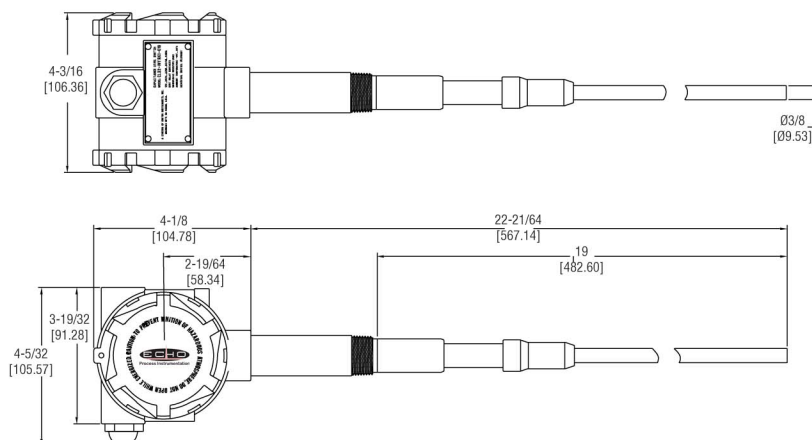


CAPSWITCH 500 Series

Instruction and Operation Manual



The **ECHO CapSwitch 500 Series** was designed to sense material level in a wide range of applications and environments using the dielectric properties of the sensed material. State of the art sensing technology in the **CapSwitch**, using RF admittance measurement combined with an active guard, provides excellent level measurement and stability while being insensitive to material buildup. This technology also provides immunity to external RF sources like walkie-talkies and cell phones as well as minimal interference with radio communication or other electronic systems.

The product features automatic calibration and 8 selectable sensitivity levels. Calibration may be initiated with either the internal switch or using the external calibration magnet allowing calibration without removing the cover. A selectable failsafe mode allows the relay to be active either normally open or normally closed. The unit also features an active guard mechanism that effectively eliminates the effects of material buildup on the probe. A selectable delay is provided to ensure false detection due to splashing or other tank disturbances will not cause nuisance triggering. A high brightness LED indicator is provided externally so that the level status can be easily seen even in bright sunlight. Three multicolored LEDs are provided internally for maintenance and diagnostic use.

SPECIFICATIONS

Service: Liquids, powder, and bulk materials compatible with wetted materials.

Wetted Materials: 316 SS and Kynar® (PVDF).

Temperature Limits: Ambient: -40 to 185°F (-40 to 85°C), -4 to 185°F (-20 to 85°C) with under 24 VAC/DC power supply.
Process: -40 to 250°F (-40 to 121°C).

Pressure Limit: 365 psi (25 bar).

Enclosure Rating: W Enclosure: Weatherproof, NEMA 4X; E Enclosure: Weatherproof, NEMA 4X, Explosion-proof Class I, Groups B, C, D; Class II, Groups E, F, and G.

Switch Type: DPDT (two form C).

Electrical Rating: 8A @ 120/240 VAC res., 30 VDC. 1/2 hp @ 120 VAC and 1/4 hp @ 240 VAC ind.

Power Requirements: 12 to 240 VAC/DC

Power Consumption: 2.8 Watts max.

Electrical Connection: 1/2" NPT conduit opening, screw termination with removable terminal block.

Process Connection: 3/4" male NPT. Optional 1-1/4" male NPT; 1", 1-1/2" BSP; 1, 1-1/2", 2" sanitary.

Mounting Orientation: Vertical or horizontal.

Set Point Adjustment: Trips when product touches probe. Cut or extend probe to length of desired trip point. Can be cut as short as 1" and can be extended by welding on to probe. (Minimum length will be effected by material being sensed.)

Response Time: 0.2 seconds.

Time Delay: Adjustable, 0 to 60 seconds.

Spark/Static Protection: 1.0 MEG Ohm dissipation resistance with spark gap. Surge current to 100A max.

Sensitivity: 8 Selectable settings, 1, 2, 4, 6, 8, 10, 14, 20 pF (at 30 pF nominal free capacitance).

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Mounting Location

CapSwitch is rated for industrial environments with few restrictions, however certain considerations must be made to ensure optimal sensing and extended operational life.

- The process temperature and ambient temperature must be within the specified limits for the instrument.
- Avoid locating the unit near or in high mechanical shock or vibration areas.
- The probe must be located away from tank inlets or chutes where material may fall on the probe during filling or emptying.
- Avoid mounting the probe close to tank structures as conductive product bridging between the guard and tank structure can cause false alarms.
- In nonmetallic tanks a ground reference must generally be provided. If the probe is near the wall of the tank an adhesive backed metallic sheet may be applied to the outside of the tank wall nearest to the probe. Other metallic objects may be used also if they are in close proximity to the tank wall. If the probe is located further than 10 inches from the wall, an internal conductor must be provided parallel to and within 10 inches of the probe. These conductors must be connected to the case ground of the sensor. An external ground clamp is provided for this if other grounding is not available.

Wiring



WARNING: Always install or service this device with the power off and where required install a disconnect lockout.

CAUTION: For power line connections use NEC Class 1 wiring rated 60°/75°C. Use 12 to 20 AWG copper only for line and load connections. Torque terminals to 5 in-lb. Strip the wires 0.25”.

Note: Installation must be made in accordance with National Electric Code and local codes and regulations. When fishing wire through the conduit connection do not allow the wire to touch or press on components on the boards. Damage to the circuitry may result.

CapSwitch has a 1/2” female NPT conduit connection. The conduit connection must be made such that condensation is not allowed to enter the housing. If nonmetallic conduit is used, the protective ground may be connected to the internal ground connection screw.

The terminal block may be removed for easier connection. To remove, place a small screwdriver between the terminal block and the connector base and pry the terminal block forward. This will unlatch the block from the base allowing it to be removed. When installing the block, tip it forward on the connector base to snap it in the forward locking tab then rock the connector back onto the contacts until it snaps in place. Make sure the terminal block is securely in place.

Strip 0.25” of insulation from the wires. Connect the power wires to terminals 1 and 2. If powered by DC, the polarity is not critical and either terminal may be selected for positive or negative. Connect control lines to the relay contact terminals (see Figure 1 for terminals). Torque terminals to 5 in-lb.

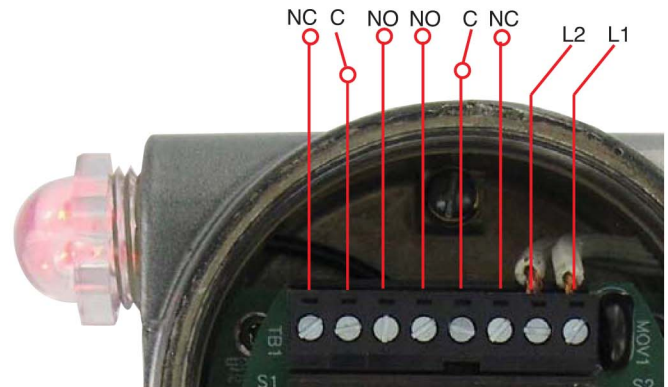


Figure 1: Terminals

Controls and Indicators (See Figure 2 and 3)

Calibrate Switch — Pressing this switch twice initiates the automatic calibration process.

Time Delay Potentiometer — This control selects a delay time from 0 to 60 seconds from the detection of a level change to the output.

Dip Switch — This four section switch selects the sensitivity level and failsafe mode.

Sensor LED — Yellow. This LED is illuminated immediately when the probe capacitance exceeds the setpoint threshold.

Output LED — Red. This LED is illuminated when the relay is powered. It is affected by the failsafe setting and the delay.

Power LED — Green. This LED is illuminated when the unit is powered and indicates that power is being supplied to the sensing circuitry.

External LED — Red. The external LED indicator operates in conjunction with the internal Output LED.

External Calibration Magnet — An external magnet is provided on the end of a chain to initiate calibration without having to open the case. Calibration is started by touching the magnet to the label target twice.

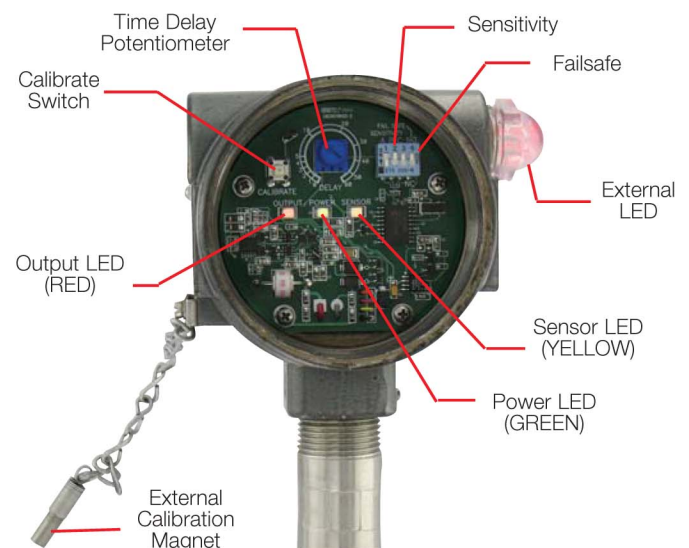


Figure 2: Switches and LED's



Figure 3: Magnet Location

Setup and Calibration

1. **Fail Safe Mode Selection:** The relay will always be off when the power fails. In this case the contacts identified as normally open will be open. The fail safe switch selects whether the normally open contacts are open or closed when the probe is uncovered. There are two options for the failsafe condition that are selected by DIP switch S4 (see Figure 2). Selecting normally open (NO) will force the relay contacts to be open when the probe is uncovered and the output status LED to be off. Selecting normally closed (NC) will energize the relay when the probe is uncovered and light the output status LED.

2. **Sensitivity Selection:** The sensitivity must be selected to match the dielectric constant of the material and its density. Eight sensitivity levels are provided by positioning DIP switches S1, S2, and S3 (see Figure 2). A high sensitivity setting is a low pF, and a low sensitivity setting would be a high pF. High sensitivity is used for materials such as plastic pellets, light powders, and dry grain. Medium sensitivity is used for materials such as cement, petroleum products, and flour. Low sensitivity is used for products such as aqueous solutions. The switch positions are summarized in Table 1. For best operation use the minimal sensitivity required for reliable operation.

Switch 1	Switch 2	Switch 3	Sensitivity
On	On	On	1 pF
Off	On	On	2 pF
On	Off	On	4 pF
Off	Off	On	6 pF
On	On	Off	8 pF
Off	On	Off	10 pF
On	Off	Off	14 pF
Off	Off	Off	20 pF

Table 1: Switch Position for Sensitivity

3. **Calibration:** Calibrate with the probe uncovered and the material at least 5 inches below the probe. To start the automatic calibration process press the calibrate switch twice (see Figure 2) or press the external magnet up to the housing at the marked location on the housing twice (see Figure 3). The external magnet is attached to the housing by a chain. The output status LEDs will begin to blink slowly, about once per second, when the calibration process has started. The automatic calibration will take approximately 10 to 15 seconds, and the output status LEDs will stop flashing at the end of the calibration process. If during the calibra-

tion process the tank level changes or a sensor failure has occurred, the calibration process may fail. The output status LEDs will begin to flash rapidly (about 4 times per second). Make sure the probe is uncovered and retry the calibration step.

4. **Time Delay Selection:** The time delay is the programmed time between when the probe senses the material and when the relay changes state from the sensed material. A time delay is good for applications that could have false or rapid pulsing of level indications from sloshing or agitated material. Choose a delay setting appropriate for the specific application. Adjust the delay potentiometer to the desired delay (see Figure 2). The delay can be set anywhere from 0 to 60 seconds and a scale is printed on the sensor board. For verification of delay programming the yellow sensor LED will come on when material is sensed and the red output LED will come on with the relay after the programmed time delay.

5. **Verify Operation:** Make sure the probe is uncovered, material at least 5 inches below the probe, and that the yellow sensor LED is off. Fill the tank until the material is at the desired threshold level and verify that the sensor LED is illuminated. If the sensor LED turns on before the material reaches the probe, reduce the sensitivity as needed. If when the probe is covered the sensor LED is not illuminated, increase the sensitivity. Water or other conductive liquids will activate the sensor when they just contact the probe. Low density and dielectric constant material may require more of the probe to be covered.

Note: Default values as the product ships from the factory is a follows: S1:off, S2:off, S3:on, S4:on, and time delay off.

MAINTENANCE

Other than the controls mentioned in this manual there are no user maintenance adjustments or routine servicing required for this product. Very heavy buildup on the probe may ultimately reduce sensitivity. Probe cleaning may be necessary in applications, such as paint level sensing, where buildup growth can occur. Moderate buildup is compensated for by the active guard.

The **CapSwitch** Capacitive Level Switch is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization (RGA) number before shipping.

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