



Product Manual

Cyl-Tel[®] and Tank-Tel[®] Liquid Level Gauges



Designed and Built by:

Chart Inc.

407 7th Street NW
New Prague, MN 56071 USA
(800) 400-4683



Contents

Revision Log	iv
Preface	1
General	1
Cyl-Tel/Tank-Tel Highlights	1
Product Manual	1
Terms	1
Acronyms / Abbreviations.	2
Introduction	3
What is the Cyl-Tel/Tank-Tel System?	3
Accurate Liquid Level Measurement	3
DP Zero (Calibration).	3
Pressure Setting.	3
Cyl-Tel/Tank-Tel Gauge Specifications	4
Physical.	4
Electrical Connections	4
Operating Conditions	4
Programmable Features.	4
Display Resolution	4
Cyl-Tel/Tank-Tel Circuit Board Diagram	5
Equipment.	7
Cyl-Tel Equipment	7
Suggested Equipment for Cyl-Tel	7
Additional Components	7
Cyl-Tel System Components	7
Tank-Tel Equipment.	8
Suggested Equipment.	8
Additional Components	8
Tank-Tel Gauge Assembly	8
Optional Components.	8
Gauge Installation	9
Cyl-Tel Gauge Installation	9
Cyl-Tel Installation Preparations	9
Replacing Existing Cyl-Tel with Cyl-Tel Gen 5	9
Cyl-Tel with Cyl-Tel Isolation Valve and Pressure Gauge Installation.	11
Cyl-Tel Isolation Valve Configuration	13
Tank-Tel Gauge Installation	14
Installation Procedure.	14
Wiring	15
External Power Installation	15
Preparing Wire	15
Connect Power Wires to the Cyl-Tel Gauge	15
Battery Power	15
Battery Installation	15
Differential Pressure Sensor.	16
Accessory Installation	17
Cyl-Tel/Tank-Tel to Scout 1.4 Installation	17
4-20 mA Output Wiring	17
Cyl-Tel/Tank-Tel to Interface Board Installation	18
Cyl-Tel/Tank-Tel to Remote Display Installation	18
Alarm Wiring	19

Gauge Operation and Setup 21
 General Operation 21
 Setting Standard Tank Parameters. 21
 Setting Custom Tank Parameters 23
 Setting Tank Level Units 26
 Differential Pressure Sensor Selection 27
 Setting the DP Zero 28
 Changing Tank Saturation Pressure 29
 Changing Pressure Units 30
 Changing GP Sensor. 32
 Setting GP Zero 33
 Setting Alarms. 34

Troubleshooting 37

Appendix A 39

Appendix B 41
 Chart Standard Bulk Tank Dimensions 41

Appendix C 43
 Determining the Values of "L" and "d" for Custom Tank Setup 43
 Determining the values based on U-1A Form: 43
 Determining the values based on outer measurements of a bulk tank: 44

Appendix D 45
 Declaration of Conformity 45

Appendix E 47
 Standard MicroBulk Tank List (with recommended pressure settings). 47

Appendix F 49
 Cyl-Tel/Tank-Tel Sensor Names 49
 Differential Pressure Sensors 49
 Gauge Pressure Sensors 49

Revision Log

Revision Level	Date	Description
A	12/06/2011	Initial publication
B	07/10/2014	Update to Cyl-Tel Gen 4. Update layout and design of manual.
C	01/18/2016	Update for Cyl-Tel Gen 5, update Appendix A, B, C, D, E, add new appendix F.
D	02/27/2017	Fix error in Circuit Board Diagram page 5, update PNs for Cellular Telemetry in Equipment section.



Preface

General

The Cyl-Tel Liquid Level Gauge is a digital electronic level gauge designed specifically for the Perma-Cyl® MicroBulk Storage System. The Cyl-Tel gauge has been updated to Gen 5 to include the latest in electronic and differential pressure measurement technologies. The new design includes accurate liquid level reading using differential pressure, a graphical display, and a simplified logic with nine selectable units of measure that eliminate the need for lookup charts. The Cyl-Tel gauge is telemetry-ready with built in outputs which eliminate the need for additional boards and is completely compatible to most current telemetry system requirements.

The Tank-Tel Liquid Level Gauge is a digital electronic level gauge designed specifically for bulk storage tanks. Featuring integrated software for digital pressure and level readouts, the Tank-Tel gauge calculates levels in real time based on the pressure in the vessel. The Tank-Tel system is designed to replace or tap in-line with existing DP gauges and is ideal for rugged outdoor installations.

Cyl-Tel/Tank-Tel Highlights

- Improves customer readability by eliminating calibration charts
- Programmable to tank model or by tank geometry
- Telemetry-ready outputs compatible with many systems
- Standard 4-20 mA output for both level and pressure, pulse output for level, and 3 local alarm switches that can be programmed for level or pressure
- Power: Battery (2 x 1.5V Long Life Lithium) powered or optional 12VDC adapter (for continuous power)
- Improved readability with a graphical display
- Built-in additional analog input port (0-5V) for optional pressure sensor connection

Product Manual

The Cyl-Tel/Tank-Tel Product Manual is designed to be used in conjunction with the Storage Systems provided by Chart. If there are any questions regarding the operation of the Cyl-Tel/Tank-Tel gauge, contact Chart's Technical Service at 1-800-400-4683.

This manual contains Introduction and Equipment sections which discuss the general features of the Cyl-Tel/Tank-Tel system and give an overview of the equipment necessary for installation.

A step-by-step guide for installing the gauge along with detailed photos can be found in the Gauge Installation and Wiring sections of this manual.

For information on how to set up and operate the Cyl-Tel/Tank-Tel gauge refer to the Gauge Operation and Setup section.

The Accessory Installation section is where you will find diagrams showing proper installation of a Cyl-Tel/Tank-Tel gauge.

The Troubleshooting section will help in deciphering any errors you might encounter along the way. The Chart Customer Service team is also available at 1-800-400-4683.

Terms

Throughout this manual safety precautions will be designated as follows:



Warning! *Description of a condition that can result in personal injury or death.*



Caution! *Description of a condition that can result in equipment or component damage.*



Note: *A statement that contains information that is important enough to emphasize or repeat.*

Acronyms / Abbreviations

The following acronyms / abbreviations are used throughout this manual:

Ar	Argon
BAR	Pressure (Metric)
CO ₂	Carbon Dioxide
DP	Differential Pressure
Kg	Kilogram
LAR	Liquid Argon
LCO ₂	Liquid Carbon Dioxide
LO ₂	Liquid Oxygen
LN ₂	Liquid Nitrogen
LN ₂ O	Liquid Nitrous Oxide
N ₂	Nitrogen
N ₂ O	Nitrous Oxide
NM ³	Normal Cubic Meters
O ₂	Oxygen
PB	Pressure Builder
PN	Part Number
PSI	Pounds per Square Inch
RV	Relief Valve
SCF	Standard Cubic Feet



Introduction

What is the Cyl-Tel/Tank-Tel System? **Accurate Liquid Level Measurement**

The Cyl-Tel/Tank-Tel Liquid Level Gauge is the latest in digital level monitoring and reporting technology. The Cyl-Tel/Tank-Tel system can significantly improve liquid distribution efficiency, reducing delivery costs and customer concerns. The Cyl-Tel/Tank-Tel system can be installed on any cryogenic tank that utilizes a differential pressure gauge. The Cyl-Tel gauge is preloaded with all Chart standard MicroBulk tank parameters and the Tank-Tel gauge is preloaded with all Chart standard bulk tank parameters. Both gauges have a custom tank setup function for tanks not manufactured by Chart. The gauge is programmable and can be used with a variety of cryogenic liquids (LO₂, LN₂, LAR, LCO₂, and LN₂O). The system consists of the following button features:

- Programmable tank parameters, displayed units, and three programmable level alerts.
- A telemetry device that can be programmed to notify your computer when alarms occur.
- Multiple inputs for use with various pressure and differential pressure sensors.
- Durability. The Cyl-Tel/Tank-Tel system is outfitted with robust sensors and components requiring little maintenance.
- User friendly software with a large LCD display that makes configuring the Cyl-Tel/Tank-Tel system quick and easy.
- Has the same dimensions and mounting bracket as the existing Cyl-Tel/Tank-Tel gauge making upgrading to the Cyl-Tel/Tank-Tel Gen 5 simple and quick.
- Improved processing capability and speed to allow for increased tank monitoring capabilities.
- Low powered components and high quality stock batteries to ensure an extended battery life.

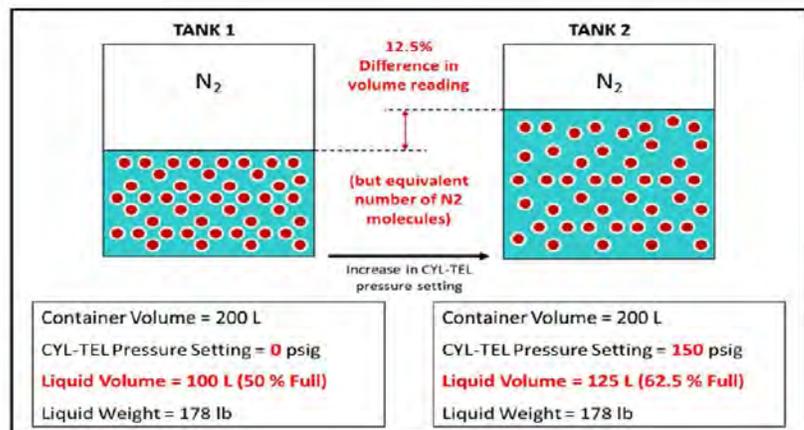
The two most critical steps for accurate liquid level measurement (after selecting the tank type) are calibrating (DP Zero) the Cyl-Tel/Tank-Tel DP sensor at zero (empty tank), and ensuring the pressure setting is close to the actual liquid conditions in the tank.

DP Zero (Calibration)

The DP Zero procedure should always be completed before the first fill; however, it can be accomplished at any time if the tank has an isolation valve. The DP Zero function must be used on all Cyl-Tel gauges, including pre-installed and pre-programmed Cyl-Tel gauges on new tanks, for accurate liquid level measurement. The DP Zero procedure is outlined in the Setting the DP Zero section of this manual.

Pressure Setting

The pressure setting (in the Cyl-Tel gauge) is set for the tank liquid saturation pressure, which is used to approximate the liquid density required for calculating the tank liquid level. It is critical (for accuracy) that the pressure setting is set close to the actual liquid condition in the tank. Since the liquid saturation pressure and corresponding liquid density are inversely proportional, if the pressure setting is increased, then the estimated liquid density (used in the liquid level calculation) is decreased. Refer to the figure below on how the pressure setting affects the contents in the tank. Use the chart in Appendix E for the recommended pressure settings for Chart standard tanks. The instructions on changing the pressure setting is in the Setting Up Tank Parameters section of this manual.



Cyl-Tel/Tank-Tel Gauge Specifications

Physical

- Approximately 5.50"W x 6.70"H x 5.75"D
- Mounting, compatible with existing Cyl-Tel/Tank-Tel differential pressure gauges used on Chart products
- Gauge is enclosed within a NEMA-4X (water-resistant, dust tight) enclosure

Electrical Connections

Inputs

- External Power - 12VDC @ 500mA
 - Display backlight works only when external power is applied
- Battery Power - Two AA Lithium batteries
 - Estimated battery life is five years based on one button press per day
- Solar Panel - 3 VDC shared with battery terminals (Remove AA batteries)
- Differential Pressure Sensor
 - 0-200" H₂O sensor - 0.2-4.7 VDC
 - 0-1000" H₂O sensor - 0.2-4.9 VDC
- Gauge Pressure Sensor (Standard on Tank-Tel/Optional on Cyl-Tel)
 - 0-600 psig sensor - 0.5-4.5 VDC
- Telemetry (Chart Supplied)
 - 0-5 VDC

Outputs

- Display resolution 128x64
- Low battery indicator
- 4-20 mA output for level - 24 VDC max
 - 4 mA = 0%
 - 20 mA = 100%
- 4-20mA output for pressure - 24 VDC max
 - 4 mA = 0 psig
 - 20 mA = 600 psig
- Three Separate Alarm Contacts - Alarms on the Cyl-Tel/Tank-Tel board are designed for DC voltage only up to 24 VDC
 - Optional local alert panel can be added if higher voltage alarm contacts are necessary
- Pulse output for level - 5 VDC
 - 10 pulses = 0%
 - 210 pulses = 100%

Operating Conditions

- Operating Temperature: -30° C to +70° C
- Operating Pressure: 0 - 50 bar
- Operating Differential Pressure Range:
 - 0-7.25 psid (0-200"H₂O sensor)
 - 0-36 psid (0-1000"H₂O sensor)
- Maximum Allowable Differential Pressure:
 - 29 psid (0-200"H₂O sensor)
 - 145 psid (0-1000"H₂O sensor)
- Operator Interface: Buttonpad (four buttons)

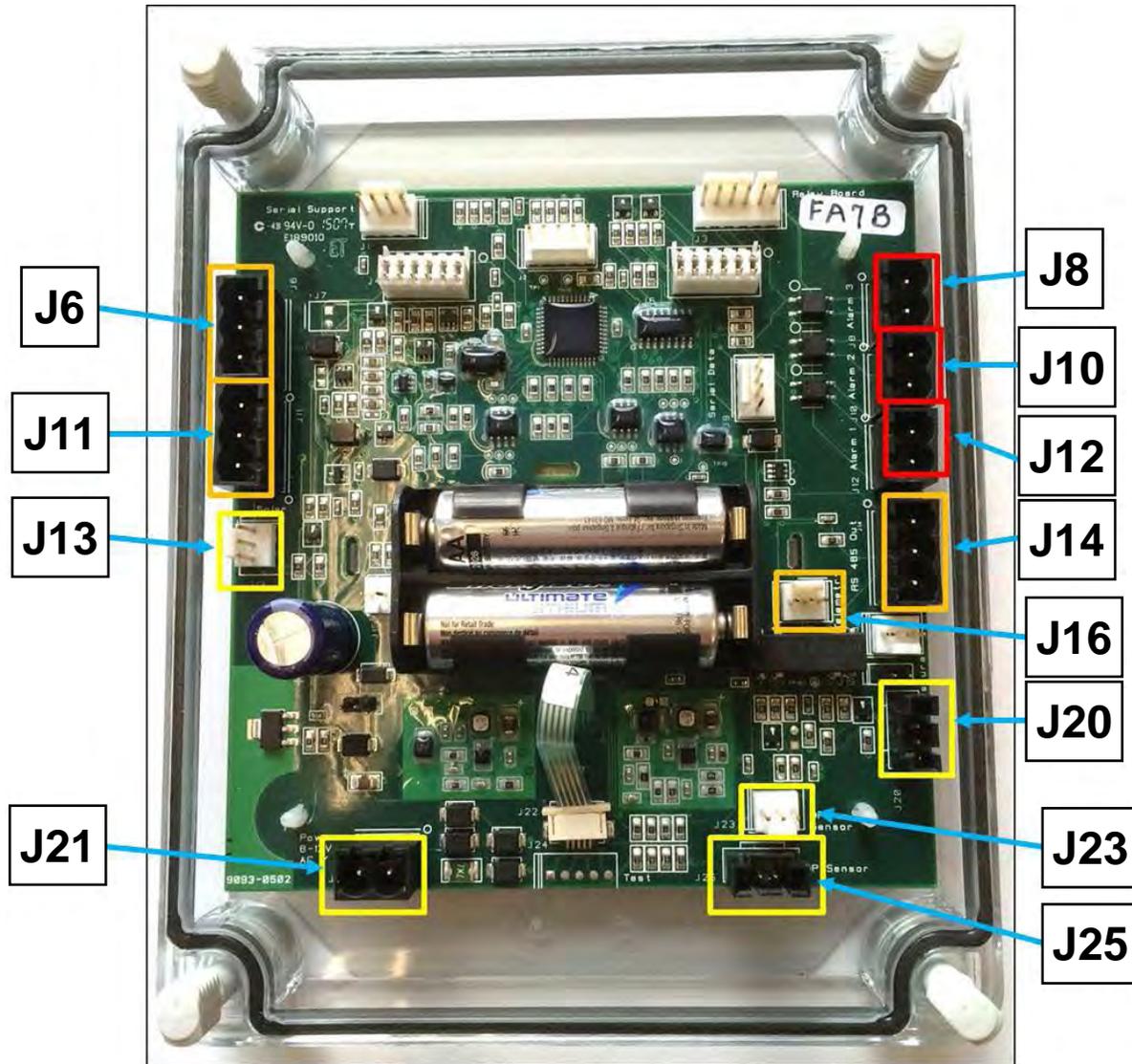
Programmable Features

- Product Type:
 - LN₂, N₂O, LAR, O₂, CO₂
- Units of Measurement Level:
 - Percent Full (% Full)
 - Liters (L)
 - Gallons (Gal.)
 - Pounds (Lbs.)
 - Kilograms (Kg.)
 - Standard Cubic Feet (SCF)
 - Inches H₂O
 - Normal Cubic Meters (NM³)
- Units Pressure Measurement (Optional on Cyl-Tel):
 - PSI
 - BAR
- Alarm Programmability
 - Each of the three alarm outputs can be configured as either a level alarm or a pressure alarm
 - Level alarm programmable for high/low level in 5% increments from 0-100%
 - Pressure alarm (if pressure sensor is equipped) for high/low pressure in 20 psig increments from 0-600 psig
- Tank Parameters
 - Length (Overall Inner Vessel Length)
 - Diameter (Inner Vessel Inside Diameter)
 - Pressure (Liquid Saturation Pressure)
 - Orientation (Vertical or Horizontal)
 - Contents (LN₂, N₂O, LAR, O₂, CO₂)

Display Resolution

- % Full 5%
- Liters 1
- Gal. 1
- Kg 1
- Lbs. 1
- SCF 10
- NM³ 1
- "H₂O 0.7

Cyl-Tel/Tank-Tel Circuit Board Diagram



J6	4-20 mA Out for Level
J11	4-20 mA Out for Pressure
J13	Solar Panel Power Input
J21	12 VDC External Power Input

J8	Alarm 3
J10	Alarm 2
J12	Alarm 1
J14	Pulse Output for Level
J16	Chart Telemetry Output
J20	Pressure Sensor Input
J23	Differential Pressure Sensor Input
J25	Differential Pressure Sensor Input

Equipment

Cyl-Tel Equipment

Suggested Equipment for Cyl-Tel

The equipment below is recommended for the installation of the Cyl-Tel gauge:

Qty	Size	Tool Description
2	5/8"	Open End Wrench (or (2) 8" Crescent Wrenches)
2	9/16"	Open End Wrenches
1	7/16"	Open End Wrench
1	#2	Phillips Screwdriver
1	#1	Phillips Screwdriver
1	1/8" x 2"	Slotted Screwdriver
1	1/2" wide	Roll of PTFE Thread Sealant Tape
1		Liquid Leak Detector
1		Wire Stripper for 22AWG Wire

Additional Components

Recommended components to use when installing a Cyl-Tel gauge:

Cyl-Tel Isolation Valve Installation Kit		
Qty	Description	PN
1	Cyl-Tel Isolation Valve Installation for Perma-Cyl® MB System 230/300/450	13830775
3	Cyl-Tel Isolation Valve Installation Kit for Perma-Cyl 1000 & 1500	13830791
3	Cyl-Tel Isolation Valve Installation Kit for Perma-Cyl 2000-3000	15072795

Cyl-Tel System Components

Description	PN
Cyl-Tel Liquid Level Gauge	20910598
Elbow BRS 1/4" ODT x 1/4" MPT	1213122
Elbow BRS 1/8" ODT x 1/4" MPT	10501634
Cyl-Tel Face Only (w/circuit board & display)	20913408
Cyl-Tel Back Only (w/DP Sensor)	20913634
Optional Power Supply	11061378
Optional Cyl-Tel Wire	11080860
Optional Cyl-Tel Remote Display	13307263
Optional Cyl-Tel Gauge Wall Mount Bracket Kit	11085302
Optional Cyl-Tel Gauge Bulk Tank Mount Bracket Kit	11085290
Optional Local Alert	20907720
Optional Scout 1.4	13060580
Optional Cellular Telemetry Board - Verizon - US Only	21099752
Optional Cellular Telemetry Board - AT&T - International	21099773
Optional Pressure Sensor	20873050
Street Tee for Pressure Sensor	1211702

Tank-Tel Equipment

Suggested Equipment

The equipment below is recommended for the installation of the Tank-Tel gauge:

Qty	Size	Tool Description
2		Open End Wrench
1		Phillips Screwdriver
1		Slotted Screwdriver
1	1/2" wide	Roll of PTFE Thread Sealant Tape
1		Liquid Leak Detector
1		Wire Stripper for 22AWG Wire

Additional Components

Recommended items to be used when installing a Tank-Tel gauge:

<i>Hose Set Installation - Vertical Tank</i>					
Set	PN		Overall Length	End Tube Size	End Connection
	Individual				
11683038	11680654		45"	0.313"OD x 0.035" WALL	1/2-20 UNF
	11680646		47"	0.375"OD x 0.035" WALL	9/16-18 UNF

<i>Hose Set Installation - Horizontal Tank</i>					
Set	PN		Overall Length	End Tube Size	End Connection
	Individual				
11682991	11680638		28-1/2"	0.313"OD x 0.035" WALL	1/2-20 UNF
	11680611		25-1/2"	0.375"OD x 0.035" WALL	9/16-18 UNF

Tank-Tel Gauge Assembly

Description	PN
Tank-Tel Gen 5 0-200	20916501
Tank-Tel Gen 5 0-200 w/equalization valve	20869070
Tank-Tel Gen 5 0-1000	20918047
Tank-Tel Gen 5 0-1000 w/equalization valve	20869071
Tank-Tel Gen 5 Lid	20913636
Equalization valve kit	20863051

Optional Components

Description	PN
Optional Power Supply	11061378
Optional Cyl-Tel Wire	11080860
Optional Cyl-Tel Remote Display	13307263
Local Alert	20907720
Scout 1.4	13060580
Cellular Telemetry Board - Verizon - US Only	21099752
Cellular Telemetry Board - AT&T - International	21099773



Gauge Installation

Cyl-Tel Gauge Installation

Cyl-Tel Installation Preparations



Note: Installation is on a Perma-Cyl® MicroBulk Storage System 1500 liter tank. Installations on different sized tanks may vary. Refers to 5-way valve installation. Also applies to 4-way valve used on Perma-Cyl tanks.

Preparing Differential Pressure Sensor for Installation

1. Install one (1) male elbow brass 1/4" ODT x 1/4" MPT (PN 1213122) on the high and low sides of the DP sensor.
 - a. Use a small amount of PTFE Thread Sealant Tape on the elbows. This will help ensure there are no leaks.



Figure 1 - Elbows installed on the high/low sides of the DP sensor

Replacing Existing Cyl-Tel with Cyl-Tel Gen 5



Note: Installation is on a Perma-Cyl 1500 liter tank. Installations on different sized tanks may vary.

Removing Existing Cyl-Tel Gauge

1. Verify that the Cyl-Tel isolation valve is in the Equalization/Service position.



Figure 2 - 5-way valve in the Equalization/Service position



Note: Use the plug on the top port of the 5-way valve as a reference point.

2. Remove the Cyl-Tel gauge from the MicroBulk tank mounting bracket.

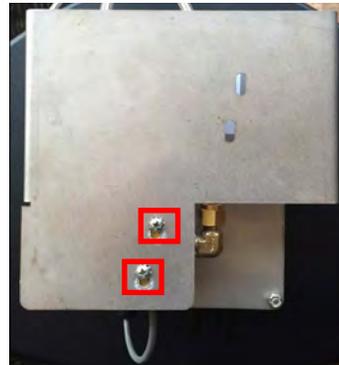


Figure 3 - Red boxes indicate the two screws that secure the mounting bracket to the Cyl-Tel gauge.

3. Disconnect the stainless steel braided pressure line labeled Cyl-Tel High from the DP sensor.

4. Disconnect the stainless steel braided pressure line labeled Cyl-Tel Low from the DP sensor.

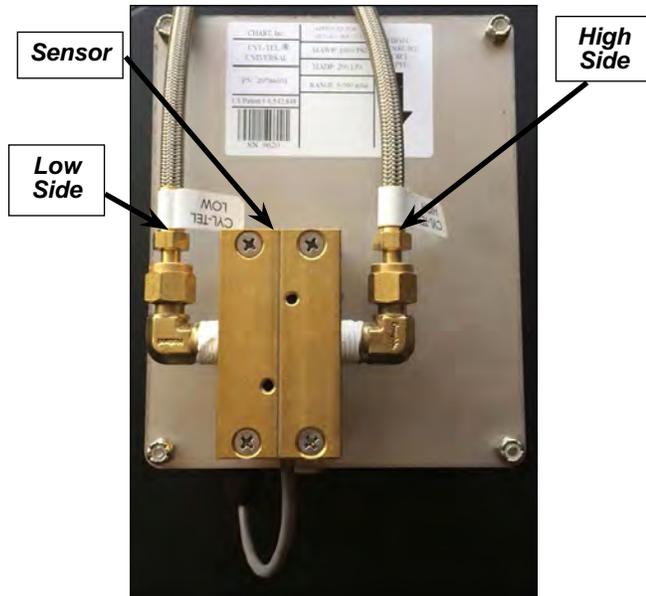


Figure 4 - Disconnect the high/low pressure lines from the DP sensor

Cyl-Tel Installation onto the Tank

1. Verify that the Cyl-Tel isolation valve is in the Equalization/Service position (refer to Figure 2).
2. Connect the stainless steel braided pressure line labeled Cyl-Tel High to the DP sensor side labeled High.
3. Connect the stainless steel braided pressure line labeled Cyl-Tel Low to the DP sensor side labeled Low.
4. Mount the Cyl-Tel Gen 5 onto the MicroBulk tank mounting bracket as shown in Figure 3.
5. Turn the Cyl-Tel isolation valve to the Normal Operation position.



Figure 5 - Cyl-Tel isolation valve in the Normal Operation position

6. Check all fittings and pressure line connections for leaks using a liquid leak detector.



Note: If a leak is detected turn the Cyl-Tel gauge isolation valve to the Equalization/Service position and tighten the areas where the leak was detected. Then repeat step 7.

7. Set the DP Zero (refer to Setting the DP Zero section).

Upgrading Cyl-Tel Faceplate to Cyl-Tel Gen 5 Faceplate

1. Verify that the Cyl-Tel isolation valve is in the Equalization/Service position (refer to Figure 2).
2. Unscrew the four plastic screws that secure the Cyl-Tel faceplate to the Cyl-Tel housing.



Figure 6 - Red boxes indicate the four plastic screws that need to be removed

3. Disconnect the DP sensor connector from the Cyl-Tel board.
4. Connect the DP sensor connector to the Cyl-Tel Gen 5 board.
5. Use the four plastics screws attached to the Cyl-Tel faceplate to secure it to the housing.

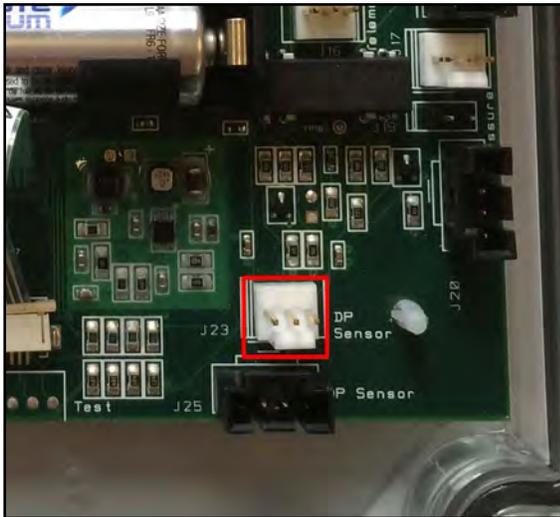


Figure 7 - Red box indicates input J23, connect the LEGACY DP sensor there

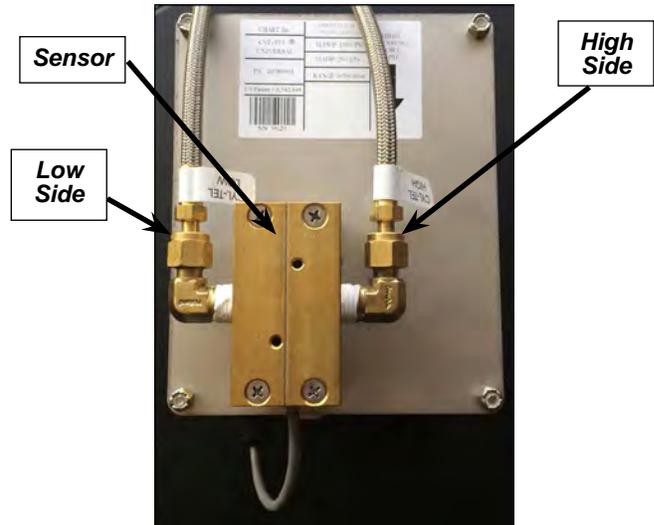


Figure 8 - High/Low pressure lines attached to the Cyl-Tel isolation valve connected to the High/Low sides of the DP sensor

6. To set up the tank refer to the Setting Up Tank Parameters section and the Differential Pressure Sensor Selection section.
7. Once you have the correct DP sensor selected refer to Setting the DP Zero section to set the zero on the Cyl-Tel gauge.

Cyl-Tel with Cyl-Tel Isolation Valve and Pressure Gauge Installation



Note: Installation example is on a Perma-Cyl® MicroBulk Storage System 1500 liter tank. Installations on different sized tanks may vary.

Installation on Tank

1. Connect the stainless steel braided pressure line attached to the Cyl-Tel isolation valve labeled Cyl-Tel High to the DP sensor side labeled High (right side).
2. Connect the stainless steel braided pressure line attached to the Cyl-Tel isolation valve labeled Cyl-Tel Low to the DP sensor side labeled Low (left side).

3. Attach the bulk tank mounting bracket onto the Cyl-Tel using the two screw holes located on the DP block.



Figure 9 - Screw holes for mounting bracket on DP sensor block (left). Mounting bracket installed onto the DP sensor block (right).

4. Verify that the Cyl-Tel gauge is level on the mounting bracket.
5. Connect the stainless steel braided pressure line attached to the Cyl-Tel isolation valve labeled GAUGE to the analog pressure gauge.
6. Place the Cyl-Tel onto the tank using the bulk tank mounting bracket to secure it to the tank.



Figure 10 - Cyl-Tel mounted onto the tank using the bulk mounting bracket

- Place the Cyl-Tel isolation valve orientation sticker onto the tank.
- Attach the Cyl-Tel isolation valve to the tank using the hole where the valve orientation sticker is located (plug on valve should be facing up).



Figure 11 - Use the nut on the Cyl-Tel isolation valve to secure it to the tank (left). After the Cyl-Tel isolation valve is secured to the tank place the black plastic knob back onto it (right).

- Attach the analog pressure gauge onto the tank using the larger hole to the right of the Cyl-Tel isolation valve mounting hole.

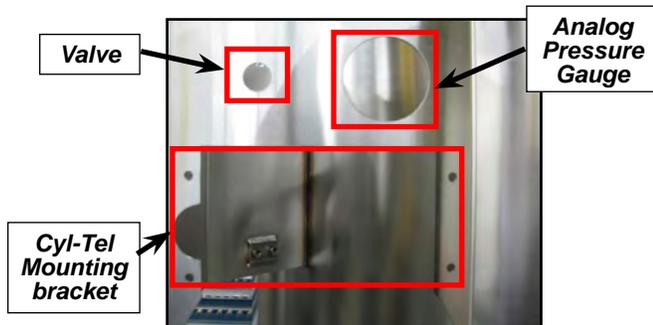


Figure 12 - Tank fixture for Cyl-Tel bracket, analog pressure gauge and Cyl-Tel isolation

- Connect the 60" stainless steel braided pressure line labeled TANK LOW to the analog pressure gauge.

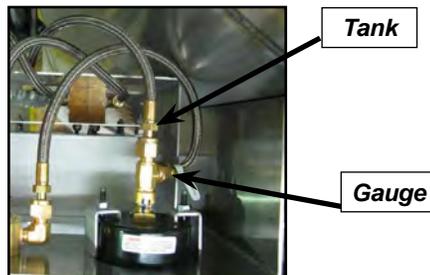


Figure 13 - TANK LOW and GAUGE pressure lines connected to the analog pressure gauge

- Connect the 60" stainless steel braided pressure line attached to the Cyl-Tel isolation valve labeled TANK HIGH to the high pressure output of the tank.
- Connect the 60" stainless steel braided pressure line attached to the analog pressure gauge labeled TANK LOW to the low pressure output of the tank.

- Secure the TANK HIGH and TANK LOW stainless steel braided pressure lines to the piping on the tank.

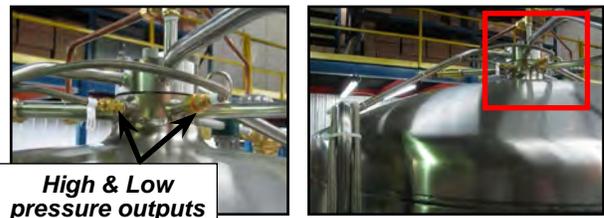


Figure 14 - High and low pressure lines connected to high and low pressure outputs of the tank

- Verify that the Cyl-Tel isolation valve is in the Normal Operation position.
- Check all fittings and pressure line connections for leaks using a liquid leak detector.



Note: If a leak is detected turn the Cyl-Tel isolation valve to the Equalization/Service position and tighten the areas where the leak was detected. Then repeat steps 14 and 15.

- Once all fittings and pressure line connections are leak free, turn the Cyl-Tel isolation valve to the Equalization/Service position.
- With 5-way valve at Equalization/Service position program the Cyl-Tel for the tank it is connected to and set the zero on the Cyl-Tel (refer to the Setting Up Tank Parameters and Setting the DP Zero sections in this manual).

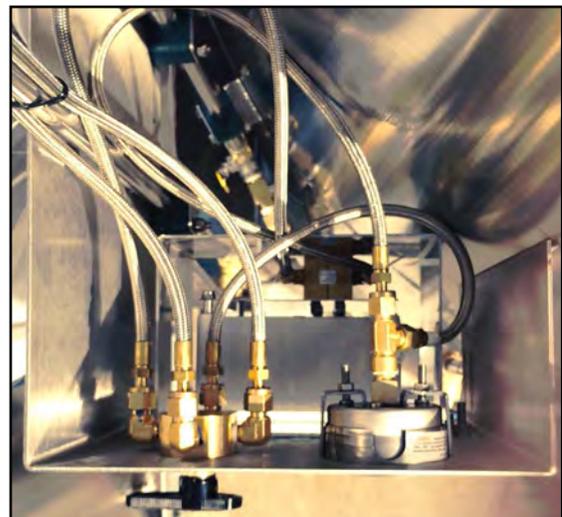


Figure 15 - Cyl-Tel isolation valve and analog pressure gauge pressure lines diagram

Cyl-Tel Isolation Valve Configuration

5-Way Valve Piping Diagram

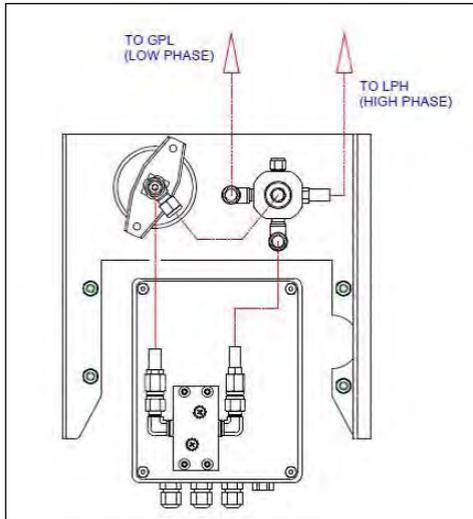


Figure 16 - Demonstrates piping for Perma-Cyl® MicroBulk Tank 1000-3000

4-Way Valve Piping Diagram

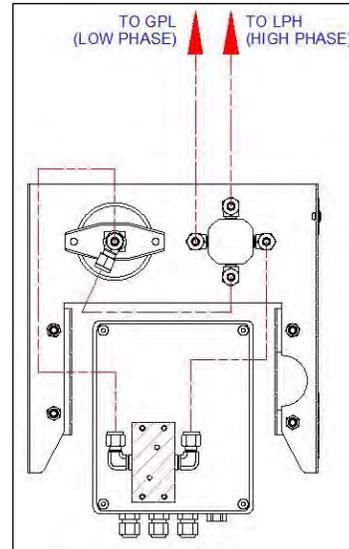


Figure 18 - Demonstrates piping diagram for Perma-Cyl® MicroBulk Tank 1000-3000

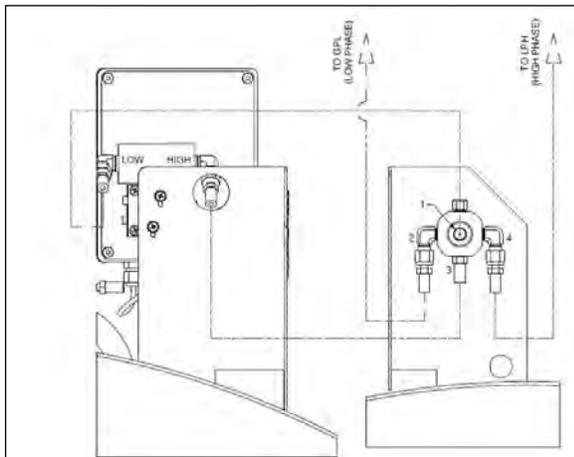


Figure 17 - Demonstrates piping for Perma-Cyl® MicroBulk Tank 300-700

Normal Operation: Ports 1 & 2 are connected and ports 3 & 4 are connected.

Equalization Mode: Ports 1 & 3 are connected and ports 2 & 4 are connected.

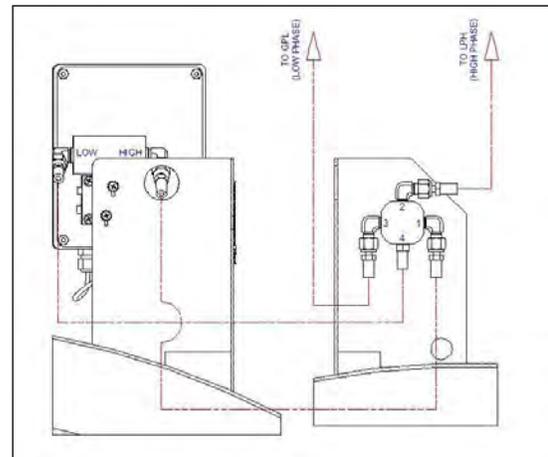


Figure 19 - Demonstrates piping diagram for Perma-Cyl® MicroBulk Tank 300-700

Normal Operation: Ports 1 & 2 are connected and ports 3 & 4 are connected.

Equalization Mode: Ports 1 & 4 are connected and ports 2 & 3 are connected.

Tank-Tel Gauge Installation



Note: Do not under any circumstances remove any phase line connections unless the equalization valve is "open" or in the "Equalization/Service" position. The equalization valve is there to protect the sensor from over pressurization.

Installation Procedure

1. Press the ON button on the Tank-Tel gauge and check the level and pressure on the screen (record).
2. Make sure the equalization valve is in the "Equalization/Service" position on the Tank-Tel assembly.
3. If this is a first time installation skip to step 10. If this is a replacement installation, continue to step 4.
4. Close the liquid and gas phase isolation valves on the bulk tank.
5. Open the equalization valve on the current gauge.
6. Use a 5/8" wrench to remove the gas phase line from the current gauge (smaller fitting).
7. Use an 11/16" wrench to remove the liquid phase line from the current gauge (larger fitting).
8. Rotate the gauge assembly off the 3/4" mounting pipe thread welded to the tank.
9. Place the other gauge assembly to the side.
10. Clean the threads on the mounting pipe.
11. Apply 6-8 layers of Teflon tape to the mounting pipe (wrap in clockwise direction).
12. Check the equalization valve on the Tank-Tel assembly to make sure the Equalization valve is in the "Equalization/Service" position.
13. Spin the Tank-Tel assembly onto the mounting pipe until snug.
14. Use a 5/8" wrench to connect the gas phase line to the Tank-Tel gauge (smaller fitting).
15. Use an 11/16" wrench to connect the liquid phase line to the Tank-Tel gauge (larger fitting).
16. Open the gas phase isolation valve and check for leaks in the plumbing using a soap solution.
17. If no leaks are detected open the liquid phase isolation valve.
18. Rotate the equalization valve on the Tank-Tel assembly to the "Normal Operation" position.
19. Press the ON button and check the level and pressure on the screen (If the unit is not already programmed follow the quick start guide to program the unit. The two most important settings are the tank selection and the DP Zero).
20. If installing telemetry please follow the telemetry installation procedure in the telemetry quick start guide.



Figure 21 - Valve in "Equalization/Service" position

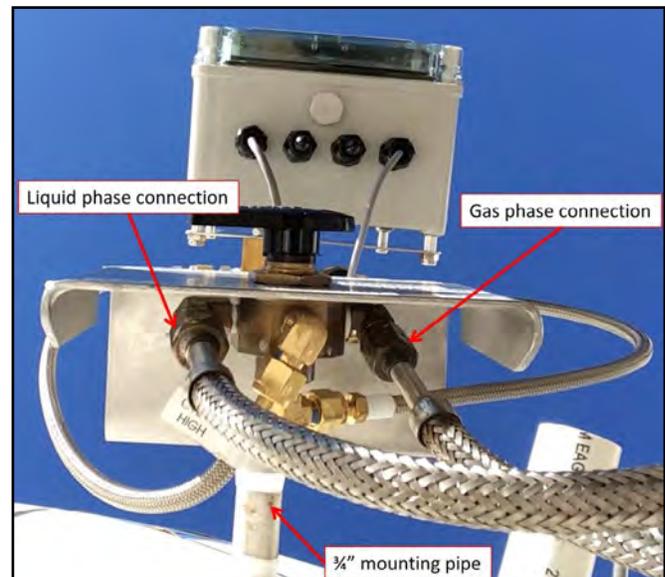


Figure 22 - Liquid and gas phase connections

Wiring

External Power Installation

Preparing Wire

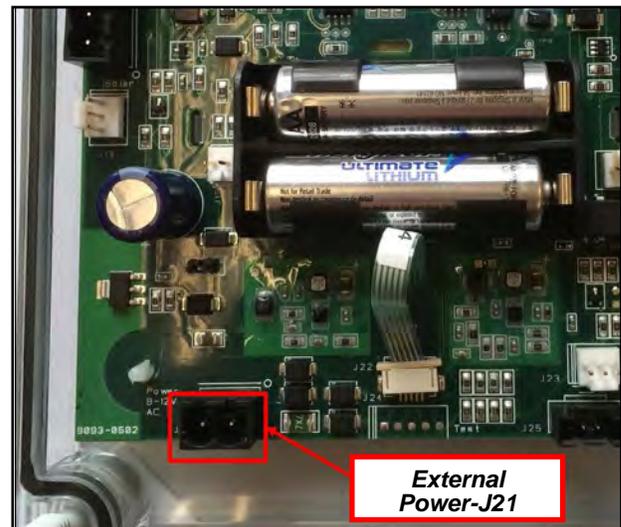
1. Remove the faceplate from the Cyl-Tel/Tank-Tel gauge using a #1 Phillips head screwdriver.
2. Disconnect the DP sensor cable from the Cyl-Tel/Tank-Tel board to separate the faceplate from the housing for easier installation.
3. Route the power cable from the AC Power Pack (PN 11061378) and its outlet to the Cyl-Tel/Tank-Tel gauge.
4. With the cover removed, route the power cable through one of the black liquid tight connectors. Leave enough wire to connect the wire to the external power terminal on the Cyl-Tel/Tank-Tel board, approximately 5".
5. Strip back about 2" of the cable jacket from each cable to expose all of the insulated wires. On each wire remove approximately 1/8" of the insulation.

Connect Power Wires to the Cyl-Tel Gauge

1. Inside of the faceplate you will find the Cyl-Tel/Tank-Tel circuit board. Locate the external power connector.
2. Connect the wires to connector J21.



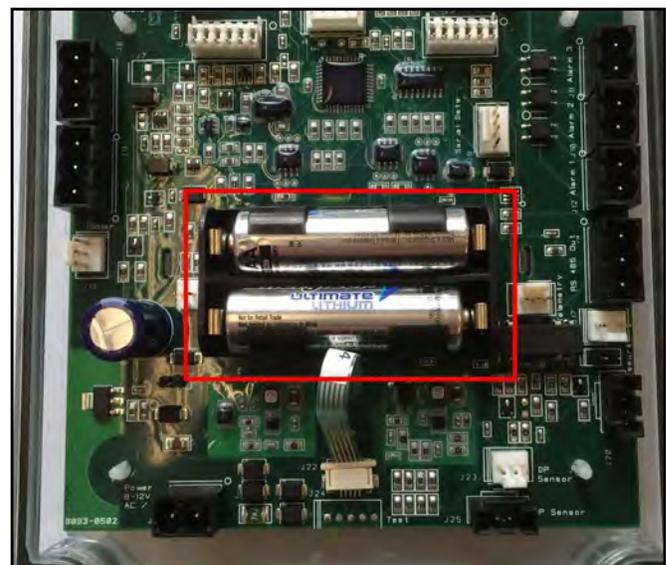
Note: The polarity of the connector is irrelevant.



Battery Power

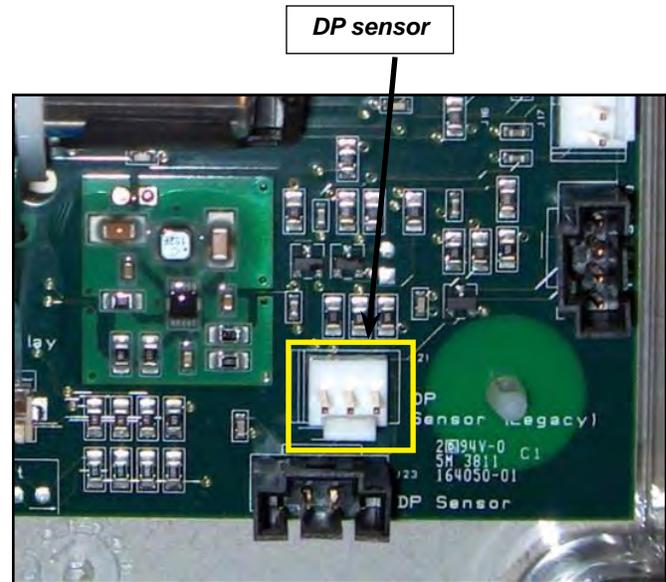
Battery Installation

1. Unscrew the four plastic screws that secure the Cyl-Tel/Tank-Tel faceplate to the enclosure.
2. Locate the battery holder on the Cyl-Tel/Tank-Tel circuit board (see picture).
3. Use the diagrams on the battery holder to correctly install the two AA Lithium batteries that will power the Cyl-Tel/Tank-Tel.
4. Once you have the batteries installed correctly secure the Cyl-Tel/Tank-Tel faceplate to the enclosure with the four plastic screws located on the Cyl-Tel/Tank-Tel faceplate.



Differential Pressure Sensor

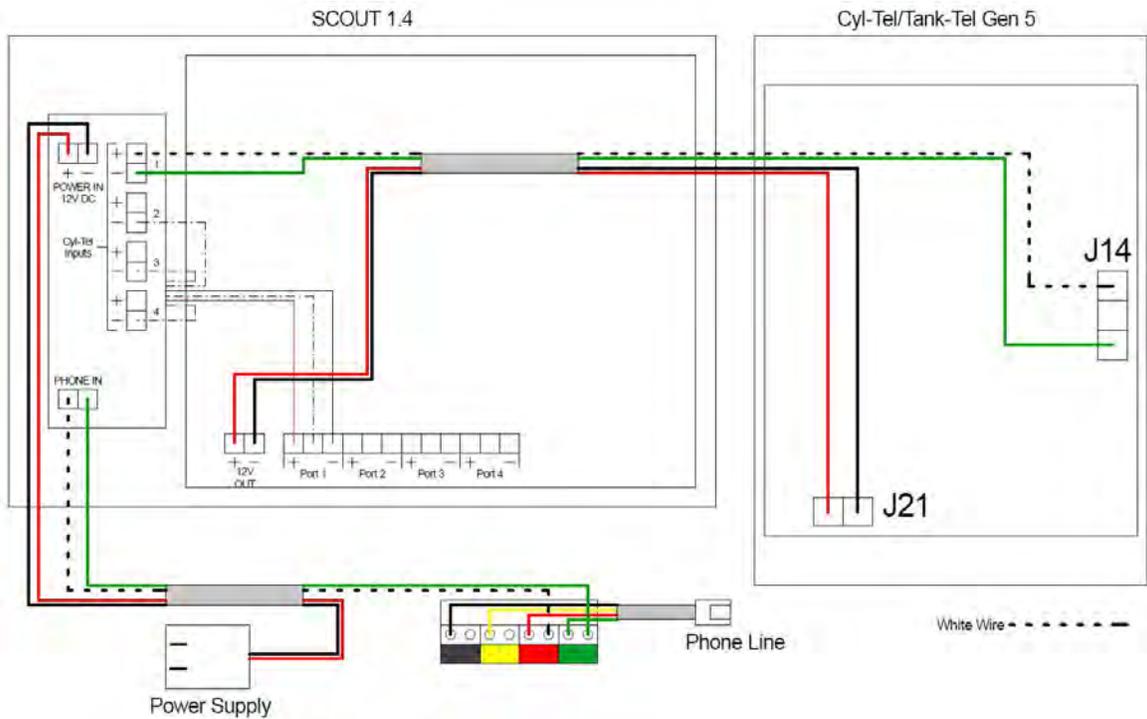
1. Locate the DP sensor connector.
2. On the Cyl-Tel circuit board locate the port J23.
3. Connect the LEGACY DP sensor connector (white 3-pin connector) to the Cyl-Tel circuit board.
4. Once you have the DP sensor connected to the Cyl-Tel board use a #1 Phillips head screwdriver to secure the Cyl-Tel faceplate to the enclosure with the four plastic screws.
5. Refer to the Differential Pressure Sensor Selection section of this manual to select the appropriate DP sensor through the Cyl-Tel programming menu.



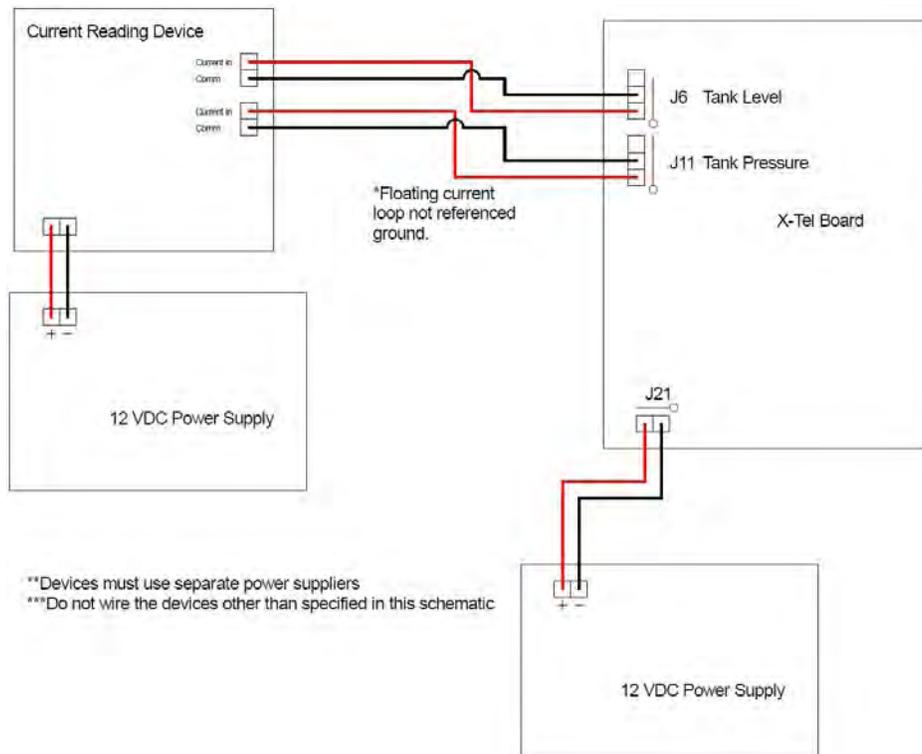
Accessory Installation

The telemetry output turns on automatically once external power is applied to the Cyl-Tel/Tank-Tel circuit board with the Gen 5 unit.

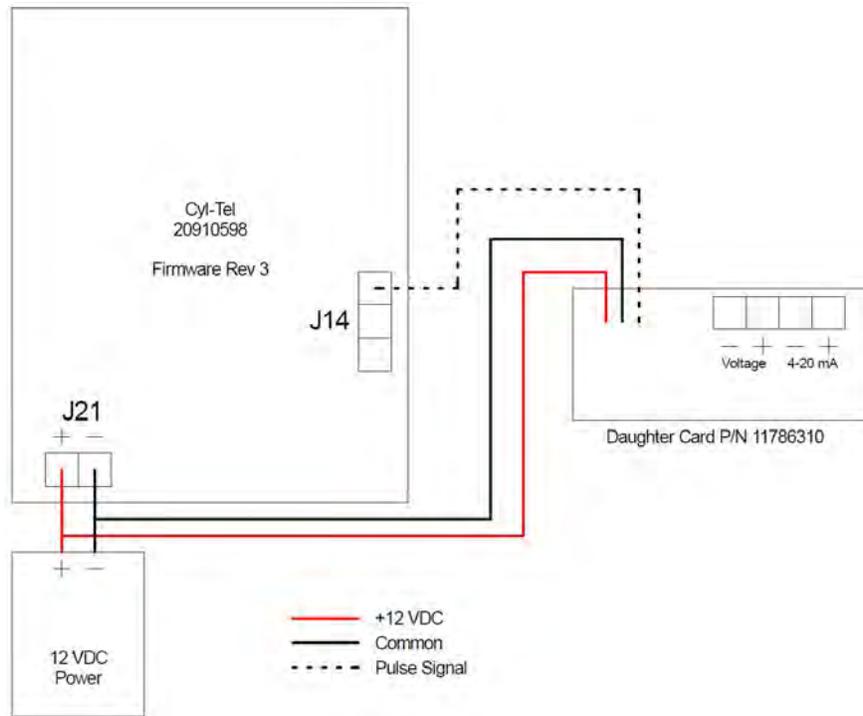
Cyl-Tel/Tank-Tel to Scout 1.4 Installation



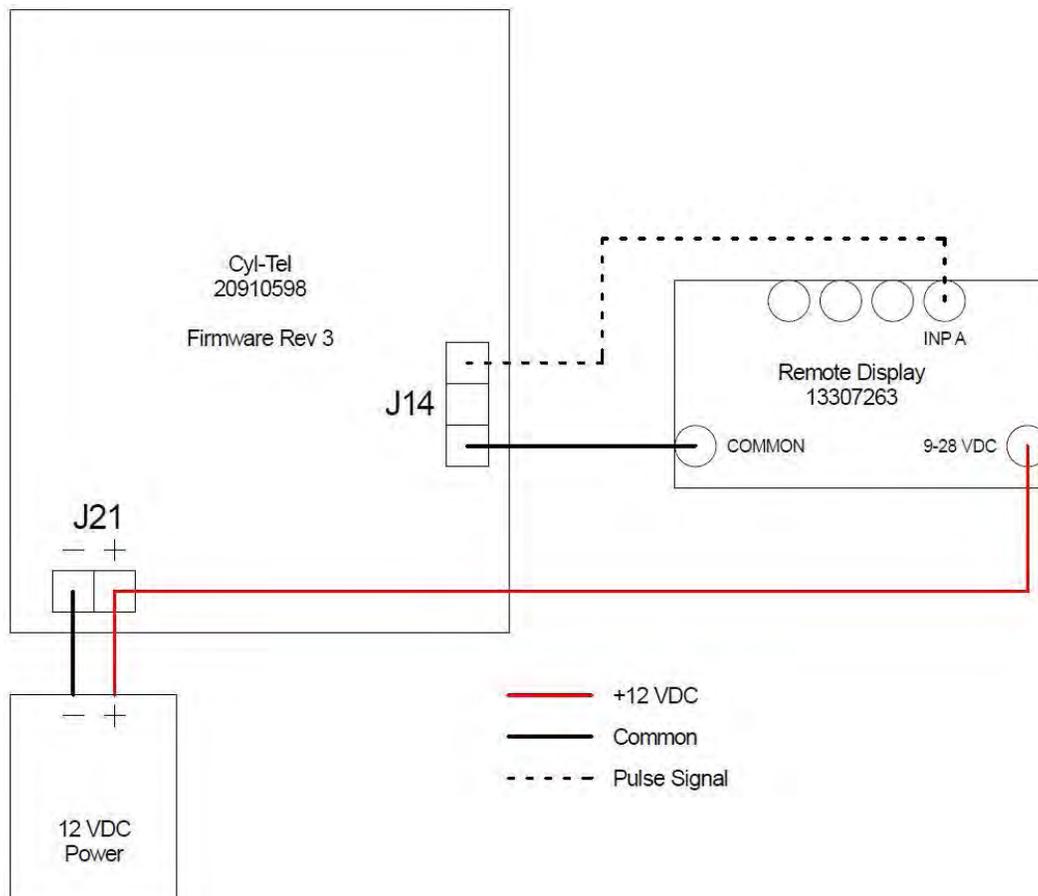
4-20 mA Output Wiring



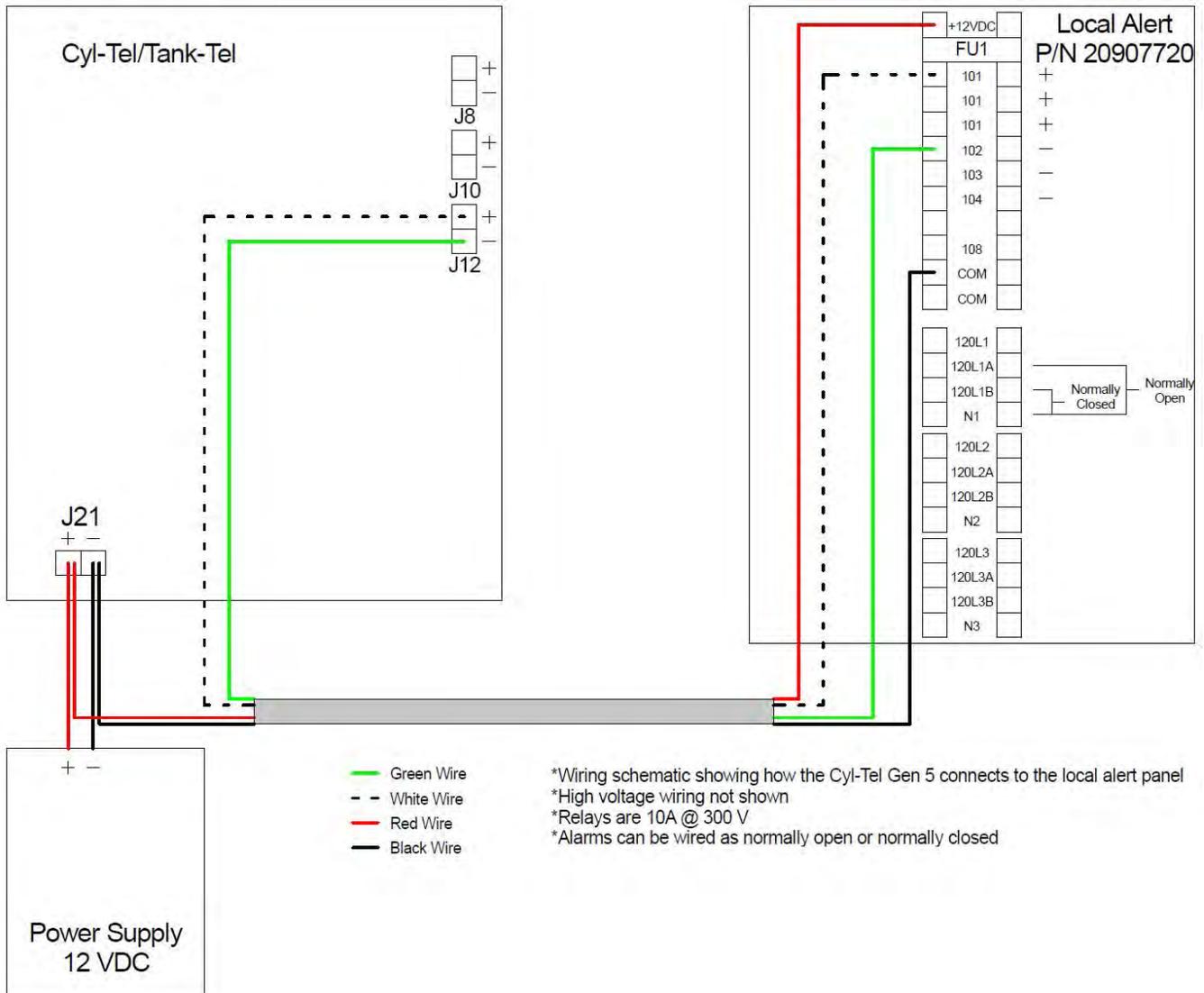
Cyl-Tel/Tank-Tel to Interface Board Installation



Cyl-Tel/Tank-Tel to Remote Display Installation



Alarm Wiring



Note: If connecting the alarms to a low voltage device (24 VDC or less) then the local alert panel is not required.

Gauge Operation and Setup

General Operation

When the ON button is pressed the Cyl-Tel/Tank-Tel gauge will run through its startup diagnostic tests. When the test is complete the screen will have the tank's liquid level displayed.

Once the Cyl-Tel/Tank-Tel gauge is ON, there will be four text boxes at the bottom of the screen that line up with the four buttons below the LCD display.

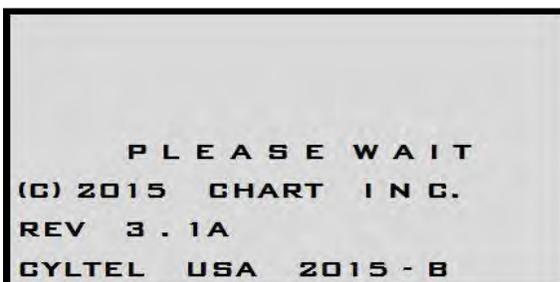
- **FILL:** Pressing the FILL button will put the Cyl-Tel/Tank-Tel gauge in fill mode and keep the display on as long as it is in fill mode. Use the fill mode when the tank is being refilled.
- **UNITS:** Pressing the UNITS button will change the unit of measure the amount of liquid is displayed in.
- **ALARM:** Pressing the ALARM button will display the set alarms and if they are activated on the left side of the LCD screen.
- **MENU:** Pressing and holding the MENU button for 15 seconds will allow you to access the MAIN MENU of the Cyl-Tel/Tank-Tel gauge.

Setting Standard Tank Parameters

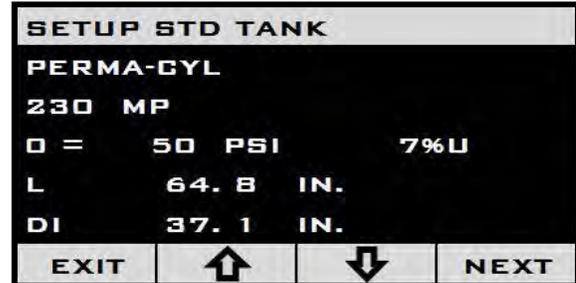
1. Press and release the 'ON' button to turn the screen on.



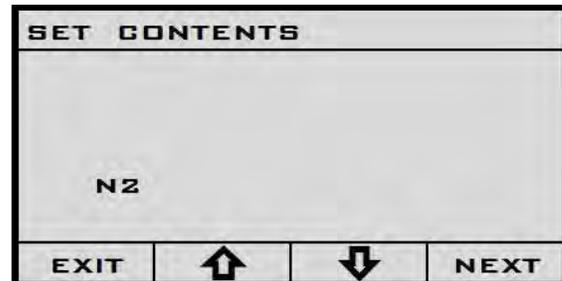
2. To access the menu, hold the 'ON' button for 10-15 seconds. The screen will read "PLEASE WAIT" as seen below.



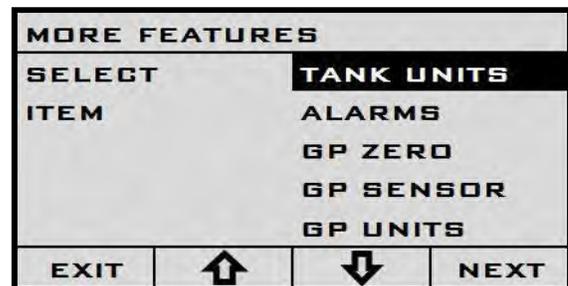
3. Once the 'ON' button is held long enough, this screen will show up asking you to select a standard tank. Use the up and down arrow buttons to select from the tanks on the tank list. If you are setting up a custom tank just select the first tank on this screen as you will need to access the custom tank menu to change the tank dimensions.



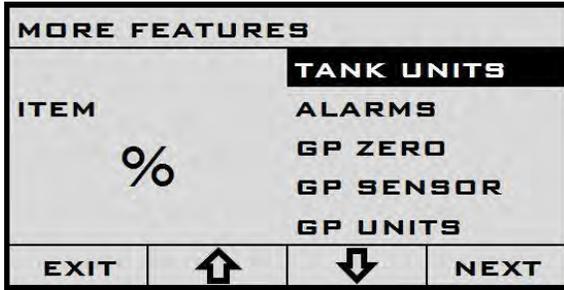
4. Once the correct tank is selected, press the NEXT button. This will select this tank. Press the NEXT button one more time to move to the next screen.
5. Set the contents of the tank by pressing the up or down arrow buttons. The options for the contents are Nitrogen (N₂), Oxygen (O₂), Argon (Ar), Carbon Dioxide (CO₂), and Nitrous Oxide (N₂O). Once the correct contents are selected, press the NEXT button to move to the next screen.



6. If the default units of display are "%" then you are done. You can press the EXIT button and skip to step 10.
7. If you would like to read out the level in units other than "%" highlight the TANK UNITS option in the menu and press the NEXT button.



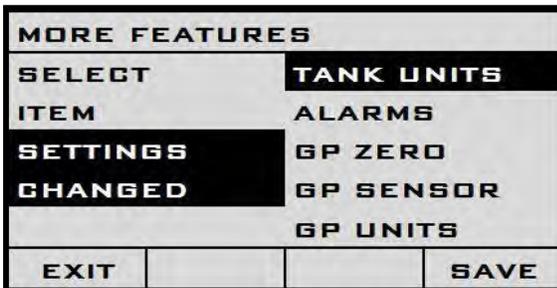
- The currently selected unit will appear on the left side of the screen. Use the up and down arrows to change the units.



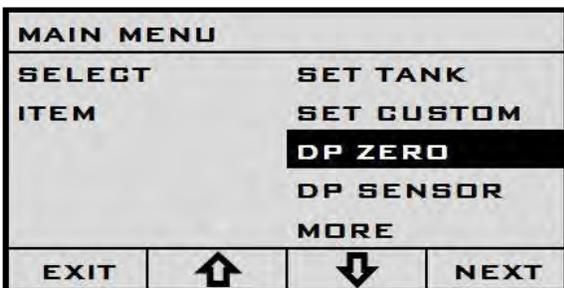
- Once the desired units are displayed, press the NEXT button to select the units.



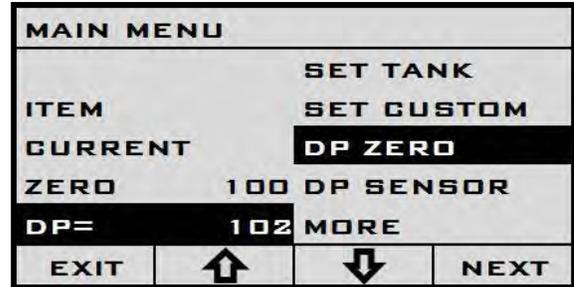
- At this point you are done setting up the tank. Press the EXIT button. A notification will appear on the left side of the screen which says "SETTINGS CHANGED". The unit is asking if you would like to save the new settings. If so, press the SAVE button on the bottom of the screen. This will then return you to the main menu.



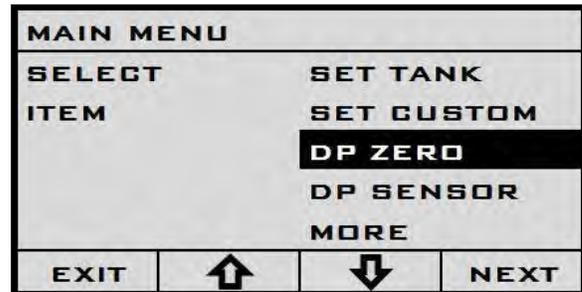
- If you do not need to/or have already set the DP Zero for the unit you can skip to step 17.
- Using the up and down arrow buttons highlight the DP ZERO option on the main menu.



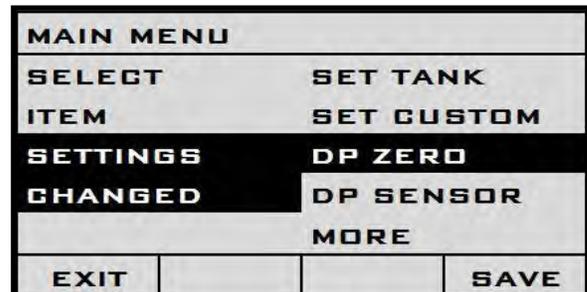
- Make sure the equalization valve is open or set to equalization/service.
- Press the NEXT button and the current DP ZERO along with the new DP ZERO will appear on the right side of the screen.



- Press the NEXT button to accept the new DP ZERO.
- At this point the unit should be fully setup. Press the EXIT button to exit to the main display.

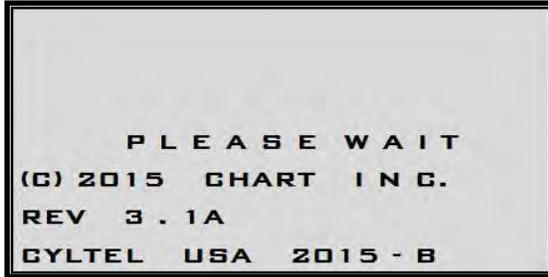


- A notification will appear on the left side of the screen which says "SETTINGS CHANGED". The unit is asking if you would like to save the new settings. Press the SAVE button on the bottom of the screen.

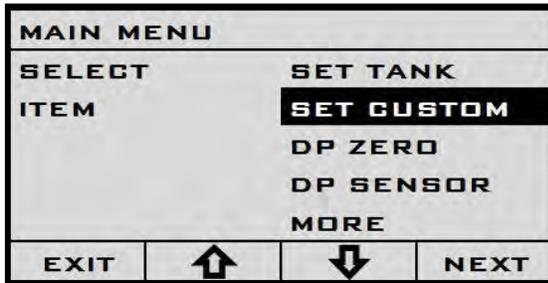


Setting Custom Tank Parameters

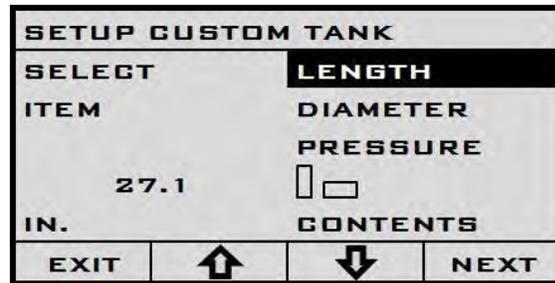
1. Press and release the 'ON' button to turn the screen on.
2. To access the menu, hold the 'ON' button for 10-15 seconds. The screen will read "PLEASE WAIT" as shown below.



3. Once in the main menu, use the arrow buttons to highlight the SET CUSTOM option and press the NEXT button to advance to the next screen.



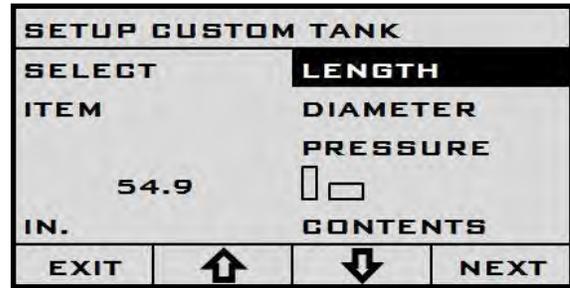
4. This is the custom tank setup menu. The first option to input is the length. This is the overall length of the inner vessel. To enter the length press the NEXT button.



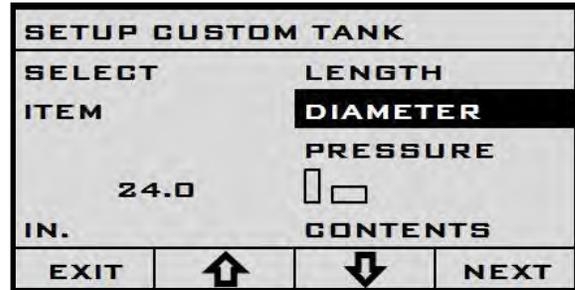
5. When the NEXT button is pressed a "*" will appear next to the length. Use the arrow buttons to change the dimension to the desired length of the inner vessel in "in." (inches).



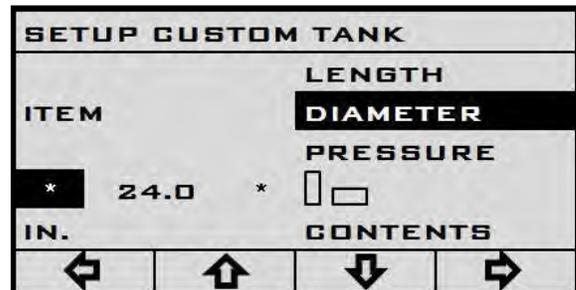
6. When you have the number how you want it, press the right arrow button until the "*" goes away.



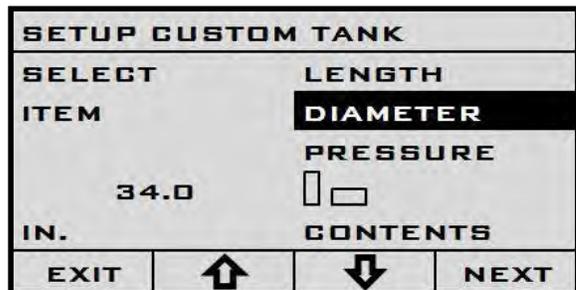
7. Use the arrow buttons to highlight DIAMETER and press the NEXT button to change the tank diameter.



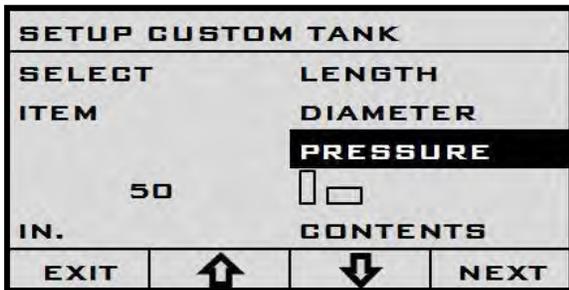
8. When the NEXT button is pressed a "*" will appear next to the length. Use the arrow buttons to change the dimension to the desired diameter of the inner vessel in "in." (inches).



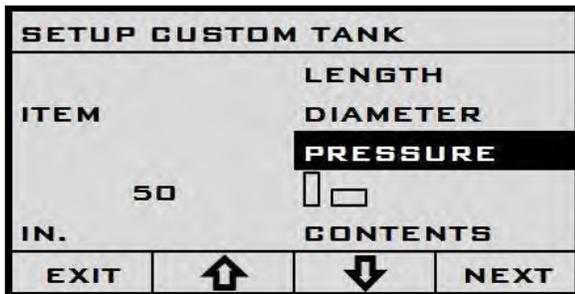
9. When you have the number how you want it press the right arrow button until the "*" goes away.



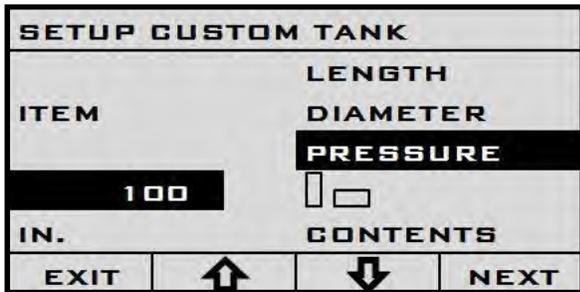
- Use the arrow buttons to highlight the PRESSURE option in the menu. This is the estimated saturation pressure of the liquid in the tank. It should be close to the average between the tank operating pressure and the delivery truck operating pressure (usually 25 psi).



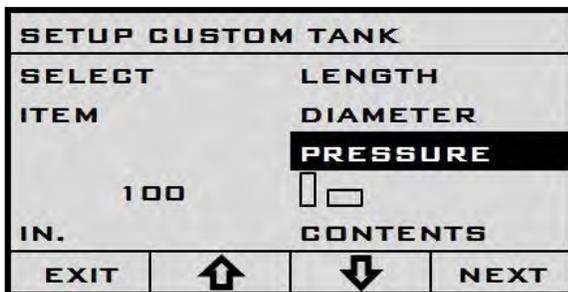
- Press the NEXT button to change the saturation pressure option. Once you press the NEXT button the only thing that will change on the screen is that the "SELECT" text will disappear from the top left corner of the screen.



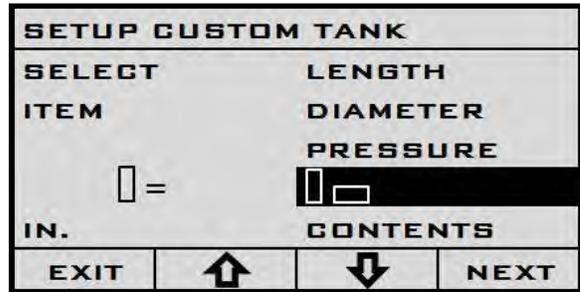
- Use the arrow buttons to change the saturation pressure setting in the program.



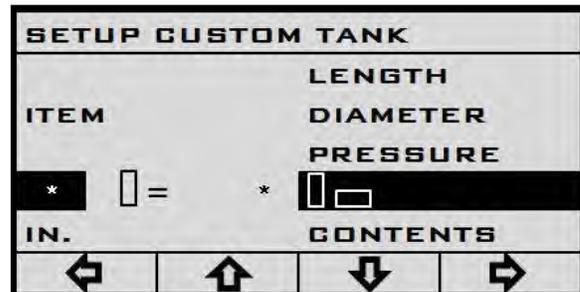
- Once the pressure is set to what you want, press the NEXT button to enter the pressure.



- Use the arrow button to highlight the orientation option on the menu. Press the NEXT button to change the tank orientation.



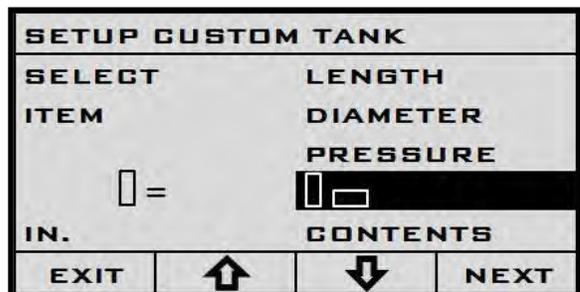
- When the NEXT button is pressed an "*" will appear next to the tank orientation.



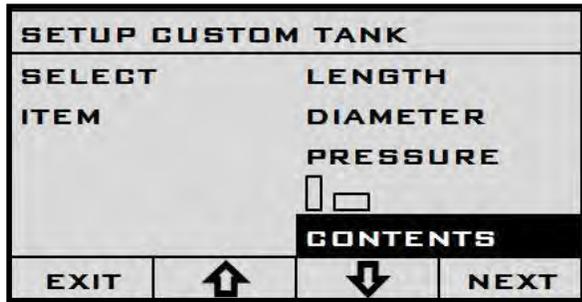
- Use the arrow buttons to change the tank orientation.



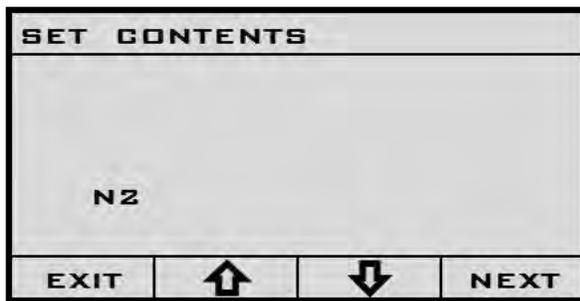
- Once the orientation is set to what you want use the right arrow button to move the cursor to the right until the "*" goes away.



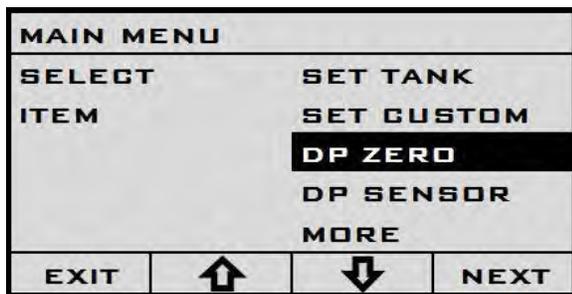
18. Use the arrow buttons to highlight the CONTENTS option and press the NEXT button to move to the next screen.



19. Use the arrow buttons to set the contents in the tank and press the NEXT button to move to the next screen.

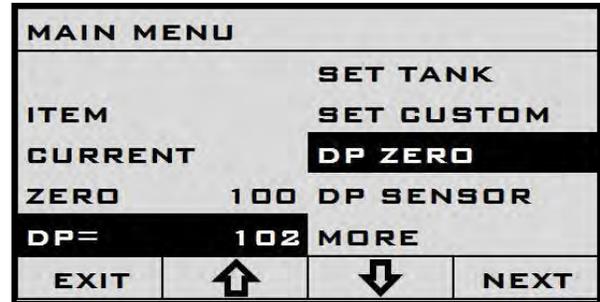


20. If you do not need to/or have already set the DP Zero for the unit you can skip to step 26.
 21. Using the up and down arrow buttons, highlight the DP ZERO option on the main menu.

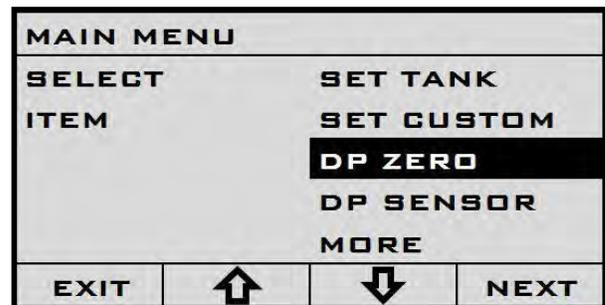


Warning! Make sure the Equalization valve it open or set to equalization/ service before setting the DP ZERO!

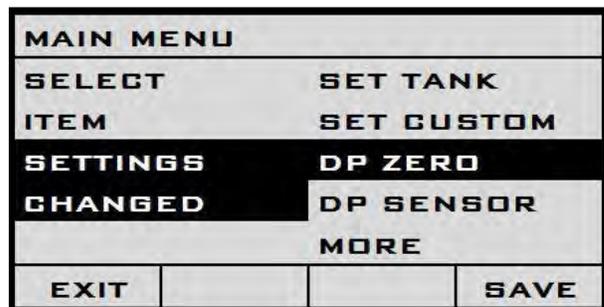
22. Press the NEXT button to display the current and new DP ZERO.



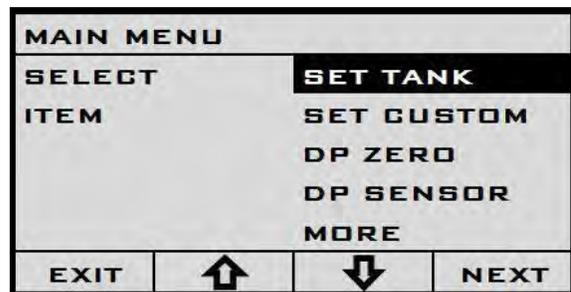
23. Press the NEXT button to accept the new DP ZERO.



24. At this point the unit should be fully setup. Press the EXIT button to exit to the main display.
 25. The unit will inform you that 'SETTINGS CHANGED' and will ask you if you would like to save the changes. Press the SAVE button to save the new settings.



26. At this point you are done. Press the EXIT button to return to the MAIN MENU.

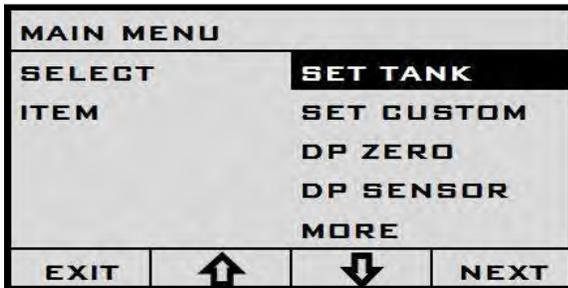


Setting Tank Level Units

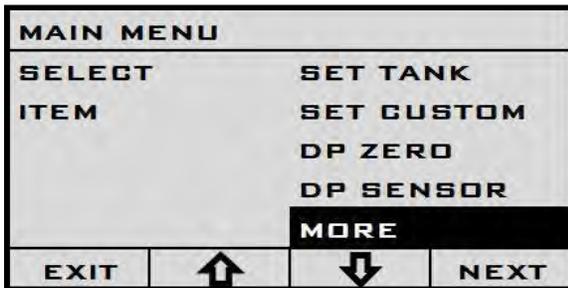
1. Press and release the 'ON' button to turn the screen on.
2. To access the menu hold the 'ON' button for 10-15 seconds. The screen will read "PLEASE WAIT" as seen below.



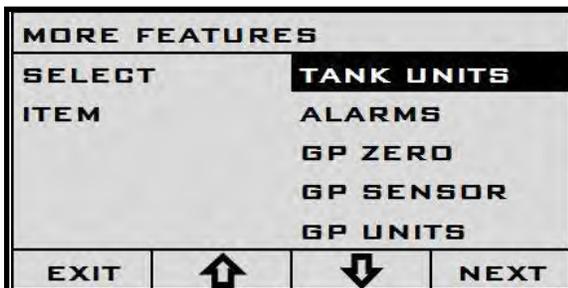
3. Once the 'ON' button has been held long enough the MAIN MENU will display with the SET TANK option highlighted.



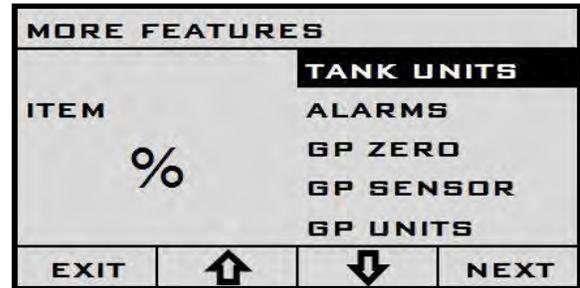
4. Use the arrow buttons to highlight the MORE option and press the NEXT button.



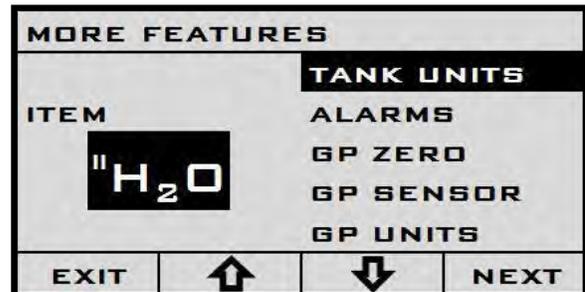
5. The MORE FEATURES menu will appear with the TANK UNITS option highlighted. Press the NEXT button to advance to the next option.



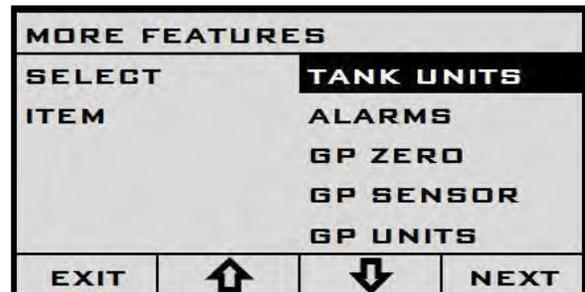
6. Once the NEXT button is pressed, the current units will appear on the left side of the screen.



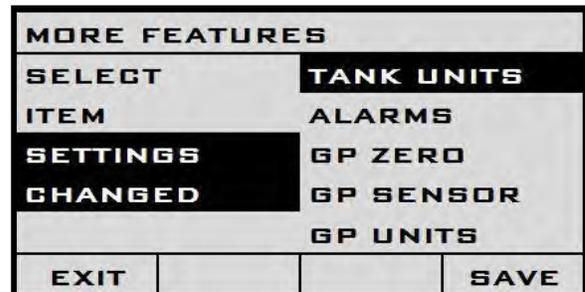
7. Use the arrow buttons to browse the units. Press the NEXT button to select the desired units.



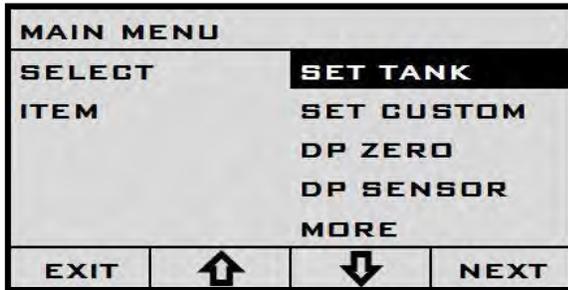
8. Once the new units are selected, the units will disappear. At this point you are done. Press the EXIT button to exit the menu.



9. The unit will ask you if you would like to save the settings. Press the SAVE button to continue.

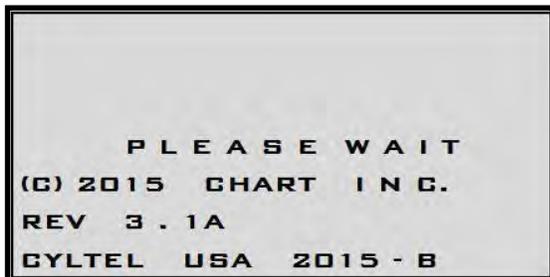


- Once the SAVE button is pressed the unit will back out to the MAIN MENU. Press the EXIT button to exit back out to the main display.

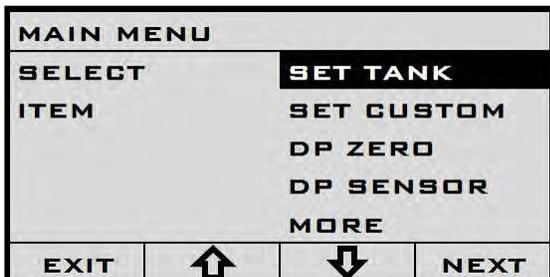


Differential Pressure Sensor Selection

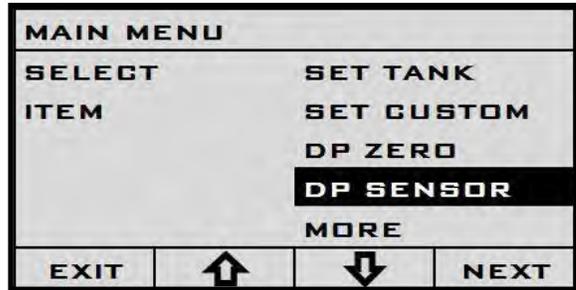
- Press and release the 'ON' button to turn the screen on.
- To access the menu hold the 'ON' button for 10-15 seconds. The screen will read "PLEASE WAIT" as shown below.



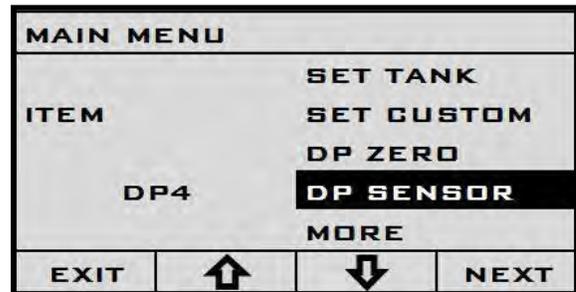
- Once the 'ON' button has been held long enough the MAIN MENU will display with the SET TANK option highlighted.



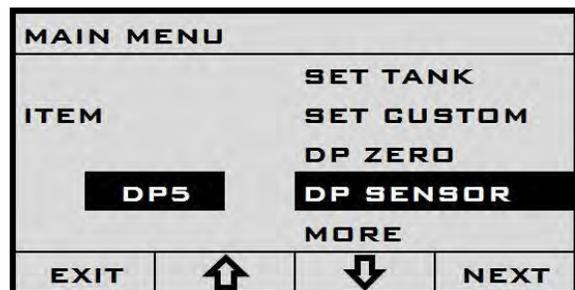
- Use the arrow buttons to highlight the DP SENSOR option in the MAIN MENU.



- Press the NEXT button to change the DP SENSOR.



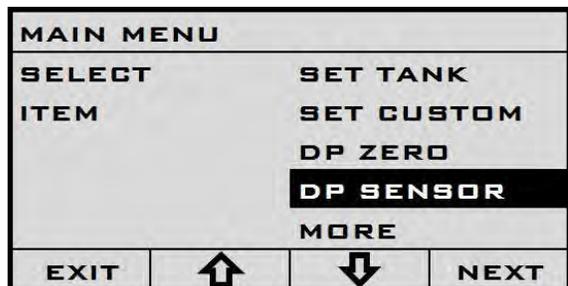
- Use the arrow buttons to cycle through the DP Sensors. The DP Sensor you need to select is displayed on the big white label on either the back or top of the enclosure. Refer to the table at the end of this manual on which DP Sensor you should be using.



- Once the correct DP Sensor is highlighted, press the NEXT button to select the new sensor.



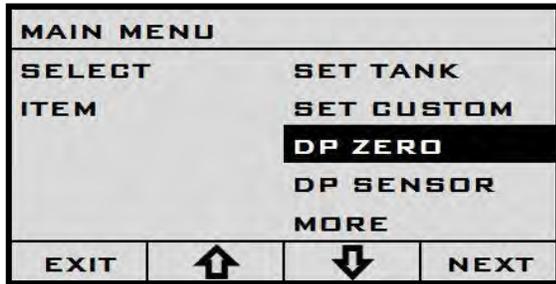
Warning! Any time you change the sensor it is suggested that a new DP Zero is set.



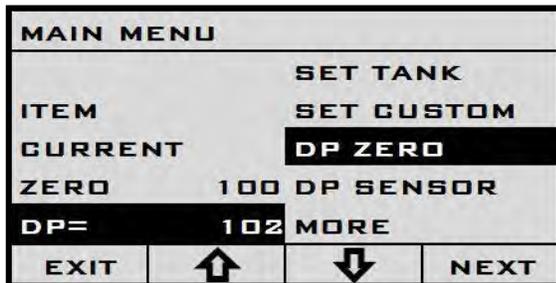
- Use the arrow buttons to highlight the DP ZERO option in the MAIN MENU.



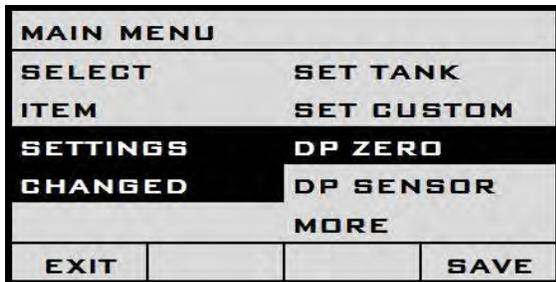
Warning! Make sure the Equalization Valve is open or set to equalization/service before setting the DP Zero!



- Press the NEXT button to display the current and new DP ZERO.



- At this point you are done. Press the EXIT button to leave the MAIN MENU. The unit will inform you that the SETTINGS CHANGED. Press the SAVE button to save the new settings.



- Close the equalization valve or rotate the isolation valve back into normal operation.

Setting the DP Zero

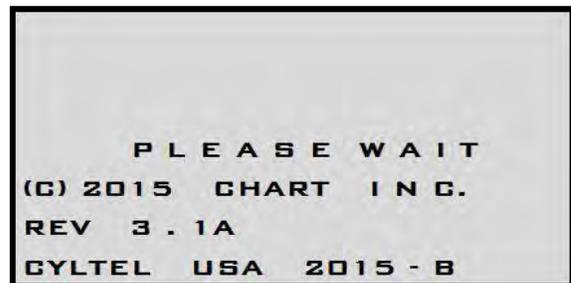


Note: This step must be done for accurate measurement!

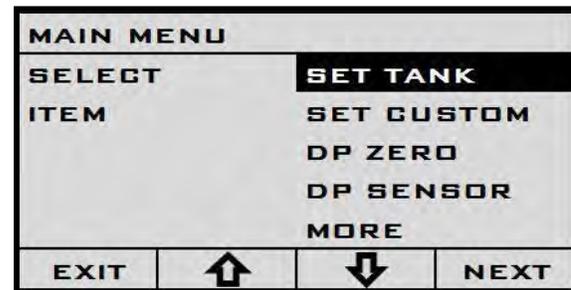


Note: The pressure must be equalized on the Cyl-Tel/Tank-Tel sensor by either opening the equalization valve or removing the Cyl-Tel/Tank-Tel from the tank.

- Press and release the 'ON' button to turn on the screen.
- To access the menu hold the 'ON' button for 10-15 seconds. The screen will read "PLEASE WAIT" as shown below.



- Once the 'ON' button has been held long enough the MAIN MENU will display with the SET TANK option highlighted.

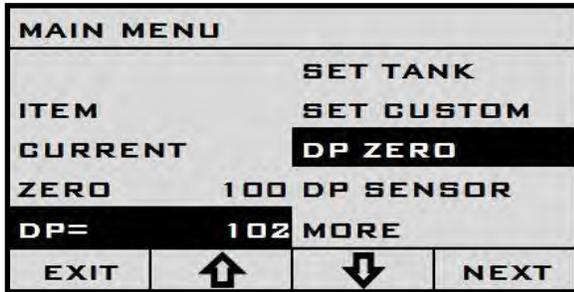


- Use the arrow buttons to highlight the DP ZERO option in the MAIN MENU.

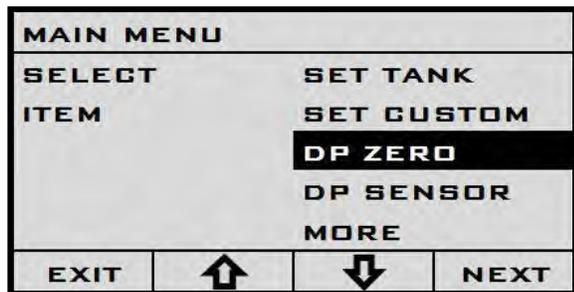


Warning! Make sure the Equalization valve is open or set to equalization/service before setting the DP ZERO!

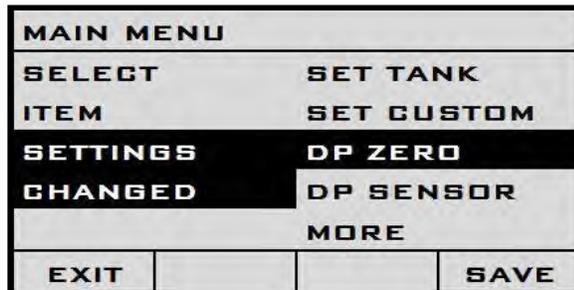
- Press the NEXT button to display the current and new DP ZERO.



- Press the NEXT button to accept the new DP ZERO. If you think the number is wrong, press the EXIT button to cancel the new DP ZERO.



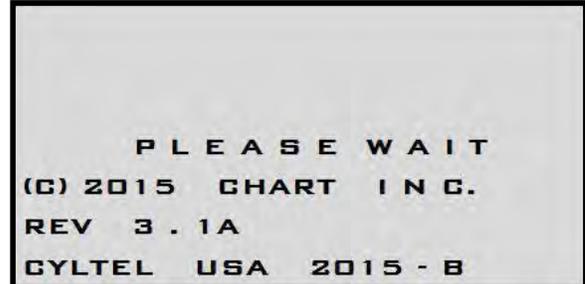
- At this point you are done. Press the EXIT button to leave the MAIN MENU. The unit will inform you that the SETTINGS CHANGED. Press the SAVE button to save the new settings.



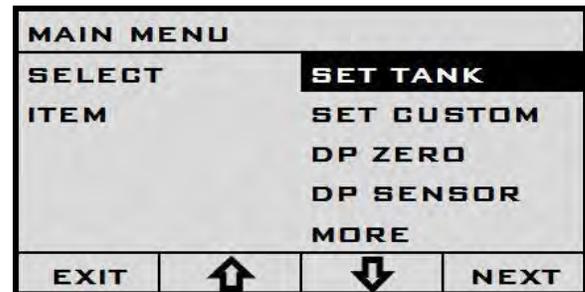
- Close the equalization valve or rotate the isolation valve back into normal operation.

Changing Tank Saturation Pressure

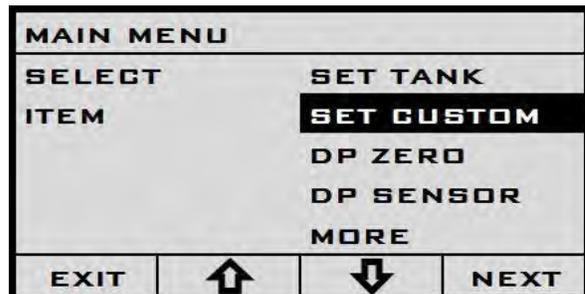
- Press and release the 'ON' button to turn the screen on.
- To access the menu hold the 'ON' button for 10-15 seconds. The screen will read "PLEASE WAIT" as shown below.



- Once the 'ON' button has been held long enough the MAIN MENU will display with the SET TANK option highlighted.



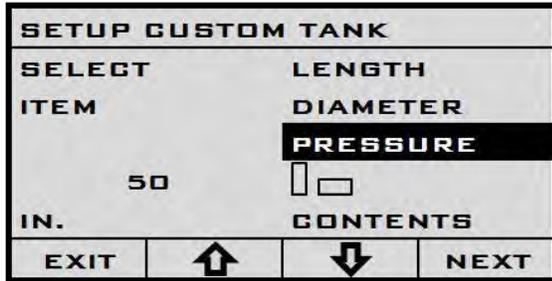
- Use the arrow buttons to highlight the SET CUSTOM option. Press the NEXT button to proceed.



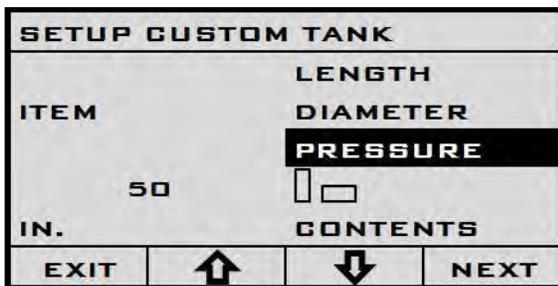
- The SETUP CUSTOM TANK will appear with the LENGTH option highlighted.



- Use the arrow buttons to navigate to the PRESSURE option and press the NEXT button.



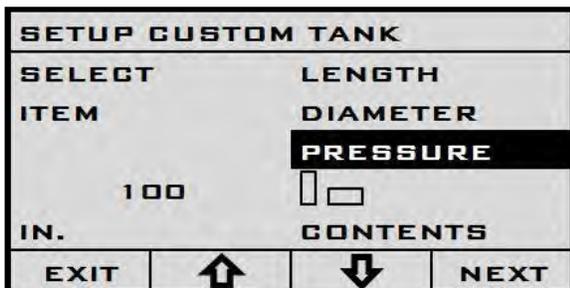
- The "SELECT" above item on the left side of the screen will disappear. You are now able to change the saturation pressure.



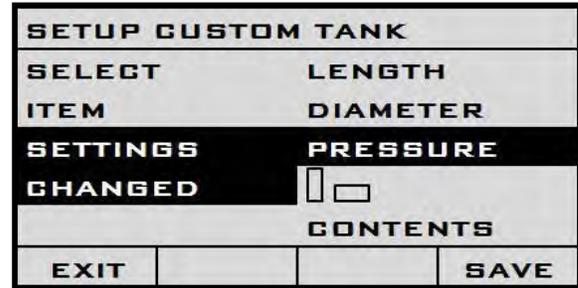
- Use the UP and DOWN arrow buttons to change the saturation pressure of the currently selected tank.



- Once the desired saturation pressure is set, press the NEXT button to select the option. Press the EXIT button to exit the menu.



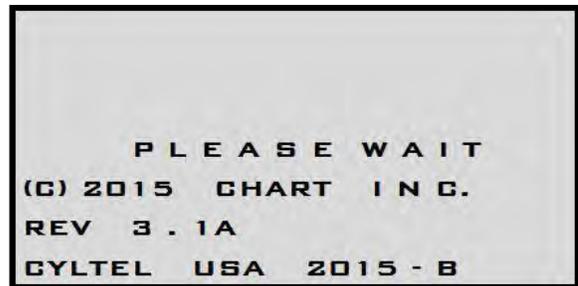
- The unit will ask if you would like to save the changes. Press the SAVE button to proceed out of the menu.



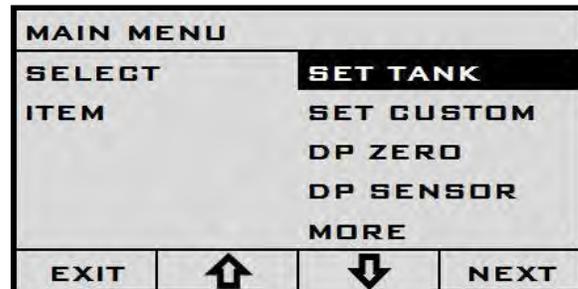
- The unit will back out to the main menu. Press the EXIT button again to exit the MAIN MENU.

Changing Pressure Units

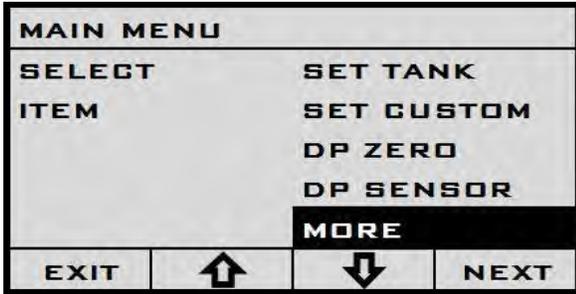
- Press and release the 'ON' button to turn the screen on.
- To access the menu hold the 'ON' button for 10-15 seconds. The screen will read "PLEASE WAIT" as shown below.



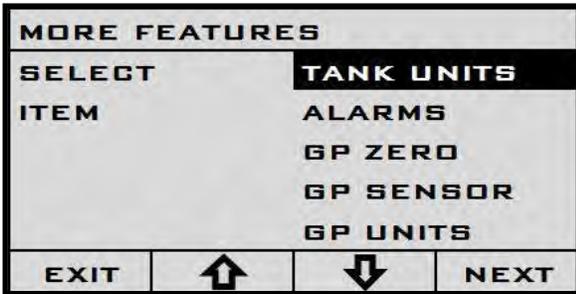
- Once the 'ON' button has been held long enough the MAIN MENU will display with the SET TANK option highlighted.



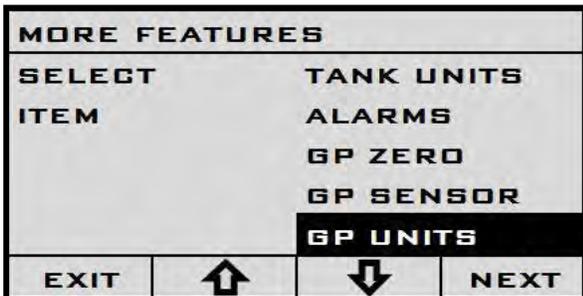
- Use the arrow buttons to highlight the MORE option and press the NEXT button.



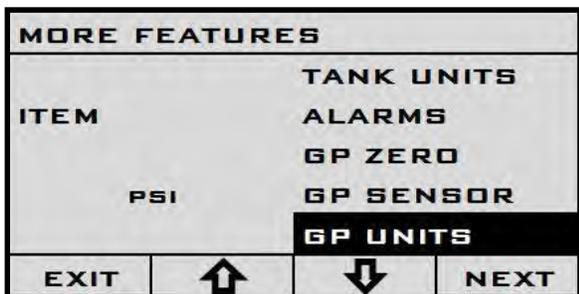
- The MORE FEATURES menu will appear with the TANK UNITS option highlighted.



- Use the arrow buttons to highlight the GP UNITS option. Press the NEXT button to proceed.



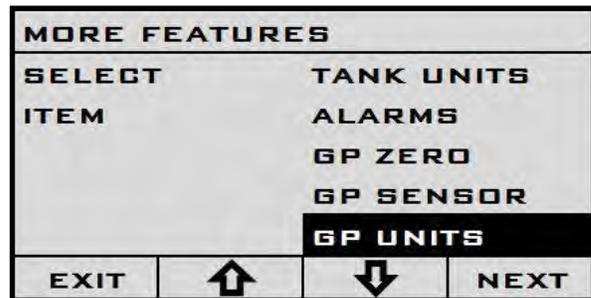
- The current units will be displayed on the left side of the screen.



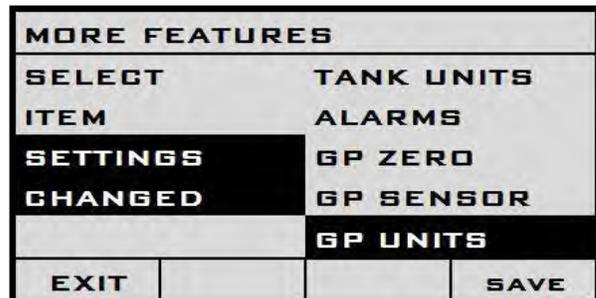
- Use the arrow buttons to browse the desired units. Press the NEXT button to select the desired units.



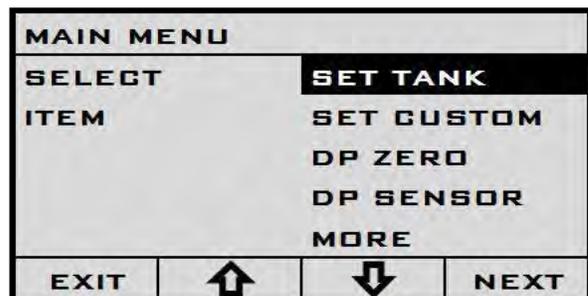
- The setting will now disappear and you will be able to navigate the menu again. Press the EXIT button to exit the menu.



- The unit will ask if you would like to save the settings. Press the SAVE button to continue.

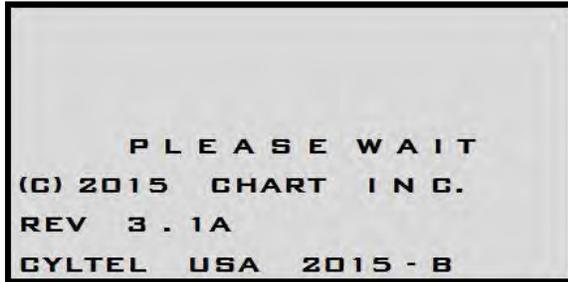


- Once the SAVE button is pressed the unit will back out to the MAIN MENU. Press the EXIT button to exit back out to the main display.

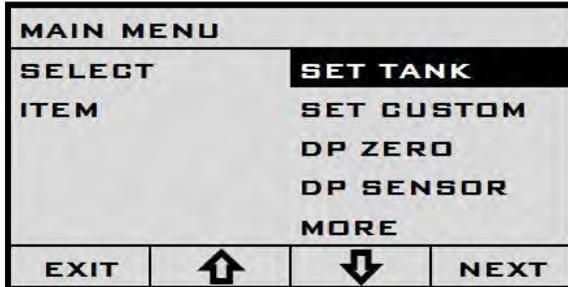


Changing GP Sensor

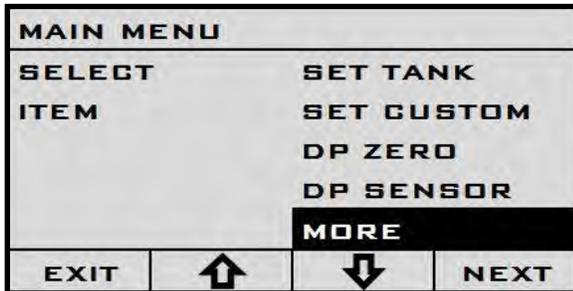
1. Press and release the 'ON' button to turn the screen on.
2. To access the menu hold the 'ON' button for 10-15 seconds. The screen will read "PLEASE WAIT" as shown below.



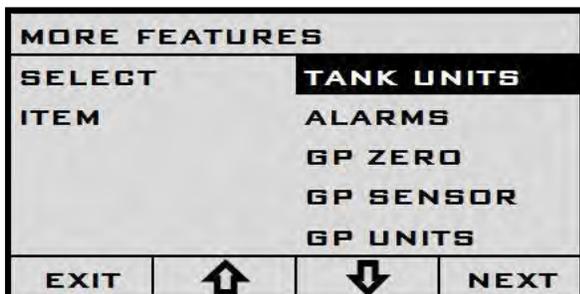
3. Once the 'ON' button has been held long enough the MAIN MENU will display with the SET TANK option highlighted.



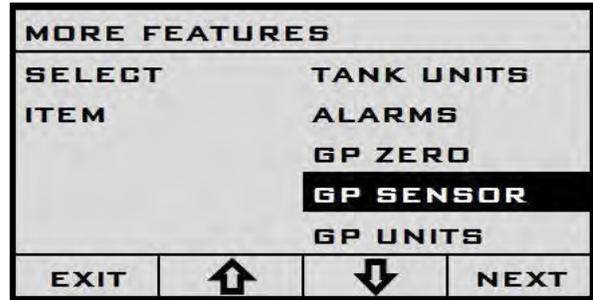
4. Use the arrow buttons to highlight the MORE option and press the NEXT button.



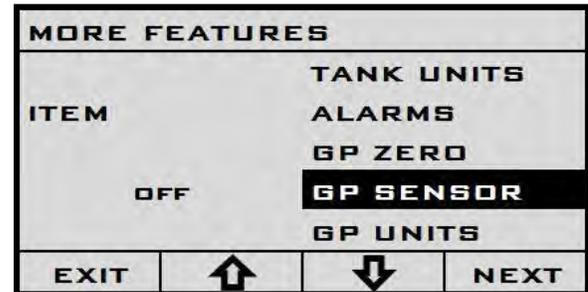
5. The MORE FEATURES menu will appear with the TANK UNITS option highlighted.



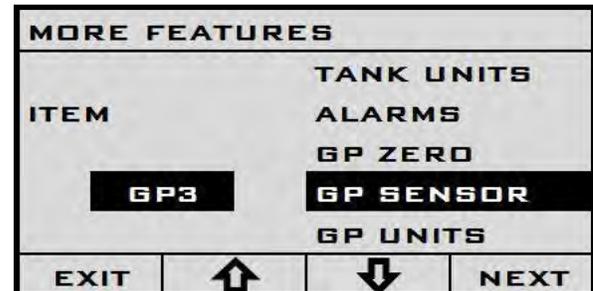
6. Use the arrow buttons to highlight the GP SENSOR option and press the NEXT button.



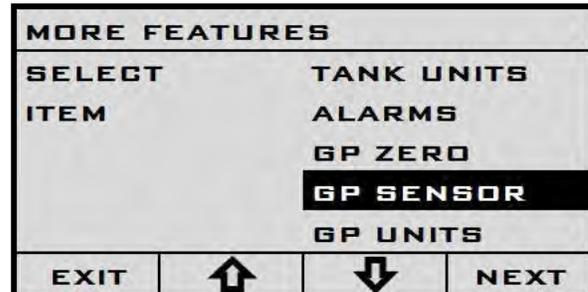
7. The current pressure sensor will be displayed on the left side of the screen.



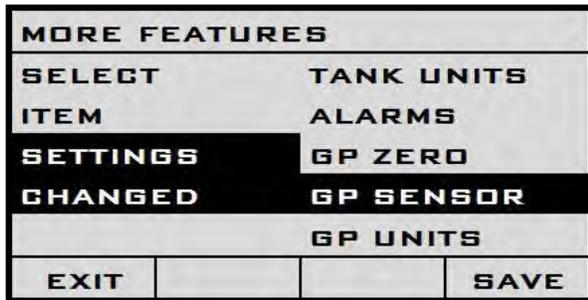
8. Use the arrow buttons to browse to the desired pressure sensor. The GP Sensor is on the large white label on the outside of the plastic enclosure.



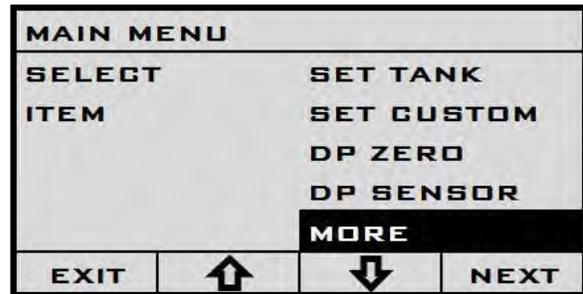
9. Once the desired sensor is highlighted, press the NEXT button. The selection will disappear and you will be able to navigate the menu again. Press the EXIT button to exit the menu.



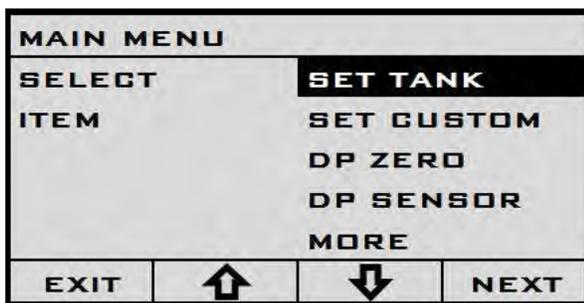
- The unit will ask if you would like to save the settings. Press the SAVE button to continue.



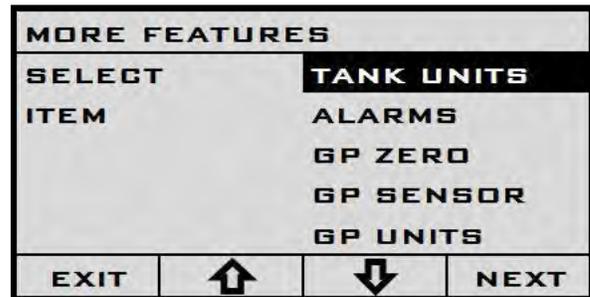
- Use the arrow buttons to highlight the MORE option and press the NEXT button.



- Once the SAVE button is pressed the unit will back out to the main menu. Press the EXIT button to exit back out to the main display.



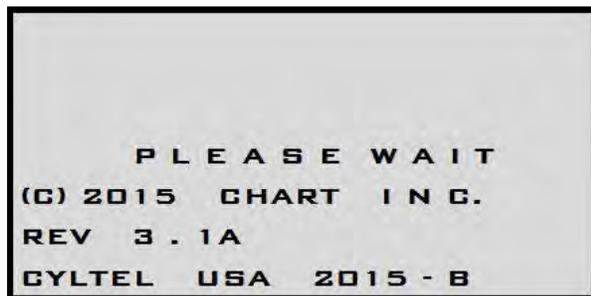
- The MORE FEATURES menu will appear with the TANK UNITS option highlighted.



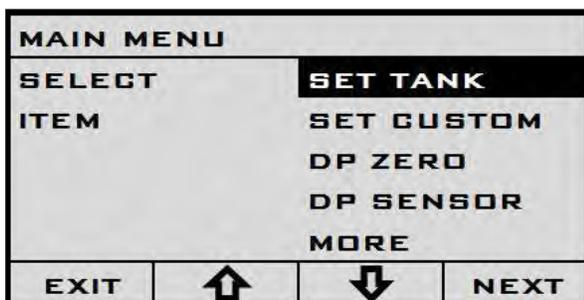
- Use the arrow buttons to highlight the GP ZERO option. Press the NEXT button to zero the sensor.

Setting GP Zero

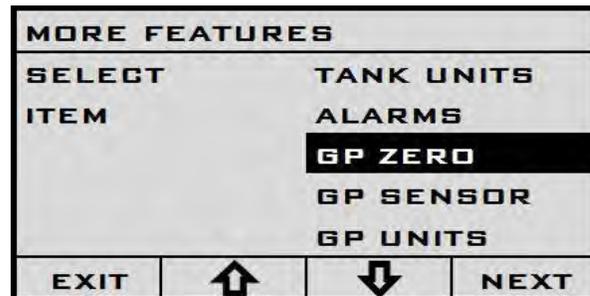
- Press and release the 'ON' button to turn the screen on.
- To access the menu hold the 'ON' button for 10-15 seconds. The screen will read PLEASE WAIT as shown below.



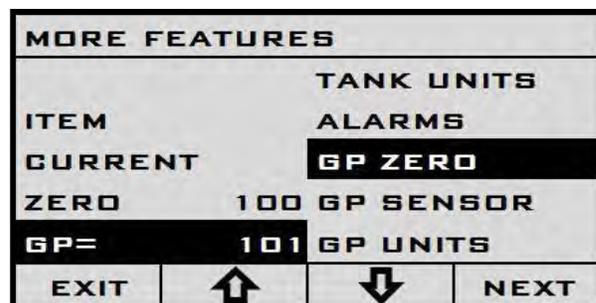
- Once the 'ON' button has been held long enough the MAIN MENU will display with the SET TANK option highlighted.



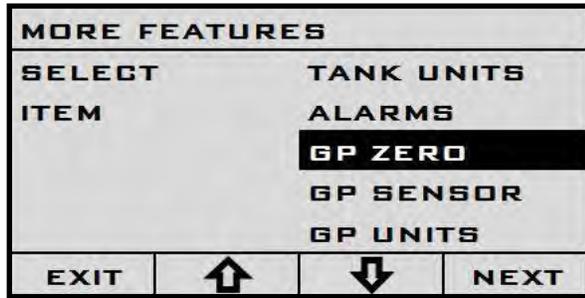
Warning! This should only be done when the unit is off the tank and the line pressure is at 0 psi.



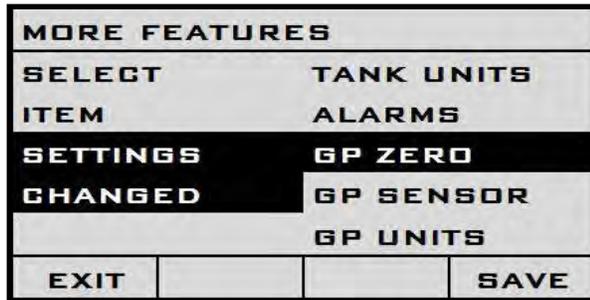
- The unit will now display the new zero along with the old zero setting. Press the NEXT button to save the setting.



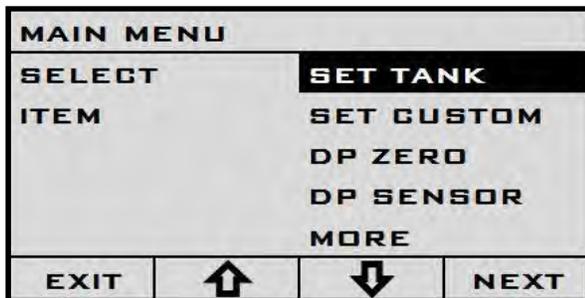
- The setting will now disappear and you will be able to navigate the menu again. Press the EXIT button to exit the menu.



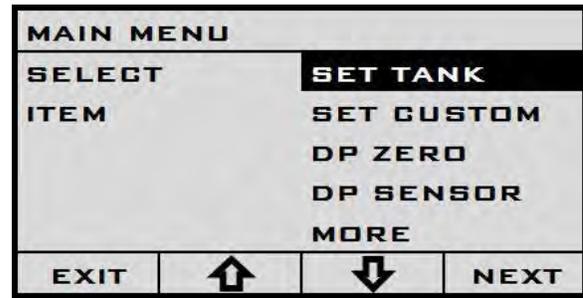
- The unit will ask if you would like to save the settings. Press the SAVE button to continue.



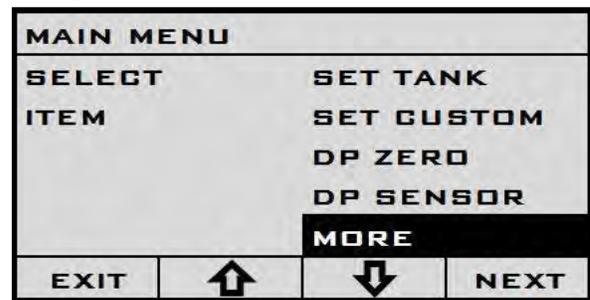
- Once the SAVE button is pressed, the unit will back out to the main menu. Press the EXIT button to exit back out to the main display.



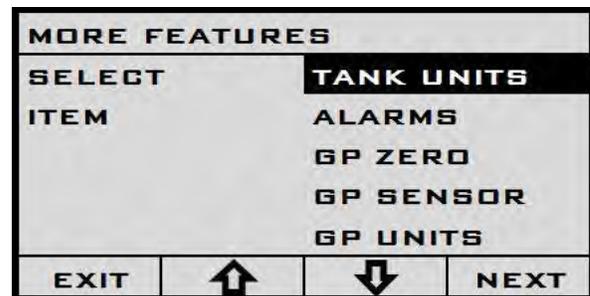
- Once the ON button has been held long enough the MAIN MENU will display with the SET TANK option highlighted.



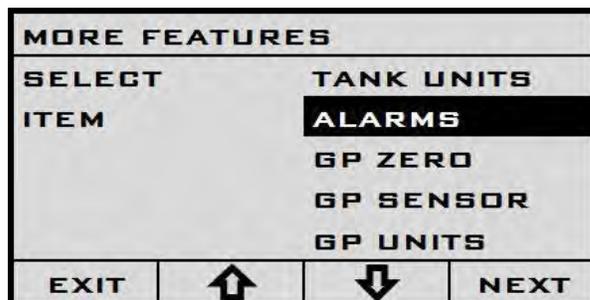
- Use the arrow buttons to highlight the MORE option and press the NEXT button.



- The MORE FEATURES menu will appear with the TANK UNITS option highlighted.

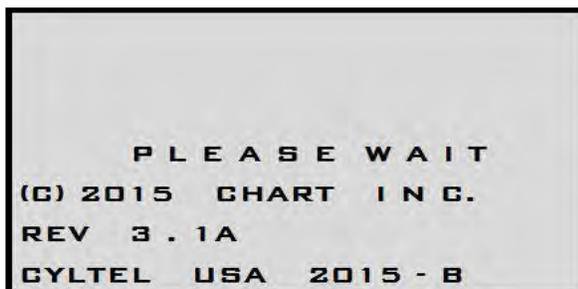


- Use the arrow buttons to highlight the ALARMS option and press the NEXT button to open the alarms menu.

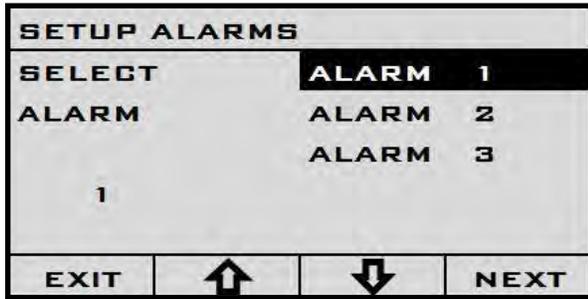


Setting Alarms

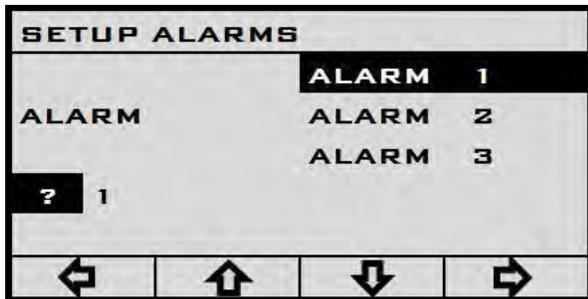
- Press and release the 'ON' button to turn the screen on.
- To access the menu hold the 'ON' button for 10-15 seconds. The screen will read "PLEASE WAIT" as shown below.



- The SETUP ALARMS menu will display and allow you to select the alarm to set. Use the arrow buttons to browse to the desired alarm to set and press the NEXT button.

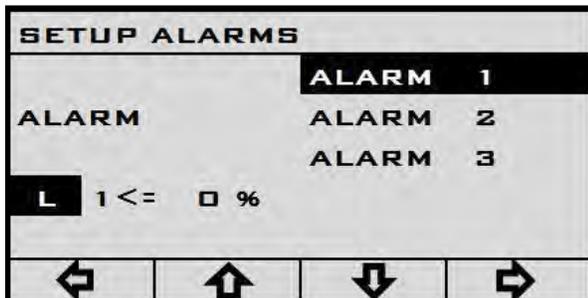


- Once an alarm is selected a "?" will appear on the left side of the screen. This allows you to select if this is a level alarm or a pressure alarm.

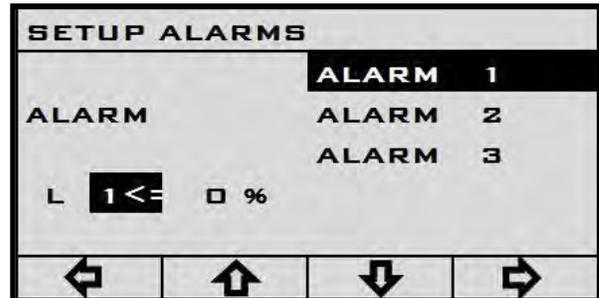


 **Warning!** Pressure alarms will not be available if a pressure sensor is not connected to the unit.

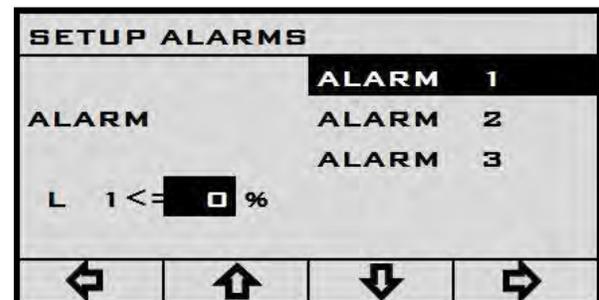
- Use the UP and DOWN arrow buttons to set which alarm is desired. "L" stands for level and "P" stands for pressure.



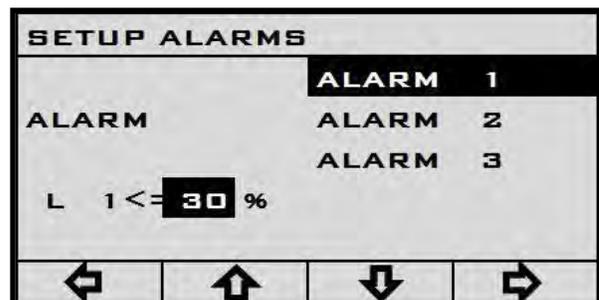
- Use the RIGHT arrow button to highlight the low level or high level option. This chooses if this is a low level alarm or a high level alarm. The "<=" symbol stands for "less than or equal to". This means the alarm will trigger as the tank empties.



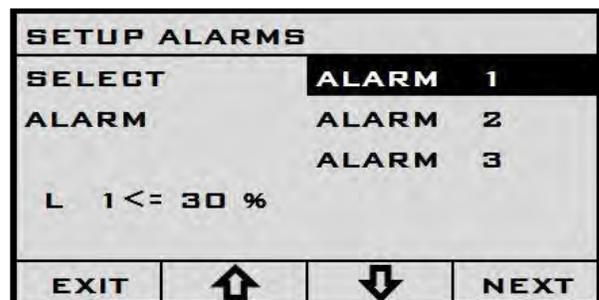
- Use the RIGHT arrow button to move to the level option and use the UP or DOWN arrow buttons to change the desired level.



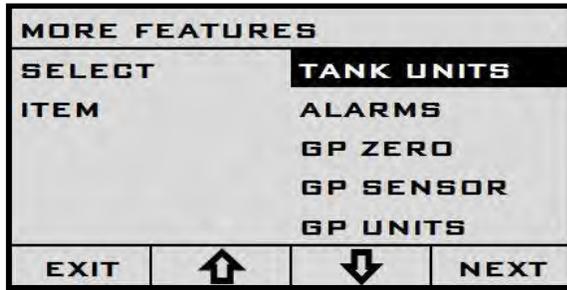
- In this instance we are setting up a 30% level alarm. This alarm will trigger once the level in the tank drops to 30% full.



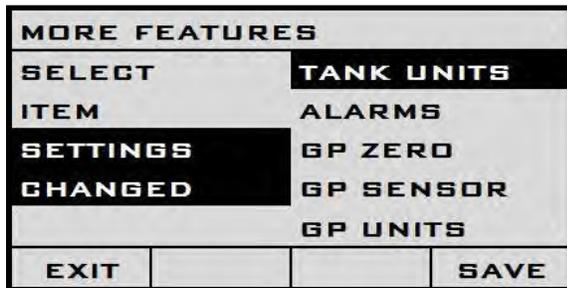
- Use the RIGHT arrow button to navigate all the way to the right until none of the options on the left side of the screen are highlighted. This means the alarm is set and you can exit the menu by pressing the EXIT button.



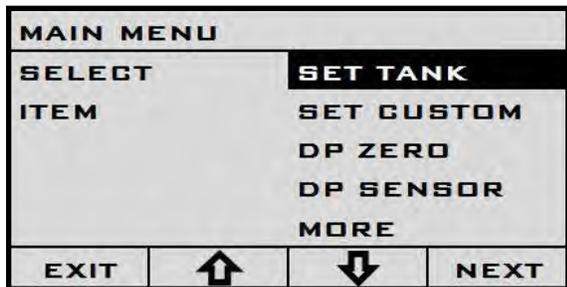
14. The unit will back you out to the MORE FEATURES menu. Press the EXIT button to back out to the MAIN MENU.



15. The unit will ask you if you would like to save the settings. Press the SAVE button to continue.



16. Once the SAVE button is pressed the unit will back out to the main menu. Press the EXIT button to exit back out to the main display.



Troubleshooting

Refer to the table below for troubleshooting procedures. The table is arranged in a Symptom/Possible Cause/Solution format. Note that possible causes for specific symptoms are listed in descending order of significance. That is, check out the first cause listed before proceeding to the next. If you need further assistance please call the Customer Support Hotline at 1-800-400-4683.

Symptom	Possible Cause	Solution
Cyl-Tel/Tank-Tel gauge does not turn on.	Battery dead, low, installed incorrectly or missing. Transformer not plugged in or faulty wiring. Electrical supply circuit breaker tripped. Faulty Cyl-Tel/Tank-Tel gauge. Physical button pad not connected to Cyl-Tel circuit board.	Replace battery. Inspect wiring and insure transformer is plugged in. Reset circuit breaker. Reset breaker. Replace Cyl-Tel/Tank-Tel front. Verify that the ribbon cable for the buttonpad is connected to the Cyl-Tel circuit board.
Cyl-Tel/Tank-Tel display is powered, but stays at zero.	No product in cylinder. 5-way valve in "Equalization/Service" position (Cyl-Tel gauge only). 5-way valve installed incorrectly (Cyl-Tel only). Tank parameters are improperly set. Faulty Cyl-Tel/Tank-Tel gauge.	Ensure there is liquid in cylinder. Turn valve to "Normal Operation" position. See Gauge Installation Section in this manual to confirm proper installation. Verify each parameter setting. The pressure setting as well as the inner dimensions can affect the accuracy of the gauge. Replace Cyl-Tel/Tank-Tel front.
Cyl-Tel/Tank-Tel display always reads 100%.	Parameters are improperly set. Cyl-Tel/Tank-Tel DP Zero not set.	Verify each parameter setting. The pressure setting as well as the inner dimensions can affect the accuracy of the gauge. Refer to Setting the DP Zero section of this manual.
Liquid level oscillates with 5-way valve in either position.	5-way valve leaking externally.	Replace 5-way valve.
Liquid level display does not drop to 0% when 5-way valve is in "Equalization/Service" position.	Cyl-Tel/Tank-Tel DP Zero not set.	Refer to Setting the DP Zero section of this manual.

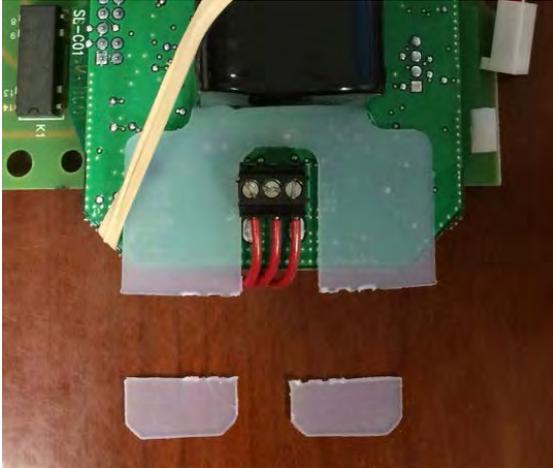
Symptom	Possible Cause	Solution
Liquid level displayed not accurate.	<p>Cyl-Tel/Tank-Tel DP Zero not set.</p> <p>Incorrect differential pressure sensor selected.</p> <p>Incorrect pressure setting.</p>	<p>Refer to Setting the DP Zero section of this manual.</p> <p>Verify that the Cyl-Tel gauge is setup with the correct differential pressure sensor selected.</p> <p>Change pressure settings to closest value to actual liquid saturation pressure (which can be much lower than gas/gauge pressure).</p>
Cyl-Tel/Tank-Tel display shows "Open Loop."	DP sensor not connected to Cyl-Tel/Tank-Tel circuit board.	<p>Verify that the differential pressure sensor is appropriately connected to the Cyl-Tel/Tank-Tel board.</p> <p>If it is appropriately connected, replace the DP sensor (PN 20786602).</p>
Pressure display always reads zero.	<p>Incorrect pressure sensor selected on Cyl-Tel/Tank-Tel gauge.</p> <p>Pressure sensor not connected to the Cyl-Tel circuit board.</p>	<p>Verify that the correct pressure sensor is selected on the Cyl-Tel gauge on the SETUP DISPLAY menu.</p> <p>Verify that the pressure sensor is connected to the Cyl-Tel circuit board at the appropriate input.</p>
Cyl-Tel/Tank-Tel display shows "Sensor Error."	DP sensor is short circuit.	Check wiring. If wired correctly and still an error, replace DP sensor (PN 20786602).



Appendix A

The following instructions explain how to install the OnSite Telemetry board in the Cyl-Tel/Tank-Tel Liquid Level Gauge housing.

1. Approximately 3/8" of the clear plastic support will need to be cut off the cellular board for it to fit into the Cyl-Tel/Tank-Tel housing.



2. Align the cellular board in the Cyl-Tel/Tank-Tel housing as shown in the pictures below. Align the three mounting holes circled in the picture.



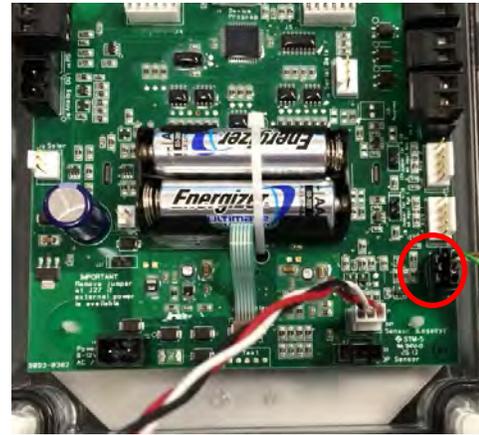
3. Secure the cellular board using the three enclosed mounting screws.



4. Plug the differential pressure sensor wire into the J1 port on the telemetry board.

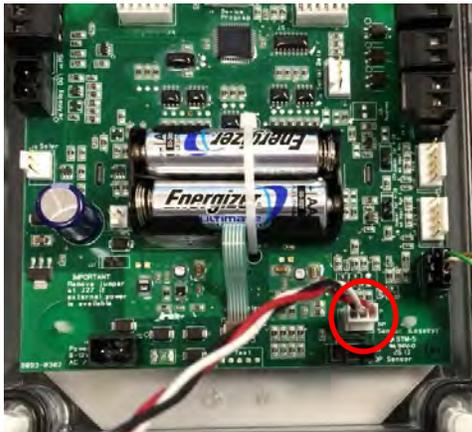


5. Plug the battery wire into the mating connector next to the battery.
7. If equipped leave the pressure sensor plugged into port J18 on the liquid level gauge board.



At this point the board is installed and ready for taking readings to calibrate the system.

6. Plug the twisted wires into the J23 port on the Cyl-Tel/Tank-Tel board.



Appendix B

Chart Standard Bulk Tank Dimensions

Table C-1

<i>Vertical</i>	<i>Inner Diameter</i>	<i>Overall Length</i>
<i>Atmospheric Vessels</i>	<i>ID (in)</i>	<i>OAL (in)</i>
VS-525	60.0	55.6
VS-900	60.0	87.6
VS-1500	60.0	141.6
VS-2000	76.0	178.0
VS-3000	75.5	178.0
VS-6000	75.5	330.5
VS-9000 (91")	90.2	360.0
VS-9000 (102")	101.1	291.5
VS-11000 (91")	90.2	434.0
VS-11000 (102")	101.1	350.5
VS-13000 (102/119)	101.1	409.5
VS-15000 (102/119)	101.1	468.5

Table C-2

<i>Horizontal</i>	<i>Inner Diameter</i>	<i>Overall Length</i>
<i>Atmospheric Vessels</i>	<i>ID (in)</i>	<i>OAL (in)</i>
HS-1500	60.0	141.0
HS-3000	75.3	178.0
HS-6000	75.3	330.5
HS-9000	101.1	291.5
HS-11000	101.1	350.5
HS-13000	101.1	409.5
HS-15000	101.1	468.5

Table C-3

<i>Vertical</i>	<i>Inner Diameter</i>	<i>Overall Length</i>
<i>CO₂ Vessels</i>	<i>ID (in)</i>	<i>OAL (in)</i>
VS-6TON	60.0	141.6
VS-14TON	74.8	178.0
VS-30TON (91")	89.5	290.0
VS-30TON (102")	100.4	232.5
VS-50TON (91")	89.5	434.0
VS-50TON (102")	100.4	350.5
VS-50TON (1299/833)	96.4	380.5

Table C-4

<i>Horizontal</i>	<i>Inner Diameter</i>	<i>Overall Length</i>
<i>CO₂ Vessels</i>	<i>ID (in)</i>	<i>OAL (in)</i>
HS-6TON	60.0	141.6
HS-14TON	74.8	178.0
HS-30TON (102")	100.4	232.5
HS-50TON (102")	100.4	350.5
VHR 120	27.6	51.3
VHR 260	37.2	44.2
VHR 400	44.0	70.5



Appendix C

Determining the Values of "L" and "d" for Custom Tank Setup

Inner Diameter,
d (in)

Shell Length, L_s
(in)

FORM U-1A MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS
 (Alternative Form for Single Chamber, Completely Shop or Field Fabricated Vessels Only)
As Required by the Provisions of the ASME Boiler and Pressure Vessel Code Rules, Section VIII, Division 1

1. Manufactured and certified by Chart Inc. 407 Seventh Street NW, New Prague, Minnesota 56071
(Name and address of Manufacturer)

2. Manufactured for STOCK
(Name and address of Purchaser)

3. Location of installation STOCK
(Name and address)

4. Type VS-3000 26474 513467890 D14028645G/D14109162B 75002 2014
(Horizontal or vertical tank) (Manufacturer's serial number) (CRN) (Drawing Number) (National Board Number) (Year Built)

5. ASME Code, Section VIII, Division 1 2013 EDITION NA LOW TEMP. SVC. UW2B
(Addenda, if applicable)(date) (Code Case number) [Special Service per UC-120(d)]

6. Shell: SA240 T304 .276" 0 6' 0.48" 11' 5.3"
(Material spec. number, grade) (nominal thickness) (Corr. Allow.) (Inner diameter) (Length (overall))

Body Flanges on Shells													
No.	Type	ID	OD	Flange Thk	Min Hub Thk	Material	How Attached	Location	Bolting				
									Num & Size	Bolting Material	Washer (OD, ID, thk)	Washer Material	
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-

7. Seams: TYPE 1 FULL 100 NA NA TYPE 2 FULL 90 3
[Long, (welded, dbl., snl., lap, butt)] [R.T. (Spot or Full)] (Eff(%)) (H.T. Temp.) (Time, hr) Girth (welded, dbl., snl., lap, butt) [R.T.(spot, or full)] (Eff., %) (No. of Courses)

8. Heads: (a) Material SA240 T304 (b) Material SA240 T304

Figure D-1: Example of U-1A Form

Determining the values based on U-1A Form:

$$L = L_s + 4.5 + d/2$$

L = Overall Tank Length

L_s = Shell Length

d = Inner Diameter

All dimensions in inches

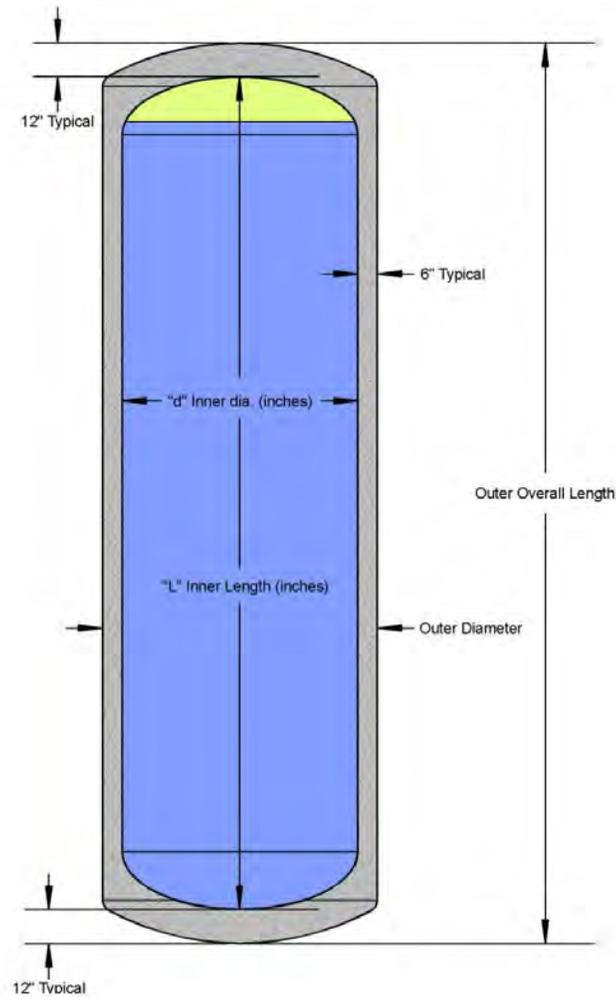


Figure D-2: Schematic drawing of a typical bulk tank

Determining the values based on outer measurements of a bulk tank:

$$\text{Inner Length, } L = \text{Outer Overall Length} - (2 \times 12")$$

$$\text{Inner Diameter, } d = \text{Outer Diameter} - (2 \times 6")$$

All dimensions in inches



Note: If facing problems on determining "L" or "d" values, please call Chart Customer Service for immediate assistance (1-800-400-4683).

Appendix D

Declaration of Conformity



Declaration of Conformity
EMC Directive 2004/108/EC

Manufacturer: Chart Inc.
Address: 1300 Airport Drive
Ball Ground, GA 30107

EC Representative: Chart Ferox, a.s.
Radek Rosenbaum
Ustecka 30
405 30 Decin
Czech Republic

Equipment Designation: CylTel®
TankTel®

We certify that the enclosed units have been manufactured
in conformance with the EMC Directive 2004/108/EC



Chart Ferox, a.s.
Ústecká 30
CZ-405 30, Děčín V

Rosenbaum 27.1.2012
Name (printed) Date

Appendix E

Standard MicroBulk Tank List (with recommended pressure settings)

Display Order	Tank Model	Length IN	Diameter IN	Orientation	RV PSI	PB PSI	Pressure Setting (PSI)
1	PERMA-CYL 230 MP	37.1	24.0	VERTICAL	250	125	50
2	PERMA-CYL 230 HP	37.1	24.0	VERTICAL	350	300	150
3	PERMA-CYL 265 MP	42.2	24.0	VERTICAL	230	100	50
4	PERMA-CYL 265 HP	42.2	24.0	VERTICAL	350	100	150
5	PERMA-CYL 300 MP	49.1	24.0	VERTICAL	250	120	50
6	PERMA-CYL 450 MP	50.9	27.6	VERTICAL	250	120	50
7	PERMA-CYL 450 HP	50.4	27.6	VERTICAL	350	300	150
8	PERMA-CYL 450 VHP	51.8	27.2	VERTICAL	500	450	150
9	PERMA-CYL 700 HP	47.5	37.3	VERTICAL	350	300	150
10	PERMA-CYL 1000 HP	65.0	37.3	VERTICAL	350	300	150
11	PERMA-CYL 1000 VHP	64.8	37.1	VERTICAL	500	450	150
12	PERMA-CYL 1500 HP	69.0	44.0	VERTICAL	350	300	150
13	PERMA-CYL 1500 VHP	69.0	44.0	VERTICAL	500	450	150
14	PERMA-CYL 2000 HP	94.2	44.0	VERTICAL	500	450	150
15	PERMA-CYL 2000 VHP	94.2	44.0	VERTICAL	500	450	150
16	PERMA-CYL 3000 HP	98.0	50.4	VERTICAL	350	300	150
17	PERMA-CYL 3000 VHP	98.0	50.4	VERTICAL	500	450	150
18	PERMA-CYL 5500 VHP	89.5	72.0	VERTICAL	500	450	150
19	PT-1000	96.1	59.6	HORIZONTAL			0
20	XT-2500	190.0	63.0	HORIZONTAL			100
21	DURA-CYL 265 MP	42.2	24.0	VERTICAL	230	100	50
22	DURA-CYL 265 HP	42.2	24.0	VERTICAL	350	100	150
23	MEGA-CYL 450 MP	50.4	27.6	VERTICAL	250	120	50
24	MEGA-CYL 450 HP	50.4	27.6	VERTICAL	350	300	150
25	MEGA-CYL 600 MP	51.5	33.5	VERTICAL	250	120	50
26	MEGA-CYL 600 HP	51.3	33.3	VERTICAL	350	300	150
27	MEGA-CYL 800 MP	55.5	37.4	VERTICAL	250	120	50
28	MEGA-CYL 800 HP	55.9	37.2	VERTICAL	350	300	150
29	MEGA-CYL 1000 MP	65.2	37.4	VERTICAL	250	120	50
30	MEGA-CYL 1000 HP	65.2	37.4	VERTICAL	350	300	150
31	LASER-CYL 450 VHP	50.4	27.4	VERTICAL	500	450	150
32	CARBO-MIZER 300	34.9	18.0	VERTICAL	350	300	250
33	CARBO-MIZER 450	51.3	18.0	VERTICAL	350	300	250
34	CARBO-MIZER 550	51.9	20.0	VERTICAL	350	300	250
35	CARBO-MAX 750	49.3	24.0	VERTICAL	350	300	250
36	CARBO-MAX 1000	52.0	28.0	VERTICAL	350	300	250

Appendix F

Cyl-Tel/Tank-Tel Sensor Names

The following tables explain the sensor names used in the Cyl-Tel/Tank-Tel liquid level gauge firmware on rev. 2.6M and later. If the Cyl-Tel/Tank-Tel gauge has rev. 2.6M or later then the sensor name will be printed on the back label of the gauge for the customer's reference. The names are used when selecting the sensor type in the Cyl-Tel/Tank-Tel gauge menu. For example, if a Cyl-Tel gauge has a brass block sensor on the back, the sensor needs to be DP4 in the sensor type in the setup menu.

The tables below give a complete list of sensors currently compatible with the Cyl-Tel/Tank-Tel liquid level gauges.

Differential Pressure Sensors

Cyl-Tel/Tank-Tel Sensor Name	Sensor Type	Sensor Range
DP1	AST15	415 "H ₂ O
DP2	AST7.25	200 "H ₂ O
DP3	AST30	830 "H ₂ O
DP4	Brass Block 200	200 "H ₂ O
DP5	Brass Block 1000	1000 "H ₂ O
DP6	Brass Block 2000	2000 "H ₂ O

Gauge Pressure Sensors

Cyl-Tel/Tank-Tel Sensor Name	Sensor Type	Sensor Range
OFF	None Attached	--
GP1	AST 50 Bar	725 psig
GP2	MLH Honeywell	1000 psig
GP3	WIKA	600 psig

