Parvath

Explore the Energy

- Open ECU Development
- Engine Management System Development
- HIL Test Bench Design & Development for POC
- Consultation/Training

EMS Test Bench

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About EMS Test Bench

Modern engines have more sensors and actuators for improved performance, efficiency, and emission management. Therefore, apart from reading the working principles theoretically, it is essential to comprehend the workings of these sensors and actuators in more depth and how they help meet engine requirements in different driving conditions. **The Engine Management System (EMS) Test Bench** was developed based on this objectivity. Through this EMS test bench, any engineer can simulate and investigate real-time engine behavior.

Key Exploration:

Mechanical Thermal - Automobile Engineering

1. Experimental study on the Fuel Injection system

1. Start of Injection calibration (Study about when to start the fuel injection. At TDC, Before or After TDC)
2. Duration of the injection (Study about the fuel calibration which depends on the engine speed & load)
3. Compensation calibration for the injector (Pressure, Temperature, Altitude, Battery Voltage, Transient).

2. Experimental study on the Fuel Ignition system

1. Start of Ignition calibration (Advance and Retard)
2. Calibration for Dwell time and its Compensation

3. How these three calibration helps to achieve better performance, higher efficiency and lower emissions.

Electrical-Electronics-Mechatronics Engineering

Hardware:

1. Sensors and Actuators used in the Automotive
2. Microcontroller Architecture.
3. Actuators Driver circuit design & development.
4. Wiring Harness Design & Development.

Software:

1. Reading the Sensors Value in Controller. (Includes sensor calibration, ADC conversion)
2. Software development to get the efficient Actuators result. (Open loop, close loop (PID) control system)
3. Overview on the software architecture for the Electronic Control Unit

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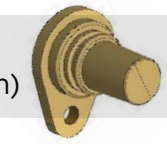
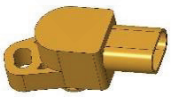
Sensors

Crank Sensor	**Working principle is Hall effect.** This sensor measures the Engine rotational speed (Rpm)
Throttle Position Sensor	**Working principle is Potentiometer.** It measures the throttle position, calculates the air flow rate based on this data, and then estimates the fuel flow accordingly.
Manifold Absolute Pressure (MAP) Sensor	**Working principle is Piezo electric.** It measures the intake manifold pressure, which is also helpful for determining the air density and calculating the final air flow.
Inlet Air Temperature	**Working principle is NTC.** It measures the intake air temperature, which is also helpful for determining the air density and calculating the final air flow.
Engine Oil Temperature (EOT)	**Working principle is NTC.** This sensor measures the engine oil temperature.

Actuators

Ignition Coil	Working principle is electromagnetic induction
Spark plug	Generally, the spark is generated at the end of the compression stroke. It is connected to the HT coil.
Injector	Working principle is Saturated type.
Fuel pump	12 V, DC Electric Fuel pump. Pressure range 2-4 bar




Controller

Processor	**16 Bit**
Ram & EEPROM	**16Kb & 4Kb**
Flash	**256 Kb**
Communications	**Serial to USB and K -Line**

Others

Electric Motor	12 V DC, Speed- 3550 rpm, Current No load- 1 A, with load - 12 A, Power 100 W.
Motor Speed Regulator	Working Voltage - DC 10 - 60 V, Maximum Current - 20 A, PWM frequency - 25 kHz
Vacuum Generator	It is connected with the MAP sensor. To simulate the real time engine intake condition, vacuum is generated.
Throttle body	It controls the amount of air entering an engine.
Trigger Wheel	24-2 trigger Wheel is used. It is used to detect engine speed and TDC- It is mounted on the DC Motor.
Accelerator	Throttle body is actuated by Accelerator
Wiring Harness	All the sensor & actuator is connected with ECU through Wiring Harness.
Switches	1. Main Power supply, 2. DC Motor, 3. Injector & Ignition.
Fuel Tank	Capacity — 8 liter.
Fuel Gauge	It shows the fuel pressure.
Battery	12 V batter used for the power supply
EMS Test Bench Frame	Aluminium channel and Acrylic sheet

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At Parvath Tech, we understand the unique nature of each research and development project, demanding a personalized approach.

Our solutions are meticulously crafted to fit specific project requirements, ensuring efficiency without unnecessary complexity. This approach allows our clients to focus on core objectives without technical burdens, empowering them to push the boundaries of research and development.

As catalysts for progress, we seamlessly translate visionary ideas into reality, ushering in an era where innovation knows no bounds.

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