

IN-SITU OPERATIONS

Cylinder Head

PARTIAL DRAINING

Only partial draining of the cooling system is necessary during some operations and the following method has been found satisfactory:

Obtain a suitable threaded reducing union having the same thread as the cylinder block drain plug tapping to which a length of plastic piping may be attached. The piping should be 1,0m to 1,5m (3 to 5 feet) in length.

If the engine is cold, the cooling system will be under partial vacuum. Under this condition remove the cylinder block drain plug and immediately fit the adaptor **before** removing the coolant filler cap.

Where an 'Engine Warm' condition exists, relieve the pressure in the system by releasing, but not removing, the coolant filler cap followed by re-tightening after the pressure diminishes. Only then must the cylinder block drain plug be removed and the reducing union fitted, followed by the removal of the coolant filler cap.

Where it proves necessary to completely drain the cooling system, use one of the above methods **followed** by the disconnection of hoses between the engine and radiator.

The above routine will minimise the loss of coolant and anti-freeze.

CYLINDER HEAD

Note: The cylinder head must be absolutely cold before removal to avoid distortion. **THE ENGINE MUST HAVE STOOD FOR AT LEAST FIVE HOURS.** There are no exceptions to this rule.

To Remove

Disconnect battery.

Open and secure bonnet.

Release clips and remove rear engine cover.

Disconnect metallised hose from air cleaner.

Release hose clip and remove air cleaner from carburettor, finally disconnecting the vacuum pipe.

Pull the heater air ducting from its location at the bulkhead and inner wing.

Remove bolt securing support bracket for oil filler neck, twist the adaptor to release from the rocker cover and remove complete assembly.

Detach spark plug leads, disconnect H.T. lead from coil, release clips and remove distributor cap.

Disconnect ventilation hose from rocker cover.

Remove rocker cover.

Position crankshaft at 6° B.T.D.C. with number 1 piston (flywheel end of engine) on compression stroke i.e. Valves of number 4 cylinder rocking. This will assist the timing operation during refitting.

Remove distributor clamp bolt and slide out clamp plate.

Disconnect vacuum pipe at distributor and multi-plug of wiring harness.

Remove distributor from engine.

Release 'Dzus' fasteners and remove front under-tray.

Remove cylinder block drain plug and partially drain coolant (Refer to 'Partial Draining' at beginning of section).

Release hose clips and disconnect breather pipes at air cleaner.

Disconnect fuel supply line at pump and plug the line to minimise fuel spillage and ingress of dirt.

Remove nuts and displace fuel pump and outlet pipe clear of working area. Recover insulation block and gaskets.

Unscrew service plug from timing case cover to obtain access to the timing chain tensioner.

Neutralise the timing chain tensioner by inserting a screwdriver into the slot of the tensioner screw, pushing it in as far as it will go, and turning it 180° clock-wise.

Note: Some tensioners incorporate a screw requiring the use of an 'Allen' key in place of a screwdriver.

Remove the cylinder head front casing.

Remove the camshaft sprocket and retaining ring, ensuring that the timing chain is not allowed to fall into the timing case. Support the chain with a length of stiff wire passed through the links.

Remove nuts securing exhaust down pipe to manifold.

Release 'Dzus' fasteners, remove bolts and remove rear undertray.

Remove exhaust clamp at flywheel housing and displace exhaust down pipe. Recover flange gasket.

Release hose clips and disconnect hoses to heater and to the cylinder head.

Unscrew union of servo pipe at manifold.

Disconnect wire from coolant temperature sensor.

Disconnect wire from carburettor idle solenoid.

Slacken accelerator cable clamp bolt, remove the return spring and arm assembly and detach the cable from its abutment.

Disconnect choke cable by releasing the cable clamp bolts.

Remove bolt securing dip stick bracket to cylinder head.

Check that the cylinder head is absolutely COLD.

Remove the cylinder head bolts in the sequence shown in Sub-section A131.

Lift off cylinder head and manifolds assembly. Remove the cylinder head gasket.

To Refit

Refitting is a reversal of the removal instructions.

Clean all joint faces and use new gaskets.

Tighten cylinder head bolts in two stages to DATA figures using the sequence shown in Sub-section A131.

Adjust rocker arm clearances if valve gear has been dismantled.

Reset the ignition timing (Refer to Sub-section D311).

Refill with coolant.

COMPRESSION TEST**Equipment**

A suitable pressure gauge having a swivel or flexible hose adaptor is required due to limited access to the spark plug holes.

The vehicle battery may be used to crank the engine during the test, providing it is in a fully charged state.

Method

Open and secure the bonnet.

Pull heater air ducting from its location at bulk-head and inner wing.

Release clips and lift out rear engine cover.

Start and run engine until HOT ('Thermostat Open' condition).

Stop engine

Remove air filter element.

Disconnect plug leads and remove all spark plugs.

Connect pressure gauge.

Crank engine with throttle held open and observe gauge reading.

If satisfactory readings are obtained, refit components previously removed.

An engine in good condition should give the compression pressures stated in DATA pages. If the readings obtained are substantially below DATA figures, the engine is in need of attention to valves or piston rings. If a high mileage has been covered the engine may require reboring.

TIMING GEAR, CHAINS AND TENSIONERS

TIMING COVER OIL SEAL

To Remove

Disconnect battery.

Open and secure bonnet.

Release 'Dzus' fasteners and remove front under-tray.

Drain the cooling system (Refer to note at beginning of section).

Remove radiator (Refer to Sub-section C200).

Remove fan securing bolts and separate the fan and strengthening ring from the water pump.

Slacken alternator pivot and adjustment bolts, move alternator towards engine and remove 'Vee' drive belt.

Slacken pivot and adjustment bolts, move power assisted steering pump towards engine and remove 'Vee' drive belt (Power assisted steering vehicles only).

Remove pulley bolt and withdraw crankshaft pulley.

Lever the oil seal from the timing cover with a screwdriver. Avoid damaging the cover or scoring the crankshaft.

Clean the surrounding area and check for damage.

To Refit

Check that the direction of rotation of the engine corresponds with that of the seal by observing the arrow marked on the seal.

Grease the outside of the lip of the new seal i.e. That part of the seal which will be visible after fitting to the timing cover. This will assist the fitting of the crankshaft pulley without damaging the seal and provide temporary lubrication.

Press the seal into the timing cover with the lip towards the cylinder block.

If the crankshaft pulley has a sharp edge where it enters the seal it should be carefully removed. Do not mark the boss upon which the seal operates.

Refit all the components previously removed.

Adjust the 'Vee' drive belt(s) to obtain a deflection of 10mm (3/8in.) on the longest belt run.

Tighten the crankshaft pulley bolt to a torque reading of 135 Nm. (100lbf ft).

Refill with coolant.

CAMSHAFT TIMING SPROCKET

To Remove

Disconnect battery.

Open and secure bonnet.

Release clips and lift out rear engine cover.

Remove bolts and lift out front engine cover.

Disconnect metallised hose from air cleaner.

Release hose clips, disconnect breather pipe and remove the air cleaner assembly. Disconnect the vacuum pipe from air cleaner.

Pull heater ducting from its location at bulkhead and inner wing.

Remove oil filler neck from rocker cover.

Detach leads from spark plugs.

Disconnect ventilation hose from rocker cover.

Remove rocker cover and recover gasket.

Drain cooling system (Refer to note at beginning of section).

Release hose clips and disconnect by-pass and bottom radiator hoses at the water pump.

Remove distributor (Refer to Sub-section D311).

Detach fuel supply line from fuel pump and plug the line.

Remove nuts and displace fuel pump and outlet pipe clear of working area. Recover insulation block and gaskets.

Unscrew service plug from timing case cover to obtain access to the timing chain tensioner.

Neutralise the timing chain tensioner by inserting a screwdriver into the slot of the tensioner screw, pushing it in as far as it will go and turning in 180° clock-wise.

Note: Some tensioners incorporate a screw requiring the use of an 'Allen' key in place of a screwdriver.

Remove eight bolts securing cylinder head front cover and carefully remove the cover.

Release locking ring and remove three set screws securing camshaft sprocket. Move the sprocket into the groove of the camshaft, lift off timing chain and move it towards the cylinder head to permit the removal of the sprocket.

Support the timing chain by passing a suitable stiff wire through the links.

To Refit

Refitting is a reversal of the removal procedure.

Set ignition timing (Refer to Sub-section D311).

Use new gaskets as necessary.

Refill with coolant.

LUBRICATION SYSTEM

SUMP

To Remove

Disconnect battery.

Open and secure bonnet.

Release 'Dzus' fasteners, remove cross-strap bolts and remove both undertrays.

Remove sump drain plug and drain engine oil. Refit drain plug.

Remove four bolts from flywheel housing/sump re-inforcement bracket and remove the bracket.

Support the sump, remove all bolts and lower sump. Recover sump gasket.

To Refit

Refitting is a reversal of the removal instructions.

Use new sump gasket. 'Hylomar' sealant may be used if necessary.

Refill sump with engine oil, run engine and check for leaks.

STRAINER

To Remove

Disconnect battery.

Remove the sump (Refer to Sub-section SUMP).

Remove bolt securing strainer to oil pump and detach strainer and anti-drain plate.

To Refit

Refitting is a reversal of the removal instructions.

OIL PUMP

To Remove

Disconnect battery.

Remove the sump (Refer to Sub-section SUMP).

Remove the two setscrews and washers securing the pump to the cylinder block.

Tilt the pump and disengage the sprocket from the drive chain.

Collect Shim(s), if fitted, from between the pump and block.

For oil pump overhaul details refer to Sub-section A122.

To Refit

Refitting is a reversal of the removal instructions.

If it is necessary to adjust the pump drive chain tension, or a new drive chain is fitted, refer to Sub-section A122.

Ensure that the two ring dowels are still fitted to the face of the cylinder block.

OIL PRESSURE RELEASE VALVE

To Remove

Disconnect battery.

Remove the sump (Refer to Sub-section SUMP).

Unscrew release valve cap.

Use an 'Allen' key to remove the adjusting cap.

Remove spring and ball from pump housing.

To Refit

Refitting is a reversal of the removal instructions.

For spring data refer to Sub-section A101.

FUEL SYSTEM

EXHAUST FLANGE GASKET

To Remove

Disconnect battery.

Open and secure bonnet.

Release 'Dzus' fasteners, remove bolts, remove front and rear undertrays and cross-strap.

Disconnect metallised hose from hot air stove.

Remove bolt to release exhaust down pipe bracket at flywheel housing.

Remove the four nuts securing down pipe to manifold and displace down pipe. Recover exhaust flange gasket.

To Refit

Refitting is a reversal of the removal instructions.

Clean flange faces and use a new gasket.

EXHAUST MANIFOLD AND GASKET

To Remove

Disconnect battery.

Open and secure bonnet.

Remove R/H noise insulation panel.

Release 'Dzus' fasteners, remove bolts and remove front and rear undertrays and cross strap.

Separate down pipe from exhaust manifold (Refer to EXHAUST FLANGE GASKET).

Remove the eight nuts and withdraw the manifold from its location on the cylinder head. Recover gasket from manifold to cylinder head joint.

Remove the heat shield from the manifold studs. Recover gasket.

To Refit

Reassembly is a reversal of the removal instructions.

Clean all joint faces and use new gaskets.

INLET MANIFOLD AND GASKET

To Remove

Disconnect battery.

Open and secure bonnet.

Release clips and lift out rear engine cover.

Disconnect breather hose from rocker cover.

Detach metallised hose from air cleaner.

Release hose clip and remove air cleaner from carburettor. Disconnect vacuum pipe.

Disconnect wire from carburettor idle solenoid.

Disconnect choke cable by releasing the cable clamp bolts.

Slacken accelerator cable clamp bolt, remove the return spring and arm assembly and detach the cable from its abutment.

Release clip and disconnect feed pipe at fuel filter.

Disconnect vacuum pipe to distributor.

Release 'Dzus' fasteners and remove front under-tray.

Drain the cooling system (Refer to note at beginning of section).

Release clips and remove carburettor heater hoses.

Remove two nuts and lift carburettor from the manifold studs. Recover the sandwich plate, insulator block and gaskets.

Unscrew union of servo pipe at rear of manifold.

Release clips and disconnect water pipes at manifold.

Disconnect vacuum hose from manifold.

Remove eight nuts from manifold securing studs and remove manifold.

Recover gasket from manifold to cylinder head joint.

To Refit

Refitting is a reversal of the removal instructions.

Clean all joint faces and use new gaskets.

Refill with coolant.

Run engine and check for leaks.

AIR CLEANER

To Remove

Disconnect battery.

Open and secure bonnet.

Release clips and remove rear engine cover.

Detach metallised hose from air cleaner.

Release hose clip and disconnect breather hose at rocker cover.

Release hose clip and lift air cleaner assembly clear of carburettor.

Disconnect vacuum pipe from underside of air cleaner.

For air cleaner element renewal details refer to Sub-section B210.

To Refit

Refitting is a reversal of the removal instructions.

HOT AIR STOVE

To Remove

Disconnect battery.

Open and secure bonnet.

Release 'Dzus' fasteners, remove cross strap bolts and detach both undertrays.

Detach metallised hose from air stove.

In-situ Operations

Remove two clamping bolts from air stove. Recover spacer tubes.

Remove the hot air stove.

Remove bolt of down pipe bracket, open the bracket slightly and slide it along the exhaust down pipe.

To Refit

Unscrew the nuts from the down pipe to manifold joint and lower the down pipe. Recover gasket.

Refitting is a reversal of the removal instructions.

Use new down pipe joint gasket.