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# PA112 Field Mounted Pre-amplifier

## 1. INTRODUCTION

This field mounted pre-amplifier is an amplifying device for use in remote and/or hazardous areas.

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 PA112 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

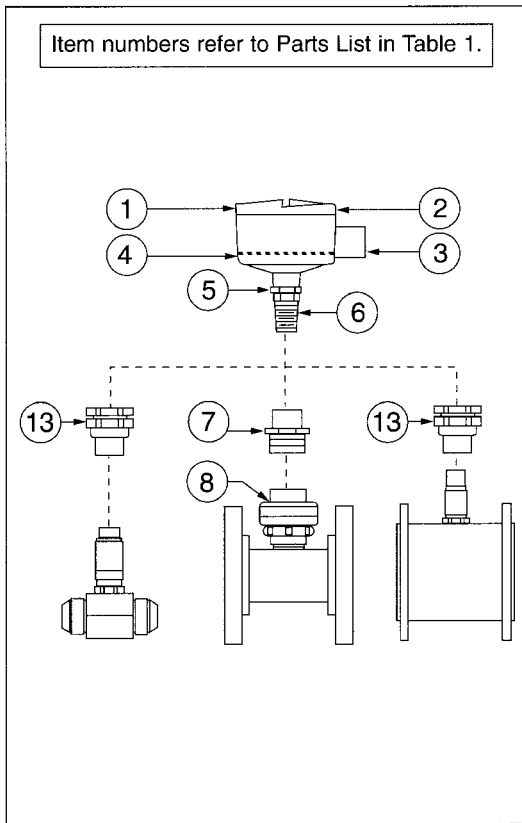


Figure 1. Mounting on Turbine Meter

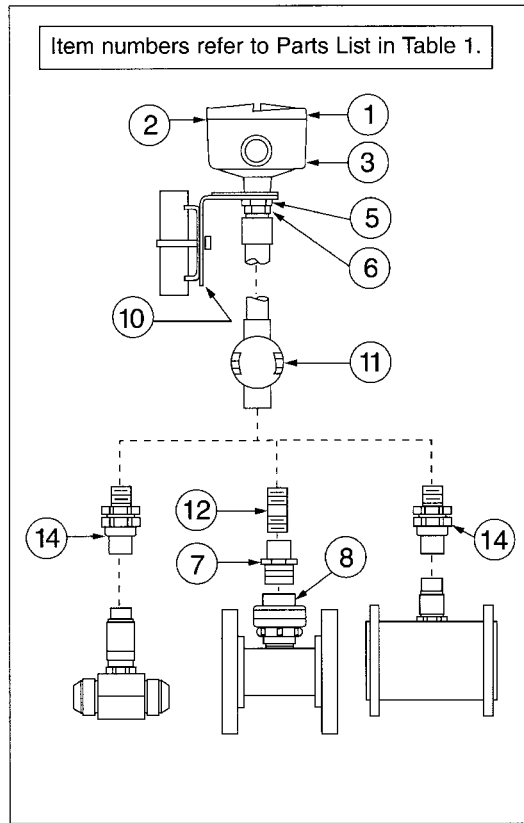


Figure 2. Surface or Pipe Mounting

## 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 cover.

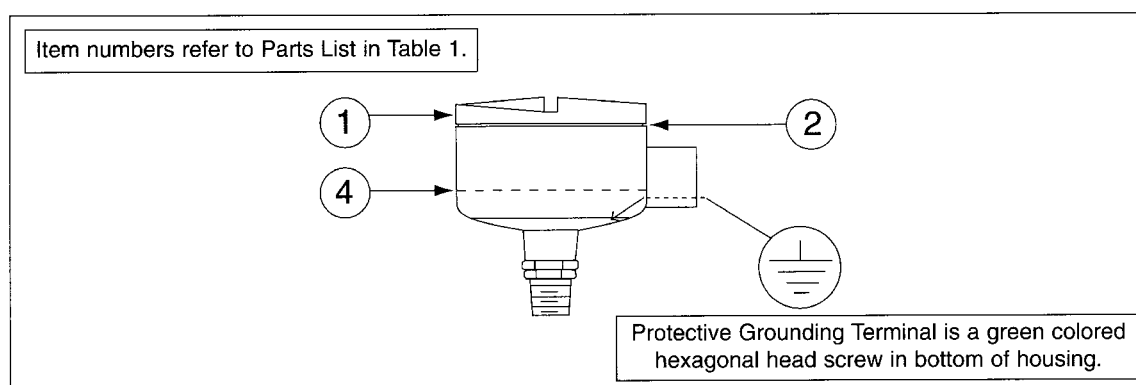


Figure 3. Protective Grounding Terminal

The PA112 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 pick-up 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.

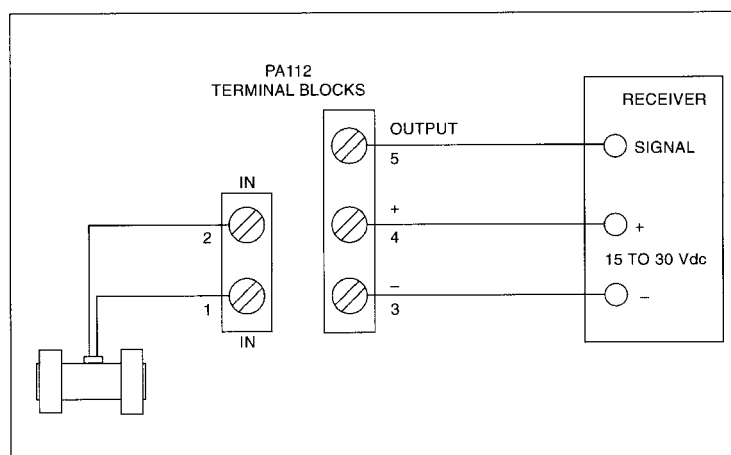


Figure 4. Wiring, turbine meter mounting

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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 PA112 is 200 feet. This type of installation will also require a junction box, item 11. See Figure 5.

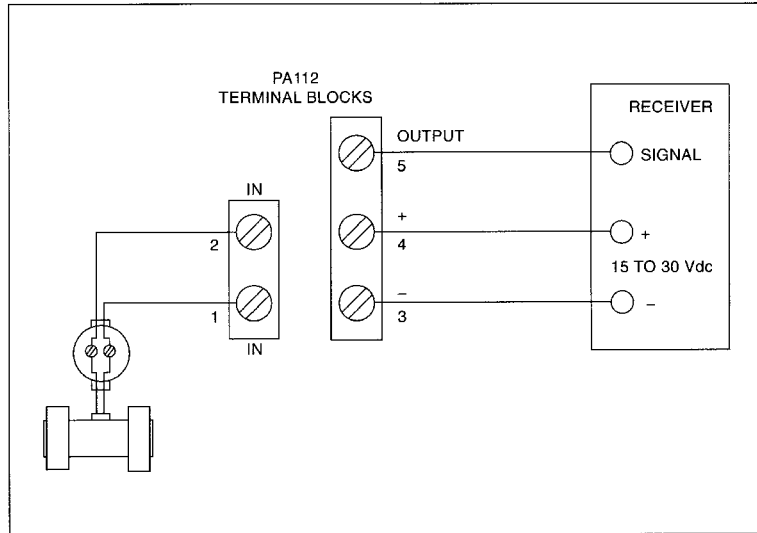


Figure 5. Wiring, remote mounting

### 3. PARTS LIST

Item	Description	Part Number
1	Cover, color violet	A2054BVA
	Cover, color blue	A2054VB
2	O-ring	A2054UZ
3	Housing, color violet	A2055CB
	Housing, color blue	A2055CC
4	Printed Wiring Assembly	A2052TH
5	Nut 0.75 - 16	B0116TW
6	Coupling	N0143SE
7	Adaptor, female	A2054FF
8	Union, female, 1.25 inch NPT	A2055TQ
9	Connector	A2020 FZ
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

#### 4. DEINSTALLATION PROCEDURE

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

**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.**

#### 5. OPERATIONAL CHECK

1. Connect the PA112 and the test equipment as shown in Figure 6. Set the power supply to +20 Vdc.
2. Set the oscillator amplitude to 120mV. The oscillator output must be floating with respect to ground. The use of a battery operated oscillator is recommended.
3. Set the oscillator frequency to 1 kHz.
4. The PA112 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 PA112 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.

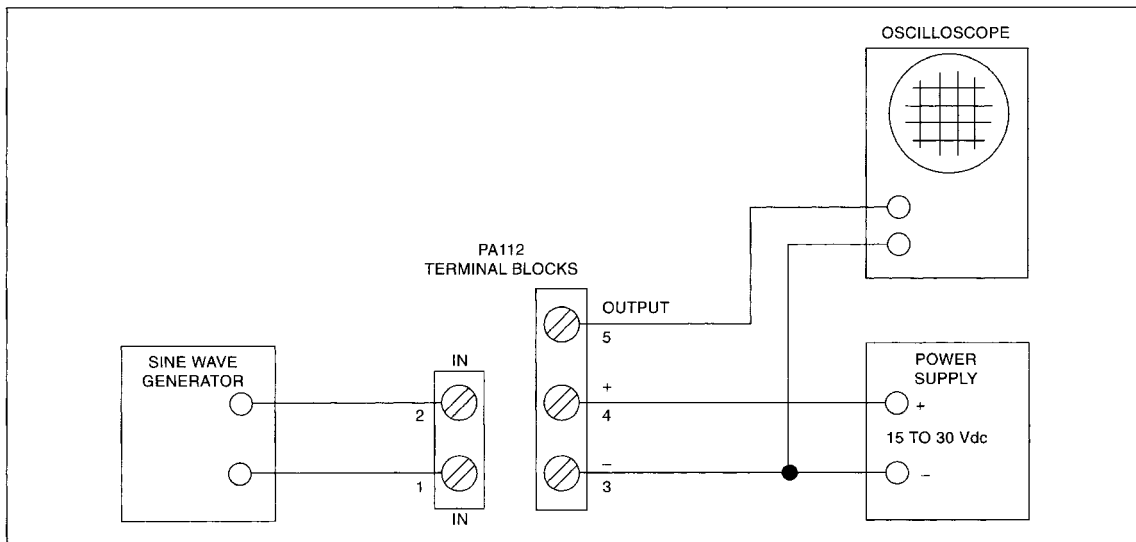


Figure 6. PA112 Test Setup

## 6. CALIBRATION

The PA112 has no controls or adjustments.

## 7. THEORY OF OPERATION

Figure 7 is the block diagram of the PA112 amplifier.

### 7.1 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.

### 7.2 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.

### 7.3 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

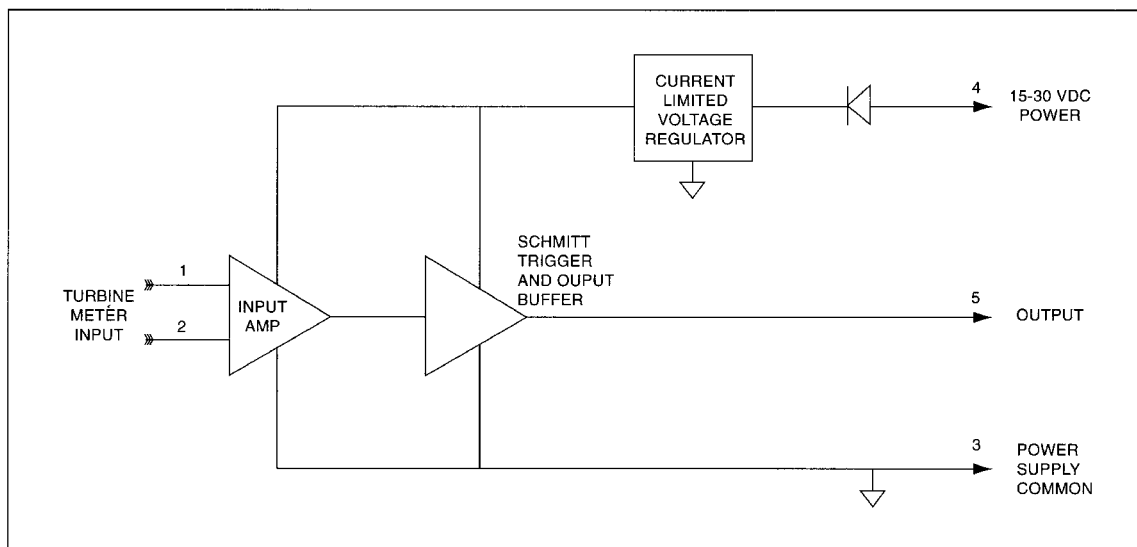


Figure 7. PA112 Block Diagram

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square wave with a frequency equal to the frequency of the input signal from the pickup coil. The output buffer is protected from damage due to external short circuits by the current limiting function of the voltage regulator.

### 7.4 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.

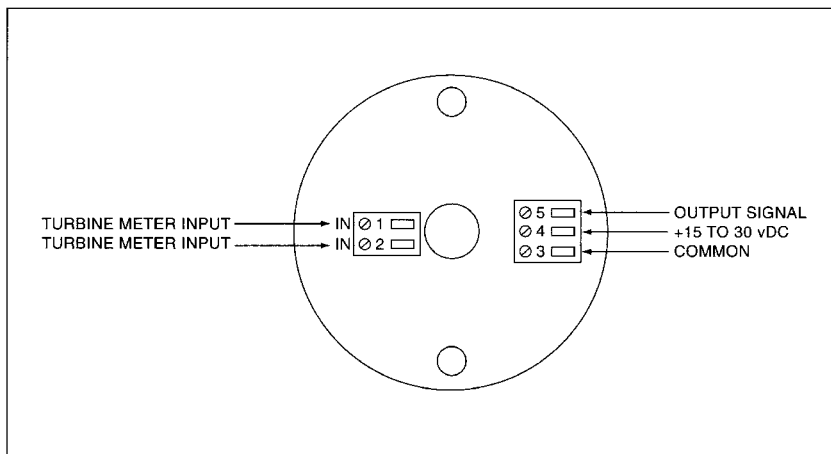
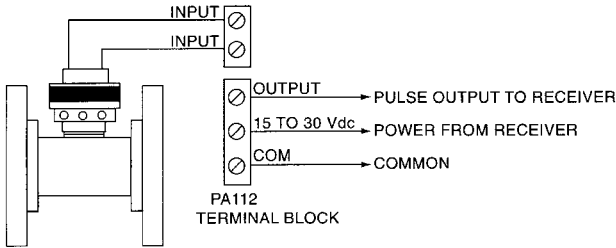
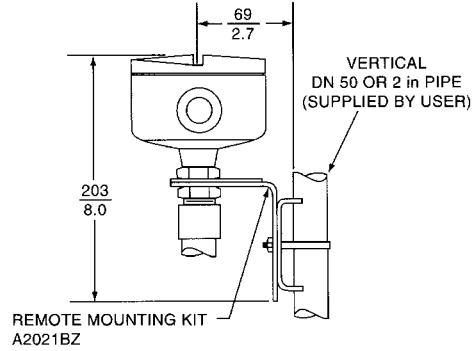
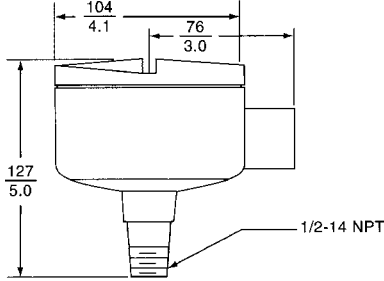


Figure 8. PA112 Connections on printed wiring board

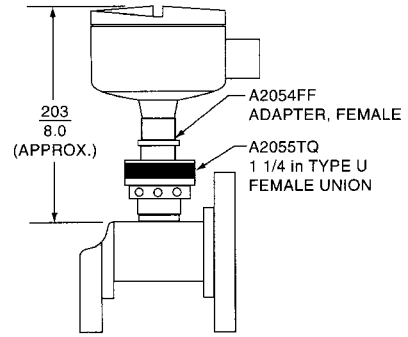
# 8. DIMENSIONAL PRINT

## PA 112 FIELD MOUNTED PRE-AMPLIFIER (3-WIRE SYSTEM)

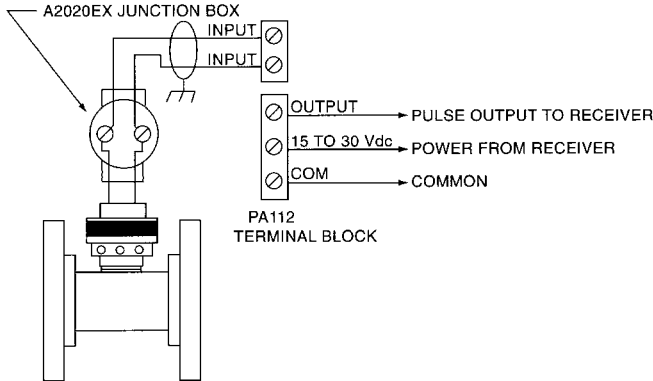
DIMENSIONS-NOMINAL  $\frac{mm}{IN}$



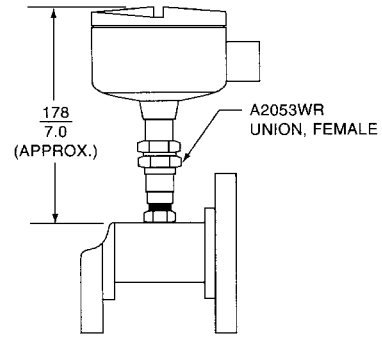
WIRING, PREAMPLIFIER MOUNTED ON TURBINE FLOWMETER.



TURBINE FLOWMETER WITH COIL BOSS



WIRING, PREAMPLIFIER REMOTE MOUNTED.



TURBINE FLOWMETER WITHOUT COIL BOSS

(NOT FOR CONSTRUCTION UNLESS CERTIFIED)

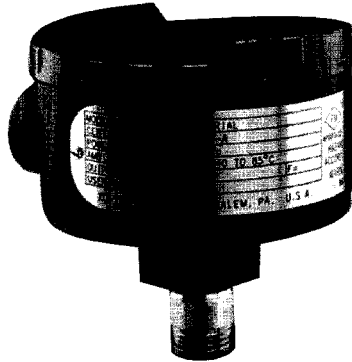
CUSTOMER \_\_\_\_\_ I.R. \_\_\_\_\_

CUSTOMER ORDER \_\_\_\_\_ ORDER \_\_\_\_\_

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## 9. PA112 SPECIFICATION SHEET



PA112 Pre-Amplifier

**Model Code**

PA112 = 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
Factory Mutual Research Approved for Hazardous Locations. Explosionproof for Class I, Division 1, Groups B, C and D. Dust-ignitionproof for Class II, Division 1, Groups E, F and G. Non-incendive resistive for Class I, Division 2, Groups A, B, C and D. NEMA Type 4.	None	CS-E/FD-A