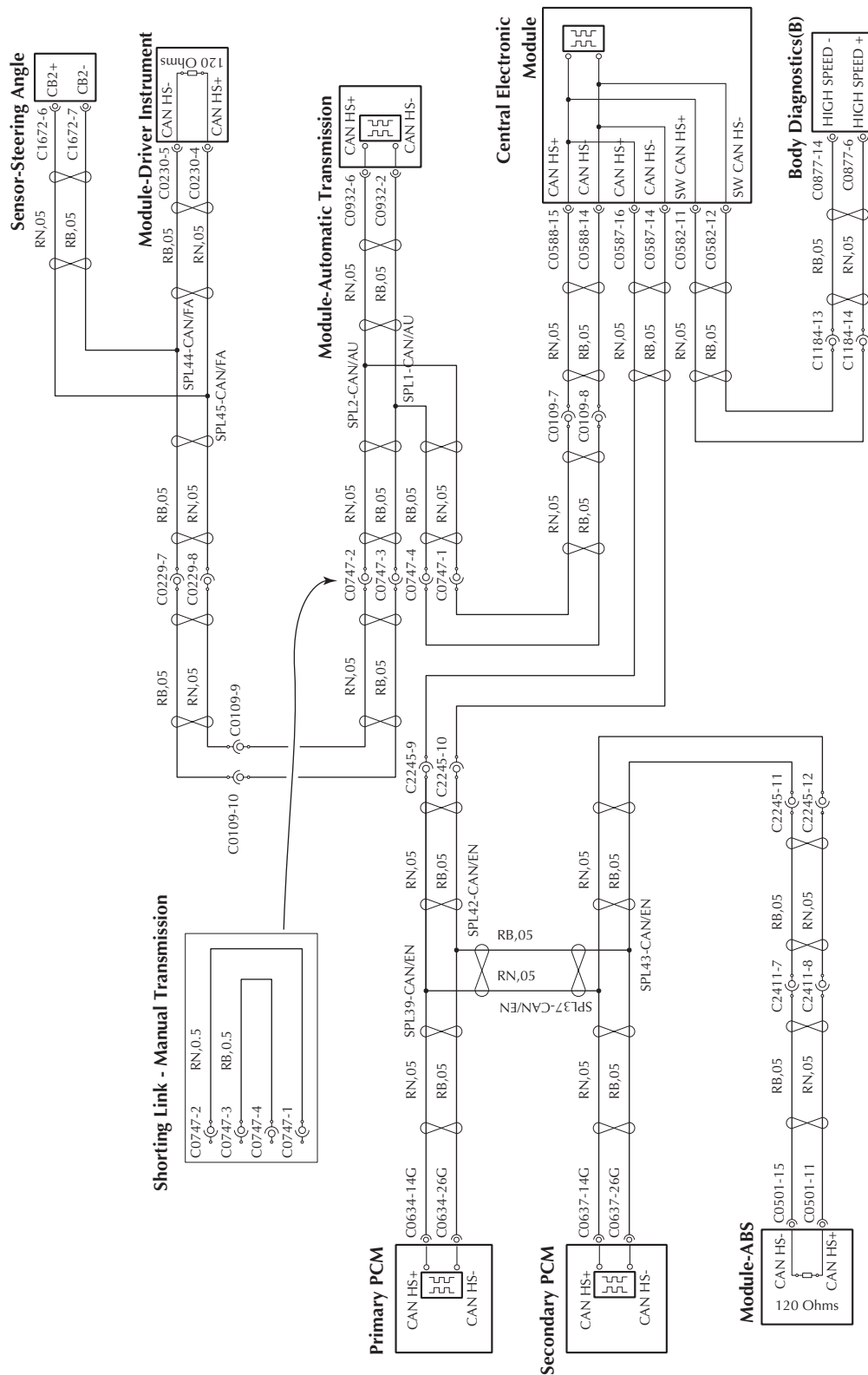


High Speed CAN Fault Analysis

1. Connect the WDS to the Body diagnostic connector. Ignition ON.
2. Read the CEM Diagnostic Codes and select those relevant to the high speed CAN bus.

Code	Definition
DE01	Brake Control Module not alive
DE11	Engine Control Module not alive
DE29	Centre Console Module not alive
DE42	Convertible Roof Module_not_alive
DE43	Driver Door Module not alive
DE45	Pass. Door Module not alive
DE49	Steering Angle Sensor not alive
DE51	Driver Information Module not alive
DE52	Convertible Roof Module not alive
DE54	Infotainment Control Module not alive
DE58	Safety Restraint System (Airbag Module) not alive
DE64	Phone Module not alive
DE6E	Transmission Control Module not alive
DF11	HS CAN Bus Open Load or Transmit / Recieve error
DF13	HS CAN + shorted to batt voltage_
DF14	HS CAN - shorted to ground
DF15	HS CAN + shorted to ground
DF16	HS CAN - shorted to battery voltage
DF17	HS CAN - shorted to HS CAN + or Open Load HS CAN - or HS CAN +
E000	HS CAN transmit recieve error(BUS_OFF)
E001	LS CAN transmit recieve error(BUS_OFF)
E010	CEM HS NWM Failed Control Initialisation
E011	CEM LS NWM Failed Control Initialisation
E020	CEM HS NWM Failed Volcano Initialisation

3. Check for relevant modules off-line. (Cross check against the following High Speed CAN Circuit).



4. Check the basic power and ground supplies to the suspect module and service as necessary. If a power fault was detected, clear the CEM DTC's and then go to step 5.

5. Switch the ignition off and then on again to repeat the power up tests. If any HS CAN module is still off line, service the defective link as necessary. If no relevant codes are displayed, go to step 6.
6. Check resistance from HS CAN + to HS CAN -.

Resistance should be 60Ω. (i.e. 2 x 120Ω terminator resistors in parallel)

Terminator resistors are in the ABS Module and the DIM Module.

If 60Ω is measured, the circuits to the terminator resistors are good. Go to step 7.

If 120Ω is measured, one of the terminator resistors is open circuit. The fault is in either the ABS or the DIM sections of the HS CAN bus. Isolate each section and analyse the fault using continuity checks. Service the open circuit as necessary.
7. With 60Ω measured between HS CAN + and - at the diagnostic socket, only the PCMs, TCM and Steering Angle Sensor spurs remain as suspects.
8. For steering angle sensor faults, go to step 9.

For Transmission Controller faults, go to step 11

For Powertrain Control Module faults, go to step 12.

Steering Angle Sensor

9. If DE49 (Steering Angle Sensor not alive) is logged, Disconnect the steering angle sensor and check continuity of the HS CAN + line from C1672-6 to C0877-6 and the HS CAN - line from C1672-7 and C0877-14.
10. Set WDS Datalogger to monitor the Steering Angle Sensor. Turn the steering wheel and check for a corresponding change in the sensor reading. If the response does not match steering wheel movement, the sensor is faulty. Replace the steering angle sensor. Reconnect all components and retest the sensor to ensure that the problem is resolved.

Transmission Control Unit

11. Set WDS Datalogger to monitor the current gear position. With the ignition on, select each gear in turn and check for a corresponding change in the 'current gear' signal.

If the current gear signal responds correctly to gearshifts, the TCM CAN spur is good. Go to step 11.

If the current gear signal does not respond correctly to gearshifts, service the CAN bus TCM spur as necessary. Reconnect all components and repeat the gearshift test to ensure that the problem is resolved.

Powertrain Control Module

12. If code DE11 (Engine Control Module not alive) is logged in the CEM, Install the breakout box to the PCM connector and check continuity from the HS CAN + and - pins on the body diagnostic connector to the corresponding pins on the PCMs. Service any circuit fault as necessary. Clear the DE11 code from the CEM. Reconnect all components and run a KOER test to ensure that the problem is resolved.

If the code is logged again, check for logged DTCs in the PCM and analyse the problem using the procedures for the PCM fault codes.

Low Speed CAN Procedures

1. Connect the WDS to the OBD II diagnostic connector. Ignition ON.
2. Read the CEM Diagnostic Codes. If CEM diagnostic codes can be read, the OBD II CAN spur and the CEM are good. Go to step 4. We can also assume that there are no shorts to ground, to supply or across the CAN bus in the remainder of the LS CAN Network. This does not eliminate intermittent faults in these areas

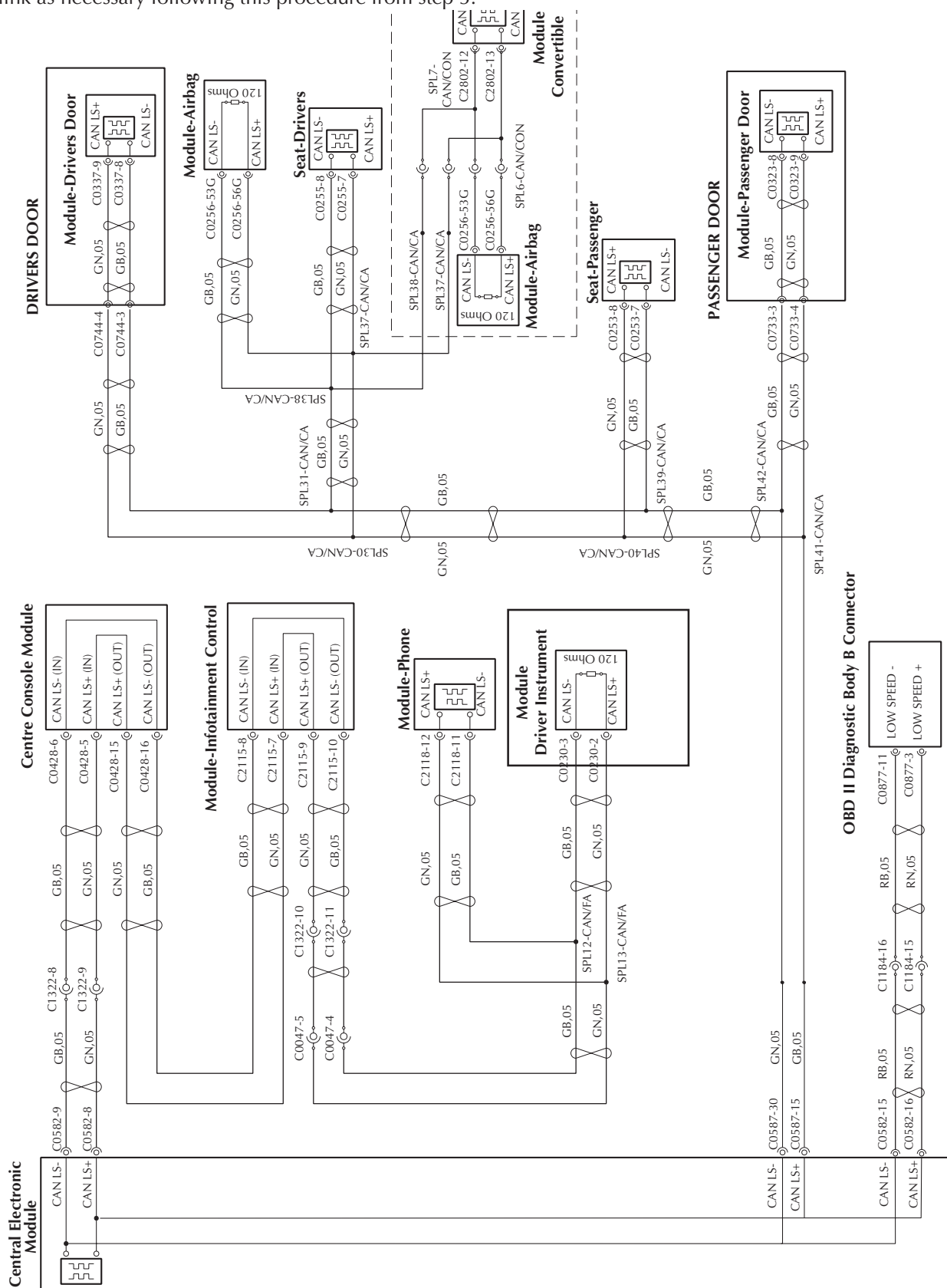
Code	Definition
DE01	Brake Control Module not alive
DE11	Engine Control Module not alive
DE29	Centre Console Module not alive
DE42	Convertible Roof Module_not_alive
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DE54	Infotainment Control Module not alive
DE58	Safety Restraint System (Airbag Module) not alive
DE64	Phone Module not alive
DE6E	Transmission Control Module not alive
DF11	HS CAN Bus Open Load or Transmit / Recieve error
DF13	HS CAN + shorted to batt voltage_
DF14	HS CAN - shorted to ground
DF15	HS CAN + shorted to ground
DF16	HS CAN - shorted to battery voltage
DF17	HS CAN - shorted to HS CAN + or Open Load HS CAN - or HS CAN +
E000	HS CAN transmit recieve error(BUS_OFF)
E001	LS CAN transmit recieve error(BUS_OFF)
E010	CEM HS Network Manager Failed Control Initialisation
E011	CEM LS Network Manager Failed Control Initialisation
E020	CEM HS Network Manager Failed Volcano Initialisation

3. If you cannot read the CEM codes, then one of the following failures exists:
 - CEM not functional. CEM failure or power failure.
 - LS CAN OBD II spur faulty
 - Short to ground, to supply or across the LS CAN Network

If any of the above faults are identified, service the circuits or components as necessary. Clear the CEM DTCs and turn the ignition off and on again. Check that no DTCs are logged in the CEM at power on.

4. From the logged DTCs, check for relevant modules off-line. (Cross check against the following Low Speed CAN Circuit). If any module is Off-Line, check the power and ground supplies to that module and service as necessary.

If no fault is found in the power and ground supplies, note the CEM fault code(s) and service the defective CAN link as necessary following this procedure from step 5.



5. If any of codes DE29, DE51, DE54, or DE58 is present, there is a continuity fault in the CAN Bus between the terminator resistors. Go to step 6.

If none of the above codes is logged but any of codes DE42, DE 43, DE45, DE52 or DE64 is present, the continuity check in step 6 should pass. The fault lies in a LS CAN bus spur and not in the main CAN bus between the terminator resistors. Go to step 7.

6. Switch off the ignition. Disconnect the battery. (Check with Elec Eng.)

Check resistance from LS CAN + to LS CAN - at the OBD II diagnostic socket.

Resistance should be 60Ω . (i.e. $2 \times 120\Omega$ terminator resistors in parallel)

Terminator resistors are in the Airbag Module and the DIM Module.

If 60Ω is measured, the circuits to the terminator resistors are good. Suspect a module failure

If 120Ω is measured, one of the circuits to the terminator resistors is open circuit. The fault is in either the DIM or the Airbag sections of the LS CAN bus. Isolate each section and analyse the fault using continuity checks. Service the open circuit as necessary.

7. For each Logged DTC, access the module connector and complete continuity checks for the CAN + and CAN - links to the OBD II diagnostic socket pins C0877-11 CAN - and C0877-3 CAN +.

Service any open or short circuits as necessary. Clear the CEM DTCs. Turn the ignition off and then on again. Check that no CEM DTCs are logged at power on.

If no circuit faults are identified, the fault must lie in the relevant module. Replace the module. Clear the CEM DTCs. Turn the ignition off and then on again. Check that no CEM DTCs are logged at power on.

Special Tests

Soak and Road Test

The vacuum tests are only run during a drive cycle after the ignition has been switched off for more than 5 hours. If less than 5 hours have elapsed, the vacuum tests are not included in the drive cycle.

Leave the vehicle parked overnight (or more than 5 hours and then run a road test which must include steady running at over 40 m.p.h. for more than 5 minutes.

Quick Check - Battery and Battery Charging

Battery - Measure battery voltage from the jump start terminal to chassis ground. If less than 12.5 volts, suspect a defective battery. Service/replace the battery as necessary and retest for a P0562 condition. If above 12.5 volts, the battery is serviceable, go to the charging check.

Charging - Run the engine at 2000 rpm whilst the headlamps are switched on. Charge voltage measured from the jump start terminal to chassis ground should be about 13.8 volts. If significantly below 13.8 volts, service the charging system and retest for a P0562 condition. If at 13.8 volts, the charging system is serviceable.

Quick Check - Engine Fuelling

This procedure is intended as a quick check for correct engine running after major work on the fuel system. It uses the WDS datalogger to monitor the engine management oxygen sensor output signals.

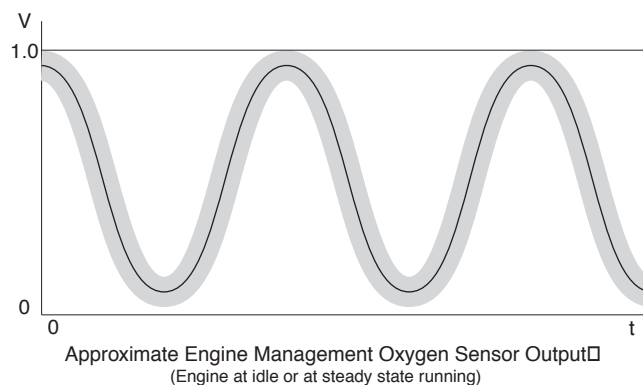
A regular fluctuating signal from all EGO sensors indicates normal fuelling and ignition performance on both sides of the engine. If this is accompanied by a clear DTC log, then there are no current engine management problems.

1. Connect the WDS and note all logged DTCs.
2. Set the datalogger to monitor VEGO11 and VEGO21 for both PCMs.

VEGO = Voltage - Exhaust Gas Oxygen sensors

Also monitor Δ FPRESS (fuel rail pressure) for both fuel rails

3. Start the engine and run at idle until the temperature gauge rises above minimum.
4. Start the datalogger to monitor the upstream engine management VEGO signals. Observe the signal trace and compare with the illustration below



5. Note also the fuel rail pressure for both fuel rails.
6. Raise the engine speed to a steady level of approximately 2000 rpm. Again monitor the upstream VEGO signals and Δ FPRESS readings.
7. If there are no engine management DTCs logged and if the signal patterns observed in steps 4 and 6 meet the following guidelines, then engine running is acceptable.

Look for:

- a regular rise and fall in the EGO signal voltage
 - Increased frequency of EGO signals with increasing rpm.
 - similar signal patterns from all four EGO sensors
 - no major irregularities over time
 - Δ FPRESS above 40 psi for both engine banks
8. If the VEGO signal patterns are irregular or not closely matched, check for newly logged DTCs and investigate them using the procedures in this manual. Stop the datalogger and switch off the engine.

