



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35.



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DEPARTMENT OF AUTOMOBILE ENGINEERING

COURSE NAME : 19AUB204 – AUTOMOTIVE ELECTRICAL AND ELECTRONICS ENGINEERING

II YEAR / IV SEMESTER

Unit 4 – Sensors and Actuators

Topic : Crankshaft Position Sensor



CRANKSHAFT POSITION SENSOR



- ❖ The crankshaft position sensor (CPS) is a crucial component in modern internal combustion engines.
- ❖ It's responsible for monitoring the position and rotational speed of the crankshaft, which is essential information for the engine control unit (ECU) to determine the precise timing of fuel injection and ignition spark.
- ❖ This sensor typically works by generating a signal based on the position of teeth or slots on the crankshaft's gear or wheel.
- ❖ The ECU uses the data from the crankshaft position sensor to synchronize the fuel injection and ignition timing, ensuring optimal engine performance and efficiency.



COMPONENTS



- ❖ **Sensor:** The sensor itself is typically a Hall effect sensor or a magnetic reluctance sensor. It generates a signal in response to the magnetic field changes caused by the rotation of the crankshaft.
- ❖ **Mounting Bracket:** The mounting bracket securely holds the sensor in place near the crankshaft. It ensures proper alignment and distance between the sensor and the rotating parts of the engine.
- ❖ **Connector and Wiring:** The sensor is connected to the engine control unit (ECU) or engine management system through a wiring harness. The connector facilitates the electrical connection between the sensor and the ECU.



COMPONENTS



- ❖ **Trigger Wheel or Tone Ring:** In some designs, the crankshaft is equipped with a trigger wheel or tone ring. This wheel has evenly spaced teeth or slots that pass by the sensor as the crankshaft rotates. These teeth or slots generate the signal detected by the sensor.
- ❖ **Alignment Notches or Marks:** To ensure accurate installation, there are often alignment notches or marks on both the sensor and the engine block or mounting bracket. These help technicians align the sensor correctly during installation.



PRINCIPLE USED



- ❖ The Hall effect principle involves a semiconductor element within the sensor that produces a voltage when exposed to a magnetic field.
- ❖ As the teeth or slots of the trigger wheel pass by the sensor, they cause changes in the magnetic field.
- ❖ These changes in the magnetic field alter the conductivity of the semiconductor material, resulting in a voltage signal proportional to the position and speed of the crankshaft.
- ❖ This voltage signal is then used by the ECU for engine control



WORKING



- ❖ The CPS is installed near the crankshaft of the engine, typically on the engine block or timing cover.
- ❖ It's positioned in close proximity to a trigger wheel or tone ring mounted on the crankshaft.
- ❖ The crankshaft is often equipped with a trigger wheel or tone ring, which has evenly spaced teeth or slots.
- ❖ As the crankshaft rotates, these teeth or slots pass by the CPS.
- ❖ When the teeth or slots of the trigger wheel pass by the CPS, they cause changes in the magnetic field or affect the semiconductor material within the sensor.



WORKING



- ❖ These changes in the magnetic field or semiconductor conductivity induce a voltage signal in the sensor.
- ❖ The amplitude and frequency of this voltage signal correspond to the position and speed of the crankshaft.
- ❖ The voltage signal generated by the CPS is sent to the engine control unit (ECU) or engine management system.
- ❖ The ECU processes this signal to determine the precise position and rotational speed of the crankshaft.



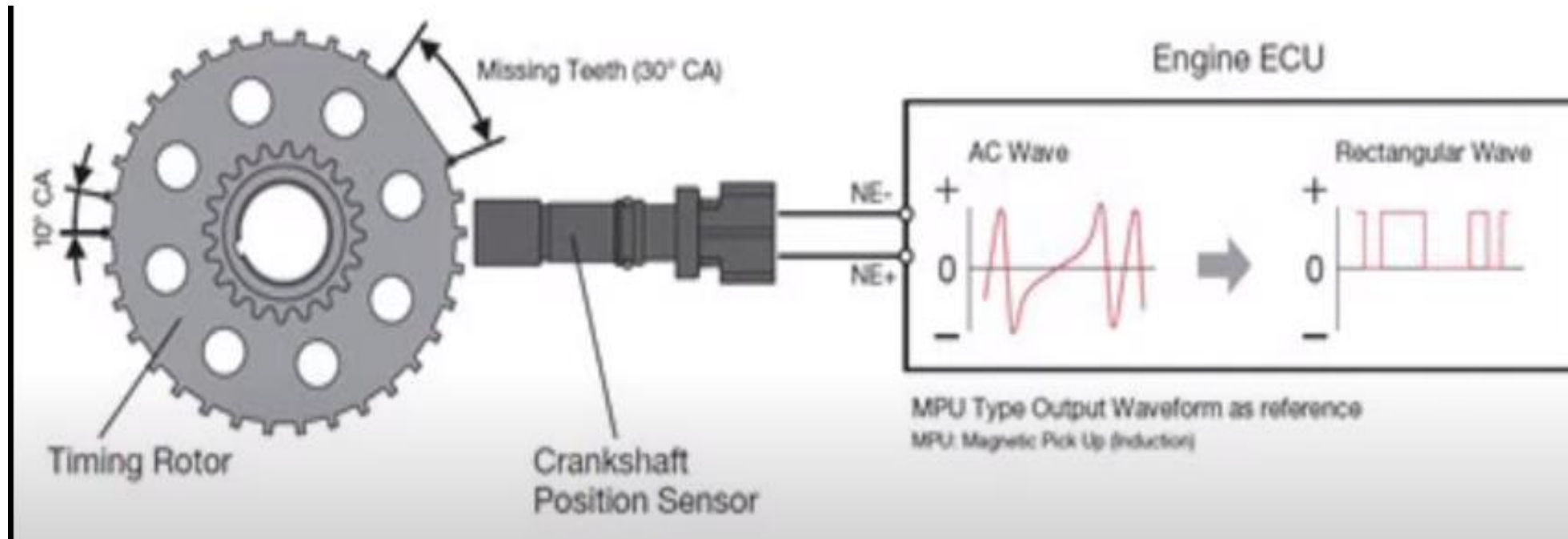
WORKING



- ❖ Based on the data received from the CPS, the ECU controls various engine functions, including ignition timing and fuel injection.
- ❖ By adjusting these parameters according to the position and speed of the crankshaft, the ECU ensures optimal engine performance, efficiency, and emissions control.



WORKING





ADVANTAGES AND DISADVANTAGES



ADVANTAGES

- ❖ Improved Engine performance
- ❖ Enhanced engine control
- ❖ Reduce Emission

DISADVANTAGES

- ❖ Potential for Sensor Damage
- ❖ Complexity in Diagnosis and Repair
- ❖ Compatibility Issue



APPLICATIONS



- ❖ Automotive Engine
- ❖ Motorcycle and ATV
- ❖ Marine Engine
- ❖ Generator set



THANK YOU !!!