

ENGINE CONTROL (1MZ-FE)

SYSTEM OUTLINE

THIS SYSTEM UTILIZES AN ENGINE CONTROL MODULE (ENGINE AND ELECTRONIC CONTROLLED TRANSMISSION ECU) AND MAINTAINS OVERALL CONTROL OF THE ENGINE, TRANSMISSION AND SO ON. AN OUTLINE OF THE ENGINE CONTROL IS EXPLAINED HERE.

1. INPUT SIGNALS

- (1) **ENGINE COOLANT TEMP. (WATER TEMP.) SIGNAL CIRCUIT**
THE ENGINE COOLANT TEMP. SENSOR (WATER TEMP. SENSOR) DETECTS THE ENGINE COOLANT TEMP. AND HAS A BUILT-IN THERMISTOR WITH A RESISTANCE WHICH VARIES ACCORDING TO THE WATER TEMP. IS INPUT INTO **TERMINAL THW** OF ENGINE CONTROL MODULE (ECU) AS A CONTROL SIGNAL.
- (2) **INTAKE AIR TEMP. SIGNAL CIRCUIT**
THE INTAKE AIR TEMP. SENSOR IS INSTALLED IN THE MASS AIR FLOW (AIR FLOW METER) AND DETECTS THE INTAKE AIR TEMP. WHICH IS INPUT AS A CONTROL SIGNAL TO **TERMINAL THA** OF ENGINE CONTROL MODULE (ECU).
- (3) **OXYGEN SENSOR SIGNAL SYSTEM**
THE OXYGEN DENSITY IN THE EXHAUST GASES IS DETECTED AND INPUT AS A CONTROL SIGNAL TO **TERMINAL OXL, OXR AND OXS** OF THE ENGINE CONTROL MODULE (ECU). TO MAINTAIN STABLE DETECTION PERFORMANCE BY THE OXYGEN SENSOR, A HEATER IS USED FOR WARMING THE SENSOR. THE HEATER IS ALSO CONTROLLED BY THE ENGINE CONTROL MODULE (ECU) (**HTL, HTR AND HTS**).
- (4) **RPM SIGNAL SYSTEM**
CAMSHAFT POSITION AND CRANKSHAFT POSITION ARE DETECTED BY THE CAMSHAFT POSITION SENSOR AND CRANKSHAFT POSITION SENSOR. CRANKSHAFT POSITION IS INPUT AS A CONTROL SIGNAL TO **TERMINAL G22+** OF THE ENGINE CONTROL MODULE (ECU). AND ENGINE RPM IS INPUT TO **TERMINAL NE+**.
- (5) **THROTTLE SIGNAL CIRCUIT**
THE THROTTLE POSITION SENSOR DETECTS THE THROTTLE VALVE OPENING ANGLE AS A CONTROL SIGNAL. WHICH IS INPUT INTO **TERMINAL VTA** OF THE ENGINE CONTROL MODULE (ECU). WHEN THE VALVE IS COMPLETELY CLOSED, THE CONTROL SIGNAL IS INPUT INTO **TERMINAL IDL**.
- (6) **VEHICLE SPEED SIGNAL SYSTEM**
THE VEHICLE SPEED SENSOR (SPEED SENSOR) INSTALLED INSIDE THE COMBINATION METER, DETECTS THE VEHICLE SPEED AND INPUTS A CONTROL SIGNAL TO **TERMINAL SP1** OF THE ENGINE CONTROL MODULE (ECU).
- (7) **PARK/NEUTRAL POSITION SW (NEUTRAL START SW) SIGNAL SYSTEM**
THE PARK/NEUTRAL POSITION SW (NEUTRAL START SW) DETECTS WHETHER THE SHIFT POSITION IS IN NEUTRAL OR PARKING OR NOT, AND INPUTS A CONTROL SIGNAL TO **TERMINAL NSW** OF THE ENGINE CONTROL MODULE (ECU).
- (8) **A/C SW SIGNAL SYSTEM**
THE A/C AMPLIFIER INPUTS THE A/C OPERATIONS TO **TERMINAL A/C** OF THE ENGINE CONTROL MODULE (ECU) AS A CONTROL SIGNAL.
- (9) **BATTERY SIGNAL CIRCUIT**
VOLTAGE IS CONSTANTLY APPLIED TO **TERMINAL BATT** OF THE ENGINE CONTROL MODULE (ECU). WHEN THE IGNITION SW TURNED ON, VOLTAGE FOR ENGINE CONTROL MODULE (ECU) START-UP POWER SUPPLY IS APPLIED TO **TERMINALS +B AND +B1** OF ENGINE CONTROL MODULE (ECU) VIA EFT MAIN RELAY.
- (10) **INTAKE AIR VOLUME SIGNAL CIRCUIT**
INTAKE AIR VOLUME IS DETECTED BY THE MASS AIR FLOW (AIR FLOW METER) AND THE SIGNAL IS INPUT TO **TERMINAL VG** OF THE ENGINE CONTROL MODULE (ECU). AS A CONTROL SIGNAL.
- (11) **STA SIGNAL CIRCUIT**
TO CONFIRM WHETHER THE ENGINE IS CRANKING, THE VOLTAGE APPLIED TO THE STARTER MOTOR DURING CRANKING IS DETECTED AND THE SIGNAL IS INPUT INTO **TERMINAL STA** OF THE ENGINE CONTROL MODULE (ECU) AS A CONTROL SIGNAL.
- (12) **ENGINE KNOCK SIGNAL CIRCUIT**
ENGINE KNOCKING IS DETECTED BY THE KNOCK SENSOR NO. 1 AND NO. 2 AND THE SIGNALS ARE INPUT INTO **TERMINALS KNKR AND KNKL** AS A CONTROL SIGNAL.

Engine Control 1mz Manual

AW Rasmussen



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rays so this is not a partial reflection which can only occur when light is going from a higher index of refraction to a lower one so $n_3 > n_4$

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web 692 reflection and refraction of light p25 9 a as measured from the diagram the incidence angle is 60 and the refraction angle is 35 from snell s law $\sin \theta_1 / v_1 = \sin \theta_2 / v_2$ then $\sin 60 / 2 \times 10^8 = \sin 35 / v_2$ and the speed of light in the block is 20 10 8 ms b the frequency of the light does not change upon refraction

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