OPW
FUEL MANAGEMENT SYSTEMS

EECO System®

1500 Console

Installation Manual

 Manual Q340-147 Rev. E

OPW Fuel Management Systems -
System and Replacement Parts Warranty Statement

Effective September 1, 2002

System and Replacement Parts Warranty

OPW Fuel Management Systems warrants that all OPW Tank Gauge and Petro Vend Fuel Control systems supplied by OPW Fuel Management Systems to the Original Purchaser will be free from defects in material and/or workmanship under normal use and service for a period of 12 months from the date of installation or 15 months from the date of shipment. Additionally, OPW Fuel Management Systems warrants that all upgrades and replacement parts (new and remanufactured) supplied by OPW Fuel Management Systems will be free from defects in material and workmanship under normal use and service for a period of 90 days from the date of installation or for the remainder of the system's original warranty, whichever is greater, as set forth in the first sentence of this statement. The foregoing warranties will not extend to goods subjected to misuse, neglect, accident, or improper installation or maintenance or which have been altered or repaired by anyone other than OPW Fuel Management Systems or its authorized representative.

The buyer's acceptance of delivery of the goods constitutes acceptance of the foregoing warranties and remedies, and all conditions and limitations thereof.

If a claim is made within the warranted time period that any equipment and/or remanufactured part is defective in material or workmanship under normal use and service, such equipment and/or remanufactured part shall be returned to OPW Fuel Management Systems, freight prepaid. If such equipment or remanufactured part is found by OPW Fuel Management Systems in its sole judgment, to be defective in material or workmanship under normal use and service, OPW Fuel Management Systems, shall, at its sole option, repair or replace such equipment and/or remanufactured part (excluding, in all instances, fuses, ink cartridges, batteries, other consumable items, etc.)

The warranties, as set forth above, are made expressly in lieu of all other warranties, either expressed or implied, including, without limitation, warranties of merchantability and fitness for any particular purpose and of all other obligations or liabilities on OPW Fuel Management Systems part. Further, OPW Fuel Management Systems neither assumes, nor authorizes any other person to assume for it, any other liability in connection with the sale of the systems, or any new/replacement part that has been subject to any damage from any act of nature or any *force majeure*.

The term "Original Purchaser" as used in these warranties shall be deemed to mean the authorized OPW Fuel Management Systems distributor to which the system or any new/replacement part was originally sold. These warranties may be assigned by the original purchaser to any of its customers who purchase any OPW Fuel Management Systems systems or new/replacement parts.

The sole liability of OPW Fuel Management Systems, for any breach of warranty, shall be as set forth above. OPW Fuel Management Systems does not warrant against damage caused by accident, abuse, faulty or improper installation or operation. In no event shall manufacturer's liability on any claim for damages arising out of the manufacture, sale, delivery or use of the goods exceed the original purchase price of the goods. In no event shall OPW Fuel Management Systems be liable for any direct, indirect, incidental or consequential damage or loss of product.

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Introduction

This manual contains installation instructions for the EECO SYSTEM 1500. Please direct all inquiries regarding installation of the system or these instructions to:

OPW Fuel Management Systems
6900 Santa Fe Drive
Hodgkins, IL 60525
Attention: Technical Support Services Manager,
(708) 485-4200

Warnings

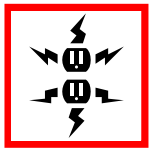
Read This Safety Information Before Beginning Your Installation

- The EECO 1500 monitors various aspects associated with hydrocarbon fuels stored in underground or aboveground tanks in a safe and reliable manner when installed as instructed. Deviation from these procedures, including the installation or use of non-approved components, could result in unsafe conditions or unreliable operation and will void the warranty. Safe installation is the responsibility of the installer.
- This system is to be installed and operated near the highly combustible environment of a fuel storage tank. You MUST carefully read and follow the warnings and instructions in this manual to protect yourself and others from serious injury, explosion, or electrical shock.
- For safety reasons, this product limits power in the wiring to probes and sensors. That wiring is also physically separated from any other wiring. It is your responsibility to maintain the effectiveness of these safety features by installing this system in accordance with the instructions and warnings that follow.

Failure to maintain this product's safety features creates a situation dangerous to life and property.

- ***Leaking tanks create serious environmental and health hazards.*** It is your responsibility to install this system in accordance with the instructions and warnings found in this manual.

Warnings



- You MUST comply with The National Electrical Code, Federal, State, and Local Codes, and other applicable safety codes while installing and operating this equipment. Failure to comply with these warnings could result in serious personal injury, property loss, and equipment damage.
- Installation must comply with NEC (NFPA 70) and Automotive and Marine Service Station Codes (NFPA 30A and local codes).
- DO NOT place wires for intrinsically safe sensors and probes inside conduit or areas of wireways (wiring troughs) that contain wires from any other device except where separated in accordance with NEC ANSI/NFPA 70 ARTICLE 504-30.
- Conductors in different intrinsically safe circuits that run in the same cable / conduit must have at least .01" of insulation.
- Circuitry within the sensors and console barriers form an intrinsically safe, energy limited system. The barrier, wiring, and sensors are listed intrinsically safe for Class I, Division 1, Group D (North America) Hazardous Locations
  when installed according to these instructions.

  Å Ex ia IIA T4 (IEC/CENELEC)
- Make sure vehicles cannot enter the work area during installation or service of sensors and probes.
- All conduits must enter the console through specified openings in the console.

Codes and Standards

Codes and standards called for or referred to herein are hereby made part of this manual. The latest edition shall apply. In the event of discrepancies in specification codes or standards, the more stringent and/or local codes shall govern.

- NEC - National Electrical Code
- NEMA - National Electrical Mfg. Association
- NFPA - National Fire Protection Association
- CSA - Canadian Standards Association

Note

A third-party test result summary of this unit's leak test capabilities appears in the back of this manual, just before the index.

System Specifications

System Specifications	
Dimensions	13" W x 11-1/4" H x 6 D (33 x 28.6 x 15.25 cm)
Weight	15 pounds (6.8 kg)
Operating Temperature	32° to 104°F (0° to 40°C)
Humidity	90% (non-condensing) maximum
Mounting Location	Indoors only, non-hazardous, protected
Power Requirements	115/230 VAC +/- 10%, 50/60 Hz, 15A dedicated circuit
Regulatory Listings and Approvals	ETL, CSA
Reports	Automatic reports, all available three times daily
Keypad	16 keys with tactile feedback
Display	2 line x 20 character
Printer	24 characters per line, thermal
Ports	Two RS-232 ports, auto-dial modem control
Relay	Standard 10 A., 250 VAC contacts, programmable. OPTIONAL programmable relay board with four relays.

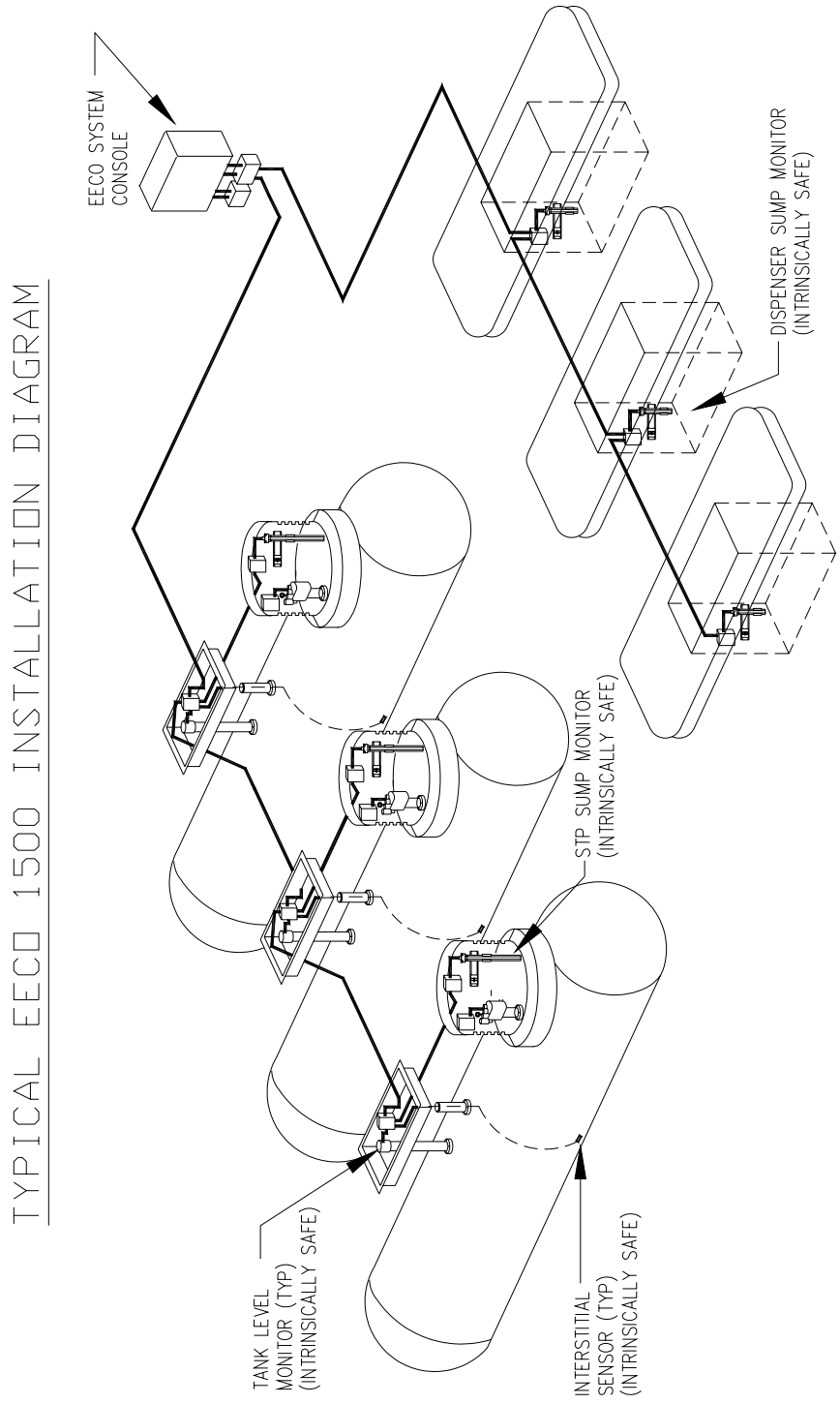


Figure 1: Multiple Tank Installation

Installation

Figure 2: EECO 1500 Front Panel

Console Installation

MINIMUM EECO SYSTEM Installation Requirements are:

- A non-hazardous, protected area.
- Controlled temperature and humidity (see *page 3*)
- Conduit must enter through the knockouts on the bottom of the console.
- 12" of clearance below the console for conduit access.

See *Figure 2* for console mounting dimensions.

The tab mounting keyhole slot at the top of the console has an opening for the mounting hardware with a maximum head diameter of 3/8” and 1/4” shaft. The bottom tab mounting holes are 1/4” diameter.

Console mounting hardware is not supplied with the console due to various wall materials.

Use hardware capable of supporting the system.

Basically, to mount the box:

1. Note the keyhole size for mounting hardware.
2. Install two top screws.
3. Place the 1500 console on the screws.
4. Secure bottom of console with two bottom screws.

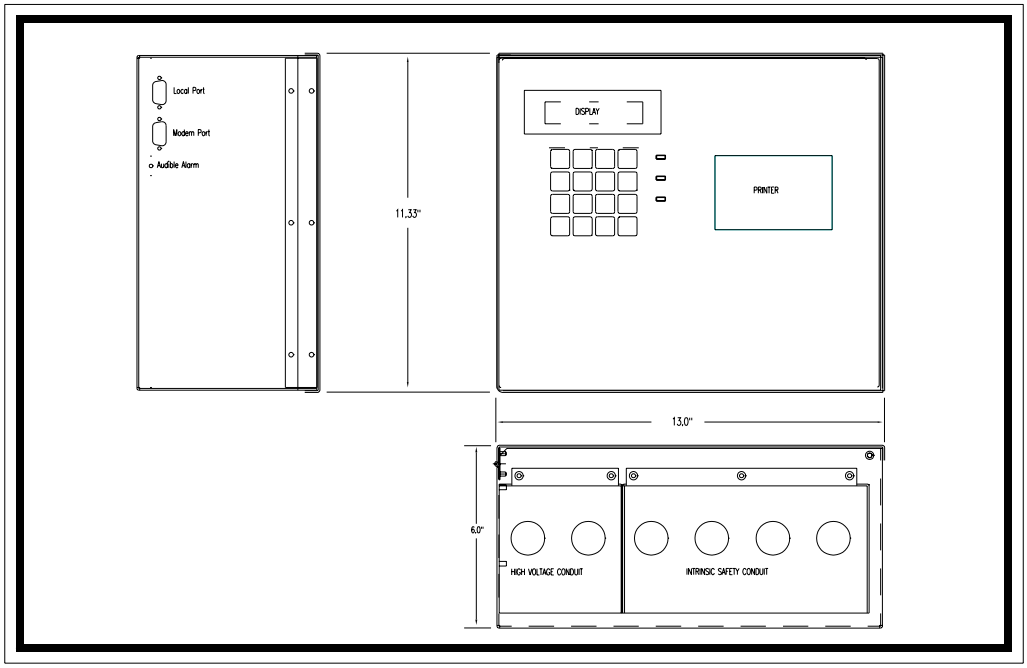


Figure 3: Console Exterior Dimensions

Conduit and I/O Ports

Conduit knockouts are shown in *Figure 3*.

The 3/4” conduit knockouts are fitted with plugs for easy installation. AC power and external relay wiring go to the high voltage conduit openings. Tank level monitoring probe and leak sensor wiring go to the intrinsically safe conduit openings.

Warning

Do not remove the plugs from unused openings.

Preliminaries

Battery Jumper Installation

To preserve battery life and prevent the remote possibility of a short-circuit, replacement main PC boards for the EECO 1500 are shipped without the JP1 battery jumper installed.

Install the jumper across the two pins marked JP1. The pins are above and to the right of the battery as shown in *Figure 4*.

CONFIRM THAT JP1 IS INSTALLED BEFORE YOU APPLY AC POWER TO THE UNIT!

Note

If JP1 is not installed, the unit will lose setup information when power is removed. This may make the unit appear defective.

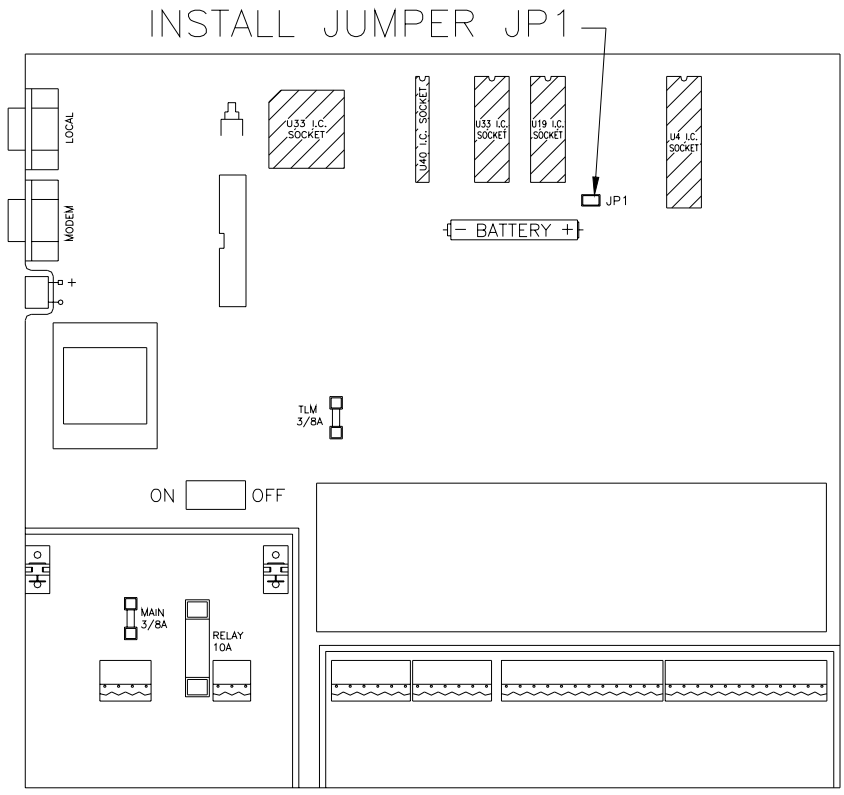


Figure 4: Battery Jumper Location

Power Connections

1. See the bottom of *Figure 5*. Run 120 VAC power to the EECO SYSTEM from a dedicated 15 AMP circuit (located in a main power distribution panel).

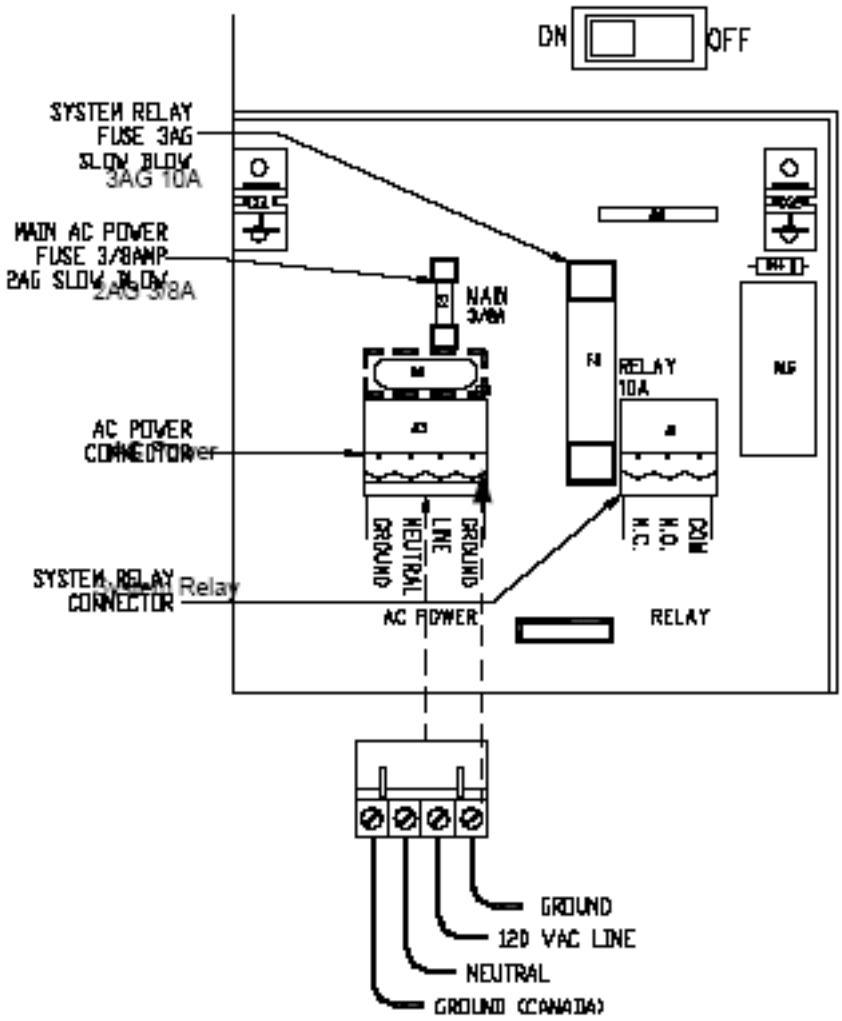


Figure 5: Power Connections

2. Install 3/4-inch conduit between one of the high voltage conduit openings in the console (*Figure 3* on *page 6*) and the AC power distribution panel.
3. Use stranded, 14 gauge wire for line, neutral, and ground (black, white, and green). Leave an extra 10 inches of wire inside the console for easy connection.

4. Make wire connections as shown in *Figure 5* on *page 8*. Connect ground, line, and neutral for United States installations, include the second ground wire for Canada.
5. Strip 1/4” insulation from the end of each individual wire. Insert the wires into the connector as shown in *Figure 5* on *page 8*. Tighten each screw securely. Insert the 4-position AC power connector into the mating receptacle.

Standard Relay

A single standard relay is provided on all system consoles. This relay is programmable to actuate on user selected system alarms and may be set to be deactivated by the [ACK] key or remain activated after the audible alarm has been silenced.

- See *Figure 5* on *page 8* for location of standard relay and connector.
- *Figure 7* shows normally open and normally closed connections to the relay contacts.
- *Figure 3* on *page 6* gives conduit openings for connection to the standard relay contacts.
- Standard relay contacts are protected by a 10A 3AG slow-blow fuse.

Optional Relay

You can install an optional relay board in the AC entry compartment.

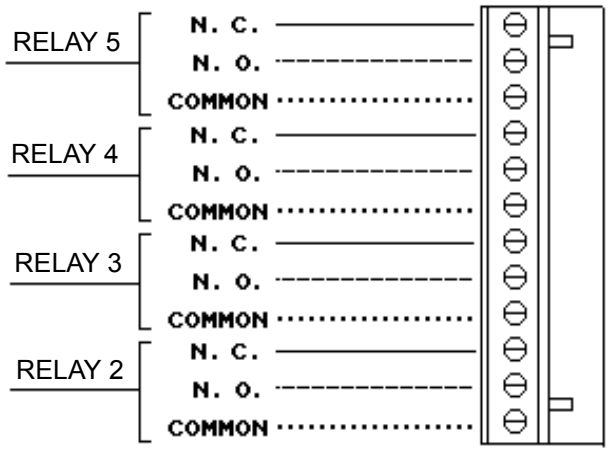
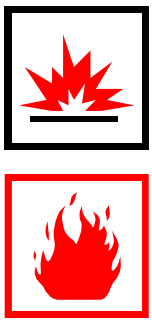


Figure 6: Optional Relay Board Connector

Warning



DO NOT place wires connected to the relay board inside any intrinsically safe conduit containing leak sensor wire or tank level monitor data cables.

The relay board connector is shown in *Figure 6*. Each relay has a Common, Normally Closed (N.C.), and Normally Open (N.O.) circuit connection. Use Common and N.C. connections for 'open-on-alarm' circuits and Common and N.O. connections for 'close-on-alarm' circuits. Each relay is programmable during setup to respond to various alarm conditions. The relay contacts are rated at 10 amps, 250 VAC (30 VDC).

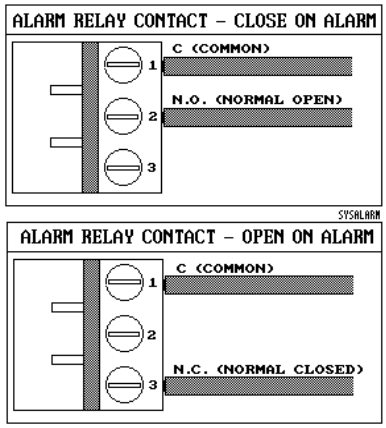


Figure 7: Relay Connections

Serial Communications

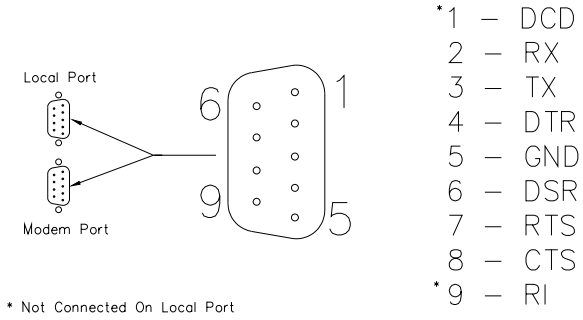


Figure 8: Serial Port Connector Pinout

Two 9-pin RS-232 serial ports (*Figure 8*) are supplied with the EECO 1500.

Caution

Connect only devices meeting EIA standards for RS-232 to these ports.

The ports are configured as DTE (Data Terminal Equipment) devices.

The modem and local ports are in the left side of the console (*Figure 3* on *page 6*)

Waterproof Field Electrical Connections

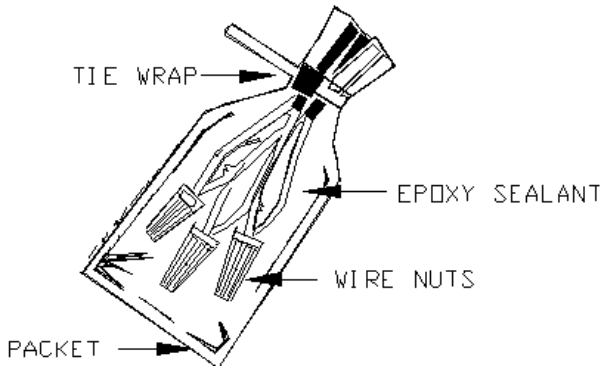


Figure 9: Resin Seal Pack

It is VERY important to seal all probe and sensor connections in the tank area to prevent connection failure.

1. Make a good mechanical joint (twist bare ends of wires together).
2. Secure the connection with a wire nut.

Note

DO NOT use electrical tape on any connections! Tape prevents proper sealing of the epoxy.

3. Waterproof the connections with the supplied 'SCOTCHCAST™ epoxy resin.

Insulating Resin Seal packs (*Figure 9*) are provided to seal the electrical connections from moisture and water and prevent corrosion of the connections. Install one for each cable connection.

4. Bend the seal pack until the barrier between the two resins weakens.
5. Force the clear and the black resins together and mix thoroughly.
6. Move the mixture to one end of pack, then clip the other end.
7. Insert wires, wire nuts, and the cable insulation end into the seal pack.
8. Work the resin mixture into the ends of the wire nuts and around both cable jackets.
9. Secure the seal pack around the cables with a tie wrap.a cable tie.

Tank Level Monitor (TLM)

Note

Leak detection applies ONLY to USTs (underground storage tanks). It does NOT apply to ASTs (above ground storage tanks).

The OPW Tank Gauges **EECO SYSTEM Tank Level Monitor** (TLM) provides accurate and automatic leak detection and inventory control. The TLM includes a DC power supply located in the console and services up to 4 probes installed in the storage tanks that measure level and temperature.

A set of probe mounting hardware provides the components necessary to install the probe in the existing riser pipe (does not include junction box).

The TLM probes continuously measure fuel level, water level, and liquid temperatures. Fuel and water levels are determined from the vertical positions of the **product float** and water floats. The **water float** is designed to sink in the fuel and float on the water. Magnets inside each float generate a field which is detected along a magnetostrictive wave-guide located inside the probe. The resulting fuel and water level measurements are extremely accurate.

Temperature is measured at up to five locations along the probe. These locations represent equal-volumetric cross sections of the tanks' actual volume. Multiple temperature measurements compensate for different liquid temperatures at different heights (stratification).

Probe inputs are continuously scanned for level and temperature information. Level information is used to determine gross gallons. Net gallons are calculated using the gross gallons and average temperature. Deliveries are automatically recorded from increases in gross and net gallons. Leak testing is performed by tracking net gallons and using statistics to calculate leak rates over certain time periods.

TLM Specifications

These specifications are valid when the system is installed and calibrated per these installation instructions.

Table 1: EECO 1500 Specifications

TLM SPECIFICATIONS	
Number of Tanks	Up to 4
Probe Inputs	Intrinsically safe, magnetostrictive, one or two floats
Leak Tests *(USTs only)* **- 0.2 GPH MONTHLY** **- 0.1 GPH YEARLY** **- Certified For**	 99% P_d, 1%P_{fa} 95% P_d, 5%P_{fa} Up to a 20,000 gallon (75,700 liter) tank
	P_d = Probability of Detection, P_{fa} = Probability of False Alarm
Cable Type & Length	*See Table under Probe Wiring. Consult OPW Fuel Management Systems if you plan on direct burial of the cable.*
PROBE SPECIFICATIONS	
Probe Type	Magnetostrictive with floats
Probe Length	From 4 to 16 feet, in 6-inch increments
Material	Stainless steel shaft
Level **- Precision** **- Accuracy**	 ± 0.0005" ± .05% Full Scale or 0.006" (whichever is greater)
Temperature **- Resolution** **- Accuracy**	 ± 0.02^{o}F (0.01^{o} C) ± 2.34^{o}F/ +/- 1.3^{o}C (over a -40^{o} C to +70^{o}C / -40^{o} F to 158^{o} F) range)
Intrinsic Safety	Hazardous Class I Division 1 Group D
Temperature Detection **- Measurement Methodology** **- Range**	 Five equally spaced RTDs for volumetric measurement STANDARD: -4^{o} F to 158^{o} F (-20^{o} C to 70^{o} C) X-TENDED TEMP: -40^{o}C to +158^{o}F (-40^{o} to 70^{o} C)

Probe Manway Requirements

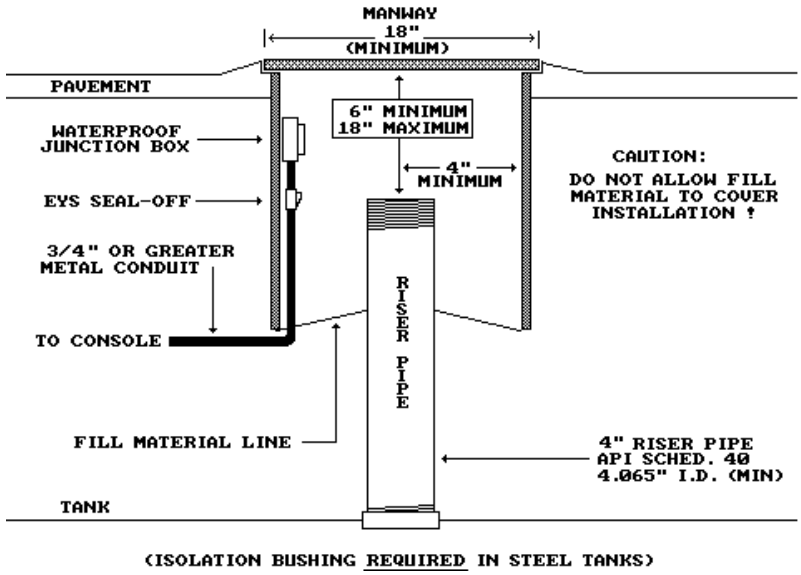


Figure 10: Manway and Riser

Make sure there's enough room between the junction box and riser in the 18" (minimum) manway. You may have to offset the probe riser pipe in the manhole. Also, make sure there's enough gravel under the manhole for proper drainage.

DO NOT COVER JUNCTION BOX OR TOP OF RISER WITH FILL MATERIAL

EYS seal-off fittings - Seal off fittings are required in all conduits leaving Class 1 Hazardous locations (*Figure 11* on *page 16*). Install an EYS (or equal) fitting at the probe and interface module ends of each conduit (*Figure 10*).

Maximum probe-to-console cable length is 1500 feet (460 meters)

Intrinsic Safety Requirements

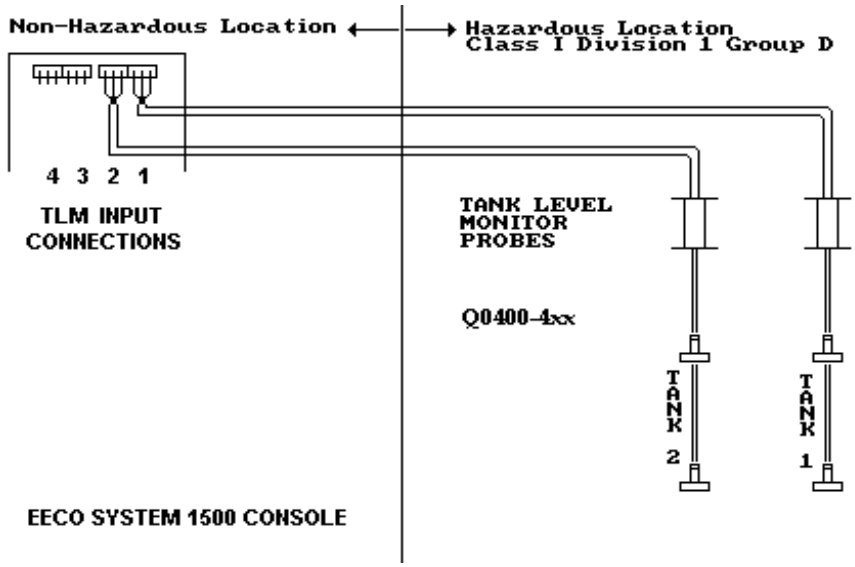


Figure 11: Hazardous Location Concept

- Probes in hazardous areas connect to the console via INTRINSICALLY SAFE circuits. These circuits prevent flammable vapors in the hazardous area from igniting. *TO MAINTAIN INTRINSIC SAFETY*:
  - Install intrinsically safe wiring in accordance with NEC ANSI/NFPA 70 Article 504, along with any other applicable local codes.
  - The intrinsically safe circuits can share a conduit, provided that the insulation between circuits is at least 0.010 inches.
  - DO NOT mix intrinsically safe with *non*-instrinsically safe circuits.

Probe Conduit Requirements

See *Figure 1* on *page 4* and *Figure 3* on *page 6* for conduit installation.

Use rigid metal conduit (3/4”) between the console and tank area. The conduit run must be complete to prevent wiring damage.

Note

If direct burial installation is required, consult the factory for approved procedures. Above grade you MUST use rigid metal conduit to prevent electrical interference.

- If PVC conduit is used due to soil conditions, ground the junction box -- install 16 gauge (minimum) stranded ground wire (required by NEC) through the conduit between a ground lug in the junction box (at the probe end) and earth ground at the console.
- Install EYS Seal-Off fittings as required by National Electrical Code and Local Codes.
- Use a waterproof or explosion proof junction box at the probe location or encapsulate wire splice with waterproof splice kit.
- Conduits must enter the console only through the designated opening.
- The conduit run can contain multiple TLM probe data cables and leak sensor wires. Remember to consider cable diameters before planning to run multi-cable bundles inside conduit.

Probe Cable Requirements

Choose a probe cable from *Table 2* below.

Caution

Using another cable that exceeds any of the specifications in Table 2 voids the system warranty.

Table 2: Cable Types

Belden Cable Number	Size	Description	Max. Length in feet	Capacitance (picofarads per foot)
8760	18	Shielded twisted pair with PVC jacket	250	24
8761	22	Shielded twisted pair with PVC jacket	250	24
88761	22	Shielded twisted pair with Teflon jacket	250	35
9182	22	Shielded twinax with PVC jacket	1500	8.8
89182	22	Shielded twinax with Teflon jacket	1500	8.8

Probe Data Cable Installation

- Multiple TLM probe data cables are allowed in one conduit run (if conduit size permits).
- Identify each cable at the console with TANK # (use self-stick labels).
- Leave 16" length of cable inside EECO 1500 console and in the probe junction box for connection.

- Install fiber dam and sealing compound in all EYS seal-off fittings if the fittings are required.

WARNINGS

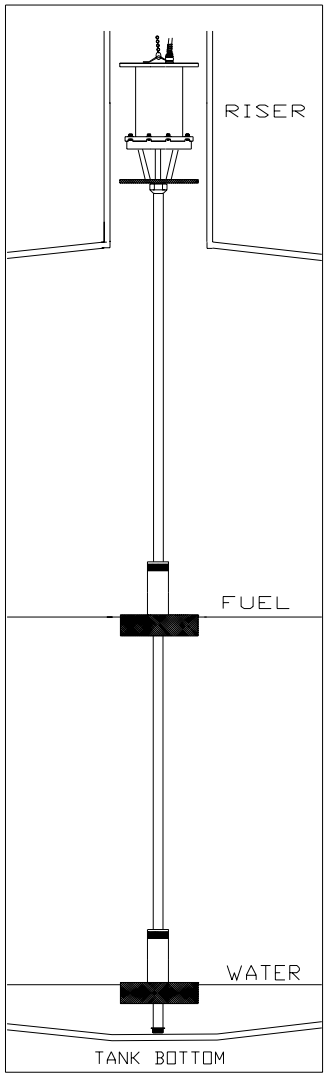
- ***Shut off all AC power to the console before installation of the Tank Level Monitor data cables between the console and the probes.***
- ***Do NOT mix intrinsically-safe and non-safe circuits (any other wiring) inside the same conduits or wireways.***
- ***Run one data cable ("home run") for each probe. No splices are allowed between probe junction box and console!***

Probe Installation

Also *See Appendix B - Tank Probe Float Installation Details* on page 57.

Generic Requirements

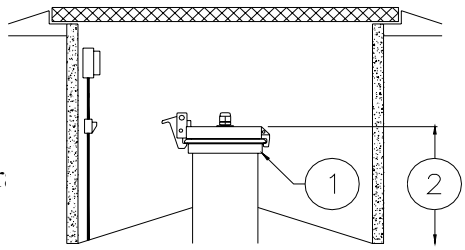
- Use the correct probe for the tank and product.
- The length of the probe shaft must be at least as long as the diameter of the tank.
- Diesel fuels use a different water float than gasoline.
- Seal all electrical connections against moisture to prevent corrosion and loss of connection.
- Probe length must result in the probe head being above the tank to allow full measurement of product in the tank.
- The probe is sealed and will not be damaged if totally submersed in hydrocarbon based products (non-pressurized normal installation).



- Some applications may require separation of the probe head and wiring from the chemical and chemical vapors.
- Refer to appropriate riser cap installation bulletin supplied with the installation kit for probe installation instructions.
- Check that the probe is touching the bottom of the tank and that the probe spacers are not hung up on an obstruction in the riser.

Riser Cap Installation

1. Locate the supplied riser cap flange (1).
2. Apply non-hardening, fuel resistant thread sealant to the riser threads.
3. Screw the riser cap flange onto the riser pipe. Tighten using a str



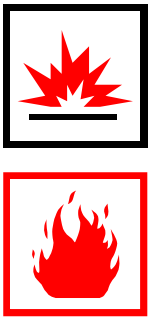
Caution

DO NOT OVERTIGHTEN THE CAP. This may cause distortion resulting in improper function.

Final Riser Cap Assembly

1. Insert the probe data cable through the cord grip body from the underside of the lid and re-assemble the cord grip components in reverse order. For large cables it may be necessary to lubricate the seal in the cord grip for the cable to slide freely.
2. Tighten the cord grip until the data cable cannot be moved in the cord grip.
3. Connect the cable to the head of the tank probe, then lower the probe assembly into the tank.
4. Place the assembled riser cap on the flange, then lock the cap in place.

Warning



DO NOT splice cables between the probe junction box and the console!

Probe Wiring Probe Junction Box Wiring

Strip 3/8” insulation from each wire, then connect them as shown below:

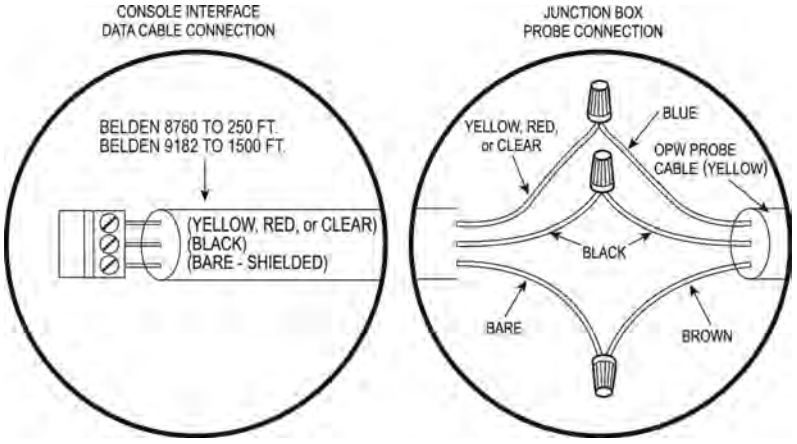
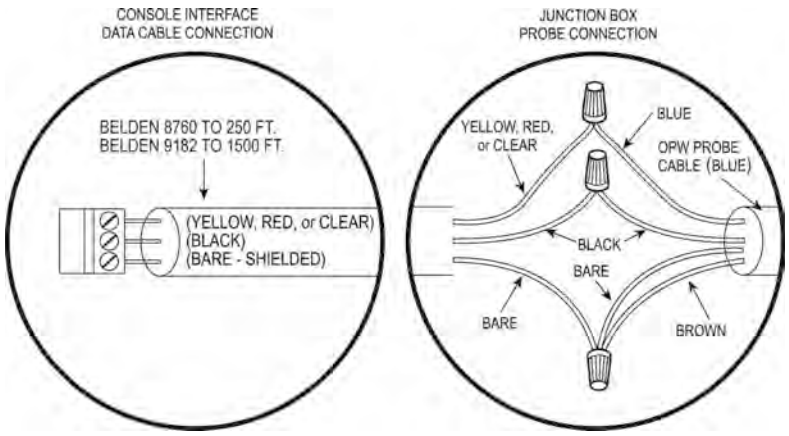


Figure υφÁ - Wiring Installation for EECO Probes with Probe Cable Type 10-1185 (yellow)



Please see warning on page 22 regarding EECO probe Installation using blue probe cable type 10-1185.

Figure υ2Â - Wiring Installation for EECO Probes to 1500, 2000, and Galaxy Systems with Probe Cable Type 10-1185 (blue)

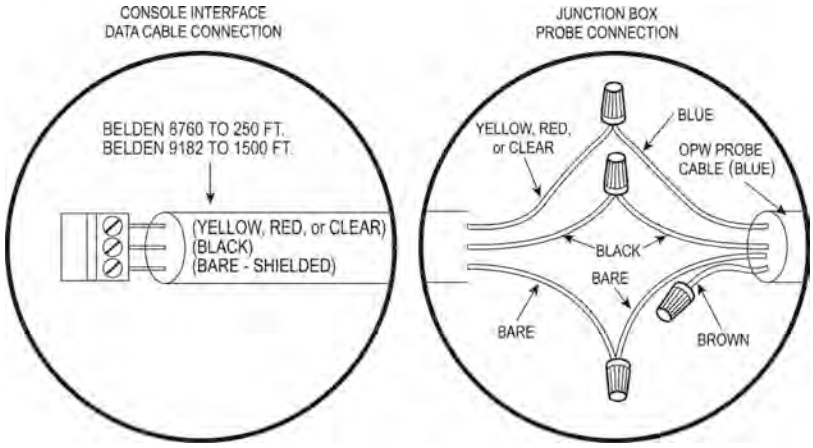


Figure 1φÃ - Wiring Installation for TLM-B Probe to 1500, 2000, and Galaxy Systems with Probe Cable Type 10-1185 (blue)

Warning

When connecting an EECO probe with a blue cable:

If the probe is insulated from the tank (most riser mounted applications), attach the brown wire to the bare (shield) wire to prevent static buildup on the probe surface as shown in figure 12b.

If the probe is installed so that an electrical connection exists between the probe shaft and earth, *leave the brown probe wire disconnected*. This often happens in flange mounting applications where the tank is steel and there is no insulator between the probe and the tank surface. This will prevent potentially dangerous ground currents in the circuit. (Ref. IEC60079-14:1996 Clause 12.2.2.3)

Warning

Never connect a TLM-B Probe with a yellow cable! This will permanently damage the probe!

Probe Console Wiring

1. Remove the input connection cover from the TLM console.
2. See *Figure 13* on *page 22* and locate the TLM input connections on the main console board. There are four sets of connections for up to four TLM probes.
3. Remove 2 1/2" of the outer insulation from each data cable.
4. Strip 1/4" insulation from each wire.
5. Insert and tighten each wire into the 3 position connector (*Figure 13*).
6. Insert probe connectors into the mating TLM probe input connectors for the correct input.

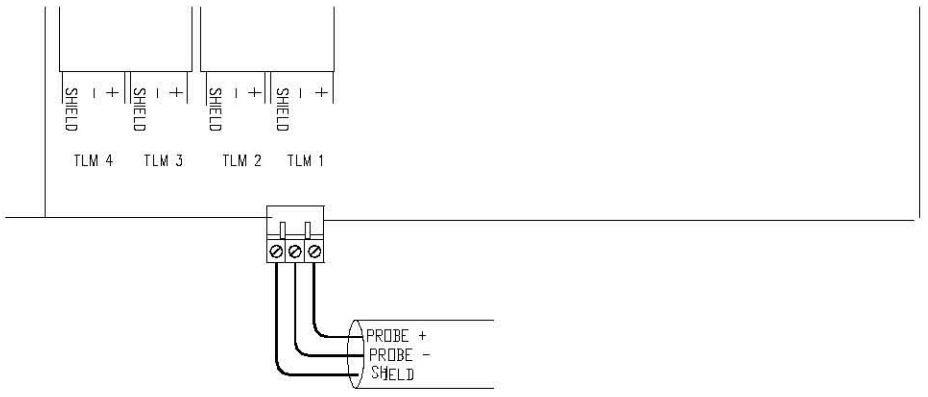


Figure 13: TLM Input Connections

7. Double-check your connections to make sure they're tight, then replace the covers over the intrinsically safe input circuits.

Leak Sensor

The Leak Sensor feature detects liquid safely and reliably if installed as instructed. Deviation from these procedures -- including the installation or use of non-approved components -- may produce unsafe conditions or unreliable operation and will void the warranty.

REMEMBER - Safe installation is the *installer's* responsibility. Safe operation is the *user's* responsibility.

Warning

This wiring is part of an intrinsically safe circuit! *Never* place this wiring in the same conduit or raceway with wiring for non-intrinsically safe devices. See *Figure 16*.

Place sensors up to 1500 feet from the EECO 1500 console using 18 gauge stranded wires.

Route all field wiring through rigid steel conduit and fittings approved for intrinsically safe circuits installed in accordance with NEC (NFPA 70) and Automotive and Marine Service Station Code (NFPA 30A) hazardous locations.

Leak Sensor Specifications

Leak Sensor Specifications	
Number of Sensors	Up to 8 Q0003 EECO Choice sensors
Q0003-001	Discriminating Dispenser Pan sensor
Q0003-002	Discriminating STP Sump sensor
Q0003-003	Discriminating Interstitial sensor
Q0003-xx4	Discriminating Monitoring Well
Q0003-005	Wet Interstitial sensor
Q0003-006	Liquid Only Interstitial sensor
Q0003-009	Liquid Float sensor
Q0003-010	Vapor sensor
Q0003-011*	Dual-Level Float sensor (up to 5 feet)
Q0003-012*	Dual-Level Float Sensor (5 to 10 feet)

* *These sensors have not been evaluated by UL, and require two channels each.*

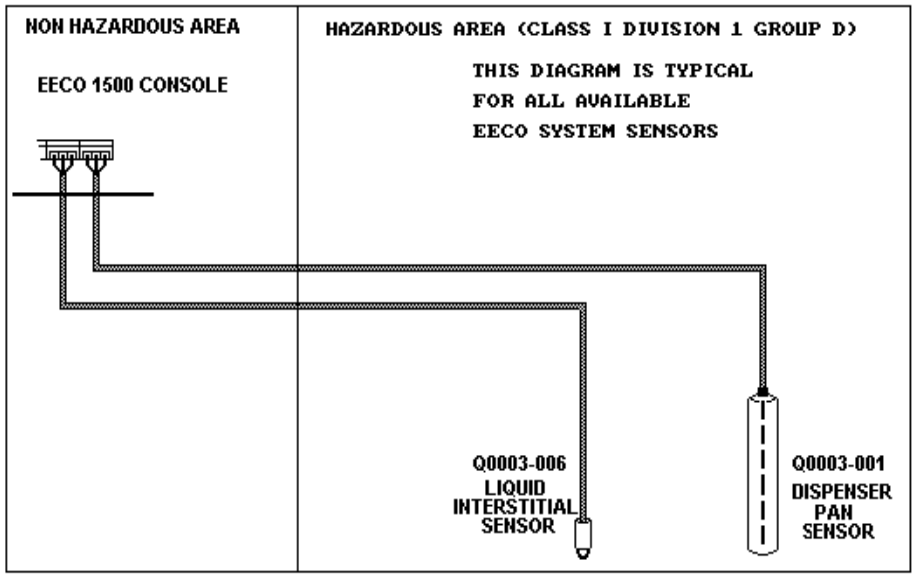


Figure 14: Typical Sensor Wiring

Leak Sensor Conduit Requirements

See *Figure 1* on *page 4* and *Figure 3* on *page 6* for conduit installation.

We STRONGLY recommend using rigid metal conduit (3/4” or larger) between the console and tank area. The conduit run must be complete to prevent exposure of wiring to damage.

Note

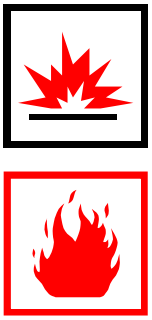
If direct burial installation is required, consult the factory for approved procedures.Above grade you MUST use rigid metal conduit to prevent electrical interference.

- If PVC conduit is used due to soil conditions, ground the junction box! Install a 16 gauge (minimum) stranded ground wire (required by NEC) through the conduit between a ground lug in the junction box (at the sensor end) and earth ground at the console.
- Install EYS Seal-Off fittings as required by National Electrical Code and Local Codes.
- Use a waterproof or explosion proof junction box at the sensor location or encapsulate wire splice with waterproof splice kit.
- Conduits must enter the console only through the designated opening.
- The conduit run can contain multiple TLM probe data cables and leak sensor wires. Remember to consider cable diameters before planning to run multi-cable bundles inside conduit.

Leak Sensor Wire Connection

1. Pull 18 gauge stranded wire through the installed conduit.
2. Identify each wire set with sensor type and location and sensor wire color.
3. Connect sensor wires to field wires inside the junction box located at tank. Strip 1/2” insulation from each wire and twist wires together. Secure wires with wire nuts. Seal all connections with supplied epoxy resin.
4. Connect field wires at EECO 1500 sensor inputs to the correct terminals as shown for the type sensor that is installed. Insert screw type connector into the correct input receptacle.

Warnings



One set of wires for each sensor.

No splices inside the wire run!

No shared wires between sensors.

Maximum 1500 feet console-sensor wire length.

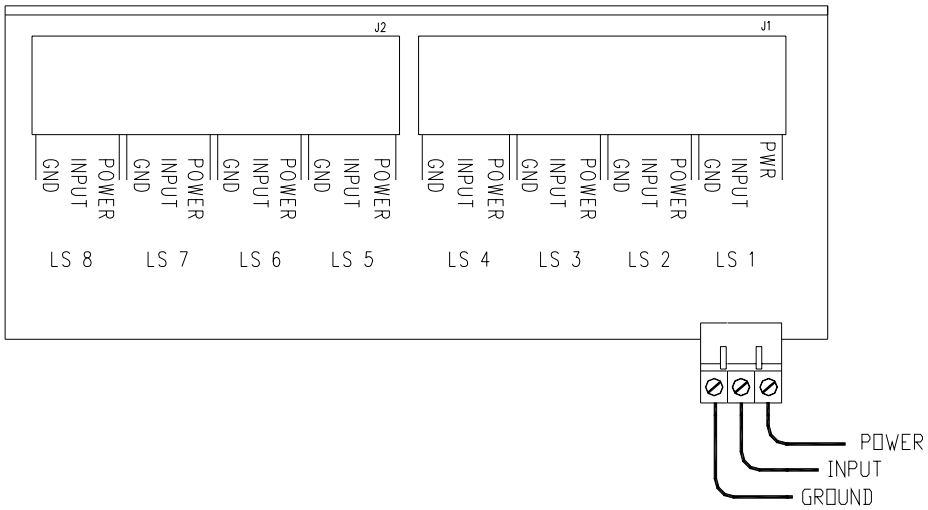


Figure 15: Console Input Connectors

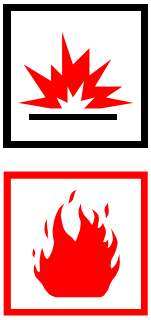
Standby Generator Application

The EECO 1500 provides special reporting and leak test (USTs only) functions for standby generator installations.

The system monitors the generator 'on' and 'off' cycles using an isolated relay contact (either normally open or normally closed) at the generator to provide the generator status.

See *Figure 16*. Wire to the input and ground terminals of one of the leak sensor channels. Do not make connections to the power terminal.

Warning



This wiring is part of an intrinsically safe circuit and must never be routed in the same conduit or raceway with non-intrinsically safe devices. See *Figure 16*.

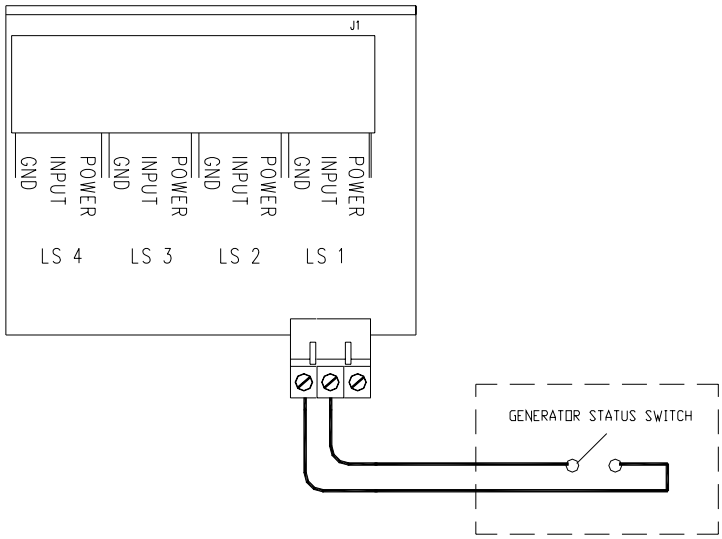


Figure 16: Generator Wiring

Sensor Connections

Use *Table 3*, *Figure 17* and *Figure 18* to connect your sensors. Wires not listed in *Table 3* can be cut off or ignored.

Table 3: Sensor Connections

Number of Wires	Part number	Sensor Type	GROUND	INPUT	POWER
3	Q0003-003	Interstitial (Discriminating)	Black	Red	White
3	Q0003-006	Interstitial (Liquid ONLY)	Black	Red	White
2	Q0003-001	Dispenser pan	Black	Red	--
2	Q0003-002	STP sump	Black	Red	--
2	Q0003-XX4	Monitoring well	Black	Red	--
2	Q0003-005	Interstitial - WET	Black	White	--
2	Q0003-009	Liquid float	Black	Red	--
2	Q0003-010	Vapor	Black	White	--
2	Q0003-011*	Dual-Level Float - TOP	None	Yellow	Yellow
2	Q0003-011*	Dual-Level Float - BOTTOM	None	Red	Red
2	Q0003-012*	Dual-Level Float - TOP	None	Yellow	Yellow
2	Q0003-012*	Dual-Level Float - BOTTOM	None	Red	Red
2	Q0003-013	Dry Interstitial Flapper (liquids only)	None	Red	Black

* *These sensors require two channels each.*

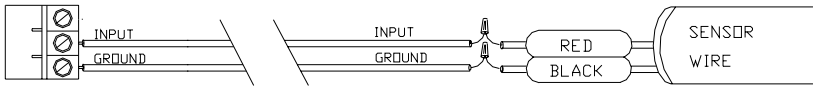


Figure 17: Two-Wire Sensor Connections

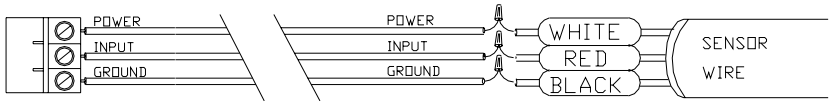


Figure 18: Three-Wire Sensor Connections

Sensors

This section contains technical data and application information for sensors used with the EECO 1500.

Glossary

Primary Use	The application for which the sensor was designed.
Alternate Use	Other acceptable uses for the sensor.
Detects	Type of detection (liquid, fuel, etc.)
Temp. Range	Sensor temperature operating range
Dimensions	Length and Width (or Diameter) of sensing element.
Installations	List of applicable installation drawings.
Connections	Number of wires and color.
Caution	Additional information on the sensor.

Also included are installation drawings and instructions for installing the sensors. Each illustration is identified with one of the following headings:

S	Sumps
T	Tanks
W	Monitoring wells.

SMART EECO Choice Sensors

Q0003-001 Discriminating Dispenser Pan Sensor

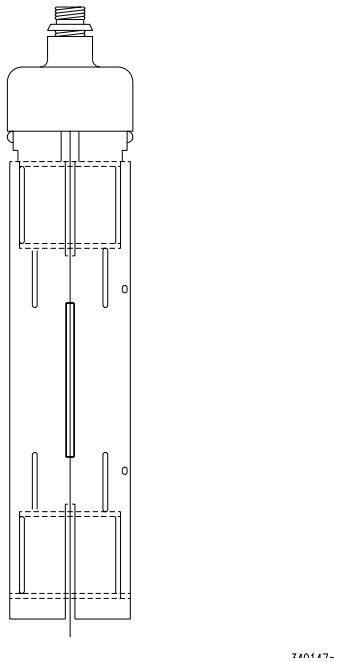


Figure 19: Discriminating Dispenser Pan Sensor

Primary Use Dispenser Pan/Sump

Alternate Use STP Sumps

Detects Low Liquid, High Liquid, Fuel

Temp. Range -40 to 150 ºF (-40 to 65 ºC)

Dimensions L = 11.1” D = 2.3” Floats: Low = 1.5” High = 8”

Installations S-1, S-2, S-3, S-4, S-5 (see *page 39*, *page 40*, *page 41*, *page 42* or *page 43*).

Connections 2 wire (Red = signal, black = ground)

Note

Remove sensor from sump/pan while servicing filters and pumps to prevent accidental exposure to fuel.

Q0003-002 Discriminating STP Sump Sensor

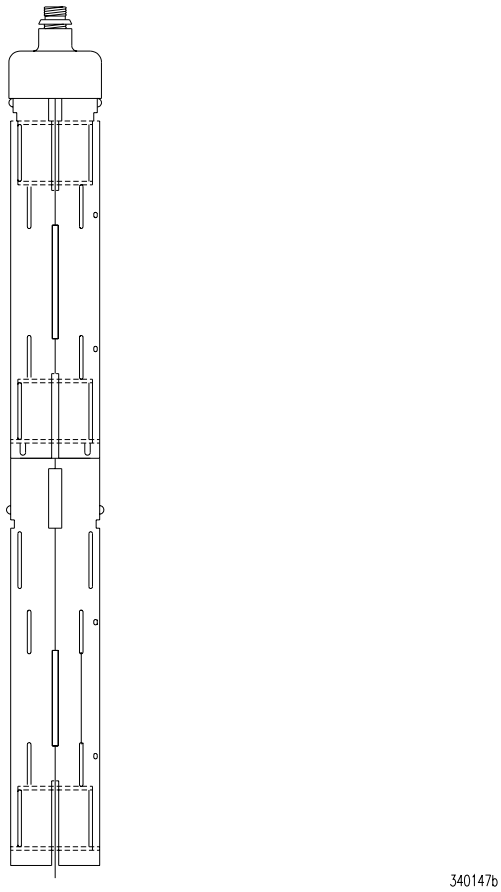


Figure 20: Discriminating STP Sump Sensor

Primary Use STP Sumps

Alternate Use Dispenser Pans/Sumps

Detects Low Liquid, High Liquid, Fuel

Temp. Range -40 to 150 ºF (-40 to 65 ºC)

Dimensions L = 21.1" D = 2.3" Floats: Low = 1.5" High = 11"

Installations S-1, S-2, S-3, S-4, S-5 (see *page 39*, *page 40*, *page 41*, *page 42* or *page 43*)

Connections 2 wire (RED = signal, BLACK = ground)

Note

Remove sensor from sump/pan while servicing filters and pumps to prevent accidental exposure to fuel.

Q0003-003 Discriminating Interstitial Sensor

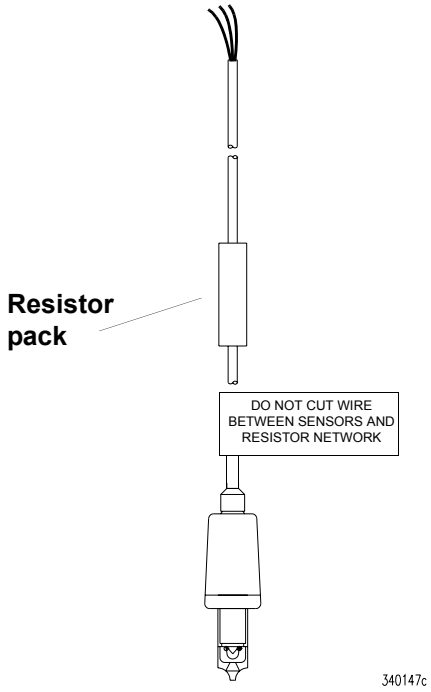


Figure 21: Discriminating Interstitial Sensor

Primary Use	Interstitial Space
Alternate Use	Dispenser Pans and STP Sumps
Detects	Liquids (Fuel and Water)
Temp. Range	-4 to 176 ºF (-20 to 80 ºC)
Dimensions	L = 3.22” W = 1.1”x.62”
Installations	T-1, T-2, S-3 (*page 44*, *page 45* or *page 41*)
Connections	3 wire (WHITE = voltage, RED = signal, BLACK = ground)

Note

Do not cut sensor wire between sensor and resistor pack.

Q0003-xx4 Discriminating Monitoring Well Sensor

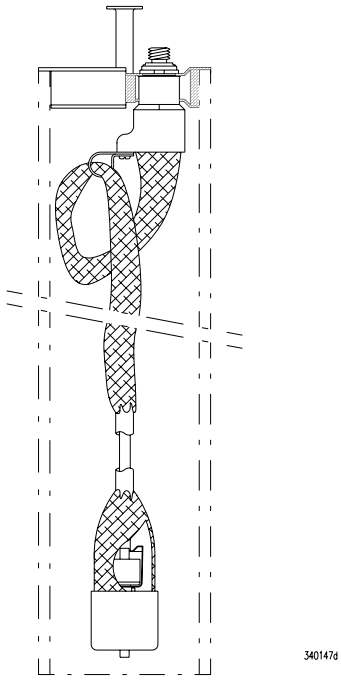


Figure 22: Discriminating Monitoring Well Sensor

Primary Use	Monitoring Wells
Detects	Fuel on Water
Temp. Range	-20 to 150 ºF (-28 to 65 ºC)
P/N Length	Q0003-104 = 10’, Q0003-154 = 15’ Q0003-204 = 20’
Installations	W-1 (*page 47*)
Connections	2 wire (RED = signal, BLACK = ground)

Note

Adjust sensor to hang vertically in monitoring well. A dry well will result in an alarm condition.

BASIC EECO Choice Sensors

Q0003-005 Wet Interstitial Sensor

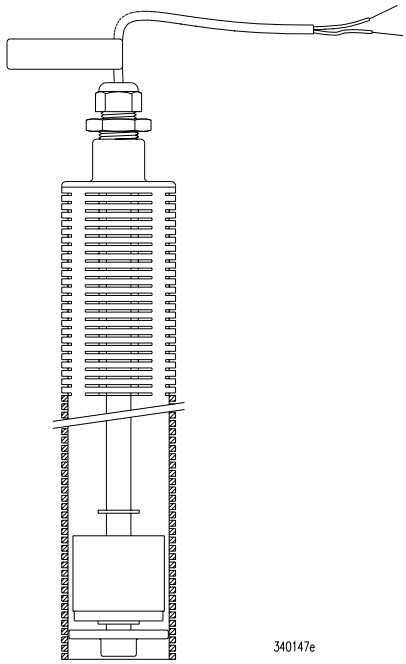


Figure 23: Wet interstitial Sensor

Primary Use	Wet Interstitial (filled with brine solution)
Detects	Liquid Level change (loss and gain)
Temp. Range	-13 to 158 ºF (-25 to 70 ºC)
Dimensions	L = 17.5” W = 2”
Installations	T-4 (*page 46*)
Connections	2 wire (WHITE = signal, BLACK = ground)

Note

Adjust interstitial liquid level to center of sensor.

Q0003-006 Liquid Only Interstitial Sensor

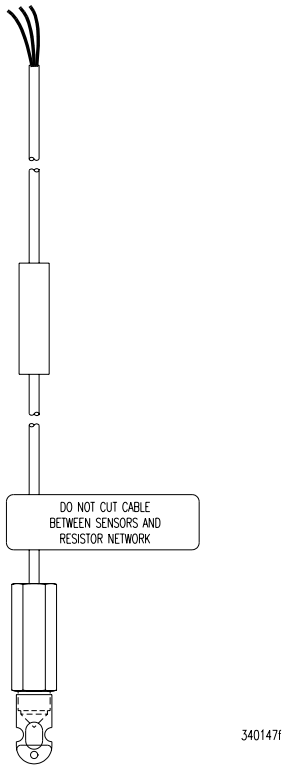


Figure 24: Liquid-Only Interstitial Sensor

Primary Use	Interstitial Space (fiberglass tanks)
Alternate Use	Dispenser Pans and STP Sumps
Detects	Liquids
Temp. Range	-4 to 176 ºF (-20 to 80 ºC)
Dimensions	L = 2.6” W =.6”
Installations	T-1, T-2, S-3 (*page 44*, *page 45*, or *page 41*)
Connections	3 wire (WHITE = voltage, RED = signal, BLACK = ground)

Note

Do not cut sensor wire between sensor and resistor pack.

Q0003-009 Liquid Float Sensor

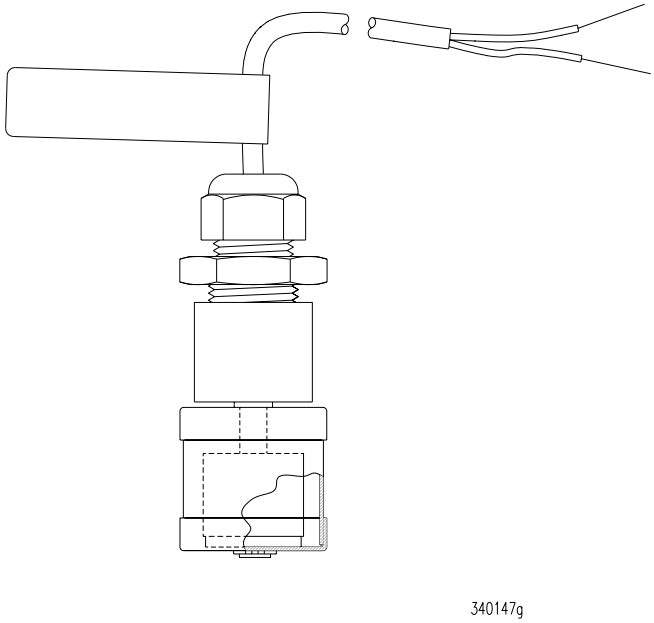


Figure 25: Liquid Float Sensor

Primary Use	STP Sumps and Dispenser Pans
Alternate Use	Steel Tank Interstitial
Detects	Liquid
Temp. Range	-40 to 180 ºF (-40 to 82 ºC)
Dimensions	L = 3.5” W = 1.43”
Installations	S-3, T-2 (*page 41*, *page 45*)
Connections	2 wire (RED = signal, BLACK = ground)

Note

Adjust sensor position for desired detection level.

Q0003-010 Vapor Sensor

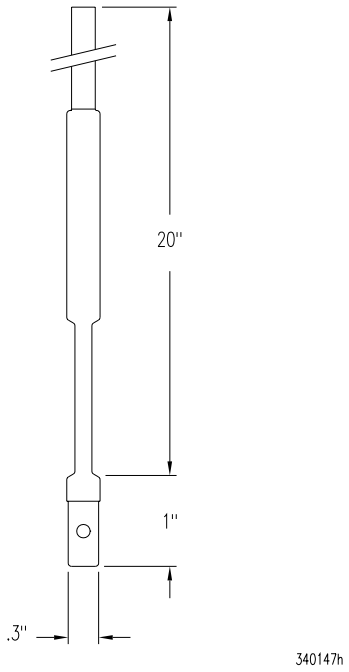


Figure 26: Vapor Sensor

Primary Use	Gasoline vapor detection in dry monitoring wells
Detects	Hydrocarbon Vapor
Temp. Range	-20 to 70 ºC (-13 to 158 ºF)
Dimensions	L = 1" W =.5"
Installations	W-2 (*page 48*)
Connections	2 wire (WHITE = signal, BLACK = ground)

Note

Hydrocarbon vapors are heavier than air and will settle to the lowest point. Vapor sensors installed in monitoring wells must be close to the lowest surface to facilitate detection. Do not allow sensor to be submersed in liquid.

Not applicable for diesel or kerosene installations.

Q0003-011 and Q0003-012 Dual-Level Float Sensor

Primary Use High Product and Overfill Level Alarm in Above-ground Tanks

Alternate Use Any containment space requiring two different alarm levels

Detects Liquid

Temp. Range -40 to 180 ºF (-40 to 82 ºC)

Dimensions L = 3.5" (8.9cm) W = 1.43" (3.6cm)

Connections 4-wire (requires 2 channels)

THIS SENSOR HAS NOT BEEN EVALUATED BY UL

The high level sensor is designed to give two different alarms, a high level and a “high, high” level alarm. The sensor uses two input channels on the monitoring system.

- A wire clamp at the lower end is used for attaching an anti-static discharge wire to prevent static buildup on the sensor.
- 2" NPT thread mounting cap with ¾” conduit connector.
- High float switch (yellow wires) is open when dry and closed when wet.
- Low float switch (red wires) is open when dry and closed when wet.

Note

Do not change position of floats on probe shaft.

Firmly attach a stranded, non-insulated wire into the clamp at the bottom end of the sensor.

Apply fuel proof, non-hardening pipe sealant to the 2" plug threads. Insert the sensor and anti-static wire into the tank and tighten the plug to prevent loss of fuel.

Attach either a conduit connection or a junction box to the ¾” threaded connector on the top of the probe for the wires and wire connections.

Pull four wires from the sensor to the console leak sensor interface. Connect the two wires from the sensor's red wires to one sensor input and the two wires from the sensor's yellow wires to a second leak sensor input.

Use the wire nuts and epoxy seal packs provided with the sensor to secure and waterproof the wire connections at the sensor.

Program the leak sensor inputs for “normally open” sensors and identify the red wire input as “High Product” and the yellow wire input as “High, High” Product.

Sensor Installation Drawings

S-1 Dispenser Pan Installation

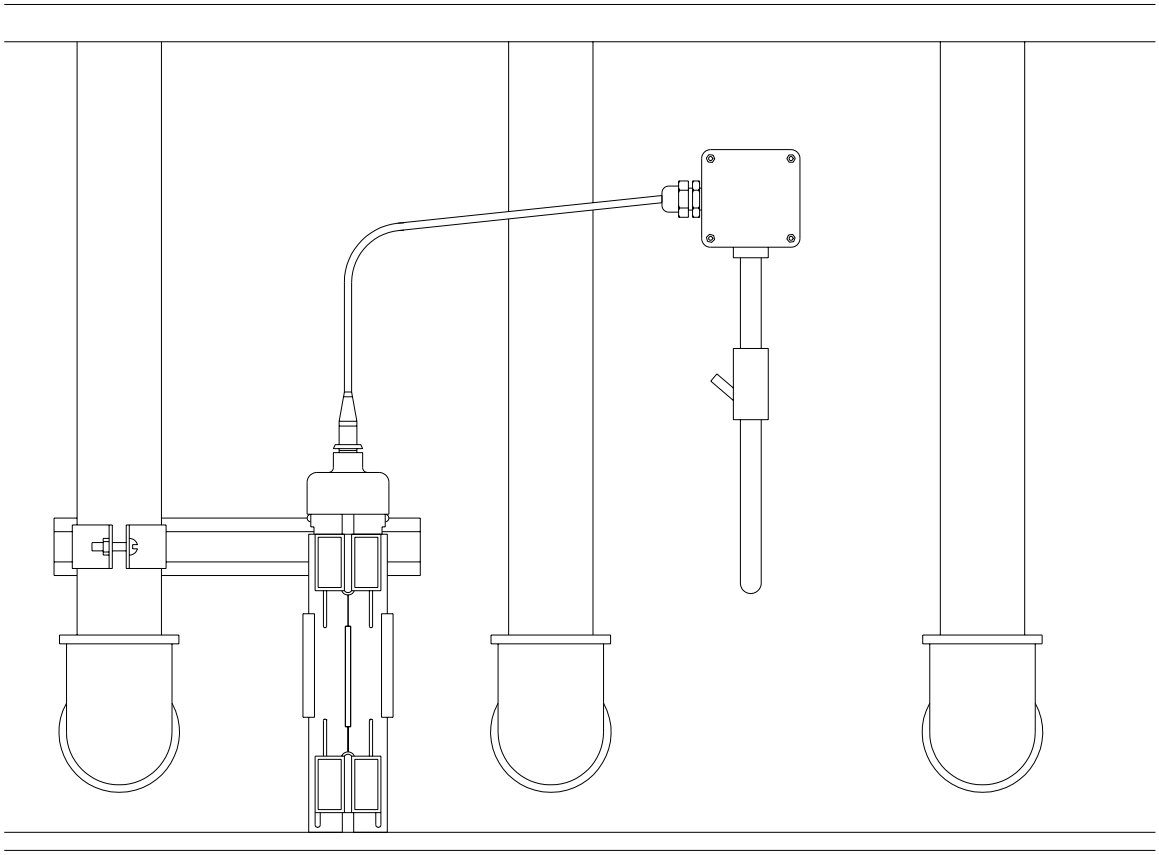


Figure 27: Typical Dispenser Pan Installation Scenario

For suitable sensors see page 30 or page 31.

1. Check that dispenser pan is dry.
2. Install bracket with pipe clamp and sensor bracket.
3. Position sensor to touch bottom of pan.
4. Connect sensor cable to sensor and field wiring.
5. Seal the electrical connections with the Scotchcast epoxy resin pack.
6. Remove sensor from sump while servicing the pump to prevent activating sensor with fuel.

S-2 Dispenser Sump installation

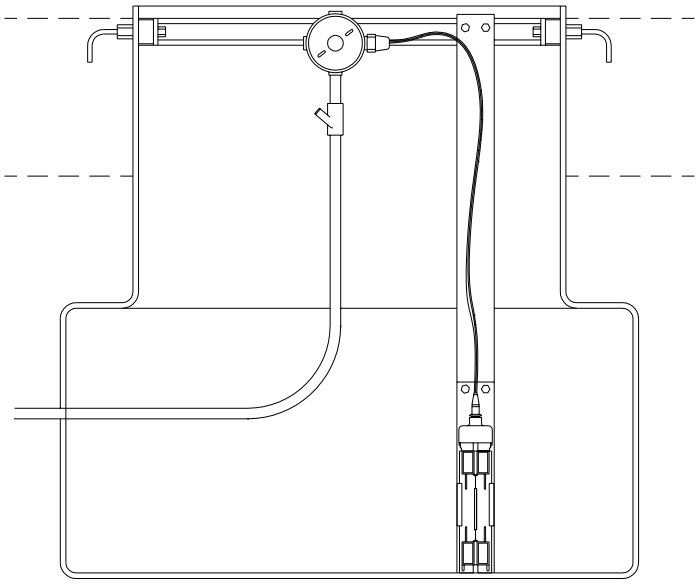


Figure 28: Typical Dispenser Sump Installation - Method 1

For suitable sensors see page 30 or page 31.

1. Check that dispenser sump is dry.
2. Install bracket with pipe clamp and sensor bracket.
3. Position sensor to touch bottom of sump.
4. Connect the sensor cable to the field wires in the junction box using the supplied wire nuts.
5. Seal the electrical connections with the Scotchcast epoxy resin pack.
6. Remove sensor from sump while servicing the pump to prevent activating sensor with fuel.

S-3 Alternate Sensor Sump Mounting

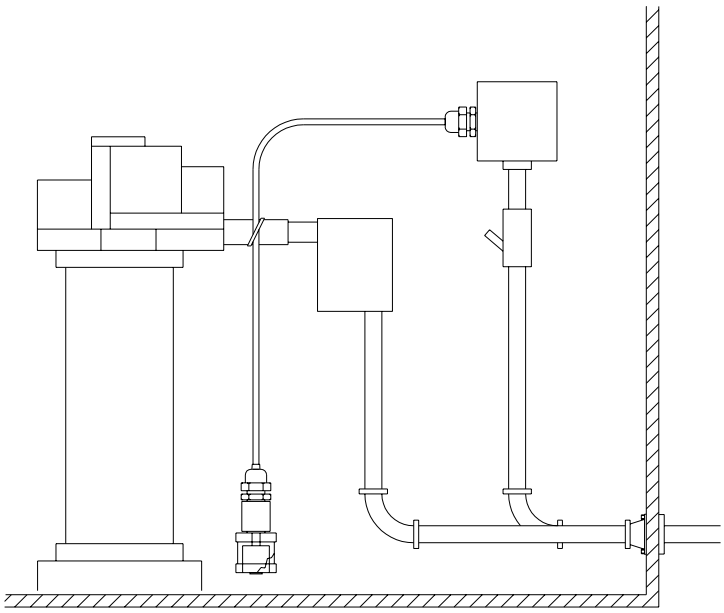


Figure 29: Typical Alternate Sensor Sump Installation

See page 30, page 31 or page 32 for applicable sensor specifications.

Note

***Figure 29** applies to dispenser pans/sumps, and STP sumps. Although only the float switch is shown, mounting applies to all liquid sensor applications.*

1. Check that sump is dry.
2. Position the sensor approximately 1/2” above bottom of the sump/pan and secure sensor wire to an existing pipe or bracket with a tie wrap.
3. Connect the sensor wires to the field wires in the junction box using the supplied wire nuts.
4. Seal the electrical connections with the Scotchcast epoxy resin pack.

S-4 STP Sump Sensor Mounting

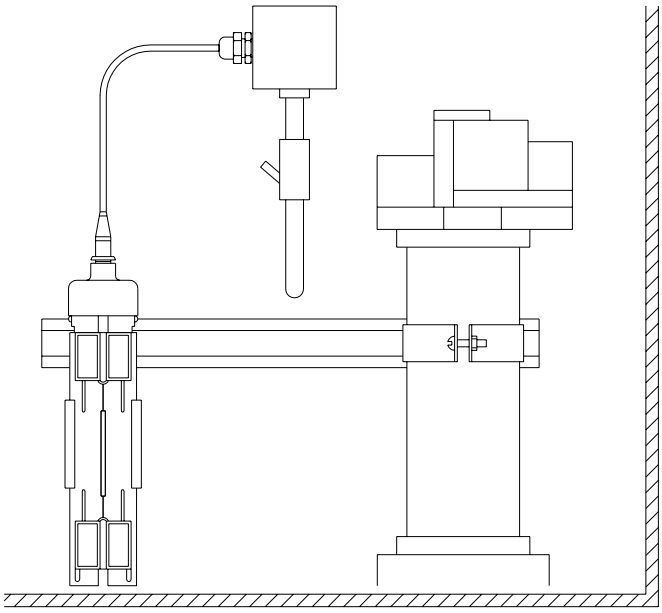


Figure 30: Typical STP Sump Sensor Installation

See page 30 or page 31 for applicable sensor specifications.

1. Check that STP sump is dry.
2. Install bracket with pipe clamp and sensor bracket.
3. Position sensor to touch bottom of the sump.
4. Connect sensor cable to sensor and route the other end through the supplied cord grip. Connect to the field wiring in the junction box.
5. Seal the electrical connections with the Scotchcast epoxy resin pack.
6. Remove sensor from sump while servicing the pump to prevent activating sensor with fuel.

S-5 Sump and Interstitial Mounting

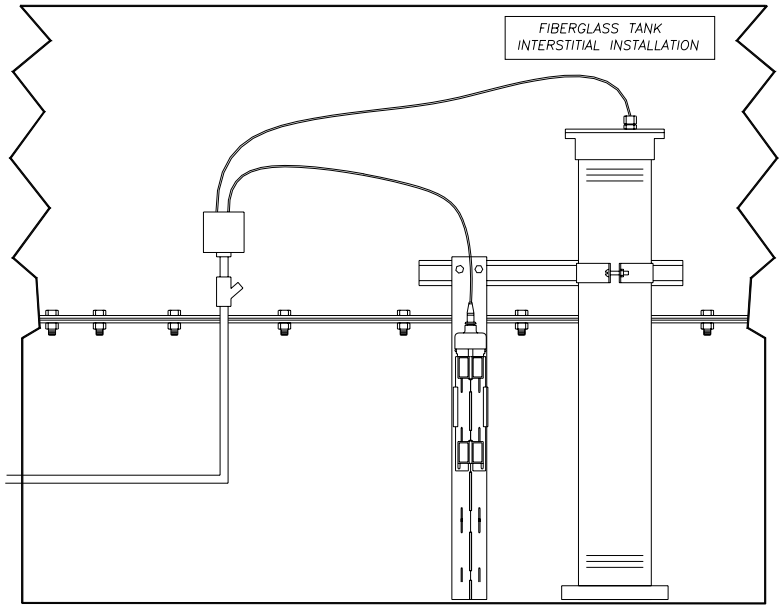


Figure 31: Typical Installation for Sump and Interstitial Sensors

See page 30 or page 31 for sensor specifications for this installation.

- This drawing illustrates installation of two sensor types.
- STP sump sensor mounting in a containment sump.
- Interstitial sensor installation into a fiberglass tank riser using the riser cap installation assembly for leak sensors.

T-1 Tank (Fiberglass) Interstitial Sensor Mounting

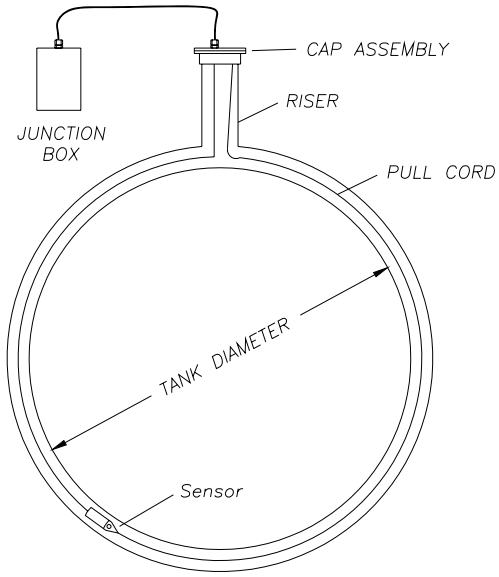


Figure 32: Typical Fiberglas Interstitial Sensor Mounting

See page 32 or page 35 for applicable sensor specifications.

1. Determine tank inside diameter (TD).
2. Measure the riser height (RH) from top of tank to cap assembly.
3. Multiply the tank diameter (TD) x 1.4 and add the riser height (RH).
4. Length = (TD) x 1.4 + (RH)
5. Measure from the sensor tip along the sensor cable the length calculated in step 4 and mark with tape or marker.
6. Attach the tank pull cord to the sensor and pull into the interstitial space until the cable marker is even with the top of the riser. Do not cut or remove the tank pull cord.
7. Assemble the cord grip into the riser cap and route the sensor cable through the cord grip.
8. Connect the sensor wires to the field wires in the junction box using the supplied wire nuts.
9. Seal the electrical connections with the Scotchcast epoxy resin pack.

T-2 Tank (Steel) Interstitial Sensor Mounting

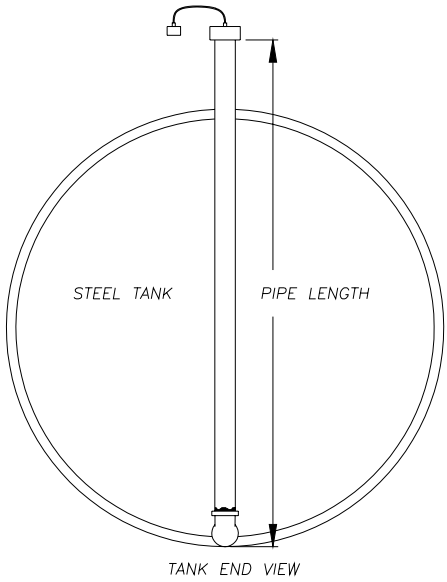


Figure 33: Typical Interstitial Sensor Installation in a Steel Tank

See page 32, page 35 or page 36 for applicable sensor specifications

1. Measure length of the annular space monitoring pipe from top to bottom and subtract 1/2” for a total measurement to be used for the sensor placement.
2. Measure from the sensor tip along the sensor cable the length calculated and mark with tape or marker.
3. Position the sensor into the monitoring pipe until the tape mark is even with the top of the pipe.
4. The sensor should not touch the bottom of the monitoring tube to prevent false alarms.
5. Connect the sensor wires to the field wires in the junction box using the supplied wire nuts.
6. Seal the electrical connections with the Scotchcast epoxy resin pack.

T-4 Tank Wet Interstitial Sensor Mounting

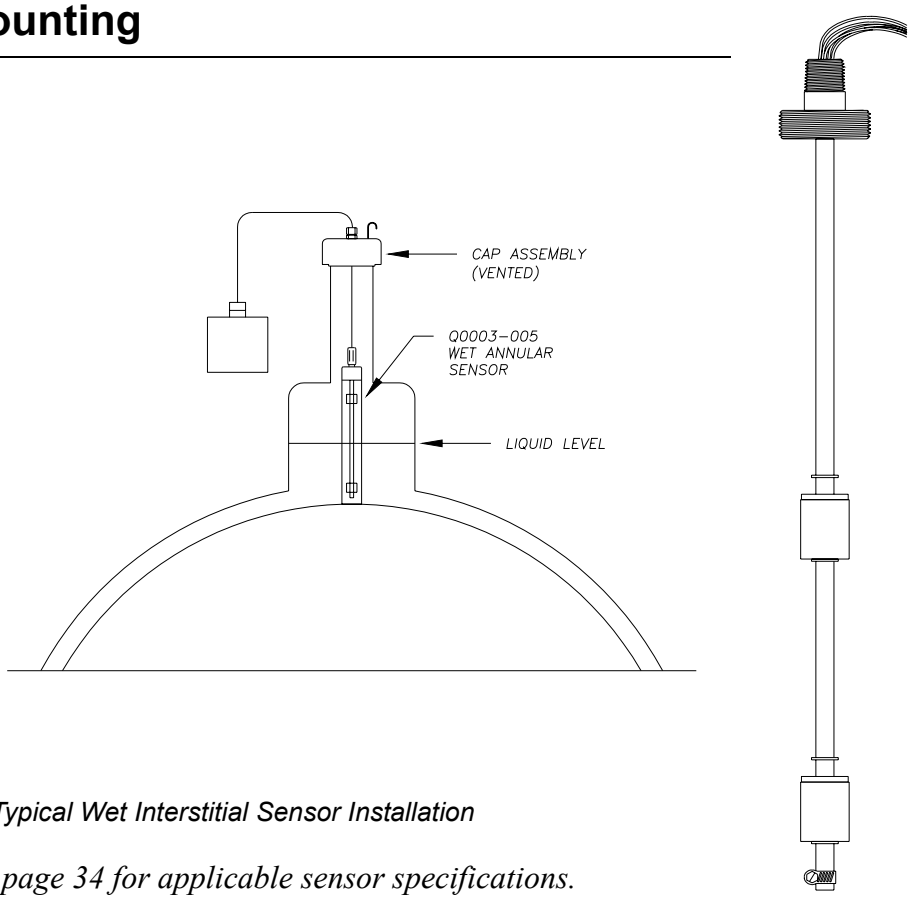


Figure 34: Typical Wet Interstitial Sensor Installation

See page 34 for applicable sensor specifications.

1. Prepare the tank with 4.5” of liquid above the surface that the sensor will rest upon. Use only liquid specified by the tank manufacturer when adding liquid to the annular space of the tank.
2. Install the sensor as shown in the diagram.
3. Install a cap assembly (including a waterproof cord grip and inverted ‘J’ vent) on top of the riser with the sensor cord installed through the cord grip to prevent water (or product) leaking into the annular space.
4. Connect the sensor wires to the field wires in the junction box using the supplied wire nuts.
5. Seal the electrical connections with the Scotchcast epoxy resin pack.

W-1 Monitoring Well Sensor Mounting

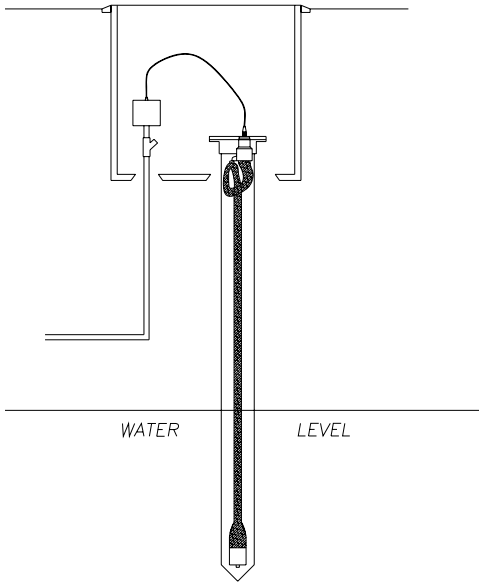


Figure 35: Typical Well Sensor Installation

See page 33 for applicable sensor specifications.

- The Monitoring Well sensor is available in 10', 15' & 20' lengths.

1. Position any excess sensor length over the hanger to allow the sensor to hang vertically in the monitoring well with the weighted end touching the bottom of the well.
2. Note that the surface of the water in the well must be on the sensor for detection of fuel or an alarm condition will be reported.
3. Seal the electrical connections with a Scotchcast epoxy resin pack.

W-2 Vapor Sensor in Monitoring Well

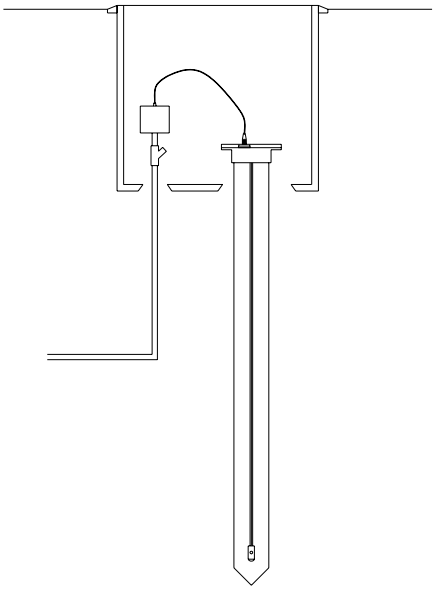


Figure 36: Typical Vapor Sensor Installation

See page 37 for applicable sensor specifications.

- Hydrocarbon vapors are heavier than air and will settle to the lowest point.
- Vapor sensors installed in monitoring wells must be close to the lowest surface to facilitate detection.
- Do not allow sensor to be submersed in liquid.
- Quantity of vapors released from the fuel will be reduced by a decrease in temperature.

Installation Checklist

The system must be installed per the EECO SYSTEM 1500 installation manual. This checklist must be completed by the installation contractor.

Note

Any 'NO' response must be corrected by the installation contractor prior to scheduling the startup contractor to inspect and commission the system. The most common installation problems are listed in ***bold****.*

Caution

Failure to complete this checklist may cause the site owner or start-up contractor to reject portions of your installation.

Console Checklist (Circle YES or NO)

YES	**NO**	Is the console located where Temperature will be between 0° and 40°C with Humidity below 90% (non-condensing)?
YES	**NO**	Does location provide easy access for servicing?
YES	**NO**	Is AC Power provided from dedicated 15 Amp circuit breaker?
YES	**NO**	Does each conduit enter the console through knockouts provided as illustrated in the installation manual?
YES	**NO**	Are the electrical conduits installed per site plan specifications?

More checklists on next page.

Tank Level Monitor Checklist (Circle YES or NO)

YES	**NO**	Is each TLM probe installed with the probe end resting on the tank bottom?
YES	**NO**	Is the TLM probe head in the riser (above the top of the tank)?
YES	**NO**	Is the riser cap in place but not sealed? Access is required for inspection, programming, and startup.
YES	**NO**	Are conduit Seal-off fittings installed properly per installation manual, National Electrical Code, and Local Authorities?
YES	**NO**	Was APPROVED TLM Data cable used?
YES	**NO**	Are Epoxy Resin Packs available for sealing all probe connections during startup?
YES	**NO**	Are all TLM data cables terminating inside the console labeled with tank # and probe serial #?
YES	**NO**	Are intrinsically safe TLM data cables totally separated from non intrinsically safe wiring?

Leak Sensor Checklist (Circle YES or NO)

YES	**NO**	Some sensors require 3 wires for connection while others require 2 wires. Are the correct number of wires installed for each of the sensors?
YES	**NO**	Are Epoxy Resin Packs available for sealing all wire connections during startup?
YES	**NO**	Are conduit Seal-off fittings installed per the installation manual, National Electrical Code, and Local Authorities?
YES	**NO**	Are all sensor wires, terminating inside the console, labeled with sensor type and location? example: STP Sump, Tank 2
YES	**NO**	**Are sumps and dispenser pans dry and free of fuel and water? Any residual fuel in sumps will create a saturated vapor environment which will be detected by the sensors.**
YES	**NO**	Are manhole covers in place and loosely sealed (until startup is completed) to prevent water accumulation in sumps ?
YES	**NO**	Are intrinsically safe leak sensor wires totally separated from non intrinsically safe wiring?
YES	**NO**	

When the installation is completed and all questions can be answered with 'YES', (for the installed options) notify the startup contractor to schedule system inspection and commissioning. Present a completed form to the startup contractor.

Issue Date: January 11, 2001
Revision Date: November 19, 2003

OPW Fuel Management Systems

(originally listed as Emco Electronics, Tuthill Transfer Systems)
EECO System 1000, 1000EG, 1500, 2000, 3000 and Galaxy ATG Systems
(Q0400-4xx Magnetostrictive Probe)

CONTINUOUS IN-TANK LEAK DETECTION METHOD

Certification	Leak rate of 0.2 gph with PD = 99.1% and PFA = 0.9%.
Leak Threshold	0.1 gph for single and manifolded tank systems. A tank system should not be declared tight and a message printed for the operator, if the test results indicate a loss or gain that exceeds this threshold.
Applicability	Gasoline, diesel, aviation fuel. The system is designed primarily for use with petroleum fuels. Other liquids with known coefficients of expansion and density may be tested after consultation with the manufacturer.
Tank Capacity	Maximum of 35,000 gallons for single tanks and for up to 2 tanks manifolded together.
Throughput	Monthly maximum of 130,000 gallons.
Waiting Time	Minimum of 6 hours stabilization time is allowed between delivery and data collection.
Test Period	Average data collection time is 12 days. During evaluation, data collection time ranged from 1 to 31 days. Data sampling frequency is at least once per minute. System collects data at naturally occurring product levels without interfering with normal tank operation and discards data from unstable periods when system performs test.
Temperature	Average for product is determined by a minimum of 5 sensors.
Water Sensor	Must be used to detect water ingress. Minimum detectable water level in the tank is 0.66 inch. Minimum detectable change in water level is 0.039 inch.
Calibration	Temperature sensors are factory calibrated. Probe must be checked and, if necessary, calibrated in accordance with manufacturer's instructions.
Comments	System reports a result of "pass" or "fail." Evaluated using both single and manifolded tank systems. Data can be collected when the product level is between 9% and 94.9% of tank volume. System distinguishes large leak rates (> 1gph) from dispensing activities and reports those as "fail". For valid monthly testing, a conclusive test report must be produced for each tank every month. System warns operator if there are no "passing" tests completed during the month. For very active tanks, a tank shut down may become necessary in order for the system to collect enough quiet-time data for a test. The 6-hour stabilization period after delivery may result in the system not testing the top portion of a very active tank. In this situation, a periodic test in the shut-down mode with a high product level should be used to test the entire portion of tank that routinely contains product. Because the database for evaluation of the system did not include sites with vapor recovery, certification is limited to sites with no vapor recovery. Evaluated using gasoline.

OPW Fuel Management Systems
6900 Santa Fe Dr.
Hodgkins, IL 60525
Tel: (708) 485-4200

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494
Dates of Evaluation: 03/13/00

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

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Notes:

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