

Warranty, Service & Repair

To register your product with the manufacturer, go to the Flowline website for on-line registration. The website address is as follows:

www.flowline.com

On-line Warranty Registration can be found under Contact Us in the Navigation Bar along the side of the home page.

If for some reason your product must be returned for factory service, contact Flowline Inc. at (562)598-3015 to receive a Material Return Authorization number (MRA), providing the following information:

1. Part Number, Serial Number
2. Name and telephone number of someone who can answer technical questions related to the product and its application.
3. Return Shipping Address
4. Brief Description of the Symptom
5. Brief Description of the Application

Once you have received a Material Return Authorization number, ship the product prepaid in its original packing to:

Flowline Factory Service
MRA _____
10500 Humbolt Street
Los Alamitos, CA 90720

To avoid delays in processing your repair, write the MRA on the shipping label. Please include the information about the malfunction with your product. This information enables our service technicians to process your repair order as quickly as possible.

FLOWLINE®

Smart Trak™ w/ Compact Relay Controller A _ 2 3 Series Owner's Manual



Version 0.1A

© 2005 FLOWLINE Inc.

All rights reserved.

Manual # LM900006 04/05

WARRANTY

Flowline warrants to the original purchaser of its products that such products will be free from defects in material and workmanship under normal use and service for a period which is equal to the shorter of one year from the date of purchase of such products or two years from the date of manufacture of such products.

This warranty covers only those components of the products which are non-moving and not subject to normal wear. Moreover, products which are modified or altered, and electrical cables which are cut to length during installation are not covered by this warranty.

Flowline's obligation under this warranty is solely and exclusively limited to the repair or replacement, at Flowline's option, of the products (or components thereof) which Flowline's examination proves to its satisfaction to be defective. FLOWLINE SHALL HAVE NO OBLIGATION FOR CONSEQUENTIAL DAMAGES TO PERSONAL OR REAL PROPERTY, OR FOR INJURY TO ANY PERSON.

This warranty does not apply to products which have been subject to electrical or chemical damage due to improper use, accident, negligence, abuse or misuse. Abuse shall be assumed when indicated by electrical damage to relays, reed switches or other components. The warranty does not apply to products which are damaged during shipment back to Flowline's factory or designated service center or are returned without the original casing on the products. Moreover, this warranty becomes immediately null and void if anyone other than service personnel authorized by Flowline attempts to repair the defective products.

Products which are thought to be defective must be shipped prepaid and insured to Flowline's factory or a designated service center (the identity and address of which will be provided upon request) within 30 days of the discovery of the defect. Such defective products must be accompanied by proof of the date of purchase.

Flowline further reserves the right to unilaterally waive this warranty and to dispose of any product returned to Flowline where:

- a. There is evidence of a potentially hazardous material present with product.
- b. The product has remained unclaimed at Flowline for longer than 30 days after dutifully requesting disposition of the product.

THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE OF THIS WARRANTY. This warranty and the obligations and liabilities of Flowline under it are exclusive and instead of, and the original purchaser hereby waives, all other remedies, warranties, guarantees or liabilities, express or implied. EXCLUDED FROM THIS WARRANTY IS THE IMPLIED WARRANTY OF FITNESS OF THE PRODUCTS FOR A PARTICULAR PURPOSE OR USE AND THE IMPLIED WARRANTY OF MERCHANTABILITY OF THE PRODUCTS.

This warranty may not be extended, altered or varied except by a written instrument signed by a duly-authorized officer of Flowline, Inc.

SPECIFICATIONS

Step One

Specifications:

Length:	8" to 10' (20 cm to 3m)
Switch points:	2 (field adjustable)
Orientation:	± 30° vertical
Supply voltage:	120/240 VAC @ 50-60 Hz.
Strobe type:	431_: N/A 432_: Xenon tube
Strobe flash:	431_: N/A 432_: 1 per second
Contact type:	(1) SPDT relay, latching
Contact rating:	250 VAC @ 10A
Contact latch:	Selectable ON/OFF
Contact delay:	0-60 seconds
LED indication:	Power, relay and sensor status
Process temp.:	F: -40° to 194° C: -40° to 90°
Electronics temp.:	F: -40° to 140° C: -40° to 60°
Pressure:	Atmospheric
Wetted material:	PP (20% glass fill)
Process mount:	2" NPT (2" G)
Enclosure rating:	NEMA 4X (IP65)
Installed height:	431_: 5.7" (14.4 cm) 432_: 7.4" (18.8 cm)
Encl. material:	PP, UL94VO
Conduit entrance:	Single, 1/2" NPT
Classification:	General purpose
CE compliance:	EN 50082-2 immunity EN 55011 emission EN 61010-1 safety

Sensor Technologies:



Vibration (LZ10 series)

Typically applied in wastewater media with light coating and/or foaming characteristics



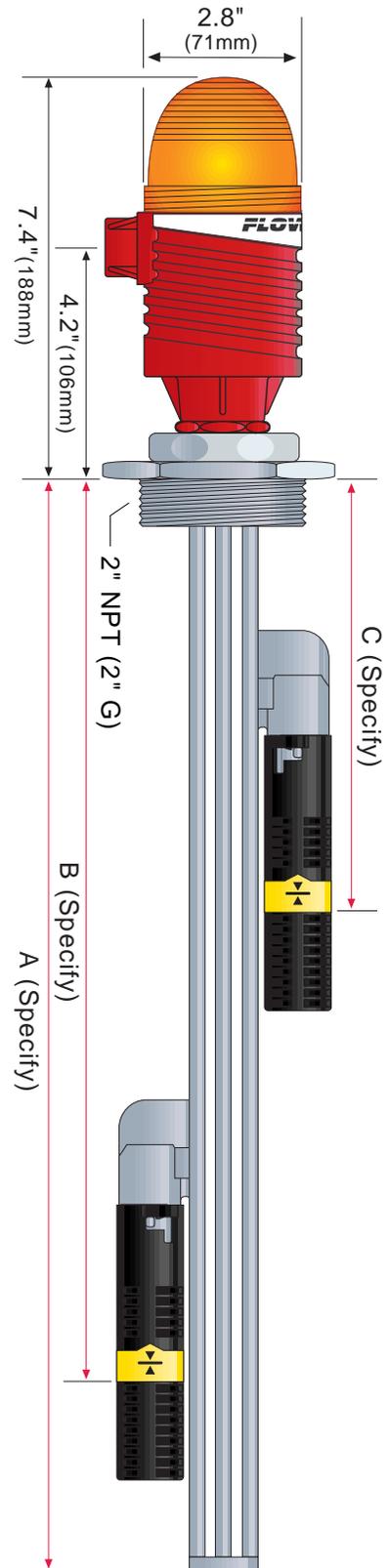
Ultrasonic (LU10 series)

Broadly applied in chemical, solvent, hydrocarbon and light weight oil media



Buoyancy (LV10 series)

Best applied in clean water or water-like chemical media that is non-coating or scaling

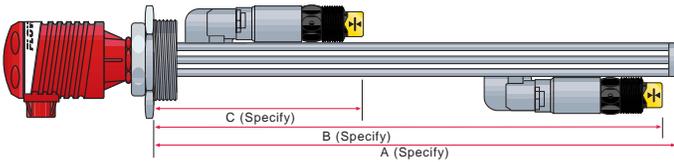


COMPONENTS

Step Two

Standard Configuration:

(AU23-431_, AV23-431_ or AZ23-431_)



Ultrasonic

AU23-4313

2 x LU10-1305
1 x LM10-1_01
2 x LM30-1001
1 x LC10-1001

Buoyancy

AV23-4313

2 x LV10-1301
1 x LM10-1_01
2 x LM30-1001
1 x LC10-1001

Vibration

AZ23-4313

2 x LZ12-1405
1 x LM10-1_01
2 x LM30-1001
1 x LC10-1001

AU23-4317

2 x LU10-1325
1 x LM10-1_61
2 x LM30-1051
1 x LC10-1051

AV23-4317

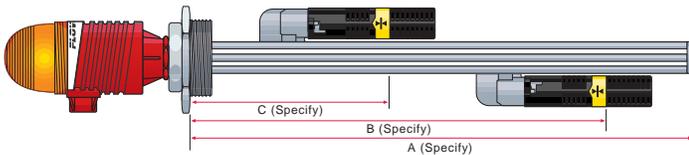
2 x LV10-1351
1 x LM10-1_61
2 x LM30-1051
1 x LC10-1051

AZ23-4317

2 x LZ12-1405
1 x LM10-1_61
2 x LM30-1001
1 x LC10-1051

Strobe Alert Configuration:

(AU23-432_, AV23-432_ or AZ23-432_)



Ultrasonic

AU23-4323

2 x LU10-1305
1 x LM10-1_01
2 x LM30-1001
1 x LC10-1002

Buoyancy

AV23-4323

2 x LV10-1301
1 x LM10-1_01
2 x LM30-1001
1 x LC10-1002

Vibration

AZ23-4323

2 x LZ12-1405
1 x LM10-1_01
2 x LM30-1001
1 x LC10-1002

AU23-4327

2 x LU10-1325
1 x LM10-1_61
2 x LM30-1051
1 x LC10-1002

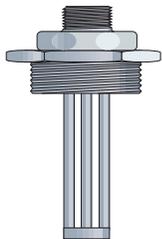
AV23-4327

2 x LV10-1351
1 x LM10-1_61
2 x LM30-1051
1 x LC10-1002

AZ23-4327

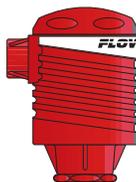
2 x LZ12-1405
1 x LM10-1_61
2 x LM30-1001
1 x LC10-1002

Component List:



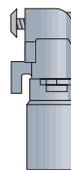
Smart Trak Fitting

P/N: LM10-1_01 or LM10-1_61



Compact Relay Controller

P/N: LC10-1001, LC10-1051,
LC10-1002 or LC10-1052



Switch Car Kit

P/N: LM30-1001 or LM30-1051



Switch-Tek Level Switch

P/N: LU10-1305, LU10-1325,
LV10-1301, LV10-1351
or LZ12-1405

SAFETY PRECAUTIONS

Step Three

⚠ About this Manual: PLEASE READ THE ENTIRE MANUAL PRIOR TO INSTALLING OR USING THIS PRODUCT. This manual includes information on the Smart Trak™ with Compact Relay Controller: AU23-43__, AZ23-43__ and AV23-34__. The units are identical except for the number of switch points and the sensors technology.

⚠ User's Responsibility for Safety: Flowline manufactures a wide range of liquid level sensors, controllers, and mounting systems. It is the user's responsibility to select components that are appropriate for the application, install them properly, perform tests of the installed system, and maintain all components. The failure to do so could result in property damage or serious injury.

⚠ Proper Installation and Handling: Use a proper sealant with all installations. Never overtighten the components. Always check for leaks prior to system start-up.

⚠ Material Compatibility:

Glass filled Polypropylene (PP, a polyolefin): Track, end cap, wire retainer clips, bayonet adapter, level switch and sensor car for all Smart Trak Assemblies.

Polychlorotrifluoroethylene (PCTFE, a fluoroplastic): Sensor car locking bolt and screw.

Polypropylene (PP, a polyolefin): Sensor, top compression fitting, thrust plate, locking pin and 2" NPT fitting.

Viton (a fluorocarbon): O-ring.

Neoprene (w/silicon gel for lubrication): Wire gasket.

Santoprene (w/silicon gel for lubrication): Seal plug.

Make sure that the application liquids are compatible with the materials that will be wetted. To determine the chemical compatibility between the components and its application liquids, refer to the Compass Corrosion Guide, available from Compass Publications (phone 858-589-9636).

⚠ Temperature and Pressure: Smart Trak™ is designed for use in application temperatures up to 90° C (194° F). It is not designed for pressurized applications due to the wiring that must travel through a gasket at the head.

⚠ Wiring and Electrical: Electrical wiring of any liquid level control system should be performed in accordance with all applicable national, state, and local codes. Take care not to cut or break the outer insulation jacket of wiring that may be immersed while routing cables in the Smart Trak™ system. Such breaks of the liquid seal of the sensor system may lead to component failure.

⚠ Flammable, Explosive and Hazardous Applications: The AU23-43__, AZ23-43__ and AV23-34__ Smart Trak™ should not be used within classified hazardous environments.

⚠ Make a Fail-Safe System: Design a fail-safe system that accommodates the possibility of system or power failure. In critical applications, Flowline recommends the use of redundant backup systems and alarms in addition to the primary system.

ASSEMBLY OF SMART TRAK™

Step Four

About Smart Trak™: Flowline's Smart Trak™ with Compact Relay Controller Assembly is an adjustable mounting system for installing two level sensors vertically within a tank. Mounted through a single point at the top of the tank, both sensors can be adjusted in the field. The compact relay controller features a 120/240 VAC latched controller with a 250 VAC, 10A SPDT relay contract. Smart Trak™ mounts vertically through a standard 2" NPT tank adapter, or on a side mount bracket (such as the LM50-1001). Unlike prefabricated "trees" or pipes, Smart Trak™ allows you to experiment with sensor position to account for variations in the point of actuation of each sensor during process testing.

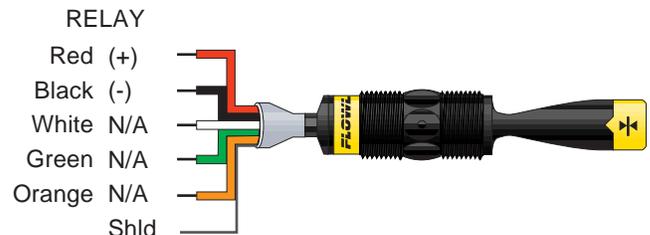
Track: The track itself is approximately 1" square, and is from 8" to 10' long depending on the A-Dimension. The track may be cut to length if desired. Four separate grooves run the length of the track, one on each side of the square. These grooves hold the sensor cars that attach to Flowline sensors, and also serve to contain the switch cable. The bottom of the track is capped with an end cap.

Relay Controller: Both level switches are pre-wired before shipment to the 4-pole terminal strip [Input 1A (+) & (-) & Input 1B (+) & (-)]. The switch technologies used to indicate level are either Ultrasonic, Buoyancy or Vibration. The Compact Relay Controller provides a 1/2" Conduit connection and 6 poles for wire termination of power and relay contact. Use the AC, AC and GND terminals for providing power. Use the NC, NC and COM terminals for interfacing to the relay contact.

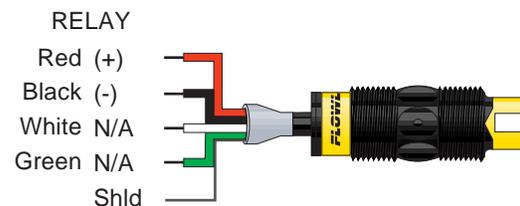


Compact Relay Controller (inside shown)

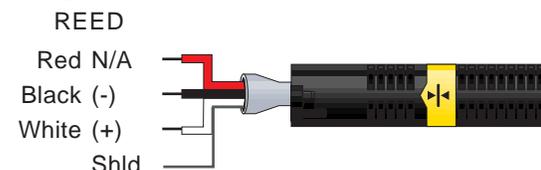
Vibration (LZ12-1405) Wire Configuration:



Ultrasonic (LU10-1305 or LU10-1325) Wire Configuration:



Buoyancy (LV10-1301 or LV10-1351) Wire Configuration:



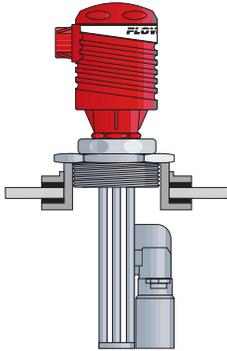
INSTALLATION

Step Five

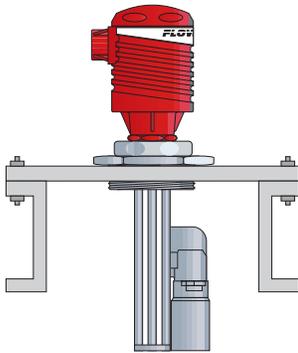
Smart Trak™, In-Tank Installation:

Flowline's Smart Trak™ mounting system is an in-tank fitting, which enables users to install any technology, along the entire length of track. Smart Trak™ may be installed thru the top wall of any tank or flange, using a standard 2" NPT tank adapter or blind flange. If tank top is not available, Flowline's side mount bracket, LM50-1001, enables Smart Trak™ to be installed directly to the side wall or lip of the tank.

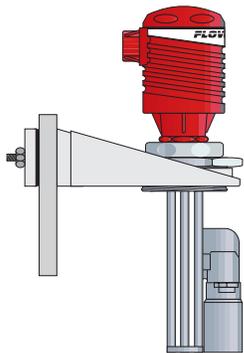
Tank Adapter:



Flange Mounting:

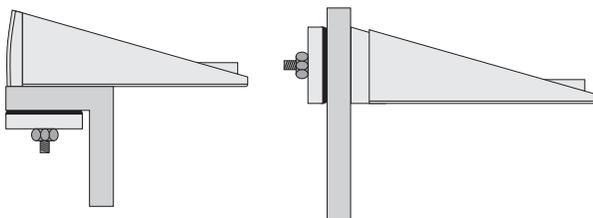


Side Mount Bracket:



Lip of Tank

Side-Wall

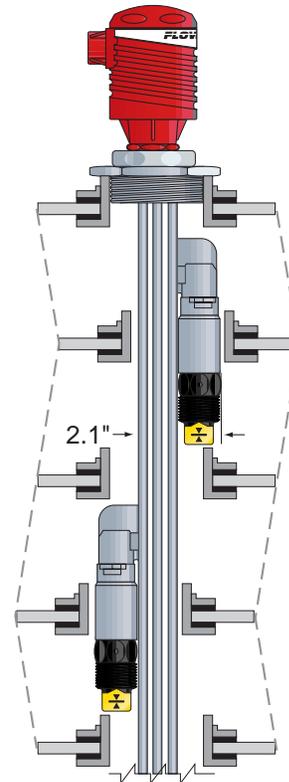


INSTALLATION

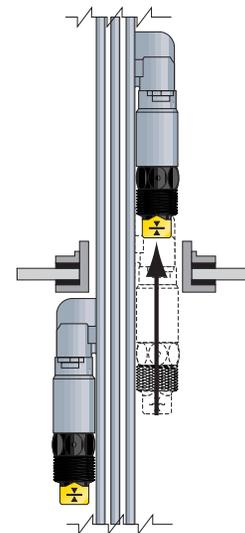
Step Six

Smart Trak™, Installation:

The Smart Trak™ with Compact Junction Box assembly is designed to be installed through a 2" NPT (2" G) thread. The level switches will be staggered through the fitting for installation.

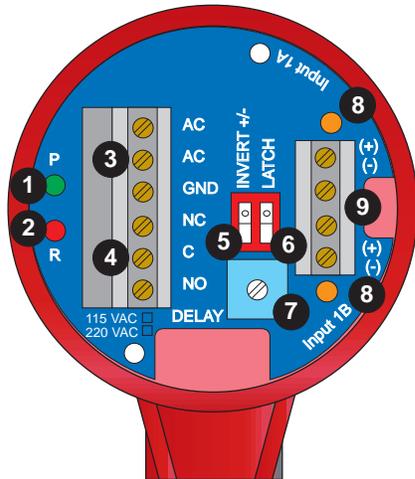


A key feature of Smart Trak™ is the adjustability of the level switches. When two level switches are placed close together, one of the switches will need to be moved to allow for the switches to be staggered into the installation fitting. Once installed, the level switch can be returned to its required position.



GUIDE TO CONTROLS

Step Seven

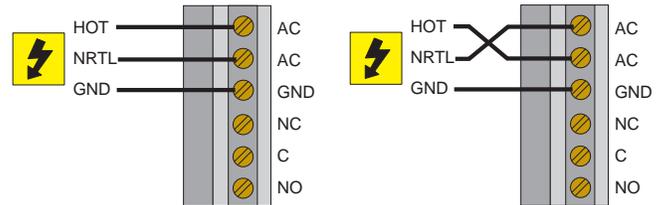


- 1. Power indicator:** This green LED lights when AC power is ON.
- 2. Relay indicator:** This red LED will light whenever the controller energizes the relay, in response to the proper condition at the sensor inputs and after the time delay.
- 3. AC Power terminals:** Connection of 120 VAC power to the controller. The setting may be changed to 240 VAC if desired. This requires changing internal jumpers; this is covered in the Installation section of the LC10/11 Series Manual. Polarity (neutral and hot) does not matter.
- 4. Relay terminals (NC, C, NO):** Connect the device you wish to control (pump, alarm etc.) to these terminals: supply to the COM terminal, and the device to the NO or NC terminal as required. The switched device should be a noninductive load of not more than 10 amps; for reactive loads the current must be derated or protection circuits used. When the red LED is ON and the relay is in the energized state, the NO terminal will be closed and the NC terminal will be open.
- 5. Invert switch:** This DIP switch reverses the logic of the relay control in response to the sensor(s): conditions that used to energize the relay will make it turn off and vice versa.
- 6. Latch switch:** This DIP switch determines how the relay will be energized in response to the two sensor inputs. When LATCH is OFF, the relay responds to sensor Input 1A only; when LATCH is ON, the relay will energize or de-energize only when both sensors (1A and 1B) are in the same condition (wet or dry). The relay will remain latched until both sensors change states.
- 7. Time Delay:** After the input(s) change(s) state, this control sets a delay from 0.15 to 60 seconds before the relay will respond.
- 8. Input 1A and 1B indicator:** These amber LEDs will light immediately whenever the appropriate sensor attached to the terminals detects liquid, and will turn off when it is dry.
- 9. Input terminals:** Connect the wiring from the sensors to these terminals: A to the upper pair, B to the lower pair. Note the polarity: (+) is a 13.5 VDC, 27 mA power supply, and (-) is the return path from the sensor. If polarity is reversed, the sensors will not work.

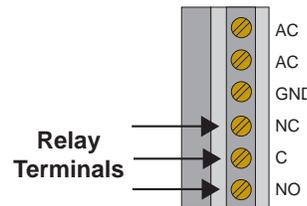
WIRING

Step Eight

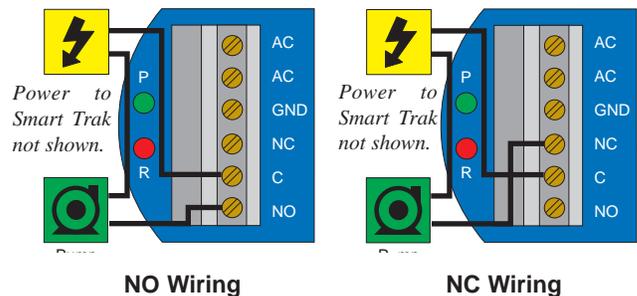
VAC Power Input Wiring: Observe the labeling on the controller. *Note: Polarity does not matter with the AC input terminal.*



Relay Input Wiring: The relay is a single pole, double throw type rated at 250 Volts AC, 10 Amps. The terminals Normally Open (NO) and Normally Closed (NC) will be used in different applications. Remember that the "normal" state is when the relay coil is de-energized and the Red relay LED is OFF (de-energized).

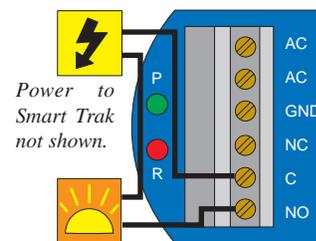


A typical application for the Smart Trak™ with Compact Relay Controller is to operate a pump or valve between the two set points (automatic fill or empty). In this application, a pump or valve can be wired to either the Normally Open (NO) or Normally Closed (NC) side of the relay.



Strobe Alert Output

With the Strobe Alert wired NO, the strobe will flash when the Red LED is ON (Invert OFF). The strobe will flash when the Red LED is OFF when wired NC or by turning the Invert ON. If the strobe is wired NC and the Invert is ON, the strobe will flash when the Red LED is ON (same as NO wiring and Invert OFF).

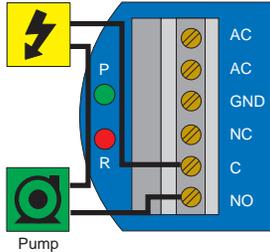


With the Latch OFF, the status of the strobe is only effected by Input 1A (Input 1B will be ignored). With the Latch ON, the status of the strobe is only changes when both Inputs are in the same state. For example, with Invert ON, the Strobe will flash when both Inputs become Wet. The strobe will continue to flash until both Inputs become dry.

WIRING

Step Nine

Automatic Fill: This system consists of a tank with a high and low level sensor, and a pump or valve that is operated by the controller. Proper fail-safe design for this system is to stop filling if power is lost. Therefore, we connect the pump/valve to the NO side of the relay. When energized, the device will activate and fill the tank. The relay LED will correspond directly to the ON/OFF status of the pump/valve. **NOTE:** If the pump motor load exceeds the rating of relay controller, a stepper relay of higher capacity must be used as part of the system design.



Determining the settings of LATCH and INVERT

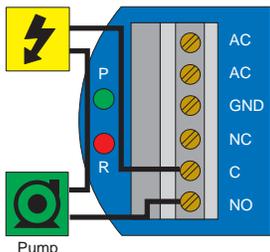
This is the way the system must operate:

- When both the high and low sensors are dry, the device should activate, starting to fill the tank.
- When the low sensor gets wet, the device should stay ON.
- When the high sensor gets wet, the device should turn OFF.

Latch: In any two-sensor control system, LATCH must be ON.

Invert: Referring to the logic chart in Step Nine, we look for the setting that will de-energize the relay (start the pump) when both inputs are wet (Amber LEDs). *In this system, Invert should be ON.*

Automatic Empty: Note that a similar system logic can be used for an automatic empty operation simply by controlling a pump/valve that takes fluid out of the tank instead of into it. Connect the pump/valve to the NO side of the relay. When energized, the device will activate and empty the tank.



Determining the settings of LATCH and INVERT

This is the way the system must operate:

- When both the high and low sensors are wet, the device should activate, starting to empty the tank.
- When the high sensor gets dry, the device should stay ON.
- When the low sensor gets dry, the device should turn OFF.

Latch: In any two-sensor control system, LATCH must be ON.

Invert: Referring to the logic chart in Step Nine, we look for the setting that will de-energize the relay (start the pump) when both inputs are wet (Amber LEDs). *In this system, Invert should be OFF.*

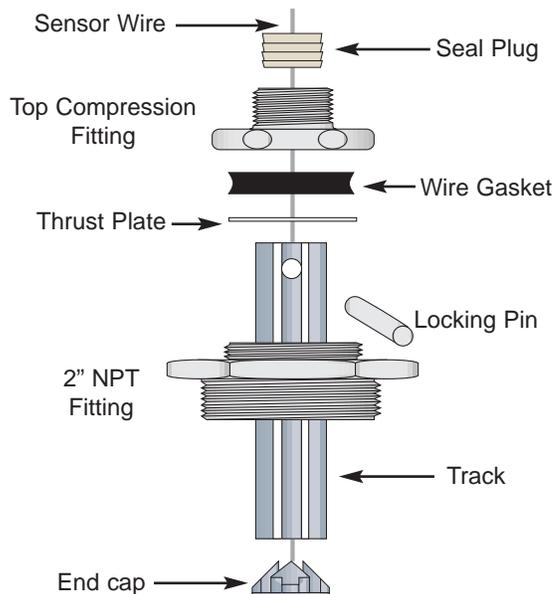
Relay Latch Logic Table: With Latch ON, the relay will activate when INPUT 1A and INPUT 1B are in the same condition. The relay will not change its condition until both inputs reverse their state.

Invert OFF		Latch Off	Invert OFF		Latch Off
Input1A	Input1B	Relay	Input1A	Input1B	Relay
ON	ON	ON	ON	ON	OFF
OFF	ON	No Change	OFF	ON	No Change
ON	OFF	No Change	ON	OFF	No Change
OFF	OFF	OFF	OFF	OFF	ON

ASSEMBLY OF SMART TRAK™

Step Ten

Smart Trak™ Assembly Drawing (Side View)

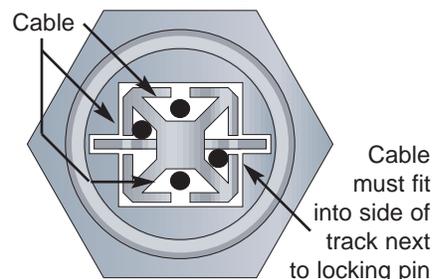


Inventory:

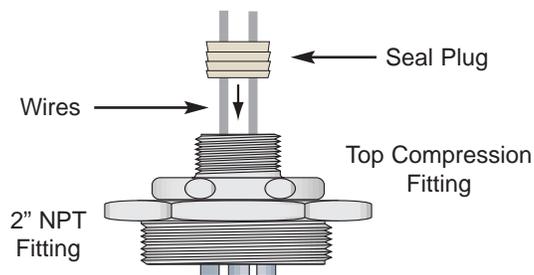
One Smart Trak™ kit (LM10-1__1) includes the following parts:

- 1 Seal Plug
- 1 Top compression fitting
- 1 Wire gasket
- 1 Thrust Plate
- 1 Locking pin
- 1 2" NPT fitting
- 1 Track
- 1 End cap
- 2 Wire retainer clips (not shown)

Smart Trak™ Assembly Drawing (Top View):



Seal Plug Assembly Drawing (Side View)



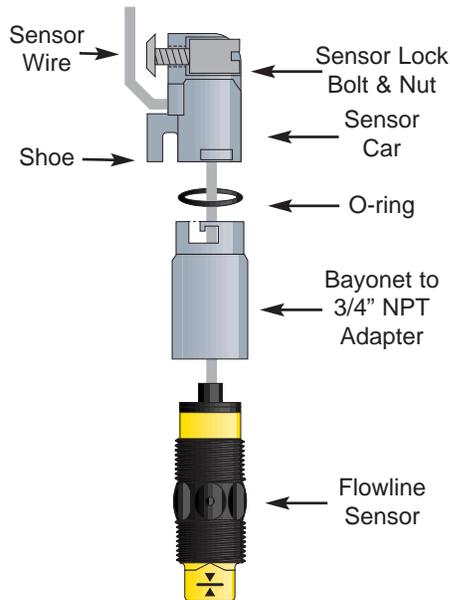
ASSEMBLY OF SWITCH CAR

Step Eleven

Sensor car and bayonet adapter:

The sensor car assembly is the heart of the Smart Trak™ system. It slides in the grooves of the track, and is locked into position by a plastic bolt and screw. The bayonet to 3/4" NPT adapter has a female 3/4" NPT fitting on one end where the sensor (not included) will screw in, and a bayonet fitting on the other end that attaches it onto the sensor car with a slight turn, with an O-ring in-between to provide tension for the push-and-turn connection.

Switch Car Kit Assembly Drawing (Side View)



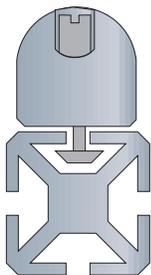
Inventory:

One switch car kit (LM30-10_1) consists of the following parts:

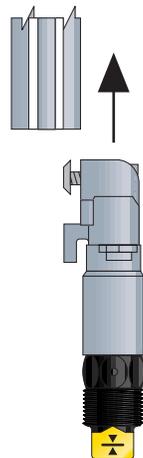
- 1 Locking bolt
- 1 Locking Nut
- 1 Sensor car
- 1 O-ring
- 1 Bayonet to 3/4" NPT adapter

Switch Car Kit to Smart Trak™

(Top View)



(Side View)



Determine the Proper Wire Length:

Don't make the mistake of trimming the sensor wires too short before the process is tested. If the sensors might need to be lowered in the future, leave sufficient slack in the wires to allow for future adjustment. This extra wire may be stored in the bottom of the terminal strip housing, or elsewhere above the compression fitting.

MAINTENANCE

Step Twelve

General: The Smart Trak™ with Compact Junction Box requires no periodic maintenance except cleaning as required. It is the responsibility of the user to determine the appropriate maintenance schedule, based on the specific characteristics of the application liquids.

Cleaning Procedure:

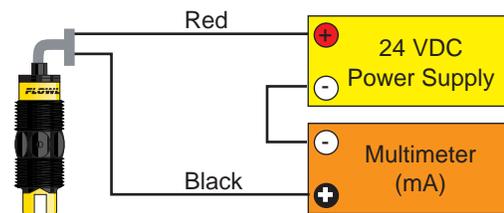
- Power:** Make Sure that all power to the sensor, controller and/or power supply is completely disconnected.
- Sensor Removal:** Make sure that the tank is in a state where it is safe to remove the sensors. Carefully, remove the Smart Trak™ from the installation.
- Cleaning the Sensor:** Use a soft bristle brush and mild detergent, carefully wash the Smart Trak™. Do not use harsh abrasives such as steel wool or sandpaper, which might damage the surface sensor. Do not use incompatible solvents which may damage the sensor's PP or Ryton plastic body.
- Sensor Installation:** Follow the appropriate steps of installation as outlined in the installation section of this manual.

Controller Logic:

- Power LED:** Make sure the Green power LED is On when power is supplied to the controller.
- Input LED(s):** The input LED(s) on the controller will be Amber when the switch(es) is/are wet and Off when the switch(es) is/are dry. *Note: see Step 5 regarding reed switches.* If the LED's are not switching the input LED, test the level switch.
- Relays:** When both inputs are wet (Amber LED's On), the relay will be energized (Red LED On). After that, if one switch becomes dry, the relay will remain energized. Only when both switches are dry (both amber LED's Off) will the controller de-energize the relay. The relay will not energize again until both switches are wet. See the Relay Latch Logic Chart below for further explanation.

Current Test (Ultrasonic and Vibration only):

Used to verify if the sensor is indicating a wet or dry condition. This test uses only two wires (Red and Black). The sensor draws 5 mA (ultrasonic) or 8 mA (vibration) when it is dry, and 19 mA when wet. The White and Green wires are not used.



Contact Test (Buoyancy only):

Used to verify if the reed switch is switching between dry (open) and wet (closed). Check for continuity across Black and White (open for dry and closed for wet). Checking across Black and Red will result in a closed when dry and open when wet condition.

