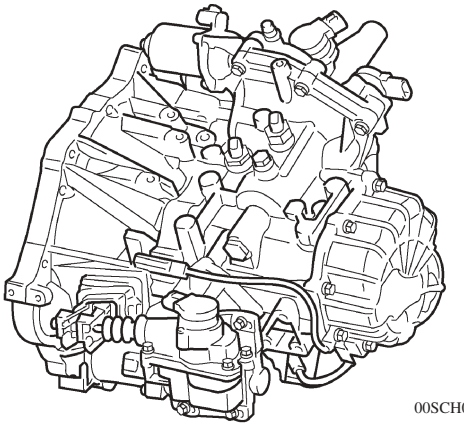
# MULTI-MODE MANUAL TRANSMISSION

## ■C53A AND C551A MULTI-MODE MANUAL TRANSMISSION SYSTEMS

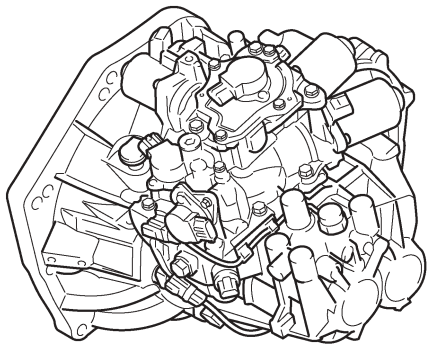
### 1. General

- C53A multi-mode manual transmission is used on the 1ND-TV engine model.
- C551A multi-mode manual transmission is used on the 1KR-FE and 2SZ-FE engine models.
- The multi-mode manual transmission system consists of two types of shift mode: the E-mode that shifts automatically to suit the driving conditions, and the M-mode that allows the driver to manually operate the shift lever to shift gears without applying the clutch. As a result, good fuel efficiency, ease of driving (in the E-mode) and a sporty drive (in the M-mode) have been realized.
- In the E-mode, the driver can select two shift patterns: the normal [E] pattern and sporty [Es] pattern.
- This system consists of C53A and C551A multi-mode manual transmissions, engine ECU, M-MT (Multi-mode Manual Transmission) ECU, LCC (Load Controlled Clutch cover), and shift lever. The C53A and C551A multi-mode manual transmissions are based on the C53 and C551 manual transaxles, to which clutch actuator, shift & select actuator, transmission revolution sensor, and neutral start switch have been added.
- The basic constructions and main operations of the multi-mode manual transmission system for the new model are same as those on the previous model (Pub. No. NCF244E).



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**C53A (1ND-TV)**



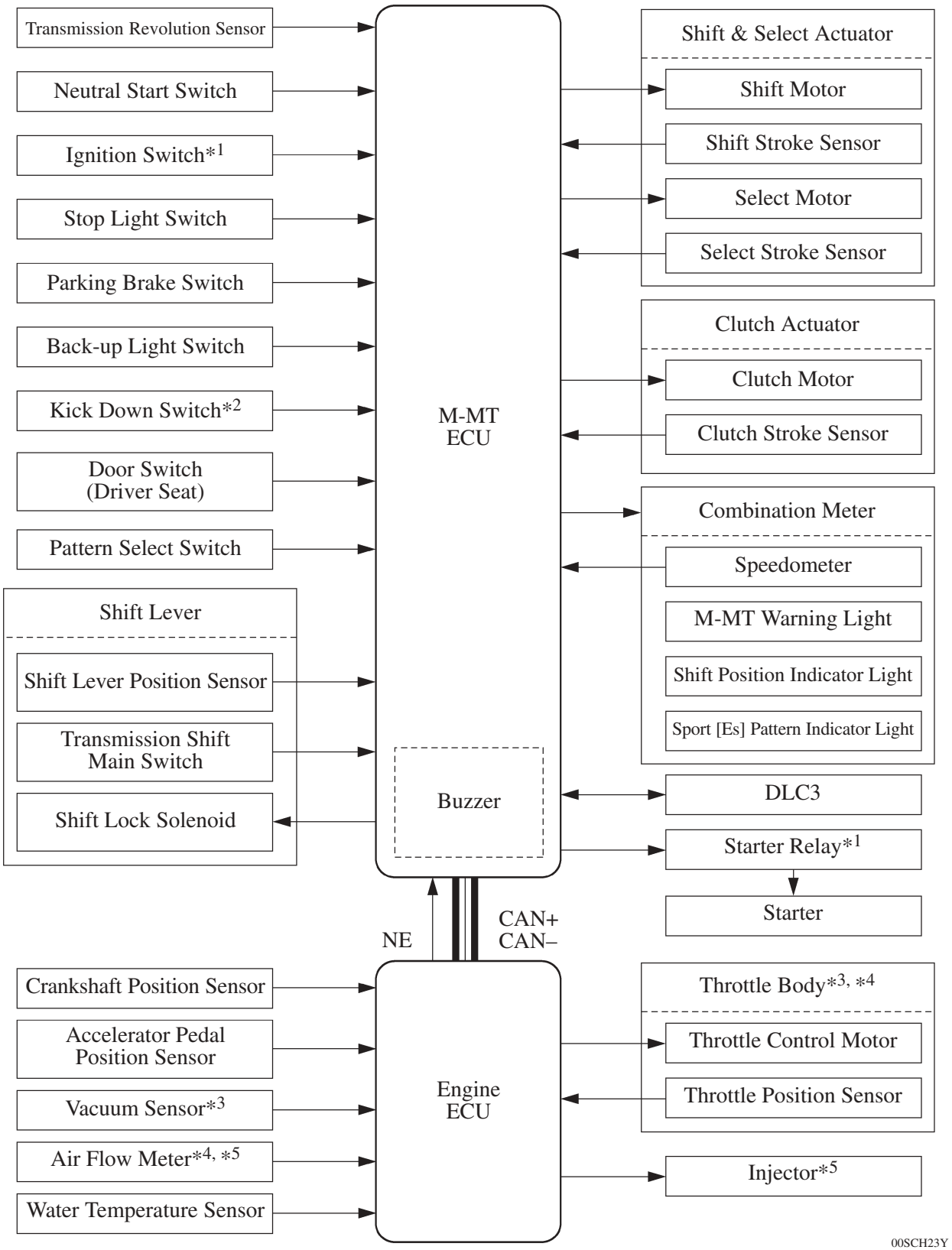
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**C551A (1KR-FE, 2SZ-FE)**

**▶ Specifications ◀**

| Transaxle Type | | C53A | C551A | |
|---|---|---|---|---|
| Engine Type | | 1ND-TV | 1KR-FE | 2SZ-FE |
| Gear Ratio | 1st | 3.545 | ← | ← |
| | 2nd | 1.904 | 1.913 | ← |
| | 3rd | 1.310 | ← | ← |
| | 4th | 0.969 | 1.027 | ← |
| | 5th | 0.725 | 0.850 | ← |
| | Reverse | 3.250 | 3.214 | ← |
| Differential Gear Ratio | | 3.526 | 4.411 | 4.055 |
| Oil Capacity | Liters (US qts, Imp. qts) | 1.9 (2.0, 1.7) | 1.7 (1.8, 1.5) | ← |
| Oil Viscosity | | SAE 75W | ← | ← |
| Oil Grade | | API GL-4 | ← | ← |

## 2. System Diagram

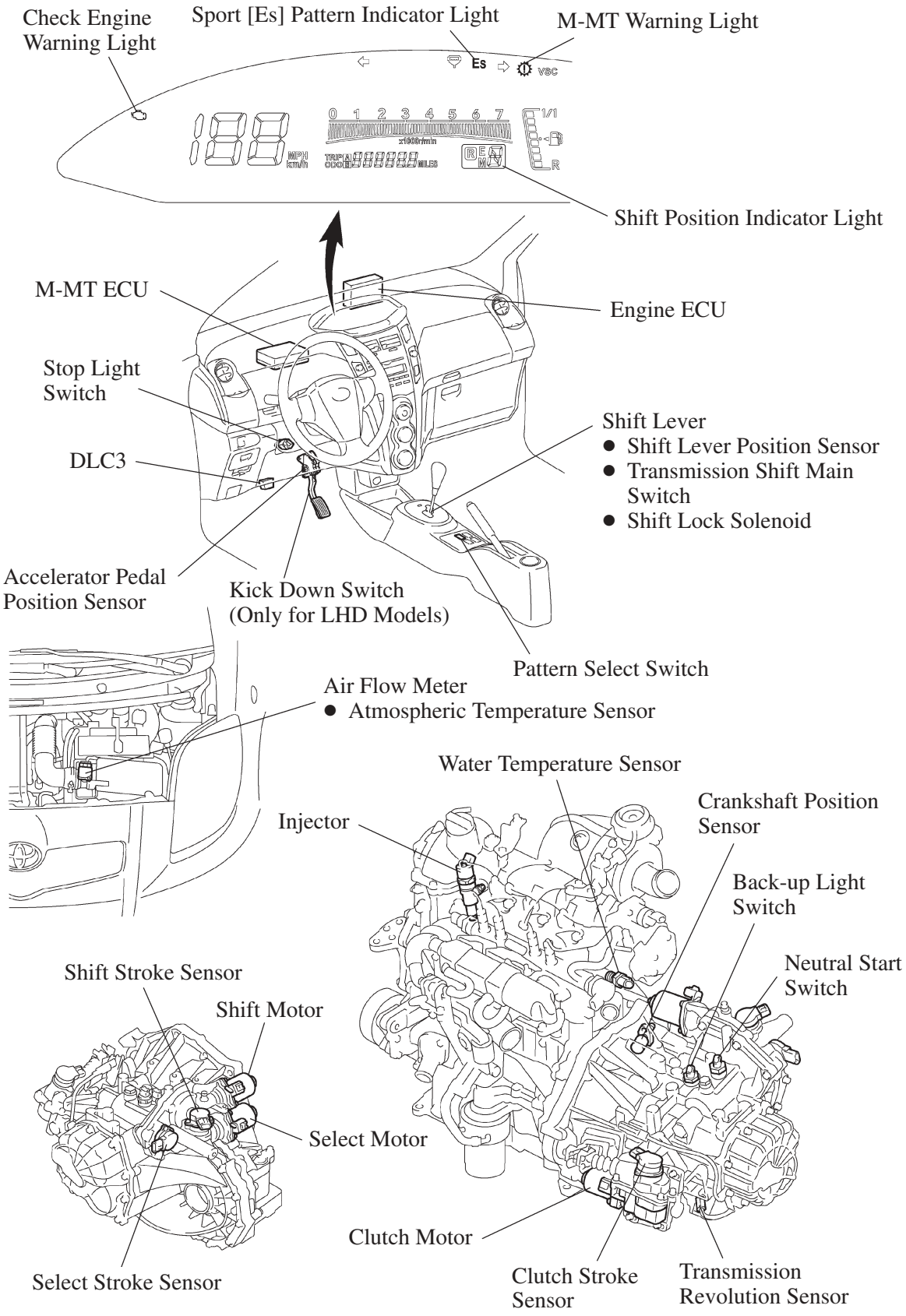



*1: See page BE-60 for vehicles equipped with the smart entry & start system.
*2: Only for LHD Models *3: 1KR-FE Engine Models *4: 2SZ-FE Engine Models
*5: 1ND-TV Engine Models

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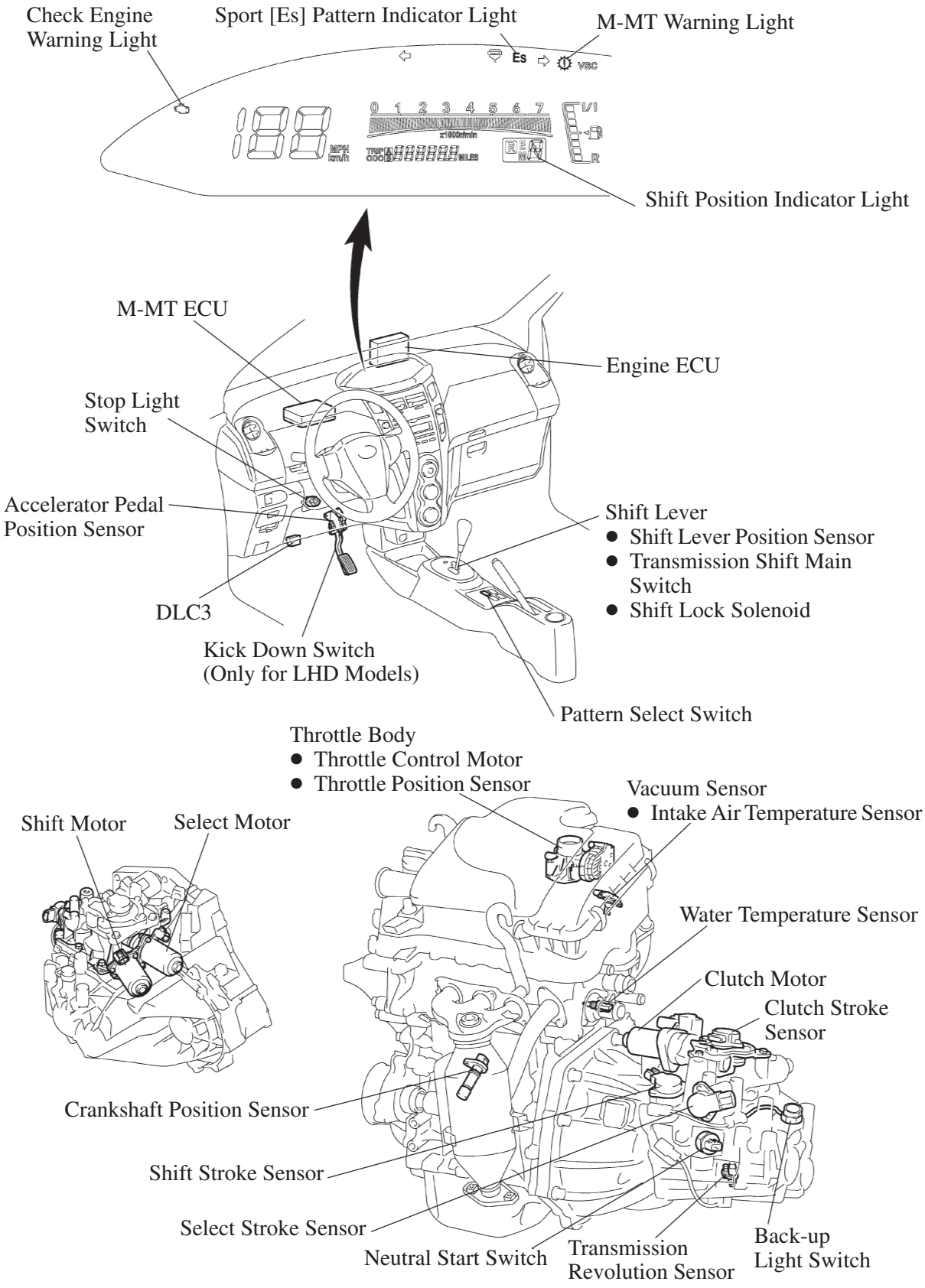
## 3. Layout of Main Components

**▶ C53A Multi-mode Manual Transmission (For 1ND-TV Engine Model) ◀**




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**▶ C551A Multi-mode Manual Transmission (For 1KR-FE Engine Model) ◀**




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## 4. Function of Main Components

| Component | | Outline |
|---|---|---|
| Clutch Actuator | Clutch Motor | Actuated by the M-MT ECU, the clutch motor engages and disengages the clutch via the reduction gear with the assist spring. |
| | Clutch Stroke Sensor | Detects the amount of the clutch stroke from the rotational angle of the worm wheel and relays this information to the M-MT ECU in the form of feedback signals. |
| Shift & Select Actuator | Shift Motor | Actuated by the M-MT ECU, the shift motor effects the shift operation of the shift & select lever shaft via the reduction gear. |
| | Shift Stroke Sensor | Detects the length of the shift stroke of the gear shift fork from the rotational angle of the shift & select lever shaft and relays this information to the M-MT ECU in the form of feedback signals. |
| | Select Motor | Actuated by the M-MT ECU, the select motor effects the select operation of the shift & select lever shaft via the rack & pinion gear. |
| | Select Stroke Sensor | Detects the length of the select stroke of the gear shift fork from the rotational angle of the shift & select lever shaft and relays this information to the M-MT ECU in the form of feedback signals. |
| Shift Lever | Shift Lever Position Sensor | The M-MT ECU determines the shift lever position from the ON/OFF combination of the 8-position switch that is built in. |
| | Transmission Shift Main Switch | The M-MT ECU determines the shift mode (M-mode or E-mode) through the condition of this switch. |
| | Shift Lock Solenoid | Actuated by the M-MT ECU, the shift lock solenoid restricts the movement of the shift lever. |
| Clutch Cover | LCC Mechanism | Actuated by the M-MT ECU and the clutch actuator, the pressure plate height of the LCC is mechanically adjusted to a predetermined position, in order to apply a constant load to the clutch motor. |
| Throttle Body*1, *2 | Throttle Control Motor | Actuated by the ETCS-i (Electronic Throttle Control System-intelligent) in the engine ECU, the throttle motor controls the throttle valve position at the torque requested by the M-MT ECU. For details of the ETCS-i control, see page EG-44. |
| | Throttle Position Sensor | Detects the throttle valve position and outputs it to the engine ECU. |
| Injector*3 | | Receives signals from the engine ECU and performs fuel volume control. For details of the fuel volume control, see page EG-178. |
| Combination Meter | Meter ECU | ● Controls the operation of the indicator lights and warning lights.<br>● Outputs the vehicle speed signal from the skid control ECU to the M-MT ECU. |
| | M-MT Warning Light | Lights up to alert the driver when a malfunction occurs in the multi-mode manual transmission system. |
| | Shift Position Indicator Light | Indicates the present gear position. In addition, this indicator light flashes if the actual gear position and the shift lever position do not match. |
| | Sport [Es] Pattern Indicator Light | Illuminates by pressing the pattern select switch and informs the driver of driving in the sport pattern. |
| Vacuum Sensor*1 | Intake Air Temperature Sensor | This sensor detects the external air temperature and outputs it to the M-MT ECU via the engine ECU.<br>(For shift protection control) |
| Air Flow Meter | Intake Air Temperature Sensor*2 | |
| | Atmospheric Temperature Sensor*3 | |

*1: 1KR-FE Engine Models *2: 2SZ-FE Engine Models *3: 1ND-TV Engine Models

(Continued)

| Component | | Outline |
|---|---|---|
| Transmission Revolution Sensor | | Detects the input shaft speed of the transaxle and outputs it to the M-MT ECU. |
| Accelerator Pedal Position Sensor | | Detects the accelerator pedal position and outputs it to the engine ECU. |
| Crankshaft Position Sensor | | Detects the engine speed and outputs it to the M-MT ECU via the engine ECU. |
| Water Temperature Sensor | | Detects the water temperature and outputs it to the M-MT ECU via the engine ECU. (for shift protection control) |
| Kick Down Switch (Only for LHD Models) | | Detects beyond the full-throttle opening and outputs it to the M-MT ECU. |
| Neutral Start Switch | | Detects the neutral position of the transaxle and outputs it to the M-MT ECU. |
| Back-up Light Switch | | Detects the reverse position of the transaxle, outputs it to the M-MT ECU, and controls the operation of the back-up lights. |
| Stop Light Switch | | Detects that the brake pedal is applied and outputs this information to the M-MT ECU. |
| Pattern Select Switch | | Switches the driving pattern ([E] or [Es]) in the E-mode. |
| Starter Relay | | The M-MT ECU restricts the operation of the starter relay in accordance with the gear position and the braking conditions, in order to control the operation of the starter. |
| M-MT ECU | | ● Controls the multi-mode manual transmission system; in addition, requests the engine ECU to effect ETCS-i control during upshift or downshift via CAN (Controller Area Network) communication.<br>● When the transmission control ECU detects a malfunction, the transmission control ECU makes a diagnosis and memorizes the failed section. Furthermore, the M-MT warning light and check engine warning light illuminate or blink to inform the driver. |
| | Buzzer | ● Sounds a built-in buzzer during system warning.<br>● Sounds if the driver door is opened while the engine is idling and the shift lever is in the E, M, or R position. |
| Engine ECU | | Effects engine output control per request from the M-MT ECU. |