MOORE INDUSTRIES

INSTRUCTION MANUAL

PSA-HP

Pressure Alarm

Form 141-705-00B

May 1988

Description

Introduction

The PSA-HP is a pressure alarm that provides a contact closure in response to pressure. When the pressure falls outside a preset limit, the PSA activates a relay and an LED on the front panel is illuminated. The unit can be arranged by jumper selection to turn a relay ON or OFF if the pressure drops below or exceeds the setpoint value.

A jumper selectable fail-safe mode de-energizes the relay when the alarm activates or when power is lost to the unit.

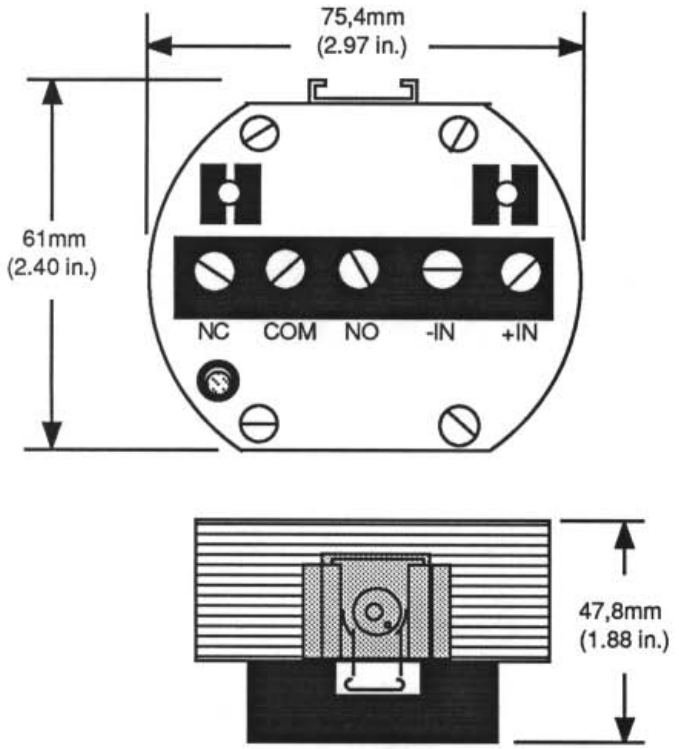

Figure 1. PSA-HP Installation Dimensions

Installation

Introduction

Input and output values for the unit should be checked on site before the unit is placed into service (see Calibration section).

Mechanical Installation

The PSA comes in a hockey puck housing. See figure 1.

Purge the mounting blocks and air lines of any debris before installing the PSA. This is done by inserting a small diameter, blunt tip probe into the fittings and unseating the ball check valves for a few seconds while pressurized.

Electrical Connections

The terminals are #8 compression screw terminals. Observe proper polarity as shown on the label when making electrical connections. Terminal designations are shown in Figure 1.

Calibration

Introduction

This section provides the necessary information to calibrate the PSA. Each unit is adjusted and checked at the factory for proper performance before shipping.

The ZERO (R12) and SPAN (R2) ptentiometers, internal to the unit on PC1, usually require 20 turns of the shaft to move the wiper from one end of its range to the other.

Important Note: This document is complete as of the printing date; however, subsequent product changes may be reflected in companion documents.

Specifications

Characteristics

Front Panel Adjustments

Setpoint: Multiturn adjustment over a range of 0-100% of span.
Panel Connections: Power Supply
Relay contacts (+IN/-IN/ NO/COM/NC)
Internal Selection (Jumpers): Alarm activates on increase or decrease in pressure. Alarm condition energizes or de-energizes relay.

Performance

Mechanical Relay Contact Rating:
6A, 28Vdc (resistive load)
6A, 300Vac (resistive load)
1/8HP, 120Vac
1/8HP, 240Vac
Calibration Capability:
20-turn potentiometer
±0.5% of full scale
Repeatability:
0.2% of span
Ambient Temperature Effects: 0 to 50°C (32 to 120°F)
Span 1.5% of full scale
Zero 2.0% of full scale
Operating Temperature Range: -18 to 82°C (0-180°F)
Proof Pressure:
150% of range

Wetted Parts: Aluminum port, chrome steel check ball, Buna-N o-ring and ceramic transducer.

Line Voltage Effect:
Negligible

Weight Approximately 5.5 ounces (155.5 grams)

Ordering Specifications

Unit **PSA-HP**

Input
0-5PSIG
0-15PSIG
0-30PSIG
0-50PSIG
0-100PSIG

Output **Mechanical Relays:**
MH1 Mechanical SPDT relay, high alarm, turns relay ON
MH2 Turns relay OFF
ML1 Mechanical SPDT relay, low alarm, turns relay ON
ML2 Turns relay OFF

Power **24DC** 24 Vdc, ±10%

Housings

FL Mounting flanges on HP unit suitable for relay track or screw mounting
FLD Mounting flanges for 3-1/2" relay track
HP Hockey puck housing with spring clips
P3HG* Explosion-proof, three hub, high glass dome. NEMA, Class I, Groups C and D, Class II, Groups E, F, and G
P3HS* Explosion-proof, three hub, high solid dome. NEMA, Class I, Groups C and D, Class II, Groups E, F, and G
P3LG* Explosion-proof, three hub, low glass dome. NEMA, Class I, Groups C and D, Class II, Groups E, F, and G
P3LS* Explosion-proof, three hub, low solid dome. NEMA, Class I, Groups C and D, Class II, Groups E, F and G

* "P" suffix adds 2-inch pipe mounting

Model number description:
Unit / Input / Output / Power [Housing]

The pot is equipped with a slip clutch at either end of its travel to prevent damage if turned beyond the wiper stop.

A slight change in torque to turn the shaft is noticed when the clutch is slipping. If this change cannot be sensed, either end of the pot can be reached by 20 turns of the shaft in the desired direction.

Turning the control shaft clockwise increases the quantity or makes it more positive. Counterclockwise decreases the quantity or makes it more negative.

Jumper Selection

On the PSA as in any alarm, there are two conditions that must be met: alarm condition and relay condition. The alarm condition decides whether the unit will alarm when the process variable reaches or exceeds a trip point (high alarm), or when the process variable reaches or goes below a trip point (low alarm). The alarm condition is selected by jumpers J1-J4. See figure 4.

High alarm - install J1 and J2
Low alarm - install J3 and J4

A relay condition decides whether the relays are energized (ON) or de-energized (OFF) in the alarm condition. The relays are numbered according to whether they turn ON or OFF. Refer to the Ordering Specifications on page 3. A "1" indicates the relay turns ON (e.g., MH1, ML1). A "2" indicates the relay turns OFF (e.g., MH2, ML2). The relay condition is decided by jumpers J5-J7. See figure 4.

"1" or ON - install J7 and J8
"2" or OFF - install J5 and J6

Test Equipment and Tools

The necessary test equipment and tools required to calibrate the PSA are listed in Table 2. This equipment and these tools are not supplied with the unit and must be provided by the user.

Adjusting and Calibrating

1. Turn SETPOINT A potentiometer fully counterclockwise. See Figure 4.
2. Apply 0% pressure.
3. Adjust base unit ZERO potentiometer (R12) for zero volts between U3-1 and U1-7.
4. Turn SETPOINT A potentiometer fully clockwise.
5. Apply full scale pressure.
6. Adjust base unit SPAN potentiometer (R2) for zero volts between U3-1 and U1-7.
7. Repeat steps 1-6 until no readjustment is needed.

Theory of Operation

This section briefly describes how the PSA operates. A simplified block diagram of the unit is provided to help understand the circuit description. See Figure 2. A detailed schematic is found in Figure 3.

Table 2. *Test Equipment and Tools*

Equipment or Tool	Characteristic	Purpose
Suitable power source	24 Vdc, ±10%	
Screwdriver (blade)	Blade no wider than 2.54 mm (0.1")	To adjust front panel ZERO and SPAN.
Adjustable instrument air supply	0 to Full Scale pressure	To simulate pressure input.
Dc voltmeter temperature	Must be accurate to ±0.05%, or better Ambient Temp. = 20°C to 35°C (68°F - 94°F)	To measure the signals to avoid causing errors in process data.
Phone tip probes (2)	Must have 2.03 mm (.080") dia. tips, 12.7 mm (.50") long handles 6.5 mm (.25") dia.	Easy monitoring of output signals.

The setpoint voltage level is derived from the current sense resistor and therefore tracks any temperature related reference voltage drift.

The transducer bridge output is amplified through a differential amplifier to produce the "pressure signal". Its span and zero are adjusted to match the range of the setpoint voltage, typically .5 to 2.5 volts. The pressure and voltage signals are then fed into two comparators in series. The polarity sense of each comparator has single-sided hysteresis. The second drives the relay.

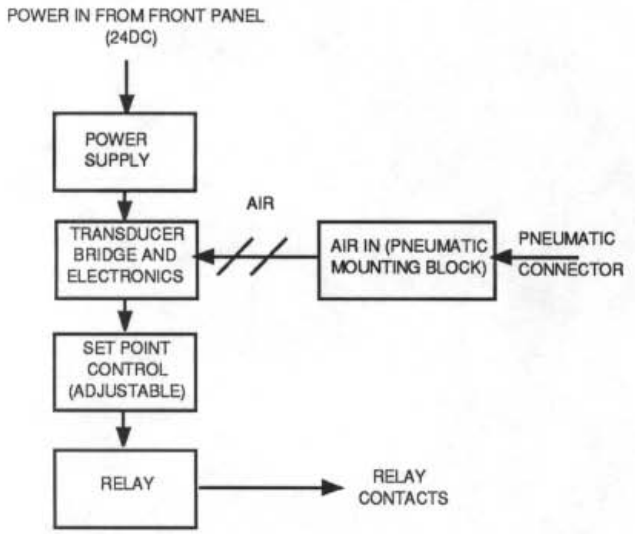

Figure 2. PSA-HP Block Diagram

Troubleshooting

In general, troubleshooting is carried out by tracing the signal with an oscilloscope and referring to the schematic diagrams to determine what component or device might cause an abnormal indication.

If the original symptom was a "complete failure of the unit to operate", the most logical components to suspect are those associated with the power supply.

If the unit is producing an incorrect (but not zero) output, check the outputs from the input circuit and trace the resulting signal through the unit.

If the relay does not work at all, check to see if +15 volts and 24 volts are present. If these voltages are present, apply some intermediate pressure (approximately 50%). Use the SETPOINT potentiometer to check for active signals in the circuit.

Next, check to see if the output of the relay driver circuits (U4, pin 1) can be forced high by turning the SETPOINT potentiometer from one extreme to the other. If the output goes high ≥ 15.7 volts) then either the relay or LED circuit is open. If the output does not go high, check to see if the differential inputs change respective polarity.

If the differential inputs do not change polarity, check that the pressure signal is active (U1-7). An active condition exists when 0% pressure is ≈0.5 volts and 100% pressure is ≈2.5 volts.

If the pressure signal is active, then there is a problem with the comparator(s) or there may be a short in the relay.

If the pressure signal is not active, check the excitation current (U1, pin 2) for a voltage ≈1.23 volts. U1, pin 1 should have at least 6 volts. If not, there may be a short or open in the constant current path of the reference diode and it may not have 1.23 voltage drop across it. Also, U1 may be defective.

Table 3. *Jumper Location Diagnosis*

Symptom	Problem	Solution
Deadband on wrong side, but alarm sense (i.e. relay activates on under/over pressure) is correct.	Hi/Lo and fail-safe jumpers are reversed.	Change jumpers
Deadband on wrong side and alarm is reversed.	Hi/Lo jumpers are reversed.	Change jumpers
Deadband on right side but alarm sense is reversed.	Fail-safe jumpers are reversed.	Change jumpers

Table 4. *Additional Troubleshooting*

Symptom	Problem
The transducer has excitation and output but pressure signal is not active.	The differential amplifier is probably defective.

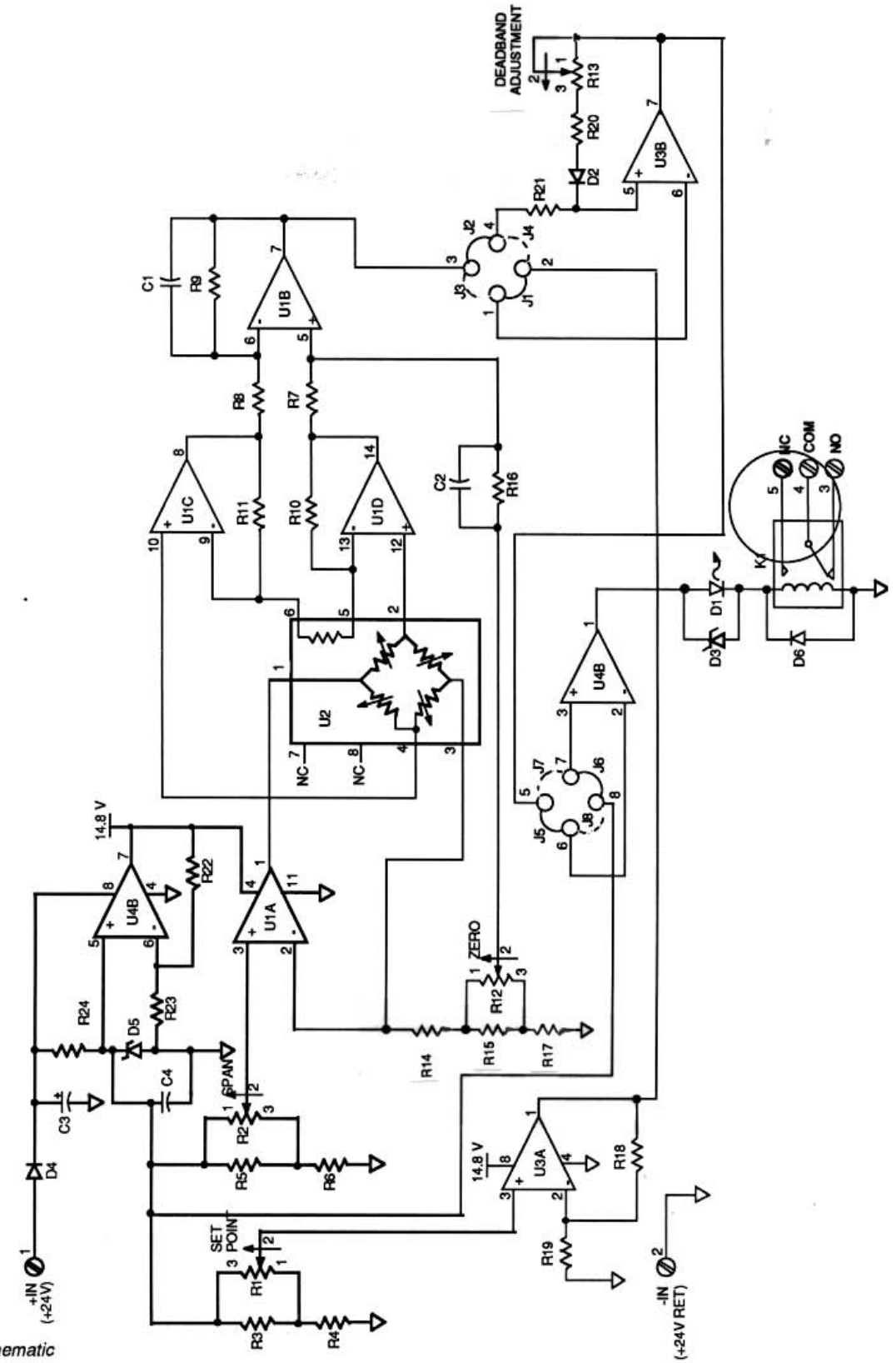

Figure 3. PSA-HP Schematic

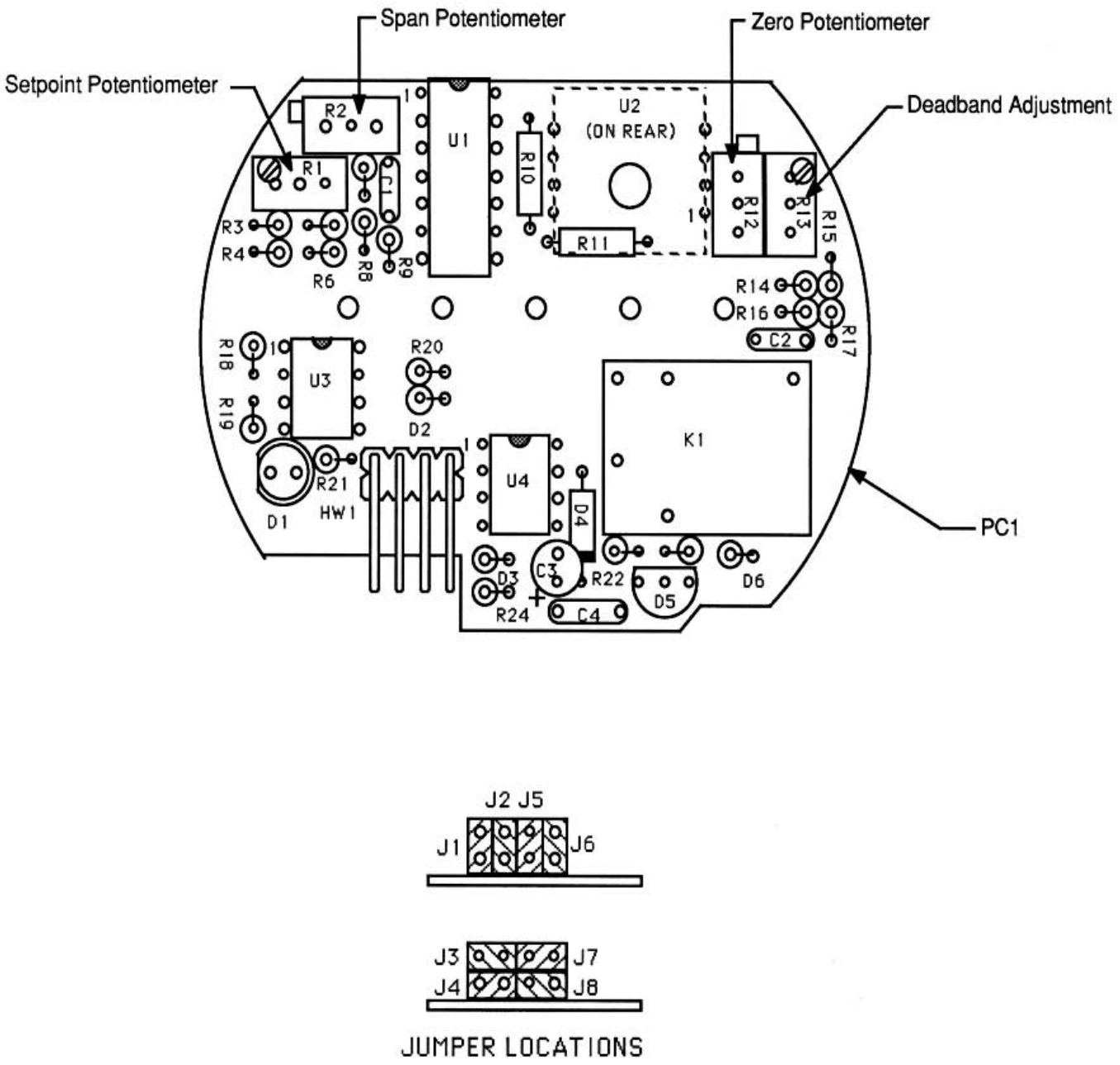

Figure 4. PSA-HP Assembly PC1

RETURN PROCEDURES

To return equipment to Moore Industries for repair, follow these four steps:

1. Call Moore Industries and request a Returned Material Authorization (RMA) number.

   Warranty Repair –
   If you are unsure if your unit is still under warranty, we can use the unit's serial number to verify the warranty status for you over the phone. Be sure to include the RMA number on all documentation.

   Non-Warranty Repair –
   If your unit is out of warranty, be prepared to give us a Purchase Order number when you call. In most cases, we will be able to quote you the repair costs at that time. The repair price you are quoted will be a "Not To Exceed" price, which means that the actual repair costs may be less than the quote. Be sure to include the RMA number on all documentation.

2. Provide us with the following documentation:
   a) A note listing the symptoms that indicate the unit needs repair
   b) Complete shipping information for return of the equipment after repair
   c) The name and phone number of the person to contact if questions arise at the factory

3. Use sufficient packing material and carefully pack the equipment in a sturdy shipping container.

4. Ship the equipment to the Moore Industries location nearest you.

The returned equipment will be inspected and tested at the factory. A Moore Industries representative will contact the person designated on your documentation if more information is needed. The repaired equipment, or its replacement, will be returned to you in accordance with the shipping instructions furnished in your documentation.

MOORE INDUSTRIES

WORLDWIDE • www.miinet.com

United States • info@miinet.com
Tel: (818) 894-7111 • FAX: (818) 891-2816

Belgium • info@mooreind.be
Tel: 03/448.10.18 • FAX: 03/440.17.97

China • sales@mooreind.sh.cn
Tel: 86-21-62491499 • FAX: 86-21-62490635

Australia • sales@mooreind.com.au
Tel: (02) 8536-7200 • FAX: (02) 9525-7296

The Netherlands • sales@mooreind.nl
Tel: (0)344-617971 • FAX: (0)344-615920

United Kingdom • sales@mooreind.com
Tel: 01293 514488 • FAX: 01293 536852