ENGINE MANAGEMENT

SECTION EMP

EMP.1 - DIAGNOSTIC TROUBLE CODE LIST

When applicable, reference may be made under the 'Notes' heading to a page in the Toyota service manual. This information should be used only for diagnosis and connection detail of the **sensor**. The Elise/Exige uses a Lotus ECU, the connections for which may be found in circuit diagrams in Section MP. Diagnostic Trouble Codes should be read using a Lotus Scan tool T000T1418F.

Camshaft Timing Control (VVT) **P0011**
P0012
P0076
P0077

P0011A Camshaft Position – Timing Over-Advanced or System Performance
P0012A Camshaft Position – Timing Over-Retarded
P0076 Intake Valve Control Solenoid Circuit Low
P0077 Intake Valve Control Solenoid Circuit High

Description
The Variable Valve Timing system (VVT) on the intake camshaft can vary the timing by approximately 25°. The camshaft relative position is varied by a system of vanes mounted on the drive end of the camshaft. The VVT oil control valve modulates a spool valve position in accordance with the drive signal duty cycle, this in turns controls the oil pressure applied to the vanes. A 50% duty cycle applied to the valve will hold the valve current timing by preventing oil flow from the VVT controller housing, a duty cycle less than 50% will retard the valve timing, a duty cycle greater then 50% will advance the valve timing.

Component connections

Sensor Connector	*Description*	*ECU Pin*	*ECU Connector*
1	Battery Voltage	-	-
2	VVT Oil Control Valve	49	52 Way

P0011, P0012

Monitor: Continuous

Enable Criteria:
- Engine running > 30 secs
- Coolant temperature > 60°C (140°F)

Disable Criteria:
P0116, P0117, P0118 – Coolant temperature fault codes

Potential failure modes:
- Static valve timing is incorrect
- VVT camshaft actuator failure
- VVT valve stuck open / closed

P0076, P0077

Monitor: Continuous

Enable Criteria: Engine running

Disable Criteria: None

Potential failure modes:
- VVT valve open circuit
- VVT valve short to ground
- ECU output circuit failure

Notes:
The MIL will be illuminated if the faults are present for 2 consecutive trips

Intake Air Flow **P0101**
P0102
P0103

P0101 Mass or Volume Air Flow Circuit Range/Performance
P0102 Mass or Volume Air Flow Circuit Low Input
P0103 Mass or Volume Air Flow Circuit High Input

Description
The Mass Air Flow (MAF) sensor is incorporated into the airbox, and measures both intake air flow rate and Intake Air Temperature (IAT). The MAF sensor uses a platinum hot wire and a cold wire element. By controlling the current flow through the hot wire to maintain a constant temperature, and therefore known resistance, any change in air flow and therefore temperature, will be detected by a change in resistance. This change of resistance is the output signal from the sensor.

Sensor connections

Sensor Connector	*Description*	*ECU Pin*	*ECU Connector*
1	Battery Voltage	-	-
2	MAF Ground	31	52 Way
3	MAF Signal	45	52 Way
4	IAT Signal	44	52 Way
5	IAT Ground	18	52 Way

Sensor characteristics
0 – 655 g/sec
Typical values: 1.5 – 5.0 g/sec (idle), 5.0 – 15.0 g/sec (2500rpm elevated idle no load)

Monitor: Continuous.

P0101

Enable Criteria:
- Engine running
- Engine speed >2490rpm
- TPS > 80% (P0101 – MAPS* too low)
- TPS < 5% (P0101 – MAPS* too high)

*(MAPS – Mass Air Per Stroke)

Disable Criteria:
P0121, P0122, P0123 – Throttle Position fault codes

Potential failure modes:
- MAF sensor battery voltage open circuit (MAF value (g/sec) = 0.0)
- MAF sensor signal open circuit or short to ground (MAF value (g/sec) = 0.0)
- MAF sensor ground open circuit (MAF value (g/sec) > 229.0)

P0102

Enable Criteria: Engine running

Disable Criteria: None

Potential failure modes:
- MAF sensor battery voltage open circuit (MAF value (g/sec) = 0.0)
- MAF sensor signal open circuit or short to ground (MAF value (g/sec) = 0.0)
- MAF sensor ground open circuit (MAF value (g/sec) > 229.0)

P0103

Enable Criteria: Engine running

Disable Criteria: None

Potential failure modes:
- MAF sensor battery voltage open circuit (MAF value (g/sec) = 0.0)
- MAF sensor signal open circuit or short to ground (MAF value (g/sec) = 0.0)
- MAF sensor ground open circuit (MAF value (g/sec) > 229.0)

Notes:
- The MIL will be illuminated if the faults are present for 2 consecutive trips
- Further information on the sensor may be found in Toyota 1ZZ-FE, 2ZZ-GE manual RM733E (B120T0327J) Page DI-26 to DI-32

Barometric Pressure **P0106**
P0107
P0108

P0106 Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance
P0107 Manifold Absolute Pressure/Barometric Pressure Circuit Low Input
P0108 Manifold Absolute Pressure/Barometric Pressure Circuit High Input

Description
The barometric pressure sensor is located internally within the ECU, and measures atmospheric pressure. This parameter is required to compensate the mass air flow when the vehicle is operated at higher altitudes.

Monitor: Continuous

P0106

Enable Criteria:
- Engine running
- Engine speed 2190 – 3510rpm
- TPS > 80%

Disable Criteria:
P0101, P0102, P0103 – MAF Sensor fault codes
P0121, P0122, P0123 – Throttle Position fault codes

Potential failure modes:
Sensor failure

P0107, P0108

Enable Criteria: Engine running

Disable Criteria: None

Potential failure modes:
Sensor failure

Notes:
The MIL will be illuminated if the fault is present for 2 consecutive trips

Intake Air Temperature **P0111**
P0112
P0113

P0111 Intake Air Temperature Sensor 1 Circuit Range/Performance
P0112 Intake Air Temperature Sensor 1 Circuit Low
P0113 Intake Air Temperature Sensor 1 Circuit High

Description
The combined sensor which measure both Mass Air Flow (MAF) and Intake Air Temperature (IAT) is incorporated into the airbox. The IAT sensor is a thermistor device which changes resistance with temperature. As air intake temperature decreases the thermistor resistance value increases, and conversely as air temperature increases so the thermistor resistance value decreases.

Sensor connections

Sensor Connector	*Description*	*ECU Pin*	*ECU Connector*
1	Battery Voltage	-	-
2	MAF Ground	31	52 Way
3	MAF Signal	45	52 Way
4	IAT Signal	44	52 Way
5	IAT Ground	18	52 Way

Sensor characteristics
IAT -20°C (-4°F) 12.5 – 16.9 kΩ
IAT 20°C (68°F) 2.19 – 2.67 kΩ
IAT 60°C (140°F) 0.50 – 0.68 kΩ

Monitor: Continuous

P0111

Enable Criteria:
- Engine running < 30 secs
- Coolant temperature < 30°C (86°F)

Disable Criteria:
P0116, P0117, P0118 – Coolant temperature fault codes

Potential failure modes:
- P0112 – signal short circuit
- P0113 – signal open circuit
- Sensor failure

P0112

Enable Criteria: Engine running

Disable Criteria: None

Potential failure modes:
- Signal short circuit (IAT = –40°C (–104°F) < 0.049 V)
- Sensor failure

P0113

Enable Criteria: Engine running

Disable Criteria: None

Potential failure modes:
- Signal open circuit (IAT > 140°C (284°F) > 4.932 V)
- Sensor failure

Notes:
- The MIL will be illuminated if the fault is present for 2 consecutive trips
- Further information on the sensor may be found inToyota 1ZZ-FE, 2ZZ-GE manual RM733E (B120T0327J) pages DI-33 to DI-38

Engine Coolant Temperature **P0116**
P0117
P0118

P0116 Engine Coolant Temperature Circuit Range/Performance
P0117 Engine Coolant Temperature Circuit Low
P0118 Engine Coolant Temperature Circuit High

Description
The engine coolant temperature sensor is a thermistor device which changes resistance with temperature. As coolant temperature decreases the thermistor resistance value increases, and conversely as coolant temperature increases so the thermistor resistance value decreases.

Sensor connections

Sensor Connector	*Description*	*ECU Pin*	*ECU Connector*
1	Ground	7	52 Way
2	Signal	33	52 Way

Sensor characteristics

0°C (32°F)	= 3.279 V
19.4°C (67°F)	= 2.186 V
42.5°C (108.5°F)	= 1.249 V
80°C (176°F)	= 0.469 V

P0116

Enable Criteria:
Engine running > 800 seconds

Disable Criteria: None

Potential failure modes:
- P0117 – signal short circuit
- P0118 – signal open circuit
- Sensor failure

P0117

Enable Criteria: Engine running

Disable Criteria: None

Potential failure modes:
- Signal short circuit (Coolant Temperature = –40°C (–104°F) < 0.029 V)
- Sensor failure

P0118

Enable Criteria: Engine running

Disable Criteria: None

Potential failure modes:
- Signal open circuit (Coolant Temperature > 140°C (284°F) > 4.892 V)
- Sensor failure

Notes:

- The MIL will be illuminated if the fault is present for 2 consecutive trips
- Further information on the sensor may be found inToyota 1ZZ-FE, 2ZZ-GE manual RM733E (B120T0327J) page DI-39 to DI-45

Throttle Position **P0121**
P0122
P0123

P0121 Throttle/Pedal Position Sensor/Switch “A” Circuit Range/Performance
P0122 Throttle/Pedal Position Sensor/Switch “A” Circuit Low
P0123 Throttle/Pedal Position Sensor/Switch “A” Circuit High

Description
The Throttle Position Sensor (TPS) is a potentiometer device, which is connected to a 5V reference source, a ground and an input signal to the ECU.

Sensor connections

Sensor Connector	*Description*	*ECU Pin*	*ECU Connector*
1	Ground	34	52 Way
2	5V Ref.	8	52 Way
3	Signal	20	52 Way

Sensor characteristics
0% = 0.595 V ± 5%
100% = 4.148 V ± 5%

Monitor: Continuous.

P0121

Enable Criteria:
Rationality check – throttle not too high at low engine load:
- Engine running
- TPS > 80%
- Engine speed >1500rpm
- MAPS* < 40%
- Vehicle Speed > 30 km/h (18.6mph)

OR
Rationality check – throttle not too low at high engine load:
- Engine running
- TPS < 10%
- Engine speed 1500 – 2010rpm
- MAPS* > 65%

*(MAPS – Mass Air Per Stroke)

Disable Criteria:
P0101, P0102, P0103 – MAF Sensor fault codes
P0500 – Vehicle Speed sensor

Potential failure modes:
- Sensor short or open circuit
- Sensor failure

P0122

Enable Criteria: None

Disable Criteria: None

Potential failure modes:
- Signal short circuit (< 0.283 V)
- Reference voltage open circuit
- Reference voltage short to ground
- Sensor failure

P0123

Enable Criteria: None

Disable Criteria: None

Potential failure modes:
- Signal open circuit (> 4.487 V)
- Reference voltage open circuit
- Reference voltage short to ground
- Sensor failure

Notes:
- The MIL will be illuminated if the fault is present for 2 consecutive trips
- Further information on the sensor may be found inToyota 1ZZ-FE, 2ZZ-GE manual RM733E (B120T0327J) page DI-45 to DI-52

Coolant Thermostat **P0128**

P0128 Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)

Description
The thermostat diagnostic is enabled after each cold engine start, and monitors the rate of temperature rise during warm up relative to the measured engine air flow.

Monitor: Continuous

Enable Criteria:
- Engine running
- Coolant Temperature > -10°C (14°F)
- Coolant Temperature < 70°C (158°F)

Disable Criteria:
P116, P117, P118 – Engine Coolant Temperature sensor faults

Potential failure modes:
Thermostat failure

Notes:
The MIL will be illuminated if the fault is present for 2 consecutive trips.

O2 Sensor (Pre Catalyst) **P0131**
P0132
P0133
P0134
P0135

P0131 O2 Sensor 1 Circuit Low Voltage
P0132 O2 Sensor 1 Circuit High Voltage
P0133 O2 Sensor 1 Circuit Slow Response
P0134 O2 Sensor 1 Circuit No Activity Detected
P0135 O2 Sensor 1 Heater Circuit

Description
The oxygen sensor monitors the oxygen content in the exhaust gases. The sensor consists of a zirconia electrode between two platinum plates. When zirconia comes into contact with oxygen, it becomes an electrical conductor. The exhaust gases pass through louvers in the sensor. One plate is in contact with the outside air and the other plate is in contact with the exhaust gases. The platinum plate in contact with the air is electrically negative due to the oxygen in the atmosphere and the plate in contact with the exhaust gases is electrically positive. This will cause a difference in electrical potential to develop between the two plates. Thus the voltage across the platinum plates ranges approximately from 100 millivolts to 900 millivolts, depending on the oxygen content of the exhaust gases. Thus when the air/fuel mixture is rich, the oxygen sensor output will be high. If the air/fuel mixture is lean, the oxygen sensor output will be low.

Sensor connections

Sensor Connector	*Description*	*ECU Pin*	*ECU Connector*
1	Signal	15	52 Way
2	Ground	41	52 Way
3	Heater ground	1	52 Way
4	Battery Voltage	-	-

Sensor characteristics
Normal operating range is 0 – 1000mV

Malfunction Criteria

P0131
Set when the sensor operates below 5mV for more than 1.5 seconds consecutively for a specified number of times.

Monitor: Continuous

Disable Criteria: DFCO (Deceleration Fuel Cut Off)

Potential failure modes:
- Low fuel pressure (Lean mixture)
- Malfunctioning sensor
- External water on sensor
- Sensor wire shorted to ground

P0132
Set when the sensor operates above 1200mV for more than 1.5 seconds consecutively for a specified number of times.

Monitor: Continuous

Potential failure modes:
- High fuel pressure (Rich mixture)
- Leaking or shorted injector
- Purge valve fault
- Oxygen sensor contamination
- Engine oil contamination
- Sensor wire

P0133
Set when the sensor fails to switch from a Lean to a Rich condition in under 600ms or switch from a Rich to a Lean condition in under 500ms. A selection of switches is used to determine the average times.

Enable Criteria:
- Vehicle speed between 0 – 255 km/h (158.5 mph)
- MAF per stroke between 15 – 70 mg
- Engine speed between 2600 – 3511rpm
- Engine run time > 200 seconds
- Coolant temperature > 60°C (140°F)
- Closed loop fuelling enabled

Disable Criteria:
P0116, P0117, P0118 – Coolant temperature sensor faults
P0131, P0132, P0134, P0135 – Pre catalyst oxygen sensor faults
P0101, P0102, P0103 – MAF sensor faults

Monitor:
Monitored until the required amount of switches in both directions has been achieved (Approx. 150 sec)

Potential failure modes:
- Sensor connector and wiring should be checked for corrosion and loose connections
- Sensor contaminated, possibly from fuel, improper use of RTV, engine oil or coolant

P0134
Set when the sensor fails to switch above 557mV and below 400mV within a 5.1 second period for 5 consecutive checks.

Enable Criteria:
- Engine run time > 30 seconds
- Engine is not at idle
- Engine is in closed loop fuel control

Monitor:
Until either passed or failed (5.1 x 5 = 25.5 sec + initial 30 sec = 55 sec maximum).

Potential failure modes:
Sensor connector and wiring should be checked for corrosion and loose connections.

P0135
Set when the sensor output is greater than 1900mA or less than 250mA for 1.5 seconds, for 40 consecutive checks.

Enable Criteria:
Engine run time > 60 seconds

Monitor:
Continuous

Potential failure modes:
Sensor connector and wiring should be checked for corrosion and loose connections.

Notes:
- The MIL will be illuminated if the fault is present for 2 consecutive trips.
- Further information on the sensor may be found inToyota 1ZZ-FE, 2ZZ-GE manual RM733E (B120T0327J) pages DI-53 to DI-62

O2 Sensor (Post Catalyst) **P0137**
P0138
P0139
P0140
P0141

P0137 O2 Sensor Circuit Low Voltage
P0138 O2 Sensor Circuit High Voltage
P0139 O2 Sensor Circuit Slow Response
P0140 O2 Sensor Circuit No Activity Detected
P0141 O2 Sensor Heater Circuit

Description
The oxygen sensor monitors the oxygen content in the exhaust gases. The sensor consists of a zirconia electrode between two platinum plates. When zirconia comes into contact with oxygen, it becomes an electrical conductor. The exhaust gases passes through louvers in the sensor. One plate is in contact with the outside air and the other plate is in contact with the exhaust gases. The platinum plate in contact with the air is electrically negative due to the oxygen in the atmosphere and the plate in contact with the exhaust gases is electrically positive. This will cause a difference in electrical potential to develop between the two plates. Thus the voltage across the platinum plates ranges approximately from 100 millivolts to 900 millivolts, depending on the oxygen content of the exhaust gases. Thus when the air/fuel mixture is rich, the oxygen sensor output will be high. If the air/fuel mixture is lean, the oxygen sensor output will be low. The post catalyst oxygen sensor performance is a good indicator of catalyst efficiency.

Sensor connections

Sensor Connector	*Description*	*ECU Pin*	*ECU Connector*
1	Signal	3	52 Way
2	Ground	29	52 Way
3	Heater ground	27	52 Way
4	Battery Voltage	-	-

Sensor characteristics
Normal operating range is 0 – 1000mV

Malfunction Criteria

P0137
Set when the sensor operates below 5mV for more than 1.5 seconds consecutively for a specified number of times.

Monitor: Continuous

Disable Criteria: DFCO (Deceleration Fuel Cut Off)

Potential failure modes:
- Check and rectify any pre catalyst sensor fault code, as they may be causing the fault code to be set
- Sensor wire shorted to ground
- Catalyst

P0138
Set when the sensor operates above 1200mV for more than 1.5 seconds consecutively for a specified number of times.

Monitor: Continuous

Potential failure modes:
- Check and rectify any front sensor fault code, as they may be causing the fault code to be set
- Catalyst

P0139
Set when the sensor fails to reach 650mV after 1.9 seconds of P.E or when the sensor fails to drop below 150mV after 5 seconds of DFCO.

Enable Criteria:
- Engine run time > 200 seconds
- Coolant temperature > 60°C (140°F)
- Open loop fuel control
- DFCO (Deceleration Fuel Cut Off)

Disable Criteria:
P0116, P0117, P0118 – Coolant Temperature Sensor faults
P0201, P0202, P0203, P0204 – Injector faults
P0300, P0301, P0302, P0303, P0304 – Misfire faults
P1301, P1302 – Misfire faults causing emission or catalyst damage

Monitor: Continuous, until the test is either passed or failed

Potential failure modes:
- Check and rectify any pre catalyst sensor fault code, as they may be causing the fault code to be set
- Catalyst

P0140
Set when the sensor fails to switch above 557mV and below 400mV within 60 seconds.

Enable Criteria:
- Engine run time > 30 seconds
- Engine is not at idle
- Engine is in closed loop fuel control

Monitor: Continuous

Potential failure modes:
- Check and rectify any front sensor fault code, as they may be causing the fault code to be set
- Sensor connector and wiring should be checked for corrosion and loose connections
- Catalyst

P0141
Set when the sensor output is greater than 1900mA or less than 250mA for 1.5 seconds, for 40 consecutive checks.

Enable Criteria: Engine run time > 60 seconds

Monitor: Continuous

Potential failure modes:
Sensor connector and wiring should be checked for corrosion and loose connections

Notes:
- The MIL will be illuminated if the fault is present for 2 consecutive trips.
- Further information on the sensor may be found inToyota 1ZZ-FE, 2ZZ-GE manual RM733E (B120T0327J) pages DI-63 to DI-66

Fuel Control System Too Lean Or Rich **P0171**
P0172

P0171 System Too Lean
P0172 System Too Rich

Description
The oxygen sensor sends a signal to the ECU corresponding to the exhaust gas oxygen content enabling the ECU to maintain a 14.7:1 air/fuel ratio under normal driving conditions. The ECU can make fuel corrections of ± 17% to the calculated fuel demand. If the ECU determines a rich condition exists (oxygen sensor above 0.450mV), it will decrease the calculated fuel demand to maintain a 14.7:1 ratio. If the ECU determines a lean condition exists (oxygen sensor below 0.450mV), it will increase the calculated fuel demand to maintain a 14.7:1 ratio.

Enable Criteria
- Fuel Trim condition enabled
- Closed loop fuelling enabled
- Engine speed > 1100 rpm
- MAF > 6 g/sec
- Engine load < 70 %
- Altitude < 8000 ft (2438 m), Baro > 756 mbar
- Inlet air temperature > -10°C (14°F)

Disable Criteria

P0106, P0107, P0108	– Baro sensor faults
P0111, P0112, P0113	– Air Intake Sensor faults
P0131, P0132, P0133, P0134, P0135	– Oxygen sensor faults
P0300, P0301, P0302, P0303, P0304	– Misfire faults
P0441, P0442, P0443, P0447, P0448, P0450, P0451, P0455, P0456	– EVAP faults

Monitor: Continuous

Malfunction Criteria
P0171
This code is set when the calculated fuel demand has been increased to its maximum limit of 17% and the system still cannot maintain an air/fuel ratio of 14.7:1 under normal driving conditions.

Potential failure modes:
- Fuel Pressure too low
- Air leak in system
- Water in fuel
- Exhaust leak / crack before front oxygen sensor
- Injector fault
- Sensor connector and wiring for signs of corrosion or loose connections

P0172
This code is set when the calculated fuel demand has been decreased to its minimum limit of -17% and the system still cannot maintain an air/fuel ratio of 14.7:1 under normal driving conditions.

Potential failure modes:
- Fuel Pressure too high
- Leaking fuel injector
- Restriction in the exhaust system or air intake / filter
- Erratic throttle position sensor

Notes:
- The MIL will be illuminated if the fault is present for 2 consecutive trips.
- Further information on the sensor may be found inToyota 1ZZ-FE, 2ZZ-GE manual RM733E (B120T0327J) pages DI-67 to DI-72

Fuel Injection System **P0201**
P0202
P0203
P0204

P0201 Injector Circuit/Open – Cylinder 1
P0202 Injector Circuit/Open – Cylinder 2
P0203 Injector Circuit/Open – Cylinder 3
P0204 Injector Circuit/Open – Cylinder 4

Description
The ECU has four injector driver circuits, each of which controls an injector. When the engine is running the ECU continuously monitors the injector circuit feedback signals. The feedback signal should be low when the injector is ON and high voltage when the injector is OFF.

Component connections

Injector	*ECU Pin*	*ECU Connector*
1	25	52 Way
2	51	52 Way
3	14	52 Way
4	40	52 Way

Malfunction Criteria
The operation of all the injector codes is the same, the last digit relates to the injector involved i.e. a code P0203 indicates there is a problem with injector number 3.

Enable Criteria: Engine running

Monitor: Continuous

Limp home:
- Limit maximum engine speed to 6000rpm
- Return the fuel system to open loop fuel control

Potential failure modes:
Sensor connector or wiring corroded or loose connections

Notes:
- The MIL will be illuminated if the fault is present for 2 consecutive trips.
- If an injector goes short circuit it is likely that the ECU injector driver will be damaged.

Misfire **P0300**
P0301
P0302
P0303
P0304

P0300 Random/Multiple Cylinder Misfire Detected
P0301 Cylinder 1 Misfire Detected
P0302 Cylinder 2 Misfire Detected
P0303 Cylinder 3 Misfire Detected
P0304 Cylinder 4 Misfire Detected

Description
A misfiring cylinder can be detected by analysing crank speed variation. As a result of a combustion event there will be a net acceleration of the crankshaft. Subsequent to a misfire event the engine will decelerate over the period following the missed cylinder event.
Speed changes can be characterised by observing changes in the time period for a fixed angle of rotation after firing events. A significant change in this period, assessed by comparison to previous periods, may be attributed to misfire on a known cylinder.

Component connections

Connector	*Description*	*ECU Pin*				*ECU Connector*
1	Supply Voltage	Coil 1	Coil 2	Coil 3	Coil 4	
2	Ignition Coil Feedback	22	22	22	22	52 Way
3	Coil Output (Logic)	52	26	47	48	52 Way
4	Ground					

Malfunction Criteria
The operation of all the misfire codes is the same, the last digit relates to the misfire involved i.e. a code P0303 indicates there is a problem with coil number 3. P0300 indicates the misfire is random and not linked to one particular cylinder.

Enable Criteria:
- Battery voltage between 10 – 16 V
- Coolant temperature between -10 – 120°C (14 – 248°F)
- Engine speed between 660 – 8010rpm
- Engine speed transient > 15rpm
- Altitude < 8000 ft (2438 m) / Baro > 756mbar
- Fuel level > 5 litres (1.3 US gallons)
- Engine load between 15 – 48% depending on engine speed

Disable Criteria: DFCO enabled (Deceleration Fuel Cut Off)

Monitor: Continuous

Limp home:
- Limit maximum engine speed to 6000 rpm
- Return the fuel system to open loop
- ECU may deactivate two cylinders, the misfiring cylinder and it's matched other i.e. 1 & 4 or 2 & 3.

Potential failure modes:
- Injector related codes, as these can cause misfire codes to be set.
- VVT or VVL codes set
- Sensor connector and wiring for signs of corrosion or loose connections
- Spark plug / Cylinder compression
- Cam timing / Damage to rocker arm assembly

Notes:

- The MIL will be illuminated if the fault is present for 2 consecutive trips.
- Further information on the sensor may be found inToyota 1ZZ-FE, 2ZZ-GE manual RM733E (B120T0327J) pages DI-73 to DI-78

Knock Control System **P0324**
P0327
P0328

P0324 Knock Control System Error
P0327 Knock Sensor 1 Circuit Low
P0328 Knock Sensor 1 Circuit High

Description
The knock sensor contains a piezoelectric element which generates a voltage when it becomes deformed. The piezoelectric element sends the signal to the ECU, when the cylinder block vibrates due to engine knocking. If knock is detected then the ECU will retard the ignition to suppress it. The knock control sensor cannot differentiate between spark knock and other similar sounding noises.

Sensor connections

Sensor Connector	*Description*	*ECU Pin*	*ECU Connector*
1	Sensor input	43	52 Way
2	Ground	13	52 Way

Malfunction Criteria
P0327 – This code is set when the knock sensor signal is < 0.586 V
P0328 – This code is set when the knock sensor signal is > 2.928 V

Potential failure modes:
- Abnormal engine noise, i.e. damaged engine or exhaust system contacting vehicle
- Knock sensor fixing too tight
- Sensor connector / wiring corroded or loose connections

Notes:
- The MIL will be illuminated if the fault is present for 2 consecutive trips.
- Further information on the sensor may be found inToyota 1ZZ-FE, 2ZZ-GE manual RM733E (B120T0327J) pages DI-79 to DI-81

Engine Speed / Position Sensors **P0335**

P0335 Crankshaft Position Sensor “A” Circuit Range/Performance

Description
Engine speed is calculated by measuring the time between the ‘teeth’ of the crankshaft sensor trigger disc. The disc has 34 ‘teeth’ and 2 missing ‘teeth’, spaced at 10 degree intervals around the disc. The 2 missing ‘teeth’ are positioned at 225 degrees before cylinder No.1 and 4 TDC. The crankshaft sensor signal is also used to determine misfires events.

Sensor connections

Sensor Connector	*Description*	*ECU Pin*	*ECU Connector*
1	Sensor input	4	52 Way
2	Ground	30	52 Way

Monitor: Continuous

Enable Criteria: Engine running

Disable Criteria: None

Potential failure modes:
- Sensor signal open circuit or short to ground
- Sensor ground open circuit
- Sensor failure

Notes:
- If a sensor or sensor circuit failure occurs, the engine will not fire or start.
- The MIL will be illuminated if the fault is present for 2 consecutive trips
- Further information on the sensor may be found inToyota 1ZZ-FE, 2ZZ-GE manual RM733E (B120T0327J) pages DI-82 to DI-83

Engine Speed / Position Sensors **P0340**

P0340 Camshaft Position Sensor “A” Circuit

Description
The camshaft position input to the ECU is used to determine engine phase, enable sequential fuel injection control and to determine camshaft position for the VVT system. The inlet camshaft has three ‘teeth’ spaced 90° apart, which are detected by the electromagnetic sensor. The valve timing setting is measured in the ECU by measuring time from a (fixed position) crankshaft tooth to a (variable position) camshaft tooth. As the engine speed and the position is known from the crankshaft sensor signal, the camshaft position can be calculated.

Sensor connections

Sensor Connector	*Description*	*ECU Pin*	*ECU Connector*
1	Signal(VR Input)	16	52 Way
2	Ground	42	52 Way

Monitor: Continuous

Enable Criteria:
- Engine running
- Engine speed > 600rpm

Disable Criteria: None

Potential failure modes:
- Sensor signal open circuit or short to ground
- Sensor ground open circuit
- Sensor failure

Notes:
- The MIL will be illuminated if the fault is present for 2 consecutive trips.
- Further information on the sensor may be found in Toyota 1ZZ-FE, 2ZZ-GE manual RM733E (B120T0327J) pages DI-84 to DI-85

Ignition System **P0351**
P0352
P0353
P0354

P0351 Ignition Coil “A” Primary/Secondary Circuit
P0352 Ignition Coil “B” Primary/Secondary Circuit
P0353 Ignition Coil “C” Primary/Secondary Circuit
P0354 Ignition Coil “D” Primary/Secondary Circuit

Description
A Direct Ignition System (DIS) is used on the engine. The DIS improves the ignition accuracy, reduces high-voltage loss, and enhances the reliability of the ignition system. The DIS is a 1-cylinder system that ignites one cylinder with one ignition coil. The ECU determines the ignition timing and outputs the ignition signals (IGT) for each cylinder. Based on IGT signals, the power transistors in the igniter cuts off the current to the primary coil, which induces a spark at the spark plug connected to the secondary coil. The igniter will also send an ignition confirmation signal (IGF) as a fail-safe measure to the ECU.

Component connections

Connector Pin	*Description*	*ECU Pin*				*ECU Connector*
1	Supply Voltage	Coil 1	Coil 2	Coil 3	Coil 4	
2	Ignition Coil Feedback	22	22	22	22	52 Way
3	Coil Output (Logic)	52	26	47	48	52 Way
4	Ground					

Malfunction Criteria
No IGF signal to ECM while engine is running

Potential failure modes:
- Open or short in IGF1 – IGF4 circuit from ignition coil to ECU
- Coil failure

Notes:
- The MIL will be illuminated if the fault is present for 2 consecutive trips.
- Further information on the sensor may be found inToyota 1ZZ-FE, 2ZZ-GE manual RM733E (B120T0327J) pages DI-97 to DI-103

Catalyst System Efficiency P0420

P0420 Catalyst System Efficiency Below Threshold

Description
The ECU compares the waveform of the oxygen sensors located before and after the catalyst to determine whether or not the catalyst has deteriorated. If the catalyst is functioning normally the front oxygen sensor will be switching rich to lean and the rear oxygen sensor should also be switching rich to lean but more slowly. When both the oxygen sensor waveforms change at the same rate, it indicates that the catalyst performance has deteriorated. The ECU counts the number of pre and post catalyst oxygen sensor switches and divides one by the other to determine a ratio number. If the ratio number is greater than 0.6 the code is set.

Sensor connections
Pre catalyst oxygen sensor

Sensor Connector	*Description*	*ECU Pin*	*ECU Connector*
1	Signal	15	52 Way
2	Ground	41	52 Way
3	Heater Supply	1	52 Way
4	Battery Voltage Battery Voltage	-	-

Post catalyst oxygen sensor

Sensor Connector	*Description*	*ECU Pin*	*ECU Connector*
1	Signal	3	52 Way
2	Ground	29	52 Way
3	Heater Supply	27	52 Way
4	Battery Voltage Battery Voltage	-	-

Malfunction Criteria
- Closed loop fuel control enabled
- Coolant temperature > 60 °C (140 °F)
- Baro > 756 mbar
- Vehicle speed < 130 km/h (81 mph)
- MAF < 40 g/sec
- Air inlet temp > -10°C (14°F)

Disable Criteria:

P0101, P0102, P0103	– MAF faults
P0107, P0108	– MAP / Baro Faults
P0116, P0117, P0118	– Coolant temperature faults
P0131, P0132, P0133, P0134, P0135, P0137, P0138, P0139, P0140, P0141	– Oxygen sensor faults
P0171, P0172	– Fuelling faults
P0300, P0301, P0302, P0303, P0304	– Misfire faults

Potential failure modes:
- Exhaust system leak
- Oxygen sensor faults
- Oxygen sensor heater failure
- Catalyst failure

Notes:
- The MIL will be illuminated if the fault is present for 2 consecutive trips.
- Further information on the sensor may be found inToyota 1ZZ-FE, 2ZZ-GE manual RM733E (B120T0327J) pages DI-86 to DI-88

Evaporative Emission Control – Leak Detection System **P0441**
P0442
P0455
P0456

P0441 Evaporative Emission System Incorrect Purge Flow
P0442 Evaporative Emission System Leak Detected (small leak)
P0455 Evaporative Emission System Leak Detected (large leak)
P0456 Evaporative Emission System Leak Detected (very small leak)

Description
During an Evaporative Emission System Leak Detection check, the vacuum in the system is monitored by ECU using the fuel tank pressure sensor. At the appropriate time, the test starts with the ECU closing the canister closure value and opening the purge solenoid with the appropriate duty cycle. This allows the engine to draw a vacuum on the entire evaporative emission system. After a calibrated vacuum level is achieved the purge solenoid is closed, sealing the system. A leak is detected by monitoring any decrease in vacuum level over a calibrated period of time.

Sensor / component connections
Vapour Pressure sensor

Connector Pins	*Description*	*ECU Pin*	*ECU Connector*
1	Ground	78	28 Way
2	Signal	75	28 Way
3	5V V. Ref.	55	28 Way

Purge Canister Closure Valve

Connector Pins	*Description*	*ECU Pin*	*ECU Connector*
A	Battery Voltage	-	-
B	ECU ground	9	52 Way

Purge Solenoid

Connector Pins	*Description*	*ECU Pin*	*ECU Connector*
A	Battery Voltage	-	-
B	ECU ground	38	52 Way

Enable Criteria:
- Altitude < 8000 ft (2438 m), Baro > 700 mbar
- Coolant > 45°C (113°F)
- Air temp < 80°C (176°F)
- Fuel level between 8 – 35 litres (2.1 – 9.24 US gallons)
- Vehicle must be stationary
- Closed loop fuelling control enabled
- Closed loop idle speed control enabled
- Ignition on

Disable Criteria:

P0171, P0172	– Fuel trim too rich or lean soft code
P0441, P0444, P0445	– Purge faults
P0446, P0447, P0448	– Canister closure faults
P0451, P0452, P0453	– Tank Pressure sensor faults
P0461, P0462, P0463	– Fuel level sensor faults
P0500	– Vehicle speed faults

Malfunction Criteria

P0441
This code can be caused by the purge value being either stuck closed or open.

Purge valve stuck open
A purge valve that is unable to seal correctly will result in a tank evacuation during the sealing phase of the leak check sequence. In this phase, a pressure rise would normally be expected but when the purge valve is not sealing this causes depression in the tank. When the pressure is below -1.7mbar a purge valve fault is detected.

Purge valve stuck closed
A purge valve that is unable to open will not be able to achieve the required depression during the evacuation phase. A positive pressure rise during the leak check evacuation phase will be detected. Additional purge checks will set a purge valve fault code.

Monitor: Until leak check is completed

P0442
This code is set during the evaporative leak check process if the system calculates the measure of leak is above a specified value (determined by a table related to fuel level) after the 6.3 second timer has expired.

Monitor: Until leak check is completed

Potential failure modes:
- Leak from pipes or connections
- Leaking or damaged seal on filler cap / not fitted correctly
- Canister Closure valve not fully closing

P0455
This code is set if during the evaporative leak check the system fails to reach the evacuation target pressure. The system will perform additional purge checks to determine the nature of the problem. The additional purge checks will also run if the leak check fails to complete because the calculated vapour concentration is above the limit.

Additional Purge Check Enable Criteria:
- Vehicle not stationary
- Load between 30 – 35%
- Purge value >= 75%

Monitor: Until leak check is completed

Potential failure modes
- Fuel filler cap not fitted
- Leak from pipes or connections
- Canister Closure valve stuck open

P0456
This code is set during the evaporative leak check process if the system calculates the measure of leak is above a specified value (determined by a table related to fuel level) after the 19.7 second timer has expired.

Monitor: Until leak check is completed

Potential failure modes:
- Leak from pipes or connections
- Leaking or damaged seal on filler cap / not fitted correctly
- Canister Closure valve not fully closing

Notes:
- The MIL will be illuminated if the fault is present for 2 consecutive trips.
- Further information on the sensor may be found inToyota 1ZZ-FE, 2ZZ-GE manual RM733E (B120T0327J) page FI-53

Evaporative Emission Control – Purge, Open / Closed Circuit

P0444
P0445
P0446
P0447
P0448
P0451
P0452
P0453

P0444 Evaporative Emission System Purge Control Valve Circuit Open
P0445 Evaporative Emission System Purge Control Valve Circuit Closed
P0446 Evaporative Emission System Vent Control Circuit
P0447 Evaporative Emission System Vent Control Circuit Open
P0448 Evaporative Emission System Vent Control Circuit Closed
P0451 Evaporative Emission System Pressure Sensor/Switch Range/Performance
P0452 Evaporative Emission System Pressure Sensor/Switch Low
P0453 Evaporative Emission System Pressure Sensor/Switch High

Description
When the engine is running the ECU continuously monitors the feedback signals from the evaporative emission components. The feedback signal should be low when the turned ON and high when turned Off. The following codes will be set if the above conditions are not met.

P0444, P0445, P0447, P0448, P0452, P0453

P0446
This code can be caused by the canister closure valve (CCV) being either stuck closed or open.

CCV stuck open:
A CCV is stuck open then there will be minimal tank depression when the leak test is performed. Addition check will be performed when the vehicle is being driven before the code is set.

CCV stuck closed:
Detection of a stuck closed CCV is implemented by detecting an excessively low tank pressure during normal purge. Detection of this fault will disable further purging
Additional checks for stuck CCV closed:
- Vehicle not stationary
- Load between 30 – 35%
- Purge Value >= 75%

Monitor: Until leak check is completed.

P0451
This code is set when the ECU detects abnormalities in the fuel tank vapour pressure sensor signal. The ECU analyses the filtered and unfiltered pressure signal at idle after a de-slosh period to determine if there is any difference, a big difference indicates as fault. The ECU also monitors the signal on gear changes to see if there is any pressure rise as a result of the fuel sloshing around.

Disable Criteria:
P0500 – Wheel speed sensor fault

Monitor: Until leak check is completed

Notes:
The MIL will be illuminated if the fault is present for 2 consecutive trips.

Fuel Level Sensor **P0461**
P0462
P0463

P0461 Fuel Level Sensor “A” Circuit Range/Performance
P0462 Fuel Level Sensor “A” Circuit Low
P0463 Fuel Level Sensor “A” Circuit High

Description
When the engine is running the ECU continuously monitors the fuel level sensor feedback signals. The feedback signal should be low when turned ON and high when turned OFF. The following codes will be set if the above conditions are not meet.

Sensor connections

Sensor Connector	*Description*	*ECU Pin*	*ECU Connector*
1	Vapour pressure and fuel level ground	78	28 Way
2	Fuel level sensor	76	28 Way
3	Vapour pressure & fuel level V ref.	55	28 Way

Enable Criteria:
- P0462 & P0463 – Condition not met as above
- P0461 – Checks for three conditions, stuck when full, stuck when empty or stuck midway. The ECU determines if the sensor is stuck by calculating the amount of fuel used during the test period with the engine conditions as listed below.
- RPM > 2800rpm
- Load > 40%
- Minimum Fuel level > 2 litres (0.5 US gallons)
- If the ECU calculates that no fuel has been used during these tests it indicates that the sensor is not working correctly. The ECU also monitors the filtered and unfiltered signal at idle after a 10 second de-slosh period and compares the differences. Gear changes cause the fuel to slosh around so the ECU monitors the signal to see if there is any pressure rise.

Disable Criteria:
P0500 – Wheel speed sensor fault

Notes:
The MIL will be illuminated if the fault is present for 2 consecutive trips.

Engine Cooling Fan Control **P0480**
P0481

P0480 Fan 1 Control Circuit
P0481 Fan 2 Control Circuit

Component connections

Sensor Connector	*Description*	*ECU Pin*	*ECU Connector*
2 (ACCM 2*)	Relay #1	67	28 Way
3 (ACCM 2*)	Relay #2	60	28 Way

*ACCM – A/C Control Module

Monitor: Continuous

Enable Criteria: Engine running

Disable Criteria: None

Potential failure modes:
- A/C Control Module failure
- ECU output circuit failure

Notes:
No MIL will be illuminated for this failure.

Vehicle Speed Sensor **P0500**

P0500 Vehicle Speed Sensor “A”

Description
The ECU uses the left rear wheel speed sensor to determine vehicle speed. This output to the ECU is via the ABS module.

Sensor connections

ABS Control Unit	*Description*	*ECU Pin*	*ECU Connector*
3	Wheel Speed 3 from ABS (LR)	77	28 Way

Sensor characteristics
Hall Effect sensor

Malfunction Criteria
- TPS < 0.8
- Engine speed > 1800rpm and < 5010rpm
- Baro > 756 mbar

Monitor: Continuous

Potential failure modes:
- Open or short in vehicle speed sensor circuit
- Build up of debris in the sensing plate on the wheel hub

Notes:
The MIL will be illuminated if the fault is present for 2 consecutive trips.

Idle Speed Control **P0506**
P0507
P0508
P0509

P0506 Idle Air Control System RPM Lower Than Expected
P0507 Idle Air Control System RPM Higher Than Expected
P0508 Idle Air Control System Circuit Low
P0509 Idle Air Control System Circuit High

Description
The ECU controls the air entering the engine with an idle air control (IAC) valve. To increase the idle the ECU commands the IAC to open up. This allows more air to bypass the throttle blades. To decrease the idle speed the ECU commands the IAC to close up. This will reduce the amount of air bypassing the throttle body. The ECU performs low and high circuit checks when it is activating the component.

Component connections

Connector	*Description*	*ECU Pin*	*ECU Connector*
1	Idle air control value	35	52 Way
2	Battery Voltage	-	-
3	Ground	-	-

Malfunction Criteria
P0506 – This code is set if the engine fails to achieve the desired idle speed by more than 100 rpm.
P0507 – This code is set if the engine fails to achieve the desired idle speed by more than 200 rpm.
P0508 – This is set when the ECU does not get the expected feedback.
P0509 – This is set when the ECU does not get the expected feedback.

Enable Criteria:
- Engine at idle speed
- Battery Voltage between 10 – 16 V
- Idle speed learn limit ± 15%
- Timer expired 5 seconds

Monitor: Continuous

Potential failure modes:
- Throttle body sticking (not fully closing)
- Connector / wiring corroded or loose connections
- Throttle linkage / cable binding
- Induction system air leak
- Excessive engine load from front end accessory drive system, e.g. water pump seizing

Notes:
The MIL will be illuminated if the fault is present for 2 consecutive trips.

Battery Voltage **P0562**
P0563

P0562 System Voltage Low
P0563 System Voltage High

Monitor: Continuous

Enable Criteria:
- Engine running
- P0562 – Voltage Too Low < 10V
- P0563 – Voltage Too High > 16V

Disable Criteria: None

Potential failure modes:
- Alternator fault
- Battery fault

Notes:
The MIL will be illuminated if the fault is present for 2 consecutive trips.

ECU Integrity **P0601**
P0606

P0601 Checksum
P0606 Watchdog

Description
These codes are used by the ECU to check the integrity of the software and calibration data. P0601 checks that on power up the checksum for calibration data is the same as checksum saved on power down. P0606 checks the watchdog timer after a defined period to see if it has reset. If the watchdog timer has not reset then the code has entered an unplanned loop or condition stopping it resetting the timer.

Monitor
- P0601 at ECU power up
- P0606 continuously while the engine running

Notes:
The MIL will be illuminated if the fault is present for 2 consecutive trips.

Fuel Pump **P0627**

P0627 Fuel Pump Control Circuit /Open

Description
The fuel system is of the non-return type. The pump is incorporated into the fuel tank module which also contains the level sensor, regulator and vapour pressure sensor.

Component connections

Connector	*Description*	*ECU Pin*	*ECU Connector*
4 (RMC 1 – MFRU*)	Inertia Switch (Pin 1)	-	-
2 (RMC 2 – MFRU*)	Fuel Pump Relay	68	28 Way

*MFRU – Multi Function Relay Unit

Monitor: Continuous

Enable Criteria: Ignition on

Disable Criteria: None

Potential failure modes:
- Pump open circuit or short to ground
- Multi Function Relay Unit failure
- Pump failure
- ECU output circuit failure

Notes:
No MIL will be illuminated for this failure.

Air Conditioning System **P0646**
P0647

P0646 A/C Clutch Relay Control Circuit Low
P0647 A/C Clutch Relay Control Circuit High

Component connections

Connector	*Description*	*ECU Pin*	*ECU Connector*
5 (ACCM 2*)	AC Clutch Relay	53	28 Way

*ACCM – A/C Control Module

Monitor: Continuous

Enable Criteria: Engine running

Disable Criteria: None

Potential failure modes:
- A/C compressor clutch open circuit or short to ground
- A/C Control Module failure
- A/C compressor clutch failure
- ECU output circuit failure

Notes:
No MIL will be illuminated for this failure.

Misfire **P1301**
P1302

P1301 Misfire level causing emissions increase
P1302 Misfire level causing catalyst system damage

Description
When the engine misfire reaches a high enough percentage the engine emission output levels can exceed the allowed limits, this will produce the fault code P1301. If the misfire percentage is high enough and there is a possibility that the catalyst may be damaged then code P1302 will be set.

See misfire faults P0300, P0301, P0302, P0303, P0304

Notes:
- The MIL will flash for a 1302 fault code
- The MIL will be illuminated if the 1301 fault is present for 2 consecutive trips.

Coolant Recirculation Pump **P2602**
P2603

P2602 Coolant Pump Control Circuit Low
P2603 Coolant Pump Control Circuit High

Description
During a hot shutdown of the engine, the recirculation pump can continue to pump coolant around the engine. The recirculation pump will run after the engine has been turned off if the enable criteria are matched.

Component connections

Connector	*Description*	*ECU Pin*	*ECU Connector*
2 (RMC 1 – MFRU*)	Fuse box	-	-
5 (RMC 2 – MFRU*)	Recirc Pump Relay	69	28 Way

*MFRU – Multi Function Relay Unit

Monitor: Continuous

Enable Criteria:
P2602 - engine not running
P2603 - engine running

Disable Criteria: None

Potential failure modes:
- Pump open circuit or short to ground
- Multi Function Relay Unit failure
- Pump failure
- ECU output circuit failure

Notes:
No MIL will be illuminated for this failure.

Camshaft Lift Control (VVL) **P2646**
P2647
P2648
P2649

P2646 A Rocker Arm Actuator System Performance or Stuck Off
P2647 A Rocker Arm Actuator System Stuck On
P2648 A Rocker Arm Actuator Control Circuit Low
P2649 A Rocker Arm Actuator Control Circuit High

Description
Intake and exhaust camshaft lift can be changed by means of the Variable Valve Lift (VVL) system, which varies the amount of maximum lift of the intake and exhaust valves. The mechanism uses dual element rocker arms to provide cam changeover, with both the intake and exhaust camshafts having high and low speed cam profiles. The system is ECU controlled, using an oil control solenoid which, when activated, uses hydraulic pressure to push a rocker arm locking pin into engagement to activate the high-speed cam profile. A signal from the VVL oil pressure switch provides feedback to the ECU that VVL activation has taken place. VVL activation* to the high lift camshaft profile occurs at 6200rpm when engine speed is increasing, and returns to the low lift camshaft profile at 6000rpm when the engine speed is decreasing.
*Coolant temperature must be >60°C (140°F).

Component connections

Connector	*Description*	*ECU Pin*	*ECU Connector*
1	Battery Voltage	-	-
2	VVL Oil Control Valve	12	52 Way
-	VVL Oil Pressure Switch	21	52 Way

Monitor: Continuous

Enable Criteria: Engine running

Disable Criteria: None

Potential failure modes:
- VVL valve stuck open / closed
- VVL valve open circuit
- VVL valve short to ground
- Rocker arm failure
- Rocker shaft location pin failure
- ECU output circuit failure

Notes:
The MIL will be illuminated if the fault is present for 2 consecutive trips.

EMP.2 - 'LOTUS SCAN' DIAGNOSTIC TOOL

In order to provide for communication with the engine management system electronic control module, a hand held electronic scanner 'Lotus Scan' (part number T000T1418F), may be plugged into a special 16 terminal harness connector socket, known as a Data Link Connector (DLC), located at the front of the passenger footwell. Note that this tool may also be used on previous Elise models (excluding Exige, 340R and 160 models).

Amongst the operations available using the 'Lotus Scan' tool are:

- Reading of Trouble Codes
- Clearing of Trouble Codes
- Reading live data
- Test operation of individual solenoids
- Running engine history report
- Reprogramming ECU

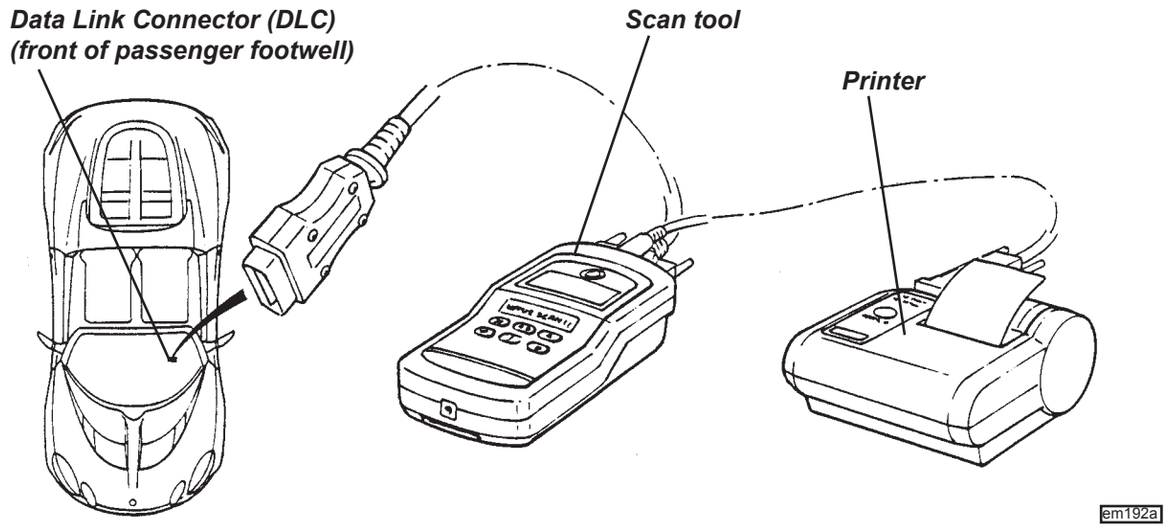
Operating instructions are provided with the tool.

Important Note

The power supply transformer is used for overnight charging of the printer, and also for powering the Scan tool during software downloading from a PC (personal computer). For the software download operation, the Scan tool requires a power supply from the mains via the transformer and an inverter. Two types of inverter have been used; early kits used an adaptor lead to plug into the bottom end of the Scanner tool. Later kits use an adaptor plug fitting into the top end of the scanner.

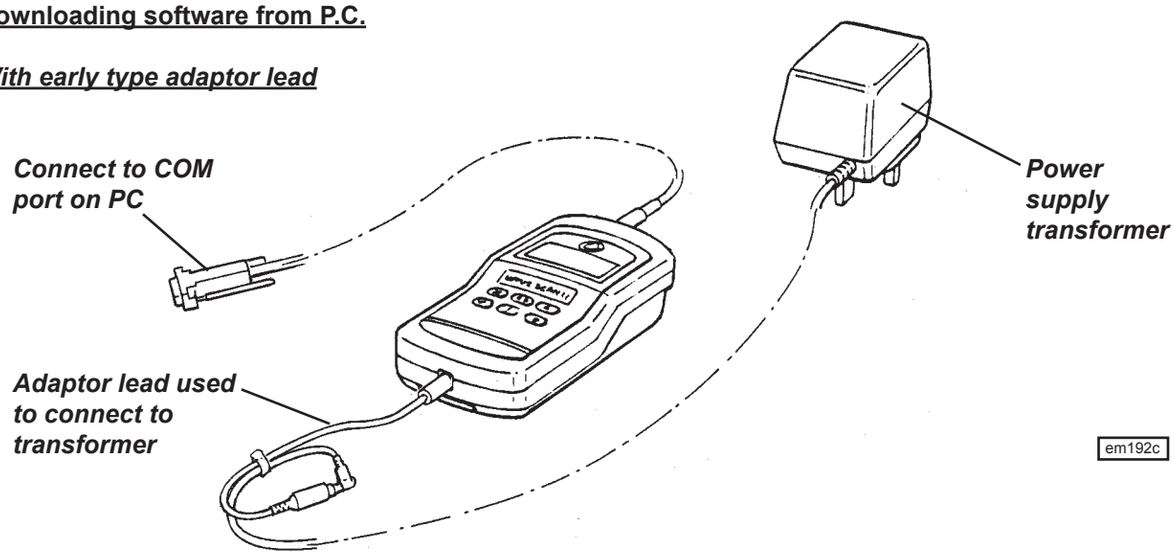
When charging the printer, it is most important that the inverter is NOT used, or damage to the transformer may be caused. Incorrect connection is possible only with the early type adaptor lead, with which extra care should be exercised.

1. Reading data from vehicle

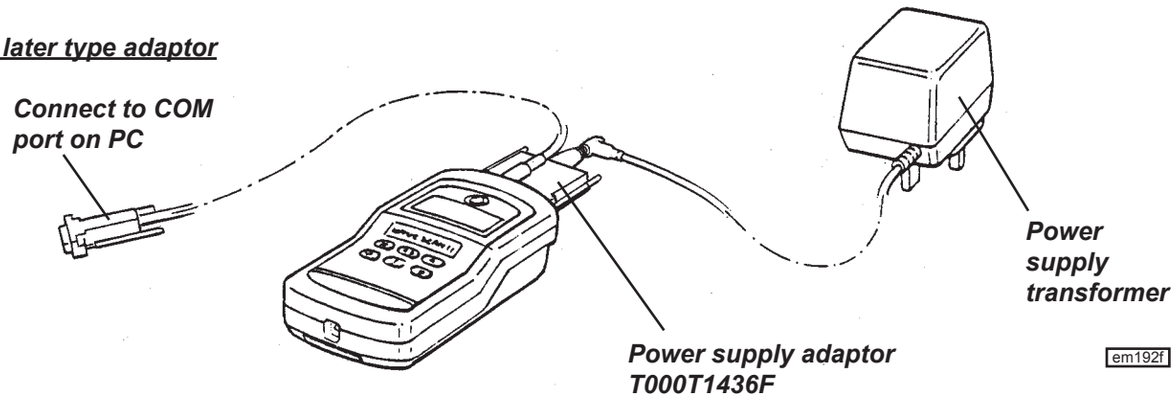


2. Downloading software from P.C.

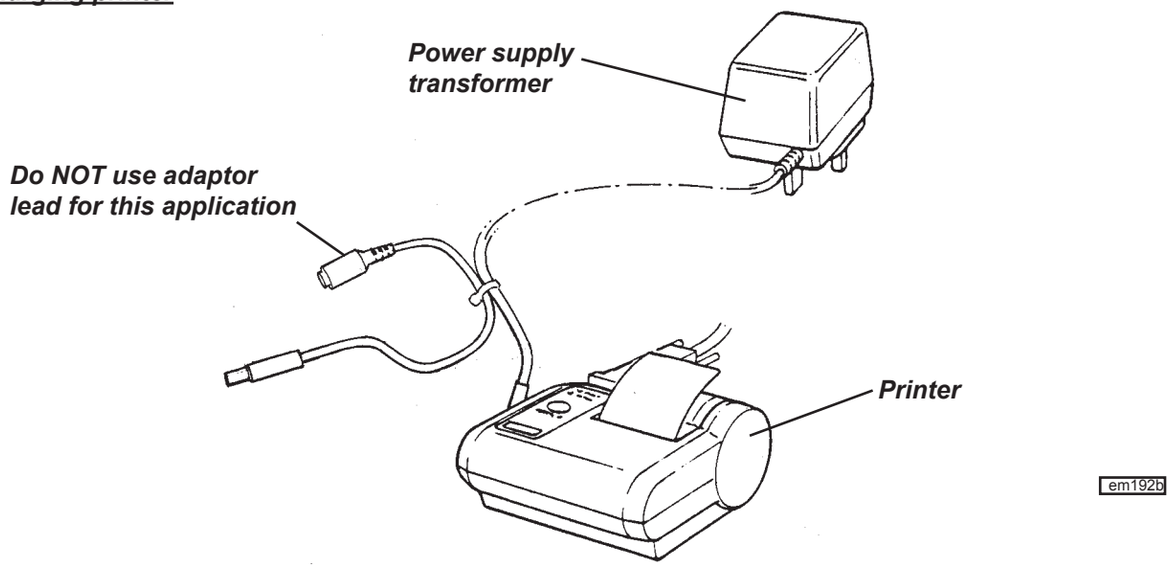
With early type adaptor lead



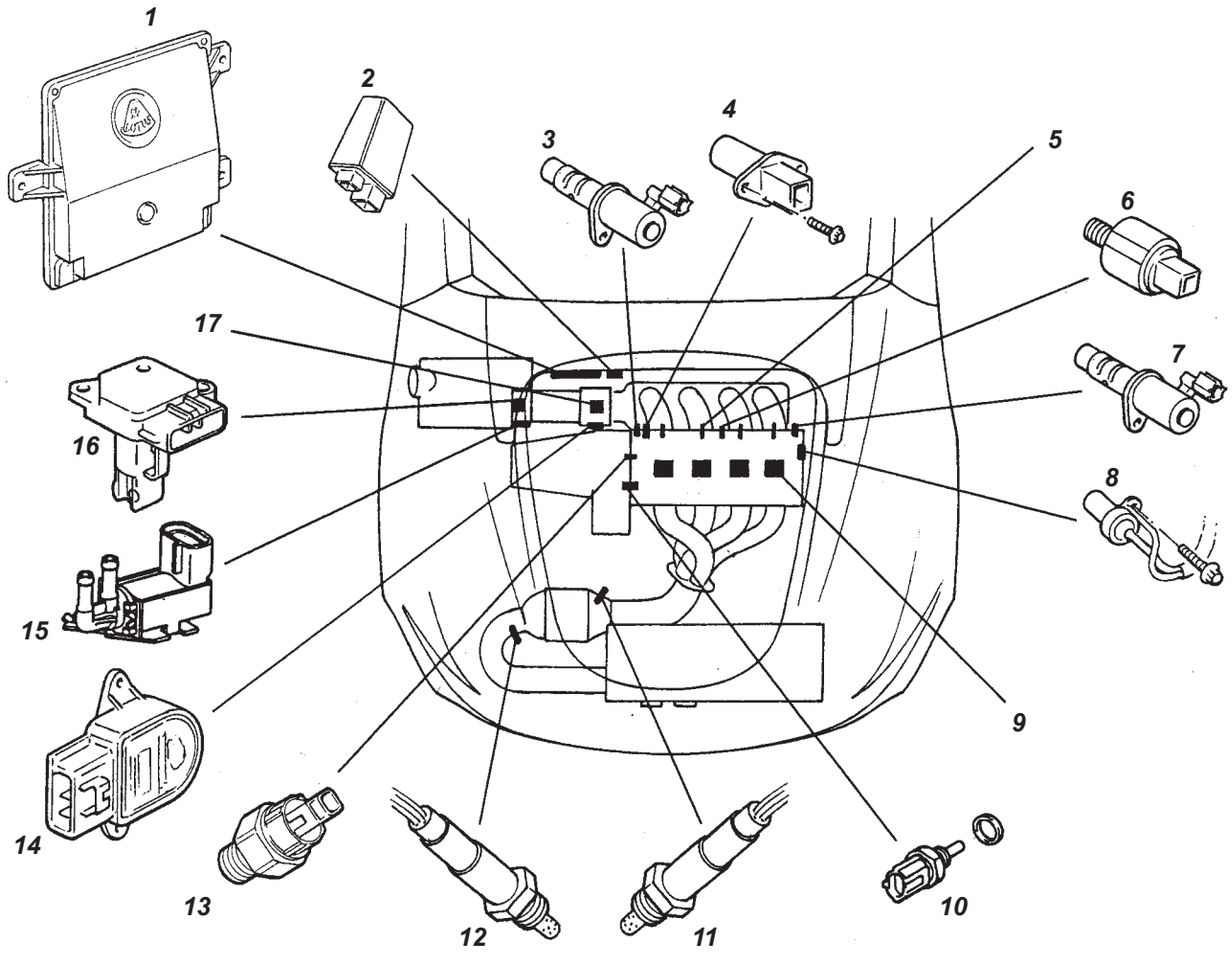
With later type adaptor



3. Charging printer



EMP.3 - ENGINE MANAGEMENT COMPONENT LOCATION



Key to engine management component location drawing

1. Electronic Control Unit (ECU).
2. Multi-function relay unit.
3. Oil control valve for variable valve lift.
4. Camshaft position sensor.
5. Fuel injector.
6. Knock sensor.
7. Oil control valve for variable valve timing.
8. Crankshaft position sensor.
9. Plug top coil.
10. Coolant temperature sensor.
11. Pre-catalyst oxygen sensor.
12. Post-catalyst oxygen sensor.
13. Oil pressure switch.
14. Throttle position sensor.
15. Vacuum solenoid for intake flap valve.
16. Mass airflow sensor.

For component replacement procedures, refer to manual B120T0327J.

EMP.4 - MECHANICAL THROTTLE SETTING PROCEDURE

To avoid throttle cable strain, and ensure correct idle control and pedal operation, the following adjustments must be maintained. If the pedal downstop is incorrectly set, overloading of the throttle body cable quadrant can occur, resulting in quadrant distortion, closed throttle position error and engine stalling:

1. Check the throttle body cable quadrant for distortion and mis-alignment. If necessary, repair or replace the quadrant.

2. Check that there is 2 - 3 mm free play at the throttle pedal, adjusting at the throttle body cable abutment bracket if necessary.

3. If an idle control problem has been reported, reset the closed throttle stop screw on the throttle body: With ignition off, use a hexagonal key in the bottom end of the throttle stop screw to allow the throttle butterfly valve to fully close, and introduce clearance between the screw and quadrant stop bracket. Screw upwards until contact is just made, and then a further ½ turn upwards. Secure with the locknut. Recheck cable adjustment as above.

4. Adjust the throttle pedal downstop such that vigorous full depression of the pedal achieves full opening of the throttle butterfly without allowing the cable or mechanism to be strained.

5. If the throttle stop screw was adjusted, allow the engine to idle for 15 minutes to relearn settings.

6. An alternative pedal position which may be preferred for 'heel and toeing', may be achieved by replacing the rubber upstop buffer with an M5x15 hex. head setscrew, with three flat washers beneath the head for a total thickness of around 7mm. The cable must then be re-adjusted at the engine abutment as above. The foopad downstop bolt should then be replaced by an M8x20 setscrew and reset as above.