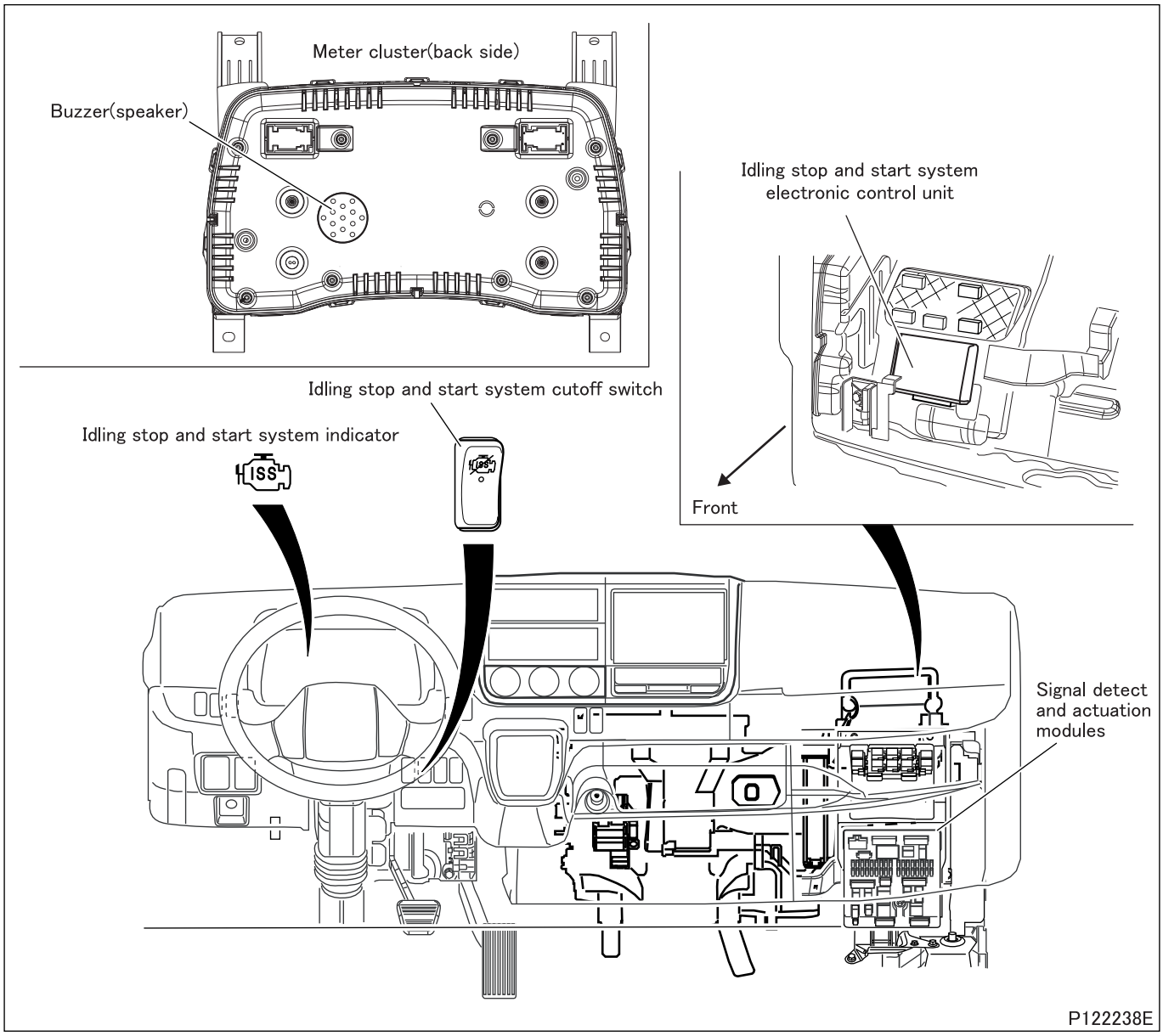
Group 54EA
Idling Stop and Start System

Pub. No. 00ELT0145

GROUP 54EA
IDLING STOP AND START SYSTEM

1. Overview

- The idling stop and start system automatically stops the engine when the vehicle is stopped and automatically starts the engine when the vehicle is started, thus reducing exhaust emissions and improving fuel consumption.

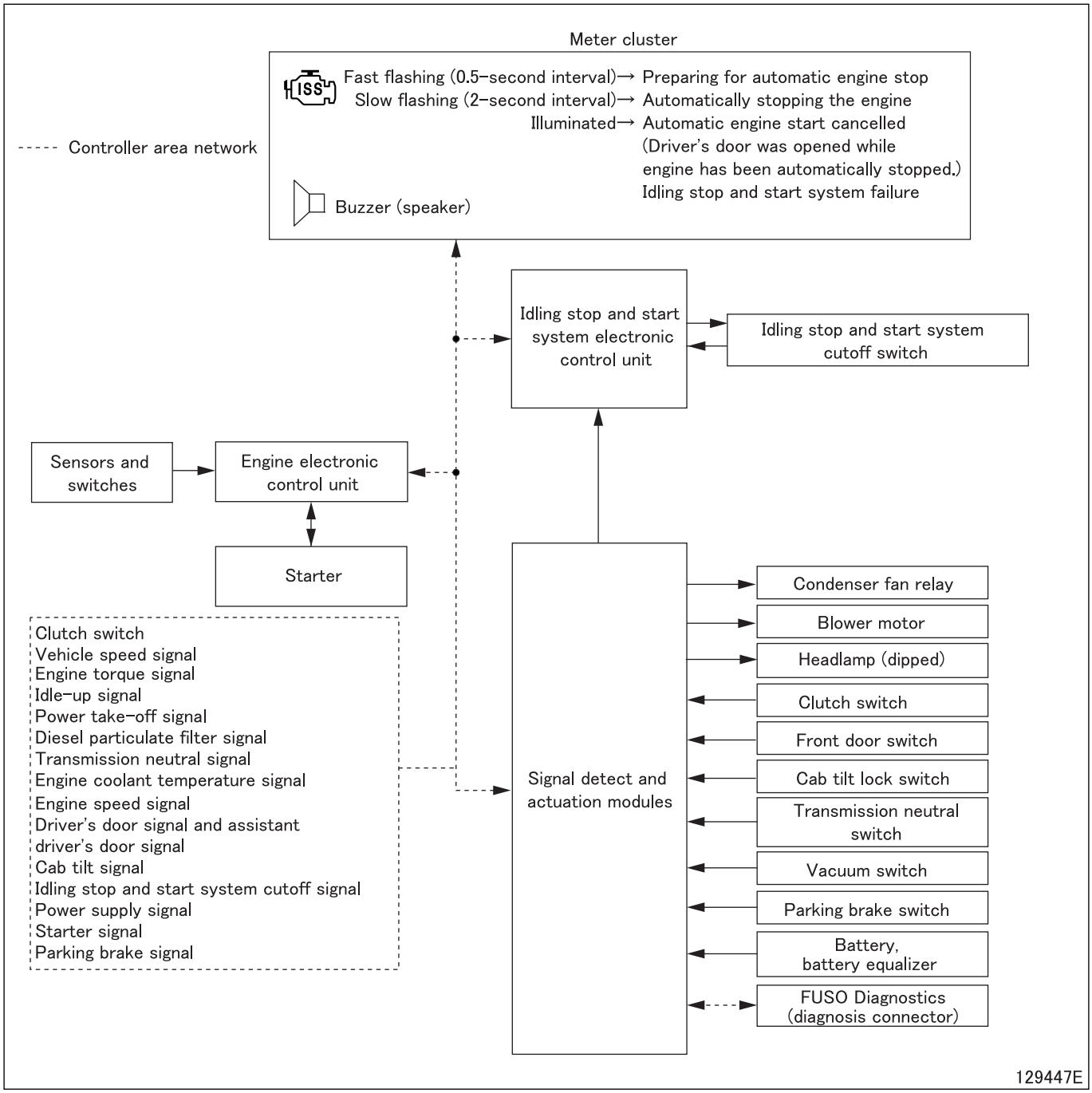


- When the idling stop and start system is operating, vehicle equipment is operated or controlled as follows:
  - When the engine is automatically stopped while the headlights (dipped beam) or fog lamps are on, the lights will be automatically turned off.
  - Even when the engine is automatically stopped while the audio system is operating, the system will keep operating.
  - Even when the engine is automatically stopped while the air conditioning system is operating, the system will keep operating for 1 minute. When the engine has been automatically stopped for more than 1 minute, the air conditioner magnet clutch will be cut off to stop the air-conditioning system.
  - The idling stop and start system does not operate under any of the following conditions:
    - The specific gravity of the battery has dropped.
    - The driver's door or assistant driver's door is open.
    - The cab is raised.
    - The idling stop and start system cutoff switch is ON.
    - Power take-off is being used.
    - Automatic or parked diesel particulate filter regeneration is under way.
    - The brake warning is illuminated. (The brake fluid pressure has dropped.)
    - The coolant temperature indicator shows 4 segments or less, or 9 segments or more.
    - The idling stop and start system indicator is illuminated.

To prevent the automatic engine stop function from activating too frequently when the vehicle is repeatedly stopped or slowed down in a traffic jam or at intersections, the engine is not automatically stopped by the idling stop and start system when the vehicle is stopped after it has been driven at a speed of 10 km/h or less. In other words, the engine is automatically stopped by the idling stop and start system when the vehicle is stopped after it has been driven at a speed of 10 km/h or more.

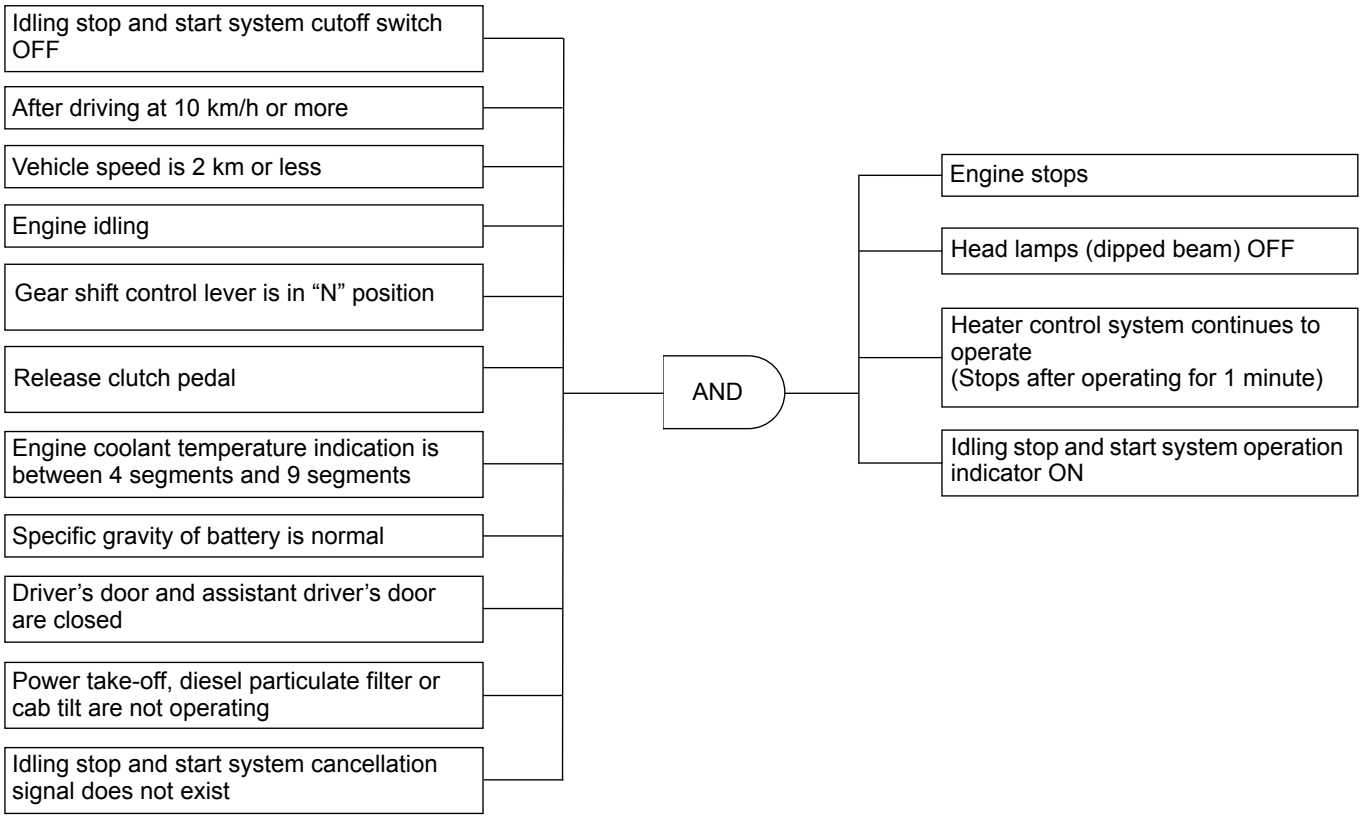
2. Electronic Control System

2.1 System block diagram

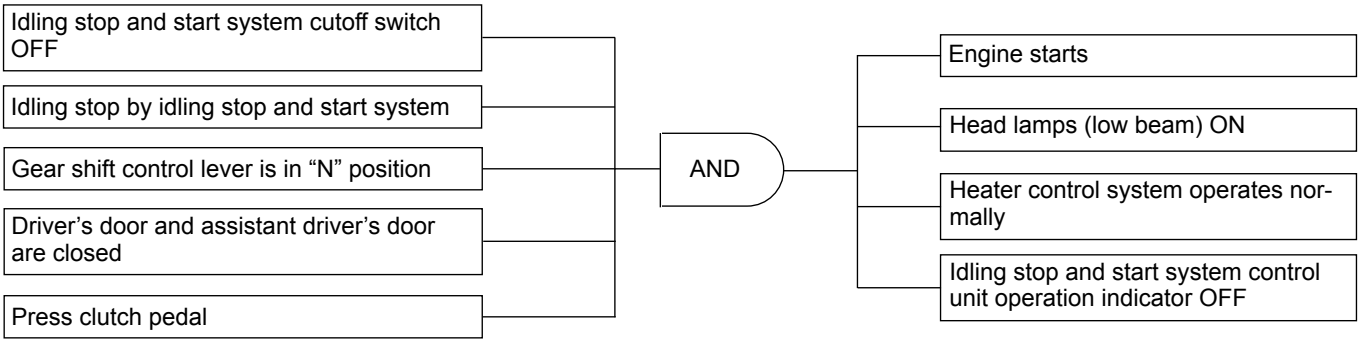


Part name		Main function/operation
Idling stop and start system cutoff switch		Idling stop and start system control stop switch
FUSO Diagnostics (diagnosis connector)		Communication between FUSO Diagnostics and idling stop and start system electronic control unit
Door switch		Detects whether driver's door and assistant driver's door are open or closed.
Blower motor		Heater control by signal detect and actuation modules when idling stop and start system is operating
Starter		Starter control by engine electronic control unit when idling stop and start system is operating
Meter cluster	System warning	Warning when idling stop and start system is faulty
	Operation indicator	Indications when preparing for automatic engine stop and when automatically stopping engine
	Buzzer	Sounds when engine is automatically stopped and driver's door or assistant driver's door is open.
Idling stop and start system electronic control unit		Requests idling stop and start system control (automatic engine stop and start) to engine electronic control unit via controller area network communication when input signals satisfy idling stop and start system actuation conditions.
		Sends or receives idling stop and start system control related signals to and from signal detect and actuation modules via controller area network communication.
Signal detect and actuation modules		Controls power supply to various equipment.
		Relays signals input or output to and from signal detect and actuation modules in response to signals received from idling stop and start system electronic control unit via controller area network communication.
Engine electronic control unit		Inputs or outputs idling stop and start system control related signals.
		Sends or receives idling stop and start system request/cancel signal from idling stop and start system electronic control unit via controller area network communication.
Headlamp (dipped)		Lamp ON/OFF control by signal detect and actuation modules when idling stop and start system is operating
Transmission neutral switch		Detects gear shift control level "N" position.
Clutch switch		Detects clutch pedal operation status.

2.2 Automatic engine stop



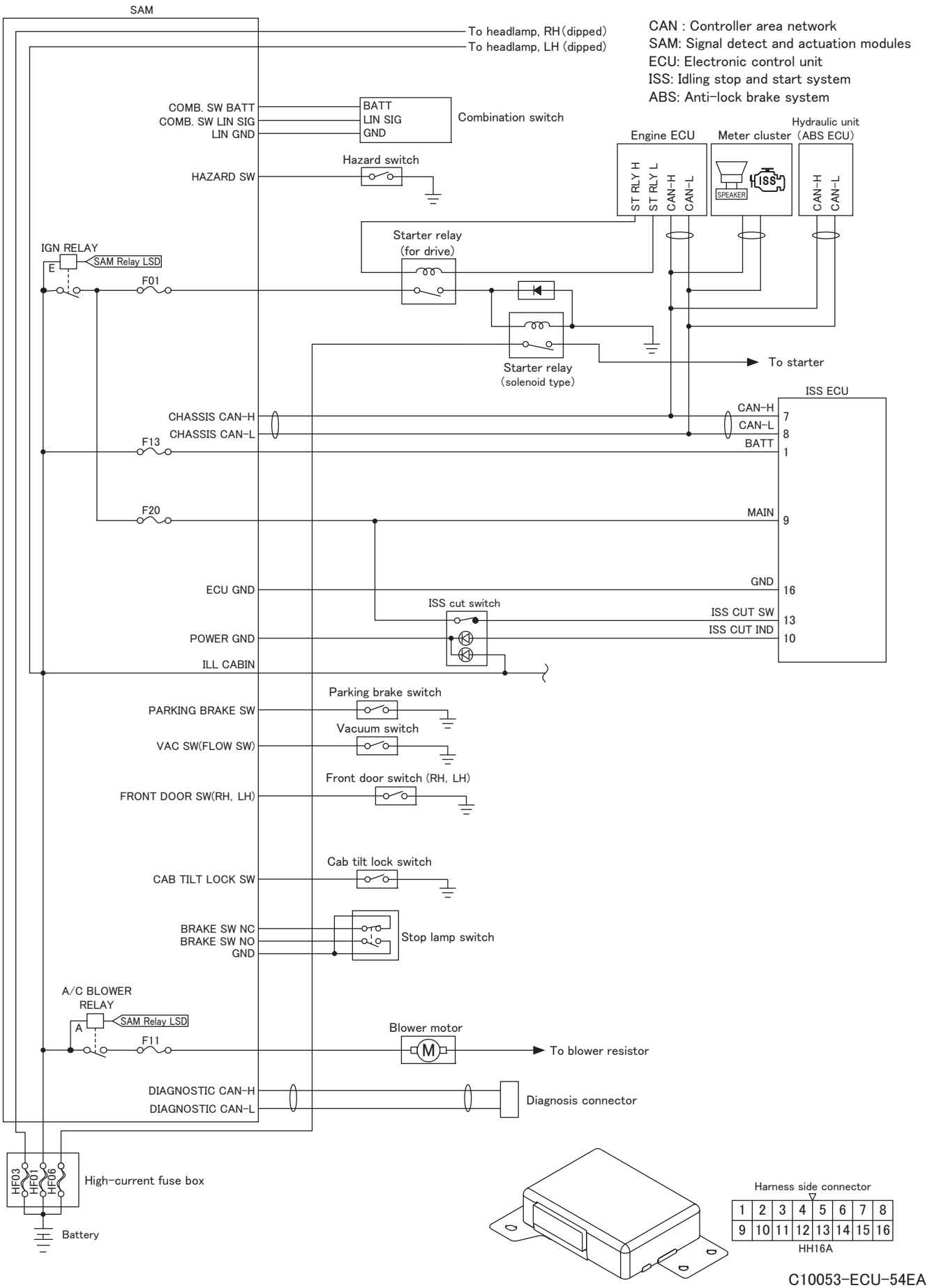
2.3 Automatic engine start



2.4 Diagnostic function

- While the starter switch is ON, the idling stop and start system control unit continuously monitors the conditions of communications with other electronic control units and whether various sensors and relays operate normally. In the event the idling stop and start system electronic control unit find fault, it sends fault information to the meter cluster to alert the driver. At the same time, it stores the fault information in the form of a diagnosis code and starts executing control under failure conditions.
- While control under failure conditions is being executed, the system’s functionality is limited to ensure vehicle and driver safety. The stored diagnosis codes can be displayed on the FUSO Diagnostics system and on the meter cluster. (See Gr54-00A.)

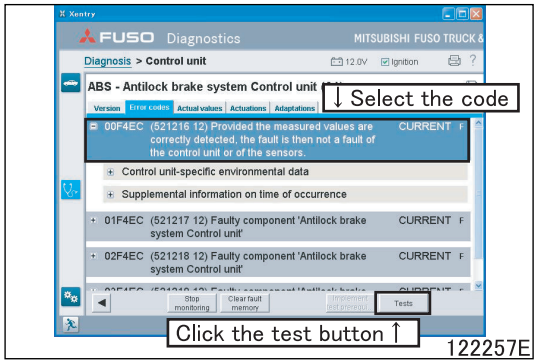
3. Electronic control unit circuit diagram



C10053-ECU-54EA

1. Inspection Based on Diagnosis Codes

- The contents of FUSO Diagnostics are updated to improve without any notice. When there is any difference between the FUSO Diagnostics and the workshop manual, check the latest information with the FUSO Diagnostics.



- When the FUSO Diagnostics is connected, perform the interactive troubleshooting with the following procedure.

  Select the code from the diagnostics code list
  ↓
  Click the test button
  ↓
  Start the interactive troubleshooting

1.1 List of Diagnosis Codes

Code	Message	Warning indication	Remarks
521752-2	CAN signal from control unit 'Combustion engine Control unit' FAULTY	O	
521753-2	CAN signal from control unit 'Signal & ActuatorModule' FAULTY	O	
521754-2	CAN signal from control unit 'Electronic transmission control' FAULTY	O	Unused
521756-4	The supply voltage of component 'Automatic engine start/stop Control unit' is too low (undervoltage).	O	
521757-3	The supply voltage of component 'Automatic engine start/stop Control unit' is too high (overvoltage).	O	
521758-7	Hill Start valve voltage-No supply	O	Unused
521759-7	Hill Start valve voltage-No intercept	O	Unused
521760-7	Component 'Control valve "Front axle service brake"' has an open circuit or short circuit.	O	Unused
521761-7	Component 'Control valve "Rear axle service brake"' has an open circuit or short circuit.	O	Unused
521762-7	Component 'DC/DC converter' is defective.	O	Unused
521763-19	The coding is implausible.	O	
521764-19	Faulty variant coding	O	
521765-13	The number of start/stop cycles of the automatic engine start/stop function exceeds 150,000.	O	
521766-13	The value is outside the permissible range.	–	
521767-4	Pin 21 at control unit 'Automatic engine start/stop Control unit' has an open circuit.	O	
521768-19	Error reading EEPROM	O	
521770-2	CAN bus OFF fault	O	

1.2 Details of Diagnosis Codes

521752-2: CAN signal from control unit 'Combustion engine Control unit' FAULTY

Generation condition	• There is no controller area network signal from engine electronic control unit.
Recoverability	• System recovers when starter switch is turned OFF.
Control effected by electronic control unit	• Idling stop and start system control is stopped.
Possible causes	• Electronic control fuel system is faulty. • Open circuit, battery short circuit, ground short circuit, or short circuit in controller area network communication line. • Engine electronic control unit is faulty. • Idling stop and start system electronic control unit is faulty.

521753-2: CAN signal from control unit 'Signal & ActuatorModule' FAULTY

Generation condition	• There is no controller area network signal from signal detect and actuation module.
Recoverability	• System recovers when starter switch is turned OFF.
Control effected by electronic control unit	• Idling stop and start system control is stopped.
Possible causes	• Signal detect and actuation module system is faulty. • Open circuit, battery short circuit, ground short circuit, or short circuit in controller area network communication line. • Signal detect and actuation module is faulty. • Idling stop and start system electronic control unit is faulty.

521756-4: The supply voltage of component 'Automatic engine start/stop Control unit' is too low (undervoltage).

Generation condition	• Idling stop and start system electronic control unit battery power has been less than 8 V for 15 seconds.
Recoverability	• System recovers when idling stop and start system electronic control unit battery power becomes 8 V or more.
Control effected by electronic control unit	• Idling stop and start system control is stopped.
Possible causes	• Open circuit or ground short circuit in harness between battery and idling stop and start system electronic control unit. • Battery is faulty. • Alternator is faulty. • Signal detect and actuation module is faulty. • Idling stop and start system electronic control unit is faulty.

521757-3: The supply voltage of component 'Automatic engine start/stop Control unit' is too high (overvoltage).

Generation condition	• Idling stop and start system electronic control unit battery power has been 16 V or higher for 15 seconds.
Recoverability	• System recovers when idling stop and start system electronic control unit battery power becomes less than 16 V.
Control effected by electronic control unit	• Idling stop and start system control is stopped.
Possible causes	• Alternator is faulty. • Idling stop and start system electronic control unit is faulty.

521763-19: The coding is implausible.

Generation condition	• At least one item of “0: As-shipped condition” exists in EEPROM.
Recoverability	• System recovers when normal vehicle information is written by coding function.
Control effected by electronic control unit	• Idling stop and start system control is stopped.
Possible causes	• Coding is not done.

521764-19: Faulty variant coding

Generation condition	• Out-of-standard data exists in coding in EEPROM.
Recoverability	• System recovers when normal vehicle information is written by coding function.
Control effected by electronic control unit	• Idling stop and start system control is stopped.
Possible causes	• Out-of-range value was written when coding.

521765-13: The number of start/stop cycles of the automatic engine start/stop function exceeds 150,000.

Generation condition	• Idling stop and start system activation count has exceeded 150,000.
Recoverability	• Idling stop and start system operation status memory delete function recovers system when starter switch is turned OFF after performing one of the following. • Delete all data. • Delete idling stop and start system auto start count data only.
Control effected by electronic control unit	• Normal control of idling stop and start system
Possible causes	• Idling stop and start system activation count has exceeded 150,000.

521766-13: The value is outside the permissible range.

Generation condition	• Count-up value has exceeded calculation range.
Recoverability	• Idling stop and start system operation status memory delete function recovers system when starter switch is turned OFF after deleting all data.
Control effected by electronic control unit	• Normal control of idling stop and start system
Possible causes	• Count-up value has exceeded calculation range.

521767-4: Pin 21 at control unit 'Automatic engine start/stop Control unit' has an open circuit.

Generation condition	• Battery power is turned OFF after backup power was turned ON.
Recoverability	• System recovers when idling stop and start system electronic control unit power is turned OFF.
Control effected by electronic control unit	• Normal control of idling stop and start system
Possible causes	• Open circuit or ground short circuit in harness between battery and idling stop and start system electronic control unit. • Battery is faulty. • Alternator is faulty. • Signal detect and actuation module is faulty. • Idling stop and start system electronic control unit is faulty.

521768-19: Error reading EEPROM

Generation condition	• Abnormal data is found when reading data stored in EEPROM.
Recoverability	• System recovers when idling stop and start system electronic control unit power is turned OFF.
Control effected by electronic control unit	• Idling stop and start system control is stopped.
Possible causes	• Idling stop and start system electronic control unit is faulty.

521770-2: CAN bus OFF fault

Generation condition	• Bus-off status has continued for 0.5 seconds.
Recoverability	• System recovers when recovered from bus-off status.
Control effected by electronic control unit	• Idling stop and start system control is stopped.
Possible causes	• Bus-off status has continued for 0.5 seconds.

2. FUSO Diagnostics Service Data (Actual Values)

- The contents of FUSO Diagnostics are updated to improve without any notice. When there is any difference between the FUSO Diagnostics and the workshop manual, check the latest information with the FUSO Diagnostics.

[Current value group: Voltage values]

No.	Description	Value	Explanation
000	Supply voltage of component 'Starter Switches'	■■■■ V	Shows voltage of signal detect and actuation modules (Starter switch (M-terminal power)). • 12V (Shows voltage equivalent to battery.) [Related parts] • Battery • Signal detect and actuation modules • Starter switch
001	Battery voltage	■■■■ V	Shows voltage of signal detect and actuation modules (Battery (B direct power)). • 12V (Shows voltage equivalent to battery.) [Related parts] • Battery • Signal detect and actuation modules

[Current value group: Vehicle speed]

No.	Description	Value	Explanation
002	Current engine speed	■■■■ 1/min	Shows engine speed received from engine electronic control unit (controller area network communication). • Synchronizes with tachometer. [Related parts] • Engine speed sensor • Engine electronic control unit
003	Current vehicle speed	■■■■ km/h	Shows engine speed received from meter cluster (controller area network communication). • Synchronizes with speedometer. [Related parts] • Vehicle speed sensor • Meter cluster
004	Braking deceleration	■■■■ km/h/s	Shows vehicle deceleration received from engine electronic control unit (controller area network communication). • Range: 0 to 60km/h/100ms [Related parts] • Engine electronic control unit

[Current value group: Temperature values]

No.	Description	Value	Explanation
005	Coolant temperature	■■■■°C	Shows coolant temperature received from meter cluster (controller area network communication). • Synchronizes with coolant temperature gauge on the meter cluster. • Range: –40 to 220°C [Related parts] • Water temperature sensor • Meter cluster

[Current value group: Other actual values]

No.	Description	Value	Explanation
006	Operating state of component 'Automatic engine start/stop Control unit'	Automatic engine stop Mode1/ Automatic engine stop Mode2/ Automatic engine stop indication Mode1/ Automatic engine stop indication Mode2/ Engine start standby Mode/ Engine stop standby Mode/ Normal Mode/ Automatic engine stop Timer Mode/ Automatic engine start Mode/ Automatic engine start indication Mode/ Automatic engine stop hold Mode/	Shows states of current control by idling stop and start system electronic control unit.
007	Original vehicle identification number	■■■■	Shows originally VIN (vehicle identification number) received from signal detect and actuation modules (controller area network communication). [Related parts] • Signal detect and actuation modules
008	Current VIN	■■■■	Shows currently VIN (vehicle identification number) received from signal detect and actuation modules (controller area network communication). [Related parts] • Signal detect and actuation modules
009	Detection of on-board electrical system status	■■■■	Shows calculated value based on source voltage judgment logic. • Range: –2550 to 2550 [Related parts] • Battery • Signal detect and actuation modules
010	Vehicle model	I1/ I2/ I3/ I4/ L1/ L2/ Default	Shows vehicle model registered in idling stop and start system electronic control unit. • I1/ : Manual transmission • I2/ : – • I3/ : – • I4/ : – • L1/ : – • L2/ : – • Default : No registration

[Current value group: Switch status]

No.	Description	Value	Explanation
011	Status of switch 'Automatic engine start/stop Control unit'	ON/OFF	Shows ON/OFF status of idling stop and start system. • ON: Idling stop and start cutoff switch is OFF. • OFF: Idling stop and start cutoff switch is ON. [Related parts] • Idling stop and start cutoff switch
012	Status of switch 'Driver door'	ON/OFF	Shows ON/OFF status of driver door. • ON: Driver's door opened • OFF: Driver's door closed [Related parts] • Front door switch (Driver's) • Signal detect and actuation modules
013	Status of switch 'Passenger door'	ON/OFF	Shows ON/OFF status of passenger door. • ON: Passenger's door opened • OFF: Passenger's door closed [Related parts] • Front door switch (Passenger's) • Signal detect and actuation modules

No.	Description	Value	Explanation
014	Automatic engine start/stop Control unit: DISABLED	ON/OFF	Shows ON/OFF status of cancel signal of idling stop and start system. • ON: Idling stop and start system has a cancel signal. • OFF: Idling stop and start system has no cancel signal.
015	Automatic engine start/stop Control unit: CANCELED by DUONIC Control unit	ON/OFF	Unused
016	Status of switch 'Power take-off'	ON/OFF	Shows ON/OFF status of transmission power-take off switch. • ON: Transmission power-take off switch is ON. • OFF: Transmission power-take off switch is OFF. [Related parts] • Transmission power-take off switch • Signal detect and actuation modules
017	Status of switch 'Cold start'	ON/OFF	Shows ON/OFF status of exhaust brake switch. • ON: Exhaust brake switch is ON. • OFF: Exhaust brake switch is OFF. [Related parts] • Combination switch • Engine electronic control unit • Signal detect and actuation modules
018	Status of switch 'Pressure differential in diesel particulate filter'	ON/OFF	Shows ON/OFF status of diesel particulate filter regeneration. • ON: Regeneration is in progress in the diesel particulate filter. • OFF: Regeneration is not in progress in the diesel particulate filter. [Related parts] • Engine electronic control unit
019	Status of switch 'Locking of cab tilt system Switches'	ON/OFF	Shows ON/OFF status of cab tilt lock switch. • ON: Cab tilt is not locked. • OFF: Cab tilt is locked. [Related parts] • Cab tilt lock switch • Signal detect and actuation modules
020	Status of switch 'Left turn signal lamp'	ON/OFF	Shows ON/OFF status of left turn signal lamp. • ON: Left turn signal lamp illuminates. • OFF: Left turn signal lamp does not illuminate. [Related parts] • Signal detect and actuation modules
021	Status of switch 'Right turn signal lamp'	ON/OFF	Shows ON/OFF status of right turn signal lamp. • ON: Right turn signal lamp illuminates. • OFF: Right turn signal lamp does not illuminate. [Related parts] • Signal detect and actuation modules
022	Status of indicator lamps (Engine diagnosis (Orange))	YES/NO	Shows YES/NO status of indicator lamps (Engine diagnosis (Amber)). • YES:Indicator lamps (Amber) illuminates. • NO: Indicator lamps (Amber) does not illuminate. [Related parts] • Meter cluster • Engine electronic control unit

No.	Description	Value	Explanation
023	Status of switch 'Starter Switches'	ON/OFF	Shows ON/OFF status of starter switch. • ON: Starter switch (ON or START) • OFF: Starter switch (LOCK or ACC) [Related parts] • Starter switch • Signal detect and actuation modules
024	Status of switch 'Parking brake'	ON/OFF	Shows ON/OFF status of parking brake switch. • ON: Parking brake lever is pulled. • OFF: Parking brake lever is released. [Related parts] • Parking brake switch • Signal detect and actuation modules
025	Status of switch 'Transmission Neutral position Switches'	ON/OFF	Shows ON/OFF status of transmission neutral position. • ON: Transmission is in neutral position. • OFF: Transmission is not in neutral position. [Related parts] • Transmission neutral switch • Signal detect and actuation modules
026	Status of switch 'Clutch pedal'	ON/OFF	Shows ON/OFF status of clutch pedal. • ON: Clutch pedal is pressed. • OFF: Clutch pedal is released. [Related parts] • Clutch switch • Signal detect and actuation modules
027	Status of switch 'Brake pedal'	ON/OFF	Shows ON/OFF status of brake pedal. • ON: Brake pedal is pressed. • OFF: Brake pedal is released. [Related parts] • Stop lamp switch • Signal detect and actuation modules
028	Automatic ENGINE STOP: PERMISSIBLE	ON/OFF	Shows ON/OFF status of engine stop permission signal of idling stop and start system. • ON: Engine stop is permitted. • OFF: Engine stop is not permitted.
029	Automatic ENGINE STOP: COMPLETED	ON/OFF	Shows ON/OFF status of engine stop operation of idling stop and start system. • ON: Engine stop is in operation. • OFF: Engine stop is not in operation.
030	Automatic ENGINE START: PERMISSIBLE	ON/OFF	Shows ON/OFF status of engine start permission signal of idling stop and start system. • ON: Engine start is permitted. • OFF: Engine start is not permitted.
031	Automatic ENGINE START: COMPLETED	ON/OFF	Shows ON/OFF status of automatic engine start operation of idling stop and start system. • ON: Engine start is in operation. • OFF: Engine start is not in operation.
032	Automatic ENGINE START: General error	ON/OFF	Shows ON/OFF status of engine start error signal of idling stop and start system. • ON: Engine start can not operate. • OFF: Engine start can operate.
033	ENGINE START demanded by TCM (Transmission control unit)	ON/OFF	Unused
034	ENGINE STOP permitted by TCM	ON/OFF	Unused
035	Status of switch 'Main switch 'Hill Start Assist''	ON/OFF	Unused
036	Hill holder system is requested by TCM	ON/OFF	Unused

No.	Description	Value	Explanation
037	Hill holder system is released by TCM	ON/OFF	Unused
038	Automatic ENGINE STOP: STANDBY mode	ON/OFF	Shows ON/OFF status of idling stop and start system standby information. • ON: Idling stop and start system has standby information. • OFF: Idling stop and start system has no standby information.
039	Status of indicator lamps (Automatic engine start/stop)	ON/OFF	Shows ON/OFF status of idling stop and start system indicator lamp. • ON: Idling stop and start system indicator lamp illuminates. • OFF: Idling stop and start system indicator lamp does not illuminate. [Related parts] • Meter cluster
040	Status of switch 'Warning lamp'	ON/OFF	Shows ON/OFF status of idling stop and start system warning lamp. • ON: Idling stop and start system warning lamp illuminates. • OFF: Idling stop and start system warning lamp does not illuminate. [Related parts] • Meter cluster
041	Automatic ENGINE STOP: Work information	ON/OFF	Shows ON/OFF status of transmission of idling stop and start system information signal. • ON: Information signal of idling stop and start system status is transmitted. • OFF: Information signal of idling stop and start system status is not transmitted.
042	Status of switch 'Warning buzzer'	ON/OFF	Shows ON/OFF status of idling stop and start system warning buzzer. • ON: Idling stop and start system warning buzzer sounds. • OFF: Idling stop and start system warning buzzer does not sound. [Related parts] • Buzzer (built in meter cluster)
043	Request for function 'Automatic ENGINE STOP'	ON/OFF	Shows ON/OFF status of engine stop request of idling stop and start system. • ON: Idling stop and start system has engine stop request. • OFF: Idling stop and start system has no engine stop request.
044	Request for function 'Automatic ENGINE START'	ON/OFF	Shows ON/OFF status of engine start request of idling stop and start system. • ON: Idling stop and start system has engine start request. • OFF: Idling stop and start system has no engine start request.
045	Releasing automatic engine start/stop is demanded	ON/OFF	Shows ON/OFF status of idling stop and start system cancellation request. • ON: Idling stop and start system has cancellation request. • OFF: Idling stop and start system has no cancellation request.
046	Status of component 'DC/DC converter'	ON/OFF	Unused

No.	Description	Value	Explanation
047	Status of component 'Blower motor Relays'	ON/OFF	Shows ON/OFF status of idling stop and start system load cut relay 1 signal. • ON: Idling stop and start system load cut relay 1 signal is on. Blower motor is not in operation. • OFF: Idling stop and start system load cut relay 1 signal is off. Blower motor is in operation. [Related parts] • Blower motor • Signal detect and actuation modules
048	Status of component 'Refrigerant compressor Relays'	ON/OFF	Unused
049	Status of component 'Headlamps and foglamps'	ON/OFF	Shows ON/OFF status of idling stop and start system load cut relay 3 signal. • ON: Idling stop and start system load cut relay 3 signal is on. Headlamp does not illuminate. • OFF: Idling stop and start system load cut relay 3 signal is off. Headlamp and fog lamp illuminate. [Related parts] • Headlamp • Signal detect and actuation modules

3. FUSO Diagnostics Actuator Test (Actuations)

- The contents of FUSO Diagnostics are updated to improve without any notice. When there is any difference between the FUSO Diagnostics and the workshop manual, check the latest information with the FUSO Diagnostics.
- The basic conditions for performing the actuator test: Vehicle stopped, engine stopped and starter switch ON.

No.	Selection	Explanation
000	Control valve "Rear axle service brake"	Unused
001	Control valve "Front axle service brake"	Unused
002	Actuation of component 'load cut indicator'	Turn on/off idling stop and start system cutoff switch indicator lamp output.
003	Actuation of component 'Automatic engine start/stop indicator lamp'	Turn on/off idling stop and start system indicator lamp output.
004	Actuation of component 'Warning lamp'	Turn on/off idling stop and start system indicator lamp output.
005	Actuation of component 'Blower motor Relays'	Turn on/off load cut relay 1 (blower motor) output.
006	Actuation of component 'Headlamps and foglamps'	Turn on/off load cut relay 3 (headlamp) output.
007	Actuation of component 'Warning buzzer'	Turn on/off idling stop and start system warning buzzer output.

4. Electronic Control Unit Coding

4.1 Overview

- The idling stop and start system electronic control unit has various kinds of information such as technical data of vehicle and equipment registered as coding data.
- Therefore, each time the meter cluster is replaced or some specification changes are made, the coding data must surely be rewritten using diagnostic tool. Otherwise, the data stored in the idling stop and start system electronic control unit could deviate from the actual conditions of the vehicles, resulting in incorrect alarms.

4.2 Rewriting of Coding Data

- If specification changes have been made, be sure to rewrite the relevant coding data. Perform the data writing and resetting work, using the diagnostic tool.

Rewriting coding data required	Standards for rewriting idling stop and start system electronic control unit internal data
Delete all items.	Update is required when electronic control unit is replaced.
Delete only automatic engine start count data of idling stop and start system.	Deletes only automatic engine start count data of idling stop and start system. • Deletes idling stop and start system activation count data when starter is replaced. • Deletes idling stop and start system activation count data when diagnosis code “521765-13 (Idling stop and start system activation count has exceeded 150,000)” has occurred.

5. Electronic Control Unit Input/Output Table

- See the Electronic Control Unit Schematic Diagram for the pin locations of each signal and ground. (See Gr54EA-3.Electronic control unit circuit diagram.)

Devices to be connected	Terminal	Input/ output	Voltage and wave form
Signal detect and actuation module (Starter switch (M-terminal power))	9-Ground	Input	[Judgment criteria] • Normal: Equivalent to battery voltage • Abnormal: 0 V
Signal detect and actuation module (Battery (B direct power))	1-Ground	Input	[Judgment criteria] • Normal: Equivalent to battery voltage • Abnormal: 0 V