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Installation and Operating Instructions

Series 506-3000
Multipoint II Level Controller
using 406-3000 Electronics

+ 215-674-1234 Outside North America
1-800-553-9092 US and Canada
www.drexelbrook.com
drexelbrook.service@ametek.com

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Series 506-3000 Multipoint II Level Controller using 406-3000 Electronics



AMETEK[®]
DREXELBROOK

An ISO 9001 Certified Company

205 Keith Valley Road Horsham, PA 19044
US Sales 1-800-553-9092
24 Hour Service 1-800-527-6297
International + 215-674-1234
Fax + 215-674-2731
E-mail drexelbrook.info@ametek.com
Web www.drexelbrook.com

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**SECTION 1 -
INTRODUCTION****1.1 General
Description**

This manual includes instructions for the Drexelbrook Multipoint II 506-3000 Series two- and three-point RF Admittance Level Controller.

The Multipoint II level control is a liquid level-to-relay controller with 2 or 3 independent and non-interacting setpoints along a single sensing element. There are no moving parts to break or wear out, and systems include CoteShield™ circuitry to ignore the effects of buildup or coatings on the sensing element.

The 506-3000 Series Multipoint II consists of a 406-3000 series electronic unit and a 700 Series sensing element. The standard control is integrally mounted (electronics and sensing element are together). For an optional remote configuration, where the electronics and sensing element are separated, a 380 Series connecting cable is also provided.

1.2 Models Available

System Model Number is 506-3XXX. Electronic Unit model number is 406-3XXX. Sensing Element is 700-X-XX.

4 0 6 - 3 X X X - 0 0 X Multipoint II

Power:
0 = 120 Vac
3 = 240 Vac

Phasing:
0 = insulating material
3 = conductive material

Relays:
2 = 2
3 = 3

Housing:
1 = No Housing
4 = Remote 5" Standard Finish
Explosionproof Condulet
6 = Remote 5" Explosionproof Condulet with Drexelcote™ corrosion-resistant coating
7 = Remote Nema 4X
8 = Integral 5" Standard Finish
Explosionproof Condulet with Drexelcote™ corrosion-resistant coating and 3/4" NPT
9 = Integral 5" Standard Finish
Explosionproof Condulet with 3/4" NPT
D = Integral 5" Standard Finish
Explosionproof Condulet with 1" NPT
E = Integral 5" Standard Finish
Explosionproof Condulet with Drexelcote™ corrosion-resistant coating and 1" NPT

SECTION 2 - INSTALLATION

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 (1-800-527-6297).

2.2 Mounting

The Multipoint II electronic unit was 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. (See Figure 2-1 for mounting integral units and 2-2a and 2-2b for mounting remote units.) 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. If extreme wash-downs are expected or flooding is possible, consult the factory for special coax and housing sealing instructions.

2.2.1 Installation of the Sensing Element

These items should be taken into consideration when mounting the sensing element. See Figure 2-3.

- If the vessel is agitated, the sensing element may require support. Consult the factory at 1-800-527-6297.
 - for rod style probes, insulated support bushings are available.
 - for flexible cable style sensing elements, flexible bottom anchors are available.
- It is not recommended to mount the sensing element inside a pipe.
- The sensing element should be installed parallel to the wall of the tank (or as vertical as practical).
- Take care that the sensor is not scratched or cut when inserting it into the tank.
- Ensure that there are no obstructions or agitator blades in the way of the sensor.

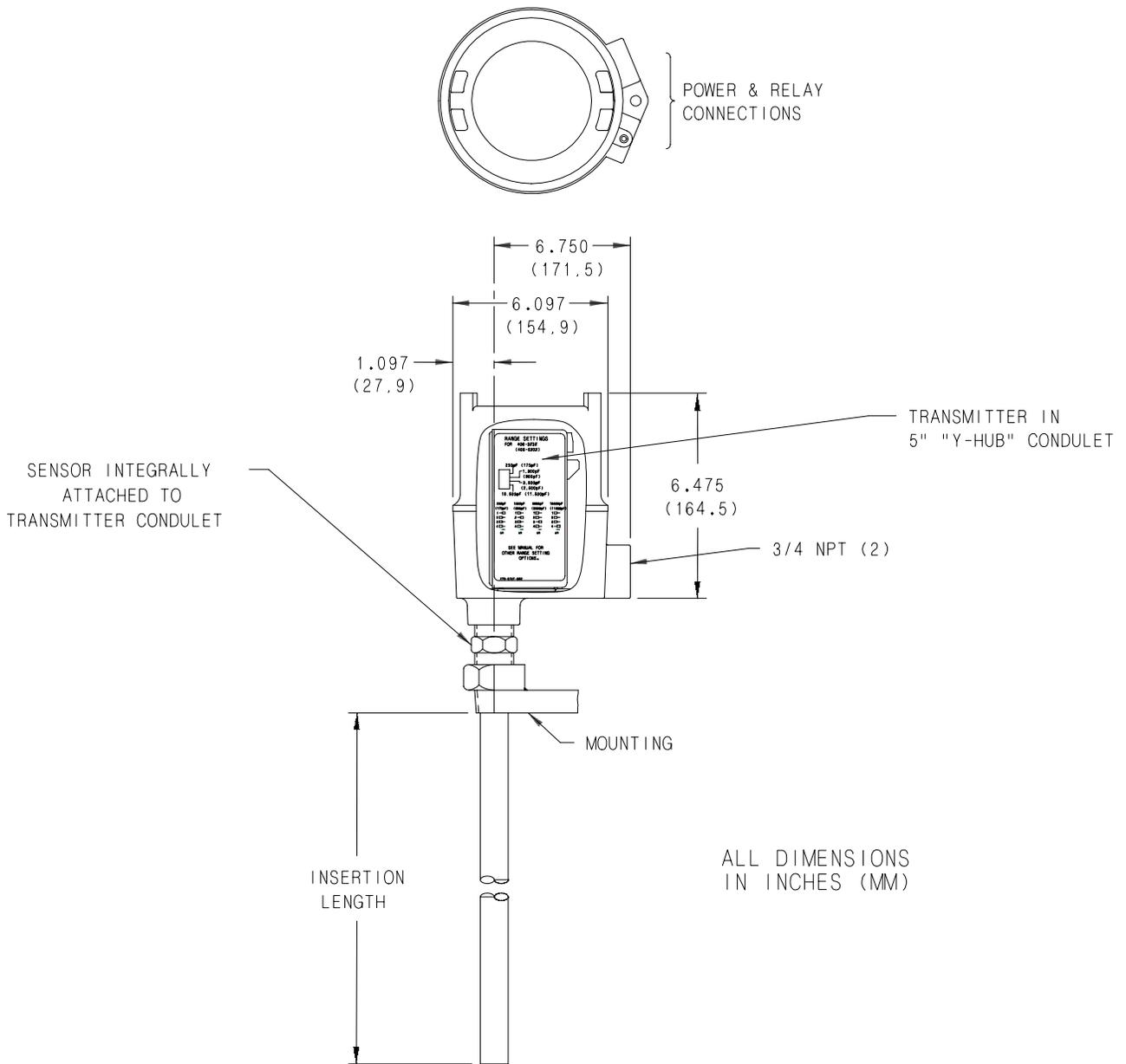


Figure 2-1
Mounting of Integral Unit
with Explosionproof Housing
406-3XXX-009

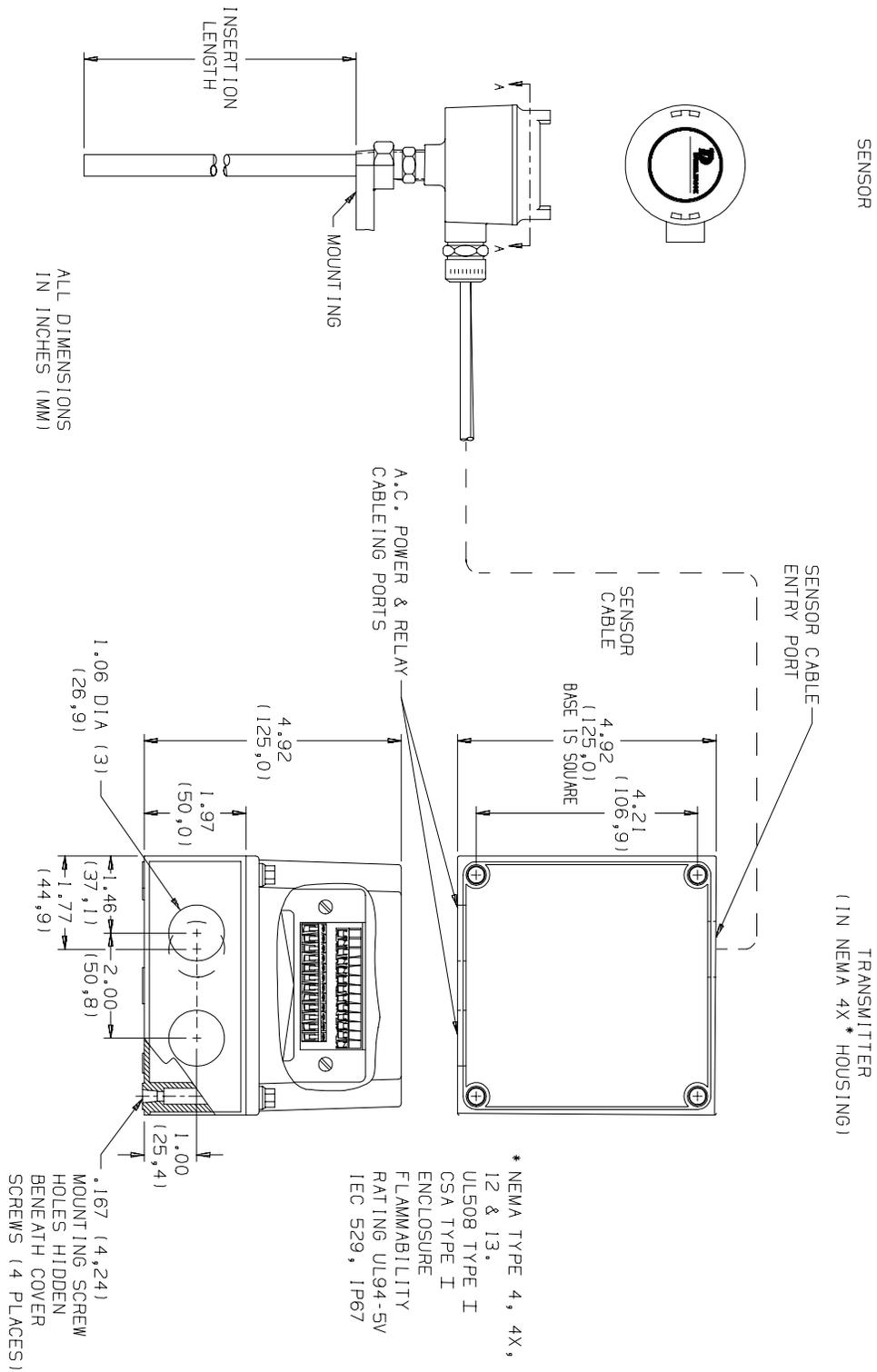


Figure 2-2b
Mounting of Remote Unit with NEMA 4X Housing
406-3XXX-007

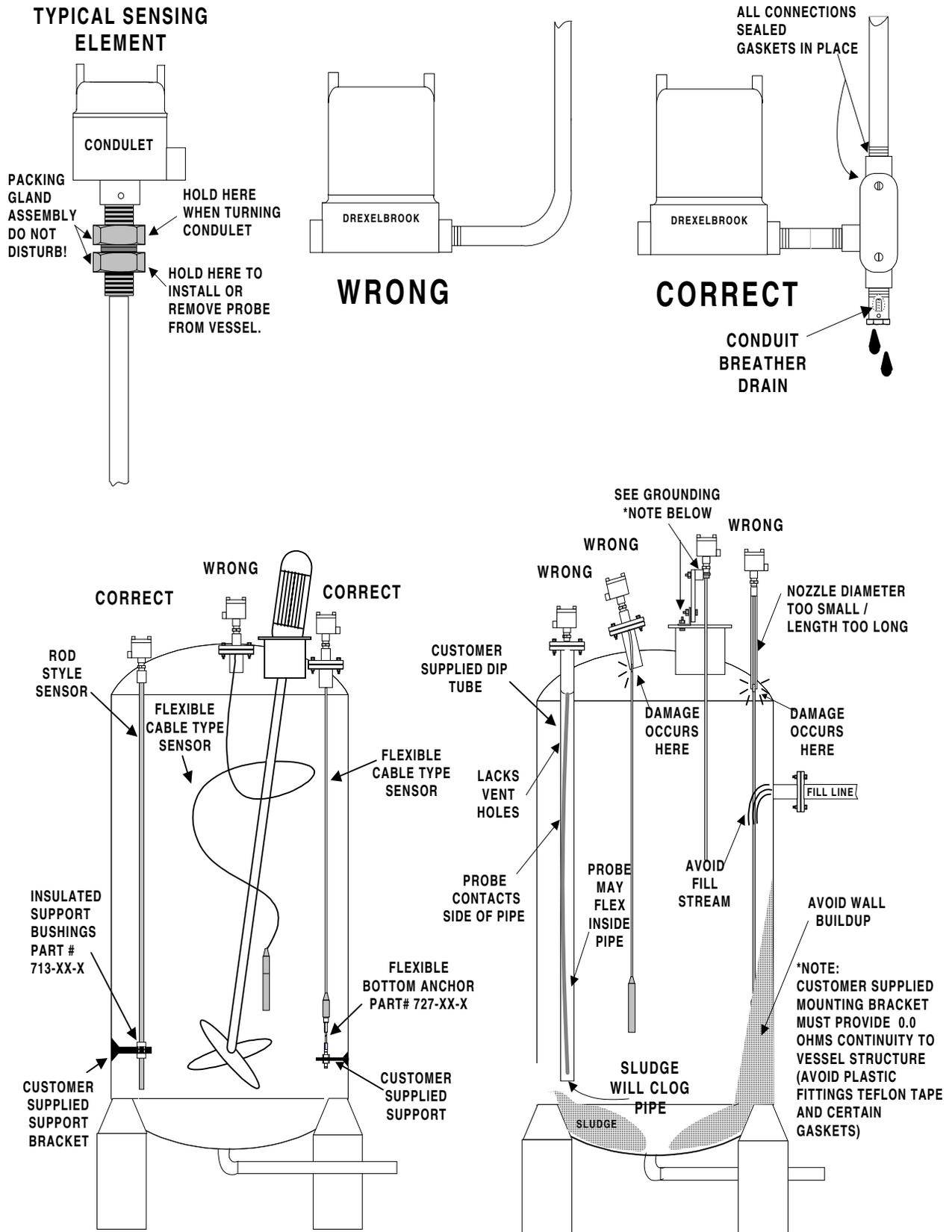
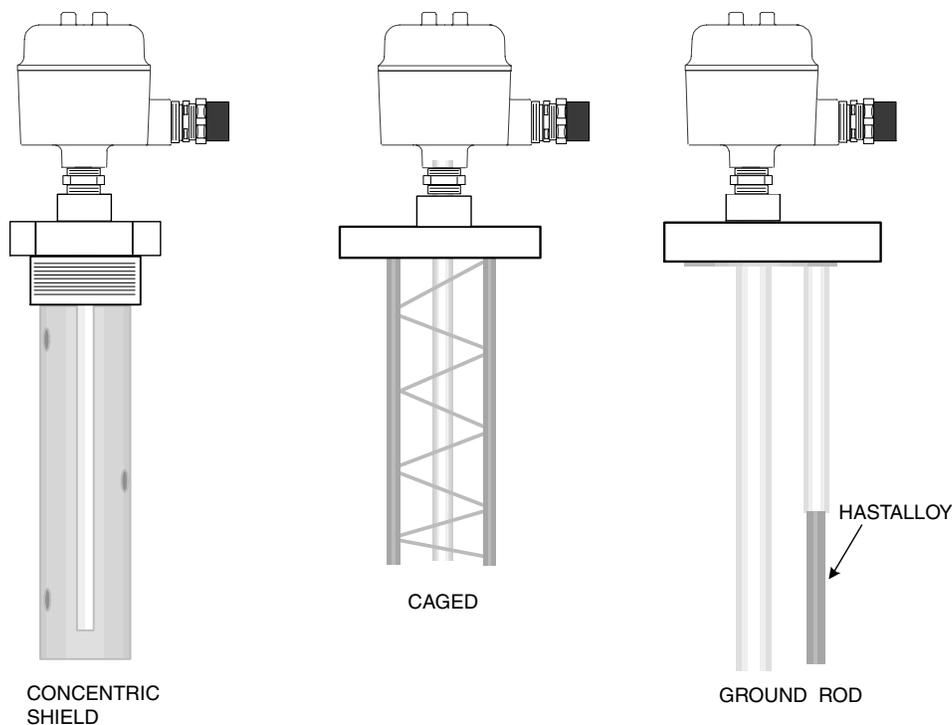


Figure 2-3
Installation Guidelines

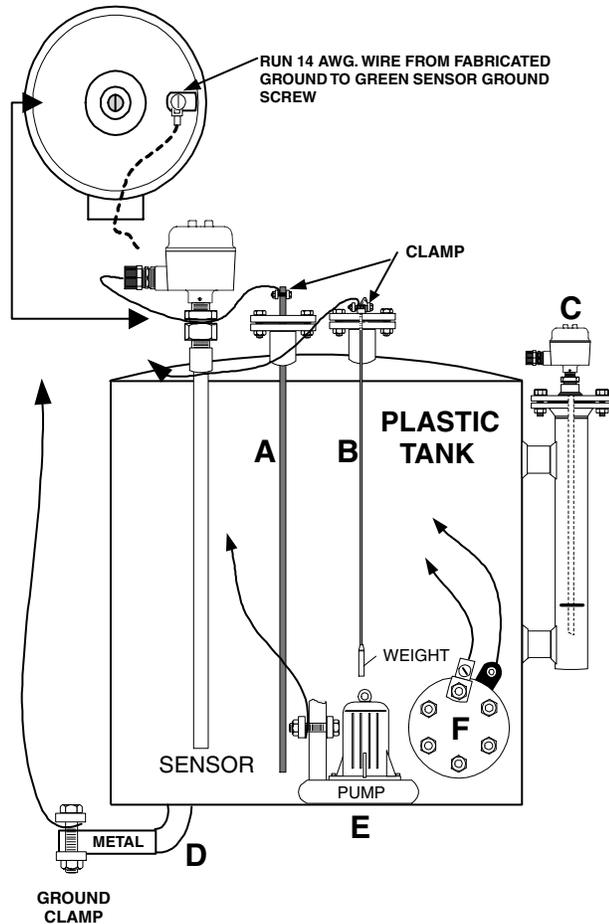
2.2.2 Non-metallic Tanks—Using a Ground Reference

When installing the sensing element in a non-metallic tank, use a Drexelbrook sensing element with a factory-installed ground reference. See Figure 2-4. If necessary, a site-fabricated ground reference can be used. See Figure 2-5. An optimal ground reference provides a large surface area and should be relatively close and parallel to the sensing element.

Operating a Multipoint II control without a proper ground reference will result in drift and poor performance. A ground reference is not the same as an earth ground derived from a driven ground rod. A ground reference is a return path to the transmitter. The Multipoint II sends a radio frequency signal down the metal rod of the sensing element. This signal then seeks a return path to the transmitter. The path usually is from the sensing element to the metal wall of the tank, from the metal wall through the coax ground, back to the transmitter. The tank wall is part of the return path and is called the ground reference. When installed in a non-metallic vessel without a ground reference, there is no return path for the sensing element signal, resulting in poor performance.



*Figure 2-4
Ground-Referenced Sensing Elements*



A
GROUND ROD
 A ground rod can be fabricated out of any metal compatible with the process. Use material that is at least 3/8inch dia. such as pipe, All-Thread, or tubing. The ground rod must be parallel and relatively close to the sensor.

B
GROUND WIRE
 1/4 inch or larger dia. stainless steel rope that is anchored or weighted can be used.

C
MOUNT SENSOR IN METAL PIPE
 Mounting the level sensor inside a metal pipe provides an excellent ground reference. Use only if the process material is greter than 1000 uMHOS/cm such as acids and caustic.

D
METAL PIPING
 Metal piping that connects to the tank bottom can be used as a ground reference. Use only if the process material is greter than 1000 uMHOS/cm such as acids and caustic.

E
SUBMERGED METAL STRUCTURE
 Use any constantly submerged metal object such as: pumps, agitators, or thermowells.

F
METAL FLANGE
 A submerged metal flange or orifice plate can be used. Use only if the process material is greter than 1000 uMHOS/Cm. such as acids and caustic.

Figure 2-5
 Customer-Fabricated Ground References

2.3 Wiring

2.3.1 Electronics

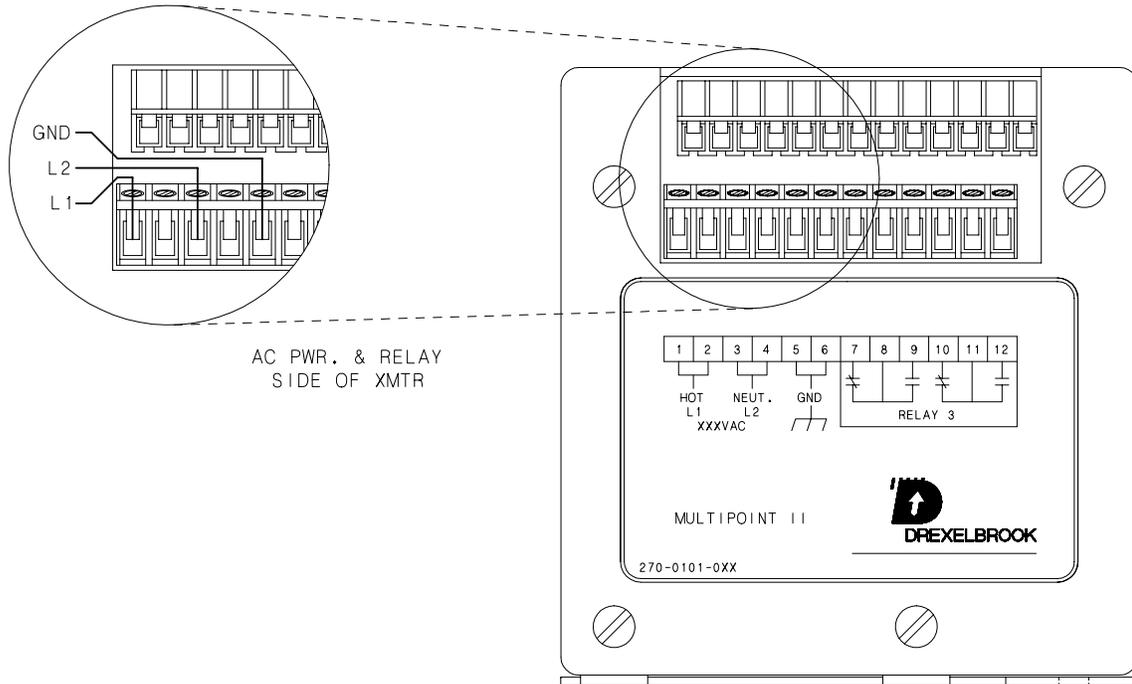
Ensure that all wiring, electrical fittings and conduit connections conform to your local electrical codes for the location and environment of use.

CAUTION

If the Multipoint II 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.

Refer to Figure 2-6 and use the following steps to wire the Multipoint II unit:

- a. Ensure that the power to the wiring is off.
- b. Remove the cover.
- c. Make all electrical connections to the electronics per the wiring diagram in Figure 2-6, using 12-28 gauge wiring. All connections are made to the terminal strip.
- d. Review Checklist:
 - Wiring correct.
 - Proper input voltage used.
 - Proper output connections.
- e. Replace cover prior to restoring power if in hazardous area.
- f. Turn power on.



AC PWR. & RELAY
SIDE OF XMTR

A.C. POWER & RELAY
CONNECTION SIDE
(WIRE SIZE #12 TO #28 AWG)
(DPDT CONTACTS RATED 5 AMPS @ 220VAC)

Figure 2-6
Wiring, Multipoint II

2.3.2 Sensing Element Wiring (Remote-mounted Units)

If the Multipoint II controller has the electronic module mounted in the same housing as the sensor (integral mount), the sensor is prewired at the factory.

When installing a remote-mount system, you must use the Drexelbrook supplied coaxial cable. The cable can be a maximum of 150 feet. Termination kits are available to shorten the cable if necessary. Following are recommendations for wiring the sensing elements. See Figure 2-7.

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 condulet attached.
- For two-terminal sensing elements, the shield connection at the condulet must be clipped and insulated so that it cannot short circuit.
- If necessary, shorten the coax cable at the sensing element end. Termination at the sensing element end is less complicated because the sensing element usually does not require termination of the shield wire.
- Always terminate and use the shield pigtail wire at the electronics' end.

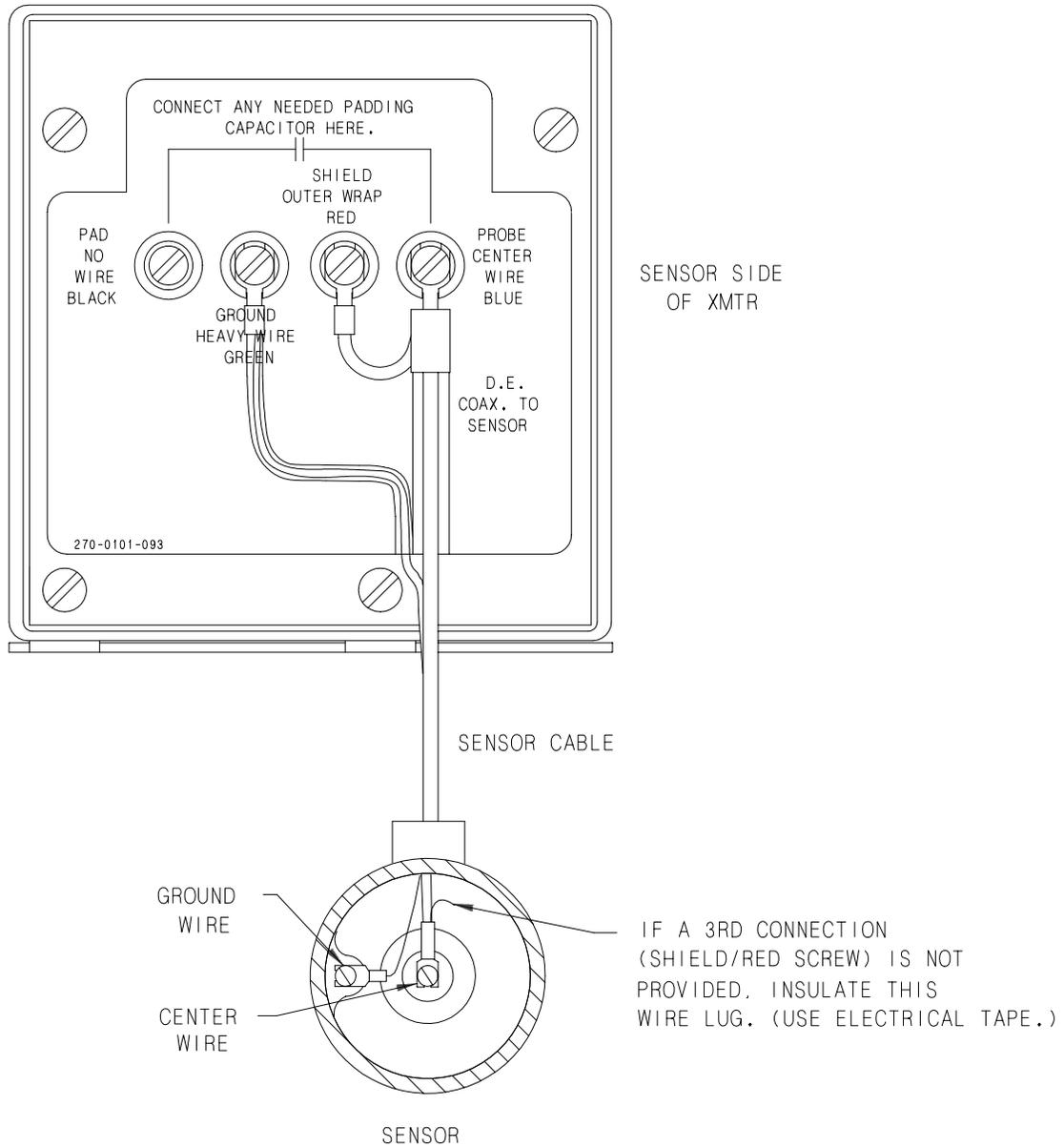


Figure 2-7
Two-Terminal Sensing Element Wiring

2.3.3 Relay Wiring

The relays are wired in various positions, depending on the fail-safe state of the channel and the selected relay operation. Typical relay wiring is:

- Relay 1 — used for high level.
- Relay 2 — used for differential.
- Relay 3 — used for low level.

Failsafe is defined as: *the condition in the vessel that will de-energize the relay.*

When level exceeds a setpoint set to HLFS, the relay will de-energize and the green LED is not lit.

When level falls below a setpoint set to LLFS, the relay will de-energize and the green LED is not lit.

Figure 2-8 shows the relay wiring for the different relay conditions. Relay 1 is shown. Terminal numbers change with relays.

Call 1-800-527-6297 for service assistance.

Relay 1 is shown.
Terminal numbers change for Relay 2 and Relay 3.

<i>Selected Fail Safe</i>	<i>Tank Level</i>	<i>LED Output</i>	<i>Relay Condition</i>	
HLFS	Below Trip Point	ON	Energized (Non Alarm)	
HLFS	Above Trip Point	OFF	De-energized (Alarm)	
LLFS	Below Trip Point	OFF	De-energized (Alarm)	
LLFS	Above Trip Point	ON	Energized (Non Alarm)	

Figure 2-8
Relay Wiring

SECTION 3 - CALIBRATION

3.1 Span Selection

Before calibrating the Multipoint II, the proper span range must be selected. It is important to select the correct range switches to ensure maximum sensitivity, repeatability, resolution, and ease of calibration.

Four factors determine the correct span range:

1. The type of product that is being measured (conductive or insulating).
2. The sensing element model number.
3. The chassis model number.
4. The distance in feet from the tip of the sensing element to the maximum trip point.

Table 3-1 shows the maximum number of feet measured from the sensing element tip to the highest trip point for each range of the instrument. The seven most common models are listed.

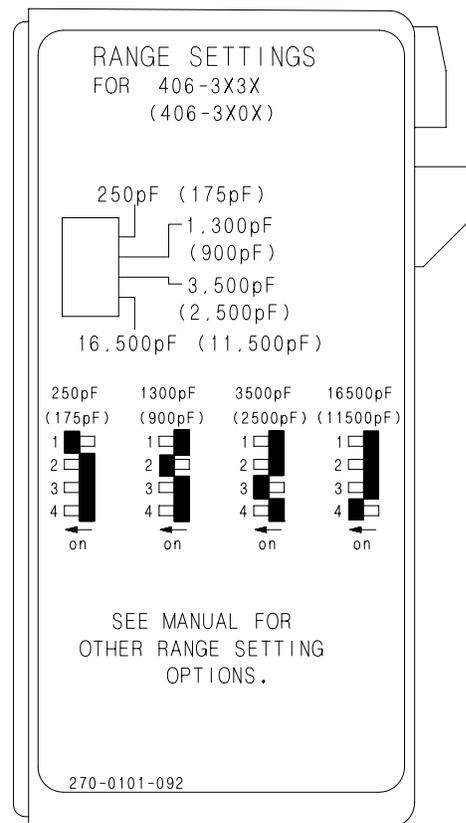


Figure 3-1
Span Selection Settings

3.1 Span Selection (cont.)

Step 1: Find the span range value (pF) for your sensing element using Table 3-1.

506-3X3X-00X SYSTEM CHASSIS NUMBER 406-3X3X-00X

For use with conductive liquids such as:
acid, caustic, beer or any substance containing water.

System Model #	Sensing Element Model #	Number of Feet (max.) from Bottom of Sensing Element to Highest Trip Point					
506-3X3X-1	700-1-22	4.6	20	20	NA	NA	NA
506-3X3X-2	700-1-24	4	20	20	NA	NA	NA
506-3X0X-7	700-2-27	1.1	6	15.5	20	20	NA
506-3X3X-6	700-2-37	0.1	0.7	1.8	2	9	10
506-3X3X-4	700-2-57	0.9	5.2	13.7	18	20	NA
506-3X3X-8	700-5-18	1.2	7.3	19	25	90	105
506-3X3X-5	700-5-54	6.6	36.4	94	124	442	519
RANGE (pF) =		250	1300	3500	5050	16500	21550

506-3X0X-00X SYSTEM CHASSIS NUMBER 406-3X0X-00X

For use with insulating liquids such as:
vegetable oil, gasoline, all hydrocarbons, asphalt, etc.

This table assumes dielectric constant = 2 (all hydrocarbons)
and assumes vessel I.D. = 60 inches

System Model #	Sensing Element Model #	Number of Feet (max.) from Bottom of Sensing Element to Highest Trip Point			
506-3X0X-1	700-1-22	20.0	NA	NA	NA
506-3X0X-2	700-1-24	14.3	20.0	NA	NA
506-3000-7	700-2-27	NOT RECOMMENDED	NA	NA	NA
506-3X0X-6	700-2-37	NOT RECOMMENDED	NA	NA	NA
506-3X0X-4	700-2-57	NOT RECOMMENDED	NA	NA	NA
506-3X0X-5	700-5-54	33.3	175.5	489.2	NA
RANGE (pF) =		175	900	2500	3575

Table 3-1
Span Range Value (pF) Selection Table

3.1 Span Selection (cont.)

Step 2: Set the span range switches using Table 3-2.

Dip Switch Settings for 406-3X3X Transmitters

SWITCH				
#1	#2	#3	#4	SPAN
On	Off	Off	Off	250
Off	On	Off	Off	1300
On	On	Off	Off	1550
Off	Off	On	Off	3500
On	Off	On	Off	3750
Off	On	On	Off	4800
On	On	On	Off	5050
Off	Off	Off	On	16500
On	Off	Off	On	16750
Off	On	Off	On	17800
On	On	Off	On	18050
Off	Off	On	On	20000
On	Off	On	On	20250
Off	On	On	On	21300
On	On	On	On	21550

Dip Switch Settings for 406-3X0X Transmitters

SWITCH				
#1	#2	#3	#4	SPAN
On	Off	Off	Off	175
Off	On	Off	Off	900
On	On	Off	Off	1075
Off	Off	On	Off	2500
On	Off	On	Off	2675
Off	On	On	Off	3400
On	On	On	Off	3575
Off	Off	Off	On	11500
On	Off	Off	On	11675
Off	On	Off	On	12400
On	On	Off	On	12575
Off	Off	On	On	14000
On	Off	On	On	14175
Off	On	On	On	14900
On	On	On	On	15075

Table 3-2
Span Range Switch Selection Tables

3.2 Calibration Procedure

Before applying power to the electronic unit, check the wiring connections. (See section 2.3). Figure 3-2 shows the failsafe switches and setpoint relay pots.

Typical calibration setpoints are:

Relay 1—used for high level

Relay 2—used for differential control

Relay 3—used for low level

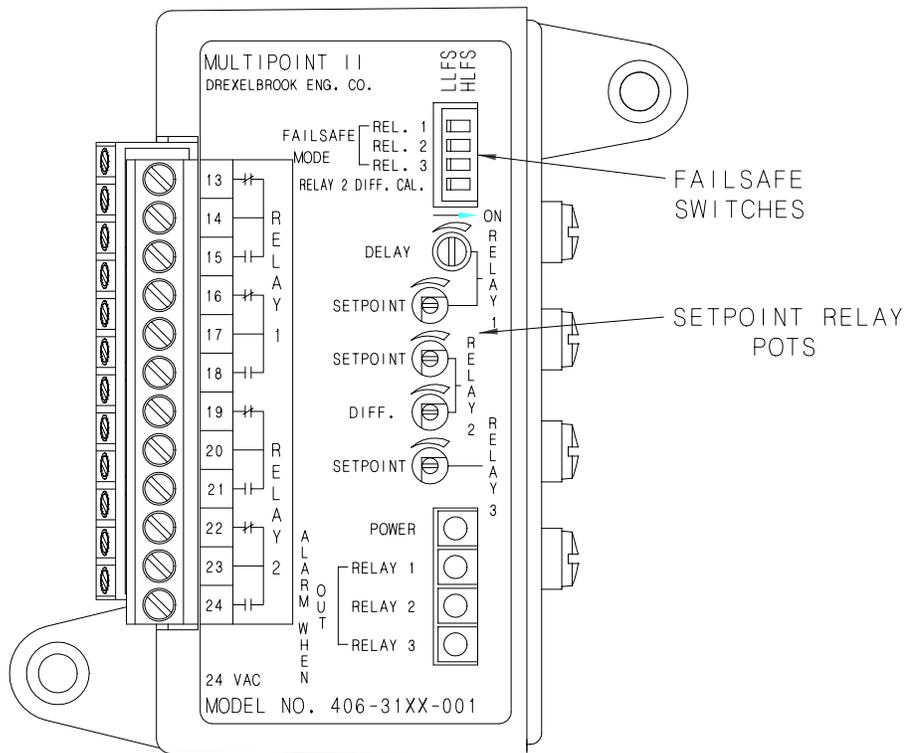


Figure 3-2
Failsafe Switches and
Setpoint Relay Pots

3.2 Calibration Procedure (cont.)

CAUTION

The *Delay* pot is a 2/3 turn device. Do not turn past its mechanical stops or damage could occur to the unit.

The following steps outline the calibration procedure.

1. Select proper fail-safe. Set fail-safe mode for each relay to its appropriate setting: high-level fail-safe (HLFS) or low-level fail-safe (LLFS).
2. Switch the *Relay 2 Diff Cal* dip switch to the OFF position.
3. Turn the *Relay 1 Delay* pot fully counterclockwise.
4. Turn each *Relay Setpoint* pot fully counterclockwise. This is approximately 32 turns. There is no mechanical stop. A slight clicking may be heard or felt when the pot is fully counterclockwise. Also turn the *Delay* and *Relay 2 Diff* pots to the full counterclockwise positions.
5. Set the *Span Range* switches to the appropriate position (as explained in Section 3.1).
6. Turn on power to the Multipoint II controller. The red power LED should illuminate.
7. Raise the material to the level where the first relay is to activate. See Figure 3-3. If you cannot raise or lower the level in your vessel, go to section 3.3 for an alternative calibration method.

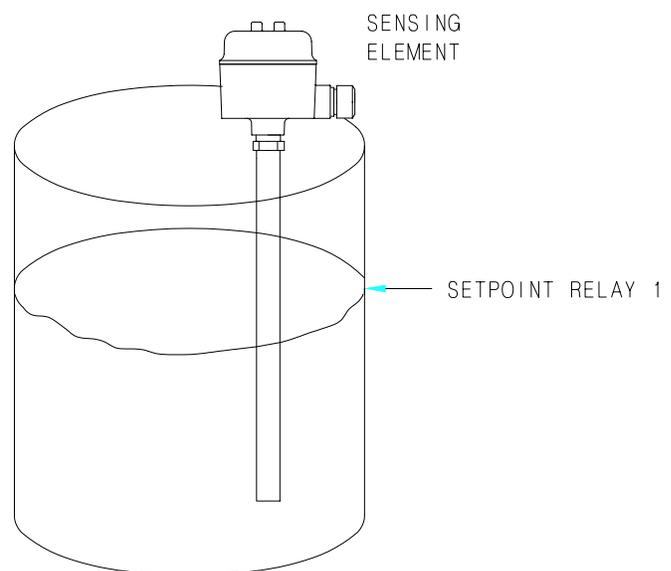


Figure 3-3
Setpoint Relay 1

3.2 Calibration Procedure (cont.)

- Then adjust the *Setpoint Relay 1* pot (turn clockwise) until the LED just changes state. The setpoint is now adjusted. See Figure 3-4.

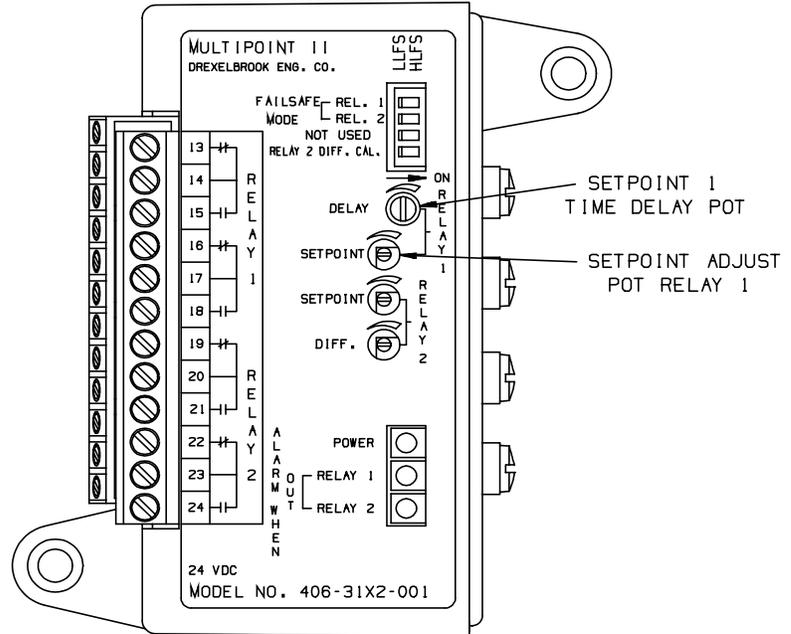


Figure 3-4
Setpoint Relay 1 and Delay Pot

- Relay 1 has a time delay option. If time delay is used, turn the *Delay* pot of Setpoint 1 clockwise to increase the delay (0-120 second range). The fully clockwise position (2/3 turn) produces a 120-second time delay. The delay interval begins upon recovery from alarm.
- Raise or lower the material to the low setpoint of *Relay 2*. See Figure 3-5.

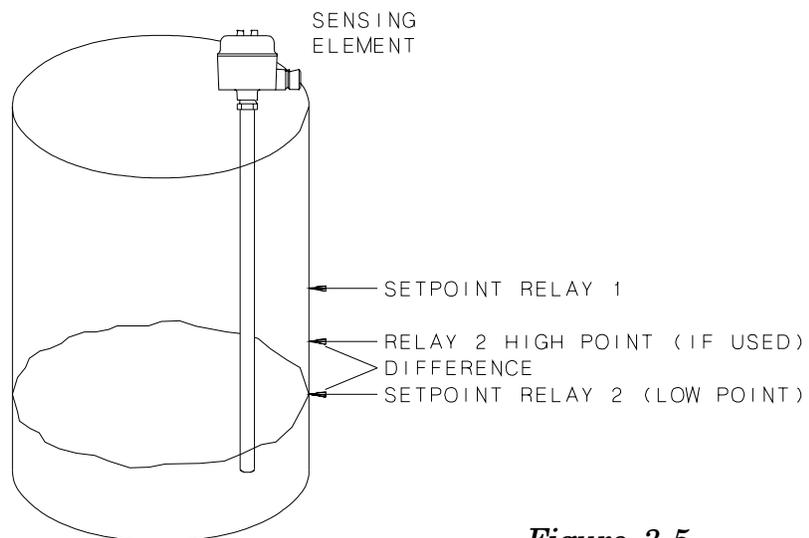


Figure 3-5
Setpoint Relay 2

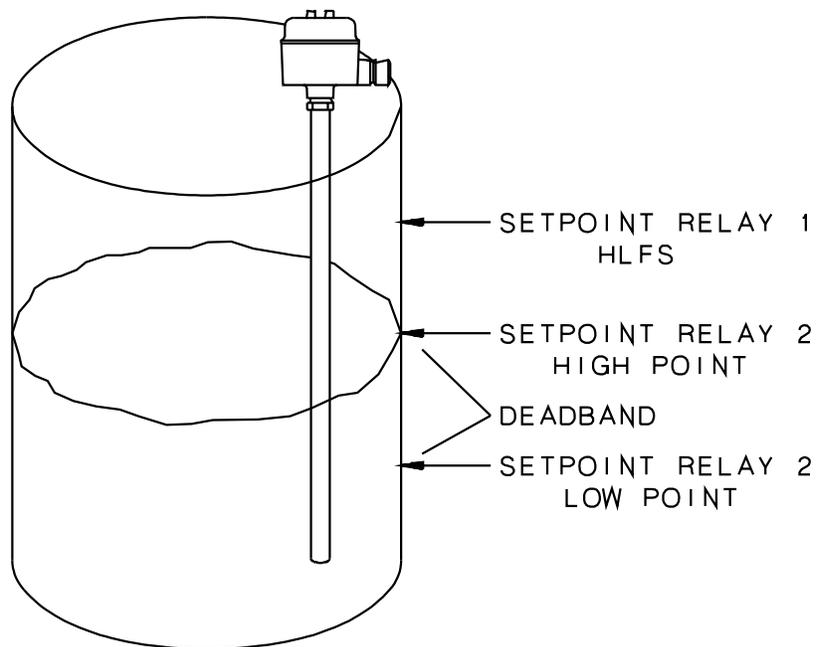
3.2 Calibration Procedure (cont.)

11. Make sure the *Relay 2 Diff Cal* switch is off and the *Setpoint* pot of Relay 2 is in the full CCW position. Then adjust the *Setpoint* pot of Relay 2 until the LED changes state.

NOTE

At this point, calibration is complete for two setpoints. If you want to use the adjustable differential feature (deadband), proceed to step 12. If you want to calibrate a third setpoint, proceed to step 15.

12. Raise the material to the level of the high point of relay 2. See Figure 3-6.



*Figure 3-6
Setpoint Relay 2
with Deadband*

3.2 Calibration Procedure (cont.)

13. Turn *Relay 2 Diff Cal* switch on. Then adjust the *Diff* pot on relay 2 clockwise (CW) until the LED changes states. See Figure 3-7. Turn *Relay 2 Diff Cal* switch off.

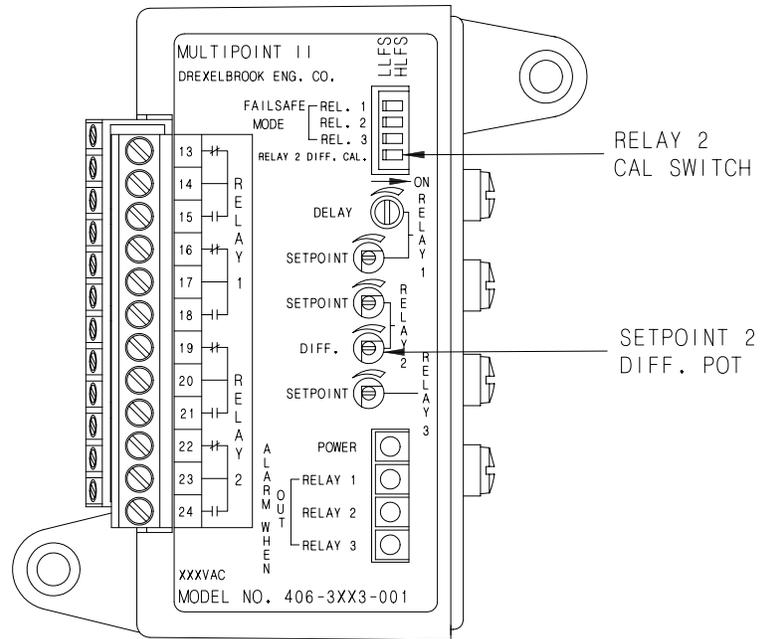


Figure 3-7
Relay 2 Diff Cal Switch with Deadband

14. A two-point Multipoint II controller with adjustable differential is now calibrated. If your system has three points, continue with step 15.

3.2 Calibration Procedure (cont.)

15. Raise or lower the material to the level where Relay 3 will change state.
16. Adjust the *Setpoint* pot for Relay 3 (turning clockwise) until the LED changes state. See Figure 3-8.

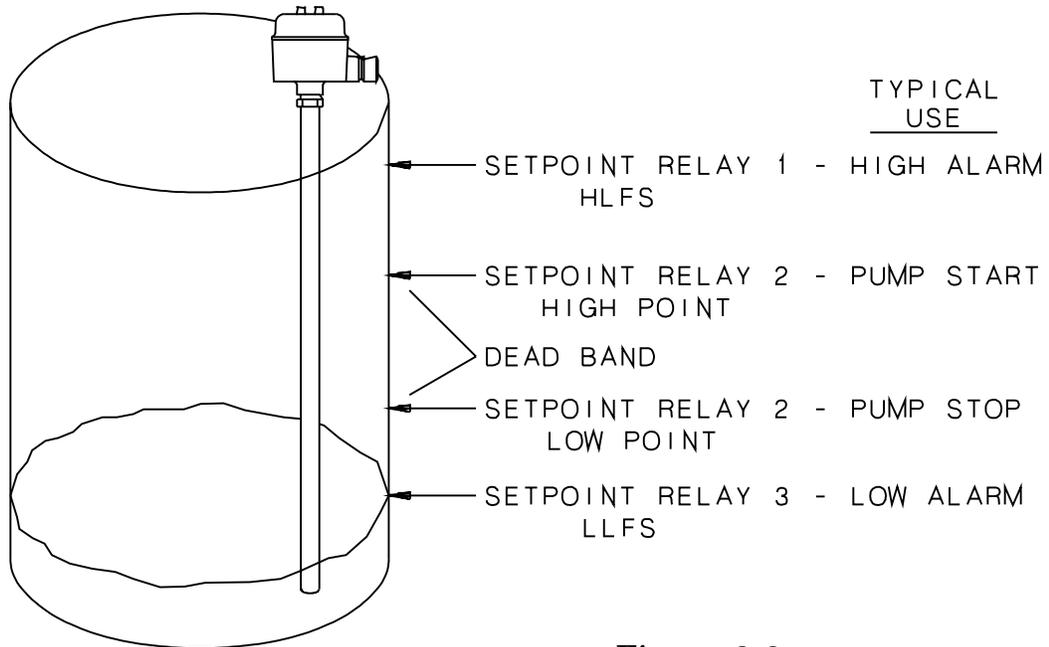


Figure 3-8
Three-point Relay Calibration

17. Calibration is now complete. Test the entire set-up by raising or lowering the material level through all of the setpoints to ensure proper operation.
18. It is recommended to use a 401-6-81 calibrator (section 3.3), to record calibration data.

3.3 Secondary Calibration Standard

NOTE

If the level cannot be moved, call the factory service department at 1-800-527-6297 or fax them at 215-443-5117 with the following information:

sensor and chassis model number

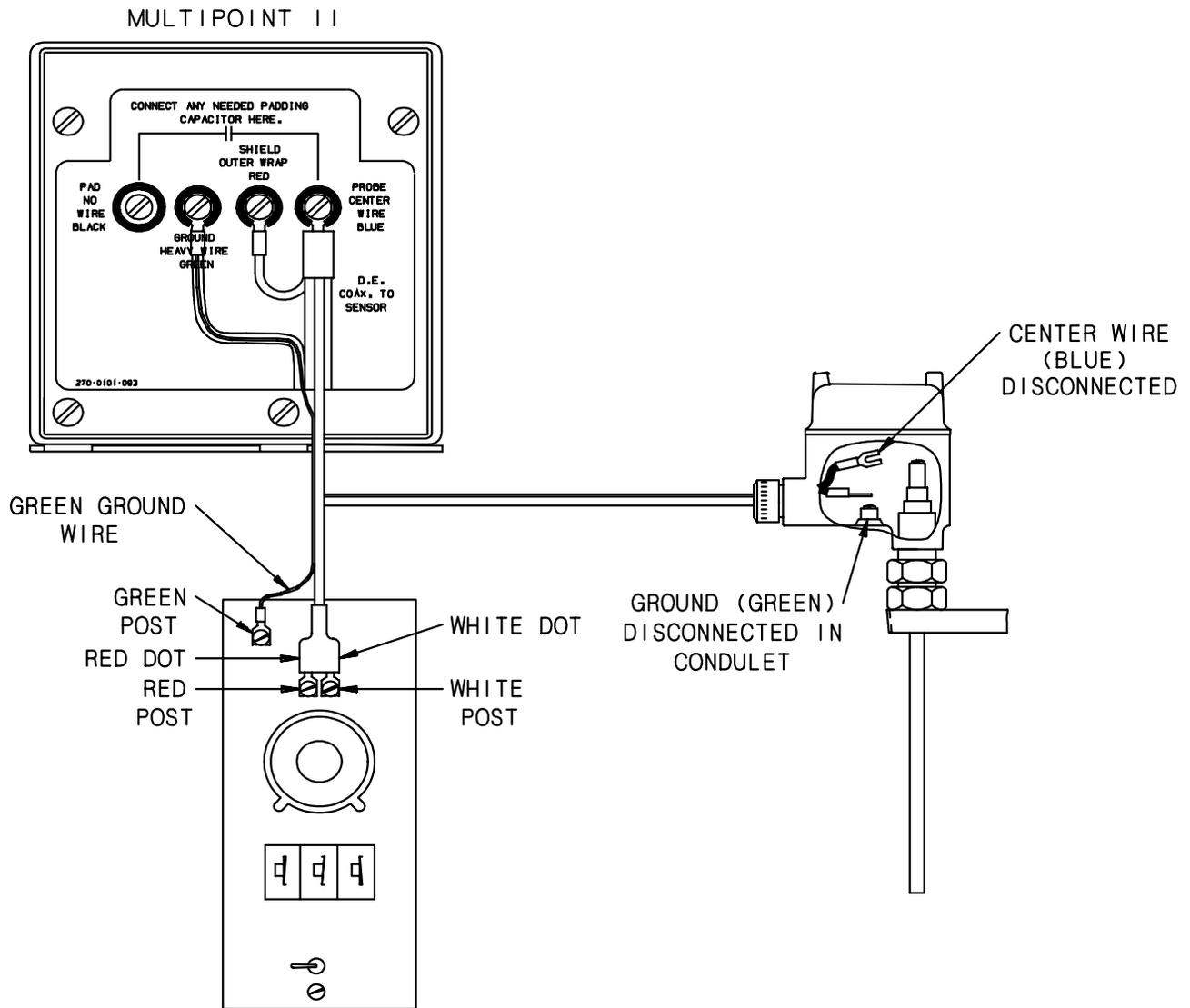
- sensor insertion length
- material being measured
- type of vessel
- desired activation levels

In some applications, it is difficult or even impossible to completely fill, empty, or change the level in a vessel. In such a case, it is desirable to have a secondary calibration standard such as the Drexelbrook model 401-6-81 C-Box (Capacitance Box) level simulator, which can be used to simulate the capacitance of an empty or full vessel. The following procedure permits calibration of an instrument without changing the level in the vessel.

Start by setting up the instrument as described under Calibration (section 3.2, steps 1-6). Then, do the following:

- A. If it is an integral system, disconnect the white coax wire from chassis and go to step B. If it is a remote system, disconnect the coax center, shield, and ground wires from the sensing element. (Be sure the wires do not short to anything.)
- B. Connect the calibration standard to the instrument in parallel with existing cable connections, ground, center wire and shield. See Figure 3-10. Also refer to the 401-6-8 Capacitance Box Manual for more information.
- C. Follow the calibration instructions (section 3.2, steps 7-17). Instead of raising or lowering level, adjust the calibrator to generate the appropriate number of picofarads for each setpoint.
- D. The calibrator can be used to record the number of picofarads for each setpoint on a system that was previously calibrated by emptying and filling the tank.
- E. Record the calibration data and save it.

When replacing a malfunctioning electronic unit, the replacement chassis can be calibrated on the bench by the preceding method and then installed in the field.



*Figure 3-10
Secondary Calibration Standard*

SECTION 4 - TROUBLESHOOTING

The Multipoint II 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 Multipoint II level control. If attempts to locate the difficulty fail, notify your local Drexelbrook representative, or call the factory direct at 1-800-527-6297.

Before removing the instrument from service, determine whether the malfunction is due to a problem with the sensing element or the process conditions.

4.1 Electronic Unit Checkout

Use the following steps to check out the electronic unit:

- A. See Figure 4-1. Disconnect the cable from the probe center wire (blue), shield outer wrap (red), and ground heavy wire (green) terminals at the instrument. Leave the power connected. Place all *Failsafe* switches to the HLFS position, and the *Relay 2 Diff Cal* switch to the OFF position.
- B. Turn *Relay 2 Diff Cal* pot fully CCW.

CAUTION

The *Time Delay* pot is a 2/3 turn device. Do not turn past its mechanical stops or damage could occur to the unit.

NOTE

If the instrument has the time delay option, turn the *Time Delay* control to the full counterclockwise (CCW) position (no time delay).

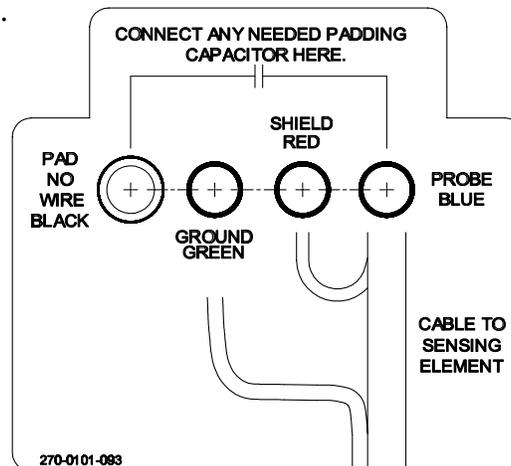


Figure 4-1
Electronic Unit Checkout

4.1 Electronic Unit Checkout (cont.)

- C. Attach a 10-100 pF load capacitor between the sensing element center wire and ground terminals.
- D. See Figure 4-2. Starting with the *Setpoint Relay* pot for channel 1 in the full counterclockwise (CCW) position, turn the adjustment slowly clockwise (CW) until the relay just operates.

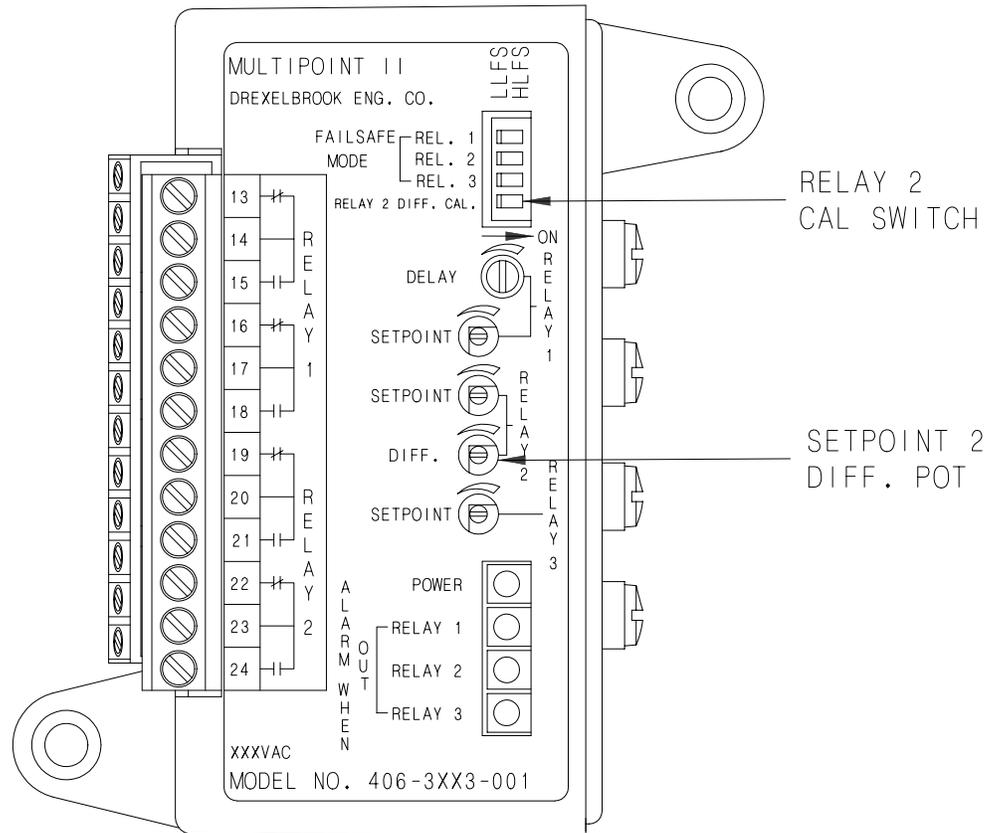


Figure 4-2
Setpoint Relay

- E. Rotate the adjustment slowly back and forth about this point, observing the travel required between relay pull-in and relay drop-out. Repeat for each channel. The pointer should travel less than 1 turn to operate the relay. If so, the instrument is working properly.
- F. If the instrument does not function properly, consult the factory service department for assistance.

4.2 Relay Circuit Checkout

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, two (and three) pairs of contacts will be open with high or low level, and two (or three) pairs will be closed with high or low level. See Figure 4-3.

Relay 1 is shown.
Terminal numbers change for Relay 2 and Relay 3.

<i>Selected Fail Safe</i>	<i>Tank Level</i>	<i>LED Output</i>	<i>Relay Condition</i>
HLFS	Below Trip Point	ON	Energized (Non Alarm)
HLFS	Above Trip Point	OFF	De-energized (Alarm)
LLFS	Below Trip Point	OFF	De-energized (Alarm)
LLFS	Above Trip Point	ON	Energized (Non Alarm)

*Figure 4-3
Relay Circuit Operation*

- B. Adjust the instrument as described in the electronics checkout section 4.1.

4.2 Relay Circuit Checkout (cont.)

- C. Relay operation may generally be heard as an audible click when the background noise is not too high. Use one of the methods shown in Figure 4-4 to determine if the relay contacts are switching.
- D. 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 4-3. Be sure to use the diagram for the fail-safe in which the channel is configured.

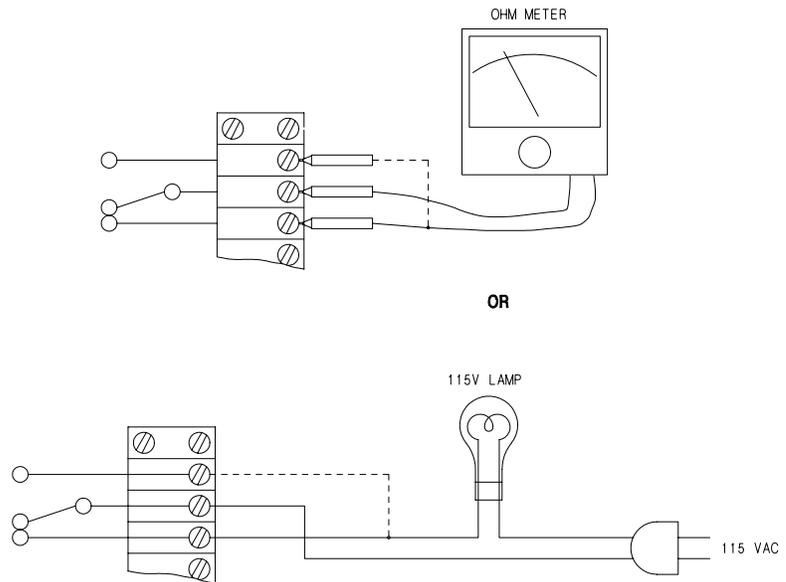


Figure 4-4
Relay Circuit Wiring

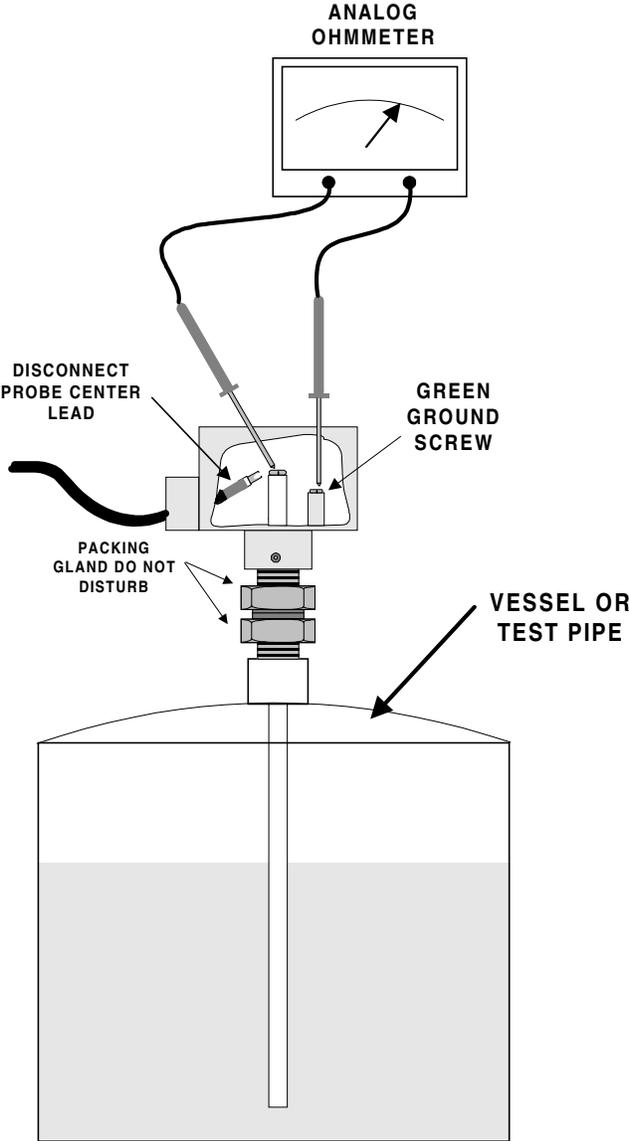
4.3 Sensing Element Checkout

NOTE

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

1. Use an analog ohmmeter¹ and set it to **R x 10K**.
2. With the *process material covering the sensing element*, check the resistance between the sensing element center and ground terminals by measuring from the sensing element center rod (blue screw) to ground (green screw).
3. A functional sensing element should measure infinite ohms (open circuit).
 - Low resistance may be caused by a crack or pinhole in the sensing element insulation or a problem in the conduit/packing nut area. Continue with step 4.
4. To determine if the low resistance reading is a result of punctured insulation or a fouled conduit, *lower the process material* below the sensing element and measure the resistance again.
 - If the resistance reading changes to infinite when the process material is below the sensing element, the sensing element insulation has failed. The sensing element needs to be rebuilt or replaced. Contact the factory.
 - If the resistance reading is still less than one megohm when the material is below the sensing element it is possible that process material, condensation or contamination has entered the sensing element conduit housing and seeped into the packing gland. Sometimes this contamination can be cleaned and removed with contact cleaner and dry compressed air. A heat gun can be used to gently heat the packing gland area to evaporate any moisture. Continue with step 5.
5. Clean the packing gland and conduit area and measure the resistance again. If the resistance reading is still less than one megohm, the sensing element needs to be rebuilt or replaced. Contact the factory.

¹Use an analog ohmmeter because the ohms/volt rating is lower and it therefore provides more current to measure the resistance. A digital meter does not measure resistance in the same way.



*Figure 4-5
Checking the Sensing Element*

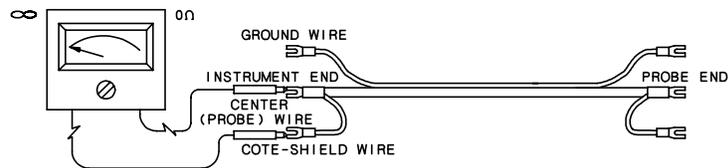
4.4 Cable Checkout

Troubleshoot the cable using the following steps.

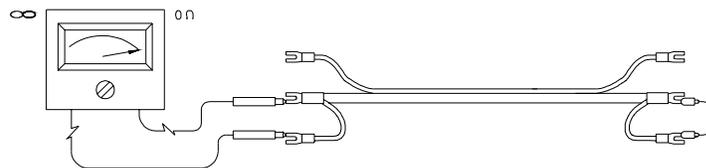
NOTE

If there is water or other conductive material in the conduit, it could cause the instrument to fail. If this is the case, it may not be detected by the following test.

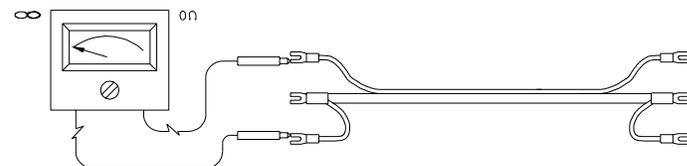
1. Disconnect cable at both ends. Ensure all terminals are standing clear.
2. Measure resistance from center wire to cote-shield using an analog ohmmeter set to R x 10K scale. Resistance should be infinity (open circuit).



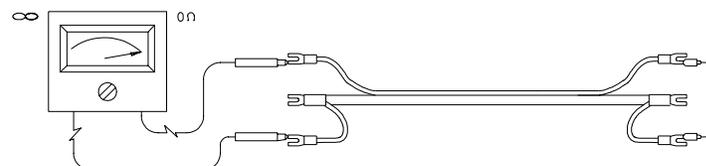
3. Short probe and cote-shield terminals together at one end.
4. Measure resistance from probe to cote-shield terminals at other end. Resistance should be near zero ohms (short circuit).



5. Repeat steps 1 and 2 for cote-shield and ground terminals. Resistance should be infinity (open circuit).



6. Repeat steps 3 and 4 for cote-shield and ground terminals. Resistance should be near zero ohms (short circuit).



4.5 Telephone Assistance

If you are having difficulty with your Drexelbrook equipment, and attempts to locate the problem have failed, notify your local Drexelbrook representative, or call the factory toll free 1-800-527-6297. Drexelbrook Engineering Company is located at 205 Keith Valley Road, Horsham, PA 19044.

To help us solve your problem quickly, please have as much of the following information as possible when you call:

Instrument Model # _____

P.O. # _____

Date _____

Insertion Length _____

Application _____

Material being measured _____

Temperature _____

Pressure _____

Agitation _____

Brief description of the problem _____

Checkout procedures that failed _____

4.6 Equipment Return

Do not return equipment without first contacting the factory for a return authorization number. Any equipment being returned must include the following information in addition to the above.

Reason for Return _____

Return Authorization # _____

Person to contact at your company _____

“Ship To” address _____

If available, please also include the original P.O. number and the original Drexelbrook order number.

To keep the paperwork in order, you must include a purchase order with returned equipment, even though it may be coming back for warranty repair. You will not be charged if the equipment is covered under warranty.

Please return your equipment with freight charges pre-paid. We regret that we cannot accept collect shipments. Drexelbrook usually has exchange units available for faster turnaround of repair orders. If you prefer your own unit repaired rather than exchanged, please mark clearly on the return unit, “Do Not Exchange”.

Spare instruments are generally in factory stock. If the application is critical, a spare chassis should be kept on hand.

4.7 Field Service

Trained field servicemen are available on a time-plus-expense basis to assist in start-ups, diagnosing difficult application problems, or in-plant training of personnel. Contact the service department for further details.

4.8 Customer Training

Periodically, Drexelbrook instrument training seminars for customers are held at the factory. These sessions are guided by Drexelbrook engineers and specialists, and provide detailed information on all aspects of level measurement, including theory and practice of instrument operation. For more information about these valuable workshops, write to Drexelbrook Engineering, attention: Communications/ Training Group, or call direct (215) 674-1234.

**SECTION 5 -
SPECIFICATIONS**

**5.1 Electronic
Specifications**

NOTE
The differential,
once set, remains
constant even when
the setpoint is moved.

—Power Requirements

95-145 Vac, 50-60 Hz

205-255 Vac, 50-60 Hz

Maximum power, 3.5 watts

—Level Output

Two-point unit: (2) DPDT relays,

406-3XX2 one with 0-120 second time delay
 one with adjustable differential

Three-point unit: (3) DPDT relays,

406-3XX3 one with 0-120 second time delay
 one with adjustable differential
 one standard on/off

—Contact Ratings (DPDT)

250 Vac, 5A Resistive Load

30 Vdc, 5A Resistive Load

250 Vac, 2A Inductive Load

30 Vdc, 3A Inductive Load

—Operating Temperature

-40°F to 140°F (-40°C to 60°C)

—Ambient Temperature Effect on Operating Point

1% per 54°F (30°C)

—Sensitivity

2% on all ranges

—Operating Point Range

0-200 feet (depending on sensing element).

Range selection includes four selectors in a “dip” switch with 16 combination ranges available.

—Fail-safe

Field selectable high-level fail-safe (HLFS) or low-level fail-safe (LLFS) for each relay.

—Connecting Cable (Remote Units only)

3-terminal coaxial up to 150 feet (45.7m).

For greater lengths, consult factory.

Rated at 160°F (70°C) standard, to 450°F (230°C) optional

—Housing

5-inch integral explosionproof, standard

5-inch remote explosionproof, optional

Nema 4X remote housing, optional

Drexelcote™ corrosion-resistant, optional

5.2 Sensing Element Specifications

The following sensing elements are most often recommended for use with the 506-3000 Series Multipoint II. They are specified according to the application requirements. The sensing element model is indicated by the last digit of the system number. For identification, the last two digits of the sensing element model number are tagged on the mounting gland or flange of the sensing element. This listing does not include all of the sensing elements available for use with the Multipoint II. If you have additional questions about sensing elements, contact your local representative or the factory.

Model Number (Sensing Element) ¹	Process Pressure/ Temperature	Applications	Sensing Element Dimensions	Standard Mounting ²	Materials of Construction	Capacitance (pF) per Foot
506-3X00-Y01 (700-1-22)	1000psi @100°F (70 BAR @ 38°C) 500 psi @300°F (34 BAR @149°C)	Light or non-coating conductive liquids	.375 in (9.5mm) O.D. 20 ft (6m) maximum length	¾ inch NPT	TFE insulated metal rod	78 pF
506-3X00-Y02 (700-1-24)	1000psi @100°F (70 BAR @ 38°C) 500 psi @300°F (34 BAR @149°C)	Insulating liquids	.375 in (9.5mm) O.D. center rod 1.66 in (42 mm) O.D. Concentric shield 20 ft (6m) maximum length	1½ inch NPT	TFE insulated metal center rod with concentric shield	78 pF
506-3X00-Y04 (700-2-57)	1000psi @100°F (70 BAR @ 38°C) 500 psi @250°F (34 BAR @120°C)	For strength and modest conductive coatings	.84 in (21.3mm) O.D. 20 ft (6m) maximum length	1 inch NPT	"X" insulated metal rod	350 pF ±10%
506-3X00-Y05 (700-5-54)	500 psi @300°F (34 BAR @149°C)	Longer lengths in water-like liquids without agitation	.093 in (2.4mm) O.D. 400 ft (122m) maximum length	¾ inch NPT	PFA insulated cable	48 pF
506-3X00-Y06 (700-2-37)	1000psi @100°F (70 BAR @ 38°C) 500 psi @250°F (34 BAR @149°C)	Best conductive coating rejection	.54 in (13.7mm) O.D. 12 ft (3.65m) maximum length	¾ inch NPT	"X" insulated metal rod	2400 pF
506-3X00-Y07 (700-2-27)	1000psi @100°F (70 BAR @38°C) 500 psi @300°F (34 BAR @120°C)	Modest conductive coatings	.56 in (13.7mm) O.D. 15 ft (4.7m) maximum length	¾ inch NPT	FEP insulated metal rod	300 pF
506-3X00-Y09 (700-1-26)	1000psi @100°F (70 BAR @38°C) 500 psi @300°F (34 BAR @149°C)	Insulating liquids	.375 in (9.5mm) O.D. center rod 1.625 in (41 mm) O.D. Concentric shield 20 ft (6m) maximum length	1½ inch NPT	TFE insulated metal center rod with concentric shield	78 pF

¹X = 0 for two-point models; X = 1 for three-point models.

Y = 0 for integral mount; Y = 7 for remote mount.

²Flange mountings available.

TERMS AND CONDITIONS OF SALE

GENERAL: ALL ORDERS ARE SUBJECT TO THE FOLLOWING TERMS AND CONDITIONS. ANY ACCEPTANCE OF ANY OFFER OF BUYER FOR ANY GOODS OR SERVICES IS CONDITIONED UPON THESE TERMS AND CONDITIONS, AND SELLER OBJECTS TO ANY ADDITIONAL OR DIFFERENT TERMS PROPOSED BY BUYER IN ANY DOCUMENT, WHICH SHALL NOT BE BINDING UPON SELLER. No salesman or other party is authorized to bind the AMETEK DREXELBROOK Division of AMETEK, Inc. (hereinafter "Seller") by any agreement, warranty, statement, promise, or understanding not herein expressed, and no modifications shall be binding on Seller unless the same are in writing and signed by an executive officer of Seller or his or her duly authorized representative. Verbal orders shall not be executed until written notification has been received and acknowledged by Seller.

QUOTATIONS: Written quotations are valid for thirty (30) days unless otherwise stated. Verbal quotations expire the same day they are made.

PRICES: All prices and terms are subject to change without notice. Buyer-requested changes to its order ("Orders"), including those affecting the identity, scope and delivery of the goods or services, must be documented in writing and are subject to Seller's prior approval and adjustments in price, schedule and other affected terms and conditions. Orders requiring certified test data in excess of commercial requirements, are subject to a special charge.

ORDER ACCEPTANCE: All Orders are subject to final approval and acceptance by Seller at its office located at 205 Keith Valley Road, Horsham, Pennsylvania 19044.

TERMS OF PAYMENT: Seller's standard terms of payment for Buyers who qualify for credit are net thirty (30) days from date of invoice. All invoices must be paid in United States dollars.

CREDIT: Seller reserves the right at any time to revoke any credit extended to Buyer or otherwise modify terms of payment if Buyer fails to pay for any shipments when due or if in Seller's opinion there is a material adverse change in Buyer's financial condition. Seller may, at its option, cancel any accepted Order if Buyer fails to pay any invoices when due.

DELIVERY: Shipments are F.O.B place of manufacture ("Shipping Point") and the Buyer shall pay all freight, transportation, shipping, duties, fees, handling, insurance, storage, demurrage, or similar charges from Shipping Point. Delivery of goods to common carrier shall constitute delivery and passing of title to the Buyer, and all risk of loss or damage in transit shall be borne by Buyer. Any claims or losses for damage or destruction after such delivery shall be the responsibility of Buyer.

Seller reserves the right to make delivery in installments which shall be separately invoiced and paid for when due, without regard to subsequent deliveries. Delay in delivery of any installment shall not relieve Buyer of its obligation to accept remaining deliveries.

Acknowledged shipping dates are approximate only and based on prompt receipt of all necessary information from Buyer and Buyer's compliance with terms of payment.

TAXES: All sales, excise and similar taxes which Seller may be required to pay or collect with respect to the goods and/or services covered by any Order, shall be for the account of the Buyer except as otherwise provided by law or unless specifically stated otherwise by Seller in writing.

TERMINATION AND HOLD ORDERS: No Order may be terminated by Buyer except upon written request by Buyer and approval by Seller, and if said request is approved by Seller, under the following conditions: (1) Buyer agrees to accept delivery of all of the units completed by Seller through the workday on which Seller receives the written termination request; (2) Buyer agrees to pay to Seller all direct costs and expenses applicable to the portion of the Order that is incomplete.

WARRANTY:

A. **Hardware:** Seller warrants its goods against defects in materials and workmanship under normal use and service for one (1) year from the date of invoice.

B. **Software and Firmware:** Unless otherwise specified, Seller warrants for a period of one (1) year from date of invoice that standard software or firmware, when used with Seller specified hardware, shall perform in accordance with Seller's published specifications. Seller makes no representation or warranty, expressed or implied, that the operation of the software or firmware shall be uninterrupted or error-free, or that functions contained therein shall meet or satisfy the Buyer's intended use or requirements.

C. **Services:** Seller warrants that services, including engineering and custom application, whether provided on a fixed cost or time and material basis, shall be performed in accordance with generally accepted industry practices.

D. **Remedies:** Seller's liability under this section is restricted to replacing, repairing, or issuing credit (at Seller's option) for any returned goods and only under the following conditions: (1) Seller must be promptly notified, in writing, as soon as possible after the defects have been noted by the Buyer, but not later than (1) year from date of invoice from Seller; (2) The defective goods are to be returned to the place of manufacture, shipping charges prepaid by the Buyer; (3) Seller's inspection shall disclose to its satisfaction that the goods were defective in materials or workmanship at the time of shipment; (4) Any warranty service (consisting of time, travel and expenses related to such services) performed other than at Seller's factory, shall be at Buyer's expense.

E. **Repaired/Reconditioned Goods:** As to out-of-warranty goods which Seller has repaired or reconditioned, Seller warrants for a period of sixty (60) days from date of its invoice only new components replaced in the most recent repair/reconditioning.

F. **Returns and Adjustments:** No goods may be returned unless authorized in advance by Seller and then only upon such conditions to which Seller may agree. Buyer must obtain an RMA (Return Material Authorization) number from Seller prior to any return shipment and such RMA number must appear on the shipping label and packing slip. Buyer shall be responsible for the returned goods until such time as Seller receives the same at its plant and for all charges for packing, inspection, shipping, transportation, or insurance associated with returned goods. In the event that credit for returned goods is granted, it shall be at the lesser of the then current prices or the original purchase price. Claims for shortage or incorrect material must be made within five (5) days after receipt of shipment.

ALL OTHER WARRANTIES, FOR ANY OF SELLER'S GOODS OR SERVICES, WHETHER ORAL, WRITTEN, EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE ARE EXCLUDED.

INTELLECTUAL PROPERTY: Seller's sale of goods or provision of related documentation or other materials to Buyer shall not transfer any intellectual property rights to Buyer unless Seller specifically agrees to do so in writing. Seller shall retain ownership of all applicable patents, trademarks, copyrights and other intellectual property rights. Buyer shall not use, copy or transfer any such items in violation of Seller's intellectual property rights or applicable law, or for any purposes other than that for which the items were furnished.

Seller shall defend any lawsuit brought against the Buyer based on a claim that the design or construction of the goods sold hereunder by Seller infringe any United States or Canadian Patent, Copyright or Mask Work Registration, provided that Buyer promptly notifies Seller of such claim in writing and further provided that, at Seller's expense, (1) Buyer gives Seller the sole right to defend or control the defense of the suit or proceeding, including settlement, and (2) Buyer provides all necessary information and assistance for that defense. In the event of a charge of infringement, Seller's obligation under the agreement shall be fulfilled if Seller, at its option and expense, either (i) settles such claim; (ii) procures for Buyer the right to continue using such goods; (iii) replaces or modifies goods to avoid infringement; or (iv) accepts the return of any infringing goods and refunds their purchase price; or (v) defends against such claim.

If Buyer furnishes specifications or designs to Seller, the obligations of Seller set forth above shall not apply to goods made by Seller using such specifications or designs, and Buyer shall defend, indemnify and hold Seller harmless against any third party claims for infringement which arise out of Seller's use of specifications or designs furnished by Buyer.

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PACKAGING/WEIGHTS AND DIMENSIONS: Buyer specified packing or marking may be subject to additional charges not otherwise included in the price of the goods. Published weights and dimensions are estimates or approximate only and are not warranted.

FORCE MAJEURE: Seller shall not be responsible for delays in delivery or any failure to deliver due to causes beyond Seller's control, including but not limited to the following items: acts of God, war, terrorism, mobilization, civil commotion, riots, embargoes, domestic or foreign governmental regulations or orders, governmental priorities, port congestion, acts of the Buyer, its agents or employees, fires, floods, strikes, lockouts and other labor difficulties, shortages of or inability to obtain shipping space or transportation, inability to secure fuel, supplies or power at current prices or on account of shortages thereof, or due to limitations imposed by the extent of availability of Seller's normal manufacturing facilities.

If a delay excused per the above extends for more than ninety (90) days and the parties have not agreed upon a revised basis for continuing providing the goods or services at the end of the delay, including adjustment of the price, then Buyer, upon thirty (30) days' prior written notice to Seller may terminate the Order with respect to the unexecuted portion of the goods or services, whereupon Buyer shall promptly pay Seller its reasonable termination charges upon submission of Seller's invoices thereof.

LIMITATION OF LIABILITY: Seller's liability for any claim of any kind, except infringement of intellectual property rights, shall not exceed the purchase price of any goods or services which give rise to the claim. **SELLER SHALL IN NO EVENT BE LIABLE FOR BUYER'S MANUFACTURING COSTS, LOST PROFITS, LOSS OF USE OF THE GOODS OR SERVICES, COST OF CAPITAL, COST OF SUBSTITUTE GOODS, FACILITIES, SERVICES OR REPLACEMENT POWER, DOWNTIME COSTS, CLAIMS OF BUYER'S CUSTOMERS FOR DAMAGES, OR OTHER SPECIAL, PROXIMATE, INCIDENTAL, INDIRECT, EXEMPLARY OR CONSEQUENTIAL DAMAGES.** Any action against Seller must be brought within eighteen (18) months after the cause of action accrues. These disclaimers and limitations of liability shall apply regardless of the form of action, whether in contract, tort or otherwise, and further shall extend to the benefit of Seller's vendors, appointed distributors and other authorized resellers as third-party beneficiaries.

PROHIBITION FOR HAZARDOUS USE: Goods sold hereunder generally are not intended for application in and shall not be used by Buyer in the construction or operation of a nuclear installation or in connection with the use or handling of nuclear material, or for any hazardous activity or critical application, where failure of a single component could cause substantial harm to persons or property, unless the goods have been specifically approved for such a use or application. Seller disclaims all liability for any loss or damage resulting from such unauthorized use and Buyer shall defend, indemnify and hold harmless the Seller against any such liability, whether as a result of breach of contract, warranty, tort (regardless of the degree of fault or negligence), strict liability or otherwise.

EXPORT CONTROL: Buyer shall comply with all export control laws and regulations of the United States, and all sales hereunder are subject to those laws and regulations. Seller shall not be named as shipper or exporter of record for any goods sold hereunder unless specifically agreed to in writing by Seller. At Seller's request, Buyer shall furnish Seller with end-user and end-user information to determine export license applicability. Buyer warrants, in accordance with U.S. Export Law, that goods sold hereunder shall not be destined for facilities or activities involving nuclear, chemical or biological weapons, or related missile delivery systems in named prohibited regions or countries.

GOVERNING LAW: Seller intends to comply with all laws applicable to its performance under any order. All matters relating to interpretation and effect of these terms and any authorized changes, modifications or amendments thereto shall be governed by the laws of the Commonwealth of Pennsylvania. No government contract regulations or clauses shall apply to the goods or services, this agreement, or act to bind Seller unless specifically agreed to by Seller in writing.

NON-WAIVER BY SELLER: Waiver by Seller of a breach of any of these terms and conditions shall not be construed as a waiver of any other breach.

SEVERABILITY AND ENTIRE AGREEMENT: If any provision of these terms and conditions is unenforceable, the remaining terms shall nonetheless continue in full force and effect. This writing, together with any other terms and conditions Seller specifically agrees to in writing, constitutes the entire terms and conditions of sale between Buyer and Seller and supercedes any and all prior discussions, and negotiations on its subject matter.

AMETEK[®]
DREXELBROOK

An ISO 9001 Certified Company

205 Keith Valley Road Horsham, PA 19044

US Sales 1-800-553-9092

24 Hour Service 1-800-527-6297

International + 215-674-1234

Fax + 215-674-2731

E-mail drexelbrook.info@ametek.com

Web www.drexelbrook.com