

Kotron® Model 811 RF Point Level Sensor

Installation and Operating Manual



RF

Capacitance

Level

Measurement

Read this Manual Before Installing

This manual provides information on the Kotron Model 811 RF Point Level Sensor. It is important that all instructions are read carefully and followed in sequence. Detailed instructions are included in the *Installation* section of this manual.

Conventions Used in this Manual

Certain conventions are used in this manual to convey specific types of information. General technical material, support data, and safety information are presented in narrative form. The following styles are used for notes, cautions, and warnings.

Notes

Notes contain information that augments or clarifies an operating step. Notes do not normally contain actions. They follow the procedural steps to which they refer.

Cautions

Cautions alert the technician to special conditions that could injure personnel, damage equipment, or reduce a component's mechanical integrity. Cautions are also used to alert the technician to unsafe practices or the need for special protective equipment or specific materials. In this manual, a caution box indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Warnings

Warnings identify potentially dangerous situations or serious hazards. In this manual, a warning indicates an imminently hazardous situation which, if not avoided, could result in serious injury or death.

WARNING! Explosion hazard. Do not connect or disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

Safety Messages

The Kotron Model 811 system may be properly installed in Category II, Pollution Degree 2 installations. Follow all standard industry procedures for servicing electrical and computer equipment when working with or around high voltage. Always shut off the power supply before touching any components. Although high voltage is not present in this system, it may be present in other systems.

Electrical components are sensitive to electrostatic discharge. To prevent equipment damage, observe safety procedures when working with electrostatic sensitive components.

Low Voltage Directive

For use in Category II installations. If equipment is used in a manner not specified by manufacturer, protection provided by equipment may be impaired.

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All Magnetrol/STI electronic level and flow controls are warranted free of defects in materials or workmanship for one full year 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/STI will repair or replace the control at no cost to the purchaser (or owner) other than transportation.

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Magnetrol's 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.



Kotron Model 811

RF Point Level Sensor

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1.0 Complete Installation

This section provides detailed procedures for properly installing, configuring, and, as needed, troubleshooting the Kotron Model 811 RF Point Level Sensor.

1.1 Unpacking

Unpack the instrument carefully. Make sure all components have been removed from the packing material. Check all the contents against the packing slip and report any discrepancies to the factory. Before proceeding with the installation, do the following:

- Inspect all components for damage. Report any damage to the carrier within 24 hours.
- Make sure the nameplate model number agrees with the packing slip and purchase order.
- Record the model and serial numbers for future reference when ordering parts.

Model Number _____

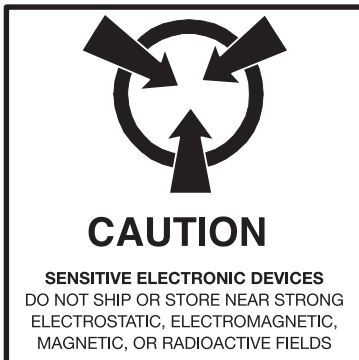
Serial Number _____

1.2 Electrostatic Discharge (ESD) Handling Procedure

Magnetrol's electronic instruments are manufactured to the highest quality standards. These instruments use electronic components that may be damaged by static electricity present in most work environments.

The following steps are recommended to reduce the risk of component failure due to electrostatic discharge.

- Ship and store circuit boards in anti-static bags. If an anti-static bag is not available, wrap the board in aluminum foil. Do not place boards on foam packing materials.
- Use a grounding wrist strap when installing and removing circuit boards. A grounded workstation is recommended.
- Handle circuit boards only by the edges. Do not touch components or connector pins.
- Make sure that all electrical connections are completely made and none are partial or floating. Ground all equipment to a good, earth ground.



1.3 Before You Begin

1.3.1 Site Preparation

Each Kotron Model 811 sensor is built to match the specific physical specifications of the required installation. Make sure the probe connection is correct for the threaded or flanged mounting on the vessel or tank where the transmitter will be placed. See *Mounting, Section 1.4*.

Make sure that the wiring between the power supply and the Model 811 sensor is complete and correct for the type of installation. See *Specifications, Section 2.6*.

When installing the Model 811 sensor in a general purpose or hazardous area, all local, state, and federal regulations and guidelines must be observed. See *Wiring, Section 1.7*.

1.3.2 Equipment and Tools

No special equipment or tools are required to install the Model 811 sensor. The following items are recommended:

- 1½" Open-end wrench or adjustable wrench to fit the probe process connection size and type
- Flat-blade screwdriver

1.3.3 Operational Considerations

The Model 811 sensor should be located to allow for easy access for service, configuration, and monitoring. There should be sufficient headroom to allow the probe to be inserted into the tank. Special precautions should be made to prevent exposure to corrosive atmosphere, excessive vibration, shock, or physical damage.

Units should not be exposed to ambient temperatures above +160° F (+71° C) or below -40° F (-40° C). Probes should be isolated from severe motion in the tank, because surface turbulence may cause signal deviation.

NOTE: The unit is designed for maximum safety intrinsically safe probe circuit). Jumper (J4) must be intact under normal operating conditions. The jumper **must not** be removed by anyone unless there is a specific need for intrinsically safe grounding separate from the standard earth ground. Consult factory before considering special grounding which would require removal of the jumper. Violation of this requirement will void warranty and release Magnetrol of any responsibility.

1.4 Mounting

The Model 811 sensor can be mounted to a tank using a variety of process connections.

Make sure all mounting connections are properly in place on the tank before installing the probe. Make sure the Kotron probe is correct for the intended installation.

It is common practice to use the metal tank wall as the reference electrode. In such cases, it is required that the probe housing makes a good electrical connection to the tank wall. If there is any doubt about this connection or to the use of PTFE thread tape gaskets, paint, rust, or any other reason, a separate strap should be installed between the probe housing and the tank.

Caution: This unit contains CMOS electronics which may be damaged by static electricity. Do not touch any semiconductor devices unless you are properly grounded.

Caution: When a probe is used in an abrasive medium, inspect the probe periodically for visible surface wear. If damage to the probe insulation is found, replace the probe.

Metal Walled Tanks

On water-based liquids, there should be no problem with sensitivity. With non-conductive, low dielectric media, sensitivity can be enhanced by locating the probe close to and parallel with the tank wall. If this is not practical, a ground reference probe may be the solution.

Non-Metallic and Glass-Lined Tank Construction

With plastic, concrete, wood, or any other non-conductive walled vessels, a ground reference is required. Most commonly, this electrode will be in the form of a concentric ground tube (e.g., stilling well). In questionable circumstances, consult the factory. In all cases, a good electrical connection must be made between the ground surface and the probe housing.

Switch/Probe Assembly

Switches with probes up to and including 12 inches (300 mm) in length are shipped pre-assembled. All other switches are shipped unassembled to avoid damage during transit. These units must be assembled prior to mounting. Choose your particular configuration from the following sections and follow the instructions carefully.

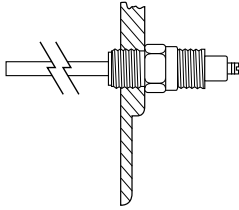


Figure 1

Recommended Horizontal Mounting

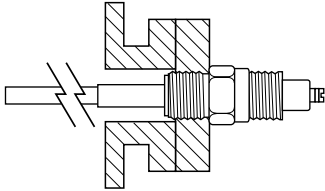


Figure 2

Recommended Mounting with Nozzle

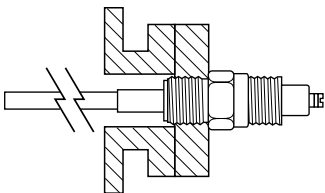


Figure 3

Not Recommended

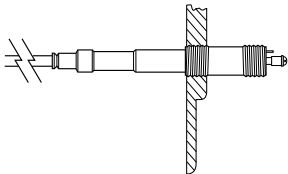


Figure 4

Recommended Horizontal Mounting
Guarded Probe

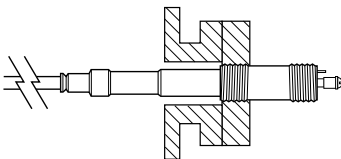


Figure 5

Recommended Horizontal Mounting
Guarded Probe

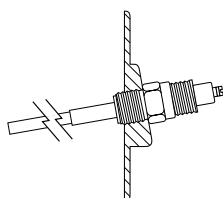


Figure 6

Alternate Horizontal Mounting

1.4.1 Horizontal Mounting **Alarm (narrow differential) applications only**

Horizontally mounted probes provide a high degree of sensitivity for use with non-conductive liquids as only approximately 0.5 inches (12 mm) of level change is required to completely cover (or uncover) the probe.

Horizontally mounted probes should be installed so that the probe is parallel to and at the level at which the control point is desired. Refer to Figure 1.

Avoid any installation method in which the material may become trapped in the mounting nozzle, thus preventing the probe from signaling when the level recedes. Refer to Figures 2 and 3.

NOTE: If nozzle mounting is unavoidable, the probe must be installed with an inactive metal sheath having a length of at least 1 inch (25 mm) greater than length of the nozzle. A sheath is required to render the length of the probe within nozzle insensitive to capacitance change. Refer to Figure 2.

Guarded Probe

Unit will signal at probe level. Refer to Figures 4 and 5.

NOTE: The guard element must be located outside of the nozzle. Do not horizontally mount the unit in a nozzle deeper than 3 inches (75 mm). Refer to Figure 5. The medium may buildup in the nozzle and cause false activation.

Alternate Horizontal Mounting

On applications involving viscous liquids or materials which tend to cling or buildup, horizontally mounted probes should be installed at a slight downward angle to allow material to drain from probe rod. With this type of installation, the packing gland face of probe assembly should extend into the tank (or vessel). Refer to Figure 6.

1.4.2 Vertical Mounting

Vertically mounted probes provide the capability to adjust the control point up or down a section of probe rod by means of calibration adjustments within the unit.

Vertically mounted probes should be installed so that the end of the probe rod is at least 2 inches (50 mm) below the lowest desired level control point with conductive materials or 4 inches (100 mm) below the lowest desired level control point with non-conductive materials. Refer to Figure 7 on page 5.

1.5 Probe Installation

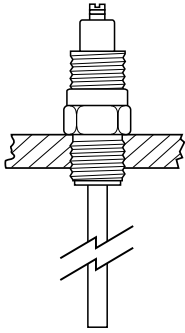


Figure 7
Vertical Mounting

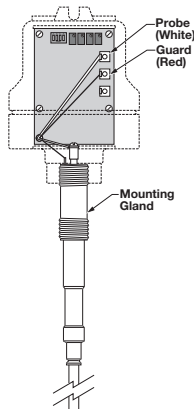


Figure 8
Integral Mount with Guarded Probe

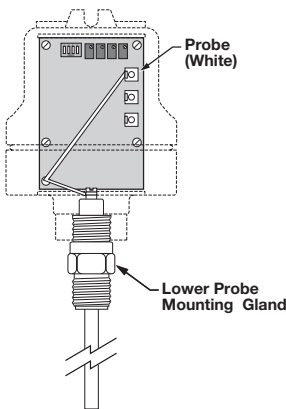


Figure 9
Integral Mount with
Standard Rigid Probe

1.5.1 Installing a Guarded Probe

1. Thread electronics/probe assembly (pre-assembled) into mounting bushing on tank.
2. Tighten securely (ensure that the wrench is applied only to the mounting gland). Refer to Figure 8.
3. Proceed to *Wiring, Section 1.7*, on page 8.

1.5.2 Installing a Standard Probe

Before installing, ensure the:

- Probe has adequate headroom for installation and has unobstructed entry in the vessel.
 - Process temperature, pressure, dielectric, and viscosity are within the probe specifications for the installation. See *Specifications, Section 2.6*, on page 21.
1. Thread probe into mounting bushing on tank.
 2. Tighten securely, being certain that the wrench is applied **ONLY** to the mounting gland. Refer to Figure 9.
 3. Screw the amplifier housing onto the probe. Refer to Figure 9.
 4. Screw housing on the probe until hand tight. Housing can be wrench tightened to align conduit connection with conduit.

1.5.3 Installing a Flexible Probe

Caution: Insulated flexible probes are shipped with the cable clamp and the packing gland nut hand tightened to permit length adjustment in the field. The cable clamp and packing gland nut must be tightened before use. The end of a flexible probe **MUST** be kept taut by attaching the anchor end at the bottom of the vessel or by using a Magnetrol supplied probe weight.

Caution: Do not discard the Mylar housing insulator.

Caution: The probe cable must not be in contact with any metallic surface in its final installation position.

1. Attach the weight or anchor assembly to the end of the probe. Insert the probe through the vessel's mounting connection, and feed the cable into the vessel. Do not allow the probe to scrape against the connection threads.
2. Secure the anchor assembly (if used), to the bottom of the vessel.

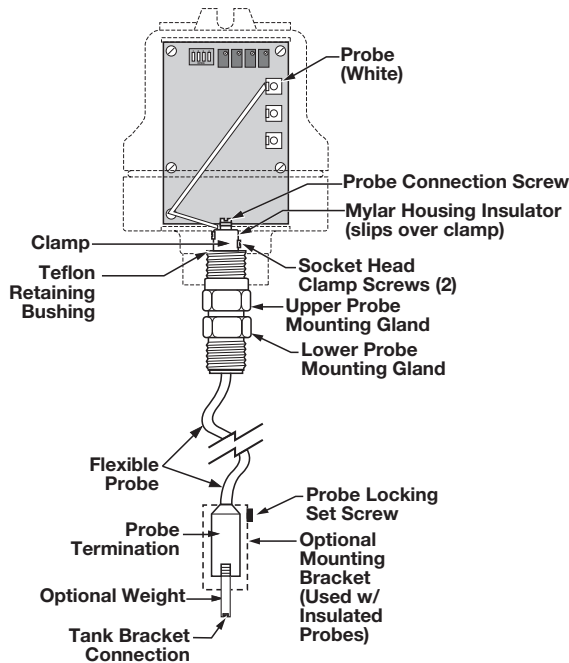


Figure 10
Integral Mount with Flexible Probe

3. Apply thread sealant to the mounting nut. Screw the mounting nut into the mounting connection until tight.
4. Remove the Mylar housing insulator located over the clamp. **DO NOT DISCARD.**
5. Loosen both socket head screws from the clamp. Pull the clamp and Teflon retaining bushing off of the probe.
6. While holding on to the probe cable, loosen the upper packing gland nut. **DO NOT ALLOW THE PROBE CABLE TO FALL INTO THE VESSEL.**
7. Pull the excess cable up through the packing gland nut until the cable is taut. Tighten the packing gland nut.
8. Cut the cable 1.35" (34 mm) above the packing gland nut and strip off 1.25" (32 mm) of insulation.
9. Slide the Teflon retaining bushing onto the cable and seat it into the packing gland nut. Slide the clamp onto the cable and seat it against the Teflon retaining bushing.
10. Tighten both socket head screws, on the clamp, to approximately 35 in/lbs of torque. Slip the Mylar insulator over the clamp.

Caution: Check probe terminal connection carefully to be certain lug will not short to packing gland or interfere with assembly of amplifier housing to probe.

1.6 Installing a Remote Mount Unit

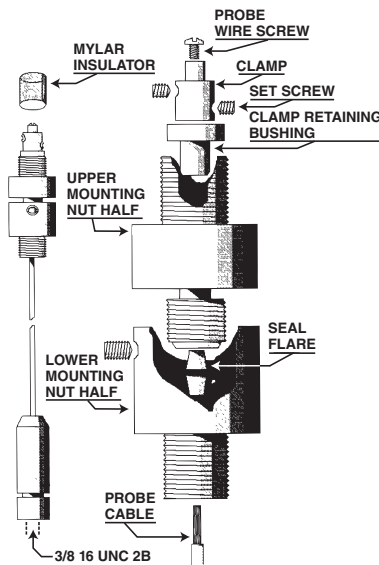
NOTE: All remote mount units use triaxial cable that is shipped in a length specified at the time of order. This cable must always make all 3 connections at the main amplifier. At the probe head, the cable will always make at least 2 connections. (PROBE and GROUND). The final connection (GUARD) is only used with the guarded probe. Cut the guard wire back to the cable and dress with tape when NOT in use.

1.6.1 Remote Mount with Guarded Probe

1.6.1.1 Electronic Housing

Remote electronic housings are normally shipped from the factory assembled with a mounting bracket. To install the electronic housing, proceed as follows. Refer to Figure 11.

1. Install bracket in a location which will isolate unit from temperatures below -40°F (-40°C) and over $+160^{\circ}\text{F}$ ($+71^{\circ}\text{C}$) or vibration/mechanical damage. Unit can be mounted up to 150 feet (45 m) from probe assembly. Location should also offer easy access for wiring, calibration and maintenance.



ECTFE Flexible Probe

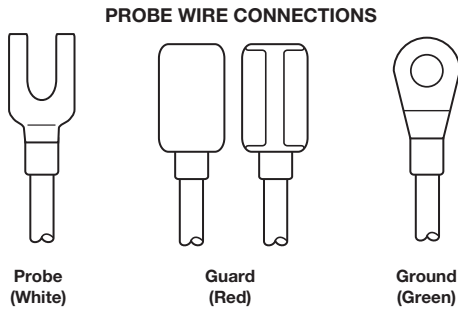


Figure 10a

1.6.1.2 Probe Housing Connections

1. Screw probe housing onto the probe.
2. Attach the red guard wire to the slip-on guard connection on probe. Refer to Figure 10a, *Probe Wire Connections*.
3. Attach the white probe wire to the probe screw on top of the probe. Refer to Figure 11.
4. Attach the green ground wire to the green ground screw in the housing base. Refer to Figure 11.
5. Proceed to *Wiring, Section 1.7*, on page 8.

1.6.2 Remote Mount with Rigid and Flexible Probes

1.6.2.1 Electronic Housing

Remote electronic housings are normally shipped from the factory assembled in a mounting bracket. To install the electronic housing, proceed as follows. Refer to Figure 12.

1. Install bracket in a location that will isolate the unit from temperatures below -40°F (-40°C) and over $+160^{\circ}\text{F}$ ($+71^{\circ}\text{C}$) or vibration/mechanical damage. Unit can be mounted up to 150 feet (45 m) from probe assembly. Location should also offer easy access for wiring, calibration, and maintenance.

1.6.2.2 Probe Housing Connections

1. Screw probe housing onto the probe. Refer to Figure 12.
2. Attach the white probe wire to the probe screw on top of the probe. Refer to Figure 12.
3. Attach the green ground wire to the green ground screw in the housing base. Refer to Figure 10a, *Probe Wire Connections* and Figure 12.
4. Trim red GUARD wire back to cable end. Insulate with electrical tape.

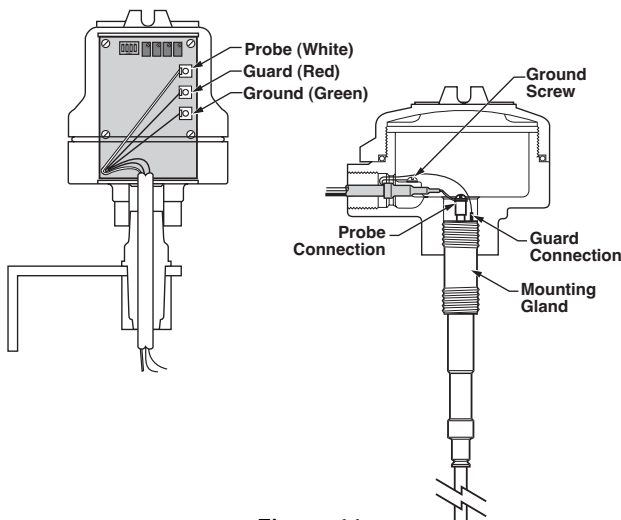


Figure 11

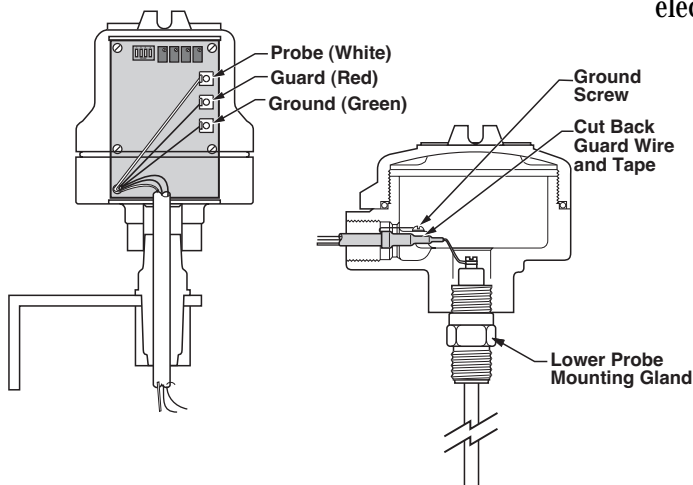


Figure 12

1.7 Wiring

1.7.1 Probe Wiring

All power and control connections are made at the terminal strip within the amplifier enclosure, EXCEPT GROUNDING. Power grounding must be made at green ground screw on the housing base. 16AWG is recommended for power and control circuits.

NOTE: There are special wiring exceptions for intrinsic safety. Observe all local electrical codes and proper wiring procedures.

1. Ensure that power source is turned off.
2. Unscrew and remove housing cover.
3. Remove electronic assembly by loosening three screws in base.
4. Pull power supply and control wires through conduit connection.
5. **Integral Mount Units** – pull probe cable through bottom base connection.
Remote Mount Units – pull triaxial probe cable through bottom base connection.
6. Loosen securing screw on bottom of shield and open the protective cover on the amplifier board.
7. a. **Integral Electronics** – Attach white probe wire from probe terminal on circuit board to probe screw on top of the probe. Attach red Guard wire (if utilized). See Figure 8 on page 5.
b. **Remote Electronics** – Attach the white and red leads from the triaxial cable to appropriate connection on circuit board. See Figure 12.
8. Ensure wiring is passed through bottom of electronic assembly bracket.
9. Close and secure protective cover.
10. Slowly lower electronic assembly into housing base while pushing slack into conduit.
11. Tighten three screws to housing base.
12. Connect electrical green ground wire to green ground screw located in the base of the housing.

NOTE: If separate I.S. ground is required in this application, then I.S. ground (conventionally, blue #12 wire) should be connected to the barrier at this time. Refer to NEC and appropriate Agency guidelines.

1.7.2 Electrical Wiring

1. Connect power leads to applicable AC or DC terminals as marked. Refer to Figure 13.
2. a. Connect control circuit leads to relay terminals Refer to Figure 13. Make sure the load to be controlled is within the relay's rated capacity.
b. Dress wiring to guard against interference or contact with cover or circuit board components.

Caution: In hazardous area, do not power the unit until the conduit is sealed and enclosure cover is screwed down securely.

3. Prevent moisture seepage into housing by installing an approved seal-drain fitting in the conduit run leading to the unit.
4. Select operating mode. (Refer to Operating Mode Selection below for detailed information.) Make sure the fail-safe switch is in the correct position.
5. Installation is complete. Replace housing cover.
6. Proceed to *Calibration, Section 1.8*, on next page.

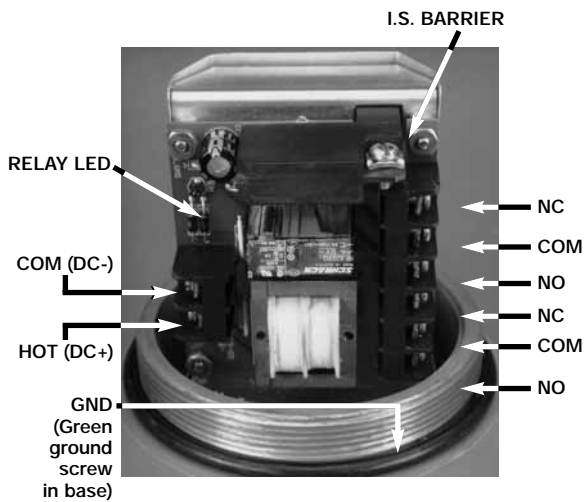


Figure 13

1.7.3 Operating Mode Selection

The Relay Wiring Chart on page 10 is provided to aid in the proper choice of relay wiring and calibration. Please note:

1. Equipment controlled by the Model 811 relay is assumed to be powered from one source, while the 811 unit itself is assumed to be powered from a different source.
2. There is a fail-safe switch on the 811 unit which may be set in either a High or Low position. Refer to Figure 15 on next page.
3. Fail means a loss of power to the 811.
4. HL (High Level) means a material level in the tank which is equal to or above the set point.
5. LL (Low Level) means a material level in the tank which is equal to or below the set point.
6. a. When the relay coil is de-energized, (LED will be off) a connection is made between the common (COM) and normally closed (NC) terminals, and there is no connection between COM and normally open (NO) terminals.
b. When the relay coil is energized, (LED will be on) a connection is made between the COM and NO terminals, and there is no connection between COM and NC terminals. Refer to *Relay Wiring Chart, Section 1.7.4*, on next page.

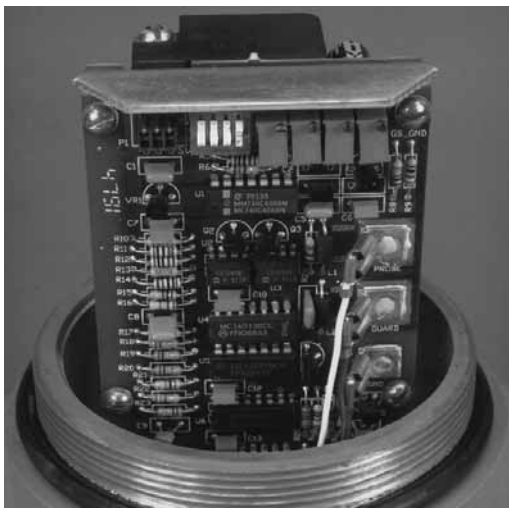


Figure 14

1.7.4 RELAY WIRING CHART

Kotron Power	Material Level	Fail-safe	Relay Coil	Relay Terminals	
				COM to NC	COM to NO
On	High	HLFS	De-energized	Closed	Open
		LLFS	Energized	Open	Closed
	Low	HLFS	Energized	Open	Closed
		LLFS	De-energized	Closed	Open
Fail	High	HLFS	De-energized	Closed	Open
		LLFS	De-energized	Closed	Open
	Low	HLFS	De-energized	Closed	Open
		LLFS	De-energized	Closed	Open

1.8 Calibration — Narrow Differential

Caution: In hazardous areas, do not remove housing cover until power is disconnected and atmosphere is determined to be safe. Hazardous environments must be declared safe by local safety authority.

1.8.1 Set Point Adjustment Alarm

1. Turn on power to the instrument.
2. Remove housing cover.
3. Set point location:
 - a. Conductive media: The set point is located at the tip of the probe (with guarded or other uninsulated probes). Calibration is not required for most conductive liquids. If the unit does not switch on alarm test, then proceed to Step 4.
 - b. Non-conductive media: The set point is located on the probe at a point determined by the set point adjustment. Minimum probe coverage is 4 inches (100 mm). Calibration is required. Proceed to Step 4.
4. Adjustments – Refer to Figure 15.

LONG DELAY
2 to 120 sec.

SHORT DELAY
0.5 to 7 sec.

DELAY DIRECTION
FAIL-SAFE

TIME DELAY

DIFFERENTIAL

COARSE

FINE

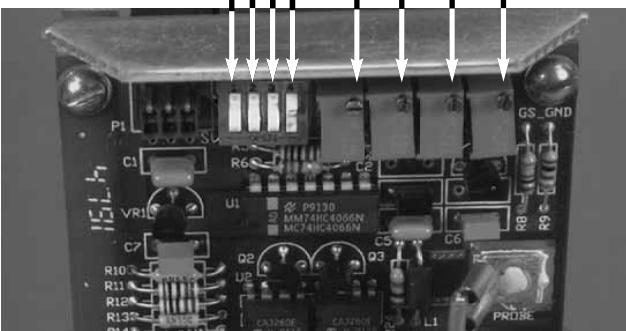


Figure 15

- 4.1 Dip switch
 - a. Fail-safe
ON = high level
OFF = low level
 - b. Time Delay Direction
ON = delay on rising level
OFF = delay on falling level
 - c. Short Time Delay (0.5 to 7 seconds)
3 ON, 4 OFF
 - d. Long Time Delay (2 to 120 seconds)
3 OFF, 4 ON

NOTE: Switch positions 3 and 4 cannot be both ON or both OFF. One must be ON the other OFF or the LED and relay will remain ON.

4.2 Potentiometers

a. Time Delay

- Allows continuous adjustment of time delay within limits of DIP switch range chosen
- Clockwise rotation increases delay.

b. Differential

- Allows continuous adjustment of pump or valve control ON to OFF.
- Clockwise rotation increases differential. Full counterclockwise rotation is the narrowest differential and is used for alarm applications.

c. Coarse

- Allows continuous adjustment of setpoint over the entire range of the electronics (0 to 1000 pF).
- Clockwise rotation raises SETPOINT on probe.

d. Fine

- Allows precision adjustment of SETPOINT within the limits of the COARSE SETPOINT adjusted initially.
- Clockwise rotation raises SETPOINT on probe.
- This is an extremely fine adjustment. Sometimes it is necessary to go 1 to 2 turns past the final SETPOINT to stop relay chatter. A small amount of time delay (2 turns) can also be used.

5. The LED shows the status of the relay coil.

LED on = relay energized | LED off = relay de-energized

6. Initial Settings

- a. Turn the COARSE, FINE, DIFFERENTIAL and TIME DELAY POTENTIOMETERS fully counterclockwise 25 full turns or until a clicking sound is detected.
- b. Turn FINE control approximately 12 turns clockwise to the midpoint.
- c. Set the DIP switch positions 3 ON, 4 OFF. (Note that if DIP switch positions 3 and 4 are both ON the LED and relay will remain on.)

1.8.2 Low Level Alarm

Fail-safe Low – with no media on the probe:

1. Set DIP switch positions 1 OFF, 2 OFF, 3 ON and position 4 OFF. LED will be ON.
2. Turn the COARSE control clockwise until the LED turns OFF.
3. Slowly turn the COARSE control counterclockwise until the LED is on.
4. Turn the FINE control clockwise until the LED stays OFF.

1.8.3 Low Level Alarm

Fail-safe Low – with media on the probe:

1. Set DIP switch positions 1 OFF, 2 OFF, 3 ON and position 4 OFF. LED will be ON.
2. Turn the COARSE control clockwise until the LED turns OFF.
3. Slowly turn the COARSE control counterclockwise until the LED is ON.
4. Turn the FINE control clockwise until the LED goes OFF, then counterclockwise until the LED stays ON.

1.8.4 High Level Alarm

Fail-safe High – with no media on the probe:

1. Set DIP switch positions 1 ON, 2 ON, 3 ON and position 4 OFF. LED will be OFF.
2. Turn the COARSE control clockwise until the LED turns ON.
3. Slowly turn the COARSE control counterclockwise until the LED is OFF.
4. Turn the FINE control clockwise until the LED stays ON.

1.8.5 High Level Alarm

Fail-safe High – with media on the probe:

1. Set DIP switch positions 1 ON, 2 ON, 3 ON and position 4 OFF. LED will be OFF.
2. Turn the COARSE control clockwise until the LED turns ON.
3. Slowly turn the COARSE control counterclockwise until the LED is OFF.
4. Turn the FINE control clockwise until the LED turns ON, then counterclockwise until the LED stays OFF.

1.8.6 Time Delay

If Time Delay is needed for any reason (e.g., surface waves causing relay chatter), the following two choices must be made:

Delay Function

- Delay on FILL (rising level) is DIP switch 2 ON.
- Delay on EMPTY (falling level) is DIP switch 2 OFF.

Delay Duration

- 0.5 to 7 second delay – DIP switch 3 ON, 4 OFF.
- 2 to 120 second delay – DIP switch 3 OFF, 4 ON.
- Clockwise rotation increases duration.

1.9 Calibration—Wide Differential

1.9.1 Set Point Adjustment Control

1. Turn on power to the instrument.
2. Remove housing cover.
3. Adjustments
 - 3.1 Dip switch
 - a. Fail-safe
 - ON = high level
 - OFF = low level
 - b. Time Delay Direction
 - ON = delay on rising level
 - OFF = delay on falling level
 - c. Short Time Delay (0.5 to 7 seconds)
 - 3 ON, 4 OFF
 - d. Long Time Delay (2 to 120 seconds)
 - 3 OFF, 4 ON

NOTE: Switch positions 3 and 4 cannot be both ON or both OFF. One must be ON the other OFF or the LED and relay will remain ON.

3.2 Potentiometers

- a. Time Delay
 - Allows continuous adjustment of time delay within limits of DIP switch range chosen.
 - Clockwise rotation increases delay.
- b. Differential
 - Allows continuous adjustment of pump or valve control ON to OFF.
 - Clockwise rotation increases differential. Full counterclockwise rotation is the narrowest differential and is used for alarm applications.
- c. Coarse
 - Allows continuous adjustment of setpoint over entire range of the electronics (0 to 1000 pF).
 - Clockwise rotation raises SETPOINT on probe.
- d. Fine
 - Allows precision adjustment of SETPOINT within the limits of the COARSE SETPOINT adjusted initially.
 - Clockwise rotation raises SETPOINT on probe.

-
- This is an extremely fine adjustment. Sometimes it is necessary to go 1 to 2 turns past the final SETPOINT to stop relay chatter. A small amount of time delay (2 turns) can also be used.
4. The LED shows the status of the relay coil.
LED on = relay energized.
LED off = relay de-energized
 5. Set the Fail-safe Mode Selection.
 - a. In low level fail-safe (LLFS) mode, the relay is de-energized on rising level and remains de-energized until upper differential point is reached.
 - b. In high level fail-safe (HLFS) mode, the relay is de-energized on falling level and remains de-energized until the lower setpoint is reached.
 6. DIP switch positions:
 - a. Low Level Fail-safe
1 OFF, 2 OFF, 3 ON, 4 OFF.
LED will be ON.
 - b. High Level Fail-safe
1 ON, 2 ON, 3 ON, 4 OFF.
LED will be OFF.
 7. Verify process level is at desired low control point.
 8. COARSE adjustment
 - a. Low Level Fail-safe
Turn COARSE control clockwise until LED turns OFF.
Turn COARSE control counter clockwise until the LED is ON.
Slowly turn COARSE control clockwise until LED is OFF. Low control point is now calibrated.
 - b. High Level Fail-safe
Turn COARSE control clockwise until LED turns ON.
Turn COARSE control counterclockwise until LED is OFF.
Slowly turn COARSE control counterclockwise until LED is ON. Low control point is now calibrated.
- NOTE: FINE control can be used during wide differential calibration, but is usually not needed.
9. Prior to raising level to desired high control point, turn Differential control 25 turns clockwise or until clicking sound is heard.
 10. Raise level to desired high control point.

11. Differential control

a. Low Level Fail-safe

Slowly turn Differential control counterclockwise until the LED turns ON. The wide differential point is calibrated.

b. High Level Fail-safe

Slowly turn Differential control counterclockwise until the LED turns OFF. The wide differential point is calibrated.

1.9.2 Time Delay

If Time Delay is needed for any reason (e.g., surface waves causing relay chatter), the following two choices must be made:

Delay Function

- Delay on FILL (rising level) is DIP switch 2 ON.
- Delay on EMPTY (falling level) is DIP switch 2 OFF.

Delay Duration

- 0.5 to 7 second delay – DIP switch 3 ON, 4 OFF.
- 2 to 120 second delay – DIP switch 3 OFF, 4 ON.
- Clockwise rotation increases duration.

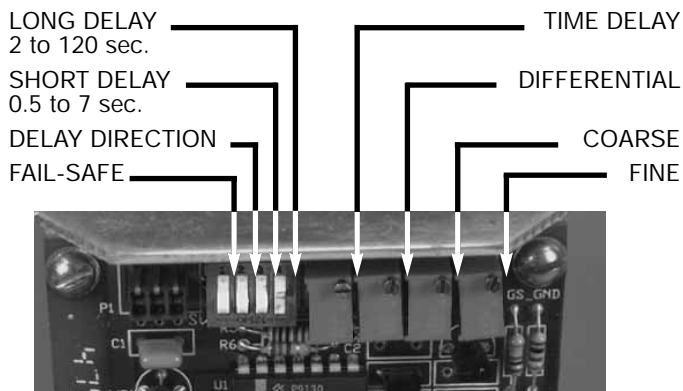


Figure 16

2.0 Reference Information

This section presents an overview of the operation of the Kotron Model 811 RF Point Level Sensor, information on troubleshooting common problems, intrinsic safety information, physical, functional and performance specifications, listings of agency approvals, and a list of recommended parts

2.1 Description

The Kotron Model 811 RF Point Level Sensor can be utilized in liquid or bulk material applications. There are no moving parts in contact with the medium.

2.2 Theory of Operation

As the medium in contact with the probe rises and falls, the amount of capacitance develops between the probe and the ground changes. This change in capacitance is converted into level. When the level (capacitance) reaches a desired amount, the relay will change state.

2.3 Troubleshooting

2.3.1 No Signal with Level Change

1. Check power and control circuit wiring.
2. Check DIP switch positions.
3. Check Calibration.
4. Check for proper ground reference particularly in non-metal tanks.

2.3.2 Probe

Caution: When an insulated probe is used in a hazardous and/or abrasive medium, the probe should be inspected periodically for nicks, cuts or abrasions which may ruin the integrity of the insulation. In the event that wear is found – replace the probe or consult the factory for further instructions. This procedure is critical in vessels containing hazardous media.

To check for a malfunctioning sensing probe:

1. Remove the white probe lead from the sensing probe and isolate it from the ground.
2. Connect an ohmmeter between the sensing probe terminal and ground. (i.e., stainless steel probe nut or housing base)

-
3. Measure the resistance between the probe and ground using the highest resistance scale available. If the resistance measures 10 Megohm to infinity and is stable, the probe is operating correctly. If the resistance measures less than 10 Megohm and/or is unstable, there may be a problem with the probe.

2.3.3 Switch Chatter



1. Check for turbulence. If turbulence is present, increase time delay until appropriate.
2. Check for proper power supply voltage.
3. Check for proper ground reference.

NOTE: If the application uses an insulated probe in a conductive medium, it is helpful to have the medium at its highest possible level. This aids in the detection of cuts or nicks in the insulation.

4. Inspect the malfunctioning probe for a cut in the insulating sheath or looseness in the seal at the probe mounting nut.
5. Inspect the probe for a coating or build-up of conductive medium.
6. Measure the resistance between the probe and ground using the highest resistance scale available. If the resistance measures 10 Megohm to infinity and is stable, the probe is operating correctly. If the resistance measures less than 10 Megohm and/or is unstable, there may be a problem with the probe.
7. If probe test is working properly, check for insufficient ground, loose or broken wiring, including the white probe wire. Also check continuity between probe mounting nut and metal tank. There should be continuity (zero resistance). If there is resistance, check for excessive teflon tape used on the probe threads.

NOTE: If the above suggestions prove unsuccessful, consult factory.

2.4 Agency Approvals

Agency	Approved Model	Protection Method	Area Classification
FM 	811-1X05-E0X 811-1X06-E0X with probe models: 041-5XXX-XXX and 8XX-XXX-XXX	Explosion Proof	Explosion proof with intrinsically safe probe circuit Class I, Div. 1, Groups C & D Class II, Div. 1, Groups E, F, & G NEMA 4X
	811-1X06-E0X (Remote) with probe models: 041-5XXX-XXX and 8XX-XXX-XXX	Intrinsically Safe	Remote probe: Class I, Groups A, B, C, & D Class II, Div. 1, Groups E, F, & G Class III, NEMA 4X
CSA 	811-1X05-E0X 811-1X06-E0X with probe models: 041-5XXX-XXX and 8XX-XXX-XXX	Explosion Proof	Explosion proof with intrinsically safe probe circuit Class I, Div. 1, Groups C & D Class II, Div. 1, Groups E, F, & G (Bare probes not approved for Groups E & F) TYPE 4X
	811-1X06-E0X (Remote) with probe models: 041-5XXX-XXX and 8XX-XXX-XXX	Intrinsically Safe	Remote probe: Class I, Div. 1, Groups A, B, C, & D Class II, Div. 1, Groups E, F, & G (Bare probes are not approved for Groups E & F) Class III TYPE 4X



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

2.5 Parts

2.5.1 Replacement Parts

Item	Description	Part Number	
	Complete electronic assembly:	Z30-9102-001	120 VAC
	Items 1 and 2 (listed below)	Z30-9102-002	240 VAC
	Mounting bracket	Z30-9102-003	12 VDC
		Z30-9102-004	24 VDC
①	Power supply board* (integral or remote)	Z30-4502-001	120 VAC
		Z30-4502-002	240 VAC*
		Z30-4502-003	12 VDC
		Z30-4502-004	24 VDC
②	I.S. amplifier board* (integral or remote)	Z30-4506-001	
③	Electronics cover (integral or remote)		
	Aluminum	002-6204-600	
	316 stainless steel	002-6204-605	
④	Electronics o-ring (integral or remote)	012-2101-345	
⑤	Electronics base (integral or remote)		
	Aluminum, dual 3/4" NPT conduit connection	004-9182-003	
	316 stainless steel, single 3/4" NPT conduit connection	004-9140-002	
⑥	Remote probe cover		
	Aluminum	004-9105-001	
	316 stainless steel	004-9142-001	
⑦	Remote housing o-ring	012-2101-345	
⑧	Remote housing base		
	Aluminum, single 3/4" NPT conduit connection	004-9104-001	
	316 stainless steel, single 3/4" NPT conduit connection	004-9140-002	
⑨	Remote triaxial cable (standard)**	037-3180-XXX	
⑩	Remote triaxial cable (high temperature)**	037-3184-XXX	
⑪	Remote mounting bracket		
	1/2" NPT conduit connection	036-3805-001	
	3/4" NPT conduit connection	036-3805-003	
⑫	Guarded Probe 18" (457 mm) (integral or remote)	8AD-AA1A-018	
⑬	Guarded Probe 36" (914 mm) (integral or remote)	8AD-AA1A-036	

* Refer to ESD handling procedure on page 1.

** Specify remote cable by exact length, 10 to 150 feet (3 to 45 M).

Standard (+176°F/+80°C) 37-3180-XXX (length in feet).

High Temp. (+392°F/+200°C) 37-3184-XXX (length in feet).

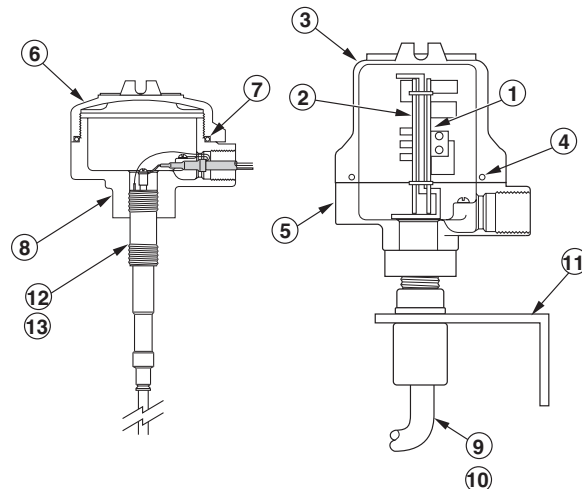


Figure 17

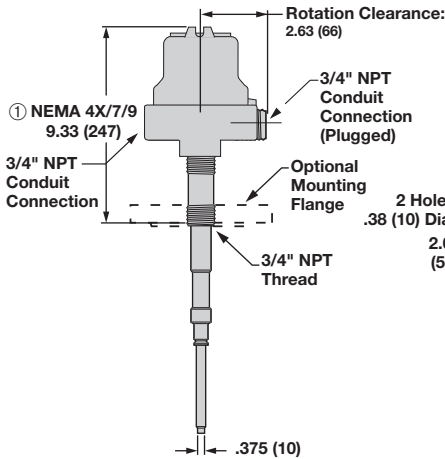
Remote Mount with Guarded Probe

2.6 Specifications

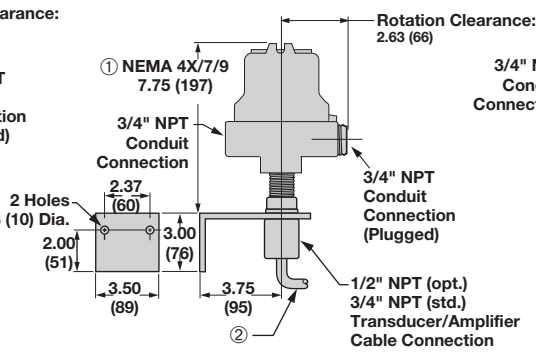
2.6.1 Functional

Supply Voltage	120 VAC	50–60 Hz (+10%, -15%)
	240 VAC	50–60 Hz (+10%, -15%)
	24 VDC	(±10%)
	12 VDC	(±10%)
Power Consumption	120 or 240 VAC	Less than 5 volt-amperes
	12 or 24 VDC	1 watt maximum
Zero Range		0 pF minimum to 1000 pF maximum
Adjustable Differential		0.5 pF to 700 pF
Output relays	DPDT with gold flash contacts	AC 10 amp @ 120/240 VAC resistive
	DPDT with gold flash contacts	DC 10 amp @ 30 VDC resistive
	DPDT with gold flash contacts	DC 0.5 amp @ 125 VDC resistive
Response time		100 milliseconds
Repeatability		Better than 1.0%
Ambient Temperature	Electronics	-40° to +160° F (-40° to +70° C)
Operating Process		
Pressure/Temperature	Dependent upon probe selected — See probe brochure 50-125	
Temperature Coefficient of		
Set Point	-40° to +160° F (-40° to +70° C)	± .01% per degree F of setpoint (± .018% per degree C of setpoint)
Electrostatic Discharge Protection		per IEC spec. 801-2

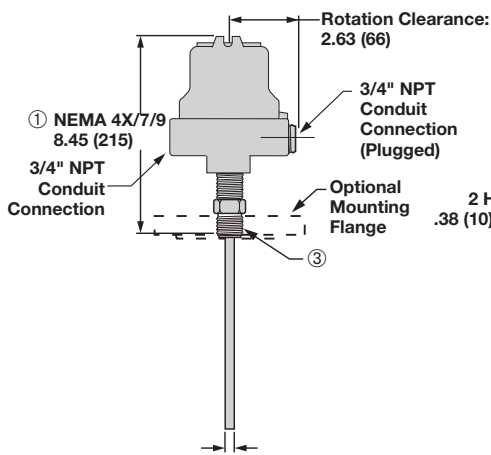
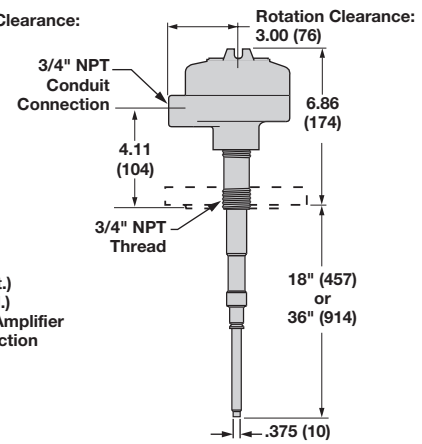
2.6.2 Physical



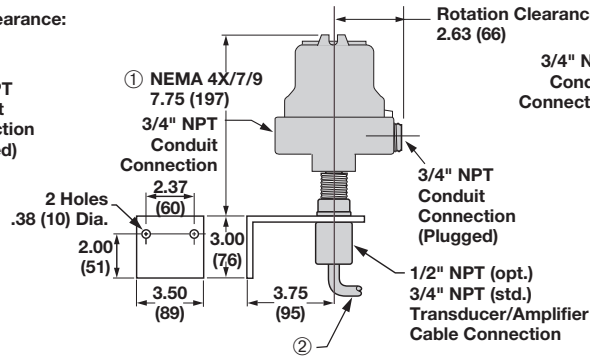
Integral Mount with Guarded Probe



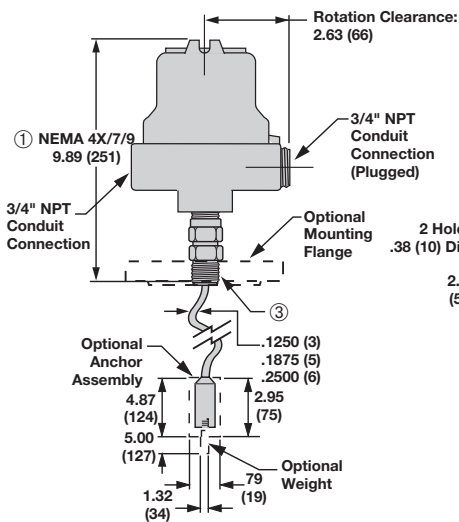
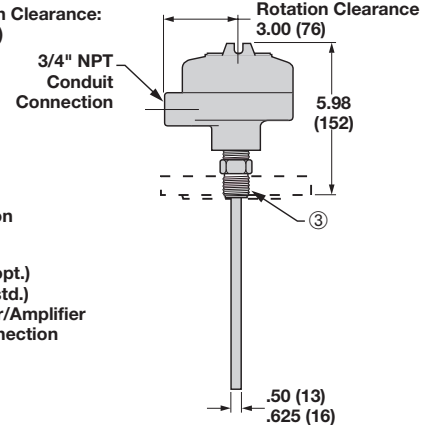
Remote Mount with Guarded Probe



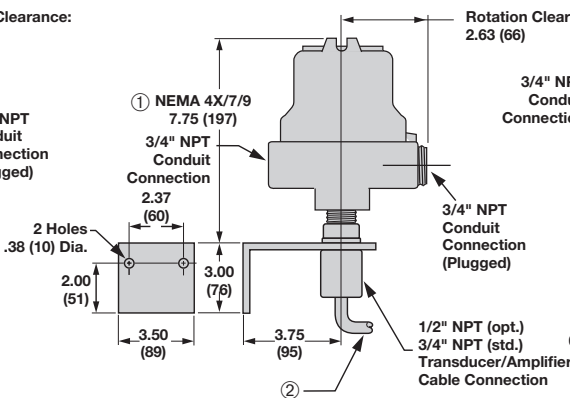
Integral Mount with Standard Rigid Probe



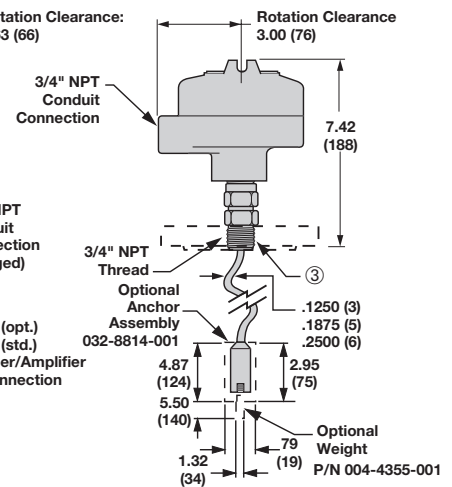
Remote Mount with Standard Rigid Probe



Integral Mount with Flexible Probe



Remote Mount with Flexible Probe



NOTES:

- ① Allow 6 in. (152 mm) overhead clearance for removal of NEMA 4X/7/9 cover.
 ② Probe/Amplifier Connecting Cable to be triaxial. Magnetrol P/N 037-3180-XXX standard or P/N 037-3184-XXX high temperature.

- ③ Standard process connection is 3/4" NPT. Consult probe brochure (50-125) for flange and other probe connections.

3.0 Model Numbers

BASIC MODEL — FM & CSA APPROVED MODELS

811	Kotron RF Capacitance Level Switch
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INPUT POWER

0	120 VAC
1	240 VAC
2	24 VDC
3	12 VDC

MOUNTING

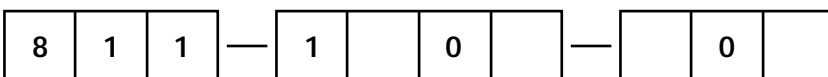
5	Integral
6	Remote

HOUSING

E	NEMA 4X/7/9 Groups C & D, aluminum, 3/4" NPT dual conduit
Y	NEMA 4X/7/9 Groups C & D, stainless steel, 3/4" NPT single conduit

PROBE

0	Probe ordered separately
1	18" (455 mm) guarded probe
2	36" (915 mm) guarded probe



NOTES:

Service Policy

Owners of Magnetrol/STI controls may request the return of a control or any part of a control for complete rebuilding or replacement. They will be rebuilt or replaced promptly. Controls returned under our service policy must be returned by Prepaid transportation. Magnetrol/STI will repair or replace the control at no cost to the purchaser (or owner) other than transportation if:

1. Returned within the warranty period; and
2. The factory inspection finds the cause of the claim to be covered under the warranty.

If the trouble is the result of conditions beyond our control; or, is NOT covered by the warranty, there will be charges for labor and the parts required to rebuild or replace the equipment.

In some cases it may be expedient to ship replacement parts; or, in extreme cases a complete new control, to replace the original equipment before it is returned. If this is desired, notify the factory of both the model and serial numbers of the control to be replaced. In such cases, credit for the materials returned will be determined on the basis of the applicability of our warranty.

No claims for misapplication, labor, direct or consequential damage will be allowed.

Return Material Procedure

So that we may efficiently process any materials that are returned, it is essential that a "Return Material Authorization" (RMA) number be obtained from the factory, prior to the material's return. This is available through Magnetrol's local representative or by contacting the factory. Please supply the following information:

1. Company Name
2. Description of Material
3. Serial Number
4. Reason for Return
5. Application

Any unit that was used in a process must be properly cleaned in accordance with OSHA standards, before it is returned to the factory.

A Material Safety Data Sheet (MSDS) must accompany material that was used in any media.

All shipments returned to the factory must be by prepaid transportation.

All replacements will be shipped F.O.B. factory.

NOTE: See Electrostatic Discharge Handling Procedure on page 1.



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