MODULE CONTENT

| Unit of Competency | **PERFORM MENSURATION AND CALCULATION** |
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| Module Title | **PERFORMING MENSURATION AND CALCULATION** |
| Module Descriptor | This unit covers the knowledge, skills and attitudes in identifying, caring , handling and using measuring instruments. |
| Nominal Duration | **Hours** |
| Summary of the Learning Outcomes: | |
| Upon completion of this module the student must be able to: | |
| LO1. Select measuring instruments | |
| LO2. Carry out measurements and calculation | |
| LO3. Maintain measuring instruments | |

**LEARNING EXPERIENCES**

**LEARNING OUTCOMES NO. 2**

**CARRY OUT MEASUREMENTS AND CALCULATION**

| **Learning Activities** | **Special Instructions** |
| --- | --- |
| Read Information Sheet 3.1-1 Select measuring instruments | If you have some problem on the content of the information sheet don’t hesitate to approach your Trainer.  If you feel that you are now knowledgeable on the content of the information sheet, you can now answer self-check provided in the module. |
| Answer Self-Check 3.1-1 on Select measuring instruments | Try to answer the Self-check without looking at the Answer Key  Compare your answer to Answer Key 3.1-1 |
| Observe Trainer’s demonstration on Task Sheet 3.1-1 on Select measuring instruments | Listen carefully and attentively so that you may be able to perform a task correctly  Ask questions if are in doubt for clarification |
| Perform the Task Sheet 3.1-1 on Select measuring instruments | Remember the step-by-step procedure the Select measuring instruments |
| Evaluate the performance using the Performance Criteria Checklist 3.1-1 | Repeat the task in case fail to meet the criteria |

**INFORMATION SHEET 1.1-1**

**CARRY OUT MEASUREMENTS AND CALCULATION**

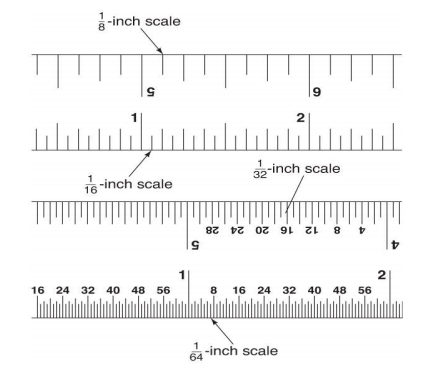
**Learning Objectives:**

After reading this **Information Sheet**, you must be able to:

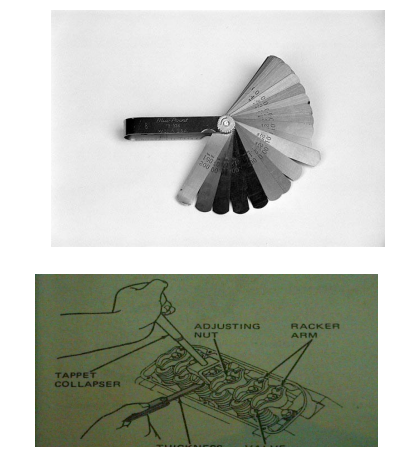
1. Object or component to be measured is identified
2. Correct specifications from relevant source are obtained
3. Correct specifications from relevant source are obtained

**Precision Measuring Instruments**

1. **Rule/Steel rule:** The simplest tool used for measuring linear distances



1. **Thickness gauges/Feeler gauges -**are strips and blades of metal of various thicknesses. -They are used to measure small gaps or distances such as the clearance between two parts.



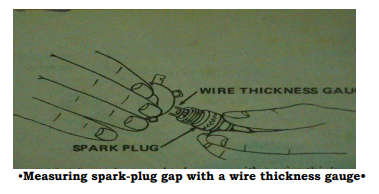
•Use a thickness gauge/feeler gauge to check the clearance between an engine rocker arm and valve stem

1. **Wire gauges**

-are precisely-sized pieces of round wire.

-the diameter is usually marked on the handle or holder.

- it measured the sparkplug gaps and other openings.

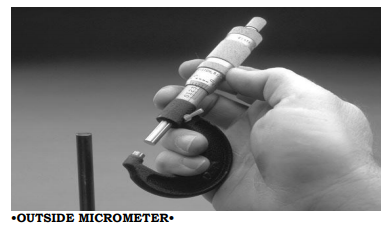


**4. Micrometer**

- a hand-held precision measuring instrument.

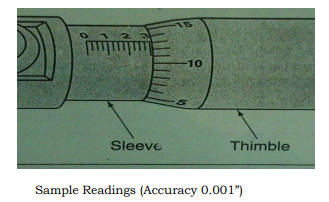
- in English metric system, it measures thicknesses in thousandths or ten-thousandths of an inch, while in Metric measurements are in hundreds or millimeter.

- there are two kinds, the inside and outside micrometer. The outside micrometer is used most in the automotive shops.



**•Reading the USC MICROMETER**

The English metric system or ―inch micrometer‖ reads in thousandths of an inch. Some read in ten-thousandths. To read the micrometer look at both the revolution line and the thimble position. Every revolution of the thimble moves it exactly one marking on the revolution line. Each marking means twenty-five thousandths (0.025) of an inch. The markings on the thimble run from 0-24. There are 25 markings on the thimble. When the thimble is turned enough for its next mark to align with the revolution line, the spindle has moved 0.001 inch.



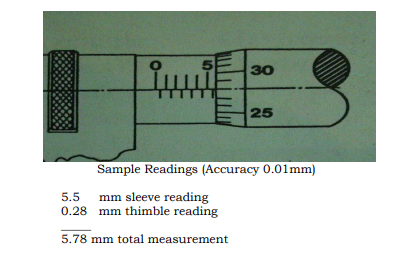
0.300 inch sleeve reading

0.013 inch thimble reading \_\_\_\_\_

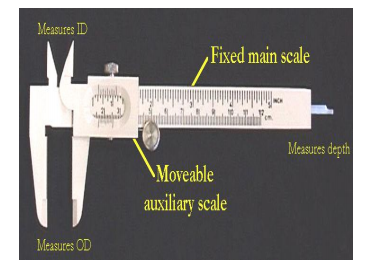
0.313 inch total measurement

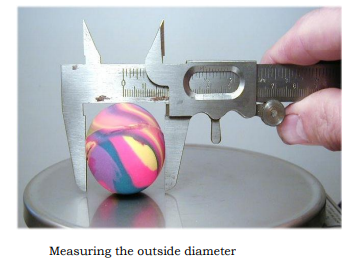
**• Reading the METRIC MICROMETER**

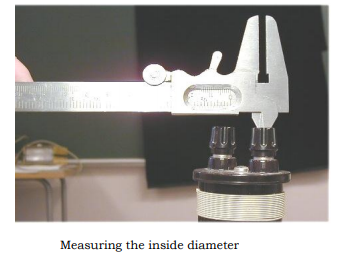
The metric micrometer reads in hundredths of a millimeter. You read directly from the revolution or reading line on the barrel, and the thimble. Millimeter marks above the reading line and half millimeter marks are below. In figure below, the thimble is backed off to show the 10(10mm) mark on the reading line, plus one of the upper markings (1.0mm). This makes 11 mm. To this, add the thimble markings of 45 (0.45mm). The total reading is 11.45mm. One complete revolution of the thimble moves it along the reading line 0.50mm.

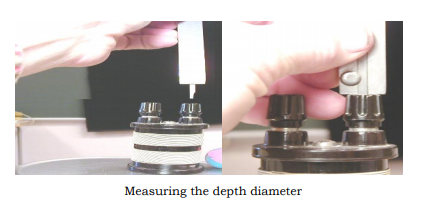


**5. Vernier Caliper** -can take both inside and outside measurements. These may be in either thousandths of an inch or hundredths of a millimeter.



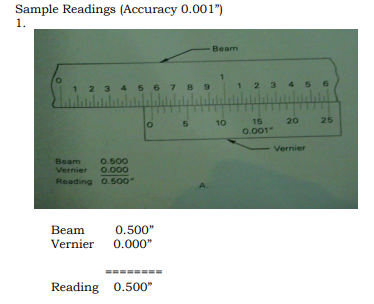


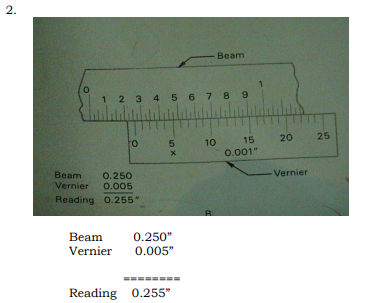


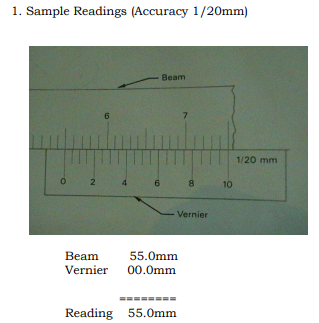


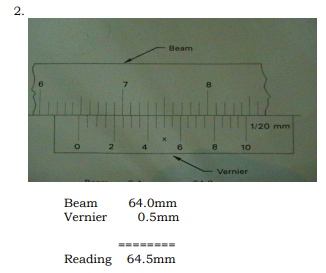
**Reading a Vernier Caliper**

-you first read the beam and then you add what you have read on the vernier scale. One graduation on the vernier scale will match a mark on the beam, except in the case, the zeros at each of the vernier will match marks on the beam.



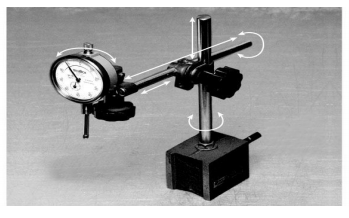


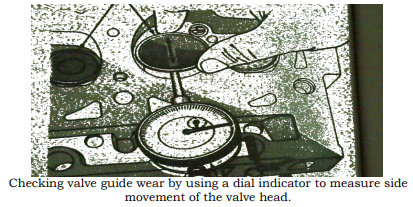




**6. Dial indicators**

-It has a dial face and a needle to register measurements. The needle moves in relation to movement of a movable arm or plunger. As the plunger moves, the needle shows the distance or variation. The reading may be in thousandths of an inch or hundredths of a millimeter.





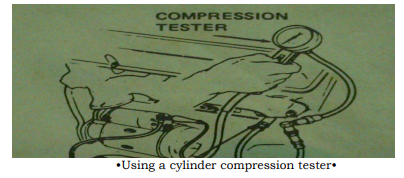
**7. Plastigage**

- a plastic material available in strips of various diameters.

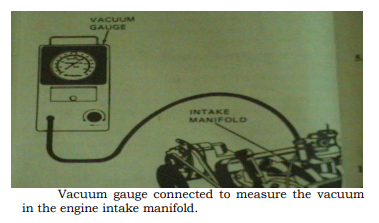
-use to measure the clearance in crankshaft main bearings and connecting rod bearings, and in some camshaft bearings.

**Electric/Electronic Testing Measuring Instrument**

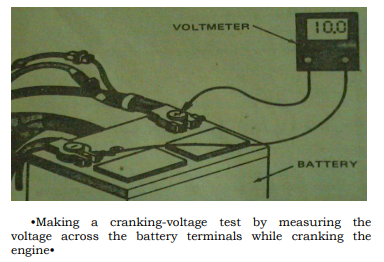
**1.Compression tester** this is used to test the compression pressure of the individual cylinders by inserting the compression tester in place of the spark plug.



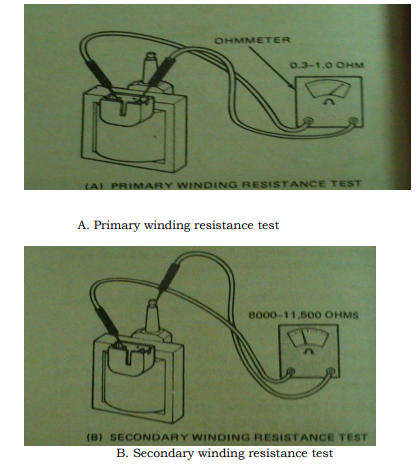
**2.Vacuum Gauge** this is used to track down troubles in an engine that does not run as well as it should. -it measures intake manifold vacuum.



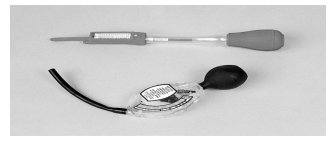
**3. Voltmeter** this is a device for measuring the potential difference of voltages between two points such as the terminals of battery alternator or two points in an electric circuit.

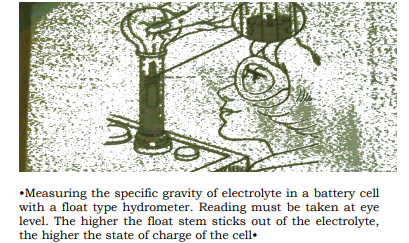


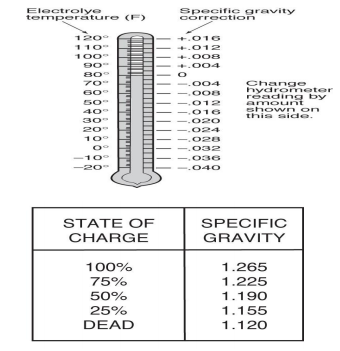
**4. Ohmmeter** this is an instrument used to measure the electrical resistance.



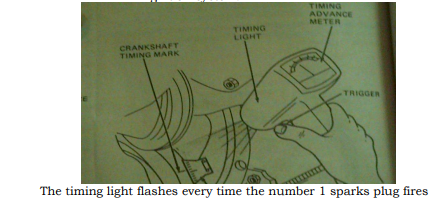
**5. Hydrometer** a device used to measure the specific gravity of battery electrolyte to determine the state of charge.







**6. Timing light** this is used in setting a perfect timing for the spark plug to give of electric spark during combustion in the ignition system.



**7. Engine Analyzer** a testing equipment used to find out common engine troubles, be they mechanical or electrical.

**8. Oscilloscope** used for diagnosing ignition and other electrical problems.

**9. Dynamometer** used by big service shops in checking engine power performance.

**10. Tachometer** this is a device for measuring engine speed or revolutions per minute (rpm)