Manual No: **577013-869** • Revision: **E**

2 To 1 Sensor Input Box

Installation Guide

VEEDER-ROOT

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.

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.

Figures

Introduction

The Veeder-Root 2 to 1 Sensor Input Box is designed for use in brine filled, double wall dispenser sumps and connects to a sump or position sensitive sump sensor installed on the base of the sump and to a mini-hydrostatic sensor monitoring the interstice brine. A 2-wire shielded cable is then pulled from the Sensor Input box to the TLS console and connected to one input on an Interstitial/Liquid Sensor Interface module. The Sensor Input Box permits the TLS console to increase from 8 to 16, the number of sump/hydrostatic sensor pairs that can be monitored by one module.

System Requirements

- TLS450PLUS series console with:
  - V9B or later software
  - Universal Sensor Module (USM)
- TLS-350 series console with:
  - ISD software enhancement module (SEM)
  - V26B or later software
  - Interstitial/Liquid Sensor Interface module

Contractor Certification Requirements

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

Service Technician Certification (Previously known as 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. This certification includes TLS-3xx and TLS4xx certification training.

In-Station Diagnostics (ISD-PMC) Technician Certification: ISD PMC Contractors holding a valid ISD/PMC Certification are approved to perform (ISD/PMC) installation checkout, startup, programming, and operations training. This training also includes troubleshooting and service techniques for the Veeder-Root In-Station Diagnostics system. A current Veeder-Root Technician Certification is a prerequisite for the ISD/PMC course.

All service personal on site must comply with all recommended safety practices identified by OSHA and your employer.

Review and comply with all the safety warnings in this and any related documents, and any other Federal, State or Local requirements.

Warranty Registrations may only be submitted by selected Distributors.

Product Marking Information

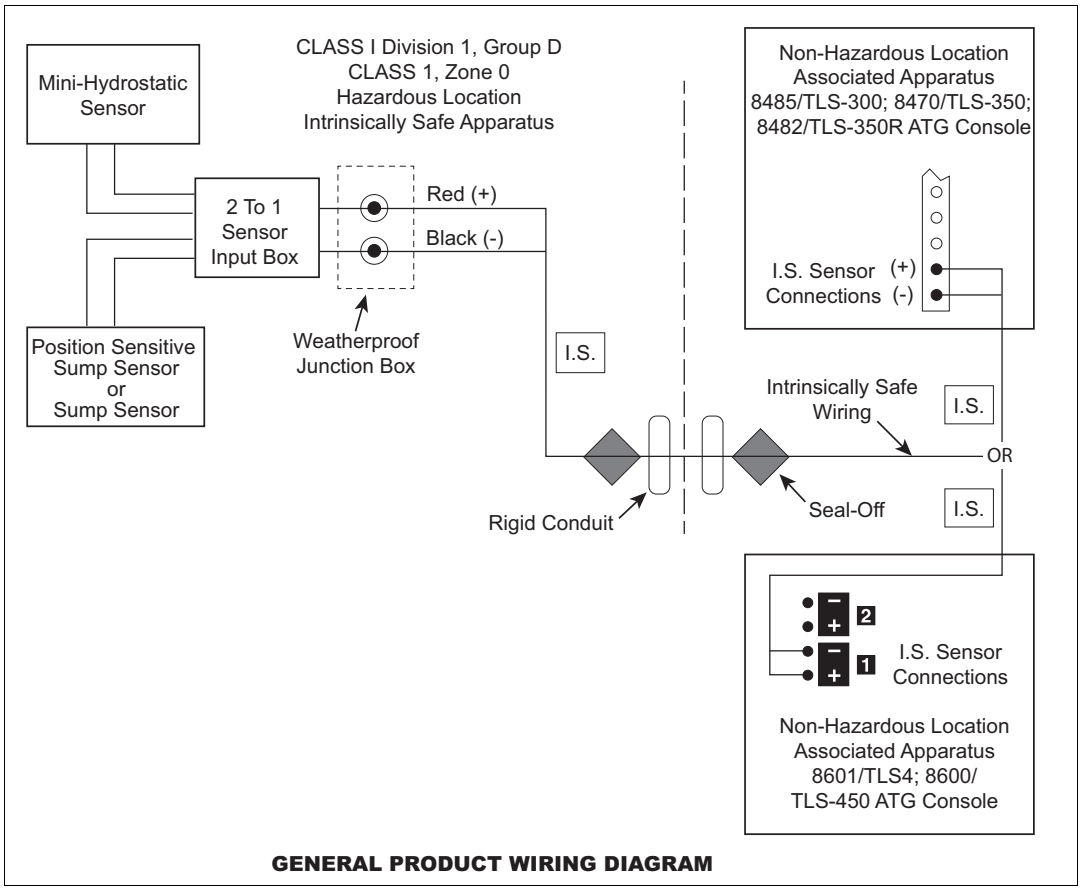
RELATED DOCUMENTS

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
Intrinsically Safe Apparatus for Wireless Applications	
Tank Gauge Accessories	331940-012
TLS-XB/8603	331940-019

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 at veeder.com.



GENERAL PRODUCT WIRING DIAGRAM

Product Label Contents

VEEDER-ROOT™

I.S. CIRCUIT FOR HAZLOC SENSOR
F/N 857390-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. 577013-869

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 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.
	**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.		**ELECTRICITY** High voltage exists in, and is supplied to, the device. A potential shock hazard exists.
	**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.
⚠WARNING	**WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.	NOTICE	**NOTICE** is used to address practices not related to physical injury.
⚠CAUTION	**CAUTION** indicates a hazardous situation which, if not avoided, could result in minor or moderate 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.

2 to 1 Sensor Input Box Kits

The 2 to 1 Sensor Input Box is available in two kits:

- Mini-Hydro and Dispenser Pan/Sump Sensor Kit (P/N 330020-536)

  Contains Hydrostatic Sensor Form No. 794380-304 and Sump Sensor Form No. 794380-208
- Mini-Hydro and Position Sensitive Dispenser Pan/Sump Sensor Kit (P/N 330020-537)

  Contains Hydrostatic Sensor, Form No. 794380-304 and Position Sensitive Sensor, Form No. 794380-323

Installation

Sensor Input Box Dimensions

The Sensor Input Box housing dimensions are shown in Figure 1.

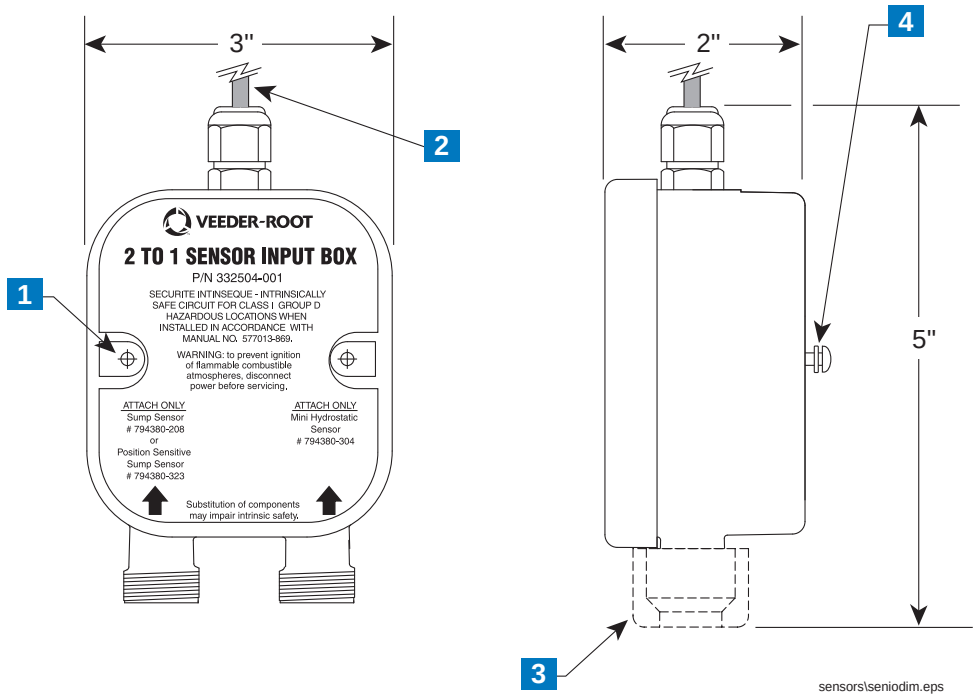


Figure 1. Sensor Input Box dimensions

LEGEND FOR NUMBERED BOXES IN Figure 1

1. Cover screws T-10 Torx (2)
2. 2 Conductor (#22 AWG), PVC jacketed cable (6 ft.)
3. Cord grips bushings and nuts from sensor kits (2 ea.)
4. #10-32 taptite, Phillips head mounting screws (2)

Installation Procedure

NOTICE **The total length of cable from the console to the sump junction box and from the junction box to both sensors cannot exceed 1000 feet.**

1. From the installation kit, install the mini-hydrostatic sensor in the brine sump and either a position sensitive or sump sensor (as ordered) in the base of the sump as per instructions in the manuals included with those sensors. Do not attach the sensor cables at this time.
2. Figure 2 shows an example installation of the Sensor Input Box. Attach the unit where practical to a rigid support member using appropriate fittings from the universal sensor mounting kit.

3. Note which sensor cord grip entry is marked for the mini-hydrostatic sensor on the label then remove the cover of the Sensor Input Box and set it aside. Keep the o-ring in its groove in the inside of the cover.
4. Attach the connector end of the mini-hydrostatic sensor's cable to the top of the sensor. Coil up and tie wrap any excess cable. Get the cord grip bushing and nut from the sensor kit and slide them over the end of the sensor cable (tapered end of bushing toward unit).

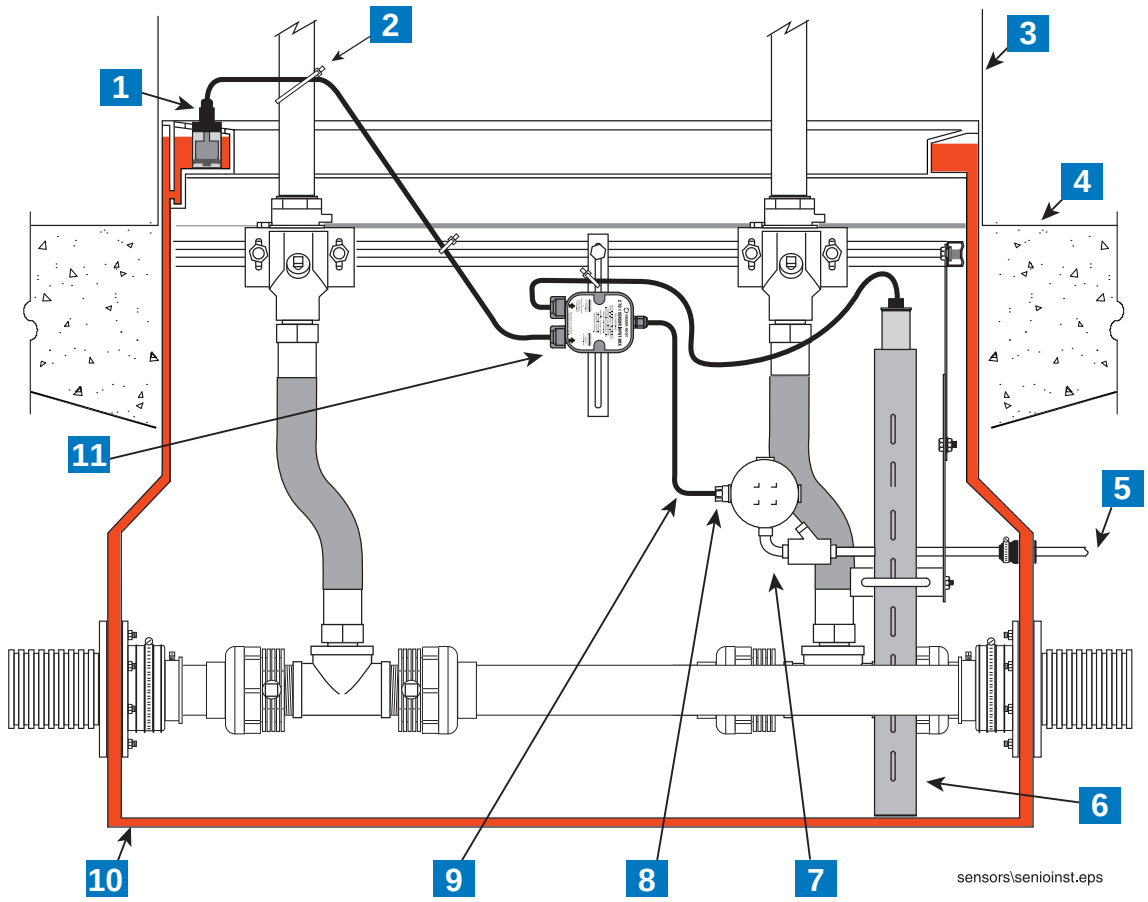


Figure 2. Sensor Input Box installation example

LEGEND FOR NUMBERED BOXES IN Figure 2

1. Mini-hydrostatic sensor
2. Use tie wraps to keep cables clear of sump components
3. Dispenser hydraulics cabinet
4. Top of pedestal island
5. Electrical conduit to TLS (customer supplied)
6. Position sensitive or sump sensor
7. Seal off and junction box (customer supplied)
8. Cord grip from install kit
9. 2 conductor shielded cable
10. Brine filled double wall dispenser sump
11. 2 to 1 Sensor Input Box

5. Push the end of the cable into the box cord grip port labeled mini-hydrostatic sensor and straight into the box until the end reaches the terminal block labeled MINI-HYDROSTATIC SENSOR ONLY. Strip back the ends of the cable jacket and wires as shown in Figure 3.

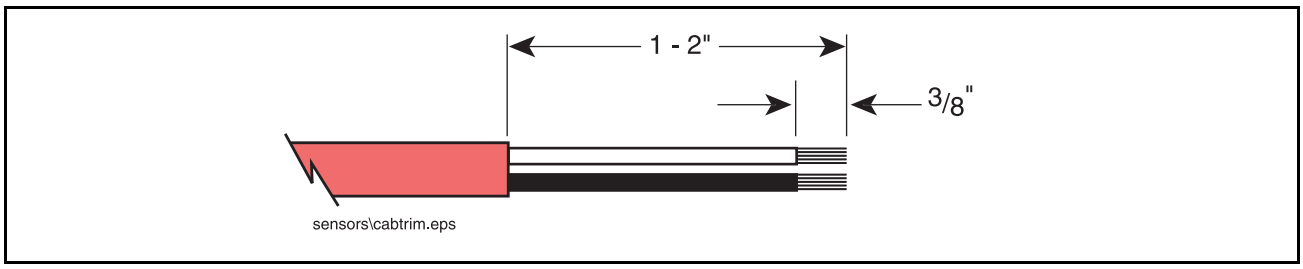


Figure 3. Stripping cable jacket and two conductor ends

6. Push down either one of the two white terminal release levers in the back of the terminal block and insert one of the two stripped wires into the terminal opening in the front of the block then release the lever. Tug gently on the wire to make sure it is secured in the terminal. Check to see that the end of the cable jacket is inside the box (see Figure 4). Note: observing polarity is not necessary for any of these connections. Push down the other white release lever on the terminal block and insert the second wire. Again pull on the wire to check that it too is secure.
7. Pull any excess cable out of the box, then tighten the cord grip to seal the cable entry into the box.
8. Attach the connector end of the Position Sensitive or Sump Sensor's cable to the top of the sensor. Coil up and tie wrap any excess cable. Get the cord grip bushing and nut from the sensor kit and slide them over the end of the sensor cable (tapered end of bushing toward unit).
9. Push the end of the cable into the box cord grip port beside the just finished Mini-Hydrostatic Sensor cord grip and straight into the box until the end reaches the terminal block labeled PAN/SUMP SENSOR ONLY. Strip back the ends of the cable jacket and wires as shown in Figure 3.
10. Push down either one of the two white terminal release levers in the back of the terminal block and insert one of the two stripped wires into the terminal opening in the front of the block then release the lever. Tug gently on the wire to make sure it is secured in the terminal. Note: observing polarity is not necessary for any of these connections. Push down the other white release lever on the terminal block and insert the second wire then release the lever. Tug gently on the wire to make sure it is secured in the terminal.
11. Pull any excess cable out of the box, then tighten the cord grip to seal the cable entry into the box.
12. Apply a coating of petroleum jelly to the Sensor Input Box cover o-ring and screw the cover down securely. The Sensor Input Box installation procedure is now complete.

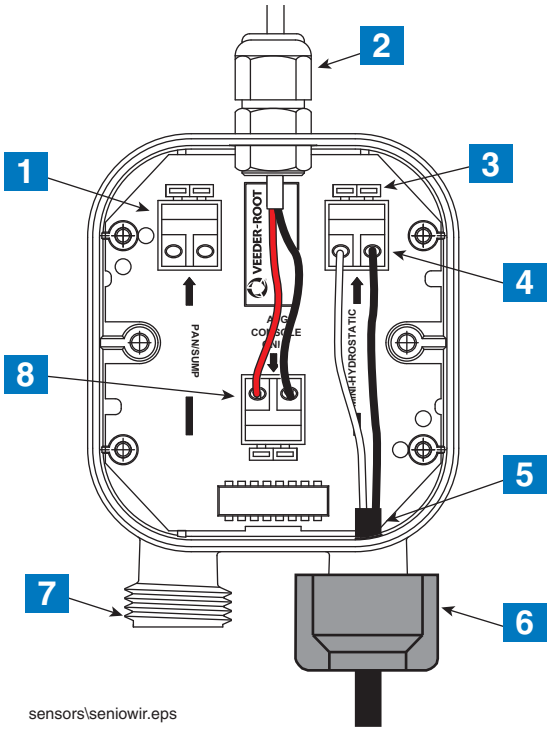


Figure 4. Attaching cables to Sensor Input Box Terminals

LEGEND FOR NUMBERED BOXES IN Figure 4

1. Position sensitive or sump sensor connects to PAN/SUMP SENSOR ONLY terminal block
2. Cable (connects to TLS console cable in sump junction box)
3. Push down lever and insert wire end (typ.)
4. Mini-hydrostatic sensor connects to MINI-HYDROSTATIC SENSOR ONLY terminal block
5. Make sure end of cable jacket is well inside box to ensure weatherproof seal (typ.)
6. Mini-hydrostatic sensor cable enters this cord grip port (see cover label)
7. Position sensitive or sump sensor cable enters this cord grip port (see cover label)
8. ATG terminal block

NOTICE **For all connections in the 2 to 1 box, wire color, or polarity is not significant.**

Field Wiring Connections

1. Open the sump junction box. If necessary, pull a shielded 2-conductor cable from the TLS console into the sump's junction box. Refer to the TLS-450PLUS Site Prep manual (P/N 577014-073) or TLS-3XX Site Prep manual (P/N 576013-879), as appropriate, for the approved size and type cable that can be used for Veeder-Root sensors.
2. Strip back the ends of the cable jacket and wires of the TLS console cable as shown in Figure 3.

3. Get a cord grip bushing and nut from the installation kit. Slide the tapered end of the bushing into one of the sump junction box fittings and loosely screw on the cord grip nut. Push the end of the cable from the Sensor Input Box into the loosened cord grip and into the junction box.
4. Connect the Sensor Input Box cable to the TLS console cable in the junction box using the two wire nuts in the kit (see Figure 5). Note: you do not have to observe polarity for these connections.

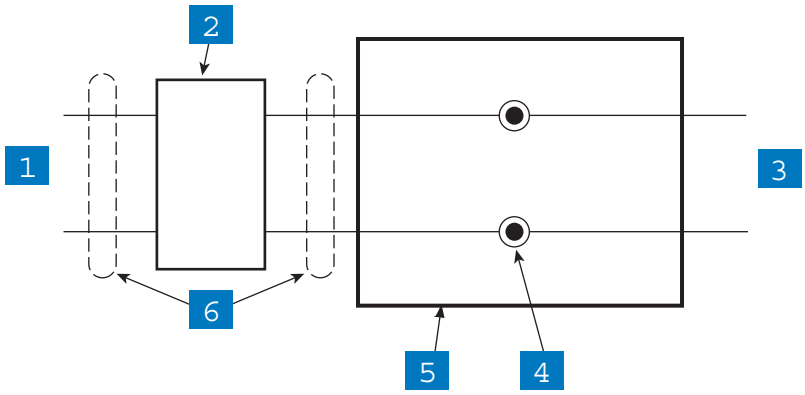


Figure 5. Sensor Input Box field connections

LEGEND FOR NUMBERED BOXES IN Figure 5

1. Cable To USB module, TLS-450PLUS Console; or to Interstitial Sensor Interface module, TLS-350 Console
2. Seal off (customer supplied)
3. Cable from 2 to 1 Sensor Input Box
4. Wire nuts from kit (1 for each connection)
5. Weatherproof junction box (customer supplied)
6. 1/2" rigid conduit (customer supplied)

Epoxy Sealing Cable Field Connections

Get the epoxy seal pack from the installation kit and follow the instructions in Figure 6

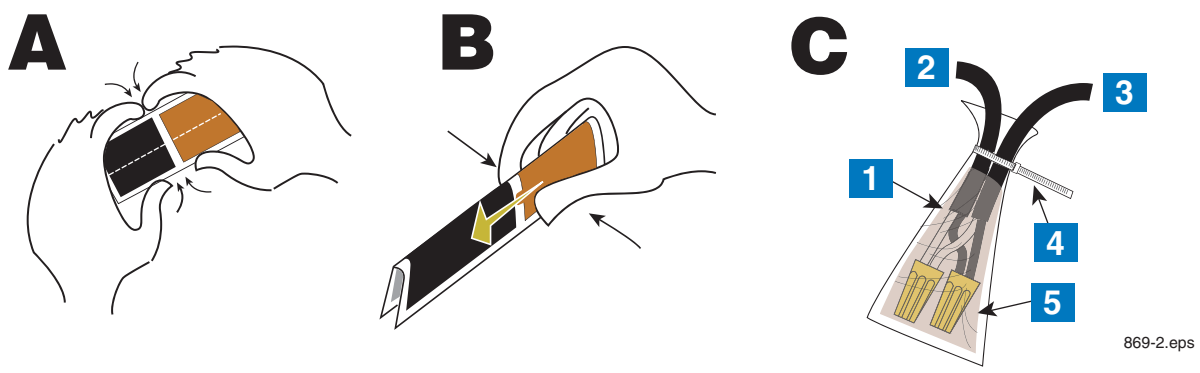


Figure 6. Epoxy Sealing Wire Connections

LEGEND FOR NUMBERED BOXES IN Figure 4

NOTICE **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).**

Open epoxy sealant package, and remove resin pack. Holding resin pack as shown in **A**, bend pack along long length. As shown in **B**, firmly squeeze the RED SIDE of the resin, forcing it through the center seal and into BLACK SIDE. Mix thoroughly to a uniform color by squeezing contents back and forth 25-30 times. Squeeze mixed, warm resin into one end of bag and cutoff other end. Slowly insert wiring connections into sealing pack until they fit snugly against the opposite end as shown in **C**. Twist open end of bag and use tie wrap to close it off and position the tie wrapped end up until the resin jells.

1. Ensure the ends of cable sheathing are submerged in sealant.
2. Cable from sensor
3. Cable to console
4. Tie wrap
5. Wire nuts

⚠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.

Sensor Setup

TLS-450PLUS Console

1. Navigate to Menu>Setup and touch Devices (Figure 7) and then touch Liquid Sensor (Figure 8).

Figure 7. Setup Screen

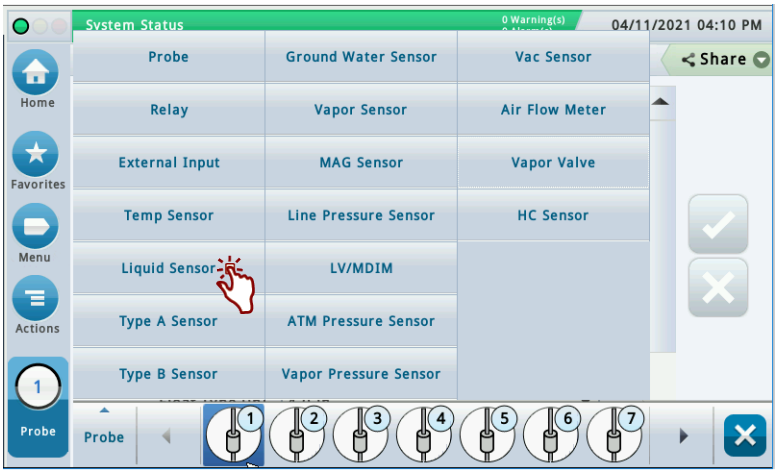


Figure 8. Selecting Device Setup

2. Select the desired sensor from the bottom device ribbon (7 in the example below) and touch the Enabled radio button configuring it.

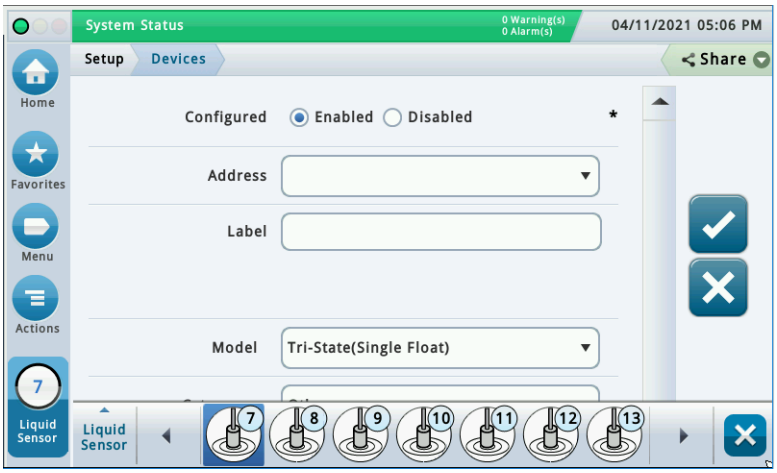


Figure 9. Configuring the Device

3. In the Address field touch the down arrow and select the sensor's location on the USM.

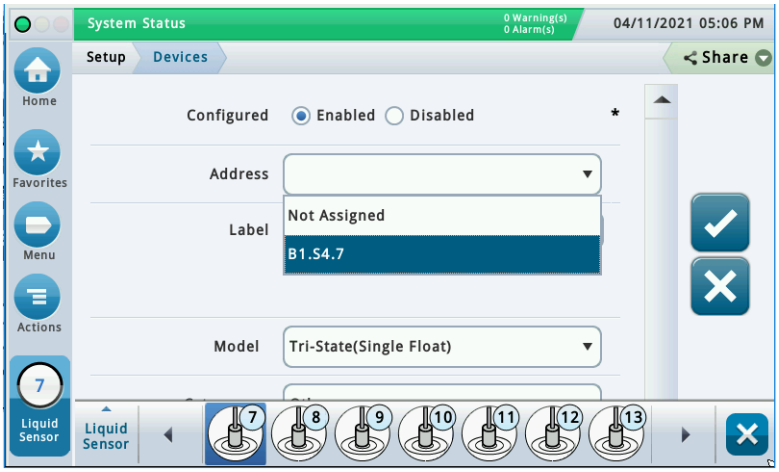


Figure 10. Selecting Device Address

4. Touch in the Label field and enter on the popup keyboard, the location (up to 20 alphanumeric characters) of the selected Sensor Input Box. Typical entries would be: Dispenser 1 sump or Dispenser 2 sump, etc. (This information will appear on sensor status and sensor alarm reports to make it easier to identify the location of alarms.)

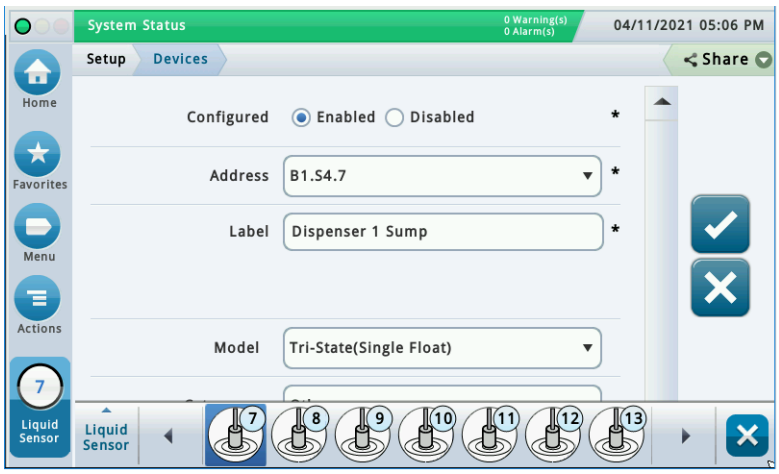


Figure 11. Device Label Entered Example

5. In the Model field touch the down arrow and select the model from the list, e.g., DW Sump 2-1 Sensor (see Figure 12).

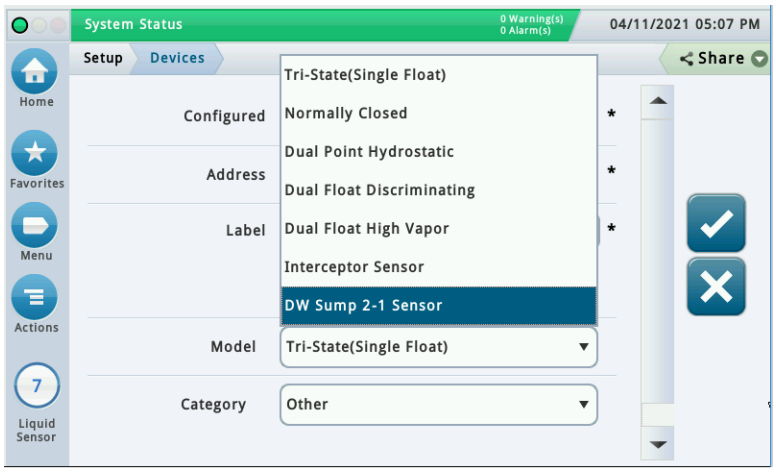


Figure 12. Selecting a Model

6. Figure 13 shows the Model selected.

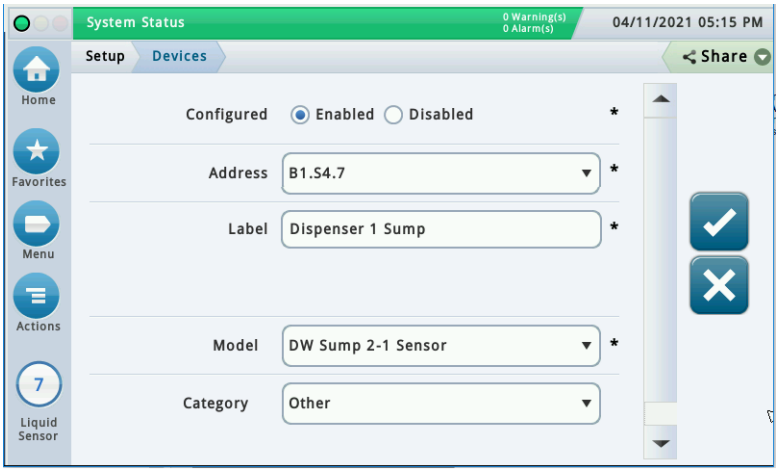


Figure 13. Model Selected Example

7. In the Category field touch to the down arrow and select the sensor category, in the example in Figure 14, Dispenser Pan.

Figure 14. Device Category Selected

8. Touch the check button to save your choices.

9. For additional liquid sensors, touch the Devices tab in the top of the screen and select the next device(s) to be programmed. Repeat the steps above until all sensors are configured.

TLS-350 Console

At the TLS-350 console front panel key pad, press MODE until you see the message:

```
SETUP MODE
PRESS <FUNCTION> TO CONT
```

The Liquid Sensor Setup function allows you to enter information about Sensor Input Boxes and their attached sensors installed in the dispenser sumps. You must enter data individually for each 2 to 1 Sensor Input Box. The information you enter tells the system the number, location, and types of sensors installed.

SELECTING THE LIQUID SENSOR SETUP FUNCTION

To select Liquid Sensor Setup, press FUNCTION until you see the message:

```
LIQUID SENSOR SETUP
PRESS <STEP> TO CONTINUE
```

Press STEP to continue.

LIQUID SENSOR CONFIGURATION

If necessary, press STEP until you see the message:

```
SENSOR CONFIG - MODULE 1
SLOT # - X X X X X X X
```

Use this display to tell the system which liquid sense wire positions on a module are connected to liquid sensors.

NOTE: If liquid sensors are not installed, this function is not available.

How the System Configures Liquid Sensors

If liquid sensors are installed, the system will recognize the presence and module slot locations of Interstitial Sensor Interface Modules. The system also establishes a module number based on the slot location. For example, if modules are installed in slots #3 and #6, the module in slot #3 automatically becomes module #1 and the module in slot #6 becomes module #2.

As you specify which liquid sense wire positions on a module are connected to liquid sensors, the system establishes a number for each liquid sensor. For example, if there is a liquid sensor in positions 3 and 5 of module 1, the sensor in position 3 becomes L3 and the sensor in position 5 becomes L5.

To indicate that a liquid sensor position is connected, choose the number corresponding to that position. For example, if the position is 3, choose 3 for the position. To indicate that a position is not connected, choose X for that position.

Specifying Liquid Sensor Positions

To specify whether the first position is connected, press CHANGE until the correct choice appears (1 if the position is connected, X if it is not). Press the Right Arrow key to move to position 2 and press CHANGE again until the correct choice appears. Repeat these steps until you have correctly specified all sensor positions. When

you have entered a choice for all positions, press ENTER to confirm your entry. The system displays the following message:

```
SLOT # - X X X X X X X
PRESS <STEP> TO CONTINUE
```

Press STEP. If more than one module is installed, the system automatically advances to the SENSOR CONFIG message for the next module. Up to 8 modules may be installed. Repeat the steps described above for each module until you have entered the configuration information (sensor positions) for all modules and the system displays the ENTER SENSOR LOCATION message.

LIQUID SENSOR LOCATION

If necessary, press STEP until you see the message:

```
ENTER SENSOR LOCATION
L1:
```

To enter the location of a Sensor Input Box, press TANK repeatedly until the sensor you want appears on the second line of the message (L1, L2, L3, etc.). Press CHANGE and enter the location (up to 20 alphanumeric characters) of the selected Sensor Input Box. Typical entries would be: DISPENSER 1 SUMP; DISPENSER 2 SUMP, etc. (This information will appear on sensor status and sensor alarm reports to make it easier to identify the location of alarms.) Press ENTER to confirm your entry:

```
L1: (Sensor Location)
PRESS <STEP> TO CONTINUE
```

Press STEP to continue.

LIQUID SENSOR TYPE

If necessary, press STEP until you see the message:

```
L1: ENTER SENSOR TYPE
TRI-STATE (SINGLE FLOAT)
```

Press CHANGE until you see the message:

```
L1: ENTER SENSOR TYPE
DW SUMP 2-1
```

Press ENTER to confirm your choice:

```
DW SUMP 2-1
PRESS <STEP> TO CONTINUE
```

Press STEP to continue.

SETTING UP ADDITIONAL LIQUID SENSORS

If you have additional liquid sensors to configure, press STEP, if necessary, until you see the ENTER SENSOR LOCATION message. Press TANK to select another sensor and follow the procedures described above beginning with the section “Liquid Sensor Location” on page 16.

If you have entered setup information for the sensor, press MODE to return to Operating Mode.

VEEDER-ROOT™

For technical support, sales or other assistance, please visit:
veeder.com