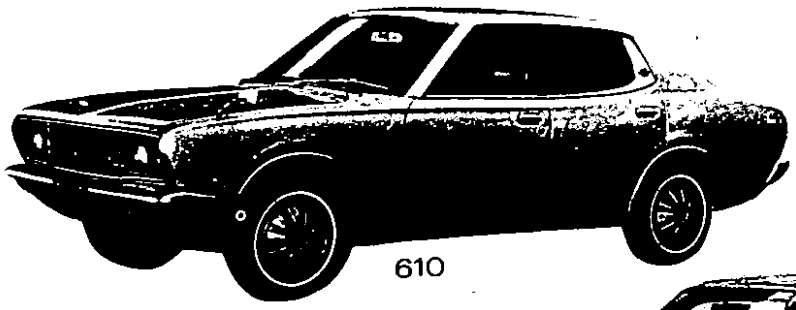
WORKSHOP MANUAL

for

DATSUN

510 series
(1300, 1400, 1600)

610 series
(160B, 180B)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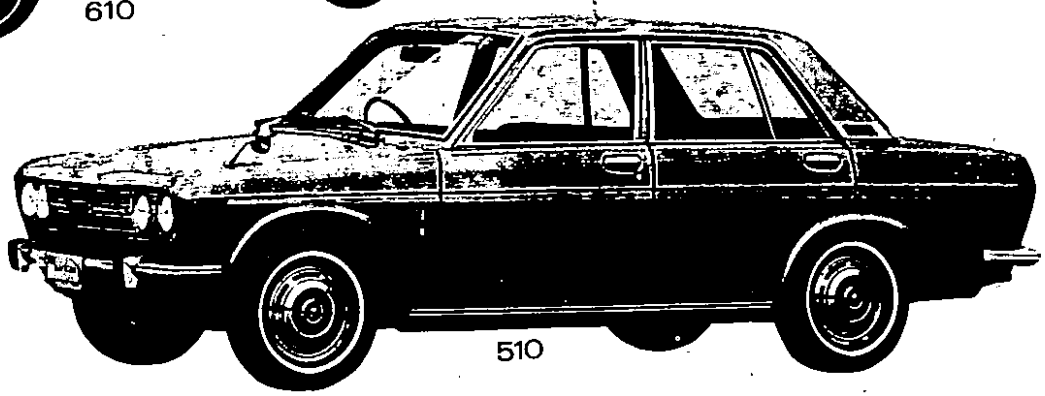
510

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SBN 901610 - 13 - 5

PUBLISHED BY
INTEREUROPE
AUTODATA DIVISION
NICHOLSON HOUSE
MAIDENHEAD
BERKSHIRE
ENGLAND

WSM 137

Printed in England

History and Type Identification

YOUR MANUFACTURER:

The Nissan Motor Company was founded in 1933 under the name of Jidosha Seizo Co. Ltd. In 1934 the present title was adopted and during 1966 the company merged with Prince Motors - builders of the Skyline and Gloria cars.

With the head office and six main factories near Tokyo, Japan, other 'sister' plants are also in production in various countries throughout the world.

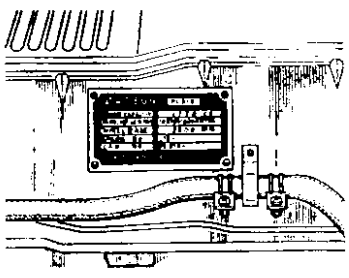
YOUR VEHICLE:

In the early days of the company's history, vehicles constructed were given the trade name DATSON which means SON of DAT: the initials of three of the financial backers forming the syllable DAT. To avoid confusion with a similar Japanese word, the name was eventually changed to DATSUN.

The various models covered in this Manual, together with alternative names used for the world markets, are listed below.

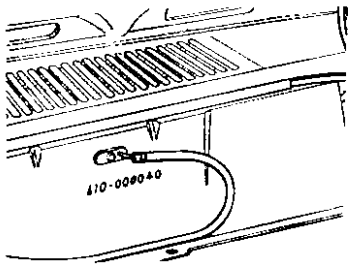
MODELS COVERED

MODEL	ALTERNATIVE IDENT.	ENGINE FITTED	REMARKS
510 SERIES	Datsun 1300	1300 c.c., L.13	Superseded by 1400 c.c. model with L.14 engine.
510 SERIES	Datsun 1400	1400 c.c., L.14	Similar to 1300 c.c. car.
510 SERIES	Datsun 1600	1600 c.c., L.16	Similar to 1300 & 1400 c.c. car.
610 SERIES	Bluebird 160 B	1600 c.c., L.16	In some markets identified as 1600 SSS & 1800 SSS.
610 SERIES	Bluebird 180 B	1800 c.c., L.18	
C30 SERIES	DATSUN 1800	1815 c.c., G18	



Identification plate location

Engine serial and model number



Car serial number location

Index

Introduction

Our intention in writing this Manual is to provide the reader with all the data and information required to maintain and repair the vehicle. However, it must be realised that special equipment and skills are required in some cases to carry out the work detailed in the text, and we do not recommend that such work be attempted unless the reader possesses the necessary skill and equipment. It would be better to have an **AUTHORISED DEALER** to carry out the work using the special tools and equipment available to his trained staff. He will also be in possession of the genuine spare parts which may be needed for replacement.

The information in the Manual has been checked against that provided by the vehicle manufacturer, and any peculiarities have been mentioned if they depart from usual workshop practice.

A fault finding and trouble shooting chart has been inserted at the end of the Manual to enable the reader to pin point faults and so save time. As it is impossible to include every malfunction, only the more usual ones have been included.

A composite conversion table has also been included at the end of the manual and we would recommend that wherever possible, for greater accuracy, the metric system units are used.

Brevity and simplicity have been our aim in compiling this Manual, relying on the numberous illustrations and clear text to inform and instruct the reader. At the request of the many users of our Manuals, we have slanted the book towards repair and overhaul rather than maintenance.

Technical Data

	1300	1400	1600	BLUEBIRD 1600	BLUEBIRD 1800	BLUEBIRD 1800 ESTATE
Engine type	L.13	L.14	L.16	L.16	L.18	L.18
Overall length		4,120 (162.20)		4,215 (165.94)		4,280 (168.50)
Overall width		1,560 (61.42)		1,600 (62.99)		
Overall height		1,420 (55.91)	1,410 (55.51)	1,405 (55.31)		1,415 (55.71)
Turning circle dia. - metres (feet)	Superseded by 1400 c.c. car	10.2 (33.5)		10.6 (34.8)		
Track - front				1,290 (50.79)	1,310 (51.57)	
& rear		1,270 (50.0)		1,300 (51.18)	1,320 (51.97)	1,330 (52.36)
Wheelbase		2,420 (95.28)		2,500 (98.43)		
Ground clearance (min)		215 (8.5)	210 (8.27)	185 (7.28)		
Weight (dry)	820 (1,808)	885 (1,951)	930 (2,051)	955 (2,106)	1,000 (2,205)	1,065 (2,348)
Fuel tank capacity		10.1 (12.1)		12.1 (14.5)		
Fuel consumption	35 (29.6)	33.2 (27.7)	28.2 (23.5)	28.2 (23.5)		
Maximum speed	150 (93)	150 (93)	160 (99)	160 (99)	165 (103)	

NOTE: mm. (in.), kg. (lbs.), km./h. (m.p.h.), cubic metres (cu. feet), imp. gals. (U.S. gals.), miles/imp. gal. (miles/U.S. gal)

Engine

INTRODUCTION

The 1400, 1600 cc and 1800 cc engines are four cylinder in-line units with a single overhead camshaft and fully balanced five bearing crankshaft. The valves are operated through rockers which are directly activated by the cam mechanism.

The crankshaft is a special steel forging, with the centre main bearing equipped with thrust washers to take up the end thrust of the crankshaft. The special aluminium pistons are of the strut construction to control thermal expansion and have two compression rings and one combined oil ring.

The gudgeon pins have special hollow steel shafts and are a fully floating fit in the pistons and a press fit in the connecting rods.

The aluminium alloy cylinder head contains wedge type combustion chambers and is fitted with aluminium bronze valve seats for the intake valves and heat resistant steel valve seats for the exhaust valves.

The cast iron camshaft is driven by a double row roller chain from the crankshaft pulley.

The engine is pressure lubricated by a rotor type oil pump which draws oil through an oil strainer into the pump housing and then forces it through a full flow oil filter into the main oil gallery.

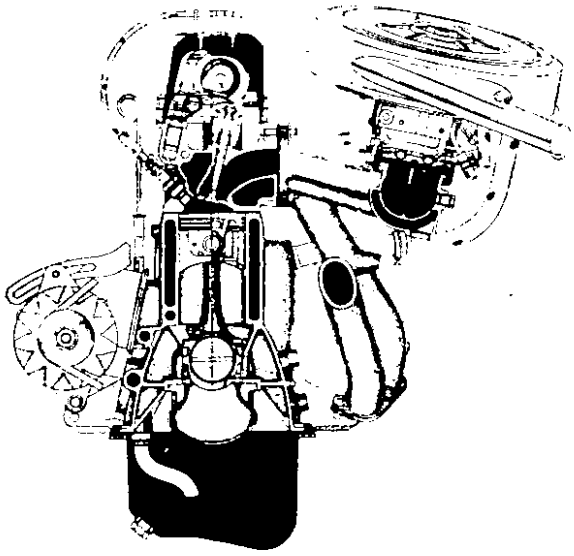
ENGINE - Removal

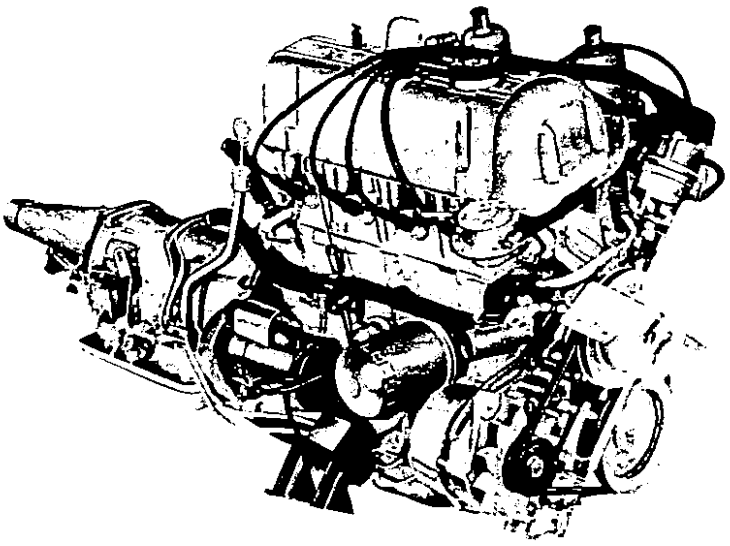
1. Place alignment marks on the bonnet and hinges; remove the bonnet from the vehicle.
2. Drain the cooling system and engine and transmission lubricant. Remove the radiator grille.
3. Disconnect the battery cables and lift out the battery.
4. Detach the upper and lower radiator hoses; remove the radiator mounting bolts and lift the radiator away from the vehicle. The torque converter cooling pipes must be disconnected from the radiator on vehicles fitted with automatic transmission.
5. Remove the cooling fan and pulley, disconnect the fuel pipe from the fuel pump and the heater hoses from the engine attachments.
6. Disconnect the accelerator control linkage and the choke cable from the carburettor.
7. Disconnect the wirings from the starter, alternator, ignition coil, oil pressure switch and temperature sender unit.
8. Remove the clutch slave cylinder (Fig.A.2.). and its return spring.
9. Disconnect the speedometer cable and withdraw the plug connector from the reversing light switch.
10. Disconnect the shift rods and selector rods, and remove the cross shaft assembly as described in the section Gearbox.
11. Disconnect the front exhaust pipe from the exhaust manifold, disconnect the centre pipe from the rear pipe and remove the front pipe, pre-muffler and centre pipe assembly.
12. Disconnect the propeller shaft flange from the companion flange from the gear carrier.
13. Jack up the gearbox slightly and remove the rear engine mounting bracket bolts: remove the mounting crossmember and handbrake cable clamp.
14. Remove the bolts securing the front engine mounting brackets to the crossmember.
15. Attach lifting cable or chains to the hooks installed at the front and rear of the cylinder head. Lower the jack under the gearbox and carefully lift and tilt the engine and gearbox unit. Withdraw the engine and gearbox from the compartment, making sure that it is guided past the accessories installed on the body.

ENGINE - Dismantling

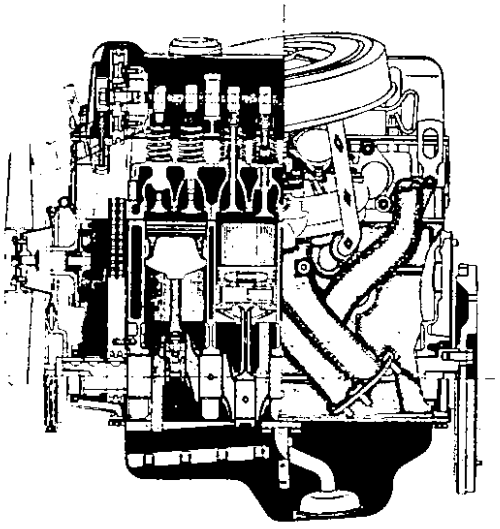
Remove the engine as previously described and carefully clean the exterior surfaces. Check for signs of fuel, oil, or water leaks past the cylinder head and block. Remove the air cleaner, alternator, distributor and starter motor. Plug the carburettor air horn and distributor hole to prevent the ingress of foreign matter.

Remove the gearbox from the engine, drain the engine oil and coolant. Mount the engine in a suitable stand; the special engine attachment ST05260001 and engine ST0501S000 should be used if available (Fig.A.3.).





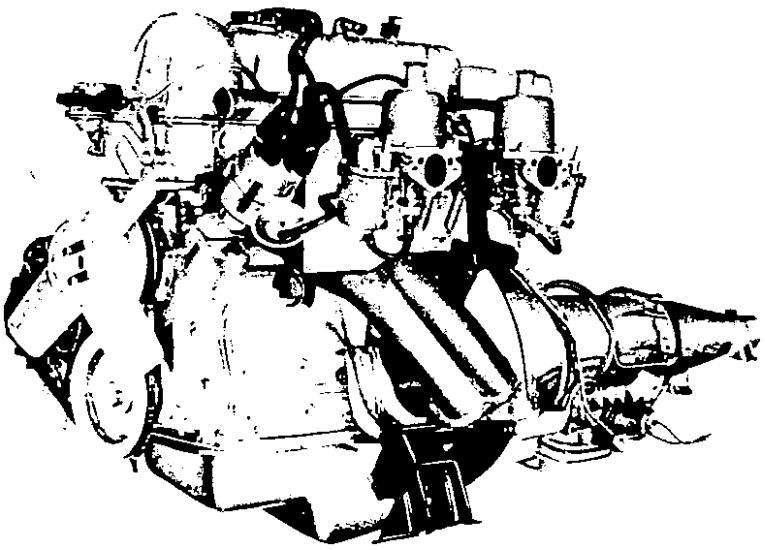
Right side view of engine



Section through the 1600 c.c. engine.

510 series

610 series
(with SU twin carburettor)



Left side view of engine

Fig. A.1 Engine: General

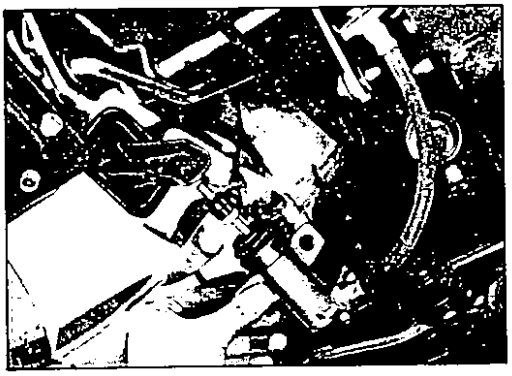


Fig. A.2 Removing the clutch slave cylinder.

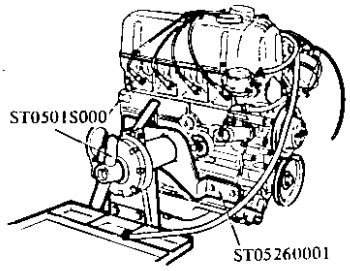


Fig. A.3 Mounting the engine.

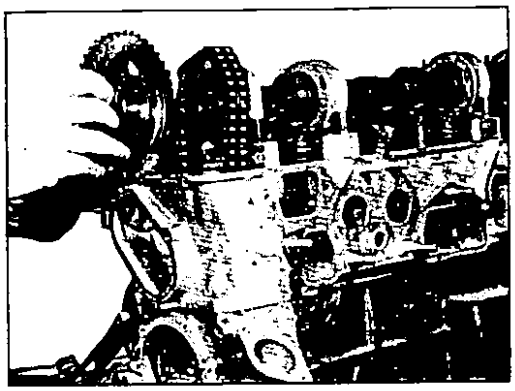


Fig. A.4 Removing the camshaft sprocket.

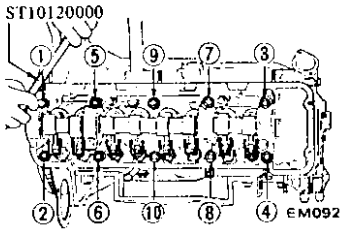


Fig. A.5 Cylinder head bolt removal sequence.

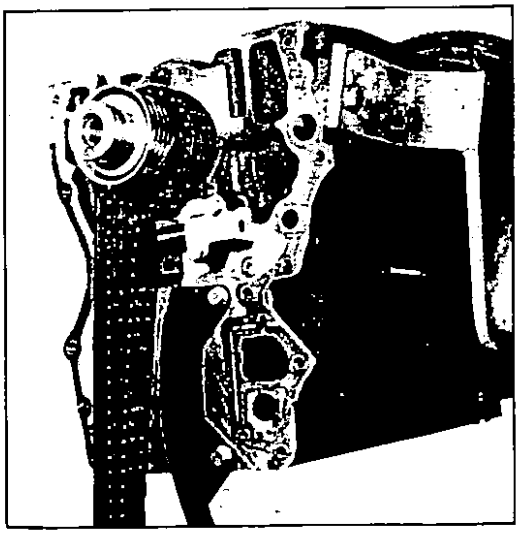


Fig. A.6 Removing the chain tensioner and timing chain.

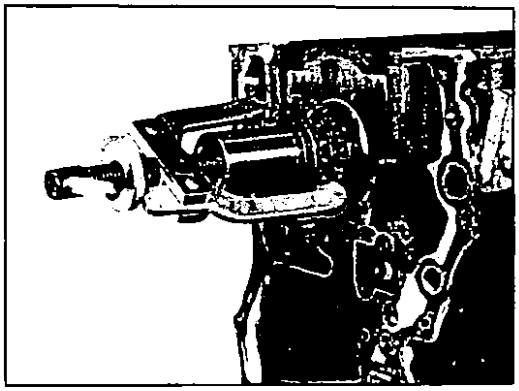


Fig. A.7 Removing the drive sprocket.

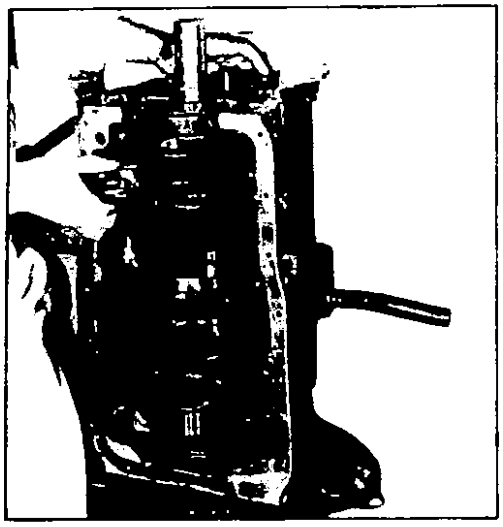


Fig. A.8 Removing the pistons and connecting rods.

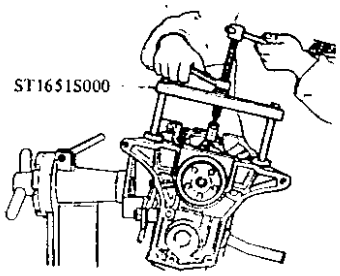


Fig. A.10 Removing the rear main bearing cap.

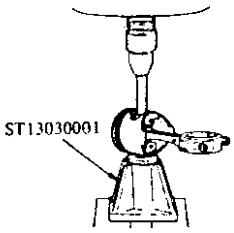


Fig. A.12 Removing the piston pin.

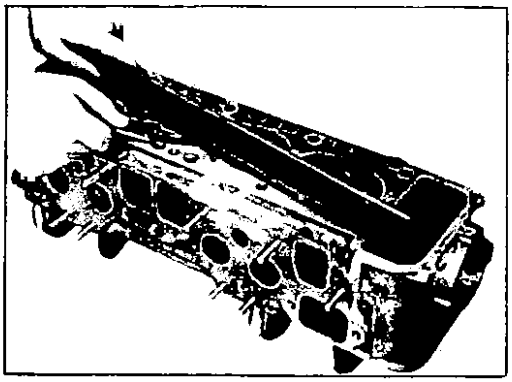


Fig. A.14 Checking the cylinder head joint face.

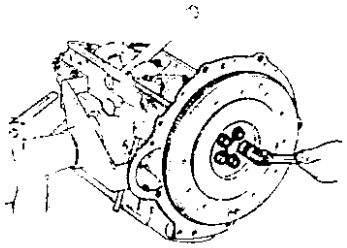


Fig. A.9 Removing the flywheel.

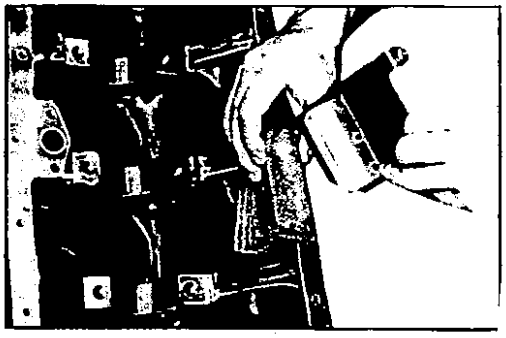


Fig. A.11 Removing the baffle plate and net.

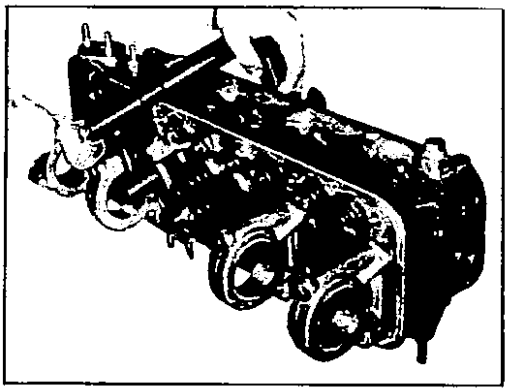


Fig. A.13 Removing the valves.

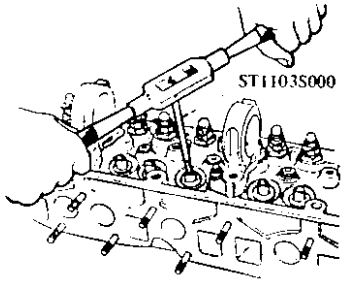


Fig. A.15 Reaming the valve guide.

Remove the fan and pulley, the right hand engine mounting and oil filter. Remove the oil pressure switch. Remove the following items; oil level gauge, spark plugs, thermostat housing, rocker cover, carburettor and inlet and exhaust manifolds.

Remove the clutch assembly as described in the section CLUTCH. Remove the left hand engine mounting, crankshaft pulley, water pump, fuel pump, fuel pump drive cam and camshaft sprocket(See. Fig.A.4.). Remove the cylinder head bolts in the sequence shown in Fig.A.5.) and lift off the cylinder head. Invert the engine and remove the oil sump and oil strainer, oil pump and drive spindle assembly, front cover and chain tensioner. Remove the timing chain, oil thrower, crankshaft worm gear and chain drive sprocket. (See Fig.A.6. andA7.).

Remove the connecting rod caps and push the pistons and connecting rods through the top of the bores as shown in Fig. A.8. Keep the connecting rod caps with their respective rods to ensure that they are assembled in their original positions.

Remove the flywheel retaining bolts and withdraw the flywheel (Fig.A.9.). Remove the main bearing caps, using the special puller ST1651S000 to withdraw the centre and rear main bearing caps as shown in Fig.A.10. Remove the rear oil seal and lift out the crankshaft, remove the baffle plate and cylinder block net. (Fig.A.11.). Remove the piston rings with a suitable expander and press out the gudgeon pins under an arbor press, using the special stand ST1300001 as shown in Fig.A.12. Keep the dismantled parts in order so that they can be reassembled in their original positions. Slacken the valve rocker pivot locknut and remove the rocker arms by pressing down the valve springs.

Remove the camshaft taking care not to damage the bearings and cam lobes. Withdraw the valves, using the valve lifter ST12070000 as shown in Fig.A.13.

ENGINE - Inspection and Overhaul
Cylinder Head and Valves

Clean all parts thoroughly and remove carbon deposits with a blunt scraper. Remove any rust which has accumulated in the water passages and blow through the oil holes with compressed air to make sure that they are clear.

Measure the joint face of the cylinder head for out of true as shown in Fig.A.14. The surface should be checked at various positions, using a straight edge and feeler gauge. The permissible amount of distortion is 0.05 mm (0.0020 in), or less. If the surface is out of true by more than the limit of 0.1 mm (0.0039 in) it will be necessary to regrind the head.

Clean each valve by washing in petrol and carefully examine the stems and heads.

If the stem is worn, damaged or not straight, the valve must be discarded. Check the diameter of the stem with a micrometer. The diameter of the inlet valves should be 7.965 - 7.980 mm (0.3136 - 0.3142 in) and the diameter of the exhaust valves 7.945 - 7.960 mm (0.3128 - 0.3134 in).

If the seating face of the valve is excessively burned, damaged or distorted, it must be discarded. A badly pitted seating face should be refaced on a valve grinding machine, removing only the minimum amount of metal.

Renew the valve if the thickness of the valve head has been reduced by 0.5 mm (0.0197 in), see Technical Data for valve dimensions.

The valve stem tip may be refaced, if necessary, the maximum allowance however is 0.5 mm (0.0197 in).

The valves can be ground-in to their seats, when completely satisfactory. The valve seats and valve guides should be in good condition and must be checked as described in the following paragraphs.

VALVE GUIDES - Replacement

The valve stem to valve guide clearance can be checked by inserting a new valve into the guide. The stem to guide clearance should be 0.020 - 0.053 mm (0.0008 - 0.0021 in) for the inlet valves and 0.040 - 0.073 mm (0.0016 - 0.0029 in) for the exhaust valves. If the clearance exceeds 0.1 mm (0.0039 in) for the inlet valves and the exhaust valves, then new guides should be fitted.

The valve guides are held in position with an interference fit of 0.027 - 0.049 mm (0.0011 - 0.0019 in) and can be removed by means of a press and drift (2 - ton pressure). This operation can be carried out at room temperature, but will be more effectively performed at a higher temperature.

Valve guides are available with oversize diameters of 0.2 mm (0.0079 in) if required. The standard valve guide requires a bore in the cylinder head of 11.985 - 11.996 mm dia. (0.4719 - 0.4723 in dia.) and the oversize valve guide a bore of 12.185 - 12.196 mm dia. (0.4797 - 0.4802 in. dia).

The cylinder head guide bore must be reamed out at normal room temperature.

Heat the cylinder head to a temperature of 150 - 200°C (302 - 392°F) before pressing in the new valve guides. Ream out the bore of the guides to obtain the desired finish and clearance (Fig.A.15.). The special valve guide reamer ST 1103 S000 should be used, if available. Valve guide inner diameters are specified in Technical Data at the end of this section. The valve seat surface must be concentric with the guide bore and can be corrected with the facing tool ST11670000 (Fig.A.16), using the new valve guide as the axis.

VALVE SEAT INSERTS - Replacing

The valve seat inserts should be replaced if they show signs of pitting and excessive wear.

The inserts can be removed by boring out to a depth which will cause them to collapse, although care must be taken not to bore beyond the bottom face of the recess in the cylinder head.

Select the valve seat inserts and check the outer diameters. Machine the recess in the cylinder head to the following dimensions, at room temperature.

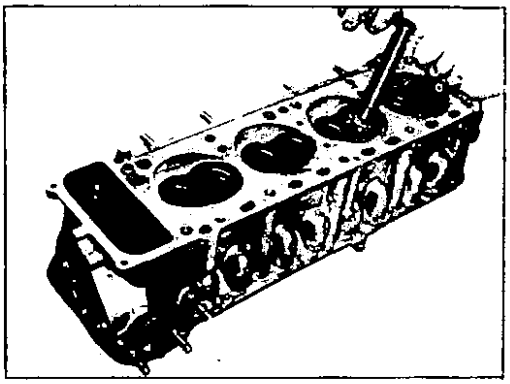


Fig. A.16 Correcting the valve seats.

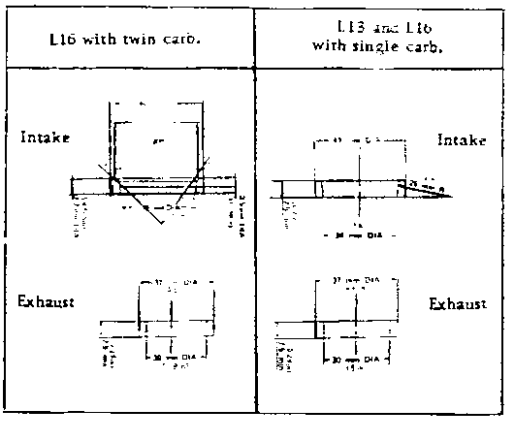


Fig. A.17 Standard valve seat dimensions.

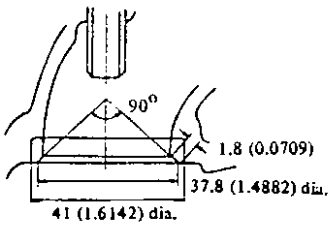
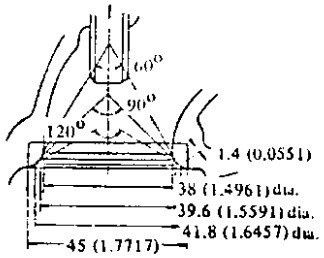
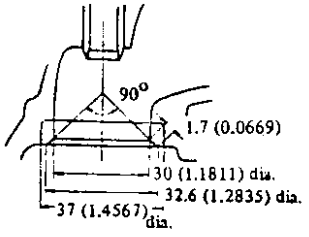
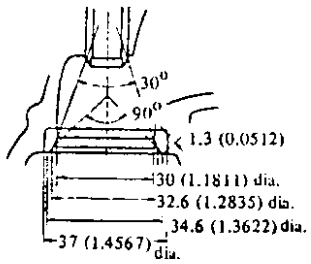
	L14	L16 and L18
Intake Unit: mm (in)		
	L14 and L16	**L18**
Exhaust Unit: mm (in)		

Fig.A.18. Valve seat grinding dimensions.

CYLINDER HEAD RECESS DIAMETER
(Standard inserts)

Engine	Inlet
L 14	41.000-41.016 (1.6142-1.6148 in)
L16 and L18	45.000-45.016 mm(1.7717-1.7723in)

Engine	Exhaust
L14	37.000-37.016mm(1.4567-1.4573 in)
L16 and L18	37.000-37.016mm(1.4567-1.4573 in)

CYLINDER HEAD RECESS DIAMETER
(Oversize inserts)

Engine	Inlet
L14	41.500-41.516mm(1.6339-1.6345in)
L16 and L18	45.500-45.516mm(1.7913-1.7920in)

Engine	Exhaust
L 14	37.500-37.516mm(1.4764-1.4770in)
L16 and L18	37.500-37.516mm(1.4764-1.4770in)

Dimensions for the standard valve inserts are shown in Fig.A.17. Heat the cylinder head to a temperature of 150-200°C (302-392°F) and drive in the inserts, making sure that they bed down correctly. The inserts should be caulked at more than four positions and then cut or ground to the specified dimensions shown in Fig.A.18.

Place a small amount of fine grinding compound on the seating face of the valve and insert the valve into the valve guide. Lap the valve against its seat by rotating it backwards and forwards approximately half a revolution in each direction until a continous seating has been obtained. Remove the valve and clean all traces of the grinding compound from valve and seat.

VALVE SPRINGS

The valve springs can be checked for squareness, using a steel square and surface plate. If the spring is out of square by more than 1.6mm (0.063 in) it must be replaced. Check the free length and the load required to deflect the spring to its assembled height. Compare the figures obtained with those given in Technical Data and replace the spring if the specified limits are exceeded.

CAMSHAFT AND CAMSHAFT BEARINGS - Checking

Measure the clearance between the inner diameter of the camshaft bearing and the outer diameter of the camshaft journal. If the wear limit for the bearing clearance exceeds 0.1mm (0.0039 in) it will be necessary to replace the cylinder block assembly. See Technical Data for all diameters.

Check the camshaft and camshaft journals for signs of wear or damage.

Place the camshaft in V Blocks as shown in Fig.A.19 and position the dial gauge to the journal. The run-out of the camshaft must not exceed 0.05 mm (0.0020in). It should be noted that the actual run-out will be half the the value indicated on the dial gauge. When the camshaft is turned one full revolution, with the dial gauge positioned against the second and third journals.

CYLINDER BLOCK - Inspection and Overhaul

Ensure that the cylinder block is thoroughly clean and check it for cracks and flaws.

Check the joint face of the block for distortion, using a straight-edge and feeler gauge as shown in Fig.A.20. The surface must be reground, if the maximum tolerance of 0.1mm (0.0039 in) is exceeded.

Examine the cylinder bores for out of round or taper, using a bore gauge as shown in Fig.A.21. The readings must be taken at the Top, middle and bottom positions indicated in Fig.A.22.

The standard bore diameters are 83.000-83.050 mm (3.2677-3.3697 in) for the 1400 and 1600cc engines and 85.000-85.050 mm (3.3465-3.3484 in) for the 1800 cc engine, with a wear limit of 0.2mm (0.0079 in).

Out of round and taper must not exceed 0.15mm (0.0006 in). If the bores are within the specified limits, remove the carbon ridge at the top of the cylinder bores, using a suitable ridge reamer.

If any of the bores are in excess of the specified limits, then all the bores must be rebored at the same time. Pistons are available in five oversizes (See Technical Data) and can be selected in accordance with the amount of wear of the cylinder.

When the oversize of the pistons has been decided it will be necessary to measure the piston at the piston skirt (Fig.A.23), and add to this dimension the specified piston to cylinder bore clearance to determine the final honed measurement of the cylinder.

Machine the cylinder bores in gradual stages, taking only a 0.5mm (0.002 in) cut each time. The bores must be brought to the final size by honing and the block thoroughly cleaned to remove all traces of metal.

Measure the finished bore and check the clearance between each piston and its cylinder. The clearance can be checked as shown in Fig.A.24. with the aid of a feeler gauge and spring scale. The standard clearance is 0.023 - 0.043 mm (0.0009 - 0.0017 in).

NOTE: Cylinder liners can be fitted: if the cylinder bores are worn beyond the maximum limit.
The liners are an interference fit in the block and must be bored to the correct inner diameter after fitting. Three undersize liners are available in the following sizes.

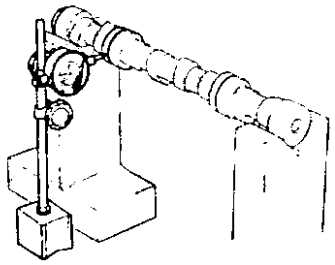


Fig. A.19 Checking the camshaft for run-out.

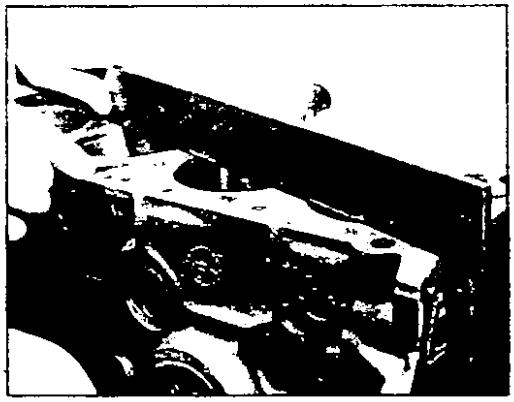


Fig. A.20 Checking the cylinder block joint face.

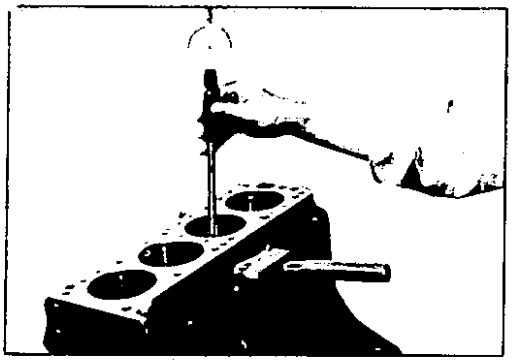


Fig. A.21 Measuring the cylinder bores.

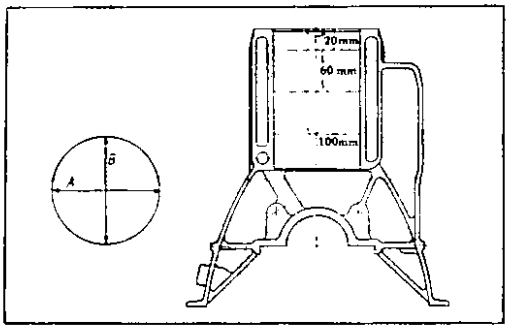


Fig. A.22 Measuring positions for the cylinder bores.

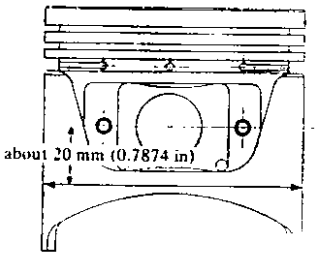


Fig. A.23 Measuring the piston skirt diameters.

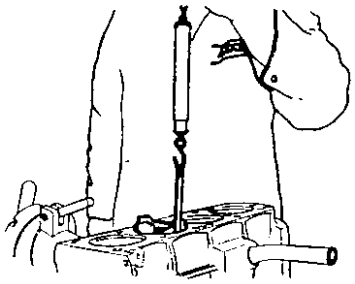


Fig. A.24 Measuring the piston fit.

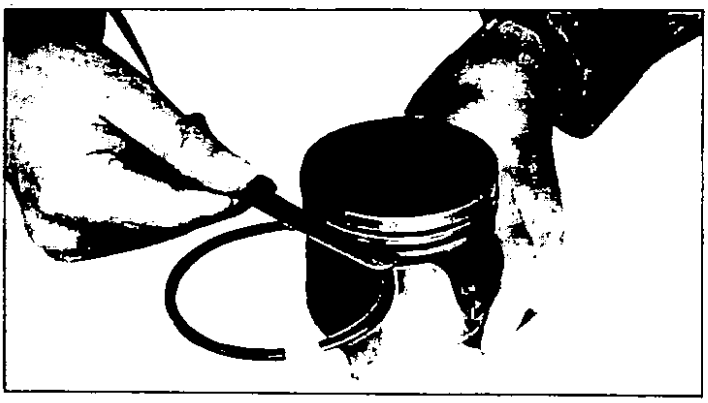


Fig. A.25 Measuring the piston ring side clearance.

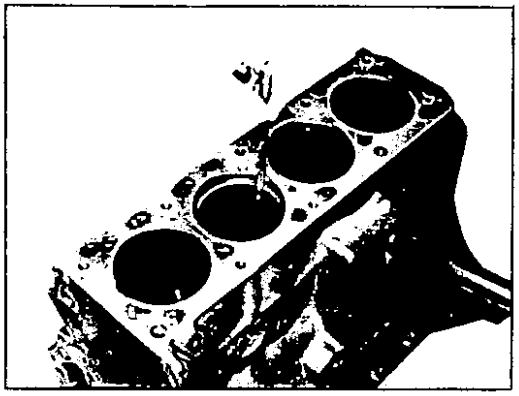


Fig. A.26 Measuring the piston ring gap.

	OUTER DIAMETER	INNER DIAMETER
4.0mm (0.1575 in) Undersize	87.000-87.05mm (3.4252-3.4272 in)	82.45-82.60mm (3.2461-3.2520 in)
4.5mm (0.1772 in) Undersize	87.50-87.55mm (3.4449-3.4468 in)	82.45-82.60mm (3.2461-3.2520 in)
5.0mm (0.1969 in) Undersize	88.00-88.05mm (3.4646-3.4665 in)	82.45-82.60mm (3.2461-3.2520 in)

PISTONS - Checking

Check each piston for signs of seizure and wear. Renew any piston which is unsatisfactory.

Remove all carbon deposits from the grooves and piston rings. Measure the side clearance of each piston ring and groove with a feeler gauge as shown in Fig.A.25. If the side clearance is excessive, new rings should be fitted. The clearance required for new pistons and piston rings can be found in Technical Data.

Check the piston ring gap by placing the ring in the cylinder bore, as shown in Fig.A.26. The ring can be squared in the bore by pushing it into position with the piston. Measure the ring gaps with a feeler gauge and compare the dimensions with the information given in Technical Data.

NOTE: If new piston rings are to be fitted and the cylinder has not been rebored, check the piston ring gap with the ring positioned at the bottom of the cylinder. This being the position with the least amount of wear.

Check the clearance between gudgeon pin and piston. If the specified limit is exceeded it will be necessary to replace both piston and pin. It should be possible to press the gudgeon pin into the piston by hand at a room temperature of 20°C (68°F). The pin should be a tight press fit in the connecting rod.

CONNECTING RODS - Checking

Check the connecting rods for bends or twists using a suitable connecting rod aligner. The maximum deviation should not exceed 0.05 mm (0.0020 in) per 100 mm (3.94 in) length of rod. Straighten or replace any rod which does not comply with the specified limit.

When replacing the connecting rod it is essential to ensure that the weight difference between new and old rods is within 5 gr. (0.18 oz.) for the 1400 cc engine and 7 gr (0.25 oz) for the 1600 and 1800 cc engines.

Install the connecting rods with bearings to the corresponding crank pins and measure the end play of the big ends (see Fig.A.27.). The end play should be between 0.2 - 0.3 mm (0.0079 - 0.0118 in). If the maximum limit of 0.6 mm (0.0118 in) is exceeded, the connecting rod must be replaced.

CRANKSHAFT - Inspection and Overhaul

Clean the crankshaft thoroughly before checking the shaft for distortion and cracks.

Measure the journals and crankpins for our of round. If the journals and pins are found to be oval, or if the wear limit exceeds the specified running clearance, it will be necessary to re-grind the crankshaft to the required undersize. (See Technical Data.

Place the crankshaft in 'V' blocks as shown in Fig.A.28. and check with the aid of a dial gauge that the shaft bending limit of 0.05 mm (0.002 in) is not exceeded. With the dial gauge positioned against the centre journal the crankshaft should be rotated by one turn. The actual bend value will be a half of the reading obtained on the gauge. If the specified limit is exceeded, it will be necessary to replace the crankshaft.

Install the crankshaft in the cylinder block and check the crankshaft end-float which should be between 0.05 - 0.18 mm (0.0020 - 0.0071 in). Make sure that the main drive shaft pilot bushing at the rear of the crankshaft is not worn or damaged in any way. Replace the bushing, if necessary, using the special puller ST16610001.

Thoroughly clean the bushing hole before installing and press in the new bushing, without oiling, so that its height above the flange end is 4.5-5.0 mm (0.18 - 0.20 in).

Main bearing clearance

The main bearing clearances can be checked using a strip of plastigage. Set the main bearings on the caps. Cut the plastigage to the width of the bearing and place it along the crankpin, making sure that it is clear of the oil hole. Install the bearing caps and tighten the bearing cap bolts to a torque reading of 4.5 - 5.5 kgm. (33 - 40 lb.ft.). DO NOT turn the crankshaft when the plastigage is inserted. Remove the main bearing cap and take out the plastigage which should be measured at its widest point, with the scale printed in the plastigage envelope. The standard clearance is 0.020 - 0.062 mm (0.0008 - 0.0024 in) with a wear limit of 0.1 mm. (0.0039 in.). If the specified limit is exceeded an undersize bearing must be used and the crankshaft journal ground accordingly - See Technical Data. Bearings are available in four undersize of 0.25, 0.50, 0.75 and 1.00 mm. (0.0098, 0.0197, 0.0295 and 0.0394 in.).

Connecting rod bearing clearance

The connecting rod bearing clearances should be checked in a similar manner to the main bearing clearances. The standard clearance is 0.025 - 0.055 mm (0.0010 - 0.0022 in) with a wear limit of 0.1 mm (0.0039 in). Undersize bearings must be fitted and the crankpins reground if the specified wear limit is exceeded - See Technical Data. Bearings are available in six undersizes of 0.6, 0.12, 0.25, 0.50, 0.75 and 1.00 mm (0.0236, 0.0047, 0.0098, 0.0197, 0.0295 and 0.0394 in).

Fitting the crankshaft bearings

Check the fit of the bearing shells in the following manner. Install the shells on the main bearing caps and cylinder block bearing recess and tighten the cap bolts to the specified torque

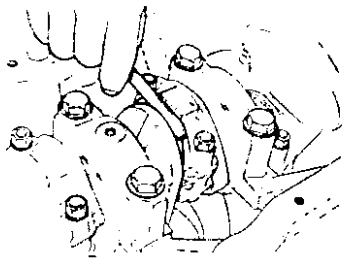


Fig. A.27 Checking the big end play.

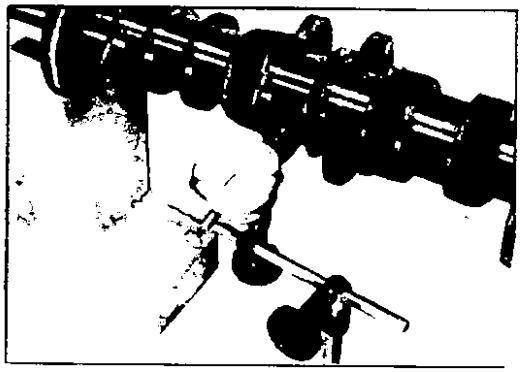


Fig. A.28 Checking the crankshaft for run-out.

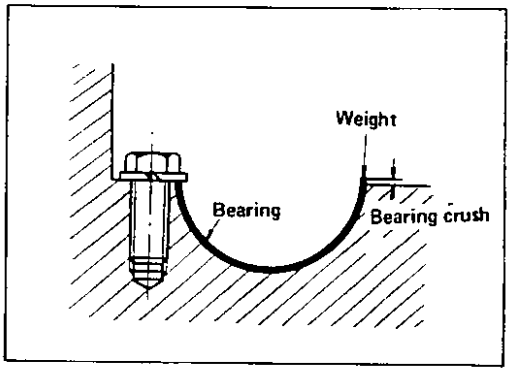


Fig. A.29 Checking the bearing crush.

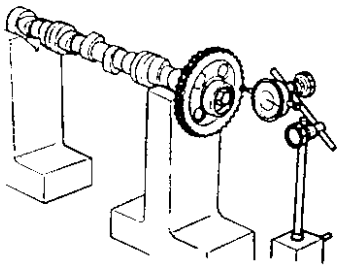


Fig. A.30 Checking the camshaft sprocket for run-out.

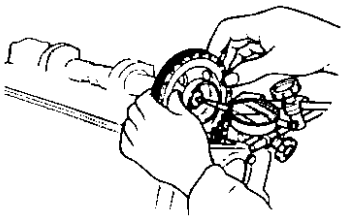


Fig. A.31 Checking the camshaft end float.

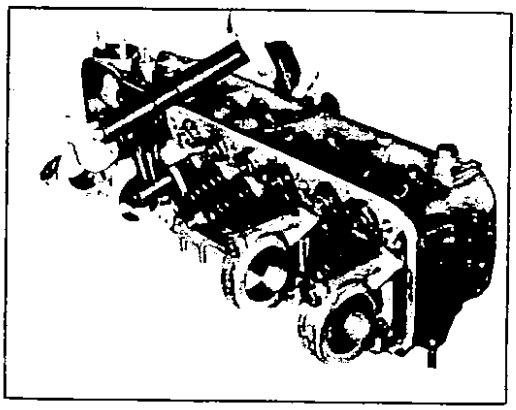


Fig. A.32 Installing the valves.

reading. Slacken one of the cap bolts and check the clearance between the cap and cylinder block with a feeler gauge (See Fig.A.29). The bearing crush "nip" should be between 0-0.03mm (0-0.0012 in), if this is not the case, then the bearing must be replaced.

Check the connecting rod bearings in a similar manner, after tightening the caps to the specified torque readings. The bearing clearance should be between 0.15 - 0.045 mm (0.0006-0.0018 in).

CAMSHAFT AND SPROCKET

Inspect the camshaft journals for signs of wear or damage and check the camshaft for run out, using a dial gauge in a similar manner to that previously described for the crankshaft. The bending limit of 0.02 mm (0.0007 in). must not be exceeded.

Install the camshaft sprocket, mount the assembly in V-blocks as shown in Fig.A.30 and check that the run-out of the sprocket does not exceed 0.1 mm (0.04331 in). Check the timing chain and sprocket to ensure that the chain is not stretched or damaged or the teeth of the sprocket damaged or distorted. A timing chain which has become stretched will affect the valve timing and be noisy in operation. Check the chain tensioner and chain guides for wear and damage, replacing the parts if necessary.

Replace the sprocket if the run-out is exceeded, or if the teeth of the sprocket are worn or damaged in any way.

The camshaft end play should be within 0.08 - 0.38 mm (0.0031 - 0.0150 in). If the clearance limit of 0.1 mm (0.0039 in) is exceeded it will be necessary to replace the camshaft locating plate. (See Fig.A.31.).

FLYWHEEL - Inspecting

Ensure that the clutch disc contact face of the flywheel is not worn or damaged. The run-out of the flywheel contact face, should not exceed 0.2 mm (0.008 in) when measured with a dial gauge.

The flywheel ring gear can be replaced if the teeth are damaged or worn. This operation will entail splitting the ring gear to remove it. A hacksaw should be used to cut between the teeth followed by splitting with a cold chisel.

When replacing the ring gear it must be heated to a temperature of approximately 180° - 200° F) before fitting and then allowed to cool slowly

ENGINE - Assembling

Before starting to assemble the engine make sure that all components are perfectly clean. It is always advisable to pay particular attention to the following points when assembling an engine. Keep the work bench and tools clean and make sure that the tools are to hand. Ensure that all engine oil ways are clear of foreign matter, fit new gaskets and oil seals throughout.

All sliding parts such as bearing shells must be smeared with engine oil before installing.

Ensure that the specified tightening torque readings are strictly followed.

Assembling the cylinder Head

To install the valves and valve springs, place the valve spring seats into position and fit the valve guides and oil lip seals.

Assemble in the following order; valve springs, spring retainers, valve collets and valve rocker guides.

Use the special compressor ST 12070000, as shown in Fig.A.32. to compress the valve springs.

Piston and connecting rods

The piston, piston pins and connecting rods must be assembled in accordance with the cylinder numbers.

The gudgeon pin is press fitted to the connecting rod and requires a fitting force from 0.5 to 1.5 tons. This operation will require the use of the special tool ST 1303000 as shown in Fig.A.33. Apply engine oil to the gudgeon pin and connecting rod before fitting.

It should be noted that the oil jet of the connecting rod big end must face towards the right hand side of the cylinder block. (See Fig.A.34.).

Fit the piston rings; the oil control ring in the bottom groove followed by the centre and top compression rings which must be installed with the marks facing upwards.

Install the connecting rod bearings and caps, making sure that the markings coincide. Ensure that the backs of the bearing shells are perfectly clean otherwise they will be damaged when tightened.

Assembling the engine

Fit the baffle plate and cylinder block net. Install the crankcase halves of the main bearing shells; the flanged shell is fitted to the centre bearing. Smear the bearing surfaces with engine oil and carefully lower the crankshaft into position.

Install the main bearing caps with their shells, making sure that the arrow on the caps faces to the front of the engine. Rotate the crankshaft to settle the caps and tighten the bearing cap bolts gradually in two or three separate stages. Work outwards from the centre bearing and finally tighten to the specified torque reading of 4.5 - 5.5. kgm (32.40 lb.ft.) in the sequence shown in Fig.A.35. Ensure that the crankshaft rotates freely after finally tightening the cap bolts. Check the crankshaft end float which should be between 0.05 - 0.18 mm (0.002 - 0.0071 in), see Fig.A.36. Smear the side oil seals with sealant and fit them into the rear main bearing cap. Install the rear oil seal, using a suitable drift and grease the lip of the seal.

Place the flywheel in position and install the lock washers and retaining bolts. Tighten the bolts evenly to a torque reading of 14 - 16 kgm (101 - 106 lb.ft).

Rotate the engine by a quarter turn and install the piston

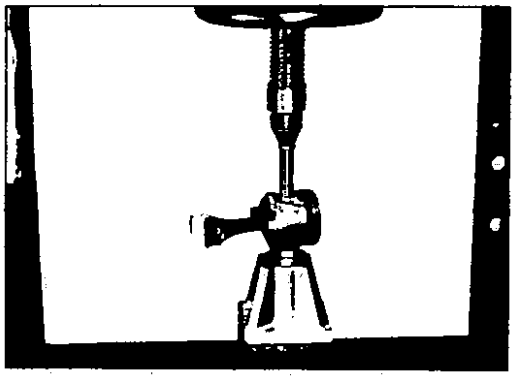


Fig. A.33 Installing the piston pins.

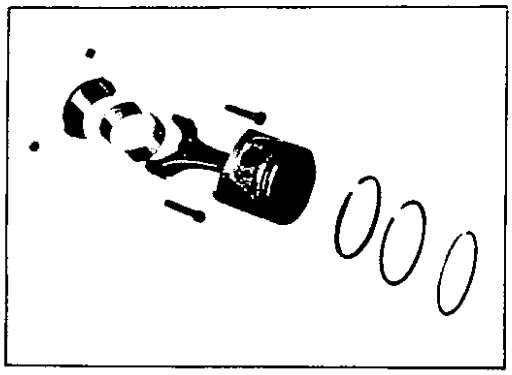


Fig. A.34 Piston and connecting rod.

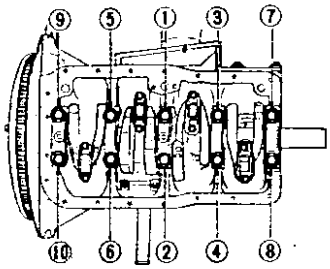


Fig. A.35 Bearing cap bolts tightening sequence.

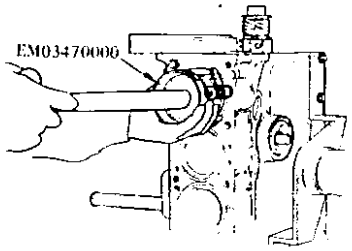


Fig. A.36 Installing the piston and connecting rod assembly.

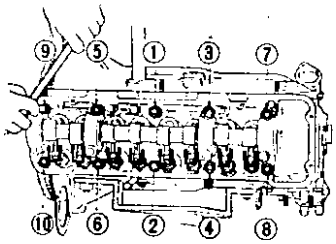


Fig. A.37 Cylinder head bolts tightening sequence.

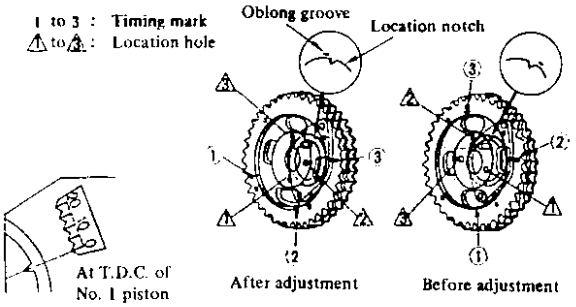


Fig. A.38 Adjusting the camshaft sprocket.

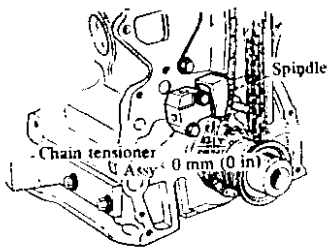


Fig. A.39 Fitting the chain tensioner.

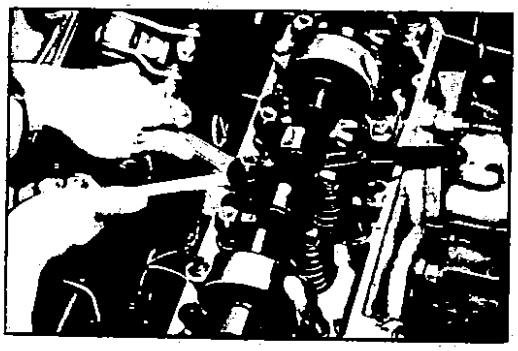


Fig.A.40. Valve clearance adjusting.

and connecting rod assemblies. Use a piston ring compressor to install the pistons through the top of the cylinder bore. Make sure that the pistons and rings and the cylinder bores are lubricated with clean engine oil. The pistons should be arranged so that the "F" mark faces to the front and with the piston ring gaps positioned at 180° to each other. Each piston must be refitted into its original bore.

NOTE: Single inlet valve springs are used on the 1400 cc engine; double valve springs are used on the 1600cc and 1800 cc engines.

Screw the valve rocker pivots with the locknuts into the pivot bushing. Set the camshaft locating plate and install the camshaft in the cylinder head, with the groove in the locating plate directed to the front of the engine. Install the camshaft sprocket and tighten it together with the fuel pump cam, to a torque reading of 12-16 kgm (86-116 lb.ft.). Check that the camshaft end play is within the specified limits. Install the rocker arms, using a screwdriver to press down the valve springs, and fit the valve rocker springs.

Clean the joint faces of the cylinder block and head thoroughly before installing the cylinder head. Turn the crankshaft until the No.1. piston is at T.D.C. on its compression stroke and make sure that the camshaft sprocket notch and the oblong groove in the locating plate are correctly positioned. Care should be taken to ensure that the valves are clear from the heads of the pistons. The crankshaft and camshaft must not be rotated separately or the valves will strike the heads of the pistons. Temporarily tighten the two cylinder head bolts 1 and 2 in Fig.A.37. to a torque reading of 2 kgm (14.5 lb.ft.).

Fit the crankshaft sprocket and distributor drive gear and install the oil thrower. Ensure that the mating marks on the crankshaft sprocket face towards the front. Install the timing chain, making sure that the crankshaft and camshaft keys are pointing upwards. The marks on the timing chain must be aligned with the marks on the right hand side of the crankshaft and camshaft sprockets. It should be noted that three location holes are provided in the camshaft sprocket (See Fig.A.38). The camshaft sprocket being set to the No.2. location hole by the manufacturers. A stretched chain will however, affect the valve timing and if this occurs it will be necessary to set the camshaft to the No.3. location hole in the camshaft sprocket. The chain can be checked by turning the engine until the No.1. piston is at T.D.C. on its compression stroke. In this position adjustment will be required if the location notch on the camshaft sprocket is to the left of the groove on the camshaft locating plate, as shown in the illustration. The correction is made by setting the camshaft on the No.3. location hole in the camshaft sprocket, the No.3. notch should then be to the right of the groove and the valve timing will have to be set using the No.3. timing mark.

Install the chain guide and chain tensioner when the chain is located correctly. There should be no protrusion of the chain tensioner spindle. (See Fig.A.39.) A new tensioner must be fitted if the spindle protrudes.

Press a new oil seal into the timing cover and fit the cover into position, using a new gasket. Apply sealing compound to the front of the cylinder block and to the gasket and to the top of the timing cover. Ensure that the difference in height between the top of the timing cover and the upper face of the cylinder block does not exceed 0.15 mm (0.006 in). Two sizes of timing cover bolts are used; the size M8 (0.315 in) must be tightened to a torque reading of 1.0 - 1.6 kgm (7.2 - 17 lb.ft.) and the size M6 (0.236 in) to a torque reading of 0.4 - 0.8 kgm (2.9 - 5.8 lb.ft.).

Install the crankshaft pulley and water pump tighten the pulley nut to a torque reading of 12-16 kgm (86.8 - 115.7 lb.ft.), then set the No.1. piston at T.D.C. on its compression stroke.

Finally, tighten the cylinder head bolts to the specified torque reading in accordance with the tightening sequence shown in Fig.A.37. The bolts should be tightened in three stages as follows:

First stage	-	4 kgm (28.9 lb.ft.)
Second stage	-	6 kgm (43.4 lb.f.t)
Third stage	-	6.5 - 85. kgm (47.0 - 61.5 lb.ft.).

The cylinder head bolts should be retightened if necessary, after the engine has been run for several minutes.

Install the oil pump and distributor drive spindle into the front cover, as described under Engine Lubrication System.

Install the fuel pump, water inlet elbow and front engine slinger. Fit the oil strainer into position, coat the oil sump gasket with sealing compound and fit the gasket and oil sump to the cylinder block. Tighten the oil sump bolts in a diagonal pattern to a torque reading of 0.6 - 0.9 kgm (4.3 - 6.5 lb.ft.).

Adjust the valve clearances to the specified cold engine figures, following the procedures described under the appropriate heading. Final adjustments will be carried out after the engine has been assembled completely and warmed up to its normal temperature.

Install the rear engine slinger, exhaust manifold and inlet manifold. Refit the distributor and carburettor assemblies, as described in their relevant sections. Install the fuel pipes and vacuum hose, making sure that they are securely clamped. Refit the thermostat housing, thermostat and water outlet together with the gasket. Bond the rocker cover gasket to the rocker cover, using sealant, and fit the rocker cover to the cylinder head.

Install the spark plugs and connect the high tension leads. Fit the left hand engine mounting bracket and install the clutch assembly, using the alignment tool ST20600000 to fit the clutch to the flywheel as described in the section CLUTCH.

Lift the engine away from the mounting stand and into the engine compartment. Install the alternator bracket, adjusting bar, alternator, fan pulley, fan and fan belt in the order given. Check the tension of the fan belt by depressing the belt at a point midway between the pulleys. The tension is correct if the belt is deflected by 8-12 mm (0.3 - 0.4 in) under thumb pressure.

Fit the right hand engine mounting bracket, the oil filter, oil pressure switch, oil level gauge and water drain plug. Take care not to overtighten the oil filter or leakage will occur.

Fill the engine and gearbox to the correct levels with recommended lubricant and refill the cooling system. Adjust the ignition timing and carburettor as described in the appropriate sections.

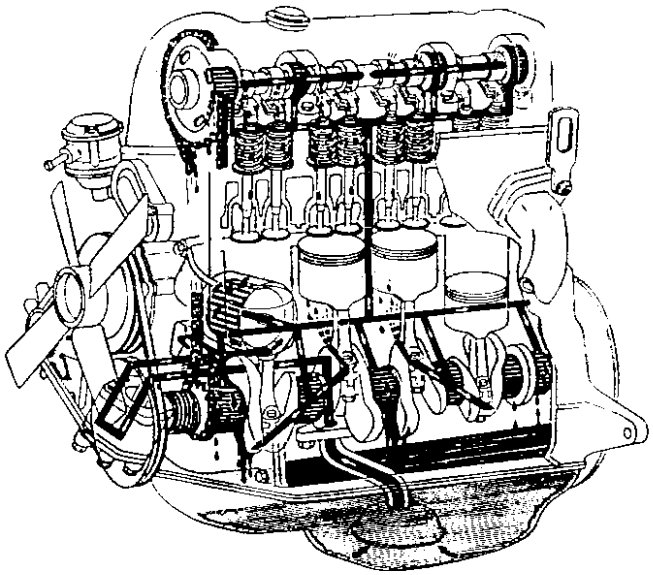


Fig. A.41 Engine lubrication circuit.

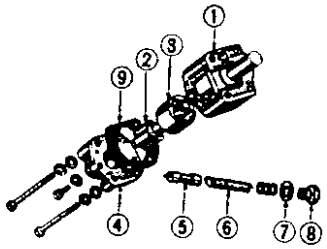


Fig. A.42 Component parts of the oil pump.

1. Pump body
2. Inner rotor and shaft.
3. Outer rotor
4. Pump cover
5. Relief valve
6. Relief valve spring
7. Washer
8. Screw cap
9. Cover gasket

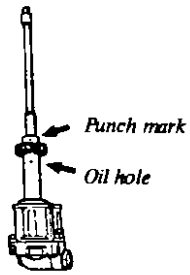


Fig. A.44 Aligning the oil pump spindle.

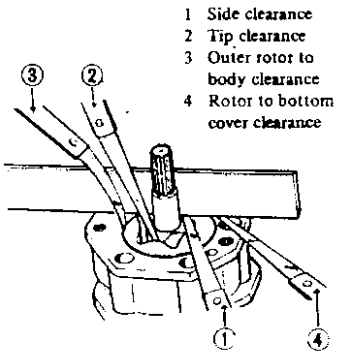


Fig. A.43 Checking the rotor clearance.

VALVE CLEARANCES - Adjusting

Incorrect valve clearance will affect the performance of the engine and may damage the valves and valve seats. Insufficient valve clearance will result in loss of power and may prevent the valve from seating properly. Excessive clearance causes the valve to seat and reduces the amount of valve lift. This will result in noisy operation, with damage to the valves and seats. Adjustment is made with the engine switched off and should be carried out initially with the engine cold, to allow the engine to run. Final adjustments are made after warming up the engine to its normal operating temperature. The engine can be rotated by removing the sparking plugs to release the cylinder compressions then selecting top gear and pushing the vehicle backwards and forwards.

The cold valve clearances should be set to 0.20 mm. (0.0079 in.) for the inlet valves and 0.25 mm. (0.0098 in.) for the exhaust valves. Check the clearance between the valve and rocker, using a feeler gauge as shown in Fig.A.40. Slacken the locknut and turn the adjusting screw until the specified clearance is obtained, then tighten the locknut and recheck the clearance. The feeler gauge should just be free to move between the rocker and valve. When the cold valve clearances have been set run the engine until it reaches its normal operating temperature, then switch off and adjust the valve clearances with the engine warm to 0.25 mm. (0.0098 in.) for the inlet valves and 0.30 mm. (0.0118 in.) for the exhaust valves.

ENGINE LUBRICATION SYSTEM (Fig.A.41.).
OIL PUMP - Removal and Dismantling

The rotor type oil pump is mounted at the bottom of the front timing cover and driven by the distributor drive shaft assembly.

Overhaul of the pump will require careful measurement of the various clearances to determine the amount of wear which has taken place. If any part is found to be worn it may be necessary to replace the entire oil pump assembly. To remove the oil pump from the engine proceed as follows:

1. Remove the distributor assembly, as described in the section IGNITION SYSTEM. Remove the oil sump drain plug and drain off the engine oil. (See under the heading CHANGING THE ENGINE OIL).
2. Remove the front stabiliser and the splash shield board.
3. Withdraw the securing bolts and detach the oil pump body together with the drive gear spindle.

Take out the bolts securing the pump cover to the pump body and withdraw the rotors and drive shaft. (See Fig.A.42.).

The pin securing the driven shaft and inner rotor must not be taken out as the shaft is press fitted to the rotor and the pin is caulked.

Unscrew the threaded plug and withdraw the regulator valve and spring. Clean each part thoroughly and examine for signs of damage or wear. Use a feeler gauge to check the side clearances between the outer and inner rotors, the clearances at the tips of the rotors and the clearance between the outer rotor and the pump body. See Technical Data for the relevant clearances. The clearances can be checked using a straight edge as shown in Fig.A.43.

OIL PUMP - Assembly and Installation

Assembly is a reversal of the dismantling procedure. Before installing the oil pump in the engine, it will be necessary to rotate the engine until the No.1 piston is at T.D.C. on its compression stroke.

Fill the pump housing with engine oil and align the punch mark on the spindle with the hole in the oil pump, as shown in Fig.A.44.

Install the pump with a new gasket and tighten the securing bolts to a torque reading of 1.1 - 1.5 kgm (8-11 lb.ft.) Replace the splash shield board and the front stabiliser refill the engine with the specified amount of engine oil.

OIL FILTER

The cartridge type oil filter can be removed with the special tool ST 19320000 or a suitable filter remover. Interior cleaning is not necessary but the filter body and element must be replaced every 10,000 km (6000 miles). Be careful not to overtighten the filter when replacing, or oil leakage may occur.

CHANGING THE ENGINE OIL

After the first oil change, which should take place at 1000 km (600 miles), the oil should be changed regularly at 5000 km (3000 miles) intervals.

Draining is more easily accomplished after a lengthy run, when the oil being thoroughly warm will flow quite freely.

Stand the vehicle on level ground and place a suitable container under the drain plug. Remove the drain plug carefully as the hot oil may spurt out with considerable force. When refilling the engine make sure that the oil is to the "H" mark on the dipstick.

Technical Data L 13 Engine

Engine model	L13
Number of cylinders	4
Arrangement of cylinders	In-line
Cubic capacity	1296 cc
Bore x stroke	83.0 x 59.9 (3.2677 x 2.3583 in.)
Arrangement of valves	Overhead camshaft
Max B.H.P.	77 at 6000 rpm
Max torque	11.1 kgm at 3600 rpm
Firing order	1 - 3 - 4 - 2
Engine idling speed	600 rpm
Compression ratio	8.5 : 1
Oil pressure	3.8 - 4.2 kg/sq.cm 54.60 lb./sq.in.

VALVES

Valve clearance (hot)	
Inlet	0.25 mm. (0.010 in.)
Exhaust	0.30 mm. (0.012 in.)
Valve clearance (cold)	
Inlet	0.20 mm. (0.008 in.)
Exhaust	0.25 mm. (0.010 in.)
Valve head diameter	
Inlet	38 mm. (1.50 in.)
Exhaust	33 mm. (1.30 in.)
Valve stem diameter	
Inlet	8.0 mm. (0.31 in.)
Exhaust	8.0 mm. (0.31 in.)
Valve lift	10.0 mm. (0.40 in.)
Valve spring free length	48.12 mm (1.89 in.)
Valve spring fitted length	40.0 mm/30.7 kg) (1.57 in./67.7 lb).
Valve spring coil diameter	34.9 mm (1.37 in.)
Valve guide length	
Inlet	59.0 mm. (2.32 in.)
Exhaust	59.0 mm. (2.32 in.)
Valve guide protrusion	10.4 - 10.6 mm. (0.41-0.42 in.)
Valve guide inner diameter	
Inlet	8.00-8.018 mm. (0.315-0.3154 in.)
Exhaust	8.00-8.018 mm. (0.315-0.3154 in.)
Valve guide outer diameter	
Inlet	11.985-11.996 mm. (0.472-0.4723 in.)
Exhaust	11.985-11.996 mm. (0.472-0.4723 in.)
Valve guide to stem clearance	
Inlet	0.015-0.045 mm. (0.0006-0.0018 in.)
Exhaust	0.040-0.070 mm. (0.0016-0.0028 in.)
Valve seat width	
Inlet	1.4-1.8 mm. (0.055-0.071 in.)
Exhaust	1.6-2.0 mm. (0.063-0.079 in).
Valve seat angle	45°
Valve seat insert interference fit	
Inlet	0.08-0.11 mm. (0.0031-0.0043 in.)
Exhaust	0.06-0.10 mm. (0.0024-0.0039 in.)
Valve guide interference fit	
Inlet	0.027-0.049 mm. (0.0011-0.0019 in.)

CAMSHAFT AND TIMING GEAR

Camshaft end play	0.08-0.38 mm. (0.0011-0.0019 in.)
Camshaft lobe lift	6.65 mm (0.261 in.)
Camshaft journal diameter	47.949-47.962 mm. (1.8877-1.8883 in.)
Max camshaft run-out	0.05 mm (0.002 in.)
Camshaft bearing to journal clearance	0.038-0.076 mm. (0.0015-0.0026 in.)
Camshaft bearing inner diameter	48.000-48.016 mm. (1.8898-1.8904 in.)

CONNECTING RODS

Distance from centre to centre	132.97-133.03 mm. (5.235 - 5.237 in.)
Bearing shell thickness	
Standard	1.498-1.506 mm. (0.059-0.593 in.)
Big end side play	0.20-0.30 mm. (0.008-0.012 in.)
Connecting rod bearing running clearance	0.014-0.056 mm. (0.0006-0.0022 in.)
Connecting rod bend or twist	0.03 mm. per 100 mm. (0.0012-in. per 3.937 in.)

CRANKSHAFT AND MAIN BEARINGS

Crankshaft material	Special forged steel
Number of bearings	5
Main journal diameter	54.942-54.955 mm. (2.1631-2.1636 in.)
Max. journal taper	0.03 mm. (0.0012 in.)
Max. journal out of round	0.03 mm. (0.0012 in.)
Crankshaft end play	0.05-0.015 mm. (0.002-0.0059 in.)

Wear limit	0.3 mm (0.012 in.)
Crankpin journal diameter	49.961-49.975 mm. (1.967-1.9675 in.)
Max. crankpin taper	0.03 mm. (0.012 in.)
Max. crankpin out of round	0.03 mm. (0.012 in.)
Thickness of main bearing shells	1.827.1.835 mm. (0.072-0.0722 in.)
Main bearing running clearance	0.020-0.062 mm. (0.0008-0.0024 in.)
Max. main bearing running clearance	0.12 mm. (0.0047 in.)
Crankshaft bend limit	0.05 mm. (0.002 in.)

PISTONS

Material	Cast aluminium
Type	Slipper skirt
Piston diameters	
Standard	82.99-83.04 mm. (3.267-3.269 in.)
1st oversize	83.22-83.27 mm. (3.276-3.278 in.)
2nd oversize	83.47-83.52 mm. (3.286-3.288 in.)
3rd oversize	83.72-83.77 mm. (3.296-3.298 in.)
4th oversize	83.97-84.02 mm. (3.305-3.308 in.)
5th oversize	84.47-84.52 mm. (3.326-3.328 in.)
Width of ring grooves:	
Top and second	2.0 mm (0.08 in.)
Oil control	4.0 mm (0.16 in.)
Piston running clearance	0.025-0.045 mm. (0.001-0.002 in.)

PISTON PIN

Pin diameter	20.995-21.000 mm. (0.8266-0.8268 in.)
Pin length	72.00-72.25 mm. (2.8346-2.8445 in.)
Pin running clearance in piston	0.008-0.010 mm. (0.0003-0.0004 in.)
Pin interference fit in small end bush	0.015-0.033 mm. (0.0006-0.0013 in.)

PISTON RINGS

Piston ring height:	
Top and second	2.0 mm. (0.08 in.)
Oil control	4.0 mm (0.16 in.)
Side clearance in grooves:	
Top	0.040-0.073 mm. (0.0016-0.0029 in.)
Second	0.030-0.063 mm. (0.0012-0.0025 in.)
Oil control	0.025-0.063 mm. (0.001-0.0025 in.)
Piston ring gaps:	
Top	0.23-0.38 mm. (0.0091-0.0150 in.)
Second	0.15-0.30 mm. (0.006-0.012 in.)
Oil control	0.15-0.30 mm (0.006-0.012 in.)

CYLINDER HEAD

Material	Aluminium alloy
Distortion of sealing face	0.03 mm. (0.0012 in.)
Max. distortion	0.1 mm. (0.004 in.)
Valve seat insert material:	
Inlet	Aluminium bronze
Exhaust	Special cast
Fit	Hot pressed

CAMSHAFT DRIVE

Drive	From crankshaft
Chain	double roller type
Chain tensioner	Spring and oil pressure control

TWIN CHOKE CARBURETTOR

Engine model		L 13
	PRIMARY	**SECONDARY**
Outlet diameter	26 mm.	30 mm.
Venturi diameter	21 x 8 mm	27 x 12 mm
Main jet	96	150
Main air bleed	80	90
Slow running jet	43	180
Power jet	40	
Float level	23 ± 1mm. (0.905 ± 0.04 in.)	
Fuel pressure	0.24 kg/sq. cm (3.4 lb./sq. in.)	
Weight	2.55 kg (5.61 lb.)	

Altitude setting (main jet)	
1000 m. (3300 ft)	94
2000 m. (6600 ft)	92
3000 m. (10,000 ft)	89
4000 m. (13,300 ft)	87
5000 m. (16,600 ft)	85

Technical Data L 14,16 and 18 Engine.

GENERAL SPECIFICATIONS

Cylinders	4 in - line
Displacement	
L14	1428 cc (87.1 cu.in).
L16	1595 cc (97.3 cu.in).
L18	1770 cc (108.0 cu.in).
Bore and stroke	
L14	83 x 66 mm (3.27 x 2.60 in)
L16	83 x 73.7 mm (3.27 x 2.90 in)
L18	85 x 78 mm (3.35 x 3.07 in)
Compression ratio	
L14	9.0 : 1
L16 (single carburettor)	8.5 : 1
L16 (SU twin carburettor)	9.5 : 1
L18 (single carburettor)	8.5 : 1
L18 (SU twin carburettor)	9.5 : 1
Valve arrangement	**Overhead valve**
Firing order	1-3-4-2
Engine idling speed	600 r.p.m. (single carburettor) 650 r.p.m. (twin carburettor)
Engine idling speed-with automatic transmission	650 r.p.m. (single carburettor) 700 r.p.m. (twin carburettor)
Oil pressure (Hot at 2000 r.p.m.)	3.5 - 4.0 kg/sq.cm. (50-57 lb/sq.in.)

VALVES

Valve clearance (Hot)	
Intake	0.25 mm (0.0098 in)
Exhaust	0.25 mm (0.0098 in)
Valve clearance (Cold)	
Intake	0.20 mm (0.0079 in)
Exhaust	0.20 mm (0.0079 in)
Valve head diameter (L14)	
Intake	38 mm (1.5361 in)
Exhaust	33 mm (1.2992 in)
Valve head diameter (L16)	
Intake	42 mm (1.6535 in)
Exhaust	33 mm (1.2992 in)
Valve head diameter (L18)	
Intake	42 mm (1.6535 in)
Exhaust	35 mm (1.3780 in)
Valve stem diameter	
Intake	7.965 - 7.980 mm (0.3136 - 0.3142 in)
Exhaust	7.945 - 7.960 mm (0.3128 - 0.3134 in)
Valve length (L14)	
Intake	115.6 - 115.9 mm (4.551 - 4.562 in)
Exhaust	115.7 - 116.0 mm (4.555 - 4.567 in)
Valve length (L16) (L18)	
Intake	114.9 - 115.2 mm (4.524 - 4.535 in)
Exhaust	115.7 - 116.0 mm (4.555 - 4.567 in)
Valve lift (Single carburettor)	10.0 mm (0.3946 in)
Valve lift (Twin carburettor)	10.5 mm (0.413 in)
Valve spring free length (L14)	
L14 Intake	49.0 mm (1.929 in)
L14 Exhaust - outer	49.98 mm (1.968 in)
L14 Exhaust - inner	44.85 mm (1.766 in)
Valve spring free length (L16, L18)	
Outer	49.98 mm (1.968 in)
Inner	44.85 mm (1.766 in)
Valve guide length	59.0 mm (2.393 in)
Valve guide height from head surface	10.6 mm (0.417 in)
Valve guide diameter inner	
Intake	8.018 - 8.000 mm (0.3154 - 0.3150 in) dia.
Exhaust	8.018 - 8.000 mm (0.3154 - 0.3150 in) dia.
Valve guide diameter outer	
Intake	12.034 - 12.023 mm (0.4738 - 0.4733 in) dia.
Exhaust	12.034 - 12.023 mm (0.4738 - 0.4733 in) dia.
Valve guide to stem clearance	
Intake	1.8 mm (1.1024 in)
Exhaust	1.7 mm (1.0630 in)
Valve seat width (L14)	
Intake	1.4 mm (0.0551 in)
Exhaust	1.3 mm (0.0512 in)
Valve seat width (L16, L18)	
Intake	0.020 - 0.053 mm (0.0008 - 0.0021 in)
Exhaust	0.040 - 0.073 mm (0.0016 - 0.0029 in)

Valve seat angle		**Valve guide interference fit**	
Intake	45°	Intake	0.027 - 0.049 mm (0.011 - 0.0019 in)
Exhaust	45°	Exhaust	0.027 - 0.049 mm (0.011 - 0.0019 in)

Valve seat interference fit

Intake	0.081 - 0.113 mm (0.0032 - 0.0044 in)
Exhaust	0.064 - 0.096 mm (0.0025 - 0.0038 in)

CAMSHAFT AND TIMING CHAIN

Camshaft end play	0.08 - 0.38 mm (0.0031 - 0.0150 in)
Camshaft lobe lift	
L14	6.65 mm (0.2618 in)
L16, L18 - intake with single carburettor.	6.65 mm (0.2618 in)
L16, L18 - Intake with twin carburettor.	7.00 mm (0.2753 in)
L16, L18 - Exhaust	7.00 mm (0.2753 in)
Camshaft journal diameters	47.949 - 47.962 mm (1.8877 - 1.8883 in)
Camshaft bend	0.02 mm (0.0007 in)
Camshaft journal to bearing clearance	0.038 - 0.067 mm (0.0015 - 0.0026 in)
Rocker arm lever ratio	
L14	1.5
L16, L18	1.45

CONNECTING RODS

Connecting rod centres	
L14	136.6 mm (5.35 in)
L16	133.0 mm (5.24 in)
L18	130.35 mm (5.132 in)
Bearing thickness	1.493-1.506 mm (0.0588 - 0.0593 in)
Big end play	0.20 - 0.30 mm (0.0079 - 0.0118 in)
Connecting rod bearing clearance	0.025 - 0.055 mm (0.0010 - 0.0022 in)
Connecting rod bend or twist	less than 0.025 mm (0.001 in) per 100 mm (2.937 in)

CRANKSHAFT AND MAIN BEARINGS

Journal diameter	54.942 - 54.955 mm (2.1631 - 2.1636 in)
Journal taper and out of round	less than 0.01 mm (0.0004 in)
Crankshaft free end play	0.05 - 0.18 mm (0.0020 - 0.0071 in)
Wear limit	0.3 mm (0.0118 in)
Crankpin diameter	49.961 - 49.974 mm (1.9670 - 1.9675 in)
Crankpin taper and out of round	less than 0.01 mm (0.0004 in)
Thickness of main bearing shells	1-822 - 1.835 mm (0.0717 - 0.0722 in)
Main bearing clearance	0.020-0.062 mm (0.0008 - 0.0024 in)
Wear limit of clearance	0.12 mm (0.0047 in)
Crankshaft bend limit	0.05 mm (0.0019 in)

PISTONS

Piston diameter (L14)		82.985 - 83.035 mm (3.2671 - 3.2691 in)
Piston diameter (L14, L16)		84.985 - 85.035 mm (3.3459 - 3.3478 in)
L14 and L16	1st oversize	0.25 mm (0.0098 in)
	2nd oversize	0.50 mm (0.0197 in)
	3rd oversize	0.75 mm (0.0295 in)
	4th oversize	1.00 mm (0.0394 in)
	5th oversize	1.25 mm (0.0492 in)

L18 Oversizes	85.465-85.515 mm (3.3648 - 3.3667 in) 86.965-86.015 mm (3.3844 - 3.3864 in)
Ring groove width	
Top ring	2.0 mm (0.0787 in)
Second ring	2.0 mm (0.0787 in)
Oil ring	4.0 mm (0.1575 in)
Piston to bore clearance	0.025 - 0.045 mm (0.0010 - 0.0018 in)

PISTON PIN

Pin diameter	20.995 - 21.000 mm (0.8266 - 0.8268 in)
Length:	
L14, L16	72.00 - 72.25 mm (2.8346 - 2.8445 in)
L18	72.25 - 73.00 mm (2.8445 - 2.8740 in)
Pin to piston clearance	0.001 - 0.013 mm (0.00004 - 0.00051 in)
Pin interference fit in small end bush	0.015 - 0.033 mm (0.0006 - 0.0013 in)

PISTON RING

Piston ring height	
Top	1.977 mm (0.0778 in)
Second	1.977 mm (0.0778 in)
Side clearance	
L14, L16, Top ring	0.040 - 0.080 mm (0.0016 - 0.0031 in)
L18 Top ring	0.045 - 0.080 mm (0.0018 - 0.0031 in)
Second ring	0.030 - 0.070 mm (0.0012 - 0.0028 in)
Ring gap	
L14 Top ring	0.23 - 0.38 mm (0.0091 - 0.0150 in)
L14 Second ring	0.15 - 0.30 mm (0.0059 - 0.0118 in)
L16 Top ring	0.25 - 0.40 mm (0.0098 - 0.0157 in)
L16 Second ring	0.15 - 0.30 mm (0.0059 - 0.0118 in)
L18 Top ring	0.35 - 0.55 mm (0.0138 - 0.0217 in)
L18 Second ring	0.30 - 0.50 mm (0.0118 - 0.0197 in)
Oil ring	0.30 - 0.90 mm (0.0118 - 0.0354 in)

LUBRICATION SYSTEM

Oil pump	Rotor Pump
Clearance between inner and outer rotor	0.05 - 0.12 mm (0.0020 - 0.0047 in)
Rotor tip clearance	less than 0.12 mm (0.0047 in)
Clearance between outer rotor and body	0.15 - 0.21 mm (0.0059 - 0.0083 in)
Rotor to bottom cover clearance	0.03 - 0.13 mm (0.0012 - 0.0051 in)
Oil pressure at idling	0.8 - 2.8 kg/sq.cm. (11-40 lb/sq.in).
Oil pressure relief valve spring	
Free length	52.5 mm (2.067 in)
Fitted length	34.8 mm (1.370 in)
Relief valve opening pressure	3.5 - 5.0 kg/sq.cm. (50 - 71 lb/sq.in).

Cooling System

GENERAL

The cooling system is pressurised and incorporates a water pump, corrugated fin type radiator, fan and a pellet type thermostat.

The water pump is of the centrifugal type and has an aluminium die cast body. The volute chamber is built into the front cover assembly and a high pressure sealing mechanism prevents water leakage and noise.

The fan pulley is driven by the V belt from a pulley on the crankshaft.

The pellet type thermostat enables the engine to warm up rapidiy and also regulates the temperature of the coolant. When the wax pellet in the thermostat is heated, it expands and exerts pressure against a rubber diaphragm causing the valve to open and allow the coolant to flow from the cylinder head back to the radiator.

As the pellet is cooled itcontractsand allows the spring to close the valve, thereby preventing coolant from leaving the cylinder head.

The radiator is of the down flow type with an expansion tank. The relief valve in the radiator filler cap controls the pressure at approximately 0.9 kg/sq.cm (13 lb/sq.in.). Always try to avoid removing the filler cap when the engine is hot, as coolant may spray out and cause scalding.

If the cap must be removed in these circumstances, use a large piece of cloth to hold the cap and turn the cap slightly. Wait until all pressure has been released before lifting off the cap.

FAN BELT TENSION

The fan belt drives the water pump and alternator as well as the fan and its correct adjustment is most essential. A loose fan belt will slip and wear and most probably cause overheating, alternatively, if the belt is too tight the pump and alternator bearings will be overloaded.

The belt is correctly tensioned if it can be depressed by approximately 10 mm (1/2 in) at a point midway, between the fan and alternator pulleys (See Fig.B.2.).

If adjustment is necessary, slacken the alternator mounting and adjustment bolts and pivot the alternator away from the engine to tighten the belt, to towards the engine if the belt is to be slackened.

NOTE: Always apply leverage to the drive end housing when pivoting the alternator and never to the diode end housing, or the alternator will be damaged.

Retighten the alternator bolts and make sure that the belt is correctly tensioned.

FLUSHING AND DRAINING THE SYSTEM

The radiator and water passages should be flushed out periodically to remove the accumulated scale or sediment. Reverse flushing equipment should be used to carry out a completely thorough flushing operation but the owner driver not possessing this type of equipment can flush out the system in the following manner:

Drain the system by removing the radiator filler cap and opening the radiator and cylinder block drain taps. Close the taps again and refill the radiator. Run the engine for a short period and then re-open the drain taps. Continue this sequence until the water flowing from the taps is clean, then close the taps and refill the radiator.

An anti-freeze mixture should always be used in Winter time. The Nissan long life coolant L.L.C. is an ethylene glycol solution, containing a corrosion preventative which can remain in the vehicle throughout the year, but must not be mixed with other products.

It is advisable to check the radiator and heater hoses when filling with anti-freeze and renew them if signs of deterioration are apparent.

WATER PUMP - Replacement

The water pump must not be dismantled and should be renewed if it becomes faulty. The pump can be removed in the following manner:

1. Drain the cooling system.
2. Take the fan belt off the pulley.
3. Remove the fan and pulley.
4. Remove the retaining nuts and withdraw the water pump. (See Fig.B.3.).

Installation of the pump is a reversal of the removal procedures.

THERMOSTAT - Testing

The thermostat is located in the water outlet passage (See Fig.B.4.). To remove the unit, drain the cooling system, remove the radiator hose and the water outlet elbow. Take out the thermostat.

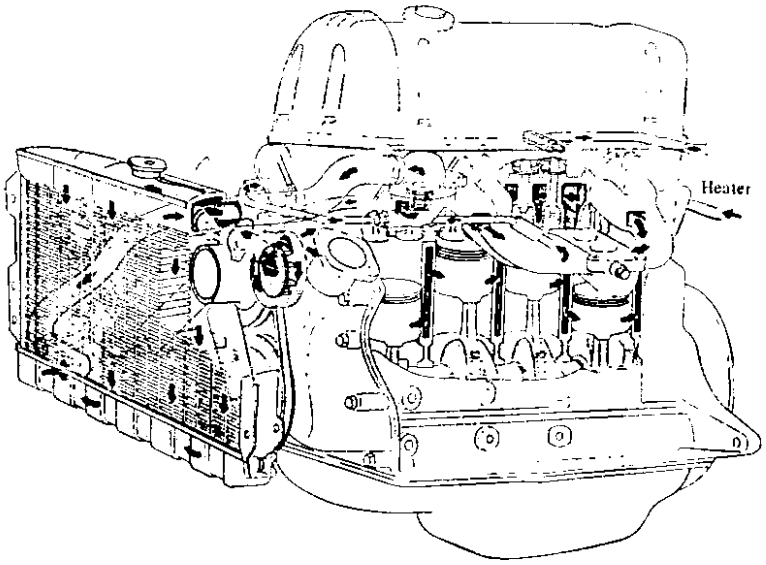


Fig. B.1 The cooling system.

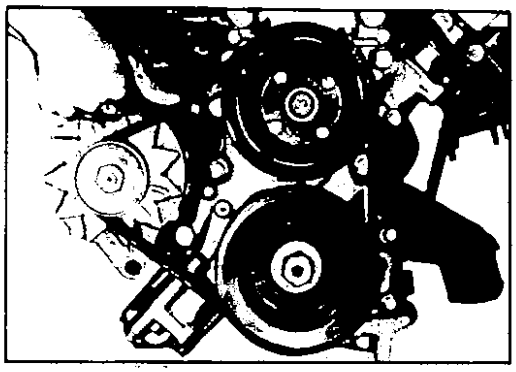


Fig. B.2 Checking the fan belt tension.

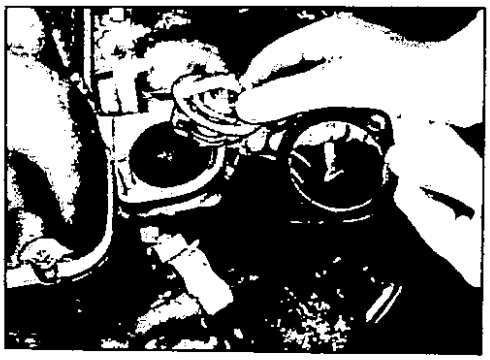


Fig. B.3 Removing the water pump.

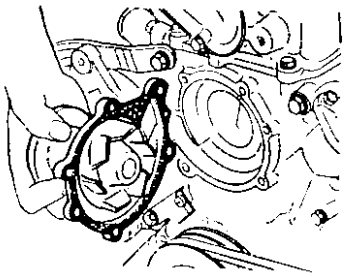


Fig. B.4 Removing the thermostat.

The thermostat can be tested by suspending it with a thermometer in a container filled with water.

Heat the water gradually and stir it to obtain a uniform temperature. Maintain a constant check of the temperature and make sure that neither the thermostat or thermometer touch the sides of the container, or false readings will be obtained.

The thermostat should begin to open at a temperature of 82°C ± 1.5°C (179.6°F ± 2.7°F), and should be fully open with a maximum valve lift of 8 mm. (0.315 in.) at a temperature of 95°C (203°F).

When installing the thermostat, apply adhesive to both sides of the gasket before refitting the water outlet elbow.

RADIATOR - Removal

1. Drain the cooling system as previously described and remove the front grille.
2. Disconnect the radiator upper hose, lower hose and hose to the reservoir tank.
3. Remove the radiator securing bolts and lift out the radiator (Fig.B.4.).

It should be noted that cars fitted with automatic transmission incorporate a transmission oil cooler which must be disconnected.

Installation is a reversal of the removal procedure, refill the system as previously described.

FLUID COUPLING

The water pump is equipped with a fluid coupling on vehicles fitted with an air conditioner. The fluid coupling limits the maximum fan speed to approximately 3000 r.p.m. and eliminates noise and loss of power at high engine speeds.

A fault in the coupling may be caused by the entry of foreign matter. If a fault developes the coupling must be removed and dismantled and the interior cleaned by washing in solvent. The condition of the seal and bearing must be carefully checked and the coupling replaced if the latter items have become blackened. If oil leaks occur, it will be necessary to replace the water pump assembly with the coupling. After cleaning the unit, refill with 11.5 cc silicon oil using a suitable syringe.

Technical Data

Radiator	Corrugated fin type
Radiator cap working pressure	0.9 kg/sq.cm. (13 lb/sq.in)
Radiator core heightxwidth. x thickness:	
1400 and 1600 cc engines (510 body)	280x488x38mm (11.0x19.2x1.49 in)
1600 and 1800 cc engines (610 body)	360x502x32mm (14.2x19.8x1.26 in)
Thermostat valve opening temperature:	
Standard	82°C (180°F)
Cold climates	88°C (190°F)
Tropical climates	76.5°C (170°F)
Max. valve lift	Above 8 mm (0.31 in)
Cooling system capacity:	
With heater	6.8 litres (1.75 US gall, 1.5 Imp gall.)
Without heater	6.4 litres (1.75 US gall,, 1.375 Imp gall.)
Cooling system capacity - 1600 and 1800 cc engines (610 body)	
With heater	6.5 litres (1.75 US gall, 1.375 Imp gall)
Without heater	6.0 litres (1.625 US gall, 1.375 Imp gall.)

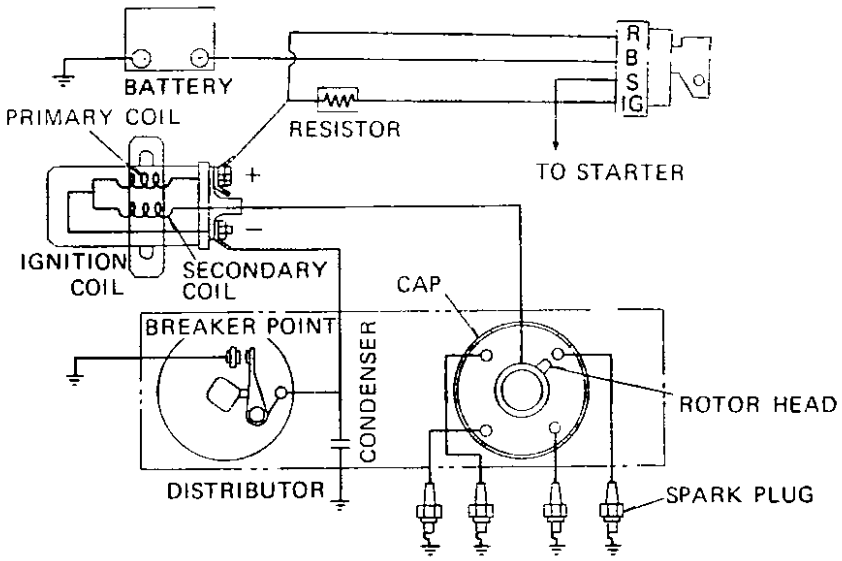
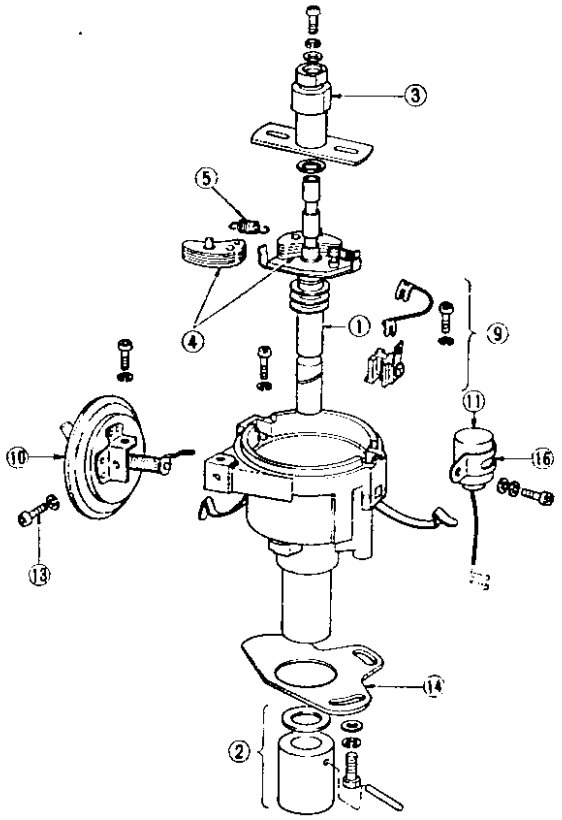


Fig. C.1 Ignition system circuit diagram.



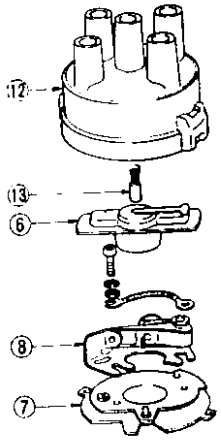


Fig. C.2 Ignition distributor.

1. Shaft assembly
2. Collar assembly
3. Cam assembly
4. Governor weights
5. Governor spring
6. Rotor head
7. Breaker plate
8. Contact set
9. Terminal assembly
10. Vacuum control
11. Condenser
12. Distributor cap
13. Carbon point
14. Plate
15. Clamp

Ignition System

DESCRIPTION

The ignition circuit comprises the distributor, ignition coil, ignition switch, spark plugs, high tension lead and the battery. (See Fig.C.1.).

The Hitachi distributor is shown in exploded form in Fig. C.2. Igniton timing is automatically regulated by the distributor centrifugal advance mechanism or vacuum advance mechanism, depending upon the demand made on the engine.

The vacuum advance mechanism operates under part throttle only and uses intake manifold depression to advance the ignition timing. When the engine speed is increased the vacuum is inoperative and ignition timing is regulated by the centrifugal advance mechanism.

The centrifugal advance mechanism uses a system of governor weights and springs which turn the cam assembly in on anti-clockwise direction to advance the ignition timing. As the engine speed is decreased the weights move back and allow the cam to return, thereby retarding the ignition timing.

The ignition coil is an oil filled unit comprising a coil around which is wound the secondary and primary windings. The number of turns in the primary winding provide a high secondary voltage throughout the speed range. The resistor is automatically by-passed at the moment of starting and allows the ignition coil to be directly connected to the battery. This applies the full battery voltage to the coil to give the necessary starting boost.

When the starter switch is released the current flows through the resistor and the voltage through the coil is dropped for normal running purposes.

IGNITION TIMING

The ignition timing can be accurately checked using a stroboscopic timing light, which should be connected in accordance with the manufacturers instructions.

Make sure that the timing marks on the crankshaft pulley are visible; if they are not visible, mark them with chalk or white paint. Each mark represents a 5° division of the crank angle.

Disconnect the distributor vacuum line, start the engine and allow it to run at normal idling speed, or slightly below.

Point the timing light at the timing pointer on the front cover. (Fig.C.3.). The crankshaft pulley groove should appear to be stationery and aligned with the pointer on the front cover. The top dead centre mark is located at the extreme right as shown in the illustration. If the setting requires adjustment, the distributor flange bolts must be slackened and the distributor body turned clockwise to advance, or anti-clockwise to retard the timing. (See Technical Data for timing settings).

After adjusting the timing, tighten the distributor flange bolts and recheck the timing.

IGNITION DISTRIBUTOR - Maintenance

Remove the distributor cap by easing away the two clamps and examine the points for signs of burning or pitting. The points can be cleaned, if necessary using a fine grade of oilstone or file. The faces of the points must be completely flat and parallel and all abrasive dust removed with compressed air. If the points are excessively pitted they must be renewed and grease applied to the moving contact pivot and the surface of the cam. Ensure that the distributor cap is thoroughly clean both inside and outside. A contaminated cap will promote "tracking" indicated by black lines and caused by electrical leakage between the segments on the inside of the cap. Make sure that the carbon button is not worn. Both the distributor cap and rotor must be renewed if they are cracked or damaged.

IGNITION DISTRIBUTOR
Adjusting the contact breaker gap

To adjust the contact breaker points remove the distributor cap and pull the rotor off the cam spindle.

Turn the engine until the heel of the contact breaker arm is positioned on the cam lobe, the contact breaker gap is set to the maximum in this position.

Slacken the adjusting screw (Fig.C.4.), insert a feeler gauge, between the points and adjust the breaker plate until the required gap of 0.45 - 0.55 mm (0.0177 - 0.0217 in) is obtained.

Tighten the adjusting screw and recheck the setting. After the contact breaker gap has been adjusted, check the ignition timing, as previously described.

The tension of the contact breaker should be 0.5 - 0.65 kg (1.1 - 1.4 lb.). Measure the tension with a gauge and at 90° to the contact breaker arm.

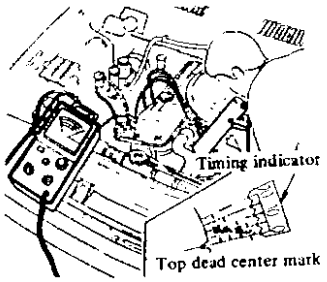


Fig. C.3 Checking the ignition timing.

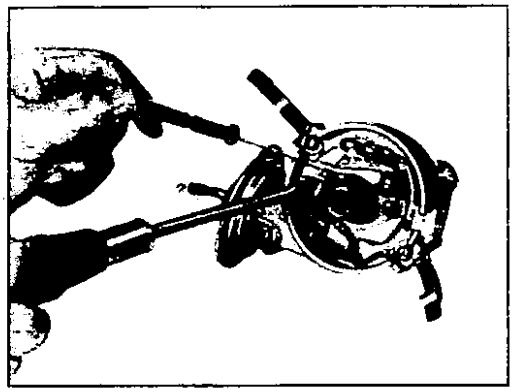


Fig. C.4 Adjusting the contact points gap.

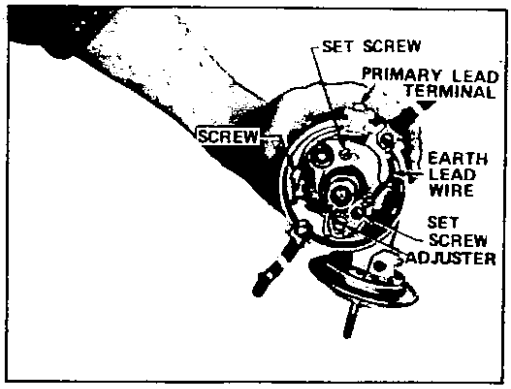


Fig. C.5 View of the distributor without cap.

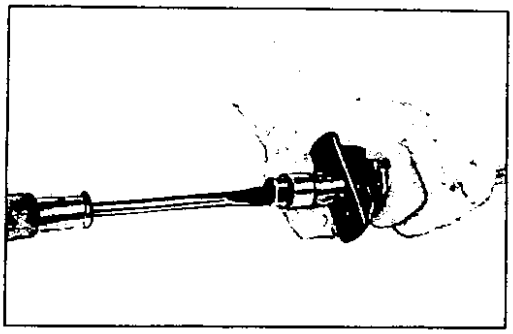


Fig. C.6 Removing the cam

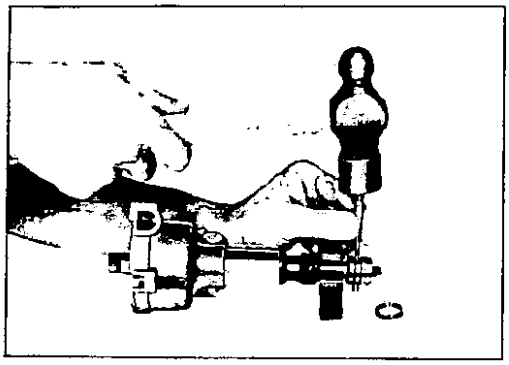
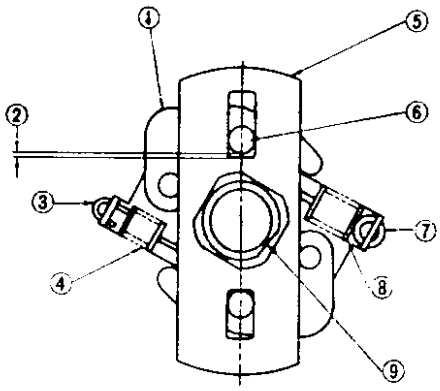


Fig. C.7 Removing the retaining pin.



1. *Governor weight*
2. *Clearance for start and end of advance angle*
3. *Hook*
4. *Governor spring (B)*
5. *Cam plate*
6. *Flyweight pin*
7. *Hook*
8. *Governor spring (A)*
9. *Rotor positioning tip*

Fig. C.8 Centrifugal advance mechanism.

CENTRIFUGAL ADVANCE MECHANISM

Special equipment is required to check the advance characteristics. It is possible, however, to carry out an examination of the cam assembly and the weights and springs to ensure that the cam is not seizing.

Lift off the distributor cap and turn the rotor anti-clockwise. When the rotor is released is should return to the fully retarded position without sticking. If it does not return to the fully retarded position it will be necessary to check for dirt and weak springs.

It should be noted that any wear in the mechanism or lose of spring tension will upset the advance characteristics and cause unsatisfactory engine running performance over the speed range.

VACUUM ADVANCE MECHANISM

The diaphragm of the vacuum advance mechanism is mechanically connected to the contact breaker plate. The rise and fall of inlet manifold depression causes the diaphragm to move the contact breaker plate to advance or retard the ignition.

If the vacuum control unit fails to function correctly a check can be carried out to ensure that the contact breaker plate is moving freely and that the three steel balls at the top and bottom of the plate are adequately lubricated.

Also make sure that the vacuum inlet pipe is not blocked or leaking and is securely tightened.

Leakage may be due to a defective diaphragm which should be renewed along with any other faulty part of the mechanism.

IGNITION DISTRIBUTOR - Removal and Dismantling

1. Disconnect the battery leads.
2. Disconnect the high tension lead at the coil.
3. Withdraw the high tension leads from the distributor cap.
4. Detach the suction pipe from the vacuum control unit.
5. Mark the position of the distributor and rotor, remove the flange mounting bolts and withdraw the distributor.

To dismantle the distributor proceed as follows:

Take off the distributor cap and remove the rotor. Slacken the two set screws holding the contact breaker upper plate. Remove the primary cable terminals and withdraw the contact set from the distributor (Fig.C.5.). Remove the vacuum control unit.

Remove the two screws and lift out the contact breaker plate, detach the clamp, the terminal and the lead.

To remove the cam, take out the centre screw, as shown in Fig.C.6. Drive out the drive pinion retaining pin with a drift and hammer (Fig.C.7.) and remove the pinion and washer. Take care not to stretch or deform the governor springs when detaching them from the weights.

IGNITION DISTRIBUTOR - Assembling and Installing

Assembly is a reversal of the dismantling procedure. Lubricate the moving contact pivot and smear the lobes of the cam with multi-purpose grease.

If the centrifugal advance mechanism has been dismantled the governor springs and cams must be refitted as shown in Fig.C.8. The governor weight pin (6) should be fitted into the longer of the two slots, leaving a certain amount of clearance for the start and end of the centrifugal advance movement.

When installing the distributor take care to align the body and rotor with the marks made during removal. The rotor must be positioned in its original location, it will turn slightly when the distributor is inserted and the gear teeth mesh. Remove and replace the distributor if the rotor does not point to the alignment mark, until both distributor body and rotor are correctly aligned.

SPARKING PLUGS

The sparking plugs should be inspected and cleaned at regular intervals, not exceeding every 10,000 km (6000 miles). New sparking plugs should be fitted at approximately 20,000 km (12,000 miles).

Remove the plugs and check the amount of electrode wear and type of deposits. Brown to greyish-tan deposits with slight electrode wear indicate that the plugs are satisfactory and working in the correct heat range.
Dry fluffy carbon deposits are caused by too rich a mixture, dirty air cleaner, excessive idling , or faulty ignition. In this case it is advisable to replace the plugs with plugs having a higher heat range. Oily wet black deposits are an indication of oil in the combustion chambers through worn pistons and rings, or excessive clearance between valve guides and stems. The engine should be overhauled and hotter plugs installed. A white or light grey centre electrode and bluish burned side electrode indicates engine overheating, incorrect ignition timing loose plugs, low fuel pump pressure, or incorrect grade of fuel. Colder sparking plugs should be fitted.

The plugs should be cleaned on a blasting machine and tested. Dress the electrodes with a small file, so that the surfaces of both electrodes are flat and parallel. Adjust the spark plug gap to 0.8 - 0.9 mm (0.031 - 0.035 in) by bending the earth electrode. Refit the plugs and tighten them to a torque reading of 1.5 - 2.5 kgm (11 - 15 lb.ft.).

Technical Data

IGNITION DISTRIBUTOR

Type:	
L16 & L 18 (with single carb)	Hitachi D411 - 58K
L16 & L18 (with twin carb)	Hitachi D409 - 54 K
L14	Hitachi D411 - 63
Firing order	1 - 3 - 4 - 2
Rotation	anticlockwise
Ignition timing (BTDC)	
D411 - 58K	10° at 600 r.p.m.
D409 - 54K	14° at 650 r.p.m.
D411 - 63	8° at 600 r.p.m.
Dwell angle	49 - 55°
Contact point gap setting	0.45 - 0.55 mm (0.0177 - 0.0217 in)
Contact spring tension	0.50 - 0.65 kg (1.10 - 1.43 lb.)
Condenser capacity	0.22 - 0.44 F

IGNITION COIL

Type	Hitachi 6R - 200
Spark plugs.	
With single carb	NGK BP-5ES
With twin carb	NGK BP - 6ES
Plug gap	0.8 - 0.9 mm (0.031 - 0.035 in)
Tightening torque	1.5 - 2.5 kgm (11 - 15 lb.ft.)

IGNITION TIMING - Adjustment

1300cc. engine	10° B.T.D.C/600 r.p.m.

Fuel System

DESCRIPTION

The diaphragm type fuel pump, shown in Fig.D.1. feeds fuel from the tank to the carburettor in a regulated supply, according to the needs of the engine. A cartridge type fuel strainer prevents any dirt from reaching the pump inlet valve.

The carburettor fitted to the engine is either a down-draught two barrel type equipped with a throttle operated acceleration pump and power valve mechanism. (See Fig.D.2.), or a twin SU carburettor of the type shown in Fig.D.3. In the two barrel type carburettor fuel flows from the passage at the bottom of the float chamber, passes through the primary main jet and mixes with air introduced through the main air bleed screw. The petrol and air mixture is injected into the venturi through the main nozzle.

Each time the accelerator pedal is depressed, the throttle opens and the accelerator pump forces a jet of petrol into the air stream to allow the engine to accelerate smoothly. (See Fig. D.4.). The power valve mechanism is operated automatically according to the demands made by the engine. Under light load, i.e. part throttle conditions, the intake manifold depression is transmitted below the throttle valve, the vacuum pulls a piston upwards against a spring and leaves the power valve closed, allowing additional air to be admitted through the air bleed screw and thereby weaken the petrol and air mixture. When the vacuum below the throttle valve is lowered during full load conditions, the piston is pushed down, opening the power valve and providing additional fuel to enrichen the mixture.

The model HJL 38W6 SU twin carburettor is of the horizontal, variable venturi type and is used only on the 1600 and 1800 cc engines. In this type of carburettor a constant flow of intake air is maintained by the automatically adjusted venturi opening, this is accomplished by the suction piston sliding in accordance with changes in the volume of intake air.

Referring to Fig.D.5. the suction chamber is mounted above the venturi. The suction piston slides vertically, within the chamber and changes the venturi opening area. The piston is operated by a difference between the upper vacuum pressure which is applied through the suction port and the atmospheric pressure which is introduced through the air hole from the air cleaner.

The amount by which the throttle is opened causes the suction piston to rise or fall under the influence of the engine suction. The nozzle opening therefore changes and provides an optimum air-fuel mixture at all engine speeds.

The cartridge type fuel strainer utilizes a fibre strainer element which should be replaced every 20,000 km (12,000 miles). Removal of the fuel strainer is a simple operation, but as it cannot be drained the strainer should not be removed when the tank is full, unless absolutely necessary.

A viscous paper type air cleaner element is fitted which does not require cleaning and should be replaced every 40,000 km (24,000 miles). The air cleaner fitted on the single carburettor is equipped with an idling compensator to prevent the mixture from becoming too rich at high idling temperatures. Additional fresh air is introduced into the inlet manifold by the action of a bimettalic strip located in the air cleaner. When the temperature under the bonnet is high, the bimetal is heated by the hot inlet air and lifts to allow the valve to open. The idling compensator valve partially opens at 55° (131°F) and is fully open at 65°C (149°F). The unit cannot be dismantled, as it is pre-sealed and correctly adjusted for valve timing. Fig.D.6. shows the layout of the idling compensator piping.

FUEL TANK - Replacing

The fuel tank can be removed in the following manner:

1. Remove the rear seat and back rest.
2. Take out the board behind the back rest.
3. Take out the luggage compartment lining board and disconnect the cable to the petrol gauge unit.
4. Disconnect the petrol filler tube from the tank.
5. Remove the tank retaining bolts and disconnect the rubber fuel outlet and return hoses.

Installation is a reversal of the removal procedure, always ensure that the fuel lines are carefully checked for signs of damage before replacing the tank.

FUEL PUMP -Testing

Pressure and capacity tests can be carried out with the pump installed, in the following manner:

Static pressure test:

Disconnect the fuel line at the carburettor, install an adaptor, "tee" fitting and suitable pressure gauge to the fuel line between carburettor and fuel pump. Start the engine and run it at varying speeds.

The reading on the gauge should be 0.18 - 0.24 kg/sq. cm (2.6 - 3.4 lb/sq.in). If the pressure is below the specified figure, then either one part of the pump has worn excessively or general wear has occured to all the working parts. The faults may include a ruptured diaphragm, worn and warped valves

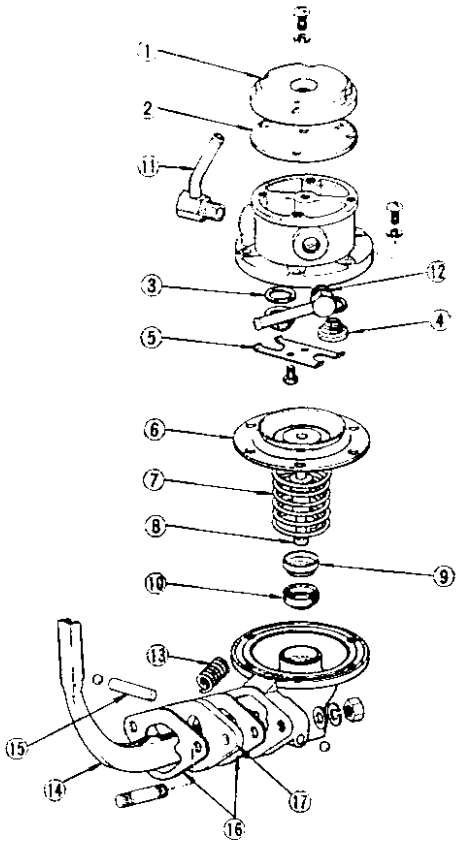
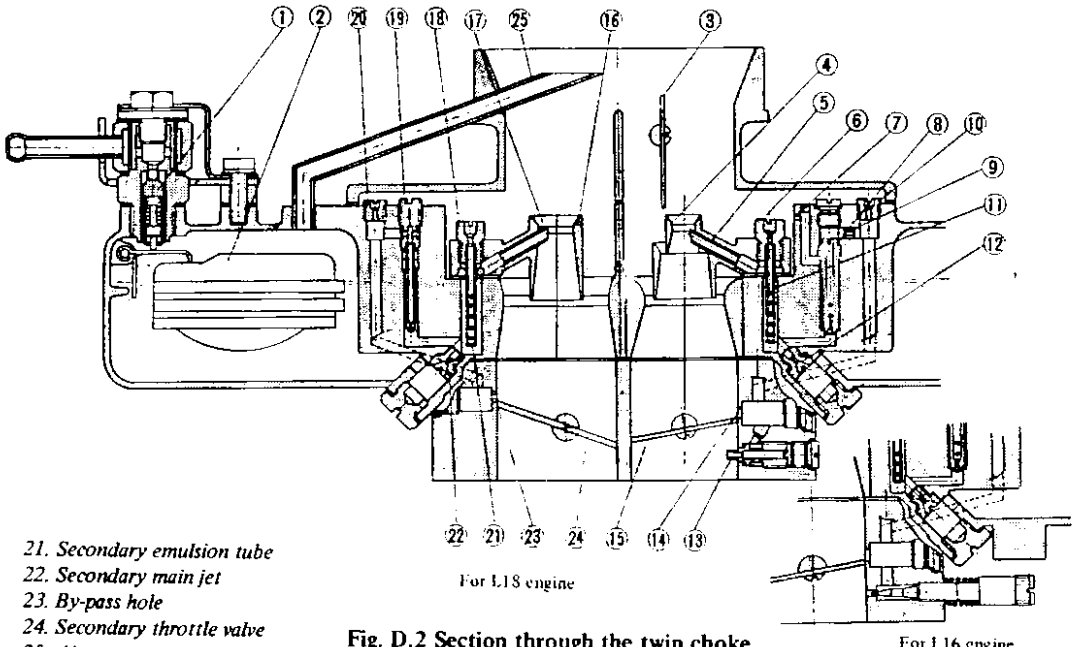


Fig. D.1 The fuel pump.

1. Cap
2. Gasket
3. Packing
4. Valve assembly
5. Valve retainer
6. Diaphragm assembly
7. Diaphragm spring
8. Pull rod
9. Seal washer
10. Seal
11. Inlet connector
12. Outlet connector
13. Rocker arm spring
14. Rocker arm
15. Rocker arm pin
16. Packing
17. Spacer



For L18 engine

For L16 engine

Fig. D.2 Section through the twin choke carburettor.

1. Float valve
2. Float
3. Choke valve
4. Small venturi (primary)
5. Primary main nozzle
6. Primary main air bleed
7. Primary slow air bleed
8. Slow running jet
9. Slow economizer jet
10. Secondary slow air bleed
11. Primary emulsion tube
12. Primary main jet
13. Idling nozzle
14. By-pass hole
15. Primary throttle valve
16. Secondary small venturi
17. Secondary main nozzle
18. Secondary main air bleed
19. Slow running jet
20. Slow running air bleed
21. Secondary emulsion tube
22. Secondary main jet
23. By-pass hole
24. Secondary throttle valve
25. Air vent pipe

and seats or a weak diaphragm return spring.

A pressure above the specified figure may be due to an excessively strong and tight diaphragm.

Capacity test:

The capacity test can be carried out when the static pressure has been tested and conforms with the specified figure of 0.18 kg/sq.cm (2.6 lb/sq.in).

Disconnect the fuel line at the carburettor and place a container under the end of the pipe to act as a fuel sump.

Start the engine and run it at a speed of 1000 r.p.m. The amount of fuel delivered from the pump in one minute should be 1000 cc. (2.1 US pt).

If petrol does not flow from the opened end of the pipe at the correct rate then either the fuel pipe is clogged or the pump is not operating correctly.

If the latter cause is suspected the pump must be removed and inspected as described below.

FUEL PUMP - Removing and Dismantling

Before removing the pump, take off the petrol tank cap and disconnect the pump inlet and outlet pipes. Blow through the pipes with compressed air to make sure that they are not clogged.

Remove the pump retaining nuts, withdraw the pump and dismantle it in the following order.

Referring to Fig.D.1.

1. Take out the screws holding the two body halves together and separate the upper body from the lower body.
2. Remove the cap and cap gasket.
3. Unscrew the elbow and connector.
4. Take off the valve retainer and remove the two valves.
5. To remove the diaphragm, diaphragm spring and lower body sealing washer, press the diaphragm down against the force of the spring and tilt the diaphragm at the same time so that the pull rod can be unhooked from the rocker arm link. (Fig.D.7.).

The rocker arm pin can be driven out with a suitable drift.

FUEL PUMP - Inspection and Assembly

Check the upper and lower body halves for cracks. Inspect the valve and valve spring assembly for signs of wear and make sure that the diaphragm is not holed or cracked, also make sure that the rocker arm is not worn at the point of contact with the camshaft.

The rocker arm pin may cause oil leakage, if worn, and should be renewed.

Assembly is a reversal of the dismantling procedure, noting the following points:

Fit new gaskets and lubricate the rocker arm link and the rocker arm pin before installing.

The pump can be tested by holding it approximately 1 metre (3 feet) above the level of fuel and with a pipe connected between the pump and fuel strainer.

Operate the rocker arm by hand; the pump is operating correctly if fuel is drawn up soon after the rocker arm is released.

CARBURETTOR IDLING ADJUSTMENT

The idling speed cannot be adjusted satisfactorily if the ignition timing is incorrect, if the spark plugs are dirty, or if the valve clearances are not correctly adjusted.

Before adjusting the idling speed, set the "hot" valve clearances to 0.25 mm (0.0098 in), for the intake valves and 0.30 mm (0.0118 in) for the exhaust valves, as described in the ENGINE section.

Idling adjustment is carried out with the throttle stop screw in conjunction with the idling adjustment screw (See Fig.D.8.).

Run the engine until it attains its normal operating temperature and then switch off.

Starting from the fully closed position, unscrew the idling adjustment screw by approximately three turns.

Screw the throttle stop screw in by two or three turns and start the engine.

Unscrew the throttle stop screw until the engine commences to run unevenly, then screw in the idling adjustment screw so that the engine runs smoothly at the highest speed.

Readjust the throttle stop screw to drop the engine speed of approximately 600 r.p.m. is obtained.

WARNING: Do not attempt to screw the idling adjustment screw down completely, or the tip of the screw may be damaged.

FAST IDLE OPENING ADJUSTMENT

The choke valve is synchronized with the throttle valve and connected to it by levers as shown in Fig.D.9. The fast idle opening can be check by fully closing the choke valve and measuring the clearance between the primary throttle valve and the wall of the throttle chamber. This clearance being shown as "A" in the illustration. The clearance for the carburettor types is as follows.

Carburettor type	Throttle opening angle	Dimension "A"
213304-361	18°	1.55mm (0.061in)
213304-421	18°	1.55mm (0.061in)
213282-331	19°	1.3 mm (0.051in)

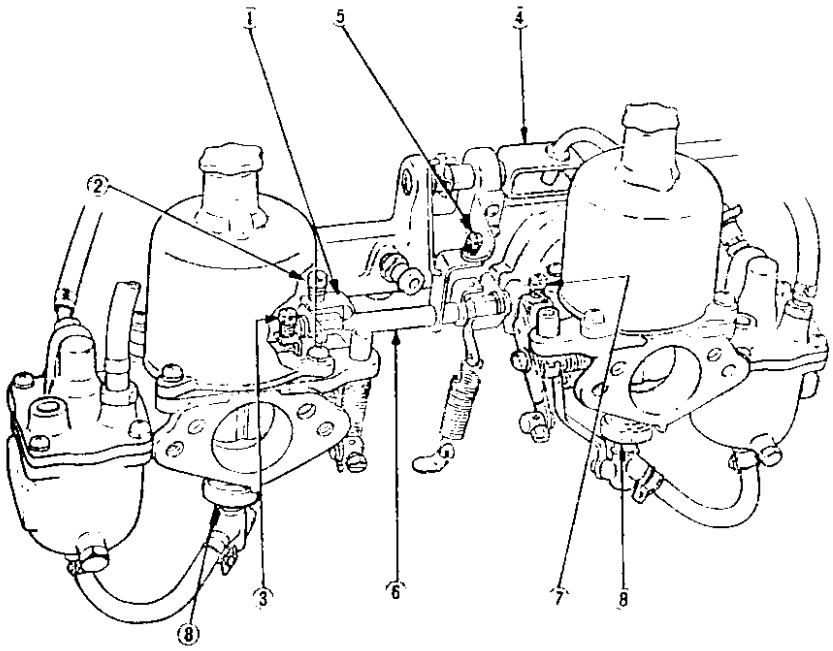


Fig. D.3 View of the SU twin type carburettors.

1. Throttle lever
2. Balance screw
3. Front throttle adjusting screw
4. Auxiliary shaft
5. Fast idle setting screw
6. Throttle shaft
7. Rear throttle adjusting screw
8. Idling adjustment nuts

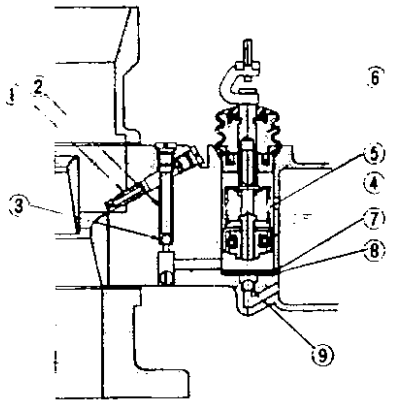


Fig. D.4 Accelerator pump mechanism.

1. Pump injector
2. Weight
2. Outlet valve
4. Piston
5. Damper spring
6. Piston return spring
7. Clip
8. Strainer
9. Inlet valve

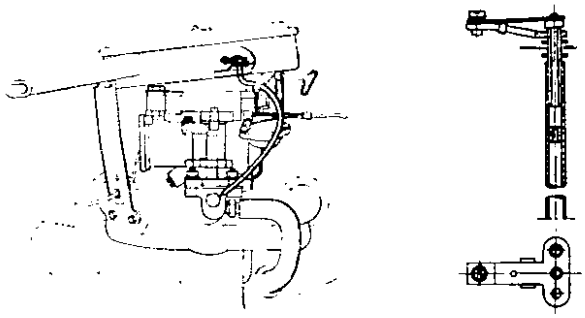


Fig. D.6 Idling compensator

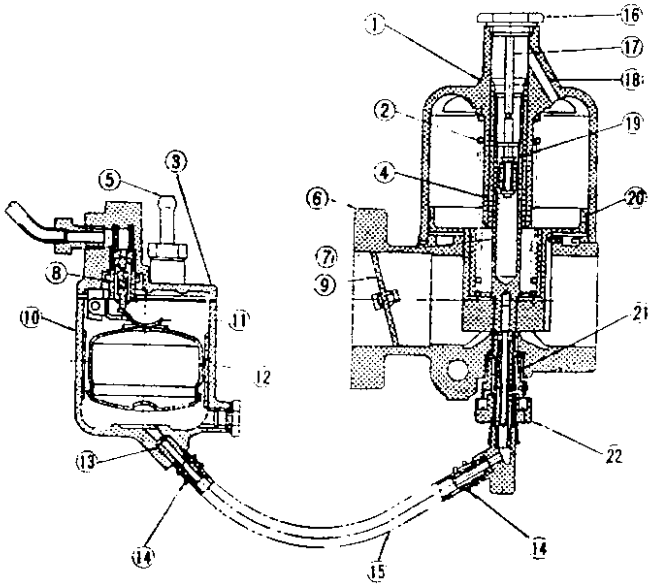


Fig. D.5 Section through the SU twin carburettor.

1. Suction chamber
2. Suction spring
3. Float chamber cover
4. Guide
5. Nipple
6. Throttle chamber
7. Piston rod
8. Needle valve
9. Throttle valve
10. Float chamber
11. Float lever
12. Float
13. Sleeve
14. Clip
15. Fuel hose
16. Oil cap nut
17. Plunger rod
18. Transverse hole
19. Oil damper
20. Suction piston
21. Nozzle
22. Idling adjustment nut

Carburettor type	Throttle opening angle	Dimension "A"
213282-341	19°	1.3mm(0.051in)
213282-221	20°	1.4mm(0.056in)

If adjustment is required the choke connecting rod can be carefully bent until the required clearance is obtained.

THROTTLE VALVES INTERLOCK OPENING ADJUSTMENT

Open the primary throttle valve 50° from the fully closed position as shown in Fig. D.10. At this angle the connecting link (2) should be at the extreme right of the groove in the primary throttle arm. The linkage between the primary and the secondary throttles is operating correctly if the clearance "G" between the primary throttle valve and the wall of the chamber is as follows:

Carburettor type	Dimension "G"
213304-361	6.3 mm (0.248 in)
213304-421	6.3 mm (0.248 in)
213282-331	7.4 mm (0.291 in)
213282-341	7.4 mm (0.291 in)

Adjustment can be made, if necessary, by bending the connecting link until the required clearance is obtained.

DASHPOT ADJUSTMENT

This adjustment is only required on carburettors fitted to vehicles with automatic transmission. Correct contact must be made between the throttle lever and the dashpot stem (See Fig.D.11.). Adjustment can be carried out, if necessary by slackening the locknut (2) and then rotating the dashpot in either direction so that the throttle arm touches the stem at a throttle valve opening angle of 11°. At this angle the clearance "B", between the throttle valve and the wall of the chamber should be as follows:

Carburettor type.	Dimension "B"
213304- 421	0.780mm 90.0307 in)
213282-341	0.586mm (0.0231 in)

Retighten the locknut after completing the adjustment.

CARBURETTOR - Removal and Overhaul

The carburettor can be removed from the engine in the following manner:

1. Remove the air cleaner assembly.
2. Disconnect the fuel and vacuum pipes and the choke wire from the carburettor.
3. Remove the throttle lever and take off the nuts and washers securing the carburettor to the manifold.
4. Lift the carburettor away from the manifold and discard the gasket.

To dismantle the carburettor for a complete overhaul remove the primary and secondary main jets and needle valves, these are accessible from the exterior of the carburettor.

Remove the choke connecting rod, pump lever, return spring and set screws and take off the choke chamber.

The primary and secondary emulsion tubes can be withdrawn after removing the main air bleed screws.

If the accelerator pump is to be checked, take off the pump cover, but take care not to lose the return spring and inlet valve ball situated at the lower part of the piston.

Separate the throttle chamber from the float chamber by removing the retaining screws; leave the throttle valve intact unless otherwise required.

All parts of the carburettor must be carefully cleaned and sediment, gum, or other deposits removed.

Clean the jets by blowing through them with compressed air. Never push wire through the jets or passages or the orifices will be enlarged and the calibration affected.

Check all parts for signs of wear and exchange them if necessary.

Examine the float needle and seat for wear and make sure that the throttle and choke bores in the throttle body and cover are not worn or out of round. If the idling adjustment needles have burrs or ridges they must be replaced.

Inspect the gaskets to make sure that they are not hard and brittle or distorted.

Clean the filter screen if it is clogged, or change it if it is otherwise unsatisfactory.

Check the operation of the accelerator pump by pouring petrol into the float chamber and operating the throttle lever. Petrol should spurt from the pump discharge jet if the pump is working correctly. If petrol cannot be ejected from the jet when the lever is actuated, clean the discharge jet by blowing through it with compressed air.

CARBURETTOR - Assembly and Installation

The assembly and installation of the carburettor is a reversal of the dismantling and removal procedures, noting the following points:

Always replace the gaskets if they are not satisfactory and take care that the carburettor linkage operates smoothly and is not bent or distorted.

The performance of the carburettor will depend on the condition of the jets and air bleeds. As previously stated these parts should be cleaned using petrol and compressed air only. Replacement jets or air bleed screws can be used to provide greater economy, or to increase output whatever the requirement. When the carburettor is installed, adjust the idling speed as previously described.

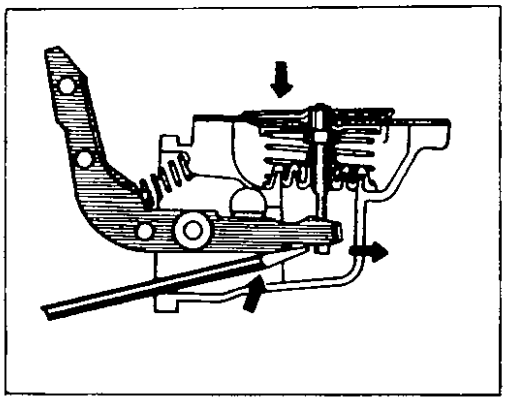


Fig. D.7 Removing the pump diaphragm

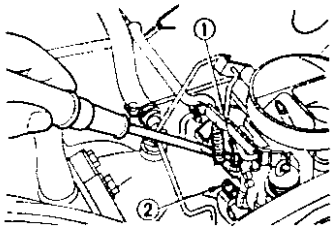


Fig. D.8 Twin choke carburettor idling adjustment.

1. Throttle adjusting screw
2. Idling adjustment screw

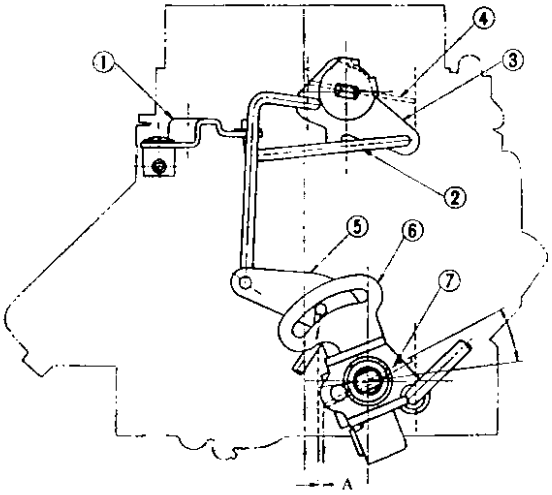


Fig. D.9 Fast idle opening adjustment.

1. Choke lever
2. Crank rod
3. Choke arm
4. Choke valve
5. Starting lever
6. Throttle arm
7. Throttle valve

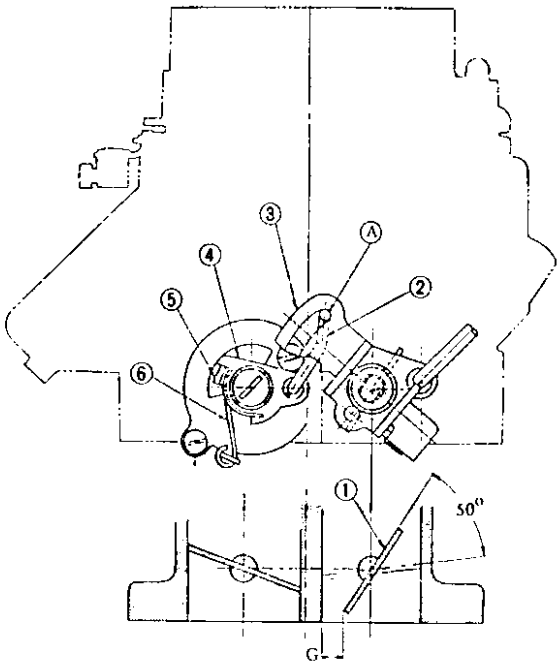


Fig. D.10 Adjusting the interlock throttle valve opening

1. Throttle valve
2. Connecting lever
3. Throttle arm
4. Rocking arm
5. Secondary throttle arm
6. Return spring

FLOAT LEVEL - Adjustment

A constant fuel level in the float chamber is maintained by the float and ball valve (Fig.D.12.). If the fuel level is not in accordance with the level gauge line it will be necessary to carefully bend the float seat until the float upper position is correctly set. (Fig.D.13.).

The clearance "H" between the valve stem and float seat should be 1.0 mm (0.039 in), with the float fully lifted as shown. Adjustment can be carried out by carefully bending the float stopper (Fig.D.14.) until the required clearance is obtained.

SU TWIN CARBURETTORS - Adjustments

It is essential that the two carburettors are correctly adjusted if peak performance and economical fuel consumption is to be realized. Incorrect carburettor adjustment will have an adverse affect during idling and on acceleration, etc.,

Carburettor synchronization and idling adjustment.

Run the engine until it reaches its normal operating temperature, remove the air cleaner and slacken the front and rear throttle adjusting screws, the balance screw and the fast idling setting screw. Make sure that the front and rear throttle shafts are not connected. Fully tighten the idling adjustment nuts of the front and rear carburettors (Fig.D.15.), the back off each nut by an equal amount and by one and a half to two turns.

Screw in the front and rear throttle adjusting screws by a few turns and start the engine. Allow the engine to reach its normal operating temperature, before proceding to the next stage.

Adjust the front and rear throttle adjusting screws until the engine speed is reduced to approximately 600 - 700 r.p.m. The engine should turn over smoothly and consistently. Apply a flow meter to the front carburettor air cleaner flange and turn the adjustment screw on the flow meter so that the upper end of the float in the glass tube is in line with the scale. Lift off the flow meter and apply it to the rear carburettor air cleaner flange without altering the setting of the flow meter adjusting screw. If the position of the flow meter float is not aligned with the scale adjust the rear carburettor throttle adjusting screw to align the float with the mark on the scale.

With the carburettor flow correctly adjusted, turn the idling adjustment nuts of both carburettors approximately 1/8 of a turn either way to obtain a fast and stable engine speed. Both nuts must be turned by an equal amount.

Back off the front and rear throttle adjusting screws and adjust the engine speed to the specified value of 650 r.p.m. for the standard engine, or 700 r.p.m. with vehicles fitted with automatic transmission. Make sure that the air flow of both carburettors remains unchanged. Screw in the balance screw until the screw head contacts the throttle shafts without changing the idling speed setting.

Move the throttle connecting shaft and accelerate the engine a few times, then check that the idling speed is unchanged.

Turn the fast idle setting screw to increase the engine speed to approximately 1500 r.p.m. and recheck with the flow meter that the air flow for both carburettors is correctly matched. . If the air flow is uneven it will be necessary to readjust the balance screw.

Finally back off the fast idle setting screw (Fig.D.16.). and decrease the engine speed. Apply the flow meter to the carburettors to confirm that the float positions are even. Readjust, if necessary, by means of the throttle adjusting screws. Stop the engine and fit the air cleaner.

SU TWIN CARBURETTOR - Dismantling
Piston and suction chamber - Dismantling

Unscrew the plug and withdraw the piston damper (Fig.D. 17.). Remove the four set screws and lift out the suction chamber, withdraw the spring, nylon washer and the piston. Take care not the damage the jet needle and the interior of the suction chamber.

Do not remove the jet needle from the piston unless absolutely necessary. If a replacement is to be fitted ensure that the shoulder of the needle is flush with the lower face of the piston. This operation can be accomplished by holding a straight-edge over the shoulder of the needle and then tightening the set screw as shown in Fig.D.18.

Wash the suction chamber and piston with clean solvent and dry with compressed air. Lubricate the piston rod with a light oil. Do NOT lubricate the large end of the piston or the interior of the suction chamber.

NOZZLE - Dismantling

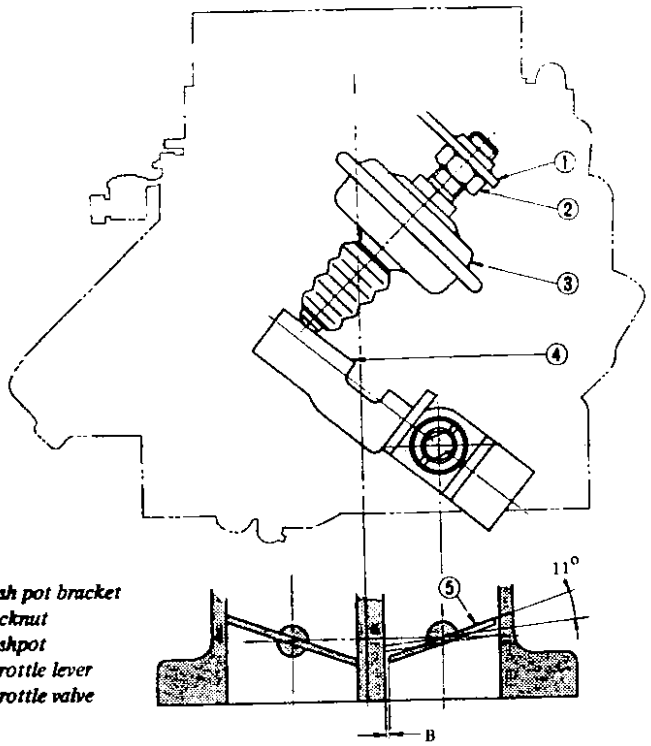
The nozzle (See Fig.D.19.) can be removed quite easily, but should not be dismantled unless absolutely necessary, as reassembly of the nozzle sleeve, washer, and nozzle sleeve set screw is an extremely intricate operation.

To remove the nozzle, detach the connecting plate from the nozzle head; pulling lightly on the starter lever to ease the operation. Loosen the retaining clip, take off the fuel line and remove the nozzle. Be careful not to damage either the jet needle or the nozzle. Remove the idle adjusting nut and spring. The nozzle sleeve can be removed, if necessary, by taking out the set screw, but as previously stated should not be dismantled unless absolutely necessary.

SU TWIN CARBURETTOR - Assembly

Assemble the piston assembly into position, but do not fill with damper oil.

Assemble the nozzle sleeve, washer and set screw by temporarily tightening the set screw. Set the piston to its fully closed position and insert the nozzle until it contacts the nozzle sleeve. When the nozzle jet contacts the jet needle the nozzle sleeve must be slightly adjusted so that it is at right angles to the centre axis and positioned to leave the nozzle jet clear of the jet needle. Raise the piston without disturbing the setting and allow it to drop. The piston should drop smoothly until the stop pin strikes the venturi with a light metallic click. (See below under - Centering the jet.) Tighten the nozzle sleeve set screw, remove the nozzle, install the idle adjusting spring and adjusting nut on the nozzle sleeve and refit the nozzle.



1. Dash pot bracket
2. Locknut
3. Dashpot
4. Throttle lever
5. Throttle valve

Fig. D.11 Adjusting the dash pot clearance

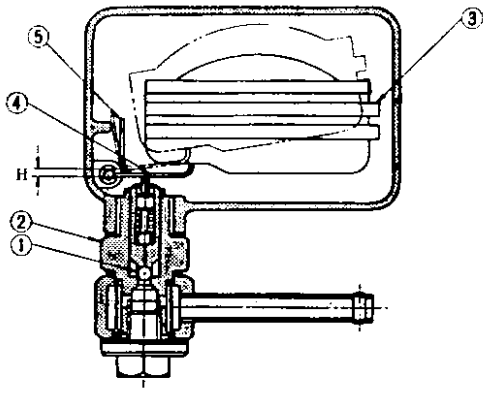


Fig. D.12 Adjusting the float level.

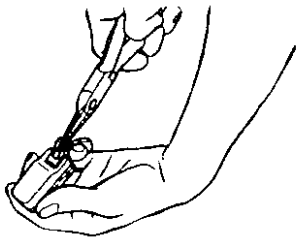


Fig. D.13 Adjusting the float seat.

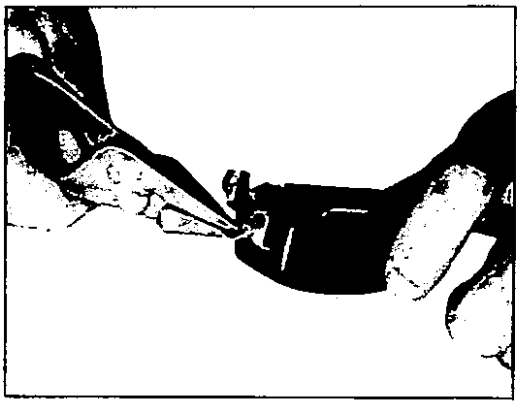


Fig. D.14 Adjusting the float stopper.

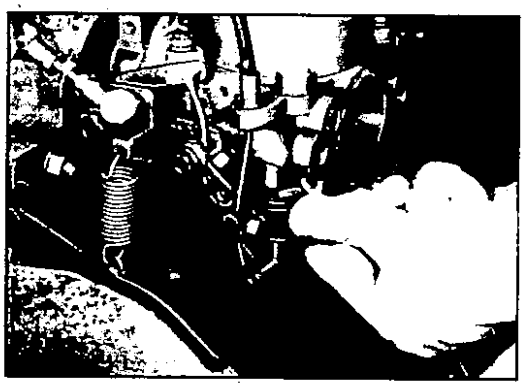


Fig. D.15 Idling adjustment - SU twin carburettors.

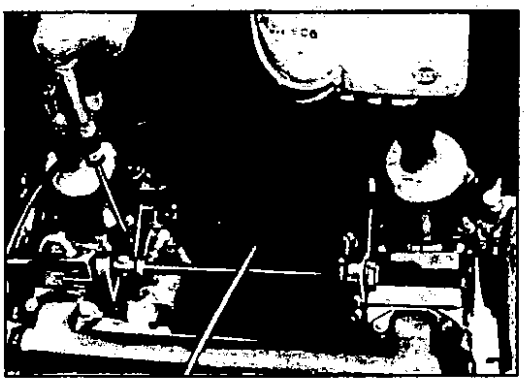
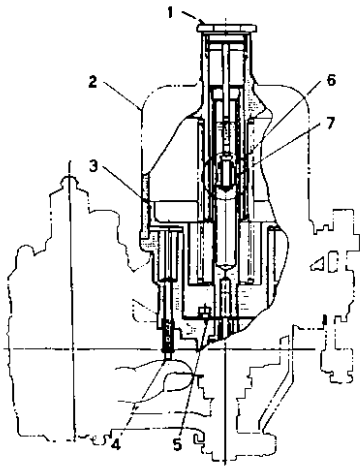
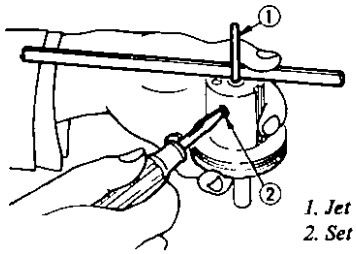


Fig. D.16 Adjusting the fast idle setting - SU twin carburettors.



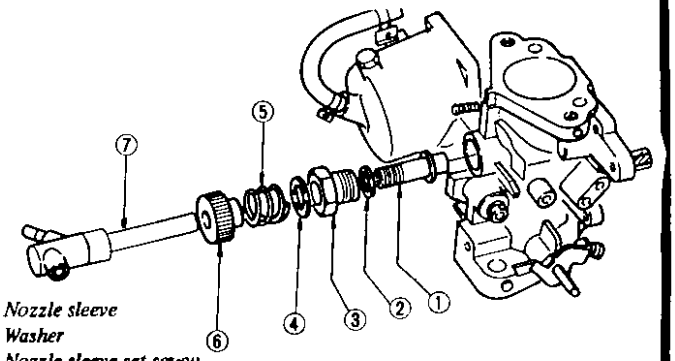
1. Oil cap nut
2. Suction chamber
3. Suction piston
4. Lifting pin
5. Stop pin
6. Oil damper
7. Plunger

Fig. D.17 Inspecting the suction piston.



1. Jet needle
2. Set screw

Fig. D.18 Installing the jet needle.



1. Nozzle sleeve
2. Washer
3. Nozzle sleeve set screw
4. Adjusting shim
5. Idling adjustment spring
6. Idling adjustment nut
7. Nozzle

Fig. D.19 Dismantling the nozzle assembly

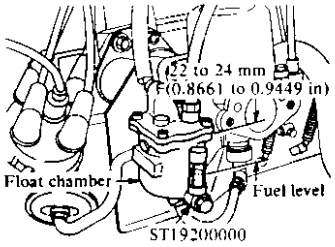
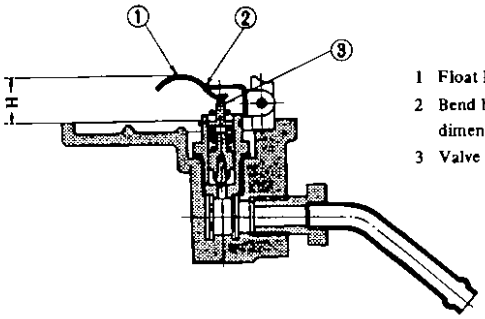
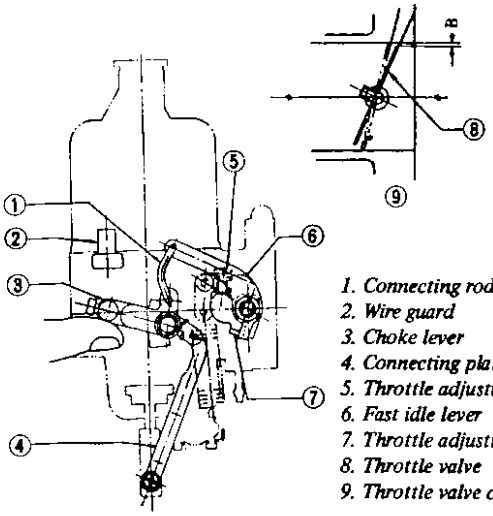


Fig. D.20 Checking the float level - SU twin carburettors.



1 Float lever
2 Bend here to adjust dimension "H"
3 Valve stem

Fig. D.21 Adjusting the float level - SU twin carburettors.



1. Connecting rod
2. Wire guard
3. Choke lever
4. Connecting plate
5. Throttle adjusting screw
6. Fast idle lever
7. Throttle adjusting plate
8. Throttle valve
9. Throttle valve clearance (B)

Fig. D.22 Adjusting the starting interlock opening.

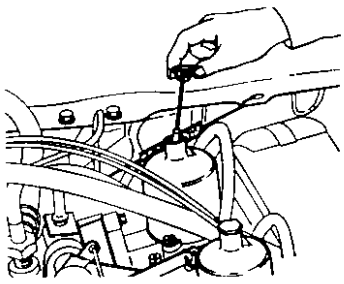


Fig. D.23 Checking the damper oil.

Connect the fuel line from the float chamber to the nozzle nipple and tighten the retaining clip. Pull out the choke lever and place the connecting plate between the washer and sleeve collar. Screw the plate to the nozzle head and check that the collar is installed in the hole in the plate by moving the choke lever as necessary.

Recheck the piston to make sure that it falls freely without binding.

SU TWIN CARBURETTOR - Centering the jet.

Remove the damper oil cap nut and gradually raise the lifter pin (4 in Fig.D.17.).

Continue to raise the lifter pin until the head of the pin raises the piston by approximately 8 mm (0.31 in). When the lifter pin is released the piston should drop freely and strike the venturi, with a light metallic click. If the piston does not fall freely it will be necessary to dismantle the carburettor in the manner previously described.

SU TWIN CARBURETTOR
FLOAT LEVEL - Inspection and Adjustment

The fuel level in the float chamber can be checked using the special gauge ST 19200000. Remove the float chamber drain plug and install the special gauge as shown in Fig.D.20.

Start the engine and allow it to run at idling speed. The fuel level is correct if it is indicated on the glass tube at a distance of 22 - 24 mm (0.866 - 0.945 in) below the top of the float chamber.

The level of the fuel can be corrected if necessary by adjusting the float level in the following manner.

Take out the float chamber cover securing screws and lift off the cover and attached float lever. Hold the cover so that the float lever is facing upwards. Lift the float lever and then lower it until the float lever seat just contacts the valve stem. The dimension "H" in Fig.D.21. should be 11-12 mm (0.43 - 0.47 in) and can be corrected by bending the float lever at the point indicated.

SU TWIN CARBURETTOR
Starting interlock valve opening adjustment

To adjust the starting interlock opening, the connecting rod (4 in Fig.D.22.). must be bent using a suitable pair of pliers. The throttle opening can be increased by lengthening the connecting rod, or reduced by shortening the rod.

The throttle opening is correctly adjusted when the clearance "B" between the throttle valve and throttle chamber is set to 0.6 mm (0.023 in) with the choke lever half completely out.

HYDRAULIC DAMPER

The damper oil should be checked approximately every 5000 km (3000 miles). To check the oil level, remove the oil cap nut as shown in Fig.D.23. and check the level of oil against the two grooves on the plunger rod. Top up with SAE 20 engine oil, if the oil level is below the lower of the two grooves. Take care not to bend the plunger rod when removing and replacing the oil cap nut and make sure that the nut is sufficiently tightened by hand.

Technical Data

Engine Model	L14 (1400cc)		L16 (1600cc)		L18 (1800cc)	
	Primary	Secondary	Primary	Secondary	Primary	Secondary
Outlet diameter	28mm	32mm	28mm	32mm	30mm	34mm
Venturi diameter	21x7mm	28x10mm	22x7mm	29x10mm	23x14x7mm	30x10mm
Main jet	96	165	102	165	102	170
Main air bleed	60	60	60	60	60	60
1st slow air bleed	1.0mm	-	1.0mm	-	1.0mm	-
2nd slow air bleed	220	100	180	100	210	100
Economizer	1.6	-	1.6	-	1.6	-
Power jet	55		55		55	
Float level	22mm		22mm		22m	
Fuel pressure	0.24 kg/sq.cm, 3.4 lb/sq.in.					
Main nozzle	2.2mm	2.5mm	2.3mm	2.5mm	2.3mm	2.8mm

SU Twin Carburettors

Type	HJL 38 W6
Bore diameter	38mm (1.4961 in)
Piston lift	29mm (1.417 in)
Jet needle	M-76
Nozzle jet diameter	2.34 mm (0.0921 in)
Suction spring	No.23.
Float needle valve inner diameter	1.5mm (0.059 in)
Float level	23mm (0.9055 in)
Throttle clearance at full throttle	0.6mm (0.0236 in)
Position at full throttle	6.5°

FUEL PUMP

Type	Mechanical
Delivery amount	1000cc/minute at 1000 r.p.m.
Delivery pressure	0.18-0.24 kg/sq.cm. (2.5 - 3.4 lb/sq.in.)
Drive	from eccentric on cam-shaft.

Clutch

DESCRIPTION

Either a diaphragm spring, or coil spring type clutch is fitted to the vehicle. The component parts of the diaphragm spring clutch are shown in Fig.E.1. and the component parts of the coil spring clutch are shown in Fig.E.2.

The clutch is of the single dry plate type, consisting of the drive plate, clutch cover and pressure plate, and release bearing.

The driven plate comprises a flexible disc and splined hub which slides on the clutch shaft. Friction linings are rivetted to both sides of the disc.

The clutch cover and pressure plate are combined by nine spring setting bolts. The diaphragm is dished to maintain a constant pressure on the pressure plate, which in turn holds the driven plate in contact with the flywheel. The release bearing is a sealed type ball bearing mounted on a bearing sleeve. Both bearing and sleeve are operated by the withdrawal lever when the clutch pedal is operated.

The clutch pedal actuates a master cylinder which transmits fluid under pressure to a slave cylinder. The movement of the slave cylinder piston operates the clutch withdrawal lever via a push rod (See Fig.E.14 .).

CLUTCH - Removal and Dismantling

The gearbox must be removed from the vehicle before the clutch can be withdrawn. The procedures for removing the gearbox can be found in the section GEARBOX.

If a diaphragm clutch is fitted insert a spare clutch shaft or a special alignment tool ST20600000, into the splines of the driven plate. So that the clutch is supported. Slacken the six bolts securing the clutch cover to the flywheel by a single turn at a time and in a diagonal pattern until the spring pressure is relieved. Remove the bolts completely and lift away the clutch assembly.

When removing the coil spring type clutch it will be necessary to insert suitable hooks under the release levers to restrain the tension of the clutch spring before removing the clutch cover bolts.

Ensure that the friction linings of the driven plate do not become comtaminated with oil or grease when removing the plate from the splined shaft.

Diaphragm clutch:

The clutch cover and pressure plate assembly should not be dismantled and must be replaced if wear or damage has occurred. Make sure that the friction face of the pressure plate is perfectly flat and smooth.

Coil spring clutch:

A special tool No. ST20050000 is available to ensure that the clutch can be dismantled and accurately reassembled. The tool, shown in Fig.E.3. consists of a Base plate (1), Centre spigot (2), Distance pieces (3), Height gauge (4), Operating lever (5), Securing bolts (6).

A chart is included to indicate the various parts to be used for each type of clutch.

To dismantle the clutch, place the distance pieces on the base plate as shown and arrange the clutch cover on the base plate so that the cover holes coincide with the threaded holes in the base plate. Insert the securing bolts provided in the kit and tighten them gradually and evenly in a diagonal pattern until the cover is firmly attached to the base plate. Mark the clutch cover, the pressure plate lugs and the release levers with a centre punch, so that they can be reassembled in their original positions.

Remove the restraining hooks from the release levers and unscrew the three nuts from the eye-bolts. Slowly release the pressure on the clutch coil springs by unscrewing the bolts securing the cover to the base plate and lift off the cover, springs and pressure plate.

CLUTCH - Inspection and Adjustment

Use a solvent to clean the dismantled parts, with the exception of the disc linings and the release bearing.

Check the clutch cover, diaphragm spring and pressure plate assembly for wear or damage and renew the complete assembly if necessary. The pressure plate on the coil spring clutch can be lapped, if necessary as described below. Ensure that the disc rivets are not loosened and inspect the linings for contamination. Grease or oil should be removed and the linings dressed using a wire brush.

Check the disc for run-out using a dial gauge as shown in Fig.E.4. Position the dial gauge at a point approximately 95mm (3.74 in.) from the centre of the disc and check that the run-out does not exceed the permissible limit of 0.5 mm (0.02in). A slight deflection can be corrected by hand pressure, with the disc mounted on the gearbox shaft.

The disc must be renewed or relined if the height of the linings above the rivets is less than 0.3mm (0.012 in). Replace the bearing sleeve if it shows signs of wear at the point of contact with the withdrawal lever. Replace the release bearing if grease is leaking from it, or if it is noisy when turned.

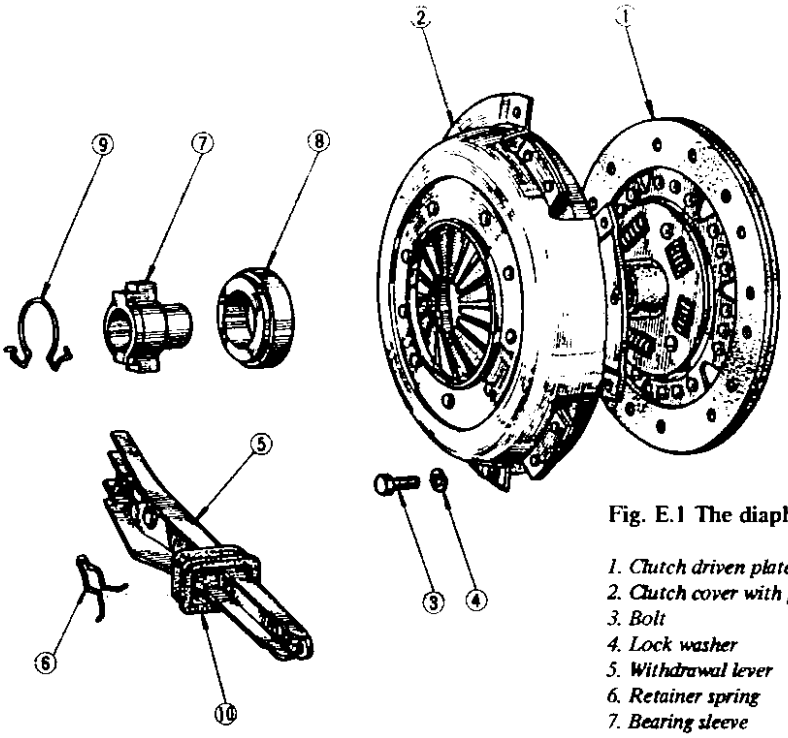


Fig. E.1 The diaphragm spring clutch.

1. Clutch driven plate
2. Clutch cover with pressure plate
3. Bolt
4. Lock washer
5. Withdrawal lever
6. Retainer spring
7. Bearing sleeve
8. Release bearing
9. Bearing sleeve holder spring
10. Dust cover

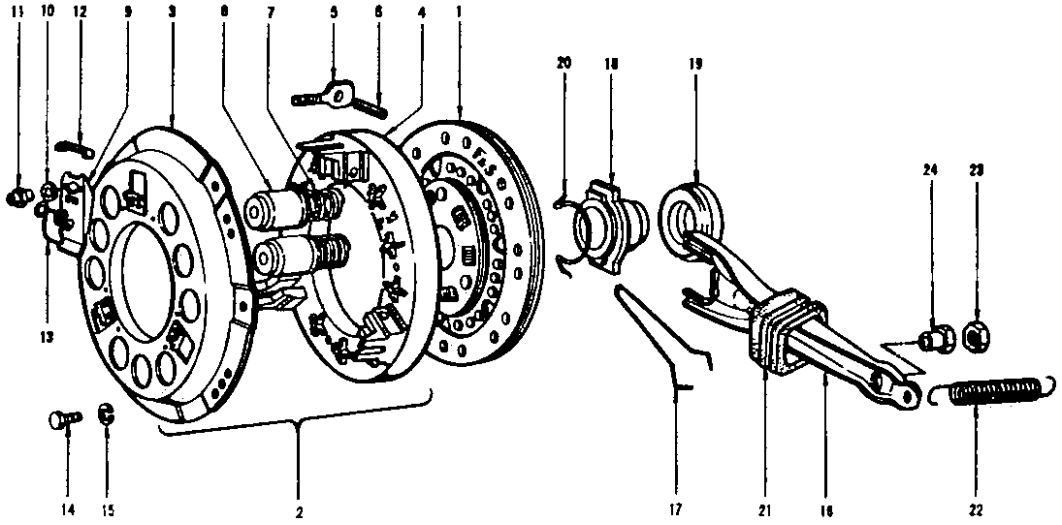


Fig. E.2 The coil spring clutch.

1. Clutch driven plate
2. Clutch assembly
3. Clutch cover
4. Pressure plate
5. Bolt
6. Eye bolt pivot pin
7. Pressure spring
8. Spring retainer
9. Release lever
10. Release lever seat
11. Locknut
12. Release lever support
13. Retaining spring
14. Bolt
15. Lock washer
16. Clutch withdrawal lever
17. Retainer spring
18. Bearing sleeve
19. Release bearing
20. Retaining clip
21. Dust cover
22. Return spring
23. Locknut
24. Withdrawal lever pusher

The coil spring clutch pressure plate can be lapped with a surface grinder to remove dents or scratches only the minimum amount of metal should be removed to restore the surface.

Check the plate for distortion by placing it on a surface plate, with the friction face towards the surface plate. Press the pressure plate down and insert a feeler gauge of 1.0mm (0.0039 in) between the pressure plate and surface plate. If it is possible to insert the feeler gauge then the pressure plate must be repaired or replaced. The plate can be skimmed but the maximum amount of metal that can be removed is 1.0mm (0.0039in).

CLUTCH SPRING - Diaphragm clutch

With the diaphragm spring assembled to the pressure plate inspect the spring height and load in the following manner. Place distance pieces of 7.8 mm (0.307 in) on the base plate as shown in Fig.E.3. and bolt down the clutch cover, using the special bolts provided with the kit. Measure the height "B" in Fig.E.5. at a diameter of 44mm (1.732 in). The release fingers should not exceed a height of 43 - 45 mm (1.693-1.772 in) from the base plate. Replace the spring if the height is in excess of the figures quoted.

Press the clutch down, as shown in Fig.E.6. to a depth of 7.8mm (0.307 in), or until the clutch driven plate upper surface lines up with the clutch cover mounting face. If the load applied is less than 350 kg (770 lbs), it will be necessary to renew the diaphragm spring. Do not press the clutch disc down by more than 9mm (0.35 in) or the diaphragm spring may be broken.

CLUTCH SPRINGS - Coil spring clutch

The clutch springs must be replaced as a set if any of the springs are found to be defective. Specifications for the springs are given in Technical Data at the end of this section. Generally a spring may be considered faulty if when assembled the load is reduced by more than 15% or if the free length has altered by more than 1.5mm (0.0590 in), or if the deflection "B" to "A" in Fig.E.7. exceeds 5mm per 100mm (0.2 in per 3.94 in).

Release Bearing

The release bearing should be renewed if excessively worn, or if roughness can be felt when the bearing is turned by hand. The bearing should also be renewed if the grease has leaked away, or if the clearance between the clutch cover and inner diameter of the sleeve is more than 0.5 mm (0.0197 in).

The bearing can be removed using a conventional puller as shown in Fig.E.8. Two types of release bearings are available and care must be taken when fitting onto the bearing sleeve. The release bearing should be pressed into place on the diaphragm spring type of clutch with a force of 400 kg (880 lbs) applied at the outer race as shown in Fig.E.9. On the coil spring clutch the same force must be applied at the inner race as shown in Fig.E.10. It should be possible to turn the bearing freely and smoothly when it is pressed into place.

CLUTCH - Assembly (Coil spring type)

Press the pin into the eyebolt and through the lug on the pressure plate. Place the three distance pieces on the surface of the base plate of the special tool ST20050000, and position the pressure plate, pressure springs and retainers on the plate.

Set the retracting springs on the cover and insert the release levers through the spring. Place the clutch cover over the pressure plate and springs making sure that the retracting springs do not become dislodged or distorted.

Compress the pressure springs by screwing the special set bolts into the holes in the cover. Tighten the bolts gradually in a diagonal pattern to avoid distorting the cover. Place the release levers on the eye bolts and screw on the securing nuts. Place retaining hooks under the release levers and remove the clutch assembly from the base plate, slackening the set bolts in a diagonal pattern.

COIL SPRING CLUTCH - Adjusting

Screw the centre pillar into the base plate and place the high finger over the pillar. The height of the release levers must be adjusted by turning the eye bolt nuts until the tops of the release levers are just touching the tip of the gauge. (See Fig.E. 11.). Remove the centre pillar when the release levers are correctly adjusted and screw in the actuating lever (Fig.E.12.). Turn the actuating mechanism several times to bed down the parts and then recheck the height of the release levers. Check for run-out as near to the edge as possible and readjust if the deviation is more than 0.5 mm (0.020 in).

CLUTCH - Installation

Ensure that the friction faces are free from oil and grease and place the driven plate on the flywheel. The longer chamfered splined end of the assembly should face the gearbox. Use a spare drive shaft to align the driven plate. The shaft must be inserted through the splined hub of the driven plate and into the pilot bearing of the flywheel.

Place the clutch cover into position on the flywheel and tighten the clutch bolts gradually in a diagonal pattern to a torque reading of 1.5 - 2.2 kgm (11-16 lb.ft.). Remove the dummy shaft and the restraining hooks from the release levers. Refit the release bearing and the bell housing.

CLUTCH PEDAL - Removal and Installation

Remove the clevis pin from the end of the master cylinder pushrod and disconnect the pushrod. Remove the return spring. Remove the pushrod after slackening the pushrod adjuster. (Coil spring clutch only). Remove the pedal lever securing bolt; slacken the handbrake bracket bolts and lift out the pedal.

Clean all parts thoroughly and check them for wear or damage, paying particular attention to the rubber parts, return spring and pedal lever bush.

Installation of the clutch pedal is a reversal of the removal procedures.

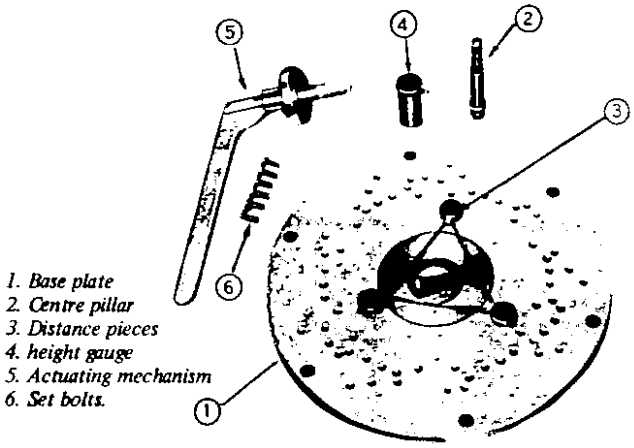


Fig. E.3 Clutch assembly tool.

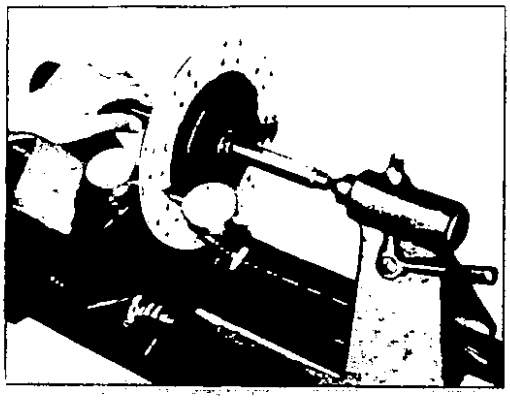


Fig. E.4 Checking the driven plate for run-out.

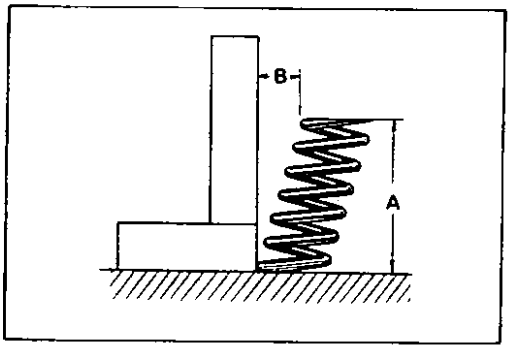


Fig. E.5 Checking the height of the diaphragm spring.

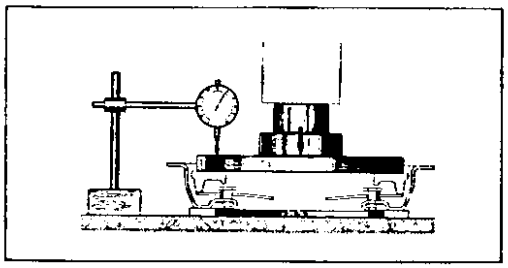


Fig. E.6 Checking the load of the diaphragm spring.

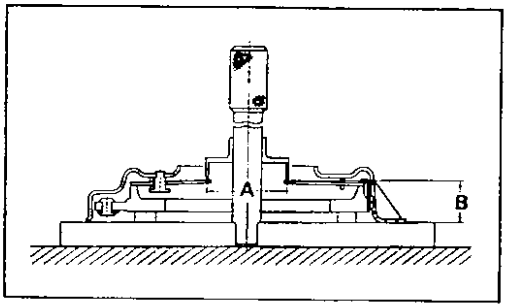


Fig. E.7 Inspecting the clutch springs for distortion.

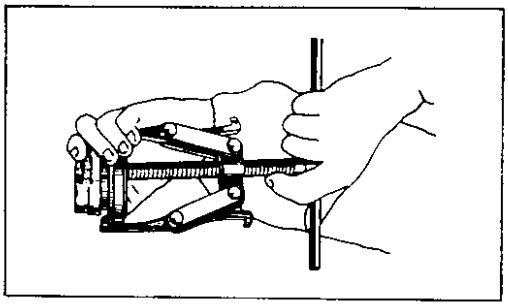


Fig. E.8 Removing the release bearing.

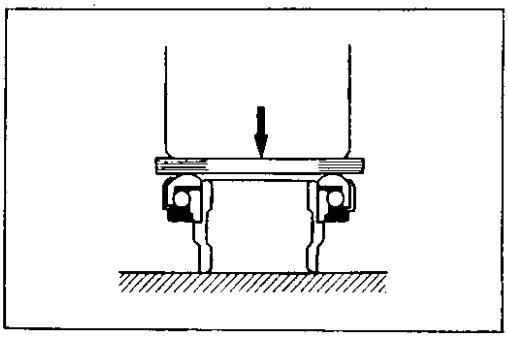


Fig. E.9 Installing the release bearing (diaphragm spring).

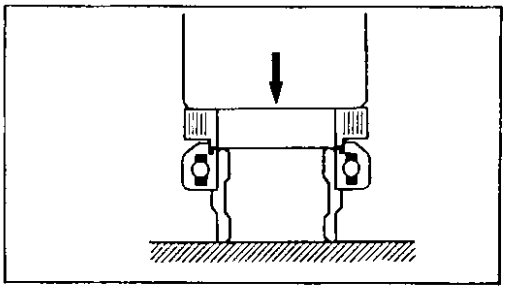


Fig. E.10 Installing the release bearing (coil spring).

CLUTCH PEDAL - Adjusting (1400 and 1600 cc models)

Adjust the pedal height to 209 mm (8.22 in) with the pedal stop slackened off, by altering the length of the master cylinder push rod. (See Fig.E.13.). Tighten the pedal stop and obtain a pedal height of 207 mm (8.15 in) for Left Hand drive models, or 182 mm (7.17 in) for Right Hand drive models. Secure the stop by tightening the locknut and make sure that the points illustrated are correctly greased.

CLUTCH PEDAL - Adjusting (1800cc models)

Adjust the pedal height to 175 mm (6.89 in) by adjusting the pedal stop (See Fig.E.13.), then retighten the locknut "A" to a torque reading of 0.79 - 1.07 kgm (6-8lb.ft.). Turn the master cylinder push rod to obtain a play between 1-5mm (0.04 - 0.2 in) at the clevis pin, then tighten the locknut "B" to a torque reading of 0.79 - 1.07 kgm (6.-8 lb.ft.). Ensure when adjusting the play that the port on the master cylinder is not blocked, too small a play at the clevis pin may block the port. Bend the clevis pin over completely.

CLUTCH MASTER CYLINDER - Removal and Dismantling

1. Disconnect the push rod from the clevis (Fig.E.14.).
2. Detach the fluid line from the master cylinder and pump the fluid into a suitable container.
3. Withdraw the retaining bolts and remove the master cylinder assembly from the vehicle.

To dismantle the master cylinder, remove the filler cap and drain away the fluid.

Pull back the dust cover and remove the snap ring, the stopper, push rod, piston assembly and return spring.

Clean the components in brake fluid and check them for wear or damage.

Renew the cylinder and piston if uneven wear has taken place; the clearance between the cylinder and piston must not exceed 0.13 mm (0.005 in).

Renew the dust cover, oil reservoir, filler cap and fluid line, if necessary.

Reassembly of the master cylinder is a reversal of the dismantling procedure, take care to soak the components in brake fluid and assemble them while still wet.

When the master cylinder is installed in the vehicle make sure that the pedal height is adjusted, as previously described and bleed the hydraulic system by following the procedures given under the heading CLUTCH SYSTEM - Bleeding.

CLUTCH SLAVE CYLINDER - Removal and Dismantling

1. Remove the return spring.
2. Disconnect the fluid line from the slave cylinder.
3. Disconnect the push rod from the clutch withdrawal lever.
4. Take out the mounting bolts and withdraw the slave cylinder from the clutch housing.

To dismantle the slave cylinder, remove the dust cover and snap ring and withdraw the remaining parts from the cylinder.

Clean all components carefully and check them for signs of damage or wear, renew any part found to be defective and fit a new piston seal.

CLUTCH SLAVE CYLINDER - Assembly and Installation

Reassembly is a reversal of the dismantling procedure. Ensure that the parts are dipped in brake fluid before assembling and that the piston seal is correctly installed.

When the slave cylinder is installed in the vehicle, bleed the hydraulic system by following the procedures given under the heading CLUTCH SYSTEM - Bleeding.

The push rod must be adjusted so that the withdrawal lever has an end play of 2.0 - 2.3 mm (0.078 - 0.091 in.); details of this operation are given below.

CLUTCH WITHDRAWAL LEVER - Adjusting

The correct adjustment of the clutch withdrawal lever is most essential, as insufficient clearance between the clutch release bearing and the diaphragm will cause the clutch to slip. On the other hand an excessive clearance will prevent the clutch from disengaging correctly.

The clearance between the release bearing and diaphragm or release levers can be adjusted in the following manner:

Slacken the locknut (Fig.E.15.) and screw the push rod fully home with the adjusting nut. Return the adjusting nut 1 3/4 turns to adjust the play at the end of the clutch withdrawal lever to 2.0 - 2.3 mm (0.078 - 0.091 in). This will give a clearance of approximately 1.3 mm (0.051 in) between the release bearing and the diaphragm spring or release levers.

NOTE: When adjusting clutch pedal free travel at the withdrawal lever, it is essential to check that the clutch driven plate has not worn by more than 2mm (0.08 in), otherwise the clutch will slip even if it is correctly adjusted. See Technical Data for the relevant clutch driven plate thickness.

CLUTCH SYSTEM - Bleeding

The clutch system must be bled after it has been dismantled, or if any part of the circuit has been opened. This operation should also be carried out if the fluid level in the reservoir has been allowed to fall and permit air to enter the system.

The presence of air in the system may be noticed by incorrect disengagement of the clutch, but in any case, if air is suspected, the clutch must be bled in the following manner:

Remove the dust cap from the slave cylinder bleed screw. Connect a length of tube to the bleed screw and immerse the

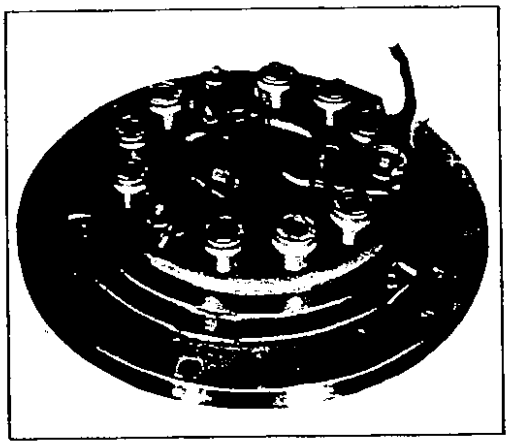


Fig. E.11 Adjusting the height of the release levers.

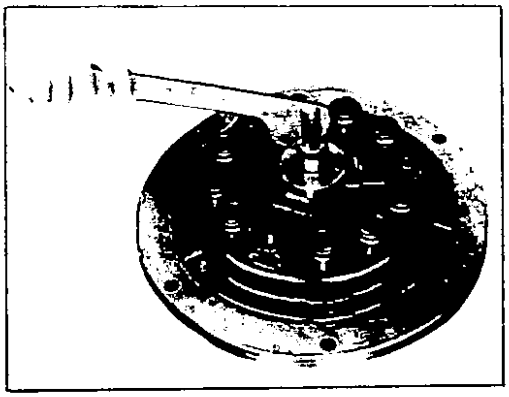
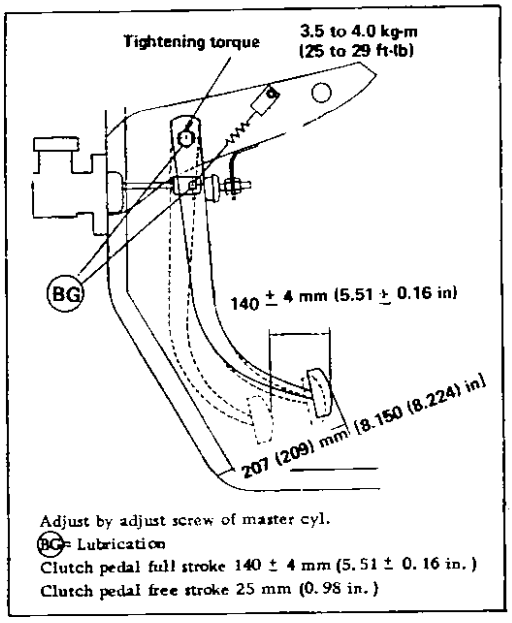
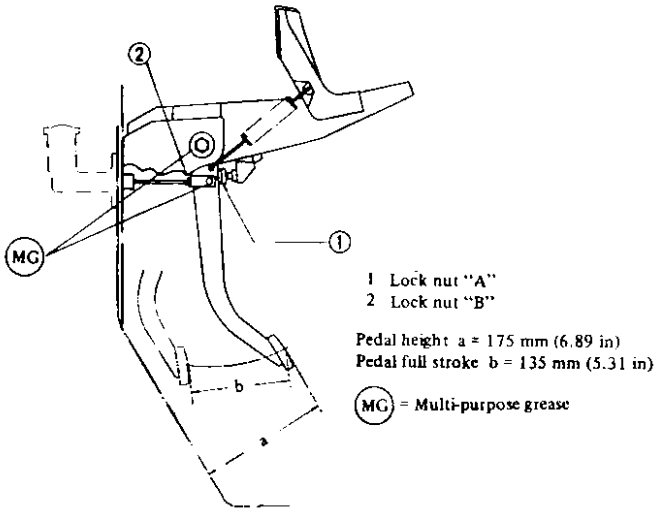


Fig. E.12 Actuating the clutch to settle the mechanism.

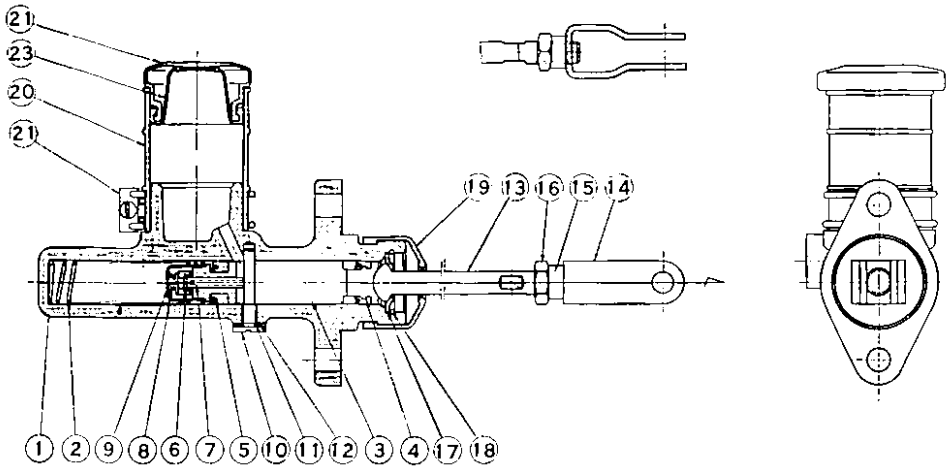


510 series

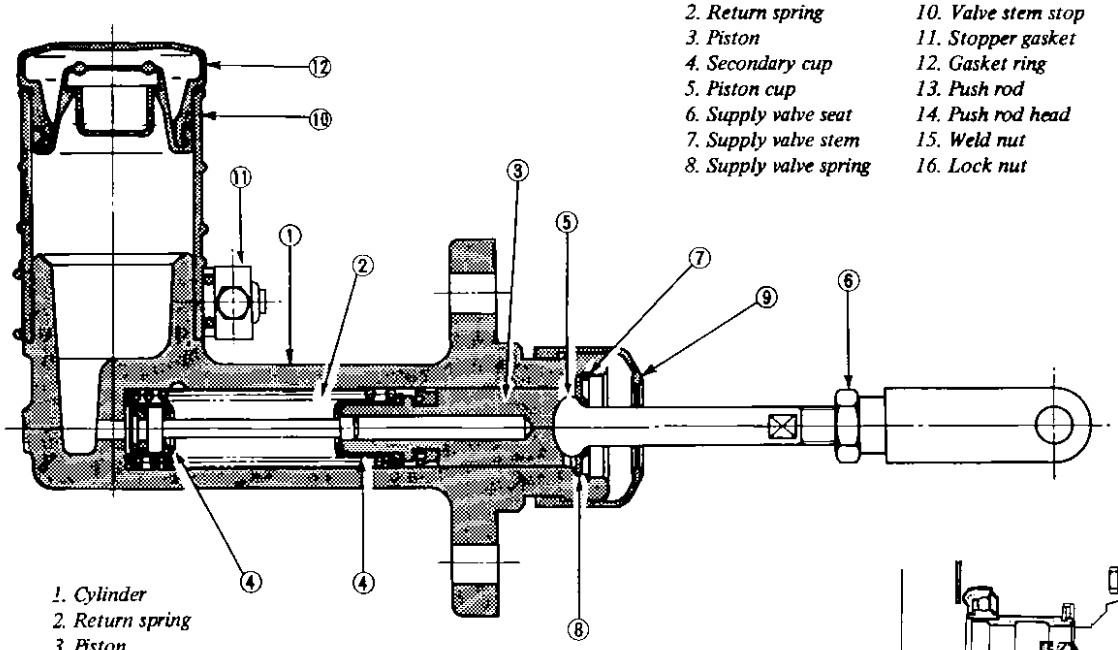


610 series

Fig. E.13 Adjusting the clutch pedal



1. *Cylinder*
2. *Return spring*
3. *Piston*
4. *Secondary cup*
5. *Piston cup*
6. *Supply valve seat*
7. *Supply valve stem*
8. *Supply valve spring*
9. *Spring seat*
10. *Valve stem stop*
11. *Stopper gasket*
12. *Gasket ring*
13. *Push rod*
14. *Push rod head*
15. *Weld nut*
16. *Lock nut*
17. *Piston stopper*
18. *Stopper ring*
19. *Boots*
20. *Oil reservoir*
21. *Reservoir band*
22. *Reservoir cap*
23. *Cap seal*
24. *Pipe seat*



1. *Cylinder*
2. *Return spring*
3. *Piston*
4. *Spring seat*
5. *Push rod*
6. *Nut*
7. *Stopper ring*
8. *Stopper*
9. *Dust cover*
10. *Oil reservoir*
11. *Reservoir band*
12. *Reservoir cap*

Fig. E.14 Section through the clutch master cylinder.

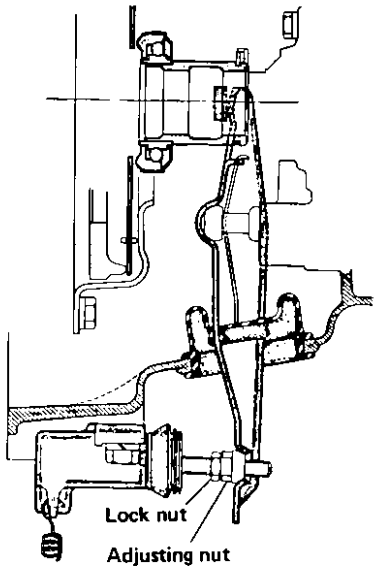


Fig. E.15 Adjusting the clutch withdrawal lever

other end of the tube into a clean container partly filled with brake fluid.

Top up the master cylinder reservoir with recommended fluid and open the bleed screw approximately three quarters of a turn.

Depress the clutch pedal slowly and hold it completely down; re-tighten the bleed screw and allow the pedal to return slowly.

Repeat the operation until the fluid emerging from the tube is free from air bubbles.

It should be noted that assistance will be required when carrying out bleeding operations, as not only must the fluid entering the glass container be watched, but also the clutch pedal has to be operated and the reservoir topped up frequently throughout the procedure.

When the fluid is completely free from air bubbles the bleed screw should be retightened on a down stroke of the pedal.

Finally, remove the bleed tube and replace the dust cap.

Technical Data

Clutch type	Diaphragm spring, or coil spring.
Pressure spring:	
Free length	52.3mm (2.059 in)
Fitted length and load	29.2mm (44 ± 2kg) (1.149 in / 97 ± 4.4 lb.)
Side distortion	5mm per 100mm (0.2in per 3.94 in)
Permissible deterioration of spring force	15%
Clutch release levers:	
Clearance between release bearing and diaphragm spring (release levers).	1.2 - 1.4mm (0.047 - 0.055 in)
Height between diaphragm spring and flywheel	44 ± 1mm (1.732 ± 0.039 in)
Height between release levers and flywheel	50.5 ± 0.05mm (1.988 ± 0.0197 in)
Clutch driven plate:	
Outer diameter	200mm (7.87 in)
Inner diameter	130mm (5.12in)
Thickness of facings	3.5mm (0.140in)
Total friction area	362 sq.cm. (56.11 sq.in.)
Thickness of clutch plate:	
Free	8.6-9.0mm (0.3386-0.3543in).
Compressed	7.65-7.95mm (0.3012-0.3130in)
No. of torsion springs	6
Permissible minimum depth of rivet heads from facing surface	0.3mm (0.0118 in)
Permissible run-out of clutch facing	0.5mm (0.0197 in)
Permissible free-play of splines	0.4mm (0.0157 in)
Clutch pedal: (1400 and 1600cc models)	
Pedal height in the rest position	182mm (7.17in) R.H.D. 207mm (8.15in) L.H.D.
Pedal free stroke	25mm (0.984in)
Pedal effort	15kg (33 lb.)
Master cylinder:	
Diameter	15.87mm (0.625in)
Maximum clearance between piston and cylinder	0.13mm (0.0051in)
Pressure plate:	
Permissible refacing limit	1mm (0.0394in)
Clutch pedal (1800cc models)	
Pedal height	175mm (6.89in)
Play at clevis pin	1-5mm (0.04-0.20in)
Full stroke	135mm (5.31in)
Pedal effort	10.5kg (23lb.)

Gearbox

GEARBOX - Removal
GEARBOX - Dismantling
GEARBOX - Inspection and Overhaul
GEARBOX - Assembling
THREE SPEED GEARBOX GEARCHANGE CONTROL - Removal and Adjusting
AUTOMATIC TRANSMISSION - Gearchange control linkage

DESCRIPTION

Three types of transmission are available for the Datsun models covered by this manual. Either a three speed gearbox, a four speed gearbox, or three speed automatic transmission can be fitted.

The three and four speed gearboxes are equipped with synchromesh on all forward gears, with the three speed gearbox operated by a steering column gearchange system and the four speed gearbox by a floor mounted gear lever.

Two types of synchromesh are used in the four speed gearboxes. Either Borg Warner or Servo types may be fitted. The gearboxes differ only in the synchromesh devices, whereby the baulk rings synchronize the coupling sleeve with the main-shaft gear on the Warner gearbox. This action is accomplished by a synchro-ring on the servo gearbox.

THREE SPEED GEARBOX - Removal

1. Jack up the vehicle and support it on stands.

2. Disconnect the handbrake cable at the equalizer bracket. Slacken the two exhaust pipe centre clamps and turn the centre section of the exhaust assembly to the left as shown in Fig.F.2.

3. Disconnect the propeller shaft from the rear axle drive flange by removing the four securing bolts. Seal off the gearbox extension housing to prevent the loss of oil and withdraw the shaft to the rear.

4. Disconnect the speedometer drive cable from the adaptor in the gearbox extension housing. (Fig.F.3.).

5. Disconnect the lower shift rods from the shift levers (Fig.F.4.). and remove the cross shaft assembly from the gearbox casing. Remove the clutch slave cylinder from the clutch housing (Fig.F.5.).

6. Support the engine with a jack positioned underneath the oil sump, making sure that the jack does not foul the drain plug. A block of wood should be placed between the sump and jack to avoid damaging the sump.

7. Remove the bolts securing the rear engine mounting to the crossmember. Position a jack under the gearbox and remove the bolts attaching the crossmember to the body. Lower the jack under the engine so that the engine is tilted to the rear. Remove the starter motor and the bolts securing the clutch housing to the engine. Lower the jack slowly and withdraw the gearbox towards the rear of the vehicle.

THREE SPEED GEARBOX - Dismantling

Drain the gearbox oil. Remove the dust cover, release the retainer spring and remove the withdrawal lever complete with release bearing from the clutch housing. See section CLUTCH.

Remove the gearbox bottom cover, the speedometer drive pinion assembly and the rear extension housing. Take out the cross-shaft retaining rings and unscrew the nuts securing the operating lever lock pins. Use a hammer and punch to drive out the pins and withdraw both cross shafts (Fig.F.6.).

Remove the front cover and withdraw the counter shaft. Lift out the countershaft gear cluster together with the needle roller bearings and spacers. (Fig.F.7.). Remove the reverse idler gear shaft lockbolt and remove the shaft and the idler gear. (Fig.F.8.). Drive out the pins securing the selector forks to the selector rods.

Unscrew the interlock plug and remove the detent ball and spring (Fig.F.9.). Remove the first/reverse speed and second/third speed selector rods and lift out the selector forks.

Withdraw the main shaft assembly and the drive shaft assembly from the gearbox. (See Fig.F.10 and F.11.).

To dismantle the mainshaft,. release the circlip from the front of the mainshaft as shown in Fig.F.12. and remove the second and third speed synchronizer hub and second speed gearwheel (Fig.F.13.). Remove the circlip securing the speedometer drive gear and withdraw the gear together with the ball and spacer (Fig.F.14.). Remove the mainshaft bearing using a press. Hold the mainshaft reverse gear and tap the shaft on a piece of wood to release the reverse gear assembly together with the first speed gearwheel.

GEARBOX - Inspection and Overhaul

Clean all parts thoroughly and examine the gearbox case and extension housing for cracks.

If the joint faces are burred or pitted it may be necessary to replace the units if repair cannot be carried out satisfactorily. Remove any adhesive which remains on the faces.

The rear extension housing bush should be renewed, if worn unevenly. Clean the bearings and dry with compressed air, taking care that the bearings do not spin. Turn the ball bearings to make sure that they run smoothly and without play. Replace the needle bearings if worn or damaged in any way.

It is advisable to renew the needle roller bearings after they have been installed for a considerable period, as it is difficult

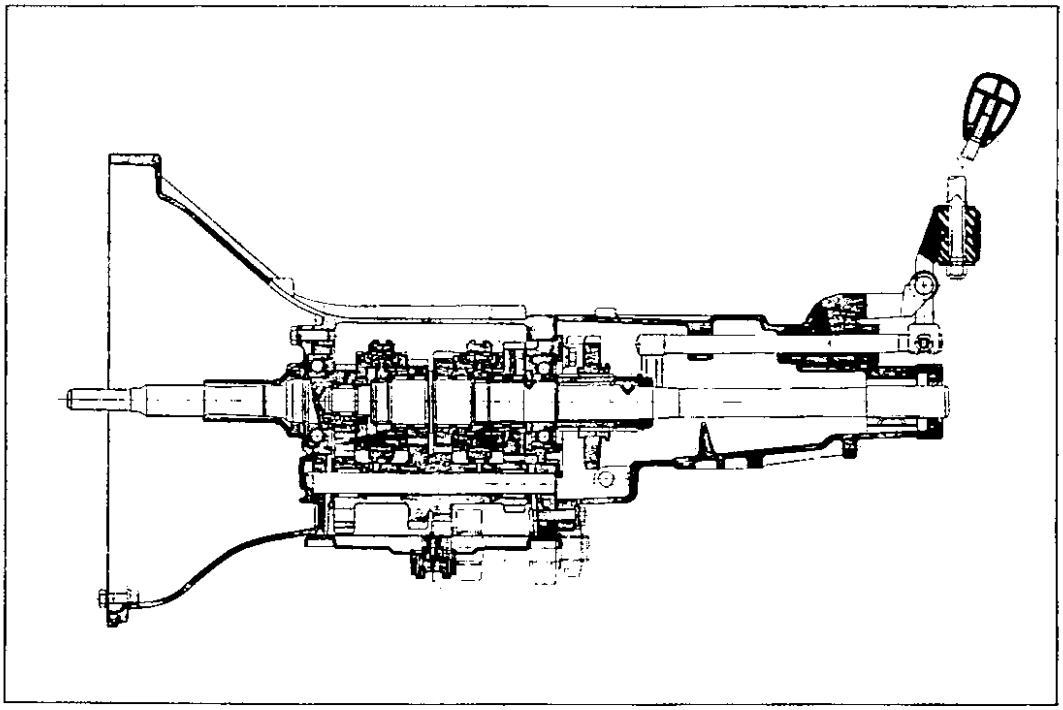


Fig. F.1 View through the four speed gearbox.

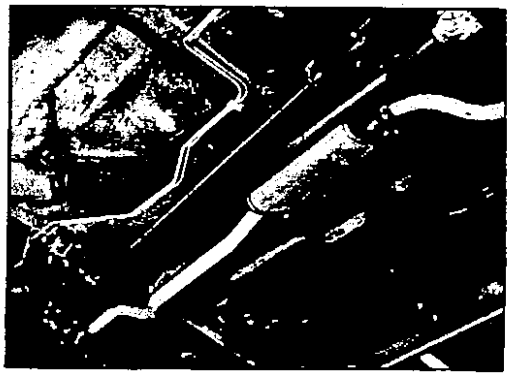


Fig. F.2 The propeller shaft.

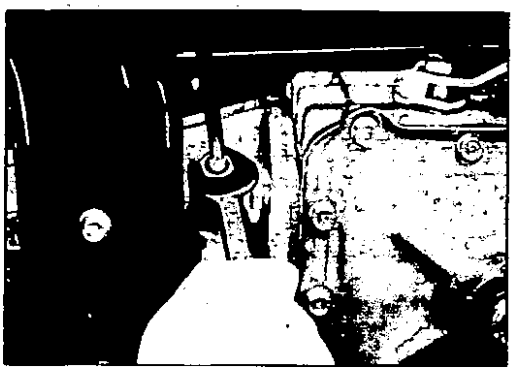


Fig. F.3 Disconnecting the speedometer cable.

Fig. F.4 Disconnecting the remote control linkage.

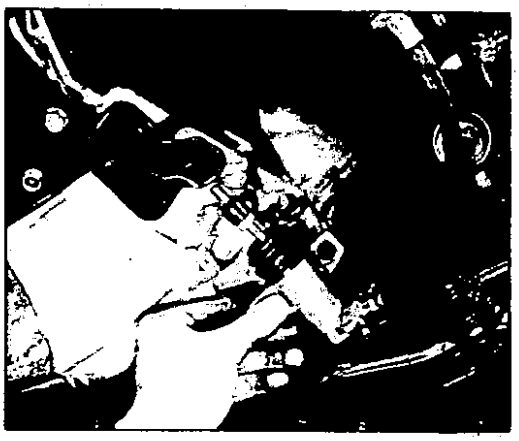


Fig. F.5 Removing the clutch slave cylinder.

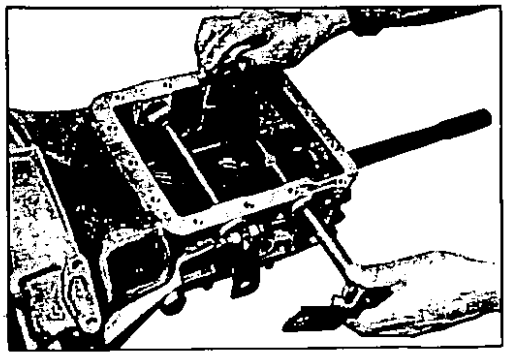


Fig. F.6 Removing the cross shaft.

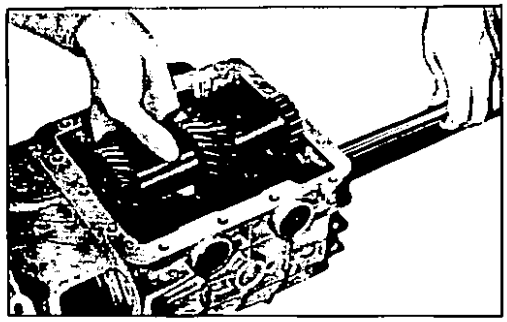


Fig. F.7 Removing the countershaft gear.

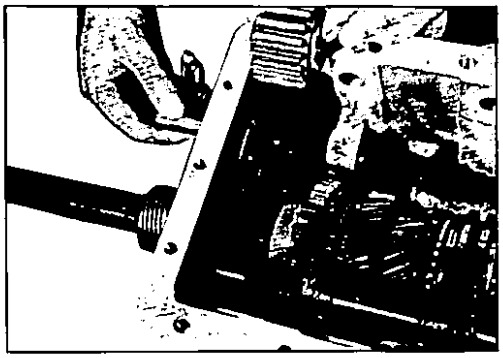


Fig. F.8 Removing the reverse idler gear.

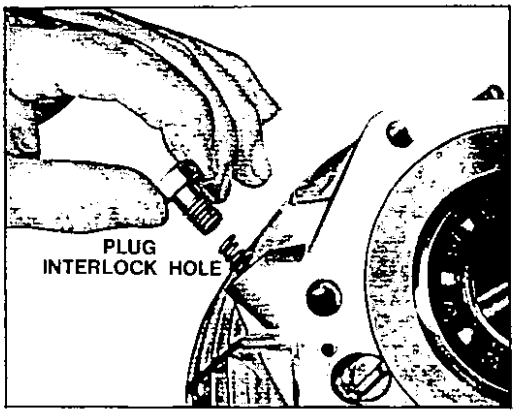


Fig. F.9 Removing the interlock plug.

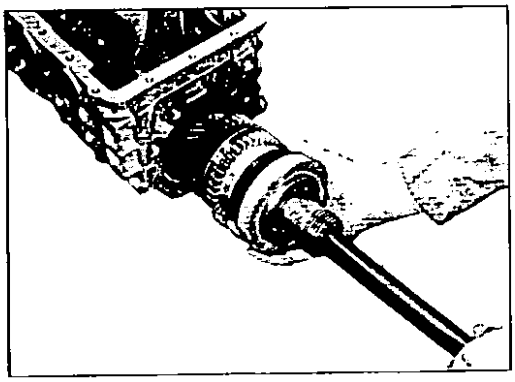


Fig. F.10 Withdrawing the mainshaft gear assembly.

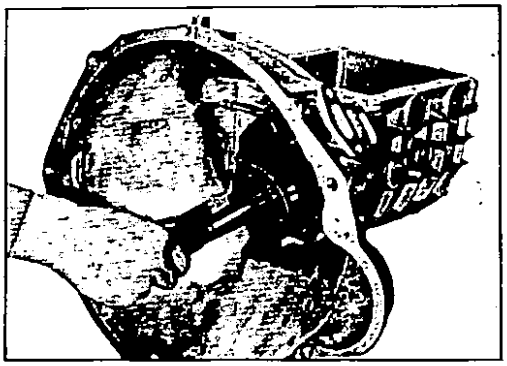


Fig. F.11 Removing the main drive shaft.

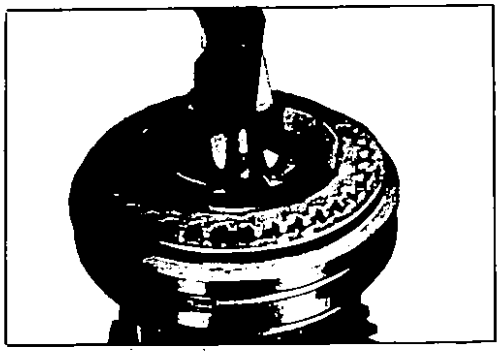


Fig. F.12 Removing the 2nd and 3rd speed synchronizer hub circlup.

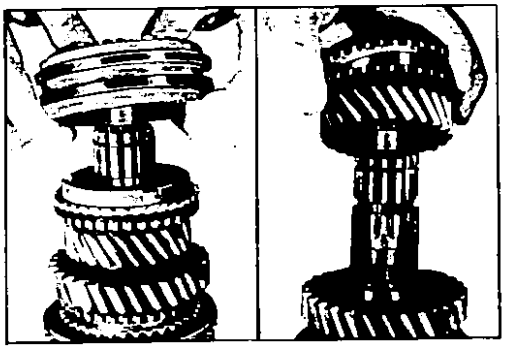


Fig. F.13 Removing the 2nd and 3rd speed hub and 2nd speed gearwheel.

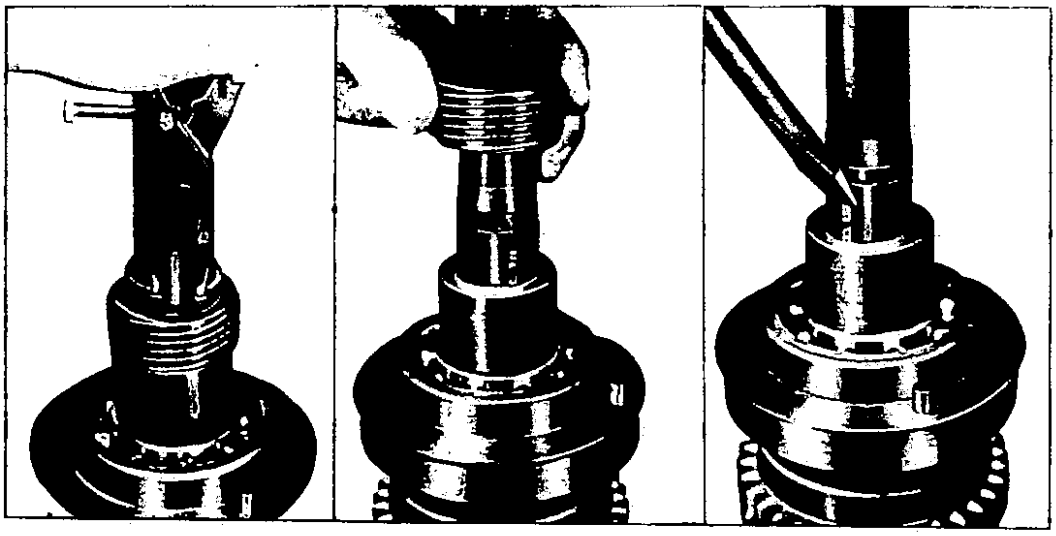


Fig. F.14 Removing the speedometer drive gear and spacer.

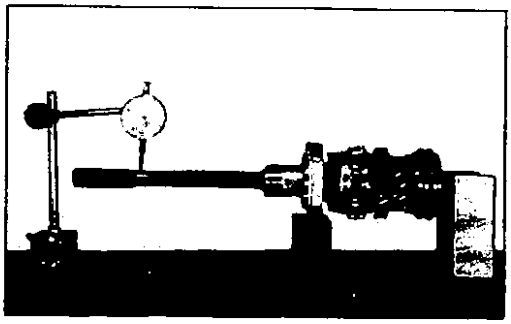


Fig. F.15 Checking the mainshaft tor run-out.

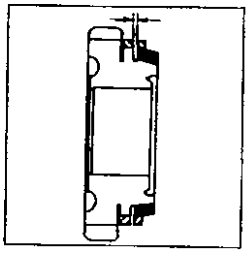


Fig. F.16 Checking the clearance between baulk ring and gear.

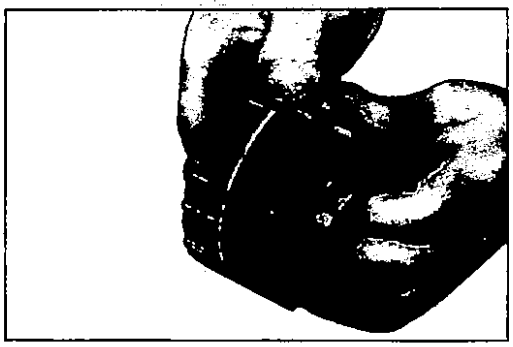


Fig. F.17 Installing the insert snap ring.

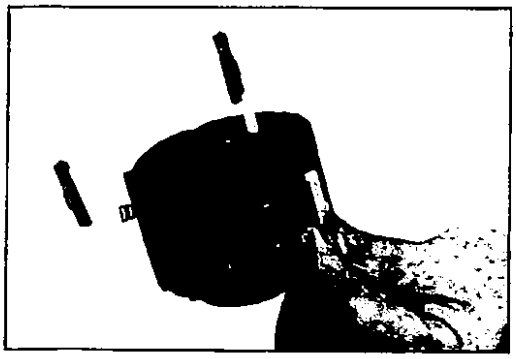


Fig. F.18 Installing the shifting inserts.

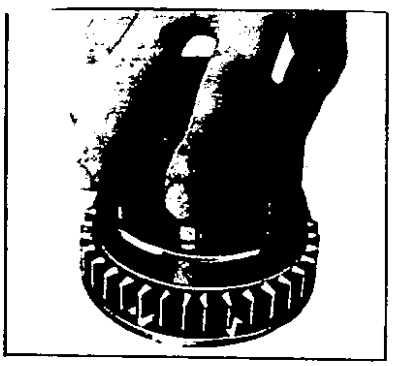


Fig. F.19 Fitting the synchronizer hub to the coupling sleeve.

to ascertain the amount of wear that has taken place.

Check the teeth of the gearwheels and the machined surfaces for signs of wear, scoring, pitting and burrs. Ensure that the synchronizer hubs slide freely on the splines of the main shaft with minimum clearance. Check the mainshaft, for run-out, using V-blocks and a dial gauge as shown in Fig.F.15. Renew the mainshaft if the run-out exceeds 0.15mm (0.0059 in).

Check the synchronizer rings for wear and renew them if necessary. Place the rings in position on their respective gear-wheel cones and check the gap between the end of the ring and the front face of the teeth (Fig.F.16.). The correct gap should be within 1.2-1.6mm (0.047 - 0.063 in). Renew the synchronizer ring if the gap is less than 0.8mm (0.0315 in).

Place the selector rods on a flat surface and check them for straightness. Renew any rod which is bent. Renew the locking pins and interlock balls if they are worn or damaged. The standard clearance between the selector forks and operating sleeve groove is 0.15 - 0.30mm (0.006 - 0.012 in).

Make sure that the oil seals are satisfactory and discard the O-rings.

THREE SPEED GEARBOX - Assembly

Press the main drive gear bearing onto the main drive shaft and fit the spacer. Select a snap ring of suitable thickness so that all play is eliminated between the bearing and snap ring. Seven sizes of snap rings are available and vary in thickness from 1.52mm (0.0598 in) to 1.89mm (0.0747in).

The synchromesh unit consists of a coupling sleeve, baulk ring, spring synchronizer hub and insert. When assembling the unit make sure that the correct insert pressure springs are fitted to the relevant speed unit. The first/reverse gear synchronizer should be fitted with the three coil spring type and the second/third gear synchronizer with the two expanding springs.

To assemble the first speed synchronizer, insert the sliding insert snap ring onto the synchronizer hub as shown in Fig.F.17 Fit the sliding inserts (Fig.F.18). and the synchronizer springs on the synchronizer hub and assemble the synchronizer hub complete with inserts into the coupling sleeve (Fig.F.19.).

Assemble the second/third gear synchronizer hub and coupling sleeve, making sure that the sleeve slides freely on the hub splines. Fit the three shifting inserts and install a spring ring on each side of the hub. (Fig.F.20.).

To assemble the mainshaft start from the front end of the shaft and slide the second speed gearwheel on to the shaft with the tapered cone facing forwards. Install the baulk ring on the gearwheel and place the second/third speed synchronizer assembly on the front end of the shaft and retain it with a snap ring which will give an end play of 0.05 - 0.25 mm (0.002 - 0.009 in). Snap rings are available in five sizes from 1.60 - 1.80 mm (0.063 - 0.071 in).

Fit the first speed gear and baulk ring on the rear of the shaft so that the tapered cone faces to the rear. Assemble the first speed synchronizer and reverse gear on the shaft. Fit the spacer and press the mainshaft bearing complete with retainer onto the shaft.

Install the spacer ball,and speedometer drive pinion. Select a snap ring which will give an end float of 0.05 - 0.22mm (0.002 - 0.009 in) on the mainshaft first gear. Snap rings are available in eight thicknesses from 1.30mm (0.0512 in) to 1.70mm (0.0669 in).

Secure the drive gear with the selected snap ring and check the end float of the gearwheels as shown in Fig.F.21. The correct end float should be as follows.

1st speed gearwheel	0.2-0.3mm (0.008 - 0.012 in)
2nd speed gearwheel	0.2-0.3mm (0.008 - 0.012 in)

Fit the main drive gear and mainshaft assembly into the gearbox casing. Fit the selector rods and forks as follows:

Turn the gearbox casing so that the detent ball hole is uppermost and insert the spring and ball in the bottom of the hole. Hold the ball with a dummy shaft and install the first/reverse selector fork and rod, pushing the dummy shaft out of position. Insert the interlocking plunger and fit the second/third speed selector fork and rod. Insert the steel ball and spring and refit the interlocking plug, after coating the threads of the plug with sealing compound. (See Fig.F.22.). Secure the selector forks to the rods by inserting the retaining pins.

Fit the reverse idler gear and shaft and secure the shaft with the lock bolt and plate. Insert the counter gear cluster and shaft using a suitable thrust washer to obtain an end float of 0.04 - 0.12 mm (0.0016 - 0.0047 in). Thrust washers are available in five sizes, from 3.85 - 4.05 mm (0.1516 - 0.1594 in) thickness, in increments of 0.05 mm (0.002 in).

Fit the cross-shafts (1 in Fig.F.23.) the thrust washers (2) and the operating levers (3). Secure the cross-shafts with the retaining rings (5) and lock the operating levers to the shafts with the pins (4).

Locate the rear extension housing on the gearbox case and tighten the bolts to a torque reading of 2.8 - 4.4. kgm (20 - 32 lb.ft.). Insert the speedometer drive pinion and retain it with the set bolt and lock plate. Check the backlash of all the gears, using a dial gauge as shown in Fig.F.24. The backlash should be between 0.05 - 0.20 mm (0.002 - 0.008 in). Fit the gearbox front cover and tighten the fixing bolts to a torque reading of 1.1 - 1.7 kgm (8.0 - 12.3 lb.ft.), taking care not to damage the oil seal. Fit the clutch release bearing and with-drawal lever. (Fig.F.25.). Replace the bottom cover and tighten the bolts to a torque reading of 1.1 - 1.7 kgm (8.0 - 12.3 lb.ft.).

THREE SPEED GEARBOX - Installation

Installation of the gearbox is a reversal of the removal procedure noting the following points.

Fit the gearbox with 1.7 litres (0.45 US gall, 0.37 Imp. gall). of MP 90 gear oil.

Adjust the clutch slave cylinder push rod as described in the section CLUTCH to provide a free play of 2.2.mm. (0.087in) at the withdrawal lever.

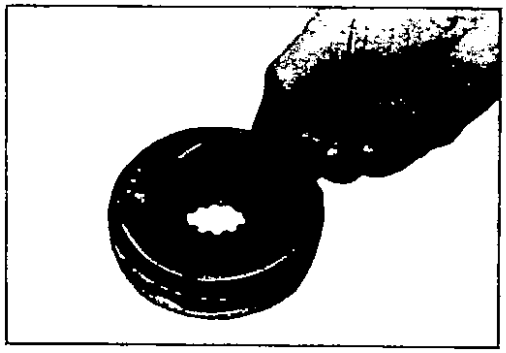


Fig. F.20 Fitting the spring rings.

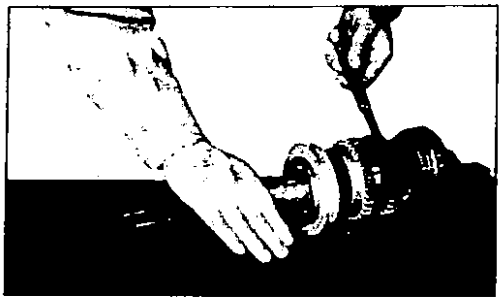


Fig. F.21 Checking the end float of the gearwheels.

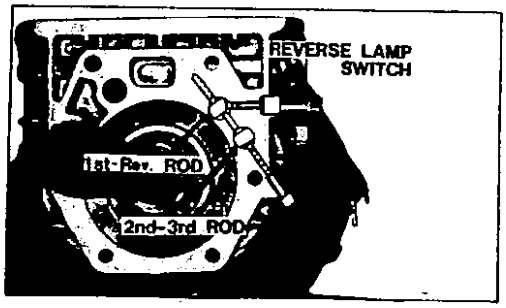


Fig. F.22 The interlock mechanism.

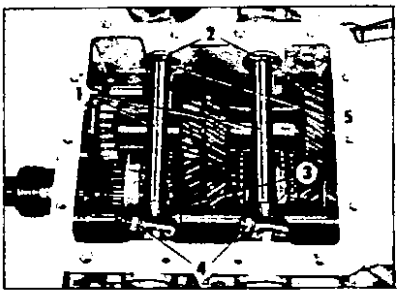


Fig. F.23 Installing the cross shaft.

1. Cross shaft
2. Thrust washers
3. Operating levers
4. Lock pins
5. Retaining rings

Fig. F.24 Checking the gear backlash.

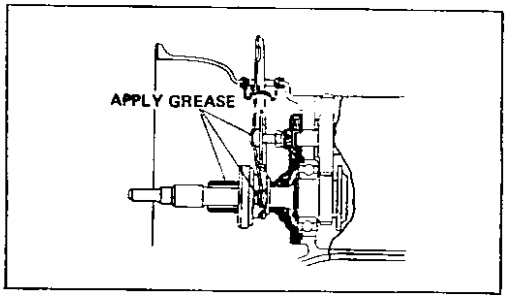


Fig. F.25 Withdrawal lever and release bearing.

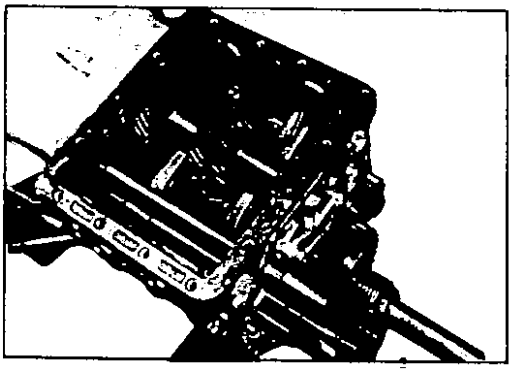


Fig. F.26 View of the four speed gearbox with bottom cover removed.

FOUR SPEED GEARBOX - Removal and Installation

The removal and installation procedures for the four speed gearbox are similar to those previously described for the three speed gearbox. However, the floor mounted gear lever must be removed from the control lever bracket in addition to the operations already detailed.

FOUR SPEED GEARBOX - Dismantling

Drain the oil from the gearbox. Remove the dust cover and release the spring securing the clutch withdrawal lever. Remove the withdrawal lever and release bearing from the clutch housing, as described in the section CLUTCH. Remove the clevis pin securing the striking rod to the control lever.

Remove the speedometer drive pinion assembly and withdraw the rear extension housing. Disengage the striking rod from the selector rod gates. Remove the gearbox covers (See Figs.F.26 and F.27.).

Unscrew the three detent ball plugs and remove the springs and detent balls. Drive out the pins securing the selector forks to the rods and withdraw the forks and rods. Lock the mainshaft by moving the first/second and third/fourth coupling sleeve into gear at the same time and release the mainshaft nut.

Remove the countershaft and the gear cluster together with the two needle roller bearings and spacers. Remove the snap ring holding the reverse idler gear and withdraw the reverse idler gears and shaft (Fig.F.28.).

Take off the bolts securing the mainshaft bearing retainer to the gearbox case (Fig.F.29.). Withdraw the mainshaft assembly (Fig.F.30), and the main drive shaft.

The mainshaft can be dismantled in the following manner: Release the third/fourth synchronizer unit snap ring and withdraw the hub complete with coupling sleeve. Remove the third speed gearwheel and the needle roller bearing from the mainshaft. Take off the mainshaft nut and locking plate. Remove the speedometer drive gear with the retaining ball. Withdraw the mainshaft reverse gear and the hub. Press off the mainshaft bearing complete with the bearing retainer.

Remove the thrust washer and the first speed gear together with the needle roller bearing, taking care not to lose the small ball used to locate the thrust washer. Slide off the first speed gearwheel bush. Withdraw the first/second synchronizer and hub. Remove the second speed gearwheel and needle roller bearing.

FOUR SPEED GEARBOX - Installation

Refer to the instructions given for the three speed gearbox and to Technical Data for the specifications applicable to the different gearboxes.

FOUR SPEED GEARBOX - Assembly

Assembly of the gearbox is similar to the procedures previously described for the three speed gearbox, with the following exceptions.

When assembling the main drive gear bearing on the shaft, install the spacer and select a new snap ring to eliminate all end float between bearing and snap ring. Snap rings are available in five thicknesses from 1.52 - 1.77mm (0.06 - 0.07 in).

The assembly procedures for the Warner type synchronizers are similar to the instructions previously described for the three speed gearbox. Refer to THREE SPEED GEARBOX - Assembly for further details.

To assemble the Servo F4C63 type synchronizers, proceed as follows.

Place the gear on a clean flat surface and install the synchronizer ring on the inner side of theclutch gear. Fit the thrust block into place as shown in Fig.F.31. Place the anchor block and brake band into position and fit the circlip into the groove in the gear to secure the synchromesh assembly.

When assembling the mainshaft, select a snap ring which will give an end float between 0.05 - 0.15 mm. (0.002 - 0.006in) to the third speed gearwheel. Snap rings are available in five sizes from 1.40 mm. (0.0551 in) to 1.60 mm. (0.0630 in) thickness. Tighten the locknut at the rear of the mainshaft to a torque reading of 7-12 kgm (51-87 lb.ft.).

Assemble the reverse idler gear as shown in Fig.F.32. The reverse idler driven gear (3) should be placed on the end of the reverse shaft (1) with the longest spline and retained with a suitable snap ring (2). Install the reverse shaft and gear assembly into the gearbox case from the rear with the thrust washer (4) between the gear and the case. Fit the thrust washer (5) and idler gear (6) (18 teeth) and secure with a suitable snap ring (2). The end float of the gear should be checked and adjusted to 0.1 - 0.3mm (0.004 - 0.012 in) by selecting a suitable snap ring (2). Five thicknesses of snap rings are available from 1.1mm. (0.043in) to 1.5mm. (0.06in). (See Technical Data for F4W63 and F4C63 gearboxes). Adjust the counter gear end float to 0.05 - 0.15 mm. (0.002 - 0.006in). by selecting a thrust washer of the required thickness. Thrust washers are available in five thicknesses from 2.40 - 2.60 mm. (0.094 - 0.102 in).

When assembling the selector mechanisms (Fig, F.33.). fit the first/second selector forks (1) and the third/fourth selector forks (2) onto the coupling sleeves and insert the first/second fork rod (3).

Fit an interlock plunger (4) and the third/fourth speed selector rod (5). Do not forget the interlock pin (7). A section through the selector and interlock mechanism is given in Fig. F.34. Install an interlock plunger (6) and assemble the reverse selector fork (8) and fork rod (9). Secure the selector forks to the rods with the retaining pins (10).

Place a check ball and spring into each of the holes and screw the plug down to a torque reading of 1.7 - 2.1 kgm (12.3 - 15.2 lb.ft.) after coating the threads with sealing compound.

Install the rear extension housing, engaging the striking rod with the fork rod gates and tighten the housing bolts to a torque reading of 1.6 - 2.5 kgm. (12. - 18lb.ft.). Fit the front and bottom covers and tighten the bolts to a torque reading of 1.1 - 1.8 kgm. (8 - 13 lb.ft.).

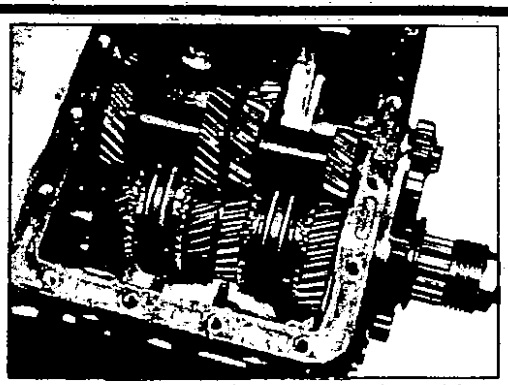


Fig. F.27 View of the four speed gearbox with front cover removed.

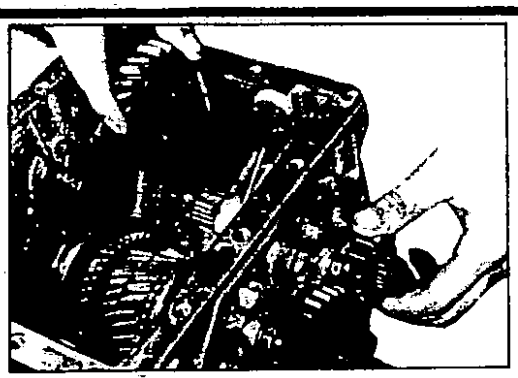


Fig. F.28 Removing the reverse idler gear.

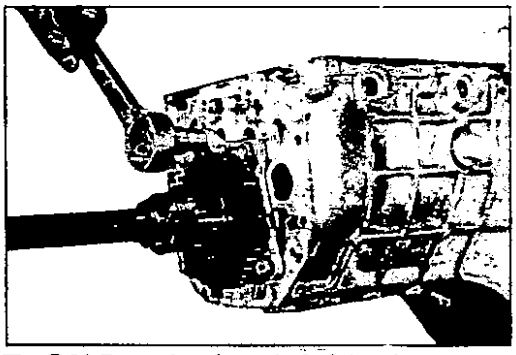


Fig. F.29 Removing the mainshaft bearing retainer.

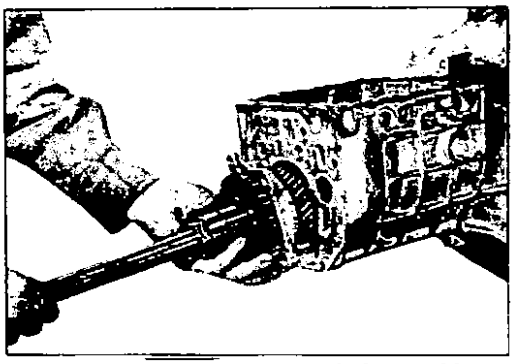
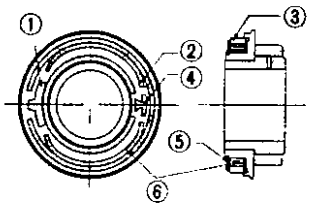
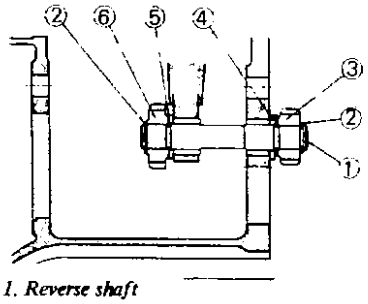


Fig. F.30 Withdrawing the mainshaft assembly.



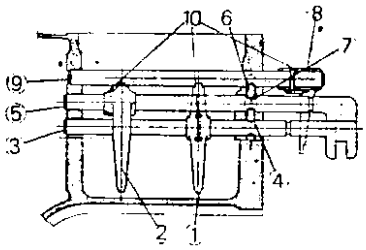
1. Thrust block
2. Band brake
3. Synchro ring
4. Anchor block
5. Circlip
6. Band brake

Fig. F.31 Synchromesh assembly.



1. Reverse shaft
2. Snap ring
3. Reverse idler driving gear (14T)
4. Thrust washer
5. Thrust washer
6. Idler gear (18T)

Fig. F.32 Reverse idler gear.



1. 1st and 2nd selector fork
2. 3rd and 4th selector fork
3. Fork rod
4. Interlock plunger
5. Fork rod
6. Interlock plunger
7. Interlock pin
8. Reverse selector fork
9. Fork rod
10. Retaining pin

Fig. F.33 Assembly of the selector forks.

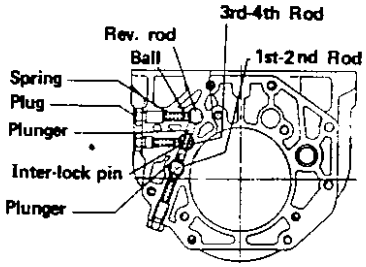


Fig. F.34 Section through the gearbox showing the interlock mechanism.

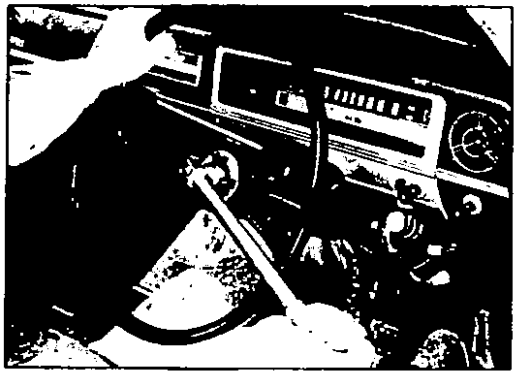


Fig. F.36 Removing the steering wheel.

THREE SPEED GEARBOX GEARCHANGE CONTROL LINKAGE (Fig.F.35.).

As previously described the three speed gearbox is equipped with a steering column gearchange linkage system which incorporates a collapsible control rod when combined with the collapsible type of steering column assembly.

The gearchange linkage can be removed and inspected in the following manner:

Remove the steering wheel (Fig.F.36.) and take off the steering column shell cover. Remove the turn signal and lighting switch (Fig.F.37.). These removal details can also be found in the section STEERING. Remove the "C" washer (1 in Fig.F.38) and the washer, then remove the upper support bracket by releasing the locating bolt and screw. The control rod insert with bush and return spring can now be removed. Remove the snap and gear lever pivot pin and withdraw the gearlever.

Remove the cotter pin plain washer and spring washer and disconnect the shift rods from the gear selector levers (Fig.F.39). Unscrew the bolts, securing the lower support bracket and the clamp. Remove the clamp and gear change lever retainer.

Remove the second/third speed selector lever, the lower support bracket and the first/reverse selector lever from the control rod. Withdraw the control rod. Disconnect the gear change rods by removing the cotter pins and remove the cross-shaft bracket from the side member. Withdraw the cross-shaft assembly (Fig.F.40.).

Examine the components for signs of wear and damage and replace if necessary.

Installation is a reversal of the removal procedure noting the following points:

Take care not to strike or apply a load to the collapsible type of control rod, or the rod may be damaged.

The rod should not be slack in the axial direction when installed and must be removed if slackness is detected. Coat the sliding surfaces with grease before assembling them.

Adjusting:

Set the gear lever to the neutral position and temporarily connect the trunnion on the lower support bracket to each rod. (Fig.F.41).

Set the rod on the lever so that the neutral adjustment grooves on the upper surface of the lower support bracket are aligned with the grooves on each lever.

When the adjustment is completed, operate the gear lever to select each gear and make sure that the lever can be moved smoothly and positively.

AUTOMATIC TRANSMISSION

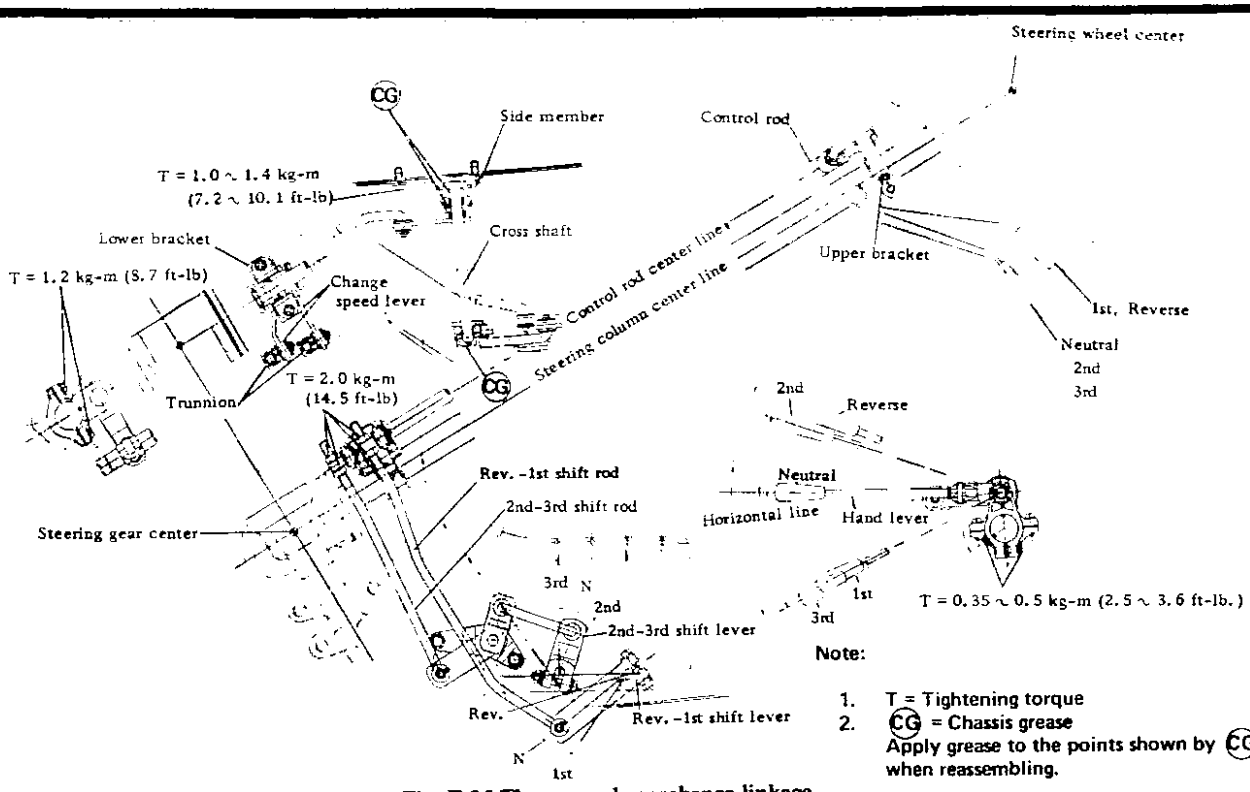
Gearchange control linkage

The automatic transmission gear change control linkage can be removed in a similar manner to the three speed gearbox linkage. Carry out the operations previously described under the relevant heading as far as the removal of the gear lever and proceed as follows:

Disconnect the upper selector rod from the selector lever by removing the cotter pin plain washer and lock washer. (See Fig.F.42). Remove the speed range position plate, the snap ring at the lower end of the control rod and unscrew and remove the lower support bracket. Release the locking screw and withdraw the selector lever assembly. Withdraw the control rod, disconnect the selector rods and remove the cross-shaft bracket and cross-shaft assembly. Clean all parts and repair or renew any part which is worn or damaged. Installation is a reversal of the removal procedure, noting the following points:

Coat all the sliding surfaces with chassis grease prior to assembling.

Set the converter side lever and the gear lever in the neutral position. Install the upper selector rod to the selector lever and adjust the gear position plate to give a clearance of 0.5 - 1.0mm. (0.02 - 0 04 in) between the selector lever stop pin and the position plate. The adjustment can be obtained by turning the selector rod adjusting nuts. Finally, tighten the nuts on each side of the trunnion.



Note:

1. T = Tightening torque
2. CG = Chassis grease
   Apply grease to the points shown by CG when reassembling.

Fig. F.35 Three speed gearchange linkage - column mounted.

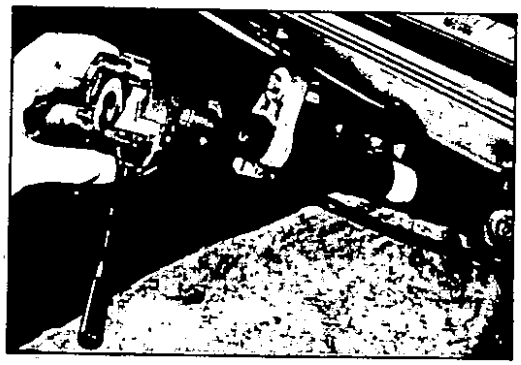


Fig. F.37 Removing the indicator and lighting switch.

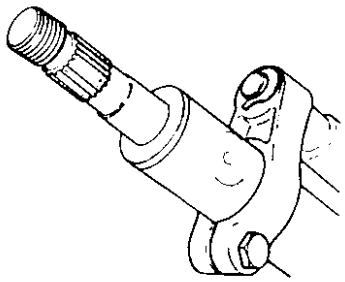


Fig. F.38 Removing the upper support bracket.

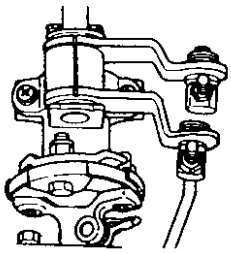


Fig. F.39 Removing the lower bracket.

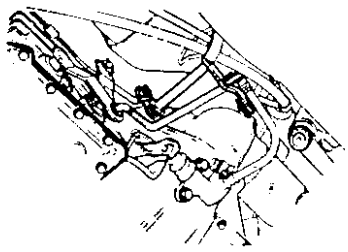


Fig. F.40 Removing the cross shaft assembly.

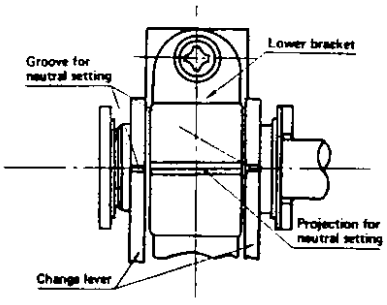


Fig. F.41 Neutral setting adjustment.

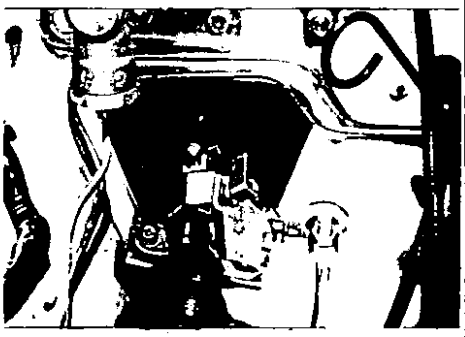


Fig. F.42 View of the selector lever.

Technical Data

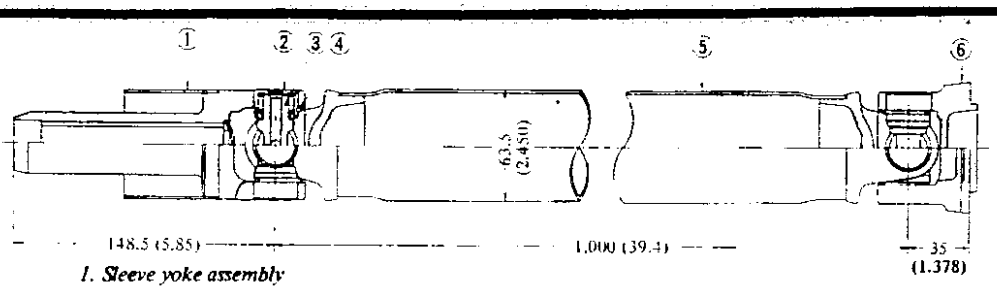
GENERAL SPECIFICATIONS

Gearbox model		R3W65L	F4C63 F4W63L	3N71B
Gearchange type		Column change	Floor change	(Floor change (Column change
Gear ratios:	1st gear	3.263:1	3.382:1	2.458:1
	2nd gear	1.645:1	2.013:1	1.458:1
	3rd gear	1.000:1	1.312:1	1.000:1
	4th gear	-	1.000:1	-
	Reverse	3.355:1	3.364:1	2.098:1
Number of teeth on mainshaft	Drive gear	19	22	
	3rd speed	-	27	
	2nd speed	25	30	
	1st speed	31	36	
	Reverse	34	39	
Number of teeth on counter-shaft	Driven gear	30	31	
	3rd speed	-	29	
	2nd speed	24	21	
	1st speed	15	15	
	Reverse	16	14	
Reverse idler gear		16	18	
Speedometer	Drive gear	5		
	Driven gear	19 or 17	16	

CLEARANCES AND PLAYS

Model	R3W65L	F4W63L
Mainshaft end float	0-0.19mm (0.-0.008 in)	0.08 - 0.29mm. (0.003 - 0.011 in)
Max. mainshaft end float	0.20mm. (0.008 in)	0.30mm. (0.012 in)
Countershaft end float	0.04 - 0.12mm. (0.002 - 0.005 in)	0.05 - 0.15mm. (0.002 - 0.006 in)
Max. countershaft end float	0.20mm. (0.008 in)	0.20mm. (0.008 in)
Reverse idler gear end float	0.20 - 0.40mm. (0.008 - 0.016 in)	0.10 - 0.30 mm. (0.004 - 0.012 in)
Max. idler gear end float	0.50mm. (0.020 in)	0.50mm. (0.020 in)
Gearwheel end float		
1st speed gearwheel	0.20 - 0.30mm. (0.008 - 0.012 in)	0.05 - 0.15mm. (0.002 - 0.006 in)
2nd speed gearwheel	0.20 - 0.30mm. (0.008 - 0.012 in)	0.05 - 0.15mm. (0.002 - 0.006 in)
3rd speed gearwheel	– –	0.05 - 0.15mm. (0.002 - 0.006 in)
Gear backlash - all gears	0.05 - 0.20mm. (0.002 - 0.008 in)	0.05 - 0.20mm. (0.002 - 0.008 in)
Clearance between fork and coupling sleeve	0.15 - 0.30mm. (0.006 - 0.012 in)	0.15 - 0.30mm. (0.006 - 0.012 in)
Mainshaft run-out	0.15mm. (0.006 in)	0.25mm. (0.010 in)

Model	F4W63 and F4663	R3W65
Gear backlash-all gears	0.05 - 0.14mm. (0.002 - 0.0055 in)	0.05 - 0.14mm. (0.002 - 0.0055 in)
Gearwheel end float:		
1st speed gearwheel	0.05 - 0.15mm. (0.002 - 0.0059 in)	0.05 - 0.22mm. (0.002 - 0.0087 in)
2nd speed gearwheel	0.05 - 0.15mm. (0.002 - 0.0059 in)	0.10 - 0.22mm. (0.0039 - 0.0087 in)
3rd speed gearwheel	0.05 - 0.15mm. (0.002 - 0.0059 in)	–
Max. countershaft end float	0.05 - 0.15mm. (0.002 - 0.0059 in)	0.04 - 0.12mm. (0.0016 - 0.0047 in)
Reverse idler gear end float	0.05 - 0.15mm. (0.002 - 0.0059 in)	0.20 - 0.40mm. (0.0079 - 0.0157 in)
Clearance between baulk ring and clutch gear	1.2 - 1.6mm. (0.0472 - 0.0630 in)	1.2 - 1.6mm. (0:0472 - 0.0630 in)



1. *Sleeve yoke assembly*
2. *Bearing race assembly*
3. *Journal assembly*
4. *Snap ring*
5. *Propeller shaft tube assembly*
6. *Flange yoke*

Unit: mm (in)

Fig. G.1 Section through the propeller shaft.

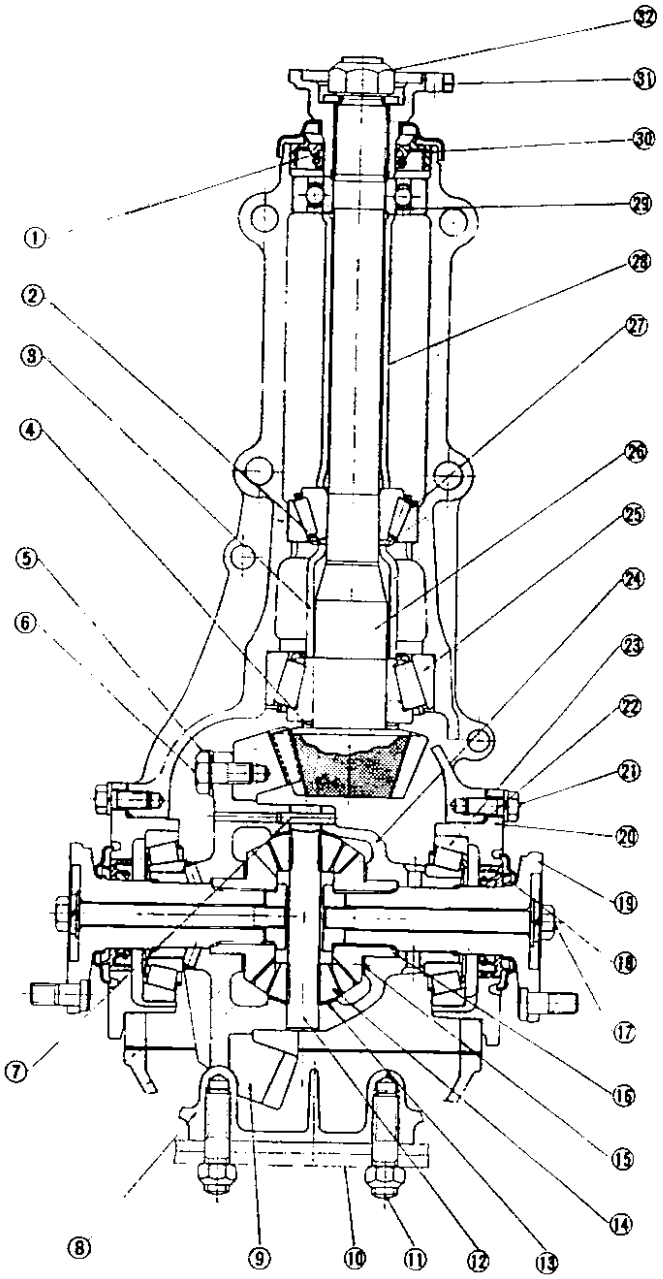


Fig. G.2 Section through the differential carrier.

1. *Supply multi-purpose grease to oil seal lip when assembling.*
2. *Pinion bearing adjusting washer Adjust pinion bearing preload by selecting 2 and 3.*
3. *Pinion bearing adjusting spacer.*
4. *Pinion height adjusting washer.*
5. *Lock strap.*
6. *Ring gear bolts T = 7.0 to 8.0 kgm. (50.6 to 57.8 lb.ft.) Tighten by tapping bolt head with 1/4 lbs. hammer.*
7. *Lock pin*
8. *Rear cover*
9. *Ring gear*
10. *Diff. mounting member*
11. *Bolt diff. to diff. mounting member T = 6.0 to 8.0 kgm. (43.4 to 7.8 lb.ft.)*
12. *Shaft pinion mate*
13. *Thrust washer*
14. *Pinion mate*
15. *Thrust washer Adjust the backlash in pinion mate and side gear (or the clearance between the differential case and the rear face of side gear) to 0.1 to 0.2 mm. (0.0039 to 0.0079 in.) by 16.*
16. *Side gear.*
17. *Bolt side flange T = 1.9 to 2.6 kgm. (13.7 to 18.8 lb.ft.)*
18. *Oil seal. Supply chassis grease to oil seal lip when assembling.*
19. *Side flange*
20. *Side retainer*
21. *Bolt side retainer T = 0.9 to 1.2 kgm. (6.5 to 8.7 lb.ft.)*
22. *O-ring*
23. *Side bearing*
24. *Diff. Gear case*
25. *Pinion rear bearing*
26. *Drive pinion*
27. *Pinion front bearing*
28. *Spacer front pilot bearing*
29. *Front pilot bearing*
30. *Oil seal*
31. *Companion flange*
32. *Drive pinion nut T = 17 to 20 kgm. (122.9 to 144.6 lb.ft.)*

Propeller Shaft and Differential

DESCRIPTION

The tubular steel propeller shafts are shown in Fig.G.1. The shaft is connected to the drive pinion flange by a yoke flange at the rear and to the transmission output shaft by a splined yoke sleeve at the front. The Datsun 1800cc station wagon and van has a three section shaft, in contrast to the two piece shaft used on the other models covered by this manual.

The differential carrier houses a hypoid bevel gear assembly. Although this manual contains dismantling and adjustment procedures for the differential assembly it must be pointed out that only workshops with specialized tools and equipment will be able to carry out the work involved.

PROPELLER SHAFT - Removal

1. Release the handbrake, jack up the vehicle at the rear and support it on stands.
2. Loosen the clamps and turn the pre-silencer to the left (saloon only).
3. Remove the adjuster nut from the handbrake cable rear adjuster and disconnect the left hand cable (Saloon only). Remove the bolts securing the centre bearing bracket (1800 cc station wagon).
4. Disconnect the rear flange from the rear axle flange. Withdraw the propeller shaft to the rear, away from the gearbox mainshaft. Take care that the shaft is not dropped during removal or the balance of the shaft may be altered.
5. Plug the gearbox rear extension to prevent the loss of oil.

PROPELLER SHAFT - Dismantling and Inspection

Clean all components and mark them before dismantling, so that they can be reassembled in their original positions. Correct reassembly is most important, otherwise the balance of the shaft may be affected.

Remove the four snap rings from the journal assembly and withdraw the needle bearing cap by tapping the yoke with a wooden mallet.

The wear on the spider journal diameter must not exceed 0.15mm. (0.006 in); the standard size of a new journal is 14.7mm. (0.579 in). Check the spider seal rings and replace them if necessary. The radial backlash of the sleeve yoke splines to gearbox splines should not exceed 0.5mm. (0.002 in). Renew the sleeve yoke if the figures are in excess of the specified value.

Mount the shaft between the centres of a suitable fixture and use a dial gauge to check that the run-out of the shaft does not exceed 0.6mm. (0.024 in) at the centre of the tubular portion The shaft can only be straightened with a hydraulic press, it is advisable however, to renew the shaft if the run-out is excessive.

Check that the dynamic balance of the shaft does not exceed 15 grm.cm. (0.208 oz.in). at 4000 r.p.m.

PROPELLER SHAFT - Assembly and Installation

Assembly and installation is a reversal of the removal and dismantling procedures, noting the following points.

Grease the needle rollers with wheel bearing grease before placing them into the bearing race. Lubricate all splines with gear oil. Adjust the journal radial end float to within 0.02mm (0.0008 in) using a suitable snap ring. Snap rings are available in eight thicknesses, from 2.00mm (0.079 in) to 2.14mm (0.084 in) and are colour coded as detailed in Technical Data at the end of this section.

DIFFERENTIAL - Removal (Saloons with independent rear suspension)

1. Remove the handbrake rear cable; remove the propeller shaft and drive shafts as described in their relevant sections.
2. Support the differential with a jack and remove the nuts securing the differential mounting crossmember (Fig.G.3.)
3. Remove the bolts holding the differential to the suspension member. Withdraw the differential and jack to the rear.
4. Support the suspension member with a stand to prevent the mountings from becoming twisted or damaged.

DIFFERENTIAL - Dismantling

Before dismantling, place the carrier assembly in a suitable mounting stand (or special stand ST 06270001) and carry out preliminary checks, as follows:

Check the tooth contact pattern of the crownwheel and pinion by applying lead oxide to three or four teeth of the crownwheel. Turn the crownwheel several times to obtain an impression of the tooth contact pattern. Check the backlash between the teeth of the crownwheel and pinion, using a dial gauge. The backlash should be within 0.10 - 0.20mm. (0.004 - 0.008 in).

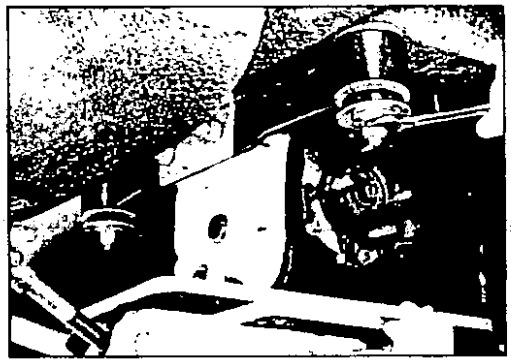


Fig. G.3 Removing the differential mounting member.

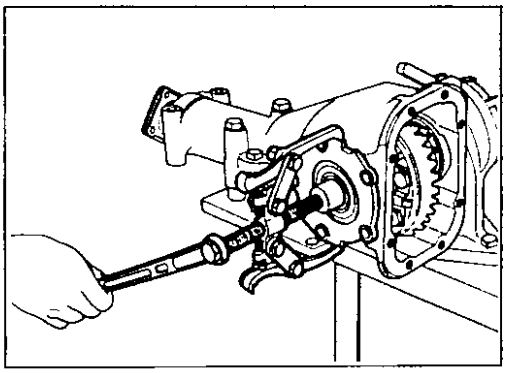


Fig. G.5 Removing the side retainer.

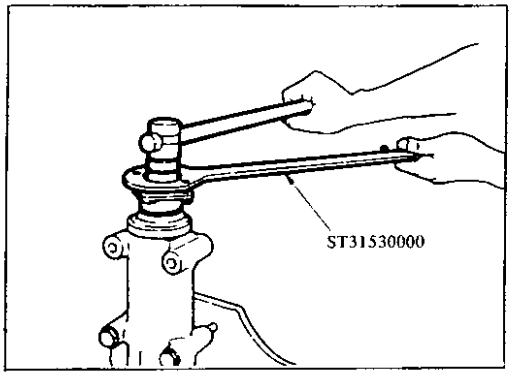


Fig. G.7 Removing the drive pinion nut.

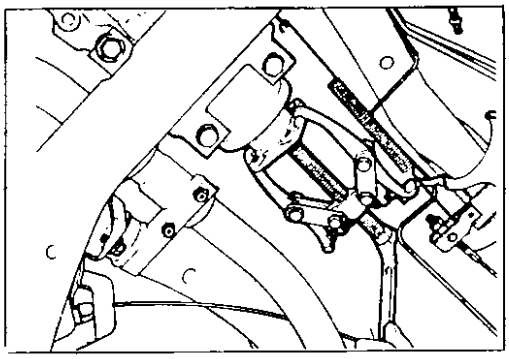


Fig. G.9 Removing the drive flange.

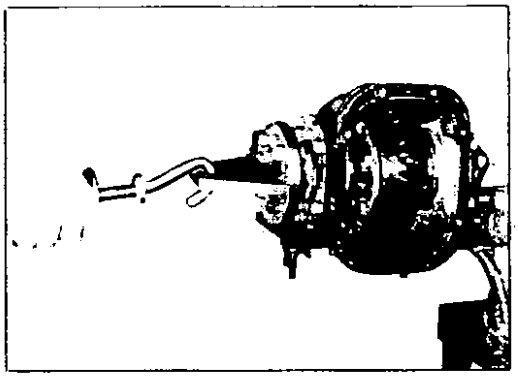


Fig. G.4 Removing the side flange.

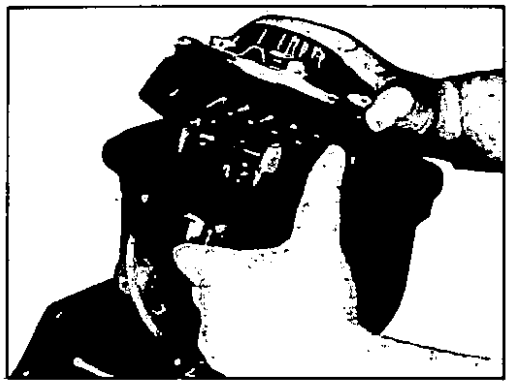


Fig. G.6 Removing the differential cage.

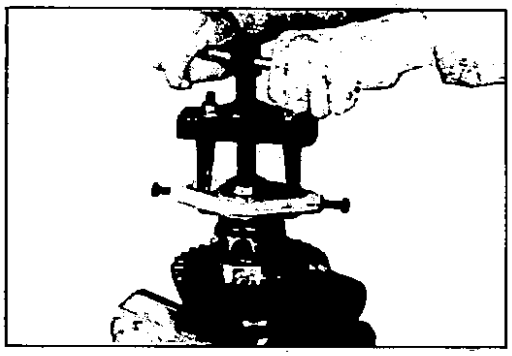


Fig. G.8 Removing the differential side bearing.

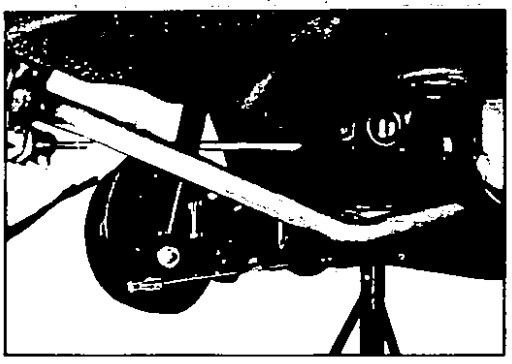


Fig. G.10 Removing the gear carrier side flange.

Check the run-out at the rear of the crownwheel, if the backlash or tooth contact pattern is incorrect. The run-out should not exceed 0.08mm. (0.003 in). Measure the turning torque of the drive pinion which should be within 7-10kg.cm. (6-9lb.in). Shims and adjusting washers must be changed if the tooth contact pattern and backlash is incorrect, the necessary details for these operations can be found towards the end of this section under the heading TOOTH CONTACT PATTERN.

To dismantle the differential, remove the flange clamp bolt and extract the side flange as shown in Fig.G.4., using the special stand ST 33730000 and sliding hammer ST 36230000.

Remove the bearing caps with a suitable puller, as shown in Fig.G.5. Remove the left hand cap first, followed by the right hand cap. The caps should be marked to ensure that they are refitted in their original positions. Withdraw the differential cage from the carrier. (Fig.G.6.).

Slacken the drive pinion and hold the flange with a suitable wrench as shown in Fig.G.7. Withdraw the flange with a standard puller. Press the drive pinion out of the differential carrier together with the rear bearing inner races, the spacers and the shims. Place a press plate between the drive pinion head and rear bearing and press out the pinion shaft.

The inner races need not be removed if the tooth contact pattern is correct and the crownwheel, drive pinion, carrier, rear bearing and shims, etc., are to be re-used. The front and rear outer races of the pinion bearings can be removed with the special tool ST 30610000, or with a suitable drift.

To dismantle the differential cage, remove the right hand bearing cone as shown in Fig.G.8. The special puller ST 3306-0000 and adaptor ST 33052000 should be used for this purpose, taking care not to damage the edge of the bearing inner race. Flatten the lock straps slacken the crownwheel bolts in a diagonal pattern and remove the crownwheel.

Remove the left hand bearing cone in a similar manner to the right hand bearing cone. Make sure that the parts do not become mixed and can be assembled in their original positions. Punch out the differential shaft lock pin from the crownwheel side using a suitable drift. Great care must be taken when carrying out this operation, as the pin is caulked into the hole in the differential cage.

Remove the shaft, the differential pinion gears and the side gears and thrust washers. Separate the left and right hand gears and washers so that they can be reassembled in their original positions.

Replacing oil seals with the differential installed.

The oil seals can be replaced, if necessary, with the differential fitted to the vehicle.

Front oil seal

Drain the oil from the differential unit and jack up the vehicle at the rear. Remove the propeller shaft from the differential flange. Disconnect the handbrake left hand rear cable. Slacken and remove the drive pinion nuts whilst holding the drive flange with a suitable wrench, or special tool ST 31530000. Withdraw the drive flange with a conventional two-arm puller as shown in Fig.G.9. Use the oil seal puller ST 33290000 to withdraw the oil seal from the retainer. Replace the oil seal using a suitable drift, or special tool ST 33270000. Fill the oil seal lips with grease when installing. Fit the oil seal retainer and replace the various parts in reverse order to the removal procedure.

Side oil seal

Detach the drive shaft from the side flange of the differential carrier. Extract the side flange with the slide hammer ST 36230000 and adaptor ST 33730000 as shown in Fig.G.10. Remove and replace the oil seal in a similar manner to that previously described for the front oil seal, taking care to apply grease between the oil seal lips.

DIFFERENTIAL - Inspection

Clean the parts thoroughly and inspect them for signs of wear or damage.

1. Check the gear teeth for scores, cracks or excessive wear. Check the tooth contact pattern of the crownwheel and pinion for correct meshing depth. The crownwheel and pinion are supplied as a set and should either part be damaged it will be necessary to renew the complete set.

2. Check the pinion shaft and gear mating faces for scores, or wear. Inspect the inner faces of the side gears and their seating faces on the differential cage.

3. Any small defects on the faces of the thrust washers can be corrected using emery cloth. The thrust washers must be replaced however, if the backlash between the side gear and pinion exceeds 0.2mm. (0.008 in) and the clearance between the side gear and thrust washer exceeds 0.3mm. (0.012 in). Three sizes of washers are available and the thicknesses are detailed in Technical Data at the end of this section.

4. Measure the run-out of the crownwheel at the rear with a dial gauge. Replace the crownwheel and drive pinion as a set, if the run-out exceeds the permissible value of 0.08mm. (0.003 in).

5. Examine the differential carrier and cage for cracks or distortion. Renew any part found to be defective. It is advisable to renew all oil seals.

DIFFERENTIAL - Assembly and Adjustment

Assembly is a reversal of the removal procedure, noting the following points:

Arrange the shims and washers, etc., in their correct order and thoroughly clean the surfaces to which the shims, washers, bearings and bearing retainers are to be installed.

Differential cage

Fit the differential side gear and bevel gear in the cage using the correct thrust washers. Insert the pinion shaft so that the lock pin hole corresponds with the hole in the differential

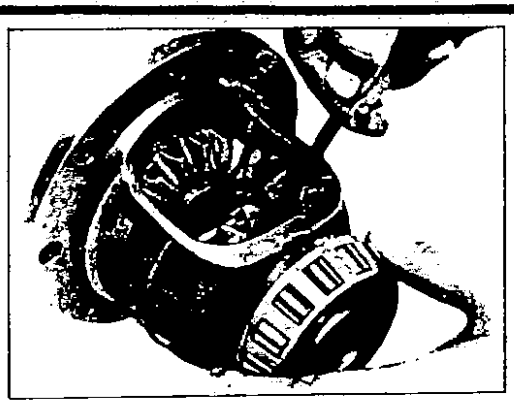


Fig. G.11 Measuring the clearance between the differential side gear and thrust washer.

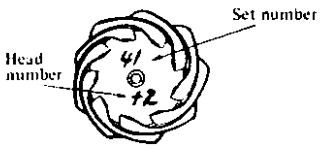


Fig. G.13 Drive pinion markings.

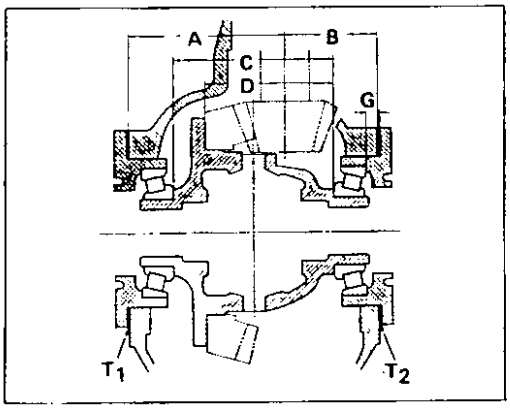


Fig. G.15 Adjustment diagram for the differential side covers.

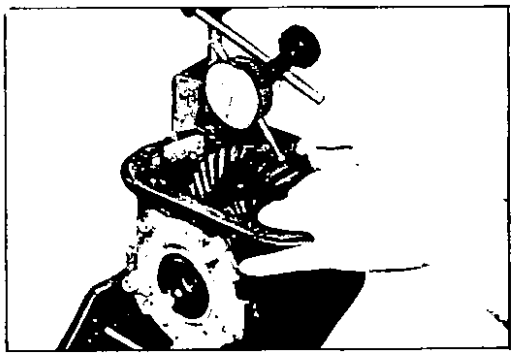


Fig. G.17 Checking the backlash of crownwheel and pinion.

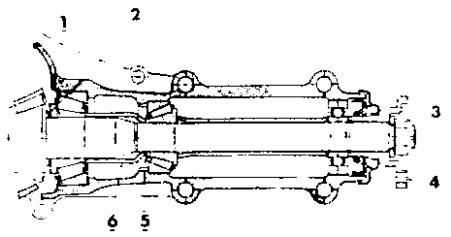


Fig. G.12 Section through the drive pinion.

1. *Pinion height adjusting washer.*
2. *Pinion height adjusting shims.*
3. *Tightening torque of nut-drive pinion 17 to 20 kgm. (122.9 to 144.6 lb.ft.).*
4. *Pre-load for pinion bearing without oil seal and drive 7 to 10 kgm. (50.6 to 72.3 lb.ft.)*
5. *Pinion bearing adjusting washer*
6. *Pinion bearing adjusting spacer*

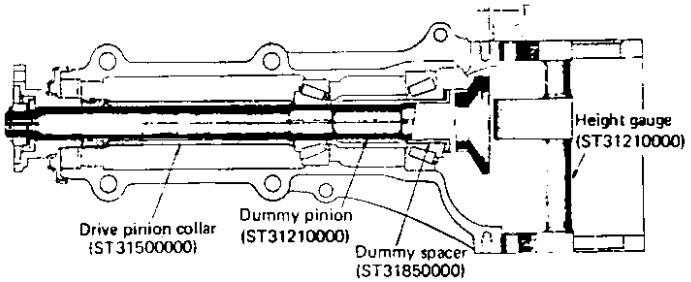


Fig. G.14 Adjusting the pinion height.

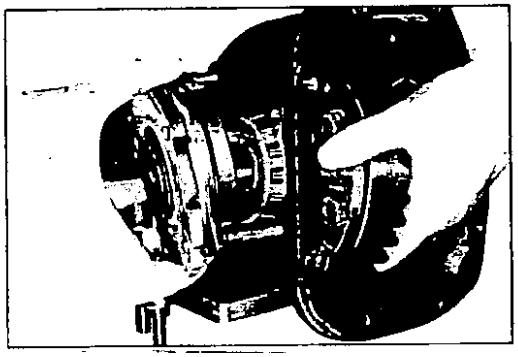


Fig. G.16 Installing the differential side covers.

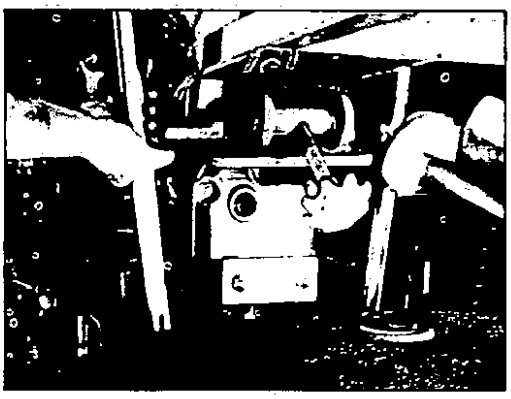


Fig. G.18 Fitting the differential mounting member.

cage. Measure the clearance between the rear face of the side gear and the differential cage as shown in Fig.G.11, and if necessary, use a thrust washer which will given a clearance of 0.1 - 0.2mm. (0.004 - 0.008 in). Fit the pinion shaft lock pin and secure it by caulking with a punch. Lubricate the gear teeth and check the gear for freedom of rotation.

Install the crown wheel in the differential cage and insert the bolts with new lock straps. Tap the head of each bolt lightly and tighten the bolts in a diagonal pattern to a torque reading of 7.0 - 8.0 kgm (51 - 58 lb.ft). Measure the width of the side bearings before installing them. Place a weight of 2.5 kg. (5.5.lb.) on the bearings and check the nominal width which should be 20mm. (0.787 in). Press the side bearings into the differential cage.

Adjustment of drive pinion preload

This adjustment is carried out without fitting the oil seal. Press the front and rear bearing outer races into the gear carrier and fit the pinion height adjusting washer (Fig.G.12.), the shims and the rear bearing inner race onto a dummy shaft, (special tool ST 312120000). The old washers and shims can be re-used if the tooth contact pattern was found to be correct on the pre-dismantling check. Fit the drive pinion bearing spacer, the washer ans special collar ST 312140000 or ST 31500000 and the drive flange on to the dummy shaft. Tighten the drive pinion nut to a torque reading of 17-20 kgm. (123-145 lb.ft.). Measure the drive pinion bearing pre-load and select washers and spacers to give a pre-load of 7-10 kg.cm. (6-9 lb.in). with new bearings, or 3-6 kg.cm. (2.6 - 5 lb.in.) with used bearings.

Adjusting spacers are available in lengths of 56.2 - 57.2 mm. (2.2126 - 2.2520 in) and adjusting washers in thicknesses of 2.59 - 2.31 mm. (0.1020 - 0.0909 in).

Adjustment of pinion height

The pinion height or distance of the face of the pinion to the axis of the crownwheel is adjusted by the thickness of the adjusting washer behind the drive pinion gear.

The drive pinion has a tolerance mark etched on its face, this tolerance is accompanied by a + or – sign to show the deviation from the nominal dimension. The plus sign indicates that the nominal distance must be increased and the minus sign that it must be decreased. The tolerances are shown in Fig. G.13.

The pinion height can be adjusted using the original adjusting washer and shims between the rear bearing cone and the drive pinion. Install the setting gauge ST 31210000 on the carrier with the dummy pinion installed (See Fig.G.14.).

Measure the clearance between the head of the dummy shaft and the tip of the setting gauge using a feeler gauge as shown in Fig.G.15. The clearance is also shown at the point "T" in Fig.G.14. The required thickness of the adjusting washer can be obtained using the following formula.

$$S = W + T - (H \times 0.01) - 0.20$$

Where, W = thickness of inserted shims and washers
T = Measured thickness
H = Figure engraved on pinion head
S = Required thickness of washers and shims.

A typical example is given below:

W = 2.20 + 1.20	= 3.40 mm.
T	= 0.24 mm.
H	= –2
S 3.40 + 0.24 – (-2 x 0.01)	
-0.20	= 3.46 mm.

An adjusting washer must be selected which is nearest in thickness to the value of 3.46mm. Adjusting washers are available in thicknesses of 3.09mm. (0.01217 in) to 3.66m. (0.1441 in) for the 1800cc. models and in thicknesses of 2.0 - 2.2. and 2.4mm. (0.787, 0.866, and 0.945 in.) for the 1400 and 1600 cc. models.

Fit the selected adjusting washer and shims to the drive. pinion and press on the rear bearing inner race. Install the drive pinion into the differential carrier together with the bearing spacer and washer, the front bearing inner race and the front bearing pilot spacer.

Fit the drive flange and washer on the drive pinion and secure them with the pinion nut. Tighten the nut to a torque reading of 17-20 kgm. (123 - 145 lb.ft.).

SIDE BEARING SHIMS - Selecting

The side bearing pre-load must be adjusted with selected shims, if the differential carrier. the cage, the side bearings or the bearing covers have been renewed.

The required thickness of the shims can be obtained using the following formula and referring to Fig.G.15.

$$T1 \text{ (left side bearing)} = (A + C + G1 - D - E + H) \times 0.01 + 0.76.$$

$$T2 \text{ (right side bearing)} = (B + D + G2 - F - H) \times 0.01 + 0.76$$

Where:
A & B = The figure on the differential carrier
C & D = The figure on the differential cage
E & F = The differences in width of the left or right hand bearings against the nominal width of 20.0mm. (0.7874 in) given in units of 1/100 mm.
G1 & G2 = The figure on the side cover
H = The figure on the crownwheel

The A,B,C,D,G, and H figures indicate the dimensional variations in units of 1/100 mm. from the standard measurement. An example of the calculations to decide the thickness of shim required is given below.

Where:
A=1, B=2, C=2, D=1,G1=3, G2=1, E=0.01mm. F= +0.02mm. H=-2.

Left side bearing

$$T1 = (A + C + G1 - D + H) \times 0.01 + 0.76 - E.$$
$$= (1 + 2 + 3 - 1 - 2) \times 0.01 + 0.76 + 0.01 = 0.8\text{mm}.$$

Right side bearing

$$T2 = (B + D + G2 - H) \times 0.01 + 0.76 - F$$
$$= (2 + 1 + 1 + 2) \times 0.01 + 0.76 - 0.02 = 0.8\text{mm}.$$

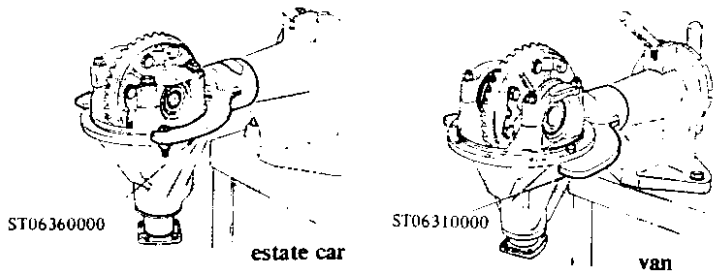


Fig. G.19 Mounting the differential carriers.

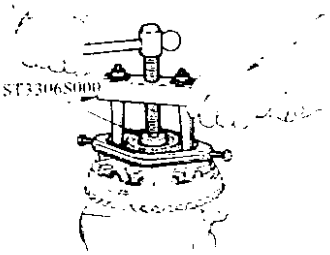


Fig. G.20 Removing the side bearing.

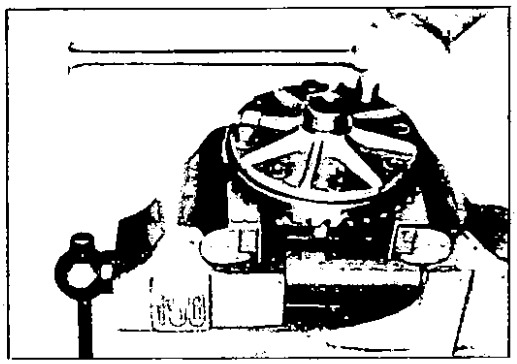


Fig. G.21 Removing the crownwheel bolts.

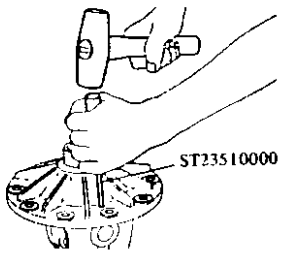


Fig. G.22 Punching out the pinion shaft lock pin.

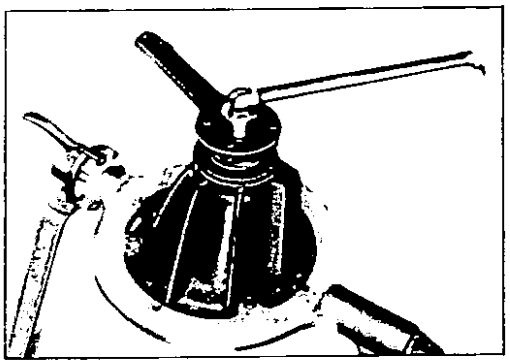


Fig. G.23 Removing the drive pinion nut.

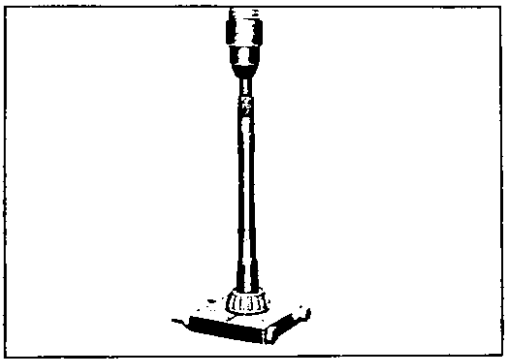


Fig. G.24 Removing the pinion rear bearing inner race.

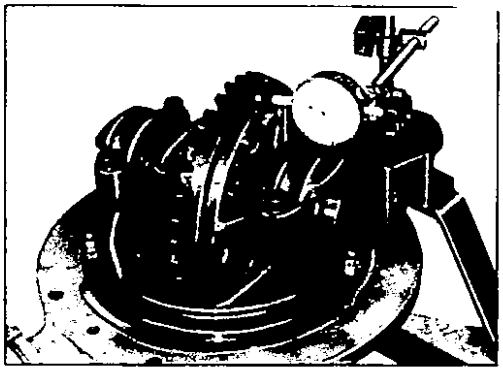


Fig. G.25 Checking the crownwheel for run-out.

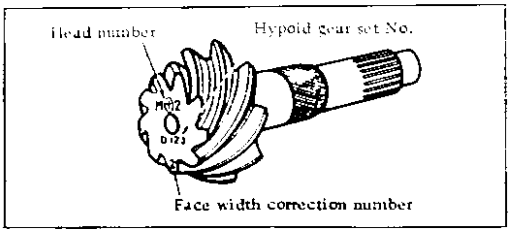


Fig. G.26 Drive pinion markings (Estate cars).

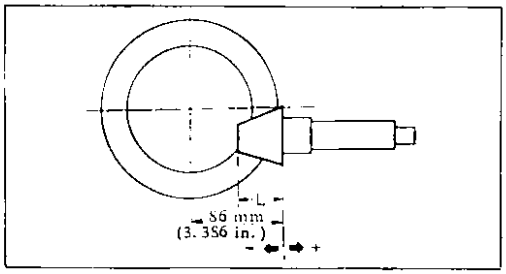


Fig. G.27 Standard pinion height dimension.

The standard width of the side bearings is 20.0mm. (0.7874) this width must be measured before attempting to calculate the thickness of the adjusting shims. Use a dial gauge and surface plate to obtain the measurement. Place a weight of approximately 2.5 kg. (5.5 lb.) on the bearing to obtain steady readings.

Install the differential cage assembly in the carrier. Fit the selected shims and 'O'-rings into both differential side bearing covers and install the covers in the carrier using the special tool ST 33720000. (Fig.G.16.). Make sure that the side bearing outer races are not damaged by the roller. Measure the backlash between the teeth of the crownwheel and drive pinion with a dial gauge as shown in Fig.G.17. Set the dial gauge to 0.10 -0.20 mm. (0.004 - 0.008 in.). If the backlash is less than the specified value, move the left side adjusting shim to the right side and vice versa if the backlash exceeds the specified figure.

Check that the run-out at the rear of the crownwheel does not exceed 0.05mm. (0.002 in) for the 1800cc. model or 0.08mm. (0.003 in) for the 1400. Check the drive pinion turning torque. The turning torque should be higher by 1-3 kg. cm. compared with the turning torque obtained before fitting the differential cage in the carrier. The higher value can be provided, if necessary by changing the side cover shims. Note however, that any decrease or increase in the thickness of shims will alter the backlash between the teeth of the crownwheel and pinion.

Check the tooth contact pattern of the crownwheel and pinion as described under the appropriate heading.

DIFFERENTIAL - Installation

Secure the differential carrier on the rear suspension member, using the four bolts and washers. Fit the differential mounting member to the mounting holes by pushing it forwards with a suitable lever (Fig.G.18.). Tighten the nuts to a torque reading of 8.5 kgm. (61.5 lb.ft.) Tighten the bolts attaching the gear carrier to the suspension member to a torque reading of 6-7 kgm (36 - 51 lb.ft.).

The remainder of the installation operations are a reversal of the removal procedure. Fill the differential with the correct quantity of recommended oil.

DIFFERENTIAL CARRIER - Removal and Dismantling (Estate car and Van)

To remove the differential carrier, disconnect and remove the propeller shaft as previously described and remove the two rear axle shafts, as described in the section REAR AXLE. Withdraw the nuts securing the differential and remove the carrier from the rear axle.

Mount the unit on the special attachment as shown in Fig.G.19. and carry out a preliminary check before dismantling.

Check the tooth contact of the crownwheel and pinion by applying lead oxide to three or four teeth of the crownwheel. Turn the crownwheel several times to obtain an impression of the tooth contact pattern. Check the backlash between the teeth of the crownwheel and pinion with a dial gauge. Hold the drive pinion with one hand and move the crownwheel backwards and forwards to check that the backlash is within the specified limits. Shims and adjusting washers must be altered if the tooth contact pattern and backlash is incorrect, the necessary details for these operations can be found towards the end of this section under the appropriate headings. Finally, mark the bearing caps with a hammer and punch to ensure correct alignment on re-assembly.

Remove the bearing caps and withdraw the differential cage; make a note of the left and right hand positions so that the bearing caps and outer race can be re-assembled in their original positions.

Withdraw the side bearings with the special puller as shown in Fig. G.20. taking care not to catch the edge of the bearing inner races.

Place the assembly in a vice and detach the crownwheel by slackening the retaining bolts in a diagonal patter (Fig.G.21.). Drive out the pinion shaft lock pin from left to right using a suitable punch, or special tool ST 23520000 (Fig.G.22). Withdraw the pinion shaft and take out the pinions, side gears and thrust washers. Store the gears and thrust washers so that they can be assembled in their original positions.

Check the initial turning torque of the drive pinion with the preload gauge ST 3190000 and measure the height of the drive pinion with the special gauge ST 31941000. Compare the figures obtained with those given in Technical Data at the end of this section.

Hold the drive pinion with the special wrench ST 31530000 as shown in Fig. G.23. and unscrew the drive pinion nut, then pull out the drive pinion flange.

Tap the drive pinion assembly to the rear with a plastic mallet and withdraw it together with the rear bearing inner race, bearing spacer and adjusting washer.

Remove and discard the oil seal and withdraw the front bearing inner race. Drive out the outer races of the front and rear bearings with a suitable drift. (Fig.G.25.).

The drive pinion rear bearing inner race can be removed with the special tool ST 300310000, as shown in Fig.G.24.

DIFFERENTIAL - Inspection

Clean all components thoroughly and examine for signs of wear or damage.

Check the teeth of the crownwheel and pinion for scoring and chipping. It should be noted that the crownwheel and pinion are supplied as a matched set and if either part is damaged the complete set must be replaced.

Examine the inner faces of the side gears and seats on the differential case. Inspect the bearing races and rollers and replace them if necessary.

Small defects on the faces of the thrust washers can be corrected using emery cloth, however, if the clearance between side gear and thrust washer exceeds 0.1 - 0.2mm. (0.0039 - 0.0079 in) it will be necessary to replace the washer. Various sizes of washers are available and the thicknesses are detailed under the heading DIFFERENTIAL GEAR CAGE - Assembling.

Check the run-out of the crownwheel as shown in Fig.G.25. Position the dial gauge to the rear of the crownwheel and check that the run-out does not exceed 0.05 mm. (0.0020 in). If the run-out limit is exceeded, replace the crownwheel and pinion as a set.

Inspect the differential carrier and case for cracks or distortion and replace them if necessary.

DIFFERENTIAL GEAR CAGE - Assembling

Install the differential side gears, pinions and original thrust washers into the cage and check the clearance between side gears and thrust washers. The clearance must be adjusted to within 0.05 - 0.20 mm. (0.002 - 0.008 in.) for the 1400 and 1600 cc. models and to within 0.10 - 0.20 mm. (0.004 - 0.008 in) for the 1800 cc. models. Correction can be made if necessary by replacing the thrust washers, which are available in the following sizes.

SIDE GEAR THRUST WASHERS

1400 and 1600 cc. Estate car -	0.78, 0.83, 0.88, 1.03, 1.23 mm. (0.0030, 0.0327, 0.0346, 0.0406, 0.0484 in).
1800cc. Estate car -	0.785, 0.835, 0.885, 1.035 1.185 mm. (0.0309, 0.0329, 0.0348, 0.0408, 0.0467 in).
1800 cc. Van -	0.75 - 0.80 mm. 0.80 - 0.85 mm. 0.85 - 0.90 mm. 0.90 - 0.95 mm. (0.0295 - 0.0315 in. 0.0315 - 0.0335 in. 0.0335 in. 0.0354 in. 0.0354 - 0.0374 in.)

Drive in the differential pinion lock pin from the right hand side of the case and peen the rim of the hole to prevent the pin from working loose.

Fit the crownwheel to the differential cage and install the bolts and new lock plates. Tap the head of each bolt lightly and tighten the bolts in a diagonal pattern to the specified torque readings.

Press in the side bearing inner race with a suitable drift. The crownwheel adjusting shims must be placed behind the bearings to obtain the correct pre-load. Press the drive pinion rear bearing outer race and front bearing outer race into the carrier. The shim at the rear of the outer race must be increased or decreased to adjust the pinion height, as described below.

Adjusting the drive pinion

The pinion height, or distance from the face of the pinion to the axis of the crownwheel is adjusted by altering the thickness of the adjusting shim between the drive pinion gear and the rear bearing cone. The drive pinion has a tolerance mark etched on its face as shown in Fig.G.26. This tolerance is accompanied by a + or – sign to show the deviation from the nominal dimension of 86mm. (3.386 in) see Fig.G.27. The plus sign indicates that the nominal dimension must be increased by the figure on the pinion, and the minus sign that it must be decreased.

To determine the thickness of the drive pinion shim, press the front and rear bearing outer races into the carrier, fit the rear bearing and dummy shaft and place the appropriate setting gauge on the carrier (See Fig.G.28.). The following setting gauges and dummy shafts should be used for the various models.

1400 and 1600cc. Estate car -	Setting gauge ST 31941000 Dummy shaftST 31942000
1800cc. Estate car -	Setting gauge ST 31141000 Dummy shaftST 31942000
1800cc. Van -	Setting gauge ST 31941000 Dummy shaftST 31942000

Measure the clearance "N" (Fig.G.28) between the tip of the setting gauge and the face of the dummy shaft with a feeler gauge. Determine the thickness of shim required using the following formula.

T = N - (H - D -S) x 0.01 + 0.28 (station wagon)
T = N - (H - D - S) x 0.01 + 2.18 (Van)

Where T = The required thickness of adjusting shim (mm.)
N = The measured clearance (mm.)
H = The plus or minus figure on the pinion head.
D = The figure on the dummy shaft
S = The figure on the setting gauge.

As an example for the Estate car.

N = 0.30 mm. H = +1, D = -1, S = 0
T = 0.30 - (-2 + 1-0) x 0.01 + 0.28 = 0.59 mm.

Shims are available in thicknesses of 0.050, 0.070, 0.10, 0.20 and 0.50 mm. (0.0019, 0.0027, 0.0039, 0.0078 and 0.0196 in) for the Estate cars and in thicknesses of 2.37 - 2.97mm. (0.0933 - 0.1169 in) for the 1800cc. Van.

Take off the drive pinion and the rear bearing outer race and adjust the position of the drive pinion by installing shims of selected thicknesses. Fit the drive pinion and bearing spacer in the pinion housing and tighten the drive pinion nut to a torque reading of 14 - 17 kgm. (101 - 130 lb.ft.) for the Estate cars, or 13 - 20 kgm (94 - 145 lb.ft.) for the 1800 cc. Van

Adjusting the drive pinion preload

The drive pinion preload on Estate car models is adjusted by means of the adjusting spacer and the shims between the spacer and the front bearing inner race.

On the 1800 cc van a collapsible spacer is used to adjust the preload.

Estate car:
Check the preload by attaching a preload gauge to the pinion flange and adjust by selecting spacers and shims from the sizes given in Technical Data. The initial turning torque without the oil seal and with the drive pinion nut tightened to a torque reading of 14 - 17 kgm (101 - 130 lb.ft.) should be 10 - 13 kg. cm. (138.9 - 180.5 in.oz.) for new bearings. If used bearings are fitted the initial torque must be reduced by 20 to 40%. Check the pinion height as previously described and re-adjust, if necessary.

Remove the pinion nut and flange. Press the new oil seal into the carrier ensuring that the lips of the seal are thoroughly

greased. Install the flange, washer and pinion nut. Tighten the nut to a torque reading of 14 - 17 kgm (101 - 130 lb.ft.). If the cotter pin hole is not correctly aligned a suitable washer should be fitted. Do NOT adjust by overtightening the pinion nut.

Van

Lubricate the front bearing with oil and place it in the carrier. Grease the lip of the oil seal and install it to the final drive housing. Install the drive pinion the new collapsible spacer, and the drive flange.

Fit the drive pinion nut and tighten temporarily, until all slackness is eliminated from the front and rear of the drive pinion.

NOTE: Ensure that oil and grease have been completely removed from the threads of the pinion gear the pinion nut and the washer.

Tighten the pinion nut and check the preload with a preload gauge. As the nut is tightened to the specified torque reading of 13 - 20 kgm (94.0 - 144.6 lb.ft.) the preload must be measured at every five to ten degrees, turn of the pinion nut. As the pinion nut is tightened the stepped portion of the spacer is deformed (See Fig.G.29.) and the length between the bearings adjusted.

The drive pinion bearing preload with oil seal and new bearing is 7-15 kg. cm. (6.1 - 13.0 lb.in.). Turn the drive pinion to settle the bearing and re-check the preload and tightening torque. If the preload rate is exceeded, it will be necessry to fit a new spacer, the old spacer cannot be reused and the preload must not be adjusted by loosening the pinion nut.

Side bearing pre-load - adjusting

If the original side bearings are to be used, the shims must be of the same thickness as those previously fitted.

To select shims for new side bearings, proceed as follows:

The standard width of the side bearings is given in Technical Data. This width must be measured before attempting to calculate the required thickness of the adjusting shims. Place a weight of approximately 2.5 kg. (5.5. lb.) and of predetermined height onto the side bearing as shown in Fig.G.30. Measure the width of the bearing with a dial gauge, as illustrated, turning the bearing two or three times to gain an accurate measurement.

Dimensional variations from the standard measurements are marked on the left side bearing housing of the gear carrier, on the right side bearing housing of the gear carrier and on the differential case. These variations are marked in units of 1/100mm and are used for the formula to calculate the thickness of the adjusting shims in the following manner:

Where T1 equals the left side bearing shim (crownwheel side), T2 equals the right side bearing shim (pinion gear). A equals the figure marked on the left side bearing housing, B equals the figure marked on the right side bearing housing, C and D equals the figure marked on the differential case and E and F is the difference between the width of the side bearings and the standard bearing width. H = the figure marked on the crownwheel. (Fig.G.31.). The following formulae can now be used to determine the required shim thicknesses for both side bearings.

100cc. Estate car:
Left side bearing. T1 = (A - C + D - H) x 0.01 + 0.200 + E
Right side bearingT2 = (B - D + H) x 0.01 + 0.090 + F)

1800cc Van:
Left side bearing T1 = (A - C + D - H) x 0.01 + 0.175 + E
Right side bearingT2 = (B - D + H) x 0.01 + 0.150 + F

As an example, where A = 1, B = 2, C = 2, D = 3, E = +0.02mm. H = + 1. The formula for the left side bearing is T1 = (1-2+3-1) x 0.01 + 0.175 + 0.02 = 0.205mm.

1400 and 1600cc. Estate car:
The required thickness of shim can be found using the following formula, in a similar manner to that previously described for the 1800cc. models.

Left side bearing T1 = A - C + D + E + 7
Right side bearing T2 = B -D + F + 6

Shims are available in five thicknesses of 0.05, 0.07, 0.10, 0.20 and 0.50 mm. (0.002, 0.0028, 0.0039, 0.0079 and 0.0197 in).

Fit the selected side bearing adjusting shims on the differential cage and press in the side bearing inner races using a suitable drift. Install the differential cage into the carrier and fit the bearing caps. Ensure that the marks on the caps coincide with the marks on the carrier. Tighten the bearing cap bolts to the specified torque reading (See Tightening torques).

Measure the dimension between the outer edges of the left and right hand caps, using a large micrometer as shown in Fig.G.32. This dimension should be 198.40 - 198.55 mm. (7.8110 - 7.8169 in) for the 1400 and 1600 cc. Estate cars and 1800 cc. Van and 173.23 - 173.29 mm. (6.8201 - 6.8244 in) for the 1800 cc. Estate cars.

Measure the backlash of the crownwheel and pinion with a dial gauge. The backlash must be adjusted to 0.13 - 0.18 mm. (0.005 - 0.007 in) on the 1800 cc. models and to 0.15 - 0.20mm. (0.006 - 0.008 in) on the 1400 and 1600 cc. models. Adjustment can be carried out by moving side bearing shims from the right hand side to the left hand side if the backlash is too high, or vice verca if the backlash is too low. Tighten the bearing cap bolts to the specified torque reading, after adjusting. Ensure that the run-out at the rear of the crownwheel does not exceed 0.05mm. (0.002 in).

Finally, check the tooth contact pattern as described below.

TOOTH CONTACT PATTERN - Checking

The final check on reassembly is an inspection of the tooth contact markings of the crownwheel and pinion.

Apply a coat of red lead in oil to 4 or 5 teeth of the crownwheel. Turn the crownwheel backwards and forwards several times to obtain a clear impression of the contact areas.

Heel contact (Fig.G.33.)

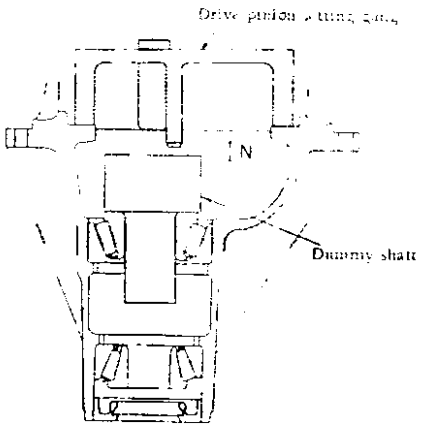


Fig. G.28 Location of the dummy shaft and drive pinion setting gauge.

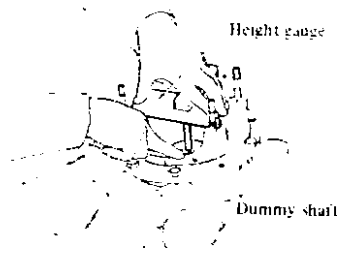


Fig. G.29 Measuring the clearance between the height gauge and dummy shaft.

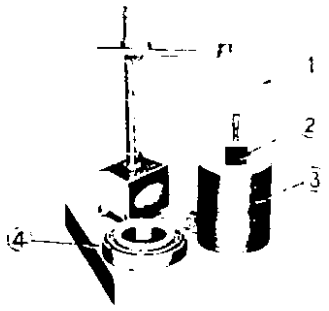


Fig. G.30 Measuring the width of the side bearing under load.

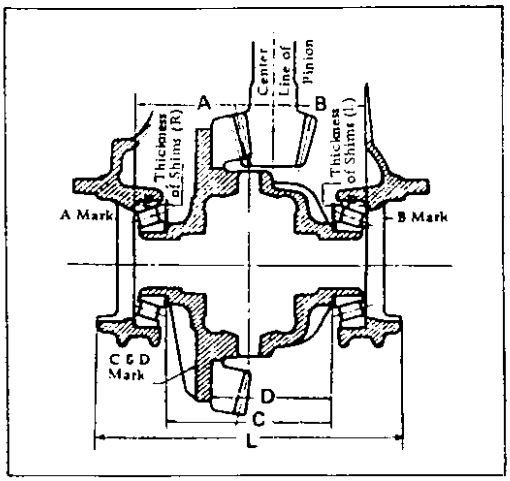


Fig. G.31 Calculating the differential side bearing shims.

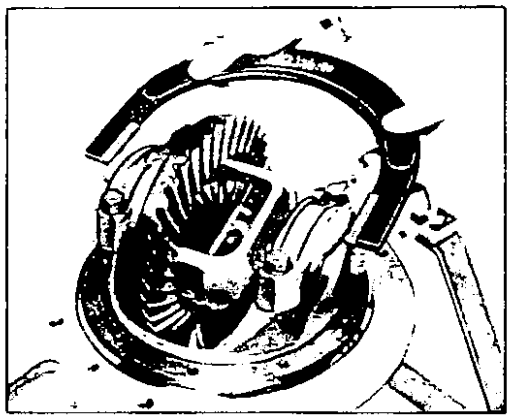


Fig. G.32 Measuring the dimension between left and right hand bearing caps (see text).

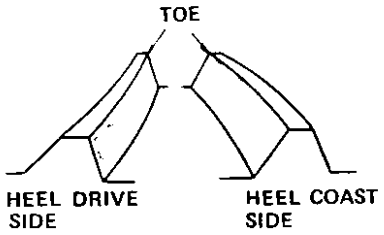


Fig.G.33. Heel contact

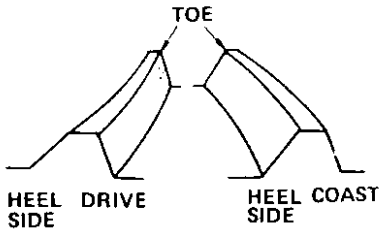


Fig.G.34. Toe contact

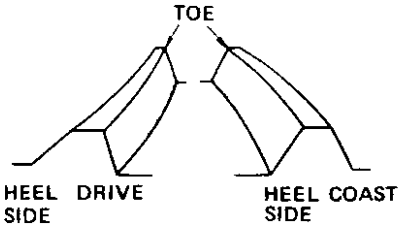


Fig.G.35. Flank contact

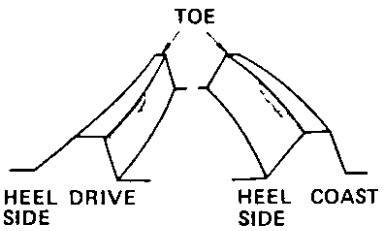


Fig.G.36. Face contact

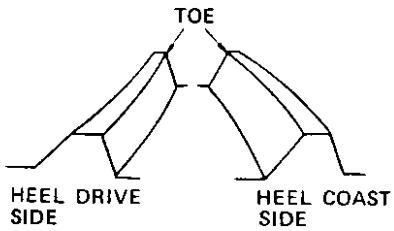


Fig.G.37. Correct contact

Increase the thickness of the drive pinion adjusting shim and washer to move the drive pinion closer to the crownwheel.

Toe contact (Fig.G.34.).

Reduce the thickness of the drive pinion adjusting shim and washer to move the drive pinion away from the crownwheel.

Flank contact (Fig.G.35.).

This pattern should be adjusted in a similar manner to toe contact.

Face contact (Fig.G.36.).

This pattern should be adjusted in a similar manner to heel contact.

Correct contact (Fig.G.37.).

A correct contact pattern showing the impressions within a range of 2/3 to 3/4 of the distance between the tip and the root of the teeth under no load.

It will be necessary to re-check the backlash between drive pinion and crownwheel, if the adjusting shim and washer are changed.

DIFFERENTIAL - Installation

Installation of the differential carrier is a reversal of the removal procedure. Reference should be made to the section REAR AXLE AND REAR SUSPENSION for a description of the operations required to replace the axle shafts.

Technical Data

PROPELLER SHAFT

Axial play of spider journal (1800 cc.)	0.02 mm. (0.0008 in.)
Axial play of spider journal (1400 and 1600 cc.)	0.08 mm. (0.003 in.)
Max. run-out of shaft	0.6 mm. (0.024 in)
Wear limit of spider diameter	0.15 mm. (0.006 in).
Permissible dynamic unbalance:	
Two joint shaft	15 gr. cm. (0.208 in. oz.) at 4000 rpm.
Three joint shaft	35 gr.cm. (0.5 in. oz.) at 5800 rpm.

FINAL GEAR RATIOS

1800cc. Saloon (610)	3.700 : 1
1800cc. Estate Car (610)	3.889 : 1
1800cc. Van (610)	4.375 : 1
1600cc. Saloon (610)	3.900 : 1
1400 and 1600cc. (510) 4 Door Saloon RHD.	4.375 : 1
" 4 Door Saloon LHD.	4.111 : 1
" De-Luxe 4 Door Saloon RHD.	3.889 : 1
" SSS 4 Door Saloon RHD.	3.900 : 1
" 2 Door Saloon LHD.	3.700 : 1

DRIVE PINION

Initial turning torque (without oil seal)	
Saloon models	7 - 10 kg. cm. (0.506 - 0.723 lb.ft.).
Estate car models	10 - 13 kg.cm. (0.723 - 0.940 lb.ft.).
Thickness of pinion height: adjusting washers (1400 and 1600 cc. Saloon) 1400 and 1600 cc. (510)	2.0, 2.2 , 2.4 mm. (0.078, 0.086, 0.094 in.)
Thickness of pinion height: adjusting washers (1800 cc. Saloon)	3.09 - 3.66mm. (0.1217 - 0.1441 in.) in increments of 0.03 mm. (0.001in.)
Thickness of pinion height: adjusting washers (1800 cc. (Estate car).	0.050, 0.070, 0.100, 0.200, 0.500mm. (0.0020, 0.0028, 0.0039, 0.0079, 0.0197 in.)
Thickness of pinion height: adjusting washers (1800 cc. Van)	2.37 - 2.97mm. (0.0933 - 0.1169 in.) in increments of 0.03 mm. (0.001 in.)

Thickness of pinion height: adjusting shims (1400 and 1600cc. Saloon)	1.09 - 1.27 mm. (0.0429 - 0.0500 in.) in increments of 0.02 mm. (0.0008 in.)
Thickness of pinion height: adjusting shims (1400 and 1600 cc. Estate)	0.75, 0.50, 0.25, 0.125 mm. (0.0295, 0.0197, 0.0098, 0.0049 in.)
Length of drive pinion bearing adjusting washers (Saloon & Estate)	2.31 - 2.59mm. (0.0909 - 0.1020 in.) in increments of 0.02 mm. (0.0008 in.)
Length of drive pinion bearing adjusting screws (Saloon)	56.20 - 57.20 mm. (2.213 - 2.252 in). in increments of 0.02 mm. (0.0008 in.)
Length of drive pinion bearing adjusting spacers (1400 and 1600 cc. Estate)	59.25, 59.50, 59.70mm. (2.338, 2.343, 2.358 in.)
Length of drive pinion bearing adjusting spacers. (1800cc. Estate)	48.4, 48.6, 48.8, 49.0 (1.9055, 1.9134, 1.9213, 1.9291 in.)
1800 cc. Van	Non adjustable collapsible spacer.

CROWNWHEEL

Backlash between gears:	
Saloon	0.10 - 0.20 mm. (0.004 - 0.008 in.)
1400 & 1600 cc. Estate	0.15 - 0.20 mm. (0.006 - 0.008 in.)
1800 cc. Estate & Van	0.13 - 0.18 mm. (0.005 - 0.007 in.)
Run-out at rear of crownwheel	
1800 cc. & 1400 & 1600cc. Estate	Less than 0.05 mm. (0.002 in.)
1400 & 1600cc. Saloon	Less than 0.08 mm. (0.003 in.)

DIFFERENTIAL GEARS

Thickness of side gear thrust washers	
Saloon	0.775, 0.825, 0.875 mm. (0.0305, 0.0325, 0.0344 in.)
Estate	0.78, 0.83, 0.88, 1.03, 1.23 mm.
Clearance between side gear and washer (Saloon)	0.10 - 0.20 mm. (0.004 - 0.008 in.)
Clearance between side gear and washer (Estate)	0.05 - 0.20 mm. (0.002 - 0.008 in.)

Rear Axle & Rear Suspension

DESCRIPTION

Saloon models are fitted with independent rear suspension with semi-trailing arms, suspension arms, coil springs and telescopic hydraulic double acting shock absorbers. The differential gear carrier and suspension member is mounted directly onto the body structure via rubber mountings. (See Fig.H.1.).

Estate cars and 1800 cc. Vans are fitted with a semi-floating rear axle with semi-elliptic leaf springs and telescopic hydraulic shock absorbers mounted on rubber bushes. (See Fig.H.2.).

REAR AXLE AND SUSPENSION - Removal (Saloon models)

1. Jack up the rear of the vehicle and support it on stands.
2. Remove the road wheels, disconnect the handbrake linkage and the return spring. (Fig.H.3.).
3. Remove the exhaust tail pipe and silencer.
4. Disconnect the brake hoses and plug the openings to prevent the ingress of dirt.
5. Remove the propeller shaft assembly as described in the relevant section, after marking the propeller rear flange and differential pinion flange.
6. Jack up the suspension arm and remove the shock absorber lower mountings, taking care not to lose the rubber bushings.
7. Place a jack under the centre of the suspension member and differential carrier and remove the nuts securing the suspension member to the body (7 in Fig.H.3.). Remove the differential mounting nuts (8).
8. Carefully lower and remove the suspension assembly.

REAR SUSPENSION - Inspection (Saloons)

Examine all parts for wear and damage, paying particular attention to the rubber bushes in the suspension arms and the bump rubbers. Check the condition of the spring rubber insulators in the suspension member and differential mounting member. The rubber insulators must be replaced if the dimension "A" in Fig.H.4. is less than 5mm. (0.2 in.)

REAR SUSPENSION - Installation (Saloons)

Installation is a reversal of the removal procedures, noting the following points:

Ensure that the suspension member and differential mounting member are correctly aligned as shown in Fig.H.5. and insert the rubber insulators from the underside of the vehicle.

Tighten the differential mounting member, the suspension member and lower shock absorber nuts to the specified tightening torques.

COIL SPRINGS - Removal (Saloons)

1. Jack up the rear of the vehicle and support it on stands.
2. Remove the road wheels and disconnect the handbrake linkage and return spring.
3. Remove the drive shaft flange nuts at the wheel side (Fig. H.6.) and the bump rubber securing nuts.
4. Place a jack under the suspension arm and remove the shock absorber from the lower mounting bracket. Carefully lower the jack and remove the coil spring, spring seat and bump rubber. (Fig.H7.).

COIL SPRINGS - Installation (Saloons)

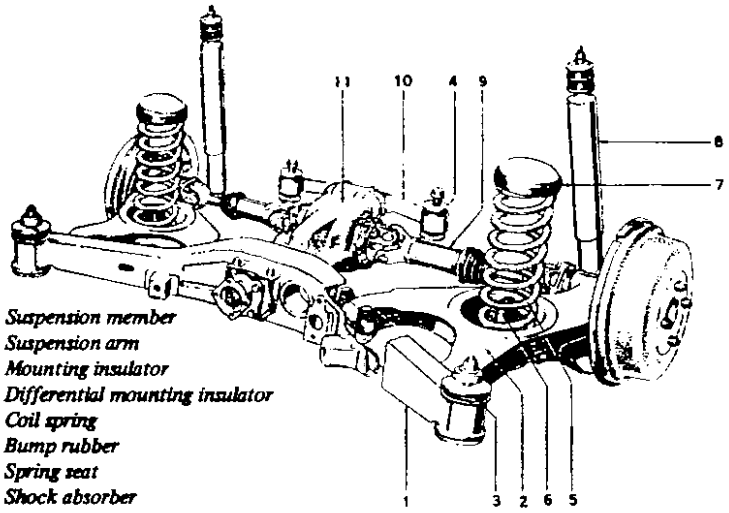
Check the coil springs for signs of deformation or cracks. Test the spring for its free length and height under load, and compare the figures obtained with the information in Technical Data. Inspect all rubber parts and replace any which are damaged or deformed.

Installation is a reversal of the removal procedure making sure that the flat face of the spring is at the top.

REAR SHOCK ABSORBERS - Removal and Installation (Saloons)

Remove the trim in the boot (trunk) and take off the two nuts securing the upper shock absorber mounting (See. Fig.H.8.). Detach the shock absorber from the lower mounting bracket.

The shock absorber should be tested and the figures compared with the specifications in Technical Data. Check for oil leaks and cracks. Make sure that the shaft is straight and that the rubber bushes are not damaged or deformed. Renew all unsatis-



1. *Suspension member*
2. *Suspension arm*
3. *Mounting insulator*
4. *Differential mounting insulator*
5. *Coil spring*
6. *Bump rubber*
7. *Spring seat*
8. *Shock absorber*
9. *Drive shaft*
10. *Differential mounting member*
11. *Differential carrier*

Fig. H.1 Independent rear suspension (Saloons).

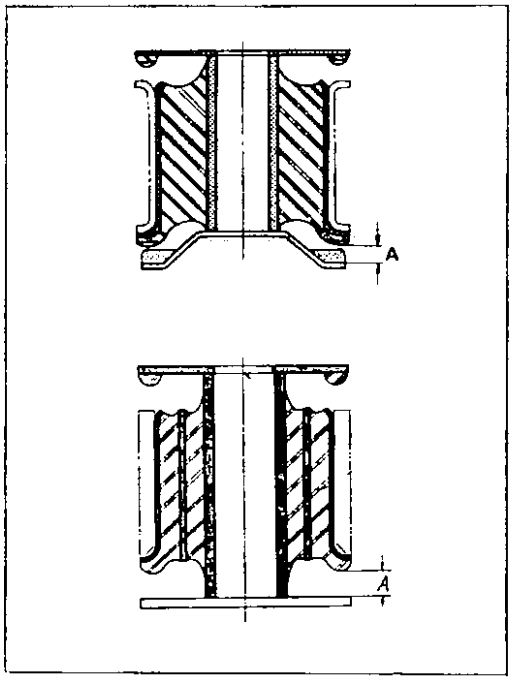
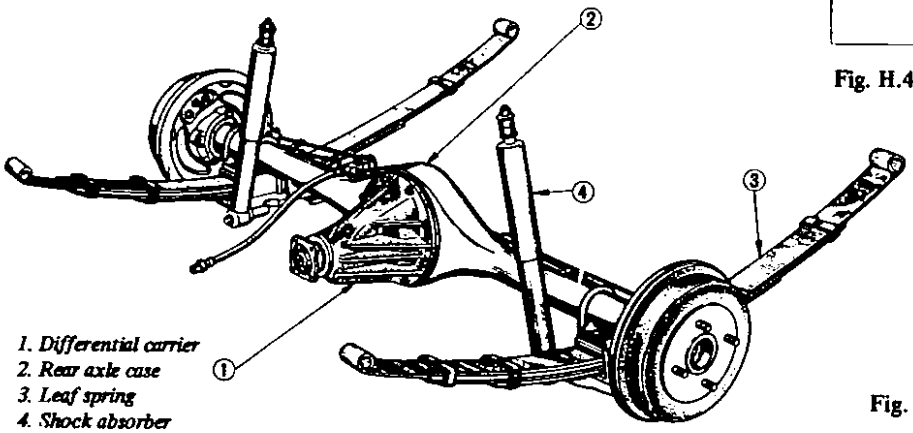


Fig. H.4 Checking the mounting insulators.



1. *Differential carrier*
2. *Rear axle case*
3. *Leaf spring*
4. *Shock absorber*

Fig. H.2 Rear suspension (Estate cars and Vans).

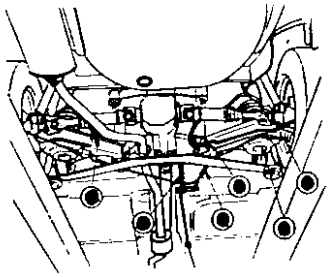


Fig. H.6 Coil spring removal points.

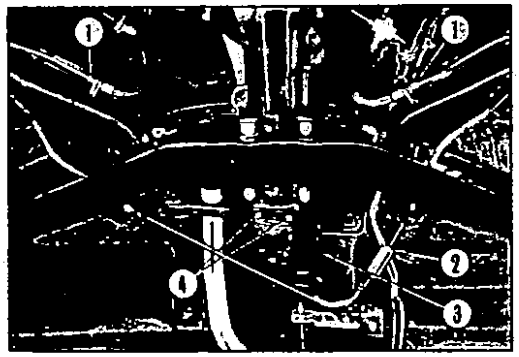


Fig. H.3 Rear suspension removal.

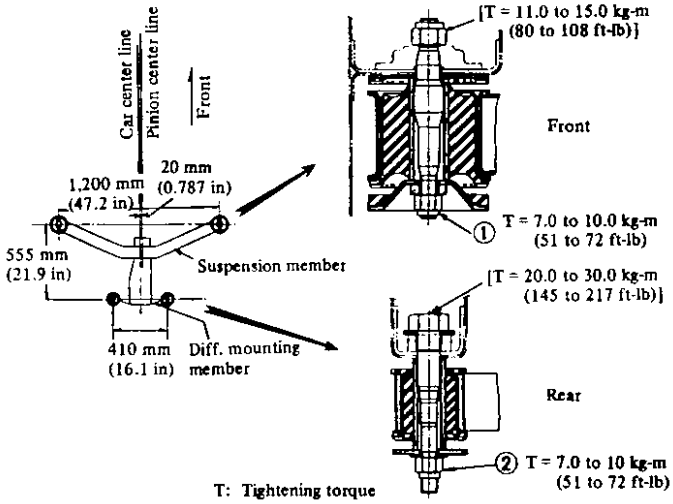


Fig. H.5 Rear suspension installation diagram.

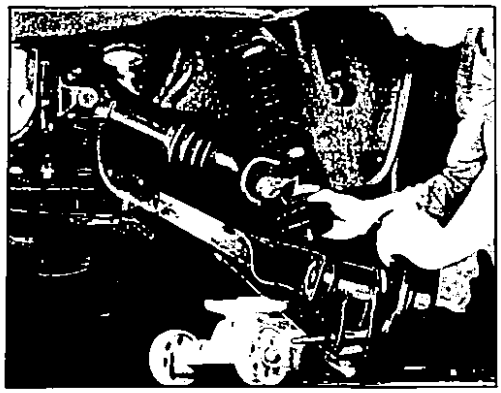


Fig. H.7 Removing the coil spring.

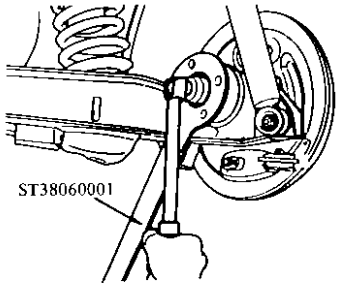


Fig. H.9 Removing the rear wheel bearing nut.

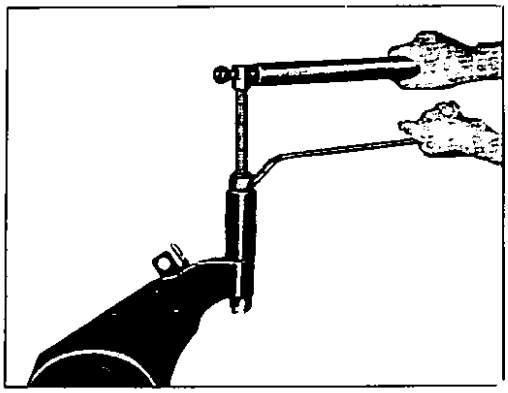


Fig. H.11 Removing the suspension arm bush.

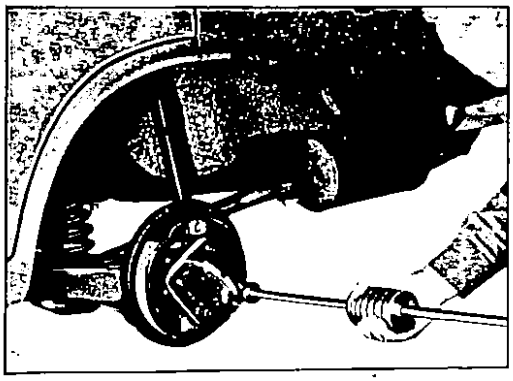


Fig. H.13 Removing the rear axle shaft.

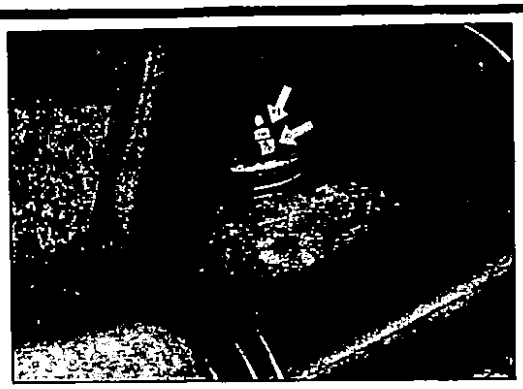


Fig. H.8 Installing the shock absorber upper mounting.

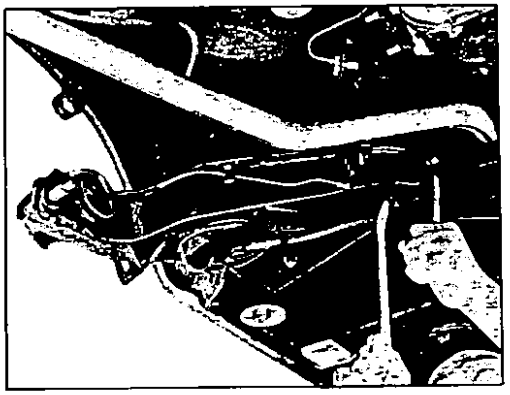


Fig. H.10 Removing the suspension arm.

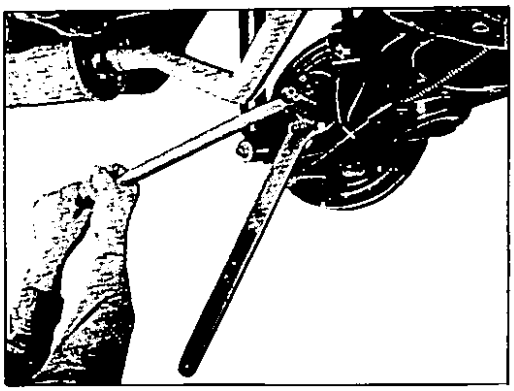


Fig. H.12 Removing the wheel bearing nut.

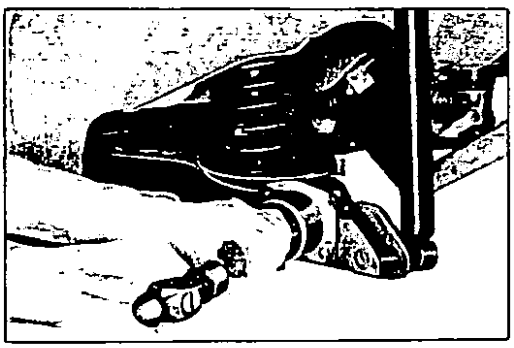


Fig. H.14 Removing the oil seal and inner bearing.

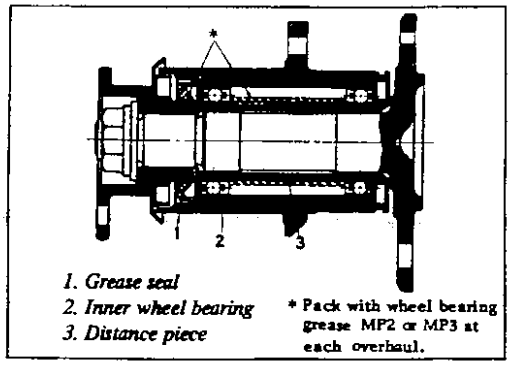


Fig. H.15 Section through the wheel hub.

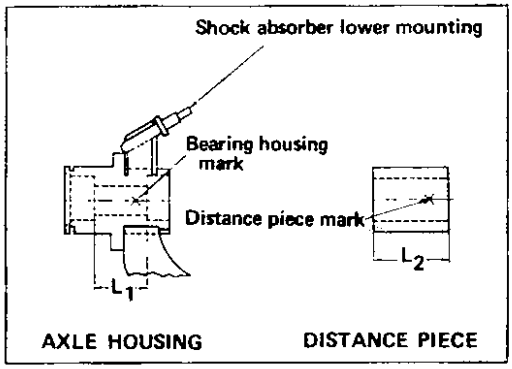
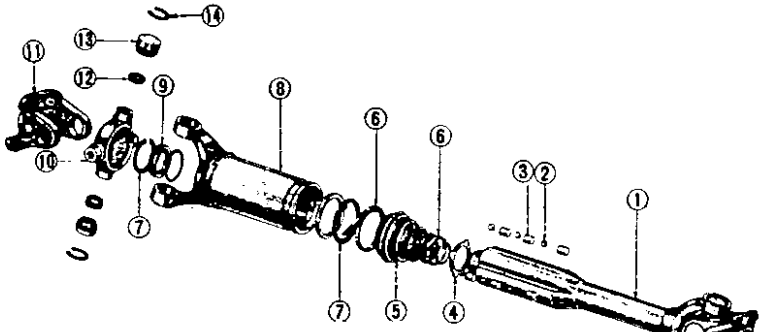


Fig. H.16 Installing the suspension arm (see text).



1. *Drive shaft*
2. *Drive shaft ball*
3. *Ball spacer*
4. *Drive shaft stop ring*
5. *Rubber gaiter*
6. *Gaiter clip*
7. *Snap ring*
8. *Sleeve yoke*
9. *Sleeve yoke plug*
10. *Spider journal*
11. *Flange yoke*
12. *Oil seal*
13. *Needle bearing*
14. *Snap ring*

Fig. H.17 Exploded view of the drive shaft.

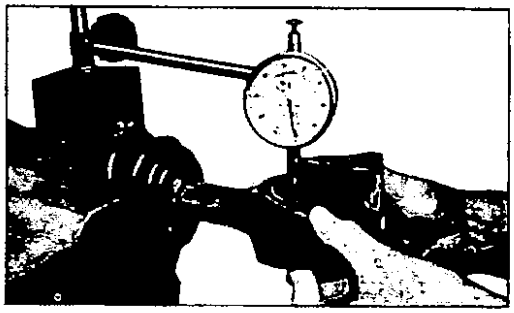


Fig. H.18 Measuring the drive shaft end float.

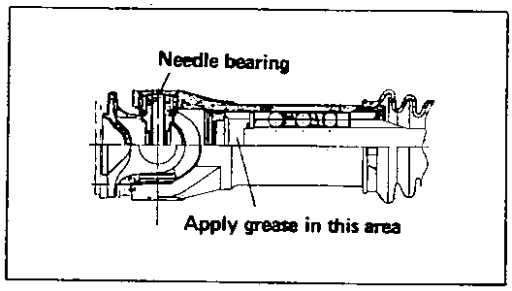


Fig. H.19 Section through the drive shaft.

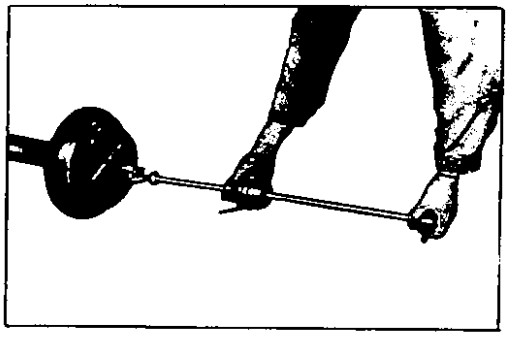


Fig. H.20 Removing the rear axle shaft (Estate cars).

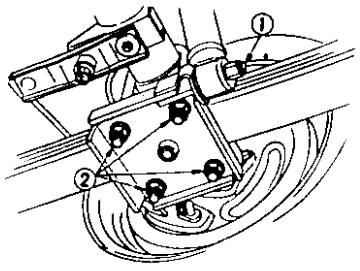


Fig.H.21. Removing the locknuts and U.Bolts.

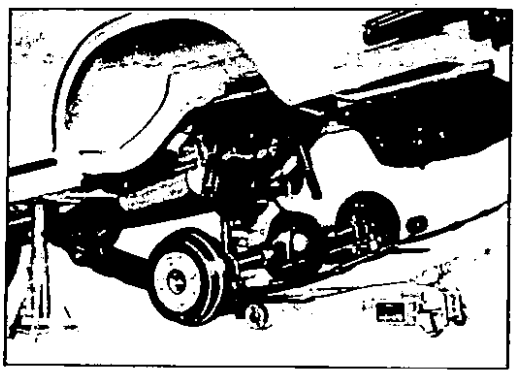


Fig.H.21a. Removal of rear axle.

factory parts.

Installation is a reversal of the removal procedure.

REAR SUSPENSION ARM - Removal and Installation (Saloon)

1. Jack up the car at the rear and support it on stands.
2. Remove the roadwheel and brake drum as described in the section BRAKES.
3. Disconnect the drive shaft from the axle shaft.
4. Disconnect the handbrake cable from the equalizer bracket and the wheel cylinder lever. Disconnect the brake hose from the brake line by removing the lock spring and then withdrawing through the connector. Plug the end of the brake line to avoid loss of fluid and ingress of dirt.
5. Remove the wheel bearing locknut (Fig.H.9.), the rear axle shaft, wheel bearings and oil seal. Remove the rear brake assembly from the suspension arm (See section BRAKES).
6. Jack up the suspension arm to relieve the tension on the shock absorber and disconnect the shock absorber from the lower mounting. Lower the jack gradually and remove the coil spring, seat and bump rubber.
7. Remove the bolts securing the suspension arm to the suspension member (Fig.H.10.) and withdraw the suspension arm.

The rubber bushes can be drawn out of the suspension arm if necessary, using the special tool ST 38280000 (Fig.H.11).

Check the suspension arm for distortion or cracks and inspect the rubber bushes for signs of wear or damage. Renew any part which is unsatisfactory.

Installation is a reversal of the removal procedure. Tighten all the suspension arm mounting bolts with the weight of the vehicle resting on the rear wheels. The self locking nuts must be renewed at each overhaul.

REAR AXLE SHAFTS, BEARINGS AND SEALS (Saloon) (Removal and Dismantling)

1. Raise the vehicle at the rear and place stands under the body member.
2. Remove the road wheel and brake drum.
3. Disconnect the drive shaft from the axle shaft and remove the wheel bearing locknut. The special wrench ST 38060001 can be used to hold the flange as shownin Fig.H.12.
4. Withdraw the axle shaft assembly as shown in Fig.H.13. using the special tool ST 07640000 and sliding hammer ST 36230000. Remove the rear axle drive flange.
5. Use a suitable drift, or special tool ST 37750000 (See Fig. H.14) to drive out the inner bearing and oil seal.
6. Remove the grease retainer and withdraw the outer bearing with a conventional puller. DO NOT re-use this outer bearing.

REAR AXLE SHAFTS, BEARINGS AND SEALS (Saloon) (Assembly and Installation)

Check the axle shaft for straightness, make sure that it is not cracked or damaged in any way. DO NOT heat the shaft if attempting to re-straighten. Make sure that the lip of the oil seal is not damaged or distorted. Check the bearing for excessive wear and damage.

Clean the wheel bearings, the oil seal and the inside of the axle housing.

When installing the wheel bearings, the sealed side of the outer bearing should face the wheel and the sealed side of the inner bearing should face the differential (See. Fig. H.15.). Pressure must be applied to the inner race when fitting.

When replacing the suspension arm check that the distance piece is 0.05 mm. (0.002 in.) shorter than the length of the housing dimension L1 (See Fig.H.16.). The distance piece and axle housing code markings must coincide.

The wheel bearing grease must be replaced every 50,000 km. (30,000 miles). Pack the wheel bearings with grease at the positions shown in Fig.H.15, and coat the lip of the oil seal. Renew the locknut and oil seal at each overhaul.

Wheel bearing adjustment:

Tighten the locknut to the specified torque reading of 25 - 33 kgm. (181 - 239 lb.ft.) and check that the rear axle shaft end play does not exceed 0.15 mm. (0.006 in.) with a turning torque of less than 7 kg. cm. (6.1 lb.in.) for the 1400 and 1600cc. models (510 series) or 4.5 kg.cm. (3.9 lb.in.) for the 1800cc. (610 series).

If the correct end play, or turning torque cannot be obtained it will be necessary to change the distance piece (See above).

DRIVE SHAFTS - Removal and Dismantling

Disconnect the end flanges and remove the shaft (See Fig.H.17). The drive shaft should only be dismantled to lubricate the splines. This operation will only be necessary every two years or 50,000 km. (30,000 miles).

Remove the universal joint spider at the differential side. (Refer to the propeller shaft section). Remove the snap ring securing the sleeve yoke plug and take out the plug. Compress the drive shaft and remove the snap ring and stopper (Fig.H.17.). Disconnect the boot and split the shaft. Make sure that the balls and spacers are retained.

DRIVE SHAFTS - Inspection and Assembly

The drive shaft should be replaced as an assembly if any part is found to be defective.

Check the shaft for straightness, damage or wear. Check

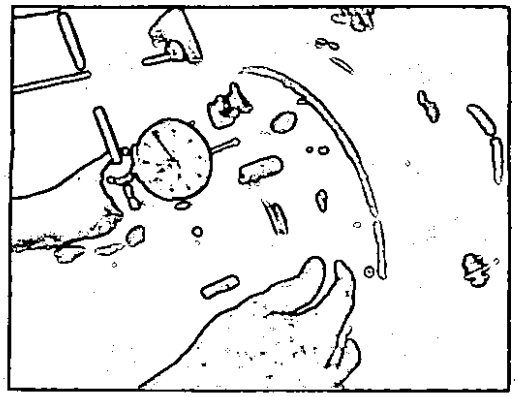


Fig. H.22 Measuring the axle shaft end float.

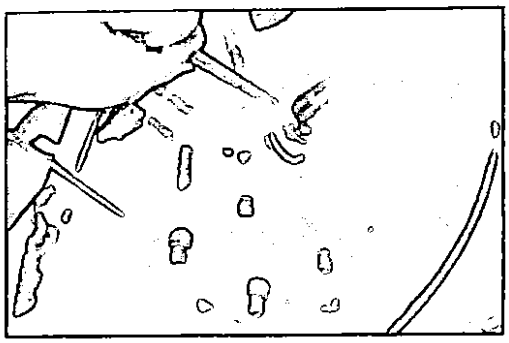


Fig. H.23 Removing the lower shock absorber attachment.

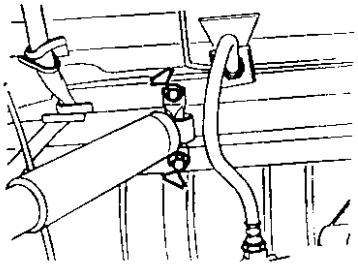


Fig. H.24 Removing the shock absorber upper attachment.

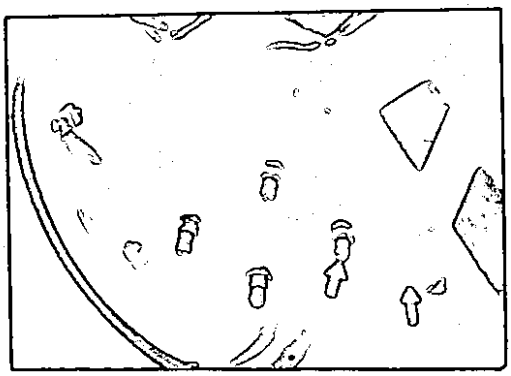


Fig. H.25 Disconnecting the shock absorber and rear spring U-bolts.

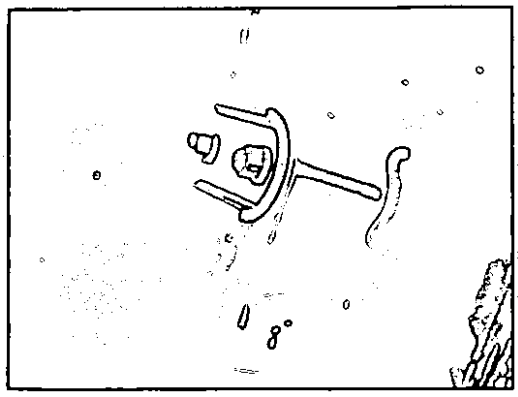


Fig. H.26 Rear spring shackle.

the steel balls and the sleeve yoke for damage or wear. Renew the boots and the sleeve yoke plug 'O' - ring if necessary. Renew the universal joint, if faulty.

Check the play in the drive shaft using a dial gauge as shown in Fig.H.18. The measurement taken with the drive shaft fully compressed should not exceed 0.1mm. (0.004 in.). Renew the drive shaft assembly, if the specified value is not obtained.

Clean the old grease from the sleeve yoke and the drive shaft ball grooves and lubricate with oil.

Assembly of the drive shaft is a reversal of the dismantling procedure, noting the following points:

Align the yokes and make sure that the steel balls and spacers are fitted in the correct order. Select a snap ring which will adjust the axial play of the universal joints to within 0.02mm. (0.0008 in.). Snap rings are available in four thicknesses of 1.49, 1.52, 1.55 and 1.58 mm. (0.0587, 0.0598, 0.0610, 0.0622 in.).

Apply a generous quantity of multi-purpose grease to the ball groove and the area shown in Fig.H.19.

REAR AXLE - Removal (See Fig.H.2.). (Estate car and Van)

1. Jack up the vehicle at the rear and support it on stands.
2. Remove the road wheels and brake drums.
3. Disconnect the brake hose from the brake pipe. Plug the end of the hose to prevent the ingress of foreign matter.
4. Disconnect the handbrake rear cable from the balance lever assembly.
5. Disconnect the propeller shaft from the differential flange. Release the lower shock absorber self locking nuts and slide the mounting eyes of the shock absorber from the rear spring seat pivot.
6. Support the rear axle with a jack, loosen the U-bolts and remove the nuts from the rear spring shackles. Withdraw the shackles from the spring eyes.
7. Remove the U-bolt lock nuts completely and lower the jack to withdraw the rear axle assembly.

REAR AXLE - Dismantling and Inspection

Disconnect the brake pipes from the wheel cylinders and remove the brake pipe and three-way connector. Remove the cross rod clamp and the balance lever from the rear axle case. Remove both cross rod ends from the wheel cylinder lever assembly.

Unscrew the oil drain plug and drain the oil from the axle case into a clean container. The oil may be re-used if it is in good condition.

Remove the nuts securing the brake backplate to the axle case and draw out the axle shaft assembly with the backplate and grease catcher. A sliding hammer ST 36230000 should be used for this operation as shown in Fig.H.20.

The bearing collar can be removed with a press or by cutting with a cold chisel and the bearing withdrawn with the puller ST 3712001 as shown in Fig.H.21. Remove the brake backplate and withdraw the gear carrier from the axle case.

Check the axle shafts for straightness, wear and cracks DO NOT attempt to straighten a bent shaft by heating. Check the oil seal lips for signs of damage or distortion. Make sure that the bearing is not worn or damaged.

REAR AXLE - Assembly and Installation

Assembly is a reversal of the removal procedure, noting the following points:

Thoroughly clean all parts and fit a new gasket between the axle case and gear carrier. Tighten the nuts in a diagonal pattern and to the specified torque readings.

Fit the grease catcher, bearing spacer, bearing and new bearing collar onto the axle shaft. A load of 4-5 tons will be required to press the bearing onto the shaft. Insert the wheel bearing with the seal side facing the wheel and ensure that the oil seal lips are coated with wheel bearing grease prior to fitting.

Check and adjust the axial play between the wheel bearing and the axle housing, using a dial gauge as shown in Fig.H.22. The axial play should be adjusted to within 0.3 - 0.5mm. (0.0118 - 0.0197 in.) on the 1400 and 1600cc. models and to within 0.1mm. (0.0039 in.) on the 1800cc. models.

Fill the rear axle with the specified amount of oil and bleed and adjust the brake system as described in the appropriate section.

REAR SPRING - Removal and Inspection (Estate cars and Vans)

The rear springs, can be removed in the following manner:

1. Jack up the vehicle at the rear until the wheels are clear of the ground and place stands under the rear frame.
2. Disconnect the shock absorber from the spring seat Fig.H.21a. and support the rear axle housing with a jack.
3. Take off the locknuts and remove the U-bolts shown arrowed in Fig.H.21. the spring seat location plates and seat pads.
4. Remove the nuts securing the front bracket to the body, remove the bracket from the spring eye and car body and withdraw the rear spring.
5. Remove the upper and lower rear shackle nuts (Fig.H.23.) and remove the rear spring from the vehicle.

Clean the spring leaves thoroughly and examine them for fractures or cracks. Renew the assembly if necessary.

Check the front pin, shackle, U-bolts and spring seat for signs of wear, cracks, and damaged threads. Renew the components as required.

REAR SPRING - Installation

Installation of the rear spring is a reversal of the removal procedure, noting the following points.

The front bracket pin, front bracket bushing, shackle pin and shackle bushing, should be coated with a soapy solution prior to assembly.

Tighten the front pin securing nut and the shock absorber lower securing nut with the vehicle weight resting on the rear wheels.

Ensure that the flange of the shackle bushing is clamped evenly, on both sides.

The tightening torque values can be found on the page entitled TIGHTENING TORQUES.

REAR SHOCK ABSORBERS - Replacing (Estate cars and Vans)

Jack up the rear of the vehicle and place stands under the rear axle housing.

Disconnect the lower end of the rear shock absorber from the spring seat (Fig.H.23.).

Remove the shock absorber upper attachment nuts and withdraw the shock absorber. The upper attachment nuts are located behind the rear seat backrest, as shown in Fig.H.24.

Check the shock absorber for leakage or cracks and make sure that the shaft is straight. Inspect the rubber bushings for damage and deterioration. Renew all defective components.

Installation is a reversal of the removal procedures. Tighten the upper and lower shock absorber attachment nuts to the torque readings stipulated in TIGHTENING TORQUES. NOTE: The weight of the vehicle must be resting on the rear wheels when tightening the lower mounting to clamp the rubber bushes in an unloaded position.

Technical Data

Type: Independent suspension with semi-trailing arms, or semi-floating.

COIL SPRINGS

1400 and 1600cc.	
Wire diameter	14.2mm. (0.559 in)
Wire diameter (hard suspension)	14.5mm. (0.571 in)
Coil diameter	90 mm. (3.543 in)
Free length R.H.	306 mm. (12.047 in)
Free length L.H.	299 mm. (11.772 in)
Free length (Hard suspension)	290 mm. (11.417 in)
1800cc.	
Wire diameter	14.5 mm. (0.571 in)
Coil diameter	90 (3.54 in)
Free length RHD – R.H.	321 mm. (12.6 in)
Free length RHD – L.H.	307 mm. (12.1 in)
Free length LHD (both)	321 mm. (12.6 in)
Free length (Hard suspension)	
RHD – R.H.	306 mm. (12.0 in)
RHD – L.H.	299 mm. (11.8 in)
LHD (both)	306 mm. (12.0 in)

SHOCK ABSORBERS

1400 and 1600 cc.	
Piston diameter	35 mm. (1.378 in)
Piston diameter (Hard suspension)	40 mm. (1.575 in)
Stroke	206 mm. (8.110 in)
Max. length	568 mm. (22.362 in)
Damping force at 0.3m/sec.	
Expansion	45 kg. (99.2 lb)
Compression	28 kg. (61.7 lb.)
1800 cc.	
Stroke	220 mm. (8.60 in)
Max. length	595 mm. (23.4 in)
Damping force at 0.3 m/sec.	
Expansion	34 - 56 kg. (75-123 lb.)
Compression	21 - 39 kg. (46 - 86 lb.)

SHOCK ABSORBERS (Estate cars and Vans)

1400 and 1600cc. estate cars and rigid axle sedan.	
Piston diameter	25 mm. (0.984 in)
Stroke	205 mm. (8.071 in)
Max. length	518 mm. (20.39 in)
Damping force at 0.3 in/sec- Estate cars	
Expansion	90 kg. (198.4 lb.)
Compression	50 kg. (110.3 lb.)
Damping force at 0.3m./sec- Sedan	
Expansion	75 kg. (165.4 lb.)
Compression	40 kg. (88.2 lb.)
1800cc. Estate cars	
Stroke	205mm. (8.071 in.)
Max. length	518 mm. (20.39 in.)
Damping force at 0.3m/sec Estate cars	
Expansion	63-87 kg. (139 - 192 lb.)
Compression	33-43 kg. (73 - 95 lb.)
Damping force at 0.3 m/sec- Estate car and Van with hard suspension.	
Expansion	97-131 kg. (214-289 lb.)
Compression	29-43 kg. (64-95 lb.)

REAR SPRINGS

1400 and 1600cc. - Estate car	
Length	1200mm. (47.2 in)
Width	60 mm. (2.362 in.)
Thickness	6 mm. (0.236 in.)
No. of leaves	4
Free camber	137 mm. (5.394 in.)
Laden camber	15 mm./265 kg. (0.59 in./ 584 lb.)
Spring eye bolt diameter:	
Front	45 mm. (1.772 in.)
Rear	30 mm. (1.181 in.)
1400 and 1600 cc. - rigid axle sedan.	
Free camber	100 mm. (3.937 in.)
Laden camber	15mm./250 kg. (0.591 in./ 551 lb.)
1800cc. - Estate	
Laden camber	15 mm./265 kg. (0.591 in./ 584 lb.)
Spring constant	2.2 kg./mm. (123 lb.in.)

REAR AXLE SHAFT

Turning torque	less than 4.5 kg.cm. (3.9 lb. in.)
End play	less than 0.15 mm. (0.006 in.)

DRIVE SHAFT AND JOURNAL

Sliding resistance - 1400 and 1600 cc.	0-15 kg. (0-33.1 lb.)
Sliding resistance-1800cc.	less than 20 kg. (44 lb.)
Radial play of ball spline	less than 0.1mm. (0.004 in.)

Front Suspension

DESCRIPTION

The front suspension is of the strut type with the coil spring and hydraulic damper units mounted on the suspension member and transverse link assembly (See Fig.J.1.).

Vertical movement of the suspension is controlled by the strut assembly; the tension rod absorbs the forward and backward movement of the transverse links, whilst side movement of the body is controlled by the stabilizer rod which is attached to the body and transverse links.

WHEEL HUBS - Removal

1. Jack up the vehicle, remove the road wheel and disconnect the brake hose at the strut outer casing bracket as described under the previous heading. Plug the opened end of the hose to prevent loss of fluid.

2. Remove the brake calliper assembly, or the brake drum, as described in the section BRAKES.

3. Remove the grease cap from the hub by tapping lightly at the joint using a screwdriver and hammer.

4. Withdraw the cotter pin from the wheel bearing locknut and remove the nut. Remove the wheel hub together with the wheel bearing and washer. (Fig.J.2.).

   On cars fitted with disc brakes, the hub is removed complete with brake disc.

5. The wheel bearing outer race can be removed from the hub using a drift as shown in Fig.J.3.

WHEEL HUBS - Inspection and Overhaul

Clean the hub and bearings by washing in petrol. Examine the grease seal and make sure that it is not worn, or cracked; renew the seal if necessary. Ensure that the races are not pitted or scored, rotate them and check for signs of wear and play. A sectional view of the wheel bearing assembly is given in Fig. J4, to provide an indication of the points to be checked.

WHEEL HUB AND BEARING - Installation

The wheel bearing outer race can be refitted with a suitable drift, or special tool ST 35310000.

Fill the wheel hub and the hub cap to the positions shown in Fig.J.5. with multi-purpose grease.

Fill the spaces between the bearing rollers and the lip of the grease seal with the same type of grease. Lightly smear the spindle shaft and threads, the bearing washer and bearing locknut with grease, and assemble the parts onto the wheel spindle. Make sure that dirt and foreign matter does not adhere to the greased surfaces.

Adjust the wheel bearings as described under the following heading.

WHEEL BEARINGS- Adjusting

The wheel bearings can be adjusted with the road wheel, the hub cap and the bearing locknut cotterpin removed as previously described.

Tighten the wheel bearing locknut to a torque reading of 3.0 - 3.5 kgm. (21.7 - 25.3 lb.ft.) Turn the hub several times in each direction to settle the bearing and then retighten the bearing locknut to the specified torque reading.

Slacken the bearing locknut to an angle between 40 to 70° away from the previously tightened position and align the cotter pin hole with the hole in the spindle. Turn the wheel hub a few times in each direction and then measure the torque required to cause the hub to turn. A spring balance should be used as shown in Fig.J.6, make sure that the brake pads are not binding on the disc type of brake unit and check that the force required to turn the hub is within the following figures.

Wheel bearing rotation starting torque:	
1800cc. - With new bearing	7.0 kg.cm. (97 in. oz.)
1400 & 1600cc. With new bearing	8.0 kg.cm. (111.2 in.oz.)
With used bearing	4.0 kg.cm. (56.0 in. oz.)
Starting torque at the hub bolt	
With new bearing	1.57 kg. (3.46 lb.)
With used bearings	0.7 kg. (1.54 lb.)

Adjust the locknut slightly if the figures do not conform, and replace the cotterpin.

Refit the hub cap and the roadwheel.

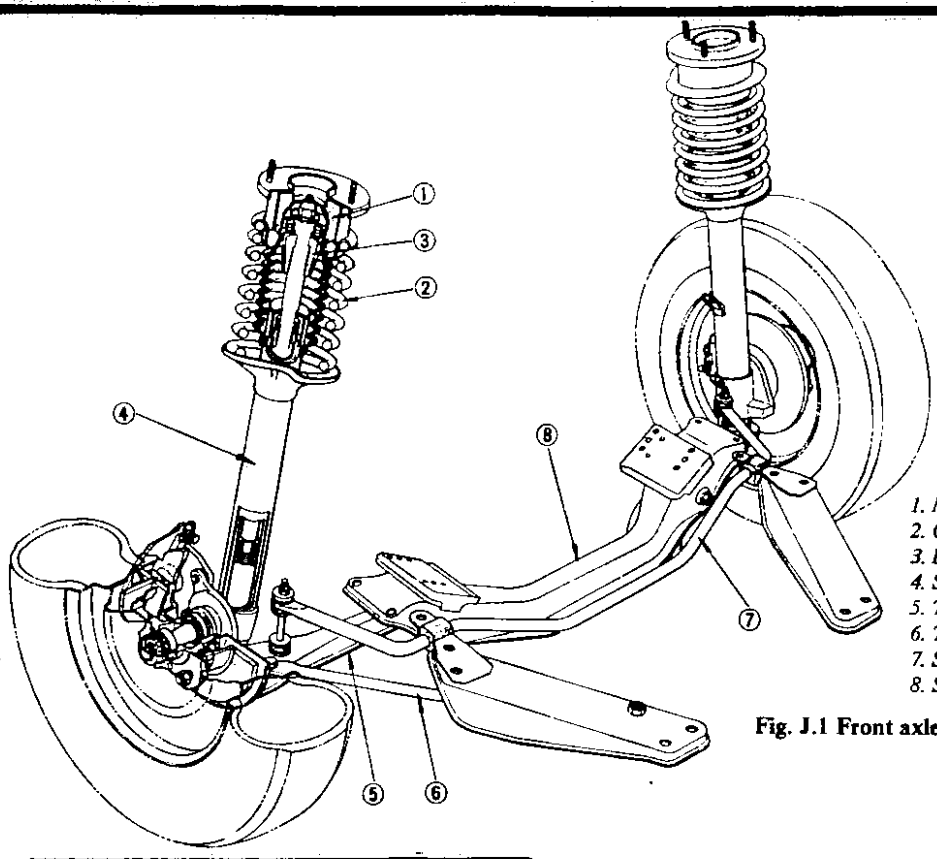
FRONT AXLE AND SUSPENSION ASSEMBLY - Removal

1. Jack up the front of the vehicle and place stands under the front side members.

2. Remove the road wheels and the splash board.

3. Disconnect the front brake hoses and remove the brake hose locking springs. Withdraw the plates and remove the hoses from the strut assembly. Plug the ends of the hoses to prevent the ingress of dirt and loss of fluid.

4. Remove the cotter pin from the tie rod ball joint, remove



1. *Mounting insulator*
2. *Coil spring*
3. *Bump rubber*
4. *Strut assembly*
5. *Transverse link*
6. *Tension rod*
7. *Stabilizer bar*
8. *Suspension cross member*

Fig. J.1 Front axle and suspension assembly.

Fig. J.2 Removing the wheel hub.

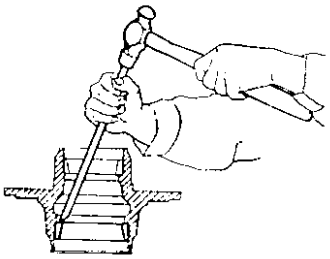
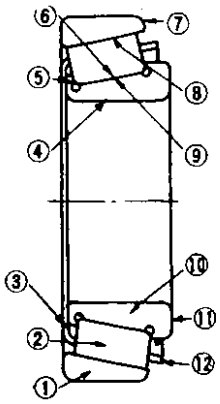


Fig. J.3 Removing the wheel bearing outer race.



1. *Outer race*
2. *Roller*
3. *Small collar*
4. *Collar surface*
5. *Inner race fitted surface*
6. *Inner race surface*
7. *Outer race fitted surface*
8. *Outer race surface*
9. *Roller rolling surface*
10. *Inner race*
11. *Large collar*
12. *Supporter*

Fig. J.4 Checking the wheel bearing assemblies.

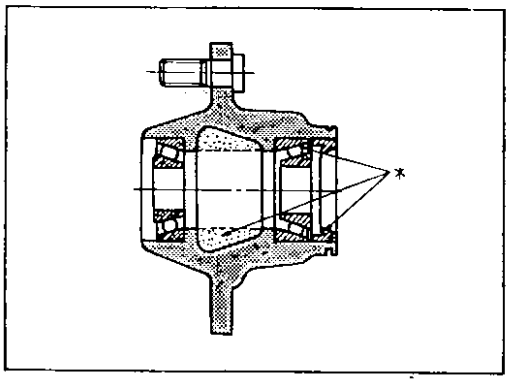


Fig. J.5 Front wheel hub greasing points.

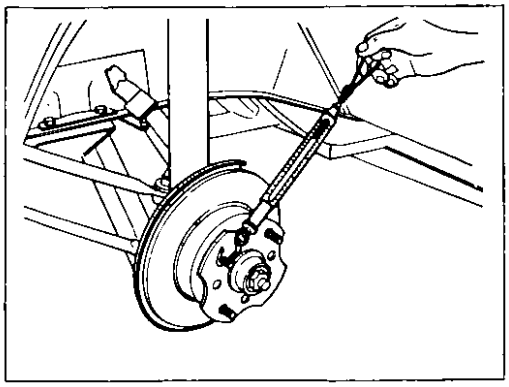


Fig. J.6 Measuring the bearing pre-load.

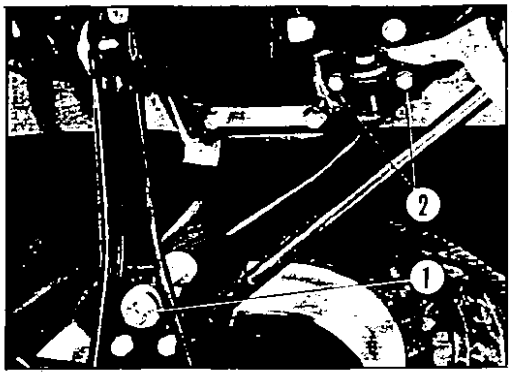


Fig. J.8 Removing the stabilizer bar.

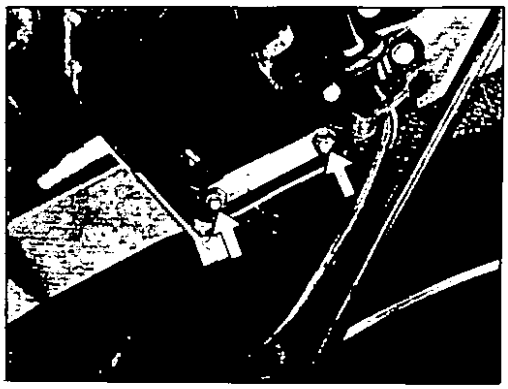


Fig. J.10 Suspension cross member mounting bolts.

Fig. J.13 Removing the strut.

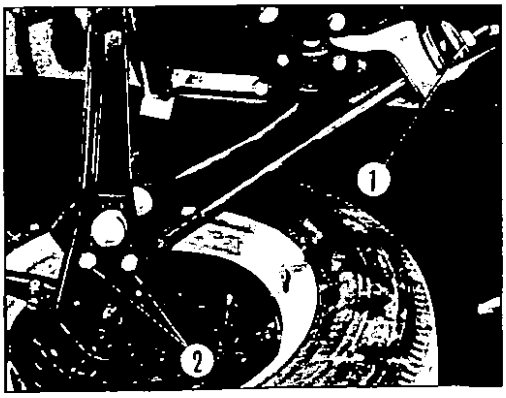


Fig. J.7 Removing the tension rod.

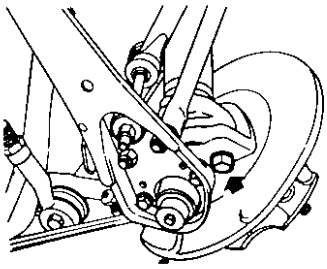


Fig. J.9 Removing the strut to knucke arm bolts.

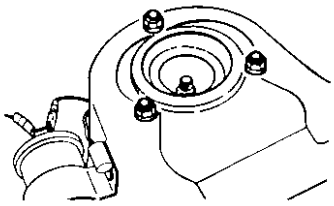


Fig. J.11 Suspension unit upper mountings.

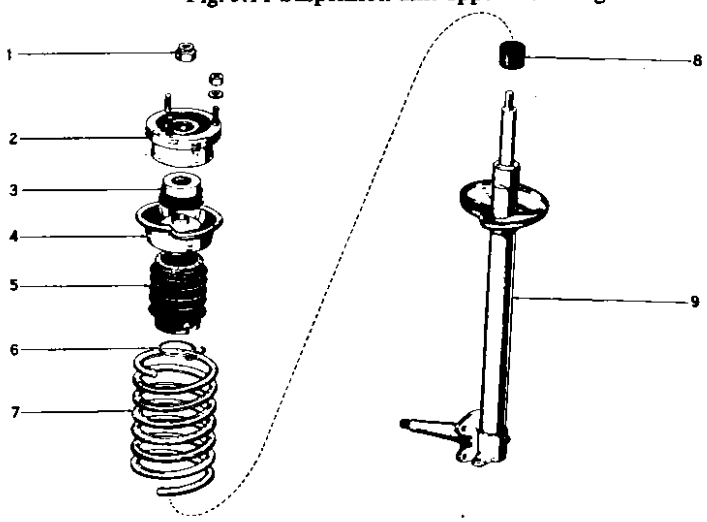


Fig. J.12 View of the front suspension unit.

1. *Self locking nut*
2. *Suspension mounting insulation*
3. *Thrust bearing*
4. *Upper spring seat*
5. *Dust cover*
6. *Clip*
7. *Coil spring*
8. *Bumper rubber*
9. *Strut assembly*

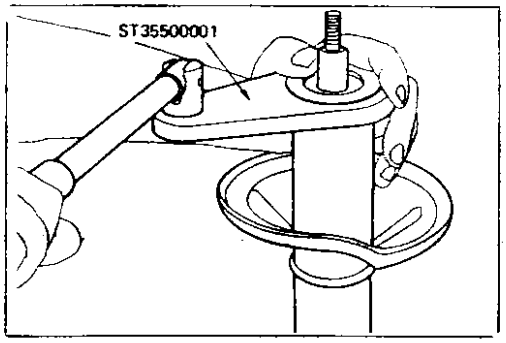


Fig. J.14 Removing the gland packing.

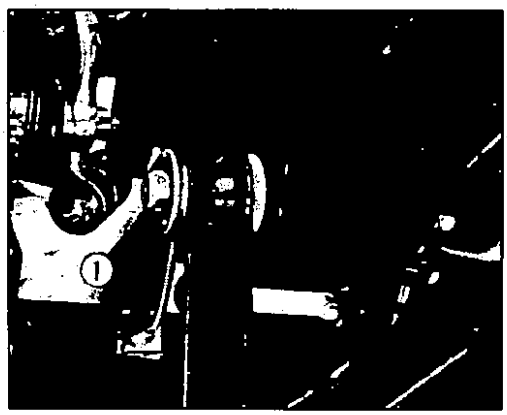


Fig. J.16 Removing the transverse link.

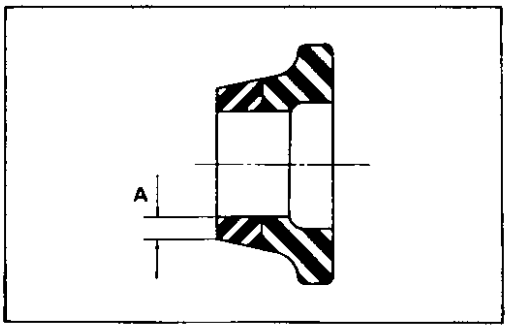


Fig. J.18 Section through the transverse link bush.

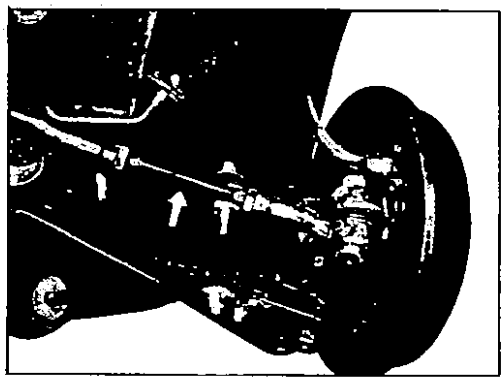


Fig. J.20 Adjusting the toe-in setting.

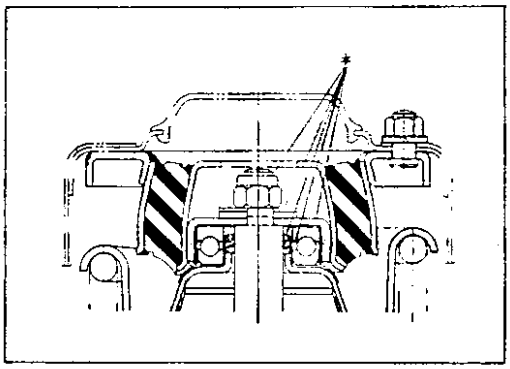


Fig. J.15 Greasing points (*)

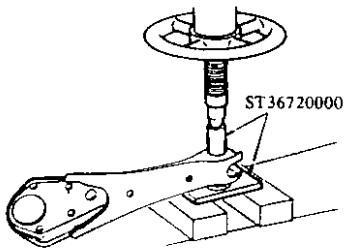


Fig. J.17 Removing the transverse link bush.

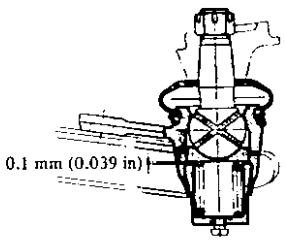


Fig. J.19 Section through the lower ball joint.

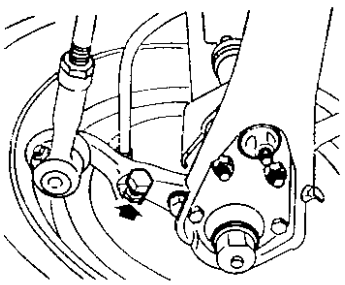


Fig. J.21 Adjusting the steering angle.

the castle nut and detach the tie rod from the knuckle arm.

5. Remove the tension rod securing nuts (Fig.J.7.), remove the bolts and withdraw the tension rod. Withdraw the nut shown arrowed in Fig.J.8. and remove the stabilizer.

6. Support the engine with suitable lifting tackle so that the engine mounting bolts can be removed and the suspension crossmember detached from the engine. (Fig.J.9.).

7. Place a jack under the crossmember. Remove the bolts indicated in Fig.J.10, and separate the crossmember from the body.

8. Remove the strut assembly upper attachment self locking nuts at both sides (Fig.J.11), and lower the front suspension assembly to remove it from the vehicle.

FRONT AXLE AND SUSPENSION ASSEMBLY - Installation

Installation is a reversal of the removal procedure, noting the following points.

Make sure that all rubber parts are free from wear and deterioration. Any part of the suspension assembly which has been damaged or distorted must be replaced. The front wheel alignment should be checked after completing the installation, a brief description is given at the end of this section. Camber and castor angles are preset and cannot be adjusted.

SPRING AND STRUT ASSEMBLY - Removal and Installation

The strut assembly consists of the outer casing, piston rod piston rod guide and cylinder, etc. An exploded view of the components is given in Fig.J.12.

The inner components must be replaced as a complete assembly. Replacement and overhaul procedures for the inner components, together with the removal of the front springs, should only be carried out by a specialist Datsun workshop. The strut assembly can be removed prior to dismantling, by following the procedures outlined below:

1. Jack up the front of the vehicle and support it on stands.

2. Disconnect the brake hose from the strut assembly bracket as previously described under the heading FRONT AXLE and SUSPENSION ASSEMBLY - Removal.

3. Remove the stabilizer bar and tension rod from the transverse links. Loosen and remove the knuckle arm fixing bolts (Fig.J.9.) and separate the strut assembly from the ball joints.

4. Remove the strut assembly upper attachment self locking nuts (Fig.J.11.) and withdraw the strut assembly from the body (Fig.J.13.).

Installation is a reversal of the removal procedure. Ensure that the bolts are tightened to the specified torque readings given under TIGHTENING TORQUES.

SPRING AND STRUT ASSEMBLY - Dismantling and Assembly

Care must be taken when dismantling the assembly to ensure that all parts are maintained in a clean condition.

Clamp the suspension strut assembly in a vice and fit the special attachment ST 27700001 to the lower end of the strut. Prise off the dust cover snap ring. Use the coil spring compressor ST 35650001 to slightly compress the spring. Remove the self locking nut and take off the mounting insulator thrust bearing, spring seat and bump rubber. Slacken the spring compressor and remove the spring. Push down the shock absorber piston until it bottoms and remove the gland packing with the special tool ST 35500001, (Fig.J.14.). Remove the 'O'-ring from the piston rod guide and lift out the piston rod and cylinder assembly. DO NOT separate the piston and cylinder, which are serviced as a complete assembly. Drain all fluid from the suspension unit and shock absorber assembly. Wash all parts thoroughly (not rubber parts) in petrol or a suitable solvent.

The gland packing and 'O'- ring must be renewed at each overhaul. Always refill with the correct grade of fresh oil in accordance with the information in the table below.

	ATSUGI	KAYABA
Part No: 54302 - U0100 - U0110 54302/3-U0500/1	325 cc.	332 cc.
54302 - N 1200	325 cc.	300 cc.

The oil quantity is extremely critical as it will affect the damping power of the shock absorber.

To assemble, fit the rubber 'O'-ring on the top of the piston rod and refit the gland packing. Take care that the oil seal does not become damaged during the latter operation. Lift the piston rod up by approximately 90 mm. (3.5 in.) before tightening the gland packing, to facilitate bleeding, then tighten the packing to a torque reading of 7 - 13 kgm. (51 - 94 lb.ft.). Bleed the shock absorber by pumping the piston rod up and down until the pressure is the same in both directions.

Position the coil spring, bump rubber, spring seat and dust cover on the top of the piston rod. The piston rod must be in the fully extended position. Compress the spring, fit the strut mounting insulator and bearing assembly. Tighten the self-locking nut to a torque reading of 6-7.5 kgm. (43 - 54 lb.ft.).

SPRING AND STRUT ASSEMBLY - Installation

Installation is a reversal of the removal procedure. Thoroughly grease the parts marked (*) in Fig.J.15. Tighten the fixing bolts to the torque readings given in TIGHTENING TORQUES.

TRANSVERSE LINK AND LOWER BALL JOINT - Removal

The transverse link with rubber bushing is connected to the suspension crossmember by a mounting bolt as shown in Fig.J.11, and to the strut assembly via the lower ball joint.

Removal from the vehicle can be carried out in the following manner:

1. Jack up the front of the vehicle and support it on stands.

2. Remove the stabilizer bar and tension rod from the transverse link, as previously described. Remove the knuckle arm fixing bolts and separate the ball joint from the strut assembly.

3. Remove the transverse link mounting bolt (Fig.J.16.) and detach the transverse link from the suspension member.

Remove the cotter pin from the knuckle arm castle nut and remove the knuckle arm from the ball joint. Unfasten the ball joint securing nut and withdraw the ball joint from the transverse link.

The bushing can be withdrawn from the transverse link using a press and the special tools shown in Fig.J.17.

TRANSVERSE LINK AND LOWER BALL JOINT - Inspection

The transverse link bushing is shown in Fig.J.18. If the rubber and inner tube joints are melted or cracked, the complete transverse link assembly must be replaced.

The ball joint cannot be dismantled and should be replaced if the dust cover is split, or, if the axial play of the joint exceeds 1.0 mm. (0.039 in). Check the axial play with a spring balance. The force required at the cotterpin hole position is between 6.6 - 11.3 kg. (15 - 25 lb.).

Lubricate the ball joint with multi-purpose grease every 50,000 km. (30,000 miles), or two years, whichever comes first.

A grease nipple must be installed in place of the plug (See Fig.J.19.) and the old grease completely replaced. If a high pressure grease gun is used, make sure that the grease is injected slowly and is not forced out through the joint clamp.

Remove the grease nipple and replace the plug.

TRANSVERSE LINK AND BALL JOINT - Installation

Installation is a reversal of the removal procedure, noting the following points:

Remove all rust from the transverse link bushing interior with a piece of emery cloth. The bushing and transverse link bore should be wetted with soapy water, so that the bushing can be more easily inserted.

Fit the bushing into the transverse link, using the special tool ST 36700000. Adjust the bushing inner tubes so that the distances from the transverse link collar ends are equal at both sides.

Install the lower ball joint on the transverse link and tighten the installation bolt to a torque reading of 1.9 - 2.5kgm. (14 - 18 lb.ft.).

Clean the knuckle arm and the ball joint stud, install the knuckle arm on the ball joint and tighten the castle nut to a torque reading of 5.5 - 7.4 kgm. (40-53 lb.ft.), fit the cotterpin and bend it over. Apply sealing agent over the ball joint castle nut to prevent the formation of rust.

Locate the knuckle arm beneath the strut assembly and tighten the mounting bolts to a torque reading of 4.9 - 6.3kgm (35 - 46 lb.ft.). Make sure that the shorter of the bolts is fitted at the front.

Install the transverse link on the suspension crossmember and temporarily tighten the mounting bolts. Make sure that the nut faces the front of the car and not the bolt head. Fit the tension rod and stabilizer bar.

Lower the vehicle and remove the jack. Tighten the transverse link mounting bolts to a torque reading of 9.0 - 10.0 kgm. (65 - 72 lb.ft.) with the vehicle unladen.

FRONT WHEEL ALIGNMENT

The castor and camber angles are preset and cannot be adjusted. If the angles do not conform with the figures in Technical Data, then a check must be made for damage to the suspension system. Wheel alignment is carried out with the tyres inflated to the correct pressures and with the vehicle on a level surface. The toe-in should be checked and adjusted, if necessary, by slackening the locknuts (Fig.J.20.) and turning the track rods by an equal amount until the correct toe-in is achieved. The standard length between the ball joints is 309.5 mm. (12.19 in.) for the 1400 and 1600 cc. models and 105.5 mm. (4.14 in.) for the 1800 cc. models.

ADJUSTING THE STEERING ANGLE

The steering angle at the full lock positions must be checked with the front wheels placed on a turntable. Adjustment can be made changing the length of the stopper bolt, shown arrowed in Fig.J.21. The clearance between the tyre and tension rod should be 30 mm. (1.181 in), or more, and can be increased if necessary by extending the length of the stopper bolt. The bolt length should not exceed 27.5 mm. (1.083 in.) when the adjustment is completed.

Steering angle figures are given in Technical Data at the end of this section.

Technical Data

FRONT WHEEL ALIGNMENT

1400 and 1600 cc. models.

		Toe-in mm. (in.)	Camber	Castor	Steering angle In	Steering angle Out
Sedan	R.H. Drive	3 to 6 (0.118 to 0.236)	35'	1°35'		
	L.H. Drive	3 to 6 (0.118 to 0.236)	25'	1°35'		
	Hard suspension	3 to 6 (0.118 to 0.236)	25'	1°25'		
	R.H. Drive	3 to 6 (0.118 to 0.236)	30'	1°20'	38°	31°40'
	L.H. Drive exc. U.S.A. and Canada	4 to 7 (0.158 to 0.276)	35'	1°40'		
Wagon	U.S.A. and Canada	2 to 5 (0.079 to 0.197)	10'	1°05'		
	Hard suspension	3 to 6 (0.118 to 0.236)	20'	1°05'		

1800cc. Models (610 Body).

Wheel alignment (Vehicle unladen)

Applied model			Camber	Castor	Kingpin inclination	Toe-in	Side slip
R.H. drive Sedan, Hardtop	Standard Suspension		1°05' to 2°35'	50' to 2°20'	6°15' to 7°45'	7 to 10 (0.276 to 0.394)	0 to 3 (0 to 0.118)
	Hard	*2	1°00' to 2°30'	55' to 2°25'	6°20' to 7°50'	6 to 9 (0.236 to 0.354)	0 to 3 (0. to 0.118)
L.H. Drive Sedan, Hardtop	Standard Suspension		1°05' to 2°35'	40' to 2°10'	6°15 to 7°45'	7 to 10 (0.276 to 0.394)	0 to 3 (0. to 0.118)
	Hard Suspension	*2	1°00' to 2°30'	45' to 2°15'	6°20' to 7°50'	6 to 9 (0.236 to 0.354)	0 to 3 (0. to 0.118)
L.H. Drive Sedan, Hardtop *1	Standard Suspension		1°00' to 2°30'	40' to 2°10'	6°20' to 7°50'	6 to 9 (0.236 to 0.354)	0 to 3 (0 to 0.118)
	Hard Suspension	*2	55' to 1°25'	45' to 2°15'	6°25' to 7°55'	5 to 8 (0.197 to 0.315)	−1 to 2 (-0.004 to 0.079)
R.H. Drive Station Wagon	Standard Suspension		1°00' to 2°30'	45' to 2°15'	6°20' to 7°50'	6 to 9 (0.236 to 0.354)	0 to 3 (0 to 0.118)
	Hard Suspension	*2	1°05' to 2°35'	45' to 2°15'	6°15' to 7°45'	7 to 10 (0.276 to 0.394)	0 to 3 (0. to 0.118)
L.H. Drive Station Wagon	Standard Suspension		1°10' to 2°40'	55' to 2°25'	6°10' to 7°40'	8 to 11 (0.315 to 0.433)	1 to 4 (0.004 to 0.158)
	Hard Suspension	*2	1°05' to 2°35'	45' to 2°15'	6°15' to 7°45'	7 to 10 (0.276 to 0.394)	0 to 4 (0 to 0.158)
R.H. drive Van	Standard Suspension		1°05' to 2°35'	50' to 2°20'	6°15' to 7°45'	8 to 11 (0.315 to 0.433)	1 to 4 (0.004 to 0.158)
L.H. drive Van	Standard Suspension		1°15' to 2°45'	1°00' to 2°15'	6°05' to 7°35'	10 to 13 (0.394 to 0.512)	2 to 5 (0.079 to 0.197)

*1 for U.S.A. & Canada
*2 Optional parts

COIL SPRINGS

Wire diameter	12 mm. (0.472 in.)
Coil diameter	130 mm. (5.12 in.)
No. of turns	8
Free length 1800 cc. (610 Body)	
Left side spring - Van and Estate	371 mm. (14.61 in.)
Right side spring - Van and Estate	386 mm. (15.20 in.)
Both springs - Saloon	386 mm. (15.20 in.)
Free length 1400 and 1600 cc.	
Left side spring	354 mm. (13.94)
Right side spring	369 mm. (14.52 in.)
Fitted height	
Left side spring	185 mm./270 kg. (7.29 in./560 lb.)
Right side spring	200 mm./270 kg. (7.87 in./560 lb.)

FRONT SUSPENSION UNITS

Parts No./Items		54302-U0100	54302/3-U0500	54302-U0110	54302/3-U0510	54302-N1200
Strut outer dia. mm.(in)		50.8 (2.0)	–	–	–	–
Piston rod dia. mm.(in)		20 (0.787)	–	–	–	22 (0.866)
Cylinder inner dia.	mm. (in.)	30 (1.181)	–	–	–	32 (1.260)
Damping force at piston 0.3 m/s (1.08 ft/s)						
Expansion	kg (lb)	40 (88.2)	–	80 (176.4)	–	40 (88.2)
Compression	kg (lb.)	25 (55.1)	–	40 (88.2)	–	25 (55.1)
Stroke	mm. (in.)	178 (7.01)	–	–	–	–

Steering

DESCRIPTION

A worm and recirculating ball type steering system is fitted to the vehicle; the component parts of the steering gear are shown in Fig.K.1.

The steering linkage consists of the centre tie rod, pitman arm, idler arm, outer tie rods and the knuckle arms as shown in Fig.K.2.

A collapsible steering column assembly can be fitted to the vehicle to protect the driver from injury in a head on collision. Details of this type of assembly are given under the appropriate heading.

STEERING - Maintenance

Check the oil level in the steering box every 10,000 km. (6,000 miles) and top up with recommended lubricant, if necessary.

Grease the steering linkage every 50,000 km. (30,000 miles). It will be necessary to replace the plug in the tie rod ball joints with a grease nipple for this operation, as previously described in the section FRONT SUSPENSION.

Use a grease gun to completely replace the old grease with new grease, making sure that the grease is not forced from under the cover clamp if a high pressure gun is used.

STEERING WHEEL AND STEERING GEAR - Removal

1. Take out the retaining bolts and remove the horn ring, remove the steering wheel nut (Fig.K.3.) and pull off the steering wheel. The special tool ST 27180000 should be used, if available.

2. Disconnect the battery leads, remove the steering column shell covers and the turn signal and lighting switch assembly.

3. On vehicles fitted with steering column gear change assemblies, the gear lever must be removed from the control rod assembly. Unscrew the retaining bolts and disconnect the gear lever.

4. Remove the bolts from the steering column upper clamp (Fig.K.4.) and the bolts holding the lower plate (Fig.K.5.).

5. If the vehicle is fitted with steering column gear change, remove the cotterpin from the trunnion and detach the gearchange rod and selector rod from the change lever and selector lever.

6. Remove the bolts securing the steering gear housing to the car body (Fig.K.6.) and pull the steering gear towards the engine compartment.

   Remove the gearchange control from the steering gear assembly as described in the section GEARBOX.

STEERING WHEEL AND STEERING GEAR - Installation

Installation is a reversal of the removal procedure. When the installation has been completed, make sure that the steering wheel can be turned smoothly and is correctly aligned. The free travel of the steering wheel should be between 25 - 30mm. (0.98 - 1.18 in.). Tighten the steering wheel locknut to a torque reading of 4.0 - 5.0 kgm. (29 - 36 lb.ft.) and the steering column upper clamp and plate bolts to a torque reading of 1.3 - 1.8 kgm. (9.4 - 1.3 lb.ft.).

Ensure that the steering box is topped up to the correct level, with recommended lubricant.

STEERING GEAR - Dismantling

Remove the pitman arm retaining nut and pull out the arm. The special puller ST 27140000 should be used, if available.

Remove the drain plug from the steering gear housing and drain the oil.

Slacken the adjusting screw nut and turn the sector shaft adjusting screw a few turns in the anti-clockwise direction.

Remove the sector shaft cover retaining bolts and pull the sector shaft cover and sector shaft from the gear housing (Fig. K.7.).

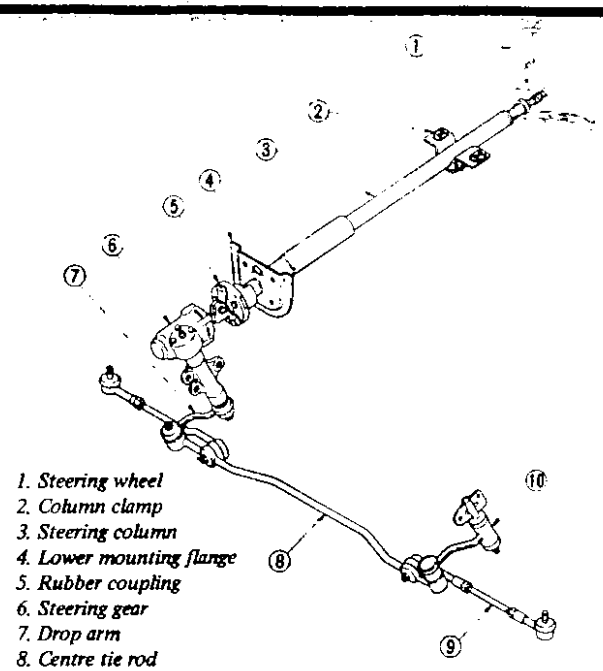
Remove the bolts securing the column jacket to the gear housing and carefully withdraw the main column jacket assembly from the gear housing (Fig.K.8.).

NOTE: The ball must not be allowed to run to either end of the worm, or the ends of the ball guides will be damaged.

Pull the column assembly from the column jacket. Remove the sector shaft oil seal and take out the rear bearing outer race from the column jacket with a suitable puller.

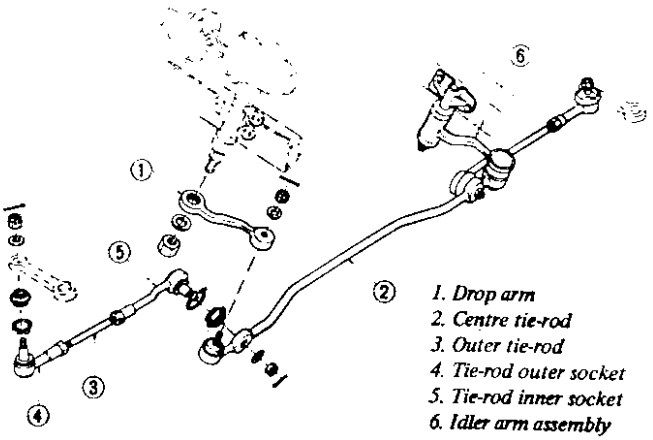
Withdraw the bearing inner races from the front and rear worm bearings.

Remove the column shaft bearing.



1. *Steering wheel*
2. *Column clamp*
3. *Steering column*
4. *Lower mounting flange*
5. *Rubber coupling*
6. *Steering gear*
7. *Drop arm*
8. *Centre tie rod*
9. *Outer tie rod*
10. *Idler arm*

Fig. K.1 The steering system components.



1. *Drop arm*
2. *Centre tie-rod*
3. *Outer tie-rod*
4. *Tie-rod outer socket*
5. *Tie-rod inner socket*
6. *Idler arm assembly*

Fig. K.2 The steering linkage components.

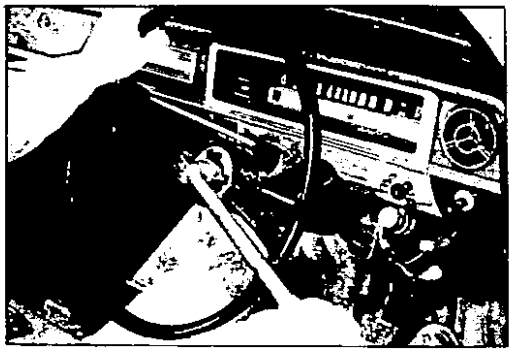


Fig. K.3 Removing the steering wheel nut.

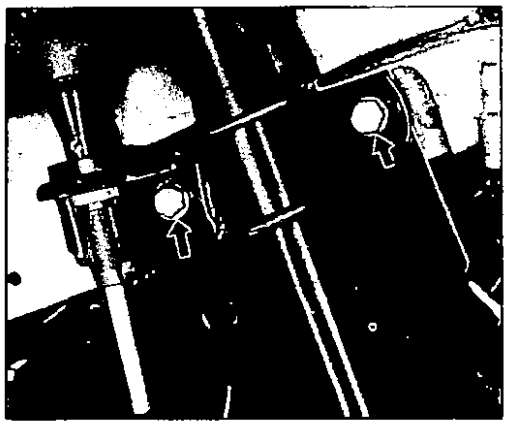


Fig. K.4 Steering column upper attachment bolts.

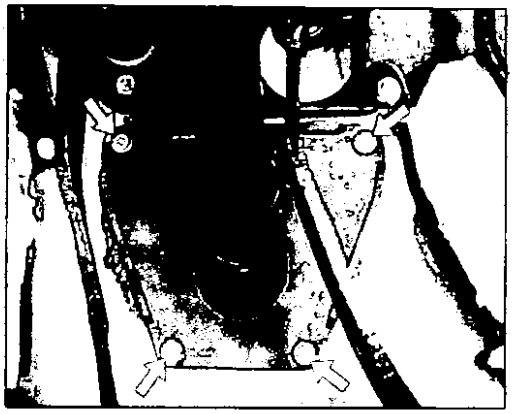


Fig. K.5 Steering column cover plate.

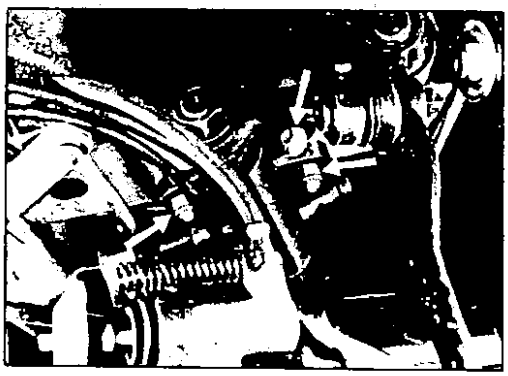


Fig. K.6 Removing the steering gear mounting bolts.

STEERING GEAR - Inspection and Adjustment

Thoroughly clean all parts and examine them for signs of wear or damage. Replace any component found to be unsatisfactory.

It is advisable to renew the assemblies, if the steering column or ball nut assembly is defective, as the adjustment procedures required to overhaul the units are rather involved.

The dismantling and adjustment procedures for the ball nut assembly can be carried out in the following manner if it is decided that overhaul procedures are to be carried out.

Ball nut

Remove the ball guide tube clamp, withdraw the guide tubes from the ball nut and collect the steel balls.

Turn the nut upside down and rotate the steering column backwards and forwards until all 36 steel balls have dropped out of the ball nut. Pull the ball nut from the column.

Inspect the ball guide tubes and make sure that they are not damaged. Pay particular attention to the ends of the tubes that pick up the balls from the helical path. Renew the tubes if they are unsatisfactory. Check the steel balls and the ball nut for wear and replace the complete unit if necessary.

Assemble the ball nut on the worm with the ball guide holes upwards. Drop 18 balls into each of the two holes on the same side of the ball nut, until all 36 balls are installed. The column should be gradually turned away from the hole being filled and if the balls are stopped by the end of the column, hold down those already installed with a clean rod or punch, while turning the column several times in the reverse direction. The filling of the circuit can then be continued but it may be necessary to turn the column backwards and forwards, holding the balls down first in one hole and then the other to close the spaces and completely fill the circuit.

Place the remaining 22 balls in the ball guide halves, 11 balls for each half. Fit the other half of the guide tube to each filled half, hold the two halves together and plug each open end with vaseline to prevent the balls falling out.

Push the guide tubes into the ball nut guide holes and assemble the guide tube clamp.

Inspection

Check the axial clearance between the ball nut and the balls. If the clearance exceeds 0.08 mm. (0.003 in.) the complete unit must be replaced. Inspect the gear teeth of the sector shaft for wear or damage. Replace any worn or imperfect bearings. Examine the steering column shaft for straightness and check that the maximum deflection does not exceed 0.2mm. (0.008 in.) at point "C" in Fig.K.9., when the shaft is supported at points"A" and "B". Check the sector shaft and steering column shaft serrations for wear. Renew the parts as necessary.

STEERING GEAR - Assembly and Adjustment

Grease the lip of the oil seal and press it into the housing.

Insert the column assembly into the column jacket and fit the worm bearing shims to the gear housing. Install the flange securing bolts and tighten them to a torque reading of 1.8 - 2.5 kgm. (13 - 18 lb.ft.). If a new column bearing assembly is fitted it must be filled with bearing grease and cemented to the column.

The preload of the worm bearing can be adjusted by altering the thickness of the worm bearing shim. Four shim thicknesses are available in sizes of 0.76, 0.254, 0.127, 0.050mm. (0.0300, 0.100, 0.005 in. 0.002 in).

This adjustment check is carried out without the sector shaft fitted and with the worm bearings oiled.

Install the steering wheel as shown in Fig.K.9, use a spring balance as indicated to check that the force required to turn the wheel is between 4.0 - 8.0 kg/cm. (56 - 112 oz./inch). Select a suitable shim from the sizes given.

Assemble the selector shaft adjuster with a shim into the sector shaft. Measure the end clearance of the adjuster with a feeler gauge as shown in Fig.K.10.

The correct clearance is 0.01 - 0.03mm. (0.0004 - 0.0012in) and can be adjusted by varying the thickness of shim. Four thicknesses of shim are available as follows:

1.57 mm. (0.0618 in.)
1.55 mm. (0.0610 in.)
1.52 mm. (0.0598 in.)
1.50 mm. (0.0591 in.)

To assemble the sector shaft into the gear housing, rotate the column by hand until the ball nut, is at the central position of its travel, so that the centre tooth of the sector shaft enters the centre tooth space of the ball nut. Fit a new gasket and push the sector shaft cover and sector shaft into place.

Ensure that a certain amount of play is present between the rack and sector teeth before tightening the cover bolts to a torque reading of 1.5 - 2.5 kgm. (10.9 - 18.1 lb.ft.).

Temporarily lock the adjusting screw with the locknut. Move the sector shaft several times from the pitman arm side to make sure that it turns smoothly.

Connect the pitman arm to the sector shaft, taking care that the alignment marks on the arm and shaft coincide.

Adjust the backlash with the steering in the central position, using a dial gauge as shown in Fig.K.11. Turn the adjusting screw with a screwdriver until the amount of free movement at the top of the pitman arm is within 0.1mm. (0.0039 in.) at a radius of 127 mm. (5.0 in.). Lock the adjusting screw with the locknut (Fig.K.12.) and recheck the free movement.

Fill the steering gear housing with the correct amount of recommended lubricant.

Refit the steering gear to the vehicle as previously described. Make sure that the steering wheel is correctly aligned and that

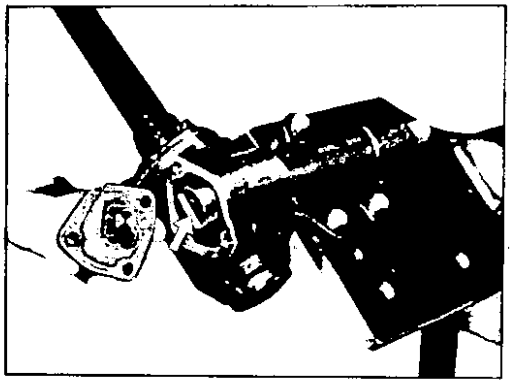


Fig. K.7 Removing the sector shaft cover.

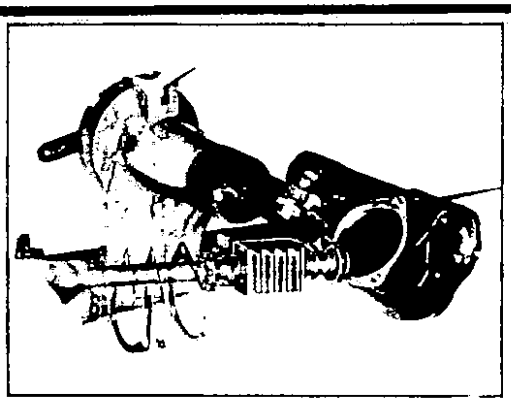


Fig. K.8 Removing the steering column assembly from the gear housing.

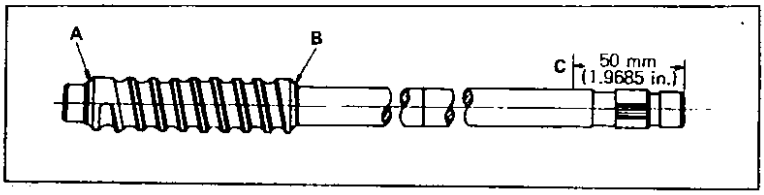


Fig. K.9 Checking the column shaft for serviceability (see text).

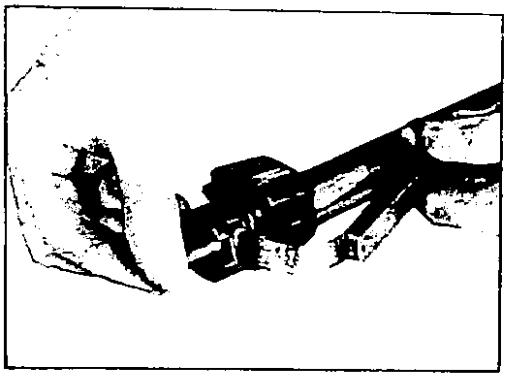


Fig. K.10 Checking the end float between adjusting screw and sector shaft.

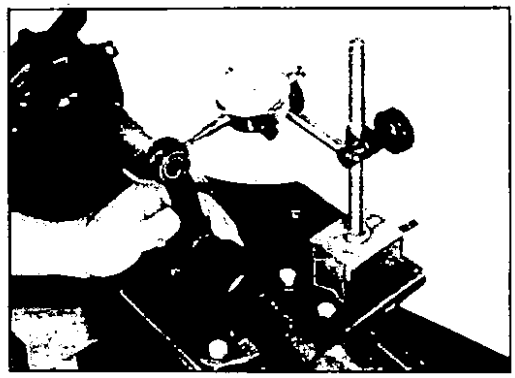


Fig. K.11 Checking the steering gear backlash.

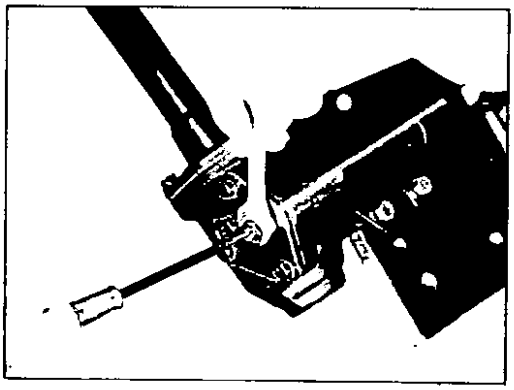
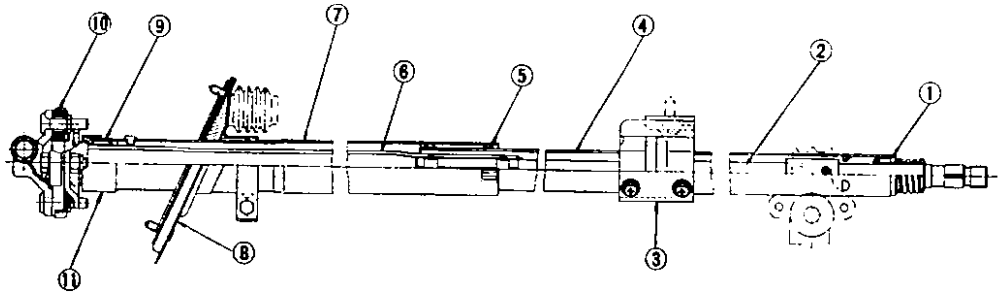
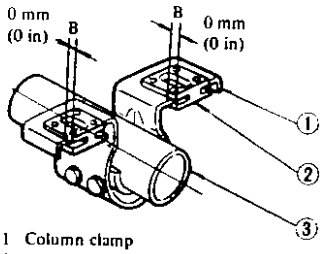


Fig. K.12 Adjusting the steering gear backlash.

Fig. K.13 The collapsible steering assembly.

1. *Upper bearing*
2. *Upper jacket shaft*
3. *Steering post clamp*
4. *Upper jacket tube*
5. *Steel ball*
6. *Lower jacket shaft*
7. *Lower jacket tube*
8. *Lower jacket tube flange*
9. *Lower bearing*
10. *Rubber coupling*
11. *Column dust cover*





1 Column clamp
2 Block
3 Jacket tube

Fig. K.14 The column clamp.

the system operates smoothly.

COLLAPSIBLE STEERING

The collapsible steering column is designed so that compression occurs when the vehicle is involved in a head-on collision. (See. Fig.K.13).

Two forces can be considered when a collision of this type takes place. These being the primary force, in which the forward motion of the car is suddenly halted, and the secondary force as the driver continues in a forward direction onto the steering wheel and column. The collapsible column is designed so that it does not move to the rear, i.e. into the driving compartment, when the primary force or forward motion of the car is suddenly halted. When the secondary force takes place, as the driver is thrown-forward, the column jacket gradually collapses and partially absorbs the amount of impact.

The collapsible type of column is no more susceptible to damage, than an ordinary column when it is installed in the vehicle; however, when a collapsible column is removed it must be carefully handled. A sharp blow on the end of the shaft or gear change levers, dropping or leaning on the assembly can cause the column jacket to bend, particularly at the bellows part which absorbs the shock.

The steering movement is transmitted by the lower shaft and upper tube. The lower shaft exterior and upper tube interior are tightly fitted together, with four plastic pins completely eliminating any gap.

When a collision occurs the plastic pins shear and the lower shaft enters the upper tube, this action will cause the shaft end to spread and the lower shaft cannot then be withdrawn unless an extremely high load is applied.

The shaft is prevented from moving towards the drivers compartment when the primary force takes place, (i.e. when the forward motion of the vehicle is suddenly halted), by the three stoppers on the jacket tube. The steering lock collar mounted to the shaft contacts the stoppers and prevents a rearward movement.

A part of the jacket tube is specially formed to act as an energy absorbing part of the collapsible steering. The upper and lower guide tubes joined with polyacetal resin are inserted into the mesh tube so that energy generated by a collision can be absorbed as smoothly as possible with a low load.

The steering column clamp shown in Fig.K.14. is secured to the jacket tube and body by bolts, with two aluminium slidings blocks set to the body by plastic pins. An impact from the drivers side causes the plastic pins to shear and leave the sliding block in the column clamp side allowing the clamp to move with the jacket as it collapses.

COLLAPSIBLE STEERING - Removal and Inspection

Steering Wheel:

1. Disconnect the battery earth cable.

2. Disconnect the horn wiring and remove the horn pad.

3. Remove the steering wheel nut, using the special puller ST 27180000 (Fig. K.15.) Remove the column shell covers (Fig.K.16) and the turn signal switch assembly.

Column shaft:

4. Remove the cotter pin and detach the shift rod (Automatic Transmission). Remove the bolt securing the worm shaft and coupling (Fig.K.17.).

5. Take out the bolts securing the column tube flange to the dash panel and the bolts securing the column clamp. Withdraw the steering column shaft towards the car interior.

A careful check should be made to ensure that the assembly is not damaged in any way.

Pull out the lower shaft, tap the column clamp towards the steering wheel end and remove the screws securing the upper and lower tubes. Separate the upper and lower tubes. Remove the snap ring from the upper end of the column, pull the upper jacket down and separate it from the upper jacket tube.

Take care not to damage the bearing. Remove the plain washer and spring from the upper shaft.

Check the column bearings for damage and lack of smoothness. Apply multi-purpose grease to the bearing if necessary. Inspect the jacket tubes for signs of deformation, renew the tubes if necessary. Check the dimension "A" in Fig.K.18. to make sure that the jacket has not been crushed. Check the dimension "B" Fig.K.14.

COLLAPSIBLE STEERING - Assembly and Installation

Assembly is a reversal of the dismantling procedure, noting the following points.

Lubricate the column bearing, the spring and dust seal sliding parts. Ensure that the upper shaft steering lock hole and the steering lock are correctly positioned (Fig.K.19.). When assembling the lower shaft take care to coincide the notch on the universal joint with the punched mark on the shaft.

Coat the upper and lower shaft serrations with multi-purpose grease. Set the steering in the straight ahead position and fit the column shaft to the steering gear. (See Fig.K.20.) Insert the column through the dash board and install it to the gear so that the punch mark at the top of the shaft is forced upwards. Slide the universal joint to the steering gear and temporarily install the column clamp (6). Fit the lower cover flange (7) and tighten the column clamp bolts.

Check the steering wheel alignment with the wheels in the straight ahead position. If the steering wheel and steering lock are misaligned by more than 35 mm. (1.4 in) from the vertical position, remove the steering wheel and re-centre it.

STEERING LINKAGE - Removal

1. Jack up the front of the vehicle and support it on stands.

2. Remove the cotterpins and castle nuts fastening the tie rod ball joints to the knuckle arms.

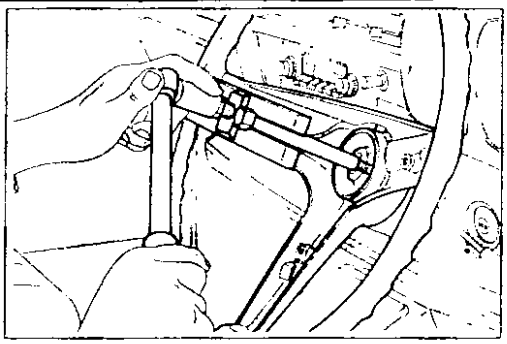


Fig. K.15 Removing the steering wheel.

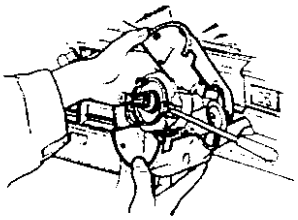


Fig. K.16 Removing the column shell covers.

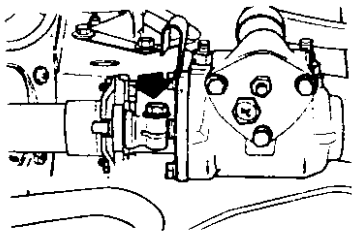
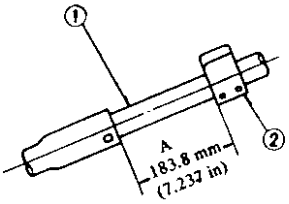


Fig. K.17 Removing the rubber coupling securing bolt.



1 Jacket tube
2 Column clamp

Fig. K.18 The standard dimension between column clamp and lower jacket.

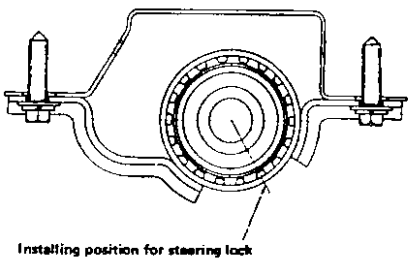
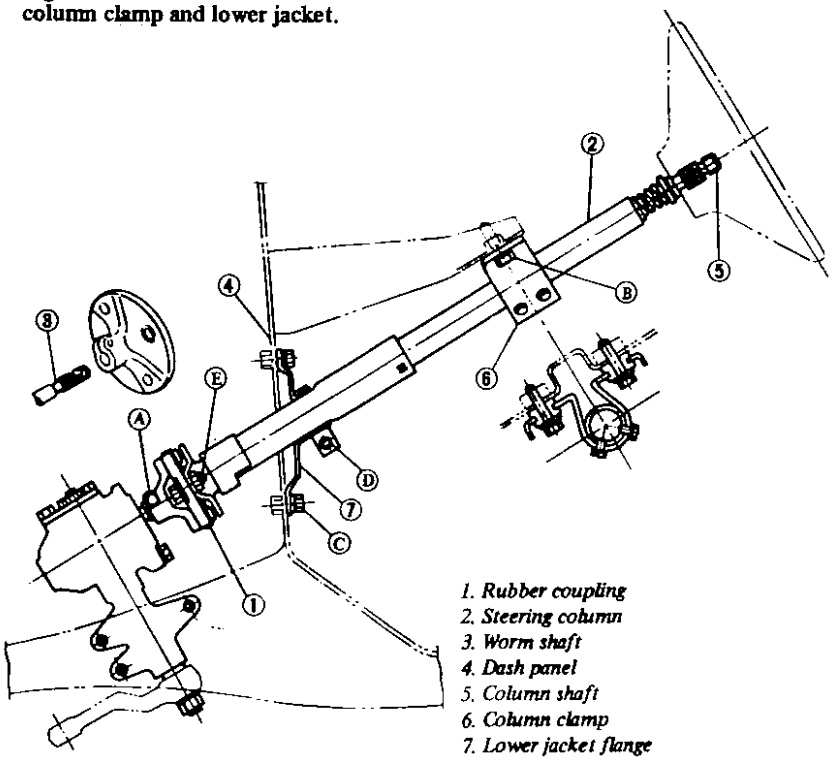


Fig. K.19 Steering lock installation



1. Rubber coupling
2. Steering column
3. Worm shaft
4. Dash panel
5. Column shaft
6. Column clamp
7. Lower jacket flange

Fig. K.20 Installing the steering column assembly.

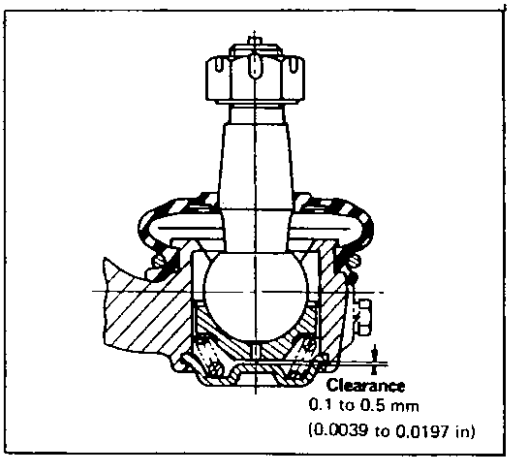


Fig. K.21 The outer tie rod ball joint.

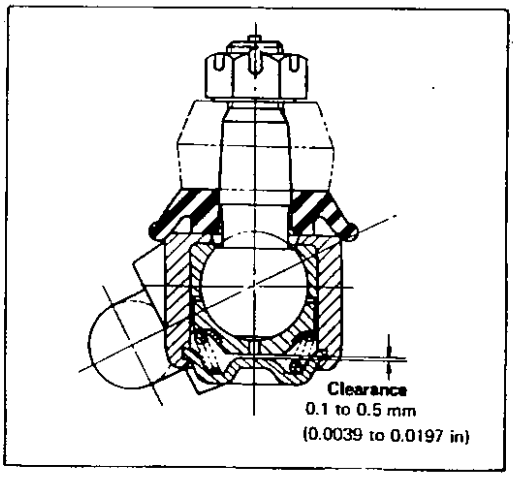


Fig. K.22 The centre tie rod ball joint

3. Free the ball studs from the knuckle arms by placing a hammer behind the boss and striking the opposite side with another hammer.

4. Remove the centre tie rod ball studs in a similar manner to that described above and remove the centre tie rod and outer tie rods as an assembly.

5. Remove the idler assembly from the side member by withdrawing the retaining bolts.

STEERING LINKAGE - Dismantling

Disconnect the tie rods from the centre rod. Loosen the clamp bolts, unscrew the socket assembly and remove the socket from the tie rods. Remove the idler arm nut and dismantle the idler assembly.

Check the idler arm rubber bushing for signs of damage, wear, or play and replace the bushing, if necessary. Check the centre and outer tie rod for damage or bending.

Inspect the ball joints and replace them if the amount of play is excessive, or if the dust cover is cracked. Further information can be found in the section FRONT SUSPENSION. (See also Figs. K.21. and K.22.).

STEERING LINKAGE - Assembly and Installation

Assembly is a reversal of the removal procedure, noting the following points:

To assembly the idler arm assembly, coat the outer diameter of the bushing with soapy water and press the bushing into the idler arm until the bushing protrudes equally at both sides.

Fit the idler arm body in the rubber bushing. Ensure that the centre line of the idler arm is parallel with the centre line of the chassis.

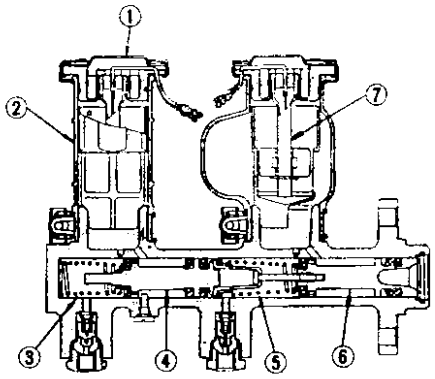
Installation is a reversal of the removal procedure. The outer tie rods must be set so that the lengths between the ball stud centres are 309.5 mm. (12.18 in.) for the 1400 and 1600cc. models and 313.2 mm. (12.33 in.) for the 1800cc. models.

Tighten the ball stud nut to a torque reading of 5.5 - 7.6 kgm. (39.8 - 55 lb.ft.). the idler arm nut to 5.5. - 7.6. kgm. (39.8 - 55 lb.ft.) and the pitman arm nut to 14 kgm. (101 lb.ft.).

The front wheel alignment, toe-in and steering angle should be checked and adjusted, as described in the section FRONT SUSPENSION.

Technical Data

Steering type	Worm and recirculating ball
Gear ratio:	15.0 : 1
Steering angle:	
Inner wheel (1800cc.)	37°-38°
Outer wheel (1800 cc.)	30°40' - 32°40'
Inner wheel (1400 and 1600cc. Saloon)	38°
(1400 and 1600cc. Estate)	38° 30'
Outer wheel (1400 and 1600cc. Saloon)	31°20'
(1400 and 1600cc. Estate)	33°
Steering wheel play (1400 and 1600cc.)	25-30mm. (0.98 - 1.18 in.)
Steering wheel play (1800cc.)	less than 35mm. (1.378 in.) at outer rim of steering wheel.
Standard total thickness of worm bearing shims.	1.5 mm. (0.059 in.)
End play between sector shaft and adjusting screw	0.01 - 0.03mm. (0.0004 - 0.0012 in.)
Initial turning torque of worm bearing. (1800cc. models)	4.0 - 6.0 kg.cm. (55.6-83.4 in.oz.)
(1400 and 1600cc. models	4.0 - 8.0 kg.cm. (55.6 - 112 in.oz.).



1. Reservoir cap
2. Reservoir tank
3. Secondary piston return spring
4. Secondary piston
5. Primary piston return spring
6. Primary piston
7. Level gauge

Fig. L.1 Tandem master cylinder (level gauge on SSS models only).

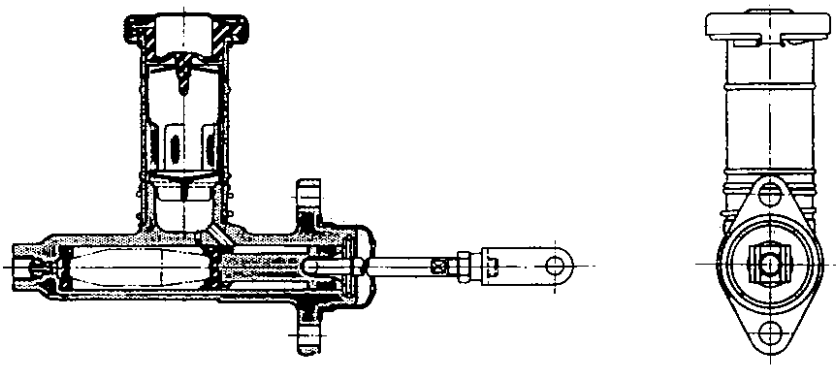


Fig. L.2 Section through the single master cylinder.

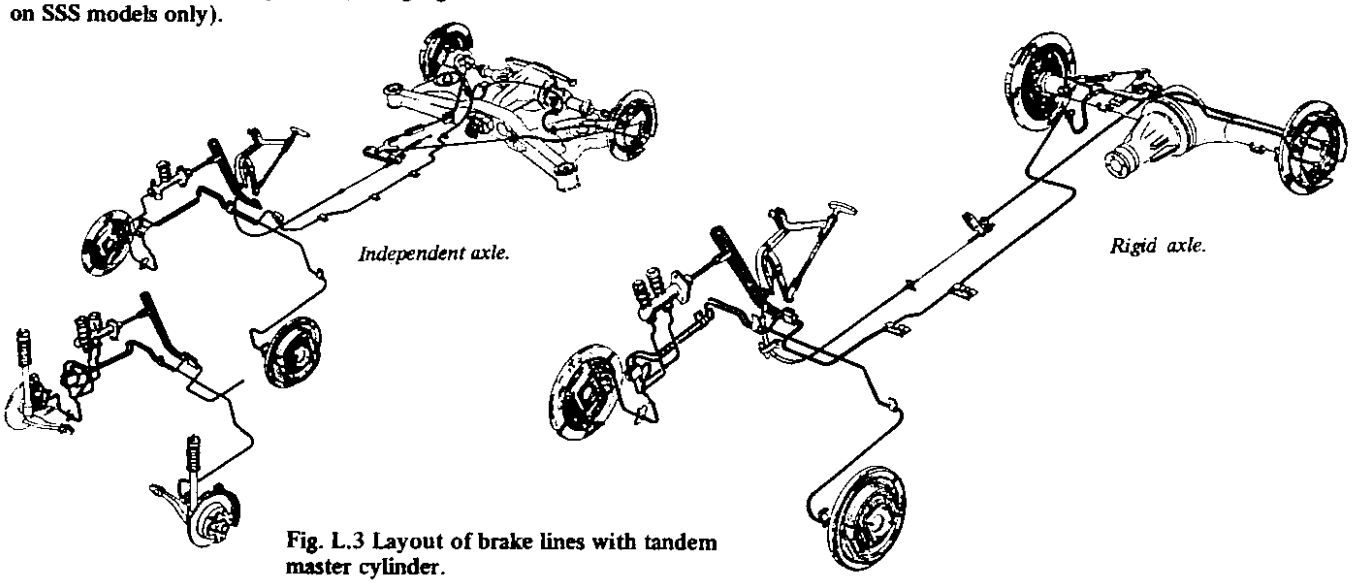


Fig. L.3 Layout of brake lines with tandem master cylinder.

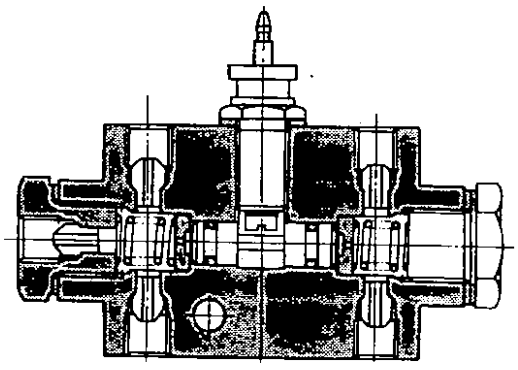


Fig. L.4 Section through the brake warning light switch.

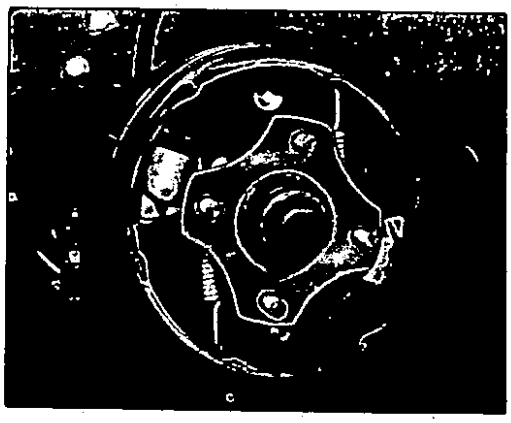


Fig. L.5 View of the front drum brake.

Braking System

DESCRIPTION

The vehicle is fitted with either disc brakes, or two-leading shoe type drum brakes for the front wheels and leading-trailing shoe type drum brakes for the rear wheels.

All brakes are hydraulically operated from the brake pedal, with the rear brakes additionally operated by a mechanical handbrake and linkage system. Either a single, or a tandem master cylinder can be fitted. The tandem master cylinder provides a dual braking circuit, in which the front and rear brakes are separately supplied, If one circuit fails, the other circuit will still operate and provide a reduced, but efficient braking action.

The brake pipes are double wall steel tubes and are galvanized at the sections beneath the vehicle floor to prevent corrosion.

MASTER CYLINDER - Removal

Either a tandem or single master cylinder can be fitted to the vehicle. Fig.L.1. shows a cross sectional view through the tandem master cylinder and Fig.L.2. a cross sectional view through the single master cylinder. The removal and dismantling procedures are similar for both types and are carried out in the following manner.

1. Remove the clevis pin and separate the brake pedal from the master cylinder push rod.
2. Disconnect the brake tubes from the master cylinder.
3. Remove the master cylinder mounting bolts, withdraw the shims and take out the master cylinder assembly.

MASTER CYLINDER - Dismantling and Overhaul

Drain the brake fluid from the cylinder and remove the stopper bolt. Remove the dust cover, the snap ring, the stopper ring and the pushrod assembly.

Take out the primary piston and secondary piston assemblies and the piston spring.

Remove the valve cap and take out the valve assembly.

Clean all the components with brake fluid and check them for wear or damage. Make sure that the cylinder bore and piston are not damaged, or unevenly worn. The clearance between cylinder and piston must not exceed 0.15mm. (0.006 in.).

Check the return springs for damage or loss of tension. Replace any part which is in an unsatisfactory condition.

MASTER CYLINDER - Assembly and Installation

Assembly of the master cylinder is a reversal of the dismantling procedure, noting the following points:

Wet the cylinder bore and piston, etc, with brake fluid before assembling. Care must be taken to prevent dust and foreign matter entering the cylinder and reservoir. Ensure that cups and seals are not damaged when locating them.

After the master cylinder is reinstalled, the system must be bled and the pedal height adjusted as described under the appropriate headings.

BRAKE LINES - Replacing

The layout of the metal brake pipes and flexible hoses is shown in Fig.L.3.

The brake pipes can be removed by taking off the flare nuts at both ends of the pipe and removing the clips securing the pipe to the body. Similarly, the brake hoses can be removed by taking off the flare nuts.

Thoroughly clean the pipe or hose, after removing from the vehicle and check for collapsing, cracking or rusting of the pipe and for signs of expansion and weakening of the hose. Any pipe or hose which is not in a satisfactory condition must be renewed. Remove any dust from the brake clip and replace the clip if the vinyl coating is torn.

Installation is a reversal of the removal procedure. Make sure that the brake pipes cannot vibrate against any part of the vehicle and the brake hoses are not twisted and rubbing against the tyres or suspension units. If the brake hose is disconnected from the three-way connector on the rear axle housing it will be necessary to fit a new copper sealing washer.

Do not overtighten the installation flare nuts, the correct tightening torques are as follows.

Three-way connector, master cylinder and brake hoses - 1.5 - 1.8 kgm. (11 - 13 lb.ft.).

Fill the master cylinder with recommended fluid and bleed the system as described under the appropriate heading. Make sure that fluid is not leaking from any part of the system., by fully depressing the brake pedal for several seconds. Check the pipes and connections and replace any defective part.

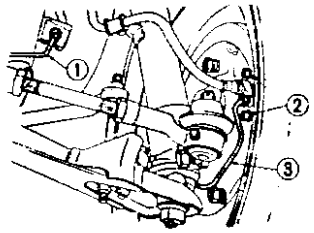


Fig. L.6 Removing the wheel cylinders.

1. Brake tube
2. Wheel cylinder bolts
3. Bridge pipe

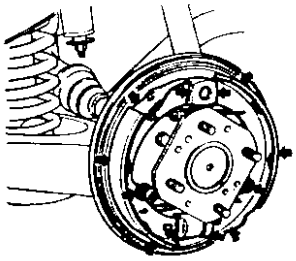


Fig. L.8 Front drum brake lubricating positions.

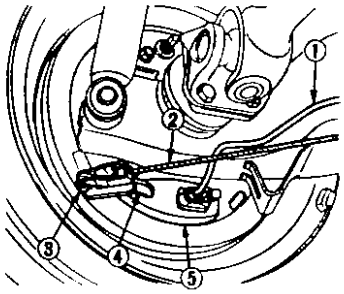


Fig. L.9 Removing the rear wheel cylinder.

1. Brake pipe
2. Handbrake cable
3. Clevis pin
4. Lever
5. Dust cover

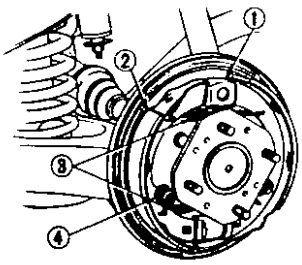
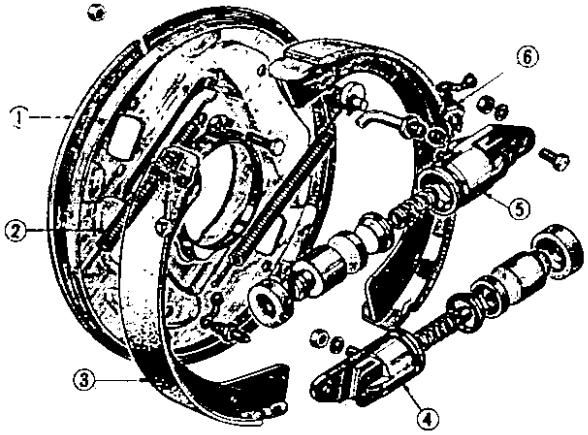


Fig. L.11 View of the rear drum brake

1. Brake shoe adjuster
2. Brake shoe
3. Return spring
4. Anti-rattle pin

Fig. L.7 Front drum brake components.

1. Brake rim
2. Return spring
3. Brake shoe assembly
4. Front wheel cylinder
5. Rear wheel cylinder
6. Air bleed screw



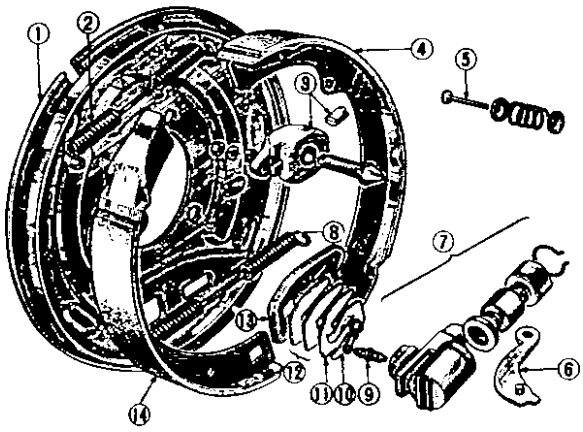


Fig. L.10 Rear drum brake components.

1. Brake backplate
2. Return spring
3. Brake shoe adjuster
4. Front brake shoe
5. Anti-rattle pin
6. Lever
7. Wheel cylinder
8. Return spring
9. Air bleed screw
10. Lockplate
11. Lockplate
12. Lockplate
13. Dust cover
14. Rear brake shoe

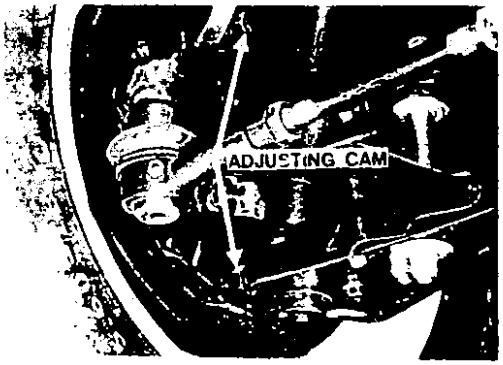


Fig. L.12 The front brake shoe adjusting cams.

BRAKE WARNING LIGHT SWITCH

A hydraulically operated warning light switch is located in the engine compartment (Fig.L.4.).

The front and rear brake systems of the dual circuit are connected to the switch, which provides a warning via the warning light on the instrument panel when a pressure difference of 13 - 17 kg/sq.cm. (185 -242 lb./sq.in.) occurs between the front and rear brake systems. The switch cannot be repaired and must be renewed if faulty.

FRONT DRUM BRAKE - Removal

1. Jack up the front of the vehicle and support it on stands.
2. Remove the brake drum and the hub cap and hub assembly.
3. Disconnect the brake pipe at the bracket on the front suspension strut, as previously described in the section FRONT SUSPENSION.
4. Unhook the two return springs shown in Fig.L.5. and remove the brake shoes.
5. Disconnect the bridge pipe (3 in Fig.L.6.) and remove the two wheel cylinders.
6. Take out the installation bolts and withdraw the brake backplate from the spindle.

FRONT DRUM BRAKE - Inspection and Overhaul

Examine the brake drums for scoring and out of round. The maximum permissible inner diameter of the drums must not exceed 228.6mm. (9.00 in.) and out of round should be below 0.02mm. (0.0008in.).

The brake shoe linings must be renewed when worn down to a thickness of 1.5mm. (0.06 in.) or below. Renew the linings if they are contaminated in any way or incorrectly seated. The complete set of linings must be replaced if any single lining is unsatisfactory.

Check the shoe return springs, and if they have become weakened, replace them.

Withdraw the pistons and springs from the wheel cylinders and inspect the bore of the cylinders for signs of wear, corrosion, or damage.

Renew the cylinder and the piston, if the clearance between the two exceeds 0.15mm. (0.006 in.). Renew the rubber boots and cups.

FRONT DRUM BRAKE - Assembly and Installation

Assembly and installation is a reversal of the removal and dismantling procedure, noting the following points:

Apply a thin layer of special grease to the piston cup and other rubber parts when assembling the wheel cylinder. The internal components of the cylinder should be dipped in brake fluid and assembled whilst still wet.

Install the wheel cylinders on the brake backplate and smear the cylinder, backplate and cylinder lever fulcrum with grease (Fig.L.8.).

Tighten the backplate mounting bolts to a torque reading of 2.7 - 3.7 kgm. (19.5 - 26.7 lb.ft.).

Adjust the brake shoes and bleed the hydraulic system as described under the appropriate headings.

REAR DRUM BRAKE REMOVAL (Fig.L.10).

1. Jack up the vehicle at the rear and support it on stands. Remove the roadwheel.
2. Release the handbrake, remove the clevis pin (3) from the rear wheel cylinder lever (4), see Fig.L.9. Disconnect the handbrake cable (2) and remove the return spring (1).
3. Remove the brake drum. Remove the shoe retainers the return springs and brake shoes (Fig.L.11.).
4. Disconnect the fluid line from the wheel cylinders and plug the opened end to prevent to loss of fluid.
5. Remove the dust cover, adjusting shims and plates, then remove the wheel cylinder from the backplate.
6. The brake backplate and axle shaft assembly can be withdrawn if necessary, by taking out the four flange bolts and removing the assembly as described in the section REAR AXLE AND REAR SUSPENSION .

REAR DRUM BRAKE - Inspection and Overhaul

The inspection and overhaul procedures for the rear drum brakes are similar to those previously described for the front drum brakes.

Tighten the brake backplate mounting bolts to a torque reading of 3.9 - 5.3 kgm. (28 - 38 lb.ft.).

FRONT DRUM BRAKE - Adjusting

Jack up the vehicle and pump the brake pedal several times. With the brake drum installed, turn one of the adjusting cams clockwise until the brake shoe is in contact with the drum. This operation is carried out from the rear of the backplate.

When the brake shoe contacts the drum, turn the cam in the opposite direction until the shoe is just clear and the brake drum can be rotated freely by hand.

Repeat the operation on the other adjusting cam and then depress the brake pedal to make sure that the brakes are working correctly. The adjusters must be released slightly if the brake drum-binds when turned by hand. Fig.L.12. shows the adjusting cams.

REAR DRUM BRAKE- Adjusting

Jack up the vehicle at the rear and pump the brake pedal several times. Turn the brake shoe adjuster (Fig.L.13.) until the

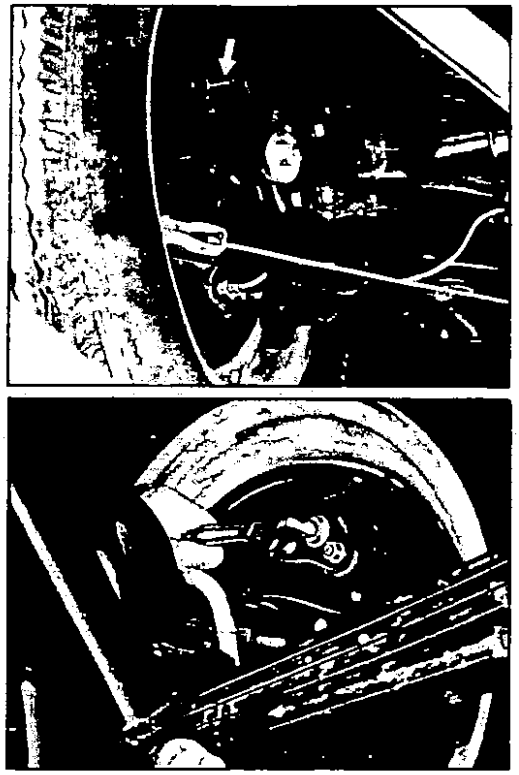


Fig. L.13 Rear brake shoe adjusting cams.

Top - Saloons
Bottom - Estate cars and vans

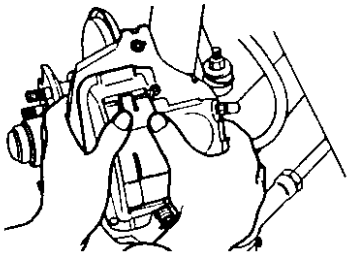


Fig. L.15 Removing the anti-rattle clip.

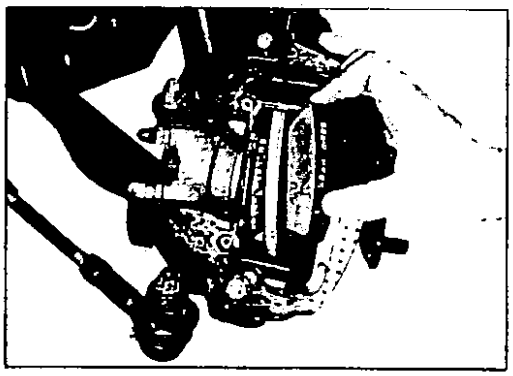


Fig. L.17 Removing the brake pad.

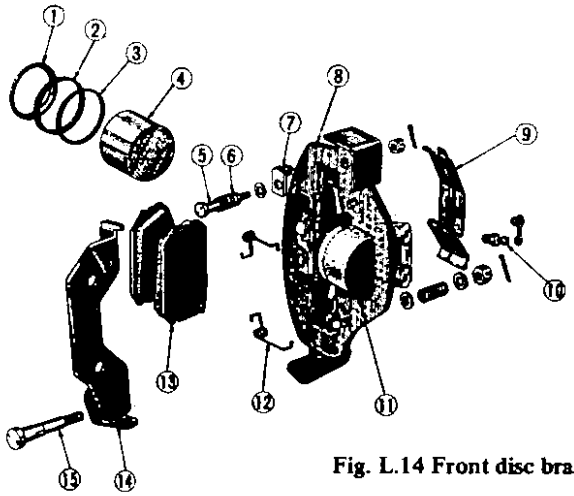


Fig. L.14 Front disc brake components.

1. Retainer
2. Wiper seal
3. Piston seal
4. Piston
5. Hold down pin
6. Spring
7. Support bracket
8. Calliper plate
9. Clip
10. Bleed screw
11. Cylinder
12. Tension spring
13. Brake pad
14. Mounting bracket
15. Pivot pin

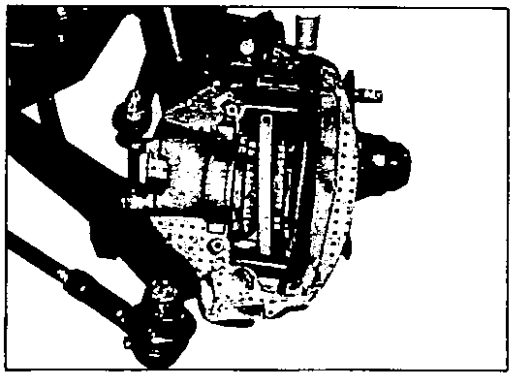


Fig. L.16 Moving the piston.

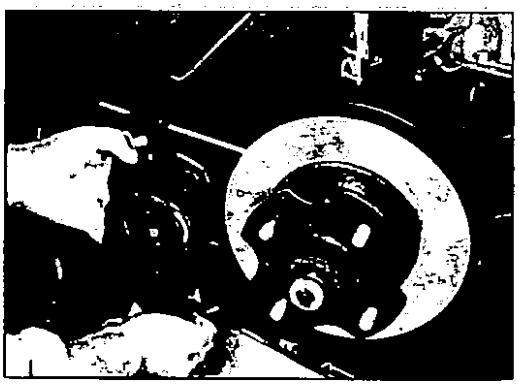


Fig. L.18 Removing the brake calliper.

brake shoe is in contact with the drum. The adjuster must be turned from the rear of the backplate and the drum turned by hand.

When the shoe contacts the drum, turn the adjuster in the opposite direction until the shoe is just clear and the drum can be rotated freely by hand.

Depress the brake pedal and make sure that the brakes operate correctly. The adjusters must be released slightly if the brake shoe binds.

FRONT DISC BRAKE - Friction pads. (Fig.L.14.).

The disc brakes are self adjusting, but the friction pads should be checked for wear every 5,000 km. (3,000 miles) and replaced if the thickness of the friction lining on any pad is less than 1.0mm. (0.004 in.) In effect, this means that renewal is necessary when the total thickness of pad and lining is less than 8.4mm. (0.24 in.).

To replace the friction pads, proceed as follows: Siphon out some of the fluid in the master cylinder reservoir. Jack up the front of the vehicle and remove the road wheel.

Remove the anti-rattle clip from the calliper plate (Fig.L.15).

Unhook the hanger spring and withdraw the brake pads and shims (Fig.L.17).

It should be noted that the friction pads must be replaced as a set and renewed at both sides of the vehicle, otherwise the braking action will be uneven.

Clean the calliper and pad at their installation positions. Press the pistons into the calliper bores so that the new friction pads can be installed. The pistons can be installed by applying light pressure, as shown in Fig.L.16, but care must be taken to avoid pushing them too far, or the groove of the piston will damage the seal.

If the pistons are pushed down excessively it will be necessary to dismantle the calliper as described under the appropriate heading.

Assemble the anti-squeal shims to the friction pads with the arrow mark on the shims pointing in the direction of forward disc rotation.

Refit the pads and retaining pins and assemble the coil spring to the retaining pin furthest away from the air bleed screw.

After installing the new pads and shims, depress the brake pedal several times to reposition the pistons in the calliper. Check the fluid level in the master cylinder reservoir and refill to the correct level.

FRONT DISC BRAKE - Removal and Dismantling

1. Jack up the front of the vehicle, remove the road wheel and take out the friction pads.

2. Disconnect the brake hose from the brake tube and plug the opened end to prevent the loss of fluid.

3. Remove the bolts securing the brake calliper to the knuckle flange and remove the calliper assembly (Fig.L.18).

4. Remove the hub nut and withdraw the hub and disc.

To dismantle the calliper, remove the anti-rattle clip and withdraw the brake pads. Remove the tension springs and pull the cylinder out of the calliper. Blow-out the piston with compressed air applied at the brake hose connection.

Clean the components in brake fluid and examine them for signs of wear or damage.

The cylinder walls can be carefully polished with fine emery cloth if they are rusted or contaminated. If the parts are excessively corroded they should be renewed.

Replace the pistons if they are unevenly worn, damaged or rusted. The sliding surface of the piston is plated and no attempt should be made to use emery cloth or similar abrasives for cleaning purposes.

Check the thickness of the friction pads as previously described and replace them if necessary. Renew the piston seals and the dust covers.

Check the brake disc for scoring and out of round. The standard disc thickness is 10.0mm. (0.0394 in.) and must not be reground below 8.4mm. (0.3307 in.).

Check the disc run-out with a dial gauge as shown in Fig. L.19. Position the gauge near the outer diameter and check that the run out does not exceed 0.06mm. (0.0024 in.).

FRONT BRAKE DISC - Assembly and Installation

Rinse the cylinder bore with brake fluid and fit the piston seal into the cylinder groove (Fig.L.20.). Fit the wiper seal and lightly grease the bore of the cylinder. Clean the brake disc and fit it to the hub. Install the hub to the knuckle spindle.

Carefully insert the piston into the cylinder until the face of the piston is almost flush with the wiper seal retainer. The relieved part of the piston should face the piston pin.

Fit the cylinder to the calliper plate and secure in position with the two torsion springs. Assemble the hold - down pin, the spring washer and the nut to the support bracket. Secure the nut with a cotter pin.

Assemble the calliper to the mounting bracket, using the pivot pin, washer, spring, washer and nut. Tighten the nut and secure with a cotter pin. Hook the hold-down bracket to the top of the mounting bracket and turn the calliper plate to make sure that it can slide smoothly. Fit the calliper assembly to the knuckle flange

Fit a shim to the inner pad and insert the pad. Draw the calliper towards the chassis and insert the lower cuts on the pad into the mounting bracket and push the pad in until it contacts the piston. Move the calliper away from the chassis and insert the upper cuts. Centre the indentation of the outer pad in the calliper plate. Fit the anti-rattle clip (Fig.L.14.).

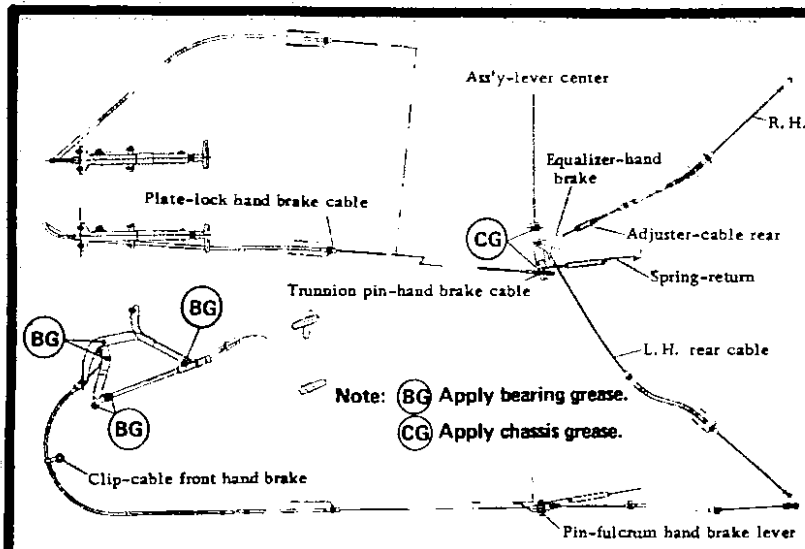


Fig. L.21 Handbrake linkage - 1400 and 1600 c.c. Saloons.

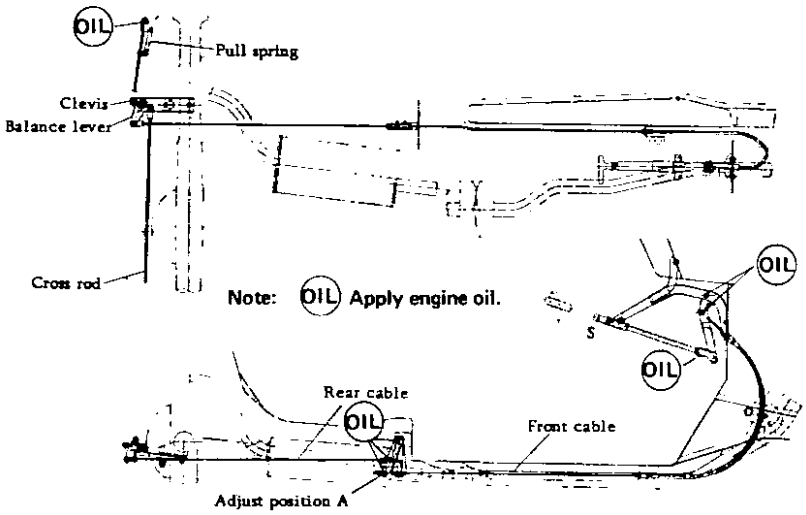
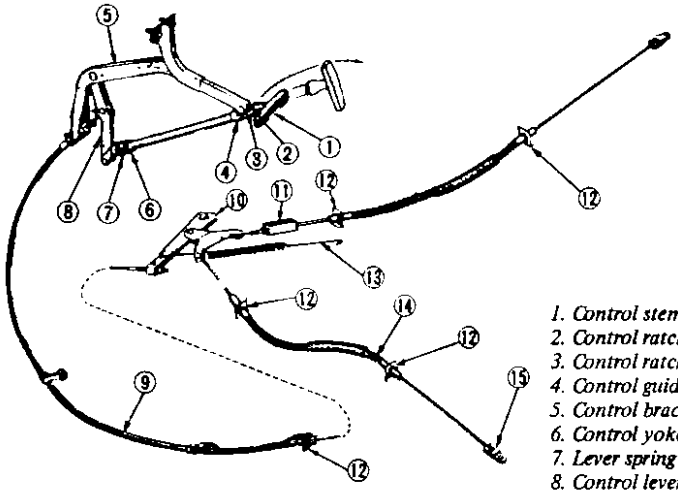


Fig. L.22 Handbrake linkage - 1400 and 1600 c.c. Estate cars.



1. Control stem
2. Control ratchet spring
3. Control ratchet
4. Control guide
5. Control bracket
6. Control yoke
7. Lever spring
8. Control lever
9. Front cable
10. Centre lever
11. Rear cable adjuster
12. Cable lock plate
13. Return spring
14. Rear cable
15. Clevis

Fig. L.23 Handbrake linkage - 1800 c.c. models.

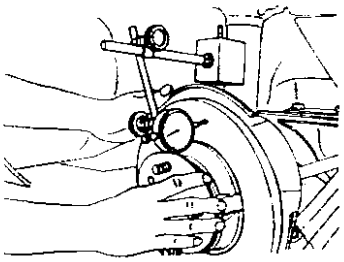


Fig. L.19 Checking the brake disc for run-out.

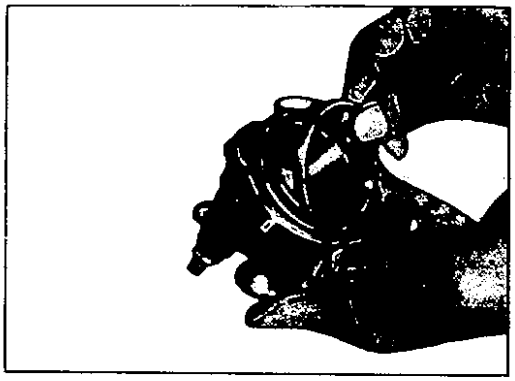


Fig. L.20 Assembling the piston, seals and retainer.

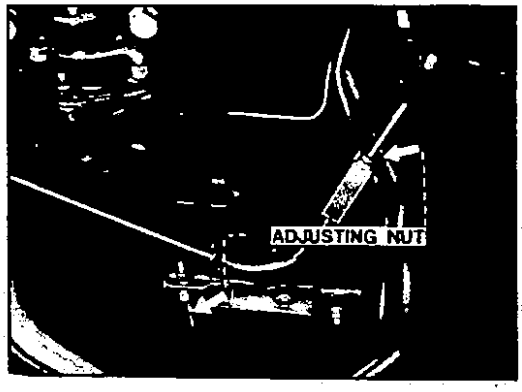


Fig. L.24 The handbrake cable adjuster - Saloons.

HANDBRAKE - Removal

The mechanical handbrake linkages are shown in Figs.L.21. L.22, and L.23.

1400 and 1600cc. models:
Front cable:
Release the handbrake and disconnect the front cable by removing the clevis pin from the lever. Unscrew the adjusting nut from the rear of the front cable (Fig.L.24.). Remove the cable from the handbrake lever.

Remove the clamp holding the cable to the under body. Pull out the lock plate holding the front cable to the retainer and completely withdraw the cable. Withdraw the cable by unfastening the outer casing which is pressed into the handbrake control bracket.

Handbrake lever. (Fig.L.25.).

Remove the clevis pin connecting the lever yoke and lever. Remove the clevis pin connecting the control guide and the control bracket. Lift out the handbrake assembly.

Rear cable (Saloons).

Remove the adjusting nut from the adjuster (Fig.L.26.). and disconnect the left hand rear cable from the handbrake adjuster. Pull out the lock plates and remove the clevis pin connecting the cables to the levers of the rear wheel cylinders.

Rear cable (Estate car and rigid axle saloon).

Remove the clevis pin from both ends of the rear cable. Remove the connecting rods by extracting the pull-off springs and clevis pins.

1800cc. models:
Handbrake lever.

Disconnect the terminal from the handbrake warning switch. Remove the nuts securing the control bracket to the dashboard. Pull out the lock pin and cotter pin and withdraw the handbrake lever assembly.

Front cable:

Remove the return spring and loosen the adjuster locknut. Detach the front cable from the handbrake lever. Remove the nuts securing the cable to the dashboard (Fig.L.27.) and withdraw the cable towards the engine.

Rear cable (Saloon):

Disconnect the cable at the adjuster and detach the return spring from the centre lever (See Fig.L.28.). Remove the cable lock plates from the rear suspension. Remove the clevis pin attaching the cable at the rear wheel cylinder.

Rear cable (Estate car and Van):

Unfasten the pull spring and remove the clevis pins at the balance lever and wheel sides (Fig.L.29.). Detach the connecting rod. Remove the nut securing the connecting rod balance lever and the lever from the rear axle housing.

HANDBRAKE - Installation

Check the cables for signs of deterioration, fraying etc. Examine the handbrake lever and ratchet for wear and renew as necessry.

Check the springs for evidence of weakness and make sure that the balance lever and bushes are satisfactory.

Installation is a reversal of the removal procedure. Make sure that all sliding parts are greased.

Adjust the handbrake in the following manner:

Release the handbrake and adjust the rear brake shoes as previously described.

The 1400 and 1600cc. Saloon handbrake is adjusted to give a lever stroke of 85 - 95mm. (3.34 - 3.74 in.) by setting the adjusting nuts (Fig.L.24.). The lever stroke on the estate car should be adjusted to 50 - 75mm. (2.0 - 3.0 in.) by turning the adjuster shown in Fig.L.30.

Adjust the 1800cc. models to give a handbrake lever stroke of 90-100 mm. (3.5 - 3.9in.) by turning the adjuster (2 in Fig.L. 28). Retighten the locknut after adjusting.

BLEEDING THE HYDRAULIC SYSTEM

The hydraulic system must be bled if the circuit has been opened at any point, or if the level of the fluid in the master cylinder reservoir has fallen too low, allowing air to enter the system.

Bleeding is usually a two man operation as assistance will be required to work the brake pedal. The master cylinder reservoir must be topped up constantly throughout the operation whilst a check is carried out on the fluid expelled.

Bleeding should be carried out at the master cylinder first, then from the brake furthest away from the master cylinder and working round finally to the brake nearest to the master cylinder. Bleeding should therefore be carried out in the following order. Rear left wheel, rear right wheel, front left wheel, front right wheel.

Clean the area round the master cylinder cover, take off the cover and top up the reservoir if necessary. Clean the relevant air bleed screw and take off the cap.

Attach a suitable hose to the bleed screw and place the free end of the hose in a glass jar containing brake fluid.

Open the bleed screw and depress the brake pedal to allow the fluid to enter the glass container. Tighten the bleed screw when the pedal is fully depressed and allow the pedal to return.

Repeat the procedure until the fluid is completely free from air bubbles, then carry out the same operation on the other three wheels.

Top up the fluid in the reservoir, to the correct level, but do not re-use the fluid previously withdrawn from the system.

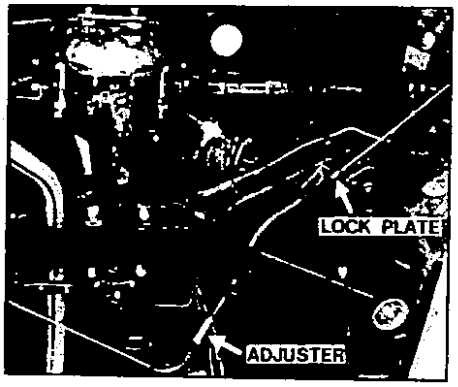


Fig. L.25 The handbrake assembly.

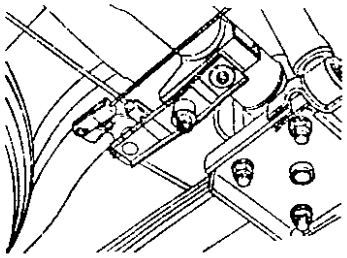


Fig. L.27 Front handbrake cable attachment nuts.

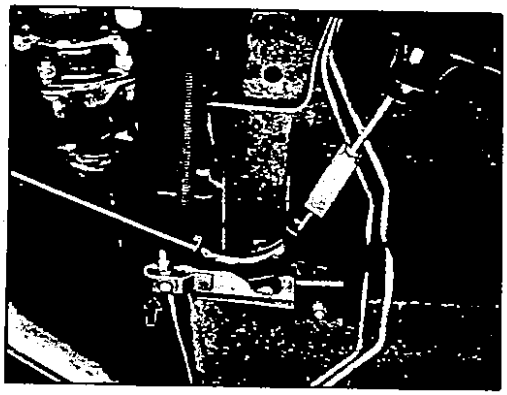


Fig. L.29 Balance lever - Estate cars and Vans.

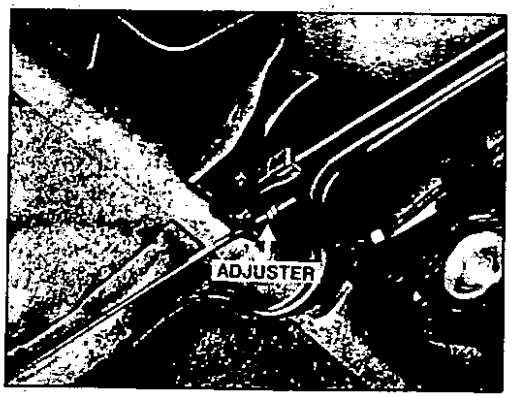


Fig. L.30 Adjusting the handbrake cable - Estate cars.

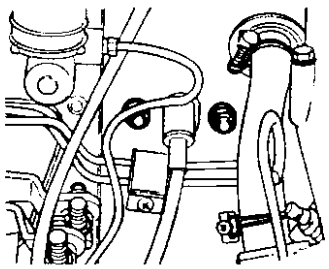


Fig. L.26 Removing the lock plates (see text).

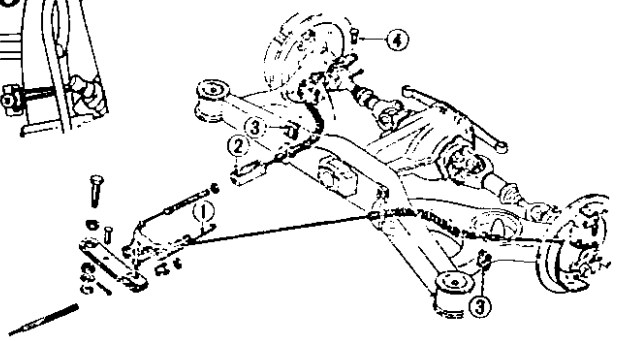
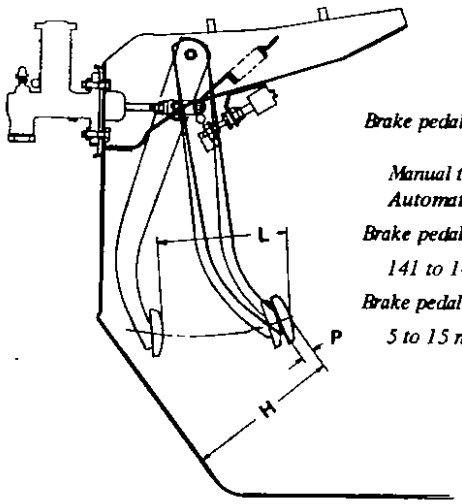


Fig. L.28 Rear cable layout 1800 c.c. Saloons.



Brake pedal height H:

Manual transmission . . . . . 187 mm. (7.362 in.)
Automatic transmission . . . . 202 mm. (7.953 in.)

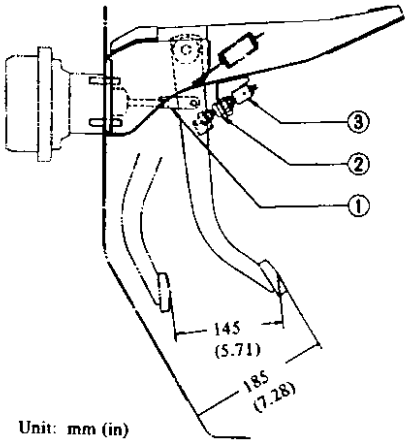
Brake pedal full stroke L:

141 to 149 mm. (5.55 to 5.86 in.)

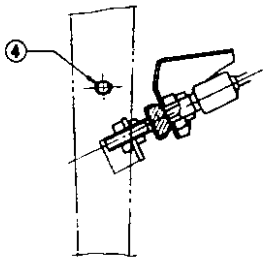
Brake pedal play P:

5 to 15 mm. (0.2 to 0.6 in.)

Fig. L.31 Brake pedal adjustment - 1400 and 1600 c.c. models.



Unit: mm (in)



1. Push rod adjusting screw
2. Pedal stop
3. Brake lamp switch
4. Clevis pin

Fig. L.32 Brake pedal adjustment - 1800 c.c. models

BRAKE PEDAL ADJUSTMENT

The brake pedal height and free play can be adjusted in the following manner: 1400 and 1600 cc. models:

Adjust the length of the master cylinder push rod until the height of the pedal pad is 187 mm. (7.36 in.) for manual gearboxes and 202 mm. (7.95in.) for automatic transmission vehicles without brake light switch. (Fig.L.31.). Retighten the locknut. Screw in the brake light switch until the screwed part of the switch is against the front of the stopper bracket, then tighten the locknut.

Screw in the stopper bolt until the moveable part of the switch is completely pushed in by the pedal and tighten the locknut in this position. Make sure that the lamp is on when the pedal is pushed down by 1.5mm. (0.06 in.).

1800cc. models:

Adjust the bolt of the brake lamp switch until its end face is flush with the locknut, then tighten the locknut securely (See. Fig.L.32.). Adjust the pedal stopper until the pedal pad is positioned at a height of 185 mm. (7.28 in.) from the floor, then tighten the stopper with the locknut. Adjust the length of the master cylinder push rod until a pedal free play of 1-5mm. (0.04 - 0.2in.) is obtained, then retighten the locknut.

Depress the brake pedal several times to make sure that a full travel of 145mm. (5.7 in.) is available and that the pedal moves freely and without noise.

Technical Data

BRAKE PEDAL

Pedal height:	
1400 and 1600cc. models	187mm.(7.362in.) manual gearbox. 202mm. (7.953in.) automatic.
1800cc. models	185mm. (7.28in.)
Full stroke	145mm. (5.71 in.)

MASTER CYLINDER

Inner diameter	19.05mm. (0.75 in.)
Piston running clearance	0.15mm. (0.006 in.)

WHEEL BRAKE CYLINDERS

Inner diameter (1400 and 1600cc.)	
Front drum	22.22mm. (7/8in.)
Front disc	50.8mm. (2.0 in.)
Rear (with front drum)	22.22mm. (7/8in.)
Rear (with front disc)	20.64mm. (13/16 in.)
Inner diameter (1800cc.)	
Front drum	20.6mm. (13/16in.)
Front disc	50.8mm. (2.0in.)
Rear	22.2mm. (7/8 in.)

BRAKE DRUM AND BRAKE DISC

Drum inner diameter	228.6mm. (9.0in.)
Drum outer diameter	232mm. (9.13in.)
Out of round maximum	0.05mm. (0.002 in.)
Repair limit of drum	230mm. (9.055 in.)
Maximum disc run-out	0.06mm. (0.0024 in.)
Repair limit of disc	8.4mm. (0.331 in.)

BRAKE LININGS

Drum brakes:	
Width x thickness x length	40 x 4.5 x 219.5mm. (1.575 x 1.772 x 8.642in.)
Disc brakes	39.7 x 9 x 86mm. (1.563 x 0.354 x 3.386in)
Total braking area:	
Front drum brake	351 sq.cm.. (54.4 sq.in.)
Front disc brake	114.2 sq.cm. (17.7 sq.in.)
Rear	351 sq.cm. (54.4 sq.in.)

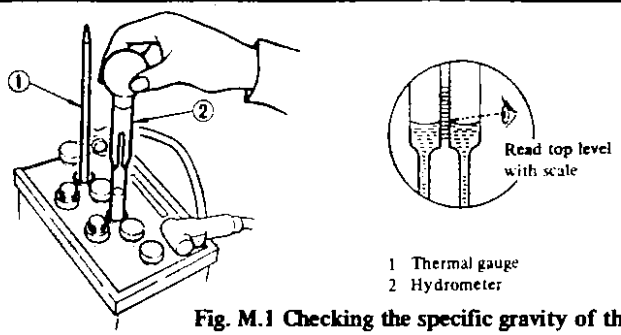


Fig. M.1 Checking the specific gravity of the battery electrolyte.

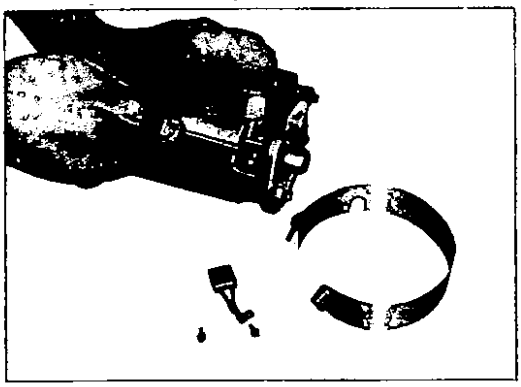


Fig. M.3 Brush cover removed.

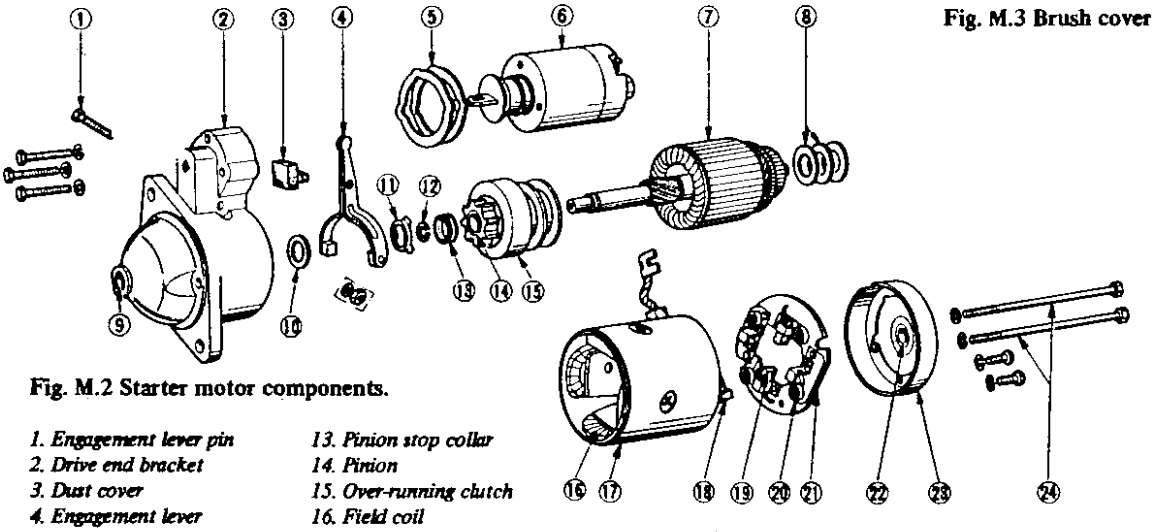


Fig. M.2 Starter motor components.

1. Engagement lever pin
2. Drive end bracket
3. Dust cover
4. Engagement lever
5. Dust seal
6. Solenoid switch
7. Armature
8. Thrust washer
9. Drive end bracket bush
10. Thrust washer
11. Stop washer
12. Circlip
13. Pinion stop collar
14. Pinion
15. Over-running clutch
16. Field coil
17. Yoke
18. Positive brush
19. Negative brush
20. Brush spring
21. Brush holder
22. Bearing bush
23. Rear cover
24. Through bolts

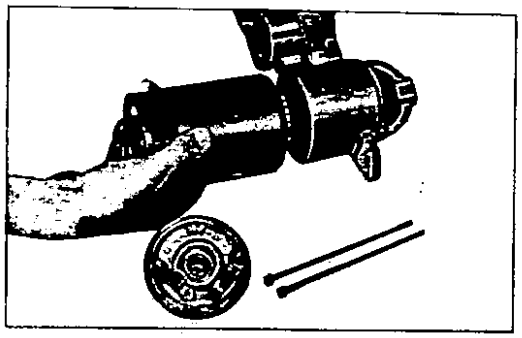


Fig. M.5 Yoke assembly removed.

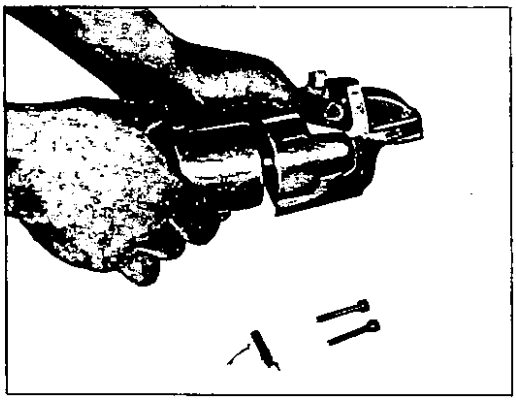


Fig. M.4 Solenoid switch removed.

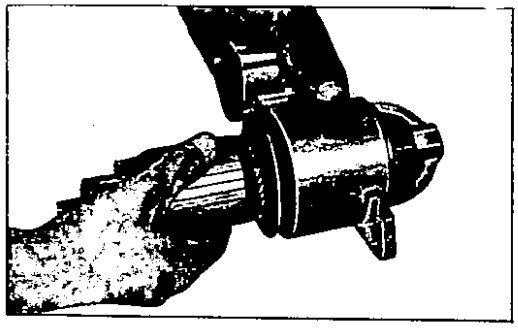


Fig. M.6 Armature assembly and engagement lever removed.

Electrical Equipment

DESCRIPTION

A 12- volt negative earth electrical system is used in which the battery is charged by an alternator. In the alternator a magnetic field is produced by the rotor which consists of the alternator shaft, field coil, pole pieces and slip rings.

Output current is generated in the armature coils located in the stator. Six silicon diodes are incorporated in the alternator casing to rectify the alternating current supply. A voltage regulator and pilot lamp relay are built-in the regulator box, which normally does not give trouble or require attention.

The starter motor is a brush type series wound motor in which positive meshing of the pinion and ring gear teeth are secured by means of an overrunning clutch.

BATTERY - Maintenance

The battery should be maintained in a clean and dry condition at all times or a current leakage may occur between the terminals. If frequent topping-up is required it is an indication of overcharging or deterioration of the battery. When refitting the cables clean them thoroughly and coat their terminals and the terminal posts with petroleum jelly.

Check the level of the electrolyte in the battery at frequent intervals and top up if necessary to the level mark on the battery case with distilled water. A hydrometer test should be carried out to determine the state of charge of the battery by measuring the specific gravity of the electrolyte. It should be pointed out that the addition of sulphuric acid will not normally be necessary and should only be carried out by an expert when required.

The specific gravity of the electrolyte should be ascertained with the battery fully charged at an electrolyte temperature of 20°C (68°F).

The specific gravity of the electrolyte decreases or increases by 0.0007 when its temperature rises or falls by 1°C (1.8°F). respectively.

The temperature referred to is that of the electrolyte and not the ambient temperature; to correct a reading for an air temperature it will be necessary to add 0.0035 to the reading for every 5°C above 20°C. Conversely 0.0035 must be deducted for every 5°C below 20°C. Test each cell separately and draw the liquid into the hydrometer several times, if a built-in thermometer type is used.

The correct specific gravity readings should be as follows:

	Permissible value	Fully charged at 20°C (68°F).
Cold climates	Over 1.22	1.28
Temperature climates	Over 1.20	1.26
Tropical climates	Over 1.18	1.23

The battery should be recharged if a low specific gravity reading is indicated. Always disconnect both terminals of the battery when charging and clean the terminal posts with a soda solution. Remove the vent plugs and keep the electrolyte temperature below 45°C (113°F) during charging.

Check the specific gravity after charging and if it is above 1.260 at 20°C (68°C), add distilled water.

STARTER MOTOR - Removal and Dismantling

As previously stated the starter motor is brush type series wound motor in which the positive meshing of the pinion and ring gear teeth are secured by an overrunning clutch. The overrunning clutch employs a shift lever to slide the pinion into mesh with the flywheel ring gear teeth when the starter is operated.

When the engine starts the pinion is permitted to overrun the clutch and armature, but is held in mesh until the shift lever is released. An exploded view of the starter is shown in Fig.M.2.

To remove the starter motor, proceed as follows:

1. Disconnect the battery earth cable.
2. Disconnect the black and yellow wire from the solenoid terminal and the black cable from the battery terminal.
3. Remove the two bolts securing the starter motor to the clutch housing. Pull the starter motor assembly forwards and withdraw it from the vehicle.

To dismantle the starter motor; first remove the brush cover, and lift out the brushes as shown in Fig.M.3.

Loosen the nut securing the connecting plate to the solenoid "M" terminal. Remove the solenoid retaining screws, take out the cotter pin, and withdraw the shift lever pin. Remove the solenoid assembly as shown in Fig.M.4.

Remove the two through bolts and rear cover assembly, then remove the yoke assembly by lightly tapping it with a wooden mallet. (Fig.M.5.). Withdraw the armature and shift lever (Fig.M.6.). Remove the pinion stopper from the armature shaft by removing the stopper washer, pushing the

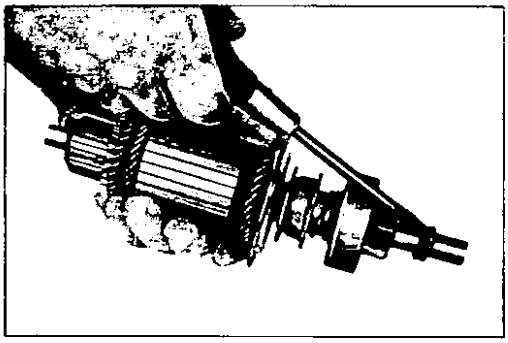


Fig. M.7 Over-running clutch assembly removed.

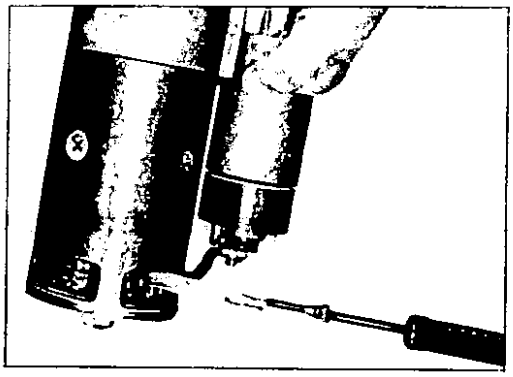


Fig. M.8 Checking the brush spring tension.

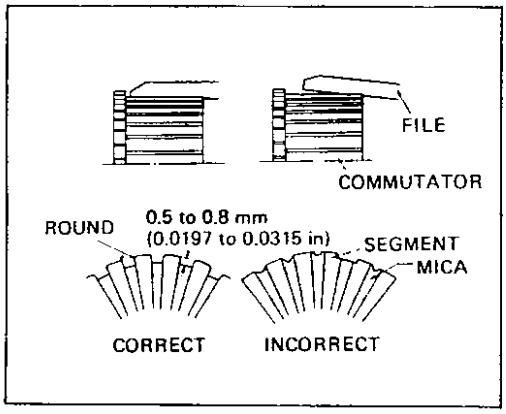


Fig. M.9 Undercutting the commutator insulation.

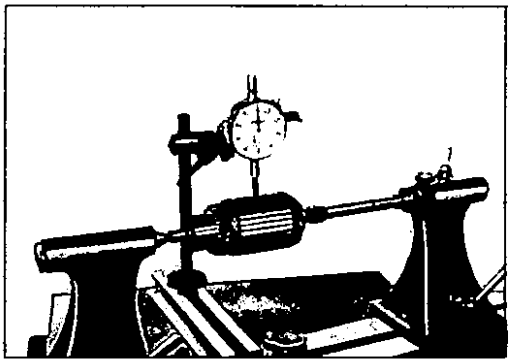


Fig. M.10 Checking the armature shaft for run-out.

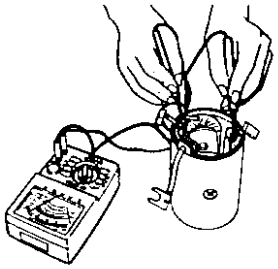


Fig. M.11 Testing the field coils for continuity.

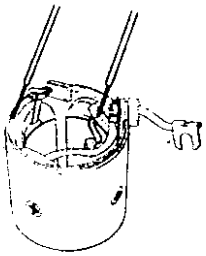


Fig. M.12 Testing the field coils for earthing.

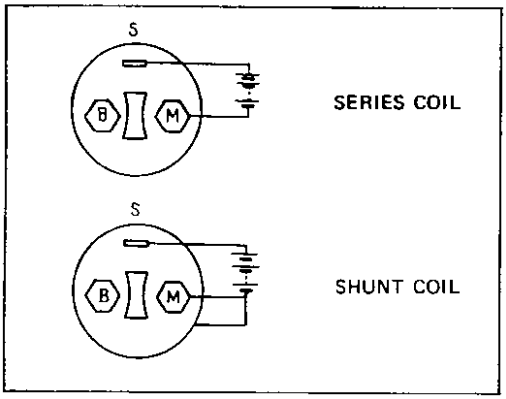
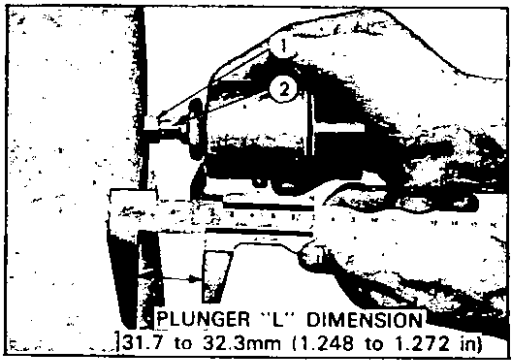


Fig. M.13 Testing the solenoid switch.



1 Adjusting nut 2 Plunger adjuster

Fig. M.14 Measuring the gap between pinion and pinion stop.

stopper to the overrunning clutch side and removing the stopper clip. Remove the stopper and overrunning clutch as shown inFig. M.7.

Clean the dismantled components and check them for wear or damage.
Check the brushes, and renew them if worn below 6.5mm. (0.257 in.). Fit new brushes, if the brush contact is loose. Check the brush holders and spring clips and make sure that they are not bent or distorted. The brushes should move freely in their housings, and can be eased with a file if necessary. The brush spring tension should be approximately 0.8kg. (1.76 lb.) and can be checked with a spring balance as shown in Fig.M.8.

Armature assembly:

Make sure that the surface of the commutator is not rough or pitted. Clean and lightly polish with a No.500 emery cloth, if necessary. If the commutator is badly worn or pitted it should be skimmed in a lathe only a light cut must be taken to remove the minimum amount of metal. If the commutator diameter wear limit of 0.2mm. (0.08 in.) is exceeded the assembly must be renewed.

Undercut the mica between the commutator, segments, when the depth of mica from the surface of the segment is less than 0.2mm. (0.08 in.). The depth should be between 0.5 - 0.8mm. (0.0197 - 0.0315 in.) as shown in Fig.M.9.

The armature shaft should be checked for straightness by mounting between the centres of lathe, and positioning a dial gauge as shown in Fig.M.10. Renew the armature if the bend of the shaft exceeds 0.08mm. (0.0031 in.).

Field coils - testing:

Test the field coils for continuity by connecting a circuit tester between the positive terminal of the field coil and the positive terminal of the brush holder as shown in Fig.M.11. If a reading is not obtained, the field circuit or coil is open.

Connect the tester to the yoke and field coil positive terminal as shown in Fig.M.12. to check the field coils for earthing.

Unsolder the connected part of each coil, and check the circuit for earthing in a similar manner. Renew the field coils if they are open, earthed or short-circuited.

Clutch assembly:

The overrunning clutch must be replaced if it is slipping or dragging. Examine the pinion and sleeve, making sure that the sleeve is able to slide freely along the armature shaft spline. Inspect the pinion teeth for signs of rubbing, and check the fly-wheel ring gear for damage or wear.

Bearings:

Inspect the metal bearing bushes for wear and side play. The bushes must be renewed if the clearance between the bearing bush and armature shaft is in excess of 0.02mm. (0.008 in.). New bearing bushes must be pressed in so that they are flush with the end of the case, and reamed out to give a clearance of 0.03 - 0.10 mm. (0.0012 - 0.0039 in.).

Solenoid assembly:

Inspect the solenoid contact surface and replace if showing signs of wear or roughness. Replace the pinion sleeve spring if weakened.

Check the series coil by connecting an 8-12 volt supply between the S and M terminals as shown in Fig.M.13. The series coil is normal if the plunger operates.

Test the shunt coil by connecting the S terminal the M terminal and the solenoid body as shown in the lower illustration of Fig.M.13. Open the M terminal when the plunger is operated; the shunt coil is satisfactory if the plunger stays in the operated position.

Measure the length L between the plunger adjusting nut and solenoid cover. Press the plunger against a firm surface as shown in Fig.M.14, and check that the dimension is within the figures given. Turn the adjusting nut if necessary, until the required dimension is obtained.

STARTER MOTOR - Assembly and Installation

The assembly and installation procedures are a reversal of the removal and dismantling operations. When assembling the starter, smear the armature shaft spline with grease, and lightly oil the bearing bushes and pinion.

ALTERNATOR

The alternator is driven by the fan belt and has an advantage over a dynamo in that it provides current at low engine speeds thereby avoiding battery drain. Maintenance is not normally required, but the tension of the fan belt should be checked and adjusted if necessary as described in the section COOLING SYSTEM. Care must be taken not to overtighten the fan belt or the alternator bearings will be overloaded.

The alternator output can be checked with the alternator in the vehicle by carrying out the following test. Ensure that the battery is fully charged. Withdraw the connectors from the alternator F and N terminals, and connect a jumper lead between the F and A terminals.

Connect a voltmeter to the E and A alternator terminals, with the negative lead to terminal E and the positive, lead to the terminal A, as shown in Fig.M.15. Switch the headlamps on to full beam and start the engine. Increase the engine speed gradually and note the reading on the voltmeter when the engine reaches a speed of approximately 1000 rpm. The alternator is operating satisfactorily if the voltmeter shows a reading above 12.5 volts. If the reading is below 12.5 volts the alternator is defective and should be removed for inspection.

ALTERNATOR - Removal

Disconnect the negative lead from the battery, and the two lead wires and connector from the alternator. Slacken the alternator mounting bolts, and take off the fan belt. Take out the mounting bolts, and withdraw the alternator from the vehicle.

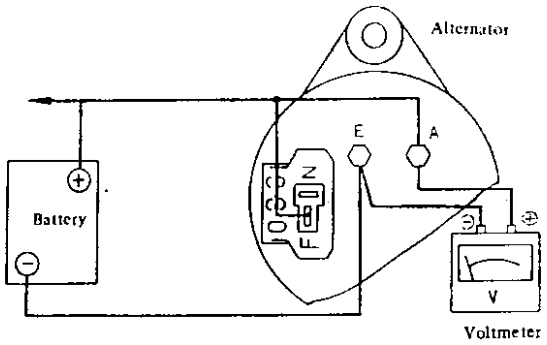


Fig. M.15 Testing the alternator.

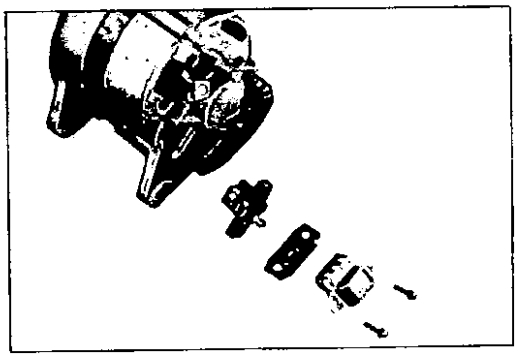
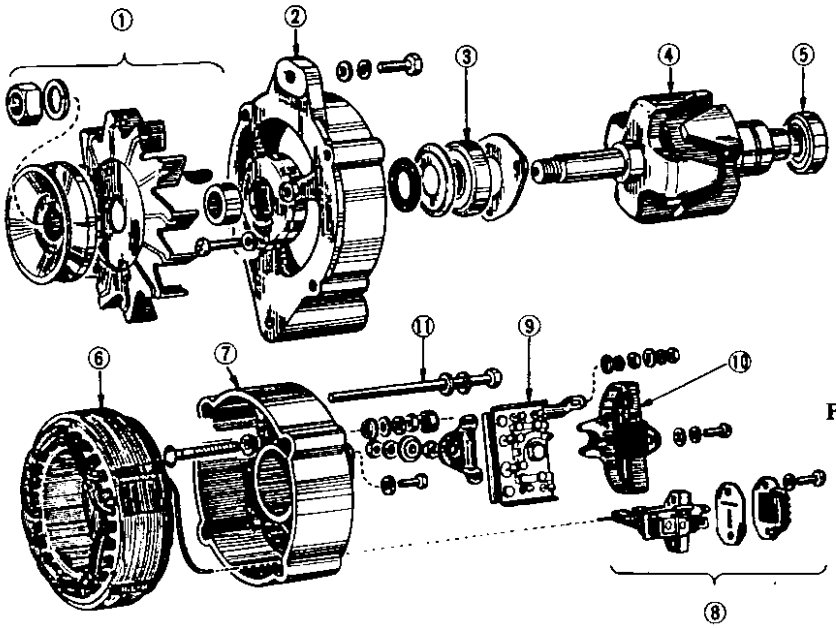


Fig. M.17 Removing the brush holder.



1. *Pulley assembly*
2. *Front cover*
3. *Front bearing*
4. *Rotor*
5. *Rear bearing*
6. *Stator*
7. *Rear cover*
8. *Brush assembly*
9. *Diode plate*
10. *Diode cover*
11. *Through bolts*

Fig. M.16 The alternator components.

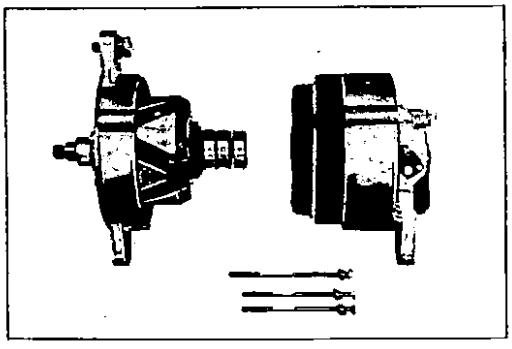


Fig. M.18 Separating the front and rear covers.

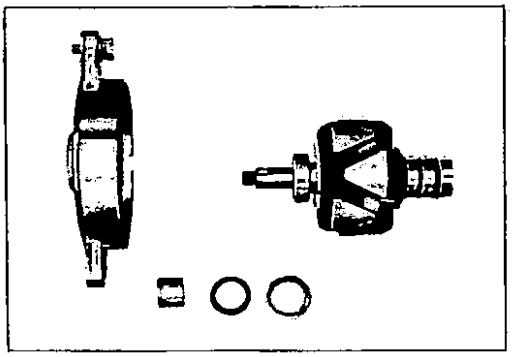


Fig. M.19 Removing the rotor from the front cover.

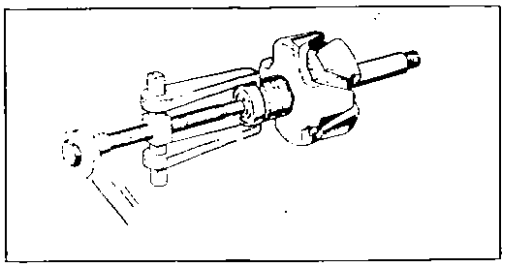


Fig. M.20 Pulling out the rear bearing.

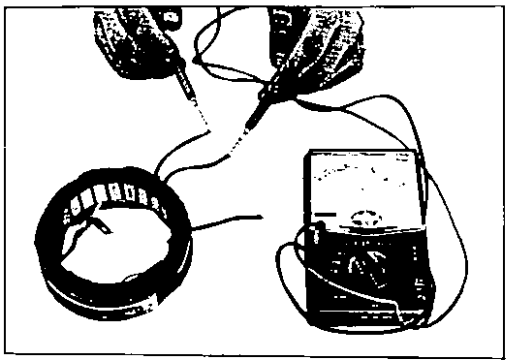


Fig. M.23 Testing the stator for conduction.

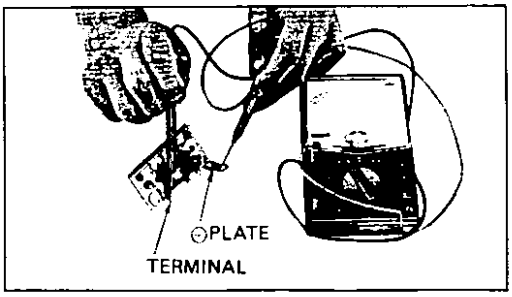


Fig. M.25 Inspecting the positive diodes.

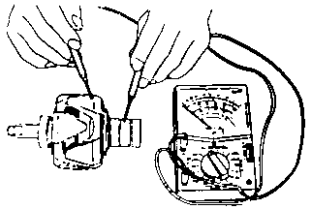


Fig. M.21 Testing the rotor coils for conduction.

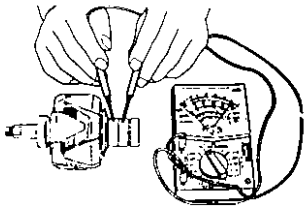


Fig. M.22 Testing the rotor coils for earthing.

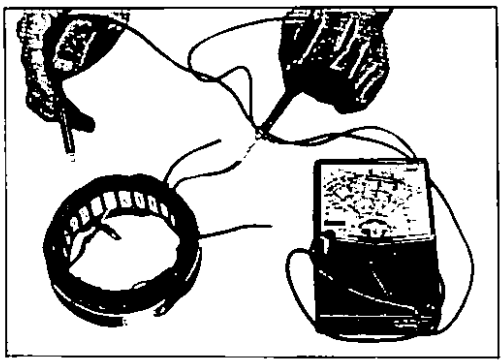


Fig. M.24 Testing the stator for earthing.

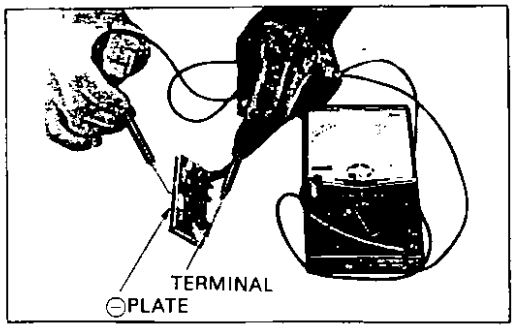


Fig. M.26 Inspecting the negative diodes.

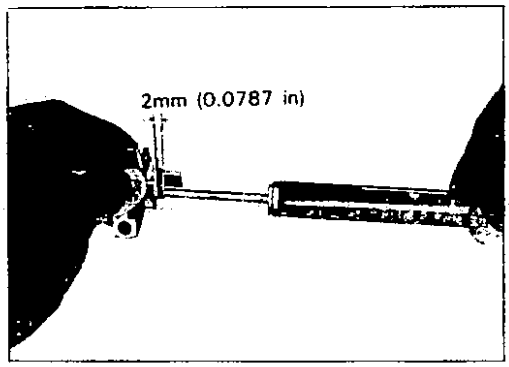


Fig. M.27 Measuring the brush spring pressure.

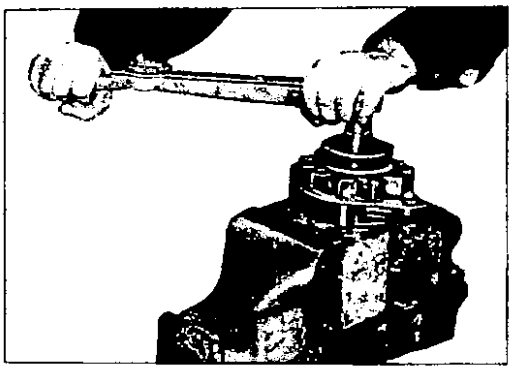


Fig. M.28 Tightening the pulley nut.

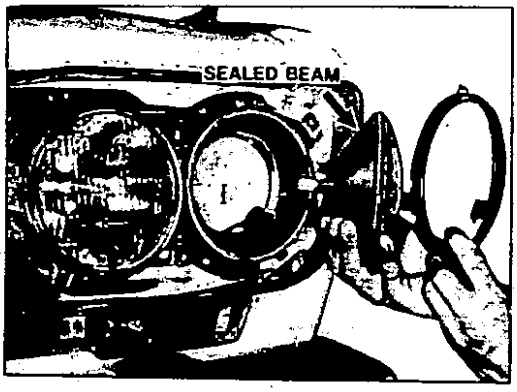


Fig. M.29 Removing the headlamp sealed beam.

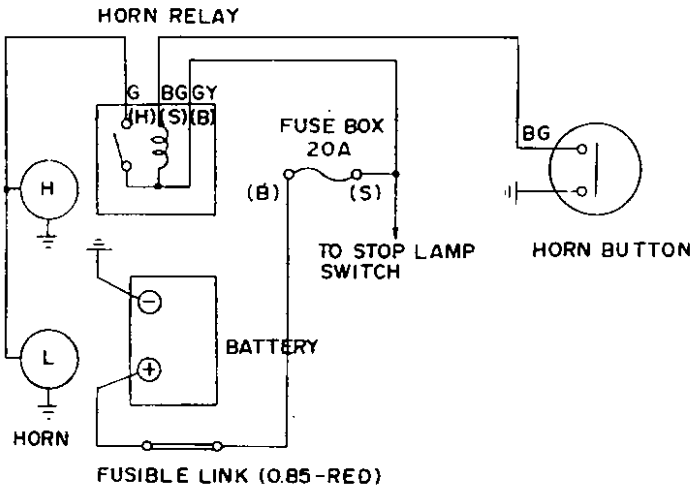


Fig. M.30 Circuit diagram for the horn system.

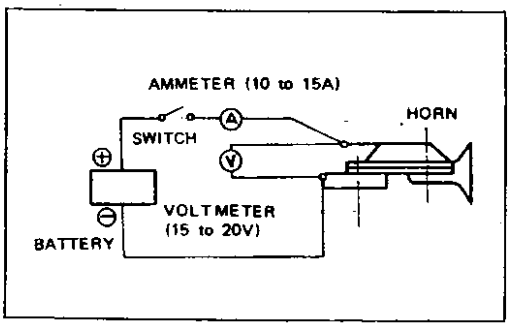


Fig. M.31 Testing and adjusting the horn.

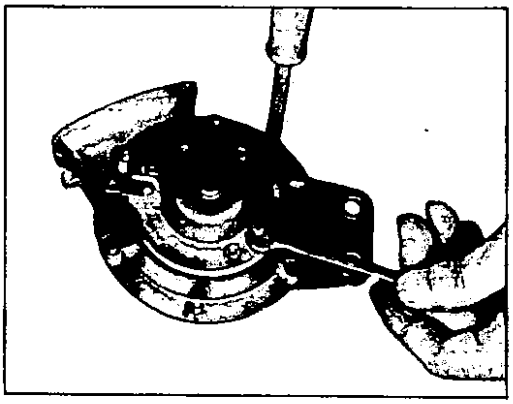


Fig. M.32 Adjusting the horn volume and tone.

ALTERNATOR - Dismantling

Referring to Fig.M.16, remove the pulley nut, and take off the pulley rim, fan and spacer. Withdraw the brush holder, retaining screws, and remove the brush holder cover. Withdraw the holder and brushes as shown in Fig.M.17.

Slacken and remove the three through bolts and separate the diode housing from the drive end housing by tapping the front bracket lightly with a wooden mallet. (Fig.M.18.). Remove the screws from the bearing retainer and separate the rotor from the front cover (Fig.M.19.).

Remove the rear bearing from the rotor assembly with the aid of a puller, as shown in Fig.M.20. Take off the diode cover, and unsolder the three stator coil lead wires from the diode terminal.

Remove the A terminal nut and diode installation nut, and remove the diode assembly. Do not force the diode assembly when removing or it may be damaged. Remove the stator from the rear cover.

ALTERNATOR - Inspection

Use an ohmmeter as shown in Fig.M.21 to test the rotor field coil. Apply the tester between the slip rings and check that the resistance is approximately 4.4 ohms. at normal ambient temperature. Check the conductivity between slip ring and rotor core as shown in Fig.M.22. if conductivity exists, the field coil or slip ring must be earthing and the rotor assembly should be renewed.

Check the stator to ensure that there is conductivity between the individual stator coil terminals as shown in Fig.M. 23. If there is no conductivity between the individual terminals the stator is defective.

Check each lead wire (including the neutral wire) as shown in Fig.M.24. If there is conductivity between any wire and the stator core the stator core is earthing and the stator must be replaced.

Diodes:

Three positive diodes are mounted on the positive plate, and three negative diodes are mounted on the negative plate. The diodes allow current to flow in one direction only. The diodes on the positive plate only allow current to flow from the terminal to the positive plate, whilst the diodes on the negative plate only allow current to flow from the negative plate to the terminal. A diode which allows current to flow in both directions, or does not allow current to flow in the correct direction is unserviceable, and all six diodes must be replaced. Use a tester as shown in Figs.M.25 and M26. to check each diode.

Brushes:

Check the movement of the brushes in their holders. The brushes should move freely and can be eased in necessary by carefully filing the sides. Clean the brush holders before replacing the brushes. Renew the brushes if they are worn below a length of 7mm. (0.275 in.). With the brush projecting approximately 2mm. (0.08 in.) from the holder it is possible to measure the brush spring pressure using a spring balance as shown in Fig.M.27

The pressure of a new brush should be 255 - 345 grammes (9.0 - 12.2 oz.) the pressure will however decrease by approximately 20 grammes per 1.0mm. (0.039 in.) of wear.

ALTERNATOR - Assembly and Installation

Asssembly is a reversal of the dismantling procedure, noting the following points:

The stator coil lead wires must be resoldered to the diode assembly terminal as quickly as possible, or the diodes may be damaged. When installing the diode A terminal, make sure that the insulating bushing and tube are correctly fitted.

The pulley nut should be tightened to a torque reading of 350 - 400 kg.cm. (301 - 344 lb.in.). Mount the assembly in a vice as shown in Fig.M.28, and when the pulley is tightened, make sure that the deflection of the pulley groove does not exceed 0.3mm. (0.0118 in.).

HEADLAMPS - Replacing

All weather type sealed beam headlamp units are fitted to the vehicle. Each lamp is of the double filament type, with a full beam filament of 50W. and a dipped beam filament of 40W.

The replacement of the sealed beam unit can be carried out as follows:

Remove the wiring socket from the back of the headlamp unit. On Coupe models withdraw the screws attaching the front grille to the radiator core support. On all other models, remove the three retaining screws, and remove the headlamp rim.

Withdraw the three retaining screws securing the retaining ring (3 in Fig.M.29.), and remove the sealed beam unit.

When installing a new sealed beam unit, make sure that the "Top" mark on the ring is uppermost when fitted.

HORNS

The circuit for the horns is shown in Fig.M.30. The horns can be adusted for volume and tone in the following manner:

Remove the connector and the retaining nut in the centre of the horn, withdraw the horn from the vehicle. Connect a voltmeter and ammeter into circuit as shown in Fig.M.31. Set the switch to ON, and check that the voltmeter shows a reading of 12 to 12.5 volts. The sound can be regulated by turning the adjusting screw (Fig.M.32.). A reading of 2.5 amps should be obtained for the flat type of horns, or 5.0 amps for the spiral type of horns.

Turning the adjusting screw clockwise will increase the current, turning anti-clockwise decreases the current.

Install the horns in the vehicle and check that the correct sound can still be obtained when the higher voltage of 14-15 volts is generated by the alternator. Turn the adjusting slightly, if necessary, then tighten the locknut.

INSTRUMENT PANEL - Removal

The instrument panel holds the various meters and indicators. A printed circuit board is located at the rear of the panel and the connections to it are multiple-connectors. When the panel is remove the instruments are easily withdrawn for inspection and servicing.

1. Disconnect the battery negative terminal.
2. Remove the windscreen wiper switch, lighting switch and choke control knobs, by pressing them in and turning anticlockwise. Remove the escutcheon.
3. Disconnect the cigarette lighter cable at the rear of the instrument panel, and turn the cigarette lighter outer case so that it can be removed.

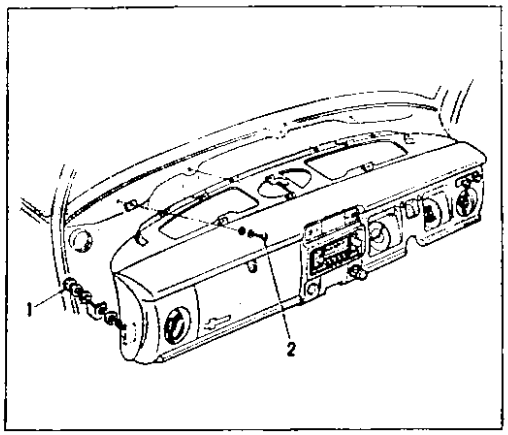


Fig. M.33 Removing the instrument panel.

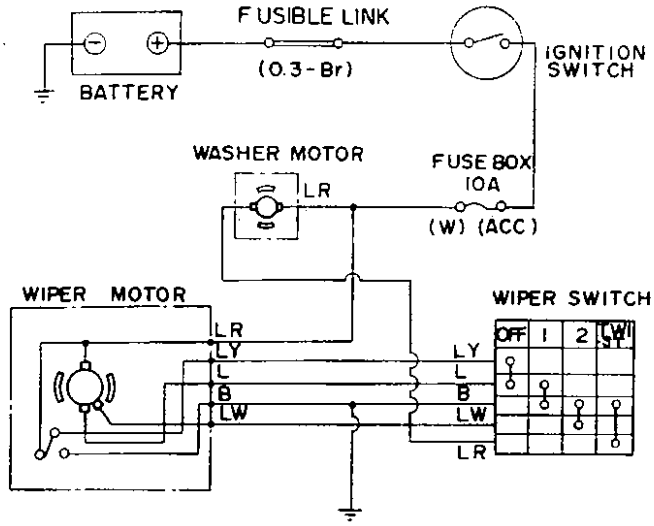


Fig. M.36 Circuit diagram for the windshield wipers and washer.

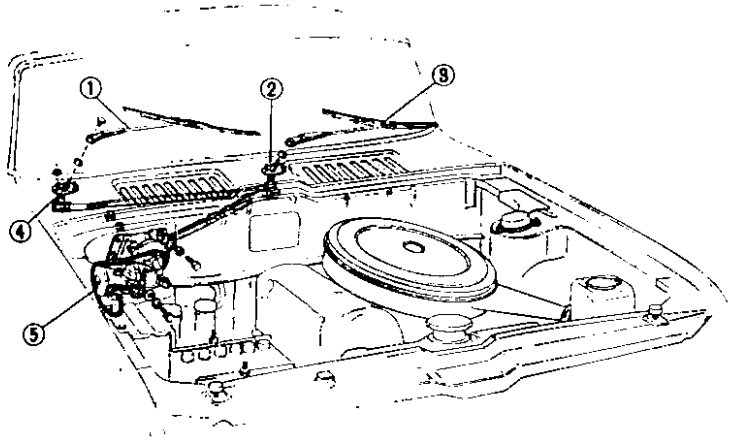


Fig. M.34 Wiper motor and linkage.

1. Wiper arm
2. Pivot
3. Wiper arm
4. Pivot
5. Wiper motor

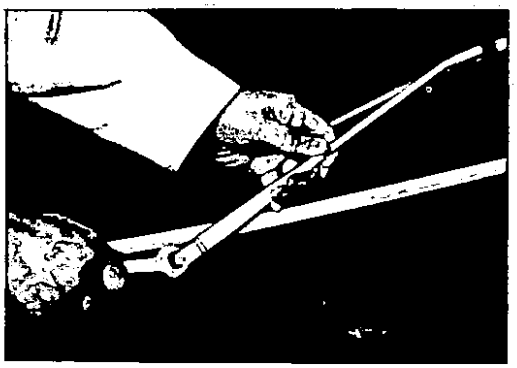


Fig. M.35 Removing the wiper arm.

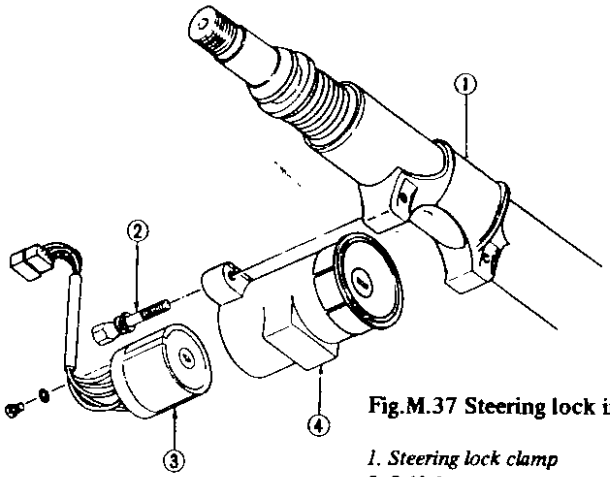


Fig.M.37 Steering lock installation.

1. Steering lock clamp
2. Self shear type screw
3. Ignition switch
4. Steering lock

4. Remove the shell covers from the steering column, slacken the screws securing the meter housing and withdraw the panel from the facia. (Fig.M.33.).

5. Pull out the 12 pole round shaped connector and remove the speedometer cable union nut. then remove the instrument panel completely.

WINDSCREEN WIPERS

A two-speed wiper motor is fitted. The motor has an auto-stop mechanism, and drives the wiper arms through a link mechanism located behind the instrument panel. If the wiper system does not operate check the fuses, connectors, control switch and motor. If the wiper speed does not change the switch must be repaired or replaced. If the wiper motor becomes unserviceable it can be removed from the vehicle in the following manner:

1. Remove the connector plug from the motor (See Fig.M. 34.).

2. Working from the passenger compartment side of the dash panel, remove the nut connecting the wiper motor worm wheel shaft to the connecting rod.

3. Remove the three bolts securing the wiper motor to the cowl, and lift out the motor.

The wiper arms can be removed quite easily by taking off the attachment bolt as shown in Fig.M.35, and then pulling the wiper arm from the pivot shaft. When installing the wiper arm, make sure that the blade is positioned approximately 27mm. (1.06 in.) away from the bottom of the windscreen and tighten the wiper arm attachment bolt.

WINDSCREEN WASHERS

The windscreen washer switch and wiper switch are combined in a single unit. (See Fig.M.36.).; the washers can be operated by turning the switch in the appropriate direction. It should be pointed out that it is inadvisable to operate the washers for more than 30 seconds at a time. If the washers are operated in short spells of approximately 10 seconds duration their working efficiency will remain unimpaired for a considerable length of time.

IGNITION SWITCH AND STEERING LOCK

The steering lock is built-in to the ignition switch. When the key is turned to the "LOCK" position and then removed, the steering system is automatically locked by the steering lock spindle which engages in a notch in the collar on the steering shaft. (See. Fig.M.37.). The heads of the screws are sheared off on installation so that the steering lock system cannot be tampered with. If the steering lock is to be replaced it will be necessary to remove the two securing screws (8), and then drill out the self shearing screws (7). When installing a new steering lock, tighten the new self shearing screws until the heads shear.

Technical Data

Battery	12 - volt
Starter motor:	
Type	HITACHI S114 - 87M.
Output	1.0 KW.
No load:	
Terminal voltage	12- volts
Current	Less than 60 amperes
Revolution	More than 7000 r.p.m.
Load:	
Terminal voltage	6.3 - volts
Current	Less than 420 amperes
Torque	More than 0.9 mkg. (6.5 lb. ft.).
Brushes:	
Brush length	16 mm. (0.630 in.)
Wear limit	6.5mm. (0.256 in.)
Spring tension	0.8 kg. (1.8 lb.).
Commutator:	
Standard outer diameter	33mm. (1.299 in.)
Wear limit	2mm. (0.078 in.)
Depth of mica:	
Repair limit	0.2mm. (0.008 in.)
Repair accuracy	0.5 - 0.8mm. (0.0197 - 0.0315 in.).
Clearance between armature shaft and bushing'	
Repair limit	0.2mm. (0.008 in.).
Repair accuracy	0.03 - 0.1mm. (0.0012 - 0.0039 in.).
Armature shaft outer diameter	
Pinion side	13mm. (0.512 in.)
Rear end	11.5 mm. (0.453 in.)
Wear limit	0.1mm. (0.0039 in.)
Bend limit	0.08 mm. (0.0031 in.)
Clearance between pinion and stopper.	0.3 -1.5mm. (0.0118 0.0591 in.)

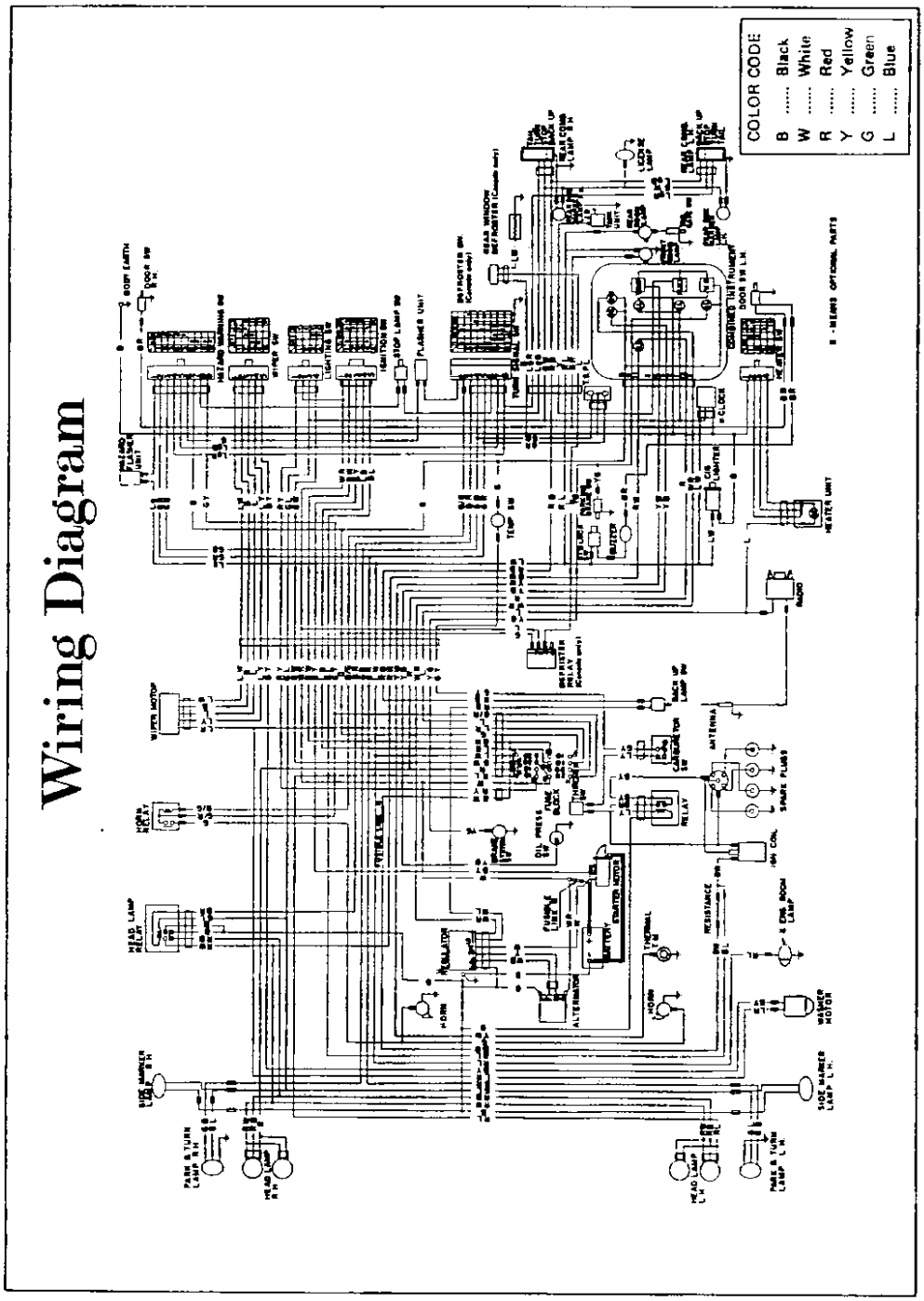
ALTERNATOR

Type	HITACHI LT125 - 06 HITACHI LT133-05 USA & Canada.
Output current LT125-06	More than 18 amps. at 14 volts, 2500 r.p.m. More than 25 amps. at 14 volts, 5000 r.p.m.
Output current LT 133-05	More than 24 amps. at 14 volts, 2500 r.p.m. More than 33 amps. at 14 volts, 5000 r.p.m.
Brushes:	
Length	14.5mm. (0.571 in.)
Wear limit	7mm. (0.2756 in.)
Spring pressure	0.25 - 0.35 kg. (0.55 - 0.77 lb.)
Slip ring:	
Outer diameter	31 mm. (1.220 in.)
Reduction limit	1 mm. (0.039 in.)
Repair limit	0.3mm. (0.0118 in.)
Repair accuracy	0.05 mm. (0.0197 in.)

VOLTAGE REGULATOR

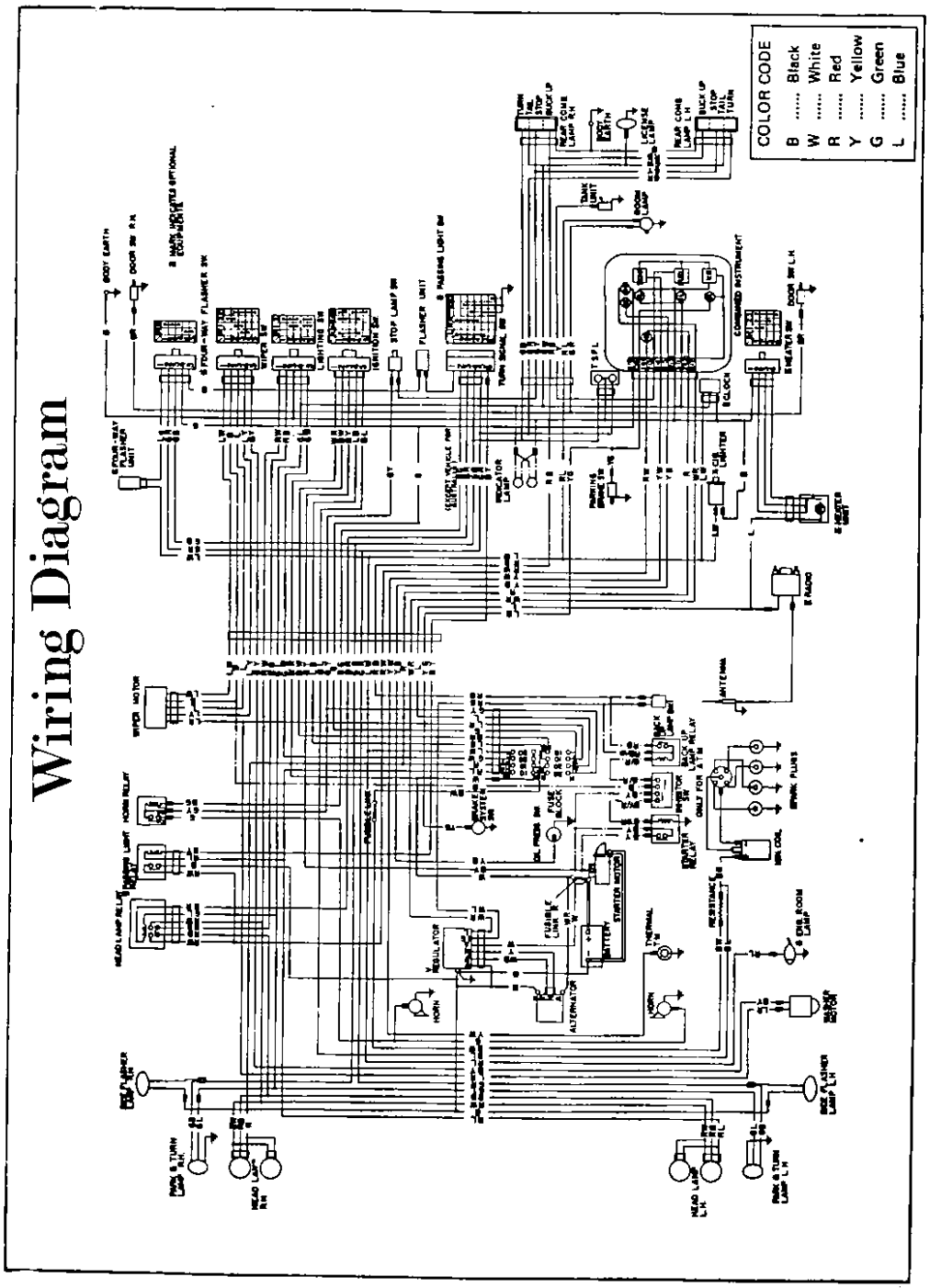
Type	HITACHI TL 1Z - 37
Regulating voltage	14.3 - 15.3 volts at 20°C (68°F).

Wiring Diagram

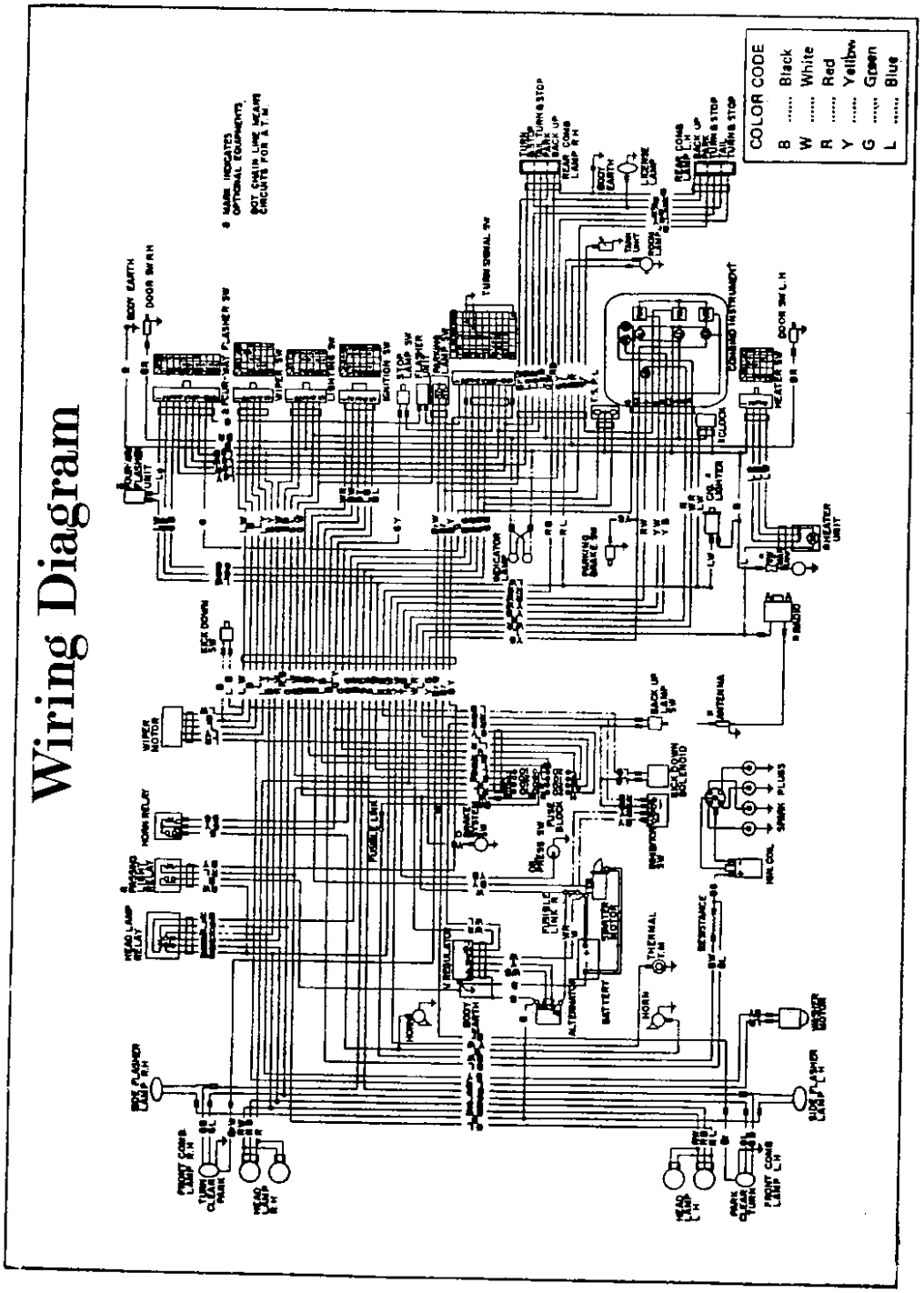


Wiring diagram (Wagon with manual transmission for U.S.A. and CANADA)

Wiring Diagram

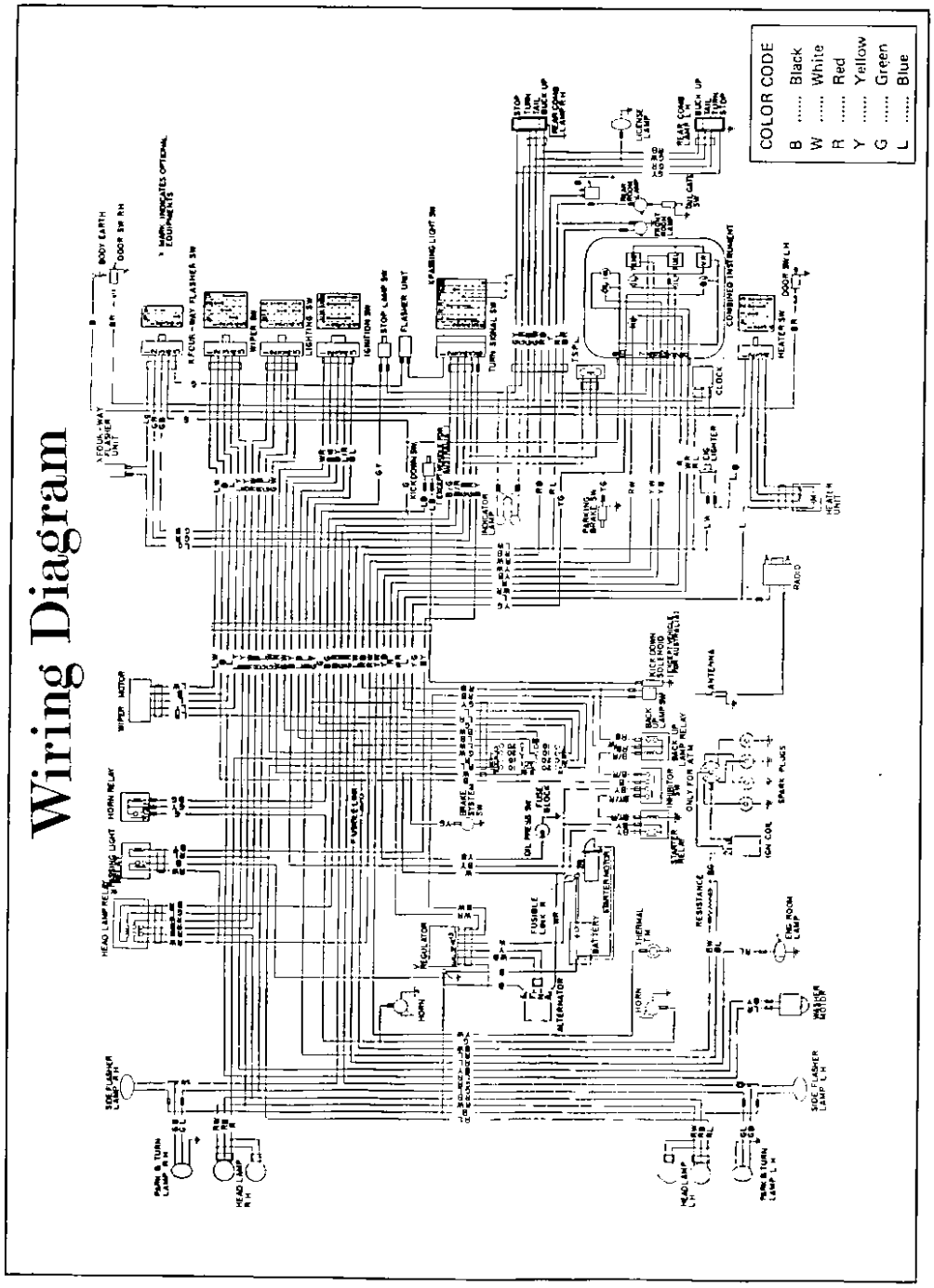


Wiring diagram (Sedan with BW1.35 type automatic transmission except for U.S.A. and CANADA)



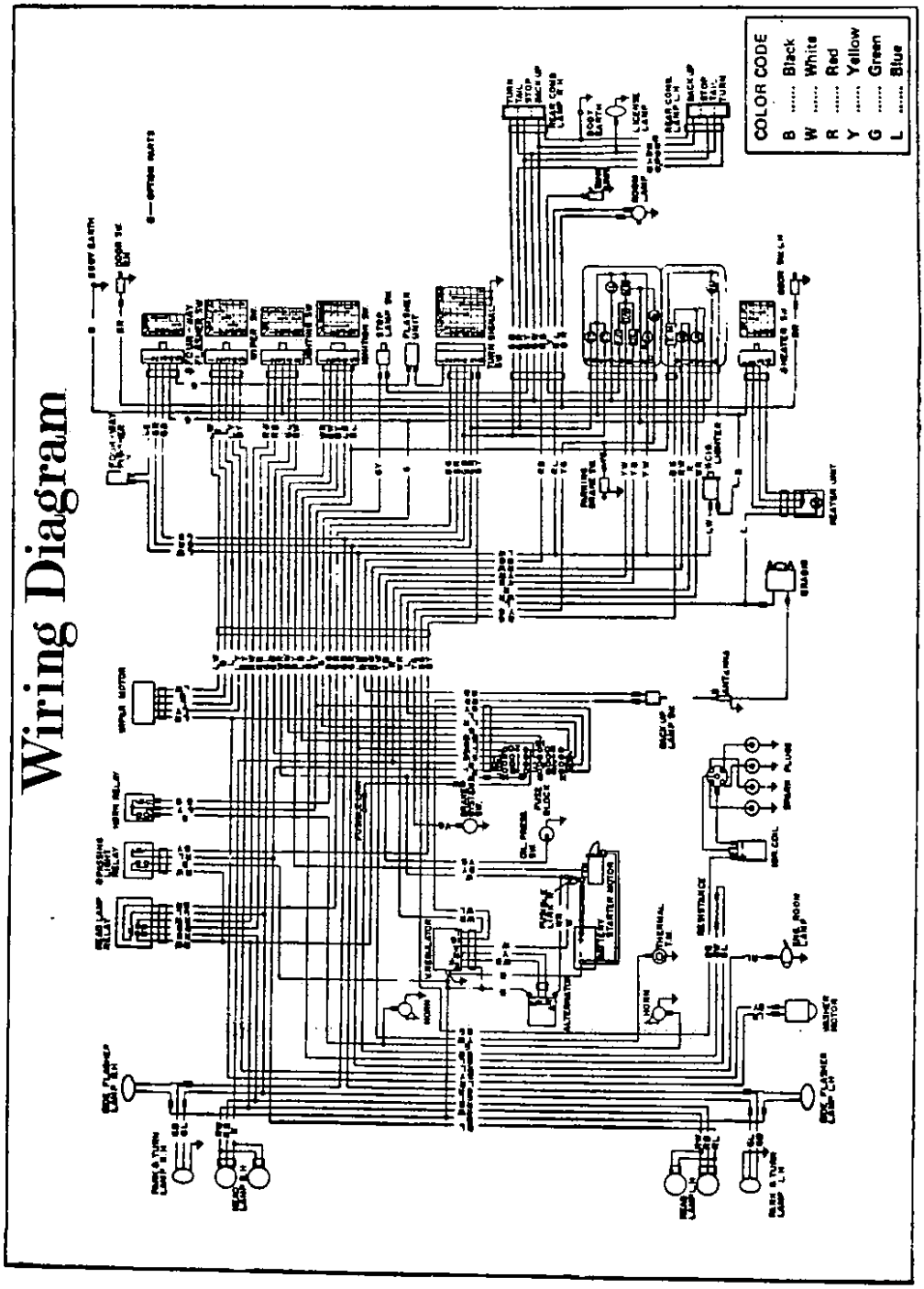
Wiring diagram (Sedan with 3N71B type automatic transmission except for U.S.A. and CANADA)

Wiring Diagram



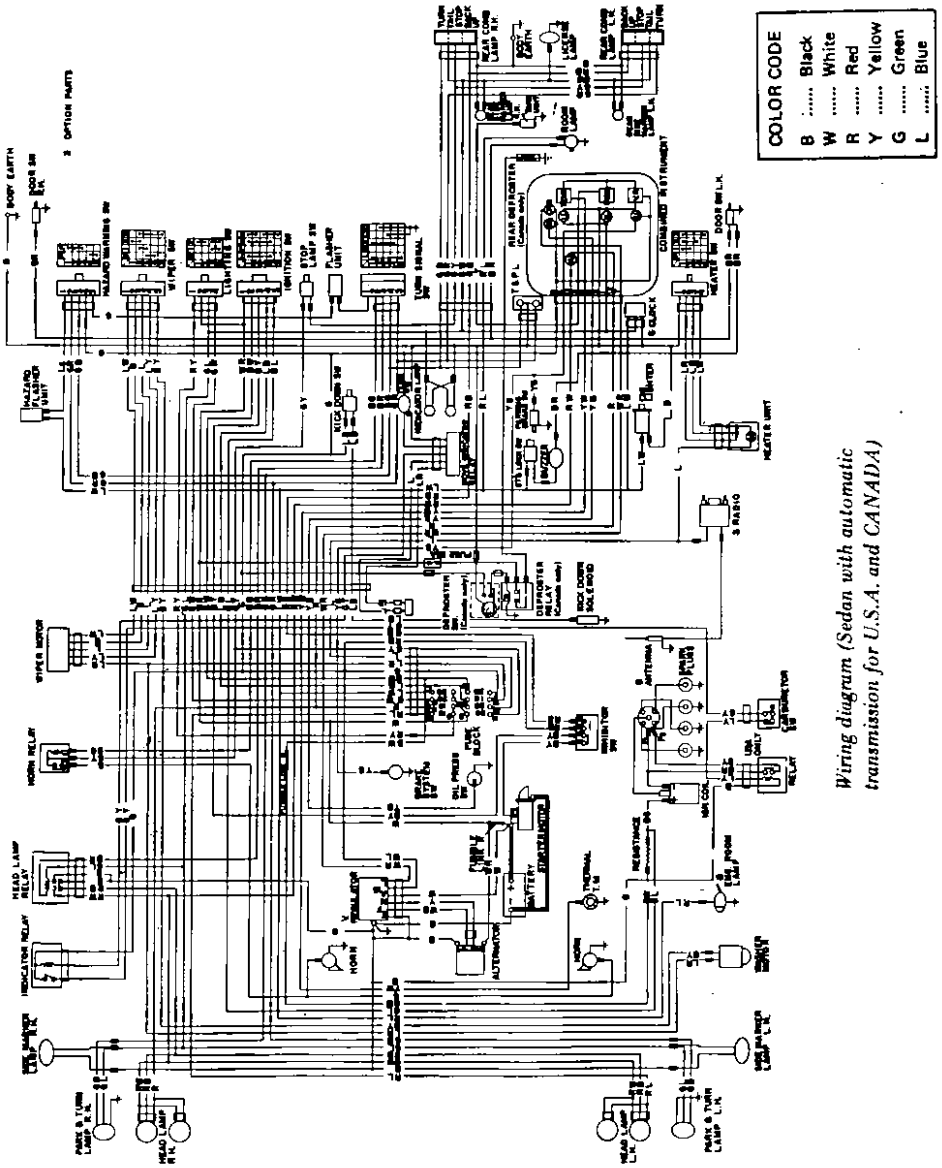
Wiring diagram (Wagon except for U.S.A. and CANADA)

Wiring Diagram



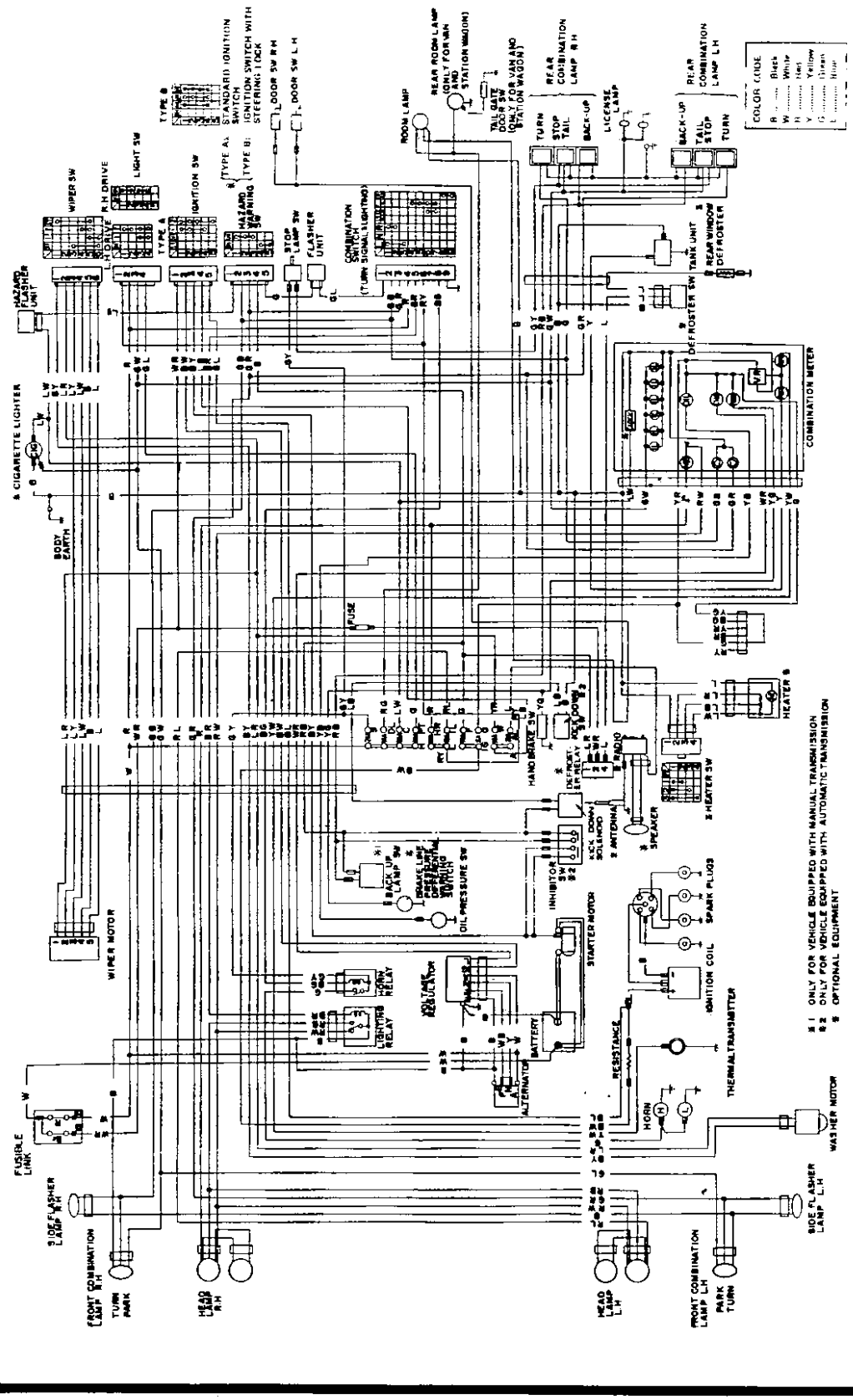
Wiring diagram (SSS Sedan)

Wiring Diagram



Wiring diagram (Sedan with automatic transmission for U.S.A. and CANADA)

Wiring Diagram



Trouble Shooting

Engine

SYMPTOMS

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v
ENGINE WILL NOT CRANK	*			*																		
ENGINE CRANKS SLOWLY	*			*																		
ENGINE CRANKS BUT DOES NOT START					*		*		*				*									
ENGINE STARTS BUT RUNS FOR SHORT PERIODS ONLY					*		*				*											
ENGINE MISFIRES AT LOW SPEED					*		*				*		*									
ENGINE MISFIRES AT HIGH SPEED					*		*					*										*
ENGINE MISFIRES AT ALL SPEEDS					*		*				*		*		*							*
ENGINE MISFIRES ON ACCELERATION AND FAILS TO REV.					*		*					*										*
ROUGH IDLE					*		*		*		*				*		*					*
RUNS ROUGH AT HIGH SPEED					*		*		*		*		*		*		*					*
LACK OF POWER		*			*		*		*		*				*		*					*
POOR ACCELERATION					*		*		*			*			*		*					*
LACK OF TOP SPEED					*		*		*		*		*		*		*					*
EXCESSIVE FUEL CONSUMPTION		*			*		*								*		*					
EXCESSIVE OIL CONSUMPTION																	*					
PINKING					*		*															
COMPRESSION LEAK								*			*		*				*					*

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v

PROBABLE CAUSE

a. Fault in the starting system – Refer to the ELECTRICAL EQUIPMENT section for diagnosis.
b. Engine oil too thick.
c. Stiff engine.
d. Mechanical seizure.
e. Fault in the ignition system – Refer to the IGNITION SYSTEM section for diagnosis.
f. Fault in the fuel system – Refer to the FUEL SYSTEM section for diagnosis.
g. Incorrect valve timing.
h. Compression leak.
i. Air leak at inlet manifold.
j. Restriction in exhaust system.
k. Poor valve seating.
l. Sticking valves.
m. Leaking cylinder head gasket.
n. Worn camshaft lobes.
o. Incorrect tappet clearance.
p. Worn or damaged cylinder bores, pistons and/or piston rings.
q. Worn valve guides.
r. Damaged valve stem seals.
s. Leaking oil seal or gasket.
t. Incorrectly installed spark plug.
u. Cracked cylinder.
v. Broken or weak valve springs.

REMEDIES

b. Drain oil and replace with correct oil.
c. Add small quantity of oil to the fuel and run engine gently.
d. Strip engine and renew parts as necessary.

g. Retime engine.
h. Trace and seal.
i. Trace and seal.
j. Remove restriction.
k. Regrind seats.
l. Free and trace cause.
m. Renew gasket.
n. Fit new camshaft.
o. Adjust tappets.
p. Exchange engine.
q. Replace valve guides.
r. Replace seals.
s. Replace gasket.
t. Replace plug with correct one.
u. Renew cylinder block.
v. Replace springs.

Lubrication System

SYMPTOMS

	a	b	c	d	e	f	g	h	i	j	k	l	m	n
EXCESSIVE OIL CONSUMPTION	*			*								*		*
LOW OIL PRESSURE						*	*	*	*	*	*	*		*

PROBABLE CAUSE

a. Worn or damaged cylinder bores, pistons and/or piston rings.
b. Worn valve guides.
c. Damaged valve stem seals.
d. Leaking oil seal or gasket.
e. Faulty oil pressure gauge, switch or wiring.
f. Relief valve defective.
g. Oil pick-up pipe strainer blocked.
h. Oil filter over-flow valve defective.
i. Worn oil pump.
j. Damaged or worn main and/or big-end bearings.
k. Incorrect grade of engine oil.
l. Oil level low.
m. Oil level too high.
n. Oil leak or the pressurised side of the lubrication system.

REMEDIES

a. Regrind cylinder bores and new oversize pistons and rings.
b. Replace valves and guides.
c. Replace seals.
d. Seal leak or replace gasket.
e. Trace and rectify.
f. Check and replace if necessary
g. Remove blockage.
h. Check and replace if necessary
i. Replace pump or parts.
j. Renew bearings.
k. Replace oil with correct grade.
l. Top up oil.
m. Drain off surplus oil.
n. Trace and remedy.

Cooling System

SYMPTOMS

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
OVERHEATING	*			*		*		*		*		*		*	
ENGINE FAILS TO REACH NORMAL OPERATING TEMPERATURE									*						*

PROBABLE CAUSE

a. Insufficient coolant.
b. Drive belt slipping or broken.
c. Radiator fins clogged.
d. Cooling fan defective.
e. Water pump defective.
f. Thermostat jammed shut.
g. Thermostat jammed open.
h. Ignition timing too far retarded.
i. Excessive vehicle load or dragging brakes.
j. Internal passage in the engine and/or radiator blocked.
k. Hoses blocked.
l. Carburetter mal-adjustment.
m. Excessive carbon deposit in the cylinders.
n. Insufficient engine oil or use of inferior grade of oil.
o. Excessive radiator area.

REMEDIES

a. Top up radiator.
b. Tighten belt or renew.
c. Unclog fins.
d. Trace fault, rectify or renew.
e. Replace water pump.
f. Replace thermostat.
g. Replace thermostat.
h. Retime ignition.
i. Unload car, check brakes.
j. Trace and clear.
k. Trace clear blockage.
l. Adjust correctly.
m. Decarbonise engine, top overhaul.
n. Top up with correct grade. Drain if necessary
o. Partially blank off in winter only.

Trouble Shooting

Ignition System

SYMPTOMS

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r
ENGINE CRANKS BUT DOES NOT START	*	*	*			*	*		*	*	*	*	*	*				
ENGINE STARTS BUT RUNS FOR SHORT PERIODS ONLY	*	*	*			*	*			*	*	*	*	*				
ENGINE MISFIRES AT LOW SPEED	*					*	*	*										
ENGINE MISFIRES AT HIGH SPEED		*	*	*	*	*	*		*	*	*	*		*				
ENGINE MISFIRES AT ALL SPEEDS		*	*	*	*	*	*		*	*	*	*	*	*				
ENGINE MISFIRES ON ACCELERATION AND FAILS TO REV.		*	*	*	*	*	*		*	*	*	*		*				
ROUGH IDLE	*	*	*			*	*	*	*	*	*	*	*	*	*		*	
ENGINE RUNS ROUGH AT HIGH SPEED		*	*	*	*	*	*		*	*	*	*		*	*		*	
LACK OF POWER		*	*	*	*	*	*	*	*	*	*	*		*	*		*	
POOR ACCELERATION		*	*	*	*	*	*	*	*	*	*	*		*	*		*	
LACK OF TOP SPEED		*	*	*	*	*	*	*	*	*	*	*		*	*		*	
EXCESSIVE FUEL CONSUMPTION		*	*	*	*	*	*	*	*	*	*	*			*	*	*	
PINKING		*	*		*	*		*			*	*			*	*		*
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	c	p	q	r

PROBABLE CAUSE

a. Battery discharged or defective.
b. Contact breaker points need cleaning or renewing.
c. Incorrect contact breaker points.
d. Contact breaker spring weak.
e. Spark plugs need cleaning or renewing.
f. Incorrect spark plug gaps.
g. Wrong type of spark plug fitted.
h. Static ignition timing incorrect.
i. Coil or capacitor defective.
j. Open circuit or loose connection in the L.T. circuit.
k. Open circuit, short to earth or loose connection on the coil H.T. lead.
l. Open circuit, short to earth or loose connection on the spark plug leads.
m. Plug leads incorrectly connected.
n. H.T. leak on coil, distributor cap or rotor, due to oil, dirt, moisture or damage.
o. Centrifugal advance not functioning correctly.
p. Vacuum advance not functioning correctly.
q. Worn distributor cam or distributor shaft bush.
r. Using wrong grade of fuel.

REMEDIES

a. Recharge or replace battery.
b. Clean or renew.
c. Fit correct points.
d. Renew contact breaker set.
e. Clean or renew plugs.
f. Adjust gaps.
g. Fit correct plugs.
h. Retime ignition.
i. Replace as necessary.
j. Trace and rectify.
k. Trace and rectify.
l. Trace and rectify.
m. Connect correctly.
n. Clean with dry lint free rag.
o. Examine and oil sparingly.
p. Check and rectify.
q. Replace defective parts.
r. Change to correct grade of fuel.

Fuel System

SYMPTOMS

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v
ENGINE CRANKS BUT DOES NOT START	*	*	*	*	*	*	*	*														
ENGINE STARTS BUT RUNS FOR SHORT PERIODS ONLY	*		*	*	*	*		*	*	*	*	*	*					*	*			
ENGINE MISFIRES AT LOW SPEED			*	*			*	*														
ENGINE MISFIRES AT HIGH SPEED	*		*	*			*	*					*									
ENGINE MISFIRES AT ALL SPEEDS	*	*	*	*	*	*		*	*			*	*	*								
ENGINE MISFIRES ON ACCELERATION AND FAILS TO REV.	*		*	*				*	*		*	*	*	*	*	*	*				*	
ROUGH IDLE				*				*	*	*	*	*	*	*					*	*		*	*
ENGINE RUNS ROUGH AT HIGH SPEED				*				*	*		*	*	*	*					*			*
LACK OF POWER				*				*			*	*	*	*					*		*	*
POOR ACCELERATION				*				*			*	*	*	*	*	*			*		*	*
LACK OF TOP SPEED				*				*			*	*	*	*	*		*		*		*	*
EXCESSIVE FUEL CONSUMPTION			*	*							*	*				*	*		*		*	*
PINKING															*					*		*
BACKFIRE				*				*		*			*	*								
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v

PROBABLE CAUSE

a. Fuel tank empty.
b. Fuel line blocked.
c. Fuel pump defective.
d. Blockage in carburetter.
e. Air lock in fuel line.
f. Fuel filter blocked.
g. Carburetter needle valve jammed.
h. Water in carburetter.
i. Erratic fuel flow due to blockage.
j. Idling speed too low.
k. Incorrect setting of choke control.
l. Incorrect carburetter fuel/float level.
m. Carburetter icing.
n. Air leak at inlet manifold.
o. Incorrect grade of fuel.
p. Carburetter accelerator pump defective.
q. Throttle linkage mal-adjusted.
r. Incorrect adjustment of idling mixture.
s. Air filter clogged.
t. Incorrect ignition timing.
u. Carburetter piston sticking.
v. Wrong carburetter jets fitted.

REMEDIES

a. Fill tank.
b. Blow out obstruction with compressed air
c. Replace pump.
d. Remove blockage.
e. Trace and bleed out.
f. Clean filter.
g. Free needle.
h. Drain out water, dry out
i. Remove blockage.
j. Adjust throttle stop screw.
k. Reset control.
l. Adjust level.
m. Wait for ice to melt. If persistent, trace cause.
n. Trace leak and seal.
o. Dilute fuel with highest octane rating obtainable.
p. Trace fault and rectify.
q. Adjust correctly.
r. Adjust mixture control.
s. Clean filter.
t. Retime ignition.
u. Oil carburetter.
v. Replace with correct jets.

Trouble Shooting

Clutch

SYMPTOMS

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r
CLUTCH SLIPPING (WILL NOT ENGAGE PROPERLY)	•			•	•	•												
CLUTCH DRAG (WILL NOT DISENGAGE PROPERLY)			•		•		•	•	•	•	•	•					•	•
CLUTCH JUDDER	•		•	•			•		•	•	•	•	•	•				
CLUTCH GRAB (ON ENGAGEMENT)	•		•	•	•		•	•		•	•		•	•				•
CLUTCH NOISE – SQUEAL WHEN DEPRESSING THE PEDAL																•		
CLUTCH NOISE – RATTLE WHEN IDLING			•						•						•			
CLUTCH NOISE – CHATTER ON ENGAGEMENT									•						•			
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r

PROBABLE CAUSE

a. Insufficient free-play in release linkage.
b. Clutch disc facing worn or hardened.
c. Grease or oil on clutch disc facing.
d. Weak or broken pressure plate coil springs or diaphragm spring.
e. Air in hydraulic system.
f. Insufficient free-travel at clutch pedal.
g. Excessive free-play in release linkage.
h. Misalignment of clutch housing.
i. Clutch disc hub binding on splines of gearbox input shaft.
j. Clutch disc facing loose or broken.
k. Pressure plate mating surface warped.
l. Clutch cover distorted.
m. Looseness in transmission or suspension.
n. Clutch disc distorted.
o. Loose drive plate hub.
p. Release bearing defective.
q. Release arm bent.
r. Low hydraulic fluid level.

REMEDIES

a. Adjust linkage.
b. Replace clutch disc.
c. Clean and remedy cause.
d. Renew springs.
e. Bleed system.
f. Adjust travel.
g. Adjust or renew worn parts.
h. Realign housing.
i. Remove cause of binding.
j. Replace clutch disc.
k. Fit new parts.
l. Replace cover.
m. Take up play.
n. Renew disc.
o. Replace hub.
p. Renew bearing.
q. Straighten or renew.
r. Top up hydraulic fluid.

Steering

SYMPTOMS

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s
STEERING STIFFNESS	•	•	•	•	•	•													
STEERING SLACK				•		•	•	•		•	•	•							
STEERING WANDER	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•			
WHEEL SHIMMY			•	•		•	•	•		•	•	•	•	•	•				
CAR PULLS TO ONE SIDE	•		•			•		•			•	•	•	•	•	•			
POOR RECOVERY OF STEERING WHEEL TO CENTRE	•	•	•	•	•	•												•	
EXCESSIVE OR ABNORMAL TYRE WEAR	•		•			•	•	•						•	•	•	•	•	•
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s

PROBABLE CAUSE

a. Tyre pressures incorrect or uneven.
b. Lack of lubricant in steering gear.
c. Lack of lubrication at steering linkage ball joints.
d. Incorrect wheel alignment.
e. Incorrectly adjusted steering gear.
f. Steering column bearings too tight or column bent or misaligned.
g. Steering linkage joints worn or loose.
h. Front wheel bearings worn or incorrectly adjusted.
i. Slackness in front suspension.
j. Road wheel nuts loose.
k. Steering wheel loose.
l. Steering gear mounting bolts loose.
m. Steering gear worn.
n. Shock absorbers defective or mountings loose.
o. Road wheels imbalanced or tyres unevenly worn.
p. Suspension springs weak or broken.
q. Brakes pulling on one side.
r. Chassis frame or suspension misaligned.
s. Improper driving.

REMEDIES

a. Inflate and balance tyres.
b. Inject lubricant.
c. Lubricate.
d. Check steering geometry.
e. Adjust correctly.
f. Adjust renew defective parts.
g. Tighten or replace joints.
h. Adjust or renew bearings.
i. Tighten to correct torque.
j. Tighten nuts to correct torque.
k. Tighten to correct torque.
l. Tighten to correct torque.
m. Replace worn parts.
n. Replace with new.
o. Balance wheels.
p. Renew springs.
q. Balance brakes.
r. Realign.
s. Arrange tuition on driving.

Trouble Shooting

Braking System

SYMPTOMS

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w
BRAKE FAILURE			*		*	*		*		*										*			*
BRAKES INEFFECTIVE	*	*	*	*	*	*	*	*	*	*							*			*			
BRAKES GRAB OR PULL TO ONE SIDE	*	*	*	*					*		*	*	*	*		*							*
BRAKES BIND					*										*		*	*	*		*		*
PEDAL SPONGY					*	*	*	*												*			*
PEDAL TRAVEL EXCESSIVE	*			*						*		*	*	*		*				*			*
EXCESSIVE PEDAL PRESSURE REQUIRED	*	*	*		*					*	*									*		*	*
HYDRAULIC SYSTEM WILL NOT MAINTAIN PRESSURE								*	*											*			*
BRAKE SQUEAL DEVELOPS	*	*	*	*	*											*		*					
BRAKE SHUDDER DEVELOPS	*	*	*	*								*	*	*		*		*					*
HANDBRAKE INEFFECTIVE OR REQUIRES EXCESSIVE MOVEMENT	*	*	*	*													*						
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w

PROBABLE CAUSE

a. Brake shoe linings or friction pads excessively worn.
b. Incorrect brake shoe linings or friction pads.
c. Brake shoe linings or friction pads contaminated.
d. Brake drums or discs scored.
e. Incorrect brake fluid.
f. Insufficient brake fluid.
g. Air in the hydraulic system.
h. Fluid leak in the hydraulic system.
i. Fluid line blocked.
j. Mal-function in the brake pedal linkage.
k. Unequal tyre pressures.
l. Brake disc or drum distorted or cracked.
m. Brake back plate or calliper mounting bolts loose or looseness in the suspension.
n. Wheel bearings incorrectly adjusted.
o. Weak, broken or improperly installed shoe return springs.
p. Uneven brake lining contact.
q. Incorrect brake lining adjustment.
r. Pistons in wheel cylinder or calliper seized.
s. Weak or broken brake pedal return spring.
t. Master cylinder defective.
u. Fluid reservoir overfilled or reservoir air vent restricted.
v. Servo vacuum hose disconnected or restricted, or servo unit defective.
w. Wheel cylinder or calliper defective.

REMEDIES

a. Replace linings or pads.
b. Replace with correct linings or pads.
c. Clean thoroughly.
d. Renew drums or discs.
e. Bleed out old fluid and replace with correct type.
f. Top up reservoir.
g. Bleed brake system.
h. Trace and seal.
i. Trace and clear blockage.
j. Correct as necessary.
k. Adjust and balance tyre pressures.
l. Renew disc or drum.
m. Tighten as necessary to correct torque.
n. Adjust wheel bearings.
o. Renew or install correctly.
p. Trace cause and remedy.
q. Adjust correctly.
r. Free and clean.
s. Renew spring.
t. Replace master cylinder and seals.
u. Lower fluid level. Clear air vent.
v. Check and replace hose. Renew servo unit if defective.
w. Replace as necessary.

Electrical Equipment

SYMPTOMS

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r
STARTER FAILS TO OPERATE	*	*	*	*			*	*										
STARTER OPERATES BUT DOES NOT CRANK ENGINE	*	*	*			*	*	*										
STARTER CRANKS ENGINE SLOWLY	*	*	*															
STARTER NOISY IN OPERATION					*			*	*									
IGNITION WARNING LIGHT REMAINS ILLUMINATED WITH ENGINE AT SPEED			*							*	*	*						
IGNITION WARNING LIGHT FAILS TO ILLUMINATE WHEN IGN. IS SWITCHED ON		*	*						*		*		*					
IGNITION WARNING LIGHT STAYS ON WHEN IGN. IS SWITCHED									*		*	*						
LIGHTS DIM OR WILL NOT ILLUMINATE		*	*								*		*	*		*	*	*
BULBS BLOW FREQUENTLY AND BATTERY REQUIRES FREQUENT TOPPING-UP											*							
DIRECTION INDICATORS NOT FUNCTIONING PROPERLY		*	*						*				*		*	*		*
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r

PROBABLE CAUSE

a. Stiff engine.
b. Battery discharged or defective.
c. Broken or loose connection in circuit.
d. Starter pinion jammed in mesh with flywheel ring gear.
e. Starter motor defective.
f. Starter pinion does not engage with flywheel ring gear due to dirt on screwed pinion barrel.
g. Starter drive pinion defective or flywheel ring gear worn.
h. Starter solenoid switch defective.
i. Ignition/starter switch defective.
j. Broken or loose drive belt.
k. Regulator defective.
l. Generator/alternator defective.
m. Bulb burned out.
n. Mounting bolts loose.
o. Fuse blown.
p. Light switch defective.
q. Short circuit.
r. Flasher unit defective.

REMEDIES

a. Add a small quantity of oil to the fuel and run the engine carefully.
b. Recharge or replace battery
c. Trace and rectify.
d. Release pinion.
e. Rectify fault or replace starter motor.
f. Clean and spray with penetrating oil.
g. Replace defective parts
h. Trace fault, renew if necessary.
i. Renew switch.
j. Replace belt.
k. Adjust or replace.
l. Adjust or replace.
m. Renew bulb.
n. Tighten bolts to correct torque.
o. Replace fuse after ascertining cause of blowing
p. Renew switch.
q. Trace and rectify.
r. Replace unit.

Tightening Torques

ENGINE

Cylinder head bolts:	
1st stage	4.0 kgm. (28.9 lb.ft.).
2nd stage	6.0 kgm. (43.4 lb.ft.).
3rd stage	6.5 - 8.5 kgm. (47.0 -61.5 lb.ft.)
Connecting rod big end nuts:	
L14, L18 engines	4.5 - 5.5 kgm. (33-40 lb.ft.)
L16 engine	3.2 - 3.8 kgm. (23-27 lb.ft.)
Flywheel bolts	14-16 kgm. (101-106 lb.ft.)
Main bearing cap bolts	4.5-5.5 kgm. (33-40 lb.ft.)
Camshaft sprocket bolt	12-16 kgm. (86.8-116 lb.ft.)
Oil sump bolts	0.6 - 0.9 kgm. (4.3 - 6.5 lb.ft.)
Oil pump bolts	1.1 - 1.5 kgm. (8.0 - 10.8 lb.ft.).
Oil drain plug	2-3 kgm. (14.5 - 21.7 lb.ft.)
Rocker pivot locknuts	5-6 kgm. (36 - 43 lb.ft.)
Camshaft locating plate bolts	0.6 - 0.9 kgm. (4.3 - 6.5 lb. ft.).
Crankshaft pulley nut	12 - 16 kgm. (86.8 - 115.7 lb.ft.).
Clutch mounting bolts:	
L14, L16	2.4 - 2.6 kgm. (17.4 - 18.8 lb.ft.).
L18	1.6 - 2.2 kgm. (12 - 16 lb.ft.)

GEARBOX

L14 and L16 engines - Three speed Gearbox.

Rear extension to case bolts	2.8 - 4.4 kgm. (20 - 32 lb.ft.)
Gearbox to engine	2.5 - 4.0 kgm. (18 - 29 lb.ft.)
Bottom cover	1.1 - 1.7 kgm. (8.0 - 12.3 lb. ft.).
Front cover	1.1 - 1.7 kgm. (8.0 - 12.3 lb. ft.).
Drain plug	3.5 - 5.0 kgm. (25.3 - 36.2 lb.ft.).
Selector lever bolts	1.8 - 2.1 kgm. (13.0 - 15.2 lb.ft.).
Reverse lamp switch	2-4 kgm. (14.5 - 29 lb.ft.).
Idler shaft screw	0.7 - 1.1 kgm. (5.1 - 8.0 lb. ft.)
Cross shaft lock pin	0.7 - 1.1 kgm. (5.1 - 8.0 lb. ft.).
Mainshaft locknut	9-11 kgm. (65.1 - 79.5 lb.ft.)

L14 and L16 engines – Four speed gearbox.

Rear extension to case bolts	1.6 - 2.5 kgm. (12 - 18 lb.ft.)
Gearbox to engine	2.5 - 4.0 kgm. (18 - 29 lb.ft.)
Bottom cover	1.1 - 1.8 kgm. (8 - 13 lb.ft.)
Front cover	1.1 - 1.8 kgm. (8 - 13 lb.ft.).
Drain plug	3.5 - 5.0 kgm. (25.3 - 36.2 lb.ft.).
Reverse lamp switch	2-4 kgm. (14.5 - 28.9 lb.ft.).
Mainshaft nut	9-11 kgm. (65.1 - 79.5 lb.ft.).

L18 engines - Three speed geabox.

Gearbox to engine	2.5 - 4.0 kgm. (18-29 lb.ft.)
Dust cover	0.3 - 0.4 kgm. (8-13 lb.ft.)
Front cover	1.1-1.8 kgm. (8.0-12.1 lb.ft.)
Rear extension	1.6-2.5 kgm. (12 - 18 lb.ft.)
Bottom cover	1.1 - 1.8 kgm. (8.0 -12.1 lb.ft.)
Reverse idler shaft	0.7 - 1.1 kgm. (5.1 -8.0 lb.ft.)
Detent ball plug	1.7 - 2.1 kgm. (12 - 15 lb.ft.)
Mainshaft nut	7.0 - 12.0 kgm. (51 - 87 lb.ft.)
Mainshaft bearing retainer	0.8 - 1.0 kgm. (5.8 - 7.2 lb.ft.)
Speedometer pinion sleeve lock plate	0.3 - 0.4 kgm. (2.2 - 2.9 lb.ft.)
Reverse lamp switch	2-3 kgm. (14 - 22 lb.ft.)
Control lever nut	1.9 - 2.2 kgm. (14 - 16 lb.ft.)

L18 engines - Four speed gearbox.

Gearbox to engine	2.5 - 4.0 kgm. (18 - 29 lb.ft.)
Dust cover	0.8 - 1.0 kgm. (5.8 - 7.2 lb.ft.)
Front cover	1.1 - 1.7 kgm. (8 - 12 lb.ft.)
Bottom cover	1.1 - 1.7 kgm. (8 - 12 lb.ft.)
Rear extension	3.3 - 4.4 kgm. (24 - 32 lb.ft.)
Detent ball plug	1.7 - 2.1 kgm. (12 - 15 lb.ft.)
Reverse lamp switch	2 - 3 kgm. (14 - 22 lb.ft.)
Lower bracket bolt	0.5 - 0.7 kgm. (3.6 - 5.1 lb.ft.)
Shift rod nut	0.8 - 1.1 kgm. (5.8 - 8.0 lb.ft.)
Cross shaft bracket bolt	0.8 - 1.1 kgm. (5.8 - 8.0 lb.ft.)
Gear change lever mounting bolt	0.8 - 1.0 kgm. (5.8 - 7.2 lb.ft.)

PROPELLER SHAFT AND DIFFERENTIAL

Drive pinion nuts (Saloon)	17-20 kgm. (122-145 lb.ft.)
Drive pinion nuts (Estate car)	14-17 kgm. (101-123 lb.ft.)
Drive pinion nuts (Van)	13-20 kgm. (94-145 lb.ft.)
Crownwheel bolts:	
1400 and 1600 cc. Saloon	7-8 kgm. (51 - 58 lb.ft.)
1400 and 1600 cc. Estate	4.8 - 5.5 kgm. (35-40 lb.ft.)
1800cc Saloon	7-8 kgm. (51 - 58 lb.ft.)
1800cc. Estate	7-8 kgm. (51 - 58 lb.ft.)
1800cc. Van	4.8 - 5.5 kgm. (35 -40 lb.ft.)
Side retainer bolts (Saloon)	0.9 - 1.2 kgm. (6.5-8.7 lb.ft.)
Drive flange bolts (Saloon)	1.9 - 2.6 kgm. (13.7 - 18.8 lb.ft.)
Rear cover bolts	1.9 - 2.6 kgm. (13.7 - 18.8 lb.ft.)
Final drive to mounting member	
1400 and 1600cc. models	6- 8 kgm. (43.4 - 57.8 lb.ft.)
1800cc. models	5-7 kgm. (36.2 - 50.6 lb.ft.)
Final drive to suspension member	6-7 kgm. (43.4 - 51.0 lb.ft.)
Final drive to drive shafts	5-6 kgm. (36 - 43 lb.ft.)
Final drive flange to propeller shaft	1.6 - 2.4 kgm. (12-17 lb.ft.)
Final drive flange to propeller shaft (Estate)	1.6-2.4 kgm. (12-17 lb.ft.)
Final drive flange to propeller shaft (1800cc. 610 only)	2.0 -2.7 kgm. (14.5 - 19.5 lb. ft.)
Oil drain and filler plug (Saloon)	4-6 kgm. (29 - 43 lb.ft.)

REAR AXLE AND REAR SUSPENSION

Rear wheel bearing nut	25 -33 kgm. (181 - 239 lb.ft.)
Brake backplate	2.7 - 3.7 kgm. (19.5 -26.8 lb. ft.)
1400, 1600 Shock absorber upper mounting.	2.3 kgm. (16.6 lb.ft.)
Shock absorber lower mounting	2.3 kgm. (16.6 lb.ft.)
1800cc. Shock absorber mountings	1.6 - 2.2 kgm. (12 - 16 lb.ft.)
Drive shaft to differential nuts	5-6 kgm. (36.2 - 43.4 lb.ft.)
Drive shaft to rear axle flange	5-6 kgm. (36.2 - 43.4 lb.ft.)
Bump rubber nuts	2.8-4.0 kgm. (20-29 lb.ft.)
Bump rubber nuts (1800cc.)	1.6 - 2.2 kgm. (12-16 lb.ft.)
Wheel nuts	8-9 kgm. (58 - 65 lb.ft.)
Rear suspension member mounting nuts	10 kgm. (72 lb.ft.)
Differential member mounting nuts	8.5 kgm. (61.5 lb.ft.)
Suspension arm to suspension member nuts	8-10 kgm. (58 - 72 lb.ft.)
Differential to differential member.	6-8 kgm. (43 - 58 lb.ft.)
Propeller shaft flange nuts	4.0-8.5 kgm. (29-62 lb.ft.)
Propeller shaft flange nuts (1800cc)	2.0 - 2.7 kgm. (14 - 20 lb.ft.)
Differential to suspension member	6-8 kgm. (43 - 58 lb.ft.).

1800cc. Estate car and Van (610 Body)

Shock absorber upper mounting	0.9 - 1.2 kgm. (6.5 - 8.7 lb.ft.)
Shock absorber lower mounting	3.5 - 4.5 kgm. (25 -33 lb.ft.)
Rear spring U bolt (clip)	6.0 - 6.5 kgm (43-47 lb.ft.)
Shackle spring	6.0 - 6.5 kgm. (43 - 47 lb.ft.)
Spring front pin	6.0 - 6.5 kgm. (43 - 47 lb.ft.)
Brake back plate:	
Estate car	2.2 - 2.7 kgm. (16 - 20 lb.ft.)
Van	1.5 - 2.0 kgm. (11 - 14 lb.ft.)
Differential gear carrier to axle case	2.0 - 2.5 kgm. (14 - 18 lb.ft.)
Propeller shaft flange	2.0 - 2.7 kgm. (14 - 20 lb.ft.)
Bump rubber	0.9 - 1.2 kgm. (6.5 - 8.7 lb.ft.)
Wheel nut	8-9 kgm. (58 - 65 lb.ft.)
Drain and filler plug	4.2 - 6.9 kgm. (30.4 - 49.9 lb. ft.)

FRONT SUSPENSION

Front hub nut	3.0 - 3.5 kgm. (21.7 - 25.3 lb.ft.)
Disc brake backplate to strut	2.7 - 3.7 kgm. (19.5 - 26.7 lb.ft.)
Brake calliper bolts	7.3 - 9.9 kgm. (52.8 - 71.6 lb.ft.)
Brake disc bolts	3.9 - 5.3 kgm. (28 - 38 lb.ft.)
Stabilizer bolts (suspension arm side)	1.2 - 1.7 kgm. (8.7 - 12.3 lb.ft.)
Tension rod to frame	4.5 - 5.5 kgm. (33 - 40 lb.ft.)
Tension rod to transverse link	4.9 - 6.3 kgm. (35.4 -45.6 lb.ft.)
Strut assembly upper nuts	3.9 - 5.2 kgm. (28.2 - 37.6 lb.ft.).
Steering lever to strut	6-8 kgm. (43 - 58 lb.ft.)
Ball joint to transverse link	1.9 - 2.5 kgm. (14 - 18 lb.ft.)
Ball joint to knuckle arm	5.5 - 7.6 kgm. (40 - 55 lb.ft.)
Piston rod nut	6-7.5 kgm. (43 - 54 lb.ft.)
Gland packing	7-13 kgm. (51 - 94 lb.ft.)

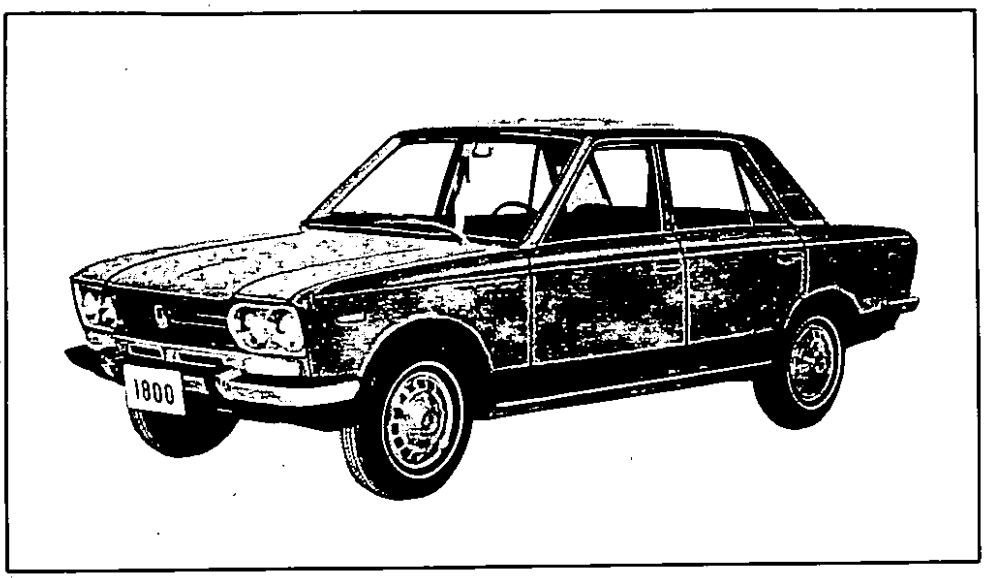
STEERING

1400 and 1600 cc. models:	
Flange mounting bolts	1.8 - 2.5 kgm. (13 - 18 lb.ft.)
Ball stud nut	5.5 - 7.6 kgm. (40 - 55 lb.ft.)
Gear arm nut	12.5 - 14.0 kgm. (90 - 101 lb. ft.)
Idler arm nut	5.5 - 7.6 kgm. (40 - 55 lb.ft.)
Adjusting screw nut	1.8 - 2.5 kgm. (13 - 18 lb.ft.)
Steering gear mounting bolts	10 kgm. (72 lb.ft.)
Idler arm bolts	4.4 - 6.1 kgm. (32 - 44 lb.ft.)
1800cc. models (610 Body)	
Gear arm nut	14 kgm. (101 lb.ft.)
Rear cover bolts	1.5 - 2.5 kgm. (11 - 18 lb.ft.)
Sector shaft cover	1.5 - 2.5 kgm. (11 - 18 lb.ft.)
Sector shaft adjusting screw locknut	2.0 - 2.5 kgm. (14.5 - 18 lb.ft.)
Steering gear mounting bolts	6 -8 kgm. (43.4 - 57.8 lb.ft.)
Steering linkage:	
Idler arm to frame	4.4 - 6.1 kgm. (32 - 44 lb.ft.)
Ball stud nuts	5.5 - 7.6 kgm. (40 - 55 lb.ft.)
Side rod locknuts	4.4 - 6.1 kgm. (32 - 44 lb.ft.)
Column shaft	
Steering wheel nut	4 - 5 kgm. (29 - 36 lb.ft.)
Column clamp	1.3 - 1.8 kgm. (9.4 - 13.0 lb. ft.)
Coupling worm shaft	4 - 5 kgm. (29 - 36 lb.ft.)
Coupling mounting bolts	1.5 - 2.2 kgm. (11 - 16 lb.ft.)

BRAKES

Brake pedal pivot	3.5 - 4.0 kgm. (25.3 - 28.9 lb.ft.)
Brake pipe connection	1.5 - 1.8 kgm. (10.8 - 13.0 lb. ft.)
Brake disc bolts	3.9 - 5.3 kgm. (28.2 - 38.3 lb.ft.)
Bridge pipe	1.7 - 2.0 kgm. (12.3 - 14.5 lb, ft.)
Brake hose to cylinder	1.7 - 2.0 kgm. (12.3 - 14.5 lb ft.)
Brake calliper bolts	7.3 - 9.0 kgm. (52.8 - 65.1 lb.ft.)
Wheel cylinder bolts	
Stud side	0.5 - 0.7 kgm. (3.6 - 5.1 lb.ft.)
Hexagon side	1.4 - 1.8 kgm. (10 - 13 lb.ft.)

SUPPLEMENT for the DATSUN 1800 SERIES C.30 MODEL WITH G.18 ENGINE

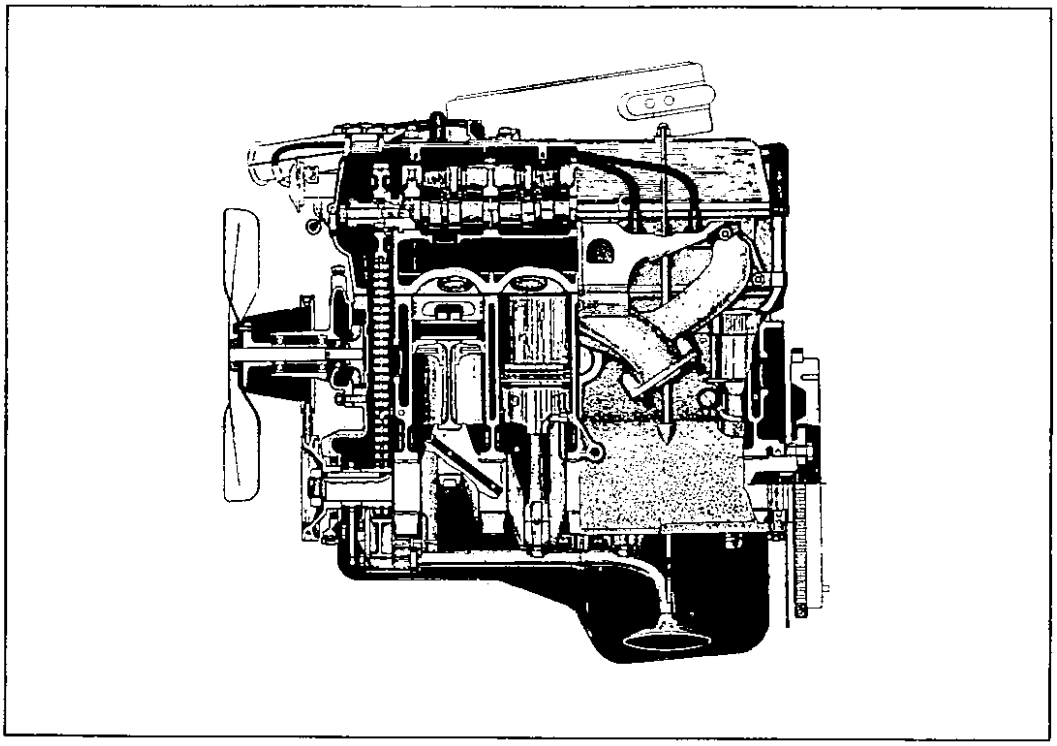


Contents

Introduction

This supplement has been added to include Series C.30 model with the G.18 engine.

Main changes only are detailed in the following pages and for all other information please cross-refer to the Manual's parent sections.



General view of G18 engine

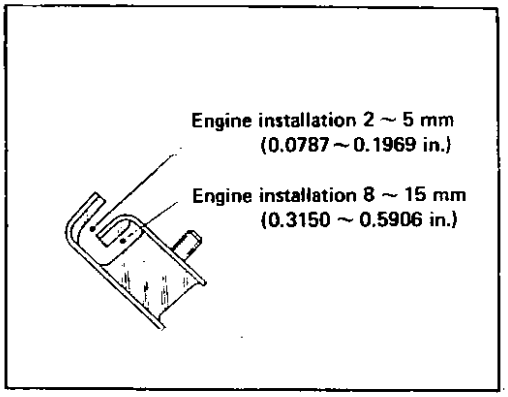


Fig.A.1 Front mounting insulator

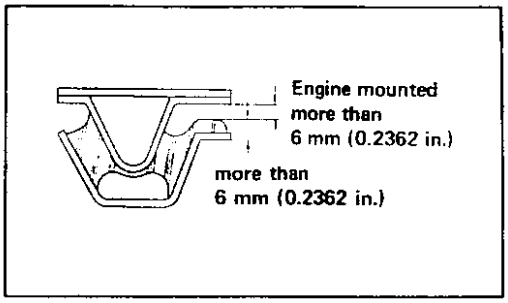


Fig.A.2 Rear mounting insulator

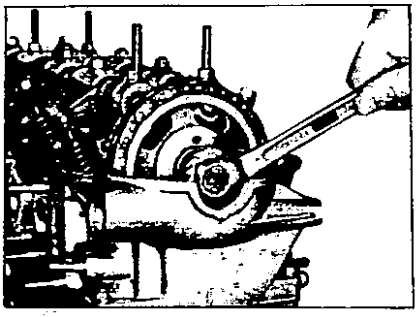


Fig.A.3 Removing the camshaft sprocket

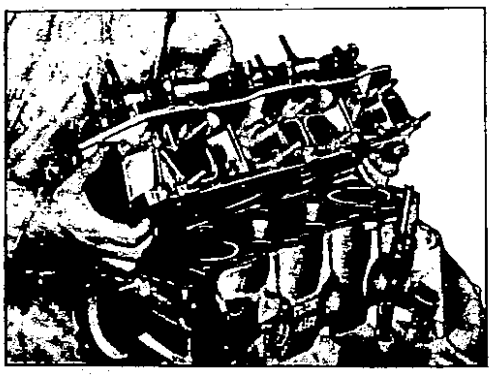


Fig.A.4 Removing the cylinder head

G18 Engine

DESCRIPTION

The G18 engine is a short stroke unit with a displacement of 1,815 cc. The aluminium alloy cylinder head has cross flow ports and a V-shaped valve layout. The single overhead camshaft is driven from the crankshaft by a double-row roller chain at a reduction ratio of 2:1.

The crankshaft is a carbon steel forging, and is provided with five main bearings and four balancing weights. Aluminium thrust bearings are located at the No. 2 journal.

The cast aluminium alloy pistons have two compression rings and one oil ring. Gudgeon pins are fully floating in the piston bores, and are equipped with circlips at each end to limit the amount of their travel. The forged steel connecting rods have weight adjusting bosses at both large and small ends to insure that the rods are correctly balanced during operation.

The lubricating system is of the pressure feed type, with the oil pump driven by a gear on the crankshaft. Oil is delivered to the main gallery via a full flow filter.

ENGINE - Removal and Installation

Although the engine can be removed as a single unit, it will prove an easier operation to remove the engine with the transmission. Proceed as follows:-

1. Fit the engine slingers ST49760000 to the engine. Disconnect the battery cables, and lift out the battery. Drain the coolant and engine oil.
2. Place alignment marks on the bonnet and hinges, remove the bonnet from the vehicle.
3. Remove the blow-by hose from the rocker cover, and take off the air cleaner.
4. Disconnect the accelerator linkage and choke cable from the carburettor.
5. Detach the upper and lower radiator hoses; remove the two brackets from the core support, and lift the radiator away from the vehicle. The torque convertor oil pipes must be disconnected from the oil cooler if the vehicle is equipped with automatic transmission. Detach the fuel pipe (if fitted), from the engine and heater hose.
6. Disconnect the electrical wires from the alternator, thermal transmitter, the primary side of the distributor, oil pressure switch, starter motor, and reverse light switch.
7. Remove the clutch slave cylinder and its return spring from the transmission, as described in the section CLUTCH.
8. Disconnect the shift rods and selector rods, then remove the cross shaft assembly by detaching the bracket from the side member (See GEARBOX section).
9. Disconnect the speedometer cable, and detach the front exhaust pipe from the exhaust manifold.
10. Disconnect the propeller shaft, and plug the gearbox rear extension to prevent the loss of oil.
11. Jack up the gearbox slightly, and remove the rear engine mounting support. Take out the bolts which secure the front mounting insulators to the cross member.
12. Attach chains or wire rope to the engine. Gradually lower the jack under the gearbox, and carefully lift and tilt the engine and gear box to clear the compartment. Withdraw the unit, making sure that it does not foul the accessories.

Installation is a reversal of the removal procedure. Refill with the correct quantities of oil and coolant, when the engine is installed.

ENGINE MOUNTING INSULATORS - Replacing

The front and rear mounting insulators should be checked with the engine installed, to make sure that the dimensions conform with those given in Figs. A.1 and A.2.

To remove the front insulator, proceed as follows:-

Position a jack under the oil sump. Make sure that the jack is clear of the drain plug, and insert a wooden block between the jack and sump to prevent the sump from being damaged. Remove the bolts securing the insulator to the front suspension member, and the nut attaching the insulator to the engine mounting bracket. Raise the jack slightly, and remove the insulator. To remove the rear mounting insulator, proceed as follows:-

Position a jack to take the weight of the gearbox, and take out the bolts connecting the insulator to the transmission rear extension housing. Remove the bolts attaching the cross member to the underside of the body,and withdraw the insulator.

Installation of both insulators is a reversal of the removal procedures.

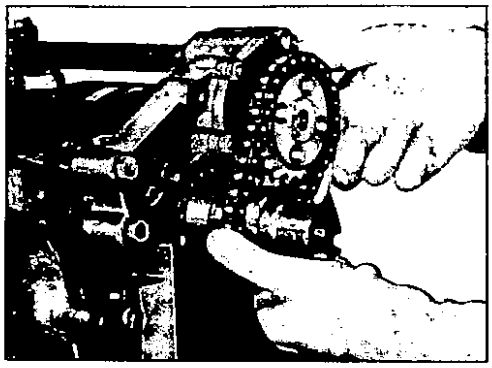


Fig.A.5 Removing the oil pump sprocket

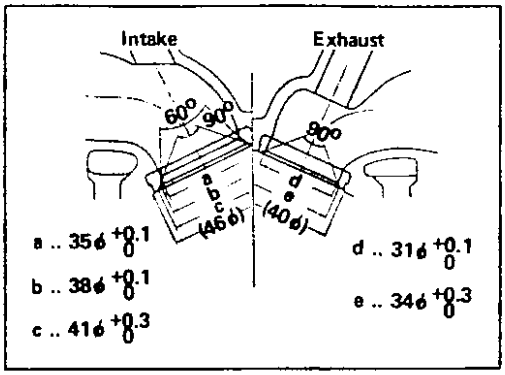


Fig.A.6 Correcting the valve seats.

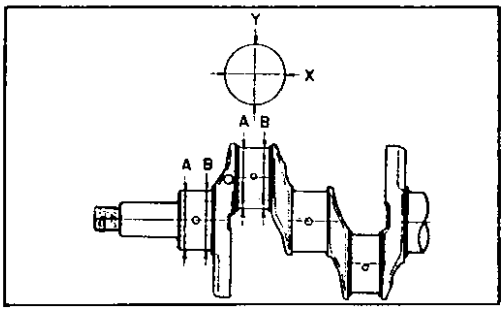


Fig.A.7 Measuring the crankshaft journals and crankpins

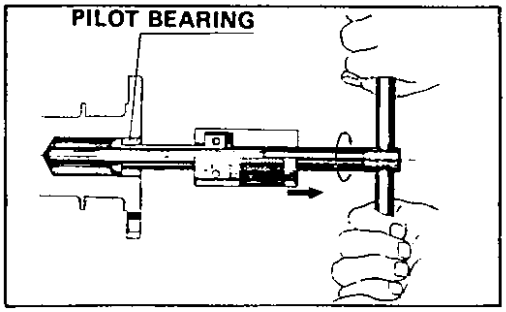


Fig.A.8 Removing the main drive shaft pilot bearing

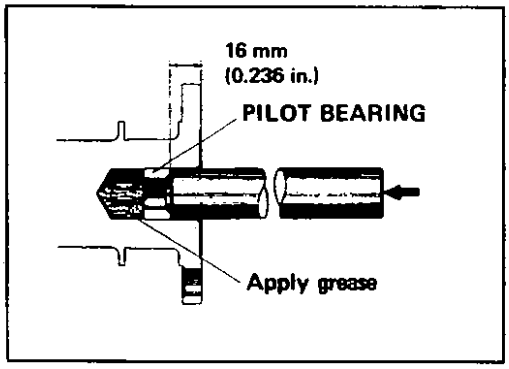


Fig.A.9 Fitting the main drive shaftpilot bearing

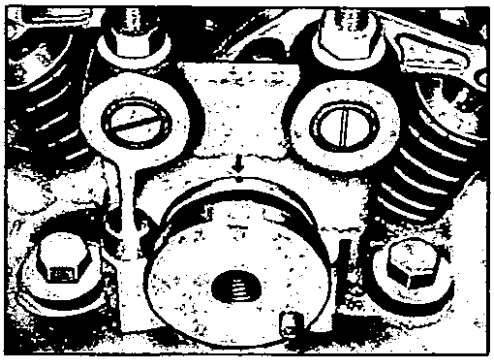


Fig.A.11 Camshaft and camshaft bracket alignment marks

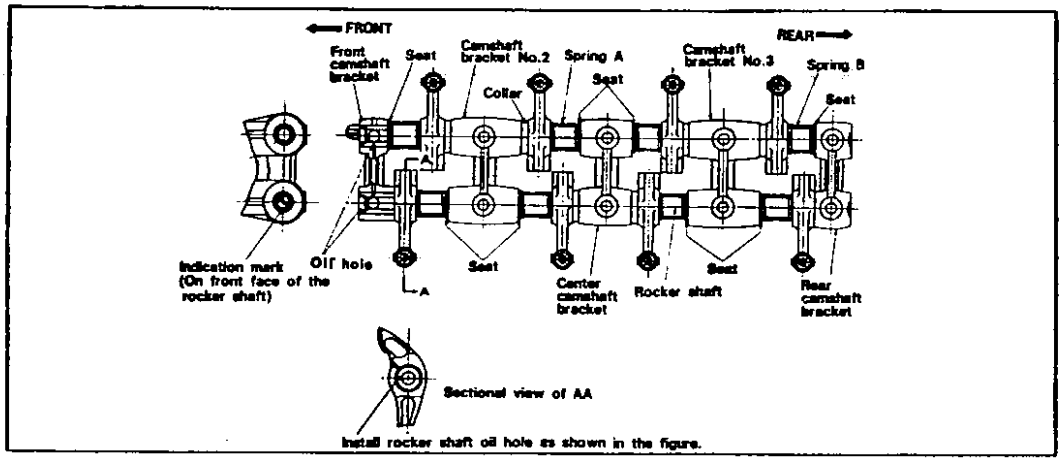


Fig.A.10 The rocker shaft assembly

ENGINE - Dismantling

Remove the engine from the vehicle as previously described, and carefully clean the exterior surfaces. The alternator, distributor, and starter motor should be removed before washing. Plug the carburettor air horn to prevent the ingress of foreign matter. Place the engine and transmission on the engine carrier ST4797 0000 if available, and dismantle as follows:-

Remove the gearbox from the engine. Disconnect the intake manifold water hose, the vacuum hose and the intake manifold to oil separator hose. Remove the intake manifold with the carburettor. Fit the engine attachment ST37200G18 to the cylinder block and place the engine on the stand ST37100000.

Remove the clutch assembly as described in the section CLUTCH. Remove the exhaust manifold and heat baffle plate Take off the fan blades, and remove the water pump pulley and fan belt. Remove the rocker cover hose, manifold heat hose, and by pass hoses.

Remove the generator bracket,and the oil filter. Extract the engine breather assembly from above. Note that the breather is fitted to the guide and is installed with a "O"-ring which is pressed into the cylinder block.

Flatten the lockwasher, and unscrew the crankshaft pulley nut. Withdraw the pulley with the puller ST44820000, if available, but do not hook it in the 'V' groove of the pulley.

Remove the rocker cover, and take off the rubber plug located on the front of the cylinder head. Straighten the locking washer, and remove the bolt securing the distributor drive gear and camshaft sprocket to the camshaft. Remove the drive gear, and take off the sprocket (See Fig.A.3).

Remove the cylinder head bolts in reverse order to the tightening sequence shown in Fig.A.18 and lift off the cylinder head as an assembly, (See Fig.A.4). Note that in addition to the ten cylinder head bolts there are also two bolts securing the chain cover to the head. Invert the engine and remove the oil sump. Remove the chain cover and oil flinger. Take off the nut securing the oil pump sprocket, and withdraw the sprocket with the chain in position as shown in Fig.A.5. Remove the oil pump and strainer. Note that two of the pump mounting bolts are pipe guides.

Remove the timing chain, crankshaft sprocket, chain tensioner, and chain stop.

Remove the connecting rod caps, and push the piston and connecting rod assemblies through the tops of the bores. Keep all parts in order so they can be assembled in their original positions.

Take out the flywheel retaining bolts, and withdraw the flywheel. Remove the main bearing caps, but take care not to damage the pipe guides. Lift out the crankshaft and main bearings, noting that the bearings must be reassembled in their original positions. Remove the piston rings with a suitable expander, and take off the gudgeon pin clips. The piston should be heated to a temperature of 50 to 60°C (122 to 140°F) before extracting the gudgeon pin. Keep the dismantled parts in order, so they can be reassembled in their original positions.

Remove the camshaft, rocker arm shaft and rocker arm assemblies from the head by taking off the cam bracket clamping nuts. It is advisable to insert disused bolts in the No. 1 and No. 5 bracket holes, as the cam bracket will fall from the rocker arm shaft when it is removed. Remove the valve cotters, using the special tool ST47450000, and dismantle the valve assemblies. Keep the parts together so they can be installed in their original order.

ENGINE - Inspection and Overhaul

Cylinder head and valves

Inspection and overhaul procedures can be carried out by following the instructions previously given for the L14,L16 and L18 engines, noting the following points:-

Measure the joint face of the cylinder head, using a straight edge and feeler gauge. The permissible amount of distortion is 0.03 mm (0.0012 in.) or less. The surface of the head must be reground if the maximum limit of 0.1 mm (0.0039 in.) is exceeded.

Clean each valve by washing in petrol, then carefully examine the stems and heads. Discard any valves with worn or damaged stems. Use a micrometer to check the diameter of the stems, which should be 8.0 mm (0.315 in.) for both intake and exhaust valves. If the seating face of the valve is excessively burned, damaged, or distorted, the valve must be discarded. The valve seating face and valve tip can be refaced if necessary, but only the minimum amount of metal should be removed. Check the free length and tension of each valve spring, and compare the figures obtained with those given in Technical Data at the end of this section. Use a square to check the springs for deformation, and replace any spring with a deflection of 1.6 mm (0.0630 in.) or more.

Valve guides

Measure the clearance between the valve guide and valve stem. The stem to guide clearance should be 0.025-0.055 mm (0.0010-0.0022 in.) for the intake valves, and 0.04-0.077 mm (0.0016-0.0030 in.) for the exhaust valves. The maximum clearance limit is 0.1 mm (0.0039 in.). The valve guides are held in position with an interference fit of 0.040-0.069 mm (0.0016-0.0027 in.), and can be removed using a press and valve guide replacer set ST49730000 (under 2 ton pressure). This operation can be carried out at room temperature, but will be more effectively performed at a higher temperature. Valve guides are available with oversize diameters of 0.2 mm (0.0079 in.). The cylinder head guide bore must be reamed out at normal room temperature, and the new guides pressed in after heating the cylinder head to a temperature of approximately 80° C (176°F). The standard valve guide requires a bore of 14.0-14.018 mm (0.551-0.552 in.) and the oversize valve guide a bore of 14.2-14.218 mm (0.559-0.560 in.). Ream out the bore of the guides to obtain the desired finish and clearance. Use the reamer set ST49710000 to ream the bore to 8.000-8.015 mm (0.3150-0.3156 in.). The valve seat surface must be concentric with the guide bore, and must be corrected if necessary using the new valve guide as axis.

Valve seat inserts

Check the valve seat inserts for signs of pitting. The inserts cannot be replaced, but may be corrected if necessary using a valve seat cutter ST49720000. Scrape the seat with the 45° cutter then reduce the width of the contacting faces using the 15° and 60° cutters for the intake valve inserts, and 15° cutter for the exhaust valve inserts. Seat correction dimensions are shown in millimeters in Fig.A.6.

Lap each valve into its seat after correcting the seat inserts. Place a small quantity of fine grinding paste on the seating face of the valve, and lap-in as previously described for the L14, L16, and L18 engines.

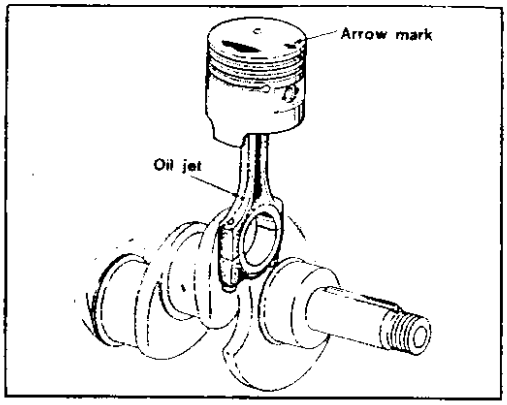


Fig. A.12 Assembling a piston and connecting rod

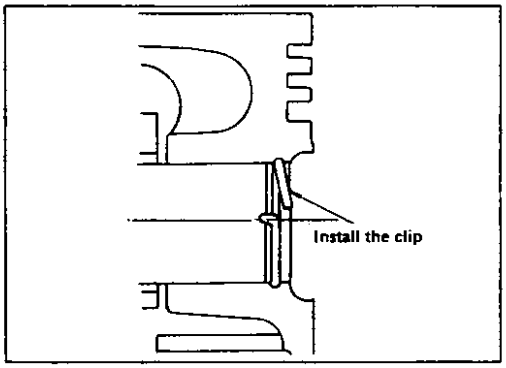


Fig.A.13 Installing the gudgeon pin circlip

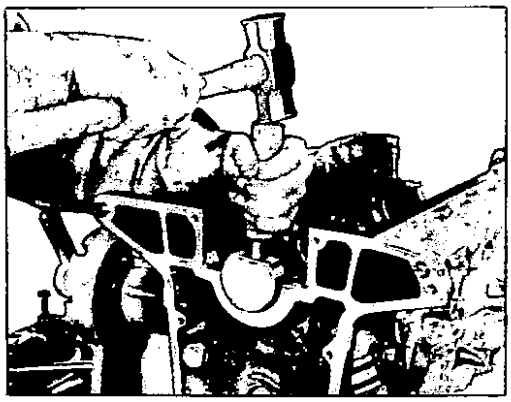


Fig.A.14 Installing the cylinder block oil seal

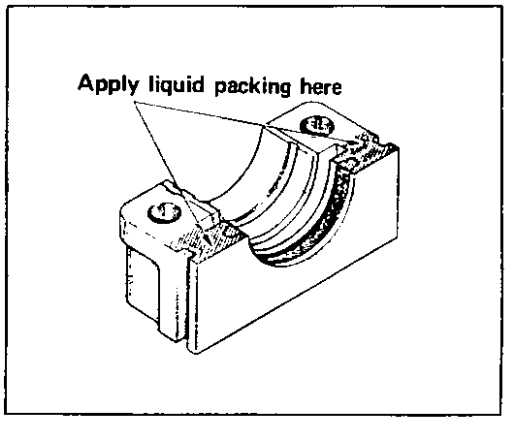


Fig.A.15 Rear bearing cap

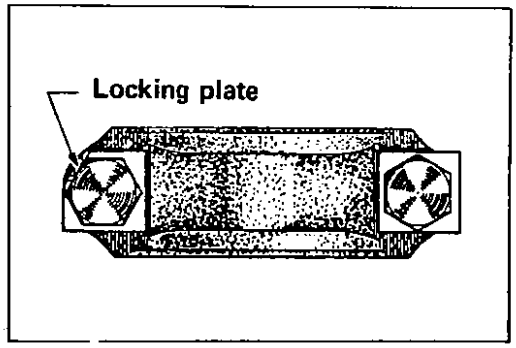


Fig.A.16 Connecting rod caps and lock washers

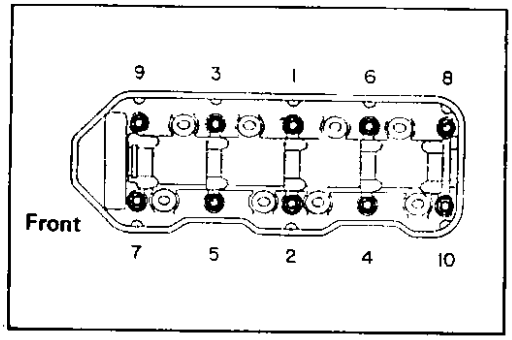


Fig.A.18 Cylinder head bolts tightening sequence

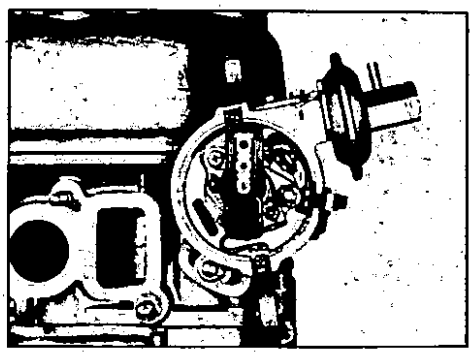


Fig.A.19 Installing the ignition distributor - note the position of rotor.

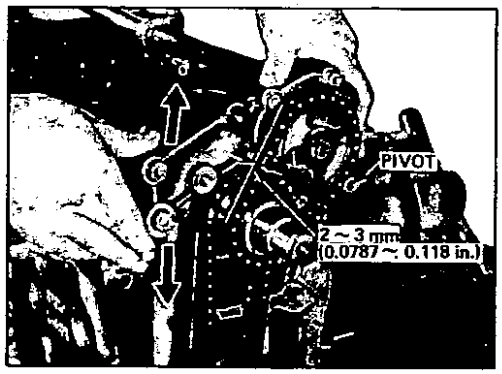


Fig.A.20 Tensioning the oil pump drive chain

CAMSHAFT AND CAMSHAFT BEARINGS

Check the camshaft bearings and journals for signs of wear. Plastigage should be used to check the clearance between bearing and journal, which should be 0.025-0.075 mm (0.0010-0.0030 in.). The cylinder head assembly must be renewed if the wear limit of 0.1 mm (0.0039 in.) is exceeded.

Place the camshaft in "V" blocks, and apply a dial gauge to the centre journal to check the amount of camshaft bend. The run-out of the camshaft must not exceed 0.03 mm (0.0012 in.). It should be noted that the actual run-out will be half the value indicated on the dial gauge when the camshaft is turned one full revolution. Check the camshaft end-play which should be within 0.07-0.148 mm (0.0028-0.0058 in.).

Check the cam contacting surfaces of the valve rocker and the cam heels of the camshaft. Slight damage can be corrected using a fine oil stone. It is advisable at this stage to check the clearance of the rocker shaft and rocker bushes which should be 0.016-0.052 mm (0.0006-0.0020 in.). The parts must be renewed if the wear limit of 0.07 mm (0.0028 in.) is exceeded.

CYLINDER BLOCK - Inspection and Overhaul

Check the block for signs of cracks or flaws. Measure the joint face for distortion, using a straight edge and feeler gauge as described for the L14, L16 and L18 engines. The surface must be reground if the maximum limit of 0.10 mm (0.0039 in.) is exceeded.

Check the cylinder bores for wear, out of round, and excessive taper. Use a bore gauge to take readings at the top, middle, and bottom positions of the bore as previously described. The standard bore diameters are 85.000 mm + 0.035-0 mm (3.347 + 0.0014-0 in.), with a wear limit of 0.2 mm (0.0079 in.) Out of round and taper must not exceed 0.02 mm (0.0008 in.). If any of the bores are worn or in excess of the specified limit, then all bores must be rebored at the same time.

Pistons are available in five oversizes, and should be selected in accordance with the amount of wear of the cylinder. Refer to the instructions given for the L14, L16, and L18 engines, and select pistons from the table below.

PISTON SIZE	OUTER DIAMETER
Standard	84.958-84.990 mm (3.345-3.346 in.)
25 O.S.	85.220-85.240 mm (3.355-3.356 in.)
50 O.S.	85.470-85.490 mm (3.365-3.366 in.)
75 O.S.	85.720-85.740 mm (3.375-3.376 in.)
100 O.S.	85.970-85.990 mm (3.3846-3.3854 in.)
125 O.S.	86.220-86.240 mm (3.394-3.395 in.)

Cylinder liners can be fitted if the bores are worn beyond the maximum limit. Undersize liners are available with outer diameters of 89.091-89.126 mm (3.507-3.509 in.) and inner diameters of 83.5-84.5 mm. (3.287-3.327 in.). The liners are an interference fit in the block, and must be rebored after fitting.

PISTONS - Checking

Check the pistons for signs of seizure and wear, measure the side clearance of the rings in the ring grooves, and check the piston ring gaps as previously described for the L14, L16 and L18 engines. Compare the figures obtained with those given in the tables opposite:-

Side clearance in grooves

	Standard
Top ring	0.04-0.08 mm (0.0016-0.0031 in.)
Second ring	0.02-0.06 mm (0.0008-0.0024 in.)
Oil ring	0.02-0.06 mm (0.0008-0.0024 in.)
	Limit
Top ring	1.0 mm (0.0039 in.)
Second ring	1.0 mm (0.0039 in.)
Oil ring	1.0 mm (0.0039 in.)

Piston ring gap

	Standard
Top ring	0.35-0.55 mm (0.0138-0.0217 in.)
Second ring	0.3-0.5 mm (0.0138-0.0197 in.)
Oil ring	0.35-0.55 mm (0.0138-0.0217 in.)
	Limit
Top ring	1.0 mm (0.0394 in.)
Second ring	1.0 mm (0.0394 in.)
Oil ring	1.0 mm (0.0394 in.)

Measure the outer diameter of the gudgeon pin in relation to the hole diameter in the piston. Compare the figures obtained with those given in Technical Data, and replace the piston and pin if the wear limit is exceeded.

CONNECTING RODS - Checking

Check the connecting rods for bends or twists, using a suitable connecting rod aligner. The maximum deviation should not exceed 0.05 mm (0.0020 in.) per 100 mm (3.94 in.) of rod. Straighten, or replace any rod which does not comply with the specified limit. When renewing a rod make sure that the weight difference between new and old rods in within 6 gr (212 oz).

Install the connecting rods with bearings to the corresponding crank pins, and check that the end play of the big ends is between 0.10-0.246 mm (0.0043-0.0097 in.). Replace the appropriate rod if the maximum limit of 0.3 mm (0.0118 in.) is exceeded.

CRANKSHAFT - Inspection and Overhaul

Clean the crankshaft thoroughly, and check the journals and crankpins for taper and out of round. Use a micrometer to measure the journals and crankpins at the positions shown in Fig.A.7. It will be necessary to regrind the crankshaft if the specified limit of 0.03 mm (0.0012 in.) is exceeded, and then fit the appropriate undersize bearings. Place the crankshaft in 'V' blocks as described for the L14, L16, and L18 engines, and apply a dial gauge to the centre journal to check that the bend limit of 0.05 mm (0.0020 in.) is not exceeded. The actual bend value will be half the reading obtained on the gauge. Install the crankshaft in the cylinder block, and check the crankshaft end float which should be 0.060-0.192 mm (0.0024-0.0076 in.). Replace the centre shims if the specified figure is exceeded. Make sure that the main drive shaft pilot bearing at the rear of the crankshaft is not worn or damaged in any way. Remove the bearing if necessary, using the special tool ST49700000 as shown in Fig.A.8. Clean the bearing hole, oil the outer side of the new bearing, and use a drift as shown in Fig.A.9, to drive it into the hole. Insert 2 grams (0.07 oz) of multi-purpose grease into the hole as illustrated.

Main bearing clearance

Check the main bearing clearances as described for the L14, L16 and L18 engines. The Plastigage should be placed so

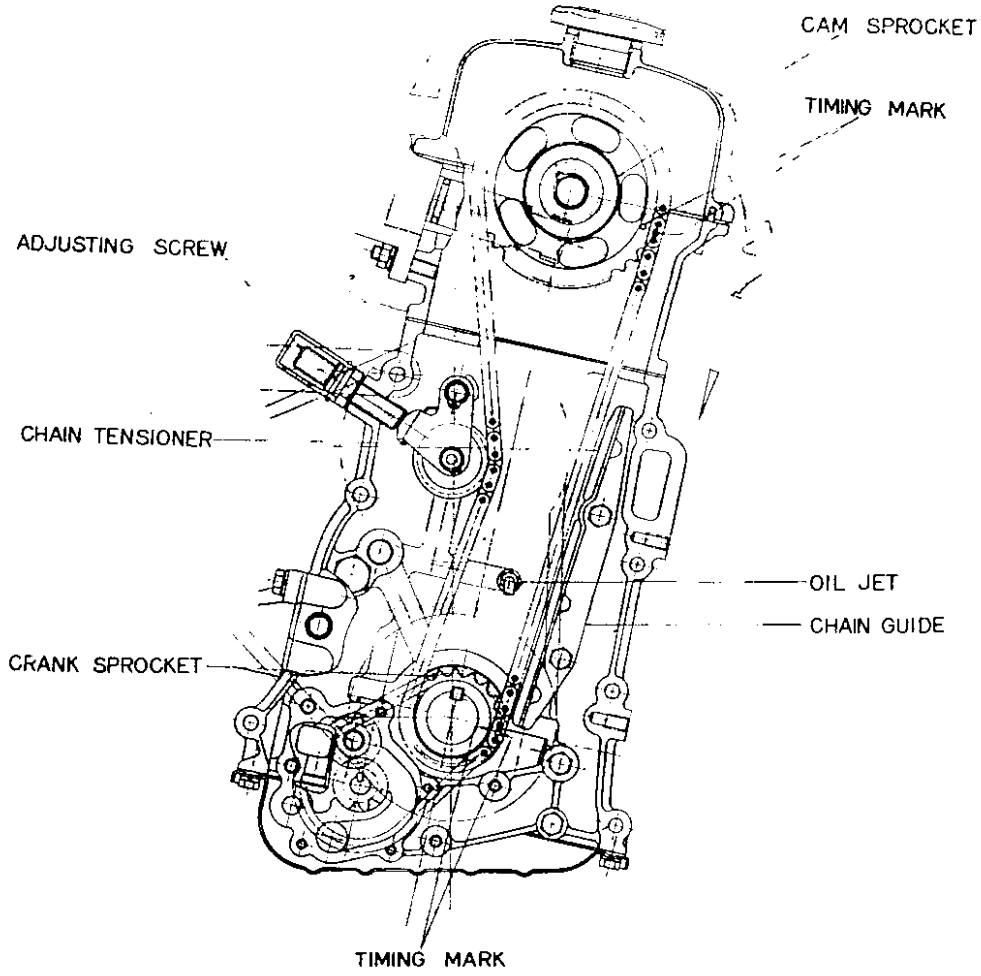


Fig.A.17 Timing mechanism

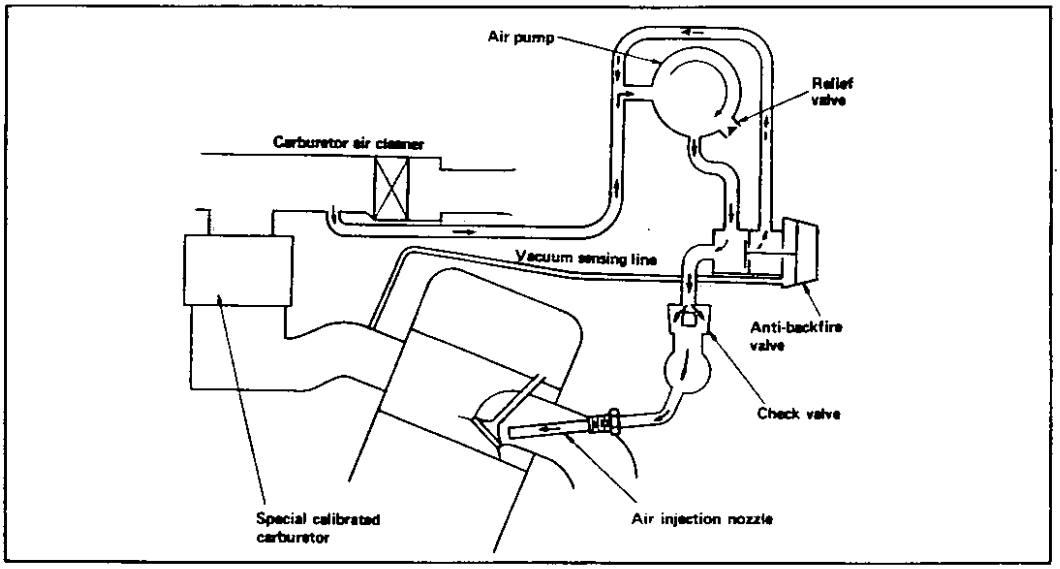


Fig.A.23 Details of the exhaust emission control system

that it is clear of the oil hole. Install the bearing caps, and tighten the bolts to a torque reading of 10.0-11.0 kgm (72.3-79.5 lb.ft.).

The standard main bearing clearance is 0.03-0.06 mm (0.0012-0.0024 in.) with a wear limit of 0.1 mm (0.0039 in.). If the specified limit is exceeded, an undersize bearing must be fitted, and the crankshaft journal ground accordingly. Bearings are available in four undersizes - See Technical Data.

Connecting rod bearing clearance

Check the connecting rod bearing clearances in a similar manner to the main bearing clearances. The standard clearance is 0.03-0.06 mm (0.0012-0.0024 in.), with a wear limit of 0.1 mm (0.0039 in.). Undersize bearings must be fitted, and the crankpins reground if the specified limit is exceeded. Bearings are available in four undersizes - See Technical Data.

Fitting the crankshaft bearings

Check the fit of the bearing shells in the following manner. Install the bearings on the main bearing caps and cylinder block bearing recess, and tighten the cap bolts to the specified torque reading of 10.0-11.0 kgm (72.3-79.5 lb.ft.). Slacken one of the cap bolts, and check the clearance between the cap and cylinder block with a feeler gauge, as described for the L14, L16 and L18 engines. The bearing crush should be from 0 to 0.04 mm (0 to 0.0016 in.).

Replace the bearing if the clearance is not correct.

Check the connecting rod bearings in a similar manner, after tightening the rod cap bolts to a torque reading of 4.5-5.0 kgm (32.6-36.2 lb.ft.).

ENGINE - Assembling

Make sure that all components are perfectly clean before starting to assemble the engine. Refer to the instructions given for the L14, L16, and L18 engines.

Cylinder Head

Install the valve spring seats and valves. Fit the oil seal rings on the valve stems, and place the seal ring covers over the oil seal rings. Note that a gap of from 0.3 to 0.7 mm (0.0118 to 0.0276 in.) should be present between the seal ring cover and spring seat. If the gap is less than 0.3 mm (0.0118 in.) the oil seal ring or the cover must be replaced. Assemble the valve springs and retainers. Compress the valve springs, and install the cotters. See instructions for the L14, L16 and L18 engines. Assemble the camshaft brackets, valve rockers, seats, spacers and springs on the rocker shafts in the order shown in Fig.A.10. Note that the exhaust rocker shaft has identification marks, but the intake rocker shaft has not. Make sure that the oil holes point in the direction shown. It may be advisable to insert any convenient bolts into the bolt holes of the front and rear camshaft brackets to prevent the assembly from being displaced.

Mount the camshaft on the head, fit the rocker assembly, and tighten the nuts, Make sure that the mark on the flange of the camshaft is aligned with the arrow mark on the No. 1 camshaft bracket as shown in Fig.A.11.

Pistons and connecting rods

Assemble the pistons, gudgeon pins, and connecting rods in accordance with the cylinder numbers.

Heat the piston to a temperature of 50° to 60° (122° to 140°F), and press the gudgeon pin in by hand. The pistons and connecting rods must be assembled as shown in Fig.A.12, with the arrow mark on the head of the piston pointing to the front of the engine.

Fit new clips to both ends of the gudgeon pins as indicated in Fig.A.13, Fit the piston rings, with the marks facing upwards. Place the bearings on the connecting rods and caps, making sure that the backs of the bearing shells are perfectly clean.

Assembling the engine

Insert the oilseal into the grooves of the cylinder block and rear bearing cap. Fit the seal down with the special tool ST49750000 if available, as shown in Fig.A.14, and trim off the excess with a knife. Apply sealing agent to the oil plug, and install it in the cylinder block.

Fit the main bearings, lubricate with clean engine oil, and install the crankshaft. Fit the bearing caps, and tighten the bolts to a torque reading of 10.0 to 11.0 kgm (72.3 to 79.5 lb.ft.).

Note that liquid packing should be applied to the rear bearing cap surfaces as shown in Fig.A.15.

Fit the thrust washers at both sides of the No. 2 bearing, with the oil channel in the washers facing the thrust face of the crankshaft. Install the rear bearing cap side seal so that is projects 0.2 to 0.6 mm (0.008 to 0.024 in.) from the lower surface of the cylinder block, then apply liquid packing to the projecting tip.

Install the engine rear plate. Fit the flywheel, and tighten the bolts to a torque reading of 10.0 to 11.0 kgm (72.3 to 79.5 lb.ft.), using new lock washers.

Lubricate the crankshaft journals, pistons,and cylinder bores with clean engine oil, and install the piston and connecting rod assemblies. The pistons should be arranged so that the arrow marks face towards the front, and with the piston ring gaps at 180° to each other. Make sure the gaps do not face to the thrust side of the piston, or in the same axial direction as the gudgeon pin.

Install the connecting rod caps so that the marks face the same way, and tighten the bolts to a torque reading of 4.5 to 5.0 kgm (32.6 to 36.2 lb.ft.). Bend the lock washers as shown in Fig.A.16.

Fit the oil jet to the front of the cylinder block. Install the chain tensioner and stopper, crankshaft sprocket and timing chain.

Note that the timing mark on the chain must be aligned with the mark on the sprocket as shown in Fig.A.17.

Smear the mounting face of the oil pump with sealing agent (Three Bond No. 4, or equivalent), install the pump, and temporarily tighten the mounting bolts. Adjust the tension of the oil pump chain, using the pin as the central point, then tighten the mounting bolts.

Install the oil thrower. Fit the chain cover into position, after coating the new cover gasket with sealing compound. Cut off the projecting parts of the gasket.

Fit the crankshaft pulley, and tighten the pulley nut to a torque reading of 15.0 to 20.0 kgm (108.5 to 144.6 lb.ft.).Bend the lock washer. Install the oil strainer and oil pump.

Invert the engine, and set the No. 1 piston to T.D.C. of the compression stroke. Note that the notch on the crankshaft

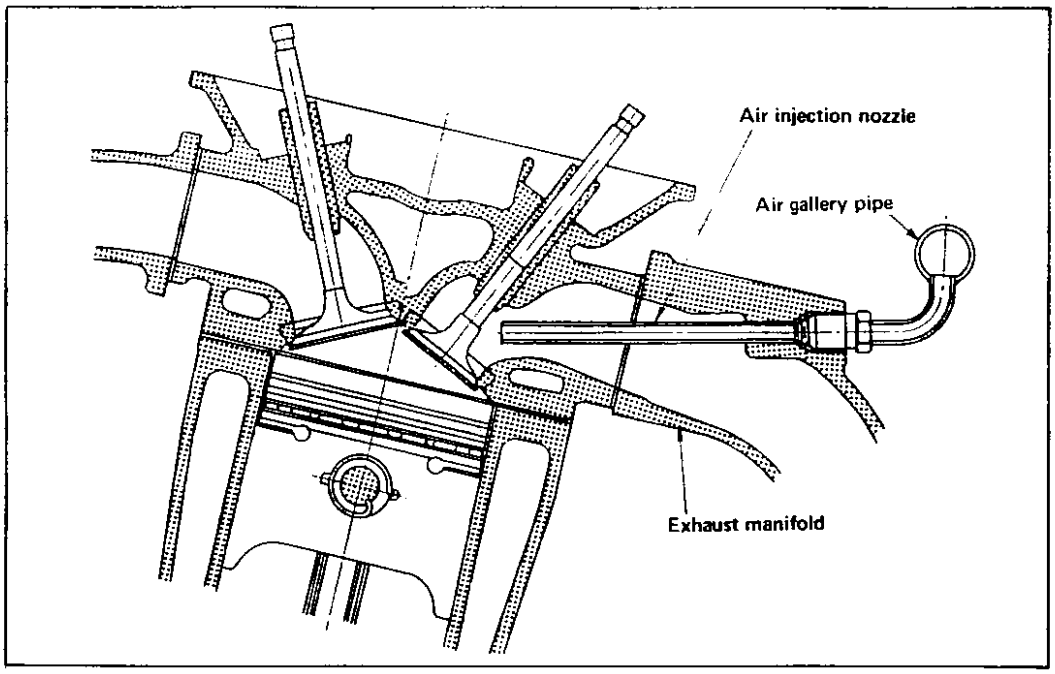


Fig.A.24 Sectional view of air injection nozzle and exhaust port

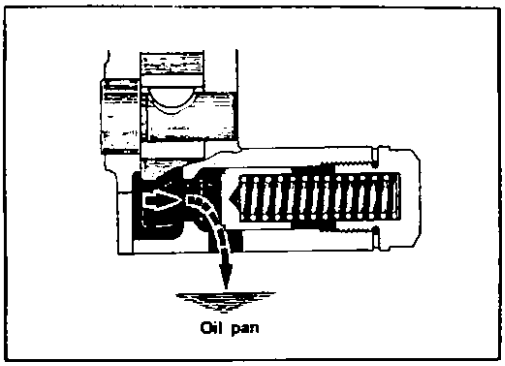


Fig.A.21 Section through the pressure relief valve

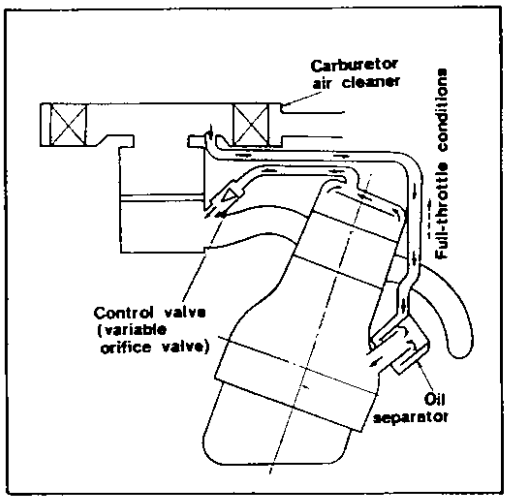


Fig.A.22 Details of the positive crankcase ventilation system

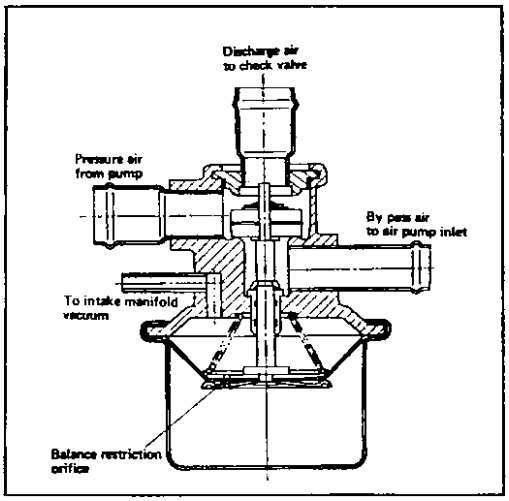


Fig.A.25 Sectional view of anti-backfire valve

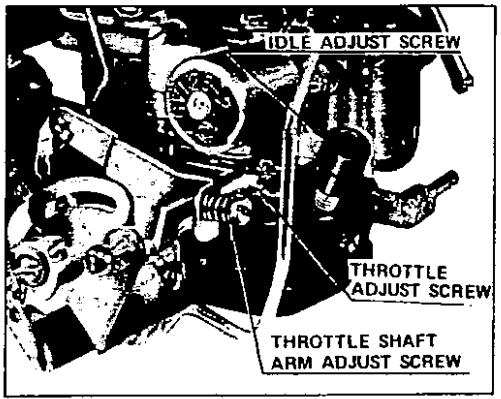


Fig.A.26 Adjusting the ignition timing and idling speed mixture (emission control system)

pulley should be aligned with the 'T' mark on the chain cover.

Install the cylinder head assembly. Coat the cylinder block side of the head gasket with sealing agent (Three Bond No. 4, or equivalent), but take care that the sealing agent does not enter the cylinders.

Tighten the head bolts in several stages to a torque reading of 8.0 to 9.0 kgm (58 to 65 lb.ft.). Tighten the bolts to the sequence shown in Fig.A.18.

Pull the timing chain out of the chain cover, and set it on the camshaft sprocket so that the timing marks are aligned, then place the sprocket and chain on the camshaft.

Install the distributor drive gear on the camshaft, and tighten the bolt to a torque reading of 4.5 to 5.5 kgm (32.6 to 39.8 lb.ft.). Note that the camshaft bolt has a left-hand thread.

Adjust the valve clearances as described under the appropriate heading. Fit the rubber plugs at the front and rear of the cylinder head, taking care to apply sealing agent to the rear plug.

Install the chain adjusting screw, and adjust the tension of the chain in the following manner:

Rotate the crankshaft clockwise to establish the correct chain tension; screw the adjusting screw fully home, then back it off by half a turn, and secure with the locknut.

Install the valve rocker cover, and fit the water pump. Note that one of the water pump mounting bolts also secures the generator adjusting arm.

Install the bracket and alternator, water pump pulley, fan blades, and fan belt. Tighten the fan bolts, and lock each pair of bolts together, using wire inserted through the holes provided in the bolts.

Install the oil filter, and fit the rocker cover hose. Install the distributor so that the vacuum control unit and rotor are positioned as shown in Fig.A.19.

Oil the distributor driven gear. Fit the breather assembly; the clamp of the pipe is tightened together with the exhaust manifold. Install the spark plugs, and connect the high tension leads.

Install the exhaust manifold. Fit the head shield plate and engine slinger, and tighten them together. Note that the exhaust manifold gasket must be fitted with the steel plate facing the manifold. Install the clutch as described in the section CLUTCH.

Remove the engine from the mounting stand, and install the gearbox, intake manifold and carburettor, stater motor, engine mounting, oil pressure warning switch, etc.

Fill the engine and gearbox to the correct levels with recommended oils. and refill the cooling system. Adjust the ignition timing and carburettor as described in the appropriate sections.

VALVE CLEARANCES - Adjusting

The valves clearances can be adjusted in a similar manner to the instructions given for the L14, L16, L18 engines. Initially adjust the clearances with the engine switched off and cold to 0.2 mm (0.0079 in.) for both intake and exhaust valves. Set the final clearances to 0.28 mm (0.011 in.) for both intake and exhaust valves, with the engine warmed up to its normal operating temperature.

OIL PUMP

The gear type oil pump is chain driven from a sprocket on the crankshaft. The pump can be removed in the following manner:-

1. Remove the sump plug and drain the engine oil. Remove the distributor as described in the section IGNITION.
2. Remove the cylinder head assembly, fan belt, crankshaft pulley, and oil sump.
3. Take off the chain cover with oil flinger.
4. Remove the oil pump and crankshaft sprockets with the drive chain, then withdraw the pump after removing the four mounting bolts.

   Separate the cover from the body by unscrewing the four securing bolts, and withdraw the drive and idler gear assemblies. Unscrew the threaded plug, and take out the relief valve and spring.

   Clean the parts thoroughly and inspect them four signs of wear or damage. Check the following clearances.

Gear backlash	0.1 to 0.5 mm (0.0039 to 0.0195 in.)
Side clearance between gear and body	0.016 to 0.15 mm (0.0006 to 0.0059 in.)
Clearance between drive shaft and body	0.016 to 0.1 mm (0.0006 to 0.0039 in.)
Clearance between drive shaft and cover	0.02 to 0.1 mm (0.00078 to 0.0039 in.)
Clearance between idler gear and idler shaft	0.016 to 0.1 mm (0.0006 to 0.0039 in.)

Assembly is a reversal of the dismantling procedures, taking care to position the gears so that the dotted mark is towards the cover.

Install the pump, and adjust the tension of the drive chain by pivotting the pump body as shown in Fig.A.20. When the chain is correctly tensioned it should be capable of a deflection of 2.0 to 3.0 mm (0.079 to 0.118 in.) as indicated.

OIL PRESSURE RELIEF VALVE

The pressure relief valve shown in Fig.A.21 is not adjustable. This valve regulates the oil pressure to 4.55 - 4.85 kg/sq. cm 64.7-69.0 lb/sq. in. and when opened allows the oil to by-pass through a passage in the pump body and return to the sump.

Check the free length of the spring which should be 64.0 to 66.0 mm (2.51 to 2.60 in.). The compressed length should be 50 mm at 7.8 to 9.7 kg, (1.96 in. at 17.2 to 21.4 lbs). Renew the spring if necessary.

OIL FILTER

The oil filter is of the full flow type with a replaceable element, and incorporates a by-pass valve in the cover.

Oil leaks can be corrected by replacing the body, centre shaft, or cover gaskets. The body and centre shaft gaskets should always be renewed after dismantling the filter.

Renew the filter element at 10,000 km (6000 miles) intervals. Dismantling is a straight forward operation. Remove the plug from the cover, and withdraw the washer, spring, and by-pass valve. Check the free length and compressed length of the by-pass valve spring and renew if necessary. The free length of the spring should be 54.5 to 56.0 mm (2.14 to 2.20 in.) and the compressed length 49.0 mm (1.93 in.).

EMISSION CONTROL SYSTEM

Crankcase and exhaust gas emissions are controlled by two systems. The crankcase emissions by a Positive Crankcase Ventilation System, and the exhaust emissions by a Nissan Air Injection System. Brief descriptions of the systems, together with the testing and servicing procedures are given below.

Positive Crankcase Ventilation System

This system returns the blow-by gases to the intake manifold and the carburettor air cleaner (see Fig.A.22). Under part throttle conditions the intake manifold draws the gases through a variable orifice valve (Control valve), into the combustion chambers. Ventilating air is then drawn from the carburettor air cleaner and passes through a tube into the crankcase.

With the throttle fully open the manifold vacuum is insufficient to draw the gases through the valve. Under these conditions the gases flow through the tube to the air cleaner, in the reverse direction. The gases are therefore retained or burnt to lessen the risk of air pollution.

Servicing and testing

Once a year, or every 20,000 km (12,000 miles), the Positive Crankcase Ventilation System should be serviced as follows:-

Check all hoses and connectors for signs or leakage. Disconnect the hoses, and blow through them with compressed air to make sure they are not blocked. Fit a new hose if air cannot be forced through.

Check the ventilation control valve for servicability, and renew it if defective. To test the valve, run the engine at idling speed (see under IGNITION TIMING AND IDLING SPEED), and disconnect the ventilation hose from the rocker cover. If the valve is working correctly a hissing noise will be heard as air passes through the valve, and a strong vacuum should be felt immediately a finger is placed over the valve inlet. The valve cannot be serviced and must be renewed if unsatisfactory.

Exhaust emission control system

The Nissan Air Injection System comprises an air cleaner belt driven air injection pump, check valve, anti-backfire valve, and the related connecting tubes and hoses. The sealed pump is driven by the engine and injects clean filtered air into the exhaust port of each cylinder. The clean air combines with unburnt gases as they are expelled into the exhaust manifolds, and reduces the emissions to below the permissible level required by air pollution laws.

A modified carburettor and distributor is fitted with this type of system. The air injection system is shown in Fig.A.23.

The anti-backfire valve is controlled by intake manifold vacuum, and is fitted to prevent the exhaust system from back firing during deceleration. When decelerating, the mixture in the intake manifold is too rich to burn and ignites as it combines with air injected by the pump. The valve shuts off the air delivered to the exhaust system during the first predetermined period of deceleration and prevents back firing from occuring.

To check valve is located between the air pump and air injection nozzle, and is fitted to prevent a backflow of exhaust gases from entering the system. The valve closes when the exhaust manifold pressure exceeds air injection pressure, as it will at high speed, or if the pump drive belt fails.

A relief valve is mounted in the discharge cavity of the air pump and is incorporated to hold the exhaust gas temperatures to a minimum to minimize any loss of power caused by the air injection system, and to protect the pump from excessive back pressures.

Testing

The following tests should be carried out to make sure that the exhaust emission control system is operating correctly. The engine must be at normal operating temperature to perform the tests. Before the system can be tested, the engine itself must be checked to ensure that it is functioning correctly. Disconnect the anti-backfire valve sensing hose, and insert a plug into the hose to close the passage to the intake manifold. Make sure that the engine operates normally, and then reconnect the parts.

Testing the check valve

Run the engine until it reaches its normal operating temperature, and check all hoses and connectors for signs of leakage.

Disconnect the air supply hose from the check valve, and check the position of the plate inside the valve body. The plate should be lightly positioned against the valve seat and away from the air distributor manifold. Insert a suitable probe into the valve, and depress the plate. When released the plate should return freely to its position against the valve seat.

Leave the hose disconnected, and start the engine. Slowly increase the engine speed to 1500 r.p.m,and examine the valve to make sure that the exhaust gases are not leaking. The valve may flutter or vibrate at idling speed, but this is quite normal. Renew the valve, if necessary.

Testing the anti-backfire valve

Run the engine until it reaches its normal operating temperature. Check the hoses and connections for signs of leakage. Rectify any leakage before testing the valve.

Accelerate the engine in neutral, and allow the throttle to close quickly. The valve is operating correctly if the exhaust system does not backfire. Further test can be made with the by-pass hose to the air pump suction line disconnected from the valve.

Open and close the throttle valve rapidly. Hold a finger over the valve outlet, and check that air flows for between a half and one second. If air does not flow, or alternatively, if it flows continuously for more than two seconds, the valve is faulty and must be renewed.

Disconnect the vacuum sensing hose from the valve. Insert a suitable plug securely into the hose. The valve is not functioning correctly if the idling speed now differs excessively from the speed at which the engine operated with the hose connected.

Testing the air pump

Special tools are required to test the air pump. The vehicle should therefore be taken to an Approved Agent capable of

carrying out extensive tests with the necessary equipment. The hoses and connectors can of course be checked for signs of leakage, and corrected as necessary. Also the tension of the air pump belt.

IGNITION TIMING AND IDLING SPEED (Emission control system)

The ignition timing should be set, and the idling speed mixture adjusted in the following manner:-

Run the engine until it reaches its normal operating temperature. Connect an ignition tachometer and timing light observing the manufacturers instructions.

NOTE:- If the vehicle is equipped with automatic transmission, make sure that the dashpot does not prevent the throttle from closing. Turn the throttle shaft arm adjusting screw anti-clock wise so that the tip of the screw is clear of the throttle shaft arm (see Fig.A.26).

Turn the throttle adjusting screw to set the idling speed to 700 r.p.m. (650 rpm for automatic transmission). Adjust the ignition timing to 5º A.T.D.C. Refererence should be made to the instructions given in the section IGNITION SYSTEM for the L14, L16, and L18 engines, for ignition timing details. Turn the idling adjustment screw and throttle adjusting screw until the engine runs smoothly at the correct idling speed. Turn the idling adjustment screw clockwise until the engine speed starts to drop as a weaker mixture is obtained. Now turn the idling adjustment screw anti-clockwise by one turn (one and a half turns for automatic transmission), to obtain a richer mixture.

Adjust the idling speed to 700 rpm (650 rpm for automatic transmission), by turning the throttle adjusting screw. Make sure that the ignition timing remains at 5º A.T.D.C.

Turn the throttle shaft arm adjusting screw clockwise until the tip of the screw just contacts the throttle shaft arm. The screw must not exert pressure on the throttle shaft arm.

EMISSION CONTROL SYSTEM - Maintenance

The system should be inspected and serviced every 12 months or 20,000 km (12,000 miles), whichever comes first, to make sure that the exhaust emissions are maintained at the minimum level.

1 Check the carburettor choke setting, and adjust as described in the section FUEL SYSTEM.

Check the carburettor idling speed mixture, and adjust if necessary, as described under the heading IGNITION TIMING AND IDLING SPEED in this section.

2 Check the distributor cam dwell angle, and also the condi tion of the contact breaker points. Check the ignition timing, and adjust if necessary. The distributor dwell angle should be adjusted to 49-55 degrees and the points gap to 0.45 - 0.55 mm (0.0177-0.0217 in.).

3. Remove and clean the sparking plugs. Renew any plug with badly worn electrodes. Set the plug gaps to 0.80-0.90 mm (0.0315 - 0.0355 in.) by adjusting the earth electrode.

IGNITION SYSTEM

The maintenance and servicing procedures for the components of the ignition system on vehicles fitted with the G18 engine are basically similar to the instructions previously given for the L14, L16 and L18 engines. The distributor is however of a different type. Either an Hitachi D416-57 distributor being fitted, or an Hitachi D423-53 if the vehicle is equipped with an emission control system. The distributors have different advance curve characteristics as shown in Technical Data.

IGNITION TIMING

Check the ignition timing with a timing light as previously described for the L14, L16 and L18 engines. Disconnect the distributor vacuum line, and run engine at idling speed, or slightly below. The timing should be set at 8 BTDC/600 rpm. for the D416-57 distributor, or at 5 ATDC/600 rpm for the D423-53 distributor fitted to engines with emission control systems.

IGNITION DISTRIBUTOR - Maintenance

Maintenance instructions are similar to those given for the L14, L16, and L18 engines. Set the contact breaker points gap to 0.45 - 0.55 mm (0.0177 - 0.0217 in.) as previously described.

SPARKING PLUGS

The sparking plugs should be inspected and cleaned at regular intervals, and renewed at approximately 20,000 km (12,000 miles). Clean the plugs thoroughly, and make sure they are of the same type and heat range. File the centre electrode flat before adjusting the gap. Set the gap to 0.8 - 0.9mm (0.031-0.035 in.) if the engine is fitted with emission control system or to 0.7 - 0.8 mm (0.028 - 0.031 in.) if emission control is not fitted. Adjustment must always be made by bending the earth electrode.

Technical Data

GENERAL SPECIFICATION (G18 Engine)

Cylinders	4 in line
Bore and stroke	85x80 mm (3.346x3.150 in.)
Displacement	1.815 cc. (110.8 cu. in.)
Valve arrangement	OHC
Firing order	1 - 3 - 4 - 2
Engine idler speed	600 r.p.m. (STD)
Compression ratio	8.3 : 1
Oil pressure at 3000 r.p.m.	4.7 to 5.5 kg/sq.cm (66.8 to 78.2 lb/sq. in.)

LIQUID PACKING APPLICATION

1. Cylinder block

Oil gallery blind plug
Expansion plug
Gas breather guide
Rear bearing cap fitting surface
Rear bearing cap side seal both ends

2. Cylinder head

Expansion plug
Rubber plug (Rear)
Manifold heat pipe

3. Chain cover gasket both sides

4. Cylinder head gasket (Cylinder block side).

5. Intake manifold

Control valve
Angle tube connector

6. Oil pump

Block installing surface near to oil exit

7. Rocker cover.

Tapping screw of buffle plate installing.

SPECIFICATION

a) Valve mechanism

Valve clearance (cold	In.	0.25 mm	(0.0098 in.)
	Ex.	0.25 mm	(0.0098 in.)
	(Hot)	(Reference value)	(0.0098 in.)
	In.	0.28 mm	(0.011 in.)
	Ex.	0.28 mm	(0.011 in.)
Valve head diameter	In.	42 mm	(1.654 in.)
	Ex.	35 mm	(1.378 in.)
Valve stem diameter	In. Ex.,	8 mm	(0.3150 in.)
Valve length	In.	116.4 mm	(4.58 in.)
	Ex.	117.2 mm	(4.61 in.)
Valve lift		9.0 mm	(0.354 in.)
Valve spring free length	Outer	42.5 mm	(1.673 in.)
	Inner	41.4 mm	(1.630 in.)
Valve spring loaded length	Outer	29.0 mm	(1.142 in.)
	Inner	26.0 mm	(1.024 in.)
Valve spring assembling height	Outer	37.0 mm	(1.457 in.)
	Inner	34.0 mm	(1.339 in.)
Valve spring effective wind number	Outer	4.5 mm	(0.1772 in.)
	Inner	6.25 mm	(0.2461 in.)
Valve spring wire diameter	Outer	4.2 mm	(0.1654 in.)
	Inner	2.9 mm	(0.1142 in.)
Valve spring coil diameter	Outer	27.5 mm	(1.083 in.)
	Inner	19.9 mm	(0.733 in.)
Valve guide length	In.	48 mm	(1.890 in.)
	Ex.	60 mm	(2.362 in.)
Valve guide height from cylinder head	In. Ex	16.7 mm	(0.657 in.)
Valve guide inner diameter	In. Ex	7 mm	(0.2756 in.)
Valve guide outer diameter	In. Ex	14.2 mm	(0.559 in.)
Valve guide to stem clearance	In.	0.025 - 0.055 mm (0.0010 - 0.0022 in.)	
	Ex.	0.04 - 0.077 mm. (0.0016 - 0.0030 in.)	
Valve guide interference fit	In. Ex	0.040 - 0.069 mm. (0.0016 - 0.0027 in.)	
Max. tolerance of above clearance	In. Ex	0.1 mm	(0.0049 in.)
Valve seat width	In. Ex.	2.05 - 2.33 mm. (0.0807 - 0.0917 in.)	
Valve seat angle	In. Ex	90°	

b) Camshaft and timing chain

Camshaft end play	0.07 - 0.148 mm (0.0028 - 0.0058 in.)	
Cam height	36.53 mm	(1.438 in.)
Camshaft journal diameter	37.45 - 37.475 mm (1.474 - 1.475 in.)	

Camshaft bend	0.1 mm	(0.0004 in.)
Camshaft bearing inner diameter	37.5 - 37.525 mm (1.476 - 1.477 in.)	
Camshaft journal to bearing clearance	0.025 - 0.075 mm. (0.0008 -0.0030 in.)	

c) Connecting rod

Centre distance	140 mm	(5.51 in.)
Big end play	0.110 - 0.246 mm. (0.0043 - 0.0097 in.)	
Connecting rod bearing clearance	0.05 mm	(0.0020 in.)
Connecting rod bend	0.03 - 0.06 mm (0.0012 - 0.0024 in.)	

Connecting rod bearing under size

Bearing size	Bearing thickness	Crank pin diameter
S.T.D.	1.483 - 1.499 mm (0.0584 - 0.0590 in.)	49.975 - 59.991 mm (1.967 - 1.968 in.)
25 U.S.	1.609 - 1.622 mm. (0.0633 - 0.0639 in.)	49.725 - 49.741 mm. (1.9576 - 1.9582 in.)
50 U.S.	1.734 - 1.747 mm. (0.0683 - 0.688 in.)	49.475 - 49.491 mm (1.9477 - 1.9483 in.)
75 U.S.	1.857 - 1.872 mm (0.0731 - 0.0737 in.)	49.225 - 49.241 mm (1.938 - 1.939 in.)
100 U.S.	1.984 - 1.997 mm (0.081 - 0.0786 in.)	48.975 - 48.991 mm (1.928 - 1.929 in.)

d) Crankshaft and main bearing

Journal taper and out of round	Less than 0.01 mm	.(0.0004 in.)
Crankshaft free end play	0.060 - 0.192 mm (0.0024 - 0.0008 in.)	
Wear limit of ditto clearance	0.3 mm	(0.0118 in.)
Crank pin taper and out of round	Less than 0.01 mm	(0.0004 in.)
Main bearing clearance	0.03 - 0.06 mm (0.0012 - 0.0024 in.)	
Wear limit of ditto clearance	1.0 mm	(0.0039 in.)

Main bearing under size

Bearing size	Bearing thickness	Crank journal diameter
S.T.D.	2.485 - 2.505 mm (0.0978 - 0.0986 in.)	55.971 - 55.990 mm (2.2036 - 2.2043 in.)
25 U.S.	2.612 - 2.625 mm (0.1028 - 0.1033 in.)	55.721 - 55.740 mm (2.194 - 2.195 in.)
50 U.S.	2.737 - 2.750 mm (0.1078 - 0.1083 in.)	55.471 - 55.490 mm (2.184 - 2.185 in.)
75 U.S.	2.862 - 2.875 mm (0.1127 - 0.1132 in.)	55.221 - 55.240 mm (2.174 - 2.175 in.)
100 U.S.	2.987 - 3.000 mm (0.1176 - 0.1181 in.)	54.971 - 54.990 mm (2.164 - 2.165 in.)

Crankshaft bend	Less than 0.02 mm	(0.0008 in.)

e) Piston

Piston diameter		84.968 - 85.0 mm (3.345 - 3.346 in.)	
Ellipse - difference		0.4 mm	(0.0157 in.)
Ring groove width	Top	+ 0.05	+0.0020
		2.0 +0.03 mm (0.0787 +0.0012 in.)	
	Second	+0.03	+0.0012
		2.0 +0.01 mm (0.0787 + 0.0004 in.)	
	Oil	+ 0.03	+0.0012
		4.0 +0.01 mm (0.1575 + 0.0004 in.)	

Piston to bore clearance		0.035 - 0.55 mm (0.0014 - 0.0022 in.)
Piston ring side clearance	Top	0.04 - 0.08 mm (0.0016 - 0.0031 in.)
	Second	0.02 - 0.06 mm (0.0008 - 0.0024 in.)
	Oil	0.02 - 0.06 mm (0.0008 - 0.0024 in.)
Ring gap	Top	0.35 - 0.55 mm (0.0138 - 0.0217 in.)
	Second	0.3 - 0.5 mm (0.0118 - 0.0197 in.)
	Oil	0.35 - 0.55 mm (0.0138 - 0.0217 in.)
Ring height	Top	- 0.01 0.0004 2 - 0.03 mm (0.0787 - 0.0012 in.)
	Second	- 0.01 - 0.0004 2 - 0.03 mm (0.0787 - 0.0012 in.)
	Oil	- 0.01 - 0.0004 4 - 0.03 mm (0.1575 - 0.0012 in.)
Piston pin interference fit of piston pin to piston		0 - 0.09 mm (0 - 0.0035 in.)
Clearance between piston pin a connecting rod bushing		0.003 - 0.013 mm (0.0001-0.0005 in.)
Piston pin outer diameter		21.991 - 22.0 mm (0.8658 - 0.8661 in.)
Connecting rod bushing inner diameter		21.995 - 22.008 mm (0.8659 - 0.8664 in.)

EMISSION CONTROL

Crankcase emission control	Closed type
Exhaust emission control	Nissan Air Injection System
Carburettor	Nihonkikaki D3034C
Distributor	Hitachi D423
Spark plugs	BP - 6E
Air pump:	
Model	ECP 200-IA
Capacity	200 cc/rev
Pulley ratio	120 : 120 (1.00)

Anti-backfire valve:	
Type	Air by-pass
Model	DV54
Duration time	1.3 - 1.7 sec. at 500 Hg (19.7 in. Hg).
Check valve:	
Type	AMC
Opening pressure	0.15 mAq. (5.91 in. Aq).
Cooling fan:	
Type	Spider
No. of blades	4

Fan coupling	Fan rpm/water pump rpm 3,300 4,000
Pulley ratio-fan and water pump	120 : 103 (1.17)
Tuning data	
Basic timing	5° A.T.D.C.
Idling speed	700 rpm (650 rpm, automatic)
Distributor dwell angle	49° - 55° at 0.02 in breaker gap
Spark plug gap	0.80-0.90 mm (0.0315-0.0355 in.)
Choke setting	Manual
CO percent setting	6.0 + 1 - 0.5% (air supply hose disconnected).
Air pump drive belt tensioning	Permissible slackness of 8.0-12.0 mm (0.315-0.472 in.) under a load of 7-10 kg (1.54-2.20 lb.)

IGNITION SYSTEM

DISTRIBUTOR

Type	Hitachi D416-57 Hitachi D423-53 (with emission control system)
Firing order	1 - 3 - 4 - 2
Rotation	Anti-clockwise
Ignition timing:	
Without emission control	8° B.T.D.C. at 600 rpm
With emission control	5° A.T.D.C. at 600 r.p.m.
Dwell angle	49 to 55 degrees
Condenser capacity	0.20 - 0.24 μF
Advance characteristics (D416-57 distributor)	
Centrifugal:	
Start	550 r.p.m.
Maximum (degree/r.p.m.)	(11.5° at 1,400) 16.5° at 2,800
Vacuum:	
Start	80 mmHg
Maximum (degree/r.p.m.)	6.5° at 200 r.p.m.
Advance characteristics (D423-53 distributor)	
Centrifugal:	
Start	475 r.p.m.
Maximum (degree/r.p.m.)	(11.5° at 1,000) 23.5° at 2,600
Vacuum:	
Start	80 mm. Hg.
Maximum (degree/r.p.m.)	3° at 120 r.p.m. 8° at 400 r.p.m.

IGNITION COIL

Type	Hanshin HM-12F, or HP5-10E with emission control system
Primary voltage	12 volts
Spark gap	more than 6 mm. (0.2362 in.)
Primary resistance	3.8 ohms at 20°C
Secondary resistance	11.2-16.8 ohms at 20° C

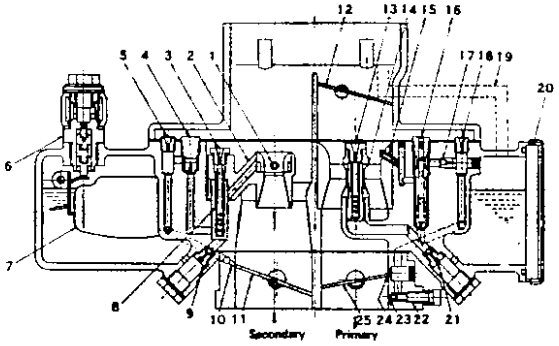
SPARKING PLUGS

Type	NGK BP-6E
Gap	0.7-0.8 mm (0.028-0.031 in.) or 0.8 0.9 mm (0.031-0.035 in.) with emission control system.

Fuel System

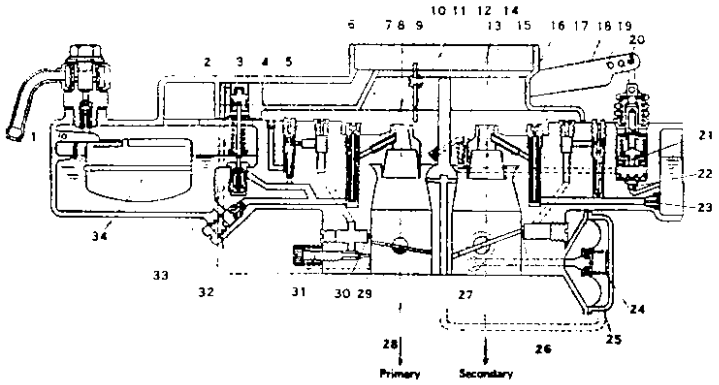
DESCRIPTION

A dual barrel down draught type carburettor is fitted to vehicles with the G18 engine. A Stromberg type D3034C carburettor is installed on engines with exhaust emission control, and a Solex type DAK340 carburettor on engines not equipped with this type of system. Both types of carburettors incorporate a primary system for normal running, and a secondary system for full load running, a float assembly which supplies fuel to both primary and secondary systems, a starting mechanism and accelerator pump which provides a richer mixture on acceleration.



1. *S Main nozzle*
2. *S Small venturi*
3. *S Main air bleed*
4. *S Slow jet*
5. *S Slow air bleed*
6. *Needle valve*
7. *Float*
8. *S Emulsion tube*
9. *S Main jet*
10. *S By-pass hole*
11. *S Throttle valve*
12. *Choke valve*
13. *P Main air bleed*
14. *P Main nozzle*
15. *Economizer bleed*
16. *P Slow jet*
17. *Slow economizer*
18. *P Slow air bleed*
19. *Air vent*
20. *Level gauge*
21. *P Main jet*
22. *Idle limitter*
23. *Idle hole*
24. *P By-pass hole*
25. *P Throttle valve*

Fig.B.1 Sectional view of the DAK340 carburettor



1. *Float valve*
2. *Vacuum piston*
3. *P Slow air bleed*
4. *Slow jet*
5. *Slow economizer*
6. *P Slow air bleed*
7. *Air vent*
8. *P Main air bleed*
9. *P Main nozzle*
10. *P Small venturi*
11. *Choke valve*
12. *Pump nozzle*
13. *Pump weight*
14. *Discharge check valve*
15. *S Small venturi*
17. *S Main air bleed*
18. *Step air bleed*
19. *Pump arm*
20. *Step jet*
21. *Pump plunger*
22. *Inlet check valve*
23. *S Main jet*
24. *Diaphragm spring*
25. *Diaphragm*
26. *Step port*
27. *Idle port*
28. *P Throttle valve*
29. *Idle port*
30. *Slow port*
31. *Idle adjust screw*
32. *P Main jet*
33. *Power jet*
34. *Float*

Fig.B.2 Sectional view of the D3034C carburettor fitted to engines with emission control system

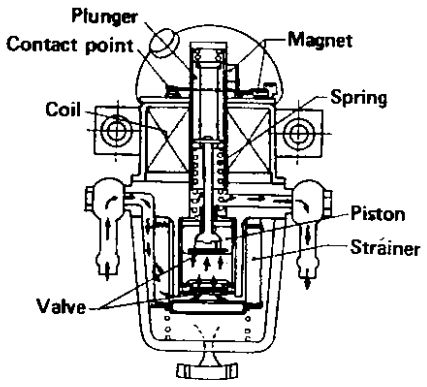
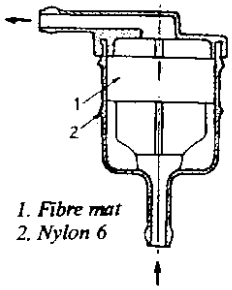


Fig.B.3 Electrical fuel pump



1. *Fibre mat*
2. *Nylon 6*

Fig.B.4 Fuel strainer

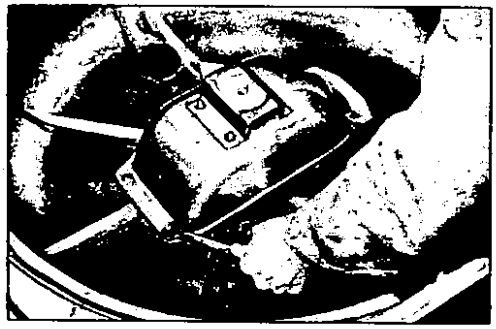


Fig.B.5 Removing the fuel pump cover

The type D3034C carburettor has certain additional features. These include a power valve mechanism to improve the performance at high speed, a fuel cut-off valve which cuts the fuel supply when the ignition key is turned to the off position and an idling limiter to maintain the emissions below a certain level.

Sectional views of the two types of pumps are shown in Figs. B.1 and B.2 An EP-3 electrical fuel pump is located in the centre of the spare wheel housing in the boot. Fig.B.3 shows a sectional view of the pump with its contact the pump mechanisms solenoid relay, and built-in filter.

The air cleaner uses a viscous paper type element which should be replaced every 40,000 km (24,000 miles). Cleaning is not required, and should not be attempted.

The cartridge type fuel strainer incorporates a fibre element which should be renewed at inervals not exceeding 40,000 km (24,000 miles). Fit B.4 shows a sectional view of the assembly. The fuel lines should not be disconnected from the strainer when the fuel tank is full, unless absolutely necessary, as the strainer is below the fuel level.

FUEL PUMP - Testing

Disconnect the fuel hose from the pump outlet. Connect a hose with an inner diameter of approximately 6 mm (0.024 in.) to the pump outlet, and place a container under the end of the pipe. Note that the inner diameter of the pipe must not be too small, or the pipe will be incapable of delivering the correct quantity of fuel when testing, Hold the end of the hose above the level of the pump, and operate the pump for more than 15 seconds to check the delivery capacity. The capacity should be 1,400 cc (3.24 U.S. pts) in one minute or less. The pump must be removed from the vehicle if it does not operate. or if a reduced quantity of fuel flows from the end of the hose. Remove the pump from the vehicle, and test as follows:-

Connect the pump to a fully charged battery. If the pump now operates and discharges fuel correctly, the fault does not lie in the pump, but may be attributed to any of the following causes. Battery voltage drop, poor battery earth, loose wiring, loose connections, blocked hoses, or a faulty carburettor.

If the pump does not operate and discharge fuel when connected to the battery, then the pump itself is faulty, and must be checked as follows:-

First make sure that current is flowing. This will be indicated by sparking at the terminals. If current flows the trouble is caused by a sticking pump plunger or piston. The pump must be dismantled in this case, and the parts thoroughly cleaned in petrol.

If the current does not flow, a coil or lead wire is broken, and the pump must be renewed. A reduced fuel flow is caused by a faulty pump inlet or discharged valve, or blocked filter mesh. The pump must of course be dismantled and serviced as necessary.

FUEL PUMP - Removing and Dismantling

1. Remove the bolts attaching the fuel pump cover to the floor panel, (see Fig.B.5). Remove the bolts attaching the pump to the cover.
2. Disconnect the cable and fuel hoses. Withdraw the pump.

Dismantle as follows:

Slacken the locking band screws, and remove the strainer. strainer spring, filter, strainer seal, and locking band. Remove the snap ring. Withdraw the four screws from the yoke, and remove the electromagnetic unit. Press the plunger down, and withdraw the inlet valve, the packing and the cylinder, and plunger assembly.

A defective electrical unit cannot be dismantled, as it is sealed and must be renewed as a complete unit.

FUEL PUMP - Inspection and Assembly

Wash the strainer, filter, and gasket in petrol, and dry using compressed air. Renew the filter and gasket if necessary. Note that the filter should be cleaned every 40,000 km (24,000 miles). Wash the plunger, piston and inlet valve in petrol, and make sure the piston moves smoothly in the cylinder. Replace the parts if found to be defective.

Insert the plunger assembly into the cylinder of the electrical unit, and move the assembly up and down to make sure that the contacts are operated. If the contacts do not operate, the electrical unit is faulty, and must be renewed.

Assembly is a reversal of the dismantling procedures, taking care to renew the gaskets as necessary.

CARBURETTOR - Idling Adjustment

The D3034C carburettor fitted to engines equipped with an emission control system must be adjusted as described under the heading. IGNITION TIMING AND IDLING SPEED in the section EMISSION CONTROL SYSTEM.

Reference should be made to carburettor idling adjustment procedures for the L14, L16, and L18 engines when adjusting the type DAK 340 carburettor fitted to the G18 engine. A smooth engine speed of approximately 550 rpm, should be attained in this case.

FUEL LEVEL - Adjustment (DAK 340 carburettor)

A constant fuel level in the float chamber is maintained by the float and needle valve (See Fig.B.6). If the fuel level does not correspond with the level gauge line, it will be necessary to carefully bend the float seat until the float upper position is correctly set.

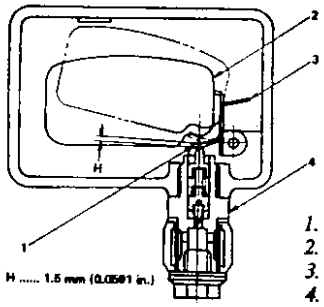
The clearance 'H' between valve stem and float seat should be 1.5 mm (0.0059 in.) with the float fully lifted. Adjustment can be carried out by carefully bending the float stopper (3).

FUEL LEVEL - Adjustment (D3034C carburettor)

The fuel level should correspond with the level gauge line. Adjustment can be carried out, if necessary, by changing the gaskets between the float chamber body and needle valve seat. The gaskets are shown as item 4 in Fig.B.7. When correctly adjusted, there should be a clearance of approximately 7 mm (0.027 in.) between float and chamber, as indicated.

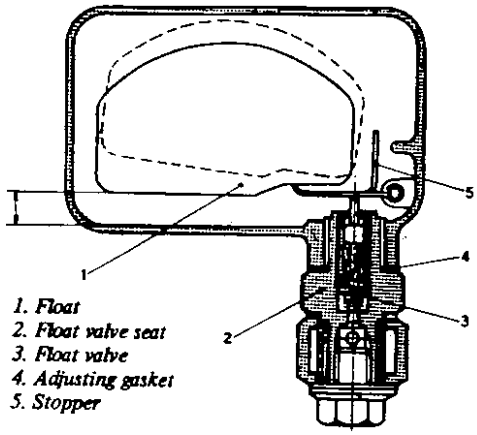
STARTING INTERLOCK VALVE OPENING

The choke valve, at its fully closed position, automatically opens the throttle valve to an optimum angle of 14 degrees on the type DAK 340 carburettor and 13.5 degrees on the D3034C carburettor. With the choke valve fully closed, the clearance 'G1' in Fig..8 should be 1.1 mm (0.0433 in.). This clearance



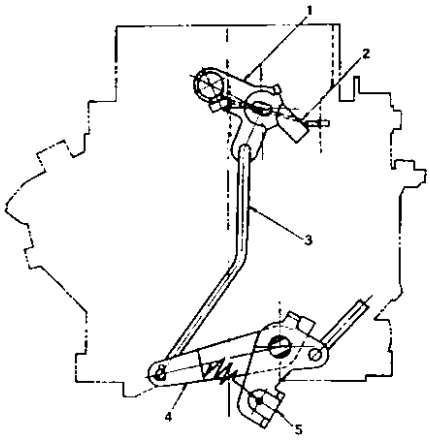
1. *Float seat*
2. *Float*
3. *Float stopper*
4. *Needle valve*

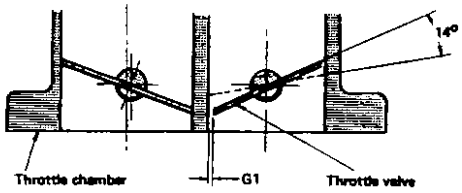
Fig. B.6 Adjusting the fuel level - DAK340 carburettor



1. *Float*
2. *Float valve seat*
3. *Float valve*
4. *Adjusting gasket*
5. *Stopper*

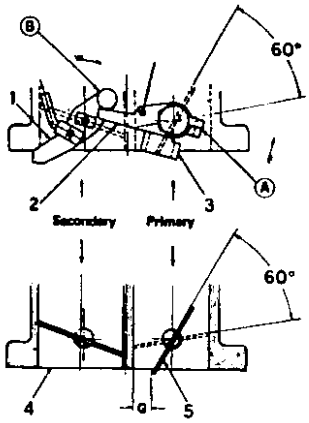
Fig.B.7 Adjusting the fuel level - D3034C carburettor





1. *Choke lever*
2. *Choke valve*
3. *Connecting rod*
4. *Connecting lever*
5. *Throttle lever*

Fig.B.8 Adjusting the starting interlock opening



1. *Connecting lever*
2. *Return plate*
3. *Adjust plate*
4. *Throttle chamber*
5. *Throttle valve*

Fig.B.9 Adjusting the throttle valve interlock opening - DAK340 carburettor

1. *S Throttle arm*
2. *S Throttle return lever*
3. *Link*
4. *P Throttle arm*
5. *P Throttle valve*

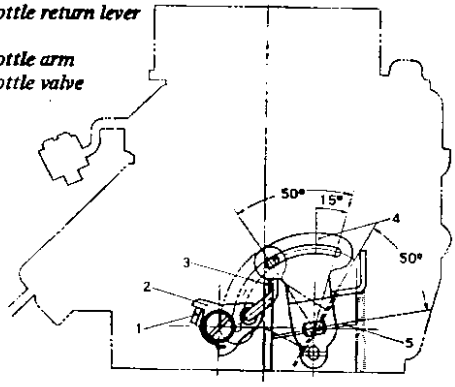


Fig.B.10 Adjusting the throttle valve interlock opening - D3034C carburettor

between primary throttle valve and the wall of the throttle chamber can be adjusted, if necessary, by carefully bending the choke connecting rod (3).

THROTTLE VALVE INTERLOCK OPENING

With the primary throttle valve of the type DAK340 carburettor opened to 60° as shown in Fig.B.9, the adjusting plate (3) should contact the connecting lever (1). This being the point before the secondary throttle valve is brough into operation. The linkage between primary and secondary throttles is working correctly if the clearance 'G' between primary throttle valve and the wall of the chamber is 7.38 mm (0.3937 in.). Adjust, if necessary, by carefully bending the adjusting plate at point 'A', until the correct setting, is obtained.

With the primary throttle valve of the type D3034C carburettor opened at an angle of 50° , the connecting link (3) in Fig.B.10 should be at the extreme left of the slot in the throttle arm (4). With the linkage positioned as shown, measure the clearance between primary throttle valve and the wall of the chamber as described for the DAK340 carburettor. Adjustment can be made, if necessary, by bending the connecting link until the correct clearance is obtained.

CARBURETTOR - Removing and Dismantling

The carburettor can be removed by following the instructions previously given for carburettor removal on the L14, L16 and L18 engines.

Dismantle the type DAK340 carburettor as follows:-

Remove the primary throttle return spring. Take off the 'E' ring, and remove the pump and connecting rod. Remove the split pin and choke connecting rod. Remove the secondary throttle return spring. Remove the choke wire arm, choke valve, shaft and valve spring. Take off the clip, and remove the choke lever and spring. To dismantle the float chamber, take off the diaphragm cover and remove the spring and diaphragm. Remove the diaphragm chamber and gasket. Take off the float chamber cover, and remove the gasket, level gauge, rubber seal, and float.

Remove the screw from the filter, and withdraw the nipple and filter. Remove the needle valve. Take off the cylinder cover and pump cover, and withdraw the piston, piston return spring, and inlet valve. Remove the primary main air bleed, the secondary main air bleed, and emulsion tube. Take off the small venturi and remove the primary and secondary slow jets and slow air bleeds. Remove the drain plugs, and take out the primary and secondary main jets.

To dismantle the throttle chamber, remove the throttle adjusting screw and spring, and the idling adjusting screw and spring. Withdraw the throttle lever, spring hanger, sleeve connecting lever, return plate, and adjusting plate. Withdraw the primary throttle valve and primary throttle shaft . Withdraw the secondary throttle valve and secondary throttle shaft.

The type D3034C carburettor can be dismantled as follows:- Detach the starting connecting rod from the choke lever and accelerator pump connecring rod.

Remove the air horn, pump rod, slow jets, the primary and secondary small venturies. Detach the primary and secondary linkages. Take off the diaphragm chambe cover, and take out the spring and diaphragm. Remove the diaphragm chamber and gasket. Separate the float chamber from the throttle chamber, take off the float chamber cover, and remove the components. Remove the inlet strainer and float valve seat. Remove the main jets, and take off the fuel cut-off valve.

CARBURETTOR - Assembly and Installation

The assembly and installation of the carburettor is a reversal of the dismantling and removal procedures.

Clean and inspect all components as described for the carburettors fitted to the L14, L16, and L18 engines.

Technical Data

CARBURETTOR

Carburettor (Type DAK340)

	Primary	Secondary
Outlet diameter	30 mm	34 mm
Venturi diameter	23 mm	29 x 9 mm
Main jet	119	165
Main air bleed	220	100
Slow jet	48	90
Slow air bleed	130	100
Slow economizer	1.4 mm	-
Economizer bleed	1.2 mm	-

Carburettor (Type D3034C)

	Primary	Secondary
Bore	30 mm	34 mm
Large venturi	23 mm	28 mm
Small venturi		
First	7 mm	8 mm
Second	14 mm	16 mm
Main jet	102	155
Slow jet	50	80
Main air bleed	60	80
Emulsion hole	0.5 mm	0.5 mm
Slow air bleed:		
First	160	-
Second	150	220
Slow economizer	1.6 mm dia.	
Power jet	50	
Cushion jet	120	
Air jet	150	

Power system	Vacuum acting
Vacuum piston diameter	9.0 mm (0.354 in.)
Piston spring	100 gr. (0.220 lbs) - 31 mm (1.22 in.)
Power valve spring	40 gr. (0.0882 lbs) - 8.6 mm (0.34 in.)

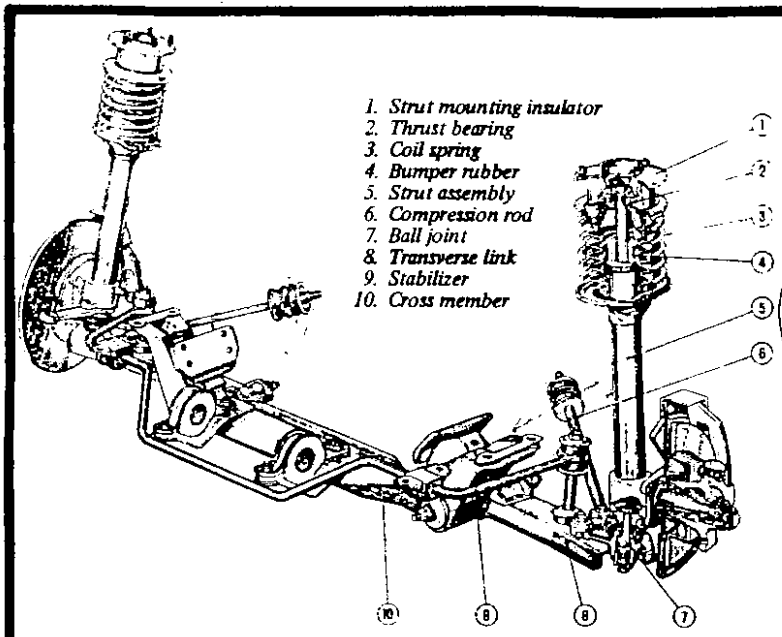


Fig.C.1 Front suspension assembly

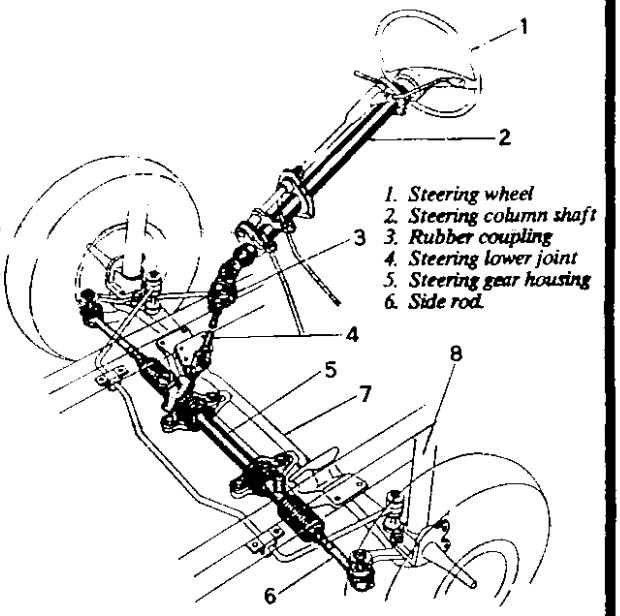


Fig.C.2 The steering gear

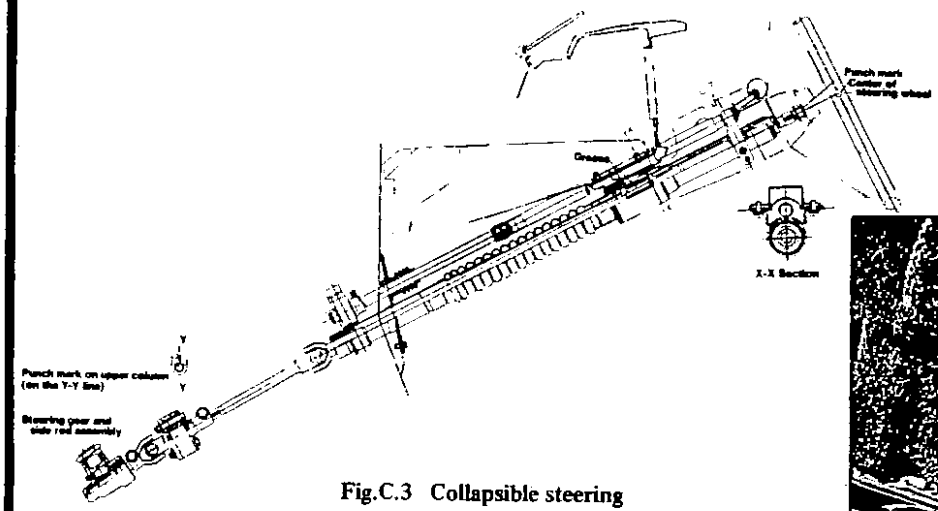


Fig.C.3 Collapsible steering

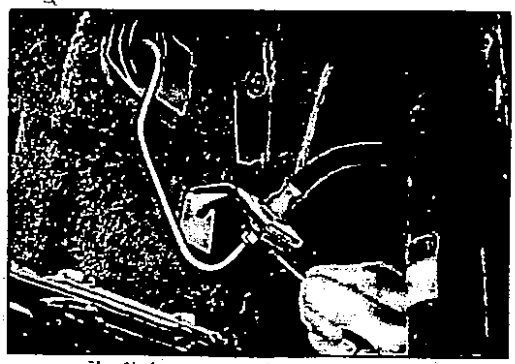


Fig.C.4 Disconnecting the brake hose

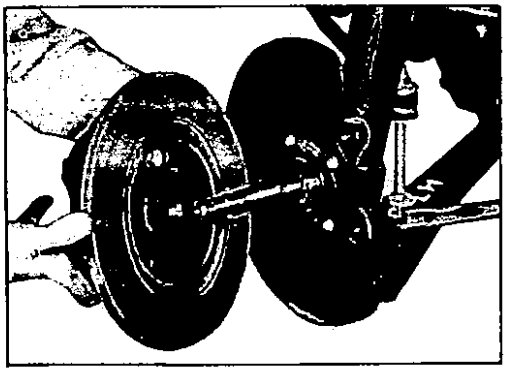


Fig.C.5 Removing the front hub and brake disc

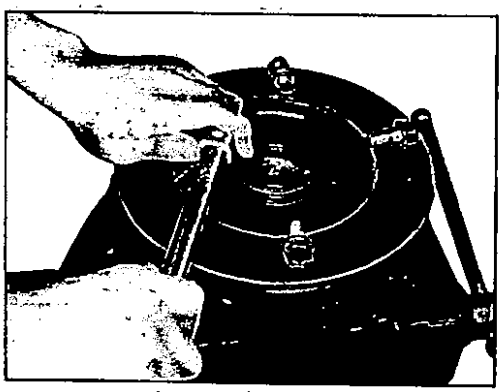


Fig.C.6 Detaching the brake disc

Accelerator pump	
Piston diameter	14.0 mm (0.551 in.)
Pump discharge	
Outer hole position	0.2 cc per stroke
Middle hole position	0.4 cc per stroke
Inner hole position	0.6 cc per stroke
Pump nozzle diameter	0.5 mm (0.020 in.)
Main nozzle diameter:	
Primary	2.3 mm (0.0906 in.)
Secondary	2.8 mm (0.110 in.)

Throttle valve fully closed angle:	
Primary	10 degrees
Secondary	20 degrees
Idling opening	5 degrees approx.
Choke valve fully closed angle	10 degrees
Throttle opening at full choke	13.5 degrees

FUEL PUMP

Type	Electric
Delivery	1400 cc . in one minute

Emission control system

Air pump bracket to cylinder head nut	1.6-2.4 kgm. (11.6-17.4 lb.ft.)
Adjusting bar to bracket bolt	1.6-2.4 kgm. (11.6-17.4 lb.ft.)
Air pump to bracket bolt	1.6-2.4 kgm. (11.6-17.4 lb.ft.)
Air pump to adjusting bar nut	1.6-2.4 kgm. (11.6-17.4 lb.ft.)
Anti-backfire bracket to rocker cover	0.40-0.65 kgm. (2.9-4.7 lb.ft.)
Anti-backfire valve to bracket	0.40-0.65 kgm. (2.9-4.7 lb.ft.)
Sensing hose clamp to rocker cover	0.40-0.65 kgm (2.0-4.7 lb.ft.)
Air gallery to exhaust manifold plug	5.0-6.0 kgm. (36.2-43.4 lb.ft)
Check valve to air gallery	9.0-10.5 kgm. (65.1-75.9 lb.ft)

Front Suspension & Steering

DESCRIPTION

The front suspension is of the strut type, with the coil spring and hydraulic damper units mounted on the crossmember and transverse link assembly, (See Fig.C.1). Vertical movement of the suspension is controlled by the strut assembly. Forward and rearward movement is absorbed by compression rods (6), and side movement controlled by the transverse links. Front suspension servicing procedures are similar to those given for vehicle fitted with L14, L16 and L18 engines, and can be carried out by reference to the instructions given in the appropriate section. Camber and castor angles are preset, and cannot be adjusted, and a check must be made for signs of damage to the suspension system if the angles do not conform to the figures given in Technical Data.

The steering is of the direct acting rack and pinion type (See Fig.C.2). A rubber coupling, which absorbs vibration and two universal joints are incorporated between the steering wheel and gear assembly. The collapsible type of steering column assembly (Fig.C.3) is an optional fitting. A full description of this type of assembly is given in the Steering section for L14, L16 and L18 engines.

STEERING - Maintenance

The steering system should be lubricated every two years, or 50,000 km. (30,000 miles), whichever comes first.

A lithium base multipurpose grease must be used for the rack and pinion, and rack and tie rod joints. The plug on the steering gear housing should be removed, and a grease nipple fitted, so that the recommended quantity of 10 to 15 gram (0.35 to 0.53 oz.) of grease can be injected. Remove the grease nipple, and replace the plug when lubrication is completed. The grease reservoir on the tube side should be replenished when the level of grease falls to approximately one third of its capacity.

WHEEL HUB AND BEARING - Removal and Installation

Wheel hub and bearing servicing procedures are similar to those previously given for vehicles fitted with L14, L16 and L18 engines.

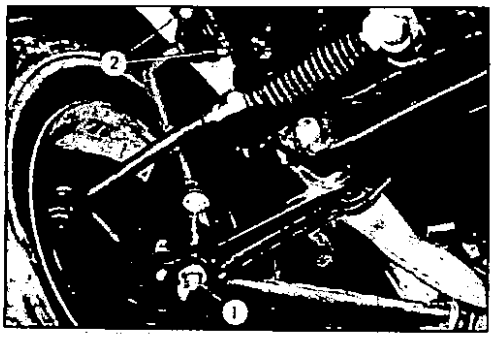


Fig.C.7 Removing the stabilizer

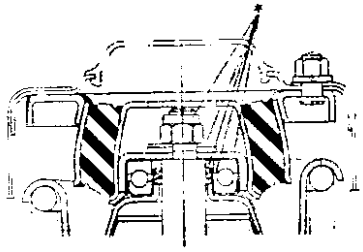


Fig.C.8 Greasing points on the strut mounting insulator

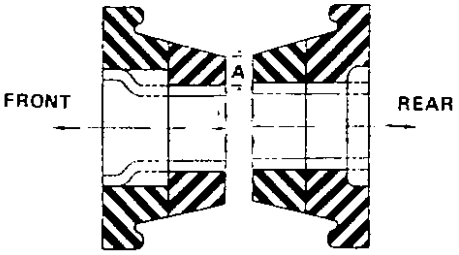


Fig.C.9 Section through the transverse link bush

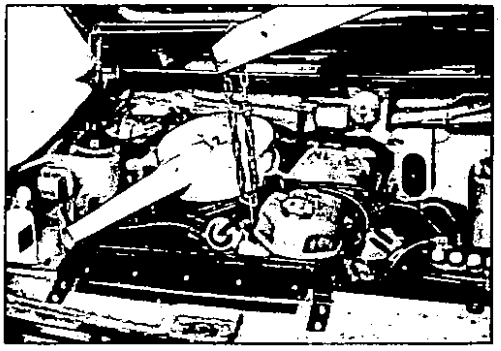


Fig.C.11 Supporting the engine

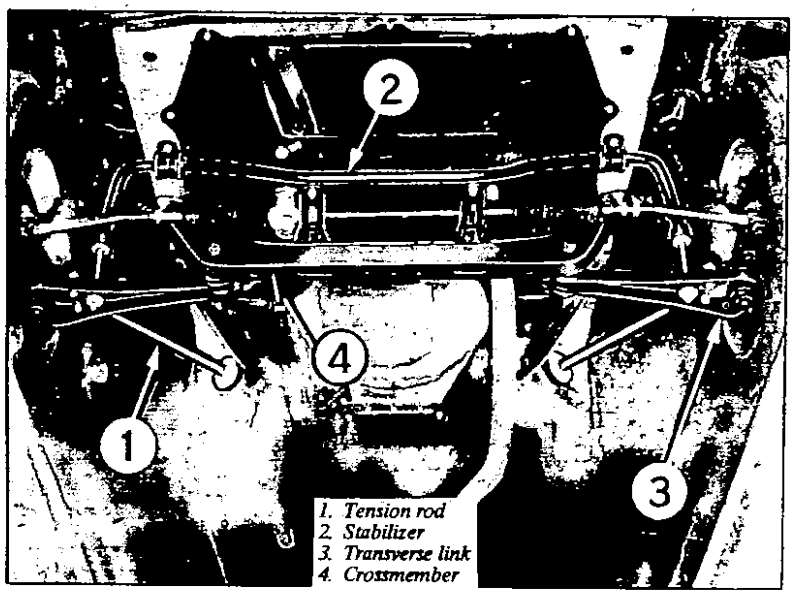


Fig.C.10 View of the front suspension

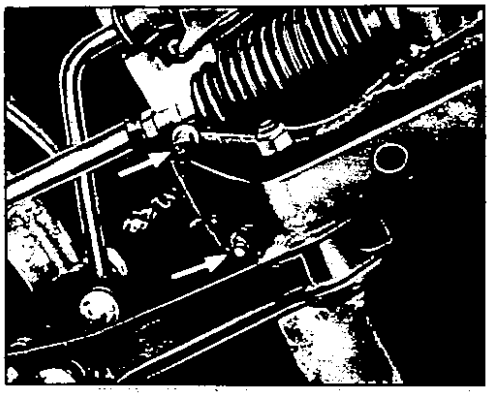


Fig.C.12 Removing the suspension member

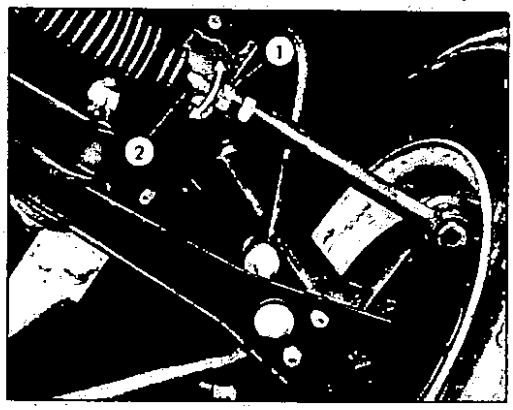


Fig.C.13 Adjusting the toe-in

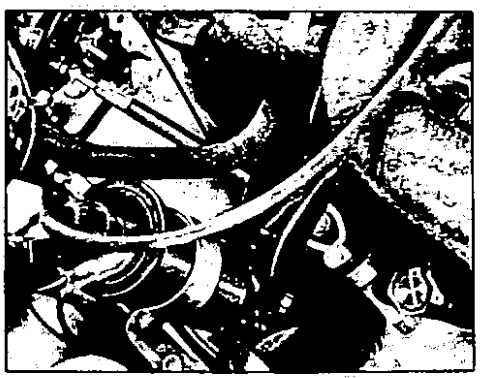


Fig.C.14 Removing the rubber coupling bolts (R.H.D.)

Remove the road wheel, and disconnect the brake hose at the connector, as shown in Fig.C.4 of this section.

Remove the brake calliper assembly and hub cap. Withdraw the cotter pin, and remove the wheel bearing locknut.

Remove the wheel bearing washer, and take off the hub and brake disc (Fig.C.5). Remove the bearing collar, take out the outer bearing cage, and prise out the hub grease seal. Remove the inner bearing cage, and drive out the outer races of the inner and outer bearings, using the special drift ST4912000, if available.

Separate the brake disc from the hub, by taking out the retaining bolts, as shown in Fig.C.6.

Installation is a reversal of the removal procedure. Adjust the wheel bearings, as previously described, taking care to tighten the wheel bearing locknut to the specified torque reading of 3.0 to 3.5 kgm (21.7 to 25.3 lb.ft.). Turn the hub several times to settle the bearing, then retighten the nut to the same figure. Slacken the locknut by a quarter turn (90°), and insert the cotter pin when the hole in the spindle is aligned with the hole in the nut. Check that the force required to turn the hub is less than 7.0 kg.cm (97.2 in. oz).

STABILIZER - Removal and Installation

Remove the splash board, and take off the bolts (1 in Fig.C.7) which attach the stabilizer at the transverse link sides.

Remove the bolts attaching the stabilizer bracket (2) to the frame, then withdraw the stabilizer.

Check the bar and rubber components for signs of deformation or damage, and renew as necessary.

Installation is a reversal of the removal procedures. Tighten the fixing bolts to a torque reading of 1.2 to 1.7 kgm (8.7 to 12.3 lb.ft.) at the transverse link side and 1.9 to 2.5 kgm (13.7 to 18.1 lb.ft.) at the frame bracket.

SPRING AND STRUT ASSEMBLY

The spring and strut assembly can be serviced, by following the instructions previously given for the assemblies on vehicles fitted with the L14, L16 and L18 engines.

When reassembling, make sure that the parts shown in Fig.C.8 are thoroughly greased. Installation of the assembly will be accomplished more easily if the dust cover on the bonnet ledge is removed.

Tighten the nuts and bolts to a torque figures given in TIGHTENING TORQUES.

TRANSVERSE LINK AND LOWER BALL JOINT

The transverse link and lower ball joint can be removed in a similar manner to the parts on vehicles fitted with L14, L16 and L18 engines.

Renew the link if cracked or damaged in any way. Check the measurement 'A' in Fig.C.9. The measurement between front and rear transverse link bushes should be less than 1.0 mm (0.039 in.). Replace the bushes if necessary. The lower ball joint should be replaced if the axial play of the joint exceeds 0.03 to 0.6 mm (0.0012 to 0.0136 in.).

A grease nipple must be installed in place of the ball joint plug so that the joint can be lubricated with multi-purpose grease, as previously described.

SUSPENSION MEMBER - Removing and Installing

1. Jack up the vehicle, and support it on stands.
2. Remove the splash board. Refer to Fig.C.10, and detach the compression rod (1), the stabilizer (2), from the transverse link (3). Detach the steering linkage from the suspension crossmember (4).
3. Take out the nuts attaching the transverse links, and remove the links at both sides of the vehicle.
4. Support the engine with a hoist as shown in Fig.C.11, taking care not to damage the throttle and remote control linkages, and then remove the engine mounting bolts at both sides.
5. Remove the bolts shown arrowed in Fig.C.12, and lift the suspension member away.

Renew the suspension member if it is cracked or deformed in any way. Installation is a reversal of the removal procedure.

FRONT WHEEL ALIGNMENT

As previously stated, the castor and camber angles are preset, and cannot be adjusted. A thorough check should be made of the steering and suspension system, and all defective parts renewed, if the angles are incorrect (See Technical Data).

The front wheels should toe-in 12 to 15 mm (0.47 to 0.59 in.). Adjustment can be carried out by slackening the locknuts (1 in Fig.C.13), and then turning the tie-rods, by an equal amount, until the correct toe-in is achieved. A toe-in gauge will, of course, be required for this operation.

STEERING WHEEL AND COLUMN - Removal

1. Disconnect the horn wire, and remove the horn bar. Remove the steering wheel nut, and pull off the steering wheel.
2. Remove the turn signal and lighting switch assembly, followed by the steering column shell covers.
3. Remove the bolts from the rubber coupling to disconnect the lower joint (See Figs. C.14 and C.15), if the car is fitted with right-hand drive. The lower joint upper bolt should be removed to disconnect the joint, if the car is fitted with left-hand drive.
4. Remove the cotter pin from the trunnion, and disconnect the gearchange rod and selector rod.
5. Remove the steering column upper clamp, and take out the bolts securing the lower plate.

STEERING COLUMN - Dismantling and Assembling

Remove the 'C' washer, socket screw, and upper bracket bolt. Remove the lower bracket bolts, and detach the remote control linkage from the column assembly.

Remove the snap ring at the top of the column, and extract the column shaft from the jacket.

Disconnect the rubber coupling from the lower joint, then remove the snap ring, and dismantle the lower joint.

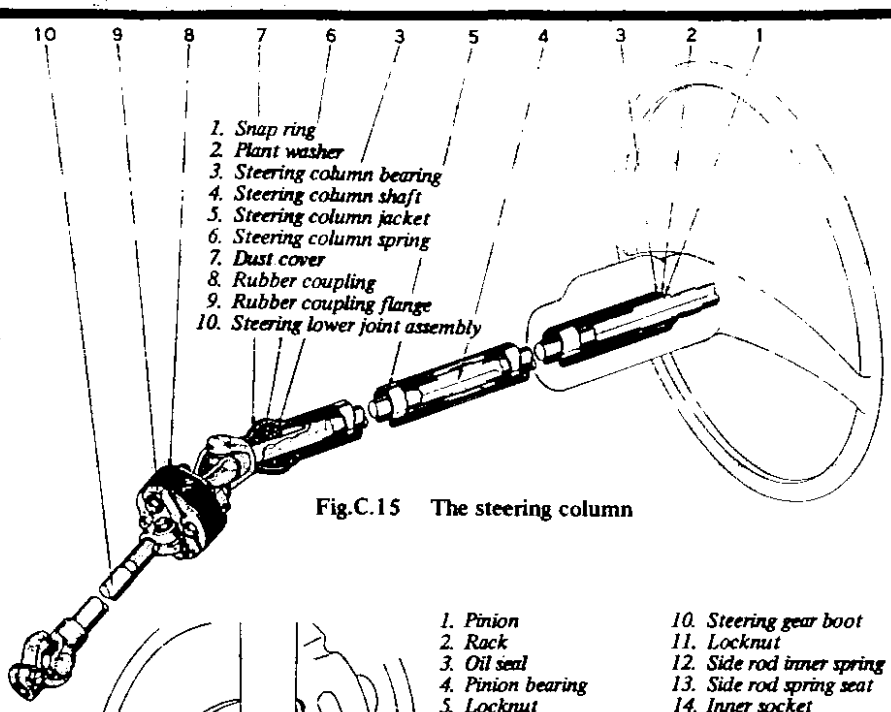
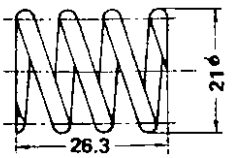
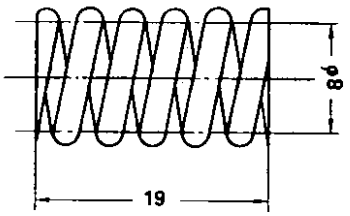


Fig.C.15 The steering column



Wire diameter	2.6 mm. (0.102 in.)
Free length	26.3 mm. (1.035 in.)
Coil turns	5.5
Load x length	20 kg. (44 lbs.) x 16.3 mm. (0.642 in.)

Fig.C.20 Retainer spring



Wire diameter	2.6 mm. (0.102 in.)
Free length	19.0 mm. (0.748 in.)
Coil turns	6.3
Load x length	40 kg. (88 lbs.) x 17.0 mm. (0.669 in.)

Fig.C.21 Tie-rod spring

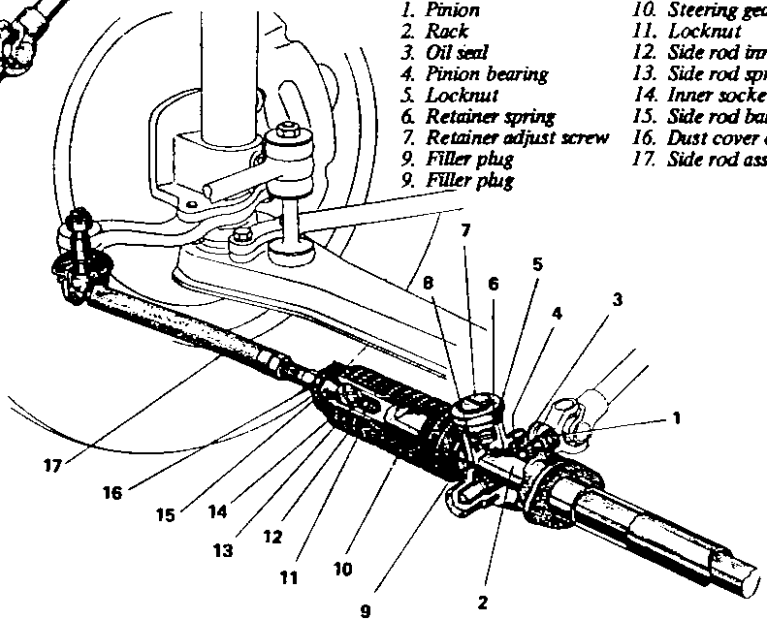


Fig.C.16 The rack and pinion with tie-rod

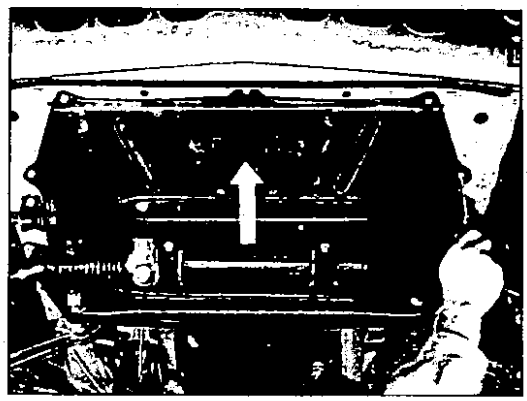


Fig.C.17 Removing the splash board

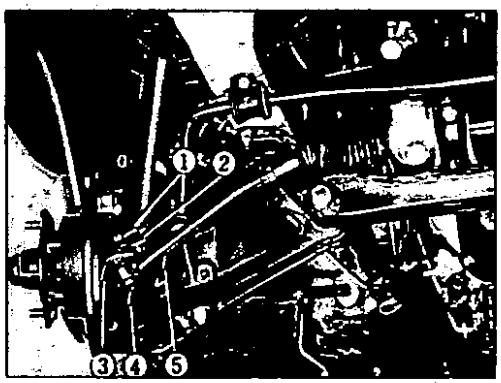


Fig.C.18 Tie-rod ball stud

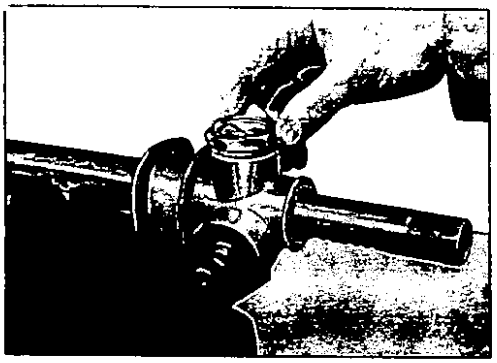


Fig.C.19 Removing the retainer locknut

Clean all parts thoroughly, and renew if damaged. If the column shaft or jacket is excessively damaged, the steering gear housing must be checked. A damaged bearing must be replaced together with the column jacket assembly.

Assembly is a reversal of the dismantling procedures. The column shaft journal should be lubricated with multipurpose grease, which can also be used to fill up the dust cover. Grease the needle bearing when assembling the universal joint. Use the tightest snap ring available when fitting the needle bearing. Snap rings are supplied in oversizes of 0.95 mm, 1.05 mm and 1.15 mm (0.0374, 0.0413 and 0.0453 in.).

Installation of the column assembly is a reversal of the removal procedures. Tighten the rubber coupling bolts to a torque reading of 1.5 to 1.8 kgm (10.8 to 13.0 lb.ft.). Refit the steering wheel, and tighten the nut to a reading of 4.0 to 5.0 kgm (28.9 to 36.2 lb.ft.).

RACK AND PINION AND TIE-ROD - Removing and Dismantling

1. Jack up the vehicle, and support it on stands. Remove the road wheels.
2. Slacken the bolts connecting the pinion to the steering lower joint (See Figs. C.16).
3. Remove the bolts from the steering column rubber coupling (See Fig.C.15), and remove the splash board (Fig.C.17).
4. Remove the tie-rod ball stud nut, and disconnect the tie-rod from the knuckle arm (Fig.C.18).
5. Lift the engine slightly with suitable tackle, but take care not to damage the accelerator or remote control linkage.

   Remove the bolts securing the steering gear housing to the suspension member. Withdraw the rack and pinion assembly.

Dismantle as follows

Detach the steering lower joint from the rack and pinion assembly. Clamp the unit in a vice, taking care not to damage the steering gear housing.

Refer to Fig.C.16, and take off the dust cover and boot clamps at both sides. Slacken the stopper nut, remove the tie-rod inner socket, and disconnect the tie-rods from the rack.

Withdraw the spring seat and tie-rod spring. Take off the steering gear boots at both sides. Slacken the locknut, and disconnect the tie-rod outer socket from the ball.

Slacken the locknut, remove the retainer adjusting screw, and withdraw the steering gear retainer (See Fig.C.19).

Take off the oil seal, remove the snap ring, and withdraw the pinion. Remove the snap ring, and withdraw the bearing from the pinion. Remove the filler plug and take out the rack. Remove the grease reservoir.

Clean all parts thoroughly, and replace any which show signs of wear or damage. Check the axial play of the inner and outer ball joints. The play should be 0.06 mm (0.0024 in.) for the inner ball joint, and from 0.1 to 0.5 mm (0.0039 to 0.0197 in.) for the outer joints. Use a spring balance to check the force required to swing the ball joints; this should be between 0.8 to 1.5 kgm (5.8 to 10.8 lb.ft.).

Renew the oil seal. Examine the retainer and tie-rod springs and compare them with the values given in Figs. C.20 and C.21.

RACK AND PINION AND TIE-ROD Assembling and Adjusting

Press the bearing onto the pinion gear and fit the tightest snap ring available. Snap rings are supplied in the following oversizes:

Snap Ring Thicknesses

1.04 to 1.09 mm (0.0409 to 0.0429 in.)
1.09 to 1.14 mm (0.0429 to 0.0449 in.)
1.14 to 1.19 mm (0.0449 to 0.0469 in.)
1.19 to 1.24 mm (0.0469 to 0.0488 in.)
1.24 to 1.29 mm (0.0488 to 0.0502 in.)

Clamp the steering gear housing in a vice. Grease the teeth and friction surfaces of the rack with multipurpose grease. Lubricate the gear housing, from the pinion housing side.

Ensure that the rack projects by an equal amount of 96 mm (3.8 in.) in both ends of the housing, with the rack teeth directed towards the pinion shaft.

Grease the pinion teeth, end bushing, and pinion bearing. Engage the teeth of the pinion with the rack, and insert the pinion. Make sure that the bushing does not become damaged. The rack must project from the housing by an equal amount at each side, with the groove on the pinion serration facing upwards.

Fit the snap ring into the housing groove to hold the bearing outer race in position. The snap ring must fit tightly, and can be selected from the following oversizes.

Snap Ring Thicknesses

1.55 to 1.60 mm (0.0610 to 0.0630 in.)
1.60 to 1.65 mm (0.0630 to 0.0650 in.)
1.65 to 1.70 mm (0.0650 to 0.0669 in.)
1.70 to 1.75 mm (0.0669 to 0.0689 in.)

Fit the oil seal. Use a dial gauge as shown in Fig.C.22 to check the thrust play of the pinion. The play should be less than 0.09mm (0.0035 in.).

Grease the retainer, and insert it with the spring. Tighten the retainer adjusting screw fully, then back it off by 20 to 25 degrees. Tighten the locknut to a torque reading of 4.0 to 6.0 kgm (28.9 to 43.4 lb.ft.). Coat the locknut with liquid packing (Three Bond).

When the rack and pinion is assembled, measure the force required to rotate the pinion and also the preload of the rack. Use a spring balance as shown in Figs. C.23 and C.24 and check that the pinion torque is 8 to 20 kg.cm (7 to 17 lb.in.) and the rack preload is from 8 to 18 kg (17.6 to 39.7 lbs). Take care to slide the assembly over the complete range of the stroke.

Fit a dust cover clamp at each end of the housing. Install the stop nut on the threads of the rack.

Liberally grease the ball joint friction area of the tie-rod assembly. Assemble the spring and ball seat, and fit the inner socket part of the tie-rod assembly to the rack. Make sure the boot is positioned at the ball stud end. Note that the left-hand tie-rod is marked with an 'L' : the right-hand rod is not marked.

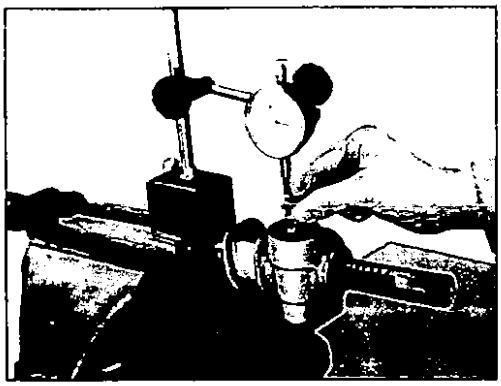


Fig.C.22 Checking the pinion thrust play

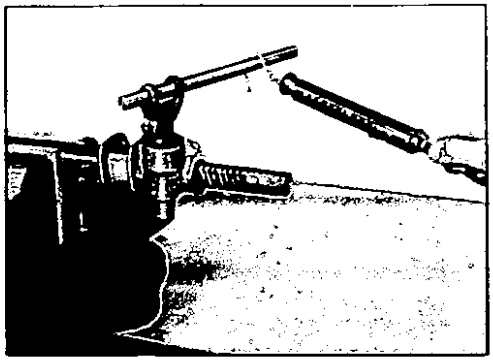


Fig.C.23 Measuring the torque required to rotate the pinion

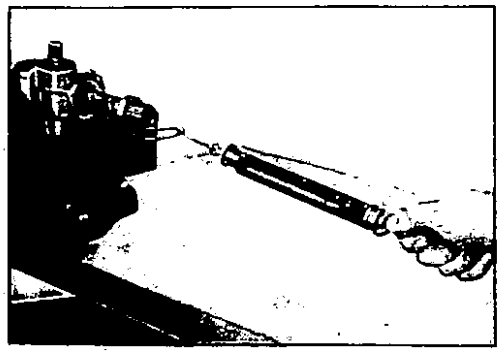


Fig.C.24 Measuring the rack pre-load

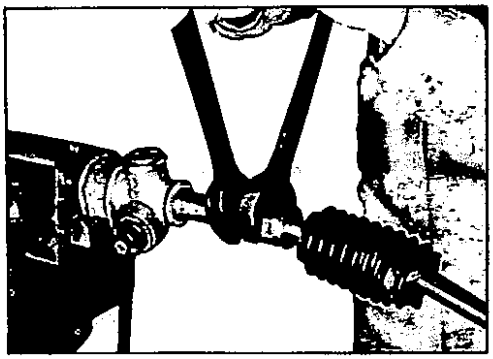


Fig.C.25 Tightening the tie-rod inner socket stop nut

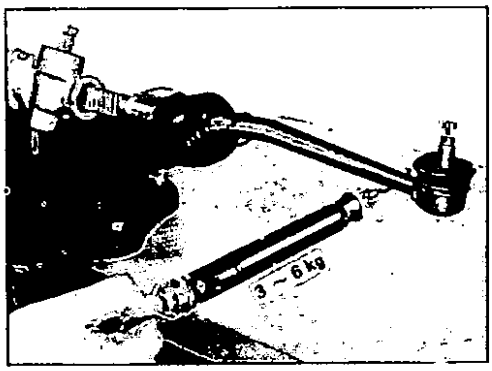


Fig.C.26 Measuring the torque required to swing the tie-rod

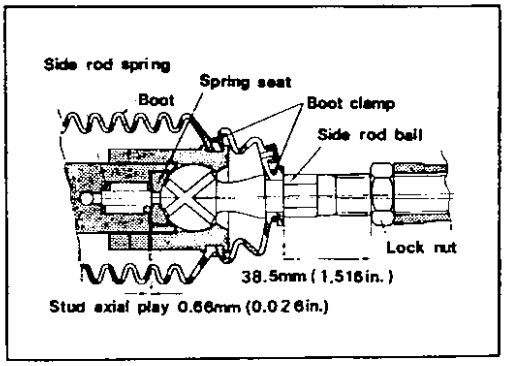


Fig.C.27 Section through the tie-rod ball joint

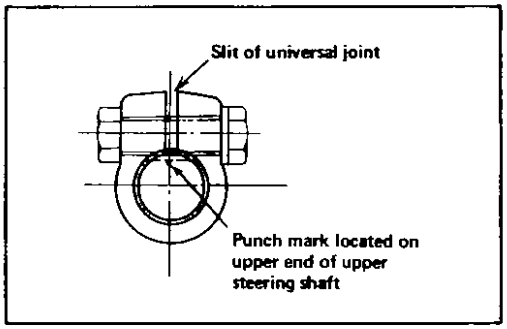


Fig.C.28 Aligning the universal joint with upper steering shaft

Tighten the inner socket until the ball seat is at the rack end, then back off the socket by 30 to 40 degrees, and tighten the stop nut to a torque reading of 8.0 to 10.0 kgm (57.8 to 72.3 lb.ft.) as shown in Fig.C.25.

With the tie-rod assembled, measure the force required to swing the tie-rod. Hook a spring balance at the end of the rod as shown in Fig.C.26, and check that the force is from 3.0 to 6.0 kgm (6.6 to 13.2 lb.). Measure the stroke of the rack which should be ± 73.0 mm (± 2.874 in.). Fit grease nipples at both ends of the rack and pinion housing. Apply multipurpose grease to each joint until a small quantity of grease appears at the outlet hole in the boot. Do not use an excessive amount of grease. The pinion housing should be lubricated until a small quantity of grease appears between rack and housing.

Remove the grease nipple, and fit the plug. Fit the boot. Fill the grease reservoir with grease, and attach it to the rack housing. Adjust the length of the tie-rods at both sides, as described under FRONT WHEEL ALIGNMENT.

Assemble the steering lower joint to the rack and pinion, and tighten the lower joint bolt to a torque reading of 4.0 to 5.0 kgm (29.0 to 36.0 lb.ft.).

Installation of the rack and pinion assembly is a reversal of the removal procedure.

COLLAPSIBLE STEERING - Removing and Dismantling

The steering column (See Fig.C.3) can be removed in a similar manner to the standard type of column. Take care not to drop the column when it is removed from the vehicle, or the shaft may collapse. Do not exert any pressure on the column, or the bellows may be deformed. To dismantle, proceed as follows:-

Remove the retaining wire, and pull out the lower shaft. Disconnect the control linkage if the vehicle is fitted with automatic transmission. Slide the steering shaft bracket away. Withdraw the screws, and separate the upper and lower tubes.

Assembly is a reversal of the dismantling procedure. Note that the slot in the universal joint must be aligned with the punch mark at the top of the upper steering shaft, as shown in Fig.C.28. When installing the column, make sure that the bellows do not become bent of twisted as the clamp and bottom plate bolts are tightened.

Technical Data

Type	Rack and pinion
Gear ratio	17.8 : 1
Steering column shaft spring - Wire diameter	2.9 mm (0.1142 in.)
- Free length	36.5 mm (1.4370 in.)
- Coil turns	3
- Load x length	25 kg (55 lbs) x 18 mm (0.7087 in.)
Retainer spring dimension - Wire diameter	2.6 mm (1.102 in.)
- Free length	26.3 mm (1.035 in.)
- Coil turns	5.5
- Load x length	20 kg (44 lbs) x 16.3 mm (0.642 in.)
Side rod spring dimension - Wire diameter	2.6 mm (0.102 in.)
- Free length	19.0 mm (0.748 in.)
- Coil turns	6.3
- Load x length	40 kg (88 lbs) x 17.0 mm (0.669 in.)
Side rod inner ball joint axial play	0.06 mm (0.0024 in.)
Side rod outer ball joint axial play	0.1 - 0.5 mm (0.0039 - 0.0197 in.)
Pinion thrust play	less than 0.3 mm (0.0118 in.)
Retainer float play	0.09 mm (0.0035 in.)
Rack stroke	± 73 mm (± 2.874 in.)
Side rod inner ball joint swinging torque	0.8 - 1.5 kg-m (5.8 - 10.8 lb.ft.)
Side rod outer ball joint swinging torque	0.8 - 1.5 kg-m (5.8 - 10.8 lb.ft.)
Pinion rotation torque	8 - 20 kg (7 - 17 lb. in.)
Rack preload	8 - 18 kg (17.6 - 39.7 lbs.)

Wheel alignment (unladen condition)

Castor	1° 40'
Camber	55'
King pin inclination	8° 05'
Toe-in	12-15 mm (0.47-0.59 in.)
Steering angle In	38° 24'
Steering angle Out	35° 36'

Strut assembly

Strut outer dia.	50.8 mm (2.0 in.)
Piston rod dia.	20 mm (0.787 in.)
Cylinder inner dia.	30 mm (1.181 in.)
Damping force at piston speed 0.3 m/s (1.08 ft/s)	
Expansion	67 ± 10 kg (147.7 ± 22 lbs.)
Compression	25 ± 4 kg (55.1 ± 8.8 lbs.)
Shock absorber inner cylinder length	410 mm (16.1 in.)

Coil spring		R.H.D. vehicle L.H.	R.H.	L.H.D. vehicle both
Wire diameter	mm (in.)	12 (0.472)	12 (0.472)	12 (0.472)
Coil diameter	mm (in.)	130 (5.12)	130 (5.12)	130 (5.12)
Coil turns		8	8	8
Coil effective turns		6.5	6.5	6.5
Free length	mm (in.)	371.5 (14.6)	386 .5 (15.2)	371.5 (14.6)
Installed height/load	mm kg (in/lb.)	180/270 (7.1/594)	200/270 (7.9/594)	180/270 (7.1/594)
Spring constant	kg/mm	1.45	1.45	1.45

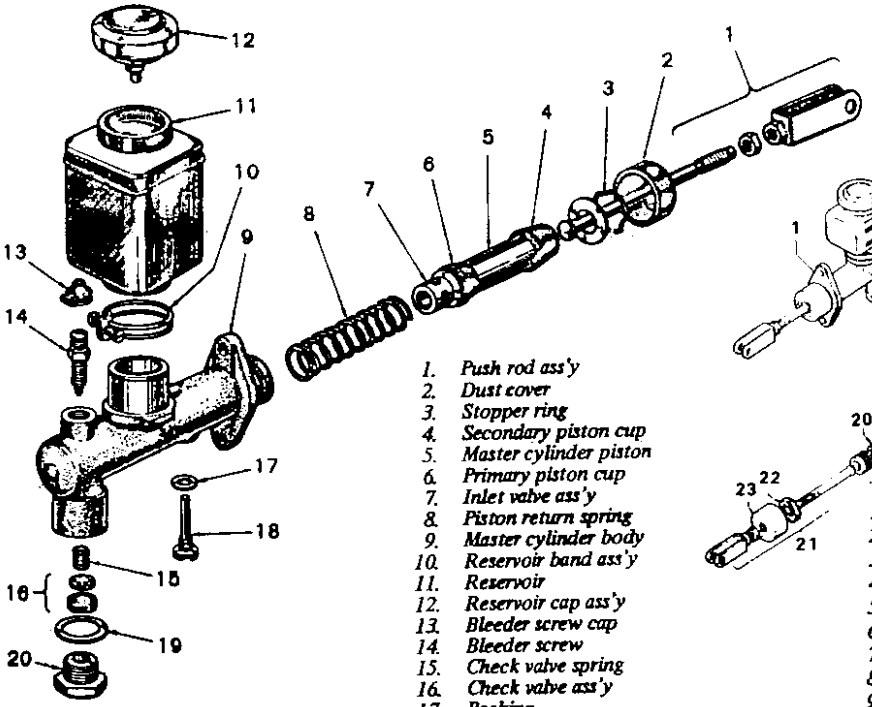


Fig. D.1 Components of the single master cylinder

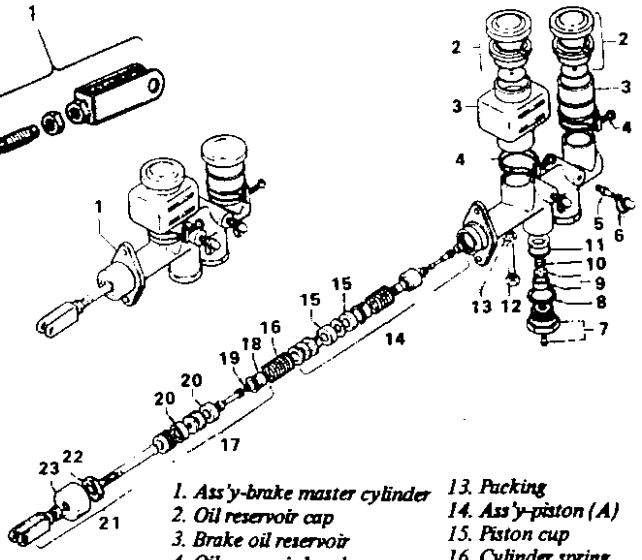


Fig. D.2 Components of the tandem master cylinder

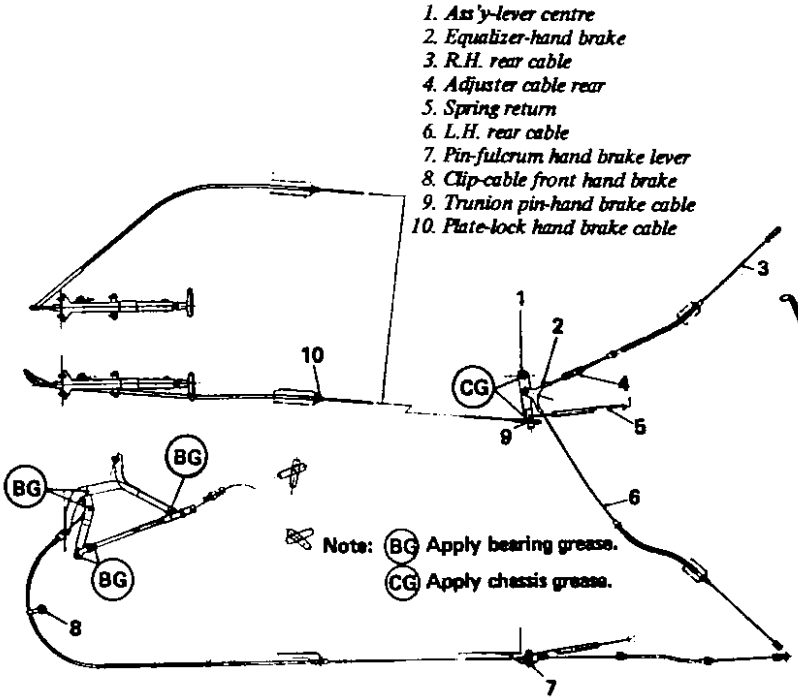


Fig.D.3 Handbrake linkage system

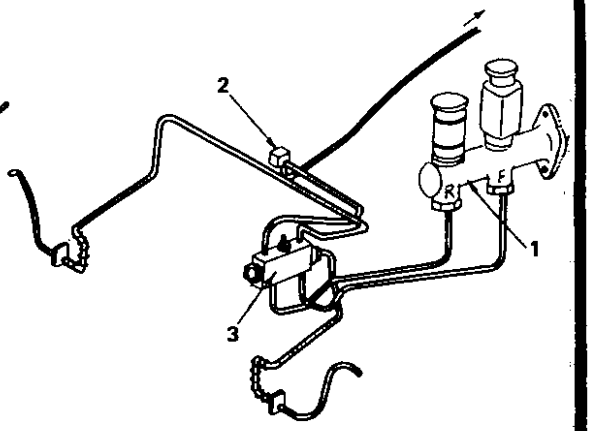


Fig.D.5 Layout of brake piping with tandem master cylinder

Braking System

DESCRIPTION

The vehicle is fitted with disc brakes for the front wheels and leading - trailing shoe type drum brakes for the rear wheels.

A conventional single master cylinder is fitted to the Standard and DeLuxe models, (See Fig.D.1 for details). The DeLuxe models are however additionally equipped with a 'Master-Vac' servo unit which provides a much higher braking performance, with minimum force required on the brake pedal.

A tandem master cylinder and 'Master-Vac' servo unit are fitted as standard equipment to the Datsun CL30UA and CL3 OUT models. Fig.D.2 gives an exploded view of this type of master cylinder.

The handbrake is of the mechanical type, with the handle linked to the rear shoe operating levers through a system of rods and wires (See Fig.D.3).

As on previous models a brake pressure differential warning light switch is incorporated with dual brake circuits. The front and rear brake systems are connected to the switch which provides a warning via a warning light on the instrument panel when a pressure difference of 13 to 17 kg/sq. cm (185 to 242 lb/sq. in.) occurs between the front and rear systems.

Brake piping layouts of the single and tandem master cylinder systems are shown in Figs. D.4 and D.5.

FRONT DISC BRAKE - Friction pads

The disc brakes are self adjusting, but the friction pads should be checked for wear after the first 6,000 km (4,000 miles), and then every 5,000 km (3,000 miles). The pads must be replaced if the friction lining on any pad has worn to less than 1.0 mm (0.04 in.).

The thickness of the pads can easily be checked after removing the anti-rattle clip from the calliper plate.

Full servicing procedures are given in the section BRAKING SYSTEM for vehicles fitted with L14, L16, and L18 engines.

FRONT DISC BRAKE - Removal and Installation

Refer to the section BRAKING SYSTEM for the L14, L16 and L18 engines, for full details of the removal and installation procedures.

Check the thickness of the friction pads, as previously described, and replace them if necessary.

Check the brake disc for scoring and out of round. The standard disc thickness is 10.0 mm (0.394 in.), and must not be reground below 8.40 mm (0.331 in.). The run-out of the disc should be less than 0.06 mm (0.0024 in.), and can be checked with a dial gauge positioned near the outer diameter of the disc, as previously described.

REAR DRUM BRAKE - Removal and Installation

The rear drum brakes (See Fig.D.6) can be removed and inspected, as described in the section BRAKING SYSTEM for vehicles fitted with L14, L16, L18 engines.

Examine the brake drums for scoring and out of round. The maximum inner diameter of the drum must not exceed 229.6 mm (9.040 in.) after reconditioning. Out of round should be below 0.05 mm (0.002 in.).

Renew the brake shoe linings if they are contaminated or incorrectly seated, or if the thickness of the lining has been reduced to 1.5 mm (0.06 in.) or less. Oil or grease can be removed from the linings, by cleaning thoroughly with carbon tetrachloride or petrol.

Check the shoe return springs, and replace them if they have become weakened. Check the bores of the wheel cylinders for signs of wear, damage, or corrosion. Renew the cylinders and pistons, if the clearance between the two parts exceeds to 0.15 mm (0.006 in.). Renew the cups when overhauling the wheel cylinders.

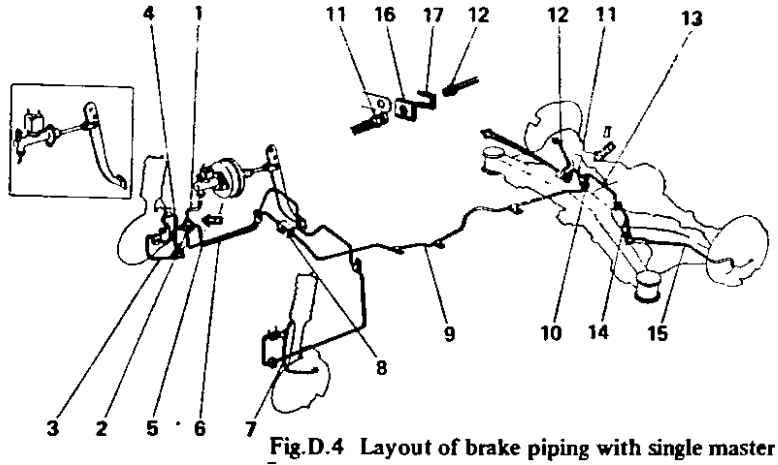
MASTER-VAC SERVO UNIT - Removing and Dismantling

The servo unit should be removed and overhauled at yearly intervals. A Master-Vac repair kit is available, and all parts marked * in Fig.D.7 should be renewed after dismantling the unit. These items are all supplied as part of the repair kit.

The unit can be removed as follows:

1. Remove the clevis pin from the push rod, and detach the Master-Vac unit from the brake pedal.
2. Disconnect the brake tube from the master cylinder, and the vacuum hose from the Master-Vac.
3. Take off the retaining nuts,and remove the Master-Vac and spacer, then separate the master cylinder from the Master-Vac.

Mark the front cylinder shell, and the rear shell and stud assembly, before dismantling the unit; then proceed as follows:



1. *Brake tube A*
2. *Front connector*
3. *Brake tube B*
4. *Pressure hose front R.H.*
5. *Brake tube C*
6. *Brake tube D*
7. *Pressure hose front L.H.*
8. *2-way connector*
9. *Brake tube E*
10. *Rear connector*
11. *Pressure hose rear R.H.*
12. *Brake tube F*
13. *Brake tube G*
14. *Pressure hose rear L.H.*
15. *Brake tube H*
16. *Hose lock plate*
17. *Hose lock spring*

Fig.D.4 Layout of brake piping with single master cylinder

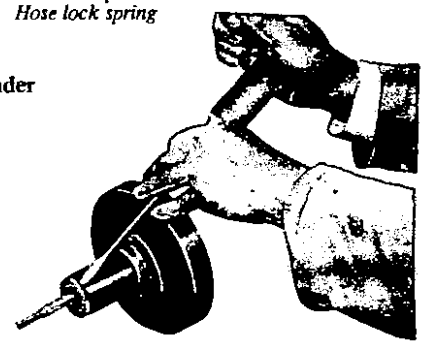
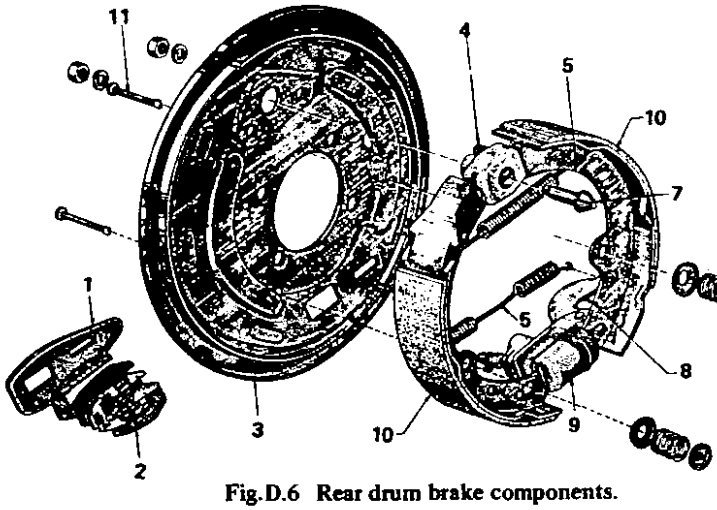


Fig.D.8 Removing the air silencer retainer



1. *Dust cover*
2. *Adjusting shim*
3. *Brake disc*
4. *Adjuster*
5. *Return springs*
6. *Anti rattle springs*
7. *Adjuster wedge*
8. *Hand brake lever*
9. *Wheel cylinder*
10. *Linings*
11. *Anti rattle pins*

Fig.D.6 Rear drum brake components.

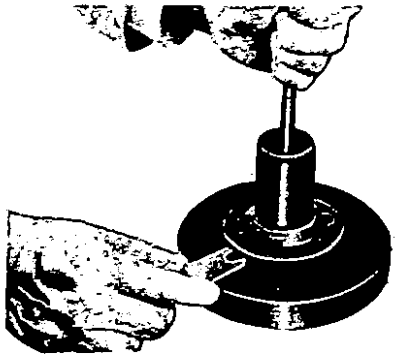
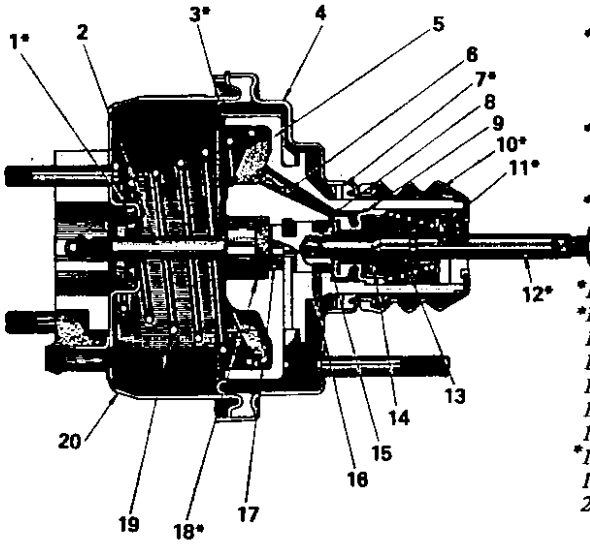


Fig.D.9 Removing the valve plunger stop key



* 1. *Plate & seal*
2. *Push rod*
* 3. *Diaphragm*
4. *Rear shell*
5. *Power piston*
6. *Vacuum rout*
* 7. *Seal*
8. *Vacuum valve*
9. *Poppet assembly*
*10. *Valve body guard*
*11. *Air silencer filter*
*12. *Valve operating rod*
13. *Valve return spring*
14. *Poppet return spring*
15. *Air valve*
16. *Rout*
17. *Valve plunger*
*18. *Reaction disc*
19. *Diaphragm return spring*
20. *Front shell*

Fig.D.7 Section through the Master-Vac unit

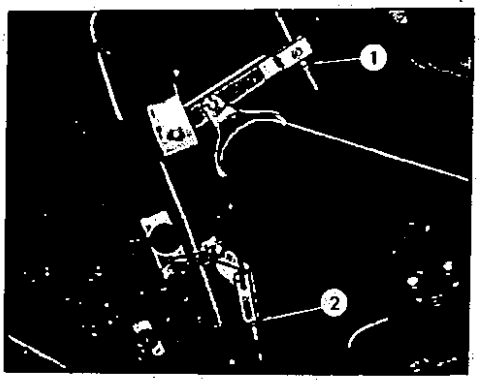


Fig.D.10 Removing the handbrake front cable

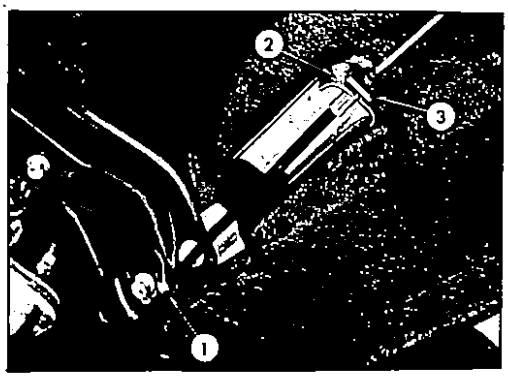


Fig.D.11 Removing the handbrake front cable

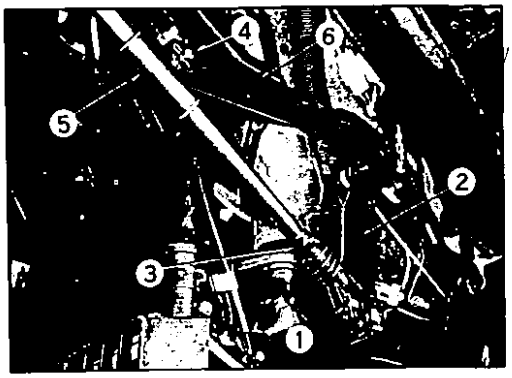


Fig.D.12 Removing the control stem

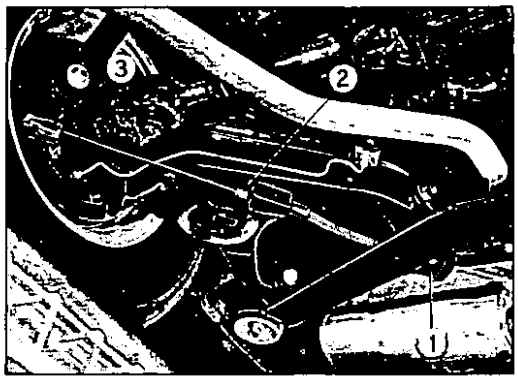


Fig.D.13 Removing the rear cable

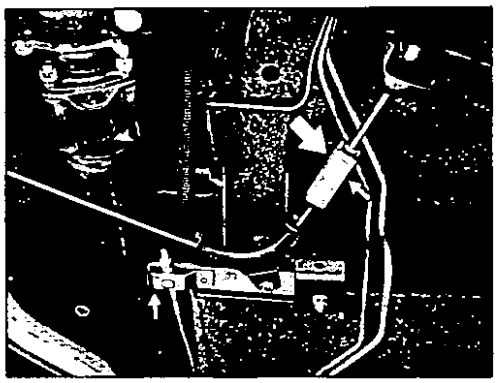


Fig.D.14 Adjusting the handbrake cable

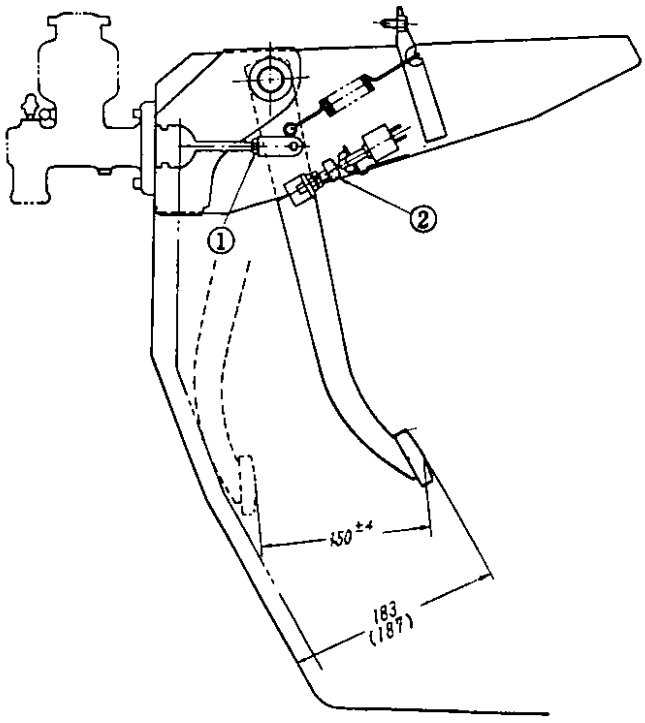


Fig.D.15 Adjusting the brake pedal

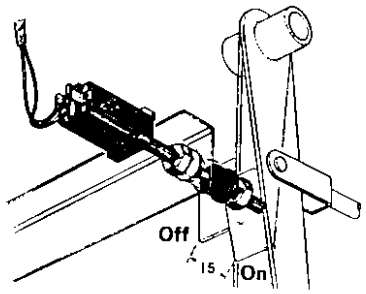


Fig.D.16 Setting the brake light switch

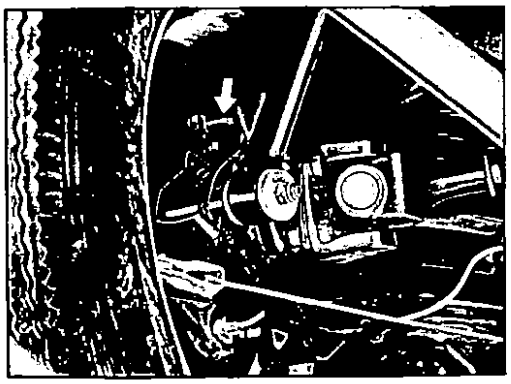


Fig.D.17 Adjusting the rear brakes

Clamp the flange and bolt assembly in a vice. Push the rear shell and stud assembly down, and turn it anti-clockwise to release. Take care not to drop the valve body and diaphragm plate which will be detached at the same time.

Remove the retainer, and detach the bearing and seal from the rear shell. A needle can be used to remove the retainer.

Pull the diaphragm from the groove in the diaphragm plate. Remove the valve body guard and the air silencer (See Fig. D.8). Remove the valve plunger stop key (Fig.D.9) detach the valve rod and plunger assembly, and the air silencer filter from the valve body and diaphragm plate. Pull out the reaction disc.

To dismantle the front shell and stud assembly, first pull out the push rod, then remove the plate and seal, and the check valve.

MASTER-VAC SERVO UNIT - Assembling

Inspect the components, and replace any which show signs of wear or damage. As previously stated, the repair kit contains a number of items which must be used to replace the original parts. Assembly is a reversal of the dismantling procedure, but the following components should be lubricated with silicon grease.

Grease the lip and face of the seal, the lip of the poppet, both faces of the reaction disc. Grease the diaphragm edge in contact with the front and rear shell.

Grease the face of the plate and seal assembly which contacts the front shell and push rod, the face of the check valve in contact with the packing, and also the push rod at the point of contact with the diaphragm plate.

Check the clearance between the master cylinder and push rod, after assembling.. The clearance should be 4.0 + 0.5-0 mm (0.1575 + 0.0197 -0 in.), and can be adjusted if necessary by altering the length of the push rod. Installation of the Master-Vac unit is a reversal of the removal procedure.

HANDBRAKE CABLES - Removing

The cables of the mechanical handbrake (See Fig.D.3) can be removed in the following manner:

Front cable

1. Release the handbrake, and disconnect the front cable by removing the clevis pin (1 in Fig.D.10) at the handbrake equalizer. Screw out the adjusting nut (2), to disconnect the cable from the handbrake lever.
2. Straighten the cable clamp (1 in Fig.D.11), and pull out the the lock plate (2), to extract the cable from the retainer.
3. Detach the cable outer casing from the handbrake control bracket, then pull out the front cable.

Control Stem:

Removal of the control stem is a straight-forward operation. Refer to Fig.D.12, and take out the clevis pin (1), connecting the yoke (2), to the lever (3). Remove the clevis pin (4) securing the guide (5) to the bracket (6), then withdraw the control stem.

Rear cable

1. Remove the nut from the adjuster, and disconnect the left-hand rear cable.
2. Disconnect the rear cables from the wheel cylinders. Refer to Fig.D.13 pull out the lock plates (1) and (2), and remove the clevis pin (3).

HANDBRAKE CABLES - Inspection and Installation

Inspect the cables, and replace them if any of the wires have broken. Cables which have stretched must be renewed, as it will no longer be possible to adjust the handbrake correctly. Check the springs, and renew them if they have weakened or broken.

Check the centre lever, trunnion pin and equalizer, and replace as necessary.

Installation is a reversal of the removal procedure. Grease all sliding parts, and adjust the handbrake as described below.

HANDBRAKE - Adjusting

Release the handbrake, and adjust the rear brake shoes as described under the appropriate heading.

Adjust the front and rear cables to give a handbrake lever stroke of 85 to 95 mm (3.35 to 3.74 in.), by setting the adjusting nuts shown arrowed in Fig.D.14.

BRAKE PEDAL - Adjusting

Adjust the length of the master cylinder push rod, until the brake pedal pad is set to a height of 187.0 mm (7.36 in.), with the brake light switch free from the pedal stopper. Lock the push rod, by tightening the locknut (1 in Fig.D.15). Screw in the brake light switch until the screwed shaft of the switch makes contact with the stopper bracket bolt then retighten the locknut.

Adjust the stopper bolt (2) until the brake pedal pad is set to a height of 183.0 mm (7.2 in.), then retighten the locknut. The full stroke of the brake pedal should now be set to 150.0 mm (5.9 in.).

The brake lamps should light up when the pedal is depressed 15.0 mm (0.6 in.), see Fig.D.16.

Lubricate all sliding parts with bearing grease.

REAR DRUM BRAKE - Adjusting

Jack up the vehicle at the rear, and release the handbrake. Depress the brake pedal several times, and turn the adjuster clockwise until the drum is locked (See Fig.D.17). Turn the adjuster in the opposite direction until the shoes are just clear of the drum, and the wheel can be turned freely by hand.

Repeat the operation on the other adjuster, and then depress the brake pedal to make sure the brakes are working correctly.

BLEEDING THE HYDRAULIC SYSTEM

Refer to the section BRAKING SYSTEM for L14, L16 and L18 engines, and follow the instructions given under the appropriate heading.

Technical Data

Brake pedal	
Pedal free height	183 mm (7.2 in.)
Full stroke of pedal head	150 ± 4 mm (5.9 ± 0.158 in.)
Master cylinder	
Inner dia. of master cylinder	
with Master-vac	22.22 mm (7/8 in.)
without Master-vac	19.05 mm (3/4 in.)
Allowable max. clearance between cylinder wall and piston	0.13 mm (0.0051 in.)
Wheel cylinder	
Inner dia. of wheel cylinder	
Front	50.8 mm (2 in.)
Rear	20.64 mm (13/16 in.)
Allowable max, clearance between cylinder wall and piston	0.18 mm (0.0709 in.)
Brake drum and rotor	
Rear brake drum inner dia.	228.6 mm (9 in.)
Front brake rotor outer dia.	232 mm (9.130 in.)
Drum inside out of roundness	below 0.05 mm (0.002 in.)
Limit of reconditioning drum in dia.	229.6 mm (9.039 in.)
Run out of the rotor	below 0.06 mm (0.0024 in.)
Limit of reconditioning rotor in thickness	8.4 mm (0.331 in.)
Lining dimension	
Front (width x thickness x length)	40 x 4.5 x 219.5 mm (1.575 x 1.772 x 8.642 in.)
Rear (width x thickness x length)	40 x 4.5 x 219.5 mm (1.575 x 1.772 x 8.642 in.)
Material	D233
Pad (width x thickness x length)	39.7 x 9 x 86 mm (1.563 x 0.354 x 3.386 in.)
Pad material	standard M78S, option S16D
Total braking area	
Front	114.2 cm^2 (17.7 $in.^2$)
Rear	351 cm^2 (54.4 $in.^2$)

Tightening Torques

ENGINE

Main bearing cap bolt	10-11 kg-m. (72.3-79.5 lb.ft.)
Connecting rod bolt	4.5-5 kg-m. (32.6-36.2 lb.ft.)
Flywheel bolt	10-11 kg-m. (72.3-79.5 lb.ft.)
Crankshaft nut	15-20 kg-m. (108.5-144.6 lb.ft.)
Cylinder head bolt	8-9 kg-m. (57.9-65.1 lb.ft.)
Camshaft centre bolt	4.5-5.5 kg-m. (32.6-39.8 lb.ft.)
Spark plug	3-4 kg-m. (21.7-28.9 lb.ft.)
Oil filter centre bolt	2.8-3.2 kg-m. (20.3-23.2 lb.ft.)
Water pump blind plug	1.5-2 kg-m. (10.9-14.5 lb.ft.)
Carburettor bowl set screw	0.15-0.2 kg-m. (1.1-1.4 lb.ft.)
Rocker cover securing screw	0.33-0.4 kg-m. (2.4-2.9 lb.ft.)

FRONT SUSPENSION

Front wheel spindle nut	3-3.5 kg-m (21.7-25.3 lb.ft.)
Front disc brake back plate to strut assembly	2.7-3.7 kg-m (19.5-26.7 lb.ft.)
Disc brake calliper fixing bolts	7.3-9.9 kg-m (52.8-71.6 lb.ft.)
Disc brake rotor fixing bolts	3.9-5.3 kg-m (28.2-38.3 lb.ft.)
Stabilizer fixing bolts (transverse link bracket side)	1.2-1.7 kg-m (8.7-12.3 lb.ft.)
Stabilizer fixing bolts (frame bracket side)	1.9-2.5 kg-m (13.7-18.1 lb.ft.)
Compression rod to frame bracket bolts	7.2-9.6 kg-m (52.1-69.2 lb.ft.)
Compression rod to transverse link bolts	4.9-6.3 kg-m (35.4-45.6 lb.ft.)
Strut assembly upper support nuts	3.9-5.2 kg-m (28.2-37.6 lb.ft.)
Steering knuckle arm to strut assembly	6.0-8.0 kg-m (43.4-57.8 lb.ft.)
Transverse link to suspension cross member fixing nut	12.2-13.5 kg-m (88.2-87.6 lb.ft.)
Lower ball joint to transverse link fixing nut	1.9-2.5 kg-m (13.7-18.1 lb.ft.)
Lower ball joint stud nut	5.5-7.6 kg-m (39.8-55.0 lb ft.)
Suspension cross member mounting bolts	1.9-2.5 kg-m (13.7-18.1 lb.ft.)
Engine mounting bracket bolts	1.3-1.7 kg-m (9.4-12.3 lb.ft.)
Piston rod self-locking nut	6.0-7.5 kg-m (43.4-54.2 lb.ft.)
Gland packing	6.0-6.5 kg-m (43.4-47.0 lb.ft.)
Wheel nuts	8.0-9.0 kg-m (57.8-65.1 lb.ft.)

BRAKING SYSTEM

Fulcrum pin of brake pedal	3.5-4.0 kg-m (25.3-28.9 lb.ft.)
Connection of brake tube	1.5-1.7 kg-m (10.8-12.3 lb.ft.)
Rotor fixing bolts	3.9-5.3 kg-m (28.2-38.3 lb.ft.)
Wheel cylinder fixing bolts	
Studs side	0.5-0.7 kg-m (3.6-5.1 lb.ft.)
Hexagon side	1.5-2.1 kg-m (10.8-15.2 lb.ft.)
Bridge tube	1.7-2.0 kg-m (12.3-14.5 lb.ft.)
Brake hose to wheel cylinder	1.7-2.0 kg-m (12.3-14.5 lb.ft.)
Calliper to knuckle flange	7.3-9.0 kg-m (52.8-65.1 lb.ft.)
Disc to knuckle flange	2.7-3.7 kg-m (19.5-26.8 lb.ft.)
Spindle nut	3.0-3.5 kg-m (21.7-25.3 lb.ft.)

STEERING

Steering wheel nut	
Rubber coupling bolt	1.5-1.8 kg-m (10.8-13.0 lb.ft.)
Lower joint bolt	4-5 kg-m (28.9-36.2 lb.ft.)
Retainer locknut	4-6 kg-m (28.9-43.4 lb.ft.)
Side rod inner socket stopper nut	8-10 kg-m (52.8-72.3 lb.ft.)
Side rod locknut	9 kg-m (65.1 lb.ft.)
Side rod ball stud nut	5.5-7.6 kg-m (39.8-54.9 lb.ft.)

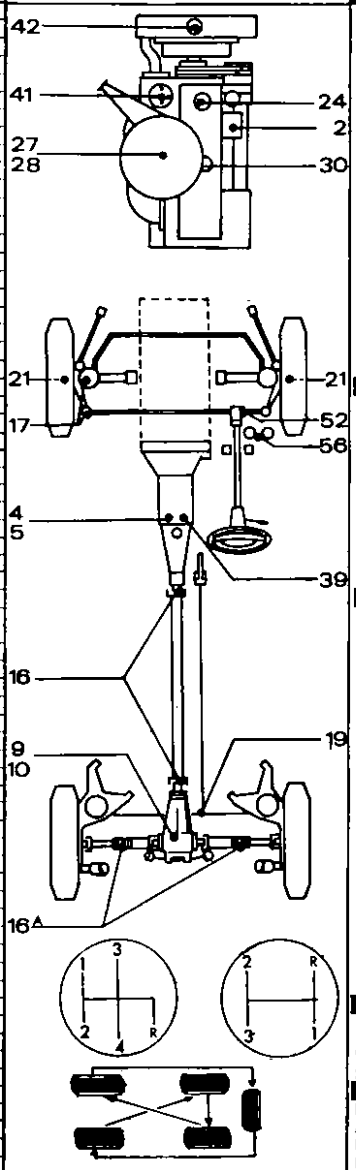
1968>

DATSUN

Lubricate and Clean

		No.	MO	MI	KM
CAR UP				3 6 12 24 30	5 10 20 40 50
ENGINE	Drain oil	1			
Filter	Change element	2			
	Clean element	3			
GEARBOX	Check oil/top up	4			
	Change oil	5			
Overdrive Filter	Clean element	6			
AUTOMATIC TRANSM.	Drain fluid	7			
Filter	Clean element	8			
DIFFERENTIAL	Check oil/top up	9			
	Change oil	10			
Limited Slip Differential	Check oil/top up	11			
	Change oil	12			
Sliding Joints(Drive Shaft)	Check oil/top up	13			
	Change oil	14			
SHOCK ABSORBERS	Check oil/top up	15			
PROP./DRIVE SHAFT(S)	Lubricate	16			
GREASE GUN POINTS	Lubricate	17			
PEDAL SHAFT(S)	Lubricate	18			
HANDBRAKE	Lubricate	19			
GEAR LINKAGE	Lubricate	20			
CAR LOWERED – WHEELS FREE					
WHEEL BEARINGS-Front	Repack	21			
WHEEL BEARINGS-Rear	Repack	22			
BRAKE FLUID	Renew/bleed syst.	23			
CAR DOWN – BONNET OPEN					
ENGINE	Refill with oil	24			
	Check oil level	25			
Breather Cap	Clean	26			
Air Cleaner	Service element(s)	27			
	Replace element(s)	28			
PCV-System	Clean filter	29			
	Clean valve/hose(s)	30			
	Replace valve	31			
Carburettor(s)	Clean jets/bowl	32			
	Top up pist. damper	33			
	Lubricate linkages	34			
Fuel Bowl/Filter(s)	Clean/replace	35			
Fuel Injection Pump	Check oil level	36			
Filter(s)	Clean/replace	37			
AUTOMATIC TRANSM.	Refill with fluid	38			
	Check fluid level	39			
DISTRIBUTOR	Clean cap & ign.coil	40			
Spindle/Cam	Lubricate	41			
COOLING SYSTEM	Check/top up	42			
	Flush system	43			
Corrosion Inhibitor	Check solution	44			
Anti-Freeze	Check	45			
Water Pump	Lubricate	46			
SCREENWASHER	Check/top up	47			
BATTERY	Check/top up	48			
	Check spec. gravity	49			
Connections	Clean, grease	50			
GENERATOR	Lubricate	51			
STEERING	Check/top up	52			
Power Steering	Check/top up fluid	53			
	Grease ram	54			
	Clean filter	55			
CLUTCH/BRAKE	Check/top up fluid	56			
BRAKE SERVO	Clean filter	57			
	Renew filter	58			
HYDR. SUSPENSION	Check/top up fluid	59			
	Renew fluid	60			
	Clean filter	61			
CAR DOWN – EXTERNAL					
LOCKS, HINGES, ETC.	Lubricate	62			
Door Drain Holes	Clean	63			
WIPER SPINDLES	Lubricate	64			

EVERY MOnths / Miles (1000) / KMs (1000) — whichever comes first



Service, Check, Adjust

		No.	MO	MI	KM
CAR UP				3 6 12 24 30	5 10 20 40 50
ENGINE	Check sump bolt torq	65			
Engine Mountings	Check torque	66			
Engine Flame Trap	Service and clean	67			
AUTOMATIC TRANSM.	Adjust brake bands	68			
	Renew sump gasket	69			
	Check sump bolt torq	70			
PROP./DRIVE SHAFT(S)	Check for wear	71			
	Tighten bolts	72			
SUSP., FRONT/REAR	Check for wear	73			
	Tighten bolts	74			
	Check boot gaiters	75			
Shock Absorbers	Check operation	76			
STEERING	Ch. compon. f. wear	77			
	Tighten bolts	78			
	Check boot gaiters	79			
U-BOLTS	Check torque	80			
HANDBRAKE	Check/adjust	81			
CLUTCH	Check/adjust	82			
GEAR LINKAGE	Check/adjust	83			
EXHAUST SYSTEM	Check/tighten bolts	84			
CHECK FOR OIL, FUEL, WATER, etc. LEAKS		85			
CAR LOWERED – WHEELS FREE					
WHEEL BEARINGS	Check/adjust	86			
BRAKES	Check/adjust	87			
	Overhaul compl. syst	88			
Linings/Drums	Clean/check wear	89			
Pads/Discs	Check for wear	90			
Self-adj. Mechanism	Check	91			
Cylinders, Hoses	Check for wear	92			
ROAD WHEELS	Inspect tyres	93			
	Interch. & balance	94			
	Adjust pressure	95			
Wheel Nuts	Check torque	96			
CAR DOWN – BONNET OPEN					
ENGINE	Check compression	97			
Cylinder Head	Check torque	98			
Valves	Adjust clearance	99			
Choke	Check operation	100			
Mixture/Idling	Check/adjust	101			
Linkages	Adjust	102			
Timing Chain	Check/adj. tension	103			
V-Belt (s)	Check/adj. tension	104			
	Renew	105			
SPARK PLUGS	Clean/set gap	106			
	Renew	107			
DISTRIBUTOR	Check/set point gap	108			
	Renew points	109			
Dwell Angle	Check/adjust	110			
Ignition Timing	Check/adjust	111			
COOLING SYSTEM	Tighten hose clips	112			
	Replace hoses	113			
	Pressure test	114			
STEERING	Check play, adjust	115			
	Tighten bolts	116			
Geometry	Check	117			
CHECK FOR OIL, FUEL, WATER, etc. LEAKS		118			
CAR DOWN – EXTERNAL					
LIGHTS, INSTRUMENTS	Check function	119			
Headlights	Check alignment	120			
WIPERS	Check blades	121			
SEAT BELTS	Check security, wear	122			
ROAD OR DYNAMOMETER TEST					
BRAKES	Check efficiency	123			
AUTOMATIC TRANSM.	Check operation	124			
ENGINE	Adjust, if required	125			
DEFECTS	Report	126			

CAPACITIES

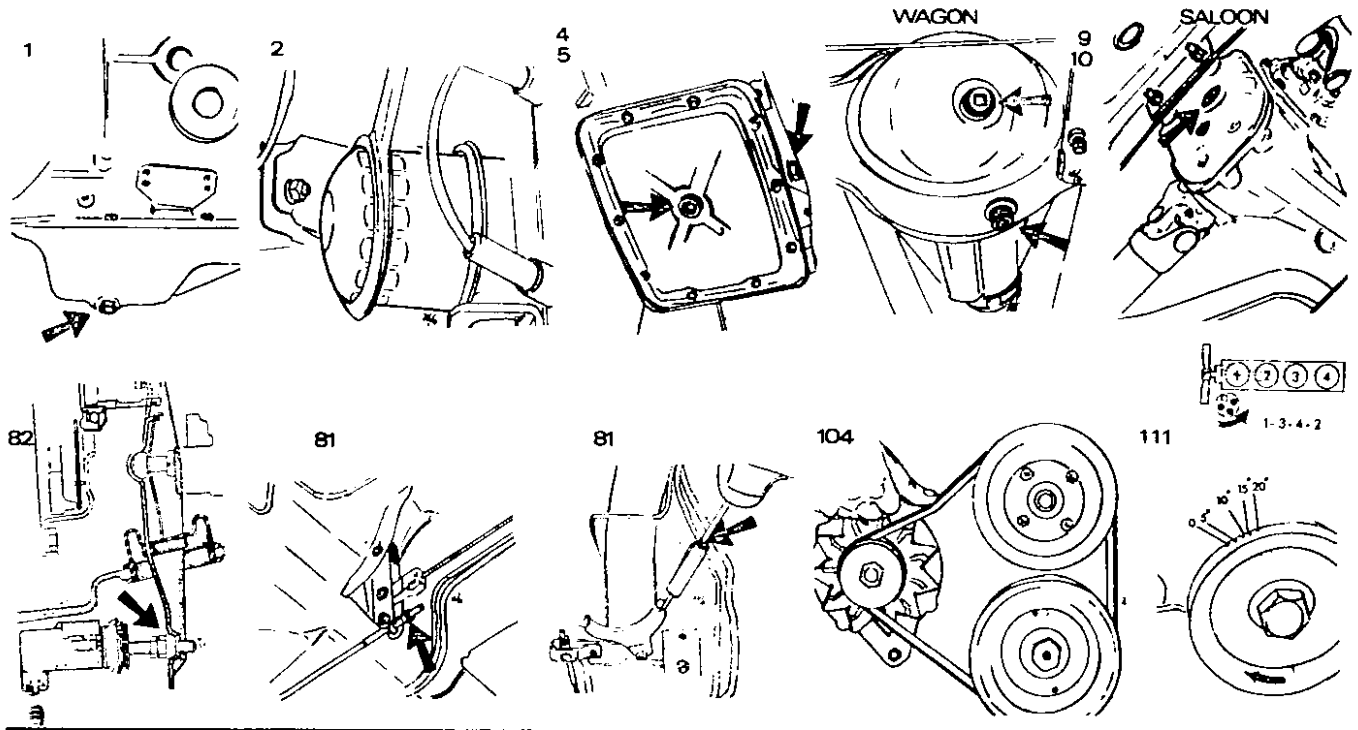
	Engine	Oil Filter	Gearbox	Automatic	Differential	Cooling inc. Heater Anti freeze	Hydr./Brake Fluid	Fuel Tank Octane	Grease	Oil can Steering Etc.
	Ltr.Imp.Pts.USQu.	Ltr.Imp.Pts.USPts.	Ltr.Imp.Pts.USPts.	Ltr.Imp.Pts.USQu.	Ltr.Imp.Pts.USPts.	Ltr.Imp.Pts.USQu.	Ltr.Imp.Pts.USPts.	Ltr.Imp.Gls.US Gls.	Ref. No.	Ref. Nr.
	4 7 4,4	0,7 1,2 1,6	1,7 3 3,2		0,75 1,3 1,6 WAGON: 1 1,7 2,1	8,8 12 7,2		45 9,9 11,9	18, 17, 18, 19, 20, 41,	62, 64, 52,

LUBRICANTS

SAE 30/20W/40	< 32°C	SAE 80 EP	TYPE A	SAE 80 EP	50 %	BFL	85	MP	SAE 10
SAE 20W/20 10W/30	< 0°C	SAE 90 EP	SUFFIX A	SAE 90 EP	–35°C		SSS : 95		SAE 80, 90 140 EP
SAE 10W, 10W/30	> 0°C	SAE 140 EP		SAE 140 EP					

AUTOSERVICE DATA CHART

1968> DATSUN



TECHNICAL NOTES

4 – Retighten Gearbox + Differential carrier every: 20,000 KM/12,000 MI.

17 – Steering Linkage Ball Joints (Grease Gun - 7 fittings.)
Steering Swivel Ball Joints (Grease Gun - 4 fittings.)

23 – DISC BRAKES only. DRUM BRAKES - change every: 40,000 KM/24,000 MI.

27 – Urethan element.

28 – Viscous element.

32 – Overhaul Carburettor every: 40,000 KM/24,000 MI.

82 – Also retighten.

84 – Manifold

116 – Also Idler Box.

16A – DRIVE SHAFT BALL SPLINES - repack every 50,000 KM/30,000 MI.(Saloon only)

ENGINE DATA	COMPRESSION kg/cm²/psi	VALVE CLEARANCE INLET mm/in.hot(h)/cold(c) OUTLET	IDLING SPEED rpm.	SPARK PLUG GAP mm/inches	DISTR. POINT GAP mm/inches	DWELL ANGLE degrees	STATIC – IGN.-TIMING – STROB. degr.-BTDC degr.-BTDC/rpm.
	Refer to Technical Data						

TYRES Pressure kg/cm²/psi	STANDARD SIZE	FRONT PRESSURE normal/full	REAR PRESSURE normal/full	OPTIONAL SIZE	FRONT PRESSURE normal/full	REAR PRESSURE normal/full	BRAKES	MINIMUM THICKNESS SHOE mm/in. PAD
SSS:	Refer to Technical Data							

STEERING GEOMETRY	TEST LOAD kg/lbs.	TOE-IN(i)/OUT(o) front-mm/in.	CAMBER degrees/min.	CASTOR degrees/min.	KING PIN INCLN. degrees/min.	TOE-IN(i)/OUT(o) rear-mm/in.	CAMBER degrees/min.	TOE-ON TURNS degr.at degr. LOCK	
L 510 L 510 S WAGON	Refer to Technical Data								

TORQUE VALUES mkg/lb.ft.	65	80	84	86	96	98	V-BELT TENSION mm/inches	RAD. CAP. PRESS. kg/cm²/psi	CLUTCH PLAY mm/inches
						4,5 - 5,5/32,5 - 39,8	10 - 15 / ,4 - ,6	0,9 / 12	

TBA									
	5,60 x 13 4 PR 5,60 S 13 4 PR	12 V / 40 Ah 12 V / 50 Ah 12 V / 60 Ah	NGK BP 6 E		FRAM PH 2850	FRAM CA 697			

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AUTOSERVICE DATA CHART

Part Names and Alternatives

Certain parts of motor cars are known by other names in different areas and countries. A list of the common alternatives is given below.

ENGINE

Gudgeon pin	Piston pin, small end pin, Wrist pin
Inlet valve	Intake valve
Piston oil control ring	Piston scraper ring
Induction manifold	Inlet manifold, intake manifold
Oil sump	Oil pan, Oil reservoir, Sump tray
Core Plug	Expansion plug, Welch plug, Sealing disc
Dipstick	Oil dipper rod, Oil level gauge rod, Oil level indicator
Silencer	Muffler, expansion box, diffuser
Tappets	Valve lifter, push rods

FUEL

Carburettor choke	Carburettor venturi
Slow running jet	Low speed jet, Idler jet
Volume control screw	Idling mixture screw
Fuel pump	Petrol pump, Fuel lift pump
Air cleaner	Air silencer, Muffler
Fuel tank	Petrol Tank
Accelerator	Throttle

CLUTCH

Clutch release bearing	Throwout bearing, Thrust bearing
Clutch lining	Disc facing, Friction ring
Spigot bearing	Clutch pilot bearing
Clutch housing	Bell housing

GEARBOX

Gearbox	Transmission
Gear lever	Change speed lever, Gearshift lever
Selector fork	Change speed fork, Shift fork
Input shaft	Constant motion shaft, First motion shaft, drive gear, First reduction pinion. Main drive pinion, Clutch shaft, Clutch gear
Countershaft	Layshaft
Synchro cone	Synchronizing ring
Reverse Idler gear	Reverse pinion

REAR AXLE

Rear Axle	Final drive unit
Crown wheel	Ring gear, Final drive gear, Spiral drive gear
Bevel pinion	Small pinion, spiral drive pinion
"U" bolts	Spring clips
Axle shaft	Half shaft, Hub driving shaft, Jack driving shaft
Differential gear	Sun wheel
Differential pinion	Planet wheel

ELECTRICAL

Generator	Dynamo
Control box	Cut out, Voltage regulator, Voltage control, Circuit breaker
Capacitor	Condenser
Interior light	Dome lamp
Lens	Glass
Head lamp ring	Headlamp surround, Headlamp moulding
Direction indicators	Signal lamps, Flashers
Micrometer adjustment	Octane selector
Rear lamps	Tail lamps
Reversing light	Back-up light

STEERING

Drop arm	Pitman arm
Rocker shaft	Pitman shaft, Drop arm shaft
Swivel pin	Pivot pin, King pin, Steering pin
Stub axle	Swivel axle
Track rod	Cross tube, Tie rod
Drag link	Side tube, Steering connecting rod
Steering column	Steering gear shaft
Steering column bearing	Mast jacket bearing
Steering arm	Steering knuckle arm
Stator tube	Control tube
Steering joints	Steering knuckles

BRAKES

Master cylinder	Main cylinder
Brake shoe lining	Brake shoe facing

BODY

Bonnet	Hood
Luggage locker	Boot, Luggage compartment
Luggage locker lid	Boot lid, Rear deck
Mudguards	Quarter panels, Fenders, Mud wings
Roof	Canopy
Nave plate	Wheel disc, Hub cap
Finishing strip	Moulding, Chrome strip
Windscreen	Windshield
Rear window	Rear windscreen, Rear windshield Backlight
Quarter vent	(N.D.V.) No draught ventilator
Bumpers	Fenders
Loom	Harness
Odometer	Trip recorder
Bonnet catch	Hood latch
Kerosene	Paraffin
Boot	Trunk

Conversion Tables

LINEAR MEASUREMENT

INCHES		MM.	MILLIMETRES TO INCHES		INCHES TO MILLIMETRES	
FRACTIONS	DECIMALS		MM.	INCHES	INCHES	MM.
1/64	0.01563	0.3969	0.001	.00004	0.0001	.00254
1/32	0.03125	0.7937	0.002	.00008	0.0002	.00508
3/64	0.04688	1.1906	0.003	.00012	0.0003	.00762
1/16	0.0625	1.5875	0.004	.00016	0.0004	.01016
5/64	0.07813	1.9844	0.005	.00020	0.0005	.01270
3/32	0.09375	2.3813	0.006	.00024	0.0006	.01524
7/64	0.10938	2.7781	0.007	.00028	0.0007	.01778
1/8	0.125	3.1750	0.008	.00032	0.0008	.02032
9/64	0.14063	3.5719	0.009	.00035	0.0009	.02286
5/32	0.15625	3.9688	0.010	.00039	0.001	.0254
11/64	0.17188	4.3656	0.020	.00079	0.002	.0508
3/16	0.1875	4.7625	0.030	.00118	0.003	.0762
13/64	0.20313	5.1594	0.040	.00157	0.004	.1016
7/32	0.21875	5.5563	0.050	.00197	0.005	.1270
15/64	0.23438	5.9531	0.060	.00236	0.006	.1524
1/4	0.25	6.3500	0.070	.00276	0.007	.1778
17/64	0.26563	6.7469	0.080	.00315	0.008	.2032
9/32	0.28125	7.1438	0.090	.00354	0.009	.2286
19/64	0.29688	7.5406	0.10	.00394	0.010	0.254
5/16	0.3125	7.9375	0.02	.00787	0.020	0.508
21/64	0.32813	8.3344	0.30	.01181	0.030	0.762
11/32	0.34375	8.7313	0.40	.01575	0.040	1.016
23/64	0.35938	9.1281	0.50	.01969	0.050	1.270
3/8	0.375	9.5250	0.60	.02362	0.060	1.524
25/64	0.39063	9.9219	0.70	.02756	0.070	1.778
13/32	0.40625	10.3188	0.80	.03150	0.080	2.032
27/64	0.42188	10.7156	0.90	.03543	0.090	2.286
7/16	0.4375	11.1125	1.0	.03937	0.10	2.54
29/64	0.45313	11.5094	2.0	.07874	0.20	5.08
15/32	0.46875	11.9063	3.0	.11811	0.30	7.62
31/64	0.48438	12.3031	4.0	.15748	0.40	10.16
1/2	0.5	12.700	5.0	.19685	0.50	12.70
33/64	0.51563	13.0969	6.0	.23622	0.60	15.24
17/32	0.53125	13.4938	7.0	.27559	0.70	17.78
35/64	0.54688	13.8906	8.0	.31496	0.80	20.32
9/16	0.5625	14.2875	9.0	.35433	0.90	22.86
37/64	0.57813	14.6844	10.0	.39370	1.0	25.4
19/32	0.59375	15.0813	11.0	.43307	2.0	50.8
39/64	0.60938	15.4781	12.0	.47244	3.0	76.2
5/8	0.625	15.875	13.0	.51181	4.0	101.6
41/64	0.64063	16.2719	14.0	.55118	5.0	127.0
21/32	0.65625	16.6688	15.0	.59055	6.0	152.4
43/64	0.67188	17.0656	16.0	.62992	7.0	177.8
11/16	0.6875	17.4625	17.0	.66929	8.0	203.2
45/64	0.70313	17.8594	18.0	.70866	9.0	228.6
23/32	0.71875	18.2563	19.0	.74803	10.0	254.0
47/64	0.73438	18.6531	20.0	.78740	11.0	279.4
3/4	0.75	19.050	21.0	.82677	12.0	304.8
49/64	0.76563	19.4469	22.0	.86614	13.0	330.2
25/32	0.78125	19.8438	23.0	.90551	14.0	355.6
51/64	0.79688	20.2406	24.0	.94488	15.0	381.0
13/16	0.8125	20.6375	25.0	.98425	16.0	406.4
53/64	0.82813	21.0344	26.0	1.0236	17.0	431.8
27/32	0.84375	21.4313	27.0	1.0630	18.0	457.2
55/64	0.85938	21.8281	28.0	1.1024	19.0	482.6
7/8	0.875	22.225	29.0	1.1417	20.0	508.0
57/64	0.8905	22.6219	30.0	1.1811	21.0	533.4
29/32	0.90625	23.0188	31.0	1.2205	22.0	558.8
59/64	0.92188	23.4156	32.0	1.2598	23.0	584.2
15/16	0.9375	23.8125	33.0	1.2992	24.0	609.6
61/64	0.95312	24.2094	34.0	1.3386	25.0	635.0
31/32	0.96875	24.6063	35.0	1.3780	30.0	762.0
63/64	0.98438	25.0031	40.0	1.5748	35.0	889.0
	1.0	25.40	45.0	1.7717	40.0	1016.0

UNITS	LIQUIDS				PRESSURES		SPEED OR DISTANCE		BRAKING DISTANCE	
	LITRES TO PINTS	PINTS TO LITRES	LITRE^3 TO GALL^3	GALL^3 TO LITRE^3	kg/cm^2 to lbs/in^2	lbs/in^2 to kg/cm^2	KILOS TO MILES	MILES TO KILOS	ON FIRM DRY GROUND, NO WIND	
									METRE	FT.
1	1.76	0.57	0.22	4.55	14.22	0.07	0.62	1.61		
2	3.52	1.14	0.44	9.09	28.45	0.14	1.24	3.22		
3	5.28	1.71	0.66	13.64	42.67	0.21	1.86	4.83		
4	7.04	2.27	0.88	18.18	56.89	0.28	2.49	6.44		
5	8.80	2.84	1.10	22.73	71.12	0.35	3.11	8.05		
6	10.56	3.41	1.32	27.28	85.34	0.42	3.73	9.66		
7	12.32	3.98	1.54	31.82	99.56	0.49	4.35	11.27		
8	14.08	4.55	1.76	36.37	113.79	0.56	4.97	12.88		
9	15.84	5.12	1.98	40.91	128.00	0.63	5.59	14.48		
10	17.60	5.68	2.20	45.46	142.23	0.70	6.21	16.09	4.58	15
15	26.40	8.52	3.30	68.19	213.35	1.05	9.32	24.14	7.62	25
20	35.20	11.37	4.40	90.92	284.47	1.41	12.43	32.19	12.19	40
25	44.00	14.21	5.50	113.65	355.59	1.76	15.53	40.24	16.77	55
30	52.79	17.05	6.60	136.40	426.70	2.11	18.64	48.28	22.88	75
40	70.39	22.74	8.80	181.80	568.90	2.81	24.85	64.37	36.59	120
50	87.99	28.50	11.00	227.30	711.20	3.52	31.07	80.47	56.40	175
60	105.58		13.20				37.28	96.56	73.18	240
70	123.18		15.40				43.50	112.65	96.04	315
80	140.78		17.60				49.71	128.75	128.05	420
90	158.38		19.80				55.92	144.84		
100	175.97		22.0				62.14	160.93	NOTE:-	
110	193.57		24.20				68.35	177.02	Speeds are in miles per hour.	
120	211.17		26.40				74.57	201.17		

TORQUE - LOADING

UNITS ON TORQUE SPANNER	1	2	3	4	5	6	7	8	9	10	15	20	25	30	40	50	60
kg.m. to lb.ft.	7.23	14.47	21.70	28.93	36.17	43.40	50.63	57.86	65.10	72.33	108.45	144.66	180.75	216.99	289.20	361.5	433.8
lb.ft. to kg.m.	0.14	0.28	0.42	0.55	0.69	0.83	0.97	1.11	1.25	1.38	2.10	2.77	3.40	4.15	5.50	6.90	8.35

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