

GENERAL INSTRUCTIONS

- Cox Instrument designs, manufactures, and tests its products to meet many national and international standards. However, for these products to operate within their normal specifications, you must properly install, use and maintain these products. The following must be adhered to and integrated with your safety program when installing, using, and maintaining Cox Instrument products.
- Read and save all instructions prior to installing, operating, and servicing the product.
- If you do not understand any of the instructions, contact your Cox Instrument representative for clarification.
- Follow all warnings, cautions, and instructions marked on and supplied with the product.
- Inform and educate your personnel in the proper installation, operation, and maintenance of the product.
- Install your equipment as specified in Cox Instrument site planning/installation instructions and per applicable local/national codes. Connect all products to the proper electrical and/or pressure sources.
- Handle, move, and install each product using the appropriate number of personnel and moving devices/equipment (dolly, forklift, crane, etc.). Failure to do so could cause serious personal injury.
- To ensure proper performance, use qualified personnel to install, operate, update, program, and maintain the product.
- When replacement parts are required, ensure that the qualified service technician uses replacement parts specified by Cox Instrument.
- **WARNING! This equipment may contain static sensitive devices. Failure to comply with the proper handling procedures may result in damage to the equipment. Unauthorized substitutions may result in fire, electrical shock, other hazards, or improper equipment operation.**
- Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified personnel, to prevent electrical shock and personal injury.

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PA111 Field Mounted Pre-amplifier

1. INTRODUCTION

This field mounted pre-amplifier is an amplifying device for use in intrinsically safe applications. It converts the low level pulses from a turbine meter reluctance pickup coil to high level pulses that may be transmitted over long wires to a receiving device. The PA111 uses a 3 wire system. Two wires are used for power and the output pulses are on the third wire.

2. INSTALLATION

2.1 Mounting

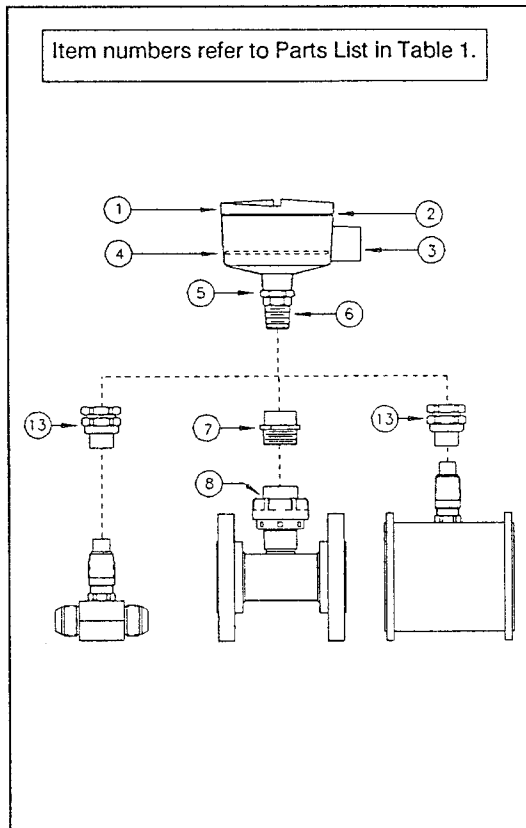


Figure 1. Mounting on Turbine Meter.

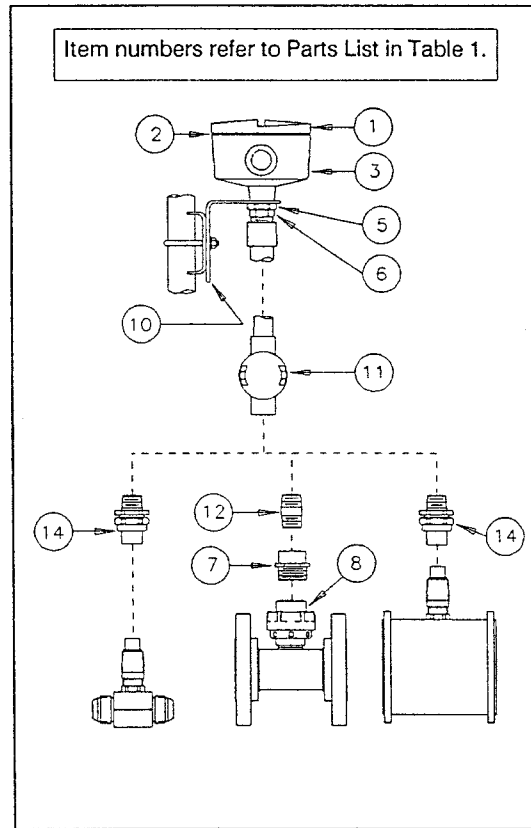


Figure 2. Surface or Pipe Mounting.

2.2 Wiring

CAUTION: Protective Grounding Terminal.

A green-colored hexagonal head screw is provided which must be connected to earth ground prior to making any other connections to the equipment. This grounding screw is located inside the amplifier housing and under the printed circuit board. To access the protective grounding screw, first remove the amplifier housing cover, item 1. Second, remove the two screws which hold the printed circuit board, item 4, to the housing. The printed circuit board, item 4, may now be removed from the housing. Reassemble in the reverse order using caution to insure that the O-Ring seal, item 2, is properly seated in the groove in the housing.

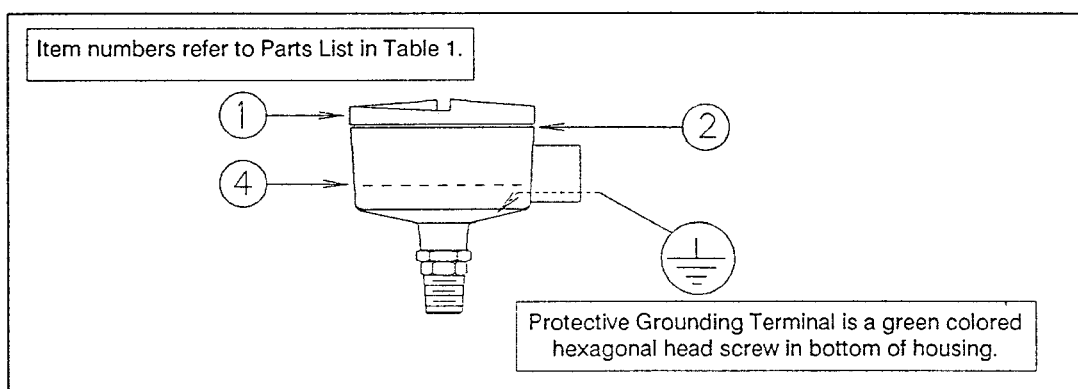


Figure 3. Protective Grounding Terminal

When the PA111 is installed in intrinsically safe applications, it must be installed in accordance with the Installation Control Drawing, 12003LJ. This Control Drawing is found at the end of this manual.

The PA111 uses a three wire system. These three wires are the power and signal interconnection between the amplifier and receiver. There are a total of five wires which are connected to the amplifier, two from the turbine meter pickup coil and three from the receiver. Wiring connections to the amplifier are made to a terminal block, no lugs are required. Access to the terminal block is by removing the threaded round cover, item 1. See Figure 4 and Figure 8.

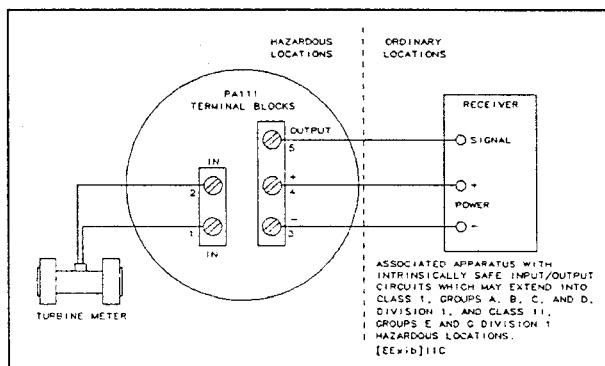


Figure 4. Wiring, turbine meter mounting.

PA111 Installation and Maintenance Manual

A remote mounted amplifier which is within three feet of the turbine meter may be wired directly to the turbine meter using the wires provided with the meter. A remote mounted amplifier which is greater than three feet from the meter is connected using 18 AWG shielded cable. The maximum length of cable between the turbine flowmeter and the PA111 is 200 feet. This type of installation will also require a junction box, item 11. See Figure 5.

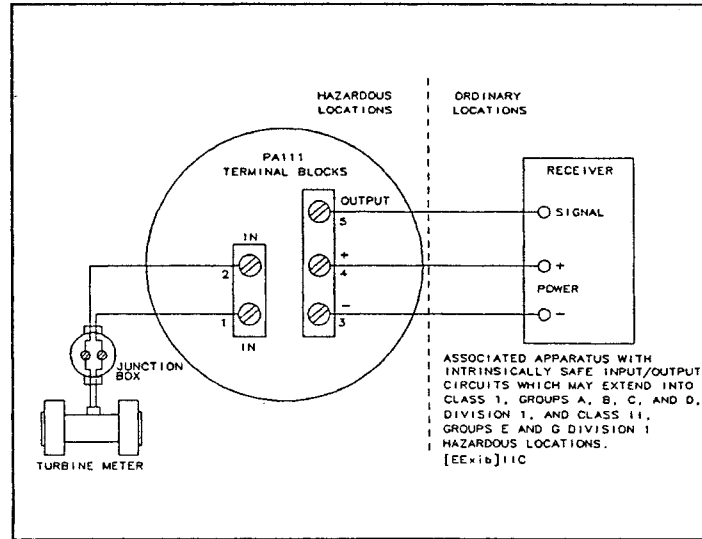


Figure 5. Wiring, remote mounting.

4. PARTS LIST

Item	Description	Part Number
1	Cover	A2056WB
2	O-ring	A2054UZ
3	Housing	A2056WF
4	Printed Wiring Assembly	A2057AY
5	Nut 0.75 - 16	B0116TW
6	Coupling	N0143SE
7	Adaptor, female	A2054FF
8	Union, female, 1.25 inch NPT	A2055TQ
9	Connector	A2020FZ
10	Mounting kit, DN50 / 2 inch pipe	A2021BZ
11	Junction Box	A2055TR
12	Nipple	A2054GJ
13	Union, female	A2053WR
14	Union, male-female	A2053WJ

Table 1. Parts List

5. DEINSTALLATION PROCEDURE

1. Remove cover from top works.
2. Disconnect five wires from the internal terminal block. Hold the top works from rotating as the union, on turbine meter mounted units, or the lock nut, on remote mounted units, is unthreaded. Remove the top works.

CAUTION: Do not attempt to rotate the pre-amplifier housing with respect to the turbine meter before disconnecting the wiring. Doing so will twist the wires and may cause damage.

6. OPERATIONAL CHECK

1. Connect the PA111 and the test equipment as shown in Figure 6. Set the power supply to +20 Vdc.
2. Set the oscillator amplitude to 120 mV.
3. Set the oscillator frequency to 1 kHz.
4. The PA111 output signal as measured on the oscilloscope should be a 1 kHz square wave with an amplitude of approximately 10 Vp-p.
5. After successful completion of this test, if the PA111 fails to operate properly when connected to the turbine meter, the pickup coil in the turbine meter should be tested per the Master Instruction for the turbine meter.

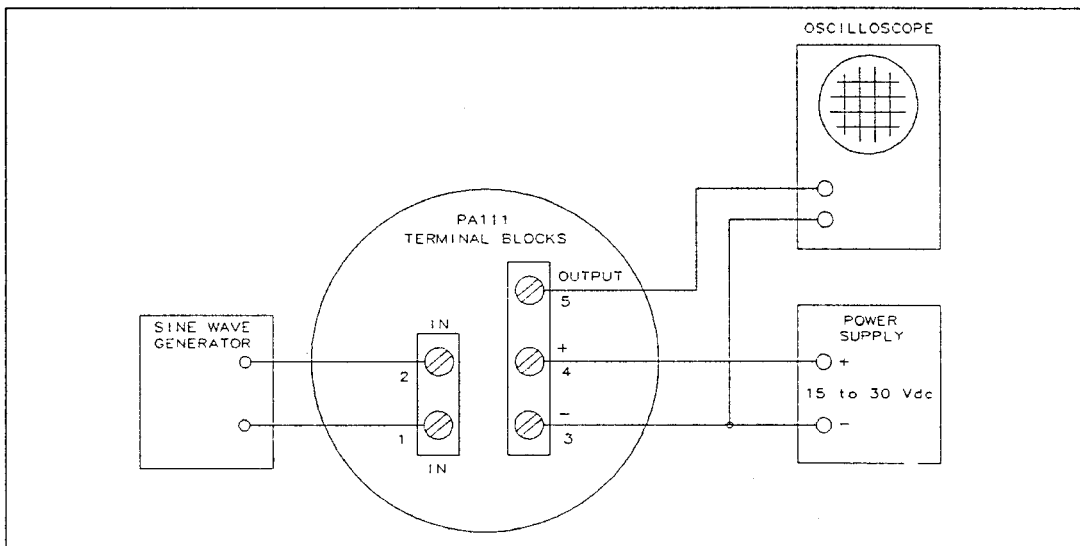


Figure 6. PA111 Test Setup

7. CALIBRATION

The PA111 has no controls or adjustments.

8. THEORY OF OPERATION

Figure 7 is the block diagram of the PA111 amplifier.

8.1 Power supply.

The input amplifier, switch driver and output buffer circuits are provided with dc power from a current limited voltage regulator. A diode in series with the power connection provides reverse polarity protection.

8.2 Input amplifier.

The input amplifier receives the input signal from the pickup coil of the turbine meter. With an increasing flow rate through the turbine meter, the signal from the pickup coil increases in frequency and amplitude. Feedback circuits around the input amplifier cause the gain of this stage to decrease with frequency at the same rate that the signal amplitude from the pickup coil increases with frequency. This configuration minimizes the possibility of noise pickup causing false triggering of the following circuit.

8.3 Schmitt Trigger and Output Buffer

The output buffer receives the signal from the input amplifier. Positive feedback around this stage generates the Schmitt trigger action. When the amplitude of the signal received by the output buffer exceeds the hysteresis window, the signal at the buffer output changes state. The output signal, therefore, is a square wave with a frequency equal to the frequency of the input signal from

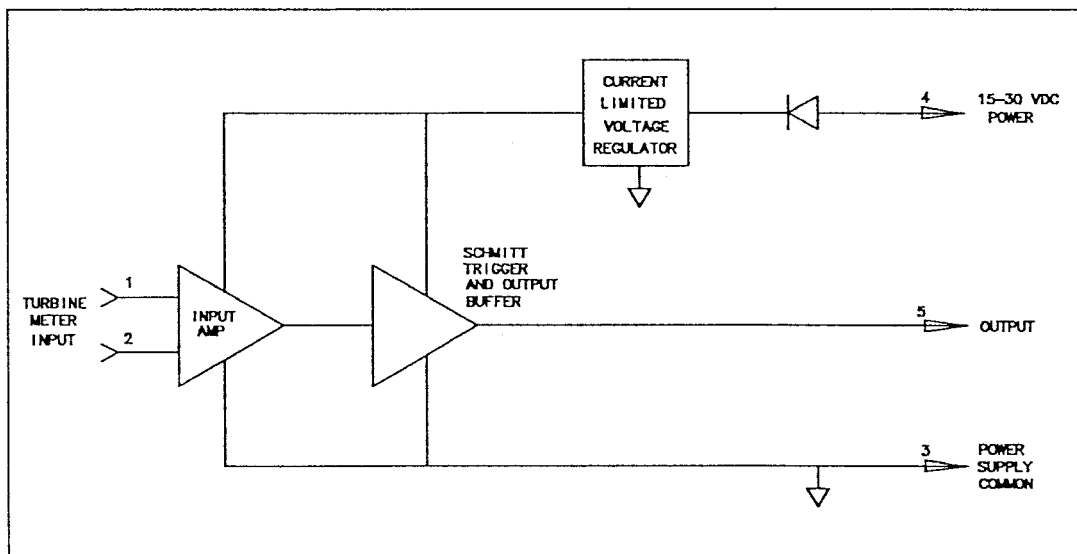


Figure 7. PA111 Block Diagram

the pickup coil. The output buffer is protected from damage due to external short circuits by the current limiting function of the voltage regulator.

8.4 Transient protection.

The amplifier inputs, voltage regulator power input and buffer output are protected from damage due to application of over voltages. This protection is provided by diode clamps.

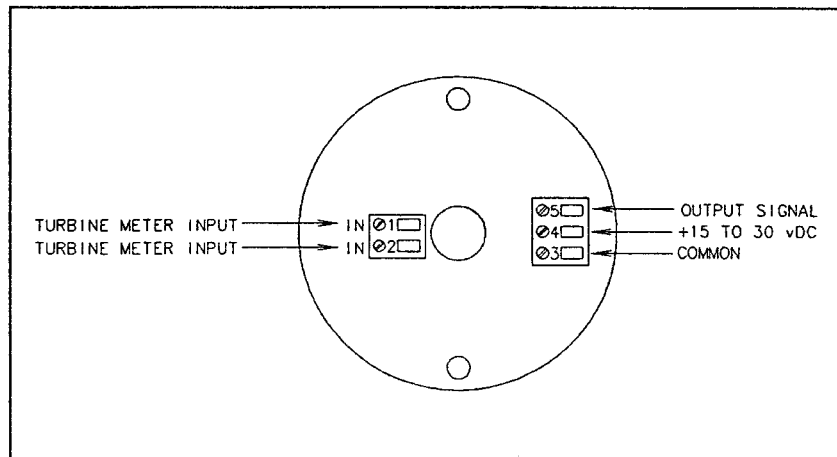
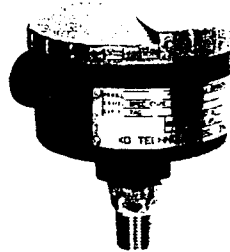


Figure 8. PA111 Connections on printed wiring board

PA111 Specification Sheet



PA111 Pre-Amplifier

Model Code

PA111 = Pre-Amplifier (Specify mounted or not mounted on Turbine Flowmeter.)

Input Signal: from pickup coil of turbine flowmeter. 20 mV to 10 V, 10 to 2000 pps

Output Signal: 10 V p-p pulses, three wire system.

Input-output relationship: The output pulse frequency is the same as the input frequency from the turbine meter.

Operating Temperature: -40 to +85 C (-40 to +185 F)

Supply Voltage: 15 - 30 Vdc

Supply Current: 4.5 mA

Housing: NEMA 4 cast aluminum housing.

Mass: 1 kg (2.2 lbs) approx.

Safety Specifications:

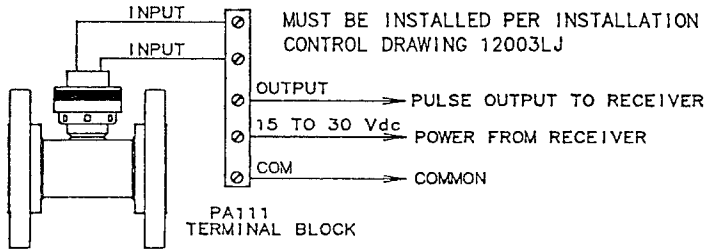
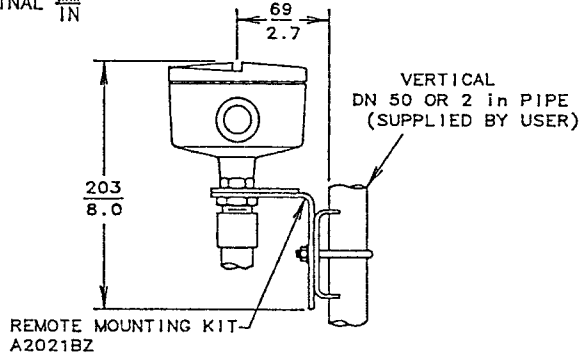
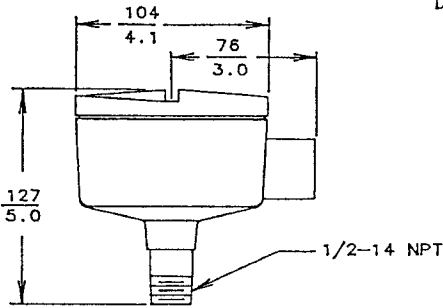
Testing Laboratory, Types of Protection, and Area Classification.	Conditions of Certification	Electrical Classification Code
Designed to be Intrinsically Safe for Class I, Division 1, Groups A, B, C and D; Class II, Groups E and G, Division 1. NEMA Type 4.		CS-E/FB-D
Designed to be Intrinsically Safe for EExibIIC Hazardous Locations.		CS-E/KB-D

Dimensional Print

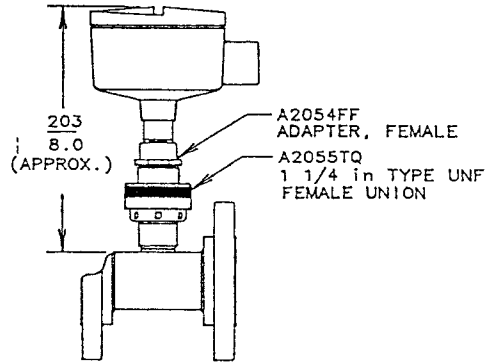
DP
 XO-114DP
 MARCH 15, 1993
 SHEET 1 of 1

PA111 FIELD MOUNTED PREAMPLIFIER (3-WIRE SYSTEM)

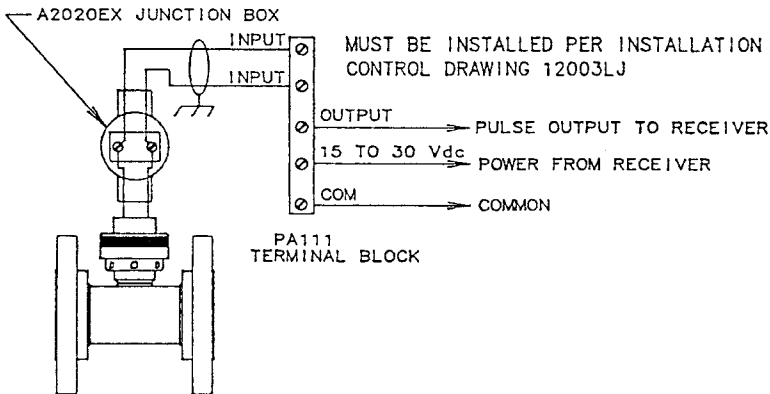
DIMENSIONS-NOMINAL $\frac{mm}{IN}$



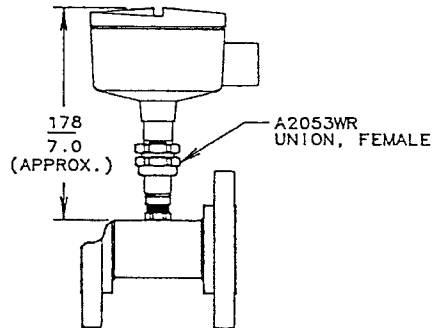
WIRING, PREAMPLIFIER MOUNTED ON TURBINE FLOWMETER.



TURBINE FLOWMETER WITH COIL BOSS



WIRING, PREAMPLIFIER REMOTE MOUNTED.



TURBINE FLOWMETER WITHOUT COIL BOSS

CUSTOMER _____ I. R. _____
 CUSTOMER ORDER _____ ORDER _____
 ITEM-TAG _____

CERTIFIED BY _____ DATE _____

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