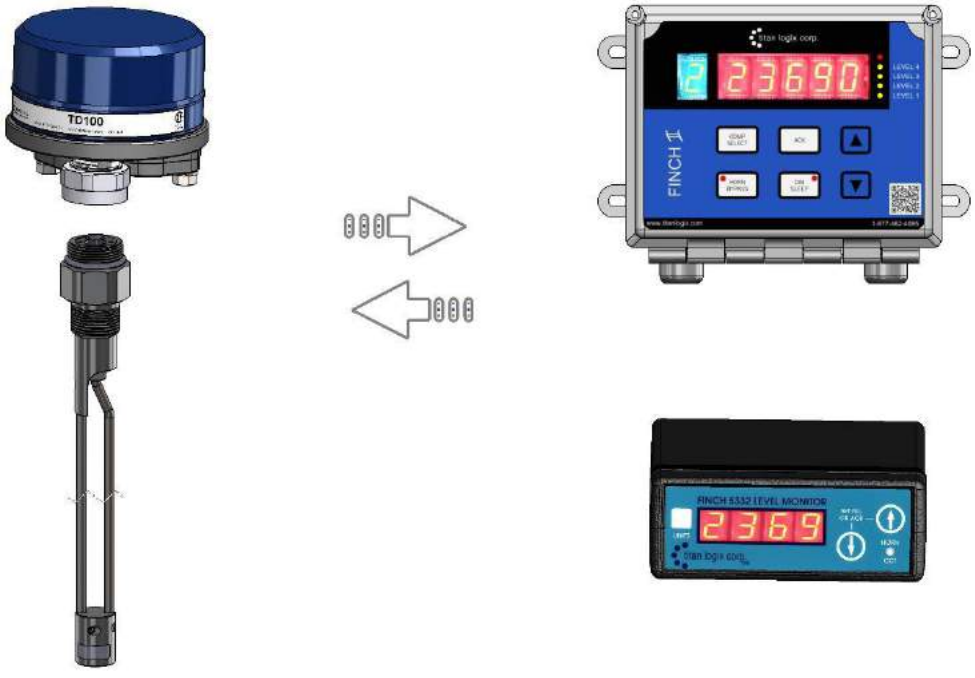
TD100 INSTALLATION & OPERATION MANUAL



TPM 057

Version 1.4

TITAN LOGIX

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1 CUSTOMER SUPPORT

24 Hour Technical Support Line

1-877-462-4085

Titan Logix provides 24-hour technical support for their products. Call the technical support number:

- to arrange a service call
- if you have immediate questions regarding operations and installation
- if you have a request for documentation and/or software
- technical assistance

1.1 RETURNS FOR REPAIR, REPLACEMENT, OR CREDIT

Inside Sales (8:00-4:30 Mountain Daylight Time)

1-877-462-4085

!	**NOTE** **Returned product for repair, replacement, or credit, must be accompanied by a Titan Logix generated RMA number.**

To obtain an RMA number:

1. Call the Inside Sales number to speak with a representative and obtain an RMA number
2. Provide the serial number of the item with a description of issue and expected resolution (repair, replacement, return)
3. Describe the issue and indicate whether the item is defective, missing components, not suitable for the intended use, or purchased in error
4. Return the item together with the RMA number to the indicated Titan Logix service facility

When speaking with your Titan Logix representative, please indicate whether the item is still under warranty.

Shipping cost to and from a Titan Logix service facility is the responsibility of the customer unless the product is under warranty. If the product is under warranty, the freight cost to Titan Logix is incurred by the customer. From Titan Logix, the cost is incurred by Titan Logix.

All returns for credit are subject to a restocking fee.

2 INTRODUCTION

This manual provides information specific to the Titan Logix Corp. TD100™ Level Gauge and Overfill Prevention System (hereafter referred to as the TD100) only.

Installation and operational information pertaining to optional equipment or peripheral systems will not be included in this manual. Refer to the vendor supplied documents for more information or go to www.support.titanlogix.com for Titan Logix online documents.

This guide is intended to assist the user on the installation, use, and maintenance, of the Titan Logix TD100, under normal working conditions. Any user performing installations or operations outside the scope of this guide, are advised to contact Titan Logix technical support.

It is essential that this manual be read and understood for proper installation and operation of your new TD100 system.

2.1 WARRANTY

Please see the Terms and Conditions at http://www.titanlogix.com/products.aspx for details about product warranty.

2.2 DISCLAIMER

The information in this document is subject to change without notice. Titan Logix Corp. makes no representations or warranties with respect to the contents hereof.

2.3 PROPRIETARY INFORMATION

The Information disclosed herein contains proprietary rights of Titan Logix Corp. Neither this document nor the information disclosed herein shall be reproduced or transferred to other documents, or used or disclosed to others for manufacturing purposes, or for any other purpose except as specifically authorized in writing by Titan Logix Corp.

2.4 SAFETY

This manual will use the following standard safety terms and conventions to indicate conditions:

	**WARNING** **Indicates a hazardous situation which, if not avoided, could result in death or serious injury.**

	**CAUTION** **Indicates a hazardous situation which, if not avoided, could result in moderate injury and/or property damage.**

!	**NOTE** **Indicates an important message not related to personal injury or property damage.**

The TD100 system must be installed and operated in accordance with details described in the Titan Logix manuals, application notes, and all other relevant publications. Only qualified personnel familiar with the installation and operation of this equipment should install, adjust, operate, or service this equipment. Failure to observe this warning could result in bodily injury or loss of life.

Do not install or repair the system where flammable gases and/or fumes may be present.

Observe all federal, state/provincial, and local safety standards and industry recommended practices.

Turn vehicle power off before any installation or maintenance.

3 SYSTEM OVERVIEW

Figure 1 TD 100 System

The TD100 system consists of a TD100 transmitter, dual-rod or a coax probe , a Finch II or 5332INT In-Cab display. The TD100 system continuously measures liquid level in the tank and transmits volume information to a display. Relays within the displays can be programmed to indicate Spill, High-High (HH), and system Fail alarms to external devices such as overfill prevention valves, lights, horns, and stationary loading controls. HH is normally the first shutdown level; Spill is a backup level slightly higher on the probe than HH, while Fail indicates failure of the TD100 system. Activation of any alarm halts loading to prevent a dangerous overfill condition or spill at the loading facility. In addition, Fall and Fill alarms, managed by settings stored in the Finch II display, can control relays that indicate a pre-set, increasing Fill or decreasing Fall level to warn of an approaching fluid level while loading or unloading product .

The TD100 transmitter uses Guided Wave RADAR (GWR) to measure the liquid level in a tank. It does not use any moving parts for level measurement. The TD100 transmits a continuous stream of radio frequency pulses into the probe. These pulses travel along the probe and part of the pulse energy is reflected back to the transmitter when encountering the surface of the liquid in a tank. The time delay between the transmit pulse and reflected pulse is used to calculate the distance from the tank top

mounted transmitter to the liquid level. This distance is then used to determine level of the liquid in the tank. The calculated level is converted into common volume units and is sent to the Finch II display.

The SensorLink™ software interface compiles and displays a strapping table tracking volume characteristics and allows the user to view and set alarms. The strapping table is programmed before installation and operation on the tank.

Optional components are installed as required.

3.1 COMPONENTS

Figure 2 TD100 Transmitter

TD100 Transmitter (T21)

The TD100 transmitter generates and processes the radar signals to determine liquid level in a tank. The TD100 is mounted on the tank top and connected to the probe, is weatherproof and rated for use in hazardous locations where explosive fumes may be present. TD100 transmitter connects with a probe and supports level measurement of a wide range of liquids. The transmitter can be configured in two detection modes (Standard and Performance), used for variations in fluid handling.

The TD100 transmitter can only be used with probes supplied by Titan.

The Finch II display is required to display both level information and alarms/states.

Current Loop Transmitter (T22)

TD100 transmitters are available with an optional 4-20mA output. This option will communicate level information only (no alarms) and must be ordered when purchasing the TD100 system. It is not upgradable after manufacture of the transmitter.

Current loop transmitters are used for long distance communication due to their insensitivity to electrical noise. They are resistant to power supply voltage variations and wiring resistance.

Figure 3 Dual Rod Probe

Dual-Rod Probe

The probe guides the GWR pulse and reflection from the surface of the liquid. The probe is mounted on the tank top and is connected to the bottom of the transmitter via the top fitting. It is seated in the anchor cone. The dual rod probe is most suitable for viscous liquids such as crude oil but can be used with most refined liquids.

The probe is available in a Stainless Steel, or in a Hastelloy® option for corrosive environments.

The Dual Rod probe is available with Titan Logix supplied 1" NPT top fitting (recommended) and anchor cone.

Figure 4 Coax Probe

Coax Probe

The Coax probe is a tubular probe which guides the GWR pulse and reflection from the surface of the liquid. The probe is mounted on the tank top and is connected to the bottom of the transmitter via the top fitting. The use of an anchor cone is recommended. This probe is primarily used for refined fuels and liquids. The coax probe enjoys a variable SPILL alarm setting that allows for special needs applications such Aviation Fuelers.

The Coax probe is available with Titan Logix supplied 1" NPT top fitting (recommended) and anchor cone.

Figure 5 Finch II Display

Finch II Display

The Finch II Display is an external use, numeric display of volume information, alarms, and system error codes from the TD100 transmitter. Various alarm and error conditions are detected by the transmitter and display. These alarm states control internal relays for alarm annunciation, high level shutdown, and low-level prevention.

The Finch II contains high current relays to directly control a bottom loading solenoid valve or control of an onboard loading pump. A weather-proof junction box may be required to terminate alarm accessory wiring.

Refer to TPM 010 – Finch II Installation & Operation Manual.

Figure 6 5332INT In-cab Display

5332INT In-Cab Display

The 5332INT In-Cab display is a numeric display of fluid volume (or level), alarms, and system error codes from the TD100 transmitter. It is typically mounted in the driver's cab for convenience.

SensorLink™

The SensorLink™ software compiles strapping table information and, together with inputs from the user, allows the user to set volume alarms and track volume levels through the TD100 transmitter.

3.1.1 Optional Components

Figure 7 Smart Battery Module

Smart Battery Module

The Smart Battery Module detects a loss of power to the Titan system and provides auxiliary power for the transmission of position and system information. The module connects to the Titan Gateway and Finch II.

Figure 8 Gateway

Gateway

The Gateway module transmits position and motion information of the vehicle through a cellular connection, as well as gathering and transmitting data from the TD100 and Finch II components.

Refer to TPM 053 – Gateway Installation & Operation Manual.

Figure 9 MIC 10

MIC 10

The MIC 10 is an interface device for connecting multiple TD100s to a third-party Gateway or PLC system. Level, alarm, and error information from the TD100s is collected by the MIC 10 and forwarded to the connected device.

Figure 10 Rack Control Module

Rack Control Module (RCM)

The RCM is an accessory that enables secondary overfill prevention when used with industry standard optic and thermistor terminal rack controllers. The TD100 transmitter sends loaded volume, alarm states and detected errors to the RCM.

Refer to TPM 007 – Rack Control Module Product Manual.

Figure 11 Air Weigh Load-Maxx

Air-Weigh Load-Maxx

The Air-Weigh Load-Maxx provides over-weight prevention alarms and shutdowns. Combined with the TD100 and Finch II it monitors volume and weight simultaneously.

Refer to TPM 050 – Air-Weigh Shutdown System Application Note.

3.2 TECHNICAL SPECIFICATIONS

SPECIFICATION	STANDARD DETECTION MODE		PERFORMANCE DETECTION MODE	
Power	8 to 30VDC @ 125mA max			
Probe	Dual Rod	Coax	Dual Rod	Coax
Accuracy	+/- 7mm	+/- 7mm	+/- 5mm	+/- 5mm
Minimum Probe Length	-	-	47.2” (120cm)	47.2” (120cm)
Maximum Probe Length	120” (304.8cm)	120” (304.8cm)	120” (304.8cm)	120” (304.8)
Top Deadband (from tank top)	9.3 in	4 in	7.1 in	4 in
Bottom Deadband (from tank bottom)	5.5 in	5.5 in	4.5 in	4.5 in
Resolution	1mm			
Repeatability	1mm			
Materials	SS316L, Hastelloy® C276			
Process Pressure	14.9 PSI Maximum			
Chemical Resistance	Compatible with most substances. Alternate seal materials available.			
Ambient Temperature	-40°F (-40°C) to 185°F (75°C)			
Process Temperature	-49°F (-45°C) to 248°F (120°C)			
Dielectric Constant of Measured Liquid	>1.7 (Contact factory to confirm application)			
Cable	3 Conductor AWG #14 Max (AWG #18 recommended) 5 Conductor AWG #14 Max (4-20mA Output Option)			
Cable Entry	1 x ½” NPT threaded entry			
Outputs	SV Bus Digital Optional 4-20mA			
Enclosure Type	Type 4/4x			
Hazardous Area Approvals	Class I, Division 1 Groups B, C, D Class II, Groups E, F, G Class III, T5 Class I, Division 2, Groups A, B, C, D T4A			
ICES & FCC Approval	ICES-003 Class B, FCC Part 15 Class B			

3.3 TRANSMITTER SHEAR POINT

The transmitter shear point provides a safety spill prevention feature in the event of a vehicle rollover or other instance where there is a danger of a force impacting the TD100 transmitter that could damage the tank connection if there was not a shear groove. The shear point is provided as a seal point to prevent leaks or spills through the probe fitting.

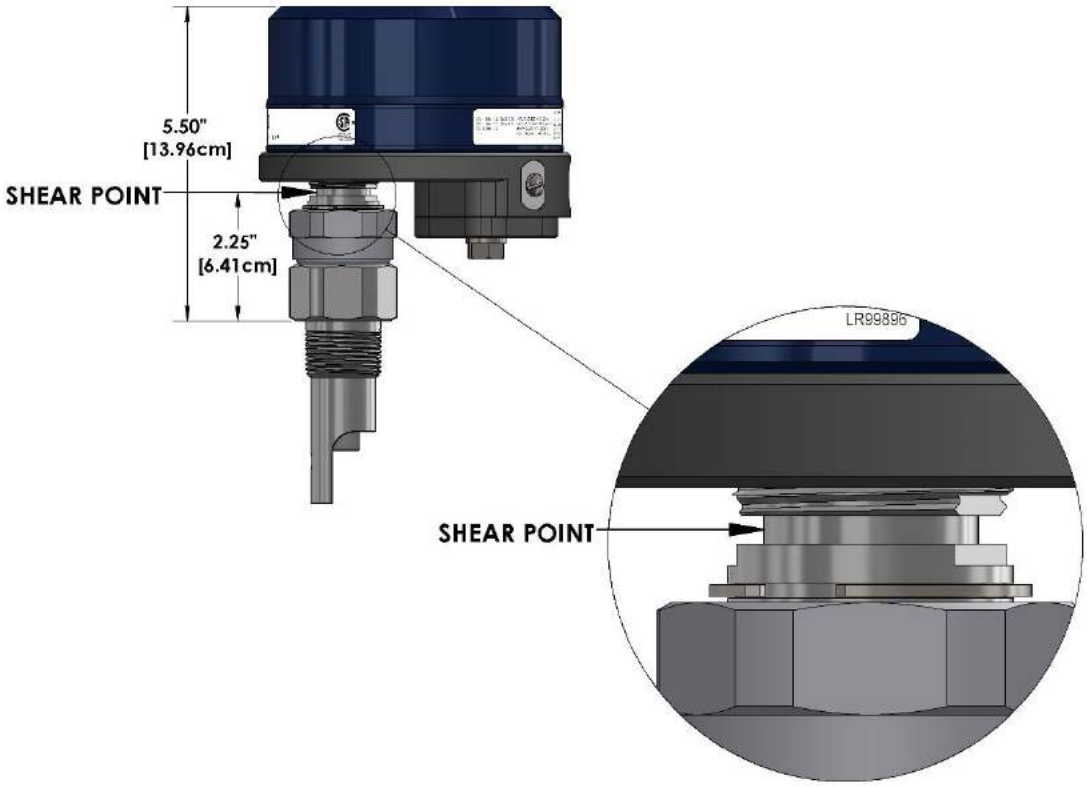

Figure 12 Transmitter Head Shear Point

3.4 PROBE SENSING

The transmitter and probe have two sensing options described as Standard Detection Mode and Performance Detection Mode. These choices in operating modes are offered for variations in fluid handling. If the operator is unsure which detection mode to choose, contact Titan Logix for guidance in choosing the correct detection mode.

3.4.1 Standard Detection Mode

This probe-sensing mode is intended for multifluid applications, where the operator will be collecting more than one fluid in the tank.

Calibration for this transmitter/probe combination is described in the Configuration & Calibration section of this manual.

3.4.2 Performance Detection Mode

This probe and transmitter combination continually learns from each new load or when the tank dimensions change, and can sense differences in fluids, calibrating volume data accordingly.

To ensure correct data readings, the operator must allow for a **minimum fill volume of 12”** (tank) to accurately calibrate for any changes in fluid type or tank type. This must be done when first using the system (commissioning) or changing the tank or load type, or when changing the transmitter from one probe to another.

Probe length for accurate sensing in this mode must be a minimum of 47.2” (120cm).

Calibration for this transmitter/probe combination is described in the Configuration & Calibration section of this manual.

3.4.3 Deadband Areas

Physical limitations of the Guided Wave RADAR (GWR) creates a deadband at the top and bottom of the dual rod and coax probes where transmitted pulses interfere with the reflected echo and inaccurate readings can occur within the indicated areas.

3.4.3.1 Performance Detection Mode Dual Rod

The bottom deadband region is 2.5” from the top of the shorting block.

The top deadband region occurs 7.1” from the top of the tank or 3.9” from the fiducial.

Level measurements within the deadbands are unreliable.

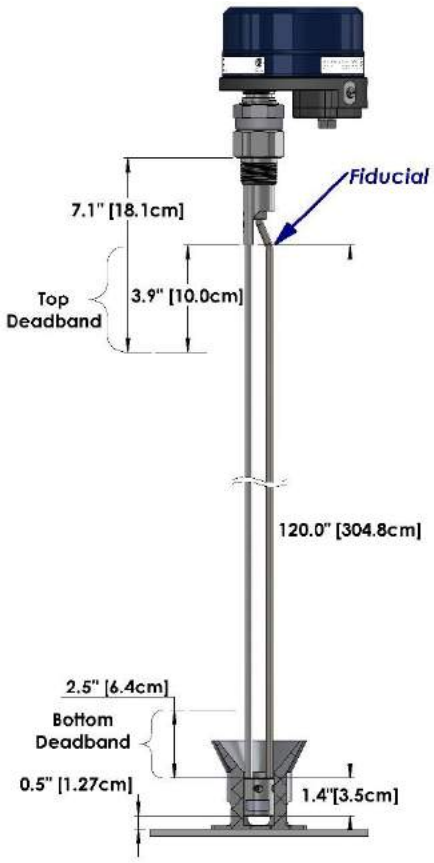

Figure 13 Deadband Areas – Dual Rod Performance Detection Mode

3.4.3.2 Standard Detection Mode Dual Rod Probe

The bottom deadband region is 3.5” from the top of the shorting block.

For the Dual Rod probe, the top deadband region occurs 9.3” from the top of the tank or 6.1” from the fiducial. Level measurements within the deadband regions are unreliable.

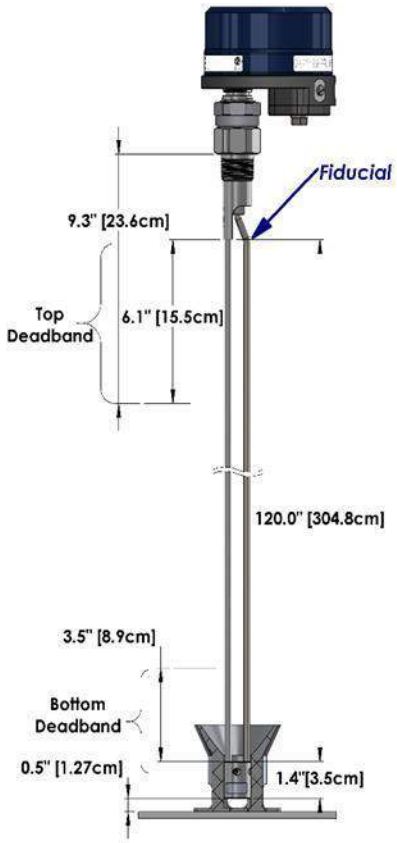

Figure 14 Deadband Areas – Dual Rod Standard Detection Mode

3.4.3.3 Performance Detection Mode Coax Probe

The bottom deadband region is 2.5” from the top of the shorting block.

The top deadband region is 4” from the top of the tank. Level measurements within the deadband regions are unreliable.

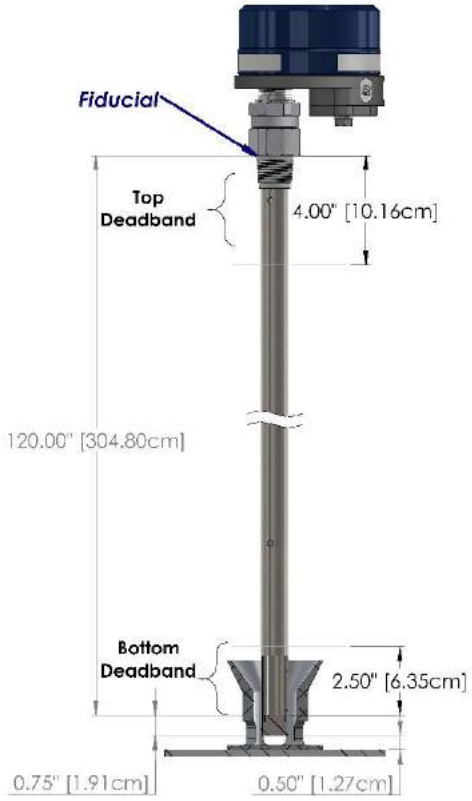

Figure 15 Deadband Areas – Coax Performance Detection Mode

3.4.3.4 Standard Detection Mode Coax Probe

The bottom deadband region is 3.5” from the top of the shorting block.

The top deadband region is 4” from the top of the tank. Level measurements within the deadband regions are unreliable.

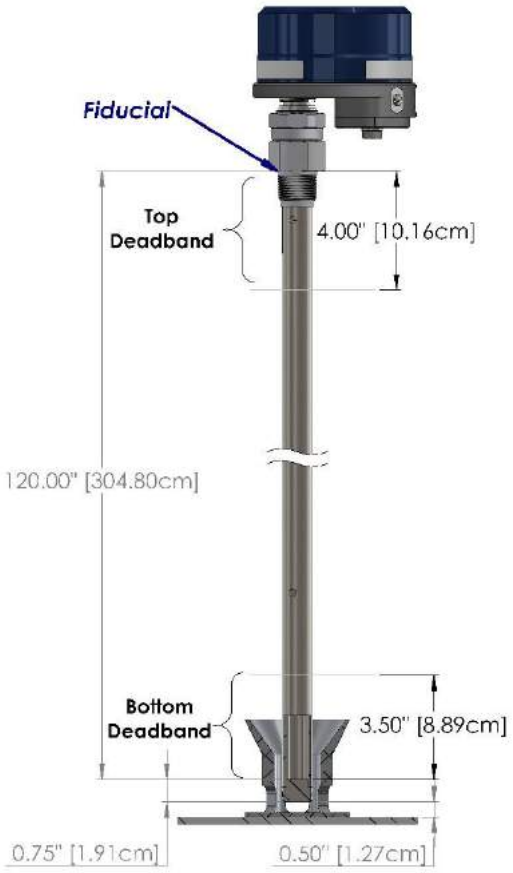

Figure 16 Deadband Areas – Coax Standard Detection Mode

3.4.4 Band Clear and Auto Clear

Band Clear

During a Spill alarm, volume information sent from the transmitter is frozen at the Spill alarm level. It will not increase with detected liquid level above this point.

With the Dual Rod probe the Spill alarm is cleared by unloading liquid to a minimum of 1” below the spill alarm level while the TD100 system is powered on. The TD100 transmitter must detect a tank level within the band clear region, which begins 1” below the spill level and ends 16.5” below the spill level, before clearing the Spill alarm.

The Coax probe system can be set to operate as a Band Clear or Auto Clear system that is explained below.

Auto Clear

With the Coax probe set to Auto Clear the SPILL alarm is cleared by unloading liquid below the SPILL alarm level while the TD100 is powered on or off. The Spill alarm will automatically clear when the liquid level is below the SPILL alarm setting and therefore will not latch in a displayed SPILL like a system set to Band Clear behavior.

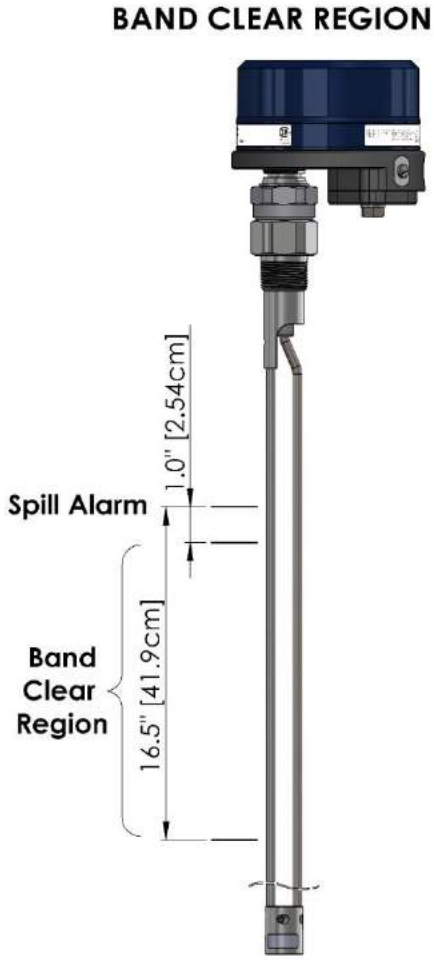

Figure 17 Band-Clear Region

3.5 ALARM POINTS

The figures below show the alarm points along the probe that can be programmed or pre-set to alert the operator to critical levels in the tank.

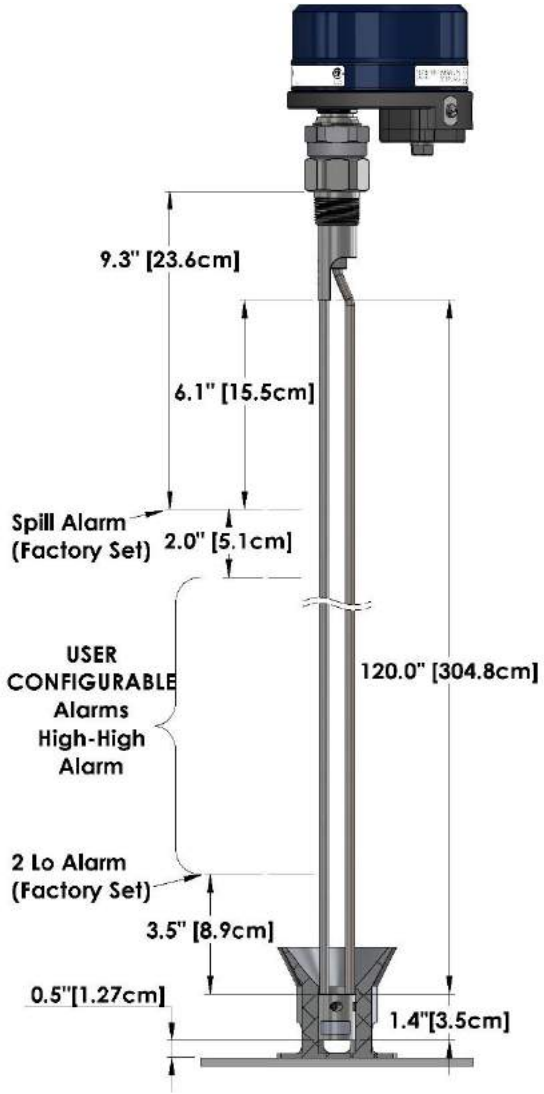

Figure 18 Alarm Points – Dual Rod Standard Detection Mode

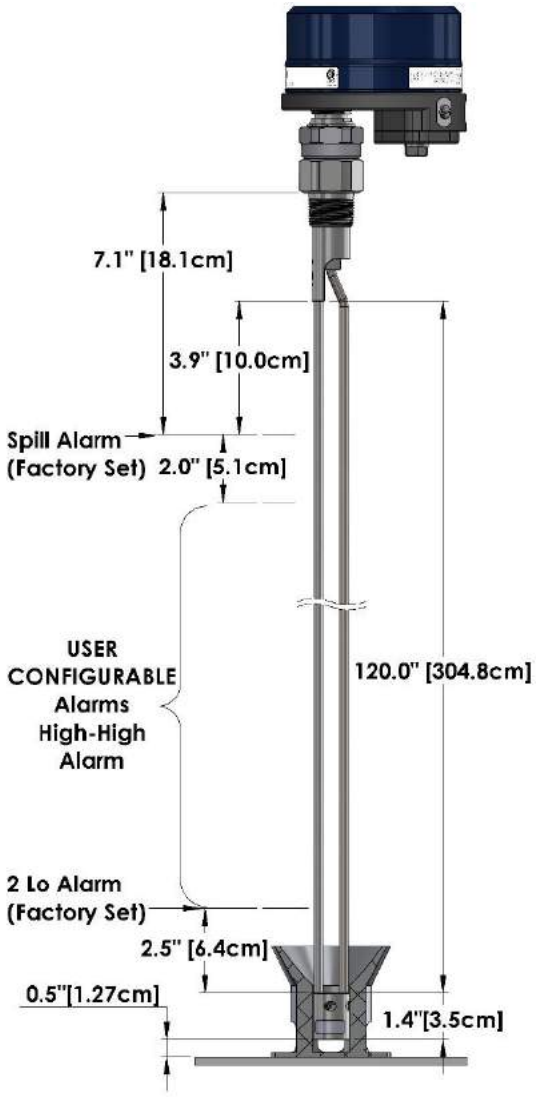

Figure 19 Alarm Points – Dual Rod Performance Detection Mode

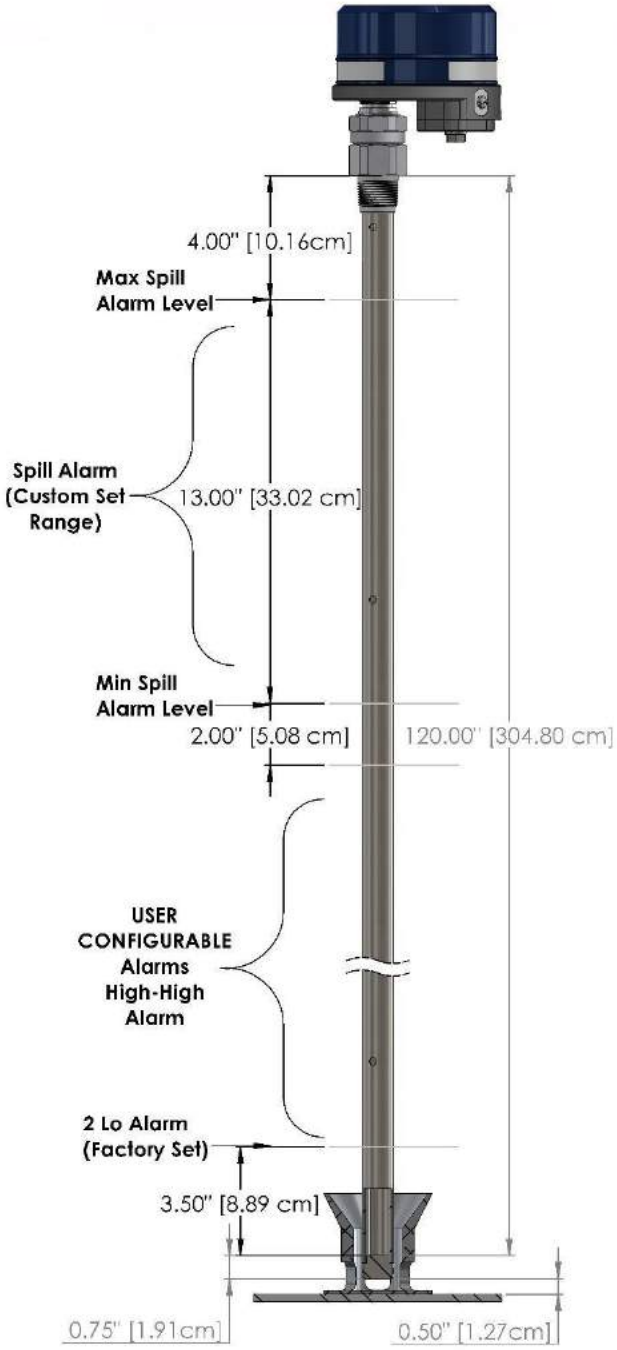

Figure 20 Alarm Points – Coax Standard Detection Mode

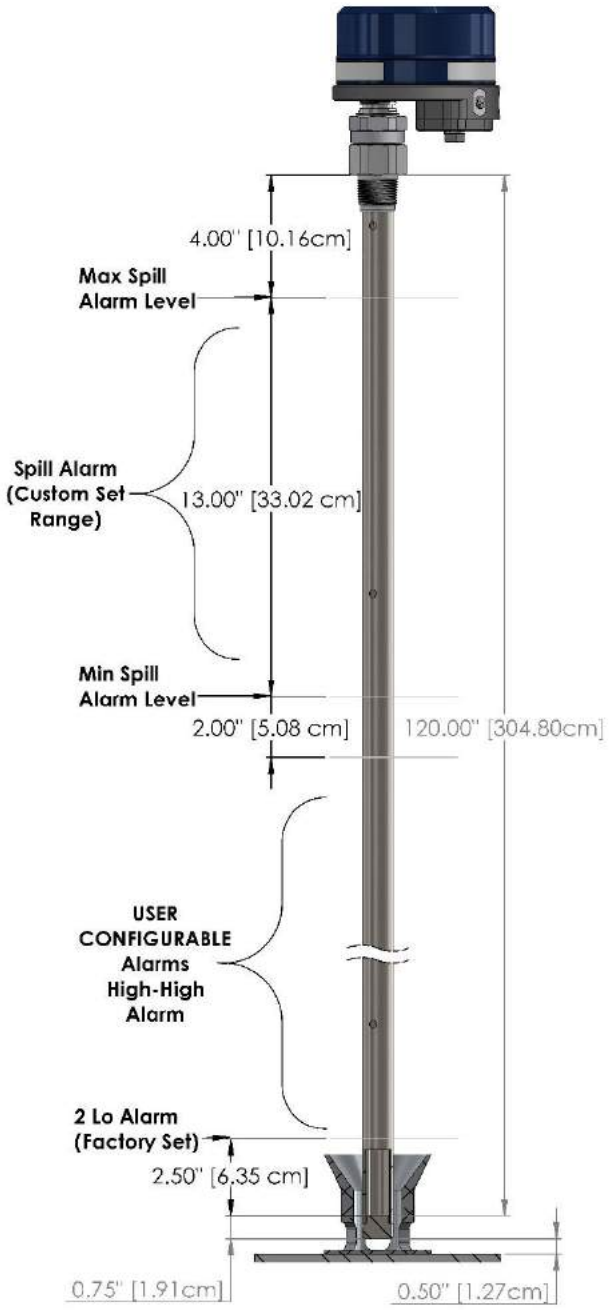

Figure 21 Alarm Points – Coax Performance Detection Mode

3.5.1 Finch II/5332INT Generated Alarms

Alarm	Alarm Set By	Condition	Control Relay Assignments
Spill	Dual-rod = Factory (Pre-Set) Coax = SensorLink™	Tank volume is within the top deadband region (overfill state or too high for correct reading)	Programmable*
High-High	SensorLink™	The maximum safe volume of the tank (set by the user)	Programmable*
Fill/Fall	Finch II/5332INT	User determined tank levels for use when filling the tank	Programmable*
Fail	Finch II/533INT and TD100 Transmitter	System failures such as internal transmitter errors, probe faults or loss of communications are reported by the Spill/Fail Relay and shown on the Finch II display	Programmable*
2 Lo	Factory (Pre-Set)	Tank level is within the bottom deadband region (too low for correct readings)	No Relay - Factory Pre-Set

*Refer to TPM051 Finch II Programming Manual and TPM059 5332INT Installation & Operation Manual

3.5.1.1 Spill

The SPILL indicates an overfill condition when the tank level is within the top deadband region and too high for correct readings. For Dual-rod, the Spill level is factory set at 7.1” for performance detection mode, and 9.3” for standard detection mode. For Coax, the Spill level is programmed by the operator using SensorLink™ and is adjustable between 4” and 17” below the below the bottom of the probe nut.

The TD100 transmitter is the source of this alarm. Spill alarms are indicated by showing “SPill” on the display and may activate a relay depending on the user’s configuration.

3.5.1.2 High-High

The High-High alarm is the maximum safe volume of the tank.

The TD100 transmitter is the source of this alarm. The HH alarm is activated by a measured volume equal to or exceeding the alarm level set during programming. High-High alarms are indicated by alternately flashing “HH” along with the current level on the Display and may activate a relay depending on the user’s configuration.

3.5.1.3 Fill/Fall

The Fill alarm is used to warn the operator when the loading process is nearing maximum capacity and the Fall alarm is used when a minimum volume of product must be retained in the tank to prevent pump cavitation or damage.

The Fill and Fall alarms are programmed by the operator using the Finch II or 5332INT displays.

(Finch II only)

Fill/Fall alarms are indicated by flashing Fill or Fall and the level on the display. The Horn relay is activated by default on a Fill alarm and no relay is activated by default on a Fall alarm.

(5332INT only)

The Fill and Fall alarms are managed by settings stored in the display. They are configured from the front panel buttons by the installer or operator when the system is installed.

Fill/Fall alarms are indicated by the flashing current volume level on the display and activating the Fill/Fall relay.

3.5.1.4 Fail

The Finch II/5332INT display reports communication failure or other system failures. The TD100 transmitter is the source for all other system errors.

(Finch II only)

System failures such as internal transmitter errors, probe faults or loss of communications are reported by a Fail alarm.

(5332INT only)

Internal malfunctions and loss of communication between transmitter and display are reported by the Fail alarm as error codes on the 7-segment display and optional relay control for external devices.

System failures such as internal transmitter errors, probe faults or loss of communications are reported by activating the Spill/Fail relay and shown on the display.

3.5.1.5 2Lo

The 2Lo alarm occurs when the tank level is within the bottom deadband region indicating the volume is too low for correct reading.

3.6 FINCH II DISPLAY

3.6.1 Finch II Interface

The Finch II Display receives a continuous stream of volume information and alarm states from the TD100 over the SV Bus communication line. Volume alarm states and errors are shown on the numeric display. Alarms and errors control relays to signal or operate external devices. Relays can indicate Spill, High-High and system Fail alarms to external devices such as overfill prevention valves, lights, horns and stationary loading controls. These relays can indicate a pre-set, increasing Fill or decreasing Fall level to warn of an approaching operator action while loading or unloading product. Full programming capability of the Finch II display is done through the Finch II Utility. See TPM 051 – Finch II Programming Manual for further details.

TD100 reported errors or malfunctions are indicated by the Finch II showing “E xxxx”, where “xxxx” is an error code and activates the Fail alarm.

See TPM 010 – Finch II Installation & Operation Manual for details on installation and use.

Figure 22 Finch II Display

The Finch II contains 1 green digit for a compartment select, 5 digits for volume readings, 6 buttons, and 7 LEDs.

❶ RED 5 DIGIT DISPLAY:

The 5 red digits can display volume readings, alarm messages, error codes, fill/fall settings, and offset calibration settings. When no TD100 connection is available, the display will show "-----".

❷ RED LED:

The red LED at the top right of the display is used to indicate an error state. Currently, this LED is enabled during Spill and Fail alarms and any alarms set to "Not Acknowledgeable" using the Finch II Configuration Utility.

❸ LEVEL LEDS:

These LEDs indicate the level of the currently selected compartment. The Level LEDs are mapped in the following manner:

Level LED	% of HH
Level 4	100%
Level 3	75%
Level 2	50%
Level 1	25%

❹ COMPARTMENT (COMP.) SELECT BUTTON:

The green digit is used to indicate the currently selected compartment. Each **COMP SELECT** button press will cycle the display through the available compartments and optional 3rd party devices. The digit flashes when the Auto Compartment Select feature has switched compartment displays due to an activated alarm.

When a compartment is selected the 5-digit display and error/level LEDs will show information about the compartment. The Remote Alarm Acknowledge input optionally provides the same compartment selection feature. It is intended to provide operators with a single external push button to acknowledge alarms and to select a compartment for display.

There is a feature currently implemented that will automatically jump to a compartment if any alarms are triggered on that compartment. For example, if the display were monitoring tank 1 but the Fill alarm were to go off on compartment 2 then the display would jump automatically to compartment 2. The user can still manually go back to compartment 1.

❺ HORN BYPASS BUTTON AND LED:

The Horn Bypass LED is on when the horn bypass feature is enabled. When enabled the horn relay does not respond to alarms. The attached horn remains silent.

The Horn Bypass button turns the horn bypass feature on and off. When the horn bypass feature is enabled, the horn relay does not respond to alarms. The attached horn remains silent.

❻ ACKNOWLEDGED (ACK) BUTTON:

The ACK button will acknowledge any active alarms that are acknowledgeable. The Fall, Fill and High-High alarms are factory set as acknowledgeable. Once acknowledged the alarms are cleared and any assigned relays are deactivated. Spill and Fail alarms are not acknowledgeable.

All alarms except for Spill and Fail can optionally be configured as acknowledgeable or locked until the alarm condition clears. For example, the Fall alarm may be configured as non-acknowledgeable and assigned to control a pump. This may be useful in applications where equipment can be damaged from running the tank dry.

❼ DIM/SLEEP BUTTON AND LED:

The DIM/SLEEP LED blinks when the display is in sleep or display mode.

The DIM/SLEEP button adjusts the brightness level of the display as well as puts the display into sleep mode. The display has 3 brightness levels max, medium, and low as well as sleep mode. When in sleep mode, the display is turned off and does not respond to any TD100 alarms.

This button press will put the display to sleep after the lowest brightness setting. All acknowledgeable alarms must be cleared with the ACK button before entering sleep. Non-acknowledgeable alarms do not prevent sleep mode entrance.

❽ UP/DOWN ARROW BUTTONS:

The ▲ arrow is used when setting the Fill alarm level, the Fall alarm level and when in offset calibration mode.

The Set Fill alarm mode is entered by pressing the ▲ arrow for longer than 2 seconds and then releasing. The display will flash "Fill" 3 times followed by the fill alarm level. The level can be adjusted by pressing the ▲ and ▼ arrows. If you hold down the button it will continuously increase the level and after 5 seconds it will increase in speed.

The ▼ arrow is used when setting the Fill alarm level, Fall alarm level and when in offset calibration mode.

The Set Fall alarm mode is entered by pressing the ▼ arrow for longer than 2 seconds and then releasing.

3.6.2 Finch II Modes of Operation

!	**NOTE** **The Finch II Display will not allow the user to switch operating modes until all alarms have been acknowledged.**

3.6.2.1 Sleep Mode

- The Finch II display goes blank and the DIM/SLEEP LED blinks
- All relays are de-energized, and the display does not respond to alarms
- When the Display Enable signal is inactive, controlled by a PTO or parking brake switch
- When the DIM/SLEEP button has been pressed for Sleep Mode
- Volume is displayed for 30 seconds by momentarily pressing the ▲ or ▼ button

3.6.2.2 2 Lo

- When the tank level is within the bottom deadband region, the display shows 2Lo
- Optional flashing 2Lo and estimated volume when the Enable Low Level Reading switch is turned on

!	**NOTE** **It is not recommended that the unit be operated in this state. The readings within the bottom deadband are unreliable.**

3.6.2.3 FILL/FALL Alarm

- When the tank level rises to the user set FILL Alarm, the display flashes the current volume and "FILL". When the tank level drops to the user set FALL Alarm, the display flashes the current volume and "FALL".
- Pressing the ACK button on the display, or if installed, an external alarm acknowledge button clears the alarm.

3.6.2.4 HH Alarm

- Once the tank level reaches the programmed "High-High" Alarm, the display alternately flashes "HH" and current volume.
- To acknowledge the alarm, press the ACK button on the display or if installed, press an external alarm acknowledge button.

3.6.2.5 SPILL Alarm

- When the tank level is within the top deadband region, the display flashes "SPILL" and the last known volume before the Spill alarm.
- To clear the alarm, fluid must be removed from the tank while the TD100 and Finch II Display are turned on.

3.6.2.6 Calibration Mode

Calibration adjusts the strapping table offset in the transmitter.

- Select the compartment to be calibrated. Press and hold the following four buttons:
  - COMP SELECT
  - HORN BYPASS
  - ACK
  - DIM SLEEP
- Continue to hold down the four buttons until the display flashes "CAL". Then release the buttons.
- Alternately, the Finch II can enter Calibration mode by holding either ▲ or ▼ arrow while applying power to the display.
- The unit will then show the current volume of liquid in the tank.
- If the current measurement displayed is not valid for what is in the tank, the operator may change the reading at this time by pressing the ▲ or ▼ arrow until the displayed value is correct. All alarms in the transmitter are cleared at this time.

Calibration adjusts the strapping table offset in the transmitter. The transmitter also ensures that the HH alarm level does not exceed 2" below the Spill alarm level. If this state occurs, the operator will need to correct the strapping table. Correcting the strapping table requires the following steps:

1. Review the tank or compartment depth chart for correct information.
2. Confirm probe mounting details such as tank depth, probe mounting height, riser height, or sump depth.
3. Program the transmitter with the corrected information.

4. Repeat the offset calibration.
5. Once the display is reading accurately, the Finch II must be turned off and restarted for normal operation.

3.6.3 Finch II Relays

The Finch II display contains four independently controlled relays. These relays are fuse protected to limit short-circuit current. Each of the relays has a distinctive name that may be used to describe the controlled device such as the following:

- Relay 1, Engine/Aux Relay
- Relay 2, Pump/Aux Relay
- Relay 3, Light Relay
- Relay 4, Horn Relay

The relays have all contacts, Normally Open (NO), Normally Closed (NC) and Common (COM) contacts available for power or signal control.

The TD100 generated alarms, or alarms generated by the Finch II display can control these relays for various purposes including overfill prevention.

3.6.3.1 Relay Assignments and Alarming States

The factory settings are as follows:

Finch II Relay Assignments

	Engine/AUX	Pump	Light	Horn	Can Ack?
Spill/Fail	✓	✓			
HH		✓	✓	✓	✓
Fill				✓	✓
Fall					✓

Figure 23 Finch II Relay Assignments

RELAY ALARMING STATES

ENGINE/AUX RELAY = Energized when alarming
PUMP/AUX RELAY = De-energized when alarming
LIGHT RELAY = Energized when alarming
HORN RELAY = Energized when alarming

Refer to TPM 010 Finch II Display Installation & Operation Manual for further details.

3.7 5332 INT IN-CAB DISPLAY

Refer to TPM059 5332INT Installation and Operation manual for further details.

3.7.1 5332INT In-Cab Interface

The 5332INT In-Cab display receives a continuous stream of volume information and alarm states from the TD100 over the SV Bus communication line. Volume alarm states and errors are shown on the numeric display. Alarms and errors control relays to signal or operate external devices. Relays can indicate Spill, High-High and system Fail alarms to external devices such as overfill prevention valves, lights, horns, and stationary loading controls. These relays can indicate a pre-set, increasing Fill or decreasing Fall level to warn of an approaching operator action while loading or unloading product.

TD100 reported errors or malfunctions are indicated by the 5332INT showing “E xxx”, where xx is an error code and activating the Fail alarm.

Figure 24 5332INT In-Cab Display

The 5332INT consists of 4 digits for volume readings, 2 buttons, and 5 LEDs.

1 UP/DOWN ARROW BUTTON:

The Up/Down buttons are used to set the Fill or Fall alarm, change modes, or acknowledge alarms.

The user can enable Fill or Fall alarms by setting the correct jumpers on the circuit board. Refer to TPM059 5332INT Installation and Operation.

Press up or down for 2 second to enter fill/fall mode. The display will flash “Fill” or “Fall” 3 times followed by the alarm level. Pressing the ▲ and ▼ arrows again allows the user to adjust the Fill/Fall setpoint. Releasing the button will complete the sequence.

Holding down either button will continuously increase/decrease the level and after 5 seconds it will increase in speed.

The Up/Down arrow buttons are also used to acknowledge alarms on the 5332INT. Pressing UP or DOWN will acknowledge an active Fill/Fall alarm. **To acknowledge an active HH alarm press the sequence UP, UP, DOWN, UP.**

❷ RED 4 DIGIT DISPLAY:

The display shows volume readings, alarm messages, error codes, fill/fall settings, and offset calibration settings. When no TD100 connection is available, the display will show "- - - -".

❸ UNITS OVERLAY:

An area where the user can manually write preferred units of operation.

3.7.2 5332INT In-Cab Modes of Operation

After starting up, the 5332INT will enter either Monitor Mode or Off Mode.

If the PTO connection is on (grounded), the display will go directly into Monitor Mode and will display the current level and act on any alarms. If the PTO connection is off, (left open) the unit will go directly into Off Mode. See the mode descriptions below for more information.

3.7.2.1 OFF Mode

Figure 25 5332INT Off Mode

This mode is a sleep mode for the 5332INT. It allows the user to disable alarms from being displayed while still displaying the liquid level in the tank. The display shows "oFF". To view the current tank level, the user must press either the Up or Down button. The unit displays the level for 30 seconds before returning to Off Mode.

To exit Off mode, the user needs to press either button on the face plate to display a level or turn on the PTO to enter Monitor Mode.

3.7.2.2 Monitor Mode

In this mode the 5332INT display shows the current tank level, as well as any errors received from the TD100 transmitter. The unit will act on any alarms it receives. To enter Monitor Mode the PTO must be on (grounded).

If the tank level is within the bottom deadband region, the unit will display "2 LO". The Spill Alarm, Fill/Fall Alarm and the HH Alarm are all active in this mode and will respond if the conditions are reached.

If the display does not receive any information from the transmitter for 6 seconds the display will show four dashes (- - - -) and trigger the Fail alarm. The Fail Alarm will also be triggered if the display receives an error message or a Spill alarm.

3.7.2.3 Set Fill / Fall

Figure 26 5332INT Fill/Fall Display

The Fill/Fall alarm setting can be done while displaying the tank level from Off Mode or while in Monitor Mode by momentarily pressing either of the buttons on the front panel. The Fill or Fall alarm is determined during installation by inserting or removing the Fill/Fall jumper inside the 5332INT display. If the Fill/Fall Jumper is removed, the display will blink “FILL”.

If the Fill/Fall jumper is installed, the display will blink “FALL”. After a few seconds, the display will show the current Fill or Fall setting. The current setting can then be adjusted up or down by pressing the appropriate button on the front panel. Each button press changes the level by one unit while holding the button down will change the level by tens of units. The fill level is prevented from exceeding the HH Level. After 5 seconds of inactivity the 5332INT display will revert to the previous display.

3.7.2.4 2 Lo

Figure 27 2 Lo Display

When the tank level is within the bottom deadband region, the display shows 2Lo, alternating with an estimated volume. An installed jumper on the circuit board disables the 2Lo display and allows the display to give level readings all the way to the shorting block.

!	**NOTE** **It is not recommended that the unit be operated in this state. The readings below the bottom dead band are unreliable.**

3.7.2.5 Calibration Mode

!	**NOTE** **If there is not enough liquid in the tank, the display will flash “2 LO”. More liquid will need to be added to the tank for calibration. Clear the error before proceeding with calibration.**

While powering up the unit, the operator must press and hold down either of the buttons on the front of the display. While continuing to hold down either of the buttons, the operator must apply power and

continue to hold down the button throughout the display's test cycle. Once the cycle is complete, the display will flash "CAL". Release the button when "CAL" is displayed.

Figure 28 Offset Calibration Display

The unit will flash CAL for a few seconds to indicate that it has entered calibration mode, and it will then show the current level of liquid in the tank. If the current measurement displayed is not valid for what is in the tank, the operator may change the reading at this time by pressing the up or down arrow until the displayed value is correct. All alarms in the transmitter are cleared at this time.

Calibration adjusts the strapping table offset in the TD100 transmitter. The transmitter also ensures that the HH alarm volume level does not exceed the Spill alarm level; the unit will not allow the operator to continue adjusting levels in that direction.

If this condition is reached, the strapping table will need to be corrected. Correcting the strapping table requires the following steps:

1. Review the tank or compartment strapping chart for correct information
2. Confirm probe mounting details such as tank depth, probe mounting height, riser height, or sump depth.
3. Program the transmitter with the corrected information
4. Repeat the offset calibration
5. Once the display is reading accurately, the unit must be turned off and restarted for normal operation.

4 INSTALLATION

!	**NOTE** **It is recommended that the user updates the TD100 transmitter and the Finch II firmware to the newest version prior to installation. Refer to TPM051 Finch II Programming manual. The latest firmware can be located at.**

⚠	**CAUTION** **Where ambient temperature conditions exceed 60°C, use cable suitable for the higher ambient temperature conditions.**

Ensure that the installation area is in a weather protected area with adequate lighting, heating, and ventilation. Have battery/electrical power and compressed air (optional) available for tools and trailer installation. Refer to the Finch II Installation & Operation Manual TPM 010.

4.1 REQUIRED TOOLS AND EQUIPMENT

4.1.1.1 Required Tools

- Common automotive mechanical and electrical tools
- Power drill, drill bits
- Laptop PC w/WiFi Connection
- SensorLink™ software

4.1.1.2 Titan Logix Supplied Parts

- TD100 Transmitter
- Dual-Rod or Coax Probe depending on application
- Finch II Display and/or 5332INT In-Cab Display

4.2 MECHANICAL INSTALLATION

Follow all federal, state/provincial, and local safety standards and industry recommended practices for the vehicle. For example, the Federal Motor Vehicle Safety Standards (FMVSS) and the American Trucking Association (ATA) Technology and Maintenance Council (TMC) Recommended Practices (RP).

⚠	**WARNING** **Ensure the tank is completely drained of liquid, steam cleaned and vapour free. No drilling or welding is to be performed on the tank and frame without first consulting with the tank manufacturer.**

⚠	**CAUTION** **Ensure that the vehicle power is turned off before performing any other work.**

⚠	**CAUTION** **Ensure fuses and components are appropriate for the area classification.**

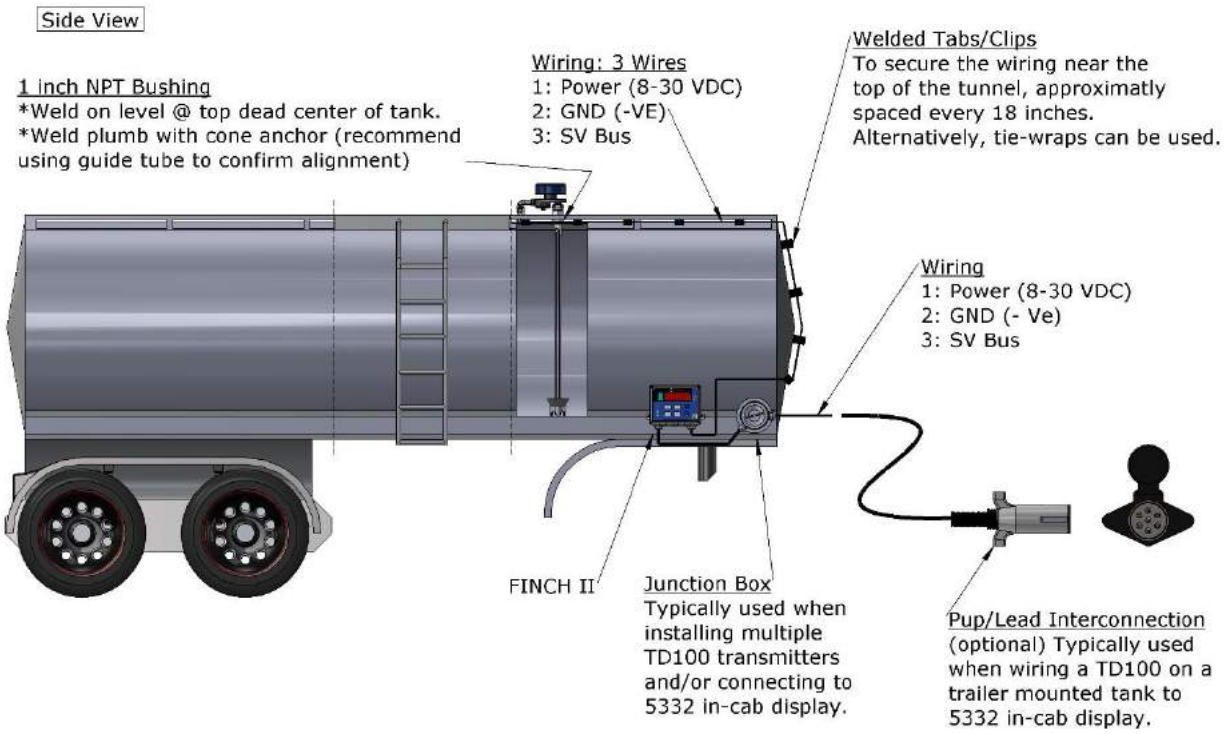

Figure 29 TD100 System Mount - Side View

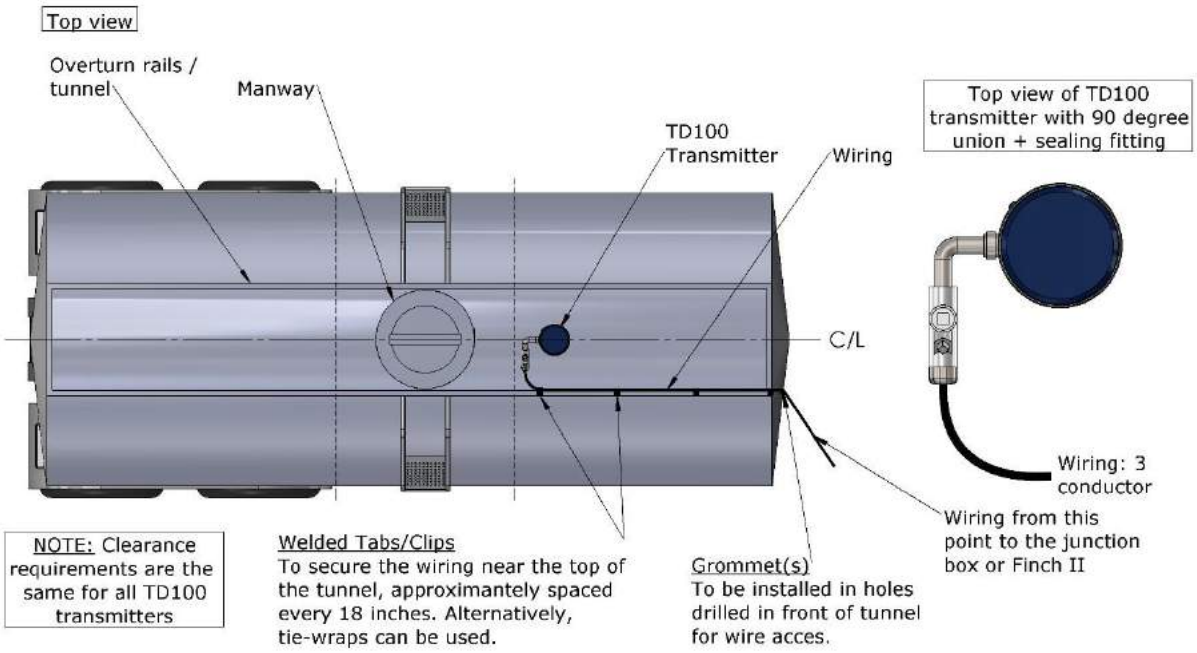

Figure 30 TD100 System Mount - Top View

4.2.1 Probe Installation

Care must be taken when installing the probe.

The nature of Guided Wave RADAR requires a 4” minimum diameter around the probe to be free of metal. The probe must be mounted at least 2” away from any internal pipes, fittings, and structural members. In-feeds, weirs, drains, and agitators may cause mechanical damage to the probe. They will also create turbulence that causes incorrect level measurements. The probe must be mounted as far as possible from turbulent areas of the tank.

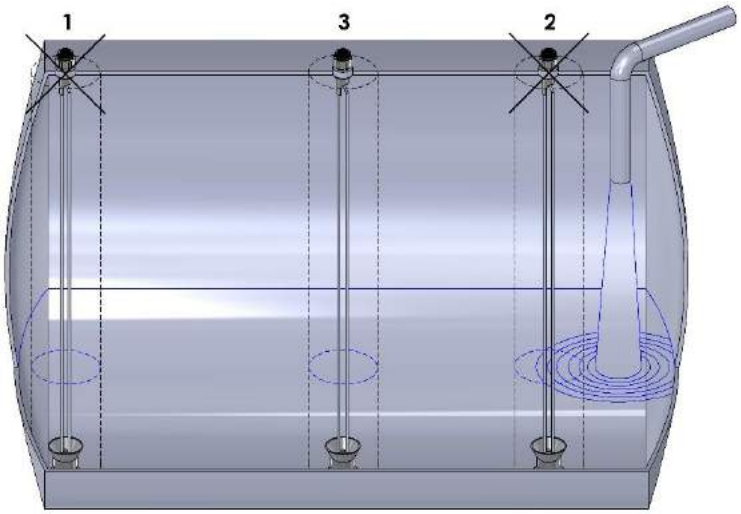

Figure 31 Probe Location

1. The probe is too close to the side of the tank (or other fittings).
2. The probe is too close to the tank infeed.
3. The probe is placed correctly. There is no interference within 2" of the probe.

4.2.1.1 Align and Weld the Mounting Fittings

⚠	**WARNING** • **It is recommended to use the Titan Logix supplied 1" NPT top fitting. Alternative fittings must not be longer than 1 ½". Fittings exceeding 1 ½" in length with an internal diameter of less than 4" interfere with the RADAR signal and prevent the TD100 transmitter from measuring the tank level or cause false level alarms.** • **Ensure that connections to the ½" NPT thread meet Ex installation requirements.**

1. Make a hole in the top of the tank where indicated by the manufacturing or installation drawings.
2. Ensure that the top fitting will allow the probe to hang vertically in the tank. If the tank has a curved top a leveling piece may be required. This will prevent the probe from bending (see Figure 16 below).
3. Ensure that the top fitting is aligned within 3 degrees of vertical above where the anchor cone will be welded.
4. Weld the top fitting to the tank top, using a leveling piece if required.
5. Clean all debris from the threads of the top collar. This will prevent the probe from jamming during installation.

!	**NOTE** **Ensure that the probe hangs vertically in the tank, within 3 degrees of vertical. Tanks with curved tops may require a leveling piece to meet the required vertical position.**

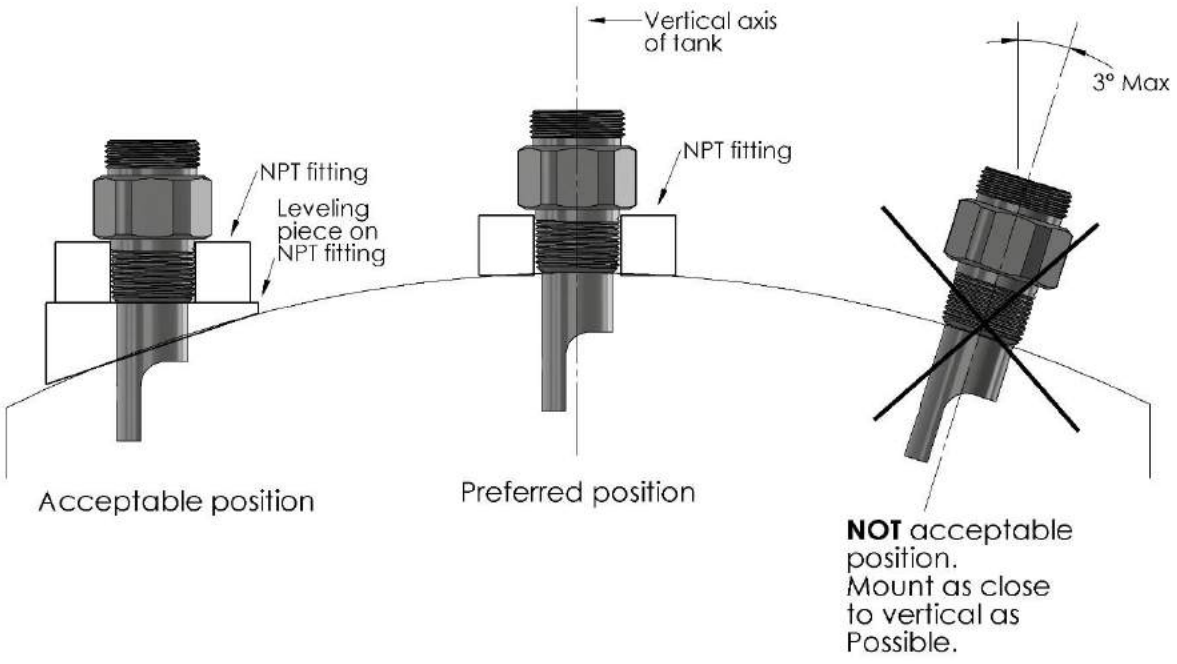

Figure 32 Curved Surface Fitting Mount

!	**NOTE** **No Mounting Hardware Should Extend Beyond 1½" Below the Nut on the Probe.**

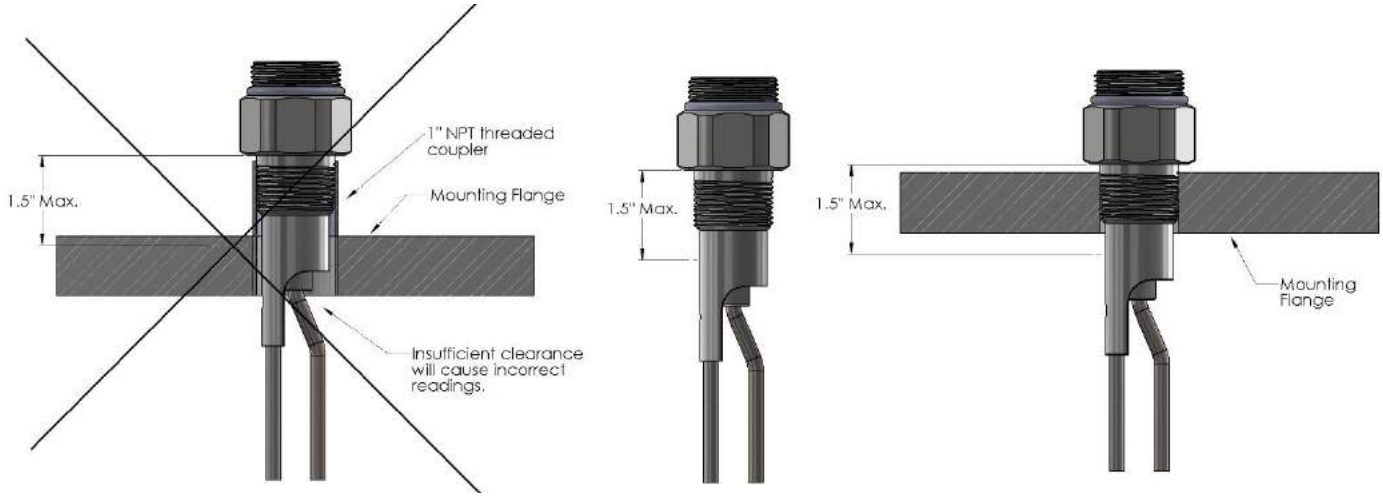

Figure 33 Top Fitting Location

4.2.1.2 Mount the Anchor Cone

It is recommended to use the Titan supplied anchor cone. The anchor cone is required to prevent excessive probe flexing and resulting damage to the probe or tank. It must be mounted directly in line with the top fitting to prevent bending the probe when installed. A bent or bowed probe produces inaccurate or false level measurements. Alternative anchors must have an internal diameter of 1 ½" and be approximately 2" high.

The following steps describe the recommended procedure for correct alignment of the top fitting and anchor cone for retrofit installations or where the positions are not accurately shown in a drawing. Materials required are a suitable length of rigid 1" tube and a bored through 1" NPT swage fitting.

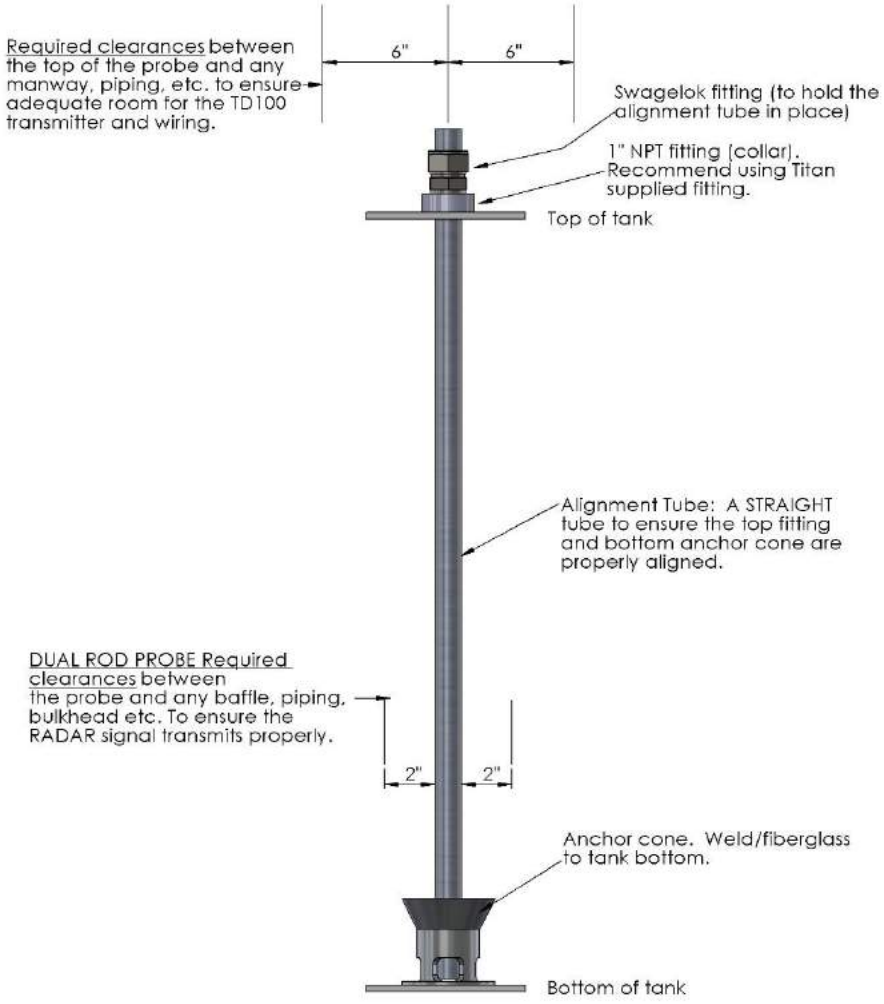

Figure 34 Anchor Cone Location

1. Locate the probe and transmitter according the recommended guidelines.
2. Install the top collar.
3. Screw the swage fitting into the 1" NPT top fitting.
4. Insert the tube into the swage fitting until it reaches the bottom of the tank.
5. Position the anchor cone where the tube meets the bottom of the tank.
6. Mark the anchor cone position and remove the tube. Ensure that the anchor cone is aligned within 3 degrees of vertical above where the top fitting is welded.
7. Weld the anchor cone in place.

4.2.1.3 Cut and Install the Probe

!	**NOTE** **The operator must be sure which detection mode (performance or standard) they will be using before cutting the probe. Performance Detection Mode requires a minimum 47.2" (120cm) probe length.**

!	**NOTE** **If the probe is to be used in corrosive environments, ensure the Hastelloy® probe, shorting block, and set screws are used.**

The probe ships with a protective orange cap. Ensure that the top of the probe is covered by the orange plastic cap it is shipped with. This cap must remain in place until the transmitter is mounted to protect from dirt, oil, and physical damage.

The probe is shipped longer than required to fit all installations. The installer must cut it to the desired length once the height of the tank is known.

1. Measure the height from the bottom of the tank, inside the anchor cone to the top edge of the 1" NPT top fitting. Add 1 ½" to this height. This is the overall length of the probe. **Temporarily** remove the protective orange cap. Transfer the measurement to the probe, starting at the very top of the probe. **Replace the cap before proceeding.**
2. Loosen the screws retaining the shorting block on the rods of the probe. Do not completely remove the screws.
3. Slide the shorting block up the probe until the bottom of the block is at the overall length of the probe when it is installed.
4. Tighten the screws (2) on the shorting block. Ensure that the rods are not twisted and then completely tighten the screws.
5. Use a hacksaw to cut off the rods at the bottom of the shorting block. For the Hastelloy® probe rods, a pipe cutter or die grinder is recommended.
6. Use a flat file to remove any burrs after cutting the rods. The ends should be smooth and flush with the shorting block.
7. Inspect the probe for any bends or twists. Loosen the shorting block to readjust the rods, and then retighten once the rods are straight and parallel.
8. Inspect the threads on the probe and top fitting for damage or debris. Do not install the probe with damaged threads.
9. Apply Teflon tape or anti-seize compound to the 1" NPT threads that mate with the top fitting.
10. Carefully insert the probe through the top fitting, resting the shorting block inside the anchor cone.
11. Hand tighten the probe into the top fitting, then finish tightening with a 1 ¾" wrench.
12. Ensure that the probe is not bent or twisted after installation.
13. Ensure that there is approximately a ½" gap between the shorting block and the bottom of the tank.

The probe has been cut to the proper length when it is fully threaded into the top fitting with a ½" gap between the bottom of the tank and end of the probe at the shorting block, inside the anchor cone.

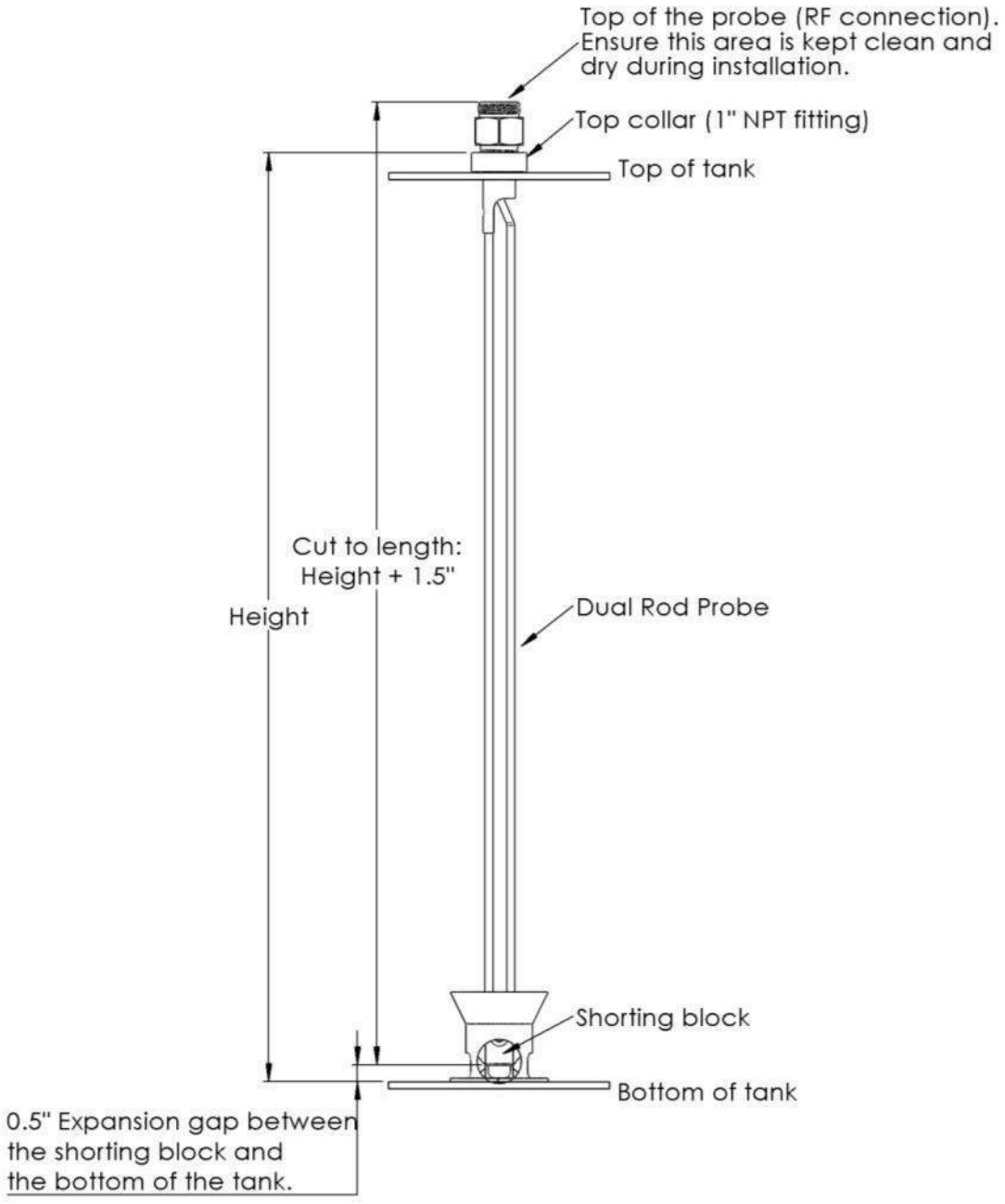

Figure 35 Probe Measurement

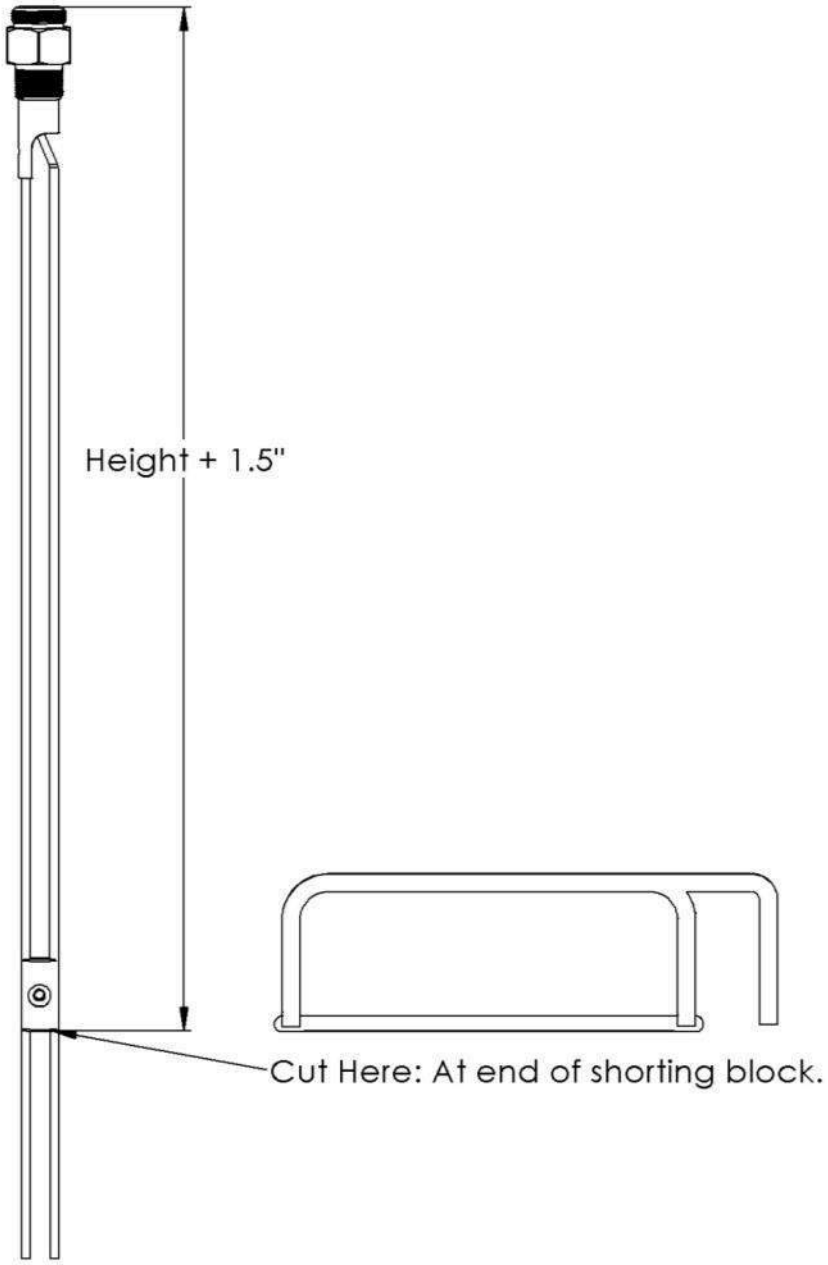

Figure 36 Cutting the Dual Rod Probe

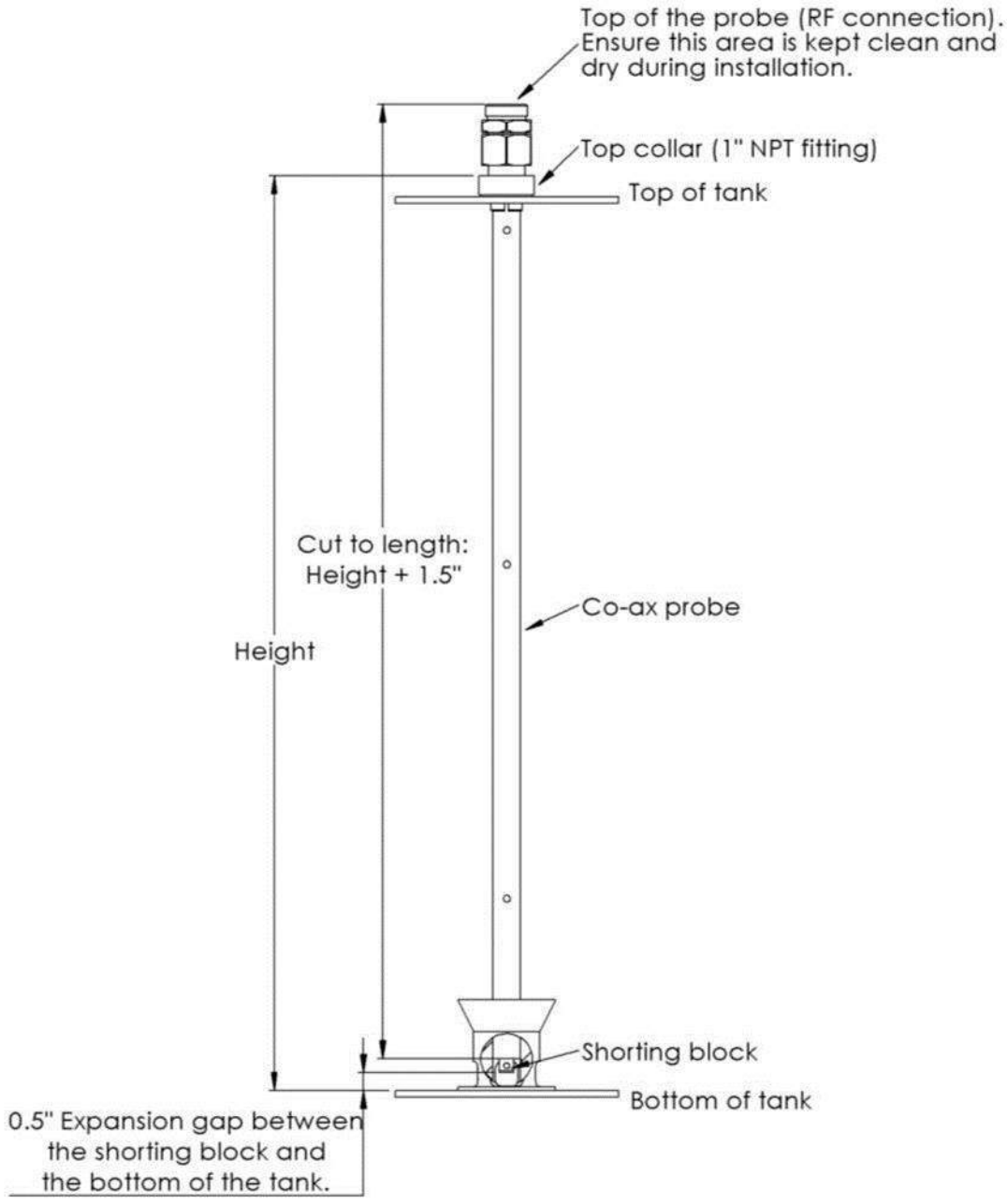

Figure 37 Probe Measurement

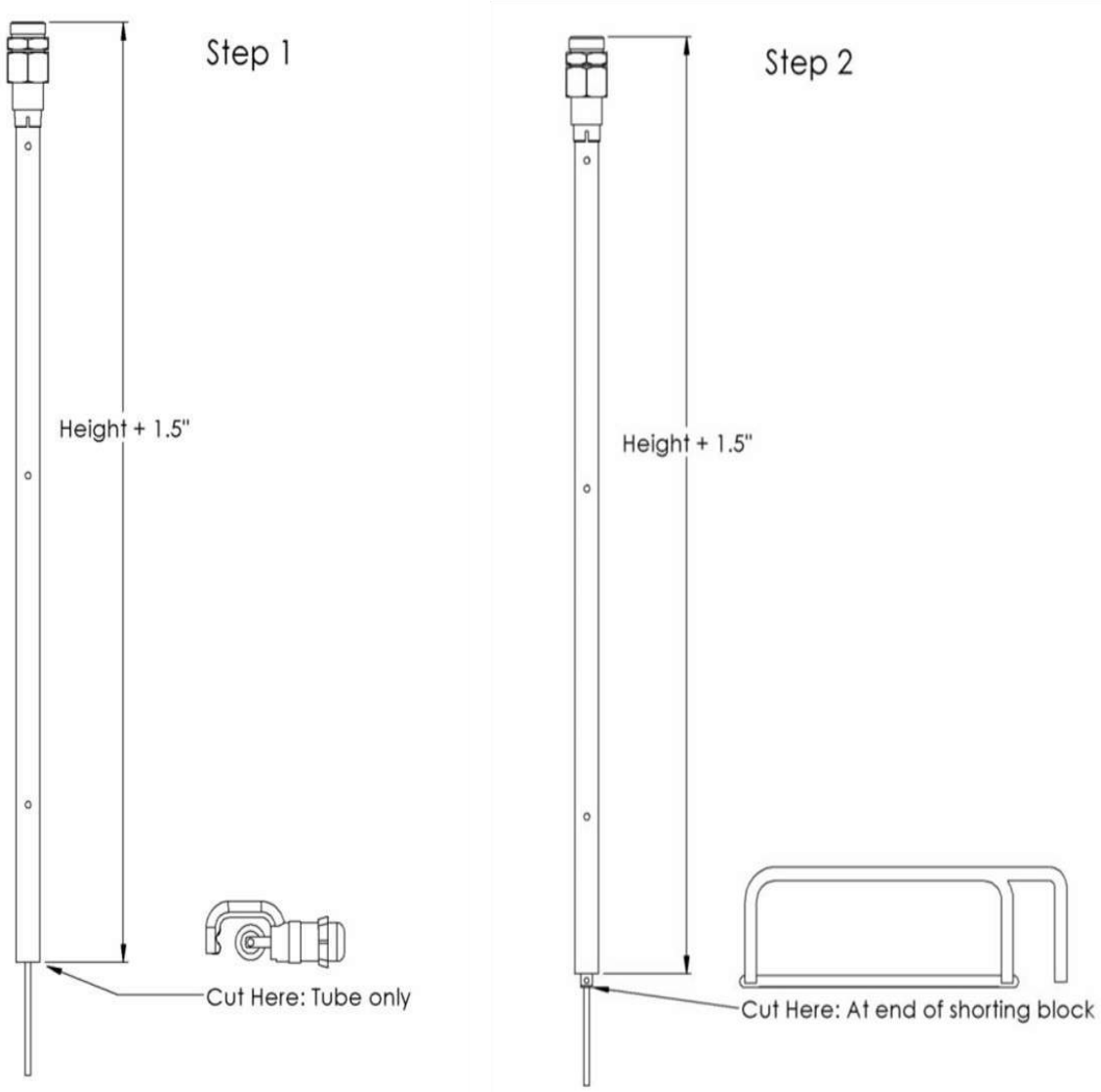

Figure 38 Cutting the Coax Probe

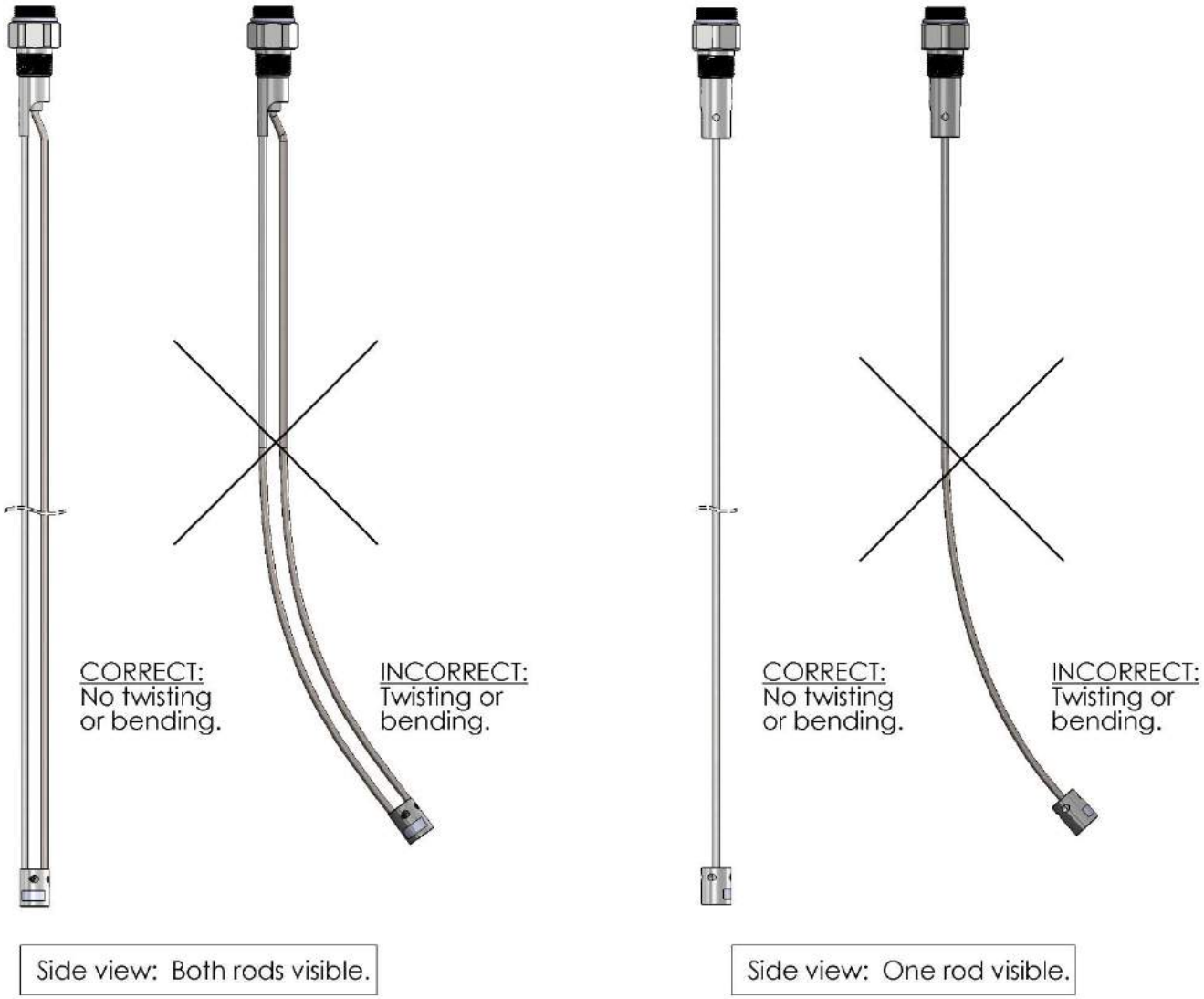

Figure 39 Probe Installation

4.2.2 Transmitter Installation

1. Ensure sufficient clearance between the transmitter and tank top mounted fittings, obstructions, or manway. Provide at least 4" of clearance around the transmitter. Consider the installation location for clearance of the large 1 ¾" wrench required to install the probe and transmitter. These components must be sufficiently tightened for safe and reliable operation.
2. Ensure that the protective orange cap remains on the probe if the transmitter will be mounted later.
3. Carefully remove the protective cap from the probe. Ensure that the threads are not damaged. Inspect the transmitter and probe for dirt, oil, moisture, or debris.

	**WARNING** **Do not apply Teflon tape or anti-seize compound to the transmitter threads. Do not apply dielectric grease to the transmitter and probe connection. This must be a clean and bare metal-to-metal connection.**

4. Hand-tighten the transmitter nut, and then use a wrench to secure the connection.
5. Place the transmitter on top of the probe, supporting it with one hand while hand engaging the transmitter nut with the probe.
6. Continue to support the transmitter while hand tightening the transmitter nut until it is resting on the probe O-ring seal.
7. Position the transmitter for the required cable routing. The angled sealing fitting and cable must not interfere with the tank top mounted fittings and manway.
8. Continue tightening the transmitter nut with a 1 ¾" wrench until the nut compresses the O-ring on the probe and the transmitter does not rotate on the probe when twisted by hand. The transmitter to probe connection must not have any movement to operate properly.

4.2.3 Finch II/5332INT Display Installation

Refer to TD010 Finch II Installation & Operation Manual for detailed installation instructions.

Ensure that the unit is:

- sheltered from weather and moisture
- easily visible and within reach of the operator
- installed location does not exceed Class 1, Div. 2 area classification
- shielded from wheel spray and stones
- away from direct sunlight
- not operated in temperatures less than -40C and greater than +65C
- away from high voltage/current wiring, contactors, inverters, and radio transmitters

4.2.4 Accessories Installation (Optional)

1. Position the lights, horns and other alarm accessories where indicated by the manufacturing or installation drawings
2. Bolt the accessories to the panel, bracket, or protective box. Ensure that the bolts are not torqued to the extent that the plastic mounting tabs are crushed.

4.3 ELECTRICAL INSTALLATION

!	**NOTE** **Observe all federal, state/provincial, and local safety standards and industry recommended practices.**

This electrical installation refers to the TD100 transmitter and optional equipment. For a complete description of the electrical installation of the Finch II display, refer to TPM010 Finch II Installation and Operation Manual.

⚠	**WARNING** **All electrical grounding is to the vehicle or trailer electrical ground connection and not to the chassis.**

If using conduit, use a minimum 18 AWG.

Observe the following instructions during installation:

- The TD100 transmitter is provided with a 50’ or 75’ cable kit (optional). It is recommended to use the kit with included sealing fitting for connection to the Finch II display. If the cable kit is not used, a cable assembly is selected that uses a sealing fitting if the transmitter is installed in a hazardous area.
- For trailers, connect the TD100 system power and ground to the nose box electrical connector. For trucks, connect TD100 system power to a switched accessory power connection from the battery.
- Wire splices should be made inside a weatherproof enclosure or junction box to prevent premature failure due to corrosion.
- Secure all wires and cabling with clips or cable ties and tighten all compression fittings.
- The TD100 transmitter terminal wiring area forms an explosion proof enclosure. Care must be taken when opening or closing the enclosure.
- Keep the surface of the terminal cover area (where the terminal cover attaches to the base) free of scratches, dust, or dirt.

⚠	CAUTION **Replace the transmitter if the terminal cover or terminal cover area on the transmitter base become dented or scratched, to maintain explosion-proof protection.**

⚠	CAUTION **Replace the transmitter if the threads for the transmitter lid become damaged, to maintain explosion-proof protection.**

- The transmitter lid should only be removed at Titan factory. Warranty will be void if lid is removed outside of the Titan Factory.

4.3.1 Installation Wiring – System

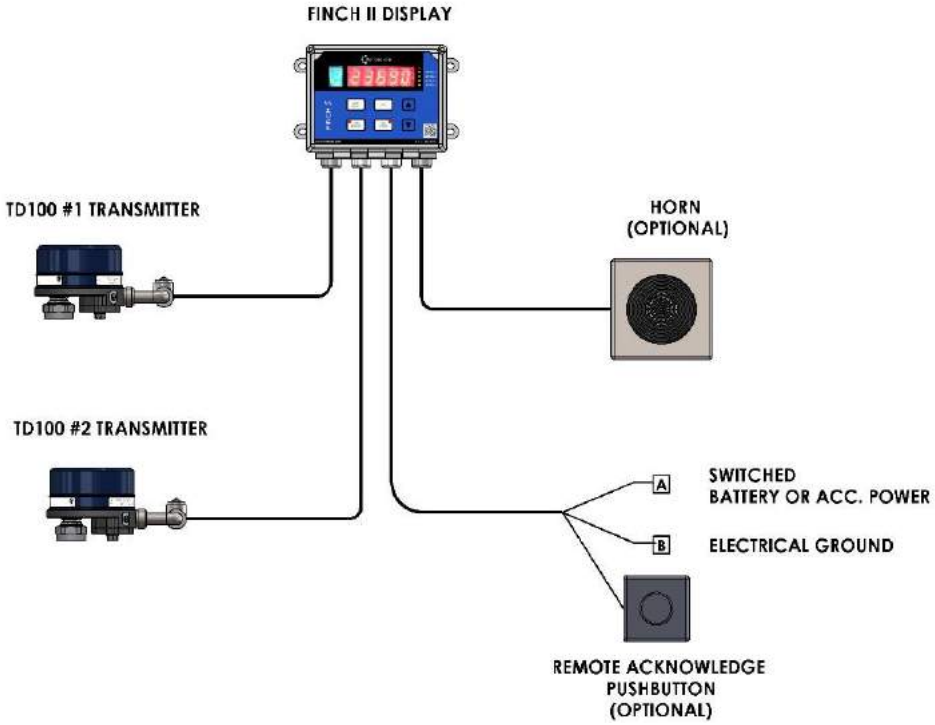

Figure 40 Basic System Wiring Diagram

4.3.2 Installation Wiring - Transmitter

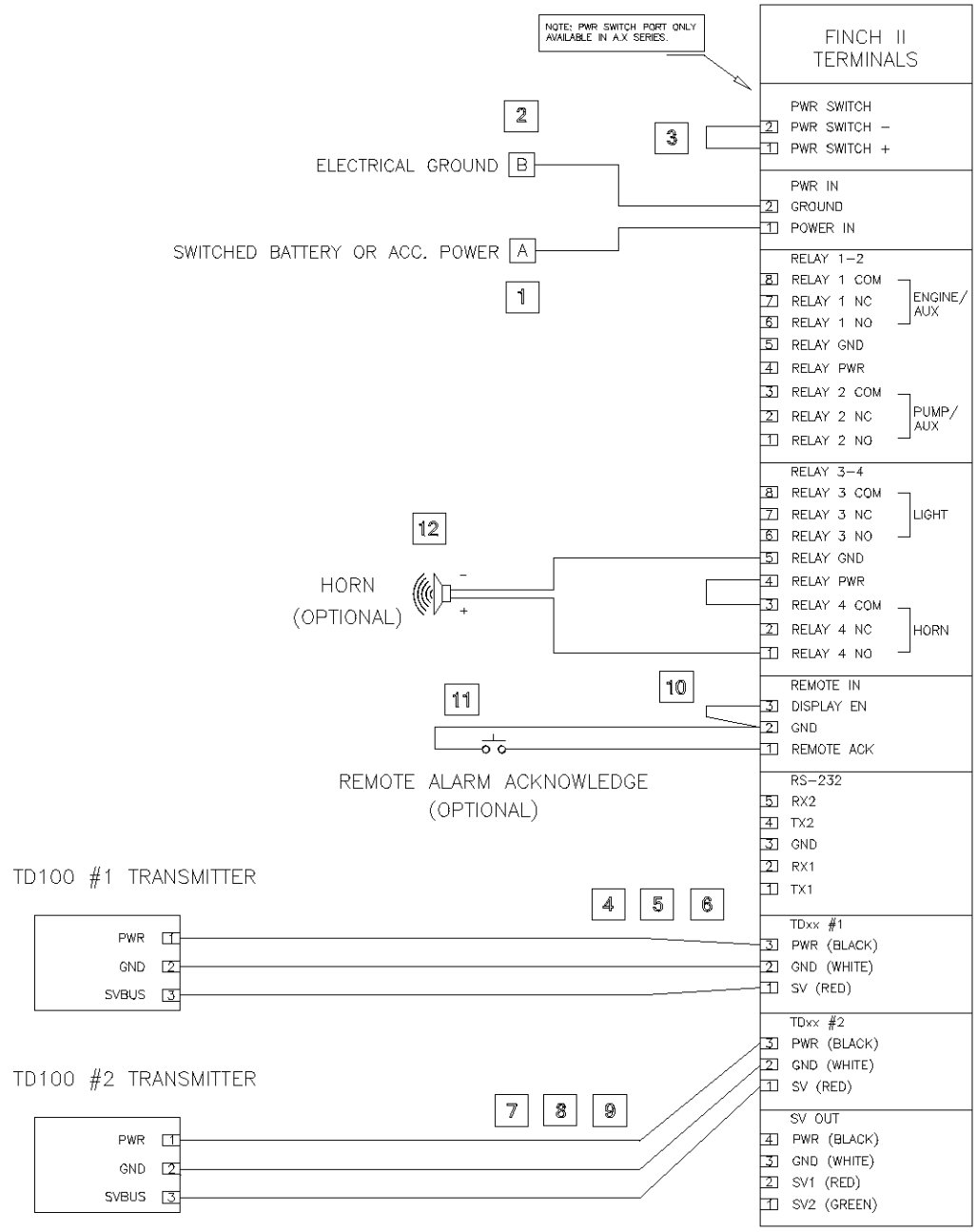

Figure 41 Transmitter/Finch II Connections Schematic

⚠	**WARNING** **Seal shall be installed within 50 mm of enclosure.**

⚠	**WARNING** **Open circuits before removing cover.**

⚠	**WARNING** **Not including the Acidic Atmospheres-Ketones and Halogenated Hydrocarbons.**

4.3.3 Installation Wiring - Finch II Relays

For additional programming options Refer to Figure 34 and to the Finch II Programming Manual TPM051 manual. Any TD80 references in TPM051 will correlate with TD100 wiring applications for the purposes of this wiring installation.

⚠	**WARNING** **EXPLOSION HAZARD – Do not connect or disconnect equipment or replace fuse unless power has been switched off or the area is known to be non-hazardous.**

⚠	**WARNING** **EXPLOSION HAZARD – Substitution of components may impair suitability for Class 1, Division 2.**

The relay contacts are rated for 30VDC, 2A continuous current maximum. Each set of contacts is protected by a 5A fuse (Finch II display) and a 2A fuse (5332INT display) located on the terminal board.

Ensure that the power and ground are connected as described below.

1. Fused power wire from nose box socket or junction box to Finch II POWER IN (1)
2. Ground wire from nose box socket or junction box to Finch II GROUND IN (2)

Using one transmitter:

1. TD transmitter Power (black wire) to Finch II PWR (BLACK) (3)
2. TD transmitter Ground (white wire) to Finch II GND (WHITE) (2)
3. TD transmitter SV Bus (red wire) to Finch II SV (RED) (1)

Using a second transmitter:

4. TD transmitter Power (black wire) to Finch II PWR (BLACK) (3)
5. TD transmitter Ground (white wire) to Finch II GND (WHITE) (2)

6. TD transmitter SV Bus (red wire) to Finch II SV (RED) (1)

Continuation for both:

7. Wire from Finch REMOTE IN: DISPLAY EN (3) to REMOTE IN: GND (2).

Optional Remote Alarm Acknowledge push button:

8. Wire REMOTE IN: REMOTE ACK (1) to one terminal of the Normally Open push button switch.
9. Wire REMOTE IN: GND (2) to the other terminal of the push button switch.

Optional Horn:

10. Wire from RELAY 3-4: RELAY PWR (4) to RELAY 3-4: RELAY4 COM (3).
11. RELAY 3-4: RELAY4 NO (1) to HORN (+)
12. RELAY 3-4: RELAY GND (5) to HORN (–)

Tighten all terminal screws; both wired and unused. The screws may loosen and fall out due to vibration if not secured. Loose metal hardware inside the enclosure may cause permanent equipment damage.

4.3.4 Installation Wiring – 5332INT In-Cab Display

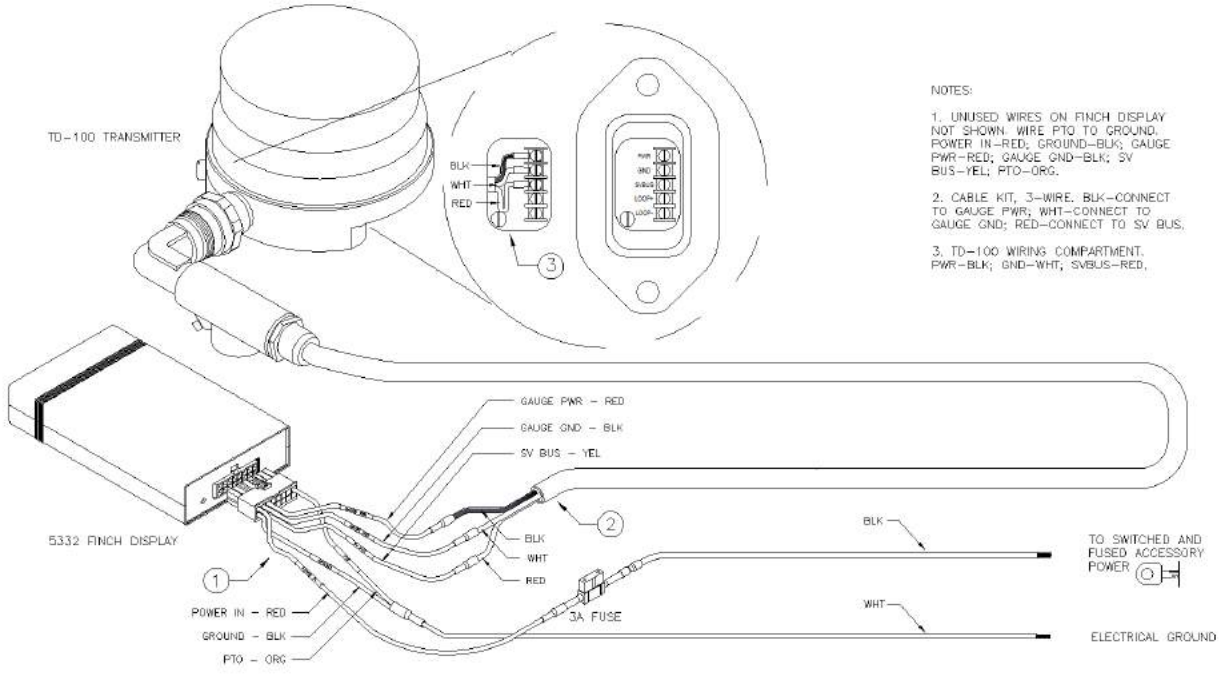

Figure 42 5332INT In-Cab Wiring Diagram

1. Fused Power wire from the fuse or junction box through a 3A fuse to 5332INT POWER IN (red wire)
2. Ground wire from the fuse or junction box to 5332INT GROUND (black wire)
3. TD100 Power (black wire) to 5332INT GAUGE PWR (red wire)
4. TD100 Ground (white wire) to 5332INT GAUGE GND (black wire)
5. TD100 SV Bus (red wire) to 5332INT SV BUS (yellow wire)

6. Optional PTO or brake air switch to 5332INT PTO (orange) input **OR** wire 5332INT PTO (orange) input to GROUND when not connected to a PTO or brake air switch

4.3.5 Installation Wiring - Current Loop Option

The 4-20mA current loop option may be used along with any TD100 configuration. This option does not interfere with the Finch II display, lights, horns, RCM, or the MIC 10.

The loop power supply is automatically controlled along with the TD100 and Finch II (if installed).

3.8mA is signaled during the 10 second TD100 transmitter warm up period, indicating that no valid level information is available.

4.3.5.1 Wiring - 4-20MA Current Loop (No Finch II)

1. At the TD100, ensure that the following wires are connected to the correct terminals:
    a. Black wire to PWR
    b. White wire to GND
    c. Red wire to SVBUS
2. At the TD100, connect the following wires for the 4-20mA option:
    a. PWR terminal to LOOP+
    b. Unused wire in the cable to LOOP-.
3. At the junction box, connect the following wires from the TD100:
    a. TD100 Power (black wire) to the junction box black terminal
    b. TD100 Ground (white wire) to the junction box white terminal
    c. TD100 SV Bus (red wire) to the junction box red terminal
4. At the junction box, connect LOOP- wire, colour noted from step 4 above, to the same colour terminal
5. Connect the following current loop wires from the junction box to the Remote Monitor:
    a. LOOP- wire, now called 4-20mA+ to the Remote Monitor 4-20mA+ input
    b. A wire at the white terminal (ground) now called 4-20mA- to the Remote Monitor 4-20mA- input.

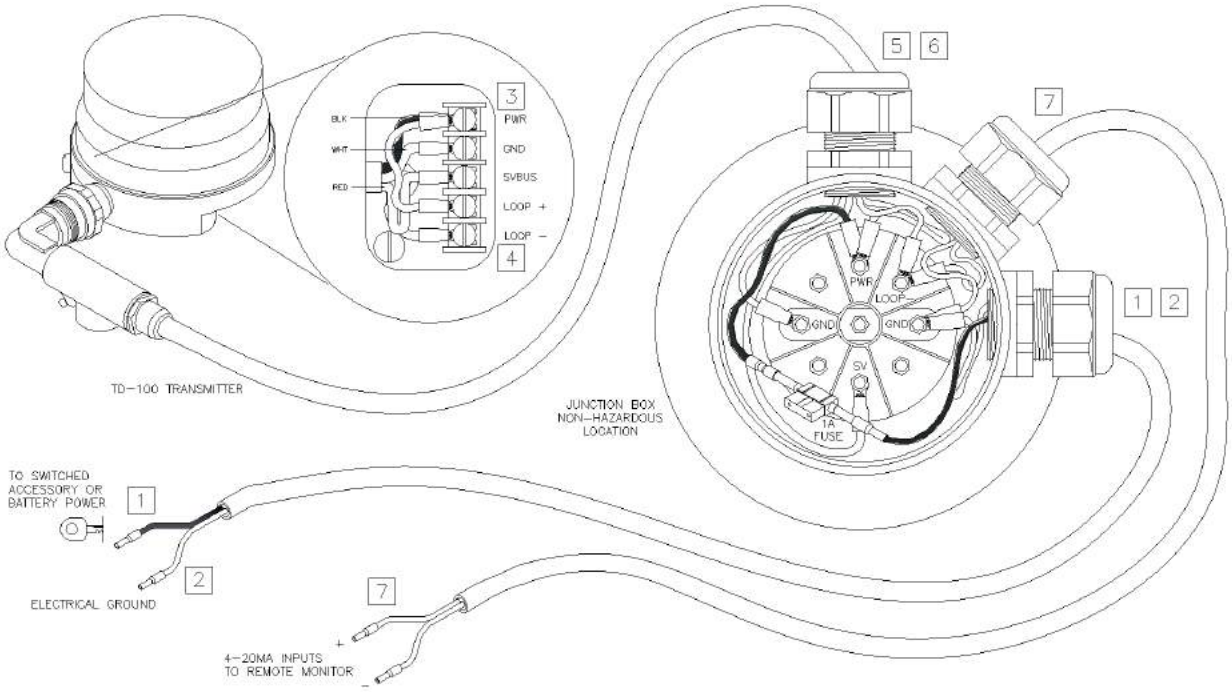

Figure 43 Current Loop Wiring Diagram

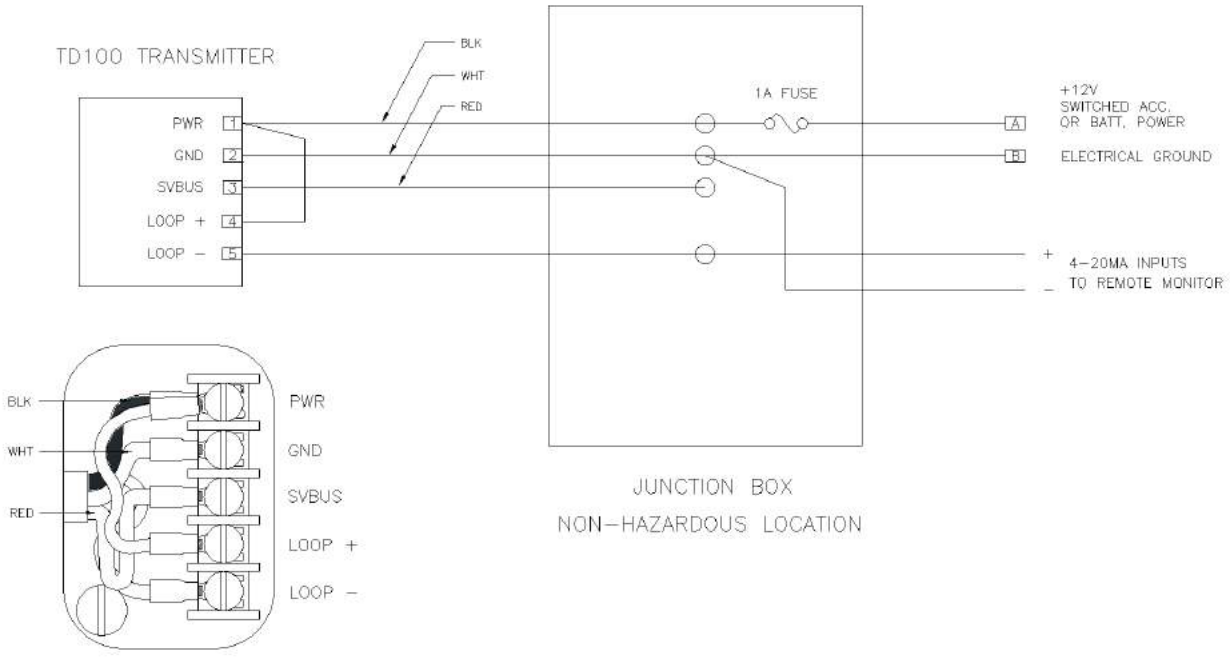

Figure 44 TD100 Transmitter Wiring Schematic

5 CONFIGURATION & CALIBRATION

!	**NOTE** **References to SensorLink™ programming and/or graphics in this manual are subject to change. See the latest manual version of SensorLink2 for the most current information.**

5.1 TRANSMITTER

The TD100 system must be configured before use. This is done through the Finch II display or the 5332INT In-Cab display, and the SensorLink™ software.

HH and Spill alarms are set by the installer with the SensorLink™ software (refer to the SensorLink™ User Manual TPM058). This is done during transmitter programming only and cannot be changed by any Finch II buttons or switches. Strapping table information is compiled or downloaded using SensorLink™.

The Fall and Fill alarms are managed by settings stored in the Finch II display. They are configured from the front panel buttons on the Finch II or 5332INT displays by the installer or operator.

The source of Fail alarm is from both the TD100 transmitter and Finch II display. Internal malfunctions and loss of communication between transmitter and display are reported by the Fail alarm as error codes on the Finch II display and optional relay control for external devices.

Programming may be done at the factory when purchased, by the customer prior to installation, or after installation on the vehicle when necessary. If the TD100 is not programmed to the specific parameters of the tank it is measuring; it will not provide useable and accurate readings.

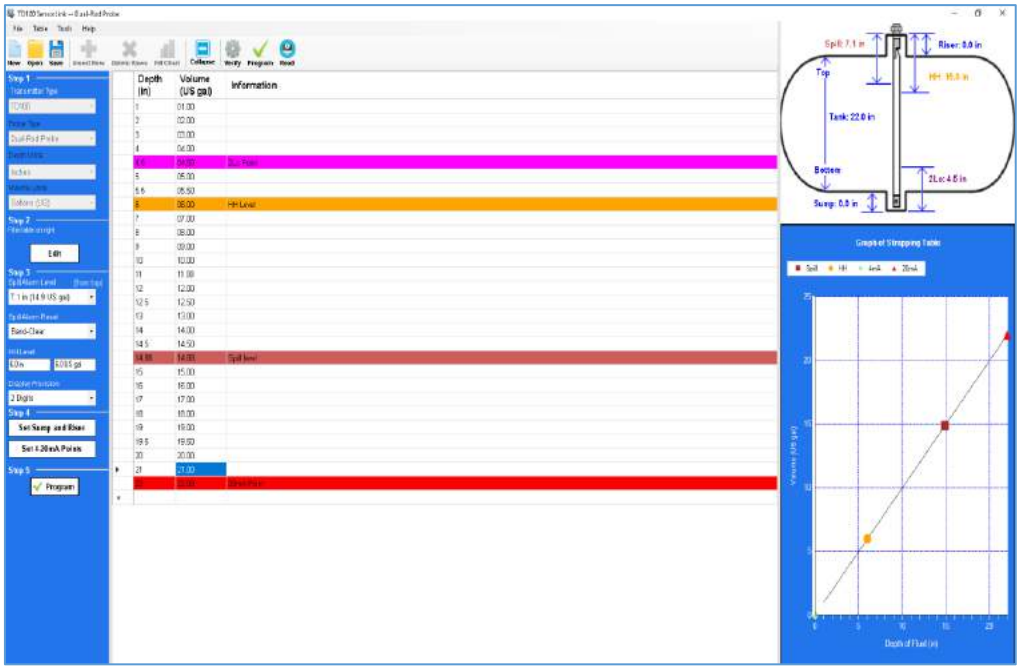

Figure 45 SensorLink™ Strapping Table

5.1.1 Detection Modes

During configuration, the operator has the option of selecting either Standard Detection Mode or Performance Detection Mode.

The default detection mode is always set to Standard Detection mode.

If the operator requires greater accuracy or smaller deadband regions, and is using **only one** fluid in the tank, select Performance Detection Mode.

5.1.2 Riser Parameter

The Riser Parameter is the measurement taken from the bottom of the probe nut to the tank top. This measurement is entered in the Riser and Sump dialogue box (second last item on left hand column) in the Riser field of the SensorLink software. This measurement compensates for probe placement allowing for more accurate readings.

5.2 FINCH II DISPLAY

Refer to TPM051 Finch II Programming Manual for full configuration and programming details.

5.3 CURRENT LOOP TRANSMITTER (OPTION)

The tank level is detected by the TD100 using a probe and transmitter. This level or depth is converted into a signal of between 4mA and 20mA. A current of 4mA represents the lowest value in the measurement range, or 0% full. The 4-20mA signal represents depth of the liquid, not volume.

The 4mA and 20mA positions on the probe may be programmed for any distance required by the application. The only requirement is for 4mA to be positioned lower on the probe than the 20mA position.

Normal programming of the volume and depth, compensation for a riser or sump, High-High alarm volume and Spill alarm height results in a 4-20mA output that is suitable for most applications and is programmed through the SensorLink™ software.

For any depth of liquid, the transmitter sends the corresponding volume along with alarm states to the Finch II display. The 4-20mA output sends the percentage filled only, scaled between 4mA for empty and completely full at 20mA.

The 4-20mA signal will not give a reliable reading within the top and bottom deadband regions.

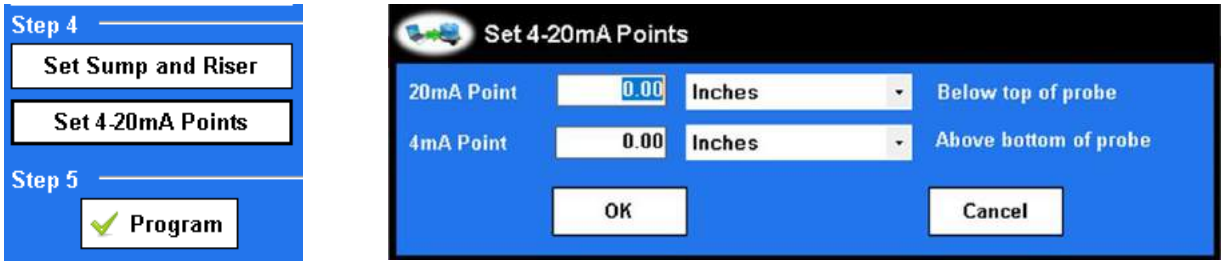

Figure 46 SensorLink™ 4-20mA Set Points

The current loop option will not indicate when the tank level is within the lower deadband of the probe.

The output current will not rise above the programmed Spill alarm level. The Spill level is in the upper deadband of the probe where tank level cannot be measured accurately.

A current of 0mA is usually caused by an open loop circuit, most likely due to a broken wire. It may also be caused by a defective loop current transmitter, receiver, or power supply.

Offset calibration of the TD100 does not affect the 4-20mA output. The 4-20mA current output is linear and reflects the level or depth of the liquid loaded, not volume.

The following table summarizes data and alarm states available through the SV bus to a Finch II display and information signaled by the 4-20mA output.

Data and Alarm States	TD100 SV Bus and Finch II Display	TD100 4-20mA Signal
Level Output	Volume, 0-9999 units	Depth, 0 to 100% = 4 to 20mA
10 Second Warm Up		3.8mA
2 LO Indication	YES	NO
Fill/Fall Alarm	YES	NO
High-High Alarm	YES	NO
Spill Alarm	YES	NO
Finch II Generated Error (including loss of communication) Indication	YES	NO
TD100 Detected Error	Error Code, 00 to 91	22mA failure signal

5.4 START UP

!	**NOTE (Performance Detection Mode only)** **When first using the system (commissioning) or changing the tank or load type, or when changing the transmitter from one probe to another, the user must allow for a minimum fill volume beginning with an empty tank and rising to 12" (tank) to allow the system to accurately calibrate for any changes in fluid or tank dimensions. The display will show an E90 or E91 error during the first start-up until the fluid level has passed the 12" level.**

Refer to sections 3.5, 3.6, and 3.7 of this manual for details on alarm points and setting and deactivating alarm states for both the Finch II and 5332INT In-Cab displays.

The following steps are to be completed after installation and configuration of the probe, transmitter, and display.

!	**NOTE** **If the display test is completed before the transmitter warm-up; the unit will display dashes (-----) for a few seconds while the transmitter warm-up completes.**

1. Inspect installation before power is applied.

2. Turn power on to the TD100 system. During the warm-up cycle, the Finch II display will run tests showing the current software revision number, followed by a display test consisting of all five digits and compartment number(s) showing the values from 0 to 9 and A to F. At the same time as the display test, the Finch II unit will test the HORN relay. It will pulse the HORN relay for 1 second.

   If applicable, the 5332INT display will test the Fill and Spill/Fail relays. The unit will wait 2 seconds, pulse the Fill relay for 1 second, wait for 2 seconds, and pulse the Spill/Fail relay for 1 second.

   The Finch II display may show one of the following:
   - "2 LO" if the tank is empty or tank level is within the bottom deadband region
   - Tank volume if the tank level is outside of the top and bottom deadband regions
   - "E xxxx", (where x is a number) represents an error code (error codes are described in the Troubleshooting section of this manual)
   - "SPILL" if the tank level is within the top deadband region

3. Clear any active alarms.

4. Set the Fill and Fall alarms.

5. Set and verify the Finch II display DIP and Rotary switches. Refer to TPM 010 Finch II Installation & Operation Manual for further details.

6. Ensure the strapping table is in place using the SensorLink™ software.

7. Add fluid to the tank to confirm volume programming:
   - Confirm 2Lo alarm activates, and display shows 2Lo when the tank level is within the bottom deadband region. Deactivate the alarm.
   - Confirm High-High alarm activates, and the display shows HH when the level reaches the HH alarm setting. Deactivate the alarm.
   - Confirm Spill alarm activates, and the display shows SPILL when the tank level is within the top deadband region. Deactivate the alarm.
   - If the optional Fill/Fall alarm have been set, confirm the alarm by moving past these points on the probe. Confirm the display shows FILL or FALL. Deactivate the alarm.

8. Test the 4-20mA output (if installed) by doing the following:
   a. Monitor the 4-20mA signal with a Digital Multimeter (DMM).
   b. Short the probe at several points along the length of the probe.
   c. No short across the probe produces a signal of 4mA or slightly greater. Increasing height of the short produces an increasing current toward 20mA.

9. Perform an Offset Calibration. See the Offset Calibration procedure in the following section of this manual.

5.5 OFFSET CALIBRATION

Refer to sections 3.6.2.6 and 3.7.2.5 for details on entering Finch II and 5332INT Calibration Modes.

Offset calibration of the TD100 transmitter is required after installation, programming, or replacement of the TD100 transmitter. The calibration compensates for variations from the calibration chart provided by the tank manufacturer, small differences in tank height, and probe mounting height above the tank top.

To perform an offset calibration on the system, a known amount of liquid must be in the tank. This level must be greater than 6".

!	**NOTE** **If both Finch II and 5332INT are being used, calibration is done on one only.**

Large changes to the offset calibration indicate an error in programming. Review the strapping table and confirm that the TD100 transmitter is programmed for the compartment it is installed on and reprogram if necessary.

Offset calibration will halt if the adjusted level causes the High-High alarm setting to exceed the Spill alarm level. The adjusted level may not rise higher than 2" below the Spill alarm level.

There are three different methods for offset calibration.

Methods 1 and 2 are preferred, while method 3 is acceptable as better than no calibration. The first two methods calibrate to a metered load under normal conditions. This is the most accurate compensation for mounting location and calibration chart differences. The third method compensates for mounting height only and does not have any effect on variations from the calibration chart supplied by the tank manufacturer.

5.5.1 Method 1: Offset Calibration Using a Loaded and Metered Volume

1. Ensure the tank is level in all directions.
2. Fill the tank approximately 1/2 to 2/3 full. Determine the volume with a flow meter.
3. Turn the gauge power off.
4. Enter Calibration Mode for either Finch II or 5332INT.
5. Adjust the displayed volume to the actual amount. Then release the buttons.
6. Turn the gauge power off.
7. Turn the gauge power on, without holding any buttons.
8. Verify that the display matches the actual volume.

5.5.2 Method 2: Offset Calibration Using an Unloaded and Metered Volume

Refer to the SensorLink™ strapping chart for the following steps:

1. Ensure the tank is level in all directions at the unloading site.
2. Note the TD100 reported volume. This must be less than the Spill alarm level.
3. Unload at a metered site. Note the metered volume when the tank is completely empty.
4. Refer to the strapping chart to determine the distance between the TD100 reported volume and the metered amount.
5. At the next site, load the tank to approximately 3/4 full. Note the TD100 reported volume.

6. Refer to the strapping chart to determine the depth at the currently loaded volume reported by the TD100.
7. Add or subtract the distance calculated at step 4 to increase or decrease to the actual volume. Note the actual volume from the strapping chart.
8. The TD100 can now be calibrated to a metered volume.
9. Turn the gauge power off.
10. Enter Calibration Mode for either Finch II or 5332INT.
11. Adjust the displayed volume to the amount determined previously. Then release the buttons.
12. Turn the gauge power off.
13. Turn the gauge power on, without holding any buttons.
14. Verify that the display matches the actual volume.

5.5.3 Method 3: Offset Calibration Using a Measured Level

Refer to the SensorLink™ strapping chart for the following steps:

1. Fill the tank approximately 1/2 to 2/3 full. Determine the volume by dipping and referring to the strapping chart. An alternative is to place a wire short at a level 1/2 to 2/3 of the probe depth in an empty tank.
2. Turn the gauge power off.
3. Enter Calibration Mode for either Finch II or 5332INT.
4. Adjust the displayed volume to the actual amount. Then release the buttons.
5. Turn the gauge power off.
6. Turn the gauge power on, without holding any buttons.
7. Verify that the display matches the actual volume.

5.6 SPILL ALARM RESET

!	**NOTE** **During a Spill alarm, volume information sent from the transmitter is frozen at the Spill alarm level. It will not increase with detected liquid level above this point. Levels above the Spill alarm setting are within the probe top deadband where measurements are unreliable.**

The Spill alarm is cleared by unloading liquid below the spill alarm level, while the TD100 system is powered on and reporting level through the SV bus and optional 4-20mA transmitter. This is the normal method to silence the Spill alarm. It cannot be cleared by any button press or turning the power off.

Unloading from a Spill alarm condition while the power is turned off will not clear the Spill alarm. The TD100 transmitter must detect a tank level within the band clear region, which begins 1” below the spill level and ends 16.5” below the spill level, before clearing the Spill alarm.

5.6.1 Offset Calibration Method

⚠	**WARNING** **Using the Offset Calibration Method will bypass the Spill Alarm and may result in a spill situation. Ensure fluid in the tank has been reduced to a safe level.**

A Spill alarm may be cleared by starting an Offset Calibration from the Finch II display. Do not change the current offset, cycle the system power and the Spill alarm will be cleared. The alarm can only be cleared when the tank level in the compartment is below the set Spill alarm level.

6 TROUBLESHOOTING & MAINTENANCE

For complete system troubleshooting Refer to the 5332INT (TPM059) or Finch II (TPM010) manuals for complete troubleshooting information.

6.1 REQUIRED TOOLS AND EQUIPMENT

- Short length of wire bare at both ends or with alligator clips.
- Digital Multimeter (DMM)

6.2 ERROR CODES

The transmitter constantly checks the system for errors. Detected errors are shown on the Finch II or the 5332INT display. These error codes assist in diagnosing and repairing the problems.

E 80 through E 84 indicate an error caused by an incorrect strapping table or internal transmitter malfunction. For these errors, review the programming information, correct if necessary and reprogram the transmitter. If the malfunction persists, then replace the transmitter and ensure it is programmed correctly.

The error codes and possible solutions are listed below:

ERROR CODE	FINCH II	5332INT	ERROR CODE DESCRIPTION	POSSIBLE SOLUTIONS
E00	E0000	E_00	Could not measure level	- possibly bent or damaged probe - move the probe location to a less turbulent area of the tank - possibly defective transmitter
E01	E0001	E_01	Too many samples rejected (too much turbulence)	- move the probe to a less turbulent area of the tank - possibly defective transmitter
E02	E0002	E_02	Internal transmitter error, Wrap around on Timer 1	- defective transmitter
E04	E0004	E_04	Internal transmitter error, Timer 1 count is too large, PWM count out of range (TD100 only)	- defective transmitter
E10	E0010	E_10	Internal transmitter error, timeout between captures	- defective transmitter
E20	E0020	E_20	No fiducial detected	- possibly defective transmitter - possibly damaged or defective probe - possible turbulence in the tank - possible disconnection of transmitter and probe - possible liquid or grease contamination of transmitter to probe connection
E40	E0040	E_40	Internal transmitter error, Watchdog reset	- defective transmitter
E80	E0080	E_80	Internal strapping table error, HH alarm level set too close to Spill alarm level	- incorrect strapping table, reprogram the transmitter with a correct table

The above error codes may be combined if more than one error code exists at a time (e.g. E26 = E02+E04+E20).

ERROR CODE	FINCH II	5332INT	ERROR CODE DESCRIPTION	POSSIBLE SOLUTIONS
E81	E0081	E_81	Internal strapping table error, Alarms set, No strapping table	- program the transmitter with a strapping table - possibly defective transmitter
E82	E0082	E_82	Internal strapping table error	- reprogram the transmitter - possibly defective transmitter
E84	E0084	E_84	Internal strapping table error, error detected in strapping table during operation	- restart the transmitter, if problem persists then reprogram the transmitter - possible defective transmitter
E90	E0090	E_90	No edge compensation value has been set.	- fill the tank above 25cm from the bottom of the probe.
E91	E0091	E_91	No ref compensation value has been set	- fill the tank above the ref waveform stop update threshold
E92	E0092	E_92	No shorting block detected, or no probe attached	- possible shorting block has fallen off - possible damaged or defective probe - possible defective transmitter
E93	E0093	E_93	Invalid fluid level detected	- incorrect strapping table, reprogram the transmitter with a correct table - possible defective transmitter
E94	E0094	E_94	Auto compensation when PWM is out of range	- possible defective transmitter

***** E90 to EAF is reserved for low severity error codes within the Finch II. If an error code is received within this range it will be displayed but no relays will toggle.**

ERROR CODE	FINCH II	5332INT	ERROR CODE DESCRIPTION	POSSIBLE SOLUTIONS
E180	E0180		RS-232 #2 communication error	- check the RS-232 #2 connector and wiring connections - possible defective display - possible defective remote RS-232 device
E190	E0190		RS-232 #1 communication error	- check the RS-232 #1 connector and wiring connections - possible defective display - possible defective remote RS-232 device
E500	E0500		Could not send remote acknowledgement to remote Finch II displays	- check B-DIP, switch 3 in ON. Unlock the hardware setting by turning B-DIP, switch 4 OFF - possible defective display
E700	E0700		Finch II cannot read sector 0 settings from Flash	- possible defective display
E701	E0701		Finch II Relay Alarm map and Relay polarity settings have not been set	- possible defective display
E702	E0702		Finch II cannot read sector 1 settings from Flash	- possible defective display

ERROR CODE	FINCH II	5332INT	ERROR CODE DESCRIPTION	POSSIBLE SOLUTIONS
E703	E0703		Finch II serial flash timeout	- possible defective display
E704	E0704		Loaded old sector 0 settings from flash	- this may occur after upgrading from old firmware, power cycle display - check current compartment and DIM/SLEEP settings
E705	E0705		Loaded old sector 1 settings from flash	- this may occur after upgrading from old firmware, power cycle display - check relay assignments and Fill/Fall alarm settings
E706	E0706		Finch II can't read sector 2 (advanced settings) from Flash.	- this may occur after upgrading from old firmware, power cycle display - possible defective display
E707	E0707		Loaded old sector 2 settings from flash	- this may occur after upgrading from old firmware, power cycle display - check LoadMaxx settings
E780	E0780		Finch II Engine relay failed	- possible defective Engine relay - possible defective display
E781	E0781		Finch II Pump relay failed	- possible defective Pump relay - possible defective display
E782	E0782		Finch II Light relay failed	- possible defective Light relay - possible defective display
E783	E0783		Finch II Horn relay failed	- possible defective Horn relay - possible defective display
E800	-----		TD80 or TD100 timeout	- check transmitter wiring on the appropriate compartment - possible defective TD series transmitter. - possible defective display
E801	E0801		Failure during Finch II system initialization	- possible defective display - restart the display, if problem persists then replace display board or entire display
E802	E0802		Input voltage too low	- check the power supply for adequate operating voltage
E803	E0803		Input voltage too high	- check the power supply for adequate operating voltage
E804	E0804		Internal watchdog expired	- possible defective display
E805	E0805		Test Global Fault	
E806	-----		LoadMaxx timeout	- check LoadMaxx wiring on RS232 channel 2 - possible defective LoadMaxx. - possible defective display
E8FF	E08FF		Unknown fault condition has occurred.	- possible defective display

***** E180 to EAF is reserved for low severity error codes within the Finch II. If an error code is received within this range it will be displayed but no relays will toggle.**

6.3 SYSTEM TROUBLESHOOTING

The following troubleshooting items identify some of the most common system wiring and component failures along with suggested troubleshooting and repair steps.

Always check there is power to the battery and that power is applied through the wiring to the transmitter and displays. Check for any of the following:

- Corroded connector pin/socket, terminal, or crimp
- Loose screw on terminal
- Corroded wire or splice
- Pinched wire shorting to power, ground, or another signal
- Poor solder joint
- Defective electrical component such as connector, switch, plug, socket, terminal strip, or junction box

Loss of power. No system operation, display is blank.		
WHAT TO DO:	**DETAILS:**	**REMEDY:**
a. Check fuses, cable connections, wiring and power switches. See the following examples and suggestions.	i. Turn on the power/key switch	
	ii. Replace all blown fuses	
	iii. Repair all defective wiring	
	iv. Replace all defective components	
b. Check the power supply for adequate operating voltage.	Provide power from a well charged battery or DC power source, 8VDC to 30VDC, steady output. Confirm this voltage using a DMM. Do not use a battery charger.	
c. Use a DMM to test points for battery voltage in the following sequence.	i. Check all points from the Finch II Display back to the battery	
	ii. Inspect all junction boxes, plugs and sockets for broken wires and corrosion	
d. If power is at all points, use a DMM to check for grounds at points in the following sequence.	i. Check all points from the Finch II Display back to the battery	
	ii. Inspect all junction boxes, plugs and sockets for broken wires and corrosion	
e. If fuses keep blowing:	i. Verify that the type and rating of the fuse is appropriate for the application	
	ii. Continue by disconnecting power to system components to isolate the short circuit. Clip on battery power; probe each component at the power terminal. A short circuit to ground is indicated by the light fully illuminating.	Repair or replace the defective component as necessary.

Display shows only a decimal point, no numbers, flicker or shows 8's.	
WHAT TO DO:	**DETAILS:**
a. Check the power supply for adequate operating voltage.	Provide power from a well charged battery or DC power source, 8VDC to 30VDC, steady output. Confirm this voltage using a DMM. Do not use a battery charger.
b. Use a DMM or DMM to test terminals for battery voltage and ground in a logical sequence.	i. Check all terminals from the display back to the battery ii. Inspect all junction boxes, plugs and sockets for broken wires and corrosion.
c. Possibly faulty display, replace the unit	

Display restarts at erratic intervals. The digit test begins and then displays a level for some time, then restarts with the digit test.	
WHAT TO DO:	**DETAILS:**
a. Check power supply wiring for intermittent or corroded connections	
b. Ensure that the battery voltage is at least 8VDC and steady	Provide power from a well charged battery or DC power source, 8VDC to 30VDC, steady output
c. Finch II Display may be faulty, replace the unit	

Display shows incorrect volume.	
WHAT TO DO:	**DETAILS:**
a. Offset calibration may be required.	Perform the offset calibration.
b. The TD100 transmitter may be incorrectly programmed.	Reprogram the transmitter with correct information.
c. The TD100 transmitter may be defective.	Replace the TD100 transmitter with a serviceable unit that has been programmed with same information as the one it is replacing.

Faint beeping coming from horn.
DETAILS/REMEDY:
1. Check the horn for loose, corroded, or disconnected wiring 2. Ensure that a 150ohm to 500ohm, 2W resistor is connected across the horn 3. Replace the horn with a less sensitive one

Display shows erratic level measurements or “2 LO”.		
WHAT TO DO:	**DETAILS:**	**REMEDY:**
a. Display shows erratic level measurements while a mobile radio is keyed or other radio equipment transmits.	Physically separate all TD100 system components and wiring from the radio devices.	
b. Display shows erratic level measurements or “2 LO” while loading or unloading product.	i. Check the probe for physical damage, defects, corrosion, or product build up.	1. Probe may be faulty, replace the probe. 2. Probe may be bent or twisted, repair or replace the probe. 3. Probe may be corroded, replace the probe. 4. The shorting block may be loose or missing, repair or replace the shorting block. 5. Inspect the probe for product buildup. Clean the probe with a solvent compatible with the product.
	ii. The TD100 transmitter may be defective.	Replace the TD100 transmitter with a serviceable unit that has been programmed with same information as the one it is replacing.
	iii. Check the probe to TD100 transmitter connection for contamination.	Clean out any contamination such as water, oil, grease, or dirt. The connectors must be clean and make a solid mechanical connection. Retighten the connectors and test the system.

Spill alarm is on continuously, unable to clear the alarm by unloading while the TD100 is turned on or by entering Calibration mode.		
WHAT TO DO:	**DETAILS:**	**REMEDY:**
a. Check installation of the dual-rod probe if installed.	i. The tank mounting collar or fitting must not extend more than 1.5” below the 1 3/4” nut on the probe.	The mounting fitting height must be reduced to 1.5” or less.
	ii. A 4” minimum diameter around the probe must be free of any metal objects.	The probe must be relocated to an area that has at least 4” diameter around it free from metal objects.
	iii. The transmitter must be securely fastened to the probe	Hand tighten the transmitter nut until it is at the o-ring, then fully tighten with a wrench.
c. Check probe for buildup of product at or near the top of the probe.	Clean the probe with a solvent compatible with the product	The probe may require removal for thorough inspection and cleaning

Unable to offset calibrate the TD100.		
WHAT TO DO:	**DETAILS:**	**REMEDY:**
a. Finch II Display shows "2 LO" after flashing "CAL".	i. The tank may be empty, or the tank level is within the bottom deadband region	Fill the tank above 6" and Calibrate
b. Finch II Display continues to flash "CAL" without showing current volume.	i. Possibly defective Finch II Display	Replace Finch II Display
	ii. possibly defective TD100 transmitter	Replace TD100 transmitter
	iii. TD100 transmitter power may be independent from the Finch II Display power. Power must be cycled to the Finch II Display and TD100 at the same time for offset calibration	
c. Finch II Display shows a level after flashing "CAL", unable to set the Display to the actual volume.	i. The TD100 transmitter may be defective	Replace the TD100 transmitter with a serviceable unit that has been programmed with same information as the one it is replacing
	ii. The TD100 transmitter may be incorrectly programmed	Reprogram the transmitter with correct information

Fuses keep blowing.		
WHAT TO DO:	**DETAILS:**	**REMEDY:**
a. Verify that the type and rating of the fuse is appropriate for the application	Install fuse with the correct type and rating	
b. Verify that the system components are installed and wired correctly.	i. Inspect all wiring for installation errors	
	ii. Continue by disconnecting power to system components to isolate the short circuit iii. Clip on battery power; probe each component at the power terminal. A short circuit to ground is indicated by the light fully illuminating	Repair or replace the defective component as necessary

Display does not turn on.
DETAILS/REMEDY:
1. Check for a blown power fuse 2. Check for loose, corroded, or disconnected wires on the power or ground wiring 3. Possibly faulty display 4. Battery voltage is less than 8VDC

Large level offset or error.
DETAILS/REMEDY:
1. Level transmitter may be faulty, or programming is incorrect

Display shows "2 LO" during calibration.

DETAILS/REMEDY:
1. Power down the system, add more liquid to the tank and recalibrate. (see Calibration section of this manual)

Display shows only "- - - -"
DETAILS/REMEDY:
Communication between the level transmitter and the display has been interrupted. 2. Check the wiring between the display and transmitter 3. Possible faulty level transmitter 4. Possible faulty display

6.4 CURRENT LOOP SYSTEM (OPTIONAL)

A loop current of **0mA** indicates one or more of the following:

1. Open circuit in the loop wiring
2. Defective loop power supply
3. Defective current transmitter
4. Defective current receiver

22mA signalling current indicates a system failure detected and reported by the TD100. An error code is also available at the Finch II display (if installed).

Analyse the Finch II displayed indications along with current and voltage measurements of the current loop components. The SensorLink™ tool may be used in the place of a Finch II display. For further details refer to TPM058 SensorLink™ Installation and Operation manual.

The first step is to ensure a reliably operating TD100 system. Perform a complete system test and resolve any problems before attempting to troubleshoot and repair the current loop output. Most 4-20mA problems are caused by other failures and are only indicated by the output.

Ensure that the TD100 system is provided power from a well charged battery or DC power supply, 8VDC to 30VDC.

Confirm this voltage is correct and stable using a Digital Multimeter (DMM).

The following steps are suggestions for a methodical troubleshooting procedure. Analyse each result and troubleshoot specific components if the test results are abnormal.

1. Test the TD100 system for normal operation. Troubleshoot and repair any problems before continuing.
2. Measure the current loop power supply voltage and determine if it is within acceptable limits.
3. Measure the TD100 power supply voltage and determine if it is within acceptable limits.
4. Measure the 4-20mA loop current and check for the following:
   a) 0mA indicates a broken wire or defective current loop component
   b) 3.8mA indicates that the TD100 transmitter is still in the 10 second warm up cycle or did not start normally.
   c) 22mA indicates a TD100 reported system failure or error. Finch II displayed error codes state the nature of the error.

d) Erratic current measurements between 4mA and 20mA with corresponding fluctuations of the Finch II displayed volume or error codes indicate a TD100 level transmitter or probe problem.
e) Erratic current measurements between 4mA and 20mA while the Finch II displayed volume is steady indicate a defective TD100 transmitter, current loop power supply instability or intermittent loop wiring. It may also be caused by a defective current loop receiver.

6.5 Repair

The TD100 transmitter has no serviceable parts. Return to Titan for repair if required. It is not recommended to field repair any damaged TD100 system components or TD100 system cabling. Temporary or emergency field repair of damaged cables or cut wiring is acceptable. Replace the cable at the earliest opportunity.

6.6 Maintenance

WARNING

Explosion hazard. Do not remove the transmitter cover in the field. If the transmitter is damaged or is not functioning, contact Titan for instructions.

WARNING

Clean the transmitter with a damp cloth to prevent static charge.

CAUTION

Replace the transmitter if the terminal cover or terminal cover area on the transmitter base become dented or scratched, to maintain explosion-proof protection.

CAUTION

Replace the transmitter if the threads for the transmitter lid become damaged, to maintain explosion-proof protection.

Visually inspect the TD100 system (mechanical and electrical components) periodically, ensuring that:

- mounting brackets and fittings are secure
- connecting cables to all system components are secure
- cables are not damaged or frayed
- Finch II status lights are displaying correctly
- all TD100 system components and peripheral equipment are free of any obstructions or debris

7 TD80 TO TD100 RETROFIT PROCEDURE

This section describes the steps to be followed for the replacement of the TD80 transmitter where there may or may not be fluid in the tank. This procedure includes copying the strapping table from the TD80 to the TD100.

7.1 REQUIRED TOOLS AND EQUIPMENT

- SensorLink v4 software
- SV Bus Programming Kit that contains the SV-RS232F SV to serial converter
- Dual-rod probe with shorting block, 122cm to 152cm (4 to 5 feet) long (measured from the top of the probe) is required if either the tank is empty, or the level of the fluid is within the bottom deadband region (2Lo alarm is set).
- Hand tools and cables

7.2 RETROFIT PROCEDURE (FLUID IN THE TANK)

Use this procedure if the level in the tank is above the bottom deadband region.

7.2.1 Retrieving the TD80 Strap Table

1. Ensure power is applied to the Finch II/TD80 system.
2. Record the volume as shown on the Finch II display.
3. If there is a sump and/or riser on the tank, record their corresponding values.
4. Read the strap table off the TD80 using SensorLink utility program.
5. Save the TD80 strap table as a file for future reference.

7.2.2 Exchanging the Transmitter

1. Power down the TD80 transmitter and Finch II and proceed to replace the TD80 with TD100 transmitter.
2. Ensure proper electrical connections to the TD100 transmitter have been made.

7.2.3 Transferring the TD80 Strap Table to the TD100

Open the SensorLink software and perform the following steps:

1. Select TD100 from the main landing page.
2. Under the “3 dot” icon  select “Import File”.
3. Select the file saved in the previous step.
4. The strap table should be loaded. Ensure to check all levels and corresponding volumes for accuracy. Note that Standard Detection Mode will be selected for all TD80 tables and a default riser height of 1.813” will be added automatically. With these values, all alarm levels (2Lo, HH, and Spill) should match their corresponding volumes as in the TD80 table. They can be adjusted if necessary.
5. Consider saving the imported strap table to a file.
6. Program the strapping table after connecting to the TD100 transmitter.

7. After successfully programming the strap table, power down the TD100 and Finch II and perform an offset calibration (see next section).

7.2.4 Performing Offset Calibration on the TD100

(TD80 transmitter has been replaced with a TD100 transmitter)

1. Apply power to the Finch II/TD100 system. **DO NOT INITIATE OFFSET CALIBRATION YET**.
2. At the Finch II, select the compartment to be calibrated by pressing the "COMP SELECT" button. Verify that the Finch II displays a volume (should not show any errors).
3. Enter offset calibration mode as described in section 3.6.2.6.
4. The Finch II will then show the current volume of liquid in the tank.
5. Change the Offset Calibration to match the volume based on the previously recorded volume from the TD80 transmitter by either pressing the ▲ or ▼ arrow on the Finch II.
6. Power cycle the Finch II/TD100 system.
7. The TD100 should now contain the same strapping table as stored in the TD80, and Offset Calibration has been applied.

7.2.5 Confirming Offset Calibration on the TD100

1. Power cycle the Finch II/TD100 system. Wait until a level is displayed.
2. Confirm that the offset calibration has been applied. The level displayed should match the previously recorded volume from the TD80 transmitter.
3. Power cycle the Finch II/TD100 system one more time. Observe the level displayed on the Finch II. It should be consistent and should match the previously recorded volume from the TD80 transmitter.
4. Repeat Offset Calibration if the display is inconsistent each time a power cycle occurs or is not accurate.
5. As an additional test, add fluid or drain the fluid from the tank and observe the display on the Finch II. The display should change correspondingly – decreasing when draining and increasing when adding fluid to the tank.

7.3 RETROFIT PROCEDURES (EMPTY TANK)

Use this procedure if the level of fluid is within the bottom deadband region or the tank is empty.

7.3.1 Retrieving the TD80 Strap Table

1. Ensure power is applied to the Finch II/TD80 system.
2. Record the volume as shown on the Finch II display.
3. If there is a sump and/or riser on the tank, record their corresponding values.
4. Read the strap table off the TD80 using SensorLink utility program.
5. Save the TD80 strap table as a file for future reference.

7.3.2 Exchanging the Transmitter

An external dual-rod probe is required for this procedure.

1. Place and secure the shorting block of the dual-rod probe approximately 32 inches (81cm) from the fiducial.

2. Remove the TD80 transmitter from the existing installation and connect it to the external dual-rod probe with all electrical cabling in place.
3. Power up the TD80 transmitter and record the volume as shown on the Finch II. Note that any objects close to the probe may affect the reading.
4. Power down the system.
5. Remove the TD80 transmitter and connect the TD100 transmitter to the dual-rod probe along with all cabling.

7.3.3 Transferring the TD80 Strap Table to the TD100

Open the SensorLink software and perform the following steps:

1. Select TD100 from the main landing page.
2. Under the "3 dot" icon  select "Import File".
3. Select the file saved in the previous step.
4. The strap table should be loaded. Check all levels and corresponding volumes for accuracy. Note that Standard Detection Mode will be selected for all TD80 tables and a default riser height of 1.813" will be added automatically. With these values, all alarm levels (2Lo, HH, and Spill) should match their corresponding volumes as in the TD80 table. They can be adjusted if necessary.
5. Consider saving the imported strap table to a file.
6. Program the strapping table after connecting to the TD100 transmitter.
7. After successfully programming the strap table, power down the TD100 and Finch II and perform offset calibration (see next section).

7.3.4 Performing Offset Calibration on the TD100

1. At this point it is assumed the TD80 transmitter has been removed and replaced with a TD100 transmitter.
2. Apply power to the Finch II/TD100 system. **DO NOT INITIATE OFFSET CALIBRATION YET.**
3. At the Finch II, select the compartment to be calibrated by pressing the "COMP SELECT" button. Verify that the Finch II displays a volume (should not show any errors).
4. Enter offset calibration mode as described in section 3.6.2.6.
5. The Finch II will then show the current volume of liquid in the tank.
6. Change the Offset Calibration to match the volume based on the previously recorded volume from the TD80 transmitter by either pressing the ▲ or ▼ arrow on the Finch II.
7. Power cycle the Finch II/TD100 system.
8. The TD100 should now contain the same strapping table as stored in the TD80 and offset calibration has been applied.

7.3.5 Installing the TD100 Transmitter

1. Detach the TD100 transmitter from the external dual-rod probe and install onto the truck.
2. Power up the system and verify that the system is working. There should not be any error codes reported by the TD100 transmitter.

7.3.6 Confirming Level Readings of the TD100

1. Power cycle the Finch II/TD100 system. Wait until a level is displayed.

2. There should be no error displayed on the Finch II. Since the tank is empty at this point, the display should indicate 2Lo.
3. If it is safe to do so, short the dual rods by running a metallic conductor at various points along the length of the probe. The display should change accordingly. Check the HH and Spill alarms near the top of the probe.
4. Alternatively, if possible, fill the tank with liquid and confirm that the level increasing when filling and decreases when draining.

8 REFERENCE DRAWINGS

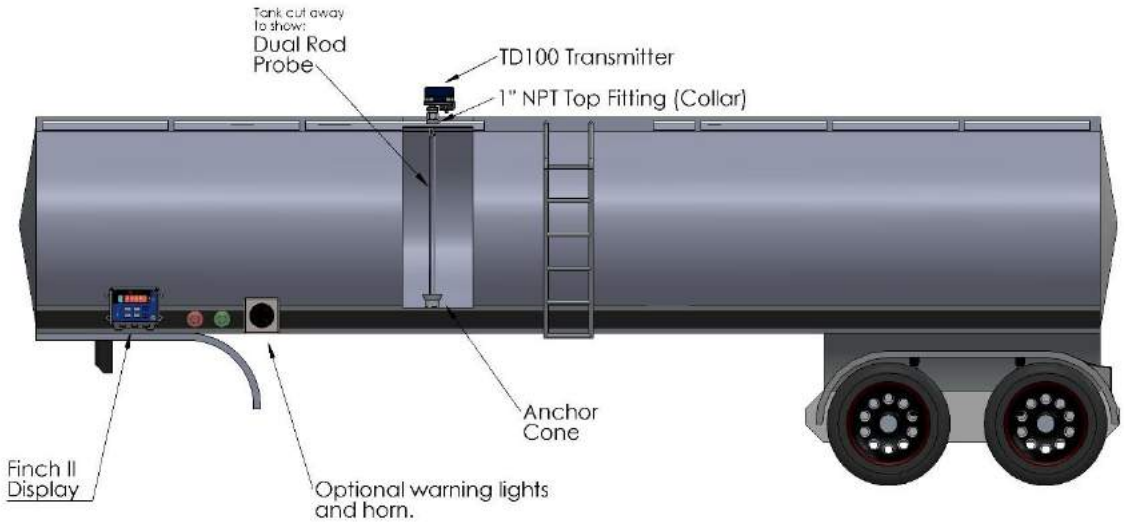

Figure 47 TD100 System Component Location

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Manufactured in Canada