



EXCALIBUR 7000

Microprocessor Based Level Control System



Probe shown for illustration only. Not included.

GENERAL DESCRIPTION

The Robertshaw **EXCALIBUR 7000** offers you TWO INSTRUMENTS FOR THE PRICE OF ONE. Both a SMART RF capacitance microprocessor based Level Transmitter and PID Controller, this unique instrument provides the flexibility to meet all your level application requirements. The Excalibur 7000 has built-in PID Control with AUTO TUNE to eliminate offset and provide accuracy and stability. The auto tune feature eliminates periodic on-line tuning by automatically matching control action with your particular process characteristics. This feature alone eliminates many hours of fine tuning to your particular process and the need for, and the cost of, a separate controller. Patented optional RF anti-coating circuitry eliminates errors due to product build-up on the probe assuring you of accurate level measurements in all types of coating applications.

FEATURES AND BENEFITS

- SMART TRANSMITTER AND PID CONTROLLER OPTION W/AUTO TUNE
- MENU DRIVEN SETUP/ CALIBRATION WITH KEYPAD ENTRY
- SETPOINT AND PROCESS VARIABLE DISPLAYS
- TEST/VERIFY PUSH-BUTTON (REMOTE)
- ANTI-COATING CIRCUITRY (OPTIONAL) IGNORES BUILD-UP ON PROBES
- FIELD SELECTABLE INPUT LINEARIZATION FOR OPEN CHANNEL FLOW OR NON - CYLINDRICAL / HORIZONTAL VESSELS
- OPTIONAL TWO OR FOUR ALARM RELAYS W / T. D. & DIFFERENTIAL
- CONTINUOUS SELF DIAGNOSTICS
- COMMUNICATION OPTIONS INCLUDE ISOLATED 4-20 mA OUTPUT, SERIAL COMMUNICATIONS RS232 OR RS485, OR HART PROTOCOL
- PATENTED PFM TRANSMITTER PROVIDES DIGITAL TRANSMISSION UP TO 1 MILE WITH STANDARD TWISTED PAIR CABLE (NO COAX OR TRIAX NEEDED)
- NEMA 4X OR EXPLOSION PROOF ENCLOSURES OPTIONAL
- FIELDBUS UPGRADEABLE
- INTRINSICALLY SAFE PFM TRANSMITTER, UL/c-UL LISTED (STANDARD & LOW SPAN VERSIONS ONLY)

Robertshaw's patented Pulse Frequency Modulated (PFM) transmitter technology provides digital transmission up to 1 mile using economical standard twisted pair wire. This eliminates the cost of more expensive coaxial or triaxial cable and provides no-loss accuracy eliminating errors typically found with analog transmission. Built in field selectable input linearization allows open channel flow measurement and level control with volume conversions for non-cylindrical or horizontal cylindrical vessels. Setup is simple - just select from the menu. This eliminates programming at the factory, entering of time consuming strapping tables, and allows the user flexibility to use the same controller if his application changes.

Simple menu prompts guide you step-by-step through all Setup and Calibration. No technical knowledge is required. Entry can be by built-in keypad, standard HART Calibrator (with HART option) or Personal Computer (with communications option). If you don't use a HART calibrator at your installation, you don't need one. Everything can be done with direct keypad entry. Calibration can also be accomplished without completely emptying or filling the vessel. This feature is invaluable where tanks are emptied and filled only once or twice a year during shutdown. All Setup and Calibration entries can be password protected with a selection of three distinct levels of access. Calibration also offers selection of Engineering Units, type of variable(s) to be displayed, measurement of level and/or volume or flow, etc. Non-volatile memory insures setup and calibration data is retained if electrical power is lost. No battery backup is required.

Displays are abundant to keep you informed of setup parameters selected, calibration data, setpoint, process variable, alarm status, error codes, etc. In all there are two (2) five digits LED displays (one green and one red), typically used to display the measured variable and control setpoint; one 2 line by 20 character alpha-numeric vacuum fluorescent display (visible in any type of lighting) for menu prompts during setup/calibration and configurable as to the data displayed during normal operation; eight (8) LED controller status indicators and eight (8) LED alarm status indicators. These displays give you a wealth of information at a glance.

Optional features leave nothing to be desired. Relay options include two or four SPDT 10 amp relays with independent selectable differential and time delay on each. All relays are also field selectable High or Low Level Fail Safe to suit the customer's particular safety

requirements. Power supply requirement is 120/240 VAC that is switch selectable in the field. Output options include isolated 4-20 mA, 4-20 mA/HART Protocol and Serial Communication RS-232 or RS485. Adjustable response time to handle agitated or wavy processes is standard. The HART option is fully HART compatible - all levels. No need to buy additional software to get full HART compatibility. These communication capabilities allow easy remote configuration, or reconfiguration when required, and documentation that may be necessary for a company's ISO 9000 certification process. **THE EXCALIBUR IS FIELDBUS UPGRADABLE. All options can easily be added in the field by simple plug in modules.**

Continuous Self-Diagnostics and remote Test/Verify push-button insure you of constant reliability and safety. Error codes appear on the vacuum Fluorescent Display when failures occur. This self-monitoring feature increases instrument stability and accuracy, eliminating the need for ongoing manual calibration checking, reducing downtime, and improving system performance and quality control. It permits early detection and identification of sensing problems before they lead to a major breakdown. The test feature allows conformance to local and federal environmental regulations.

A variety of sensing probes are available to suit any application; high temperature/pressure, sanitary, flanged, inactive lengths, grounded for non-metal vessels, rigid, flexible, bare or insulated. Lengths are available up to 100 feet.

In summary, the EXCALIBUR 7000 packs more features and benefits into one package than you will find anywhere. It provides local or remote calibration capability, greater measurement accuracy/stability, lower startup costs, reduced maintenance costs, quality control, and lower design costs. It provides flexibility of configuration or reconfiguration. Features and options can easily be added in the field by simple plug in modules. It provides self-monitoring/self diagnostic capability. This transmitter/controller will suit ALL your level Applications... save time, money, and reduce your parts inventory. **Applications are unlimited!!!** These include level and/or interface control in all storage or process vessels containing liquids, granulars or slurries. This includes the chemical/petrochemical, petroleum refining, water/wastewater, food and beverage, electric power, pulp and paper, pharmaceutical, mining and primary metals industries.

Specifications

Electrical/Electronic:

Supply Voltage..... 120/240 VAC \pm 10%,
50/60 Hz switch selectable.

Supply Power 20VA. Max.

Measurement Range:

With Standard PFM Transmitter (1 range):

10 to 6000 pF

With Low Span PFM Transmitter (1 range):

2 to 335 pF

With Anti-Coating PFM Transmitter (5 ranges):

2 to 200 pF

5 to 500 pF

8 to 1000 pF

12 to 2000 pF

30 to 6000 pF

Resolution \pm 0.002% of Span

Accuracy..... \pm 0.5% Typical

Repeatability \pm 0.1pF

Ambient Temperature Effect \pm 0.005pF/Deg. F
 \pm 0.01pF/Deg.C

Alarm Setpoint 0 to 100.00%, 0.01% Resolution

Alarm Differential..... 0 to 100.00%, 0.01% Resolution

Alarm Time Delays 0 to 60 seconds
0.001 second resolution

Relay Output Optional
Type-Electromechanical contacts
SPDT, 8A @ 30 VDC, 10A @
250 VAC GP, 5A @ 120 VAC
IND, 1/3 HP @ 120 VAC

Analog Output Optional
4-20 mADC into a 650 ohm load
max.

**Maximum Distance Between
Transmitter and Controller** One (1) mile

Interconnecting Cable Between

Transmitter and Controller Two (2) wire, twisted pair
recommended. Similar to Belden #8205 (unshielded), or #8762
(shielded)

Environmental:

Temperature (Operating or Storage):
-40 to +140°F (-40 to +60°C)

Relative Humidity 0 to 95%, Non-Condensing

Vibration \pm 2 G, 10 to 200Hz

Shock..... 75G's for 11msec. without permanent damage

Enclosure:

PFM Transmitter

Raintight, NEMA 4

Optional – Raintight, NEMA 4X, epoxy painted

Controller

Non-metallic – UL Listed Type 4X and

CSA Certified Type 4X

Explosion-Proof – UL Listed and CSA Certified

Class I, Division 1, Groups B, C & D: Class

II, Division 1, Groups E, F & G, and NEMA

3, 4

Weights:

Standard PFM Transmitter 2.8 lbs (1.27 kg)

Low Span PFM Transmitter 2.8 lbs (1.27 kg)

Anti-coating PFM Transmitter 3.3 lbs (1.50 kg)

Non-metallic Controller 11.4 lbs (5.17 kg)

Explosion proof Controller (Later)

Intrinsic Safety:

Standard & Low Span PFM Transmitters and Probe are certified as intrinsically safe for Class I, Division 1, Groups A, B, C & D; Class II, Division 1, Groups E, F & G and Class I, Zone 0, Group IIC when connected as shown on drawing #907GA811 (barrier required).

Agency Certifications:

Standard PFM Transmitter UL & c-UL Listed

Low Span PFM Transmitter UL & c-UL Listed

Anti-Coating PFM Transmitter None

Controller None

EMC Emissions & Immunity Conformity:

Standard PFM Transmitter CE & FCC

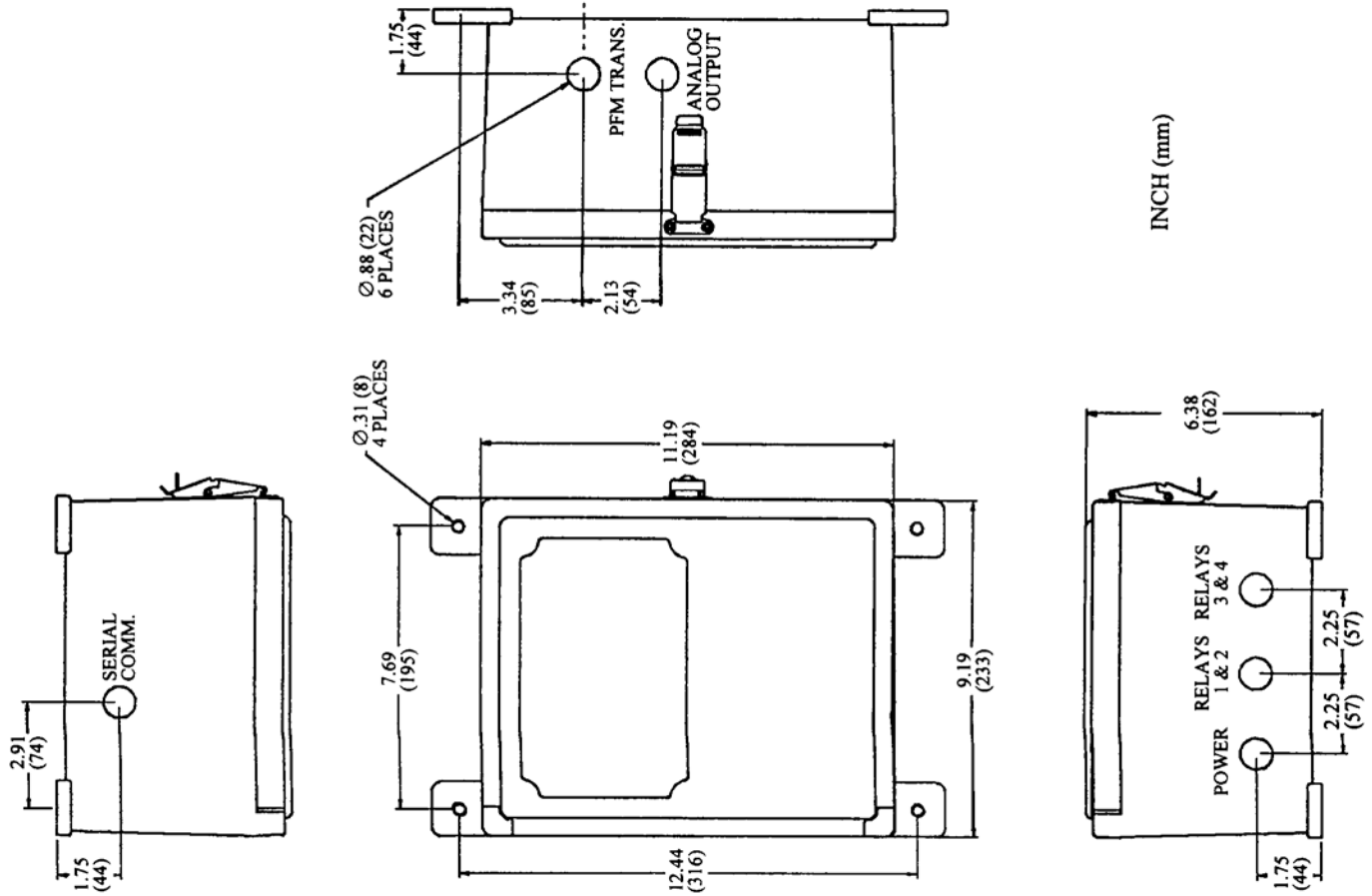
Span PFM Transmitter CE & FCC

Anti-Coating PFM Transmitter CE

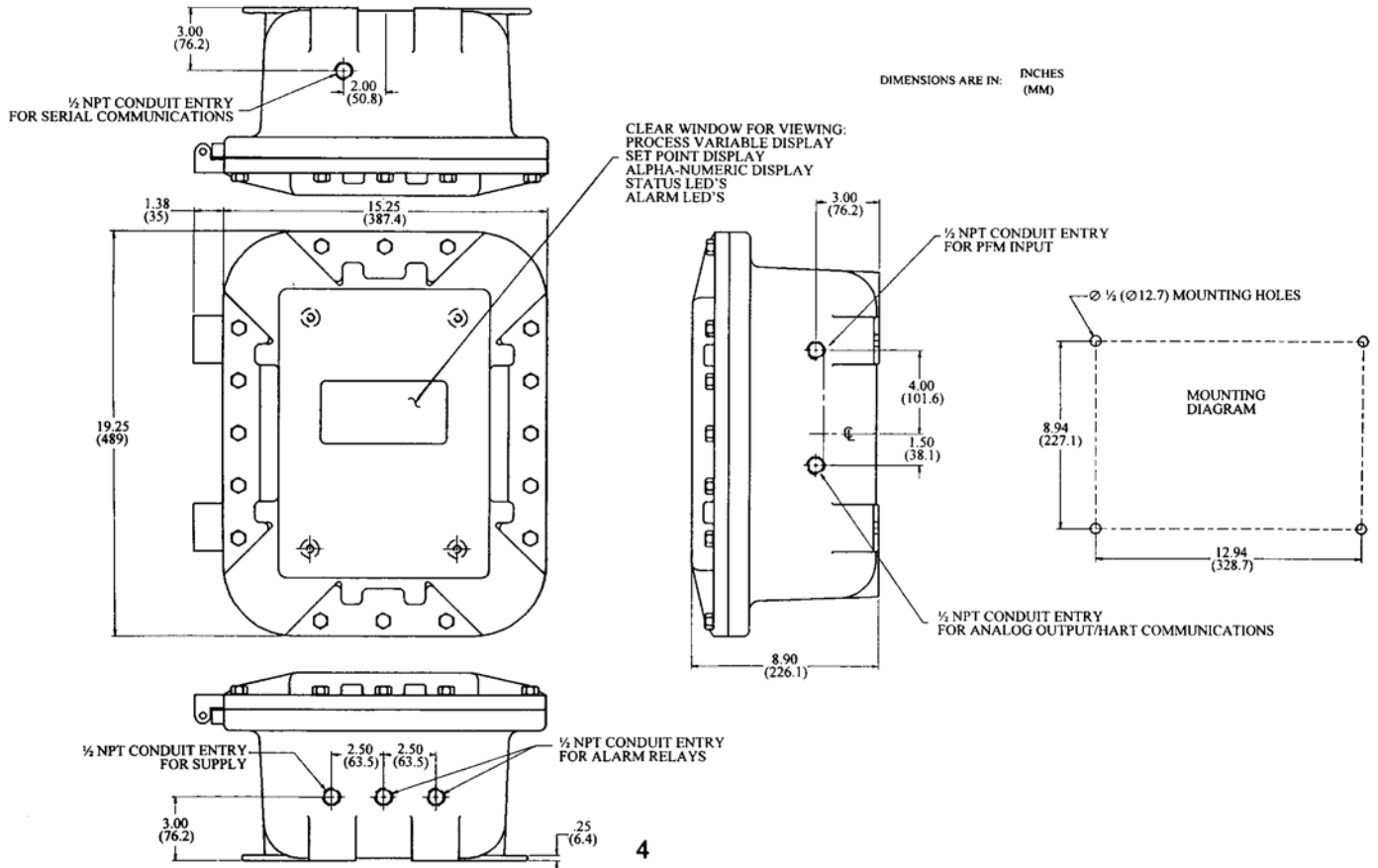
Controller None

Outline Dimensions:

NEMA 4X Non-Metallic Enclosure:

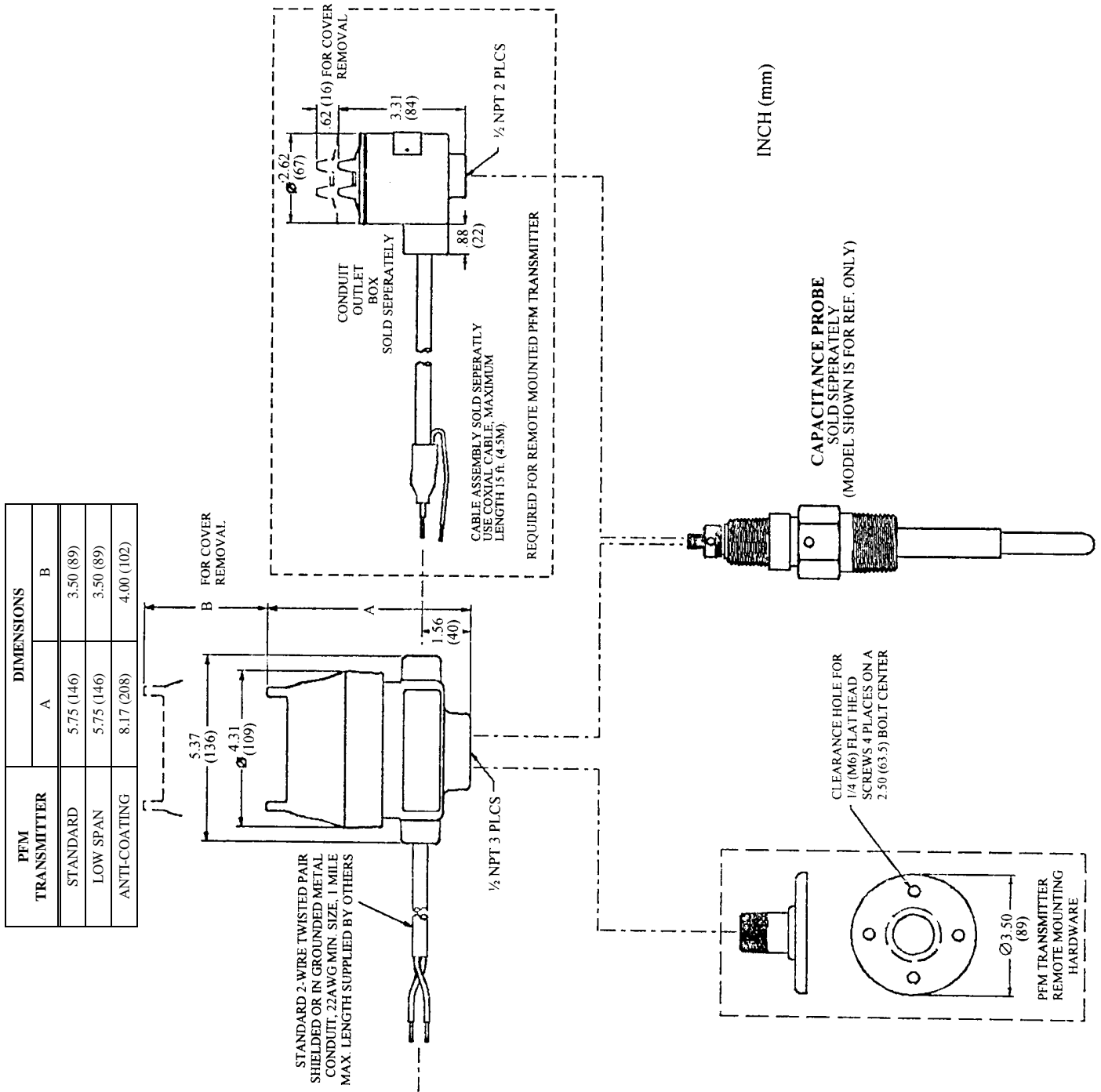


Explosion Proof Enclosure with Window:



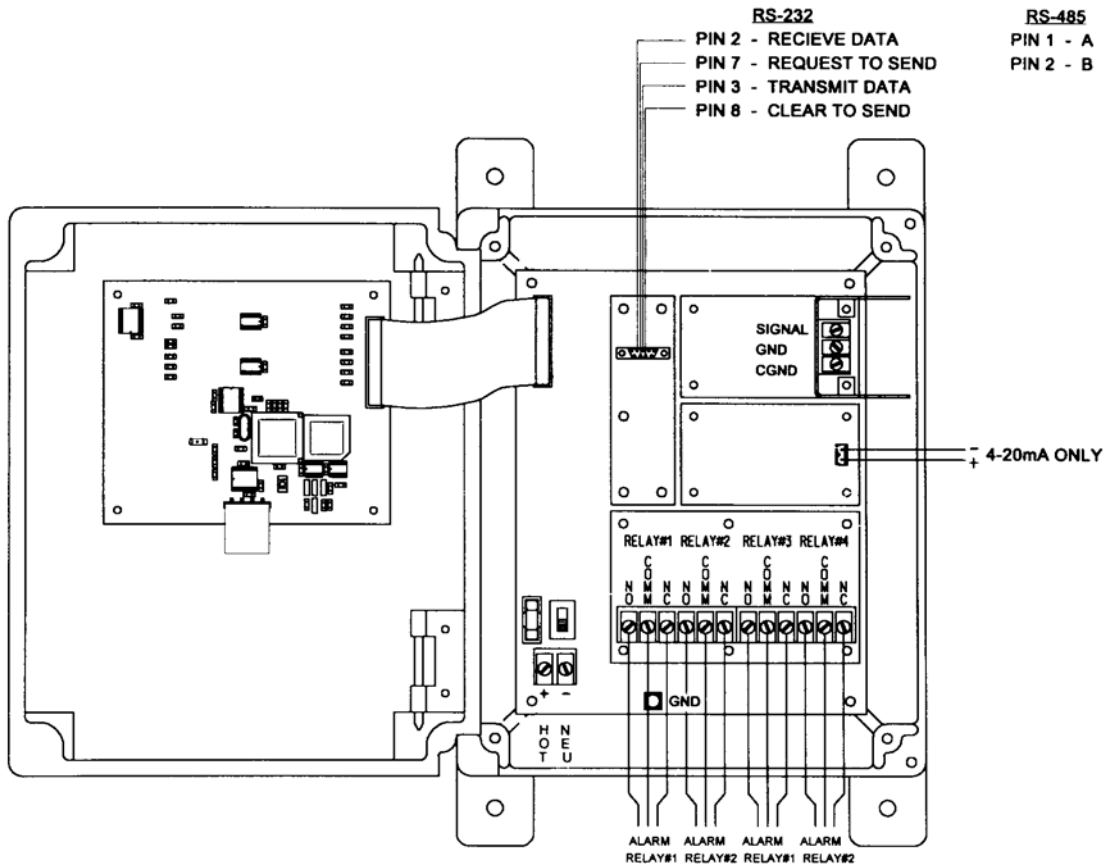
Outline Dimensions:

PFM Transmitter:

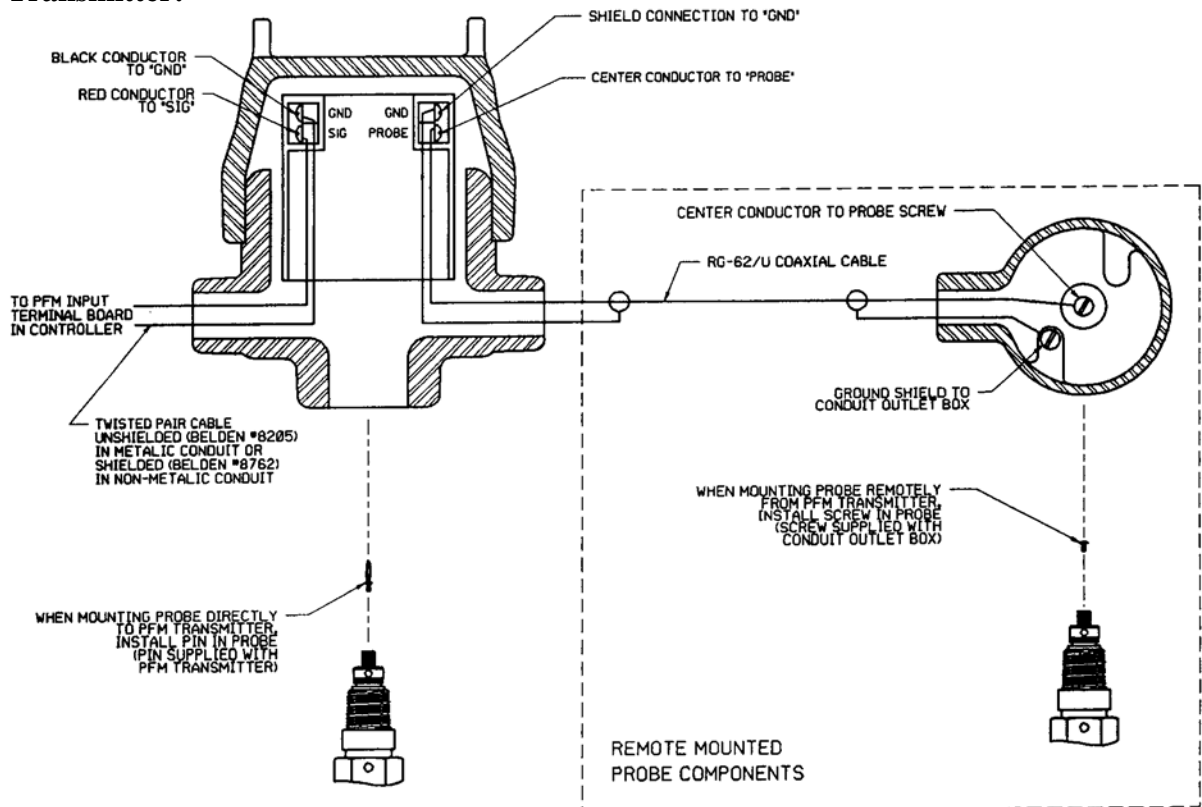


Electrical Connections:

Controller:



PFM Transmitter:



ORDERING INFORMATION

Base Model Number

Model No.	Description
7000	Excalibur 7000, Microprocessor-based level control system. Consisting of a wall mounted controller and a field mounted PFM Transmitter.

Table 1 - Controller Enclosure

Desig.	Description
A	NEMA-4/4X, Non-metallic
C	Explosion-Proof w/o window, NEMA 4 (extended delivery)
D	Explosion-Proof w/window, NEMA 4 (extended delivery)

Table 2 - Supply Power

Desig.	Description
2	120/240 VAC \pm 10%, 50/60 HZ

Table 3 - Alarm Relays

Desig.	Description
A	None
B*	Two (2) SPDT, 10 AMP, Relays
C*	Four (4) SPDT, 10 AMP, Relays

* Only one relay option can be installed in a given unit.

Table 4 - Analog Output

Desig.	Description
1	None
2	Isolated 4-20 mADC
3	Isolated 4-20 mADC W/PID Control
4	Isolated 4-20 mADC W/Hart Communications
5	Isolated 4-20 mADC W/Hart & PID Control

Table 5 - Serial Communications

Desig.	Description
A	None
B*	RS-485 Modbus
C*	RS-232 Modbus

* Not available if designation 4 or 5 is selected in table 4.

Table 6 - PFM Transmitter

Desig.	Description
1	Standard, Probe Mounted, NEMA 4
2	Standard, Probe Mounted, NEMA 4X
3*	Standard, Remote Mounted, NEMA 4
4*	Standard, Remote Mounted, NEMA 4X
5	None, Controller Only
1L	Low Span, Probe Mounted, NEMA 4
2L	Low Span, Probe Mounted, NEMA 4X
3L*	Low Span, Remote Mounted, NEMA 4
4L*	Low Span, Remote Mounted, NEMA 4X
6	Anti-Coating, Probe Mounted, NEMA 4
7	Anti-Coating, Probe Mounted, NEMA 4X
8*	Anti-Coating, Remote Mounted, NEMA 4
9*	Anti-Coating, Remote Mounted, NEMA 4X

* Maximum distance between transmitter and probe is 15 feet. Includes nipple plug and floor flange.

NOTE:

Remote mounted PFM Transmitter requires 032KC Series coaxial cable with conduit outlet box. Order separately. See Table 7 for available cables.

Table 7 – Accessories

Part Number	Description
032KC700-XX*	Coax cable with NEMA 4 conduit outlet box
032KC710-XX*	Coax cable with general purpose conduit and NEMA 4 conduit outlet box
032KC720-05	Coax cable, 5 ft. long, with explosion proof conduit and NEMA 4 conduit outlet box**
032KC720-08	Coax cable, 8 ft. long, with explosion proof conduit and NEMA 4 conduit outlet box**
032KC720-10	Coax cable, 10 ft. long, with explosion proof conduit and NEMA 4 conduit outlet box**
032KC800-XX*	Coax cable with NEMA 4X epoxy painted conduit outlet box
032KC810-XX*	Coax cable with general purpose conduit and NEMA 4X epoxy painted conduit outlet box
032KC820-05	Coax cable, 5 ft. long, with explosion proof conduit and NEMA 4X epoxy painted conduit outlet box**
032KC820-08	Coax cable, 8 ft. long, with explosion proof conduit and NEMA 4X epoxy painted conduit outlet box**
032KC820-10	Coax cable, 10 ft. long, with explosion proof conduit and NEMA 4X epoxy painted conduit outlet box**
032KC900-XX*	Coax cable with NEMA 4X stainless steel conduit outlet box
032KC910-XX*	Coax cable with general purpose conduit and NEMA 4X stainless steel conduit outlet box
032KC920-05	Coax cable, 5 ft. long, with explosion proof conduit and NEMA 4X stainless steel conduit outlet box**
032KC920-08	Coax cable, 8 ft. long, with explosion proof conduit and NEMA 4X stainless steel conduit outlet box**
032KC920-10	Coax cable, 10 ft. long, with explosion proof conduit and NEMA 4X stainless steel conduit outlet box**

* Substitute the desired cable length, in feet, for "XX" to complete the Cable Assembly Part Number.
 Maximum Allowable Coax Cable Length is 15 feet.
 Coax cable is Teflon insulated, maximum temperature 350°F,
 with terminations for attachment to probe and PFM Transmitter.

** Conduit outlet boxes are explosion proof.



U.S.A. & Canada

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