COX INSTRUMENTS
FLOW MEASUREMENT
Proven Performance for Over 50 Years

TURBINE METER PREAMPLIFIER

INSTALLATION AND MAINTENANCE MANUAL

MODEL NO. PA-115

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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.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

PA 115 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 PA115 uses a 2-wire system with the output pulses and the power on the same pair of wires.

2. INSTALLATION

2.1 Mounting

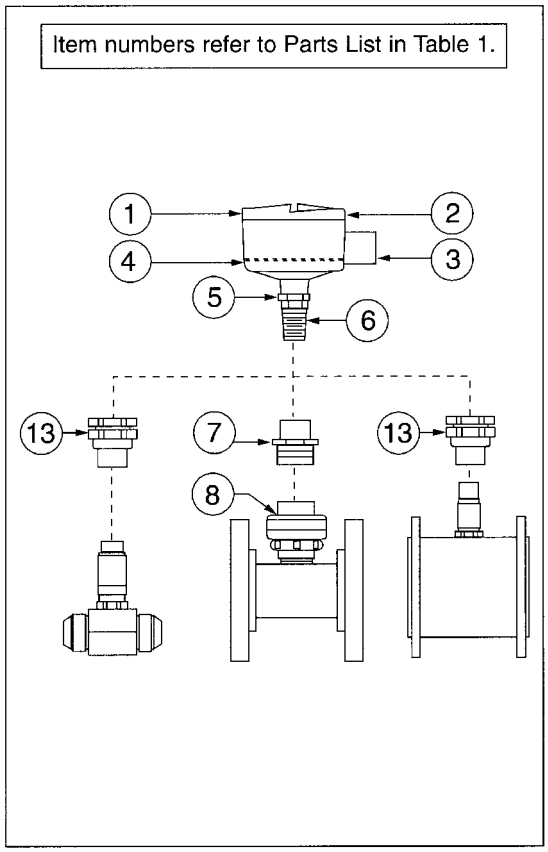


Figure 1. Mounting on Turbine Meter

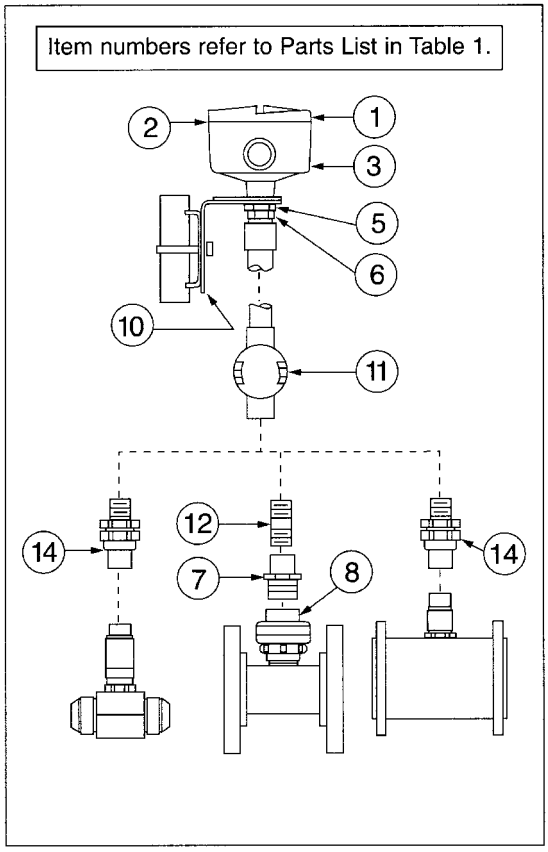


Figure 2. Surface or Pipe Mounting

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 ground 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.

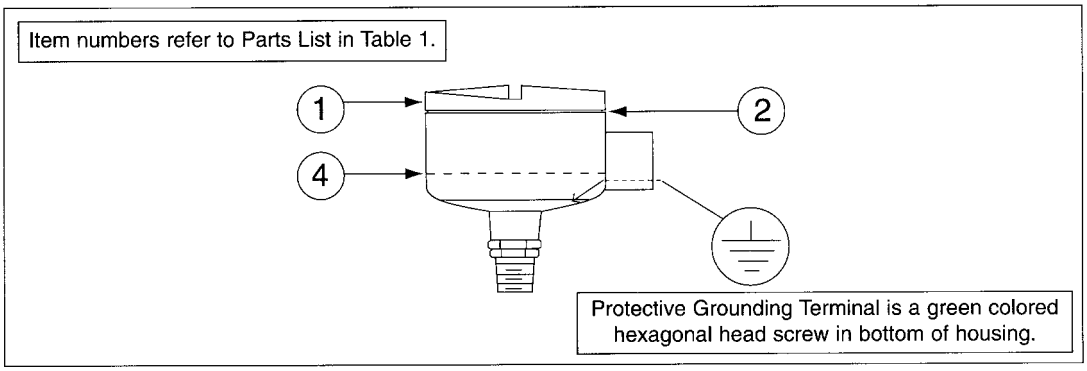


Figure 3. Protective Grounding Terminal

The PA115 uses a two wire system. These two wires are the power and signal interconnection between the amplifier and receiver. There are a total of four wires which are connected to the amplifier, two from the turbine meter pickup coil and two 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.

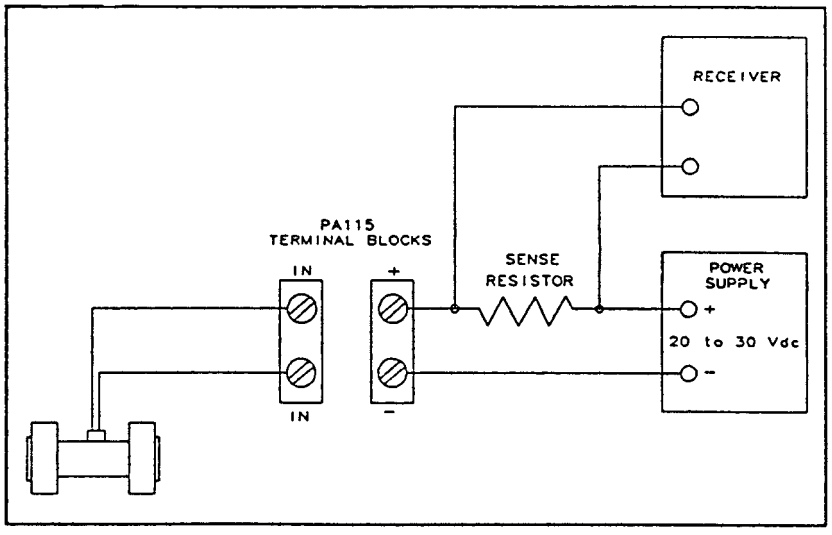


Figure 4. Wiring, turbine meter mounting.

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 PA115 is 200 feet. This type of installation will also require a junction box, item 11. See Figure 5.

2.3 Sense Resistor

The value of the user supplied sense resistor is determined by the supply voltage. The range of the supply voltage is 20 to 30 Vdc.

$$R = \text{PPUUPUUPUU}\frac{Supply}{Voltage}$$

$$0.04$$

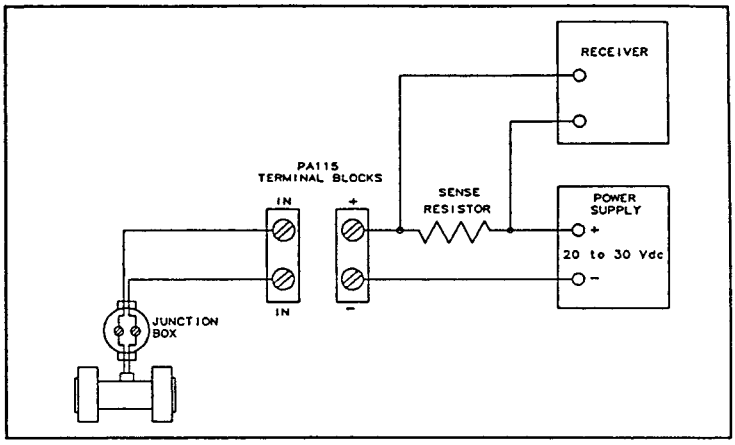


Figure 5. Wiring, remote mounting.

3. PARTS LIST

Item	Description	Part Number
1	Cover, color violet Cover, color blue	A2054VA A2054VB
2	O-ring	A2054UZ
3	Housing, color violet Housing, color blue	A2055CB A2055CC
4	Printed Wiring Assembly	A2053EK
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

4. DEINSTALLATION PROCEDURE

1. Remove cover from pre-amplifier housing.

2. Disconnect four wires from the internal terminal block. Hold the pre-amplifier housing from rotating as the union, on turbine meter mounting 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 PA115 and the test equipment as shown in Figure 6. Set the power supply to +20 Vdc.

2. Set the oscillator amplitude to 0. The oscillator output must be floating with respect to ground. The use of a battery operated oscillator is recommended.

3. The PA115 output signal as measured on the oscilloscope should be 20 Vdc ± 3 Vdc.

4. Set the oscillator frequency to 1 kHz. Set the oscillator amplitude to 200 mV peak to peak.

5. The PA115 output signal as measured on the oscilloscope should be a 1kHz square wave with an amplitude of approximately 20 Vp-p.

6. After successful completion of this test, if the PA115 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.

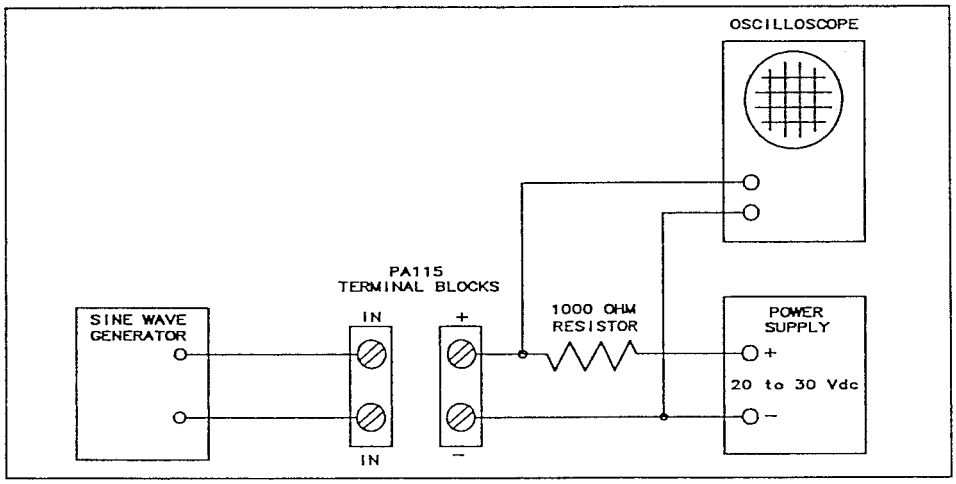


Figure 6. PA115 Test Setup

6. CALIBRATION

The PA115 has no controls or adjustments.

7. THEORY OF OPERATION

Figure 7 is the block diagram of the PA115 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 negative power connection provides reverse polarity protection.

7.2 Input amplifier.

The input amplifier receives the input signal from the pickup coil to 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 Voltage Comparator and FET Switch

The voltage comparator produces a high level square wave signal from the output of the input amplifier. The output of the voltage comparator drives the FET switch. The FET switch effectively connects the + and – power input terminals of the PA115 together. This causes a high current to flow through the external sense resistor. When the FET switch is off, the current through the sense resistor is at a low value, approximately 3 mA. The receiver senses the output signal developed across the sense resistor.

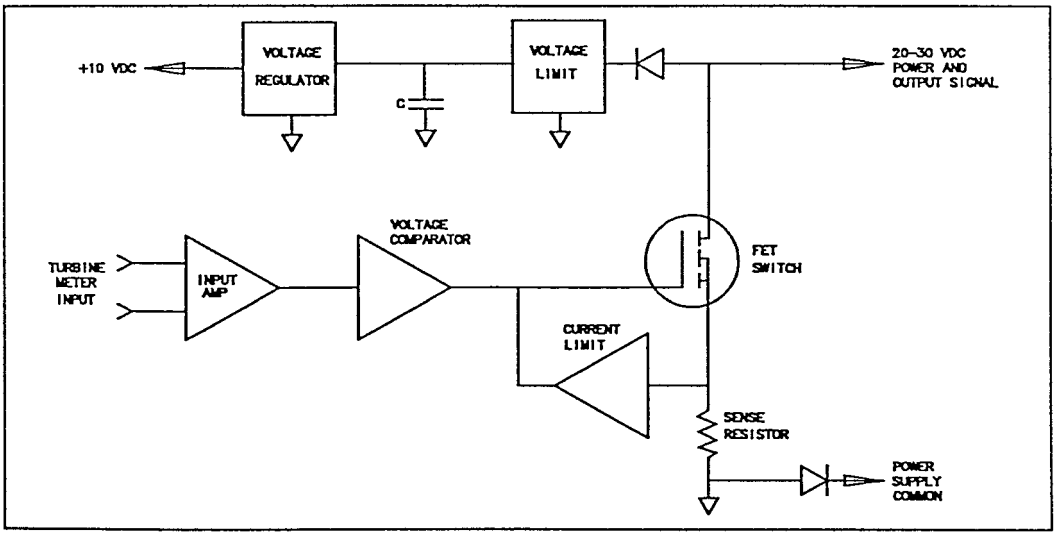


Figure 7. PA115 Block Diagram

7.4 Current Limit.

The output FET switch is protected from excessive current by a dynamic current limit circuit. If external conditions, such as excessive supply voltage or a shortened external sense resistor, would cause excessive current to flow, the current limit circuit will limit the current to approximately 50 mA.

7.5 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.

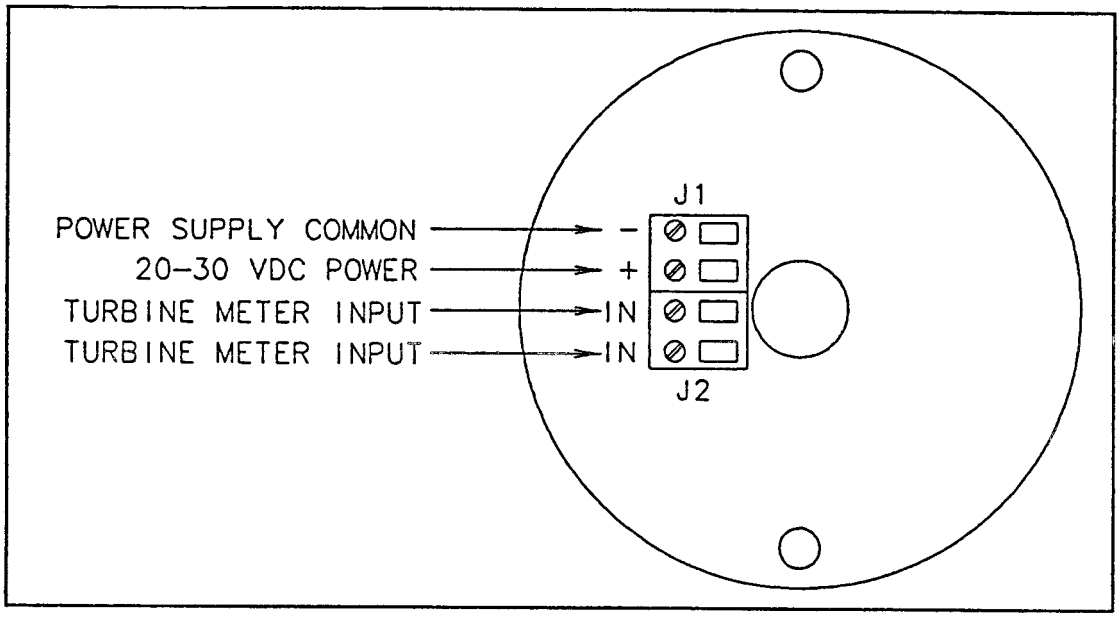
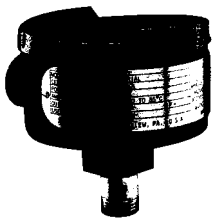


Figure 8. PA115 Connections on printed wiring board



PA115 Pre-Amplifier

Model Code

PA115 = Pre-Amplifier (Specify mounted or not mounted on Turbine Flowmeter.)

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

Output Signal: 20 V p-p pulses, two-wire system. (Power is supplied over signal wires.)

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

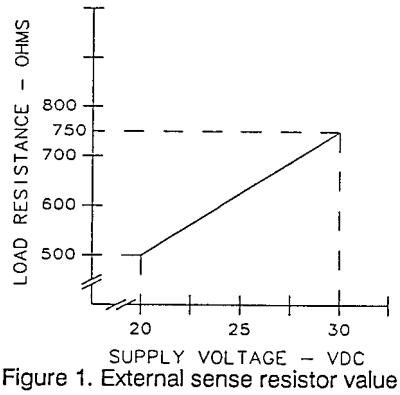


Figure 1. External sense resistor value

Sense Resistor: An external, user-supplied sense resistor is required for operation. See Figure 1 for resistor value.

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

Supply Voltage: 20 – 30 Vdc

Supply Current: 40 mA peak, 25 mA average

Housing: NEMA 4 cast aluminum housing.

Mass: 1 kg (2.2 lbs) approx.

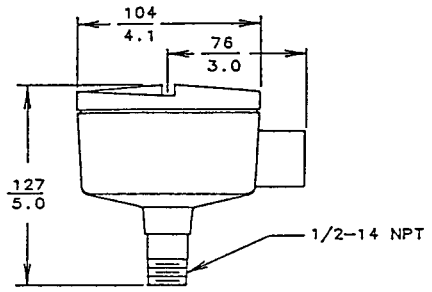
Testing Laboratory, Types of Protection, and Area Classification	Conditions of Certification	Electrical Classification Code
Factory Mutual Research Approved for Hazardous Locations. Explosionproof for Class I, Division 1, Groups B, C and D. Dust-ignitionproof for Class II, Division 1, Groups E, F and G. Non-incendive resistive for Class I, Division 2, Groups A, B, C and D. NEMA Type 4.	None	CS-E/FD-A

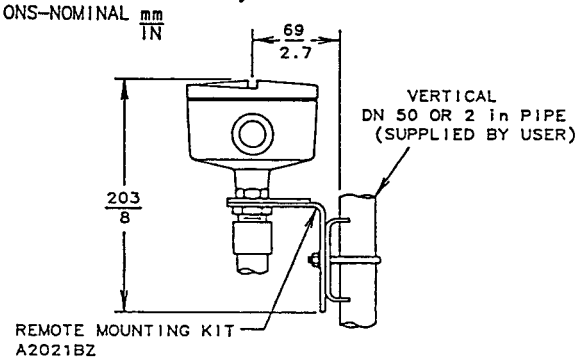
Dimensional Print

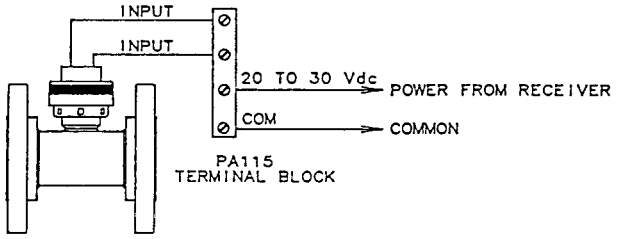
DP
XO-107DP
FEB 1,1993
SHEET 1 of 1

PA115 FIELD MOUNTED PREAMPLIFIER (2-WIRE SYSTEM)

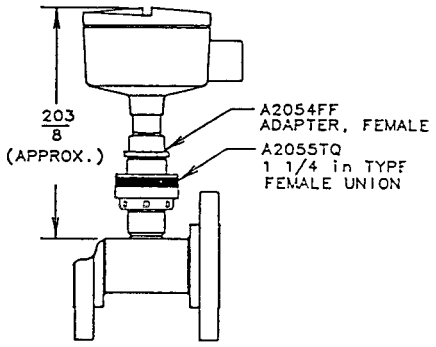
DIMENSIONS-NOMINAL $\frac{mm}{IN}$



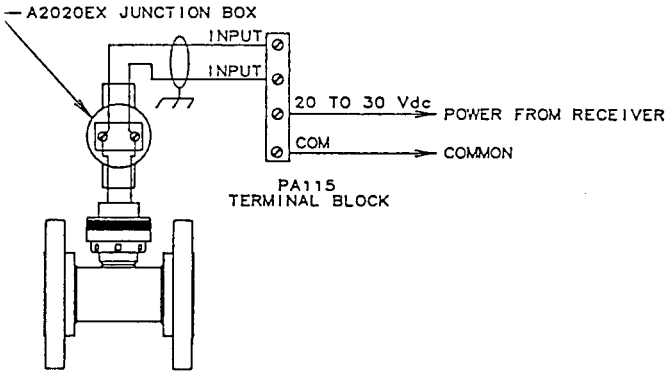




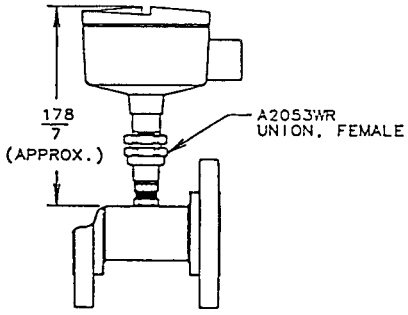
WIRING, PREAMPLIFIER MOUNTED ON TURBINE FLOWMETER.



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 _____

ITEM-TAG _____

_____

_____

CERTIFIED BY _____ DATE _____