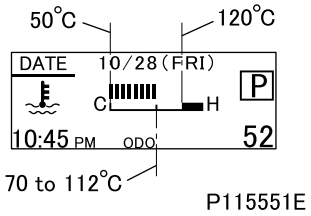
Group 54EM
Meter Cluster

Pub. No. 00ELT0145

GROUP 54EM
METER CLUSTER

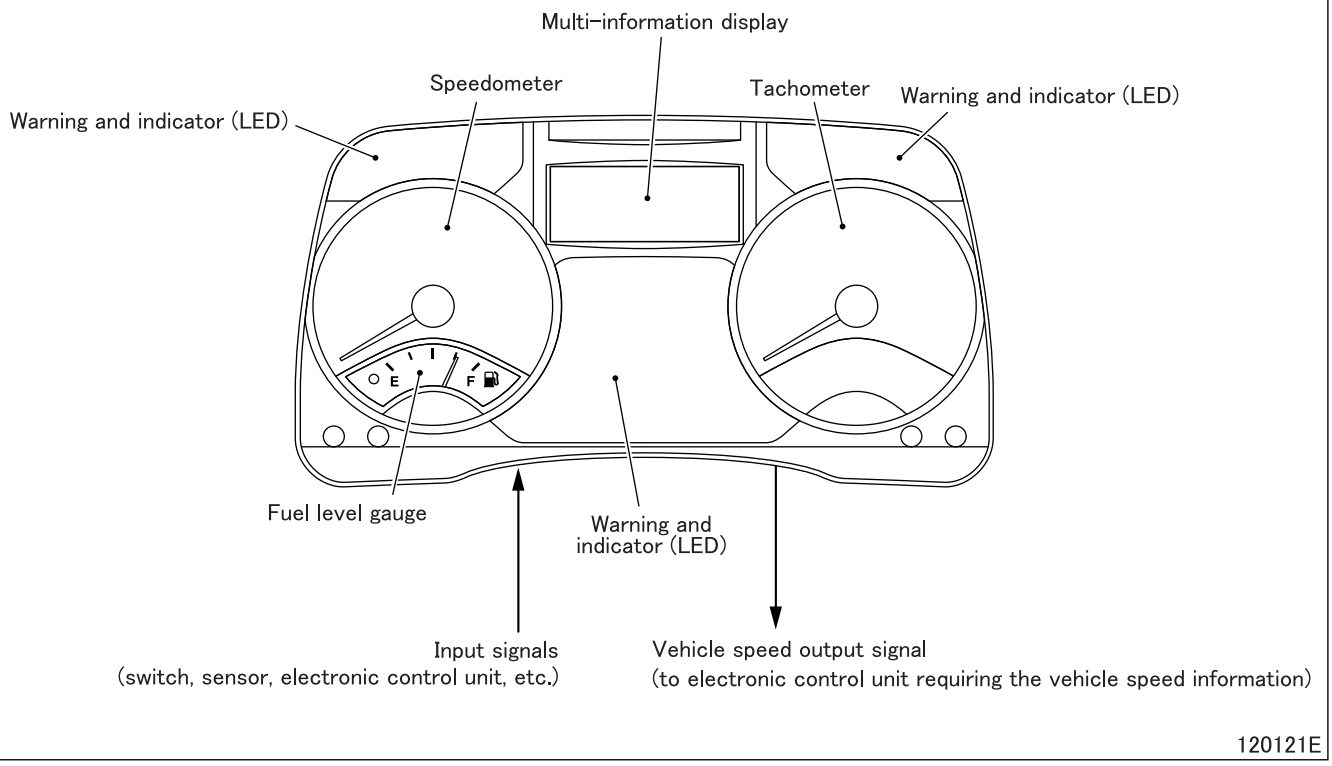
SPECIFICATIONS

Meter

Item			Specifications
Meter cluster	Manufacturer		Continental
	Voltage V		12
	Speedometer indicating range km/h		0 to 160 ($^{+3}_{0}$ at 60 km/h)
	Tachometer indicating range rpm		0 to 5000 (±50 at 3000 rpm)
	Water temperature gauge indicating range		 P115551E
	Meter warning buzzer	Sound pressure dB	55 ± 3 (at 1 m)
	Low vacuum pressure buzzer	Sound pressure dB	75 ± 3 (at 1 m)

M E M O

1. Overview

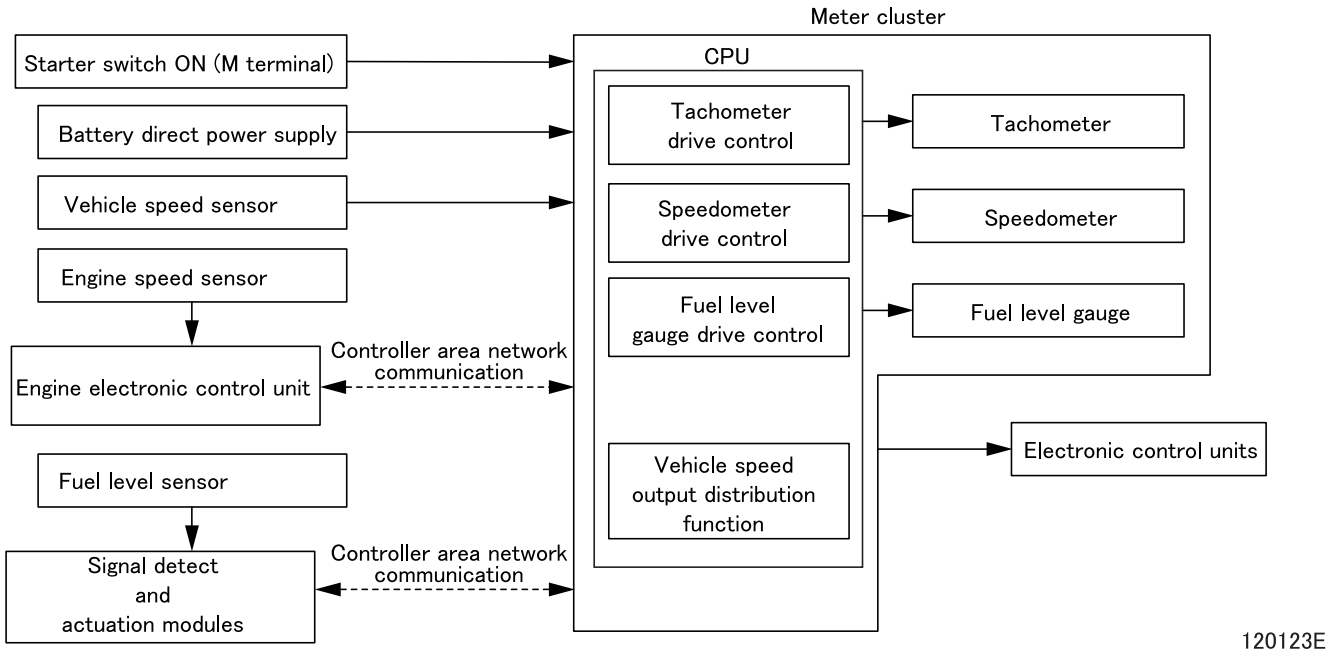


- This meter cluster contains a central processing unit with the following functions.
  - Instrument drive function (speedometer, tachometer, fuel level gauge)
  - Vehicle speed output distribution function
  - Indicator and warning indication function
  - Multi-information display indication function
  - Buzzer sound function
  - Fault diagnosis function

2. Electronic Control System

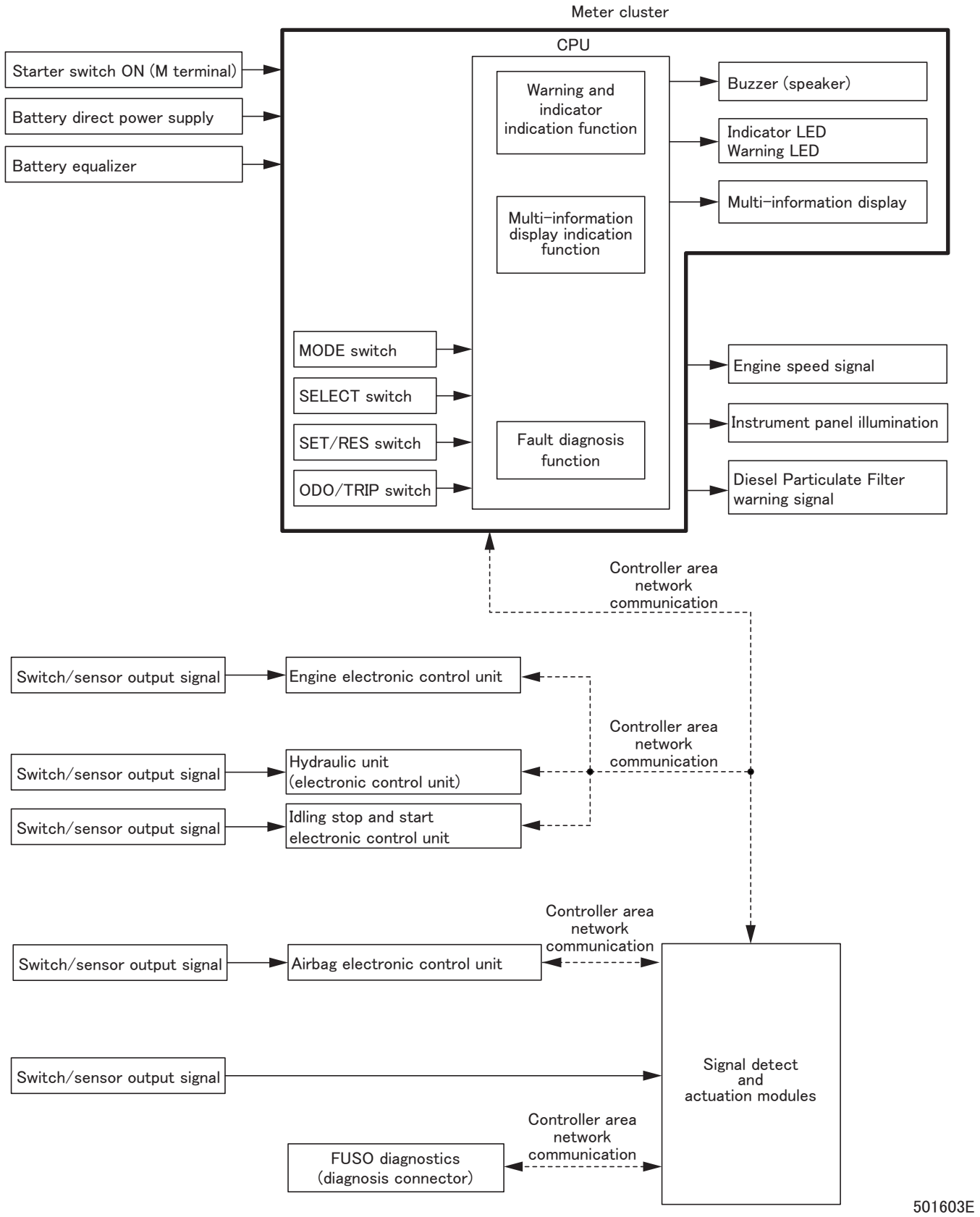
2.1 Instrument drive function and vehicle speed output distribution function

(1) System block diagram

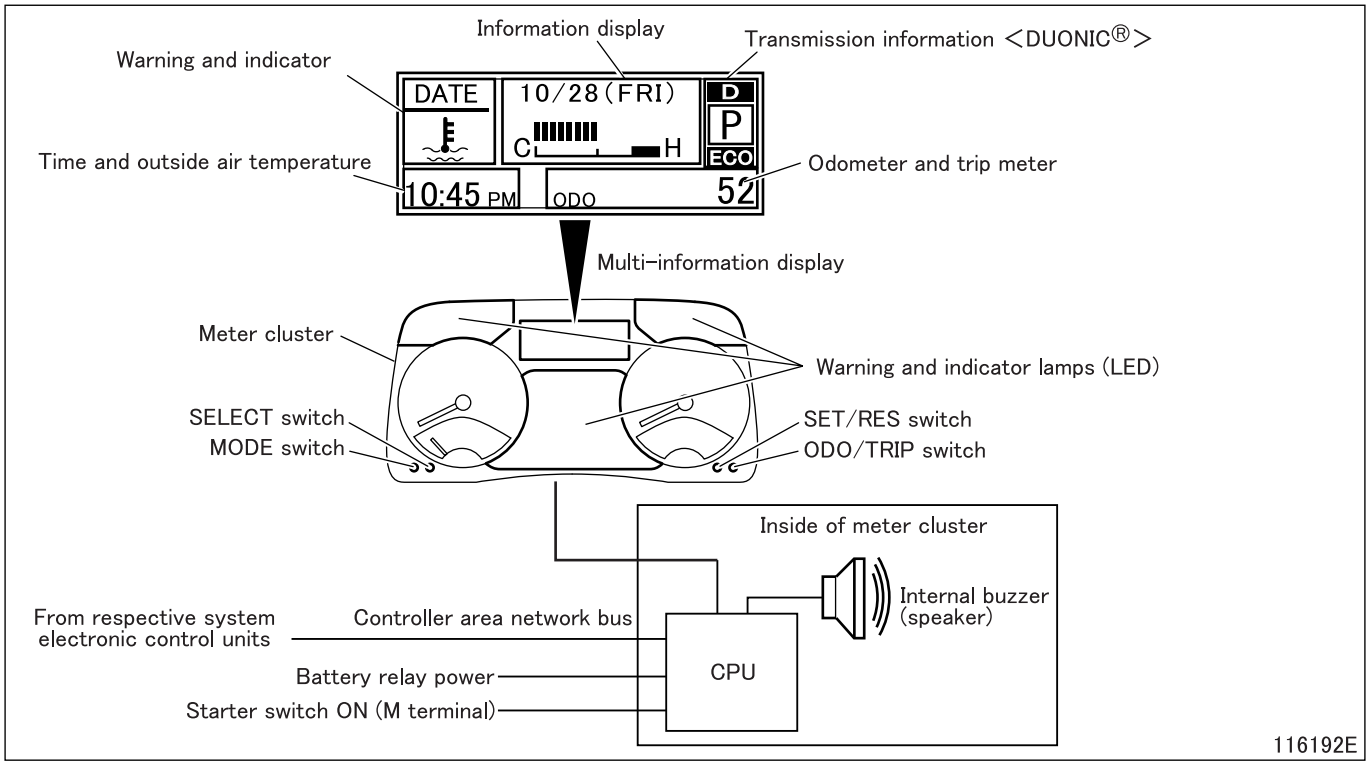


2.2 Warning and indicator lamps indication function, multi-information display function and fault diagnosis function

(1) System block diagram

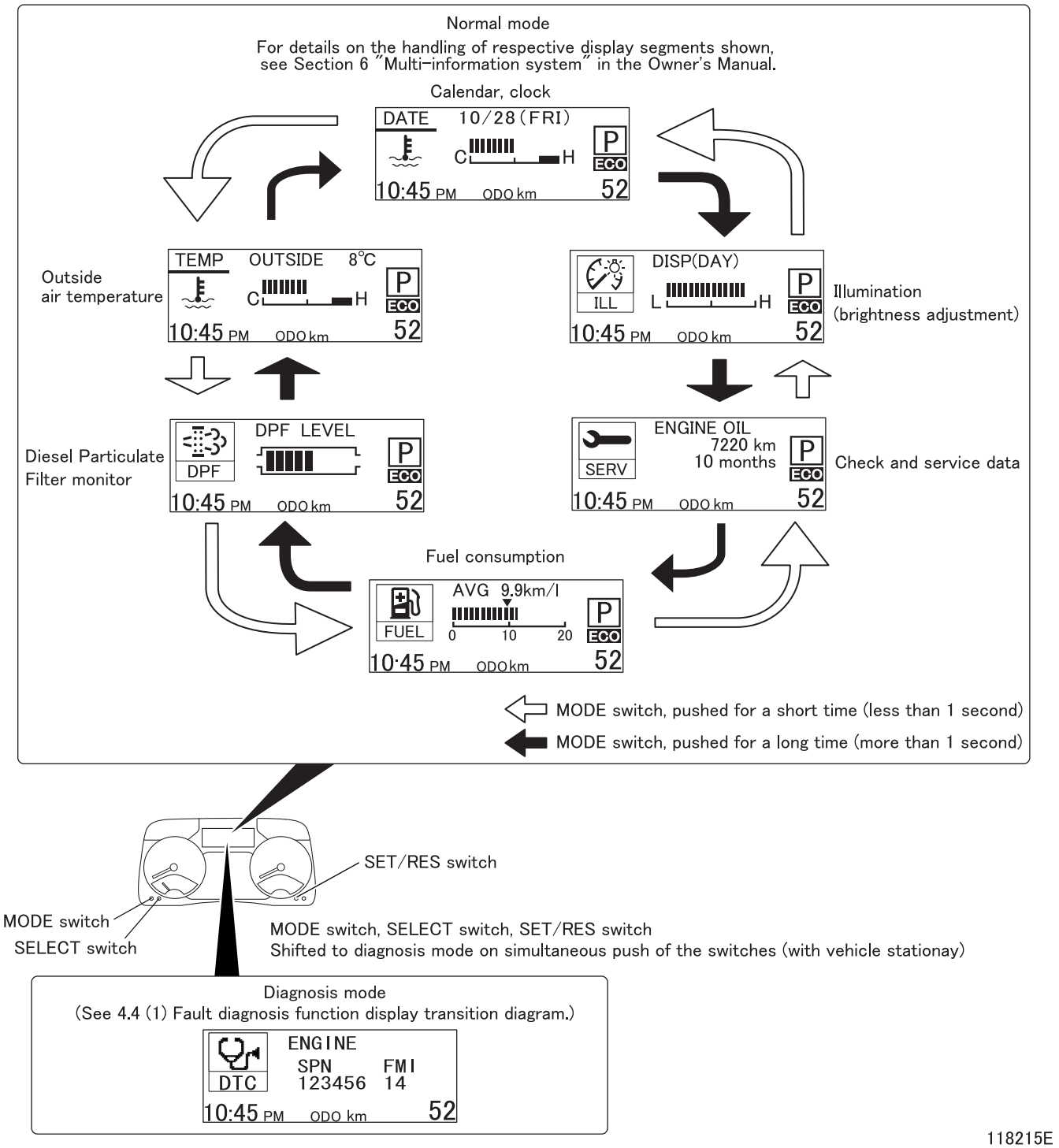


2.3 General description



- The warning and indicator lamps indication function indicates warning characters or graphical marks (LED), thereby adequately alerting the driver to abnormalities.
- Output data signals from respective systems are gathered in the central processing unit in the meter cluster and indicated through appropriate LED or the multi-information display. Alarm is sounded by the buzzer (speaker) in the meter cluster.
- The system features are as shown below.
  - The multi-information display distinctly shows necessary information by changing display colors according to the degree of significance of the information.
  - MODE switch, SELECT switch, SET/RES switch and ODO/TRIP switch are used to have option vehicle information (such as trip meter, clock, check and service data) and diagnosis codes for respective electronic control systems indicated by the multi-information display according to information gathered in the meter cluster.
  - When there are two or more warning items, the display is switched to show them in every three seconds.

(1) Multi-information display indication transition diagram



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(2) Indicator lamps (LED)

Lamp	Illuminating/ flashing	Internal buzzer sounding	Condition for illuminating/flashing	Remarks
FUEL LEVEL GAUGE •	Illuminates	–	Fuel level is low	See Gr54 **420**.
	Illuminates	O	Parking brake is engaged (Buzzer sounds when vehicle speed exceeds 12 km/h with parking brake engaged.)	See Gr54 **510**.
		–	Brake fluid level is low	See Gr54 **515**.
	Illuminates	–	Vacuum in vacuum tank is low <Vacuum booster-equipped vehicle>	See Gr54 **515**.
	Illuminates	O	Engine is overheated	See Gr54 **537**.
	Illuminates	–	Charging system is defective	See Gr54 **125**.
	Illuminates	–	Engine fluid pressure is low	See Gr54 **536**.
	Illuminates	–	Engine is being preheated	See Gr54 **880**.
	Illuminates	–	• Engine control system is defective • Exhaust gas aftertreatment is defective	See Gr54 **880**.
 (amber)	Flashes	–	• Soot is accumulated in Diesel Particulate Filter (flashes at 0.5 second interval)	See Gr54 **880**.
	Flashes	–	• Diesel Particulate Filter requires cleaning (flashes at 0.25 second interval)	
	Illuminates	–	• Parked regeneration is in progress in the Diesel Particulate Filter	
 (green)	Illuminates	–	Automatic regeneration is in progress in the Diesel Particulate Filter	See Gr54 **880**.
	Illuminates	–	Headlamp high beam is on	See Gr54 **310**.
	Flashes	O (turn signal sound)	• Turn signal lamp is on • Hazard lamp is on	See Gr54 **330**.
	Illuminates	–	• Exhaust brake is on • Warm-up system is on	See Gr54 **880**.
	Illuminates	–	Anti-lock brake system is abnormal	See Gr54 **790**.
	Flashes	–	• Idling stop and start system is preparing for automatic engine stop (fast flashing: 0.5-second interval)	See Gr54 **275**.
		–	• Idling stop and start system is automatically stopping the engine (slow flashing: 2-second interval)	
	Illuminates	O	• Idling stop and start system canceled automatic engine start (door open)	
		–	• Idling stop and start system is faulty	
	Illuminates	–	SRS airbag electrical circuit is defective	See Gr54 **631**.

(3) Multi-information display indications

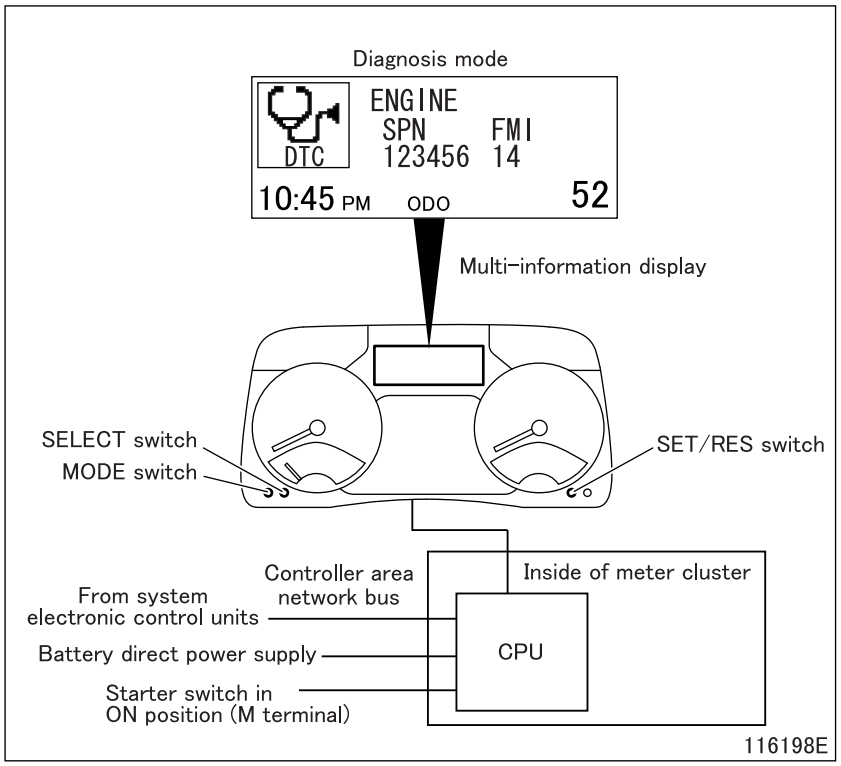
Mark	Illuminating/ flashing	Internal buzzer sounding	Condition for illuminating/flashing	Remarks
ENG SYS (red)	Illuminates	–	Engine output is limited	See Gr54 (880).
ENG SYS (amber)	Illuminates	–	• Engine check is required • Engine oil change is required (when the mark appears alternately with ENG OIL) • System is reset after engine oil change (indicated for 10 seconds)	See Gr54 (880).
SAM (red)	Illuminates	–	Signal detect and actuation modules are faulty in electric control system	–
SAM (amber)	Illuminates	–	Signal detect and actuation modules are abnormal in electric control system (when outside light check is needed)	–
METER	Illuminates	–	Meter cluster electric circuit is defective	–
ENG OIL (amber)	Illuminates	–	• Engine oil change is required (when quantity of fuel mixed in engine oil exceeds upper limit)	See Gr54 (880).
ENG OIL (green)	Illuminates	–	PCV (positive crankcase ventilation) filter regeneration must be performed or PCV (positive crankcase ventilation) filter must be replaced.	See Gr13E.
DPF FULL	Illuminates	–	Soot accumulation in Diesel Particulate Filter is excessive	See Gr54 (880).
WATER SEPR	Illuminates	–	Moisture in fuel filter becomes excessive	See Gr54 (566).
CAB TILT	Illuminates	O	Cab tilt lock is incomplete (Buzzer sounds at vehicle speed beyond 5 km/h.)	See Gr54 (550).
PTO	Illuminates	–	Transmission power take-off is connected <Vehicles with transmission power take-off>	See Gr54 (850).
ENG OIL	Illuminates	–	Less than 1,000 km or one month remains before the next scheduled engine oil change interval	–
OIL FILTER	Illuminates	–	Less than 1,000 km or one month remains before the next scheduled engine oil filter replacement interval	–
FUEL FILTER	Illuminates	–	Less than 1,000 km or one month remains before the next scheduled fuel filter replacement interval	–
BRAKE FLUID	Illuminates	–	Less than 1,000 km or one month remains before the next scheduled brake fluid change interval	–

Mark	Illuminating/ flashing	Internal buzzer sounding	Condition for illuminating/flashing	Remarks
	Illuminates	–	Less than 1,000 km or one month remains before the next scheduled air cleaner replacement interval	–
	Illuminates	–	Less than 1,000 km or one month remains before the next scheduled transmission fluid change interval	–
	Illuminates	–	Less than 1,000 km or one month remains before the next scheduled wheel hub bearing grease change interval	–
	Illuminates	–	Less than 1,000 km or one month remains before the next scheduled differential gear oil change interval	–
	Illuminates	–	Less than 1,000 km or one month remains before the next scheduled power steering fluid change interval	–
	Illuminates	–	Less than 1,000 km or one month remains before the next scheduled engine coolant change interval	–

(4) Alarm with buzzer only (without warning lamp on)

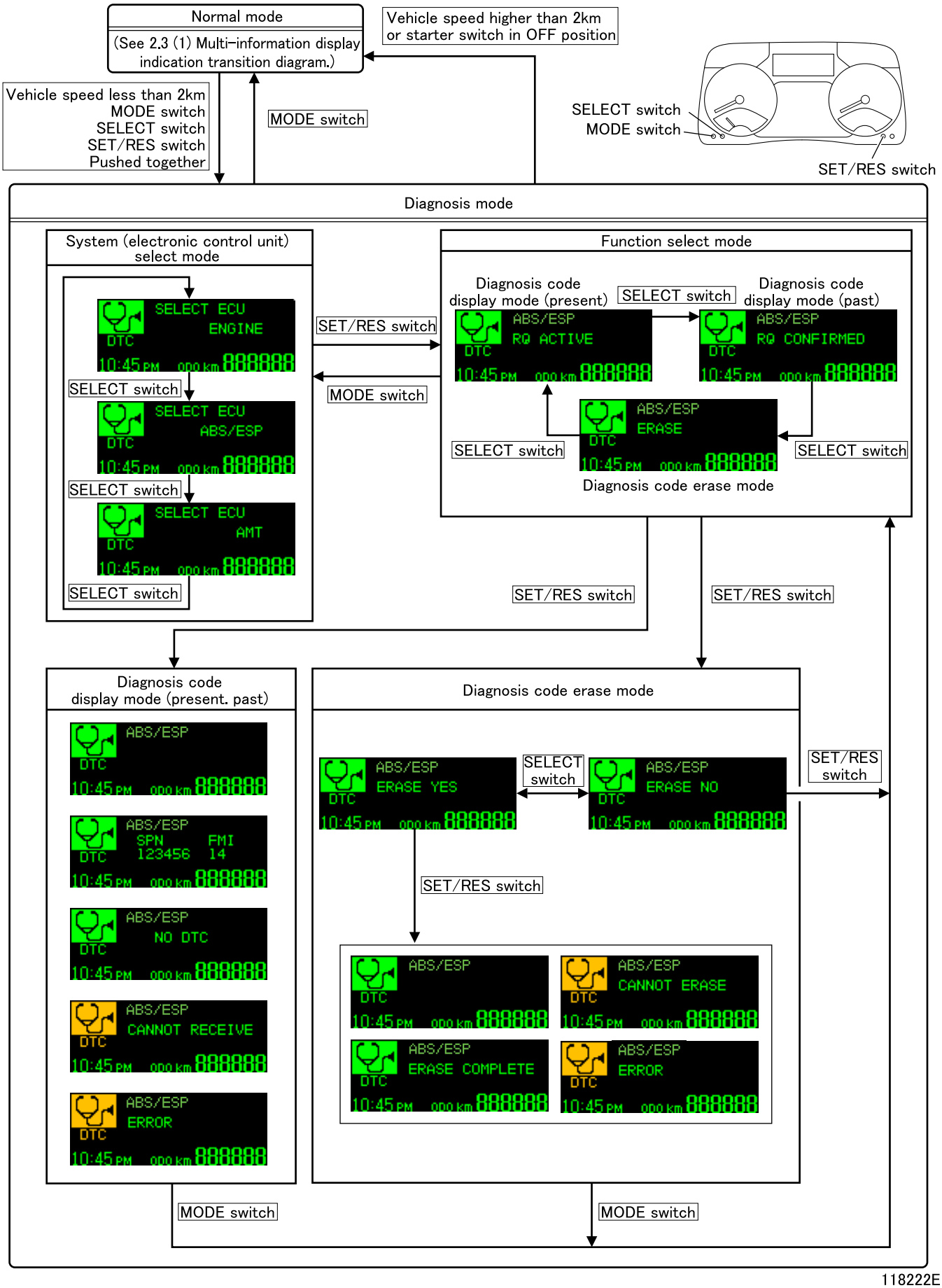
Buzzer	Internal buzzer sounding	Condition for buzzing	Remarks
Back buzzer	O	Shifter lever is put in the “R” position	–
Key reminder buzzer	O	When all conditions below are established • Starter key is left inserted • Starter switch in the OFF position • Driver’s side door switch is in “OPEN” position	–

2.4 Fault diagnosis function

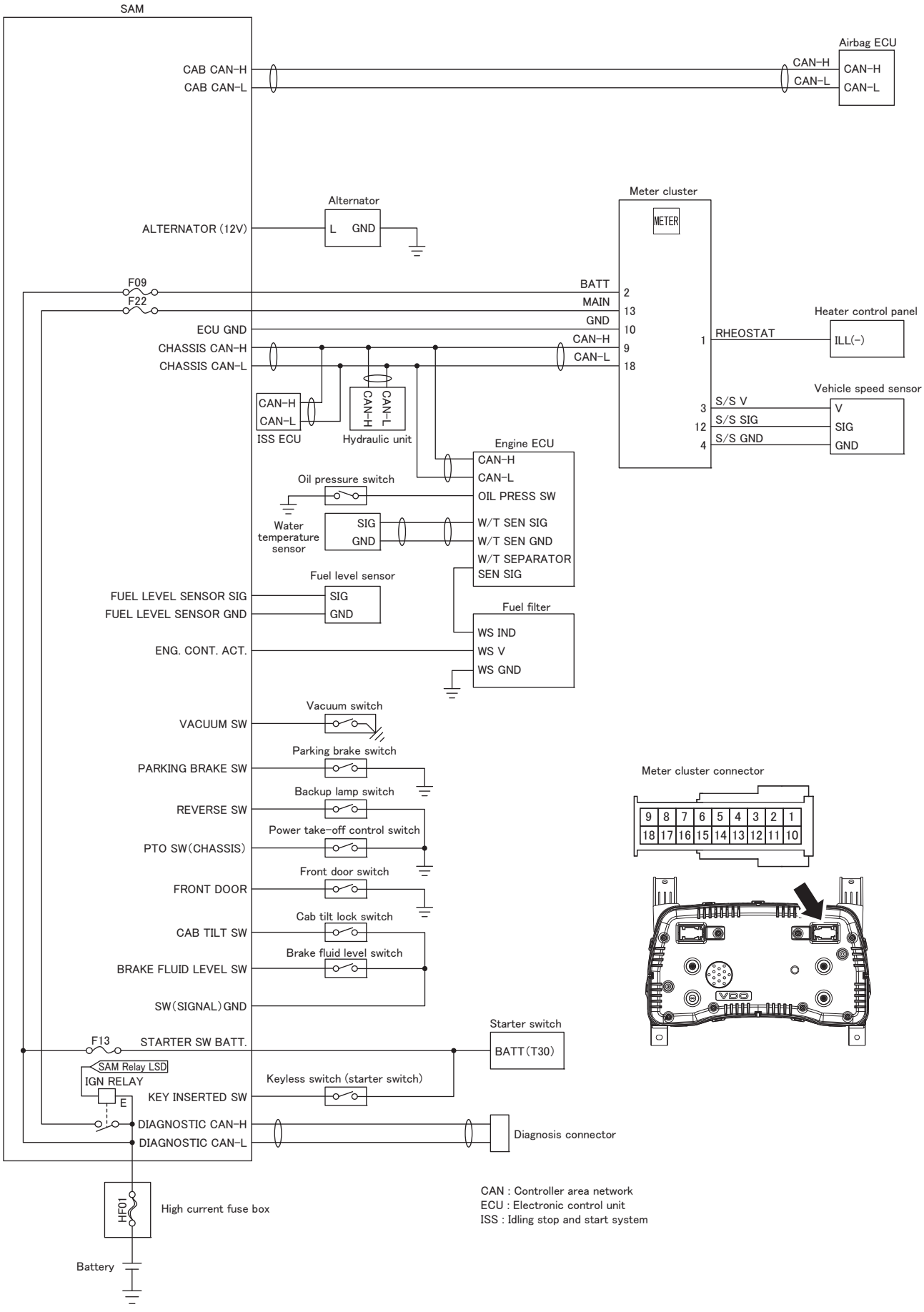


- The fault diagnosis function establishes the diagnosis mode through simultaneous push of the MODE, SELECT and SET/RES switches with the vehicle at a stop to perform the fault diagnosis of respective systems.

(1) Fault diagnosis function (diagnosis mode) display transition diagram (anti-lock brake system electronic control unit (hydraulic unit))



3. Electronic Control Unit Circuit Diagram



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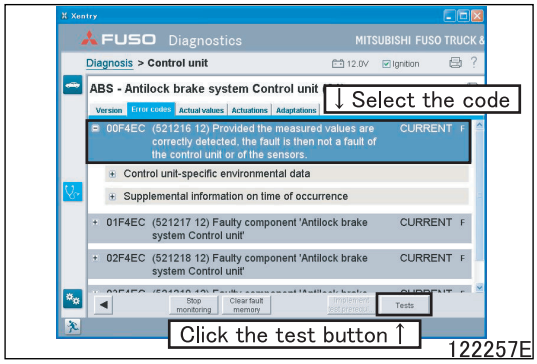
M E M O

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 METER	Remarks
158-3	The battery voltage is too high.	O	
158-4	The battery voltage is too low.	O	
629-31	Faulty part CPU inside component “Instrument panel”	O	
639-4	CAN bus OFF fault	O	
1213-14	There is an internal fault in component ‘instrument panel’.	O	
521751-7	There is an internal fault in component ‘instrument panel’.	O	
521768-19	Faulty part CPU inside component “Instrument panel”	O	

1.2 Details of Diagnosis codes

158-3: The battery voltage is too high.

Generation condition	• In meter cluster is indicated a battery voltage higher than 16 V for 10 seconds.
Recoverability	• System recovers if normal reading is obtained when starter switch is turned to OFF and then to ON.
Control effected by electronic control unit	• None
Possible causes	• Faulty alternator • Faulty signal detect and actuation module • Defective meter cluster

158-4: The battery voltage is too low.

Generation condition	• In meter cluster is indicated a battery voltage lower than 10 V for 10 seconds
Recoverability	• System recovers if normal reading is obtained when starter switch is turned to OFF and then to ON.
Control effected by electronic control unit	• None
Possible causes	• Open-circuit or short-circuit to ground in harness between battery and meter cluster • Malfunction of battery • Faulty alternator • Faulty signal detect and actuation module • Defective meter cluster

629-31: Faulty part CPU inside component “Instrument panel”

Generation condition	• CPU in meter cluster is reset.
Recoverability	• System recovers if any normal signal is received when starter switch is turned to OFF and then to ON.
Control effected by electronic control unit	• None
Possible causes	• Defective meter cluster

639-4: CAN bus OFF fault

Generation condition	• Controller area network communication bus off condition is detected.
Recoverability	• System recovers if any normal signal is received when starter switch is turned to OFF and then to ON.
Control effected by electronic control unit	• None
Possible causes	• Controller area network communication bus is open or shorted to power, ground or another circuit. • Faulty resistor in meter cluster • Defective meter cluster

1213-14: There is an internal fault in component “instrument panel”.

Generation condition	• Internal circuit is malfunctioning.
Recoverability	• System recovers if any normal signal is received when starter switch is turned to OFF and then to ON.
Control effected by electronic control unit	• Error message is sent through controller area network.
Possible causes	• Defective meter cluster

521751-7: There is an internal fault in component “instrument panel”.

Generation condition	• Internal circuit is malfunctioning.
Recoverability	• System recovers if any normal signal is received when starter switch is turned to OFF and then to ON.
Control effected by electronic control unit	• None
Possible causes	• Defective meter cluster

521768-19: Faulty part CPU inside component “Instrument panel”

Generation condition	• Access to EEPROM is impossible.
Recoverability	• System recovers if any normal signal is received when starter switch is turned to OFF and then to ON.
Control effected by electronic control unit	• None
Possible causes	• Defective meter cluster

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.

No.	Current Value Group	Description	Value	Explanation
000	–	Vehicle speed Tachograph	■■■■ km	Unused
001	–	Vehicle speed ECU	■■■■ km	Shows the vehicle speed as determined by the option connector • Synchronous with the speedometer • 0.000 to 255.000 km/h [Related parts] • vehicle speed sensor

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	Instrument cluster	[Test method] Operate each indication in the meter cluster. [Checking method] • The speedometer operates from 0 to maximum. It stops on the way for about 5 seconds at the 40 km/h point. • The tachometer operates from 0 to maximum. It stops on the way for about 5 seconds at the 2000 rpm point. • The fuel level gauge operates from 0 to full. It stops on the way for about 5 seconds at the one half point. • The indicator lamp, illumination, multi-information display, and buzzer change to ON/OFF for every second. [Note] The test stops automatically when three rounds of inspection are completed. (Or, terminated using the stop button.)

4. Coding Data in Electronic Control Unit

4.1 Overview

- The meter cluster 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 meter cluster could deviate from the actual conditions of the vehicles, resulting in incorrect alarms.

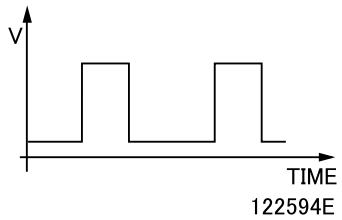
4.2 Rewriting of Coding Data

- 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 meter cluster internal data
Final gear	When the final gear is changed, the meter cluster internal data must be updated.
Rear tire	When the tire size is changed, the meter cluster internal data must be updated.
Anti-lock brake system	When specifications of this system are changed, the meter cluster internal data must be updated.
Meter cluster replacement	All data (entire set of the latest history data for the vehicle)

5. Electronic Control Unit Input/Output Table

- For the signal and ground terminal positions, see the circuit diagram for the electronic control unit.

Connected unit	Terminal	I/O	Voltage or waveform
SAM (Starter switch (M terminal voltage))	13 - Ground	Input	[Judgment criteria] • Starter switch ON: Approx. 12 V (battery voltage) • Starter switch OFF: 0 V
SAM (Battery direct (B terminal voltage))	2 - Ground	Input	[Judgment criteria] • Constant: Approx. 12 V (battery voltage)
Vehicle speed sensor	12 - 4	Input	 122594E [Judgment criteria] • Lo: 0.8 V max. • Hi: Approx. 6.0 V