INSTRUCTION MANUAL

ANTI-COATING PFM TRANSMITTER
900GA337

We do our level best

Robertshaw

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INSTRUCTION MANUAL NUMBER

909GF285F

EC DECLARATION OF CONFORMITY

We, Manufacturer:

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declare under our sole responsibility that the

900GA337 series PFM Transmitters

are in conformity with the protection requirements of Council Directive:

89/336/EEC as amended by 92/31/EEC and 93/68/EEC on the approximation of the laws of the Member States relating to Electromagnetic Compatibility.

and the relevant provisions of the following standards:

EN 55011:1989 Group 1 Class B ISM Emission Requirements (EMC).
EN 50082-2:1995, Electromagnetic Compatibility - Heavy Industrial Generic Immunity Standard.

We, the undersigned, hereby declare that the product specified above conforms to the listed directives and standards:

Manufacturer

Signature:

Name: Benjamin N. Lease
Title: Project Engineer
Date: November 27, 1996

Authorized Representative based within the EU

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Date: November 27, 1996

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Name: John Yankowski
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Date: November 27, 1996

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SECTION I - DESCRIPTION

1.1 GENERAL DESCRIPTION

The ROBERTSHAW Anti-Coating PFM Transmitter provides level measurements of sticky, viscous products not possible with conventional level instrumentation. The Anti-Coating PFM Transmitter compensates for most errors due to Conductive coatings or Build-ups without necessitating frequent cleaning or maintenance.

The patented ROBERTSHAW RF Impedance Pulse Frequency Modulated (PFM) Transmitters are designed for use with the 7000 Series Excalibur™ and the 5400A series Level-Lance™ microprocessor based instruments. They employ ROBERTSHAW's patented data transmission scheme for improved accuracy, repeatability and longevity over analog transmission systems. The PFM transmitter converts the input impedance (level) to a pulse width modulated current signal that can then be transmitted, over a pair of common wires, to the receiving instrument, up to one (1) mile away. The PFM transmitter typically requires no user calibration because the microprocessor based system continuously self-calibrates adapting to voltage and temperature excursions. The transmitter is also equipped with a built in test feature, input range selection switch for improved dynamic range, and an LED indicator to provide visual indication that the transmitter is functioning.

The PFM transmitter is typically mounted directly onto the sensing probe, but may be remotely mounted up to fifteen (15) feet from the probe. Optional conduit outlet box, conduit and cable assemblies are available to facilitate remote mounted installations. ROBERTSHAW also offers a wide variety of sensing probes to suit the application needs.

The PFM transmitter is offered in a number of enclosure options to fit the application requirements of the user. The standard enclosure is weather-proof and an optional epoxy painted enclosure is offered for corrosive applications.

1.2 PART NUMBER IDENTIFICATION

PART NUMBER

Part Number	Description
900GA337-01	PFM Transmitter, Probe Mounted (NEMA 4)
900GA337-02	PFM Transmitter, Remote Mounted (NEMA 4)
900GA337-03	PFM Transmitter, Probe Mounted, Corrosion Resistant (NEMA 4X)
900GA337-04	PFM Transmitter, Remote Mounted, Corrosion Resistant (NEMA 4X)

1.3 ACCESSORIES

CABLES

Part Number	Description
032KC190-XX*	Conduit with ½" NPT connections, flexible, liquid tight, general purpose
032KC600-XX*	Coaxial cable
032KC650-XX*	Coaxial cable with general purpose conduit
032KC700-XX*	Coaxial cable with NEMA 4 conduit outlet box**
032KC710-XX*	Coaxial cable with general purpose conduit and NEMA 4 conduit outlet box
032KC720-02	Coaxial cable, 2 ft long, with explosion proof conduit and NEMA 4 conduit outlet box**
032KC720-05	Coaxial cable, 5 ft long, with explosion proof conduit and NEMA 4 conduit outlet box**
032KC720-08	Coaxial cable, 8 ft long, with explosion proof conduit and NEMA 4 conduit outlet box**
032KC720-10	Coaxial cable, 10 ft long, with explosion proof conduit and NEMA 4 conduit outlet box**
032KC800-XX*	Coaxial cable with NEMA 4X epoxy painted conduit outlet box**
032KC810-XX*	Coaxial cable with general purpose conduit and NEMA 4X epoxy painted conduit outlet box
032KC820-02	Coaxial cable, 2 ft long, with explosion proof conduit and NEMA 4X epoxy painted conduit outlet box**
032KC820-05	Coaxial cable, 5 ft long, with explosion proof conduit and NEMA 4X epoxy painted conduit outlet box**
032KC820-08	Coaxial cable, 8 ft long, with explosion proof conduit and NEMA 4X epoxy painted conduit outlet box**

CABLES - Cont'd

Part Number	Description
032KC820-10	Coaxial cable, 10 ft long, with explosion proof conduit and NEMA 4X epoxy painted conduit outlet box**
032KC900-XX*	Coaxial cable with NEMA 4X stainless steel conduit outlet box**
032KC910-XX*	Coaxial cable with general purpose conduit and NEMA 4X stainless steel conduit outlet box.
032KC920-02	Coaxial cable, 2 ft long, with explosion proof conduit and NEMA 4X stainless steel conduit outlet box**
032KC920-05	Coaxial cable, 5 ft long, with explosion proof conduit and NEMA 4X stainless steel conduit outlet box**
032KC920-08	Coaxial cable, 8 ft long, with explosion proof conduit and NEMA 4X stainless steel conduit outlet box**
032KC920-10	Coaxial cable, 10 ft long, with explosion proof conduit and NEMA 4X stainless steel conduit outlet box**
909SD029**	Conduit outlet box, NEMA 4
909SD029-50**	Conduit outlet box, NEMA 4X, epoxy painted
909SD029-51**	Conduit outlet box, NEMA 4X, stainless steel

* Substitute the desired cable length, in feet, for "XX" to complete the part number. Maximum length is 15 feet.
Coaxial cable is Teflon insulated, maximum temperature 350° F, with terminations for attachment to probe and PFM Transmitter.

** Conduit outlet boxes are explosion proof.

SECTION II - SPECIFICATIONS

2.1 ENVIRONMENTAL:

Operating Temperature:	-40^{o} to +140^{o}F (-40^{o} to +60^{o}C)
Storage Temperature:	-40^{o} to +257^{o}F (-40^{o} to +125^{o}C)
Relative Humidity:	0 to 95% (non-condensing)
Vibration:	±2G, 10 to 200 Hz
Shock:	75G's For 11 ms, Without Permanent Damage
Enclosure:	
Material:	Cast Aluminum
Finish:	Polyurethane Enamel, Blue (Standard) Epoxy Enamel, Gray (Optional)
Ratings:	
Raintight	NEMA-4 (Standard)
Raintight Corrosion Resistant	NEMA-4X (Optional)
Weight:	3.3 lbs (1.5 Kg)

2.2 ELECTRICAL/ELECTRONIC:

Supply Voltage:	11 to 13 VDC (Supplied By 5400A Series Level-Lance™ or 7000 Series Excalibur™ Receiver)
Supply Current:	30 mADC (Max.)
Ambient Temperature Effect:	±0.005 pF/ºF (±0.01 pF/ºC) or ±0.01%/º F (±0.01 %/ºC) Which-Ever Is Greater
Supply Variation Effect:	None
Linearity:	±0.5%
Repeatability:	±0.1 pF
Accuracy:	<1%, 0.5% Typ.
Maximum Distance Between Transmitter And Receiver:	One (1) Mile
Type Of Interconnecting Cable:	Two (2) Wires, #18 AWG min, #14 AWG max, Rated 80° C min. Twisted Pair, Unshielded (Belden #8461 or Equivalent) in Grounded Metal Conduit or Twisted Pair, Shielded (Belden #8760 or Equivalent) In Non-Metallic Conduit.
Maximum Distance Between Transmitter And Probe:	15 feet using interconnecting cable
Type Of Interconnecting Cable:	RG-62/U coaxial cable rated 80° C min.
Capacitance Input Range (SW1 - See Figure 2.1)	1) 0 – 200 pF 2) 0 – 500 pF 3) 0 – 1000 pF 4) 0 – 2000 pF 5) 0 – 6000 pF For minimum spans refer to paragraph 3.3.1

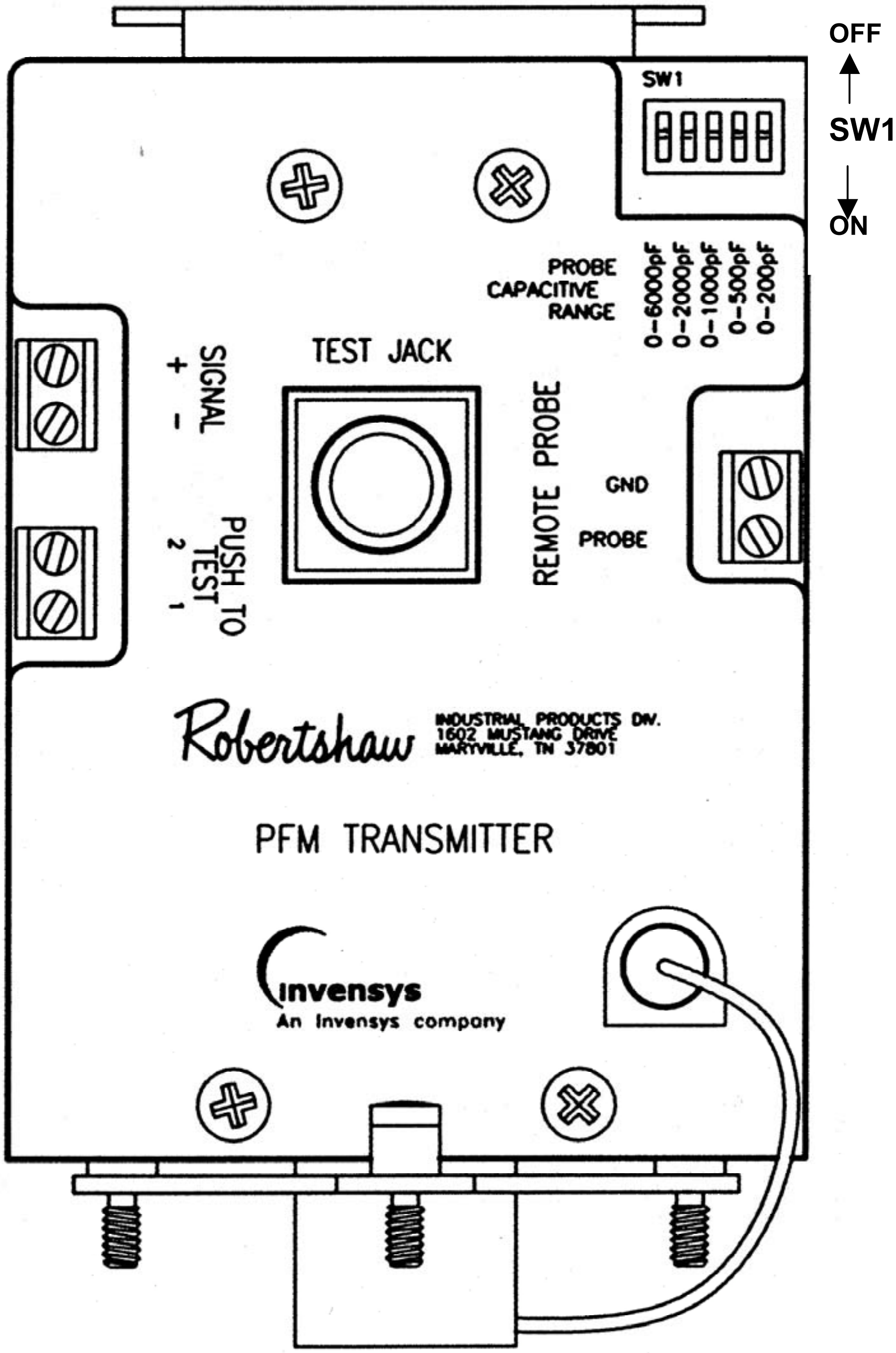

Figure 2.1
Switch SW1 for Selection of Capacitance Range

SECTION III - INSTALLATION

3.1 GENERAL

Examine the instrument for possible shipping damages.

> **IMPORTANT**
> If for any reason it is determined that parts should be returned to the factory, please notify the nearest ROBERTSHAW sales representative prior to shipment. Each unit must be properly packaged to prevent damage. ROBERTSHAW assumes no responsibility for equipment damaged in shipment due to improper packaging.

Choose the location in accordance with good instrument practice, avoiding extremes of temperature, humidity and vibration. (See SPECIFICATIONS, Section II).

3.2 PROBE

ROBERTSHAW probes are purchased separately from the instruments and are available in a variety of sizes and types with numerous options for the materials and construction. Each probe should be selected for the specific application in order to ensure the best and most reliable operation of the system.

Probes are available with or without insulation. Insulated probes may be used for liquid, solid or interface detection and can also be used on conductive material. Bare probes are normally used with non-conductive materials only.

> **CAUTION**
> When installing an insulated probe, care should be taken to prevent accidental puncture of the probe insulation.

Standard type probes are installed so that the face of the packing gland is flush (or nearly so) with the vessel wall. When installing the probe in a nozzle, recess or open end well, a sheathed probe should be used, with the sheath length equal to the nozzle, recess or well length. This insures that the "active" portion of the probe is extended into the process area and eliminates potential problems due to build-up in the nozzle, recess or well.

3.2.1 Horizontal Mounting

Horizontally mounted rod-type probes must be installed in the vessel at the desired point of level detection. Horizontally mounted probes provide the closest control (smallest deadband) in that a small level change at, or near, the probe will produce a large capacitance change.

3.2.2 Vertical Mounting

Vertically mounted rod-type probes should be installed in either the top or bottom of the vessel. Vertically installed probes allow a variation in the level detection point up and down the length of the probe by means of the instrument zero adjustment.

Continuous level measurements typically require a vertically mounted probe.

3.3 TRANSMITTER MOUNTING

The RF Impedance PFM Transmitter is designed to be mounted remotely from the receiver unit of the system. The separation distance between the receiver and the probe can be up to one (1) mile. See Figure 3.1 for transmitter mechanical mounting details.

The following steps outline the procedure for installing a probe mounted PFM transmitter:

1. Remove the enclosure cover from the transmitter assembly. Remove the plastic bag containing the ‘Probe Pin Kit’.
2. Remove the ‘Electronics Assembly’ with its mounting bracket.
3. Remove the ‘Probe Pin’ (Banana Plug) from the ‘Probe Pin Kit’ and install it in the center rod of the probe. Do not over tighten..
4. Apply a conductive anti-seize compound, such as NEVER-SEEZ, to the ½ NPT threads on the probe. Then install the transmitter enclosure base by screwing it onto the threads of the probe. Align the conduit hubs as required. Do not use Teflon thread sealing tape on the probe threads.
5. Re-install the "Electronics Assembly" into the enclosure base. Verify that the probe pin makes a good electrical connection with

the mating jack in the 'Electronics Assembly'.

6. Make the proper electrical connections as detailed in the following sections.

NOTICE
Tighten field wiring screws to five (5) pound-inches (0.56 NM).

7. Set the probe capacitance range by selecting one of the 5 ranges available (See Paragraph 3.3.1). The range is selected by setting the corresponding dip switch to the ON position. All other switches must be set to the off position, failure to do this will result in lost resolution.
8. Install the enclosure cover.

The RF Impedance PFM Transmitter can also be remotely mounted from the probe by up to fifteen (15) feet using coaxial cables.

The following steps outline the procedure for installing a remote mounted PFM Transmitter:

1. Remove the mounting flange from the transmitter assembly.
2. Install the mounting flange on the selected mounting surface.
3. Install the transmitter assembly on the mounting flange. Align the conduit hubs as required.
4. Apply a conductive anti-seize compound, such as NEVER-SEEZ, to the ½ NPT threads on the probe. Then install the conduit outlet box (ordered separately) by screwing it onto the threads of the probe. Align the conduit hub as required. Do not use Teflon thread sealing tape on the probe threads.
5. Remove the enclosure cover from the transmitter assembly. Remove the plastic bag containing the 'Probe Pin Kit'. The Probe Pin is not required for remote mounting.
6. Install conduit between the transmitter and probe mounted conduit outlet box.
7. Install and connect coaxial cable (ordered separately) as detailed in the following sections.
8. Set the probe capacitance range by selecting one of the 5 ranges available (See Paragraph 3.3.1). The range is selected by setting the corresponding dip switch to the ON position. All other switches must be set to the off position, failure to do this will result in lost resolution.
9. Install the enclosure cover.

3.3.1 CAPACITANCE RANGE SWITCH

A range should be selected so that the capacitance generated by the probe when the vessel is full does not exceed the range maximum and the span is not less than the minimum span specified below. The ideal range is the lowest range that meets this criteria.

MINIMUM SPANS

RANGE	INSTRUMENT	
	7000 Series Excalibur™	5400A Series Level-Lance™
0 – 200 pF	2 pF	2 pF
0 – 500 pF	5 pF	2 pF
0 – 1000 pF	8 pF	2 pF
0 – 2000 pF	12 pF	2 pF
0 – 6000 pF	30 pF	2 pF

In order to pick the correct range the capacitance generated by the probe with the process at the high level must be known. Choose the lowest range that this capacitance falls within.

The best way to determine the maximum capacitance is to use a capacitance meter and measure the capacitance, with the process at the high level. If the transmitter is to be mounted on the probe, the capacitance should be measured between the center rod of the probe and the probe gland before mounting the transmitter. If the transmitter is to be remote mounted, the capacitance should be measured at the transmitter end of the coaxial interconnecting cable before attaching to the transmitter terminals.

Another method to determine the capacitance is to calculate it. Since there are many variables involved, the methods of calculating the capacitance will not be explained in this manual.

CAUTION
Whenever changing the range, a two point calibration must be performed.

If the maximum capacitance cannot be determined the following procedure should be used:

Select a range according to the following chart:

INITIAL RANGE SELECTION

TRANSMITTER MOUNTING	PROBE LENGTH	RANGE
On Probe	7 in. or less	0 – 200 pF
On Probe	21 in. or less	0 – 500 pF
On Probe	46 in. or less	0 – 1000 pF
On Probe	94 in. or less	0 – 2000 pF
On Probe	Over 94 in.	0 – 6000 pF
On Probe	Unknown	0 – 6000 pF
Remote	6 in. or less	0 – 500 pF
Remote	30 in. or less	0 – 1000 pF
Remote	78 in. or less	0 – 2000 pF
Remote	Over 78 in.	0 – 6000 pF
Remote	Unknown	0 – 6000 pF

If the instrument is a 7000 Series Excalibur™, and it will not accept the high and low inputs with a significant difference in level change, select the next lower level. Repeat as necessary.

3.4 ELECTRICAL CONNECTIONS

All electrical connections must be made in accordance with figure 3.5. It is important that the conduit be grounded to the process in some way to provide continuity for the impedance signal. If a metallic vessel is not employed it may be necessary to provide a ground rod inside the vessel.

3.4.1 Interconnecting Cable

The PFM Transmitter is connected to the 7000 Series Excalibur™ or the 5400A Series Level-Lance™ receiver using two wires (color coded, twisted pair cable is recommended) in grounded metal conduit with no power lines present. Otherwise shielded, twisted pair, cable must be used for this connection. Terminals GND and SIG on the PFM Transmitter are connected to the corresponding terminals of the receiver.

WARNING
Seal fittings must be installed in all explosion-proof installations.

When installing the optional remote mounted PFM Transmitter the interconnecting cable between the sensing probe and the transmitter must be high temperature Teflon insulated coaxial.

The outer shield of the coaxial cable should be connected to the GND terminal on the PFM Transmitter and the ground screw (green) in the probe mounted conduit outlet box. The center conductor of the cable should be connected to the PROBE terminal on the PFM Transmitter and the screw in the probe rod in the probe mounted conduit outlet box.

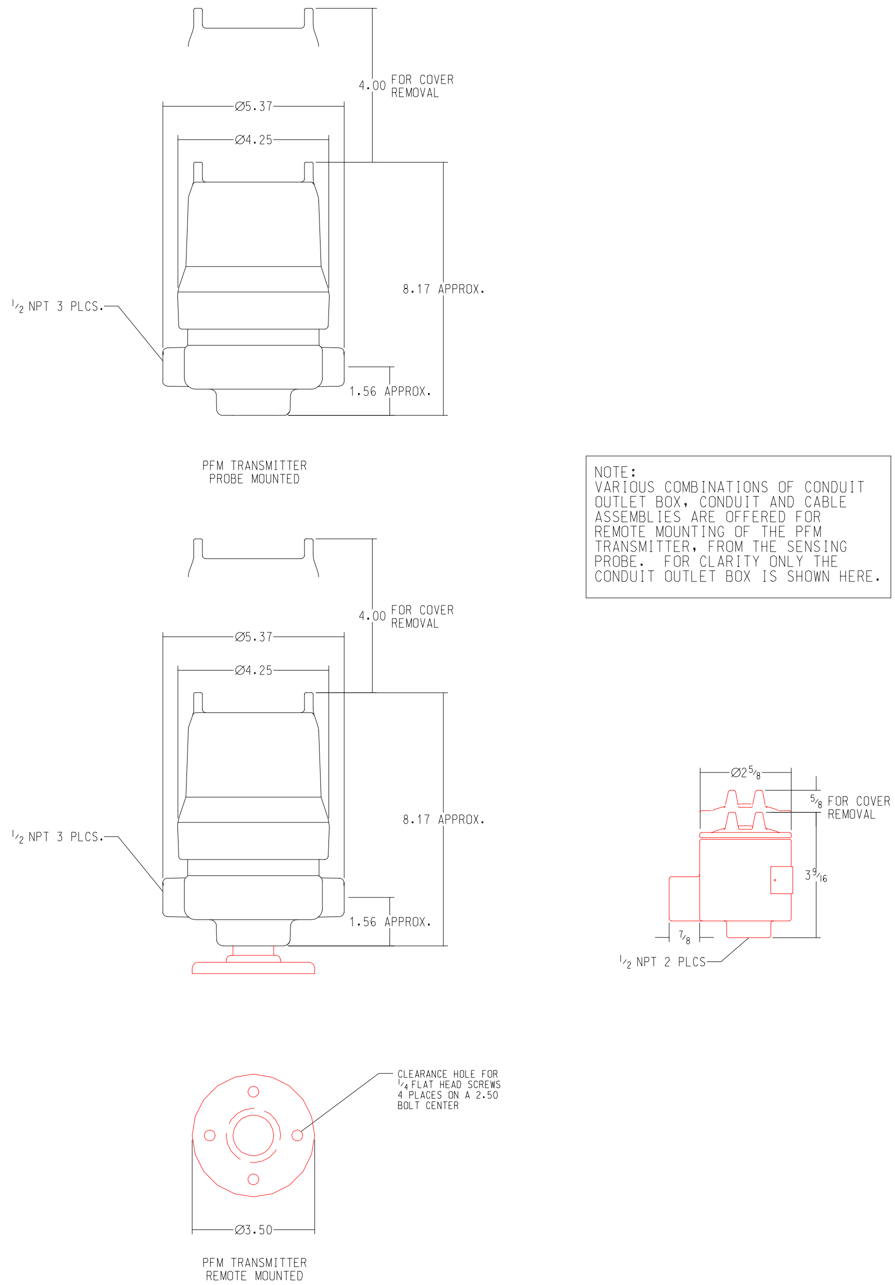

Figure 3.1 Dimensions
PFM Transmitter and Probe Mounted Conduit Outlet Box

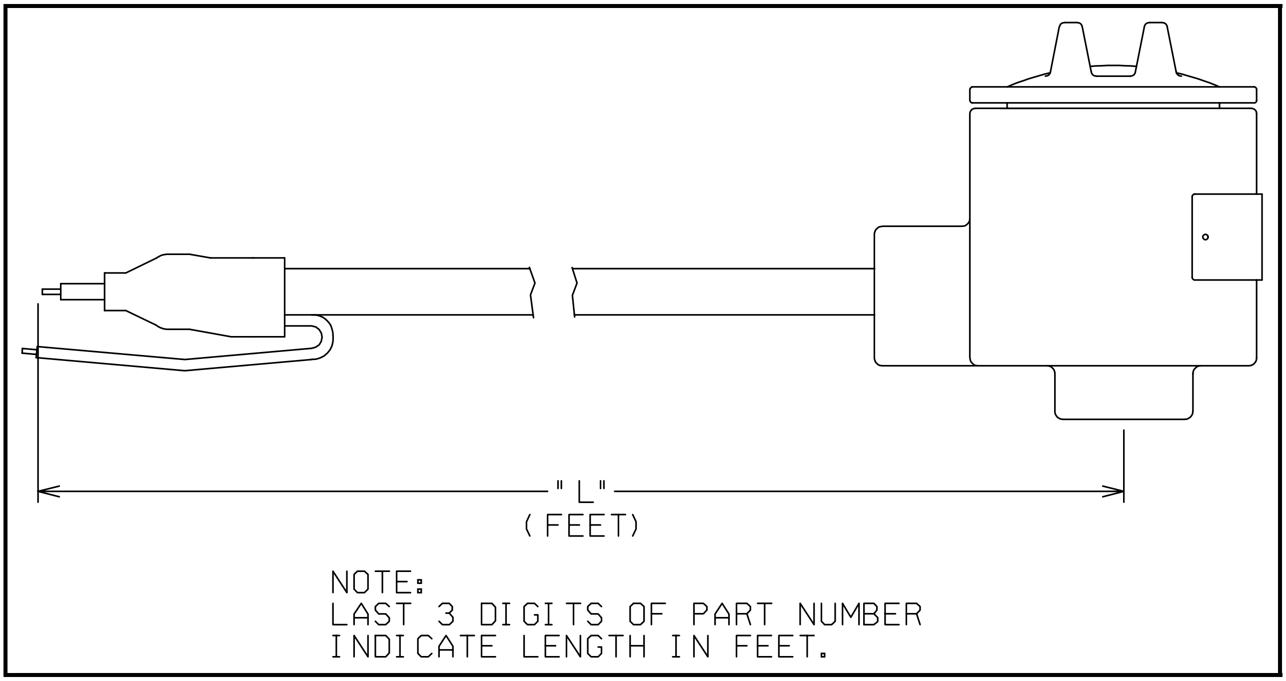

Figure 3.2 Dimensions
Conduit Outlet Box And Cable Assembly
(032KC700-XX, 032KC800-XX & 032KC900-XX)

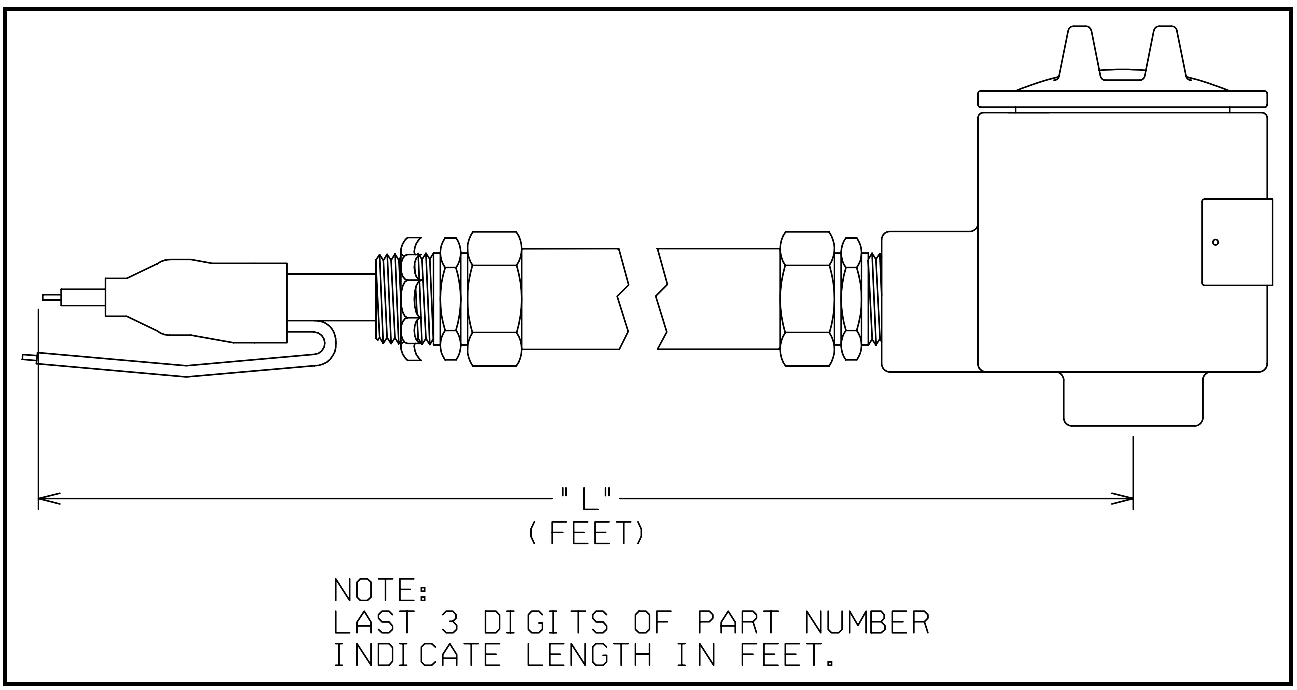

Figure 3.3 Dimensions
Conduit Outlet Box, Conduit And Cable Assembly
General Purpose, NEMA 4 & NEMA 4X
K(032C710-XX, 032KC810-XX & 032KC910-XX)

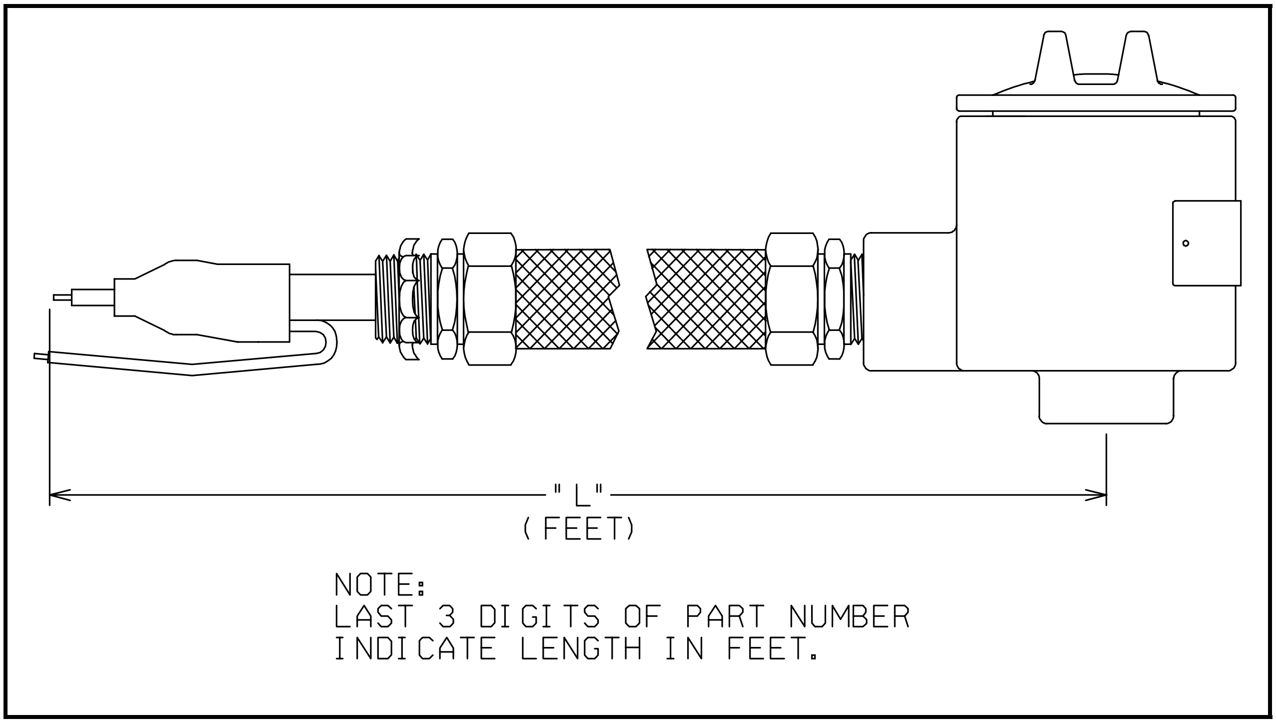

Figure 3.4 Dimensions
Conduit Outlet Box, Conduit And Cable Assembly
Explosion-Proof
(032KC720-XX, 032KC820-XX & 032KC920-XX)

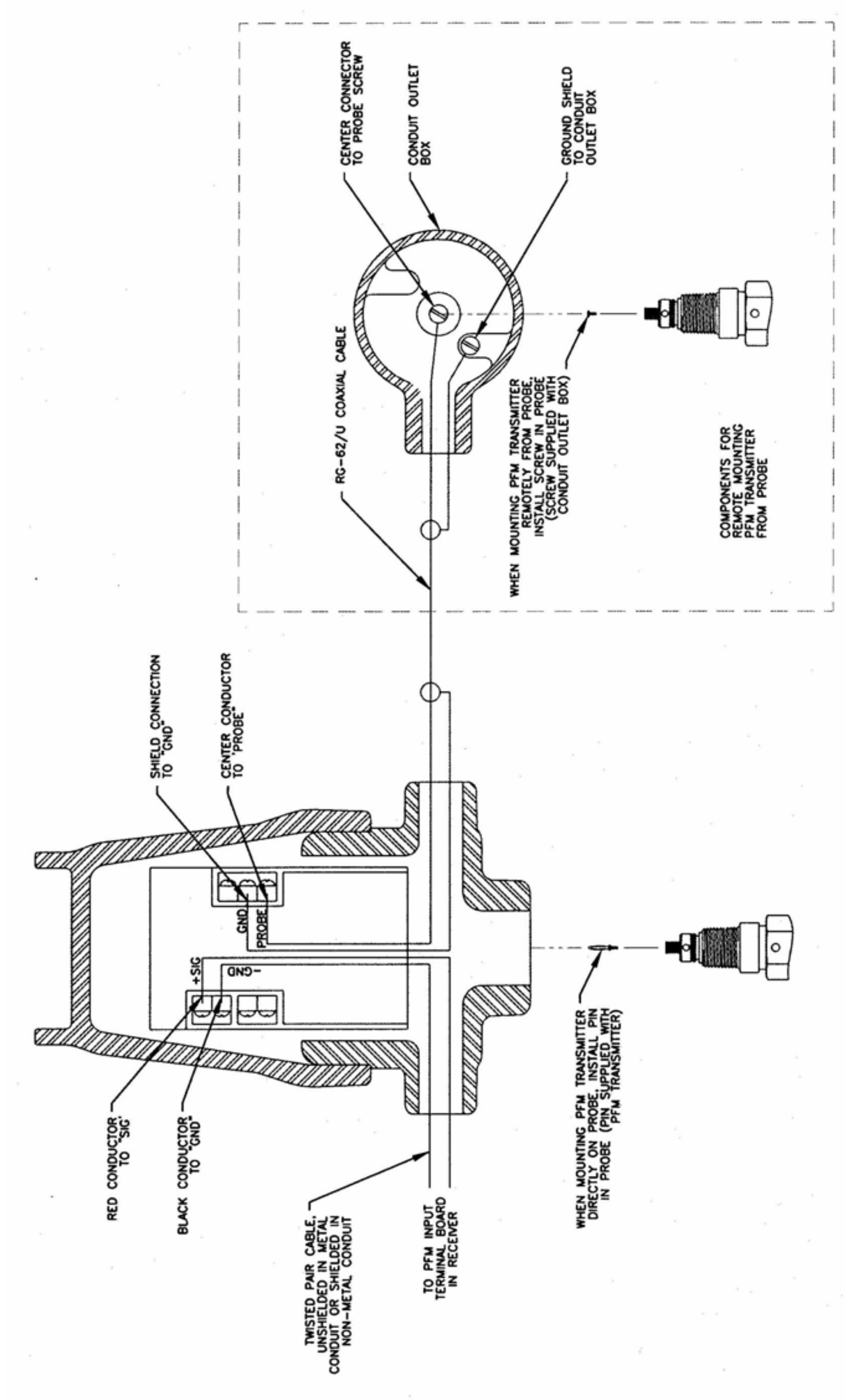

Figure [illegible] Electrical Connections

NOTICE
Tighten field wiring terminal screws to five (5) pound-inches (0.56NM)

SECTION IV - OPERATION

4.1 GENERAL

The PFM Transmitter converts an i
input to a pulse frequency modulated current output. Its input is typically the impedance change generated by a varying level in a vessel equipped with a rod type sensing probe. The sensing probe provides an increasing impedance with an increasing level. The actual impedance change is a function of the sensing probe construction, installation location and the material's dielectric constant. Since typically there is no calibration required for the PFM Transmitter the actual values are unimportant as long as they fall within one of the input sensitivity ranges of the transmitter.

The PFM Transmitter circuitry can be divided into four major function blocks (See Figure 4.1) as shown below:

1. Analog Block
2. Data Conversion Block
3. Output Block
4. Push to Test Block

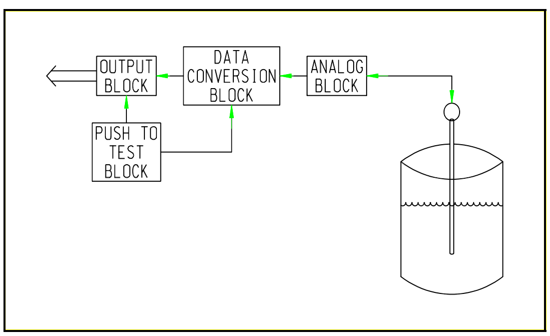

Figure 4.1 Block Diagram

4.2 CIRCUIT DESCRIPTION

The power for the PFM Transmitter is supplied over the same two wires that carry the current pulse signal back to the receiver. The receiver, which is typically a 7000 Series Excalibur™ or a 5400A Series Level-Lance™ controller, provides 12 VDC. The PFM transmitter component values are chosen so that the "Off" portion of the pulse is represented by an approximately 4 mA current and the "On" portion is represented by an approximately 20 mA current. A local LED indicator is included to provide indication of the transmitter status. The LED is on when the current is at its high level.

4.2.1 Analog Block

A constant current source is used to charge a reference capacitor. This source is mirrored. The mirrored source is used to charge the sensing element. An op-amp is used to generate an error signal which is proportional to the difference in the voltages across the reference and the sensing element. The error signal is low pass filtered, and used as a control voltage for a selectable gain voltage controlled current source. The selectable gain current source sums with the mirrored source charging the sensing element. The selectable gain source acts as a feedback element which adjusts the voltage waveform of the sensing element to match that of the reference capacitor. The gain adjustment allows the source to be appropriately scaled for different sensing element impedances. The selectable gain current source is also mirrored. This mirrored source biases a sampling resistor. A proportional voltage is developed across the sampling resistor (which by the way is low pass filtered). This signal has a dynamic range of approximately 0 to 1.8 Vdc. This range is constant no matter which gain resistor is selected, therefore the selectable gain current source can be used to maximize the system dynamic range for any sensing element. The ranges are: 0 - 200 pf , 0 - 500 pf, 0 - 1000 pf , 0 - 2000pf, and 0 - 6000pf.

The microprocessor generates a pulse width modulated signal which drives two N channel enhancement mode MOSFETs. These FETs allow the alternating charge and discharge of both the sensing element and the reference capacitor. The frequency, and the duration can be arbitrarily set by the microprocessor.

A terminal strip is provided for a remote probe connection. The maximum effective distance for a remote mounted probe is specified in Section II.

4.2.2 Data Conversion Block

A 16 bit Analog to Digital Converter is used to convert the voltage across the sampling resistor into a 16 bit binary number. The reference for the A/D is provided by a resistor divider network. This allows ratiometric conversions. As the 5 volt supply varies, so does the reference voltage and the current sources, as they are also driven from resistor divider networks. Thermal transients also effect these voltages. The A/D continuously compensates for these variations. The A/D converter is configured with a sampling rate of approximately 38.4Khz. The sigma delta conversion is configured with a 5.24Hz $SINC^3(x)$ digital filter, providing a 20Hz output update rate. Anti-aliasing is provided by a discrete low pass network. The communications between the microprocessor and the A/D are via an SPI (Serial Peripheral Interface) three wire serial data bus. Transmission, and reception are permitted on the bus. Collision avoidance is built in to the interface, and is complimented in software. A data ready pin from the A/D tells the microprocessor when new conversion data is available, and if errors in transmission have occurred. The data ready pin is also used for frame synchronization of all transmitted and received data. The reset line for the A/D is also connected to the microprocessor. This allows the microprocessor to arbitrarily reset the A/D. This would happen in the case of a communications fault, a low power condition, or as part of the built in test.

4.2.3 Output Block

Two high resolution timers are used to create the PFM timing. It should be noted that the entire PFM conversion process is interrupt driven and essentially happens in parallel with all other microprocessor functions. The PFM is generated by modulating from a carrier wave. The carrier wave is generated by allowing one of the high resolution timers (Timer 1) to overflow. The timer register is initialized with E000. This corresponds to a time of (FFFF - E000) * 2 (Prescaler) * 1/4Mhz * 4 (number of master clock ticks per timer tick) = 16.382 milliseconds. The conversion result from the A/D is then added to this time by way of the second timer (Timer 0). Since Timer 0 is only an 8 bit timer, the 16 bit result is decimated into a high and low byte. The low byte is loaded in to the Timer 0 register as (FF - low byte) and the timer is allowed to over flow once. There is a 16:1 prescaler set for Timer 0. The high byte acts as an overflow counter. It counts the number of overflows when the timer is loaded with 00. This combined time is added to the Timer 1 base time, after which the output port is toggled. A 50% duty cycle PFM signal is therefore generated at the output pin. The frequency with an input of 0000 is therefore approximately 30.5 Hz and with an input of FFFF, the frequency is approximately 0.47 Hz. The output pin drives the base of a NPN transistor. When the base of the transistor is driven high it causes a current pulse whose duration is proportional to the impedance on the sensing element as discussed above. When the base of the transistor is driven low, it causes the current pulse to turn off.

4.2.4 Push to Test Block

The push to test contacts are buffered, filtered low power inputs. By shorting the contacts together, a low signal is provided to the microprocessor. The input pin on the microprocessor is equipped with an internal CMOS weak pull up, so no external pull up is required. A logic low signal on this pin causes the microprocessor to go into a test mode. The A/D is cycled through a hardware reset, zero and span are calibrated, and the validity of the returned information is assessed. If the unit is functioning correctly, the output is forced into an high level condition, ie) the output is forced to FFFF. This should trigger high level alarms in the controller, and the safety systems of the control loop can then be evaluated. current pulse to turn off.

4.2.5 Test Jack

The test jack is used for factory calibration and testing. It serves no function in the field.

SECTION V - TROUBLESHOOTING

5.1 GENERAL

There is no calibration required on the PFM Transmitter. A review of Section IV (Operation) of this manual will be helpful prior to trouble shooting the transmitter.

It is normal for the green LED on the PFM Transmitter to be flashing (blinking).

5.2 PROBE CIRCUIT ELECTRICAL CHECK

Most problems can be traced to the probe, the PFM Transmitter, or associated wiring. When a probe problem is indicated the following procedure should be used to isolate it. A multimeter is needed to perform these tests. The tests should be performed in the order given in the table below.

MEASUREMENT	READING	REMARKS
On receiver, voltage between SIG and GND terminals with the PFM Transmitter discon-nected.	11 to 13 VDC	Normal, proceed.
	Less than 11 VDC	Defective receiver.
	Greater than 13 VDC	Defective receiver.
On receiver, voltage between SIG and GND with the PFM Transmitter connected.	6 to 12 VDC, may be erratic	Normal, Proceed.
	1 to 5 VDC	Defective PFM Transmitter or interconnecting wiring reversed.
	0 VDC	Interconnecting wiring shorted.
On PFM Transmitter, voltage between Signal Plus (+) and Signal Minus (-) with the receiver connected.	0 VDC	Open circuit condition exists in the interconnecting wiring.
On receiver, current between SIG terminal and its wire from the transmitter. NOTE: Meter is in series with the (+) lead and SIG terminal.	Approximately 12 to 15 mA, may be erratic and will vary with meter used.	Normal - Problem is most likely a defective receiver.
	0 mA	Interconnecting wiring open.
	Steady 1 to 9 mA	Abnormal, proceed.
	Steady 17 to 26 mA	Abnormal, proceed.
Remove PFM Transmitter and measure the resistance from the center rod of the probe and ground using the highest scale on the meter. Do not touch the probe or the meter leads as your body resistance will change the reading.	Greater than 10 Megohm	Normal - problem is most likely a defective PFM Transmitter.
	Less than 1 Megohm	Defective probe – shorted.
	Less than 1 Megohm	Bare probe used in conductive material.
	1 to 10 Megohm	Leaky probe, probably not causing a problem, but possible future problem.

SECTION VI - SPARE PARTS

6.1 SPARE PARTS

Electronics Assembly (includes bracket and PCA cover)..044KX249-01

Printed Circuit Assembly (without bracket and PCA cover)..044KX248

Cover, Enclosure, NEMA 4 (Nitro Blue)..040KB387-01

Cover, Enclosure, NEMA 4X (Grey Epoxy)..040KB387-02

O-Ring, Cover..560KB051-57

Probe Pin Kit (For Direct Mounting)..909GM079

Probe Termination Kit (For Remote Mounting)..909GM085

Remote Mounting Kit

Standard..909GM174-01

Corrosion Resistant..909GM174-03

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