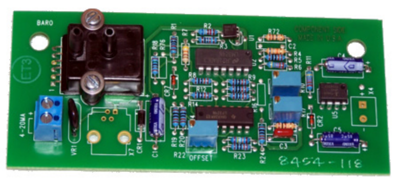
A70-P

Barometric Pressure Sensor

Instruction Manual



A70-PLX Board

PRODUCTS COVERED:

A70-PL0-T/E
A70-PL0-T/M
A70-PL4-T/E
A70-PL6-T/E

DOCUMENT VERSION:

210426

INTRODUCTION:

The barometric pressure is sensed by an integrated silicon absolute pressure sensor with internal temperature compensation. The sensor is mounted to the signal conditioner board. A 3/16 inch diameter tube may be attached to the sensor to provide remote pressure sensing. The output of the sensor is scaled to provide the desired output signal.

Systems are available with outputs of 0-1 mA, 0- 1 V or 4-20 mA. All systems may be powered from either 12 - 24 VDC, 120 VAC, or 230 VAC.

The instruments are available in a variety of packages including steel JIC boxes meeting NEMA 12 standards, weatherproof fiberglass enclosures meeting NEMA 4X, IP66 and IEC 529 standards and track mounted versions. NEMA 12 enclosures provide protection from dust for indoor applications. NEMA 4X enclosures may be used indoors or outdoors. They provide protection from corrosion, wind blown dust and rain and are undamaged by ice. Track mounted versions are intended for mounting inside an enclosure provided by the user. Where required, electrical connection to the sensor is via terminal block. A barrier strip is provided for connection to operating power.

DESCRIPTION:

The A70-PL provides a 4-20 mA signal proportional to barometric pressure. The instrument utilizes a temperature compensated IC pressure transducer to measure the ambient pressure. The output from the pressure transducer modulates the transmitter's loop current. The instrument as supplied is calibrated to absolute pressure. The instrument may be adjusted to sea level pressure if desired by means of the offset adjustment.

The barometric air pressure sensor has a 3/16 inch diameter port. Flexible tubing may be attached to this port if it is desired to monitor air pressure at a remote location. Other ranges are available up to 100 psi absolute or + 100 psi gauge.

The system may be packaged in a rugged steel box or as a circuit board with mounting track. The steel box has a NEMA 12 rating. Two 1/2" conduit hubs on the side walls provide electrical access to the unit. Top and bottom ears with two 1/4" holes each provide means for wall mounting. The track mounted version is suitable for installation inside an existing enclosure. The track is easily attached to a back plane with two screws.

A70-P

Barometric Pressure Sensor

FEATURES

-Can be mounted in NEMA4X and NEMA 12 enclosures

APPLICATIONS

-Building Automation and Controls
-Environmental Research
-Meterological Studies

SPECIFICATIONS

Operating Power: 12-24 VDC, 24 VAC, 120 VAC, 230 VAC
Input Device: Barometer - Intergrated Silicone Sensor
Pressure Range: /E 27 - 31 inHG
/K 900 - 1100 mbar
Output: 4 - 20 mA into 0 - 300 Ohms
Accuracy: Electronics - ±1%
Sensor - ±0.05 inHG (±2 mbar)
Environmental: Temperature Range - 0°C to 60°C

INSTALLATION:

Before proceeding verify that the maximum resistance of the current loop including the wiring and sensing element does not exceed the maximum given by Formula 1. If this resistance is exceeded the loop current will not attain full scale.

MAXIMUM LOOP RESISTANCE

Formula 1

R - Maximum Loop Resistance in Ohms
V - DC Excitation Voltage

R = (V - 10 VDC) X 50

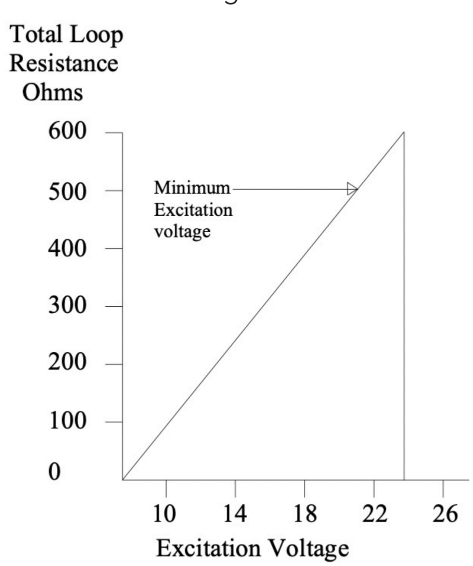
COPPER WIRE GAUGE RESISTANCE

Table 1

AWG	RESISTANCE Ohm / Foot
12	.0016
14	.0026
16	.0041
18	.0065
20	.0103
22	.0165
24	.0262

MAXIMUM LOOP RESISTANCE

Figure 1



INSTALLATION:
(Continued)

1. Select a suitable mounting location where the temperature can be maintained between 0 and 50°C
2. Mount the instrument to a wall or other suitable panel.
3. Connect the two wires from the current loop to the terminals on the barrier strip, taking care to observe polarity.
4. Apply power to the loop and allow the system to stabilize for 20 minutes or more while proceeding with Step 5.
5. Determine local barometric pressure as referred to sea level. A nearby radio or television station weather report is generally suitable. Refer to Formula 2 and calculate the desired loop current.
6. Refer to Figure #3 and locate the "baro. offset" adjustment. Use this as a course adjustment. Turn the small screw on the top to set the loop current calculated in Step 5 to within + 0.5 mA.
7. Locate the "ZERO" adjustment. Turn the small screw on top to obtain the final adjustment for the loop current calculated in Step 5 + 0.02 mA.

Note:
Adjustment of the "GAIN" potentiometer is not initially required. If calibration is necessary after a year or more of service a suitable pressure reference will be required.

LIGHTNING PROTECTION:

The Transmitter electronics has integral metal oxide varistors for protection from lightning induced surges, electrostatic discharge and other atmospheric discharges. Wind blown aerosols such as sand and snow can generate electrostatic charges with consequences similar to lightning discharges. The A96 Series of gas tube surge arrestors can safely dissipate much higher energy discharges than the internal varistors.

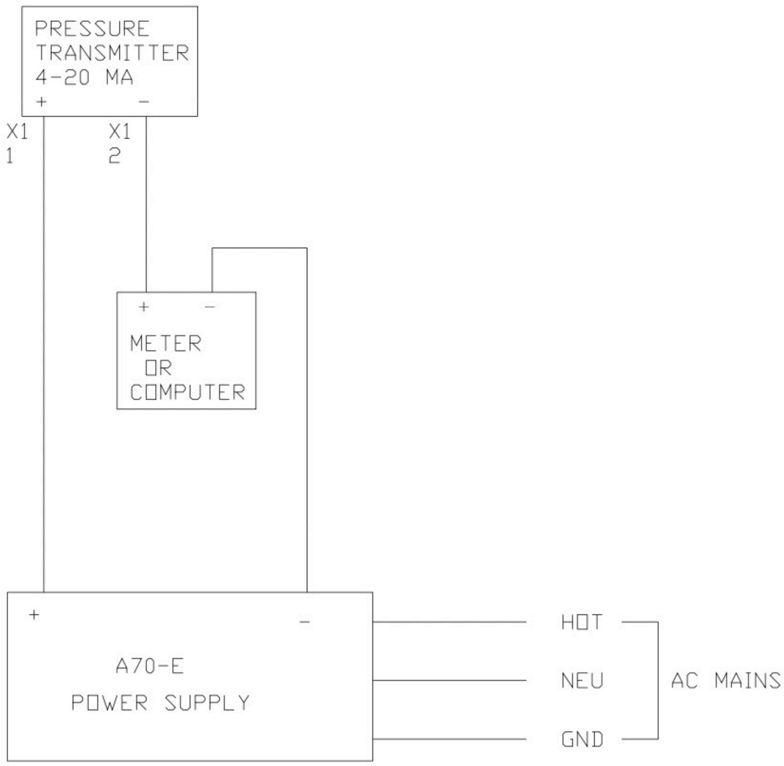
A consequence of the rapid rise time of these electrostatic discharges is the inductance of the grounding system and interconnecting wiring is generally of more concern than resistance. Gas tube surge arrestors should be placed as close to the device they are intended to protect to mini- mize the effect of inductance in the wiring.

LOOP CURRENT GIVEN A KNOWN PRESSURE
Formula 2

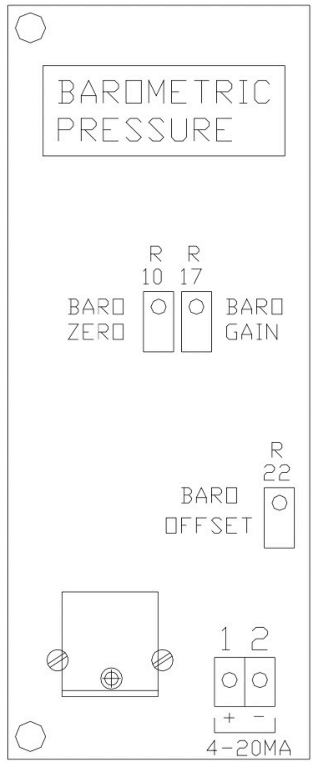
I - Loop Current in mA
P- Barometric pressure in inches of mercury

I = (P X 4) - 104 ma

Connection Diagram
Figure 3

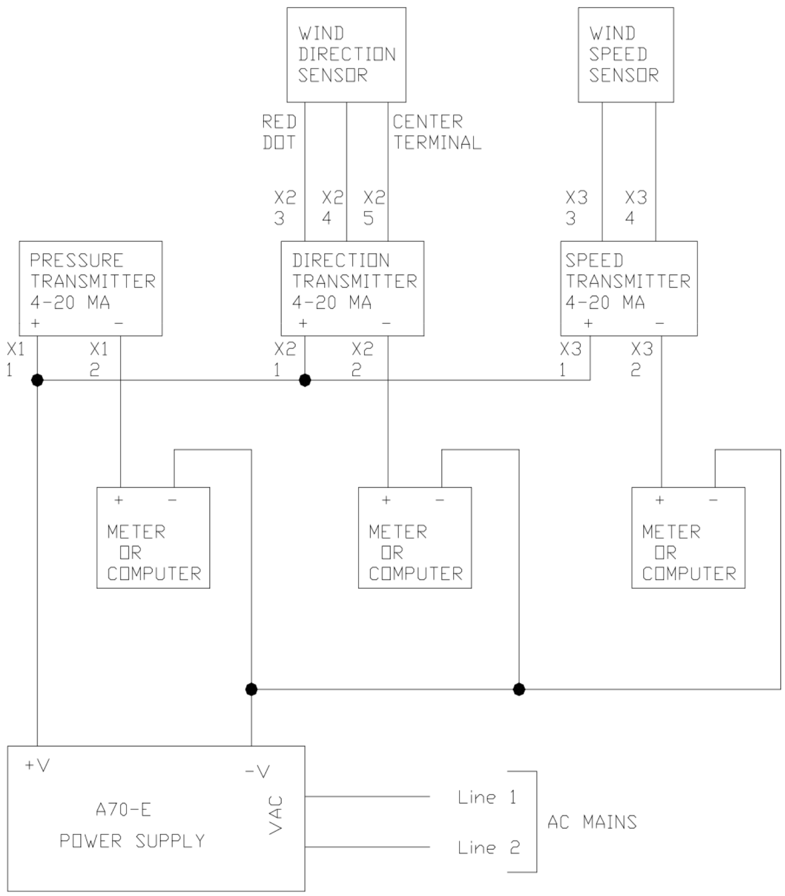


Component Layout
Figure 4



Multiple Transmitters on One Power Supply

Figure 4



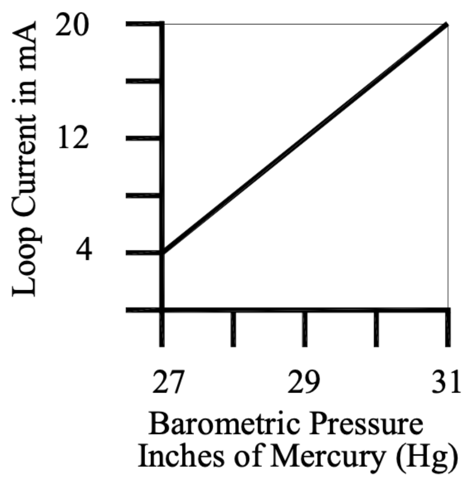
OPERATION:

Operation of the transmitter is fully automatic. A loop current in the range of 3-4 mA or 20-30 mA indicates a pressure outside the range of the instrument.

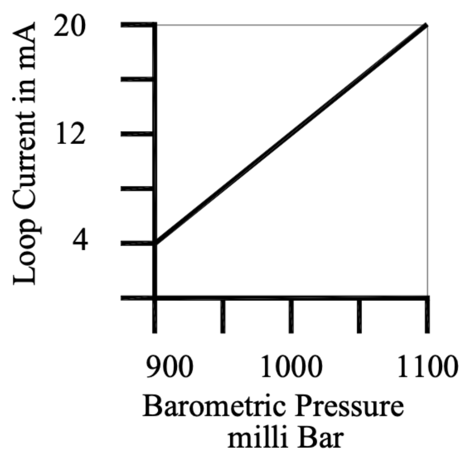
Refer to Formula 3 to determine barometric pressure given the loop current.

It is possible to monitor the loop current indirectly by measuring the voltage drop across a known resistance installed in series with the current loop.

Barometric Pressure Transfer Function
(Range E)
Figure 5



Barometric Pressuretransfer Function
(Range M)
Figure 6



Barometric Pressure Given a Known Loop Current (inHg)

Fomula 3

P - Barometric Pressure in Inches of Mercury
I - Loop Current in mA

P = (I + 104)/4

Barometric Pressure Given a Known Loop Current (mbar)

Fomula 4

P - Barometric Pressure in milli Bar
I - Loop Current in mA

P=(I X12.5)+850

Voltage Across Sensing Resistor

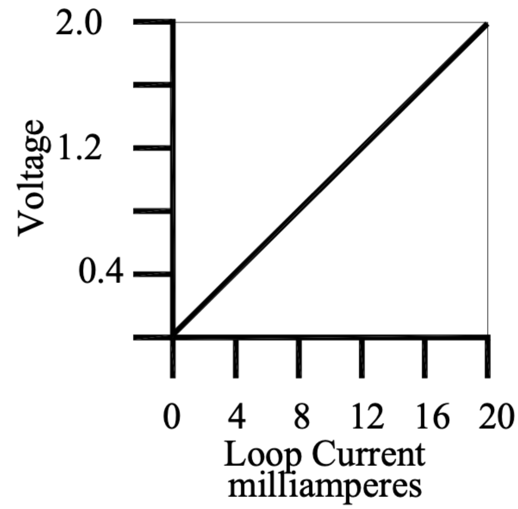
Fomula 5

I - Loop Current in Milliamperes
R - Resistance in Ohms
V - Voltage in Volts

V = I X R / 1000

Voltage v. Loop Current

Figure 7



TROUBLESHOOTING:

Effective trouble shooting requires that problem locations be systematically eliminated until the problem is found. There are four basic questions to answer when trouble shooting (Ref. #1):

1. Did it ever work right?
2. What are the symptoms that tell you it's not working right?
3. When did it start working badly or stop working?
4. What other symptoms showed up just before, just after, or at the same time as the failure?

It is best to write down any clues you may obtain. Be sure to write down anything unusual.

The response to question #3 should probably not be 3:04 P.M.. A useful response might be, "Just after an electrical storm." or, "Just after it fell off the shelf." Double check all the simple solutions to the problem before searching for complex ones. If the problem occurs right after installation, it probably has a simple solution. If an automobile engine cranks, but doesn't start, make sure there is fuel in the tank before replacing the engine. If the electronic equipment doesn't function verify that it has power and is turned on.

Systems containing parts which can be quickly interchanged are easy to trouble shoot. Swap parts until the problem moves. The location has then been narrowed to the part that caused the problem to move. Sometimes there are multiple problems. These reveal themselves in layers much like peeling an onion.

It often helps to explain the problem to another person, even if that person is not knowledgeable about the particular piece of equipment. This does two things. First it requires you to organize the situation so it can be explained to another. Secondly, it may turn out that you are so familiar with the situation that you have overlooked the obvious. Another person unfamiliar with the equipment may be able to help. If you are unable to solve the problem, put it aside until the next day. Some new thoughts will probably occur while working on another project.

References
1. "Troubleshooting is More Effective with the Right Philosophy", Robert A. Pease, Electronic Design News, January 5, 1989.

General Electrical Problems:

Loop Current:	Failure Description:
0 mA	Current loop polarity reversed Open circuit in cable Power supply failure Transmitter Failure
< 3 mA	Low power supply voltage Loop resistance too high
> 20 mA	Ambient pressure above range Adjust "Baro. Offset" Transmitter failure
Does not reach 20 mA, otherwise operates properly	Low power supply voltage Loop resistance too high

MAINTENANCE:

No maintenance is required except to check calibration at yearly intervals. See recalibration section.

CALIBRATION:

Altitude Adjustment

1. Apply power to the loop and allow the system to stabilize for 20 minutes or more.
2. Determine local barometric pressure as referred to sea level. A nearby radio or television station weather report is generally suitable. Refer to Formula 2 and calculate loop current.
3. Refer to Figure #3 and locate the “baro. offset” adjustment. Use this as a course adjustment. Turn the small screw on the top to set the loop current calculated in Step 2 to within + 0.5 mA.
4. Locate the “ZERO” adjustment. Turn the small screw on top to obtain the final adjustment for the loop current calculated in Step 2 +0.02 mA.

Note:
Adjustment of the “GAIN” potentiometer is not initially required. If calibration is necessary after a year or more of service a suitable pressure reference will be required.

Recalibration

The transmitter is calibrated when shipped from the factory. Recalibration requires special equipment and should only be attempted with guidance from the factory. A milliammeter & means of generating the reference pressures are required.

See Figure 2. Connect the transmitter to a power supply. Allow the circuit to stabilize for 20 minutes or more for best accuracy.

Calibration Range - E
1. Apply a pressure of 27 inches of Hg to the pressure transducer using a tube with 3/16” ID.
2. Monitor the output current and adjust the “baro. offset” potentiometer to produce 4.02 mA.
3. Apply a pressure of 30 inches of Hg and adjust the “baro. gain” potentiometer to produce a loop current of 15.98 - 16.02 mA
4. Repeat steps 1 - 3 until instrument is in calibration.

Calibration Range - M
1. Apply a pressure of 900 mBar to the pressure transducer using a tube with 3/16” id.
2. Monitor the barometer loop output current and adjust the “baro. offset” potentiometer to produce a loop current of 3.98 - 4.02 mA.
3. Apply a pressure of 1050 mBar and adjust the “baro. gain” potentiometer to produce a loop current of 15.98 - 16.02 mA
4. Repeat steps 1 - 3 until instrument is in calibration.