



The Leader of RF
and Sonic Level

For Assistance Call 1-800-527-6297
Outside North America 1-215-674-1234

Installation and Operating Instructions

Series 508-46-718
Interface Controller
for
Electrostatic Separator Applica-
tions

*(215) 674-1234 Drexelbrook Headquarters
1-800-527-6297 Service Assistance
<http://www.drexelbrook.com>
e-mail: Service@Drexelbrook.com*

AMETEK Drexelbrook makes no warranty of any kind with regard to the material contained in this manual, including, but not limited to, implied warranties or fitness for a particular purpose. Drexelbrook shall not be liable for errors contained herein or for incidental or consequential damages in connection with the performance or use of material.

Copyright 2000 AMETEK Drexelbrook

**ED0 #9-97-247
508-46-718-LM**

**Series 508-46-718
Interface Controller
for
Electrostatic Separator Applications**

** [®]
DREXELBROOK**

An ISO 9001 Certified Company

205 Keith Valley Road Horsham, PA 19044

US Sales 800-553-9092

24 Hour Service 800-527-6297

International 215-674-1234

Fax 215-674-2731

E-mail deinfo@drexelbrook.com

Web www.drexelbrook.com

Table of Contents

SECTION 1 INTRODUCTION	1
1.1 Electrostatic Separator Operation	1
1.2 Model Numbering	2
SECTION 2 INSTALLATION	3
2.1 Installation Guidelines	3
Certified Drawings for Installation (CDs)	5-8
SECTION 3 CALIBRATION	9
3.1 Using Actual Interface to Calibrate	9
3.2 Using a Calibrator to Calibrate	12
3.2.1 Calculating Zero and Span Capacitance (optional)	13
3.3 External Padding Capacitor	16
SECTION 4 TROUBLESHOOTING	17
4.1 Electronic Unit Supply Voltage Check	17
4.2 Electronic Unit Checkout	18
4.3 Testing the Sensing Element	20
4.4 Testing the Coaxial Cable	21
4.5 Electronic Unit Drift Test	22
SECTION 5 SPECIFICATIONS	26
SECTION 6 THEORY OF OPERATION	28
APPENDIX A ADDITIONAL TROUBLESHOOTING	29

SECTION 1 INTRODUCTION

The instructions in this manual are for the Drexelbrook Interface Controller, covering system model number 508-46-718. This system utilizes the electronic unit 408-82XX. The system output is a 4-20 mA 24VDC signal. This equipment is designed to accurately measure the interface that forms between oil and water in any electrostatic separator or coalescer including desalters.

1.1 Electrostatic Separator Operation

This system measures the interface between water and oil. However, there usually is an emulsion layer present between the oil and water phases. The standard system measures the point where electrically the emulsion changes from oil phase (oil surrounding water droplets) to water phase (water surrounding oil droplets.)

An accurate interface measurement is important to maximize throughput of an electrostatic precipitator. Maximum throughput and efficiency occurs when:

- the interface is maintained in a fixed narrow range.
- the interface is kept low enough to prevent the water from contacting the high voltage grids, causing a short circuit and tripping of the grid circuit breakers.
- the interface is prevented from falling too low and allowing oil to be discharged through the water outlet.

The Drexelbrook system uses radio frequency technology to make the interface measurement. This technology is designed to handle the high voltage environment, temperature, pressure, corrosive atmosphere, wax, sediment, and build-up unique to electrostatic separator applications.

508-46-718 Series Interface Controller

1.2 Model Numbering

The Drexelbrook 508-46-718 interface controller consists of:

- 408-8202-4** (Modification 91-128) in explosionproof/ NEMA 4 housing. Includes loop surge arrestor and padding capacitor.

- 380-xxx-12** interconnecting coaxial cable.
The xxx denotes the number of feet, with a maximum length of 150 feet (45.7 M). The standard cable length is 25 feet (7.6M).

- 700-2-24** (Modification 91-250) immersion type sensing element with factory supplied metallic inactive section and 6-inch cooling extension. Includes electrostatic filter (installed) and conduit.

- 385-28-4** electrostatic filter.
The filter is used to protect the electronic unit from electrostatic fields due to the high voltage grids. The electrostatic filter mounts on the sensing element. Older systems may have a similar filter mounted on the sensing element terminals of the electronic unit.

- 377- 4-12** loop surge arrestor.
The surge arrestor protects the electronic unit from voltage surges on the loop supply wires. Surges are often caused by poor quality electrical service and nearby lightning strikes. The surge arrestor mounts on the 4-20 loop side of the electronic unit.

SECTION 2
INSTALLATION

2.1 Installation
Guidelines

For mounting and wiring drawings on pages 5-8.

- Do *not* install the sensing element in an internal displacer stilling well or external chamber (side arm). The interface which forms in these chambers may not be representative of the vessels internal interface. See Figure 2-1.

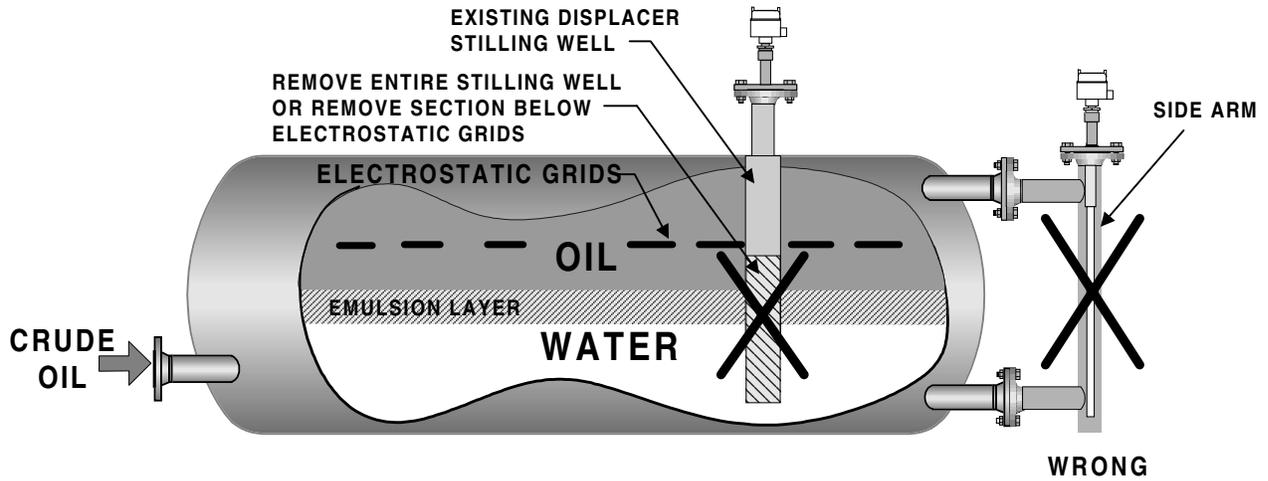


Figure 2-1
Mounting Guidelines

508-46-718 Series Interface Controller

2.1 Installation Guidelines (cont.)

- The sensing element must be installed in a location that provides maximum phase separation. If sample taps are used to check the interface, the ideal mounting location for the sensing element is near the inside extensions of the sample taps.

- 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 Teflon™ tape when installing threaded sensing elements. Brushable pipe sealant is acceptable.

- If the installation area is rated explosionproof, requiring conduit seal fittings, they should be used in accordance with your company standards and local codes. See Appendix B for the required control drawings covering explosionproof installations.

- Do not coil up excess 380-xxx-12 interconnecting coax. Coiled coax acts as an antenna to pick up stray 60 Hz noise. Factory supplied coax cable may be shortened (this is easier at the sensing element end). Termination kits are available.

Refer to Figure 2-2.

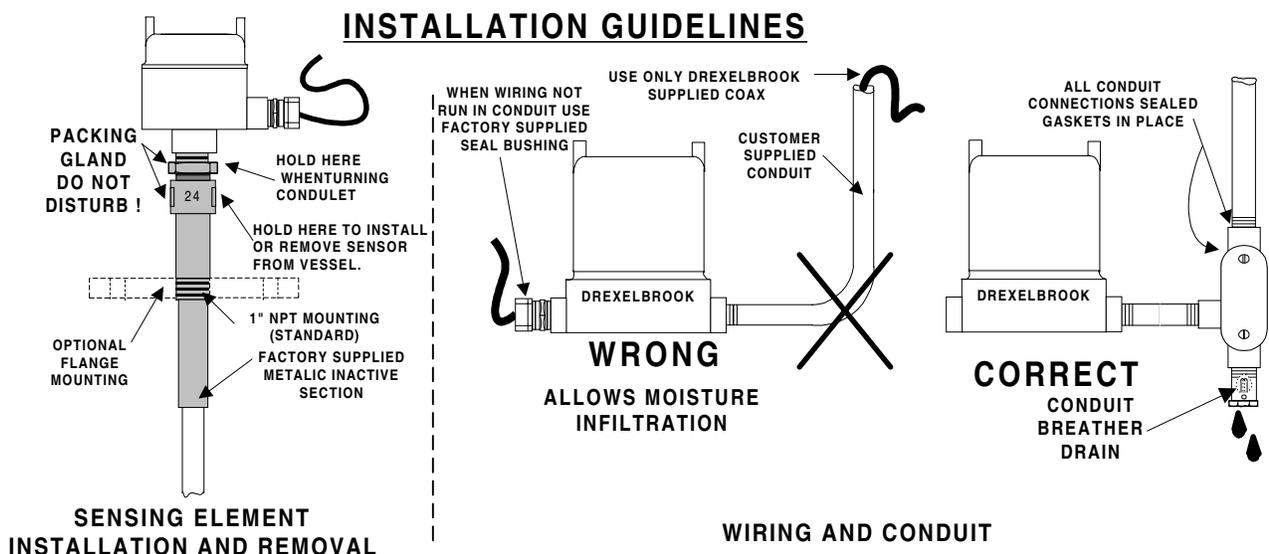
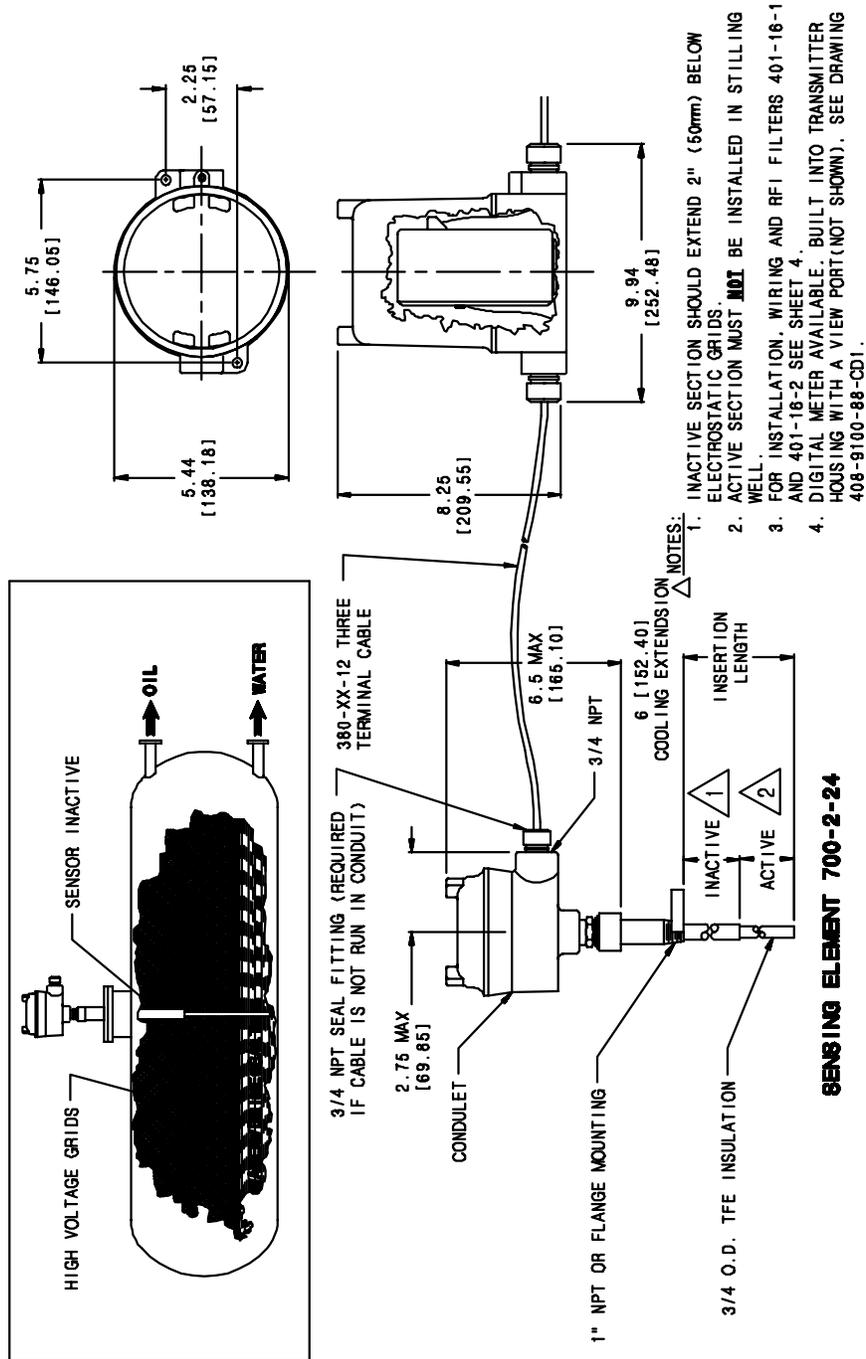
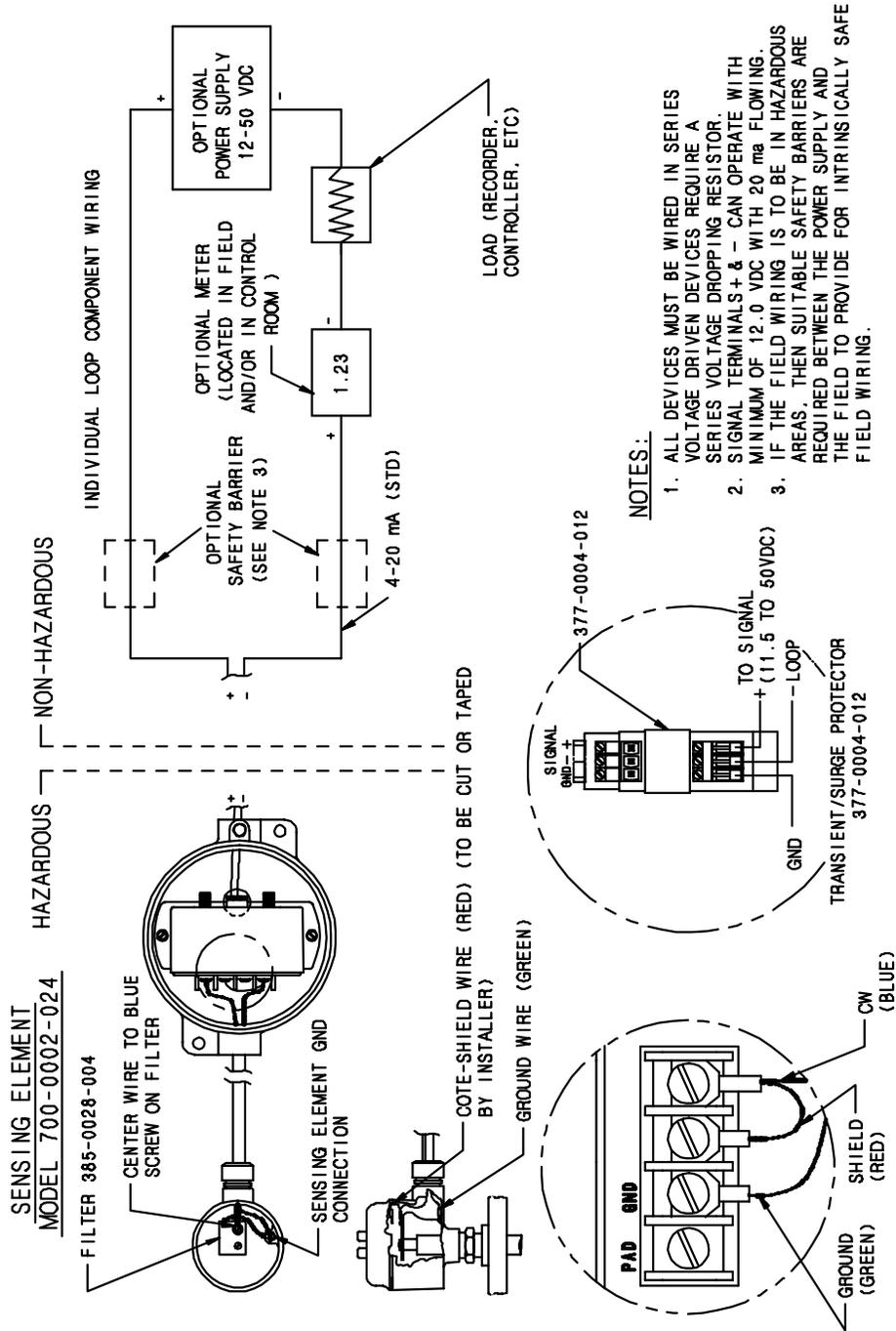
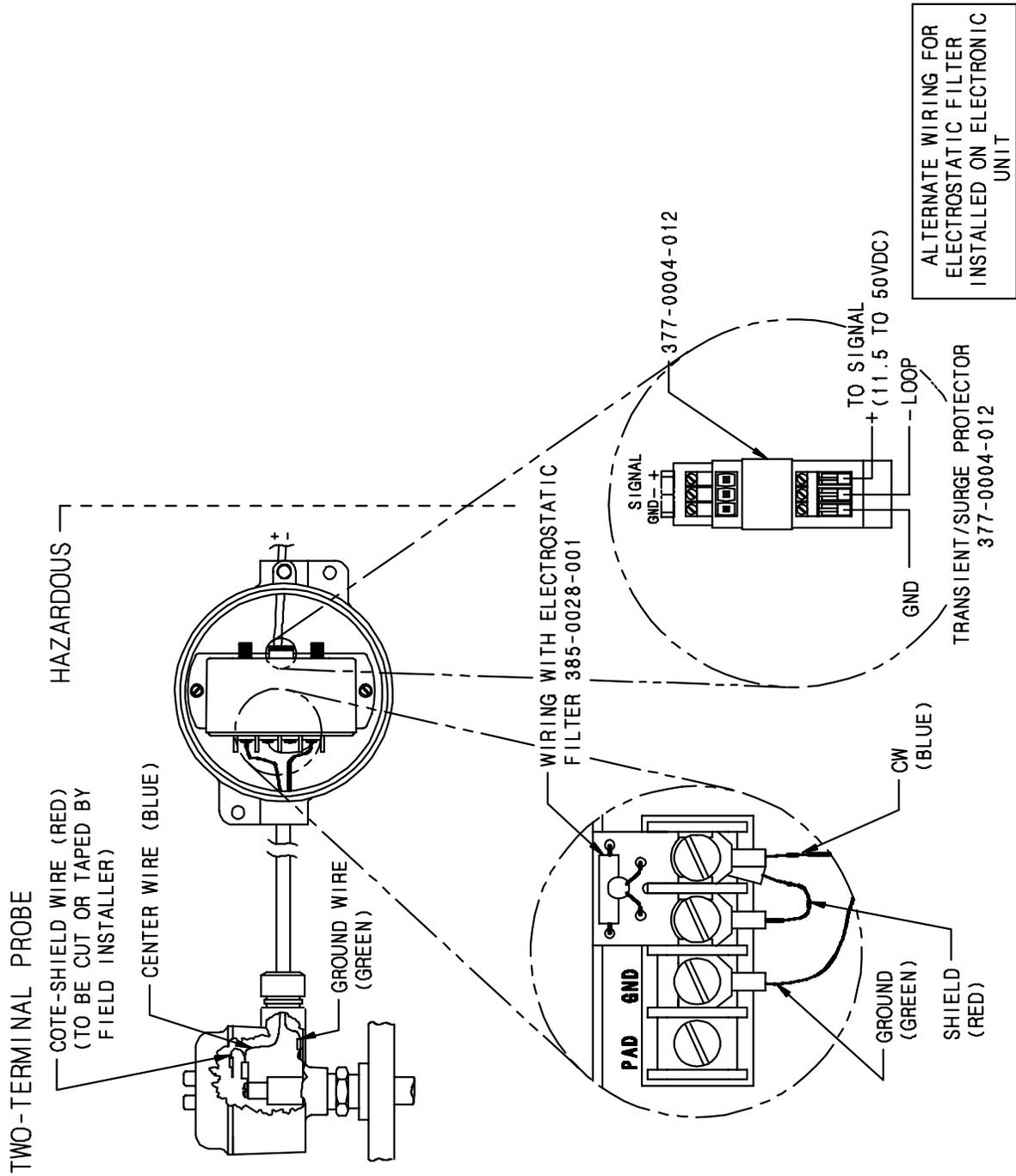
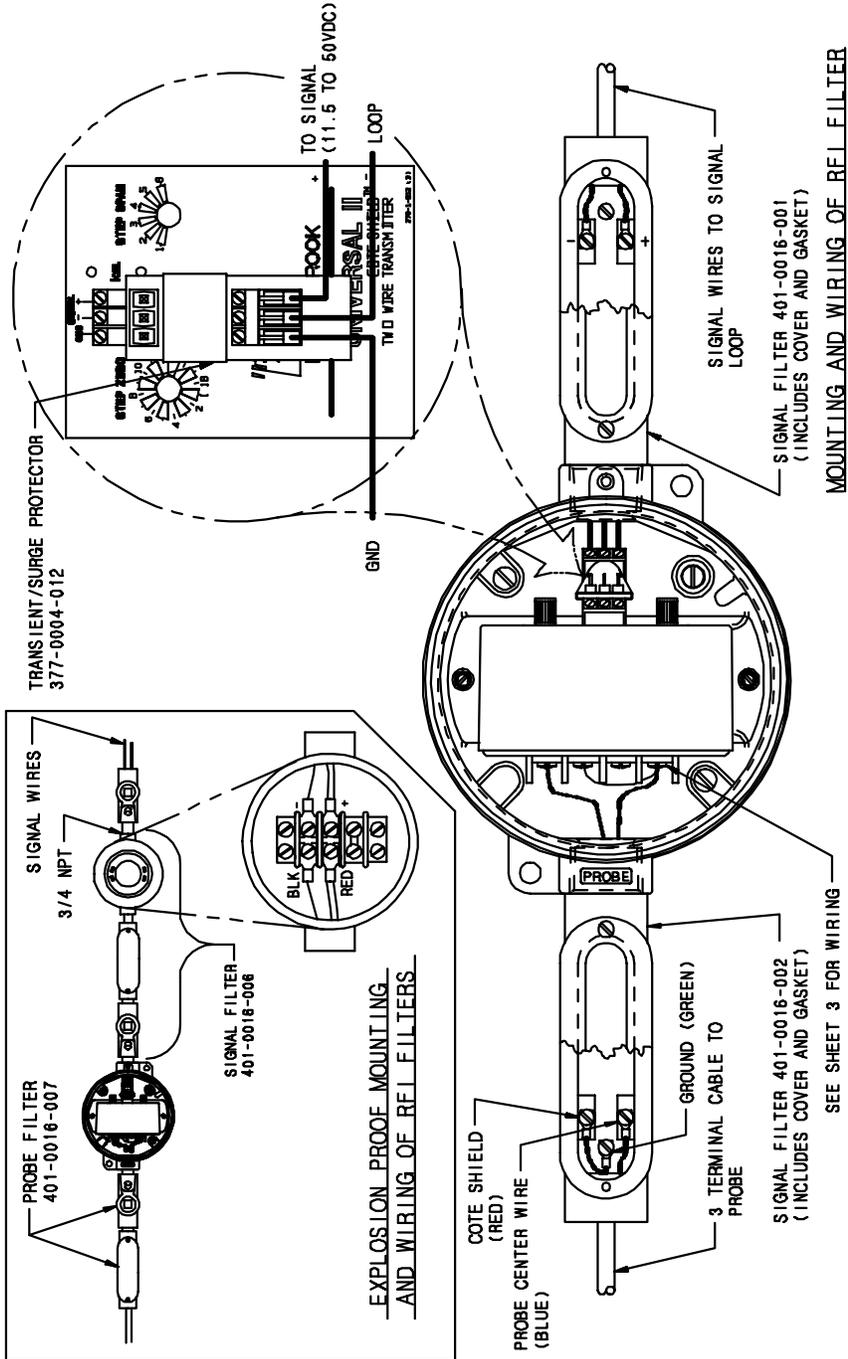


Figure 2-2
Installation Guidelines









SECTION 3 CALIBRATION

There are two methods used to calibrate the Drexelbrook Electrostatic separator system.

1. Use actual interface (provides the best accuracy).
2. Use a calibrator (model number 401-6-81) Provides rough calibration, needing touch-up using actual vessel level.

3.1 Using Actual Interface to Calibrate

—Use actual interface level

This procedure involves moving the interface for proper calibration. This method produces the most accurate calibration.

Preset the calibration dials as follows:



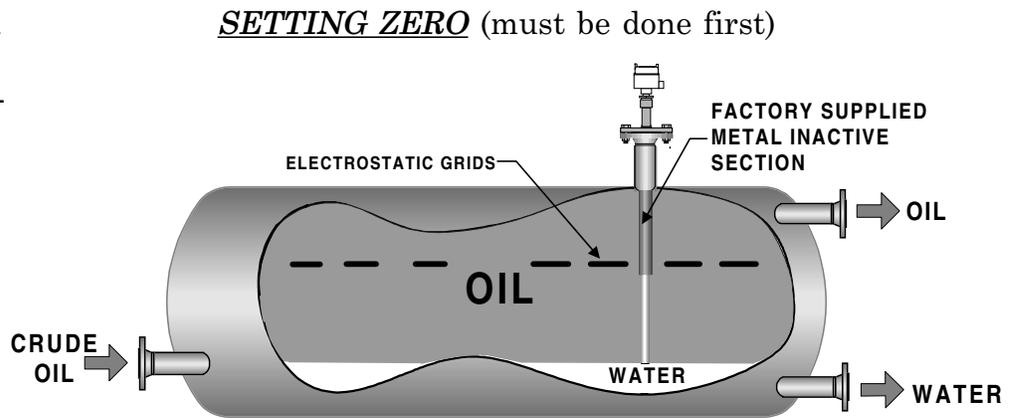
Figure 3-1
Calibration Dials

- Turn the fine zero pot fully counterclockwise using a small screwdriver.
- Turn the fine span pot fully clockwise using a small screwdriver.

(Both of these controls are 35 turn potentiometers. They do not have mechanical stops. No damage will occur if turned more than 35 turns)

- Set the step zero switch to position 1.
- Set the step span switch to position 1.

3.1 Using Actual Interface to Calibrate - Setting Zero (cont.)



*Figure 3-2
Setting Zero*

- Power-up the transmitter
- Fill the vessel with crude oil.
- Bring vessel up to normal operating temperature and pressure.
- Allow time for an interface to form.
- Turn on the electrostatic grids.
- Lower the water level until the sensing element is completely covered with oil or to the point you want to call 0 %. (If the desired 4 mA point is above the sensing element tip, lower the level to this point.)
- Attach a milliammeter in series with the current loop. Easy loop access is provided at the **CAL** test points of the electronic unit. See Figure 4-1.
- If a factory supplied pad capacitor is attached across the “CW “ and “PAD,” do not remove.
- The output current will now typically be greater than 20 mA.
- Adjust the step zero control until the output drops to a value between 4 and 20 mA..
- Adjust the fine zero with a small screwdriver to equal exactly 4.00 mA.

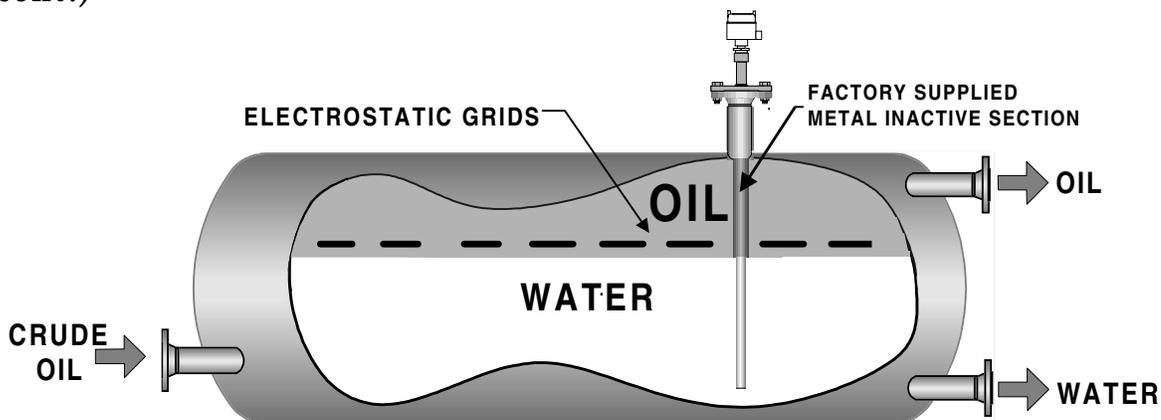
NOTE

If you are unable to bring the output down to 4 mA and have reached the end of the travel of the adjustment controls see section 3.3 External Padding Capacitor.

3.1 Using Actual Interface to Calibrate - Setting Span (cont.)

SETTING SPAN

- Raise the interface until the 100 percent point (20mA) has been completely covered with water.



*Figure 3-3
Setting Span*

- The output will typically be greater than 20mA.
- Turn the step span switch clockwise position by position until the output is between 4 and 20mA.
- Adjust the fine span pot with a small screwdriver until the output current equals exactly 20.00mA.

NOTE

It is possible to set the span at a point less than 100 percent. For example, if the highest you can raise the water level is 75%, simply adjust the step span and fine span controls to produce a 16mA output. The calibration will be linear and accurate even though calibration was not made at 100%.

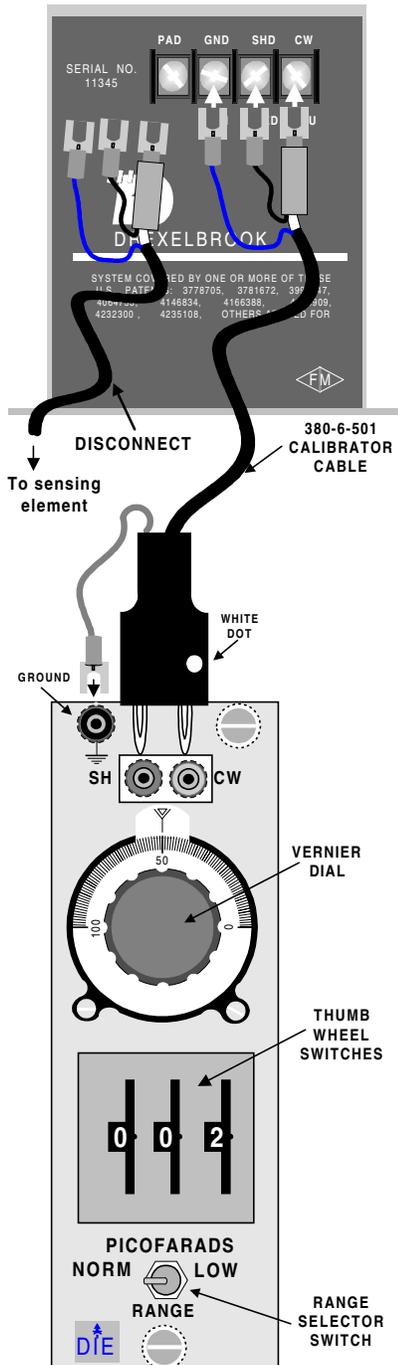
NOTE

Using the actual interface to establish calibration produces a very accurate calibration. When this procedure is completed, a calibrator (401-6-81) should be used to record the calibration data. Use the calibrator to dial up the capacitance that produces 4mA and the capacitance that produces 20mA. Record this data and save it for future use. Using a calibrator and good calibration data can make routine calibration checks easy and can also be used to calibrate a rebuilt transmitter on the workbench without needing to move tank level. See section 3.2 for detailed instructions on use of a calibrator.

3.2 Using a Calibrator to Calibrate

A calibrator (C-box 401-6-81) can be used to simulate the sensing element and changes in interface level. The easiest method of starting a calibration is to obtain calibration numbers in picofarads (pF) from your local representative, the factory, or by calculating it yourself using the instructions in paragraph 3.2.1. The resulting system accuracy is within 5% when using a calibrator. This provides a functioning system that reads on scale. To improve accuracy, determine the actual interface level and use the fine span control to adjust the 4-20 mA output to read exactly the measured interface.

Once you have obtained the proper value of capacitance required for zero and span, refer to Figure 3-4 and proceed as follows:



- Disconnect the coax cable from the sensing element at the electronic unit.
- Hook the calibrator coax cable to the center, shield, and ground screws of the electronic unit (Figure 3-4).
- Place the range selector switch of the calibrator in the normal position.
- Set the calibrator to equal the zero capacitance by adjusting the calibrator thumbwheels and vernier dial. For example using 416 pF (the zero capacitance calculated in Example 3-1), place the thumbwheels in position 0 0 4 and dial the vernier to 16.
- Place a milliammeter in series with the current loop.
- Adjust step zero and fine zero to produce 4.0 mA.
- Set the calibrator to equal the span capacitance by adjusting the calibrator thumbwheels and vernier dial. For example, using 611 pF (the span capacitance calculated in example 3-1), place the thumbwheels in position 0 0 6 and dial the vernier to 11.
- Adjust step span and fine span controls on the electronic unit to produce an output current of 20 mA.
- Calibrating zero and span is finished.

*Figure 3-4
Using a Calibrator*

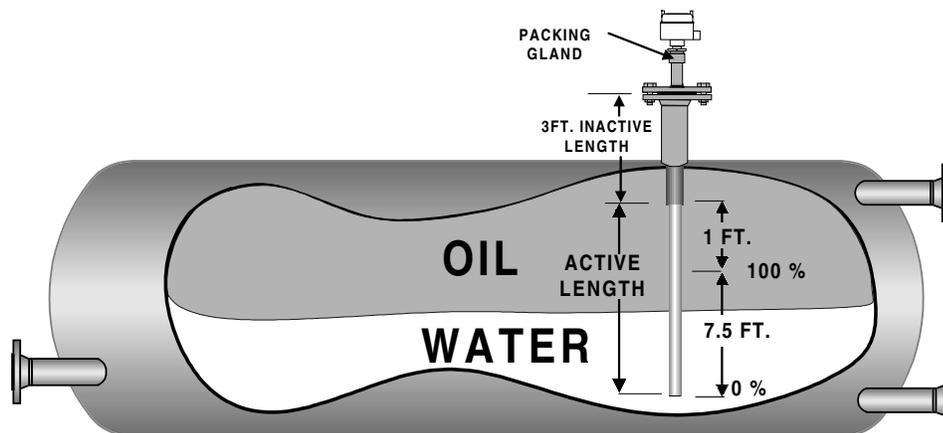
3.2.1 Calculating Zero and Span Capacitance (optional)

Calibration numbers consist of the zero capacitance and span capacitance measured in picofarads (pF). The zero capacitance is the amount of capacitance generated by the sensing element when covered in oil. The span capacitance is the capacitance that is generated when the interface is at the 100% point when covered with water. To calculate the zero and span, use the following data:

- a) The sensing element typically generates 30 pF per foot of active length covered with oil. (*This value may vary due to the amount of entrained water in your crude oil.*)
- b) The sensing element generates 56 picofarads per foot for each foot of active length covered with water.
- c) Each foot of factory-supplied metallic inactive generates 47 pF.
- d) The packing gland generates 40 pF.

NOTE

Above data only applies to sensing element model number 700-2-24.



*Figure 3-5
Calibrator Application Example*

3.2.1 Calculating Zero and Span Capacitance (cont.)

To obtain the proper calibration numbers you will need to know:

- sensing element model number (700-2-24).
- sensing element insertion length.
- sensing element factory installed metal inactive length.
- desired length of probe to be covered to produce zero percent output, (usually set to the sensing element tip).
- desired length of sensing element to be covered by the interface to produce 100 percent output.

Refer to Figure 3-5 and Example 3-1.

ZERO CAPACITANCE

$$C_{(ZERO)} = C_{(GLAND)} + C_{(INACTIVE)} + C_{(OIL)} - C_{(CALIBRATOR)}$$

$$C_{(ZERO)} = 40 + (3ft.)(47) + (8.5ft.)(30) - 20$$

$$C_{(ZERO)} = 40 + 141 + 255 - 20$$

$$C_{(ZERO)} = 416 \text{ Picofarads}$$

SPAN CAPACITANCE

$$C_{(SPAN)} = C_{(GLAND)} + C_{(INACTIVE)} + C_{(WATER)} + C_{(OIL)} - C_{(CALIBRATOR)}$$

$$C_{span} = 40 + (3ft.)(47) + (7.5ft.)(56) + (1ft.)(30) - 20.5$$

$$C_{span} = 40 + 141 + 420 + 30 - 20$$

$$C_{span} = 611 \text{ Picofarads}$$

Subtract the standing capacitance of the calibrator from the desired zero and span capacitance. When the calibrator is set to 0.00 pF, it actually generates 10 pF in the low range and 20 pF in the normal range.

Example 3-1 Calculating Zero and Span Capacitance

NOTE

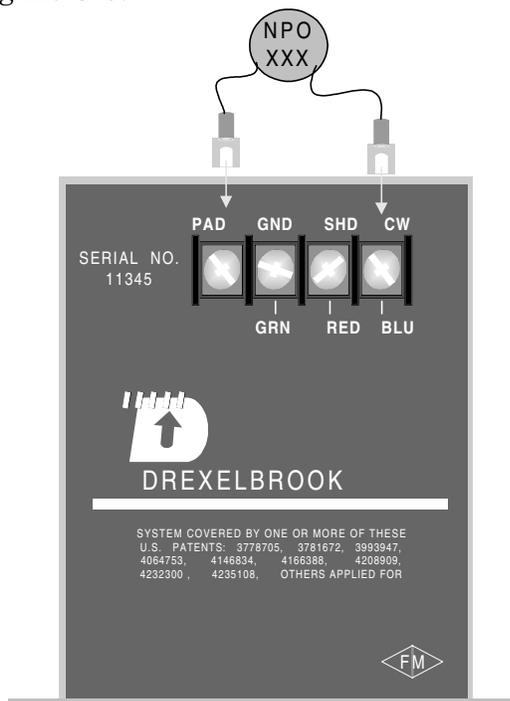
When using the Drexelbrook Calibrator to enter calculated capacitance values, remember the calibrator has a standing capacitance of 20 Picofarads when switched to normal range. For the example above you would set the dials of the 401-6-81 calibrator to 325 Picofarads for zero and 520 for span. Never use the low range for electrostatic separators.

3.3 External Padding Capacitor

The 408-8200 series transmitter has the ability to zero up to 350 pF of capacitance. Normally this is not a problem. On applications where the sensing element is longer than 10 feet or the factory supplied metallic inactive is longer than 4 feet, the zeroing ability of the instrument may be exceeded. By attaching an external padding capacitor between the PAD and CW (center wire) terminals on the back side of the electronic unit the zeroing range of the electronic unit can be increased.

Capacitors used for padding must be NPO type capacitors. Pad capacitor kit part number 330-9-21 is available from your local representative or Drexelbrook directly. If your system is supplied with a capacitor installed on the electronic unit, do not remove it.

For installation of a padding capacitor on the electronic unit, see Figure 3-6.



*Figure 3-6
External Padding Capacitor*

—Calculating Pad Capacitor Value

$$\text{Pad capacitor (picofarads)} = \frac{\text{Zero capacitance} - 100}{4.7}$$

3.3 External Padding Capacitor (cont.)

In Example 3-1, the calculated zero of 416 picofarads will exceed the zeroing ability of the electronic unit. To calculate the proper value of external pad capacitor, perform the following calculation:

$$\text{Pad capacitor (picofarads)} = \frac{416 - 100}{4.7} = 67 \text{ picofarads}$$

- 67 picofarads is not usually commercially available. 50 picofarads is commonly available and can be substituted successfully.
- The calculated pad capacitance value does not have to be exact. The object is to obtain a commercially available value that is within 20% of the calculated value.
- Remember capacitors can be combined in parallel and will add together. For example, 3 capacitors placed in parallel (20 pF, 80 pF, and 100 pF) would equal 200 pF.

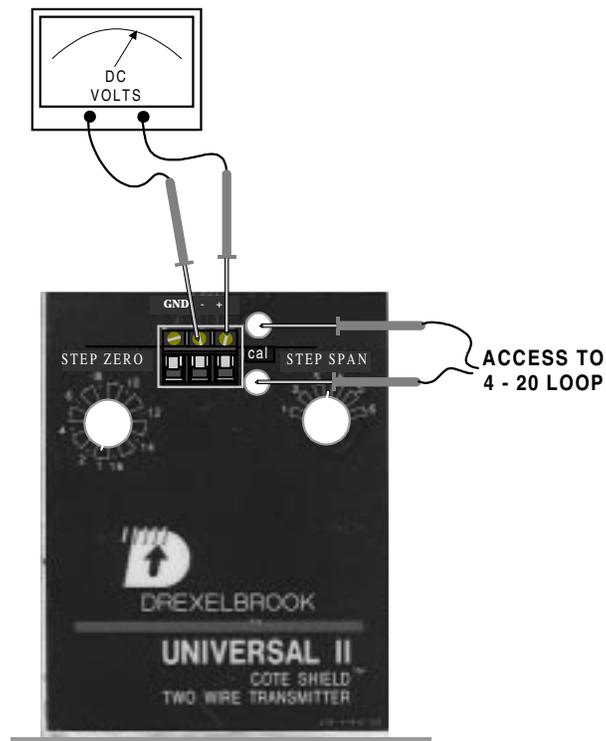
SECTION 4 - TROUBLESHOOTING

If difficulty occurs with an electrostatic interface controller, divide the controller into its components, e.g. incoming power, electronic unit, sensing element, etc. Each system component can be tested individually. Most tests can be performed easily using only a screwdriver, digital volt-ohmmeter, and an analog ohmmeter (such as a Simpson 260, Triplet, or others).

If satisfactory performance cannot be achieved after completing the tests for each component, there may still be a problem but not related to the hardware. Field experience has shown that most field problems are due to water damaged electronics, incorrect assumptions made about vessel conditions and/or incomplete separation of the crude oil.

4.1 Electronic Unit Supply Voltage Check

Measure the DC voltage present across the input terminals of the electronic unit. See Figure 4-1. A constant 11.5-50 VDC should be present (typically 24 VDC). The electronic unit will not function below 11.5 VDC.



*Figure 4-1
Checking the Electronic Unit*

508-46-718 Series Interface Controller

4.1 Electronic Unit Supply Voltage Check (cont.)

- If the voltage is below 11.5, disconnect the coax cable leading to the sensing element. This allows the electronic unit to operate with no load.
- If the voltage now tests normal, the problem may be due to poor calibration or a damaged sensing element. These conditions allow the electronic unit to draw greater than 20 mA, which draws the supply voltage down.
- If the voltage measured is still below 11.5, across the input terminals of the transmitter, check the AC source feeding the 24 VDC power supply and the 24 VDC power supply itself.
- If the AC supply voltage tests OK, then check the wiring of the 4-20 loop. Remember the loop is a series loop. Do not wire the electronic unit in parallel.
- If low supply voltage is still a problem, check the 4-20 loop for excessive loop resistance. The maximum loop resistance when using a 24 VDC supply is 625 ohms. The maximum loop resistance when using a 45 VDC supply is 1675 ohms.

4.2 Electronic Unit Checkout

The electronic unit can be checked by performing the following test:

1. Remove any padding capacitor before proceeding.

NOTE

Set padding capacitor aside and re-install on electronic unit or replacement electronic unit.

2. Remove the sensing element wires from the electronic unit. Check that the electronic unit is powered-up and receiving a constant 24 VDC supply.
3. Note the position of all calibration controls.
4. Preset the calibration controls as follows:
 - Step span knob to position 1.
 - Step zero knob to position 1.
 - Fine span pot fully clockwise.
(this is a 35 turn pot)

4.2 Electronic Unit Checkout (cont.)

5. Insert a milliammeter in series with the current loop.
6. Adjust the fine zero pot until the milliammeter reads 4.00 mA. If successful, go to step 7.

*If you reach the end of the travel of the fine zero pot and you have tried turning it a full 35 turns clockwise and counterclockwise and cannot achieve an output of 4.00 mA, then the **electronic unit has failed**.*

7. With the output still at 4.00 mA advance the fine zero pot exactly one turn clockwise.
8. This should produce an increased output of at least 13 mA (56%) or more. It is acceptable to produce an output after one turn of the zero pot of greater than 20 mA.

*If one turn of the fine zero pot does not produce this increase in loop current then the **electronic unit has failed**.*

9. If you are unable to achieve 4.00 mA in step 6 or an increase in current from step 8 the electronic unit has failed. Contact your local Drexelbrook Representative or the factory at 1-800-527-6297 to arrange for repair or replacement.

4.3 Testing the Sensing Element

The following test can be performed in the vessel or in a metal test pipe filled with water.

1. See Figure 4-2. Disconnect the wires that are attached to the sensing element. Using an analog meter (such as a Simpson 260 or a Triplet) set to the R x 10,000 scale. Measure from the steel center rod to the conduit ground or the outside of a metal test pipe or tank. A good sensing element will measure an open circuit.
2. If a low ohmmeter reading was measured (less than 50,000 ohms) and the sensing element is covered with water, lower the level. If the ohmmeter reading is no longer low, it is highly likely that the sensing element insulation has been cut or damaged. The sensing element should be removed for further inspection.
3. If a low reading was measured regardless of where the tank level is, look carefully for moisture or process material inside the sensing element conduit head and associated conduit. If foreign material is present, clean with solvent and dry compressed air. Re-measure the sensing element resistance.

NOTE

An analog ohmmeter must be used for this test due to its ohm per volt rating. (A digital meter will provide erroneous readings).

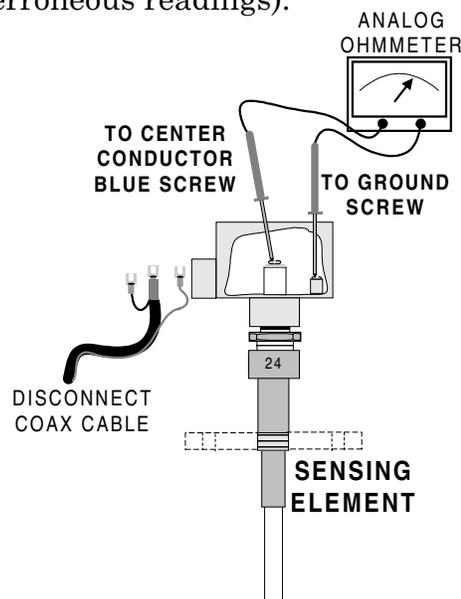


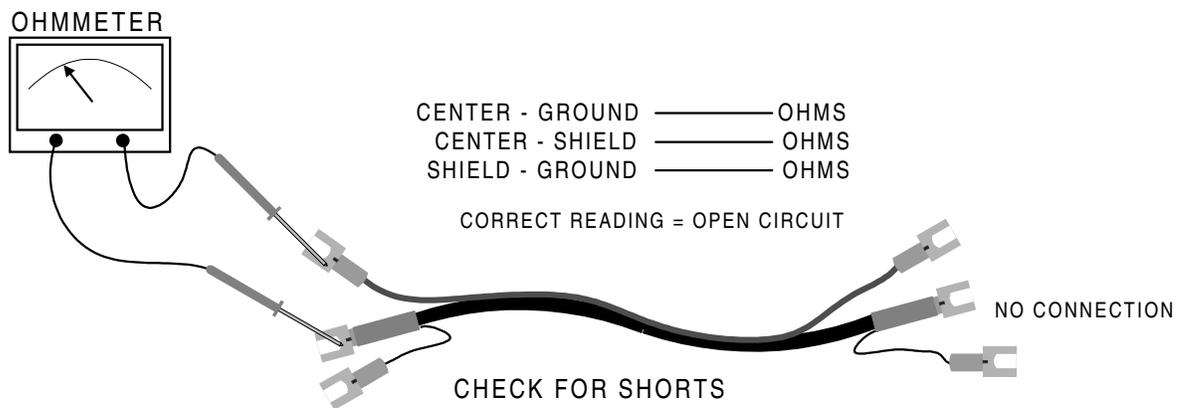
Figure 4-2
Testing the Sensing Element

4.4 Testing the Coaxial Cable

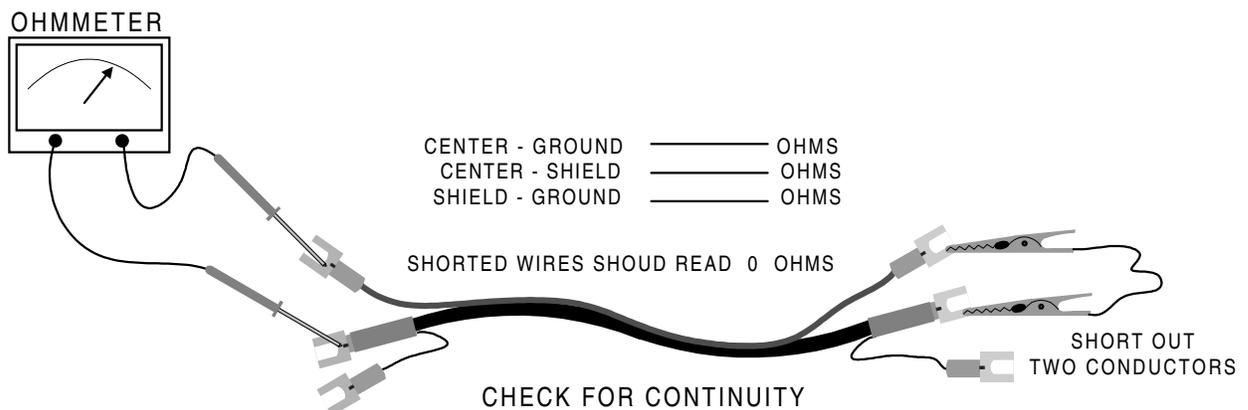
NOTE

If there is water or other conductive material in the conduit it 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. The only sure way is to inspect the coax and associated conduit for trapped water.

1. Disconnect all three wires of the coaxial cable at the electronic unit.
2. Disconnect all wires at the sensing element end of the coax.
3. Using an ohmmeter, measure between two of the coaxial cable conductors. Note any reading. Repeat for all three conductors. All readings should show an open circuit, (infinite resistance).



4. Check for continuity of each conductor. Short out two of the coaxial cable conductors and measure these two conductors at the other end. A reading close to 0.0 ohms should be shown.



4.5 Electronic Unit Drift Test

Disconnect the wires connecting the sensing element to the electronic unit.

Attach a “drift test capacitor” across the CW and GND connections on the electronic unit. See Figure 4-3. A Drexelbrook 401-6-81 Calibrator can also be used.

The capacitor used for this test should be large enough to produce a mid scale reading. See Figure 3-4 to determine typical zero and span capacitance values. Pick a value midway between the zero and span capacitance. A NPO capacitor should be used. This type of capacitor is a precision capacitor that does not drift with temperature.

Once the drift test capacitor is in place note the output current reading. This reading should not change. Leave the drift test capacitor in place if possible overnight. If using a process control computer with trending capabilities this test should produce a straight line. If this test is passed the source of drift must be the sensing element, coax, or process conditions.

If more than a few hundredths of a milliamp change are noted, the transmitter is the cause of the drift and needs repair or replacement. This type of failure is extremely rare.

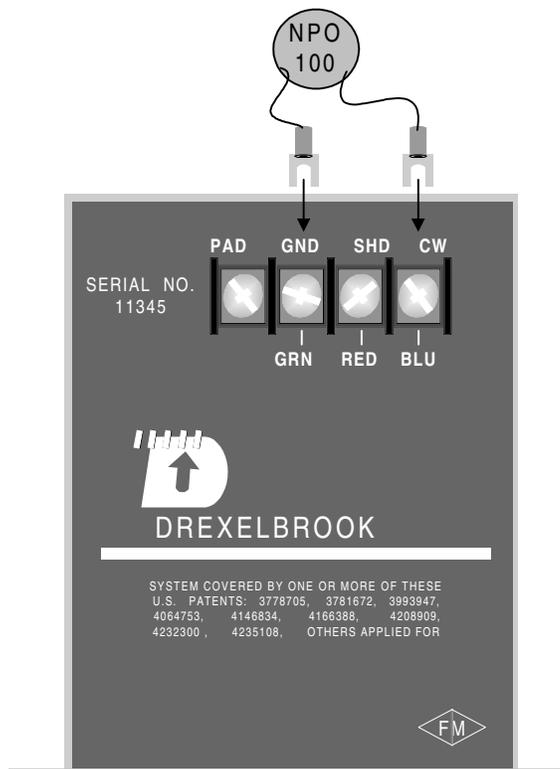


Figure 4-3
Electronic Unit Drift Test

508-46-718 Series Interface Controller

<u>SYMPTOM</u>	<u>CAUSE</u>	<u>ACTION</u>
Output is incorrect.	Samples not taken properly.	Take samples over again.
Output does not agree with sightglass.	Sightglass usually does not represent internal tank conditions.	Ignore sightglass.
Output slowly drifts up or down.	May be normal changes in interface level.	Pull sample from sample taps to verify interface level.
Output drifts, sample taps show interface is steady.	a) Moisture in sensing element conduit.	a) Dry conduit and conduit. Find source of moisture.
	b) Moisture in conduit.	b) Special potting compound available for severe moisture problems.
	c) Sensing element insulation punctured.	c) See section 4.3, Testing the Sensing Element.
	d) Transmitter defective.	d) See section 4.1, Testing the Electronic Unit and Appendix A.
	e) Wire connections loose or corroded.	e) Clean and tighten all connections.
System needs frequent recalibration(zero picofarads continually increase).	Sediment building up and elevating the zero point.	Tank needs maintenance. See Appendix A.
Oil in discharge water.	a) Calibration is incorrect.	a) See Section 3- Calibration and Appendix A.
	b) Interface is not forming or throughput is too great.	

508-46-718 Series Interface Controller

<u>SYMPTOM</u>	<u>CAUSE</u>	<u>ACTION</u>
Excess water in product oil.	Process problem.	Call Factory or Local Representative.
Output jumps when electric grids are turned on or off.	Electrostatic filter (part number 385-28-4 or 385-28-1) not installed or installed improperly.	Call Factory or Local Representative.
Unable to bring output current down to 4 mA when setting zero.	Electronic unit needs pad capacitor or larger pad capacitor.	See Section 3-3.
Output stuck below 4 mA while setting zero, step zero and fine span have no effect.	Pad capacitor value too large.	Decrease value of capacitor. See Section 3.3.
Output stuck at less than 4 mA.	a) Short circuit in coax cable.	a) See section 4.4, Testing the Coaxial Cable.
	b) Coax cable is broken.	b) See section 4.4, Testing the Coaxial Cable.
	c) Tank is empty.	c) This is normal. Zero is established with sensing element completely covered with oil not air.
Output less than 4 mA.	Electronic unit damaged due to lack of electrostatic filter.	See section 4.2, Testing the Electronic Unit.
Output greater than 20 mA.	a) Shield wire grounded at sensing element or electronic unit	a) Shield wire at sensing element must be cut or taped. Shield wire at electronics must be hooked up to shield screw.
	b) Sensing element shorted.	b) See Figure 4.3, Testing the Sensing Element.

508-46-718 Series Interface Controller

<u>SYMPTOM</u>	<u>CAUSE</u>	<u>ACTION</u>
Output greater than 20 mA. (cont.)	c) Coax cable shorted.	c) See section 4.4, Testing the Coaxial Cable.
	d) Calibration is wrong.	d) See calibration section.
Unable to obtain 20 mA when setting span.	a) Insufficient voltage available to power electronic unit.	a) See electronic unit supply voltage check.
	b) Sensing element mounted in a sidearm or still well. Still well clogged or not vented.	b) Do not mount sensing element in a sidearm or still well.
	c) Sensing element not electrically bonded to tank.	c) Clean and tighten mounting hardware
Output incorrect, does not agree with sample taps.	Calibration is wrong.	Touch up span using fine span pot. See calibration section.
Output seems incorrect.	Interface is not forming.	See Appendix (misinterpreting emulsion).

508-46-718 Series Interface Controller

SECTION 5 SPECIFICATIONS

408-8202-001 Electronic Unit:
(For complete specification listing see separate Instruction Manual 508-45,-46,-47,-49)

Power
Requirement: 11.5-50 VDC

Output: 4-20 mA

Maximum
Loop Resistance: 625 ohms at 24 VDC

Temperature
Range: -40° F to 140° F (-40° to 75° C)

Fail-safe: High level, Low level field-selectable
For this application, failsafe should be
Low Level.

Intrinsic safety: Sensing element and coax cable are
intrinsically safe for Class I Groups
A,B,C, and D Class II Groups E,F
and G (Div. 1 and 2).

Electronic unit and loop signal
wires are intrinsically safe and non-
incendive for Class I Groups A, B, C
and D, Class II Groups E, F and G
(Div.1 and 2) when powered from an
intrinsically safe power supply.

508-46-718 Series Interface Controller

SECTION 5 SPECIFICATIONS (cont.)

700-2-24 Sensing Element:

Insertion Length: as specified.
Bottom typically extends to about 6 inches (152 mm) above tank bottom. 0% is usually set to the sensing element tip, but may be elevated above this point. The 100% point can be set anywhere along the sensing element active length. The sensing element tip should be above any sand build-up at the bottom.

Factory-installed
cooling extension: 6 inches (152 mm)

Factory-installed length as specified (typically
inactive extension: 2 inches [50.8mm] below grids).

Wetted parts: 316 stainless steel and
TFE Teflon™

Maximum
Temperature: 450 °F (232 °C)

Maximum
Pressure: 500 psi (34 Bar)

SECTION 6 THEORY OF OPERATION

Drexelbrook uses radio frequency technology to accurately measure the interface level inside an electrostatic separator. A capacitor is formed when two metal plates are separated by an insulator (in this case crude oil).

Drexelbrook forms a capacitor between the sensing element inserted into the tank and the metal wall of the tank. Plate number one is the sensing element, plate number two is the metal wall of the tank (sometimes called ground reference). The amount of capacitance (Picofarads) that is generated by the sensing element is directly related to how much oil and water is covering the sensing element. Maximum current flow occurs when the sensing element is fully covered with water and minimum current flow occurs when the sensing element is fully covered with oil. A radio frequency signal is sent down the sensing element. A bridge circuit is used to convert the changing amount of radio frequency energy into a 4-20 mA signal. Special Radio Frequency Admittance CoteShield™ circuitry effectively ignores any build up on the sensing element. This technology uses no moving parts and is unaffected by density changes in the oil or water phases. The radio frequency signal present on the coax cable and sensing element is intrinsically safe. The electronic unit is intrinsically safe when used with approved barriers. If not otherwise specified the system will be furnished with US approvals (Factory Mutual). Cenelec, KEMA, CSA or others are available.

APPENDIX A ADDITIONAL TROUBLESHOOTING

WATER IN CONDULETS AND CONDUIT is the leading cause of equipment failure. All conduit must be sealed, drain breathers must be used. Special non corrosive RTV potting compound is available to fill the sensing element housing if moisture infiltration is a problem. Potting compound is part number 290-1-18.

LACK OF ELECTRO-STATIC FILTER (Part number 385-28-4 or 385-28-1) on installations that use high voltage grids will cause a full scale output or falsely high readings when the electric grids are switched on. Lack of this filter can cause damaging voltage to reach the electronic unit. Electronic unit damage or shortened life may result.

MISINTERPRETING THE ELECTRICAL PROPERTIES OF THE EMULSION LAYER. Depending on electrical nature of the emulsion layer it may be read as either oil or water by the Drexelbrook interface system. If the emulsion layer consists primarily of water with some oil droplets then the interface control will read the emulsion layer as water. If the emulsion layer is mainly oil with some water droplets the level control will read the emulsion as oil. Typically the level control reads the level as somewhere close to the middle of the emulsion layer. It is possible to look at a sample, noting its black color and assume it is oil. An electrical test to detect conductivity may prove it is actually water.

VESSEL UPSET When the interface monitoring system produces questionable output and equipment failure is not the cause check for the proper functioning of the entire electrostatic separator. The grids may be malfunctioning or shut off. Is it possible that chemical addition is required, or not functioning, or improper? Has temperature control been lost? Has the throughput been increased, reducing the residence time? All of these vessel upset conditions can result in no interface forming. In this case the Drexelbrook system will read no interface.

APPENDIX A ADDITIONAL TROUBLESHOOTING (cont.)

ZERO SHIFT Careful notes may reveal that over time the number of Picofarads required to produce 4 ma. is increasing. An increasing zero calibration value may indicate a buildup of sludge, silt and sand on bottom of vessel that has begun to cover the bottom of the sensing element, signaling need for vessel cleaning. Zero calibration data can be easily recorded using a 401-6-81 calibrator or by using the real time view on the smart transmitter. In extreme cases the residence time, throughput, and efficiency of the electrostatic separator may be significantly degraded. Other indications of bottom buildup are that the zero check tap is clogged, and the back wash system is inoperable or not run regularly.

AMETEK[®]
DREXELBROOK

An ISO 9001 Certified Company

205 Keith Valley Road Horsham, PA 19044

US Sales 800-553-9092

24 Hour Service 800-527-6297

International 215-674-1234

Fax 215-674-2731

E-mail deinfo@drexelbrook.com

Web www.drexelbrook.com