

SCIENTIFIC PUBLICATIONS

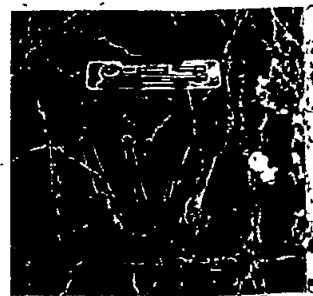
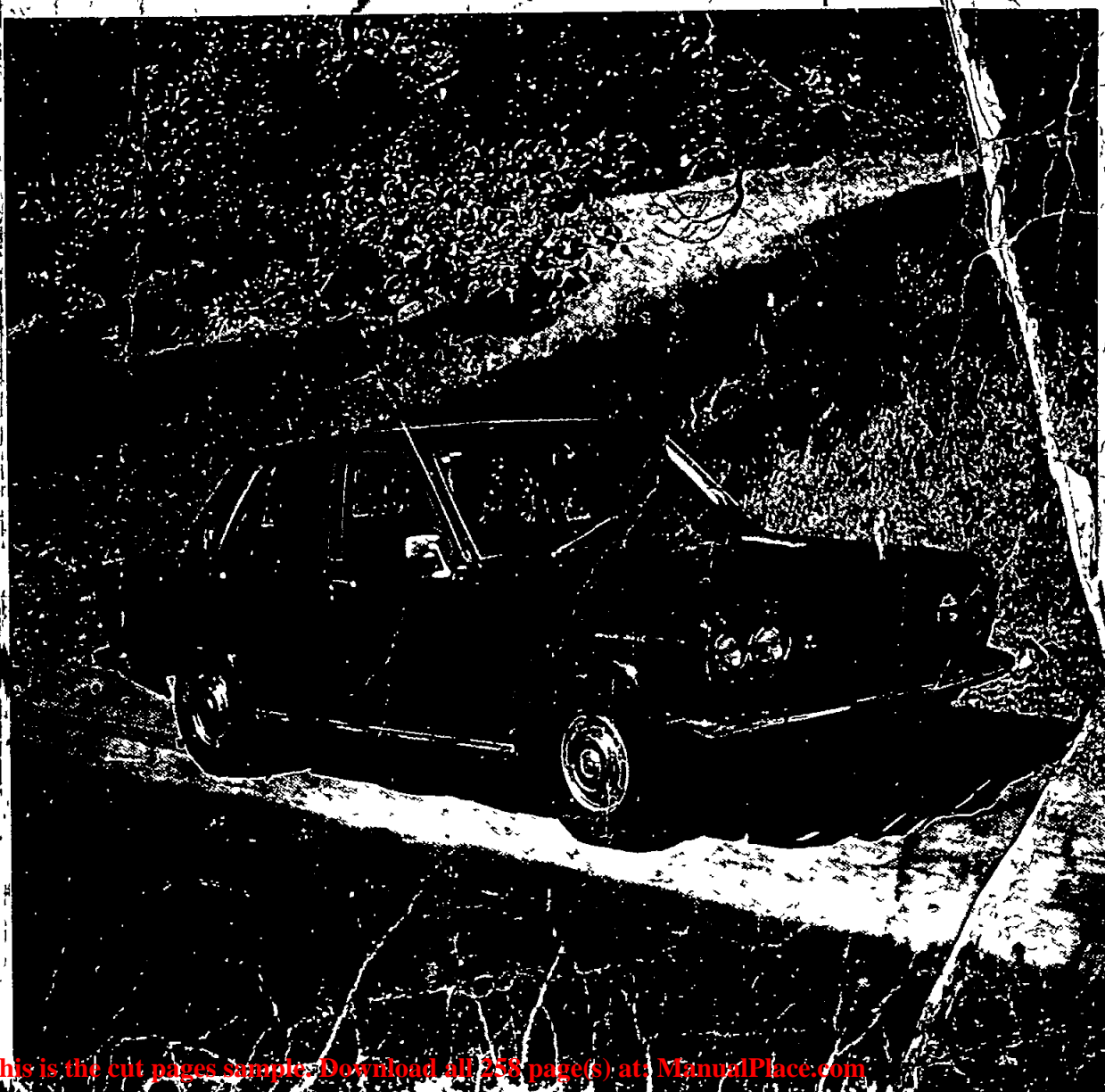
WORKSHOP MANUAL SERIES No 88

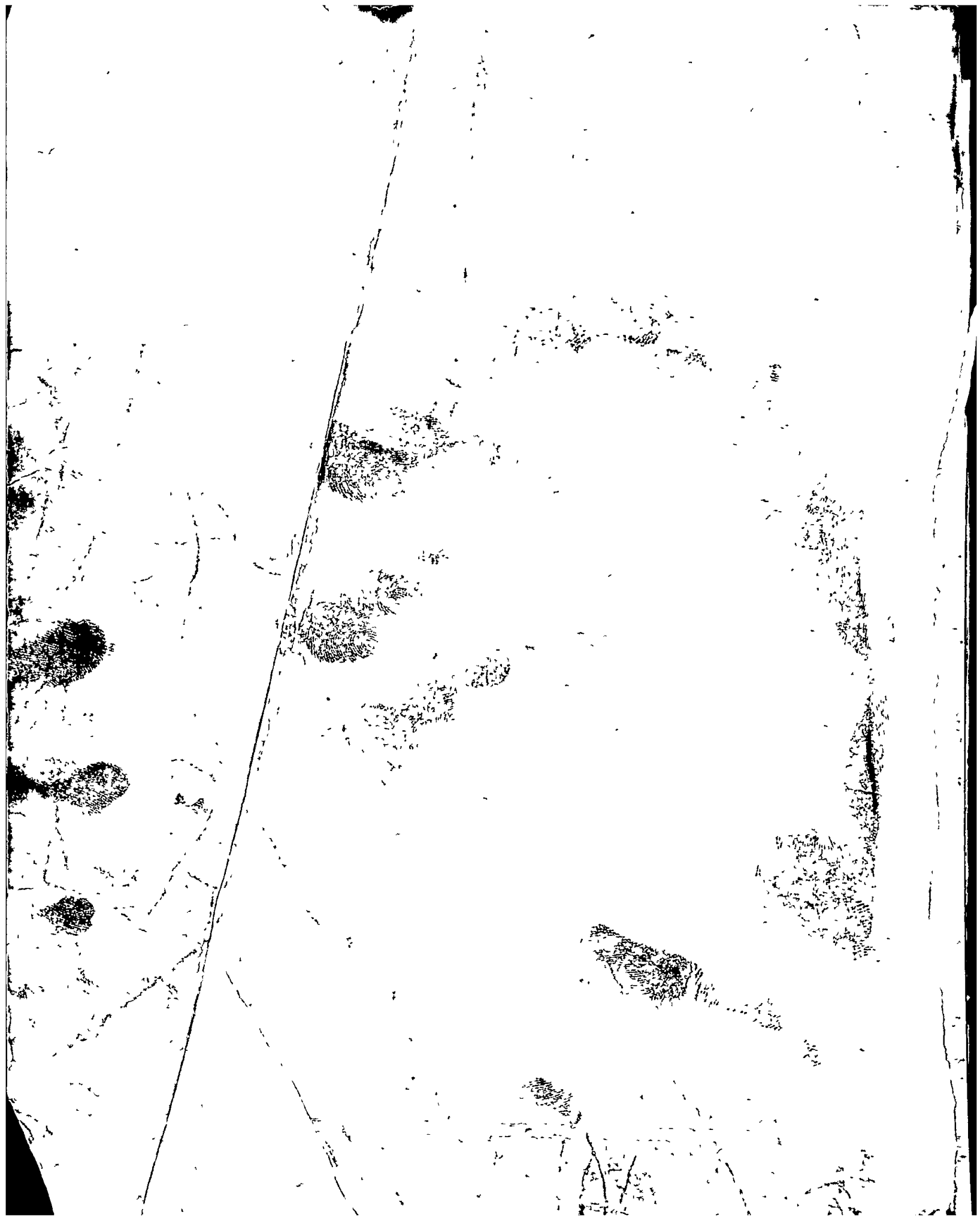
DATSUN

510 SERIES 1300-1600

ENGINES L13-L16

SEDAN, SSS, STATION WAGON.





SCIENTIFIC PUBLICATIONS'
WORKSHOP MANUAL SERIES No. 88

DATSUN 1600, 1300
SERIES 510

SEDAN, WAGON, 1600 sss, PICKUP

AUTOMATIC and MANUAL TRANSMISSIONS:
L13, L16, L14 Specifications

With Specifications,
Repair and Maintenance Data.

SCIENTIFIC PUBLICATIONS
SYDNEY · DURHAM
BRISBANE · LONDON
MELBOURNE

PUBLISHED BY SCIENTIFIC PUBLICATIONS PTY LTD

Australia

89-97 Jones Street
ULTIMO, N.S.W. 2007
Phone: 211-5611

England

Unit 4
Hetton Lyons Industrial Estate
HETTON-LE-HOLE,
TYNE AND WEAR DH5 0RH
Phone Hetton-le-Hole 2443

Printed by Times Printers Sdn Bhd
Singapore.

© Copyright by Scientific Publications Pty. Ltd
Registered at GPO Sydney for transmission by post as a book

First Edition. December 1971

Reprinted: May 1972

Reprinted: December 1973

Reprinted: November 1975

Reprinted: June 1977

ISBN 85566 039 2

The information in this manual is derived from the latest models available for our workshop research, and from other available sources at the time of writing. Any subsequent modifications will need to be taken into consideration by the operator.

While every precaution is taken to ensure the accuracy of the contents, onus can not be accepted for any misinterpretation of the described repair operations or for any errors or omissions inadvertently made.

ACKNOWLEDGEMENT

Scientific Publications wishes to thank Nissan Motor Corp USA and Borg-Warner Ltd, Fairfield, for help in aspects of preparing this manual

OVERSEAS REPRESENTATIVES

Canada: Repco Auto Parts (Canada) Ltd, 325 West 6th Avenue, Vancouver, 10BC

New Zealand: M.E.P. Bookshop, 82 Taranaki St., Wellington.

Publishers Services, 13 Eden St Newmarket, Auckland

E. Sime and Co., 82 Tory St., Wellington, and 140 Target Rd, Glenfield Auckland.

South Africa: Australian Industries (Export) Pty Ltd, PO Box 2016, Johannesburg.

United Kingdom: Alltech Distributors, 15 High St., Hampton, Middlesex.

Frederick Muller Ltd., Victoria Works, Edgware Road, London

Scientific Publications, Unit 4, Hetton Lyons Industrial Estate,

HETTON-LE-HOLE, TYNE and WEAR, DH5 0RH.

| | |
|------------------------------------|------------|
| ENGINE | 7 |
| COOLING SYSTEM | 40 |
| FUEL SYSTEM | 46 |
| CLUTCH | 71 |
| MANUAL TRANSMISSION | 80 |
| AUTOMATIC TRANSMISSION | 99 |
| REAR AXLE | 106 |
| FRONT SUSPENSION | 126 |
| REAR SUSPENSION | 135 |
| STEERING | 143 |
| BRAKES | 150 |
| ELECTRICAL SYSTEM | 167 |
| ROAD TEST | 216 |
| BODY | 217 |
| WHEELS AND TYRES | 226 |
| LUBRICATION AND MAINTENANCE | 231 |
| EMISSION CONTROL SYSTEMS | 233 |
| INDEX | 252 |
| GLOSSARY OF TERMS | 255 |

ENGINE

SPECIFICATIONS

| | | | |
|-------------------------------|--|--|--|
| Engine type | 4 cyl -- OHC | Engine idling speed | |
| Engine models | L13-L14-L16 | L13-L14-L16 (single carb) | 600 rpm |
| Firing order | 1-3-4-2 | L16 (twin carb) | 650 rpm |
| Compression ratio | | Ignition timing | |
| L13-16 (single carb) | 8.5 : 1 | (initial setting at idling speed) | |
| L14 | 9.0 : 1 | L13-L14-L16 (single carb) | 10 deg btdc |
| L16 (twin carb) | 9.5 : 1 | L16 (twin carb) | 14 deg btdc |
| Bore | 83 mm (3.2677 in) | | |
| Stroke | | CYLINDER BLOCK | |
| L13 | 59.9 mm (2.358 in) | Type | 4 cyl in line, integral with crankcase |
| L14 | 66.0 mm (2.598 in) | Bore diameter (standard) | 83.000 - 83.050 mm (3.2677 - 3.2697 in) |
| L16 | 73.7 mm (2.901 in) | Bore wear limit | 0.20 mm (0.008 in) |
| Capacities | | Bore measuring points (depth from block face) | |
| L13 | 1296 cc (79.086 cu in) | First | 20 mm (0.787 in) |
| L14 | 1428 cc (87.141 cu in) | Second | 60 mm (2.362 in) |
| L16 | 1595 cc (97.331 cu in) | Third | 100 mm (3.937 in) |
| Brake horsepower | | Cylinder block face warp limit | 0.10 mm (0.004 in) |
| L13 | 77 @ 6000 rpm | O/S pistons available | |
| L14 | 85 @ 6000 rpm | First O/S | 0.250 mm (0.010 in approx) |
| L16 (single carb) | 96 @ 5600 rpm | Second O/S | 0.500 mm (0.020 in approx) |
| L16 (twin carb) | 109 @ 6000 rpm | Third O/S | 0.750 mm (0.030 in approx) |
| Maximum torque | | Fourth O/S | 1.000 mm (0.040 in approx) |
| L13 | 11.1 kg/m @ 3600 rpm (80.3 ft/lb @ 3600 rpm) | Fifth O/S | 1.500 mm (0.060 in approx) |
| L14 | 11.9 kg/m @ 3600 rpm (86.0 ft/lb @ 3600 rpm) | | |
| L16 (single carb) | 13.8 kg/m @ 3600 rpm (99.8 ft/lb @ 3600 rpm) | CYLINDER HEAD | |
| L16 (twin carb) | 14.3 kg/m @ 4000 rpm (103.4 ft/lb @ 4000 rpm) | Type | One piece |
| Standard compression pressure | | Material | Aluminium Alloy |
| @ 350 rpm | | Valve seat width in cylinder head | |
| L13-L14-L16 (single carb) | 12.0 kg/cm ² (171 psi) | Inlet | 1.40 - 1.80 mm (0.055 - 0.071 in) |
| L16 (twin carb) | 12.5 kg/cm ² (178 psi) | Exhaust | 1.60 - 2.00 mm (0.063 - 0.079 in) |
| Minimum compression pressure | | | |
| @ 350 rpm | 11.5 kg/cm ² (159 psi) | | |

2—Engine

| | | | |
|--------------------------------|--|----------------------------------|--|
| Valve seat angle | 45 deg | Main bearing oil clearance | |
| Inlet and exhaust | | L13-L14 | 0 020 – 0 062 mm (0 0008 – 0 0024 in) |
| Valve seat insert interference | | L16 | 0 020 – 0 072 mm (0 0008 – 0 0028 in) |
| fit in cylinder head | | | |
| Inlet | 0 08 – 0 11 mm (0 0031 – 0 0043 in) | Main bearing oil clearance limit | |
| Exhaust | 0 06 – 0 10 mm (0 0024 – 0 0039 in) | L13-L14-L16 | 0 10 mm (0 0039 in) |
| Cylinder head temperature | 150 – 200 deg C (302 – 392 deg F) | Crankpin diameter (standard) | 49 961 – 49 975 mm (1 9670 – 1 9675 in) |
| for fitting valve seat inserts | | Crankpin taper and ovality limit | 0 03 mm (0 0012 in) |
| Valve guide interference | | | |
| fit in cylinder head | | | |
| Inlet and exhaust | 0 027 – 0 049 mm (0 0011 – 0 0019 in) | | |
| Cylinder head face warp limit | 0 10 mm (0 004 in) | | |

CRANKSHAFT AND MAIN BEARINGS

| | | | |
|---------------------------|--|-------------------------------------|--|
| Type | Counter-balanced | Connecting rod type | H section |
| Material | Forged steel | Material | Forged steel |
| Number of main journals | 5 | Length (centre to centre) | |
| End thrust taken at | No 3 main bearing | L13 | 139 87 – 139 93 mm (5 507 – 5 509 in) |
| Thrust clearance | 0 05 – 0 15 mm (0 002 – 0 006 in) | L14 | 136 6 mm (5 371 in) |
| Thrust clearance limit | 0 3 mm (0 012 in) | L16 | 132 97 – 133 03 mm (5 235 – 5 237 in) |
| Main bearing journal | 54 942 – 54 955 mm (2 1631 – 2 1636 in) | Connecting rod bend or twist | |
| diameter (standard) | | (maximum limit per 100 mm (3 94 in) | 0 05 mm (0 0020 in) |
| Main bearing journal | 0 03 mm (0 0012 in) | Big end bearing type | Replaceable |
| taper and ovality limit | | Big end bearing oil clearance | |
| U/S bearing available for | | L13-L14 | 0 014 – 0 056 mm (0 0006 – 0 0022 in) |
| U/S journals | | L16 | 0 014 – 0 066 mm (0 0006 – 0 0026 in) |
| First U/S | 0 250 mm (0 010 in approx) | Big end bearing oil clearance limit | |
| Second U/S | 0 500 mm (0 020 in approx) | L13-L14-L16 | 0 10 mm (0 0039 in) |
| Third U/S | 0 750 mm (0 030 in approx) | U/S bearings available | |
| Fourth U/S | 1 00 mm (0 040 in approx) | for U/S crankpins | |
| | | First U/S | 0 060 mm (0 002 in approx) |
| | | Second U/S | 0 120 mm (0 004 in approx) |

| | |
|------------|----------------------------------|
| Third U/S | 0 250 mm (0 010 in approx) |
| Fourth U/S | 0 500 mm (0 020 in approx) |
| Fifth U/S | 0 750 mm (0 030 in approx) |
| Sixth U/S | 1 00 mm (0 040 in approx) |

| | |
|------------|--|
| Third O/S | 83 72 -- 83 77 mm (3 296 -- 3 298 in) |
| Fourth O/S | 83 97 -- 84 02 mm (3 305 -- 3 308 in) |
| Fifth O/S | 84 47 -- 84 52 mm (3 326 -- 3 328 in) |

GUDGEON PINS

| | |
|-------------------------|--|
| Type | Interference fit in rod |
| Diameter | 20 995 -- 21 000 mm (0 8266 -- 0 8268 in) |
| Length | 72 00 -- 72 25 mm (2 8346 -- 2 8445 in) |
| Clearance in piston | 0 008 -- 0 010 mm (0 0003 -- 0 0004 in) |
| Interference fit in rod | 0 015 -- 0 033 mm (0 0006 -- 0 0013 in) |

| | |
|--------------------------|--|
| * Piston measuring point | 18 6 mm (0 732 in) |
| Skirt clearance in bore | 0 025 -- 0 045 mm (0 001 -- 0 0018 in) |
| Gudgeon pin bore offset | 0 950 -- 1 050 mm (0 03740 -- 0 04134 in) |

* Distance below centre line of gudgeon pin

PISTON RINGS

| | |
|---------------------------------------|--|
| Location | Above gudgeon pin |
| Number | 3 |
| Width | |
| Upper compression | 2 0 mm (0 078 in) |
| Lower compression | 2 0 mm (0 078 in) |
| Oil control | 4 0 mm (0 156 in) |
| Clearance in grooves | |
| Upper compression -- L13--L14 | 0 040 -- 0 073 mm (0 0016 -- 0 0029 in) |
| L16 | 0 045 -- 0 078 mm (0 0018 -- 0 0031 in) |
| Lower compression -- L13--L14--L16 | 0 030 -- 0 063 mm (0 0012 -- 0 0025 in) |
| Oil control -- L13--L14--L16 | 0 025 -- 0 063 mm (0 001 -- 0 0025 in) |

PISTONS

| | |
|---------------------|---|
| Type | |
| L13--L14 | Flat top -- Invar strut -- slipper skirt |
| L16 | Concave top -- Invar strut -- slipper skirt |
| Material | Cast aluminum |
| Removal | Top of cylinder |
| Diameter (standard) | 82 99 -- 83 04 mm (3 267 -- 3 269 in) |
| Diameters O/S | |
| First O/S | 83 22 -- 83 27 mm (3 276 -- 3 278 in) |
| Second O/S | 83 47 -- 83 52 mm (3 286 -- 3 288 in) |

4—Engine

Ring gap
Upper compression

0.023 —
0.38 mm
(0.0091 —
0.015 in)

Lower compression

0.15 — 0.30 mm
(0.0059 —
0.0118 in)

Oil control

0.15 — 0.30 mm
(0.0059 —
0.0118 in)

VALVE SPRINGS

Type

Helical

Free length

Outer —

L13—L14

48.12 mm
(1.89 in)

L16

52.00 mm
(2.0472 in)

Inner —

L16

44.85 mm
(1.7657 in)

Length at load (valve closed)

Outer —

L13—L14

40.0 mm
@ 29.2 —

32.2 k/g

(1.57 in

@ 64.39 —

71.01 lb)

38.9 mm

@ 27.5 —

30.5 k/g

(1.53 in

@ 60.62 —

67.24 lb)

Inner —

L16

35 mm

@ 11.6 —

13.0 k/g

(1.38 in

@ 25.58 —

28.66 lb)

Length at load (valve open)

Outer —

L13—L14

30.0 mm

@ 67.7 —

74.7 k/g

(1.18 in

@ 149.19 —

164.61 lb)

30.7 mm

@ 45.4 —

50.2 k/g

(30.7 in

@ 100.09 —

110.67 lb)

Inner —

L16

24.5 mm

@ 24.2 —

26.8 k/g

(0.96 in

@ 53.34 —

59.08 lb)

Valve spring squareness limit

1.6 mm

(0.063 in)

VALVES

Head diameter (inlet)

L13—L14—L16 (single carb)

38.00 mm
(1.50 in)

L16 (twin carb)

42.0 mm
(1.65 in)

Head diameter (exhaust)

33 mm
(1.30 in)

Stem diameter

Inlet and exhaust

8 mm
(0.31 in)

Clearance in guide bore

Inlet

0.015 —
0.045 mm
(0.0006 —
0.0018 in)

Exhaust

0.040 —
0.070 mm
(0.0016 —
0.0028 in)

Valve length

Inlet

115.9 mm
(4.56 in)

Exhaust

116.0 mm
(4.57 in)

Valve lift

Inlet and exhaust —

L13—L14—L16 (single carb)

10.0 mm
(0.3937 in)

L16 (twin carb)

10.5 mm
(0.4124 in)

Valve face angle

Inlet and exhaust

45 deg 30 min

Valve clearance

Hot —

Inlet

0.25 mm
(0.010 in)

Exhaust

0.30 mm
(0.012 in)

Cold —

Inlet

0.20 mm
(0.008 in)

Exhaust

0.25 mm
(0.010 in)

VALVE GUIDES

| | |
|-----------------------------------|--|
| Type | Renewable |
| Length | 59.0 mm (2.32 in) |
| Inner diameter | 8.000 — 8.018 mm (0.3150 — 0.3154 in) |
| Outer diameter | 11.985 — 11.996 mm (0.4718 — 0.4723 in) |
| Fitted height above cylinder head | 10.4 — 10.6 mm (0.409 — 0.417 in) |
| Guide to valve stem clearance | |
| Inlet | 0.015 — 0.045 mm (0.0006 — 0.0018 in) |
| Exhaust | 0.040 — 0.070 mm (0.0016 — 0.0028 in) |

CAMSHAFT

| | |
|---------------------------------------|--|
| Type | Overhead |
| Number of bearings | 4 |
| Camshaft journal diameter | 47.949 — 47.962 mm (1.8877 — 1.8883 in) |
| Camshaft journal wear limit | 0.10 mm (0.0039 in) |
| Camshaft bearing diameter | 48.000 — 48.016 mm (1.8898 — 1.8904 in) |
| Camshaft lobe lift | |
| L13—L14—L16 (single carb) | 6.65 mm (0.261 in) |
| L16 (twin carb) | 7.00 mm (0.275 in) |
| Camshaft journal to bearing clearance | 0.038 — 0.076 mm (0.0015 — 0.0026 in) |
| Bearing clearance limit | 0.10 mm (0.0039 in) |
| Camshaft end float | 0.08 — 0.38 mm (0.0031 — 0.0150 in) |
| Camshaft bend limit | 0.05 mm (0.002 in) |

CAMSHAFT DRIVE

| | |
|---------------------|-------------------|
| Type | Sprocket and cham |
| Camshaft sprocket | Light fit |
| Fit on camshaft | One bolt and peg |
| Method of securing | |
| Crankshaft sprocket | Light fit |
| Fit on crankshaft | Key |
| Method of securing | |

LUBRICATION

| | |
|---|--|
| Pump type | Eccentric rotor |
| Outer rotor to pump body clearance (max) | 0.21 mm (0.009 in) |
| Inner rotor tip clearance (max) | 0.12 mm (0.005 in) |
| Inner and outer rotor end clearance (max) | 0.12 mm (0.005 in) |
| Oil pressure at idle | 1.0 — 1.2 kg/cm ² (14.2 — 17.1 psi) |
| Relief valve spring | |
| Free length | 57 mm (2.24 in) |
| Length at load | 39 mm (1.540 in) |
| Relief valve opening pressure | 3.8 — 4.2 kg/cm ² (54.00 — 59.7 psi) |
| Oil capacity | |
| Sump without filter | 4.0 litre (7.0 imp pt) (8.4 US pt) |
| Sump including filter | 4.7 litre (8.2 imp pt) (9.9 US pt) |

TORQUE WRENCH SETTINGS

| | |
|------------------------|--------------------------|
| Cylinder head bolts | 6.0 kg/m (43.0 ft/lb) |
| Main bearing cap bolts | 5.5 kg/m (40.0 ft/lb) |
| Big end bearing nuts | 3.3 kg/m (24.0 ft/lb) |
| Camshaft sprocket bolt | 6.0 kg/m (43.0 ft/lb) |

6—Engine

| | | | |
|---|---------------------------|--|--------------------------|
| Sump bolts | 0.7 kg/m (5.0 ft/lb) | Rear crossmember to body bolts | 5.2 kg/m (38.0 ft/lb) |
| Oil pump bolts | 2.1 kg/m (15.0 ft/lb) | Front engine mounting bracket to engine bolts | 3.0 kg/m (22.0 ft/lb) |
| Flywheel bolts | 10.5 kg/m (76.0 ft/lb) | Front engine mounting to bracket bolts | 3.2 kg/m (23.0 ft/lb) |
| Rear engine mounting to transmission bolts | 3.2 kg/m (23.0 ft/lb) | Front engine mounting to crossmember | 1.7 kg/m (12.0 ft/lb) |
| Rear engine mounting to crossmember bolts | 1.6 kg/m (12.0 ft/lb) | | |

1. DESCRIPTION

The L13 and L16 overhead camshaft engines are almost identical in design. The L16 engine with its longer stroke and thus increased capacity develops more horsepower. Dimensions of some components in the L16 engine have been increased to take the load of the higher output. The L16 engine is also available in a sports type version and utilizes twin carburetors and higher compression ratio to increase power by 13 bhp over that of the L16 standard version of the engine.

The engines have a cast iron deep skirt design cylinder block. The five main bearings which are used to support the crankshaft are of the precision insert replaceable type. The main bearings in all engines must not be adjusted by filing or by scraping.

The crankshaft end-float is controlled by thrust faces which are integral with the centre main bearing half shells. Oil leaks from the front and rear of the crankshaft are

prevented by seals which are installed in the timing cover and rear main bearing. The front seal runs on the crankshaft pulley hub and the rear seal runs on the crankshaft flange.

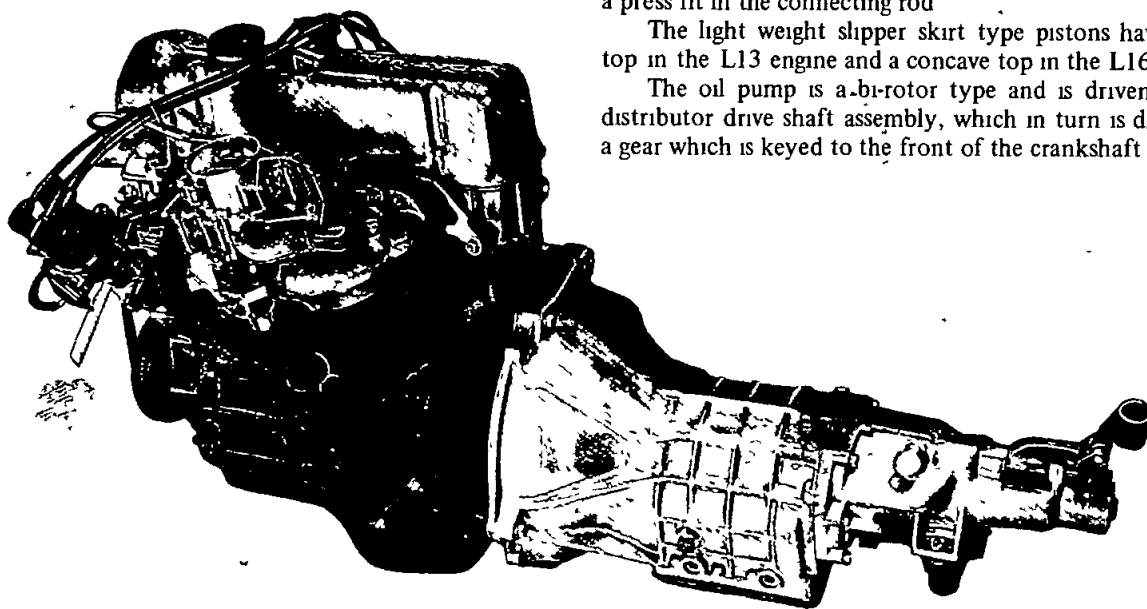
The cylinder head is constructed of aluminium alloy. Special aluminium bronze valve seats are used for the inlet valves and special cast seats are installed for the exhaust valves.

Both inlet and exhaust valve seats are a hot press fit into the cylinder head. The camshaft is supported over the top of the cylinder head by four aluminium alloy brackets. A long double row roller chain drives the camshaft from the crankshaft sprocket. Chain tension is controlled by a tensioner which is operated by a spring and oil pressure. A shoe type Neoprene pad, which is bolted on the face of the crankcase, keeps chain vibration down to a minimum.

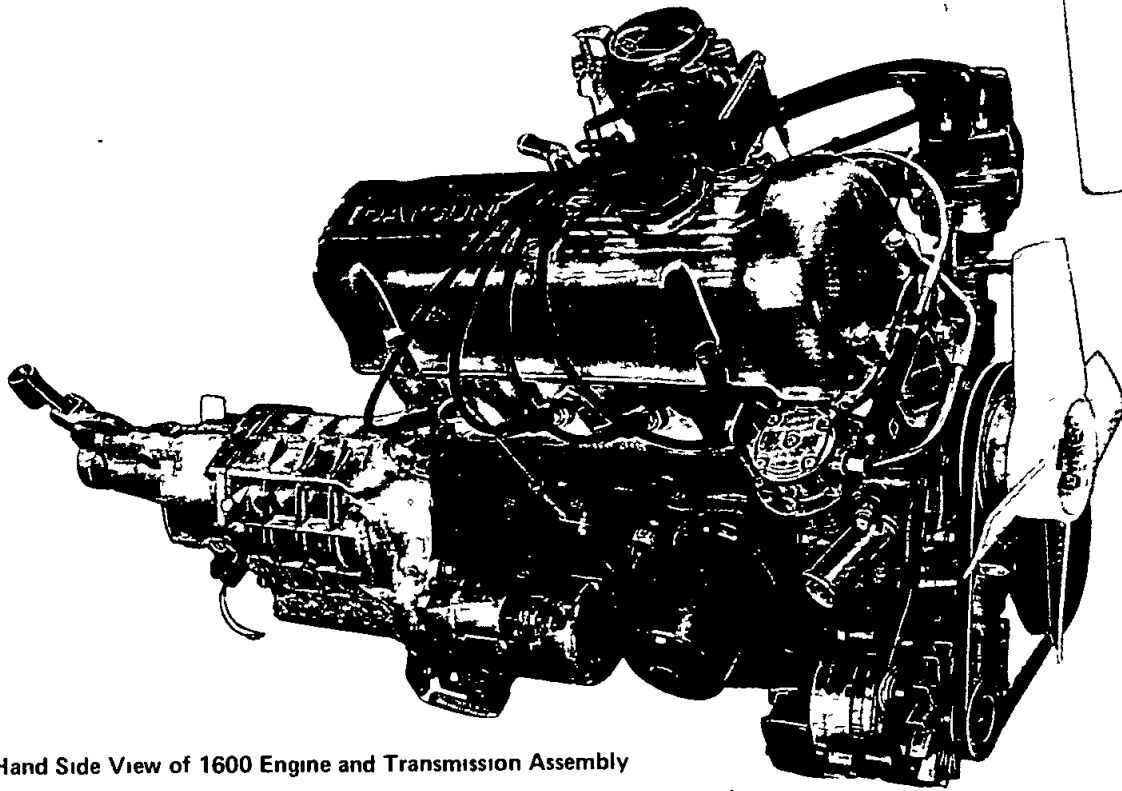
Connecting rods are H section forgings fitted with replaceable big end precision insert bearings. The gudgeon pins are a hollow type being fully floating in the piston and a press fit in the connecting rod.

The light weight slipper skirt type pistons have a flat top in the L13 engine and a concave top in the L16 engine.

The oil pump is a bi-rotor type and is driven by the distributor drive shaft assembly, which in turn is driven by a gear which is keyed to the front of the crankshaft.



Left Hand Side View of 1600 Engine and Transmission Assembly.



Right Hand Side View of 1600 Engine and Transmission Assembly

2. ENGINE ASSEMBLY

TO REMOVE AND INSTAL

(1) Raise the engine bonnet and fit fender covers to both front fenders

(2) Mark around the bonnet hinge plates on the bonnet with a soft lead pencil to facilitate correct replacement and remove the bonnet

(3) Remove the radiator cap and drain the cooling system via the drain tap on the lower radiator tank

(4) Remove the sump and transmission drain plugs and drain the lubricant from both assemblies

(5) Disconnect the leads at the battery terminals and remove the battery from the engine compartment

(6) Disconnect the ventilation hose from the rocker cover and remove the air cleaner assembly

(7) Disconnect and remove the upper and lower radiator hoses and the heater hoses (where applicable)

(8) Unscrew the fixing bolts and detach the radiator grille

(9) On vehicles fitted with automatic transmission disconnect the torque converter cooling pipes at the lower radiator tank, plug the pipes and unions to prevent entry of dirt

(10) Remove the radiator retaining bolts and lift out the radiator

(11) Slacken the alternator mounting bolts and remove the fan belt. Remove the four bolts, fan and pulley from the water pump

(12) Disconnect the wires at the oil pressure-switch, temperature sender unit, coil and alternator

(13) Disconnect the throttle control linkage and the choke control wire at the carburettor

(14) Disconnect the fuel pipe from the inlet side of the fuel pump

(15) Remove the nuts and detach the exhaust pipe from the exhaust manifold. Tie the exhaust pipe away from the engine assembly

(16) Raise the front and rear of the vehicle and support safely on four suitable chassis stands

(17) Remove the clutch actuating cylinder and return spring. Tie the cylinder to a convenient out of the way position on the underbody

(18) Disconnect the reversing light switch plug or the inhibitor and reversing light switch plug, (whichever is applicable for either manual or automatic transmission)

(19) Disconnect the speedometer cable

(20) On manual floor shift transmission – from inside the vehicle remove the garter from the gear shift lever, undo the self locking nut from the lower end of the lever and remove the lever

On manual column shift transmission – disconnect the select and shift rods, undo the cross shaft bracket to side member retaining bolts and remove the cross shaft bracket assembly

On automatic transmission – disconnect the selector linkage at the cross shaft bracket, undo the cross shaft bracket to side member retaining bolts and remove the cross shaft bracket assembly

(21) Remove the four bolts and nuts from the

Engine

propeller shaft rear flange and withdraw the shaft from the transmission

NOTE To remove the propeller shaft it may be necessary to disconnect the rear handbrake cable where it runs under the rear section of the propeller shaft

(22) Detach the handbrake cable from its retaining clip at the transmission rear crossmember

(23) Remove the two transmission rear crossmember to mounting securing bolts

(24) Interpose a wooden block between the transmission and a jack and take the weight of the rear engine and transmission assembly

(25) Remove the four bolts which attach the rear transmission crossmember to the underbody and remove the crossmember

(26) Instal a suitable lifting cable or chain to the lifting hooks which are positioned at the front and the rear of the engine cylinder head and with suitable lifting tackle take the weight of the engine assembly

(27) Remove the front engine mounting to front crossmember securing bolts

(28) Check around the engine and transmission assembly to ensure that nothing will foul on the assembly and also that all relevant items have been disconnected

(29) Gradually raise the engine with the front tilted upwards to clear the body and at the same time lowering the transmission on the jack until the engine assembly can be lifted clear of the vehicle

Installation is a reversal of the removal procedure with attention to the following points

Ensure that the engine assembly is installed and bolted securely to all mountings, and that the full engine assembly weight is taken by the mountings before connecting up the various components to the engine and transmission

Fill the radiator with water and add conditioner and/or anti-freeze if necessary

Fill the crankcase with the correct amount of the recommended grade of M/S engine oil

Start and run the engine until it reaches normal operating temperature and check for oil and water leaks

3. ROCKER ARM AND PIVOTS

TO REMOVE

(1) Detach the rocker cover to air cleaner ventilation hose and the thermostatic air bleed hose (where fitted)

(2) Loosen the air cleaner assembly thumb screw, remove the two bolts which secure the air cleaner assembly bracket to the inlet manifold and remove the air cleaner assembly

NOTE On engines fitted with twin SU carburettors it will not be necessary to remove the air cleaner assembly

(3) Detach the high tension leads at the spark plugs and carefully tie the high tension leads at a convenient point away from the rocker cover

NOTE Carbon filled high tension leads should be handled carefully at all times Mishandling of leads will cause a breakdown in lead continuity

(4) Remove the rocker cover securing bolts and detach the rocker cover and rocker cover gasket

(5) Unclip and remove the small steady spring from each rocker arm

(6) Back off the rocker pivot locknuts and screw the pivots down as far as possible into the cylinder head

(7) With a screwdriver, push down on each valve spring (see illustration) and manoeuvre out each rocker arm. During this operation take care that the valve rocker guides which are located on the end of the valve stems are not dislodged and lost

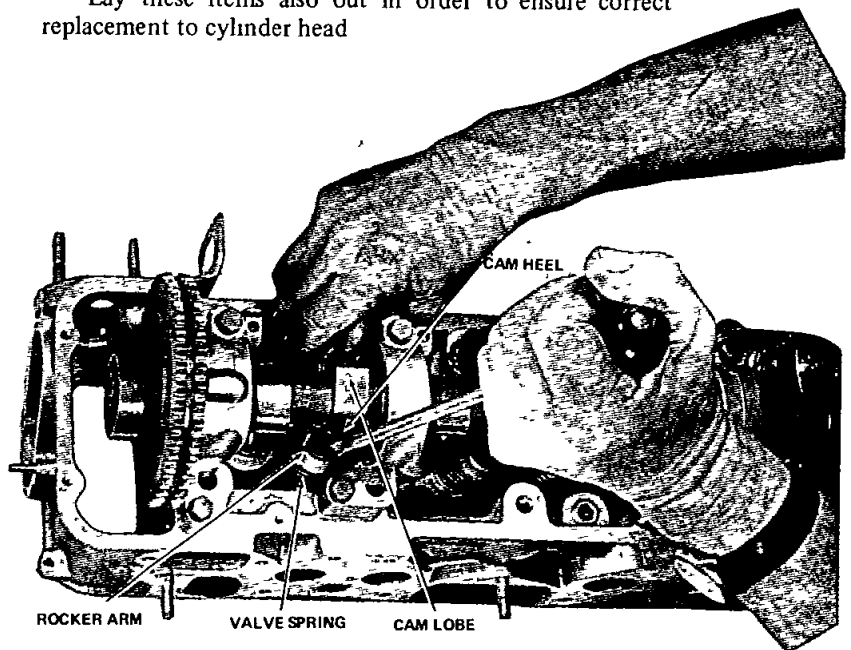
NOTE When removing rocker arms ensure that the cam heel for the rocker arm being removed is adjacent to its

relevant arm before attempting to compress the valve spring and removing the arm

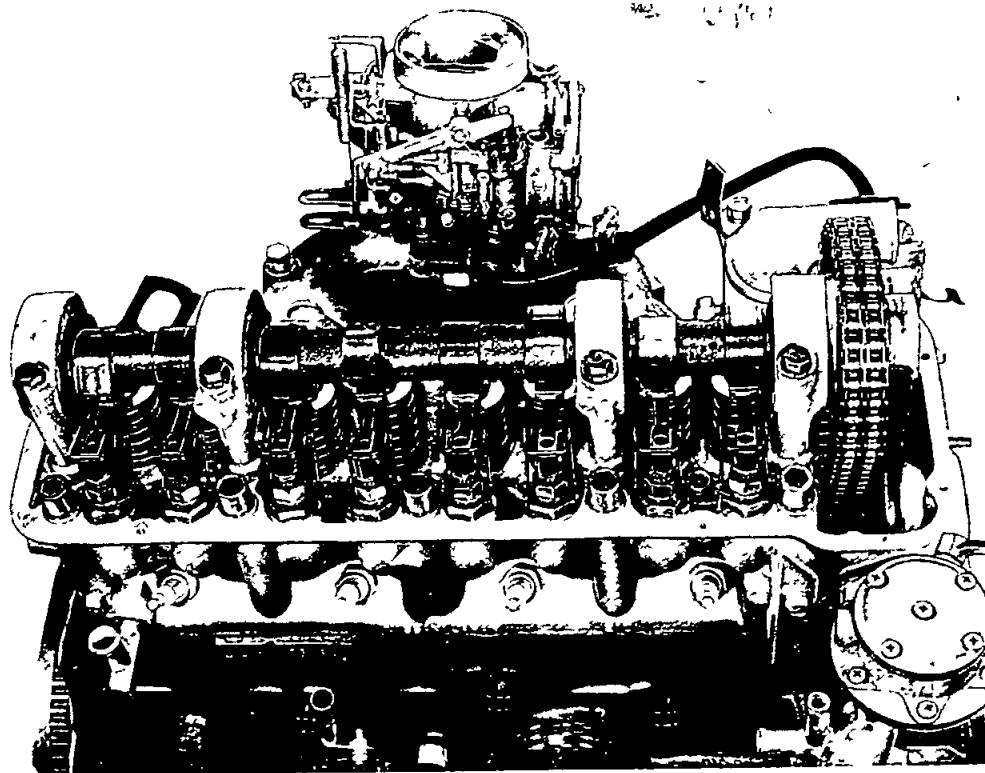
(8) Place the rocker arms in a rack or lay them out in order to ensure that they will be installed in their original positions in the cylinder head

(9) Unscrew the rocker arm pivots from the cylinder head and remove the rocker guides from the valve stem ends

Lay these items also out in order to ensure correct replacement to cylinder head



Method of Removing Valve Rocker Arms.



Engine Rocker Cover Removed Showing Valve Rocker Arm and Pivot Layout

TO CHECK

- (1) Wash all components in cleaning solvent and blow dry with compressed air
- (2) Check the rocker arm pivot head surface for wear or damage
- (3) Check the rocker arm to cam, and the rocker arm to pivot contact surfaces for wear or damage
- (4) Wear or damage to one of the above mentioned components will necessitate the renewal of the corresponding pivot or rocker arm, as the case may be

TO INSTAL

- Installation is a reversal of the removal procedure with attention to the following
- Assemble the rocker arm components with engine oil to ensure lubrication for initial start up
 - Adjust the valve clearance See TO ADJUST VALVE LASH section
 - Clean the gasket surfaces on the cylinder head and rocker cover Use a new gasket when installing the rocker cover

4. CYLINDER HEAD

TO REMOVE AND INSTAL

- (1) Disconnect the rocker cover to air cleaner ventilation hose and where fitted the inlet manifold to air cleaner thermostatic air bleed hose
- (2) Remove the air cleaner assembly
- (3) Remove the carburettor(s) as follows
 - Single application – disconnect the fuel inlet pipe and fuel by pass hose (where fitted)
 - Disconnect the distributor vacuum feed pipe
 - Disconnect the choke control cable
 - Disconnect the throttle linkage at the carburettor throttle lever
 - Remove the carburettor to manifold retaining nuts and lift off the carburettor
 - Twin application -- remove the inlet elbows from the carburettor

- Disconnect the fuel inlet pipes
- Disconnect the choke control cables
- Remove the fuel overflow pipes from the float chambers
- Disconnect the throttle linkage
- Detach the distributor vacuum feed pipe
- Unbolt and remove each carburettor from the inlet manifold
- (4) Drain the cooling system via the tap on the radiator bottom tank and the plug in the cylinder block
- (5) Disconnect and remove the top radiator hose
- (6) Disconnect the heater hose at the rear of the cylinder head
- (7) Detach the high tension leads at the spark plugs and ignition coil tower, unclip the distributor cap and remove the cap with leads
- (8) Disconnect and remove the crankcase to inlet manifold ventilation hose

Engine

(9) Remove the retaining clip and then disconnect and remove the inlet manifold water pipe

(10) Detach the wire from the temperature sender unit

(11) Disconnect the fuel inlet and outlet pipes from the fuel pump

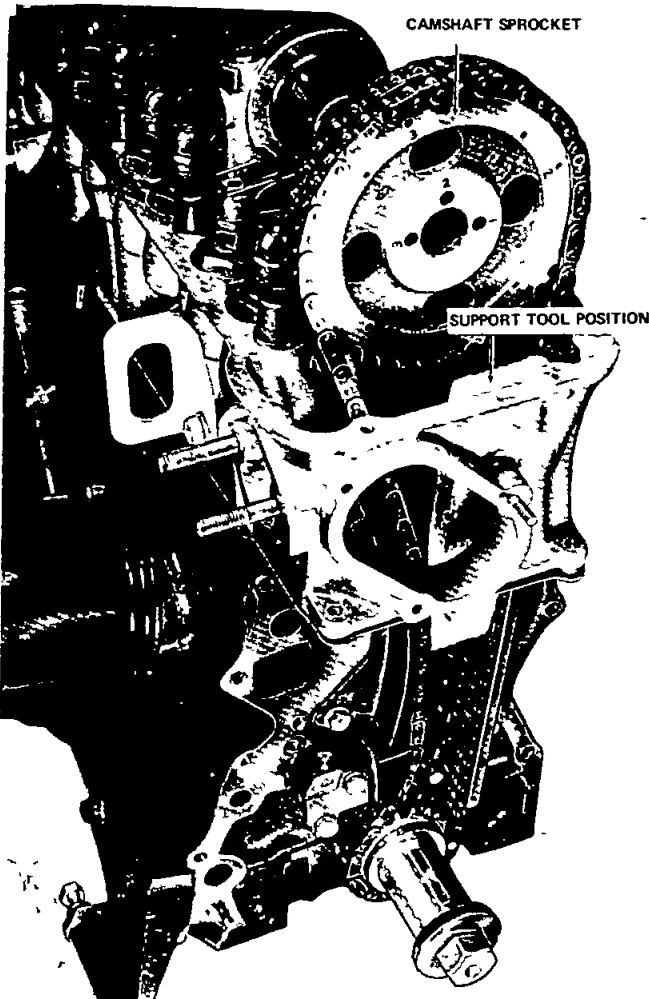
(12) Remove the two nuts securing the fuel pump to the cylinder head and withdraw the fuel pump, gasket and insulator block

(13) Remove the exhaust manifold to exhaust pipe flange nuts and detach the exhaust pipe from the manifold

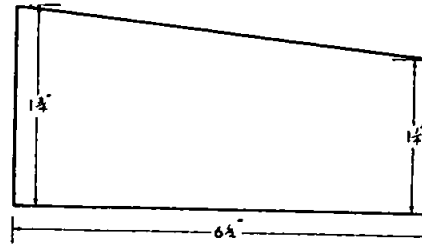
(14) Progressively slacken and remove the inlet manifold to cylinder head attaching nuts and lift away the inlet manifold

(15) Progressively slacken and remove the exhaust manifold to cylinder head attaching nuts and lift away the exhaust manifold. Discard the inlet and exhaust manifold gasket

(16) Remove the rocker cover securing bolts and detach the rocker cover. Discard the rocker cover gasket



Correct Position of Support Tool to Withdraw Camshaft Sprocket



Dimensions of Wooden Wedge for Holding Timing Chain when Camshaft and Cylinder Head are Removed

NOTE Adhered rocker covers can be dislodged from the cylinder head by bumping firmly with the palm of the hand. Under no circumstances use screwdrivers or similar tools to prise between the aluminum cover and head

(17) Remove the two external bolts which secure the protruded front portion of the cylinder head to the timing cover

(18) Rotate the crankshaft until the 'O' timing mark on the chain is aligned and clearly visible with the timing mark dimple on the camshaft sprocket periphery

(19) The sprocket timing mark number which is stamped adjacent to the mark dimple will be found to be either a 1, 2 or 3, depending whether the timing chain has been previously readjusted due to stretching

These numbers are also stamped on the sprocket boss adjacent to the camshaft dowel locating holes

For example, if a 2 number on the sprocket periphery is found to be aligned with the timing chain 'O' mark, then the 2 number on the sprocket boss will be adjacent to the camshaft sprocket dowel locating hole and also the camshaft dowel

(20) Using a correct fitting metric socket spanner and suitable bar, unscrew the camshaft sprocket retaining bolt. Remove the bolt and the fuel pump actuating cam

(21) Install the special timing chain support tool down between the tracks of the timing chain to retain the chain on the crankshaft sprocket and also to prevent the timing chain tensioner plunger from becoming dislodged from the timing chain tensioner bore

The support tool can be readily fabricated from a suitable piece of wood to the dimensions shown in the illustration

NOTE If through unforeseen circumstances the timing chain is dropped off the crankshaft sprocket and correct valve timing is lost it will be necessary to remove the sump and timing cover to readjust the valve timing

(22) With the timing chain firmly wedged by the support tool, withdraw the camshaft sprocket from the camshaft, disconnect the timing chain from the sprocket and remove the sprocket

(23) In the reverse order of the tightening sequence, progressively loosen and remove the cylinder head securing bolts

Lift the cylinder head upwards from the cylinder block far enough to clear the timing chain and support tool

IMPORTANT It is essential when installing the cylinder head to make sure that the valves are clear of the piston crowns

If the cylinder head is installed with the camshaft in its original position (i.e. when the chain sprocket was removed prior to head removal) then the possibility of the valves contacting the pistons will be eliminated

Do not rotate the camshaft until the timing chain and sprocket have been installed on the camshaft and the chain support tool removed

Use guide studs screwed into diagonal holes at opposite ends of the block face to position both the cylinder head and gasket

Install and tighten the cylinder head bolts evenly and progressively, in the order as shown in the illustration, to the specified torque (see Specifications)

Check and adjust the rocker arm to valve stem clearance as outlined in TO ADJUST VALVE CLEARANCE section

Check and adjust the carburettor idling mixture and engine idling speed as necessary

Check for engine oil or water leaks

TO DISMANTLE

(1) Remove the cylinder head assembly from the engine as described earlier and place on a suitable bench

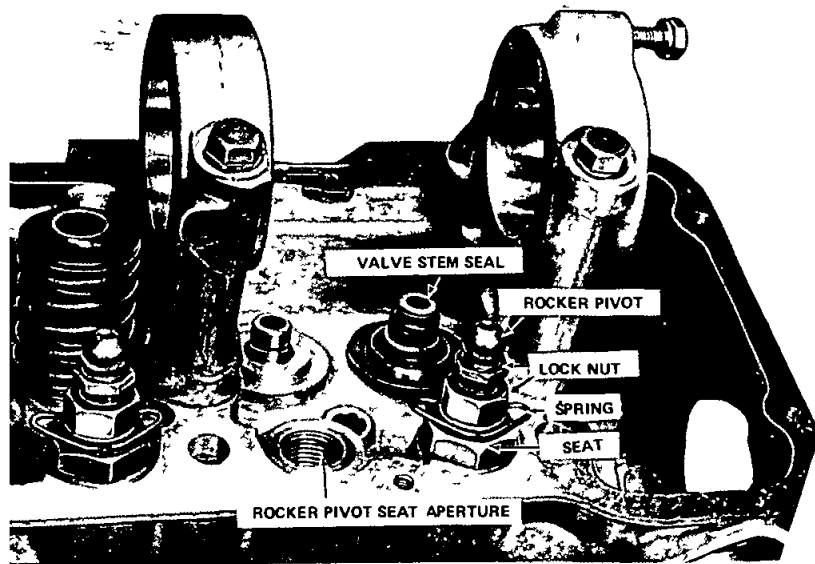
(2) Unclip and remove the small steady spring from each rocker arm

(3) Back off the rocker pivot locknuts and screw the pivots down as far as possible into the cylinder head

(4) With a screwdriver push down on each valve spring and manoeuvre each rocker arm from the cylinder head

During this operation take care that the valve rocker guides which are located on the end of the valve stems are not dislodged and lost

NOTE When removing the rocker arms, ensure that the cam heel for the rocker arm being removed is adjacent to its



Section of Cylinder Head Showing Exhaust and Inlet Valve and Rocker Pivot and Seat Assembly Removed

before moving it forward and out of the engine compartment

NOTE For both L13 and L16 engines it will be necessary to use Tool No. ST49010000 to remove the special headed cylinder head securing bolts

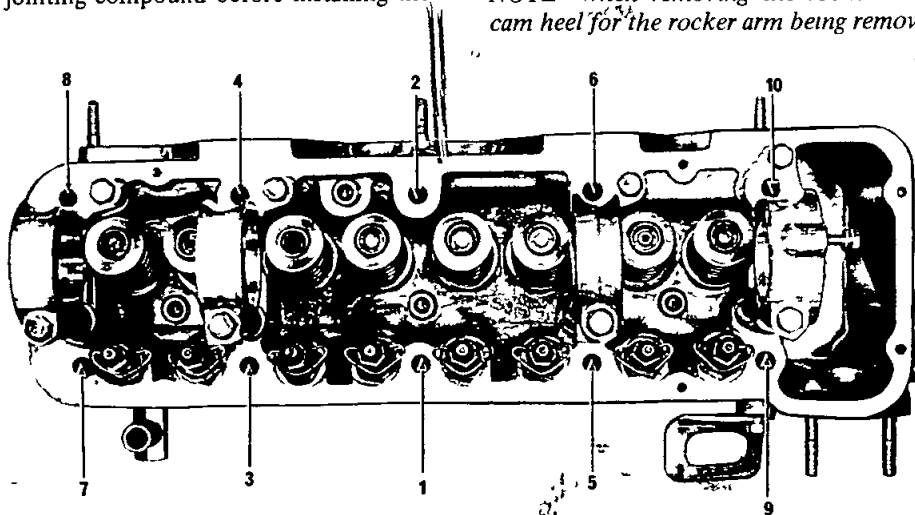
(24) Remove and discard the cylinder head gasket

NOTE Do not rotate the crankshaft while the timing chain is wedged by the support tool

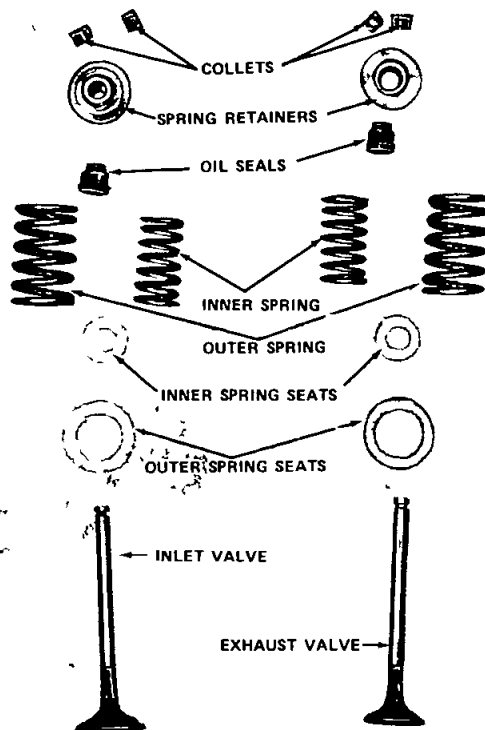
Installation is a reversal of the removal procedure with particular attention to the following points

Use new gaskets throughout

Smear both sides of the cylinder head gasket with an approved grade of jointing compound before installing the cylinder head



Sequence for Tightening Cylinder Head Bolts



Exploded View of Valve and Spring Components

relevant arm before attempting to compress the valve and remove the arm

- (5) Place the rocker arms in a rack or lay them out in order to ensure that they will be installed back in their original positions
- (6) Unscrew the rocker arm pivots from the cylinder head and remove the rocker guides from the valve stem ends. Lay these components also out in order to ensure correct replacement
- (7) Remove the two camshaft thrust plates to camshaft, front bearing securing bolts and detach the thrust plate
- (8) Carefully withdraw the camshaft from the cylinder head ensuring that the camshaft journals or lobes do not damage the camshaft bearings

IMPORTANT Do not remove the camshaft bearing bracket bolts or brackets from the cylinder head assembly. If bracket bolts or brackets are removed bearing misalignment will result, which will necessitate the renewal of the cylinder head assembly

(9) Using a suitable valve spring compressor, compress each valve spring in turn and remove the valve retaining collets

(10) Remove the compressor and lift off the spring retainer, valve spring(s), valve stem oil seal and spring seat(s). Discard the oil seals

(11) Remove any burrs from the valve stem ends with a warding file, to ensure that the valve guides are not damaged when the valves are withdrawn

(12) Withdraw the valves from the cylinder head and place them in a rack so they can be installed in their original positions when reassembling the cylinder head

TO CHECK AND INSPECT

(1) Clean the valves thoroughly of carbon deposit and discard any valve that is cracked or burnt

(2) Reface each valve face to the recommended angle as shown in the specifications and each valve stem flat and true on a suitable valve refacing machine. Discard any valve that proves to be excessively bent

If a valve head has been reduced to 0.50 mm (0.020 in) or less, after the grinding operation, then the valve concerned should be renewed

Valve stem ends may only be reduced up to 0.50 mm (0.020 in)

(3) Measure the valve stem outer diameter and the valve guide inner diameter to calculate the actual valve stem to guide clearance. If clearance is in excess of the limit of 0.1 mm (0.004 in) then the valve guides and/or valves should be renewed

(4) Remove the carbon deposits from the cylinder head face and the valve throats and check the conditions of the valve seats

If necessary, recut the seats with a valve seat cutter to the recommended angle and width

NOTE If the seats in the head are worn or recessed excessively then new inserts will have to be installed. It is recommended that the installation of new valve inserts and/or valve guides, if necessary, be entrusted to an automotive engine reconditioner who has the necessary specialised equipment to carry out these operations

(5) Lap the valves to the valve seats with a lapping compound. Apply a smear of prussian blue to the valves after lapping and check the valves on their respective seats to ensure that a true and concentric seating has been gained

(6) With a steel straight edge and feeler gauge, check the cylinder head face for warping. If the cylinder head is found to be warped in excess of the limit specified (see Specifications), then it will be necessary to have the head surface ground to bring the head back to a serviceable condition

(7) With a valve spring tester check the valve spring tensions and lengths (see Specifications). If a valve spring tester is unavailable then the test can be made by comparing the used springs with a new spring

Also check the valve springs for squareness. See Specifications for squareness limit. Renew springs that upon testing prove to be unserviceable

TO ASSEMBLE

Assembly is a reversal of the dismantling procedure with attention to the following

Lubricate all component wear surfaces with engine oil before assembly to ensure adequate lubrication when starting

The special flared type valve stem seals should be installed below the spring retainers with the flared end positioned over the ends of the valve guides

Use care when compressing the valve springs to avoid damage to the seals

Ensure that the valve retaining collets are fully seating in the valve stem grooves before releasing the spring compressor

TO ADJUST VALVE CLEARANCE

Valve clearance may be adjusted either hot or cold. If the cylinder head has been removed from the vehicle then it will be found more convenient to adjust the valve clearance with the cylinder head sitting on the work bench

If the valve clearance is adjusted cold it is still advisable to recheck the clearance when the engine is hot and make any necessary readjustments (See Specifications for valve clearances for hot or cold, whichever is applicable)

NOTE It is not practicable to adjust the valve clearance with the engine running

- (1) Rotate the camshaft until the heel of the No 1

cam on the camshaft is adjacent to the valve rocker arm for No 1 exhaust valve

NOTE In this position the lobe of the abovementioned cam will be pointing vertical from the cylinder head assembly

- (2) Back off the rocker arm pivot lock nut and with the correct thickness feeler gauge positioned between the heel of the cam and the rocker arm adjust the pivot until the feeler gauge is a light sliding fit between the cam heel and the rocker arm

- (3) When the desired adjustment is obtained tighten the rocker pivot lock nut and recheck the adjustment

- (4) Adjust the clearance on the remaining seven valves in turn, ensuring that each valve that is being adjusted has its cam in the heel position as previously explained

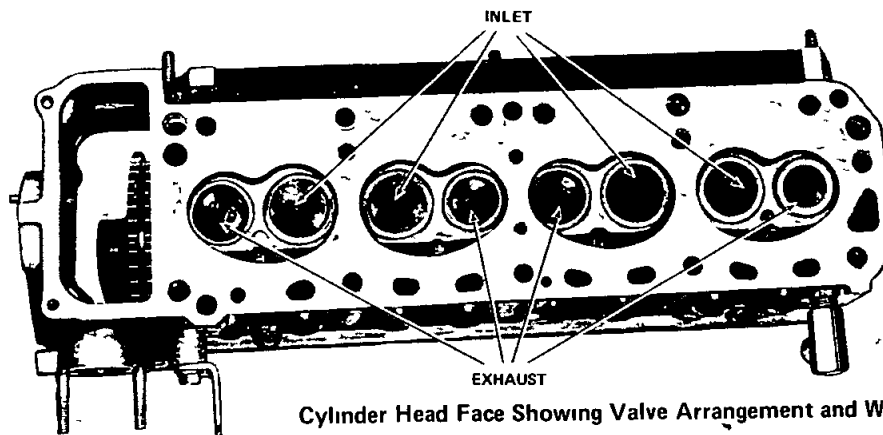
Valve location commencing from the front of the cylinder head is as follows

Exhaust-inlet-inlet-exhaust-exhaust-inlet-inlet-exhaust

NOTE It is important that valve clearance is measured between the camshaft and rocker arm and NOT between the rocker arm and valve stems

- (5) If the valve clearance is to be adjusted with the engine hot, ensure that the engine is in fact at normal operating temperature, if necessary run the engine at a fast idle to obtain the correct temperature

Carry out the adjustment procedure in the order already outlined using the appropriate settings for the hot engine



Cylinder Head Face Showing Valve Arrangement and Water Circulation Holes

5. ENGINE SUMP

TO REMOVE AND INSTAL

- (1) Raise the engine bonnet and fit fender covers to both front fenders

- (2) Drain the cooling system at the radiator bottom tank

- (3) Disconnect the upper and lower radiator hoses and the heater hoses (where applicable)

- (4) Disconnect the fuel pipe from the inlet side of the fuel pump, and detach the throttle linkage from the carburettor

- (5) On vehicles fitted with automatic transmission, disconnect the torque converter cooling pipes at the lower radiator tank, plug the pipes and unions to prevent entry of dirt

14—Engine

(6) Remove the nuts and detach the exhaust pipe from the exhaust manifold

(7) Raise the front and rear of the vehicle and support safely on four suitable chassis stands

(8) Unscrew the sump plug and drain the engine oil

(9) Remove the cover plate from the front of the clutch housing (or torque converter housing, where automatic transmission is fitted)

(10) Disconnect the steering connecting rod at the idler arm and steering box and lower the linkage away from the sump

(11) Remove the engine front splash tray

(12) Interpose a wooden block between the sump and a jack and take the weight of the engine assembly

(13) Remove the front engine mounting to front crossmember securing bolts

(14) Raise the front of the engine assembly and insert two blocks of wood of suitable dimensions between the

engine mountings and the front crossmember. Lower the jack and allow the blocks of wood to take the weight of the engine assembly

(15) Remove the screws securing the sump to the engine crankcase and timing cover and manoeuvre the sump clear of the engine

Installation is a reversal of the removal procedure with attention to the following points

Scrape the sump and cylinder block faces free of the old gasket

With cleaning solvent, wash the inside of the sump free of carbon or sludge deposits

Apply jointing compound to both sides of the new sump gasket and attach the gasket in position on the crankcase

Install the sump and tighten the securing screws progressively and evenly

6. OIL PUMP

TO REMOVE

(1) Raise the engine bonnet and fit fender covers to both front fenders

(2) Rotate the crankshaft until the tdc mark on the crankshaft pulley is aligned with the pointer on the engine timing cover, with No 1 piston on the top of its compression stroke

NOTE: The tdc mark on the crankshaft pulley is the mark on the extreme left of the pulley, looking in from the front of the engine compartment. The graduated marks on the right hand side of the tdc mark are in 5 deg increments and are used for ignition timing purposes only

(3) Disconnect the high tension leads at the spark plugs and coil and remove the distributor cap and leads

(4) Disconnect the distributor low tension lead and the distributor vacuum advance hose

(5) Scribe a mark on the distributor mounting bracket and timing cover to facilitate correct replacement

(6) Remove the two bolts securing the distributor and mounting bracket assembly to the timing cover and withdraw the assembly from the timing cover

(7) To facilitate correct replacement of the oil pump drive gear spindle, scribe a pencil or crayon mark across the timing cover to distributor assembly mounting flange in line with the offset driving dog on the drive gear spindle. Note that the driving dog is offset towards the front of the

(8) Raise the front of the vehicle and support on chassis stands

(9) Drain the engine oil

(10) Disconnect and remove the front stabiliser bar

(11) Remove the engine front splash tray

(12) Remove the oil pump securing bolts and withdraw the oil pump together with the drive gear spindle

TO INSTAL

(1) Check to ensure that the tdc marks are still aligned at the crankshaft pulley

If the engine has been rotated since the oil pump has been removed then realign the tdc marks as described in the removal operation

(2) Install the oil pump and drive gear spindle to the timing cover with a new gasket so that when installed the offset dog on the gear spindle is aligned with the pencil or crayon mark before removal

Ensure that the offset dog is facing towards the front of the engine. Install and securely tighten the pump mounting bolts

NOTE: To minimise the chance of oil leakage, coat both sides of the new oil pump mounting gasket with an approved jointing compound

(3) With a new gasket, install and secure the distributor and mounting bracket assembly, aligning the marks on the timing cover and mounting bracket which were made before removal

The distributor offset drive tongue will only engage with the oil pump drive gear spindle dog in one position but it may be necessary to rotate the distributor shaft by the ~~for~~ until engagement of these components takes place

(4) Further installation is a reversal of the removal procedure

Ensure that the sump is replenished with the correct amount and grade of engine oil

Check for oil leaks with the engine running at operating temperature