Installation & Maintenance Instructions

Series 506-70

Wet Coating System

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AMETEK®

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Installation and Operating Instructions

Series 506-70
Wet Coating System

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506-70-LM

Series 506-70
Wet Coating System

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Table of Contents

SECTION 1 INTRODUCTION 1
1.1 System Description 1
1.2 Models Available 3
1.2.1 System Number Description 3
1.2.2 Electronic Unit 3
1.2.3 Sensing Element 3
1.2.4 Housings 3

SECTION 2 SPECIFICATIONS 4
2.1 Electronics 4

SECTION 3 INSTALLATION 6
3.1 Unpacking 6
3.2 Wiring the Electronic Unit 6
3.3 Wiring the Sensing Element 7
3.4 Mounting the Electronic Unit 9
3.5 Mounting the Sensing Element 11

SECTION 4 OPERATION AND CALIBRATION 12
4.1 Start-up 12
4.2 Controls 12
4.2.1 Setpoint Control 12
4.2.2 Fail Safe 12
4.3 Calibration 13
4.3.1 Calibration of Flush Mounted Sensing Elements 13
4.3.2 Emergency Method of Calibration 16
4.3.3 Recalibration 16
4.3.4 Time Delay 16

SECTION 5 TROUBLESHOOTING 17
5.1 Introduction 17
5.2 Checking the Electronic Unit 17
5.3 Checking the Relay Circuits 18
5.4 Checking the Cable 19
5.5 Checking the Sensing Element 20
5.6 Possible Problems and Solutions 22

SECTION 5 FACTORY AND FIELD SERVICE ASSISTANCE 23
5.1 Factory Service Assistance 23
5.2 Equipment Return 23
5.3 Field Service 24
5.4 Customer Training 24

SECTION 1 -INTRODUCTION

The instructions in this manual are for the Drexelbrook 506-70 Series Wet Coating System, used to detect the presence or absence of material while ignoring wet coatings.

1.1 System Description

The Drexelbrook 506-70 Series control consists of three major components. The sensing element mounts into the wall of the vessel. The electronic unit includes the measuring circuit, customer connection terminals, high and low level Fail Safe Selector, and time delay. The sensing element and remote electronic unit are connected by a three-terminal cable. See Figures 1-1.

The 406-70 Series electronic unit is a precision radio frequency (RF) relay output instrument. It provides double-pole, double-throw relay contact closure when the material level passes the height of the sensing element.

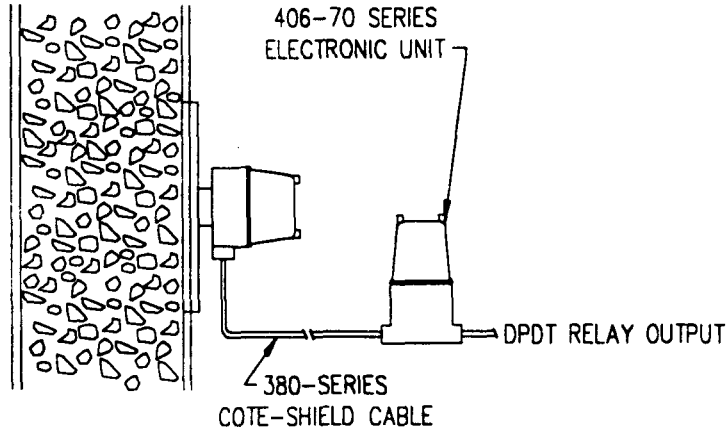


Figure 1-1
Typical System in a Standard
Explosionproof Housing

This Wet Coating system features Cote-Shield™ electronics which enables the instrument to ignore the effects of material coatings or build-up on the sensing element.

The sensing element is mounted in the vessel wall where the presence/absence detection is desired. It consists of two sections: a center measuring electrode, and a Cote-Shield electrode. See Figure 1-2. When a coating or build-up occurs on the sensing element, the Cote-Shield electrode inhibits the flow of current from the center electrode to the vessel wall (ground). The only path to ground available for the current is through the material being measured. This prevents a false level indication when only a coating is present.

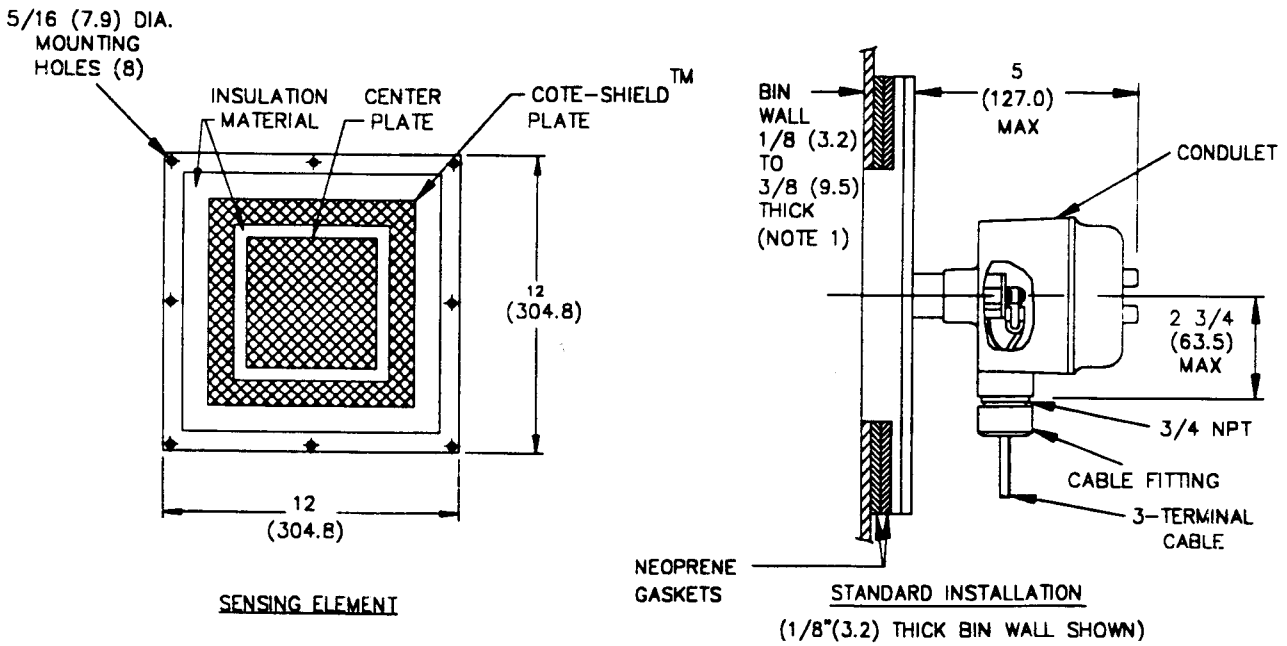


Figure 1-2a
Flush Sensing Element

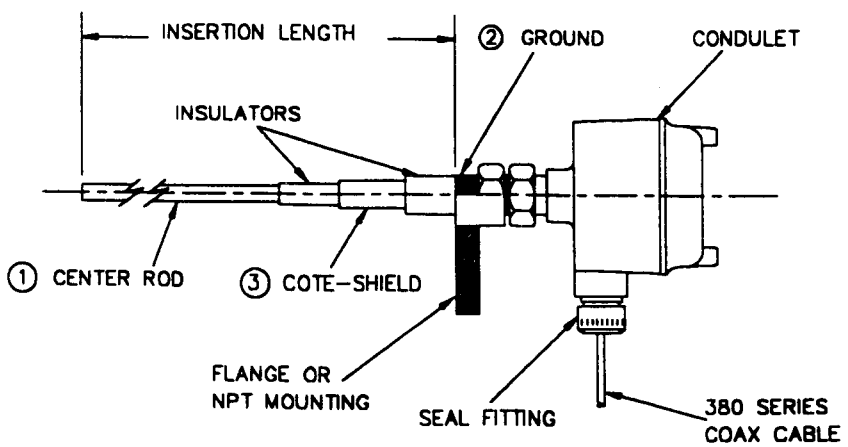


Figure 1-2b
Three-Terminal Sensing Element
(Insertion-type)

1.2 Models Available

1.2.1 System Number Description

In the Drexelbrook Wet Coating System model number, the first three digits indicate an on/off control, the middle digits indicate the electronic unit series and the last three digits refer to the type of the sensing element.

1.2.2 Electronic Unit

406-70XX 120 VAC powered
406-71XX 12-30 VDC powered
406-73XX 230 VAC powered

1.2.3 Sensing Element

700-207-1
12" X 12" 304 SS and Special Polyurethane.
700-207-2
12" x 12" 304 SS and Teflon
700-207-3
12" X 12" Curved 304 SS and Rubber
700-207-4
12" X 12" extra heavy duty special polyethylene and 400 series SS.
700-207-6
8" X 8" 304 SS and Special Polyurethane.

Sensing Element includes 25 feet of cable and condulet.

1.2.4 Housings

The 406-7000 Series electronics comes standard in an explosionproof housing. An optional NEMA 4 housing with red/ green indicator lights is also available.

SECTION 2 - SPECIFICATIONS

2.1 Electronics

A. Power Requirement

120 ± 25 Vac 50/60 Hz 1 watt (406-70XX)

240 ± 50 Vac 50/60 Hz 1 watt (406-73XX).

12-30 VDC 1 watt (406-71XX)

B. Ambient Temperature

-40° to 140° F

C. Sensitivity

Designed to sense presence/absence of liquids and liquid-based slurries.

D. Hazardous Areas

Standard Explosion-proof Housing meets NEMA Classifications 1-5 and 12, and is explosionproof for Class I, Groups A,B,C,D and Class II, Groups E,F,G (Division 1 & 2).

Optional NEMA 4 housing is suitable for non-hazardous areas.

E. RFI Protection (built-in)

The operating point for unit in an explosion-proof housing is unaffected by 5W field @ 27 MHz, 150 MHz, or 450 MHz at a distance of 5 feet from exposed sensing element, cable, or power line.

F. Temperature Effect

No measurable effect within ambient and process temperature limits.

G. Output (relay contact rating)

120 Vac: 5A non-inductive, 3A inductive
240 Vac: 5A non-inductive, 2A inductive
24 Vdc: 5A non-inductive.

H. Fail Safe

Field-switchable to either Low-Level Fail Safe (LLFS) or High-Level Fail-Safe (HLFS).

I. Measuring Cable

3-terminal coaxial cable, up to 150 feet (25 feet standard). 160°F max temp limit; less than 5/8 inch O.D. at largest point.

J. Time Delay (Reverse-Acting)

Adjustable 0-90 seconds. Alarm output will be delayed by the delay period.

SECTION 3 -INSTALLATION

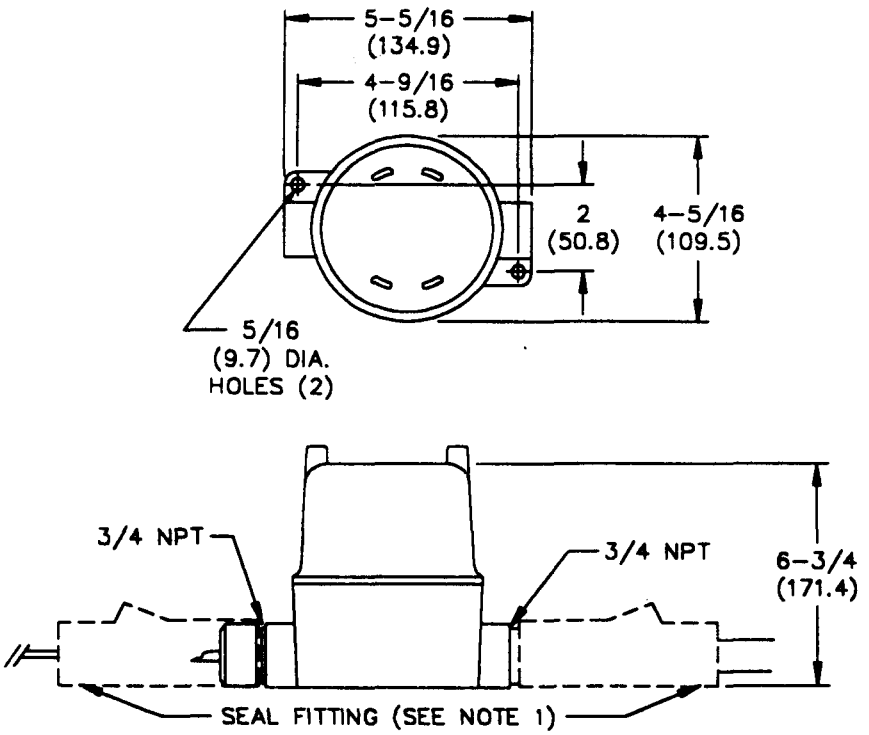
Note: Before installing Sensing Element in vessel wall, it is recommended that an operational check be performed on system. See Section 4 - Operation, for further details.

3.1 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.

3.2 Mounting the Electronic Unit

The electronic unit is designed for wall mounting, and it should be mounted in a location that is free of vibration, corrosive atmospheres, and any possibility of me chanical damage. Ambient temperatures should be between -40°F and 140°F. For convenience at start-up, it is best to install the instrument in a reasonably accessible location. See Figure 3-1.



NOTE

1. FOR EXPLOSIONPROOF INSTALLATIONS IN CLASS I, DIV. 1 OR 2, GROUPS A,B,C,D SEAL FITTINGS ARE REQUIRED WITHIN 18 INCHES OF BOTH SIDES OF TRANSMITTER. CONSULT NATIONAL ELECTRICAL CODE.

Figure 3-1
Mounting Dimensions for Standard Explosionproof Housing

3.3 Mounting the Sensing Element

The mounting location of the sensing element, whether remotely mounted, integrally mounted, or close-coupled to the electronic unit, often depends on the placement of nozzles or openings into the vessel.

Note: Do not mount a Cote-Shield sensing element through a nozzle which exceeds the length of the first insulator. See Figure 3-2. In all cases, it is necessary to protect the insulation on the sensing element against cuts and scrapes during installation.

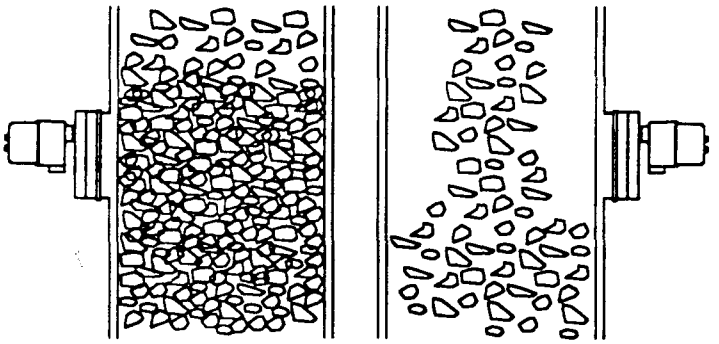


Figure 3-2
Mounting a Rigid Sensing Element

The flush sensing element should be mounted IN THE FLOW STREAM, see Figure 3-3. These sensing elements are designed and built to withstand the impact of coal, rock, wood, chips, etc.

For a recommended sensing element location at the top of a chute, see Figure 3-4.

For recommended sensing element location at the bottom of a chute, see Figure 3-5. Low Level sensors detect "empty" chutes.

For recommended sensing element location in an angle chute, see Figure 3-6.

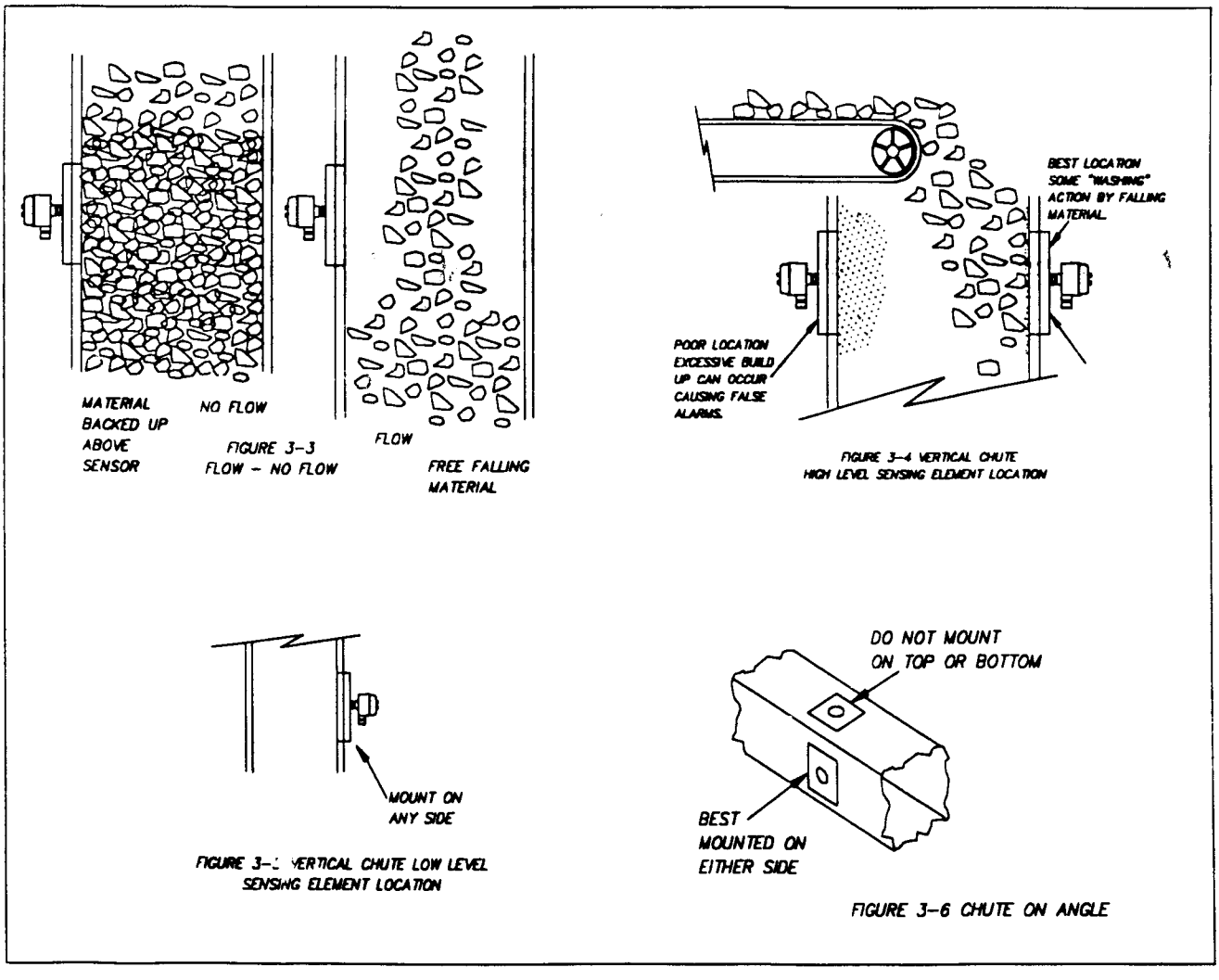


FIGURE 3-3 FLOW - NO FLOW

FIGURE 3-4 VERTICAL CHUTE HIGH LEVEL SENSING ELEMENT LOCATION

FIGURE 3-5 VERTICAL CHUTE LOW LEVEL SENSING ELEMENT LOCATION

FIGURE 3-6 CHUTE ON ANGLE

3.4 Wiring the Electronic Unit

All power and relay connections are made to the terminal strips inside the electronic unit housing. Due to the low power consumption of the instrument (1 watt), wiring need only follow local electrical codes.

The power connections on the standard explosionproof units are made to terminals 1 and 2 on the electronic chassis. See Figure 3-7.

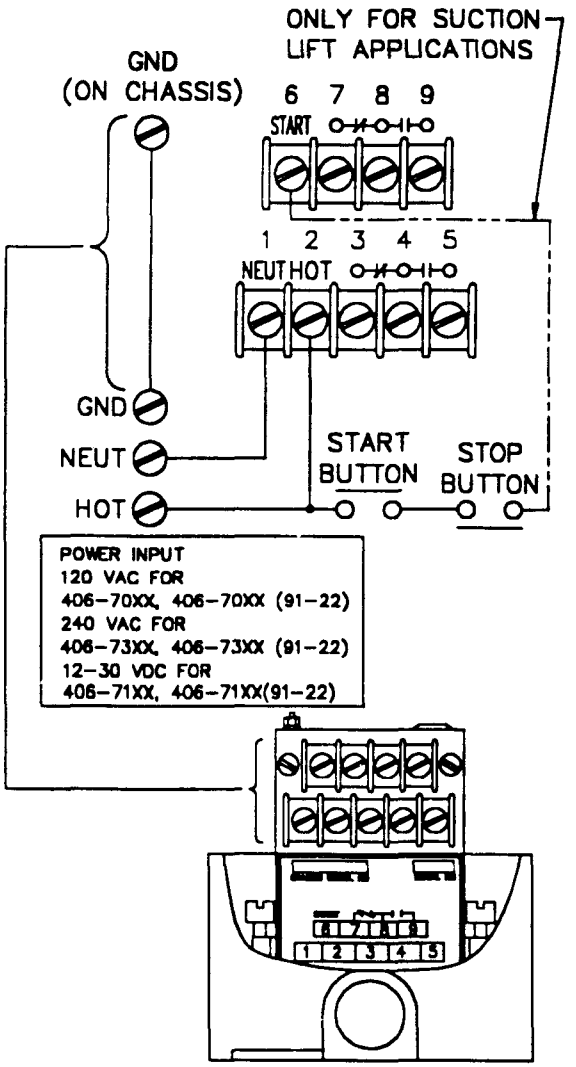


Figure 3-7
Customer Connections to
Standard Explosionproof Unit

The relay connections are made to the terminal strips on the front of the electronic unit chassis.

The relay has double-pole, double-throw contacts. On the explosionproof unit, both sets of contacts are available to the customer. See Figure 3-7. The relay is a dry contact closure and may not provide sufficient current to activate motors or heavy equipment (see specifications).

All sensing element cable connections to the electronic chassis are made to the individual terminals on the side opposite the relay terminal strips. Be sure to match the colors on the terminals to the colors on the cable. See Figure 3-8.

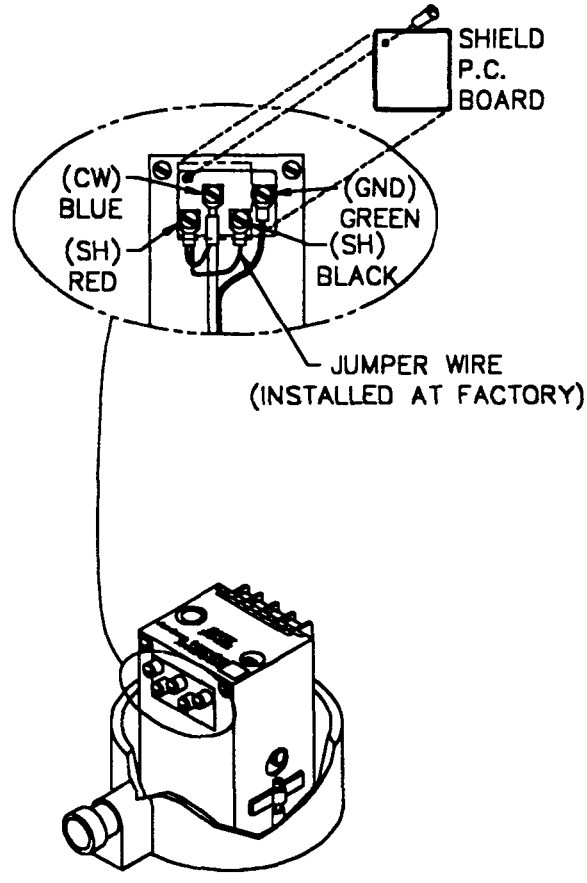


Figure 3-8
Cable Connections to
Electronic Unit

3.5 Wiring the Sensing Element

The cable connections to the sensing element should be wired per Figure 3-9.

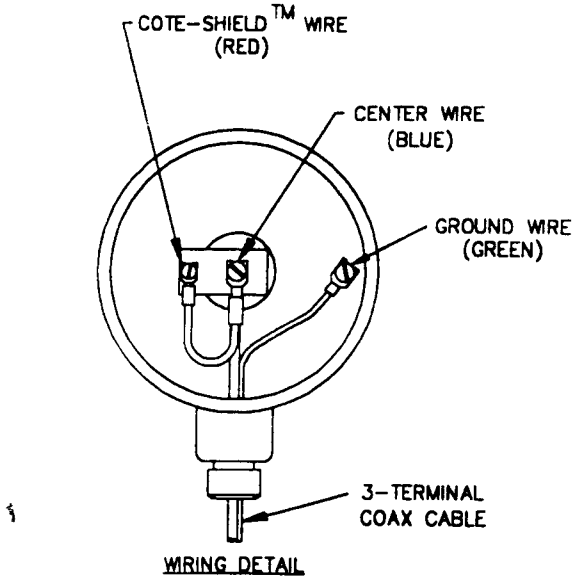


Figure 3-9
Cable Connections to Sensing Element

A. Remove the condulet cover.

B. Wire the green, red and blue cable leads to the corresponding color-coded screws as shown in Figure 3-9.

C. Replace the condulet cover.

SECTION 4 - OPERATION AND CALIBRATION

4.1 Start-Up

Before applying power to the instrument, be sure that the input power and wiring connections are correct. See Sections 3.2 and 3.3.

Warning - Units in Hazardous Area:
Before an explosionproof housing cover can be removed, the area must be checked and known to be non-hazardous. The area must remain non-hazardous until the cover is replaced.

Each connection to an explosionproof housing in a hazardous area must be equipped with an approved seal fitting.

4.2 Controls

4.2.1 Setpoint Control

There is a single adjustment located on top of the instrument that controls the point at which the relay operates. A lighted LED indicates that the relay is energized.

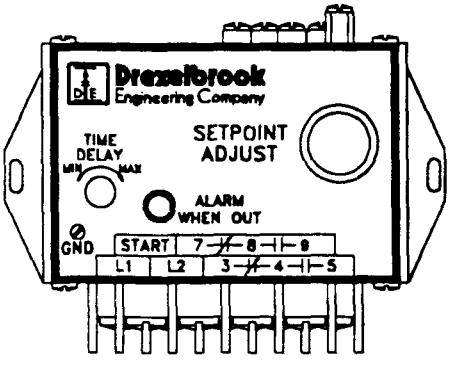


Figure 4-1
Setpoint Control

4.2.2 Fail Safe

Fail-safe describes the relay contact position when power to the unit is lost. The 406-7000 Series electronic unit is available with High Level Fail Safe (HLFS) and Low Level Fail-Safe (LLFS). In HLFS, the relay will de-energize due to a high level or loss of power. In LLFS, the relay will de-energize due to a low level or loss of power.

The instrument is supplied in the fail-safe requested when the order is placed. (HLFS, if not specified).

The fail-safe may be field selected by a slide switch, accessible through a hole in the side of the chassis. See Figure 4-2.

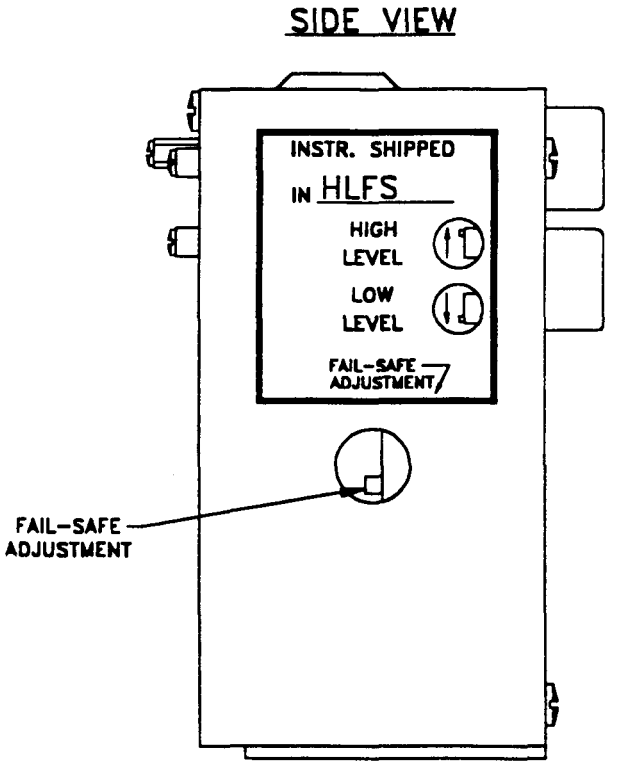


Figure 4-2
Fail-Safe Adjustment

4.3 Calibration

If the material that is being measured is non-conducting, or the factory-set calibration adjustment has been tampered with, use one of the following calibration procedures.

4.3.1 Calibration of Flush-Mounted Sensing Elements

Note: Be sure to use the insulated calibration tool. See Figure 4-3. Do not turn any adjustment past its mechanical stops; damage to the unit may occur. LED on indicates that the relay is energized or normal condition (not alarm).

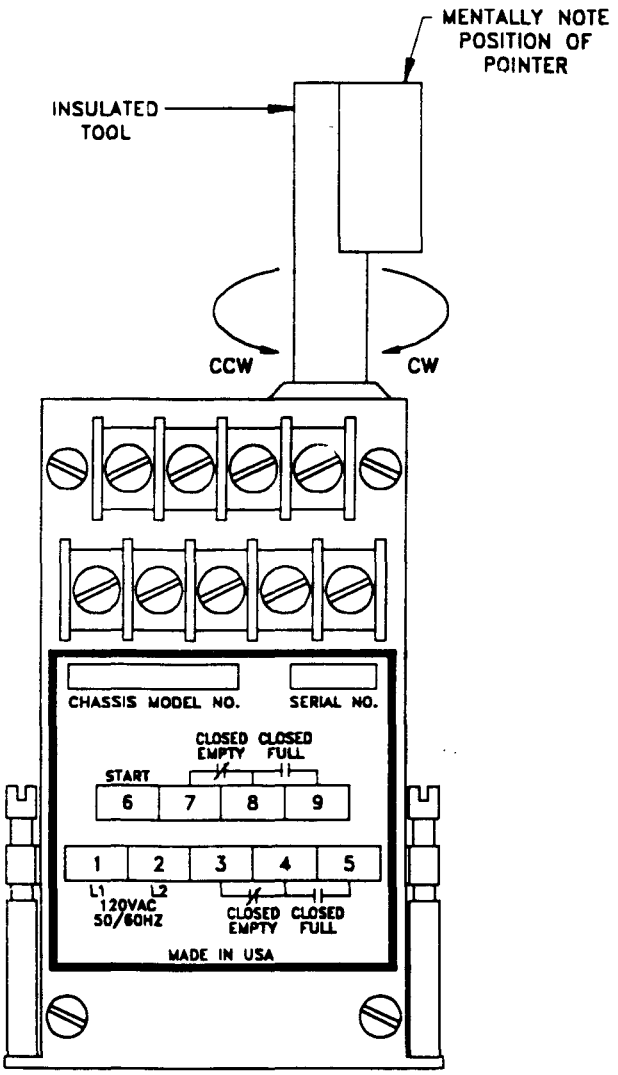


Figure 4-3
Insulated Calibration Tool

A. Check that the level is well below the sensing element. See Figure 4-4.

B. Using the insulated tool supplied with the instrument, turn the setpoint adjust ment to the full counterclockwise (CCW) position. See Figure 4-3.

C. Turn the adjustment slowly clockwise (CW) until the relay just operates. (LED changes states).

D. Mentally note the position of the adjustment tool pointer.

E. Increase the material level until it is well above the sensing element. See Figure 4-5 (LED changes states).

F. Counting the number of turns, turn the adjustment slowly clockwise (CW) until the relay once again just operates or until the end of the adjustment travel.

G. Turn the adjustment back counterclockwise (CCW) half the number of turns that were counted.

H. For recalibration purposes, record half the number of turns that were counted as "*Preload.*" See Section 4.3.2.

Calibration is now complete.

Note: If less than 1/4 turn of the adjustment was observed between the points where the sensing element was covered and uncovered, please consult the factory.

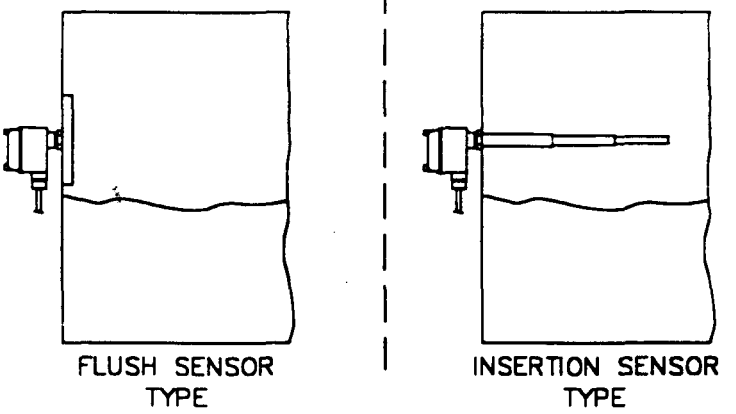


Figure 4-4
Material Level Below Sensing Element

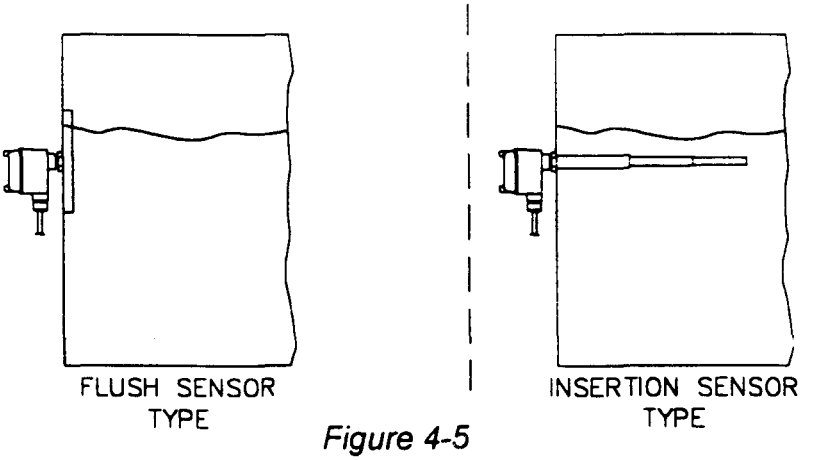


Figure 4-5
Material Level Above Sensing Element

Note: When excessive build-up on the sensor occurs, turning the adjustment clockwise will generally eliminate a false high-level signal. But build-up may continue to form or it may drop off. In the latter case, when material reaches the sensing element it may not respond, at which point it is necessary to call factory service at 1-800-527-6297.

4.3.2 Quick Calibration

Note: This method is only recommended when it is not possible to follow one of the standard methods of calibration. The correct insulated calibration tool is required. See Figure 4-3. Do not turn any adjustment past its mechanical stops; damage to the unit may occur. LED on indicates that the relay is energized or normal condition (not alarm).

A. In either HLFS or LLFS when it is not possible to lower the level below the sensing element, find the operating point in the material and rotate the adjustment 1/2 turn counterclockwise (CCW). (If no operating point is found, then continue to end of the adjustment travel.)

B. In the HLFS or LLFS when it is impossible to cover the sensing element with material, find the operating point in air and turn the adjustment clockwise (CW) 1/2 turn for dry insulating powders or 1 turn for moist granulars.

4.3.3 Recalibration

A. For recalibration using the procedure in Section 4.3.1, follow steps A,B, and C, then turn the adjustment further clockwise (CW) the amount of preload.

4.3.4 Calibration of Time Delay Units

The time delay adjustment is locted on top of the electronic unit chassis. See Figure 4-6. The standard time delay is adjustable from 0-90 seconds.

The delay occurs when the unit is going into the alarm condition. The output will continue to indicate a normal condition until the delay has timed out.

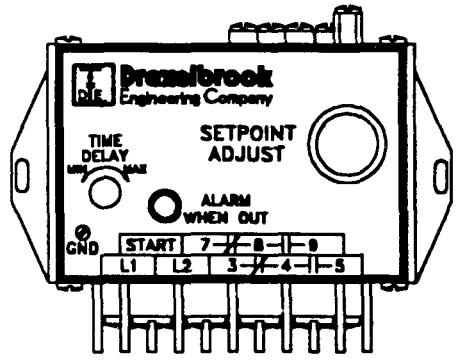


Figure 4-6
Time Delay Control

Turning the adjustment clockwise (CW) will increase the time delay, and turning it counter-clockwise (CCW) will decrease the time delay.

SECTION 5 - TROUBLESHOOTING

5.1 Introduction

The 506-70 Series instruments are designed to give years of unattended service. No periodic or scheduled maintenance is required.

There are no specific spare parts that we recommend be stocked by the user. However, if the application is critical, it is best to have a spare electronic unit chassis available in the event of a component failure. The electronic unit chassis should be returned to the factory for repair.

If difficulty should occur when operating your system, divide the system into its component parts and test each part individually for proper operation.

The following troubleshooting procedures should be used in checking out your system. If attempts to solve the difficulty fail, notify our local representative or call the factory direct and ask for the Service Department.

5.2 Checking the Electronic Unit

Before checking the components separately, check all wiring connections to both the electronic unit and sensing element. See Sections 3.2 and 3.3 Be sure to match the cable wire sleeve colors to the terminal screw colors on the electronic unit.

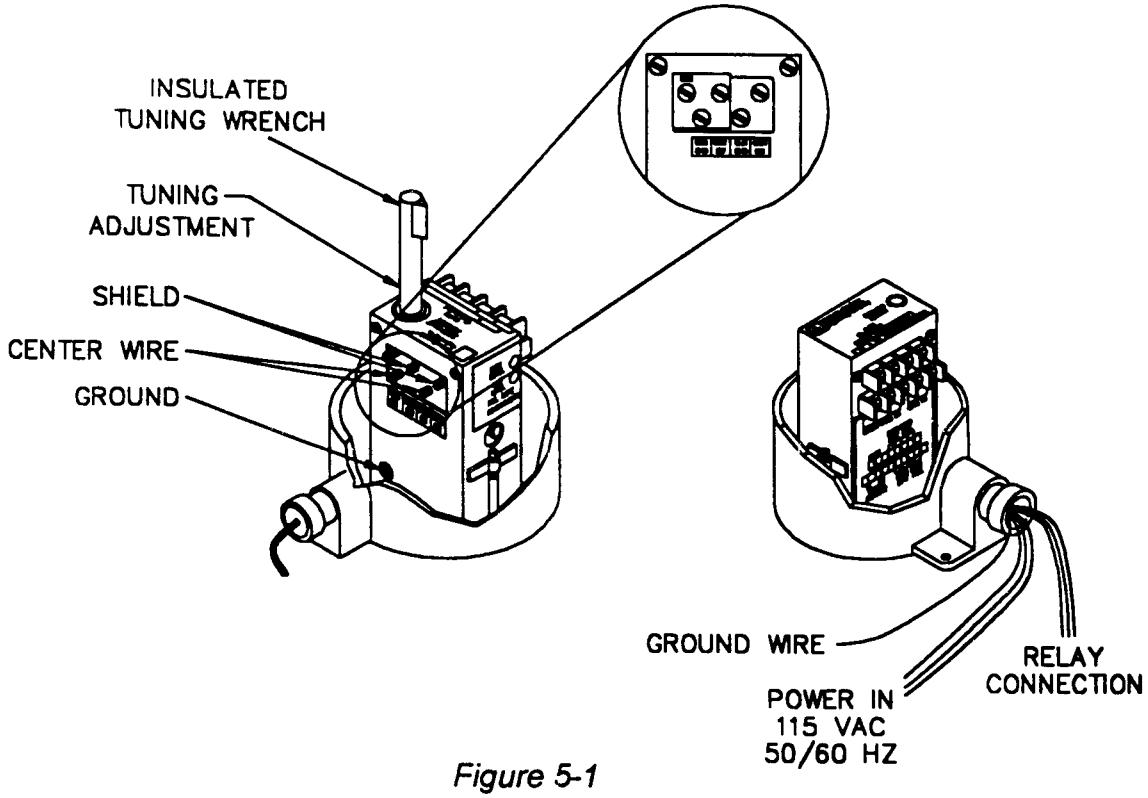


Figure 5-1
Testing the Electronic Unit

A. Disconnect the sensing element cable from the electronic unit. Leave the power connected. See Figure 5-1.

B. Put a capacitor, any value from 200 pF to 400 pF, across the blue center (CW) connection and the green ground (GND).

C. With the capacitor attached, the relay and the LED on top of the electronic unit will change state, after a delay time of 0-90 seconds.*

**Note: To disengage the time delay, mark the original position of the adjustment, then turn to the full counterclockwise (CCW) position. Be sure to reset the time delay to its original position after checking the electronic unit.*

5.3 Checking the Relay Circuits

A. The relay output circuit consists of double-pole double-throw relay contacts brought out to a terminal strip. When the relay is operating properly, the following conditions will apply:

1. The LED on the top of the electronic unit chassis should be lit when relay contacts 4 and 5, and 8 and 9 are closed.

2. The LED should be out when relay contacts 3 and 4, and 7 and 8 are closed. See Figure 5-2.

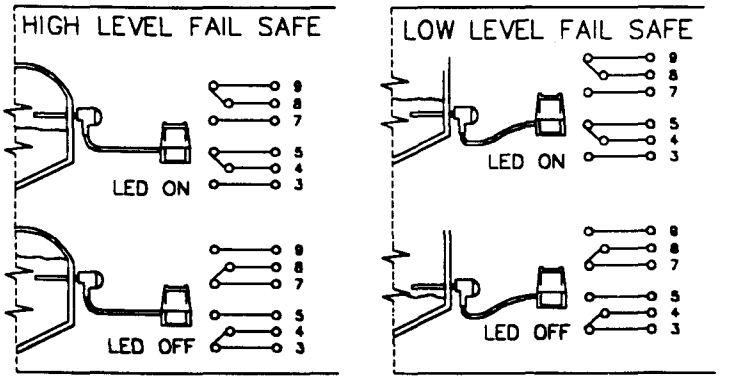


Figure 5-2
Relay Contact Chart

B. Relay operation may be heard as an audible click when the background noise is not too high. Use one of the methods shown in Figure 5-3 to deter mine if the relay contacts are switching.

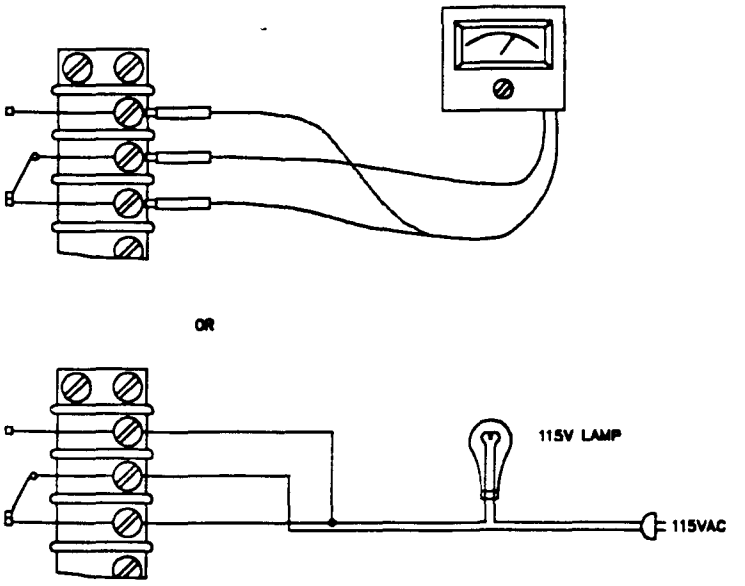


Figure 5-3
Checking the Relay Circuits

5.4 Checking the Cable

A. Disconnect the cable at both ends. Be sure all terminals are standing clear. See Figure 5-4.

B. With an analog ohmmeter, measure the resistance between the CW (Blue) and the SH (Red). Resistance should be infinite (open circuit). With the CW(Blue) and SH (Red) shorted together at the other end, the resistance should be near zero.

C. Measure the resistance from CW (Blue) to GND (Green). Resistance should be infinite (open circuit). With the CW (Blue) and the GND (Green) shorted together at the other end, the resistance should be near zero.

D. Measure the resistance from the SH (Red) to the GND (Green). Resistance should be infinite. If the two are shorted together at the other end, the resistance should be near zero.

E. If measured resistances are not acceptable, replace cable.*

** Only coaxial cables supplied by Drexelbrook Engineering Company should be used to connect the control unit to the sensing element.*

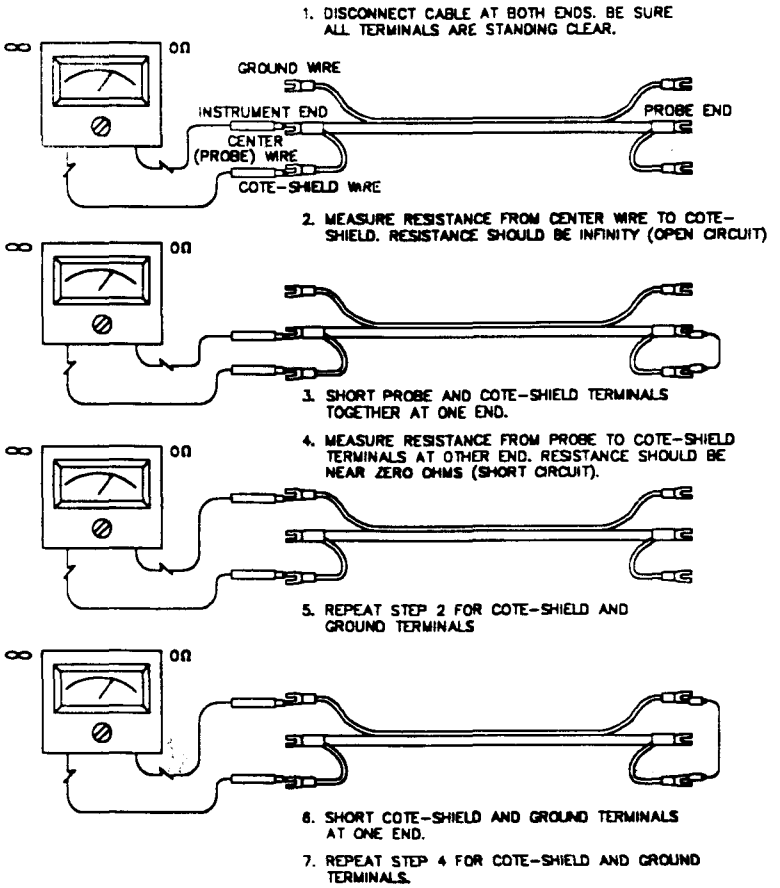


Figure 5-4
Checking the Cable

5.5 Checking the Sensing Element

A thorough check of the sensing element requires factory service equipment. However, the following test can be done with only an ohmmeter to help determine the cause of a possible malfunction. If this test indicates the sensing element is not functioning properly, or if none of the checkout procedures indicate a problem but the system is still not operating properly, please call the factory service department at 1-800-527-6297.

A. Disconnect the measuring cable from the sensing element terminals. See Figure 5-5.

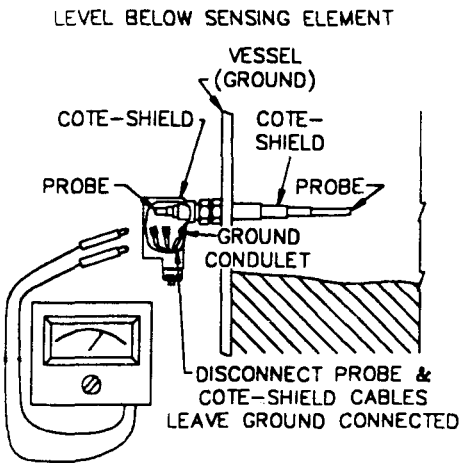


Figure 5-5
Checking the Sensing Element

B. Use an ohmeter to measure the resistance between the sensing element terminals. See the chart below.

Blue (CW) to red (SH)	Infinite (open circuit)
Blue (CW) to green (GND)	Infinite (open circuit)
Green (GND) to either mounting flange	Near zero (short circuit)

5.6 Posssible Problems and Solutions

Table 5-1 lists some possible symptoms, causes, nd solutions of the 506-70 system.

SYMPTOM	POSSIBLE CAUSE	SOLUTION
Both red and green lights on the cover door of the optional NEMA 4 housing are out.	a) No voltage between 'hot' and 'neutral' terminals. b) One or both bulbs are burnt out. c) Electronic unit malfunction.	a) Check wiring. See section 3.2. b) Replace defective bulb(s). c) See sections 5.2 and 5.3.
LED on chassis or green cover light is on, even when vessel is known to be full (HLFS).	a) Defect in cable. b) Electronic unit malfunction. c) Sensing element malfunction. d) Improper calibration. e) Vessel not grounded. f) Vessel not metallic.	a) See section 5.4. b) See sections 5.2 and 5.3. c) See section 5.5. d) See section 4.3. e) Ground vessel. f) Add a ground reference to vessel.
LED on chassis is out or red cover light is on in a normal condition.	a) Defect in cable. b) Electronic unit malfunction. c) Sensing element malfunction. d) Heavy coating build-up on sensor.	a) See section 5.4. b) See sections 5.2 and 5.3. c) See section 5.5. d) Consult factory.
Instrument operates intermittently.	a) Loose wiring. b) Ground strap not connected properly. c) Electronic unit malfunction. d) Voids in the process stream are longer than the time delay period. e) Sensing element malfunction.	a) Check wiring. See section 3.2. b) See section 3.5. c) See sections 5.2 and 5.3. d) Increase the time delay period. See section 4.2.2. e) See section 5.5.

Table 5-1
Troubleshooting

6.0 FACTORY AND FIELD SERVICE ASSISTANCE

6.1 Telephone Assistance

If you are having difficulty with your Drexelbrook equipment, and attempts to locate the problem has failed, notify your local Drexelbrook representative, or call the factory direct and ask for the Service Department. Drexelbrook Engineering Company is located at 205 Keith Valley Road, Horsham, PA 19044. The telephone number is 1-800-527-6297.

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_____
Cable Length_____
Material being measured_____
_____
Temperature_____
Pressure_____
Brief description of the problem_____
_____
_____

Checkout procedures that failed _____
_____
_____

6.2 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_____

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

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 prepaid. We regret that we cannot accept collect shipments.

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

6.3 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.

6.4 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, Attn: Communications/Training Group, or call direct (215) 674-1234.

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