



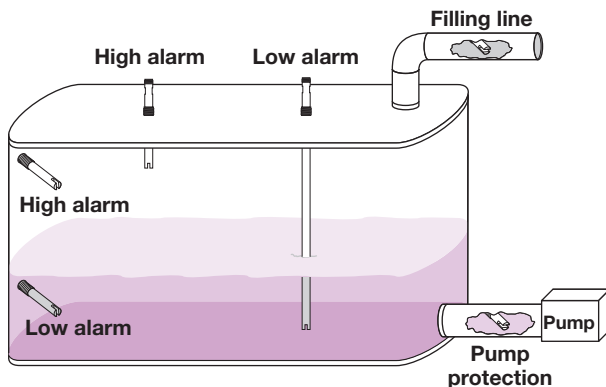
## Echotel® Model 940/941 Ultrasonic Level Switch

### DESCRIPTION

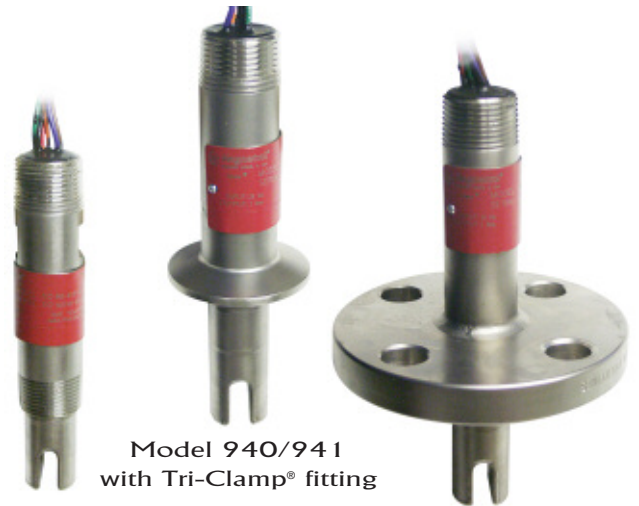
Echotel® Model 940 and 941 Ultrasonic Level Switches are compact integral units that utilize pulsed signal technology to perform high or low level measurement in a wide variety of liquid applications. These switches feature a 316 stainless steel tip-sensitive transducer that is offered in a variety of NPT, flanged, and hygienic process connections. The compact electronics are completely encapsulated just above the process fitting. The Magnetrol® Model 940 offers a 1-amp SPDT relay output. The Model 941 has a mA current shift output.

### FEATURES

- Pulsed electronics for excellent performance in difficult process conditions and superior immunity from sources of electromagnetic noise
- Tip-sensitive transducer gap provides reliable operation by draining viscous liquids and shedding foam in turbulent applications
- Safety Integrity Level (SIL) data (FMEDA analysis) is available. Model 940 is suitable for SIL 2 loops. Model 941 is suitable for SIL 1 loops.
- Extremely compact unit is easily installed in areas where access space is limited
- 1-amp SPDT relay output (940), or mA current shift (941) output
- No calibration required



Typical Mounting Orientations



Model 940/941  
with 3/4" NPT

Model 940/941  
with Tri-Clamp® fitting

Model 940/941  
with ASME flange

### APPLICATIONS

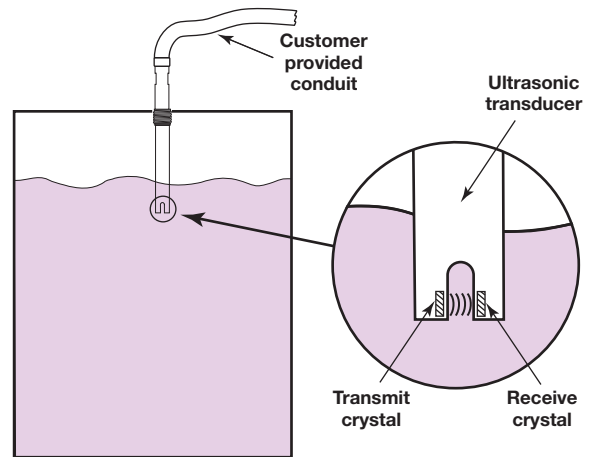
The Model 940/941 can be applied in a wide variety of high or low liquid level applications, pump protection, and fill line monitoring as shown in the diagram at the left. These compact units can also be installed in the interstitial space between two tank walls for fluid leak detection.

Small size and simplicity of installation make these units ideal for OEM skids as a low cost, yet high performance level measurement solution. They are also the perfect replacement for older floats, conductivity switches, and tuning forks.

# TECHNOLOGY

Ultrasonic energy detects the presence or absence of liquid in a tip sensitive transducer gap. The principle behind contact ultrasonic technology is that high frequency sound waves are easily transmitted across a transducer gap in the presence of liquid, but are attenuated when the gap is dry.

The transducer uses a pair of piezoelectric crystals that are encapsulated in epoxy at the tip of the transducer. The crystals are made of a ceramic material that vibrates at a given frequency when subjected to an applied voltage. The transmit crystal converts the applied voltage from the electronics into an ultrasonic signal. When liquid is present in the gap, the receive crystal is able to sense the ultrasonic signal from the transmit crystal and convert it back to an electrical signal. This signal is sent to the electronics to indicate the presence of liquid in the transducer gap. When there is no liquid present, the ultrasonic signal is attenuated and is not detected by the receive crystal.



**Figure 1**  
**Ultrasonic signal transmission across transducer gap**

# SPECIFICATIONS



## Electrical:

Power Supply:	12–35 VDC
Power Consumption:	Less than 1 Watt
Signal Output:	Model 940: SPDT relay, 1 amp @ 30 VDC, 0.5 amp @ 125 VDC, 0.5 amp @ 150 VAC Model 941: Dry Gap: 8 mA (±1 mA), Wet Gap: 16 mA (±1 mA)
Cabling:	18" (457 mm) flying leads of 18 AWG wires
Repeatability:	0.078" (2 millimeters)
Response Time:	½ second typical

## Environmental:

Ambient Temperature:	-40 to +185 °F (-40 to +85 °C)
Process Temperature:	-40 to +185 °F (-40 to +85 °C)
Maximum Pressure:	2000 psig (138 bar) for 1" (3 cm) NPT and 2" (5 cm) BSP transducers 1500 psig (103 bar) for longer transducers
Shock	ANSI/ISA-S71.03 Class SA1
Vibration	ANSI/ISA-S71.03 Class VC2

# AGENCY APPROVALS

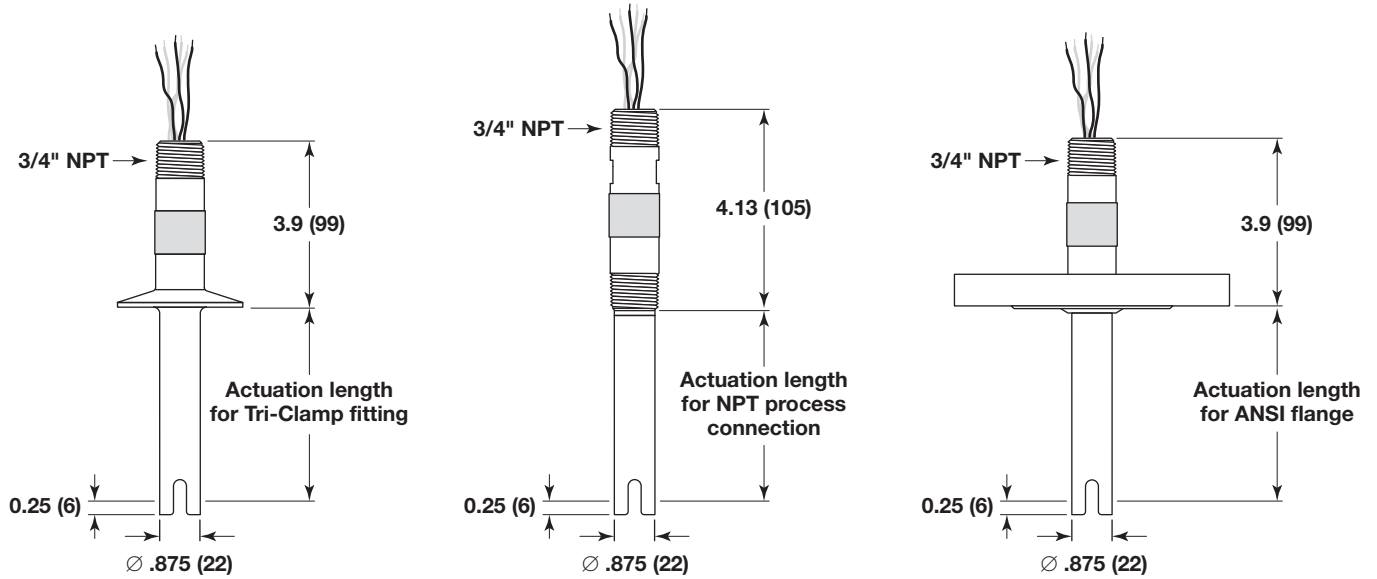
AGENCY	APPROVED MODELS	PROTECTION METHOD	AREA CLASSIFICATION
<b>FM &amp; CSA</b>  	94X-XXXX-XXX	Non-Incendive	Class I, Div. 2, Groups A, B, C, & D Class II, Div. 2, Groups E, F & G Class III, Type 4X, IP 66, T4
	941-XXXX-XXX	Intrinsically Safe	Class I, Div. 1, Groups A, B, C & D Class II, Div. 1, Groups E, F & G Class III, Type 4X, IP 66, T4



These units have been tested to EN 50081-2 and EN 50082-2 and are in compliance with the EMC Directive 89/336/EEC.

# SPECIFICATIONS

Inches (mm)



Model 940/941 with Tri-Clamp fitting

Model 940/941 with 3/4\"/>

Model 940/941 with ASME flange

## MODEL NUMBER

### BASIC MODEL NUMBER

940	Low cost compact ultrasonic level switch with SPDT relay output
941	Low cost compact ultrasonic level switch with current shift output

### AGENCY APPROVAL

1	FM/CSA Intrinsically Safe & Non-Incendive (Model 941 only)
2	FM/CSA Intrinsically Safe & Non-Incendive (Model 941 only) with ASME B31.3 – CRN Available
7	FM/CSA Non-Incendive (Model 940 only)
8	FM/CSA Non-Incendive (Model 940 only) with ASME B31.3 – CRN Available

### PROCESS CONNECTIONS

11	3/4\"/>
22	1\"/>
23	1\"/>
33	1 1/2\"/>
43	2\"/>
3T	1 1/2\"/>
4T	2\"/>

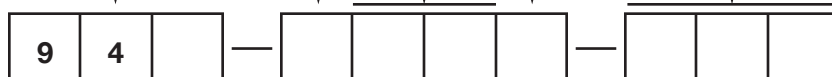
\* Minimum actuation length of 2 inches or 5 centimeters

### ACTUATION UNITS

E	English (inches)
M	Metric (centimeters)

### ACTUATION LENGTH

1 to 100 inches (Example: 4 inches = 004)
3 to 250 centimeters (Example: 6 cm = 006)



Note: Optional NEMA 4 cast aluminum junction box assembly 052-7012-XXX is available from the factory.

## QUALITY

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The quality assurance system in place at MAGNETROL guarantees the highest level of quality throughout the company. MAGNETROL is committed to providing full customer satisfaction both in quality products and quality service.

The MAGNETROL quality assurance system is registered to ISO 9001 affirming its commitment to known international quality standards providing the strongest assurance of product/service quality available.

## WARRANTY

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All MAGNETROL electronic level and flow controls are warranted free of defects in materials or workmanship for eighteen months from the date of original factory shipment.

If returned within the warranty period; and, upon factory inspection of the control, the cause of the claim is determined to be covered under the warranty; then, MAGNETROL will repair or replace the control at no cost to the purchaser (or owner) other than transportation.

MAGNETROL shall not be liable for misapplication, labor claims, direct or consequential damage or expense arising from the installation or use of equipment. There are no other warranties expressed or implied, except special written warranties covering some MAGNETROL products.

For additional information, see Instruction Manual 51-647.

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**BULLETIN: 51-136.4**

**EFFECTIVE: April 2018**

**SUPERSEDES: October 2017**