True Echo™ Pulse Radar Level Transmitter User Manual

Series PRL for Liquids and Series PRS for Solids

APG®

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Introduction

Thank you for purchasing a True Echo™ series PRL or PRS Pulse Radar Level Transmitter from APG. We appreciate your business! Please take a few minutes to familiarize yourself with your True Echo™ Radar Level Transmitter and this manual.

True Echo™ series Pulse Radar Level Transmitters bring the unassailably accurate level readings of radar sensors to difficult to solids and liquids. Whether powders or pellets, grains or granules, the True Echo™ PRS Dual Frequency Pulse Radar Level Transmitter For Solids quickly and accurately reads the complex reflections from piled solids. The True Echo™ PRL Pulse Radar Level Transmitter For Liquids comes with a variety of housing and antenna materials, but all are IP68 for worry-free level measurement, All True Echo™ sensors are field calibratable and fully programmable via RS-232, RS-485 Modbus, or Hart communications.

Reading your label

Every APG instrument comes with a label that includes the instrument's model number, part number, serial number, and a wiring pinout table. Please ensure that the part number and pinout table on your label match your order.

FCC Information

This equipment has been tested and found to comply with limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

IMPORTANT: Changes or Modifications not expressly approved by factory could void the user's authority to operate the equipment.

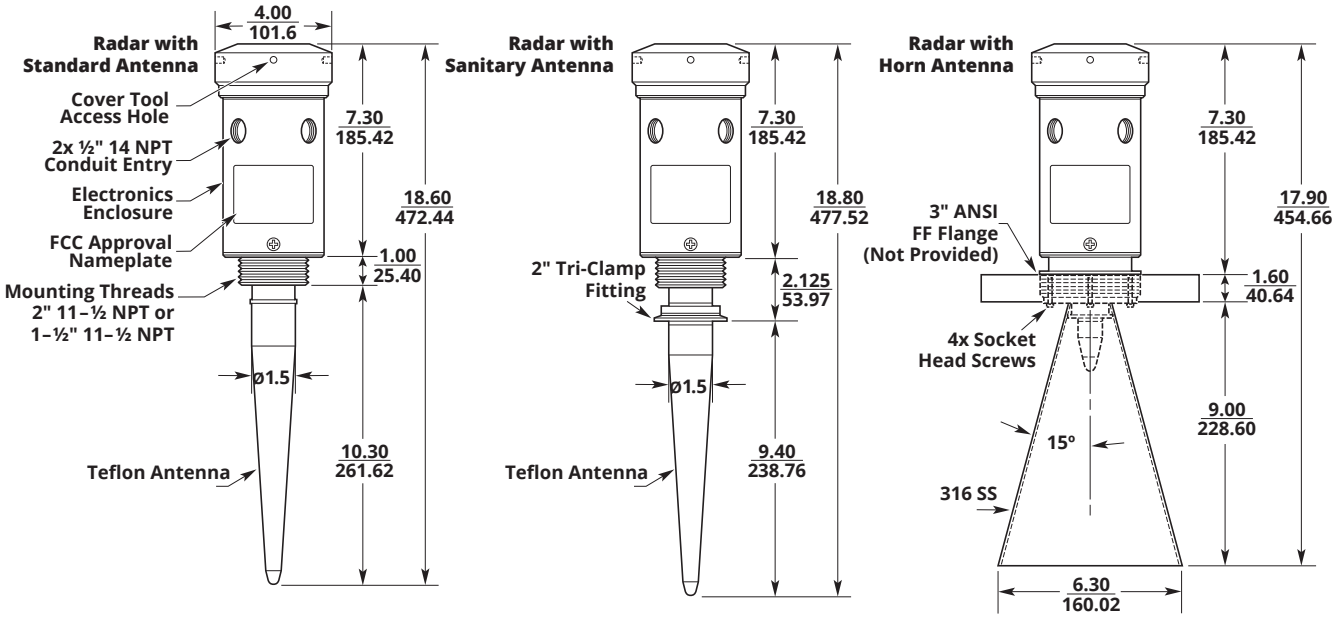
Warranty and Warranty Restrictions

This product is covered by APG's warranty to be free from defects in material and workmanship under normal use and service of the product for 24 months. For a full explanation of our Warranty, please visit https://www.apgsensors.com/about-us/terms-conditions. Contact Technical Support to receive a Return Material Authorization before shipping your product back.

Scan the QR code below to read the full explanation of our Warranty on your tablet or smartphone.

Chapter 1: Specifications and Options

• Dimensions



- **Specifications**

Performance

Operating Range	0 - 17 ft. / 0 - 5 m 0 - 50 ft. / 0 - 15 m 0 - 100 ft. / 0 - 30 m
Transducer Frequency	PRL: 6.3 MHz PRS: 6.3 MHz & 26 MHz
Target Dielectric Constant	$\varepsilon_r > 2$
Beam Spread	Teflon Antenna: 6° from center 316L SS Horn: 3° from center

Accuracy

Accuracy	±0.25% of measured range
Resolution	6.1 µA

Environmental

Housing Operating Temperature	-40 to 140°F (-40 to 60°C)
Process/Probe Temperature	
Standard Temperature	-40 to 176°F (-40 to 80°C)
High Temperature	-40 to 350°F (-40 to 177°C)
Sanitary Temperature	-40 to 400°F (-40 to 204°C)
Extreme Temperature	-40 to 572°F (-40 to 300°C)
Maximum Process Pressures	
Standard Temp/Pressure	5 bar (72.5 psi)
Standard Temp/High Pressure	70 bar (1015.3 psi)
High/Sanitary/Extreme Temps	2 bar (29 psi)
Housing Enclosure Rating	NEMA 6 / IP 68

Electrical

Supply Voltage	12-30 VDC; 20-35 VDC (HART) 115 VAC @ 60 Hz / 230 VAC @ 50 Hz
Current Draw	70 mA max, 1.68 W @ 24 VDC 1.7 VA for 115/230 VAC

Materials of Construction

Housing	Aluminum, 316L Stainless Steel
Antenna	Teflon, 316L Stainless Steel Horn

Mounting

Teflon Antenna	1.5” or 2” NPT
Sanitary Teflon Antenna	1.5” or 2” Sanitary Tri-Clamp
316L SS 6” Ø Horn	3” NPT
316L SS 13” Ø Horn	13” Ø Flange

Communication

Output	4-20 mA (shared common or isolated); HART
Calibration & Diagnostics	RS-232, RS-485 Modbus, HART

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• Model Number Configurators

Model Number: PRL - ___ - ____ - ____ - ____ - ____ - ____ - ____
A B C D E F G

A. Range

- □ **017** 17 ft (5m)
- □ **050** 50 ft (15m)
- □ **100** 100 ft (30m)

B. Supply Voltage, Signal

- □ **V115** 115 VAC (60 Hz) - 4-wire, Isolated 4-20 mA
- □ **V230** 230 VAC (50 Hz) - 4-wire, Isolated 4-20 mA
- □ **V024**▲ 12-30 VDC - 3-wire, 4-20 mA w/ shared common
- □ **V20L** 20-35 VDC - 2-wire HART†

C. PC Communications

- □ **C2** RS-232
- □ **C4**▲ RS-485
- □ **CH** HART†

D. Housing Material

- □ **AL**▲ Aluminum
- □ **SS** 316 Stainless Steel

Note: † CH HART PC Communications requires V20L 20-35 VDC Supply Voltage

E. Antenna Material

- □ **TE**▲ Teflon Rod
- □ **TE6** Teflon Rod with 6 in. extension
- □ **TE8** Teflon Rod with 8 in. extension
- □ **LT** Teflon Rod with 1.5 in. built-in extension
- □ **ST** Sanitary Tri-Clamp mount, Teflon Ant.†
- □ **HT** High Temperature Radar, Tefon Ant.
- □ **PT** High Pressure Tefon Rod Ant.(≤70 bar)†††
- □ **S6** 316L Stainless Steel 6” Ø Horn††
- □ **HS** High Temperature Radar, 316L SS Horn††

F. Mounting

- □ **T15** 1.5 in. NPT
- □ **T2**▲ 2 in. NPT
- □ **T3** 3 in. NPT
- □ **S15** 1.5 in. Sanitary Tri-Clamp (ST only)
- □ **S2** 2 in. Sanitary Tri-Clamp (ST only)
- □ **BF** 13 in. Ø 316L SS Bottom Flange (S6, HS only)

G. Firmware

- □ **S**▲ Standard
- □ **F** Fast Firmware
- □ **OW** Oil-Water Interface Detection††††

Note: † ST Teflon Rod Ant. with Sanitary Tri-Clamp mount requires S15 1.5 in. or S2 2 in. Sanitary Tri-Clamp mount

Note: †† S6 and HS 316L SS horns require T3 3 in. NPT or BF 13 in. Bottom Flange mount

Note: ††† PT High Pressure Teflon Rod requires T2 2 in NPT mount

Note: †††† OW Oil-Water Interface Detection requires Supply Voltage V024: 12-30 VDC and either TE Teflon Rod antenna or S6 316L SS horn antenna

▲This option is standard

Model Number: PRS - ___ - _____ - _____ - _____ - _____ - _____ - _____ - _____
A B C D E F G

A. Range

- □ **017** 17 ft (5m)
- □ **050** 50 ft (15m)
- □ **100** 100 ft (30m)

B. Supply Voltage, Signal

- □ **V115** 115 VAC (60 Hz) - 4-wire, Isolated 4-20 mA
- □ **V230** 230 VAC (50 Hz) - 4-wire, Isolated 4-20 mA
- □ **V024**▲ 12-30 VDC - 3-wire, 4-20 mA w/ shared common
- □ **V20L** 20-35 VDC - 2-wire HART†

C. PC Communications

- □ **C2** RS-232
- □ **C4**▲ RS-485
- □ **CH** HART†

Note: † CH HART PC Communications requires V20L 20-35 VDC Supply Voltage

D. Housing Material

- □ **AL**▲ Aluminum
- □ **SS** 316 Stainless Steel

E. Antenna Material

- □ **S6**▲ 316L Stainless Steel 6” Ø Horn
- □ **HS** High Temp. Radar, 316L SS 6” Ø Horn

F. Mounting

- □ **T3**▲ 3 in. NPT
- □ **BF** 13 in. Ø 316L SS Bottom Flange
- □ **A3** 8 in. Ø Swivel Aimer

G. Firmware

- □ **S**▲ Standard
- □ **F** Fast Firmware

▲This option is standard

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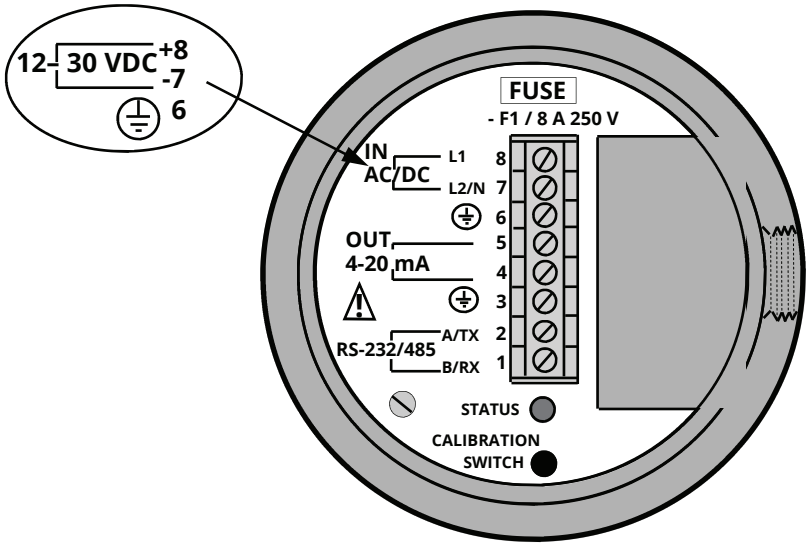
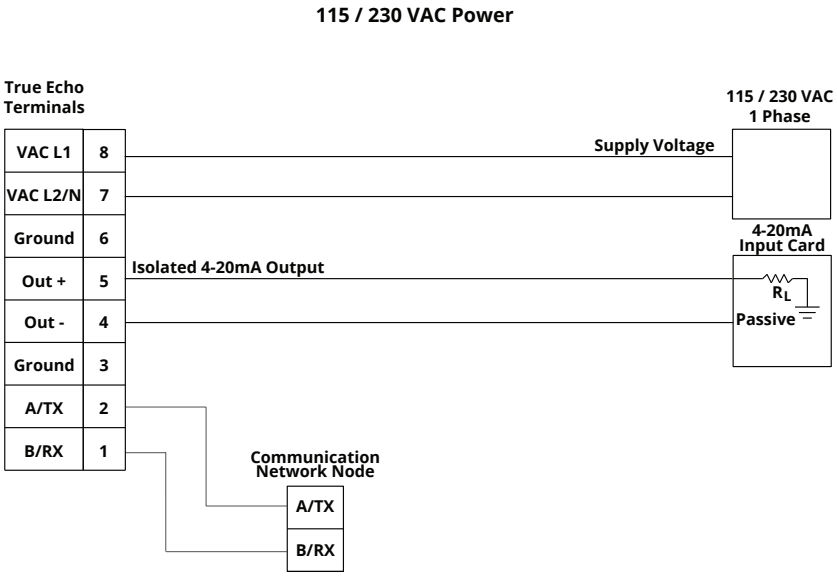
- **Electrical Terminals and System Wiring Diagrams**

Terminals



Power & Control Wiring For 115 or 230 1Ø VAC Supply

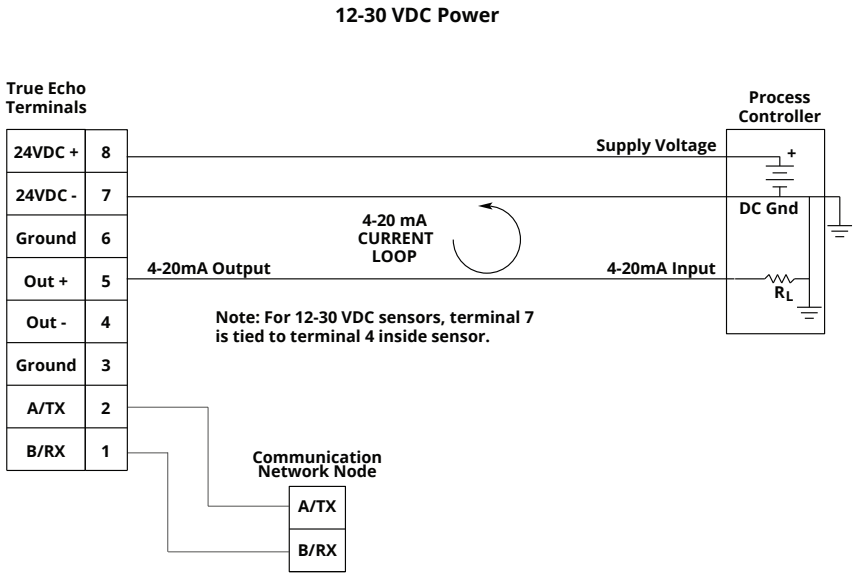


Recommended Wiring:

- Power - 3 Conductor, 22 AWG, 300V.
- Signal - 1 Shielded Twisted Pair, 24 AWG, 300V.
- Communication - 1 Shielded Twisted Pair, 24 AWG, 300V.

NOTE: For RS-232 or RS-485 direct to PC wiring, see Communication Connection Diagrams.

Power & Control Wiring For 12-30 VDC Supply

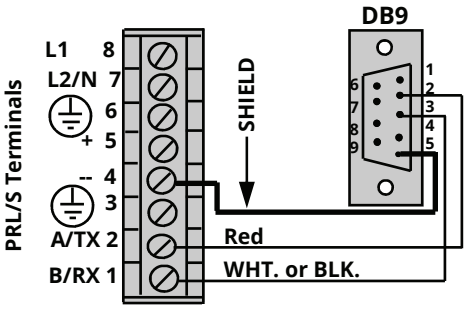


Recommended Wiring:

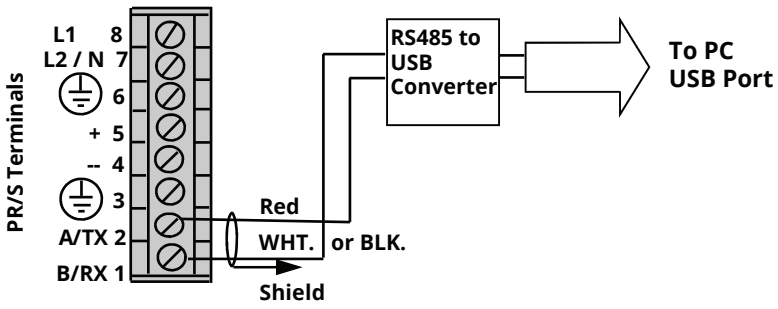
- Power & Signal - 3 Conductor, Shielded, 24 AWG, 300V.
- Communication - 1 Shielded Twisted Pair, 24 AWG, 300V.

NOTE: For RS-232 or RS-485 direct to PC wiring, see Communication Connection Diagrams.

Communication Connection Diagrams for RS-232 and RS-485/Modbus



RS-232 Serial Connection to PC



RS-485/Modbus Connection to PC

IMPORTANT: Shield wire for RS-485/Modbus must only be connected on one end. If connecting at radar terminals, use terminal 3.

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Chapter 2: Installation and Removal Procedures and Notes

• Tools Needed

- You should not need any tools to install your True Echo™ series Radar Level Transmitter. If you are using a stand pipe to mount your radar, you will probably need tools to install the stand pipe.

• Installation Notes

- Mount your True Echo™ series radar so that it has a clear, perpendicular path to the surface being monitored. Your sensor should be mounted away from tank or vessel inlets. Do not mount radar in center of domed tank. (See Figure 2.1)
- The radar path should be free from obstructions and as open as possible for the 4° off axis beam pattern.
- If you are using a stand pipe, please see our guide to stand pipes on our website: http://www.apgsensors.com/about-us/blog/how-to-install-a-stand-pipe.

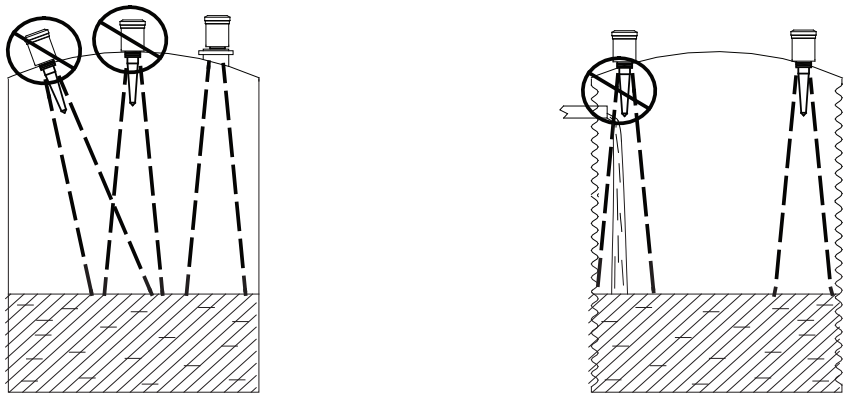

Figure 2.1

• Mounting Instructions

Mounting your radar level transmitter is easy if you follow a few simple steps:

- Never over-tighten the sensor.
- Always screw in your sensor by hand to avoid cross-threading. Thread failure can be a problem if you damage threads by over-tightening them or by crossing threads.

ⓘ IMPORTANT: Do not over tighten! The sensor should be threaded in only hand tight.

NOTE: Do not mount the sensor where the beam will intersect objects such as fill streams, pipes, ladder rungs, wall seams, or corrugated tank walls.

• Electrical Installation

- Unscrew top lid of radar, exposing electrical terminals.
- Feed wires from your control system through 1/2" NPT conduit hole on side of radar.
- Attach the wires of your control system to the radar according to the appropriate Power & Control Wiring Diagram on page 5 and 6.
- Secure conduit in 1/2" NPT hole.
- Replace lid of radar.

• Software Installation

- Download the Probe Gateway software zipfile from http://apgsensors.com/support.
- Open the zip file.
- Choose "Install" from the options at the top of the zip file window.
- The installation process will prompt you as needed to complete the installation.

• Removal Instructions

- Ensure that power (VAC or VDC, control power, and communication power) to the radar is off.
- Unscrew top lid and detach wires from terminals.
- Disconnect conduit from radar.
- Remove the radar and store it in a dry place, at a temperature between -40° F and 140° F.
- If the radar was installed in a hazardous location, ensure that the cables will not energize while the sensor is disconnected.

DANGER: Do not disconnect equipment installed in hazardous locations unless power has been switched off or area is known to be non-hazardous.

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Chapter 3: Maintenance

• General Care

Your True Echo™ Radar Level Transmitter is very low maintenance and will need little care as long as it was installed correctly. However, in general, you should:

- Avoid applications for which the sensor was not designed. Follow all temperature range restrictions, and avoid contact with incompatible corrosive chemicals and fumes, or other damaging environments.
- Inspect the threads whenever you remove the sensor from duty or change its location.

• Low Dielectric Material Setting

Your True Echo™ Pulse Radar Level Transmitter has a setting to more accurately measure target materials with low dielectrics (ε < 4). The Low Dielectric Materials mode can be turned on or off via the Calibration Switch on the radar.

- Unscrew the lid of the radar.
  - Blinking Green Status LED (see Terminals on Page 5) indicates Low Dielectric Materials mode is ON.
  - Solid Green Status LED indicates Low Dielectric Materials mode is OFF.
- To toggle the Low Dielectric Materials mode, press and hold the Calibration Switch button until the Status LED cycles from Yellow to Red and then off (see Terminals on page 5).
- Replace lid of radar when finished.

• Field Calibration

All True Echo™ Pulse Radar Level Transmitters can be calibrated in the field to set minimum or maximum material levels for 4 mA or 20 mA output.

For Full/Maximum Level Calibration

- Turn Low Dielectric Materials mode OFF (see instructions above).
- With target material at maximum desired level, press and hold Calibration Switch button.
  - For 20 mA output, release button when Status LED turns Yellow.
  - For 4 mA output, release button when Status LED turns RED.
- Status LED will flash after release to confirm setting.

For Empty/Minium Level Calibration

- Turn Low Dielectric Materials mode OFF (see instructions above).
- With target material at minimum desired level, press and hold Calibration Switch button.
  - For 20 mA output, release button when Status LED turns Yellow.
  - For 4 mA output, release button when Status LED turns RED.
- Status LED will flash after release to confirm setting.

IMPORTANT: Low Dielectric Material mode must be OFF before performing level/output calibration. To calibrate for low dielectric materials, do not turn on Low Dielectric Material Mode until AFTER performing level/output calibration.

• Repair and Returns

Should your True Echo™ Pulse Radar Level Transmitter require service, please contact the factory via phone, email, or online chat. We will issue you a Return Material Authorization (RMA) number with instructions.

- Phone: 888-525-7300
- Email: sales@apgsensors.com
- Online chat at www.apgsensors.com

Please have your radar's part number and serial number available. See Warranty and Warranty Restrictions for more information.

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