MODEL AG-100

Digital Pressure Indicator

SENSOTEC

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Model AG-100 User's Guide
Sensotec Part Number: 008-0269-00
Rev. D: August, 2000

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Chapter 1

INTRODUCTION

SENSOTEC's AG- Series instruments combine a high-quality transducer with a precision signal conditioner/ indicator in attractive DIN-size cases. It measures pressure accurately and displays the results in engineering units.

1.1 Standard Features

- Full 4-1/2 digit, 0.56-inch display
- Display in any engineering unit desired
- Full 20,000 count resolution
- 0 - 5 volt analog output at full-scale pressure
- 110 VAC, 60Hz. power (Optional: 220VAC 50Hz)
- Attractive extruded aluminum cases
- 3/8 DIN “panel-meter style” cases
- 1/4-18 NPT input fitting
- 15 pressure ranges to 30,000 psi

1.2 Optional Features

- Panel-mounting adapter
- Bench-mount adapter

Chapter 2

DESCRIPTION

2.1 Configuration

Within the AG-100's enclosure is a transducer which is mounted on the inside of the rear panel, and three (or four, with an option board) printed circuit boards.

1.The Main Board contains the circuitry for the power supply, analog-to-digital converter, a portion of the display hardware, and the SCALING potentiometer.

2. The Display Board solders to the Main Board and contains the displays and the necessary circuitry to drive them.

3. The Amplifier Board contains the excitation circuit for the transducer, the signal conditioning amplifier, and referencing circuits. Adjustments of the analog circuitry are located on this board and may be reached by removal of the front panel (2 screws), or in the case of the FINE ZERO adjustment, through the lens.

4. An extra Option circuit board is used if the peak, track/hold, or limits option is ordered.

2.2 Specifications

Environmental:

Temperature, Storage:	-20° F to 200° F
Temperature, Operating:	60° F to 130° F

Amplifier Characteristics:

Full-scale Output:	5 volts
Output Impedance:	< 2 ohms
Accuracy:	+/- 0.25% bslf
Frequency Response:	0 - 250 Hz.

Display Characteristics:

No. of Characters Displayed:	4-1/2
Conversions per second:	3
Scaling Range:	0 - 19999
Scaling Method:	Potentiometer
Decimal Point Selection:	Plug-in Jumper
Display Size:	0.56"
Overrange Indication:	Flashing Display
Resolution:	1/20,000
Type:	LED

Physical Characteristics:

Case Material:	Extruded Aluminum
Weight:	3 lbs.
Mounting:	Bench, Panel or Rack
DIN Size:	3/8 DIN

Size:	5.6" width
	2.8" height
	8.5" depth

Power Requirements

115VAC/220VAC (factory set)

Optional (field changeable) 220VAC 50 Hz.

Chapter 3

INSTALLATION

The AG-100 is shipped in a single container. Inspect the unit for shipping damage and gently shake and listen for loose components prior to energizing it. Report shipping damage to the carrier; it is his responsibility to safely transport the unit. If there is transportation damage and you have difficulty getting the problem resolved, contact SENSOTEC. We will attempt to assist in resolving the situation.

3.1 Mounting the Unit

For panel mounting, cut a rectangular hole 5.35" in width by 2.65" in height. Using a small Allen wrench, remove the panel-mounting jack screws from the case. These screws are reached by inserting the Allen wrench through the slots in the rear panel located directly behind the panel jacks. After the screws are removed, the jacks may be moved toward the rear and out of the slots in the case. The case may then be inserted through the panel cutout, the jacks reinserted into the slots, and the screws inserted and tightened to force the instrument bezel to contact the panel. Figure 3 gives dimensions and panel cutouts for the 3/8 DIN case. Recommended panel thickness is 0.090 to 0.250 inches.

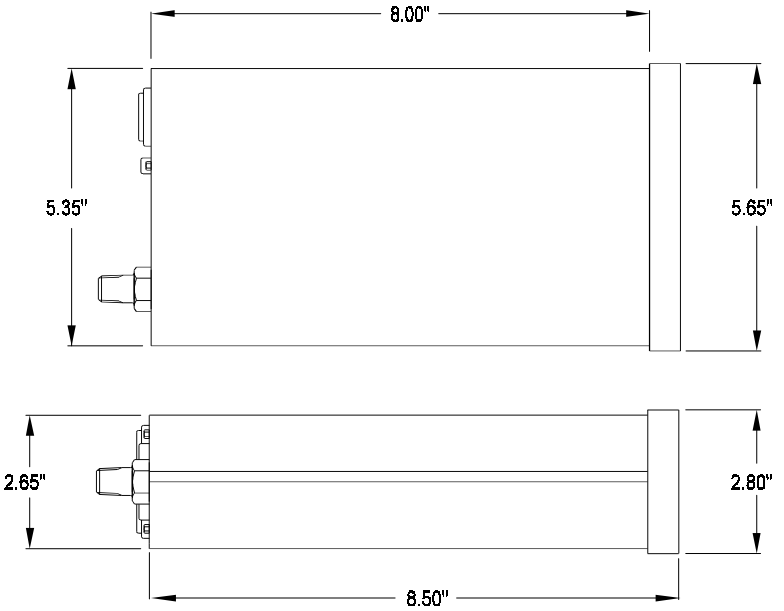

Figure 3-1 Dimensions

3.2 Pressure Connection

The fitting supplied on the rear panel for pressure connection is a 1/4-18 NPT connection. The use of Teflon thread tape is recommended. Flexible tubing may be used in connecting to the pressure source; care must be used to insure that the flexible tubing has a pressure rating at least twice the expected pressure. Figure 3-2 is a sketch of the AG-100 rear panel.

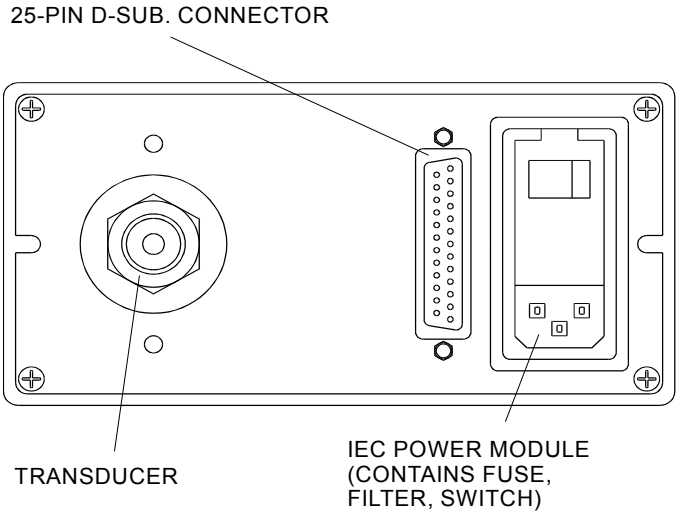

Figure 3-2 Rear Panel

3.3 Power Connections

AC power for the AG-100 is applied by plugging in the power cord to a 110 volts, 60 Hz. power source.

Note: 220 volts, 50 Hz. may be used if proper jumpering is done on the Main Board. If you desire to change the AG-100 to work with this power choice, contact SENSOTEC for instructions regarding modification.

3.4 Using the Analog Output

The analog output voltage of the AG-100 may be found on pins 24 and 25 of the 25-pin D-subminiature connector. Pin 24 is the signal and pin 25 is the reference.

The complete wiring of this connector is discussed in the Options section in Chapter 6 of this manual.

Chapter 4

INITIAL ADJUSTMENTS

The AG-100 has been carefully calibrated at the factory and should require no initial setup. However, if you wish to check the initial setup or make small changes in it, this section will guide you.

4.1 Amplifier Adjustments

Amplifier adjustments include “tweaking” the FINE ZERO and FINE SPAN controls.

FINE ZERO Adjustment

Because of ambient temperature changes, transducers may exhibit some small amount of zero shift. The AG-100 employs a front panel FINE ZERO adjustment which may be used to cancel this shift. Proceed in the following manner:

1. Establish a no-stimulus condition on the AG-100's transducer by removing any pressure from it.

2. Connect a voltmeter to the analog output terminals. (See Section 3.4).

3. Adjust the FINE ZERO potentiometer by use of a small screwdriver (through the hole provided in the lens) to give a 0-volt output. The display will read 0000.

FINE SPAN Adjustment

After the FINE ZERO has been adjusted, to determine if the span is properly adjusted, remove the lens and press the SHUNT CAL switch to determine if the number displayed is the same as that given on the Calibration Record. If it is not, “tweak” the FINE SPAN to give this number.

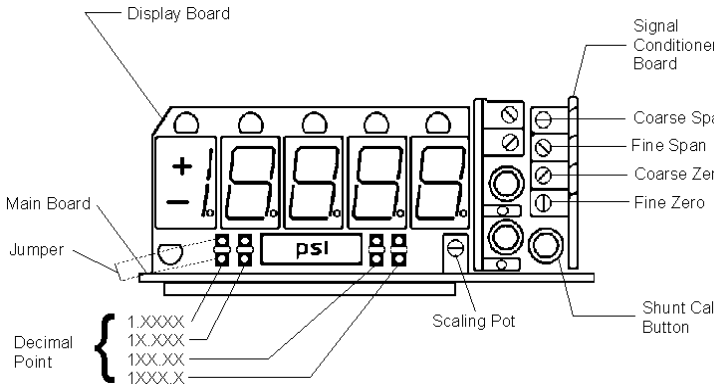

Figure 4-1 Main Unit Adjustment Locations

Chapter 5

RECALIBRATION

The AG-100 is normally ready to use as received because setup has been performed at the factory. The adjustments in this section are usually not performed, and are for making a completely new setup (like a “major field overhaul”).

The following instructions will serve to zero and recalibrate the amplifier circuits, located on the Amplifier Board. See Figure 4.1.

5.1 ZERO Adjustment

The adjustment of the no-signal zero indication is made first. For all of the adjustments in this section, the transducer has no pressure applied. If the AG-100 is an absolute pressure (psia) unit, a vacuum must be applied. Otherwise, the unit will read the present local barometric pressure (approximately 14.7 psia) and adjustment cannot be made using the ZERO adjustment only.

1. Remove the front lens.

2. Apply power to the AG-100 and allow about 10 minutes for warm-up.

3. Connect a digital voltmeter to read the analog output voltage of the AG-100.

4. Adjust the COARSE ZERO potentiometer (see Figure 4-1) to give an output voltage of about 0 volts. Then adjust the FINE ZERO potentiometer to bring this value exactly to 0 volts.

5.2 Full-Scale (Span) Adjustment

Span adjustment calibrates the gain of the amplifier section of the Amplifier Board to provide the proper voltage output for a given pressure. The shunt calibration feature of SENSOTEC instruments facilitates this adjustment.

A “Calibration Record” is shipped with each AG-100, listing the amplifier output voltage when the SHUNT CAL switch is pressed. This record also lists the displayed value under the same condition. Locate the Calibration Record for the AG-100.

1. Connect the digital voltmeter to the analog output voltage terminals.

2. Depress the SHUNT CAL switch.

3. Adjust the COARSE SPAN control to give the approximate shunt calibration output voltage as shown on the Calibration Record.

4. Adjust the FINE SPAN control to give the exact value given for shunt calibration output voltage on the Calibration Record.

5.3 Scaling Adjustment

Scaling adjustment permits the AG-100 to display values in engineering units desired by the customer. Scaling adjustment establishes the ratio between the voltage output of the AG-100 and its displayed value. The SCALING potentiometer is located on the Main Board, as shown in Figure 4-1. The engineering units to be displayed are given on the Calibration Record.

1. Depress the SHUNT CAL switch.

2. Adjust the SCALING potentiometer to yield the displayed value from the Calibration Record.

5.4 Miscellaneous Adjustments

Decimal Point Selection

Figure 4-1 shows jumper location for decimal point selection. Move the jumper to the desired position.

Chapter 6

OPTIONS

The AG-100 offers optional Peak, Limit or Track-and-Hold outputs. .

Table 6-1: 25-PIN D-SUBMINIATURE WIRING

pin	Option		
	Limits	Peak	Track/Hold
1	N/C	N/C	N/C
2	N/C	N/C	N/C
3	N/C	N/C	N/C
4	N/C	N/C	N/C
5	N/C	N/C	N/C
6	N/C	N/C	N/C
7	ground	ground	ground
8	N/C	N/C	N/C
9	N/C	MODE SEL	$\overline{\text{HOLD}}$
10	N/C	RESET	N/C
11	N/C	COMMON	COMMON
12	N/C	PEAK OUTPUT	N/C
13	N/C	AMP OUTPUT	AMP OUTPUT
14	L1 N.O.	N/C	N/C
15	L1 COM	N/C	N/C
16	L1 N.C.	N/C	N/C
17	L2 N.O.	N/C	N/C
18	L2 COM	N/C	N/C
19	L2 N.C.	N/C	N/C
20	N/C	N/C	N/C
21	N/C	N/C	N/C
22	N/C	N/C	N/C
23	N/C	N/C	N/C
24	ANALOG OUTPUT		
25	ANALOG RETURN		

6.1 The Limits Option

Figure 6-1 illustrates location of the limits option board adjustments. The Limits option allows the transducer output signal to be continuously compared to two adjustable set points called “limits”. The limits are designated L1 and L2. This option uses relay outputs which are energized when the signal level exceeds the limit setting, as illustrated in Figure 6-2. LED indicators, visible through the front panel, light when the relays are energized. The present setting of the limits may be viewed by pressing the front panel L1 or L2 switches.

Form C contacts are used on the limits so that exceeding a limit may result in a contact closing (using the N.O. and COM terminals) or a contact opening (using the N.C. and COM terminals).

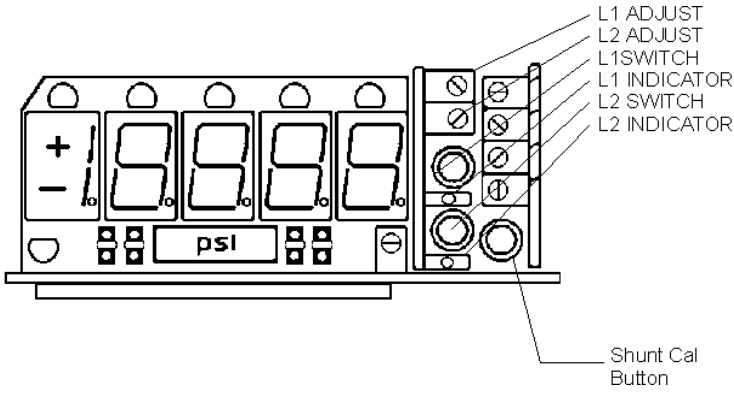

Figure 6-1 Limits Option Board Locations

Setting the LIMITS Adjustments

1. Remove the lens.

2. Depress the LIMITS push-button (L1 or L2) to display the present setting of the limit.

3. Adjust the proper (L1 or L2) LIMITS potentiometer to give the proper limits value on the display.

4. Reinstall the lens.

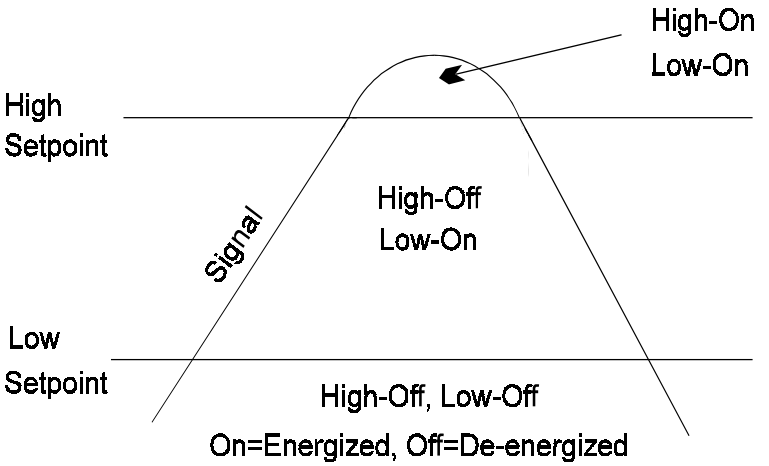

Figure 6-2 How Limits Work

Limit Polarity and Hysteresis

If a limit de-energizes at the same level at which it is energized, a noisy input signal will cause the limit to chatter, eventually destroying the relay. For this reason, the AG-series Limits option contains “hysteresis,” a 1% difference between the energizing point and the de-energizing point of the limit. This 1% difference should always be between the limit setpoint and zero. For a positive setpoint the signal would rise, activating the limit; when the signal drops, it must drop to 1% below the setpoint before the relay will de-energize. For negative setpoints, where the setting of the limit is a negative value, it is necessary to reverse the hysteresis polarity (see Figure 7-3). At the factory, all limit hysteresis jumpers are set for a positive setpoint. If a negative setpoint is to be used, proceed as follows:

1. Unplug the AC power and remove the limits options circuit board from the case.

2. Locate the hysteresis jumper for the particular limit (either L1 or L2). Place the jumper in the correct location to correspond to the polarity of the limit setpoint (See Figure 7-3).

3. Replace the Options board and reinstall the case and lens.

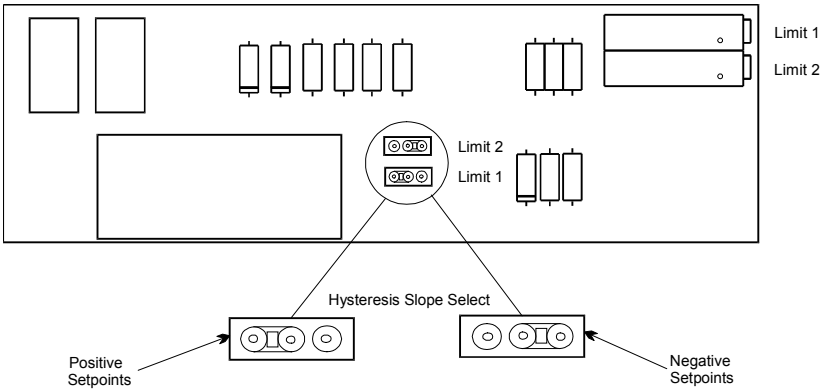

Figure 6-3 Hysteresis Jumpers on Options Board

6.2 Peak Detector Option

The AG-series Peak Detector option detects the highest positive value which has been attained by the signal since the peak detector was last reset. Reset may be accomplished by pressing the RESET button on the front panel, or by interconnecting the RESET and COMMON terminals on the Options connector (25 pin). The front panel PEAK switch will cause the peak value to be displayed in either vertical position. The up position is momentary. When released, the switch will return to tracking the input. In the down position of the PEAK switch, the peak value will be continuously displayed. Further, the PEAK OUT terminal will constantly monitor the output of the peak detector signal; the AMP OUT terminal will constantly monitor the amplifier (non-peak) output signal. The ANALOG OUTPUT terminals will monitor the output of the peak detector when one of two conditions occur:

1. The front panel PEAK switch is in either vertical (up, or down) position,

or

2. The MODE SEL and COMMON terminals on the Options connector are interconnected.

6.3 Track-and-Hold Option

The AG-series Track-and-Hold option permits the instrument to stop tracking an input signal upon command. This command can be issued by connecting the rear-connector's HOLD terminal with the COMMON terminal. When the Track-and-Hold feature is in the "hold" mode, the front panel HOLD light will be lighted. Potentiometers on the Track-and-Hold board permit small erros of zero and span to be tuned out, so that true tracking results.

The ANALOG OUTPUT and ANALOG OUTPUT RETURN terminals will track the input signal unless the HOLD mode is active.

Chapter 7

WARRANTY AND REPAIR POLICY

7.1 Limited Warranty on Products

Any of our products which, under normal operating conditions, proves defective in material or in workmanship within one year from the date of shipment by SENSOTEC, will be repaired or replaced free of charge provided that you obtain a return material authorization from SENSOTEC and send the defective product, transportation charges prepaid with notice of the defect, and establish that the product has been properly installed, maintained, and operated within the limits of rated and normal usage. Replacement or repaired product will be shipped F.O.B. our plant. The terms of this warranty do not extend to any product or part thereof which, under normal usage, has an inherently shorter useful life than one year. The replacement warranty detailed here is the buyer's exclusive remedy, and will satisfy all obligations of SENSOTEC whether based on contract, negligence, or otherwise. SENSOTEC is not responsible for any incidental or consequential loss or damage which might result from a failure of any SENSOTEC product. This express warranty is made in lieu of any and all other warranties, express or implied, including implied warranty of merchantability or fitness for particular purpose. Any unauthorized disassembly or attempt to repair voids this warranty.

7.2 Obtaining Service Under Warranty

Advance authorization is required prior to the return to SENSOTEC. Before returning the items, either write to the Customer Service Department, c/o SENSOTEC, Inc., 2080 Arlingate Lane, Columbus, Ohio 43228, or call (614) 850-5000 with: 1) a part number; 2) a serial number for the defective product; 3) a technical description (with information to assist us in understanding the application and the observed difficulty) of the defect; 4) a no- charge purchase order number (so products can be returned to you correctly); and 5) ship and bill addresses. Shipment to SENSOTEC shall be at buyer's expense and repaired or replacement items will be shipped F.O.B. our plant in Columbus, Ohio. Non-verified problems or defects may be subject to an evaluation charge. Please return the original calibration data with the unit.

7.3 Obtaining Non-Warranty Service

Advance authorization is required prior to the return to SENSOTEC. Before returning the item either write to the Customer Service Department, c/o SENSOTEC, Inc., 2080 Arlingate Lane, Columbus, Ohio 43228, or call (614) 850-5000 with: 1) a part number; 2) a serial number for the defective product; 3) a technical description (with information to assist us in understanding the application and the observed difficulty) of the defect; 4) a purchase order number to cover SENSOTEC's repair cost; and 5) ship and bill addresses. After the product is evaluated by SENSOTEC, we will contact you to provide the estimated repair costs before proceeding. Shipment to SENSOTEC shall be at buyer's expense and repaired items will be shipped to you F.O.B. our plant in Columbus, Ohio. Please return the original calibration data with the unit.

7.4 Repair Warranty

All repairs of SENSOTEC products are warranted for a period of 90 days from date of shipment. This warranty applies only to those items which are found defective and repaired, and does not apply to products in which no defect was found and returned as is or merely recalibrated. Out-of-warranty products may not be capable of being returned to the exact original specifications or dimensions.

GLOSSARY OF TERMS

ACCURACY -- The combined error of nonlinearity, repeatability, and hysteresis expressed as a percent of full-scale output.

CHARACTERS DISPLAYED -- The number of digits in a display. Some of the digits may be active (part of the quantizing process), and some may be passive (displaying a constant zero).

COMMON-MODE REJECTION -- The ability of an instrument to reject the effects of signals such as noise, that appear on all signal lines. Expressed as a logarithmic ratio at a particular maximum voltage.

CONVERSIONS PER SECOND -- The number of times per second that an analog-to-digital converter ranges and quantizes a given input.

COUNTS -- The total number of steps of resolution of an instrument.

dB -- 20 times the logarithm to the base 10 of the ratio of two numbers.

DIN (DEUTSCHE INDUSTRIE NORM) -- A set of German standards, now being recognized throughout the world. A 3/8 DIN standard specifies an outer bezel dimension of 144 mm (5.66") x 72 mm (2.83").

EXCITATION -- The voltage applied to the strain-gage transducer or amplified cell by the signal conditioning device.

FREQUENCY RESPONSE -- The range of frequencies over which the output voltage will follow the sinusoidally-varying stimulus input within the specified accuracy of the instrument.

FULL-SCALE OUTPUT -- The maximum output derived from the signal conditioner when the transducer is at its full scale value. For example, a 100 psi pressure applied to a 100 psi transducer will cause a full-scale output from the signal conditioner. Full- scale output is usually 5 volts.

GAIN RANGE -- The range of signal multiplication factors for a given signal conditioner.

INPUT IMPEDANCE -- The resistance of the input circuit of a signal conditioner. If this value is large, the signal conditioner will not load the transducer output excessively.

LINEARITY -- The maximum deviation of a calibration curve from the best-fit straight line calibration curve, expressed as a percentage of full-scale value.

LSD (LEAST SIGNIFICANT DIGIT) -- The right-most active digit in a display.

MSD (MOST SIGNIFICANT DIGIT) -- The left-most digit in a display.

NOISE AND RIPPLE -- Noise is randomly-occurring low-level signal not related to the stimulus. Ripple is periodic noise, usually associated with the signal conditioner power supply. Both noise and ripple limit the ability of a signal conditioner to handle small signals.

RESOLUTION -- The smallest change in input signal which produces a one-digit change in the display.

SHUNT-CAL -- The change in electrical output of a transducer which is caused by momentarily placing a fixed, known resistance between one leg of a strain-gage transducer and one of the excitation leads. This causes the bridge to become unbalanced by a precise, known amount, and permits the verification of proper gain in the signal conditioning system.

SIGNAL CONDITIONER -- An instrument which provides precise electrical drive to a transducer, and accepts and amplifies the transducer output. It may also digitize and display the output in engineering units.

SPAN ADJUSTMENT -- The ability to adjust the gain of a signal conditioner so that a specified display span in engineering units corresponds to a specified signal span.

ZERO ADJUSTMENT -- The adjustment of the displayed value to zero when no output signal is being issued by the transducer.