## King Jahd University of Petroleum and Minerals

University Diploma Program
Electronic Equipment Maintenance
Lab Instructor: Muhammad Ajmal Khan

EET-027, Experiment #8

# Strain Gauge Measurement by Applying Displacement using Strain Indicator

#### **Objectives:**

Measuring strain when the strip end is displaced in the strain gauge micrometer device.

#### **Apparatus:**

Strain gauge

Staring gauge micrometer

Different Weights 1 kg, 2k, 5 kg.

Strain Indicator

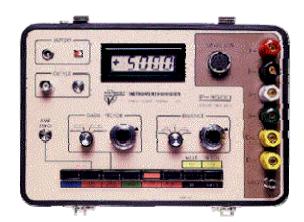
### Theory:

The strain gauge is a transducer employing electrical resistance variation to sense the strain produced by a force or weight. It is a very versatile detector for measuring weight, pressure, mechanical force, or displacement.

The Model P-3500 Strain Indicator is a portable, battery-powered instrument with unique features for use in stress analysis testing, and for use with strain gage based transducers. In use, the operator follows a logical sequence of setup steps by activating color-coded push-button controls to prepare the instrument for making accurate and reliable measurements. The P-3500 also incorporates a highly stable DC amplifier, precisely regulated bridge excitation supply, and precisely settable gage factor controls.

Static measurements are displayed directly on the indicator's readout with 1 micro-strain resolution. The instrument will accept full-, half-, or quarter-bridge strain gage inputs, and all required bridge completion components for 120, 350 and 1000 ohm gages are built in.

Gage factor is precisely settable (to a resolution of 0.001) by a front-panel 10-turn potentiometer, and is displayed on the digital readout when the gage factor push button is depressed.



**Strain Indicator P-3500 Front Panel** 

#### **Procedure:**

#### 1. Measuring Strain using Strain Indicator:

The P-3500 is designed for ease of operation, the push-button switches and front panel controls are arranged such that the proper setup procedure generally follows a straightforward left-to-right sequence. To measure the strain, the steps is outlined below:

- 1. Select 1/4-1 /2 position of BRIDGE push button.
- 2. Select XI position of MULT push button.
- 3. Connect strain gage to binding posts connector. These binding posts are color-coded in accordance with conventional practice, and are clearly labeled. Input connections are shown on the inside cover of the instrument.
- 4. Depress AMP ZERO push button. Allow instrument to warm up for two minutes minimum. Set AMP ZERO control for a readout display of ±0000. This adjustment must be made with MULT in XI position.
- 5. Depress GAGE FACTOR push button. Set GAGE FACTOR range switch and GAGE FACTOR control for the desired gage factor.
- 6. Depress the RUN push button. Set the BALANCE switch and the BALANCE control for a reading of  $\pm 0000$ . This setting must be made with the MULT in the XI position.

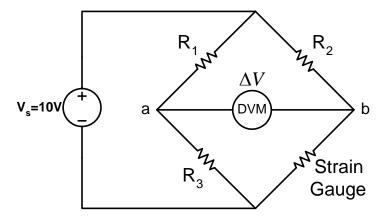
- 7. Depress the CAL push button and verify calibration of the instrument.
- 8. Select the Xl or Xl 0 MUL T position as required.
- 9. Depress the RUN push button. Displace the end of strip and record the reading of strain in the table 1.
- 10. Plot the graph of Strain versus Resultant Displacement and find the slope of the graph and find strain at displacement of 0.115 inch from graph.

Table 1

S. No.	Displacement (inch)	Resultant Displacement (x-a) (inch)	Strain (micro-strain)
1	a =		0
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			

## 2. Measuring Differential Voltage of Full Bridge Circuit when Strip is displaced:

1. Connect strain gauge with the bridge circuit as shown the following figure. Set the power supply to 10 Volts and all three resistances are 120 ohms.



- 2. Find the voltage difference ( $\Delta V$ ) across nodes "a" and "b" using digital volt-meter (DVM) without any displacement and record the value in the table 2.
- 3. Apply some displacement using micrometer and find the voltage difference ( $\Delta V$ ) using digital volt-meter (DVM) and record the values in the following table 2.
- 4. Plot the graph of differential voltage versus Resultant Displacement and find the slope of the graph and find the differential voltage at displacement of 0.115 inch from graph.

Table 1

S. No.	Displacement (inch)	Resultant Displacement (x-a) (inch)	Differential Voltage (Volts)
1	a =		0
2			
3			
4			
5			
6			
7			
8			

9		
10		

### **Conclusions:**

Compare the slope of the two graphs? And write your comments.