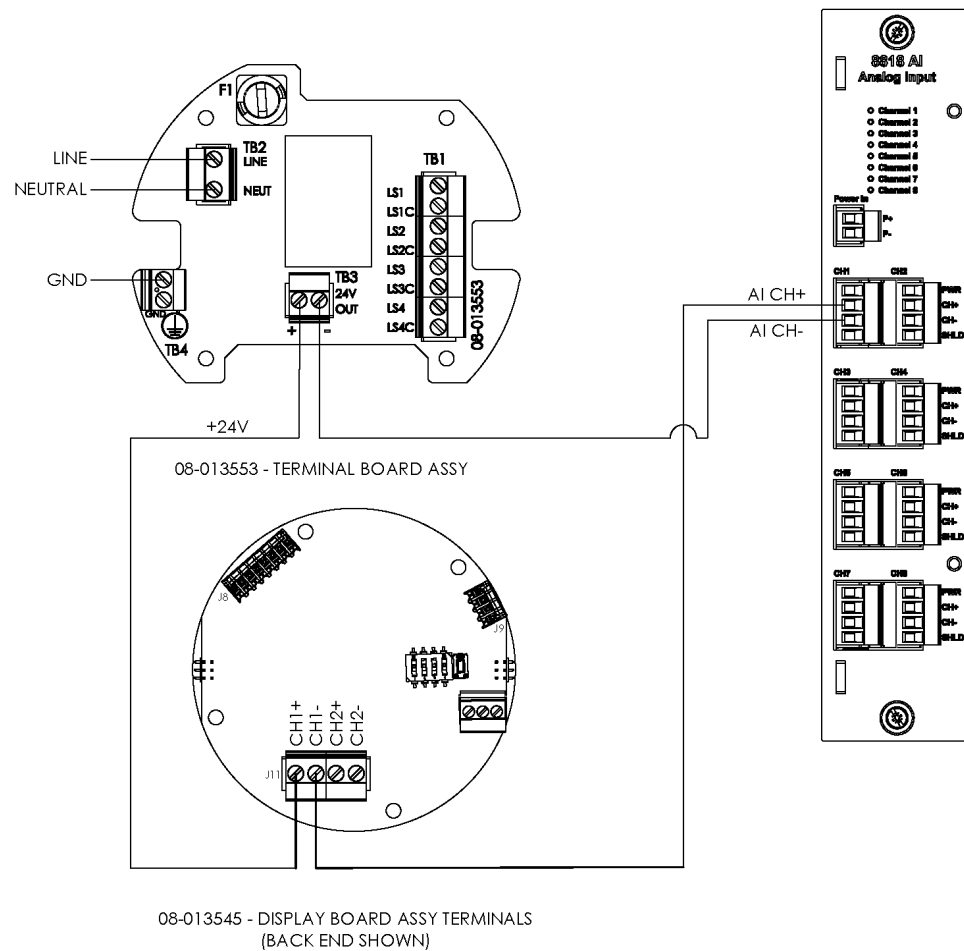


Figure 2-4: Field Wiring the 8920 LPT to an 8818 Analog Input Module

## AC Electrical Connections

Follow the steps below to install AC line power:

1. AC Line Power connects to **TB2 LINE**.
2. The neutral connector connects to **TB2 NEUT**.
3. The ground connector connects to **TB4 (Ground Symbol)**.
4. On the terminal board, connect **TB3 24V+** to **J11 CH1+** on the display board.
5. On the display board, connect **J11 CH1-** to **AI CH+** on the 8818 AI Analog Input module.
6. On the 8818 AI Analog Input module, connect **AI CH-** to **TB3 24V-** on the terminal board.

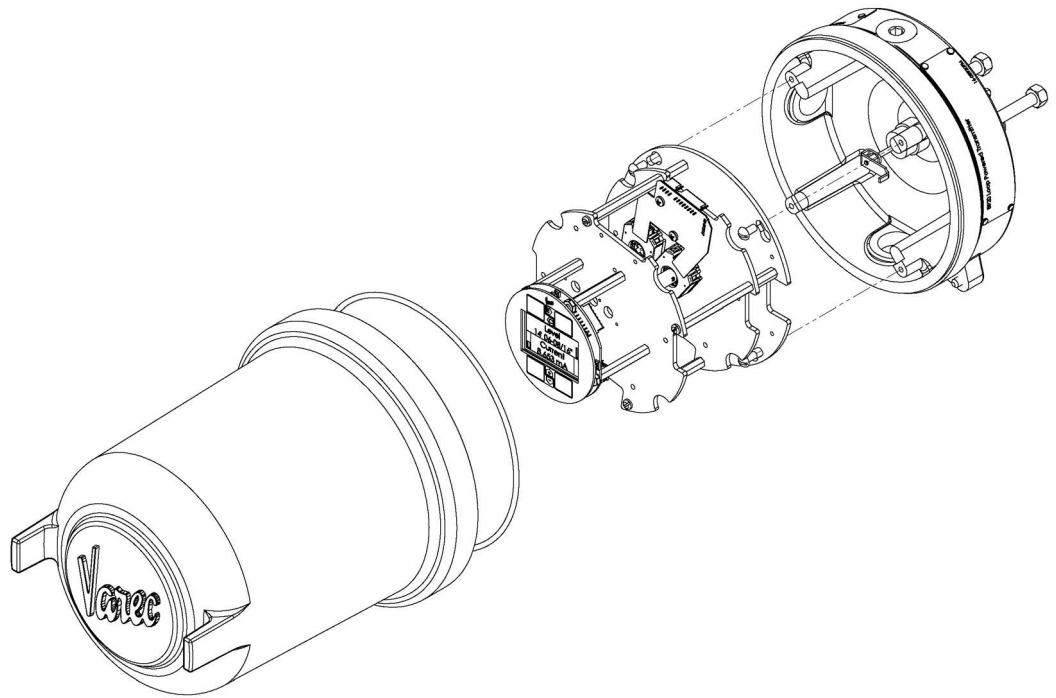
## User-Furnished DC Power (Loop Powered)

1. Connect the (+) lead of the user power to **CH1+**.
2. Connect the (-) lead of the user power to **CH1-**.

## Junction Boxes and Limit Switches

The 8920 LPT is shown without the optional junction box in [Figure 2-5 on page 15](#). See [Figure 2-6 on page 16](#) that shows it with the optional junction box. See [Figure 2-7 on page 17](#) and the accompanying tables for details regarding junction box connections.

The 8920 LPT offers two or four limit switches as options. The wiring is prewired Normally Closed (N.C.). The switch has connections for N.C. and Normally Open (N.O.). All switches use one common wire. The customer may change the connection on the switch if N.O. wiring is desired.



*Figure 2-5: 8920 LPT Exploded View – Loop Powered with Internal Display*

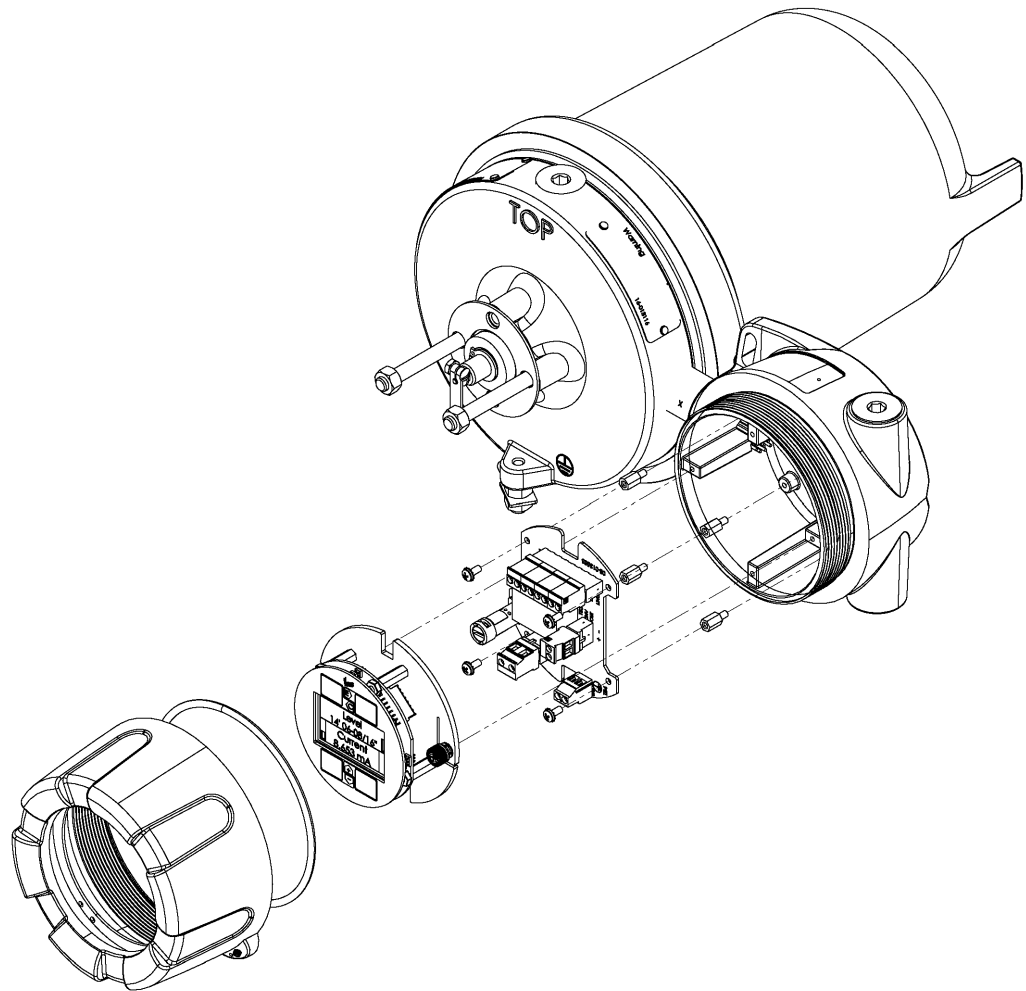


Figure 2-6: 8920 LPT Exploded View with External Display (Junction Box Side)

Refer to [Table 2-1 on page 17](#) and [Table 2-2 on page 18](#) for more information on limit switch connections.

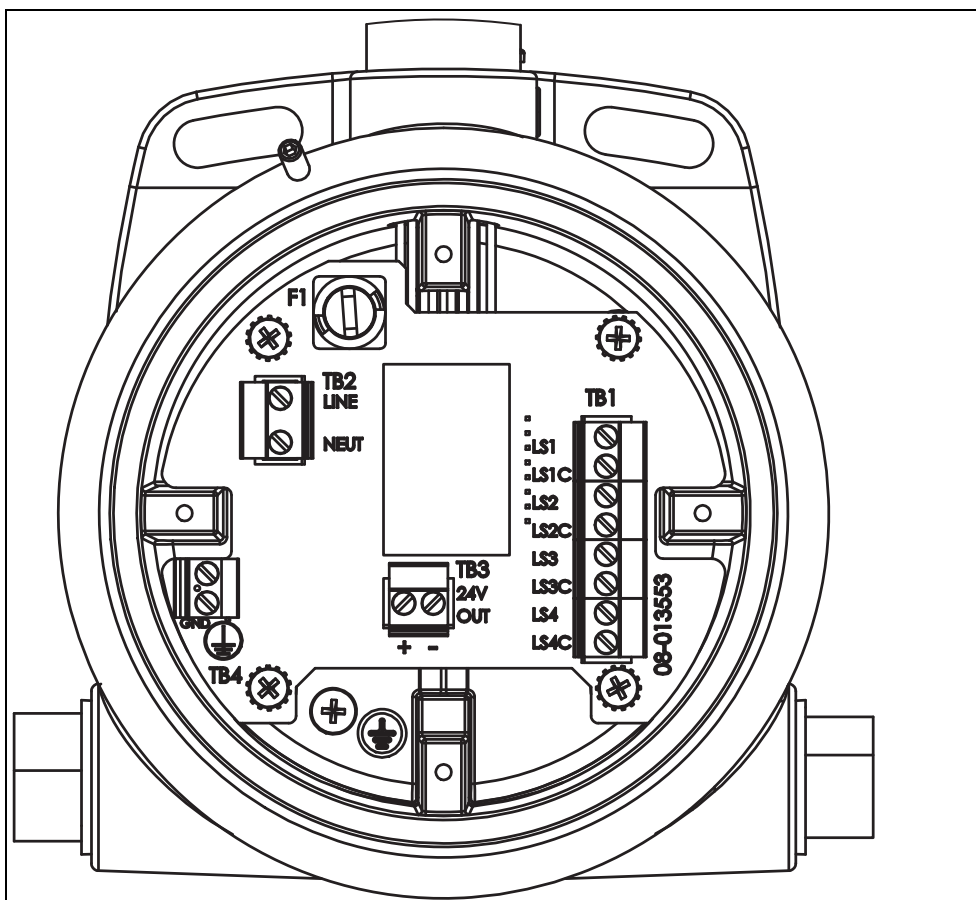


Figure 2-7: Junction Box DC Connectors

TB1	
Connection	Description
LS1	Limit Switch 1
LS1C	Limit Switch 1 Common
LS2	Limit Switch 2
LS2C	Limit Switch 2 Common
LS3	Limit Switch 3
LS3C	Limit Switch 3 Common
LS4	Limit Switch 4
LS4C	Limit Switch 4 Common
TB2	
LINE	AC Line
NEUT	AC Neutral

Table 2-1: Junction Box Terminals

TB3	
Connection	Description
+24V	24V Out (+)
–OUT	24V Out Common (–)
TB4	
	Earth/AC Ground
	Earth/AC Ground

Table 2-2: Junction Box Terminals (cont.)

## Initial Calibration

Transmitters are calibrated at the factory for full scale range operation. The scale may be selected by the user to any range between 0–100% (0-120'). Refer to [“Calibration” on page 32](#) for calibration procedures. Calculate the loop resistance of the installed instrumentation for full-scale operation before installing the wiring. Then check it after the wiring has been installed.

## Installation Checkout

Check the rotation of the sprocket sheave and transmitter mechanical coupling. Check the installation of the instrumentation wire loop. Proceed to [“Initial Checkout and Power-up” on page 35](#).



## Resistance Curve

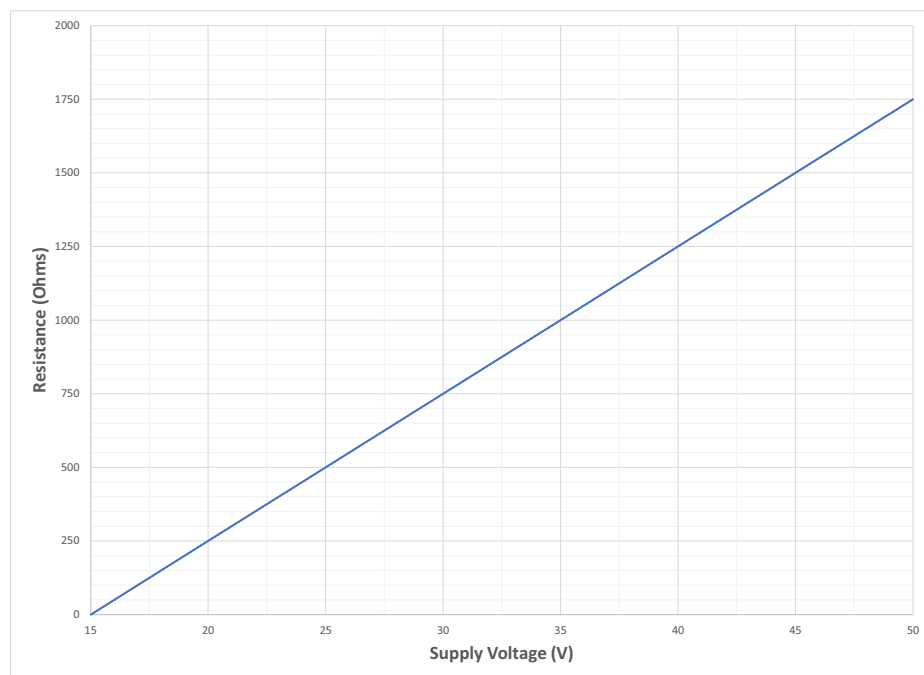


Figure 2-8: Loop Resistance



### 3 Display and Configuration Interface

The 8920 LPT local display serves two functions: It displays tank information, transmitter status, and output signal as well as allows you to program all features and functions of the 8920 LPT. A hot work permit is not required for models with an external display in a junction box when configuring the transmitter, but is required if opening the transmitter body to configure an internal display that is contained inside the enclosure. The display provides a system of menus that navigates you through the set-up process. The digital display is shown in the following figure.

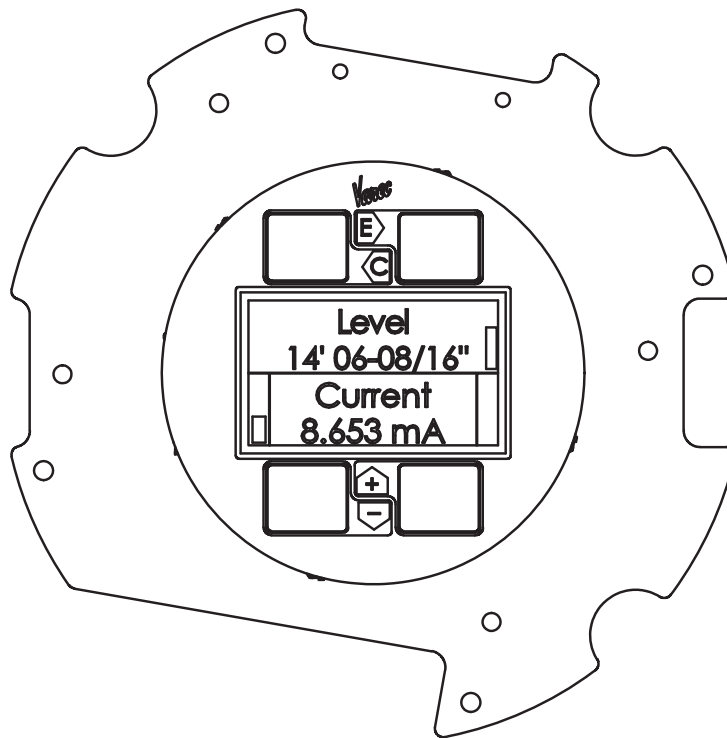


Figure 3-1: The 8920 LPT Display and Configuration Interface


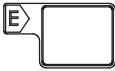

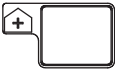
By default, the display shows the tank's **Level** on the top half and the **Current** in mA as well as alternating the % Range used on the bottom half of the display.

The side status indicators display information about the communications the 8920 LPT is receiving from other components, as follows:

Indicator	Description
Bottom Left	A visual indication of the level of the product in the tank, with marks at the quarter levels
Upper Right	A visual indication that the display is obtaining the most recent information—the bar should be changing over time to show the transmitter is operating

# Configuration

The display provides 4 capacitive–touch buttons and a 4–line LCD display. The buttons have the following functions:

	Name	Function
	Cancel	Cancels the operation and returns you to the previous menu
	Enter	Enters the selection or confirms the selection made
	Minus (–)	Scrolls down through the menu options
	Plus (+)	Scrolls up through the menu options

**Note** To adjust the LCD contrast on the screen, go to the Main Data display by pressing the E and Plus (+) or the E and Minus (–) to adjust the contrast up or down respectively. To access the configuration menu tree, press Enter.

The Main Menu appears as shown below:

Main Menu	00→
System Data	
Setup	
Encoder Data	

Use the Plus (+) and Minus (–) buttons to navigate through the Main menu. The selections in the Main menu and a description of each are listed in the table below.

Menu Selection	Description
System Data	Lists the software specifications of the system. Allows configuration of how the 8920 LPT presents data, such as data scroll rate or how the zero is displayed, and so on.
Setup	Contains basic configuration parameters, such as minimum and maximum level, gauge type, and encoder direction.
Encoder Data	Contains parameters about the encoder, such as unit temperature, number of resets, and so on.
Analog Output	AO data is preconfigured calibration data. Also, these points provide configuration parameters for setting the scale and offset of the measurement and reference data.
Calibration	Allows you to recalibrate the transmitter.

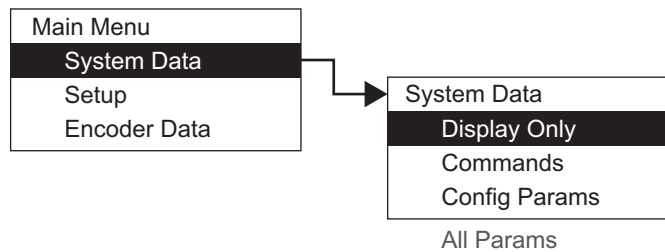
## System Data

The System Data is used to configure how the 8920 LPT user interface presents system data. System Data menu presents 4 options:

- Display Only — displays the current reading, such as with a level or temperature, or current setting such as feet or degrees Fahrenheit
- Commands — displays the commands available, such as align sensors
- Config Params — allows you to change the configuration parameters in System Data
- All Params — scrolls through the Display, Commands, and Config parameters in one all-inclusive list

### To Access the System Data

1. Press **Enter** to access the Main Menu. The System Data point is automatically highlighted.



2. Press **Enter** to open the System Data parameters and the System Data options appear.
3. To select one of the options, press **Minus (-)** to move the highlight to the option you want, and then press **Enter**.
4. Refer to the table below for more information on each System Menu option.

Display Only		Description
	softw. version	The firmware version
	Sys Checksum	CRC-16 Checksum of the firmware
	Build Date	The date the database structure was generated
	DB Size	The size of the database in bytes
	Num DB Pnts	The number of database points defined
	Board Number	The specific number of the encoder board
	Product SN	The product serial number
	Order Code	The product's order code of the encoder assembly added during production
	Hardware Version	The PCB hardware version

Commands		Description
	Admin PIN	Allows you to set the administrative PIN code. See <a href="#">“Administrative PIN”</a> .
	Display Test	The Display test temporarily illuminates all segments of the graphical display to test the operation of the display.
	Reset Cmd	The Reset Command allows reset of the transmitter through the user interface. A soft reset restarts the application. A hard reset resets all configuration data to default values.  <b>Note</b> Be careful not to perform a hard reset inadvertently.
	User PIN	Allows you to set the user PIN code. See <a href="#">“User PIN”</a> .
Config Params		Description
	Tag	The Tag contains 7 bytes of data to identify the transmitter. The format of the TAG is “LT xxx” where xxx is the transmitter address
	User Ref Level	
	Sec. Display 1 through 4	These parameters determine which data items is displayed in the lower (secondary) area of the display. Display 1 defaults to Tank Temperature. Display 3 & 4 default to no value (undefined)
	Prim Display	This determines data value displayed in the upper (primary) portion of the LCD The default in Tank Level
	Display Timeout	The time in seconds without a key press before the Display will returns to the main data display screen
	LCD Contrast	Set the contrast on the LCD. The LCD contrast can be adjusted from the Main Data display by pressing the E and Plus (+) or the E and Minus (–) to adjust the contrast up or down respectively
	Scroll Rate	The bottom portion of the display can display up to four data values by scrolling through the items. This parameter sets (in seconds) how long each item is displayed
	leading zeroes	Select to display leading zeros in front of the numerical values
	Format of zero	Selects either a zero or a zero with a slash
	Decimal Sep.	Selects the display of the decimal separator, either a period (.) or a comma (,)
All Params		Lists all Display, Commands, and Config Params in a list

## PIN Codes

PIN codes operate independently and are used to restrict access to configuration or to local calibration data.

PINs are numerical and the range is between 1 and 9999 inclusively. A PIN code of 0 (zero) indicates there is no PIN set, the PIN has timed out, or the PIN needs to be entered. The time out period is about 10 minutes. If the PIN times out, you must re-enter the PIN to continue working with the 8920 LPT.

The Administrative PIN locks all setup configuration menus for the 8920 LPT. However, it does not prevent access of the Level Calibration. The User PIN prevents access to Level Calibration. Using both PINs, you can completely prevent casual access to the 8920 LPT.

After the PINs are set, the appropriate PIN window opens depending on the type of data you are trying to access. For instance, if you are trying to access System Setup information, the Admin PIN window opens. If you are trying to set a Temperature Offset, the User PIN window opens.

### *Administrative PIN*

The Administrative PIN is set in the System Data menu. When set, the Admin PIN prohibits access to all configuration data.

#### **To Set the Admin PIN:**

1. Press **E** to gain access to the menus.
2. Press **E** to open the System Data menu.
3. Press **E** one time to access the Commands menu and the Admin PIN option opens.

**Note** If no PIN has been set, the Admin PIN displays a 0 (zero).

4. Press **E** to open Admin PIN.
5. Use the + and - keys to select the first number.
6. Press **E** to advance to the next digit.
7. Continue setting digits as needed.
8. With the Return arrow highlighted, press **E** two times. A message is shown "Editing enabled" to indicate that the PIN has been accepted and you can edit any configuration settings.

**Note** After about 10 minutes of no key presses, the 8920 LPT forces you to re-enter the PIN before allowing access.

### *User PIN*

The User PIN is set in the System Data menu. When set, the User PIN prohibits access to the following calibration data:

- Level
- Temperature Offset
- Manual Temperature
- Manual Level

**Note** The Admin PIN must be set before the User PIN can be set. Likewise, if the Admin PIN is removed, the User PIN is also removed.

### To Set the User PIN:

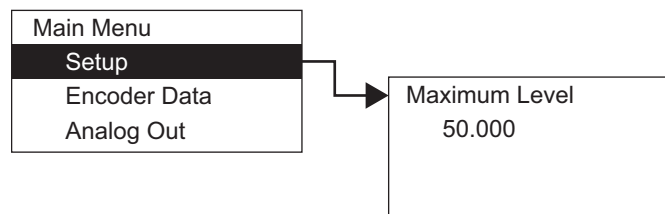
1. Press **E** to gain access to the menus.
2. Press **E** to open the System Data menu.
3. Press **E** one time to access the **Commands** menu and Enter Admin PIN option opens.
4. Enter the **Admin PIN**.
5. Scroll down to **User PIN**.
6. Press **E** to open User PIN.
7. Use the + and – keys to select the first number.
8. Press **E** to advance to the next digit.
9. Continue setting digits as needed.
10. With the Return arrow highlighted, press **E** two times. A message is shown "Editing enabled" to indicate that the PIN has been accepted and you can edit the above listed calibration settings.

## Setup

The Setup menu is used to configure various parameters of the device, such as level, temperature, and so on.

### To Access the Setup

1. Press **Enter** to access the Main Menu. The System Menu point is automatically highlighted.



2. Press the **up arrow** (the + arrow) or the **down arrow** (the – arrow) on the display interface to get to Setup.
3. Press **Enter** and the Setup menu opens.
4. To select one of the options, press **Minus (-)** to move the highlight to the option you want, and then press **Enter**.



Refer to the table below for more information on each Setup option.

Config	Description
Maximum Level	The 20 mA value for the tank
Cal Level	<p>Calibration Level is used to set (calibrate) the encoder level.</p> <p><b>Note</b> If you enter a decimal value, the 8920 LPT interprets the measurement as a decimal value and applies the Level Display Units to format the level</p> <p>If you enter a string of numbers separated by a dash (xx – xx – xx), the 8920 LPT applies the format of feet–inches–sixteenths</p>
Enc Failure mA	The mA output value if the encoder fails.
Gauge Type	<p>Mechanical Gauge Type:</p> <ul style="list-style-type: none"> <li>English for 2500 ATG English</li> <li>Metric for 2500 ATG Metric</li> </ul>
Lev Disp Units	Level Display Units – How the level is formatted on the Display, for example, in decimal feet, or feet, inches & 16ths, meters, and so on
Enc Direction	<p>The direction the encoder turns:</p> <ul style="list-style-type: none"> <li>Forward for Varec 2500 ATG</li> <li>Reverse for L&amp;J</li> </ul>
Minimum Level	The 4mA value for the tank

## Encoder Data

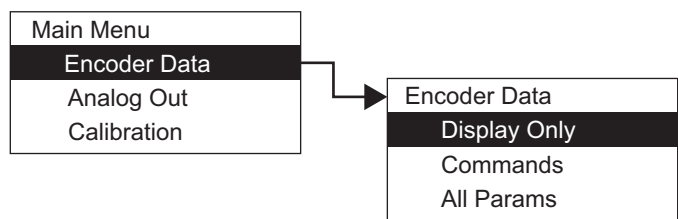
The Encoder Data point lists the parameters associated with the internal operation of the transmitter hardware. This includes parameters associated with the operation of the encoder. The Encoder Data is used to diagnose the current operation of the transmitter. The parameters can be used to evaluate the proper operation of the rotary switches as well as the proper operation of the encoders. The raw absolute and incremental encoder values can be evaluated. The current sensor states can be

evaluated. The calculated reference values can be evaluated. Encoder Data menu presents 3 options:

- Display Only — data display, such as level, or field voltage
- Commands — commands that can be executed from the Encoder Data menu
- All Params — scrolls through the Display, Commands, and Config parameters in one menu

To Access Encoder Data

1. Press **Enter** to access the Main Menu. The System Data menu is automatically highlighted.



2. Press the **up arrow** (the + arrow) or the **down arrow** (the - arrow) on the display interface to get to Encoder Data.
3. Press **Enter** and the Encoder Data menu opens as shown below.
4. To select one of the options, press **Minus (-)** to move the highlight to the option you want, and then press **Enter**.

Refer to the table below for more information on each Encoder Data option.

Display Only		Description
	Level	This parameter represents the level in feet derived from the absolute encoding process. This parameter is always encoded in the forward rotation direction.
	Pnt Status	Byte value indicating status of point. Values are: 0: No error
	Lev Disp Units	Indicates the level units that have been set to display level on the LCD Set in Setup
	Sixteenths	This parameter indicates the 1/16–inch portion of the level derived from the absolute encoding process This parameter is shown in 1/16–inch units
	Inches	This parameter indicates the inches portion of the level derived from the absolute encoding process This parameter is shown in inch units from zero to eleven in binary.
	Feet	This parameter indicates the feet portion of the level derived from the absolute encoding process This parameter is shown in foot units from zero to ninety–nine in binary
	Enc State	This is a diagnostic code that describes the encoder state
	Inch Disk	This parameter is a 12–bit value indicating the level read from the fractional foot (inches) encoder sensor
	Foot Disk	This parameter is a 12–bit value indicating the level read from the foot encoder sensor
Display Only		Description
	Number Resets	Shows the number of types the transmitter has reset – soft or power resets. This value resets to zero when a hard reset is performed.
	Internal Temp.	The temperature in degrees Fahrenheit of the internal electronics. Not supported
	Level Offset	
	Encoder Value	
Commands		
	No Action	
All Params		Lists all Display and Commands in a list.

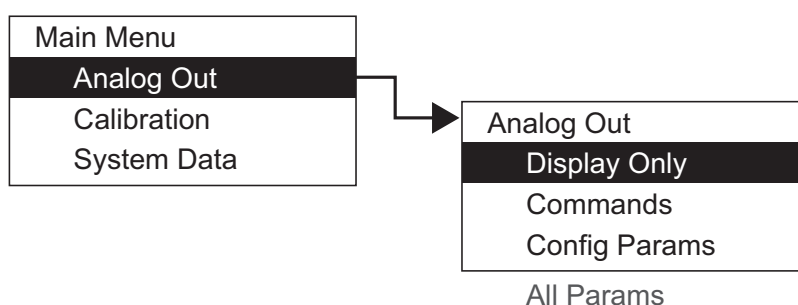
## Analog Out

Analog Out menu presents 4 options:

- Display Only — data display, such as reference values and percent range
- Commands — no commands are available
- Config Params — parameters that are used to configure data in Analog Out data
- All Params — scrolls through the Display, Commands, and Config parameters in one menu

## To Access Analog Out

1. Press **Enter** to access the Main Menu. The System Data menu option is automatically highlighted.



2. Press the **up arrow** (the + arrow) or the **down arrow** (the - arrow) on the display interface to get to Analog Out.
3. Press **Enter** and the **Analog Out** menu opens.
4. To select one of the options, press **Minus (-)** to move the highlight to the option you want and then press **Enter**.

Refer to the table below for more information on each Analog Out option.

Display Only		Description
	RefValue	Displays the data value from the Encoder level
	Pnt Status	Byte value indicating status of point Values are: 0: No error
	% Range	Displays the percent of range for the analog output value A 0 percent is 4 mA, and 100 is 20 mA
Commands		
		No Action
		Factory Reset

Config Params		
	Cal. Point #1	Calibration points form a curve which is used to correct the output signal, #1 corresponds to 4 mA
	Cal. Point #2	Calibration points form a curve which is used to correct the output signal, #2 corresponds to 8 mA
	Cal. Point #3	Calibration points form a curve which is used to correct the output signal, #3 corresponds to 12 mA
	Cal. Point #4	Calibration points form a curve which is used to correct the output signal, #4 corresponds to 16 mA
	Cal. Point #5	Calibration points form a curve which is used to correct the output signal, #5 corresponds to 20 mA
All Params		Lists all Display, Commands, and Config Params in a list

## Analog Output User Calibration

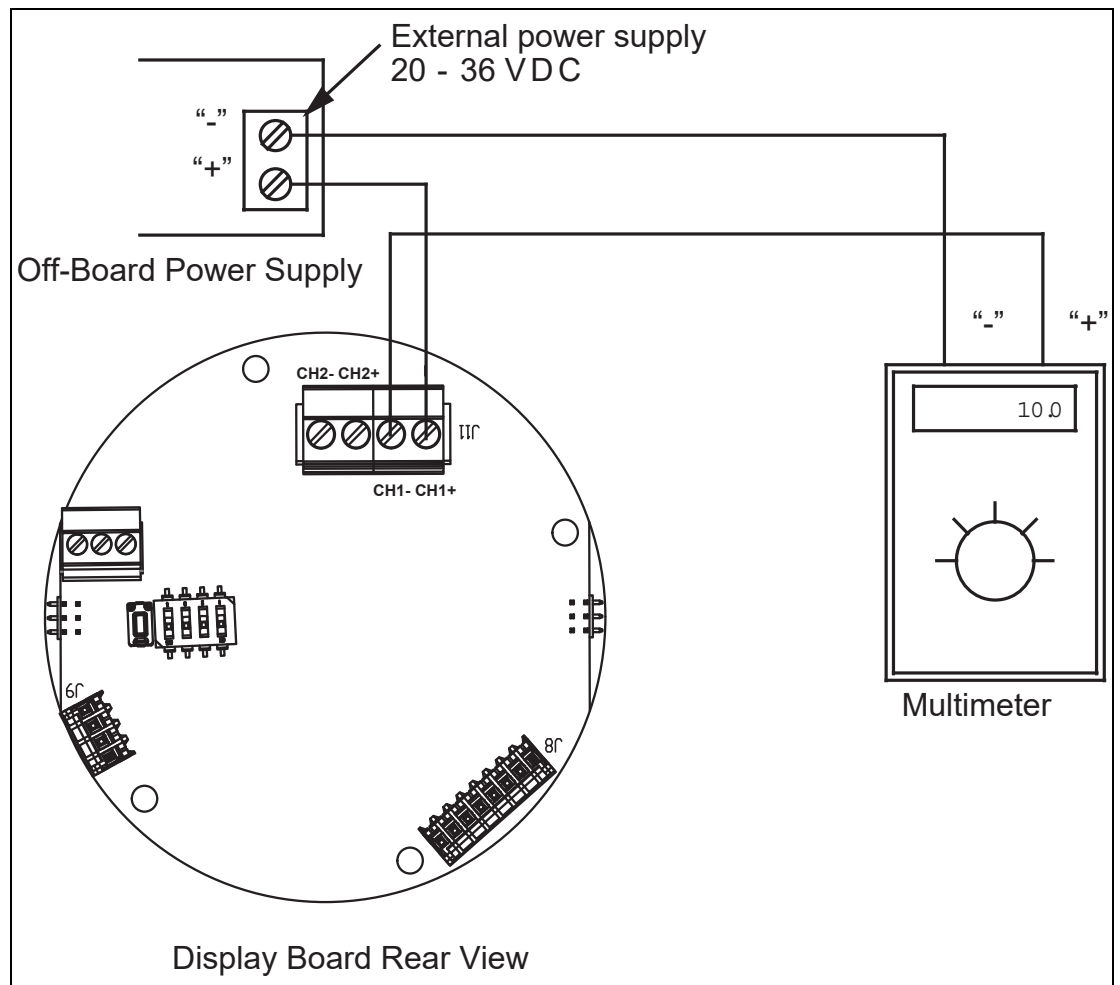


Figure 3-2: Calibration Test Setup

To calibrate the Analog Output, do the following:

**Warning!** Obtain a hot working permit before beginning this procedure in the field.

### *Output Calibration of Channel 1*

1. Wire up a meter to the 8920 LPT.
2. Connect terminals **CH1+** to **Power Supply +**.
3. Connect a calibrated 4–20 mA Meter to terminals **CH1–** to **Power Supply –**.
4. Select **Calibration** from the Main Menu on the 8920 LPT.
5. Select **Analog Output**.
6. Select **Analog Output #1**.
7. Monitor the 4–20 mA meter, and press the **E** button.
8. Enter the value from the 4–20 mA Meter into the **Cal. Point #1**.
9. Repeat this process for calibration points 2 through 5.
10. Press the **C** button twice to exit to the main menu

## Calibration

The Calibration menu selection allows the user to calibrate the 8920 LPT to the tank it is connected to through the display interface.

**Note** After the Calibration menu selection, the menu rolls over to the beginning (System Data) and continues through the menu sequence.

### Calibrate Level Shortcut

You can use a shortcut to calibrate the product level for the 8920 LPT. This procedure opens the Cal Level configuration parameter in the Setup menu.

To use the Cal Level shortcut:

1. Press and hold the **C** button for 4 to 5 seconds.
2. The display opens the Cal Level so you can set it.

The Setup menu and Cal Level description can be found in the Setup section. Level can be entered in either decimal format (nnn.nnn) or in Ft–In–16ths format (nnn–nn–nn.) If the level is entered in decimal format, the 8920 LPT assumes the value is the same unit as specified in the transmitter setup (**Basic Setup > Level Disp Units**). The level can be entered in Ft–In–16ths format regardless of the level display units. If the transmitter is set up for level units other than Ft–In 16ths, the level is converted to the transmitter level display units automatically.

## Calibration Steps

1. Press **E** to bring up the Main Menu.
2. Press the **up arrow** (the + arrow) or the **down arrow** (the – arrow) on the display interface to get to Calibration.
3. Press **E** to bring up Calibration.
4. Use the **up arrow** (the + arrow) or the **down arrow** (the – arrow) on the display interface to configure the calibration points as needed. Press **E** to move to the next digit. Press **E** again to finish the calibration point value and to go to the next calibration point you want to configure. Repeat this step for all calibration points that need to be configured.





## 4 Configuration

### Initial Checkout and Power-up

1. Recheck wiring throughout the instrumentation loop.
2. Replace the explosion proof cover on the transmitter.
3. Apply power.
4. Proceed to calibrate the level.
5. Check that tank data is received and displayed correctly. At the 2500 ATG gaugehead, rotate the check knob and determine that the receiving end of the instrumentation indicates the check knob movement.

### Limit Switch Operational Setup

**Warning!** Do not apply power to the transmitter until all connections have been made and the cover of the transmitter has been replaced.

The limit switches normally are configured in arrays of 2 or 4 switches. To set these switches proceed as follows:

1. Remove power or obtain a hot work permit before removing the transmitter cover.
2. Determine which switch sets which specific limit to be selected. (High, Low, etc.)
3. Use the indicator dial as a reference. Align the lobe on the cam to the selected limit. Spring washers are used to keep the cams from moving.



## 5 Maintenance

Maintenance of the 8920 LPT consists of routine regular inspections under normal operating conditions. The user should make sure that the shaft connecting the transmitter to the gaugehead is not binding and that operation of the check knob on the gaugehead results in an appropriate change on the receiving instrument. The mechanical coupling to the potentiometer should be free and not binding.

Varec provides maintenance service contracts that provide regular periodic inspection and maintenance at substantial savings. Some repair tasks may require special tools.

## Major System Assemblies and Components

The major system assemblies and components for the 8920 LPT are identified in [Table 5-1](#) and illustrated in [Figure 5-1](#).

Item	Part No.	Description
1	D5235-011	Transmitter Cover
2	P14-170	Transmitter Cover O-ring
3	N8920-EAabcdef	8920 LPT Electronics Assembly
4	05-013229-CVR	Junction Box Window Cover
	05-013230-CVR	Junction Box Solid Cover
5	P14-185	Junction Box Cover O-ring
6	06-013607-S	8920 LPT External Display Assembly - Single Channel
	06-013607-D	8920 LPT External Display Assembly - Dual Channel + RTD
	06-013607-H	8920 LPT External Display Assembly - HART + Single Channel + RTD
	06-013607-A	8920 LPT External Display Assembly - Full Build: HART + Dual Channel + RTD
7	08-013553-1	8920 LPT AC / Terminal Board Assembly - Full Build: AC & Limit Switch Terminals
	08-013553-2	8920 LPT AC / Terminal Board Assembly - AC Only
	08-013553-3	8920 LPT AC / Terminal Board Assembly - Limit Switch Terminals Only

Table 5-1: Major System Components

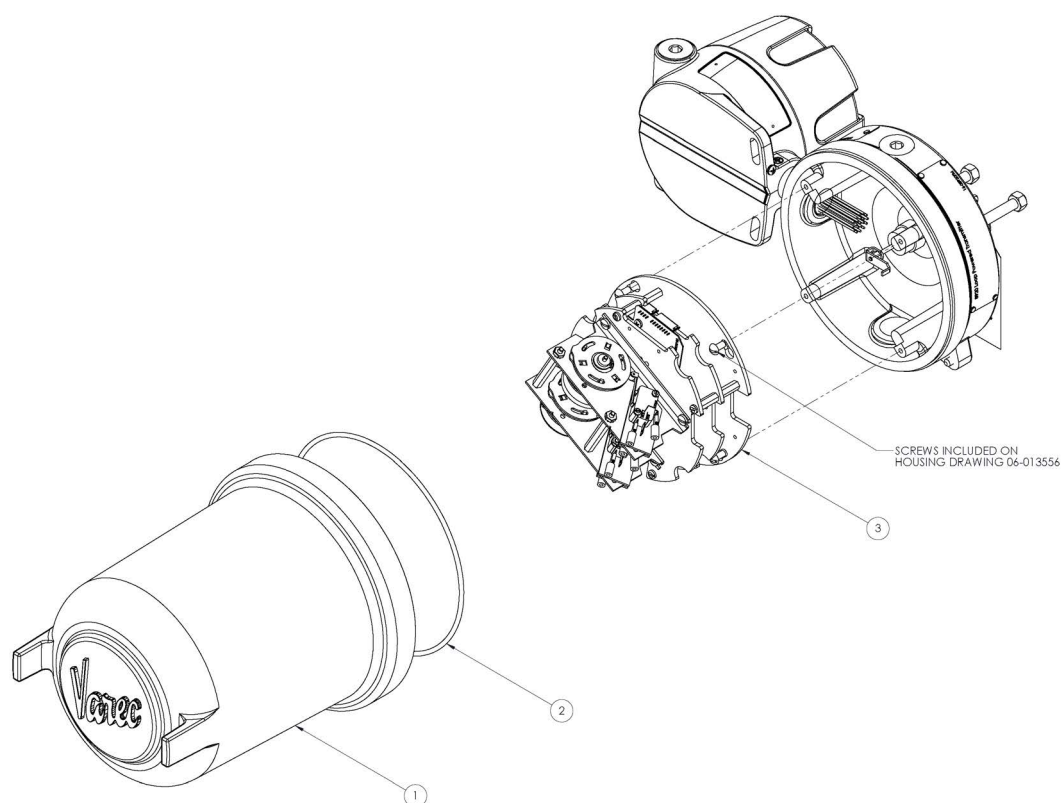


Figure 5-1: 8920 LPT Exploded View with External Display (Transmitter Side)

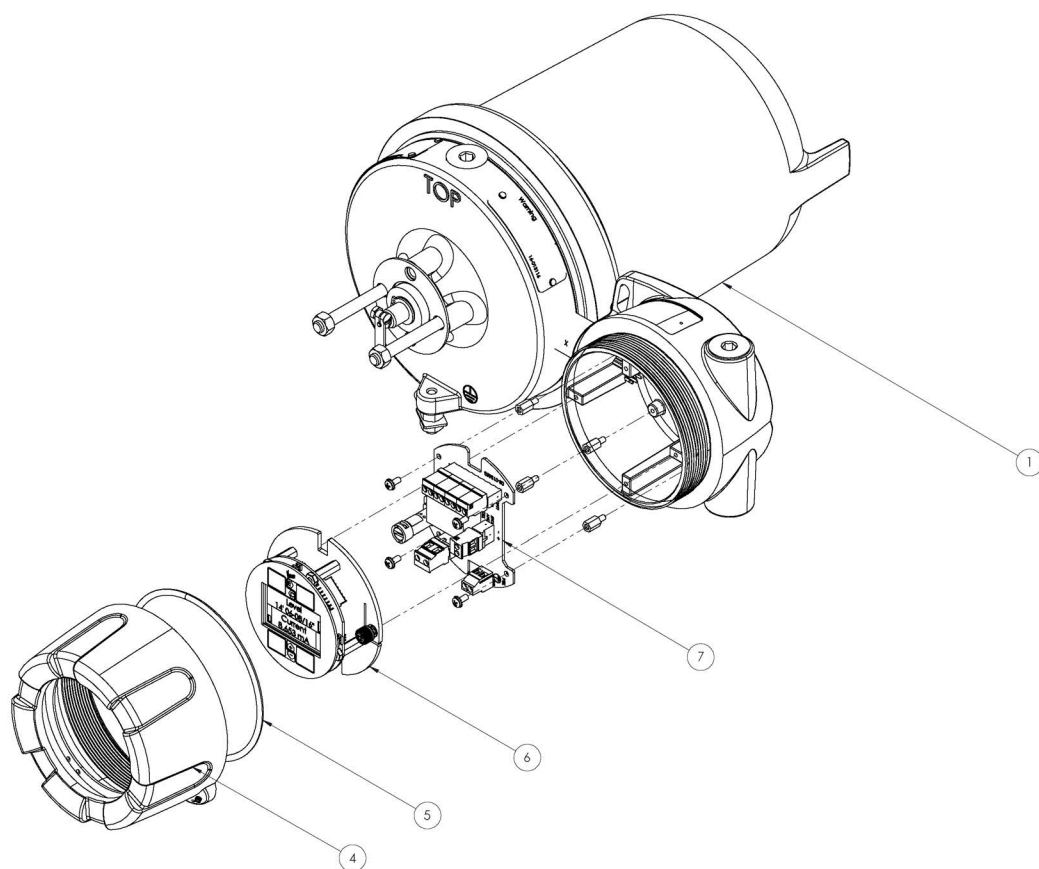


Figure 5-2: 8920 LPT Exploded View with External Display (Junction Box Side)

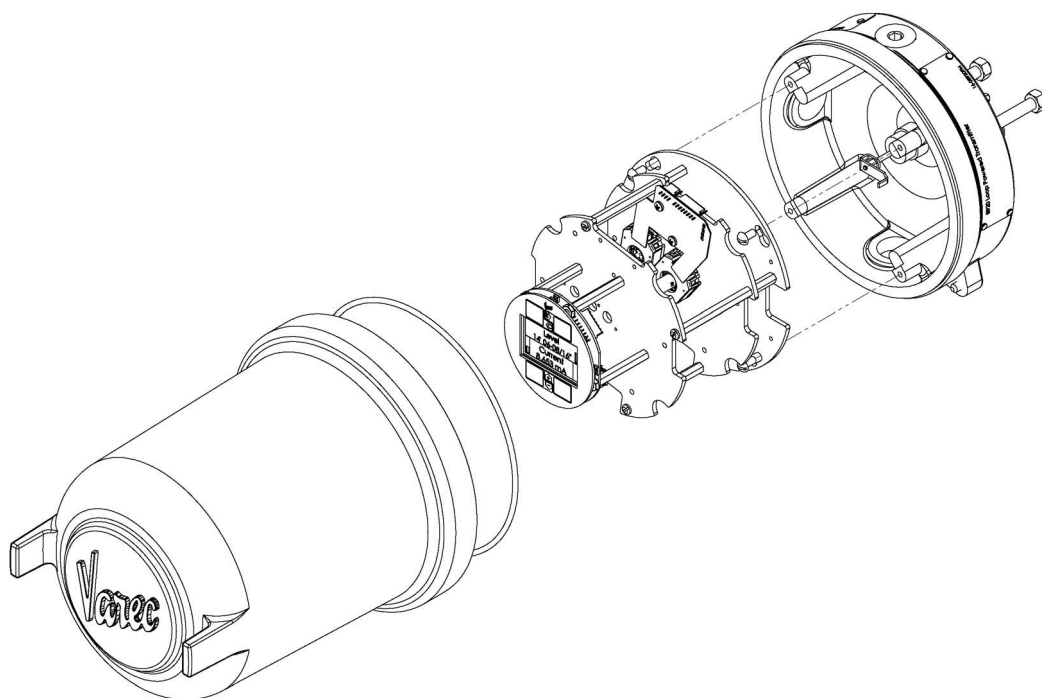


Figure 5-3: 8920 LPT Exploded View – Loop Powered with Internal Display

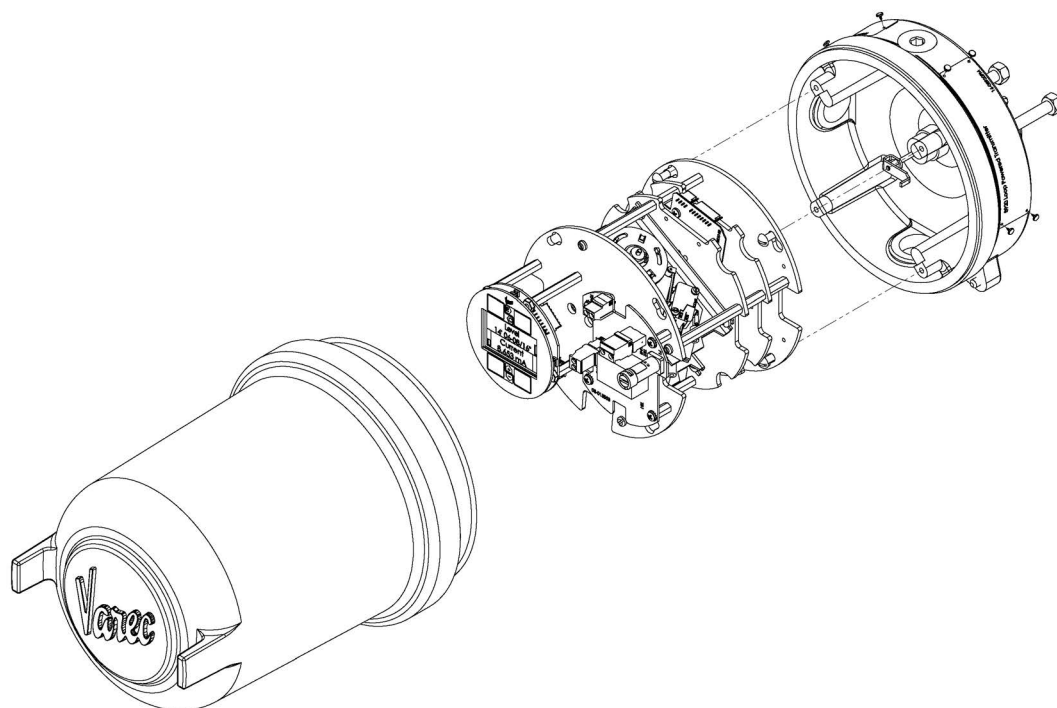


Figure 5-4: 8920 LPT Exploded View – AC Powered with External Display

## 6 Specifications

### General

Item	Specification
Accuracy	+/- 1/16th"
Repeatability	0.16% Full Range
Output Current Loop	4-20 mA, jumper selectable
Range Adjustment	0-100% (0-120')
Dimensions	13.75" W x 7.5" H x 15" D (350 mm x 190 mm x 380 mm)
Net Weight	17 lbs. (7.7 kg)
Enclosure	<ul style="list-style-type: none"> <li>Material: Impregnated Aluminum Base and Cover</li> <li>NEMA 4 IP66</li> </ul>
Electrical Requirements	<ul style="list-style-type: none"> <li>Operating voltage range 20 to 48 Volts DC (regulated), 2 W from external power supply OR</li> <li>85 to 305 VAC, 50/60 Hz, 4.5 W</li> </ul>

Table 6-1: General Specifications

### Available Level Ranges

Item	Specification
Feet	Adjustable min and max of 0-120.0' Limit switches have a range of 0-100'
Meters	Adjustable min and max of 0-36m Limit switches have a range of 0-30m

Table 6-2: Available Level Ranges

## Environmental

Item	Specification
Temperature	N8920FM: <ul style="list-style-type: none"> <li>-25 °C to +73 °C (-13 °F to +163 °F)</li> </ul> N8920AC & N8920FC: <ul style="list-style-type: none"> <li>-40 °C to +73 °C (-40 °F to +163 °F)</li> </ul>
Humidity	0 to 95% relative humidity (non-condensing)
Safety Approvals	N8920FC: (Divisions & Zones, Low Temp): Factory Mutual (cFMus) <ul style="list-style-type: none"> <li>Explosion Proof, Class I, Division 1, Groups C &amp; D, T5</li> <li>Class I, Zone 1, IIB, T5 (USA)</li> <li>Zone 1 per CEC 18-100 (CAN)</li> <li>-40 °C ≤ Ta ≤ +73 °C</li> </ul>
	N8920FM: Factory Mutual (cFMus) <ul style="list-style-type: none"> <li>Explosion Proof, Class I, Division 1, Groups C &amp; D, T5</li> <li>-25 °C ≤ Ta ≤ +73 °C: Enclosure NEMA 4</li> </ul>
	N8920AC: ATEX / IECEx / UKEx <ul style="list-style-type: none"> <li>Flameproof, EX II 2 G, Ex db IIB, T5 Gb</li> <li>-40 °C ≤ Ta ≤ +73 °C</li> </ul>
Environmental	IP66, NEMA 4

Table 6-3: Environmental Specifications



## Options and Accessories

Item	Specification
AC Power	
Limit Switches — Two (2) or four (4) SPDT limit switches (optional)	<p>They have the following ratings:</p> <ul style="list-style-type: none"> <li>• 11 amp @ 125, 250, 277 VAC</li> <li>• 4 amp @ 125 VAC Tungsten filament Lamp Load</li> <li>• 1/3 HP @ 125 VAC, 250 VDC</li> <li>• 1/2 amp @ 125 VDC, 1/4 A @ 250 VDC</li> </ul> <p><b>Note</b> The optional switches will be prewired for normally closed (N.C.) operation. They are mechanically operated directly from the main drive gearing and can be independently configured to switch at any desired tank level.</p>

Table 6-4: Options and Accessories



## 7 Order Codes

N8920						
Housing / Approvals						
	AC	ATEX/IECEX/UKEx (Low Temp.) II 2 G Ex db IIB T5 Gb -40° C ≤ Ta ≤ +73° C				
	FC	cFMus (USA & Canada – Divisions & Zones, Low Temp.) Class I, Division 1, Groups C&D, T5 Class I, Zone 1, IIB, T5 (USA) Zone 1 per CEC 18-100 (CAN) -40° C ≤ Ta ≤ +73° C				
	FM	cFMus (USA & Canada –Divisions, Std Temp.) Class I, Division 1, Groups C&D, T5 -25° C ≤ Ta ≤ +73° C				
Power						
	1	DC Power Input				
	2	AC Power Input				
Output						
	S	Single 4-20 mA Output (Level)				
	D	Dual 4-20 mA Outputs (Level & Temperature)				
	H	HART Output (Level & Temperature) (Pending)				
Limit Switches						
	0	No Limit Switches				
	2	2 SPDT Limit Switches (18° adjustable dwell, positive activation)				
	4	4 SPDT Limit Switches (18° adjustable dwell, positive activation)				
Limit Switch Range						
	N	N/A Range, No Limit Switches				
	A	0-25 ft Limit Switch Range				
	B	0-50 ft Limit Switch Range				
	C	0-100 ft Limit Switch Range				
	D	0-7.5 m Limit Switch Range				
	E	0-15 m Limit Switch Range				
	F	0-30 m Limit Switch Range				
Display Option						
	A	Forward Facing (standard) Display				
	B	Backward Facing Display				
	C	Side Facing Display				
	D	Internal Display				
N8920	aa	b	c	d	e	f

N8920 Electronic Assembly						
Housing/Approval						
	E	No Housing/Approvals, Electronic Assembly Only				
	A					
		Power				
		1	DC Power Input			
		2	AC Power Input			
		Output				
		S	Single 4-20 mA Output (Level)			
		D	Dual 4-20 mA Outputs (Level & Temperature)			
		H	HART Output (Level & Temperature) (Pending)			
		Limit Switches				
		0	No Limit Switches			
		2	2 SPDT Switches (18° adjustable dwell, positive activation)			
		4	4 SPDT Switches (18° adjustable dwell, positive activation)			
		Limit Switch Range				
		N	N/A Range, No Limit Switches			
		A	0-25 ft Limit Switch Range			
		B	0-50 ft Limit Switch Range			
		C	0-100 ft Limit Switch Range			
		D	0-7.5 m Limit Switch Range			
		E	0-15 m Limit Switch Range			
		F	0-30 m Limit Switch Range			
		Display Option				
		D	Internal Display			
		E	External Display			
N8920	a	b	c	d	e	f
	a					

## 8 Identification

### Device Designation

#### Warning

The following warning is posted on the instrument:

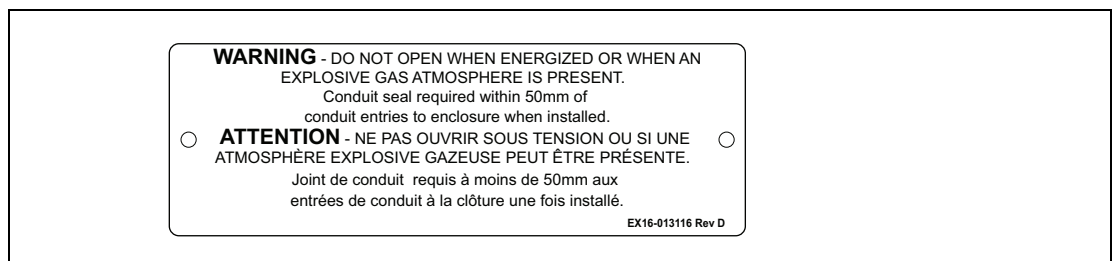


Figure 8-1: 8920 LPT Warning

#### Nameplate

The following technical data are given on the instrument nameplate:

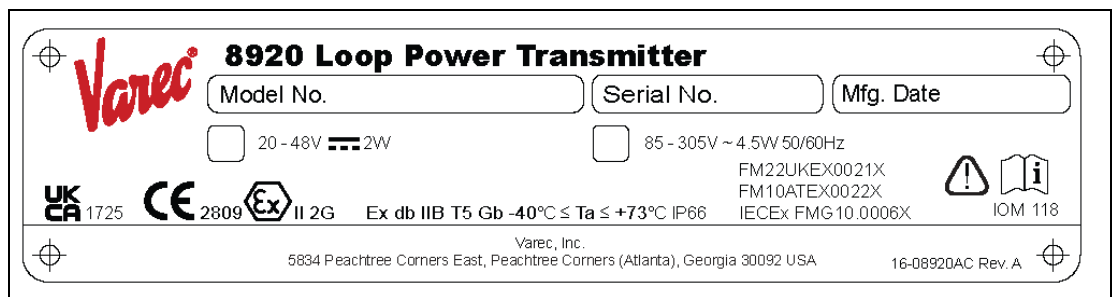


Figure 8-2: 8920 LPT Nameplate - 16-08920AC

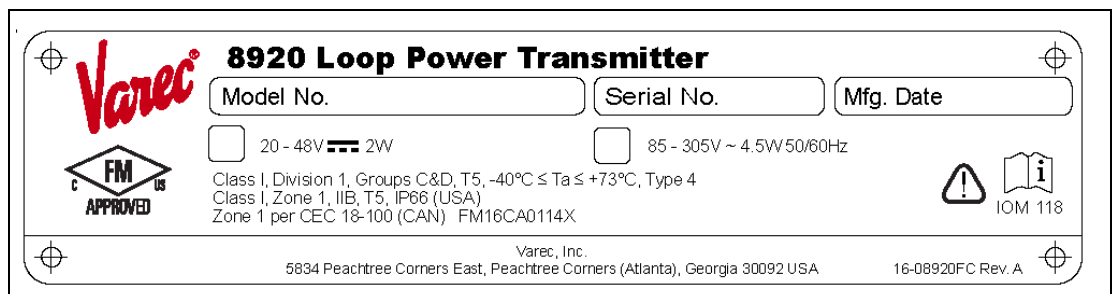


Figure 8-3: 8920 LPT Nameplate - 16-08920FC

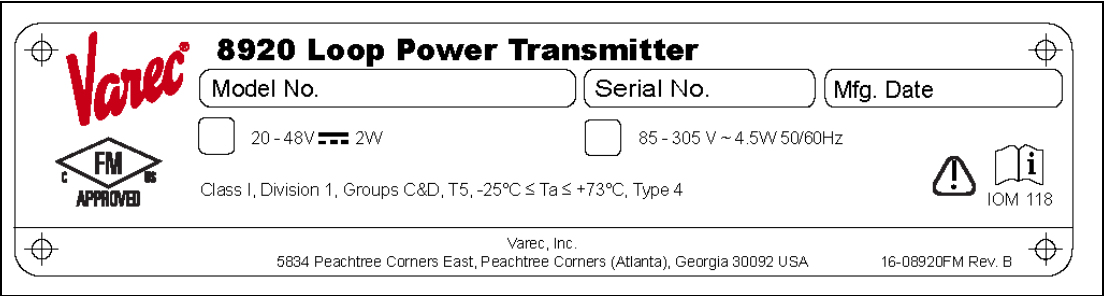


Figure 8-4: 8920 LPT Nameplate - 16-08920FM



