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Installation and Operating Instructions

507-6000 NoCal™
Point Level Control

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507-6000 NoCaI™ Point Level Control

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**SECTION 1
INTRODUCTION**

The instructions in this manual describe the AMETEK Drexelbrook *No-Cal*TM Point Level Control.

**1.1 System
Description**

The *No-Cal* Point Level Control includes:

- a 407-6000 Series electronic unit and,
- a 700 Series sensing element.

Cote-ShieldTM action is designed into each *No-Cal* Control and enables the instrument to ignore the effect of build-up or material coating on the sensing element.

The *No-Cal* instrument does not require calibration. It is initiated in the field using a magnetic key (provided with the instrument).

The 407-6000 electronic unit:

- provides double-pole double-throw relay contact closure when material reaches a specific point in a vessel. The relay contacts may be used to operate alarms, solenoid valves, or other low power devices.
- provides a 0-90 second time delay for agitated vessels.
- provides a manual VerifyTM test feature to ensure system is functioning properly.

The 700-series sensing element:

- is mounted in or near the material being measured.
- provides a change in RF admittance indicating presence or absence of material.
- consists of three sections (center measuring section, ground, and Cote-Shield). The Cote-Shield element guards against the transmission of RF current through any coating on the sensing element, from the center measuring element to ground. The only path to ground available for the RF current is through the material being measured. With remote-mounted electronics, the change in admittance at the sensing element is transmitted to the electronic unit through a Drexelbrook 380 Series cable.

1.2 Model Number

The model number for the *No-Cal* Level Control is

- System Model Number is 507-6000.
- Electronic Unit model number is 407-6XXX.
- Sensing Element is 700-X-XX.

4 0 7 - 6 X 0 0 - 0 0 X *No-Cal* Electronic Unit

|
Power:

0 = 120 Vac

3 = 230 Vac

|
Housing:

1 = No Housing, Chassis Only.

4 = Remote 4" Explosionproof Housing.

9 = Integral 4" Explosionproof Housing.

G = Remote 5" Explosionproof Housing Y-hub 3/4" NPT connection to sensing element.

H = Integral 5" Explosionproof Housing Y-hub 3/4" NPT connection to sensing element.

J = Integral 5" Explosionproof Housing Y-hub 1" NPT connection to sensing element.

K = Remote 5" Explosionproof Housing Y-hub 3/4" NPT connection to sensing element. No viewport.

L = Integral 5" Explosionproof Housing Y-hub 3/4" NPT connection to sensing element. No viewport.

M = Integral 5" Explosionproof Housing Y-hub 1" NPT connection to sensing element. No viewport.

- 1.2 Model Number (cont.) The remote electronic unit and sensing element are connected by:
- a three-terminal coaxial cable (380-0XX-1X):
 - general purpose (-12);
 - high temperature (-11);
 - composite-first 10 feet high temperature (-18).

- or -

- a CE mark triaxial cable (380-0XX-520).
- The XX in the model number indicates the length of the cable in feet.
- Standard length is 25 feet (e.g. 380-025-12).
- Longer and shorter lengths are available.
- Cable can also be purchased in bulk lengths with termination kits.

See Table 1-1 for detailed specifications of sensing elements that are most often recommended with the *NoCal* instrument. Contact the factory or your local representative if additional information is required.

| System Number | Typical Application | Sensing Element Model Number | Standard Material of Construction | OD and Standard Mounting | Temperature & Pressure Limits |
|----------------------|--|-------------------------------------|--|---|--|
| 507- | | | | | |
| 6000-X55 | Liquids, slurries, granulars | 700-1202-1 | T1 insulation | 3/8" OD 3/4" NPT | 450°F @ 200 PSI |
| 6000-X56 | Liquids, slurries, granulars | 700-1202-14 | T1 insulation | 3/8" OD 3/4" NPT with cable attachment and 316SS bottom weight | 450°F @ 200 PSI |
| 6000-X67 | Liquids, slurries, granulars | 700-1202-12 | T1 insulation | 3/8" OD 3/4" NPT with cable attachment and brass bottom weight | 450°F @ 200 PSI |
| 6000-X05 | Liquids, light slurries | 700-201-5 | Bare SS with TFE insulators | 1/4" OD 3/4" NPT | 100°F @ 1000 PSI 450°F @ 200 PSI |
| 6000-X36 | Liquids, light slurries, or granulars | 700-202-36 | 316 SS | 3/8" OD 1 1/2" Clamp | 300°F @ 50 PSI 450°F @ 20 PSI |
| 6000-X22 | Liquids, light slurries, or granulars | 700-202-43 | 316 SS | 1/2" OD 1" NPT | 100°F @ 1000 PSI 450°F @ 200 PSI |
| 6000-X02 | Liquids, light slurries, or granulars | 700-202-2 | 316 SS | 3/8" OD 3/4" NPT | 300°F @ 50 PSI 450°F @ 20 PSI |
| 6000-720 | Flush control | 700-207-1 | Special polyurethane and 304 SS | 12" x 12" | 180° @ 1PSI |
| 6000-721 | Flush control | 700-207-2 | TFE and 304 SS | 12" x 12" | 300° @ 1PSI |
| 6000-723 | Flush control | 700-207-3 | Rubber and 304 SS | 12" x 12" | 180° @ 1PSI |
| 6000-726 | Flush control | 700-207-6 | Special polyurethane and 304 SS | 8" x 8" | 180° @ 1PSI |
| 6000-X18 | Corrosive liquids | 700-1-18 | PFA | 3/8" OD 3/4" NPT | 300° @ 50 PSI |
| 6000-748 | Insulating or Conductive High temperature and pressure | 700-204-48 | 316 SS Ceramic | 1/2" OD 1 1/4" NPT | 600° @ 4000PSI |

*Table 1-1
Sensing Element
Model Numbering*

SECTION 2 - INSTALLATION

Mounting dimensions are shown in Figure 2-1.

2.1 Unpacking

Carefully remove the contents of the shipping carton and check each item against the packing list before destroying any packing material. If there is any shortage or damage, report it immediately to the factory.

2.2 Mounting and Installation Guidelines

The *No-Cal* electronic unit is designed for field mounting, but it should be mounted in a location as free as possible from vibration, corrosive atmospheres, and any possibility of mechanical damage. For convenience at start-up, place the instrument in a reasonably accessible location. Ambient temperatures at the electronic unit should be between -40°F and 140°F (-40°C to 60°C).

Water damage is the leading cause of equipment failure. Make sure water and corrosive fumes cannot enter the conduit, electronic unit, or housings. If a vertical run of conduit is necessary, install a drip loop and breather drain to purge any accumulated moisture.

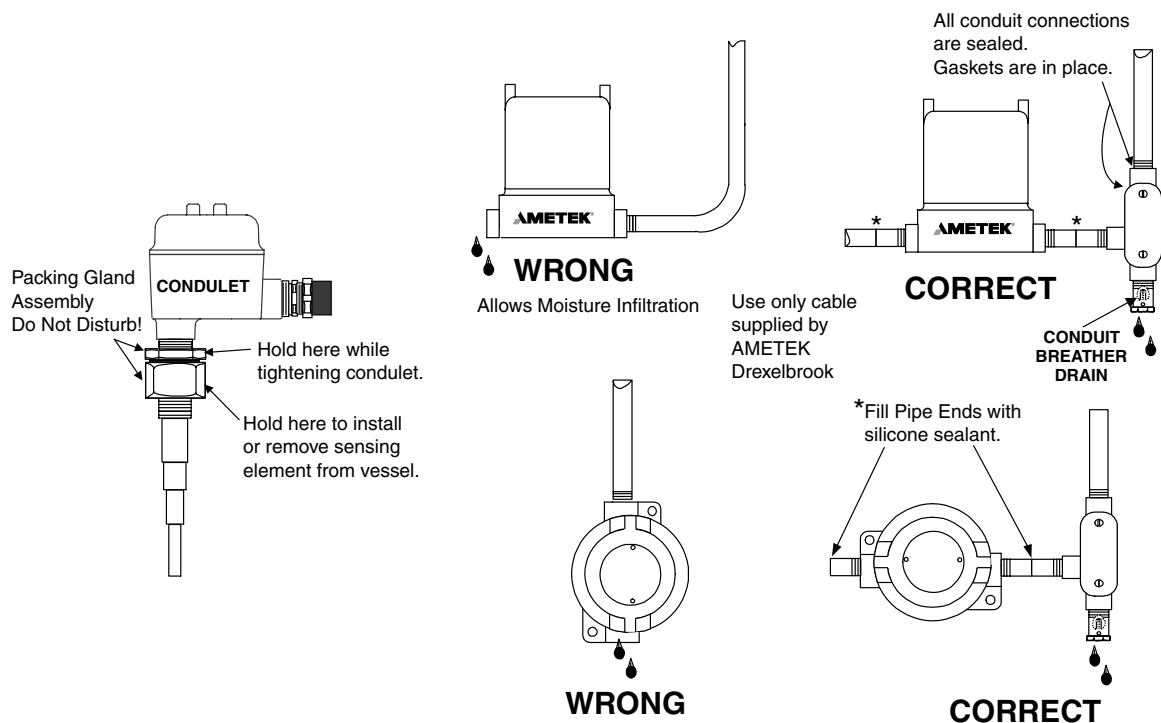
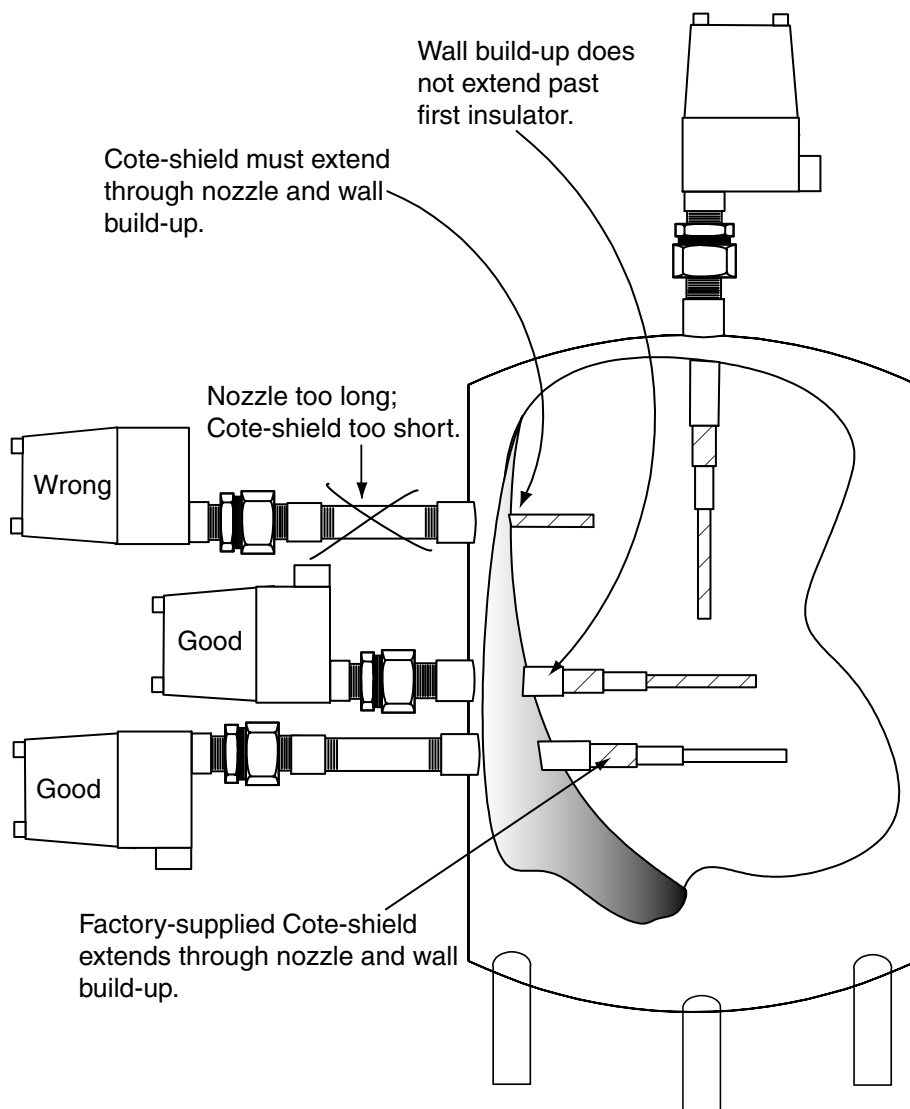


Figure 2-1
Installation Guidelines

2.2 Mounting and Installation Guidelines (cont.)

The following items should be taken into consideration when mounting the sensing element. Refer to Figure 2-2.

- When installing flange-mounted sensing elements, keep mating surfaces and bolts free of paint and corrosion to ensure proper electrical contact with the vessel. Avoid using excessive amounts of Teflon™ tape when installing threaded sensing elements.
- If the installation area is rated explosionproof and requires conduit seal fittings, they should be used in accordance with company standards and local codes.



- Mounting the sensing element inside a pipe is not recommended.
- Do not mount a Cote-Shield sensing element through a nozzle that exceeds the length of the first insulator.
- Ensure that there are no obstructions or agitator blades in the way of the sensor.
- Rigid sensing elements can be mounted either vertically or horizontally.

Figure 2-2
Installation Recommendations

2.3 Wiring the Electronic Unit

WARNING

If the *No-Cal* instrument is located in a hazardous environment, do not open the enclosure cover or make/break any electrical connections without first disconnecting electrical power at the source. Ensure that the wiring, electrical fittings and conduit connections conform to the electrical codes for the specific location and hazard level.

Refer to Figure 2-3 and use the following steps to wire the *No-Cal* instrument:

- a. Ensure that all power to the wiring is off.
- b. Remove the cover.
- c. The power connections are made to terminals 1, 2, and 3 on the electronic chassis as shown in Figure 2-3, using 12-28 gauge wire. The *No-Cal* instrument requires 1 watt of power.
- d. The alarm relays are wired as shown in Figure 2-4.
- e. Review Checklist:
 - Wiring correct.
 - Input voltage matches instrument label.
 - Proper output connections.
- f. Replace the cover prior to restoring power if in hazardous area.
- g. Turn power on.

407-6000 120 VAC
407-6300 240 VAC

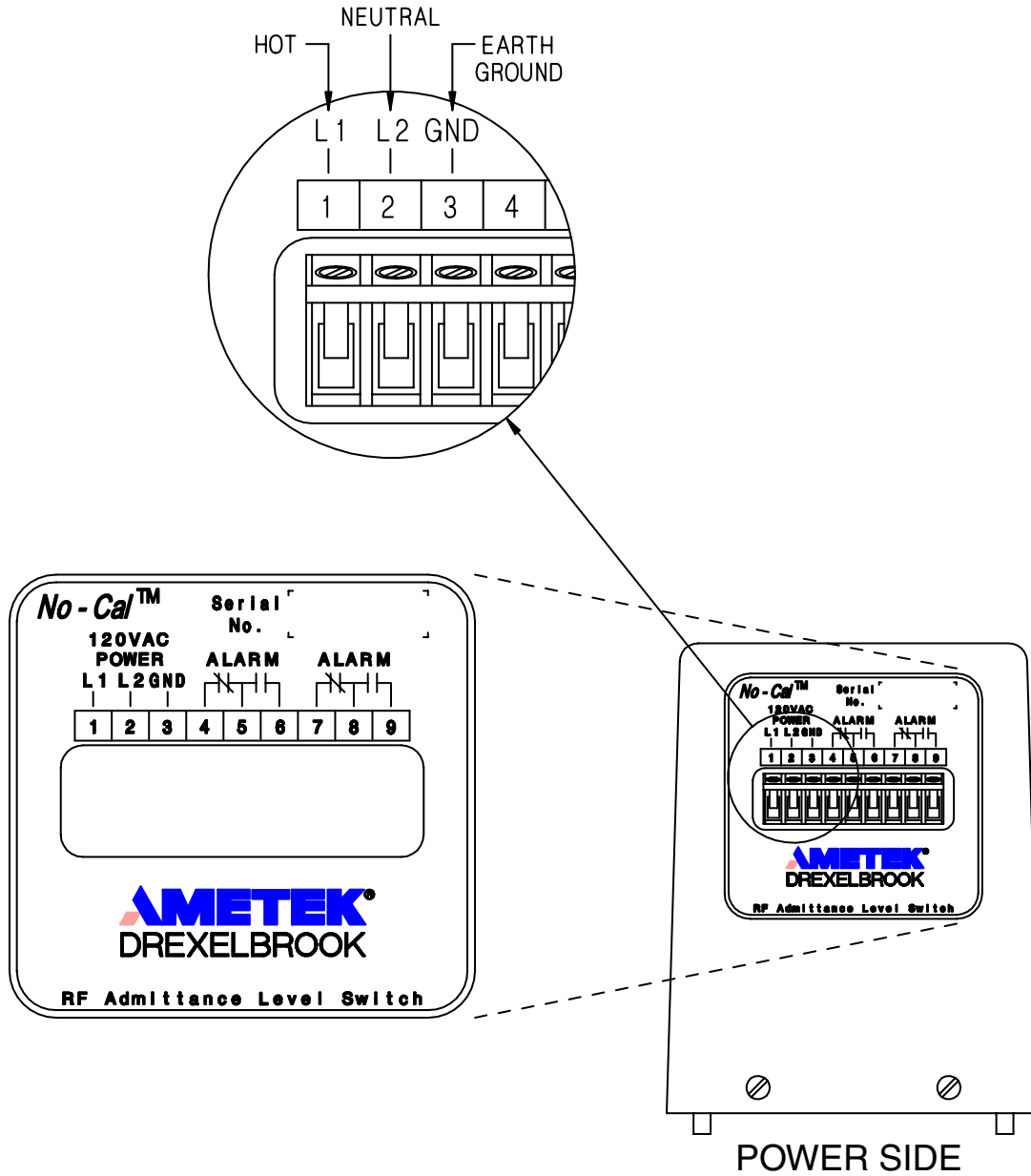


Figure 2-3
Wiring the Electronic Unit

2.4 Wiring the Relays

Refer to Figure 2-4 for the relay contact wiring. The *No-Cal* relay has double-pole, double-throw (DPDT) dry contacts. The relay serves as a switch and does not provide the power to operate an annunciator or other equipment. All relay connections are made to the terminal strip on the electronic unit.

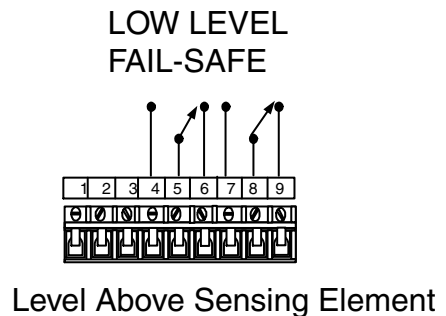
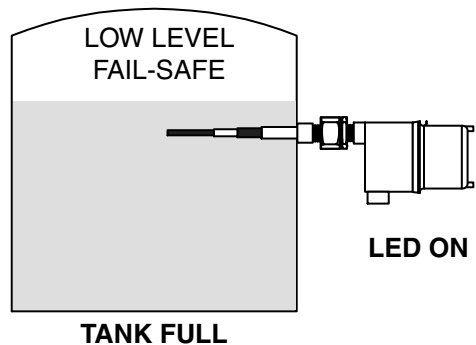
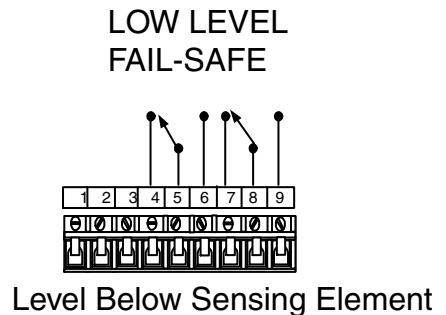
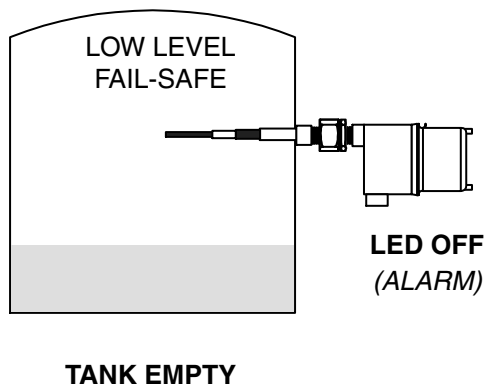
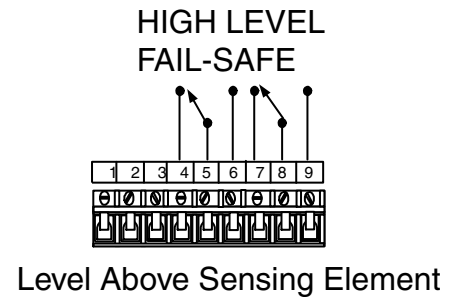
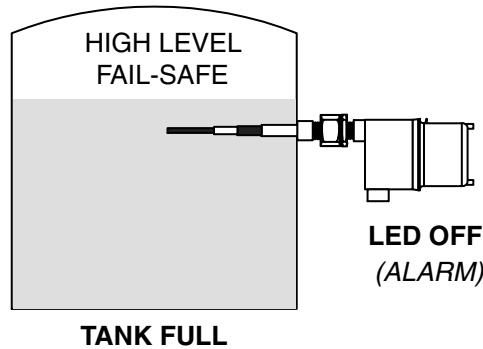
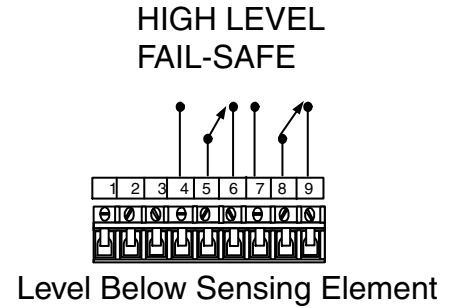
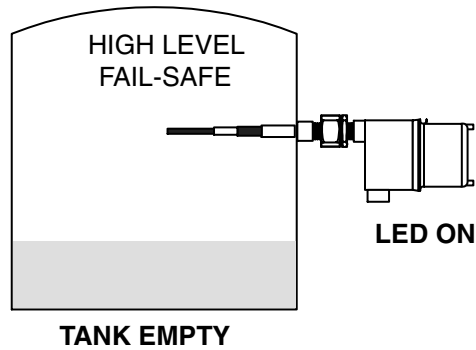
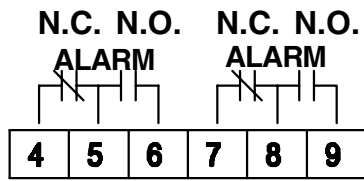


Figure 2-4 Wiring the Relays

2.5 Wiring the Sensing Element

If the *No-Cal* instrument has the electronic unit mounted in the same housing as the sensing element (integral mount), the sensing element is prewired at the factory, as shown in Figure 2-5.

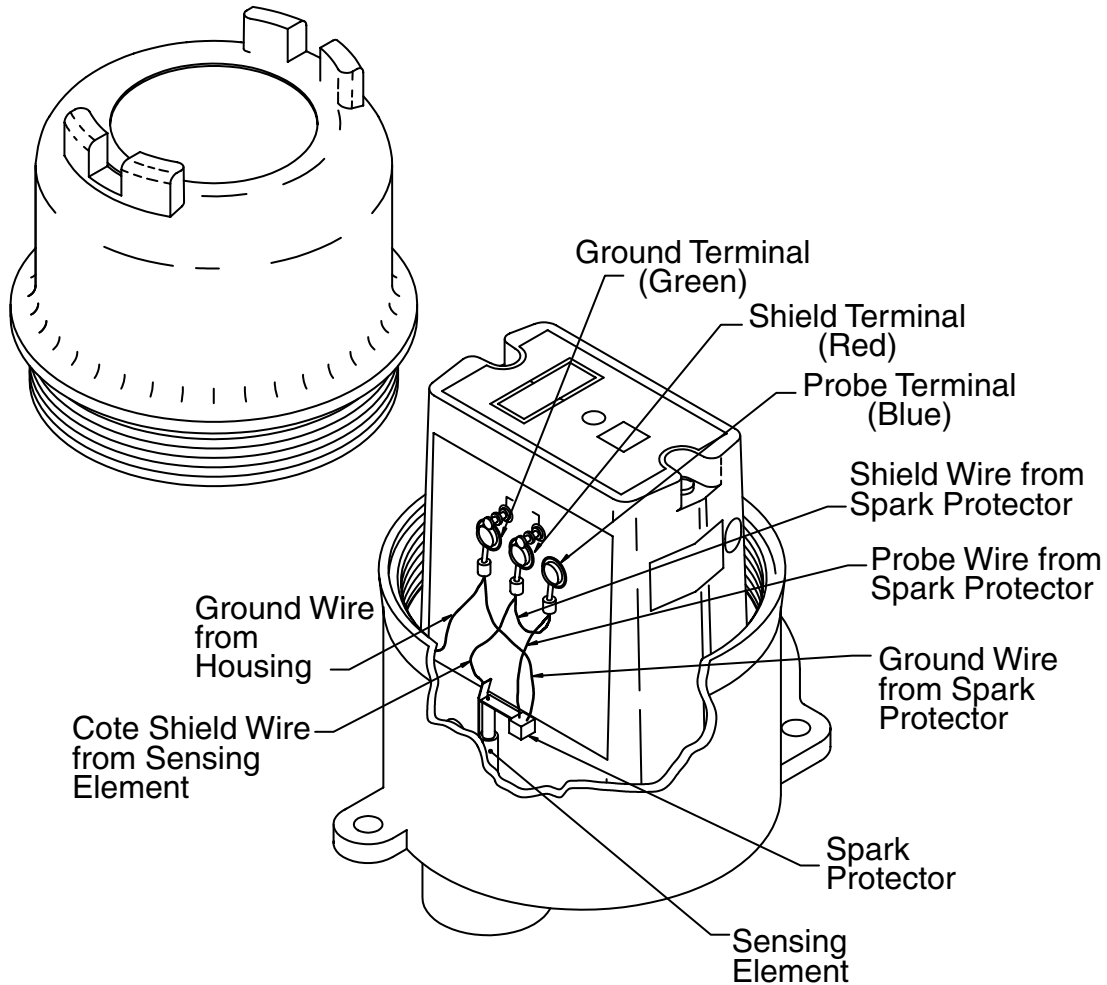


Figure 2-5
Sensing Element Wiring
Integral Mount

2.5 Sensing Element Wiring (cont.)

For *No-Cal* instruments that are mounted remotely from the sensing element, the cable connections from the sensing element to the electronic unit are made to the individual terminals on the side opposite the terminal strips. See Figure 2-6.

NOTE

It is important that the sensing element cable is mechanically separated from the power wiring.

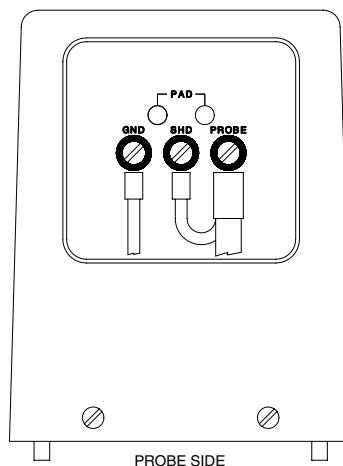


Figure 2-6
Sensing Element Wiring
Remote Mount

When installing remote-mount electronics, use the cable supplied by AMETEK Drexelbrook. See Figure 2-7. The cable can be a maximum of 150 feet. Termination kits are available to shorten the cable if necessary.

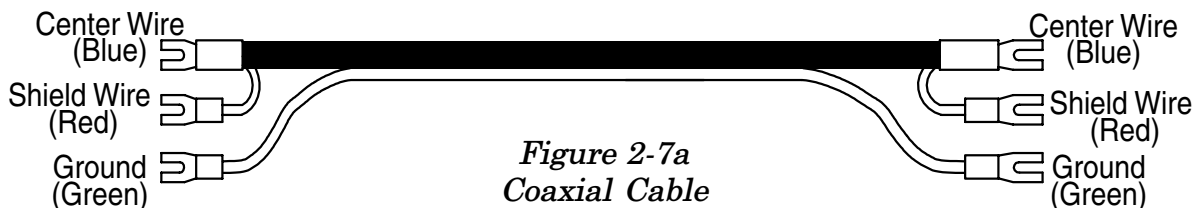


Figure 2-7a
Coaxial Cable



Figure 2-7b
Triax Cable

2.5 Sensing
Element
Wiring
(cont.)

Following are recommendations for wiring the sensing elements.

CAUTION

When pulling the cable through the conduit, do not use pulling lubricant. Pulling lubricant changes the electrical characteristics of the cable.

- The remote-mount sensing element cable connections are made to the sensing element after it has been installed in the vessel, with the conduit attached.
- For two-terminal sensing elements, the shield connection at the conduit end must be taped so that it cannot short circuit.
- Do not coil up excess interconnecting coaxial cable. Coiled coaxial cable acts as an antenna to pick up stray 60 Hz noise. Termination kits are available from the factory to shorten the cable.
- Always terminate and use the cote-shield pigtail wire at the electronic unit end.
- No adjustment of the instrument is required to compensate for cable length.

2.5.1 Spark Protection

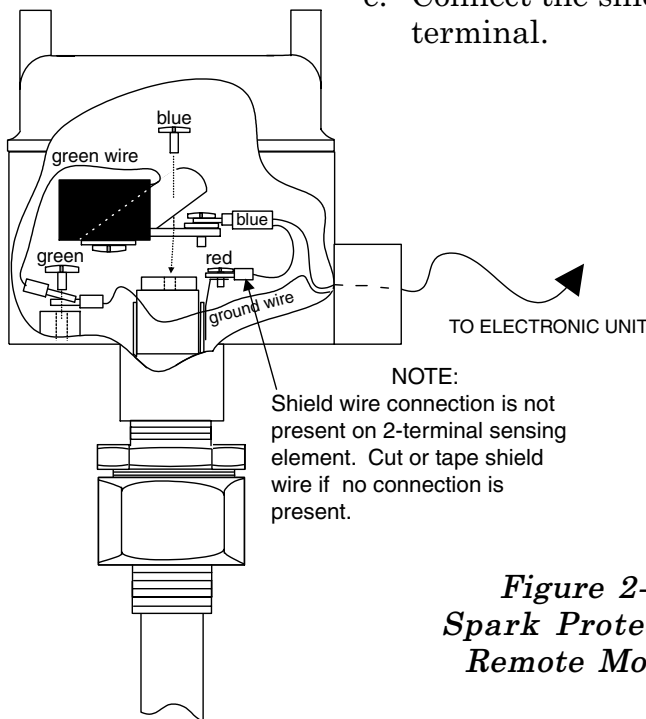
NOTE

A spark protector is factory-installed with integral *No-Cal* instruments. If supplied with a remote *No-Cal* instrument, a spark protector requires installation.

Applications involving insulating granulars and insulating liquids may require extra spark protection against static discharge that can damage the electronic unit. If required, a heavy duty spark protector is normally shipped separately (remote units) and must be mounted in the sensing element conduit when wiring the instrument.

If spark protection is supplied, use the following instructions for installing the spark protector in the sensing element conduit. See Figure 2-8.

- a. Attach the mounting link on the spark protector to the sensing element center connection screw.
- b. Connect the green wire from the spark protector to the conduit ground screw.
- c. Feed the cable into the conduit.
- d. Connect the cable center wire (CW) to the spark protector and the cable ground wire (gnd) to the conduit ground screw.
- e. Connect the shield wire (SH) to the Cote-Shield terminal.



NOTE

For sensing elements that do not have shield connections, tape the shield wire at the conduit so that it does not short circuit.

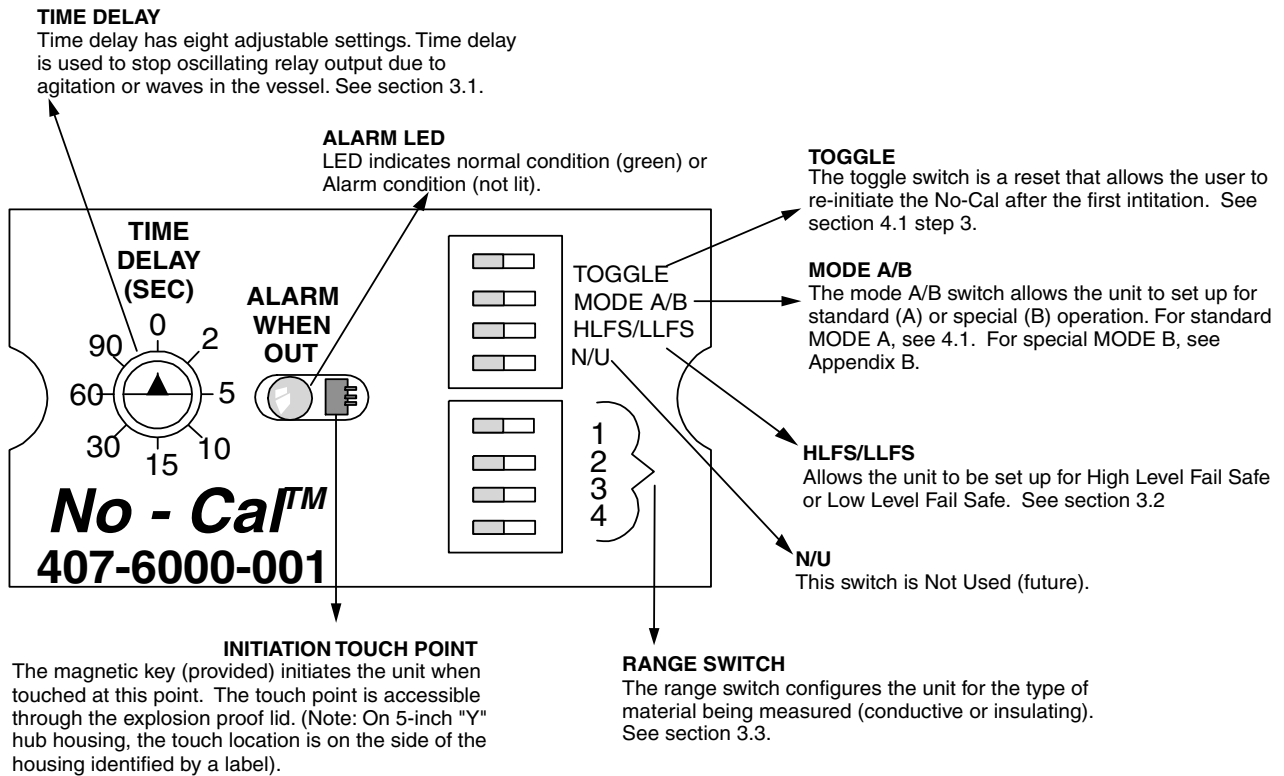
Figure 2-8
Spark Protection
Remote Mount

**SECTION 3
OPERATION**

This section describes the operating switches of the *No-Cal* instrument. Remove the dome lid and use a small screwdriver to set the switches. Figure 3-1 shows the top panel of the *No-Cal* instrument.

WARNING

Before the explosionproof cover is removed to configure the unit, the area must be checked and known to be non-hazardous or, power should be removed from the unit. When configuration is complete, the cover must be replaced prior to re-applying power.



*Figure 3-1
Top Panel of No-Cal Instrument*

3.1 Time Delay

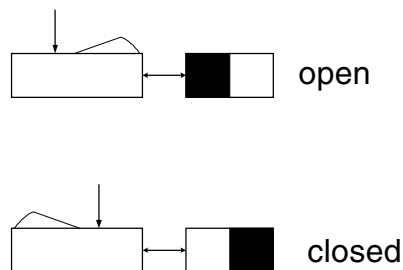
The time delay adjustment switch is located on top of the instrument, as shown in Figure 3-1. It is used to help stop an oscillating relay output due to agitation or waves in the vessel.

- There are eight time delay settings:

| | |
|------------|------------|
| 0 seconds | 15 seconds |
| 2 seconds | 30 seconds |
| 5 seconds | 60 seconds |
| 10 seconds | 90 seconds |
- The delay applies only to recovery from the alarm condition.
- With High Level Failsafe, the delay will be effective only on falling level. The output will indicate high level as long as waves continue to touch the sensing element. The unit will stop indicating high level only after the delay time has passed, with no further contact between the sensing element and the material being measured.

3.2 Failsafe Selector

Failsafe describes the level condition which causes the output relay to de-energize and also the state of the relay upon loss of power.



- High Level Failsafe (HLFS) means the relay will de-energize when level is high, indicating high level upon loss of power. (N.O. contacts open/N.C. contacts closed)
- Low Level Failsafe (LLFS) means the relay will de-energize when level is low, indicating low level upon loss of power. (N.O. contacts open/N.C. contacts closed)
- The instrument is supplied in the failsafe mode that is requested when the order is placed (default is HLFS).
- The failsafe is field selectable by a dip switch on top of the electronic unit. See Figure 3-2.

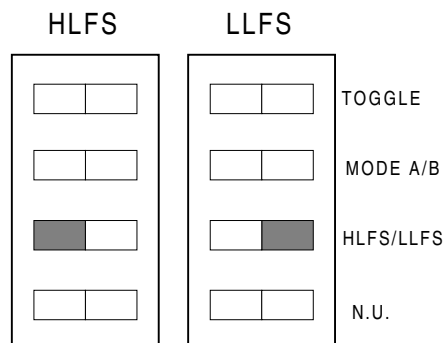


Figure 3-2
Failsafe Switch Settings

3.3 Range Setting

Table 3-1 provides a guideline for the range settings per application. The range switch settings are shown in Figure 3-3.

| Range Setting | Pre-load | Liquids | Granular |
|---------------|----------|------------|-------------------------------|
| Range 0 | 0.5 pF | See Note 1 | 20 to 40# per cubic foot |
| Range 1 | 1 pF | Insulating | 30 to 60# per cubic foot |
| Range 2 | 2 pF | See Note 1 | 50# per cubic foot or greater |
| Range 3 | 5 pF | See Note 1 | See Note 1 |
| Range 4 | 15 pF | Conductive | Conductive |

Table 3-1
Range Switch Settings

NOTES

1. The range setting recommendations for liquid and granular applications are typical. However, in some cases, it may be necessary to step up or down to the next range setting. If the switch fails to operate properly in the recommended setting, see *Section 5, Troubleshooting*.
2. Most water-based materials are conducting. This includes water, acids, bases, salt solutions, water-based slurries, and very wet granular materials. Carbon black and powdered metals are conducting even without water.

Select the range of the No-Cal instrument using the dip switch on top of the unit, as shown in Figure 3-3.

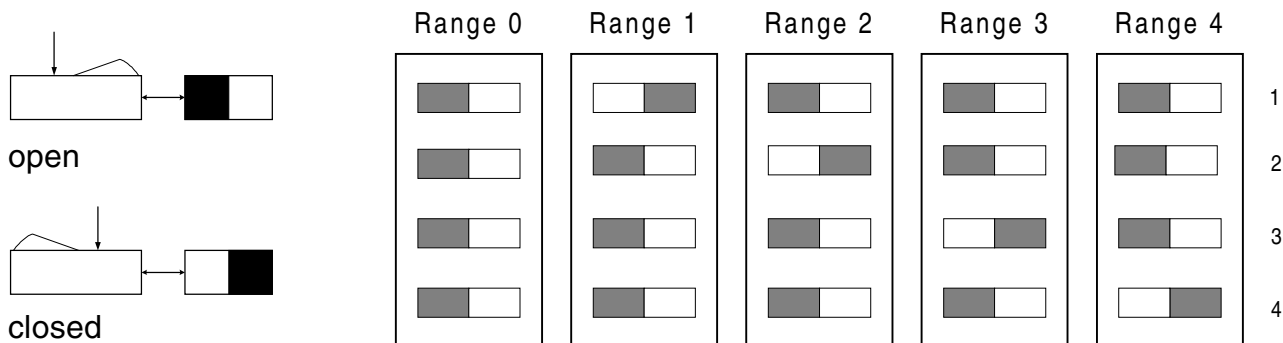


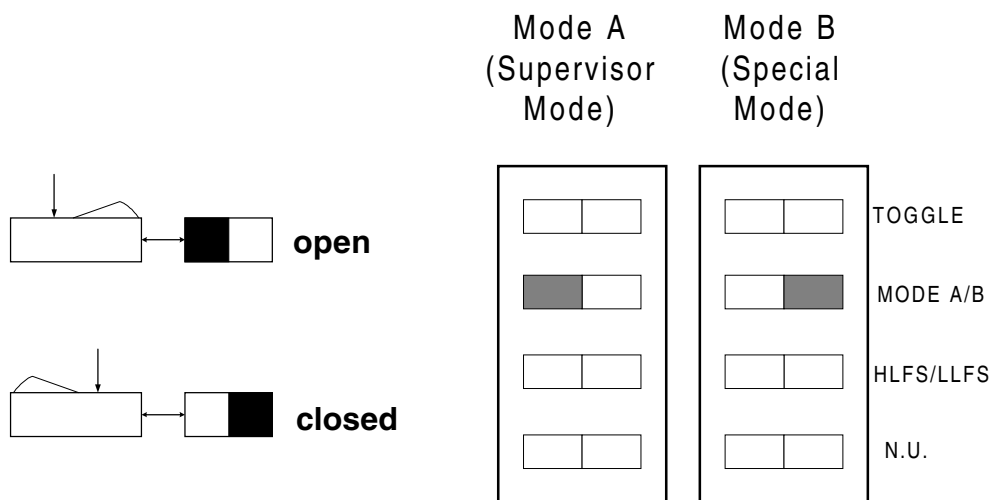
Figure 3-3
Range Setting

SECTION 4 INITIATION

There are two modes of initiation for the *No-Cal* unit.

Mode A Supervisor Mode
In Mode A, the unit is initiated the first time that the magnetic key is applied. If the key is applied to the unit after initiation, a Verify test is performed instead of initiation (see *Section 4.3*).

Mode B Special Mode
Refer to *Appendix A* for instructions on using Mode B.



4.1 Initiation Mode

Mode A (Supervisor Mode)

WARNING

Before the explosionproof cover is removed to configure the unit, the area must be checked and known to be non-hazardous or, power should be removed from the unit. When configuration is complete, the cover must be replaced prior to re-applying power.

To use the *No-Cal* unit in Mode A:

1. Remove the dome lid.
2. Make sure unit is set to Mode A.
3. Change the position of the TOGGLE switch (shown in Figure 3-1) from left to right or right to left. (This is a reset switch that allows the unit to be initiated. The final position of the switch is of no consequence.)

4.1 Initiation Mode (cont.)

4. Set range setting (see *Section 3.3*).
 5. Set failsafe mode (see *Section 3.2*).
 6. Replace dome lid and re-apply power to unit.
 7. Make sure the sensing element is uncovered.
 8. Apply the magnetic key for 2 seconds and then remove it to initiate the instrument. (On 5-inch "Y" hub housing, the magnetic touch location is on the side of the housing identified by a label).
 9. The LED flashes for approximately 7 times and then remains **ON** in HLFS mode; **OFF** in LLFS mode.
- Initiation is complete.
 - Any subsequent application of the magnetic key causes a Verify test to be performed (on HLFS only). See *Section 4.3*.

4.2 Normal or Extended Range

The range selector switch on the side of the instrument (Figure 4-1) is set at the factory. In most applications, the *No-Cal* instrument functions in normal range. However, when the standing capacitance (pF) of the sensing element in air is very high, extended range is used.

The *No-Cal* unit indicates when to use extended range; the LED goes into a continuous pulse flash mode.

Place the unit in extended range by:

- locating range selector jumper on side of unit. See Figure 4-1.
- moving jumper from the upper two pins to the lower two pins.
- reset the unit by initiation (see *Section 4.1*).

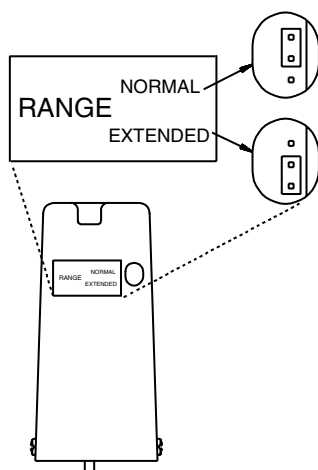


Figure 4-1
Range Selector Switch

4.3 Verify[™]Test

The Verify test feature performs a confidence test of the system by duplicating the same signal as a high-level alarm condition. Simulating a high level with the Verify test feature:

- confirms that the system is set up correctly for ISO 9000 purposes.
- checks the integrity and continuity of wiring connections.
- verifies that the sensing element is working properly.
- checks the relay connection to other control devices.

The manual Verify test (HLFS) can be performed in the Supervisor mode (Mode A) only.

Do the following to manually verify the No-Cal unit:

- a. Initiate the No-Cal unit in the Supervisor mode (see *Section 4.1*).
- b. Place the magnetic key in the window area of the dome. (On 5-inch "Y" hub housing, the magnetic touch location is on the side of the housing identified by a label).
- c. The unit will alarm for 2 seconds (relay changes state and LED is not lit) and then return to normal.

SECTION 5 TROUBLESHOOTING

The *No-Cal* Level Control is a solid-state device with no moving parts other than its relays, and requires no maintenance or adjustments. The units are designed to give years of unattended service.

A spare electronic chassis is recommended for every 10 units so that, in case of a failed unit, a critical application will not be held up while the unit is returned to the factory for repair.

Use the following troubleshooting procedures to check out the *No-Cal* Level Control. If attempts to locate the difficulty fail, notify your local Drexelbrook representative, or call the factory direct at 1-800-527-6297 (US and Canada) or 1-215-674-1234 (International).

5.1 Testing the Sensing Element

NOTE

The sensing element is intrinsically safe. Therefore, when using this product, it is recommended that all service activity comply with appropriate guidelines.

The following procedure is used to test the sensing element:

- a. If the electronic unit is integrally-mounted, remove all wires leading from the sensing element to the electronic unit.

If the sensing element is remotely-mounted, disconnect all three coax leads at the sensing element.

- b. On remote-mount instruments, remove spark protector if present.
- c. Use an analog ohmmeter¹ that is set to the R x 1K ohm scale. Measure the resistances between each pair of sensing element terminals. See Figure 5-1.

| | |
|-----------------------|-----------|
| Center wire to ground | _____ohms |
| Center wire to shield | _____ohms |
| Shield to ground | _____ohms |

¹Use an analog ohmmeter because the ohms/volt rating is lower and it provides more current to measure the resistance.

5.1 Testing the Sensing Element (cont.)

A new sensing element that is clean and not coated or wet should look like an open circuit on all sensing element tests.

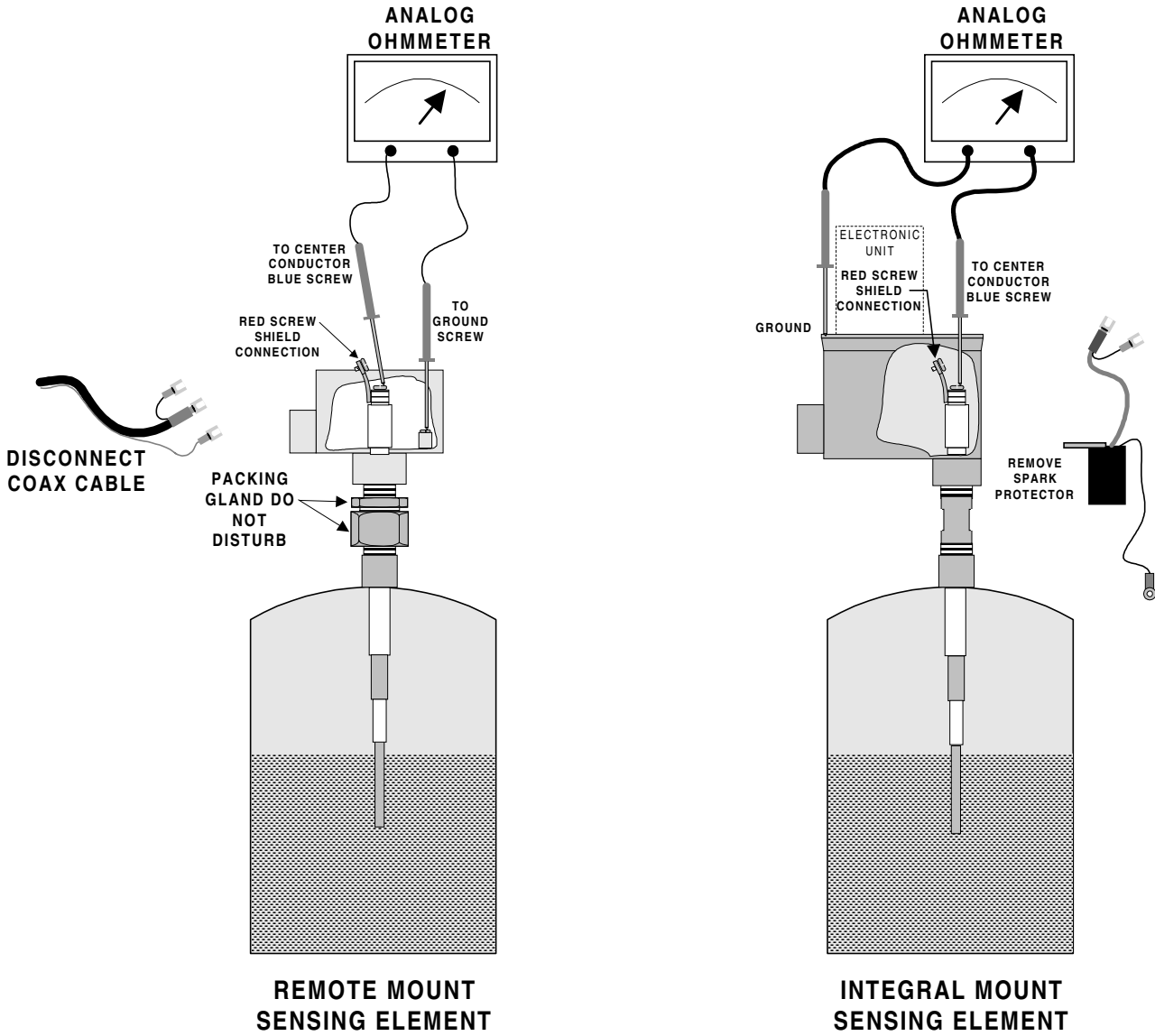
If the sensing element is clean and dry, and shows resistance between terminals of less than 10K ohms, it is possible that moisture has soaked into the gland of the sensing element. In this case, the sensing element may be dried until the resistance increases to its maximum value.

If the process material is conductive, you may read some resistance between sensing element terminals. The lowest permissible resistance values are:

| | |
|-----------------------|------------|
| Center wire to ground | 1000 ohms. |
| Center wire to shield | 600 ohms. |
| Shield to ground | 300 ohms. |

A resistance reading of less than 10 ohms on any sensing element terminal is usually due to a metal-to-metal short circuit. Check that the sensing element is not touching any vessel structure.

5.1 Testing the Sensing Element
(cont.)



MEASURE SENSING ELEMENT RESISTANCE

| | |
|-----------------|------------|
| CENTER - GROUND | ohms _____ |
| CENTER - SHIELD | ohms _____ |
| SHIELD - GROUND | ohms _____ |

Figure 5-1
Checking the Sensing Element

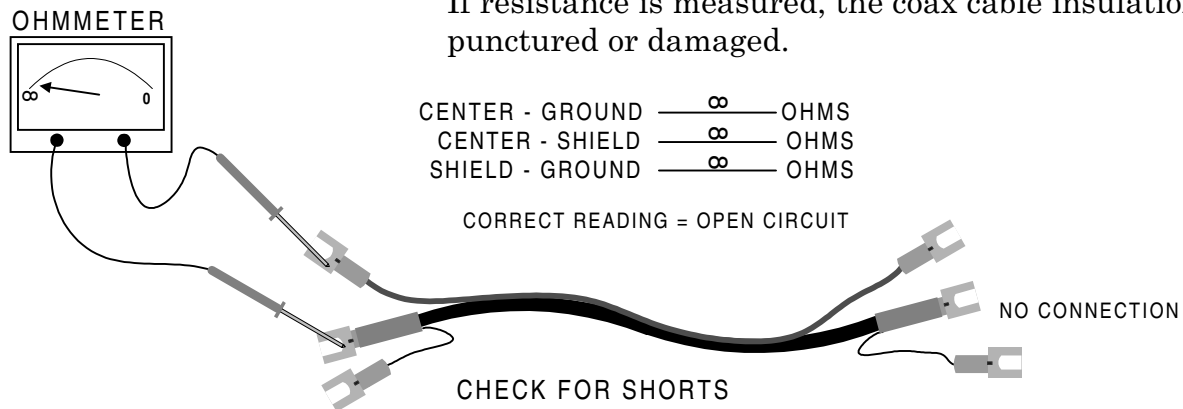
5.2 Testing the Cable

NOTE

Water or other conductive material in the conduit can change the electrical properties of the coax cable and cause the system to perform poorly. Moisture in the conduit may not be detected by the following test. Inspect the coax and associated conduit for trapped water.

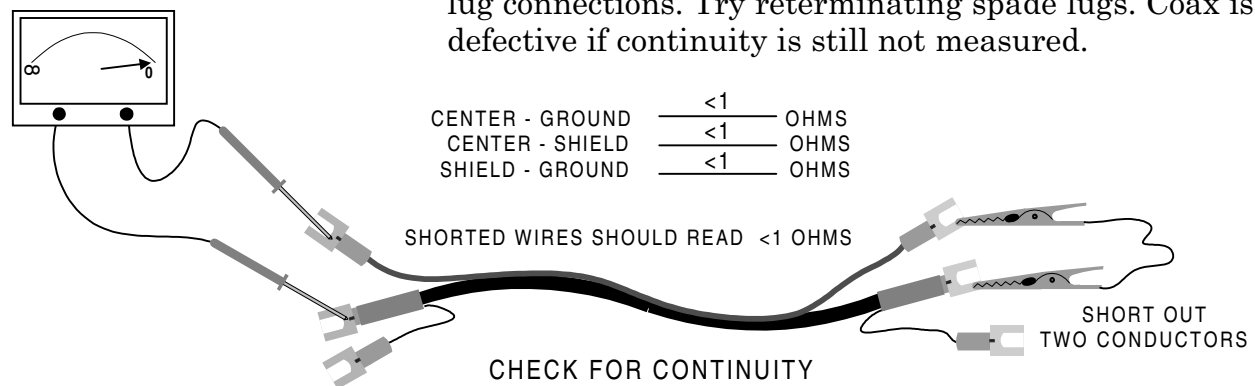
1. Disconnect all three spade lugs of the coaxial cable at the electronic unit.
2. Disconnect all three spade lugs of the coaxial cable at the sensing element.
3. Check for short circuits. Using an ohmmeter, measure between two of the coaxial cable conductors. Repeat for all three conductors. All readings should show an open circuit, (infinite resistance).

If resistance is measured, the coax cable insulation is punctured or damaged.

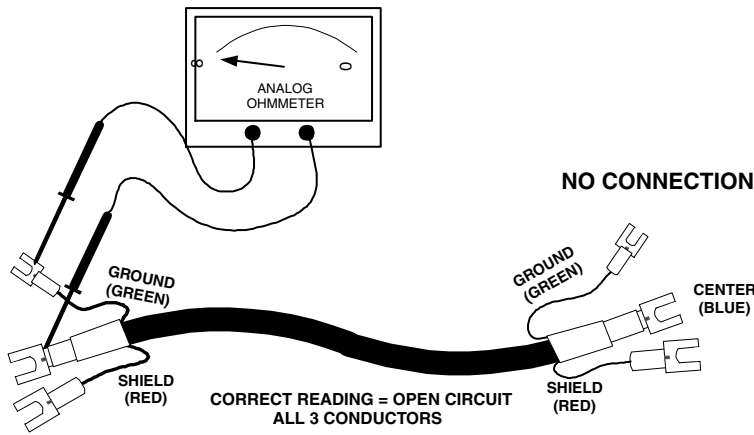


4. Check for continuity of each conductor. Short out two of the coaxial cable conductors. Using an ohmmeter, measure between two of the coaxial cable conductors. Repeat for all three conductors. All readings should show less <1 ohm resistance.

If no continuity is measured, check for corroded spade lug connections. Try reterminating spade lugs. Coax is defective if continuity is still not measured.



TRIAx CABLE CHECK

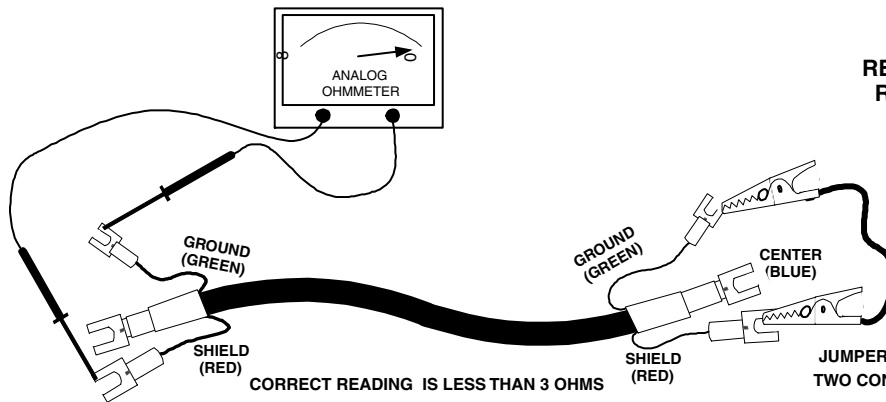


RESISTANCE READINGS

CW - G = _____
 CW - S = _____
 SH - CW = _____

NO CONNECTION

CHECK FOR SHORT CIRCUIT



RESISTANCE READINGS

CW - G = _____
 CW - S = _____
 SH - CW = _____

CHECK FOR CONTINUITY

5.3 Testing the Relay Circuits

Use the following steps to check out the relay circuits:

- a. The relay circuits consist of double-pole double-throw relay contacts brought out to terminal strips. When the relays are operating properly, one pair of contacts will be open with high or low level, and one pair will be closed with high or low level. See Figure 5-2.

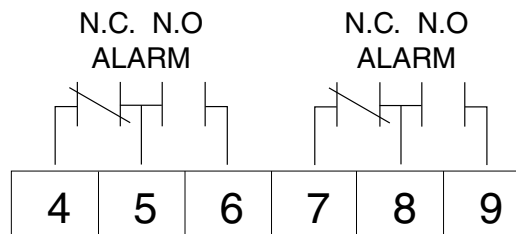


Figure 5-2
Relay Circuit Operation

- b. Relay operation may generally be heard as an audible click when the background noise is not too high. Connect an ohmmeter to the relay contacts to determine if they are switching.
- c. Difficulty in calibration can often be traced to improper wiring of the relay terminals to an annunciator or other panel device. Check the wiring against the relay chart in Figure 2-4.

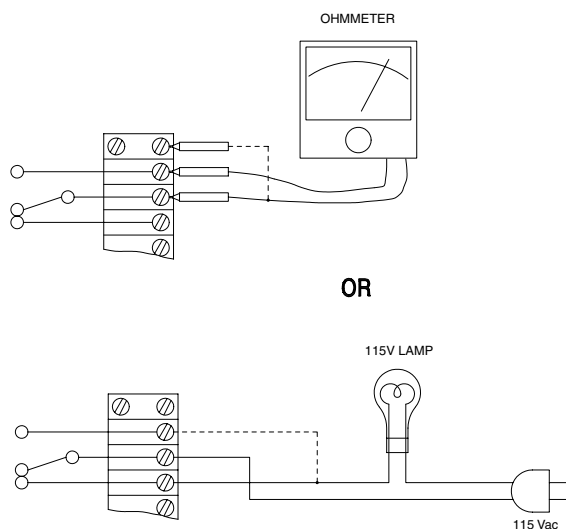


Figure 5-3
Relay Circuit Troubleshooting

5.4 Troubleshooting Checklist

SYMPTOM

Instrument is indicating alarm at all times.

CHECK RELATED ITEMS?

- 1) Is power applied to instrument?
- 2) Is instrument wired correctly? Refer to Section 2.
- 3) Is this a first-time installation and initiation?

YES

POSSIBLE CAUSES AND SOLUTIONS

Instrument range setting is wrong. Increase range setting (HLFS) or decrease range setting (LLFS) and re-initiate. Refer to Sections 3 and 4.

In LLFS mode, initiation was done with material on the sensing element. Perform initiation with sensing element in air.

In LLFS mode, if the sensing element is not "seeing" material, then the application requires a longer insertion length. Consult factory.

NO

In some rare applications, a coating of material will build up on the sensing element over time, causing the alarm to trigger at a different point than when the unit was first initiated. This could be interpreted as a false alarm.

To best adapt the range setting to coating build-up consider the severity of the coating (how much it changes the standing capacitance) and how long it takes the coating to build up.

Choose **one** of the following solutions:

1. Clean the sensing element. Remove the coating.
2. Re-initiate the *No-Cal* instrument, but do not change the range setting. It "sees" a higher standing capacitance (coating build-up) and adjusts the alarm trigger point.
3. Increase the range setting (HLFS) or decrease the range setting (LLFS) and re-initiate the unit.
4. Increase length of cote-shield (HLFS). Consult factory.
5. Sensing element is defective. Consult factory.

5.4 Troubleshooting Checklist (cont.)

SYMPTOM

Instrument fails to alarm.

CHECK RELATED ITEMS?

- 1) Is power applied to instrument?
- 2) Is instrument wired correctly? Refer to Section 2.
- 3) Is this a first-time installation and initiation?

? = **YES**

POSSIBLE CAUSES AND SOLUTIONS

Instrument range setting is wrong. Decrease range setting (HLFS) or increase range setting (LLFS) and re-initiate. Refer to Sections 3 and 4.

In HLFS mode, sensing element is not "seeing" material. Application requires a longer insertion length. Consult factory.

NO

In some rare applications, a coating of material will build up on the sensing element over time, causing the alarm to trigger at a different point than when the unit was first initiated. This could be interpreted as the unit is failing to alarm.

To best adapt the range setting to coating build-up consider the severity of the coating (how much it changes the standing capacitance) and how long it takes the coating to build up.

Choose one of the following solutions:

1. Clean the sensing element. Remove the coating.
2. Re-initiate the *No-Cal* instrument, but do not change the range setting. It "sees" a higher standing capacitance (coating build-up) and adjusts the alarm trigger point.
3. Decrease the range setting (HLFS) or increase the range setting (LLFS) and re-initiate the unit.
4. Increase length of cote-shield (HLFS). Consult factory.
5. Sensing element is defective. Consult factory.

5.4 Troubleshooting Checklist (cont.)

SYMPTOM

Instrument gives intermittent false alarm.

CHECK RELATED ITEM?

1) Is this a first-time installation and initiation?

YES

POSSIBLE CAUSES AND SOLUTIONS

Instrument range setting is wrong. Increase range setting (HLFS) or decrease range setting (LLFS) and re-initiate. Refer to Sections 3 and 4.

Loose Wiring. Check wiring connections.

Tank agitation. Add time delay (Section 3.1).

Instrument Malfunction. Consult Factory.

NO

Loose Wiring. Check wiring connections.

In some rare applications, a coating of material will build up on the sensing element over time, causing the alarm to trigger at a different point than when the unit was first initiated. This could be interpreted as a false alarm.

To best adapt the range setting to coating build-up consider the severity of the coating (how much it changes the standing capacitance) and how long it takes the coating to build up.

Choose one of the following solutions:

1. Clean the sensing element. Remove the coating.
2. Re-initiate the *No-Cal* instrument, but do not change the range setting. It "sees" a higher standing capacitance (coating build-up) and adjusts the alarm trigger point.
3. Increase the range setting (HLFS) or decrease the range setting (LLFS) and re-initiate the unit.

SYMPTOM

Instrument operates intermittently

POSSIBLE CAUSES AND SOLUTIONS

Have any wiring connections come loose? Check wiring connections.

Instrument malfunction. Consult factory.

5.5 Telephone Assistance

If you are have questions about your Drexelbrook equipment and attempts to locate the problem have failed:

- contact your local Drexelbrook representative,
- call the Service department toll-free at 1-800-527-6297 (in US and Canada) or 1-215-674-1234 (International),
- fax the following information to the Service department at 1-215-443-5117.

To expedite assistance, please provide the following information:

Instrument Model Number _____

Sensing Element Model Number and Length _____

Coax Cable Length (remote systems) _____

Original Purchase Order Number _____

Material being measured _____

Temperature _____

Pressure _____

Agitation _____

Brief description of the problem _____

Checkout procedures that have failed _____

5.6 Equipment Return

In order to provide the best service, any equipment being returned for repair or credit must be preapproved by the factory.

In many applications, sensing elements are exposed to hazardous materials.

- OSHA mandates that our employees be informed and protected from hazardous chemicals.
- Material Safety Data Sheets (MSDS) listing the hazardous materials that the sensing element has been exposed to **must** accompany any repair.
- It is your responsibility to fully disclose all chemicals and decontaminate the sensing element.

**5.6 Equipment
Return (cont.)**

To obtain a return authorization (RA#), contact the Service department at 1-800-527-6297 (US and Canada) or 1-215-674-1234 (International). Please provide the following information:

Model Number of Return Equipment _____

Serial Number _____

Original Purchase Order Number _____

Process Materials that equipment has been exposed to _____

MSDS sheets for any hazardous materials

Billing Address _____

Shipping Address _____

Purchase Order Number for Repairs _____

Please include a purchase order even if the repair is under warranty. If repair is covered under warranty, you will not be charged.

Ship equipment freight prepaid to:

AMETEK Drexelbook
205 Keith Valley Road
Horsham, PA 19044

COD shipments will not be accepted.

5.7 Field Service

Trained field service personnel are available on a time-plus-expense basis to assist in start-ups, diagnosing difficult application problems, or in-plant training of personnel. Preventative Maintenance and Calibration Certification service contracts are also available to maintain plant efficiency. Contact the Service department for information.

**5.8 Customer
Training**

Instrument Training Seminars for customers are conducted at the factory. These sessions, guided by Drexelbrook engineers and specialists, provide detailed information on all aspects of level measurement, including theory and practice of instrument operation. Contact the Training Department for further information

**SECTION 6
SPECIFICATIONS**

| | |
|---|---|
| 6.1 Electronic Unit Specifications | <i>Power Requirement</i> |
| | 407-6000 120(±25) Vac, 50-60 Hz 407-6300 230(±20) Vac, 50-60 Hz Maximum power, 1 watt Maximum voltage, 250 Vac |

Operating Temperature
-40° to 140°F (-40° to 60°C).

Sensitivity (Max. Differential)
0.1 pF normal range
0.2 pF extended range

Operating Point Range
0-40 pF normal range
0-80 pF extended range

RFI Protection (Built-in)
Less than 2 pF shift in operating point for unit in standard housing from 5W field @ 27 mHz, 150 mHz, or 450 mHz at a distance of 5 feet from exposed sensing element, cable, or power line.

Temperature Effect
Operating Point:
.10 pF shift/30°F

Output — Relay Contact
DPDT Relay, 2 Form C

Relay Rating (Standard)
120 Vac: 5A non-inductive
3A inductive
230 Vac: 5A non-inductive
3A inductive

Failsafe
Field-Switchable to either Low-Level Failsafe (LLFS) or High-Level Failsafe (HLFS).

Housing
Integral explosionproof, standard
Remote explosionproof, optional

6.2 Cable Specifications

General Purpose (380-XXX-12)

.51" O.D. at largest point. 160°F (71°C) temperature limit.

Composite, first 10 ft. high temp. (380-XXX-18)

.62" O.D. at largest point. 450°F (232°C) temperature limit for first 10 feet. 160°F (71°C) temperature limit for remainder of cable length.

High Temp (380-XXX-11)

.51" O.D. at largest point. 450°F (232°C) temperature limit.

CE mark Triaxial (380-0XX-520)

-58° to 176° F (-55 to 80°C)

APPENDIX A
MODE B
Special/Continuous
Mode

NOTE

For most installations, Mode A setting should be used. Mode A secures the configuration so that it cannot be changed without opening the housing and resetting the TOGGLE switch. Mode A also allows operation of the Verify confidence check, which cannot be used in Mode B.

A.1 Using Mode B

Mode B allows the No-Cal instrument to be configured each time the magnetic key is placed on the window. The Verify confidence check is not functional in the Mode B setting.

CAUTION

Make certain that the sensing element is not covered with material when placing the magnet on the window and re-configuring the unit. If there is material on the sensing element, it is possible that the instrument will not “see” material when covered during successive fillings.

WARNING

Before the explosionproof cover is removed to configure the unit, the area must be checked and known to be non-hazardous or, power should be removed from the unit. When configuration is complete, the cover must be replaced prior to re-applying power.

To use the *No-Cal* instrument in Mode B:

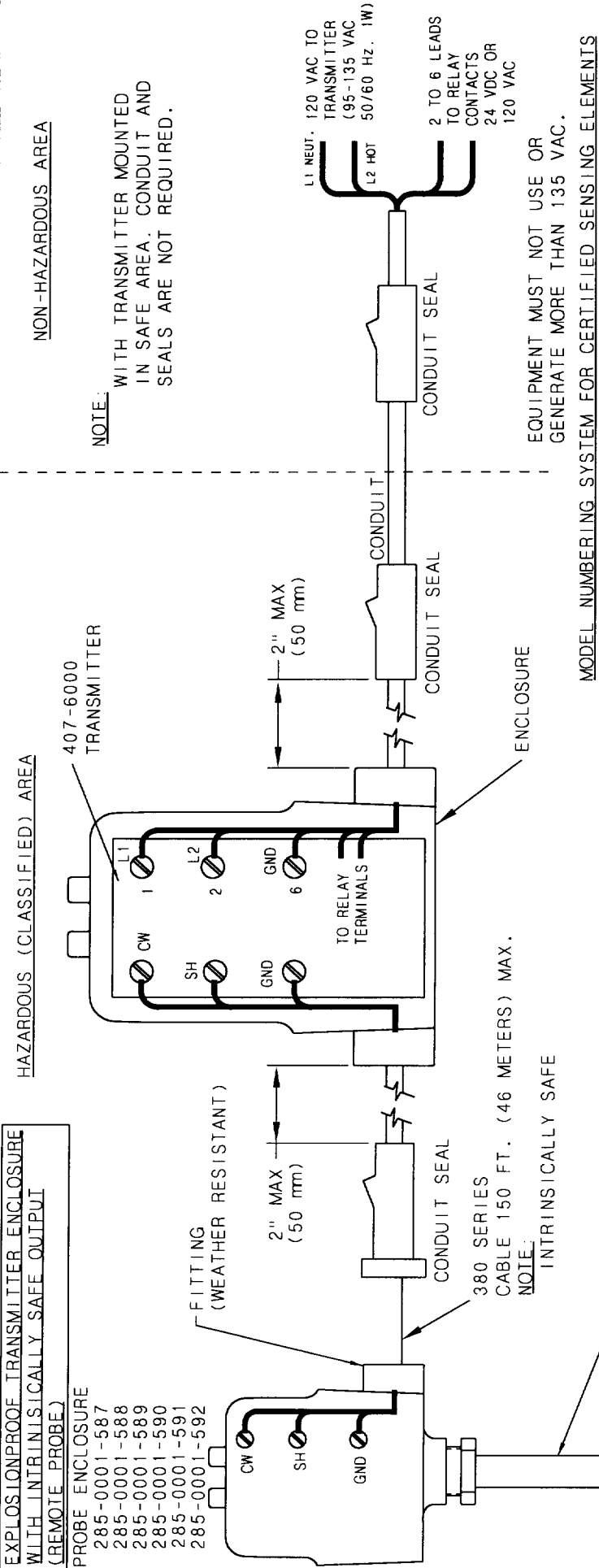
1. Remove the dome lid.
2. Make sure instrument is set to Mode B (set the dip switch to closed).
3. Set range setting (see *Section 3.3*).
4. Set failsafe mode (see *Section 3.2*).
5. Replace lid and re-apply power to instrument.
6. Make sure the sensing element is uncovered.

**A.1 Using Mode B
(cont.)**

7. Apply the magnetic key for 2 seconds and then remove it to initiate the instrument. (On 5-inch "Y" hub housing, the magnetic touch location is on the side of the housing identified by a label).
8. The LED flashes for approximately 7 times and then remains **ON** in HLFS mode; **OFF** in LLFS mode.

• Initiation is complete.

To change configuration in the future, return to step 7.



NOTE: WITH TRANSMITTER MOUNTED IN SAFE AREA. CONDUIT AND SEALS ARE NOT REQUIRED.

EQUIPMENT MUST NOT USE OR GENERATE MORE THAN 135 VAC.

MODEL NUMBERING SYSTEM FOR CERTIFIED SENSING ELEMENTS

- 70 f - gh i j - k l m - n o
- f = "0 OR 4"
- g, h, i = "0-9 OR BLANK"
- j = "0-9"
- k, l = "0-9 OR BLANK"
- m = "0-9"
- n = "0, A-W OR BLANK"

DIVISION 1 CLASS I GROUPS A-D, CLASS II GROUPS E-G, CLASS III (SENSING ELEMENTS ARE INTRINSICALLY SAFE FOR ABOVE CLASSIFICATIONS).

MODEL NUMBERING SYSTEM FOR 407-6000 SERIES FM APPROVED TRANSMITTERS

407-6a00-b0c-de

a = SUPPLY VOLTAGE
 "0" = 120 VAC 50/60 Hz

b = APPROVALS
 "F" = FM GLOBAL <FM>

c = ENCLOSURE
 "4, 9, G, H, J"

d = FAIL SAFE
 "0 OR 1"

e = RANGE
 "0, 1, 2, 3, 4"

****APPROVED DRAWING****
 CHANGES TO THIS DRAWING
 REQUIRE AGENCY APPROVAL
 PER 440-0015-003

FM CSA KEMA

420-0004-08Z

MODEL NUMBER OF CERTIFIED 380 SERIES CABLES (REMOTE ONLY)

380-0ppp-qqq

ppp=LENGTH IN FEET (150 FT/46 METERS MAXIMUM)

qqq=CABLE TYPE
 "011.012.018" (COAXIAL) OR "520" (TRIAxIAL)

NOTE: SEAL FITTINGS SUPPLIED ARE "WEATHER RESISTANT." THEY ARE NOT CERTIFIED AS "EXPLOSIONPROOF" (XP) OR "FLAMEPROOF" (d). REPLACE WITH APPROPRIATE SEAL FITTINGS AS REQUIRED.

ALWAYS INSTALL TO NEC® AND OR LOCAL CODES/REQUIREMENTS/DIRECTIVES AS MANDATED BY THE AUTHORITY HAVING JURISDICTION.

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 (REMOTE)

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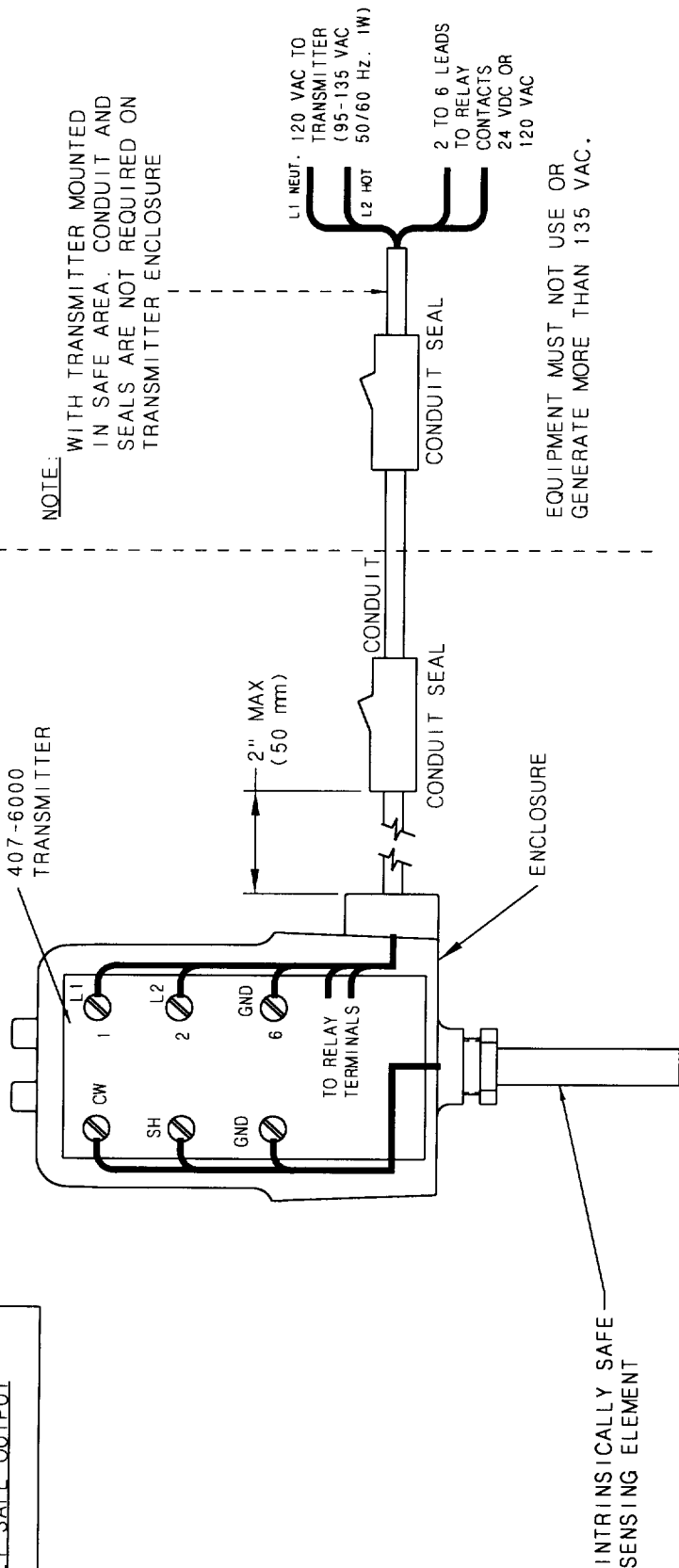
SHT. 1 OF 3

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**EXPLOSIONPROOF TRANSMITTER ENCLOSURE
WITH INTRINSICALLY SAFE OUTPUT
(INTEGRAL PROBE)**

HAZARDOUS (CLASSIFIED) AREA

NON-HAZARDOUS AREA



NOTE:

WITH TRANSMITTER MOUNTED IN SAFE AREA. CONDUIT AND SEALS ARE NOT REQUIRED ON TRANSMITTER ENCLOSURE

EQUIPMENT MUST NOT USE OR GENERATE MORE THAN 135 VAC.

INTRINSICALLY SAFE
SENSING ELEMENT

DIVISION 1 CLASS I GROUPS B-D, CLASS II GROUPS E-G, CLASS III (SENSING ELEMENTS ARE INTRINSICALLY SAFE FOR ABOVE CLASSIFICATIONS. SEE SHEET 3 FOR MODEL NUMBERS).

MODEL NUMBERING SYSTEM FOR 407-6000 SERIES FM APPROVED TRANSMITTERS

- 407-6a00-b0c-de
- a = SUPPLY VOLTAGE
"0" = 120 VAC 50/60 HZ
- b = APPROVALS
"F" = FM GLOBAL <FM>
- c = ENCLOSURE
"4, 9, G, H, J"
- d = FAIL SAFE
"0 OR 1"
- e = RANGE
"0, 1, 2, 3, 4"

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PER 440-0015-003

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OF 3

FACTORY MUTUAL RESEARCH CORPORATION
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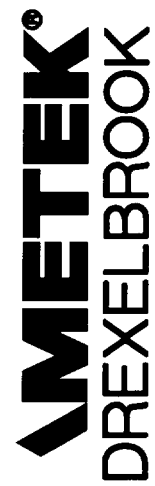
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