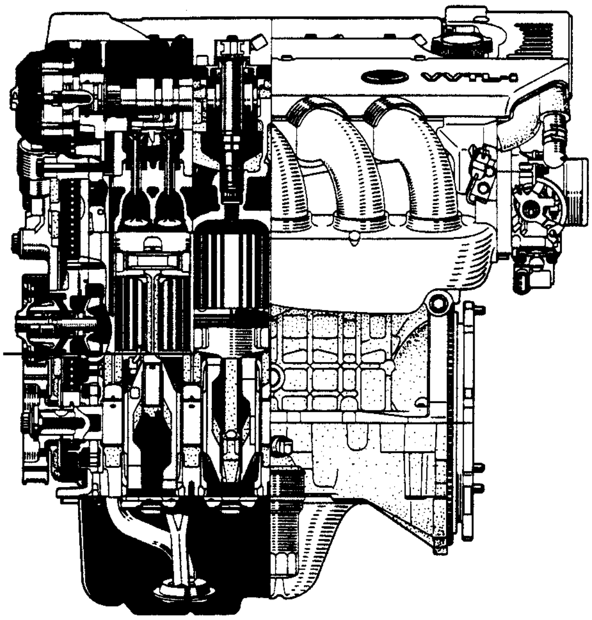
ENGINE

SECTION EH

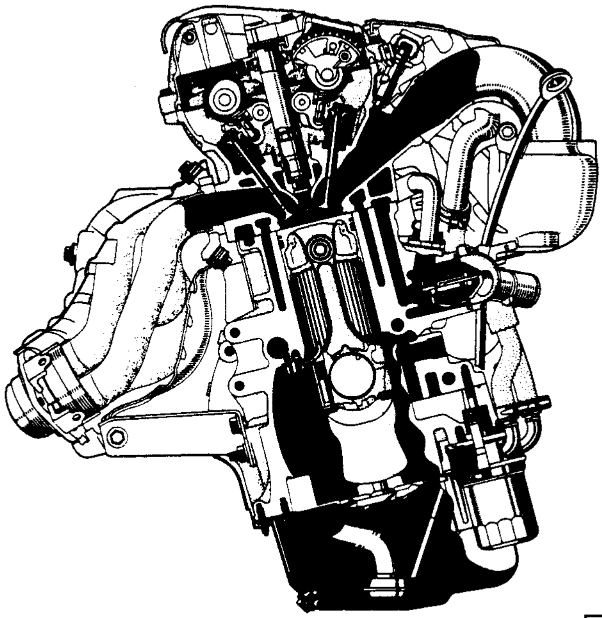
See also Toyota engine repair manual B120T0327J and Toyota 2ZZ-GE engine supplement C120T0327J

Engine Sections

From LH side



From front



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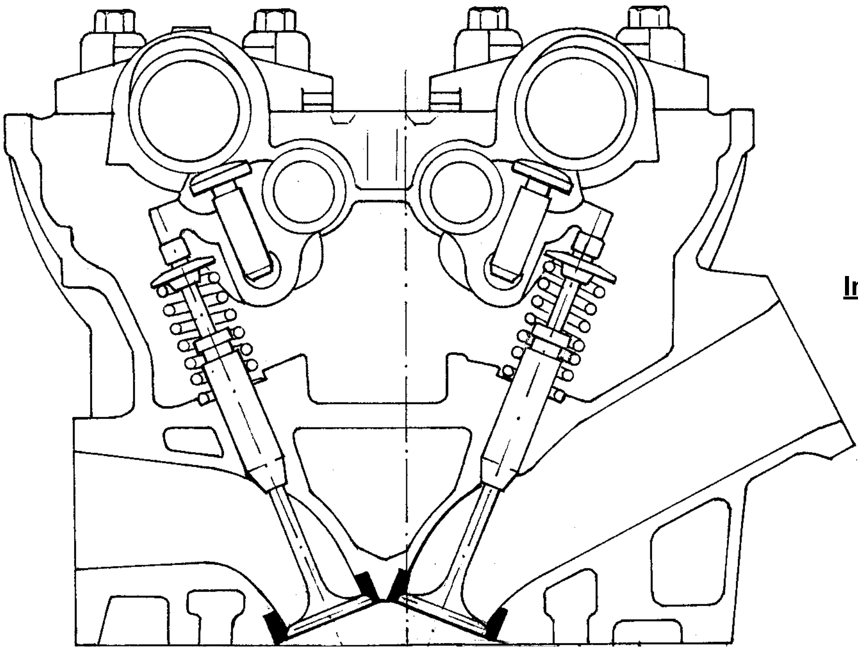
Cylinder head section

Exhaust side



Intake side

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EH.1 - GENERAL DESCRIPTION

The 1.8 litre, 16 valve four cylinder engine used in the Lotus 2005 model Elise is supplied by Toyota Motor Corporation, and is designated '2ZZ-GE'. The engine number is stamped on the rear end of the cylinder block, exhaust side, and is followed by '2ZZ'. A full description and overhaul procedure for this engine family is contained in the Toyota Repair Manual RM733E, a copy of which follows this section.

The lightweight alloy cylinder block uses no separate cylinder liners, but has the integral cylinder walls constructed from MMC (Metal Matrix Composite). The forged steel crankshaft is supported in five cast iron main bearing caps which are integrated into a single piece alloy main bearing panel bolted to the bottom of the block. A pressed steel sump is fitted below the main bearing panel. The iron and tin coated pistons, fitted with three piston rings, are mounted via fully floating gudgeon pins to forged steel connecting rods which use two bolt big end caps around the crankpins. The cylinder head houses four valves per cylinder, with inlets arranged at 43° to the exhaust valves, and incorporates laser clad alloy valve seats welded into the cylinder head. At the front of the engine, a single row chain, automatically tensioned by spring and oil pressure, is used to drive the two overhead camshafts which incorporate VVTL-i (Variable Valve Timing and Lift-intelligent) to advance and retard the inlet camshaft timing under electro/hydraulic control, and increase the lift of both inlet and exhaust valves at high engine speed (see later).

A trochoid type oil pump, driven directly by the front end of the crankshaft supplies an oil gallery along the left hand side of the crankcase, from which are fed the crankshaft main bearings, then the big ends, and via oil jets, the underside of the pistons. The gallery also feeds a drilling up to the cylinder head for the two camshafts, and the VVTL-i mechanism, with the chain tensioner fed from the exhaust cam drilling. The main gallery also feeds the oil filter, vertically mounted on the left hand side of the cylinder block. The timing chain is lubricated via an oil jet directly from the oil pump, and by oil draining down through the timing chest.

The water pump is mounted at the left hand front of the block and is driven by a multi-rib serpentine auxiliary belt from the crankshaft. Coolant is pumped into the front of the cylinder block and head, and when the thermostat is closed, returns to the pump via a by-pass gallery in the cylinder head and block. When the thermostat opens, the by-pass route is closed off, and a greater volume of coolant flows via the heater matrix, and throttle body as well as through the engine cooling radiator.

The die-cast aluminium intake manifold draws air from a single throttle body with cable controlled butterfly valve, into a plenum chamber from which the four intake ports are fed by individual tubes. A twelve hole fuel injector is mounted in the top of each of the four intake ports in the cylinder head, with fuel supplied via a one-way flow system with a pressure regulator contained inside the fuel tank. The Direct Ignition System (DIS) uses separate high tension coils mounted directly onto each of the four spark plugs, with timing control by the engine management ECU.

VVTL-i (Variable Valve Timing & Lift - intelligent)

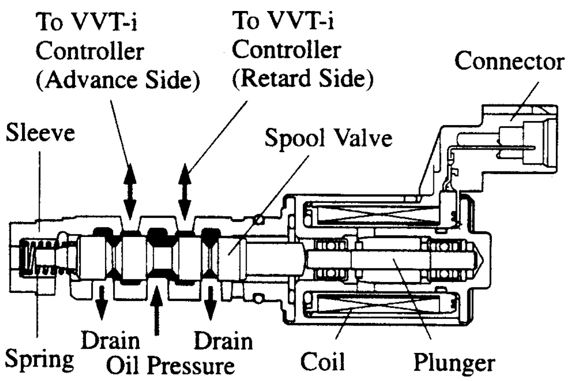
This system features two elements:

Variable Valve Timing

In order to allow the inlet valve timing to be advanced or retarded to the benefit of particular running conditions, the inlet camshaft is provided with a hydraulic hub connecting the chain sprocket to the inlet camshaft. The hub comprises a housing fixed to the sprocket and a four vane rotor fixed to the camshaft. The rotor is contained within the housing with the rotor vanes dividing each of the four chambers in the housing into two volumes, an advance and a retard side. Each of the chamber volumes is supplied with pressurised engine oil from a spool valve under ECU control. By varying the relative pressure of the two oil volumes, the positional relationship of the camshaft to the sprocket can be altered. The ECU monitors engine speed, intake air volume, throttle position and water temperature to determine the optimum cam phasing for the particular running conditions, and modulates the duty cycle to the oil control (spool) valve until the desired timing is achieved, as determined by reference to the crankshaft and camshaft sensors. Duty cycles greater than 50% cause the timing to be advanced, and duty cycles less than 50% retard the timing. When the target timing is achieved, a 50% 'holding' duty cycle is applied. The oil control valve is mounted at the left hand front of the cylinder head and feeds oilways within the head connecting with the inlet camshaft immediately behind the hydraulic hub.

When the engine is stopped, the inlet cam timing is set at full retard, to allow easy starting. To allow time for oil pressure to build after engine start up, a spring loaded lock pin engages at full retard to mechanically lock the hub, until normal oil pressure releases the pin automatically.

The table shows the basic timing strategy for different operating conditions:



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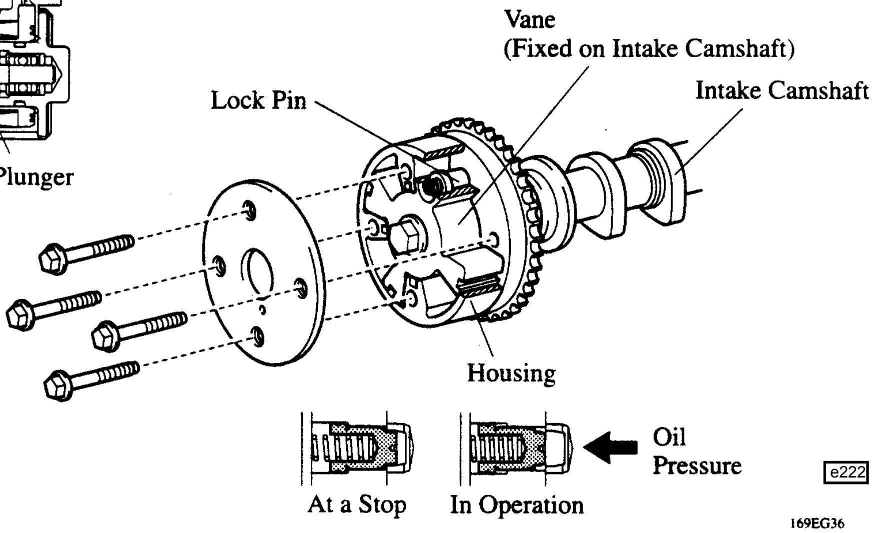

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Lock Pin

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Operation State	Range	Valve Timing	Objective	Effect
During Idling	1	TDC, IN, EX, Latest timing	Minimizing overlap to reduce blow back to the intake side	Stabilized idling rpm Better fuel economy
At Light Load	2	IN, EX, To retard side	Decreasing overlap to eliminate blow back to the intake side	Ensured engine stability
At Medium Load	3	IN, EX, To advance side	Increasing overlap to increase internal EGR for pumping loss elimination	Better fuel economy Improved emission control
In Low to Medium Speed Range with Heavy Load	4	IN, EX, To advance side, BDC	Advancing the intake valve close timing for volumetric efficiency improvement	Improved torque in low to medium speed range
In High Speed Range with Heavy Load	5	IN, EX, To retard side	Retarding the intake valve close timing for volumetric efficiency improvement	Improved output
At Low Temperatures	–	IN, EX, Latest timing	Minimizing overlap to prevent blow back to the intake side for reduction of fuel increase at low temperatures, and stabilizing the idling rpm for decreasing fast idle rotation	Stabilized fast idle rpm Better fuel economy
Upon Starting/ Stopping the Engine	–	IN, EX, Latest timing	Minimizing overlap to minimize blow back to the intake side	Improved startability

Note that compromises are involved in the programming of inlet cam timing, since advancing the valve opening point also advances the valve closing point, when the ideal might be to advance the opening and retard the closing points. For any particular engine running conditions, the timing is adjusted to optimise either the valve opening point and overlap period, or the valve closing point, whichever provides the most benefit.

The range of inlet cam timing available is from:

Opening 33° BTDC, Closing 15° ABDC)
to;) with standard (low speed) valve lift
Opening 10° ATDC, Closing 58° ABDC)
or;
Opening 58° BTDC, Closing 54° ABDC }
to; } with high speed valve lift (see below)
Opening 15° BTDC, Closing 97° ABDC }

Variable Valve Lift

Both inlet and exhaust camshafts are machined with two cams for each cylinder, a low lift cam and a high lift cam. Each low lift cam actuates, via a low friction roller, a rocker arm which connects with a pair of inlet or exhaust valves. The corresponding high lift cam actuates a spring loaded tappet housed within the rocker arm, and under low speed conditions, has no effect on valve operation due to the clearance between the bottom of the tappet and the rocker arm.

When engine speed reaches 6,000 rpm at normal running temperature, the ECU operates a spool valve on the back of the cylinder head to close an oil return line, and raise oil pressure within the rocker pivot shaft and passages within each rocker. This increased oil pressure is sufficient to overcome the spring loading of a packer pin contained within each rocker arm, which is then forced between the bottom of the high speed cam tappet and the rocker arm. Each high lift cam then controls valve operation, with the rocker being lifted clear of the low speed cam. The higher valve lift for both inlet and exhaust valves in conjunction with the variable valve timing, provides greater efficiency and power output at high engine speeds.

Standard (low speed) valve lift:	- inlet; 7.25 mm
	- exhaust; 7.25 mm
High speed valve lift:	- inlet; 11.4 mm
	- exhaust; 10.0 mm

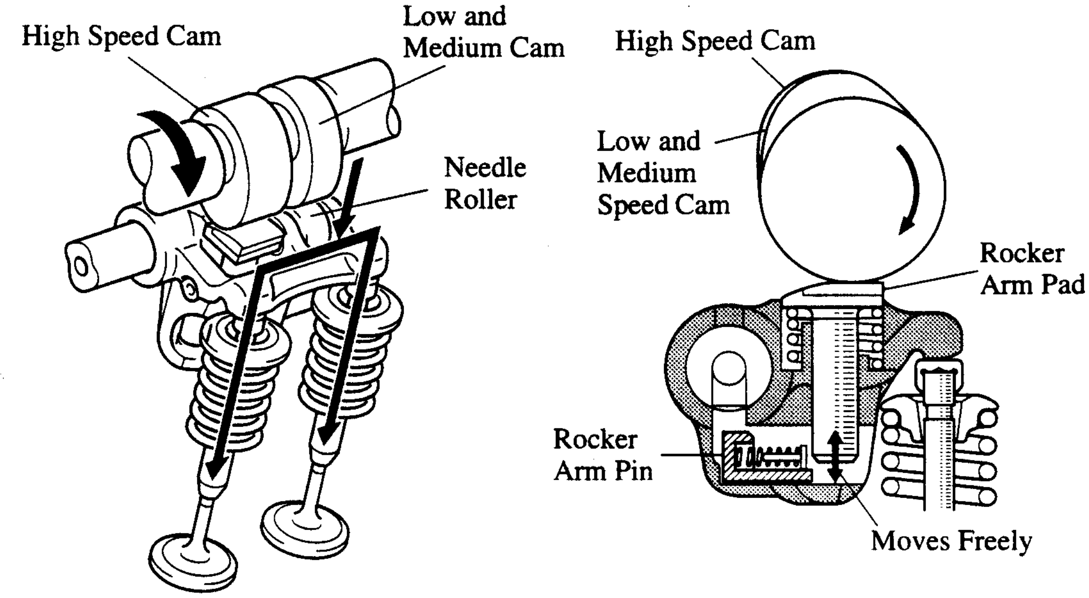
Note that engine speed is limited to 6,000 rpm until normal running temperature has been attained.

Illustrations overleaf

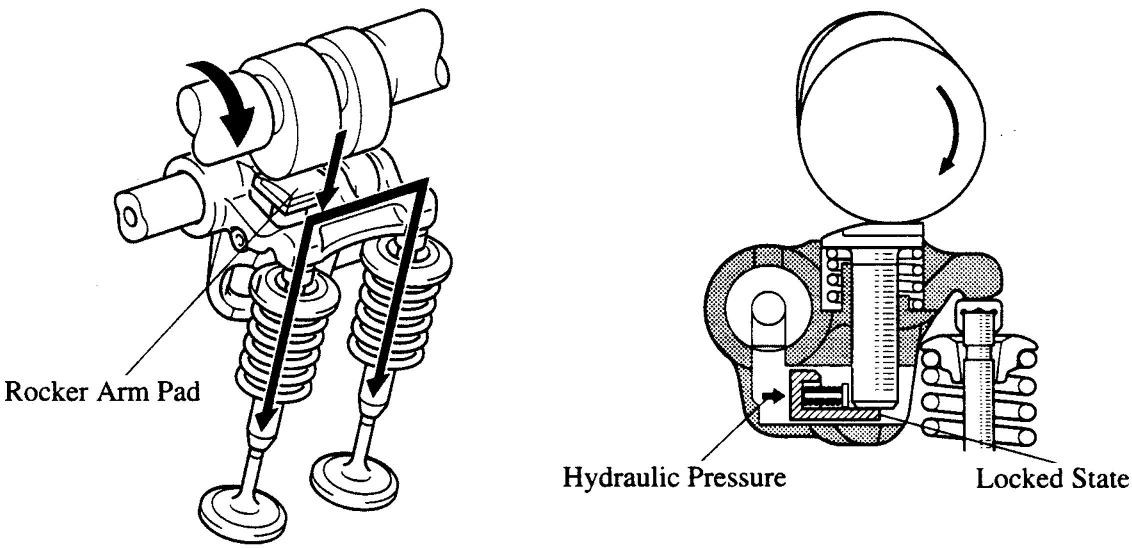
Airbox Flap Valve

In order to reduce airflow restriction into the airbox at periods of high demand, and also to provide an acoustic enhancement, the ECU, when switching to high valve lift mode, also opens a flap valve in the underside of the airbox body. This butterfly valve is sprung open, and is closed by a vacuum actuator supplied from the inlet manifold. The vacuum supply uses an in-line non-return valve and a reservoir incorporated into the front face of the airbox body to maintain flap closure during periods of low inlet depression. A solenoid valve mounted on top of the airbox, and connected into the vacuum capsule line, is energised by the ECU when appropriate to ventilate the capsule and open the valve.

Low and Medium Speed



High Speed



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Overhaul Notes

1. Timing Marks
Take care when setting the engine to its 'timing' postion. Crankshaft at TDC, inlet cam pulley mark facing inwards on centreline, exhaust cam pulley mark facing inwards but ONE TOOTH COUNTERCLOCKWISE from centreline.

2. Valve Clearances
a) It is unlikely that valve clearances will require adjustment unless components are replaced. A single forked rocker arm is used to operate a pair of valves, which are shimmed during manufacture for equal clearance. Routine service clearance checks should be made between the cam and roller follower. Only if a valve or rocker arm is replaced need the clearance between individual valves and the rocker arm be measured. Adjustment procedure is detailed in the text.
b) When using the shim adjustment special tool, before removing a shim from a valve stem, ensure that the oil drain passages on the exhaust side of the head are blocked with paper towel. Shims are easily dropped and may fall down the drain passages into an oil gallery in the crankcase, requiring engine removal to retrieve.

3. Stretch Bolts
The cylinder head bolts, big end bolts and main bearing cap bolts are 'stretch' type with an angular tightening procedure. The bolts should be measured to determine their suitability for re-use. Measure length or diameter as specified in the text. Note that the big end bolts are 8.7 to 8.8 mm standard diameter, with 8.5 mm minimum.

4. Timing Chain Tensioner
The maintenance free timing chain tensioner uses spring tension and engine oil pressure in conjunction with a non-return ratchet mechanism to maintain chain tension. A pivotted hook on the tensioner body is provided to aid assembly, by enaging with a pin on the spring plunger to hold the assembly retracted whilst fitting. After fitment to the timing cover, the engine is then turned backwards so that the chain forces the plunger into the tensioner body, which action pushes the hook into a disengaged position and allowing tension to be applied on resumption of normal rotation. The ratchet mechanism prevents subsequent plunger retraction.

5. Bearing Shell Size Coding
Note that the main bearing shells and big end shells are selective thickness dependent on journal and housing size. Pistons are one size only. No reboring or crankshaft grinding is permitted.
Main bearing housing size codes are stamped onto the cylinder block, and crankshaft journal size codes on the crank. If necessary, Plastigage can be used to deterime oil clearance. Big end codes are stamped only on the connecting rod caps. Service replacement shells will also be marked on the back with the size code.

6. Knock Sensor
The knock sensor used for Lotus applications is an annular type fitted over an M8 stud, with the retaining nut tightened to 20 Nm.

EH.2 - MAINTENANCE OPERATIONS

Engine Oil Level Check

The engine oil level should be checked regularly, such as every two or three fuel stops, and the oil level maintained near the top mark on the dipstick. It is especially important to keep a check on the oil level during the vehicle’s first 1,000 miles (1,600 km), as both the fuel and oil consumption will be prone to some variance until the engine components have bedded in.

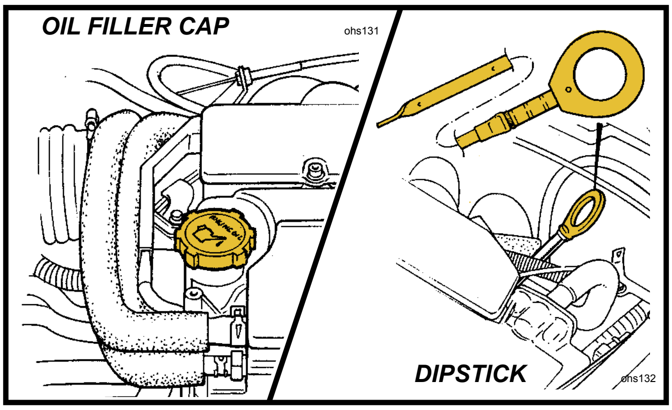
The best time to check the level is when the oil is warm, such as during a fuel stop. Ensure that the car is parked on a level surface and that a few minutes have elapsed since stopping the engine to allow oil to drain back into the sump. If the engine is stopped before reaching normal running temperature, the oil will not drain back so readily, and the dipstick will display an artificially low reading.

Dipstick: The dipstick is identifiable by its yellow loop handle, and is located at the right hand front of the engine. Withdraw the dipstick, and wipe with a paper towel. Replace the dipstick, if necessary feeding the blade into the tube with the fingers, before pressing firmly to ensure that the handle is fully seated. Withdraw the dipstick again to inspect the oil level, which should lie between the two dimples on the end of the stick.

The oil level should be maintained at the upper of these two marks in order to provide optimum engine protection.

Topping Up: If topping up is necessary, unscrew the oil filler cap from the left hand end of the cam cover. Add a suitable quantity of the recommended engine oil (see 'Recommended Lubricants') taking care not to spill any oil onto engine or electrical components; use a funnel if necessary.

The difference between high and low dipstick marks is equivalent to 1.5 litre. Allow several minutes for the oil to drain through to the sump before re-checking the oil level.



Do NOT overfill, or lubrication will be degraded and consumption increased as the oil becomes aerated. Refit the filler cap, turning clockwise until secure.

Engine Oil Change

The use of high quality oil, renewed at the specified intervals, is the key to engine longevity and sustained performance. Adhere strictly to the engine oil and filter change intervals specified in the Maintenance Schedule.

For access to the engine sump and filter, the engine bay undertray must first be removed. This is most easily achieved with the vehicle raised on a garage hydaulic lift, or alternatively, parked over an inspection pit. The drain plug is located at the rear of the sump, and should be removed to drain the sump immediately after a run when the oil is warm and the impurities are still held in suspension.

WARNING: - Take all suitable precautions to guard against scalding from the hot oil.

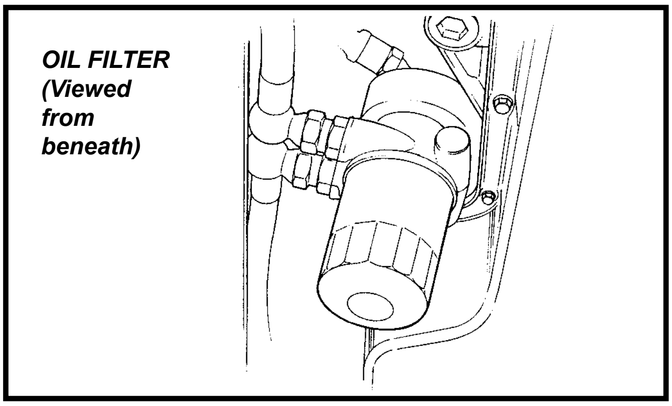
Allow the oil to drain completely before cleaning the drain plug, fitting a new sealing washer, and tightening securely. Refill with the recommended lubricant via the oil filler on the camshaft cover, to the top mark on the dipstick, allowing several minutes for the oil to drain through to the sump before checking the level. Take care not to overfill. Refit the oil filler cap securely, and check the oil level again when the engine is fully warm (see above).

Oil Filter

The canister type oil filter is vertically mounted at the front of the engine, and is accessible from beneath after removal of the engine bay undershield. The filter should be renewed along with the engine oil, at intervals specified in the Maintenance Schedule.

WARNING: Take all suitable precautions to guard against scalding from the hot oil.

Remove the filter by turning in a counterclockwise direction, if necessary using an oil filter wrench, and dispose of safely.



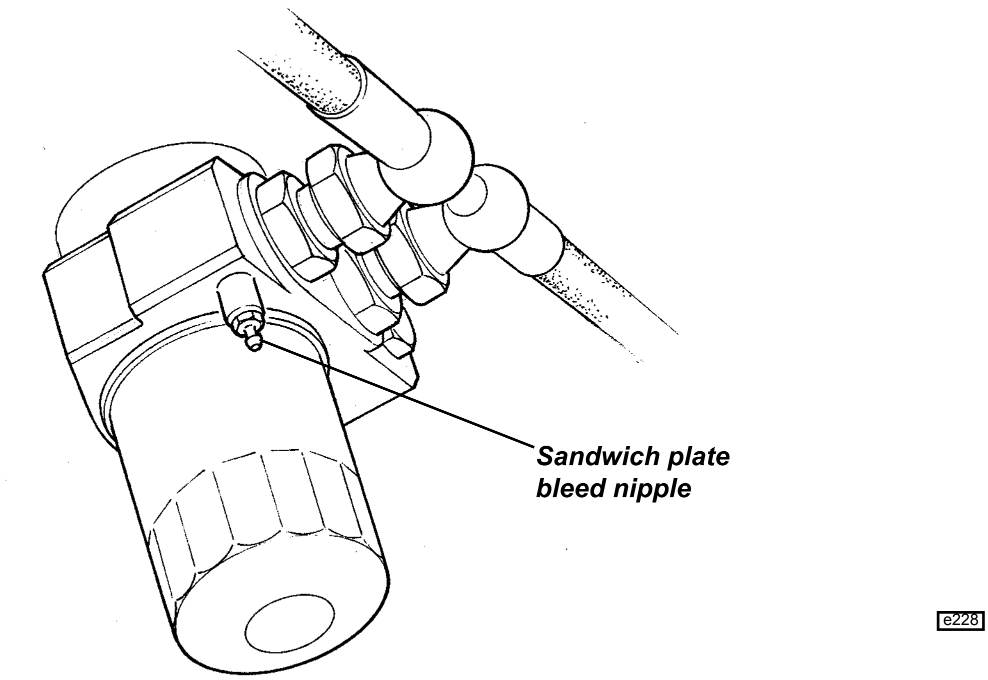
Ensure that only a Lotus specified filter is fitted, as parts with identical outward appearance can contain different internal features. Before fitting a new filter, clean the mating face on the engine, and smear the new seal on the filter with clean oil. Add a small amount of clean engine oil into the filter, screw onto its spigot and tighten BY HAND sufficiently to make a secure seal, typically 2/3 to 3/4 of a turn after the sealing faces have made contact. Overtightening using a filter wrench may damage the canister and/or complicate subsequent removal. Start the engine and check for oil leaks. Re-check the security of the filter, further tightening by hand if necessary. Check the oil level (see above) when the engine is fully warm.

Oil Coolers

The foregoing oil change procedure does not disturb the oil quantity contained in the twin oil coolers and associated pipework, but is considered perfectly satisfactory for routine maintenance operations. In instances of major engine failure where the oil system may be contaminated with metallic debris, all oil cooler lines should be thoroughly flushed out and the oil cooler radiators replaced.

If the oil cooler circuit is drained or replaced, the following procedure should be adopted to fill the cooler system before starting the engine:

1. Attach a tube to the bleed nipple on the sandwich plate between oil filter and engine block, and lead into a catch tank. Open the bleed nipple.



2. Disconnect the outlet hose from the top of the LH oil cooler, and pour engine oil into the cooler until oil reaches the bleed nipple (approx. 2.5 litres). Close the bleed nipple, tightening to 8 Nm.

3. Connect the LH cooler outlet hose and tighten to 40 Nm.

4. Add a further 0.7 litres of oil into the engine to accommodate the volume of the return hose between LH oil cooler and engine.

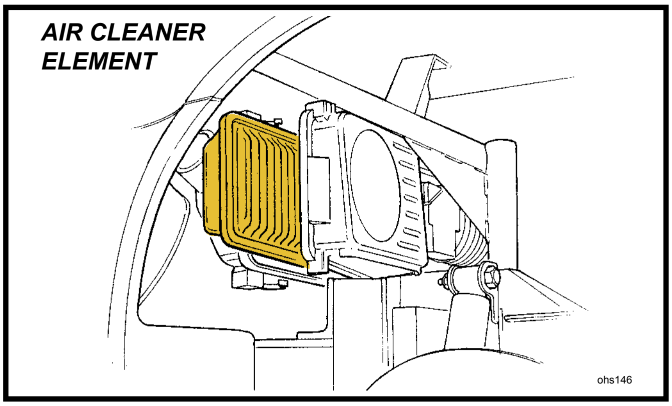
5. After starting the engine, restrict running to idle speed for a minimum of 5 minutes, to allow the oil cooler lines to be purged of air. Stop engine and re-check oil level.

Air Cleaner Element

The air filter should be inspected at intervals dependent on the operating conditions. When the vehicle is operated in a relatively clean environment, the element should be renewed at intervals specified in the Maintenance Schedule, but where a dusty or smog laden atmosphere prevails, or other factors contribute to filter contamination, more frequent replacement will be required dependent on the level of pollution.

A disposable folded paper type air cleaner element is fitted in a housing at the left hand front of the engine bay. For access to the element, the left hand rear wheel and wheelarch liner must first be removed. Before opening the air cleaner housing, the wheelarch area should be cleaned to reduce the possibility of filter or housing contamination with road dirt.

To open the filter housing, release the two spring clips at the outboard end of the housing, and hinge open sufficiently to allow the element to be withdrawn.



Clean the inside of the housing, including the joint faces, taking care not to contaminate the 'clean' engine side of the assembly. Fit the new filter element into position with the shallow side facing the 'clean', engine side of the housing. Ensure that the hinge lugs at the inboard end of the housing are correctly engaged before closing the housing and securing with the two spring clips. Refit the wheelarch liner and rear wheel.

Auxiliary Drive Belt

A single multi-rib serpentine type belt is used to transmit drive from the crankshaft to the water pump, alternator and a.c. compressor, with a slave pulley fitted in place of the power steering pump used in other applications. A hydraulically damped, spring loaded tensioner arm applies tension to the back of the belt, and is maintenance free. The belt itself should be inspected for condition at each service interval, and if it exhibits any evidence of physical damage, cracking, fraying, perishing, abrasion or contamination, it should be replaced. In the case of oil or coolant contamination, the cause must be identified and rectified, and each of the pulleys must be thoroughly degreased before the new belt is fitted.

For further details, refer to section CH in the Engine Repair Manual, but note that only a six-sided socket should be used on the cast boss on the tensioner arm. Due to the manufacturing draft angle of the casting, a twelve point socket is liable to cause damage.

Spark Plugs

The ignition system uses a distributorless ignition system (DIS) which employs an individual high tension coil for each of the four spark plugs. Each coil is mounted directly onto its spark plug using an integral connector and is secured to the cam cover with a single screw. The spark plugs use small diameter centre electrodes made of iridium for long life and high performance, and require changing only at 54,000 mile (90,000 km) intervals.

For further details, refer to section IG in the Engine Repair Manual.

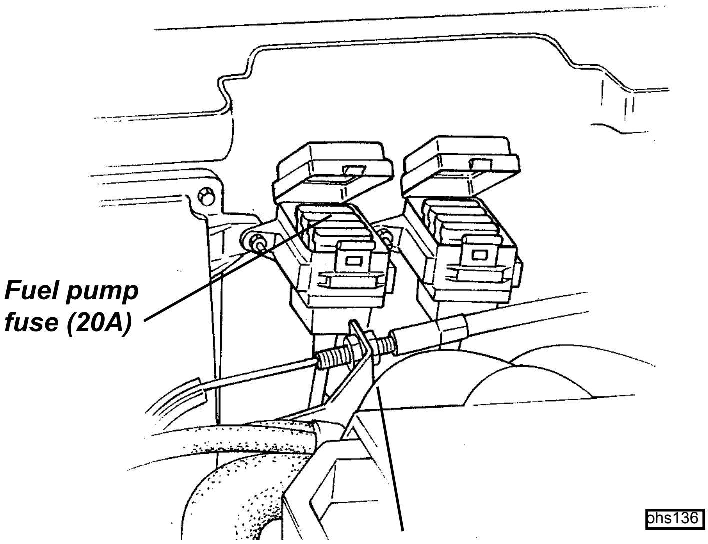
EH.3 - ENGINE REMOVAL/REPLACEMENT

It is recommended to remove the rear clamshell prior to powertrain removal in order to improve access, and to reduce the possibility of paint damage. The engine may be removed from above, with or without the transmission. The following procedure applies to the engine/transmission assembly, but to avoid disturbing the suspension, refer to sub-section FJ.5 to separate the engine from the transmission before withdrawing the engine alone.

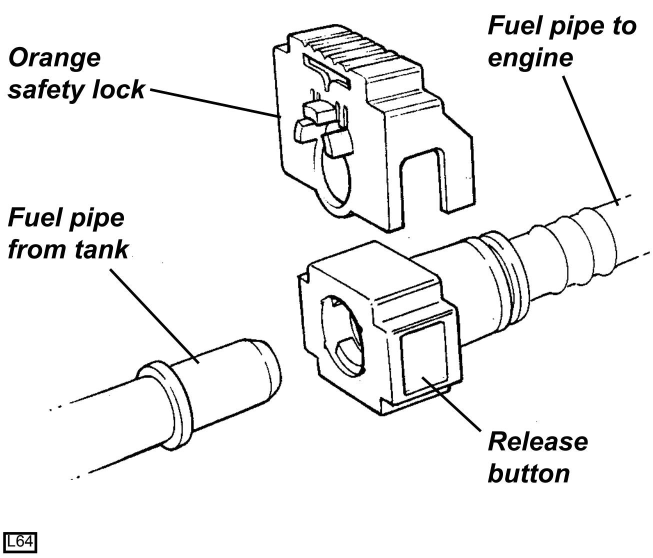
Fuel Pressure Relief Procedure

This procedure should be used prior to disconnecting any part of the fuel line.

- Pull out the fuel pump fuse (on the left hand side of the engine bay bulkhead, as shown), start the engine, and run until it stops from starvation. Crank the engine for a further few seconds.
- If the engine is a non-runner, pull out the fuel pump fuse, and crank the engine for 20 seconds to minimise residual fuel pressure.
- Disconnect the battery.
  It is recommended first to release the quick fit connector located to the rear of the coolant header tank:
- Release the retaining clip securing the pipe joint to the header tank bracket.
- Slide the orange coloured safety lock to allow access to the connector release buttons.
- Surround the pipe joint with a shop towel to absorb fuel contained in the pipework before pressing the release buttons and separating the joint.



WARNING: Be aware of the possibility of full pressure retention in the fuel line caused by a system fault.



- Before re-making the joint, ensure that the orange safety lock is fitted onto the pipe connector in the orientation shown in the illustration.
- Push the male pipe end fully into the female connector until a click is heard. Pull on the pipe to ensure complete engagement.
- Slide the orange safety lock over the connector to prevent accidental pressing of the release buttons.
- Secure the pipe/connector using the pipe clip on the header tank bracket.

1. Remove the engine bay undertray and diffuser, both rear road wheels and the rear clamshell (see sub-section BR.7).

2. On a.c. cars, recover refrigerant and disconnect both a.c. hoses from the pipes at the rear of the RH sill.

From beneath the car:

3. Drain coolant, transmission oil and, if necessary, engine oil. Diconnect the coolant inlet hose from the thermosat housing and cap both apertures. Disconnect the two oil cooler hoses from the sandwich plate and cap all ports and hoses.

4. Disconnect the exhaust manifold from the downpipe.

5. Release the gear cable routing clips from beneath the engine. Disconnect the earth braid between chassis and transmission.

6. Release the clutch slave cylinder from the transmission housing and support aside.

7. Release the steady mounting between the front of the engine and the chassis, and between the rear of the engine and the subframe.

From above:

8. Release the gearchange cables from the transmission by removing the 'R' clips retaining the inner cable eyes, and the 'C' clips retaining the outer cables.

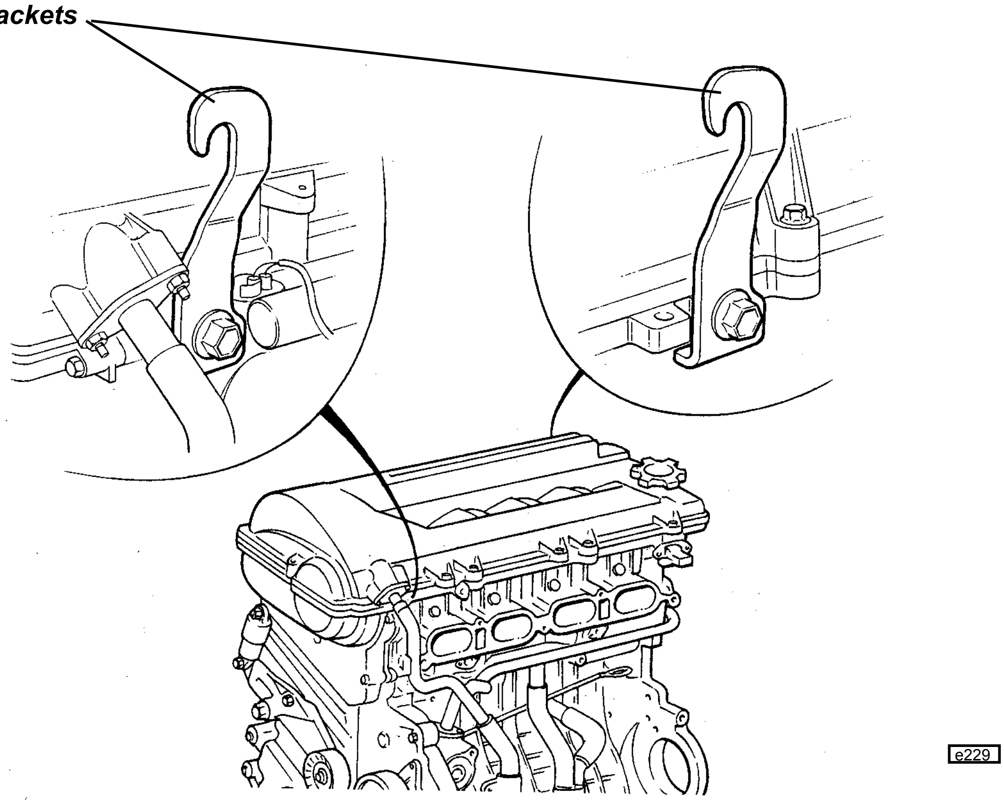
9. Disconnect the air intake hose between air cleaner and intake plenum, and release the brake servo vacuum hose from the intake plenum.

10. Disconnect the throttle cable. Disconnect the radiator feed hose and heater feed hose from the rear end of the cylinder head. Disconnect the heater return hose from the water rail, and the two hoses and electrical connector from the header tank. Disconnect the re-circ. pump hose to the chassis pipe, and release the electrical connector. Unplug the engine harness. Release the header tank bracket from the subframe, and remove the bracket complete with tank and recirc. pump. Release the purge pipe from the throttle body.

11. Remove the LH driveshaft from the transmission:
Release the top ball joint plinth from the LH hub carrier noting and retaining the camber adjustment shims, and separate the toe-link ball joint separated from the carrier. The driveshaft inboard joint is retained in the transmission by a round section circlip. The joint may be removed by applying a shock pull to the C.V. joint body using a slide hammer with a forked end. Take great care not to damage the output oil seal on withdrawal.
<u>CAUTION:</u> Do NOT attempt to remove the inboard C.V. joint from the transmission by pulling on the driveshaft. The balls of the inboard joint are restrained for transit purposes only, by a circlip at the end of the ball tracks. Applying an extension force to the joint will damage the balls and require joint replacement. Apply pressure only to the outer body of the joint. Do not allow the brake hose to be stetched or stressed, and support the driveshaft after withdrawal to protect the shaft joints and hub carrier. Cap the driveshaft aperture in the transmission.

12. Remove the RH driveshaft from the transmission:
Release the top ball joint plinth from the RH hub carrier noting and retaining the camber adjustment shims, and separate the toe-link ball joint separated from the carrier. The right hand driveshaft incorporates a bearing for the extension shaft and it is this which retains the shaft in the transmission. Remove the two bolts ecuring the bearing bracket, and withdraw the complete shaft assembly taking great care not to damage the ouput oil seal. Do not allow the brake hose to be stetched or stressed, and support the driveshaft after withdrawal to protect the shaft joints and hub carrier. Cap the driveshaft aperture in the transmission.

13. Fit two engine lifting brackets T000T1437S to the left hand front and right hand rear of the cylinder head. Sling support the power unit before releasing the RH and LH engine mounting brackets.



17. Carefully hoist the power unit from the car, whilst monitoring for any remaining connections.

Refit the unit in reverse order to removal with the following notes:

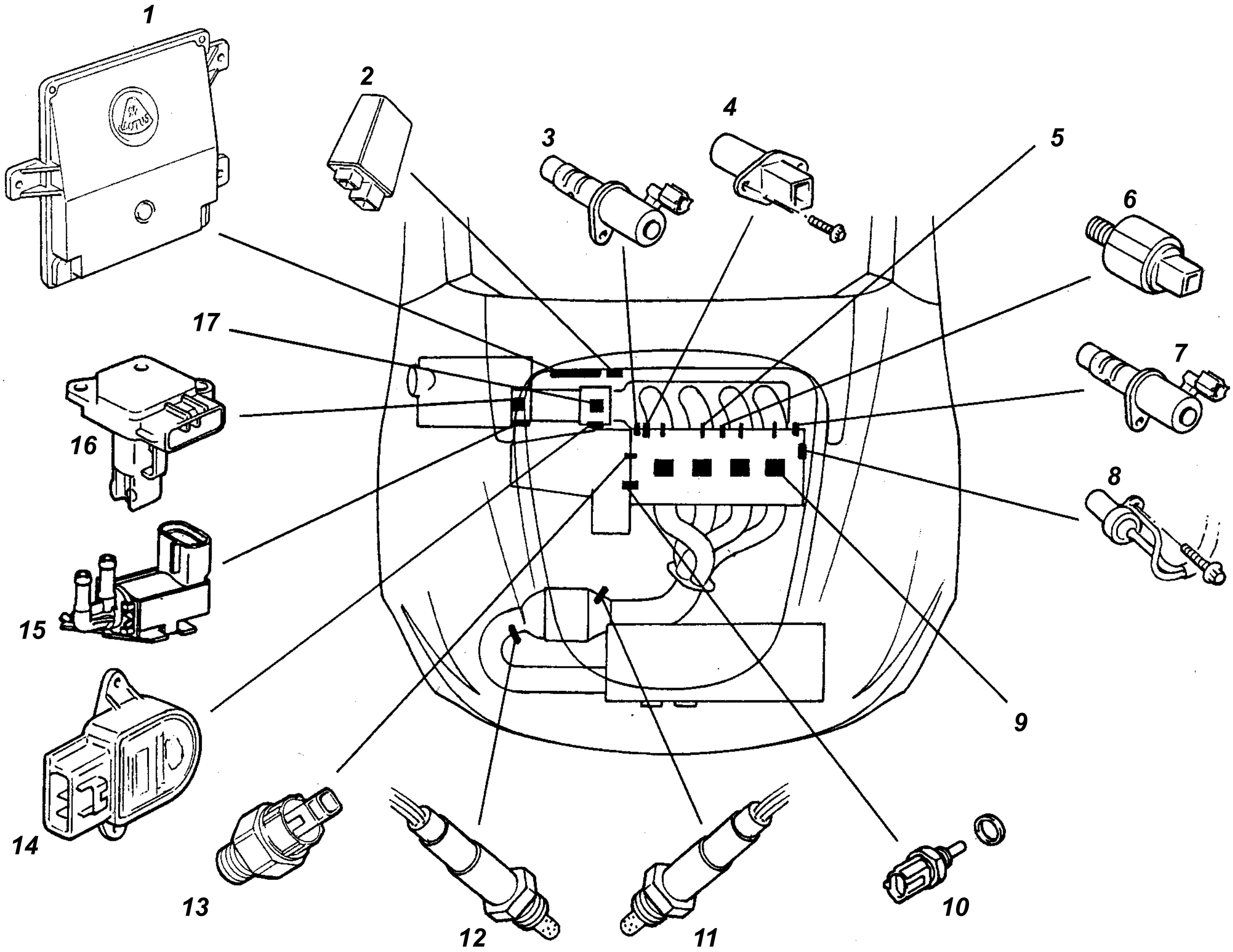
- Before re-fitting a driveshaft, first renew the round section circlip on the end of the left hand inboard joint spigot shaft, and lubricate the circlip with grease. Also, check the condition of the transmission output seal, and renew if necessary. Lubricate the lip of the seal with transmission oil, and grease the corresponding shoulder on the driveshaft (C.V. joint) spigot, to reduce the danger of damaging the seal on assembly.
- Carefully insert the driveshaft into the transmission, with, on the left hand shaft, the two ends of the circlip positioned lowermost, and rotate the shaft if necessary to engage the splines. Press the inboard joint outer until a click indicates the engagement of the retaining circlip, if necessary using a brass drift and hammer. Pull on the body to ensure its security. On the right hand shaft, fit the bolts securing the extension shaft bearing to the engine mounted bracket, and torque to 64 Nm.
- Refer to section DH for rear suspension assembly details.
- For coolant refilling procedure, refer to section KH.
- For transmission details and gear cable adjustment, refer to section FJ.

EH.4 - SPECIAL TOOLS

The following engine special tools are available under Lotus part number:

Engine Lift Bracket	T000T1437S	2 off
Bolt, engine lift bracket	T000T1440S	2 off
Oil Filter Wrench	T000T1441F	1 off
Valve Clearance Adjuster Set	T000T1442F	1 off
Crankshaft Pulley Holding Tool	T000T1443F	1 off
Flange Holding Tool	T000T1444F	1 off

EH.5 - 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. For diagnostic codes, refer to Section EMP.