



## Level Lance Model 5100

### GENERAL DESCRIPTION

The Robertshaw Model 5100 Level-Lance is a microprocessor based, advanced technology On-Off level detection instrument. By utilizing the microprocessor, the device can be calibrated without screwdriver adjustments or knobs to turn. The simplicity of the "Auto Set" calibration is the ultimate in level control ease of adjustment.

The Model 5100 has eight (8) separate and individual programs preprogrammed into its memory. These programs let the user select the "type" of On-Off control action best suited for the application. The eight programs are field selectable by means of a 10 position rotary switch. These program selections are as follows:

#### Indicated By Rotary Switch Position Number.

0. **AVERAGING** – sets the control point midway between the selected high and low point on a vertically mounted probe. This is applicable to certain special applications.
1. **CYCLIC (Differential) Control** – used where a level difference or deadband between the high and low points on a vertically mounted probe is desired. Typically used for motor or pump control.
2. **CONTROL (Fixed Differential)** – Used to provide relay operation at a given point on a vertical or horizontal mounted sensing probe.
3. **ALARM+ (Fixed Differential)** – used to provide single point control. Allows high level calibration while the tank or vessel level is below the desired trip point. Used with low dielectric materials and horizontally mounted probes.
4. **ALARM++ (Fixed Differential)** – same as above except for use with high dielectric materials.
5. **ALARM- (Fixed Differential)** – used to provide single point control. Allows low level calibration while the tank or vessel level is above the desired trip point. Used with low dielectric materials and horizontally mounted probes.
6. **ALARM-- (Fixed Differential)** – same as above except for use with high dielectric materials.
7. **WINDOW** – This mode is designed for special applications only. The relay actuation occurs whenever the level is between the selected High and Low points on the probe (HLFS) or whenever the level is not between the two points (LLFS).

Selection of the desired control type is made prior to beginning the calibration process.

Probe shown for illustration only.  
Not included.



### FEATURES AND BENEFITS

- **Microprocessor Based.**
- **Auto-Set Calibration**
- **Calibration Data Retained on Loss of Power (no battery required)**
- **Digitally Set time delays.**
- **Selectable Fail-Safe Modes.**
- **Eight Pre-programmed Control Modes (user selectable).**
- **Built in self diagnostics.**
- **Optional Status Indicating Lights (Rain tight version only).**
- **No Special Cables (Transmitter can be located up to 1 mile from the receiver using standard twisted pair instrument wire).**
- **Utilizes Robertshaw's Patented PFM Transmitter Technology.**
- **Intrinsically Safe PFM Transmitter, UL/c-UL Listed (Non Short Stop version only).**

## General Description (continued)

The Model 5100 also has user selectable "Fail-Safe" modes of operation. High Level Fail Safe (HLFS) or Low Level Fail-Safe (LLFS) are selected by a switch located on the main circuit board.

Field selectable time delays are also provided. The Model 5100 provides the user with a choice of time delay modes. These modes are selected with a pair of switches located on the main circuit board. The user may select no time delay, delay when the relay operates, delay when the relay returns to normal or delay when the relay operates and when it returns to normal. The length of the time delay is set by means of a pair of 10 position rotary switches. The delay duration is adjustable in one (1) second steps from 00 to 99 seconds.

The relay output is a Double Pole Double Throw (DPDT) type rated at 10 amps.

The system utilizes ROBERTSHAW'S patented Pulse Frequency Modulation (PFM) method of level transmission. This allows the transmitter to be located up to one (1) mile from the controller. The connections between them can be made with either two (2) wires, standard probe, or three (3) wires, Short-Stop probe. No special cables are required.

Calibration of the system is accomplished by the "Auto-Set" feature. By pressing the appropriate calibration pushbutton the micro-processor is automatically set to look for the current level as a control point. Thus the levels corresponding to the high and low relay trip points are stored in the microprocessor's non-volatile memory. Single level trip points, with fixed differential, can be set without varying the level in the vessel by using the special control modes provided.

Power supply options include 120 VAC and 240 VAC as well as 18 to 30 VDC operation.

## OPTIONS

The system is available in either rain tight (NEMA 4) enclosures or corrosion resistant (NEMA 4X) enclosures or explosion proof enclosures. Rain tight enclosures are available with, or without, indicating lights. These indication lights provide the user with convenient indication of the system status.

## SPECIFICATIONS

(Subject to change without notice)

### ELECTRICAL/ELECTRONICS:

#### Supply Voltage:

120 VAC,  $\pm 10\%$ , 50/60 Hz Standard.

240 VAC,  $\pm 10\%$ , 50/60 Hz Optional.

18 to 30 VDC, Optional.

**Supply Power:** ..... 10 VA (max.)

**Control Range:** ..... 0.1 to 3000 pF

**Adjustable Differential:** ..... 0.2 pF to 100% of Control Range

**Adjustable Time Delay:** ..... 0 to 99 Seconds

**Ambient Temperature Effect:** .....  $\pm 0.005$  pF/ $^{\circ}$ F or  $\pm 0.01$  %/ $^{\circ}$ F whichever is greater

**Supply Variation Effect:** ..... None

**Linearity:** .....  $\pm 0.5$  %

**Resolution:** ..... 0.1 pF

**Repeatability:** .....  $\pm 0.1$  pF

**Relay Output:** .Electro-Mechanical, DPDT 10 amp @ 120/240 VAC, 10 amp @ 30 VDC, Non-Inductive

#### Maximum Distance Between

**Transmitter and Receiver:** ..... One (1) mile

**Type Of Interconnection Cable:** ..... Two (2) wires

(Twisted Pair) for Standard PFM Transmitter

(BELDEN #8205 or #8762, Shielded) or Three (3)

Wires (BELDEN #9492 or #9364, Shielded) For

Short-Stop™ PFM Transmitter.

### ENVIRONMENTAL:

#### Temperature (Operating or Storage):

-40 to +140 $^{\circ}$ F

-40 to + 60 $^{\circ}$ C

**Relative Humidity:** ..... 0 to 95% Non-Condensing

**Vibration:** .....  $\pm 2$ G, 10 to 200 Hz

**Shock:** ... 75 G's for 11 ms without permanent Damage

**Intrinsic Safety:** UL/c-UL listed PFM and probe input

circuit intrinsically safe for Class I, Div. 1, Groups

A, B, C & D; Class II, Div. 1, Groups E, F & G;

Class I, Zone 0, Group IIC (Requires safety barrier,

wiring connections, and sensors per Robertshaw

Dwg. # 907GA811). Non Shortstop version only.

## **ENCLOSURE:**

### **PFM**

#### **Transmitter:**

Material: .....Cast Aluminum  
Finish: ..... Polyurethane Enamel, Blue - Standard  
Epoxy Enamel, Gray - Optional  
Rain Tight, NEMA 4 - Standard  
Rain Tight, Corrosion Resistant, NEMA 4X -  
Optional  
Explosion Proof: Class I, Division 1, Groups C &  
D  
Class II, Division 1, Groups E, F & G Standard  
Explosion Proof, Corrosion Resistant: Class I,  
Division 1, Groups C & D; Class II, Division 1,  
Groups E, F, & G Optional.

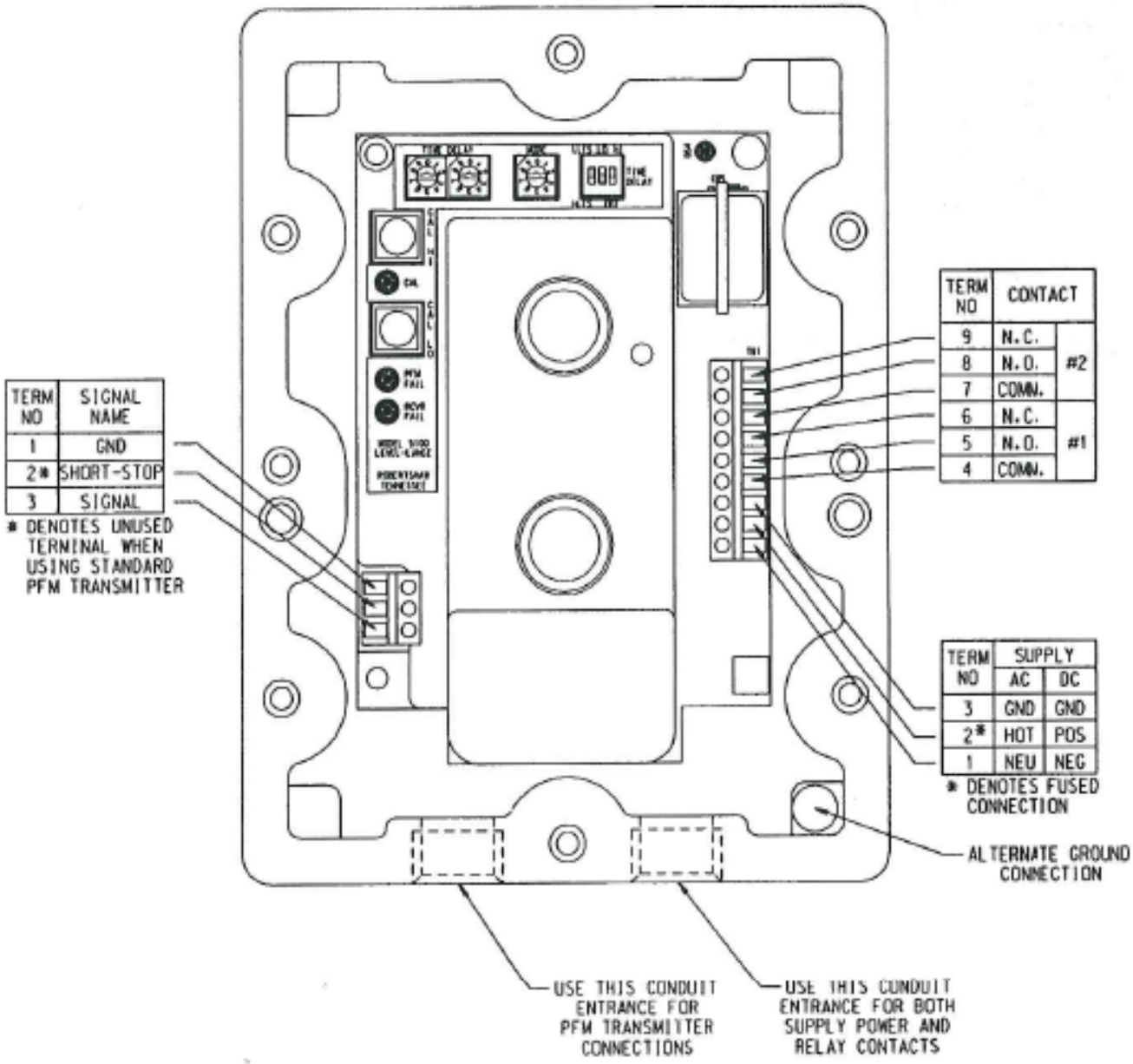
#### **Model 5100 Receiver:**

Material: Cast Aluminum  
Finish: Polyurethane Enamel, Blue -  
Standard  
Epoxy Enamel, Gray - Optional.  
Rain tight, NEMA 4 -  
Standard.

#### **Weight:**

PFM Transmitter: All - 2.5 lbs. (1.14 Kg)  
Receiver: Rain tight: 6.5 lbs. (2.95 Kg)

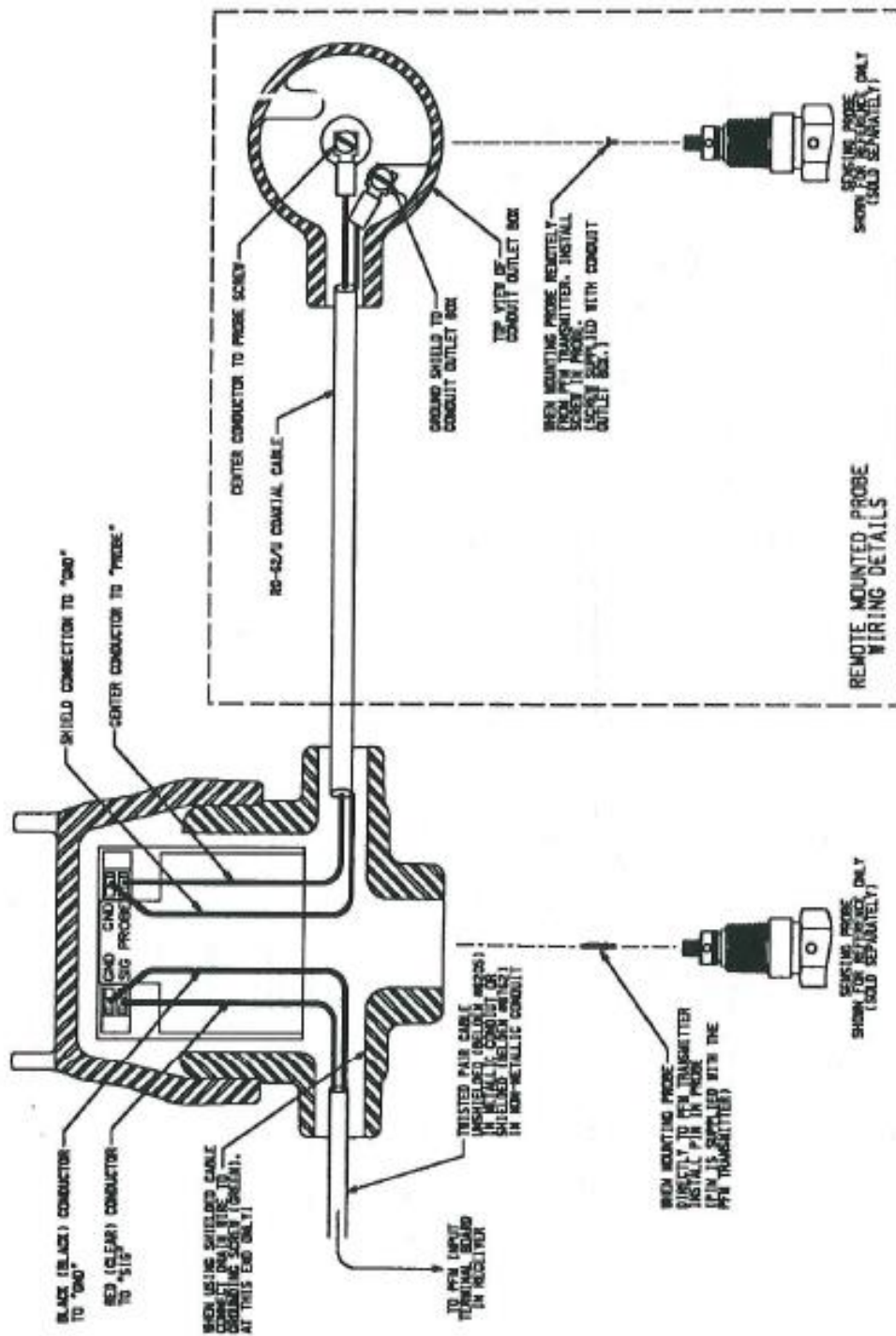
**WIRING, RECEIVER (All Versions)**



THE ALARM CONTACTS ARE SHOWN IN THE DE-ENERGIZED, ALARM, CONDITION

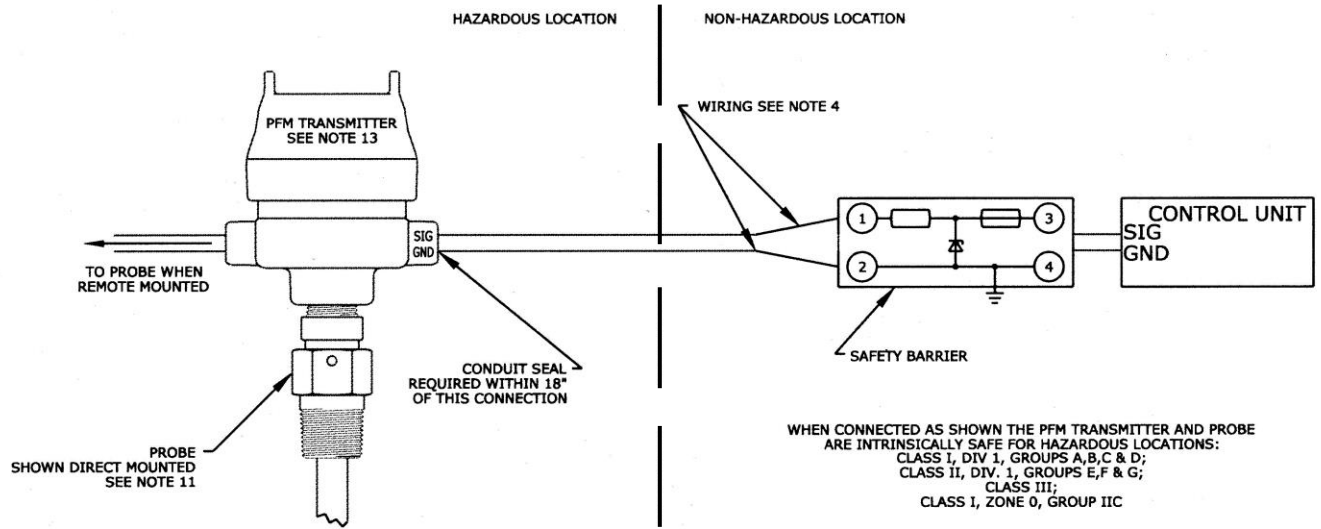
**NOTICE**  
TIGHTEN FIELD WIRING TERMINAL SCREWS TO 5 POUND-INCHES (0.56 NM)

WIRING, STANDARD PFM TRANSMITTER (All Versions)



**NOTICE**  
 TIGHTEN FIELD WIRING TERMINAL SCREWS TO 5 POUND-INCHES (0.56 NM)

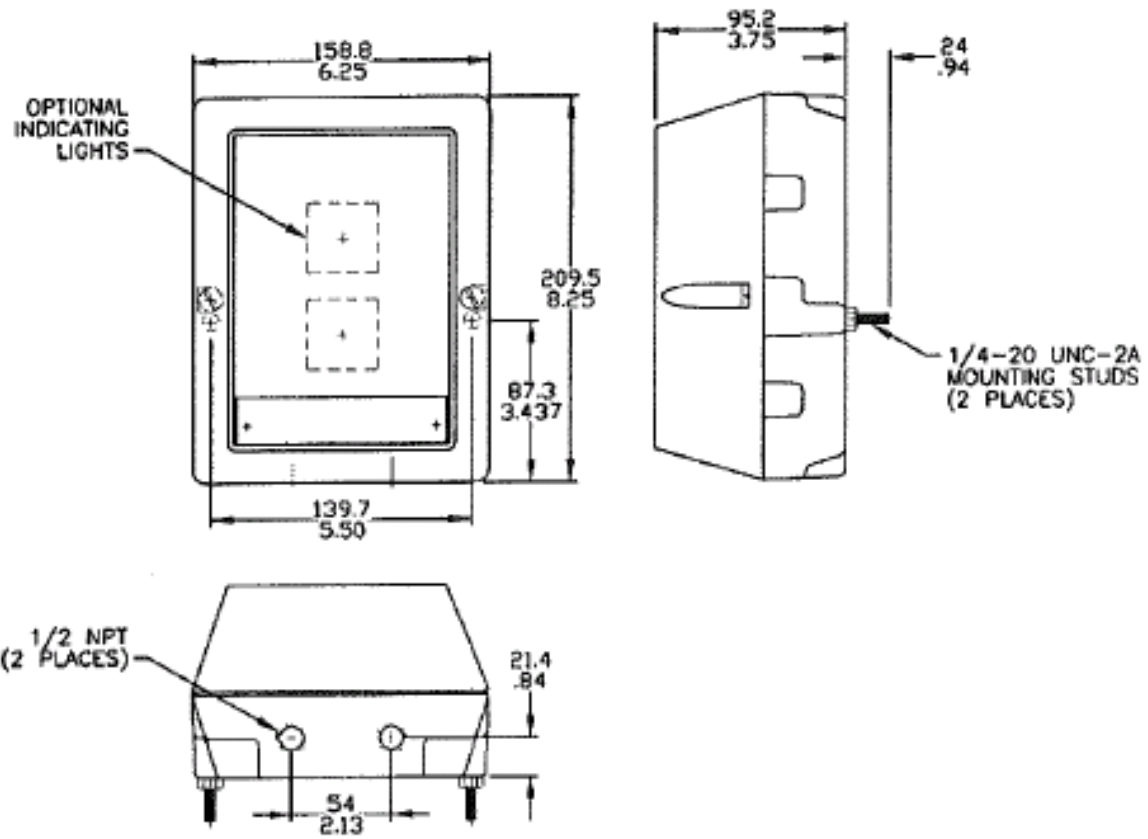
# DRAWING 907GA811



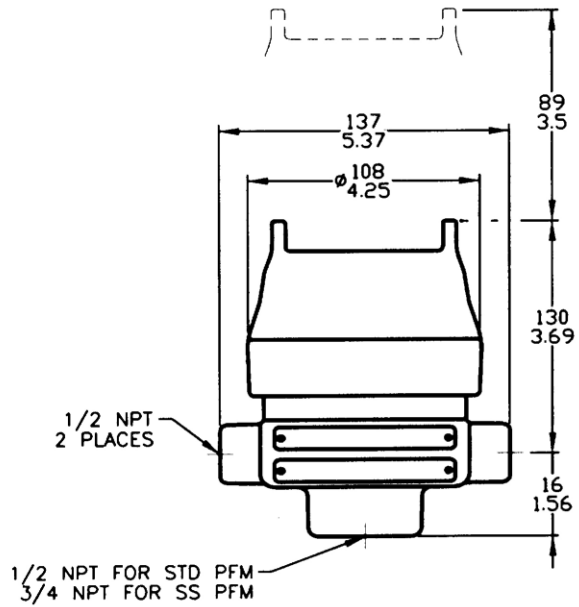
## NOTES

1. Selected safety barriers shall be listed or approved with intrinsically safe circuits for Class I, II and III, Division 1, Groups A, B, C, D, E, F and G, and Class I, Zone 0, Group IIC as appropriate for the application.
2. Output current of the barrier must be limited by a resistor such that the output voltage current plot is a straight line drawn between open circuit voltage and short circuit current.
3. Safety barriers must be installed in accordance with manufacturer's installation instructions.
4. Safety barriers and it's intrinsically safe wiring must be installed in accordance with articles 504 of the NEC ANSI/NFPA 70 or, if applicable, with the Canadian Electrical Code.
5. The safety barrier must meet the following parameters:  
 $V_{oc} \leq V_{max} = 15.7 \text{ V}$                        $C_a \geq C_i + C_{\text{cable}}$   
 $I_{sc} \leq I_{max} = 386.8 \text{ mA}$                        $L_a \geq L_i + L_{\text{cable}}$
6. If the electrical parameters of the cable are unknown, the following values must be used:  
 Capacitance = 60 pF/ft.  
 Inductance = 0.20 uH/ft.  
 Example: 1000 feet of cable would equal: C cable = 1000 x 60 pF = 0.06 uF                      L cable = 1000 x 0.20 uH = 0.2 mH
7. If the safety barrier requires an earth ground then the resistance between the terminal on the safety barrier and earth ground shall be less than 1 ohm.
8. The PFM Transmitter entity parameters are:  
 $V_{max} = 15.7 \text{ V}$                        $C_i = 0.54 \text{ uF}$   
 $I_{max} = 386.8 \text{ mA}$                        $L_i = 0$
9. Recommended safety Barriers:  
 A. R. Stahl incorporated No. 9001/01-158-390-10 (UL listed, FM Approved & CSA Certified)  
 B. Measurement technology Ltd. No. MTL 715P+ (FM Approved & CSA Certified)
10. Not applicable.
11. Robertshaw Model 702, 728, 729, 736, 737, 738, 739, 740, 741, 750, 150KB284 or 150KB285 probe. Insulated probes only may be used in Class II, Group E & F areas.
12. Tighten PFM field wiring terminal screws to 5 pound-inches (0.56Nm)
13. PFM Transmitter, Part Numbers 900GA336-01 & -03 are probe mounted. Part Numbers 900GA336-02 & -04 are remote mounted.

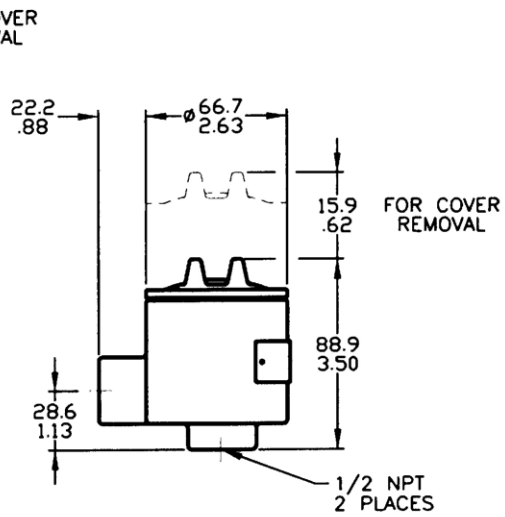
# DIMENSIONS, RECEIVER (Rain Tight, NEMA 4 or NEMA 4X)



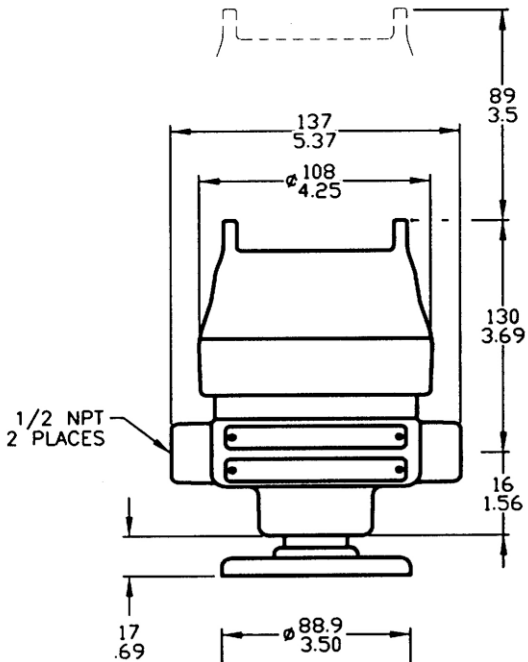
# DIMENSIONS, TRANSMITTER (All Versions)



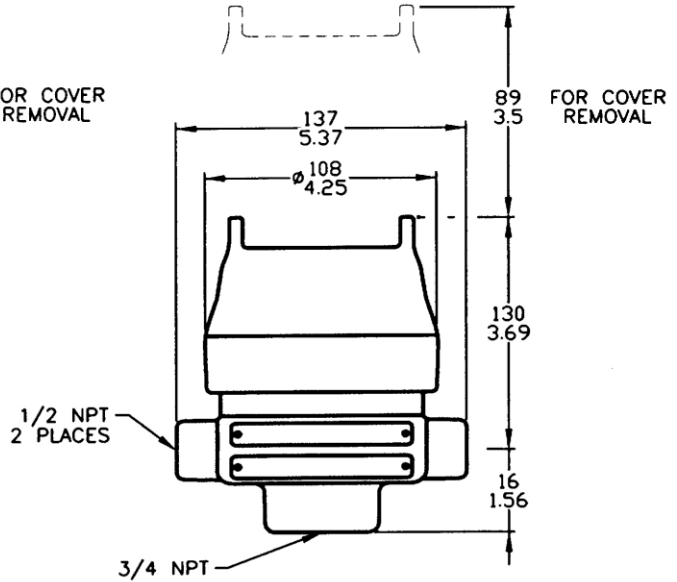
PFM TRANSMITTER  
PROBE MOUNTED



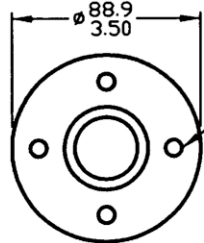
CONDUIT JUNCTION BOX FOR REMOTE MOUNTING  
STANDARD PFM TRANSMITTER  
(SOLD SEPARATELY)



PFM TRANSMITTER  
REMOTE MOUNTED



CONDUIT JUNCTION BOX FOR REMOTE MOUNTING  
SHORT-STOP PFM TRANSMITTER  
(SOLD SEPARATELY)

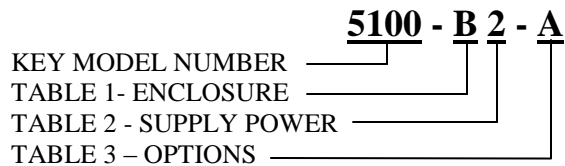


CLEARANCE HOLE FOR  
 $\phi .25$  FLAT HEAD SCREW  
ON A  $\phi 63.5$  BOLT CIRCLE  
4 PLCS EQUALLY SPACED

MM  
INCH



**Ordering Information:**



**KEY MODEL NUMBER**

DESIGNATION	DESCRIPTION
5100	MICROPROCESSOR BASED ON/OFF LEVEL DETECTOR. RECEIVER UNIT, IN AN ENCLOSURE, PER TABLE 1. ALSO INCLUDES A PROBE MOUNTED PFM TRANSMITTER IN AN EXPLOSION-PROOF ENCLOSURE

**TABLE 1-ENCLOSURE**

DESIGNATION	DESCRIPTION
A	NEMA 4, RAIN TIGHT, WITHOUT INDICATOR LIGHTS
B	NEMA 4, RAIN TIGHT WITH INDICATOR LIGHTS
F	NEMA 4X, CORROSION RESISTANT (EPOXY PAINTED), WITH INDICATOR LIGHTS

**TABLE 2 - SUPPLY POWER**

DESIGNATION	DESCRIPTION
1	18 TO 30 VDC
2	120 VAC ±10%, 50/60 HZ
3	240 VAC ±10%, 50/60 HZ

**TABLE 3 - PFM TRANSMITTER OPTIONS**

DESIGNATION	DESCRIPTION
A	PROBE MOUNTED PFM TRANSMITTER
B	REMOTE MOUNTED PFM TRANSMITTER*
E	PROBE MOUNTED, CORROSION RESISTANT (EPOXY PAINTED), PFM TRANSMITTER
F	REMOTE MOUNTED, CORROSION RESISTANT (EPOXY PAINTED), PFM TRANSMITTER*
J	NO PFM

\* Includes nipple and floor flange. requires cable and conduit outlet box shown in accessories. Maximum allowable cable length is 15 feet.

## ACCESSORIES – STANDARD PFM TRANSMITTER

PART NO.	DESCRIPTION
032KC700-XX*	Coaxial Cable, Teflon Dielectric, with NEMA 4 conduit outlet box.
032KC710-XX*	Coaxial Cable, Teflon Dielectric, with general purpose conduit and NEMA 4 conduit outlet box.
032KC800-XX*	Coaxial Cable, Teflon Dielectric, with NEMA 4X (epoxy painted) conduit outlet box.

\* Substitute the desired cable length, in feet, for "XX" to complete the cable part number.  
Maximum Recommended Coax Cable Length is 15 feet.

\*\* Conduit outlet boxes are explosion proof.

NOTE: All Coaxial Cables have a maximum operating temperature of 350° F.



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