



Department of Environmental Protection

2600 Blair Stone Road ♦ Tallahassee, Florida 32399-2400

DEP Form: 62-761.900(9)

Form Title: Storage Tank Equipment

Registration Form

Effective Date: July 2019

Incorporated in Rule 62-761.850, F.A.C.

Storage Tank System Equipment Registration Form

Fill out completely

General Information

Company Name: The Veeder-Root Company Contact Name: David Emmington
Company Address: 125 Powder Forest Drive City, State: Simsbury, CT Zip: 06070
E-mail: demmington@veeder.com Contact Number: 916 638-2066
Product Name: TLS4 Consoles
Model Number(s): 8601 Series Product Type: Automatic Tank Gauge (ATG)
Rule(s) citation that registration is being requested within Chapter 62-761 (UST), and/or 62-762 (AST), _____
Release detection requirements for UST Equipment 62-761.600 and AST Equipment 62-762.601 _____
F.A.C.: Write a brief description of equipment registration request including product limitations:

Request is for TLS4 8601 series ATG console and associated equipment, leak detection components and methods. Fuel compatibility for all sensors is documented in attached Manual 577013-750 "Sensor Application Guide" and other product/method limitations are documented in the attached manuals, guides and approvals

Information Checklist (Choose Yes, No, or N/A - Not Applicable):

	Yes	No	N/A
1. Third-party Certification by a Nationally Recognized Testing Laboratory? (Required)	☒	☐	☐
2. Documentation of third-party evaluation that the equipment meets DEP Rules?	☐	☐	☐
3. Documents included about the qualifications of the Nationally Recognized Testing Laboratory?	☐	☐	☐
4. Technical information and drawings included?	☒	☐	☐
5. Installation instructions included?	☒	☐	☐
6. Annual Operability Testing Requirements (Rules 62-761.500, 62-762.501, & 62-762.502 F.A.C.)?	☒	☐	☐
7. Integrity Testing Requirements (Rules 62-761.700, 62-762.701, & 62-762.702, F.A.C.)?	☒	☐	☐
8. Compatible with fuel blends containing >10% ethanol or >20% biodiesel?	☒	☐	☐
9. Has the product been approved or registered in other countries or states? (If so provide list)	☒	☐	☐
10. Any requirements for company-certified installers or trainers?	☐	☐	☐
11. Was this product(s) previously approved or registered by the Department? If yes, EQ- <u>876</u>	☐	☐	☐
12. Any changes or modifications to the equipment since the last submittal to DEP?	☐	☒	☐

Document Information: Provide supporting documents indicated as "Yes" above including this form via email to Tanknotify@floridadep.gov, or documents can be sent to FDEP, Division of Waste Management, 2600 Blair Stone Road, MS 4560, Tallahassee, FL 32399.

Write a brief description of equipment installation and performance in the U.S.:

Veeder-Root provides highly customizable automatic tank gauge solutions for petroleum site owners fuel and compliance management needs. Veeder-Root's TLS automatic tank gauges (ATGs) provides advanced fuel monitoring and compliance technology to over 500,000 tanks nationally and worldwide.

Equipment Registration Certification:

To the best of my knowledge and belief, all information submitted on this form is true, accurate and complete.

David S. Emmington Manager - Environmental Platform

Printed Name and Title

David Emmington

Signature (right click to sign)

Digitally signed by David Emmington
Date: 2022.04.28 11:02:38 -07'00'

04/28/2022

Date

For Department Use Only:

Date Application Received: 04/28/2022 Application complete: Yes: ☒ No: ☐

EQ- 876 Date of complete or incomplete letter sent: 04/29/2022 Date Equipment Requires Renewal: 4/29/2027

Storage tank system equipment requires renewal every 5 years in accordance with subsection 62-761.850(2), F.A.C.



Department of Environmental Protection

2600 Blair Stone Road ♦ Tallahassee, Florida 32399-2400

DEP Form: 62-761.900(9)

Form Title: Storage Tank Equipment

Registration Form

Effective Date: January 2017

Incorporated in Rule 62-761.850, F.A.C.

Storage Tank Equipment Registration Form

Fill out completely

General Information

Company Name: The Veeder-Root Company

Contact Name: David Emmington

Company Address: 125 Powder Forest Drive

City: Simsbury, CT

Zip: 06070

E-mail: demmington@veeder.com

Contact Number: 916 638-2066

Product Name: TLS4i (up to 4 tanks) and TLS4c (up to two tanks)

Model Number(s): 8601 Series

Product Type: Automatic Tank Gauge (ATG)

Rule(s) citation within Chapter 62-761, or 62-762, F.A.C. that registration is being requested: _____

Release detection requirements for UST Equipment 62-761.600 and AST Equipment 62-762.601

Write a brief description of equipment registration request including product limitations:

Request is for TLS4 (i/c) 8601 series ATG console and associated equipment, leak detection components and methods. Fuel compatibility for all sensors is documented in attached Manual 577013-750 "Sensor Application Guide" and other product/method limitations are documented in the attached manuals, guides and approvals.

Information Checklist

	Yes	No	N/A
1. Third-party Certification by a Nationally Recognized Testing Laboratory?	☒	☐	☐
2. Documentation of third-party evaluation that the equipment meets DEP Rules?	☒	☐	☐
3. Documents included about the qualifications of the Nationally Recognized Testing Laboratory?	☒	☐	☐
4. Installation instructions included?	☒	☐	☐
5. Technical information and drawings included?	☒	☐	☐
6. Annual Operability Testing Requirements (Rules 62-761.700, 62-762.701, & 62-762.702 F.A.C.)?	☒	☐	☐
7. Compatible with fuel blends containing >10% ethanol or >20% biodiesel?	☒	☐	☐
8. Has the product been approved or registered in other countries or states? (If so provide list)	☒	☐	☐
9. Any requirements for company-certified installers or trainers?	☒	☐	☐
10. Was this product(s) previously approved or registered by the Department?	☐	☐	☐
If yes, please specify the Equipment Number: <u>EQ-_____</u>			
11. Any changes or modifications to the equipment since the last submittal to DEP?	☐	☐	☐

Document Information: Provide supporting documents indicated as "Yes" above including this form via email to Tanknotify@dep.state.fl.us, or documents can be sent to FDEP, Division of Waste Management, 2600 Blair Stone Road, MS 4560, Tallahassee, FL 32399.

Write a brief description of equipment installation and performance in the U.S.:

Veeder-Root provides highly customizable automatic tank gauge solutions for petroleum site owners fuel and compliance management needs. Veeder-Root's TLS automatic tank gauges (ATGs) provides advanced fuel monitoring and compliance technology to over 500,000 tanks nationally and worldwide.

Equipment Registration Certification:

To the best of my knowledge and belief, all information submitted on this form is true, accurate and complete.

David S. Emmington Manager - Environmental Platform

Printed Name and Title

David Emmington

Signature

Digitally signed by David Emmington

Date: 2017.06.13 08:24:29 -07'00'

June 13, 2017/corrected

Date

For Department Use Only:

Date Application Received: 5/15/2017 Renew by 5/18/2022

Application complete:

Yes: ☒ No: ☐

EQ- 876

Date of complete or incomplete letter sent: 5/18/2017

Date of entry to the DEP Equipment Registration List: 5/18/2017

From: Emmington, Dave
To: [Curran, Kimberley](#)
Subject: EQ-876
Date: Tuesday, June 13, 2017 11:34:13 AM
Attachments: [image001.png](#)
[62-761.900\(9\)EquipmentRegistrationFormRevised.pdf](#)

Hi Kim,

There was a typo that I made on the submittal form for EQ-876. A revised copy is attached.

Typo was – Product Name: TLS4i (up to 4 tanks) and TLSc (up to two tanks)

Correction - Product name: TLS4i (up to 4 tanks) and **TLS4c** (up to two tanks)

It does identify correct model numbers in the “brief description” field of previously submitted form.

Let me know if you need any additional info.

Thanks as always,

Dave

David S. Emmington | Manager, Environmental Platform | The Veeder-Root Company | O: 916-638-2066 | M: 916-715-9400 | www.veeder.com



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Results of U.S. EPA Standard Evaluation Automatic Tank Gauging System (ATGS)

This form tells whether the automatic tank gauging system (ATGS) described below complies with the performance requirements of the federal underground storage tank regulation. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's "Standard Test Procedure for Evaluating Leak Detection Methods: Automatic Tank Gauging Systems." The full evaluation report also includes a form describing the method and a form summarizing the test data. Tank owners using this leak detection system should keep this form on file to provide compliance with the federal regulations. Tank owners should check with State and local agencies to make sure this form satisfies their requirements.

ATGS Description

Name Veeder-Root 8601 Series Consoles/TLS4 Automatic Tank Gauge

Version number 8463 Series Mag Plus probe

Vendor Veeder-Root

125 Powder Forest Drive
(street address)

<u>Simsbury</u>	<u>CT</u>	<u>06070</u>	<u>U.S.A.</u>	<u>1-860-650-2700</u>
(city)		(state)	(zip)	(country) (phone)

Evaluation Results (see Tables below for summary of Evaluation Results)*

This ATGS, which declares tank to be leaking when the measured leak rate exceeds the threshold of 0.126 gallon per hour, has a probability of false alarms [P_{FA}] of 0.12%.

The corresponding probability of detection [P_D] of a 0.10 gallon per hour leak is 97.1%.

The minimum water level (threshold) in the tank that the ATGS can detect is 0.50 inches.

The minimum change in water level that can be detected by the ATGS is 0.023 inches. (provided that the water level is above the threshold).

Therefore, this ATGS (X) does () does not meet the **federal** performance standards established by the U.S. Environmental Protection Agency (0.20 gallon per hour at P_D of 95% and P_{FA} of 5%), and this ATGS (X) does () does not meet the **federal** performance standard of measuring water in the bottom of the tank to the nearest 1/8 inch. *Tables 1 and 2 summarize all of the performance data that was evaluated in this project.*

Summary of Results	
Description	8463 Series Mag Plus Probe
Number of Tests =	25(24 Valid)
Leak Rate =	0.2
Threshold =	0.126
Variance =	0.00137
MSE =	0.00155
Standard deviation =	0.0370
Bias =	-0.0155
t(bias) =	-2.051
Significant Bias ? =	No (P=0.052)
PFA (%) =	0.12%
PD (%) =	97.1%
Minimum Threshold for 5% PFA =	0.0635 gal/hr
Minimum Detectable Leak Rate for 95% =	0.127
Minimum Detectable Leak Rate for 95% using 0.1 gal/hr as threshold =	0.164
Test Parameters	
Maximum Tank Size	30,000 gallons
Average Stabilization Time (1 st Test of pair)	8 hrs
Average Data Collection Time	3 hrs
Maximum Temperature Differential	6.74
Effects of Stabilization Time	Not Significant
Water Detection Mode	
Liquid Type	Water
minimum Detectable Water Level (in)	0.5
Minimum Water Level Change (in)	0.023 in

Test Conditions During Evaluation (identical for all floats)

The evaluation testing was conducted in a 20,055 gallon () steel (X) fiberglass tank that was 120 inches in diameter and 450 inches in length.

The temperature difference between product added to fill the tank and product already in the tank ranged from -5.7 deg F to 5.6 deg F, with a standard deviation of 4.49 deg F.

The tests were conducted with the tank product levels 50% and 90 % full.

The product used in the evaluation was diesel fuel.

Limitations on the Results (identical for all floats)

The performance estimates above are only valid when:

- The method has not been substantially changed.
- The vendor's instructions for installing and operating the ATGS are followed.
- The tank contains a product identified on the method description form.
- The tank is no larger than 30,000 gallons.
- The fuel level in the tank must be at or above 50%. The waiting time after adding any substantial amount of product to the tank is 8 h.
- The temperature of the added product does not differ more than 6.74 degrees Fahrenheit from that already in the tank.
- The total data collection time for the test is at least 3 hours.
- Other limitations specified by the vendor of determined during testing:
None Specified

➤ **Safety disclaimer: This test procedure only addresses the issue of the ATG system's ability to detect leaks. It does not test the equipment for safety hazards.**



Certification of Results

I certify that the ATGS was installed and operated according to the vendor's instructions and that the results presented on this form are those obtained during the evaluation. I also certify that the evaluation was performed according to one of the following:

- (X) standard EPA test procedure for ATGS
() alternative EPA test procedure for ATGS

H. Kendall Wilcox, President
(printed name)

H. Kendall Wilcox

(signature)

January 15, 2014
(date)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, Missouri 64029
(city, state, zip)

(816) 443-2494
(phone number)

Results of Alternative Evaluation

Continuous In-Tank Leak Detection System (CITLDS)

This form tells whether the continuous leak detection system (CITLDS) described below complies with the performance requirements of the federal underground storage tank regulation. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the Continuous Leak Detection System Evaluation Protocol. This protocol is deemed equivalent in stringency to the EPA Evaluation Protocols. The full evaluation report also includes a form describing the method and a form summarizing the test data.

Tank owners using this leak detection system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with State and local agencies to make sure this form satisfies their requirements.

CITLDS Description

Name	8600 Series and 8601 Series		
Version Number	CSLD		
Vendor	Veeder-Root		
	125 Powder Forest Drive (street address)		
	Simsbury	CT	06070-7684 (860) 651-2700
	(city)	(state) (zip)	(phone)

Evaluation Results

Quantitative Results For Tank Leak Simulation (Complete this section based on the tank leak simulation data if the CITLDS reports a leak rate. If this section is not applicable, check here ☐ and leave the section blank.)

This CITLDS declares a tank to be leaking when the measured leak rate exceeds a threshold. The threshold, probability of false alarm, PFA, and probability of detection, PD, of detecting an average leak rate of 0.20 gallon per hour or 150 gallons per month, are given in the table below.

Threshold	Probability of False Alarm (PFA)	Probability of Detection (PD) of leak <u>0.2</u> gph
	Single Tanks	
0.15	<0.001%	99%
0.16	<0.001%	96%
	Manifold Systems (up to 3)	
0.12	0.05%	99%
0.14	0.01%	96%

The mean difference between the measured and reported leak rate was 0.0147 gph. The standard deviation was 0.0361 gph.

Any results that were invalid due to operational difficulties are to be reported. If the data included any invalid results, record that fact here. If not, indicate that. There were 0 invalid results out of 72 records in the data, or 0%. This means that the system may not provide a conclusive test result 0% of the time.

If the CITLDS has a water detection function, complete the following:

The minimum water level (threshold) in the tank that the CITLDS can detect is 0.75 inch.
The minimum change in water level that can be detected by the CITLDS is 0.08 inch.

Quantitative Results for Line Leak Simulation (Complete this section based on the line leak simulation data if the CITLDS reports a leak rate. If this section is not applicable, check here X and leave the section blank.)

This CITLDS declares a tank system to be leaking when the measured leak rate exceeds a threshold. The threshold, probability of false alarm, PFA, and probability of detection, PD, of detecting an average leak rate of 0.20 gallon per hour or 150 gallons per month, are given in the table below.

The mean difference between the measured and reported leak rate was 0.01471 gph. The standard deviation was 0.0361 gph.

Threshold	Probability of False Alarm (PFA)	Probability of Detection (PD) of leak <u>0.2</u> gph

Any results that were invalid due to operational difficulties are to be reported. If the data included any invalid results, record that fact here. If not, indicate that. There were 0 invalid results out of 72 records in the data, or 0 %. This means that the system may not provide a conclusive test result 0 % of the time.

Qualitative Results for Tank Leak Simulation (Complete this section based on the tank leak simulation data if the CITLDS reports on a pass/fail basis. If this section is not applicable, check here **X** and leave the section blank.)

Actual Status	Reported			
	Tight	Leaking	Invalid	Total
Tight				
Leaking				

The estimated PFA was _____ with a 95% confidence interval from _____ to _____.

Name of CITLDS 8600 Series and 8601 Series

Version Veeder-Root CSLD

The estimated PD for detecting a leak rate of 0.20 gallon per hour (150 gallons per month) was with a 95% confidence interval from _____ to _____.

Any results that were invalid due to operational difficulties are to be reported. If the data included any invalid results, record that fact here. If not, indicate that. There were _____ invalid results out of _____ records in the data, or _____. This means that the system may not provide a conclusive test result _____% of the time.

Qualitative Results for Line Leak Simulation (Complete this section based on the line leak simulation data if the CITLDS reports on a pass/fail basis. If this section is not applicable, check here **X** and leave the section blank.)

Actual Status	Reported			
	Tight	Leaking	Invalid	Total
Tight				
Leaking				

The estimated PFA was _____ with a 95% confidence interval from _____ to _____.

The estimated PD for detecting a leak rate of 0.20 gallon per hour (150 gallons per month) was with a 95% confidence interval from _____ to _____.

Any results that were invalid due to operational difficulties are to be reported. If the data included any invalid results, record that fact here. If not, indicate that. There were _____ invalid results out of _____ records in the data, or _____. This means that the system may not provide a conclusive test result _____% of the time.

Automatic Monthly Inventory Control Results (If the system is an automatic monthly inventory control system, enter the results in this section. If there is no monthly inventory control function, check here **X** and leave this section blank.)

The mean of the monthly inventory reconciliations was _____ gallons per month. The standard deviation was _____ gallons per month. Using the EPA action level of 1% of throughput plus 130 gallons gave the estimated false alarm rate reported below. Also reported is the smallest loss that could be detected with 95% probability using the EPA threshold.

Threshold	Probability of False Alarm (PFA)	Size of Leak Detected with a PD of <u>95%</u>

Name of CITLDS 8600 Series and 8601 Series

Version Veeder-Root CSLD

Test Conditions During Evaluation

The data evaluation set included data from tanks of the following sizes:

	Min.	25	Median 50	75	80	Max.
Percentile of Records						
Tank Size (gal)	5,929	10,310	11,859	15,281	29,148	29,148

The tanks had various monthly throughputs:

	Min.	25	Median 50	75	80	Max.
Percentile of Records						
Monthly throughput (gal)	7,791	26,850	50,223	85,727	91,228	234,794

The temperature difference between product added to fill the tanks and product already in the tank ranged from -26.2 °F to +9.2 °F, with a standard deviation of 4.84 °F.

The tests were conducted with the tank product levels ranging from 15 % to 80 % full.

The duration of the CITLDS tests ranged from 25 days to 28 days, with an average duration of 27.6 days (specify appropriate time units, e.g., day or hours).

The system correctly identified 10 leaks of 10 simulated leaks in the 1 to 10 gph range. Note: must be 100% in this range to be acceptable.

Name of CITLDS 8600 Series and 8601 Series

Version Veeder-Root CSLD

For a quantitative system, enter the average difference between the estimated leak rate with a variable simulated leaks minus the estimated rate with a constant simulated leak was 0.00221 gph. This difference must be greater than or equal to zero for the system to be acceptable. For a qualitative system, enter the number of leaks identified with variable leak rates and the number identified with constant leak rates . The number with variable leak rates must be at least as large as the number with constant leak rates.

Based on the results reported on pages 1 and 2 of this form, the reported method X does does not meet the **federal** performance standards established by the U.S. Environmental Protection Agency of an average leak rate of 0.20 gallon per hour or 150 gallons per month from X a tank or lines (mark applicable boxes) at PD of 95% and PFA of 5%.

Limitations on the Results

The performance estimates above are only valid when:

The method has not been substantially changed.

The vendor's instructions for installing and operating the CITLDS are followed.

The tank contains a product identified on the method description form.

The tank is no larger than 43,722 gallons.

The data records cover 25 days or more.

The monthly throughput is 235,000 gallons or less.

The difference in temperature between product in the tank and that delivered is 7.26 °F or less.

The system X may or may not be used for manifolded tank systems. If the system may be used for manifolded tank systems, check here if there was no significant difference in performance between single and manifolded tank systems. If there was a significant difference, enter the PD and PFA for the two types of systems here:

System	PFA	PD (of 0.2 gph)
Single Tanks (using 0.15 gph threshold) Using 0.16 gph threshold	<0.001% <0.001%	99% 96%
Manifolded (2 or 3) (using 0.12 gph threshold) Using 0.14 gph threshold	0.05% 0.01%	99.% 96%

Name of CITLDS 8600 Series and 8601 Series

Version Veeder-Root CSLD

The minimum product level for the system is 15% of the tank volume. The maximum product level for the system is 80% of the tank volume.

Other limitations specified by the vendor or determined during testing:

> **Safety disclaimer: This test procedure only addresses the issue of the method's ability to detect leaks.**

Certification of Results

I certify that the results presented on this form are those obtained during the evaluation. I also certify that the evaluation was performed according to the proposed test procedure for Continuous Leak Detection Systems. In particular, the requirements summarized in Section 6.4 for the data base and in Section 7.8 for the data analysis were followed. Any exceptions are noted below:

Exceptions to Sections 6.4 and 7.8. If none, state "None."

None

This test procedure is deemed equivalently stringent to EPA published evaluation protocols.

H. Kendall Wilcox

(printed name)

Ken Wilcox Associates, Inc.

(organization performing evaluation)

H. Kendall Wilcox

(signature)

Grain Valley, MO 64029

(city, state, zip)

10/3/2014

(date)

(816) 443-2494

(phone)

Results of U.S. EPA Standard Evaluation Automatic Tank Gauging System (ATGS)

This form tells whether the automatic tank gauging system (ATGS) described below complies with the performance requirements of the federal underground storage tank regulation. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's "Standard Test Procedure for Evaluating Leak Detection Methods: Automatic Tank Gauging Systems." The full evaluation report also includes a form describing the method and a form summarizing the test data. Tank owners using this leak detection system should keep this form on file to provide compliance with the federal regulations. Tank owners should check with State and local agencies to make sure this form satisfies their requirements.

ATGS Description

Name Veeder-Root 8601 Series Console/TLS4 Automatic Tank Gauge

Version number 8463 Series Mag Plus probe

Vendor Veeder-Root

125 Powder Forest Drive
(street address)

<u>Simsbury</u>	<u>CT</u>	<u>06070</u>	<u>U.S.A.</u>	<u>1-860-650-2700</u>
(city)		(state)	(zip)	(country) (phone)

Evaluation Results (see Tables below for summary of Evaluation Results)*

This ATGS, which declares tank to be leaking when the measured leak rate exceeds the threshold of 0.0625 gallon per hour, has a probability of false alarms [P_{FA}] of 0.42%.

The corresponding probability of detection [P_D] of a 0.0625 gallon per hour leak is 95%.

The minimum water level (threshold) in the tank that the ATGS can detect is 0.50 inches.

The minimum change in water level that can be detected by the ATGS is 0.023 inches.
(provided that the water level is above the threshold).

Therefore, this ATGS (X) does () does not meet the **federal** performance standards established by the U.S. Environmental Protection Agency (0.10 gallon per hour at P_D of 95% and P_{FA} of 5%), and this ATGS (X) does () does not meet the **federal** performance standard of measuring water in the bottom of the tank to the nearest 1/8 inch. *Tables 1 and 2 summarize all of the performance data that was evaluated in this project.*

Table 1. Summary of Results

Basic Statistics	
Description	8463 Series Mag Plus Probe
Number of Tests	30
Leak Rate	0.1 gal/h
Threshold	0.0625 gal/h
Variance	0.000487
MSE	0.000548
Standard deviation	0.0221 gal/h
Bias	-0.0077 gal/h
t(bias)	1.911
Significant Bias ?	Not Significant (P=0.066)
PFA (%)	0.42%
PD (%)	95%
Minimum Threshold for 5% PFA=	0.0375 gal/h
Minimum Detectable Leak Rate for 95%	0.075 gal/h
Minimum Detectable Leak Rate for 95% using 0.05 gal/hr as threshold	0.0875 gal/h
Test Parameters	
Maximum Tank Size	20,000 gallons
Average Stabilization Time (1 st Test of pair)	8 hrs
Average Data Collection Time	2 hrs 56 min
Maximum Temperature Differential	7.12 degrees F
Effects of Stabilization Time	NS (P=0.23,bias; P=0.20 var)
Effects of Tank Level	Variability: NS (P=0.24)
System estimated leak rate closer to zero at 90% level (0.0007) than at 50% (-0.0187)	Bias: Sig (P=0.014)
Water Detection Mode	
Minimum Detectable Water Level (in)	0.5
Minimum Water Level Change (in)	0.023

Test Conditions During Evaluation (identical for all floats)

The evaluation testing was conducted in a 13,767 gallon () steel (X) fiberglass tank that was 120 inches in diameter and 322 inches in length.

The temperature difference between product added to fill the tank and product already in the tank ranged from -5.8 deg F to 6.4 deg F, with a standard deviation of 4.75 deg F.

The tests were conducted with the tank product levels 50% and 90 % full.

The product used in the evaluation was diesel fuel.

Limitations on the Results (identical for all floats)

The performance estimates above are only valid when:

- The method has not been substantially changed.
- The vendor's instructions for installing and operating the ATGS are followed.
- The tank contains a product identified on the method description form.
- The tank is no larger than 20,000 gallons.
- The fuel level in the tank must be at or above 50%. The waiting time after adding any substantial amount of product to the tank is 8 h.
- The temperature of the added product does not differ more than 7.12 degrees Fahrenheit from that already in the tank.
- The total data collection time for the test is at least 2h 56m.
- Other limitations specified by the vendor of determined during testing:
None Specified

➤ **Safety disclaimer: This test procedure only addresses the issue of the ATG system's ability to detect leaks. It does not test the equipment for safety hazards.**

➤

Certification of Results

I certify that the ATGS was installed and operated according to the vendor's instructions and that the results presented on this form are those obtained during the evaluation. I also certify that the evaluation was performed according to one of the following:

(X) standard EPA test procedure for ATGS
() alternative EPA test procedure for ATGS

H. Kendall Wilcox, President
(printed name)

H. Kendall Wilcox
(signature)

April 9, 2014
(date)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, Missouri 64029
(city, state, zip)

(816) 443-2494
(phone number)

TLS-450PLUS / TLS4

Operator's Manual

Notice

Veeder-Root makes no warranty of any kind with regard to this publication, including but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

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Introduction

This manual contains instructions for using the Workflow Wizard Setup Application in the TLS450PLUS and TLS4/8601 Series consoles. Workflow Wizard guides the user through the Veeder-Root recommended setup screens during the console's initial commissioning.

This manual assumes all devices are connected to the console and that a site diagram of all probes, sensors and tanks is at hand to assist in determining the correct console addresses for these devices. The procedures herein are intended to be followed using the console's touch screen. Other setup interface methods vary in feature and accessibility options.

Some of the screens are only visible if the applicable features/devices are installed in your console. Skip over programming instructions for any features/devices that are not installed in your console.

Contractor Certification Requirements

Veeder-Root requires the following minimum training certifications for contractors who will install and setup the equipment discussed in this manual:

Installer (Level 1) Certification: Contractors holding valid Installer Certification are approved to perform wiring and conduit routing; equipment mounting; probe, sensor and carbon canister vapor polisher installation; wireless equipment installation; tank and line preparation; and line leak detector installation.

ATG Technician (Level 2/3 or 4) Certification: Contractors holding valid ATG Technician Certifications are approved to perform installation checkout, startup, programming and operations training, system tests, troubleshooting and servicing for all Veeder-Root Series Tank Monitoring Systems, including Line Leak Detection. In addition, Contractors with the following sub-certification designations are approved to perform installation checkout, startup, programming, system tests, troubleshooting, service techniques and operations training on the designated system.

Related Documents

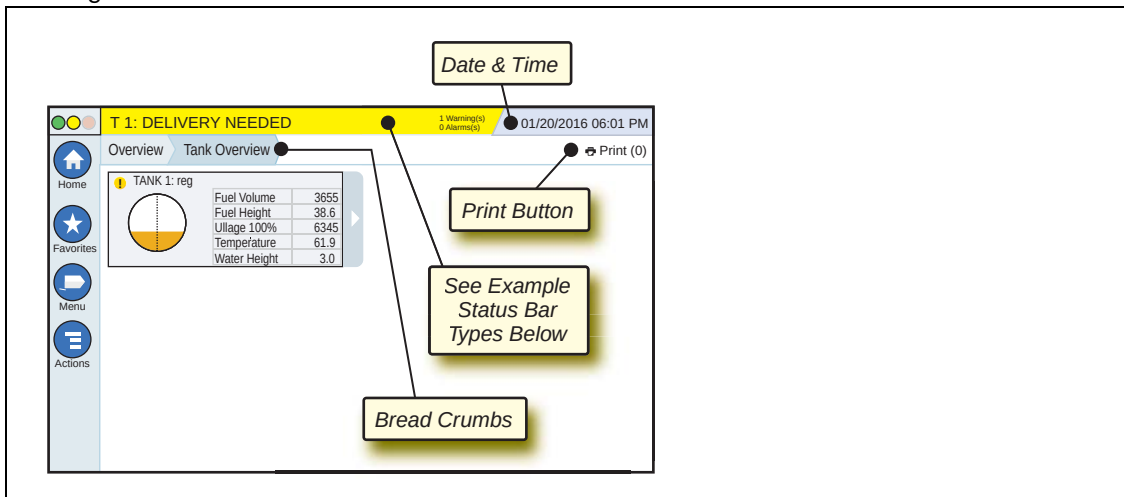
577014-073	TLS450PLUS Site Prep Manual
577014-075	TLS-450PLUS Troubleshooting Guide
577014-022	TLS4 Site Prep Manual
577014-058	TLS4 Troubleshooting Manual
577013-465	Electronic Line Leak Detectors Application Guide
577013-770	Media-Isolated Mag Plus Probe LPG-ISO Kit Installation Guide
577013-773	Media-Isolated Mag Plus Probe Chem-ISO Kit Installation Guide
577014-056	Mag-FLEX Probe Low Level Water Float Kit Installation Guide

Console Touch Screen Overview

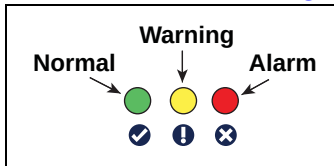
The following section console features, touch screen layout and how to access and navigate the setup procedure using the touch screen controls.

Console Home Screen

An example Tank Overview Screen (Default Home Screen) is shown below which has 2 Tanks Monitored and 1 active Warning



Front Panel Status Lights



Example Touch Screen Status Bar Notifications

SYSTEM STATUS ⚡ 0 Warning(s) 0 Alarm(s) Power On to console and no warnings or alarms from system.	L 10: FUEL ALARM ⚡ 0 Warning(s) 1 Alarm(s) Something needs to be acted upon immediately. In this state, touching the status/warning bar brings you to the Reports > Alarms > Active screen so you can see the cause of the alarm. While in that screen, touching the status/warning bar again acknowledges the alarm and shuts off the beeper.
T2: DELIVERY NEEDED ⚡ 1 Warning(s) 0 Alarm(s) Something needs to be reviewed and/or assessed. In this state, touching the status/warning bar brings you to the Reports > Alarms > Active screen so you can see the cause of the warning. While in that screen, touching the status/warning bar again acknowledges the warning and shuts off the beeper.	SAVING ⚡ 0 Warning(s) 0 Alarm(s) System tasks message bar.

Touch Screen Icon Descriptions

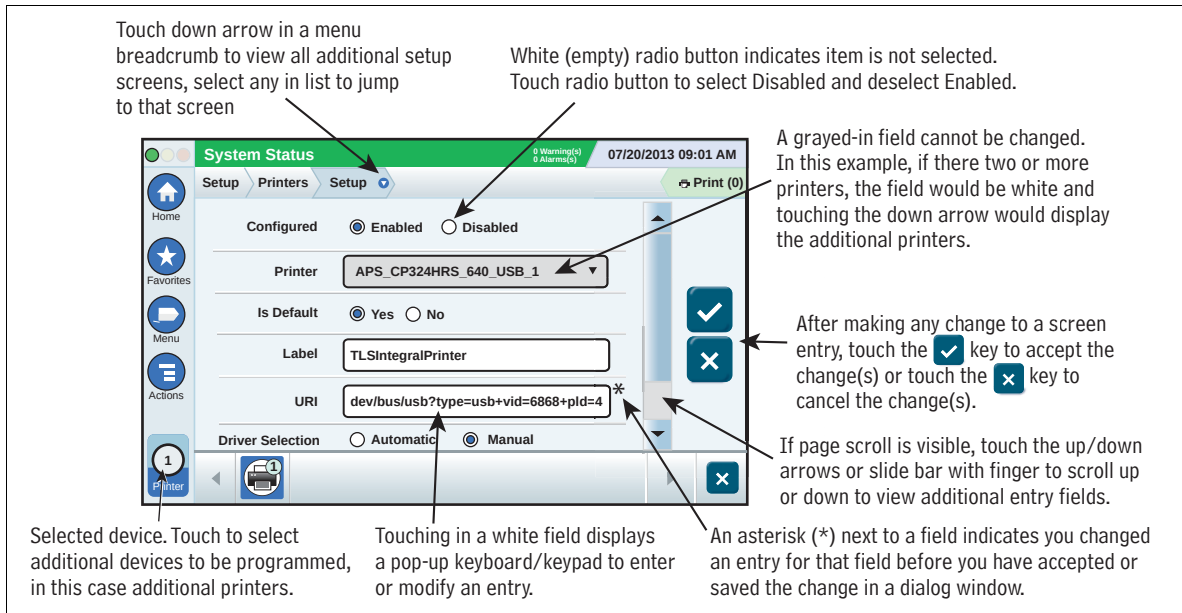
-  **Home Screen Icon** - Touch to navigate to the home screen. Default is the Tank Overview screen (Home screen shown above).
-  **Favorites Screen Icon** - Touch to setup/access your favorite screens and designate which screen will be the home (default) screen.
 -  Touch to add the current screen to your Favorites list. You can have up to six Favorites screens. If you want to delete a screen from your Favorites list, touch  next to that screen.
 -  Touch to set the current screen as the home screen.
-  **Menu Icon** - Touch to access System Setup Menus, Reports, Diagnostics and other screens (Administrator assigned access). For initial setup of the console, touch Menu>Setup>Workflow Wizard which steps you through the console setup screens in the proper sequence. See Workflow Wizard setup
-  **Actions Icon** - Touch to access Help. Touch the Help icon  to open On-Board Help. Also, if the Shifts feature is set up, touching the Actions icon will display the Close Shift icon  which can be touched to close a shift.
-  Unrelated to the choices above, when entering data in any screen, a Red Circle may appear on the Actions icon to indicate that additional tasks/menu choices for that screen.

Screen Dependent Icons - The number in the circle under the Actions icon indicates the device you are viewing or setting up. Touching the circled number displays all of the similar devices in a row along the bottom of the screen (other tanks, ports, probes, etc.) that you have set up. Touching the circled number again hides the device icon row. A highlighted icon indicates the device you are viewing or setting up. Some of the device icons you may see depending on system features installed in your console are shown below:

 Device					
	Tank	Ethernet Port	Probe	External Input	Relay
					
	Product	Sensor	Printer	Siphon Set	Serial Port

Entering Changes On A Touch Screen

The screen example below describes entering data into the screen's field windows.



Console Comm Ports

When setting up comm ports, you should verify the connections to the console's comm ports prior to entering their setup parameters.

TLS4 Comm Ports - Menu>Setup>Communication

Your console's Comm Port configuration will depend on features ordered. Note: Ethernet ports 2 and 3 are programmed as the same ethernet device.

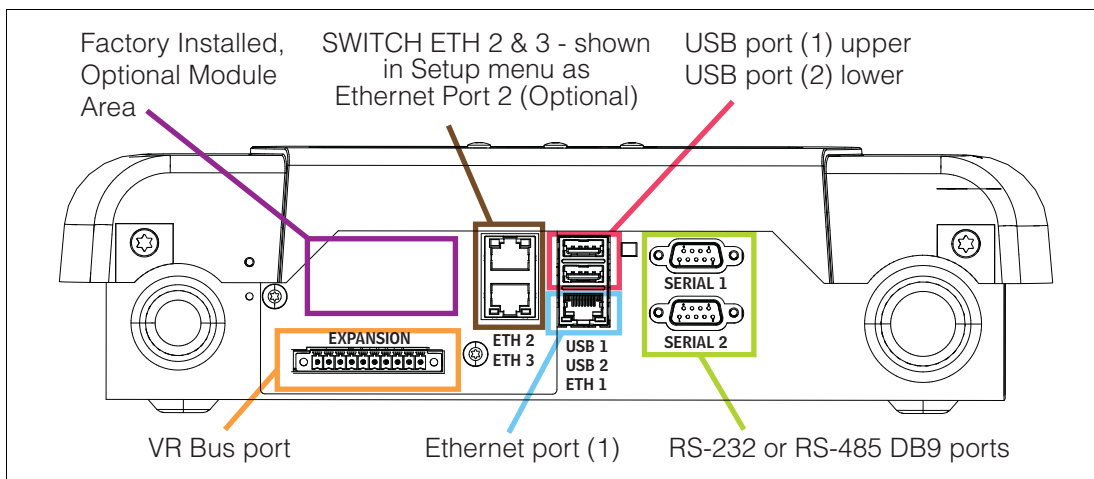


Figure 1. TLS4 Comm Ports

TLS-450PLUS Comm Ports - Menu>Setup>Communication

Your console's available Comm Port configuration will depend on features ordered.

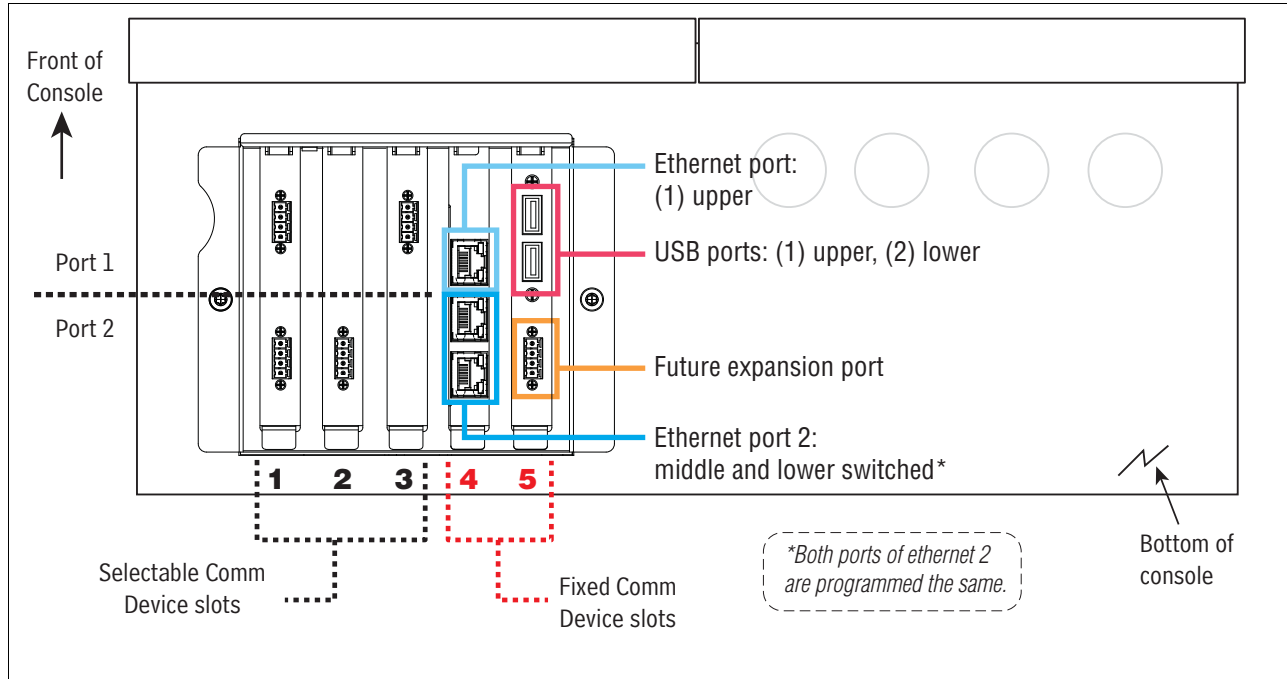
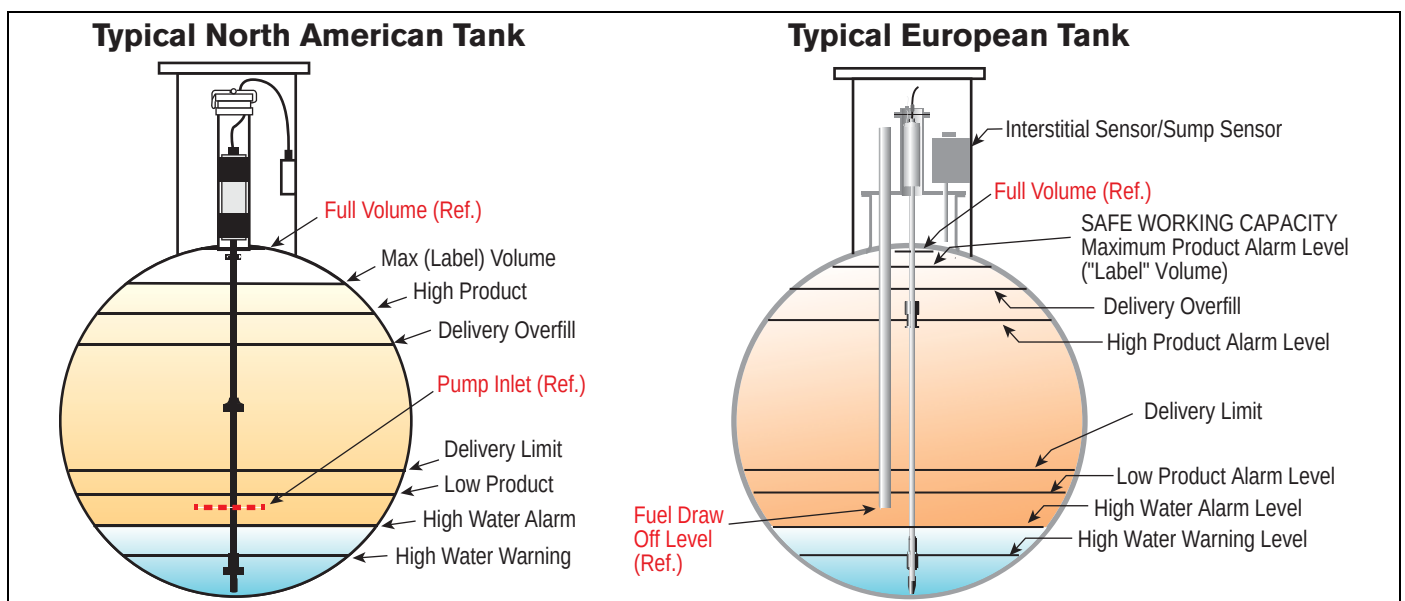


Figure 2. TLS-450PLUS Comm Ports

Alarm Limit Settings - Menu>Setup>Tank>Limits

The diagrams below show the relative position of tank alarm (Limit) settings. See "Setup>Tank>Limits" on page 27 for more information about tank alarm limits.



Security Login

If the console Security Feature is Enabled - Touch the Login button  to open the login screen so you can login as a user:



VEEDER-ROOT

Username:

Password:

Language: Default ▼



Once the screen displays, log in to the system with your Username and Password. NOTE: If you do not log in, you are only permitted to view system status screens and to print out end-user reports.

Touch the Logout button  to log out of the console. NOTE: If the console is inactive for 15 minutes, the console will automatically log you out. You will need to log back in to access your user account.

Using On-Board Help - Actions>Help

Note: On-board help covers all console features, some of which may not be on visible/applicable if they were not ordered with your console.

To access On-Board Help touch the Actions icon  then touch the Help icon .

Upon entering Help, the topic associated with the currently displayed screen will be visible. Repeatedly touch the side scroll bar up/down arrows to scroll through a topic. You can also drag and pan through a topic. Touch the 'X' in the right corner of the Help screen title bar to return to the TLS4/TLS-450PLUS screen you were viewing.

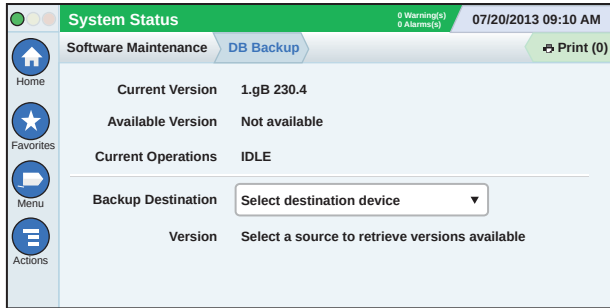
- To show or hide the help Table of Contents (TOC) pane on left side of screen - Quickly tap the text (Show TOC or Hide TOC) twice with your finger.
- To expand () or close () a book - Touch the icon of the book once with your finger.
- To go to a topic () within a book - Quickly tap the book topic twice with your finger.
- Touch the side TOC scroll bar, and either move your finger up (to scroll down) or move your finger down (to scroll up).
- Repeatedly touch the side TOC scroll bar upper arrow to scroll up, or repeatedly touch the side scroll bar down arrow to scroll down.

On-board Help Topics of Interest - Actions>Help

- Understanding ATG -This help section explains the fundamentals of automatic tank gauges (ATG) as implemented by Veeder-Root.
- Configuration and Maintenance - This help book discusses Comm Ports, Initial Console Setup Sequence, and Periodic Maintenance recommendations.
- Welcome (Help Intro) , Screen Icons, On-Screen Keyboards, and Touchscreen navigation are essential help topics which you can view in the On-Board Help's Table of Contents.
- Reference Tables - This help section contains topics that cover a wide variety of useful information replaceable fuses, V-R acronyms, system device identifiers, tank tilt calculation information, DIM data, etc.

System Maintenance Screen Examples

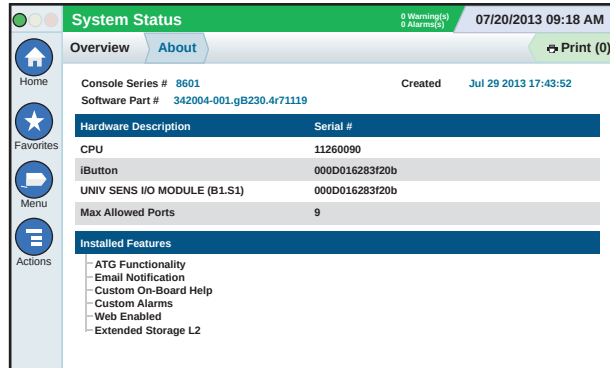
Backup System Data - Menu>Software Maintenance>DB Backup



Insert your Fat 32 formatted thumb drive (minimum 4 GB) in a USB port and touch the down arrow in the Backup Destination field to select the thumb drive, then follow the on-screen instructions to backup console data.

You should perform a DB Backup weekly.

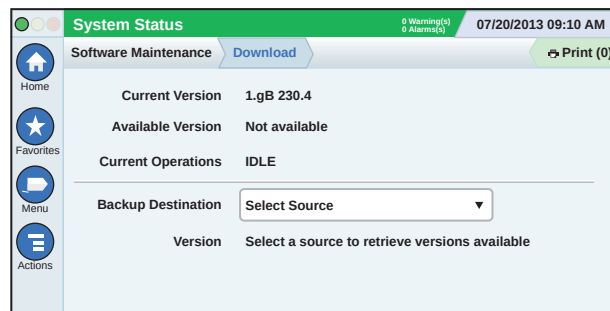
To View The Console's Software Version - Menu>Overview>About



This screen provides important information about your console's software version and installed features. If you should be experiencing problems with the console, please have the information on this screen available with you before contacting us.

The Veeder-Root Technical Support number is (800) 323-1799.

To Download Console Software - Menu>Software Maintenance>Download



Insert your valid V-R Code thumb drive in a USB port and touch the down arrow in the Backup Destination field to select the coded thumb drive, then follow the on-screen instructions to begin the download. Once the download process has completed, you must activate the software (see "Activate/Revert Screen (Menu>Software Maintenance>Activate/Revert)" on page 58).

Initial Setup Of The Console Using Workflow Wizard

After the console has been installed and connected to the power panel and to all site monitored devices, apply power to the console and let it boot up and display the Home Screen (see below).

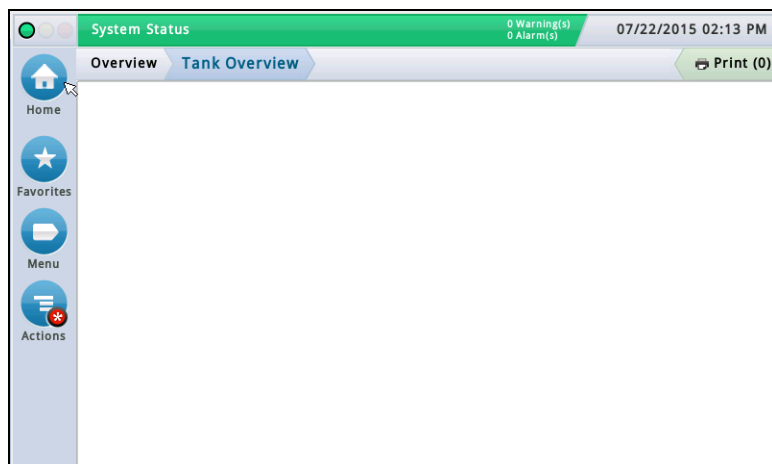


Figure 3. Initial Setup Home Screen

Access Workflow Wizard Setup by touching Menu>Setup>Workflow Wizard>Setup Workflow:

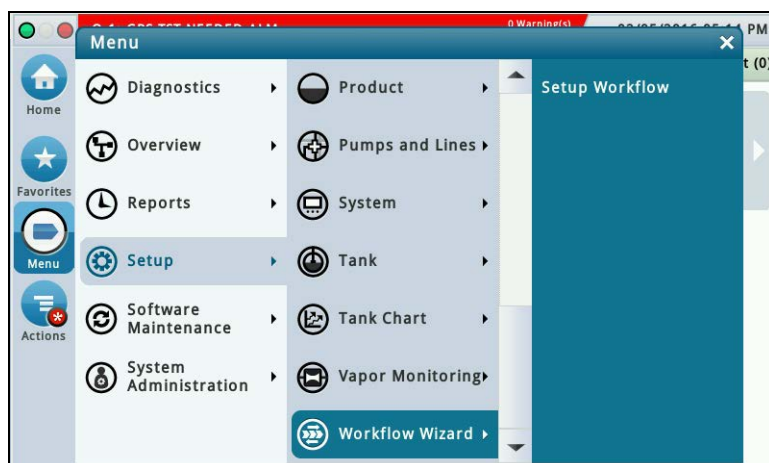


Figure 4. Accessing Workflow Wizard Setup

Initial Screen - Menu>Setup>Workflow Wizard>Setup Workflow

The initial setup screen in the Workflow Wizard app is shown below. Note that the Workflow Wizard steps through the setup screens in a V-R recommended sequence for initial setup of the console. This manual assumes all devices are connected and recommends you are accessing WW setup from the console GUI. Other setup interface methods vary in feature and accessibility options.

Navigating Workflow Wizard is described in the figure below. When you exit the Workflow Wizard app, or it times out, reentering the app always returns you to the initial screen. To return to the screen you were working on after exiting the app, touch the Next button repeatedly until the desired screen is displayed.

Once the console is setup and functioning and a screen needs modification, the user would likely use the standard quicker path (from the home screen) to the desired screen, e.g., Menu>Setup>etc>etc..

Setup>Display>Language/Units

Touch the Exit icon to quit Workflow Wizard and return to the Home screen

Touch to step back to previous screen

Touch to step forward to next screen

Touch the and icons to access online help for the current screen

System Language
Touch to select the system language used for all displays and reports.

System Units
Touch to select U.S., Metric or Imperial units to be used in all displays and calculations.

Setup>Date and Time

This screen lets you enter the current date and time for the console.

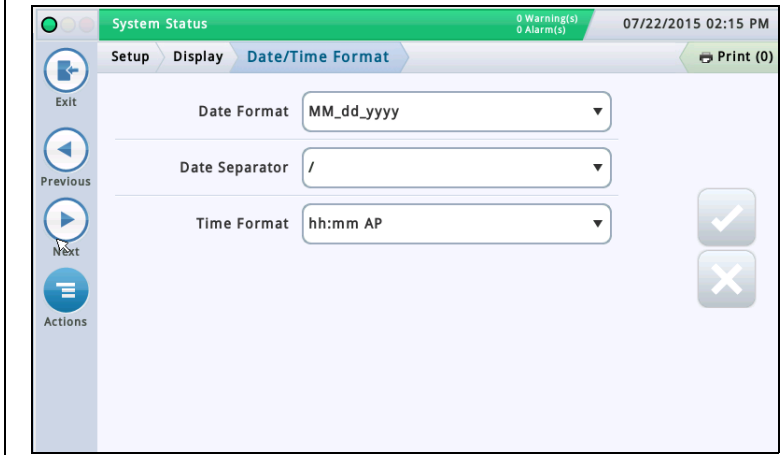
Current Date
Touch to enter current date.

Current Time
Touch each field to enter time.
Note: the default time format is 12 hour AM/PM (hh:mm AP). If 24 hour time is desired, enter the correct time on this screen then select hh:mm in the Time Format field in the next Workflow Wizard screen.
Note: Switching to and from Daylight Savings Time is automatic based upon your time zone entry below.

Time Zone
Touch and scroll to select local time zone.

Setup>Display>Date/Time Format

This screen lets you select the date and time format used in all screens and reports.



Date Format

Touch to enter desired date format.

Date Separator

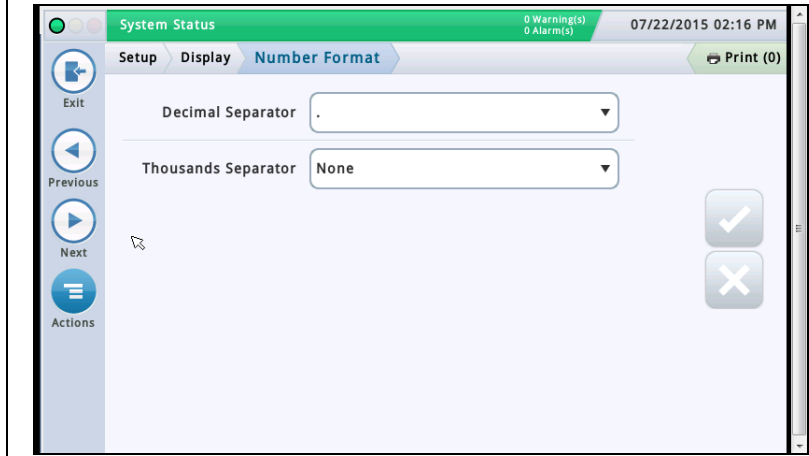
Touch to enter desired date separator.

Time Format

Touch to select 24 hr time (hh:mm) or 12 hour AM/PM time (hh:mm AP).

Setup>Display>Number Format

This screen lets you select the numerical separators used in all screens and reports.



Decimal Separator

Touch to enter desired decimal separator.

Thousands Separator

Touch to enter desired thousands separator.

Setup>Headers

This screen lets you enter information to identify your site location, address, phone number, etc. This information appears on the top of most inventory and BIR reports. This screen also lets you enter a fax sender name and fax number when sending faxes.

Header 1 - 4

Touch to enter desired Site Name (1), Street (2), City and State (3) and Phone (4) - up to 20 characters each header.

Fax Sender Name

Touch to enter data printed at top of transmitted faxes from console - up to 30 alphanumeric characters.

Fax Phone Number

Touch to enter phone number to which the console will dial to send faxes - up to 40 digits.

Setup>System>Alarm Filtering

This screen lets you enable/disable Alarm Filtering. Alarm Filtering reduces the total number of alarms without compromising the reporting of critical alarms.

Alarm Filtering

When this feature is enabled, the console manipulates a combination of the detection time (the time before an alarm sounds) and the clear time (the time before an alarm is reset) for certain alarms that often go in and out of an alarm state in a short period of time. In addition, some alarm reports during the clear time are consolidated, reducing their number without eliminating the alarm reports.

Mag Sensors

The following Mag Sensor alarms will be filtered:

- Mag sensor fault, install and communication alarms - NOTE: Mag Sensor alarms are reset if the Mag Sensor is replaced or deconfigured and then reconfigured.

Analog Sensors

The following Liquid, Vapor, Groundwater, Type A (2-wire) and Type B (3-wire) alarms will be filtered:

- Open, Short, Water, Water Out, Liquid Warning, Low Liquid, High Liquid and Fuel - NOTE: Liquid Warning, High Liquid, Low Liquid and Fuel alarms are posted immediately even when filtered.

DIMs (Dispenser Interface Modules)

The following DIM alarm will be filtered:

- Communication Alarm - NOTE: If there is more than one DIM card in the console, each card is filtered independently. DIM alarm filtering takes into account the possibility of lost POS sales data by monitoring dispensing during the clear time, but the possibility exists that the filter may not identify all cases when POS sales data may be lost. Unfiltered DIM Communication Alarm reports are available by contacting Veeder-Root Technical Support.

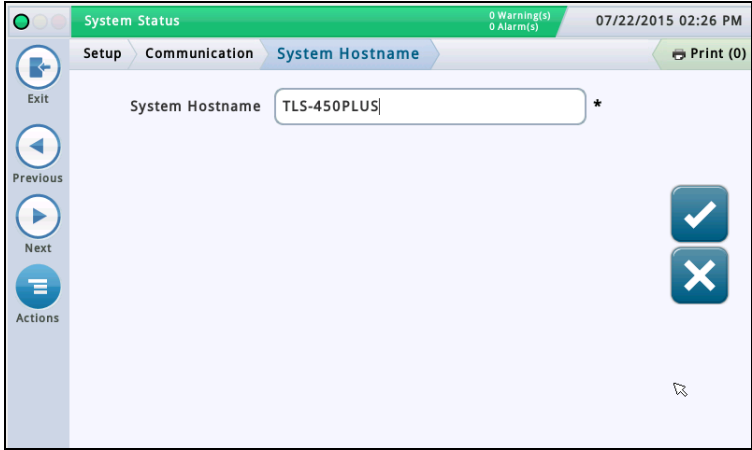
Probes

The following Probe alarm will be filtered:

- Probe Out

Setup>Communication>System Hostname

This screen lets you specify and change the host name of this console (i.e., what the console is called on the customer's network, such as "MyTLSConsole").



System Hostname

Touch to select the host name of the console as it appears on the customer's network, in this example TLS-450PLUS. The default host name can be changed to accommodate the customer's network needs.

A blank host name is not allowed. The host name may contain only ASCII letters 'a' through 'z' (case-insensitive), digits '0' through '9' and the hyphen '-' with no spaces or other characters allowed.

(Note: the console converts any uppercase letters in the host name to lower case when they are saved.)

Setup>Communication>Ethernet Port

The screenshot shows the 'Ethernet Port' configuration screen. At the top, it says 'System Status' with '0 Warning(s)' and '0 Alarm(s)' and the date '07/24/2015 10:21'. The navigation bar includes 'Setup', 'Communication', and 'Ethernet Port'. On the left, there are buttons for 'Exit', 'Previous', 'Next', 'Actions', and 'Eth'. The main area has fields for 'ID' (13), 'IP Address Type' (STATIC), 'IP Address' (192.168.11.100), 'IP Subnet Mask' (255.255.255.0), 'IP Gateway Address' (0.0.0.0), and 'IP Default Gateway' (Enabled/Disabled). At the bottom, there are icons for two Ethernet ports, labeled 1 and 2.

This screen lets you configure the ethernet port(s) on the console which is used for remote connectivity to a POS, remote printer, etc.. NOTE: Changes made in this screen may take 10 - 15 seconds before they take effect and then display on the screen. The fastest way to see changes is to accept the changes, go to the Home screen, then back to this screen.

The default port selection is Ethernet Port 1. If more than one Ethernet Port is installed (as in the example above), complete all of the entries for port 1, then select the next Ethernet port from the icon list on the bottom of the screen that you want to configure and repeat the complete field entry process for port 2.

IP Address Type

Dynamic - An Ethernet comm device can have a different IP address every time it connects to the network. This address is usually administered by a network service such as DHCP (Dynamic Host Configuration Protocol).

Static [Default] - An Ethernet comm device will have a permanent IP address every time it connects to the network. This is entered once on the console.

IP Address

[Field only available if IP Address Type is set to Static]

Enter an IP address that was assigned by the customer's IT department (the default setting of 192.168.11.100 won't work).

IP Subnet Mask

[Field only available if IP Address Type is set to Static]

Default is 255.255.255.0 and is typical of console configurations. Do not change unless assigned something different by the customer's IT department.

IP Gateway Address

[Field only available if IP Address Type is set to Static]

Enter a Gateway address that was assigned by the customer's IT department (the default setting of 192.168.11.100 won't work).

IP Default Gateway

When set to Enabled, makes this Ethernet port the default pathway for outbound communications, such as email.

Primary DNS

[Field only available if 'IP Address Type' is set to Static]

Enter a Primary DNS address that was assigned by the customer's IT department.

Secondary DNS

[Field only available if 'IP Address Type' is set to Static]

Enter a Secondary DNS address that was assigned by the customer's IT department.

MAC Address [Read-only field] Physical address of the Ethernet board and is automatically updated by the system (for example, 01:23:45:67:89:ab).

Serial Command Port

Address of serial port used for communications in the console (default port is 10001). If the customer is using port 10001 already for another device, you can select another port.

NOTES:

- Do not use ports 20001, 22, 80, or 443. These are used for other communication purposes within the console.
- If each Ethernet comm device on the console has a different IP address they can be setup with the same serial command port. Otherwise, when setting up two or more Ethernet devices with the same IP address on the same serial command serial port, communications may be compromised and no warning messages will be provided.
- When the serial command port is disabled on the "Setup>System>Security" screen, the Serial Command Port field on this screen is not available.

SSH Port

A secure port that is required by the console to ensure protection on the communication side of the device. The default port is 22 and should not be changed.

NOTE: Any changes to this field will affect the same field for the other Ethernet comm device (if one exists).

HTTPS port

A secure port used by the browser to ensure security on the browser's side of the device. The default port is 443 and should not be changed.

NOTE: Any changes to this field will only affect the specific Ethernet port being programmed.

Changes to the HTTPS port will affect web enable access.

Serial Command Security

Enables or disables the requirement of entering a security code to make changes to the Ethernet comm ports.

Security Code

[Field available if Serial Command Security field is enabled]

Enter a security code (6 alphanumeric characters) that will be required to make any change to the Ethernet comm port(s).

ETX Characters Display

[Field enabled only if RSR 232 End of Message field is enabled]

End-Of-Text (ETX) character. ETX is programmable if enabled via the S53100f command. If it is disabled, the ETX is a fixed Control-C character (ASCII 03).

ETX Characters Computer

[Field enabled only if RSR 232 End of Message field is enabled]

End-Of-Text (ETX) character. ETX is programmable if enabled via the S53100f command. If it is disabled, the ETX is a fixed Control-C character (ASCII 03).

Setup>Communication>Internal Modem

This screen lets you configure the internal modem (TLS-450PLUS consoles only) which is used for data collection (Note: in the above example screen no internal modem is installed).

Configured

Determines if the internal modem is enabled or disabled.

Label

Name of the internal modem.

Baud Rate

Choices are: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200. The default is 9600.

Byte Size/Data Bits

Choices are: 8 or 7

Parity

Choices are: Odd Parity, Even Parity, or None

Stop Bits

Choices are: 1 or 2

Use Handshaking

Choice is: No Handshaking

Modem Dial Type

Choices are: Tone or Pulse

Dial Tone Interval

Choose interval to wait if there is no dial tone: From 0001 to 9999 hours

Answer On

Choose answer on the number of rings selected: From 0 to 9

Dial In Config

Advanced setting. Leave blank unless directed by Support.

Dial Out Config

Advanced setting. Leave blank unless directed by Support.

Serial Command Security

Select Enable to require all incoming serial commands to have a security code.

Security Code

[Field available and required if Serial Command Security field is enabled].

This the security code that all serial commands must have to be accepted by the console. Valid security codes must be exactly 6 digits (0 - 9) long.

RS232 End of Message

Enables or disables the End of Message RS232 protocol.

This protocol is used by third party devices that may want to interrogate the console for inventory or other related data. These devices require an End-Of-Text command that signals to the device when the communication string from the console ends.

Please refer to the customer's third party device for the type of code to enter in the ETX Characters Display and ETX Characters computer fields below.

ETX Characters Display

[Field enabled only if RSR 232 End of Message field is enabled]

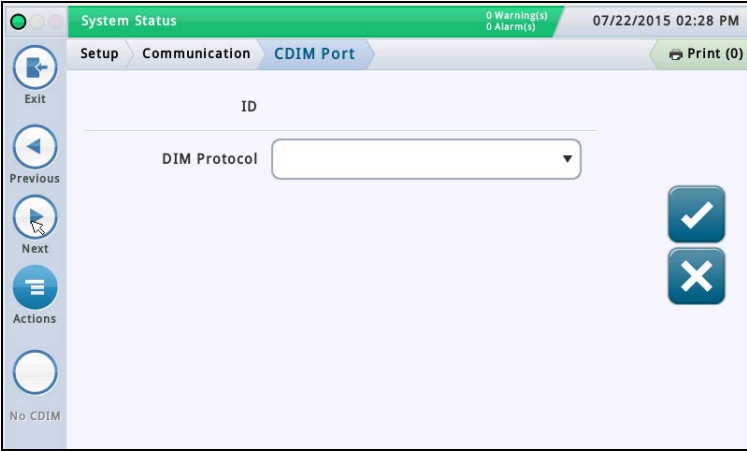
End-Of-Text (ETX) character. ETX is programmable if enabled via the S53100f command. If it is disabled, the ETX is a fixed Control-C character (ASCII 03).

ETX Characters Computer

[Field enabled only if RSR 232 End of Message field is enabled]

End-Of-Text (ETX) character. ETX is programmable if enabled via the S53100f command. If it is disabled, the ETX is a fixed Control-C character (ASCII 03).

Setup>Communication>CDIM Port



DIM Protocol

This screen lets you configure the DIM protocol for the optional CDIM (Current Loop Dispenser Interface Module). This module is used by the system to collect dispenser transactions for the BIR feature.

Select a CDIM port from the icon list on the bottom of the screen that you want to configure. NOTE: This field will be grayed out for DIMs that do not support 'pass-through' communications.

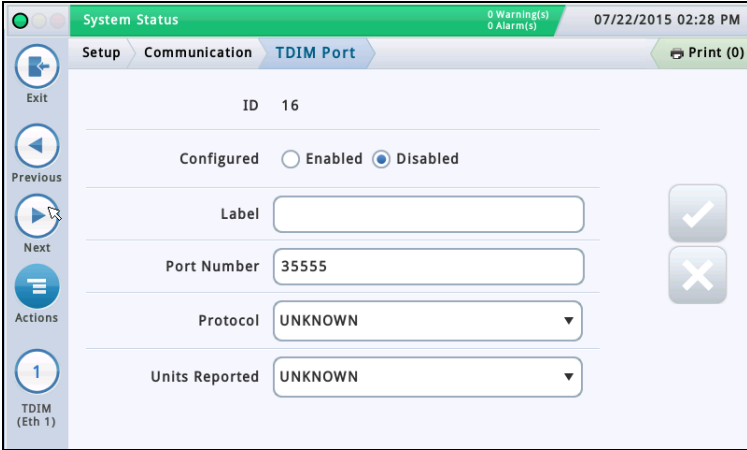
Touch to select a DIM Protocol. Choices are:

- Gilbarco CL
- Wayne CL
- Unknown

Setup>Communication>TDIM Port

This screen lets you configure the TCP/IP DIM (Dispenser Interface Module) port. This is used at sites where the console communicates to the dispensers via Ethernet (TCP/IP) instead of the typical serial communications pathway.

Select a TDIM port from the icon list on the bottom of the screen that you want to configure. Repeat the entry process for each TDIM Port.



Configured

Touch the radio button to enable or disable this port. NOTE: When the card is auto-detected, this field will be enabled but grayed out.

Label

Touch to enter a unique label (up to 20 alphanumeric characters) for the DIM device.

Port Number

Communications port number assigned to this device (default is 35555). Note: this port is known as the listening port.

Protocol

Touch to select applicable DIM protocol for your TDIM port. Choices are: GilbarcoEDIM, VRProtocolDIM, or Unknown.

Units Reported

Touch to select units for this protocol. Choices are: U.S., Metric, or Imperial.

Setup>Communication>IFSF

This screen lets you configure communication based on International Forecourt Standards Forum (IFSF) standards for a TLS over TCP/IP or a LonWorks® card (LON Module). These international standards for petroleum retail facilitate the interoperability of service stations and equipment.

NOTE: A single console cannot support both TCP/IP and LON Module communications simultaneously, even though a site may have a mixed configuration on different consoles. The maximum number of tanks a site can support is 30.

Configured

Touch the radio button to enable or disable IFSF communication.

Device

The device used for communication. Choices are: LON Module (if installed) or Eth1 for Ethernet Port 1 (for TCP/IP), depending on your hardware configuration.

NOTE: On the TLS450PLUS, Ethernet Ports 2a and 2b are not available for IFSF configuration.

Protocol

The protocol used for IFSF. The choice is: IFSF-China1. This field is not available with the LON Module device option.

Node Id

The ATG Node Identifier. Each IFSF tank gauge present on a network must have a unique node ID. The default is 01, but you can change it as required. This field is not available with the LON Module device option.

NOTE: With a LonWorks® card, the Node ID is set using the IFSF Node Address Dip Switch on the IFSF Interface Module during installation. Refer to the [Console Troubleshooting](#) section of the TLS-450PLUS Troubleshooting manual (P/N 577014-075) or the [Troubleshooting](#) section of the TLS4 / 8601 Series Consoles Troubleshooting manual (P/N 577014-058), as appropriate, for more information on IFSF module cable connector assembly and Node ID switch settings.

UDP Port

The port used for User Datagram Protocol (UDP) communication. The default is 3486, but this field can be edited if you need to use a different port (1024-65535). This field is not available with the LON Module device option.

TCP Port

The port used for Transmission Control Protocol (TCP) connection requests. The default is 9000, but this field can be edited if you need to use a different port (1024-65535). This field is not available with the LON Module device option.

Setup>Communication>Serial Port

This screen lets you configure the serial ports which may be used for data collection or diagnostics purposes. Select a serial port from the icon list on the bottom of the screen that you want to configure. Repeat the entry process for each Serial Port.

Configured

Touch to enable or disable the Serial Port.

Label

Touch to enter a name for this port.

Usage

Touch to select the type of communication card (board) in the console

Choices are: RS-232, RS485, EDIM, Satellite HJBox, Satellite SSAT, VMCI, Digicom GSM.

Protocol (only visible if EDIM is selected for Usage)

Touch to select applicable DIM protocol for your EDIM port.

Choices are: GilbarcoEDIM, VRProtocolDIM, Sinopec EDIM.

Baud Rate

Touch to select the communication data rate of this serial port. Choices are: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200. The default is 9600.

Stop Bits

Choices are: 1 or 2

Byte Size/Data Bits

Choices are: 8 or 7

Parity

Choices are: Odd Parity, Even Parity, or None

Use Handshaking

Choice is: No Handshaking, RTSCTS or XON XOFF

Serial Command Security

Select Enable to require all incoming serial commands to have a security code.

Security Code

[Field available and required if Serial Command Security field is enabled].

This the security code that all serial commands must have to be accepted by the console. Valid security codes must be exactly 6 digits (0 - 9) long.

RS232 End of Message

Enables or disables the End of Message RS232 protocol.

This protocol is used by third party devices that may want to interrogate the console for inventory or other related data. These devices require an End-Of-Text command that signals to the device when the communication string from the console ends.

Please refer to the customer's third party device for the type of code to enter in the ETX Characters Display and ETX Characters computer fields below.

ETX Characters Display

[Field enabled only if RSR 232 End of Message field is enabled]

End-Of-Text (ETX) character. ETX is programmable if enabled via the S53100f command. If it is disabled, the ETX is a fixed Control-C character (ASCII 03).

ETX Characters Computer

[Field enabled only if RSR 232 End of Message field is enabled]

End-Of-Text (ETX) character. ETX is programmable if enabled via the S53100f command. If it is disabled, the ETX is a fixed Control-C character (ASCII 03).

Setup>Communication>SMTP Relay

The system supports Simple Mail Transfer Protocol (SMTP), an Internet standard for email transmission. This screen lets you configure this feature, which allows the console to act as a mail client, using SMTP to send messages to a mail server.

NOTES:

1. Some fields require the Total Control Feature.
2. Sender Email Address, System Hostname, SMTP Relay and SMTP Server Password must be provided by the ISP (Internet service provider).

Sender Name

Touch to enter the name that will display as the sender of the email. Maximum of 40 characters.

Sender Email Address

Touch to enter valid sender's email address (using the standard format, such as technical-support@veeder.com). Maximum of 254 characters.

This entry specifies the originating email address. It also appears in the 'From:' header field within the email message.

NOTE: If you leave this field blank, the email message is set to the Linux account on the console that is sending email, followed by @[hostname].[domainname] (your hostname and domain name).

Use System Hostname

If enabled, the system hostname is used and is displayed below. If disabled, you can enter a valid hostname in the field below. The default is enabled.

Sender Hostname

Touch to enter the name that is sent to the SMTP server (used for SMTP tasks such as connecting remote mail servers). Some mail servers require a valid Internet hostname when other mail servers connect. Usually this the hostname that your IP address resolves to and would be included in the information from your ISP. It should never be the domain name or the relayhost name.

Relay Host Enabled

If disabled, these fields are not available. If enabled, SMTP is used for email and the following fields are available:

- SMTP server/Relay Host
- Port Number
- Authentication Type
- SMTP Server Username
- SMTP Server Password
- SMTP Server Requires SSL

SMTP Server / Relay Host [Relayhost/Smart host]

Touch to enter the IP address or hostname of the SMTP server/relay host that the console is attempting to connect with. When this field is used, all mail is forwarded through this host and not sent directly to recipients. NOTE: a URL is not valid for this field.

SMTP uses this field to determine the appropriate internet destination. Some ISPs block email traffic until it is sent through their mail server.

Port Number [Relayhost/Smarthost Port]

The port on the server where the email should be sent. This field is populated when the SMTP server is entered. The default port number is 25.

NOTE: if the 'SMTP Server Requires SSL' field below is enabled, this port number should be 465 or 587.

Authentication Type

Touch to enter the type of SMTP authentication that is required by the remote server:

- **No Authentication** - no username and password is required.
- **CRAM MD5** - secure transmission of username and password.
- **Plain** - the username and password are sent as human-readable text to the server (without encryption).
- **Login** - the username and password are sent as human-readable text to the server (without encryption).

NOTE: you should select the most secure method allowed by your server. Check with your ISP if you have questions.

SMTP Server Username [Relayhost/Smart host Server User Name]

Touch to enter the server name for authentication - maximum 60 characters.

SMTP Server Password [Relayhost/Smart host Password]

Touch to enter the server password or 'shared secret' for the server - maximum 25 characters.

SMTP Server Requires SSL [Relay Requires SSL]

When enabled it forces the use of SSL encryption for the entire session when communicating with the server.

Generally this should not be enabled (checked) because the console will automatically use SSL encryption if the server supports it. It should be enabled only for older email servers where the entire communication must be wrapped in SSL.

This selection should not be enabled for modern servers that negotiate encryption after connecting or the connection will fail. If the relay server port number is 25 (default), this selection should not be enabled.

Setup>Devices

The Setup>Device screens let you configure each of the monitored devices that is connected to the console (probes, sensors, relays, external inputs) and (LVDIM/MDIM modules - TLS-450PLUS only).

System Status

0 Warning(s)
0 Alarm(s)

07/22/2015 02:30 PM

Setup

Devices

Print (0)

Exit

Previous

Next

Actions

1

Probe

Configured

☐ Enabled

☒ Disabled

Address

Not Assigned

Label

Serial Number

0000000000

Type

Probe

Float Type [in]

Unknown

Water Minimum [in]

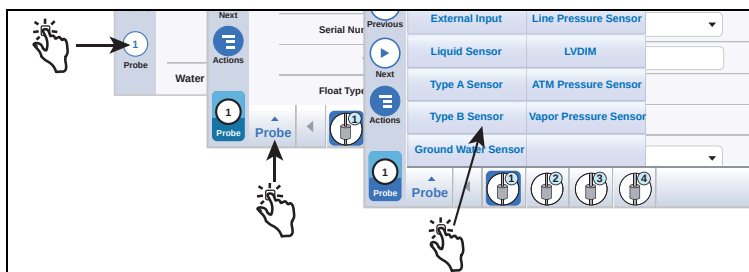
0

✓

✗

Selecting A Device Type

Initially the first device type to be displayed in Workflow Wizard setup is Probe 1. To select another probe, touch the probe 1 button on the lower left of the screen and select the desired probe from the icon list along the bottom of the probe device screen. To select another device type, use the touch sequence shown in the illustration below to view the device matrix, then touch the desired device type button to open that device's setup screen.

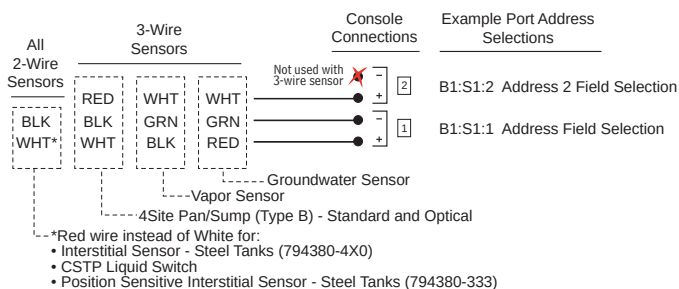


Selecting A Device Address

IMPORTANT! You must know to which console connector a device is wired to select the correct address for that device. Some general rules discussed below concern device addresses.

TLS4 Consoles

Probes/Sensors connected to the console will display the following address code in the Address Field: B1:S2:X, where x is the connector input to which the device is attached (from 1 to 16). NOTE: 3-wire sensors require three connector inputs (2 '+' channels and 1 '-' channel) so each 3-wire sensor takes up two of the available intrinsically safe ports and uses two addresses (see 2- and 3-wire connection examples below):



Relay will display the following possible address codes in the Address Field: B1:S1:X, where X = 14 (relay connector input 1) or 15 (relay connector input 2).

External Input will display the following possible address codes in the Address Field: B1:S1:X, where X = 12 (Ext. Input connector input 1) or 13 (Ext. Input connector input 2).

TLS-450PLUS Consoles

Probes/Sensors connected to the console will display the following possible address ports in the Address Field: B1:Sx:X, where Sx is the slot in which the USM module is installed (from 1 to 4) and X is the connector input to which the device is attached (from 1 to 16). NOTE: 3-wire sensors require three connector inputs (2 '+' channels and 1 '-' channel) so each 3-wire sensor takes up two of the available intrinsically safe ports and has two addresses (**Address** field and **Address 2** field (see 3-Wire Sensor Addresses Example illustration above)).

Relays connected to the I/O module will display the following possible address codes in the Address Field: B1:Sx:X, where Sx is the slot in which the I/O module is installed (from 1 to 4) and X is the connector input to which the device is attached (from 5 to 9). Note: The relay address B1:S7:1 refers to the single input Power Bay relay which, if used, would connect to the site's Overfill Alarm.

Relays connected to a 10 AMP Controller module will display the following possible address codes in the Address Field: B1:S4x:X, where S4 is the only slot in which the 10 AMP Controller module is installed and X is the connector input to which the device is attached (from 1 to 6).

External Inputs connected to the I/O module will display the following possible address codes in the Address Field: B1:Sx:X, where Sx is the slot in which the I/O module is installed (from 1 to 4) and X is the connector input to which the device is attached (from 1 to 4 and 10 to 14).

External inputs connected to a 10 AMP Controller module will display the following possible address codes in the Address Field: B1:S4:X, where S4 is the only slot in which the 10 AMP Controller module is installed and X is the connector input to which the device is attached (from 7 to 12).

LVDIM inputs, connected to the console will display the following possible address codes in the Address Field: B1:Sx:X, where Sx is the slot in which the LVDIM module is installed (from 1 to 4) and X is the connector input to which the device is attached (from 1 to 12).

MDIM inputs connected to the console will display the following possible address codes in the Address Field: B1:Sx:X, where Sx is the slot in which the MDIM module is installed (from 1 to 4) and X is the connector input to which the device is attached (from 1 to 12).

Setup>Devices - Continued

PROBE SETUP

Set up each probe being monitored before selecting the next device type.

Configured

Touch the radio button to enable or disable configuration of the selected probe.

NOTES:

- **Do not enable probe configuration until its address is assigned!**
- Once enabled, do not disable a probe if it is assigned to a tank. You must first unassign the probe from the tank before the probe can be disabled. (see Setup > Tank > General).

Address

Touch and select the address of this probe.

Label

Touch to enter a description of this probe (up to 20 alphanumeric characters) that will appear on the console screens and in reports.

Serial Number

[Read Only] Console auto-detected serial number of this device.

Type

[Read Only] Console auto-detected type of this device.

Float Type

Installed Mag probe float type (the console will display only the applicable float size options for this device). For example, depending on the probe installed the float sizes below could display in the drop down list:

• 4.0 in	• 4.0 in phase separation	• 3.0 in
• 2.0 in non-density water float	• 2.0 in standard - standard density water float (1.5 inch minimum water level)	• 2.0 in low water- low water density water float (1 inch minimum water level)
• Custom		

NOTES:

- Only circuit codes D004, D005 and D006 are allowed to set the float type to 4.0 in phase separation.
- If the probe is changed and the previous float is supported by the new probe, the float assignment will remain the same. Otherwise the default float will be assigned to the new probe.
- Only select **Custom** if the literature that was shipped with probe float kit specifically states that you must choose this Float Type. Currently only three mag probes use Custom Float Types: Chem-ISO mag probes, LPG-ISO mag probes and the Mag-FLEX probe with low level water floats.

When **Custom** float type is selected, the Fuel Offset, Water Offset, Water Minimum and Invalid Fuel parameter fields below are enabled for edit. Refer to the appropriate installation kit manual for these entries (see "Related Documents" on page 1).

Fuel Offset - Touch to enter the Fuel Offset value listed in the appropriate kit manual (577013-770, 577013-773 or 577014-056).

Water Offset (Mag-FLEX probes with Low Level Water Float only) - Touch to enter the Water Offset value listed in the 577014-056 manual.

Water Minimum (Mag-FLEX probes with Low Level Water Float only) - Touch to enter the Water Minimum value listed in the 577014-056 manual.

Invalid Fuel - Touch to enter the Invalid Fuel value listed in the appropriate kit manual (577013-770, 577013-773 or 577014-056).

Density Code

This field stores specifications for a density probe. It must be exactly 14 characters, and is composed of four parts as described below:

The density code has the following format: FGGGGGMMMMDD, e.g., B7053686719512, and is impressed in the float body (see image below).

Where:

F = Fuel Type: A for gasoline and B for diesel.

Using the example density code above: B = Diesel, **G** = Gauss

The last two digits are the gauss readings for each magnet in the density float. The prefix is always 7 and is omitted from the density code.

Using the example density code above:

70 Gauss = 72.0 for top magnet in grams

53 Gauss = 75.3 for middle magnet in grams

68 Gauss = 76.8 for bottom magnet in grams

M = Mass

The last four digits of the mass of the float. The prefix is always 1 and is omitted from the density code.

Using the example density code above:

6719 = Mass of 16.719 grams

D = Density of the float

The prefix is dependent on the fuel type and is omitted from the density code. A = 7 (gasoline) and B = 8 (diesel).

Using the example density code above:

512 = density of 851.2 kg/m³ for a fuel type of diesel.

NOTE: If you change the Density Code, the Density Offset History is cleared and current Density Offset is set to zero. See Diagnostics> Probe> Density Offset screen for details on console density values.

Density Float Serial Number

Touch this field to enter the density float's serial number.

NOTE: if you change the density float serial number, the Density Offset History is cleared and the current Density Offset is reset to zero.

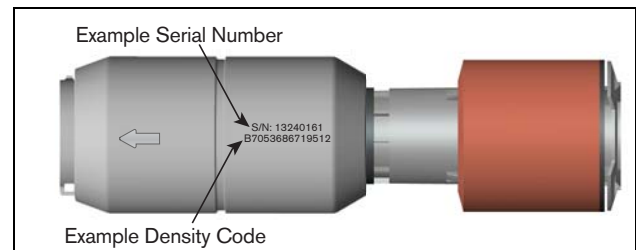
The density float serial number has the following format - yywwxxxx, e.g., 13240161, and is impressed in the float body (see image below).

Where;

YY = the last two digits of the year it was manufactured'

WW = the number of the week it was manufactured,

XXXX = a unique integer for the density float



Setup>Devices - Continued

RELAY SETUP

Set up each relay being monitored before selecting the next device type.

Configured

Touch the radio button to enable or disable configuration of the selected relay.

Address

Touch and select the address of this relay.

Label

Touch to enter a description of this relay (up to 20 alphanumeric characters) that will appear on the console screens and in reports.

Relay Type

Touch to select relay type:

- **Standard** - On/Off state is determined by assigned alarms or warnings.
- **Momentary** - On/Off state is determined by the assigned alarms or warnings (relay returns to the inactive state after the alarm is acknowledged).
- **Pump Control Output** - Relay state is controlled by the console pump/line controller (TLS-450PLUS only).

Relay Orientation

Touch to select relay orientation:

- Normally Open
- Normally Closed

EXTERNAL INPUT SETUP

Set up each external input being monitored before selecting the next device type.

Configured

Touch the radio button to enable or disable configuration of the selected external input.

Address

Touch and select the address of this external input.

Label

Touch to enter a description of this external input (up to 20 alphanumeric characters) that will appear on the console screens and in reports.

Type

Touch to select external input type:

- **Standard** - Generates an external input alarm when it is active.
- **Generator** - Generates the ON and OFF messages for CSLD on a generator.
- **Pump Sense** - Indicates the On/Off state and the state of hook signal for a dispenser and also is used to configure PLLD (TLS-450PLUS only);
- **Acknowledge Alarm** - External Input is used as an ALARM/TEST key (for example, a remote push button) and also generates the external input alarm.
- **Pump Relay Monitor** [Available with PLLD] - Generates a pump relay alarm when the console suspects a relay is stuck closed or when the pump has been running continuously for a period exceeding the Max Run (set in "Setup>Pumps and Lines>PLLD") (TLS-450PLUS only).

Orientation

Touch to select External Input orientation:

- Normally Open
- Normally Closed

LIQUID SENSOR SETUP

Set up each liquid sensor being monitored before selecting the next device type.

Configured

Touch the radio button to enable or disable configuration of the selected liquid sensor.

Address

Touch and select the address of this liquid sensor.

Label

Touch to enter a description of this liquid sensor (up to 20 alphanumeric characters) that will appear on the console screens and in reports.

Model

Touch and select the model of this liquid sensor:

- **Tri-State (Single Float)** - Single float, liquid sensor.
- **Normally Closed** - Liquid sensor whose normal state is closed, and activates an alarm when it is in an open state (NOT recommended).
- **Dual Point Hydrostatic** - Liquid sensor used in liquid-filled, double-wall tanks.
- **Dual Float Discriminating** - Liquid sensor with two floats, discriminates between water and fuel, generally used in containment sumps.
- **Dual Float High Vapor** - Liquid sensor with two floats, discriminates between high and low vapor, generally used in containment sumps.
- **Interceptor Sensor** - European type, liquid sensor.

Category

Touch to select liquid sensor category:

- Annular Space • Dispenser Pan • Monitoring Well • STP Pump
- Containment Pump • Other

TYPE A SENSOR (2-WIRE CL) SETUP

Set up each Type A sensor being monitored before selecting the next device type.

Configured

Touch the radio button to enable or disable configuration of the selected Type A sensor.

Address

Touch and select the address of this Type A sensor.

Label

Touch to enter a description of this Type A sensor (up to 20 alphanumeric characters) that will appear on the console screens and in reports.

Model

Touch and select the model of this Type A sensor:

- **Discriminating Interstitial** - Discriminating sensor used in dry, double-wall tanks.
- **Ultra 2** - Older version of discriminating sensor used in dry, double-wall tanks.

Category

Touch to select Type A sensor category:

- Annular Space • Dispenser Pan • Monitoring Well • STP Pump
- Containment Pump • Other

Setup>Devices - Continued

TYPE B SENSOR (3-WIRE CL) SETUP Set up each Type B sensor being monitored before selecting the next device type. Configured Touch the radio button to enable or disable configuration of the selected Type B sensor. Address Touch and select address 1 of the 3-wire Type B sensor. Label Touch to enter a description of this Type B sensor (up to 20 alphanumeric characters) that will appear on the console screens and in reports. Address 2 Touch and select the next sequential address for the third wire of the Type B sensor (e.g., if the Address field above is B1:S2:2, then this address should be B1:S2:3). Model Touch and select the model of this Type B sensor: • Ultra/Z-1 - 4Site Pan/Sump - Standard. • Ultra/Z-1 HV - 4Site Pan/Sump - High Vapor. Category Touch to select Type B sensor category: • Annular Space • Dispenser Pan • Monitoring Well • STP Pump • Containment Pump • Other MAG SENSOR SETUP Set up each Mag sensor being monitored before selecting the next device type. Configured Touch the radio button to enable or disable configuration of the selected Mag sensor. Address Touch and select the address of this Mag sensor. Label Touch to enter a description of this Mag sensor (up to 20 alphanumeric characters) that will appear on the console screens and in reports. Serial Number [Read Only] Console auto-detected serial number of this Mag sensor. Alarm Delay Touch to enter the time in hours following the triggering of un-cleared warnings before they are upgraded to alarms. Fuel Alarm Touch to enter the height at which this Mag sensor will activate the fuel alarm. Fuel Warning Touch to enter the height at which this Mag sensor will activate the fuel warning. Water Alarm Touch to enter the height at which this Mag sensor will activate the water alarm.	MAG SENSOR SETUP - Concluded Water Warning Touch to enter the height at which this Mag sensor will activate the water warning. GROUNDWATER SENSOR SETUP Set up each groundwater sensor being monitored before selecting the next device type. Configured Touch the radio button to enable or disable configuration of the selected groundwater sensor. Address Touch and select address 1 of the 3-wire groundwater sensor. Label Touch to enter a description of this groundwater sensor (up to 20 alphanumeric characters) that will appear on the console screens and in reports. Address 2 Touch and select the next sequential address for the third wire of the groundwater sensor (e.g., if the Address field above is B1:S2:4, then this address should be B1:S2:5). Category Touch to select this groundwater sensor category: • Annular Space • Dispenser Pan • Monitoring Well • STP Pump • Containment Pump • Other VAPOR SENSOR SETUP Set up each vapor sensor being monitored before selecting the next device type. Configured Touch the radio button to enable or disable configuration of the selected groundwater sensor. Address Touch and select address 1 of the 3-wire vapor sensor. Label Touch to enter a description of this vapor sensor (up to 20 alphanumeric characters) that will appear on the console screens and in reports. Address 2 Touch and select the next sequential address for the third wire of the vapor sensor (e.g., if the Address field above is B1:S2:6, then this address should be B1:S2:7). Threshold Touch to enter the vapor level which identifies a leak or serious spillover and that triggers the vapor alarm. Thresholds are in ohms and must be calculated for each vapor sensor (see Vapor Sensor Threshold topic for determining value). Category Touch to select this vapor sensor category: • Annular Space • Dispenser Pan • Monitoring Well • STP Pump • Containment Pump • Other
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Setup>Devices - Concluded

LINE PRESSURE SENSOR SETUP Set up each line pressure sensor being monitored before selecting the next device type. Configured Touch the radio button to enable or disable configuration of the selected line pressure sensor. Address Touch and select the address of this line pressure sensor. Label Touch to enter a description of this line pressure sensor (up to 20 alphanumeric characters) that will appear on the console screens and in reports. Serial Number [Read Only] Console auto-detected serial number of this line pressure sensor. ATM PRESSURE SENSOR SETUP Set up each ATM pressure sensor being monitored before selecting the next device type. Configured Touch the radio button to enable or disable configuration of the selected ATM pressure sensor. Address Touch and select the address of this ATM pressure sensor. Label Touch to enter a description of this ATM pressure sensor (up to 20 alphanumeric characters) that will appear on the console screens and in reports. Serial Number [Read Only] Console auto-detected serial number of this ATM pressure sensor.	VAPOR PRESSURE SENSOR SETUP Set up each vapor pressure sensor being monitored before selecting the next device type. Configured Touch the radio button to enable or disable configuration of the selected vapor pressure sensor. Address Touch and select the address of this vapor pressure sensor. Label Touch to enter a description of this vapor pressure sensor (up to 20 alphanumeric characters) that will appear on the console screens and in reports. Serial Number [Read Only] Console auto-detected serial number of this vapor pressure sensor. LVDIM/MDIM SETUP (TLS-450PLUS only) Configured Touch the radio button to enable or disable configuration of the selected LVDIM/MDIM input. Address Touch and select the address of this LVDIM/MDIM input. Label Touch to enter a description of this LVDIM/MDIM input (up to 20 alphanumeric characters) that will appear on the console screens and in reports. Unit Conversion Touch to select US, Imperial, or Metric units. Pulse Conversion Touch to select the number of pulses per unit volume.
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Setup>BIR>General

In this screen you set up reconciliation parameters for your inventory reports if the BIR function is enabled (ref. "Meter Data Present" on page 26).

Product Threshold Alarm

Touch to enable an alarm that is triggered when your periodic reconciliation data exceeds a preset product threshold value (see Setup > BIR > Threshold Alarms for details about this alarm).

Daily Close Time

Touch to enter a time when you want the system to store the data for the current day (default is 02:00 AM).

BIR needs approximately 2-5 minutes of quiet time to generate a report. Because 2:00 AM is normally the quietest time of the day, we recommend using that time (unless there is a business need to do it at another time).

Week Close Time

Touch to enter the Day of the week when you want the system to store the data for the current week (used in weekly reports).

Alarm Threshold Delivery Type

Touch to select how the BIR variance amount is calculated:

- **Standard** - does not use delivery receipts in the BIR variance amount calculation.
- **Ticketed Delivery** - uses delivery receipts in the BIR variance amount calculation. Select this if the ticketed delivery feature is enabled in the Setup>Delivery screen.

Temperature Compensation

Touch to enter the method for calculating BIR volumes:

- **Standard** - use when the meters are not temperature compensated (TC).
- **TC Volume** - use when meters are temperature compensated (TC).

Meter Calibration Offset %

If you have meters that require a calibration offset, use this field to enter a meter calibration % to compensate (applies to all dispenser meters and is used in the calculated dispensed amount). For most domestic (US) sites, the default of 0% is fine.

BIR Daily Close Warning Enable

Touch the radio button to enable or disable the posting of this warning when the BIR daily close cannot occur at the scheduled time.

BIR Status Warning Enable

Touch the radio button to enable or disable the posting of this warning when conditions occur that may impact the reconciliation variance (such as meter map incomplete, meter map unstable, invalid fuel height, probe out, tank chart changed, DIM queue overrun).

BIR Shift Enable

Touch the radio button to enable or disable the posting of this warning when the BIR shift close cannot occur at the scheduled time (a BIR shift close could be delayed when a delivery is in progress, a dispense is in progress, the station is too busy, etc.).

Setup>BIR>Threshold Alarm

In this screen you can configure up to four reconciliation alarms per tank based on Throughput, Capacity, Deliveries and Fixed Values. You can also select a specific test method that will be used to post the selected threshold alarm. The choices in this screen are only allowed if the Product Threshold alarm is enabled in the "Setup>BIR>General" screen above.

Test Type

Touch to select a monitoring period option for the selected test protocol:

- **Disabled** - Test is disabled.
- **Monthly** - Threshold is compared against the monthly variance summation over a calendar month. This test is performed monthly and generates one report per monitoring period.
- **Rolling** - Threshold is compared to the variance summation over the defined number of days you enter in the Rolling Days field. The test is performed daily, but a single report is generated at the end of the monitoring period (i.e., the Rolling Days entry).
- **Daily** - Daily variance is compared to the threshold. This test is performed daily and a report is generated daily.
- **Rolling Consecutive** - Rolling Consecutive monitors the variance during the period entered in the Rolling Days field. The first report is generated at the end of the monitored Rolling Days period. Thereafter, a report is generated each day for the monitored Rolling Days period. For example, you select Rolling Consecutive test type and enter 10 in Rolling Days field. The test starts March 1. On March 10 a report is generated for days March 1 - March 10. On March 11 the next report is generated for days March 2 - March 11 (the Rolling Days period), and so on, each report covering the last 10 days.

Rolling Days

[Only available when Rolling Consecutive is chosen above] Touch to enter the number of rolling days.

Throughput

Touch the radio button to enable or disable this threshold alarm.

% - Touch to enter the percentage amount of metered sales or throughput (typically 1%).

Volume Offset - Touch to enter the offset amount (e.g., 130 gallons or 492 liters) added to the % of throughput value above to trigger BIR variance threshold alarm.

Capacity

Touch the radio button to enable or disable this threshold alarm.

% - Touch to enter a percentage amount of tank capacity (typically 1%).

Volume Offset - Touch to enter the offset amount (e.g., 130 gallons or 492 liters) added to the % of tank capacity value above to trigger BIR variance threshold alarm.

Deliveries

Touch the radio button to enable or disable this threshold alarm.

% - Touch to enter a percentage amount of deliveries (typically 1%).

Volume Offset - Touch to enter the offset amount (e.g., 130 gallons or 492 liters) added to the % of deliveries values above to trigger BIR variance threshold alarm.

Fixed Values

Touch the radio button to enable or disable this threshold alarm.

Value - Touch to enter a A fixed amount (e.g., 130 gallons or 492 liters) that triggers the BIR variance threshold alarm.

Setup>Tank>General

Configured

Touch the radio button to enable or disable the tank.

NOTE: Set to Enabled only after completing all of the Setup>Tank screens.

Label

Touch to enter a description for the tank (normally based on the name of the product in the tank and should be unique for each tank).

NOTE: This field is not the same as the label associated with the product, which is assigned in the **Setup > Product > Labels** screen.

Product Code

Touch to enter an alphanumeric code for a POS terminal used to identify the product for inventory control purposes. This typically defaults to the corresponding tank number, such as T1 and PC 1.

NOTE: There are instances when you may want to override the default value provided and enter a different code. For example, in BIR, you may have two tanks that have the same product type. In this case, you would want to program the same product code the for each tank. By manually entering in the correct code, you would ensure BIR is presenting the correct data for the product type..

Product Color

Touch and select a color that represents this product when displayed on screen.

Probe

Touch to enter an Identifier of the installed probe (as set up in "Setup>Devices"). A probe assignment to a tank is one to one:

- Probe 1 is assigned to tank 1
- Probe 2 is assigned to tank 2
- etc.

Probe Offset

The probe offset value is the distance the probe is off the bottom of the tank and helps to obtain an accurate measurement of fuel in the tank.

In console calculations, the probe offset value is always added to the product height value when product height is displayed (for example, in Overview>Tank Detail).

Touch to enter a value compensating for probes that are not resting on the bottom of the tank.

Full Volume (Capacity)

Touch to enter the full volume of the tank at 100% height (this volume is provided by the tank manufacturer).

Diameter

Touch to enter the inside diameter of the tank (look for this dimension on the tank chart provided by the manufacturer).

Tank Tilt

Touch to enter the amount of offset (in inches [mm]) of the tank from a perfect horizontal. For an explanation of tank tilt and how to calculate this value, see Actions>Help>Reference Tables>Tank Tilt Calculation.

NOTES:

- If the probe is installed in the center of the tank, enter a value of 0.00.
- Tank Tilt may be a positive (+) or negative (-) value. If it is a negative value, make sure to change the value symbol to minus (-) when entering a negative tank tilt value.

Thermal Coefficient

Touch to enter a value representing the coefficient of thermal expansion for the fuel in the tank. This value provides the proper expansion and contraction rate for a particular product type. If this value is entered incorrectly, it impacts inventory and tank test results. For a list of thermal coefficients, see Actions>Help>Reference Tables>Thermal Coefficients.

NOTE: Make sure you enter the correct value. If you are off by one decimal point, it can substantially affect system calculations.

Meter Data Present

For the selected tank, touch the radio button to enable or disable BIR software* to collect dispenser transaction data from the meters. (Note: BIR monitors data only from tanks assigned to Mag probes 1 to 32).

NOTE: Do not enable unless the Veeder-Root electronic Dispenser Interface Module (DIM) or current loop Dispenser Interface Module (DIM) are connected properly to the console.

*BIR option required

Pump Threshold %

[Field enabled when using line manifolded tanks and the Dispense Mode field is set to 'Manifolded:Sequential' in "Setup>Pumps and Lines>Line"].

When the tank volume drops below the pump threshold percentage entered in this field, pumping will switch over immediately to the next available tank in the line-manifolded line. Pumping will continue from the current tank for another 10 seconds to avoid a disruption in any dispenser during the switch-over.

Setup>Tank>General - Concluded

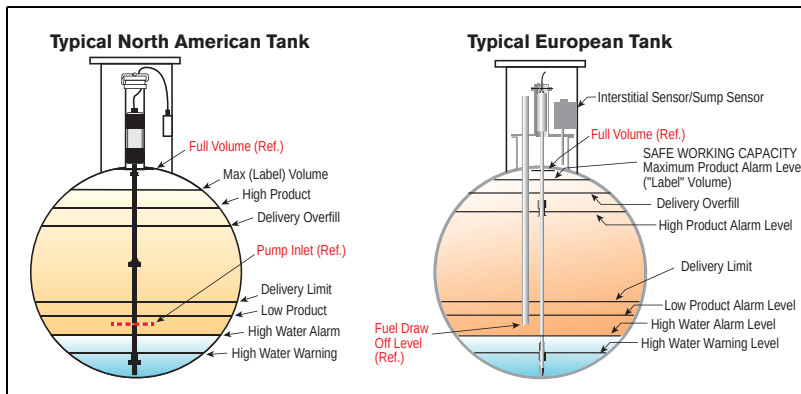
Stick Height Offset [Field available only if Stick Height is enabled in S"Setup>Tank>All Tanks"]. The value This value compensates for the difference between the stick (no tilt) and the gage. The difference is due to the stick and the probe measuring slightly different locations in a tilted tank since the riser used for the stick measurement is different than the riser used for the probe. Offset values can be +144 to -144 inches (+365.76 to -365.76 cm). The stick height equals the tank height (without the tilt), plus the stick height offset. However, if the calculated stick height is greater than the tank diameter, the stick height is set to the tank diameter. If the stick height is less than zero, it will be set to zero. NOTE: All displays of height include tilt. When determining the stick offset, the tilt adder must be taken into account. Stick height is not used for volume calculation; it is for display only. Delivery Delay Because the system has the ability to detect a delivery automatically, the time entered in this field represents the delay (in minutes, usually 5 - 10) after the actual delivery and before the console indicates that a delivery is complete. This delay provides extra time for the fuel level to stabilize, preventing false alarms and warnings and ensuring a more accurate delivery report.	Gross Test Fail Touch to enable or disable the alarm that triggers when a Gross Test [(1.5 gph (5.8 lph)] leak test fails. Periodic Test Fail Touch to enable or disable the alarm that triggers when a Period [0.2 gph (0.76lph)] leak test fails. Annual Test Fail Touch to enable or disable the alarm that triggers when the Annual [0.1 gph (0.38lph)] leak test fails. GOST Volume Correction Touch to enable or disable the GOST R 8.595 correction factor that adjusts the volume calculation of fuel in the tank. When you enable this field, the system automatically adjusts all volume calculations for this tank based on the temperature of the fuel (mainly used in Eastern Europe and Russia).
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Setup>Tank>Limits

This screen lets you enter tank capacity and tank alarm set points. These tank limits provide the ability for the system to warn of conditions that may arise that need immediate addressing. When programming tank limits, the customer should discuss their needs with a Veeder-Root representative to determine these levels.

Max. Volume (Label Vol.)

Set this value at 100% of the tank's capacity (see alarm references diagram below). The maximum volume or label volume alarms occur when the level of fluid in the tank exceeds the value entered in this field.

**High Product (% of max. vol.)**

High Product alarms occur when the volume of fluid in the tank exceeds the value you enter in this field, typically set to 95%.

In U.S. installations, this is especially useful in applications such as in used-oil holding tanks, where the rate of fill can be too gradual for the system to recognize the increase as a delivery and possibly fail to activate the Delivery Overfill Limit Alarm.

In International Sites this field is useful to warn of an impending over-fill (it can trigger the same alarm indications as Overfill Limit):

- Set this limit to 98% if the Maximum (Label) Volume value is greater than 25,000 liters.
- Set this limit to 96% if the Maximum (Label) Volume value is less than 25,000 liters.

Delivery Overfill (% of Max. Volume)

Delivery overfill alarms alert you to potential overfill conditions during a delivery. When the volume reaches this value, the console can activate an overfill alarm and can trigger a printout showing the tank number, date, time, and product. Set this percentage no greater than 90% of the tank capacity. For International Sites, set this percentage to no greater than 99% of maximum (label) Volume.

Delivery Limit (% of Full Volume)

Delivery limit alarms occur when the volume of product in the tank drops to a level at which you should request a delivery. This is referred to as the minimum operating capacity. Set this value at a volume higher than that of the Low Product Volume field.

Low Product

Low product is typically used to indicate that the inventory is at a critical point and the operator/owner should consider taking the tank out of service until a delivery is made. Normally, this is set around 5-10% of the tank's capacity. A Low Product alarms alert you when the volume in the tank drops to the low product level.

International Sites

Assuming no water is present in the tank, this limit should be set no lower than minimum volumes that can be measured by each probe type:

- The tank volume at 250mm for Mag probe type 8473
- The tank volume at 125mm for Mag probe type 8493

High Water Warning

When you have a Mag probe with water detection, you can set this threshold to provide a warning condition when water enters the tank. In the United States, there is a requirement to know when and how much water you have in the tank. Typical water warning setting is 2 inches and is lower than the high water alarm.

NOTE: This message does not appear for tanks in which high alcohol probes are installed.

High Water Alarm

When water in the tank rises to the high water alarm value, the console triggers an alarm. Set this value at a level lower than the pickup for the submersible pump or suction line.

NOTE: This message does not appear for tanks in which high alcohol probes are installed.

- Continued on next page

Setup>Tank>Limits - Concluded

Water Alarm Filter Level

During the delivery process, turbulence may be generated in the tanks that may cause the water float to rise above the water alarm thresholds and trigger false water alarms. In addition, a delivery of fuel containing water and/or surface water flooding the area and entering the tank through a riser or other opening may result in significant quantities of water entering the underground tanks. The Water Alarm Filter Level feature increases the system's ability to respond to all of these situations. This field provides three choices of filtering:

Low - This is the quickest response to either flooding or water delivery scenarios and is the default choice. The water alarm will be reported 3 minutes after the water level has crossed the programmed threshold. A delivery may be in progress during this alarm.

Medium - This level disables the water/alarm monitor during a delivery. The delivery detection threshold will be set to 25 GPM. This will be small enough to detect most deliveries and large enough to not mistakenly identify a delivery when water is leaking into a tank during a flooding situation. This filter will only be applied to the water alarm.

High - The level follows the same behavior as the medium level filter. The delivery activity detection rate is raised to 6 GPM; (roughly equivalent to the current delivery detection rate). The maximum Wait Time will be increased to 45 Minutes and the Maximum Height Value will be increased to 10 inches. NOTE: Adjustments to the delivery fill tube may eliminate false water alarms caused by delivery turbulence.

See Actions>Help>Understanding ATG>Water Alarm Filter Level for more on this subject.

Leak Alarm Limit

[Applies to SLD tests only]

During a leak test, the leak alarm limit alerts you when the cumulative temperature compensated (TC) product loss from a tank reaches the leak alarm limit value and helps identify large losses of product during a leak test.

To prevent false reports and alarms from being triggered, do not set the limit value to identify losses of 0.2 gph (0.76 lph) or less during the test period. The leak alarm limit should be set to identify losses of 1 gph (4 lph) or greater.

Consider both the leak rate you wish to identify, and the length of the test, when determining a value for leak alarm limit. For example, a value of 8 gallons (32 liters) will warn of:

- A 1 gph (4 lph) leak in 8 hours
- A 2 gph (8 lph) leak in 4 hours

NOTE: The console automatically interprets the limit you enter as a negative. It is not necessary to enter the minus (-) sign.

Sudden Loss Limit

[Applies to SLD and Timed Sudden Loss Detection (TSLD) tests only]

This value allows the system to look for significant losses during a quiet period to determine if the tank is leaking or fuel has left the tank (e.g., by bypassing the dispenser meters). It is not based on TC Volume and is intended to identify losses larger than the leak alarm limit. The default is 99 gallons (374.7 liters) but can be set to 1 to 999,999 gallons (3.78 to 3781.63 liters). Typically, you should set this limit to 25 gallons (100 liters) or higher. If you are getting too many false alarms, consider increasing this limit.

Note: Siphoned-manifolded tanks are monitored as a single tank. The Sudden Loss Limit threshold is the sum of the thresholds for each member of the manifolded set.

Density Low Limit

[Field only available if density probe is installed]

Triggers density warning (when greater than the value you enter here plus 1.00kg/m3 (0.062 lbs/ft3) and a density alarm.

Density High Limit

[Field only available if density probe is installed]

Triggers density warning (when greater than the value you enter here minus 1.00kg/m3 (0.062 lbs/ft3) and a density alarm.

Fuel Low Temperature Limit

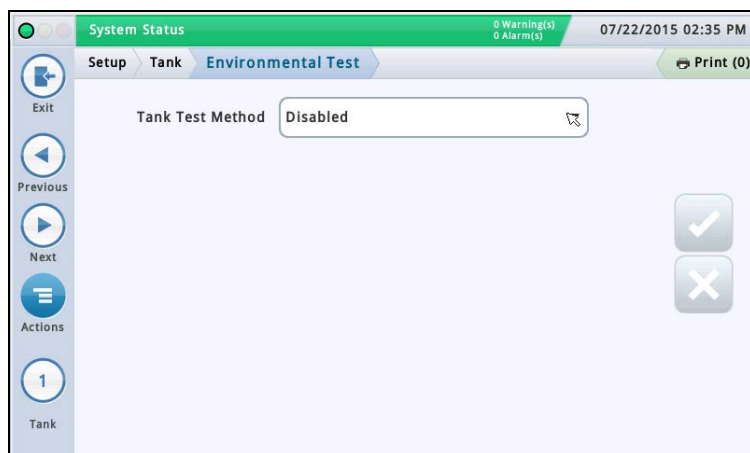
The limit that triggers a low fuel temperature alarm. The default is -50 degrees Celsius (-58 degrees Fahrenheit). The alarm clears when the fuel in the tank returns to a temperature that is two degrees Celsius (3.6 degrees Fahrenheit) higher than this temperature.

Fuel High Temperature Limit

The limit that triggers a high fuel temperature alarm. The default is 60 degrees Celsius (140 degrees Fahrenheit). The alarm clears when the fuel in the tank returns to a temperature that is two degrees Celsius (3.6 degrees Fahrenheit) lower than this temperature.

Setup>Tank>Environmental Test

This screen provides a choice of selecting a tank test method (SLD, CSLD, or Disabled) for a selected tank. Once a tank test method has been chosen, the corresponding setup parameters for either SLD or CSLD are displayed, and you can enter settings by which the selected test will be conducted.



Tank Test Method

Select the method for testing your tanks:

- **SLD** (Static Leak Detection) - a single tank test (that runs on demand, at a programmed time, or by pump sense signal) where there must be no dispensing during the test.
- **CSLD** (Continuous Statistical Leak Detection) - leak tests that are run continuously during idle tank times.
- **Disabled** - no testing method has been enabled.

SLD

Leak Test Rate

Touch to select which leak rate test is printed:

- 0.2 gph (0.76 lph) Leak Test
- 0.1 gph (0.38 lph) Leak Test

NOTE: Both of the above tests, as well as the Gross Leak Test [(1.5 gph (5.8 lph))], are run when you start the SLD tank test. This field determines what the system prints out for the test results.

Periodic Test Type

Touch to select a periodic test type:

- **Standard** - System runs the periodic leak test for the entire test duration before posting a test result. The minimum wait time after delivery when a test can be run is 8 hours, and the minimum test duration is 2 hours.
- **Quick** - System runs the periodic leak test for the entire test duration before posting a test result. The minimum wait time after delivery when a test can be run is 5 hours, and the minimum test duration is 1 hour.

Test Frequency

Touch to select the frequency for SLD tests as described below. Most local agencies require a minimum monthly (30 days) test.

Field	Range, Min, Max	Default	Visible If:
Period	On Date, Annually by Day of Week, Monthly by Day of Week, Weekly, Daily, Annually by Day of Month, Monthly by Day of Month, Auto	On Date	Always
Set Date	Month: 1-12, Day: 1-31, Year: 1970 - 2038	Current Date	If Period choice is On Date
Month	January - December	January	If Period choice is Annually by Day of Week, Annually by Day of Month
Weekday	Sunday - Saturday	Sunday	If Period choice is Annually by Day of Week, Monthly by Day of Week, Weekly
Occurrence	1st, 2nd, 3rd, 4th, Last	1st	If Period choice is Annually by Day of Week, Monthly by Day of Week
Day of Month	1 - 31	1	If Period choice is Annually by Day of Month, Monthly by Day of Month
Time of Day	Time in Hours and Minutes, 12 Hr. sensitive	Current time + 2 minutes	If Period choice is On Date, Annually by Day of Week, Annually by Day of Month, Monthly by Day of Week, Monthly by Day of Month, Weekly, Daily

Gross Test Auto-Confirm

Touch to enable or disable the ability of the console to require two failed Gross Tests [(1.5 gph (5.8 lph))] before it considers the test a failure. **NOTE:** When enabled, this feature may reduce false alarms.

Duration

Touch to enter the amount of time (in hours, from 2 - 24) for the test to complete.

Leak Min. Periodic (% Full Volume)

Touch to enter a minimum tank volume required to record a valid periodic test (value reflects federal, state, and local requirements)

Setup>Tank>Environmental Test - Concluded

Leak Min. Annual (% Full Volume) Touch to enter a minimum tank volume required to record a valid annual test (value reflects federal, state, and local requirements) • If the system has enough data to declare a Passed test result before the test duration ends, it reports it immediately and ends the test. • If not, it runs the entire duration of the test before reporting a Failed or Invalid result. Early Stop Touch to enable or disable Early Stop. When enabled, the following occurs: Starting the Test - System checks for these unrecoverable conditions, and if it encounters any one of them, it reports an Invalid test result immediately and ends the test: • Fuel level is less than the Leak Min. Periodic (% full Volume) value (0.2 gph test rate) or the Leak Min. Annual (0.1 gph test rate) value. • Less than 8 hours has passed from the time of a delivery for a Standard test, or 5 hours from the delivery for a Quick test. • The product temperature is less than 0°F (-17.6°C) or more than +100°F (+37.4°C). • The fuel level is too low. Running the Test - If the system does not encounter any unrecoverable conditions (as listed above), it begins the test and does the following: • If the system has enough data to declare a Passed test result before the test duration ends, it reports it immediately and ends the test. • If not, it runs the entire duration of the test before reporting a <u>Failed</u> or <u>Invalid</u> result. Tank Test Notify Touch to enable or disable Tank Test Notify. When enabled, a Tank Test Notify message is posted in the alarm indicator screen during a periodic test (used in conjunction with Tank Test Siphon Break field below) Tank Test Siphon Break To properly perform an in-tank leak test on siphon manifolded tanks, the following is required: • A siphon break solenoid valve is installed between the two siphon manifolded tanks. • Both the Tank Test Notify field (above) and the Tank Test Siphon Break field are enabled. • A relay must be programmed to perform the siphon break. The Tank Notify condition is assigned to this relay (that controls the siphon break solenoid valve) in Setup>Automatic Events>Device Tasks.	CSLD Gross Test Auto-Confirm Enables or disables the ability of the console to require two failed Gross Tests [1.5 gph (5.8 lph)] before it considers the test a failure. NOTE: When enabled, this feature may reduce false alarms. Probability of Detection Touch to enter a probability of detection rate (95% or 99%). This value represents the detection percentage. Some locations require a 99% probability of detection (with a false alarm rate of 1%). NOTE: If Custom appears in this field, the console is using a special value that should not be changed. Climate Factor Touch to enter a climate factor • Moderate - for most situations • Extreme - when a tank exhibits consistent, extreme vapor loss due to fuel evaporation.  NOTE: If this is set incorrectly, it may cause false Leak Alarms with normal CSLD leak detection. CSLD Evap. Compensation [Field available only if the Climate Factor field is set to Extreme] Enables or disables the CSLD Evaporation Compensation feature which is used on tanks that exhibit evidence of consistent, extreme vapor loss due to fuel evaporation that can otherwise lead to false Leak Alarms with normal CSLD leak detection.  NOTE: This field should only be enabled after consulting a Veeder-Root field engineer or technical support representative. State II Vapor Recovery [Field available only if the Climate Factor field is set to Extreme and CSLD Evap. Compensation field is Enabled] If the site incorporates the Stage II Vapor Recovery feature (which recovers vapors during the vehicle refueling process), this field should be set to Enabled.
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Setup>Tank>Profile

Charts define how the console calculates the volume of fuel in each tank. A point in a chart specifies a height value at a certain volume of fuel (chart data is stored for each monitored tank). This information is critical for proper operation. This screen lets you manually setup a tank chart using one of four tank profiles listed below.

You must have entered the diameter and full volume before selecting a tank chart (see "Setup>Tank>General").

Select a tank from the icon list on the bottom of the screen to configure.

Tank Profile

Touch to select a tank profile option:

One Point - This option uses only the 100% (full) volume to profile a tank.

This selection can be used for horizontally installed, flat-end cylindrical tanks, and when AccuChart is available for this tank.

Four Point - This option requires 4 points to profile the tank. The requested volumes are at percentages of height (e.g., the 75% volume of a 96" diameter tank equals the volume at a height which is 75% of 96" or 72").

This selection can be used for all rounded- and dished-end tanks, and should be selected when AccuChart is available for these type tanks.

Twenty Point - This option uses 20 Points to profile a tank. The requested volumes are percentages of height (e.g., the 5% volume of a 96" diameter tank = the volume at a height which is 5% of 96" or 4.8").

This selection can be used for all rounded-end and dished-end tanks.

Linear - This option requires only the 100% (full) volume to profile a tank.

NOTE: Instead of entering a diameter value in the diameter field, enter a height value in the diameter field of the "Setup>Tank>General" screen.

This profile can be used for flat-end cylindrical tanks standing on end, and for rectangular tanks.

Multi Point - This option is used for charts having more than 20 points. See **Setup > Tank > Multi Point** for more information.

Full Volume

[Read-only field] Total capacity and the diameter (full height) of the tank.

This information can be handy when you are entering chart information. The Full Volume value is entered in "Setup>Tank>General".

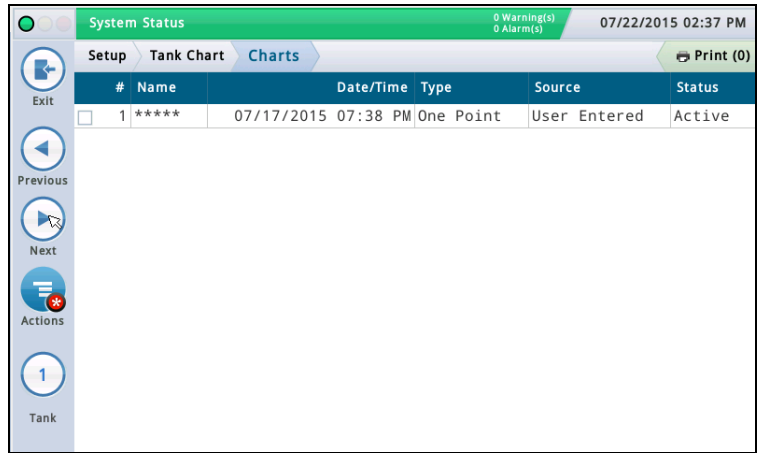
End Shape

[Field only available when you select **One Point** for Tank Profile field]

Enter a value from 0 to 1.0 in 0.1 increments (0.3 is the recommended value for dished-end tanks).

Setup>Tank Chart>Charts

This screen provides information on the active and inactive charts for a tank, and lets you select the chart you want to use for a tank (i.e., make a chart active for a tank).



Select a tank from the icon list on the bottom of the screen to view that tanks available charts.

#

Number assigned by the console

Name

Name of chart. NOTE: If the chart is created by the console (for example, via AccuChart), the name is automatically assigned

Date/Time

Date and time the chart was created.

Type

Chart type:

- One Point
- Four Point
- Twenty Point
- Multi Point
- Linear

See Setup > Tank > Profile for more information about chart types.

Source

How the chart was created:

- **Automatic** - Using AccuChart
- **User-Entered** - Using Setup > Tank Chart>Manual Calibration.
- **Meter Drop** - Using Setup> Tank Chart > Manual Calibration. (Uses meters to measure fuel volume; it does not require a full tank). Not available for siphon-manifolded tanks.
- **Meter Dispensed** - Using Setup > Tank Chart > Manual Calibration. (Uses meters to measure fuel volume; it does require a full tank). Not available for line-manifolded or siphon-manifolded tanks.

Status

Current status of the chart:

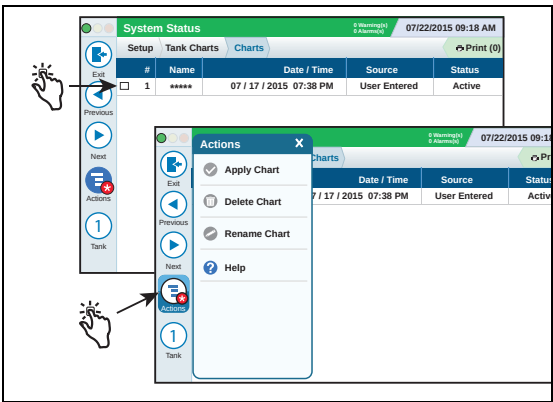
- Active
- Ready
- Incomplete
- Bad Point
- Calculating

Making a Chart Active for a Tank

Select a tank from the icon list on the bottom of the screen to view that tanks available chart(s).

Select a tank chart in the list by touching the check box next to the chart number, then touch the Actions icon, to display the Actions popup menu shown below.

Touch the Apply chart  icon then the  key to save your entry.



Deleting a Chart

NOTE: You cannot delete the first (initial) chart for a tank.

Select a tank chart in the list by touching the check box next to the chart number, then touch the Actions icon, to display the Actions popup menu.

Touch the Delete Chart  icon then the  key to save your entry.

Renaming A Chart

Select a tank chart in the list by touching the check box next to the chart number, then touch the Actions icon, to display the Actions popup menu.

Touch the Rename Chart  icon, enter a new name, then touch the  key to save your entry

Setup>Tank>HRM Limits (International Option)

When running the BIR program, the system has the capability to run in HRM mode, which provides hourly reconciliation results. HRM is used in countries that use metric mode. When a console is in HRM (Hourly Reconciliation Monitoring) mode, a tank Maximum Volume Limit threshold is imposed. This screen lets you view and set three HRM volume threshold alarms.

Warning Limit

An hourly limit in the variance in inventory, that when exceeded generates a warning. The default warning limit is 3 litres. Min. value is 1 litre and max. value is 400 litres.

Alarm Limit

An hourly limit in the variance in inventory, that when exceeded generates an alarm. The default warning limit is 4 litres. Min. value is 1 litre and max. value is 400 litres.

Maximum Volume Limit

An hourly volume limit in inventory, that when exceeded generates an alarm.

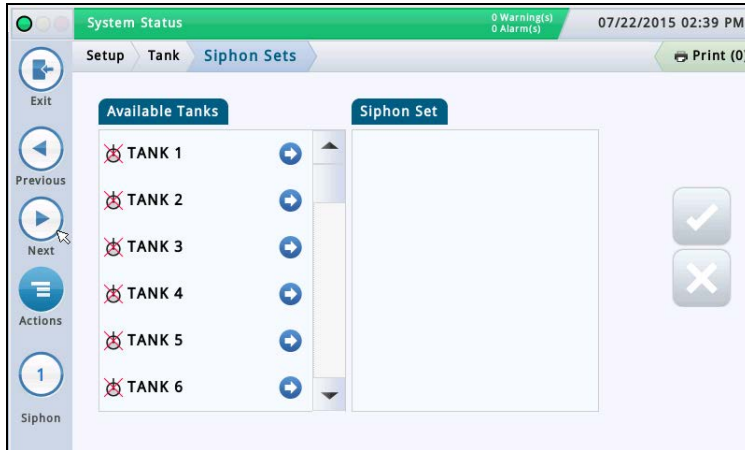
The minimum entry and default for this field is Tank Capacity minus 500 litres. Since the user-entered Max. Volume (Label Vol.) field in "Setup>Tank>Limits" screen is set to 100% tank capacity, the HRM Maximum Volume Limit value entered in this field will take precedence for Max Volume Alarm and for computing ullage values.

The allowable range for this field is 500 to 999,999,999 litres.

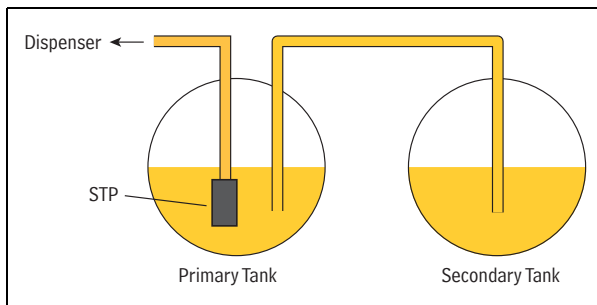
Other notes: The default 500 liter limit is programmed as 132 gallons. In metric mode this gets displayed as 499.674. Changing the US limit to 132.09 will display as 500 liters. There is no need to display resolution lower than 1 liter.

Setup>Tank>Siphon Sets

This screen lets you define siphon manifold sets, which are two or more tanks connected by a manifold. Typically, with a 2" diameter manifold pipe and with the proper vacuum on the line, a system can keep product flowing from one tank to another.



An example siphon set diagram is shown below:



This setup allows roughly the same amount of product in both tanks. This application is typically used in large truck stops or high throughput tanks for unleaded fuel.

Available Tanks

Lists enabled  and disabled  tanks in your system.

Siphon Set

Tanks that make up the selected siphon set (if one is selected), separated by a semi-colon.

Viewing a Siphon Set

Select a siphon set from the icon list on the bottom of the screen. The tanks that make up that siphon set are displayed in the Siphon Set column.

Creating a Siphon Set

Once a siphon set is created, the manifolded set icon appears in tank displays like the Overview>Tank Overview screen.

NOTE: The maximum number of siphon sets that can be configured is the maximum number of tanks divided by 2, rounded down.

1. Select the siphon set icon (bottom left of screen) and then select a new siphon set number from the siphon set list that displays along the bottom of the screen.
2. In the Available Tanks column, select the first tank you want as part of this new siphon set and press . This moves the tank to the Siphon Set column.
3. Repeat Step 2 for the next tank you need to add to your siphon set. Continue to do this until all of the tanks you need are moved into the Siphon Set column. If you need to move a tank out of the Siphon Set column, select  next to that tank. That tank returns into the Available Tanks column.

4. Touch  to save your settings.

Deleting a Siphon Set

1. Select a siphon set (from bottom left of screen). The tanks that make up that siphon set are displayed in the Siphon Set column.
2. Select  next to each tank. This moves the tank out of the Siphon Set column and back into the Available Tanks column.
3. Once you have moved out all tanks, touch  to save your settings.

Reporting When Using Siphon Sets

When using siphon manifold sets, the console will print multiple reports (one for each tank in the siphon set). To avoid multiple reports, configure the print task using an event-based trigger that references the first tank listed in the siphon set. See Actions>Help>Understanding Automatic Events for information about event-based triggers.

When you configure a print task using this method, the Last Delivery Report includes a summation for all tanks in the siphon set.

Setup>Tank>All Tanks

This screen lets you configure parameters that apply across all tanks in the system.

User Ullage

Touch radio button to enable or disable the display of the User Ullage field (as can appear in Overview>Tank Overview and Inventory Reports).

NOTE:

- The regular Ullage Volume field is displayed on most console screens, and is calculated by taking the Max Volume field in the "Setup>Tank>Limits" screen and subtracting the volume of fuel currently in the tank. This result represents the total amount of empty space in the tank.
- The User Ullage field is an additional informational field that calculates ullage using a percentage of the Ullage Volume field. User Ullage can be used as a cross-check for deliveries to make sure you do not overfill a tank. In some regions, the ullage is set to between 50 and 100% of the tank (see field below). By setting the ullage to a lower percentage, it adds an additional buffer so the tank will not be overfilled.

User Ullage%

[Field available only if User Ullage field is enabled]

Touch to enter a percent (from 50 to 100%) of ullage volume to display.

Print TC Volumes

Touch radio button to enable or disable the printing of temperature compensated (TC) volumes in screens or reports (inventory, delivery, etc.).

TC Reference

Temperature compensated (TC) reference temperature for all volume calculations, and is location-specific. Some common values:

- U.S. 60°F • Canada 15°C

NOTES:

- All leak test calculations are based on the TC reference value that you enter in this field.
- If you do not enable the Print TC Volumes field above, TC values will not appear in the screens.
- To use TC values, your probe must support temperature measurement capabilities.
- If BIR is being used and the meters reporting the sales are temperature compensated, the value you enter must match the meters' reference temperature value. Also, in "Setup>BIR>General", the TC Reference field must be set to TC Volume.

CSLD Evaporation Reid Vapor Pressure Chart

This field, when enabled, lets you enter Reid Vapor Pressure (RVP) values used by CSLD. Enabling RVP allows you to enter evaporation compensation values for each month for non-diesel tanks at the site.

This field is enabled if the following fields are set up in "Setup>Tank>Environmental Test": Tank Test Method is set to **CSLD**, Climate Factor is set to **Extreme** and CSLD Evap. Compensation is set to **Enabled**.

Entering Values for the CSLD Evaporation RVP Chart

Once enabled (see above) and you select inside the RVP field box, a popup window appears that lets you view or enter RVP entries for each month of the year. Enter values for each month field. touch ☒ to save your entries when done.

NOTE: CSLD evaporation compensation will use the RVP values from your entries for the applicable month. The console does not provide evaporation compensation during months having a RVP value of 0 (zero). The RVP monthly values for your geographical area can be obtained from your local Petroleum Distributor or is located on the delivery bill of lading.

Periodic Test Needed Warnings

Touch radio button to enable or disable the console to post a warning or an alarm after a specified number of days have passed (0 - 30 days) since the last 0.2 gph (0.76 lph) leak test was run or successfully passed. The subsequent two fields relate to this function:

Days Before Periodic Alarm

Post an alarm when the test did not successfully pass after a warning, or if the test was not conducted in a specified number of days.

Days Before Periodic Warning

Post a warning when the test did not successfully pass, or if the test was not conducted in a specified number of days.

Annual Test Needed Warnings

Touch radio button to enable or disable the console to post a warning or an alarm after a specified number of days have passed (0 - 365 days) since the last 0.1 gph (0.38 lph) leak test was run or successfully passed. The subsequent two fields relate to this function:

Days Before Annual Alarm

Post an alarm when the test did not successfully pass after a warning, or if the test was not conducted in a specified number of days.

Days Before Annual Warning

Post a warning when the test did not successfully pass, or if the test was not conducted in a specified number of days.

TC Density

Touch radio button to enable or disable TC density readings for inventory reports.

NOTE: This should only be enabled if the site is equipped with a Mag Plus Probe with a density float system.

Stick Height

Enables or disables the Stick Height fields that compensate for any difference between a stick measurement and the probe measurement (no tilt). The difference is due to the stick and the probe measuring slightly different locations in a tilted tank since the riser used for the stick measurement is different than the riser used for the probe.

The stick height offset is set in "Setup>Tank>General". When enabled, the calculated stick heights are visible in Tank Detail.

Stick height is not used for volume calculation; it is for display only.

Setup>Products>Labels

This screen lets you setup tank product labels which are used in all BIR reports.

Product #	Label
☐ 1	Not Assigned
☐ 2	Not Assigned
☐ 3	Not Assigned
☐ 4	Not Assigned
☐ 5	Not Assigned
☐ 6	Not Assigned
☐ 7	Not Assigned
☐ 8	Not Assigned
☐ 9	Not Assigned
☐ 10	Not Assigned
☐ 11	Not Assigned
☐ 12	Not Assigned
☐ 13	Not Assigned

Product

This column lists the console assigned product number.

Product Label

This column lists the product label for the product number.

Editing A Label

1. Touch (highlight) a product number in the data view (a checkmark appears in the box next to the number).
2. Touch the Actions  icon and then the Edit Label  icon and enter a new label (up to 20 characters) for this product.
3. Touch  to save your settings.

Setup>Product>Product Mapping

This screen lets you map a specific tank to a product. Depending on your site, you could have two or more tanks with the same product. By properly mapping your tanks to the products, you can group single and manifolded tanks into product-summarized BIR Reports.

Tank(s)	Product
☐ T 1	Not Assigned
☐ T 2	Not Assigned
☐ T 3	Not Assigned
☐ T 4	Not Assigned
☐ T 5	Not Assigned
☐ T 6	Not Assigned
☐ T 7	Not Assigned
☐ T 8	Not Assigned
☐ T 9	Not Assigned
☐ T 10	Not Assigned
☐ T 11	Not Assigned
☐ T 12	Not Assigned
☐ T 13	Not Assigned

Tank(s)

This column lists the configured tank short device identifier/ number (for example, T1).

Product

This column lists the product number and the assigned product label (for example, "F1:Regular"). "Not Assigned" indicates the tank has not had a product mapped to it.

Editing Tank(s) Product Mapping

1. Touch (highlight) a tank in the data view (a checkmark appears in the box next to the tank's device identifier/number).
2. Touch the Actions  icon and then select Edit Tank(s) Product.
1. From the pull down menu select the product you want to map to this tank.
3. Touch  to save your settings.

Setup>Tank Chart>AccuChart

This screen lets you setup the AccuChart automatic calibration feature for a tank.

Make sure the following is done before you start an AccuChart calibration:

- The tank has a chart created in Tank Profile which will be used in the AccuChart calibration.
- The dispenser meters are calibrated so the system has accurate dispense measurements to use in the AccuChart calibration process.

Select any tank from the icon list on the bottom of the screen to enter its AccuChart settings.

Update Schedule -

Describes how AccuChart calibration charts are updated and assigned to tanks Method:

Immediate - The active chart is updated every time AccuChart generates a chart. Because the chart immediately becomes active, the console calculation of product volume will also change based on the data in the newly active chart.

Charts may be created multiple times during the calibration period, so the calculated product volume may also change multiple times.

If you enable AccuChart warnings, the console will post warnings if charts have not been generated during the calibration period.

Periodic - Select up to four target dates on which the console will activate a generated chart. If a chart is available on one of the target dates, the console activates the chart. You can view available charts in "Setup>Tank Chart>Charts".

If there are multiple charts available, the console will activate the chart with the best data sufficiency. See the Actions>Help>Diagnostic>AccuChart>Data Sufficiency topic for more information.

If you enable AccuChart warnings, the console will post alarms if the console has not generated any charts during the calibration period. On the final target date the console will also post a warning if there are no new charts available for this tank.

Complete - The last chart generated by AccuChart at the end of the calibration period becomes the active chart. Data Sufficiency is not considered; only the date the chart was created.

If you enable AccuChart warnings, the console will post warnings if charts have not been generated during the calibration period.

Never - The console never automatically makes an AccuChart-generated chart the active chart for this tank.

Apply Date 1 - Date 4 Fields

[Field available only if the Update Schedule field is set to **Period**]

Touch to enter four target dates for periodic generation of an active chart by the console. The recommended periodic selection period is 14 days apart (for example, 14, 28, 42 and 56).

Calibration Period

Touch to enter the number of days to calibrate the tank (typically 30 - 120 days).

The calibration period depends on tank activity. A low-throughput tank (e.g., one that has a "high test" fuel) may require a longer calibration period than a quick-throughput tank (e.g., one that has "regular" fuel).

NOTE: If, at one day prior to the end of your calibration period selection, AccuChart has insufficient data to create a tank chart, it posts a warning (if the Enable AccuChart Warnings field below is set to Enabled), allowing you the opportunity to extend the calibration period.

Days Left to Calibration Completion

[Read-only field] The number of days remaining to complete the calibration (after you initiate a calibration using the Start button), including the start date of the calibration.

Exclude Days

Touch to remove specific days from the calibration period. For example, you may want to exclude the days the site had maintenance performed, such as when meter calibration occurs.

NOTE: If you need to exclude more than 25% of the calibration period, we recommend you stop the tank calibration. Delete any created charts and restart the calibration.

Enable AccuChart Warnings

Touch to enable or disable AccuChart warnings. When enabled, the system produces a warning when AccuChart has not completed a calibration because of insufficient data. See Diagnostic>AccuChart>Calibration Feedback for more information.

Min Operating Level%

Touch to enter the desired minimum operating height of the fuel (as percentage of tank diameter) for valid calibration results. It should be greater than or equal to 10%. The default is 10%.

Max Operating Level%

Touch to enter the desired maximum operating height of the fuel (as percentage of tank diameter) for valid calibration results. It should be less than or equal to 95%. The default is 95%.

NOTE: The difference between the Min Operating Level% and the Max Operating Level% should be at least 50% and should include the midpoint of the tank (50%). The 50% setting cannot be the endpoint of the range between the Min and Max Operating Level%. For example, you can enter a range of 25% to 85%, but you cannot enter a range of 5% to 50%.

Start

Touch Actions  then the Start  on the Actions popup menu. If you select at the prompt to start the calibration, a new AccuChart calibration is started and the following is done:

- Sets the Start of Calibration field to the current date.
- Sets the Days Left To Calibration Completion field to the number of days in the calibration period. This field displays in the Diagnostic > AccuChart > Data Sufficiency screen.
- Clears all AccuChart alarms and warnings.

Setup>Tank Chart>AccuChart - Concluded**Stop**

Touch Actions  then the Stop  on the Actions popup menu. If you select at the prompt to stop the calibration, the AccuChart calibration stops.

Notes When Working with AccuChart:

- If the console is powered down during one of the Immediate or Periodic updates, or if a time/date change is made at this time, the update will be missed. If this occurs during the final Periodic update, or at the end of the calibration period for Immediate and Complete update selections, the calibration will be attempted at the next date change. The update will be done with this calibration, or the last generated calibration, or AccuChart will generate warnings.
- If you enter the Start Date values in a random order, the system will rearrange them in increasing order (after screen is refreshed). Empty Apply Date 1 through 4 fields will be grouped at the bottom of the set. This may cause the entered values to move around.
- If the calibration is in progress and the console clock is set back before the start of calibration, the start of calibration will be moved back to the new time, and the 'Update Schedule' dates will all be adjusted appropriately (including Periodic).

Setup>Pumps and Lines>Pumps

This screen lets you configure the site's pumps that will be monitored by the console.

Select a pump from the icon list on the bottom of the screen to configure.

Configured

Touch the radio button to enable or disable the selected pump.



NOTE: Set to Enabled only after completing all of the settings for this pump.

Pump Label

Touch to enter a description for this pump.

Mode

Touch to determine how the pump is controlled:

- **TLS Pump Control** - Pump is controlled or actuated locally by the console.
- **Pump Sense** - A pump request signal is sent to the console to turn on/off the pump (this signal also acts as a tank "active" signal to the console).
- **External Pump Control** - Pump is controlled externally to the console and identifies tanks that are line manifolded together.

Tank

Touch to assigned the tank assigned to the selected pump. NOTE: There may be both configured and non-configured items on this field's drop-down list (non-configured items will be prefixed by a "!").

Pump Control

[Field only enabled when the **Mode** field is set to "TLS Pump Control"].

A device that responds to dispense requests and actuates the selected pump. These devices are normally relays that have been configured and assigned as pump controlling devices in Setup>Devices ("RELAY SETUP").

Pump control relay assignments are usually unique for each pump. A warning dialog will display if the pump control selected is already assigned to another pump (this alert is not an alarm or error since some sites use a single pump control output for more than one pump).

NOTE: There may be both configured and non-configured items on this field's drop-down list (non-configured items will be prefixed by a "!").

Pump Sense

[Field only enabled when the **Mode** field is set to "TLS Pump Control" or "Pump Sense"].

The external input that tells the console when the pump is on or off. Pump sense inputs are configured and assigned in Setup > Devices ("EXTERNAL INPUT SETUP"). More than one pump may use the same pump sense input.

NOTE: There may be both configured and non-configured items on this field's drop-down list (non-configured items will be prefixed by a "!").

Line

[Read-only field]. The line identifier of the selected pump (shows "Not Assigned" if that is the case).

Pump Relay Monitor Device

[Available with PLLD]. The external input that generates a pump relay alarm when the console suspects a relay is stuck or when the pump has been running continuously for a period exceeding the Max Run. The device is configured and assigned in Setup>Devices ("EXTERNAL INPUT SETUP").

Stuck Relay

[Available with PLLD]. The console suspects a pump relay is "stuck" when the pump relay signal is inactive but the pump monitor indicates the pump is powered. When a pump relay fault detected by the console has persisted beyond this delay, a Pump Relay Alarm is generated. Touch to enter a Stuck Relay delay time from 5 to 600 seconds. The default is 60 seconds.

Max Run Time

[Available with PLLD]. When the console detects that a pump has running continuously for longer than the time entered in this field. Touch to enter time from 1 to 24 hours.

Setup>Pumps and Lines>Line

This screen lets you configure line leak monitoring of individual product lines (TLS-450PLUS consoles only).

Select a line from the icon list on the bottom of the screen to configure.

Configured

Touch the radio button to enable or disable the selected line.

NOTE: Set to Enabled only after completing all of the settings for this line.

Line Label

Touch to enter a description for this line.

Leak Monitoring

Touch to enable or disable PLLD monitoring on this line.

Pressure Sensor

Touch to select the line pressure sensor assigned to this line, (see 'Setup>Devices - "LINE PRESSURE SENSOR SETUP").

Line Manifolded

Touch Yes if line is manifolded, No if not.

Dispense Mode

[Only enabled if Line Manifolded field is set to "Yes"] - Touch to select the dispense mode for this line.

- **Standard** - Only one pump feeds the line.
- **Manifolded Alternate - Volume**^{1,2} - For line manifolded tanks, the console chooses the tank with the greatest inventory volume and switches to an alternate tank based on the Active Switchover and Threshold settings below.

- **Manifolded Sequential**^{1,2} - If there is more than one tank with a pump on the line, tanks are pumped one at a time until the volume drops below the Pump Threshold (%) value set in the Setup > Tank > General screen. At that point, pumping will commence on the next available tank in the line set.
- **Manifolded: All Pumps** - All pumps on the line are run.
- **Manifolded: Pump Sense** - Pump Sense information is available for the pumps on this line. This can be used to improve CSLD performance.
- **Manifolded: Alternate Height** - For line manifolded tanks, the console chooses the tank with the greatest height and switches to an alternate tank based on the Active Switchover and Threshold settings below.

Active Switchover

This field is active if either Alternate Volume or Alternate Height is selected in the Dispense Mode field above. Choices are:

- Yes - Enables the switchover to an alternate tank, based on which tank has the greatest volume/height, taking into account the threshold value below
- No - Disables the switchover to an alternate tank. This is the default.

Switchover Volume Threshold

The volume used to determine when to switch over to an alternate tank. The console switches to an alternate tank (without losing line pressure) when the difference is greater than this threshold. The field can be set to a value between 10 and 999 gallons (37.8 - 3781.6 litres). The default value is 200 gallons (757 litres).

Switchover Height Threshold

The height used to determine when to switch over to an alternate tank. The console switches to an alternate tank (without losing line pressure) when the difference is greater than this threshold. The field can be set to a value between 1 and 99 inches (25.4 - 2514.6 mm). The default value is 2 inches (50.8 mm).

Pumps

Touch to select a pump to assign to the line. If the Line Manifolded field above is set to Yes, you can select multiple pumps for this line.

1. To prevent backfilling, the level of all tanks connected to the line will be monitored. If the level of any tank exceeds 95% of the Max or Label Volume limit (see "Setup>Tank>Limits" on page 28), the pump for that tank will also be turned on during dispensing. The state of the pump that was already ON will not be changed.
2. At locations with manifolded fuel lines that have a mechanical line leak detector installed for each pump, the TLS Console must be programmed for either Alternate or Sequential. Doing so ensures that each line meets the 3 GPH requirement.

Setup>Pumps and Lines>PLLD

This screen lets you setup parameters for individual lines when Pressurized Line Leak Detection (PLLD) is enabled. Also, if **Leak Monitoring** is not enabled (in "Setup>Pumps and Lines>Line") for at least one line, then none of the PLLD screens can be edited.

The maximum number of lines that can be configured for Leak Detection is equal to the maximum number of STPs as determined by your console. However, only those lines for which Leak Monitoring is enabled (in "Setup>Pumps and Lines>Line") are shown.

Automatic dialing or sending of PLLD alarms is setup in Automatic Events setup (Setup>Automatic Events).

Select a line from the icon list on the bottom of the screen to configure.

Configured

Touch the radio button to enable or disable the PLLD feature for the selected line.



NOTE: In setup wizard, you should enable settings as you go.

Controlling Pump

Touch to enter pump controlling this tank. Note: Pump must be programmed to use Pump Control (see "Setup>Pumps and Lines>PLLD" on page 42).

Pipe Type

Touch to enter the pipe type for this line. Refer to the 'Supported Pipe Types and Line Lengths' table in the Veeder–Root Electronic Line Leak Detectors Application Guide (P/N 577013–465).

NOTE: The fields that display below are dependent on, and applicable to, the Pipe Type selected. For example, if you select 2/3 IN. FIBERGLASS, the applicable fields that display will allow you to enter lengths for the 2" diameter and the 3" diameter pipe. If you select "user defined" pipe type, fields for setting up the 1st and 2nd line diameters, line lengths, and bulk modulus will display.

Line Length

The length of the piping between the tank and the dispensers, including the length between the check valve and where it connects into the product line. Line lengths are whole numbers. Values are in foot or meter increments, depending on system units.

Allowable selections: Refer to the 'Supported Pipe Types and Line Lengths' table in the Veeder–Root Electronic Line Leak Detectors Application Guide (P/N 577013–465).

The default is 0 but leaving it at 0 after entering a line length will cause a data setup warning.

Line Diameter

Allowable selections: 0 to 3.00 in (0 to 76.20mm)

The default is 0 but leaving it at 0 after entering a line length will cause a data setup warning.

2nd Line Length

Allowable selections: Refer to the 'Supported Pipe Types and Line Lengths' table in the Veeder–Root Electronic Line Leak Detectors Application Guide (P/N 577013–465).

Default: 0

2nd Line Diameter

Allowable selections: 0 to 3.00 in (0 to 76.20mm)

The default is 0 but leaving it at 0 after entering a line length will cause a data setup warning.

1st Line Bulk Modulus

[only available if the pipe type is user-defined]

The line's resistance to uniform compression.

Refer to the 'Supported Pipe Types and Line Lengths' table in the Veeder–Root Electronic Line Leak Detectors Application Guide (P/N 577013–465).

Allowable selections: 1000 to 200,000 psi (6892 to 1,378,359kPa).

The default is 0 but leaving it at 0 after entering a line length will cause a data setup warning.

2nd Line Bulk Modulus

[only available if the pipe type is user-defined]

The line's resistance to uniform compression.

Refer to the 'Supported Pipe Types and Line Lengths' table in the Veeder–Root Electronic Line Leak Detectors Application Guide (P/N 577013–465).

Allowable selections: 1000 to 200,000 psi (6892 to 1,378,359kPa)

The default is 0 but leaving it at 0 after entering a line length will cause a data setup warning.

Thermal Coefficient

If the controlling pump assigned to the line has a tank assignment, this field is set to the thermal coefficient from that tank (see "Setup>Tank>General") and the field is read-only. If there is no tank assignment, you can edit this field. If the tank assignment is removed, the system will use the default thermal coefficient 0.00070 U.S. Units (0.00126 Metric Units).

Allowable selections: 0.0 to 0.0016 gal./gal./°F (0.0 to 0.00288 lit./lit./°C)

Setup>Pumps and Lines>PLLD

0.2 gph (0.76lph) Line Leak Test

Touch to select the scheduling frequency of the 0.2 gph (0.76lph) periodic tests:

Disabled - No manual, repetitive, or monthly 0.2 gph (0.76lph) testing is allowed. This is the default.

Repetitive - After a dispense, a 3.0 gph (11.3lph) test is run, followed by a 0.2 gph (0.76lph) test. The test blackout period (the **Precision Test Delay** in "Setup>Pumps and Lines>All PLLD") is then observed. Following the test blackout period, the test sequence repeats after the next dispense.

NOTE: If the 0.1 gph (0.3 lph) test is set for **Repetitive**, this test must also be set to Repetitive. This selection also enables manual 0.2 gph (0.76lph) tests to run when manually started.

Monthly - The test is scheduled at the beginning of a new month and remains scheduled until a test is passed.

Manual - 0.2 gph (0.76lph) tests run only when manually started in Diagnostics>PLLD>Manual Tests

0.1 gph (0.38lph) Line Leak Test

Touch to select the scheduling frequency of the 0.1 gph (0.38lph) precision tests.

Disabled - No manual or automatic 0.1 gph (0.3 lph) testing is allowed. This is the default.

Repetitive - After a dispense, a 3.0 gph (11.3lph) test is run, a 0.2 gph (0.76lph) test is run, followed by the 0.1 gph (0.38lph) test. The test blackout period (the **Precision Test Delay** in "Setup>Pumps and Lines>All PLLD") is then observed. Following the test blackout period, the test sequence repeats after the next dispense. This selection also enables manual 0.1 gph (0.38lph) testing tests to run when manually started.

Auto - The 0.1 gph (0.38lph) test is automatically scheduled to run 6 months after the last passed 0.1 gph (0.38lph) test. This setting also gives you the option to run the Passive 0.1 gph (0.38lph) Line Leak Test.

Manual - 0.1 gph (0.38lph) test runs only when manually started in Diagnostics>PLLD>Manual Tests.

Passive 0.1 gph (0.38lph) Line Leak Test

[only available if the pipe type is user-defined and the 0.1 gph (0.38lph) Line Leak Test is set to **Auto**].

Enables a 0.1 gph (0.38lph) test to run after a passed 0.2 gph (0.76lph) test without the 0.1 gph (0.38lph) test being actively scheduled. If the 0.1 gph (0.38lph) test also passes, you are notified in Diagnostics>PLLD> 0.1 GPH Tests. If it fails, there is no notification of the passive 0.1 gph (0.38lph) test.

Allowable selections: Yes, No (default is No).

Shutdown Rate

The line is shut down if a specified or less precise PLLD test fails. For example, if you set the shutdown rate for 0.2 gph (0.76lph), the line will shut down if it fails both the 3.0 gph (11.3lph) test and the 0.2 gph (0.76lph) test.

Allowable selections: 3.0 gph (11.3lph), 0.2 gph (0.76lph), 0.1gph (0.38lph), or None (default is 3.0 gph (11.3lph)).

Low Pressure Shutoff

If a low pressure is detected during dispense, the Low Pressure Alarm is triggered. The dispenser also halts dispensing if this field is enabled and the pressure is less than the **Low Pressure Shutoff Value** field below.

Allowable selections: Disabled, Enabled (default is Disabled).

Low Pressure Shutoff Value

If a low pressure is detected during dispense, a low pressure alarm is triggered. The dispenser also halts dispensing if the pressure is lower than the value in this field.

Allowable selections: 0 to 25 psi (0 to 172kPa)

Default: 0.0

Continuous Handle Timeout

If the dispenser handle remains off the hook for the period of time entered in this field, the line is shut down by the console.

Allowable selections: 1 to 16 hours. Default: 16 hours

Fuel Out Limit

If the tank product level is below the limit entered in this field, the Fuel Out Alarm is triggered.

Allowable selections: 0.00 to 15.00 in (0.00 to 381.00mm). Default: 10.00 in (254mm).

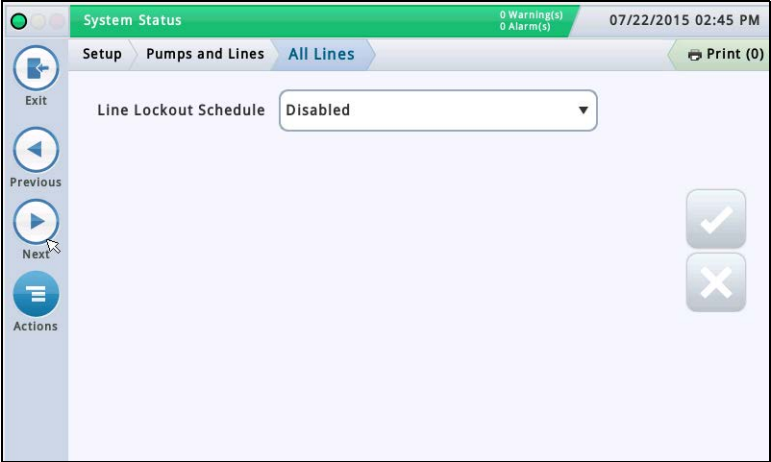
Altitude Pressure Offset

Allows you to set an altitude pressure adjustment for the absolute pressure transducer of plus or minus 5psi.

Allowable selections: -5.0 to 5.0. Default: 0.0.

Setup>Pumps and Lines>All Lines

This screen lets you setup a line lockout schedule to prevent PLLD testing when you know that the pump will be powered off. In some areas, regulations prohibit leaving power to submersible pumps switched on during hours when the site is unattended. You should lock out the lines during these hours.



Line Lockout Schedule
Touch to select a schedule for lockout events:
Disabled - No lockout events scheduled
Daily - Allows for one lockout event per day
Individual - Allows for up to seven lockout events per week

Day of Week
Touch to select the day of the week for the lockout event. Only available if the **individual** lockout schedule was selected above.

Start Time
Touch to select the start time for the lockout event.

End Time
Touch to select the end time for the lockout event.

Setup>Pumps and Lines>All PLLD

This screen lets you setup test parameters for all pressurized line leak detectors.

Line Re-Enable Method

Determines what conditions allow you to re-enable the line.

Allowable selections:

- Pass Line Test - The line must pass the test in order to be enabled.
- Alarm Acknowledge - The line can be enabled after the alarm is acknowledged.

Periodic Test Warnings

Touch to enable or disable the Periodic Test Needed Warning/Alarm which informs you that a line will soon be out of compliance because a Periodic test was not completed within the required time. This lets you stop dispensing from the line until a Periodic test has been completed.

Days before Periodic Warning

The number of days before the Periodic Test Alarm Warning is triggered.

Allowable selection: 0 - 30 days (default is 25 days).

Days before Periodic Alarm

The number of days before the Periodic Test Needed Alarm is triggered.

Allowable selection: 0 - 30 days (default is 30 days).

Annual Test Needed Warnings

Touch to enable or disable the Annual Test Needed Warnings which informs you that a line will soon be out of compliance because an Annual test was not completed within the required time. This lets you stop dispensing from the line until an Annual test is completed.

Days before Annual Warning

The number of days before the Annual Test Needed Warning is triggered.

Allowable selection: 0 - 365 days (default is 355).

Days before Annual Alarm

The number of days before the Annual Test Needed Alarm is triggered.

Allowable selection: 0 - 365 days (default is 365)

Precision Test Delay (hours)

The number of hours between a passed periodic or annual test and running the next line test(s).

NOTE: In previous TLS consoles, this was referred to as Precision Test Duration.

Allowable selection: 12 to 744 hours

NOTE: When CSLD is enabled for the tank assigned to the line, a minimum value of 60 hours is used internally when the precision test delay value is less than 60.

0.1 gph (0.38 lph) Line Test Auto Confirm

Touch to enable or disable the ability of the console to evaluate several 0.1 gph (0.38 lph) line tests before a result is posted. Enabling Auto Confirm reduces the risk of false test results, but it extends the time that it may take to post results.

0.2 gph (0.76 lph) Line Test Auto Confirm

Touch to enable or disable the ability of the console to evaluate several 0.2 gph (0.76 lph) line tests before a result is posted. Enabling Auto Confirm reduces the risk of false test results, but it extends the time that it may take to post results.

See the Actions>Help>Understanding Regulatory Compliance In-Tank Leak Tests topic for more information.

Setup>Inventory>Report Times

This screen lets you set up how often Inventory History reports are generated.

Reporting Interval

Touch to select how often reports are generated (choices are):

Disabled, 5 minutes, 10 minutes, 15 minutes, 20 minutes, 30 minutes, 1 hour (default), 2 hours, 3 hours, 4 hours, 6 hours, 8 hours, 12 hours or 24 hours.

Storage Length

[Read only field] This is the maximum number of records that can be stored by the system.

NOTE: When you the system reaches 721 records, the oldest records will start to drop off the report.

Log Start Time

[If reporting interval is set to two hours or more]
touch to select time to start logging.

Setup>Inventory>Shifts

This screen lets you setup the shift schedule and the shift close method. Shifts are used as planning time periods for activities like reconciliation and BIR reporting.

If shifts are enabled, a new shift inventory report will be created and will include the shift number. You can also access current or historical reports of shifts.

Shift Close Method

Timed

- The console will start and stop shifts automatically without any user action.
- You need to enter at least one shift time field (see Shift Times field below).
- When set to timed, a manual shift close will close the shift for ALL tanks, but the tank(s) must be idle before a shift can close. Once a timed shift has been closed, no other shift can be closed until the shift duration ends.

Manual

- You close a shift directly on the console by going to Actions > Close Shift. Each time you close a shift directly, the console considers the current shift over, and the next shift has started.

- You must wait a minimum of two hours between the close of each manual shift. If you try to close a shift sooner, a warning message displays.
- BIR manual shift close can be applied to all tanks or to an individual tank. The BIR tank will immediately close when the operator makes the request. There is no waiting or idle time. The remaining open tanks must be closed within the shift close timeout period (see Shift Close Timeout field below). Tanks opened after the shift close timeout period will be automatically closed.

Shift Close Timeout

[For "Manual" shift close method only].

Touch to enter the shift Close Timeout period (30 to 60 minutes)

NOTES:

- When you close a shift, you can select an individual tank to close. The console will close the selected tank, but wait for the amount of time as specified in this field, and then close the shift for all remaining tanks.
- This feature makes it possible to complete a delivery for a tank before closing the shift.

Max. Number of Shift/Day

[For "Manual" shift close method only]

Touch to enter the maximum number of shifts per day, up to 8 (default is 3)

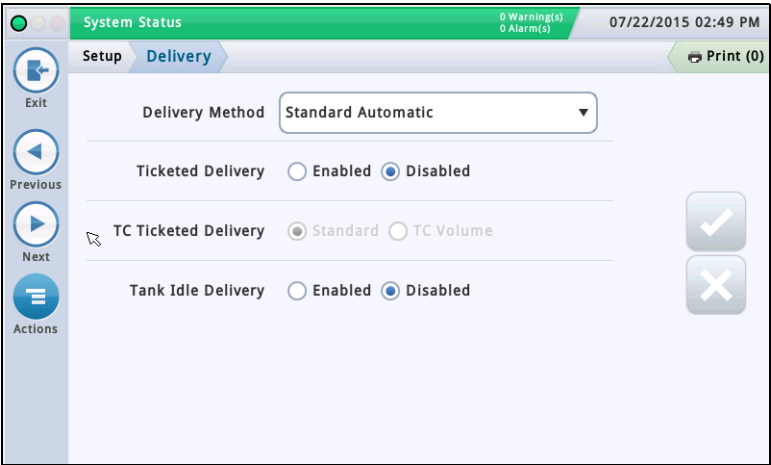
Shift Times (1 - 8)

[For "Timed" shift close method only]

Touch to enter the starting time for each shift.

Setup>Delivery

This screen lets you configure the delivery method.



Delivery Method

Touch to select the type of delivery method for receiving inventory. Choices are:

Standard Automatic - The console detects that a delivery is taking place when there is an increase in fuel height as measured by the probe. A delivery is complete when the height no longer increases (default option that works in most applications).

Manual - You manually indicate that a delivery is taking place using the Start and Stop buttons. See the Reports>Delivery>Manual Delivery screen for information about how to perform a Manual Delivery.

Ticketed Delivery

If you enable ticketed delivery, you can manually enter ticketed volumes using the receipts from delivery trucks. Enabling this feature generates reports showing delivery variances between ticketed volume and gauged volume and book variance.

TC Ticketed Delivery

[Available only if you **Enabled** Ticketed Delivery]

Touch to select the type of ticketed delivery. Choices are: Standard, TC Volume

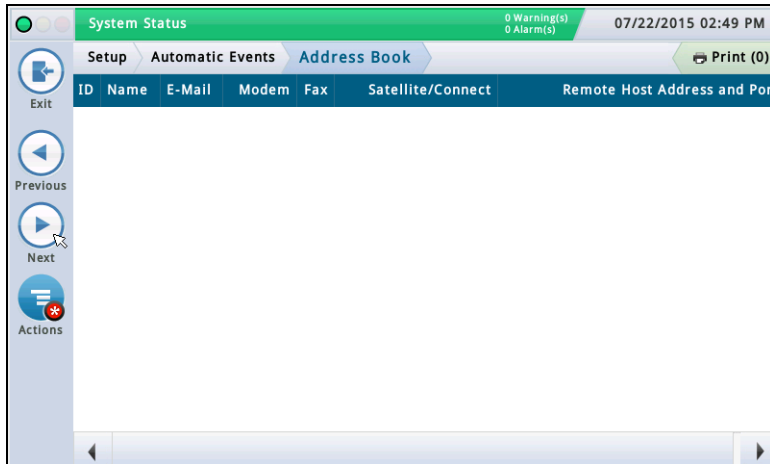
You can choose whether the values you enter are standard (gross) volumes or temperature-compensated (TC) volumes. This field must be enabled for TC volumes to be included on the Delivery Reports.

Tank Idle Delivery

Touch to enable or disable the tank idle delivery feature. The tank idle delivery feature enables you to shut down dispenser activities during the delivery process. This helps to eliminate problems caused by delivery turbulence, like false water alarms.

Setup>Automatic Events>Address Book

This screen provides a list of your contact names and their outbound connectivity details. It also lets you add or edit your contacts as necessary.



Screen Column Descriptions:

ID - An automatically assigned identifier number

Name - Contact name

E-Mail - Email address of the contact entry

Modem - Computer modem phone number of the contact entry

Fax - Fax modem phone number of the contact entry

Satellite/Connect - Satellite connection string and satellite COM port of contact entry

Remote Host Address and Port - Remote host TCP/IP address and port of the contact entry

Adding/Editing a Contact

1. Do the following:

- If editing a contact, touch a record to modify (a checkmark appears next to the entry), then touch **Actions>Edit Contact**.
- If adding a contact, touch **Actions>Add Contact**.

2. Enter or edit information in the appropriate fields below:

Name - Label for this contact.

Email - Email address of contact

Modem

Modem # (Computer) - Phone number of the modem

Modem COM Port - Comm Port of the modem installed on the console

Modem Dial-Out String - Add an alternate modem dial-out initialization string that overrides the one stored in the Comm Device Setup screen. Leave this field blank to use the modem dial-out initialization string stored on the Comm Device Setup screen.

NOTE: The Comm Device Setup screen must be changed on the console directly.

Modem Number of Retries - Number of times the console attempts to connect if the last connection attempt fails.

Modem Retry Delay Time - Amount of time to wait between retry attempts.

FAX

FAX # (Computer) - Phone number of the Fax machine.

FAX COM Port - Comm Port of the Fax modem installed on the console.

FAX Dial-Out String - Add an alternate modem dial-out initialization string that overrides the one stored in the Comm Device Setup screen. Leave this field blank to use the modem dial-out initialization string stored on the Comm Device Setup screen.

NOTE: The Comm Device Setup screen must be changed on the console directly.

FAX Number of Retries - Number of times the console attempts to connect if the last connection attempt fails.

FAX Retry Delay Time - Amount of time to wait between retry attempts.

TCP/IP

Remote TCP/IP Address - An IP address with the format XXX.XXX.XXX.XXX; where XXX is from 0 to 255 (you can also specify a server address such as myServer.bigg.com).

Remote TCP/IP Port - TCP/IP port of the remote host.

Local TCP/IP COM Port - Local TCP/IP assignment.

TCP/IP Number of Retries - Number of times the console attempts to connect if the last connection attempt fails.

TCP/IP Retry Delay Time - Amount of time to wait between retry attempts.

Satellite

Satellite Conn. String - Satellite connection string.

Satellite COM Port - Satellite assignment for the current contact

Satellite Number of Retries - Number of times the console attempts to connect if the last connection attempt fails

Satellite Retry Delay Time - Amount of time to wait between retry attempts.

Setup>Automatic Events>AutoXmit

This screen lets you set up messages that automatically transmit (AutoXmit) through an RS-232 communication port when alarms are posted by the console.

NOTE: To use this feature, you need to have an RS-232 module installed on your console. The Diagnostics>Module>Communication screen shows if this module is currently installed.

The screenshot shows the 'AutoXmit' configuration screen. At the top, it says 'System Status' with '0 Warning(s)' and '0 Alarm(s)' and the date/time '07/22/2015 02:50 PM'. Below this is a navigation bar with 'Setup', 'Automatic Events', and 'AutoXmit'. On the left is a sidebar with 'Exit', 'Previous', 'Next', and 'Actions' buttons. The main area contains the following fields:

- Comm Port:** A dropdown menu showing 'COMM 1'.
- Delay Time (Secs):** A text input field with the value '5'.
- Repeat Time (Mins):** A text input field with the value '60'.
- Leak Alarm:** A dropdown menu showing 'Disabled'. Below it is a message format field containing '\$LEAK##\$'.
- High Water Alarm:** A dropdown menu showing 'Disabled'. Below it is a message format field containing '\$WATR##\$'.

On the right side of the main area, there are two buttons: a checkmark button and an 'X' button. A 'Print (0)' button is also visible in the top right corner.

Comm Port

Touch to select a Comm port for serial communication (for example, "Comm.id1")

NOTE: Only Comm1 supports AutoXmit.

Delay Time (Secs)

Touch to enter an amount of time in seconds (up to 240) to wait after an alarm is posted by the console before the message is sent.

Repeat Time (Mins)

[Field applies If you select "repeat" for any alarm message (see below)]

Touch to enter an amount of time (up to 240 minutes) to wait before the console retransmits the message up until the alarm is cleared.

AutoXmit Alarm List

- Leak Alarm
- High Water Alarm
- Overfill Alarm
- Low Limit Alarm
- Theft Alarm
- Delivery Start Alarm
- Delivery Stop Alarm
- External Input On Alarm
- External Input Off Alarm
- Sensor Fuel Alarm
- Sensor Water Alarm
- Sensor Out Alarm

Selecting Alarms to Automatically transmit.

1. The default selection is **Disable** - Do not transmit a message.
2. To transmit a message for an alarm, in the field next to that alarm, touch the drop down arrow to select Transmit or Repeat:

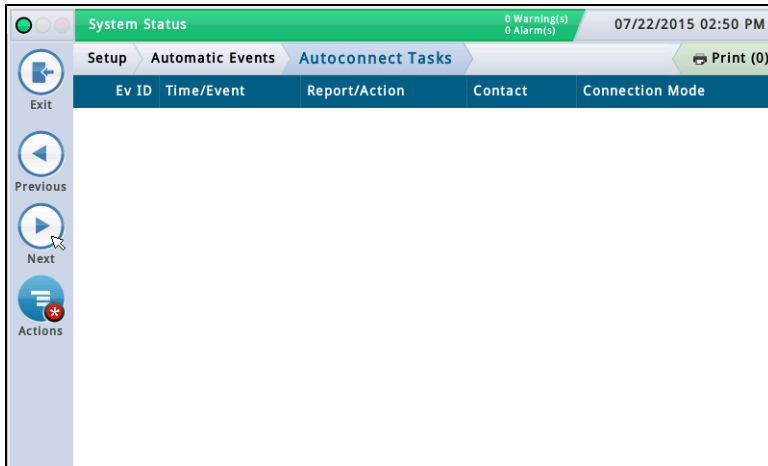
Transmit - Transmit one message when this alarm is posted.

Repeat - Transmit a message continuously until the alarm is cleared. Between transmissions wait for the period of time specified in the **Repeat Time (mins.)** field above.

3. The second field below each alarm shows the string format that controls how the message appears. Veeder-Root recommends that you accept the default selection.

Setup>Automatic Events>Autoconnect Tasks

This screen lets you view, add, edit, or delete tasks that automatically transmit information. One task can involve many combinations of reports or actions, times, events, contacts, and connection modes.



Screen Column Descriptions

Ev ID - Identifier automatically assigned to an event by the console.

Time/Event - Time or event that triggers the device-related task (e.g., daily at 3:00 PM). May have more than one listed.

Report/Action - Reports to be issued (e.g., inventory report), or the auto connect action (e.g., outbound connection).

Contact - Organization/person to be contacted (e.g., "ABC Mgmt.") as defined in Setup > Automatic Events > Address Book.

Connection Mode - Device used (e.g., computer) and format of the data to be transmitted (e.g., TCP/IP, Modem, FAX, Satellite, Email).

Adding or Editing A Task

- Do the following:
 - If editing a task, select a task entry to modify (a checkmark appears next to the entry), then select **Actions>Edit Task**.
 - If adding a task, select **Actions>Add Task**.
- Touch the fields below to enter the appropriate information:

Connection Mode

- Modem - To use, a USB modem must be installed to the console.
- Remote TCP/IP Address - To use, an Ethernet comm device must be installed in the console.
- Satellite - To use, a satellite comm device must be installed to the console.
- Email - To use, an e-mail feature must be installed on the console.
- Fax - To use, if a fax modem card must be installed in the console.

Reports

[only available if you select a connection mode of Email or Fax]

One (or more) reports that will be sent with the trigger.

Contact

Name of an address book contact (as defined in Setup>Automatic Events>Address Book).

Trigger

Trigger for the automatic task:

On Time - Select the time and date for this autoconnect task.

On Event - Select the event and/or alarm for this autoconnect task. Navigate to the proper sub-items in the list to make your choice.

- Choices in capital letters (AUTO EVENT, CONTACT, COMM, PRODUCT, TANK) are alarms
- Choices in upper and lower case (Delivery Start, Delivery Complete, etc.) are events.

- Touch  to save your settings.

Deleting A Task

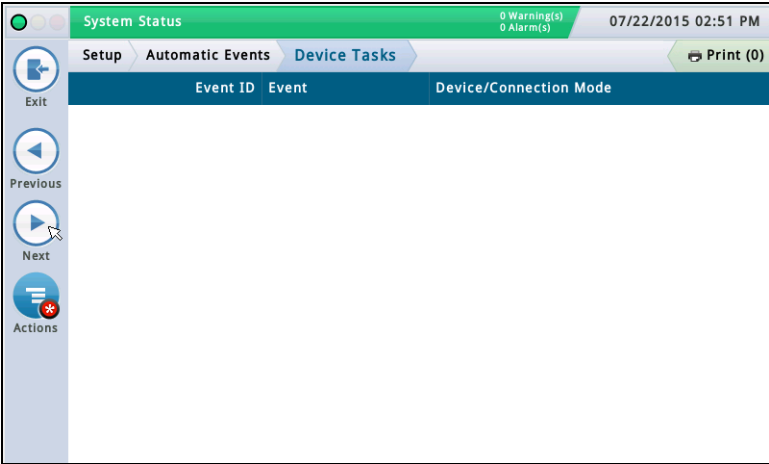
- Select the task record entry that you want to delete (a checkmark appears next to the entry).

- Touch **Actions**  then **Remove Task**.

- Touch  to save your settings.

Setup>Automatic Events>Device Tasks

This screen lists the device tasks currently configured for the console, and it also allows you to add, edit, or delete these tasks.



Screen Column Descriptions

- Ev ID - Identifier automatically assigned to an event by the console.
- Time/Event - Event that triggers the task (for example, "Overfill Alarm").
- Device/Connection Mode - Label of the device that is involved in performing the function (usually this is a relay, such as "Relay 1").

Adding or Editing A Task

- Do the following:
 - If editing a task, select a task record to modify (a checkmark appears next to the entry), then select **Actions>Edit Task**.
 - If adding a task, select **Actions>Add Task**.

- Touch the fields below to enter or edit the appropriate information:
 - Device** - Select the relay from the list of available relays on your console (you can also select other devices).
 - Trigger** - Select a trigger from the list of available triggers (Events). The triggers that you see depend on your configuration. For example, a console alarm can be a trigger for a device task.

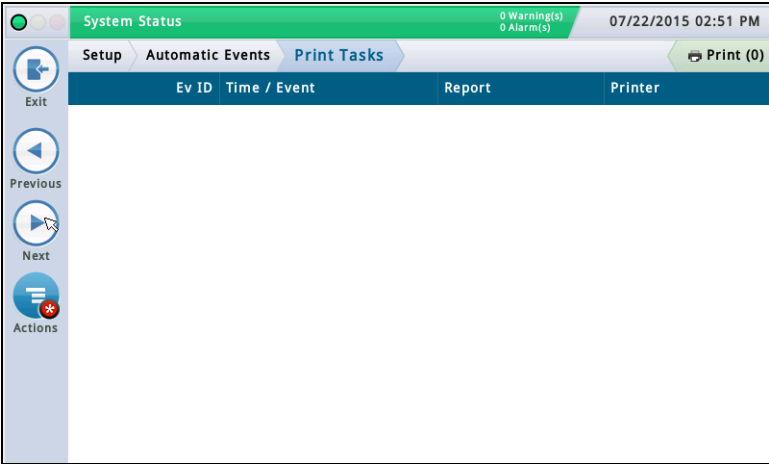
- Touch to save your settings.

Deleting A Task

- Select the task record entry that you want to delete (a checkmark appears next to the entry).
- Touch **Actions** then **Delete Task**.
- Touch to save your settings.

Setup>Automatic Events>Print Tasks

This screen lists the printer-related automatic activities currently configured for the console, and it also lets you add, edit, or delete these tasks.



Screen Column Descriptions

- Ev ID - Console-automatically assigned identifier (1- 30) to an event
- Time / Event - Time or event that triggers the task (e.g., Daily at 3:00 PM)
- Report - Name of report to be printed
- Printer - Printer device label

Adding or Editing A Task

- Do the following:
 - If editing a task, select a task record to modify (a checkmark appears next to the entry), then select **Actions>Edit Task**.
 - If adding a task, select **Actions>Add Task**.

2. Touch the fields below to enter or edit the appropriate information:

- **Event** - Select the Event that will trigger the task (depends on your configuration).
- **Printer** - Select the printer printing this task.
- **Report** - Select the report (or reports) to print.

3. Touch  to save your settings.

Deleting A Task

- Select the task record entry that you want to delete (a checkmark appears next to the entry).
- Touch **Actions**  then **Delete Task**.
- Touch  to save your settings.

Setup>Automatic Events>All Tasks

This screen lists tasks that automatically transmit information. One task can involve many combinations of reports or actions, times, events, contacts, and connection modes. You can store up to 30 auto connect tasks.

Ev Id	Time / Event	Report / Action	Contact	Device
1	• Sensor Water Alarm : Disabled • Sensor Out Alarm : Disabled • Reserved : Disabled • Reserved : Disabled • Reserved : Disabled	• AutoXmit	Co1	Co1

Screen Column Descriptions

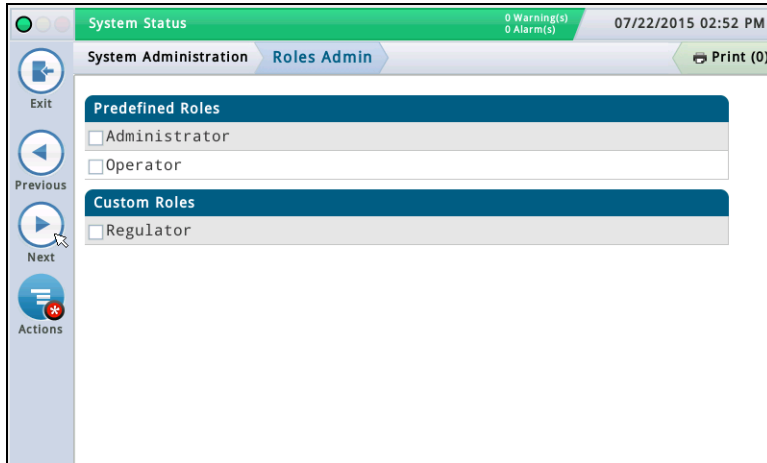
- Ev Id - Identifier automatically assigned to an event by the console.
- Time / Event - Time or event that triggers the device-related task (e.g., "Leak Alarm: Disabled"); may have more than one listed.
- Report / Action - Reports to be issued (e.g., "Inventory Report"), or the auto connect action (e.g., "AutoXmit").
- Contact - Organization/person to be contacted (e.g., ABC Mgmt.) as defined in Setup > Automatic Events > Address Book.
- Device / Connection Mode - Device used (e.g., "Co 1") and format of the data to be transmitted (e.g., "EMAIL", etc.).

System Administration>Roles Admin

This screen lets you set up roles (levels of security) and customize how each role should behave for a user who is assigned to that role.

Setting up a role involves specifying the screens that a user can view and/or edit/perform.

- The first user created must have the admin role.
- Only users with an Administrator role can add, edit, or delete roles.
- You cannot edit or delete the Predefined Roles of Administrator or Operator.
- For the user login feature to be activated, you need to **Enable the Front Panel Security** field in "Setup>System>Security" screen.



Predefined Roles Description

Administrator - Able to edit console configuration, perform software upgrades, generate reports, and start various diagnostic tests. Also able to create new roles and users.

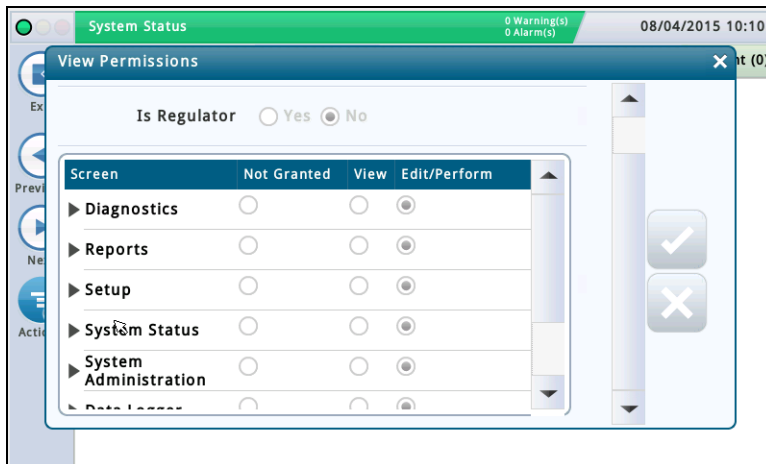
Operator - Able to view and generate reports and perform certain manual functions, like a manual delivery.

Custom Roles Description

- Regulator - Can print and review the console reports.
- Any custom roles you have created - User- defined.

Viewing Role Permissions (available to an Administrator user only)

1. Touch **Actions>View Permissions**:



2. View the permissions by program section or by individual program as describe below:

Field	Description
Is Regulator	Lets you choose whether this role is regulator role or not (the regulator role can review the console reports)
Screen	Lets you view permissions by program section. Click on the down arrow by the section to view the permissions of individual programs within that section.
Not Granted	⊖ Designates that permissions to view or edit/performance have not been granted to this program or program section
View	⊙ Designates that this program or program section can be viewed by this role
Edit/Perform	⊙ Designates that this program or program section can be edited/performed by this role

3. Touch the **X** in the upper right corner of the screen to exit the screen.

Adding a Role (available to an Administrator user only)

1. Touch **Actions>Add Role**:



2. Enter information in the Add New Role fields as described below:

Field	Description
Role	Name of Role
Is Regulator	Lets you choose whether this role is regulator role or not (the regulator role can review the console reports)
Screen	Lets you view permissions by program section. Click on the down arrow by the section to set the permissions of individual programs within that section.
Not Granted	⊖ Designates that permissions to view or edit/performance have not been granted to this program or program section
View	⊙ Designates that this program or program section can be viewed by this role
Edit/Perform	⊙ Designates that this program or program section can be edited/performed by this role

3. Touch ☒ to save your entry. Touch ☒ and touch the **X** in the upper right corner to exit without saving changes.

Continued on next page

System Administration>Roles Admin - Concluded

Cloning A Role (available to an Administrator user only)

Cloning a role lets you copy a role (and all of its permissions) to use as a starting point when creating a new role. This lets you save setup time when the new role is similar in nature to an existing role.

1. Select a role to clone (a checkmark appears next to the entry), then select **Actions>Clone Role**:

Screen	Not Granted	View	Edit/Perform
▶ Diagnostics	☐	☐	☒
▶ Reports	☐	☐	☒
▶ Setup	☐	☐	☒
▶ System Status	☐	☐	☒
▶ System Administration	☐	☐	☒
▶ Data Logger	☐	☐	☒

2. Enter information in the Clone Role fields as described below::

Field	Description
Role	Name of Role
Is Regulator	Lets you choose whether this role is regulator role or not (the regulator role can review the console reports).
Screen	Lets you set permissions by program section. Click on the down arrow by the section to set the permissions of individual programs within that section.
Not Granted	☐ Designates that permissions to view or edit/perform have not been granted to this program or program section.
View	☒ Designates that this program or program section can be viewed by this role.
Edit/Perform	☒ Designates that this program or program section can be edited/performed by this role.

3. Touch ☒ to save your entry. Touch ☒ and touch the **X** in the upper right corner to exit without saving changes.

Editing A Role (available to an Administrator user only)

NOTE: You cannot edit the Operator or Administrator roles.

1. Select a role to modify (a checkmark appears next to the entry), then select **Actions>Edit Role**:

Screen	Not Granted	View	Edit/Perform
▶ Diagnostics	☐	☐	☒
▶ Reports	☒	☐	☐
▶ Setup	☒	☐	☐
▶ Custom Status	☐	☐	☐

2. Enter information in the Edit Role fields as described below:

Field	Description
Role	Name of Role
Is Regulator	Lets you choose whether this role is regulator role or not.
Screen	Lets you set permissions by program section. Click on the down arrow by the section to set the permissions of individual programs within that section.
Not Granted	☐ Designates that permissions to view or edit/perform have not been granted to this program or program section.
View	☒ Designates that this program or program section can be viewed by this role.
Edit/Perform	☒ Designates that this program or program section can be edited/performed by this role.

3. Touch ☒ to save your entry. Touch ☒ and touch the **X** in the upper right corner to exit without saving changes.

Deleting A Role (available to an Administrator user only)

NOTE: You can not delete the Operator or Administrator roles. Also, no user can be assigned to a role that you want to delete (the Delete option will be unavailable). In that situation, reassign users to another role, or delete users assigned to that role, before deleting that role.

1. Select a role to delete (a checkmark appears next to the entry), then select **Actions>Delete Role**:

2. Touch ☒ to delete selected role or ☒ to cancel deletion.

System Administration>Users Admin

This screen lets you set up users with different roles (levels of security) so you can control a user's access to specific screens on the console. This is necessary when you want to ensure untrained personnel are not changing the programming and possibly disabling different aspects of your compliance reporting. NOTE: the first user created must have the admin role.

IMPORTANT

- If this is the first time you are entering users on the console, you have full access to add, modify, or delete users at any role (level). Once you setup users, however, only users with an Administrator role have the ability to add or delete users.
- After you add a user, make sure you enable the Front Panel Security field in "Setup>System>Security" screen for the user login feature to be activated.

The data in this columns of this screen will differ for Users and Administrators as follows:

Logged in User

User - Login name of the person who is currently logged in.

Full Name - Full name of the logged in user.

Role - Role (level of security) assigned to the logged in user.

Email - Email address of logged in user.

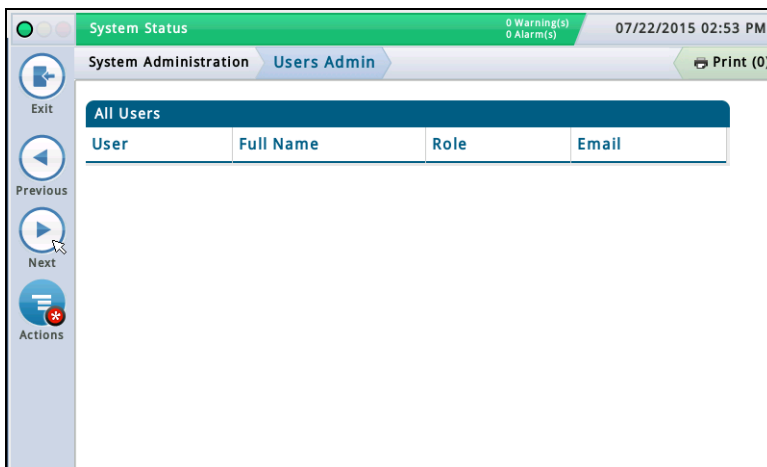
Logged In Administrator User

User - Login name of the Admin user.

Full Name - Full name of the Admin user.

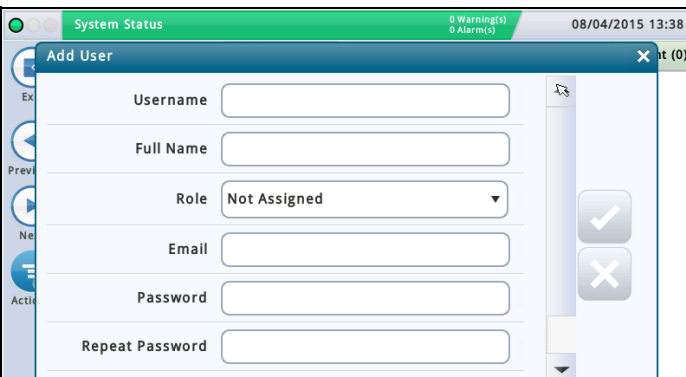
Role - Role (level of security) assigned to that Admin user.

Email - Email address of that Admin user.



Adding a User (available to an Administrator user only)

1. Select **Actions>Add User**:



2. Enter information in the Add User fields as described below:

Field	Description
User	Login name of user (cannot have spaces).
Full Name	Full name of user.
Role	Level of security for that user - choices are: • Administrator • Operator • Regulator • Any custom roles that you have setup for (example, "Manager"). See Action>Help>System Administration> Roles Admin topic for more information.
Email	Email address of user.
Password	Password for user (minimum of 3; maximum of 123 alpha-numeric characters).
Repeat Password	Repeat entry of password to confirm.
Force Change Password [checkbox]	When checked, forces the user to enter a new password then next time the user logs on to the console.

3. Touch ☒ to save your entry. Touch ☐ and touch the **X** in the upper right corner to exit without saving changes.

Editing a User (available to that user and/or an Administrator user) - NOTE: there has to be at least one user with an Admin role.

You may need to edit a user if a person's responsibility has changed and you need to reassign their role.

1. Select a user to modify (a checkmark appears next to the entry), then select **Actions>Edit User**.
2. Change information in the following fields. NOTE: You cannot change the login name of a user. If you need to change the login name, delete the user, and then re-enter a new user with a login name you desire.

Field	Description
Full Name	Full name of user
Email	Email address of user
Role [field accessible by an Administrator user only]	Level of security for that user - choices are: • Administrator • Operator • Regulator • Any custom roles that you have setup for (example, "Manager"). See Action>Help>System Administration> Roles Admin topic for more information.
Change Password [checkbox]	When checked, let's a user change his/her password while in this screen
Password	Password for user (minimum of 3 alpha-numeric characters)
Repeat Password	Repeat entry of password to confirm
Force Change Password [checkbox] [field accessible by an Administrator user only]	When checked, forces the user to enter a new password then next time the user logs on to the console

Continued on next page

System Administration>Users Admin - Concluded

3. Touch ☒ to save your entry. Touch ☐ and touch the **X** in the upper right corner to exit without saving changes.

Deleting a User (available to an Administrator user only)

NOTE: You can not delete or reassign the role of the last Admin user - there has to be at least one user with an Admin role.

1. Select a user to delete (a checkmark appears next to the entry, and then select **Actions>Delete User**.

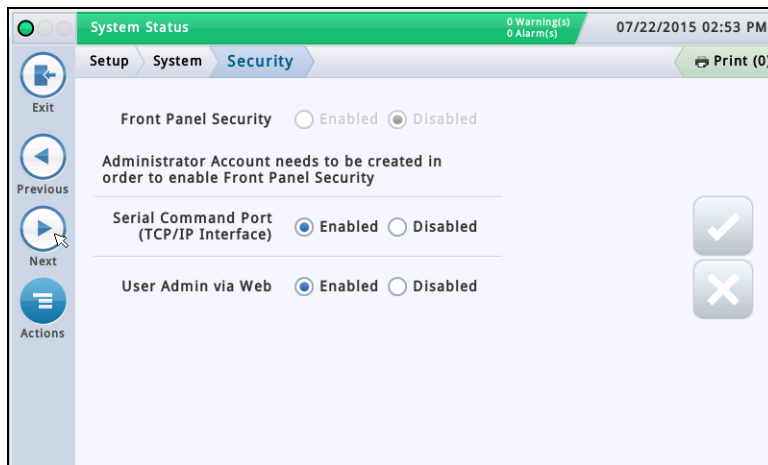
2. Touch ☒ to delete selected role or ☐ to cancel deletion. .

Setup>System>Security

This screen lets you enable the front panel security feature which requires a password for a user to login to the console. With this feature disabled (i.e., no password required), all users can access all screens. When enabled, users must login with the appropriate password to gain access to the programs they are allowed to view (as set up in the "System Administration>Users Admin" screen). This is helpful when you want to limit access to sensitive areas of the system, such as the setup and diagnostic screens.

NOTES:

- This feature cannot be enabled until an Administrator account has been created (done in the System Administration>Users Admin screen).
- Once the Front Panel Security field is enabled, you must enter the correct password or you will remain in the logged-out mode. In the logged-out mode, you can only view a very limited number of screens (such as system status).



Front Panel Security

Touch to enable or disable the Front Panel Security feature.

Serial Command Port (TCP/IP Interface)

Default is enabled.

This will completely disable access to the serial command port via Ethernet. The port is defined under Setup > Communication > Ethernet Port Serial Command Port (default is 10001).

Serial commands should still continue to function via the physical RS232 interface (Serial COM Port 1 & 2).

• Serial Command Port: This is the port many companies use for entering RS232/Serial commands via TCP/IP port 10001. Disabling this will prevent remote systems from changing parameters on the gauge.

User Admin via Web

Default is enabled

The "User Admin via Web" setting will allow an Administrator to provide user administration via the web.

Today, it is possible to configure user's via web. The "user Management via Web" control will allow the system administrator to enable / disable the "Users Admin" link on the screen System Administration > Users Admin. Note: this only enables / disables access to System Administration > Users Admin.

The users will still be able to login to the Web, if they have Web access rights.

Software Maintenance

This section contains information on TLS-450PLUS and TLS4 software maintenance screens. Veeder-Root recommends frequent database backups to ensure setup and report data archives are up to date.

Touch the Menu>Software Maintenance icons to view a list of the available Software Maintenance screens:

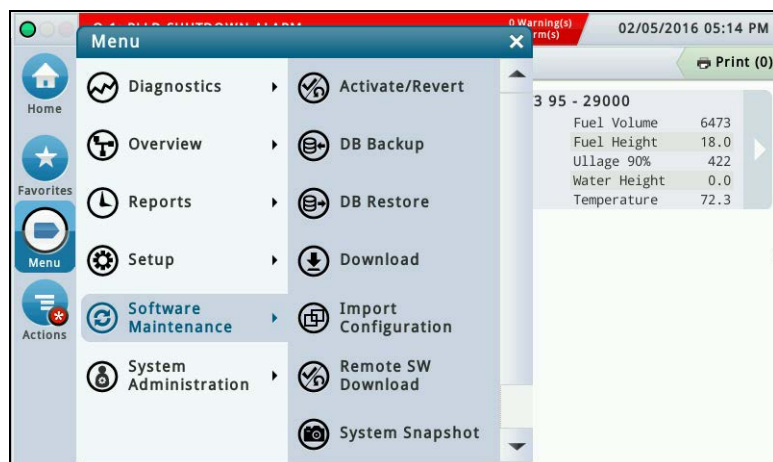


Figure 5. Software Maintenance Screen

Activate/Revert Screen (Menu>Software Maintenance>Activate/Revert)



This screen lets you activate newly installed software or revert to a previously stored version of software. During the activation process, several dialog boxes will be displayed to inform you of key events.

 **NOTE: Activation will reboot the console and could interrupt dispensing.**

Notes on Reverting to a Previous Software Version

A copy of the previous (older) system software and databases is stored on the console SD card. If the current (newer) version of system software/features does not perform properly, the Revert operation gives you the ability to revert to the previous software version stored in the SD card. No USB devices are required for the revert operation.



During feature activation, which only takes a few minutes, there must be no dispensing.

Table 1. Activate/Revert Screen Field Descriptions

Field	Description
Current Version	Current version of software (x.xx xxx.x) installed in the console
Available Version	Version of software that can be accessed by the console (Not Available will display if a version of software has not been stored).
Current Operation	Status of the console: Idle (no software is being installed or reverted), or Activating (a software install is in progress)
Connection Message	Not applicable to a revert or upgrade process.
Disclaimer	Lists any messages for the newly activated software.
Click to acknowledge the system will be stopped [check box]	Select this check box to agree to start a software install/reversion procedure.
Revert	Starts the actual Revert process. Note: When you click Revert, a confirmation prompt displays, letting you know that the system will restart (reboot) to do the revert. If the system is not in use, Touch the  button to continue. The system reboots and the system is reverted.
Activate	Starts the actual Activate process. Note: When you click Activate, a confirmation prompt displays, letting you know that the system will restart (reboot) to do the revert. If the system is not in use, Touch the  button to continue. The system reboots and the new system software is activated.

DB Backup (Menu>Software Maintenance>DB Backup)

This screen lets you backup the data file of the console. A FAT32 formatted USB thumb drive is required.

Note: a thumb drive will only store 5 backups. On the 6th backup, the oldest backup record is deleted from the thumb drive.



Keep the V-R Code/Feature and Recovery USB thumb drives in a secure location.

Table 2. DB Backup Screen Field Descriptions

Field	Description
Current Version	Current version of software (x.xx xxx.x) installed in the console
Available Version	Not applicable to a backup.
Current Operation	Status of the console: Idle (no backup procedure is executing), or Discovering Backup Device (system is validating installed thumb drive) Backup Operation has started (backup is in progress)
Connection Message	Lists any messages that may occur between the device and the console.
Backup destination	Backup destination (device) for your data files (the normal choice is "Thumb drive")
Version	USB drive name.
Backup	Starts the actual backup.
Backup Progress	Completion percentage of backup process.

Example Database Backup Procedure

NOTE: A valid backup thumb drive must be Windows FAT32 formatted and must have at least 4 GB of available memory.

1. Insert the backup thumb drive into one of the console's USB ports.
2. Navigate to the Menu>Software Maintenance>DB Backup screen.
3. Select thumb-drive as the backup destination. Notice the Version field displays thumb drive information.
4. Touch **Backup** button to begin the backup.
5. After completing the backup, the 'Backup Completed Successfully!' message appears.

6. Remove the thumb drive and put it in a secure location.



NOTE: For ultimate protection against possible loss of data and to protect against system crashes, run the DB Backup operation weekly.

DB Restore (Menu>Software Maintenance>DB Restore)

This screen lets you restore the data files of the console. A valid USB recovery thumb drive (with previously backed up data from this console) is required.

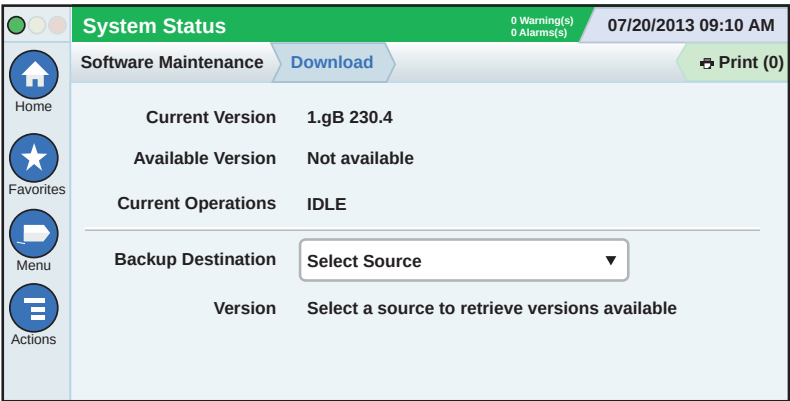


Keep the V-R Code/Feature and Recovery USB thumb drives in a secure location.

Table 3. DB Restore Screen Field Descriptions

Field	Description
Current Version	Current version of software (x.xx xxx.x) installed in the console
Available Version	Version of software that can be accessed by the console (Not applicable to a backup).
Current Operation	Status of the console: Idle (no restore procedure is executing), or Discovering Restore Device (system is validating installed thumb drive) Restore Operation in Progress (restore is in progress)
Connection Message	Lists any messages that may occur between the device and the console.
Restore destination	Select the device containing the data files for the restore (the normal choice is "Thumbdrive").
Version	Date and software version of when the data archive was created.
Restore	Starts the actual restore. Note: When you click Restore, a confirmation prompt displays, letting you know that the system will restart (reboot) to do the restore. If the system is not in use, touch the  button to continue. The system reboots and the database is restored.
Restore Progress	Completion percentage of restore process.

Download (Menu>Software Maintenance>Download)



This screen lets you do USB downloads from either a valid V-R Code/Features USB thumb drive or a V-R Recovery USB thumb drive that is plugged into a USB port in the console.

 **Keep the V-R Code/Feature and Recovery USB thumb drives in a secure location.**

Table 4. Download Screen Field Descriptions

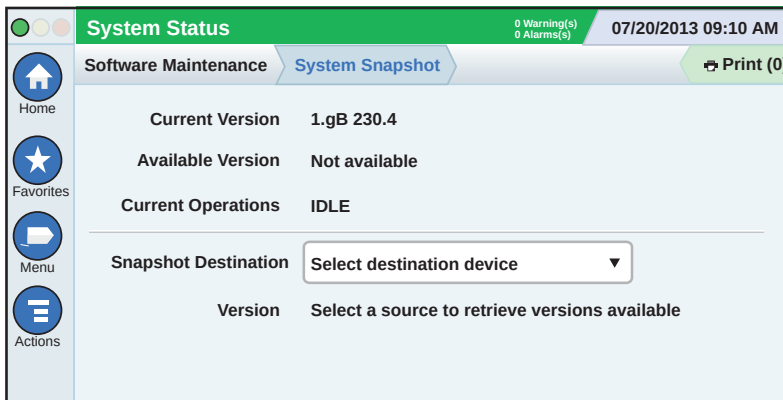
Field	Description
Current Version	Current version of software (x.xx xxx.x) installed in the console
Available Version	Version of software that can be accessed on the USB drive.
Current Operation	Status of the console: Idle (no backup procedure is executing), Scanning Devices (system is validating installed thumb drive), Reading Update List Downloading
Connection Message	Lists any messages that may occur between the device and the console.
Download Source	Device where the files are coming from.
Version	Date and software version of when the data archive was created.
Download	Starts the actual download. NOTE: When you click Download, a confirmation prompt displays, letting you know that the system will restart (reboot) to do the download. If the system is not in use, touch the  button to continue. The system reboots and the database is restored.
Download Progress	Completion percentage of download process.

Example Software Download Procedure

1. Insert the Software Maintenance thumb drive into one of the USB ports.
2. Navigate to the Menu>Software Maintenance>Download screen.

3. Touch the Download Source down arrow and select the thumb drive. Notice the Version field displays contained software version.
4. Touch the **Download** button to begin the software download.
5. After successful completion of the download (approximately 30 minutes), the 'Download Completed' message appears.
6. Navigate to the Menu>Software Maintenance>Activate/Revert screen. Notice the Current version and Available (downloaded) version are displayed.
7. Touch the box beside the message 'Click to acknowledge the system will be stopped.'
8. Touch the Activate button to overwrite the Current of software with the Available (just downloaded) version of software.
9. The Confirmation Needed dialog box displays. Touch the ✓ button to confirm and activate the new software, or touch the X button to cancel the activation.

System Snapshot (Menu>Software Maintenance>System Snapshot)



If a problem cannot be diagnosed over the phone with technical support, Tech Support may request a System Snapshot be taken and returned V-R. The System Snapshot captures comprehensive system data to facilitate a thorough problem analysis. This screen lets you copy a System Snapshot to a USB thumb drive that is plugged into a USB port in the console.

Table 5.

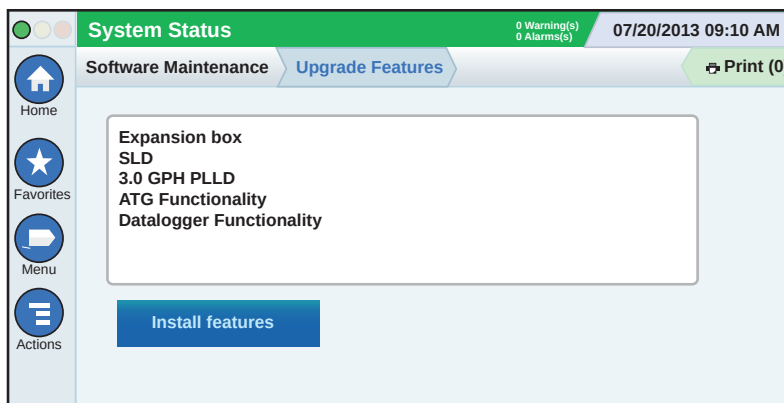
System Snapshot Screen Field Descriptions

Field	Description
Current Version	Current version of software (x.xx xxx.x) installed in the console
Available Version	Previous version of software or Not Available message.
Current Operation	Status of the console: Idle Activate Snapshot
Snapshot Destination	Select destination device
Version	Describes the destination device.

Example System Snapshot Procedure

1. Insert a USB thumb drive with at least 10 Mb of free space into one of the USB ports.
2. Navigate to the Menu>Software Maintenance>System Snapshot screen.
3. Touch the Snapshot Destination field down arrow and select the thumb drive. Notice the Version field displays information about the thumb drive.
4. Touch the **Take Snapshot** button to begin the procedure.
5. After successful completion of the snapshot (approximately 3 minutes), the 'Snapshot Completed' message appears and you can remove the thumb drive.

Upgrade Features (Menu>Software Maintenance>Upgrade Features)



This screen lets you activate features to be installed on your console. During the activation process, several dialog boxes will be displayed to inform you of key events.



During feature activation, which only takes a few minutes, there must be no dispensing!

Following activation, the console converts the setup databases. Once new features are installed, setup(s) relevant to the new feature(s) will be required.

Table 6. Upgrade Features Screen Field Descriptions

Field	Description
Feature (box)	List features which are available to be activated. Multiple features may be activated concurrently. Select the boxes beside each of the desired items in this column. If you change your mind about a selection, select the box again to remove the check.
Install features button	Touch to start the installation process.
Status [during installation]	Current status of each feature with one of the following messages: Ready to Activate Activation in Progress



Line Leak Detection Systems, UST Leak Detection Equipment, Mag Sump Sensor, and Other Sensors

Operability Testing Guide

Notice

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Contact TLS Systems Technical Support for additional troubleshooting information at 800-323-1799.

DAMAGE CLAIMS / LOST EQUIPMENT

Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

Veeder-Root must be notified of any damages and/or shortages within 30 days of receipt of the shipment, as stated in our Terms and Conditions.

VEEDER-ROOT'S PREFERRED CARRIER

1. Contact Veeder-Root Customer Service at 800-873-3313 with the specific part numbers and quantities that were missing or received damaged.
2. Fax signed Bill of Lading (BOL) to Veeder-Root Customer Service at 800-234-5350.
3. Veeder-Root will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

CUSTOMER'S PREFERRED CARRIER

1. It is the customer's responsibility to file a claim with their carrier.
2. Customer may submit a replacement purchase order. Customer is responsible for all charges and freight associated with replacement order. Customer Service will work with production facility to have the replacement product shipped as soon as possible.
3. If "lost" equipment is delivered at a later date and is not needed, Veeder-Root will allow a Return to Stock without a restocking fee.
4. Veeder-Root will NOT be responsible for any compensation when a customer chooses their own carrier.

RETURN SHIPPING

For the parts return procedure, please follow the appropriate instructions in the "General Returned Goods Policy" pages in the "Policies and Literature" section of the Veeder-Root **North American Environmental Products** price list. Veeder-Root will not accept any return product without a Return Goods Authorization (RGA) number clearly printed on the outside of the package.

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Appendix A - Filtered Alarms

Introduction

This manual contains instructions to verify operability for Veeder-Root WPLLD and PLLD Line Leak Systems, UST Leak Detection Equipment, Mag Sump Sensor, and other sensors to satisfy requirements of state or local regulations, as applicable.

Veeder-Root environmental monitoring systems installed in accordance with installation manual requirements are designed to detect and report conditions that inhibit proper operation. Veeder-Root systems self-diagnose essential components, and if a component failure is detected, will not complete and report tank and line tests. The system will issue an audible and visual alarm when a failed or disconnected sensor is detected.

Veeder-Root recommends periodic operability testing on its leak detections systems at a minimum annually.

General Testing Requirements

- The certified Veeder-Root Technicians below must be available (on site) to assist in these types of testing.
 - **Technician Certification (Level 2/3):** Contractors holding valid Technician Certifications are approved to perform installation checkout, startup, programming and operations training, system tests, troubleshooting and servicing for all Veeder-Root Series Tank Monitoring Systems, including Line Leak Detection..
- Comply with all recommended safety practices identified by OSHA and your employer.
- Follow all installation requirements per NFPA 30A.
- Review and comply with all the safety warnings in the manuals listed above and any other Federal, State or Local requirements.

Reference Documents

The following reference documents may be helpful when performing the operability tests outlined in this manual.

WPLLD & PLLD Systems

- Veeder-Root TLS-450 Setup and Operation Screens Manual (577013-940) - WPLLD is not supported
- Veeder-Root TLS-3XX Operators Manual (576013-610)
- Veeder-Root TLS-3XX Setup Manual (576013-623)
- Veeder-Root W/PLLD Troubleshooting Guide (577013-344)
- Veeder-Root Performance results Certification Reports (576013-308)
- Veeder-Root Line Leak Application Guide (577013-465)

- Red Jacket Test Procedures for Electronic Leak Detectors (RJP-2018 Rev. A 2/01)
- Red Jacket Engineering Report Test Procedures for Mechanical Leak Detectors (Red Jacket document RJ-20)
- Red Jacket Engineering Report Testing Mechanical Leak Detectors with the FX Tester (Red Jacket document 051-272)

UST Leak Detection Equipment

- Veeder-Root TLS-3XX Operators Manual (576013-610)
- Veeder-Root TLS-450 Setup, Operation and Diagnostics Screens Manual (577013-940)

Sensors

- Veeder-Root TLS-3XX Operators Manual (576013-610)
- Veeder-Root TLS-3XX Setup Manual (576013-623)
- Veeder-Root TLS-450 Setup, Operation and Diagnostics Screens Manual (577013-940)

Safety Precautions

The following safety symbols may be used throughout this manual to alert you to important safety hazards and precautions

 EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.	 FLAMMABLE Fuels and their vapors are extremely flammable.
 ELECTRICITY High voltage exists in, and is supplied to, the device. A potential shock hazard exists.	 TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.
 APPROVED CONTAINERS Use nonbreakable, clearly marked containers, suitable for collecting and transporting hazardous fuels during service.	 READ ALL RELATED MANUALS Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.
 WARNING Heed the adjacent instructions to avoid damage to equipment, property, environment or personal injury.	

⚠ WARNING

This product is installed in systems operating on lethal voltages, near locations where highly combustible fuels or vapors may be present.

SWITCHING ON THE PUMP WHILE FITTING TEST EQUIPMENT TO DISPENSER SHEAR VALVES OR MAKING WIRING CHANGES FOR TESTING CAN CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH.

Product spillage could create serious environmental and safety hazards.



1. Read and follow all instructions in this manual, including all safety warnings.
2. Turn off, tag, and lockout power to pumps before removing dispenser shear valve fittings and when disconnecting pump wiring.
3. Dispose of drained fuel properly. Use an approved container suitable for moving fuel. Dispose of fuel soaked materials properly and not into trash barrels that may be used by customers.
4. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes.

Verifying Operability of WPLLD & PLLD Systems

Scope:

These procedures can be used at field sites to determine the operability of Veeder-Root line leak detection systems. Testing line leak detection equipment in accordance with this procedure will verify the equipment's operability for leak detection at 3 gph (gallons per hour), 0.2 gph (if equipped and programmed for this capability), and 0.1 gph (if equipped and programmed for this capability).

Reference Documents:

- Veeder-Root TLS-450 Setup, Operation and Diagnostics Screens Manual (577013-940)
- Veeder-Root TLS-3XX Operators Manual (576013-610)
- Veeder-Root TLS-3XX Setup Manual (576013-623)
- Veeder-Root W/PLLD Troubleshooting Guide (577013-344)
- Veeder-Root Performance results Certification Reports (576013-308)
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- Red Jacket Test Procedures for Electronic Leak Detectors (RJP-2018 Rev. A 2/01)
- Red Jacket Engineering Report Test Procedures for Mechanical Leak Detectors (Red Jacket document RJ-20)
- Red Jacket Engineering Report Testing Mechanical Leak Detectors with the FX Tester (Red Jacket document 051-272)

Before You Begin:

- Verify that the TLS Console is programmed correctly for the Site and the application.
- Identify all breakers for disconnecting power to the pumps (STP).
- Identify and lock all dispenser nozzle handles which could interrupt this test. It is recommended that the entire station be shut down during this procedure to prevent a test from being interrupted.

3 GPH testing utilizing the Red Jacket FTA

Hardware Necessary:

Reference Red Jacket RJ-20, page 8

Testing Procedure:



1. Shut off, lock out, and tag the circuit breakers that provide pump power to the STP. Disconnect the electrical power yoke at the STP for the product being tested.
2. Install the Red Jacket FTA leak simulating apparatus in the impact valve following the procedures defined in the RJ-20 document (pages 2-4, Section I, steps 1 - 10).

3. Calibrate the leak rate corresponding to 3.5 gph at 10 psi (pounds per square inch) per Section V (page 5, steps 22 - 26) of the RJ-20 document.
-  4. Rotate V1 to the vertical position to remove the pressure regulator from the fluid circuit and to place the simulated leak on the product line. Place the discharge hose into a suitable test container.
5. Re-connect the STP yoke, turn on the circuit breaker, and authorize the fueling position. Verify that no product is leaking from the connections to the FTA. Dispense approximately 5 gallons from the dispenser to ensure the line is purged of air.
6. When a steady stream of product is observed flowing from the hose, hang up the nozzle (this will initiate a 3 gph leak test).
7. If you are at a TLS-350 console go to step 7a. If you are at a TLS-450 console go to Step 7b.

- a. Enter the TLS-350 DIAGNOSTIC mode and monitor the front panel display. When the test is complete, the front panel display will read "Test Complete Handle Off", the system will alarm, and will shut down the line. Press the "Alarm/Test" key on the TLS-350 to silence the alarm.

Note: During the 3 gph test, the STP will turn On and Off intermittently. Do NOT assume the test has completed until the TLS Console has alarmed.

Note: If the test does NOT fail, the leak rate needs to be confirmed. Confirm the leak rate at pump pressure by referring to the procedure on page 2 of the RJP-2018 document (note that 3.5 gph at 10 psi with a pump-on pressure of 28 psi = 369 ml/minute). If the leak rate is correct, refer to the W/PLLD Troubleshooting Guide for instructions. Proceed to Step 8.

- b. At the TLS-450, touch the Home button, touch the Diagnostic button, touch the PLLD button to display the PLLD Diagnostics - Manual Test tab screen. When the test is complete, the Manual Test Status column will read "Test Complete", the system will alarm, and will shut down the line. Touch the "Alarm" button once to view the Active Alarm report and a second time to silence the alarm.

Note: During the 3 gph test, the STP will turn On and Off intermittently. Do NOT assume the test has completed until the TLS Console has alarmed.

Note: If the test does NOT fail, the leak rate needs to be confirmed. Confirm the leak rate at pump pressure by referring to the procedure on page 2 of the RJP-2018 document (note that 3.5 gph at 10 psi with a pump-on pressure of 28 psi = 369 ml/minute). If the leak rate is correct, refer to the W/PLLD Troubleshooting Guide for instructions. Proceed to Step 8.

-  8. Close the ball valve to stop the leak, shut off, lock out and tag the STP's circuit breaker, and disconnect the electrical power yoke at the STP for the product being tested.
9. Remove the leak testing hardware and replace the plug on the shear valve using the appropriate sealant on the threads and torque per the manufacturer's specification. **WARNING:** Over tightening the shear valve plug may result in damage to the shear valve.
10. Print the leak test history report for your records.
11. Re-connect the STP yoke and turn on the circuit breaker.
12. If you are at a TLS-350 console go to step 12a. If you are at a TLS-450 console go to Step 12b.
 - a. At the front panel of the TLS-350 press Function until you see 'Start Line Pressure Test, Press <Step> To Continue'. Select the line, select 3.0 test and at the prompt 'Start Line Leak Test Press <Enter>', press 'Enter' to start the test.
 - b. At the TLS-450's PLLD Diagnostics - Manual Test tab screen, select '3.0' test and touch the 'Start' button to begin the test.

13. Visually verify that product is not leaking from the shear valve port during the test, and confirm that the line now passes the 3 gph leak test.

3 GPH testing utilizing the Red Jacket FX tester

Hardware Necessary:

Reference Red Jacket 051-272, page 9

Testing Procedure:



1. Shut off, lock out and tag the circuit breakers that provide power to the STP. Disconnect the electrical power yoke at the STP for the product being tested.

2. Install the Red Jacket FX Tester leak simulating apparatus in the impact valve following the procedures defined in the 051-272 document (page 6-7, Section II - J, steps 1 - 4).



3. Re-connect the STP yoke, turn on the circuit breaker, and authorize the fueling position. Verify that no product is leaking (except into the test can). Dispense approximately 5 gallons from the dispenser into a suitable test container to ensure the line is purged of air.

4. Calibrate the leak rate corresponding to 3.5 gph at 10 psi per Table 1 below.

Table 1

Pump Operating Pressure (psi)	Flow rate to set at Pump Pressure (gph)
20	5.0
22	5.2
24	5.4
26	5.6
28	5.9
30	6.1
32	6.3
34	6.5
36	6.7
38	6.8
40	7.0

5. Set the FX Tester to the leak test position per Section II - B (page 3, step 2a-c) of the 051-272 document.
6. When a steady stream of product is observed flowing from the hose, hang up the nozzle (this will initiate a 3 gph leak test).
7. If you are at a TLS-350 console go to step 7a. If you are at a TLS-450 console go to Step 7b.

- a. Enter the TLS-350 DIAGNOSTIC mode and monitor the front panel display. When the test is complete, the front panel display will read "Test Complete Handle Off", the system will alarm, and will shut down the line. Press the "Alarm/Test" key on the TLS-350 to silence the alarm.

Note: During the 3 gph test, the STP will turn On and Off intermittently. Do NOT assume the test has completed until the TLS Console has alarmed.

Note: If the test does NOT fail, the leak rate needs to be confirmed. Confirm the leak rate at pump pressure by referring to the procedure on page 2 of the RJP-2018 document (note that 3.5 gph at 10 psi with a pump-on pressure of 28 psi = 369 ml/minute). If the leak rate is correct, refer to the W/PLLD Troubleshooting Guide for instructions. Proceed to Step 8.

- b. At the TLS-450, touch the Home button, touch the Diagnostic button, touch the PLLD button to display the PLLD Diagnostics - Manual Test tab screen. When the test is complete, the Manual Test Status column will read "Test Complete", the system will alarm, and will shut down the line. Touch the "Alarm" button once to view the Active Alarm report and a second time to silence the alarm.

Note: During the 3 gph test, the STP will turn On and Off intermittently. Do NOT assume the test has completed until the TLS Console has alarmed.

Note: If the test does NOT fail, the leak rate needs to be confirmed. Confirm the leak rate at pump pressure by referring to the procedure on page 2 of the RJP-2018 document (note that 3.5 gph at 10 psi with a pump-on pressure of 28 psi = 369 ml/minute). If the leak rate is correct, refer to the W/PLLD Troubleshooting Guide for instructions. Proceed to Step 8.



8. Close the ball valve to stop the leak, turn-off, lock out and tag the circuit breaker of the STP for the product being tested, then disconnect the electrical power yoke at that STP.
9. Remove the leak testing hardware and replace the plug on the shear valve using the appropriate sealant on the threads and torque per the manufacturer's specification NOTE: Over tightening the shear valve plug may result in damage to the shear valve.
10. Print the leak test history report for your records.
11. Re-connect the STP yoke and turn on the circuit breaker.
12. If you are at a TLS-350 console go to step 12a. If you are at a TLS-450 console go to Step 12b.
 - a. At the front panel of the TLS-350 press Function until you see 'Start Line Pressure Test, Press <Step> To Continue'. Select the line, select 3.0 test and at the prompt 'Start Line Leak Test Press <Enter>', press 'Enter' to start the test.
 - b. At the TLS-450's PLLD Diagnostics - Manual Test tab screen, select '3.0' test and touch the 'Start' button to begin the test.
13. Visually verify that product is not leaking from the shear valve port during the test, and confirm that the line now passes the 3 gph leak test.
14. Print out the applicable line leak setup and line leak test history for your records.

3 GPH testing utilizing the KWA LS 2003 Leak Detector Tester



1. All fuel accumulated during the testing should be collected in an approved container and returned to the tank at the conclusion of the testing.
2. Shut off, lock out and tag the circuit breakers that provide power to the STP(s) for the product line being tested. Install the quick-connect fittings in the shear valves for the tested pipeline beneath the dispensers or other convenient location.



3. Turn On the power to the turbines.
 4. Authorize a dispenser to pressurize the line. Dispense approximately 5 gallons into a suitable container to ensure that the line is purged of air.
 5. Connect the blue hose to the quick connect in the shear valve on one end and the KWA (Ken Wilcox Associates) LS 2003 on the other end. The selector should be in the "Off" position when connecting the hose.
 6. Turn the selector valve to the "Calibrate" position.
 7. Set the outlet pressure on the LS 2003 to 10 psi on the pressure gauge using the built-in regulator provided with the system.
 8. Set the leak rate to 3.5 gph, (221 ± 10 ml/min) at 10 psi using a stopwatch and the 500 ml graduated cylinder. The position of the float on the flow meter may vary slightly from site to site.
 9. Switch the selector valve to the "Test" position on the LS 2003.
 10. Hang up the nozzle to shut Off the dispenser. The leak detector should automatically perform a 3 gph leak test.
-
11. Turn Off, lock out and tag the turbines at the breaker panel and on the pump controllers.
 12. Remove the quick-connect fittings from the shear valves beneath the dispensers. Check to make sure the safety valve on the shear valve has not been accidentally tripped.
 13. Print the leak test history report for your records.
 14. Re-connect the STP yoke and turn-on the circuit breaker.
 15. If you are at a TLS-350 console go to step 15a. If you are at a TLS-450 console go to Step 15b.
 - a. At the front panel of the TLS-350 press Function until you see 'Start Line Pressure Test, Press <Step> To Continue'?. Select the line, select 3.0 test and at the prompt 'Start Line Leak Test Press <Enter>', press 'Enter' to start the test.
 - b. At the TLS-450's PLLD Diagnostics - Manual Test tab screen, select '3.0' test and touch the 'Start' button to begin the test.
 16. Visually verify that product is not leaking from the shear valve port during the test, and confirm that the line now passes the 3 gph leak test.

Verification of 0.2 and 0.1 GPH Performance (if present)

This procedure verifies that the system is performing 0.2 and 0.1 gph testing, if desired, and if the system is programmed to perform these tests.

Note: Since the hardware and system set-up parameters used for 0.2 and 0.1 gph testing are the same as those used for 3 gph testing, this test procedure can be used to verify system operability for all levels of line leak detection.

1. If you are at a TLS-350 console go to step 1a. If you are at a TLS-450 console go to Step 1b.
 - a. Press the <Function> key on the TLS -350 until the display reads "Pressure Line Results". Then press <Step> to obtain the most recent line leak test results. Pressing <Step> once provides the 3 gph results; pressing it again provides 0.2 gph results, and pressing it a third time provides 0.1 gph results. If a printout is desired and a printer is present, pressing the <Print> button will print out the test results.
 - b. Touch the 'Home' button, touch the 'Environmental' button and touch the 'Line Leak' tab. to view the line leak test results.

Verifying Operability of UST Leak Detection Equipment

Scope:

These procedures can be used at field sites to determine the operability of Veeder-Root's underground storage tank leak detection systems. Testing underground tank leak detection equipment in accordance with this procedure will verify the equipment's operability for leak detection at 0.2 gph static, 0.1 gph static, and Continuous Statistical Leak Detection (CSLD).

Compliance Inspection Recommendations:

Veeder-Root TLS systems self-diagnose essential components, and will not complete and report passing tank tests in the event of failure of components used in the test. Completed tank tests, whether 0.2 gph static, 0.1 gph static, or using CSLD, are evidence that the system was powered as needed for the duration of the test, and that its components are in working order.

The unit provides audible and visual alarms on tank test failures. This feature is standard and not programmable.

In-tank probes do not require periodic calibration.

Completed compliance tests are evidence that, during the test,

- The system was properly powered for the data collection periods.
- All necessary tank probes were connected.
- All tank probes were operating within specification.
- All internal components were operating within specification.

Veeder-Root recommends that TLS tank testing systems be inspected periodically to determine that compliance tests, which can be 0.2 gph static tests, 0.1 gph static tests, or CSLD are being completed in accordance with local regulations. Since the leak detection system is required to compensate for changes in product level due to temperature changes in the tank in order to pass a leak test, a review of completed and successful periodic tank tests provides sufficient verification of system operability and should satisfy local agency requirements.

Reference Documents:

- Veeder-Root TLS-3XX Operators Manual (576013-610)
- Veeder-Root TLS-450 Setup and Operation Screens Manual (577013-940)

Test Results

1. If you are at a TLS-350 console go to step 1a. If you are at a TLS-450 console go to Step 1b.
 - a. Press the <Function> key on the TLS 350 until the display reads "In-Tank Test Results". Then press <Step> to obtain the latest test result. Pressing the <Tank/Sensor> button will scroll through the results for each tank. If a printout is desired and the console is equipped with a printer, pressing the <Print> button will print out the results.
 - b. Touch the 'Environmental' button to view the test results for each tank.

Testing of 'Probe Out' and 'Sensor Out' Condition

1. Disconnect probe or sensor cable from the top of the probe or sensor.
2. Wait for up to 2 minutes for a 'Probe Out' or 'Sensor Out' alarm.
3. Re-connect the probe or sensor and confirm that the console alarm has cleared.

Alternate Procedure



1. Remove power from the TLS console.
2. Open the right console door to access the modules and disconnect one of the probe or sensor wires from the appropriate module.
3. Wait for up to 2 minutes for a 'Probe Out' or 'Sensor Out' alarm.
4. Remove power to the TLS console.
5. Open console door and re-connect the probe or sensor wire. Close the console door(s).
6. Restore power to the console and confirm that the alarm has cleared.

Verifying Operability of Mag Sump Sensor

Scope:

This procedure shall be used to determine the operability of the Mag Sump sensor, Form number 875080-1xx.

Reference Documents:

- Veeder-Root TLS-3XX Operators Manual (576013-610)
- Veeder-Root TLS-3XX Setup Manual (576013-623)
- Veeder-Root TLS-450 Setup and Operation Screens Manual (577013-940)

Before You Begin:

This testing (which is not required by Veeder-Root) can be dangerous and any safety precautions as required by your organization, customer's requirements and all state/local safety mandates should be followed.

Review and comply with all the safety warnings in the manuals listed above and any other federal, state, or local requirements.

Verify that the TLS Console is programmed correctly for the site and the application. Document any programming changes you have made from the original configuration.

If the site console is a TLS-350 console in Simplicity mode, it must be switched out of this mode for this test.

Required Hardware:

Safety equipment to perform this testing as required by your organization, customer's requirements, and all state/local safety mandates.

Testing Procedure:

1. Remove the Mag sensor carefully from its containment area. This should produce an 'Installation Alarm' on the TLS console. Visually inspect the sensor for any damage as defined by in the Periodic Maintenance Checklist in the console Operator's manual, such as damage to the cable or to the sensor housing.
2. If you are at a TLS-350 console go to step 2a. If you are at a TLS-450 console go to Step 2b.
 - a. In Setup mode, press Function until you see Smart Sensor Setup Press <Step> To Continue. Select the Mag sensor your are testing and press Print to print out its water warning and height settings.
 - b. Touch the 'Home' button, touch the 'Setup' button, touch the 'Devices' button, touch the 'Mag Sensor' tab to display the Mag Sensor setup screen. Touch the 'Down' arrow to view page 2 of the Mag Sensor setup and record the water warning and alarm height settings.
3. Fill one of the test containers with water to just above the recorded Mag Sensor's Water Warning Height setting to test the 'Water Warning' alarm.

4. While holding the sensor vertically, place the sensor into the container until it is resting on the bottom; this should clear the Installation Alarm. Test only one sensor per test container (multiple test containers may be used). Wait up to 1 minute for the console to alarm. If it does not alarm after 1 minute, the sensor has failed the test. Document the alarm and proceed to the next step.
5. Remove the sensor from the test vessel after observing a response. Allow the water to drain out of the sensor to clear the alarm.
6. Fill the test container with water to just above the recorded Mag Sensor's Water Alarm Height setting to test the 'Water Alarm' alarm. Then repeat steps 5 and 6.
7. Fill a second test container with a minimum of 2 inches of product (fuel). Then insert the sensor being tested in the second container and wait for up to 1 minute for the console to alarm. If it does not alarm after 1 minute, the sensor has failed the test.
8. Remove the sensor from the test container after observing a response and allow the test fuel to completely dry off the unit. Document the alarm and proceed to the next step.
9. Press the Alarm/Test key on the TLS-350 or touch the Alarm button on the TLS-450 twice to clear the alarm before moving on to the next sensor.
10. Reinstall the sensor(s) upon verification of proper operation.
11. Print the test history and console status for your records. This completes the test procedure. Report any performance concerns to Veeder-Root while on site.

Verifying Operability of Other Sensors

Table 2 lists Veeder-Root sensors by part number and test procedure.

Table 2

Part No.	Sensor	Test Procedure
794380-320	Solid State Discriminating Pan Sensor	Ref Procedure A
794380-350	Solid State Discriminating Sump Sensor	Ref Procedure A
794380-322	Discriminating Pan Sensor	Ref Procedure A
794380-352	Discriminating Sump Sensor	Ref Procedure A
794380-36X series	Fiber Trench Sensor	Ref Procedure A
794380-341, -343	Discriminating Interstitial Sensor	Ref Procedure B or D
794380-208, -209	Piping Sump Sensor	Ref. Procedure C
794380-321	Solid State Pan Sensor	Ref. Procedure C
794380-351	Solid State Sump Sensor	Ref. Procedure C
794390-420, -460	Interstitial Liquid Sensor for Steel Tanks	Ref. Procedure C
794380-341, -343	Discriminating Interstitial Sensor (Used in the non-discriminating mode)	Ref. Procedure D
794380-345	Interstitial Sensor for High-Alcohol	Ref. Procedure D
794380-340, -344	MicroSensor	Ref. Procedure D
794390-40X series	Interstitial Sensor for Fiberglass Tanks	Ref. Procedure E
794380-301, -302, -303, -304	Hydrostatic Sensor	Ref. Procedure F
794380-62X	Groundwater Sensor	Ref. Procedure G
794390-700	Vapor Sensor	Ref. Procedure H
847990-001, -002	Standalone Dispenser Pan Sensor with Dispenser Control Interface	Ref. Procedure I
794380-323	Position Sensitive Sensor	Ref. Procedure J
857280-100, -200, -30X	Vacuum Sensor (TLS-350 only)	Ref. Procedure K
794380-333	Position Sensitive Interstitial Liquid Sensor for Steel Tanks	Ref. Procedure L

Reference Documents:

- TLS-3XX Operators Manual (576013-610)
- TLS-3XX Setup Manual (576013-623)
- TLS-450 Setup, Operation and Diagnostics Screens Manual (577013-940)

Before You Begin:

- Verify that the TLS Console is programmed correctly for the site and the application. Document any programming changes you have made from the original configuration.
- If the site console is a TLS-350 console in Simplicity mode, it must be switched out of this mode for these tests.

Required Hardware:



- Safety equipment to perform this testing as required by your Organization, Customer's requirements, and all state and local safety mandates.
- Two Test containers that are suitable to be used for fuel. Containers used in Procedure A must be able to support a liquid depth of 30 inches and should be marked to indicate the liquid heights specified in the test procedures. Containers used in Procedure B for testing the 794380-341 sensor must be non-metallic containers which are approved for use with gasoline and must be properly grounded when filling them with gasoline. Containers used in Procedures H and I must be able to support a liquid depth of 4 inches and should be marked to indicate this liquid height. Procedures C, E, and J require a vessel which can support a liquid depth of 2 inches and have a mark to indicate this liquid height. Procedures D and F require a depth that will cover the sensor.

Alarm Filtering

Veeder-Root has worked with many customers in an effort to reduce false and nuisance alarms which cause unneeded service calls and expense. In Software Version 32, Veeder-Root added filters to reduce nuisance alarms and to consolidate multiple alarms into a single alarm.

The following alarms were selected for filtering: The DIM Communication alarm, Tank Probe Out alarm, MAG Sensor Alarms, and various other Sensor Alarms. These filters do not alter the ATG's ability to respond to potential fuel loss events.

Keep in mind that when performing annual testing, maintenance, or troubleshooting, the alarm filter will increase the time needed to post and clear the above alarms. However if your TLS-350 system has version 32C or later software, or if your TLS-450 system has version V4A or later software, you can enable/disable this feature. (Default is Enabled.)

Note: In the TLS-350 consoles this feature is called **Alarm Reduction** and the path to it is as follows: press the MODE key, then press the FUNCTION key until you see the SYSTEM SETUP Function, then press the STEP key until you see the ALARM REDUCTION Step. In TLS-450 Consoles this feature is called **Alarm Filter** and the path to it is found from the Home screen by touching the SETUP button, then the ALARMS button and then selecting the Enable tab screen.

Refer to Appendix A for a list of the alarms that will be filtered and their resulting delay times.

Testing Procedure A:

Discriminating Pan/Sump Sensors 794380-320, 794380-350, 794380-322, 794380-352; Fiber trench Sensors 794380-360, 794380-361, 794380-362

1. Fill one of the test containers to obtain the level of water specified in Table 3 below in order to test the Low Liquid alarm:

Table 3

Sensor	Water Level (Inches)
794380-320	2
794380-350	2
794380-360	23
794380-361	13
794380-362	3
794380-322	2
794380-352	2

2. Remove the sensor carefully from tank or containment area. Visually inspect the sensor for any damage as defined by sensor category in the Periodic Maintenance Checklist in the console's Operators manual, such as damage to the cable or to the sensor housing.
3. While holding the sensor vertically, place the sensor into the container until it is submerged. Test only one sensor per test container (multiple test containers may be used). Wait up to 5 minutes for the console to alarm. If it does not alarm after 5 minutes, the sensor has failed the test.
4. Remove the sensor from the test vessel after observing a response. Allow the sensor to completely dry off in order to clear the alarm. Document the alarm and proceed to the next step.
5. In order to test the High Level Alarm, add Water to the test container until the top of the sensor is submerged. Then repeat steps 4 and 5.
6. Fill the second test container with a minimum of one inch of product (fuel). Then insert the sensor being tested in the second container and wait for up to 20 minutes for gasoline and 60 minutes for diesel fuel for the console to alarm (in most cases, the sensor will alarm more quickly). If it does not alarm after the wait time, the sensor has failed the test.

Optional procedure for faster recovery times (applicable to testing in gasoline only):

Instead of keeping the sensor immersed in the product until it registers a Fuel alarm, remove it after 3 - 4 minutes of exposure. If it does not alarm after 8 minutes from the start of the immersion, the sensor will need to be immersed again until it alarms.

Note: If it is required by National, State, or Local requirements to test the sensor in fuels other than gasoline, the sensor response time may be significantly longer than 20 minutes. Also, it will be necessary to soak the sensor in Coleman Fuel for half an hour after testing before beginning the recovery period.

7. Remove the sensor from the test container after observing a response and allow the test fuel to completely dry off the unit. Document the alarm and proceed to the next step. Due to the time sensors take to recover when immersed in fuel, it may take up to one hour after testing in Gasoline (in most cases the sensor should recover within 30 minutes) and up to three hours after testing in Diesel or Kerosene for the sensor to return to a Normal state

8. Press the Alarm/Test key on TLS-350 consoles, or touch the Alarm button twice on TLS-450 consoles to clear the alarm before moving on to the next sensor.
9. Reinstall the sensor(s) upon verification of proper operation.
10. Print the test history and console status for your records. This completes the test procedure. Report any performance concerns to Veeder-Root while on site.

Testing Procedure B:

Discriminating Interstitial Sensors 794380-341, 794380-343

1. Print out system status, sensor configurations and alarm history
2. Fill one of the test containers with enough Water to completely cover the sensor.
3. Remove sensor carefully from tank or containment area. Visually inspect the sensor for any damage as defined by sensor category in the Periodic Maintenance Checklist in the console's Operators manual, such as damage to the cable or to the sensor housing.
4. While holding the sensor vertically, place the sensor into the container until it is submerged. Test only one sensor per test container (multiple test containers may be used). Test times may run as long as 10 minutes depending upon console type and configuration. If it does not alarm after 10 minutes, the sensor has failed the test.

Note: The 794380-343 sensor must be tested in a dark container. If there is too much ambient light, this may prevent the sensor from going into alarm.

5. Remove the sensor from the test container after observing a response. Allow the sensor to completely dry off in order to clear the alarm. Document the alarm and proceed to the next step. For the 794380-341 sensor, it is important that the sensor be tilted at an angle after removal because the sensor may trigger a false fuel alarm if small amounts of water are trapped in the window of the sensor.
6. Fill the test container with enough Fuel to completely cover the sensor.
7. Insert sensor to be tested in the container and wait up to 10 minutes for the console to alarm. Ensure that the sensor is completely submerged for the duration of the test. If it does not alarm after 10 minutes, the sensor has failed the test.

When testing, the sensor must be completely submerged. Also, the P/N 794380-341 sensor must be tilted at an angle after removal from the test container so that liquid does not become trapped in the window of the sensor.

8. Remove the sensor from the test container after observing a response. For the P/N 794380-343 sensor, dip the sensor into a small container of alcohol and briefly swirl it around to rinse off the unit.
9. Press the Alarm/Test key on TLS-350 consoles, or touch the Alarm button twice on TLS-450 consoles to clear the alarm before moving on to the next sensor.
10. Print the test history report for your records.
11. Reinstall the sensor (s) upon verification of proper operation.
12. This completes the testing. Report any performance concerns to Veeder-Root while on site.

Testing Procedure C:

Piping Sump Sensors 794380-208, 794380-209, Interstitial Sensors 794390-420, 794380-430, 794390-460, Solid-State Pan Sensor 794380-321, and Solid State Sump Sensor 794380-351

1. Fill one of the test containers with a minimum of 2 inches of water.
2. Remove sensor carefully from tank or containment area. Visually inspect the sensor for any damage as defined by sensor category in the Periodic Maintenance Checklist in the console's Operators manual, such as damage to the cable or to the sensor housing.
3. While holding the sensor vertically, place the sensor into the container until it is submerged. Test only one sensor per test container (multiple test containers may be used). Test times may run as long as 5 minutes depending upon console type and configuration. If the sensor does not issue a "Fuel" alarm after 5 minutes, the sensor has failed the test.
4. Remove the sensor from the test vessel after observing a response. Allow the sensor to completely dry off in order to clear the alarm. Document the alarm and proceed to the next step.
5. Press the Alarm/Test key on TLS-350 consoles, or touch the Alarm button twice on TLS-450 consoles to clear the alarm before moving on to the next sensor.
6. Reinstall the sensor(s) upon verification of proper operation.
7. Print the test history and console status for your records. This completes the test procedure. Report any performance concerns to Veeder-Root while on site.

Testing Procedure D:

MicroSensor 794380-340, -344; Interstitial Sensor for High-Alcohol 794380-345, Discriminating Interstitial Sensors 794380-341, 794380-343 used in the Non-discriminating mode

1. Remove sensor carefully from the interstice containment area. Visually inspect the sensor for any damage as defined by sensor category in the Periodic Maintenance Checklist in the console's Operators manual, such as damage to the cable or to the sensor housing.
2. Fill the test container with enough fuel to completely cover the sensor.
3. Insert sensor to be tested in the container and wait up to 10 minutes for the console to alarm. Ensure that the sensor is completely submerged for the duration of the test. If it does not alarm after 10 minutes, the sensor has failed the test.

Note: When testing, the sensor must be completely submerged.

Note: The 794380-344 and 794380-343 sensors must be tested in a dark container. If there is too much ambient light, this may prevent the sensor from going into alarm.

4. Remove the sensor from the test container after observing a response. For the P/N 794380-343 sensor, dip the sensor into a small container of alcohol and briefly swirl it around to rinse off the unit.
5. Press the Alarm/Test key on TLS-350 consoles, or touch the Alarm button twice on TLS-450 consoles to clear the alarm before moving on to the next sensor.
6. Print the test history report for your records.
7. Reinstall the sensor(s) upon verification of proper operation.
8. This completes the testing. Report any performance concerns to Veeder-Root while on site.

Testing Procedure E:

Interstitial Sensors for Fiberglass tanks 794380-401, -404, -407, and -409

1. Print out system status, sensor configurations, and alarm histories and save for your records.
2. Fill one of the test containers with a minimum of 2 inches of water.
3. Remove sensor carefully from the interstice containment area. Visually inspect the sensor for any damage as defined by sensor category in the Periodic Maintenance Checklist in the console's Operators manual, such as damage to the cable or to the sensor housing.
4. While holding the sensor flat and with the side with the Red dot facing upwards, place the sensor into the container until it is submerged. Test only one sensor per test container (multiple test containers may be used). Test times may run as long as 5 minutes depending upon console type and configuration. If the sensor does not issue a "Fuel" alarm after 5 minutes, the sensor has failed the test.
5. Remove the sensor from the test vessel after observing a response. Allow the sensor to completely dry off in order to clear the alarm. Document the alarm and proceed to the next step.
6. Press the Alarm/Test key on TLS-350 consoles, or touch the Alarm button twice on TLS-450 consoles to clear the alarm before moving on to the next sensor.
7. Reinstall the sensor(s) upon verification of proper operation.
8. Print the test history and console status for your records. This completes the test procedure. Report any performance concerns to Veeder-Root while on site.

Testing Procedure F:

Hydrostatic Sensors 794380-301, 794380-302, 794380-303, 794380-304

1. Remove sensor carefully from tank reservoir. Visually inspect the sensor for any damage as defined by sensor category in the Periodic Maintenance Checklist in the console's Operators manual, such as damage to the cable or to the sensor housing.
2. For Hydrostatic sensors, removal of the sensor from the tank reservoir represents the "Low Liquid" Alarm condition for a Dual Point sensor and a "Fuel" Alarm condition for a Single Point sensor. Time to alarm may run as long as 5 minutes depending upon console type and configuration. If the sensor does not alarm after 5 minutes, the sensor has failed the test.
3. For Dual Point Hydrostatic sensors, a second alarm condition representing a "High Liquid" alarm is present. To test this alarm, completely submerge the sensor in water. Time to alarm may run as long as 5 minutes depending upon console type and configuration. If the sensor does not alarm after 5 minutes, the sensor has failed the test.
4. In order to clear the alarm, re-install the sensor in the reservoir. Document the alarm and proceed to the next step.
5. Press the Alarm/Test key on TLS-350 consoles, or touch the Alarm button twice on TLS-450 consoles to clear the alarm before moving on to the next sensor.
6. Print the test history and console status for your records. This completes the test procedure. Report any performance concerns to Veeder-Root while on site.

Testing Procedure G:

Groundwater Sensor 794380-621, 794380-622, 794380-624

1. Print out system status, sensor configurations, and alarm histories and save for your records.
2. Remove sensor carefully from monitoring well. Visually inspect the sensor for any damage as defined by sensor category in the Periodic Maintenance Checklist in the console's Operators manual, such as damage to the cable.
3. For Groundwater sensors, removal of the sensor from the monitoring well represents the "Water Out" Alarm condition. Test times may run as long as 5 minutes depending upon console type and configuration. If the sensor does not alarm after 5 minutes, the sensor has failed the test.
4. In order to clear the alarm, re-install the sensor in the monitoring well. Document the alarm and proceed to the next step.
5. Press the Alarm/Test key on TLS-350 consoles, or touch the Alarm button twice on TLS-450 consoles to clear the alarm before moving on to the next sensor.
6. Print the test history and console status for your records. This completes the test procedure. Report any performance concerns to Veeder-Root while on site.

Testing Procedure H:

Vapor Sensor 794390-700

1. Fill one of the test containers with a minimum of 4 inches of water.
2. Remove sensor carefully from monitoring well. Visually inspect the sensor for any damage as defined by sensor category in the Periodic Maintenance Checklist in the console's Operators manual, such as damage to the cable.
3. Submerge the sensor in the water to produce a "Water Alarm" condition. Test times may run as long as 5 minutes depending upon console type and configuration. If the sensor does not alarm after 5 minutes, the sensor has failed the test.
4. In order to clear the alarm, remove the sensor from the container. Document the alarm and proceed to the next step.
5. Press the Alarm/Test key on TLS-350 consoles, or touch the Alarm button twice on TLS-450 consoles to clear the alarm before moving on to the next sensor.
6. Print the test history and console status for your records. This completes the test procedure. Report any performance concerns to Veeder-Root while on site.

Testing Procedure I:

Standalone Dispenser Pan Sensor with Dispenser Control Interface 847990-001, 847990-002

1. Fill one of the test containers with a minimum of 4 inches of Water.

2. Remove sensor carefully from dispenser pan. Visually inspect the sensor for any damage as defined by sensor category in the Periodic Maintenance Checklist in the console's Operators manual, such as damage to the cable or the sensor housing.
3. While holding the sensor vertically, place the sensor into the container until it is submerged. Test only one sensor per test container (multiple test containers may be used). The Alarm state is indicated by the dispenser power being turned off (i.e., there is no other visible or audible alarm).
4. Remove the sensor from the test vessel after observing a response and allow the sensor to completely dry off. Document the alarm and proceed to the next step.
5. Reinstall the sensor(s) upon verification of proper operation.
6. Turn Off power to the dispenser for at least 5 seconds in order to re-enable dispensing.



Testing Procedure J:

Position Sensitive Sensor 794380-323

1. Fill one of the test containers with a minimum of 2 inches of Water.
2. Remove sensor carefully from the pan or containment area - this should result in a "Sensor Out" alarm. Visually inspect the sensor for any damage as defined by sensor category in the Periodic Maintenance Checklist in the console's Operators manual, such as damage to the cable or the sensor housing.
3. While holding the sensor vertically, place the sensor into the container until it is resting securely on the bottom of the container (this should clear the "Sensor Out" alarm). Test only one sensor per test container (multiple test containers may be used). Test times may run as long as 5 minutes depending upon console type and configuration. If the sensor does not issue a "Fuel" alarm after 5 minutes, the sensor has failed the test.
4. Remove the sensor from the test vessel after observing a response. Allow the sensor to completely dry off in order to clear the alarm. Document the alarm and proceed to the next step.
5. Press the Alarm/Test key on TLS-350 consoles, or touch the Alarm button twice on TLS-450 consoles to clear the alarm before moving on to the next sensor.
6. Reinstall the sensor(s) upon verification of proper operation.
7. Print the test history and console status for your records. This completes the test procedure. Report any performance concerns to Veeder-Root while on site.

Testing Procedure K (TLS-350 Consoles Only):

Vacuum Sensors 857280-100, -200, -30x

1. Vacuum leak test: rotate the manual shut-off valve (which should be connected to the containment space being monitored) from the 'normal' position to the 'test' position. This should vent the vacuum sensor to atmosphere while maintaining vacuum in the test space.
2. Wait at least 1 minute at the console for the system to produce a 'No Vacuum' alarm. Press the Alarm/Test key to silence the beeper and acknowledge the alarm.
3. Rotate the manual shut-off valve back to the 'normal' position.
4. At the console go to DIAG MODE ↵ VAC SENSOR DIAG ↵ VAC SENSOR MANUAL TEST ↵ START MANUAL TEST to initiate a manual test that will clear the No Vacuum alarm (Refer to the TLS-3XX Operator's manual for instructions).

5. Vac Float Liquid Sensor (in sump) test: This test is performed using water, gasoline, or other appropriate test liquid for systems with the float housing in the sump. Rotate the manual shut-off valve from the 'normal' to the 'test' position. Remove the lower float bowl and fill it with the test liquid. Upon re-installation, a Liquid Alarm will be generated. At the console press the Alarm/Test key to silence the beeper and acknowledge the alarm.

NOTE: in some instances, it may be impossible to fill the float bowl enough to produce an alarm. If this occurs, follow this alternate procedure.

- a. Loosen the nut on the side of the liquid sensor housing that connects to the 3-way ball valve and remove the barbed fitting.
 - b. Connect a 1 - 2 foot (30 - 60 cm) piece of tubing to another 1/4" barbed fitting and insert this barbed fitting into the liquid sensor housing. Insert a funnel into the other end of the piece of tubing.
 - c. Completely loosen the nut on the opposite side of the liquid sensor and remove the hose and bushing together.
 - d. Pour 22 - 25 ml of water, gasoline, or other appropriate test liquid into the funnel. A liquid alarm should be produced. At the console press the Alarm/Test key to silence the beeper and acknowledge the alarm.
 - e. Remove the short piece of tubing/funnel and re-install the original barbed fitting (with tubing connected to 3-way valve) and tighten the nut. Replace the hose and bushing in the other side of the liquid sensor and tighten the nut.
6. To remove the test liquid and clear the alarm, remove the lower float bowl of the liquid sensor, and ensure that all liquid is removed.
 7. Replace the lower float bowl and rotate the manual shut off valve back to the 'normal' position.
 8. Repeat Step 5 above.
 9. For double-walled tanks, the interstitial sensor must be removed from the tank to perform a functional test. Follow "Testing Procedure C:" (Interstitial Sensor for Steel Tanks) or "Testing Procedure E:" (Interstitial Sensor for Fiberglass Tanks) as applicable. NOTE: first you must vent the vacuum in the interstice and restore it per Step 5 above to clear the 'No Vacuum' alarm.
 10. Print the test history and console status for your records. This completes the test procedure. Report any performance concerns to Veeder-Root while on site.

Testing Procedure L:

Position Sensitive Interstitial Sensor for Steel Tanks 794380-333

1. Fill one of the test containers with a minimum of 2 inches of water.
2. Remove sensor from tank and visually inspect the sensor for any damage as defined in the sensor category in the Periodic Maintenance Checklist in the consoles Operator manual, such as damage to the cable or to the sensor housing.
3. While holding the sensor vertically over the test container, suspend the sensor so it rests above the bottom of the test container a minimum of 2 inches.
4. Verify on the TLS system that the sensor is in a "FUEL ALARM". When the sensor is not positioned properly (Resting on the bottom of tank) it will generate a fuel alarm.
5. After verifying the sensor alarmed properly, holding the sensor vertically to the container lower the sensor until it's submerged. Test only one sensor at a time. Test time may take up to 5 mins. The sensor should go into a "Fuel Alarm".
6. Remove the sensor from the test vessel after observing a response. Allow the sensor to completely dry off in order to clear the alarm. Document the alarm and proceed to the next step.
7. Press the Alarm/Test key on TLS-350 consoles, or touch the Alarm button twice on TLS-450 consoles to clear the alarm before moving on to the next sensor.
8. Reinstall the sensor(s) upon verification of proper operation.
9. Print the test history and console status for your records. This completes the test procedure. Report any performance concerns to Veeder-Root while on site.

TLS-RF Wireless 2 (W2) Testing Procedure

Testing Sensor Out Alarm

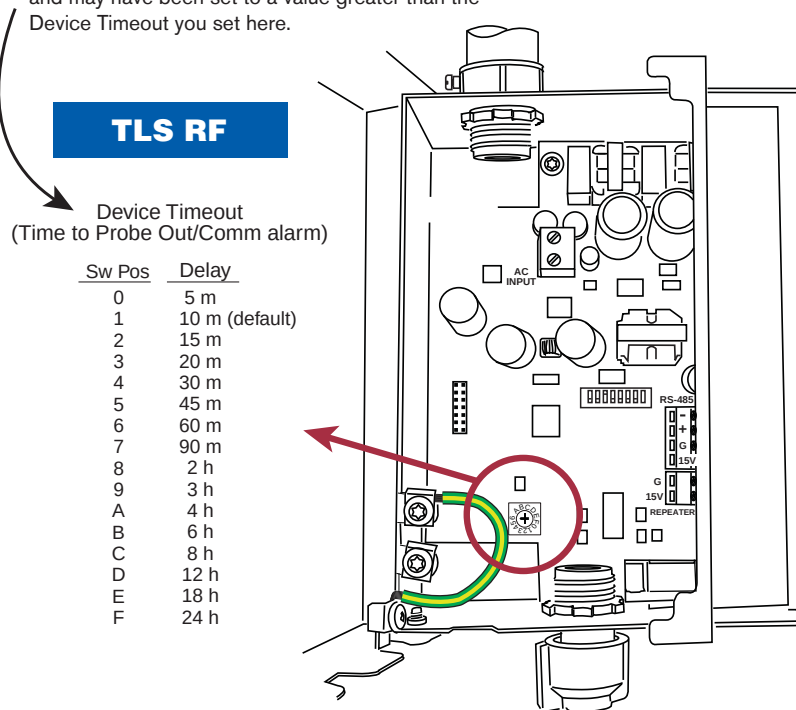
1. Disconnect sensor wiring from top of sensor.
2. Wait for up to 2 minutes for "Sensor Out" alarm.
3. Re-connect sensor wiring and confirm that console alarm has cleared.

Testing Communication Alarm

1. Visually determine Device Timeout delay via Dip Switch setting inside TLS RF (see illustration below).
2. Disconnect battery cable from wireless transmitter.
3. Wait the Device Timeout delay time for a "Communication Alarm".
4. Re-connect battery cable to wireless transmitter and confirm that console alarm has cleared.

NOTICE

Setting the Device Timeout delay to less than 10 minutes may result in Device Out errors since the transmitter's transmit time intervals are programmable and may have been set to a value greater than the Device Timeout you set here.



Appendix A - Filtered Alarms

Alarm	Detection Response Time	Clear Response Time
DIM Communication Alarm	6-minute delay	10-minute delay
Probe Out Alarm	2-minute delay	3-minute delay
Liquid • Fuel • Water • Water Out • High Liquid • Low Liquid • Liquid Warning	Immediate	3-minute delay
Liquid • Open	2-minute delay	3-minute delay
Liquid * when caused by open circuit and no open alarms within the last 24-hours	Immediate	3-minute delay
Liquid • Short	2-minute delay	15-minute delay
Vapor • Fuel • Water Out	Immediate	3-minute delay
Vapor • Open	2-minute delay	3-minute delay
Vapor * when caused by open circuit and no open alarms within the last 24-hours	Immediate	3-minute delay
Vapor • Short	2-minute delay	15-minute delay
Ground Water • Fuel • Water Out • Liquid Warning	Immediate	3-minute delay
Ground Water • Open	2-minute delay	3-minute delay
Ground Water * when caused by open circuit and no open alarms within the last 24-hours	Immediate	3-minute delay

Appendix A - Filtered Alarms

Alarm	Detection Response Time	Clear Response Time
Ground Water • Short	2-minute delay	15-minute delay
2-wire current loop • Fuel • Water Out • Liquid Warning	Immediate	3-minute delay
2-wire current loop • Open	2-minute delay	3-minute delay
2-wire current loop * when caused by open circuit and no open alarms within the last 24-hours	Immediate	3-minute delay
2-wire current loop • Short	2-minute delay	15-minute delay
3-wire current loop • Fuel • High Liquid • Liquid Warning	Immediate	3-minute delay
3-wire current loop • Open– caused by noise • Open – open circuit	2-minute delay	3-minute delay
3-wire current loop * when caused by open circuit and no open alarms within the last 24-hours	Immediate	3-minute delay
3-wire current loop • Open – open circuit *one or more open alarms within the last 24-hours	2-minute delay	3-minute delay
3-wire current loop • Short	2-minute delay	15-minute delay
Mag Sump Sensor • Fault • Communication	2-minute delay	15-minute delay
Mag Sump Sensor • Install	2-minute delay	3-minute delay



Sensor Products

Application Guide

Notice

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Example Illustrations

Illustrations used in this guide for example sensor installations may contain components that are customer supplied and not included with the sensor. Please check with your Veeder-Root Distributor for recommended installation accessories.

Third Party Evaluations

Third party evaluations of the Veeder-Root sensors contained in this application guide can be found under the Veeder-Root vendor name on the National Work Group on Leak Detection Evaluations (NWGLDE) website:

<http://www.nwglde.org>

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Sensor Application Matrix

	Sensor Description	Where Used						Category					Product type										Notes																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
		Standards						Dispenser Pan	Spill Containment	STP	Annular Space	Monitoring Well	Oil/Water Separator Tank	Discriminating	Non-Discriminating	Position Sensitive	Level Sensing	Static Testing	Hydrostatic	ASTM D975	Kerosene	Jet Fuel		ASTM D7547	E-15	E-85	ASTM D7467	ASTM D6751	ASTM D975	Renewable (Green) Diesel	Diesel Exhaust Fuel (DEF)	Waste Oil	Motor Oil																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
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Discriminating Dispenser Pan and Containment Sump Sensors

These discriminating sensors are installed in a dispenser pan or in a containment sump and will detect the presence of, and differentiate between, hydrocarbons and other liquids. Two types of discriminating sensors (Standard, and Optical) are discussed in this section. A third type, the Mag Sump sensor, is discussed on page 4.

Table 1. Discriminating Sensor Features and Console Compatibility

Item	STANDARD Dispenser Pan (DPS) and Containment Sump (CSS) Sensors	OPTICAL Dispenser Pan (DPO) and Containment Sump (CSO) Sensors
Form Number	794380-322 (DPS); 794380-352 (CSS)	794380-320 (DPO); 794380-350 (CSO)
Operating principle	Conductive elastomer, reed switch/float	Conductive elastomer/optical
Product activation height ^{1, 2}	DPS: Gasoline - 0.005" (0.127mm); Water - low 1.37" (3.4cm), High 7.66" (19.5cm) CSS: Gasoline - 0.005" (0.127mm); Water - low 1.35" (3.4cm), High 12.28" (31.2cm)	Gasoline - 1.34 inches (3.4cm)
Operating temperature:	32 to +140°F (0 to +60°C)	-40 to +140°F (-40 to +60°C)
Dimensions	11.6" (29.4cm) high, 2.2" (5.6cm) dia. (DPS); 22.1" (56.1cm) high, 2.2" (5.6cm) dia. (CSS)	11.6" (29.4cm) high, 2.2" (5.6cm) dia. (DPO); 22.1" (56.1cm) high, 2.2" (5.6cm) dia. (CSO)
Compatible consoles	TLS-450/TLS-450PLUS, TLS4/8601 Series, TLS-350 Series	TLS-450/TLS-450PLUS, TLS4/8601 Series, TLS-350 Series
Console Interface Module	TLS-350 Series - Interstitial/Liquid Sensor Interface Module, 8 sensor input, P/N 329358-001	TLS-350 Series - Type B Interface Module, 6 sensor input, P/N 329950-001
	TLS-450/8600 Series - Universal Sensor Module (USM), 16 sensor input, P/N 332812-001	
	TLS4/8601 Series - Universal Sensor Input Output Module (USIOM) (AC ver.), 12 sensor input, P/N 333238-001; (AC ver.), 6 sensor input, P/N 333238-002; (DC ver.), 12 sensor input, P/N 333238-003; (DC ver.), 6 sensor input, P/N 333238-004	
Maximum number of sensors monitored per console	TLS-350 Series (64); TLS-350J (3)	TLS-350 Series(48)
	TLS-450/TLS-450PLUS (32)	
	TLS4/8601 Series (12)	
Compatible fuels	See "Sensor Application Matrix" on page 1.	

¹For additional third party evaluation data of Standard Types see: http://www.nwglde.org/evals/veeder_root_o.html

²For additional third party evaluation data of Optical Types see: http://www.nwglde.org/evals/veeder_root_n.html

Miscellaneous

- An open sensor triggers a Sensor Out alarm
- Standard cable length: 12 feet (3.6m)
- Universal Sensor Mounting Kit, P/N 330020-012 (see Fig. 1)

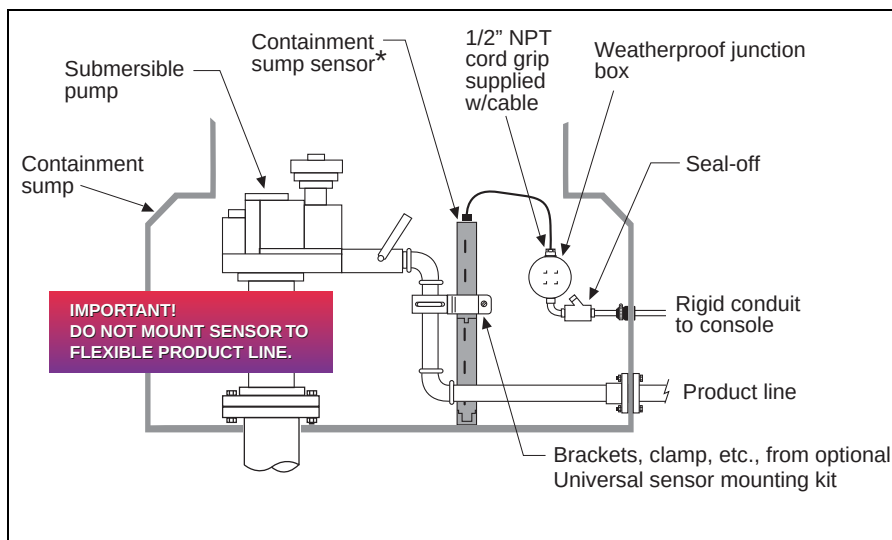


Fig. 1 Example Containment Sump Sensor Installation

Servicing Discriminating Dispenser Pan and Containment Sump Sensors

When replacing Dispenser Filters or servicing Dispensers

The sensor should be removed from the dispenser pan before replacing the filters. All fuel must be cleaned up in the dispenser pan prior to reinstalling the sensor. If the sensor is exposed to fuel during the filter replacement, the sensor may go into a fuel alarm. If this occurs the sensor must be removed from the dispenser pan and the sensor allowed to dry in a well ventilated area for up to 7 days. The recovery time will depend on how long the sensor was exposed to the fuel.

If the sensor has been exposed to diesel fuel or kerosene, it will be necessary to first soak the sensor in Coleman™ fuel for 30 minutes and then set aside to dry in a well ventilated area for up to 7 days. It is advisable that the affected sensor be replaced and taken to a location where the soaking and recovery process can be safely performed. The recovery time will depend on how long sensor was exposed to the diesel fuel or kerosene.

When Sensor is in alarm due to a spill or leak in the containment area

Remove the sensor from the containment area upon arrival at the location. Dry off the sensor and allow it to recover in a well ventilated area for up to 7 days. The recovery time will depend on how long the sensor was exposed to the fuel.

The sensor can be reinstalled in the containment area once the sensor has recovered and the source of the leak repaired. The containment area must be free of fuel.

If the sensor has been exposed to diesel fuel or kerosene, it will be necessary to first soak the sensor in Coleman™ fuel for 30 minutes and then set aside to dry in a well ventilated area for up to 7 days. It is advisable that the affected sensor be replaced and taken to a location where the soaking and recovery process can be safely performed. The recovery time will depend on how long sensor was exposed to the diesel fuel or kerosene.

Biodiesel Blend Limitations

Biodiesel blends that meet ASTM standards D6751 or D7467 are compatible with the respective sensors.

Mag Sump Sensor

The discriminating Mag Sump Sensor detects the presence and amount of water and/or fuel in the containment sump or dispenser pan. Using proven magnetostrictive technology, Veeder-Root's Mag Sump Sensor produces fast reaction and recovery times, which eliminates costly and unwarranted service calls and sensor replacements. And where it's allowed, stations can remain open when only water is detected.

Table 2. Mag Sump Sensor Features and Console Compatibility

Item	Description
Form Number	See Table 3 below
Operating principle	Magnetostrictive probe with dual floats
Product activation height¹	1.368" (3.47cm), gasoline; 1.614" (4.1cm), water; 1.116" (2.83cm) gasoline on 7" (17.8cm) of water (fuel alarm w/water present)
Operating temperature	-40 to +140°F (-40 to +60°C)
Dimensions	-111, -121, -211, -221 versions 22" (55.9cm) high, 2.2" (5.6cm) dia.; -112, -122, -212, -222 versions 34" (86.4cm) high, 2.2" (5.6cm) dia.
Compatible consoles	TLS-450/TLS-450PLUS, TLS4/8601 Series, TLS-350 Series
Console Interface Module	TLS-350 Series - Smart Sensor Interface Module, 8 sensor input, -P/N 329356-004
	TLS-450/TLS-450PLUS - Universal Sensor Module (USM), 16 sensor input, P/N 332812-001
	TLS4/8601 Series - Universal Sensor Input Output Module (USIOM) (AC ver.), 12 sensor input, P/N 333238-001; (AC ver.), 6 sensor input, P/N 333238-002; (DC ver.), 12 sensor input, P/N 333238-003; (DC ver.), 6 sensor input, P/N 333238-004
Maximum number of sensors monitored per console	TLS-350 Series (48)
	TLS-450/TLS-450PLUS (32)
	TLS4/8601 Series (12)
Compatible fuels	See "Sensor Application Matrix" on page 1.

¹For additional third party evaluation data see: http://www.nwglde.org/evals/veeder_root_x.html

Table 3. Mag Sump Sensor Form Numbers

Form Number	Product	Measurement Limit	Leak Detect	Fixed Threshold
857080-111	Gasoline & Diesel	12" (30.5cm)	No	No
857080-112		24" (61cm)	No	No
857080-121		12" (30.5cm)	No	Yes**
857080-122		24" (61cm)	No	Yes**
857080-211		12" (30.5cm)	Yes	No
857080-212		24" (61cm)	Yes	No
857080-221		12" (30.5cm)	Yes	Yes**
857080-222		24" (61cm)	Yes	Yes**

**This version has a fixed water warning of 1.7" (4.32cm), water alarm of 3.0" (7.6cm) and an alarm upgrade delay of 48 hours.

Miscellaneous

- Universal Sensor Mounting Kit (optional) - P/N 330020-012 (see Fig. 2)
- Standard cable length - 10 feet (3m)

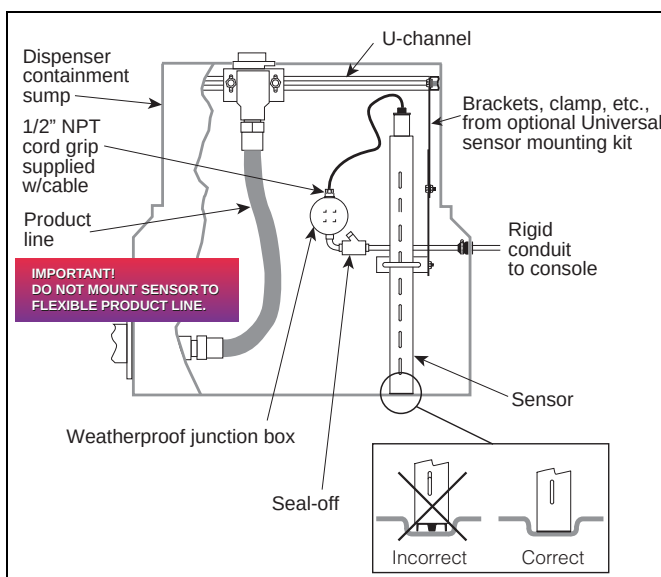


Fig. 2 Example Mag Sump Sensor Installation

Solid-State Dispenser Pan and Containment Sump Sensors

These solid-state, non-discriminating sensors are installed in a dispenser pan or in a containment sump and will detect the presence of a liquid. Optical liquid level sensing technology means no moving parts and a lower temperature operating limit.

Table 4. Non-Discriminating Sensor Features and Console Compatibility

Item	Description
Form Number	794380-321 (DP); 794380-351 (CS)
Operating principle	Optical
Product activation height¹	Gasoline or Water - 1.02 inches (2.6cm)
Operating temperature:	-40 to +140°F (-40 to +60°C)
Dimensions	11.6" (29.4cm) high, 2.2" (5.6cm) dia. (DP); 22.1" (56.1cm) high, 2.2" (5.6cm) dia. (CS)
Compatible consoles	TLS-450/TLS-450PLUS, TLS4/8601 Series, TLS-350 Series
Console Interface Module	TLS-350 Series - Type A Sensor Interface Module, 8 sensor input, P/N 329956-001
	TLS-450/TLS-450PLUS - Universal Sensor Module (USM), 16 sensor input, P/N 332812-001
	TLS4/8601 Series - Universal Sensor Input Output Module (USIOM) (AC ver.), 12 sensor input, P/N 333238-001; (AC ver.), 6 sensor input, P/N 333238-002; (DC ver.), 12 sensor input, P/N 333238-003; (DC ver.), 6 sensor input, P/N 333238-004
Maximum number of sensors monitored per console	TLS-350 Series (64)
	TLS-450/TLS-450PLUS (32)
	TLS4/8601 Series (12)
Compatible fuels	See "Sensor Application Matrix" on page 1.

¹For additional third party evaluation data of Standard Types see: http://www.nwglde.org/evals/veeder_root_r.html

Miscellaneous

- An open sensor triggers a Sensor Out alarm
- Standard cable length: 12 feet (3.66m)
- Universal Sensor Mounting Kit, P/N 330020-012 (see Fig. 1)

Piping Sump Sensor

The Piping Sump Sensor is installed in a tank piping sump and will detect the presence of a liquid. An open sensor triggers a Sensor Out alarm.

Table 5. Piping Sump Sensor Features and Console Compatibility

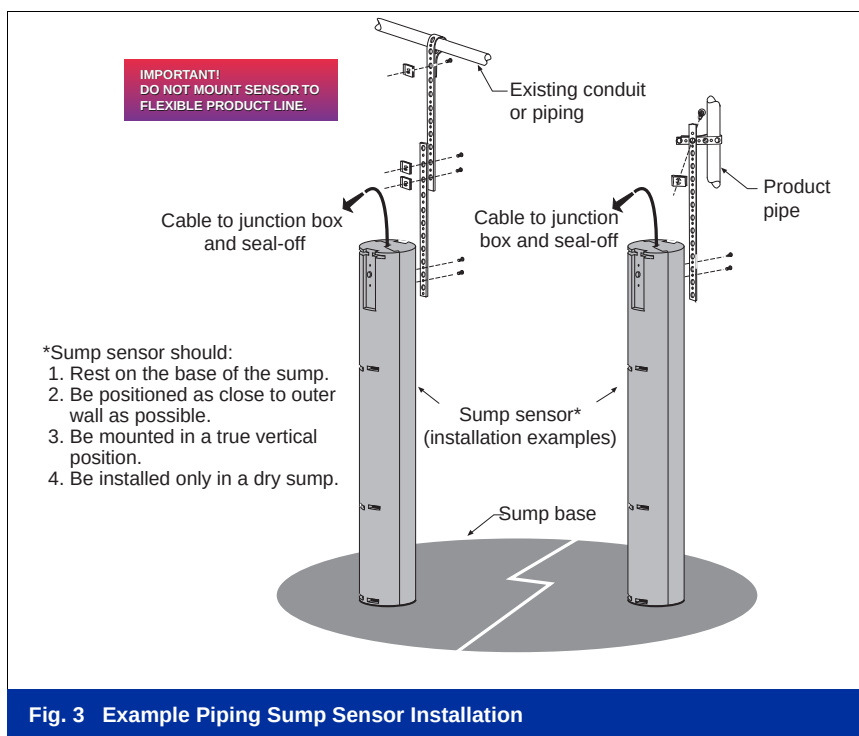
Item	Description
Form number ¹	794380-208
Operating principle	Float/magnetic reed switch
Product activation height ²	Gasoline - 1.84 inch (4.67cm)
Operating temperature	32 to +140°F (0 to +60°C)
Dimensions	12" (30.5cm) high, 1.9" (4.8cm) diameter
Compatible consoles	TLS-450/TLS-450PLUS, TLS4/8601 Series, TLS-350 Series, TLS-300 Series
Console Interface Module	TLS-300 Series - No input module required
	TLS-350 Series, Interstitial/Liquid Sensor Interface Module, 8 sensor input, P/N 329358-001
	TLS-450/TLS-450PLUS - Universal Sensor Module (USM), 16 sensor input, P/N 332812-001
	TLS4/8601 Series - Universal Sensor Input Output Module (USIOM) (AC ver.), 12 sensor input, P/N 333238-001; (AC ver.), 6 sensor input, P/N 333238-002; (DC ver.), 12 sensor input, P/N 333238-003; (DC ver.), 6 sensor input, P/N 333238-004
Maximum number of sensors monitored per console	TLS-300 Series (8)
	TLS-350 Series, (48)
	TLS-450/TLS-450PLUS (32)
	TLS4/8601 Series (12)
Compatible fuels	See "Sensor Application Matrix" on page 1.

¹Sensors 794380-208 and -209 are direct replacements for sump sensor 794380-206

²For additional third party evaluation data see: http://nwgldc.org/evals/veeder_root_m.html

Miscellaneous

- Installation kit 330020-076 (see Fig. 3)
- Standard cable length: 12 feet (3.66m)



Stand-Alone Dispenser Pan Sensors

The Stand-Alone Dispenser Pan Sensors immediately shut down AC power to the dispenser when fluid is detected in the dispenser pan. These sensors control and shut down power to the dispenser without the need for additional relays, circuitry, wiring, or consoles. The separate sensor control interface ensures intrinsically-safe integrity in a Class I Div. 1 Group D; Class I Zone 0 IIA hazardous area. Two models of Stand-Alone Dispenser Pan sensors are available.

Table 6. Stand-Alone Dispenser Pan Sensor Features and Console Compatibility

Item	Dispenser Pan Stand-Alone Sensor Non-Discriminating	Dispenser Pan Stand-Alone Sensor Discriminating
Form Number	847990-001	847990-002
Operating principle	Product permeable, reed switch/float	Product permeable, reed switch/float
Product activation height ¹	Gasoline - 1.71" (4.34cm); Water - 1.62" (4.11cm)	Gasoline - 0.03" (0.76mm); Water - 6.39" (16.23cm)
Operating temperature:	32 to +140°F (0 to +60°C) freezing liquids; -13 to +140°F (-25 to +60°C) for hydrocarbons	
Compatible fuels	See "Sensor Application Matrix" on page 1.	

¹For additional third party evaluation data see: http://nwglde.org/evals/veeder_root_p.html

Miscellaneous

- Latching alarm circuitry ensures dispenser can't be restarted until hazardous condition has been corrected.
- Connects directly to dispenser wiring.
- Controls most manufacturer's dispensers.
- Cable length: 5 feet (1.5m).
- Sensor dimensions: 11.6" (29.5cm) high, 2.2" (5.6cm) dia.
- Control Interface dimensions: 9.4" (23.9cm) high, 2.2" (5.6cm) dia.

Installation Accessories

- Universal Sensor Mounting Kit, P/N 330020-012, contains sensor mounting brackets and screws (see Fig. 4).

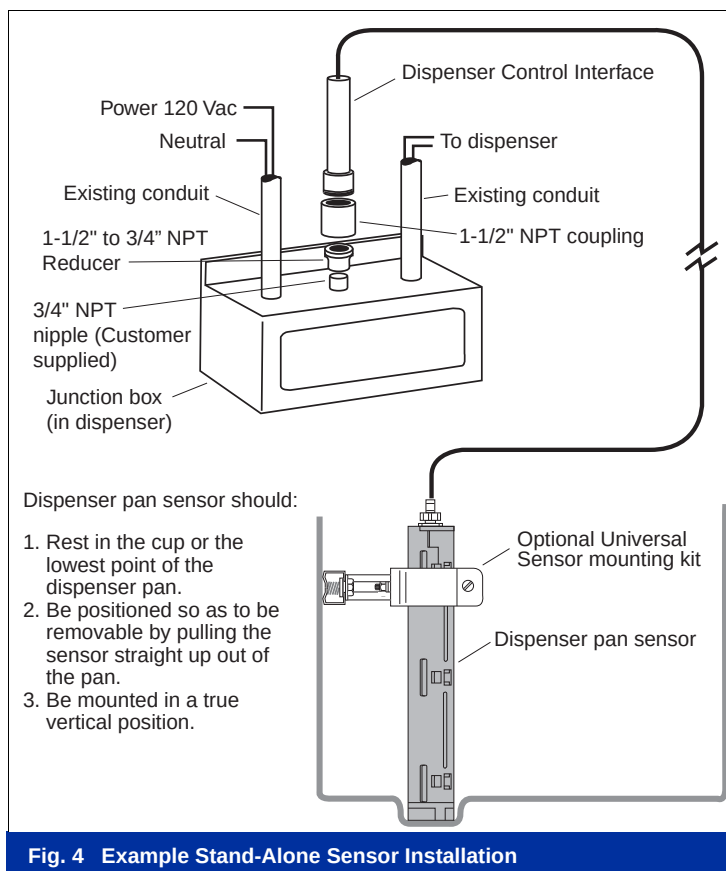


Fig. 4 Example Stand-Alone Sensor Installation

Position-Sensitive Sensor

Compatible with fuel blends up to 85%Ethanol!

The Position-Sensitive Sensor is installed in a pan/sump and incorporates a float switch to detect water and/or hydrocarbons. A Sensor Out alarm is triggered when sensor is moved off bottom of the pan/sump.

Table 7. Position-Sensitive Sensor Features and Console Compatibility

Item	Description
Form number	794380-323
Operating principle	Float switch
Product activation height ¹	1.52" (3.86cm)
Operating temperature	32 to +140°F (0 to +60°C)
Dimensions	12" (30.5cm) high, 2.2" (5.6cm) diameter
Compatible consoles	TLS-450/TLS-450PLUS, TLS4/8601 Series, TLS-350 Series, TLS-300 Series
Console Interface Module	TLS-300 Series - No input module required
	TLS-350 Series, Interstitial/Liquid Sensor Interface Module, 8 sensor input, P/N 329358-001
	TLS-450/TLS-450PLUS - Universal Sensor Module (USM), 16 sensor input, P/N 332812-001
	TLS4/8601 Series - Universal Sensor Input Output Module (USIOM) (AC ver.), 12 sensor input, P/N 333238-001; (AC ver.), 6 sensor input, P/N 333238-002; (DC ver.), 12 sensor input, P/N 333238-003; (DC ver.), 6 sensor input, P/N 333238-004
Maximum number of sensors monitored per console	TLS-300 Series (8)
	TLS-350 Series (48)
	TLS-450/TLS-450PLUS (32)
	TLS4/8601 Series (12)
Compatible fuels	See "Sensor Application Matrix" on page 1.

¹For additional third party evaluation data see: http://www.nwglde.org/evals/veeder_root_w.html

Miscellaneous

- Universal Sensor Mounting Kit (optional) - P/N 330020-012 (see Fig. 5)
- Standard cable length: 12 feet (3.66m)

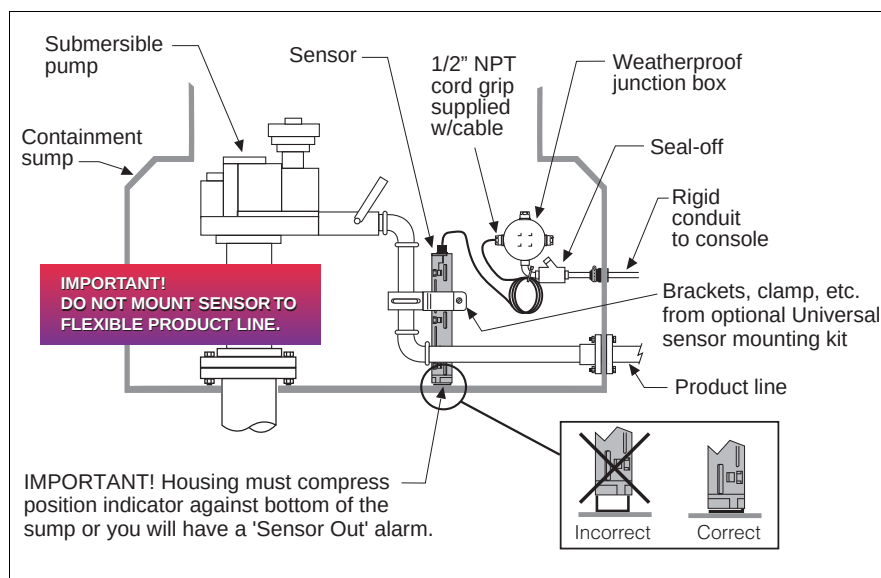


Fig. 5 Example Position-Sensitive Sensor Installation

Discriminating Interstitial Sensor for Double-Wall Fiberglass Tanks

The Discriminating Interstitial Sensor for double-wall fiberglass tanks uses solid-state liquid level sensing technology to detect liquid in the interstitial space of the tank. The sensor can differentiate between hydrocarbons and other liquids. An open sensor triggers a Sensor Out alarm.

Table 8. Discriminating Interstitial Sensor for Double-Wall Fiberglass Tanks Features and Console Compatibility

Item	Description
Form Number	794380-343 (includes 25 ft [7.6m] cable; for 4 - 10 ft [1.2 to 3m] I.D. fiberglass tanks)
Operating principle	Optical sensor and conductivity
Product activation height¹	Gasoline <0.1 inch (0.25cm); Water <0.1 inch
Operating temperature:	14 to +140°F (-10 to +60°C)
Dimensions	4.3" (11cm) length, 1.5" (3.8cm) width, 0.5" (1.3cm) thick
Compatible consoles	TLS-450/TLS-450PLUS, TLS4/8601 Series, TLS-350 Series
Console Interface Module	TLS-350 Series - Type A Sensor Interface Module, 8 sensor input, P/N 329956-001
	TLS-450/TLS-450PLUS - Universal Sensor Module (USM), 16 sensor input, P/N 332812-001
	TLS4/8601 Series - Universal Sensor Input Output Module (USIOM) (AC ver.), 12 sensor input, P/N 333238-001; (AC ver.), 6 sensor input, P/N 333238-002; (DC ver.), 12 sensor input, P/N 333238-003; (DC ver.), 6 sensor input, P/N 333238-004
Maximum number of sensors monitored per console	TLS-350 Series (64)
	TLS-450/TLS-450PLUS (32)
	TLS4/8601 Series (12)
Compatible fuels	See "Sensor Application Matrix" on page 1.

¹For additional third party evaluation data of Standard Types see: http://nwgldc.org/evals/veeder_root_u.html

Miscellaneous

- Installation example (see Fig. 6)

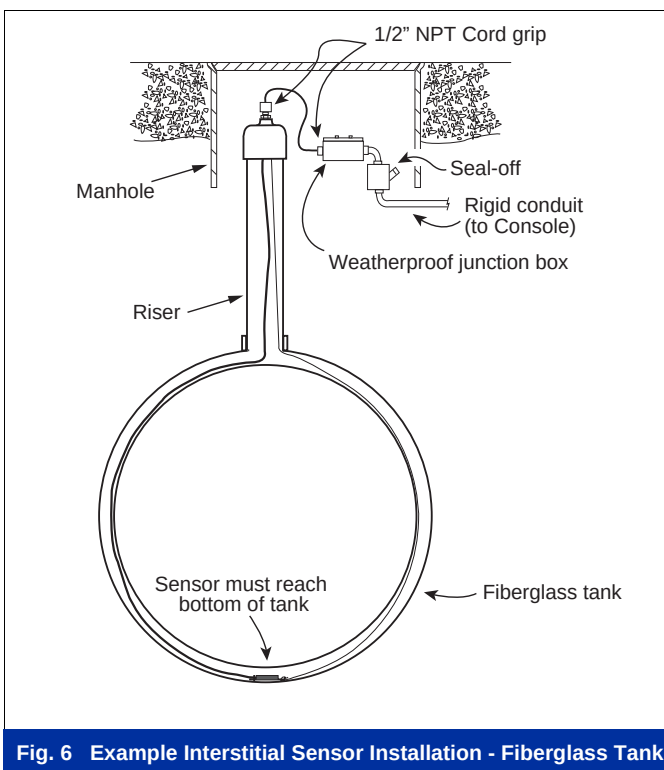


Fig. 6 Example Interstitial Sensor Installation - Fiberglass Tank

Interstitial Sensors for Double-Wall Fiberglass Tanks

The non-discriminating interstitial sensor for fiberglass tanks detects the presence of liquid in the interstitial space of the tank. An open sensor triggers a Sensor Out alarm.

Table 9. Interstitial Sensor for Double-Wall Fiberglass Tanks Features and Console Compatibility

Item	Description
Form number	794380-409 (includes 25 ft [7.6m] cable; for 4 - 12 ft [1.2 to 3.6m] I.D. fiberglass tanks)
Operating principle	Float switch
Product activation height¹	0.72 inches (1.84 cm)
Operating temperature	-4 to +140°F (-20 to +60°C)
Dimensions	2.2" (5.6cm) length, 1.3" (3.3cm) width, 0.6" (1.5cm) thick
Compatible consoles	TLS-450/TLS-450PLUS, TLS4/8601 Series, TLS-350 Series, TLS-300 Series
Console Interface Module	TLS-300 Series - No input module required
	TLS-350 Series, Interstitial/Liquid Sensor Interface Module, 8 sensor input, P/N 329358-001
	TLS-450/TLS-450PLUS - Universal Sensor Module (USM), 16 sensor input, P/N 332812-001
	TLS4/8601 Series - Universal Sensor Input Output Module (USIOM) (AC ver.), 12 sensor input, P/N 333238-001; (AC ver.), 6 sensor input, P/N 333238-002; (DC ver.), 12 sensor input, P/N 333238-003; (DC ver.), 6 sensor input, P/N 333238-004
Maximum number of sensors monitored per console	TLS-300 Series (8)
	TLS-350 Series (48)
	TLS-450/TLS-450PLUS (32)
	TLS4/8601 Series (12)
Compatible fuels	See "Sensor Application Matrix" on page 1.

¹For additional third party evaluation data see: http://nwglde.org/evals/veeder_root_m.html

Miscellaneous

- Installation example (see Fig. 6)

Interstitial High Alcohol Sensor for Double-Wall Fiberglass Tanks

Compatible with fuel blends up to 85%Ethanol!

The interstitial sensor for double-wall fiberglass tanks with high alcohol product uses solid-state liquid level sensing technology to detect liquid in the interstitial space of the tank. An open sensor triggers a Sensor Out Alarm.

Table 10. Interstitial High Alcohol Sensor for Double-Wall Fiberglass Tanks Features and Console Compatibility

Item	Description
Form Number	794380-345 (includes 25 ft [7.6m] cable; for 4 - 10 ft [1.2 to 3m] I.D. fiberglass tanks)
Operating principle	Optical sensor
Product activation height¹	Gasoline <0.2" (0.5cm); Water <0.2 inch
Operating temperature:	14 to +140°F (-10 to +60°C)
Dimensions	4.3" (11cm) length, 1.5" (3.8cm) width, 0.5" (1.3cm) thick
Compatible consoles	TLS-450/TLS-450PLUS, TLS4/8601 Series, TLS-350 Series
Console Interface Module	TLS-350 Series - Type A Sensor Interface Module, 8 sensor input, P/N 329956-001
	TLS-450/TLS-450PLUS - Universal Sensor Module (USM), 16 sensor input, P/N 332812-001
	TLS4/8601 Series - Universal Sensor Input Output Module (USIOM) (AC ver.), 12 sensor input, P/N 333238-001; (AC ver.), 6 sensor input, P/N 333238-002; (DC ver.), 12 sensor input, P/N 333238-003; (DC ver.), 6 sensor input, P/N 333238-004
Maximum number of sensors monitored per console	TLS-350 Series (64)
	TLS-450/TLS-450PLUS (32)
	TLS4/8601 Series (12)
Compatible fuels	See "Sensor Application Matrix" on page 1.

¹For additional third party evaluation data of Standard Types see: http://nwglde.org/evals/veeder_root_zd.html

Miscellaneous

- Installation example (see Fig. 6)

Interstitial Sensors for Steel Tanks

The Interstitial Sensor for steel tanks detects the presence of liquid between the double walls of the tank. An open sensor triggers a Sensor Out alarm.

Table 11. Interstitial Sensor for Steel Tanks Features and Console Compatibility

Item	Description
Form number	794380-420 (16 foot [4.9m] cable); 794380-460 (30 foot [9.1m] cable)
Operating principle	Float switch
Product activation height¹	1.59 inches (4.05 cm)
Operating temperature	-4 to +140°F (-20 to +60°C)
Dimensions	2.5" (6.4cm) high, 1.5" (3.8cm) diameter
Compatible consoles	TLS-450/TLS-450PLUS, TLS4/8601 Series, TLS-350 Series, TLS-300 Series
Console Interface Module	TLS-300 Series - No input module required
	TLS-350 Series, Interstitial/Liquid Sensor Interface Module, 8 sensor input, P/N 329358-001
	TLS-450/TLS-450PLUS - Universal Sensor Module (USM), 16 sensor input, P/N 332812-001
	TLS4/8601 Series - Universal Sensor Input Output Module (USIOM) (AC ver.), 12 sensor input, P/N 333238-001; (AC ver.), 6 sensor input, P/N 333238-002; (DC ver.), 12 sensor input, P/N 333238-003; (DC ver.), 6 sensor input, P/N 333238-004
Maximum number of sensors monitored per console	TLS-300 Series (8)
	TLS-350 Series (48)
	TLS-450/TLS-450PLUS (32)
	TLS4/8601 Series (12)
Compatible fuels	See "Sensor Application Matrix" on page 1.

¹For additional third party evaluation data see: http://nwgldc.org/evals/veeder_root_m.html

Miscellaneous

- Riser cap and adapter kit (2") - P/N 312020-928
- Installation example (see Fig. 7)

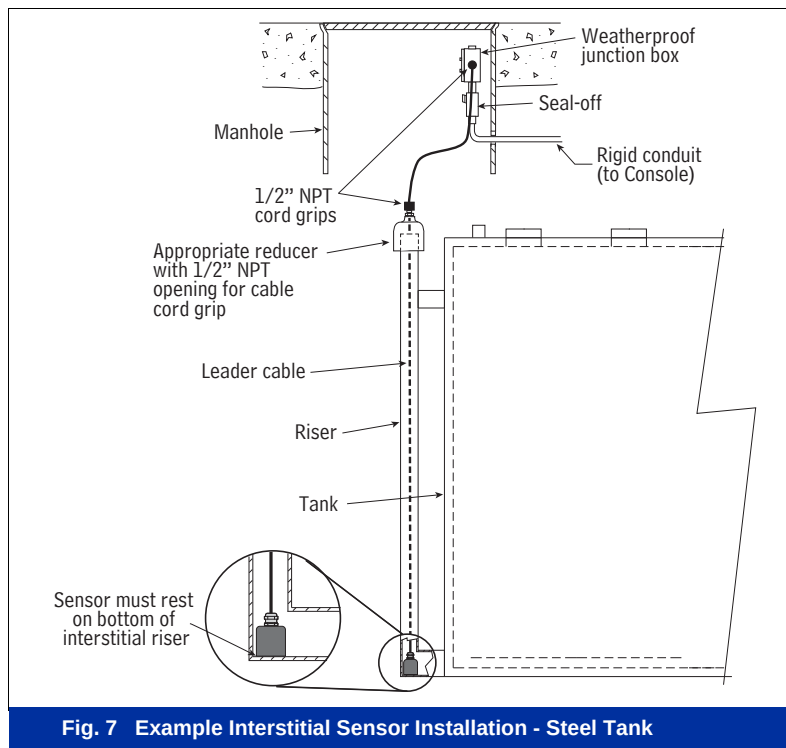


Fig. 7 Example Interstitial Sensor Installation - Steel Tank

Position Sensitive Interstitial Sensor for Steel Tanks

Compatible with fuel blends up to 85%Ethanol!

The sensor for steel tanks detects the presence of liquid between the double walls of the tank. In addition, it provides an alarm when the sensor is not positioned correctly on the bottom of the interstitial space.

Table 12. Position Sensitive Interstitial Sensor for Steel Tanks Features and Console Compatibility

Item	Description
Form number	794380-333 (15 Foot cable [4.6m])
Operating principle	Float switch
Product activation height	1.25" (3.2cm)
Operating temperature	-4 to +140°F (-20°C to +60°C) (hydrocarbons, non-freezing water)
Dimensions	3.5" (8.9cm) High, 1.75" (4.4cm) Diameter
Compatible consoles	TLS-450/TLS-450PLUS, TLS4/8601 Series, TLS-350 Series, TLS-300 Series
Console Interface Module	TLS-300 Series - No input module required
	TLS-350 Series, Interstitial/Liquid Sensor Interface Module, 8 sensor input, P/N 329358-001
	TLS-450/TLS-450PLUS - Universal Sensor Module (USM), 16 sensor input, P/N 332812-001
	TLS4/8601 Series - Universal Sensor Input Output Module (USIOM) (AC ver.), 12 sensor input, P/N 333238-001; (AC ver.), 6 sensor input, P/N 333238-002; (DC ver.), 12 sensor input, P/N 333238-003; (DC ver.), 6 sensor input, P/N 333238-004
Maximum number of sensors monitored per console	TLS-300 Series (8)
	TLS-350 Series (48)
	TLS-450/TLS-450PLUS (32)
	TLS4/8601 Series (12), AC or DC versions of TLS4b only monitor a maximum of (6)
Compatible fuels	See "Sensor Application Matrix" on page 1.

Miscellaneous

- Riser cap and adapter kit (2" [50mm]) - P/N 312020-928
- Installation example (see Fig. 8) and control drawing 577014-041

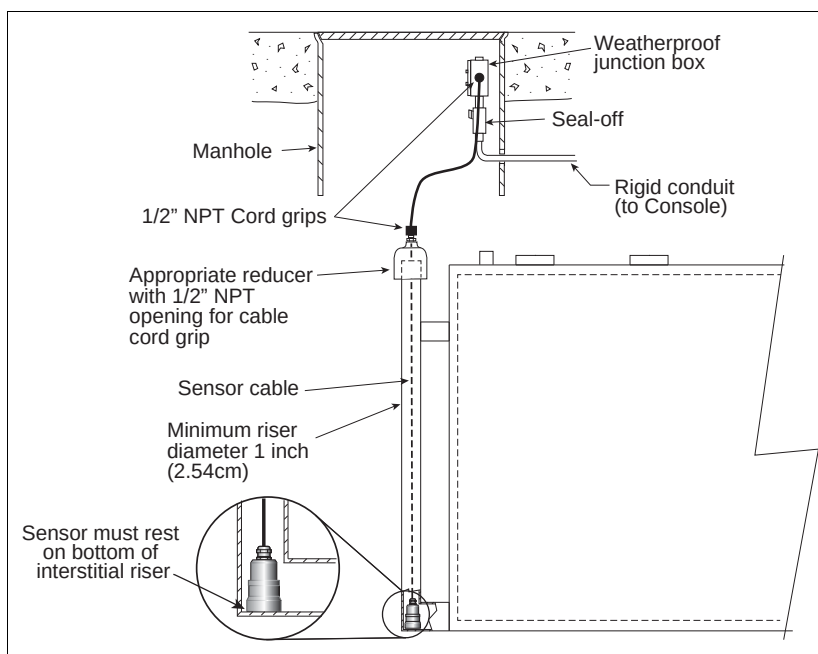


Fig. 8 Example Position Sensitive Interstitial Sensor for Steel Tanks

Interstitial High Alcohol Sensors for Steel Tanks

Compatible with fuel blends up to 85%Ethanol!

The Interstitial Sensor for steel tanks with high alcohol product detects the presence of liquid between the double walls of the tank. An open sensor triggers a Sensor Out alarm.

Table 13. Interstitial High Alcohol Sensors for Steel Tanks Features and Console Compatibility

Item	Description
Form number	794380-430 (15 foot [4.6m] cable)
Operating principle	Float switch
Product activation height ¹	0.95" (2.4cm)
Operating temperature	-4 to +140°F (-20 to +60°C)
Dimensions	2.5" (6.4cm) high, 1.5" (3.8cm) diameter
Compatible consoles	TLS-450/TLS-450PLUS, TLS4/8601 Series, TLS-350 Series, TLS-300 Series
Console Interface Module	TLS-300 Series - No input module required
	TLS-350 Series, Interstitial/Liquid Sensor Interface Module, 8 sensor input, P/N 329358-001
	TLS-450/TLS-450PLUS - Universal Sensor Module (USM), 16 sensor input, P/N 332812-001
	TLS4/8601 Series - Universal Sensor Input Output Module (USIOM) (AC ver.), 12 sensor input, P/N 333238-001; (AC ver.), 6 sensor input, P/N 333238-002; (DC ver.), 12 sensor input, P/N 333238-003; (DC ver.), 6 sensor input, P/N 333238-004
Maximum number of sensors monitored per console	TLS-300 Series (8)
	TLS-350 Series (48)
	TLS-450/TLS-450PLUS (32)
	TLS4/8601 Series (12)
Compatible fuels	See "Sensor Application Matrix" on page 1.

¹For additional third party evaluation data see: http://nwglde.org/evals/veeder_root_zb.html

Miscellaneous

- Riser cap and adapter kit (2" [50mm]) - P/N 312020-928
- Installation example (see Fig. 9)

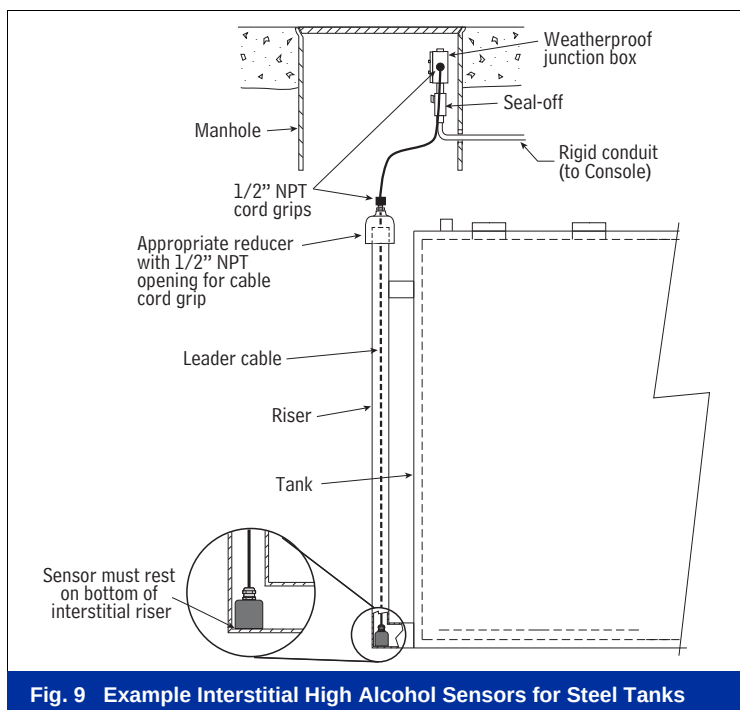


Fig. 9 Example Interstitial High Alcohol Sensors for Steel Tanks

MicroSensor

Compatible with fuel blends up to 85%Ethanol!

The non-discriminating small, easy to install solid-state MicroSensor is designed detect liquid in the interstitial space of a steel tank or a fill riser containment. An open sensor triggers a Sensor Out alarm.

Table 14. MicroSensor Features and Console Compatibility

Item	Description
Form number	794380-344 (25 foot [7.6m] cable)
Operating principle	Optical
Product activation height ¹	0.95" (2.4cm)
Operating temperature	-25.6 to +140°F (-32 to +60°C)
Dimensions	0.63" (16mm) max. diameter, 2" (51mm) long
Compatible consoles	TLS-450/TLS-450PLUS, TLS4/8601 Series, TLS-350 Series
Console Interface Module	TLS-350 Series, Type A Sensor Interface Module, 8 sensor input, P/N 329956-001
	TLS-450/TLS-450PLUS - Universal Sensor Module (USM), 16 sensor input, P/N 332812-001
	TLS4/8601 Series - Universal Sensor Input Output Module (USIOM) (AC ver.), 12 sensor input, P/N 333238-001; (AC ver.), 6 sensor input, P/N 333238-002; (DC ver.), 12 sensor input, P/N 333238-003; (DC ver.), 6 sensor input, P/N 333238-004
Maximum number of sensors monitored per console	TLS-350 Series (48)
	TLS-450/TLS-450PLUS (32)
	TLS4/8601 Series (12)
Compatible fuels	See "Sensor Application Matrix" on page 1.

¹For additional third party evaluation data see: http://nwglde.org/evals/veeder_root_u.html

Miscellaneous

- Installation examples Fig. 10 and Fig. 11.

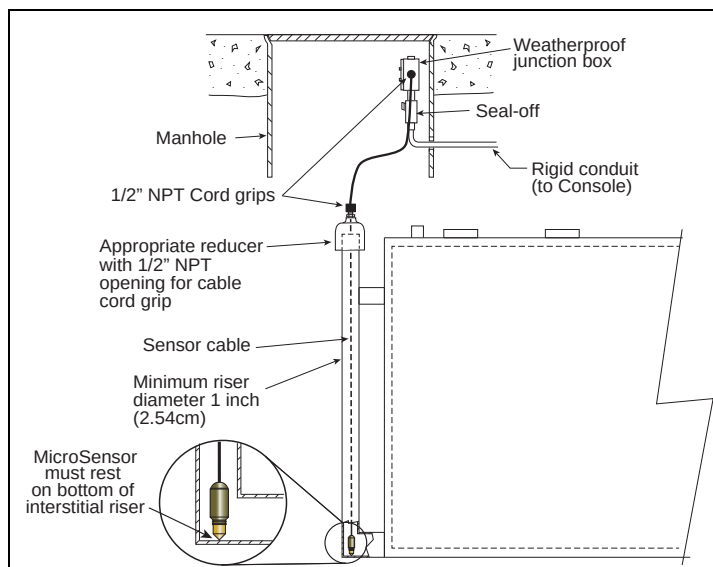


Fig. 10 Example Interstitial MicroSensor Installation - Steel Tank

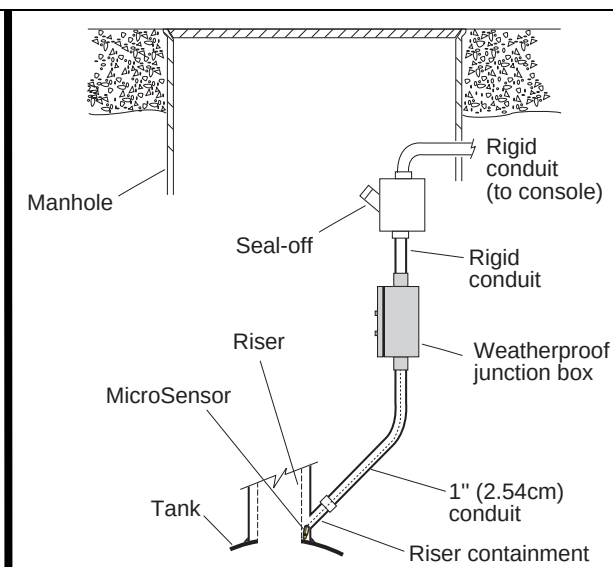


Fig. 11 Example MicroSensor Installation - Riser

Hydrostatic Reservoir Sensor

The Hydrostatic Reservoir Sensor accurately detects fluid level change in the reservoir and interstice of a double-wall storage tank. This sensor is available in a dual-point or single-point configuration. The Dual-Point version is ideal for high groundwater areas, and can differentiate between a high level alarm condition and a low level alarm condition. If an inner-wall leak occurs, the brine seeps into the tank triggering a low level alarm, if an outer wall leak occurs, fluid seeps into the interstice triggering a high level alarm. The Single-Point version can be used in low groundwater locations. If an inner-wall leak occurs, the brine seeps into the tank triggering a fuel alarm, or if the outer wall leaks, the brine seeps out of the tank interstice triggering a fuel alarm.

Table 15. Hydrostatic Reservoir Sensor Features and Console Compatibility

Item	Description
Form number	794380-301 Single-Point (12 foot [3.7m] cable); 794380-303 Dual-Point (12 foot [3.7m] cable)
Operating principle	Float switch
Product activation height¹	1.74" (4.4cm) Single-Point; Low 1.2" (3cm), High 13.13" (33.4cm) Dual-Point
Reservoir solutions	Up to 50% ethylene glycol in water; up to 50% propylene glycol in water; salt brine solution of up to 30% CaCl
Operating temperature	-13 to +122°F (-25 to +50°C)
Dimensions	6" (15cm) high, 2.5" (6.4cm) dia. Single-Point; 17.3" (44cm) high, 2.5" (6.4cm) dia. Dual-Point
Compatible consoles	TLS-450/TLS-450PLUS, TLS4/8601 Series, TLS-350 Series, TLS-300 Series
Console Interface Module	TLS-300 Series - no input module required
	TLS-350 Series, Interstitial/Liquid Sensor Interface Module, 8 sensor input, P/N 329358-001
	TLS-450/TLS-450PLUS - Universal Sensor Module (USM), 16 sensor input, P/N 332812-001
	TLS4/8601 Series - Universal Sensor Input Output Module (USIOM) (AC ver.), 12 sensor input, P/N 333238-001; (AC ver.), 6 sensor input, P/N 333238-002; (DC ver.), 12 sensor input, P/N 333238-003; (DC ver.), 6 sensor input, P/N 333238-004
Maximum number of sensors monitored per console	TLS-300 Series (8)
	TLS-350 Series (48)
	TLS-450/TLS-450PLUS (32)
	TLS4/8601 Series (12)
Compatible fuels	See "Sensor Application Matrix" on page 1.

¹For additional third party evaluation data see: http://nwglde.org/evals/veeder_root_q.html

Miscellaneous

- Interstitial sensor riser cap and adapter kit, 2" P/N 312020-928
- Sensor, fiberglass interstitial sensor installation kit P/N 330020-436
- Installation example (see Fig. 12)

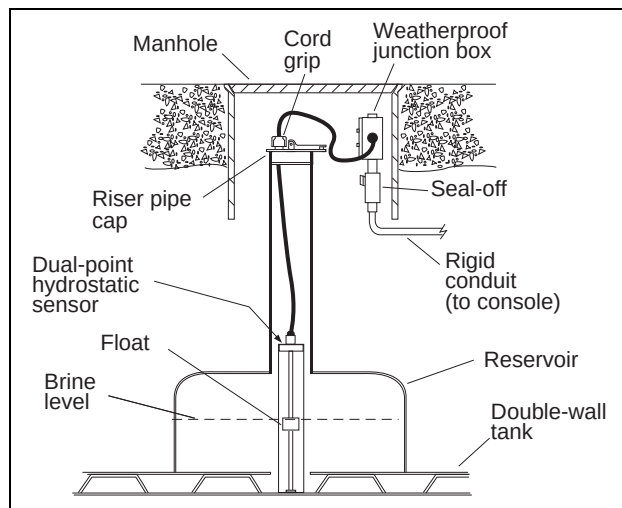


Fig. 12 Example Hydrostatic Dual-Point Sensor Installation

Single-Point Mini Hydrostatic Sensor for Double Wall Sumps

The Single-Point Mini Hydrostatic sensor accurately detects fluid level change in the interstice reservoir of a double-wall sump. If a leak occurs in the sump interstice, the brine seeps out of the reservoir triggering a low level alarm. An open sensor triggers a Sensor Out alarm.

Table 16. Mini Hydrostatic Reservoir Sensor Features and Console Compatibility

Item	Description
Form number	794380-304 (8 foot [2.4m] cable)
Operating principle	Float switch
Product activation height¹	0.793" (2cm)
Reservoir solutions	Up to 50% ethylene glycol in water; up to 50% propylene glycol in water; salt brine solution of up to 30% CaCl
Operating temperature	-13 to +122°F (-25 to +50°C)
Dimensions	2.5" (6.4cm) high, 1.5" (3.8cm) dia.
Compatible consoles	TLS-450/TLS-450PLUS, TLS4/8601 Series, TLS-350 Series, TLS-300 Series
Console Interface Module	TLS-300 Series - no input module required
	TLS-350 Series, Interstitial/Liquid Sensor Interface Module, 8 sensor input, P/N 329358-001
	TLS-450/TLS-450PLUS - Universal Sensor Module (USM), 16 sensor input, P/N 332812-001
	TLS4/8601 Series - Universal Sensor Input Output Module (USIOM) (AC ver.), 12 sensor input, P/N 333238-001; (AC ver.), 6 sensor input, P/N 333238-002; (DC ver.), 12 sensor input, P/N 333238-003; (DC ver.), 6 sensor input, P/N 333238-004
Maximum number of sensors monitored per console	TLS-300 Series (8)
	TLS-350 Series (48)
	TLS-450/TLS-450PLUS (32)
	TLS4/8601 Series (12)
Compatible fuels	See "Sensor Application Matrix" on page 1.

¹For additional third party evaluation data see: http://nwglde.org/evals/veeder_root_zs.html

Miscellaneous

- Installation example (see Fig. 13)

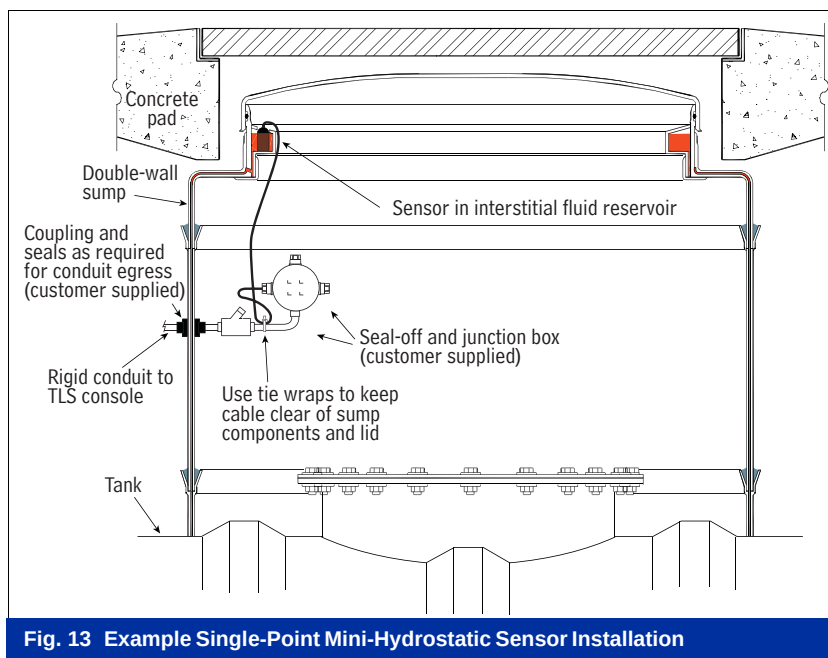


Fig. 13 Example Single-Point Mini-Hydrostatic Sensor Installation

Vapor Sensor

The Vapor Sensor detects hydrocarbon vapor exceeding the programmed threshold limit in the monitoring well. An open sensor triggers a Sensor Out alarm.

Table 17. Vapor Sensor Features and Console Compatibility

Item	Description
Form number	794390-700
Operating principle	Adsistor
Product activation ¹	500 ppm
Operating temperature	-4 to +140° (-20 to +60°C)
Dimensions	4.9" (12.4cm) long, 1.1" (2.8cm) dia.
Compatible consoles	TLS-450/TLS-450PLUS, TLS4/8601 Series, TLS-350 Series,
Console Interface Module	TLS-350 Series, Vapor Sensor Interface Module, 5 sensor input, P/N 329357-001
	TLS-450/TLS-450PLUS - Universal Sensor Module (USM), 16 sensor input, P/N 332812-001
	TLS4/8601 Series - Universal Sensor Input Output Module (USIOM) (AC ver.), 12 sensor input, P/N 333238-001; (AC ver.), 6 sensor input, P/N 333238-002; (DC ver.), 12 sensor input, P/N 333238-003; (DC ver.), 6 sensor input, P/N 333238-004
Maximum number of sensors monitored per console	TLS-350 Series (30)
	TLS-450/TLS-450PLUS (32)
	TLS4/8601 Series (12)
Compatible fuels	See "Sensor Application Matrix" on page 1.

¹For additional third party evaluation data see: http://nwglde.org/evals/veeder_root_t.html

Miscellaneous

- 4-inch (100mm) cap and adapter kit - P/N 312020-939
- Installation example (see Fig. 14)

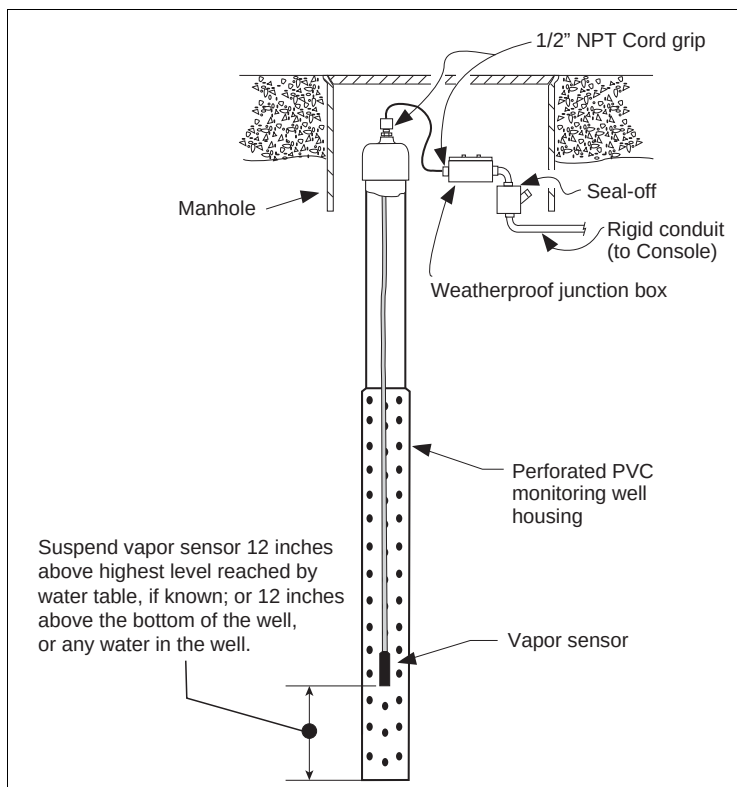
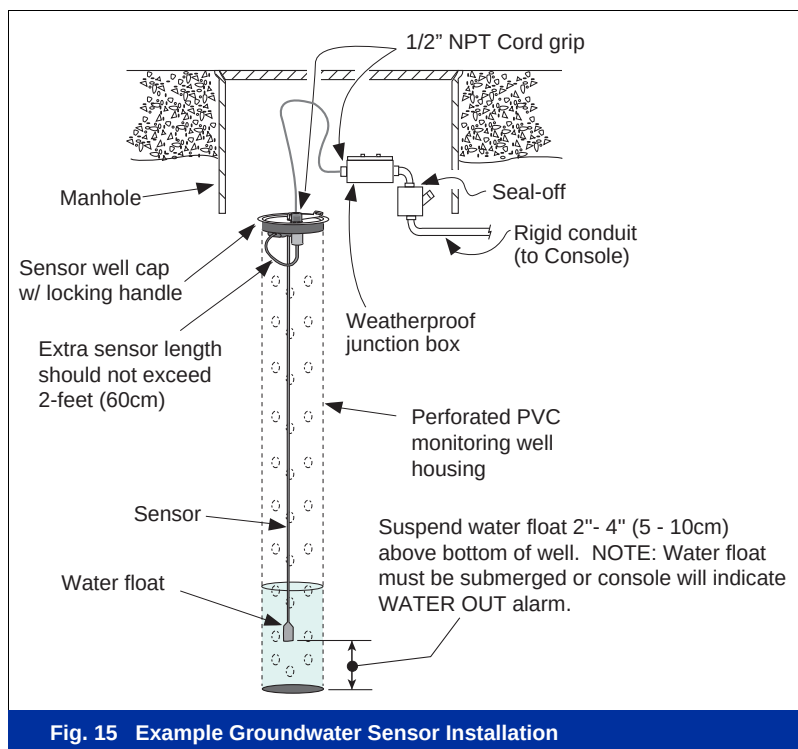


Fig. 14 Example Vapor Sensor Installation

Table 18. Groundwater Sensor Features and Console Compatibility

¹For additional third party evaluation data see: http://nwglde.org/evals/veeder_root_s.html

- 4-inch (100mm) cap and adapter kit - P/N 312020-939
- Installation example (see Fig. 15)



Direct Burial Cable

The Veeder-Root direct burial cable system provides everything needed for an alternative wiring installation method for use with our probes and sensors. Installation of buried cable should only be done in those locations where existing conduit is not available, and where local codes permit the use of buried cable instead of conduit, and epoxy splices instead of junction boxes. Before considering buried cable runs, check with the local authority having jurisdiction to be sure that direct burial practices are acceptable at your location.

If you are unfamiliar with direct burial techniques, you should consider either of two Veeder-Root kits:

- Direct Burial Cable Site Preparation kit (P/N 848100-500) which contains the Direct Burial Installation Manual, a splice kit installation manual and the 890-SL joint sealant instruction guide.
- Direct Burial Cable Site Demonstration kit (P/N 848100-502) which contains one splice kit with installation instructions, a 890-SL joint sealant instruction guide, a 6-inch piece of 2 conductor direct burial wire.

After reviewing the contents of these kits, and after verifying local code requirements, you should be much more informed as to the applicability of this wiring method for your site.

Direct Burial Cable Specifications

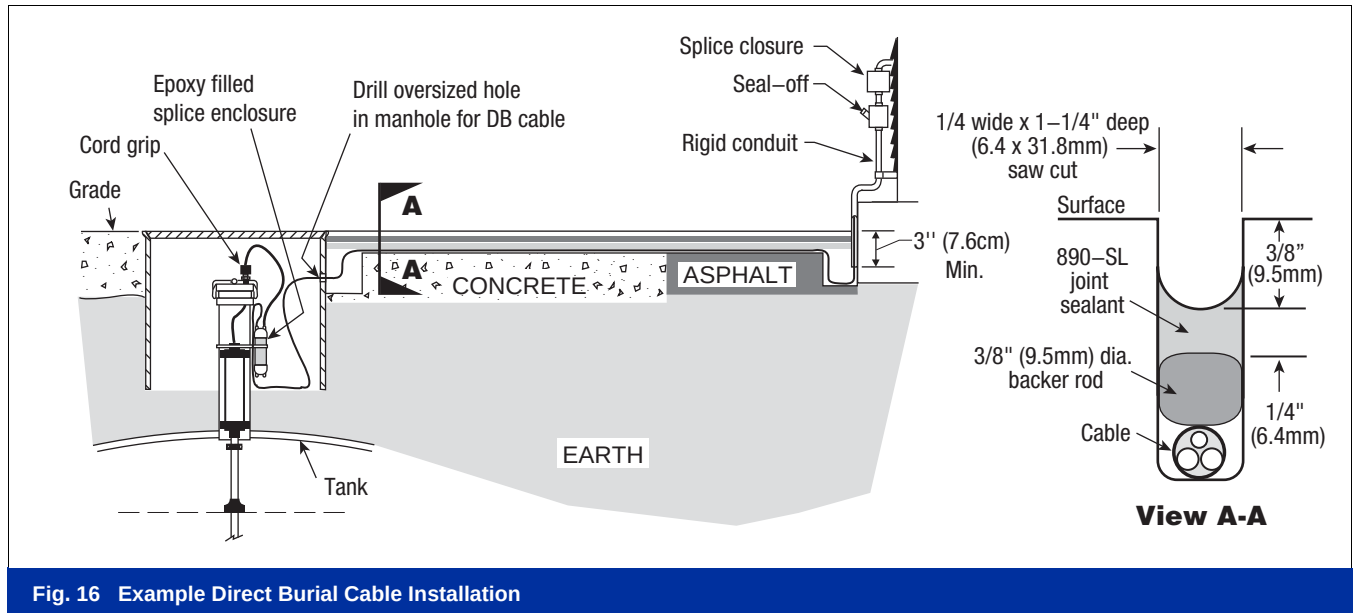
2-CONDUCTOR, SHIELDED CABLE		3-CONDUCTOR, SHIELDED CABLE	
Item	Description	Item	Description
Primaries		Primaries	
Conductor	#18 AWG (19/30) tinned copper	Conductor	#18 AWG (19/30) tinned copper
Insulation Type	Fluoropolymer	Insulation Type	Fluoropolymer
Primary O.D.	0.063" (1.6mm) nominal	Primary O.D.	0.063" (1.6mm) nominal
Drain	#20 AWG (7/28) tinned copper, located under the tape	Drain	#20 AWG (7/28) tinned copper, located under the tape
Jacket		Jacket	
Insulation type	Fluoropolymer	Insulation type	Fluoropolymer
Final O.D.	0.161" (4.1mm)	Final O.D.	0.171" (4.34mm)
Color	Red tint	Color	blue tint
UL temp rating	257°F (125°C)	UL temp rating	392°F (200°C)

Direct Burial Cable Components

Order equal lengths of filler rod and either type cable. Refer to V-R manual 576013-858 to estimate length.

- Filler rod - P/N 848100-1XX (lengths of 100 to 2000 feet [30.5 to 610m], in increments of 100 feet [30.5m])
- Filler rod installation tool P/N 848100-904 (adjusts to 1/8" [0.32cm], 1/4" [6.4mm], 3/8" [9.5mm], or 1/2" [12.7mm] saw cuts)
- 2-conductor cable - P/N 848100-2XX (lengths of 100 to 2000 feet (30.5 to 610m), in increments of 100 feet)
- 3-conductor cable - P/N 848100-3XX (lengths of 100 to 2000 feet, in increments of 100 feet)
- Cartridge of 890-SL sealant P/N 848100-800 (60 linear feet [18m] in 1/4" [6.4mm] wide cut)
- 4.5 gallon (17 liter) can of 890-SL sealant P/N 848100-805 (1200 linear feet [365m] in 1/4" [6.4mm] wide cut)
- Sealant cartridge gun, manual driven - P/N 8481021 (for use with P/N 848100-800 cartridge)
- Sealant bulk gun, air driven - P/N 848100-903 (for use with P/N 848100-805 4.5 gallon (17 liter) can)

Direct Burial Cable Installation Example



Appendix A - Sensor Type Programming Table

The table below is helpful when selecting Sensor Type (for TLS-3XX Series consoles) or Sensor Model (for TLS4/8601 and TLS-450 and TLS-450PLUS consoles) during sensor setup.

Sensor Type Programming Table for TLS Consoles

Sensor	Form Number	Sensor Category (Location)	TLS-3XX Series Sensor Type	TLS4/8601 Series TLS-450 and TLS-450PLUS Sensor Model
Discriminating Dispenser Pan and Sump Sensors - Standard	794380-322 (DPS), 794380-352 (CSS)	Sump/Pan	Liquid Sensor Setup: Sensor Type - Dual Float Discriminating	Device Setup Liquid Sensor: Model - Dual Float Discriminating
Discriminating Dispenser Pan and Sump Sensors - Optical	794380-320 (DPO), 794380-350 (CSO)	Sump/Pan	3-Wire C.L. Setup: Sensor Mode - Standard	Device Setup Type B Sensor: Model - Ultra/Z-1 (Standard)
Mag Sump Sensor	857080-XXX	Sump/Pan	Smart Sensor Setup: Sensor Category- Mag Sensor	Device Setup MAG Sensor
Solid-State Dispenser Pan and Containment Sump	794380-321 (DP); 794380-351 (CS)	Sump/Pan	2-Wire C.L. Setup: Sensor Type - Discrim Interstitial	Device Setup Type A Sensor: Model - Discrim. Interstitial
Piping Sump	794380-208	Sump/Pan	Liquid Sensor Setup: Sensor Type - Tri-State Liquid	Device Setup Liquid Sensor: Model - Tri-State
Position-Sensitive Sensor High Alcohol Compatible!	794380-323	Sump/Pan	Liquid Sensor Setup: Sensor Type - Tri-State Liquid	Device Setup Liquid Sensor: Model - Tri-State
Discriminating Interstitial Sensor for Double-Wall Fiberglass Tanks	794380-343	Annular Space	2-Wire C.L. Setup: Sensor Type - Discrim Interstitial	Device Setup Type A Sensor: Model - Discrim. Interstitial
Interstitial Sensors for Double-Wall Fiberglass Tanks	794380-409	Annular Space	Liquid Sensor Setup: Sensor Type - Tri-State Liquid	Device Setup Liquid Sensor: Model - Tri-State
Interstitial High Alcohol Sensor for Double-Wall Fiberglass Tanks High Alcohol Compatible!	794380-345	Annular Space	2-Wire C.L. Setup: Sensor Type - Ultra 2	Device Setup Type A Sensor: Model - Ultra 2
Interstitial Sensors for Steel Tanks	794380-4X0	Annular Space	Liquid Sensor Setup: Sensor Type - Tri-State Liquid	Device Setup Liquid Sensor: Model - Tri-State
Position Sensitive Interstitial Sensor for Steel Tanks High Alcohol Compatible!	794380-333	Annular Space	Liquid Sensor Setup: Sensor Type - Tri-State Liquid	Device Setup Liquid Sensor: Model - Tri-State
Interstitial High Alcohol Sensors for Steel Tanks High Alcohol Compatible!	794380-430	Annular Space	Liquid Sensor Setup: Sensor Type - Tri-State Liquid	Device Setup Liquid Sensor: Model - Tri-State
MicroSensor High Alcohol Compatible!	794380-344	Annular Space	2-Wire C.L. Setup: Sensor Type - Discrim Interstitial	Device Setup Type A Sensor: Model - Discrim Interstitial
Hydrostatic Reservoir	794380-301 (1 float)	Annular Space	Liquid Sensor Setup: Sensor Type - Tri-State Liquid	Device Setup Liquid Sensor: Model - Tri-State
	794380-303 (2 float)	Annular Space	Liquid Sensor Setup: Sensor Type - Dual Float Hydrostatic	Device Setup Liquid Sensor: Model - Dual Float Hydrostatic
Single-Point Mini Hydrostatic Sensor for Double Wall Sumps	794380-304	Annular Space	Liquid Sensor Setup: Sensor Type - Tri-State Liquid	Device Setup Liquid Sensor: Model - Tri-State
Vapor	794390-700	Monitor Well	Vapor Sensor Setup	Device Setup Vapor Sensor
Groundwater	794380-62X	Monitor Well	Groundwater Sensor Setup	Device Setup Groundwater Sensor
Oil/Water Separator	794690-XXX	Oil/Water Separator Tank	Liquid Sensor Setup: Sensor Type - Dual Float Discriminating	Device Setup Liquid Sensor: Model -Dual Float Discriminating

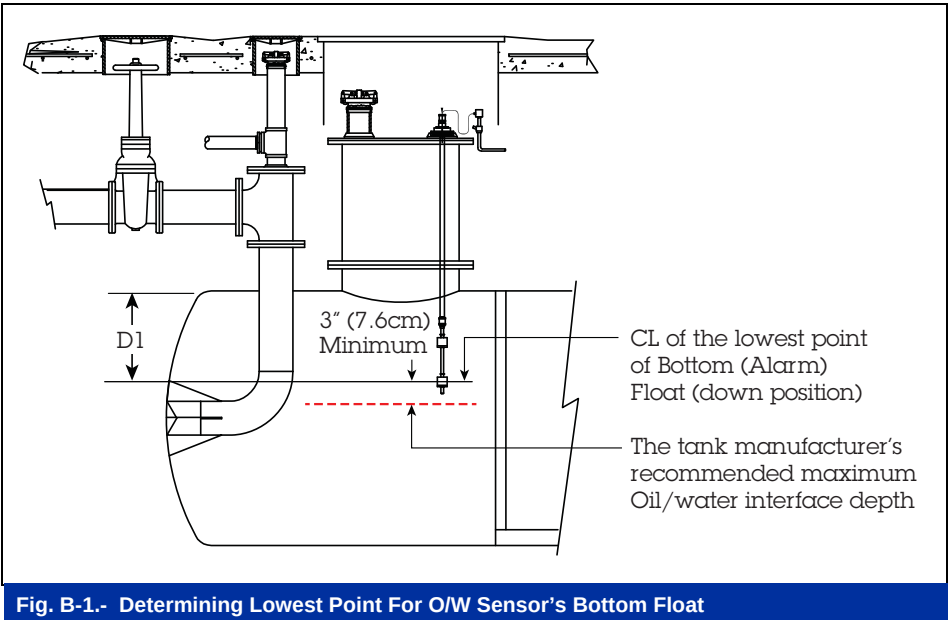
Appendix B - How To Order An Oil/Water Separator Sensor (OWSS)

Sensor Sizing

To determine the correct sensor length for the oil/water separator tank application use the manufacturer's tank chart to determine height - to - volume thresholds for warning and alarm conditions and make three measurements, including verifying fluid depths on the manufacturer's tank chart.

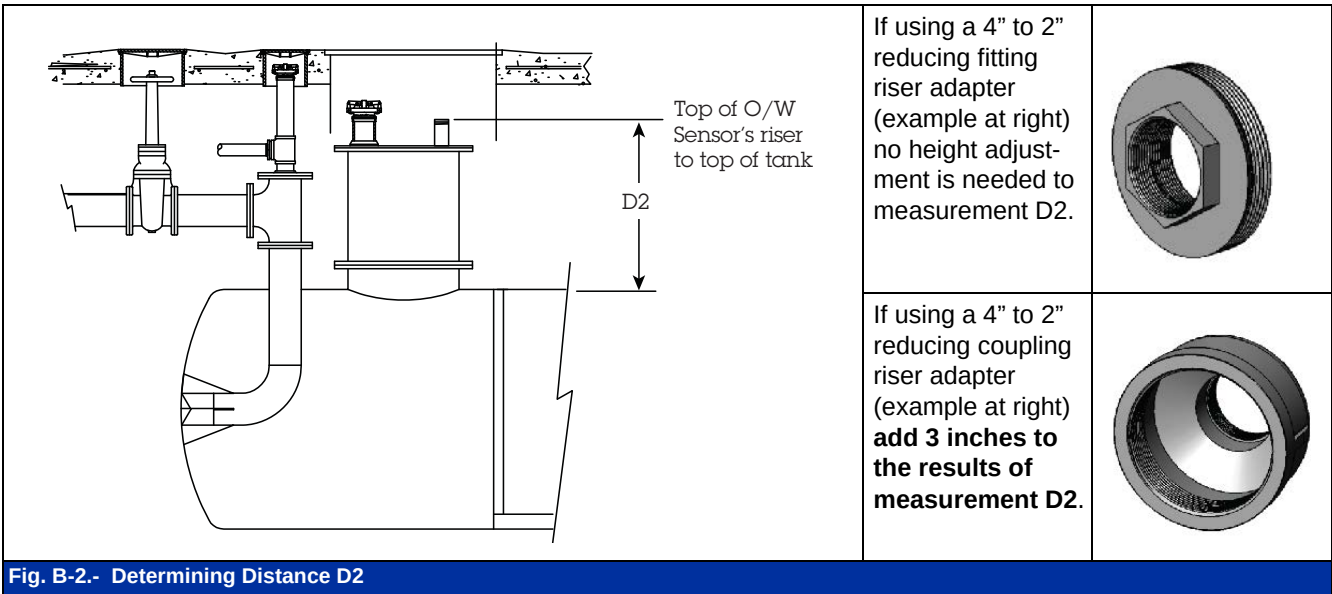
1. Determining The Lowest Point Of The Bottom (Alarm) Float

Measure and record the distance from inside the top of the tank to the maximum depth of waste oil/water interface in the tank as recommended by the tank's manufacturer (Fig.B-1). Subtract 3 inches from this measurement to determine the lowest permissible point in the tank for the centerline of the sensor's bottom (alarm) float and **note this measurement as D1**.



2. Determining Distance From Top Of Riser To Top Of Tank

Measure from the top of the riser down to the top of the tank and if using the riser reducing 4x2 fitting **note this measurement as D2**, OR, If using the riser reducing 4x2 coupling add 3" to the measured distance and **note this measurement as D2** (Fig.B-2)



3. Determining The Top (Warning) Float Position

Consult the tank chart to determine the height of the top warning level (centerline of the top float). Measure the distance from the top of the tank to the centerline of the top float (Fig.B-3). **Note this measurement as D3.**

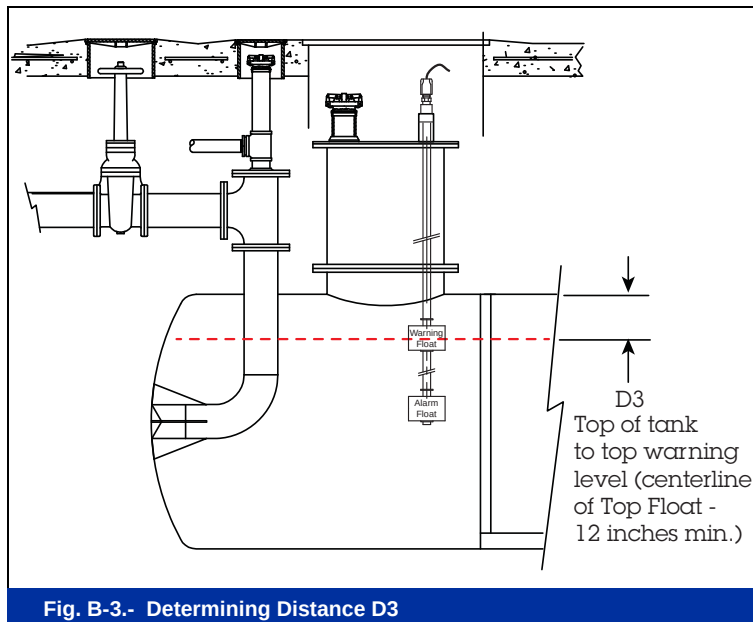


Fig. B-3.- Determining Distance D3

4. Determining Correct Sensor To Order

Use the D1, D2 and D3 measurements made in Steps 1 - 3 to determine the part number of the sensor from the V-R Oil/Water Separator Sensor matrix shown in Fig.B-4.

For example: D1 = 33", D2 = 24.5, D3 = 13"

D2 + D3 = Top float position, i.e., 24.5 + 13 = 37.5" (Dimension A in the V-R P/N matrix)

D1 - D3 = Bottom float position, i.e., 33 - 13 = 20" (Dimension B in the V-R P/N matrix)

Using the OWSS float positions calculated in the example above, the top float (Warning) would activate at 13 inches below the top of the tank and the bottom float (Alarm) would activate at 33" below the top of the tank. The correct part number for these example float positions would be 764690-053.

Round dimension A or B down to the nearest available option if necessary. Note: doing so will impact the float Warnings and Alarms generated on the TLS system.

Alarm Conditions

Alarm Type	Alarm Condition
Liquid Warning	Oil present in tank
Liquid Alarm	Oil has reached its maximum volume, remove from tank
Sensor Out Alarm	No communication to ATG
Normal	Tank is properly setup with liquid

Order OWSS part number 764690-XXX, where XXX equals the three digits where Dimensions A and B intersect in the part number matrix:

		DIMENSION "B"									
		5"	10"	15"	20"	25"	30"	35"	40"	45"	50"
DIMENSION "A"	18"	-010	-011	-012	-013	-014	-015	-016	-017	-018	-019
	22"	-020	-021	-022	-023	-024	-025	-026	-027	-028	-029
	26"	-030	-031	-032	-033	-034	-035	-036	-037	-038	-039
	30"	-040	-041	-042	-043	-044	-045	-046	-047	-048	-049
	34"	-050	-051	-052	-053	-054	-055	-056	-057	-058	-059
	38"	-060	-061	-062	-063	-064	-065	-066	-067	-068	-069
	42"	-070	-071	-072	-073	-074	-075	-076	-077	-078	-079
	46"	-080	-081	-082	-083	-084	-085	-086	-087	-088	-089
	50"	-090	-091	-092	-093	-094	-095	-096	-097	-098	-099
	54"	-100	-101	-102	-103	-104	-105	-106	-107	-108	-109
	58"	-110	-111	-112	-113	-114	-115	-116	-117	-118	-119
	62"	-120	-121	-122	-123	-124	-125	-126	-127	-128	-129
	66"	-130	-131	-132	-133	-134	-135	-136	-137	-138	-139
	70"	-140	-141	-142	-143	-144	-145	-146	-147	-148	-149
	74"	-150	-151	-152	-153	-154	-155	-156	-157	-158	-159
	78"	-160	-161	-162	-163	-164	-165	-166	-167	-168	-169
	82"	-170	-171	-172	-173	-174	-175	-176	-177	-178	-179
	86"	-180	-181	-182	-183	-184	-185	-186	-187	-188	-189
	90"	-190	-191	-192	-193	-194	-195	-196	-197	-198	-199

Fig. B-4.- Oil/Water Separator Sensor Part Number Matrix



8601 Series Console

Site Prep Certification Manual



Notice

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Contact TLS Systems Technical Support for additional troubleshooting information at 800-323-1799.

DAMAGE CLAIMS / LOST EQUIPMENT

Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

Veeder-Root must be notified of any damages and/or shortages within 30 days of receipt of the shipment, as stated in our Terms and Conditions.

VEEDER-ROOT'S PREFERRED CARRIER

1. Contact Veeder-Root Customer Service at 800-873-3313 with the specific part numbers and quantities that were missing or received damaged.
2. Fax signed Bill of Lading (BOL) to Veeder-Root Customer Service at 800-234-5350.
3. Veeder-Root will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

CUSTOMER'S PREFERRED CARRIER

1. It is the customer's responsibility to file a claim with their carrier.
2. Customer may submit a replacement purchase order. Customer is responsible for all charges and freight associated with replacement order. Customer Service will work with production facility to have the replacement product shipped as soon as possible.
3. If "lost" equipment is delivered at a later date and is not needed, Veeder-Root will allow a Return to Stock without a restocking fee.
4. Veeder-Root will NOT be responsible for any compensation when a customer chooses their own carrier.

RETURN SHIPPING

For the parts return procedure, please follow the appropriate instructions in the "General Returned Goods Policy" pages in the "Policies and Literature" section of the Veeder-Root **North American Environmental Products** price list. Veeder-Root will not accept any return product without a Return Goods Authorization (RGA) number clearly printed on the outside of the package.

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Introduction

This manual assumes that you are installing the console in a new site (before pavement is put down and with no wiring runs in place). Among the topics covered are:

- Related documents
- Installing the console
- Component locations
- Console specifications/features
- Connecting wiring from the AC power panel or DC power source
- Installing wiring conduit between the console and probes and sensors

If installing ATEX (European) approved Mag Probes use Manual No. 577014-031, if installing UL/cUL approved Mag Probes use Manual No. 577013-744.

Related Documents

DOCUMENTS REQUIRED TO INSTALL EQUIPMENT

This equipment must be installed according to the applicable installation document:

Equipment	ATEX Descriptive System	IECEX Descriptive System	UL/cUL Control Drawing
	Document No.	Document No.	Document No.
Associated Apparatus			
8601 Series Console	331940-017	331940-117	331940-018
Intrinsically Safe Apparatus for Wireless Applications			
Tank Gauge Accessories	331940-005	331940-105	331940-012

Related Manuals

577013-578 TLS Monitoring Systems Contractor's Site Preparation Guide

576013-858 Direct Burial Cable Installation Guide

577013-034 TLS4 Quick Start Guide

Safety Symbols

The following safety symbols are used in this manual to alert you to important safety hazards and precautions.

 EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.	 FLAMMABLE Fuels and their vapors are extremely flammable.
 ELECTRICITY High voltage exists in, and is supplied to, the device. A potential shock hazard exists.	 TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.
 WARNING Heed the adjacent instructions to avoid damage to equipment, property, environment or personal injury.	 READ ALL RELATED MANUALS Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.
 STATIC SENSITIVE COMPONENTS Wear grounded anti-static wrist strap before handling the printed circuit boards and mounted components.	

National Electrical Code Compliance

The following information is for general reference and is not intended to replace recommended National Electric Code (NEC) procedures. It is important for the installer to understand that electrical equipment and wiring located in Class I, Division 1 and 2 installations shall comply with the latest appropriate Articles found in the National Electric Code (NFPA 70), the Code for Motor Fuel Dispensing Facilities and Repair Garages (NFPA 30A), CEC codes and all applicable local codes.

PROBE- AND SENSOR-TO-CONSOLE WIRING

Wire Type

To ensure the best operating systems available, Veeder-Root **REQUIRES** the use of shielded cable for all probes and sensors regardless of conduit material or application. In these installations, shielded cable must be rated less than 100 picofarad per foot and be manufactured with a material suitable for the environment, such as Carol™ C2534 or Belden™ 88760, 8760, or 8770.

Note: Throughout this manual, when mentioning any cable or wire being used for probe and sensor to console wiring, it will be referring to shielded cable.

Wire Length

Improper system operation could result in undetected potential environmental and health hazards if the probe- or sensor-to-console wire runs exceed 1000 feet. Wire runs must be less than 1000 feet to meet intrinsic safety requirements.

Wire Gauges - Color coded

Shielded cable must be used in all installations. Sensor-to-console wires should be #14-#18 AWG stranded copper wire and installed as Class 2 circuits. As an alternate method when approved by the local authority having jurisdiction, #22 AWG wire such as Belden 88761 may be suitable in installations with the following provisions:

- Wire run is less than 750 feet
- Capacitance does not exceed 100 pF/foot
- Inductance does not exceed 0.2 μ H/foot

AC POWER WIRING

Wires carrying 120 or 240 Vac from the power panel to the console should be #14 AWG (or larger) wire for line, neutral and chassis ground (3); and 4 sq. mm, rated for at least 90°C, for barrier ground.

DC POWER WIRING

Wires carrying +24 and +5 Vdc from the DC power source to the console should be #14 AWG wire. For barrier ground, 4 sq. mm wire, rated for at least 90°C.

Component Identification

Figure 1 through Figure 3 show assembly and component locations referenced in the troubleshooting section of this manual.

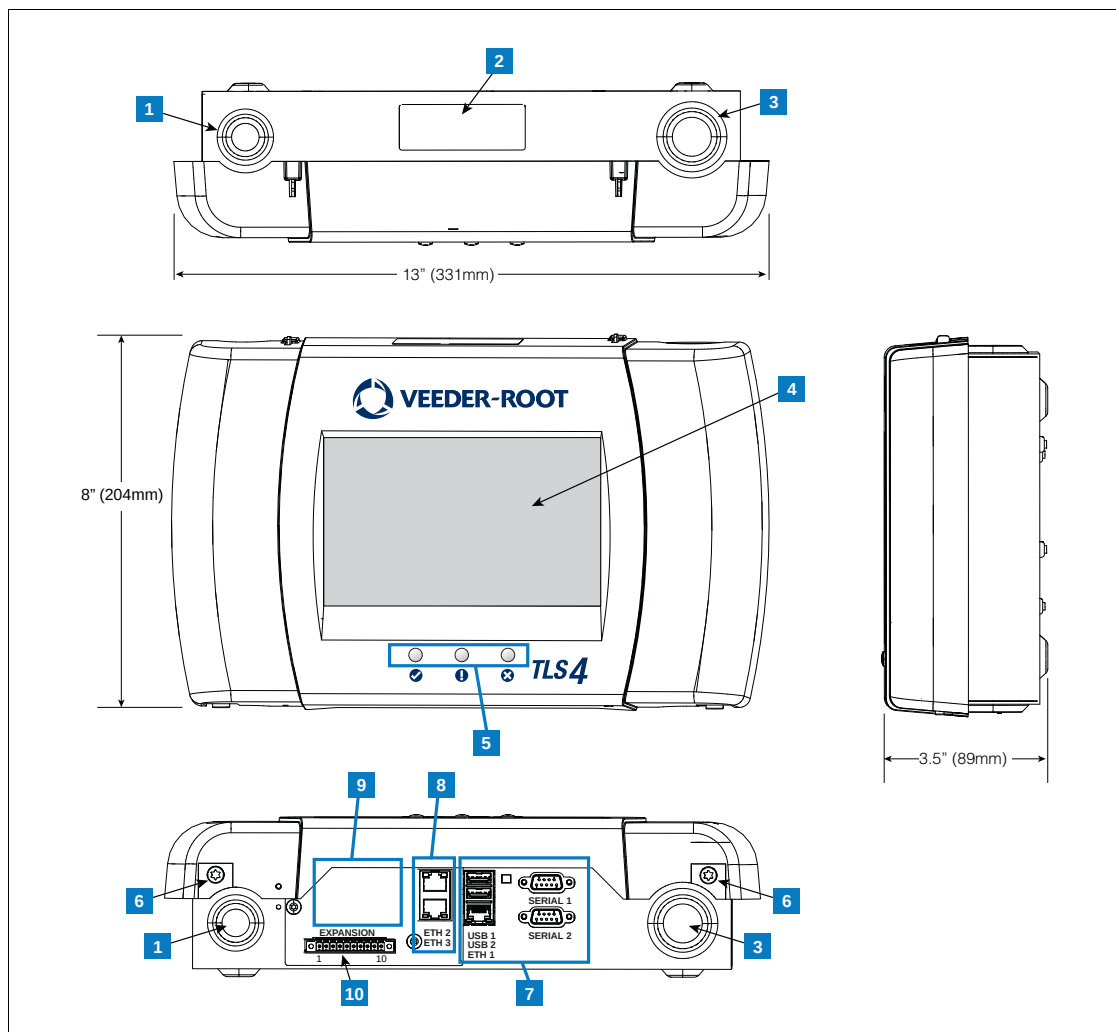


Figure 1. TLS4/8601 Series Console - Dimensions and Hardware

LEGEND FOR NUMBERED BOXES IN Figure 1

- | | |
|--|---|
| 1. Power conduit knockout (1 top/1 bottom) | 7. Communication ports - standard:
Serial ports 1 (full handshaking) and 2
USB ports 1 and 2
Ethernet port 1 |
| 2. Console label contains input power ratings and Form and Serial number | 8. Communication port - optional integrated ethernet switch ports 2 and 3 |
| 3. Intrinsically safe wiring conduit knockout (1 top/1 bottom) | 9. Factory Installed Optional Module |
| 4. Optional touch screen display | 10. Expansion port |
| 5. Status LEDs | |
| 6. T15 screws secure cover (2 places) | |

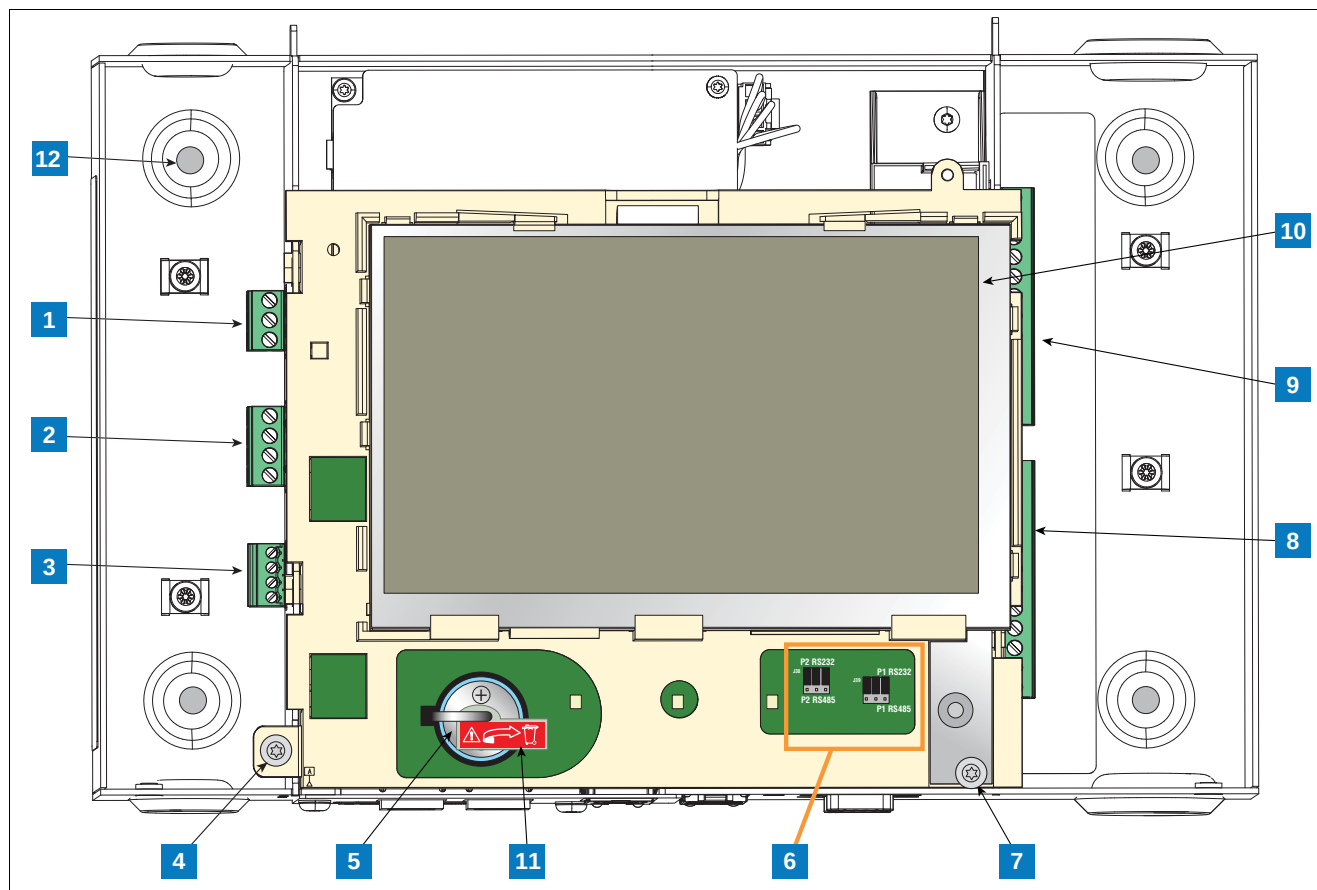
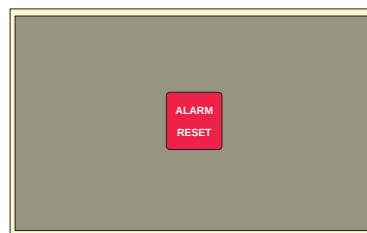


Figure 2. Component Locations (Front Cover Removed)

LEGEND FOR NUMBERED BOXES IN Figure 2

1. AC or DC input power connector (as ordered)
2. High voltage output relay connector
3. Low voltage external input connector
4. T15 screw secures Display/CPU assembly
5. Rechargeable 3V Lithium battery (battery backup)
6. RS232/485 selection jumpers SERIAL 1 (P1) and SERIAL 2 (P2)(factory set to RS232 position)
7. T20 screw secures Display/CPU assembly
8. Optional 6-device intrinsically safe input connector (7 - 12)
9. Standard 6-device intrinsically safe input connector (1 - 6)
10. Optional Graphical User Interface (GUI) display (on non-display consoles, the GUI display is replaced with the Alarm

Reset (Acknowledge) button panel shown below:



11. Battery Isolator - Remove and discard prior to startup.
12. Mounting Holes - 0.28" (7mm) diameter holes - (2 hole versions - upper left and lower right corners; 4 hole versions - all four corners) .

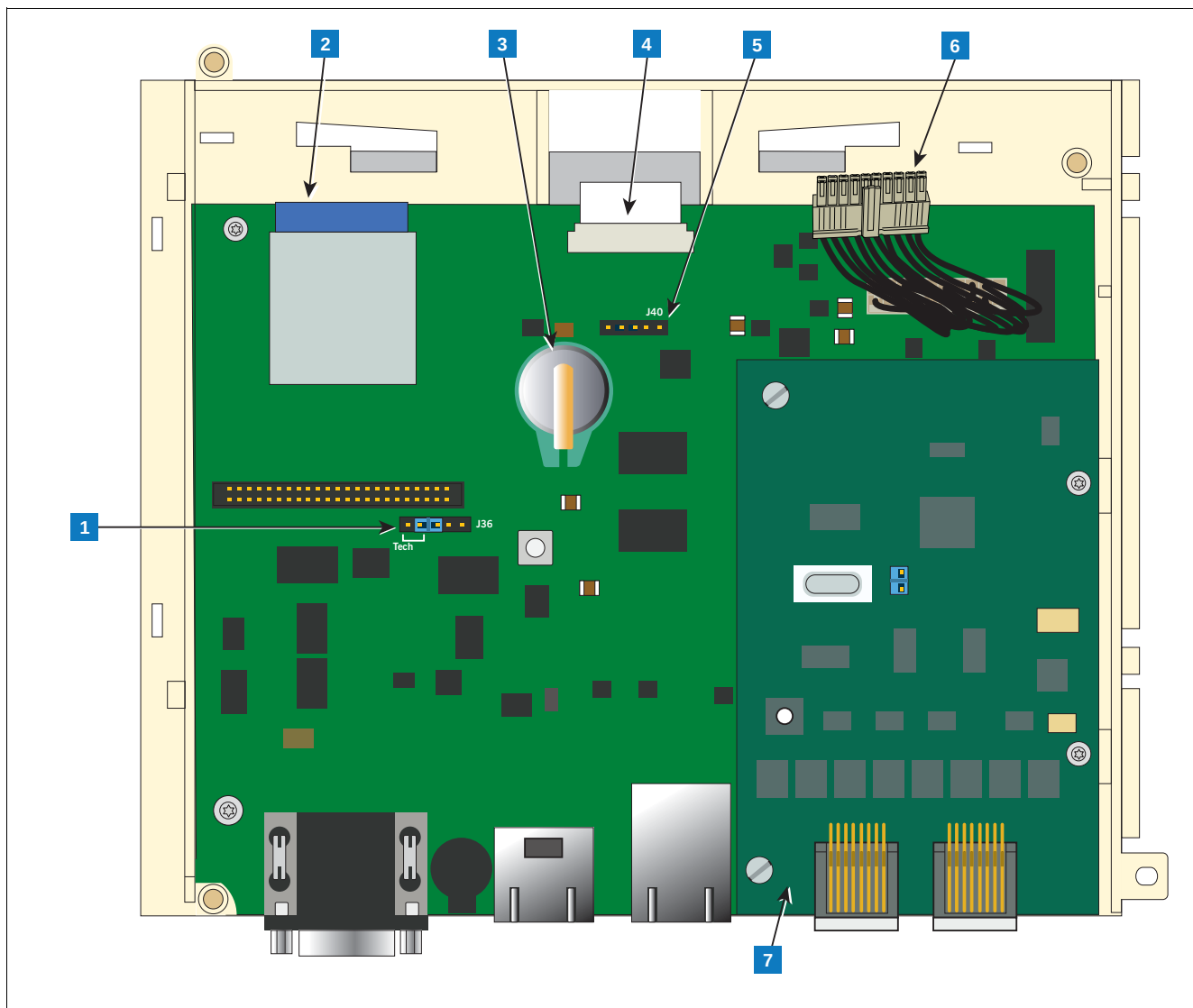


Figure 3. Component Locations Underside Of Display/CPU Board Ass'y.

LEGEND FOR NUMBERED BOXES IN Figure 3

- | | |
|--|---|
| 1. J36 Mode Jumper (shown in Operating Mode Position) | 5. Acknowledge switch cable connector (J40) - Consoles without GUI display only |
| 2. SD Card | 6. 20-pin Display/CPU-to-USIOM board cable |
| 3. Software Features iButton | 7. Optional CDIM module or IFSF module (CDIM module shown) |
| 4. Display ribbon cable connector - Consoles with GUI display only | |

Console Wiring Inputs

This section details TLS4 power, communication, and device input connections and requirements.

Table 1. TLS4 Wiring Inputs

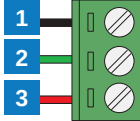
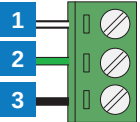
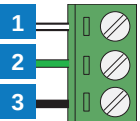
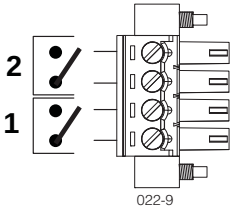
Connector	Description
Input Power (Item 1, Figure 2)	NOTE: The TLS4/8601 Series console is factory configured for either AC input power or DC input power, <u>but not both</u>. Universal AC power supply: 100 to 249Vac, 50/60Hz, 2A maximum; or DC power supply (optional): +24Vdc, 2A max. and +5Vdc, 4A max. Um <= 250Vrms or 250Vdc 240 Vac input: 1 - N/L2 (black), 2 - Ground (green), 3 - L1 (red)  120 Vac Input: 1 - N/L2 (white), 2 - Ground (green), 3 - L1 (black)  +24/+5 Vdc Input: 1 - +24 (white), 2 - Ground (green), 3 - +5 (black). NOTE: This input wiring diagram is only for consoles with DC Power option. 
HV Relay Outputs (Item 2, Figure 2)	2 Relay Outputs: 120/240 Vac, 5A; 30 Vdc, 5A; Fuse ratings 5A, 250 Vac Type T (Slo-Blo) 

Table 1. TLS4 Wiring Inputs

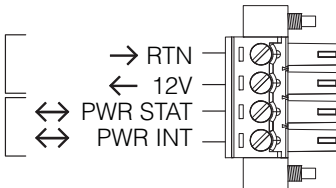
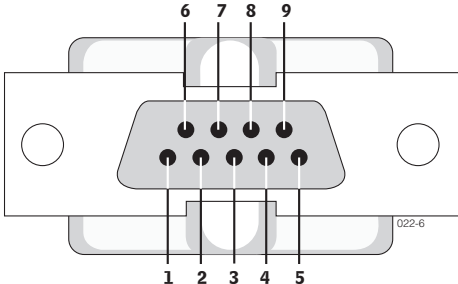
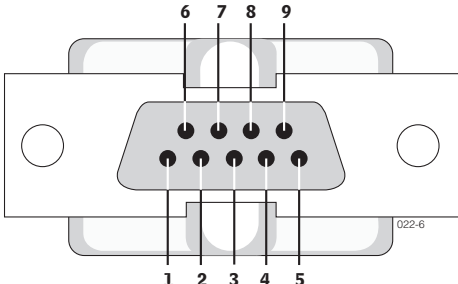
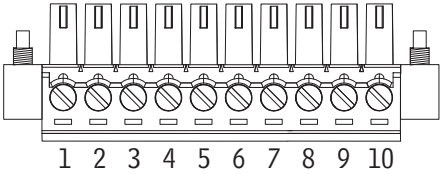
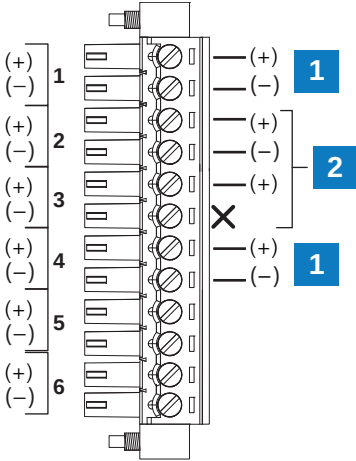
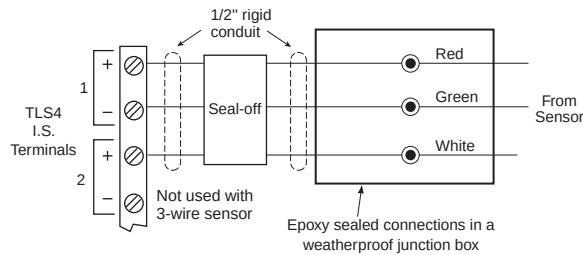
Connector	Description			
Low Voltage Inputs (Item 3, Figure 2)	1 Low Voltage Input: Maximum contact closure circuit ratings 12 Vdc, 0.015A Class I wiring is required for these 12 volt closure circuits.			
	Legend	Pin	Input	
	Dry Contact Switch	1	RTN	
		2	12V	
	For Future Use	3	PWR STAT	
4		PWR INT		
				
RS-232 Ports (Item 7 in Figure 1)	2 optically isolated serial ports standard, labeled SERIAL 1 supporting full handshaking and SERIAL 2.			
	The RS-232 D-connector is a panel mount, 9-pin female type, wired in a Data Terminal Equipment (DTE) configuration. For example, any RS-232 port in any TLS consoles is also a DTE, therefore, a Null Cable is needed in order for communication to happen between the two consoles.			
	A Data Communication Equipment (DCE) device such as a modem may be connected directly to the interface using a straight-through cable (modem support may not be available on all ATGs). Handshake signals in the system are configurable.			
	RS-232 signals are wired to the female D-connectors as follows:			
	SERIAL1 (Full Handshake)			
	Pin	Signal	Pin	Signal
	1	Data Carrier Detect	6	Data Set Ready
	2	Received Data	7	Request to Send
	3	Transmitted Data	8	Clear to Send
	4	Data Terminal Ready	9	Ring Indicator
5	Signal Ground			
				
SERIAL 2				
Pin	Signal	Pin	Signal	
1		6		
2	Received Data	7		
3	Transmitted Data	8		
4		9		
5	Signal Ground			
				

Table 1. TLS4 Wiring Inputs

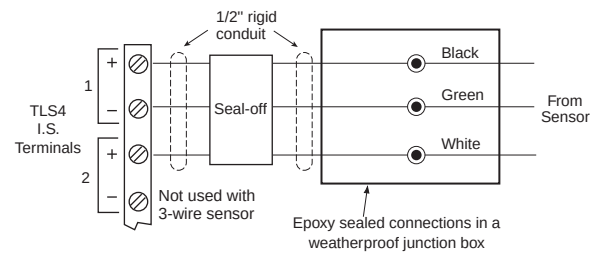
Connector	Description			
Ethernet Ports	1 Ethernet port standard, labeled ETH 1 (Item 7 in Figure 1)			
	1 Optional Ethernet port (Switch ETH 2 and ETH 3) (Item 8 in Figure 1)			
Factory Installed Optional Modules (One module per console)	Optional CDIM module - Two RJ-45/RJ-485 serial ports, labeled CDIM 1 and CDIM 2 (Item 9 in Figure 1)			
	Optional IFSF module - One IFSF port, labeled IFSF LON (Item 9 in Figure 1). The IFSF cable's plug will have to be assembled in the field. See TLS4 Troubleshooting manual (P/N 577014-058) for full instructions.			
USB Ports	2 USB ports, labeled USB 1 and USB 2 (Item 7 in Figure 1)			
Expansion Port	10-pin connector VR bus, labeled EXPANSION (Item 10 in Figure 1)			
	Legend			
	Pin	Signal	Pin	Signal
	1	+W	6	Ground
	2	-W	7	+ 24 Vdc
	3	+15 Vdc	8	+ Expansion Bus
	4	Ground	9	- Expansion Bus
	5	N/C	10	Expansion Reset
Intrinsically Safe inputs	6 or 12 universal intrinsically safe inputs as ordered (Items 8 and 9 in Figure 2)			
	Item	Description		
	1	Typical 2-wire device		
	2	Typical 3-wire device		

Probe And Sensor Field Wiring

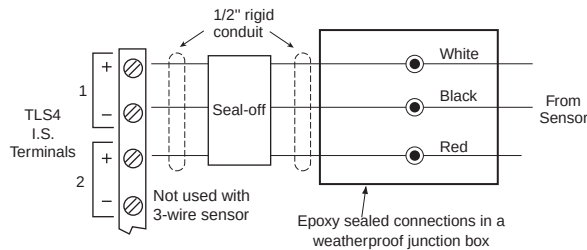
Figure 4 contains diagrams for connecting, at the field junction box, cables from the probes and sensors to cables from the console. Check diagrams closely for polarity requirements.



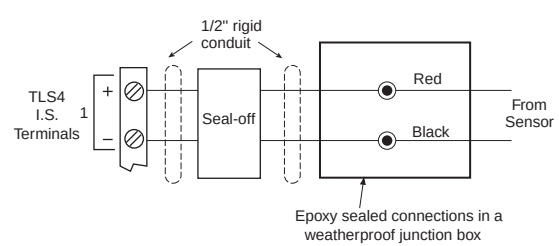
Groundwater Sensor



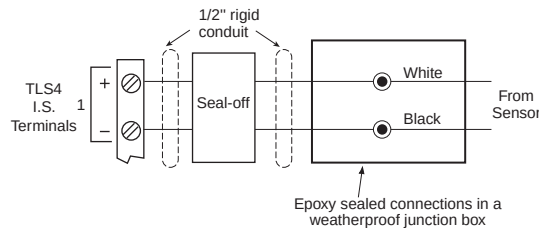
Vapor Sensor



**4SITE Solid-State Discriminating Containment Sump Sensor
4SITE Solid-State Discriminating Dispenser Pan Sensor**



**Position Sensitive Interstitial Sensor for Steel Tanks
Interstitial Sensor For Steel Tanks
CSTP Liquid Switch**



**Magnetostrictive Probe
Position-Sensitive Sensor
Solid-State Containment Sump Sensor
Sump Sensor
Solid-State Dispenser Pan Sensor
Solid-State Discriminating Interstitial Liquid Sensor For Fiberglass Tanks
Discriminating Containment Sump Sensor
Hydrostatic Sensors For Fiberglass Tanks
Interstitial Sensor For Fiberglass Tanks
Microsensor**

Figure 4. Field Wiring Probe And Sensor Cables To Console Cables

Console Installation

⚠ WARNING



FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH.

Explosive vapors or flammable liquids could be present near locations where fuels are stored or being dispensed.

This console is not explosion proof. Do not install this console in a volatile, combustible, or explosive atmosphere.

An explosion or fire resulting in serious injury or death, property loss and equipment damage could occur if the console is installed in a volatile, combustible or explosive atmosphere (Class I, Division 1 or 2).

Console Location

For console location, refer to the 'System Consoles' section of manual 577013-578 on the Veeder-Root Tech Docs CD-ROM prior to installing the 8601 Series Console.

Mounting the Console

To mount the console remove the two T15 screws in the bottom of the cover (see Figure 1). As you lift up the bottom of the cover it pivots on two tabs that project from the top of the console's chassis into slots in the top of the cover. Lift the cover off the chassis tabs and set it aside. Notice the corner mounting holes in the base of the chassis (Item 12 in Figure 2). Locate the chassis on the wall in the desired mounting location, mark the hole locations, drill the appropriate pilot holes; and using 1/4-inch (6mm) maximum fasteners (customer supplied), attach the chassis to the mounting surface at all four locations.

Figure 1 shows the two designated knockouts through which power wiring can safely enter the console.

Wiring the Console

The 8601 Series Console can be operated using either AC or DC power.

⚠ WARNING



This console contains high voltages which can be lethal. It is also connected to low power devices that must be kept intrinsically safe.

1. Turn power off at the circuit breaker. Do not connect the console AC power supply wires at the breaker until all devices are installed.
2. Attach conduit from the power panel to the console's Power Area knockouts only.

Connecting power wires to a live circuit can cause electrical shock that may result in serious injury or death.

Routing conduit for power wires into the intrinsically safe compartment can result in fire or explosion resulting in serious injury or death

AC INPUT POWER

1. Check the Input power rating on the label affixed to the underside of the console to verify whether input power requirements are 120 Vac or 240 Vac.
2. Pull four wires between the power panel and the console; three #14 AWG or larger color-coded wires for AC line (hot), AC neutral and chassis ground; and one 4 sq. mm wire, rated for at least 90°C, for barrier ground.
3. Connect the input 120 or 240 Vac power wires as shown in Figure 5.

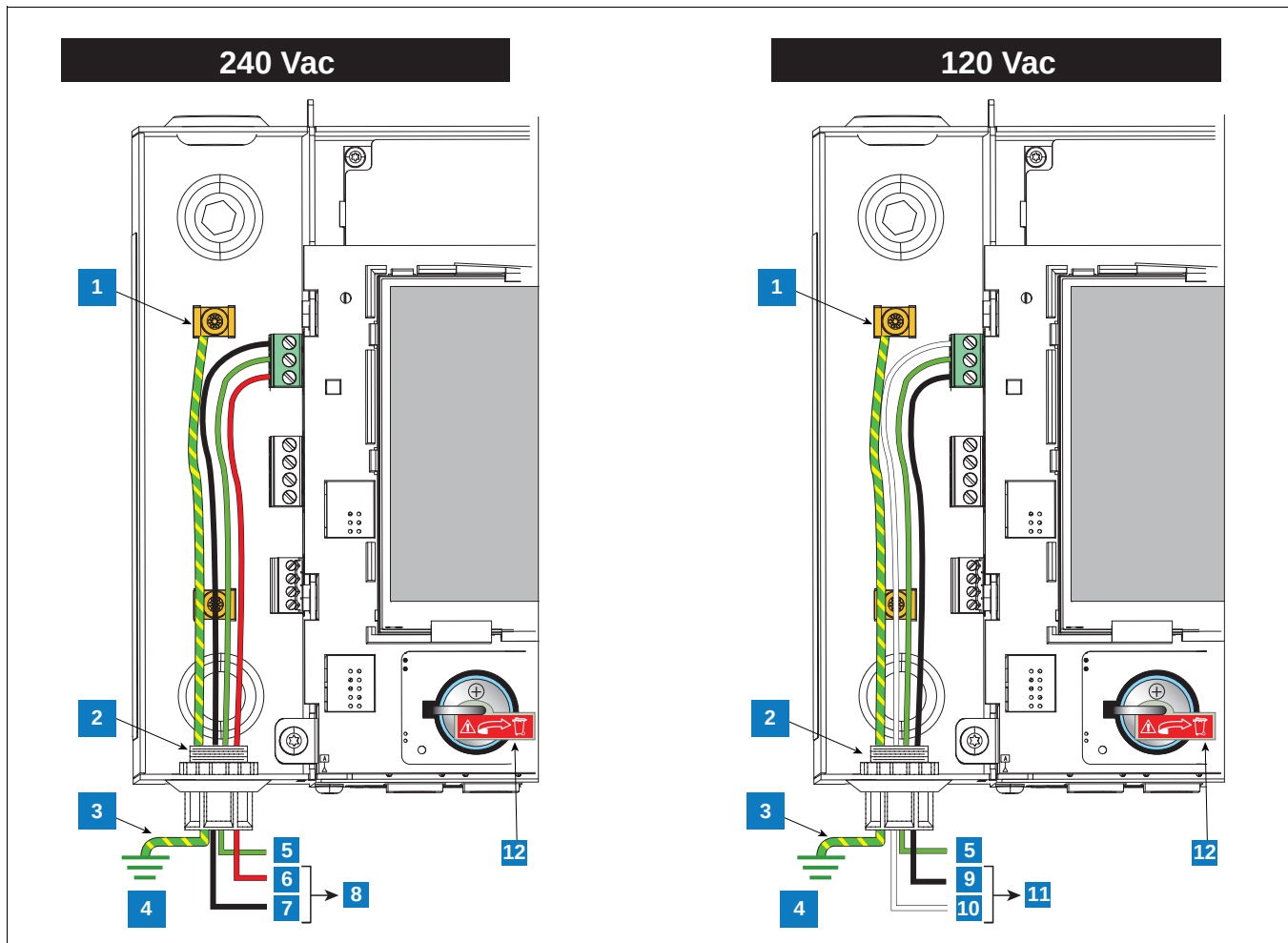


Figure 5. Wiring AC Power to the Console

LEGEND FOR NUMBERED BOXES IN Figure 5

- | | |
|--|---|
| 1. Attach barrier wire to grounding clamp | 7. N/L2 (black) |
| 2. Power connector conduit entry | 8. (To 240 Vac breaker in power panel) |
| 3. Equipotential bonding conductor (4 sq. mm min.) | 9. L1 (black) |
| 4. Earth ground | 10. N/L2 (white) |
| 5. GND (green) | 11. (To 120 Vac breaker in power panel) |
| 6. L1 (Red) | 12. Battery Isolator - Remove and discard prior to startup. |

DC INPUT POWER

1. Check the Input Power Rating on the label affixed to the underside of the console to verify whether input power requirements are +24Vdc and +5Vdc.
1. Pull three wires between the DC power source and the console; three #14 AWG or larger color-coded wires for +24 Vdc, +5Vdc and Ground; and one 4 sq. mm wire, rated for at least 90°C, for barrier ground.
2. Connect the DC power wires as shown in Figure 6.

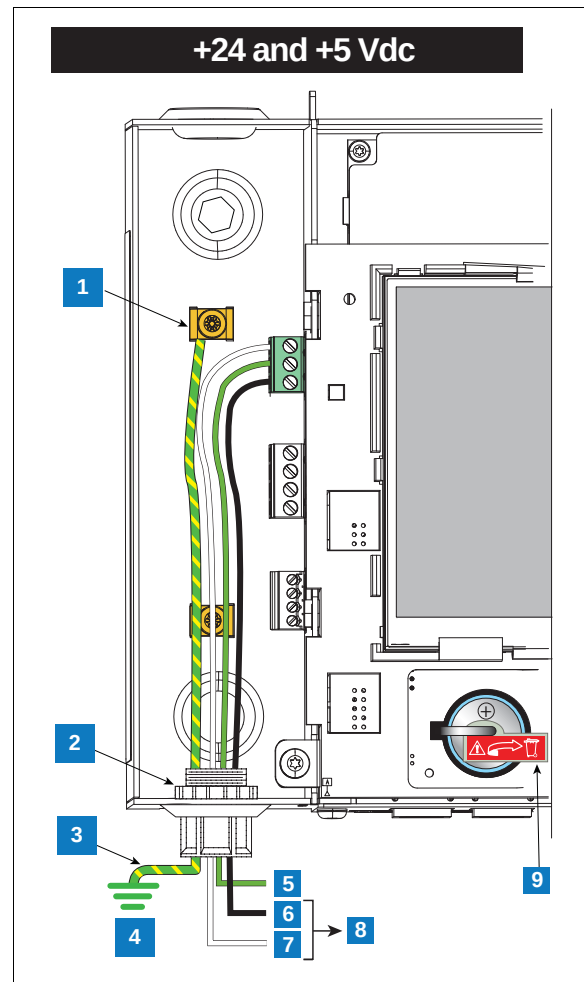


Figure 6. Wiring DC Power to the Console

LEGEND FOR NUMBERED BOXES IN Figure 6

- | | |
|--|--|
| 1. Attach barrier wire to grounding clamp | 6. +5 Vdc (black) |
| 2. Power connector conduit entry | 7. +24 Vdc (white) |
| 3. Equipotential bonding conductor (4 sq. mm min.) | 8. To DC power source |
| 4. Earth ground | 9. Battery Isolator - Remove and discard prior to startup. |
| 5. GND (green) | |

Probe and Sensor Conduit Installation

WARNING



FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH.

Probes and sensors operate in areas where flammable liquids and explosive vapors may be present.

Improper installation may result in fire or explosion causing serious injury or death.

Practice the following:



1. Read thoroughly and follow the instructions shipped with each probe and sensor.
2. Probe and sensor wiring conduit must not contain any other wires.
3. Probe and sensor wiring and conduits must enter the console only through their designated areas.
4. Power and communication wires must not enter the intrinsically safe compartment of the console.

Wiring Run Methods

Two wiring run methods are commonly used for probes and sensors - Wiring pulled through buried, sealed 1/2" conduit; or direct burial cable. NOTE: PVC conduit is an acceptable alternate where accepted by local codes [ref. "National Electrical Code Compliance" on page 3 for more detail on cable requirements].

BURIED RIGID CONDUIT

The preferred method, especially in new sites before driveway surfaces are paved, is to pull probe and sensor wiring through buried 1/2" rigid conduit [Figure 7].

Pull two or three conductors shielded cable (as required). Individual wires should be color-coded between the console and the junction box at each probe and sensor location (do not gang wires together, i.e., splicing all sump sensor + wires together to run one wire back to console). Use single lengths of wire with no splices to ensure optimum signal strength.

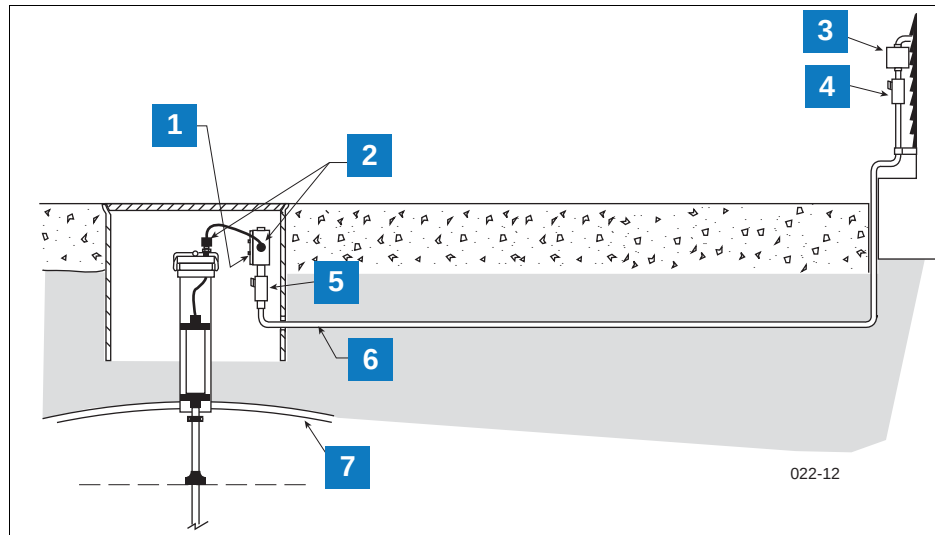


Figure 7. Example Probe Wiring Run in Buried Rigid Conduit

LEGEND FOR NUMBERED BOXES IN Figure 7

- | | |
|---|------------------------------------|
| 1. Weatherproof junction box with 1/2-inch N.P.T. threads (16 cubic inch minimum) | 5. Epoxy seal per NFPA spec |
| 2. Cord grip seals | 6. 1/2" rigid conduit (to console) |
| 3. Splice Closure | 7. Tank |
| 4. Seal-Off | |

CAUTION: Since wires for multiple sensors may enter the console through a single conduit, it is recommended that you use a different color-code for each wire or individually mark each wire to identify sensor inputs. Also, if the intrinsically safe wires enter the building in a wiring trough, only Veeder-Root intrinsically safe wire can be in the trough. Keep all low power (intrinsically safe) wiring isolated from high power wires in all wiring troughs.

DIRECT BURIAL CABLE

An alternative to trenching through existing pavement is to use direct burial cable. Before considering the direct burial method, check to be sure that direct burial practices are acceptable by the authority having jurisdiction at this location. The direct burial method requires grinding using an abrasive wheel, a 1/4" to 3/8" wide by 1-1/4" deep groove (adding 1/4" of depth for each additional cable) in the pavement surface, laying Veeder-Root supplied direct burial cable down in the bottom of the groove, laying an expanded polyethylene foam backer rod over the cable(s), and then a placing a 1/4" to 1/2" bead of silicone sealant over the backer rod to within a minimum of 3/8" below the pavement surface [see Figure 8].

If you decide upon the direct burial method, consult the direct burial cable installation manual for detailed installation instructions (reference manual 576013-858).

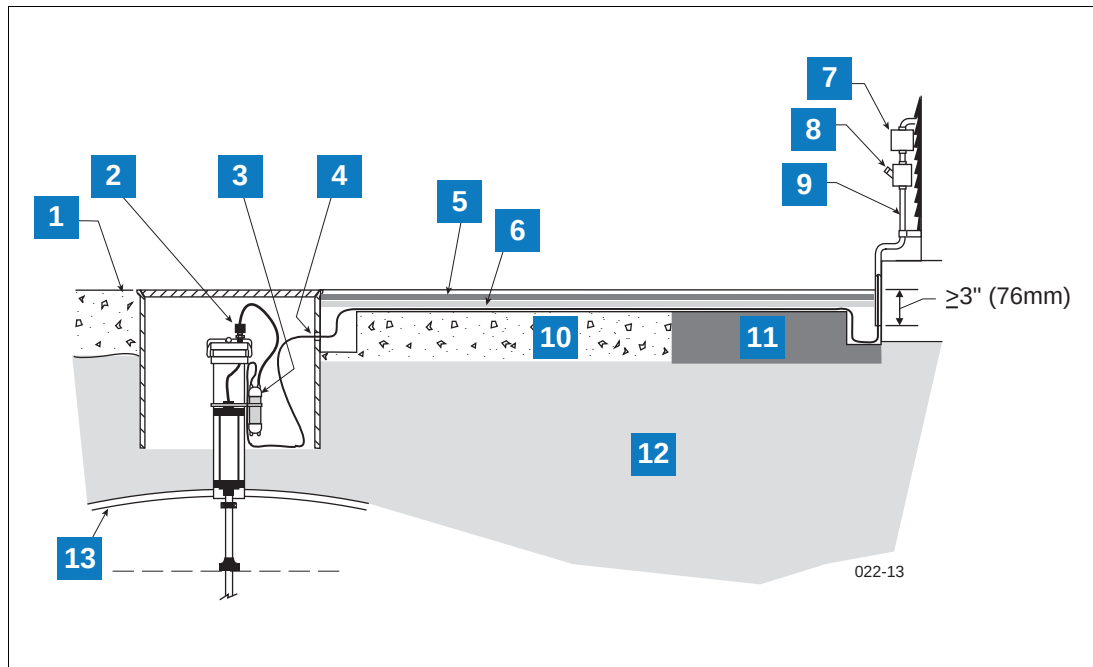


Figure 8. Example Probe Wiring Run via Direct Burial Cable

LEGEND FOR NUMBERED BOXES IN Figure 8

- | | |
|--|------------------|
| 1. Grade | 8. Seal-off |
| 2. Cord grip | 9. Rigid conduit |
| 3. Epoxy filled splice enclosure | 10. Concrete |
| 4. Drill oversized hole in sump for DB cable | 11. Asphalt |
| 5. Dow Corning 890-SL silicone Pavement Sealant | 12. Earth |
| 6. Expanded polyethylene foam backer rod, e.g., Applied-Extrusion Technologies SOF ROD | 13. Tank |
| 7. Splice closure | |

Initial Startup Procedure

Once the probes, sensors, communication devices, etc., are connected to the console, remove and discard the backup battery isolator strip (item 11 in Figure 2).

Replace front cover. Attach a label to the breaker feeding the console. This allows others to know how to disconnect power to the console when servicing the system. Communicate to facility personnel which breaker feeds the console.

Switch the dedicated circuit breaker ON to apply power to the console.

TLS4 GUI NAVIGATION

If the operation of the TLS4 is unfamiliar, review the TLS4 Quick Help Guide (P/N 577014-034) or, after the home screen displays, touch the Actions icon , then the Help icon  to open the TLS4 console's online help. Once online help displays, touch the **Show TOC** link in the top left of the display to view the online help's Table Of Contents. Read the Welcome, Explanation of Screen Icons, How to Use On-Screen Keyboard and Using Touchscreen with Help topics.

TLS4 INITIAL SETUP

Workflow Wizard is an application in the TLS4 that guides the user through the Veeder-Root recommended setup screens during the console's initial commissioning. From the console's touch screen, Workflow Wizard Setup can be accessed by touching Menu>Setup>Workflow Wizard>Setup Workflow.

Appendix A: Universal Sensor Mounting Kit

Introduction

This addendum describes installation procedures for the Universal Mounting Kit for Dispenser Pan and Containment Sump Sensors, Part Number 331144-001.

Since you can use the Universal Mounting Kit in a variety of ways, only the most commonly used mounting methods are described.

Product Description

The Universal Mounting Kit is compatible with most manufacturer's dispenser pans and containment sumps and provides added flexibility when mounting the sensors.

KIT CONTENTS

The Universal Mounting Kit, Part No. 331144-001 consists of:

Quantity	Description
2	Extension brackets (see Item 1, Figure A-1)
1	L-bracket (see Item 2, Figure A-1)
1	3/4-inch U-bolt (see Item 3, Figure A-1)
1	1-inch U-bolt (see Item 3, Figure A-1)
1	2-inch U-bolt (see Item 3, Figure A-1)
1	3/8-inch spring nut (see Item 4, Figure A-1)
1	3/8-16 X 7/8-inch bolt (see Item 4, Figure A-1)
4	1/4-20 nut
3	1/4-20 x 3/4-inch bolt
4	1/4 flat washer
1	1/4-20 x 1-1/2 inch machine screw (See Item 5, Figure A-1)
1	2-inch sensor clamp (See Item 5, Figure A-1)
1	1/4 X 1-inch spacer (See Item 5, Figure A-1)

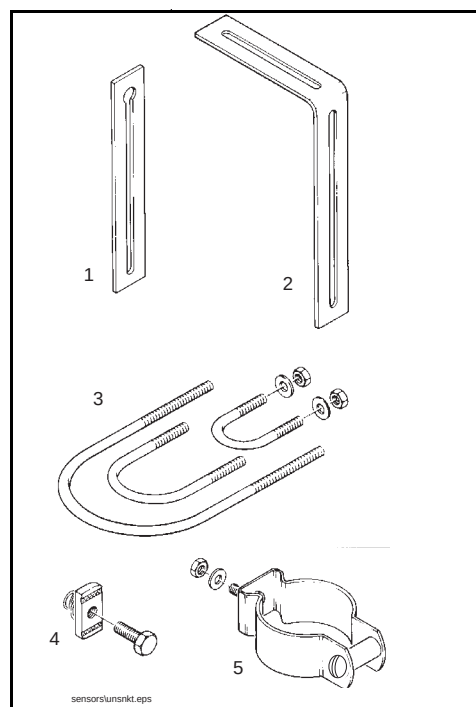


Figure A-1. Universal Mounting Kit Contents

Mounting Sensors

Depending on the type of pan you are using, you can configure the Universal Mounting Kit in several different ways. Some of the more frequently used mounting methods are illustrated in the following figures using selected

components from the kit as required. The spacer for the 1-1/2 inch machine screw is only needed with a stabilizer tube to prevent excess clamping pressure on the sensor (see Figure A-2).

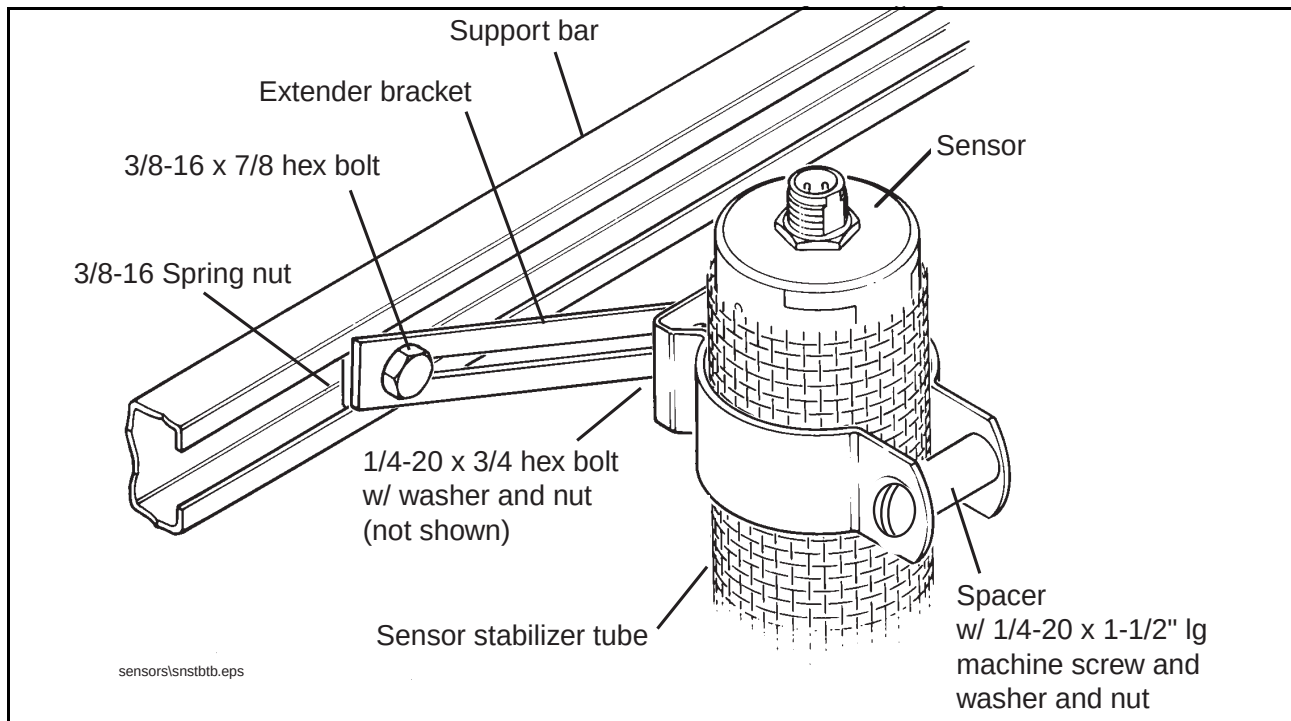


Figure A-2. Mounting the Sensor in a Stabilizer Tube to a Support Bar

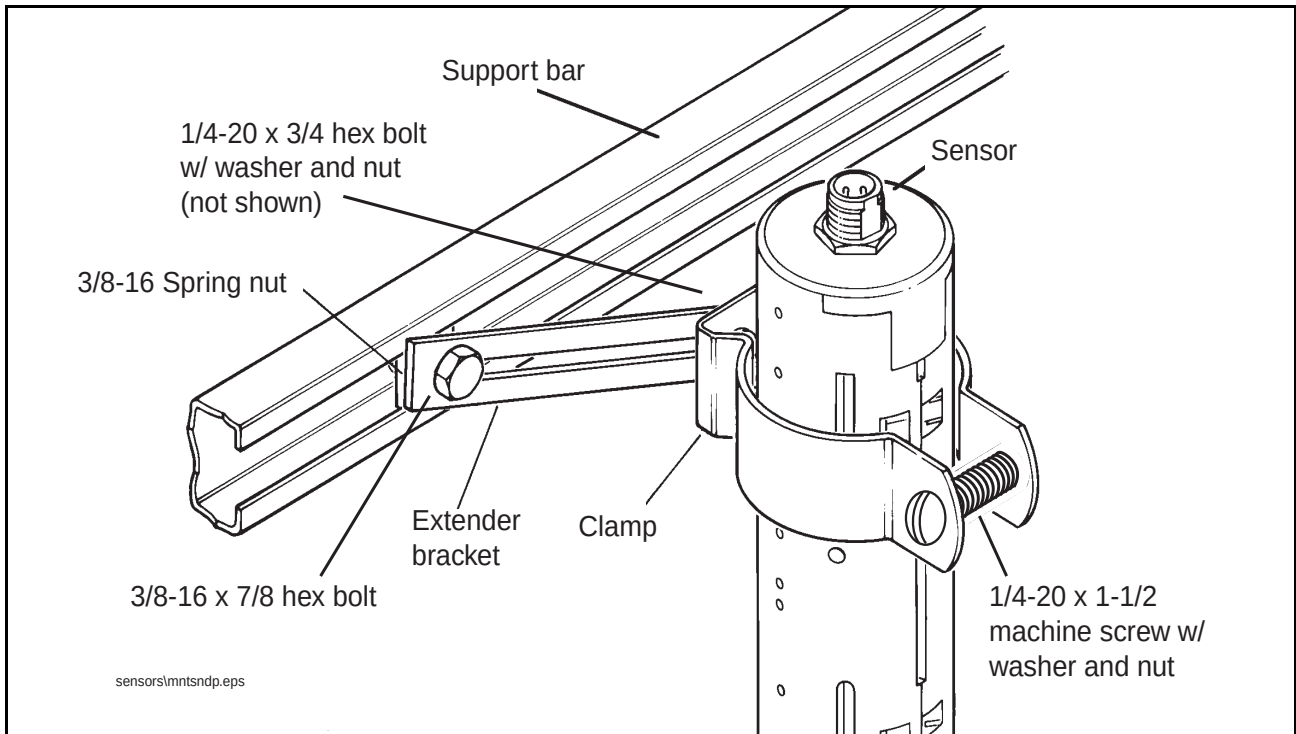


Figure A-3. Mounting the Sensor in the Dispenser Pan

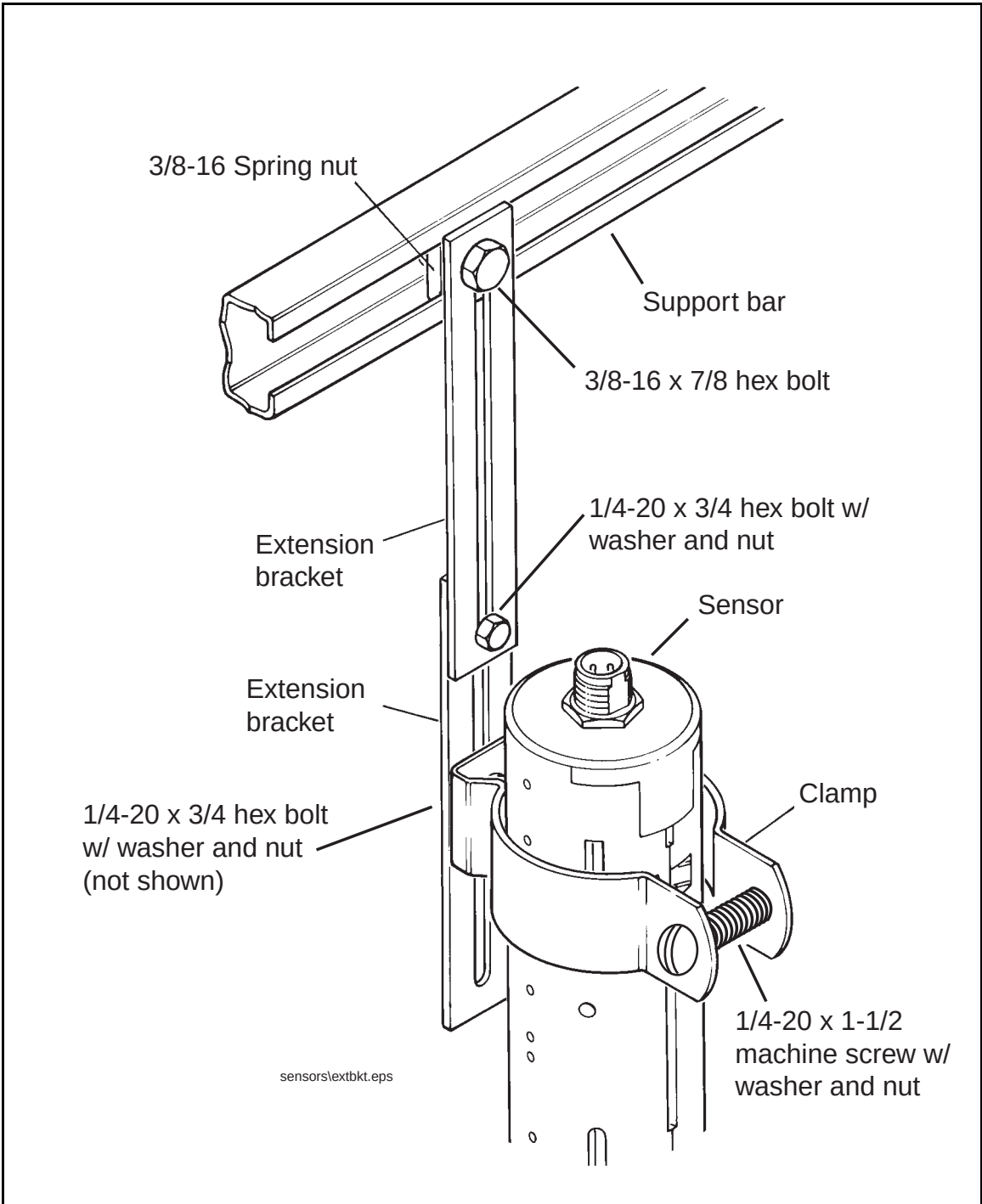


Figure A-4. Mounting the Sensor using Two Extension Brackets

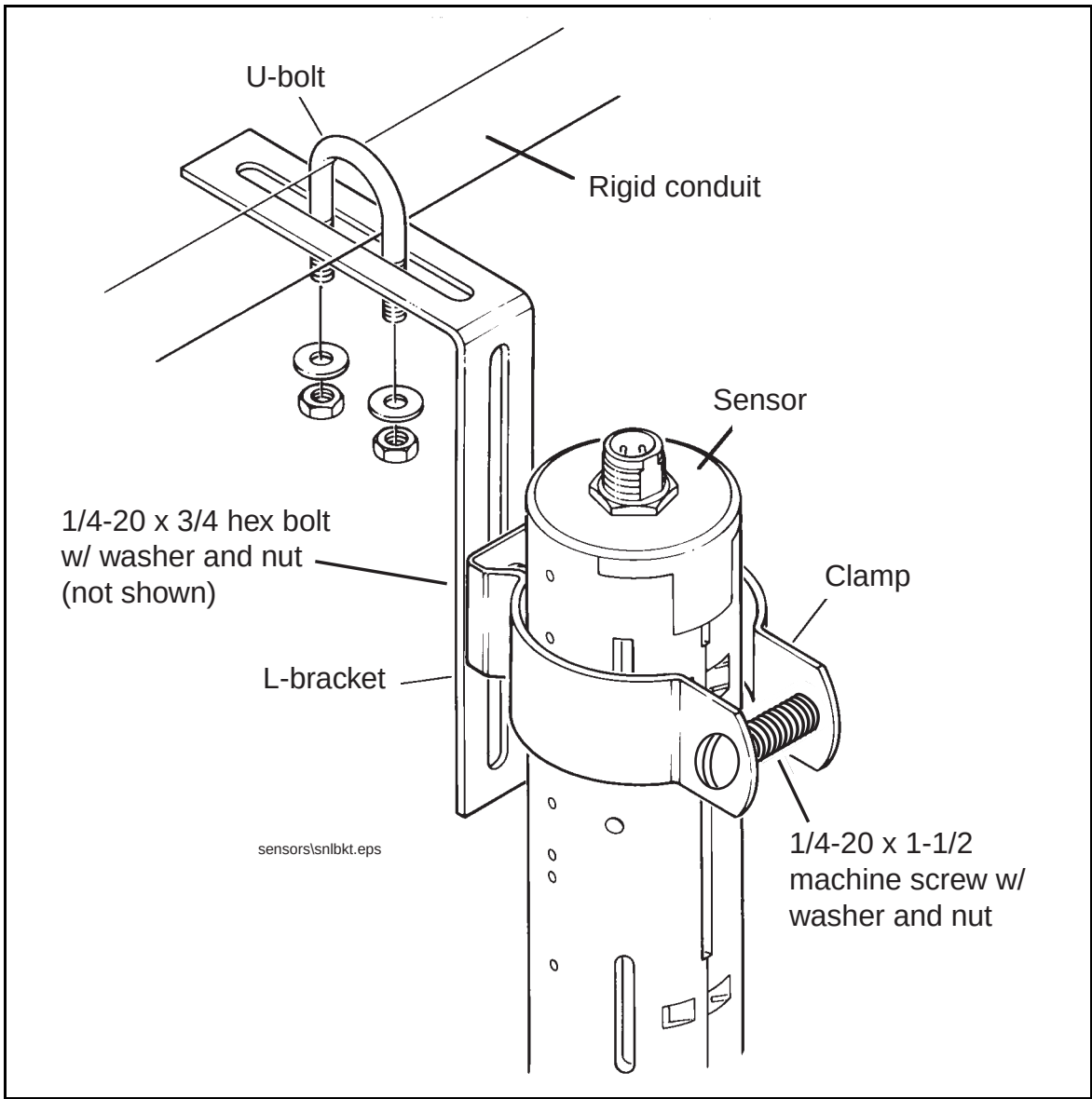


Figure A-5. Mounting the Sensor to Rigid Conduit

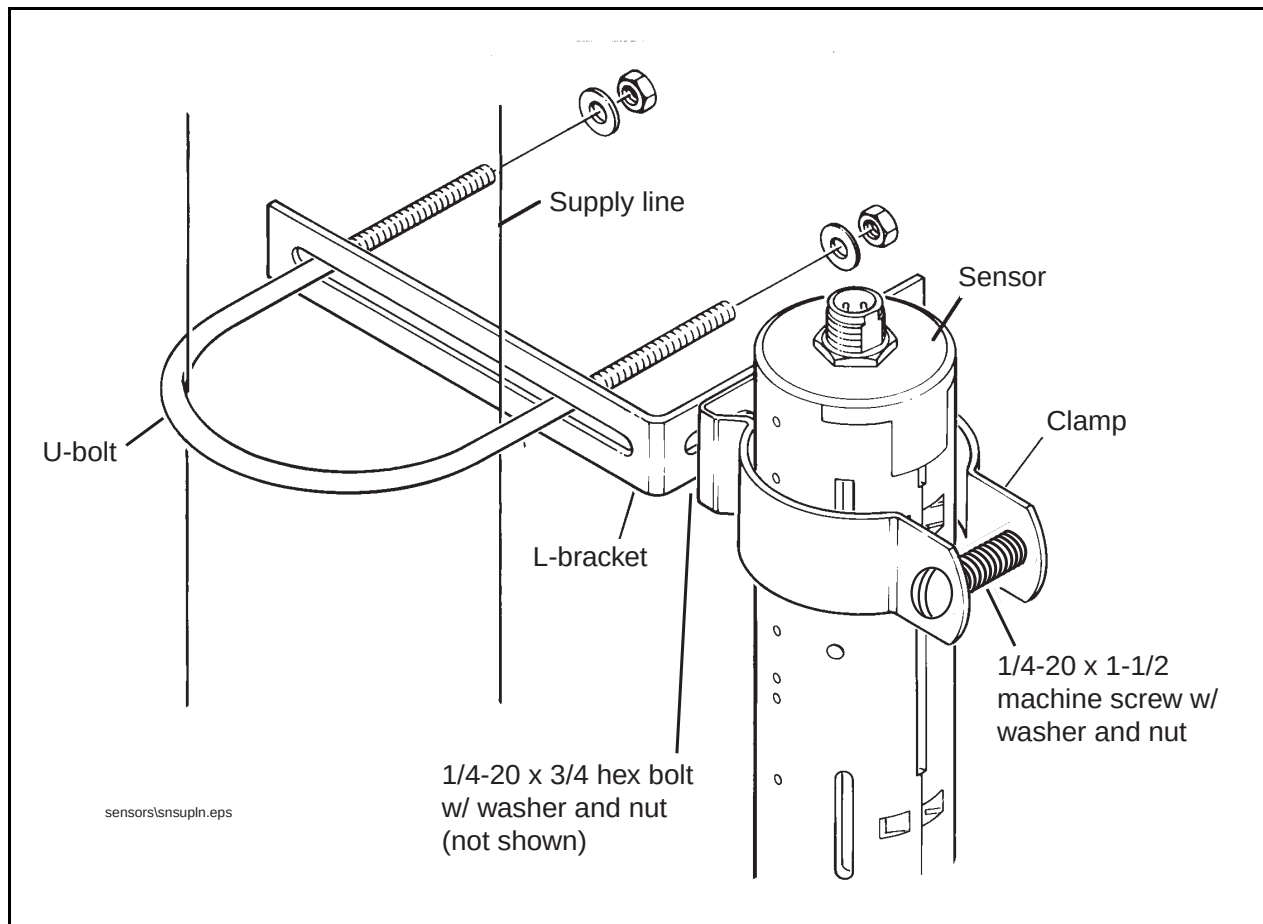


Figure A-6. Mounting the Sensor to a Supply Line

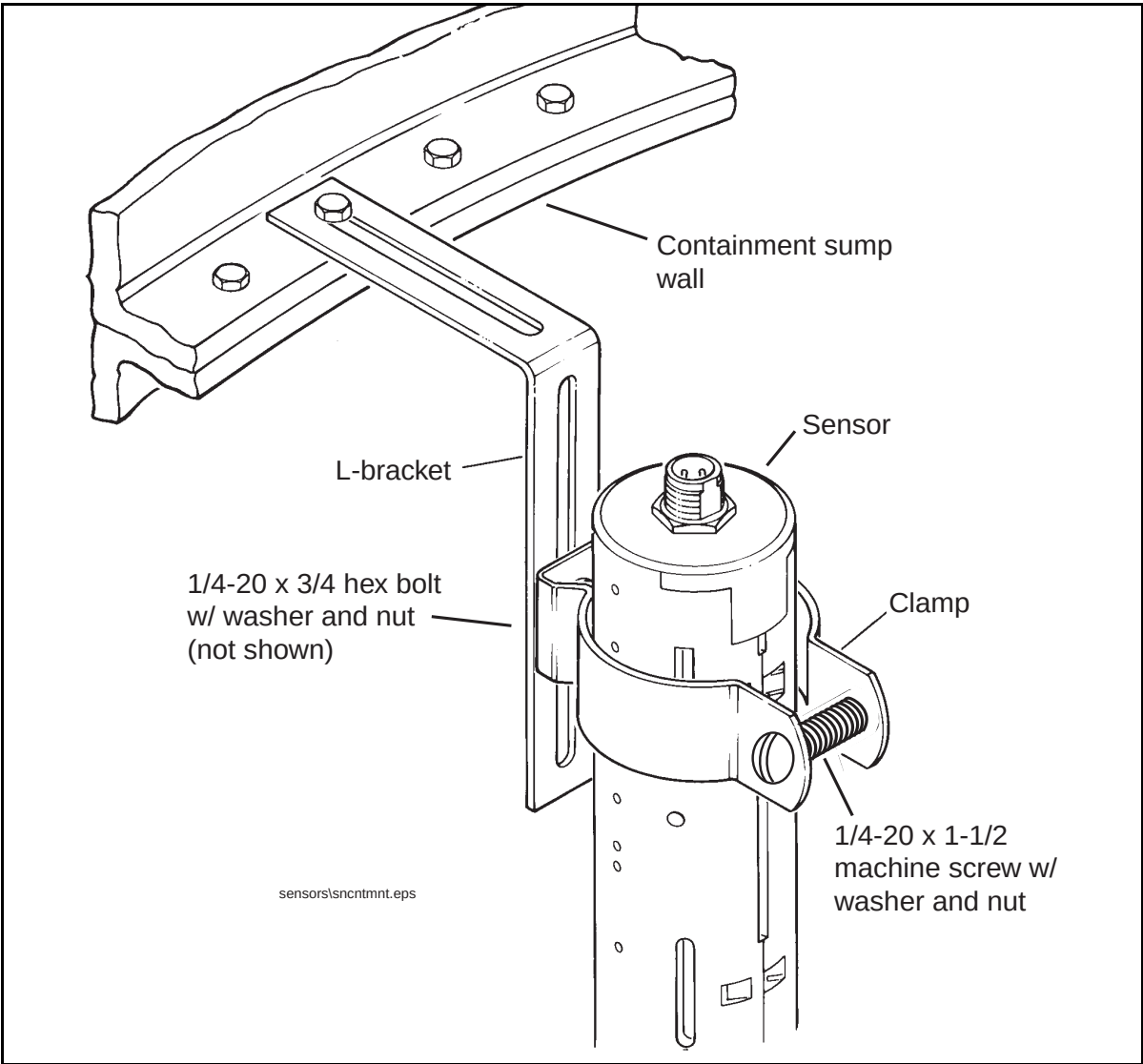


Figure A-7. Mounting the Sensor in a Containment Sump

Appendix B: Enabling The TLS4 To Function As A Datalogger

This document explains how to enable a TLS4 to function as a Datalogger. A laptop, an ethernet crossover cable and a FMS ID number will be required.

NOTE: Several of the steps below may have been completed when the TLS4 was originally setup, in which case, you can verify the settings as you step through the complete enabling process.

BIR Protocol DIM

POS SYSTEM REQUIREMENTS AND LIMITATIONS

For sites using the Datalogger DIM, the Point of Sales (POS) system must conform to established Veeder-Root protocol and allow the Datalogger to collect the metered sales data necessary for it to perform its Business Inventory Reconciliation (BIR) and Wet Stock Management (WSM) tasks. This protocol is separate and distinct from the inventory protocol commonly used by POS and other systems to collect inventory data from Veeder-Root TLS consoles.

The following POS systems (Table B-1) are known to have implemented the Veeder-Root protocol and thus support BIR protocol DIM (Dispenser Interface Module).

Table B-1. POS Systems Using V-R Protocol*

Forecourt Controller	Protocol Name	TLS-350R	TLS-450
Allied	Station Site Controller (SSC)	X	X
Gilbarco	T-4 (Australia)	X	
PEC	8850	X	
POSTEC	RCC	X	
Wayne	Marketer 2000 (Sweden)	X	

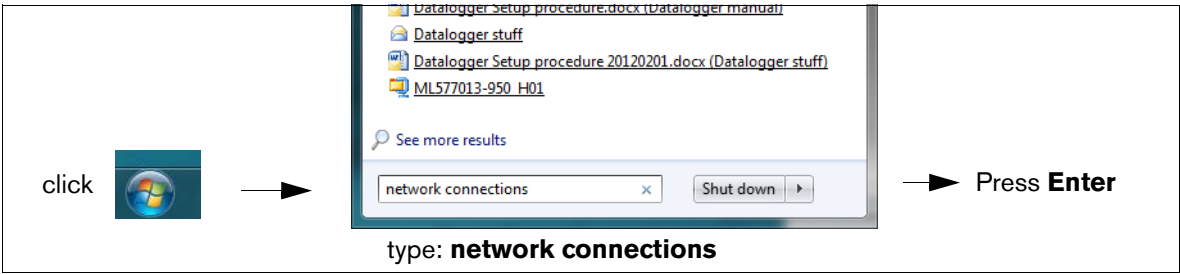
*When the proper hardware/software combinations are used.

Datalogger Site Connection and Initialization

After you are connected the Datalogger to the appropriate site equipment follow the steps below to setup the Datalogger.

NOTE: You must wait at least 5 minutes after powering on the Datalogger before starting this procedure.

1. Using an ethernet crossover cable, connect a laptop PC to ethernet port ETH 1 on the Datalogger (see Figure 1 on page 1 of this manual).
2. You must configure the laptop's wired integrated Local Area Network by clicking on the Windows Globe in the lower right of the task bar, and typing in network connections in the 'Search programs and files' field and then pressing Enter (see below):



3. **NOTE: The screen shots contained in this appendix are for reference purposes only. The actual settings and data shown in the following examples are dependent on the laptop or PC operating system used to configure this hardware.**

In the Network Connections screen, double click on the wired (not wireless) integrated Local Area Connection. In the example below (Figure B-1), you would double-click Local Area Connection 2.

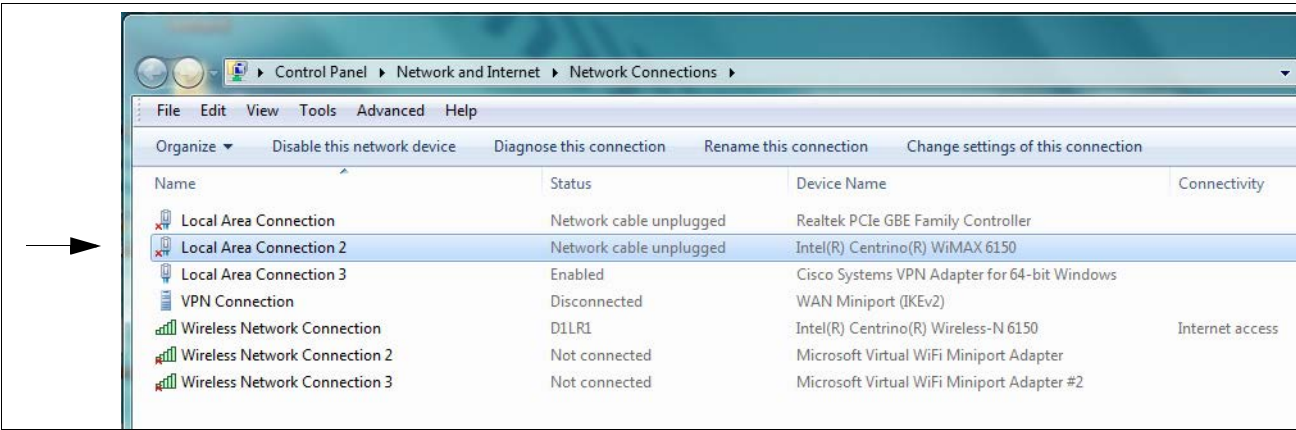


Figure B-1. Configuring LAN

4. When the selected Local Area Connection Properties dialog box opens make the selection shown in Figure B-2.

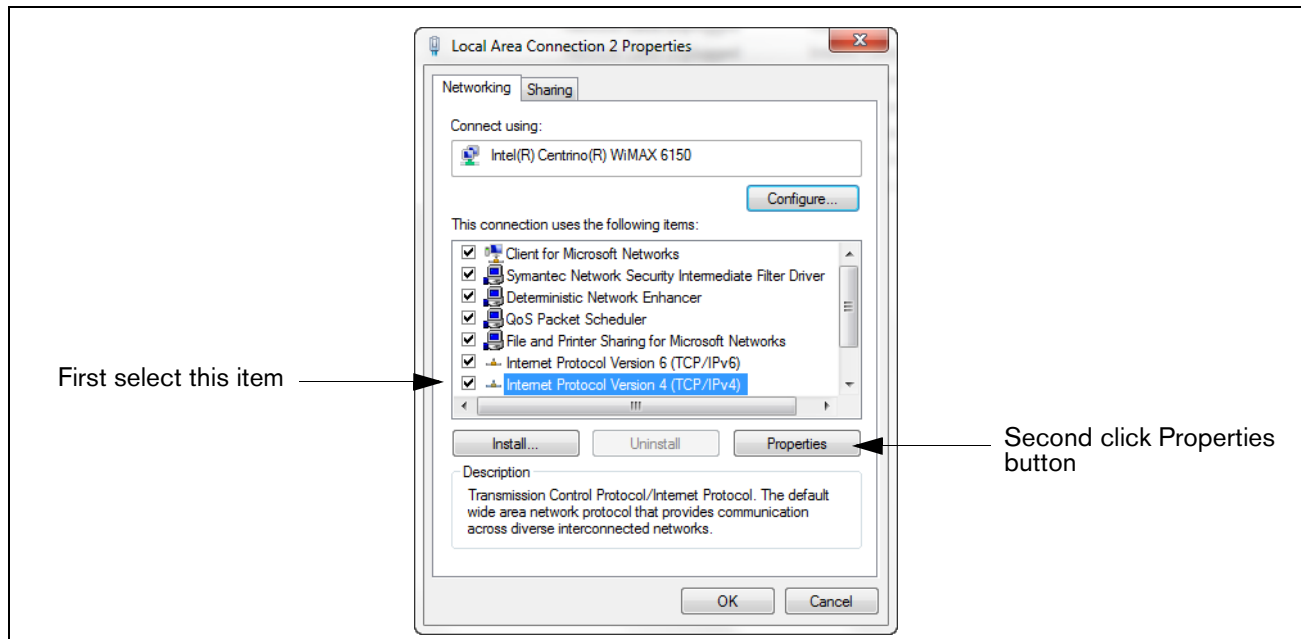


Figure B-2. Local Area Connection 'X' Properties dialog box selections

5. When the Internet Protocol Version 4 (TCP/IPv4) Properties dialog box opens make the selections shown in Figure B-3.

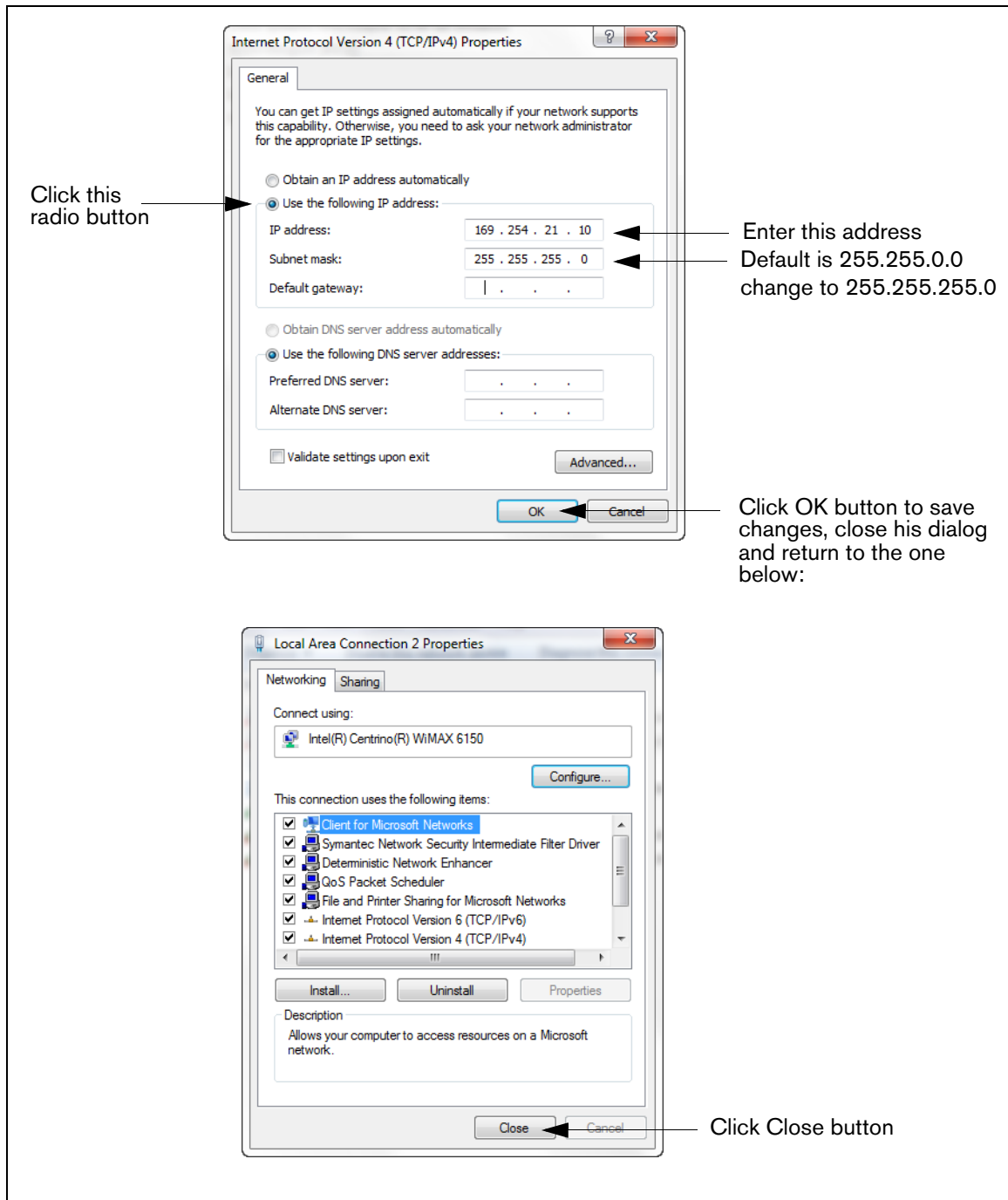


Figure B-3. Internet Protocol Version 4 (TCP/IPv4) Properties dialog box selections

6. On the laptop, open an internet browser and enter the IP address **https://169.254.21.12/GeneralSetup** in the browser's address bar. When the login page displays, enter 'guest' for both User name and Password.

NOTE: The Datalogger simultaneously runs two applications; one programs the general communication protocols (GeneralSetup), and the other programs how the Datalogger gathers its information (DLSetup). Pressing the blue arrow at the top middle of the screen will toggle you between the two programs (see Figure B-4). After entering selections/changes to fields on any page, click the Save button to save your entries, or Cancel to discard them. Programming screens used to setup the Datalogger are listed in Table B-2.

Table B-2. Datalogger User Interface Screens

GeneralSetup Application Pages		See Example	DLSetup Application Pages		See Example
Communication Setup	Ethernet Port Setup	Step 7.	System Setup	FMS Identification	Step 16.
	Serial Port Setup	Step 8.			
	CDIM Setup	Diag. use only		ATG Commands	Step 9.
	TDIM Setup	Step 10.		DIM Commands	Step 11.
	Site Id Server Setup	Diag. use only	Communication Testing	FMS Heartbeat	Step 19.
System Setup	Hostname	ATG		Step 17.	
	Date and Time	POS		Step 18.	
	Units	DIM		Diag. use only	
	Alarm Filtering	Diag. use only			
Diagnostics	DIM Communica- tions	Step 12.			
	Ping	Diag. use only			
	Traceroute				
Software Mainte- nance	DB Backup				
	DB Restore				
	Download New Version				
	Activate/Revert				
	Upgrade Fea- tures				

7. On the "Communication Setup" page (see Figure B-4), click on "Ethernet Port Setup" (1) and select the Device type "ETH 1" (2) from the drop-down menu. In the IP Address Type field (3):

If the site is using a static IP address, select "Static IP"; and enter the IP address assigned by your network administrator. Once this is complete, click the "Save" button to keep these settings (see example in Figure B-4).

If the site is using a dynamic IP address, select "Dynamic IP" (the remaining parameters will auto-fill once the Datalogger is reconnected to the site network). Click "Save" (4) to accept your entries.

NOTE: If you receive an error message after clicking "Save", click "OK" and refresh the page.

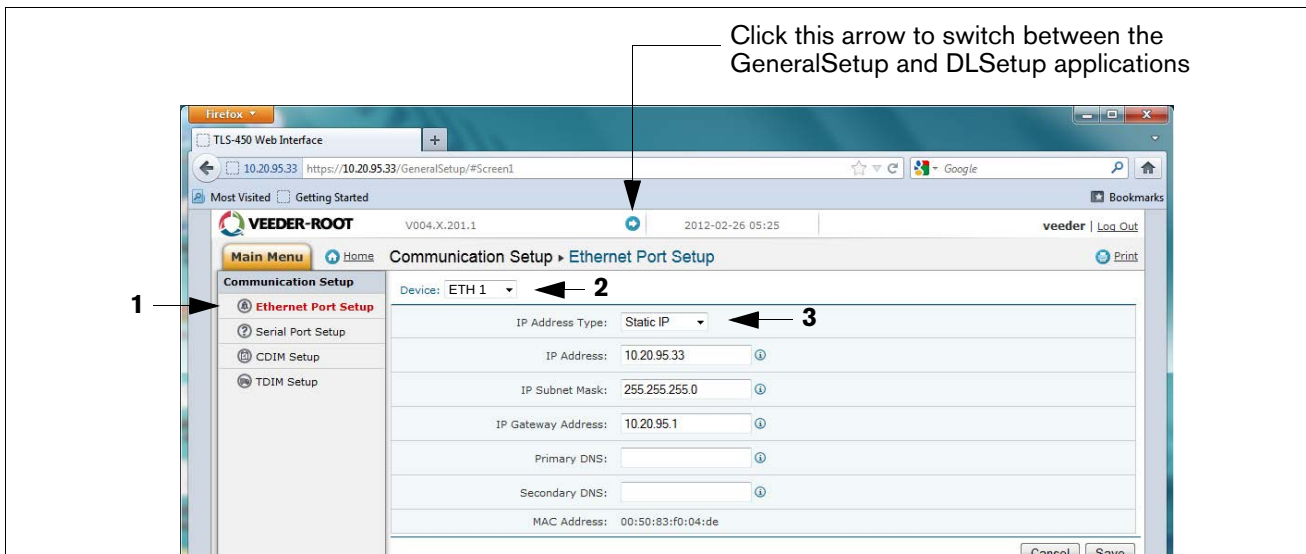


Figure B-4. Ethernet Port Setup

8. Click on “Serial Port Setup” (1) and in the “Device” field, select “SERIAL 2:”. Use this connection for the connection to the POS, and enter “POS” for the Label. Set the correct communications parameters for the POS using the drop down menus. Click the “Save” button to keep these settings (see example in Figure B-5).

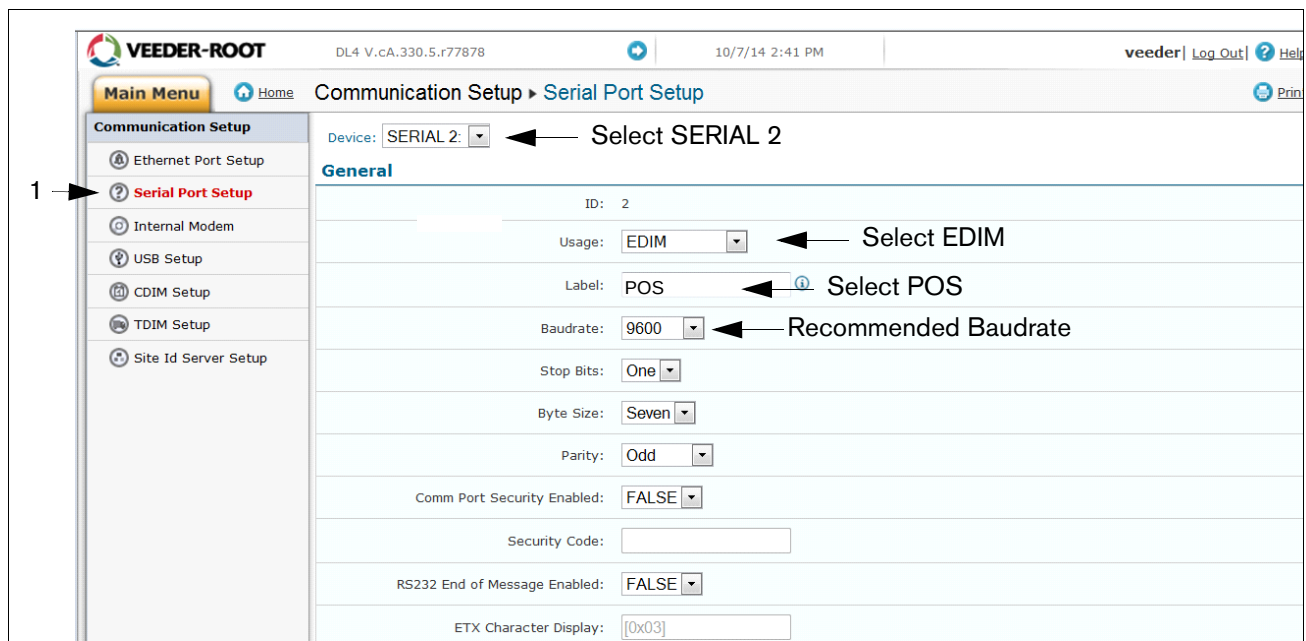


Figure B-5. Serial Port Setup, SERIAL 2-POS

9. Go to the “DLSetup” application by clicking on white arrow in blue circle top center of screen (see Figure B-6), and under “System Setup”, click on “ATG Commands (1 in Figure B-6)”. Then click on the “+ Add New Command” text at top right of screen (2 in figure). When the Add Command dialog box appears enter the command “i@C300”, add the Description “DIM_EVENTS”, set the Repeat Interval to “60” (3 in figure) and click Save (4 in figure).

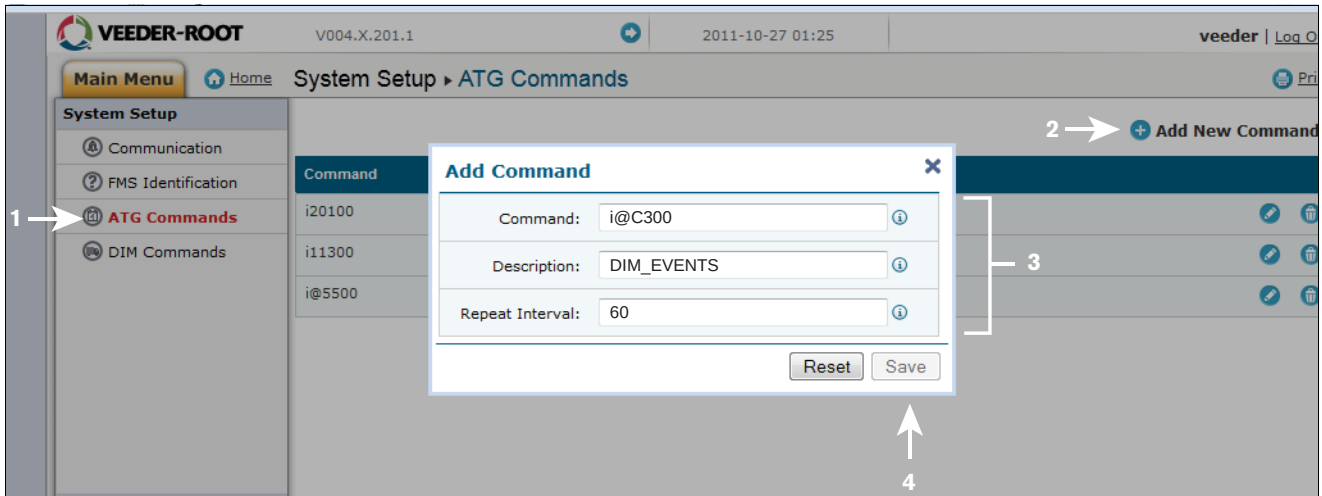


Figure B-6. Entering ATG Command

Click on the DIM Command page and then click on the trash can icon on the right end of the i@C300 command line to delete the i@C300 command (see Figure B-7). Jump back to the “General Setup” application by clicking on arrow top center of screen.

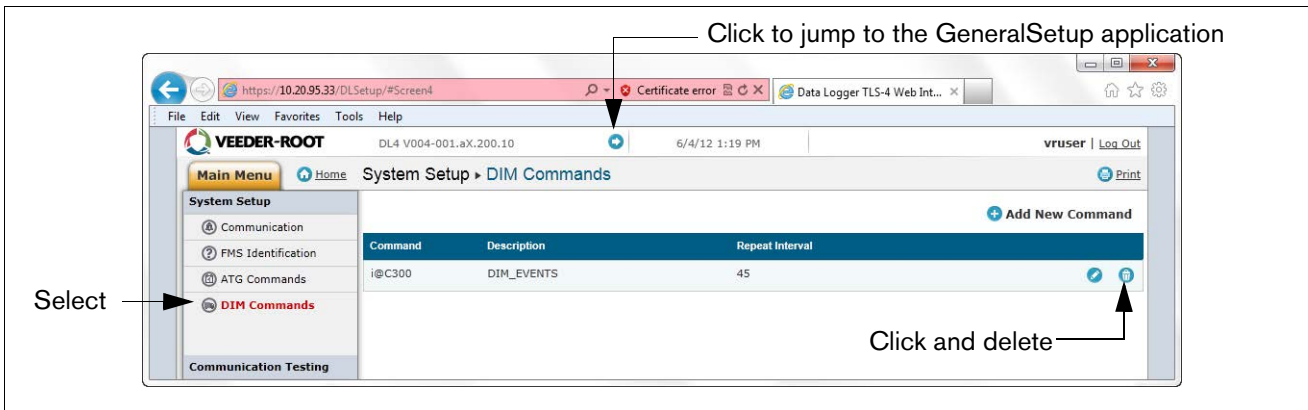


Figure B-7. Deleting ATG Command

10. Select “TDIM” set-up. Select “TDIM (ETH1)” from the drop-down menu. On the “TDIM Enable” drop down, select “TRUE” and type in a label (maximum of 20 characters). Then select the DIM protocol being used and click “Save”. Accept the default Listen Port (unless there is a conflict with another device) and select the desired units (see example in Figure B-8). Once this is complete, click on “Save” to keep these settings.

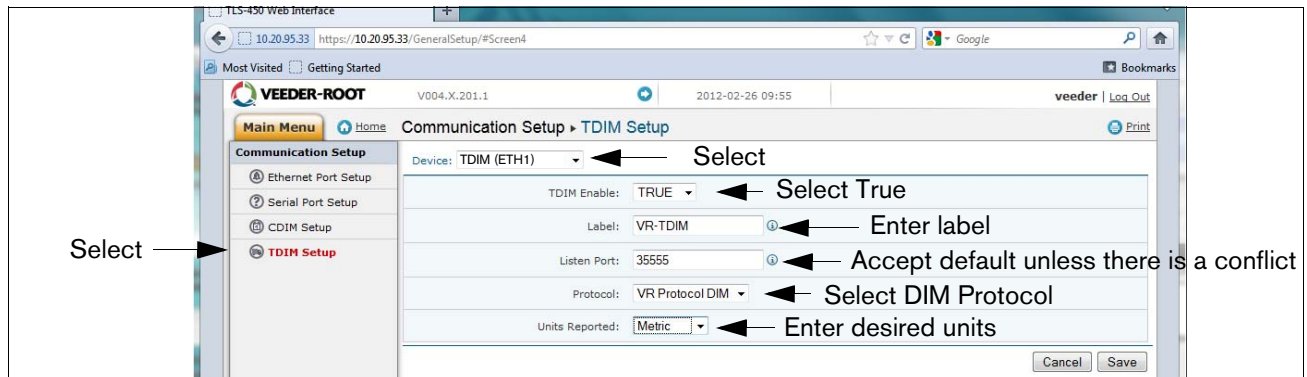


Figure B-8. TDIM Setup

11. Select the "System Setup" page and type in the Host name and then click the "Save" button (see example in Figure B-9). It is recommended that you use the network name assigned by the network administrator or some other name that identifies the location. While on this page click the Diagnostic Page link (bottom Left).

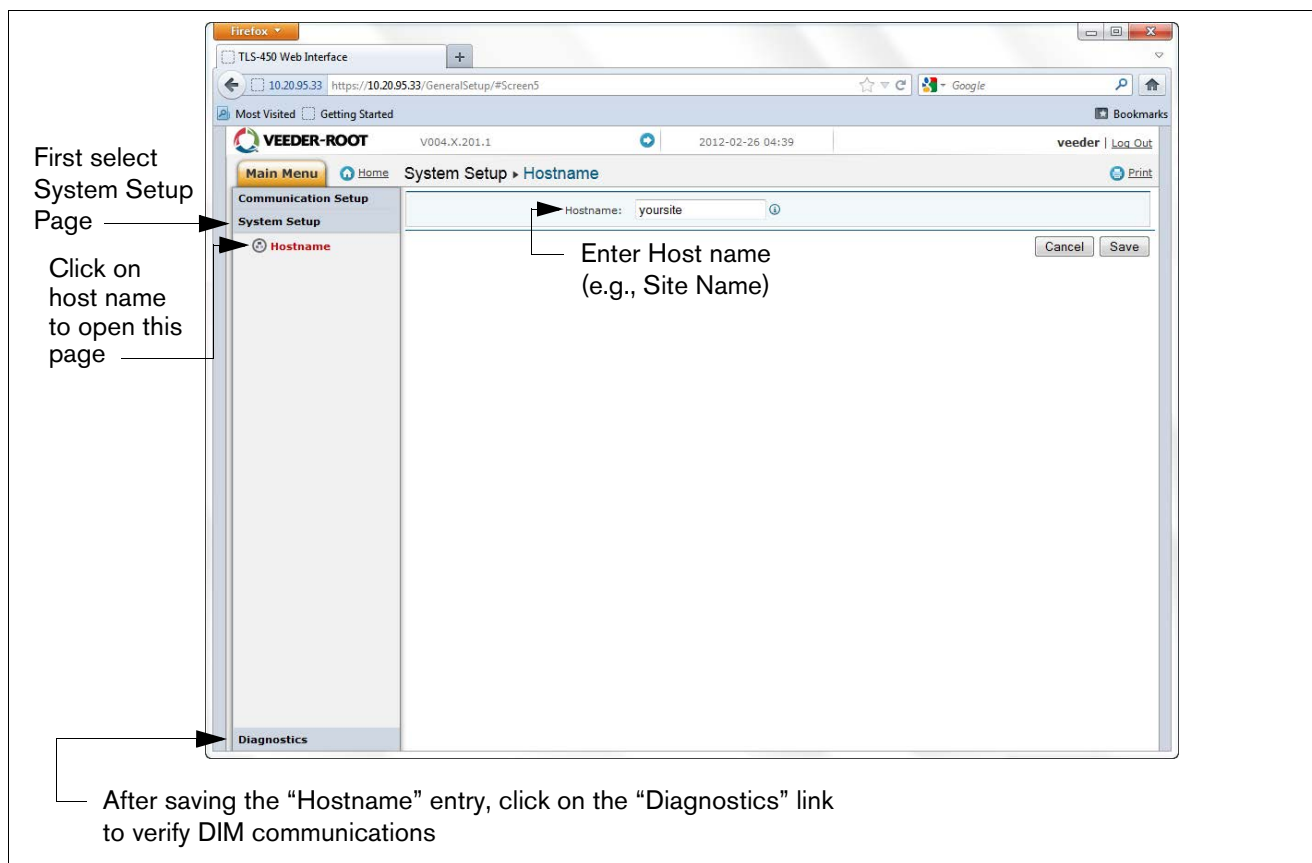


Figure B-9. Entering Host name

12. In the "Diagnostics" page (lower left in above figure), click on "DIM Communications" to verify that the DIM communications are successfully being recorded by the Datalogger. Any transactions occurring after the Datalogger was configured will be shown on the screen (see example in Figure B-10).

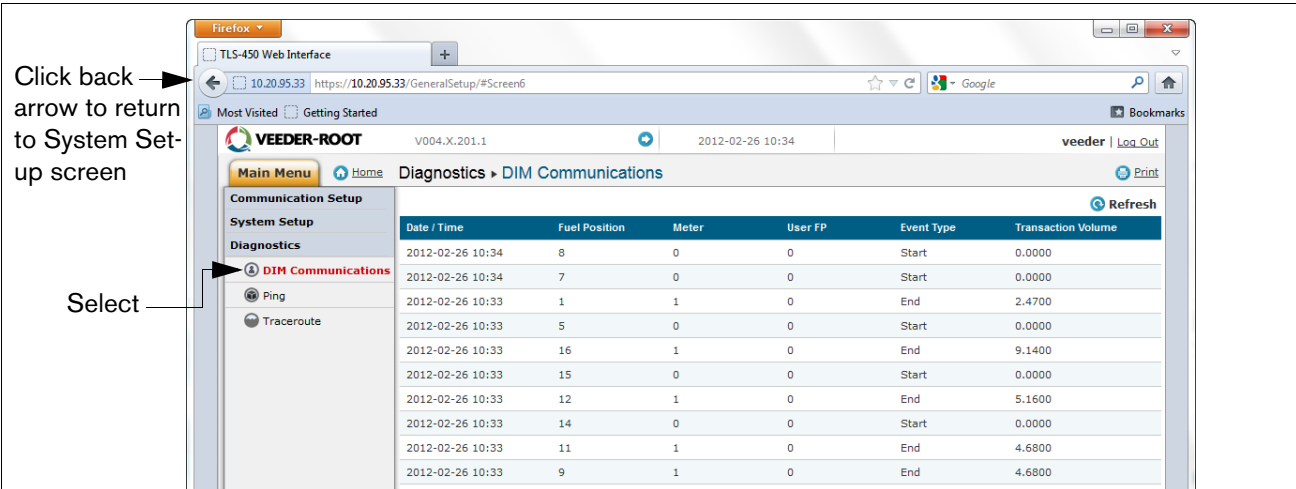


Figure B-10. Verifying DIM Communication

13. From the System Setup menu, select Date and Time link to access the current date/time entry screen (see example in Figure B-11).

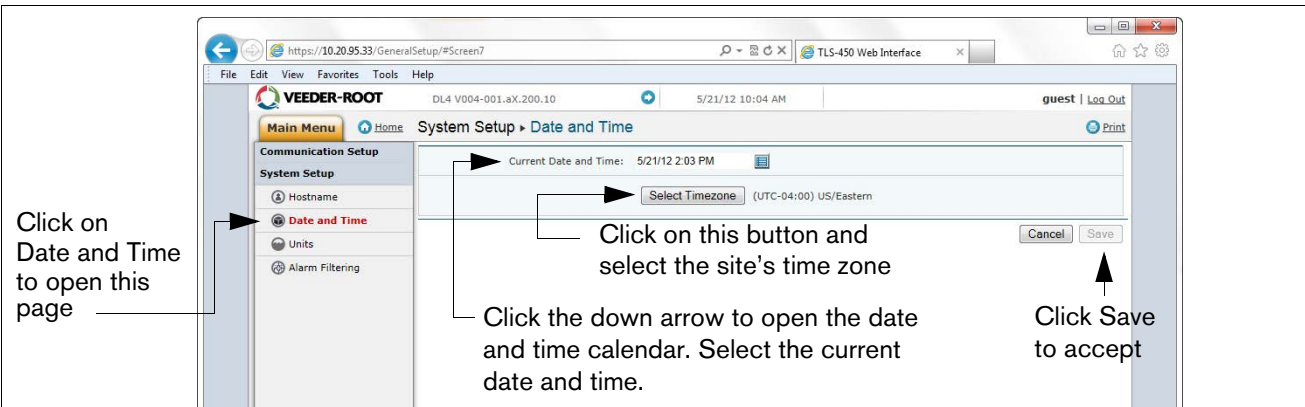


Figure B-11. Entering Date and Time

14. From the System Setup menu, click on the Units page(1), select the desired units (2), click Save (3) (see example in Figure B-12).

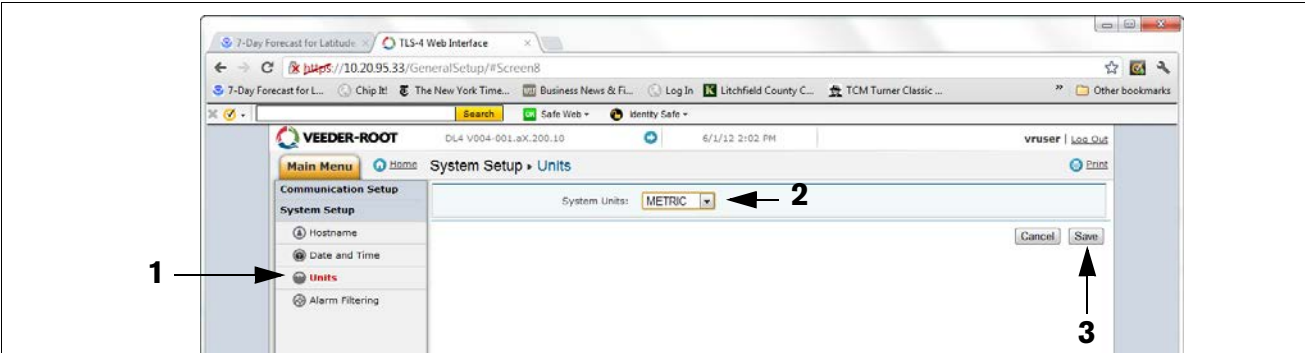


Figure B-12. Selecting System Units

15. Click on arrow just to the left of the date to switch to DLSetup application (see Figure B-13).

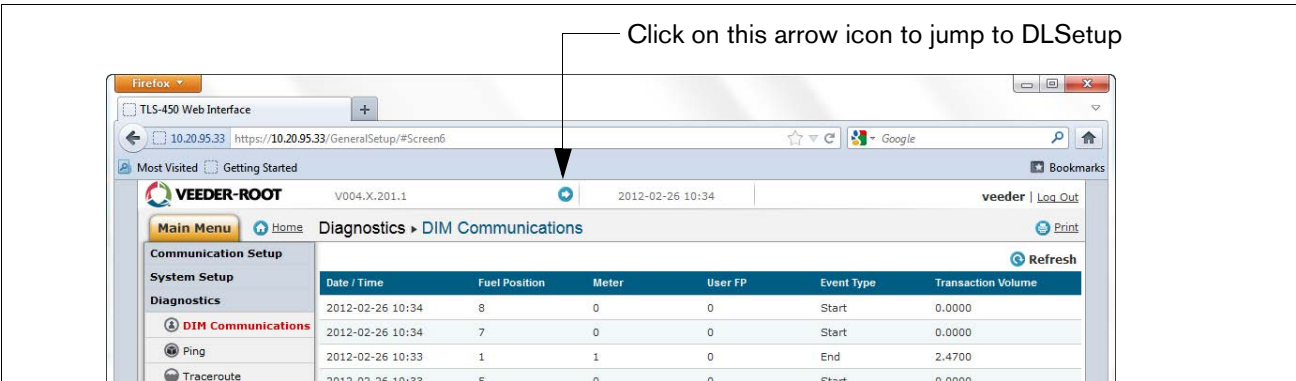


Figure B-13. Switching to DL Setup

16. Select the “FMS Identification” screen and enter the six-digit FMS site identification number. Then click on the “Save” button (see Figure B-14).

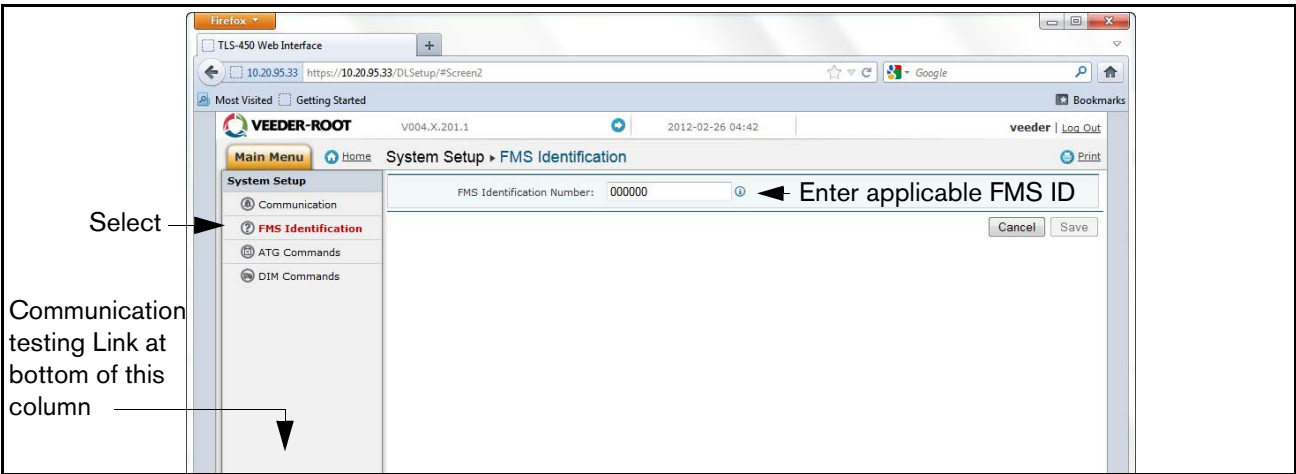


Figure B-14. Example FMS ID Entry

17. Wait at least 30 seconds from the completion of the previous step to allow for the system to re-initialize with the new settings. Then click on the “Communication Testing” link at the lower left bottom of the System Setup column (see above figure), then click on “ATG”. Click on the “Inventory” button, which will enter the command “I20100”. After several seconds, a Response should appear providing the current inventory data from the ATG. If no response is received, there is a problem in the setup parameters.

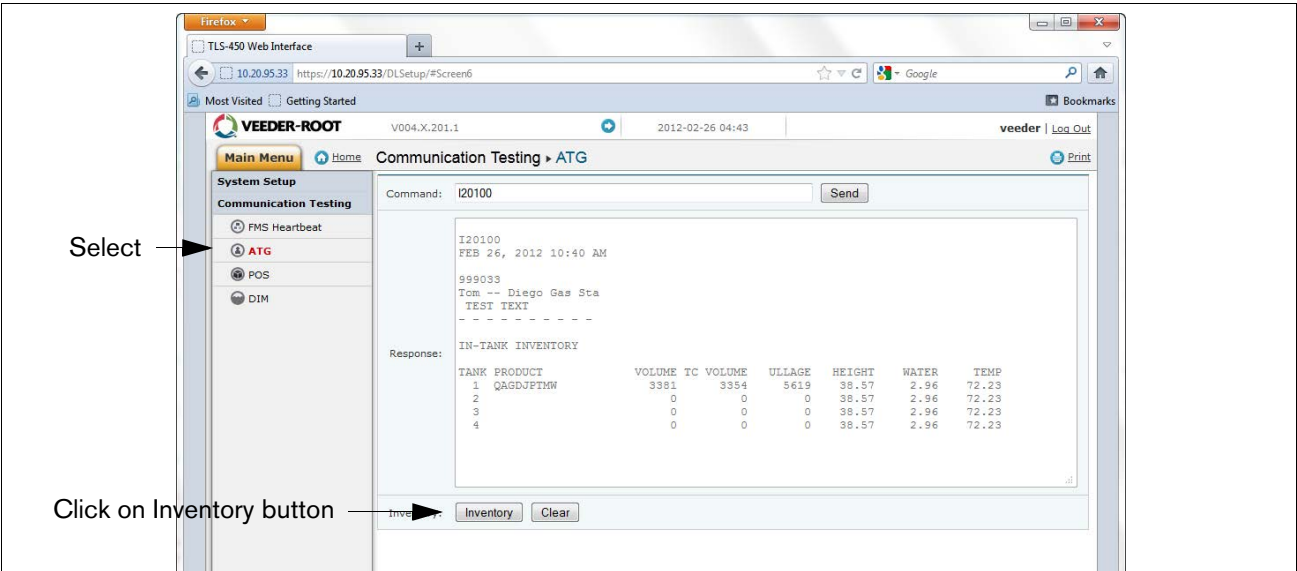


Figure B-15. Inventory Command Results

18. Click on "POS" to detect the POS protocol. Click the "START" button next to "Auto Detect Protocol" and wait for the Protocol Type to appear (see example in Figure B-16).



Figure B-16. POS Protocol Type Query

Verify that this is the correct protocol that was entered in the DIM setup in Step 10. Then click on the "Stop" button (see example in Figure B-17).

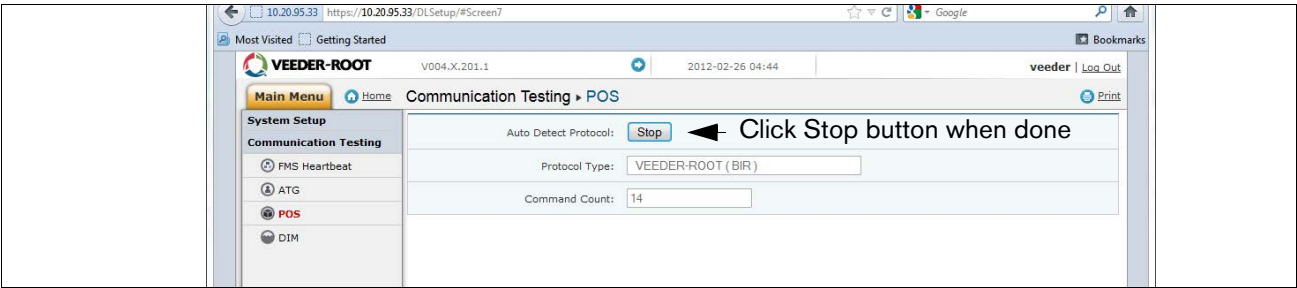


Figure B-17. POS Protocol Type Results

19. The Datalogger should now be configured to collect inventory and transactional data, which will be periodically retrieved by FMS. To verify connectivity with FMS, reconnect the Datalogger to the network or cell modem. Go to the "DLSetup" application's Communication Testing screen, click on "FMS Heartbeat", then click on the "Send Heartbeat" button (see Figure B-18). Wait for the "Response" text to indicate PASS or

FAIL. A PASS confirms that the Datalogger is successfully communicating with FMS. A FAIL indicates that the connection has failed and you will need to contact FMS or the network administrator for troubleshooting assistance.

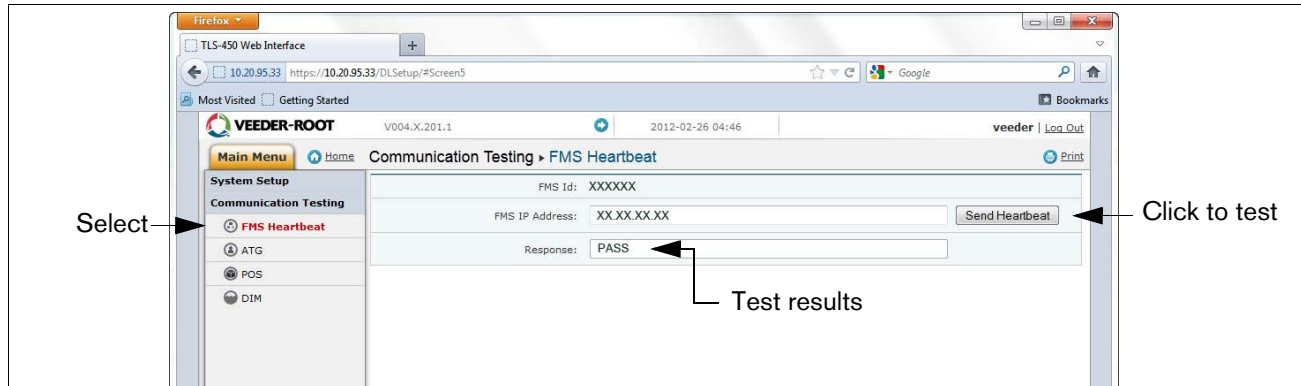


Figure B-18. FMS Heartbeat Screen

 **IMPORTANT! Connectivity between the Datalogger and FMS must be verified prior to completing the installation.**

Return your laptop PC to the network settings originally set prior to the changes you made in Step 5.



Direct Burial Cable

Installation Guide



Notice

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DAMAGE CLAIMS / LOST EQUIPMENT

Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

VEEDER-ROOT'S PREFERRED CARRIER

1. Contact VR Customer Service at 800-873-3313 with the specific part numbers and quantities that were missing or received damaged.
2. Fax signed Bill of Lading (BOL) to VR Customer Service at 800-234-5350.
3. VR will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

CUSTOMER'S PREFERRED CARRIER

1. It is the customer's responsibility to file a claim with their carrier.
2. Customer may submit a replacement purchase order. Customer is responsible for all charges and freight associated with replacement order. Customer Service will work with production facility to have the replacement product shipped as soon as possible.
3. If "lost" equipment is delivered at a later date and is not needed, VR will allow a Return to Stock without a restocking fee.
4. VR will NOT be responsible for any compensation when a customer chooses their own carrier.

RETURN SHIPPING

For the parts return procedure, please follow the appropriate instructions in the "General Returned Goods Policy" and "Parts Return" pages in the "Policies and Literature" section of the Veeder-Root **North American Environmental Products** price list.

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Introduction

General

Do not attempt to wire sensors and probes into a new installation based solely on the information contained in this manual. This manual contains installation and wiring procedures for the installation of Direct Burial Cable only.

If this is a new installation and site preparation is necessary, refer to the appropriate Site Preparation and Installation Instructions or contact your Veeder-Root representative for assistance.

Related Manuals

Depending on your installed console, you must reference the appropriate manual below, to connect the probe/sensor to the console:

576013-879 TLS-3XX0 Series Site Prep and Installation Manual

577013-879 TLS-4XX Console Site Prep and Installation Manual

Contractor Certification Requirements

Veeder-Root requires the following minimum training certifications for contractors who will install and setup the equipment discussed in this manual:

Level 1 Contractors holding valid Level 1 Certification are approved to perform wiring and conduit routing, equipment mounting, probe and sensor installation, tank and line preparation, and line leak detector installation.

Level 2/3 Contractors holding valid Level 2 or 3 Certifications are approved to perform installation checkout, startup, programming and operations training, troubleshooting and servicing for all Veeder-Root Tank Monitoring Systems, including Line Leak Detection and associated accessories.

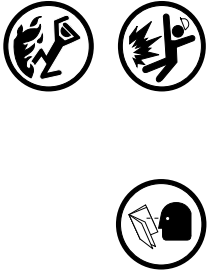
Warranty Registrations may only be submitted by selected Distributors.

Safety Symbols

The following safety symbols may be used throughout this manual to alert you to important safety hazards and precautions

 EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.	 FLAMMABLE Fuels and their vapors are extremely flammable.
 ELECTRICITY High voltage exists in, and is supplied to, the device. A potential shock hazard exists.	 TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.
 NO SMOKING Sparks and embers from burning cigarettes or pipes can ignite fuels and their vapors.	 NO OPEN FLAMES Open flames from matches, lighters, welding torches, etc. can ignite fuels and their vapors.
 NO POWER TOOLS Sparks from power tools (such as drills) can ignite fuels and their vapors.	 NO VEHICLES Moving vehicles in the area during service can create a potential for personal injury to you or others. Sparks from starting vehicles can ignite fuels and their vapors.
 NO PEOPLE IN THE AREA Unauthorized people in the area during service can create a potential for personal injury to you and them.	 USE SAFETY BARRICADES Unauthorized people or vehicles in the work area are dangerous. Always use safety cones or barricades, safety tape, and your vehicle to block the work area.
 WEAR EYE PROTECTION Fuel spray from residual pressure in the lines can cause serious eye injuries. Always wear eye protection.	 INJURY Careless or improper handling of materials can result in bodily injury.
 GLOVES Wear gloves to protect hands from irritation or injury.	 READ ALL RELATED MANUALS Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.
 MASK Wear a mask when cutting or grinding or when using epoxy sealant.	 EAR PROTECTION Wear ear protection when cutting or grinding.

Warnings and Important Notes

 WARNING	
	This product is to be installed in systems operating near locations where highly combustible fuels or vapors may be present. Fire or explosion resulting in serious injury or death could result if the equipment is improperly installed or modified. Serious contamination of the environment may also occur. 1. Read and follow all instructions in this manual, including all safety warnings. 2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes. 3. Do not modify or use service parts other than those provided by Veeder-Root.

Before You Begin

Installation Sequence

1. Read all Installation Instructions.
2. Determine if Direct Burial is possible.
3. Plan lay out for saw cutting.
4. Calculate sealant and filler rod length.
5. Calculate cable length.
6. Plan installation with respect to weather conditions.
7. Make saw cut.
8. Clean trench with compressed air.
9. Lay and test cable for shorts and opens.
10. Install probes and sensors.
11. Make Direct Burial connections with splice kits.
12. Verify probe and sensor operation.
13. Install filler rod to proper depth.
14. Install sealant.
15. Verify probe and sensor operation.

Parts Needed For Direct Burial Installations

Site Preparation Document

One set of Installation Instructions needed for each site. Order Kit No. 848100-500.

Splice Kits

A splice kit is needed for every probe or sensor installed with a Direct Burial Cable. Order Kit No. 848100-501.

Filler Rod

Available in lengths of 100 to 2,000 feet, in increments of 100 feet. Refer to *Sealant and Rod Filler Calculations* to calculate length needed. Order Part No. 848100-1XX.

Direct Burial Cable

Available in lengths of 100 to 2,000 feet, in increments of 100 feet. Refer to *Cable Length Calculations* to calculate length needed. Order Part No. 848100-2XX for 2-conductor cable and 848100-3XX for 3-conductor cable.

Sealant

Refer to *Sealant and Rod Filler Calculations* to calculate amount of sealant required. Sealant is available in quart cartridges, Part No. 848100-800, or 4.5 gallon cans, Part No. 848100-805. A cartridge will cover about 60 feet of filler rod and one can will cover about 1200 linear feet. See *Filler Rod and Sealant Installation* for recommendations on dispensing sealant.

Conduit

Installation of this Direct Burial System can only be done in those locations where local codes permit the use of buried cable instead of conduit and epoxy splices instead of junction boxes.

If needed, order Conduit entry boots from sump manufacturer.

Rigid conduit may be used when entering a sump. A coupling will be needed for installing our cord grip on rigid conduit. Rigid conduit must be used in areas below grade not covered by either asphalt or concrete.

Recommended Tools

- ☐ Filler Rod Installation Tool, Part No. 848100-904
- ☐ Manually Driven Cartridge Gun, Part No. 848100-901
- ☐ Compressed Air Driven Cartridge Gun, Part No. 848100-902
- ☐ Compressed Air Driven Bulk Gun, Part No. 848100-903

Installation

Important  Before considering Direct Burial, check to be sure that Direct Burial practices are acceptable at this location. Determine acceptability prior to ordering materials.

Site Layout

Important  The Direct Burial cable is for intrinsically safe wiring only. Using Direct Burial Cable for any other wiring is not permitted.

The wiring and cables for the intrinsically safe probes and sensors cannot be combined with wiring from any other system. a physical separation of at least two inches must be maintained. probe and sensor wiring cables must have a two inch separation from all other wiring.

Failure to maintain proper separation of probe and sensor wiring, can result in equipment damage, inaccurate inventory control, or undetected environmental and health hazards.

The words “saw cut”, “joint” and “trench” refer to the location of the Direct Burial Cable when installed below grade.

1. Determine the following: building junction box location; location of each probe and sensor; which probe and sensor cables can be run together.
2. Use a layout diagram to determine the number and length of the saw cuts. Figure 1 shows a typical layout including trench lengths

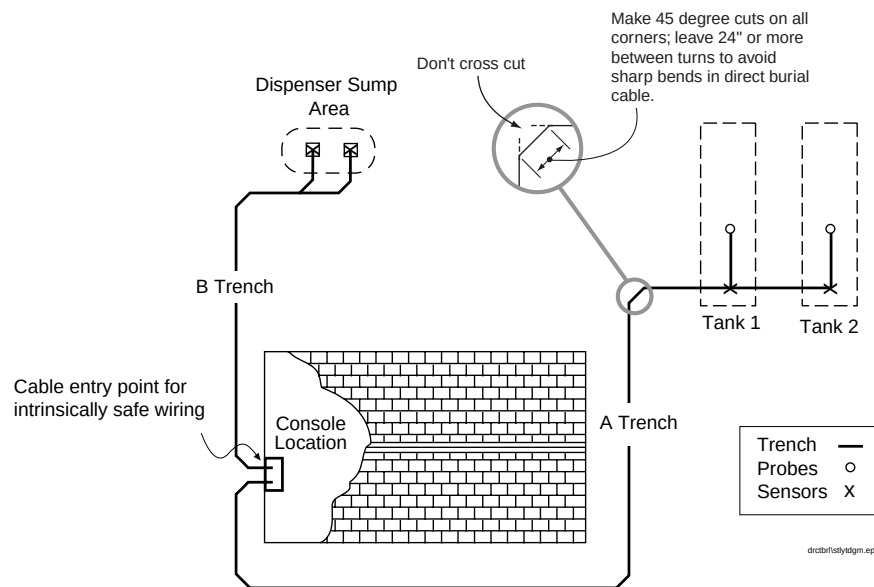


Figure 1. Site Layout Diagram, Top View

! WARNING



Careful consideration must be given to existing fuel and wiring systems. The trench layout must not cut through existing systems as fire and explosion may result.

Important

Each probe and sensor will have its own Direct Burial Cable. These cables must run from each probe and sensor to a junction box located prior to the seal-off.

When crossing over existing piping or wiring, determine their depth before cutting a new trench.

3. Measure the trench lengths with a tape measure. Record these lengths on a layout sketch.
4. The Direct Burial Layout should not be located in areas of poor drainage or improperly designed subsurface drainage systems.

Sealant And Filler Rod Calculations

Use the dimensions recorded on your layout sketch for determining the required amount of sealer and filler rod.

The calculation for the “A” trench length uses the longest linear length for the furthest probe or sensor. Separate wires for each probe and sensor are placed in a common trench “A”. The length of the trench is obtained by determining the total trench length including all its branches from the console to the probe and sensor locations. Add 15 percent to the determined length to allow for measurement errors.

The same method is used for calculating the “B” trench length. Add the length needed for another sensor, plus 15 percent.

Cable Length Calculation

1. Use your layout diagram to determine the distance from the cable entry point to each probe or sensor.
2. Add all of the probe and sensor cable lengths together. Add an additional 40 feet to the total required cable length for cabling connections.

See Figure 2 for a cross sectional view of a single Direct Burial Cable run. Figure 2 is a typical cable run from a probe to the cable entry point.

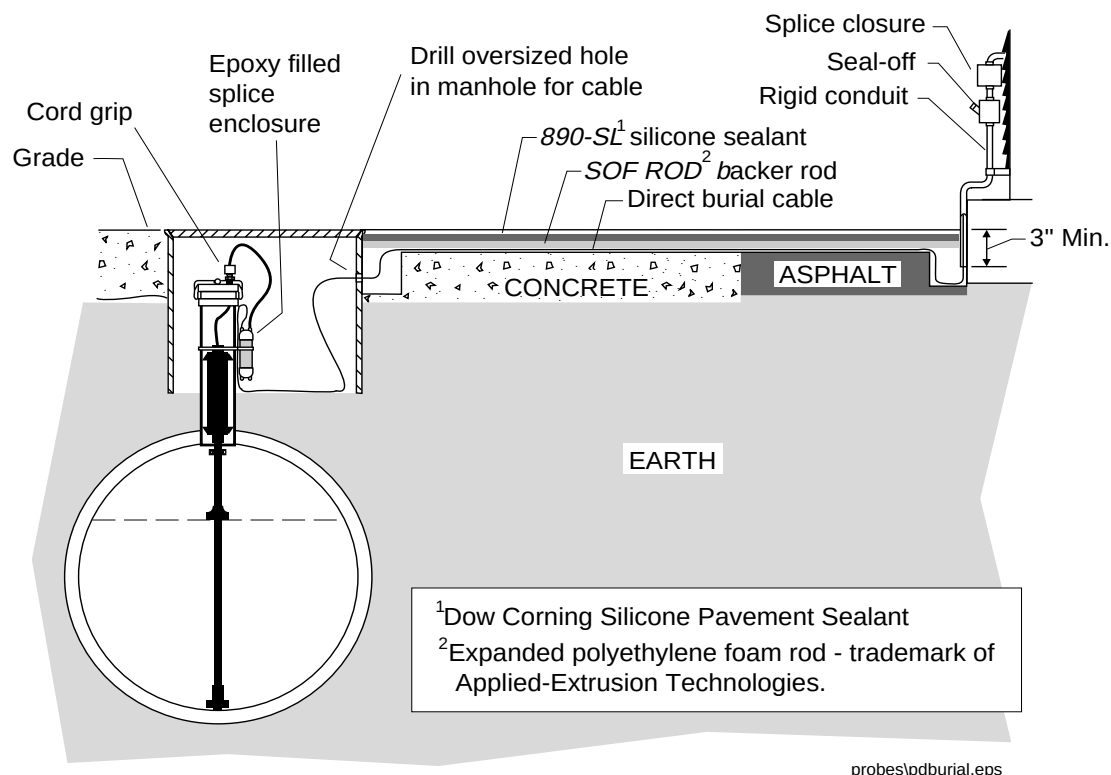


Figure 2. Direct Burial Installation

Direct Burial Cable can be ordered as one continuous length up to 2,000 feet. Always “round up” any length calculation to the next 100 feet length.

Where possible, the Direct Burial Cable should be run in asphalt or concrete. If an unpaved surface cannot be avoided in the cable layout, the cable must be run through rigid conduit. Refer to local applicable codes when using Direct Burial Cable in an unpaved surface.

Example: Sealant and Filler Rod

From the cable entry point to the probe riser in Tank 2, the “A” length is 295 feet. From the cable entry point to the furthest sump sensor, the “B” length is 205 feet. For the “A” trench, add an additional 40 feet for the tank 1 probe. For the “B” trench, add an additional 40 feet for the other sump sensor. Add the lengths for both trenches together. An equal length of sealant and filler rod is needed.

“A”: $295 + 40 = 335$ feet

“B”: $205 + 40 = 245$ feet

Total length = 335 feet + 245 feet or 580 feet.

In this example, the total amount of sealant and filler rod needed is 580 feet. Order Part No. 848100-106 for 600 feet of filler rod. Order 600 linear feet of sealant; either ten 1 quart cartridges, Part No. 848100-800, or one 4.5 gallon can, Part No. 848100-805. The 10 cartridges will cover $10 \times 60 = 600$ linear feet. One 4.5 gallon can covers 1,200 linear feet.

Example: Direct Burial Cable

Calculate six cable lengths plus 40 feet per cable for making connections at both the riser and the cable entry point.

2 Probes: $295 + 275 + 80 = 650$ feet.

2 Interstitial Sensors: $275 + 255 + 80 = 610$ feet

Total length is 650 feet + 610 feet or 1260 feet

2 Sump Sensors: $205 + 195 + 80 = 480$ feet

In this example, a 1300 feet cable spool would be used for probes and interstitial sensors. Order 1300 feet of 2 conductor Direct Burial Cable, Part No. 848100-213. Order 500 feet of 3 conductor cable, Part No. 848100-305, for the sump sensors.

Installation Strategy

Important  Maintain a 6-foot separation between direct burial conductors and lighting conductors.

It is recommended that all materials be on site before starting the Direct Burial Installation.

Although saw cutting can be done under various conditions, sealant installation cannot be. The sealant cure time depends on humidity and temperature. The cure time will increase with lower humidity or lower temperatures. Sealant cannot be installed at temperatures below 20°F or when surfaces are wet. Below 40°F the sealant will probably require more effort to “shoot” out of the gun, but this can be helped by keeping it indoors until it is ready to use. At 20°F the sealant will be tack-free in about 3 hours. At 75°F the tack-free time is about an hour; at which time the area can be reopened to traffic provided the sealant is properly recessed.

Joint faces must be clean, dry and frost-free when the sealant is installed. Joints must be free of standing water; and under no circumstances shall sealing take place during rain, snow, or temperatures below 20°F.

Do not install sealant when the temperature is below the dew point (the point at which dew begins to form).

If rain or other inclement weather occurs during joint preparation or sealing, all operations should cease. Sufficient time must be allowed for the trench to dry prior to continuing.

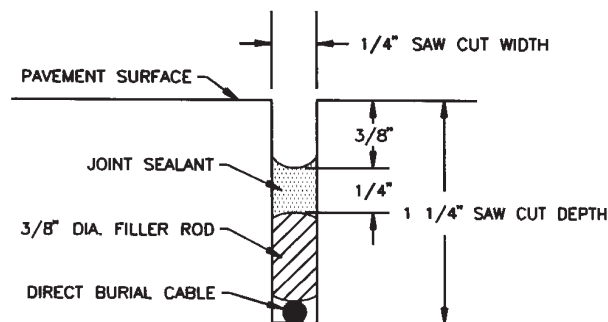
Trench Preparation



When Cutting Or Grinding, Be Sure To Wear Adequate Safety Protection: Ear Protection, Gloves, Goggles, And A Dust Mask.

Sawing through concrete is actually a grinding operation. Please follow the rules listed in the ANSI B7.1 Safety Requirements for Use, Care and Protection of Abrasive Wheels. For more information, you may contact ANSI by writing to American National Standards Institute, 11 W. 42nd Street, New York, New York, 10036.

1. The saw cut depth is determined by the number of cables to be run in the trench [Figure 3]. The depth for one Direct Burial Cable is 1 1/4 inches. For each additional cable, 1/4 inch should be added to the saw cut depth.



dntrb/asecvdbac.apa

Figure 3. Sectional View of Direct Burial Saw Cut

Important If the Direct Burial Cable exits the ground in a hazardous location, a sealoff must be used prior to any J-Box, raceway, or cable entry.

2. The width of the trench should not be less than 1/4-inch or more than 3/8-inch.

In the example from , the “A” trench with four cables would need a depth of 2 1/4 inches and the “B” trench with two cables would need 1 1/2 inch depth.

3. Dig out areas around the entry and exit points for the Direct Burial Cable (see Figure 2 on page 8). In the sump area these holes need to be about eight inches deep for cord grip installation. For the building entry area, about six inches is needed for the conduit which can be secured to the outside walls or come up through the floor. These areas should be back filled once the cable has been tested.
4. In sumps using conduit entry boots, run the Direct Burial Cable in a short piece (6 to 12 inches) of 1/2-inch conduit [Figure 4 on page 11]. Use a 1/2-inch NPT coupling with female threads for connecting the cord grip to the conduit. In other types of sumps drill and tap a 1/2-inch NPT hole in the sump wall for the cord grip. Make sure all pipe threads are sealed with a suitable compound and use corrosion resistant materials.

Important  *The conduit, coupling and entry boot are not provided by Veeder-Root. You may substitute with 3/4-inch or 1-inch parts with a suitable adapter to mate with the cord grip.*

When turning corners with saw cuts, always use 45 degree cuts (see Figure 1 on page 6). 90 degree saw cuts may cause damage to the Direct Burial Cable.

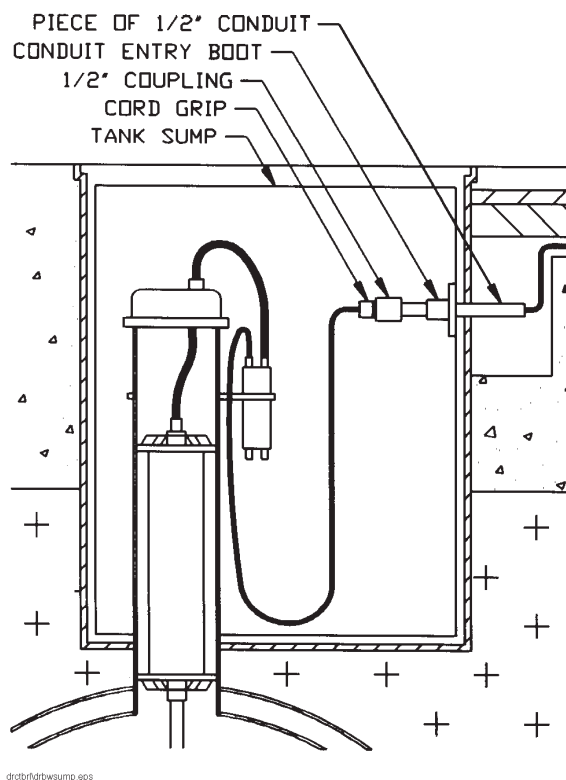


Figure 4. Direct Burial with Sump

5. Follow the sump manufacturer's guidelines when drilling and tapping holes in the sumps. If required, seal the conduit according to local applicable codes.

6. After cutting, clean the trench using compressed air. A clean trench will have no visible signs of residual sealant or debris on the joint wall, and will leave no residual cement powder or dust on your fingers after rubbing the joint face. If residuals are found, wash the entire trench and air blast dry.

Important ⓘ *The trench must be clean and dry before proceeding.*

7. Install Direct Burial Cables leaving enough slack to make probe and sensor connections.

Important ⓘ *The cables should lie in the bottom of the trench so that at least 1 inch of clearance remains between the top of the cables and the pavement surface.*

When removing the outer jacket of a cable, care should be taken not to damage the insulation on the inner conductors.

8. In the sump area, install a cord grip over each Direct Burial Cable. Mount each cord grip into the sump wall. Run the Direct Burial Cables along the bottom of the sump, as shown in Figure 2 on page 8, then tighten the cord grips.
9. If a sump is not used, see Figure 5.

Important ⓘ *This application does not provide the containment required for a riser pipe used for filling the tank.*

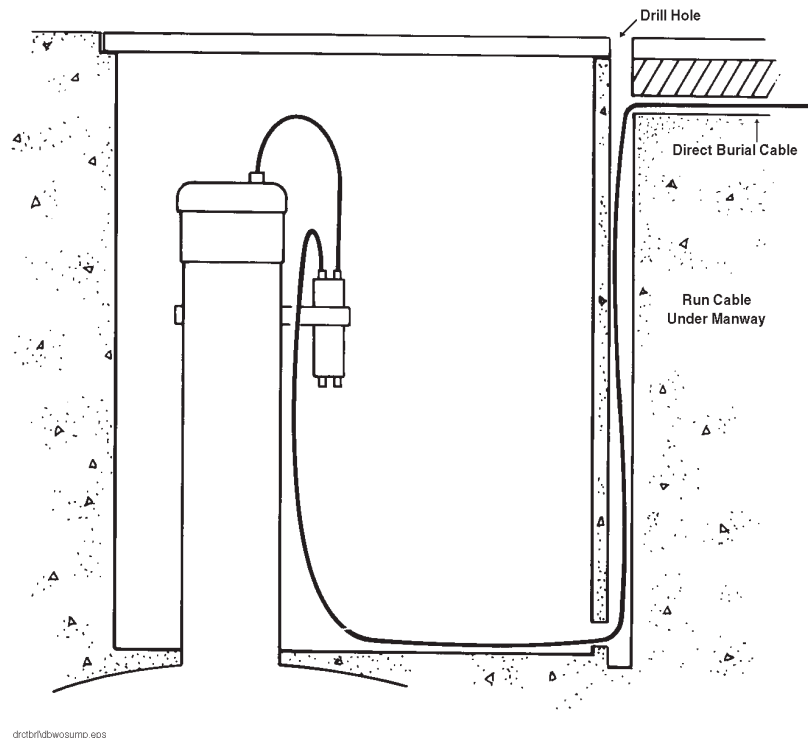


Figure 5. Direct Burial without a Sump

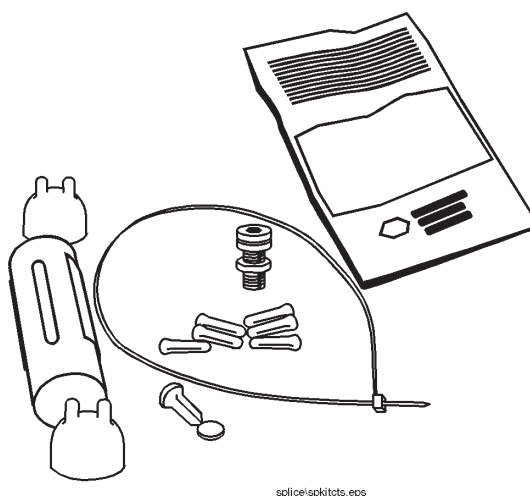
10. At the entry point into the Hazardous Location, install a weatherproof junction box for making the wiring connections (refer to appropriate console Site Prep manual for all sensor/probe wiring connections).
11. Test each cable conductor, one at a time, for continuity. Then check for shorts between both the black and white conductors and the drain wire. After each successful test, label each cable inside the junction box.
12. Install probes and sensors according to the instructions shipped with them. In place of the junction box, located in the sump, use the Direct Burial Splice Kit. Read the Splice Kit Instructions Installation Manual for more information on Direct Burial Installation.

Splicing

Splicing Instructions

When making direct burial cable connections to a sensor/probe cable, mark the direct burial cable wires to ensure that probe/sensor polarity is maintained (if required). Defer to sensor/probe wiring diagrams in the applicable console Site Prep manual when making these connections.

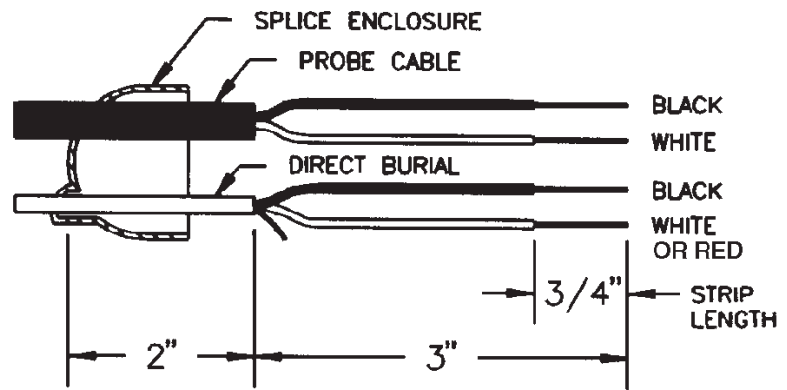
1. Use a Splice Kit [Figure 6] for making splices.



splice/spkitets.eps

Figure 6. Splice Kit Contents

2. Insert the probe cable or sensor cable through the top of each riser cap and through the cable bushing.
3. If the Direct Burial Cable is entering from a sump wall, insert the Direct Burial Cable through the cable bushing supplied in the Splice Kit (see the Direct Burial Cable Installation Instructions manual for more information).
4. Cut the soft vinyl end cap entrance hole to accommodate each cable diameter. Keep the hole size to a minimum. Insert about 5 inches of cable through the opening [Figure 7].

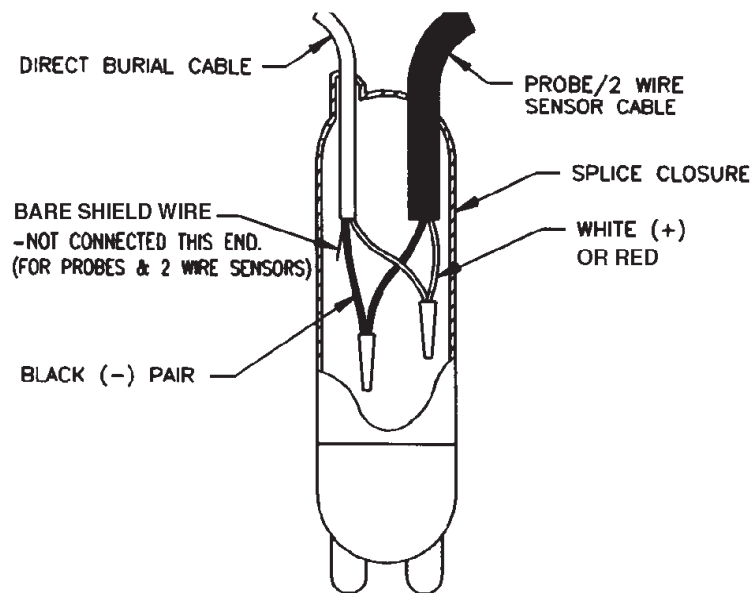


splice/lengthdim.eps

Figure 7. Splice Length Dimensions

5. Remove 3 inches of the outer jacket from each cable. Trim the insulation from the conductors [Figure 7 on page 15].
6. Make the connections using wire nuts [Figure 8 on page 15] for a 2-wire sensor or probe. Cut off the bare shield wire.

Important Normally the drain wire is not connected to probes and sensors in the sump area. At the other end (conduit entry point), the drain wire must be spliced to a wire connected to a bonding screw inside the console. This connection effectively ties the Direct Burial Cable shield to console ground.



splice/spclcb2w.eps

Figure 8. Splice Closure/Cable Diagram—Probe and 2-Wire Sensor

Important  For the 3-wire sensors, see Figure 9.

For direct burial of 3-wire sensors, use 3-wire shielded cable.

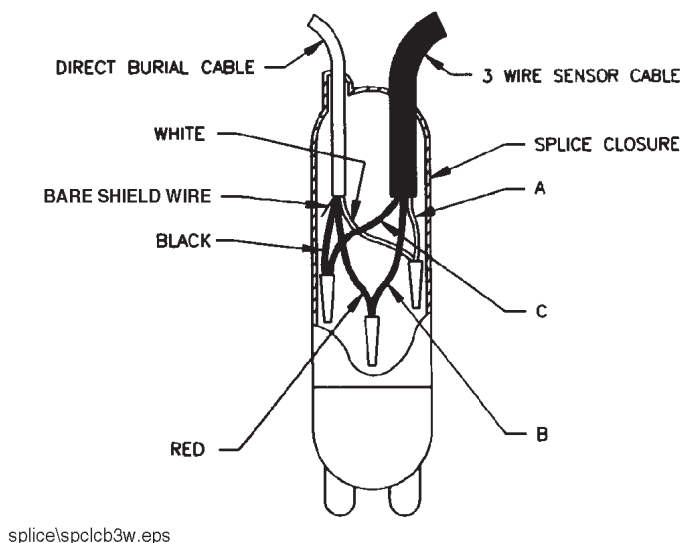


Figure 9. Splice Closure/Cable Diagram—3-Wire Sensor

7. Use the aluminum bonding clamp to hold the Direct Burial and probe/sensor cables together [Figure 10 on page 16]. Finger tighten, being careful not to damage the conductor insulation. This clamp is not intended to make any electrical connections.

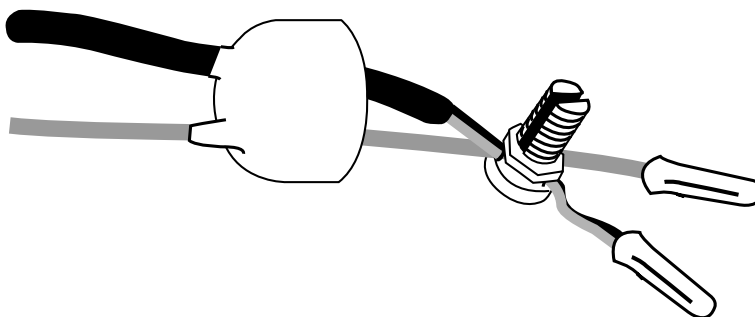


Figure 10. Probe Cable Splice

8. Center the splice in the clear plastic sleeve. Assemble the splice closure, making sure the sleeve is fully inserted into each of the vinyl end caps. Rotate the sleeve cover until both openings line up. Place the splice on a level surface.

! CAUTION

Q-compound and epoxy sealant may be irritating to skin and eyes, absorbed through the skin, or cause skin sensitization in susceptible individuals.



Minor injury may result. Also materials contained in epoxy have caused skin cancer in animal tests.

You must wear gloves that are chemically resistant.



Avoid skin and eye contact. Wear appropriate safety equipment. Use only in well ventilated areas. If exposed, wash affected skin areas with soap and water. For eye contamination, flush with water for 15 minutes and get immediate medical attention. For ingestion, if conscious give plenty of water and induce vomiting.

9. Remove bag of “Q-compound” from foil package. Grasp the ends, one in each hand, then pull sharply to remove plastic clip [Figure 11].

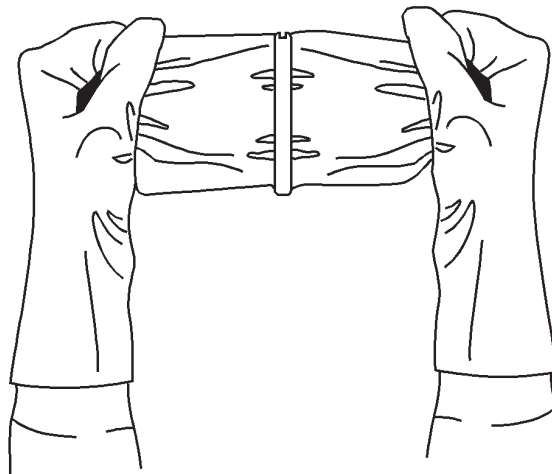


Figure 11. Q Compound, Clip Removal

10. Thoroughly mix compound together. Invert bag several times while squeezing compound from one end to the other for a minimum of one minute.

11. Once the mixture feels warm, immediately cut one corner and slowly fill the plastic sleeve. Stop just short of filling the entire sleeve. **Do not overfill.** [Figure 12]

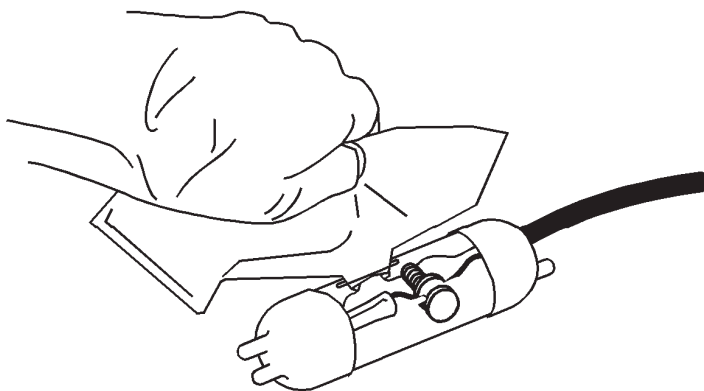
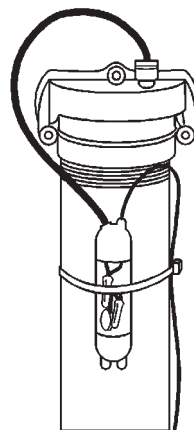


Figure 12. Pouring Q Compound

12. With a twisting motion, rotate the outer clear plastic barrel to close the pouring slot.
13. Wait at least five minutes, then use the large cable tie to mount the splice to the riser pipe [Figure 13].



SP-20180301-001

Figure 13. Direct Burial Splice with Cable

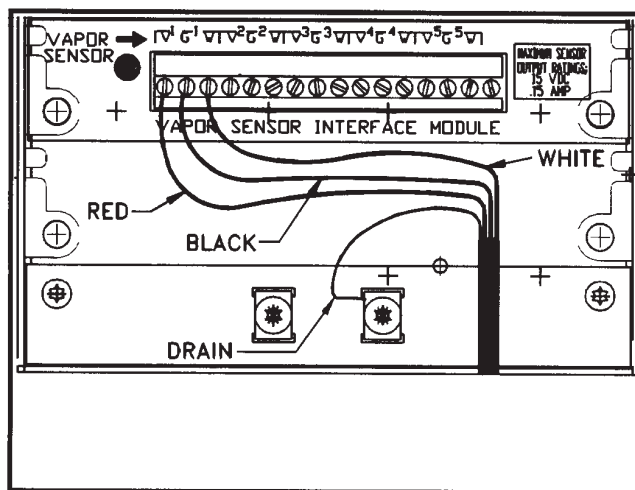
14. Make the console connections at the entry point into the hazardous location. Refer to the appropriate console Site Prep manual for making field wiring connections. Use wire nuts provided with Splice Kit to make these connections.
15. Splice the Direct Burial Cables using the Splice Kit for all probes and sensors. Use the console to verify wiring, connections, probe and sensor operation. Do NOT proceed until the entire system is communicating with every probe and sensor.

- 16. There must be no paths for gases to pass from the Hazardous Location to the Non-Hazardous Location.** To ensure water-tight seals, tighten all probe and sensor cable bushing nuts. Pour and check all seals in accordance with the National Electrical Code (NFPA 70) and the Automotive and Marine Service Station Code (NFPA 30A) since they pass from a Class I, Division I or Division II area into a non-hazardous area.

Important  Using cables or sealants other than those described in this manual will void the product warranty. For sealing the trench, the only acceptable sealant is the 890-SL (self-leveling) from Dow Corning.

Sealant and epoxy are not interchangeable. Do not use sealant for potting wires and do not use the epoxy for covering the buried cable. The sealant, 890-SL, is dark gray, and packaged in cartridges and cans. The epoxy, Q Compound, is clear and packaged in a foil package.

Normally the drain wire cable shield is not connected to probes and sensors in the sump area. At the other end (conduit entry point), the drain wire must be spliced to a wire connected to a bonding screw inside the console [Figure 14]. This connection effectively ties the Direct Burial Cable shield to console ground.



dratbrlbgdmr.eps

Figure 14. Bonding the Drain Wire

Filler Rod And Sealant Installation



Avoid skin contact with Q-compound and sealant. If exposed, wash affected skin areas with soap and water. For eye contamination, flush with water for 15 minutes and get immediate medical attention. For ingestion, if conscious give plenty of water and induce vomiting.

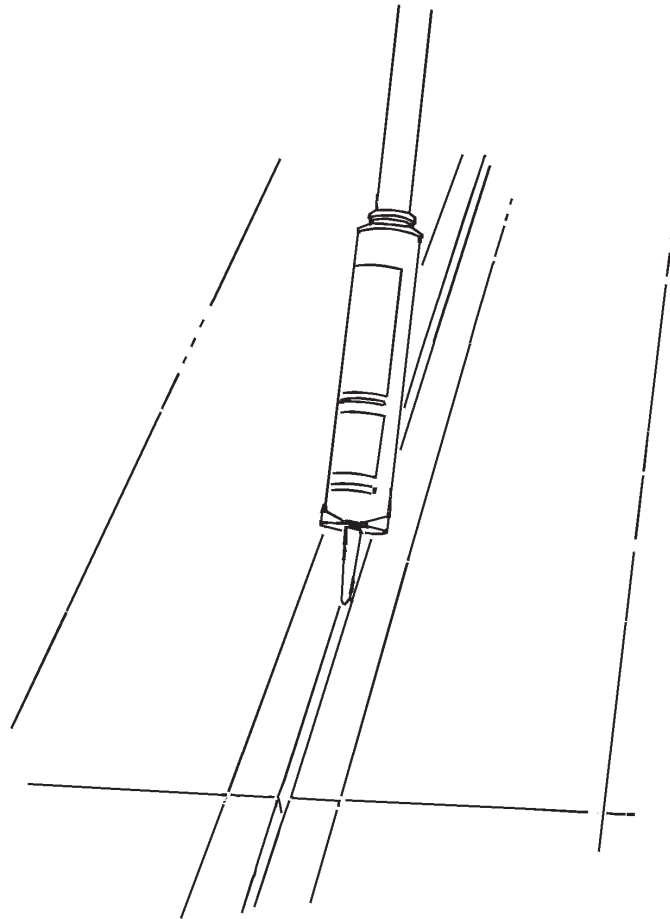
1. Uncoil the filler rod over the trenches. Install the rod to proper depth [Figure 3 on page 10]. The depth, 5/8 inch, is measured from the paved surface to the top of the filler rod. Placing the rod too deep will result in the need for excessive sealant.

Important  *Filler rod can be installed by hand, but a roller tool to aid in placement is a better choice. Order Veeder-Root Filler Rod Installer Part No. 848100-904. Sealant should only be installed if the temperature is above 20°F and joint surfaces are dry (see “Installation Strategy” on page 9 for more on application temperatures).*

2. The self-leveling sealant should be installed as soon as the container is opened. An air powered dispenser works best, but a manual pump gun can be used.
3. The following types of sealant dispenser guns are available. Order using these part numbers:
 - ☐ 848100-901, Manually Driven Cartridge Gun.
 - ☐ 848100-902, Compressed Air Driven Cartridge Gun.
 - ☐ 848100-903, Compressed Air Driven Bulk Gun, for use with 4.5 gallon cans.
4. When using compressed air to dispense the sealant, an air line pressure regulator is recommended. Adjust air line pressure to achieve the desired flow rate. The air line pressure needed will usually be below 60 psi.
5. To load the bulk gun, first remove the bottom cap. Immerse the bottom of the gun into the sealant to a depth of about one inch. While holding the barrel, pull the piston rod back slowly. Pause at every inch allowing the barrel to fill with a minimum of air pockets. Remove gun and clean any excess sealant with a putty knife. Replace the bottom cap and attach a nozzle.
6. When using sealant cartridges, cut the nozzle at an angle and be sure to break the seal between the nozzle and the cartridge.
7. Pump the sealant along the top of the filler rod [Figure 15 on page 21]. Move the nozzle along the joint pushing the sealant ahead to form a uniform bead. Fill the joint from the top of the filler rod to 3/8 inches below the pavement surface.

Important  *Filler rod must be installed to the proper depth or sealant failure may occur. When installed, the top of the filler rod should be 5/8 inch deep.*

Failure to install sealant to a minimum depth of 1/4 inch below grade will result in sealant failure [Figure 3 on page 10].



dratbafnabrd aen

Figure 15. Sealing the Filler Rod

8. Excess sealant on the pavement surface should be scraped up and removed to prevent possible tracking.
9. Use the console to again verify that all probes and sensors are working correctly.
10. Once a skin has formed on the sealant surface, about one to three hours depending on cure time, the area can be reopened to traffic. Typically the sealant surface will feel tacky.



Fiberglass Interstitial Sensor Installation Kit

User's Manual



Notice

Veeder-Root makes no warranty of any kind with regard to this publication, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

Veeder-Root shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this publication.

Veeder-Root reserves the right to change system options or features, or the information contained in this publication.

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Contact TLS Systems Technical Support for additional troubleshooting information at 800-323-1799.

DAMAGE CLAIMS / LOST EQUIPMENT

Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

Veeder-Root must be notified of any damages and/or shortages within 30 days of receipt of the shipment, as stated in our Terms and Conditions.

VEEDER-ROOT'S PREFERRED CARRIER

1. Contact Veeder-Root Customer Service at 800-873-3313 with the specific part numbers and quantities that were missing or received damaged.
2. Fax signed Bill of Lading (BOL) to Veeder-Root Customer Service at 800-234-5350.
3. Veeder-Root will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

CUSTOMER'S PREFERRED CARRIER

1. It is the customer's responsibility to file a claim with their carrier.
2. Customer may submit a replacement purchase order. Customer is responsible for all charges and freight associated with replacement order. Customer Service will work with production facility to have the replacement product shipped as soon as possible.
3. If "lost" equipment is delivered at a later date and is not needed, Veeder-Root will allow a Return to Stock without a restocking fee.
4. Veeder-Root will NOT be responsible for any compensation when a customer chooses their own carrier.

RETURN SHIPPING

For the parts return procedure, please follow the appropriate instructions in the "General Returned Goods Policy" pages in the "Policies and Literature" section of the Veeder-Root **North American Environmental Products** price list. Veeder-Root will not accept any return product without a Return Goods Authorization (RGA) number clearly printed on the outside of the package.

Introduction

Contractor Certification Requirements	1
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Safety Precautions	1
Installation Kit	2
How the Strip Positions the Sensor in the Annulus	2
Attaching the Sensor to the Strip	3
Installing Sensor	5

Introduction

This manual contains instructions for attaching the Veeder-Root Calibrated Sensor Positioning Strip to an interstitial liquid sensor and installing the sensor/strip assembly in the annular space of a fiberglass tank.

Instructions for completing the sensor's installation are discussed in the manual shipped with the sensor.

Contractor Certification Requirements

Veeder-Root requires the following minimum training certifications for contractors who will install and setup the equipment discussed in this manual:

Installer Certification (Level 1): Contractors holding valid Installer Certification are approved to perform wiring and conduit routing; equipment mounting; probe, sensor and carbon canister vapor polisher installation; wireless equipment installation; tank and line preparation; and line leak detector installation.

Technician Certification (Level 2/3): Contractors holding valid Technician Certifications are approved to perform installation checkout, startup, programming and operations training, system tests, troubleshooting and servicing for all Veeder-Root Series Tank Monitoring Systems, including Line Leak Detection. In addition, Contractors with the following sub-certification designations are approved to perform installation checkout, startup, programming, system tests, troubleshooting, service techniques and operations training on the designated system.

- Wireless 2
- Tall Tank

Warranty Registrations may only be submitted by selected Distributors.

Related Manuals

576013-617 Interstitial Liquid Sensor - Fiberglass Tanks Installation Guide

Safety Precautions

The following safety symbols may be used throughout this manual to alert you to important safety hazards and precautions.



EXPLOSIVE

Fuels and their vapors are extremely explosive if ignited.



FLAMMABLE

Fuels and their vapors are extremely flammable.



READ ALL RELATED MANUALS

Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.

! WARNING



This product is to be installed and operated in the highly combustible environment of a gasoline storage tank where flammable liquids and explosive vapors may be present.

FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH.

Leaking underground tanks can create serious environmental and health hazards. It is your responsibility to install this product in accordance with the instructions and warnings found in this manual. Failure to do so could result in undetected potential environmental and health hazards.

Failure to install this product in accordance with its instructions and warnings will result in voiding of all warranties connected with this product.

Installation Kit

Table 1 lists the components in the Calibrated Sensor Positioning Strip kit.

Table 1. Interstitial Sensor Installation Kit (P/N 330020-436)

Item	Description	Part No.	Qty.
1	Calibrated Sensor Positioning Strip - 1/2" wide, 528" long	331969-001	1
2	Tie wrap	510901-337	4
3	Installation manual	577013-802	1

How the Strip Positions the Sensor in the Annulus

Select an out-of-the-way spot at the site where you can unroll the Calibrated Sensor Positioning Strip from the kit (the strip is 44 feet long). Notice that there are 10-, 8-, 6-, and 4-foot markers on both ends of the strip. The distance between any of two identical FT markers (e.g., 4 and 4) is equal to the circumference of that diameter tank, plus 12 feet. Notice at the very center of the Calibrated Sensor Positioning Strip there is a small hole in a painted area centered between two larger holes. The sensor is attached to the strip at this point so that for any of the four tank diameters, the sensor will always be positioned at the bottom of the tank annulus when the markers line up above the top of the riser (see Figure 1).

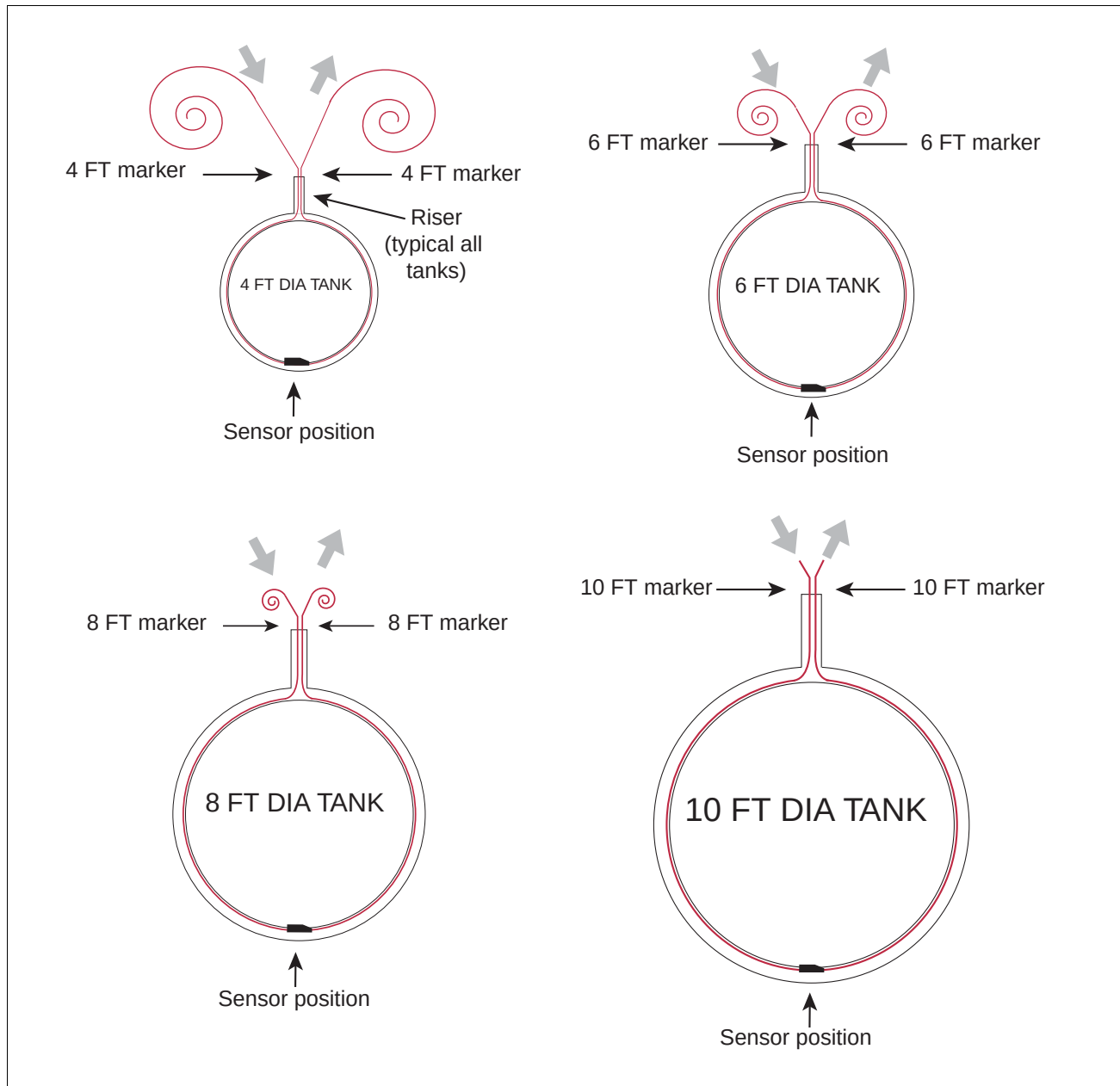


Figure 1.

Attaching the Sensor to the Strip

1. With the strip unrolled, look at the center of the strip. Notice that there are three holes in the center of the strip's length, one small hole in a painted area (which marks the Calibrated Support Strip's center point), equally spaced between two larger (5/16") holes. Orient the Calibrated Support Strip so that the painted side is up.

2. Place the Interstitial sensor along the top of the support strip so that the sensor body is over the painted area and the hole in the front of the sensor aligns with the 5/16" hole to the right of the center hole (see Figure 2). The black housing of the sensor must be facing up and the flat white perforated side of the sensor against the strip.

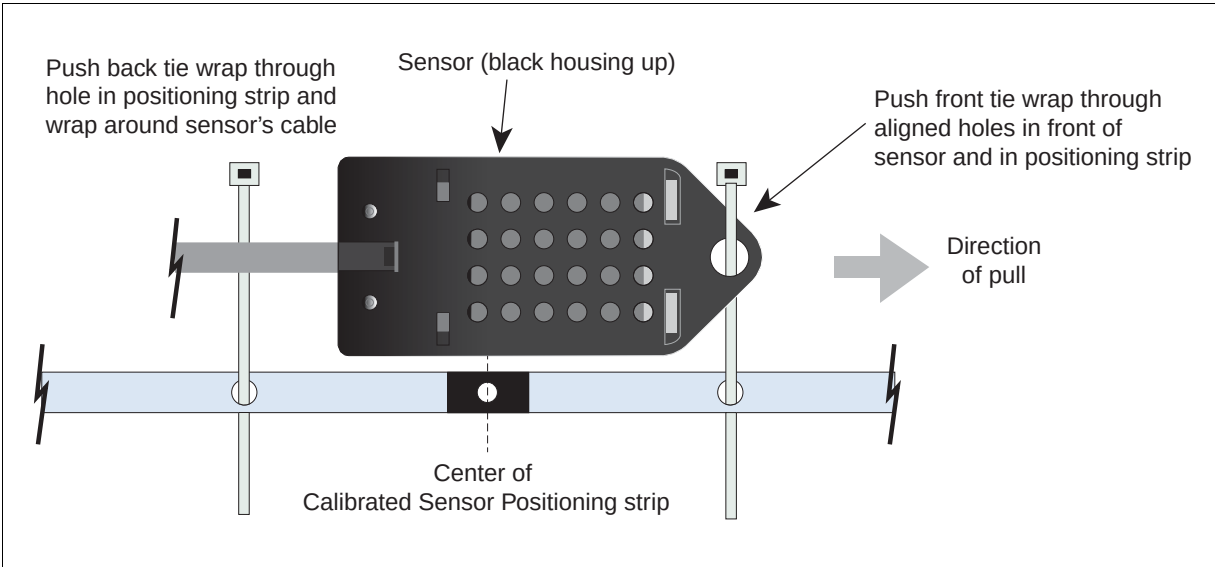


Figure 2.

3. Thread one of the tie wraps from the kit through the aligned holes of the Sensor and the Calibrated Support Strip. Snug up the tie wrap until the sensor is flat against the Calibrated Support Strip (see Figure 2). Thread another tie wrap from the kit through the 5/16" hole to the left of the calibrated support strip's center hole and around the sensor's cable. Pull the tie wrap ends until the sensor is snug against the calibrated support strip (see Figure 3). Trim off excess ends from tie wraps.

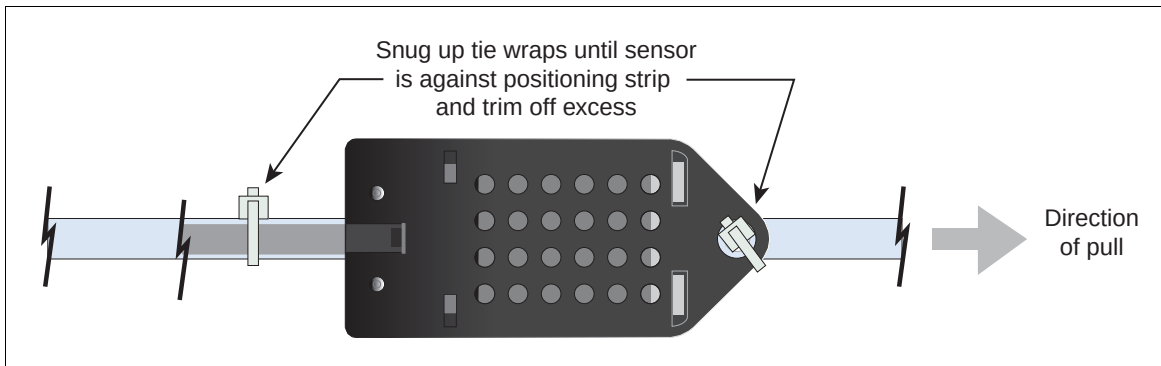


Figure 3.

4. Notice to which end of the Calibrated Sensor Positioning Strip the front of the sensor is pointing (this will be the direction of pull). Place a piece of tape at that end of the calibrated Sensor Positioning Strip - this is the end to which you will attach the tank's annulus pull cord.

Installing Sensor

1. Move the Sensor/Support strip assembly to the tank in which it will be installed.
2. Tie the tank pull cord to the end of the Calibrated Sensor Positioning Strip which you marked with tape above as identifying the 'direction of pull' end. As you pull the Calibrated Sensor Positioning Strip into the annulus, make sure the painted side of the strip is facing in towards the tank (see Figure 4).

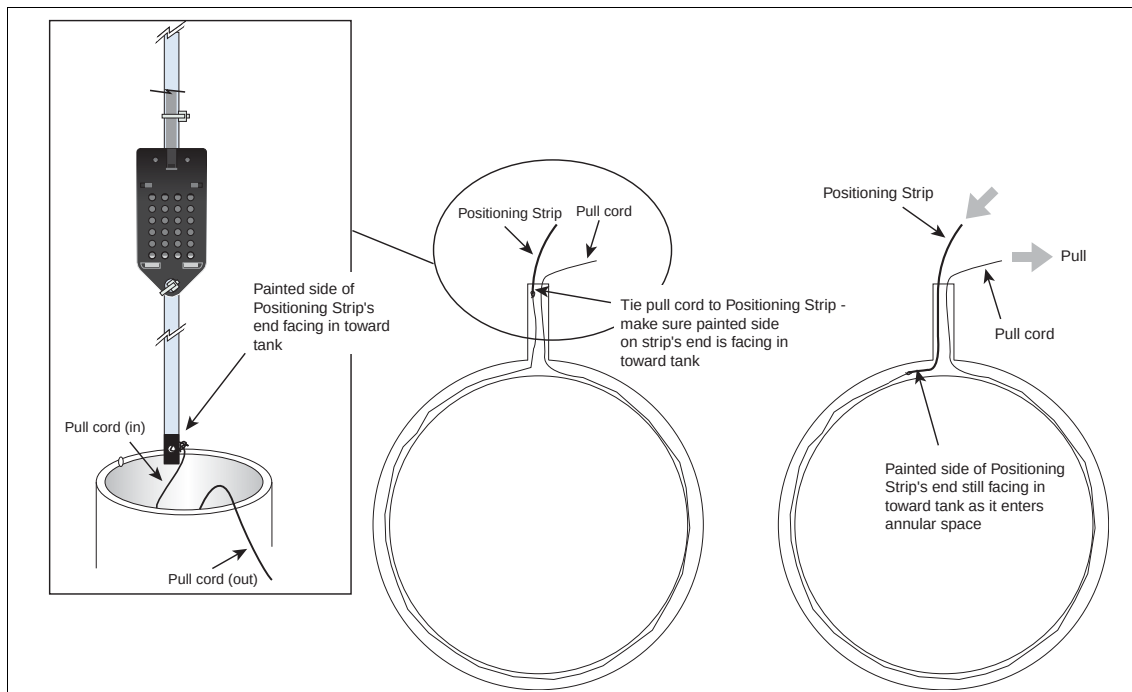


Figure 4.

3. Continue to pull the cord while feeding the sensor/strip assembly into the annulus. Depending on what diameter tank you have, pull the strip until the markers for that tank size are visible above the top of the riser. Pull both ends of the strip until the two markers line up (see Figure 5).

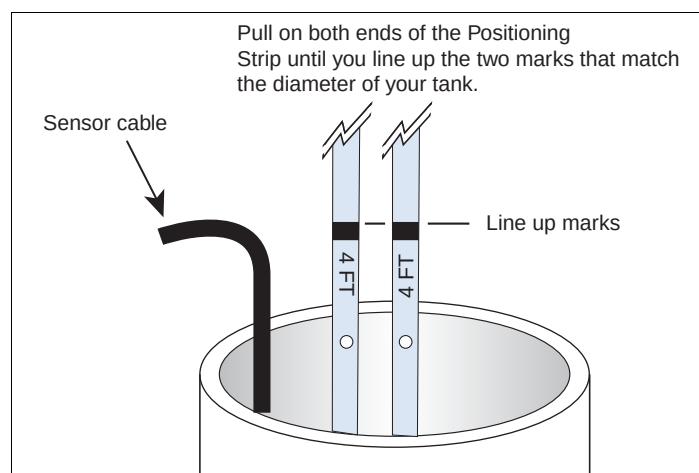


Figure 5.

4. When the two markers are lined up, the sensor is centered correctly at the bottom of the annulus (Figure 6).

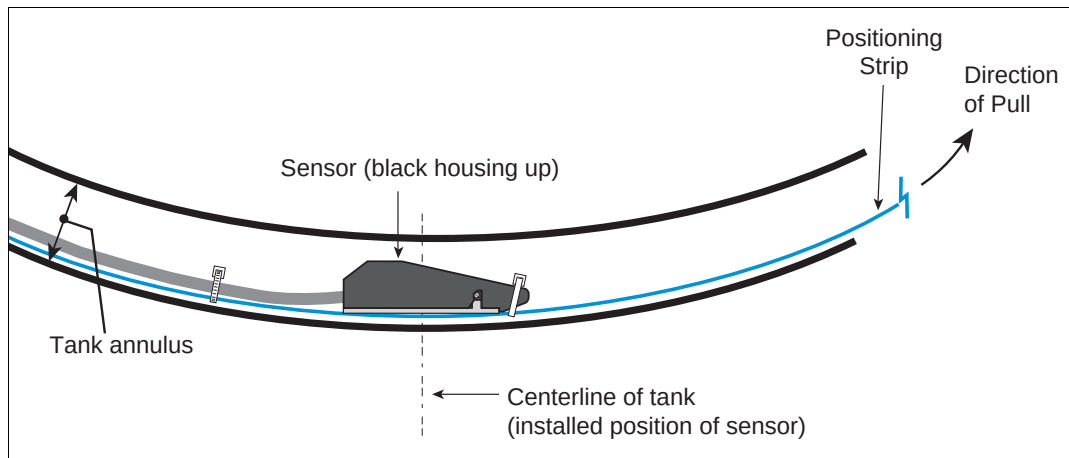


Figure 6.

5. For 4-, 6-, and 8-foot diameter tank installations, trim off the two ends of the Calibrated Sensor Positioning Strip above the matched markers. **IMPORTANT! Be sure to reattach the pull cord in the hole below the marker on the 'out' end of the strip** (Figure 7). Attach a tie wrap through the two aligned holes to keep the sensor in its correct position.

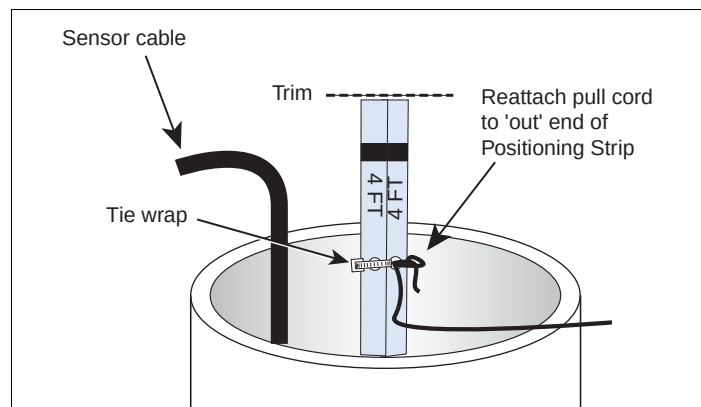


Figure 7.

6. Tuck the strip ends and pull cord down into riser (Figure 8). Consult the Interstitial Liquid Sensor installation manual for instructions on completing sensor installation (install riser cap, connect field wiring, etc.).

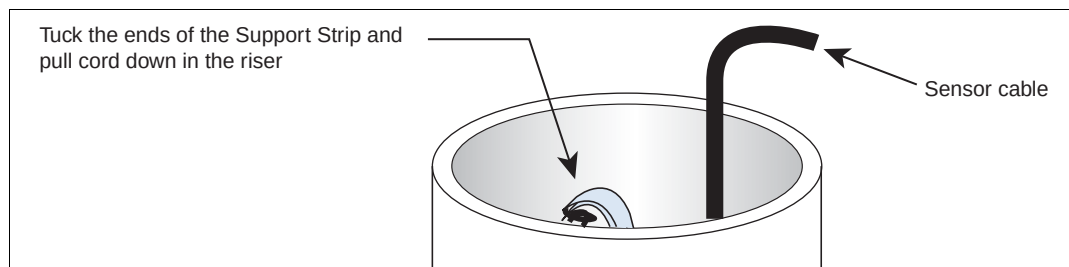


Figure 8.



Hydrostatic Reservoir Sensors for Double-Wall Fiberglass Tanks

Installation Guide

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Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

Veeder-Root must be notified of any damages and/or shortages within 30 days of receipt of the shipment, as stated in our Terms and Conditions.

VEEDER-ROOT'S PREFERRED CARRIER

1. Contact Veeder-Root Customer Service at 800-873-3313 with the specific part numbers and quantities that were missing or received damaged.
2. Fax signed Bill of Lading (BOL) to Veeder-Root Customer Service at 800-234-5350.
3. Veeder-Root will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

CUSTOMER'S PREFERRED CARRIER

1. It is the customer's responsibility to file a claim with their carrier.
2. Customer may submit a replacement purchase order. Customer is responsible for all charges and freight associated with replacement order. Customer Service will work with production facility to have the replacement product shipped as soon as possible.
3. If "lost" equipment is delivered at a later date and is not needed, Veeder-Root will allow a Return to Stock without a restocking fee.
4. Veeder-Root will NOT be responsible for any compensation when a customer chooses their own carrier.

RETURN SHIPPING

For the parts return procedure, please follow the appropriate instructions in the "General Returned Goods Policy" pages in the "Policies and Literature" section of the Veeder-Root **North American Environmental Products** price list. Veeder-Root will not accept any return product without a Return Goods Authorization (RGA) number clearly printed on the outside of the package.

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Introduction

This manual contains installation procedures for the installation or replacement of a Dual-Point Hydrostatic Sensor or Single-Point Hydrostatic Sensor for fiberglass tanks

This manual assumes all preliminary site preparation is completed, and that wiring from the monitor to the sensor junction box is in place and meets the requirements set out in the appropriate Console Site Prep manual. If this is a new installation or if site preparation is necessary, you must refer to the applicable Site Prep manual.

Contractor Certification Requirements

Veeder-Root requires the following minimum training certifications for contractors who will install and setup the equipment discussed in this manual:

Installer (Level 1) Certification: Contractors holding valid Installer Certification are approved to perform wiring and conduit routing; equipment mounting; probe, sensor and carbon canister vapor polisher installation; wireless equipment installation; tank and line preparation; and line leak detector installation.

ATG Technician (Level 2/3 or 4) Certification: Contractors holding valid ATG Technician Certifications are approved to perform installation checkout, startup, programming and operations training, system tests, troubleshooting and servicing for all Veeder-Root Series Tank Monitoring Systems, including Line Leak Detection. In addition, Contractors with the following sub-certification designations are approved to perform installation checkout, startup, programming, system tests, troubleshooting, service techniques and operations training on the designated system.

- Wireless 2
- Tall Tank

Warranty Registrations may only be submitted by selected Distributors.

Product Marking Information

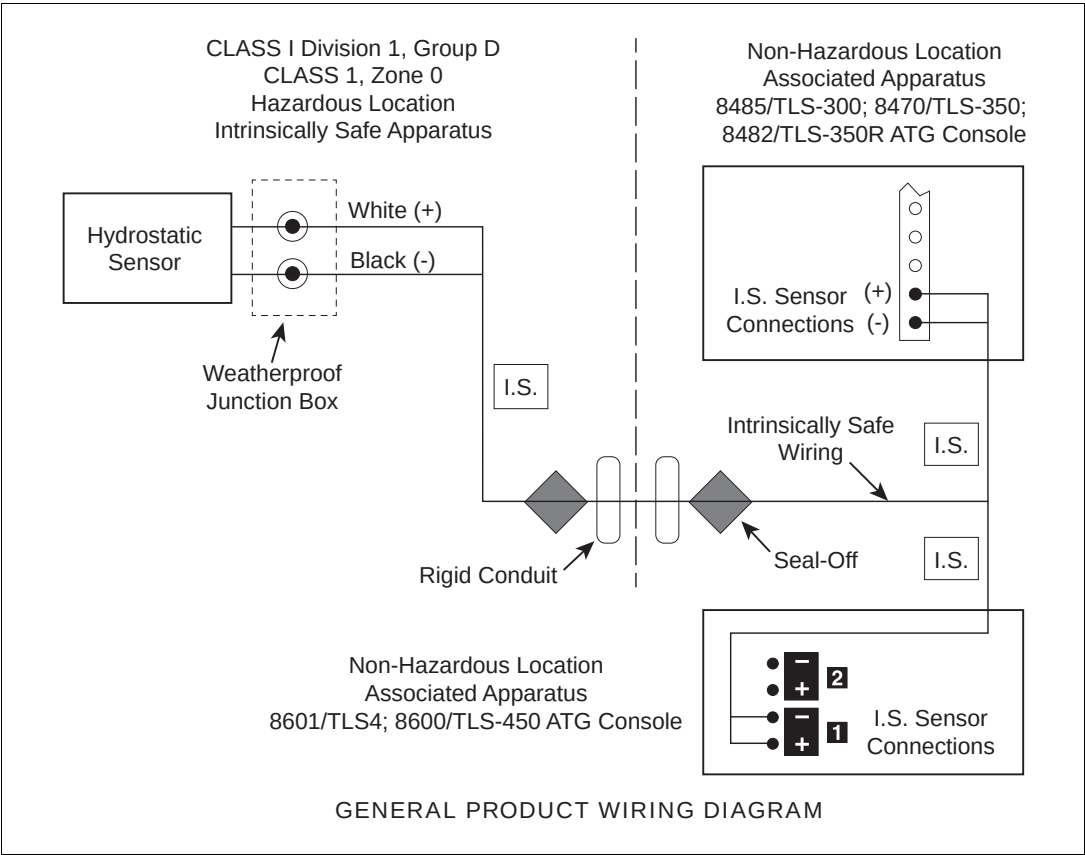
RELATED DOCUMENTS

Documents Required to Install Equipment

This intrinsically safe apparatus is only for use as part of a Veeder-Root Automatic Tank Gauging System (ATG Console with probes and sensors). To install intrinsically safe apparatus, use the specific control drawing that appears on the nameplate of the applicable associated apparatus (ATG Console):

Equipment	UL/cUL Control Drawing Document No.
Associated Apparatus	
TLS-450/8600	331940-008
TLS-350, TLS-350R	331940-011
TLS-300	331940-013
TLS4/8601	331940-018

The control drawings contain information related to the correct installation of the overall intrinsically Safe System. This includes information such as maximum number of apparatus, specific apparatus allowed in the system, maximum cable lengths, references to codes, proper grounding and so on. Control drawings can be found on the accompanying Compact Disk (TECH DOCS CD) or on the internet at veeder.com under SUPPORT; VR TECHNICAL DOCUMENTS; DRAWINGS.



Product Label Contents

	VEEDER-ROOT CL I, DIV. 1, GP.D CL I, ZONE 0 AEx ia IIA Ex ia IIA TC=T4 SECURITE INTRINSEQUE	I.S. CIRCUIT FOR HAZLOC SENSOR F/N 794380-XXX S/N XXXXXX $-40^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$ MANUAL NO. 576013-795	
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Safety Warnings

**WARNING**



This product is to be installed and operated in the highly combustible environment of a gasoline storage tank where flammable liquids and explosive vapors may be present.

FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH.

1. Read and follow all instructions in this manual, including all safety warnings to protect yourself and others from serious injury, explosion, or electrical shock.
2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes.
3. To protect yourself and others from being struck by vehicles, block off your work area during installation or service.
4. Do not alter or modify any component or substitute components in this kit.
5. Warning! Substitution of components may impair intrinsic safety.
6. Field wiring to the Sensor must not share a conduit with any non-intrinsically safe device's wiring.
7. Warning! To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.
8. Before installing or taking the unit into a hazardous area, earth the unit in a safe area to remove any static charge. Then immediately transport the unit to the installation site. Do not rub or clean the unit prior to installation. Cleaning is not required under normal service conditions. Do not rub or clean the unit after installation. If the unit is not fixed to a known earth point when installed, ensure that a separate earth connection is made to prevent the potential of a static discharge. When fitting or removing the unit, use of anti-static footwear or clothing is required.
9. Materials used in the construction of this device do not contain, by mass, more than 10% in total of aluminum, magnesium, zirconium and titanium or 7.5% in total of magnesium, titanium and zirconium.

Safety Precautions

The following safety symbols may be used throughout this manual to alert you to important safety hazards and precautions.

 EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.	 FLAMMABLE Fuels and their vapors are extremely flammable.
 ELECTRICITY High voltage exists in, and is supplied to, the device. A potential shock hazard exists.	 TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.

3

 INJURY Careless or improper handling of materials can result in bodily injury.	 WEAR EYE PROTECTION Wear eye protection when working with pressurized fuel lines or epoxy sealant to avoid possible eye injury.
 GLOVES Wear gloves to protect hands from irritation or injury.	 USE SAFETY BARRICADES Unauthorized people or vehicles in the work area are dangerous. Always use safety cones or barricades, safety tape, and your vehicle to block the work area.
 READ ALL RELATED MANUALS Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.	

System Description

The Veeder-Root Hydrostatic Reservoir Sensor accurately detects the fluid level change in the reservoir and interstitial space of a double-wall fiberglass tank.

The hydrostatic sensor is available in a Dual-Point or Single-Point configuration. The Dual-Point version is ideal for high groundwater areas, and can differentiate between a high level alarm condition and a low level alarm condition. If an inner-wall leak occurs, the brine solution seeps into the tank lowering the brine level in the reservoir. The Dual-Point Sensor will then trigger a low level alarm. If an outer-wall leak occurs, the groundwater seeps into the reservoir. The Dual-Point sensor will then trigger a high level alarm.

The Single-Point Sensor is ideal for low groundwater areas, since it only detects low level alarm conditions. If an inner-wall leak occurs, the brine solution seeps into the tank. If an outer-wall leak occurs, the brine solution seeps out of the tank. In both cases, the brine level decreases and the Single-Point Sensor triggers a low level alarm.

The housing is constructed of clear PVC, allowing the operator to pull the sensor from the reservoir to visually inspect float operation. A vented riser cap restricts liquid from entering the reservoir.

DETECTION CAPABILITIES

- Dual-Point sensor alarm conditions:
 - Leak in inner wall triggers a low level alarm.
 - Leak in outer wall triggers a high level alarm in high groundwater areas and a Low level alarm in low groundwater areas.
- Single-Point sensor alarm conditions:
 - Leak in inner or outer wall triggers a low level alarm in low groundwater areas.

OPERATING CAPABILITIES

- Operating temperature Range: -25°C to +50°C
- Storage Temperature Range: -40°C to +60°C
- Operates in solutions containing up to 30% calcium chloride or 50% ethylene glycol.
- Cable length: 12 feet
- Single-Point Sensor Dimensions: 6.0" high, 2.5" diameter

- Dual-Point Sensor Dimensions: 17.3" high, 2.5" diameter
- Clear PVC housing permits visual inspection of float operation.

SENSOR MODELS

Table 1. Sensor Part Numbers

Form No.	Description
794380-301	Single-Point Hydrostatic Sensor
794380-303	Dual-Point Hydrostatic Sensor

RISER CAP KIT

The Riser Cap kit contents for both the single- and dual-point hydrostatic sensors are listed in Table 2 and illustrated in Figure 1.

Table 2. Riser Cap Kit (P/N 330020-435)

Item	Qty.	Description	P/N
1	1	Plastic 4-inch riser cap	329992-002
2	2	Cord grip nut	330594-001
3	2	Cord grip bushing	330787-002
4	1	Vent tube	329981-001

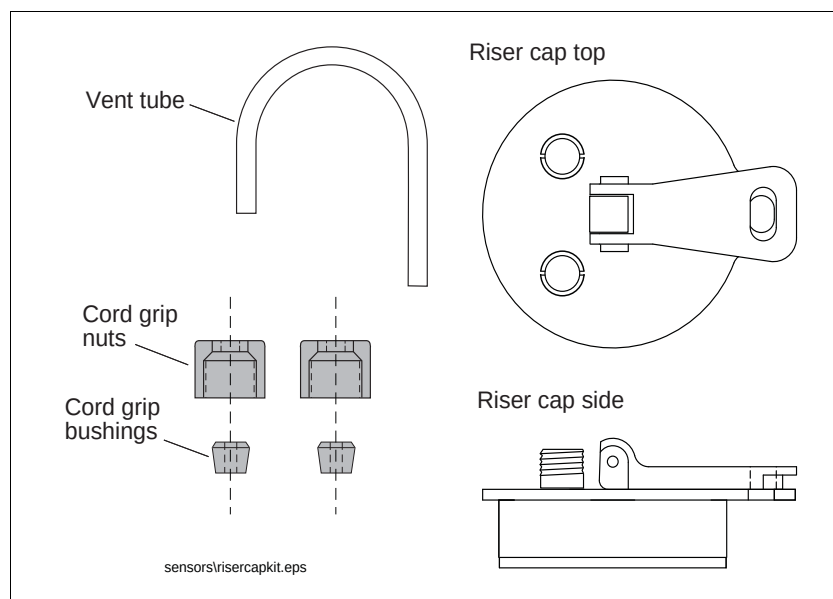


Figure 1. Plastic Riser cap kit contents

CABLE SEAL KIT

The Cable Seal Kit is required for field wiring connections and is listed in Table 3 and illustrated in Figure 2.

Table 3. Cable Seal Kit (P/N 312020-990)

Item	Qty.	Description	P/N
1	1	Cord grip assy	331028-011
2	1	Sealing pack	514100-304
3	2	Wire nuts	576008-461
4	2	Tie wrap	510901-337

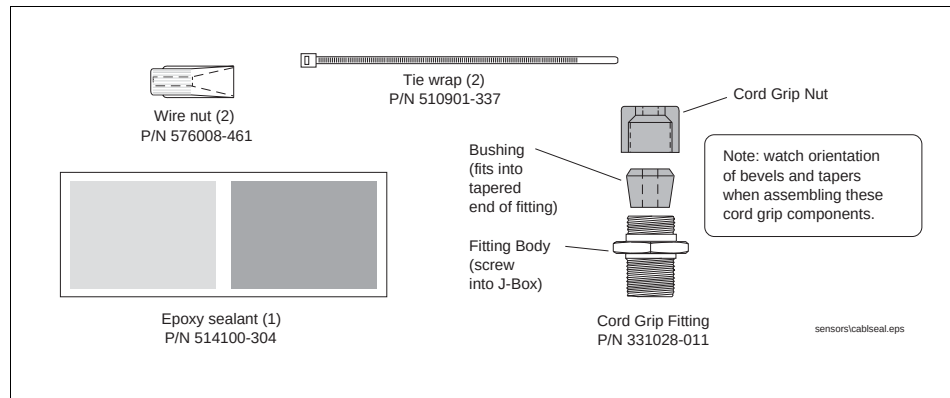


Figure 2. Cable seal kit contents

Installation

Dual-Point Hydrostatic Sensor Installation



1. Turn Off power to the console.
2. Lower the sensor into the riser until it rests on the bottom of the reservoir (see Figure 3). Note: Refer to the tank manufacturer's instructions for setting the proper brine levels. The ideal brine solution level is approximately halfway between the high and low water levels. With the Dual-Point Sensor resting on the inner-tank wall, the sensor will alarm when the brine level is below 2" or when the brine level is above 13".
3. Install a cord grip bushing/nut into one of the two riser cap fittings. Loosen the nut and push the straight end of the vent tube down through the bushing (ref. Figure 3) about an inch and tighten the cord grip nut. Insert the remaining cord grip bushing and nut from the riser cap kit in the other riser cap fitting. Push the sensor cable up through the loosened second cord grip. Place the cap in the riser and snap down the cap lever to seat the gasket against the inside of the pipe.

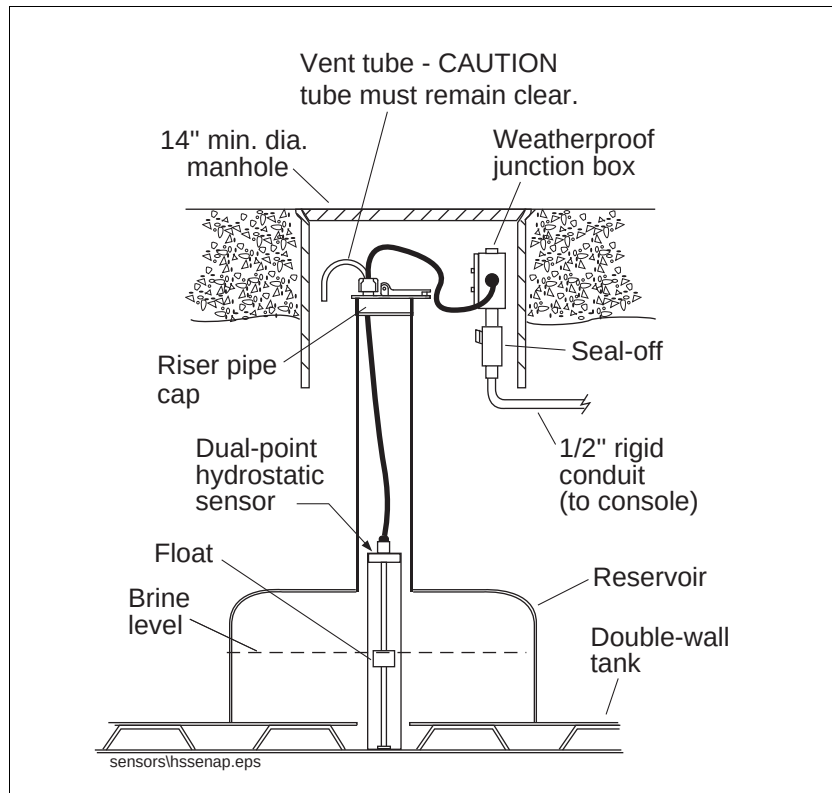


Figure 3. Dual-Point Sensor Installation

4. With the sensor still resting on the bottom of the reservoir, gently pull out the excess sensor cable, leaving a little slack in cable between the cap and the sensor. Tighten the cable's cord grip nut.
5. Install the cord grip from the Cable Seal kit into the field junction box. Push the sensor cable into the junction box through the cord grip. Using the wire nuts from the kit, connect the sensor cable to the console cable as shown in Figure 4. Tighten the cord grip.
6. Seal wire nuts with epoxy sealant following the instructions in Figure 5.
7. Push the epoxy sealed bag into the junction box. Replace and tighten the junction box cover.

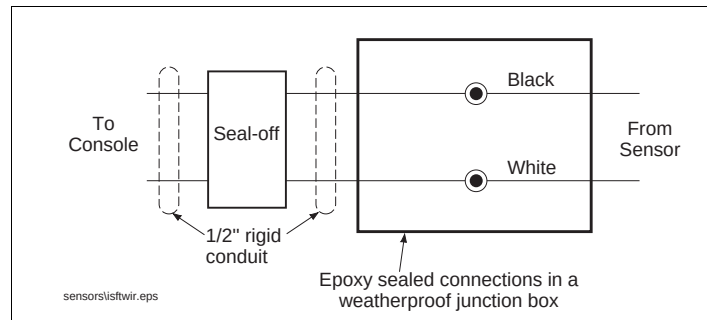
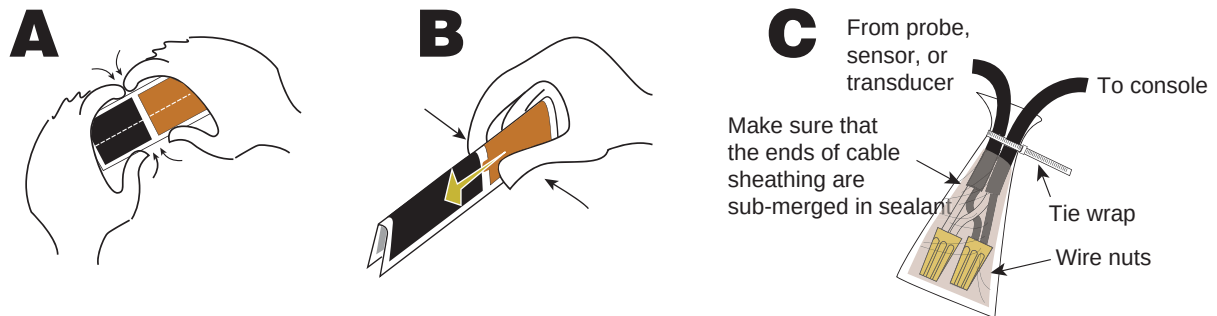


Figure 4. Sensor Field Wiring Diagram

**Instructions:**

NOTE: When temperature is below 50°F (10°C), keep resin in a warm place prior to mixing (e.g., in an inside pocket next to body).

1. Open epoxy sealant package, and remove resin pak.
2. Holding resin pak as shown in A, bend pak along long length.
3. As shown in B, firmly squeeze the RED SIDE of the resin, forcing it through the center seal and into BLACK SIDE.

4. Mix thoroughly to a uniform color by squeezing contents back and forth 25-30 times.
5. Squeeze mixed, warm resin into one end of bag and cutoff other end.
6. Slowly insert wiring connections into sealing pack until they fit snugly against the opposite end as shown in C.
7. Twist open end of bag and use tie wrap to close it off and position the tie wrapped end up until the resin jells.



CAUTION: Epoxy sealant is irritating to eyes, respiratory system, and skin. Can cause allergic skin reaction. Contains: epoxy resin and Cycloaliphatic epoxycarboxylate.

Precautions: Wear suitable protective clothing, gloves, eye, and face protection. Use only in well ventilated areas. Wash thoroughly before eating, drinking, or smoking.

consolesepxy2w.eps

Figure 5. Epoxy Sealing Sensor Field Connections

Single-Point Hydrostatic Sensor Installation



1. Turn Off power to the console.
2. Install a cord grip bushing/nut into one of the two riser cap fittings. Loosen the nut and push the straight end of the vent tube down through the bushing (ref. Figure 6) about an inch and tighten the cord grip nut. Insert the remaining cord grip bushing and nut from the riser cap kit in the other riser cap fitting. Push the sensor cable up through the loosened second cord grip. Place the cap in the riser and snap down the cap lever to seat the gasket against the inside of the pipe.

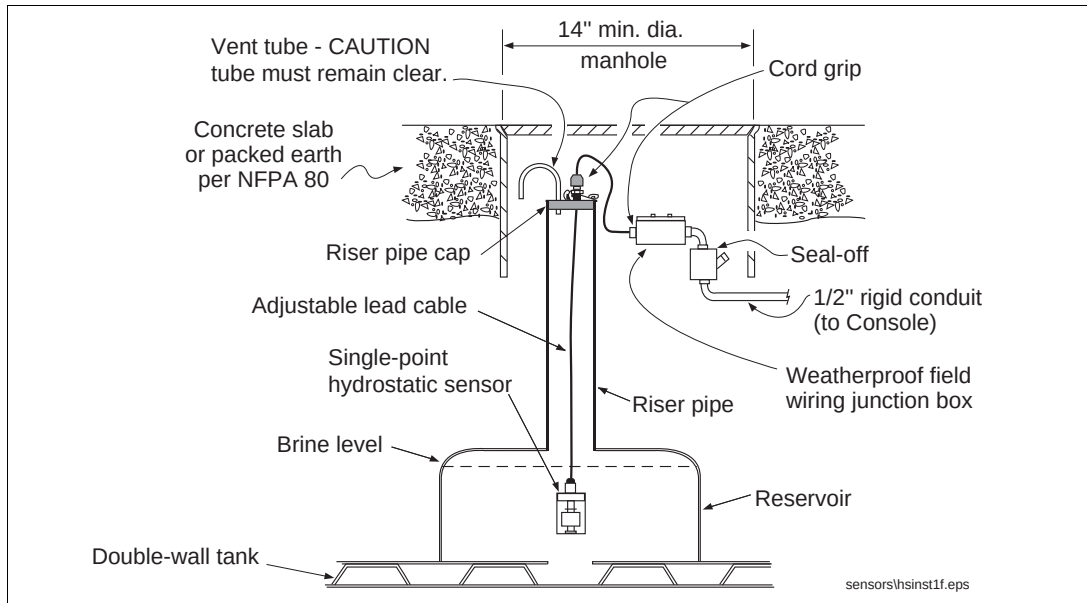


Figure 6. Single-Point Sensor Installation

3. Install the cord grip from the Sensor Install Kit into the field junction box. Push the sensor cable into the junction box through the cord grip. Using the wire nuts from the Sensor Install Kit, connect the sensor cable to the console cable as shown in Figure 4. Tighten cord grip.
4. Seal wire nuts with epoxy sealant following the instructions in Figure 5.
5. Turn On power to the console.
6. With the sensor resting on the top of the tank, mark the cable position at the riser cap with a piece of tape.
7. Pull the sensor up until it triggers an alarm on the console. Mark the cable position at the top of the cap with a piece of tape.
8. Lower the sensor until the riser cap is halfway between the taped marks on the cable.
9. Secure the sensor in position by tightening the cable cord grip in the cap (see Figure 6).



Interstitial Liquid Sensor - Fiberglass Tanks

Installation Guide



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Introduction

This manual contains procedures to install an interstitial liquid sensor in a fiberglass tank.

This manual assumes all preliminary site preparation is completed as instructed in the appropriate console site prep manual, and that field wiring from the console to the sensor junction box is in place.

The Veeder-Root Interstitial Liquid Sensor for use in Fiberglass Tanks detects the presence of liquid in the interstitial space of a double-wall fiberglass tank. When liquid is detected, the sensor sends an alarm signal to console.

Contractor Certification Requirements

Veeder-Root requires the following minimum training certifications for contractors who will install and setup the equipment discussed in this manual:

Installer Certification (Level 1): Contractors holding valid Installer Certification are approved to perform wiring and conduit routing; equipment mounting; probe, sensor and carbon canister vapor polisher installation; wireless equipment installation; tank and line preparation; and line leak detector installation.

Technician Certification (Level 2/3): Contractors holding valid Technician Certifications are approved to perform installation checkout, startup, programming and operations training, system tests, troubleshooting and servicing for all Veeder-Root Series Tank Monitoring Systems, including Line Leak Detection. In addition, Contractors with the following sub-certification designations are approved to perform installation checkout, startup, programming, system tests, troubleshooting, service techniques and operations training on the designated system.

- Wireless 2
- Tall Tank

Warranty Registrations may only be submitted by selected distributors.

Product Marking Information

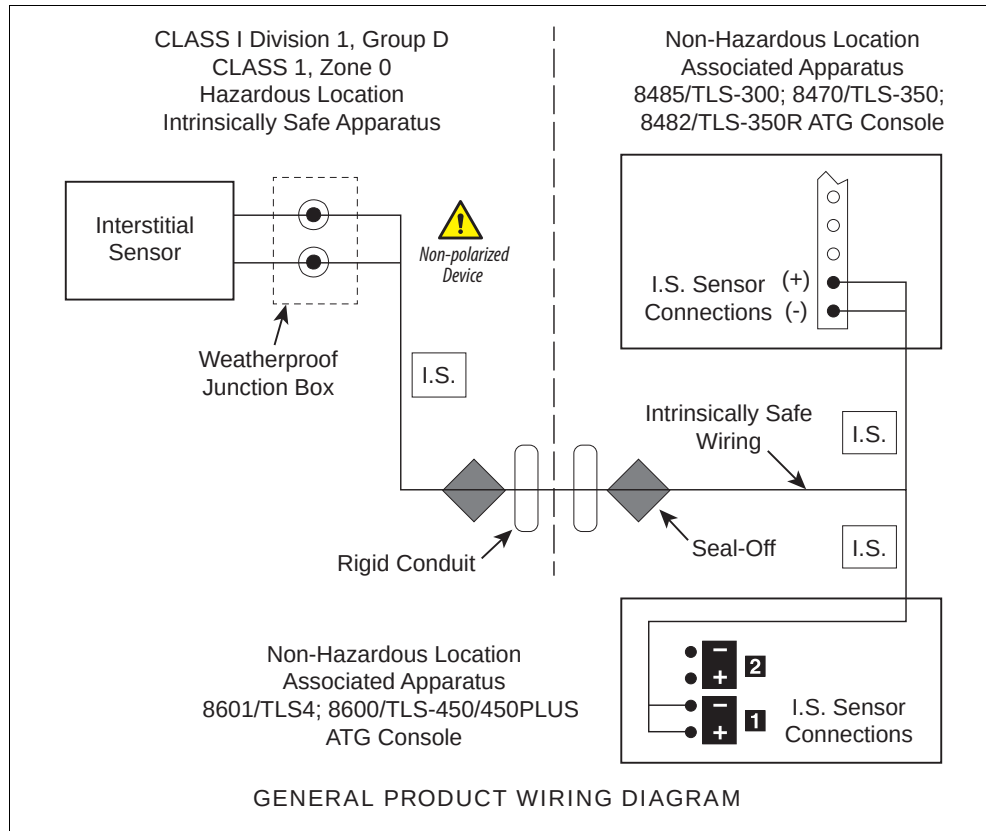
RELATED DOCUMENTS

Documents Required to Install Equipment

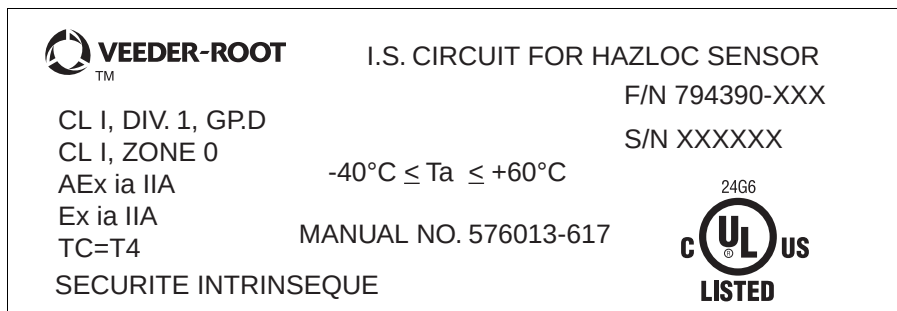
This intrinsically safe apparatus is only for use as part of a Veeder-Root Automatic Tank Gauging System (ATG Console with probes and sensors). To install intrinsically safe apparatus, use the specific control drawing that appears on the nameplate of the applicable associated apparatus (ATG Console):

Equipment	UL/cUL Control Drawing Document No.
Associated Apparatus	
TLS-450, TLS-450PLUS /8600	331940-008
TLS-350, TLS-350R	331940-011
TLS-300	331940-013
TLS4/8601	331940-018

The control drawings contain information related to the correct installation of the overall intrinsically Safe System. This includes information such as maximum number of apparatus, specific apparatus allowed in the system, maximum cable lengths, references to codes, proper grounding and so on. Control drawings can be found on the accompanying Compact Disk (TECH DOCS CD) or on the Internet at veeder.com under SUPPORT; VR TECHNICAL DOCUMENTS; DRAWINGS.



Product Label Contents



Safety Warnings

 WARNING	
    	This product is to be installed in systems operating near locations where highly combustible fuels or vapors may be present. FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH. 1. Read and follow all instructions in this manual, including all safety warnings to protect yourself and others from serious injury, explosion, or electrical shock. 2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes. 3. To protect yourself and others from being struck by vehicles, block off your work area during installation or service. 4. Do not alter or modify any component or substitute components in this kit. 5. Warning! Substitution of components may impair intrinsic safety. 6. Field wiring to the Interstitial Sensor must not share a conduit with any non-intrinsically safe device's wiring. 7. Warning! To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing. 8. Before installing or taking the unit into a hazardous area, earth the unit in a safe area to remove any static charge. Then immediately transport the unit to the installation site. Do not rub or clean the unit prior to installation. Cleaning is not required under normal service conditions. Do not rub or clean the unit after installation. If the unit is not fixed to a known earth point when installed, ensure that a separate earth connection is made to prevent the potential of a static discharge. When fitting or removing the unit, use of anti-static footwear or clothing is required. 9. Materials used in the construction of this device do not contain, by mass, more than 10% in total of aluminum, magnesium, zirconium and titanium or 7.5% in total of magnesium, titanium and zirconium.

Safety Symbols

The following safety symbols may be used throughout this manual to alert you to important safety hazards and precautions.

 EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.	 FLAMMABLE Fuels and their vapors are extremely flammable.
 ELECTRICITY High voltage exists in, and is supplied to, the device. A potential shock hazard exists.	 TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.
 WEAR EYE PROTECTION Wear eye protection when working with pressurized fuel lines or epoxy sealant to avoid possible eye injury	 INJURY Careless or improper handling of materials can result in bodily injury.
 GLOVES Wear gloves to protect hands from irritation or injury.	 USE SAFETY BARRICADES Unauthorized people or vehicles in the work area are dangerous. Always use safety cones or barricades, safety tape, and your vehicle to block the work area.



WARNING
Heed the adjacent instructions to avoid equipment damage or personal injury.



READ ALL RELATED MANUALS
Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.

Operating Capabilities

- Operating temperature Range: -20°C to +60°C (hydrocarbons); 0°C to 60°C (non-freezing water).
- Storage Temperature Range: - 40° C to + 75° C.
- Dimensions: 2.76" (70mm) long, 1.30" (33mm) wide, 0.69" (17.5mm) high

Installation Kit

Figure 1 shows the components in the sensor install kit, P/N 312020-949.

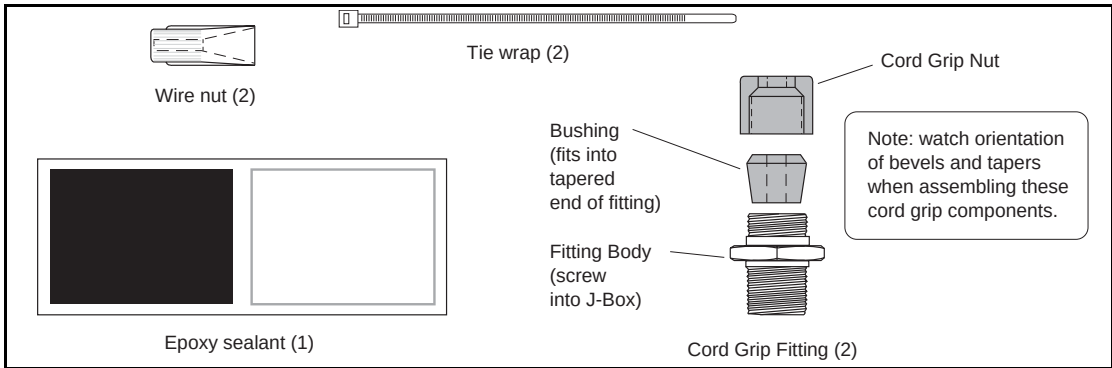


Figure 1. Installation Kit

Sensor Part Number

Table 1 lists the Interstitial Liquid Sensor part number for fiberglass tanks.

Table 1. Interstitial Liquid Sensor

Part No.	Description
794390-409	Sensor for 4' to 12' diameter fiberglass tanks

Sensor Installation

1. Turn Off power to the console.
2. Make sure no liquid is present in the annular space. Do not install the sensor if any liquid is present in the annular space.



Failure to remove any liquid in the annular space will lead to an alarm.

3. Measure the length of the riser pipe as shown in Figure 2.

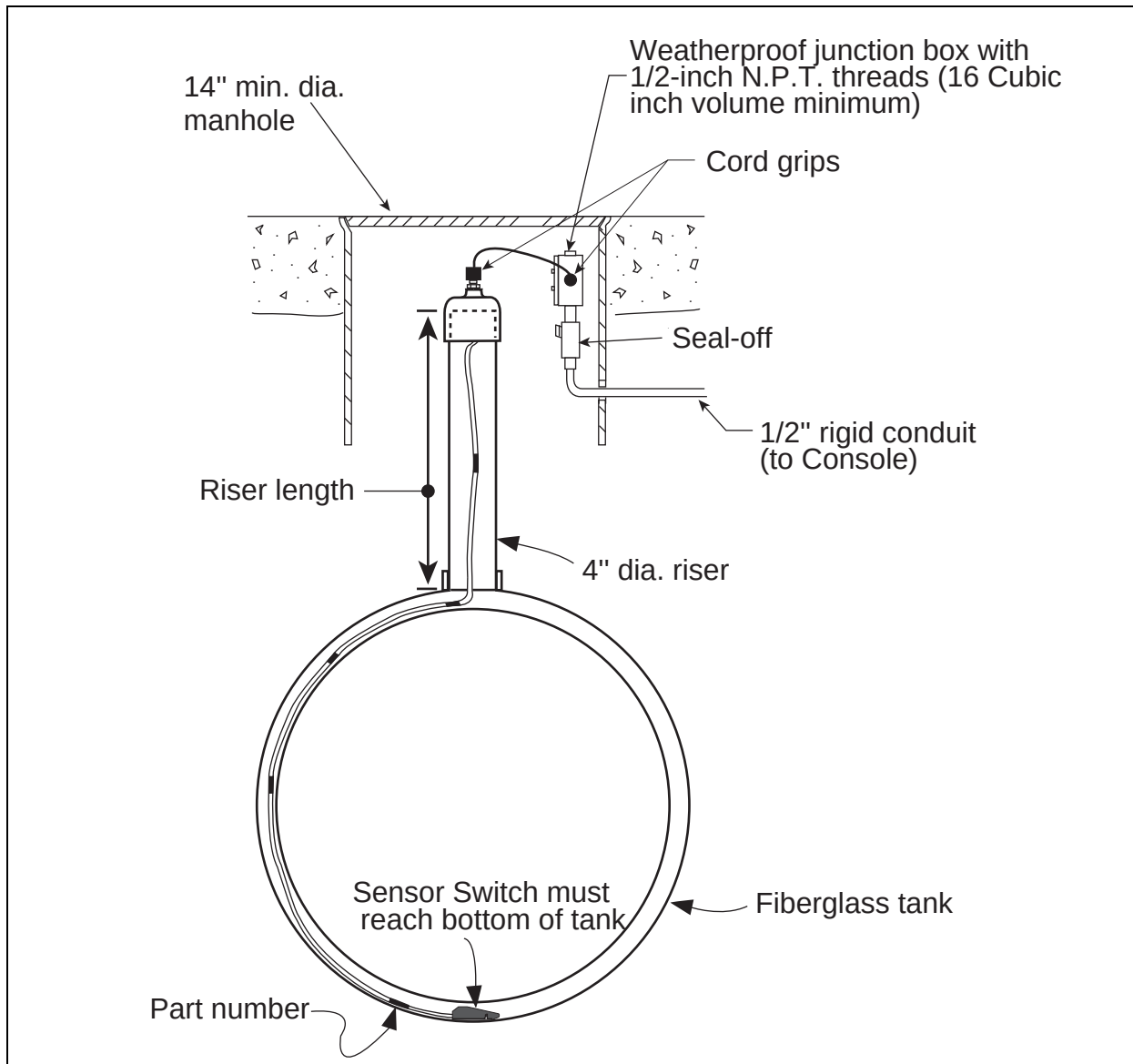


Figure 2. Example Sensor Installation

4. Locate the label on the sensor cable that corresponds to the tank size. Add the riser pipe length determined in Step 3 (measuring away from the sensor). Mark this position on the cable with one of the tie wraps provided, NOT by cutting into the cable jacket with a knife.
5. Attach a pull cord to the eyelet in the sensor and after confirming correct entry orientation (ref. Figure 3), pull the sensor through the interstitial space until the cable marked tie wrap is even with the top of the riser pipe. NOTE: All sensor types should rest at the bottom of the tank as shown in Figure 4.

The switch assembly has a flat, white bottom for switch orientation during installation. When installing the sensor, start the sensor into the annulus with the white bottom piece facing up (Figure 3).

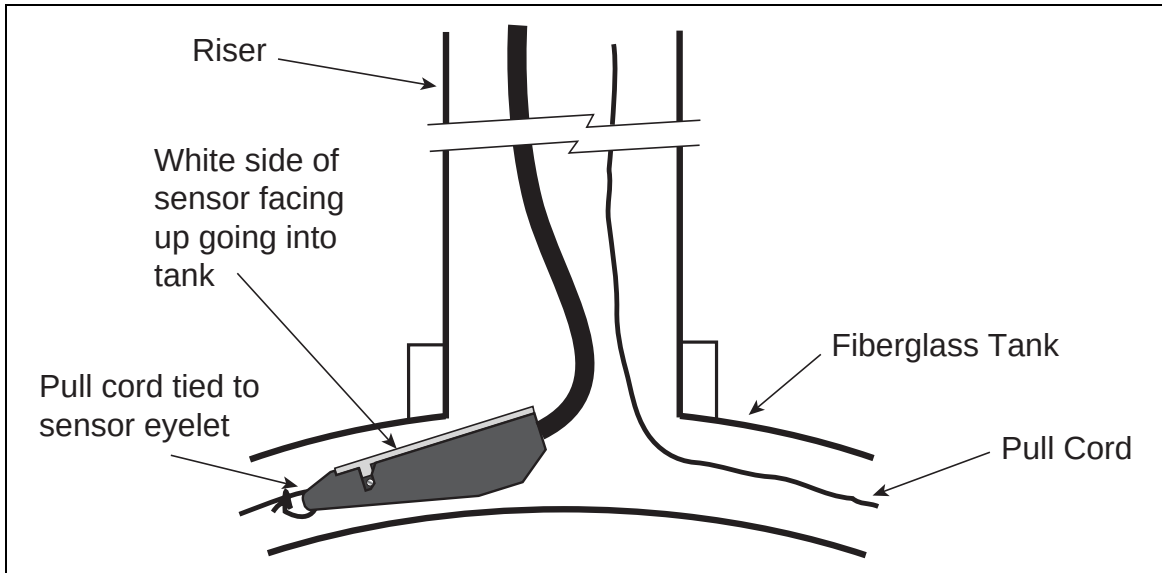


Figure 3. Correct Sensor Orientation Entering Top Of Tank Annulus

The switch will be orientated correctly at the bottom of the tank with the white bottom piece facing down (Figure 4).

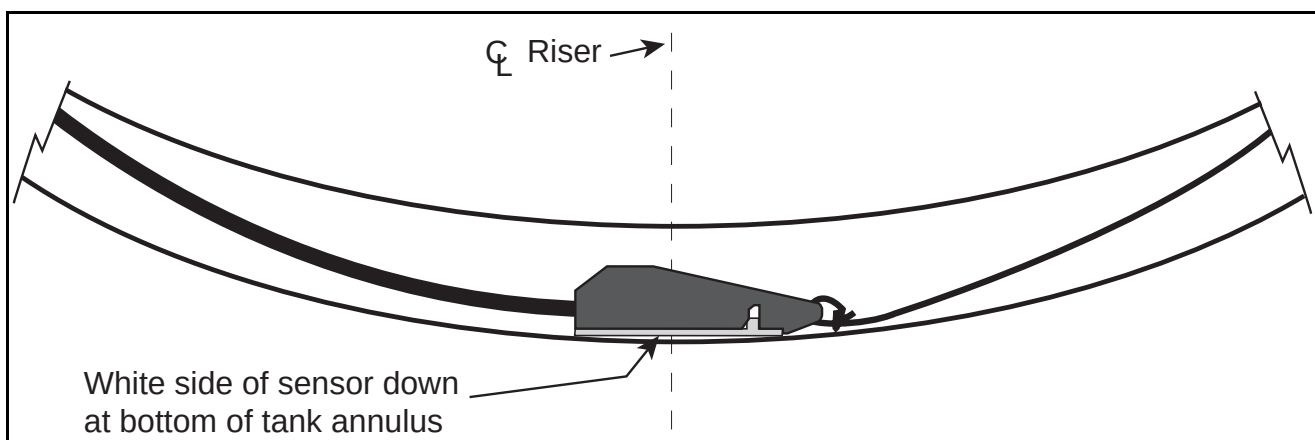


Figure 4. Correct Sensor Orientation At Bottom Of Tank Annulus

6. Get the installation kit. Put the cord grip bushing in the riser cap and screw the cord grip nut onto the fitting. Screw the second cord grip fitting into the junction box.
7. Pass the end of the sensor cable through the cord grip fittings in the riser cap and in the junction box.

8. Secure the riser cap to the riser pipe.
9. Tighten the cable cord grip nuts on the riser cap and junction box to ensure a water-tight seal at the cable entry.
10. Using wire nuts from the kit, connect the two wire sensor cable to the field wires in the sensor junction box (ref. Figure 5).

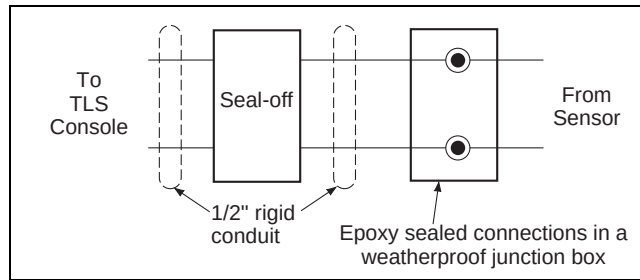


Figure 5. Sensor Field Wiring Diagram

11. Seal wire nuts with epoxy sealant following the instructions in Figure 6.

A

B

C

Instructions:

NOTE: When temperature is below 50°F (10°C), keep resin in a warm place prior to mixing (e.g., in an inside pocket next to body).

1. Open epoxy sealant package, and remove resin pak.
2. Holding resin pak as shown in A, bend pak along long length.
3. As shown in B, firmly squeeze the RED SIDE of the resin, forcing it through the center seal and into BLACK SIDE.
4. Mix thoroughly to a uniform color by squeezing contents back and forth 25-30 times.
5. Squeeze mixed, warm resin into one end of bag and cutoff other end.
6. Slowly insert wiring connections into sealing pack until they fit snugly against the opposite end as shown in C.
7. Twist open end of bag and use tie wrap to close it off and position the tie wrapped end up until the resin jells.

CAUTION: Epoxy sealant is irritating to eyes, respiratory system, and skin. Can cause allergic skin reaction. Contains: epoxy resin and Cycloaliphatic epoxycarboxylate.

Precautions: Wear suitable protective clothing, gloves, eye, and face protection. Use only in well ventilated areas. Wash thoroughly before eating, drinking, or smoking.

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Figure 6. Epoxy Sealing Sensor Field Connections

12. Push the epoxy sealed bag into the junction box. Replace and tighten the junction box cover.
13. Turn On power to the console.



Groundwater Sensor

Installation Guide



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Contact TLS Systems Technical Support for additional troubleshooting information at 800-323-1799.

DAMAGE CLAIMS / LOST EQUIPMENT

Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

Veeder-Root must be notified of any damages and/or shortages within 30 days of receipt of the shipment, as stated in our Terms and Conditions.

VEEDER-ROOT'S PREFERRED CARRIER

1. Contact Veeder-Root Customer Service at 800-873-3313 with the specific part numbers and quantities that were missing or received damaged.
2. Fax signed Bill of Lading (BOL) to Veeder-Root Customer Service at 800-234-5350.
3. Veeder-Root will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

CUSTOMER'S PREFERRED CARRIER

1. It is the customer's responsibility to file a claim with their carrier.
2. Customer may submit a replacement purchase order. Customer is responsible for all charges and freight associated with replacement order. Customer Service will work with production facility to have the replacement product shipped as soon as possible.
3. If "lost" equipment is delivered at a later date and is not needed, Veeder-Root will allow a Return to Stock without a restocking fee.
4. Veeder-Root will NOT be responsible for any compensation when a customer chooses their own carrier.

RETURN SHIPPING

For the parts return procedure, please follow the appropriate instructions in the "General Returned Goods Policy" pages in the "Policies and Literature" section of the Veeder-Root **North American Environmental Products** price list. Veeder-Root will not accept any return product without a Return Goods Authorization (RGA) number clearly printed on the outside of the package.

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Introduction

This manual tells you how to install the Veeder-Root Groundwater Sensor, Part No. 794380-62X. The manual assumes all preliminary site preparation is completed, and that field wiring from the monitor to the sensor junction box is in place.

For new installations, or if site preparation is necessary, refer to the appropriate Veeder-Root Site Preparation and Installation Instructions or contact your Veeder-Root representative for assistance.

Contractor Certification Requirements

Veeder-Root requires the following minimum training certifications for contractors who will install and setup the equipment discussed in this manual:

Installer (Level 1) Certification: Contractors holding valid Installer Certification are approved to perform wiring and conduit routing; equipment mounting; probe, sensor and carbon canister vapor polisher installation; wireless equipment installation; tank and line preparation; and line leak detector installation.

ATG Technician (Level 2/3 or 4) Certification: Contractors holding valid ATG Technician Certifications are approved to perform installation checkout, startup, programming and operations training, system tests, troubleshooting and servicing for all Veeder-Root Series Tank Monitoring Systems, including Line Leak Detection. In addition, Contractors with the following sub-certification designations are approved to perform installation checkout, startup, programming, system tests, troubleshooting, service techniques and operations training on the designated system.

- Wireless 2
- Tall Tank

Warranty Registrations may only be submitted by selected Distributors.

Product Marking Information

RELATED DOCUMENTS

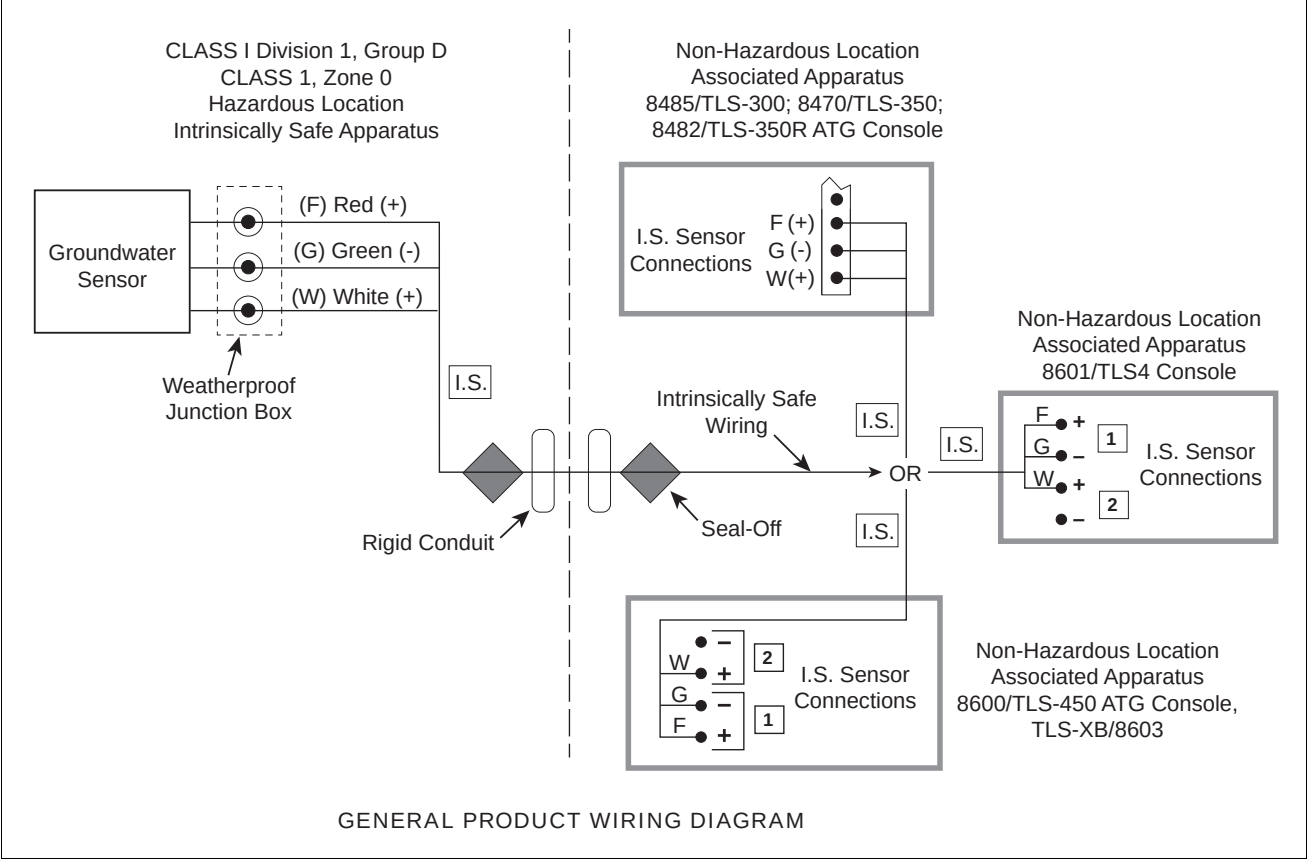
Documents Required to Install Equipment

This intrinsically safe apparatus is only for use as part of a Veeder-Root Automatic Tank Gauging System (ATG Console with probes and sensors). To install intrinsically safe apparatus, use the specific control drawing that appears on the nameplate of the applicable associated apparatus (ATG Console):

Equipment	UL/cUL Control Drawing Document No.
Associated Apparatus	
TLS-450/8600	331940-008
TLS-350, TLS-350R	331940-011
TLS-300	331940-013
TLS4/8601	331940-018

The control drawings contain information related to the correct installation of the overall intrinsically Safe System. This includes information such as maximum number of apparatus, specific apparatus allowed in the system,

maximum cable lengths, references to codes, proper grounding and so on. Control drawings can be found on the accompanying Compact Disk (TECH DOCS CD) or on the internet at veeder.com under SUPPORT; VR TECHNICAL DOCUMENTS; DRAWINGS.



Product Label Contents

	VEEDER-ROOT TM	I.S. CIRCUIT FOR HAZLOC SENSOR	
CL I, DIV. 1, GP.D		F/N 794380-XXX	
CL I, ZONE 0		S/N XXXXXX	
AEx ia IIA		$-40^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$	
Ex ia IIA		MANUAL NO. 576013-763	
TC=T4			
SECURITE INTRINSEQUE			

Safety Warnings

To protect yourself and your equipment, observe the following warnings and important information:

 WARNING	
     	This product is to be installed and operated in the highly combustible environment of a gasoline storage tank where flammable liquids and explosive vapors may be present. FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH. 1. Read and follow all instructions in this manual, including all safety warnings to protect yourself and others from serious injury, explosion, or electrical shock. 2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes. 3. To protect yourself and others from being struck by vehicles, block off your work area during installation or service. 4. Do not alter or modify any component or substitute components in this kit. 5. Warning! Substitution of components may impair intrinsic safety. 6. Field wiring to the Sensor must not share a conduit with any non-intrinsically safe device's wiring. 7. Warning! To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing. 8. Before installing or taking the unit into a hazardous area, earth the unit in a safe area to remove any static charge. Then immediately transport the unit to the installation site. Do not rub or clean the unit prior to installation. Cleaning is not required under normal service conditions. Do not rub or clean the unit after installation. If the unit is not fixed to a known earth point when installed, ensure that a separate earth connection is made to prevent the potential of a static discharge. When fitting or removing the unit, use of anti-static footwear or clothing is required. 9. Materials used in the construction of this device do not contain, by mass, more than 10% in total of aluminum, magnesium, zirconium and titanium or 7.5% in total of magnesium, titanium and zirconium. 10. A groundwater sensor should be installed only in wet wells where preliminary testing has determined that water in the well is not contaminated, or contaminated water has been remediated and is now clean.

Safety Symbols

The following safety symbols may be used throughout this manual to alert you to important safety hazards and precautions

	EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.		FLAMMABLE Fuels and their vapors are extremely flammable.
	ELECTRICITY High voltage exists in, and is supplied to, the device. A potential shock hazard exists.		TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.

 GLOVES Wear gloves to protect hands from irritation or injury.	 USE SAFETY BARRICADES Unauthorized people or vehicles in the work area are dangerous. Always use safety cones or barricades, safety tape, and your vehicle to block the work area.
 WEAR EYE PROTECTION Fuel spray from residual pressure in the lines can cause serious eye injuries. Always wear eye protection.	 INJURY Careless or improper handling of materials can result in bodily injury.
 READ ALL RELATED MANUALS Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.	

Installation Components

- Groundwater sensor P/N 794380-62X
- Installation Kit - P/N 330020-280 (Figure 1)
- Manual 576013-763

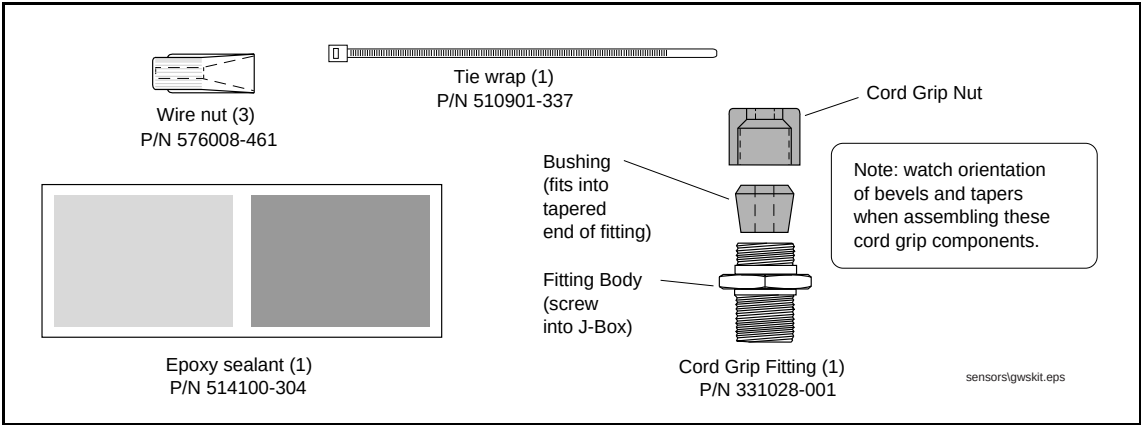


Figure 1. Installation Kit

Sensor Installation



1. Turn off AC power to the Veeder-Root monitoring system.
2. Remove any existing cap from the well in which the sensor will be installed. (A new well cap is supplied with the groundwater sensor.)
3. Lower the groundwater sensor into the monitoring well until the water float touches the bottom of the well.
4. Raise the sensor 2-inches to 4-inches from the bottom of the well and mark the sensor with a piece of tape at the point even with the top of the well casing.
5. Secure the sensor at the point marked with the tape to the retainer under the sensor well cap. Allow any excess sensor length (should be no more than 2-feet) to hang loosely from the retainer [Figure 2].

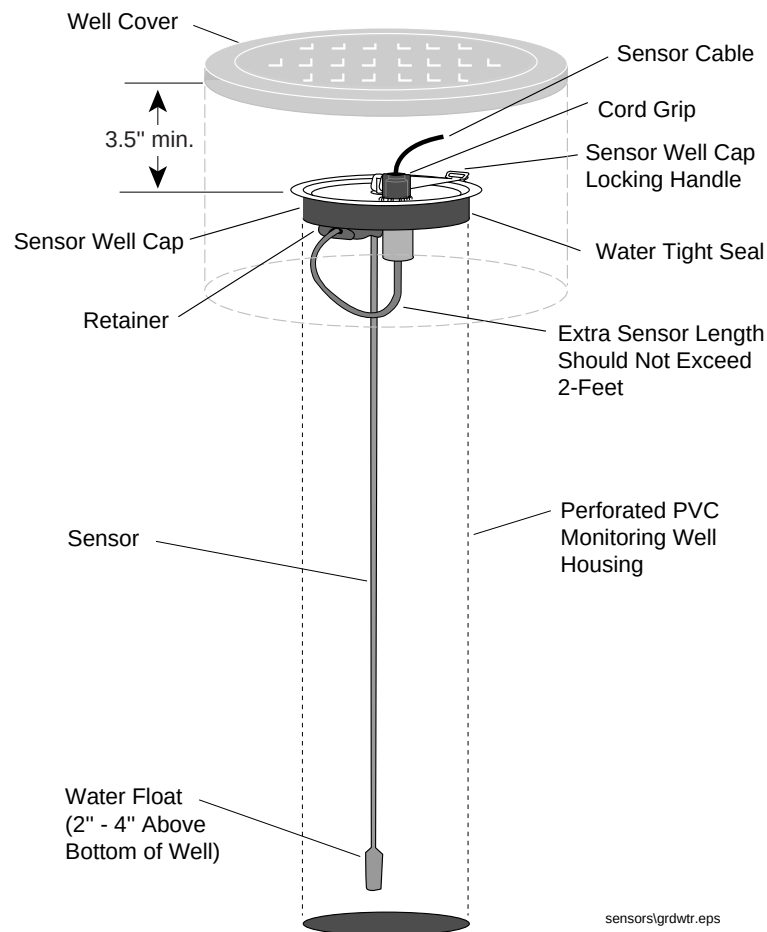
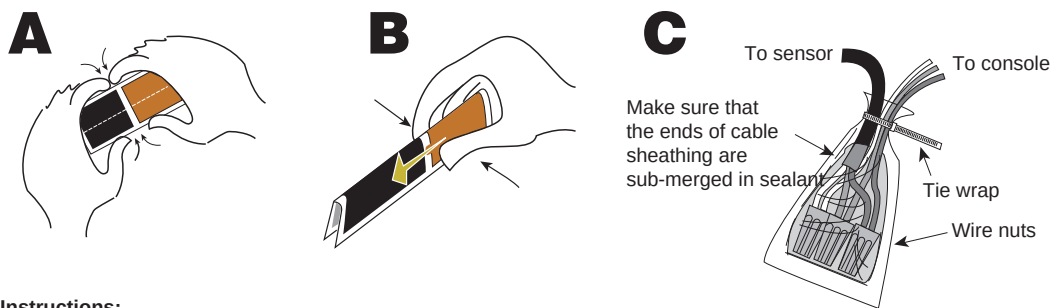


Figure 2. Groundwater Sensor Installation

6. Press the sensor well cap into the top of the well with the excess sensor length hanging inside the well housing.
7. Press down the locking handle on the sensor well cap to secure it in position and to form a water-tight seal between the sensor well cap and the monitoring well housing.
8. Pass the end of the sensor cable through the nut, bushing, and cord grip fitting and into the Junction box (J-box). Pull the excess cable through the fitting and out the opened side of the J-box.
9. After sliding the J-box cord grip fitting up to the J-box, apply the UL-classified sealant (suitable for use with the fuel involved) to the fitting then screw it into the J-box. Tighten the J-box cord grip fitting nut to ensure a watertight seal at the sensor cable entry.
10. Using the wiring nuts, connect the wires from the sensor cable to the field wires from the console (see General Product Wiring Diagram on page 2). Be sure to observe proper polarity between sensor and console.
11. Seal wire nuts with epoxy sealant following instructions in Figure 3.
12. For additional security, a padlock may be installed on the sensor cap to ensure that the locking handle cannot be opened by unauthorized personnel.



Instructions:

NOTE: When temperature is below 50°F (10°C), keep resin in a warm place prior to mixing (e.g., in an inside pocket next to body).

1. Open epoxy sealant package, and remove resin pak.
2. Holding resin pak as shown in A, bend pak along long length.
3. As shown in B, firmly squeeze the RED SIDE of the resin, forcing it through the center seal and into BLACK SIDE.

4. Mix thoroughly to a uniform color by squeezing contents back and forth 25-30 times.
5. Squeeze mixed, warm resin into one end of bag and cutoff other end.
6. Slowly insert wiring connections into sealing pack until they fit snugly against the opposite end as shown in C.
7. Twist open end of bag and use tie wrap to close it off and position the tie wrapped end up until the resin jells.



CAUTION: Epoxy sealant is irritating to eyes, respiratory system, and skin. Can cause allergic skin reaction. Contains: epoxy resin and Cycloaliphatic epoxycarboxylate.

Precautions: Wear suitable protective clothing, gloves, eye, and face protection. Use only in well ventilated areas. Wash thoroughly before eating, drinking, or smoking.

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Figure 3. Epoxy Sealing Field Wiring Connections



Mag Plus Probe

Installation Guide

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Veeder-Root must be notified of any damages and/or shortages within 30 days of receipt of the shipment, as stated in our Terms and Conditions.

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3. If "lost" equipment is delivered at a later date and is not needed, Veeder-Root will allow a Return to Stock without a restocking fee.
4. Veeder-Root will NOT be responsible for any compensation when a customer chooses their own carrier.

RETURN SHIPPING

For the parts return procedure, please follow the appropriate instructions in the "General Returned Goods Policy" pages in the "Policies and Literature" section of the Veeder-Root **North American Environmental Products** price list. Veeder-Root will not accept any return product without a Return Goods Authorization (RGA) number clearly printed on the outside of the package.

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Introduction

This manual describes Mag Plus probe components and typical installation kits. Instructions are included for assembling floats onto the probe's shaft, attaching spacer rings to the probe's canister, example installations of the probe into both an underground and above ground tank and field wiring connections.

For guidelines on site preparation and atypical installation examples, refer to the appropriate Veeder-Root Site Preparation and Installation manual. For assembly of float kits such as required for Density or Phase separation detection, refer to the float assembly instructions included in those kits.

Make a record of the float size installed on each probe. The installed float size will be required for each probe during system setup.

Veeder-Root maintains a continuous process of product development and therefore product specifications may not be as described in this manual. Please contact the Veeder-Root office nearest you, or visit our website at www.veeder.com for information on new or updated products. Changes affecting products or procedures described in this manual will be reported in subsequent revisions. Veeder-Root has taken every care in the compilation of this manual; however it is the installers' responsibility to take every precaution to safeguard themselves and others.

Every person working with Veeder-Root equipment is expected to take every safety precaution possible and to have read this manual, particularly the sections referring to health and safety.

NOTE Deviation from the specifications contained in this manual can result in rework, delays in system installation and additional installation charges.

Contractors are advised to contact their nearest Veeder-Root office where local conditions may preclude using the specifications contained in this manual.

Contractor Certification Requirements

Veeder-Root requires the following minimum training certifications for contractors who will install and setup the equipment discussed in this manual:

Installer Certification (Level 1): Contractors holding valid Installer Certification are approved to perform wiring and conduit routing; equipment mounting; probe, sensor and carbon canister vapor polisher installation; wireless equipment installation; tank and line preparation; and line leak detector installation.

Technician Certification (Level 2/3): Contractors holding valid Technician Certifications are approved to perform installation checkout, startup, programming and operations training, system tests, troubleshooting and servicing for all Veeder-Root Series Tank Monitoring Systems, including Line Leak Detection. In addition, Contractors with the following sub-certification designations are approved to perform installation checkout, startup, programming, system tests, troubleshooting, service techniques and operations training on the designated system.

- Wireless 2
- Tall Tank

VR Vapor Products Certification: Contractors holding a certification with the following designations are approved to perform installation checkout, startup, programming, system tests, troubleshooting, service techniques and operations training on the designated system.

- ISD – In Station Diagnostics
- PMC – Pressure Management Control
- CCVP - Veeder-Root Vapor Polisher
- Wireless – ISD/PMC Wireless
- A current Veeder-Root Technician Certification is a prerequisite for the VR Vapor Products course.

Warranty Registrations may only be submitted by selected Distributors.

Product Marking Information

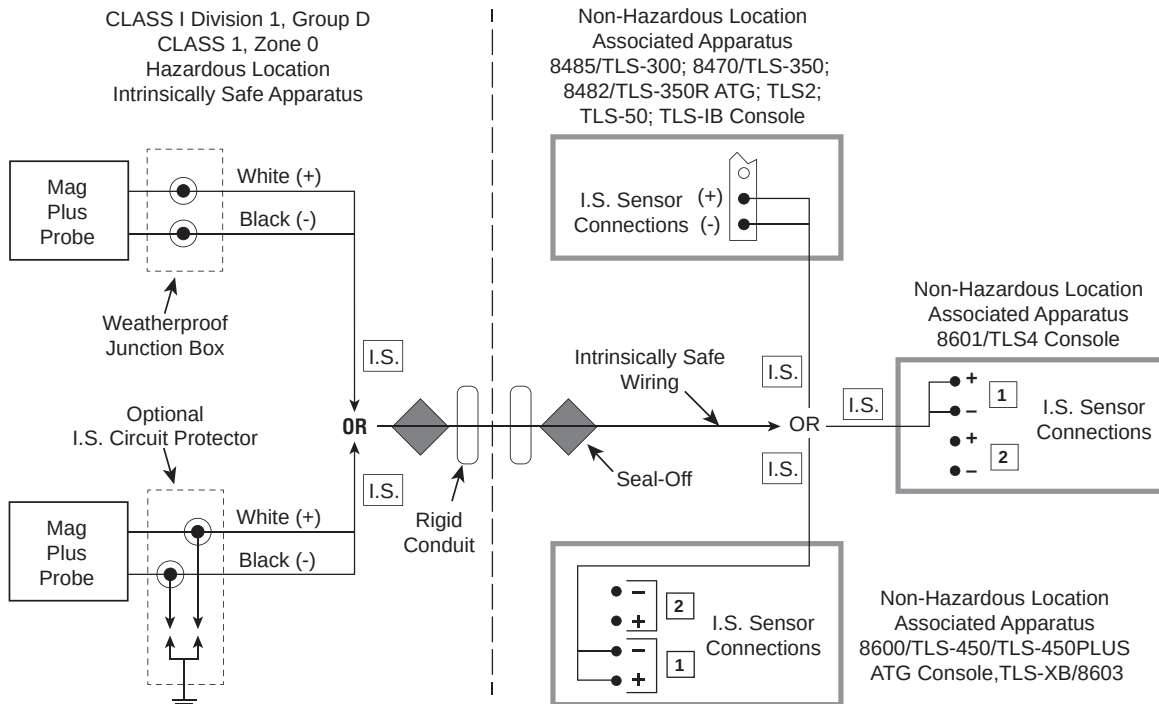
RELATED DOCUMENTS

Documents Required to Install Equipment

This intrinsically safe apparatus is only for use as part of a Veeder-Root Automatic Tank Gauging System (ATG Console with probes and sensors). To install intrinsically safe apparatus, use the specific control drawing that appears on the nameplate of the applicable associated apparatus (ATG Console):

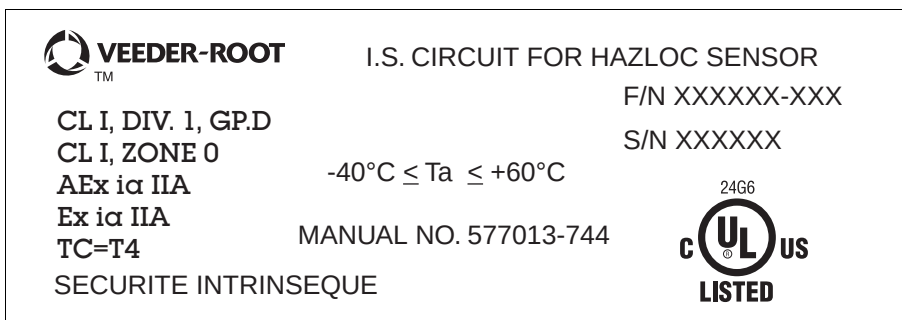
Equipment	UL/cUL Control Drawing Document No.
Associated Apparatus	
TLS-450/8600, TLS-450PLUS/8600	331940-008
TLS-350, TLS-350R	331940-011
TLS-300	331940-013
TLS-50 or TLS2 or TLS-IB	331940-014
TLS4/8601	331940-018
TLS-XB/8603	331940-019
Intrinsically Safe Apparatus for Wireless Applications	
Tank Gauge Accessories	331940-012

The control drawings contain information related to the correct installation of the overall intrinsically Safe System. This includes information such as maximum number of apparatus, specific apparatus allowed in the system, maximum cable lengths, references to codes, proper grounding and so on. Control drawings can be found on the accompanying Compact Disk (TECH DOCS CD) or on the Internet at www.veeder.com under SUPPORT; VR TECHNICAL DOCUMENTS; DRAWINGS.



GENERAL PRODUCT WIRING DIAGRAM - WIRED INSTALLATIONS ONLY

Product Label Contents



Safety Warnings

To protect yourself and your equipment, observe the following warnings and important information:

 WARNING	
    	This product is to be installed in systems operating near locations where highly combustible fuels or vapors may be present. FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH. 1. Read and follow all instructions in this manual, including all safety warnings to protect yourself and others from serious injury, explosion, or electrical shock. 2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes. 3. To protect yourself and others from being struck by vehicles, block off your work area during installation or service. 4. Do not alter or modify any component or substitute components in this kit. 5. Warning! Substitution of components may impair intrinsic safety. 6. Field wiring to the Mag Plus probe must not share a conduit with any non-intrinsically safe device's wiring. 7. Warning! To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing. 8. Materials used in the construction of this device contain aluminum. Care must be taken to avoid ignition hazards due to impact or friction. 9. Before installing or taking the unit into a hazardous area, earth the unit in a safe area to remove any static charge. Then immediately transport the unit to the installation site. Do not rub or clean the unit prior to installation. Cleaning is not required under normal service conditions. Do not rub or clean the unit after installation. If the unit is not fixed to a known earth point when installed, ensure that a separate earth connection is made to prevent the potential of a static discharge. When fitting or removing the unit, use of anti-static footwear or clothing is required.

NOTE Failure to install this product in accordance with its instructions and warnings will result in voiding of all warranties with this product.

Safety Symbols

The following safety symbols are used throughout this manual to alert you to important safety hazards and precautions.

 EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.	 FLAMMABLE Fuels and their vapors are extremely flammable.
 ELECTRICITY High voltage exists in, and is supplied to, the device. A potential shock hazard exists.	 TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.
 WEAR EYE PROTECTION Wear eye protection when working with pressurized fuel lines or epoxy sealant to avoid possible eye injury.	 GLOVES Wear gloves to protect hands from irritation or injury.
 INJURY Careless or improper handling of materials can result in bodily injury.	 USE SAFETY BARRICADES Unauthorized people or vehicles in the work area are dangerous. Always use safety cones or barricades, safety tape, and your vehicle to block the work area.
 READ ALL RELATED MANUALS Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.	

Equipment Protection

LIGHTNING AND INTRINSICALLY SAFE CIRCUIT PROTECTION

In a Veeder-Root system, each intrinsically safe (I.S.) circuit may use an optional I.S. circuit protector in place of the weatherproof junction box located in Zone 1. Intrinsically safe circuit protectors consist of a certified in-line device or a simple apparatus.

An intrinsically safe circuit protector provides protection of the system against lightning strikes and any other source of possible electrical surges caused by electrical railway systems, high voltage direct current facilities and the like.

In locations where the intrinsically safe cables or circuits are considered to be at risk of developing hazardous potential differences within the hazardous location, an external I.S. circuit protection device may be needed.

EQUIPOTENTIAL GROUNDING

The intrinsically safe circuit in the TLS Monitoring System is derived from a fuse protected Zener diode intrinsic safety barrier. This type of explosion protection requires that the intrinsically safe electric circuit is referenced to the safety ground associated to the mains circuit. If the site has a submersible pump connected to the same mains safety ground as the TLS Monitoring System Console and it is installed in a metallic riser of a metallic storage tank, the Zener diode barrier must be referenced to the same earth (safety) ground.

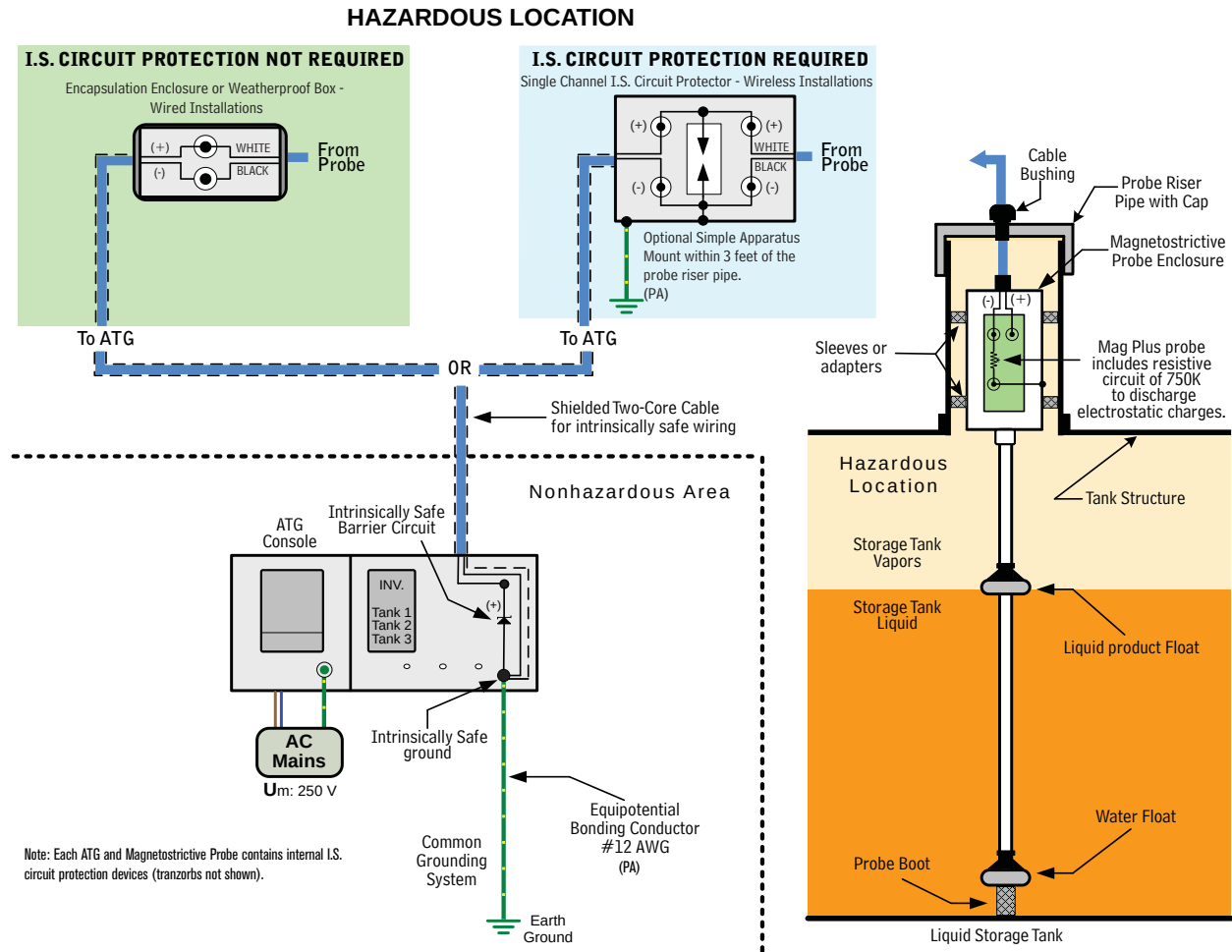


Figure 1. Connection For A Wired Mag Plus Probe Installation With And Without Optional I.S. Circuit Protection

Mag Plus Probe Installation Kits

Installation Kits

Available Mag Plus probe installation kits are listed in Table 1 and Table 2..

Table 1.- Installation Kit P/N 846100-1XX, 846400-1XX And 846402-1XX

Qty.	Description	Part Number
1	Cable, 5 feet long (standard size)	330272-001
1	2-inch Product Float	331627-001
1	2-inch Water Float	331582-00X
1	Boot	333202-001
2	Canister Insulating Sleeves	332457-001
1	Cable Seal Kit (CSK)	330020-415 or 330020-067

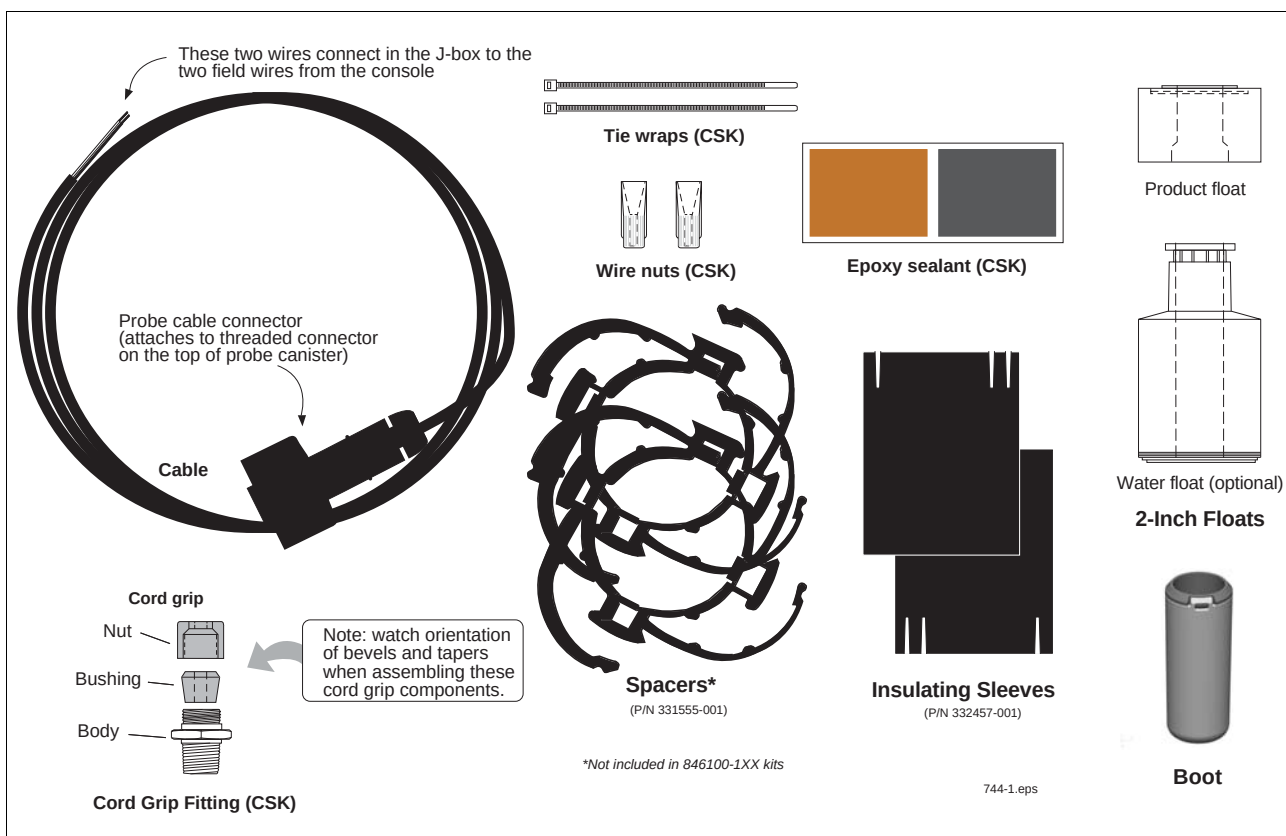


Figure 2. Installation Kit 846100-1XX, 846400-1XX And 846402-1XX Contents

Table 2.- Installation Kit P/N 846400-3XX, -0XX And 846402-3XX, -0XX, 330020-720, -721, -722

Qty.	Description	Part Number
1	Cable, 5 feet long (standard size)	330272-001
1	3-inch* Product Float	331759-001
1	3-inch* Water Float	331583-00X
1	4-inch* Product Float	331719-001
1	4-inch* Water Float	331718-00X
1	Boot	333202-001
2	Canister Spacer Ring	331555-001
1	Cable Seal Kit (CSK)	330020-067

*Note: Depending on your order, this kit is shipped with either 3- or 4-inch floats.

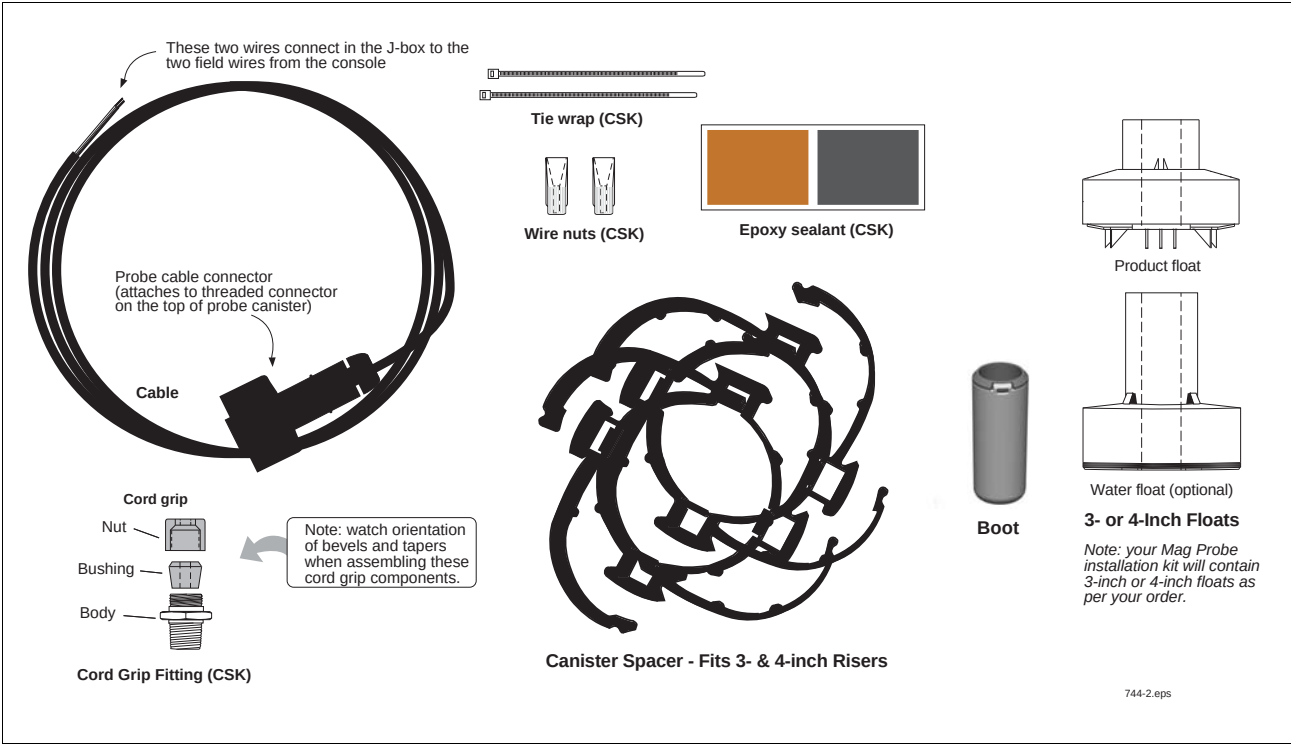


Figure 3. Installation Kit 846400-3XX, -0XX And 846402-3XX, -0XX Contents

Riser Cap Kit for Mag Plus Probe Installations

The cap on the riser containing the Mag Plus probe must be modified to allow the probe's cable to exit the riser. This modification requires making a 1/2"-14 NPT tapped hole in the cap for a cord grip. Two types of drilled and tapped Riser Cap kits are available for purchase, or you may be able to modify the existing riser cap.

CAP AND CORD GRIP KIT

This Riser Cap kit (Table 3) contains a non-metallic cap which screws onto the 4" NPT riser (Figure 4). The cap comes drilled and tapped with a cord grip.

Table 3.- Cap And Cord Grip Kit - Part No. 330020-282

Qty.	Description	Part Number
1	Cap Riser	331106-001
1	Gasket	339112-001
1	Bushing - Cord Grip	330787-001
1	Nut - Cord Grip	330594-001

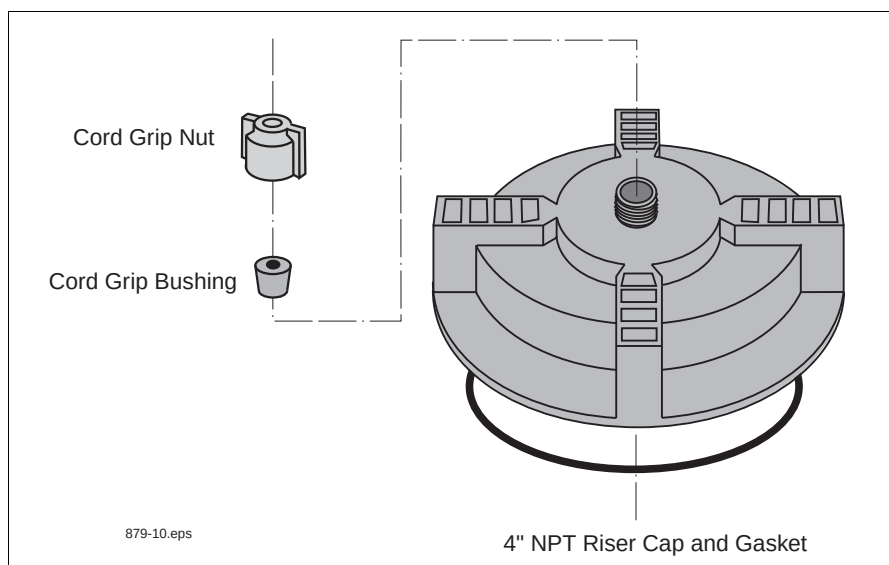


Figure 4. Cap And Cord Grip Kit

METAL CAP AND RING KIT

This riser cap kit contains an adapter ring which screws onto the 4"NPT riser and a quick-release metal cap which clamps onto the ring (Table 4). The cap comes drilled and tapped with a cord grip (Figure 5).

Table 4.- Metal Cap And Ring Kit - Part No. 312020-952

Qty.	Description	Part Number
1	Adapter ring	339104-001
1	Adapter ring gasket	339112-001
1	Cap	339119-001
1	Cap gasket	339111-001
1	Group Cord Grip	331028-001

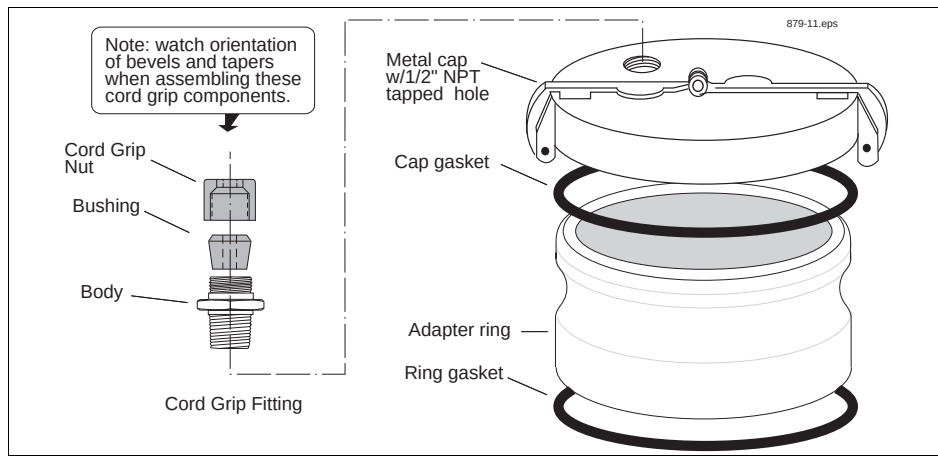


Figure 5. Metal Cap And Ring Kit

Modifying an Existing Metal Cap

In order to ensure that the riser cap seals properly to the probe cable and riser, we recommend purchasing one of the kits available for this purpose. Riser Caps from other manufacturers may require modification. If using an existing metal riser cap, drill and tap it for a cord grip fitting (P/N 331028-001) as follows.

1. Remove the cap to a non-hazardous location.
2. Drill and tap the cap for a 1/2"-14 NPT cord grip thread [Figure 6].

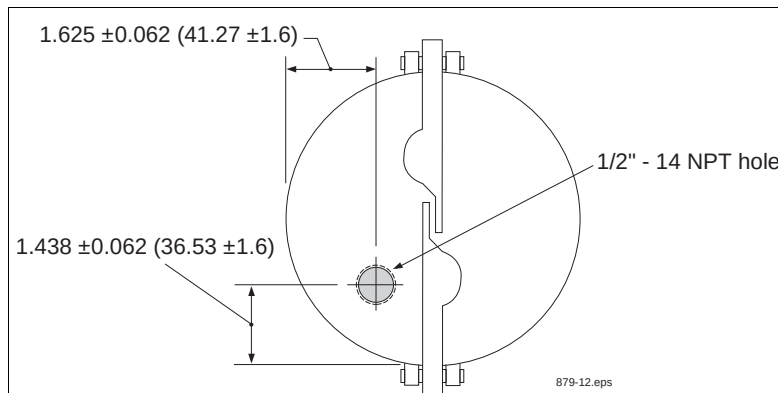


Figure 6. Modifying An Existing Metal Riser Cap

AST Installation Kit

This kit is recommended when installing Mag Plus probes into an above ground storage tank (AST). This kit contains a length of flexible conduit, connectors, etc., for easier probe access. The kit contents are listed in Table 5 and shown in Figure 7.

Table 5.- AST Installation Kit - Part No. 312020-984

Qty.	Description	Part Number
5 feet	3/8" Flexible conduit	576008-294
1	3/8" Adaptor nut	329972-002
2	3/8" Straight liquidtight connectors and related parts	576008-295
1	Cord Grip Group	331028-001

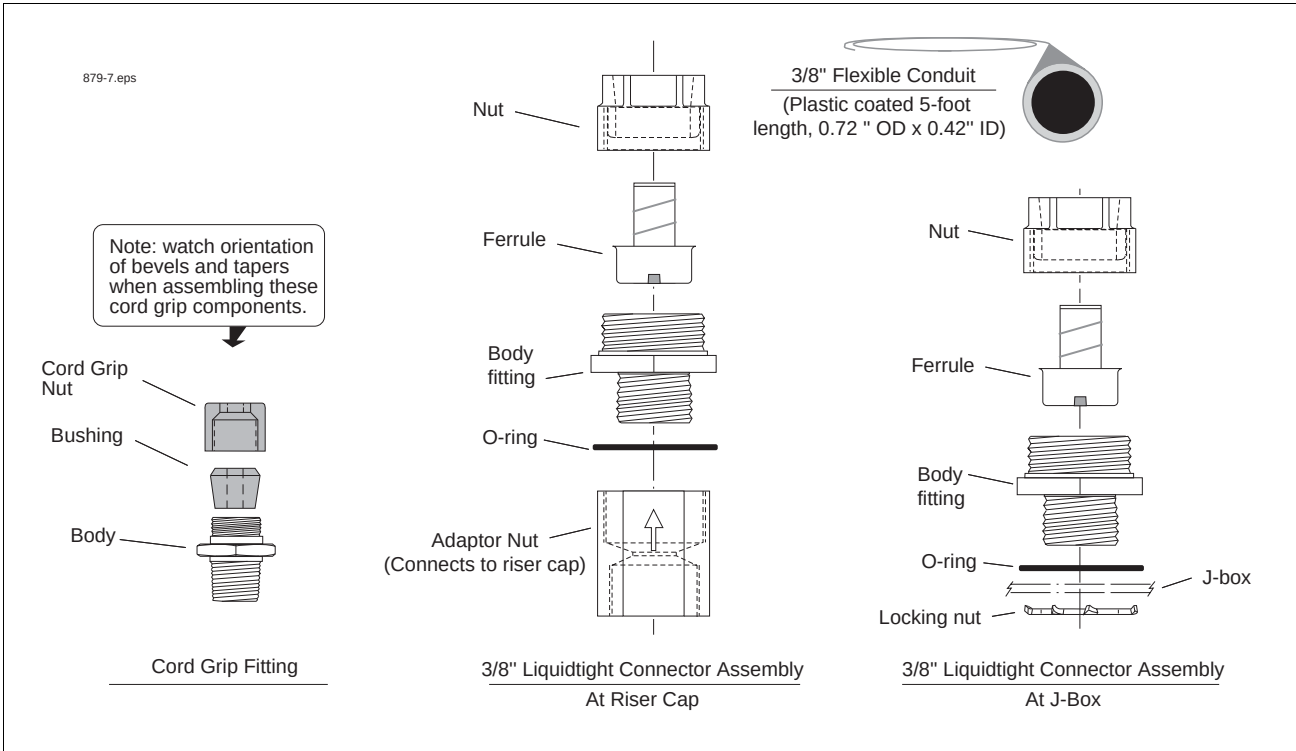


Figure 7. AST Installation Kit

I.S. Circuit Protection Kit

Kit 848190-001 (Table 6) is required for wireless installations of Mag Plus probes and kit 848190-002 (Table 7) is optional for wired installations of Mag Plus probes. The kit contents are shown in Figure 8.

Table 6.- Single Channel I.S. Circuit Protector Installation Kit - Part No. 848190-001

Qty.	Description	Part Number
6	Wire nut	576008-461
1	Cable tie	576008-482
1	Single-Channel I.S. protector	333500-003
1	Manual - splice kit	577013-744

Table 7.- Dual Channel I.S. Circuit Protector Installation Kit - Part No. 848190-002

Qty.	Description	Part Number
6	Wire nut	576008-461
1	Cable tie	576008-482
1	Dual-Channel I.S. protector	333500-004
1	Manual - splice kit	577013-744

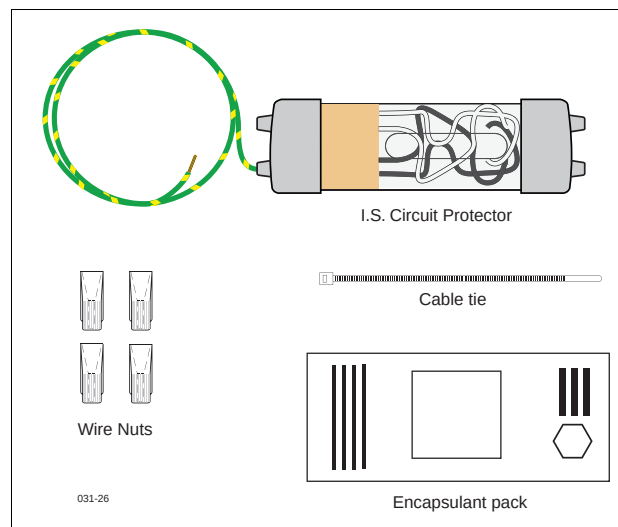


Figure 8. I.S. Circuit Protector Installation Kit Contents

Assembling Mag Plus Probe Components

Attaching Canister Insulator Sleeves (2-Inch Risers)

1. Open the shipping carton so that you have access to the Mag Plus probe. Also open the installation kit.
2. Install the two canister insulator sleeves onto the Mag Plus probe canister as shown in Figure 9.

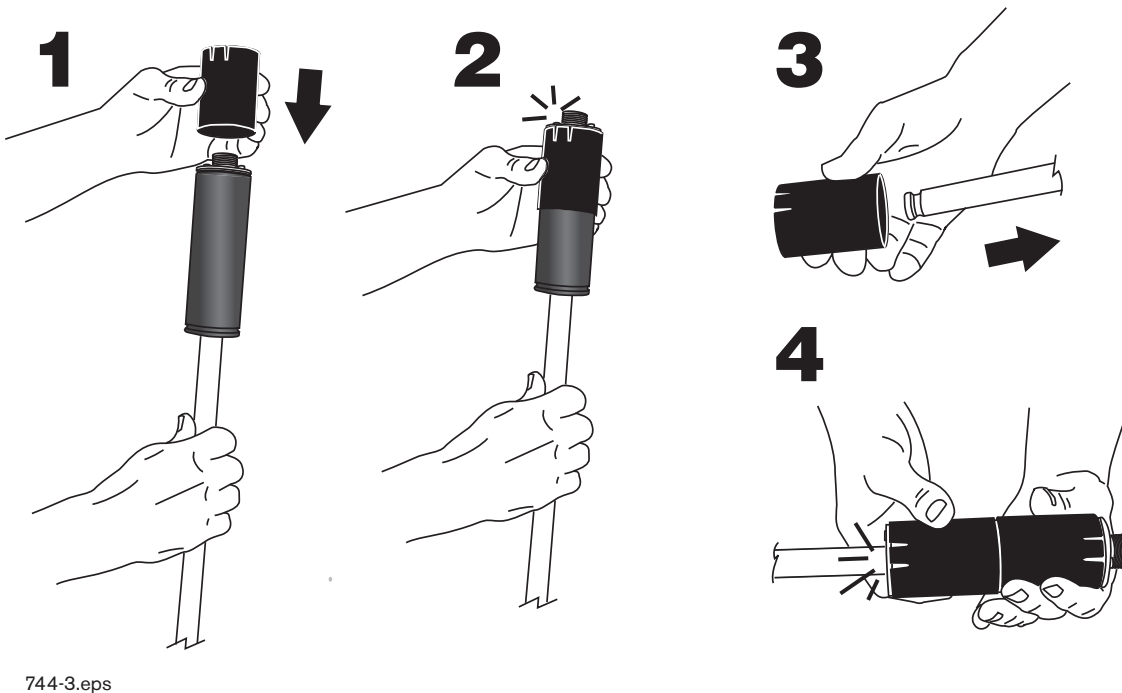


Figure 9. Installing Mag Plus Probe Canister Insulator Sleeves

Attaching Mag Plus Probe Canister Spacer Rings (3- & 4-Inch Risers)

1. Open the shipping carton so that you have access to the Mag Plus probe. Open the installation kit.
2. Set the spacer vanes for a 3- or 4-inch riser (see Figure 10) as required. Install the two spacer rings onto the Mag Plus probe canister as shown in the figure below. Note: you must slide the bottom spacer up the Mag Plus probe shaft and onto the lower end of the canister.

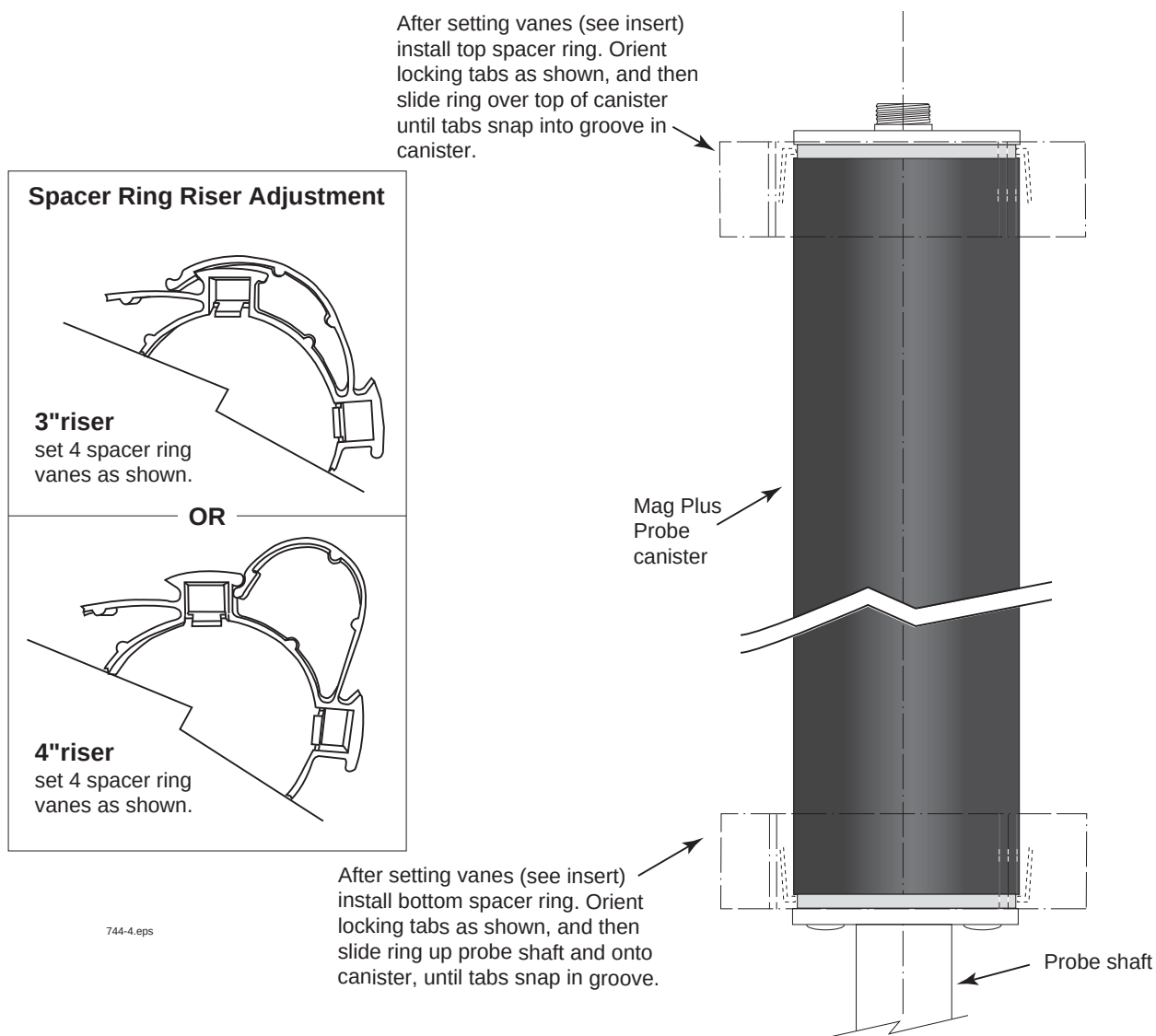


Figure 10. Installing Mag Plus Probe Canister Spacer Rings

Assembling Floats onto Mag Plus Probe Shaft

The Product floats, Water Floats (if ordered), and Boots from the installation kits are assembled on the probe shafts in the exact sequence and orientation shown in Figure 11.

IMPORTANT! Failure to push the boot as far as possible onto the probe shaft could cause the boot and float(s) to fall into the tank. The boot must be pushed on until it “locks” on the probe shaft. Also, water floats must be installed, if ordered, for the probe to operate correctly.

Handle the probe carefully. Striking or dropping the probe will result in loss of calibration and could cause permanent damage.

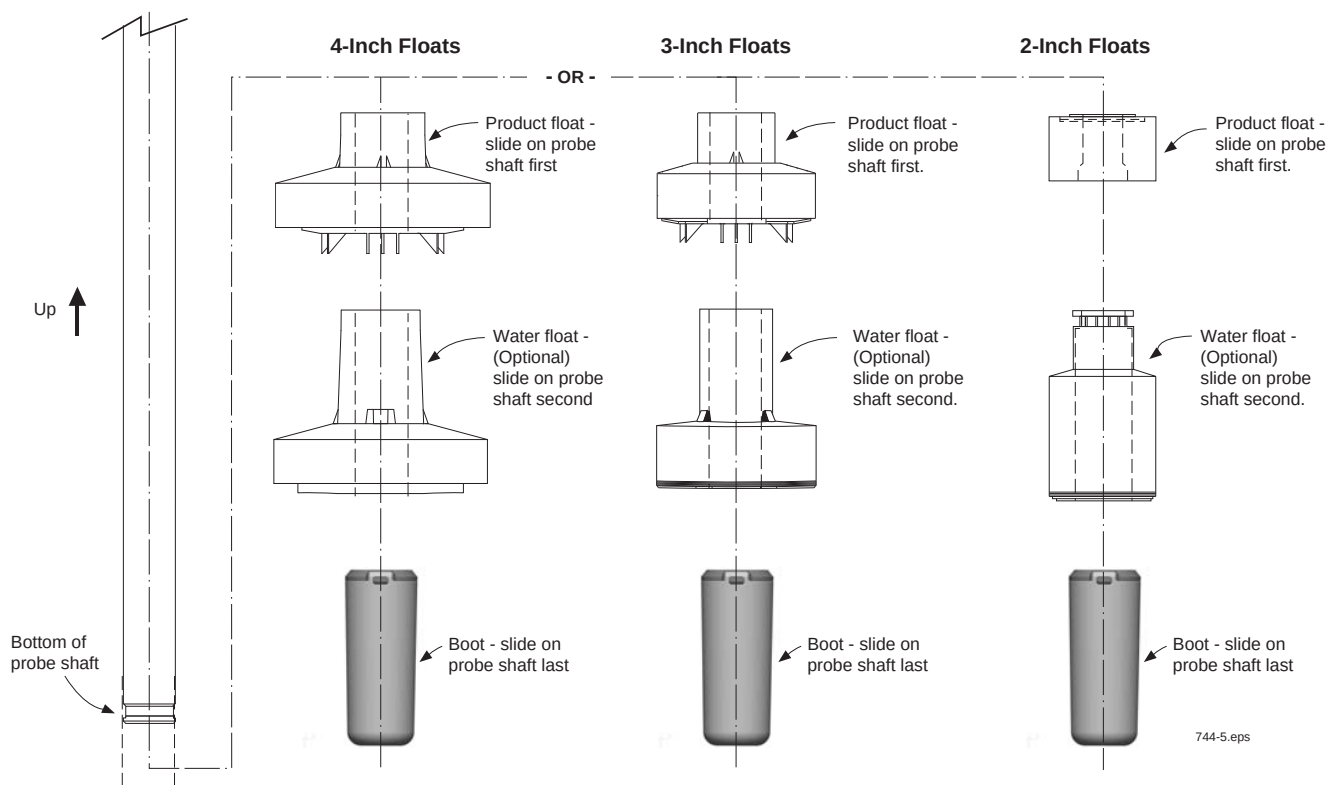


Figure 11. Mag Plus Probe Float Installation

Mag Plus Probe Installation Examples

UST Tank



1. Turn OFF power to the console.
2. Remove any sludge from the bottom of the tank.
3. Check that floats, boot, and cable are assembled correctly on probe.
4. Gently slide the float(s) to the bottom of the probe shaft before raising the probe. Carefully lower the probe into the riser pipe until the boot rests on the bottom of the tank [See Figure 12 for example UST installation, Figure 13 for example UST installation with I.S. Circuit Protector or Figure 14 for example AST installation].



WARNING! Handle probes carefully. Striking or dropping the probe will result in loss of calibration and damage to the probe.

5. Attach the connector end of the probe cable to the threaded connector on top of the probe canister and tighten down the integral nut.

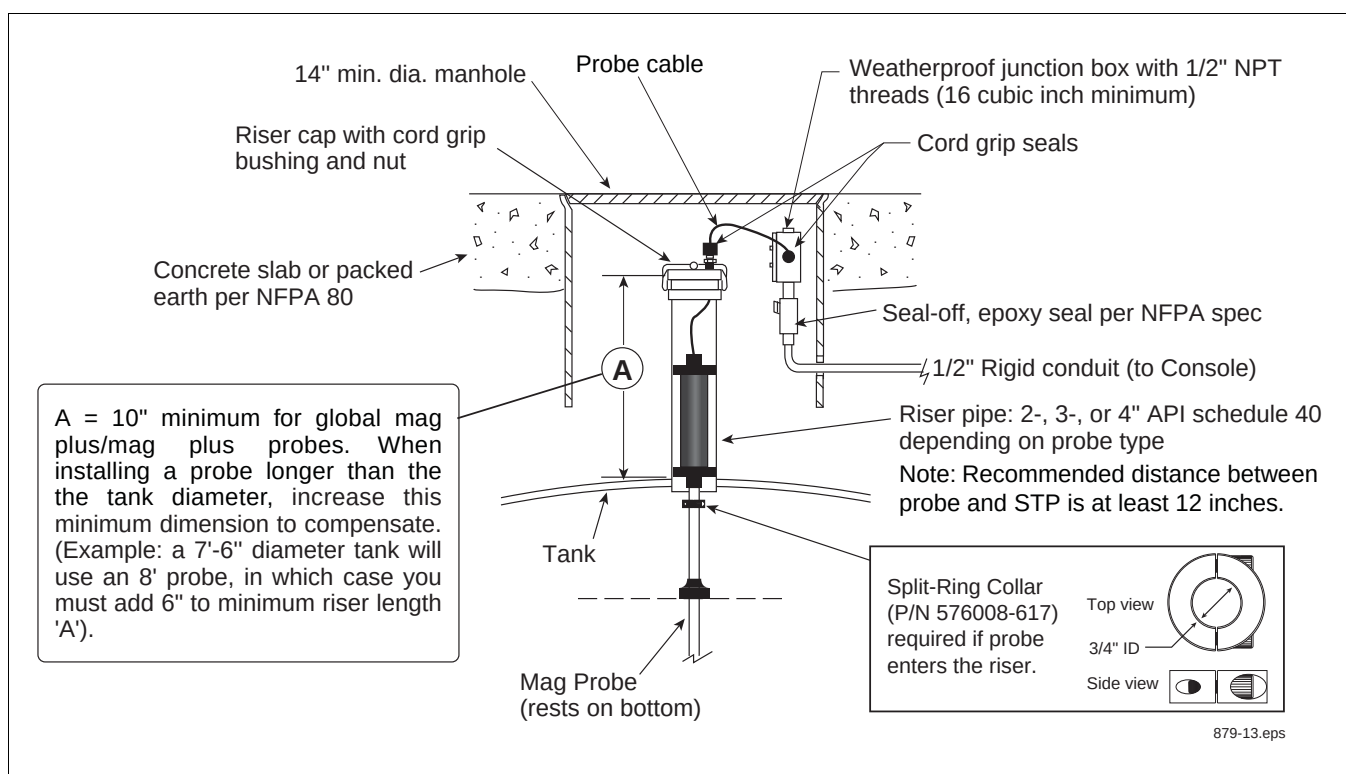


Figure 12. UST Mag Plus Probe Installation - Dedicated Riser

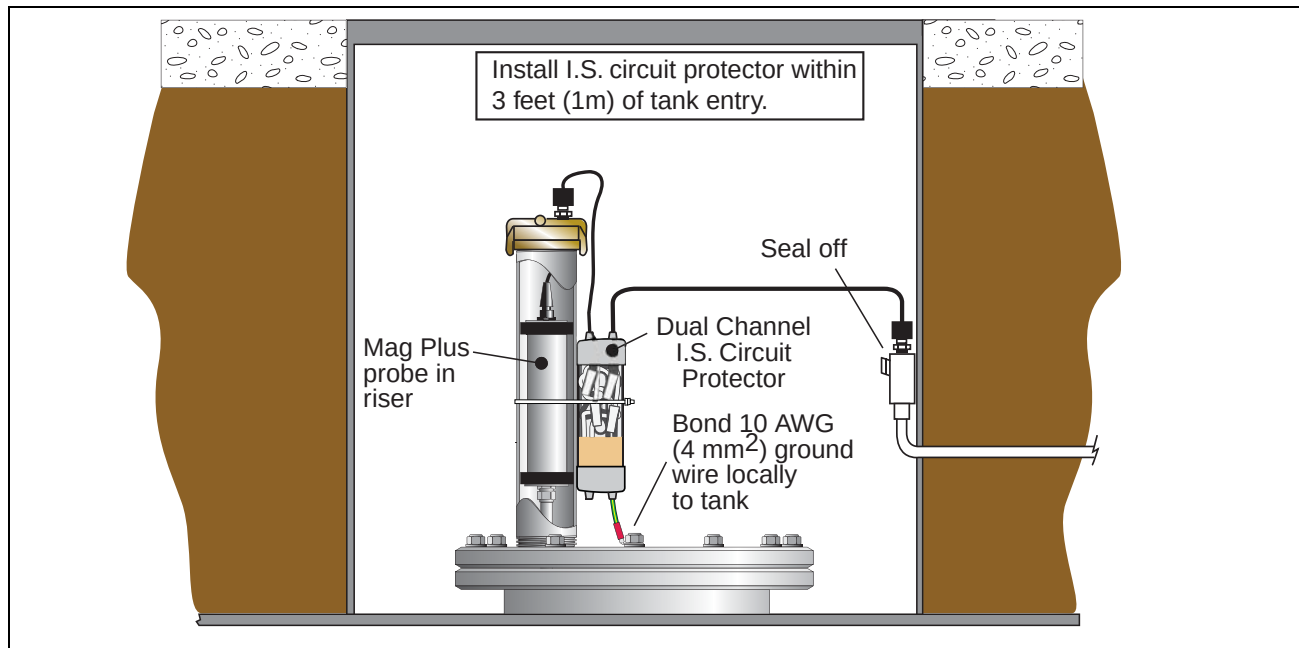


Figure 13. Optional UST Mag Plus Probe Installation With I.S. Circuit Protector

UST RISER CAP ATTACHMENT

1. If using the one piece cap (see Figure 4 on page 8), push the end of the probe cable through the cord grip bushing and nut on the cap, leaving a minimal amount of slack between the probe and cap. Screw the cap onto the riser by hand until the gasket first contacts the pipe. Then lightly tap the cap with a hammer to tighten it an additional 3/4 turn. Go to Step 3.

If installing the metal cap and adapter ring (see Figure 5 on page 9), screw the ring onto the 4" riser until the gasket contacts the pipe, then use a torque wrench attached to an appropriate strap wrench (K-D Specialty tools nylon strap oil filter wrench, or equivalent) and tighten the ring to 35 - 45 ft-lbs. Push the cable through the metal cap and cord grip, then clamp the cap onto the adapter ring.

2. Make sure there is a minimal amount of slack between the probe and cap, then tighten the cord grip nut until the cable is held firmly. Push the end of the cable through the field J-box cord grip, then tighten that cord grip nut as well. Splice and seal the wires in the J-box.

AST Tank.

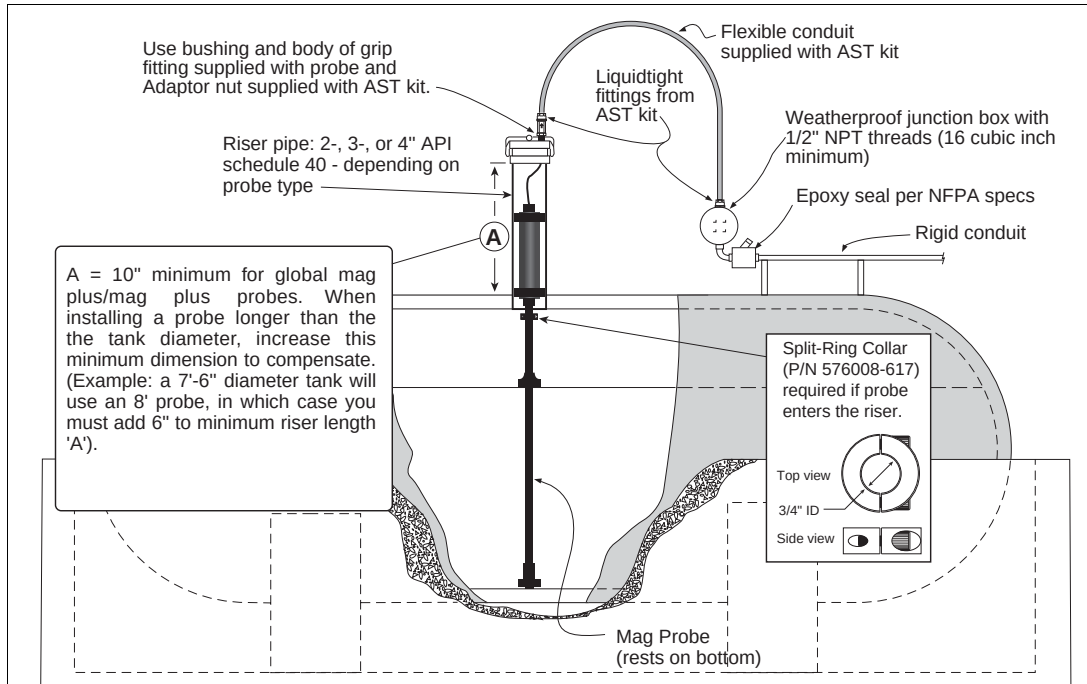


Figure 14. AST Mag Plus Probe Installation - Dedicated Riser

AST RISER CAP ATTACHMENT

1. If using the one piece cap (see Figure 4), push the end of the probe cable through the cap and cord grip bushing, leaving a minimal amount of slack between the probe and cap. Discard the cord grip nut and attach the Adapter Nut from the AST kit to the cap (see Figure 7). Tighten the Adapter Nut until the cable is held firmly. Go to Step 3.
2. If installing the metal cap and ring (see Figure 5), screw the ring onto the 4" riser until the gasket contacts the pipe, then use a pipe wrench to tighten it an additional 3/4 turn. Using UL-classified pipe sealant (suitable for the fuels involved), screw the cord grip fitting into the tapped hole and tighten. Place the cord grip bushing in the fitting. Discard the cord grip nut and loosely screw the Adapter Nut from the AST kit onto the cord grip fitting (see Figure 7). Push the cable through the metal cap, bushing, and Adapter nut, then clamp the cap onto the ring. Make sure there is a minimal amount of slack between the probe and cap, then tighten the Adapter Nut until the cable is held firmly.
3. Next assemble the liquid tight connectors on both ends of the flexible conduit as shown in Figure 7. Push the cable through the flexible conduit assembly and into the J-box. Connect the flexible conduit assembly to the Adapter Nut on one end and the J-box on the other.
4. Tighten the fittings until snug. Splice and seal the wires in the J-box.

Wireless Mag Plus Probe Installation

An example wireless Mag Plus probe installation is shown in Figure 15. Mount the I.S. circuit protector as close as possible to the entry point for the probe leader cable.

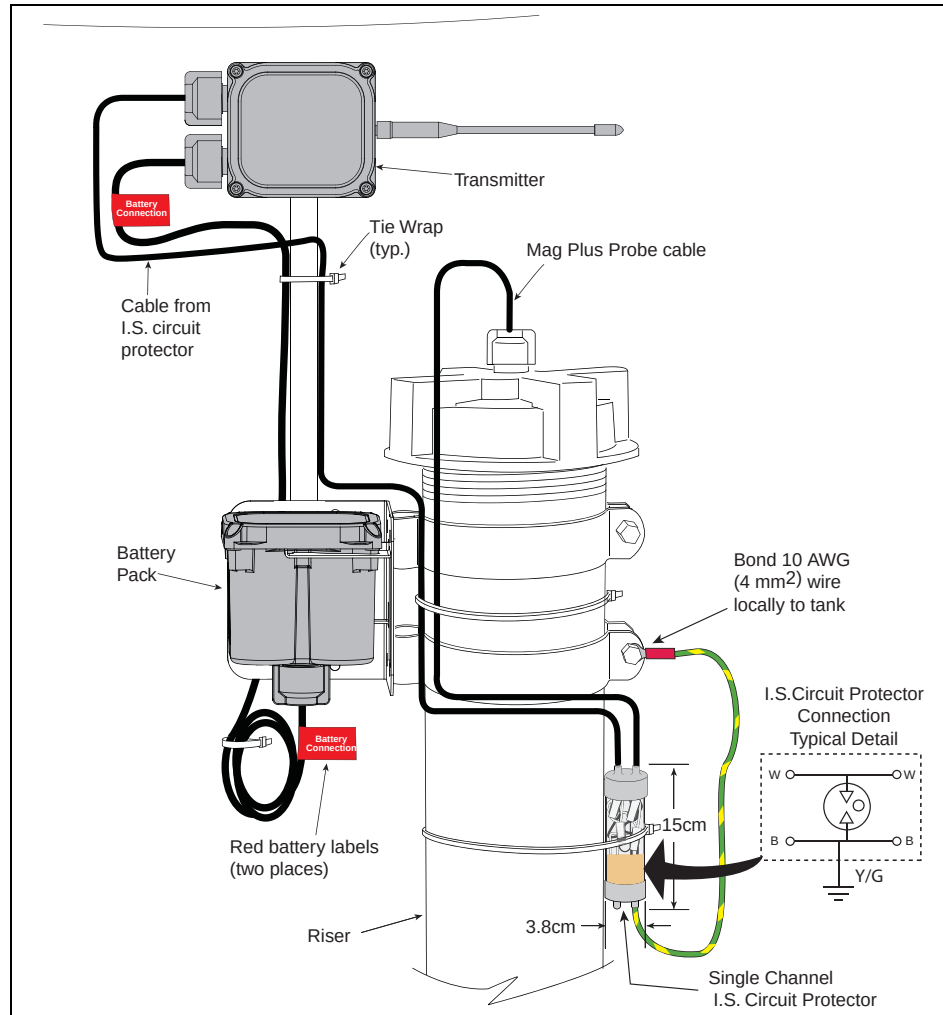


Figure 15. Example Wireless Mag Plus Probe Installation With Single-Channel I.S. Circuit Protector

Field Wiring

WIRED MAG PLUS PROBE

Pull appropriate cable from the each Mag Plus probe location to the TLS console.



An explosion could occur if other, non-intrinsically safe wires share TLS intrinsically safe wire conduits or wiring troughs. Conduits and wiring troughs from probes and sensors to the console must not contain any other wires.

NOTE At least 2 feet of free cable must be left for connection at both the TLS console and the probe locations.

Ensure that **all** cables are correctly identified. All probe field wiring **must** be legibly and permanently labeled with the tank number.

NOTE Failure to correctly mark probe field wiring may lead to re-work, delays in system installation and additional charges.

Maximum Cable Lengths

A maximum of 1000 feet of cable length per Mag Plus probe must be observed.

Sealing Field Connections

Wiring Run Through Rigid Conduit

1. Route the wire from the Mag Plus probe canister into the weatherproof junction box. If necessary, pull the two-wire cable from the console into the junction box.
2. Using the wiring nuts, connect the wires from the Mag Plus probe cable to the field wires from the console (see General Product Wiring Diagram on page 2). Observe polarity!
3. Seal wire nuts with epoxy sealant following the instructions in Figure 16.

A

B

C

Instructions:

NOTE: When temperature is below 50°F (10°C), keep resin in a warm place prior to mixing (e.g., in an inside pocket next to body).

1. Open epoxy sealant package, and remove resin pak.
2. Holding resin pak as shown in A, bend pak along long length.
3. As shown in B, firmly squeeze the RED SIDE of the resin, forcing it through the center seal and into BLACK SIDE.
4. Mix thoroughly to a uniform color by squeezing contents back and forth 25-30 times.
5. Squeeze mixed, warm resin into one end of bag and cutoff other end.
6. Slowly insert wiring connections into sealing pack until they fit snugly against the opposite end as shown in C.
7. Twist open end of bag and use tie wrap to close it off and position the tie wrapped end up until the resin jells.

CAUTION: Epoxy sealant is irritating to eyes, respiratory system, and skin. Can cause allergic skin reaction. Contains: epoxy resin and Cycloaliphatic epoxycarboxylate.

Precautions: Wear suitable protective clothing, gloves, eye, and face protection. Use only in well ventilated areas. Wash thoroughly before eating, drinking, or smoking.

Figure 16. Epoxy Sealing Mag Plus Probe Field Connections

4. Do NOT terminate shield or drain wire in the field junction box, ground shield and drain wires at console only.
5. Place the bag with the resin sealed wiring connections in the junction box. Replace and tighten the junction box cover.

WIRED MAG PLUS PROBE USING DIRECT BURIAL CABLE

When using direct burial cable for probe-to-console wiring runs, the sealing materials and procedure are completely different. Refer to the Direct Burial Cable Installation Manual 576013-858.

I.S. CIRCUIT PROTECTOR INSTALLATIONS

Wireless Probe Installs require the installation of a single-channel I.S. Circuit Protector between the probe and the transmitter.

Some wired probe installs, that are subject to high levels of electrical interference, may require the installation of the dual-channel I.S. Circuit protector between the probe and the TLS console. In these instances, the I.S. circuit protector replaces the weatherproof junction box and epoxy-sealed connections described in Figure 16.

1. Cut the soft vinyl epoxy enclosure end cap entrance holes of the appropriate I.S. circuit protector to accommodate each cable diameter. Keep the hole sizes to a minimum. Insert about 5 inches (127mm) of each cable through the openings [Figure 17]. Remove 3 inches (76mm) of the outer jacket from each cable. Trim the insulation from the conductors.

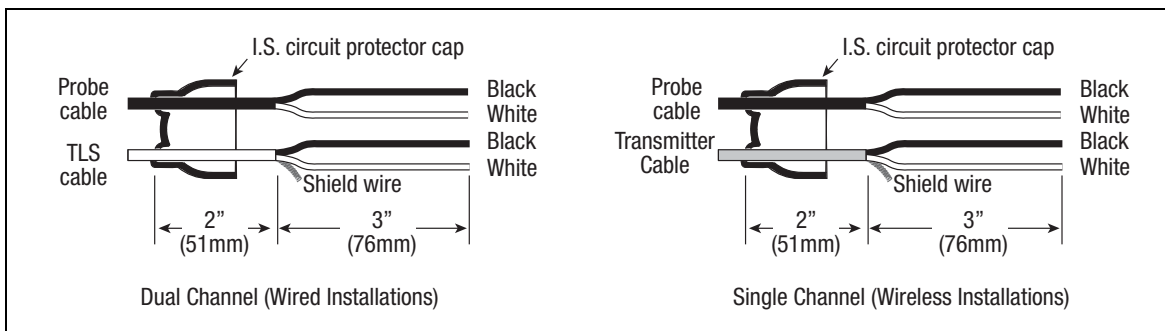


Figure 17. Splice Length Dimensions

2. Connect incoming cable wires and to the I.S. circuit protector wires using wire nuts as shown in Figure 18. Cut off the TLS/Transmitter cable's bare shield wire at the cable jacket.

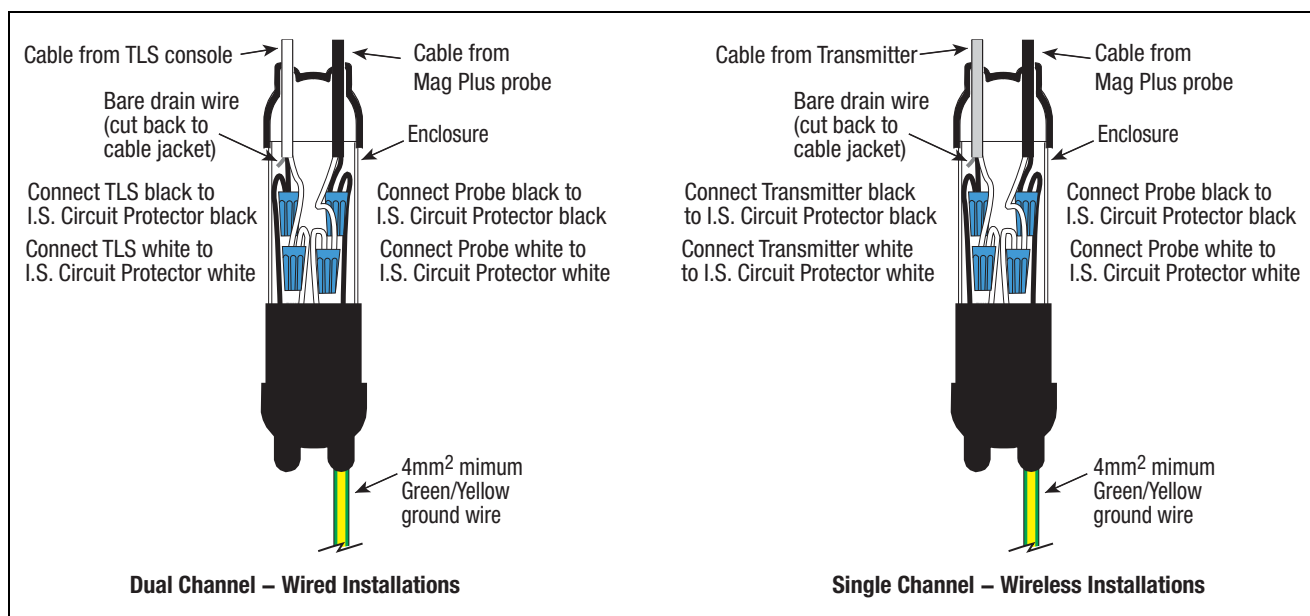


Figure 18. I.S. Circuit Protector Splice Connections

3. Center the splices in the clear plastic sleeve. Assemble the I.S. circuit protector closure, making sure the sleeve is fully inserted into each of the vinyl end caps. Rotate the sleeve cover until both slot openings line up. Arrange the closure so the slot openings are facing up and the I.S. circuit protector is as level as possible.

 WARNING!	
	Sealing compound contains isocyanate. Vapor and liquid may cause sensitization. May be irritating to the eyes. Avoid skin and eye contact. Avoid repeated and prolonged breathing of vapor. Use only in well ventilated areas. Wear chemically resistant gloves. Inhalation - provide fresh air. In case of eye contact flush eyes with plenty of water for 10 minutes and get medical attention. If ingested do not induce vomiting. Get medical attention. Wash with soap and water in case of skin contact.

4. Remove bag of "Sealing compound" from foil package. Grasp the ends, one in each hand, then pull sharply to remove plastic clip [Figure 19].

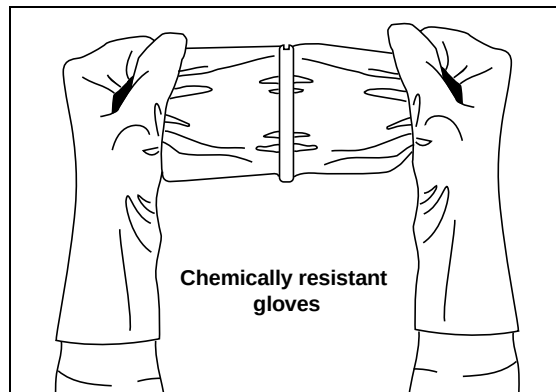


Figure 19. Removing Sealing Compound Clip

5. Thoroughly mix compound together. Invert bag several times while squeezing compound from one end to the other for a minimum of one minute.
6. Once the mixture feels warm, immediately cut one corner and slowly fill the I.S. circuit protector's plastic sleeve [Figure 20]. Stop just short of filling the entire sleeve. **Do not overfill!**

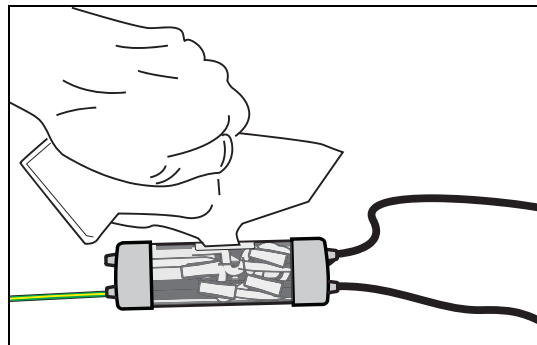


Figure 20. Pouring Sealing Compound Into Sleeve

7. With a twisting motion, rotate the outer clear plastic barrel to close the pouring slot. Wait at least five minutes, then use the large cable tie to mount the I.S. circuit protector to the riser pipe or probe canister as applicable.
8. Connect the green/yellow ground wire from the I.S. circuit protector to an appropriate tank ground (see Figure 15). In non-conductive tank installations, connect the green/yellow ground wire from the I.S. circuit protector to a grounding rod as per the local authority.





MicroSensor

Installation Guide



Notice

Veeder-Root makes no warranty of any kind with regard to this publication, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

Veeder-Root shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this publication.

Veeder-Root reserves the right to change system options or features, or the information contained in this publication.

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Contact TLS Systems Technical Support for additional troubleshooting information at 800-323-1799.

DAMAGE CLAIMS / LOST EQUIPMENT

Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

Veeder-Root must be notified of any damages and/or shortages within 30 days of receipt of the shipment, as stated in our Terms and Conditions.

VEEDER-ROOT'S PREFERRED CARRIER

1. Contact Veeder-Root Customer Service at 800-873-3313 with the specific part numbers and quantities that were missing or received damaged.
2. Fax signed Bill of Lading (BOL) to Veeder-Root Customer Service at 800-234-5350.
3. Veeder-Root will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

CUSTOMER'S PREFERRED CARRIER

1. It is the customer's responsibility to file a claim with their carrier.
2. Customer may submit a replacement purchase order. Customer is responsible for all charges and freight associated with replacement order. Customer Service will work with production facility to have the replacement product shipped as soon as possible.
3. If "lost" equipment is delivered at a later date and is not needed, Veeder-Root will allow a Return to Stock without a restocking fee.
4. Veeder-Root will NOT be responsible for any compensation when a customer chooses their own carrier.

RETURN SHIPPING

For the parts return procedure, please follow the appropriate instructions in the "General Returned Goods Policy" pages in the "Policies and Literature" section of the Veeder-Root **North American Environmental Products** price list. Veeder-Root will not accept any return product without a Return Goods Authorization (RGA) number clearly printed on the outside of the package.

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Introduction

This manual contains procedures to install the Veeder-Root MicroSensor in a double-walled steel tank or a contained riser interstice space. This manual assumes all preliminary site preparation is completed, and that field wiring from the monitor to the sensor junction box is in place. For new installations, and for wiring requirements, see the "Site Preparation and Installation Instructions" manual provided with the system.

The MicroSensor uses solid-state technology to detect liquids. When used as a contained riser sensor, it fits in the 5/8" interstice space between the 4" and 6" riser. When used as a steel tank interstitial monitor, it fits into risers as small as 1" diameter or 1" square.

Contractor Certification Requirements

Veeder-Root requires the following minimum training certifications for contractors who will install and setup the equipment discussed in this manual:

Installer (Level 1) Certification: Contractors holding valid Installer Certification are approved to perform wiring and conduit routing; equipment mounting; probe, sensor and carbon canister vapor polisher installation; wireless equipment installation; tank and line preparation; and line leak detector installation.

ATG Technician (Level 2/3 or 4) Certification: Contractors holding valid ATG Technician Certifications are approved to perform installation checkout, startup, programming and operations training, system tests, troubleshooting and servicing for all Veeder-Root Series Tank Monitoring Systems, including Line Leak Detection. In addition, Contractors with the following sub-certification designations are approved to perform installation checkout, startup, programming, system tests, troubleshooting, service techniques and operations training on the designated system.

- Wireless 2
- Tall Tank

Warranty Registrations may only be submitted by selected distributors.

Product Marking Information

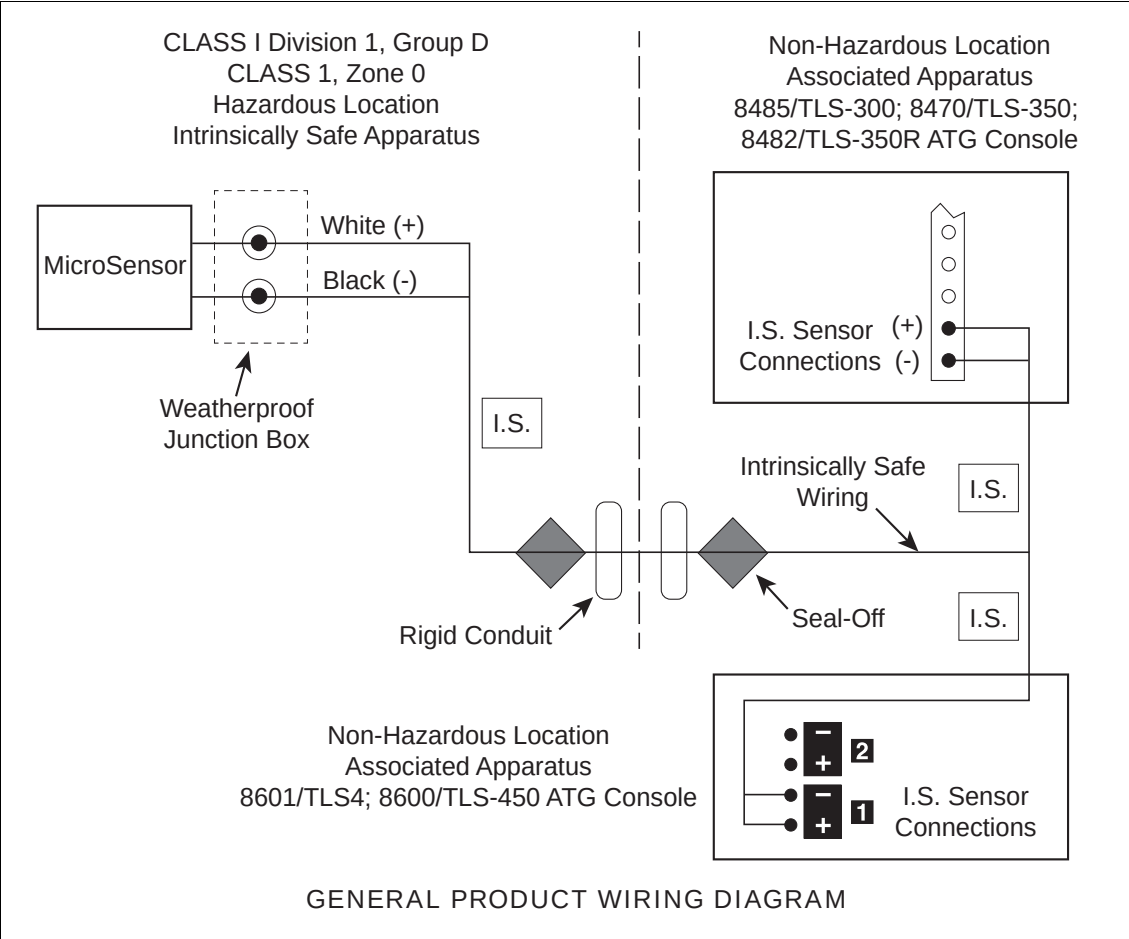
RELATED DOCUMENTS

Documents Required to Install Equipment

This intrinsically safe apparatus is only for use as part of a Veeder-Root Automatic Tank Gauging System (ATG Console with probes and sensors). To install intrinsically safe apparatus, use the specific control drawing that appears on the nameplate of the applicable associated apparatus (ATG Console):

Equipment	UL/cUL Control Drawing Document No.
Associated Apparatus	
TLS-450/8600	331940-008
TLS-350, TLS-350R	331940-011
TLS-300	331940-013
TLS4/8601	331940-018

The control drawings contain information related to the correct installation of the overall intrinsically Safe System. This includes information such as maximum number of apparatus, specific apparatus allowed in the system, maximum cable lengths, references to codes, proper grounding and so on. Control drawings can be found on the accompanying Compact Disk (TECH DOCS CD) or on the internet at veeder.com under SUPPORT; VR TECHNICAL DOCUMENTS; DRAWINGS.



Product Label Contents

**VEEDER-ROOT**
TM

I.S. CIRCUIT FOR HAZLOC SENSOR
F/N 794380-XXX
S/N XXXXXX

CL I, DIV. 1, GP.D
CL I, ZONE 0
AEx ia IIA
Ex ia IIA
TC=T4
SECURITE INTRINSEQUE

$-40^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$
MANUAL NO. 576013-285


24G6
c **UL** us
LISTED

Safety Warnings

To protect yourself and your equipment, observe the following warnings and important information:

**WARNING**



This product is to be installed in systems operating near locations where highly combustible fuels or vapors may be present.

FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH.

1. Read and follow all instructions in this manual, including all safety warnings to protect yourself and others from serious injury, explosion, or electrical shock.
2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes.
3. To protect yourself and others from being struck by vehicles, block off your work area during installation or service.
4. Do not alter or modify any component or substitute components in this kit.
5. **Warning!** Substitution of components may impair intrinsic safety.
6. Field wiring to the Sensor must not share a conduit with any non-intrinsically safe device's wiring
7. **Warning!** To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.
8. Before installing or taking the unit into a hazardous area, earth the unit in a safe area to remove any static charge. Then immediately transport the unit to the installation site. Do not rub or clean the unit prior to installation. Cleaning is not required under normal service conditions. Do not rub or clean the unit after installation. If the unit is not fixed to a known earth point when installed, ensure that a separate earth connection is made to prevent the potential of a static discharge. When fitting or removing the unit, use of anti-static footwear or clothing is required.
9. Materials used in the construction of this device do not contain, by mass, more than 10% in total of aluminum, magnesium, zirconium and titanium or 7.5% in total of magnesium, titanium and zirconium.

NOTE Failure to install this product in accordance with its instructions and warnings will result in voiding of all warranties with this product.

Safety Precautions

The following safety symbols are used throughout this manual to alert you to important safety hazards and precautions.

 EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.	 FLAMMABLE Fuels and their vapors are extremely flammable.
 TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.	 INJURY Careless or improper handling of materials can result in bodily injury.

3

 WEAR EYE PROTECTION Wear eye protection when working with pressurized fuel lines or epoxy sealant to avoid possible eye injury.	 GLOVES Wear gloves to protect hands from irritation or injury.
 READ ALL RELATED MANUALS Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.	 USE SAFETY BARRICADES Unauthorized people or vehicles in the work area are dangerous. Always use safety cones or barricades, safety tape, and your vehicle to block the work area.

National Electrical Code Compliance

The following information is for general reference and is not intended to replace recommended National Electric Code (NEC) procedures. It is important for the installer to understand that electrical equipment and wiring located in Class I, Division 1 and 2 installations shall comply with the latest appropriate Articles found in the National Electric Code (NFPA 70) and the Code for Motor Fuel Dispensing Facilities and Repair Garages (NFPA 30A).

INSTALLATION COMPONENTS

- MicroSensor for Fiberglass Tanks P/N 7943X0-34X
- Installation Kit - P/N 312020-949 (Figure 1)
- Optional 2" riser cap and adaptor kit - P/N 312020-928
- Manual 576013-285

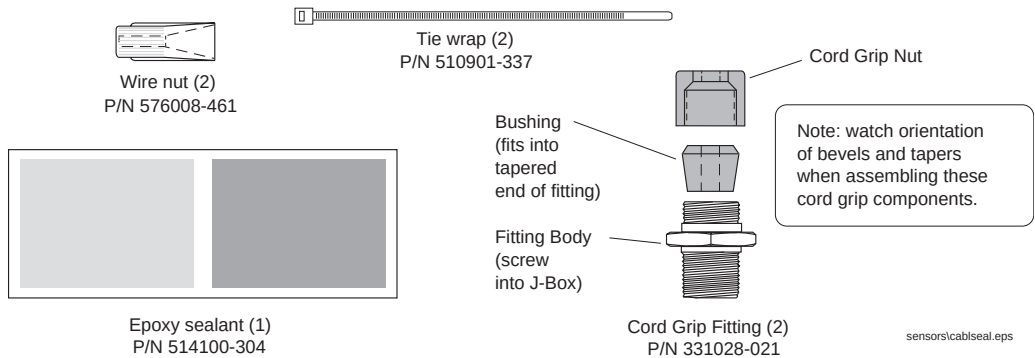


Figure 1. Installation kit

Installation Procedures

⚠ WARNING

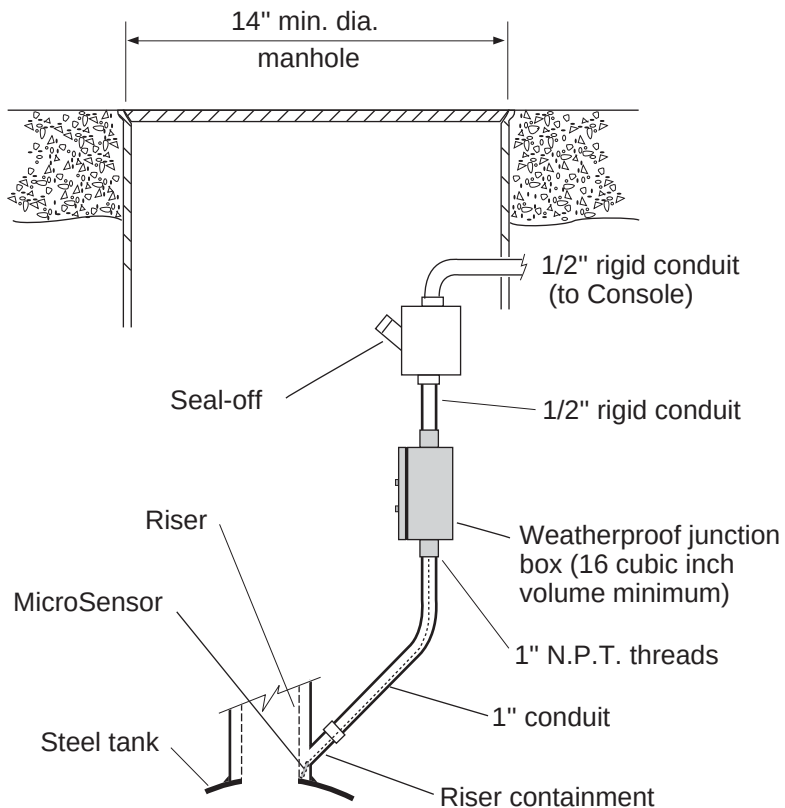


Before installing this device, turn OFF power to the system.

Sensor wiring connects components of an intrinsically safe circuit. Conduit containing sensor wiring must not contain any other wires and must enter the console only through designated knockouts.

Sensor Installation - Containment Riser

1. Turn OFF power to the console.
2. Make sure no liquid is present in the annular space.
3. Install the sensor in the conduit by pushing the cable until it cannot be pushed any further. When fully inserted, you should be able to feel the sensor contact the bottom of the containment riser (see Figure 2). To function correctly, the sensor must rest as close as possible to the bottom of the riser annulus. The MicroSensor uses a stiff cable to provide the required stiffness for ease of installation.



sensors\micrisin.eps

Figure 2. MicroSensor Installation - Containment Riser

4. Using wire nuts, connect the two-wire sensor cable to the console field wires in the sensor junction box. For proper polarity, the black wire from the sensor is ground and the other wire, which could be one of several colors, is positive (See Figure 3).

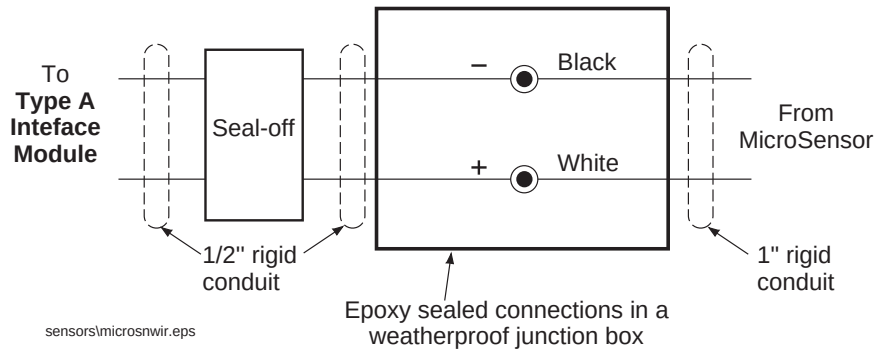
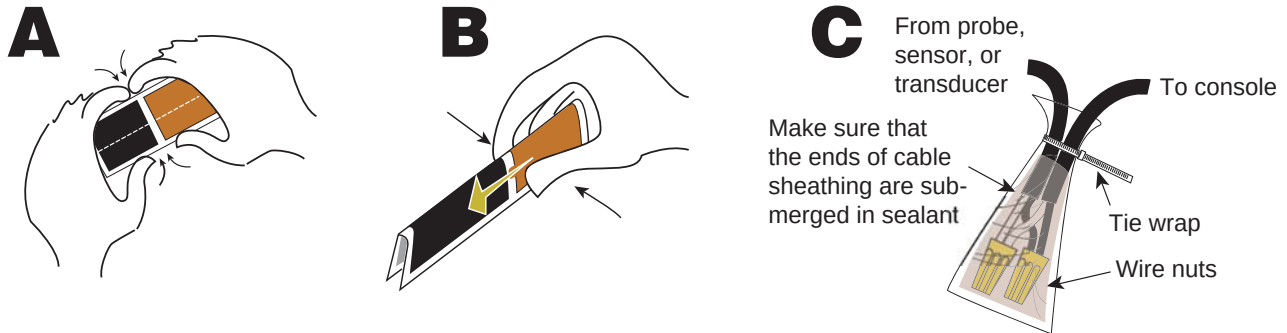


Figure 3. MicroSensor Field Wiring Diagram

5. Seal wire nuts with epoxy sealant following the instructions below.



Instructions:

NOTE: When temperature is below 50°F (10°C), keep resin in a warm place prior to mixing (e.g., in an inside pocket next to body).

1. Open epoxy sealant package, and remove resin pak.
2. Holding resin pak as shown in A, bend pak along long length.
3. As shown in B, firmly squeeze the RED SIDE of the resin, forcing it through the center seal and into BLACK SIDE.

4. Mix thoroughly to a uniform color by squeezing contents back and forth 25-30 times.
5. Squeeze mixed, warm resin into one end of bag and cutoff other end.
6. Slowly insert wiring connections into sealing pack until they fit snugly against the opposite end as shown in C.
7. Twist open end of bag and use tie wrap to close it off and position the tie wrapped end up until the resin jells.



CAUTION: Epoxy sealant is irritating to eyes, respiratory system, and skin. Can cause allergic skin reaction. Contains: epoxy resin and Cycloaliphatic epoxycarboxylate.

Precautions: Wear suitable protective clothing, gloves, eye, and face protection. Use only in well ventilated areas. Wash thoroughly before eating, drinking, or smoking.

consoles\epoxy2w.eps

Sensor Installation - Steel Tank

1. Make sure no liquid is present in the annular space.
2. To be sure the sensor will reach the bottom of the annular space, first measure the sensor riser pipe from the bottom of the pipe to the top. (See *Distance to Measure* in Figure 4.) Then measure the same distance up the sensor leader cable from its connection to the sensing element and mark the leader cable. Do not use a knife or other sharp object to mark the leader cable to avoid damaging wire. Use instead, a marker, piece of tape, or a twist tie.
3. Install a cord grip into the junction box.

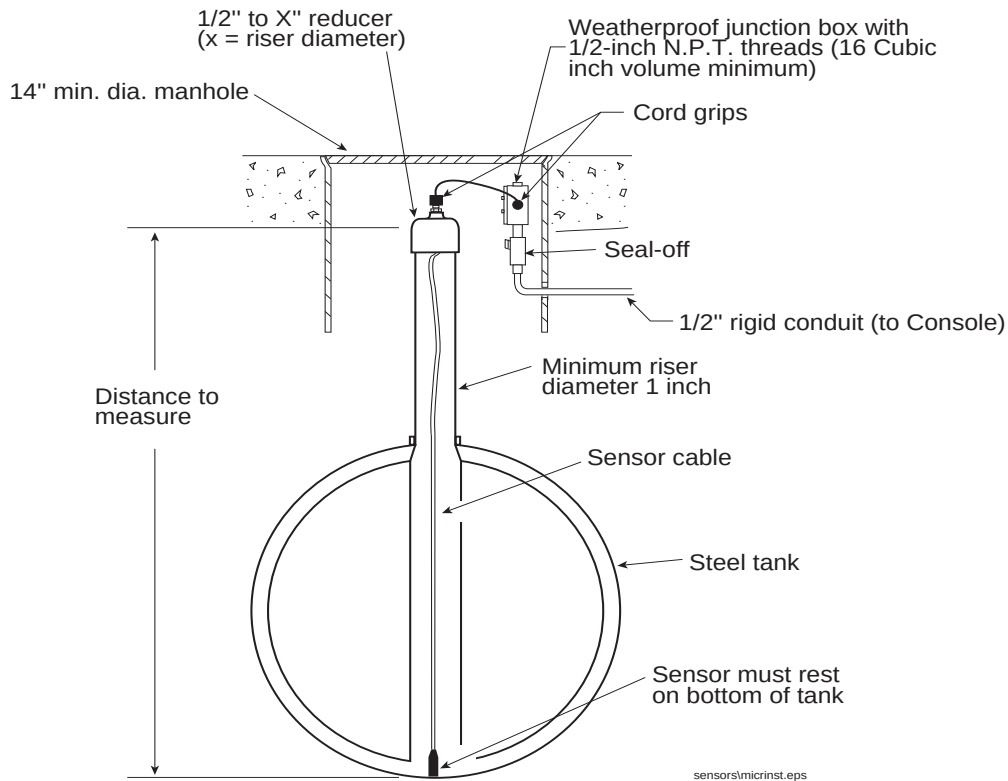


Figure 4. Sensor Dimensions and Installation - Steel Tanks

4. Lower the sensor assembly into the riser pipe until the sensor is just resting on the bottom of the tank.
5. Run the sensor leader cable through the reducer up to the mark previously made on the cable.
6. Secure the reducer to the riser pipe.
7. Keeping the cable taut, secure the sensor assembly in place by attaching the cord grip.
8. Tighten the cable bushing nuts on the riser cap and junction box to ensure a watertight seal at the cable entry.
9. Using wire nuts, connect the two-wire sensor cable to the console field wires in the sensor junction box. Be sure to observe color codes for proper polarity (as shown in Figure 3 on page 6).
10. Seal wire nuts with epoxy sealant using one bag for two wire nut connections as discussed in Step 5 of the containment riser installation above.



Single-Point Mini Hydrostatic Sensor for Double-Wall Sumps

Installation Guide

Notice

Veeder-Root makes no warranty of any kind with regard to this publication, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

Veeder-Root shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this publication.

Veeder-Root reserves the right to change system options or features, or the information contained in this publication.

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DAMAGE CLAIMS / LOST EQUIPMENT

Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

VEEDER-ROOT'S PREFERRED CARRIER

1. Contact VR Customer Service at 800-873-3313 with the specific part numbers and quantities that were missing or received damaged.
2. Fax signed Bill of Lading (BOL) to VR Customer Service at 800-234-5350.
3. VR will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

CUSTOMER'S PREFERRED CARRIER

1. It is the customer's responsibility to file a claim with their carrier.
2. Customer may submit a replacement purchase order. Customer is responsible for all charges and freight associated with replacement order. Customer Service will work with production facility to have the replacement product shipped as soon as possible.
3. If "lost" equipment is delivered at a later date and is not needed, VR will allow a Return to Stock without a restocking fee.
4. VR will NOT be responsible for any compensation when a customer chooses their own carrier.

RETURN SHIPPING

For the parts return procedure, please follow the appropriate instructions in the "General Returned Goods Policy" and "Parts Return" pages in the "Policies and Literature" section of the Veeder-Root **North American Environmental Products** price list.

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Introduction

This manual contains procedures to install the Veeder-Root Single-Point Mini Hydrostatic Sensor for double-walled sumps. This manual assumes all preliminary site preparation is completed, and that wiring from the TLS Console to the sensor junction box in the sump is in place.

If this is a new installation or site preparation is necessary, refer to the appropriate Site Preparation and Installation manual, or contact your Veeder-Root representative for assistance.

Contractor Certification Requirements

Veeder-Root requires the following minimum training certifications for contractors who will install and setup the equipment discussed in this manual:

Level 1 Contractors holding valid Level 1 Certification are approved to perform wiring and conduit routing, equipment mounting, probe and sensor installation, tank and line preparation, and line leak detector installation.

Level 2/3 Contractors holding valid Level 2 or 3 Certifications are approved to perform installation checkout, startup, programming and operations training, troubleshooting and servicing for all Veeder-Root Tank Monitoring Systems, including Line Leak Detection and associated accessories.

Warranty Registrations may only be submitted by selected Distributors.

Related Manuals

- 576013-879 TLS-3XX Site Prep and Installation Manual
- 577013-879 TLS-4XX Console Site Prep and Installation Manual
- 576013-623 TLS-3XX Series System Setup Manual

Safety Precautions

The following safety symbols are used throughout this manual to alert you to important safety hazards and precautions.

 EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.	 FLAMMABLE Fuels and their vapors are extremely flammable.
 TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.	 TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.

 USE SAFETY BARRICADES Unauthorized people or vehicles in the work area are dangerous. Always use safety cones or barricades, safety tape, and your vehicle to block the work area.	 READ ALL RELATED MANUALS Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.
 WEAR EYE PROTECTION Fuel spray from residual pressure in the lines can cause serious eye injuries. Always wear eye protection.	 INJURY Careless or improper handling of materials can result in bodily injury.
 GLOVES Wear gloves to protect hands from irritation or injury.	

Before You Begin

To protect yourself and your equipment, observe the following warnings and important information:

**WARNING**



This product is to be installed and operated in the highly combustible environment of a gasoline storage tank where flammable liquids and explosive vapors may be present.

1. Improper installation may result in fire or explosion causing serious injury or death.
2. Leaking underground tanks can create serious environmental and health hazards. It is your responsibility to install this product in accordance with the instructions and warnings found in this manual. Failure to do so could result in undetected potential environmental and health hazards.
3. Failure to install this product in accordance with its instructions and warnings will result in voiding of all warranties connected with this product.

System Description

The Veeder-Root Single-Point Mini Hydrostatic Sensor monitors the level of liquid in the interstitial space of a double-wall sump. When liquid in the sump's interstitial brine reservoir drops below a certain level, the sensor sends an alarm signal to the TLS Console. The console's visual and audible built-in alarm indicators immediately tell you where the problem is, so you can quickly take action to help prevent environmental problems.

Required Components

- Single-Point Mini Hydrostatic Sensor and install kit for double-wall sumps - P/N 794380-304

Operating Capabilities

- Operating temperature Range: -25°C to +50°C. Rests in salt brine solution of up to 30% calcium chloride.
- Storage Temperature Range: -40° C to + 60° C.
- Dimensions: 2.5" high, 1.50" diameter
- Cable length: 8 feet
- Minimum (alarm) operating liquid depth: 0.8"

Installation

Safety Warnings

 WARNING	
    	This device is installed in equipment where potentially lethal voltages may exist and where product spillage could create serious environmental and safety hazards. The following hazards exist: 1. Electrical shock resulting in serious injury or death may result if power is on during installation and the device is improperly installed. 2. Product leakage could cause severe environmental damage or explosion resulting in death, serious personal injury, property loss and equipment damage, Observe the following precautions: 1. Read and follow all instructions in this manual, including all safety warnings. 2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes. 3. Before installing this device, turn off power to the system, including console and submersible pumps. 4. To protect yourself and others from being struck by vehicles, block off your work area during installation or service. 5. Substitution of components may impair intrinsic safety.

Field Wiring Requirements

You must consult your console's latest Site Prep manual for required connection diagrams and wiring type, gauge, length, etc., needed for field wiring the sensor to the console.

Installing Sensor



1. Turn OFF power to the console.
2. Make sure liquid is present in the sump's interstitial liquid reservoir. Important! Do not install the sensor if there is less than 0.8" of liquid in the reservoir. Failure to comply will lead to an alarm.
3. Lower the float switch assembly into the reservoir until it sits on the bottom of the reservoir as shown in the installation example in Figure 1. Note: the actual reservoir type and location will vary between sump manufacturers.

The sensor housing should not be suspended by the cable. Do not use more cable than necessary between the sensor and junction box to avoid excess cable being damaged when replacing the sump lid. Route and tie off the cable so that it can not be damaged by sump component installation or maintenance.

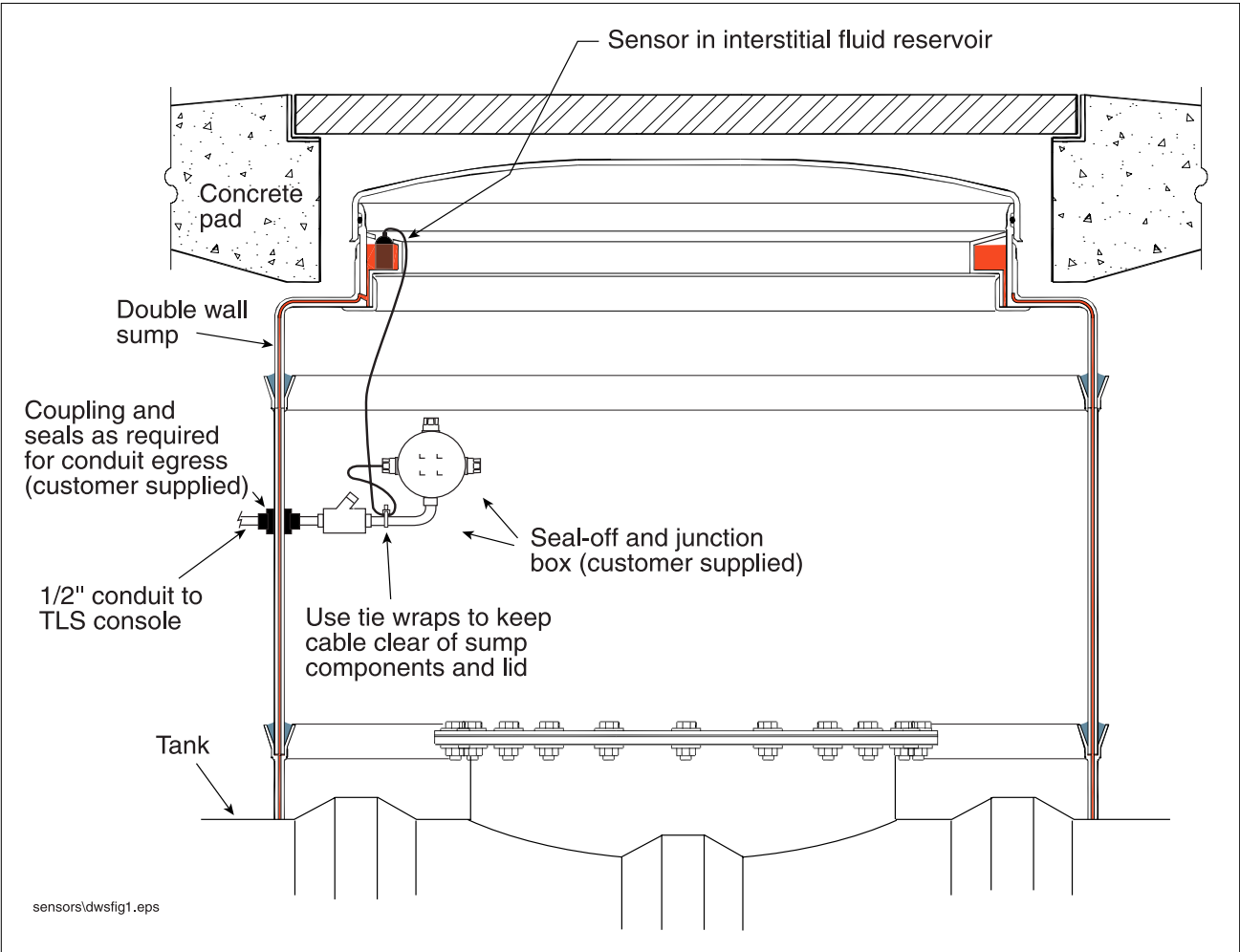


Figure 1. Example sensor installation

4. Using wire nuts, connect the two-wire sensor cable to the field wires in the sensor junction box (Figure 2).

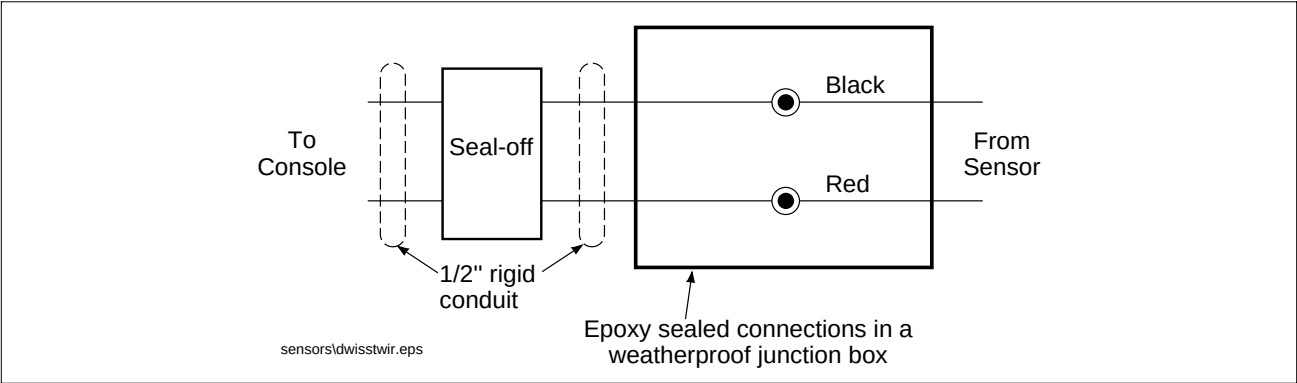
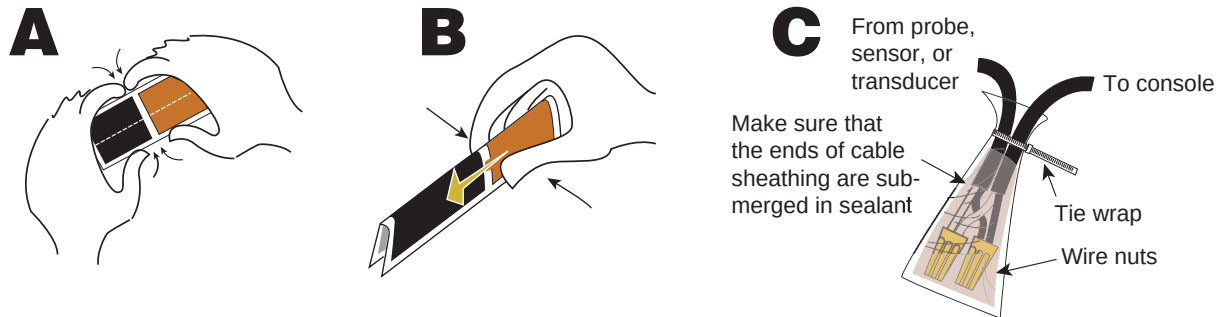


Figure 2. Sensor Wiring Installation Diagram

5. Seal wire nuts with epoxy sealant following the instructions in Figure 3



Instructions:

NOTE: When temperature is below 50°F (10°C), keep resin in a warm place prior to mixing (e.g., in an inside pocket next to body).

1. Open epoxy sealant package, and remove resin pak.
2. Holding resin pak as shown in A, bend pak along long length.
3. As shown in B, firmly squeeze the RED SIDE of the resin, forcing it through the center seal and into BLACK SIDE.

4. Mix thoroughly to a uniform color by squeezing contents back and forth 25-30 times.
5. Squeeze mixed, warm resin into one end of bag and cutoff other end.
6. Slowly insert wiring connections into sealing pak until they fit snugly against the opposite end as shown in C.
7. Twist open end of bag and use tie wrap to close it off and position the tie wrapped end up until the resin jells.



CAUTION: Epoxy sealant is irritating to eyes, respiratory system, and skin. Can cause allergic skin reaction. Contains: epoxy resin and Cycloaliphatic epoxycarboxylate.

Precautions: Wear suitable protective clothing, gloves, eye, and face protection. Use only in well ventilated areas. Wash thoroughly before eating, drinking, or smoking.

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Figure 3. Epoxy sealing example



Mag Sump Sensor

Installation Guide

Notice

Veeder-Root makes no warranty of any kind with regard to this publication, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

Veeder-Root shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this publication.

Veeder-Root reserves the right to change system options or features, or the information contained in this publication.

This publication contains proprietary information which is protected by copyright. All rights reserved. No part of this publication may be photocopied, reproduced, or translated to another language without the prior written consent of Veeder-Root.

Contact TLS Systems Technical Support for additional troubleshooting information at 800-323-1799.

DAMAGE CLAIMS / LOST EQUIPMENT

Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

Veeder-Root must be notified of any damages and/or shortages within 30 days of receipt of the shipment, as stated in our Terms and Conditions.

VEEDER-ROOT'S PREFERRED CARRIER

1. Contact Veeder-Root Customer Service at 800-873-3313 with the specific part numbers and quantities that were missing or received damaged.
2. Fax signed Bill of Lading (BOL) to Veeder-Root Customer Service at 800-234-5350.
3. Veeder-Root will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

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Introduction

This manual contains procedures for the installation or replacement of the Veeder-Root Mag Sump Sensor. This manual assumes all preliminary site preparation is completed, and that field wiring from the console to the pan/sump junction box is in place.

Following Mag Sump Sensor installation, you will need to configure and select certain programmable features of this sensor at the TLS Console. NOTE: If the Mag Sump Sensor you are installing has **NO** programmable features (i.e., alarm upgrade delay, water warning height, or water alarm height), you will not be able to enter Mag Sensor Setup.

Contractor Certification Requirements

Veeder-Root requires the following minimum training certifications for contractors who will install and setup the equipment discussed in this manual:

Installer (Level 1) Certification: Contractors holding valid Installer Certification are approved to perform wiring and conduit routing; equipment mounting; probe, sensor and carbon canister vapor polisher installation; wireless equipment installation; tank and line preparation; and line leak detector installation.

ATG Technician (Level 2/3 or 4) Certification: Contractors holding valid ATG Technician Certifications are approved to perform installation checkout, startup, programming and operations training, system tests, troubleshooting and servicing for all Veeder-Root Series Tank Monitoring Systems, including Line Leak Detection. In addition, Contractors with the following sub-certification designations are approved to perform installation checkout, startup, programming, system tests, troubleshooting, service techniques and operations training on the designated system.

- Wireless 2
- Tall Tank

VR Vapor Products Certification: Contractors holding a certification with the following designations are approved to perform installation checkout, startup, programming, system tests, troubleshooting, service techniques and operations training on the designated system.

- ISD – In Station Diagnostics
- PMC – Pressure Management Control
- CCVP - Veeder-Root Vapor Polisher
- Wireless – ISD/PMC Wireless
- A current Veeder-Root Technician Certification is a prerequisite for the VR Vapor Products course.

Warranty Registrations may only be submitted by selected Distributors.

Product Marking Information

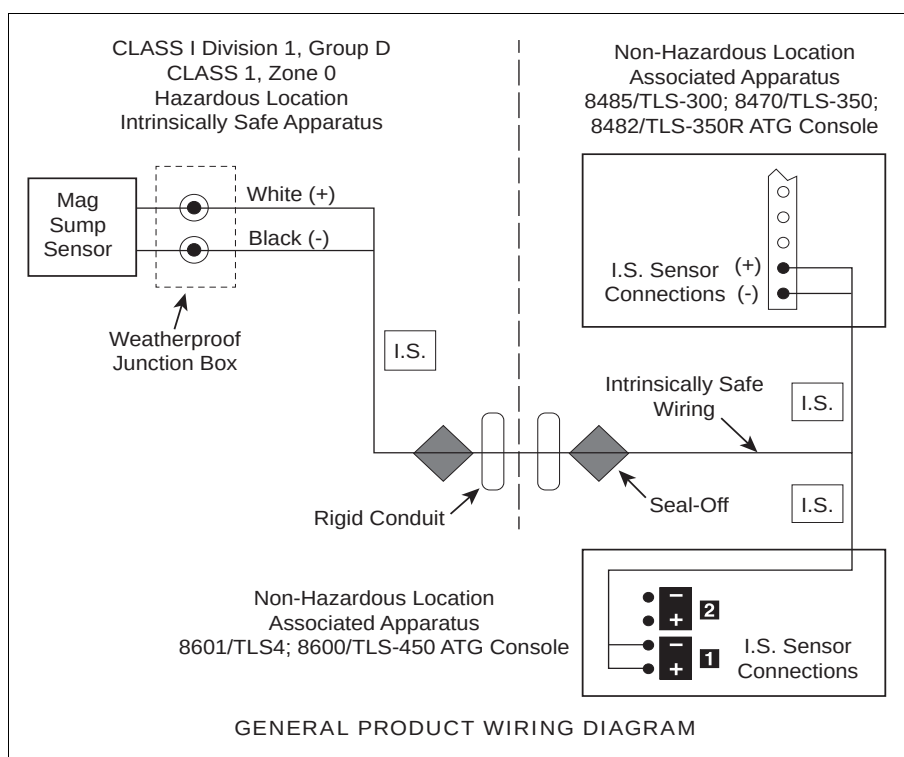
RELATED DOCUMENTS

Documents Required to Install Equipment

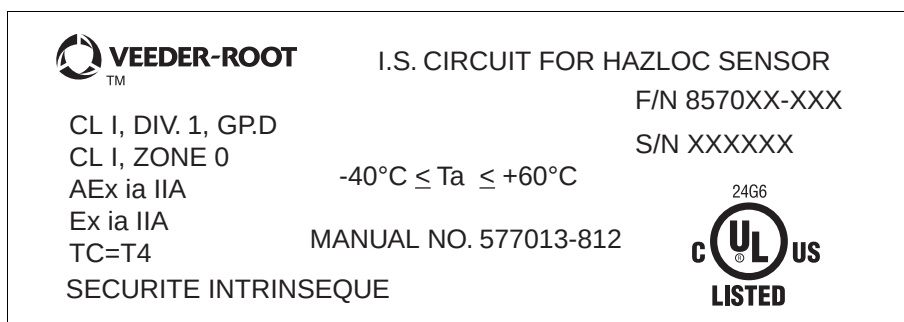
This intrinsically safe apparatus is only for use as part of a Veeder-Root Automatic Tank Gauging System (ATG Console with probes and sensors). To install intrinsically safe apparatus, use the specific control drawing that appears on the nameplate of the applicable associated apparatus (ATG Console):

Equipment	UL/cUL Control Drawing Document No.
Associated Apparatus	
TLS-450/8600	331940-008
TLS-350, TLS-350R	331940-011
TLS-300	331940-013
TLS4/8601	331940-018
Intrinsically Safe Apparatus for Wireless Applications	
Tank Gauge Accessories	331940-012

The control drawings contain information related to the correct installation of the overall intrinsically Safe System. This includes information such as maximum number of apparatus, specific apparatus allowed in the system, maximum cable lengths, references to codes, proper grounding and so on. Control drawings can be found on the accompanying Compact Disk (TECH DOCS CD) or on the internet at veeder.com under SUPPORT; VR TECHNICAL DOCUMENTS; DRAWINGS.



Product Label Contents



Safety Warnings

To protect yourself and your equipment, observe the following warnings and important information:

 WARNING	
    	This product is to be installed in systems operating near locations where highly combustible fuels or vapors may be present. FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH. 1. Read and follow all instructions in this manual, including all safety warnings to protect yourself and others from serious injury, explosion, or electrical shock. 2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes. 3. To protect yourself and others from being struck by vehicles, block off your work area during installation or service. 4. Do not alter or modify any component or substitute components in this kit. 5. Warning! Substitution of components may impair intrinsic safety. 6. Field wiring to the Sensor must not share a conduit with any non-intrinsically safe device's wiring. 7. Warning! To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing. 8. Materials used in the construction of this device contain aluminum. Care must be taken to avoid ignition hazards due to impact or friction. 9. Before installing or taking the unit into a hazardous area, earth the unit in a safe area to remove any static charge. Then immediately transport the unit to the installation site. Do not rub or clean the unit prior to installation. Cleaning is not required under normal service conditions. Do not rub or clean the unit after installation. If the unit is not fixed to a known earth point when installed, ensure that a separate earth connection is made to prevent the potential of a static discharge. When fitting or removing the unit, use of anti-static footwear or clothing is required.

NOTE Failure to install this product in accordance with its instructions and warnings will result in voiding of all warranties with this product.

Safety Precautions

The following safety symbols are used throughout this manual to alert you to important safety hazards and precautions.

 EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.	 FLAMMABLE Fuels and their vapors are extremely flammable.
 ELECTRICITY High voltage exists in, and is supplied to, the device. A potential shock hazard exists.	 TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.
 WEAR EYE PROTECTION Wear eye protection when working with pressurized fuel lines or epoxy sealant to avoid possible eye injury.	 GLOVES Wear gloves to protect hands from irritation or injury.
 INJURY Careless or improper handling of materials can result in bodily injury.	 USE SAFETY BARRICADES Unauthorized people or vehicles in the work area are dangerous. Always use safety cones or barricades, safety tape, and your vehicle to block the work area.
 READ ALL RELATED MANUALS Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.	

Related Manuals

576013-879	TLS-3XX Site Prep and Installation Manual
577013-879	TLS-4XX Site Prep and Installation Manual
576013-623	TLS-3XX System Setup Manual

Equipment Needed for Installation

- Mag Sump Sensor (available in two lengths):
 - 1-foot measurement range, 22-inch overall length - Part No. 857080-XX1
 - 2-foot measurement range, 34-inch overall length - Part No. 857080-XX2
- Cable - 10 feet - Part No. 330272-002
- Cable Seal Kit - Part No. 330020-067
- Optional - Universal Sensor Mounting kit - Part No. 330020-012.

Installation

Installation Requirements

1. The sensor must rest in the lowest point of the pan or sump and completely compress the position indicator or you will have a 'Sensor Out' alarm (see example illustrations).
2. The sensor should be mounted in a true vertical position to ensure proper operation of the sensor.
3. The sensor should be mounted such that you can pull the sensor straight out of the pan/sump if service is required.

INSTALLATION PROCEDURE



IMPORTANT! Do not install the sensor if there is any liquid in the pan or sump. Failure to comply can result in equipment damage or undetected potential environmental and health hazards.



1. Turn OFF power to the TLS Console.
2. Make sure no liquid exists in the pan/sump.
3. Remove Mag Sump Sensor from its shipping box. Hold the sensor flat (horizontally), and remove the insert from the outer tube of the sensor. NOTE! failure to remove the insert will result in an alarm condition following the setup procedure.

SENSOR INSTALLATION

Figure 1 through Figure 3 show sensor installation examples using rigid conduit to the console. However, direct burial cable could be used from the junction box to the console. Also, the examples make use of the optional universal sensor mounting kit.

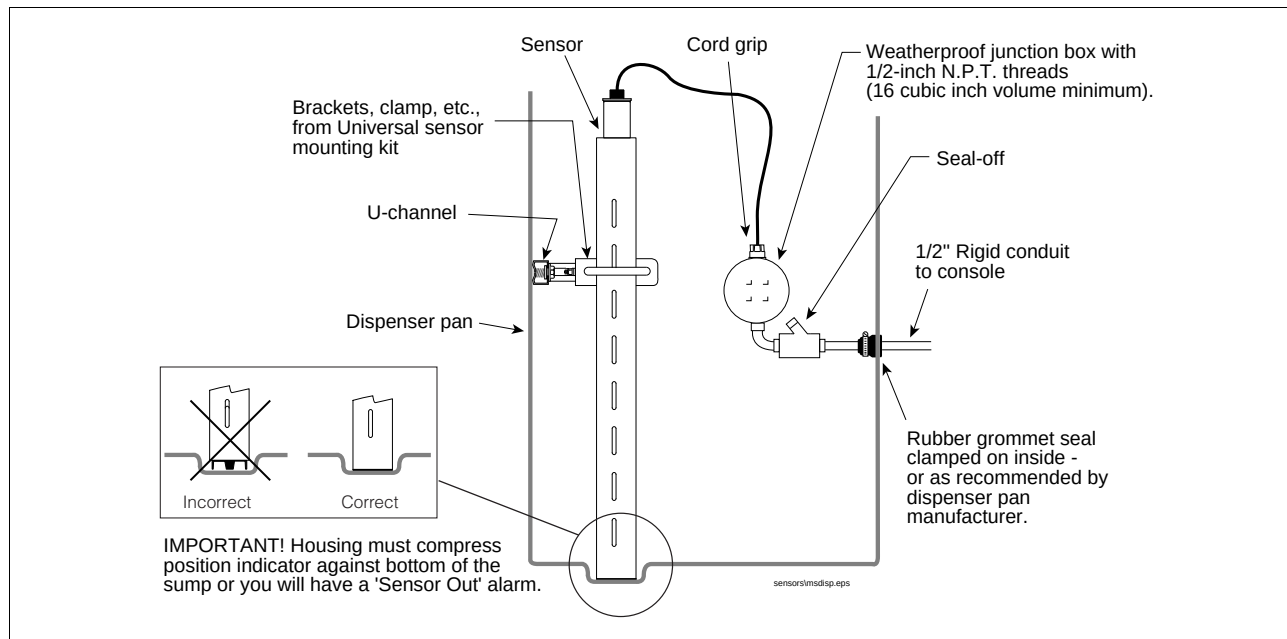


Figure 1. Example Dispenser Pan Installation

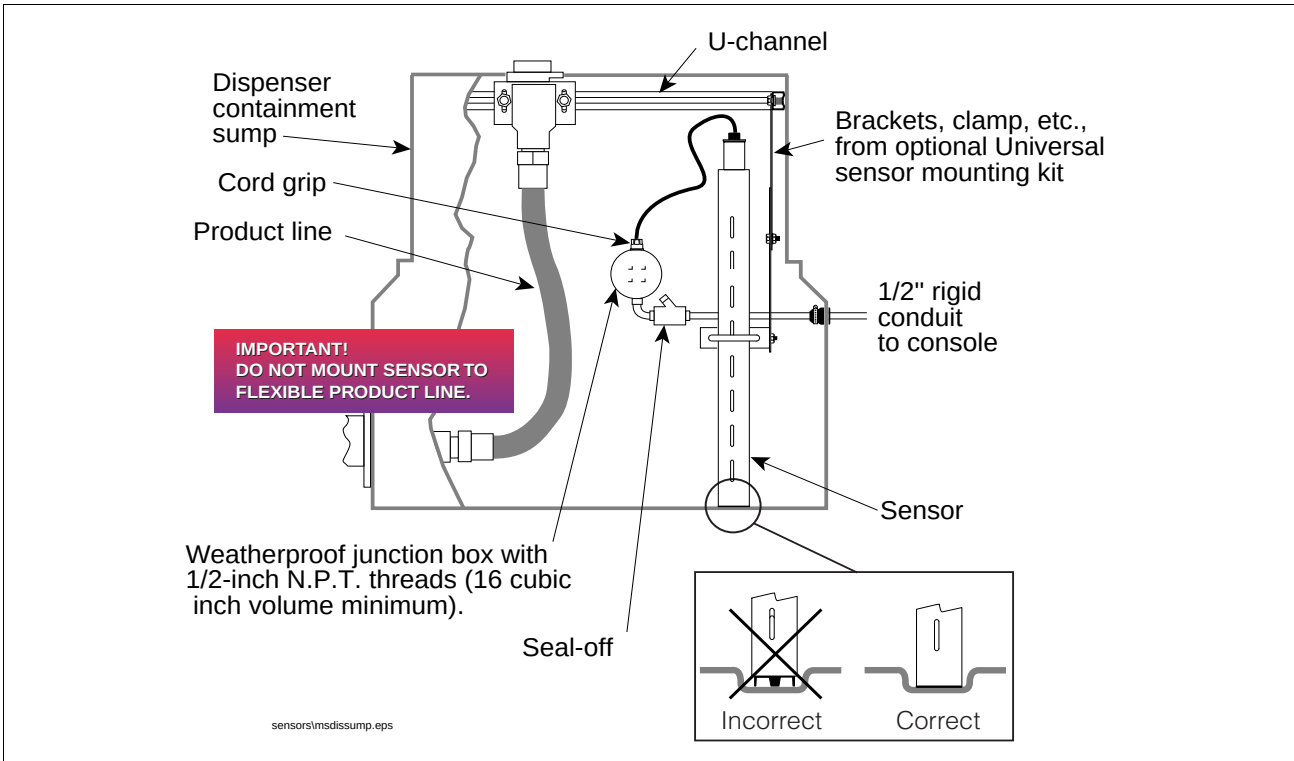


Figure 2. Example Dispenser Containment Sump Installation

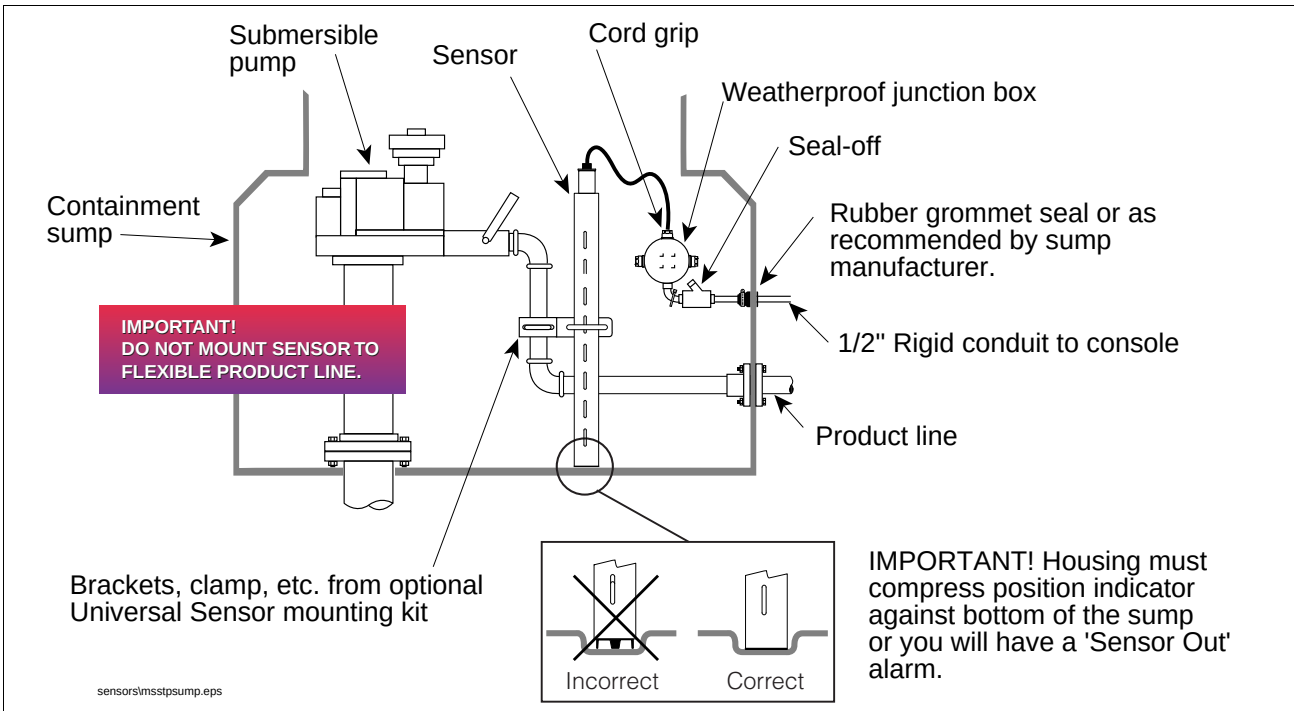


Figure 3. Example STP Containment Sump Installation

SENSOR WIRING

1. Firmly hold the top of the sensor, and attach the sensor cable connector into the receptacle in the top of the sensor. Be sure the connector is attached securely by tightening the locking nut.
2. Install the cord grip supplied with the cable seal kit in the pan/sump junction box in which the field wiring from the console terminates.
3. Coil up the excess cable and tie wrap it out of the way. Feed the two-lead end of the sensor cable through the cord grip in the junction box. Tighten the cord grip nut to ensure a watertight seal at the cable entry.
4. Using wire nuts, connect the two-wire cable to the field wires from the console as shown in Figure 4.

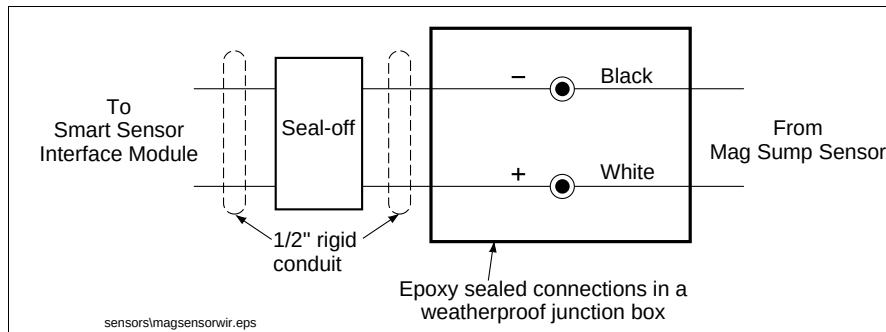


Figure 4. Field Wiring Connections (Observe Polarity)

5. Seal wire nuts with epoxy sealant following the instructions in Figure 5.
6. Push the epoxy sealed bag into the junction box. Replace and tighten the junction box cover.
7. The Mag Sump sensor connects to a Smart Sensor module in the TLS-3XX Console or to a USM module in the TLS-4XX Console - observe polarity.

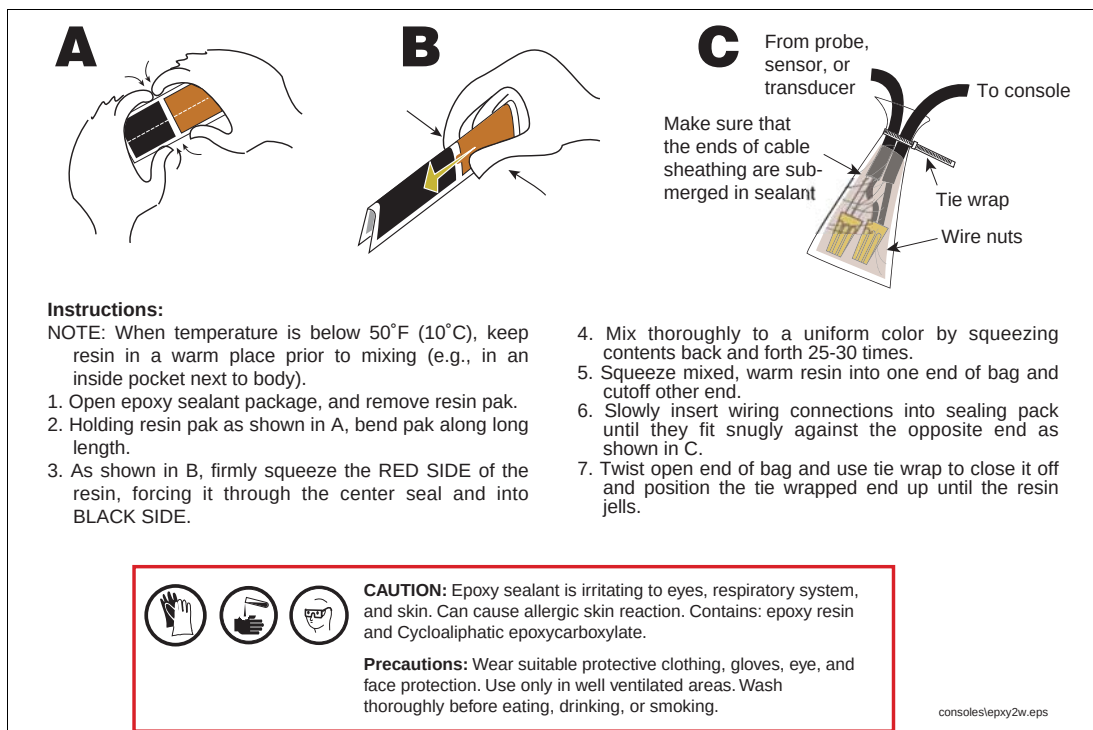


Figure 5. Epoxy Sealing Two-Wire Connections



Overfill Alarm

Installation Guide



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Veeder-Root reserves the right to change system options or features, or the information contained in this publication.

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DAMAGE CLAIMS / LOST EQUIPMENT

Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

VEEDER-ROOT'S PREFERRED CARRIER

1. Contact VR Customer Service at 800-873-3313 with the specific part numbers and quantities that were missing or received damaged.
2. Fax signed Bill of Lading (BOL) to VR Customer Service at 800-234-5350.
3. VR will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

CUSTOMER'S PREFERRED CARRIER

1. It is the customer's responsibility to file a claim with their carrier.
2. Customer may submit a replacement purchase order. Customer is responsible for all charges and freight associated with replacement order. Customer Service will work with production facility to have the replacement product shipped as soon as possible.
3. If "lost" equipment is delivered at a later date and is not needed, VR will allow a Return to Stock without a restocking fee.
4. VR will NOT be responsible for any compensation when a customer chooses their own carrier.

RETURN SHIPPING

For the parts return procedure, please follow the appropriate instructions in the "General Returned Goods Policy" and "Parts Return" pages in the "Policies and Literature" section of the Veeder-Root **North American Environmental Products** price list.

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Introduction

This manual contains installation procedures for the Veeder-Root Overfill Alarm and Acknowledgement (Ack) Switch.

The Overfill Alarm unit contains:

- Red flashing light
- Alarm horn

The Acknowledgement Switch unit contains:

- ACKNOWLEDGED light
- RESET push button
- TEST push button

Compatible Consoles

- TLS-3XX/4XX Series
- TLS-IB
- TLS-50
- TLS-HLD
- TLS2

Related Manuals

Depending on your installed console, you should reference the appropriate manuals below, to connect/setup the Overfill Alarm:

576013-879	TLS-3XX Series Site Prep Manual	576013-623	TLS-3XX Series Setup manual
577013-608	TLS-50 Site Prep manual	577013-609	TLS-50 Setup manual
577013-756	TLS2 Site Prep manual	577013-757	TLS2 Setup manual
577013-719	TLS-IB Site Prep manual	577013-785	TLS-HLD Setup manual
577013-784	TLS-HLD Site Prep manua	577013-879	TLS-4XX Site Prep Manual

Contractor Certification Requirements

Veeder-Root requires the following minimum training certifications for contractors who will install and setup the equipment discussed in this manual:

Level 1 Contractors holding valid Level 1 Certification are approved to perform wiring and conduit routing, equipment mounting, probe and sensor installation, tank and line preparation, and line leak detector installation.

Level 2/3 Contractors holding valid Level 2 or 3 Certifications are approved to perform installation checkout, startup, programming and operations training, troubleshooting and servicing for all Veeder-Root Tank Monitoring Systems, including Line Leak Detection and associated accessories.

Warranty Registrations may only be submitted by selected Distributors.

Safety Symbols

The following safety symbols are used throughout this manual to alert you to important safety hazards and precautions.

 EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.	 ELECTRICITY High voltage exists in, and is supplied to, the device. A potential shock hazard exists.
 TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.	 READ ALL RELATED MANUALS Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.

Safety Warnings



⚠ WARNING

This product is to be installed in systems operating near locations where highly combustible fuels or vapors may be present.

Fire or explosion resulting in serious injury or death could result if the Overfill Alarm and Ack switch units are installed in a volatile, combustible or explosive (Class I, Division I and Division II) atmosphere.

Explosion could occur if alarm wires share tank monitor or console probe or sensor wire conduits or wiring troughs. Do not run Overfill Alarm and Ack Switch wires with console probe and sensor wires.

1. Read and follow all instructions in this manual, including all safety warnings.
2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes.
3. Do not alter or modify any component or substitute components in this kit.

Mounting Instructions

Overfill Alarm and Acknowledgement Switch Dimensions

Figure 1 shows the Overflow Alarm mounting dimensions and Figure 2 shows the Acknowledgement Switch mounting dimensions.

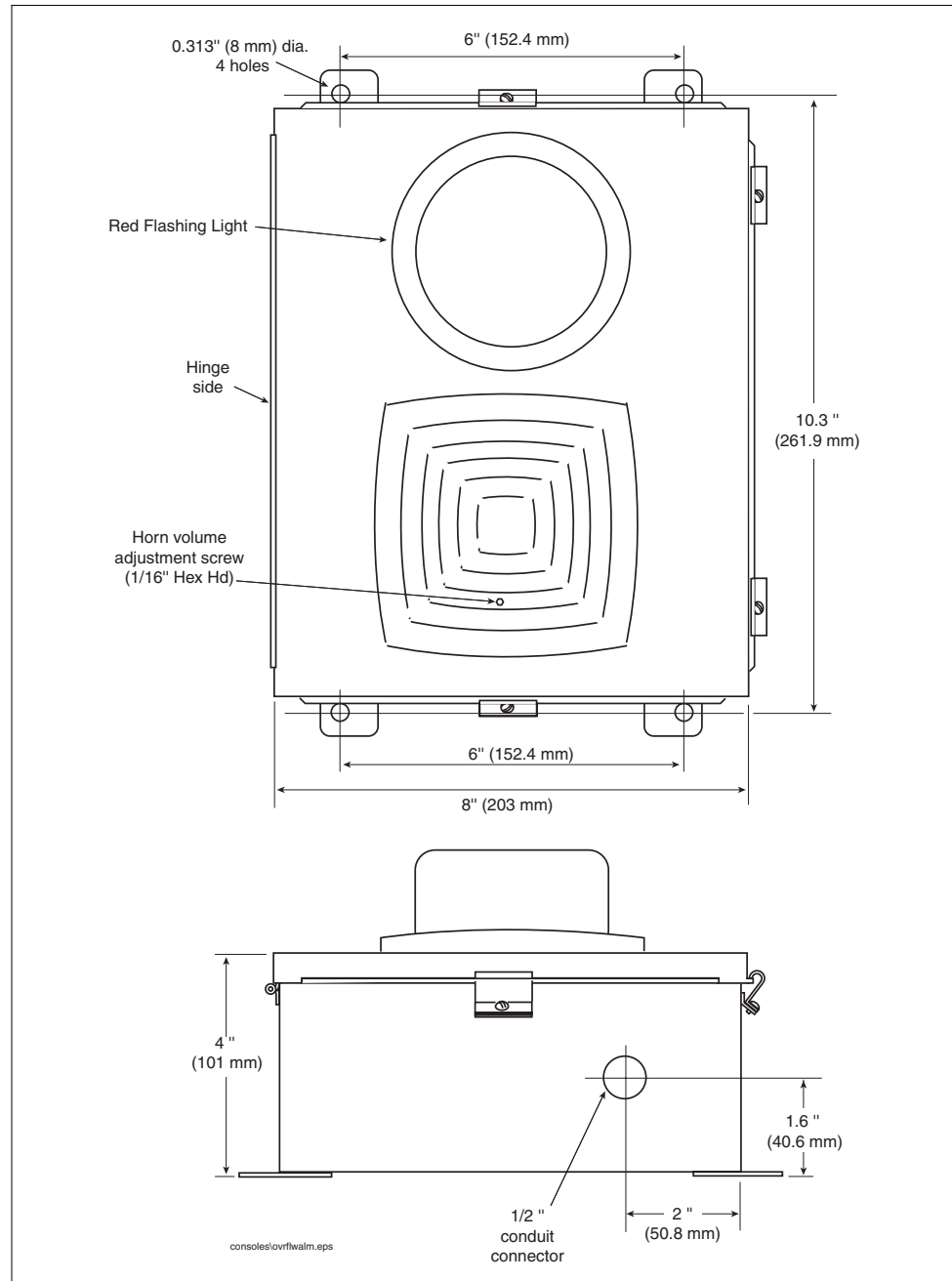


Figure 1. Overflow Alarm mounting dimensions

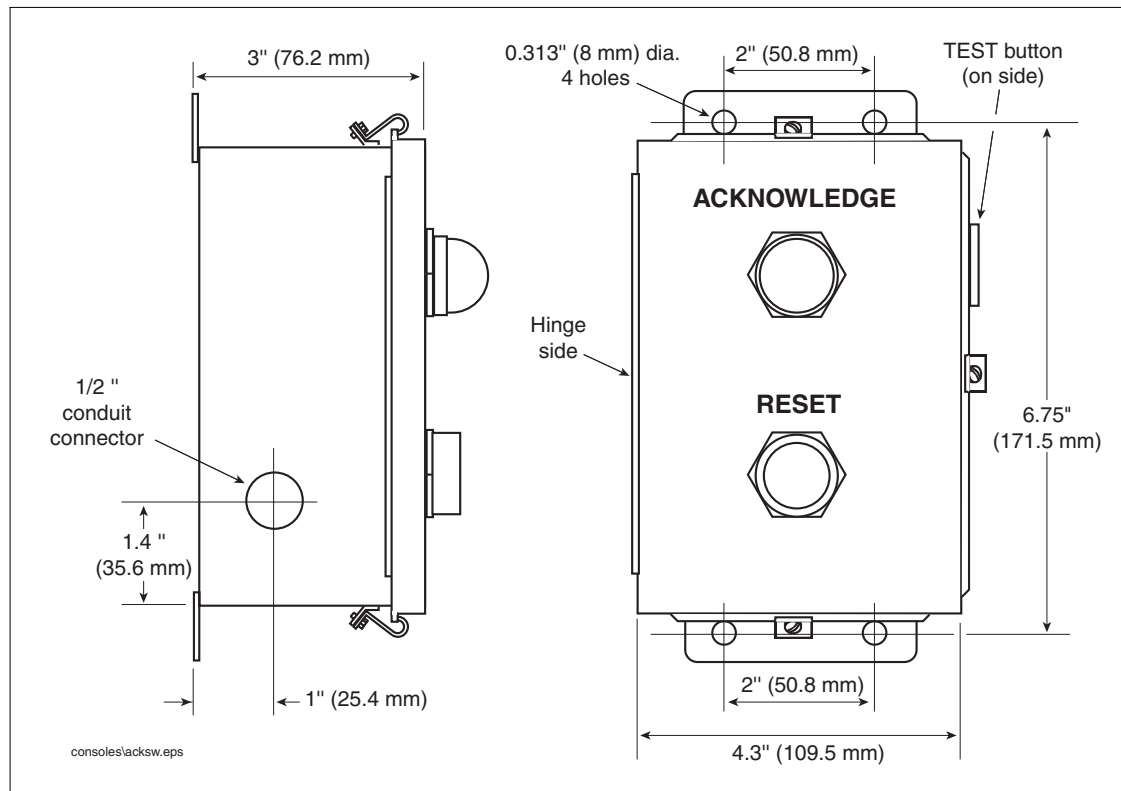


Figure 2. Acknowledgement Switch mounting dimensions

Mounting Instructions

OVERFILL ALARM

1. Select a mounting location where the Overfill Alarm can be seen and heard clearly from the area where the fuel tanks are filled. In addition, consider the ease of routing interconnection conduit.
2. Locate and mark mounting holes using the hole pattern in Figure 1.
3. Mount the Overfill Alarm using the four mounting tabs on the housing.

ACKNOWLEDGEMENT SWITCH

1. Select a mounting location where the Acknowledgement Switch can be easily activated by the tank truck driver. In addition, consider the ease of routing interconnection conduit.
2. Locate and mark mounting holes using the hole pattern in Figure 2.
3. Mount the Acknowledgement Switch using the four mounting tabs on the housing.
4. Install conduit between the Acknowledgement Switch, Overfill Alarm, and TLS Console.

Wiring Instructions

IMPORTANT! Wire used for this installation must have a temperature rating of at least 90°C, be either 14 or 16 AWG, and be color coded. Splicing alarm power with TLS Console power will cause improper operation of the monitor.

Wiring Overfill Alarm with Acknowledgement Switch

1. Pull two wires from the switch to the Overfill Alarm.
2. Pull two wires for line and neutral from the switch to the power panel.
3. Pull one wire from the switch to the TLS Console for connection to the alarm relay.
4. Pull one wire for line from the alarm relay in the TLS Console to the power panel.
5. Turn power Off and connect wiring according to the wiring diagram in Figure 3 and Table 1.

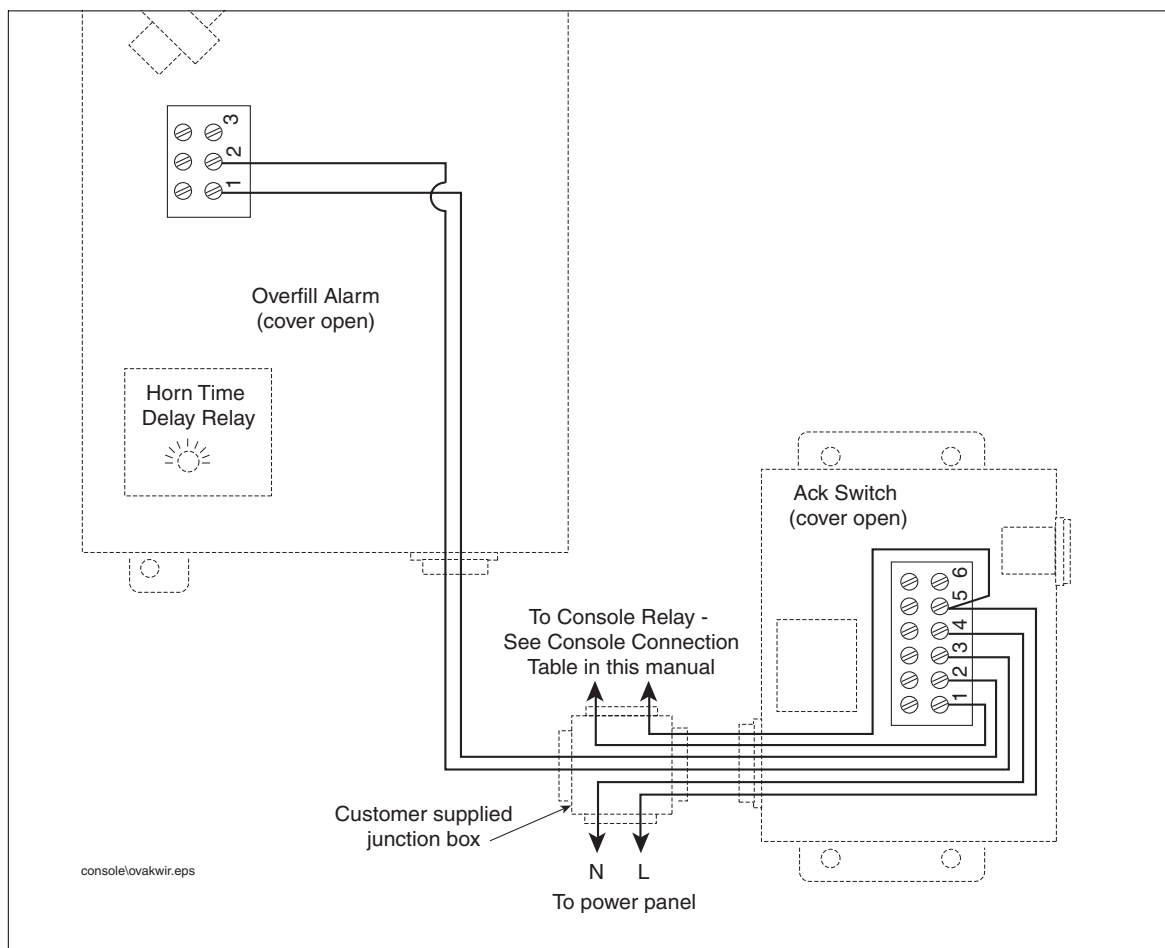


Figure 3. Overfill Alarm/Acknowledgement Switch wiring connections

Wiring Overfill Alarm without Acknowledgement Switch

1. Pull one wire for neutral from the Overfill Alarm to the power panel.
2. Pull one wire from the Overfill Alarm to the console for connection to the alarm relay.
3. Pull one wire for line from the alarm relay in the console to the power panel.
4. Turn power Off and connect wiring according to the wiring diagram in Figure 4 and Table 1.

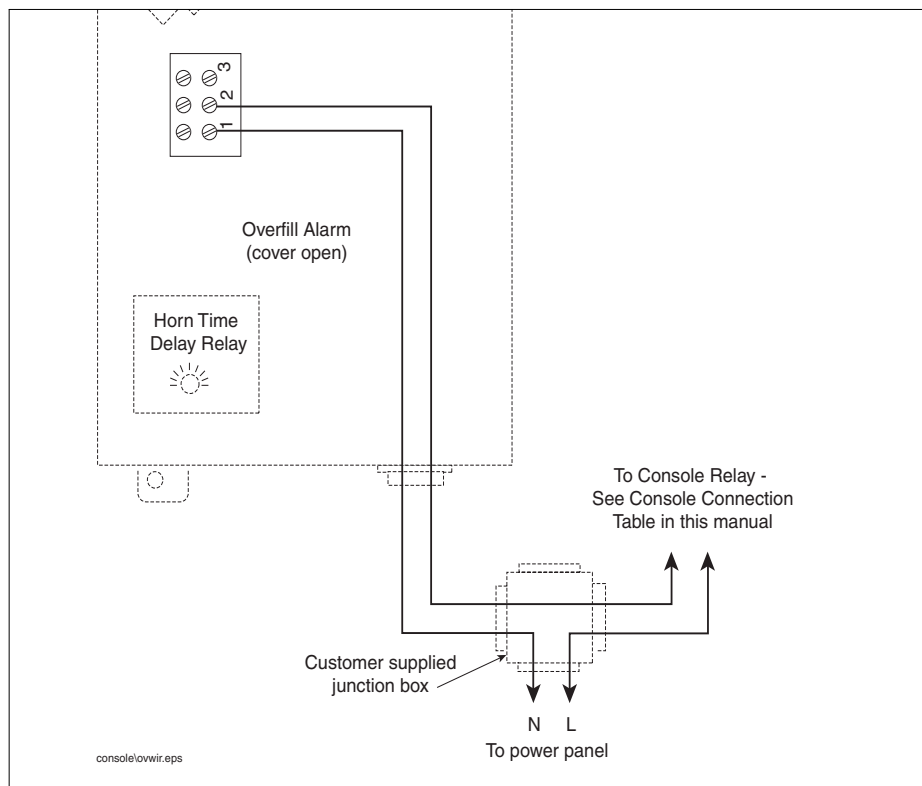


Figure 4. Overfill Alarm only wiring connections

Table 1.- Console Connections

Input	TLS2 or TLS-IB Connection	TLS-50 or TLS-HLD Connection	TLS-300 Output Relay Connection	TLS-350 I/O Combo Relay Connection	TLS-350 4 Relay Output Module Connection	TLS-4XX Overfill Alarm Relay Connector
Overfill Alarm without Acknowledge Switch (see Figure 4)						
Overfill Alarm terminal 2	J6, 1	J5, 1	NO	NO	NO	NO
Line (from power panel)	J6, 2	J5, 2	C	C	C	C
Overfill Alarm with Acknowledge Switch (see Figure 3)						
Ack Switch terminal 1	J6, 1	J5, 1	NO	NO	NO	NO
Ack Switch terminal 5 (line)	J6, 2	J5, 2	C	C	C	C

Setup and Test

Setting Overfill Alarm Horn Delay Time

1. Loosen the four screws that secure the Overfill Alarm cover clamps to the case. Slide the clamps away from the retaining lip on the door. Open the door.
2. Locate the Horn Time Delay Relay (see Figure 3).
3. Adjust the time the horn remains On from 0 to 60 seconds by turning the knob on the relay to the desired setting.
4. Close the door and tighten the four cover screws.

Testing the Overfill Alarm with the Acknowledgement Switch

Turn On power to the Overfill Alarm and Acknowledgement Switch. Depress and hold in the TEST Button on the right side of the switch. The Overfill Alarm horn will sound immediately, and the Overfill Alarm's red light will start flashing. The horn will turn Off at the preset delay time you set above (0 -60 seconds). The red light will continue to flash until the TEST button is released.

Setting the Overfill Alarm Horn's Volume Level

1. Locate the adjustment set screw (1/16" Hex wrench) on the exterior of the Overfill Alarm's horn cover (see Figure 1 on page 3).
2. Turn the adjustment screw counterclockwise to increase the dB level of the horn or clockwise to decrease its dB level.

Testing the Overfill Alarm with the Console

1. With the Overfill Alarm and Acknowledgement Switch (if installed) connected to the console, consult the setup instructions for your console and perform the Output Relay setup procedure to recognize the Overfill Alarm.
2. Turn power Off to the console and the Overfill Alarm. Put a jumper between the two Overfill Alarm relay connections in the console.



OVERFILL ALARM W/O ACKNOWLEDGEMENT SWITCH

1. Reapply power. If the Overfill Alarm is wired properly, the alarm horn should sound immediately followed by the red alarm light flashing.



2. Turn Off power to the console and to the Overfill Alarm. Remove the jumper between the Output Relay connections.



OVERFILL ALARM WITH ACKNOWLEDGEMENT SWITCH

1. Stand by the Acknowledgement Switch and have someone reapply power to the console and Overfill Alarm. If the Overfill Alarm is wired properly, the alarm horn should sound immediately followed by the red alarm light flashing.

2. Press the RESET button on the front of the switch. The alarm horn and red flashing light should shut off. The ACKNOWLEDGED light on the front of the switch should be On. (Pressing the RESET button shuts Off the alarms but does not clear the alarm. The cause of the alarm must be removed before the ACKNOWLEDGED light will turn Off.)



3. Turn Off power to the console and to the Overfill Alarm. Remove the jumper between the console's Output Relay connections.



4. Reapply power to the console and to the Overfill Alarm. The ACKNOWLEDGED light should now be Off because the cause of the alarm (in this case, the shorting jumper) has been removed.



TLS Overfill Alarm Light Replacement Guide

Manual No. 577014-321• Rev A



1. Turn off the electricity, tag and lockout the electrical power switch to the Overfill Alarm box.

WARNING! Electricity must be turned off to the Overfill Alarm box prior to service to avoid personal injury or death!

1. Loosen the 4 door securing clamp screws and slide all of the clamps free of the cover (Figure 1).

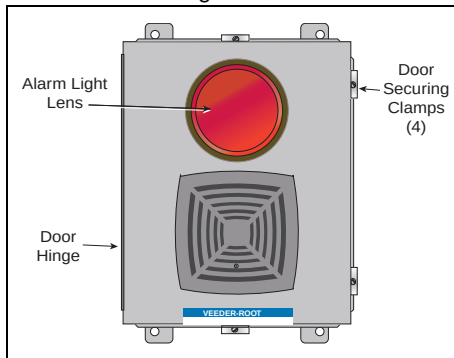


Figure 1. Overfill Alarm Box

2. Open the box door and notice the lamp socket in its mounting plate on the inside of the cover. Remove and set aside the two screws holding the lamp socket mounting plate to the inside of the door (Figure 2).

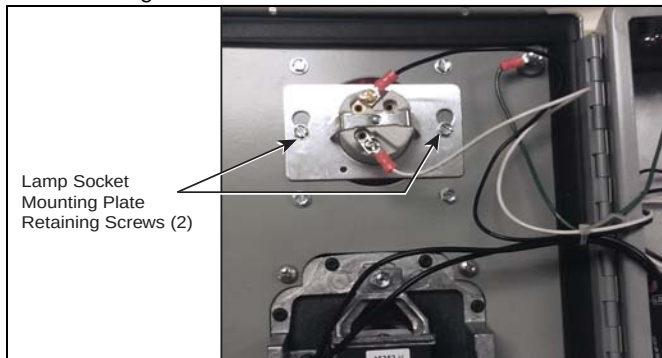


Figure 2. Remove Lamp Socket

3. Carefully remove the lamp socket mounting plate from the door as you guide the lamp bulb through the hole in the door.
4. Unscrew the old light bulb and discard it.
5. Get the replacement LED bulb from the kit# 330020-829 and screw it into the socket.
6. Carefully insert the new bulb through the hole in the door and secure the socket mounting plate to the inside of the door using the two screws removed earlier.

TEST THE REPLACEMENT BULB

Testing the Overfill Alarm Lamp - Using Ack Switch

1. Turn On power to the Overfill Alarm box and Acknowledge (Ack) Switch.

2. Depress and hold in the TEST Button on the right side of the Ack Switch box (Figure 3).

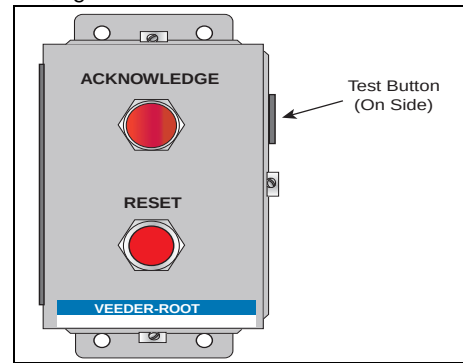


Figure 3. Test Switch Location On Ack Switch Box

3. The Overfill Alarm horn will sound immediately, and the Overfill Alarm's red light will start flashing. The horn will turn off after the preset delay time (0-60 seconds). The red light will continue to flash until the TEST button is released.



Testing the Overfill Alarm Lamp - No Ack Switch

1. With no deliveries about to begin or in progress, turn off, tag and lockout power to the console and to the Overfill Alarm box. Open the console door and locate the relay output terminals that are wired to the Overfill Alarm box. Put a jumper between these two terminals (Figure 4)..

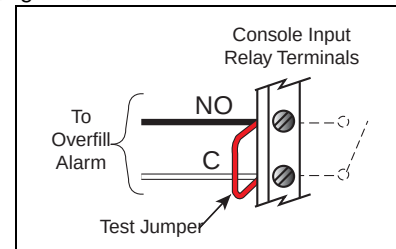


Figure 4. Lamp Test Jumper Console Connection

2. Reapply power to the first to the Overfill Alarm box and then to the console. The Overfill Alarm horn should sound immediately followed by the red Overfill Alarm light flashing.
3.   Turn Off power to the console and to the Overfill Alarm box. Remove the jumper between the Output Relay connections.
4. Close and secure the door of the console.
5. Reapply power to the console and the Overfill Alarm box.

Position-Sensitive Pan/Sump Sensor

Installation Guide

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Contact TLS Systems Technical Support for additional troubleshooting information at 800-323-1799.

DAMAGE CLAIMS / LOST EQUIPMENT

Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

Veeder-Root must be notified of any damages and/or shortages within 30 days of receipt of the shipment, as stated in our Terms and Conditions.

VEEDER-ROOT'S PREFERRED CARRIER

1. Contact Veeder-Root Customer Service at 800-873-3313 with the specific part numbers and quantities that were missing or received damaged.
2. Fax signed Bill of Lading (BOL) to Veeder-Root Customer Service at 800-234-5350.
3. Veeder-Root will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

CUSTOMER'S PREFERRED CARRIER

1. It is the customer's responsibility to file a claim with their carrier.
2. Customer may submit a replacement purchase order. Customer is responsible for all charges and freight associated with replacement order. Customer Service will work with production facility to have the replacement product shipped as soon as possible.
3. If "lost" equipment is delivered at a later date and is not needed, Veeder-Root will allow a Return to Stock without a restocking fee.
4. Veeder-Root will NOT be responsible for any compensation when a customer chooses their own carrier.

RETURN SHIPPING

For the parts return procedure, please follow the appropriate instructions in the "General Returned Goods Policy" pages in the "Policies and Literature" section of the Veeder-Root **North American Environmental Products** price list. Veeder-Root will not accept any return product without a Return Goods Authorization (RGA) number clearly printed on the outside of the package.

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Introduction

This manual contains procedures for the installation or replacement of the Veeder-Root Position-Sensitive Pan/Sump Sensor.

This manual assumes field wiring has been run from the console to the pan/sump junction box in which the sensor will be installed following instructions in the appropriate console's site prep manual.

Following sensor installation, you will need to setup the console to monitor the sensor.

Contractor Certification Requirements

Veeder-Root requires the following minimum training certifications for contractors who will install and setup the equipment discussed in this manual:

Installer (Level 1) Certification: Contractors holding valid Installer Certification are approved to perform wiring and conduit routing; equipment mounting; probe, sensor and carbon canister vapor polisher installation; wireless equipment installation; tank and line preparation; and line leak detector installation.

ATG Technician (Level 2/3 or 4) Certification: Contractors holding valid ATG Technician Certifications are approved to perform installation checkout, startup, programming and operations training, system tests, troubleshooting and servicing for all Veeder-Root Series Tank Monitoring Systems, including Line Leak Detection. In addition, Contractors with the following sub-certification designations are approved to perform installation checkout, startup, programming, system tests, troubleshooting, service techniques and operations training on the designated system.

- Wireless 2
- Tall Tank

Warranty Registrations may only be submitted by selected Distributors.

Product Marking Information

RELATED DOCUMENTS

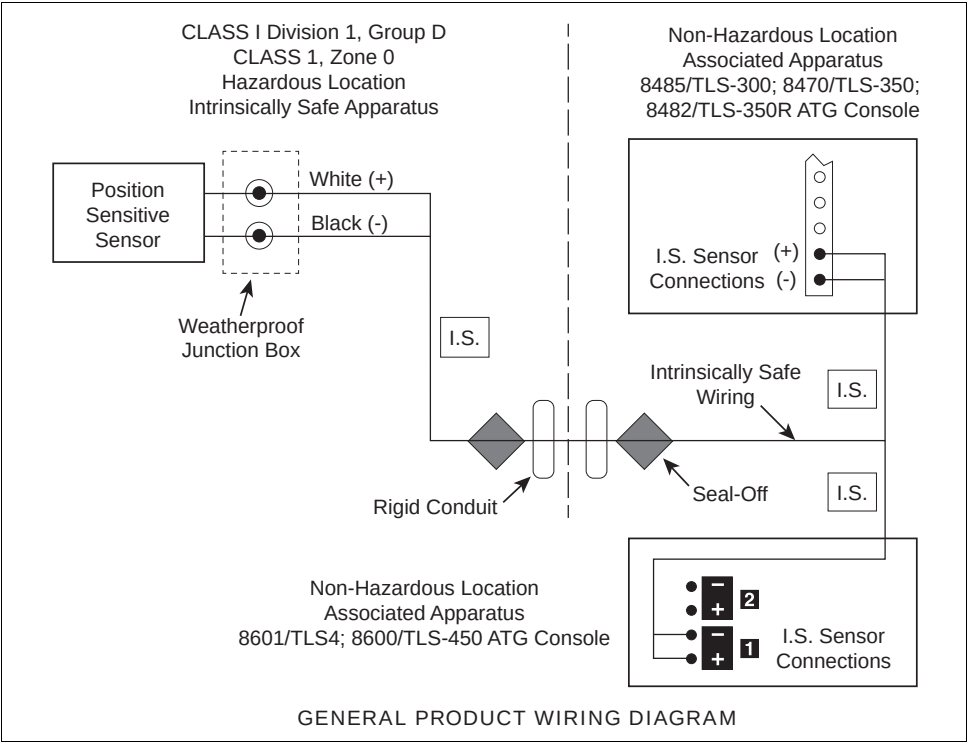
Documents Required to Install Equipment

This intrinsically safe apparatus is only for use as part of a Veeder-Root Automatic Tank Gauging System (ATG Console with probes and sensors). To install intrinsically safe apparatus, use the specific control drawing that appears on the nameplate of the applicable associated apparatus (ATG Console):

Equipment	UL/cUL Control Drawing Document No.
Associated Apparatus	
TLS-450/8600	331940-008
TLS-350, TLS-350R	331940-011
TLS-300	331940-013
TLS4/8601	331940-018

The control drawings contain information related to the correct installation of the overall intrinsically Safe System. This includes information such as maximum number of apparatus, specific apparatus allowed in the system,

maximum cable lengths, references to codes, proper grounding and so on. Control drawings can be found on the accompanying Compact Disk (TECH DOCS CD) or on the internet at veeder.com under SUPPORT; VR TECHNICAL DOCUMENTS; DRAWINGS.



Product Label Contents

**VEEDER-ROOT**
TM

I.S. CIRCUIT FOR HAZLOC SENSOR
F/N 794380-XXX
S/N XXXXXX

CL I, DIV. 1, GP.D
CL I, ZONE 0
AEx ia IIA
Ex ia IIA
TC=T4
SECURITE INTRINSEQUE

-40°C ≤ Ta ≤ +60°C

MANUAL NO. 577013-809


24G6
c UL us
LISTED

Safety Warnings

 WARNING	
    	This product is to be installed and operated in the highly combustible environment of a gasoline storage tank where flammable liquids and explosive vapors may be present. FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH. 1. Read and follow all instructions in this manual, including all safety warnings to protect yourself and others from serious injury, explosion, or electrical shock. 2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes. 3. To protect yourself and others from being struck by vehicles, block off your work area during installation or service. 4. Do not alter or modify any component or substitute components in this kit. 5. Warning! Substitution of components may impair intrinsic safety. 6. Field wiring to the Sensor must not share a conduit with any non-intrinsically safe device's wiring. 7. Warning! To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing. 8. Before installing or taking the unit into a hazardous area, earth the unit in a safe area to remove any static charge. Then immediately transport the unit to the installation site. Do not rub or clean the unit prior to installation. Cleaning is not required under normal service conditions. Do not rub or clean the unit after installation. If the unit is not fixed to a known earth point when installed, ensure that a separate earth connection is made to prevent the potential of a static discharge. When fitting or removing the unit, use of anti-static footwear or clothing is required. 9. Materials used in the construction of this device do not contain, by mass, more than 10% in total of aluminum, magnesium, zirconium and titanium or 7.5% in total of magnesium, titanium and zirconium.

Safety Precautions

The following safety symbols are used throughout this manual to alert you to important safety hazards and precautions.

 EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.	 FLAMMABLE Fuels and their vapors are extremely flammable.
 ELECTRICITY High voltage exists in, and is supplied to, the device. A potential shock hazard exists.	 TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.
 WEAR EYE PROTECTION Fuel spray from residual pressure in the lines can cause serious eye injuries. Always wear eye protection.	 INJURY Careless or improper handling of materials can result in bodily injury.

 GLOVES Wear gloves to protect hands from irritation or injury.	 USE SAFETY BARRICADES Unauthorized people or vehicles in the work area are dangerous. Always use safety cones or barricades, safety tape, and your vehicle to block the work area.
 READ ALL RELATED MANUALS Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.	

Equipment Needed for Installation

1. Position-Sensitive Sensor - Form No. 794380-323, includes 12-foot cable w/ connector one end.
2. Wiring Kit - Part No. 312020-990 (Table 1).

Table 1. Wiring Kit - Part No. 312020-990

Item	Description	Part No.	Qty.
1	Wire Nut	576008-461	2
2	Sealing Pack	514100-304	1
3	Cord Grip	331028-011	1
4	Tie Wrap	510901-337	2

3. Optional - Universal Sensor Mounting kit - Part No. 330020-012.
4. Optional - 20-foot cable w/ connector one end - Part No. 331102-001

Installation

Installation Requirements

1. The sensor should rest in the lowest point of the pan or sump and completely compress the position indicator or you will have a 'Sensor Out' alarm (see example installations).
2. The sensor should be mounted in a true vertical position to ensure proper operation of the sensor.
3. The sensor should be mounted such that you can pull the sensor straight out of the pan/sump if service is required.

Installation Procedure

IMPORTANT! Do not install the sensor if there is any liquid in the dispenser pan. Failure to comply can result in equipment damage or undetected potential environmental and health hazards.



1. Turn OFF power to the TLS Console.
2. Make sure no liquid exists in the pan/sump.
3. Figure 1 through Figure 3 show sensor installation examples using rigid conduit to the console. However, direct burial cable may have been used from the junction box to the console. Also, the examples make use of the optional Universal Sensor Mounting kit. Other mounting methods, such as a tube in which the sensor is inserted, are acceptable if the installation requirements noted above are met.

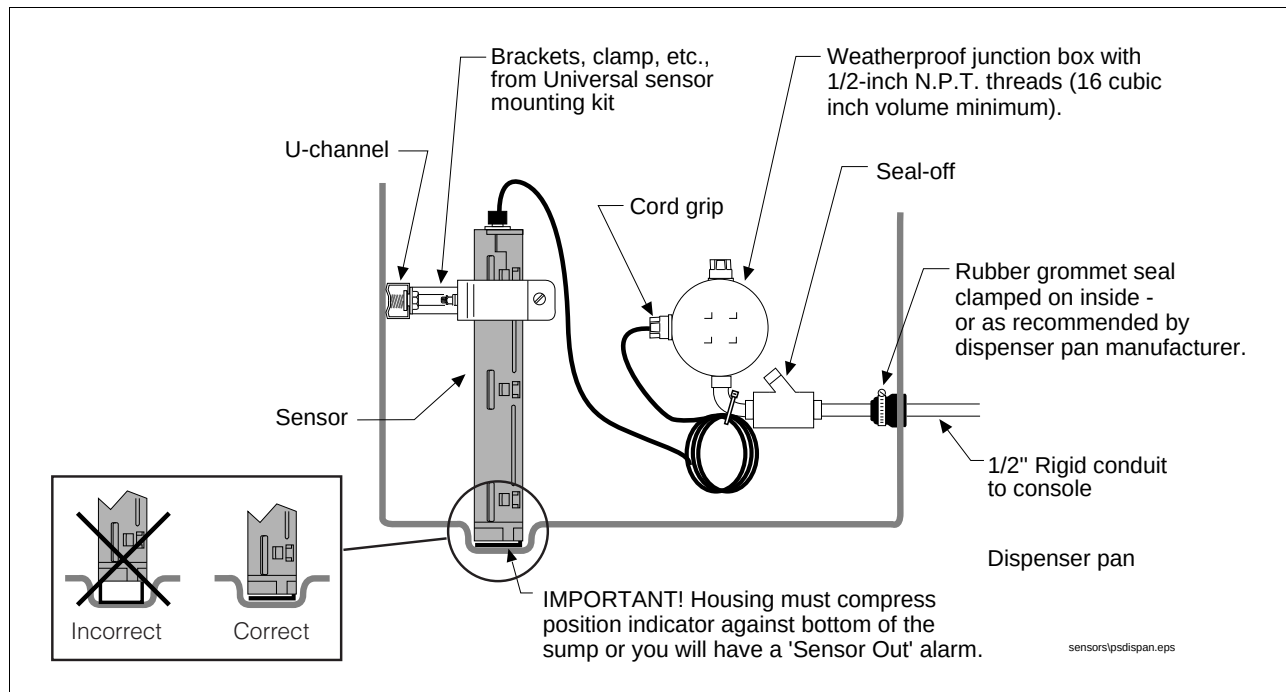


Figure 1. Example Dispenser Pan Installation

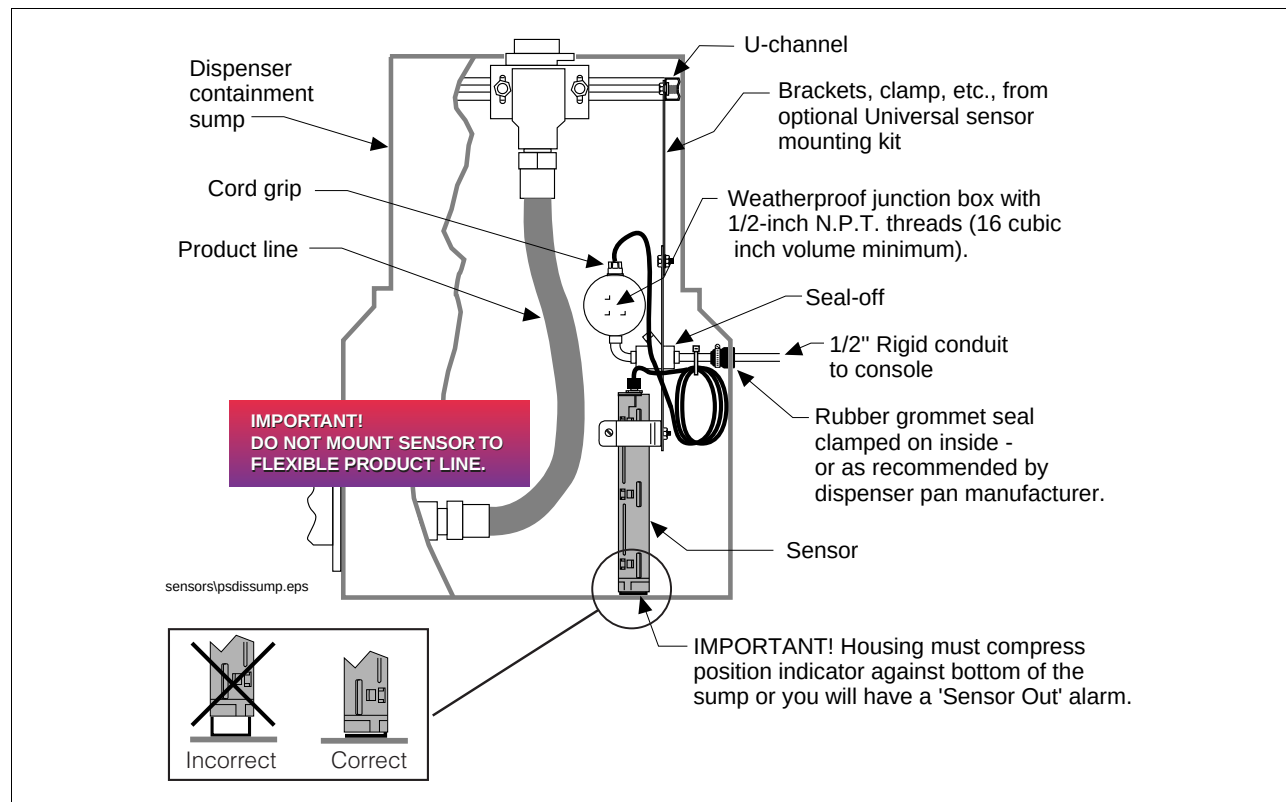


Figure 2. Example Dispenser Containment Sump Installation

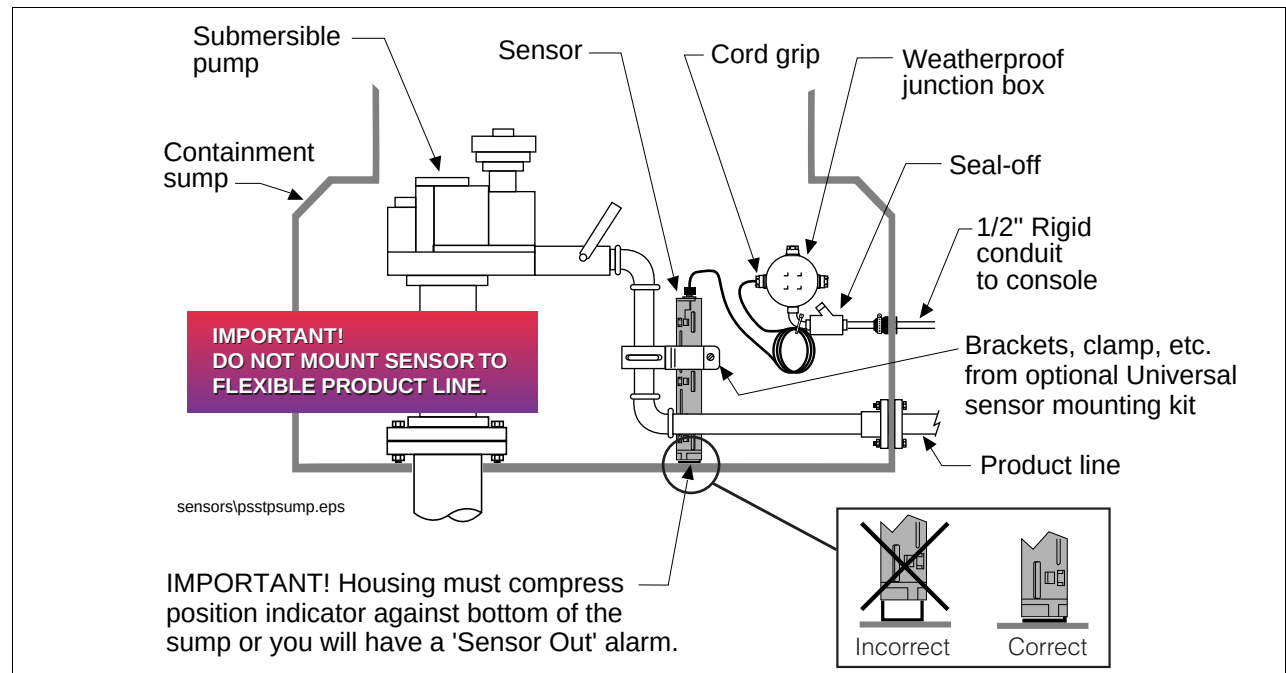


Figure 3. Example STP Containment Sump Installation

SENSOR FIELD WIRING

1. Screw the connector on the end of the sensor cable onto the plug in the top of the sensor housing.
2. Install the Cord Grip supplied with the wiring kit in the pan/sump junction box in which the field wiring from the console terminates.
3. Coil up the excess cable and tie wrap it out of the way. Feed the two-lead end of the sensor cable through the cord grip in the junction box. Tighten the cord grip nut to ensure a watertight seal at the cable entry.
4. Using wire nuts, connect the two-wire cable to the field wires from the console as shown in Figure 4. and seal connections in epoxy pack as shown in Figure 5.
5. Push the epoxy sealed bag into the junction box. Replace and tighten the junction box cover.

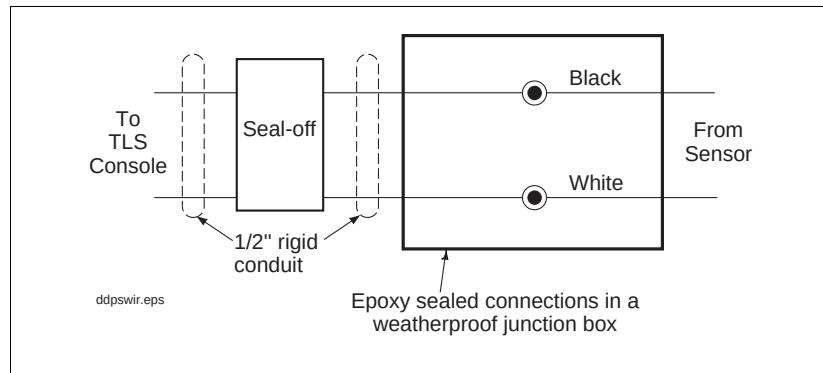


Figure 4. Sensor Wiring Connections (No Polarity)

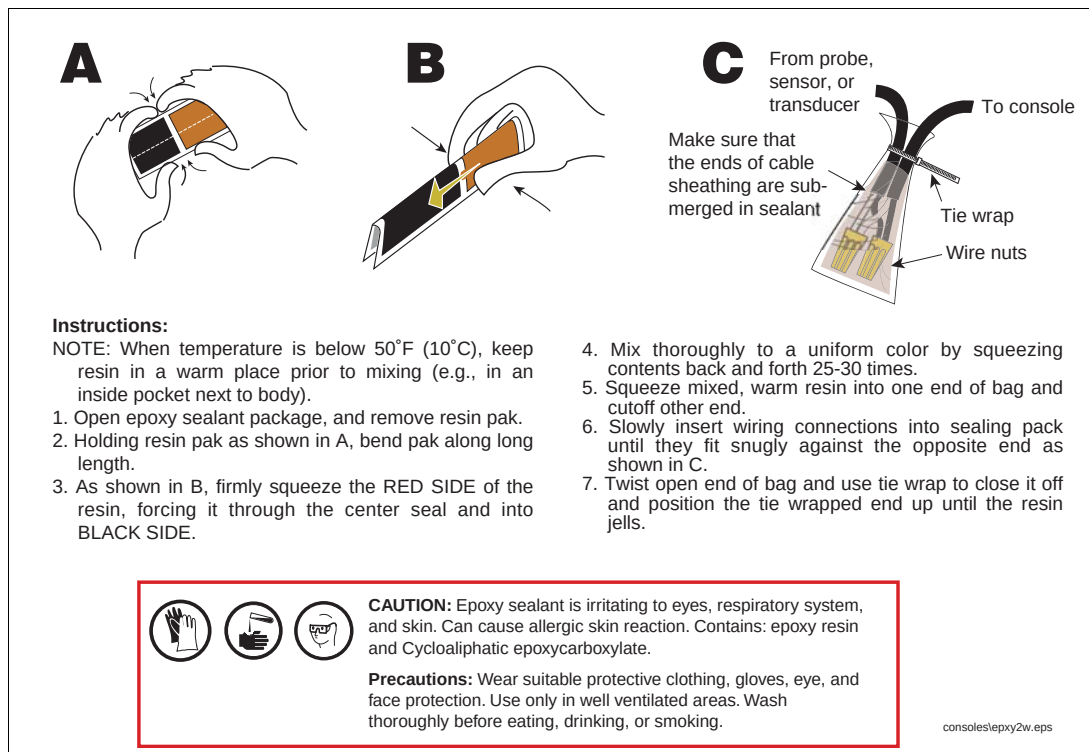


Figure 5. Epoxy Sealing Two-Wire Connections



Vacuum Sensors

Installation Guide

Notice

Veeder-Root makes no warranty of any kind with regard to this publication, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

Veeder-Root shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this publication.

Veeder-Root reserves the right to change system options or features, or the information contained in this publication.

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Contact TLS Systems Technical Support for additional troubleshooting information at 800-323-1799.

DAMAGE CLAIMS / LOST EQUIPMENT

Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

Veeder-Root must be notified of any damages and/or shortages within 30 days of receipt of the shipment, as stated in our Terms and Conditions.

VEEDER-ROOT'S PREFERRED CARRIER

1. Contact Veeder-Root Customer Service at 800-873-3313 with the specific part numbers and quantities that were missing or received damaged.
2. Fax signed Bill of Lading (BOL) to Veeder-Root Customer Service at 800-234-5350.
3. Veeder-Root will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

CUSTOMER'S PREFERRED CARRIER

1. It is the customer's responsibility to file a claim with their carrier.
2. Customer may submit a replacement purchase order. Customer is responsible for all charges and freight associated with replacement order. Customer Service will work with production facility to have the replacement product shipped as soon as possible.
3. If "lost" equipment is delivered at a later date and is not needed, Veeder-Root will allow a Return to Stock without a restocking fee.
4. Veeder-Root will NOT be responsible for any compensation when a customer chooses their own carrier.

RETURN SHIPPING

For the parts return procedure, please follow the appropriate instructions in the "General Returned Goods Policy" pages in the "Policies and Literature" section of the Veeder-Root **North American Environmental Products** price list. Veeder-Root will not accept any return product without a Return Goods Authorization (RGA) number clearly printed on the outside of the package.

WARRANTY

Please see next page, iii.

Warranty

TLS-350 MONITORING SYSTEMS.

We warrant that this product shall be free from defects in material and workmanship for a period of one (1) year from the date of installation or twenty-four (24 months) from the date of invoice, whichever occurs first. During the warranty period, we or our representative will repair or replace the product, if determined by us to be defective, at the location where the product is in use and at no charge to the purchaser. LAMPS AND FUSES ARE NOT COVERED UNDER WARRANTY.

We shall not be responsible for any expenses incurred by the user.

This warranty applies only when the product is installed in accordance with Veeder-Root's specifications, and a Warranty Registration and Checkout Form has been filed with Veeder-Root by an authorized Veeder-Root Distributor. This warranty will not apply to any product which has been subjected to misuse, negligence, accidents, systems that are misapplied or are not installed per Veeder-Root specifications, modified or repaired by unauthorized persons, or damage related to acts of God.

If "Warranty" is purchased as part of the Fuel Management Service, Veeder-Root will maintain the equipment for the life of the contract in accordance with the written warranty provided with the equipment. A Veeder-Root Fuel Management Services Contractor shall have free site access during Customer's regular working hours to work on the equipment. Veeder-Root has no obligation to monitor federal, state or local laws, or modify the equipment based on developments or changes in such laws.

MODULES, KITS, OTHER COMPONENTS (PARTS PURCHASED SEPARATE OF A COMPLETE CONSOLE).

We warrant that this product shall be free from defects in material and workmanship for a period of fifteen (15) months from date of invoice. We will repair or replace the product if the product is returned to us; transportation prepaid, within the warranty period, and is determined by us to be defective. This warranty will not apply to any product which has been subjected to misuse, negligence, accidents, systems that are misapplied or are not installed per Veeder-Root specifications, modified or repaired by unauthorized persons, or damage related to acts of God.

We shall not be responsible for any expenses incurred by the user.

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Introduction

These instructions describe the installation of Veeder-Root Vacuum sensors in a STP containment sump to monitor the interstitial space of:

- Double-wall product lines
- Double-wall vapor return lines
- Double-wall tank vent lines
- Double-wall tanks*
- Double-wall containment sumps

*NOTE: Double-walled tanks must provide access for installation of a liquid sensor at the lowest point of the interstice.

Product Marking Information

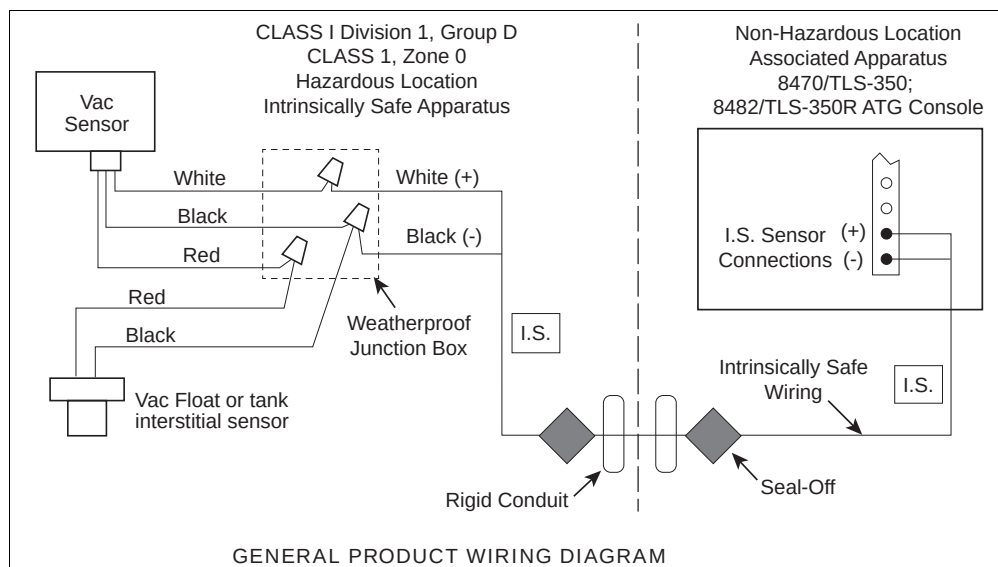
RELATED DOCUMENTS

Documents Required to Install Equipment

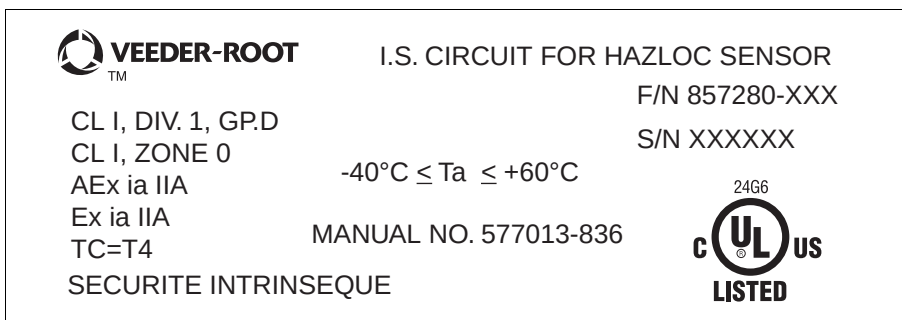
This intrinsically safe apparatus is only for use as part of a Veeder-Root Automatic Tank Gauging System (ATG Console with probes and sensors). To install intrinsically safe apparatus, use the specific control drawing that appears on the nameplate of the applicable associated apparatus (ATG Console):

Associated Apparatus	UL/cUL Control Drawing Number
TLS-350, TLS-350R	331940-011

The control drawings contain information related to the correct installation of the overall intrinsically Safe System. This includes information such as maximum number of apparatus, specific apparatus allowed in the system, maximum cable lengths, references to codes, proper grounding and so on. Control drawings can be found on the accompanying Compact Disk (TECH DOCS CD) or on the internet at veeder.com under SUPPORT; VR TECHNICAL DOCUMENTS; DRAWINGS.



Product Label Contents



Safety Warnings

To protect yourself and your equipment, observe the following warnings and important information:

WARNING	
 	This product is to be installed in systems operating near locations where highly combustible fuels or vapors may be present. FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH. 1. Read and follow all instructions in this manual, including all safety warnings to protect yourself and others from serious injury, explosion, or electrical shock. 2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes. 3. To protect yourself and others from being struck by vehicles, block off your work area during installation or service. 4. Turn off, tag, and lockout power to the STP before connecting or servicing wiring to the STP. 5. Do not alter or modify any component or substitute components in this kit. 6. Warning! Substitution of components may impair intrinsic safety. 7. Field wiring to the Sensor must not share a conduit with any non-intrinsically safe device's wiring. 8. Warning! To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing. 9. Before installing or taking the unit into a hazardous area, earth the unit in a safe area to remove any static charge. Then immediately transport the unit to the installation site. Do not rub or clean the unit prior to installation. Cleaning is not required under normal service conditions. Do not rub or clean the unit after installation. If the unit is not fixed to a known earth point when installed, ensure that a separate earth connection is made to prevent the potential of a static discharge. When fitting or removing the unit, use of anti-static footwear or clothing is required. 10. Materials used in the construction of this device do not contain, by mass, more than 10% in total of aluminum, magnesium, zirconium and titanium or 7.5% in total of magnesium, titanium and zirconium.

NOTE Failure to install this product in accordance with its instructions and warnings will result in voiding of all warranties with this product.

Safety Symbols

The following safety symbols are used throughout this manual to alert you to important safety hazards and precautions.

 EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.	 FLAMMABLE Fuels and their vapors are extremely flammable.
 ELECTRICITY High voltage exists in, and is supplied to, the device. A potential shock hazard exists.	 TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.
 WARNING Heed the adjacent instructions to avoid equipment damage or personal injury.	 INJURY Careless or improper handling of materials can result in bodily injury.
 WEAR EYE PROTECTION Wear eye protection when working with pressurized fuel lines or epoxy sealant to avoid possible eye injury.	 GLOVES Wear gloves to protect hands from irritation or injury.
 USE SAFETY BARRICADES Unauthorized people or vehicles in the work area are dangerous. Always use safety cones or barricades, safety tape, and your vehicle to block the work area.	 READ ALL RELATED MANUALS Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.

Before You Begin

Prior to backfilling the tank top (i.e. covering the lines, UDC, etc.) the contractor is strongly advised to test all of the secondary containments for leaks, and to monitor the vacuum during the backfill process. Any leakage detected must be repaired to prevent future vacuum system alarms.



CAUTION: Do not exceed equipment manufacturer's recommended vacuum levels!



While it is common practice to use an independent vacuum source to provide the initial vacuum, you must ensure that pump lubricating oil and any other foreign substance is not introduced into the Secondary Containment Vacuum Sensor (SCVS) system. Failure to do so may damage the SCVS system and will void warranty.

Hardware Requirements

- TLS-350/350R with version 24C or later software
- For proper STP operation, an in-tank Mag Probe is required for TLS Systems without electronic Line Leak (PLLD or WPLLD).
- At least one Smart Sensor with Pressure Sensor Module
- Line leak (PLLD or WPLLD), or w/o line leak, a Pump Sense and a 4-Relay module is required for STP control

- STP siphon port with Siphon Check Valve (V-R P/N 188-241-5) installed. An external Siphon Check Valve (V-R P/N 188-241-5) must be used when making a vacuum source connection between the SCVS system sensors and the siphon port cartridge for the following STPs including Red Jacket Standard, Red Jacket Quantum and FE pumps.

NOTE: Only V-R supplied vacuum hose (V-R P/N 332310-001, -002, -003) is approved for use with the SCVS system).

- Schrader Fitting 576008-672 (optional for North American installations; not required for EU - fitting is included)
- Siphon manifolded tank requirements:
 - The Red Jacket STP requires a secondary siphon assembly (V-R P/N 410151-001).
 - The Quantum STP comes with two siphons as standard equipment - no additional parts are required.
 - FE pumps require a secondary siphon kit (FE P/N 402-507-930).

Available Kits

Vac sensor kits are available in several configurations:

1, 2, 3 or 4 Vac Sensor/Vac Float pre-assembled kits - includes mounting hardware, tubing/connections, and cables (for one containment sump)

- 1, 2, 3 or 4 Vac Sensor kit w/steel float
- 1, 2, 3 or 4 Vac Sensor kit w/fiberglass 4', 6', 8', or 10' float (includes relief valve)
- 1,2, 3 or 4 Vac Sensor kit w/o tank interstitial sensor
- 1, 2, 3 or 4 Vac Sensor kits w/o tank float for EU installations (ATEX approved)

Individual kits (requires Vac Sensor/Vac Float field assembly)

Note: For best and fastest installation, purchase of pre-assembled kits is recommended.

- Mounting kit - 1 required per containment sump
- Secondary piping vacuum monitoring kit - 1 each required for product line, vapor recovery line, or containment sump interstice monitoring - includes mounting hardware, tubing/connections, and cables
- Interstitial sensor kit for steel tank - includes Vac Sensor, mounting hardware, tubing/connections, riser cap, 3-way valve and cables
- 4', 6', 8', or 10' diameter fiberglass tank Interstitial sensor kit - includes Vac Sensor, mounting hardware, tubing/connections, riser cap, relief valve, 3-way valve and cables. NOTE: you do not need to order an additional relief valve for a fiberglass tank installation.

Installation

Overview

A simplified Veeder-Root vacuum sensor installation in an STP containment sump is shown in Figure 1. Vac Sensor (VS) and Vac Float (VF) modules are assembled in a housing which is shown in Figure 2. A separate mounting bracket (see Figure 2) is easily attached to the STP riser to support the Vac Sensor housing. Approximately 12 inches (304.8mm) of clearance is required below the pump manifold for the Vac Sensor components. Final vacuum connections are made once the housing and bracket are in place. A 1/4" NPT port into the interstitial space of the double-wall vapor return line, double-wall product line, and/or double-wall containment sump must be accessible in the containment sump. For installations requiring tank interstice monitoring, a riser must be in the same containment sump for the tank interstitial sensor. Field wiring connections of the Vac Sensor components are sealed in a customer supplied containment sump junction box (JB).

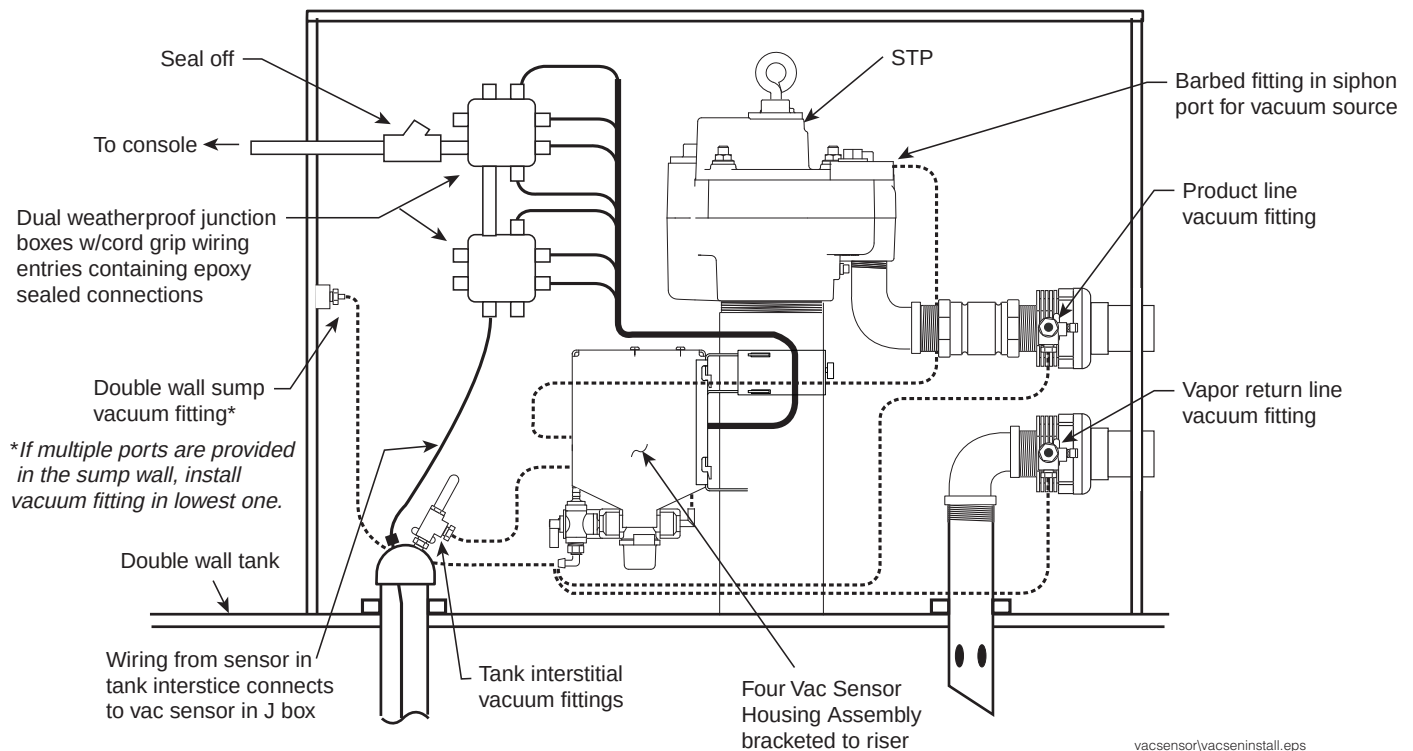


Figure 1. Installation example of Four Vac Sensor w/tank interstitial monitoring



CAUTION! Use only the materials specified in this manual during installation. Use of any other materials or lubricants may damage the SCVS system and will void warranty. Lubricate fittings only with soapy water - do not use any other materials.

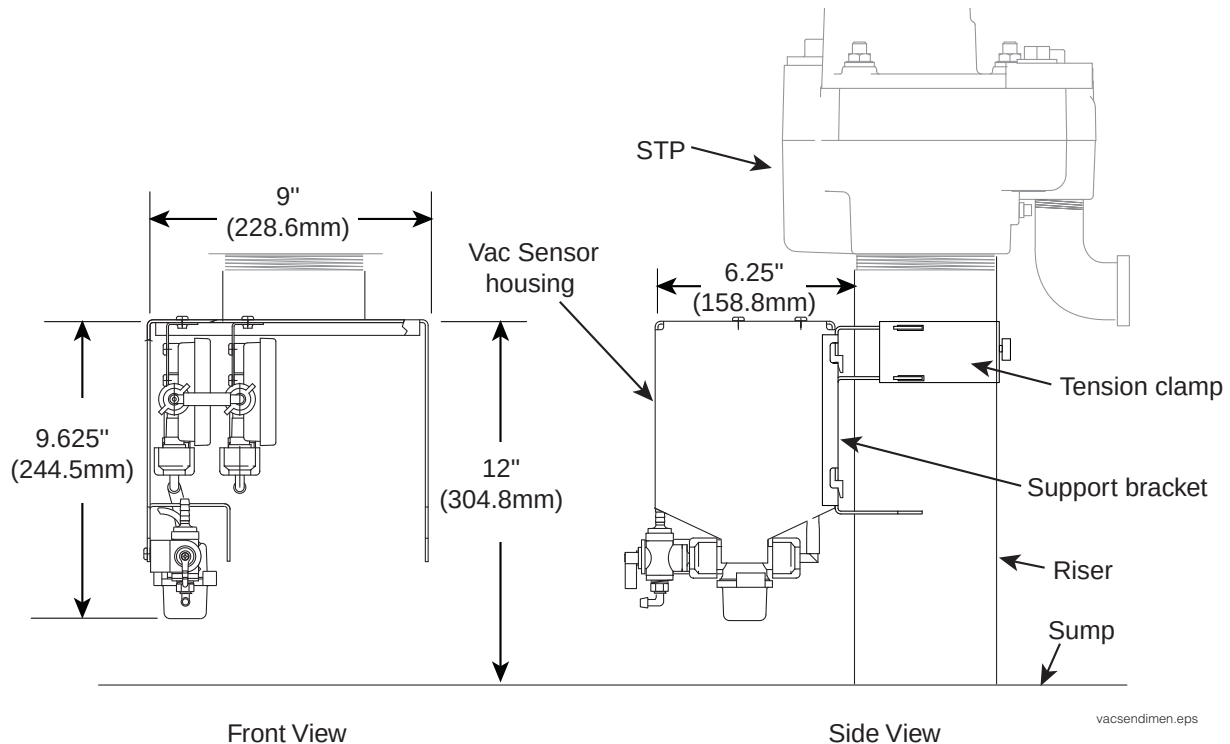


Figure 2. Vac Sensor Assembly Dimensions

Field Assembling Vac Sensor/Vac Float modules

If you are field assembling the Vac Sensor/Vac Floats into the Vac Sensor housing continue to Step 1. If you are installing the pre-assembled 2, 3, or 4 Vac Sensor kit go to "Installing Vac Sensor Housing Support Bracket" on page 9.

1. Get the Vac Sensor modules and brackets from each of the secondary piping vacuum monitoring kits. If a tank interstice is being monitored, also get the Vac Sensor module and bracket from that kit.
2. Get the Vac Sensor housing from the mounting kit and attach each of the Vac Sensors (up to 4) to the top of the housing using #10 x 3/8" self-tapping screws as shown in Figure 3. Mount the Vac Sensors with the 'STP Siphon' labeled port facing the front of the housing.
3. For Vac Sensors requiring Vac Floats, continue to Step 4. For the Vac Sensor monitoring the tank interstice skip to step.
4. Get the Vac Floats, support brackets, plastic valves and #10 x 1/2" self-tapping screws from the secondary piping vacuum monitoring kits.

If you are not monitoring a tank interstice, there is a maximum of two left-hand Vac Sensor/Float mounting positions and two right-hand Vac Sensor/Float mounting positions in the Vac Sensor Housing (Figure 3). If a tank interstice is being monitored, then one of the four Vac Sensors will have no Vac Float attached.

5. Get the plastic valves, barbed elbows, tapered bushings and cord grip nuts from the Vac Float kits. Insert bushings and screw cord grip nuts into the two ports of the Vac Float. Insert a valve into one port and a barbed elbow into the other port of each Vac Float. Orient elbow and valves in Vac Floats as shown in Figure 4 then tighten nuts to secure the fittings.

6. Get the angled support brackets from each Vac Float kit. Depending on the Vac Float's position in the housing, orient the bracket so that when you slip the large hole in the front of the bracket over the valve handle, the two holes in the side of the bracket are in line with the two holes in the side of the Vac Float body as shown in Figure 3. Secure the Vac Float assembly to the housing using two #10 x 1/2" self-tapping screws which screw into the two holes in the side of the Vac Float.

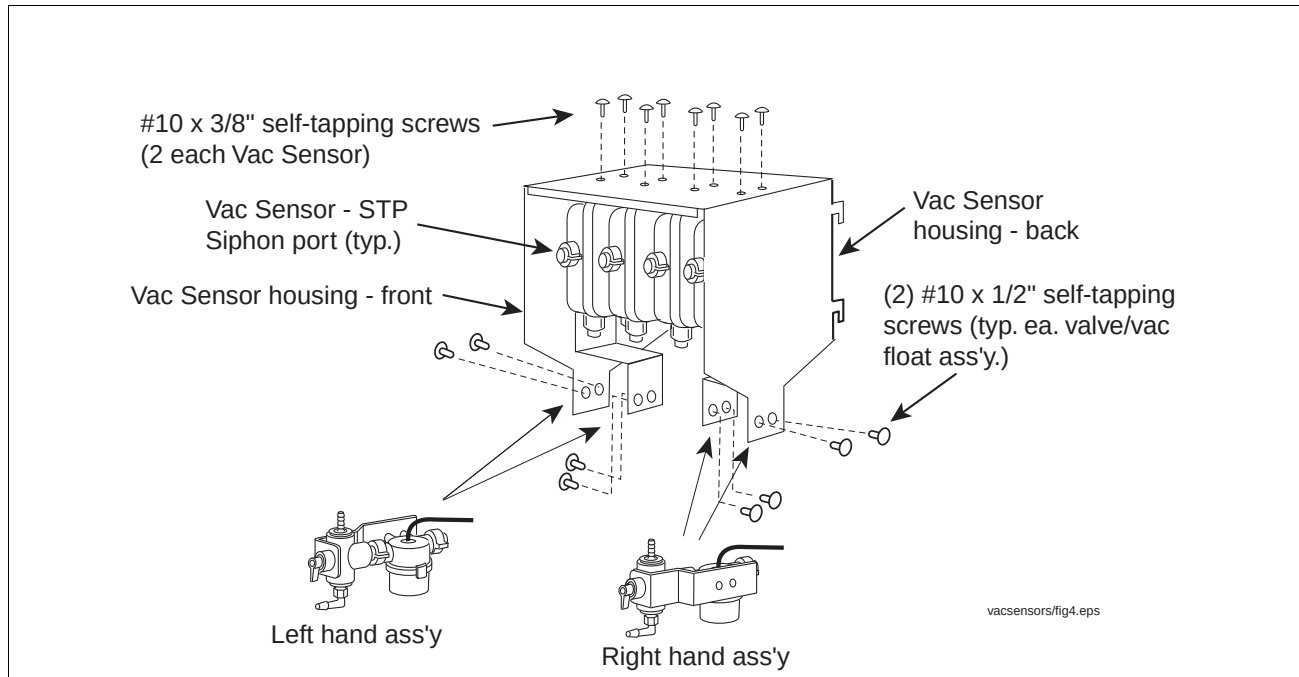


Figure 3. Attaching four Vac Sensors/Floats to the housing

7. Get barbed elbows, tapered bushings and cord grip nuts (1 each for each Vac Sensor) from the secondary piping vacuum monitoring kits. Insert a tapered bushing and barbed elbow in the bottom port labeled VAC TEST (embossed on cover) of one of the Vac Sensors. Orient the elbows as shown in the Figure 4, then tighten the cord grip nut.
8. From the kit's 1/4" tubing, cut a piece of the 1/4" tubing and connect the VAC TEST port in one of the Vac Sensors to the rear elbow fitting in one of the Vac Floats (preferably the one under it). Keep the connection kink free and as short as possible (see Figure 4). Repeat this procedure for each additional Vac Sensor/Vac Float pair. Skip to Step 10.
9. If the tank interstice is monitored, get a barbed elbow, tapered bushing and cord grip nut (1 each) from the Vac Sensor tank interstice monitoring kit. Insert a tapered bushing and barbed elbow into the bottom port labeled VAC TEST (embossed on cover) of the Vac Sensor without a Vac Float. Orient the elbow as shown in the Figure 5, then tighten the cord grip nut.
10. Get the barbed tees, tapered bushings, cord grip nuts and one barbed elbow from the vacuum monitoring kits.
11. Looking at the front of the Vac Sensor housing, insert the elbow in the side vacuum port bushing labeled 'STP Siphon' (on the Vac Sensor cover) in the Vac Sensor closest to the side of the housing. Orient the elbow so that the open half is horizontal and pointing to the other Vac Sensors (see Figure 7). Insert a tee in the same vacuum port in each of the other Vac Sensors. Orient the tees in the horizontal position, except the Vac Sensor closest to the other side of the Vac Sensor housing. Remove this tee and orient it so that one end points toward the other tees and one end points out at you then insert the inlet end into the bushing. Measure and cut a piece of the tubing approximately 1-3/4" (44.5mm) long to connect each of the tees and elbow as

shown in Figure 7. Once the tubing pieces are cut, remove the barbed elbows and tees to push on the tubing pieces, then reinsert this connected assembly back into the Vac Sensor bushings and tighten the nuts.

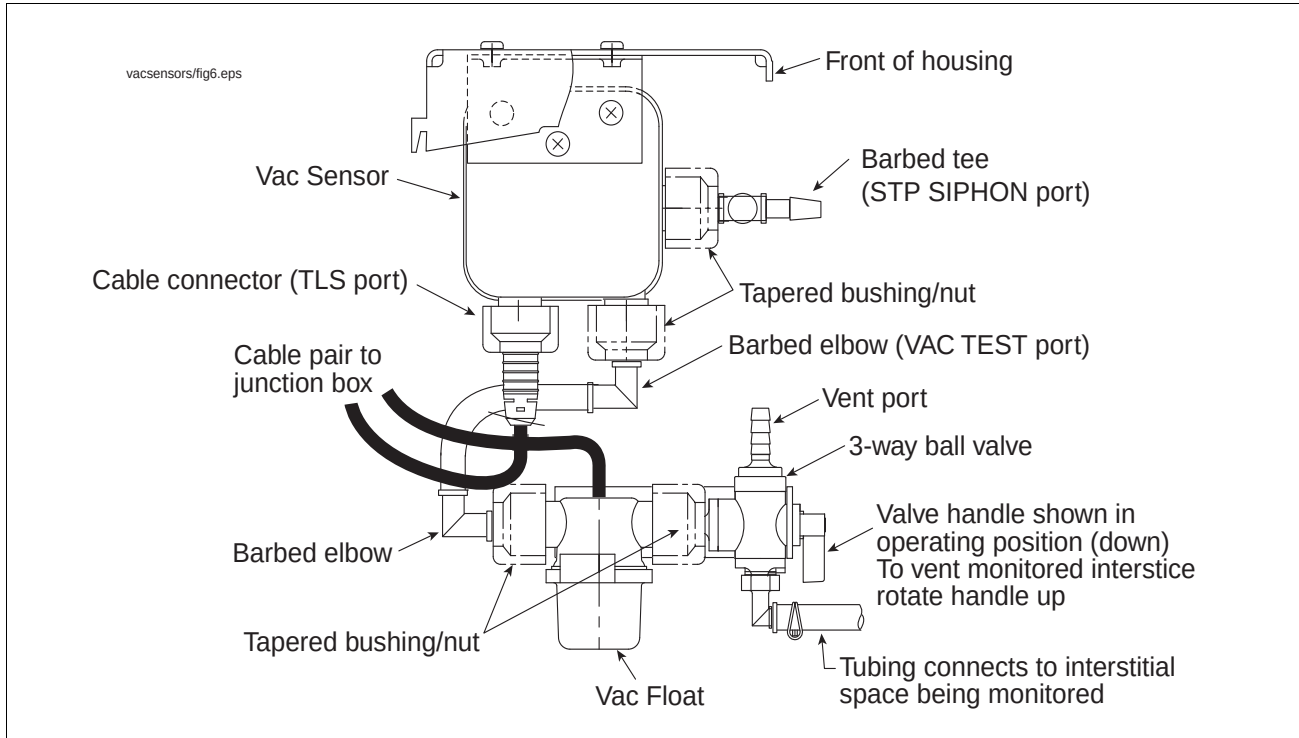


Figure 4. Vac Sensor/Vac Float tubing connections

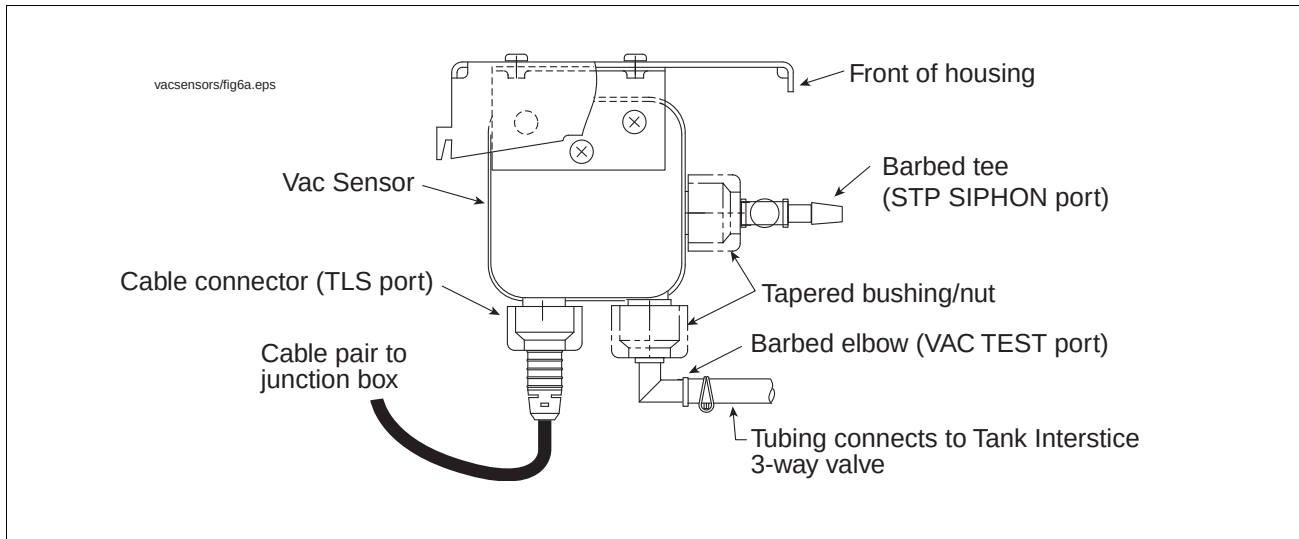


Figure 5. Vac Sensor /tank interstice tubing connections

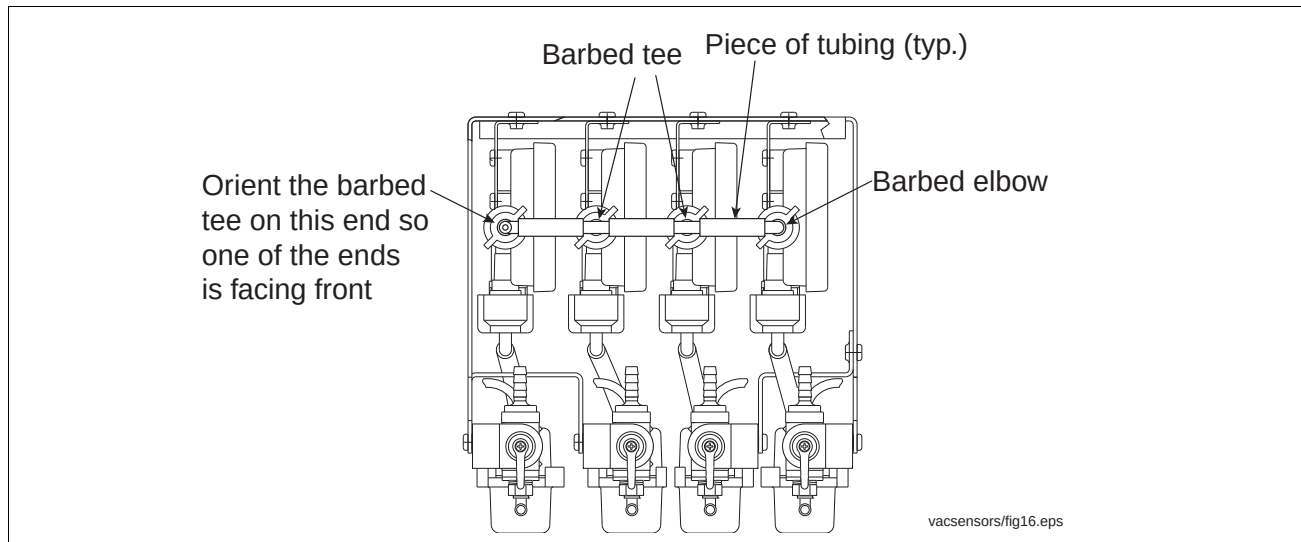


Figure 6. Attaching vacuum tubing between Vac Sensors (In this example there is no Tank monitoring)

Installing Vac Sensor Housing Support Bracket

Get the Vac Sensor housing support bracket and the curved tensioning clamp from the mounting kit. Hold the bracket against the STP riser. Place the curved clamp around the back of the riser and hook the four notches in the clamp over the four barbs in the top of the bracket (see Figure 7). Position the bracket so the top of bracket is at least 12 inches (304.8mm) above the containment sump floor and hand tighten the tension adjust knob on the back of the clamp until the assembly is secure.

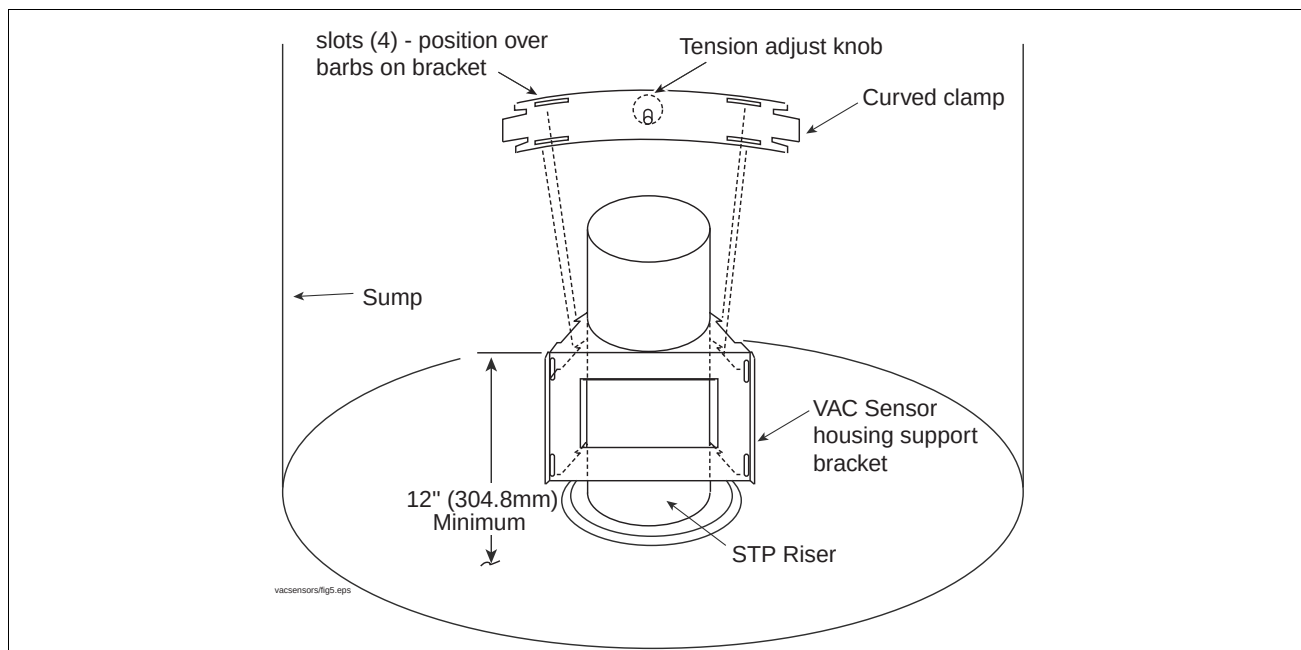


Figure 7. Attaching Vac Sensor housing support bracket

Attaching Vac Sensor Cables and Tagging Vac Sensor/Vac Float Pairs

1. Next get the Vac Sensor cables (with connectors on one end) from the kit(s) and attach the connector of each cable to each of the Vac Sensor ports labeled TLS (on the Vac Sensor cover). Uncoil each of the Vac Float cables. Notice that each Vac Sensor, except the one for the tank interstice, has a short piece of tubing connecting it to a Vac Float beneath it (Figure 8). A Vac Sensor/Vac Float tubing connected pair must be wired together in the junction box.
2. Use a felt pen and write on the top of the Vac Sensor housing to what device each of the Vac Sensors below will be attached (see Figure 9). For example, P = product line, S = containment sump interstice, V = vapor line, and T = tank interstice. NOTE: If the mark you wrote on the housing over the first Vac Sensor was 'P', locate the cable ends of this Vac Sensor/Vac Float pair, tape them together about every foot along their length and at their ends, and tag the end of this cable pair 'P' or 'Product Line Vac Sensor'. Repeat this taping and tagging for each of the Vac Sensor/Vac Float pairs. The Vac Sensor marked 'T' will only have one cable, so tag the end of this cable 'T' for 'Tank Vac Sensor'.

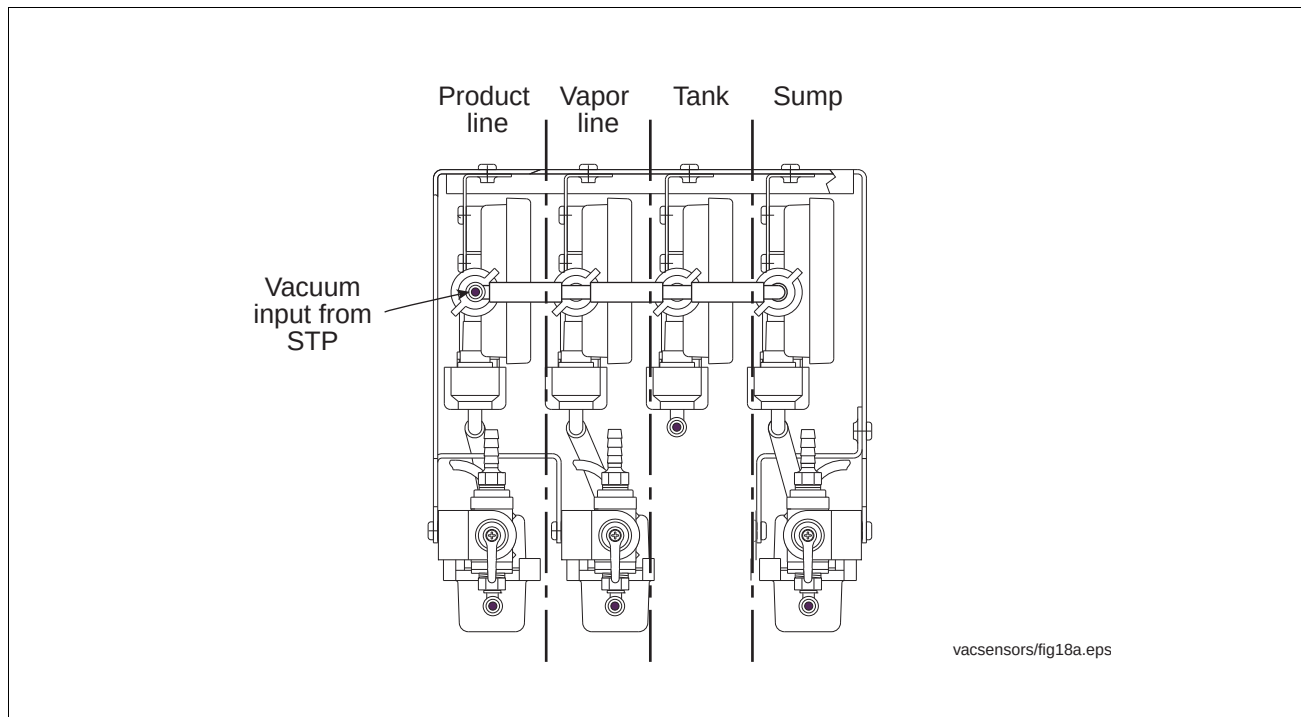


Figure 8. Identifying Vac Sensor/Vac Float pairs

Installing Vac Sensor Housing onto Support Bracket

Route all of the cables through the opening in the mounting bracket and attach the Vac Sensor housing to the bracket by pushing the four hooks on the rear of the housing into the four slots in the bracket (see Figure 9)

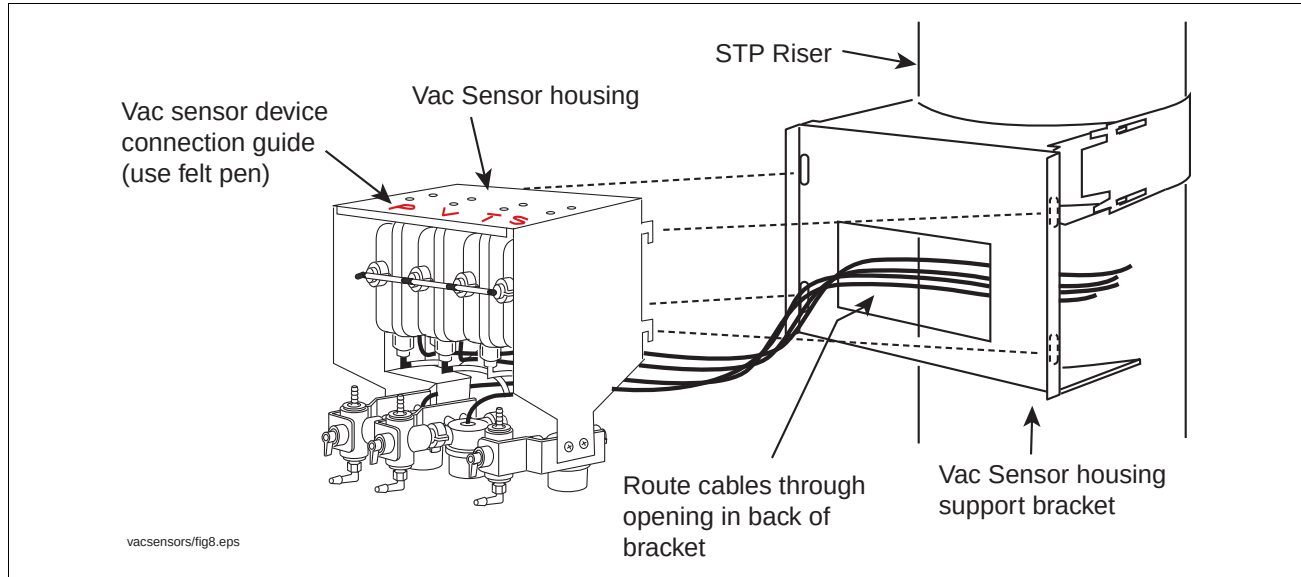


Figure 9. Attaching Vac Sensor housing to support bracket

Vacuum Connections within Containment Sump

Vacuum Connections to a Double-Wall Product Line

1. Get a 1/4" NPT/ barbed adapter and spring clamp from the Vac Sensor install kit.
2. Apply an adequate amount of fresh, UL classified for petroleum, non-setting thread sealant (herein after referred to as sealant) to the threads of the 1/4" NPT barbed fitting and screw it into the 1/4" NPT port in the vacuum termination fitting of the product line (Figure 10).

NOTE: In some installations, the double-walled piping is equipped with one or more Schrader valves. You can connect the vacuum tubing directly to the Schrader valve using the Schrader fitting (P/N 576008-672 for North American installations; P/N 576008-504 for EU installations).



NOTE: any unused Schrader fittings must be capped to avoid leaks.

3. Get the 1/4" ID tubing from the install kit and measure a piece that will reach the barbed fitting on the bottom of the plastic valve (see Figure 4) that is connected to the Vac Sensor/Vac Float pair you labeled 'P'. Plan enough tubing so that it isn't stretched between fittings or have any sharp bends/kinks in it. Cut and install this tubing and secure tubing ends with spring clamps.

Vacuum Connections to a Double-Wall Vapor Return Line

Repeat steps 1 - 2 of the Product Line connection instructions for the vapor return line connection, except:

- Install the 1/4" NPT barbed fitting in the vacuum termination port of the vapor return line (see Figure 10),
- Connect one end of the tubing to the vapor return line barbed adapter and the other end to the barbed fitting on the bottom of the plastic valve that is connected to the Vac Sensor/Vac Float pair you labeled 'V'. Plan enough tubing so that it isn't stretched between fittings or have any sharp bends/kinks in it. Cut and install this tubing and secure tubing ends with spring clamps.

Vacuum Connections to a Double-Wall Containment Sump

Repeat steps 1 - 2 of the Product Line connection instructions for the sump interstice connection, except:

- Install the 1/4" NPT barbed fitting in the interstitial space access port provided in the sump's wall (if multiple ports are provided, select the lowest one).
- Connect one end of the tubing to the sump interstice barbed fitting and the other end to the barbed fitting on the bottom of the plastic valve that is connected to the Vac Sensor/Vac Float pair you labeled 'S'. Plan enough tubing so that it isn't stretched between fittings or have any sharp bends/kinks in it. Cut and install this tubing and secure tubing ends with spring clamps.

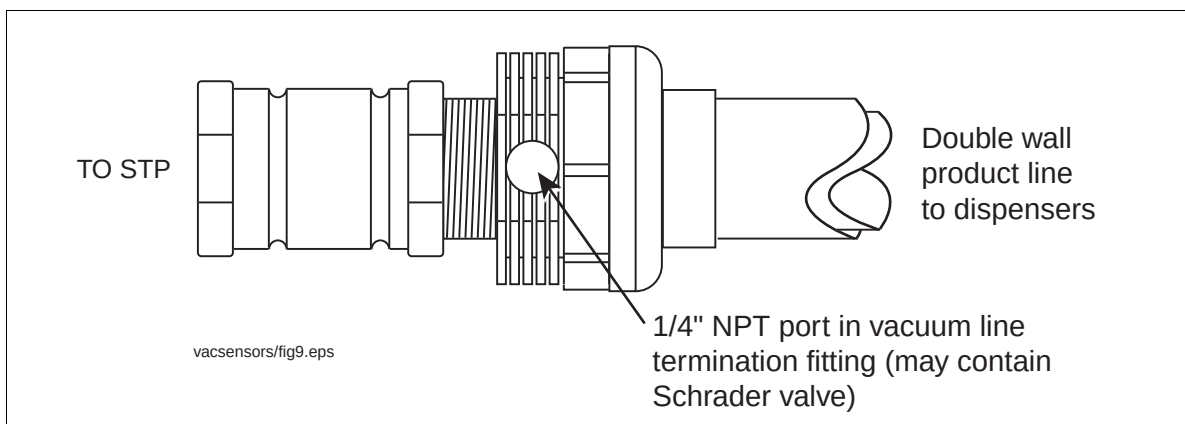


Figure 10. Example vacuum termination fitting - double-wall pipe

Vacuum Connections to a Double-Wall Steel Tank

NOTE: Double-walled tanks must provide access for installation of a liquid sensor at the lowest point of the interstice.

1. Get the tank's interstitial riser cap, interstitial sensor, cord grip components, 3-way ball valve, 1/4" NPT close nipple, 1/4" NPT/barbed adapter fitting, and spring clamps from the kit.
2. Assemble the cord grip components and apply sealant to its threads. Screw it into the 1/2" NPT hole in the cap.
3. Slowly lower the steel tank interstitial sensor into the tank riser until it rests on the bottom of the riser. Push the end of the sensor's cable through the loosened cord grip in the cap - being careful not to lift the sensor off bottom. Apply sealant to the threads of the riser pipe and screw on the cap until tight. Tighten the cable cord grip.
4. Apply sealant onto the threads of one end of the nipple and screw it into the 1/4" NPT port in the cap. Apply sealant to the other end of the nipple and screw on the 3-way ball valve. Apply sealant to the threaded end of the barbed adapter and screw it into the side port of the 3-way ball valve. (see Figure 11).

5. Measure a length of 1/4" ID tubing to connect the VAC TEST port on the Vac Sensor (labeled 'T') to the tank's interstitial 3-way ball valve. Plan enough tubing to avoid sharp bends in it or stretching it. Cut and install this tubing and secure tubing ends with spring clamps.
6. The Vac Sensor labeled 'T', and which is connected to the 3-way ball valve in the tank interstice riser cap, must be wired together with the tank interstice liquid sensor in the junction box. Locate the ends of the Vac Sensor cable labeled 'T' and the tank interstitial liquid sensor cable, tape them together, and tag them 'Tank Vac Sensor'.

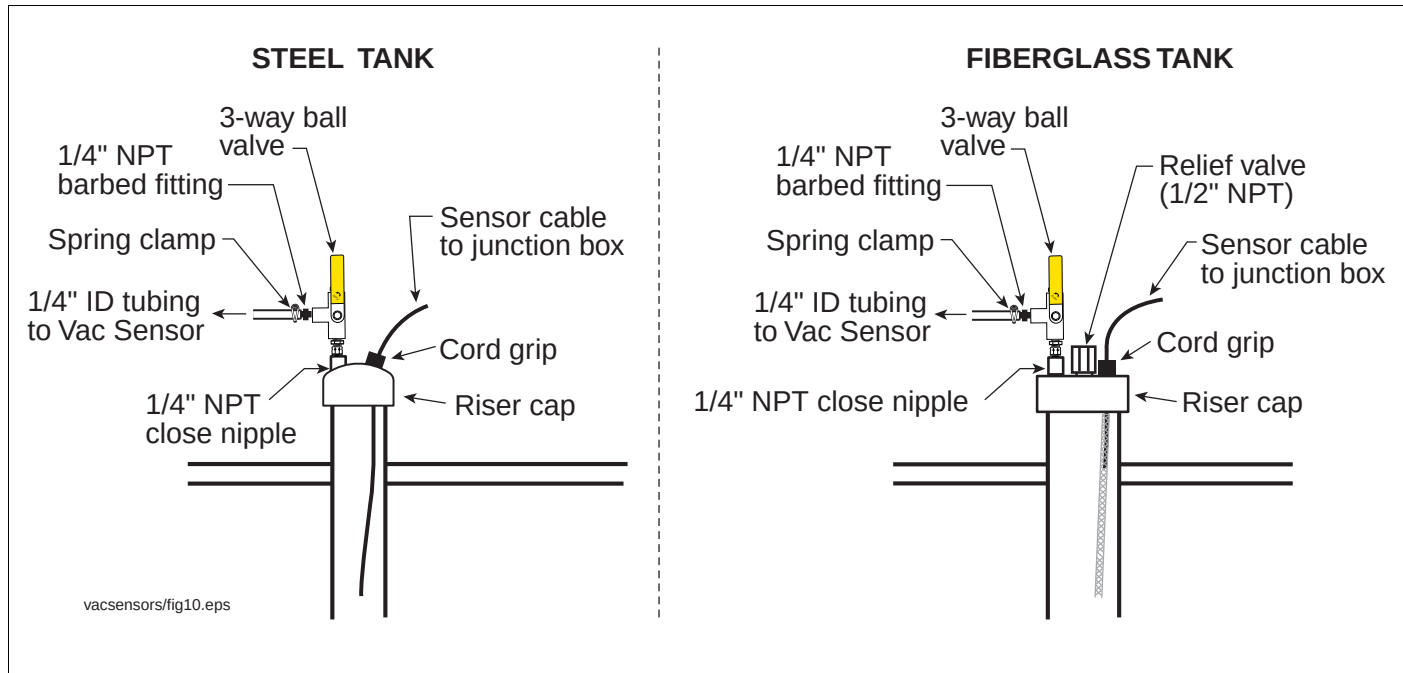


Figure 11. Example tank interstitial sensor riser cap connections - steel and fiberglass tanks

Vacuum Connections to a Double-Wall Fiberglass Tank

1. Get the tank's interstitial riser cap, interstitial sensor, cord grip components, 3-way ball valve, 1/4" NPT close nipple, 1/4" NPT/barbed adapter fitting, spring clamps, and relief valve from the kit.
2. Assemble the cord grip components and apply sealant onto its threads. Screw it into one of the 1/2" NPT holes in the cap.
3. Install the fiberglass tank interstitial sensor into the tank riser following the instructions accompanying the sensor (manual P/N 576013-617). Once installed, push the end of the sensor's cable through the loosened cord grip in the cap - being careful not to alter the sensor's position. Apply an adequate amount of sealant to the threads of the riser pipe and screw on the cap until tight. Tighten the cable cord grip.
4. Apply sealant onto the threads of one end of the nipple and screw it into the 1/4" NPT port in the cap. Apply sealant to the other end of the nipple and screw on the 3-way ball valve. Apply sealant to the threaded end of the barbed adapter and screw it into the side port of the 3-way ball valve. (see Figure 11).
5. Apply sealant onto the threads of the relief valve and screw it into the other 1/2" NPT hole in the cap.



IMPORTANT: You must install the relief valve in the fiberglass tank riser cap or damage to the tank may occur!

6. Measure a length of 1/4" ID tubing to connect the VAC TEST port (ref. Figure 12) on the Vac Sensor labeled 'T' to the tank's interstitial 3-way ball valve. Plan enough tubing to avoid sharp bends in it or stretching it. Cut and install this tubing and secure tubing ends with spring clamps.
7. The Vac Sensor labeled 'T', and which is connected to the 3-way ball valve in the tank interstice riser cap, must be wired together with the tank interstice liquid sensor in the junction box. Locate the ends of the Vac Sensor cable labeled 'T' and the tank interstitial liquid sensor cable, tape them together, and tag them 'Tank Vac Sensor'.

Vacuum Connections to Siphon Port of the Pump

1. Figure 12 is an example diagram of the vacuum connection at the The Red Jacket STP.

NOTE: It is recommended that you replace the Siphon Jet assembly on FE Petro pumps used with the Vac Sensor.

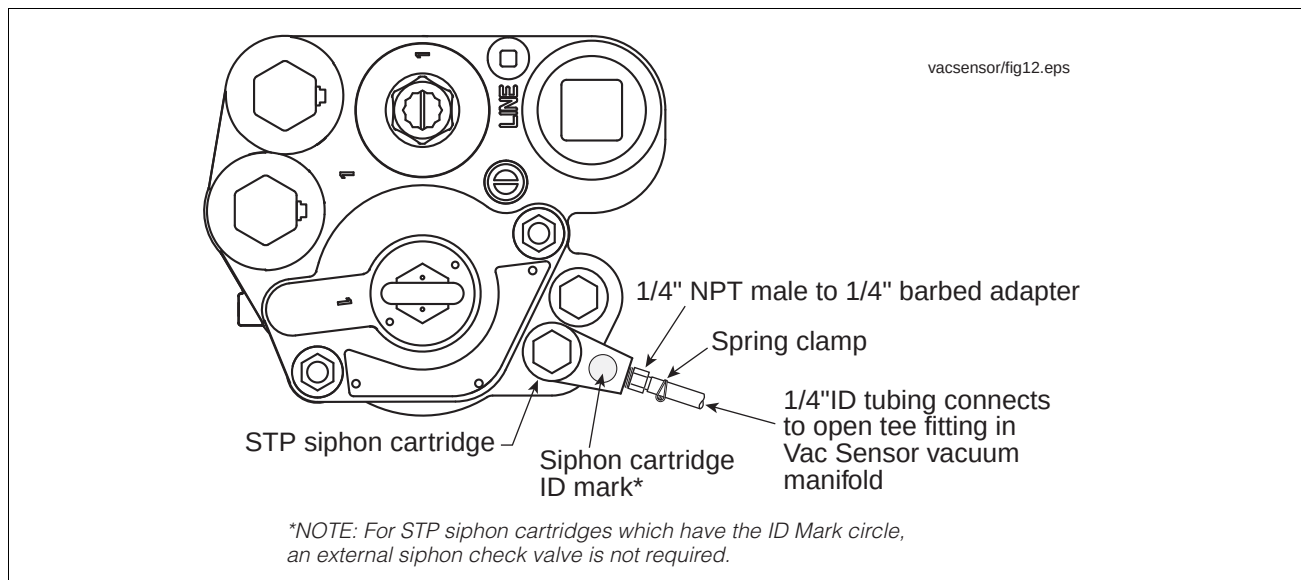


Figure 12. Example Vacuum Source Connection at The Red Jacket STP

2. Measure a length of 1/4" ID tubing to connect 1/4" ID barbed tubing fitting in the siphon cartridge port and the vacuum input open tee of the Vac Sensor (see Figure 13). Plan enough tubing to avoid sharp bends in it or stretching it. Cut and install this tubing and secure tubing ends with spring clamps.

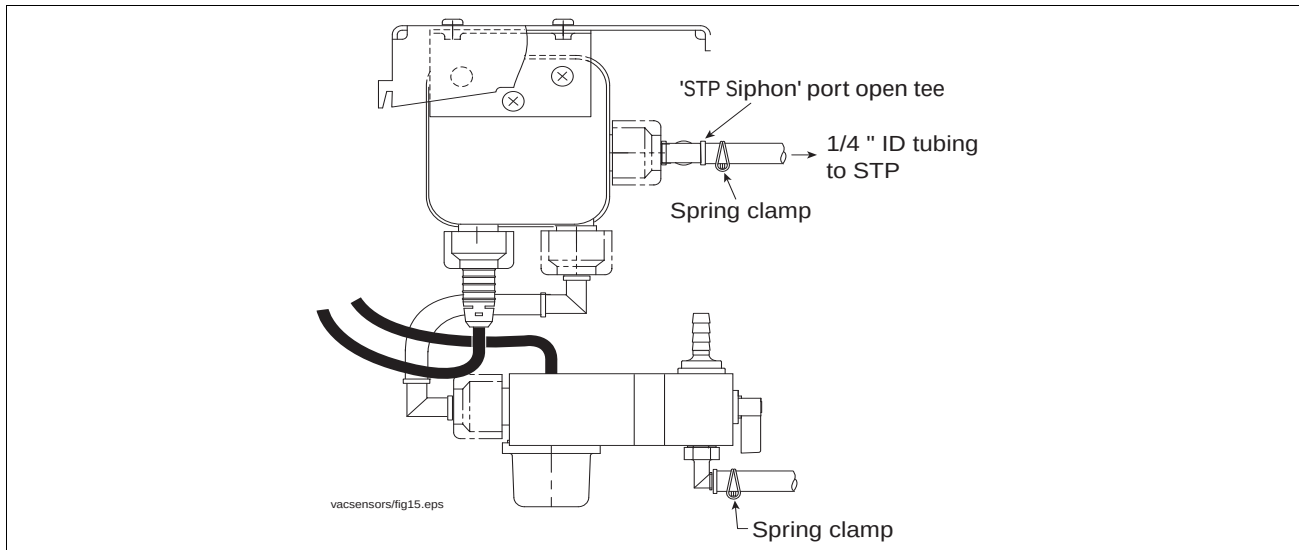


Figure 13. Connecting vacuum tubing from pump siphon port to Vac Sensor

Field Wiring Vac System Connections

1. Tie wrap the loose cable pairs into a bundle going from the Vac Sensor housing to the containment sump junction box(es).
2. Get necessary cord grip bushings from the kits - one for each Vac Sensor, Vac Float, and the Tank interstitial sensor cable that will enter the junction box(es) in the containment sump. Loosen the cord grips and screw each one into a junction box port.
3. Push the first Vac Sensor/Vac Float cable pair into adjacent cord grips (keep the pairs together as the two cables will typically be wired to one cable going to the TLS Console). Make sure all of the cables to the console are tagged (e.g., Tank 1 product line, Tank 1 vapor line) to facilitate TLS setup.
4. Strip back the leads of one of the cables from the TLS Console 3/8" (10mm). Strip back the leads of the Vac Sensor/Vac Float pairs 3/8". Using wire nuts from the kits attach the wires as per the diagram in Figure 14. NOTE: the Vac Sensor cable has three wires and the Vac Float cable has two wires.
5. Seal wire nuts with epoxy sealant following the instructions in Figure 15.
6. Connect the remaining Vac Sensor/Vac Float pairs and the Vac Sensor/Tank Float pair as discussed above, sealing each set of wires in epoxy sealant packs.

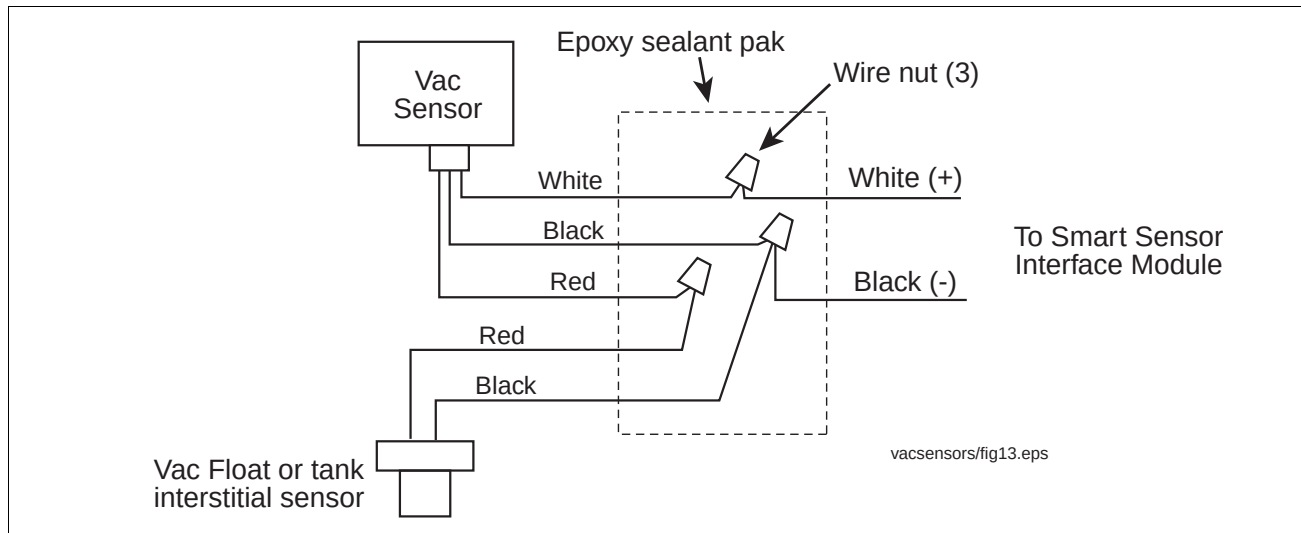


Figure 14. Field wiring connections

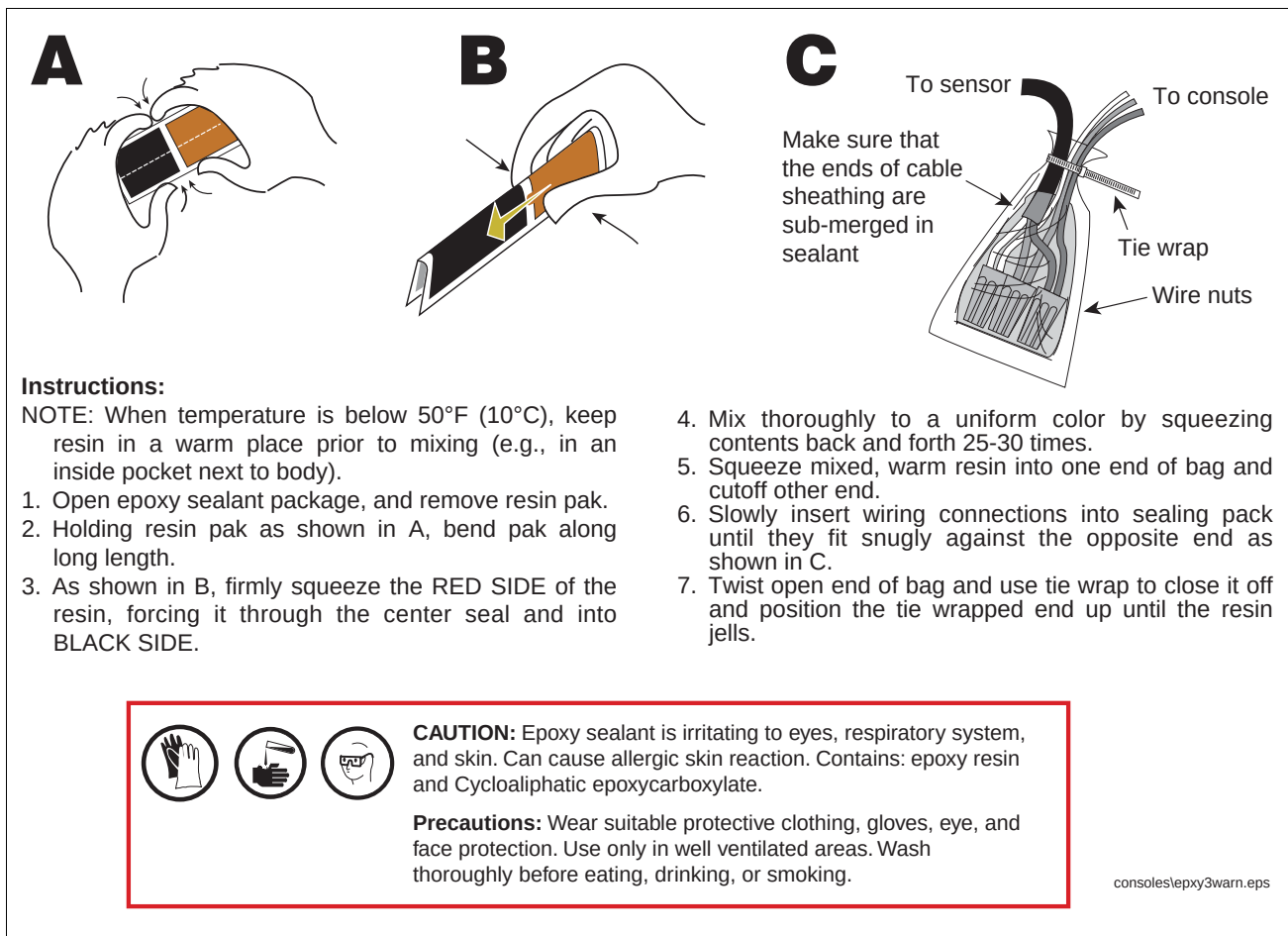


Figure 15. Epoxy sealing wiring connections

Connecting Vac Sensor Field Wiring to TLS Console

1. Connect each Vac Sensor/Vac Float pair and the Vac Sensor/ Tank Interstitial Float pair cables to either a Smart Sensor with Pressure Sensor module or a Smart Sensor Interface module as shown in Figure 16. Note: at least one Smart Sensor with Pressure Sensor module must be installed in the console for proper Vac Sensor operation.
2. System programming of the Vacuum Sensors is performed following instructions in the TLS-3XX Setup Manual.

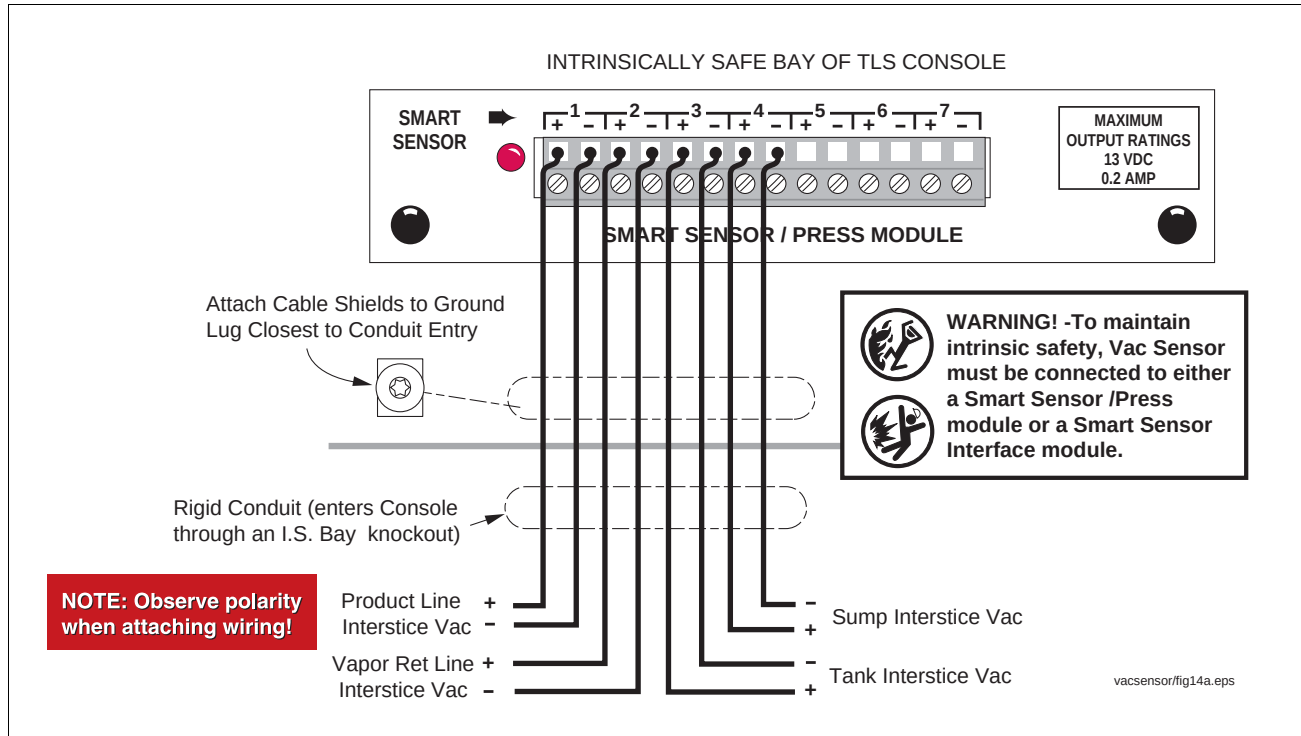


Figure 16. Attaching Vac Sensors to Smart Sensor with Pressure Sensor Module

Connecting Pump Control Field Wiring to TLS Console

For Sites with PLLD or WPLLD Leak Detection

Pump control for Vac Sensors is shared with PLLD or WPLLD line leak detection. Connecting PLLD/WPLLD leak detection as per the instructions provided with that equipment is all that is required.

For Sites without PLLD or WPLLD Leak Detection

A Pump Sense module and a 4-Relay module are required in the TLS Console for Vac Sensor pump control.

Field Wiring:

- For module connections with Red Jacket pumps see Figure 17. For module connections with non-Red Jacket pumps see Figure 18.

Console Setup:

- Pump Sense setup - assign each tank to Pump Sense device
- Output Relay setup - select 'Pump Control Output'

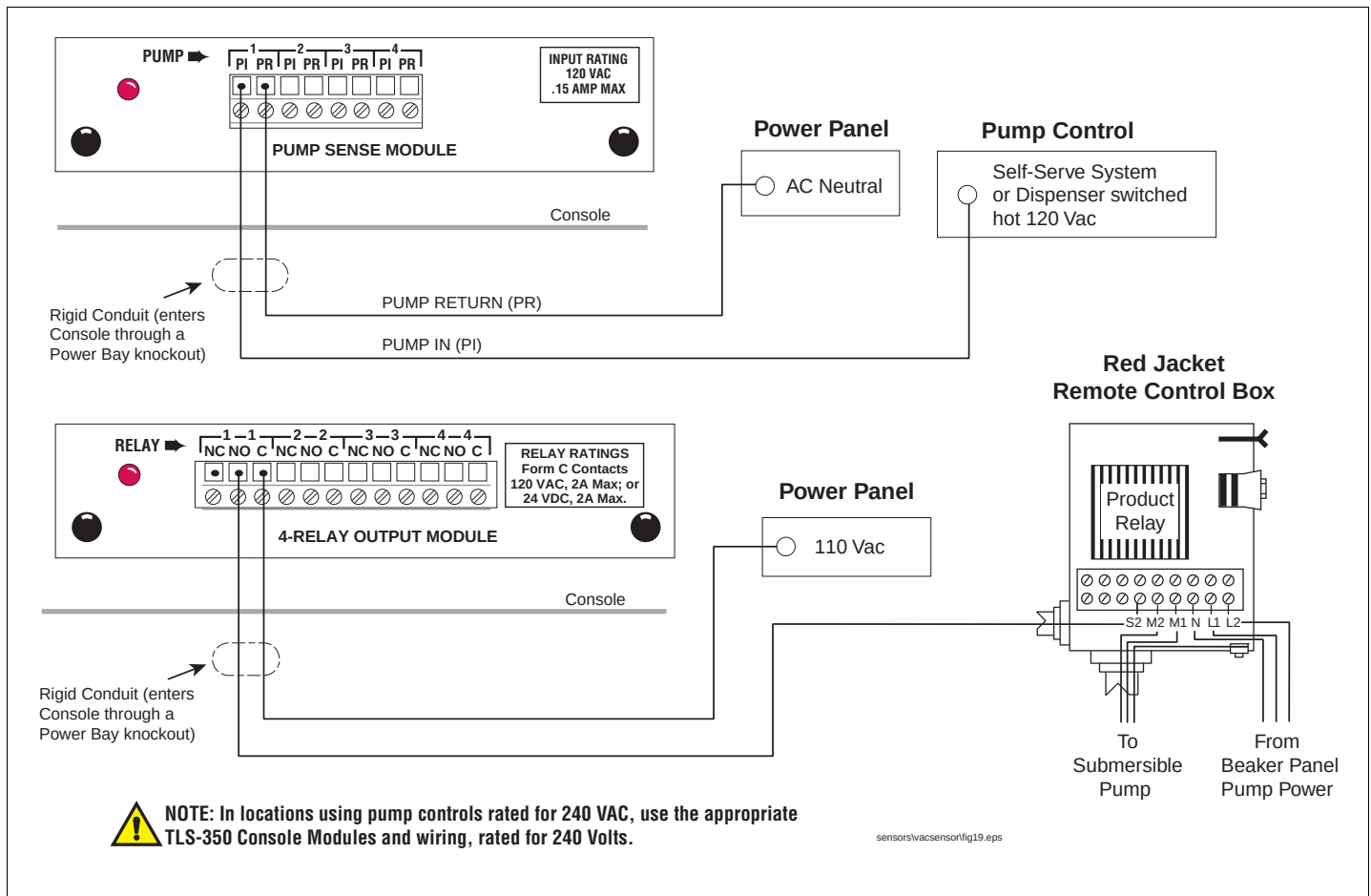


Figure 17. Connecting Pump Sense & 4-Relay Modules - Red Jacket Pumps

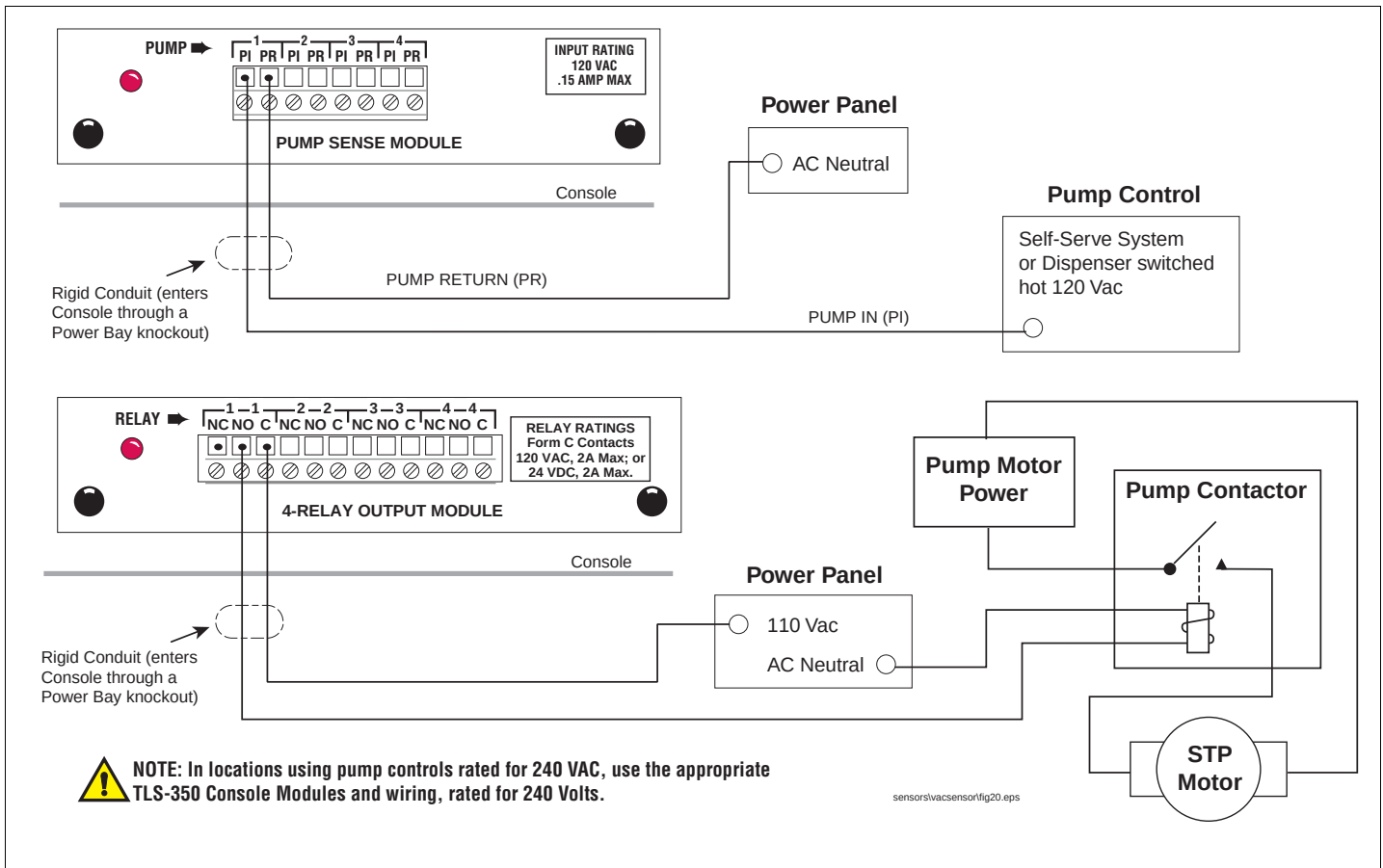


Figure 18. Connecting Pump Sense & 4-Relay Modules - Non-Red Jacket Pumps

Disable Extended Run Feature in the Pump Controller



IMPORTANT! Certain pump controllers may be programmed to turn off the pump after an extended run period and post an ER (Extended Run) error in the controller. Because the Vac Sensors may require the pumps to run for several hours and possibly triggering this error, you must disable this ER feature in the pump controller. Refer to the Pump Controller's documentation for instructions on how to disable the Extended Run feature.

Vac System Testing

This section describes a sequence of procedures and tests necessary to complete the Vac Sensor installation:

1. ATM Pressure Sensor setup
2. Vac Sensor setup
3. Vacuum integrity test prior to filling tank*
4. Manual test*
5. Operability test

*NOTE: Only one of these two tests is required to complete the installation.

ATM Pressure Sensor Setup

The ATM Pressure Sensor is factory installed in the Smart Sensor / Press module and preassigned to channel 8. At least one Smart Sensor / Press module, which contains the ATM Pressure Sensor, must be installed in the console. You must configure at least one ATM Pressure Sensor for use by the Vac Sensors or a Setup Data Warning will occur. NOTE: if more than one Smart Sensor / Press module is installed, only one ATM Pressure Sensor needs to be configured.

Look in console and note the slot position of the SmartSensor / Press module. Enter the Setup Mode and press the FUNCTION key until you see the message:

**SMARTSENSOR SETUP
PRESS <STEP> TO CONTINUE**

Press STEP until you see the message:

**SS CONFIG - MODULE *n*
SLOT *x* - X X X X X X X X**

Where *x* is the slot number containing the SmartSensor / Press module. Press the → key to move the cursor to the last (8th) X. Press CHANGE and the message below should appear:

**SLOT *x* - X X X X X X X 8
PRESS <STEP> TO CONTINUE**

Press STEP:

**ENTER SMARTSENSOR LABEL
s 8:**

NOTE: In the example above, the ATM P sensor position is 8 but it could be 16, 32, or 40 depending on the SmartSensor's module number.

Press CHANGE and enter a label:

**ENTER SMARTSENSOR LABEL
s 8: (ATMP Sensor Label)**

Press ENTER to accept your label:

**s 8: (ATMP Sensor Label)
PRESS <STEP> TO CONTINUE**

Press STEP:

**s 8: SELECT SS CATEGORY
UNKNOWN**

Press CHANGE until you see the message:

**s 8: SELECT SS CATEGORY
ATM P SENSOR**

Press ENTER to accept the category. Press STEP, then BACKUP to return to the configuration display for Smart Sensor module 1:

**SS CONFIG - MODULE 1
SLOT x - X X X X X X X**

This completes the ATM Pressure Sensor configuration.

Vac Sensor Setup

Identifying Vac Sensor Zones

Before configuring the Vac Sensors, enter the Monitored Zone, Smart Sensor module number, and channel number for each Vac Sensor attached to the console in the worksheet in Table 1 below. NOTE: The Vac Sensor Zone Worksheet and the Secondary Containment Volumes By Manufacturer index are both included in the installation kit (P/N 577013-849). Use the Containment Volume index to calculate a zone's interstice volume in gallons. For example, if Tank 1's double wall product piping uses 100 feet of Ameron Dualoy 3000/L piping, you would multiply 0.2186 (from the Secondary Containment Volume index) x 100 feet = 21.86 gallons. For the Tank 1 product piping zone you would enter 21.9 (round to nearest tenth of a gallon) as the calculated zone volume. If the Tank 1 sump is a Containment Solutions 42" Double wall tank sump, you would multiply 0.8216 (from the Secondary Containment Volume index) x 3.5 feet = 2.88 gallons as the calculated zone volume.

Table 1. Vac Sensor Zone Worksheet

Vac Sensor Monitored Zone	SS Module Number	SS Module Channel Number	Calculated Zone Volume (Gallons)
	1	1	
	1	2	
	1	3	
	1	4	
	1	5	
	1	6	
	1	7	

Table 1. Vac Sensor Zone Worksheet

Vac Sensor Monitored Zone	SS Module Number	SS Module Channel Number	Calculated Zone Volume (Gallons)
	1	8	
	2	9	
	2	10	
	2	11	
	2	12	
	2	13	
	2	14	
	2	15	
	2	16	
	3	17	
	3	18	
	3	19	
	3	20	
	3	21	
	3	22	
	3	23	
	3	24	
	4	25	
	4	26	
	4	27	
	4	28	
	4	29	
	4	30	
	4	31	
	4	32	
	5	33	
	5	34	
	5	35	
	5	36	
	5	37	
	5	38	
	5	39	
	5	40	

Performing Vac Sensor Setup

After filling in the Vac Sensor Zone Worksheet, enter the Setup Mode and press the FUNCTION key until you see the message:

SMARTSENSOR SETUP
PRESS <STEP> TO CONTINUE

Press STEP until you see the message:

SS CONFIG - MODULE 1
SLOT x - X X X X X X X

Following the completed Vac Sensor Zone Worksheet, configure each Vac Sensor channel for all SmartSensor modules. NOTE: Once the console communicates with a Vac Sensor (approximately 2 minutes after configuration), it automatically selects the Vac Sensor SS Category for that sensor.

When all Vac Sensors have been configured, if necessary, press Tank/Sensor until you see the message:

s 1: VAC SENSOR SETUP
PRESS <ENTER>

Press ENTER:

s 1: SELECT PUMP #
NONE

You must select the pump that will provide the source of vacuum for this Vac Sensor or a Setup Data Warning will be posted for this Vac Sensor. If necessary, press CHANGE until the correct pump's control device displays [QX (PLLD), WX (WPLLD), or RX (Output Relay)]. NOTE: an Output Relay must be set to Pump Control Output to be assigned as a pump. If the selected pump output relay is not assigned to a pump sense device, a Setup Data Warning for this Vac Sensor will be posted.

Press ENTER to confirm your entry.

Press STEP to continue:

s 1: (Vacuum Label)
VOLUME: 501

Referring to your previously completed volume worksheet, enter the volume in gallons of the interstitial space being monitored by this Vac Sensor. The permitted range is 0.1 to 500 gallons (0.378 to 1892.7 litres). Default is 501 (1896.4 Litres). A Setup Data Warning alarm will activate if a volume between 0.1 and 500 is not entered.

Press CHANGE and enter the interstitial space volume. Press ENTER to confirm your entry.

Press STEP to continue:

s 1: (Vacuum Label)
RELIEF VALVE: NO

For all Vac Sensors except the one monitoring a fiberglass tank's interstitial space, a relief valve is usually not needed. For Vac Sensors not requiring a relief valve press STEP to accept the default NO. Press Tank/Sensor to setup another Vac Sensor.

For the Vac Sensor that monitors a fiberglass tank's interstitial space, a relief valve is required to prevent excess vacuum from damaging the tank. Press CHANGE and select YES. Press ENTER to confirm your entry.

Press STEP to continue.:

s 1: (Vacuum Label)
RELIEF VALVE PRESSURE: -9.0

Enter the pressure at which the installed Relief Valve is rated to open (the vent pressure is stamped on the body of the V-R Relief Valve). The permitted range is -5 to -9 psi (-34 to -62 kPa). Default vent pressure is -9 psi. Press ENTER to confirm your entry. Press Tank/Sensor to setup another Vac Sensor.

Vacuum Integrity Test Prior to Filling Tank (Optional)

Skip to 'Running a Manual Test' if this optional test is not going to be performed.

If an external vacuum source is not used to produce a vacuum in the monitored zones prior to startup, you must perform a 'Manual Test' on each sensor to clear the 'No Vac' alarm.

A procedure to test the integrity of the interstitial spaces monitored by the Veeder-Root Vacuum Sensors is discussed in this section. An external vacuum source and necessary fittings must be supplied by the customer.

Before beginning this procedure all vacuum sensor components in the containment sump must be installed as described in this manual and be connected to a Smart Sensor module in the TLS Console.



1. Shut off, tag, and lock out power to the pump.
2. At the TLS Console, configure each of the monitored Vac Sensors in the containment sump (ref. TLS-3XX Setup Manual). Go to the SmartSensor Diag and place each of the monitored Vac Sensors in EVAC HOLD (ref. TLS-3XX Troubleshooting Manual).
3. At the 3-way ball valve connected to the tank's interstitial riser cap, connect the external vacuum source to the valve's top barbed fitting. Rotate the valve handle to its up position and pull a vacuum down to -8 psi (-55.1 kPa), or if a relief valve is present, down to 1 psi (6.89kPa) above the relief valve's opening pressure (e.g., if valve opens at -7 psi [-48.26 kPa], pull the vacuum down to -6 psi [-41.36kPa]). When the desired vacuum is attained, rotate the valve handle to its down position. Remove the external source from the valve's upper barbed fitting.
4. If necessary, repeat this procedure for the product line's interstitial space, the vapor line's interstitial space and the double-wall containment sump's interstitial space.
5. With all of the monitored interstitial spaces under vacuum, at the TLS Console, stop the EVAC HOLD for each Vac Sensor. After a minimum wait of 12 minutes, monitor the Leak Rate and Time to No Vac display for each Vac Sensor. Record the displayed values for each of the containment sump's vac sensor in the chart in Appendix B.

As a general guideline, the Time to No Vac should ideally be 100 hours, and should not be less than 24 hours (a time less than 2 hours will produce an alarm). Also, a Leak Rate greater than 22.4 gph (84.79 litre) will generate a Vacuum Warning. Both of these diagnostics are indicators of whether the system has a significant vacuum leak. Note that on systems with small volumes, a very small leak rate, well below the 22.4 gph limit, may still cause a Time to No Vac alarm.

If either diagnostic exceeds the guideline, the source of the leak should be corrected before the system is started up. Once the leak(s) is corrected, repeat steps 2-6.

6. When the monitored interstitial spaces under vacuum are within normal operating limits as described in Step 6, fill the tank.
7. Once the tank is full, restore power to the pump.

Running a Manual Test

Perform the Manual Test for Each Vac Sensor

You enter the DIAG MODE of the TLS Console by pressing the MODE key until its display appears. Press the FUNCTION key to select diagnostic functions and the STEP key to view each of the Function's displays. Where you can enter changes to displayed data, you do so with the same front keys used enter to system programming selections (i.e., ENTER, CHANGE, etc.).

Figure 19 displays the Vac Sensor Manual Test procedure steps and Figure 20 displays the Vac Sensor Evac Hold procedure steps.

Vacuum Sensor Operability Test - Required for Each Sensor Prior to Startup

1. Vacuum leak test: Turn the 3-way ball valve handle (connected to the interstice being monitored) from its down 'operating' position all the way up to its 'test' position. This should vent the vacuum sensor to atmosphere while maintaining vacuum in the interstice.
2. Wait at least 1 minute at the console for the system to produce a 'No Vac' alarm. Press the console's Alarm/Test key to silence the beeper and acknowledge the alarm.
3. Turn the 3-way ball valve handle all the way down to its 'operating' position.
4. At the console enter the DIAG MODE and initiate a manual test that will clear the 'No Vac' alarm (Refer to Figure 19 for Manual Test instructions).
5. Vac Float Liquid Sensor (in containment sump) test: This test is performed using water, gasoline, or other appropriate test liquid for systems with the float housing in the containment sump. Unscrew the lower float bowl (about a 1/4 turn) from the Vac Float body and fill the bowl with the test liquid. Screw the filled bowl back onto the Vac Float body and a Liquid Alarm will be generated. At the console press the Alarm/Test key to silence the beeper and acknowledge the alarm. Again unscrew the bowl to clear the alarm. Empty the bowl, wipe it clean, then screw it onto the Vac Float body.
6. For double-walled tanks, the interstitial sensor must be removed from the tank to perform a functional test. Refer to the Operability Testing Guide (P/N 577013-814) and follow 'Testing Procedure C' (interstitial sensor for steel tanks) or 'Testing Procedure E' (interstitial sensor for fiberglass tanks) as applicable.
7. Print the test history and console status for your records. This completes the test procedure. Report any performance concerns to Veeder-Root while on site.

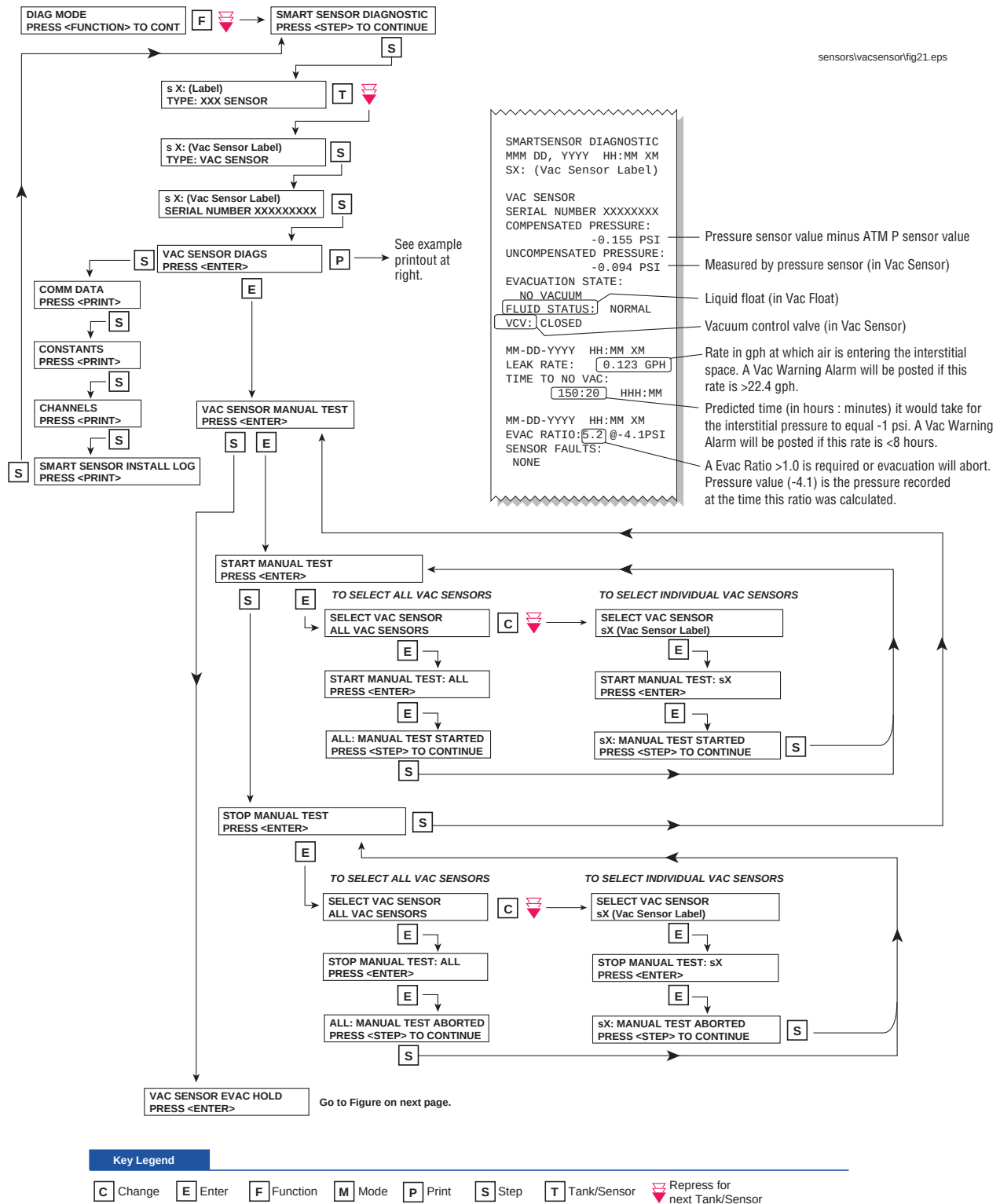


Figure 19. TLS Console Vac Sensor Manual Test

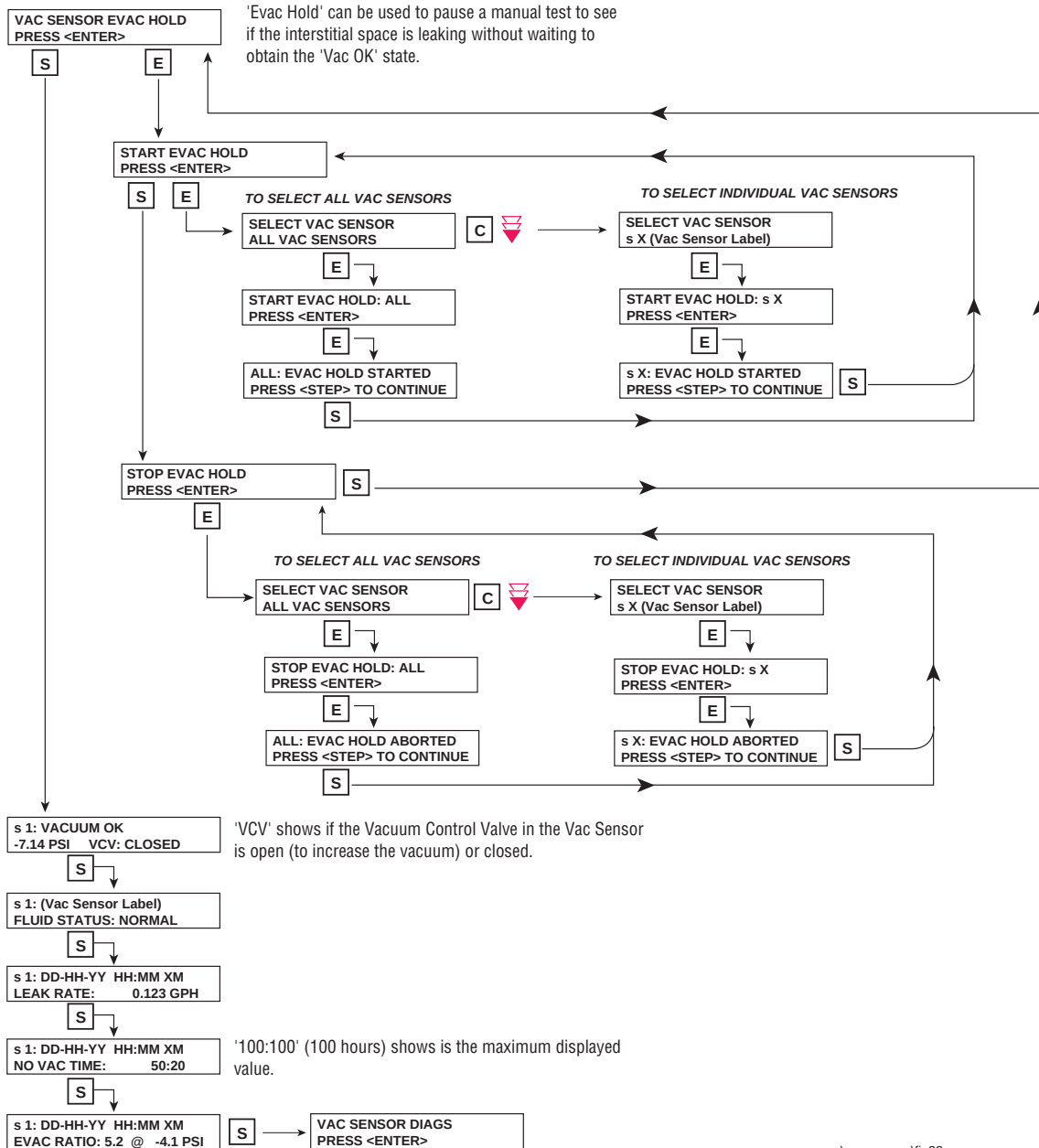
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Figure 20. TLS Console Vac Sensor Evac Hold Procedure

Appendix A: Vac Sensor Test Values Record

The leak rate for each interstice will affect the 'Time to No Vac', which is the time it would take for the vacuum to be lost if the STP did not turn on to replenish it. However, the smaller the volume, the greater the impact of a small leak on the 'Time to No Vac'. A general guideline is to eliminate any leaks so that the 'Time to No Vac' reads 100 hours, which is the maximum displayed value.

Use the chart below to record Vac Sensor test values.

TANK	VAC SENSOR	LEAK RATE (gph)	TIME TO NO VAC (hr)
	Product Line		
	Vapor Return Line		
	Tank or Tank Vent		
	Containment Sump		
	Product Line		
	Vapor Return Line		
	Tank or Tank Vent		
	Containment Sump		
	Product Line		
	Vapor Return Line		
	Tank or Tank Vent		
	Containment Sump		
	Product Line		
	Vapor Return Line		
	Tank or Tank Vent		
	Containment Sump		
	Product Line		
	Vapor Return Line		
	Tank or Tank Vent		
	Containment Sump		



Solid-State Interstitial Liquid Sensor for Fiberglass Tanks

Installation Guide

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Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

VEEDER-ROOT'S PREFERRED CARRIER

1. Contact VR Customer Service at 800-873-3313 with the specific part numbers and quantities that were missing or received damaged.
2. Fax signed Bill of Lading (BOL) to VR Customer Service at 800-234-5350.
3. VR will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

CUSTOMER'S PREFERRED CARRIER

1. It is the customer's responsibility to file a claim with their carrier.
2. Customer may submit a replacement purchase order. Customer is responsible for all charges and freight associated with replacement order. Customer Service will work with production facility to have the replacement product shipped as soon as possible.
3. If "lost" equipment is delivered at a later date and is not needed, VR will allow a Return to Stock without a restocking fee.
4. VR will NOT be responsible for any compensation when a customer chooses their own carrier.

RETURN SHIPPING

For the parts return procedure, please follow the appropriate instructions in the "General Returned Goods Policy" and "Parts Return" pages in the "Policies and Literature" section of the Veeder-Root **North American Environmental Products** price list.

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Introduction

This manual contains procedures for installing Veeder-Root solid-state interstitial liquid sensors in fiberglass tanks.

This manual assumes field wiring has been run from the console to the tank in which the sensor will be installed following instructions in the appropriate console's site prep manual.

Contractor Certification Requirements

Veeder-Root requires the following minimum training certifications for contractors who will install and setup the equipment discussed in this manual:

Installer (Level 1) Certification: Contractors holding valid Installer Certification are approved to perform wiring and conduit routing; equipment mounting; probe, sensor and carbon canister vapor polisher installation; wireless equipment installation; tank and line preparation; and line leak detector installation.

ATG Technician (Level 2/3 or 4) Certification: Contractors holding valid ATG Technician Certifications are approved to perform installation checkout, startup, programming and operations training, system tests, troubleshooting and servicing for all Veeder-Root Series Tank Monitoring Systems, including Line Leak Detection. In addition, Contractors with the following sub-certification designations are approved to perform installation checkout, startup, programming, system tests, troubleshooting, service techniques and operations training on the designated system.

- Wireless 2
- Tall Tank

Warranty Registrations may only be submitted by selected distributors.

Product Marking Information

RELATED DOCUMENTS

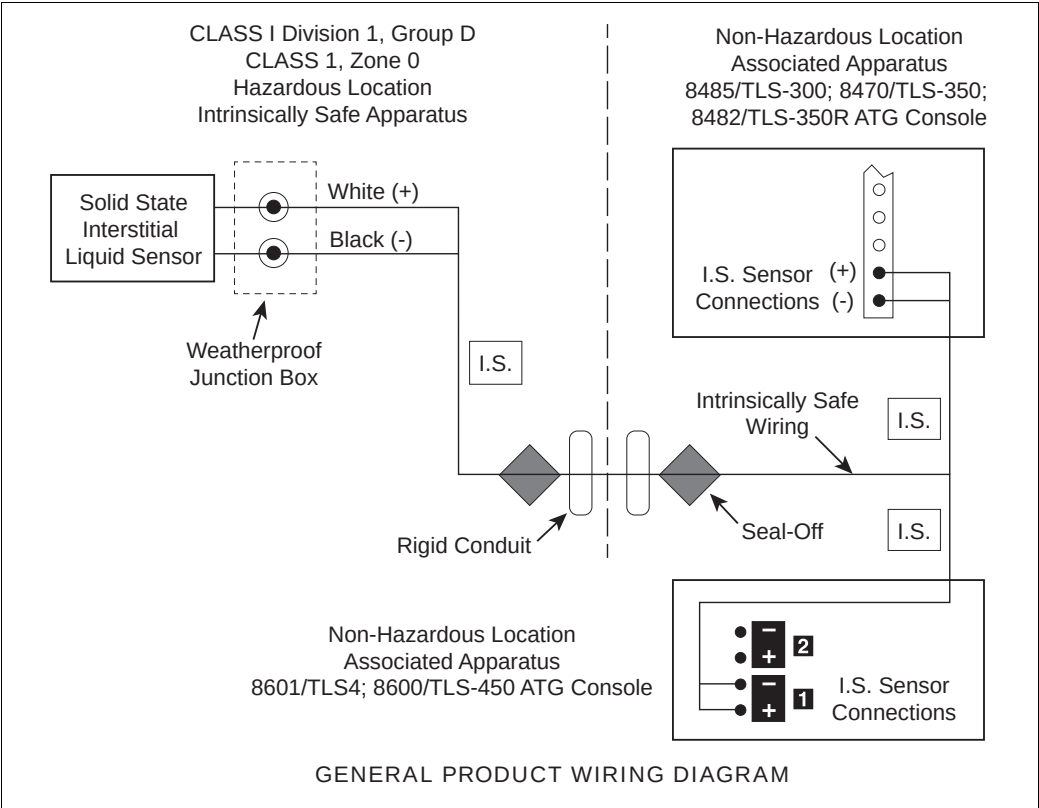
Documents Required to Install Equipment

This intrinsically safe apparatus is only for use as part of a Veeder-Root Automatic Tank Gauging System (ATG Console with probes and sensors). To install intrinsically safe apparatus, use the specific control drawing that appears on the nameplate of the applicable associated apparatus (ATG Console):

Equipment	UL/cUL Control Drawing Document No.
Associated Apparatus	
TLS-450/8600	331940-008
TLS-350, TLS-350R	331940-011
TLS-300	331940-013
TLS4/8601	331940-018

The control drawings contain information related to the correct installation of the overall intrinsically Safe System. This includes information such as maximum number of apparatus, specific apparatus allowed in the system, maximum cable lengths, references to codes, proper grounding and so on. Control drawings can be found on the

accompanying Compact Disk (TECH DOCS CD) or on the internet at veeder.com under SUPPORT; VR TECHNICAL DOCUMENTS; DRAWINGS.



Product Label Contents

**VEEDER-ROOT**TM

I.S. CIRCUIT FOR HAZLOC SENSOR
F/N 794380-XXX
S/N XXXXXX

CL I, DIV. 1, GP.D
CL I, ZONE 0
AEx ia IIA
Ex ia IIA
TC=T4
SECURITE INTRINSEQUE

-40°C ≤ Ta ≤ +60°C

MANUAL NO. 576013-826



Safety Warnings

 WARNING	
     	This product is to be installed and operated in the highly combustible environment of a gasoline storage tank where flammable liquids and explosive vapors may be present. FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH. 1. Read and follow all instructions in this manual, including all safety warnings to protect yourself and others from serious injury, explosion, or electrical shock. 2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes. 3. To protect yourself and others from being struck by vehicles, block off your work area during installation or service. 4. Do not alter or modify any component or substitute components in this kit. 5. Warning! Substitution of components may impair intrinsic safety. 6. Field wiring to the Sensor must not share a conduit with any non-intrinsically safe device's wiring. 7. Warning! To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing. 8. Before installing or taking the unit into a hazardous area, earth the unit in a safe area to remove any static charge. Then immediately transport the unit to the installation site. Do not rub or clean the unit prior to installation. Cleaning is not required under normal service conditions. Do not rub or clean the unit after installation. If the unit is not fixed to a known earth point when installed, ensure that a separate earth connection is made to prevent the potential of a static discharge. When fitting or removing the unit, use of anti-static footwear or clothing is required. 9. Materials used in the construction of this device do not contain, by mass, more than 10% in total of aluminum, magnesium, zirconium and titanium or 7.5% in total of magnesium, titanium and zirconium.

Safety Precautions

The following safety symbols are used throughout this manual to alert you to important safety hazards and precautions.

	EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.		FLAMMABLE Fuels and their vapors are extremely flammable.
	ELECTRICITY High voltage exists in, and is supplied to, the device. A potential shock hazard exists.		TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.
	WEAR EYE PROTECTION Wear eye protection when working with pressurized fuel lines or epoxy sealant to avoid possible eye injury.		GLOVES Wear gloves to protect hands from irritation or injury.

 INJURY Careless or improper handling of materials can result in bodily injury.	 READ ALL RELATED MANUALS Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.
 WARNING Heed the adjacent instructions to avoid equipment damage or personal injury.	 USE SAFETY BARRICADES Unauthorized people or vehicles in the work area are dangerous. Always use safety cones or barricades, safety tape, and your vehicle to block the work area.

Sensor Description

Veeder-Root’s solid-state interstitial sensor accurately detects the presence of fluid in the interstitial space of a double-wall fiberglass tank, and depending on the model installed, differentiates between hydrocarbons and other liquids.

Alarm conditions - fuel, water, sensor out - detected by the sensor are indicated by an audible alarm, a displayed message on the TLS console, and a printed message if the console is equipped with a printer. The alarms are also recorded as part of the console’s alarm history report.

INSTALLATION COMPONENTS

- Solid-state Interstitial Liquid Sensor for Fiberglass Tanks (P/N 794360-343, 794380-343, or 794380-345)
- Installation Kit
- Manual 576013-826

Sensor Installation



1. Turn Off power to the console.
2. Make sure no liquid is present in the annular space. Do not install the sensor if any liquid is present in the annular space.



Failure to remove any liquid in the annular space will lead to an alarm.

3. Measure the length of the riser pipe as shown in Figure 1.
4. Locate the label on the sensor cable that corresponds to the tank size. Add the riser pipe length determined in Step 3 (measuring away from the sensor). Mark this position on the cable with one of the tie-wraps provided, NOT by cutting into the cable jacket with a knife.
5. Attach a pull cord to the eyelet in the sensor and after confirming correct orientation of sensor (ref. Figure 1), pull the sensor through the interstitial space until the cable mark tie-wrap is even with the top of the riser pipe. All sensor types should rest at the bottom of the tank as shown.
6. Get the installation kit. Put the cord grip bushing in the riser cap and screw the cord grip nut onto the fitting. Screw the second cord grip fitting into the junction box.
7. Pass the end of the sensor cable through the cord grip fittings in the riser cap and in the junction box.
8. Secure the riser cap to the riser pipe.
9. Tighten the cable cord grip nuts on the riser cap and junction box to ensure a water-tight seal at the cable entry.
10. Using wire nuts from the kit, connect the two-wire sensor cable to the field wires in the sensor junction box (ref. Figure 2).



Observe polarity - the black wire from the sensor is ground and the other wire, which could be one of several colors, is positive.

11. Seal wire nuts with epoxy sealant following the instructions in Figure 3.

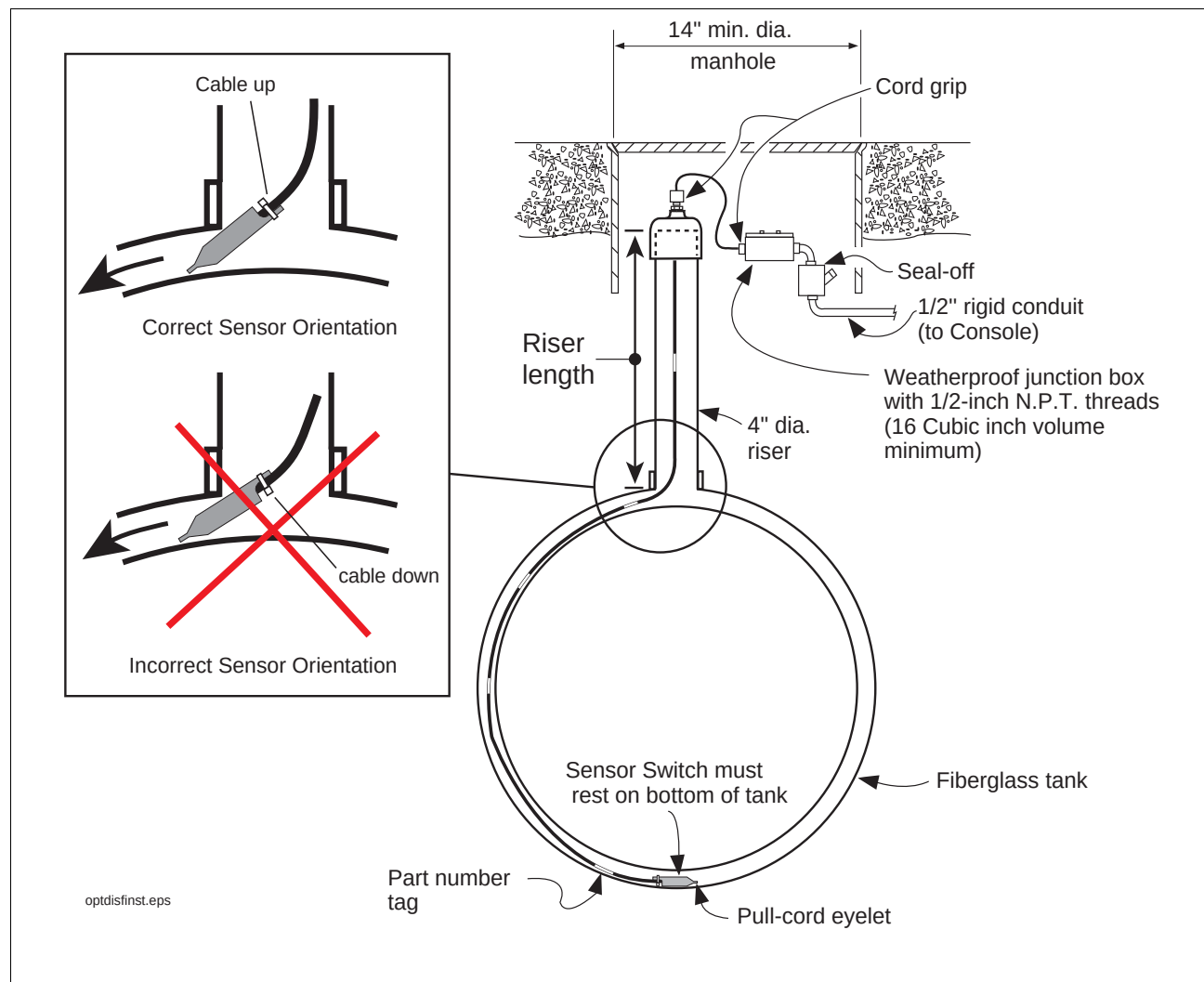


Figure 1. Sensor installation example

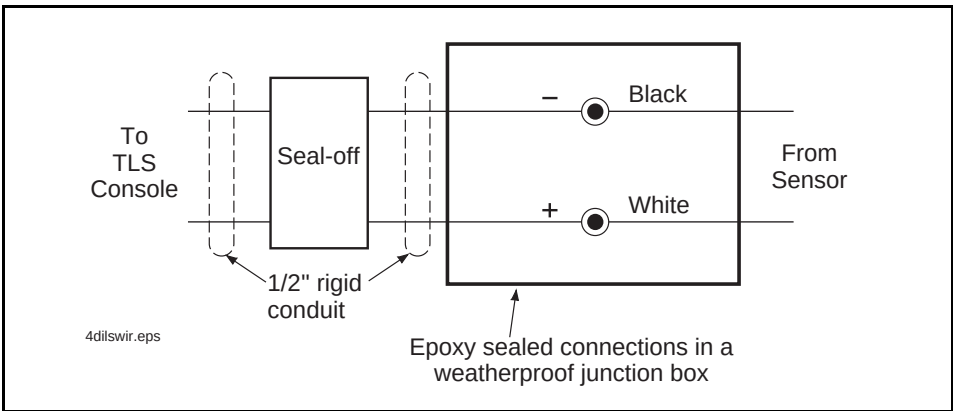
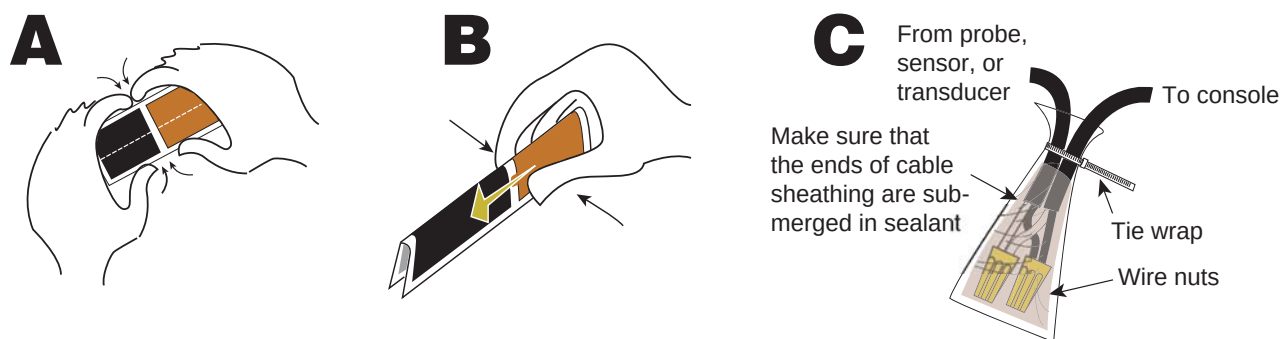


Figure 2. Sensor field wiring diagram

**Instructions:**

NOTE: When temperature is below 50°F (10°C), keep resin in a warm place prior to mixing (e.g., in an inside pocket next to body).

1. Open epoxy sealant package, and remove resin pak.
2. Holding resin pak as shown in A, bend pak along long length.
3. As shown in B, firmly squeeze the RED SIDE of the resin, forcing it through the center seal and into BLACK SIDE.

4. Mix thoroughly to a uniform color by squeezing contents back and forth 25-30 times.
5. Squeeze mixed, warm resin into one end of bag and cutoff other end.
6. Slowly insert wiring connections into sealing pak until they fit snugly against the opposite end as shown in C.
7. Twist open end of bag and use tie wrap to close it off and position the tie wrapped end up until the resin jells.



CAUTION: Epoxy sealant is irritating to eyes, respiratory system, and skin. Can cause allergic skin reaction. Contains: epoxy resin and Cycloaliphatic epoxycarboxylate.

Precautions: Wear suitable protective clothing, gloves, eye, and face protection. Use only in well ventilated areas. Wash thoroughly before eating, drinking, or smoking.

consoleslepxy2w.eps

Figure 3. Epoxy sealing field wiring connections



Installation Manual

Stand-Alone Dispenser Pan Sensor with Dispenser Control Interface

Manual Number 576013-845, Revision C

Non-Discriminating Stand-Alone Dispenser Pan Sensor
with Dispenser Control Interface
Part Nos. 847990-001, 847970-001

Discriminating Stand-Alone Dispenser Pan Sensor
with Dispenser Control Interface
Part Nos. 847990-002, 847970-002

Notice

Veeder-Root makes no warranty of any kind with regard to this publication, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

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Introduction

This manual contains procedures for the installation or replacement of the following:

For applications which require UL listing:

- ☐ Veeder-Root Non-Discriminating Stand-Alone Dispenser Pan Sensor with Dispenser Control Interface
Part No. 847990-001 (Float-Switch Type)
- ☐ Veeder-Root Discriminating Stand-Alone Dispenser Pan Sensor with Dispenser Control Interface
Part No. 847990-002 (Differentiating type)

For applications which require cUL listing:

- ☐ Veeder-Root Non-Discriminating Stand-Alone Dispenser Pan Sensor with Dispenser Control Interface
Part No. 847970-001 (Float-Switch Type)
- ☐ Veeder-Root Discriminating Stand-Alone Dispenser Pan Sensor with Dispenser Control Interface
Part No. 847970-002 (Differentiating Type)

The above parts are designed and manufactured by Veeder-Root. This manual assumes all preliminary site preparation is completed, and that field wiring to the dispenser junction box is in place.

Damage Claims

1. Thoroughly examine all components and units as soon as received. If damaged, write a complete and detailed description of the damage on the face of the freight bill. The carrier's agent *must* verify the inspection and sign the description.
2. Immediately notify the delivering carrier of damage or loss. This notification may be given either in person or by telephone. Written confirmation must be mailed within 48 hours. Railroads and motor carriers are reluctant to make adjustments for damaged merchandise unless inspected and reported promptly.
3. Risk of loss, or damage to merchandise remains with the buyer. It is the buyer's responsibility to file a claim with the carrier involved.
4. Immediately advise your Veeder-Root representative, distributor, or the factory so that we may assist you.

Return Shipping

All product returns, including warranty replacements, repairs, and core credits, must be returned on an RGA (Returned Goods Authorization) for proper processing. To return a product under this procedure:

1. Call Customer Service at (800) 873-3313 to obtain an RGA number.
2. Clearly print the RGA number on the packages being returned. No package can be received without this number.
3. All shipments of Veeder-Root products must be prepaid.
4. If the system is damaged, return it in the original shipping container with shock absorbing material provided. Veeder-Root will accept no liability for damage caused by improper packing.
5. Address the shipment to Veeder-Root Co., 6th Avenue at Burns Crossing, Altoona, Pennsylvania 16602.
6. All warranty returns must also include a legible WSR (warranty service report). Problem description and corrective action must be filled out in detail.

Safety Symbols

The following safety symbols are used throughout this manual to alert you to important safety hazards and precautions.



Explosive

Fuels and their vapors are extremely explosive if ignited.



Flammable

Fuels and their vapors are extremely flammable.



Electricity

High voltage exists in, and is supplied to, the device. A potential shock hazard exists.



Turn Power Off

Live power to a device creates a potential shock hazard. Always turn power off to the device and associated accessories when servicing the unit.



Wear Eye Protection

Fuel spray from residual pressure in the lines can cause serious eye injuries. Always wear eye protection.



Injury

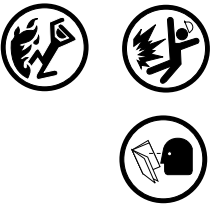
Careless or improper handling of materials can result in bodily injury.



Gloves

Wear gloves to protect hands from irritation or injury.

Warnings and Important Notes

 WARNING	
	This product is to be installed in systems operating near locations where highly combustible fuels or vapors may be present. Fire or explosion resulting in serious injury or death could result if the equipment is improperly installed or modified. Serious contamination of the environment may also occur. 1. Read and follow all instructions in this manual, including all safety warnings. 2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes. 3. Do not alter or modify any component or substitute components in this kit. 4. Do not use this component for other systems aside from the TLS Console. Install only as described in this manual.

Important

Failure to install this product in accordance with its instructions and warnings will result in voiding of all warranties connected with this product.

To help ensure proper installation and unit performance, we recommend that a Veeder-Root Authorized Service Contractor install this equipment.

Installing the Dispenser Pan Sensor

This section describes the hardware, requirements, wiring guidelines, and procedures for installing the Dispenser Pan Sensor with Dispenser Control Interface.

Installation Hardware

The Stand-Alone Dispenser Pan Sensor with Dispenser Control Interface comes with the following installation hardware:

For applications which require UL listing:

- ☐ Veeder-Root Non-Discriminating Stand-Alone Dispenser Pan Sensor with Dispenser Control Interface
Part No. 847990-001 (Float-Switch Type)
- ☐ Veeder-Root Discriminating Stand-Alone Dispenser Pan Sensor with Dispenser Control Interface
Part No. 847990-002 (Differentiating type)

For applications which require cUL listing:

- ☐ Veeder-Root Non-Discriminating Stand-Alone Dispenser Pan Sensor with Dispenser Control Interface
Part No. 847970-001 (Float-Switch Type)
- ☐ Veeder-Root Discriminating Stand-Alone Dispenser Pan Sensor with Dispenser Control Interface
Part No. 847970-002 (Differentiating Type)

For both:

- ☐ 1 Wiring Kit (Part No. 330020-024)
- ☐ Installation Instructions

Important  *Mounting brackets are required and must be ordered separately. Use of Veeder-Root Universal Mounting Kit (Part No. 330020-012) is recommended.*

Installation Requirements

Before you install each Dispenser Pan Sensor, consider the following important requirements:

1. The sensor should rest in the cup or lowest point of the dispenser pan.
2. It is recommended that the sensor be mounted in a true vertical position to ensure proper operation of the sensor.
3. Ensure that there will be enough room to pull the sensor straight out of the pan if service is required.

Dispenser Junction Box Requirements

Installing Dispenser Control Interface

- 1. The dispenser junction box must have at least one unused threaded conduit opening, either 1/2", 3/4", or 1" trade size.
- 2. The opening may be anywhere on the junction box, as long as sufficient clearance exists around the opening for installation of the Dispenser Control Interface.

Important  *When determining the installation location of the Dispenser Control Interface on the junction box, choose a location in which the Dispenser Control Interface will not interfere in any way with the operation of the dispenser or in maintenance or service access.*

Wiring Dispenser Control Interface to Dispenser

The following requirements must be met before attempting to wire the Dispenser Control Interface to a dispenser.

- 1. Be sure AC power to the dispenser junction box is OFF before attempting to open the junction box and wire the dispenser control interface to the dispenser.

The following applies to **both** installing and wiring the Dispenser Control Interface:

 WARNING	
  	Before installing this device, turn OFF power to the system. Electrical shock resulting in serious injury or death may result if power is on during installation and the device is improperly installed. High voltages are present in the dispenser junction box. Be sure to turn OFF all power before opening the junction box. More than one disconnect may be required to completely de-energize the box. Failure to comply with this warning may result in personal injury, property loss, and equipment damage. Do not use any electric tools in the area of the dispenser island. Since the island is considered a Class I, Group D Hazardous Location, failure to comply with this warning could result in an explosion.

Important  2. The junction box must have sufficient volume to accommodate the extra wiring to be installed, and must comply with the National Electric Code, Article 370-16. The required volume for any dispenser can be calculated using the information in Table I.

Table 1. Volume Required per Conductor in Junction Box

Size of Conductor AWG	Free Space Required within Box for Each Conductor (Cubic Inches)
18	1.5
16	1.75
14	2.0
12	2.25
10	2.5
8	3.0
6	5.0

NOTE: A conductor passing through the box and each conductor terminating in the box is counted as one conductor. No unplugged openings are permitted.

Dispenser Control Interface Installation

The wires between the junction box and the dispenser control interface must be of a type designed for use in the presence of gasoline and oil, must be between AWG 14 and AWG 18, rated 300 Volt (minimum), and must be suitable for pulling through conduit (for example THHN or THWN).

1. Be sure AC power to the dispenser junction box is OFF.

WARNING



Before installing this device, turn OFF power to the system.

Electrical shock resulting in serious injury or death may result if power is on during installation and the device is improperly installed.

High voltages are present in the dispenser junction box. Be sure to turn OFF all power before opening the junction box. More than one disconnect may be required to completely de-energize the box. Failure to comply with this warning may result in personal injury, property loss, and equipment damage.

Do not use any electric tools in the area of the dispenser island. Since the island is considered a Class I, Group D Hazardous Location, failure to comply with this warning could result in an explosion.

2. Remove lower-front panels from dispenser to be modified.

Important ☞ *It may be necessary to remove both the front and rear panels of the dispenser to gain access to the junction box.*

3. Remove the junction box cover and pipe plug from the appropriate junction box conduit opening. Retain cover and bolts for reassembly.
4. Insert WHITE, BLACK, AND RED wires from the dispenser control interface into the threaded opening in the junction box. Screw the interface into the junction box and tighten. See Figure 1 below. At least 5 full threads must be engaged between each interconnect of the conduit.

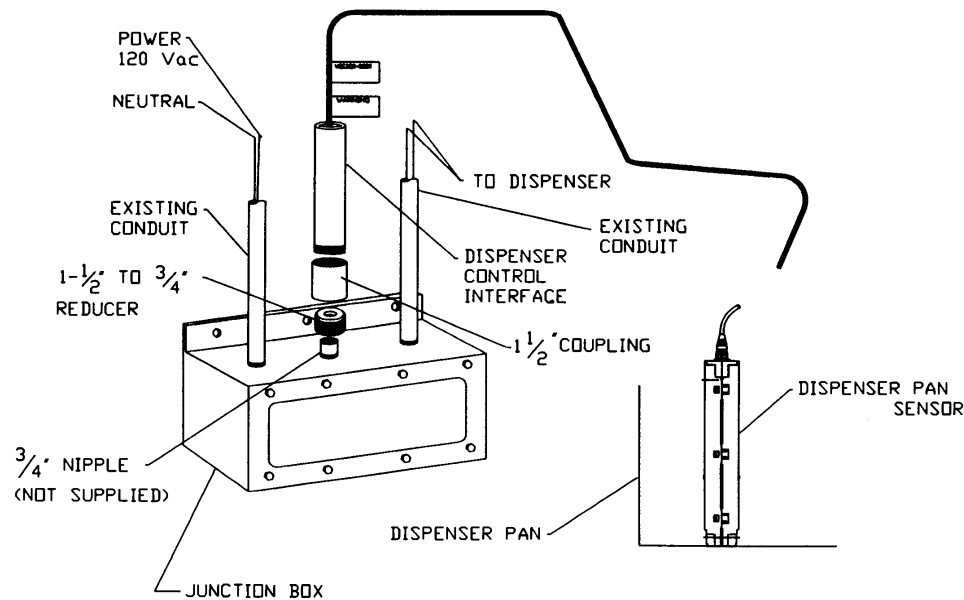


Figure 1. Typical Dispenser Control Interface Installation

5. For Discriminating Dispenser Pan Sensor with Dispenser Control Interface, Part Nos. 847990-002 and 847970-002, attach the CAUTION Tag to the dispenser pan in a visible area.
6. Any additional parts required to allow the interface to clear the parts adjacent to the junction box conduit opening must be provided by the installer. At least 5 full threads must be engaged between each interconnect of the conduit.

CAUTION: Do not use pipe sealant or teflon tape to seal conduit interconnections. Failure to comply can result in explosion hazard.

Important ☞ *Check to see that the Intrinsic Safety WARNING Label is still securely attached to the cable. The labels must be attached to the cables at all times. Replace them if they are missing or the wording is not legible. See Figure 2 below; refer to Figure 1 for label location.*

 WARNING	
	To maintain intrinsic safety, route cable in accordance with Article 504 of the National Electrical Code.

<u>WARNING</u> TO MAINTAIN INTRINSIC SAFETY, DO NOT INSTALL THESE WIRES NEAR WIRING FOR ANY OTHER CIRCUIT PT. NO.326429-001

Figure 2. Dispenser Control Interface WARNING Label

7. Route and secure protective Dispenser Control Interface cable with plastic wire ties, supplied in the wiring kit. The cable may be tied to the plumbing and structural members of the pump frame. **Cable must not be tied to sharp edges or moving parts.** Any remaining slack may be looped and tied at a convenient point.
8. Use wire nuts or other approved connectors for junction box connections to red, black, and white wires of the Dispenser Control Interface. See Figure 3 on page 10.

Dispenser Control Interface Wiring

1. Wire Dispenser Control Interface to dispenser according to the appropriate Dispenser Control Interface wiring diagram (Figure 3 on page 10, Figure 4 on page 10, Figure 5 on page 11, Figure 6 on page 12, Figure 7 on page 13, Figure 8 on page 14, or Figure 9 on page 15).

 WARNING	
	Be sure no unplugged openings exist in the junction box. Close or plug any openings before proceeding. Failure to comply with this warning may result in personal injury, property loss, and equipment damage.

2. Place the cover on the junction box and ensure that all cover screws are replaced and tight.
3. Visually check to be sure that the security plugs, Dispenser Control Interface, and all wiring and cables are secure.
4. Restore AC power to the junction box.

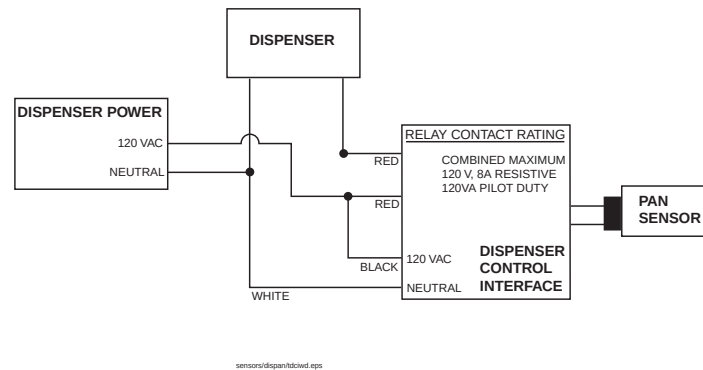


Figure 3. Typical Dispenser Control Interface Wiring Diagram

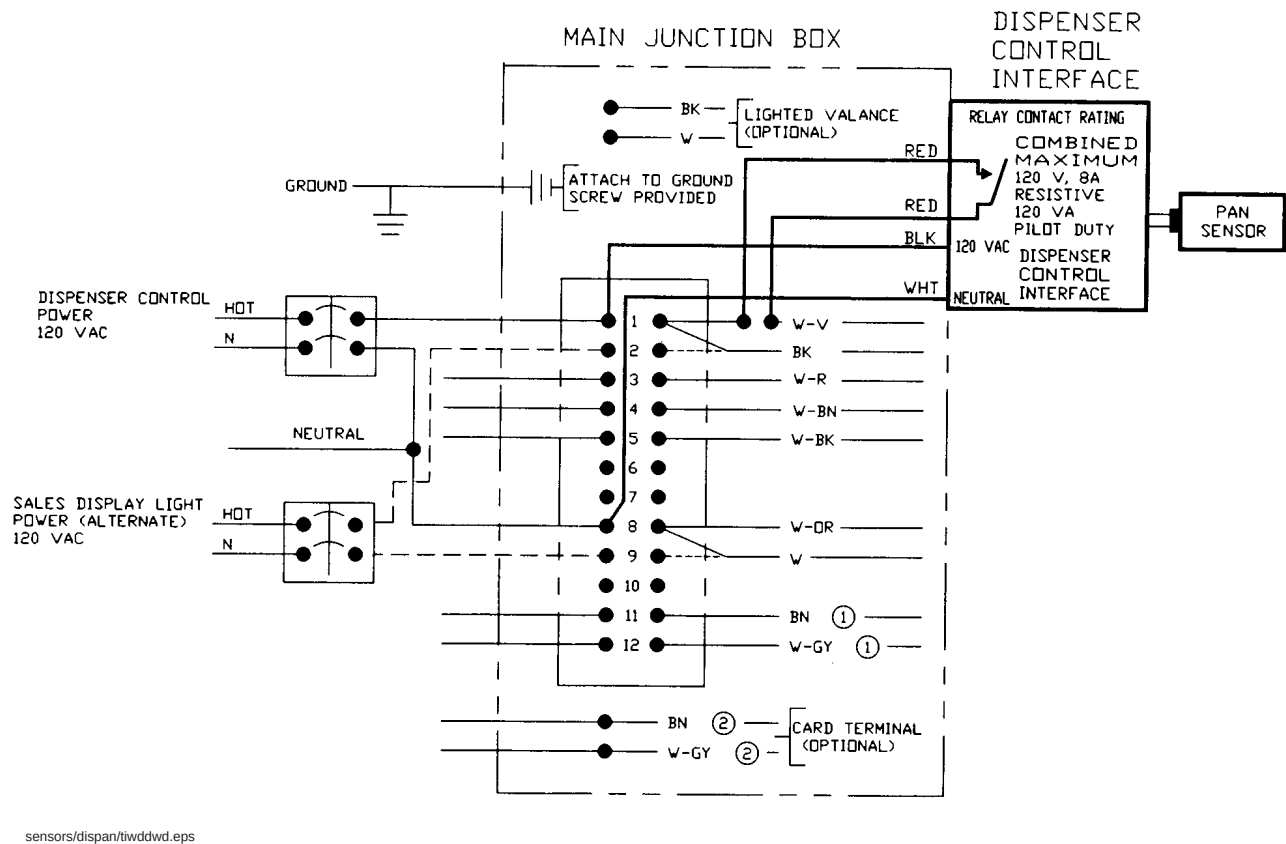


Figure 4. Typical Installation Wiring Diagram for Dispenser Control Interface to a Dresser-Wayne Dispenser (120 VAC)

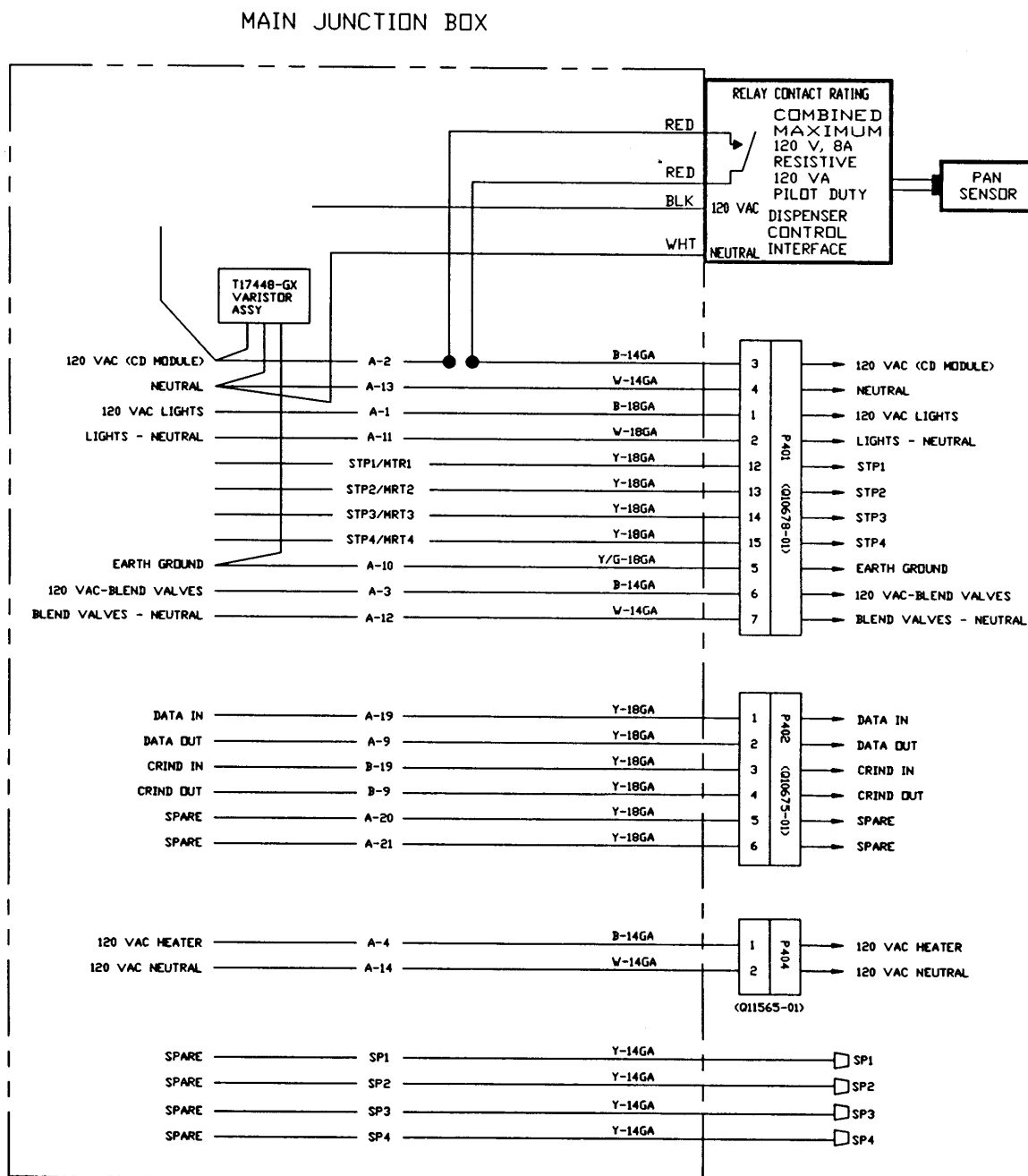


Figure 5. Typical Installation Wiring Diagram for Dispenser Control Interface to a Gilbarco Dispenser (120 VAC Models)

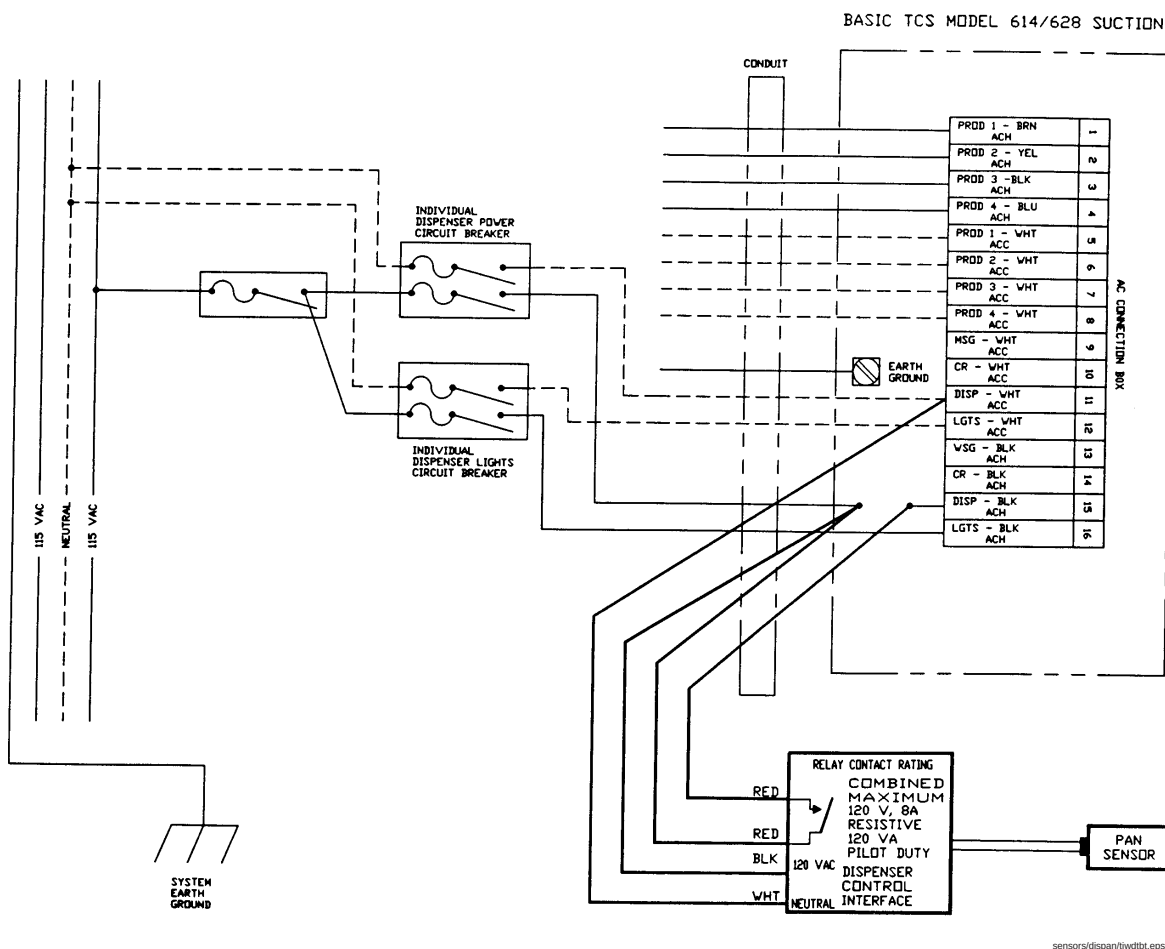


Figure 6. Typical Installation Wiring Diagram for Dispenser Control Interface to a Tokheim Basic TCS Model 614/628 Dispenser

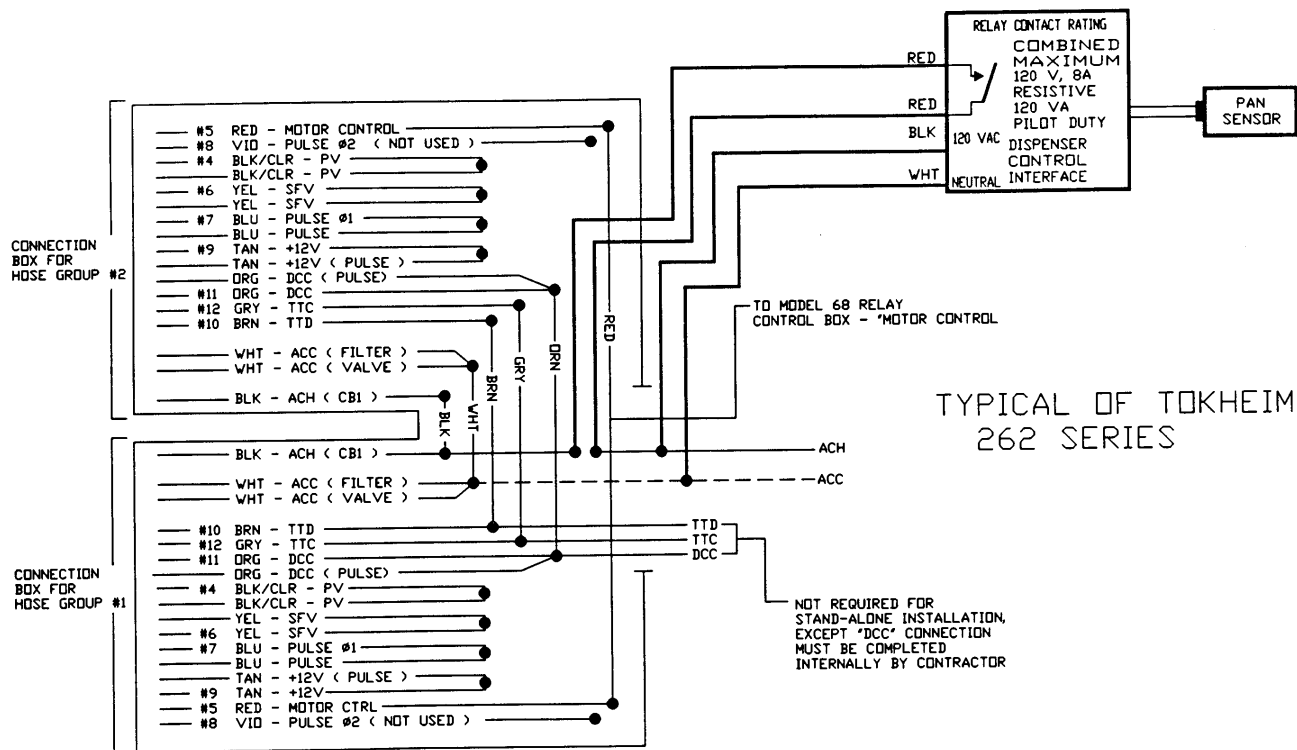
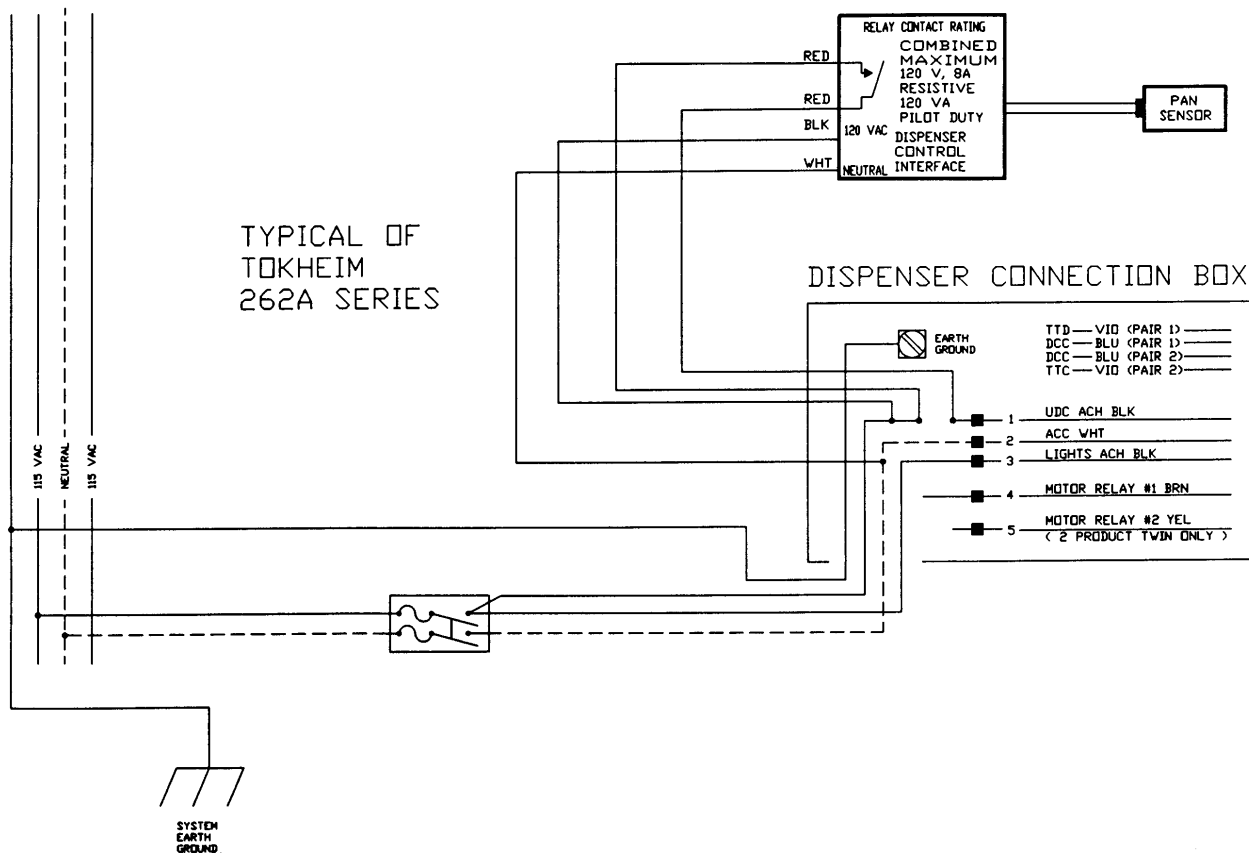
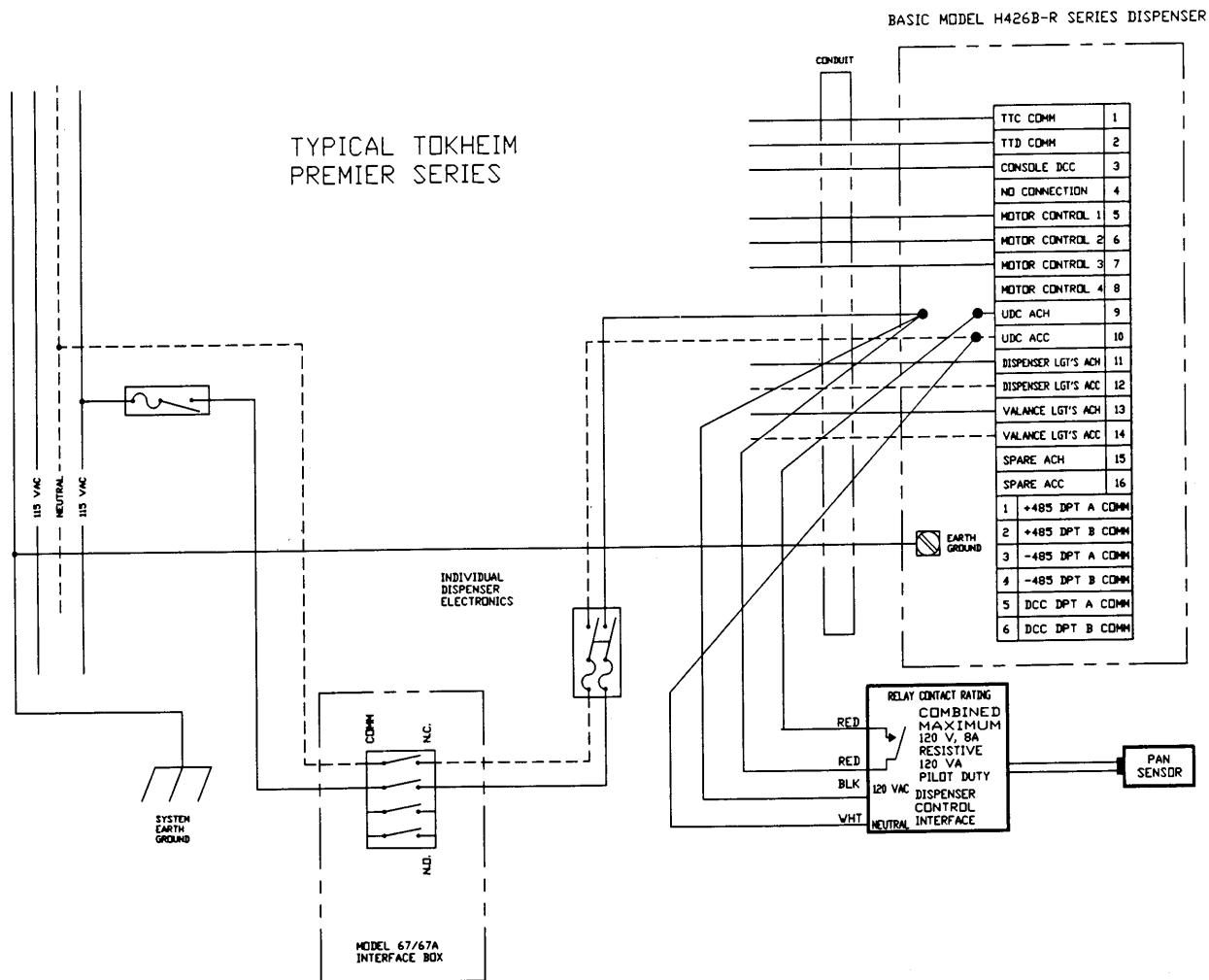


Figure 7. Typical Installation Wiring Diagram for Dispenser Control Interface to a Tokheim 262 Series Dispenser



sensors/dispan/twdtasd.eps

Figure 8. Typical Installation Wiring Diagram for Dispenser Control Interface to a Tokheim 262A Series Dispenser



sensors/dspan/twdtpsd.eps

Figure 9. Typical Installation Wiring Diagram for Dispenser Control Interface to a Tokheim Premier Series Dispenser

Dispenser Pan Sensor Installation

 WARNING	
 	This device is installed in equipment where potentially lethal voltages may exist. Electrical shock resulting in serious injury or death may result if power is on during installation and the device is improperly installed. Before installing this device, turn off power to the system.

To install any of the Dispenser Pan Sensors:

Important  *Do not install the dispenser pan sensor if there is any liquid in the dispenser pan. Failure to comply can result in equipment damage or undetected potential environmental and health hazards.*

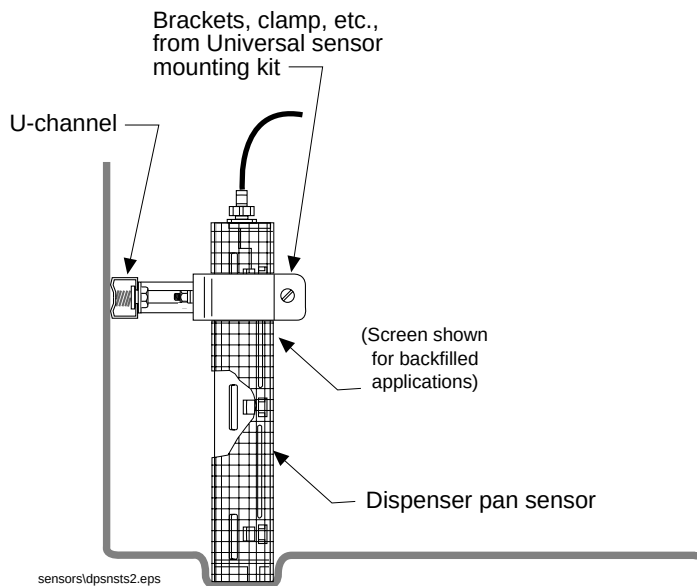
1. Make sure no liquid exists in the dispenser pan.

Important  *Before removing an existing dispenser pan sensor be sure to mark field wires in the junction box to maintain correct sensor wiring polarity during the replacement procedure.*

2. Choose a location in the dispenser pan following these guidelines to help insure proper operation of the sensor:

- ☐ The sensor should rest in the cup or lowest point of the dispenser pan.
- ☐ The sensor should be mounted in a true vertical position, where it can be pulled straight out for future service or replacement.
- ☐ If installing the sensor into a backfilled pan, it is recommended that a screen tube be used for ease of removal and reinstallation.

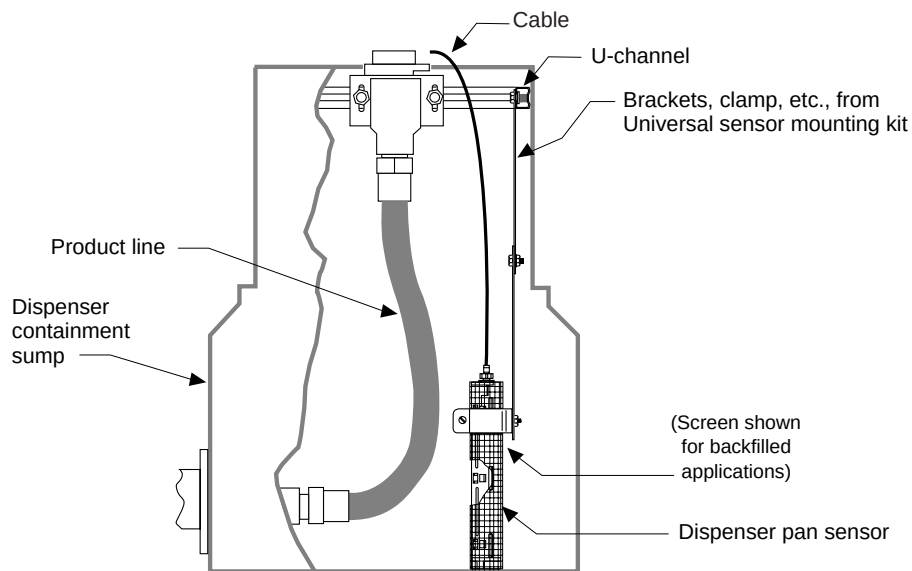
Refer to Figure 10, “Typical Dispenser Pan Sensor Installation,” on page 17, or Figure 11, “Typical Dispenser Pan Sensor Installation in a Dispenser Sump,” on page 17.



*Dispenser pan sensor should:

1. Rest in the cup or the lowest point of the dispenser pan.
2. Be positioned so as to be removable when pulling the sensor straight up out of the pan.
3. Be mounted in a true vertical position.

Figure 10. Typical Dispenser Pan Sensor Installation



*Dispenser pan sensor should:

1. Rest in the cup or the lowest point of the dispenser containment sump.
2. Be positioned so as to be removable when pulling the sensor straight up out of the pan.
3. Be mounted in a true vertical position.

Figure 11. Typical Dispenser Pan Sensor Installation in a Dispenser Sump

3. Install the mounting hardware according to the dispenser pan manufacturer's instructions.

Important ☞ *Mounting hardware should be ordered from the dispenser pan manufacturer. Specify that you are installing a Veeder-Root Dispenser Pan Sensor when ordering from the pan manufacturer. An optional Veeder-Root Universal Mounting Kit (No. 330020-012) is available.*

4. Secure the mounting bracket in the dispenser pan and slide the sensor into position.
5. Connect the cable from the Dispenser Control Interface to the sensor and secure the cable nut.

Important ☞ *For proper sensor operation, sensor connector and cable interface must be dry and free from any contaminants.*

6. Tighten the cord grip nut to ensure a watertight seal at the cable entry.
7. Restore AC power to the junction box.

Dispenser Pan Sensor Testing

After sensor installation, test each dispenser pan sensor with dispenser interface installed to be sure it is working properly:

1. To test the sensor, turn the sensor upside-down. The dispenser should be disabled.

Important ☞ *If the dispenser is not disabled during the test, review the installation instructions in "Dispenser Control Interface Installation" on page 7. If the sensor does not deactivate after you review the installation, contact your Veeder-Root representative or distributor.*

2. To reactivate the dispenser, turn the dispenser power OFF for at least 15 seconds, then turn it back ON.

Important ☞ *Final approval of a field installation of this product into an existing dispenser is under the authority of the local inspector.*

Warranty Conditions and Limitations of Liability

Limitations Of Liability

We warrant that this product will be free from defects in materials and workmanship for a period of 1 year from the date of installation or 24 months from the date of invoice, whichever occurs first. During the warranty period, we or our representative will repair or replace the product, if determined by us to be defective, at the location where the product is in use and at no charge to the purchaser.

We shall not be responsible for any expenses incurred by the user.

This warranty applies only when the product is installed in accordance with Veeder-Root's specifications, and a Warranty Registration and Checkout Form has been filed with Veeder-Root by an Authorized Veeder-Root Distributor. This warranty will not apply to any product which has been subjected to misuse, negligence or accident; or misapplied; or used in violation of product manuals, instructions or warnings; or modified or repaired by unauthorized persons; or improperly installed.

Inspection

You shall inspect the product promptly after receipt and shall notify us at our Simsbury office in writing of any claims, including claims of breach of warranty, within 30 days after you discover or should have discovered the facts upon which the claim is based. Your failure to give written notice of a claim within the time period shall be deemed to be a waiver of such claim.

Limitation of Remedy and Warranty

The provisions of "Limitations Of Liability" on page 19 are our sole obligation and exclude all other remedies or warranties, express or implied, including warranties of MERCHANTABILITY and FITNESS FOR A PARTICULAR PURPOSE, whether or not purposes or specifications are described herein. We further disclaim any responsibility whatsoever to you or to any other person for injury to person or damage to or loss of property or value caused by any product which has been subjected to misuse, negligence, or accident; or misapplied; or used in violation of product manuals, instructions or warnings; or modified or repaired by unauthorized persons; or improperly installed.

Limitation of Damages

Under no circumstances shall we be liable for any incidental, consequential or specific damages, losses or expenses arising from this contract or its performance or in connection with the use of, or inability to use, our product for any purpose whatsoever.

Limitation of Actions

No action regardless of form arising out of this contract may be commenced more than 1 year after the cause of action has accrued, except an action for nonpayment.

Collateral Promises

There are no representations, warranties, or conditions, express or implied, statutory or otherwise except those herein contained, and no agreement or waivers collateral hereto shall be binding on either party unless in writing and signed by you and accepted by us at our Simsbury office.

Interpretation

Rights and liabilities arising out of any contract with us shall be determined under the Uniform Commercial Code as enacted in Connecticut.

Sales Offices

Veeder-Root has offices around the world to serve you.

Headquarters

Veeder-Root Company
125 Powder Forest Drive
Simsbury, CT 06070-7684 U.S.A.
(860) 651-2700 FAX: (860) 651-2719 TECH SUPPORT (860) 651-2753

England

Veeder-Root Environmental Systems Limited
Hydrex House, Garden Road
Richmond, Surrey TW9 4NR ENGLAND
44-181-392-1355

Brazil

Veeder-Root do BRASIL
Rua ado Benatti, 92
Caixa Postal 8343
01051 Sao Paulo BRAZIL
55-11-861-2155

Germany

Veeder-Root GmbH
Uhlandstrasse 49
D-78554 Aldingen GERMANY
49 (0)7424 89285

France

Veeder-Root SARL
ZI des Mardelles
94-106 rue Blaise Pascal
93600 Aulnay-sous-Bois FRANCE
33 (0)1 4879 5599

Canada

Veeder-Root Canada
151 Superior Boulevard, Suite 24
Mississauga, Ontario, L5T 2L1 CANADA
905-670-2755

Singapore

Veeder-Root Singapore
#2 Kallang Pudding Road
#06-16 Mactech Industrial Building
SINGAPORE 1334
(65) 745-0368 FAX: (65) 745-0636

Mexico

Veeder-Root Mexico
Prado de las Camelias
No. 4483-4
Prados Tepeyac C.P. 45500
Zapopan, Jal., MEXICO
(52) 36-47-3750

Interstitial Liquid Sensor - Steel Tanks

Installation Guide

Notice

Veeder-Root makes no warranty of any kind with regard to this publication, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

Veeder-Root shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this publication.

Veeder-Root reserves the right to change system options or features, or the information contained in this publication.

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Contact TLS Systems Technical Support for additional troubleshooting information at 800-323-1799.

DAMAGE CLAIMS / LOST EQUIPMENT

Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

Veeder-Root must be notified of any damages and/or shortages within 30 days of receipt of the shipment, as stated in our Terms and Conditions.

VEEDER-ROOT'S PREFERRED CARRIER

1. Contact Veeder-Root Customer Service at 800-873-3313 with the specific part numbers and quantities that were missing or received damaged.
2. Fax signed Bill of Lading (BOL) to Veeder-Root Customer Service at 800-234-5350.
3. Veeder-Root will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

CUSTOMER'S PREFERRED CARRIER

1. It is the customer's responsibility to file a claim with their carrier.
2. Customer may submit a replacement purchase order. Customer is responsible for all charges and freight associated with replacement order. Customer Service will work with production facility to have the replacement product shipped as soon as possible.
3. If "lost" equipment is delivered at a later date and is not needed, Veeder-Root will allow a Return to Stock without a restocking fee.
4. Veeder-Root will NOT be responsible for any compensation when a customer chooses their own carrier.

RETURN SHIPPING

For the parts return procedure, please follow the appropriate instructions in the "General Returned Goods Policy" pages in the "Policies and Literature" section of the Veeder-Root **North American Environmental Products** price list. Veeder-Root will not accept any return product without a Return Goods Authorization (RGA) number clearly printed on the outside of the package.

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Introduction

This manual contains installation procedures for the replacement of all interstitial liquid sensors for steel tanks in an existing TLS monitoring system designed and manufactured by Veeder-Root.

This manual assumes field wiring has been run from the console to the tank in which this sensor will be installed following instructions in the appropriate console's site prep manual.

Contractor Certification Requirements

Veeder-Root requires the following minimum training certifications for contractors who will install and setup the equipment discussed in this manual:

Installer (Level 1) Certification: Contractors holding valid Installer Certification are approved to perform wiring and conduit routing; equipment mounting; probe, sensor and carbon canister vapor polisher installation; wireless equipment installation; tank and line preparation; and line leak detector installation.

ATG Technician (Level 2/3 or 4) Certification: Contractors holding valid ATG Technician Certifications are approved to perform installation checkout, startup, programming and operations training, system tests, troubleshooting and servicing for all Veeder-Root Series Tank Monitoring Systems, including Line Leak Detection. In addition, Contractors with the following sub-certification designations are approved to perform installation checkout, startup, programming, system tests, troubleshooting, service techniques and operations training on the designated system.

- Wireless 2
- Tall Tank

Warranty Registrations may only be submitted by selected Distributors.

Product Marking Information

RELATED DOCUMENTS

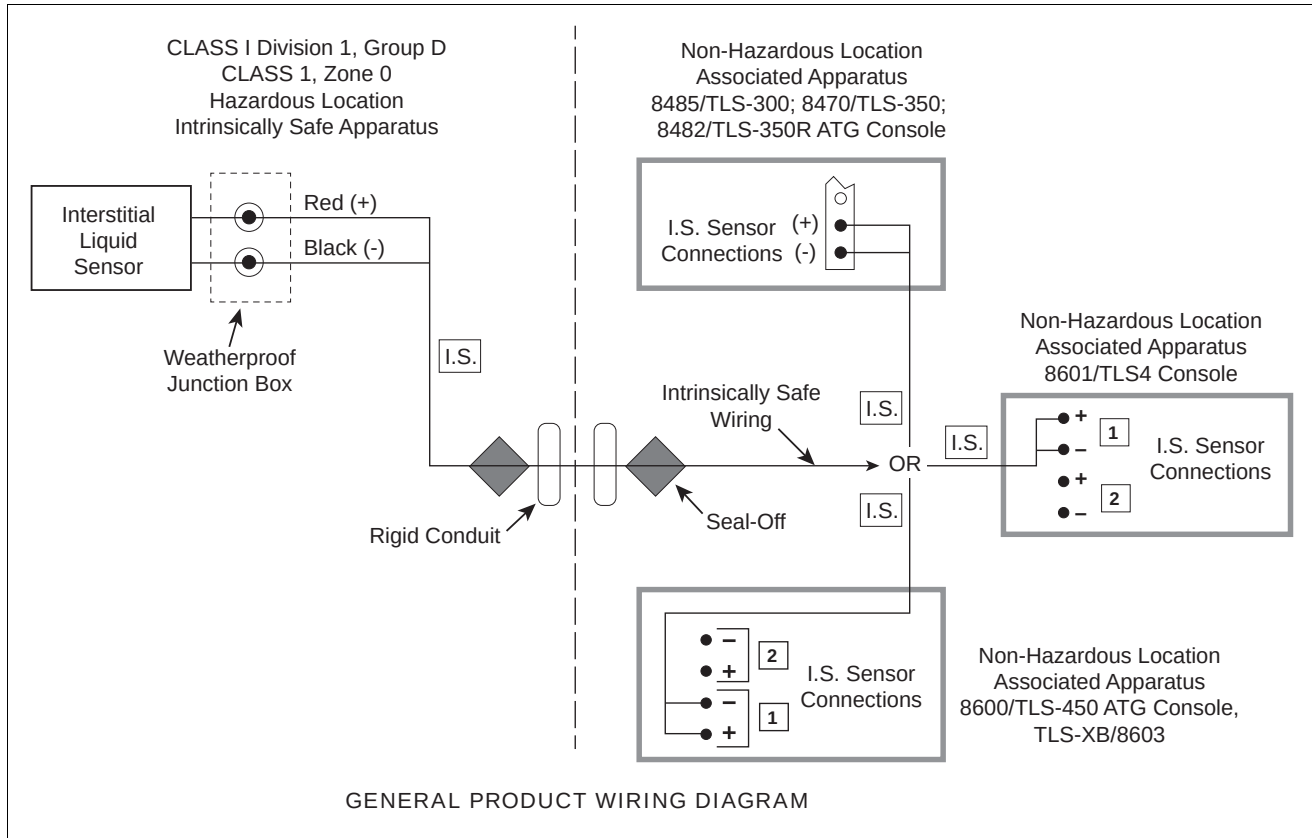
Documents Required to Install Equipment

This intrinsically safe apparatus is only for use as part of a Veeder-Root Automatic Tank Gauging System (ATG Console with probes and sensors). To install intrinsically safe apparatus, use the specific control drawing that appears on the nameplate of the applicable associated apparatus (ATG Console):

Equipment	UL/cUL Control Drawing Document No.
Associated Apparatus	
TLS-450/8600	331940-008
TLS-350, TLS-350R	331940-011
TLS-300	331940-013
TLS4/8601	331940-018
TLS-XB/8603	331940-020

The control drawings contain information related to the correct installation of the overall intrinsically Safe System. This includes information such as maximum number of apparatus, specific apparatus allowed in the system, maximum cable lengths, references to codes, proper grounding and so on. Control drawings can be found on the

accompanying Compact Disk (TECH DOCS CD) or on the internet at veeder.com under SUPPORT; VR TECHNICAL DOCUMENTS; DRAWINGS.



Product Label Contents

 VEEDER-ROOT CL I, DIV. 1, GP.D CL I, ZONE 0 AEx ia IIA Ex ia IIA TC=T4 SECURITE INTRINSEQUE SIMPLE APPARATUS	I.S. CIRCUIT FOR HAZLOC SENSOR F/N 7943X0-XXX S/N XXXXXX	
	$-40^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$	
	MANUAL NO. 576013-616	
		

Safety Warnings

To protect yourself and your equipment, observe the following warnings and important information:

 WARNING	
    	This product is to be installed and operated in the highly combustible environment of a gasoline storage tank where flammable liquids and explosive vapors may be present. FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH. 1. Read and follow all instructions in this manual, including all safety warnings to protect yourself and others from serious injury, explosion, or electrical shock. 2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes. 3. To protect yourself and others from being struck by vehicles, block off your work area during installation or service. 4. Do not alter or modify any component or substitute components in this kit. 5. Warning! Substitution of components may impair intrinsic safety. 6. Field wiring to the Sensor must not share a conduit with any non-intrinsically safe device's wiring. 7. Warning! To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing. 8. Before installing or taking the unit into a hazardous area, earth the unit in a safe area to remove any static charge. Then immediately transport the unit to the installation site. Do not rub or clean the unit prior to installation. Cleaning is not required under normal service conditions. Do not rub or clean the unit after installation. If the unit is not fixed to a known earth point when installed, ensure that a separate earth connection is made to prevent the potential of a static discharge. When fitting or removing the unit, use of anti-static footwear or clothing is required. 9. Materials used in the construction of this device do not contain, by mass, more than 10% in total of aluminum, magnesium, zirconium and titanium or 7.5% in total of magnesium, titanium and zirconium.

NOTE Failure to install this product in accordance with its instructions and warnings will result in voiding of all warranties with this product.

Safety Symbols

The following safety symbols may be used throughout this manual to alert you to important safety hazards and precautions.

	EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.		FLAMMABLE Fuels and their vapors are extremely flammable.
	TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.		GLOVES Wear gloves to protect hands from irritation or injury.

 USE SAFETY BARRICADES Unauthorized people or vehicles in the work area are dangerous. Always use safety cones or barricades, safety tape, and your vehicle to block the work area.	 READ ALL RELATED MANUALS Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.
 WEAR EYE PROTECTION Wear eye protection when working with pressurized fuel lines or epoxy sealant to avoid possible eye injury.	 INJURY Careless or improper handling of materials can result in bodily injury.

Sensor Description

The Veeder-Root Interstitial Liquid Sensor detects the presence of liquid in the interstitial space of a double-wall tank. When liquid is detected, the sensor sends an alarm signal to the console. The console's visual and audible built-in alarm indicators immediately tell you where the problem is, so you can quickly take action to help prevent serious safety and environmental problems. The Interstitial Liquid Sensor can be used in the annulus of a tank with a sensor riser pipe of 2" I.D. or greater.

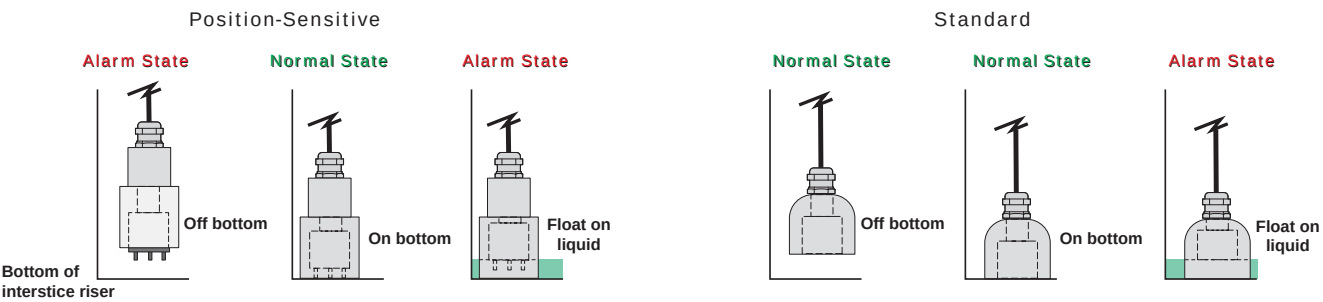
COMPONENTS SHIPPED

Qty.	Description
1	Interstitial Steel Tank Sensor (as ordered)
1	Field wiring kit, P/N 330020-539
1	Installation Guide, P/N 576013-616

MODELS

Sensor Form No.	Operating Temp.	Storage Temp.	Dimensions	Cable Length	Other
794380-333	-40°C to +60°C	-40°C to +75°C	3.275" high, 1.75" dia.	16 feet	Position Sensitive
794380-430			2.5" high, 1.5" dia.	16 feet	Alternate Fluids
794390-420				16 feet	
794390-460				30 feet	

SENSOR STATES



Installation



1. Turn OFF power to the console.
2. Make sure no liquid is present in the annular space. Important! Do not install the sensor if any liquid is present in the annular space. Failure to comply will lead to an alarm.
3. To ensure proper operation of these sensors, they must rest on the bottom of the tank's interstitial riser. Lower the sensor into the riser until it rests on the bottom of the riser (see Figure 1).
4. Keeping the cable taut, secure the sensor in place by attaching a grip cord. Note: The sensor should not be suspended by the cable, but should rest on the bottom of the tank.
5. Secure the riser cap to the riser pipe.
6. Tighten the cable bushing nuts on the riser cap and junction box to ensure a water-tight seal at the cable entry.

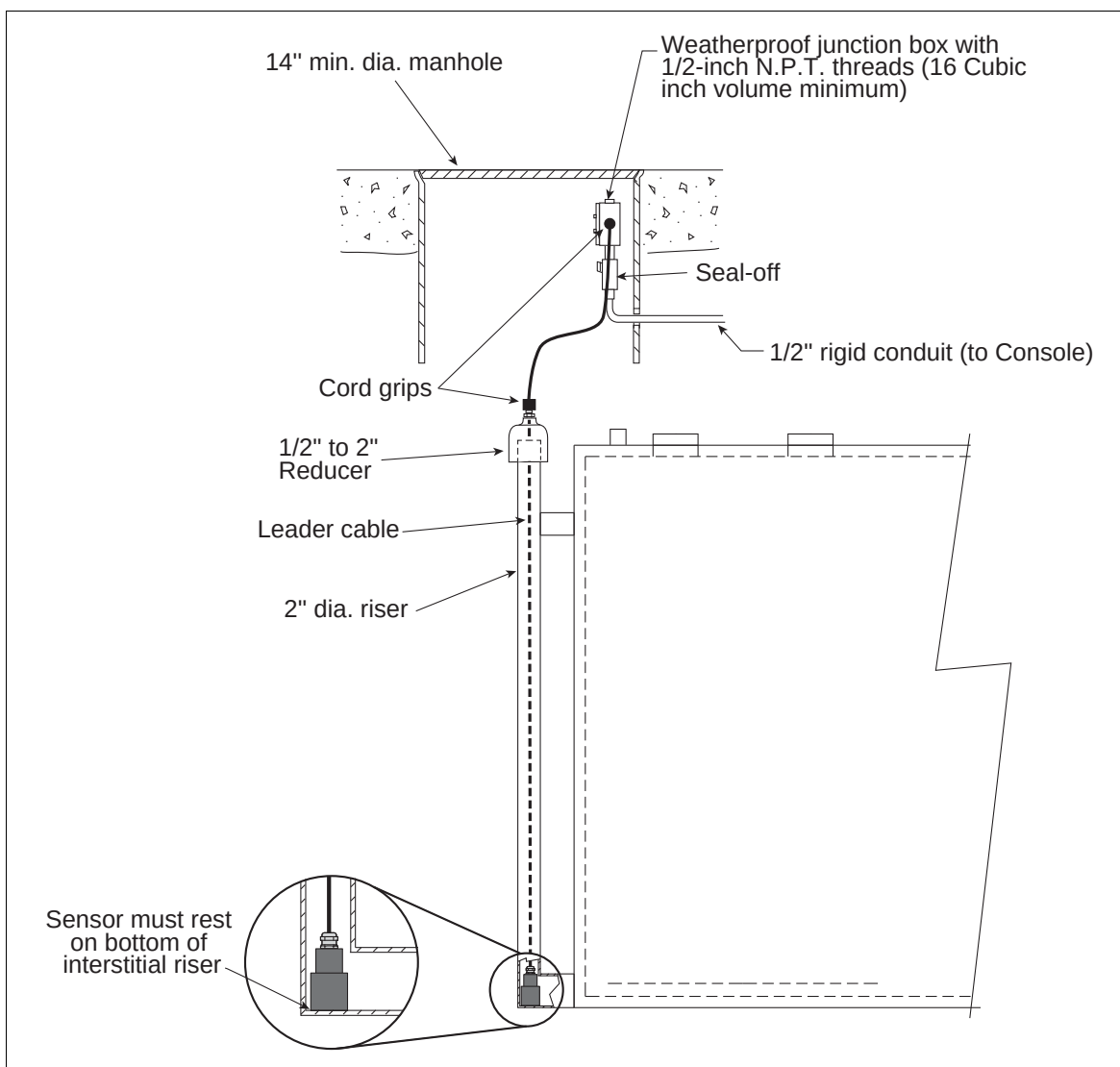


Figure 1. Example Sensor Installation - Steel Tank

7. Using wire nuts, connect the two-wire sensor cable to the field wires in the sensor junction box (Figure 2). Seal wire nuts with epoxy sealant following the instructions in Figure 3.

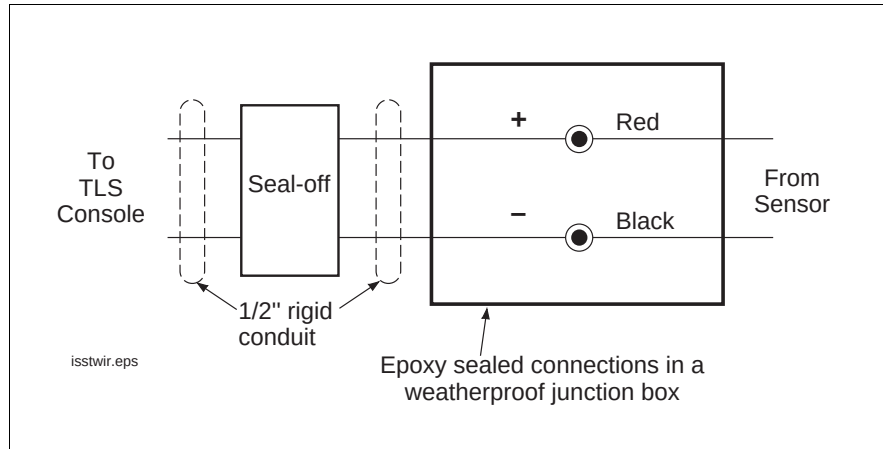


Figure 2. Sensor Field Wiring Diagram

A

B

C

Instructions:

NOTE: When temperature is below 50°F (10°C), keep resin in a warm place prior to mixing (e.g., in an inside pocket next to body).

1. Open epoxy sealant package, and remove resin pak.
2. Holding resin pak as shown in A, bend pak along long length.
3. As shown in B, firmly squeeze the RED SIDE of the resin, forcing it through the center seal and into BLACK SIDE.
4. Mix thoroughly to a uniform color by squeezing contents back and forth 25-30 times.
5. Squeeze mixed, warm resin into one end of bag and cutoff other end.
6. Slowly insert wiring connections into sealing pack until they fit snugly against the opposite end as shown in C.
7. Twist open end of bag and use tie wrap to close it off and position the tie wrapped end up until the resin jells.

CAUTION: Epoxy sealant is irritating to eyes, respiratory system, and skin. Can cause allergic skin reaction. Contains: epoxy resin and Cycloaliphatic epoxycarboxylate.

Precautions: Wear suitable protective clothing, gloves, eye, and face protection. Use only in well ventilated areas. Wash thoroughly before eating, drinking, or smoking.

consolesepxy2w.eps

Figure 3. Epoxy sealing example



Sump Sensor

Installation Guide

Notice

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Veeder-Root shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this publication.

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Contact TLS Systems Technical Support for additional troubleshooting information at 800-323-1799.

DAMAGE CLAIMS / LOST EQUIPMENT

Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

Veeder-Root must be notified of any damages and/or shortages within 30 days of receipt of the shipment, as stated in our Terms and Conditions.

VEEDER-ROOT'S PREFERRED CARRIER

1. Contact Veeder-Root Customer Service at 800-873-3313 with the specific part numbers and quantities that were missing or received damaged.
2. Fax signed Bill of Lading (BOL) to Veeder-Root Customer Service at 800-234-5350.
3. Veeder-Root will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

CUSTOMER'S PREFERRED CARRIER

1. It is the customer's responsibility to file a claim with their carrier.
2. Customer may submit a replacement purchase order. Customer is responsible for all charges and freight associated with replacement order. Customer Service will work with production facility to have the replacement product shipped as soon as possible.
3. If "lost" equipment is delivered at a later date and is not needed, Veeder-Root will allow a Return to Stock without a restocking fee.
4. Veeder-Root will NOT be responsible for any compensation when a customer chooses their own carrier.

RETURN SHIPPING

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Introduction

This manual contains installation procedures for the Veeder-Root Sump Sensor (Part No. 794380-208 or 794380-209).

This manual assumes field wiring has been run from the console to the sump in which the sensor will be installed following instructions in the appropriate console's site prep manual.



Important! Sump Sensor field wiring must not be connected to the console prior to sensor installation.

Contractor Certification Requirements

Veeder-Root requires the following minimum training certifications for contractors who will install and setup the equipment discussed in this manual:

Installer (Level 1) Certification: Contractors holding valid Installer Certification are approved to perform wiring and conduit routing; equipment mounting; probe, sensor and carbon canister vapor polisher installation; wireless equipment installation; tank and line preparation; and line leak detector installation.

ATG Technician (Level 2/3 or 4) Certification: Contractors holding valid ATG Technician Certifications are approved to perform installation checkout, startup, programming and operations training, system tests, troubleshooting and servicing for all Veeder-Root Series Tank Monitoring Systems, including Line Leak Detection. In addition, Contractors with the following sub-certification designations are approved to perform installation checkout, startup, programming, system tests, troubleshooting, service techniques and operations training on the designated system.

- Wireless 2
- Tall Tank

Warranty Registrations may only be submitted by selected distributors.

Product Marking Information

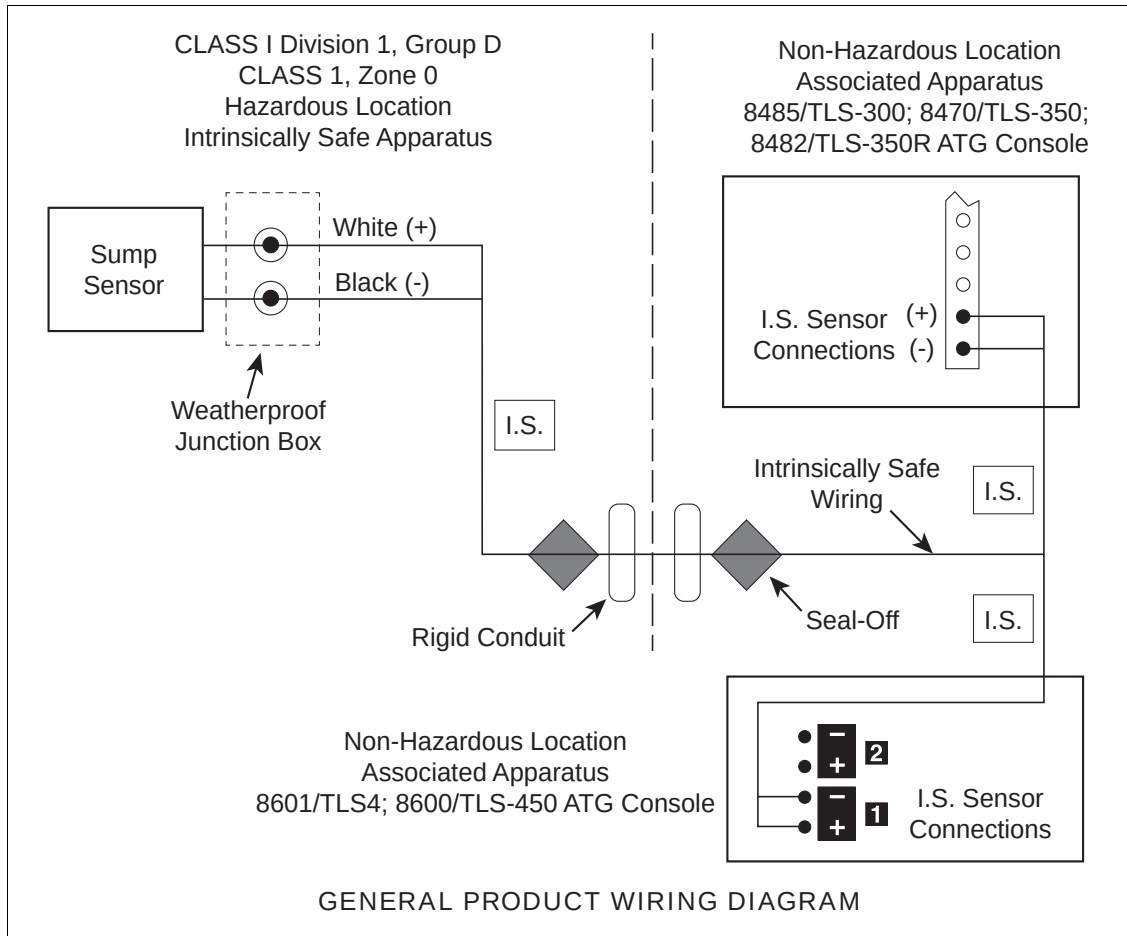
RELATED DOCUMENTS

Documents Required to Install Equipment

This intrinsically safe apparatus is only for use as part of a Veeder-Root Automatic Tank Gauging System (ATG Console with probes and sensors). To install intrinsically safe apparatus, use the specific control drawing that appears on the nameplate of the applicable associated apparatus (ATG Console):

Equipment	UL/cUL Control Drawing Document No.
Associated Apparatus	
TLS-450/8600	331940-008
TLS-350, TLS-350R	331940-011
TLS-300	331940-013
TLS4/8601	331940-018

The control drawings contain information related to the correct installation of the overall intrinsically Safe System. This includes information such as maximum number of apparatus, specific apparatus allowed in the system, maximum cable lengths, references to codes, proper grounding and so on. Control drawings can be found on the accompanying Compact Disk (TECH DOCS CD) or on the internet at veeder.com under SUPPORT; VR TECHNICAL DOCUMENTS; DRAWINGS.



Product Label Contents

 VEEDER-ROOT TM		I.S. CIRCUIT FOR HAZLOC SENSOR F/N 794380-XXX S/N XXXXXX	
CL I, DIV. 1, GP.D		-40°C ≤ Ta ≤ +60°C	
CL I, ZONE 0		MANUAL NO. 576013-301	
AEx ia IIA			
Ex ia IIA			
TC=T4			
SECURITE INTRINSEQUE			

Warnings and Important Notes

 WARNING	
     	This product is to be installed in systems operating near locations where highly combustible fuels or vapors may be present. FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH. 1. Read and follow all instructions in this manual, including all safety warnings to protect yourself and others from serious injury, explosion, or electrical shock. 2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes. 3. To protect yourself and others from being struck by vehicles, block off your work area during installation or service. 4. Do not alter or modify any component or substitute components in this kit. 5. Warning! Substitution of components may impair intrinsic safety. 6. Field wiring to the Sump Sensor must not share a conduit with any non-intrinsically safe device's wiring. 7. Warning! To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing. 8. Before installing or taking the unit into a hazardous area, earth the unit in a safe area to remove any static charge. Then immediately transport the unit to the installation site. Do not rub or clean the unit prior to installation. Cleaning is not required under normal service conditions. Do not rub or clean the unit after installation. If the unit is not fixed to a known earth point when installed, ensure that a separate earth connection is made to prevent the potential of a static discharge. When fitting or removing the unit, use of anti-static footwear or clothing is required. 9. Materials used in the construction of this device do not contain, by mass, more than 10% in total of aluminum, magnesium, zirconium and titanium or 7.5% in total of magnesium, titanium and zirconium.

NOTE Failure to install this product in accordance with its instructions and warnings will result in voiding of all warranties with this product.

Safety Precautions

The following safety symbols may be used throughout this manual to alert you to important safety hazards and precautions

 EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.	 FLAMMABLE Fuels and their vapors are extremely flammable.
 TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.	 INJURY Careless or improper handling of materials can result in bodily injury.
 GLOVES Wear gloves to protect hands from irritation or injury.	 WEAR EYE PROTECTION Wear eye protection when working with pressurized fuel lines or epoxy sealant to avoid possible eye injury.
 READ ALL RELATED MANUALS Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.	 USE SAFETY BARRICADES Unauthorized people or vehicles in the work area are dangerous. Always use safety cones or barricades, safety tape, and your vehicle to block the work area..

Sensor Installation

Installation Hardware

The Sump Sensor's Installation kit is shown in Table 1:

Table 1.- Sump Sensor Installation Kit (P/N 330020-076)

Item	Qty.	Description	Part No.
1	2	Mounting strip	330314-001
2	2	#4-20 x 3/8" Plastite screw	510500-398
3	3	1/4"-20 x 1/2" Bolt, hx hd	503328-001
4	3	1/4"-20 Speed nut	511000-232
5	2	Wire nut	576008-461
6	1	Sealing pack	514100-304
7	1	Cord grip	331028-001
8	2	Tie wrap	510901-337

Site Preparation

Check that the Sump Sensor's field wiring is not connected to the console.

Mounting Sensor to Support Member

1. Make sure no liquid exists in the sump. Failure to comply can result in undetected potential environmental and health hazards.
2. Attach one of the mounting strips to the top of the sensor using the 2 Plastite screws provided as shown in Figure 1.

Important! The sensor must be positioned in the lowest part of the sump and it must be mounted in a true vertical position to ensure proper operation of the float switch contained inside.
3. Depending on your mounting requirements (again see Figure 1), attach the second mounting strip to the first strip using two 1/4-20 x 1/2-inch screws and speed nuts. With the sensor resting on the bottom of the sump, wrap the mounting strip around the support member and secure it using a 1/4-20 x 1/2-inch screw and speed nut.
4. Carefully bend the mounting strip so that the sensor is in a true vertical position and still rests on the bottom of the sump.
5. Install the cord grip into the junction box. Feed the sensor cable through the cord grip on the junction box. Tighten the cord grip nut to ensure a water-tight seal at the cable entry.

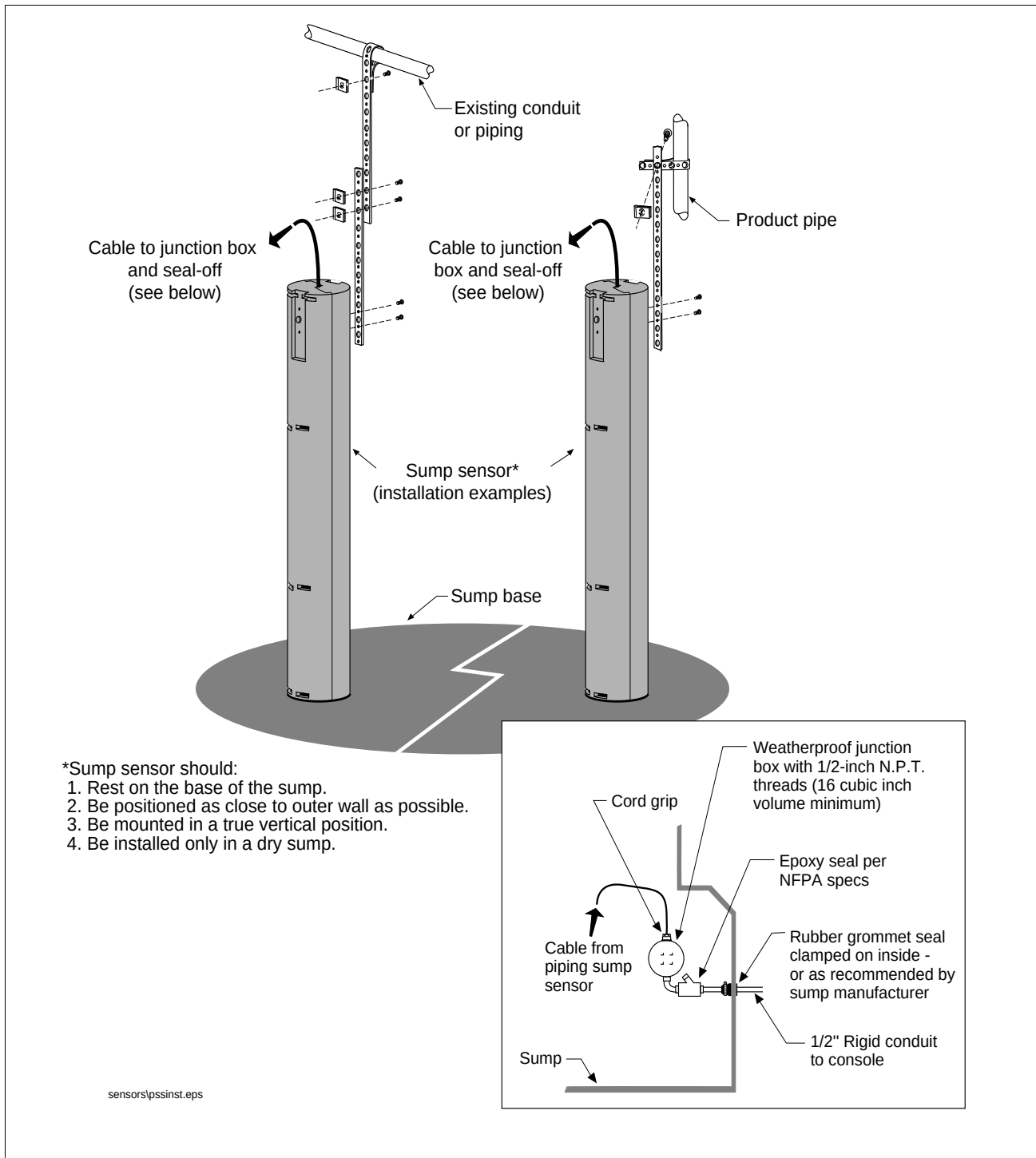


Figure 1. Sensor Mounting Examples

Wiring Procedure

- Using wire nuts, connect the two-wire sensor cable to the field wires in the sensor junction box (see Figure 2). Note, the Sump Sensor wiring has no polarity.

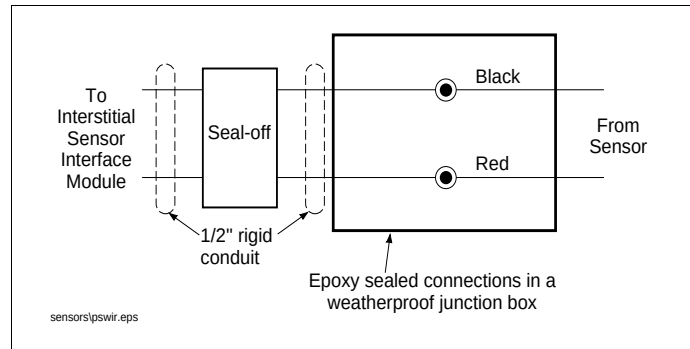


Figure 2. Sensor Field Wiring Diagram

- Do NOT terminate drain wire at this location, ground drain wire at console only.
- Seal wire nuts with epoxy sealant following the instructions in Figure 3.
- Push the epoxy sealed bag into the junction box. Replace and tighten the junction box cover.
- Consult the appropriate console site prep manual to connect the Sump Sensor to the console.

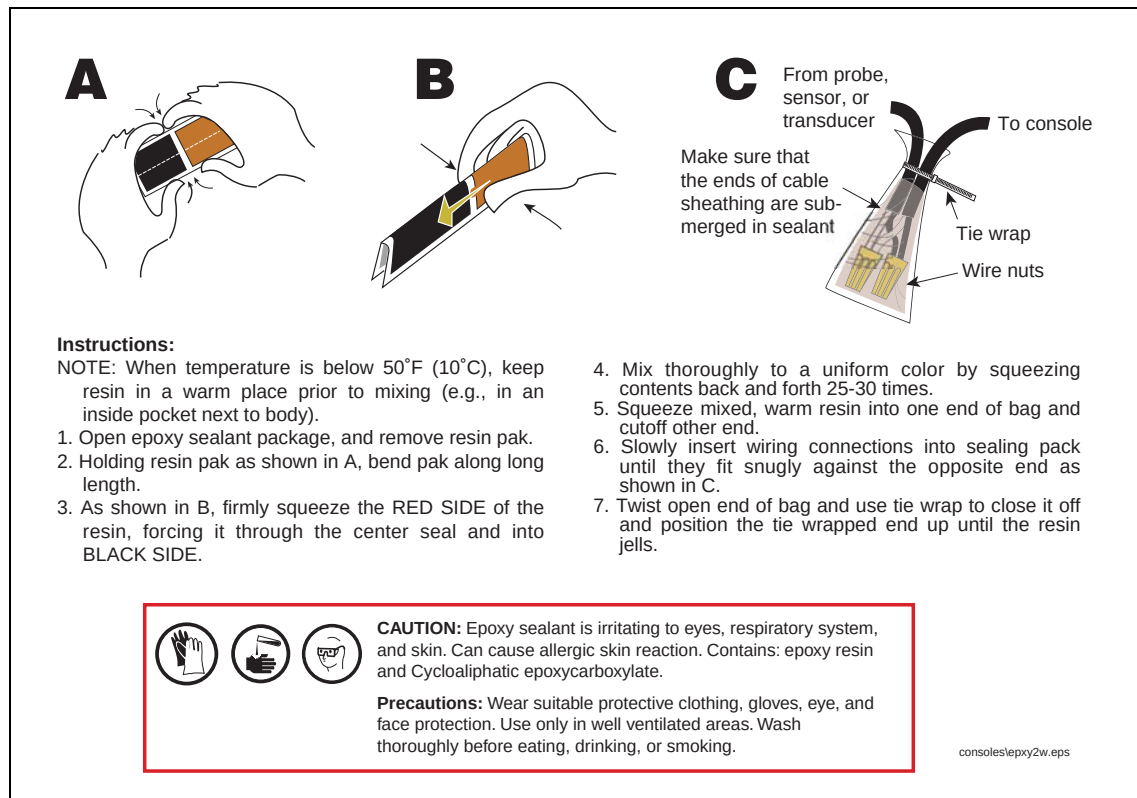


Figure 3. Epoxy Sealing Field Connections



Addendum

This is an addendum for the *Dispenser Pan Sensors and Containment Sump Sensors for TLS Consoles* Installation Manual (Manual Number 576013-306).

Installing the Fiberglass Trench Liner Sensor

This section describes the hardware, requirements, and procedures for installing the Solid-State Discriminating Fiberglass Trench Liner Sensor.

Installation Hardware

The Fiberglass Trench Liner Sensor comes with the following installation hardware:

- ☐ One 12-foot long cable (including connector) (Part No. 331103-002)

Important ☞ *If a longer cable is required, you may order a 20-foot long cable (Part No. 331103-001).*

- ☐ 1 Installation Kit (Part No. 330020-287)
- ☐ 1 Installation Addendum

Installation Requirements

The Fiberglass Trench Liner Sensor should rest at the lowest point of the fibertrench system. This point should be in the sump if there is a sump present.

Sensor-to-Console Wiring

Wire Type

In order to ensure the best operating systems available, Veeder-Root **REQUIRES** the use of shielded cable for all probes and sensors regardless of conduit material or application. In these installations, shielded cable must be rated less than 100 picofarad per foot and be manufactured with a material suitable for the environment, such as Carol™ C2534 or Belden™ 88760 or 8760.

Important ☞ *When using bonded metal conduit, the wiring **MUST** be contained in bonded metal conduit the **ENTIRE** way to the console, including wiring located indoors. Bonded conduit means that the metallic sections of conduit are permanently joined to form an electrically conductive path that will assure electrical continuity, and that the conduit has the capacity to conduct safely, any current likely to be imposed.*

Installation Procedures

 WARNING	
 	This device is installed in equipment where potentially lethal voltages may exist. Electrical shock resulting in serious injury or death may result if power is on during installation and the device is improperly installed. Before installing this device, turn off power to the system.



To install the Sensor:

1. Turn OFF power to the TLS console.
2. Inspect for any liquid in trench liner prior to installation.
(Liquid levels at or above 13.3" will activate alarm with 794380-361. See Figure 2)
(Liquid levels at or above 3.0" will activate alarm with 794380-362. See Figure 1)
3. Lower the sensor into the Monitoring Well.

Important

Refer to Figure 1, "Typical Fiberglass Trench Liner Sensor Installation without Sump" and Figure 2, "Typical Fiberglass Trench Liner Sensor Installation with Sump"

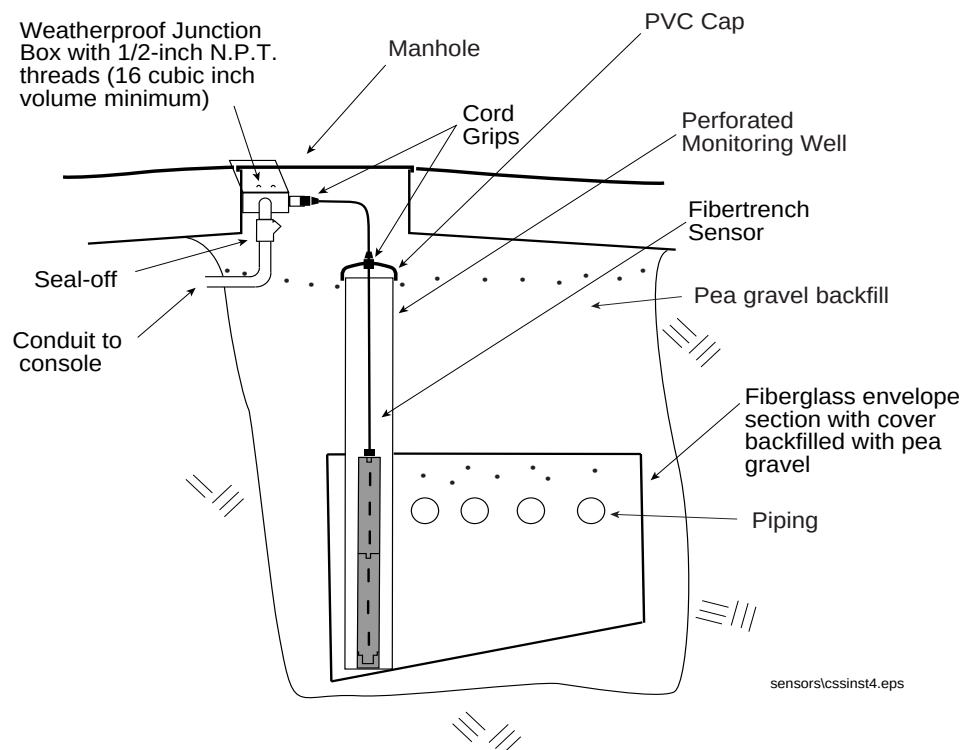


Figure 1. Typical Fiberglass Trench Liner Sensor Installation Without Sump using 794380-362

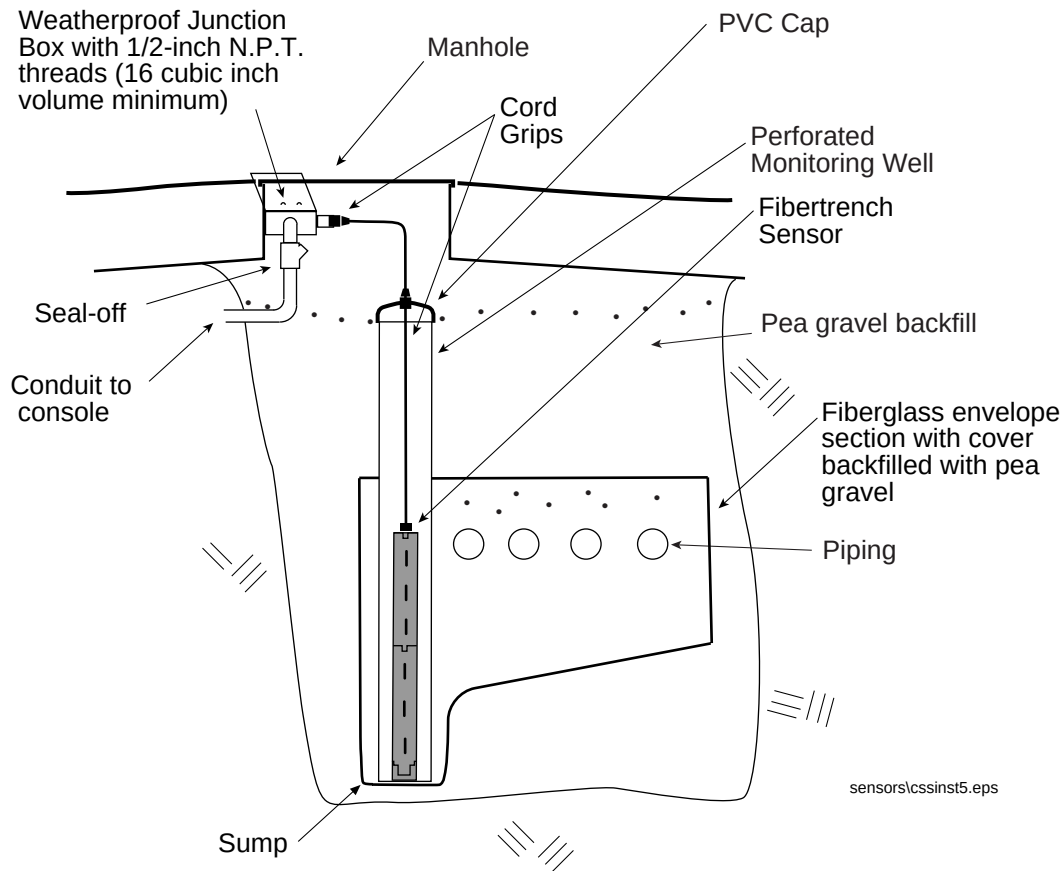


Figure 2. Typical Fiberglass Trench Liner Sensor Installation with Sump using 794380-361.

4. Install the Cord Grip (Part No. 331028-011), supplied with the wiring kit, in the PVC cap.
5. Feed the cable through the cord grip on the cap.
6. Tighten the cord grip nut to ensure a watertight seal.
7. Install the Cord Grip (Part No. 331028-011), supplied with the wiring kit, on the junction box.
8. Feed the cable through the cord grip on the junction box.
9. Tighten the cord grip nut to ensure a watertight seal at the cable entry.
10. Using wire nuts, connect the three-wire cable to the field wires in the sensor junction box. Be sure to observe color codes to maintain proper polarity hookup with the Type B Interface Module (Part No. 847490-106) in the TLS-350 or TLS-350R console.

Important ☞ Refer to Figure 3 below.

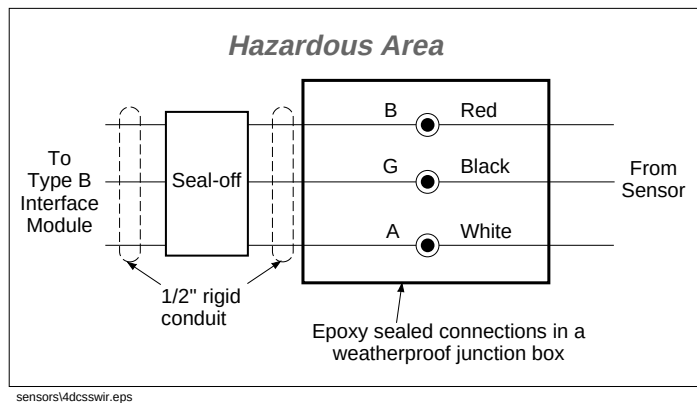


Figure 3. Three-Wire (Type B Interface) Sensor Wiring Installation Diagram

Important ☞ Refer to Figure 4: “Epoxy Sealant for Three-Wire Connections” below.

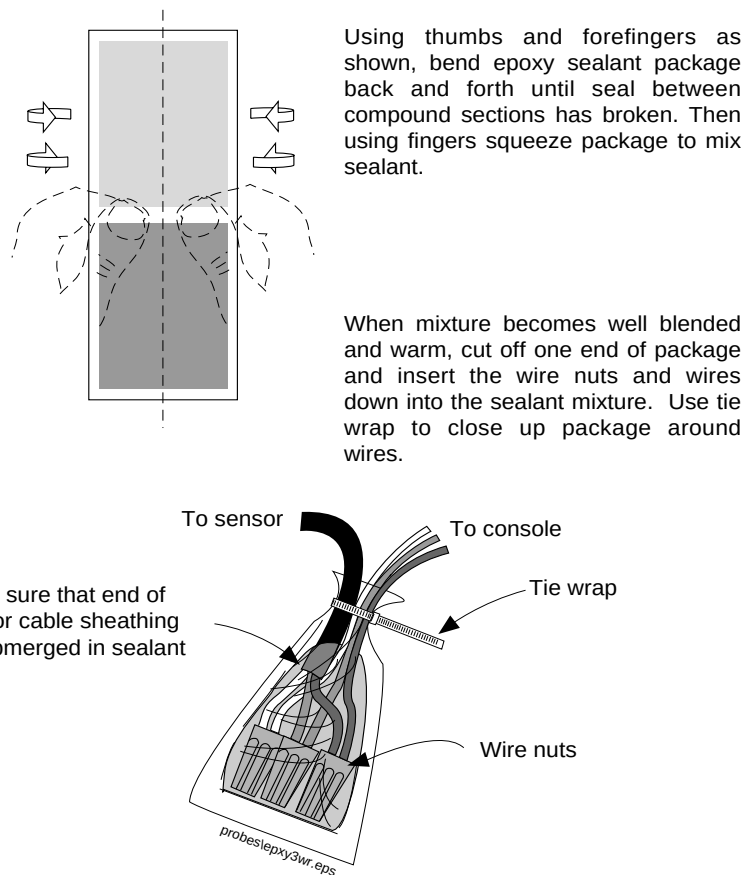


Figure 4. Epoxy Sealant for Three-Wire Connections

Dispenser Pan Sensors & Containment Sump Sensors

Installation Guide

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Contact TLS Systems Technical Support for additional troubleshooting information at 800-323-1799.

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Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

Veeder-Root must be notified of any damages and/or shortages within 30 days of receipt of the shipment, as stated in our Terms and Conditions.

VEEDER-ROOT'S PREFERRED CARRIER

1. Contact Veeder-Root Customer Service at 800-873-3313 with the specific part numbers and quantities that were missing or received damaged.
2. Fax signed Bill of Lading (BOL) to Veeder-Root Customer Service at 800-234-5350.
3. Veeder-Root will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

CUSTOMER'S PREFERRED CARRIER

1. It is the customer's responsibility to file a claim with their carrier.
2. Customer may submit a replacement purchase order. Customer is responsible for all charges and freight associated with replacement order. Customer Service will work with production facility to have the replacement product shipped as soon as possible.
3. If "lost" equipment is delivered at a later date and is not needed, Veeder-Root will allow a Return to Stock without a restocking fee.
4. Veeder-Root will NOT be responsible for any compensation when a customer chooses their own carrier.

RETURN SHIPPING

For the parts return procedure, please follow the appropriate instructions in the "General Returned Goods Policy" pages in the "Policies and Literature" section of the Veeder-Root **North American Environmental Products** price list. Veeder-Root will not accept any return product without a Return Goods Authorization (RGA) number clearly printed on the outside of the package.

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Introduction

This manual contains procedures for the installation or replacement of the following:

- Veeder-Root Solid-State Discriminating Dispenser Pan Sensor (P/N 794380-320)
- Veeder-Root Discriminating Dispenser Pan Sensor (P/N 794380-322)
- Veeder-Root Solid-State Dispenser Pan Sensor (P/N 794380-321)
- Veeder-Root Solid-State Discriminating Containment Sump Sensor (P/N 794380-350)
- Veeder-Root Discriminating Containment Sump Sensor (P/N 794380-352)
- Veeder-Root Solid-State Containment Sump Sensor (P/N 794380-351)

The above parts are for the TLS System designed and manufactured by Veeder-Root. This manual assumes all preliminary site preparation is completed, and that field wiring from the monitor to the sensor junction box is in place.

Contractor Certification Requirements

Veeder-Root requires the following minimum training certifications for contractors who will install and setup the equipment discussed in this manual:

Installer (Level 1) Certification: Contractors holding valid Installer Certification are approved to perform wiring and conduit routing; equipment mounting; probe, sensor and carbon canister vapor polisher installation; wireless equipment installation; tank and line preparation; and line leak detector installation.

ATG Technician (Level 2/3 or 4) Certification: Contractors holding valid ATG Technician Certifications are approved to perform installation checkout, startup, programming and operations training, system tests, troubleshooting and servicing for all Veeder-Root Series Tank Monitoring Systems, including Line Leak Detection. In addition, Contractors with the following sub-certification designations are approved to perform installation checkout, startup, programming, system tests, troubleshooting, service techniques and operations training on the designated system.

- Wireless 2
- Tall Tank

Warranty Registrations may only be submitted by selected distributors.

Product Marking Information

RELATED DOCUMENTS

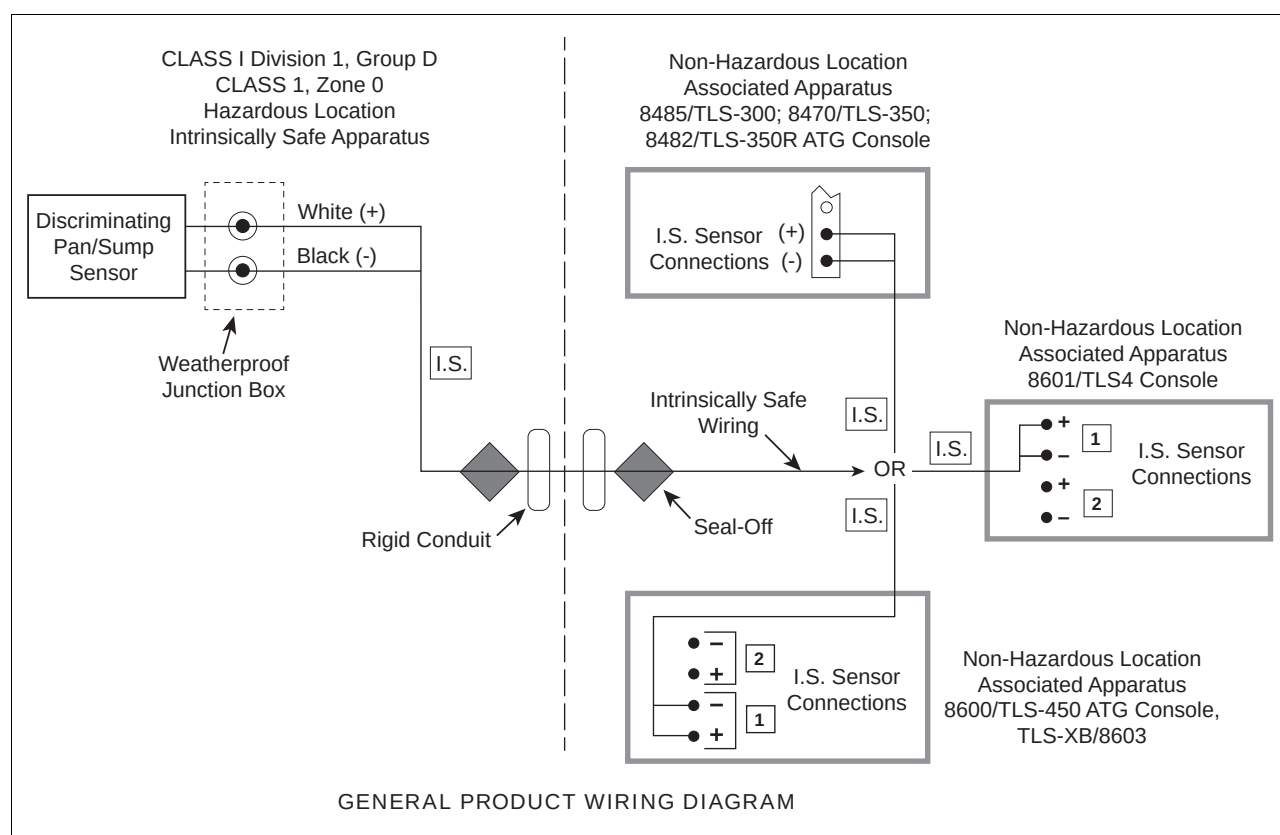
Documents Required to Install Equipment

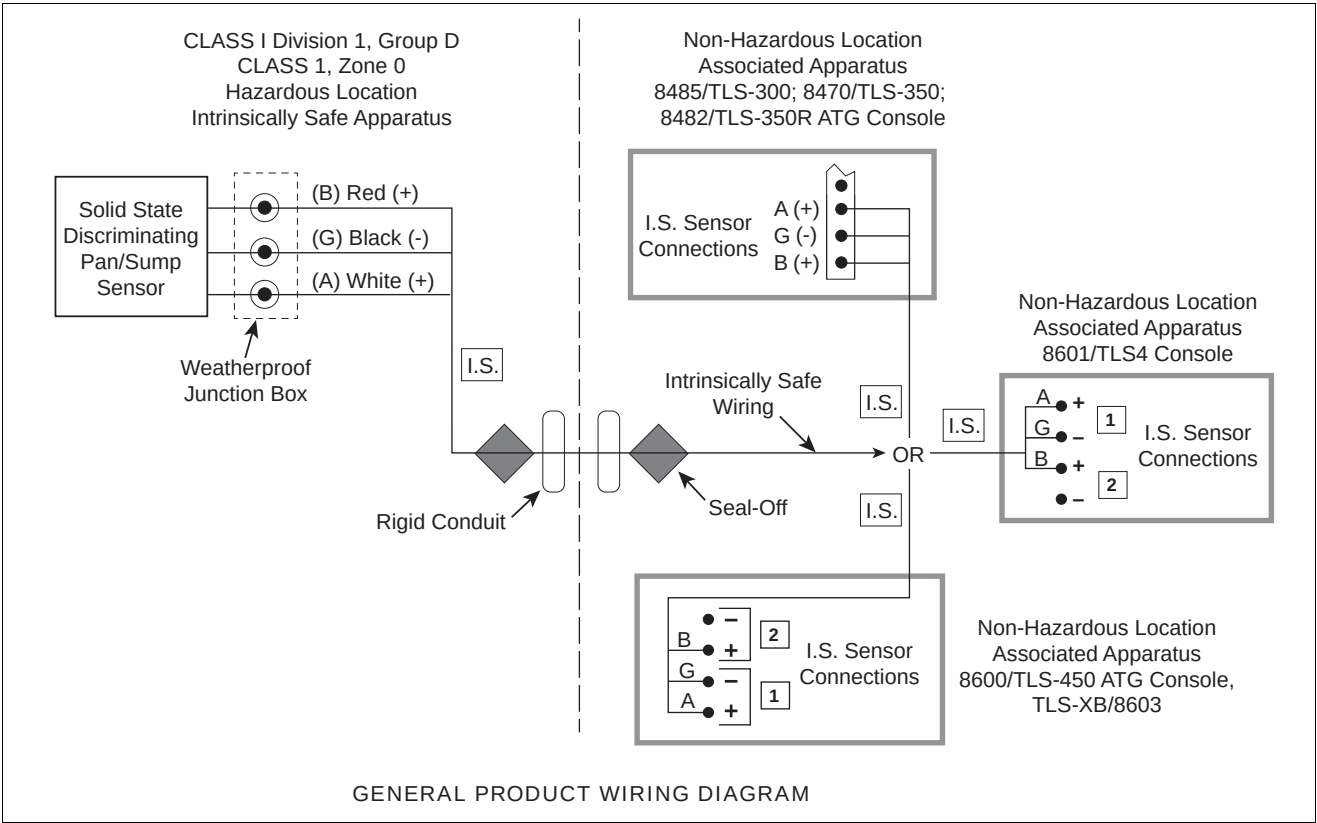
This intrinsically safe apparatus is only for use as part of a Veeder-Root Automatic Tank Gauging System (ATG Console with probes and sensors). To install intrinsically safe apparatus, use the specific control drawing that appears on the nameplate of the applicable associated apparatus (ATG Console):

Equipment	UL/cUL Control Drawing Document No.
Associated Apparatus	
TLS-450/8600	331940-008
TLS-350, TLS-350R	331940-011

Equipment	UL/cUL Control Drawing Document No.
TLS-300	331940-013
TLS4/8601	331940-018

The control drawings contain information related to the correct installation of the overall intrinsically Safe System. This includes information such as maximum number of apparatus, specific apparatus allowed in the system, maximum cable lengths, references to codes, proper grounding and so on. Control drawings can be found on the accompanying Compact Disk (TECH DOCS CD) or on the internet at veeder.com under SUPPORT; VR TECHNICAL DOCUMENTS; DRAWINGS.





Product Label Contents

**VEEDER-ROOT**
TM

I.S. CIRCUIT FOR HAZLOC SENSOR
F/N 794380-XXX
S/N XXXXXX

CL I, DIV. 1, GP.D
CL I, ZONE 0
AEx ia IIA
Ex ia IIA
TC=T4
SECURITE INTRINSEQUE

-40°C ≤ Ta ≤ +60°C
MANUAL NO. 576013-306

2466

LISTED

Safety Symbols

The following safety symbols are used throughout this manual to alert you to important safety hazards and precautions.

	EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.		FLAMMABLE Fuels and their vapors are extremely flammable.
	ELECTRICITY High voltage exists in, and is supplied to, the device. A potential shock hazard exists.		TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.

 WARNING Heed the adjacent instructions to avoid equipment damage or personal injury.	 GLOVES Wear gloves to protect hands from irritation or injury.
 WEAR EYE PROTECTION Fuel spray from residual pressure in the lines can cause serious eye injuries. Always wear eye protection.	 INJURY Careless or improper handling of materials can result in bodily injury.
 READ ALL RELATED MANUALS Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.	 USE SAFETY BARRICADES Unauthorized people or vehicles in the work area are dangerous. Always use safety cones or barricades, safety tape, and your vehicle to block the work area.

Warnings and Important Notes

 **WARNING**







This product is to be installed in systems operating near locations where highly combustible fuels or vapors may be present.

FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH.

1. Read and follow all instructions in this manual, including all safety warnings to protect yourself and others from serious injury, explosion, or electrical shock.
2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes.
3. To protect yourself and others from being struck by vehicles, block off your work area during installation or service.
4. Do not alter or modify any component or substitute components in this kit.
5. **Warning!** Substitution of components may impair intrinsic safety.
6. Field wiring to the Sensor must not share a conduit with any non-intrinsically safe device's wiring.
7. **Warning!** To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.
8. Before installing or taking the unit into a hazardous area, earth the unit in a safe area to remove any static charge. Then immediately transport the unit to the installation site. Do not rub or clean the unit prior to installation. Cleaning is not required under normal service conditions. Do not rub or clean the unit after installation. If the unit is not fixed to a known earth point when installed, ensure that a separate earth connection is made to prevent the potential of a static discharge. When fitting or removing the unit, use of anti-static footwear or clothing is required.
9. Materials used in the construction of this device do not contain, by mass, more than 10% in total of aluminum, magnesium, zirconium and titanium or 7.5% in total of magnesium, titanium and zirconium.

NOTE Failure to install this product in accordance with its instructions and warnings will result in voiding of all warranties with this product.

Installing the Dispenser Pan Sensor

This section describes the hardware, requirements, and procedures for installing the Solid-State Discriminating Dispenser Pan, Discriminating Dispenser Pan, and Solid-State Dispenser Pan Sensors.

Installation Hardware

All Dispenser Pan Sensors come with the following installation hardware:

- One 12-Foot Long Cable (including connector). If a longer cable is required, you may order a 20 foot long cable (for either 2-wire or 3-wire sensors) separately. For 2-wire sensors, order Part No. 331102-001; for 3-wire sensors, order Part No. 331103-001.
- 1 Wiring Kit
- Installation Instructions
- Mounting brackets are required and must be ordered separately. Use of Veeder-Root Universal Mounting Kit (Part No. 330020-012) is recommended.

Table 1. Dispenser Pan Installation Hardware Part Numbers

Sensor	Cable Part No.	Wiring Kit Part No.
Solid-State Discriminating Dispenser Pan	331103-002	330020-011
Discriminating Dispenser Pan	331102-002	330020-011
Solid-State Dispenser Pan	331102-002	330020-011

Installation Requirements

Before you install each Dispenser Pan Sensor, consider the following important requirements:

1. The sensor should rest in the cup or lowest point of the dispenser pan.
2. It is recommended that the sensor be mounted in a true vertical position to ensure proper operation of the sensor.
3. Ensure that there will be enough room to pull the sensor straight out of the pan if service is required.

Installation Procedures

 WARNING	
 	This device is installed in equipment where potentially lethal voltages may exist. Electrical shock resulting in serious injury or death may result if power is on during installation and the device is improperly installed. Before installing this device, turn off power to the system.



Do not install the dispenser pan sensor if there is any liquid in the dispenser pan. Failure to comply can result in equipment damage or undetected potential environmental and health hazards.



1. Turn OFF power to the TLS Console.
2. Make sure no liquid exists in the dispenser pan.
3. Before removing an existing dispenser pan sensor be sure to mark field wires in the junction box to maintain correct sensor wiring polarity during the replacement procedure.

If this is an existing installation where mounting hardware is already in place and only the sensor is being replaced, omit steps 4 and 6.
4. Install the mounting hardware according to the instructions provided with the Universal Mounting Kit. Refer to either Figure 1: "Typical Dispenser Pan Sensor Installation" or Figure 2: "Typical Dispenser Pan Sensor Installation in a Dispenser Containment Sump" (whichever most resembles your installation). These examples apply to all Solid-State Discriminating Dispenser Pan, Discriminating Dispenser Pan, and Solid-State Dispenser Pan Sensors.



Do not attach sensor to flexible product hose!

5. Slide the sensor into the mounting bracket and secure in a vertical position.
6. Install the Cord Grip supplied with the wiring kit in the junction box.
7. Feed the cable through the cord grip on the junction box. Tighten the cord grip nut to ensure a watertight seal at the cable entry.

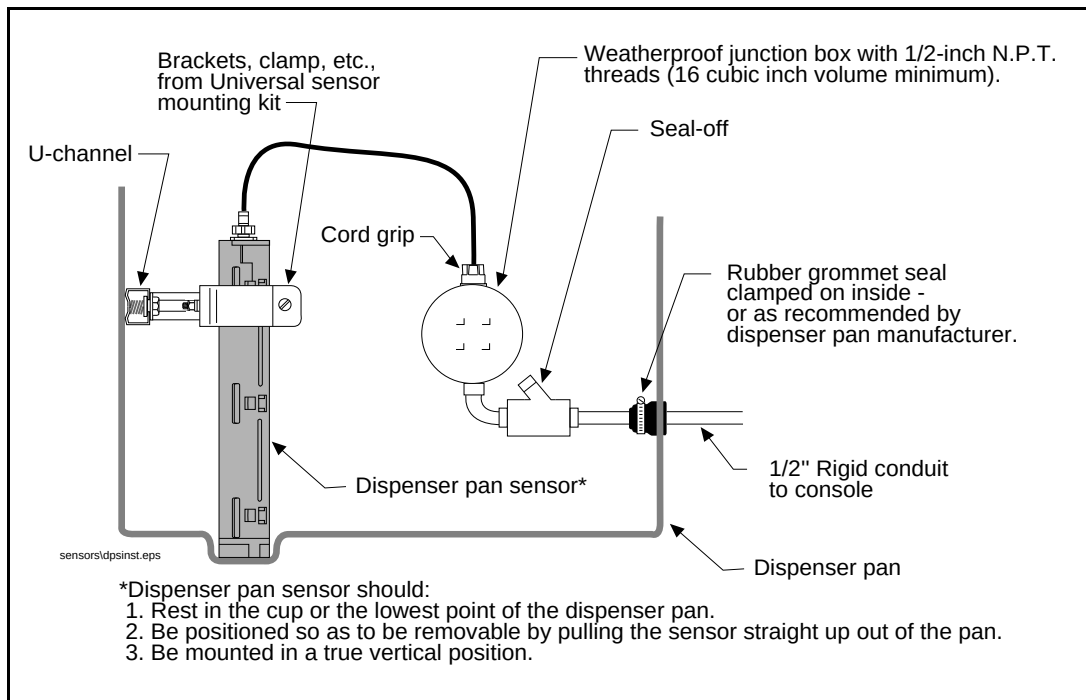


Figure 1. Typical Dispenser Pan Sensor Installation

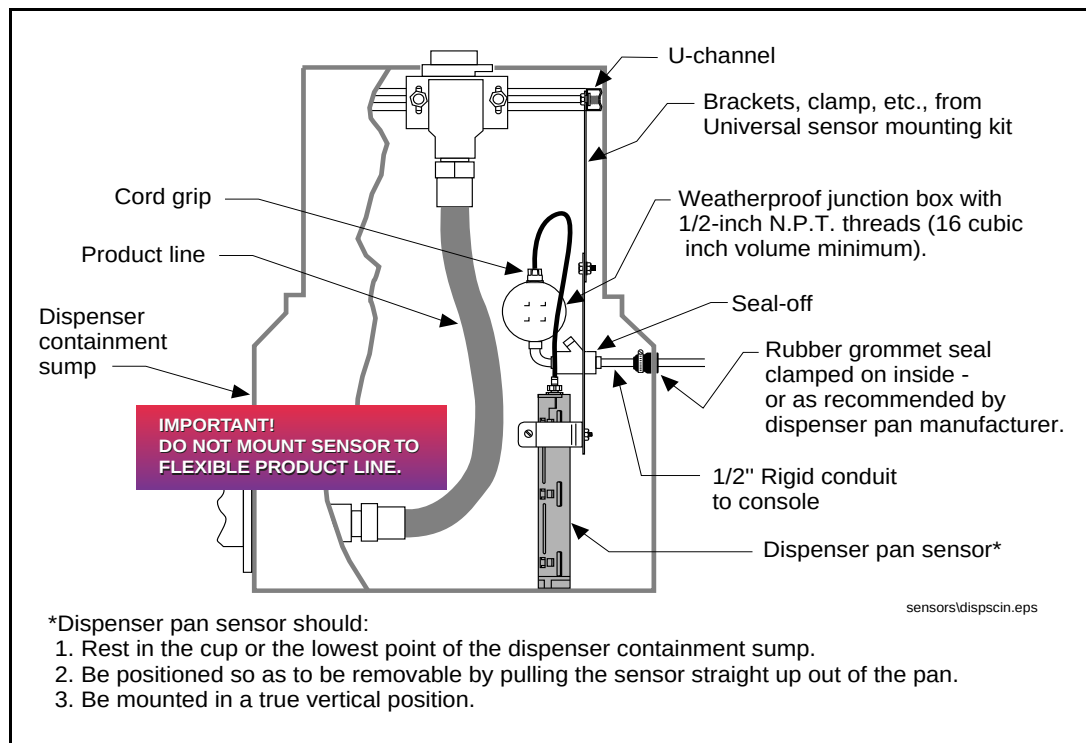
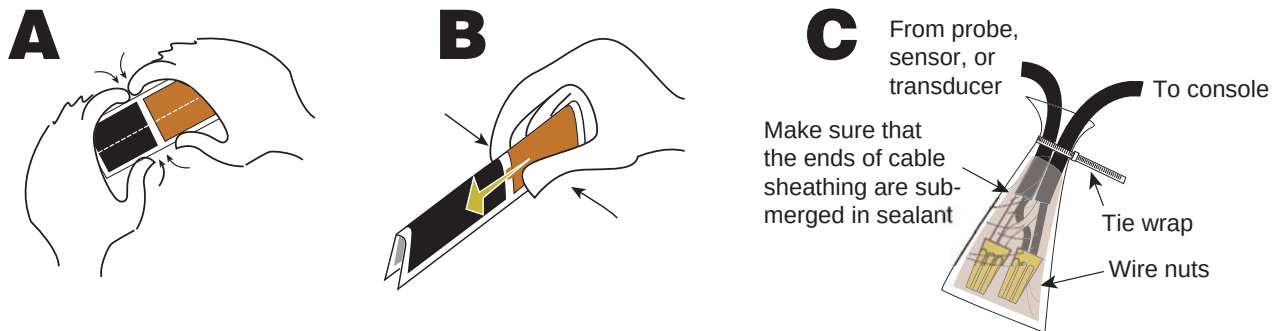


Figure 2. Typical Dispenser Pan Sensor Installation in a Dispenser Containment Sump

8. See subsections below, as each type of sensor has different wiring requirements. In the wiring examples below, rigid conduit is shown between the junction box and the console. However, some sites use direct burial cable between the junction box and the console.
 - a. Solid-State Discriminating Dispenser Pan Sensor (Part No. 794380-320): Using the wiring nuts, connect the 3 wires from the sensor cable to the field wires from the console (see General Product Wiring Diagram on page 3). Observe polarity!
 - b. Discriminating Dispenser Pan Sensor (Part No. 794380-322) and Solid-State Dispenser Pan Sensor (Part No. 794380-321): Using the wiring nuts, connect the 2 wires from the sensor cable to the field wires from the console (see General Product Wiring Diagram on page 2). Observe polarity!
9. Seal wire nuts with epoxy sealant using one bag for two wire nut connection or three wire nut connection (Figure 5).



Instructions:

NOTE: When temperature is below 50°F (10°C), keep resin in a warm place prior to mixing (e.g., in an inside pocket next to body).

1. Open epoxy sealant package, and remove resin pak.
2. Holding resin pak as shown in A, bend pak along long length.
3. As shown in B, firmly squeeze the RED SIDE of the resin, forcing it through the center seal and into BLACK SIDE.

4. Mix thoroughly to a uniform color by squeezing contents back and forth 25-30 times.
5. Squeeze mixed, warm resin into one end of bag and cutoff other end.
6. Slowly insert wiring connections into sealing pack until they fit snugly against the opposite end as shown in C.
7. Twist open end of bag and use tie wrap to close it off and position the tie wrapped end up until the resin jells.



CAUTION: Epoxy sealant is irritating to eyes, respiratory system, and skin. Can cause allergic skin reaction. Contains: epoxy resin and Cycloaliphatic epoxycarboxylate.

Precautions: Wear suitable protective clothing, gloves, eye, and face protection. Use only in well ventilated areas. Wash thoroughly before eating, drinking, or smoking.

consolesepxy2w.eps

Figure 3. Epoxy Sealing Field Wiring Connections - Two Wire Shown

Installing the Containment Sump Sensor

This section describes the hardware, requirements, and procedures for installing the Solid-State Discriminating Containment Sump, Discriminating Containment Sump, and Solid-State Containment Sump Sensors.

Installation Hardware

All Discriminating Containment Sump Sensors come with the following installation hardware:

- One 12-Foot Long Cable (including connector)
If a longer cable is required, you may order a 20 foot long cable (for either 2-wire or 3-wire sensors) separately. For 2-wire sensors, order Part No. 331102-001; for 3-wire sensors, order Part No. 331103-001.
- 1 Wiring Kit
- 1 Installation Instructions
- Mounting brackets are required and must be ordered separately. Use of Veeder-Root Universal Mounting Kit (Part No. 330020-012) is recommended.

Table 2. Containment Sump Installation Hardware Part Numbers

Sensor	Cable Part No.	Wiring Kit Part No.
Solid-State Discriminating Containment Sump	331103-002	330020-011
Discriminating Containment Sump	331102-002	330020-011
Solid-State Containment Sump	331102-002	330020-011

Installation Requirements

Before you install each Containment Sump Sensor, consider the following important requirements:

1. The sensor should rest in the cup or lowest point of the containment sump.
2. It is recommended that the sensor be mounted in a true vertical position to ensure proper operation of the sensor.
3. The sensor must be positioned as close to the containment sump outer wall as possible.

Installation Procedures

 WARNING	
 	This device is installed in equipment where potentially lethal voltages may exist. Electrical shock resulting in serious injury or death may result if power is on during installation and the device is improperly installed. Before installing this device, turn off power to the system.



Installing the float in a sump where water or fuel already exists will result in an immediate alarm. Make sure no liquid is present in the containment sump. Failure to comply can result in equipment damage or undetected potential environmental and health hazards.



1. Turn OFF power to the TLS Console.
2. Make sure no liquid exists in the containment sump.

If this is an existing installation where mounting hardware is already in place and only the Containment Sump Sensor is being replaced, omit Step 3.

3. Install the mounting hardware according to the instructions provided with the Universal Mounting Kit (see Figure 6).



Do not attach sensor to flexible product line.

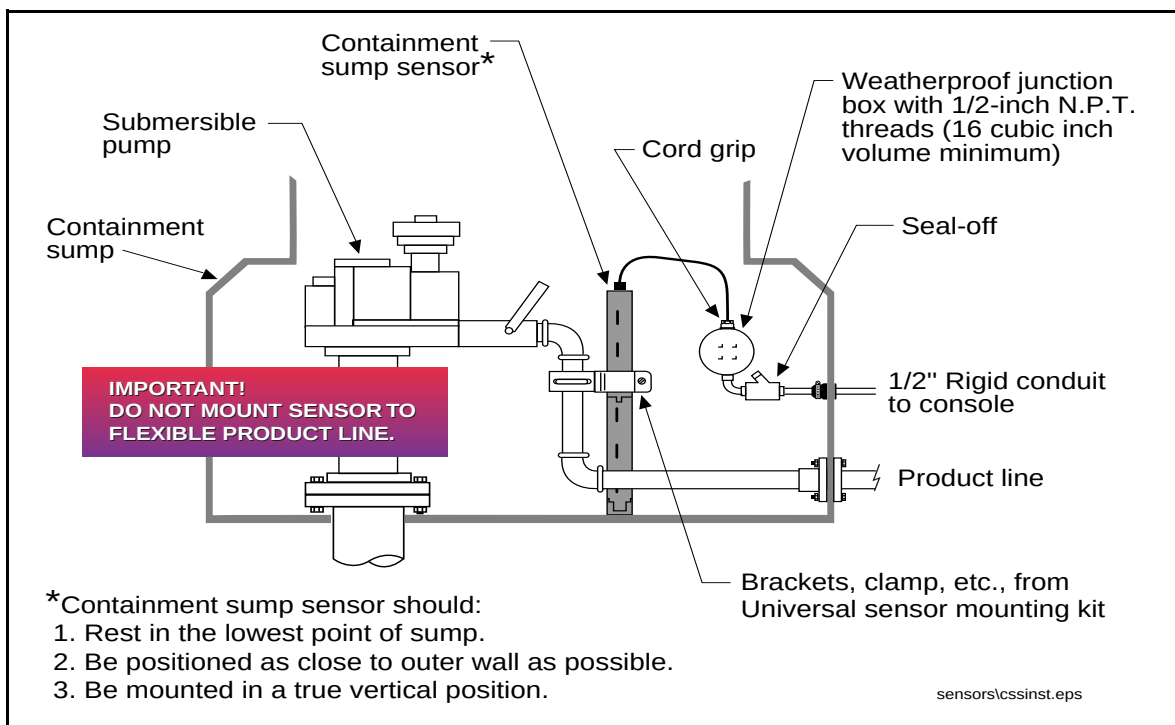
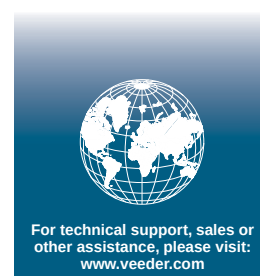


Figure 4. Typical Containment Sump Sensor Installation

4. Slide the sensor into the mounting bracket and secure in a vertical position.
5. Install the Cord Grip supplied with the wiring kit in the junction box.
6. Feed the cable through the cord grip on the junction box.
7. Tighten the cord grip nut to ensure a watertight seal at the cable entry.
8. See subsections below, as each type of sensor has different wiring requirements. Although rigid conduit is shown between the junction box and console in the following wiring examples, some sites may use direct burial cable between the junction box and the console.
 - a. Solid-State Discriminating Containment Sump Sensor (Part No. 794380-350):
Using the wiring nuts, connect the 3 wires from the sensor cable to the field wires from the console (see General Product Wiring Diagram on page 3). Observe polarity!
 - b. Discriminating Containment Sump Sensor (Part No. 794380-352), Solid-State Containment Sump Sensor (Part No. 794380-351):
Using the wiring nuts, connect the 2 wires from the sensor cable to the field wires from the console (see General Product Wiring Diagram on page 2). Observe polarity!
9. Seal wire nuts with epoxy sealant using one bag for two wire nut connection or three wire nut connection (Refer to Figure 5).



Vapor Sensor

Installation Guide

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Veeder-Root must be notified of any damages and/or shortages within 30 days of receipt of the shipment, as stated in our Terms and Conditions.

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2. Fax signed Bill of Lading (BOL) to Veeder-Root Customer Service at 800-234-5350.
3. Veeder-Root will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

CUSTOMER'S PREFERRED CARRIER

1. It is the customer's responsibility to file a claim with their carrier.
2. Customer may submit a replacement purchase order. Customer is responsible for all charges and freight associated with replacement order. Customer Service will work with production facility to have the replacement product shipped as soon as possible.
3. If "lost" equipment is delivered at a later date and is not needed, Veeder-Root will allow a Return to Stock without a restocking fee.
4. Veeder-Root will NOT be responsible for any compensation when a customer chooses their own carrier.

RETURN SHIPPING

For the parts return procedure, please follow the appropriate instructions in the "General Returned Goods Policy" pages in the "Policies and Literature" section of the Veeder-Root **North American Environmental Products** price list. Veeder-Root will not accept any return product without a Return Goods Authorization (RGA) number clearly printed on the outside of the package.

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Introduction

This manual contains installation procedures for a Vapor Sensor.

This manual assumes the vapor monitoring well has been prepared with a removable cap to support the sensor and that field wiring has been run from the console to the well in which the sensor will be installed following instructions in the appropriate console's site prep manual.

Contractor Certification Requirements

Veeder-Root requires the following minimum training certifications for contractors who will install and setup the equipment discussed in this manual:

Installer (Level 1) Certification: Contractors holding valid Installer Certification are approved to perform wiring and conduit routing; equipment mounting; probe, sensor and carbon canister vapor polisher installation; wireless equipment installation; tank and line preparation; and line leak detector installation.

ATG Technician (Level 2/3 or 4) Certification: Contractors holding valid ATG Technician Certifications are approved to perform installation checkout, startup, programming and operations training, system tests, troubleshooting and servicing for all Veeder-Root Series Tank Monitoring Systems, including Line Leak Detection. In addition, Contractors with the following sub-certification designations are approved to perform installation checkout, startup, programming, system tests, troubleshooting, service techniques and operations training on the designated system.

- Wireless 2
- Tall Tank

Warranty Registrations may only be submitted by selected Distributors.

Product Marking Information

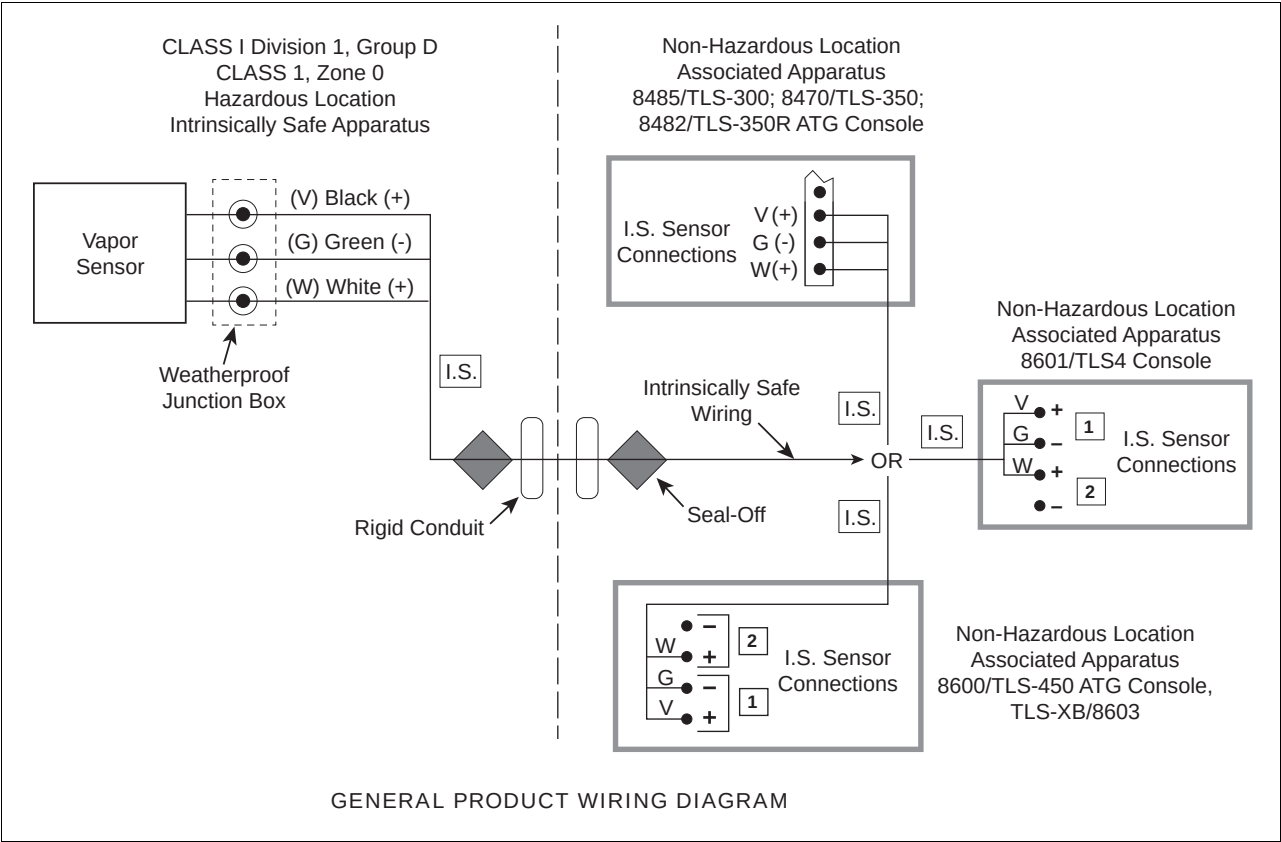
RELATED DOCUMENTS

Documents Required to Install Equipment

This intrinsically safe apparatus is only for use as part of a Veeder-Root Automatic Tank Gauging System (ATG Console with probes and sensors). To install intrinsically safe apparatus, use the specific control drawing that appears on the nameplate of the applicable associated apparatus (ATG Console):

Equipment	UL/cUL Control Drawing Document No.
Associated Apparatus	
TLS-450/8600	331940-008
TLS-350, TLS-350R	331940-011
TLS-300	331940-013
TLS4/8601	331940-018

The control drawings contain information related to the correct installation of the overall intrinsically Safe System. This includes information such as maximum number of apparatus, specific apparatus allowed in the system, maximum cable lengths, references to codes, proper grounding and so on. Control drawings can be found on the accompanying Compact Disk (TECH DOCS CD) or on the internet at veeder.com under SUPPORT; VR TECHNICAL DOCUMENTS; DRAWINGS.



Product Label Contents



VEEDER-ROOT
TM

I.S. CIRCUIT FOR HAZLOC SENSOR
F/N 794390-XXX
S/N XXXXXX

CL I, DIV. 1, GP.D
CL I, ZONE 0
AEx ia IIA
Ex ia IIA
TC=T4
SECURITE INTRINSEQUE

$-40^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$
MANUAL NO. 576013-607

24G6

UL
LISTED

Safety Warnings

To protect yourself and your equipment, observe the following warnings and important information:

 WARNING	
     	This product is to be installed in systems operating near locations where highly combustible fuels or vapors may be present. FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH. 1. Read and follow all instructions in this manual, including all safety warnings to protect yourself and others from serious injury, explosion, or electrical shock. 2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes. 3. To protect yourself and others from being struck by vehicles, block off your work area during installation or service. 4. Do not alter or modify any component or substitute components in this kit. 5. Warning! Substitution of components may impair intrinsic safety. 6. Field wiring to the Sensor must not share a conduit with any non-intrinsically safe device's wiring 7. Warning! To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing. 8. Before installing or taking the unit into a hazardous area, earth the unit in a safe area to remove any static charge. Then immediately transport the unit to the installation site. Do not rub or clean the unit prior to installation. Cleaning is not required under normal service conditions. Do not rub or clean the unit after installation. If the unit is not fixed to a known earth point when installed, ensure that a separate earth connection is made to prevent the potential of a static discharge. When fitting or removing the unit, use of anti-static footwear or clothing is required. 9. Materials used in the construction of this device do not contain, by mass, more than 10% in total of aluminum, magnesium, zirconium and titanium or 7.5% in total of magnesium, titanium and zirconium.

Safety Symbols

The following safety symbols are used throughout this manual to alert you to important safety hazards and precautions.

 EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.	 FLAMMABLE Fuels and their vapors are extremely flammable.
 ELECTRICITY High voltage exists in, and is supplied to, the device. A potential shock hazard exists.	 TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.
 WARNING Heed the adjacent instructions to avoid equipment damage or personal injury.	 GLOVES Wear gloves to protect hands from irritation or injury..

 WEAR EYE PROTECTION Fuel spray from residual pressure in the lines can cause serious eye injuries. Always wear eye protection.	 INJURY Careless or improper handling of materials can result in bodily injury.
 NO VEHICLES Moving vehicles in the area during service can create a potential for personal injury to you or others. Sparks from starting vehicles can ignite fuels and their vapors.	 USE SAFETY BARRICADES Unauthorized people or vehicles in the work area are dangerous. Always use safety cones or barricades, safety tape, and your vehicle to block the work area.
 NO POWER TOOLS Sparks from power tools (such as drills) can ignite fuels and their vapors.	 READ ALL RELATED MANUALS Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.

Sensor Description

The Veeder-Root Vapor Sensor detects the presence of hydrocarbon vapors in a dry monitoring well which could mean a dangerous leak. When vapors are detected that exceed a programmed threshold, the sensor sends a signal to the console. The monitor's visual and audible built-in indicators immediately tell you where the problem is, so you can quickly take action to prevent serious safety and environmental problems.

Operating Capabilities

- Operating temperature Range: -40°C to +60°C
- Storage Temperature Range: - 40° C to + 75° C.
- Dimensions: 4.88" long, 1.06" dia.
- Power Requirements: Intrinsically safe power supplied by the Veeder-Root console.
- Withstands removal and replacement from monitoring well without sensor damage.

Detection Capabilities

- Hydrocarbon vapor exceeding the programmed threshold triggers fuel alarm.
- Liquid present in the monitoring wells triggers a Water Alarm.

Components

Table 1. Standard Components

Qty.	Description
1	Vapor Sensor (Form No. 794390-700) and Cable
2	Watertight Cord Grips

⚠ CAUTION

A Veeder-Root Vapor Sensor should be installed only in wells where:

- Preliminary testing has determined that the soil is not contaminated beyond acceptable limits, or
- Where contaminated soil has been remediated and is now clean and present vapor levels are acceptable for its use.

A Vapor Sensor should not be installed in wells where preliminary testing indicates that the initial vapor sensor resistance exceeds 25K Ohms.

Sensor Installation



To prepare your equipment for sensor installation:

1. Turn OFF AC power to the console.
2. Remove the cap from the monitoring well.



WARNING



Do not perform drilling and tapping procedures in a hazardous area. Drilling and tapping can cause sparks and ignite fumes and liquids found in a Class I, Group D, Hazardous location. Failure to comply could result in death, serious personal injury, property loss and equipment damage.

3. Drill (0.703" dia.) and tap a 1/2-inch - 14 NPT pipe thread through the top of the cap.
4. Thread the furnished cord grip into the cap.
5. Determine the distance from the well cap down to a point that is 12 inches above the highest level to which the water table normally rises. If this level is not known, then take the measurement to a point 12 inches above the bottom of the monitoring well or 12 inches above any water in the well.
6. Pass the sensor cable through the cord grip from the inside of the cap until the bottom of the sensor is the distance from the cap equal to the measurement you made in step 6. Tighten the cord grip to secure the seal the cable entry into the cap.



Should the water table rise immersing the sensor and causing a water alarm, loosen the cord grip and reposition the sensor to hang (the higher of) 12 inches above the new water level or 12 inches above its previous position.

7. Before lowering the sensor body into the well, check the slots on each side of the sensor body and the hole in the bottom of the sensor body to ensure that no debris is clogging these openings.

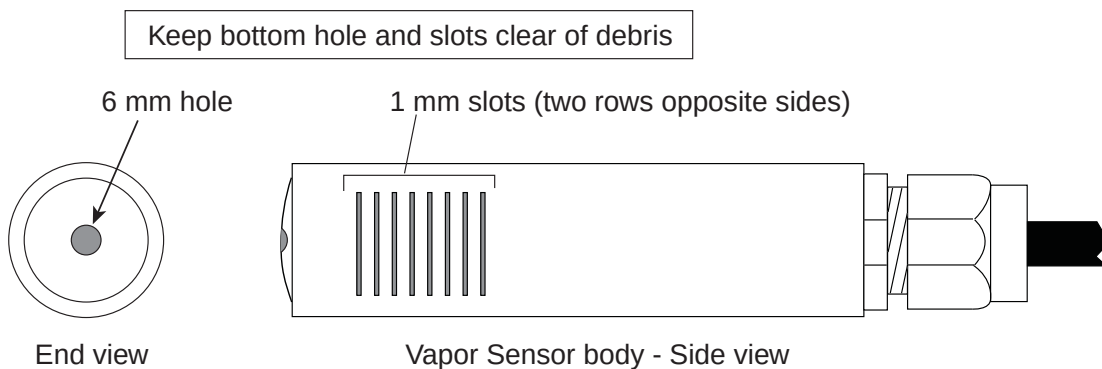


Figure 1. Check sensor openings for debris

8. Lower the sensor into the hole and replace the cap on the well (see Figure 2).
9. Measure the cable length required to reach to the sensor junction box and trim the cable accordingly.
10. Install the furnished junction box cord grip in one of the threaded junction box access holes.
11. Pass the sensor cable through the cord grip into the junction box. Tighten the cord grip to ensure a water-tight seal at the cable entry.
12. Using the wiring nuts, connect the wires from the sensor cable to the field wires from the console (see General Product Wiring Diagram on page 2). Observe polarity!
13. Seal wire nuts with epoxy sealant using one bag for two wire nut connections and another bag for the third wire nut connection. (See Figure 3).



NOTE: If more than two wire nut connections share an epoxy sealant bag, the connections will not be properly sealed. Improper sealing of these connections will result in inaccurate sensor readings and possibly false alarm conditions.

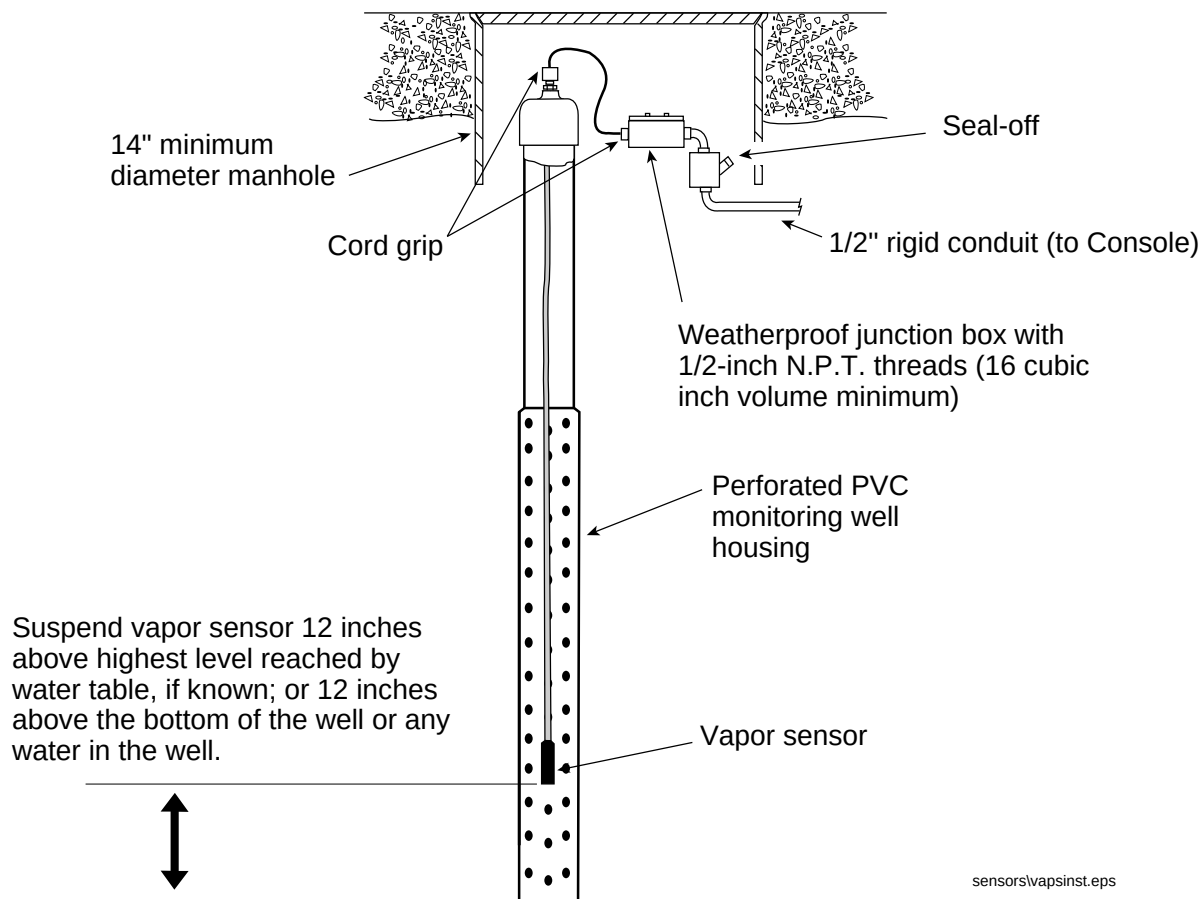
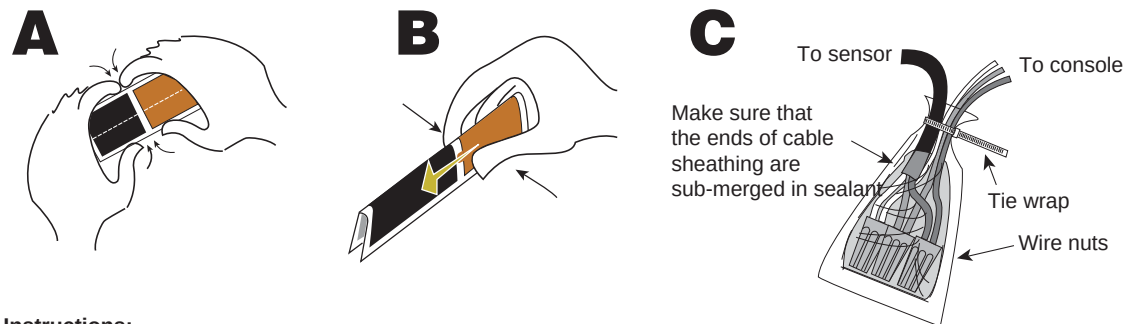


Figure 2. Example Vapor Sensor Installation

**Instructions:**

NOTE: When temperature is below 50°F (10°C), keep resin in a warm place prior to mixing (e.g., in an inside pocket next to body).

1. Open epoxy sealant package, and remove resin pak.
2. Holding resin pak as shown in A, bend pak along long length.
3. As shown in B, firmly squeeze the RED SIDE of the resin, forcing it through the center seal and into BLACK SIDE.

4. Mix thoroughly to a uniform color by squeezing contents back and forth 25-30 times.
5. Squeeze mixed, warm resin into one end of bag and cutoff other end.
6. Slowly insert wiring connections into sealing pack until they fit snugly against the opposite end as shown in C.
7. Twist open end of bag and use tie wrap to close it off and position the tie wrapped end up until the resin jells.



CAUTION: Epoxy sealant is irritating to eyes, respiratory system, and skin. Can cause allergic skin reaction. Contains: epoxy resin and Cycloaliphatic epoxycarboxylate.

Precautions: Wear suitable protective clothing, gloves, eye, and face protection. Use only in well ventilated areas. Wash thoroughly before eating, drinking, or smoking.

consoleslep3w.eps

Figure 3. Epoxy Sealing Field Wiring Connections



Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Sump Sensor

Version number(s) 794380-208 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root
(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003
(Address)

<u>Simsbury,</u>	<u>CT</u>	<u>06070-7684</u>	<u>(860) 651-2700</u>
(City)	(State)	(Zip Code)	(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794380-208 Sump Sensor

Table 1. Results of the Evaluation of the 794380-208 sensor with Water

Parameter	Data
Threshold Level (inches)	1.1983
Precision - Standard Deviation (inches)	0.0022
Detection Time (minute)	< 1
Fall Time (minute)	<1

Table 2. Results of the Evaluation of the 794380-208 sensor with Diesel

Parameter	Data
Threshold Level (inches)	1.3860
Precision - Standard Deviation (inches)	0.0021
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 3. Results of the Evaluation of the 794380-208 sensor with Unleaded

Parameter	Data
Threshold Level (inches)	1.3348
Precision - Standard Deviation (inches)	0.0027
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using water, diesel fuel, unleaded and
gasoline.

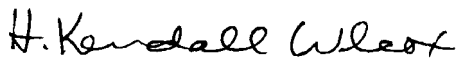
Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

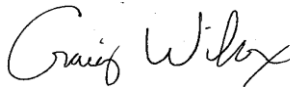
I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)



(Signature)

Craig Wilcox, Vice President
(printed name)



Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 16, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Sump Sensor

Version number(s) 794380-209 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root
(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003
(Address)

<u>Simsbury,</u>	<u>CT</u>	<u>06070-7684</u>	<u>(860) 651-2700</u>
(City)	(State)	(Zip Code)	(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794380-209 Sump Sensor

Table 1. Results of the Evaluation of the 794380-209 sensor with Water

Parameter	Data
Threshold Level (inches)	1.1983
Precision - Standard Deviation (inches)	0.0022
Detection Time (minute)	< 1
Fall Time (minute)	<1

Table 2. Results of the Evaluation of the 794380-209 sensor with Diesel

Parameter	Data
Threshold Level (inches)	1.3860
Precision - Standard Deviation (inches)	0.0021
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 3. Results of the Evaluation of the 794380-209 sensor with Unleaded

Parameter	Data
Threshold Level (inches)	1.3448
Precision - Standard Deviation (inches)	0.0027
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using water, diesel fuel, unleaded and
gasoline.

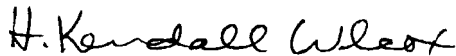
Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

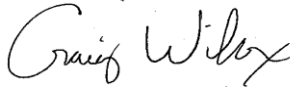
I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)



(Signature)

Craig Wilcox, Vice President
(printed name)



Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 16, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Single-Point Hydrostatic Sensor

Version number(s) 794380-301 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root

(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003

(Address)

Simsbury,

CT

06070-7684

(860) 651-2700

(City)

(State)

(Zip Code)

(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794380-301 Single-Point Hydrostatic Sensor

Table 1. Results of the Evaluation of the 794380-301 sensor with Brine

Parameter	Data
Threshold Level (inches)	1.7315
Precision - Standard Deviation (inches)	0.0057
Detection Time (minute)	< 1
Fall Time (minute)	<1
Fall Time (minute)	

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using Brine.

Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)

H. Kendall Wilcox
(Signature)

Craig Wilcox, Vice President
(printed name)

Craig Wilcox
Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 22, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Dual-Point Hydrostatic Sensor

Version number(s) 794380-303 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root
(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003
(Address)

<u>Simsbury,</u>	<u>CT</u>	<u>06070-7684</u>	<u>(860) 651-2700</u>
(City)	(State)	(Zip Code)	(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794380-303 Dual-Point Hydrostatic Sensor

Table 1. Results of the Evaluation of the 794380-303 sensor Low Level Brine

Parameter	Data
Threshold Level (inches)	1.2005
Precision - Standard Deviation (inches)	0.0033
Detection Time (minute)	< 1
Fall Time (minute)	<1

Table 2. Results of the Evaluation of the 794380-303 sensor High Level Brine

Parameter	Data
Threshold Level (inches)	13.1263
Precision - Standard Deviation (inches)	0.0075
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using brine.

Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)

H. Kendall Wilcox

(Signature)

Craig Wilcox, Vice President
(printed name)

Craig Wilcox

Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 22, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Single-Point Mini Hydrostatic Sensor

Version number(s) 794380-304 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root

(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003

(Address)

Simsbury,

CT

06070-7684

(860) 651-2700

(City)

(State)

(Zip Code)

(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794380-304 Single-Point Mini Hydrostatic Sensor

Table 1. Results of the Evaluation of the 794380-304 sensor with Brine

Parameter	Data
Threshold Level (inches)	0.8010
Precision - Standard Deviation (inches)	0.0020
Detection Time (minute)	< 1
Fall Time (minute)	<1

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using brine.

Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
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H. Kendall Wilcox

(Signature)

Craig Wilcox, Vice President
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Craig Wilcox

Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 22, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Solid-State Discriminating Dispenser Pan Sensor

Version number(s) 794380-320 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root
(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003
(Address)

<u>Simsbury,</u>	<u>CT</u>	<u>06070-7684</u>	<u>(860) 651-2700</u>
(City)	(State)	(Zip Code)	(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794380-320 Solid-State Discriminating Dispenser Pan Sensor

Table 1. Results of the Evaluation of the 794380-320 Sensor Low Level Alarm with Water

Parameter	Data
Threshold Level (inches)	1.071
Precision - Standard Deviation (inches)	0.0028
Detection Time (minute)	< 1 minute
Fall Time (minute)	< 1 minute

Table 2. Results of the Evaluation of the 794380-320 sensor High Level Alarm with Water

Parameter	Data
Threshold Level (inches)	8.2496
Precision - Standard Deviation (inches)	0.0030
Detection Time (minute)	< 1 minute
Fall Time (minute)	< 1 minute

Table 1. Results of the Evaluation of the 794380-320 sensor with Diesel

Parameter	Data
Threshold Level (inches)	< 0.125
Precision - Standard Deviation (inches)	NA
Detection Time (minute)	99.3
Fall Time (minute)	> 24 hours

Table 2. Results of the Evaluation of the 794380-320 sensor with Unleaded

Parameter	Data
Threshold Level (inches)	< 0.125
Precision - Standard Deviation (inches)	NA
Detection Time (minute)	8.3 minutes
Fall Time (minute)	10.3 minutes

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using water, diesel fuel, unleaded and
gasoline.

Additional Limitations or Considerations - None

**> Safety Disclaimer: This test procedure only addresses the issue of the methods
ability to respond to liquids. It does not test the equipment for safety hazards.**

Certification of Results

I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)

Craig Wilcox, Vice President
(printed name)

H. Kendall Wilcox

Craig Wilcox

(Signature)

Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 21, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Solid-State Dispenser Pan Sensor

Version number(s) 794380-321 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root

(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003

(Address)

Simsbury,

CT

06070-7684

(860) 651-2700

(City)

(State)

(Zip Code)

(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794380-321 Solid-State Dispenser Pan Sensor

Table 1. Results of the Evaluation of the 794380-321 sensor with Water

Parameter	Data
Threshold Level (inches)	0.9708
Precision - Standard Deviation (inches)	0.0025
Detection Time (minute)	< 1
Fall Time (minute)	<1

Table 2. Results of the Evaluation of the 794380-321 sensor with Diesel

Parameter	Data
Threshold Level (inches)	1.0204
Precision - Standard Deviation (inches)	0.0040
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 3. Results of the Evaluation of the 794380-321 sensor with Unleaded

Parameter	Data
Threshold Level (inches)	1.0193
Precision - Standard Deviation (inches)	0.0054
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using water, diesel fuel, unleaded and
gasoline.

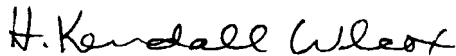
Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

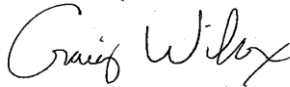
I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)



(Signature)

Craig Wilcox, Vice President
(printed name)



Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 21, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Discriminating Dispenser Pan Sensor

Version number(s) 794380-322 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root

(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003

(Address)

Simsbury,

CT

06070-7684

(860) 651-2700

(City)

(State)

(Zip Code)

(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794380-322 Discriminating Dispenser Pan Sensor

Table 1. Results of the Evaluation of the 794380-322 sensor with Water Low Level

Parameter	Data
Threshold Level (inches)	1.3458
Precision - Standard Deviation (inches)	0.0066
Detection Time (minute)	< 1
Fall Time (minute)	<1

Table 2. Results of the Evaluation of the 794380-322 sensor with Water High level

Parameter	Data
Threshold Level (inches)	7.6523
Precision - Standard Deviation (inches)	0.0055
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 3. Results of the Evaluation of the 794380-322 sensor with Diesel

Parameter	Data
Threshold Level (inches)	< 0.125
Precision - Standard Deviation (inches)	NA
Detection Time (minute)	99.3 minutes
Fall Time (minute)	> 24 hours

Table 4. Results of the Evaluation of the 794380-322 sensor with Unleaded

Parameter	Data
Threshold Level (inches)	< 0.125
Precision - Standard Deviation (inches)	NA
Detection Time (minute)	8.3 minutes
Fall Time (minute)	10.3 minutes

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using water, diesel fuel, unleaded and
gasoline.

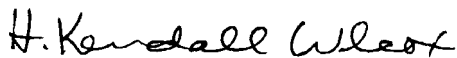
Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

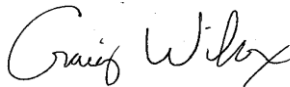
I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)



(Signature)

Craig Wilcox, Vice President
(printed name)



Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 16, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Position Sensitive Pan/Sump Sensor

Version number(s) 794380-323 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root

(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003

(Address)

Simsbury,

CT

06070-7684

(860) 651-2700

(City)

(State)

(Zip Code)

(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794380-323 Position Sensitive Pan/Sump Sensor

Table 1. Results of the Evaluation of the 794380-323 sensor with Water

Parameter	Data
Threshold Level (inches)	1.3665
Precision - Standard Deviation (inches)	0.0041
Detection Time (minute)	< 1
Fall Time (minute)	<1

Table 2. Results of the Evaluation of the 794380-323 sensor with Diesel

Parameter	Data
Threshold Level (inches)	1.3851
Precision - Standard Deviation (inches)	0.0067
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 3. Results of the Evaluation of the 794380-323 sensor with Unleaded

Parameter	Data
Threshold Level (inches)	1.4419
Precision - Standard Deviation (inches)	0.0035
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using water, diesel fuel, unleaded and
gasoline.

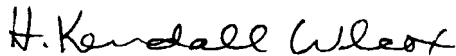
Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

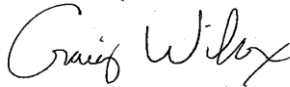
I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)



(Signature)

Craig Wilcox, Vice President
(printed name)



Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 12, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Position Sensitive Interstitial Sensor for Steel Tanks

Version number(s) 794380-333 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root

(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003

(Address)

Simsbury,

CT

06070-7684

(860) 651-2700

(City)

(State)

(Zip Code)

(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794380-333 Position Sensitive Interstitial Sensor for Steel Tanks

Table 1. Results of the Evaluation of the 794380-333 sensor with Water

Parameter	Data
Threshold Level (inches)	1.2404
Precision - Standard Deviation (inches)	0.0027
Detection Time (minute)	< 1
Fall Time (minute)	<1

Table 2. Results of the Evaluation of the 794380-333 sensor with Diesel

Parameter	Data
Threshold Level (inches)	1.2966
Precision - Standard Deviation (inches)	0.0033
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 3. Results of the Evaluation of the 794380-333 sensor with Unleaded

Parameter	Data
Threshold Level (inches)	1.3950
Precision - Standard Deviation (inches)	0.0071
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using water, diesel fuel, unleaded and
gasoline.

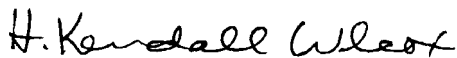
Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

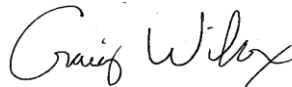
I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)



(Signature)

Craig Wilcox, Vice President
(printed name)



Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 12, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Solid-State Discriminating Interstitial Sensor for Fiberglass Tanks

Version number(s) 794380-343 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root

(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003

(Address)

Simsbury,

CT

06070-7684

(860) 651-2700

(City)

(State)

(Zip Code)

(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794380-343 Solid-State Discriminating Interstitial Sensor for Fiberglass Tanks

Table 1. Results of the Evaluation of the 794380-343 sensor with Water

Parameter	Data
Threshold Level (inches)	< 0.1
Precision - Standard Deviation (inches)	NA
Detection Time (minute)	< 1
Fall Time (minute)	<1

Table 2. Results of the Evaluation of the 794380-343 sensor with Diesel

Parameter	Data
Threshold Level (inches)	< 0.1
Precision - Standard Deviation (inches)	NA
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 3. Results of the Evaluation of the 794380-343 sensor with Unleaded

Parameter	Data
Threshold Level (inches)	< 0.1
Precision - Standard Deviation (inches)	NA
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using water, diesel fuel, unleaded and
gasoline.

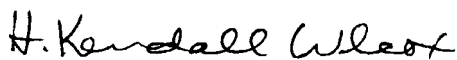
Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

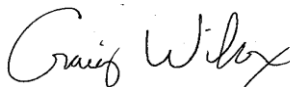
I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)



(Signature)

Craig Wilcox, Vice President
(printed name)



Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 5, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root MicroSensor

Version number(s) 794380-344 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root

(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003

(Address)

Simsbury,

CT

06070-7684

(860) 651-2700

(City)

(State)

(Zip Code)

(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794380-344 MicroSensor

Table 1. Results of the Evaluation of the 794380-344 sensor with Water

Parameter	Data
Threshold Level (inches)	< 0.1
Precision - Standard Deviation (inches)	NA
Detection Time (minute)	< 1
Fall Time (minute)	<1

Table 2. Results of the Evaluation of the 794380-344 sensor with Diesel

Parameter	Data
Threshold Level (inches)	< 0.1
Precision - Standard Deviation (inches)	NA
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 3. Results of the Evaluation of the 794380-344 sensor with Unleaded

Parameter	Data
Threshold Level (inches)	< 0.1
Precision - Standard Deviation (inches)	NA
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using water, diesel fuel, unleaded and
gasoline.

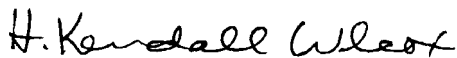
Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

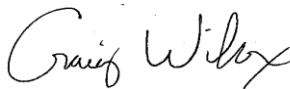
I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)



(Signature)

Craig Wilcox, Vice President
(printed name)



Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 5, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Solid-State Interstitial Sensor for Fiberglass Tanks

Version number(s) 794380-345 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root

(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003

(Address)

Simsbury,

(City)

CT

(State)

06070-7684

(Zip Code)

(860) 651-2700

(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794380-345 Solid-State Interstitial Sensor for Fiberglass Tanks

Table 1. Results of the Evaluation of the 794380-345 sensor with Water

Parameter	Data
Threshold Level (inches)	0.1482
Precision - Standard Deviation (inches)	0.0073
Detection Time (minute)	< 1
Fall Time (minute)	<1

Table 2. Results of the Evaluation of the 794380-345 sensor with Diesel

Parameter	Data
Threshold Level (inches)	0.1276
Precision - Standard Deviation (inches)	0.0055
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 3. Results of the Evaluation of the 794380-345 sensor with Unleaded

Parameter	Data
Threshold Level (inches)	0.1488
Precision - Standard Deviation (inches)	0.0054
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using water, diesel fuel, unleaded and
gasoline.

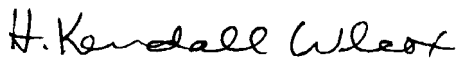
Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

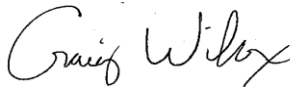
I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)



(Signature)

Craig Wilcox, Vice President
(printed name)



Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 12, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Solid-State Discriminating Containment Sump Sensor

Version number(s) 794380-350 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root

(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003

(Address)

Simsbury,

CT

06070-7684

(860) 651-2700

(City)

(State)

(Zip Code)

(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794380-350 Solid-State Discriminating Containment Sump Sensor

Table 1. Results of the Evaluation of the 794380-350 Sensor Low Level Alarm with Water

Parameter	Data
Threshold Level (inches)	1.1179
Precision - Standard Deviation (inches)	0.0041
Detection Time (minute)	< 1 minute
Fall Time (minute)	< 1 minute

Table 2. Results of the Evaluation of the 794380-350 sensor High Level Alarm with Water

Parameter	Data
Threshold Level (inches)	10.3427
Precision - Standard Deviation (inches)	0.0027
Detection Time (minute)	< 1 minute
Fall Time (minute)	< 1 minute

Table 1. Results of the Evaluation of the 794380-350 sensor with Diesel

Parameter	Data
Threshold Level (inches)	< 0.125
Precision - Standard Deviation (inches)	NA
Detection Time (minute)	99.3
Fall Time (minute)	> 24 hours

Table 2. Results of the Evaluation of the 794380-350 sensor with Unleaded

Parameter	Data
Threshold Level (inches)	< 0.125
Precision - Standard Deviation (inches)	NA
Detection Time (minute)	8.3 minutes
Fall Time (minute)	10.3 minutes

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using water, diesel fuel, unleaded and
gasoline.

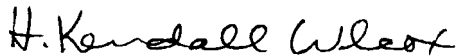
Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

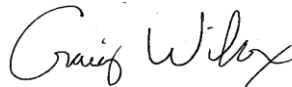
I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)



(Signature)

Craig Wilcox, Vice President
(printed name)



Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 21, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Solid-State Containment Sump Sensor

Version number(s) 794380-351 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root

(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003

(Address)

Simsbury,

CT

06070-7684

(860) 651-2700

(City)

(State)

(Zip Code)

(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794380-351 Solid-State Containment Sump Sensor

Table 1. Results of the Evaluation of the 794380-351 sensor with Water

Parameter	Data
Threshold Level (inches)	1.0629
Precision - Standard Deviation (inches)	0.0042
Detection Time (minute)	< 1
Fall Time (minute)	<1

Table 2. Results of the Evaluation of the 794380-351 sensor with Diesel

Parameter	Data
Threshold Level (inches)	1.0622
Precision - Standard Deviation (inches)	0.0036
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 3. Results of the Evaluation of the 794380-351 sensor with Unleaded

Parameter	Data
Threshold Level (inches)	1.0598
Precision - Standard Deviation (inches)	0.0039
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using water, diesel fuel, unleaded and
gasoline.

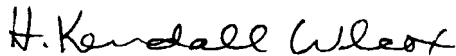
Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

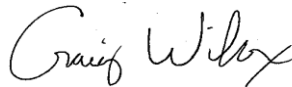
I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)



(Signature)

Craig Wilcox, Vice President
(printed name)



Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 21, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Discriminating Containment Sump Sensor

Version number(s) 794380-352 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root

(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003

(Address)

Simsbury,

CT

06070-7684

(860) 651-2700

(City)

(State)

(Zip Code)

(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794380-352 Discriminating Containment Sump Sensor

Table 1. Results of the Evaluation of the 794380-352 sensor with Water Low Level

Parameter	Data
Threshold Level (inches)	1.3671
Precision - Standard Deviation (inches)	0.0073
Detection Time (minute)	< 1
Fall Time (minute)	<1

Table 2. Results of the Evaluation of the 794380-352 sensor with Water High level

Parameter	Data
Threshold Level (inches)	12.2522
Precision - Standard Deviation (inches)	0.0055
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 3. Results of the Evaluation of the 794380-352 sensor with Diesel

Parameter	Data
Threshold Level (inches)	< 0.125
Precision - Standard Deviation (inches)	NA
Detection Time (minute)	99.3 minutes
Fall Time (minute)	> 24 hours

Table 4. Results of the Evaluation of the 794380-352 sensor with Unleaded

Parameter	Data
Threshold Level (inches)	< 0.125
Precision - Standard Deviation (inches)	NA
Detection Time (minute)	8.3 minutes
Fall Time (minute)	10.3 minutes

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using water, diesel fuel, unleaded and
gasoline.

Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

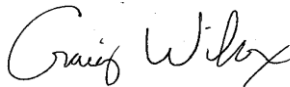
I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)



(Signature)

Craig Wilcox, Vice President
(printed name)



Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 16, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder Root Interstitial Liquid Sensor for Fiberglass Tanks

Version number(s) 794390-409 Sensor

For use with the 8601 Series/TLS4 Series, TLS-3xx Series, Red Jacket ProMax, Red Jacket ProPlus and 8600 Series /TLS-450 Series

Vendor Veeder-Root

(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003

(Address)

Simsbury,

CT

06070-7684

(860) 651-2700

(City)

(State)

(Zip Code)

(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the Interstitial Sensor

Table 1. Results of the Evaluation of the TLS-3xx Series console with Water

Parameter	Data
Threshold Level (inches)	0.2578
Precision - Standard Deviation (inches)	0.0034
Detection Time (minute)	< 1
Fall Time (minute)	<1

Table 2. Results of the Evaluation of the 8601 Series / TLS4 Series console with Water

Parameter	Data
Threshold Level (inches)	0.2540
Precision - Standard Deviation (inches)	0.0028
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 5. Results of the Evaluation of the 8601 Series / TLS4 Series console with Unleaded

Parameter	Data
Threshold Level (inches)	0.2767
Precision - Standard Deviation (inches)	0.0023
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 6. Results of the Evaluation of the 8600 Series / TLS-450 Series console with Unleaded

Parameter	Data
Threshold Level	0.2770
Precision - Standard Deviation (inches)	0.0028
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 7. Results of the Evaluation of the TLS-3xx Series console with Diesel

Parameter	Data
Threshold Level (inches)	0.2695
Precision - Standard Deviation (inches)	0.0042
Detection Time (minute)	< 1
Fall Time (minute)	<1

Table 8. Results of the Evaluation of the 8601 Series / TLS4 Series console with Diesel

Parameter	Data
Threshold Level (inches)	0.2677
Precision - Standard Deviation (inches)	0.0038
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Specificity – The sensor evaluated will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using water, diesel fuel, unleaded and
gasoline.

Additional Limitations or Considerations - None

**> Safety Disclaimer: This test procedure only addresses the issue of the methods
ability to respond to liquids. It does not test the equipment for safety hazards.**

Certification of Results

I certify that the liquid level sensors were tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)



(Signature)

Craig Wilcox, Vice President
(printed name)



Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

September 28, 2015
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Interstitial Sensor for Steel Tanks (4'-12' I.D.) with 16' cable

Version number(s) 794390-420 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root

(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003

(Address)

Simsbury,

CT

06070-7684

(860) 651-2700

(City)

(State)

(Zip Code)

(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794390-420 Interstitial Sensor for Steel Tanks

Table 1. Results of the Evaluation of the 794390-420 sensor with Water

Parameter	Data
Threshold Level (inches)	1.1907
Precision - Standard Deviation (inches)	0.0048
Detection Time (minute)	< 1
Fall Time (minute)	<1

Table 2. Results of the Evaluation of the 794390-420 sensor with Diesel

Parameter	Data
Threshold Level (inches)	1.3500
Precision - Standard Deviation (inches)	0.0041
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 3. Results of the Evaluation of the 794390-420 sensor with Unleaded

Parameter	Data
Threshold Level (inches)	1.3823
Precision - Standard Deviation (inches)	0.0052
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using water, diesel fuel, unleaded and
gasoline.

Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

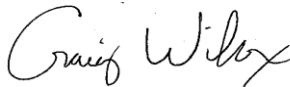
I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)



(Signature)

Craig Wilcox, Vice President
(printed name)



Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 16, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Interstitial Sensor for Steel Tanks

Version number(s) 794380-430 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root

(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003

(Address)

Simsbury,

CT

06070-7684

(860) 651-2700

(City)

(State)

(Zip Code)

(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794380-430 Interstitial Sensor for Steel Tanks

Table 1. Results of the Evaluation of the 794380-430 sensor with Water

Parameter	Data
Threshold Level (inches)	0.9168
Precision - Standard Deviation (inches)	0.0082
Detection Time (minute)	< 1
Fall Time (minute)	<1

Table 2. Results of the Evaluation of the 794380-430 sensor with Diesel

Parameter	Data
Threshold Level (inches)	0.95720
Precision - Standard Deviation (inches)	0.0163
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 3. Results of the Evaluation of the 794380-430 sensor with Unleaded

Parameter	Data
Threshold Level (inches)	1.0437
Precision - Standard Deviation (inches)	0.0248
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using water, diesel fuel, unleaded and
gasoline.

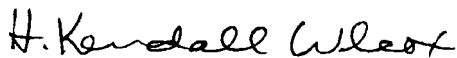
Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

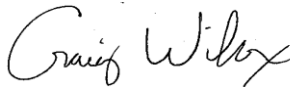
I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)



(Signature)

Craig Wilcox, Vice President
(printed name)



Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 5, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Interstitial Sensor for Steel Tanks (4'-12' I.D.) with 30' cable

Version number(s) 794390-460 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root

(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003

(Address)

Simsbury,

CT

06070-7684

(860) 651-2700

(City)

(State)

(Zip Code)

(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794390-460 Interstitial Sensor for Steel Tanks

Table 1. Results of the Evaluation of the 794390-460 sensor with Water

Parameter	Data
Threshold Level (inches)	1.1907
Precision - Standard Deviation (inches)	0.0048
Detection Time (minute)	< 1
Fall Time (minute)	<1

Table 2. Results of the Evaluation of the 794390-460 sensor with Diesel

Parameter	Data
Threshold Level (inches)	1.3500
Precision - Standard Deviation (inches)	0.0041
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 3. Results of the Evaluation of the 794390-460 sensor with Unleaded

Parameter	Data
Threshold Level (inches)	1.3823
Precision - Standard Deviation (inches)	0.0052
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using water, diesel fuel, unleaded and
gasoline.

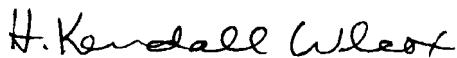
Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

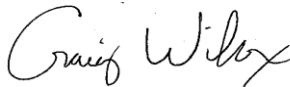
I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)



(Signature)

Craig Wilcox, Vice President
(printed name)



Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 16, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Discriminating Groundwater Sensor for 7' to 10' Well Depths

Version number(s) 794380-621 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root

(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003

(Address)

Simsbury,

CT

06070-7684

(860) 651-2700

(City)

(State)

(Zip Code)

(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794380-621 Discriminating Groundwater Sensor

Table 1. Results of the Evaluation of the 794380-621 sensor with Water

Parameter	Data
Threshold Level (inches)	3.3397
Precision - Standard Deviation (inches)	0.0030
Detection Time (minute)	< 1
Fall Time (minute)	<1

Table 2. Results of the Evaluation of the 794380-621 sensor with Diesel

Parameter	Data
Threshold Level (inches)	< 0.125
Precision - Standard Deviation (inches)	NA
Detection Time (minute)	76
Fall Time (minute)	> 24 hours

Table 3. Results of the Evaluation of the 794380-621 sensor with Unleaded

Parameter	Data
Threshold Level (inches)	< 0.125
Precision - Standard Deviation (inches)	NA
Detection Time (minute)	8 minutes
Fall Time (minute)	58.2 minutes

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using water, diesel fuel, unleaded and
gasoline.

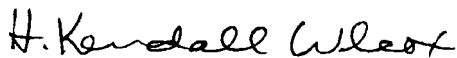
Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

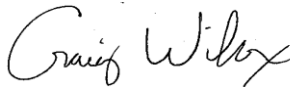
I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)



(Signature)

Craig Wilcox, Vice President
(printed name)



Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 19, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Discriminating Groundwater Sensor for 10' to 15' Well Depths

Version number(s) 794380-622 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root

(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003

(Address)

Simsbury,

CT

06070-7684

(860) 651-2700

(City)

(State)

(Zip Code)

(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794380-622 Discriminating Groundwater Sensor

Table 1. Results of the Evaluation of the 794380-622 sensor with Water

Parameter	Data
Threshold Level (inches)	3.3397
Precision - Standard Deviation (inches)	0.0030
Detection Time (minute)	< 1
Fall Time (minute)	<1

Table 2. Results of the Evaluation of the 794380-622 sensor with Diesel

Parameter	Data
Threshold Level (inches)	<0.125
Precision - Standard Deviation (inches)	NA
Detection Time (minute)	76
Fall Time (minute)	> 24 hours

Table 3. Results of the Evaluation of the 794380-622 sensor with Unleaded

Parameter	Data
Threshold Level (inches)	<0.125
Precision - Standard Deviation (inches)	NA
Detection Time (minute)	8 minutes
Fall Time (minute)	58.2 minutes

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using water, diesel fuel, unleaded and
gasoline.

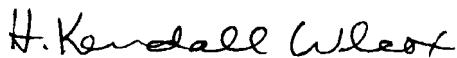
Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

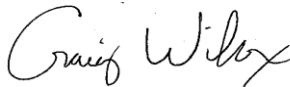
I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)



(Signature)

Craig Wilcox, Vice President
(printed name)



Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 19, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Discriminating Groundwater Sensor for 15' to 20' Well Depths

Version number(s) 794380-624 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root

(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003

(Address)

Simsbury,

CT

06070-7684

(860) 651-2700

(City)

(State)

(Zip Code)

(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794380-624 Discriminating Groundwater Sensor

Table 1. Results of the Evaluation of the 794380-624 sensor with Water

Parameter	Data
Threshold Level (inches)	3.3397
Precision - Standard Deviation (inches)	0.0030
Detection Time (minute)	< 1
Fall Time (minute)	<1

Table 2. Results of the Evaluation of the 794380-624 sensor with Diesel

Parameter	Data
Threshold Level (inches)	< 0.125
Precision - Standard Deviation (inches)	NA
Detection Time (minute)	76
Fall Time (minute)	> 24 hours

Table 3. Results of the Evaluation of the 794380-624 sensor with Unleaded

Parameter	Data
Threshold Level (inches)	< 0.125
Precision - Standard Deviation (inches)	NA
Detection Time (minute)	8 minutes
Fall Time (minute)	58.2 minutes

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using water, diesel fuel, unleaded and
gasoline.

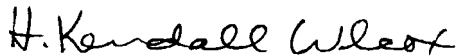
Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

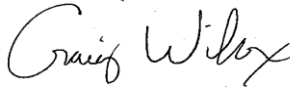
I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)



(Signature)

Craig Wilcox, Vice President
(printed name)



Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 19, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Vapor Sensor

This form documents the performance of the vapor sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Monitoring Well Vapor Sensor

Version number(s) 794390-700 Sensor

For use with the 8601 series consoles

Vendor Veeder-Root

(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003

(Address)

Simsbury,

CT

06070-7684

(860) 651-2700

(City)

(State)

(Zip Code)

(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to vapor when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The vapor levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same vapor level.

Detection Time - Amount of time the detector must be exposed to vapor before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the vapor.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 794390-700 Monitoring Well Vapor Sensor Sensor

Table 1. Results of the Evaluation of the 794390-700 Sensor at 500 ppm of Unleaded Gasoline Vapor

Parameter	Data
Threshold Level (inches)	500 ppm
Response Time (minutes)	20.6 minutes
Fall Time (minutes)	2.25 minutes
Accuracy	100%

Table 2. Results of the Evaluation of the 794390-700 sensor at 50, 500 and 1000 ppm of Diesel Fuel Vapor

Parameter	Data
Threshold Level (inches)	No Response
Precision - Standard Deviation (inches)	No Response
Detection Time (minute)	No Response within 24 hours
Accuracy	0%

Specificity – This sensor will potentially respond to any fuel vapor after its threshold is exceeded. This testing was specifically for performance using diesel fuel and unleaded gasoline.

Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to vapor. It does not test the equipment for safety hazards.

Certification of Results

I certify that the vapor sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for vapor sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)

H. Kendall Wilcox

(Signature)

Craig Wilcox, Vice President
(printed name)

Craig Wilcox

Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

January 5, 2017
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Mag Sump Sensor

Version number(s) 857060-XXX Sensor

For use with the 8601 series consoles

Vendor Veeder-Root
(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003
(Address)

<u>Simsbury,</u>	<u>CT</u>	<u>06070-7684</u>	<u>(860) 651-2700</u>
(City)	(State)	(Zip Code)	(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 857060-XXX Mag Sump Sensor

Table 1. Results of the Evaluation of the 857060-XXX sensor Water Warning with Water only

Parameter	Data
Threshold Level (inches)	2.0706
Precision - Standard Deviation (inches)	0.0045
Detection Time (minute)	< 1
Fall Time (minute)	<1

Table 2. Results of the Evaluation of the 857060-XXX sensor Water Alarm with Water only

Parameter	Data
Threshold Level (inches)	5.067
Precision - Standard Deviation (inches)	0.0038
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 3. Results of the Evaluation of the 857060-XXX sensor with Unleaded Only

Parameter	Data
Threshold Level (inches)	1.7547
Precision - Standard Deviation (inches)	0.0027
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 4. Results of the Evaluation of the 857060-XXX sensor with Diesel Only

Parameter	Data
Threshold Level (inches)	1.7707
Precision - Standard Deviation (inches)	0.0032
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 5. Results of the Evaluation of the 857060-XXX sensor with Unleaded on 7” of Water

Parameter	Data
Threshold Level (inches)	1.6395
Precision - Standard Deviation (inches)	0.0052
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 6. Results of the Evaluation of the 857060-XXX sensor with Diesel on 7” of Water

Parameter	Data
Threshold Level (inches)	1.3828
Precision - Standard Deviation (inches)	0.0061
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using water, diesel fuel, unleaded and gasoline.

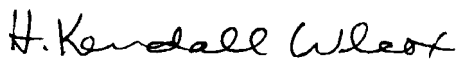
Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

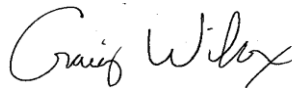
I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)



(Signature)

Craig Wilcox, Vice President
(printed name)



Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 13, 2016
(date)

(816) 443-2494
(phone number)

Results of U.S. EPA Alternative Evaluation

Liquid Level Sensor

This form documents the performance of the liquid level sensor described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's requirements for alternative protocols. The full evaluation report also includes a report describing the method, a description of the evaluation procedures, and a summary of the test data.

Tank owners using this system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with state and local agencies to make sure this form satisfies their requirements.

Method Description

Name Veeder-Root Mag Sump Sensor

Version number(s) 857080-XXX Sensor

For use with the 8601 series consoles

Vendor Veeder-Root
(Name of Manufacturer)

125 Powder Forest Drive, P.O. Box 2003
(Address)

<u>Simsbury,</u>	<u>CT</u>	<u>06070-7684</u>	<u>(860) 651-2700</u>
(City)	(State)	(Zip Code)	(Phone)

Evaluation Parameters

The sensor listed above was tested for the abilities to respond to liquids when the sensor is installed in underground storage tank applications. The following parameters were determined from this evaluation.

Threshold Levels – The liquid levels at which alarms are triggered.

Precision (standard deviation) - Agreement between multiple measurements of the same product level.

Detection Time - Amount of time the detector must be exposed to product before it responds.

Fall Time - Amount of time before the detector stops responding after being removed from the product.

Specificity - Types of products that the sensor will respond to.

Evaluation Results

Note: If the test data can be presented in a more appropriate manner, the evaluator may select to present the information below in a data table, which can be attached to these forms.

Evaluation Results of the 857080-XXX Mag Sump Sensor

Table 1. Results of the Evaluation of the 857080-XXX sensor Water Warning with Water only

Parameter	Data
Threshold Level (inches)	2.0706
Precision - Standard Deviation (inches)	0.0045
Detection Time (minute)	< 1
Fall Time (minute)	<1

Table 2. Results of the Evaluation of the 857080-XXX sensor Water Alarm with Water only

Parameter	Data
Threshold Level (inches)	5.067
Precision - Standard Deviation (inches)	0.0038
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 3. Results of the Evaluation of the 857080-XXX sensor with Unleaded Only

Parameter	Data
Threshold Level (inches)	1.7547
Precision - Standard Deviation (inches)	0.0027
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 4. Results of the Evaluation of the 857080-XXX sensor with Diesel Only

Parameter	Data
Threshold Level (inches)	1.7707
Precision - Standard Deviation (inches)	0.0032
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 5. Results of the Evaluation of the 857080-XXX sensor with Unleaded on 7” of Water

Parameter	Data
Threshold Level (inches)	1.6395
Precision - Standard Deviation (inches)	0.0052
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Table 6. Results of the Evaluation of the 857080-XXX sensor with Diesel on 7” of Water

Parameter	Data
Threshold Level (inches)	1.3828
Precision - Standard Deviation (inches)	0.0061
Detection Time (minute)	< 1
Fall Time (minute)	< 1

Specificity – This sensor will respond to any liquid after its threshold is exceeded.
This testing was specifically for performance using water, diesel fuel, unleaded and gasoline.

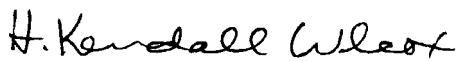
Additional Limitations or Considerations - None

> Safety Disclaimer: This test procedure only addresses the issue of the methods ability to respond to liquids. It does not test the equipment for safety hazards.

Certification of Results

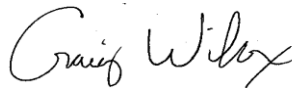
I certify that the liquid level sensor was tested under conditions according to the vendor's operating instructions. I also certify that the evaluation was performed using methods described in the attached Alternative EPA Test Procedures for Liquid level sensors, and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D., President
(printed name)



(Signature)

Craig Wilcox, Vice President
(printed name)



Ken Wilcox Associates, Inc.
(Signature)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, MO 64029
(city, state, zip)

December 13, 2016
(date)

(816) 443-2494
(phone number)

Veeder-Root
 TLS4 -8601 Series Console
 Part Numbers

Part #	Description
	Console
86019x-xxx	TLS4 Series Consoles
	Sensors
794380-208	Sump Sensor - 12 ft. cable
794380-209	Sump Sensor - 30 ft. cable
794380-301	Single-Point Hydrostatic Sensor with Vented Locking Riser Cap
794380-303	Dual-Point Hydrostatic Sensor with Vented Locking Riser Cap
794380-304	Single-Point Mini-Hydrostatic Sensor
794380-320	Solid-State Discriminating Dispenser Pan Sensor
794380-321	Solid-State Dispenser Pan Sensor
794380-322	Discriminating Dispenser Pan Sensor
794380-323	Position Sensitive Pan/Sump Sensor - 12 ft. cable
794380-333	Position Sensitive Interstitial Sensor for Steel Tanks with 15' Cable
794380-343	Solid-State Discriminating Interstitial Sensor for Fiberglass Tanks (4'-10' Tank I.D.) with 25' Cable
794380-344	MicroSensor (for small, hard to reach locations)
794380-345	Solid-State Interstitial Sensor for Fiberglass Tanks (4'-10' Tank I.D.) with 25' Cable
794380-350	Solid-State Discriminating Containment Sump Sensor
794380-351	Solid-State Containment Sump Sensor
794380-352	Discriminating Containment Sump Sensor
794380-430	Interstitial Sensor for Steel Tanks (4'-12' Tank I.D.) with 15' Cable
794380-621	Groundwater Sensor for 7' to 10' well depths
794380-622	Groundwater Sensor for 10' to 15' well depths
794380-624	Groundwater Sensor for 15' to 20' well depths
794390-409	Interstitial Sensor for up to 12' internal tank diameters
794390-420	Interstitial Sensor for Steel Tanks (4'-12' Tank I.D.) with 16' Cable
794390-460	Interstitial Sensor for Steel Tanks (4'-12' Tank I.D.) with 30' Cable
794390-700	Monitoring Well Vapor Sensor
857080-xxx	MagSump Sensor
	Probes
8463xx-xxx	MagPlus
	In Tank Leak Detection
CSLD	0.1
	0.2
Static	0.1
	0.2
	Other
790091-001	Overfill Alarm Box
790095-001	Overfill Alarm Acknowledgement Switch/Reset
857390-102	2 - 1 Sensor Input Box
848100-xxx	Direct Burial Cable

CERTIFICATE OF COMPLIANCE

Certificate Number 20170302-MH11766
Report Reference MH11766-20120601
Issue Date 2017-MARCH-02

Issued to: VEEDER-ROOT CO
125 POWDER FOREST DR
PO BOX 2003
SIMSBURY CT 06070

**This is to certify that
representative samples of** CONTROL, MONITORING AND AUXILIARY EQUIPMENT
See Addendum Page

Have been investigated by UL in accordance with the
Standard(s) indicated on this Certificate.

Standard(s) for Safety: See Addendum Page
Additional Information: See the UL Online Certifications Directory at
www.ul.com/database for additional information

Only those products bearing the UL Certification Mark should be considered as being covered by UL's
Certification and Follow-Up Service.

Look for the UL Certification Mark on the product.



Bruce Mahrenholz, Director North American Certification Program

UL LLC

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please
contact a local UL Customer Service Representative at <http://ul.com/aboutul/locations/>



CERTIFICATE OF COMPLIANCE

Certificate Number 20170302-MH11766
Report Reference MH11766-20120601
Issue Date 2017-MARCH-02

This is to certify that representative samples of the product as specified on this certificate were tested according to the current UL requirements.

8601 Liquid Level Gauge/Leak Detection System,

Associated Apparatus, non-hazardous location, liquid level gauge/leak detector control unit, Form No. 86019X-XXX where X represents any alphanumeric character. Provides intrinsically safe circuits for use in Class I, Division 1, Group D, and Class I, Zone 0, Group IIA Hazardous Locations; may be used with up to 12 intrinsically safe probes/sensors when installed in accordance with Control Drawing 331940-018.

Intrinsically Safe Devices, Class I, Division 1, Group D:

2 to 1 Sensor Input Box – Form No. 857390-102 only for use with Sump, Position Sensitive and Hydrostatic Sensors, Form Nos. 794380 followed by -208, -209, -301, -304, -323.

Magnetostrictive Probes - Form No. 84639 followed by 0 to 9, followed by 0 to 9, followed by 00 to 99 or Form No. 85639, followed by 0 or 1, followed by 0 to 9, followed by 00 to 99, or Form No. 857080, or Form No. 846291 followed by -100 through -199;

Discriminating Dispenser Pan, Containment Pump, Interstitial Sump, Hydrostatic and Position Sensitive Sensors – Form Nos. 794380 followed by -208, -209, -301, -303 -304, -322, -323, -343, -344, -345, -352, -430 or Form Nos. 794390 followed by -401, -404, -407, -409, -420, -460; or

CSTP Liquid Switch, UL Listed Veeder-Root Submersible Pump Basic Models PC or PAGC; or

Vapor Sensor – Form No. 794390-700; or

Solid State Discriminating Sensors – Form Nos. 794380 followed by -320, -350, -360, -361, -362; or

Solid State Dispenser Pan and Containment Sump Sensors – Form Nos. 794380 followed by -321, -351; or

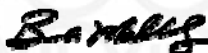
Ground Water Sensors – Form No. 794380 followed by -621, -622, -624; or

Vacuum Sensor, Form No. 332175-XXX; or Oil Water Separator Sensors – Form Nos. 794690 followed by -000 to -999; or Mag Plus1.

Temperature Sensor – Form No. 794380-210;

May be used with an I.S. Circuit Protector, Part Nos. 848190-001, -002 and -003.

The control unit may also be provided with the following equipment for use in non-hazardous locations:



Bruce Mahrenholz, Director North American Certification Program

UL LLC

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please contact a local UL Customer Service Representative at <http://ul.com/aboutul/locations/>



CERTIFICATE OF COMPLIANCE

Certificate Number 20170302-MH11766
Report Reference MH11766-20120601
Issue Date 2017-MARCH-02

Overfill alarm, Form No. 790091-001, with or without an acknowledgement switch Form No. 790095-001, or

Communication Modules, Form Nos. 333268-001, may be used with peripheral equipment as specified in the installation instructions.

Standard(s):

Standard No. UL 1238, 5th Ed., Rev. 2008-05-16, Standard for Control Equipment for use with Flammable Liquid Dispensing Devices

Standard No. CAN/CSA C22.2 No. 142-M1987, Rev. 2004, Process Control Equipment
Standard No. CSA C22.2 No. 157 - Intrinsically Safe and Non-Incendive Equipment For Use In Hazardous Locations Edition - 3, Revised June 2003, Reaffirmed 2006

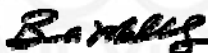
Standard No. UL 913, 7th Ed., Rev. 2011-05-25, Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations

Standard No. UL 60079-0, 5th Ed., Rev. 2009-10-21, Electrical Apparatus for Explosive Gas Atmospheres – Part 0: General Requirements

Standard No. UL 60079-11, 5th Ed., Rev. 2009-09-30, Electrical Apparatus for Explosive Gas Atmospheres – Part 11: Intrinsic Safety “i”

Standard No. CAN/CSA-C22.2 No. 60079-0:11, Explosive atmospheres — Part 0: Equipment — General requirements

Standard No. CAN/CSA-C22.2 No. 60079-11:11, Explosive atmospheres — Part 11: Equipment protection by intrinsic safety “i”



Bruce Mahrenholz, Director North American Certification Program

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