ANGLIA 1959-68 WORKSHOP MANUAL 2nd-EDITION

ANGLIA

Workshop Manual

Ford Anglia

Workshop Manual

includes:

Anglia 1959/68
Anglia Super 1962/68
Anglia Estate 1961/68
Thames 5/7cwt Van 1961/68
Prefect 1959/62

Ford of Britain

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Ford Policy is one of continuous improvement, and the right to change prices, specifications and equipment at any time without notice is reserved.

FOREWORD

This Manual gives repair and adjustment procedures applicable to the following models:

105E	Anglia (997 cc. engine)	(1959 - 1968)
	Anglia Estate (997 cc. engine)	(1961 - 1968)
123E	Anglia (1198 cc. engine)	
	Anglia Super	(1962 - 1968)
	Anglia Estate (1198 cc. engine)	
307E &	Thames 5/7 cwt. van	(1961 - 1968)
107E	Prefect (997 cc. engine)	(1959 - 1962)

It includes component illustrations wherever possible, technical specifications and details of any special tools or equipment that may be required.

When the special tools or equipment mentioned are not available, changes may be necessary to some of the dismantling and reassembly procedures. **In certain instances use of special equipment is essential if a satisfactory repair is to be ensured.** For this reason we strongly advise owners and operators to allow Ford Dealerships to carry out the more complex repairs. e.g. the overhaul of gearbox or differential assemblies.

Repair operations tabulated in this manual are of three types:—

(i) Basic Operation — This can be complete by itself or the prelude to additional work. Generally a basic operation describes the removal and installation of a component or assembly.

(ii) Subsidiary Operation — This is additional work related to a basic operation. For example, overhauling an assembly that has already been removed.

(iii) Group Operation — This is a more extensive operation which combines one basic and one or more subsidiary operations. Because the basic and subsidiary operations are themselves already given in detail, the group operation merely lists which of the basic and subsidiary operations are required to successfully perform the group operation.

Examples:—

Basic Operation
OPERATION 3498-A STEERING GEAR — REMOVE AND INSTALL

Subsidiary Operation
OPERATION 3498-A1 Extra: steering gear — adjust

Group Operation
OPERATION 3498-B **STEERING GEAR — ADJUST**
(Includes OPS 3498-A and A1)

In most cases, the basic operation number corresponds to the part number of the component being serviced, i.e. 1107 is the part number of a wheel stud and OP 1107-A refers to wheel studs.

It is not, however, practical to use part numbers for body operations. Therefore, bodywork operations commence at 1000 and are prefixed by the letter M.

eplacement Parts

ehind all Ford products are the vast resources of Ford of Britain Parts Division from which
placement parts and reconditioned units are supplied to markets throughout the world.
emember, these parts are made to the same exacting standards as the original factory fitted
›mponents. For this reason always insist that only genuine Ford parts are used as service
placements.

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WHEELS, HUBS AND TYRES

SECTION INDEX

GENERAL DESCRIPTION

QUICK REFERENCE DATA

SERVICE AND REPAIR OPERATIONS

OPERATION	1015-A	WHEEL ASSEMBLIES—BOTH FRONT OR BOTH REAR — BALANCE
"	1015-A1	Extra: remaining road wheels — balance
"	1015-B	**WHEEL ASSEMBLIES — FOUR ROAD WHEELS — BALANCE** (Includes OPS 1015-A and A1)
"	1015-C	WHEEL ASSEMBLIES — ALL FIVE — BALANCE
"	1105-A	FRONT WHEEL HUB AND DRUM ASSEMBLY — ONE — REMOVE AND INSTALL
"	1105-A1	Extra: remaining front wheel hub and drum assembly — remove and install (front of vehicle on stands)
"	1105-B	**FRONT WHEEL HUB AND DRUM ASSEMBLY — BOTH — REMOVE AND INSTALL** (Includes OPS 1105-A and A1)
"	1107-A	FRONT WHEEL STUD — ONE — RENEW
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"	1117-A1	Extra: remaining studs - renew (brake drum removed)
"	1117-B	**REAR WHEEL STUDS — ALL — ONE WHEEL — RENEW** (Includes OPS 1117-A and A1)
"	1126-A	BRAKE DRUM — REAR — ONE — REMOVE AND INSTALL
"	1126-A1	Extra: remaining rear brake drum — remove and install (rear of vehicle on stands)
"	1126-B	**BRAKE DRUMS — REAR — BOTH — REMOVE AND INSTALL** (Includes OPS 1126-A and A1)
"	1202-A	WHEEL BEARING — ONE FRONT WHEEL — ADJUST
"	1202-A1	Extra: remaining front wheel bearing — adjust (front of vehicle on stands)

OPERATION	1202-A2	Extra: bearings - one front wheel — lubricate (front of vehicle on stands)
"	1202-A3	Extra: Wheel bearing cups - each front wheel — renew (front hub removed)
"	1202-B	**WHEEL BEARINGS — BOTH FRONT WHEELS — ADJUST** (Includes OPS 1202-A and A1)
"	1202-C	**WHEEL BEARINGS — ONE FRONT WHEEL — LUBRICATE AND ADJUST** (Includes OPS 1202-A and A2)
"	1202-D	**WHEEL BEARINGS — BOTH FRONT WHEELS — LUBRICATE AND ADJUST** (Includes OPS 1202-A, A1 and A2x2)
"	1202-E	**WHEEL BEARING CUPS — ONE FRONT WHEEL — RENEW** (Includes OPS 1202-A, A2 and A3)
"	1202-F	**WHEEL BEARING CUPS — BOTH FRONT WHEELS — RENEW** (Includes OPS 1202-A, A1, A2x2 and A3x2)
"	1225-A	WHEEL BEARING — ONE — REAR — REMOVE AND INSTALL
"	1225-A1	Extra: remaining rear wheel bearing — remove and install (rear of vehicle on stands)
"	1225-B	**WHEEL BEARINGS — BOTH REAR — REMOVE AND INSTALL** (Includes OPS 1225-A and A1)

GENERAL DESCRIPTION

Pressed steel asymmetrical well-based rim wheels, size $3\frac{5}{8}$J x 13, are fitted to all models in this range. The wheels have four stud fixing to the hub. The spare wheel is located at the front of the luggage compartment and secured by a webbing strap, on saloons and under the floor of the loadspace on estate cars. On vans the spare wheel is located on a hanger underneath the floor; this is lowered by turning the bolt in the floor with the wheelbrace.

Crossply tubeless tyres, size 5.20 x 13 are fitted to the saloons, and size 5.60 x 13 to the estate cars and 5 and 7 cwt. vans. Radial ply tyres, size 145 x 13 for the saloons and 155 x 13 for the estate cars and vans are available as an option.

Tyre pressures for each model are given in the table opposite.

It is suggested that when fitting a new tubeless tyre, a new snap-in valve is also fitted. The valve is made to last the life of the tyre, but beyond that time fatigue of the valve body rubber is likely to impair the air seal at the rim hole.

When tyres are being fitted to any flat ledge wheels, they should be fitted from the side of the wheel with the narrowest ledge to avoid damage to the tyre bead.

The front hubs are each mounted on two taper roller bearings, which run in cups pressed into the hub. Never replace a bearing without also replacing the corresponding cup.

The rear hub bearings consist of ball races pressed onto the outer ends of the axle shafts. An oil seal is located between the bearing and the differential assembly.

TYRES AND TYRE CARE

Original equipment tyres

The original equipment tyres for the Anglia have undergone extensive testing by Ford and the tyre manufacturers who produce them.

It is essential for safety that the recommended inflation pressures are always maintained. When tyre tread depth is less than 1 mm, the tyre must (by legal requirement) be renewed. (U.K. only, other territories may have different regulations.)

Radial ply tyres will visually appear under-inflated at the correct recommended pressures. This is normal and they should never be inflated beyond the recommended pressures. **Under no circumstances fit radial-ply tyres on the front with conventional cross-ply on the rear, nor should both types be fitted to one axle.**

Tyre Care

Tyre tread life varies from car to car because of driving conditions. Aside from good driving practices, the most important factor in obtaining maximum tread life is maintaining proper tyre pressure. Pressures lower than recommended may affect vehicle handling. Over inflated tyres reduce ride comfort by magnifying rather than absorbing road shocks and are more vulnerable to damage from road surface impacts.

QUICK REFERENCE DATA

PERIODIC SERVICE ATTENTION

Weekly
- Check tyre pressures

At first 1,000 km. (500 miles)
- Check torque of wheel nuts
- Check tyre pressures

Every 8,000 km. (5000 miles)
- Check and adjust front wheel bearings

Every 24,000 km.(15000 miles)
- Repack and adjust front wheel bearings

DATA

Wheel Size $3\frac{5}{8}$ J x 13

Tyre Usage and Inflation

Model	Tyre	Ply Rating	Pressure kg/sq.cm. (p.s.i.)	
			Front	Rear
Saloon	5.20 x 13 Crossply	4	1.54 (22)	1.54 (22)
	145 x 13 Radial ply	—	1.69 (24)	1.98 (28)
Estate Car	5.60 x 13 Crossply	6	1.69 (24)	2.11 (30)
5 cwt. Van	5.60 x 13 Crossply	4	1.69 (24)	1.69 (24)
	155 x 13 Radial ply	—	1.98 (28)	2.25 (32)
7 cwt. Van	5.60 x 13 Crossply	6	1.69 (24)	2.11 (30)
	155 x 13 Radial ply	—	1.98 (28)	2.39 (34)

The pressures in the above table should be correct when the tyre is "cold" (i.e. after the car has been parked at least one hour). It is usual for a "hot" tyre to exceed the specified "cold" pressure. Do not let air out of a hot tyre.

For reliable vehicle control, always maintain the specified tyre pressures.

Tightening Torques, kg.m. (lb. ft.)

Wheel nuts	7.0 to 8.9 (50 to 65)
Front wheel bearing adjusting nut	See text
Axle shaft bearing retainer bolts	2.1 to 2.4 (15 to 18)

SERVICE AND REPAIR OPERATIONS

OP 1015-A WHEEL ASSEMBLIES — BOTH FRONT OR BOTH REAR — BALANCE (INCLUDES STATIC AND DYNAMIC BALANCE)

The following instructions indicate the general principles to be followed for wheel balancing. The method of balancing, however, will vary for machines of different manufacture. For specific details refer to the equipment manufacturer's instructions.

A — ON THE CAR

1. Jack up the front or rear of the car as required.
2. Check that wheel bearings, suspension ball joints, etc. are in correct order, and that no excess play is present, and that the tyres are correctly inflated.
3. Position the spin-up motor in correct relation to the wheel to be balanced.
4. Remove any wheel weights present.

5. Fit the wheel adaptor, or fit the pick-up onto the suspension as close to the wheel as possible.
6. Spin up the wheel, and balance according to the manufacturer's instructions.
7. For dynamic balance, turn the wheels as required and move the pick-up to the brake back plate or calliper.
8. Again spin up and balance the wheel.
9. Repeat for other wheel.

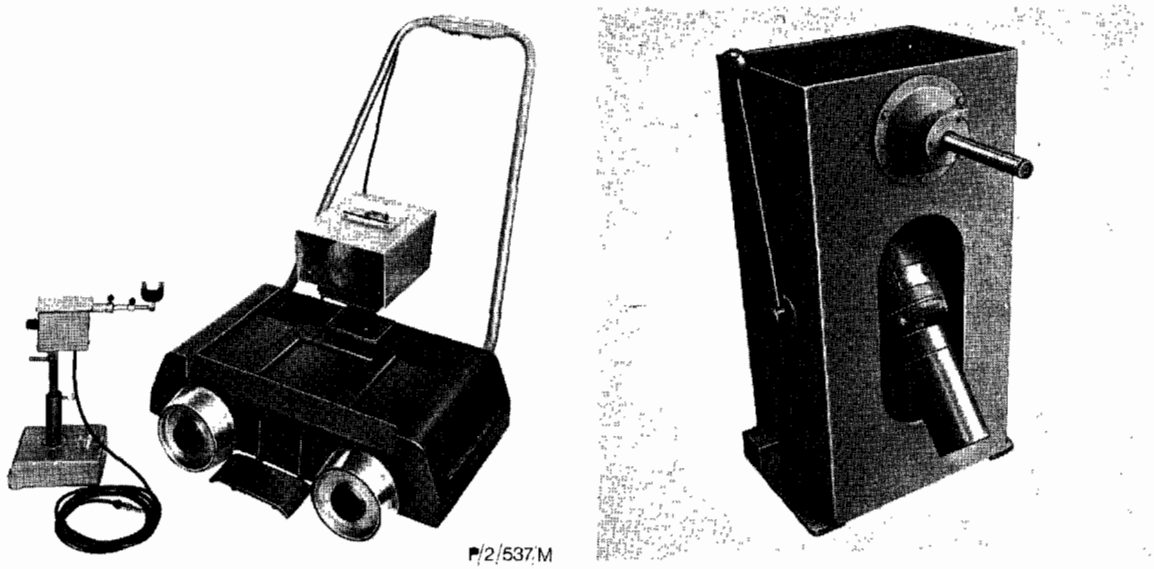
B – OFF THE CAR

1. Jack up the front or rear of the car as required, fit chassis stands and remove the wheels.
2. Remove any wheel weights present, and check that the tyres are correctly inflated.
3. Mount the wheel on the balancer, using the appropriate adaptor.
4. Statically balance the wheel by allowing it to spin so that the heaviest sector rests at the bottom, and applying suitable weights.
5. Spin up, and dynamically balance according to the manufacturer's instructions.
6. If necessary, repeat static balance.
7. Remove the wheel, mount the other wheel and balance.

OP 1015-A1 EXTRA: REMAINING ROAD WHEELS – BALANCE (INCLUDES STATIC AND DYNAMIC BALANCE)

Repeat the above operations for the remaining two wheels.

OP 1015-B WHEEL ASSEMBLIES – FOUR ROAD WHEELS – BALANCE (INCLUDES STATIC AND DYNAMIC BALANCE) – (Includes OPS 1015-A and A1)



On the Car **Off the Car**

Wheel Balancing Equipment

OP 1015-C WHEEL ASSEMBLIES – ALL FIVE – BALANCE (INCLUDES STATIC AND DYNAMIC BALANCE)

1. Jack up the car and fit chassis stands all round.
2. Remove the road wheels and spare wheel.
3. Remove any wheel weights present, and check that the tyres are correctly inflated.
4. Mount one wheel on the balancer.
5. Statically balance the wheel by allowing it to spin so that the heaviest sector rests at the bottom, and applying suitable weights.
6. Spin up and dynamically balance according to the manufacturer's instructions.
7. If necessary, repeat static balance.
8. Remove the wheel and repeat for the other four wheels.

OP 1105-A FRONT WHEEL HUB AND DRUM ASSEMBLY – ONE – REMOVE AND INSTALL

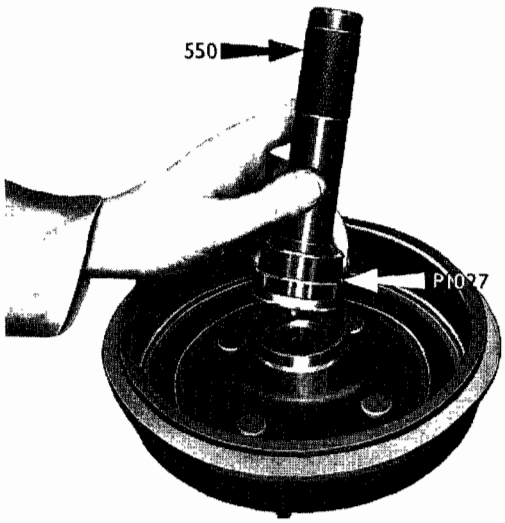
Tools Required

P.1027	Front hub grease seal replacer
550	Universal handle

To Remove

1. Remove the hub cap and slacken the wheel nuts.
2. Jack up the front of the car and fit chassis stands.
3. Detach the road wheel.
4. Prise out the dust cap from the centre of the hub. Withdraw the split pin, remove the nut retainer, adjusting nut, thrust washer and outer bearing cone.

Front Hub Bearing Adjustment



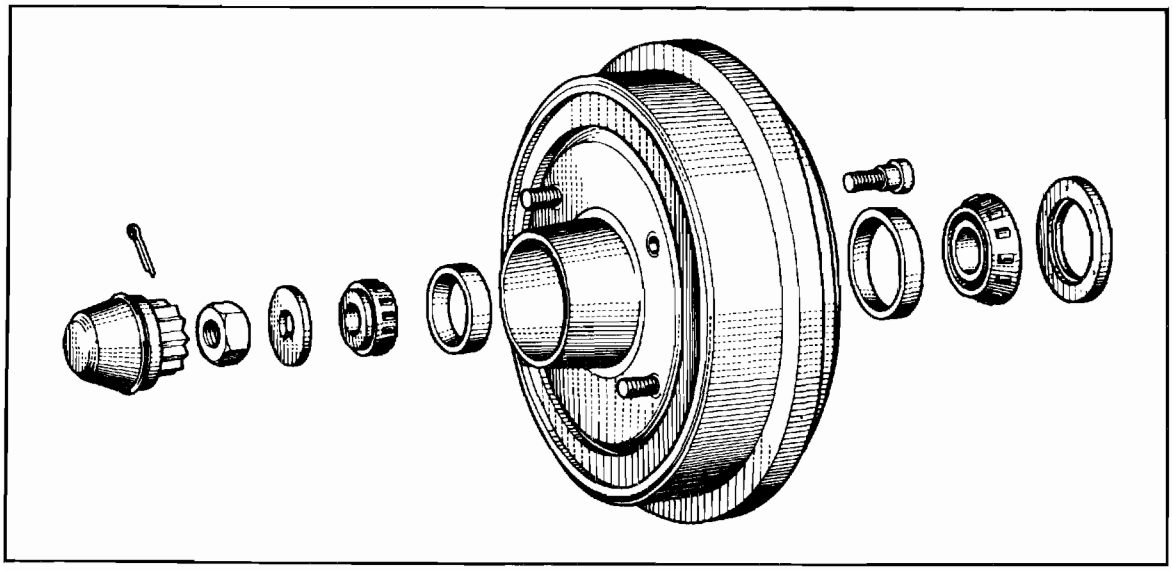
Fitting the Front Hub Oil Seal–Drum

Note: On early models, a castellated adjusting nut is fitted instead of the plain nut and retainer.

5. Remove the hub and drum assembly from the wheel spindle, slackening back the brake adjusters if necessary.
6. Extract the grease retainer from the inner end of the hub, using a suitable lever.
7. Remove the inner bearing cone and clean any old grease from the bearings and hub.

To Install

8. Pack the bearings with lithium base grease, working it well into the bearing cages.
9. Pack the hub with lithium base grease and replace the inner bearing cone.
10. Using tool no. P.1027 and the 550 handle, fit the grease seal with the lip towards the bearing.
11. Position the hub and brake drum assembly on the spindle and locate the outer bearing cone in its cup.
12. Refit the thrust washer on the spindle end with the tongue engaging in the spindle slot. Replace the adjusting nut and tighten to a torque of 4.14 kg.m. (30 lb/ft.) Slacken off 2 to 2½ flats. Where a castellated nut is used, fit a new split pin. Where a plain nut is used, position the nut retainer so that one of the slots in it aligns with the hole in the wheel spindle and fit a new split pin.
13. Attach the road wheel.
14. Adjust the brakes as described in OP 2000-C.
15. Jack up the car, remove the stands and lower the car to the ground.
16. Tighten the wheel nuts and replace the hub cap.



Front Hub and Drum Assembly — Exploded

Note: When fitting a new drum always remove any preservative with a suitable solvent, otherwise braking efficiency will be impaired and brake lining life will be reduced.

OP 1105-A1 EXTRA: REMAINING FRONT WHEEL HUB AND DRUM ASSEMBLY – REMOVE AND INSTALL (FRONT OF VEHICLE ON STANDS)

Repeat sub-operations 3 to 14 above.

OP 1105-B FRONT WHEEL HUB AND DRUM ASSEMBLY – BOTH – REMOVE AND INSTALL (Includes OPS 1105-A and A1)

OP 1107-A FRONT WHEEL STUD – ONE – RENEW

To Remove

1. Remove hub as in OP 1105-A, sub-operations 1 to 5.
2. Drive out the stud.

To Install

3. Locate the new stud in its splined hole and draw it into position using a spacer and the wheel nut reversed i.e. tapered face outwards.

   Note: On early models a stud with a shallow head was used. This can be identified by the flat head. Replacement studs will be of the later type, which can be identified by the indented head. When fitting a new stud to an early car, it may be necessary to increase the depth of the countersink in the drum.

4. Replace the hub and road wheel as in OP 1105-A sub-operations 11 to 16.

OP 1107-A1 EXTRA: REMAINING STUDS – RENEW

Repeat sub-operations 2 and 3 above.

OP 1107-B FRONT WHEEL STUDS – ALL – RENEW (Includes OPS 1107-A and A1)

OP 1117-A WHEEL STUD – REAR – ONE – RENEW

To Remove

1. Remove the hub cap, slacken the wheel nuts, chock the front wheels, jack up the rear of the car and fit stands.
2. Detach the road wheels.
3. Remove the brake drum after unscrewing the small retaining screw and releasing the handbrake.
4. Drive out the wheel stud.

To Install

5. Locate the new stud in its splined hole and draw it into position using a spacer and the wheel nut reversed i.e. tapered face outwards.
6. Replace the road wheel.
7. Jack up the car, remove the stands and lower the car to the ground.
8. Tighten the wheel nuts and fit the hub caps.

9. Apply the handbrake and remove the chocks from the front wheels.

OP 1117-A1 EXTRA: REMAINING STUDS – RENEW (BRAKE DRUM REMOVED)

Repeat sub-operations 4 and 5 above.

OP 1117-B REAR WHEEL STUDS – ALL – ONE WHEEL – RENEW
(Includes OPS 1117-A and A1)

OP 1126-A BRAKE DRUM – REAR – ONE – REMOVE AND INSTALL

To Remove

1. Chock the front wheels, jack up the rear of the car and fit chassis stands.
2. Detach the road wheel.
3. Remove the brake drum after unscrewing the small retaining screw and releasing the handbrake.

   Note: It may be necessary to back off the brake adjuster before removing the drum.

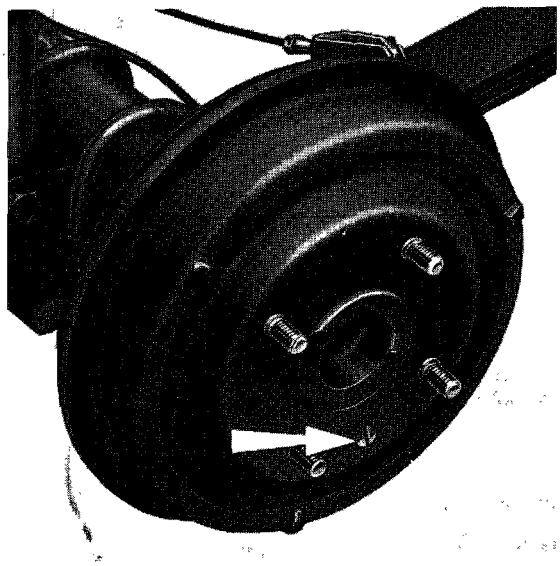
To Install

4. Install the new brake drum and secure with the small retaining screw.
5. Replace the road wheel.
6. Adjust brake if necessary.
7. Jack up the car, remove the stands and lower the car to the ground.
8. Apply the handbrake and remove the chocks from the front wheels.

   Note: When fitting a new drum, always remove any preservative with a suitable solvent otherwise braking efficiency may be impaired and brake lining life reduced.

OP 1126-A1 EXTRA: REMAINING REAR BRAKE DRUM – REMOVE AND INSTALL – (REAR OF VEHICLE ON STANDS)

Repeat sub-operations 2 to 6 above.



Rear Brake Drum

OP 1126-B BRAKE DRUMS – REAR – BOTH – REMOVE & INSTALL
(Includes OPS 1126-A and A1)

OP 1202-A WHEEL BEARING – ONE FRONT WHEEL – ADJUST

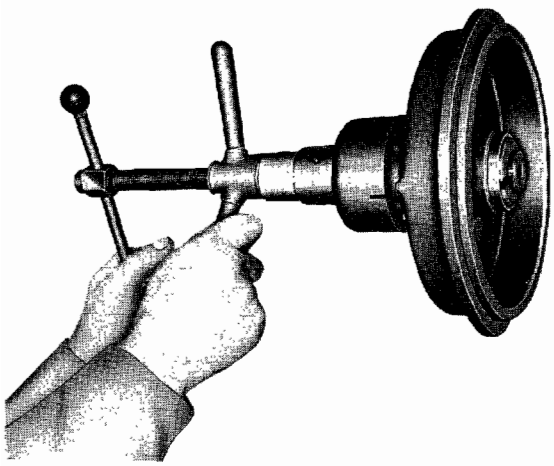
To Adjust

1. With the handbrake applied, jack up the front of the car and fit chassis stands.
2. Detach the hub cap and prise out the dust cap from the end of the wheel spindle.
3. Remove the split pin and detach the adjusting nut retainer.

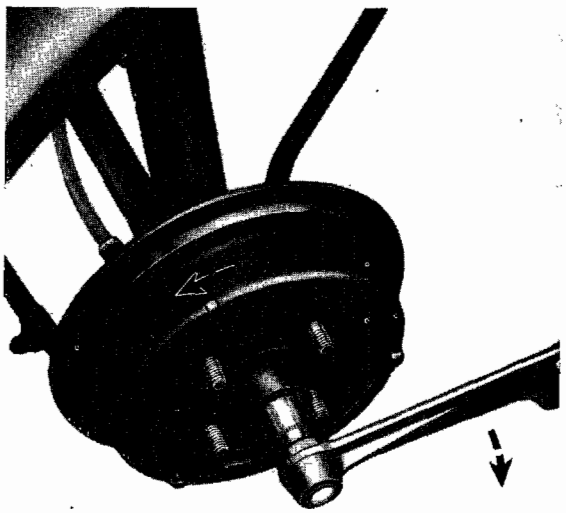
   Note: Early models have a castellated adjusting nut instead of a plain nut and nut retainer.
4. Adjust the bearing by tightening the adjusting nut to a torque of 4.14 kg.m (30 lb.ft.) whilst rotating the road wheel, and backing the nut off 2 to 2½ flats.
5. On models fitted with a plain nut, position the nut retainer so that a slot in the retainer lines up with the hole in the spindle. On models fitted with a castellated adjusting nut, two holes are drilled in the wheel spindle at 90° to each other. Line up a slot in the nut with one of these holes.
6. Fit a new split pin and bend back the legs. Tap the dust cap into place and replace the hub cap.
7. Jack up the car, remove the stands and lower the car to the ground.

OP 1202-A1 EXTRA: REMAINING FRONT WHEEL BEARING – ADJUST
(FRONT OF VEHICLE ON STANDS)

Repeat sub-operations 2 to 6 above.



Fitting a Hub Bearing Cup



Adjusting the Front Wheel Bearing

1202-A2 EXTRA: BEARING – ONE FRONT WHEEL – LUBRICATE (FRONT OF VEHICLE ON STANDS)

ls Required

127 Front hub grease seal replacer
Universal handle

Dismantle

Detach the hub cap, prise the dust cap from the centre of the hub, withdraw the split pin, remove the nut retainer (where fitted), adjusting nut, thrust washer and outer bearing cone.

Remove the hub and drum assembly from the wheel spindle.

Extract and discard the grease seal and detach the inner bearing cone.

Wash out the hub and the bearing cones. During this operation, take care not to get any grease etc. on the inner surface of the brake drum.

le-assemble

Pack the hub and bearings with lithium base grease, working it well into the bearing cages and leaving sufficient space in the hub for the wheel spindle to pass through.

202-A3 EXTRA: WHEEL BEARING CUPS – EACH FRONT WHEEL – RENEW (FRONT HUB REMOVED)

s Required

24 Front hub bearing cups remover and replacer (Main Tool)
24-3,7 Adaptors for P.1024

lemove

Remove the inner and outer bearing cups, using P.1024 and the adaptors. Remove one cup at a time using the appropriate adaptor. Check that the adaptor is correctly fitted in the cup before tightening wing nut.

Note: Never use drifts to remove bearing cups as damage may be caused to the hub which could prevent new cups seating correctly.

eplace

Locate the cups into the hub, using P.1024 to pull them into position. Fit one cup at a time.

Note: New cups should normally be fitted when cones are replaced.

202-B WHEEL BEARINGS – BOTH FRONT WHEELS – ADJUST (Includes OPS 1202-A and A1)

202-C WHEEL BEARINGS – ONE FRONT WHEEL – LUBRICATE AND ADJUST (Includes OPS 1202-A and A2)

202-D WHEEL BEARINGS – BOTH FRONT WHEELS – LUBRICATE AND ADJUST (Includes OPS 1202-A, A1 and A2 x 2)

OP 1202-E WHEEL BEARING CUPS – ONE FRONT WHEEL – RENEW
(Includes OPS 1202-A, A2 and A3)

OP 1202-F WHEEL BEARING CUPS – BOTH FRONT WHEELS – RENEW
(Includes OPS 1202-A, A1, A2 x 2 and A3 x 2)

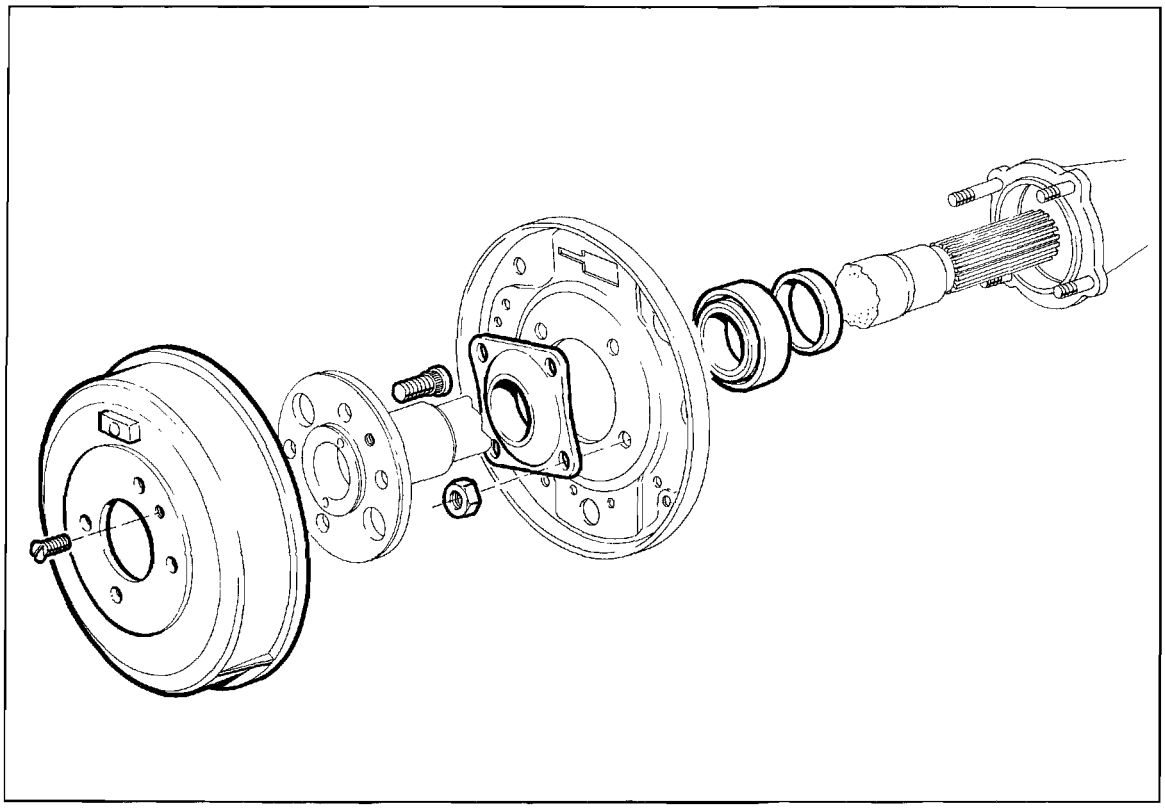
OP 1225-A WHEEL BEARING – ONE – REAR – REMOVE AND INSTALL

Tools Required

CPT 3072	Slide Hammer
P.4090-2,6	Axle shaft bearing remover
370	Universal taper bore for press
P.4084	Spring indicator

To Remove

1. Chock the front wheels, jack up the rear of the car, fit stands and remove the road wheel.
2. Release the handbrake.
3. Remove the brake drum securing screw and pull off the drum.
4. Remove the four special bolts with spring washers attached, securing the bearing retainer plate to the axle casing. These bolts are accessible through the holes in the axle shaft flange.
5. Secure the base of Tool No. CPT.3072 to the axle shaft flange with the wheel nuts. Use the slide hammer of the tool to draw out the axle shaft.



Rear Wheel Bearing and Brake Drum — Exploded

6. Locate the adaptors, Tool No. P.4090-6, and a slave ring between the bearing and axle shaft flange. Support the assembly in the base plate, Tool No. 370, of a hydraulic press and push the axle shaft out of the bearing.

To Install

7. Locate the bearing retainer plate and the bearing on the axle shaft.
8. Support the assembly in the bed of a hydraulic press on a spacer ring adaptor, Tool No. P.4090-2, and slave ring.
9. Fit a spring indicator, Tool No. P.4084, to the ram and press the bearing onto the axle shaft shoulder. A minimum pressure of 544 kg. (1,200 lb.) should be required. A lower pressure indicates an incorrect fit.
10. Use the same tools as in operations 6 and 7 and fit the bearing collar to abut the bearing. A minimum pressure of 363 kg. (800 lb.) should be required.
11. Insert the axle shaft into the casing and engage the splines in the differential side gear. Tap the shaft fully home.
12. Fit the four bolts and spring washers to secure the bearing retainer plate; tighten to a torque of 2.08 to 2.48 kg.m (15 to 18 lb.ft.).

    Note: The retainer plate only fits one way. The slightly pointed edge should face the rear of the car.

13. Replace the brake drum and refit the securing screw.
14. Replace the road wheel and apply the handbrake.
15. Jack up, remove the stands and lower the car to the ground. Remove the chocks from the front wheels.

OP 1225-A1 EXTRA: REMAINING REAR WHEEL BEARING – REMOVE AND INSTALL (REAR OF VEHICLE ON STANDS)

Repeat sub-operations 3 to 14 above

OP 1225-B WHEEL BEARINGS – BOTH REAR – REMOVE AND INSTALL (Includes OPS 1225-A and A1)

2
BRAKING SYSTEM

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:NERAL DESCRIPTION

:AKE PIPES

JICK REFERENCE DATA

RVICE AND REPAIR OPERATIONS

OPERATION	2000-A	BRAKING SYSTEM – BLEED
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„	2000-D	BRAKE SHOES – ALL – RENEW
„	2000-E	BRAKE HYDRAULIC FLUID – RENEW
„	2018-B	FRONT BRAKE SHOES AND/OR RETRACTING SPRINGS – ONE WHEEL – RENEW
„	2018-B1	Extra: brake shoes and/or retracting springs – second front wheel – remew
„	2018-B2	Extra: front brake wheel cylinders – one wheel - remove and install
„	2018-B3	Extra: front brake carrier plate – one wheel – overhaul
„	2018-B4	Extra: brake carrier plate – one – remove and install
„	2018-C	**FRONT BRAKE SHOES AND/OR RETRACTING SPRINGS – ALL – RENEW** (Includes OPS 2018-B and B1)
„	2018-D	**FRONT WHEEL CYLINDERS – ONE SIDE – REMOVE AND INSTALL** (Includes OPS 2018-B and B2)
„	2018-E	**FRONT WHEEL CYLINDERS – ALL – REMOVE AND INSTALL** (Includes OPS 2018-B, B1 and B2 x 2)
„	2018-F	**FRONT WHEEL CYLINDERS – ONE SIDE – OVERHAUL** (Includes OPS 2018-B, B2 and B4)
„	2018-G	**FRONT WHEEL CYLINDERS – ALL – OVERHAUL** (Includes OPS 2018-B, B1, B2 x 2 and B4 x 2)
„	2018-H	**FRONT BRAKE CARRIER PLATE – ONE – REMOVE AND INSTALL** (Includes OPS 2018-B, B2 and B4)
„	2018-J	**FRONT BRAKE CARRIER PLATES – BOTH –REMOVE AND INSTALL** (Includes OPS 2018-B, B1, B2 x 2 and B4 x 2)
„	2074-A	THREE WAY UNION – REAR – RENEW
„	2075-A	FOUR–WAY UNION – FRONT – RENEW
„	2078-A	HYDRAULIC FLEXIBLE HOSE – ANY ONE – RENEW
„	2078-A1	Extra: hydraulic flexible tube – each additional – renew
„	2140-A	BRAKE MASTER CYLINDER – REMOVE AND INSTALL
„	2140-A1	Extra; brake master cylinder – overhaul
„	2140-B	**BRAKE MASTER CYLINDER – OVERHAUL** (Includes OPS 2140-A and A1)
„	2220-B	REAR BRAKE SHOES AND/OR RETRACTION SPRINGS – ONE SIDE – RENEW

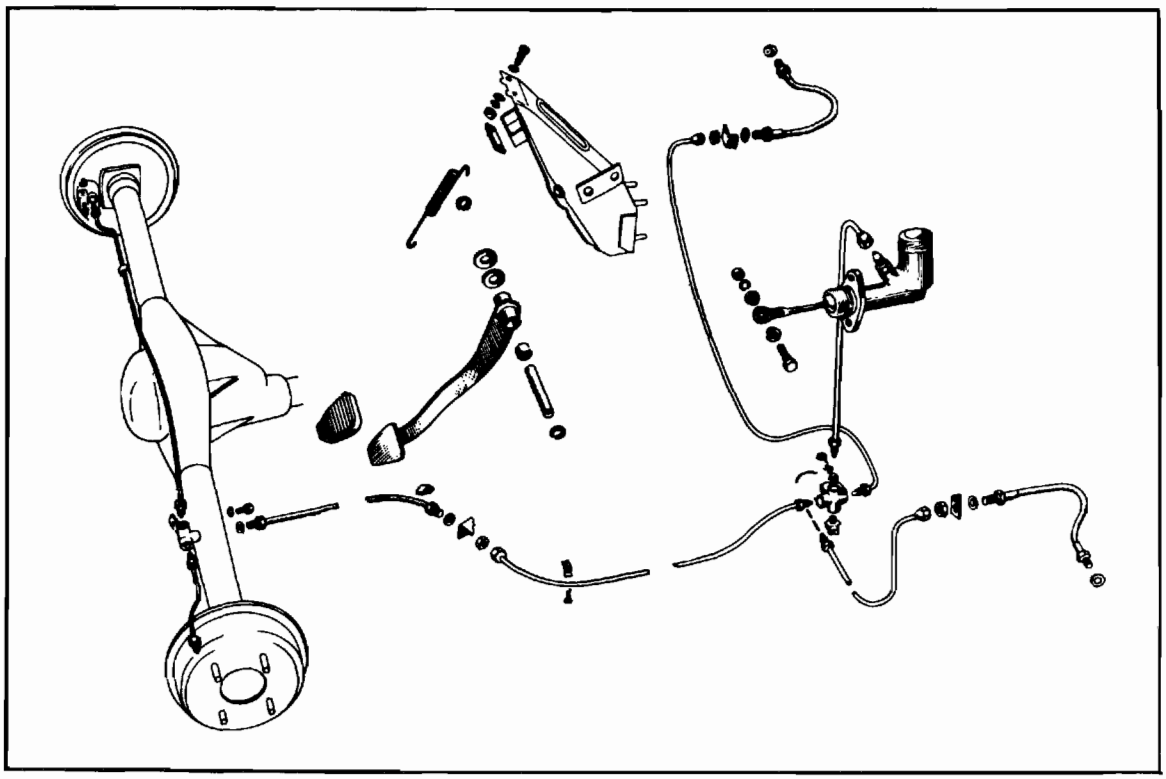
OPERATION	2220-B1	Extra: brake shoes and/or retracting springs — second side — renew
„	2220-B2	Extra: rear brake adjuster unit — remove and install and/or overhaul
„	2220-B3	Extra: rear wheel cylinder — one — remove and install
„	2220-B4	Extra: rear wheel cylinder — overhaul
„	2220-B5	Extra: rear brake carrier plate — remove and install
„	2220-C	**REAR BRAKE SHOES AND/OR RETRACTING SPRINGS —ALL — RENEW** (Includes OPS 2220-B and B1)
„	2220-D	**REAR BRAKE ADJUSTER UNIT — ONE SIDE — OVERHAUL** (Includes OPS 2220-B and B2)
„	2220-E	**REAR BRAKE ADJUSTER UNITS — BOTH —OVERHAUL** (Includes OPS 2220-B and B2 x 2)
„	2220-F	**REAR WHEEL CYLINDER — ONE SIDE —REMOVE AND INSTALL** (Includes 2220-B and B3)
„	2220-G	**REAR WHEEL CYLINDERS — BOTH — REMOVE AND INSTALL** (Includes OPS 2220-B, B1 and B3 x 2)
„	2220-H	**REAR WHEEL CYLINDER — ONE SIDE — OVERHAUL** (Includes OPS 2220-B, B3 and B4)
„	2220-J	**REAR WHEEL CYLINDERS — BOTH — OVERHAUL** (Includes OPS 2220-B, B1, B3 x 2 and B4 x 2)
„	2220-K	**REAR BRAKE CARRIER PLATE — ONE SIDE — REMOVE AND INSTALL** (Includes OPS 2220-B, B1, B2 x 2, B3 x 2 and B5)
„	2220-L	**REAR BRAKE CARRIER PLATES — BOTH — REMOVE AND INSTALL** (Includes OPS 2220-B, B1, B2 x 2, B3 x 2 and B5 x 2)
„	2800-A	HANDBRAKE LINKAGE — ADJUST
„	2811-A	HANDBRAKE LEVER ASSEMBLY — REMOVE AND INSTALL
„	2841-A	HANDBRAKE TRANSVERSE ROD — RENEW
„	2853-A	HANDBRAKE PRIMARY CABLE — RENEW

GENERAL DESCRIPTION

A hydraulic four-wheel braking system is fitted to all models in the range. The brakes are actuated by pendant pedal suspended from a bracket attached to the rear face of the engine compartment bulkhead. A cable-operated handbrake, acting on the rear wheels only, is applied by means of a "pull-up" type lever between the front seats.

The front drum brakes are of the two leading shoe type, the rear brakes are of leading and trailing shoe design. To compensate for lining wear, adjusters are provided on the brake backplates (two on the front, one on the rear) so that the shoes can be moved nearer to the brake drum.

When carrying out any work on the hydraulic system ensure that only clean, approved brake fluid (ME-3833-F) is used to top-up or refill the system. Never replace hydraulic seals that have been used, always fit new seals from the service kit. It should be noted that the only fluids that may be used to clean components that come into contact with brake fluid are commercial alcohol, methylated spirit or approved brake fluid. Mineral oils such as petrol, paraffin, carbon tetrachloride, etc. MUST NOT be used.



Hydraulic Braking System

BRAKE PIPES

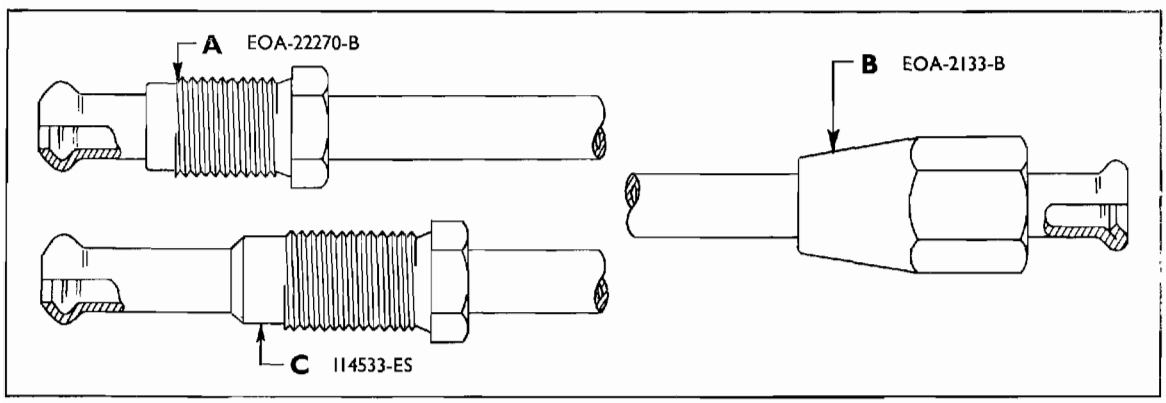
To eliminate impractical and expensive stock holding, brake pipes are not serviced individually. They should be fabricated in line with the information in the chart below.

All brake pipes must be manufactured from bundy tubing habing a wall thickness of 0.7 mm. (0.028 in.) (EM-900D-1 is a suitable material). **On no account must fuel pipe be used as it is designed to operate at a much lower pressure and will fail if used as brake pipe.**

Brake Pipe Chart

	LENGTH		END FITTINGS		
Part Number	cms.	Inches	A	B	C
105E-2263-D	43.0	17.0	1	1	–
105E-2263-F	26.5	10.5	1	1	–
105E-2264-D	118.0	46.5	–	1	1
105E-2264-F	134.5	53.0	1	1	–
309E-2265-A	194.5	76.5	1	1	–
309E-2265-B	226.0	89.0	1	1	–
105E-2266-B	189.0	74.5	1	1	–
105E-2266-C	189.0	74.5	1	1	–
105E-2266-D	219.5	86.5	1	1	–
307E-2266-B	188.0	74.0	1	1	–
307E-2266-C	218.5	86.0	1	1	–
105E-2267-A	59.5	23.5	2	–	–
105E-2267-B	63.0	24.8	2	–	–
307E-2267-	66.0	26.0	–	–	2
105E-2268-A	96.5	38.0	2	–	–
105E-2268-B	89.0	35.3	2	–	–
307E-2268	86.5	34.0	–	–	2
105E-2269-B	53.5	21.0	1	1	–
105E-2269-C	55.0	21.5	2	–	–
105E-2269-D	21.5	8.5	2	–	–
106E-2269-B	110.5	43.5	1	1	–
106E-2269-C	114.5	45.0	2	–	–
106E-2269-D	81.0	32.0	2	–	–

Brake Pipe End Fittings



FORMING PIPES

Two types of flare are used on piping:

(1) Single flare

(2) Double Flare

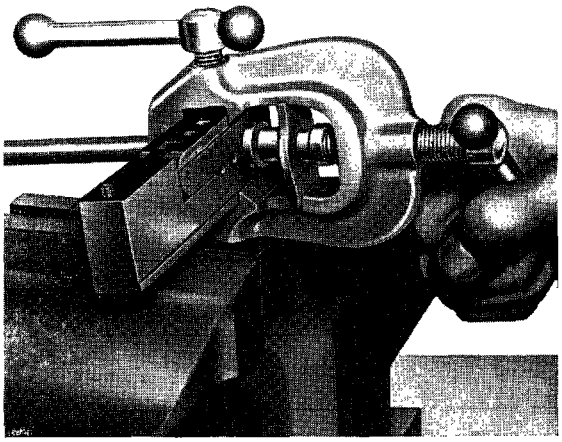
Either of these flares can be formed, using the same tool.

Flaring a Pipe (Split-Die Type)

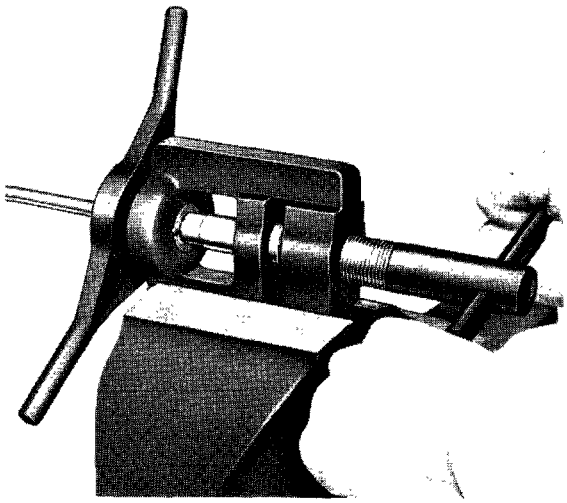
Single Flare	Ops. 1 to 5, 7 and 8
Double Flare	Ops. 1 to 8

1. Cut off and straighten the required length of pipe. (A pipe cutting tool will simplify obtaining a clean and square cut.)
2. Square off the ends of the pipe with a file and chamfer the end of the pipe to be flared.
3. Select the split die for the pipe being used and insert the die into the tapered hole in the body.
4. Push the Bundy tube through the die until the pipe is flush with the face of the die. Lock the pipe in this position by tightening the wing nut securely.
5. The punches are marked Op. 1 and Op. 2. Slide the first operation punch into the hole in the centre of the body and tighten the screw well home to form the single flare.
6. Release the screw and replace the first operation punch with the second operation punch and tighten the screw to form the double flare.
7. Release the screw, wing nut, punch and dies.
8. Remove the pipe and inspect the flare for cracks or poor flare form. If any doubt exists about the flare it should be cut off and the process repeated.

   The finished flare must be square with the pipe, free from any cracks and have a smooth mating surface to ensure a leakproof connection.



Pipe Flaring (Flaring-Bar Type)



Pipe Flaring (Split Die Type)

Flaring a Pipe (Flaring-Bar Type)

Single Flare	Ops. 1 to 6 and 8
Double Flare	Ops. 1 to 8

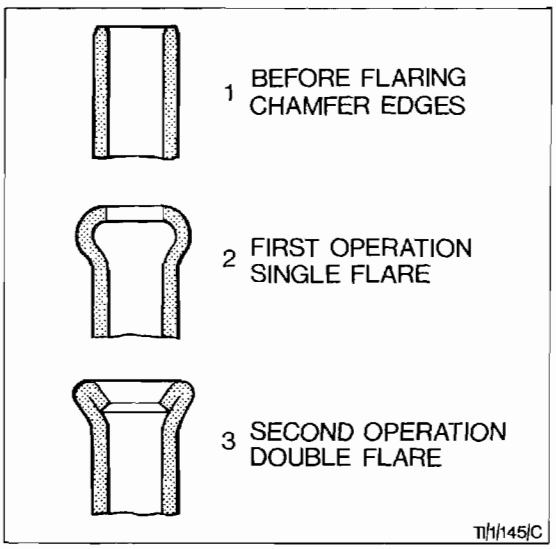
1. Cut off and straighten the required length of pipe. (A pipe cutting tool will simplify obtaining a clean and square cut.)
2. Square off the ends of pipe with a file and chamfer the end of the pipe to be flared.
3. Insert the pipe through its appropriate ribbed hole in the bar assembly until the end of the pipe protrudes approximately the thickness of the respective adaptor above the bar, or flush with the bar, depending on the tool used.
4. Fit the adaptor on to the pipe and slide the bar into the yoke. Lock the bar in position with the pipe beneath the yoke screw.
5. Form the single flare by screwing the yoke screw well home.
6. Release the screw and remove the adaptor.
7. Form the double flare by screwing down the yoke screw again, with second adaptor fitted, depending on the tool used.
8. Release the screw, bar and flared pipe. Inspect the flare for cracks or poor flare form and if any doubt exists about the flare, it should be cut off and the process repeated.

Bending the Pipe

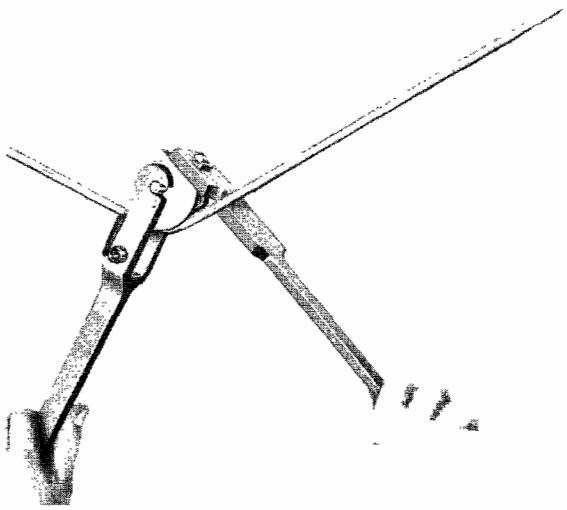
Any suitable Bundy tube bending tool should be used in the manner prescribed by the tool manufacturer. It is also possible to hand form bends around a suitable former, which can be manufactured to suit the different size pipes. When forming a pipe by hand it is essential that the pipe is not kinked as it will then be weakened, and may fracture when fitted to the car.

When special formers are made for specific applications, always keep the surfaces smooth and the shapes free from edges which could damage the tube.

If it is necessary to form a sharp bend very close to the end of the pipe, the difficulty arises of bending the pipe after forming the flare or vice versa. This can be overcome by extending the length of tube with the use of a male and female connection, alternatively, screw several Brake Pipe Plugs, Tool No. P.2012 together and screw into the pipe connection. It is then possible to grip the extension and form the bend.



Flaring Sequence



Pipe Bending

MINIMUM PERMISSIBLE BENDING RADII

UP TO 45°				46° TO 90°				91° TO 360°			
HAND BEND		DIE BEND		HAND BEND		DIE BEND		HAND BEND		DIE BEND	
mm.	in.	mm.	in.	mm.	in.	mm.	in.	mm.	in.	mm.	in
9.5	3/8	4.8	3/16	19.1	3/4	9.5	3/8	22.2	7/8	11.1	7/16

QUICK REFERENCE DATA

PERIODIC SERVICE ATTENTION

Weekly

(a) Check brake fluid reservoir.

8,000 km. (5,000 miles)

(b) Check brake shoes for wear and blow the drums clean.
(c) Check the handbrake cable adjustment and correct if required.

64,000 km. (40,000 miles) or three years whichever occurs first

(d) It is advisable at this time to discuss renewing the brake fluid, flexible hoses and hydraulic seals with your Authorised Main Dealer.

DATA

Front Brakes

	997 c.c.	1200 c.c.
Diameter of drum...	20.32 cm. (8.00 ins.)	20.32 cm. (8.00 ins.)
Width of drum	3.18 cm. (1.25 ins.)	4.45 cm. (1.75 ins.)

Linings

Length per shoe	19.51 cm. (7.68 ins.)	15.88 cm. (6.26 ins.)
Thickness	0.475 cm. (0.187 ins.)	0.477 cm. (0.188 ins.)
Total area	247.5 sq.cm. (38.4 sq.ins.)	283.7 sq. cm. (43.98 sq.ins.)
Wheel Cylinder bore	1.905 cm. (0.75 ins.)	1.905 cm. (0.75 ins.)

Rear Brakes

Diameter of drum...	20.32 cm. (8.00 ins.)	20.32 cm. (8.00 ins.)
Width of drum	3.18 cm. (1.25 ins.)	3.8 cm. (1.50 ins.)

Linings

Length per shoe	19.51 cm. (7.68 ins.)	15.88 cm. (6.26 ins.)
Thickness	0.475 cm. (0.187 ins.)	0.477 cm. (0.188 ins.)
Total Area	247.5 sq.cm.. (38.4 sq.ins.)	243.2 sq.cm. (37.7 sq.ins.)
Wheel cylinder bore – Saloon	1.778 cm. (0.70 ins.)	1.905 cm. (0.75 ins.)
Vans & Estate	1.905 cm. (0.75 ins.)	1.905 cm. (0.75 ins.)

General

Master cylinder bore ... ... 1.58 cm. (0.625 ins.)

Tightening Torques

	kg.m.	lbs.ft.
Front brake plate to spindle body	2.49 to 3.32	18 to 22
Rear brake plate to axle housing	2.49 to 3.32	18 to 22
Hydraulic unions	0.97 to 1.1	7 to 8
Bleed valves	0.69 to 1.04	6 to 7½
Road wheel nuts	6.91 to 7.60	50 to 55
Front wheel cylinders to back plate	0.55 to 0.69	4 to 5
Rear brake adjuster to back plate	0.55 to 0.69	4 to 5

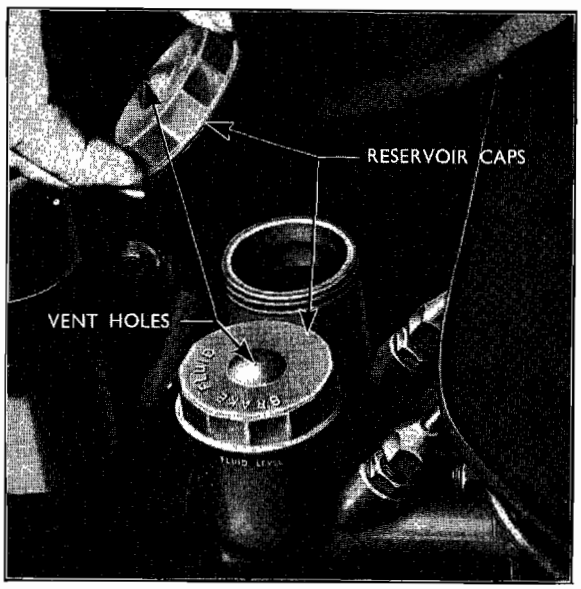
SERVICE AND REPAIR OPERATIONS

OP 2000-A BRAKING SYSTEM – BLEED

Tools Required

P.2006 Brake bleeding tubes

1. Remove the reservoir filler cap and top-up the reservoir.
2. Remove the rubber dust cap from the right hand front bleed nipple and fit a bleed tube, Tool No. P.2006.
3. Place the other end of the tube in a glass jar containing a small quantity of approved brake fluid. During the bleeding operation the end of the pipe must be kept immersed in the fluid.
4. Unscrew the bleed valve about half-a-turn, depress the brake pedal fully and then allow it to return to its "off" position. Brake fluid and/or air should have been pumped into the jar, if not, unscrew the bleed valve further.



Brake and Clutch Master Cylinders

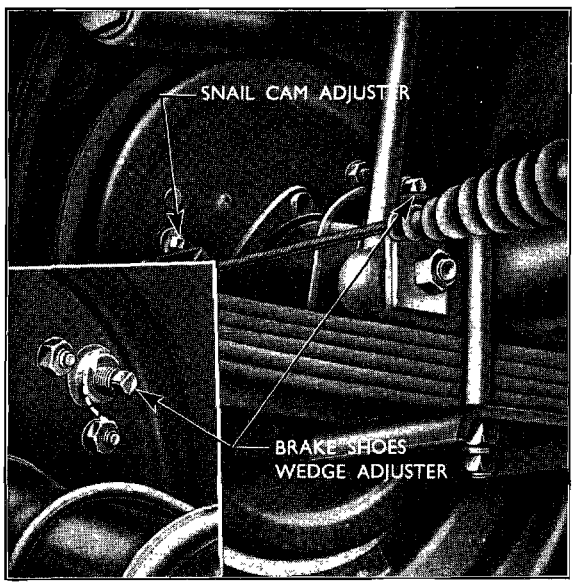
5. Pause for about three seconds to allow full recuperation of the master cylinder.
6. Continue depressing the brake pedal, pausing after each return stroke until the fluid entering the jar is clean and free from air bubbles.
7. Press the pedal down to the floor and hold it there whilst the bleed valve is tightened.

   Note: The correct tightening torque is 0.7 to 1.0 kg.m. (5 to 7 lb.ft.), DO NOT OVERTIGHTEN.
8. During the bleeding operation keep the master cylinder topped-up with approved fluid.
9. Remove the tube and replace the rubber dust cap.
10. Bleed the left hand front brake in the same way.
11. Bleed the right hand rear brake in the same way, and then the left hand rear brake.
12. Re-bleed the right hand front brake to check that air has not been drawn in through the master cylinder.
13. Top-up the master cylinder and replace the filler cap after checking that the vent hole is clear.

OP. 2000-C BRAKE SHOES – ADJUST

1. Jack up the car and fit stands.
2. On the right hand front wheel, back off one of the adjusters (anti-clockwise).
3. Tighten the other adjuster until the wheel is locked, then back it off until the wheel spins freely without the brakes binding.
4. Similarly adjust the other adjuster.
5. Repeat this procedure for the left hand front wheel.

   Note: Models produced prior to July 1963 have a snail cam adjuster incorporated on each rear brake back plate and a separate adjusting procedure exists for these models.



Rear Brake Shoe Adjustment

Front Brake Adjustment

A. Early Models

6. Check that the rear drums are cold and that the handbrake lever is released.
7. Turn the square headed threaded wedge adjuster clockwise until both shoes are held firmly against the drum.
8. Gently turn the square shank of the snail and cam adjuster clockwise until the cam can be felt to touch the loading shoe.
9. Slacken off the wedge adjuster two "clicks" and then slacken back the snail cam adjuster 1/12th of a turn.
10. Repeat on the other brake plate then rotate each wheel in turn when no binding should be perceptible.

    If a shoe is binding, the snail-cam adjuster should be slackened back just sufficiently to free this shoe. If movement of the snail-cam adjuster has no effect on the binding shoe, return the snail-cam to its original position and slacken back the wedge adjuster until the shoe is free.

B Later Models

6. Check that the rear drums are cold and that the handbrake lever is released.
7. Turn the wedge type adjuster on one brake plate clockwise until both shoes are held firmly against the drum.
8. Slacken off the wedge type adjuster two "clicks" and check that the wheel is free to rotate.
9. Repeat on the other brake plate and rotate each wheel in turn, when no binding should be apparent.

OP 2000-D BRAKE SHOES – ALL – RENEW
(This is equivalent to OPS 2018-C and 2220-C)

OP 2000-E BRAKE HYDRAULIC FLUID – RENEW
(This is equivalent to OP 2000-A, except that the system must be bled at each point until clean new fluid is expelled through each bleed valve.)

OP 2018-B FRONT BRAKE SHOES AND/OR RETRACTING SPRINGS – ONE WHEEL – RENEW

To Remove

1. Jack up the front of the vehicle and fit stands.
2. Prise the hub and dust caps from their locations.
3. Extract the split pin, detach the nut retainer (where fitted) and unscrew the bearing adjusting nut. Extract the outer wheel bearing and remove the wheel, hub and drum assembly.
4. Withdraw the brake shoe holding down spindle by first depressing the upper washer and rotating it through 90^{o} to release it.
5. Pull the tapered end of one shoe away from its piston and disengage the other end of the shoe from the slot in the back of the other wheel cylinder. Remove the retracting spring.
6. Remove the other shoe and spring in a similar manner.

To Install

Note: When fitting new shoes, apply a suitable high melting point grease to the brake shoe contact pads on the back plate, and ensure that the leading edges of the brake linings are slightly chamfered and that they are not ragged or damaged. There should be no clearance between the lining and the shoe.

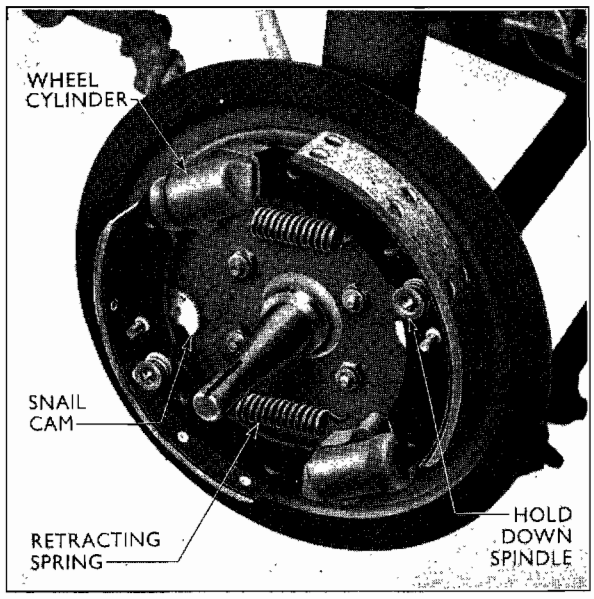
7. Locate the hooked end of the return spring in the hole in the brake shoe web, and the other in the brake plate hole adjacent to the wheel cylinder.
8. Fit the wider end of the shoe web into the slot at the closed end of the opposite shoe wheel cylinder and pull out the other end of the shoe until the web engages on the plain face of the piston.
9. Locate the shoe holding down spindle through the back plate and shoe web. Fit the first dished retaining washer with the dished part facing away from the web so that its flat flange abuts the web. Position the spring and the upper retaining washer, dish downwards, compress the spring and turn the washer through 90° to lock it in position.
10. Replace the other shoe in a similar manner.
11. Locate the wheel, hub and drum assembly on the wheel spindle, taking care not to damage the grease retainer. Assemble the outer wheel bearing, thrust washer and adjusting nut.
12. Adjust the wheel bearings as described in Section 1, OP 1202-A. Position the nut retainer (late models only) and fit a new split pin. Bend back the split pin legs and gently tap the dust cap into place. Refit the hub cap.
13. Adjust the brakes as described in OP 2000-C.
14. Jack up the car, remove the stands and lower the car to the ground.

Note: Check that the front wheel bearings are adequately lubricated before replacing the drum. The dust cap must be fitted dry.

OP 2018-B1 Extra: brake shoes and/or retracting springs - second front wheel - renew

Repeat sub-operations 2-13 above.

Front Hub Bearing Adjustment



Front Brake Plate

OP 2018-B2 EXTRA: FRONT BRAKE WHEEL CYLINDERS – ONE WHEEL – REMOVE AND INSTALL

To Remove

1. Disconnect the flexible fluid hose at the upper wheel cylinder.
2. Remove the short pipe at the rear of the back plate, which connects the two wheel cylinders.
3. Unscrew the two bolts and spring washers securing each cylinder to the back plate, and detach the cylinders.

   Note: A rubber sealing ring is fitted between the wheel cylinder and back plate to prevent the ingress of dirt and water.

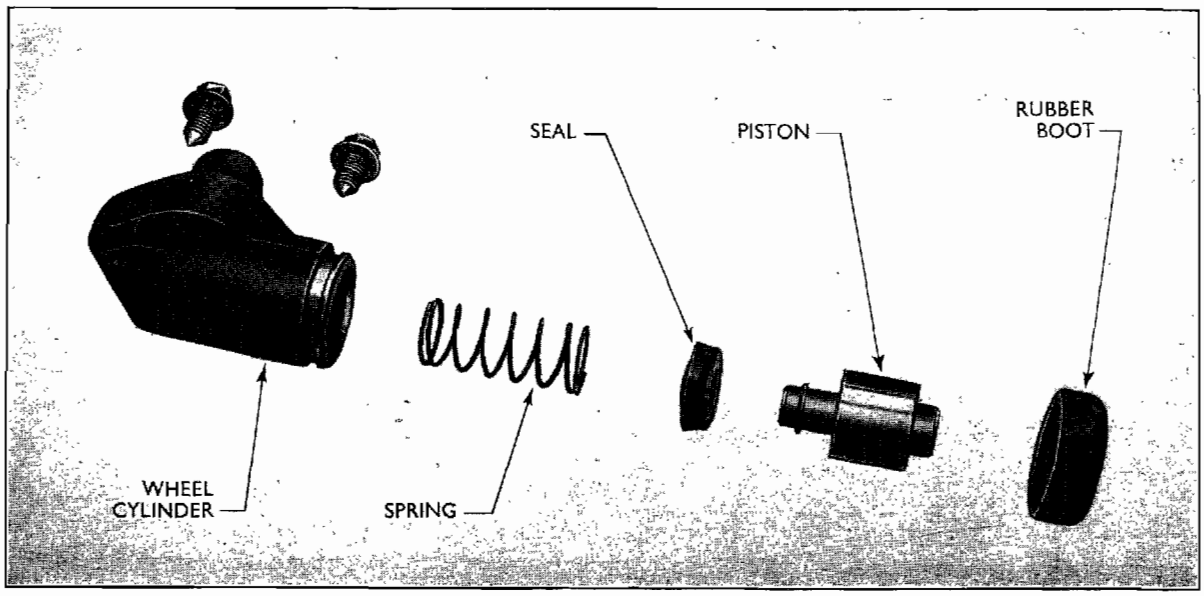
To Install

4. Locate the rubber sealing washer on the back of each wheel cylinder and fit the cylinders in their locating holes in the back plate. Secure each cylinder with two bolts and spring washers.
5. Refit the short connecting pipe between the two wheel cylinders and tighten the unions to a torque of 1.0 to 1.1 kg.m. (7 to 8 lb. ft.).
6. Reconnect the flexible fluid pipe to the upper wheel cylinder.
7. After the hub and drum assemblies have been assembled (OP 2018-B), bleed the brakes as described in OP 2000-A.

OP 2018-B3 EXTRA: FRONT BRAKE WHEEL CYLINDERS – ONE WHEEL – OVERHAUL

To Dismantle

1. Pull off the rubber boot and extract the piston and seal assembly. Remove the seal from the piston.
2. Withdraw the return spring from the cylinder.
3. Unscrew the bleed valve from the lower cylinder.



Front Wheel Cylinder – Exploded

Note: All hydraulic parts should be washed in commercial alchohol, methylated spirits or clean brake fluid.

Do not use mineral oils. or cleaning fluid extracted from mineral oil, e.g. petrol, paraffin, carbon tetrachloride, etc., as they will cause the rubber seals to swell and become ineffective. The slightest trace of mineral oil could soon render the brakes inoperative. Methylated spirits or commercial alchohol must always be used for flushing out the system, washing brake housings, components and any container that comes into contact with brake fluid.

Any foreign matter should be washed from components with methylated spirit or commercial alcohol. If foreign matter finds its way into the system it may score the pistons and cylinders or damage the seals and render the brakes either wholly or partially inoperative.

Pistons and piston seals should be carefully stored away from grease or oils and handled carefully at all times. The seals should be inspected carefully before fitting, even if they have just been drawn from stock.

See that the sealing lips are perfectly formed concentric with the bore of the seal, free from knife edges, surface blemishes or marks. Any seal that is not perfect, no matter how minute the blemish may appear to be, should be rejected. Seals should not be turned inside out when inspecting them, since this strains the surface skin and may eventually lead to a failure in service.

All pistons and housings must be carefully inspected before assembly. Any imperfections or scores on a piston or cylinder bore may provide a track for fluid leaks under pressure and any damaged parts must be discarded. Parts must be stored and handled very carefully to reduce any possibility of accidental scoring.

Prior to assembly immerse hydraulic components in clean brake fluid to facilitate fitting and provide initial lubrication for working surfaces.

To **Reassemble**

4. Assemble the piston seal to the piston with the flat face of the seal adjacent to the piston rear shoulder.
5. Dip the piston and seal assembly in hydraulic brake fluid, locate the small end of the tapered spring over the spigot end of the piston adjacent to the piston seal, and carefully insert the spring, seal and piston into the wheel cylinder. Take care not to damage the edge or lips of the seal during insertion.
6. Refit the rubber boot over the wheel cylinder and piston. Fit a rubber sealing ring over the spigot part of the wheel cylinder which accepts the flexible hose connection.
7. Replace the bleed valve.

OP 2018-B4 EXTRA: BRAKE CARRIER PLATE – ONE – REMOVE AND INSTALL

To Remove

1. Remove the wheel cylinders (OP 2018-B1)
2. Unscrew the four self-locking nuts retaining the brake plate to the suspension unit, and detach the back plate.
3. If it is necessary to dismantle the snail-cam adjusters, file off the peened over end of the cam stud and detach the cam and spring. Remove the stud from the back of the brake plate.

To Install

4. If necessary, reassemble the snail-cam adjusters to the back plate, by passing the cam adjuster stud through the back plate hole from the back, and place the cam spring on the stud.
5. Locate the cam on the flat of the stud end so that clockwise rotation of the stud head (when viewed from the back) will move the brake shoe out into contact with the drum.
6. Peen over the stud end to lock the cam securely in position and check for correct operation.
7. Secure the brake plate to the suspension unit by means of four bolts, spring washers and self-locking nuts. The bolts should be located so that a flat on one side of the hexagon head abuts the machined flat on the spindle body flange.
8. Adjust and bleed the brakes.

OP 2018-C FRONT BRAKE SHOES AND/OR RETRACTING SPRINGS – ALL – RENEW
(Includes OPS 2018-B and B1)

OP 2018-D FRONT WHEEL CYLINDERS – ONE SIDE – REMOVE AND INSTALL
(Includes OPS 2018-B and B2)

OP 2018-E FRONT WHEEL CYLINDERS – ALL – REMOVE AND INSTALL
(Includes OPS 2018-B, B1 and B2 x 2)

OP 2018-F FRONT WHEEL CYLINDERS – ONE SIDE – OVERHAUL
(Includes OPS 2018-B, B2 and B4)

OP 2018-G FRONT WHEEL CYLINDERS – ALL – OVERHAUL
(Includes OPS 2018-B, B1, B2 x 2 and B4 x 2)

OP 2018-H FRONT BRAKE CARRIER PLATE – ONE – REMOVE AND INSTALL
(Includes OPS 2018-B, B2 and B4)

OP 2018-J FRONT BRAKE CARRIER PLATES – BOTH – REMOVE AND INSTALL
(Includes OPS 2018-B, B1, B2 x 2 and B4 x 2)

OP 2074-A THREE-WAY UNION – REAR – RENEW

Tools Required

P2012 Brake line plugs.

To Remove

1. Unscrew the flexible connection and fit a brake line plug, Tool No. P.2012.
2. Detach the other two fluid pipe connections and unbolt the three way union.

To Install

3. Secure the three-way union into position. Locate the two hydraulic pipes and tighten to a torque of 1.0 to 1.1 kg.m. (7 to 8 lb.ft.).
4. Remove the brake line plug, Tool No. P.2012, and tighten the flexible connection into position.
5. Bleed the brakes as described in OP 2000-A.

OP 2075-A FOUR-WAY UNION – FRONT – RENEW

Tools Required

P.2012 Brake line plugs

To Remove

1. Unscrew the hydraulic pipe from the master cylinder at its junction with the union and fit a brake line plug, Tool No. P.2012.
2. Similarly detach the other three pipes.
3. Disconnect the electrical wiring from the brake light switch and remove the switch from the union.
4. Extract the bolt securing the union to the bodywork of the car and detach the union.

To Install

5. Securely bolt the union into position.
6. Screw the stop light switch into position and connect the electrical wiring.
7. Locate the three hydraulic pipes into their respective sockets in the union and tighten to a torque of 1.0 to 1.1 kg.m. (7 to 8 lb.ft.).
8. Remove the brake line plug from the master cylinder to union pipe and screw the pipe into position.
9. Bleed the brakes as described in OP 2000-A.

OP 2078-A HYDRAULIC FLEXIBLE TUBING – ANY ONE – RENEW.

A Front

Tools Required

P.2012 Brake line plugs.

To Remove

1. Jack up the front of the vehicle, fit stands and remove the road wheel.
2. Disconnect the hydraulic fluid pipe from the end of the flexible tube and fit a brake line plug, Tool No. P.2012.
3. Unscrew the nut securing the flexible tube to the body abutment bracket. Detach the shakeproof washer and extract the end of the tube from the bracket, taking care not to drop the other shakeproof washer.
4. Remove the lower end of the flexible tube from the upper wheel cylinder.

To Install

5. Screw the flexible tube into the upper wheel cylinder.
6. Insert the upper end of the tube through the hole in the body abutment bracket, ensuring that all the washers are in place, and secure with the nut.

NOTE: When tightening the nut, ensure that the flexible tube is not kinked or twisted and that there is no risk of it fouling or chafing the bodywork.

7. Remove the brake line plug from the hydraulic fluid pipe and secure the pipe to the end of the flexible tube.
8. Bleed the brakes as described in OP 2000-A.
9. Replace the road wheel, jack up the vehicle, remove the stands and lower the car to the ground. Finally tighten the wheel nuts and position the hub caps.

Rear

To Remove

1. Jack up the rear of the vehicle and fit stands.
2. Disconnect the hydraulic fluid pipe from the end of the flexible hose and fit a brake line plug, Tool No. P.2012.
3. Unscrew the nut securing the flexible tube to the body abutment bracket. Detach the shakeproof washer and extract the end of the tube from the bracket.
4. Remove the lower end of the flexible tube from the three-way union.

To Install

5. Screw the flexible tube into the three-way union.
6. Insert the upper end of the flexible tube through the hole in the body abutment bracket, ensuring that all the washers are in place, and secure with the nut.
   NOTE: When tightening the nut ensure that the flexible tube is not kinked or twisted and that there is no risk of it fouling or chafing the bodywork.
7. Remove the brake line plug from the hydraulic fluid pipe and secure the pipe to the end of the flexible tube.
8. Bleed the brakes as described in OP 2000-A.
9. Jack up the vehicle, remove the studs and lower the car to the ground.

OP 2078-A1 EXTRA: HYDRAULIC FLEXIBLE TUBE – EACH ADDITIONAL – RENEW

Repeat sub-operations 1 to 8 above.

OP 2140-A BRAKE MASTER CYLINDER – REMOVE AND INSTALL

Tools Required

P.2012 brake line plug.

To Remove

1. Disconnect the brake master cylinder push rod from the pedal by unscrewing the nut and withdrawing the spring washer and shouldered bolt.
2. Detach the fluid line by unscrewing the union nut, using a brake line-plug, Tool No. P.2012 to prevent dirt entering the line.
3. Withdraw the master cylinder after unscrewing the two self-locking nuts securing it to the bulkhead.
4. Empty the contents of the fluid reservoir into a clean container.

To Install

5. Fit the master cylinder over the studs on the bulkhead, replace the two self-locking nuts and tighten securely.
6. Reconnect the fluid pipe, tighten the union to a torque of 1.0 to 1.1 kg.m. (7 to 8 lb. ft.).
7. Attach the master cylinder push rod to the pedal by passing the shouldered bolt through the push rod and then the pedal. Fit the spring washer and nut.

   NOTE: On most models the bolt shoulder and shaft are concentric with the head. On very early models, up to approximate engine No. 13000, an eccentric shouldered bolt was used. In this case, the bolt must be turned to bring the brake pedal to the required level.

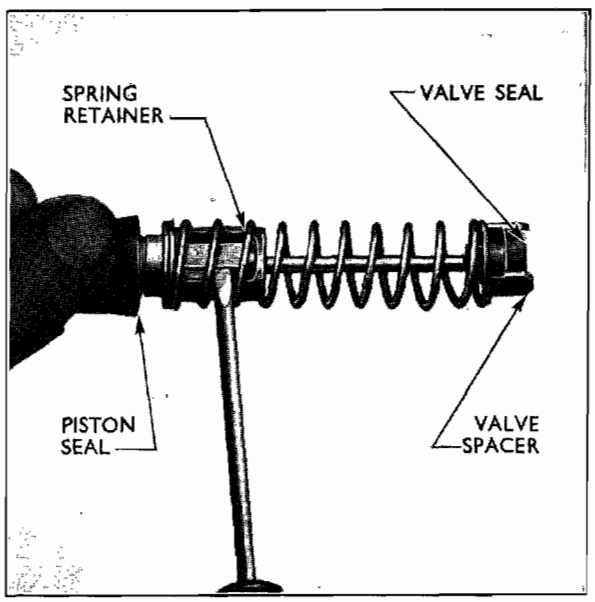
8. Bleed the brakes as described in OP 2000-A.

OP 2140-A1 EXTRA: BRAKE MASTER CYLINDER – OVERHAUL

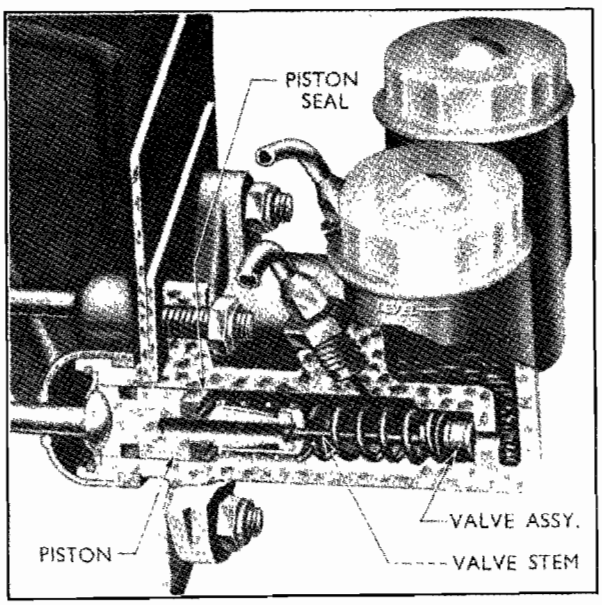
To Dismantle

1. Remove the rubber boot. Withdraw the circlip and remove the push rod.
2. Pull the piston and valve assembly from the cylinder.
3. The piston is held in the spring retainer by a tab which engages under a shoulder on the front of the piston. Carefully lift this tab, and remove the piston.
4. Compress the spring and move the retainer to one side which will release the end of the valve stem from the retainer.
5. Slide the valve spacer and shim off the valve stem.
6. Remove the rubber valve seal and the piston seal, if necessary.
7. Wash all parts in methylated spirit, commercial alcohol or approved brake fluid. Do not use mineral base oils such as petrol, paraffin or carbon tetrachloride.

   Inspect the piston and cylinder bore for score marks and the rubber seals for damage to the sealing lips. Renew any parts that appear unsuitable for further service.



Master Cylinder Piston Valve

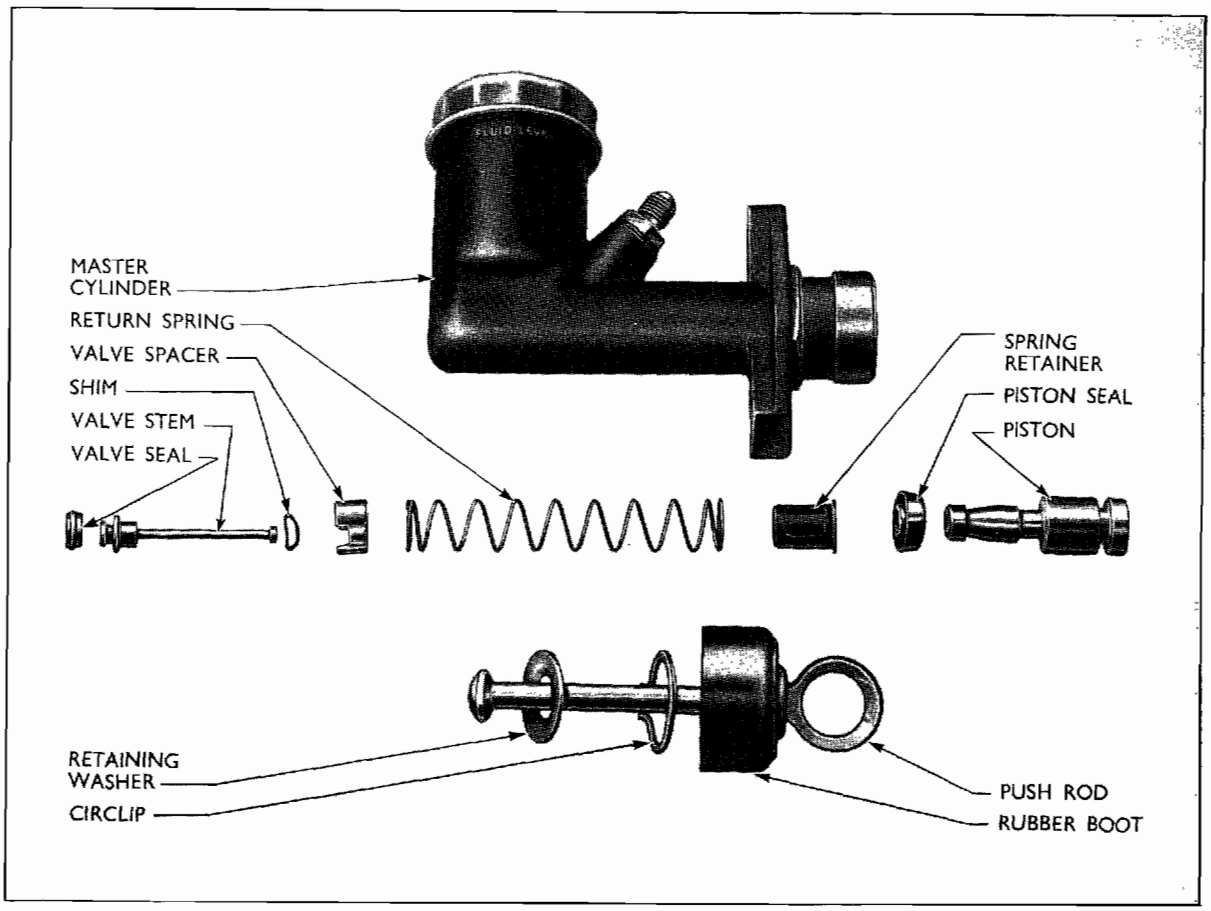


Sectioned Master Cylinder

To Reassemble

8. Fit the piston seal to the piston with the sealing lips towards the spigot end and the valve seal to the valve stem with the lip towards the front of the valve.
9. Replace the shim washer on the valve stem together with the seal spacer so that the legs of the spacer are towards the valve seal. Ensure that the shim is fitted concentrically on the rear shoulder of the valve stem so that its convex face abuts the shoulder flange.
10. Fit the return spring over the valve stem and insert the spring retainer into the end of the return spring. Compress the spring and engage the boss on the valve stem in its recess in the spring retainer.
11. Insert the spigot end of the piston into the spring retainer and secure by pressing down the tab so that it locates against the shoulder of the piston.
12. Dip the assembly in brake fluid and enter it into the cylinder, with the valve leading. Care should be taken to avoid damaging the piston seal as it enters the cylinder.
13. Install the push rod in the master cylinder. Locate the washer and install the retaining circlip.
14. Replace the dust cap.

OP 2140-B BRAKE MASTER CYLINDER – OVERHAUL
(Includes OP 2140-A and A1)



Master Cylinder Exploded

2220-B REAR BRAKE SHOES OR RETRACTING SPRINGS – ONE SIDE – RENEW

NOTE: The rear brake shoes should be inspected for wear at 8,000 km. (5,000 miles) intervals. There should always be at least 0.793 mm. (1/32 in.) of lining material above the rivet heads. If the linings are worn so that there is less than 0.793 mm. (1/32 in.) they should be renewed. Also, if the linings are contaminated by oil or grease, it is preferable to renew them rather than attempt to clean them.

Remove

Remove the hub cap, slacken off the wheel nuts, chock the front wheels, jack up the rear end, fit stands and remove the wheel.

Ensure that the handbrake is fully released then remove the pan head screw securing the brake drum to the half-shaft and remove the drum.

Remove the shoe holding down springs, one on each shoe, by turning the top washer through 90° and pulling off the washer and spring.

Disengage each shoe from its location slot in the fixed pivot and the wheel cylinder and remove the shoes. To prevent the piston falling out of the wheel cylinder it should be held in with a clip or a rubber band round the cylinder.

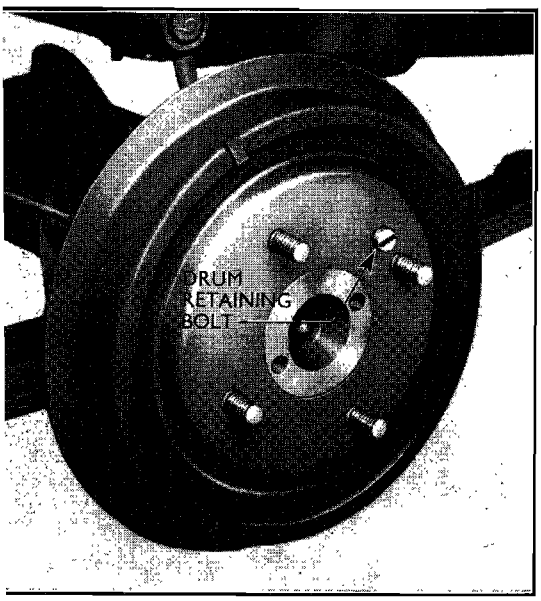
Remove the retracting springs from the brake shoes.

Install

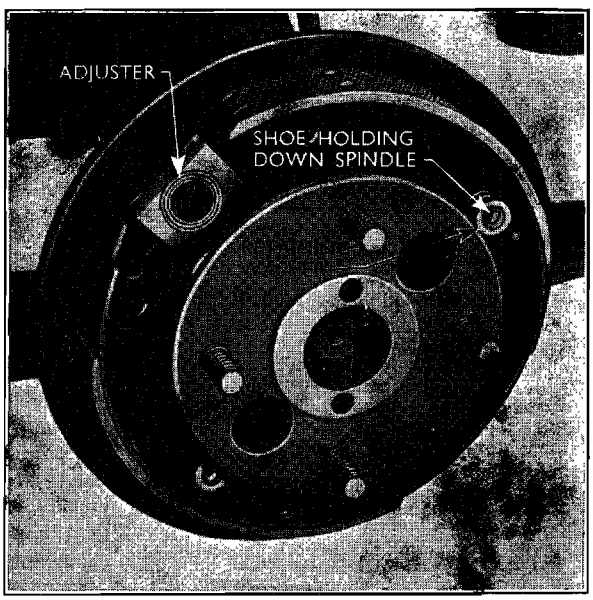
Assemble the retracting springs between the two shoes. The springs are of unequal length, the spring with the two sets of coils fitting adjacent to the expander housing, the other adjacent to the adjuster.

Smear the grease, EM IC 18, to the brake shoe support pads, brake shoe pivots and to the recess in the wheel cylinder.

Fit the shoes assembly to the backplate by positioning the rear shoe in its location on the fixed pivot and over the handbrake link.



Brake Drum



Rear Brake Plate

9. Secure the shoes to the backplate with the holding down spindles and retain the spindles with a washer, spring and another washer. Turn the top washer through 90°.
10. Check to ensure that the shoes are firmly seated and that the springs are not binding on the backplate or the slave cylinder.
11. Replace the brake drum and secure with the pan head screw.
12. Refit the wheel, remove the stands, lower the car to the ground and remove the chocks. Tighten the wheel nuts and replace the hub cap.
13. Adjust the brakes as in OP 2000-C.
14. Check the operation of the brakes on road test.

OP 2220-B1 EXTRA: BRAKE SHOES AND/OR RETRACTING SPRINGS – SECOND SIDE – RENEW

Repeat sub-operations 2 to 11 above

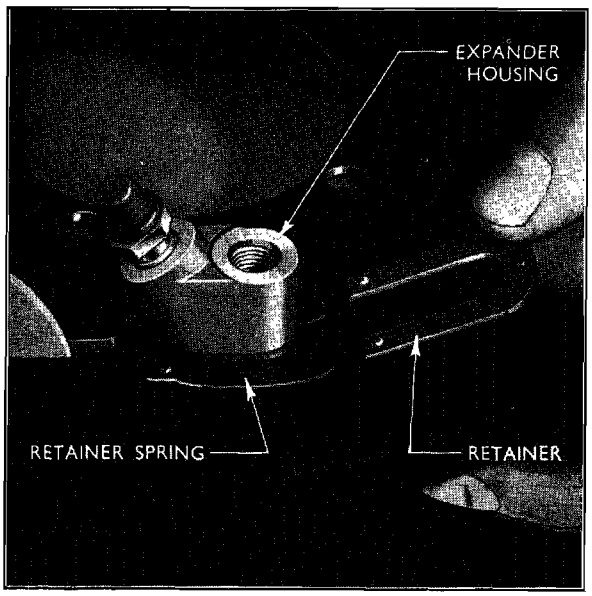
OP 2220-B2 EXTRA: REAR BRAKE ADJUSTER UNIT – REMOVE AND INSTALL AND/OR OVERHAUL

To Remove

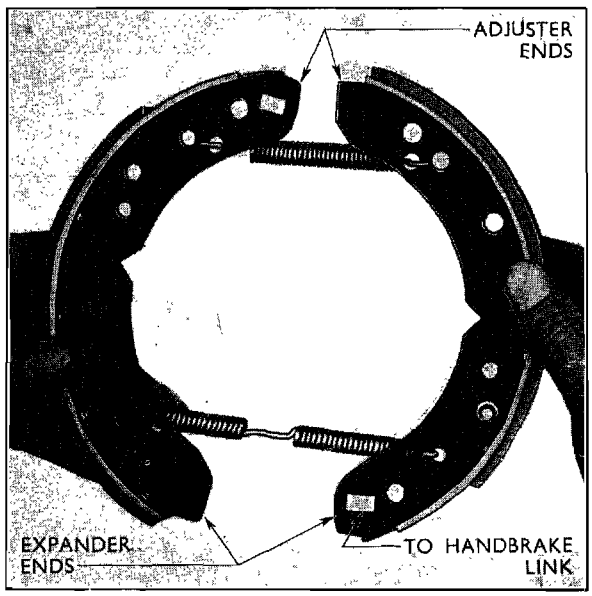
1. Remove the two nuts and spring washers retaining the adjuster, and remove the adjuster.
2. Remove the tappets and adjusting screw from the housing.

To Install

3. Replace the screw in the fully off position. Position the tappets to match the adjuster, when the slots will be correctly positioned.
4. Replace the adjuster and secure in position with the two nuts and spring washers.



Cylinder Housing Retainers



Rear Shoes and Springs

OP 2220-B3 EXTRA: REAR WHEEL CYLINDER – ONE – REMOVE AND INSTALL

Tools Required

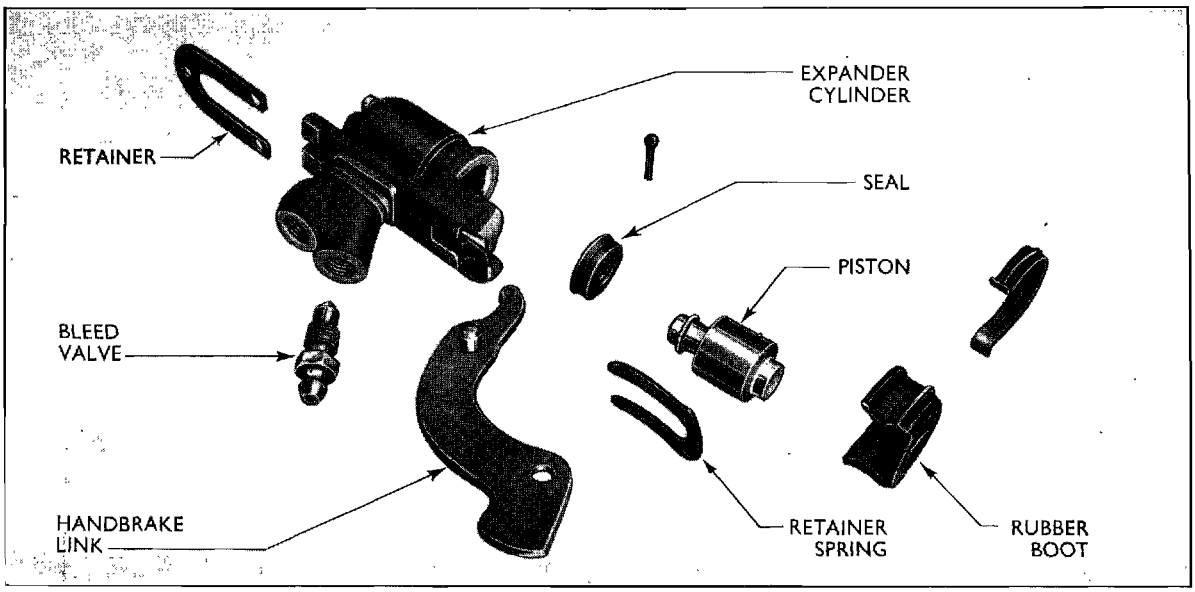
P.2012 Brake line plugs

To Remove

1. Disconnect the brake fluid pipe and fit a brake line plug, Tool No. P.2012.
2. Remove the spring clip and clevis pin from the handbrake link on the inside of the brake plate.
3. Prise the rubber boot on the rear of the wheel cylinder away from the brake plate and remove. Pull off the two 'U' shaped retainers securing the cylinder to the brake plate.
4. Remove the wheel cylinder and handbrake link.

To Install

5. Rotate the brake adjuster so that when the shoes are assembled they will be on the "fully off" limit of their adjustment.
6. Smear the brake plate with grease, EM 1C 18, in the area where the wheel cylinder slides.
7. Replace the handbrake link and wheel cylinder in the aperture in the brake plate. Ensure that the pivot on the handbrake link is correctly located in the slot in the wheel cylinder body.
8. Secure the wheel cylinder to the brake plate, using the 'U' shaped spring retainer and the 'U' shaped flat retainer. Note that the spring retainer is fitted from the handbrake link end of the wheel cylinder and the flat retainer from the other, the flat retainer being positioned between the spring retainer and the brake cylinder.
9. Fit the rubber boot over the wheel cylinder and the handbrake link. Ensure that the wheel cylinder can slide in the carrier plate.
10. Grease the brake shoe support pads, using zinc oxide grease.



Rear Brake Cylinder

11. Reconnect the handbrake linkage to the handbrake link, using a clevis pin and retain in position with a spring clip.
12. Remove the brake line blanking plug from the brake line and fit the pipe to the wheel cylinder.
13. After refitting the brake shoes, the brake drum and the road wheel (part of OP 2220-A), bleed the braking system as described in OP 2000-A.

OP 2220-B4 EXTRA: REAR WHEEL CYLINDER – OVERHAUL

To Dismantle

1. Remove the boot retainer, prise off the boot and withdraw the piston, complete with seal, from the wheel cylinder bore.
2. Detach the seal from the piston.

To Reassemble

All parts should be washed and inspected for wear or damage, any components that are not considered fit for further service should be discarded.

1. Dip the piston and seal in approved brake fluid and reassemble them. Fit the seal to the piston with the flat face of the seal adjacent to the piston rear shoulder.
2. Dip the piston and seal assembly in approved brake fluid and insert into the cylinder bore seal end first.
3. Replace the boot and secure with the boot retainer.

OP 2220-B5 EXTRA: REAR BRAKE CARRIER PLATE – REMOVE AND INSTALL

Tools Required

PT 3072	Slide hammer (main tool)
P.3072-4	Rear axle shaft assembly remover and replacer (adaptor)

To Remove

1. Rotate the axle shaft flange to gain access to two of the retaining bolts or nuts securing the axle shaft retaining plate and back plate to the axle casing. Rotate the axle shaft through 90° and remove the other two bolts or nuts and spring washers.
2. Withdraw the axle shaft, using the slide hammer and adaptor, Tool Nos. PT 3072 and P.3072-4. Remove the brake plate.

To Install

3. Position the brake plate on the axle casing and replace the axle shaft and retainer.
4. Secure the axle shaft retainer and the back plate to the rear axle housing, using four bolts/or nuts and spring washers.

OP 2220-C REAR BRAKE SHOES AND/OR RETRACTING SPRINGS – ALL – RENEW (Includes OPS 2220-B and B1)

OP 2220-D REAR BRAKE ADJUSTER UNIT – ONE SIDE – OVERHAUL (Includes OPS 2220-B and B2)

OP 2220-E REAR BRAKE ADJUSTER UNITS – BOTH – OVERHAUL
(Includes OPS 2220-B and B2 x 2)

OP 2220-F REAR WHEEL CYLINDER – ONE SIDE – REMOVE AND INSTALL
(Includes 2220-B and B3)

OP 2220-G REAR WHEEL CYLINDERS – BOTH – REMOVE AND INSTALL
(Includes OPS 2220-B, B1 and B3 x 2)

OP 2220-H REAR WHEEL CYLINDER – ONE SIDE – OVERHAUL
(Includes OPS 2220-B, B3 and B4)

OP 2220-J REAR WHEEL CYLINDERS – BOTH – OVERHAUL
(Includes OPS 2220-B, B1, B3 x 2 and B4 x 2)

OP 2220-K REAR BRAKE CARRIER PLATE – ONE SIDE – REMOVE AND INSTALL
(Includes OPS 2220-B, B1, B2 x 2, B3 x 2 and B5)

OP 2220-L REAR BRAKE CARRIER PLATES – BOTH – REMOVE AND INSTALL
(Includes OPS 2220-B, B1, B2 x 2, B3 x 2 and B5 x 2)

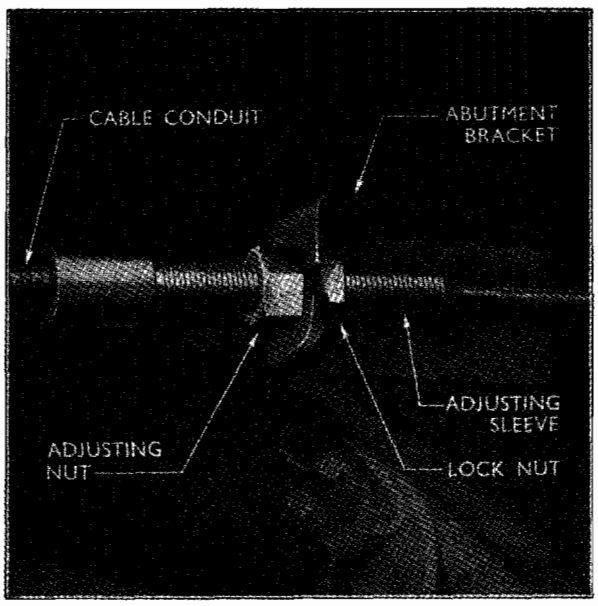
OP 2800-A HANDBRAKE LINKAGE – ADJUST – SALOON AND ESTATE CAR

To Adjust

1. Chock the front wheels, jack up the rear of the car, fit body stands and release the handbrake.

   NOTE: Prior to commencing the adjustment, check that the cable follows its correct run and is properly located in the guides. Also ensure that all cable guides are well greased.

2. Adjust the hand brake rod (connecting the equaliser to the right hand rear brake) so that the distance between the centre of the right hand clevis and the inside face of the equaliser is 809.7 to 813.6 mm. (31.88 to 32.03 in.).



Handbrake Cable Adjustment

3. Turn the rear brake adjusters fully clockwise to lock the drums.
4. Slacken the locknut on the adjuster sleeve provided on the brake outer conduit, located in the drive shaft tunnel. Tighten the adjusting nut on the threaded sleeve until all play is taken out of the handbrake cable. Tighten the locknut.
5. Slacken the brake adjusters as in OP 2000-C.
6. Apply the handbrake lever. This should move through four or five notches to lock the rear wheels.
7. Check all split pins and clevis pins for correct fitting.
8. Jack up, remove the stands, lower the vehicle to the ground and remove the chocks.

Van

To Adjust

1. Chock the front wheels, jack up the rear, fit body stands and release the handbrake.

   NOTE: Prior to commencing the adjustment check that the cables follow their correct runs and are properly located.
2. Turn the rear brake adjusters fully clockwise to lock the drums.
3. Slacken the locknut on the handbrake rod and then tighten the adjusting nut on the *threaded rod until all play is taken out of the cable. Tighten the locknut.*
4. Slacken the brake adjusters as in OP 2000-C.
5. Apply the handbrake lever. This should move through four or five notches to lock the rear wheels.
6. Check all split pins and clevis pins for correct fitting.
7. Jack up, remove the stands, lower the vehicle to the ground and remove the chocks.

OP 2811-A HANDBRAKE LEVER ASSEMBLY – REMOVE AND INSTALL

To Remove

1. Jack up the front of the car and fit stands. Chock the rear wheels and release the handbrake.
2. Disconnect the cable or rod from the end of the handbrake lever protruding beneath the car by removing the split pin and clevis pin.
3. Remove the handbrake lever boot after unscrewing the self-tapping screws.
4. Remove the two bolts securing the handbrake lever to the floor and lift out the handbrake lever assembly.

To Install

5. *Fit the handbrake lever in position on the floor and secure with the two bolts.*
6. Pass the boot over the handbrake lever and secure with the self-tapping screws. Ensure that the boot is correctly located.
7. Attach the cable or rod to the end of the handbrake lever by fitting the clevis pin (which should be smeared with grease) and securing with the split pin.
8. Jack up, remove the stands and lower the car to the ground. Apply the handbrake and remove the rear wheel chocks.

OP 2841 HANDBRAKE TRANSVERSE ROD – RENEW – SALOON AND ESTATE CAR

To Remove

1. Chock the front wheels, release the handbrake, jack up the rear of the car and fit stands.
2. Remove the split pin and clevis pin securing the rod to the right hand rear brake.
3. Unscrew the locknut and remove the rod from the handbrake equaliser.

To Install

4. Replace the rod in the equaliser, adjust as OP 2800-A and secure in position with the locknut.
5. Replace the clevis pin and split pin securing the rod to the right hand rear brake lever.
6. Jack up the rear of the car, remove the stands, lower the car to the ground, and remove the chocks.

Van

To Remove

1. Chock the rear wheels, release the handbrake, jack up the front of the car and fit stands.
2. Remove the split pin and clevis pin securing the rod to the handbrake lever.
3. Slacken the locknut and remove the adjusting nut at the equaliser.
4. Remove the handbrake rod.

To Install

5. Replace the handbrake rod in the equaliser, after first positioning the locknut on the rod.
6. Replace the adjusting nut, but do not tighten at this stage.
7. Replace the clevis pin and split pin securing the rod to the handbrake lever.
8. Adjust the handbrake linkage as described in OP 2800-A.
9. Jack up remove stands, lower the vehicle to the ground, and remove the chocks.

OP 2853-A HANDBRAKE PRIMARY CABLE – RENEW – SALOON AND ESTATE CAR

To Remove

1. Chock the front wheels, release the handbrake, jack up the rear of the car and fit stands.
2. Remove the split pin and clevis pin securing the cable to the handbrake lever.
3. Unscrew the locknut securing the brake cable conduit to the bracket in the drive shaft tunnel. Pull the conduit adjusting sleeve to the rear and slide the inner cable out of the bracket.
4. Disconnect the brake inner cable at the slotted hole in the rear left hand brake plate clevis.
5. Remove the spring clip retaining the handbrake outer cable to the equaliser, and withdraw the cable.

3

STEERING GEAR AND LINKAGE

SECTION INDEX

GENERAL DESCRIPTION

QUICK REFERENCE DATA

SERVICE AND REPAIR OPERATIONS

OPERATION	3000-A	TOE-IN AND WHEEL LOCK ANGLES – CHECK
"	3000-A1	Extra: toe-in and wheel lock angles – adjust
"	3000-A2	Extra: wheel alignment – check
"	3000-B	**FRONT WHEEL TOE-IN AND WHEEL LOCK ANGLES – ADJUST** (Includes OPS 3000-A and A1)
"	3000-C	**FRONT WHEEL ALIGNMENT – CHECK** (Includes OPS 3000-A and A2)
"	3000-D	**FRONT WHEEL ALIGNMENT – CHECK AND ADJUST** (Includes OPS 3000-A, A1 and A2)
"	3289-A	TRACK ROD END – ONE – RENEW
"	3289-A1	Extra: second track rod end – renew
"	3289-B	**TRACK ROD ENDS – ALL – RENEW** (Includes OPS 3289-A and A1)
"	3301-A	STEERING DROP ARM TO IDLER ARM ROD – RENEW
"	3351-A	IDLER ARM – RENEW
"	3482-A	STABILISER BAR CLAMPS – ONE SIDE – RENEW
"	3482-A1	Extra: mounting bushes – remove and install
"	3498-A	STEERING GEAR – REMOVE AND INSTALL
"	3498-A5	Extra: steering gear – overhaul
"	3498-B	STEERING GEAR – ADJUST
"	3498-E	**STEERING GEAR ASSEMBLY – OVERHAUL** (Includes OPS 3498-A and A5)
"	3530-A	STABILISER BAR OR BUSHES – RENEW
"	3535-A	STEERING LOCK STOPS – ADJUST
"	3575-A	ROCKER SHAFT – PRE-LOAD – ADJUST
"	3590-A	DROP ARM – REMOVE AND INSTALL

OPERATION 3591-A ROCKER SHAFT OIL SEAL – REMOVE AND INSTALL
(Steering Gear in situ)

" 3600-A STEERING WHEEL – REMOVE AND INSTALL

GENERAL DESCRIPTION

Movement of the steering wheel is transmitted by a solid shaft to a worm and nut steering gear which is mounted in the engine compartment attached to the reinforced sidemember. The nut is of the recirculatory ball type incorporating thirty balls.

The steering ratio in the straight-ahead position is 14:1, however, the ratio varies between the straight-ahead and extreme lock positions.

The construction of the steering gear provides for two adjustments:—

(a) Rocker shaft adjustment, this is by means of shims between the steering gear housing and the top cover plate.

(b) Steering shaft adjustment, this is by means of shims between the rear face of the steering box and the steering column flange.

The rocker shaft may be adjusted with the steering gear installed in the car, but to adjust the steering shaft, the steering gear must be removed from the car.

The steering linkage transmits movement of the steering rocker shaft to each front wheel.

The drop arm, which is attached to the rocker shaft, connects to one end of the drop arm to idler arm rod (drag link). The idler arm forms an idling link at the other end of this rod and is parallel to the drop arm at all times. Two adjustable track rods connect the ends of the drop arm to idler arm rod to the steering arms located at the base of each suspension unit.

The steering joints should be lubricated using a grease gun, at the intervals shown below.

QUICK REFERENCE DATA

PERIODIC SERVICE ATTENTION

At the first 1,000 km. (500 miles).
Check the front wheel toe-in.
Grease all steering joints.
Check steering box oil level. *

At 4,000 km. (2,500 mile) intervals.
Grease all steering joints.
Check steering box oil level. *

At 8,000 km. (5,000 mile) intervals.
Check the front wheel toe-in.
Grease all steering joints.
Check steering box oil level. *

* If necessary, top up with an approved S.A.E. 90 EP oil to the bottom of the combined filler and level plug hole.

DATA

Wheel Alignment

Castor	1^{o} 30′ to 3^{o} 00′
Camber	0^{o} 30′ to 2^{o} 00′
King pin inclination	4^{o} 45′ to 6^{o} 15′
Front lock wheel angle with back lock set at 20^{o}	21^{o} 36′ to 23^{o} 6′
Toe-in	3.18 to 4.76 mm (0.125 to 0.188 in.)
Turning Circle	9.75 m (32 ft.)

Steering shaft adjustment is by means of shims. Shim details are as follows:—

105E-3592-B	Paper	0.254 mm. (0.010 in.)
105E-3595-A	Steel	0.102 mm. (0.004 in.)
105E-3595-B	Steel	0.254 mm. (0.010 in.)
105E-3592-A	Paper	0.051 mm. (0.002 in.)

Rocker shaft shims are as follows:—

E102-LA-1	Steel	0.076 mm. (0.003 in.)
E103-LA-1	Steel or Paper	0.254 mm. (0.010 in.)

TIGHTENING TORQUES

Steering arm to suspension unit	4.2 to 4.8 kg.m. (30 to 35 lb. ft.)
Drop arm and idler arm to drop arm to idler arm nut	3.5 to 4.1 kg.m. (25 to 30 lb. ft.)
Idler arm joint	3.73 to 4.42 kg.m. (27 to 32 lb. ft.)
Track rod clamps	2.1 to 2.4 kg.m. (15 to 18 lb. ft.)
Track rod ball joints	2.5 to 3.0 kg.m. (18 to 22 lb. ft.)
Idler arm bracket to body sidemember	3.5 to 4.1 kg.m. (25 to 30 lb. ft.)
Drop arm nut	8.3 to 9.7 kg.m. (60 to 70 lb. ft.)
Steering wheel nut	2.8 to 3.4 kg.m. (20 to 25 lb. ft.)
Steering gear to sidemember	3.4 to 4.1 kg.m. (25 to 30 lb. ft.)
Steering gear top cover	2.5 to 2.7 kg.m. (18 to 20 lb. ft.)
Steering linkage to drop arm	3.4 to 4.1 kg.m. (25 to 30 lb. ft.)

OP 3000-A TOE-IN AND WHEEL LOCK ANGLES – CHECK

Equipment Required

Churchill 96 Track Gauge
(The following procedure is based on this equipment, if other equipment is used follow the manufacturer's instructions)
Turntables and rear wheel blocks
Pedal Depressor

1. Position the toe-in gauge and check the toe-in by rolling the car so that the road wheels revolve through 180°. The toe-in should be 3.18 to 4.76 mm. (0.125 to 0.188 in.).
2. Position the car so that the front wheels are on turntables and the rear wheels are on blocks. Set the turntable calibration scales to zero. Apply the brakes using the pedal depressor.
3. Turn the front wheels so that a back lock angle of 20° is shown on one wheel. (Due to the straight-ahead bias of the suspension unit mounts, it is necessary to hold the steering wheel in position.) Read the front lock angle of the other wheel, it should be between 21° 36′ and 23° 6′.

   N.B.– If the steering is turned onto left lock, the left front wheel indicates the back lock angle and the right front wheel the front lock angle. The converse applies on right lock.
4. Repeat this for the other steering lock.
5. Remove the car from the turntables and the wooden blocks.

Incorrect Wheel Lock Angles

If the wheel lock angles are incorrect or uneven when compared with the figures obtained on the other lock, first check the toe-in. If this is correct, examine the track rods which should be approximately the same length. If they are appreciably different, i.e. 6.40 mm. (0.25 in.) the wheel lock angles will be adversely affected. It should be noted that minor differences in track rod length are acceptable and, in fact, sometimes necessary to compensate for production tolerances in the build up of the suspension and steering assembly.

If the toe-in and the track rod lengths are satisfactory, examine the steering arms and track rods for distortion. The steering linkage ball joints should also be checked for wear or looseness.

OP 3000-A1 EXTRA: TOE-IN AND WHEEL LOCK ANGLES – ADJUST

Equipment Required

Churchill 96 Track Gauge
(The following procedure is based on this equipment, if other equipment is used follow the manufacturer's instructions)
Turntables and rear wheel blocks
Pedal Depressor

1. Slacken the clamps on the track rod outer ends adjacent to the ball joints.
2. Using the toe-in gauge, check, and if necessary, set the toe-in to within 3.18 to 4.76 mm. (0.125 to 0.188 in.).
3. Check that the track rods are approximately equal in length.

4. Position the car on turntables and set the calibration scales. Apply the brakes using the pedal depressor.
5. Turn the front wheels so that a back lock angle of 20^{o} is shown on one wheel. (Due to the straight-ahead bias of the top mounts, it is necessary to hold the road wheel in position.) Read the front lock angle of the other wheel, it should be between 21^{o} 35′ to 23^{o} 6′.

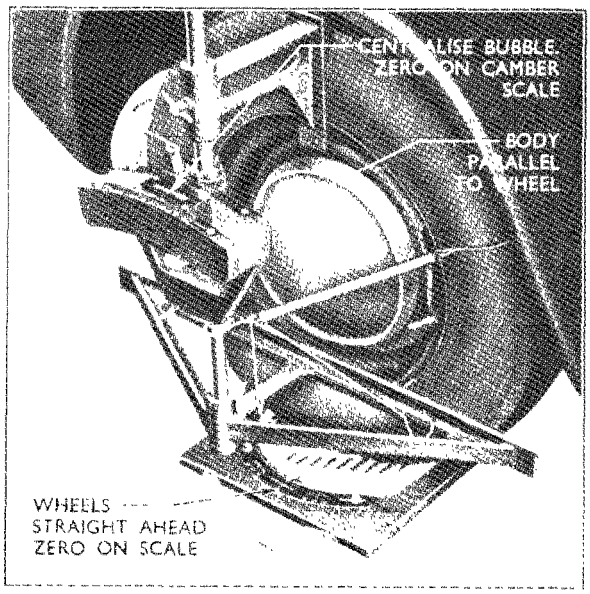
   N.B. — If the steering is turned onto left lock, the left front wheel indicates the back lock angle, and the right front wheel the front lock angle. The converse applies on right lock.
6. Repeat this for the other steering lock.
7. If these are incorrect or unequal, alter the track rod lengths. To maintain the toe-in figure, the track rods should be turned equal amounts, i.e. if one track rod is turned so that its top moves a certain amount forwards, then the top of the other track rod must also be turned the same amount forwards. Recheck the wheel lock angles.
8. Drive the car off the turntables and recheck the toe-in.
9. Tighten the clamps on the track rod outer ends.

   NOTE: If either the wheel lock angles or the toe-in is adjusted, then both the toe-in and the wheel lock angles MUST be rechecked when the adjustment is completed.

OP 3000-A2 EXTRA: WHEEL ALIGNMENT — CHECK
(Includes measuring Castor, Camber and King Pin Inclination)

Equipment Required

Churchill 121 Wheel Alignment Gauge
(The following procedure is based on this equipment, if other equipment is used follow the manufacturer's instructions)
Turntables and rear wheel blocks
Pedal Depressor



Zeroing the gauges

Before any alignment checks are made the following points should be checked and, if necessary, corrected:—

(a) Correct inflation of the tyres.

(b) Wheels for true running.

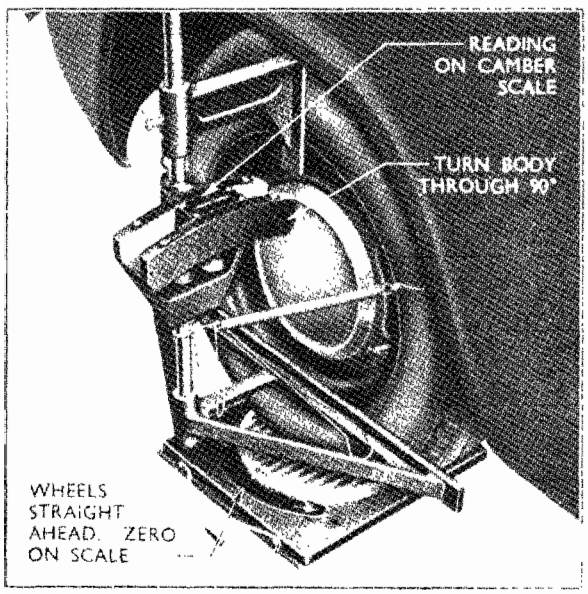
(c) Front wheel bearing adjustment.

(d) Stabiliser bar brackets to body crossmember nuts for tightness.

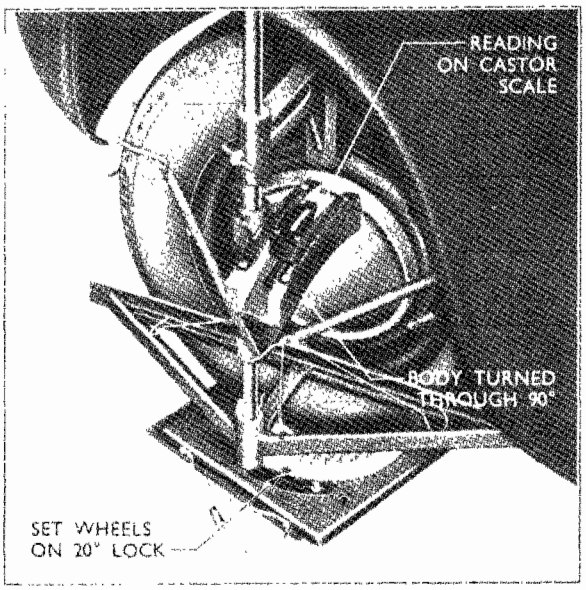
(e) All ball joints for excess play.

(f) Front suspension springs for correct seating.

1. Position the car with the front wheels on locked turntables and the rear wheels on wooden blocks so that the car is level.
2. Unlock the turntables.
3. Attach the alignment gauge to the left-hand front wheel. Level the gauge until the bubble aligns with the zero on the camber gauge.
4. Turn the gauge through 90^{o} and read off the camber (0^{o} 30′ to 2^{o} 00′)
5. Turn the road wheel onto 20^{o} back lock, turn the gauge through 90^{o} (i.e. normal to the wheel) and align the zero on the castor scale with the bubble. Turn the road wheel onto 20^{o} front lock and read the castor off the scale (1^{o} 30′ to 3^{o} 00′).
6. Fit the pedal depressor to lock the brakes. Turn the road wheel onto 20^{o} back lock and, with the gauge parallel to the wheel, align the zero on the k.p.i. scale with the bubble. Turn the road wheel onto 20^{o} front lock and read off the king pin inclination (4^{o} 45′ to 6^{o} 15′).
7. Fit the gauge to the right front wheel and repeat operations 3, 4, 5 and 6. Remove the pedal depressor.



Checking the Camber Angle



Checking the Castor Angle

The castor, camber and king pin inclination angles are not adjustable, but the following points should be checked in cases where the actual reading differs from that specified.

Incorrect Castor Angle

Check that the stabiliser bar "U" clamps are secure and that the "U" clamp retaining bolts are tight.

Incorrect Camber or King Pin Inclination Angles

If the king pin inclination angle is correct, but the camber angle is wrong the wheel spindle should be checked for distortion.

If the king pin inclination and the camber angles are both wrong, check the track control arm for distortion and the track control arm ball joint for looseness and excess wear. The track control arm to crossmember mounting should also be checked for wear and distortion.

Group Operations

OP 3000-B FRONT WHEEL TOE-IN AND WHEEL LOCK ANGLES – ADJUST
(Includes OPS 3000-A and A1)

OP 3000-C FRONT WHEEL ALIGNMENT – CHECK
(Includes OPS 3000-A and A2)

OP 3000-D FRONT WHEEL ALIGNMENT – CHECK AND ADJUST
(Includes OPS 3000-A, A1 and A2)

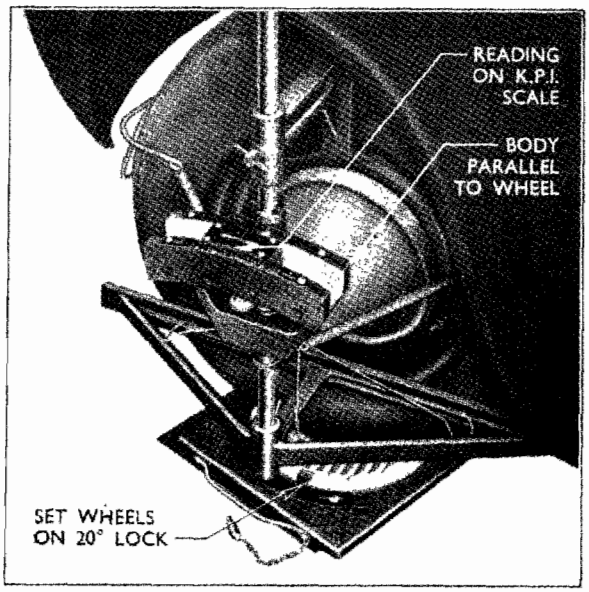
OP 3289-A TRACK ROD END – ONE – RENEW
(Includes setting toe-in)

Tools Required

P 3073-9 Steering joint taper separator
Track gauge

To Remove

1. With the handbrake applied, jack up the front of the car and fit stands under the body jacking points.



Checking King Pin Inclination

2. Remove the split pin and nut securing the track rod end to either the steering arm or the drop arm to idler arm rod.
3. Break the taper joint using the separator Tool No. P 3073-9.
4. Slacken the track rod clamp and unscrew the end, noting the number of turns required to free it from the sleeve.

To Install

5. Screw the new end into the sleeve, using the same number of turns as was required to remove the old track rod end.
6. Position the clamp against the indentation on the connecting sleeve, align the clamp slots with the slots in the sleeve and nip the clamp bolts, do not fully tighten at this stage.
7. Assemble the track rod to either the steering arm or the drop arm to idler arm rod. Tighten the castellated nut to a torque of 2.5 to 3.0 kg.m. (18 to 22 lb. ft.) and fit a new split pin.
8. Remove the stands and lower the car to the ground.
9. Check the toe-in and adjust if necessary.
10. Tighten the track rod clamp bolt to a torque of 2.1 to 2.4 kg.m. (15 to 18 lb. ft.).

OP 3289-A1 EXTRA: SECOND TRACK ROD END (Same side) – RENEW

To Remove

1. Remove the split pin and nut and detach the other track rod end.

To Install

2. Reconnect the track rod end and fit the retaining nut tightening it to a torque of 2.5 to 3.0 kg.m. (18 to 22 lb. ft.). Fit a new split pin.

OP 3289-B **TRACK ROD ENDS – ALL – RENEW**
(Includes OPS 3289- A and A1)

OP 3301-A STEERING DROP ARM TO IDLER ARM ROD – RENEW

Tools Required

P 3073-9 Steering joint taper separator
Tracking gauge

To Remove

1. With the handbrake applied, jack up the front of the car and fit chassis stands.
2. Disconnect both track rods from the drop arm to idler arm rod, using Tool No. P 3073-9 after removing the split pins and nuts.
3. Remove the split pin, nuts and washers and detach the drop arm and idler arm, remove the drop arm to idler arm rod.

To Install

4. Replace the drop arm to idler arm rod and reconnect it to the idler arm and the drop arm. Replace the nuts, tighten them to a torque of 3.5 to 4.1 kg.m. (25 to 30 lb. ft.) and fit new split pins.

5. Reconnect the track rods to the drop arm to idler arm rod securing them with the castellated nuts, tighten them to a torque of 2.5 to 3.0 kg.m. (18 to 22 lb.ft.) and fit new split pins.
6. Remove the stands and lower the car to the ground.
7. Using the track gauge, check that the toe-in is 3.18 to 4.76 mm. (0.125 to 0.188 in.).

OP 3351-A IDLER ARM – RENEW

To Remove

1. With the handbrake applied, jack up the front of the car and fit stands.
2. Remove the split pin, nut and washer and detach the idler arm from its bracket on the sidemember.
3. Remove the split pin, nut and washer and detach the idler arm from the drop arm to idler arm rod. Retrieve the polyurethane bushes.

To Install

4. Lubricate the bores of the polyurethane bushes and assemble the idler arm to the drop arm to idler arm rod. Fit the washer and nut, tighten the nut to a torque of 3.5 to 4.1 kg.m. (25 to 30 lb. ft.) and fit a new split pin.
5. Reconnect the idler arm to its bracket on the sidemember. Retain with a castellated nut, tighten the nut to a torque of 3.5 to 4.1 kg.m. (25 to 30 lb. ft.) and fit a new split pin.
6. Jack up, remove the stands and lower the car to the ground.

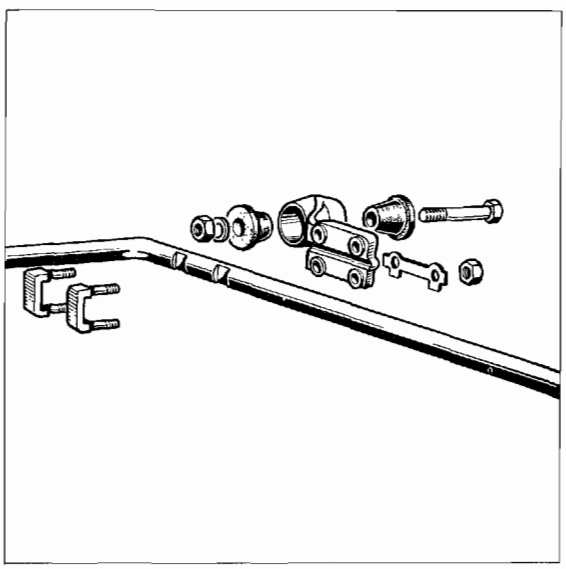
OP 3482-A STABILISER BAR CLAMPS – ONE SIDE – RENEW

Tools Required

P.5045 Adjustable Spring Restrainers

To Remove

1. Fit the adjustable spring restrainers, P.5045, to each suspension leg.
2. Jack up the car and fit stands.
3. Unfasten the locking tabs and remove the two stabiliser bar "U" bolts.



Stabiliser bar clamp exploded

4. Remove the attachment mounting foot pivot bolt, nut and flat washer and slide the attachment foot out of the side member.

To Install

5. Lubricate the flanges of the bushes of the new mounting foot with soapy water, and refit the mounting foot between the flanges of the side member. Fit the pivot bolt, flat washer and self locking nut. Do not fully tighten at this stage.
6. Fit the stabiliser bar "U" bolts in the notches cut in the stabiliser bar. Refit the locking plates and retaining nuts.
7. Tighten the nuts to a torque of 2.074 to 2.489 kg.m. (15 to 18 lb. ft.). Bend the tabs of the locking plates over.
8. Lower the car to the ground and remove the adjustable spring restrainer. Tighten the stabiliser bar attachment mounting foot pivot bolt nuts to a torque of 3.04 to 3.73 kg.m. (22 to 27 lb. ft.).

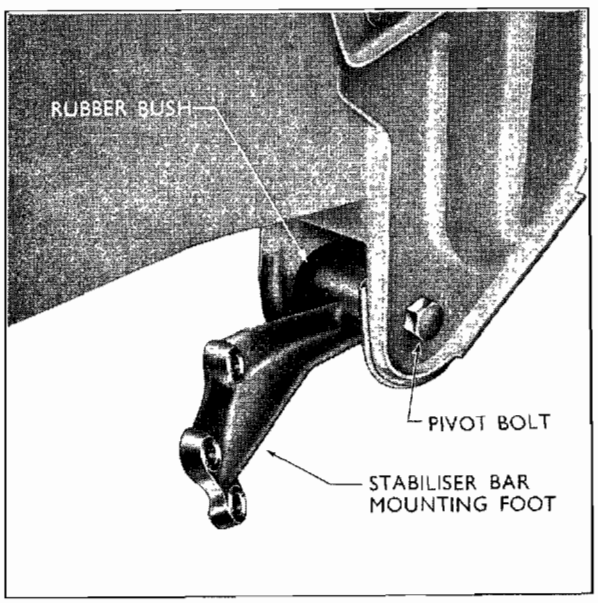
OP 3482-A1 EXTRA: MOUNTING BUSHES – REMOVE AND INSTALL

To Remove

1. Repeat sub-operations 1 to 4 of OP 3482-A.
2. Prise the old bushes from the mounting foot.

To Install

3. Push the two halves of the new bush into the mounting foot.
4. Repeat sub-operations 5 to 8 of OP 3482-A.



Stabiliser bar mounting foot

OP 3498-A STEERING GEAR ASSEMBLY – REPLACE

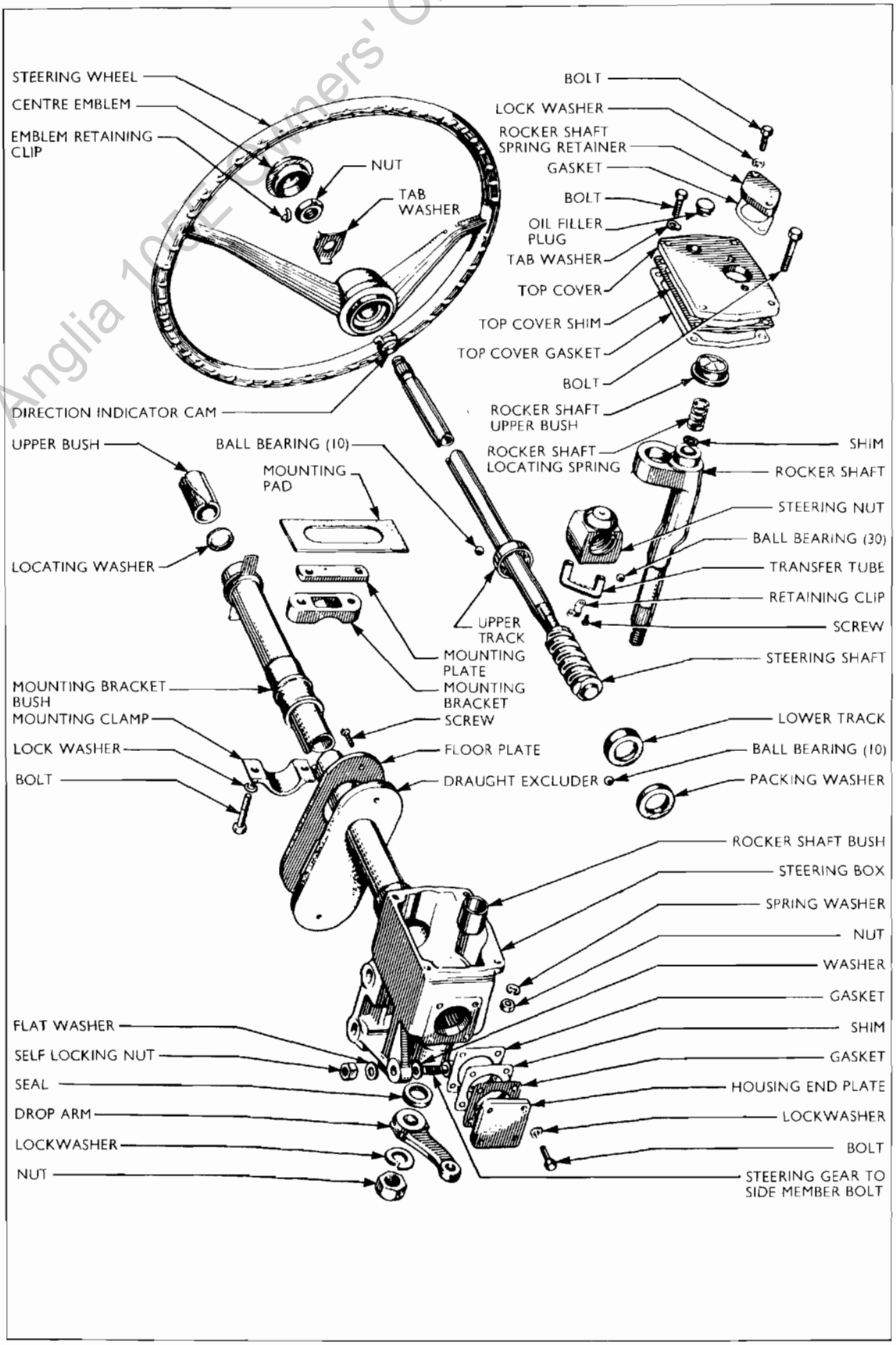
Tools Required

CP.3045 Steering wheel remover

To Remove

1. Disconnect the battery.
2. Prise off the steering wheel centre emblem.
3. Bend back the locking tab and remove the steering wheel retaining nut and washer.
4. Remove the steering wheel, using Tool No. CP.3045.
5. Remove the screws securing the column shrouds together. Separate the shrouds and remove.
6. Remove the indicator and horn switch by undoing the two screws securing it to the bracket on the column.
7. Remove the two screws securing the dipswitch to the column.
8. Remove the two mounting brackets by unscrewing them at the parcel tray and facia panel.
9. Roll back the carpet and unscrew the two screws securing the floor plate.
10. Jack up the front of the car and fit chassis stands to the front jacking points.
11. Release the lower end of the drop arm from the drop arm to idler arm rod.
12. Detach the idler arm bracket from the body.
13. Disconnect the track rod from the drop arm to idler arm rod.
14. Undo the three self-locking nuts securing the steering gear assembly to the sjdemember. Push out the bolts. Note that there is a flat washer under each nut and under each bolt head.
15. Remove the floor plate and rubber draught excluder by lifting it over the top of the steering column.

Removing the steering wheel



Steering Gear — Exploded

16. Remove the steering gear assembly by withdrawing it from beneath the car. During this operation avoid having the steering box above the steering wheel end of the column for long as this allows oil to run down the column and out through the end.
17. Rotate the drop arm so that the steering gear is in the straight-ahead position, note the position of the indicator cancelling cam and then remove it from its spline on the column.

To Install

18. Check that the drop arm is in the straight-ahead position and then tap the indicator cam into place on its spline on the top of the steering shaft. It should be fitted in the same position as that from which it was removed, i.e. with the cam pointing towards the indicator switch.
19. Place the steering gear in position and slide the draught excluder and floor plate over the top of the column.
20. Fit the bolts and locknuts securing the steering gear assembly to the sidemember. Ensure that a flat washer is fitted under each nut and each bolt head.

    NOTE: Two of these bolts also secure the steering stop bracket in position.
21. Locate the two 'U' brackets around the column and secure to the parcel tray and facia panel.
22. Torque the steering box bolts to 3.46 to 4.15 kg.m. (25 to 30 lb. ft.).
23. Replace the idler arm bracket, and track rod end.
24. Assemble the drop arm to the drop arm to idler arm rod. The conical rubber bushes should be lubricated (bore only) prior to assembly. Fit the washer and castellated nut, tighten the nut to a torque of 3.4 to 4.1 kg.m. (25 to 30 lb. ft.). Fit a new split pin.
25. Jack up, remove the stands and lower the car to the ground.
26. Locate the draught excluder and floor plate in position at the base of the steering column, and secure with two screws.
27. Assemble the indicator and horn switch to the bracket on the steering column upper end. Check that the indicator cam is correctly positioned, if necessary, temporarily fit the steering wheel to check that the cam operates the switch properly.
28. Refit the two screws securing the dipswitch to the steering column.
29. Fit the column shrouds, check that they are correctly located and do not foul the steering wheel.
30. Locate the steering wheel on its spline, check that the drop arm is in the straight-ahead position and fit the locking tab washer and nut. Tighten the nut to a torque of 2.8 to 3.4 kg.m. (20 to 25 lb. ft.) and bend up the lock tab.
31. Tap the steering wheel motif into place in the steering wheel centre.
32. Reconnect the battery and check the operation of the indicators, horn, etc.
33. Check the steering box oil level and top-up if necessary.

OP 3498-A5 EXTRA: STEERING GEAR – OVERHAUL

Tools Required

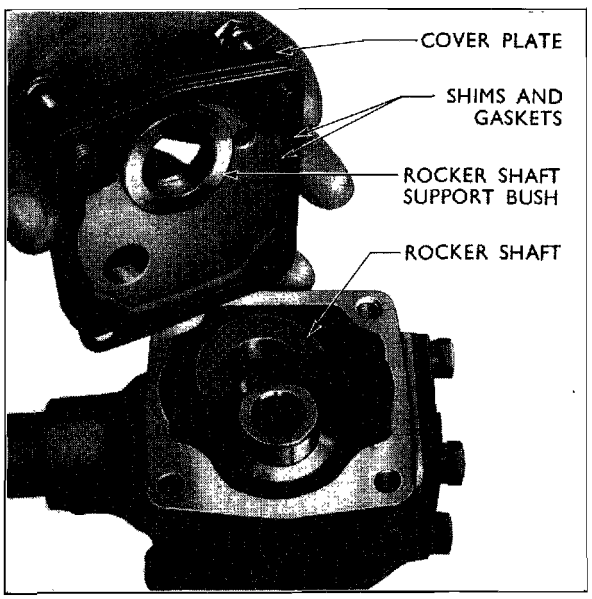
P.3041-C	Drop arm remover
P.3066	Rocker shaft bush remover and replacer
P.3070	Rocker shaft upper bush remover and replacer
P.3022	Rocker shaft bush broaching kit

Dial gauge

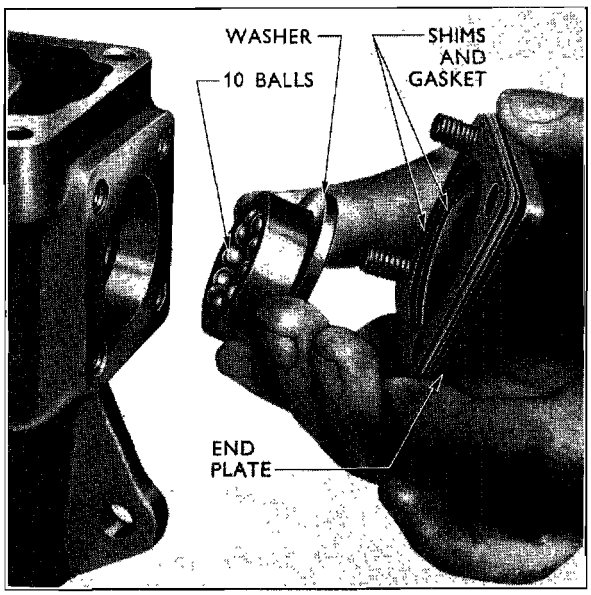
To Dismantle

1. If the lubricant has not been drained, remove the rubber filler plug and empty the oil into a suitable waste container.
2. Mark the drop arm for reference on reassembly, unscrew the retaining nut and remove the washer. Using Tool No. P.3041-C, pull the drop arm off the rocker shaft. If necessary, use a hammer on the domed nut to jar the drop arm off. NEVER hammer the drop arm.
3. Remove the two bolts and spring washers securing the spring retainer to the cover plate. Remove the retainer and spring.
4. Remove the top cover plate, shims and gaskets.
5. Unscrew the four bolts and spring washers securing the end plate to the steering box, and lift off the end plate, gaskets and shims.

   Note that a gasket is fitted on either side of the shim pack and the shims should be retained for reference on re-assembly.



Removing top cover plate

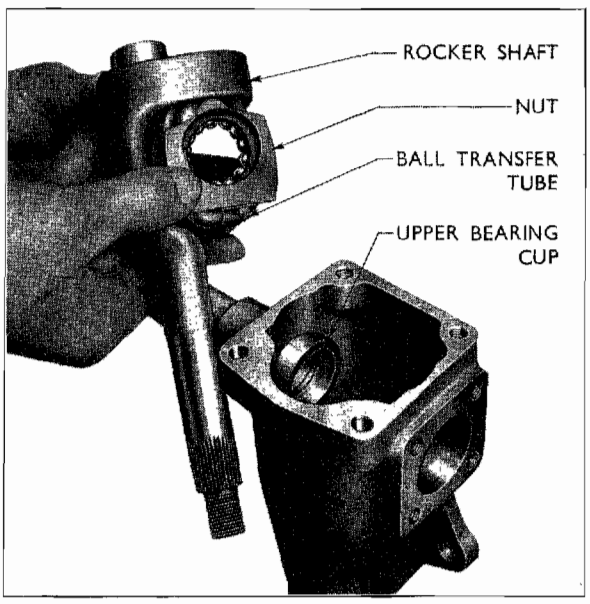


Steering shaft lower bearing and end plate

6. Withdraw the direction indication cam from the upper end of the steering shaft.
7. Screw the steering shaft down through the nut, this will displace the spacing washer, lower bearing track and the ten ball bearings, take care not to lose any. Retrieve the bearings from the lower track and the ten from the upper track, which will also have been displaced.
8. Unscrew the steering shaft from the steering nut, taking care not to lose any of the thirty balls contained inside the nut, and remove the shaft.
9. Lift the rocker shaft and nut from the steering box, and remove the upper bearing track.
10. Remove and discard the rocker shaft oil seal.
11. Inspect the rocker shaft bush and if it is unserviceable remove it by using a 5/8 in. B.S.P. tap screwed into the bush and then forcing the tap and bush out of the bore.
12. If necessary, remove the felt bush from the top of the steering column.
13. Clean all the components and examine all parts for wear, replacing those which are unserviceable.

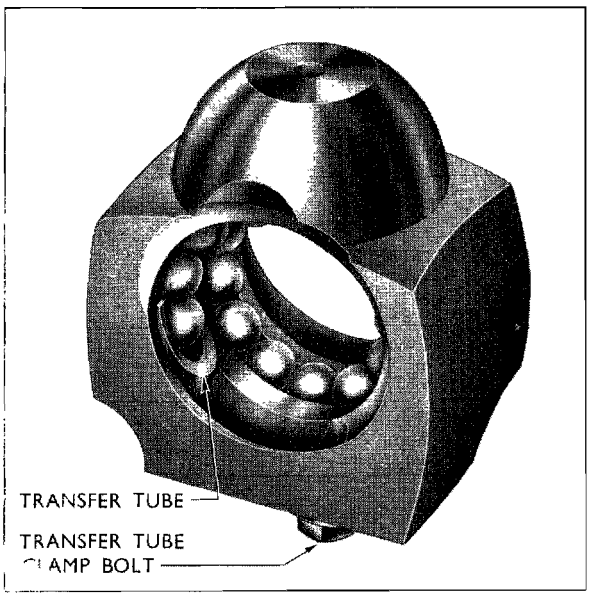
To Reassemble

14. If the felt bush has been removed from the top of the steering column, replace it with a new bush after soaking in hot grease.
15. If the rocker shaft bushes have been removed, install new bushes.
16. Press the flanged bush into the cover plate using Tool No. P.3070 so that the flange abuts the inner face of the cover plate.
17. Stake the bush to retain it in position taking care not to damage the bearing face.
18. Press the large plain rocker shaft bush into the steering gear housing using Tool No. P.3066 with the closed end of the oil groove adjacent to the shoulder on the tool. The bush should be pressed in until the tool shoulder is flush with the oil seal seating. If the housing incorporates a bush locating shoulder, press in the bush until it abuts the shoulder.

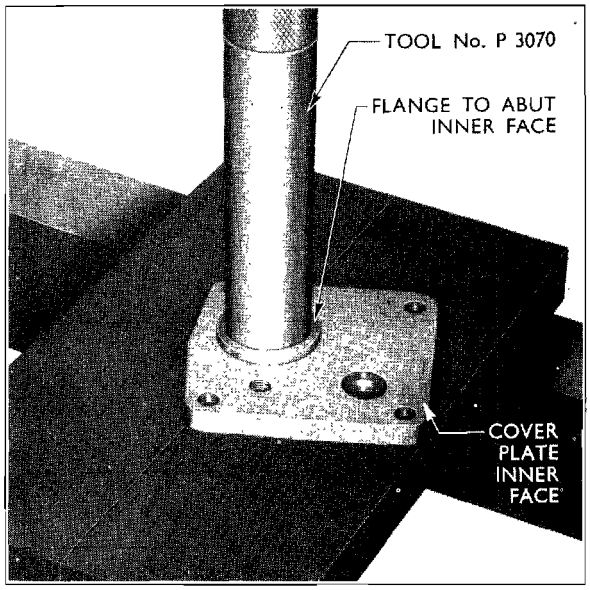


Removing the rocker shaft and steering nut.

19. Broach the large plain rocker shaft to size using Tool No. P.3022 with Tool No. P3066, detail 'b' as a pilot in the cover plate bush and detail 'a' to support the lower bush. (The cover plate should be temporarily refitted for this operation).
20. When the bush is fitted and reamed to size clean the box thoroughly to remove any traces of swarf.
21. Install a new oil seal in the housing using Tool No. P.3070. The sharp inner edge of the seal should be towards the interior of the steering box.
22. Fit the upper bearing track.
23. Assemble the thirty balls into the steering nut using grease to retain them in position.
24. Locate the spherical top of the steering nut in the recess in the rocker shaft and install the assembly in the housing.
25. With the housing clamped in a vice, pass the steering shaft into the housing and carefully screw the nut onto the worm.
26. Invert the assembly, insert the ten ball bearings in the upper track and push the steering shaft home to retain the upper bearing assembly.
27. Replace the ten ball bearings in the lower track using grease and install in the housing.
28. Locate the thick washer in its location against the lower bearing track.
29. Place a new gasket either side of the original shims and locate them in position together with the end plate.
30. Secure the end plate, shims and gaskets with the four bolts and spring washers, tightening them gradually whilst rotating the shaft. Any binding will indicate that the shim thickness is insufficient.
31. Add or remove shims until end float is just eliminated.
32. Remove one 0.102 mm. (0.004 in.) shim to give the correct bearing pre-load.
33. Turn the steering shaft until the hole in the end of the rocker shaft is concentric with the hole in the mating cone on the nut.



The Steering nut assembly.



Rebushing the cover plate.

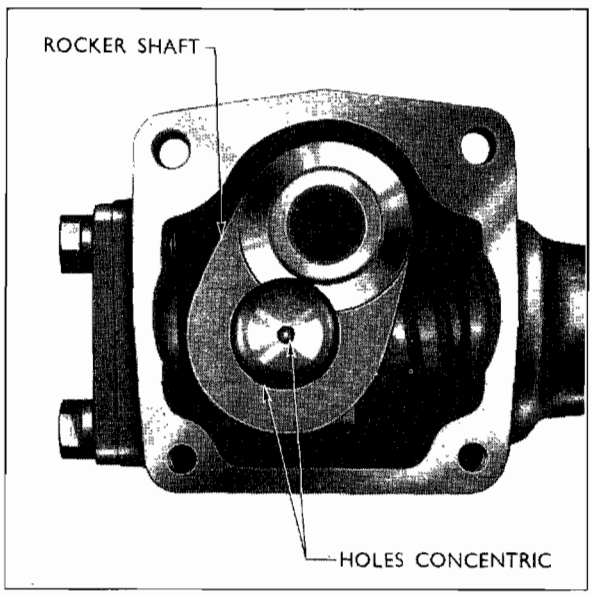
34. Fit the shims, gaskets and cover plate with the two set screws and bolts. Ensure the rocker shaft does not bind.
35. Mount the indicator dial gauge and stand Tool No. P.4008, on the housing with the gauge spindle on the end of the rocker shaft.
36. Check the concentricity of the hole in the opposite end of the rocker shaft and the hole in the mating cone on the nut by rotating the steering shaft. The point of concentricity occurs at the minimum gauge reading.
37. Check the rocker shaft end float which should be 0.076 mm. (0.003 in.) to 0.152 mm. (0.006 in.).
38. Add or subtract shims until the correct end float is obtained.
39. Refit the rocker shaft thrust spring, gasket and retaining plate using the two spring washers and bolts. Tighten the bolts.
40. Refit the drop arm to the rocker shaft, check that the mating marks align correctly.
41. Fit the washer and retaining nut, Tighten the nut to a torque of 8.3 to 9.7 kg.m. (60 to 70 lb. ft.).

OP 3498-B STEERING GEAR – ADJUST
(Includes removing the Steering Gear from the car)

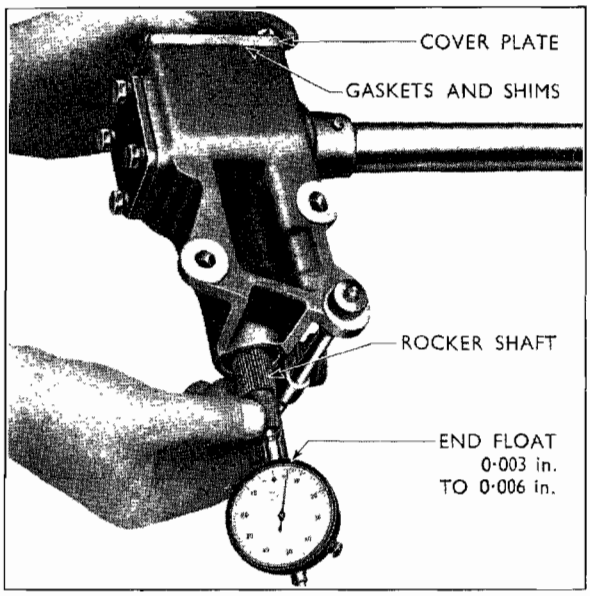
Tools Required

P.4008 Dial Gauge

1. Remove the steering gear from the car, as in OP. 3498-A.
2. Remove the end plate shims and gaskets taking care not to disturb the steering shaft or bearings.
3. Replace the end plate together with the original shims and two new gaskets and tighten the bolts.



Rocker Shaft Position for end float adjustment



Checking rocker shaft end float

4. Check the steering shaft end float.
5. Subtract or add shims and/or gaskets until end float is is just eliminated and the shaft rotates freely.
6. Remove one further 0.102 mm (0.004 in.) shim in order to give the required pre-load and reassemble the gaskets shims and end plate to the housing. Tighten the four bolts.
7. Unscrew two bolts and remove the thrust spring retaining plate, thrust spring and gasket.
8. Mount the indicator dial gauge and stand, Tool No. P.4008, on the housing with the gauge spindle on the end of the rocker shaft.
9. Rotate the steering shaft until the lowest reading is obtained on the gauge.
10. Check the rocker shaft end float which should be 0.076 mm (0.003 in.) to 0.152 mm. (0.006 in.).
11. Remove the cover plate and add or subtract shims to give the correct end float.
12. Refit the cover plate gaskets and shims.

    Tighten the bolts and set screws.
13. Replace the rocker shaft thrust spring gasket and cover plate with the two bolts and spring washers.
14. Replace the steering gear in the car, as in OP. 3498-A.

OP 3498-E STEERING GEAR ASSEMBLY – OVERHAUL
(Includes OPS 3498-A and A5)

OP 3530-A STABILISER BAR AND/OR STABILISER BAR TO TRACK CONTROL ARM BUSHES – REMOVE AND INSTALL

Tools Required

P.5045 Coil spring adjustable restrainers

To Remove

1. Fit spring restrainers, Tool No. P.5045, to the front springs.
2. Jack up the front of the car and fit chassis stands under the front crossmember.
3. Remove the stabiliser bar clamps.
4. Remove the split pins and unscrew the stabiliser bar nuts.
5. Dismantle the conical rubber bushes from the track control arms.
6. Remove the stabiliser bar from the car.
7. Remove the mounting foot bolt nut and flat washer and withdraw the stabiliser bar mounting foot. Remove the bushes.

To Install

8. Position the bushes in the mounting foot and refit the assembly with the nut bolt and flat washer. Do not fully tighten the nut at this stage.

   NOTE: the flanges of the bushes may be lubricated with soapy water to assist mounting in the side member.

9. Place a rubber bush on each end of the stabiliser bar with the flange toward the flange on the bar and refit the bar to the track control arms.
10. Locate a rubber bush on each end of the stabiliser bar on the other side of the track control arm with the flange outwards.
11. Fit the flat washers and castellated nuts to the ends of the bar and tighten to 3.46 to 4.15 Kg.m. (25 to 30 lb. ft.). Lock each nut with a new split pin.
12. Replace the stabiliser bar clamps and secure with the locking plates and nuts. Torque the nuts to 2.07 to 2.49 Kg.m. (15 to 18 lb. ft.) and bend over the locking tabs.
13. Jack up the car, remove the stands, and lower the car.
14. Remove the spring restrainers.

OP 3535-A STEERING LOCK STOPS – ADJUST

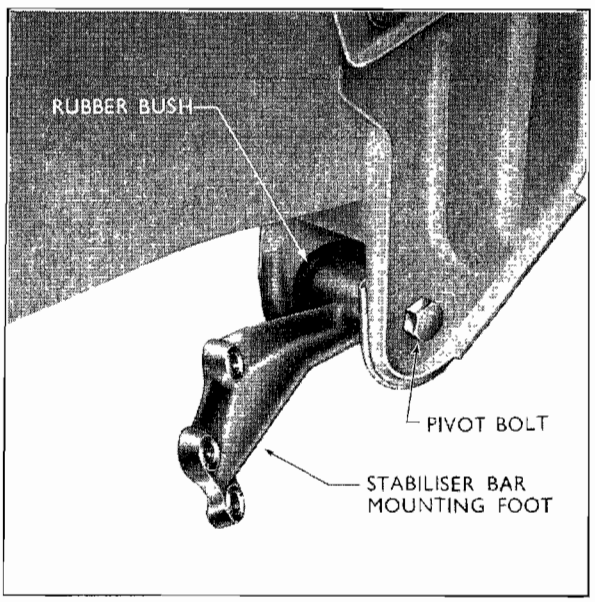
Tools Required

Turntables

1. Drive the car onto the turntables, slacken the locknuts on both steering stop bolts and screw the bolts outwards from the centre-line of the car.
2. Turn one road wheel until the minimum clearance between the tyre sidewall and the body side member is 22.2 mm (7/8 in.).
3. Adjust the appropriate steering stop bolt so that it contacts the lug on the drop arm or idler arm rod and tighten the locknut.

4. & 5. Repeat operation 2 and 3 for the other road wheel.

6. Recheck the adjustments.



Stabiliser bar mounting foot

OP 3575-A ROCKER SHAFT END-FLOAT – ADJUST
(Steering gear in situ.)

Tools Required

P.4008 Dial gauge

1. Disconnect the steering linkage from the drop arm by removing the nut and split pin.
2. Remove the rocker shaft thrust plate gasket and spring.
3. Remove the top cover plate. Turn the steering on either lock until the hole in the end of the rocker shaft and the hole in the mating cone on the nut are concentric.
4. Position a new gasket and shims on the top cover face and fit the cover.
5. Using the dial gauge, Tool No. P.4008, measure the rocker sahft end-float which should be 0.076 to 0.152 mm. (0.003 to 0.006 in.).
6. Adjust the shims to give correct end-float.
7. Replace the thrust plate, gasket and spring.
8. Reconnect the steering linkage, and top-up the steering box.

OP 3590-A DROP ARM – REMOVE AND INSTALL

Tools Required

P.3041-C Drop arm remover

To Remove

1. With the handbrake applied, jack up the car and fit stands.
2. Remove the split pin and castellated nut and detach the drop arm from the drop arm to idler arm rod.
3. Mark the drop arm and rocker shaft for reference on reassembly and remove the retaining nut and washer. Using Tool No. P.3041-C, pull the drop arm off the rocker shaft. If necessary a hammer can be used on the domed part of the tool to jar the drop arm off. NEVER hammer the drop arm.

To Install

4. Refit the drop arm to the rocker shaft spline checking that the mating marks align correctly.
5. Fit the washer and retaining nut. Tighten the nut to a torque of 8.3 to 9.7 kg.m. (60 to 70 lb. ft.).
6. Reconnect the steering linkage to the drop arm securing it with a castellated nut. Tighten the nut and fit a new split pin.

OP 3591-A ROCKER SHAFT OIL SEAL – REMOVE AND INSTALL
(Steering gear in situ)

Tools Required

P.3041-C Drop arm remover
P.3085 Rocker shaft oil seal replacer (in situ)

To Remove

1. Disconnect the steering linkage from the drop arm by removing the split pin and nut and detaching the drop arm from the drop arm to idler arm rod.
2. Centralise the steering gear in the straight-ahead position and mark the drop arm and the rocker shaft for reference on reassembly.
3. Remove the retaining nut and washer and, using Tool No. P.3041-C, pull the drop arm off the rocker shaft. If necessary, a hammer can be used on the domed part of the tool to jar the drop arm off. NEVER hammer the drop arm.
4. Using a suitable pointed instrument, lever the existing oil seal out of the recess in the steering gear housing.

To Install

5. Install a new oil seal in the housing, using Tool No. P.3085. The sharp inner edge of the seal should be towards the interior of the steering box.
6. Refit the drop arm to the rocker shaft, checking that the mating marks align correctly.
7. Fit the washer and retaining nut. Tighten the nut to a torque of 8.3 to 9.7 kg.m. (60 to 70 lb. ft.).
8. Reconnect the steering linkage to the drop arm securing it with a castellated nut. Tighten the nut and fit a new split pin.
9. Check the steering box oil level and top-up if necessary.

OP 3600-A STEERING WHEEL

Tools Required

CP3045 Steering wheel puller

To Remove

1. Set the road wheels in the straight-ahead position.
2. Prise off the steering wheel centre emblem.
3. Bend back the locking tab and remove the steering wheel retaining nut.
4. Remove the steering wheel, using Tool No. CP 3045.

To Install

5. Replace the steering wheel in the straight-ahead position.
6. Fit a new tab washer and screw the steering wheel retaining nut onto the steering shaft.
7. Tighten the steering wheel nut to a torque of 2.8 to 3.4 kg.m. (20 to 25 lb. ft.) and bend up the tabs on the lockwasher.
8. Tap the steering wheel centre emblem into position.

4

REAR AXLE

SECTION INDEX

GENERAL DESCRIPTION

QUICK REFERENCE DATA

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"	4676-A	DRIVE PINION OIL SEAL – RENEW (Includes remove and adjust differential assembly)
"	4676-B	DRIVE PINION OIL SEAL – RENEW (Differential assembly *in situ*)

GENERAL DESCRIPTION

The rear axle is of the semi-floating type with a hypoid crown wheel and pinion and a two pinion differential.

The crown wheel and pinion are mounted in the differential carrier which is bolted to the front of the axle housing. The pinion is mounted on two taper roller bearings which are pre-loaded after collapsing a tubular spacer set between them. The crown wheel is bolted to the differential case which also runs on two taper roller bearings. These bearings are pre-loaded by spreading the differential carrier. In addition to the above pre-load settings the only other adjustment is the pinion depth of mesh in the crown wheel, controlled by a selective spacer between the pinion head and the rear taper roller bearing.

The axle shafts are splined to the differential side gears and run in ball races in the axle casing at their outer ends.

The tubular drive shaft is splined to the gearbox output shaft and bolted to a flange fitted to the pinion shaft.

QUICK REFERENCE DATA

PERIODIC SERVICE ATTENTION

The combined oil filler and level plug is situated on the rear of the banjo housing welded to the axle casing.

After the first 800 km. (500 miles) and subsequently every 4,000 km. (2,500 miles) the oil level should be checked and topped up as required with the car on level ground. Only hypoid gear oil of S.A.E. 90 grade may be used.

If a new crown wheel and pinion are fitted, then the special running-in oil must be used to fill the axle.

DATA

Axle ratio	4.125:1 Standard
	4.44:1 Optional
Oil capacity	1.11 litres (2 Imperial pints)
Grade of lubricant	S.A.E. 90 hypoid gear oil
Initial fill lubricant	EM-2C-29

Tightening Torques

Crown wheel to differential case bolts	4.148 to 4.839 kg.m. (30 to 35 lb. ft.)
Differential carrier to axle housing nuts	2.074 to 2.489 kg.m. (15 to 18 lb. ft.)
Differential bearing locking plate bolts...	1.659 to 2.074 kg.m. (12 to 15 lb. ft.)
Differential bearing cap bolts	6.221 to 6.931 kg.m. (45 to 50 lb. ft.)
Axle shaft bearing retainer bolts	2.074 to 2.489 kg.m. (15 to 18 lb. ft.)
Universal joint flange to pinion flange	2.074 to 2.489 kg.m. (15 to 18 lb. ft.)

SERVICE AND REPAIR OPERATIONS

OP 4003-A REAR AXLE ASSEMBLY – COMPLETE WITH HUBS AND BRAKES – REMOVE AND INSTALL

Tools Required

P.2012 Brake line plugs

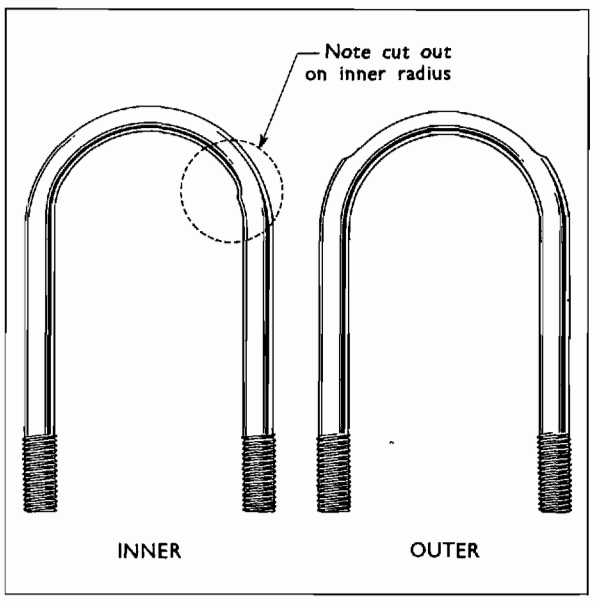
To Remove

1. Chock the front wheels, jack up the rear of the car, fit stands and remove the wheels.
2. Release the handbrake inside the car and disconnect the cable at the left-hand brake plate clevis. Remove the rod from the right-hand brake plate and the fabric stop from the axle casing.
3. Disconnect the brake pipe at the junction on the axle and fit brake line plugs, Tool No. P2012.
4. Mark the drive shaft and pinion flanges for correct re-alignment on reassembly, then remove the four self-locking nuts and bolts.
5. Jack up under the centre of the axle and disconnect the shock absorber lower mountings. Lower the jack.
6. Remove the rear spring "U" clip nuts and detach the clips and plate.
7. Lift the axle and remove it from the car through the wheel arch.

To Install

8. Lift the axle and slide it through a wheel arch into position on the springs. Ensure that the spigot on the springs fits in the hole in the axle mounting pads.
9. Fit the "U" clips over the axle, slide on the lower plates and fit the locknuts; torque to 2.8 to 3.4 kg.m. (20 to 25 lb. ft.).

NOTE: The inner clip may be identified by an offset cut on the inside of the curved end. When fitted this cut should face the front.



Rear Spring 'U' Clip Identification

10. Jack up under the centre of the axle and fit the shock absorbers into the lower mounting bracket. Fit securing bolts and locknuts. Lower jack.
11. Reconnect the drive shaft to the pinion flange, aligning the mating marks.
12. Remove the brake line plugs and reconnect the pipes.
13. Reconnect the handbrake cable to the lever on the left-hand brake plate and the brake rod at the right-hand brake plate.
14. Bleed the braking system and adjust the brakes.
15. Refit the road wheels and lower the car to the ground.

OP 4010-A REAR AXLE HOUSING — REPLACE

Tools Required

P.2012	Brake line plugs
P.3072	Axle shaft remover
P.3072-3	Oil seal remover
P.4078	Oil seal replacer
550	Universal handle

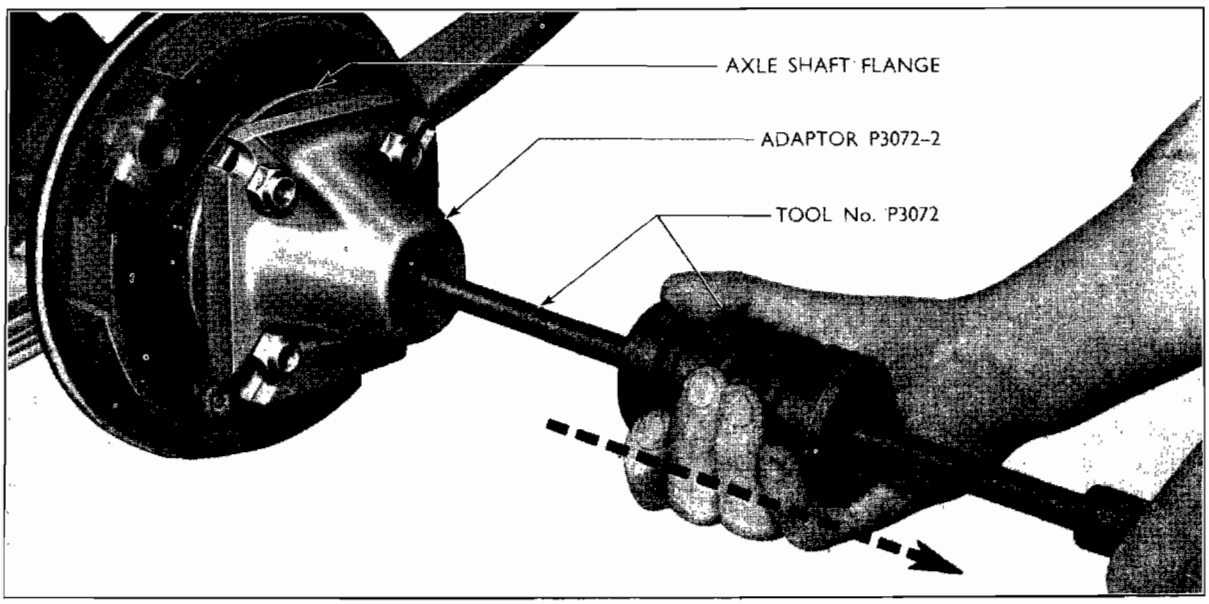
To Remove

1. Chock the front wheels, jack up the rear of the car and fit stands.
2. Remove road wheels.
3. Release the handbrake inside the car and disconnect the cable at the left hand brake plate.
4. Remove the rod from the right-hand brake plate, and the fabric strap from the axle casing.
5. Disconnect the brake pipe at the junction on the axle and fit brake line plugs, Tool No. P.2012.
6. Mark the drive shaft and pinion flanges for correct re-alignment on reassembly, then remove the four nuts and bolts.
7. Jack up under the centre of the axle and disconnect the shock absorber lower mounting bolts. Lower the jack.
8. Remove the rear spring "U" clip nuts and detach the clips and plates.
9. Lift the axle and remove it from the car through a wheel arch.
10. Disconnect the hydraulic pipes at the brake expanders and fit brake line plugs, Tool No. P.2012.
11. Remove the three-way union at the bracket on the differential housing, unhook and remove the pipe.
12. Mount the axle assembly in a suitable vice.
13. Remove the brake drum securing screw and pull off the drum.
14. Remove the four nuts securing the bearing retainer plate to the axle casing. These nuts are accessible through holes in the axle shaft flange.
15. Secure the base of Tool No. P.3072 to the axle shaft flange with wheel nuts. Use the slide hammer of the tool to knock out the axle shaft.
16. Pass the oil seal remover, Tool No. P.3072-3 fitted to the slide hammer, through the oil seal so that the wings locate behind the seal:

17. Operate the slide hammer to remove the oil seal.
18. Repeat operations 13 to 17 for the other side.
19. Unscrew the eight nuts holding the differential carrier assembly to the axle casing.
20. Withdraw the carrier assembly from the casing, and remove the bolts.
21. Drive out the eight brake plate bolts, four each side.
22. Remove the rear axle drain plug, filler and level plug, and the rear axle breather.

To Install

23. Refit the rear axle drain plug, breather and eight brake plate bolts.
24. Replace the eight differential carrier bolts and a new gasket.
25. Replace the carrier assembly, and tighten the nuts to a torque of 2.07 to 2.50 kg.m. (15 to 18 lb. ft.).
26. Locate the axle housing oil seal on the adaptor, Tool No. P.4078.
27. Using the universal handle Tool No. 550 drive the oil seal into place.
28. Insert the axle shaft into the casing and engage the splines in the differential side gear. Tap the shaft fully home.
29. Fit the four bolts and spring washers to secure the bearing retainer plate; torque to 2 to 2.5 kg.m. (15 to 18 lb. ft.).
30. Replace the brake drum and refit the securing screw.
31. Repeat operations 26 to 30 for the other side.
32. Replace the three-way hydraulic union on a differential carrier stud.
33. Reconnect the hydraulic pipes at the brake expanders, tighten the union nuts securely, but do not overtighten.



Withdrawing an Axle Shaft

34. Lift the axle and slide it through a wheel arch into position on the springs. Ensure that the spigot on the springs fits in the hole in the axle mounting pads.
35. Fit the "U" clips over the axle. Note that the inner clip can be identified by an offset cut out on the inside of the curved end. This cut out should be fitted towards the front.
36. Slide on the lower plates and fit the locknuts; torque to 2.76 to 3.46 kg.m. (20 to 25 lb. ft.).
37. Jack up the centre of the axle and fit the shock absorbers into the lower mounting bracket. Lower the jack.
38. Reconnect the drive shaft to the pinion flange after aligning the mating marks.
39. Reconnect the brake rod at the right hand brake plate, and the cable at the left hand plate.
40. Bleed the braking system and adjust the brakes.
41. Fill the rear axle with S.A.E. 90 hypoid gear oil.
42. Refit the road wheels, remove the stands, lower the car to the ground and remove the chocks.

OP 4235-A REAR AXLE SHAFT AND BEARING ASSEMBLY – ONE – REMOVE AND INSTALL

Tools Required

P.3072	Axle shaft remover

To Remove

1. Chock the front wheels, jack up the rear of the car and fit stands.
2. Ensure the handbrake is released, remove the brake drum securing screw and pull off the drum.
3. Remove the four bolts and spring washers securing the bearing retainer plate to the axle casing. These bolts are accessible through holes in the axle shaft flange.
4. Secure the base of Tool No. P.3072 to the axle shaft flange with the wheel nuts. Use the slide hammer of the tool to knock out the axle shaft.

To Install

5. Insert the axle shaft into the casing and engage the splines in the differential side gear. Tap the shaft fully home.
6. Fit the four bolts and spring washers to secure the bearing retainer plate; torque to 2.1 to 2.4 kg.m. (15 to 18 lb. ft.).
7. Replace the brake drum and refit the securing screw.
8. Refit road wheels, remove stands, lower the car to the ground and remove the chocks.

OP 4235-A2 EXTRA: REAR AXLE SHAFT OR BEARING AND OIL SEAL – ONE – RENEW (AXLE SHAFT AND BEARING ASSEMBLY REMOVED)

Tools Required

370	Universal taper base
P.4084	Spring indicator
P.4090-1 & 2	Axle shaft bearing remover

To Remove

1. Locate the adaptors, Tool No. P.4090-6, and a slave ring between the bearing and axle shaft flange. Support the assembly in the base plate, Tool No. 370, of a hydraulic press and push the axle shaft out.

To Install

2. Locate the bearing retainer plate and the bearing on the axle shaft with the oil seal side towards the splined end.
3. Support the assembly in the bed of a hydraulic press on a spacer ring, adaptor, Tool No. P.4090-2, and slave ring.
4. Fit a spring indicator, Tool No. P.4084, to the ram and press the bearing onto the axle shaft shoulder. A minimum pressure of 544 kg. (1,200 lb.) should be required. A lower pressure indicates an incorrect fit.
5. Use the same tools as in operation 3 and 4 and fit the bearing collar to abut the bearing. A minimum pressure of 363 kg. (800 lb.) should be required.

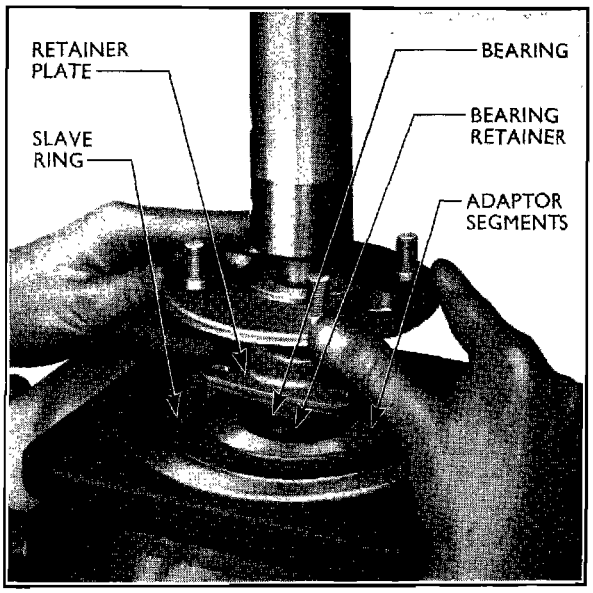
OP 4235-A3 EXTRA: DIFFERENTIAL ASSEMBLY – REMOVE AND INSTALL (AXLE SHAFTS REMOVED)

To Remove

1. Disconnect the drive shaft from the pinion flange, after marking the flanges for correct reassembly.
2. Unscrew the eight nuts holding the differential carrier assembly to the axle casing and withdraw the three-way hydraulic union from its locating stud. Allow the oil to drain.
3. Withdraw the carrier assembly from the casing.

To Install

4. Clean the mating faces of the carrier assembly and axle casing. Fit a new gasket over the studs.



Fitting an axle shaft bearing.

5. Refit the differential carrier assembly to the casing and replace the nuts; torque to 2.1 to 2.4 kg.m. (15 to 18 lb. ft.).
6. Fill the axle with S.A.E. 90 Hypoid gear oil or if a new crown wheel and pinion have been fitted fill with the initial fill lubricant.
7. Reconnect drive shaft to the pinion flange, aligning the mating marks.

OP 4235-A4 EXTRA: DIFFERENTIAL ASSEMBLY – OVERHAUL (DIFFERENTIAL ASSEMBLY REMOVED)

NOTE: If a new pinion or differential taper roller bearing is fitted, then a new cone **and** a new cup should be used. Mating cones and cups should be of the same manufacture (i.e. Timken, Skefco, etc.).

Tools Required

CP.4000	Hand press
P.4000-27A	Split ring
P.4000-28	Split ring
P.4008-1	Backlash gauge
P.4009	Cap spread gauge
P.4013	Drive pinion bearing replacer
P.4013-3	Drive pinion bearing replacer (adaptor)
P.4015	Pinion bearing cup remover
P.4028	Pinion flange wrench
CP.4030	Pre-load gauge
P.4030-2	Adaptor
P.4030-4	Adaptor
P.4075	Depth of mesh gauge
P.4075-4	Dummy pinion
P.4077-A	Mounting adaptor
P.4079	Differential bearing adjuster
P.4080	Thrust button

To Dismantle

1. Mount the assembly on a dismantling stand with an adaptor, Tool No. P.4077-A.
2. Check for mating marks on the differential adjusting nut caps and if necessary mark them for correct reassembly. Remove the lock tabs and slacken the cap bolts, and lock bolts. Back off the adjusting nuts with the special spanner, Tool No. P.4028, and then remove the cap bolts and detach the caps.
3. Lift out the crown wheel and differential case assembly, keeping the bearing cones and cups together as a pair.
4. Hold the pinion flange using Tool No. P.4028 and unscrew the nut. Pull the flange from the pinion. Remove the pinion with the tubular spacer and rear bearing cone from the carrier.
5. Prise the pinion oil seal from the carrier or if required the pinion front bearing cup and oil seal can be driven out by locating the legs of thedriver, Tool No. P.4015, through the carrier and up against the bearing in the notches provided.

   The rear bearing cup can be removed by inserting the driver from the other end of the carrier.

6. Locate the pinion in the split ring, Tool No. P.4000-28, with the lips behind the bearing cone. Mount the assembly in a hand press, Tool No. Cp.4000, and after checking that the bearing cage is not trapped, press out the pinion. Remove the spacer from behind the pinion head.

7. Remove the six bolts securing the crown wheel to the differential case. Suitably support the crown wheel in the bed of a press and press out the differential case (use thrust button P.4080).

8. Drive out the differential pinion gear shaft lock-pin from the crown wheel side of the differential case. Push out the shaft.

9. Rotate the pinion gears around the side gears and extract them from the case. Remove the side gears and the two spherical and two flat thrust washers from the case.

10. Locate the differential bearing cones in the adaptors, Tool No. P.4000-27A, and in a support ring in the bed of a press. Press off the cones, one at a time.

To Reassemble

11. Lubricate the flat thrust washers and position them on the flanges of the side gears. Fit the side gears in the differential case.

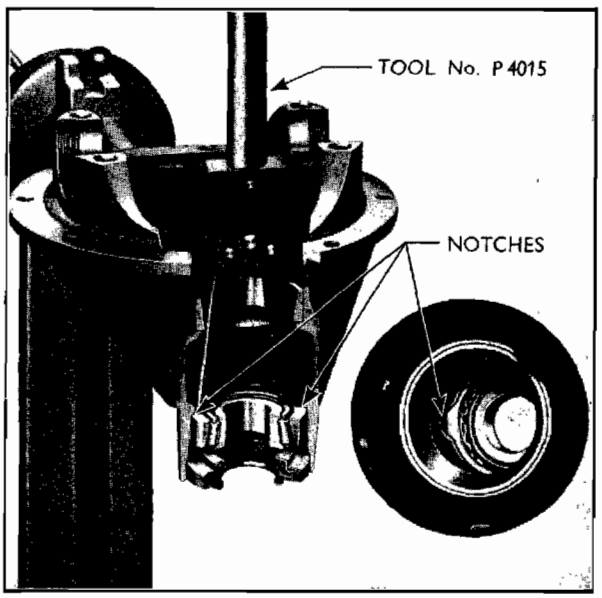
    Lubricate the spherical thrust washers and position them on the rear of the pinion gears. Position the pinions in the cut-outs and rotate the side gears to draw them into place.

    Check that the thrust washers are not misplaced.

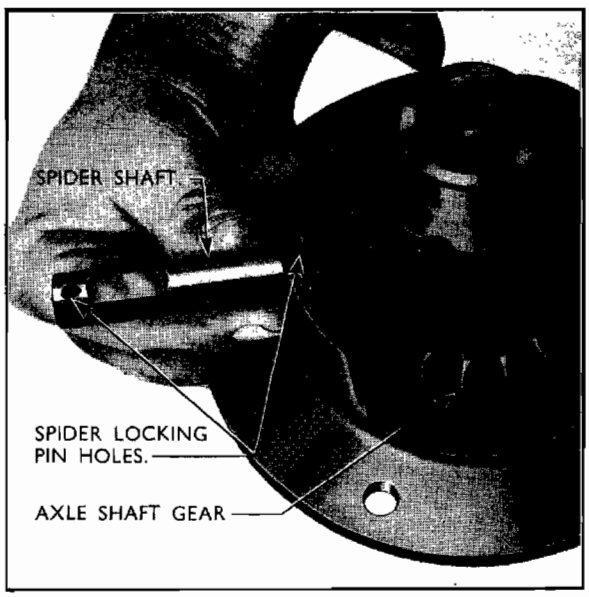
12. Push the pinion gear shaft through the case and gears so that the lock-pin holes line up. Fit the tapered end of a new lock-pin from the differential side of the case and tap it right home. Lightly peen the case to retain the pin.

13. Examine the mating faces of the crown wheel and the differential case, removing any burrs by lightly stoning. Locate the crown wheel on the case and enter three suitable long bolts through the case into the crown wheel to ensure correct alignment.

14. Place the crown wheel, teeth downwards, on wood blocks in the bed of a press. Place the thrust button, Tool No. P.4080, on the case and bring down the ram to press on the crown wheel.



Removing Front Pinion bearing and Oil Seal



Replacing or removing the Pinion Gear Shaft

Rear Axle — Exploded

15. Whilst the assembly is in the press, replace the bearing cones using the thrust button. Tool No. P.4080.

16. Remove the three pilot bolts and fit the six self-locking bolts; torque to 4.15 to 4.84 kg.m. (30 to 35 lb. ft.).

17. Place the pinion rear bearing cup on Tool No. P.4013-3 and pass it through the differential carrier from the rear. Assemble the front bearing cup to the tool and fit the front adaptor and wing nut. Tighten the wing nut to pull the cups fully home.

18. Select the pinion bearing shim.

    (a) Slide the rear bearing cone onto the dummy pinion, Tool No. P.4075-4, and fit it in the carrier.

    (b) Fit the front bearing cone to the dummy pinion, slide on the pinion flange and screw on the nut.

    (c) Using Tool No. P.4028 hold the pinion flange and tighten the nut whilst rocking the pinion to ensure correct seating of the bearings. When there is slight bearing drag, fit the pre-load gauge, Tool Nos. CP.4030 and P.4030-2, to the flange and measure the running torque by allowing the gauge weight to drop through the horizontal position. Tighten the nut until a running torque of 0.23 to 0.29 kg.m. (20 to 26 lb. in.) is obtained.

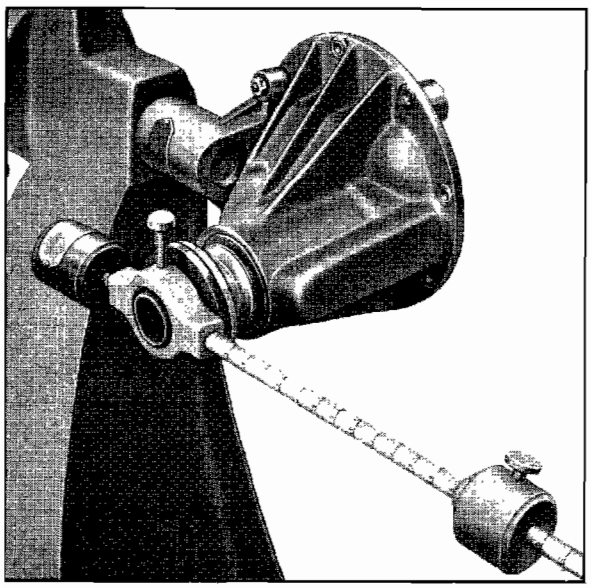
    NOTE: When refitting the part-used original bearings, a running torque of 0.12 to 0.14 kg.m. (10 to 13 lb. in.) should be used.

    If the figures specified are exceeded, slacken the nut to remove all pre-load and recommence tightening.

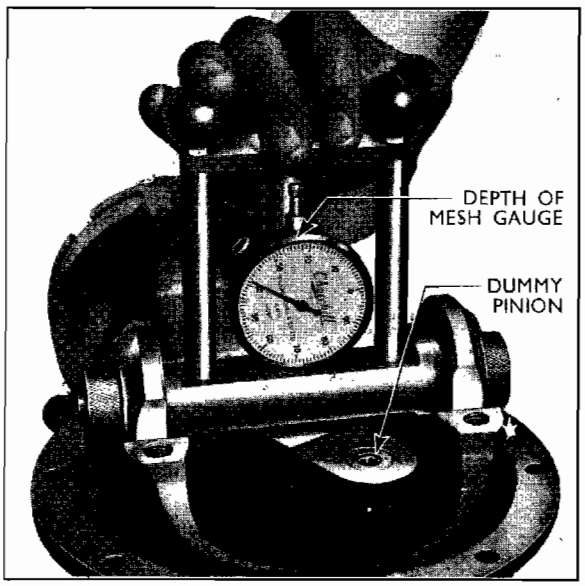
    (d) Set the dial gauge of Tool No. P.4075 to zero by sliding the setting button across the under face.

    (e) Clean the differential bearing location in the carrier and fit the gauge, with adaptors P.4075-4, so that the plunger rests on the dummy pinion. Rock the gauge backwards and forwards slightly to obtain a minimum reading.

    NOTE: It is essential to use the same bearing for assembly as was used for obtaining the shim reading.



Pinion Bearing Pre-Load Gauge



Checking Pinion Depth of Mesh

(f) To the reading obtained add the amount 2.54 mm. (0.100 in.) which is the gauge compensation figure and, to allow for bearing expansion when it is pressed onto the pinion, subtract the amount of 0.025 mm (0.001 in.). Examine the pinion shaft, any variance from standard size will be indicated. If a "+" figure should be subtracted, and if "—" it should be added.

For example:

A typical gauge reading may be	0.991 mm. (0.039 in.)
plus gauge compensation	2.540 mm. (0.100 in.)
	3.351 mm. (0.139 in.)
minus allowance for bearing expansion	0.025 mm. (0.001 in.)
	3.506 mm. (0.138 in.)
add or subtract pinion marking (say subtract 2)	0.051 mm. (0.002 in.)
	3.455 mm. (0.136 in.)

The shim required may now be selected from the following list:—

Pinion Bearing Shims

105E-4672-A	3.312 to 3.322 mm. (0.1304 to 0.1308 in.)
105E-4672-B	3.337 to 3.48 mm. (0.1314 to 0.1318 in.)
105E-4672-C	3.363 to 3.373 mm. (0.1324 to 0.1328 in.)
105E-4672-D	3.388 to 3.398 mm. (0.1334 to 0.1338 in.)
105E-4672-E	3.414 to 3.424 mm. (0.1344 to 0.1348 in.)
105E-4672-F	3.439 to 3.449 mm. (0.1354 to 0.1358 in.)
105E-4672-G	3.465 to 3.474 mm. (0.1364 to 0.1368 in.)
105E-4672-H	3.490 to 3.500 mm. (0.1374 to 0.1378 in.)
105E-4672-J	3.515 to 3.525 mm. (0.1384 to 0.1388 in.)
105E-4672-K	3.541 to 3.551 mm. (0.1394 to 0.1398 in.)
105E-4672-L	3.566 to 3.576 mm. (0.1404 to 0.1408 in.)
105E-4672-M	3.595 to 3.60 mm. (0.1414 to 0.1418 in.)
105E-4672-N	3.605 to 3.627 mm. (0.1424 to 0.1428 in.)

(g) Remove the dummy pinion and gauge.

19. Fit the selected shim to the pinion with the internal chamfer towards the gear teeth. Fit the rear bearing cone and support the assembly in the split ring, Tool No. P.4000-28. Press the bearing fully home, taking care not to damage the bearing cage.

20. Fit the front bearing cone to its cup in the carrier and locate a new oil seal in the carrier throat with the lip towards the bearing after applying sealer EM-4G-14 to the outside diameter of the seal. Pass Tool No. P.4013 through the carrier and fit adaptor No. P.4013-3 with its flat face against the seal. Tighten the wing nut to pull the seal fully home. Lightly oil the seal.

21. Fit the pinion in the carrier with a new collapsible spacer. Fit the drive flange and a new retaining nut. Tighten the nut until just a slight end-float can be felt on the pinion.

22. Fit the pre-load gauge, Tool Nos. CP.4030 and P.4030-2, to the drive flange and measure the oil seal drag (usually around 0.06 kg.m. (5 lb. in.). To the figure obtained add the specified bearing running torque of 0.15 to 0.22 kg.m. (13 to 19 lb. in.) which will give the correct figure required.

NOTE: When refitting the part-used original bearings, a running torque of (0.08 to 0.11 kg.m. (6.5 to 9.5 lb. in.) should be used.

23. Gradually and carefully tighten the drive flange nut, rocking the pinion to seat the bearings, until the required pre-load is obtained. Frequent checks must be taken with the pre-load gauge, and if the pre-load is exceeded the collapsible spacer must be renewed and the operation recommenced.

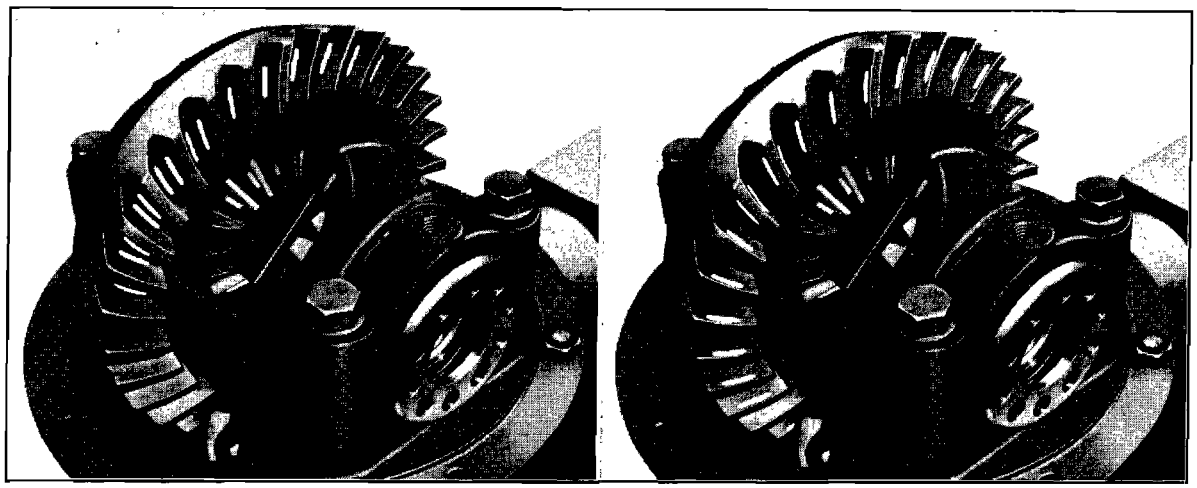
Incorrect Tooth Marking and Method of Correction

Heavy Flank Contact

In this case the area of contact is below the centre line of the tooth, and the condition should be rectified by moving the pinion away from the crown wheel, using a thinner shim behind the pinion. Reset the backlash and differential bearing pre-load.

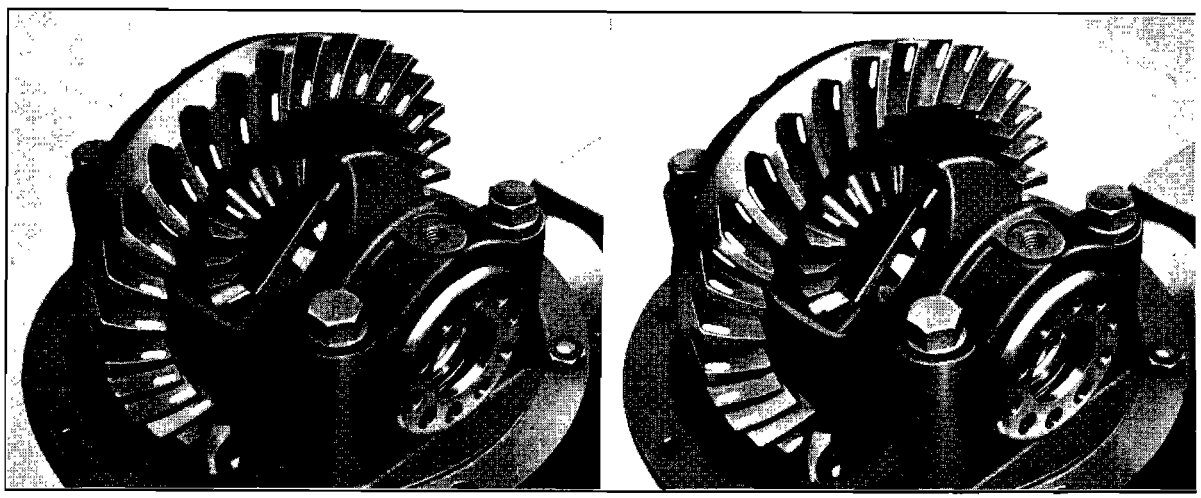
Heavy Face Contact

In this case the area of contact is above the centre line of the tooth, due to the pinion being too far away from the crown wheel. Use a thicker pinion bearing shim to lower the contact area and reset the backlash and differential bearing pre-load.



Heavy Flank Contact

Heavy Face Contact



Contact on Toe

Contact on Heel

Contact on Toe

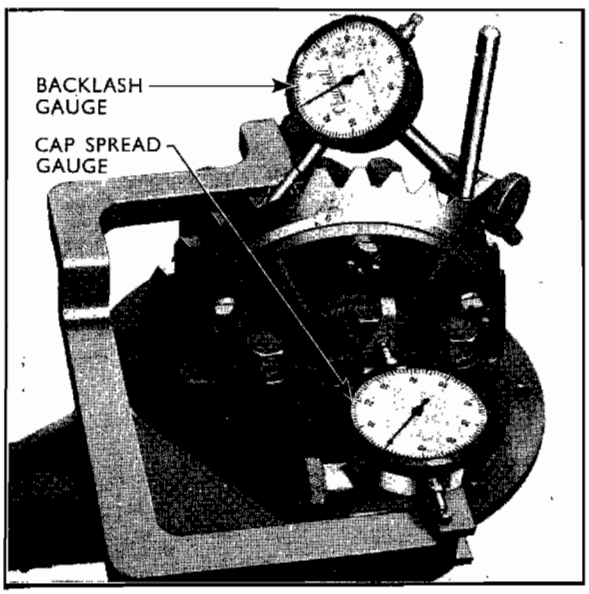
When the area of contact is running off the toe of the pinion, move the crown wheel away from the pinion. Slacken the crown wheel adjusting nut and screw in the differential side nut an equal amount. It may also be necessary to use a thicker shim behind the pinion in order to keep the backlash within the correct limits.

Contact on Heel

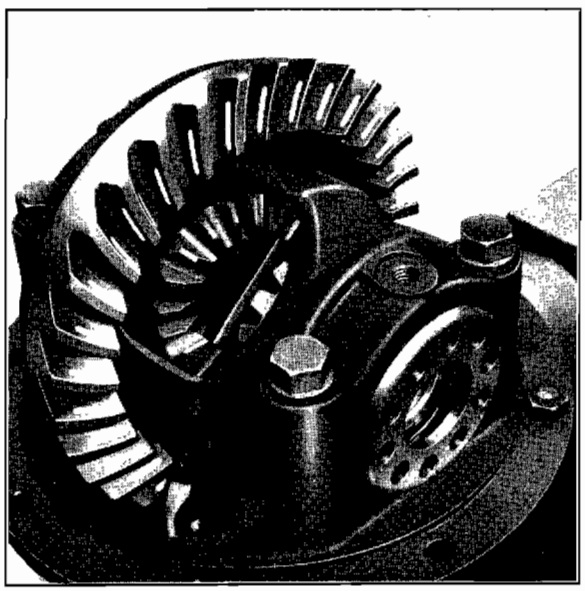
In this case the crown wheel is too far out from the pinion. Slacken the differential side bearing pre-load readings. If the backlash is reduced below the minimum specified, use a thinner shim behind the pinion and, using a new collapsible spacer, readjust pinion bearing pre-load.

24. Renew the flange nut if there is any doubt as to its condition or locking properties.
25. Locate the differential bearing cups on their cones and position the differential assembly in the carrier housing.
26. Refit the bearing caps with the mating marks aligned and replace the bolts so that they just nip the caps in position. Screw in the adjusting nuts using Tool No. P.4079, whilst rotating the crown wheel, until there is just a slight backlash.
27. Bolt a spread gauge, Tool No. P.4009, to the centre bolt hole of a bearing cap and fit an inverted bearing cap lock-tab to the other cap. Ensure that the dial plunger rests against the lock-tab and set the gauge to zero.
28. Mount a backlash gauge, Tool No. P.4008-1, to a suitable hole in the carrier flange so that the dial plunger rests against a tooth and at right angles to it. Zero the gauge.
29. Screw in the adjusting nuts using Tool No. P.4079 until a backlash of 0.025 to 0.050 mm. (0.001 to 0.002 in.) is indicated when rocking the crown wheel. Swing the backlash gauge out of position.
30. Screw in the adjusting nut on the differential side, whilst rotating the crown wheel, until a constant cap spread of 0.127 to 0.178 mm (0.005 to 0.007 in.) is indicated.

    NOTE: When refitting the part-used original bearings, a cap spread of 0.100 to 0.125 mm (0.004 to 0.010 in.) should be used.



Crown Wheel Backlash and Cap Spread Gauges



Correct Tooth Marking

31. Swing the backlash gauge back in position and zero the dial. Hold the pinion and rock the crown wheel. The backlash should now be 0.127 to 0.178 mm.(0.005 to 0.007 in.). If it is outside these limits, adjust the position of the crown wheel relative to the pinion by slackening the adjusting nut on one side and tightening the nut on the other side so that the cap spread remains unaltered. The final tightening must always be made to the nut on the crown wheel side.
32. Refit the lock-tabs (left-and right-hand offsets are available) and torque 1.66 to 2.07 kg.m. (12 to 15 lb. ft.). Torque the cap bolts to 6.2 to 6.9 kg.m. (45 to 50 lb. ft.).
33. Apply a thin coating of red, white or yellow ochre to the crown wheel teeth. Fit the axle shafts and hold them to apply a load, and rotate the pinion in both directions.
34. Place a new gasket on the axle housing and refit the differential assembly. Replace the locknuts.

OP 4235-B REAR AXLE SHAFT AND BEARING ASSEMBLY – BOTH – REMOVE AND INSTALL
(Includes 4235-A and A1)

OP 4235-C REAR AXLE SHAFT OR BEARING AND OIL SEAL – ONE – RENEW
(Includes 4235-A and A2)

OP 4235-D REAR AXLE SHAFT OR BEARING AND OIL SEAL – BOTH – RENEW
(Includes 4235-A, A1 and A2 x 2)

OP 4235-F DIFFERENTIAL ASSEMBLY – OVERHAUL
(Includes 4235-A, A1, A3 and A4)

OP 4602-A DRIVE SHAFT ASSEMBLY – REMOVE AND INSTALL

To Remove

1. Mark the drive shaft and pinion flanges for correct re-alignment on reassembly and then remove the four nuts and bolts.
2. Lower the rear of the drive shaft and withdraw it from the gearbox. A slight amount of oil may leak from the gearbox.

To Install

3. Slide the front yoke into the gearbox, engaging the mainshaft splines, taking care not to damage the oil seal or bearing in the extension housing.
4. Lift the rear of the drive shaft, align the marks and fit the four bolts and locknuts.
5. Check gearbox oil level.

OP 4602-A1 EXTRA: UNIVERSAL JOINT – ONE – OVERHAUL (DRIVE SHAFT REMOVED)

The universal joint spider, bearings, oil seals and retainers are serviced as a kit.

1. Extract each spider bearing snap ring and remove the bearing cups and rollers by gently tapping the yoke at each bearing.
2. Remove the spider and detach the oil seal and seal retainer from each spider journal.

3. To reassemble, fit new oil seals to the retainers and locate them on the shoulders of the spider journals with the oil seals outwards. Position the spider in the drive shaft yoke and assemble the needle rollers in each bearing cup. Pack the bearings with a multi-purpose lithium base grease, leaving an air space to allow for expansion of the grease when warm. Refit the bearings, tapping them squarely into place. Take care not to dislodge the needle rollers.

   NOTE: Some driveshafts incorporate a lubricating nipple. In this case the joint may be assembled dry and then lubricated with a multi purpose lithium base grease.

4. Similarly, refit the other half of the joint.
5. Refit the snap rings to each bearing.

OP 4602-A2 EXTRA: DRIVE PINION OIL SEAL – RENEW (DRIVE SHAFT REMOVED)

Tools Required

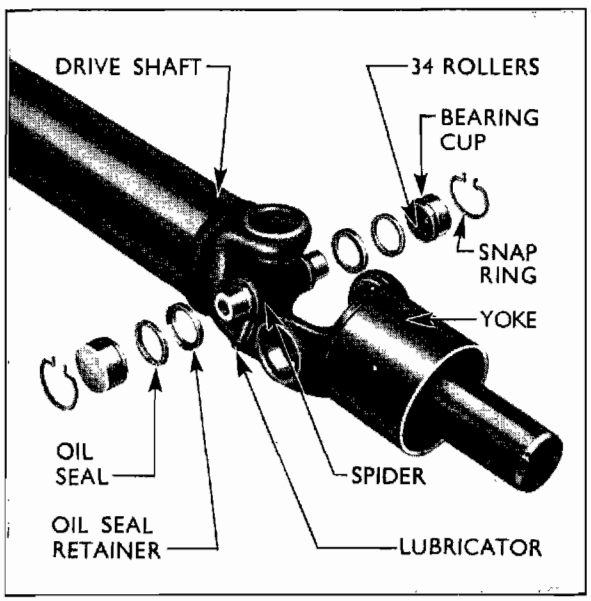
P.4028	Flange holding wrench
CP.4030	Drive pinion bearing pre-load gauge
P.4030-1	Drive pinion pre-load gauge adaptor

To Remove

1. Hold the pinion flange using Tool No. P.4028 and unscrew the pinion bearing nut.
2. Remove the pinion drive flange and oil seal.

To Install

3. Fit a new pinion drive flange oil seal, after applying sealer EM-4G-14 to the outside diameter of the seal.
4. Inspect the pinion drive flange for damage on oil seal journal, renew if necessary.



Universal Joint – Exploded View

Universal Joint Lubrication

5. Fit the drive flange and a new retaining nut. Tighten the nut until an end-float of 0.05 to 0.13 mm. (0.002 to 0.005 in.) is obtained.

6. Fit the pre-load gauge, Tool Nos. CP.4030 and P.4030-1, to drive the flange and measure the oil seal running torque.

7. Gradually and carefully tighten the drive flange nut to give 0.052 to 0.092 kg.m. (4.5 to 8 lb. in.) torque, plus the torque found in sub-operation 6.

   Frequent checks must be made with the pre-load gauge, since if the maximum pre-load is exceeded, this will necessitate the replacement of the collapsible spacer in the differential assembly.

OP 4602-B DRIVE SHAFT UNIVERSAL JOINT – ONE – OVERHAUL
(INCLUDES 4602-A and A1)

OP 4602-C DRIVE SHAFT UNIVERSAL JOINT – BOTH – OVERHAUL
(Includes 4602-A and A1 x 2)

OP 4676-A DRIVE PINION OIL SEAL – RENEW
(Includes remove and adjust differential assembly)

OP 4676-B DRIVE PINION OIL SEAL – RENEW (DIFFERENTIAL ASSEMBLY IN SITU)
(Comprises 4602-A and A2)

5/1

FRONT SUSPENSION

SECTION INDEX

GENERAL DESCRIPTION

QUICK REFERENCE DATA

SERVICE AND REPAIR OPERATIONS

OPERATION	3063-A	TRACK CONTROL ARM INNER BUSHES – ONE SIDE – RENEW
"	3073-A	TRACK CONTROL ARM BALL JOINT – ASSEMBLY
"	3078-A	TRACK CONTROL ARM ASSEMBLY – ONE – REMOVE AND INSTALL
"	5310-A	SUSPENSION COIL SPRING – REMOVE AND INSTALL
"	5425-A	FRONT SUSPENSION UPPER MOUNT ASSEMBLY – RENEW
"	5431-A	FRONT SUSPENSION ASSEMBLY – ONE SIDE – REMOVE AND INSTALL
"	5431-A3	Extra – front suspension unit – overhaul
"	5431-E	**FRONT SUSPENSION UNIT – OVERHAUL** (Includes 5431-A and A3)

GENERAL DESCRIPTION

The front suspension utilises vertical shock absorbers surrounded by large coil springs. Lateral movement of each front wheel is controlled by the track control arm and fore and aft movement is controlled by the stabiliser bar. Vertical movement of the wheel is limited by the suspension spring reaching the limit of its compression.

The suspension mounting points are all rubber insulated to minimise the transmission of road noise and vibration to the body and interior. A "compliance device" is incorporated in the stabiliser bar to track control arm mounting. Its function is to permit the wheel a small amount of fore and aft movement and thus reduce the shock loading on the steering linkage when the wheel hits a sudden irregularity in the road surface.

The toe-in and toe-out on turns (wheel-lock angles)are adjustable but the camber, castor and king-pin inclination angles are set in manufacture and are not adjustable.

If necessary the front shock absorbers may be topped up using shock absorber fluid, Part No. M-100502-E, on all vehicles having a filler plug on the front suspension leg. (see page 12). On later models, the front suspension/shock absorber units are sealed and therefore do not require periodic topping up.

QUICK REFERENCE DATA

PERIODIC SERVICE ATTENTION

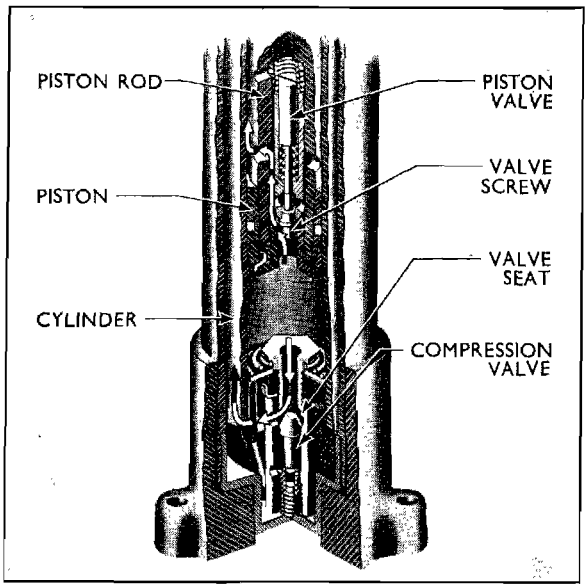
At the first 1,000 km. (500 miles) and at each 8,000 km. (5,000 miles) or six months (whichever is reached first):

(a) Check torque of front suspension crossmember retaining bolts.

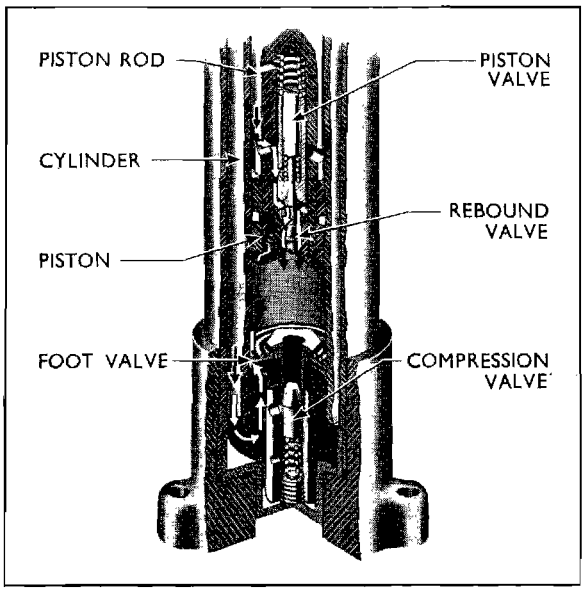
(b) Check boot type gaiters on steering and front suspension joints and renew if suspect.

(c) Check end-float of track control arm ball joints.

(d) Check fluid level in front suspension units (where applicable)



Suspension Unit Operation (Compression)



Suspension Unit Operation (Rebound)

DATA

Front Suspension Springs

Part Number	Identification	Model Application
105E-5310-A	Brown	Standard
105E-5310-B	Red	H.D. only
107E-5310		Van

TIGHTENING TORQUES

	kg.m.	lb. ft.
Suspension unit upper mounting bolts	2.07 – 2.49	15 – 18
Suspension unit thrust bearing unit	6.22 – 7.60	45 – 55
Track control arm ball stud nut	5.53 – 6.22	40 – 45
*Stabiliser bar attachment clamps	2.07 – 2.49	15 – 18
*Stabiliser bar to track control arm nut	3.46 – 4.15	25 – 30
*Track control arm inner bushing	4.15 – 4.84	30 – 35
Front suspension crossmember to body sidemember	3.46 – 4.15	25 – 30

*These to be tightened with the weight of the car resting on its wheels.

OP 3063-A TRACK CONTROL ARM INNER BUSHES – REPLACE – ONE SIDE ONLY

Tools Required

P.5010 Spring clips

To Remove

1. Fit spring clips, Tool No. P.5010, to the front suspension spring and secure the safety strap.
2. Jack up the front of the car and fit chassis stands.
3. Remove the self-locking nut and flat washer from the rear of the track control arm pivot bolt and push out the bolt.
4. Pull the inner end of the track control arm downwards and remove the two conical rubber bushes.

To Install

5. Assemble new bushes to the recesses in the track control arm.
6. Position the track control arm so that the pivot bolt can be fitted. Slide the pivot bolt into position from the front and fit the flat washer and self-locking nut from the rear. Do not tighten the nut at this stage.
7. Jack up, remove the chassis stands and lower the car to the ground, and tighten the nut to a torque of 4.15 to 4.84 kg.m. (30 to 35 lb. ft.).
8. Remove the spring clips.

OP 3073-A TRACK ROD ARM BALL JOINT – ADJUST – EARLY MODELS

Tools Required

P.3015 Track control arm outer ball joint spring compressor

1. Prise the blanking plug from the track control arm ball joint.
2. Fit the ball joint spring compressor, Tool No. P.3015, and turn the centre screw until the spring retaining plate is fully depressed.
3. Check the clearance between the retaining plate and circlip.
4. The clearance should be 0.076 to 0.254 mm. (0.003 to 0.010 in.). If this is incorrect, remove the circlip and fit a new retaining plate from the list below:-

Part No.	Thickness	
204E-3100-A	(3.226–3.325 mm.)	0.1270–0.1309 in.
204E-3100-B	(3.150–3.223 mm.)	0.1240–0.1269 in.
204E-3100-C	(2.048–3.147 mm.)	0.1200–0.1239 in.
204E-3100-D	(2.972–3.046 mm.)	0.1170–0.1199 in.
204E-3100-E	(2.870–2.969 mm.)	0.1130–0.1169 in.
204E-3100-F	(2.794–2.868 mm.)	0.1100–0.1129 in.
204E-3100-G	(2.692–2.792 mm.)	0.1060–0.1099 in.
204E-3100-H	(2.616–2.590 mm.)	0.1030–0.1059 in.
204E-3100-J	(2.515–2.614 mm.)	0.0990–0.1029 in.
204E-3100-K	(2.438–2.512 mm.)	0.0960–0.0989 in.
204E-3100-L	(2.337–2.436 mm.)	0.0920–0.0959 in.
204E-3100-M	(2.261–2.334 mm.)	0.0890–0.0919 in.
204E-3100-N	(2.159–2.258 mm.)	0.0850–0.0889 in.
204E-3100-P	(2.057–2.157 mm.)	0.0810–0.0849 in.

5. Refit the circlip remove the spring compressor and replace the blanking plug.

OP 3078-A TRACK CONTROL ARM ASSEMBLY – ONE – REMOVE AND INSTALL

Tools Required

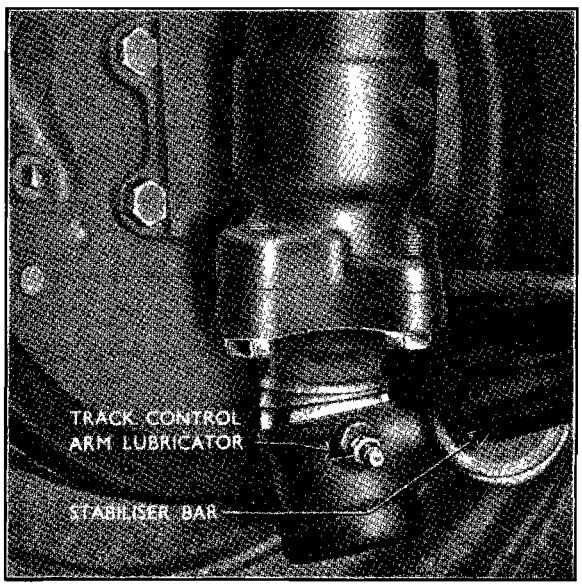
P.5010 Front coil spring clips
P.3073-9 Steering joint taper separator

To Remove

1. Fit spring clips, Tool No. P.5010 to the front suspension spring and secure the safety strap.
2. Jack up the front of the car, fit chassis stands and remove the road wheel.
3. Remove the split pin and unscrew the castellated nut securing the track control arm to the stabiliser bar. Pull off the large flat washer and the plastic bush.
4. Bend back the lock tabs and remove the three bolts securing the steering arm to the base of the suspension unit.
5. Remove the split pin and unscrew the nut securing the track control arm ball joint to the steering arm. Separate the joint using, Tool No. P.3073-9.
6. Remove the self-locking nut and flat washer from the rear of the track control arm pivot bolt and release the inner end of the track control arm.

To Install

7. Assemble new conical rubber bushes to the recesses in the track control arm. Position the track control arm so that it locates correctly over the stabiliser bar and then secure the inner end. Slide the pivot bolt into position from the front and fit the flat washer and self-locking nut from the rear. Tighten the nut to a torque of 4.15 to 4.84 kg.m. (30 to 35 lb. ft.) when the car is resting on the ground.
8. Assemble the track control arm ball stud to the steering arm, tighten to a torque of 5.53 to 6.22 kg.m. (40 to 45 lb. ft.) and fit a new split pin.
9. Fit the steering arm to the base of the suspension unit and secure with three bolts. Bend up the lock tabs to prevent the bolts loosening.



Track Control Arm Ball Joint

10. Assemble the large rubber bush and the flat washer to the end of the stabiliser bar. Ensure that the bush and washer are fitted the correct way round. Fit the castellated nut and, when the car is resting on the ground, tighten to a torque of 3.46 to 4.15 kg.m. (25 to 30 lb. ft.). Fit a new split pin.
11. Fit the road wheel, jack up the car and remove the chassis stands.
12. Remove the spring clips, tighten the road wheel nuts.
13. Fit the road wheels, jack up the car, remove the stands and lower the car to the ground.
14. Remove the spring clips and tighten the wheel nuts.

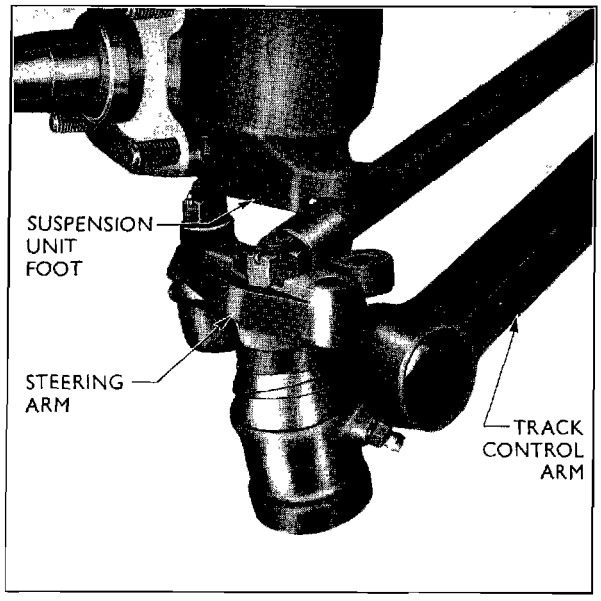
OP 5310-A SUSPENSION COIL SPRING – REMOVE AND INSTALL

Tools Required

P.5010	Spring clips
P.5025	Front suspension upper bearing locknut wrench
P.5026	Front suspension upper bearing locknut torque wrench adaptor
P.5027	Spring compressor

To Remove

1. Fit spring clips, Tool No. P.5010, over as many coils of the suspension spring as possible and secure the safety strap.
2. With the handbrake applied, jack up the front of the car and fit chassis stands.
3. Remove the road wheel.
4. Open the bonnet, fit a wing cover and remove the plastic cover over the top bearing.
5. Using the front suspension upper bearing locknut wrench, Tool No. P.5025, unscrew the upper bearing retaining nut and push the piston rod downwards.
6. From underneath the car push the piston rod into the suspension unit as far as it will go. Lift off the upper spring seat and manoeuvre the spring out of its location.
7. Using Tool No. P.5027, compress the spring and remove the spring clips.



Steering Arm Location on Unit Foot

To Install

8. Fit the new spring to the spring compressor and compress so that the spring clips can be fitted. These should be fitted over the same number of coils as on the old spring.
   NOTE: Check the colour coding of the replacement spring (Brown – Standard, Red – Heavy Duty). Also check that the other spring is the same. Never mix springs, this will give unequal ride heights each side of the car and upset the handling characteristics.
9. Manoeuvre the spring into position and locate it on the lower spring seat. Force the piston rod upwards and fit the upper spring seat so that the "D" shaped hole locates on the flat on the piston rod.
10. Push the piston rod further upwards and pass it through the top mount and bearing assembly.
11. Fit the retaining nut using Tool No. P.5025 and tighten to a torque of 6.22 to 7.6 kg.m. (45 to 55 lb. ft.) using Tool No. P.5026.
12. Refit the plastic dust cover, remove the wing cover and close the bonnet.
13. Replace the road wheel and lower the car to the ground.
14. Remove the spring clips.

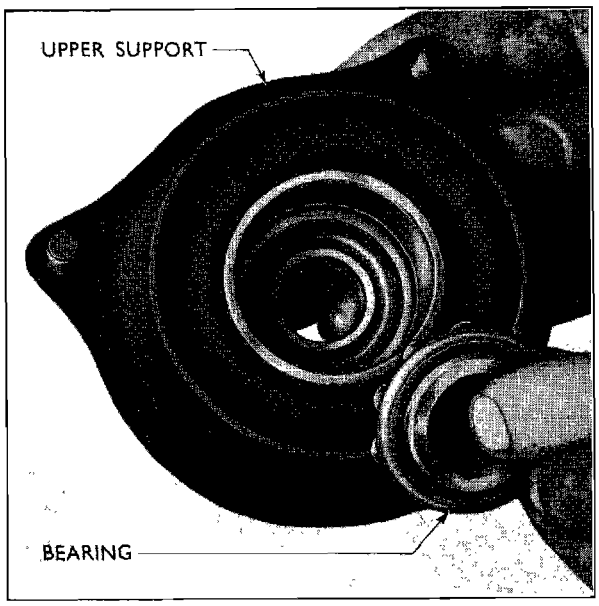
OP 5425-A FRONT SUSPENSION UPPER MOUNT ASSEMBLY – RENEW

Tools Required

P.5010	Spring clips
P.5025	Front suspension upper bearing locknut wrench
P.5026	Front suspension upper bearing locknut torque wrench adaptor

To Remove

1. Fit spring clips, Tool No. P. 5010 over as many coils of the spring as possible and secure the safety strap
2. With the handbrake applied, jack up the front of the car and fit chassis stands.
3. Remove the road wheel.



Suspension Unit Upper Mounting

4. Open the bonnet, fit a wing cover and remove the plastic cover over the top bearing.
5. Using Tool No. P.5025, unscrew the upper bearing retaining nut and push the piston rod downwards.
6. Remove the three bolts securing the upper mounting and bearing assembly to the reinforced side apron panel. Detach the mounting and bearing assembly.

To Install

7. Fit the new mounting and bearing assembly over the piston rod. Push the piston rod upwards so that it passes through the bearing.
8. Loosely fit the retaining nut in position.
9. Rotate the upper bearing assembly as necessary so that the three mounting holes align with the holes in the body reinforcement. Fit the three bolts and tighten them to a torque of 2.1 to 2.5 kg.m. (15 to 18 lb. ft.).
10. Tighten the retaining nut, using Tool No. P.5026, to a torque of 6.22 to 7.6 kg.m. (45 to 55 lb. ft.) and fit the plastic dust cover.
11. Replace the road wheel.
12. Jack up, remove the chassis stands and lower the car to the ground.
13. Remove the spring clips.
14. Remove the wing cover and close the bonnet.

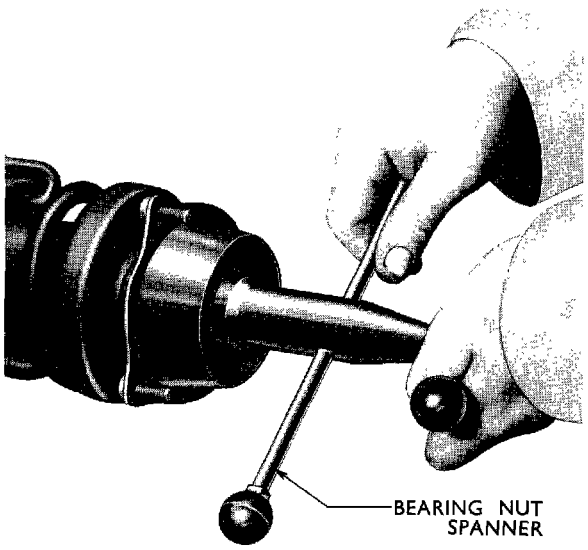
OP 5431-A FRONT SUSPENSION ASSEMBLY – ONE SIDE – REMOVE AND INSTALL

Tools Required

P.5010	Spring clips
P.5025	Front suspension upper bearing locknut wrench
P.5026	Front suspension upper bearing locknut torque wrench adaptor
P.2012	Brake line plugs

To Remove

1. Fit spring clips, Tool No. P.5010, to the front suspension coil spring and secure the safety strap.

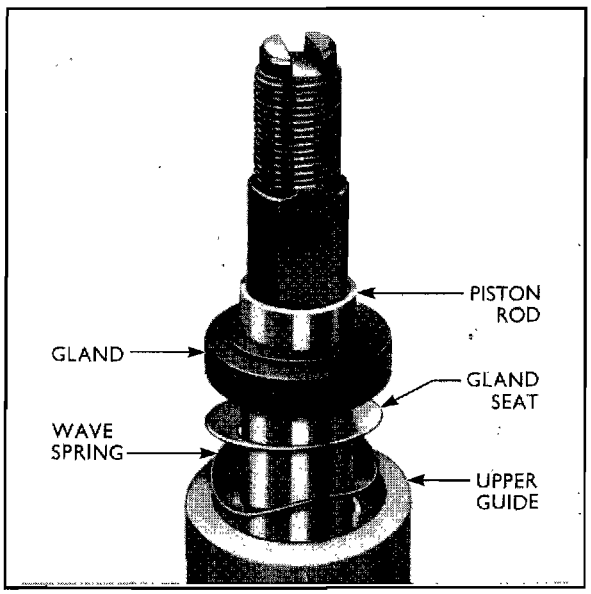


Tightening a Thrust Bearing Locknut

2. Jack up the front of the car, fit stands under the jacking points and remove the road wheel, hub and brake drum as an assembly.
3. Unscrew the four self-locking nuts and withdraw the brake plate. Support the plate so that the rubber hose is not distorted.
4. Lift the bonnet, fit a wing cover and remove the upper bearing dust cover. Unscrew the three bolts securing the upper mounting to the body reinforcement panel.
5. Bend back the lock tabs and unscrew the three bolts attaching the lower end of the suspension unit to the steering and track control arms.
6. Manoeuvre the suspension unit downwards out of the car.
7. Using Tool No. P.5025, unscrew the upper bearing retaining nut and lift off the upper bearing, spring seat and suspension spring.

To Install

8. Assemble the suspension spring, spring seat and upper bearing assembly to the top of the piston rod and loosely fit the retaining nut.
9. Place the suspension unit in position and secure the steering and track control arms to the lower end of the suspension unit. Tighten the three bolts to a torque of 4.15 to 4.84 kg.m. (30 to 35 lb. ft.) and bend up the tabs on the locking plate.
10. Position a gasket on the upper mounting assembly and secure the top of the unit to the reinforced mudguard flange. Tighten the three nuts to a torque of 2.1 to 2.5 kg.m. (15 to 18 lb. ft.).
11. Using the torque wrench adaptor, Tool No. P.5026, tighten the upper bearing locknut to a torque of 6.22 to 7.60 kg.m. (45 to 55 lb. ft.). Replace the upper bearing dust cover.
12. Position the brake plate on the studs and tighten the nuts to a torque of 2.1 to 2.5 kg.m. (15 to 18 lb. ft.).
13. Replace the wheel and brake drum, and adjust the wheel bearing and brakes.
14. Jack up the car, remove the stands, lower the car to the ground and remove the spring clips.



Upper Gland Seal Assembly

15. Remove the wing cover and close the bonnet.
16. Check the fluid level in each suspension unit.
Do not add the fluid under pressure.

(NOTE:— When periodically topping up suspension units, the car should be standing unladen on level ground).

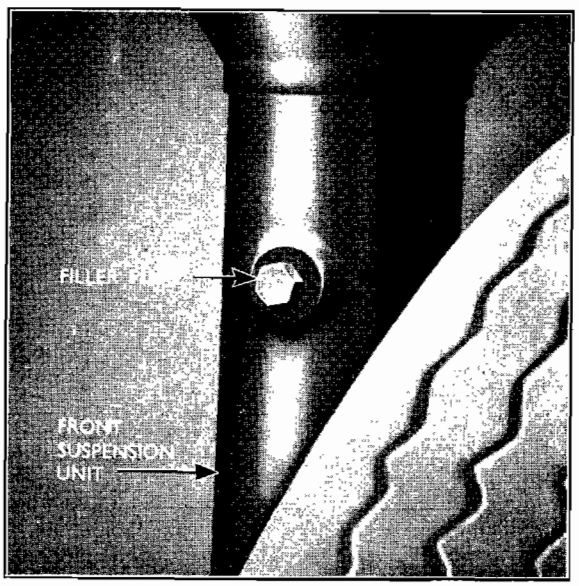
OP 5431-A3 EXTRA: FRONT SUSPENSION UNIT — OVERHAUL

Tools Required

P.5041 Front suspension unit bump stop platform wrench
P.5042 Front suspension unit gland and bush replacer guide

To Dismantle

1. Using Tool No. P.5041, unscrew the bump stop platform and lift it off the suspension unit. It should be noted that the bump stop platform incorporates a scraper seal which cleans the piston rod during operation. This seal is not serviced separately.
2. Remove the "O" ring from above the upper guide and gland assembly.
3. Ensure that the top edge of the machined area of the piston rod is free from burrs, etc., by using a suitable stone. This is most essential. If this is not done the action of removing or replacing the gland and bush assembly will inevitably damage the coated bearing surface of the bush.
4. Lift the piston rod upwards until the gland and bush assembly is clear of the outer casing. Slide the gland assembly off the rod.
5. Empty the fluid into a suitable waste container.
6. Pull the piston rod complete with piston, cylinder, rebound stop tube and compression valve out of the outer casing.
7. Remove the piston rod from the cylinder by pushing the compression valve out of the base and then lifting the rod upwards and withdrawing it from the cylinder.



Front Suspension Filler Plug

8. Remove the rebound stop tube and, if necessary, remove the piston ring from the piston.
9. Wash all components in a suitable bath and then examine them for wear or damage.

   NOTE: Do not remove the piston from the piston rod, these components are serviced as an assembly, they are not available separately. This is because the piston incorporates a valve and the assembly procedure is critical if the valve is to function correctly.

To Reassemble

10. If the piston ring has been removed, fit a new one to the piston. Fit the rebound stop tube to the piston rod above the piston.
11. Insert the piston rod into the cylinder and push the compression valve into the base of the cylinder.
12. Carefully pass the cylinder and piston rod assembly into the outer casing. Fill the unit with the correct quantity of fluid, 340 to 360 c.c. Ensure that the correct fluid is used, M-100502-E.
13. Fit the gland and bush assembly guide tool, Tool No. P.5042, to the top of the piston rod and fit the assembly to the rod. Push it down until it contacts the end of the cylinder and the complete internal assembly is below the top of the outer casing.
14. Place the rubber "O" ring on the top of the gland and bush assembly and locate it correctly round the bore of the outer casing.
15. Screw the bump stop platform into the top of the outer casing. Using Tool No. P.5401, tighten it securely.

OP 5431-E FRONT SUSPENSION UNIT – OVERHAUL
(Includes 5431-A and A6)

5/2

REAR SUSPENSION

SECTION INDEX

QUICK REFERENCE DATA

SERVICE AND REPAIR OPERATIONS

OPERATION	5500-A	REAR SHOCK ABSORBER – ONE – REMOVE AND INSTALL
"	5500-A1	Extra: Remaining rear shock absorber – Remove and install (Rear of car on stands)
"	5500-B	**REAR SHOCK ABSORBER – BOTH – REMOVE AND INSTALL** (Includes OPS 5500-A and A1)
"	5560-A	REAR LEAF SPRING ASSEMBLY – ONE – REMOVE AND INSTALL
"	5560-A1	Extra: Remaining rear leaf spring assembly – Remove and install (Rear of car on stands)
"	5560-A2	Rear spring leaf – one – Remove and install (Rear spring assembly removed)
"	5560-B	**REAR LEAF SPRING ASSEMBLY – BOTH – REMOVE AND INSTALL** (Includes OPS 5560-A and A1)
"	5560-M	REAR SPRING SHACKLE PLATES AND/OR BUSHES – ONE SPRING – REMOVE AND INSTALL
"	5560-M1	Extra: Remaining spring shackle plates and/or bushes – Remove and install (Rear of car on stands)
"	5560-N	**REAR SPRING SHACKLE PLATES AND/OR BUSHES – BOTH SPRINGS – REMOVE AND INSTALL** (Includes OPS 5560-M and M1)
"	5560-P	REAR SPRING FRONT BUSH – ONE SIDE – RENEW
"	5560-P1	Extra: Remaining rear spring front bush – Renew (Rear of car on stands)
"	5560-R	**REAR SPRING FRONT BUSH – BOTH SIDES – RENEW** (Includes OPS 5560-P and P1)
"	5560-S	**REAR SPRING FRONT AND REAR BUSHES – ALL – RENEW** (Includes OPS 5560-M, M1, P and P1)
"	5707-A	REAR SPRING 'U' BOLT – ONE SPRING – REMOVE AND INSTALL
"	5707-A1	Extra: Remaining rear spring 'U' bolt – Remove and install (Rear of car on stands)

OPERATION 5707-B **REAR SPRING 'U' BOLT – BOTH SPRINGS – REMOVE AND INSTALL**
(Includes OPS 5707-A and A1)

GENERAL DESCRIPTION

The rear suspension is of the semi-elliptic leaf spring type. The rear axle is located asymmetrically on the springs, i.e. it is closer to the forward mount than it is to the rear one. This assists in reducing axle tramp and spring wind-up during acceleration or when driving over rough surfaces.

Vertical, lever type, double action shock absorbers are bolted on the chassis sidemembers. The shock absorber arms are connected to the rear axle by rubber bushed links.

The leaf springs are mounted on rubber bushes at each end to minimise the transmission of noise and vibration to the car body and interior.

QUICK REFERENCE DATA

PERIODIC SERVICE ATTENTION

At the first 1,000 km. (500 miles)

Check torque of rear spring "U" bolts.
Check and top up rear shock absorbers

At each 8,000 km. (5,000 miles)

Check torque of rear spring "U" bolts
Check and top up rear shock absorbers
Check condition of rear spring inserts

Tightening Torques, kg.m (lb. ft.)

*Rear spring "U" bolts...	(2.8 to 3.4)	20 to 25
*Rear spring front hanger	(3.1 to 3.7)	22 to 27
*Rear spring rear shackle nuts	(1.7 to 2.0)	12 to 15
Spring centre bolt...	(2.1 to 2.4)	15 to 18

*These items to be tightened with the component in the kerb weight position, i.e. the car must be resting on its wheels.

OP 5500-A REAR SHOCK ABSORBER – ONE – REMOVE AND INSTALL

To Remove

1. Chock the front wheels, jack up the rear of the car and fit chassis stands.
2. Unscrew the two self-locking nuts holding the shock absorber to the body sidemember.
3. Unscrew the nut securing the link arm to the axle casing and remove the shock absorber.
4. Remove the nut and spring washer securing the link to the shock absorber arm.

To Install

5. Replace the link on the shock absorber arm and secure with the nut and spring washer.
6. Replace the other end of the link in the axle casing bracket and secure with the nut and spring washer. Replace the mounting bolts and flat washer and securely tighten the nuts.
7. Jack up the car, remove stands and lower the car to the ground.
8. Tighten the shock absorber to body nuts. **These bolts MUST be tightened with the weight of the car on its wheels.**

OP 5500-A1 EXTRA: REMAINING REAR SHOCK ABSORBER – REMOVE AND INSTALL (Rear of car on stands)

Repeat sub-operations 2 to 7 above.

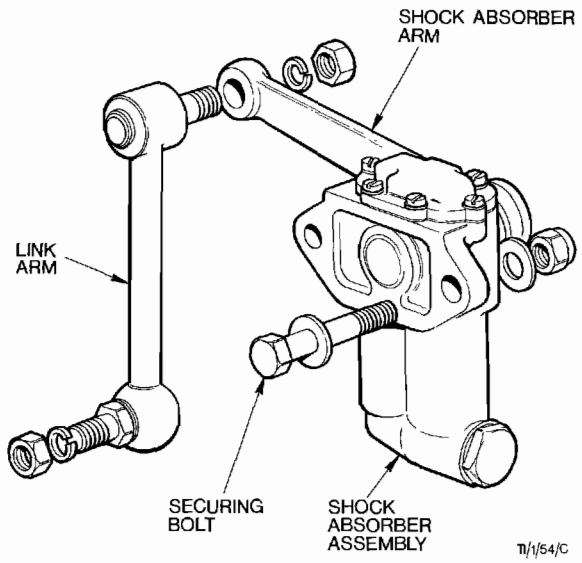
OP 5500-B REAR SHOCK ABSORBER – BOTH – REMOVE AND INSTALL (Includes Ops. 5500-A and A1)

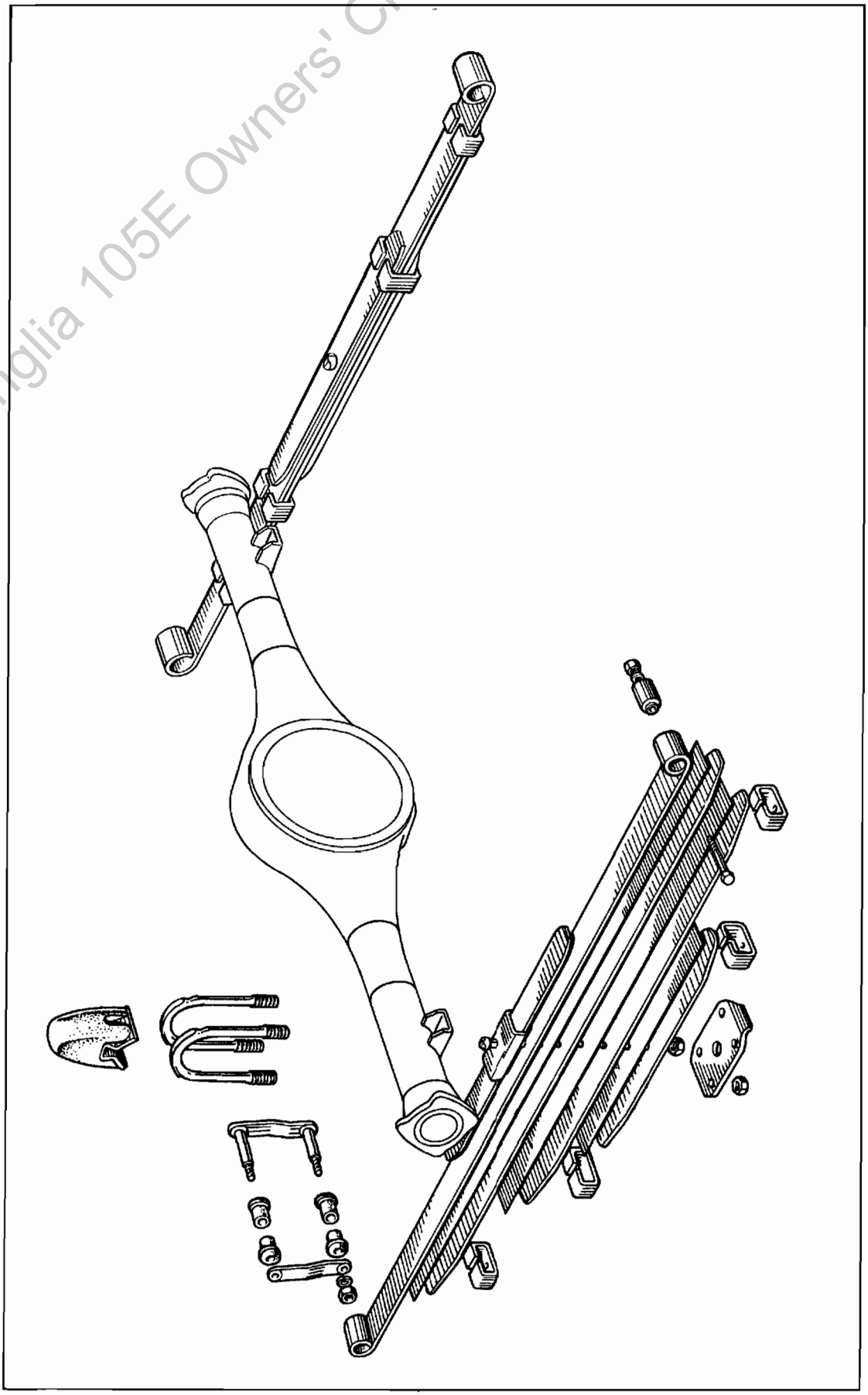
OP 5560-A REAR LEAF SPRING ASSEMBLY – ONE – REMOVE AND INSTALL

Tools Required

P.5029	Spring shackle bush remover and replacer
P.5000-3	Adaptors

Shock Absorber – Exploded View





Rear Suspension — Exploded View

To Remove

1. Chock the front wheels, jack up the rear of the car and fit chassis stands under the body jacking points.
2. Lower the trolley jack until it just supports the axle.
3. Remove the rear shackle nuts and detach the combined shackle bolt and plate assemblies. Remove the four rubber bushes.
4. Unscrew the nut from the front mounting bracket and withdraw the through bolt.
5. Remove the "U" bolts, bump stops, and the attachment plate.
6. Remove the spring assembly.
7. Using Tool No. P.5029 and adaptors, Tool No. 5000-3, pull the bush out of the spring front mounting bracket.

To Install

8. Replace the spring front mounting bush using Tool No. P.5029 and adaptors 5000-3 to ensure that the bush is fitted squarely in its aperture.
9. Locate the front of the spring in its body mounting bracket. Fit the through bolt and loosely assemble the nut. Do not tighten it at this stage.
10. Fit the spring to the axle using the "U" bolts, the plate and the lockwashers and nuts, and replace the bump stops. Do not tighten the nuts.
11. Fit new rubber bushes to the rear spring "eye" and the apertures in the body for the rear shackle.
12. Locate the spring in position and assemble the rear shackle bolt and plate assemblies. Fit the nuts, but again do not tighten.
13. Jack up the rear of the car and remove the chassis stands.
14. Lower the car so that the rear wheels are on the ground or on blocks.
15. Tighten the spring front and rear attachment points and the "U" bolts to the following torques.

"U" bolts	2.8 to 3.4 kg.m. (20 to 25 lb. ft.)
*Spring front hanger	3.1 to 3.7 kg.m. (22 to 27 lb. ft.)
*Spring rear shackles	1.7 to 2.0 kg.m. (12 to 15 lb. ft.)

*NOTE – These nuts must be tightened with the car on its wheels.

OP 5560-A1 EXTRA: REMAINING REAR LEAF SPRING ASSEMBLY – REMOVE AND INSTALL (Rear of car on stands)

Repeat sub-operations 3 to 12 above.

OP 5560-A2 REAR SPRING LEAF – ONE – REMOVE AND INSTALL (Rear spring assembly removed)

To Dismantle

1. Remove the spring centre bolt and nut.
2. Drill out the rivets securing the spring clips and slide the clips along to the ends of the spring.
3. Remove the appropriate leaf.

To Reassemble

4. Check that the zinc pads are correctly located between the spring leaves and rebuild the spring.
5. Fit the centre bolt and nut, torque to 2.1 to 2.4 kg.m. (15 to 18 lb. ft.).
6. Reposition the spring clips and rubbers and rivet the clips to the spring.

OP 5560-B REAR LEAF SPRING ASSEMBLY – BOTH – REMOVE AND INSTALL
(Includes Ops. 5560-A and A1)

OP 5560-M REAR SPRING SHACKLE PLATES AND/OR BUSHES – ONE SPRING – REMOVE AND INSTALL

P.5029	Spring shackle bush remover and replacer
5000-3	Adaptors

To Remove

1. Chock the front wheels, jack up the rear of the car and fit chassis stands under the body jacking points.
2. Lower the trolley jack until it just supports the axle.
3. Remove the rear shackle nuts and detach the combined shackle bolt and plate assemblies. Remove the four rubber bushes using Tool No. P.5029 and adaptors Tool No. 5000-3.

To Install

4. Fit new rubber bushes to the rear spring "eye" and the apertures in the body for the rear shackle, using Tool Nos. P.5029 and 5000-3.
5. Locate the rear end of the spring in position and assemble the rear shackle bolt and plate. Fit the nuts but do not tighten at this stage.
6. Jack up the rear of the car and remove the chassis stands.
7. Jack up, remove the stands and lower the car to the ground. Remove the chock from the front wheels.
8. Tighten the spring rear attachment nuts to 1.7 to 2.0 kg.m. (12 to 15 lb. ft.).

   NOTE: These nuts must be tightened with car on its wheels.

OP 5560-M1 EXTRA: REMAINING SPRING SHACKLE PLATES AND/OR BUSHES – REMOVE AND INSTALL (Rear of car on stands)

Repeat sub-operations 3 to 5 above.

OP 5560-N REAR SPRING SHACKLE PLATES AND/OR BUSHES – BOTH SPRINGS – REMOVE AND INSTALL
(Includes Ops. 5560-M and M1)

OP 5560-P REAR SPRING FRONT BUSH – ONE SIDE – RENEW

Tools Required

P.5029	Spring front eye bush remover and replacer
5000-3	Adpator

To Remove

1. Chock the front wheels, jack up the rear of the car and fit chassis stands under the body jacking points.

2. Unscrew the nut from the front mounting bracket and withdraw the through bolt.
3. Pull the front end of the spring downwards and, using Tool No. CP.5029A and CP.5029-1A, remove the bush from the front "eye".

To Install

4. Using Tool No. CP. 5029-A and CP.5029-1A, fit a new bush into the front spring "eye".
5. Position the front of the spring in its body mounting bracket. Fit the through bolt and assemble the nut, but do not tighten at this stage.
6. Jack up, remove the stands and lower the car to the ground. Remove the chocks from the front wheels.
7. Tighten the spring front eye securing nut to a torque of 3.46 to 4.15 kg.m. (25 to 30 lb. ft.). This must be tightened with the car on the ground.

OP 5560-P1 EXTRA: REMAINING REAR SPRING FRONT BUSH – RENEW (Rear of car on stands)
Repeat sub-operations 2 to 5 above.

OP 5560-R REAR SPRING FRONT BUSH – BOTH SIDES – RENEW (Includes: Ops 5560-P and P1)

OP 5560-S REAR SPRING FRONT AND REAR BUSHES – ALL – RENEW (Includes: Ops. 5560-M, M1, P and P1)

OP 5707-A REAR SPRING "U" BOLT – ONE SPRING – REMOVE AND INSTALL

To Remove

1. Chock the front wheels, jack up the rear of the car and fit chassis stands under the body jacking points.
2. Unscrew the "U" bolt nuts and detach the "U" bolts and bump stops.

To Install

3. Locate the "U" bolts and bump stops in position and loosely fit the securing nuts.
4. Jack up, remove the stands and lower the car to the ground. Remove the chocks from the front wheels.
5. Tighten the "U" bolt nuts to a torque of 2.8 to 3.4 kg.m (20 to 25 lb. ft.). These nuts must be tightened with the car on the ground.

OP 5707-A1 EXTRA: REMAINING REAR SPRING 'U' BOLT – REMOVE AND INSTALL (Rear of car on stands)
Repeat sub-operations 2 to 5 above.

OP 5707-B REAR SPRING 'U' BOLT – BOTH SPRINGS – REMOVE AND INSTALL (Includes Ops. 5707-A and A1)

6

ENGINE

GENERAL DESCRIPTION

QUICK REFERENCE DATA

SERVICE AND REPAIR OPERATIONS

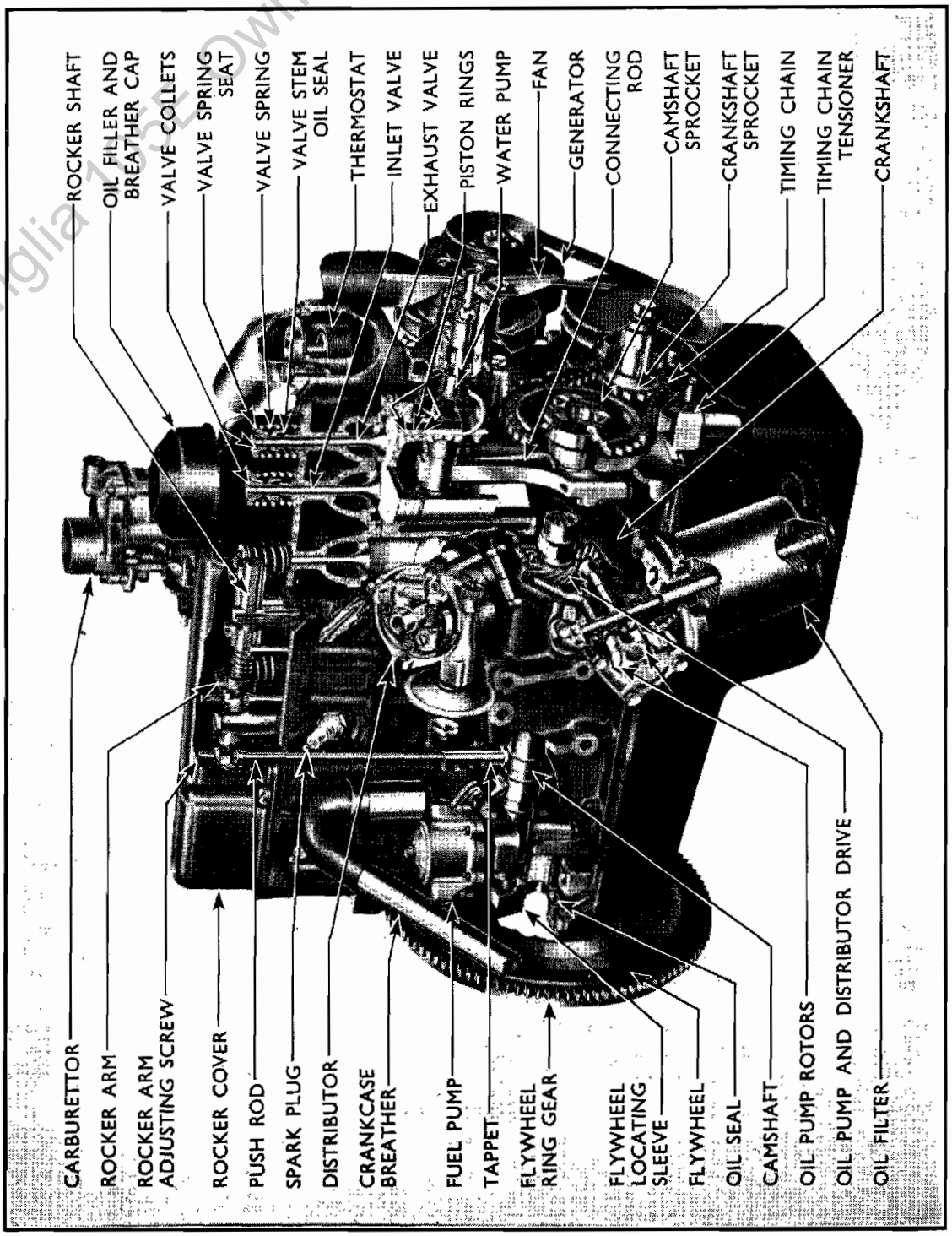
OPERATION	6000-A	ENGINE – TUNE
"	6000-B	ENGINE – CHECK COMPRESSION
"	6000-C	ENGINE ASSEMBLY – REMOVE AND INSTALL
"	6000-C1	Extra: ancillaries - remove and install
"	6000-C2	Extra: clutch disc and/or pressure plate – remove and install
"	6000-C3	Extra: clutch pilot spigot bearing – remove and install
"	6000-C4	Extra: flywheel or drive plate – remove and install
"	6000-C5	Extra: sump and/or gaskets – remove and refit
"	6000-C7	Extra: engine rear oil seal – remove and install
"	6000-C8	Extra: front cover and/or gasket – remove and install
"	6000-C9	Extra: front cover oil seal – remove and install
"	6000-C10	Extra: timing chain – remove and install
"	6000-C11	Extra: crankshaft sprocket – remove and install
"	6000-C12	Extra: connecting rod bearings – remove and install
"	6000-C13	Extra: main bearing clearances – check
"	6000-C14	Extra: main bearing liners and thrust washers – remove and install
"	6000-C15	Extra: all main bearing liner and thrust washers – check clearances and renew
"	6000-C16	Extra: camshaft – remove and install
"	6000-C17	Extra: camshaft bearings – renew
"	6000-C18	Extra: crankshaft – remove and install
"	6000-C19	Extra: cylinder head and pistons – decarbonise
"	6000-C20	Extra: valves – all – reface, reseat and grind-in
"	6000-C21	Extra: cylinder assembly – remove and install
"	6000-C22	Extra: cylinder block – remove and install
"	6000-C23	Extra: cylinder block – rebore
"	6010-A	**CYLINDER ASSEMBLY – REPLACE** (Includes 6000-C, C1 and C21)
"	6010-B	**CYLINDER BLOCK – REPLACE** (Includes 6000-C, C1, C21 and C22)
"	6010-C	**CYLINDER BLOCK – REBORE** (Includes 6000-C1, C21, C22 and C23)
"	6015-A	ENGINE ASSEMBLY – FIT NEW, SERVICE, OR RECONDITIONED UNIT

ATION	6015-A1	Extra: engine compartment – clean
	6015-A2	Extra: clutch disc and/or pressure plate – remove and install
	6015-A3	Extra: clutch release bearing – renew
	6015-A4	Extra: clutch fork – remove and install
	6015-A5	Extra: main drive gear bearing retainer gasket and/or main drive gear oil seal – renew
	6015-B	ENGINE AND GEARBOX ASSEMBLY – REMOVE AND INSTALL
	6015-B1	Extra: engine and gearbox – separate and reconnect
	6019-A	CYLINDER FRONT COVER GASKET – RENEW
	6019-A1	Extra: front cover and/or oil seal – renew
	6019-A2	Extra: timing chain and/or camshaft sprocket – remove and install
	6019-B	**FRONT COVER AND/OR OIL SEAL – REMOVE AND INSTALL** (Includes 6019-A and A1)
	6019-C	**TIMING CHAIN – REMOVE AND INSTALL** (Includes 6019-A, A1 and A2)
	6038-A	ENGINE FRONT MOUNTING – ONE – RENEW
	6038-A1	Extra: remaining front engine mounting – renew
	6038-B	**ENGINE FRONT MOUNTINGS – BOTH – RENEW** (Includes 6038-A and A1)
	6038-C	ENGINE FRONT MOUNTINGS – BOTH – CHECK TORQUE OF BOLTS
	6051-A	CYLINDER HEAD GASKET – RENEW
	6051-A1	Extra: cylinder head – decarbonise
	6051-A2	Extra: pistons – decarbonise
	6051-A3	Extra: one valve – remove and install
	6051-A4	Extra: each additional valve – remove and install
	6051-A5	Extra: each valve seat – re-cut
	6051-A6	Extra: each valve – grind-in
	6051-A7	Extra: each valve guide – ream
	6051-A8	Extra: each valve guide – renew
	6051-A9	Extra: cylinder head – renew
	6051-B	**CYLINDER HEAD AND PISTONS – DECARBONISE** (Includes 6051-A, A1 and A2)
	6051-C	**VALVE – ONE – REMOVE AND INSTALL** (Includes 6051-A, A1 and A3)
	6051-D	**VALVE – ONE – REMOVE AND INSTALL** (Includes 6051-A, A1, A3, A5 and A6)
	6051-E	**VALVES – ALL – REMOVE AND INSTALL** (Includes 6051-A, A1, A3, A4, A5 and A6)
	6051-F	**DECARBONISE CYLINDER HEAD AND PISTONS AND RESEAT AND GRIND-IN ALL VALVES** (Includes 6051-A, A1, A2, A3, A4, A5 and A6)

OPERATION	6051-G	**VALVE GUIDE – ONE – REAM** (Includes 6051-A, A1, A3, A5 and A7)
"	6051-H	**VALVE GUIDES – ALL – REAM** (Includes 6051-A, A1, A3, A4, A5 and A7)
"	6051-I	**VALVE GUIDE – ONE – RENEW** (Includes 6051-A, A1, A3, A5 and A8)
"	6051-J	**VALVE GUIDES – ALL – RENEW** (Includes 6051-A, A1, A3, A4, A5 and A8)
"	6051-K	**CYLINDER HEAD – REMOVE AND INSTALL** (Includes 6051-A, A2, A3, A4 and A9)
"	6051-M	CYLINDER HEAD BOLTS – TORQUE
"	6051-P	CYLINDER HEAD CORE PLUG – RENEW
"	6068-A	ENGINE REAR MOUNTING – RENEW
"	6250-B	CAMSHAFT AND/OR TAPPETS – REMOVE AND INSTALL
"	6250-B1	Extra: camshaft bearings - replace and check oilways
"	6250-C	**CAMSHAFT BEARINGS – RENEW** (Includes 6250-B and B1)
"	6250-D	CAMSHAFT LOBES – CHECK LIFT
"	6303-A	CRANKSHAFT – REMOVE AND INSTALL
"	6312-A	CRANKSHAFT PULLEY – REMOVE AND INSTALL
"	6374-A	DRIVE PLATE – REMOVE AND INSTALL
"	6375-A	FLYWHEEL ASSEMBLY – REMOVE AND INSTALL
"	6375-A1	Extra: flywheel ring gear – renew
"	6375-B	**FLYWHEEL RING GEAR – RENEW** (Includes 6375-A and A1)
"	6450-A	ROCKER COVER AND/OR GASKET – REMOVE AND INSTALL
"	6450-A1	Extra: all valve clearances – adjust
"	6450-A2	Extra: rocker shaft assembly and/or push rods – remove and install
"	6450-A3	Extra: any or all rocker shaft parts – renew
"	6450-B	**VALVE CLEARANCES – ADJUST** (Includes 6450-A and A1)
"	6450-C	**ROCKER SHAFT AND/OR PUSH RODS – REMOVE AND INSTALL** (Includes 6450-A, A1 and A2)
"	6450-D	**ROCKER SHAFT – OVERHAUL** (Includes 6450-A, A1, A2 and A3)
"	6513-A	VALVE SPRING AND/OR STEM SEAL – ONE – RENEW
"	6513-A1	Extra: each additional valve spring and/or stem seal – renew
"	6600-A	OIL PUMP ASSEMBLY – REMOVE AND INSTALL
"	6600-A1	Extra: oil pump – overhaul

OPERATION	6600-B	**OIL PUMP – OVERHAUL** (Includes 6600-A and A1)
"	6675-A	SUMP AND/OR GASKETS – REMOVE AND INSTALL
"	6675-A1	Extra: timing chain tensioner – remove and install
"	6675-A3	Extra: all main bearings clearances – check
"	6675-A4	Extra: all main bearing liners and/or thrust washers – remove and install
"	6675-A5	Extra: all main bearing liners and thrust washers – check clearances and renew
"	6675-A6	Extra: all connecting rod liners – remove and install
"	6675-A7	Extra: one piston, connecting rod and ring assembly – remove and install
"	6675-A8	Extra: each additional piston, connecting rod and rings – assembly remove and install
"	6675-A9	Extra: each set of piston rings – renew
"	6675-A10	Extra: each connecting rod and/or piston pin – renew
"	6675-A11	Extra: each piston, pin and rings assembly – renew
"	6675-B	**TIMING CHAIN TENSIONER – REMOVE AND INSTALL** (Includes 6675-A and A1)
"	6675-C	**MAIN BEARING CLEARANCES – ALL – CHECK** (Includes 6675-A, A1 and A3)
"	6675-D	**MAIN BEARING LINERS – ALL – RENEW** (Includes 6675-A, A1 and A4)
"	6675-E	**MAIN BEARING LINERS – ALL – CHECK CLEARANCES AND RENEW** (Includes 6675-A, A1 and A5)
"	6675-F	**CONNECTING ROD LINERS – ALL – RENEW** (Includes 6675-A and A6)
"	6675-G	**PISTON RINGS – ONE PISTON – REMOVE AND INSTALL** (Includes 6675-A, A7 and A9)
"	6675-H	**PISTON RINGS – ALL – REMOVE AND INSTALL** (Includes 6675-A, A7, A8 and A9)
"	6675-I	**PISTON – ONE – REMOVE AND INSTALL** (Includes 6675-A, A7 and A10)
"	6675-J	**PISTONS – ALL – REMOVE AND INSTALL** (Includes 6675-A, A7, A8 and A10)
"	6675-K	**CONNECTING ROD AND/OR PISTON PIN – ONE– REMOVE AND INSTALL** (Includes 6675-A, A7 and A11)
"	6675-L	**CONNECTING RODS AND PISTON PINS – ALL – REMOVE AND INSTALL** (Includes 6675-A, A7, A8 and A11)
"	6675-M	SUMP BOLTS – TORQUE

OPERATION	6731-A	OIL FILTER ELEMENT – RENEW
"	6731-B	OIL FILTER ELEMENT AND ENGINE OIL – RENEW
"	6900-A	OIL PRESSURE GAUGE OR WARNING LIGHT SENDER UNIT – REMOVE AND INSTALL
"	6900-A1	Extra: oil pressure – check
"	6900-B	TEMPERATURE GAUGE SENDER UNIT – REMOVE AND INSTALL



Sectioned View of Engine

GENERAL DESCRIPTION

The engine is a four cylinder, "in line" overhead valve unit operating on the four stroke cycle. Two engines are available; a 997 cc. and a 1200 cc. unit. These engines are also available in high and low compression versions. The increased capacity is obtained by lengthening the stroke, the bore remaining constant for both engines.

The cylinder bores are machined directly in the cast iron cylinder block, which is cast integral with the upper half of the crankcase, and are provided with full length water jacketing.

The cast iron crankshaft runs in three main bearings which have steel-backed white metal liners. End-float and thrust are controlled by half thrust washers located in the cylinder block on each side of the centre main bearing.

A rubber seal pressed in the front cover and two semi-circular asbestos oil seals, one half located in the rear seal carrier and the other half in the sump prevents oil leaks from the front and rear of the crankshaft. The front seal runs on the pulley hub whilst the rear seal runs on the crankshaft flange itself.

The connecting rods are 'H' section forgings having separate big end caps retained by two bolts and located by hollow dowel pins. Big end bearing liners are steel-backed copper/lead or lead/bronze. The small ends have steel-backed bronze bushes.

Solid skirt aluminium alloy pistons are fitted to both engines with those for the early 997 cc. engine being of the autothermic type. All pistons have two compression and one oil control ring situated above the piston pin bore. The piston pins are fully floating and are retained in position by circlips installed in grooves at each end of the piston pin bore.

The camshaft and sprocket are driven at half engine speed by a single row timing chain from a sprocket on the crankshaft, the timing chain tension being automatically adjusted by a mechanical tensioner. The camshaft runs in three steel backed white metal bushes and is retained by a sintered metal thrust plate bolted to the cylinder block front face. A skew gear, integral with the camshaft and situated between numbers 2 and 3 cams, drives the distributor and oil pump which are both mounted on the right-hand side of the engine. An eccentric between numbers 6 and 7 cams operates the fuel lift pump also situated on the right-hand side of the engine towards the rear.

Overhead valves are mounted 'normal' to the cast iron cylinder head in integral valve guides and are operated by rockers, push rods and tappets from the camshaft. The inlet valves are larger than the exhausts to improve efficiency. The rockers are mounted on a shaft supported by four mounting posts bolted to the cylinder head. Valve clearances are adjusted by screws in the rocker arms.

A cast iron flywheel is mounted on the crankshaft flange and ensures a smooth-running engine. The drive for the starter motor is provided by a steel ring gear shrunk onto the flywheel periphery.

The sump is a steel pressing and has a front well for the lubricating oil. The engine lubrication system is the force feed type incorporating a full flow oil filter. The oil pump, which is mounted externally on the engine, may be of the eccentric bi-rotor type or the sliding vane type. Both types of pump incorporate a non-adjustable plunger type relief valve.

An oil filler cap is located in the rocker cover and also incorporates a filter gauze for crankcase ventilation. Crankcase ventilation is by an open system with road draught tube.

CYLINDER BLOCK

The cylinder block is cast iron and is cast integral with the upper half of the crankcase. A common cylinder block is used for both the 997 cc and 1200 cc engines. The cylinder block on the early 997 cc. engine was identified by the number 105E 6015 cast on the left-hand side. However, with the introduction of the 1200 cc. engine the cylinder block received minor modifications and was then identified by the number 109E 6015.

Internally the crankcase incorporates three main bearings with removable caps. When dismantling the main bearing caps, ensure that they are replaced in their correct positions. The front main bearing cap has a letter F, and the centre a letter C cast on the surface. The caps are also marked with an arrow and must be fitted with the arrows pointing forwards.

The crankshaft bearing liner parent bore in the cylinder block may be either standard or 0.381 mm. (0.015 in.) oversize. Where the bore is oversize the bearing caps and inside the crankcase are marked with white paint spots. The camshaft bearing parent bore may be 0.508 mm. (0.020 in.) oversize but in this case the block is unmarked.

The cylinder bores are machined directly into the cylinder block and, in production, are graded for size, the grade number, of each bore, being stamped on the push rod side of the cylinder block adjacent to the top face. Cast iron dry type cylinder liners, however, may be fitted and two sizes of liner are available, a standard size and one 0.508 mm. (0.020 in.) oversize on the outside diameter.

To remove and replace the cylinder liners, a cylinder liner remover and replacer adaptors should be made to the dimensions shown. Locate the remover in the bottom of the cylinder liner, with the cylinder block inverted, and press the liner out on a suitable press. When replacing or fitting a liner, ensure that the cylinder bore is machined to the correct size (see Service Data section). Place the remover adaptor in the replacer ring and locate in the cylinder liner, which should be lubricated on the outside with tallow (no other lubricant should be used). Press the liner into the bore from the top on a suitable press. Cut the connecting rod clearance slots in the base of the liner and machine the bore to give the correct clearance for the piston being fitted.

CYLINDER HEAD

The cylinder head is made of cast iron and a separate casting is used for each engine. The combustion chambers are machined to give high and low compression versions. These cylinder heads can be identified by the number cast on the upper face of the casting and the letter 'H' or 'L', for high and low compression respectively, stamped on the machining location pad above the ports to number 4 cylinder.

Ten bolts are used to retain the cylinder head. On high compression engines these bolts are 89.9 mm (3.54 in.) long, and on low compression engines 96.3 mm (3.79 in.) long. The cylinder head gasket is of a copper/asbestos type.

The valves operate in guides machined directly in the cylinder head, although in some instances valve guides may be fitted and are available in service. When fitting valve guides, press each new guide into the cylinder head until the plain end is flush with the spot faced boss in the valve port.

Where the guides are machined directly in the cylinder head the bores may be reamed 0.381 mm. (0.015 in.) oversize with reamer Tool No. P.6056-015 and valves with 0.38 mm. (0.015 in.) oversize stems fitted. This, of course, may also be done where the guides are replaceable. After fitting new valve guides or reaming the valve stem bore the valve seats must be recut to ensure that the seat is concentric with the valve stem bore.

Recut the seats with the appropriate cutters fitted to pilot Tool No. 316-10 in handle Tool No. 316X. Where necessary the seats may be narrowed with top face and port cutters. If there is a hard glazed carbon deposit on the seat this may be removed with a glaze breaker. The valve seats should also be recut when they show signs of pitting or burning and when fitting new inlet valves.

	Cutter Tool Number			
Valve	Seat-45°	Top Face-15°	Port 75°	Glaze Breaker-45°
Inlet	317-22	317-T22	317-P20	317G-22
Exhaust	317-20	317-T20	317-P20	317G-20

Replaceable valve seat inserts are available and should be fitted where necessary. Where inserts have not been fitted previously it will be necessary to machine a recess in the cylinder head for the appropriate valve seat insert. If, for any reason, an existing insert has become loose or damaged, oversize inserts can be fitted. The sizes for machining the recesses for standard and oversize valve seat inserts are tabulated in the Service Data section.

Valve seat inserts may be removed by inserting a suitable chisel under the insert and striking smartly when the insert will be forced out of its location. Care should be taken in this operation to avoid damage to the combustion chamber.

To fit a new insert, select the correct size and enter the insert with the chamfered edge away from the combustion chamber and press into place using insert replacer tools made to the dimensions shown.

	Valve Seat Insert Replacer Tool Dimensions		
	Diameter 'A'	Diameter 'B'	'C'
Inlet Valve	35.80 mm. (1.41 in.)	28.96 mm. (1.14 in.)	4.3 mm. (0.17 in.)
Exhaust Valve	32.0 mm. (1.26 in.)	26.2 mm. (1.03 in.)	5.3 mm. (0.21 in.)

After fitting the inserts, the seats must be cut with the appropriate cutter tools to the correct dimensions.

INLET AND EXHAUST MANIFOLDS

The inlet and exhaust manifolds are made of cast iron and have separate ports for each cylinder. The inlet manifold has a tapered plug, located below the carburettor mounting flange to facilitate engine vacuum testing and a pressed steel hot spot located in a bore immediately below the carburettor. The hot spot is heated by exhaust gases through a similar bore in the exhaust manifold.

The exhaust manifold has a single outlet with a tapered flange onto which the exhaust pipe is attached by means of a clamp.

The two manifolds are clamped together by the carburettor inner retaining stud, which is screwed into the exhaust manifold and a bolt screwed into the inlet manifold through a flange on the exhaust. The manifold joint faces are sealed with jointing compound.

The manifolds are attached to the cylinder head by four bolts with plain washers and at each end by studs with self-locking nuts and plain washers. The manifold gasket is made of asbestos reinforced on either side with perforated steel. The inlet ports are larger than the exhausts.

FRONT COVER

The front cover is an aluminium pressure die casting bolted to the front face of the cylinder block. A composition gasket ensures an oil tight joint. To prevent oil leaks from around the crankshaft pulley boss an oil seal is pressed in the front cover. On early engines the seal has two sealing lips, an inner spring load lip to prevent oil leaks and an outer one to prevent the ingress of dirt and/or water. However, on later engines a seal of improved design having a single lip is fitted and is the only seal now available in Service. The cover is secured to the cylinder block by six bolts two of which have a larger diameter shank to provide location of the cover and therefore ensures that the seal is concentric with the crankshaft pulley.

The oil seal can be removed and replaced, after first removing the radiator and crankshaft pulley, without removing the front cover by using a crankshaft front oil seal remover Tool No. P.6128 and replacer Tool No. 6127.

Push the legs of the replacer Tool No. P.6128 into the seal and locate the jaws behind it. The sleeve Detail 'd' is then inserted between the legs to hold the jaws apart behind the seal. Withdraw the seal by screwing in the bolt with a suitable spanner.

Locate the new seal with the oil sealing lip rearwards in the front cover and place the replacer Tool No. P.6127 adjacent to it. Screw the tool centre screw into the crankshaft pulley securing bolt hole in the crankshaft and press the oil seal into the front cover by tightening the nut with a suitable spanner.

In the event that the larger locating bolts are not fitted, a centraliser Tool No. P.6150 must be inserted into the seal before any of the cover securing bolts are tightened.

A dipstick is located, on the left-hand side of the engine, in a tube pressed into the front cover. This tube is positioned so that the upper end is 124.46 mm (4.90 in.) above the sump face.

A timing pointer is also incorporated on the front cover to facilitate ignition timing and has two marks. These represent 10^{o} and 6^{o} B.T.D.C. Early 997 cc. engines, however, had a single pointer which represents 10^{o} B.T.D.C. The crankshaft pulley timing mark is aligned with the appropriate mark when fitting the distributor or when checking the ignition timing.

REAR OIL SEAL AND CARRIER

The crankshaft rear oil seal, which prevents oil leaks from around the rear journal, consists of two graphite impregnated helical weave cellulose gauze packings bonded with synthetic rubber. The helical weave, together with the scroll on the crankshaft, ensures that any oil present at this location is directed back into the sump when the engine is running. The upper packing is located in a carrier bolted to the cylinder block rear face and the lower one in the sump.

To fit a new seal, locate the upper half in the carrier and the lower half in the sump. Ensure the seal is pressed fully home and trim the ends of each seal so that they provide 0.794 mm. (0.031 in.) above the face.

The carrier is secured to the cylinder block rear face with four bolts and spring washers. Note that the two bolts adjacent to the sump flange are dowel bolts to ensure correct alignment and these must be "nipped" first. Tighten the four bolts evenly.

VALVES AND SPRINGS

The valves, which have 45^{o} seats, are mounted vertically in the cylinder head, the inlet valve head diameter being larger than the exhaust. Their respective diameters are 32.147 mm. (1.266 in.) and 30.163 mm. (1.188 in.) and both valves have stems which are phosphate coated to improve durability. The relative positions of the valves are, inlets Nos. 2, 3, 6 and 7 and exhaust Nos. 1, 4, 5 and 8, when numbered from the front.

If the valve faces are worn or pitted they may be lapped in or the faces ground if required.

Inlet and exhaust valves can be obtained with standard 0.076 mm. (0.003 in.) 0.381 mm. (0.015 in.) oversize valve stems.

An umbrella type oil seal is fitted to each valve stem immediately below the valve spring retainer. The valve springs are coloured blue for identification purposes.

ROCKER SHAFT ASSEMBLY

The rocker shaft assembly is retained by four bolts. These bolts were 7.934 mm. (0.313 in.) diameter but after May 1961, approximate engine number 105E 313550, their diameter was increased to 9.525 mm. (0.375 in.) and fitted with plain washers.

The rocker arms are arranged in pairs with rockers on either side of a rocker shaft support. A compression spring between each pair holds them against the supports, the end rockers being retained by the washers and split pins at the ends.

Push Rods and Tappets

The push rods are 5.556 mm. (0.219 in.) by approximately 168.275 mm. (6.625 in.) long and should be checked for straightness before fitting to the engine.

The chilled cast iron tappets can only be removed from the crankcase after removing the camshaft.

CAMSHAFT AND TIMING CHAIN

The camshaft used on the 997 cc. and 1200 cc. engines can be identified by the number 109E cast on the shaft at the rear end and by a band of white paint. On the 997 cc. engines, prior to January 1964, a 105E camshaft was fitted but this can be replaced by the 109E provided a later type of valve spring is also fitted.

The cams on the camshaft are off set rearwards from the tappet centre lines and are also tapered. This causes the tappets and push rods to rotate, thus improving durability and eliminating the possibility of uneven wear.

A single row timing chain, with an automatic mechanical tensioner, is used. This tensioner consists of spring-loaded snail cam bearing against a pivoted tensioner arm. The timing chain runs across a synthetic rubber pad on the tensioner arm and in use the links wear two grooves in the pad so that the chain runs directly on the rollers. DO NOT dress the surface of the pad to remove the grooves.

Timing marks are incorporated on both camshaft and crankshaft sprockets to ensure correct valve timing. The crankshaft sprocket can be removed with remover Tool No. P.6116 and replaced with replacer Tool No. P.6032A or B.

The camshaft runs in three steel-backed white metal bushes, which may have a standard size or a 0.51 mm. (0.020 in.) oversize outside diameter. The bushes available in service are pre-sized and require no machining after fitting. When one bush requires replacement it is advisable to replace all three bushes as camshaft alignment may be affected if only one bush is changed.

Remove the bushes using camshaft bearing remover Tool No. P.6031 with adaptor set P.6031-3. Locate the remover and guide detail "—3a" adjacent to the collar and with the spigot in the bearing. If the centre liner is being removed also use the centraliser detail "—3d". Remove the bush by screwing down the wing nut.
The camshaft front and rear bushes are both approximately 19.1 mm. (0.75 in.) wide, the front one having an additional oil hole for the rocker shaft oil feed, and the centre bush

approximately 15.9 mm. (0.625 in.) wide. Fit the bushes using a replacer detail "—3b" in addition to the adaptors previously used.

Ensure that the oil holes in the bushes and cylinder block are correctly aligned before fitting and that the splits in the bushes are upwards and outwards at 45° to the vertical. A line scribed on the remover and guide detail "3a" can be used as a guide to facilitate oil hole alignment.

The camshaft is retained by a sintered iron thrust plate bolted to the cylinder block front face and located in a groove behind the camshaft flange.

CRANKSHAFT AND BEARINGS

The cast iron dynamically balanced crankshaft runs in three main bearings with steel backed white metal liners on the 997 cc. engines and steel backed copper lead or lead bronze liners on the 1200 cc. engine. The crankshaft on the 1200 cc. engine has a larger throw than that for the 997cc. The respective crankshafts can be identified by the number 113E or 105E cast on the front crank.

In engines built after December 1964 the crankshaft may be either standard or 0.25 mm. (0.010 in.) undersize on the main bearing journals and crankpins. The crankshaft main bearing journals are graded, the standard crankshaft webs being marked, adjacent to the journal, with a paint spot, BLUE for the smallest grade and RED for the largest. Where the crankshaft is 0.25 mm. (0.010 in.) undersize the grades are GREEN and YELLOW respectively.

The crankshaft main bearing journals may be ground 0.25 mm. (0.010 in.), 0.51 mm. (0.020 in.), or 0.76 mm. 0.030 in. undersize and the crankpins to 1.02 mm. (0.040 in.) undersize. When grinding crankshafts undersize it is important to maintain the correct fillet radii at all times. All the main bearing journal fillet radii are 2.03 to 2.39 mm. (0.080 to 0.094 in.) and the crankpin journal fillet radii 1.78 to 2.13 mm. (0.070 to 0.084 in.). Grind with the crankshaft revolving anti-clockwise when viewed from the front. Ensure that the fillet radii are smooth and free from visual chatter marks. The main bearing journal length between the thrust faces can be increased by up to 0.51 mm (0.020 in.) providing an equal amount is machined from each face and the corresponding oversize thrust washers fitted. The crankpin length must not exceed 0.25 mm. (0.010 in.) oversize.

Main bearing journal and crankpin ovality should not exceed 0.010 mm. (0.0004 in.) T.I.R. and taper 0.013 mm. (0.0005 in.). The centre main bearing run-out relative to the front and rear journals should not exceed 0.25 mm. (0.001 in.) T.I.R. The crankpins should be parallel to the main journals within 0.25 mm. (0.001 in.) and be within 0.13 mm. (0.005 in.) on either side of the centre line through No. 1 crankpin and main journal. The thrust faces should be smooth and square to the bearing journal within 0.013 mm (0.0005 in.) T.I.R. After grinding, crankpins and journals should be polished, with a fine lapping paper and the crankshaft revolving clockwise to produce a good surface finish.

Crankshaft thrust is taken by half thrust washers located in the cylinder block at the centre main bearing. Standard size washers and 0.064 mm. (0.0025 in.), 0.127 mm (0.005 in.) 0.191 mm. (0.0075 in.) and 0.254 mm. (0.010 in.) oversize washers are available.

The clutch pilot spigot bearing is located in a bore machined in the centre of the crankshaft flange.

CONNECTING RODS

The connecting rods are H section steel forgings with detachable big end caps. The caps are located by two hollow dowel pins pressed into the connecting rod and retained by two 8.73 mm. (0.344 in.) bolts fitted without lock washers. Previous connecting rods were fitted with lock washers and required slightly longer retaining bolts.

Three types of bolts have been used in production at different times and only types 2 and 3 should be used on reassembly. However, in the event that type 2 bolt is fitted to the latest connecting rod, the latter should first be tapped through with a 8.73 mm. (0.344 in.) 24 t.p.i. Unified thread tap to accommodate the extra 1.02 mm. (0.04 in.) length of type 2 bolt.

An oil squirt hole machined in the connecting rod feeds oil from the crankpin to the non-thrust side of the cylinder bore.

Pads, formed at each end of the connecting rod forgings, are machined down during manufacture, if necessary, to produce finished connecting rods which all fall within a given weight tolerance. The weight is measured simultaneously at the small and big ends and any correction for either end is made to the respective pad (see Specification, Servicing and Repair Data).

The steel-backed big end bearing liners may have copper/lead, lead/bronze or aluminium/tin bearing surfaces. The upper liner which locates in the connecting rod incorporates an oil hole, the lower liner being plain. Each pair of bearing liners must consist of two liners made of the same material, they should not be mixed. Undersize liners are available in 0.0508 mm. (0.002 in.) 0.254 mm. (0.010 in.) 0.508 mm. (0.020 in.) 0.762 mm. (0.030 in.) and 1.016 mm. (0.040 in.) sizes.

The connecting rod small end bearing is a steel backed bronze bush, which is not available in service the connecting rod being serviced with the bush already fitted. The bush is lubricated by oil splashes and mist which enters through a drilling in the connecting rod end.

When dismantling an engine examine the piston markings to check the connecting rods for straightness. A heavy marking on the piston skirt above the pin on one side together with a correspondingly heavy marking below the pin on the other side indicates a bent connecting rod which should either be straightened or a replacement fitted.

When assembling a connecting rod to the piston ensure that it is fitted the correct way round. The word "FRONT" is embossed on the web to facilitate this.

Connecting Rod Numbering

Connecting rods are numbered when installed in the engine during manufacture, to facilitate correct reassembly should they be dismantled.

The number is stamped on the camshaft side of the big end so that a cap replaced with the numbers together must be in its original position. Never reassemble a bearing cap to another connecting rod.

It is advisable when removing connecting rods from an engine to check that the connecting rods have been numbered correctly. Where the connecting rods are unmarked they should be suitably stamped unless the connecting rods are being scrapped.

PISTONS, PISTON PINS AND RINGS

The pistons on the latest 997 cc. engines and all 1200 cc. engines are of the flat topped solid skirt type and made of aluminium alloy. On earlier 997 cc. engines, the pistons were, again, made of aluminium alloy but were of the auto-thermic type; i.e. having steel struts cast into the piston skirt to control the thermal expansion across the thrust faces, expansion along the piston axis being compensated for by machining the piston oval. Each piston has two compression and one oil control ring situated above the piston pin bore.

The piston pin is offset in the piston 1.016 mm. (0.04 in.) towards the thrust side of the engine, to minimise piston slap and uneven loading of the skirt thrust face during the power stroke. Therefore, it is important that the piston is fitted the correct way round and to facilitate this an arrow head is cast in the piston crown and must point forwards when the piston is fitted to the engine.

The tubular steel piston pins are fully floating and are retained in position by circlips installed in grooves at each end of the piston pin bore. The piston pin bores are graded during manufacture and paint spots corresponding to the grade are placed on the pin bore bosses. The

piston pins are selected to give the correct fit in the piston pin bore and small end bush in the connecting rod.

Three piston rings are fitted, two compression and one oil control ring. The upper compression rings for both engines are tapered and chrome plated. Also, the upper ring, when new, has a reddish brown "running in" compound on the outer edge. On no account must this compound be removed. The lower compression rings on the 997 cc. engines are also tapered with the oil control rings being of the slotted channel broadface type. On the 1200 cc. engines, however, the lower compression rings are stepped externally on the lower faces and the oil control rings are of the "Micro-land" scraper type. The compression rings on both engines are all marked "Top" and must be fitted this way round. The oil control rings may be fitted either way round.

Oversize pistons and rings are available 0.064 mm. (0.0025 in.) 0.127 mm. (0.005 in.) 0.381 mm. (0.015 in.) and 0.762 mm (0.030 in.) sizes.

Piston Selection

During engine manufacture the cylinder bores and pistons are graded. The piston grade number is stamped on the piston crown and each cylinder bore grade number is stamped on the push rod side of the cylinder block, adjacent to the top face, during engine assembly. These grade numbers ensure that when the piston is fitted there is a clearance of 0.013 to 0.028 mm. (0.0005 to 0.0011 in.) between the piston and the cylinder bore.

When selecting standard size pistons, measure each cylinder bore at a point 39.7 mm. (1.563 in.) from the cylinder block top face, across the axis of the crankshaft, and refer to the table in the Specification, Servicing and Repair Data section, to determine the grade of piston required. Select a piston with a grade number corresponding to that found for the cylinder bore.

When re-boring cylinders in service, to suit oversize pistons or standard size pistons after fitting cylinder liners, it is essential that each cylinder bore is machined to give the correct fit for the individual piston. The piston skirt diameter must be measured accurately at right angles to the piston pin at a point 19.05 mm. (0.75 in.) from the bottom of the skirt, the maximum measurement being taken as the piston skirt is slightly oval.

An alternative method of selecting pistons or checking their fit is to use a piston pull scale fitted with a 12.7 mm. (0.5 in.) wide by 0.038 mm. (0.015 in.) thick steel feeler blade.

Insert the piston pull scale feeler blade into the cylinder bore for its full length and then slide the corresponding piston, crown first, into the bore after it to trap the feeler blade between the piston skirt at its largest diameter and the cylinder wall. Hold the piston stationary in the cylinder bore without applying any side thrust and withdraw the feeler blade with a steady pull on the piston pull scale, observing the pounds pull required to remove the feeler blade.

A pull of 1.36 to 3.18 kg. (3 to 7 lbs.) is required to remove the feeler blade from a new piston to give the correct fit in an unused cylinder bore. Where the piston and bore have been used the cylinder walls will be polished and thus friction will be reduced and a lower pull figure can be expected for the same clearance.

Flywheel and Ring Gear

The cast iron flywheel is located concentrically on the crankshaft flange by a sleeve in the flywheel centre which fits into the spigot bearing bore in the crankshaft. A dowel in the crankshaft flange prevents the position of the flywheel, relative to the crankshaft, being moved.

The flywheel ring gear is shrunk onto the flywheel and locates in a retention groove. The flywheel is undercut on the edge to provide a lead in to the ring gear retention groove to facilitate ring gear replacement in service.

The ring gear can be removed by cutting between two adjacent teeth with a hack saw and splitting the gear with a chisel. In no circumstances should pressure be applied in an attempt to dismantle the ring gear for repositioning on the flywheel.

When renewing a ring gear it must be heated evenly to a temperature not exceeding 400°F. (204°C.) or the ring gear wear resistant properties will be destroyed. If the ring gear is heated by a naked flame place the ring gear on a bed of fire bricks and then play the flame in a circular motion onto the bricks about 1.5 in. from the inside of the gear until it reaches the required temperature. The correct temperature can be detected by using a special type of temperature sensitive crayon, or alternatively by polishing a section of the ring gear and heating until it turns a light yellow tint. Fit the ring gear with the chamfered inner edge to the shoulder and allow to cool naturally in air. DO NOT QUENCH.

The flywheel and ring gear assembly is dynamically balanced to close limits, any remaining heavy point being marked by a paint mark on the flywheel. There is a similar mark on the clutch, and when assembling the clutch to the flywheel, position the clutch so that this mark is diametrically opposite to that on the flywheel. The clutch is located on the flywheel by three dowels and is retained by six bolts with spring washers.

LUBRICATION SYSTEM

The engine lubrication system is of the forced feed type, the oil being circulated by an oil pump mounted externally on the right-hand side of the engine and driven by a skew gear on the engine camshaft. The oil pump may be of the eccentric bi-rotor type or the sliding vane type.

Oil from the engine sump is drawn through a gauze screen at the bottom of an inlet pipe attached to the cylinder block and into the oil pump. The oil pressure is controlled by a plunger type relief valve incorporated in the oil pump, which when open, bleeds oil back to the sump. This oil returns, via a pipe, to the base of the sump, thus preventing aeration of the oil.

Oil, from the pump, flows under pressure through a full flow filter, mounted on the oil pump, to a short oil gallery on the right-hand side of the engine. A switch for the oil pressure warning light is located in a tapping into this gallery. A cross drilling through the cylinder block, at the rear end of the short gallery, connects with the main oil gallery on the left-hand side of the engine.

From the main oil gallery, oil passes through drillings to each main bearing. A notch cut in the main bearing liners, feeds oil via a chamfer on the centre main bearing cap to the crankshaft rear thrust washer. Drillings in the crankshaft front, centre and rear journals feed oil to the big end bearings.

A small drilling in each connecting rod web allows a jet of oil to lubricate the small end bush, the piston pin and the non-thrust side of the cylinder bores each revolution of the crankshaft.

The camshaft bearings are fed via drillings in the cylinder block from the front, centre and rear main bearings. The timing chain and sprockets being lubricated by a metered jet of oil from the front drilling.

A flat machined on the camshaft front journal controls the oil feed to the rocker shaft, which is thus pressurised once every revolution of the camshaft. The oil is fed through drillings in the cylinder block and head to the front rocker shaft support, thence to the hollow rocker shaft to lubricate the valve rockers. Drillings in each rocker allow for lubrication of the valve stems and push rod ends.

Oil from the rockers drains through the push rod drillings and lubricates the tappets and cams as it returns to the sump through the drain holes.

SUMP

The pressed steel sump has a front well for the lubricating oil and is bolted to the base of the cylinder block. A drain plug is located in the left-hand side. The gaskets are made of aluminium foil faced with cork.

When fitting the sump apply ESEE-M4G-1008A jointing compound to the front cover and rear oil seal carrier joints to prevent oil leaks.

THE OIL PUMP

The oil pump and filter assembly is bolted to the right-hand side of the cylinder block and can be removed with the engine in place. The oil pump, which is driven by a skew gear on the engine camshaft, has the full flow element type filter bolted to a mounting flange integral with the oil pump body.

One of two types of oil pump is fitted in production. The eccentric bi-rotor type or the sliding vane type. The pumps are directly interchangeable, differing only in internal design and may be readily identified on the car by the different appearance of their end covers. The eccentric bi-rotor type has four recesses cast in the cover, the vane-type being flat.

Oil from the engine sump is drawn through a gauze screen at the bottom of an inlet pipe attached to the cylinder block and into the oil pump. The oil pressure is controlled by a plunger type relief valve incorporated in the oil pump, which when open, bleeds oil back to the sump. This oil returns, via a pipe, to the base of the sump, thus preventing aeration of the oil.

THE OIL FILTER

The full flow type oil filter is bolted to a mounting flange integral with the oil pump body. The filter and bowl on the 997 cc. and 1200 cc. engines were increased in length by approximately 1.5 in. during November 1964.

To remove the filter unscrew the securing bolt and withdraw the filter body and element. Remove the sealing ring from the groove in the filter body mounting flange, then locate the new ring (supplied with the replacement element) in the groove at four diametrically opposite points. Do not fit the ring at one point and then work it round the groove as the rubber may stretch, thus leaving a surplus which may cause an oil leak. Thoroughly clean the filter body, insert a new element, and refit the filter assembly to the oil pump body.

ENGINE VENTILATION

Fresh air enters the engine through a gauze filter in the oil filler cap on the rocker cover. From the rocker cover the air passes down the push rod drillings and through the drain holes into the crankcase. Some of the air flows from the push rod front drain hole into the front cover and then to the crankcase. The air and engine fumes leave the crankcase through a breather outlet pipe, which is attached, on the right-hand side of the engine, by an elbow to a ventilation tube located vertically on top of the fuel lift pump mounting pad. A gauze in the ventilation tube traps oil droplets and mist being carried out of the crankcase.

The gauze filter in the oil filler cap should be cleaned every 8000 km. (5,000 miles) or whenever the engine oil is changed. To clean the filter it is only necessary to remove the filler cap from the rocker cover and wash the assembly in petrol to remove any accumulation of dirt. Oil the gauze with clean engine oil, shaking off any surplus, and replace the cap.

QUICK REFERENCE DATA

Compression ratio—997 cc.	8.9:1 STD 7.5:1 Optional
—1198 cc.	8.7:1 STD 7.3:1 Optional
Firing order	1, 2, 4, 3,
Location of No. 1 cylinder	Next to radiator
Sump capacity – Prior to approx. November 1964	2.56 litres (4.5 Imp. pints)
(Inc. Filter) – After approx. November 1964	3.12 litres (5.5 Imp. pints)
Valve clearance (At normal running temp.)—Inlet	0.254 mm. (0.010 in.)
—Exhaust	0.432 mm. (0.017 in.)
Valve clearance (cold) —Inlet	0.203 mm. (0.008 in.)
—Exhaust	0.432 mm. (0.017 in.)
Radiator cap pressure	0.492 Kg./sq. cm. (7 lbs./sq.in.)
Capacity without heater	5.82 litres (10.25 Imp. pints)
Capacity with heater	6.39 litres (11.25 Imp. pints)
Initial advance (997 cc.) engines	10° (crankshaft) High Compression.
	8° (crankshaft) Low Compression. (After September, 1963).
	10° (crankshaft) Low Compression. (Prior to September, 1963).
	6°(crankshaft) High Compression .
Initial Advance (1198 cc. engine)	10° (crankshaft) Low Compression. (After February, 1965).
	6° (crankshaft) Low Compression. (Prior to February, 1965)
Spark Plugs	14 mm. Autolite AG32.
Gap	0.584 mm. (0.023 in.)
Contact Breaker Gap	(Models prior to 1st Jan., 1966) 0.356 to 0.406 mm. (0.014 to 0.016 in.)
Contact Breaker Gap	(Models subsequent to 1st Jan., 1966 fitted with Ford distributor) 0.64 mm. (0.025 in.)

Tightening Torques

Cylinder head	8.98 to 9.67 kg.m. (65 to 70 lb. ft.)
Main bearing cap	7.60 to 8.29 kg.m. (55 to 60 lb. ft.)
Connecting rod big end	2.765 to 3.456 kg.m. (20 to 25 lb. ft.)
Flywheel	6.22 to 6.91 kg.m. (45 to 50 lb. ft.)
Rocker shaft	2.35 to 3.04 kg.m. (17 to 22 lb. ft.)
Manifolds—bolts	2.07 to 2.49 kg.m. (15 to 18 lb. ft.)
—nuts	2.07 to 2.49 kg.m. (15 to 18 lb. ft.)
Front cover	0.69 to 0.97 kg.m. (5 to 7 lb. ft.)
Sump	0.83 to 1.11 kg.m. (6 to 8 lb. ft.)
Camshaft thrust plate	0.69 to 0.97 kg.m. (5 to 7 lb. ft.)
Camshaft sprocket	1.66 to 2.07 kg.m. (12 to 15 lb. ft.)

SERVICE AND REPAIR OPERATIONS

When working around the engine compartment care must be taken to prevent damage to the paintwork. Immediately after opening the bonnet, wing covers must be fitted. This is assumed in all operations where required.

Before reassembling, during any operation, all components should be thoroughly cleaned, paying particular attention to joint faces and bearing surfaces. Any local high spots or burrs on the joint faces should be carefully removed with a fine oil stone. Ensure that any piece of gasket material or dirt which enters a blind tapped hole, during cleaning, is removed as the bolt may bottom on the resulting plug of dirt before the bolt head clamps the mating part. When tightening a bolt which bottoms, a characteristic springiness may be felt through the spanner or torque wrench. If this occurs, the bolt should be removed and the hole cleaned out.

Inspect all moving parts and bearing surfaces for wear. Check the dimensions of worn parts against the "Specification" and select new parts where necessary.

In the following repair operations it is assumed that all normal precautions regarding cleanliness and lubrication are observed and that all gaskets, oil seals and lockplates, etc. are renewed.

OP 6000-A TUNE ENGINE

(Includes the use of diagnosis equipment. Cleaning and adjusting spark plugs, cleaning air cleaner element or replacing paper element where fitted. Replacing and/or adjusting contact breaker points, checking and/or adjusting timing, cleaning and adjusting carburettor and fuel pump and adjusting valves).

Tools Required

Spark plug cleaner
Tach dwell meter
Timing light
500 X Gang gauge set (Vacuum gauge)
Exhaust gas analyser

1. Pull off the spark plug leads and remove the spark plugs. Clean the spark plugs and reset the gap to 0.58 mm (0.023 in.).
2. Replace the spark plugs and reconnect the spark plug leads.
3. Remove the distributor cap and examine the contact breaker points. Replace the points if badly burnt or excessive metal transfer has occurred, i.e. more than 0.64 mm. (0.025 in.).
4. Adjust the dwell angle to 58 to 68 degrees at 1,000 r.p.m. with the vacuum tube disconnected, alternatively adjust the points gap to 0.056 to 0.406 mm. (0.014 to 0.016 in.) on models prior to 1st Jan. 1966, on models subsequent to 1st Jan. 1966, the dwell angle will be 38 to 40 degrees and the points gap will be 0.64 mm. (0.025 in.).
5. Unscrew the fuel pump sediment bowl retainer clamp and lift off the bowl and filter screen.
6. Carefully wash the screen in petrol and flush all traces of sediment from the sediment chamber and bowl.
7. Refit the screen to the fuel pump body, ensure that the gasket is in good condition, refit the sediment bowl and tighten the clamp.

8. Unscrew the bolt and lift off the carburettor air cleaner cover.
9. Remove the air cleaner element. If the wire gauze type element is fitted it should be washed in petrol allowed to dry and then saturated with engine oil. If the paper type element is fitted it should be shaken clean or replaced.
10. Remove the air cleaner body and wash in petrol.
11. Disconnect the fuel pipe at the carburettor.
12. Remove the carburettor upper body, carefully lift off body and gasket. On models subsequent to 1st Jan. 1966 carefully disconnect the choke link at the same time.

    NOTE—On the Ford carburettor the accelerator pump discharge valve will be exposed in its bore when the upper body is removed. Exercise care when operating the throttle linkage in this condition as the valve and weight may be ejected. Serious damage will occur if the valve enters the engine.
13. Withdraw the float arm pivot pin and remove the float.
14. Unscrew the main jet and blow it clear with an air line.
15. Remove the needle valve and the needle valve body and blow it clear with an air line.
16. Replace the main jet, the needle valve body and needle valve.
17. Clean the float and float chamber using clean petrol.
18. Locate the gasket on the upper body and fit the float assembly, sliding the pivot pin into position. Check the float setting.
19. Refit the upper body and the choke cable bracket (Ford carburettor only). Check the throttle operation.
20. Reconnect the fuel feed pipe.
21. Adjust the valve clearances, see Operation 6450-A1.
22. Connect the leads of a timing light using the clips provided in accordance with the manufacturer's instructions.
23. Check that the timing marks are visible and mark with chalk or paint if necessary.
24. Disconnect the distributor vacuum pipe and start the engine, allowing it to idle.
25. Point the timing light at the timing pointer. Check that the appropriate marks on the crankshaft pulley and front cover timing pointer align. Adjust the timing if necessary by turning the distributor body.
26. Securely tighten the distributor body clamp bolt and reconnect the vacuum pipe.
27. Connect a vacuum gauge with a suitable connector to the inlet manifold.
28. Run the engine and adjust the throttle stop screw until the correct idling speed is obtained. Adjust the volume control screw to obtain the maximum vacuum, readjusting the idling speed as necessary.
29. Remove the vacuum gauge and refit plug to the manifold.

    NOTE—An exhaust gas analyser can be used instead of a vacuum gauge to adjust the slow running. Connect it in accordance with the manufacturer's instructions and adjust the volume control screw to give the optimum mixture strength.

OP 6000-B ENGINE – CHECK COMPRESSION

(Includes remove all spark plugs, record pressures and replace spark plugs)

Tools Required

500X Gang gauge set

1. Warm up the engine to the normal operating temperature.
2. Remove all the spark plugs.
3. Set the throttle to the wide open position.
4. Place the gang gauge in a convenient position, insert the expanding rubber plug into the No. 1 spark plug orifice and expand the plug by turning the knurled nut.
5. Crank the engine with the starter motor until full pressure is recorded on the gauge.
6. Test the remaining cylinders in a similar manner.
7. Replace the spark plugs.

NOTE—If the above check is made at an altitude appreciably above sea level proportionally lower pressures will be obtained.

OP 6000-C ENGINE ASSEMBLY – REMOVE AND INSTALL

(Includes remove engine from vehicle, transfer lifting brackets and replace engine in vehicle, adjust carburettor and ignition timing only).

Tools Required

P.6171 Engine lifting brackets

To Remove

1. Drain the cooling system. A drain tap is situated beneath the radiator and one on the left-hand side of the cylinder block.
2. Drain the engine oil. Unscrew and remove the sump drain plug, preferably while the engine is warm. Remove the engine splash shield.
3. Remove the bonnet. Disconnect the bonnet support, then unscrew the pivot bolt, lockwasher and flat washers on each side and lift off the bonnet.
4. Disconnect and remove the battery.
5. Remove the air cleaner.
6. Detach the upper and lower radiator hoses and heater hoses. Remove the radiator.
7. Disconnect the throttle linkage from the cross-shaft and the choke control cable from the carburettor.
8. Unscrew the exhaust pipe clamp bolts and disconnect the exhaust pipe from the manifold.
9. Disconnect the two leads from the generator terminals, the lead from the temperature gauge bulb and the lead from the oil pressure switch sender unit.
10. Temporarily detach the heater motor and place on one side to facilitate access to the engine compartment.
11. Remove the starter motor. Disconnect the lead from the starter motor solenoid, unscrew the two bolts retaining the motor to the clutch housing, and withdraw the starter motor.

12. Dismantle the engine breather pipe. Unscrew the one bolt securing the breather pipe to the clutch housing and lift off the pipe and its rubber connector to the crankcase.
13. Disconnect the fuel feed pipe from the lift pump.
14. Unclip and lift off the distributor cap. Disconnect the high tension lead from the coil terminal and the low tension lead from the contact breaker terminal of the distributor.
15. Remove the splash shield secured to the front of the clutch housing.
16. Suitably support the gearbox, then unscrew and remove the bolts around the clutch housing.

    If the special engine lifting bracket, Tool No. P.6115, is available, remove Nos. 2 and 3 spark plugs and the second and fourth cylinder head bolts on the left-hand side of the head. Locate the bracket ends in the plug recesses and secure the bracket to the cylinder head with bolts 12.7 mm. (0.5 in.) longer than those removed.

    When the bracket is not available, position a rope sling around the engine and support the weight of the engine on suitable tackle.
17. Remove the two bolts securing each engine mounting to the cross tube, pull the engine unit forward off the main drive gear and lift the assembly from the engine compartment.

To Install

18. Suitably support the engine by a sling and lower it into the engine compartment, locate the unit on the main drive gear ensuring that the tubular dowels are correctly located in the clutch housing and fit the clutch housing bolts.
19. Secure the engine mounting brackets to the cross member with two bolts and self-locking nuts in each bracket.
20. Refit the starter motor to the gearbox securing it in place with two bolts and lock-washers and reconnect the lead to the starter motor terminal.
21. Secure the splash shield to the clutch housing with the bolts and lockwashers.
22. Refit the engine breather pipe to the crankcase connection and secure the pipe to the clutch housing with one bolt and lockwasher and refit the engine splash shield.
23. Refit the heater motor to the heater.
24. Reconnect the leads to the "D" and "F" terminals of the generator, the lead to the temperature gauge unit and the lead to the oil pressure switch unit.
25. Refit the distributor cap. Reconnect the high tension lead to the coil terminal and the low tension lead to the contact breaker terminal of the distributor.
26. Reconnect the throttle linkage and choke control cable, the carburettor and the fuel pipe to the fuel pump, and reconnect the exhaust.
27. Refit the radiator, reconnect the radiator and heater hoses (check that the fan does not foul the lower hose clip) and refill the cooling system.
28. Refit the carburettor air cleaner.
29. Refit and reconnect the battery.
30. Refill the engine with the correct grade engine oil, see specification.

    Refit the bonnet, pivot bolts and support.

OP 6000-C1 EXTRA: ANCILLARIES – REMOVE AND INSTALL
(Includes distributor, fuel pump, generator, engine mounting, sender units, and thermostat.

To Remove

1. Slacken the generator mounting and remove the fan belt. Remove the fan, water pump pulley, generator and the left-hand front engine mounting. Remove the fuel pump, distributor, oil pressure sender unit, right hand front engine mounting, water pump, thermostat housing and thermostat.

To Install

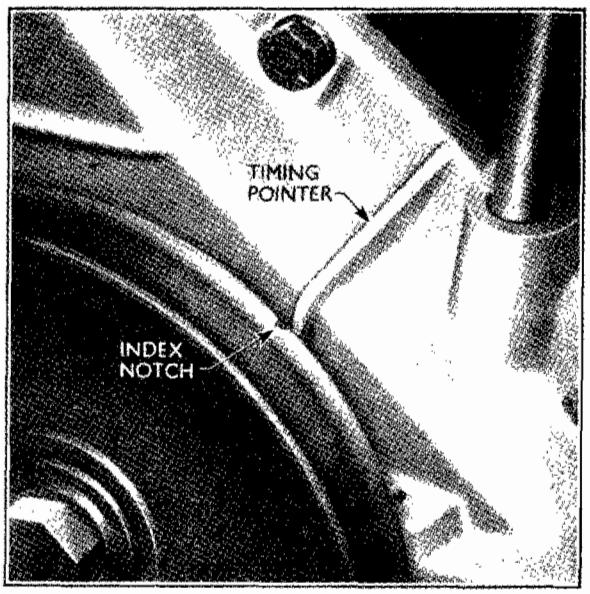
2. Fit the thermostat, thermostat housing, right-hand front engine mounting, oil pressure sender unit and fuel pump. Fit the left-hand front engine mounting, generator, water pump, water pump pulley and fan.
3. Fit the fan belt. Adjust the fan belt tension to give 12.7 mm. (0.5 in.) total free play.
4. Refit the distributor.
   (a) Turn the engine until the timing mark on the crankshaft pulley is in line with the pointer on the timing cover with number one piston on compression stroke (check by feeling compression at No. 1 cylinder spark plug hole), see illustration.
   (b) Fit the distributor into position so that the rotor is pointing towards No. 1 segment in the distributor cap with the contact breaker points just opening. To allow for the helical gear drive, first set the distributor with the tip of the rotor adjacent to the low tension terminal and the vacuum unit spindle parallel to the cylinder block, see illustration. Secure the distributor to the cylinder block with one bolt and lockwasher through the clamp plate.
   (c) Slacken the body clamp bolt, take up any lost motion in the drive and adjust the distributor body so that the contact breaker points are just opening. Tighten the clamp bolt to secure the body in this position.

OP 6000-C2 EXTRA: CLUTCH DISC AND/OR PRESSURE PLATE – REMOVE AND INSTALL

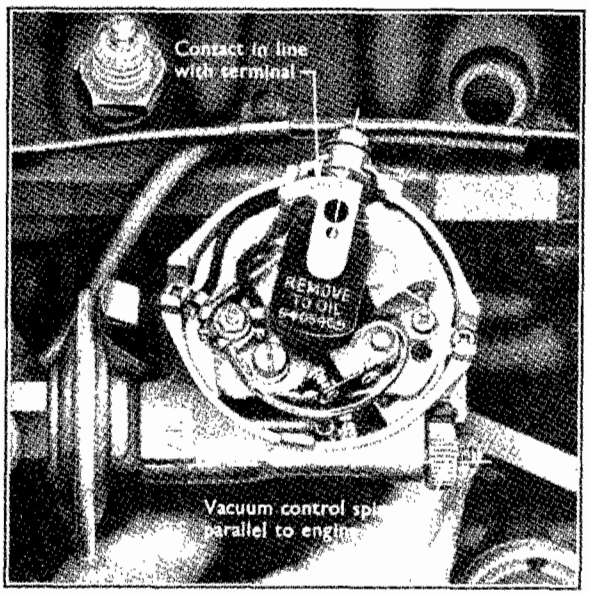
See Operation No. 7000-A2 of Section 7A

OP 6000-C3 EXTRA: CLUTCH PILOT SPIGOT BEARING – REMOVE AND INSTALL

See Operation No. 7000-A3 of Section 7A



Correct Engine Timing Position



Distributor Position – Ignition Timing

OP 6000-C4 EXTRA: FLYWHEEL REMOVE AND INSTALL

Tools Required

P.4008 Crown wheel and pinion backlash gauge

To Remove

1. Remove the flywheel.

To Install

2. Locate the flywheel squarely upon crankshaft flange and tighten the retaining bolts evenly to a torque of 6.22 to 6.91 kg.m. (45 to 50 lb. ft.).
3. Check the flywheel run-out using the gauge Tool No. P.4008 at the rim. The flywheel run-out should not exceed 0.102 mm. (0.004 in.) total indicator reading.

OP 6000-C5 EXTRA: SUMP AND/OR GASKETS – REMOVE AND REFIT

Tools Required

200A or B Engine stand
P.6107 Universal stand adaptor
P.6171 Engine lifting brackets

To Remove

1. Fit a universal stand adaptor Tool No. P.6107 and mount the engine on a stand Tool No. 200A or B. Remove the lifting bracket Tool No. P6171.
2. Remove the sump and gasket.
3. Clean the sump and cylinder block faces and remove the cork packing strips.

To Install

4. Fit new gaskets on the block flange, using ESEE-M4G-1008A jointing compound at each end. Fit the cork packing strips, with the chamfered ends into the grooves, again using ESEE-M4G-1008A jointing compound. Refit the sump and tighten the bolts evenly to a torque of 0.83 to 1.11 kg.m. (6 to 8 lb. ft.).

   NOTE—The two sump gaskets should abut the crankshaft, and should be "nipped" by the cork packing strip at the front end of the engine, and by the rear main bearing seal at the rear end.

5. Fit lifting brackets Tool No. P.6171 and remove from the stand and adaptor.

OP 6000-C6 EXTRA: CRANKSHAFT REAR SEAL AND/OR GASKET – REMOVE AND INSTALL

To Remove

1. Remove the crankshaft rear oil seal housing. NOTE—Two of these bolts are dowel bolts.
2. Locate a new gasket on the rear oil seal housing, using ESEE-M4G-1008A jointing compound at the ends and fit the housing to the block rear face. Ensure the dowel bolts are refitted in the correct positions.

OP 6000-C8 EXTRA: FRONT COVER AND/OR GASKET – REMOVE AND INSTALL (with sump removed)

To Remove

1. Remove the front cover.

To Replace

2. Position the gasket on the front cover with 105E-19554 jointing compound at the ends. Align the cover in position with Tool No. P.6150. Tighten the retaining bolts evenly to a torque of 0.69 to 0.97 kg.m. (5 to 7 lb. ft.) and remove the aligner tool.

OP 6000-C9 EXTRA: FRONT COVER OIL SEAL—REMOVE AND INSTALL (with front cover removed)

Tools Required

550	Driver handle
P.6161	Crankshaft front oil seal remover/replacer

To Remove

1. Suitably support the front cover and remove the oil seal from the rear, using remover/replacer Tool No. P.6161 fitted to a 550 handle.

To Replace

2. Insert the remover/replacer Tool No. P.6161 on the 550 handle and with the front cover suitably supported drive a new seal into the housing.

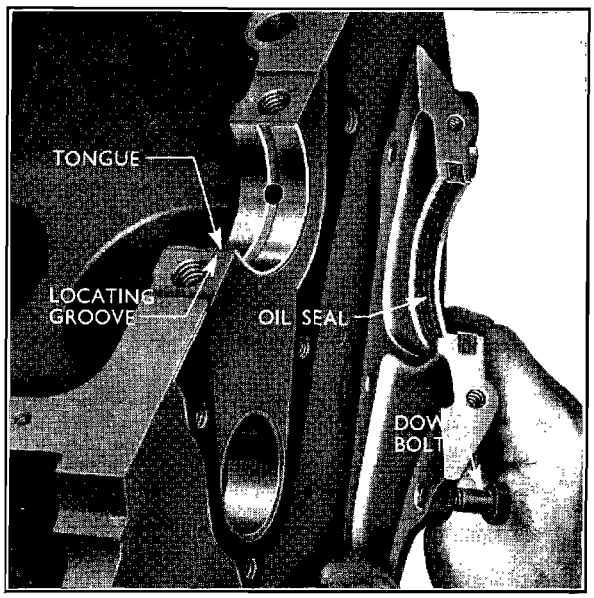
OP 6000-C10 EXTRA: TIMING CHAIN—REMOVE AND INSTALL (with front cover removed)

To Remove

1. Remove the crankshaft oil slinger.
2. Remove the timing chain tensioner and the tensioner arm.
3. Remove the camshaft sprocket and timing chain.

To Install

4. Locate the timing chain on the camshaft sprocket, and fit the camshaft sprocket with the timing mark adjacent to the one on the crankshaft sprocket. Tighten the retaining bolts to 1.66 to 2.07 kg.m. (12 to 15 lbs. ft.) torque and bend up the locking tabs.
5. Locate the tensioner arm on the pivot and fit the timing chain tensioner.
6. Fit the oil slinger on the crankshaft.



The Crankshaft Rear Oil Seal

Valve Timing Marks Location

OP 6000-C11 EXTRA: CRANKSHAFT SPROCKET – REMOVE AND INSTALL
(with front cover and timing chain removed)

Tools Required

P.6032	Crankshaft sprocket replacer
P.6116	Crankshaft sprocket remover

To Remove

1. Remove the crankshaft sprocket using Tool No. P.6116.

To Replace

2. Replace the crankshaft sprocket using replacer Tool No. P.6032.

OP 6000-C12 EXTRA: CONNECTING ROD BEARINGS – REMOVE AND INSTALL
(with sump removed)

To Remove

1. Turn the crankshaft to facilitate removal of number one big end cap. Unscrew the big end bolts two or three turns and tap them to release the cap. Completely unscrew the bolts and remove the cap.
2. Remove the upper connecting rod liner from the connecting rod and the lower from the connecting rod cap.

To Replace

3. Replace the upper and lower bearing liners in their appropriate locations.
4. Locate the big end caps on the connecting rod and tighten the bolts to a torque of 2.765 to 3.456 kg.m. to (20 to 25 lb. ft.).
5. Repeat sub-operations 1 to 4 for the other three connecting rods.

OP 6000-C13 EXTRA: MAIN BEARING CLEARANCES – CHECK
(with sump removed)

Tools Required

Micrometer, or means such as "Plastigage" to measure bearing clearance

1. Remove the bearing cap and wipe the bearing and journal clean
2. Place a piece of "Plastigage" on the bearing surface the full width of the bearing cap and about 6.4 mm. (0.25 in.) off centre.
3. Install the cap and tighten the bolts to a torque of 7.604 to 8.295 kg.m. (55 to 60 lb. ft.). DO NOT TURN THE CRANKSHAFT WHILE THE PLASTIGAGE IS IN PLACE.
4. Remove the cap and using the "Plastigage" scale check the width of the now compressed "Plastigage" strip.

   Check at the widest point to get the minimum clearance.

   Check at the narrowest point to get the maximum clearance.

   The difference between the two readings is the taper.
5. Clean the bearing liner and refit the cap.
6. Check the remaining bearing clearances using the same procedure.

OP 6000-C14 EXTRA: MAIN BEARING LINERS AND THRUST WASHERS – REMOVE AND INSTALL
(with sump removed)

To Remove

1. **Check that each main bearing cap is marked correctly** for its location on the cylinder block. Unscrew the bearing cap bolts evenly and lift off each cap.
2. Lift out the crankshaft. Two half thrust washers are located, one either side of the centre main bearing journal in the cylinder block; these can now be withdrawn. Remove the bearing liners

To Install

3. Position the upper halves of the main bearing liners in their block locations. The tabs of the liners should engage in the machined key-ways in the sides of the bearing locations. Lightly oil the main bearing liners after they have been fitted to the cylinder block.

   NOTE—After approximate Engine No. 105E-52000, an oil feed is provided to the rear crankshaft thrust washer. The centre main bearing cap is provided with a 30^{o} chamfer 0.76 mm. (0.03 in.) to 1.02 mm. (0.04 in.) thick between the bearing locating notch and the rear face of the cap.

   Oil is fed into the groove formed by this chamfer through a "vee" notch 1.78 mm. (0.07 in.) deep in the oilway at the locating tab end of the liner.
4. Replace the crankshaft in the cylinder block and fit new end-float thrust washers of the same thickness as those removed from the engine. The thrust washers locate in recesses on either side of the main bearing in the cylinder block and should be fitted with the oil grooves facing the crankshaft flange. Check the crankshaft end-float which should be 0.076 to 0.279 mm (0.003 to 0.011 in.). If the end-float is incorrect, select thrust washers to give the correct crankshaft end-float. Oversize thrust washers will be available to enable the correct end-float to be established.
5. Position the lower halves of the main bearing liners in the appropriate caps, engaging the locking tabs in the machined grooves.

   Refit the main bearing caps in accordance with the mating marks and with the cast arrows pointing to the front of the engine. Tighten the cap bolts to 7.60 to 8.29 Kg.m. (55 to 60 lbs. ft.).

The Crankshaft Thrust Washers

OP 6000-C15 EXTRA: ALL MAIN BEARING LINER AND THRUST WASHERS—CHECK CLEARANCES AND RENEW (with sump removed)

1. Check the clearances, see Operation No. 6000-C13.
2. Remove the bearing liner, see Operation No. 6000-C14 sub-operations 1 and 2.
3. Select bearing liners to give the correct clearance.
4. Fit the bearing liners, see Operation No. 6000-C14 sub-operation 3.
5. Recheck the bearing clearance, see Operation No. 6000-C13 sub-operations 2 to 7.
6. Repeat the procedure for the remaining bearings.

OP 6000-C16 EXTRA: CAMSHAFT—REMOVE AND INSTALL (with timing chain and sprocket removed)

To Remove

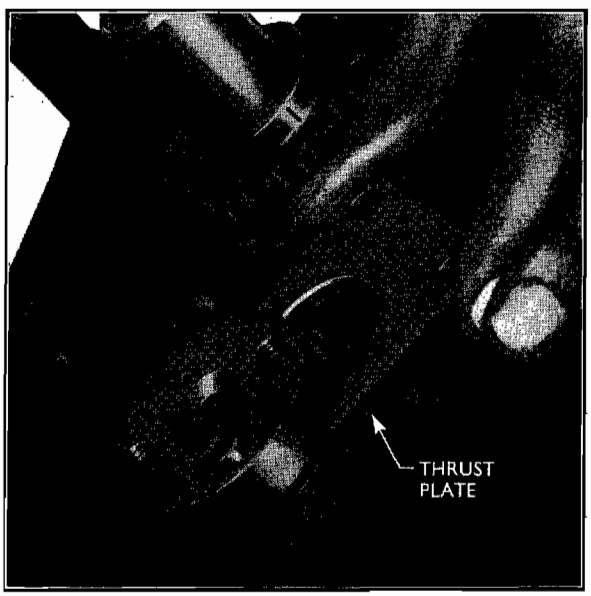
1. Remove the camshaft thrust plate.
2. Rotate the camshaft to fully lift the tappets and then remove the camshaft. Remove the tappets from the cylinder block and keep them in their correct order.

To Install

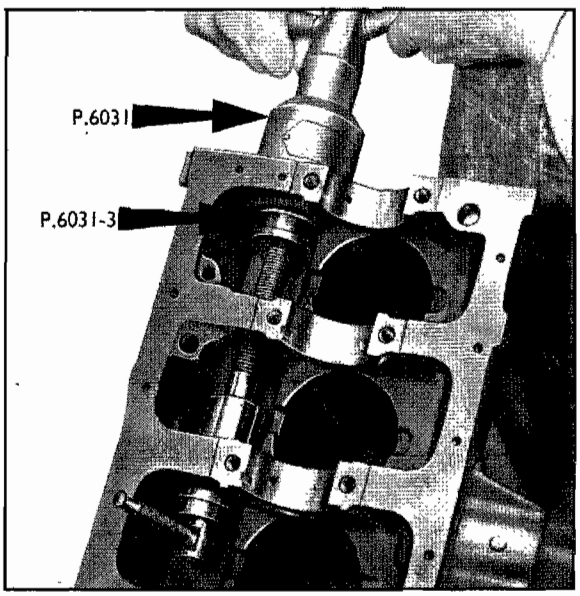
3. Insert the tappets into the bores from which they were removed and slide the camshaft into position, fit the camshaft thrust plate in the camshaft groove. Tighten the retaining bolts to 0.35 to 0.48 kg.m. (2.5 to 3.5 lbs.ft.) and bend up the lock tabs.
4. Check the camshaft end-float with feeler blades between the thrust plate and camshaft flange. This should be between 0.06 and 0.19 mm. (0.002 and 0.007 in.).

OP 6000-C17 EXTRA: CAMSHAFT BEARINGS—RENEW (with camshaft and crankshaft removed)

1. Remove the camshaft bearing bushes using Tool No. P.6031.
2. Check all the oilways to ensure that they are clear, apply EM-4G-52 sealing compound to the oil gallery plugs prior to refitting.



Removing the Camshaft Thrust Plate



Fitting the Camshaft Bushes

To Replace

3. Fit new camshaft bearing bushes again using Tool No. P.6031. Ensure that the oil holes in the bushes and cylinder block are aligned.

OP 6000-C18 EXTRA: CRANKSHAFT—REMOVE AND INSTALL
(with sump, front cover, rear oil seal carrier, connecting rods and main bearings removed)

To **Remove**

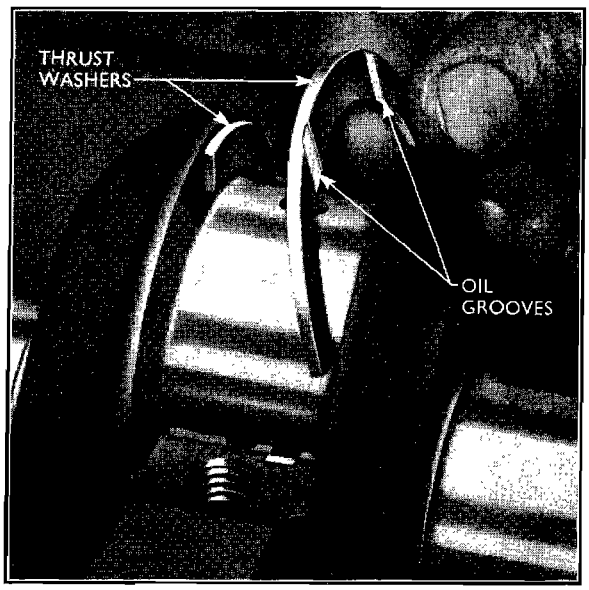
1. Remove the rear oil seal housing.
2. Unscrew the big end bolts two or three turns and tap them to release the caps. Completely unscrew the bolts and remove the caps. Push the pistons up into the cylinder bores.
3. Unscrew the main bearing cap bolts evenly and lift off each cap. Lift out the crankshaft and remove the bearing liners and thrust washers.

To **Install**

4. Fit a new spigot bearing into the crankshaft.
5. Fit the main bearing liners and replace the crankshaft. Fit the crankshaft thrust washers with the oil grooves facing the crankshaft flange. Refit the main bearing caps and tighten the bolts to 7.60 to 8.29 kg.m. (55 to 60 lb. ft.) torque.
6. Check the crankshaft end-float with feeler blades between the crankshaft and the thrust washers. This should be between 0.08 and 0.28 mm. (0.003 and 0.011 in.).

OP 6000-C19 EXTRA: CYLINDER HEAD AND PISTONS – DECARBONISE
(with engine removed)
See Operation No. 6051-A, sub-operations 10 to 19 and Operations No. A1 and A2.

OP 6000-C20 EXTRA: VALVES – ALL – REFACE, RESEAT AND GRIND-IN
(with engine removed)
(Includes initial setting of valves, running-up engine and final setting of valve clearances)
See Operation No. 6051-A, sub-operations 10 to 19 and Operations No. A3, A4, A5 and A6



The Crankshaft Thrust Washers

OP 6000-C21 EXTRA: CYLINDER ASSEMBLY – REMOVE AND INSTALL
(with engine and ancillaries removed)

Tools Required

200 A or B	Engine stand
P 4008	Crown wheel and pinion backlash gauge
PT.4063	Cylinder head gasket locating studs
P.6041	Crankshaft pulley remover
P.6107	Universal stand adaptor
P.6171	Engine lifting brackets
P.7091	Spigot bearing replacer and clutch disc locator

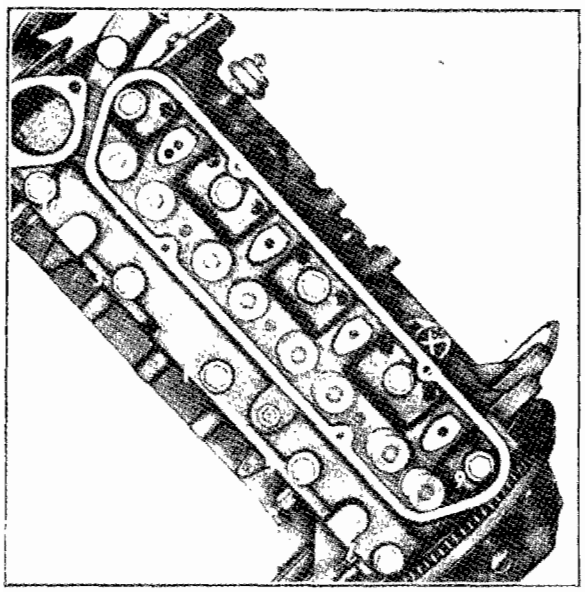
To Remove

1. Detach the generator, engine block drain tap and left hand engine support bracket.
2. Fit a universal stand adaptor Tool No. P.6107 and mount the engine on a stand Tool No. 200 A or B. Remove the engine lifting brackets Tool No. P.6171.
3. Unscrew the pressure plate bolts evenly and detach the pressure plate and clutch disc.
4. Remove the flywheel.
5. Remove the crankshaft pulley, using remover Tool No. P.6041. and remove front timing cover.
   NOTE—Two of these bolts are dowel bolts.
6. Remove the oil pump and filter assembly.
7. Remove the rocker cover and gasket.
8. Slacken the rocker shaft support bolts evenly and lift off the rocker shaft assembly.
9. Withdraw the push rods from their locations in the cylinder block, taking care to keep them in their correct order.
10. Unscrew the cylinder head bolts evenly and lift off the cylinder head and gasket.
11. Invert the engine on the stand and remove the sump and gaskets.
12. Remove the oil pump inlet tube and oil return pipe.
13. Remove the distributor.
14. Remove the fuel pump
15. Unscrew the oil warning light sender unit.
16. Remove the cylinder assembly from the stand and remove the adaptor.

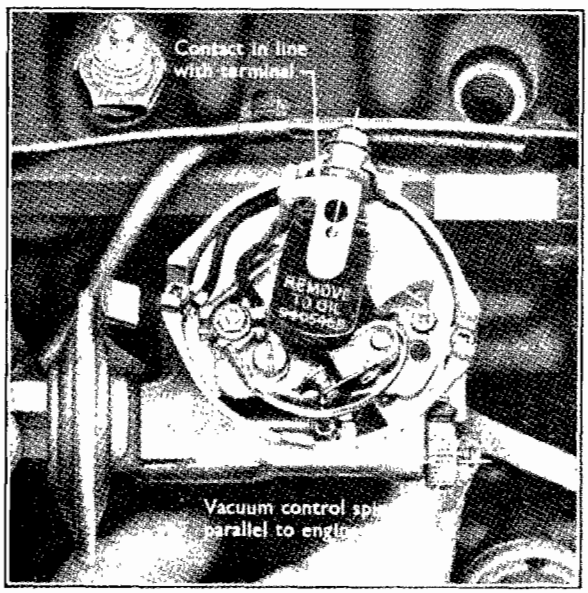
To Install

17. Bolt the adaptor Tool No. P.6107 to the new cylinder assembly and mount on the universal stand.
18. Replace the oil pump inlet tube and oil return pipe. Press the pipe fully home to the full depth of the counterbored hole.
19. Fit new gaskets on the block flange using ESEE-M4G-1008A jointing compound at each end on the front cover and rear oil seal carrier. Fit the cork strips again using ESEE-M4G-1008A. Refit the sump and then tighten the bolts evenly to a torque of 0.083 to 1.11 kg.m. (6 to 8 lb. ft.).
20. Fit the timing cover and crankshaft pulley.

21. Fit a new clutch pilot spigot bearing.
22. Locate the flywheel, squarely on the crankshaft flange. Tighten the retaining bolts evenly to a torque of 6.22 to 6.91 kg.m. (45 to 50 lb. ft.).
23. Check the flywheel run-out using gauge Tool No. P.4008. This should not exceed 0.102 mm. (0.004 in.) total indicator reading on the 997 cc. engine or 0.153 mm. (0.006 in.) on the 1198 cc. engine.
24. Centralise the clutch disc, with the hub assembly away from the flywheel using the locator Tool No. P.7091. Tighten the bolts evenly to a torque of 1.66 to 2.07 kg.m. (12 to 15 lb. ft.) then remove the clutch disc locator.
25. Locate the cylinder head gasket on the cylinder block, steel face downwards, using the locating studs, Tool No. P.T.4063 screwed into diagonally opposite bolt holes in the block face.
26. Install the cylinder head assembly and refit the cylinder head bolts before removing the locating studs. Tighten the bolts in sequence to 8.98 to 9.67 kg.m. (65 to 70 lb. ft.). torque.
27. Locate the push rods in the push rod bores in the same order in which they were extracted.
28. Fit the rocker shaft assembly to the cylinder head engaging the push rod with the adjusting screws. Tighten the retaining bolts evenly to a torque of 2.35 to 3.04 kg.m. (17 to 22 lb. ft.)
29. Adjust the valve clearances, see Operation No. 6450-A1.
30. Inspect the rocker cover gasket and if necessary renew. Replace the rocker cover and tighten the retaining screws.
31. Fit the oil pump and filter assembly.
32. Refit the distributor, positioning it as shown in the diagram.
33. Screw in the oil warning light sender unit.
34. Refit the fuel pump, along with a new gasket using ESEE–M4G-1008A jointing compound.
35. Fit lifting brackets Tool No. P.6171 and remove from the stand and adaptor.
36. Refit the generator, engine block drain tap and the engine support brackets.



Cylinder Head Bolt Tightening Sequence



Fitting the Distributor

OP 6000-C22 Extra: CYLINDER BLOCK – REMOVE AND INSTALL
(with cylinder assembly removed)

Tools Required

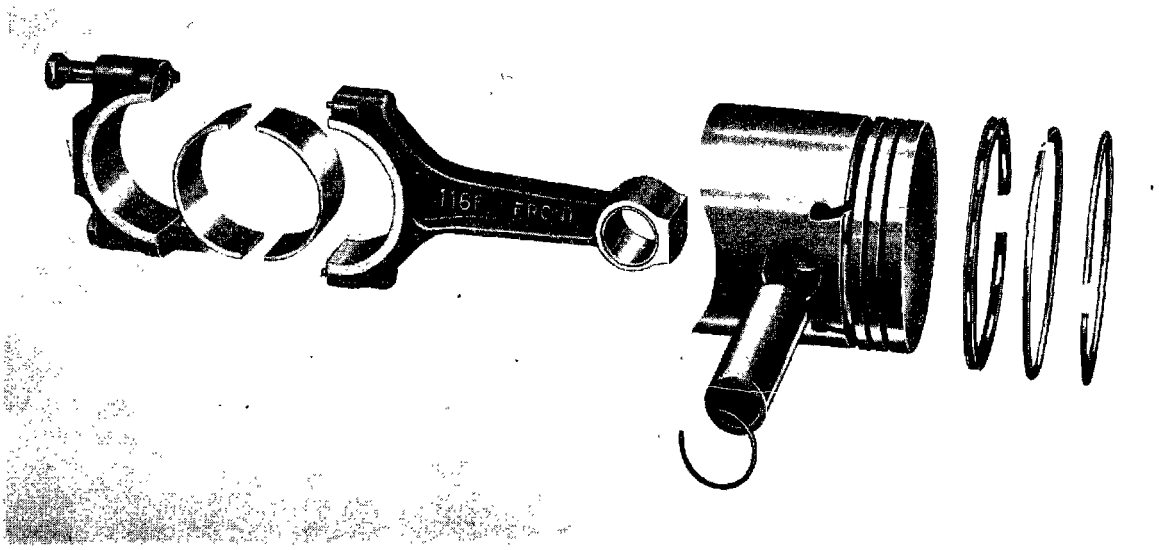
P.6108	Piston ring squeezer
P.6150	Front oil seal aligner
P.6161	Front oil seal remover and replacer
P.6165	Crankshaft rear oil seal remover and replacer

To Remove

1. Remove the front cover and crankshaft oil slinger.
2. Remove the timing chain tensioner.
3. Remove the rear oil seal carrier.
4. Unscrew the bolts several turns and tap them to release the big end caps. Unscrew the bolts completely and remove the caps. Push the pistons out of the bores and withdraw the assemblies.
5. Remove the camshaft sprocket and timing chain.
6. Remove the camshaft thrust plate and withdraw the camshaft. Extract the cam followers, keeping them in their correct order.
7. Unscrew the main bearing cap bolts evenly and lift off each cap. Lift out the crankshaft and remove the main bearing liners and thrust washers.
8. Dismantle the piston and connecting rod assemblies. Remove the piston rings and remove the two piston pin circlips. Push the piston pin out of each piston.

To Install

9. Fit the tappets into their appropriate bores and slide the camshaft into position.
10. Locate the camshaft thrust plate in the camshaft groove and tighten the retaining bolts to 0.35 to 0.48 kg.m. (2.5 to 3.5 lb. ft.) torque. Check the camshaft end-float which should be between 0.051 and 0.18 kg.m. (0.002 and 0.007 in.). Turn over the locking tabs.



Connecting Rod and Piston Assembly

11. Fit the camshaft sprocket and timing chain aligning the timing marks on the camshaft and crankshaft sprockets. Tighten the retaining bolts to 1.66 to 2.07 kg.m. (12 to 15 lb. ft.) and turn up the locking plate tabs.
12. Fit the crankshaft main bearing liners and thrust washers. Install crankshaft in cylinder block and refit main bearing caps. Tighten main bearing cap bolts evenly to 7.60 to 8.29 kg.m. (55 to 60 lb. ft.) torque and check crankshaft rotation.
13. Check the crankshaft end-float. Take up the end-float in one direction and insert a feeler blade between the crankshaft and the thrust washer to measure the clearance. The end-float should be between 0.08 and 0.28 mm. (0.003 and 0.011 in.).
14. Select pistons for the individual bores. Each piston should be fitted to its individual cylinder bore by direct measurement.

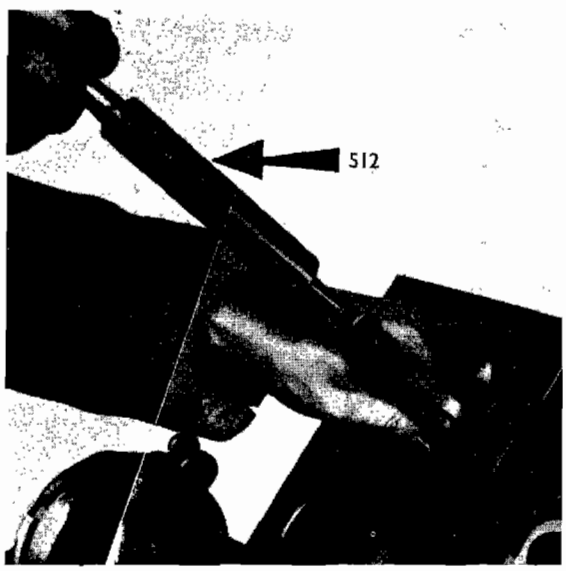
    NOTE—The cylinder bores are measured at a point 8.9 cm. (3.5 in.) on the 997 cc. engine, 3.96 cm. (1.56 in.) and on the 1198 cc. engine, from the top face of the cylinder block across the axis of the crankshaft Grade numbers are stamped in accordance with the sizes at the end of the engine section. Pistons are also graded and stamped on the crown with the appropriate grade number.

    Pistons of the correct grade number are fitted to the appropriate bore. This gives the specified clearance of 0.0127 to 0.0275 mm. (0.0005 in. to 0.0011 in.) on the 997 cc. engine, or 0.0203 to 0.0356 mm. (0.0008 in. to 0.0014 in.) on the 1198 cc. engine, when measured at the bottom of the skirt on the thrust axis, (997 cc. engine) or at the grading plane, which is 1.8796 cm. (0.74 in.) from the bottom of the piston on the major axis, on the 1198 cc. engine.
15. Piston Fit. Pistons (rings not fitted) are to be fitted to cylinder bores so that when a steel feeler blade 12.7 mm. (0.5 in.) wide and 0.038 mm. (0.0015 in.) thick is inserted between the piston, (at right angles to the axis of the piston pin) and the cylinder wall, a pull of 1.36 to 3.18 kg. (3 to 7 lbs.) is required to remove the blade.

    The feeler must project, inside the bore, farther than the piston.

    (i) Insert the 0.038 mm. (0.0015 in.) feeler blade supplied with the pull scale, Tool No. 512, together with the piston, into the bore in which it is to operate, positioning the blade at right angles to the centre line of the piston pin. Holding the connecting rod as shown, apply a steady pull to the piston scale, observing the poundage required to remove the feeler blade.

    (ii) Select a piston for each bore to give a pull of 1.36 to 3.18 kg. (3 to 7 lbs.).



Selecting a Piston with a Pull Scale

Locate the piston compression and oil control rings in the unworn portion of the cylinder bore and check the ring gaps, which should be between 0.229 to 0.356 mm. (0.009 to 0.014 in.).

Check piston ring to groove clearances, which should be as follows:—

Top compression ring Lower compression ring	0.0406 to 0.0914 mm. (0.0016 to 0.0036 in.)
Oil control ring	0.0457 to 0.0965 mm. (0.0018 to 0.0038 in.)

Fit a circlip in position in one of the piston pin bosses and locate the connecting rod in the piston with the marking FRONT on the connecting rod on the same side of the assembly as the arrow mark in the piston crown. Heat the piston in water or oil and slide the piston pin through the pin bosses and connecting rod small end until it abuts the circlip already fitted. Fit the second circlip.

Assemble the piston rings, noting that the compression rings are marked TOP and that the upper compression ring is chromium plated. Space the ring gaps at 120°.

Fit the piston and connecting rod assemblies to the appropriate bores, with the arrow on the crown of each piston pointing towards the front of the engine. Compress the piston rings, using the ring squeezer, Tool No. P.6108 and push each piston down its cylinder bore.

16. Turn the crankshaft as necessary to fit the connecting rod big end caps to the crankpins. Tighten the big end bolts to 2.76 to 3.45 kg.m (20 to 25 lbs.) torque and bend over the lock tabs. Check the engine for rotations.
17. Fit a new gasket to the rear oil seal carrier using ESEE-M4G-1008A jointing compound at the ends. Secure the carrier to the cylinder block, and tighten the bolts evenly to 1.66 to 2.07 kg.m. (12 to 15 lb. ft.) torque.
18. Position the timing chain tensioner arm on the pivot pin and fit the tensioner.
19. Fit the oil slinger on the crankshaft.
20. Fit a new oil seal to the front cover using Tool No. P.6111.
21. Position the front cover gasket in place with ESEE-M4G-1008A jointing compound at the ends and fit the front cover, aligning the seal with Tool No. P.6150. Tighten the bolts evenly to 0.69 to 0.97 kg.m. (5 to 7 lb. ft.) torque.

OP 6000-C23 EXTRA: CYLINDER BLOCK – REBORE (with cylinder block removed)

Tools Required

Boring Bar

1. Rebore cylinder block using proprietary boring equipment and adhering to the manufacturer's instructions.

   NOTE:—If re-boring cylinders in service, to suit oversize pistons, it is essential that each cylinder bore is machined to suit the individual piston to give the specified fit. The piston skirt measurement at right angles to the piston pin holes must be measured accurately, the maximum measurement being taken as the piston skirt is cam ground.

OP 6010-A CYLINDER ASSEMBLY—REPLACE
(Includes 6000-C, C1 and C21)

OP 6010-B CYLINDER BLOCK—REPLACE
(Includes 6000-C, C1, C21 and C22)

OP 6010-C CYLINDER BLOCK—REBORE
(Includes 6000-C, C1, C21, C22 and C23)

OP 6015-A ENGINE ASSEMBLY—FIT NEW, SERVICE, OR RECONDITIONED UNIT
(Includes transferring, but not overhauling, ancillaries, adjusting carburettor and ignition timing, cleaning exterior of ancillaries and checking for water, oil or fuel leaks. Does not include valve adjustment)

1. Remove and install the engine assembly, see OP 6000-C and C1.

OP 6015-A1 EXTRA: ENGINE COMPARTMENT — CLEAN
(with steam cleaner with engine removed)

Tools Required

Steam cleaner

Clean engine compartment using proprietary steam cleaner, following manufacturer's instructions.

OP 6015-A2 EXTRA: CLUTCH DISC AND/OR PRESSURE PLATE — REMOVE AND INSTALL
(with engine removed)

To Remove

1. Unscrew the pressure plate bolts evenly and remove the pressure plate and disc.

To Install

2. Centralise the clutch disc, with the hub assembly away from the flywheel, using Tool No. P.7091. Fit the pressure plate and cover assembly and tighten the bolts evenly to a torque of 1.66 to 2.07 kg.m. (12 to 15 lb. ft.) and remove the clutch disc locator.

OP 6015-A3 EXTRA: CLUTCH RELEASE BEARING — RENEW
(with engine removed)

To Remove

1. Withdraw the clutch release bearing and hub assembly.
2. Press the hub from out of the bearing.

To Install

3. Press the new bearing onto the hub.
4. Slide the release bearing and hub assembly onto the main drive gear bearing retainer and engage the lugs on the release fork with the slots in the bearing carrier.

OP 6015-A4 EXTRA: CLUTCH FORK — REMOVE AND INSTALL
(with clutch release bearing removed)

To Remove

1. Disconnect the clutch fork boot.
2. Remove the clutch fork.

To Install

3. Locate the clutch in the bell housing with the end under the pivot pin.
4. Refit the boot.

OP 6015-A5 EXTRA: MAIN DRIVE GEAR BEARING RETAINER GASKET AND/OR MAIN DRIVE GEAR OIL SEAL — REMOVE AND INSTALL
(with engine and clutch release bearing removed)

See Operation No. 7000-A6 of Section 7A.

OP 6015-B ENGINE AND GEARBOX ASSEMBLY – REMOVE AND INSTALL
(Includes remove assembly, position on blocks on floor and refit assembly)

To Remove

1. Disconnect the engine components prior to removal, see Operation No. 6000-C sub-operations 1 to 29, but do not disconnect the gearbox or remove the starter motor.
2. Remove the drive-shaft (see Section 4, Operation No. 4602-A sub-operations 1 and 2) and fit a dummy sliding spline.
3. Disconnect the engine rear insulator crossmember from the floorpan.
4. Remove the insulator from the gearbox extension housing.
5. Disconnect the clutch release arm retracting spring, slip the rubber boot off the operating cylinder and remove the retaining circlip from around the cylinder body. Push the cylinder out of its location, removing the boot and push rod simultaneously. Refit the boot to prevent the piston becoming misplaced with the resultant loss of fluid.
6. Disconnect the speedometer cable.
7. Remove the gear lever.
8. Remove the engine and gearbox assembly and place on blocks on the floor.

To Install

9. Install the engine and gearbox assembly in the engine compartment.
10. Fit the engine rear insulator to the gearbox extension housing.
11. Fit the rear insulator crossmember to the floorpan.
12. Refit the clutch operating cylinder. Pass the cylinder through the gearbox housing, from the rear. Fit the circlip, rubber boot and push rod, then check and adjust the release arm clearance. The clearance should be 2 to 3 mm. (0.063 to 0.125) free movement of the clutch release fork. Refit the spring.
13. Connect the speedometer cable.
14. Refit the drive-shaft, see Section 4, Operation No. 4602-A sub-operations 3 to 5.
15. Fit the gear lever.
16. Reconnect the engine components, see Operation No. 6000-C sub-operations 34 to 64.

OP 6015-B1 EXTRA—ENGINE AND GEARBOX – SEPARATE AND RECONNECT

To Separate

1. Remove the starter motor.
2. Unscrew the engine to clutch housing bolts and clutch housing to engine bolts.
3. Separate the gearbox and engine.
4. Remove the clutch housing dust cover.

To Reconnect

5. Locate the clutch housing cover on the dowels in the cylinder block rear face.
6. Offer the gearbox up to the engine so that the main drive gear spigot enters the crankshaft bearing and the splines engage with the clutch disc splines. Turn the mainshaft with the box in gear, if necessary, to engage the splines. Push the gearbox fully home.
7. Refit the clutch housing to engine bolts and engine to clutch housing bolts.
8. Refit the starter motor.

OP 6019-A CYLINDER FRONT COVER GASKET – RENEW
(Includes cutting front of sump gasket and splicing in a new section)

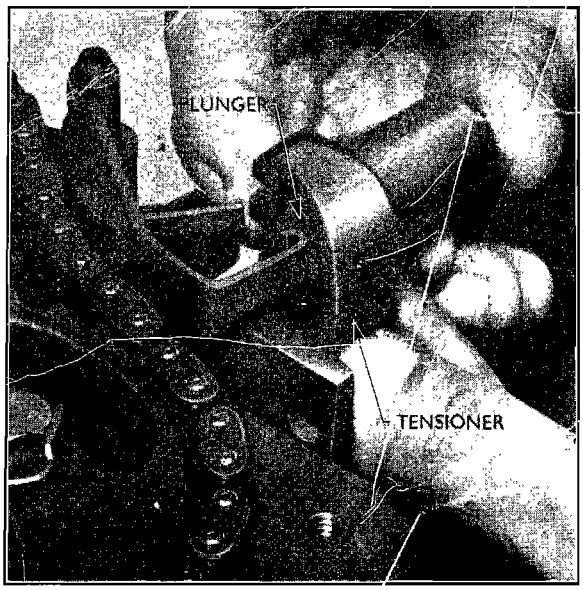
To Remove

1. Raise the bonnet and fit wing covers.
2. Drain the engine coolant by opening the drain plugs on the radiator and cylinder block.
3. Disconnect the radiator hoses at the engine.
4. Remove the radiator assembly.
5. Remove the fan belt and then remove the fan and the water pump pulley.
6. Remove the dipstick.
7. Remove the crankshaft pulley, using Tool No. C.P.4061.
8. Remove the front cover, note that it is also retained by two sump bolts. Also that two of the retaining bolts are dowel bolts.

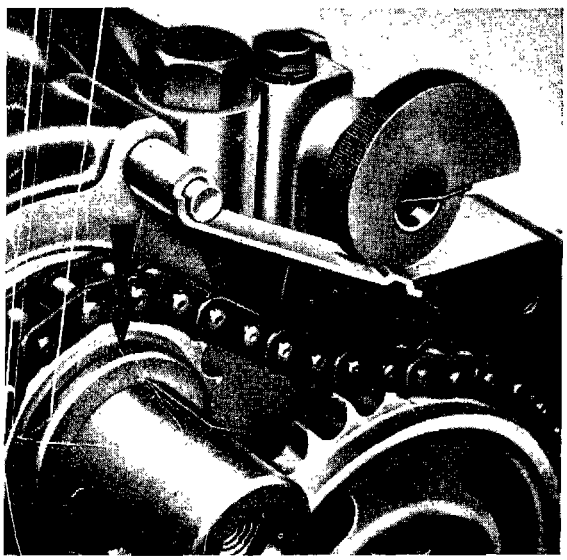
To Replace

9. Position portions of sump gasket, if necessary, and the cork packing strip on the front cover with ESEE-M4G-1008A jointing compound. Align the cover in position. Tighten the retaining bolts evenly to a torque of 0.69 to 0.97 kg.m. (5 to 7 lb. ft.). Ensure that the two dowel bolts are replaced in the same holes as they were removed from.

   Tighten the two sump bolts to 0.83 to 1.11 kg.m. (6 to 8 lb. ft.) torque.
10. Fit the crankshaft pulley aligning the pulley slot with the crankshaft key.
11. Replace the water pump pulley and the fan. Fit the fan belt and adjust the tension so that there is 12.7 mm. (0.5 in.) total movement.
12. Replace the radiator assembly.
13. Refit the radiator top and bottom hoses and tighten the clips.
14. Refit the dip-stick.
15. Refill the radiator with long life anti-freeze.
16. Remove the wing covers and close the bonnet.



The Timing Chain Tensioner Fitted Before April 1961



The Timing Chain Tensioner Fitted After April 1961

OP 6019-A1 EXTRA: FRONT COVER AND/OR SEAL – RENEW
(with front cover removed)

See Operation No. 6000-C9)

OP 6019-A2 EXTRA: TIMING CHAIN AND/OR CAMSHAFT SPROCKET – REMOVE
(with front cover removed)

To Remove

1. Remove the crankshaft oil slinger.
2. Remove the camshaft sprocket, and disconnect the timing chain.

To Install

3. Locate the timing chain over the camshaft and crankshaft sprockets so that the timing marks are aligned when the sprocket is fitted. Tighten the bolts to 1.66 to 2.07 kg.m. (12 to 15 lb. ft.) torque and bend up the locking tabs.
4. Fit the oil slinger on the crankshaft.

OP 6019-B FRONT COVER AND/OR OIL SEAL – REMOVE AND INSTALL
(Includes 6019-A and A1)

OP 6019-C TIMING CHAIN – REMOVE AND INSTALL
(Includes 6019-A, A1 and A2)

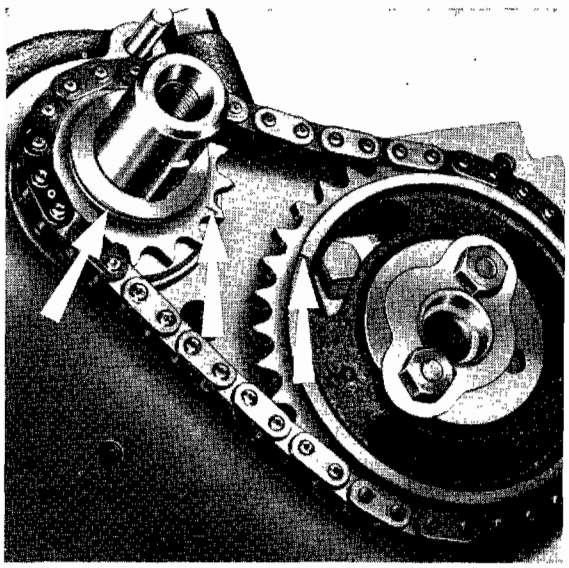
OP 6038-A ENGINE FRONT MOUNTING – ONE – RENEW

To Remove

1. With handbrake applied, jack up the front of car and fit stands.
2. Support the engine on a jack.
3. Remove one of the engine mountings.

To Install

4. Replace the engine mounting.
5. Remove the jack from under the engine.
6. Remove the stands and lower the car to ground.



The Valve Timing Marks

OP 6038-A1 EXTRA: REMAINING FRONT ENGINE MOUNTING – RENEW

To Remove

1. Remove other engine mounting.

To Install

2. Replace other engine mounting.

OP 6038-B ENGINE FRONT MOUNTINGS – BOTH – RENEW
(Includes 6038-A and A1)

OP 6038-C ENGINE FRONT MOUNTINGS – BOTH – CHECK TORQUE OF BOLTS

OP 6051-A CYLINDER HEAD GASKET – RENEW
(Includes remove and install cylinder head assembly, clean cylinder head and block mating faces and adjust valves. Does not include decarbonise cylinder head or pistons).

Tools Required

PT.4063 Cylinder head gasket locating studs

To Remove

1. Raise the bonnet and fit wing covers.
2. Drain the engine coolant.
3. Remove the carburettor air cleaner.
4. Remove the thermostat housing and the thermostat.
5. Disconnect the heater hoses.
6. Disconnect the temperature gauge sender unit.
7. Detach the exhaust pipe and move clear of the cylinder head.
8. Disconnect the throttle linkage, the choke cable, the fuel pipe and the distributor vacuum pipe from the carburettor.
9. Disconnect the leads from the spark plugs and remove the distributor cap.
10. Remove the rocker cover and gasket.
11. Unscrew the rocker shaft bolts evenly and lift off the rocker shaft assembly.
12. Lift out the push rods from their locations and keep them in their correct order.
13. Unscrew the cylinder head bolts evenly and lift off the cylinder head and gasket.

To Install

14. Locate the cylinder head gasket on the cylinder block. Screw the studs Tool No. PT.4063 into diagonally opposite bolt holes on the block face to locate the gasket.
15. Install the cylinder head assembly and refit the cylinder head bolts before removing the locating studs. Tighten the bolts down evenly in sequence to 8.98 to 9.67 kg.m. (65 to 70 lb. ft. torque.
16. Replace the push rods in the push rod bores in the correct order.
17. Fit the rocker shaft assembly to the cylinder head locating the push rods on the adjusting screws. Tighten the bolts evenly to a torque of 2.35 to 3.04 kg.m. (17 to 22 lb.ft.).
18. Adjust the valve clearances, see Operation No. 6450-A1.

19. Fit the rocker cover and gasket.
20. Reconnect the exhaust pipe.
21. Reconnect the vacuum pipe, the fuel pipe, the choke cable, and the throttle linkage to to the carburettor.
22. Reconnect the temperature gauge sender unit.
23. Reconnect the heater hoses.
24. Locate the thermostat in its bore in the cylinder head and refit the thermostat housing.
25. Fit the distributor cap and reconnect the spark plug leads.
26. Fit the carburettor air cleaner.
27. Refill the cooling system with a 50% solution of Ford anti-freeze plus.
28. Remove the wing covers and close the bonnet.

OP 6051-A1 EXTRA: CYLINDER HEAD – DECARBONISE (with cylinder head removed)

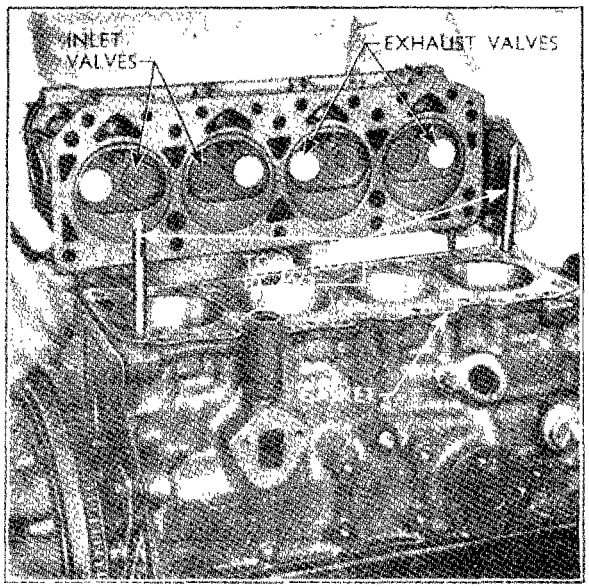
1. Remove the sparking plugs.
2. Remove the inlet manifold and carburettor assembly.
3. Remove the exhaust manifold.
4. Using a suitable implement, remove all carbon deposits from cylinder head faces, cylinder head ports and valve heads.

To Install

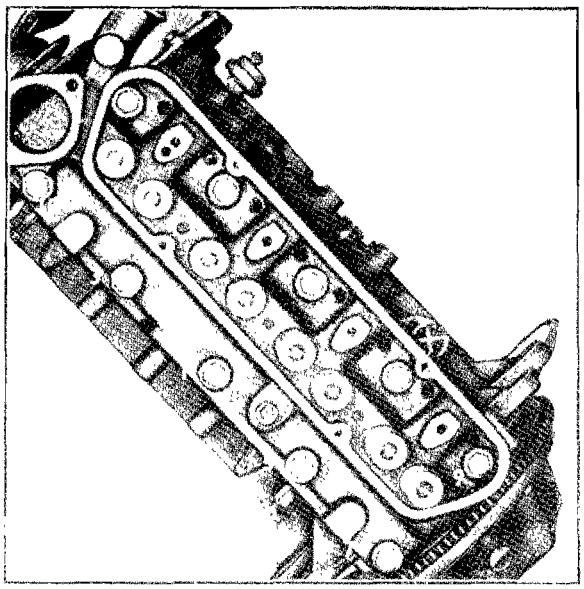
5. Fit the exhaust manifold and tighten the retaining nuts and bolts.
6. Fit the inlet manifold.
7. Refit the sparking plugs.

OP 6051-A2 PISTONS – DECARBONISE (with cylinder head removed)

Using a suitable implement, remove all carbon deposits from the piston crown. Care must be taken to ensure that carbon scraped off is prevented from contaminating any part of the engine.



Refitting the Cylinder Head



Cylinder Head Bolt Tightening Sequence

OP 6051-A3 EXTRA: ONE VALVE – REMOVE AND INSTALL
(does not include refacing seat or grind-in valve)

Tools Required

6118	Valve spring compressor
P.6118-1	Valve spring compressor (adaptor)

To Remove

1. Place the cylinder head on its face.
2. Compress the valve spring, using Tool No. 6118A and adaptor Tool No. P.6118-1A located in a rocker support bolt hole. Remove the split tapered collets. Release the spring and remove the valve spring and retainer.
3. Remove the rubber seal fitted to the valve stem and withdraw the valve.

To Install

4. Insert the valve into the valve guide. Fit the rubber seal to the stem with the open end to the head.
5. Place the cylinder head on its face and position the valve spring and retainer over the valve stem.
6. Compress the valve spring using Tool No. 6118A and Tool No. P.6118-1 as before. Locate the split collets in the valve stem collet grooves and slowly release the spring compressor to engage the collets in the retainer tapers.

OP 6051-A4 EXTRA: EACH ADDITIONAL VALVE – REMOVE AND INSTALL

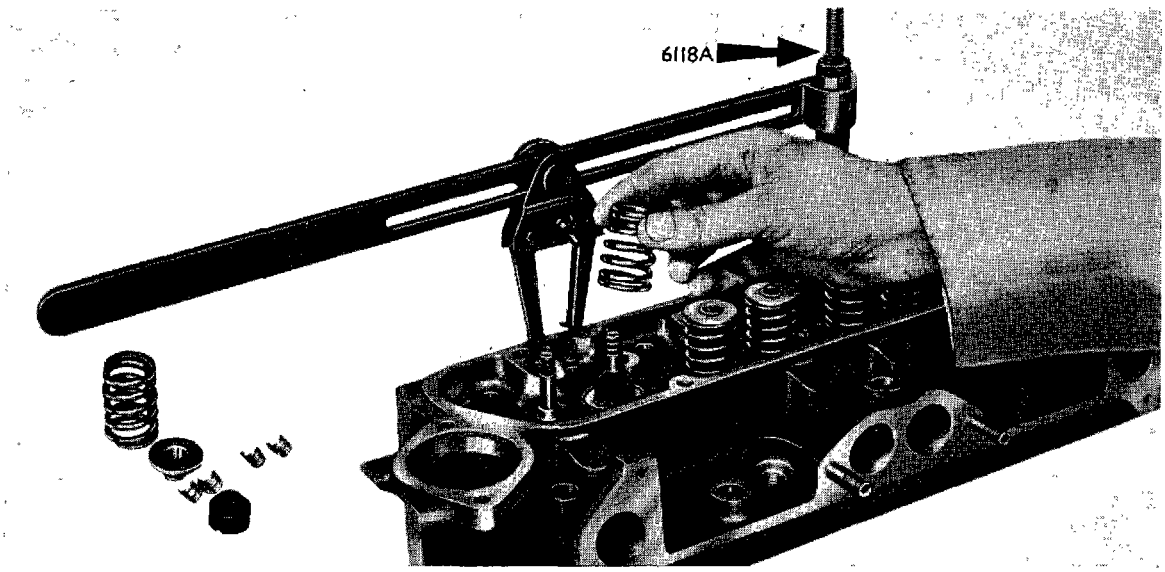
Using the procedure in Operation No. 6051-A3 remove and install each additional valve.

OP 6051-A5 EXTRA: EACH VALVE SEAT – RECUT (with valve removed)

Tools Required

Valve seat cutter
Valve seat cutter pilot

1. Recut the valve seat to ensure that the seat is concentric with the valve stem bore.
2. If necessary, reduce the seat width.



Assembling the Valves and Springs

OP 6051-A6 EXTRA: EACH VALVE – GRIND-IN (with valve removed)

Tools Required

Valve lapping dolly

1. Grind or lap in the valves using a suitable grade of grinding paste.

OP 6051-A7 EXTRA: EACH VALVE GUIDE – REAM (with valve removed)

Tools Required

Tap wrench

P.6056-015 Valve guide reamer

1. Ream the guide bore using Tool No. P.6056-015 and a suitable tap wrench.

OP 6051-A8 EXTRA VALVE GUIDE ASSEMBLY (with valve removed)

Tools Required

Valve guide remover/replacer

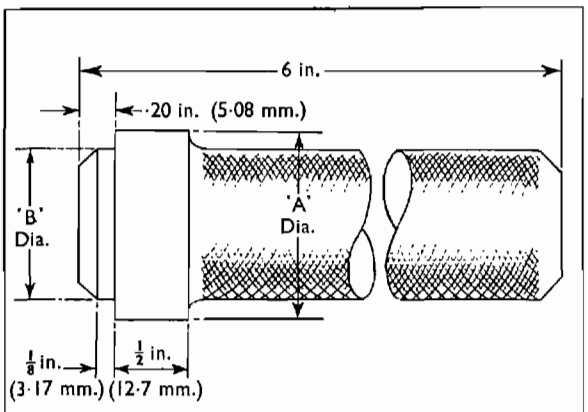
A suitable drift must be made to the dimensions given. The inserts must be pressed squarely into position, and it may therefore be found advantageous to extend the end of the shaft into the valve stem guide. Valve seat inserts are serviced for both inlet and exhaust valves.

To Remove

1. Remove the valve guide using a suitable drift.

To Install

2. Fit replacement inserts if required. Enter the insert in the recess, chamfered edge first, and press it into position with the appropriate tool.



Valve	'A' Dia.	'B' Dia.
Inlet	1·41 in. (35·80 mm.)	1·14 in. (28·96 mm.)
Exhaust	1·26 in. (32 mm.)	1·03 in. (26·16 mm.)

Valve Seat Insert Replacer Tool

OP 6051-A9 EXTRA: CYLINDER HEAD – RENEW (with valves removed)

1. Remove the temperature gauge sender unit.
2. Replace the temperature gauge sender unit on the new cylinder head.
3. Remove the manifold studs from the head being replaced and fit them to the new cylinder head. Alternatively fit new studs in the new cylinder head.

OP 6051-B CYLINDER HEAD AND PISTONS – DECARBONISE
(Includes 6051-A, A1 and A2)

OP 6051-C VALVE – ONE – REMOVE AND INSTALL
(Includes 6051-A, A1and A3)
(Does not include reface valve seat or grind-in valve)

OP 6051-D VALVE – ONE – REMOVE AND INSTALL
(Includes 6051-A, A1, A3, A5 and A6)
(Includes reface valve seat and grind-in valve)

OP 6051-E VALVES – ALL – REMOVE AND INSTALL
(Includes 6051-A, A1, A3, A4, A5 and A6)

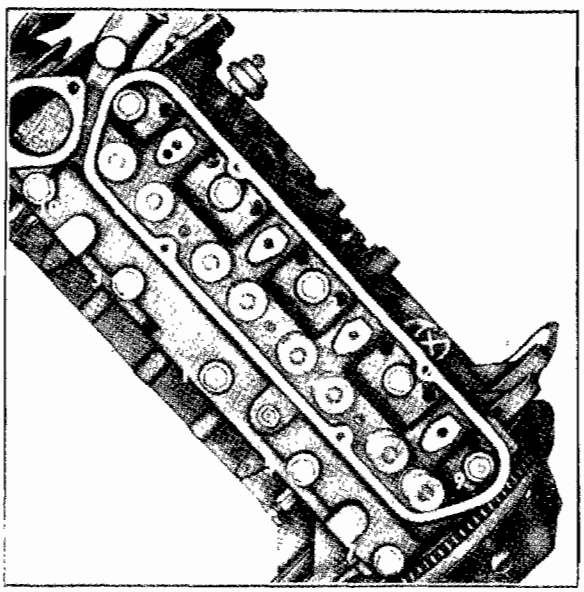
OP 6051-F DECARBONISE CYLINDER HEAD AND PISTONS AND RESEAT AND GRIND-IN ALL VALVES
(Includes 6051-A, A1, A2, A3, A4, A5 and A6)

OP 6051-G VALVE GUIDE – ONE – REAM
(Includes 6051-A, A1, A3, A5 and A7)
(Includes recut valve seat)

OP 6051-H VALVE GUIDES – ALL – REAM
(Includes 6051-A, A1, A3, A4, A5 and A7)
(Includes recut valve seats)

OP 6051-I VALVE GUIDE – ONE – RENEW
(Includes 6051-A, A1, A3, A5 and A8)

OP 6051-J VALVE GUIDES – ALL – RENEW
(Includes 6051-A, A1, A3, A4, A5 and A8)



Cylinder Head Bolt Tightening Sequence

OP 6051-K CYLINDER HEAD – REMOVE AND INSTALL
(Includes 6051-A, A2, A3, A4 and A9)

OP 6051-M CYLINDER HEAD BOLTS – TORQUE
(Includes adjust valve clearances)

Tools Required

P.6129 Cylinder head bolt socket.

1. Raise the bonnet and fit wing covers.
2. Remove the rocker cover, see Operation No. 6450-A, sub-sections 1 to 6.
3. Partially drain the cooling system, store the coolant if it is to be used again.
4. Remove the thermostat housing.
5. Tighten the bolts evenly in sequence to a torque of 8.98 to 9.67 kg.m. (65 to 70 lb. ft.)
6. Adjust the valve clearances, see Operation No. 6450-A1.
7. Refit the thermostat housing.
8. Refill the cooling system with long life anti-freeze.
9. Install the rocker cover, see Operation No. 6450-A sub-sections 7 to 12.
10. Remove the wing covers and close the bonnet.

OP 6051-P CYLINDER HEAD CORE PLUG – RENEW
(Includes remove and install cylinder head and adjust valves)

Tools Required

PT.4063 Cylinder head gasket locating studs

To Remove

1. Remove the cylinder head, see Operation No. 6051-A sub-sections 1 to 14.
2. Remove the core plug and clean its bore.

To Replace

3. Fit the new core plug using ESE-M4G-116A sealer to ensure a watertight joint.
4. Refit the cylinder head, see Operation No. 6051-A sub-sections 15 to 30.

OP 6068-A ENGINE REAR MOUNTING INSULATOR – RENEW

To Remove

1. With the handbrake applied, jack up the car front end and fit stands.
2. Suitably support the gearbox with a jack.
3. Disconnect the crossmember from the body floor pan.
4. Unscrew the engine rear mounting centre bolt and remove the crossmember.

To Install

5. Locate the crossmember on the gearbox extension housing and fit the centre bolt.
6. Fit the crossmember to the body.
7. Remove the jack from under the gearbox.
8. Jack up the car, remove the stands, and lower the car to the ground.

OP 6250-B CAMSHAFT AND/OR TAPPETS – REMOVE AND INSTALL
(Includes remove and install engine)

Tools Required

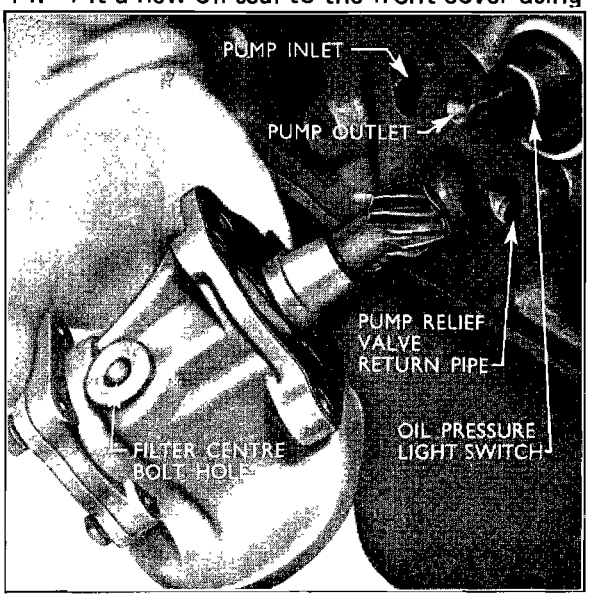
200 A or B	Engine stand
550	Driver handle
CP.4061	Crankshaft pulley remover
P.6107	Engine bracket
P.6171	Engine lifting brackets
P.6111	Camshaft front cover oil seal remover/replacer

To Remove

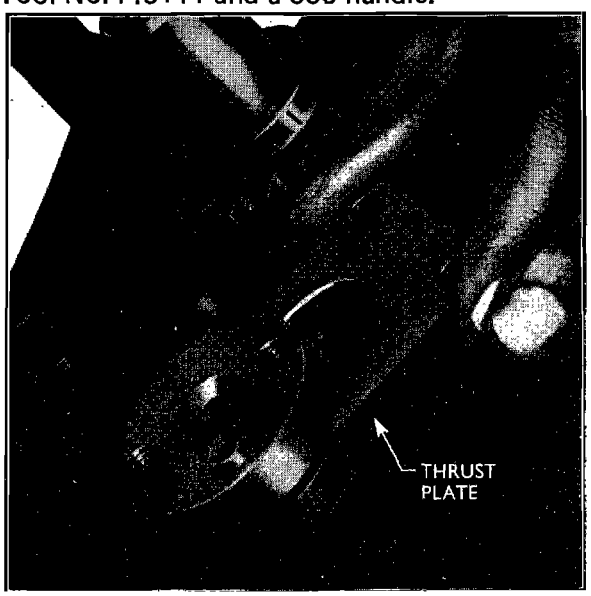
1. Remove the engine assembly as described in OP 6000-C.
2. Fit the bracket Tool No. P.6107 and mount the engine on a stand Tool No. 200 A. Remove the lifting brackets Tool No. P.6171.
3. Remove the rocker cover.
4. Remove the rocker shaft support bolts evenly and lift off the rocker shaft assembly.
5. Lift out the push rods from their locations and keep them in their correct order.
6. Remove the crankshaft pulley using Tool No. CP.4061
7. Remove the oil pump and filter assembly.
8. Invert the engine and remove the sump, gaskets and cork packing strips.
9. Remove the front cover and gasket.
10. Remove the timing chain and sprocket, see Operation No. 6000-C10 sub-operations 1 to 3.
11. Remove the camshaft and tappets, see Operation No. 6000-C16 sub-operations 1 and 2.

To Install

12. Install the tappets and camshaft, see Operation No. 6000-C16 sub-operations 3 and 4. and check the camshaft and float. This should be between 0.051 and 0.18 mm. (0.002 in. and 0.007 in.)
13. Refit the timing chain and sprocket, see Operation No. 6000-C10 sub-operations 4 to 6.
14. Fit a new oil seal to the front cover using Tool No. P.6111 and a 550 handle.



The Oil Pump



The Camshaft Thrust Plate

15. Position a gasket on the front cover with ESEE-M4G-1008A jointing compound at the ends, align the front cover and tighten the bolts evenly to 0.69 to 0.97 kg.m. (5 to 7 lb. ft.) torque.
16. Locate a new gasket on the oil pump mounting flange and fit the oil pump and filter assembly. Tighten the retaining bolts to 1.66 to 2.07 kg.m. (12 to 15 lb. ft.).
17. Fit new gaskets on the block flange using ESEE-M4G-1008A jointing compound at each end. Fit the cork packing strips, chamfered ends into the groove, again using ESEE-M4G-1008A jointing compound at the ends and refit the sump. Tighten the sump bolts to 0.83 to 1.11 kg.m. (6 to 8 lb. ft.) torque.
18. Fit the crankshaft pulley aligning the pulley slot with the crankshaft key. Tighten the pulley retaining bolt to 3.32 to 3.87 kg.m. (24 to 28 lb. ft.) torque.
19. Locate the push rods in their respective bores and fit the rocker shaft assembly, ensuring that the cupped ends of the push rods engage with the adjusting screws. Tighten the rocker shaft retaining bolts evenly to 2.35 to 3.04 kg.m. (17 to 22 lb. ft.) torque.
20. Adjust the valve clearances as in Operation No. 6450-A1.
21. Replace the rocker cover and gasket and tighten the screws.
22. Fit lifting brackets Tool No. P.6171 and remove the engine from the work stand and remove the bracket Tool No. P.6107.
23. Refit the engine assembly in the car as in Operation No. 6000-C.

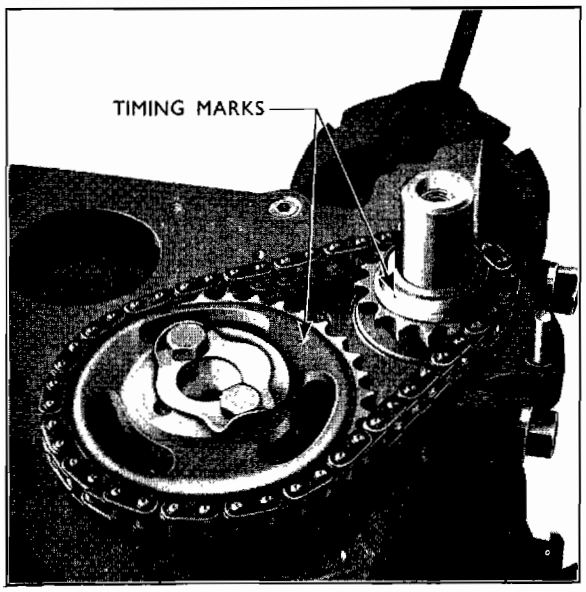
OP 6250-B1 EXTRA TO REPLACE CAMSHAFT BEARINGS
(Includes Checking Oilways)

Tools Required

P.6031	Camshaft bearing bush remover/replacer
P.6031-3	Camshaft bearing bush remover/replacer adaptors
P.7137	Spigot bearing replacer and clutch disc locator or P.7091 clutch disc locator.

To Remove

1. Unscrew the pressure plate bolts evenly and detach the pressure plate and disc.
2. Remove the flywheel
3. Remove the crankshaft rear oil seal carrier.



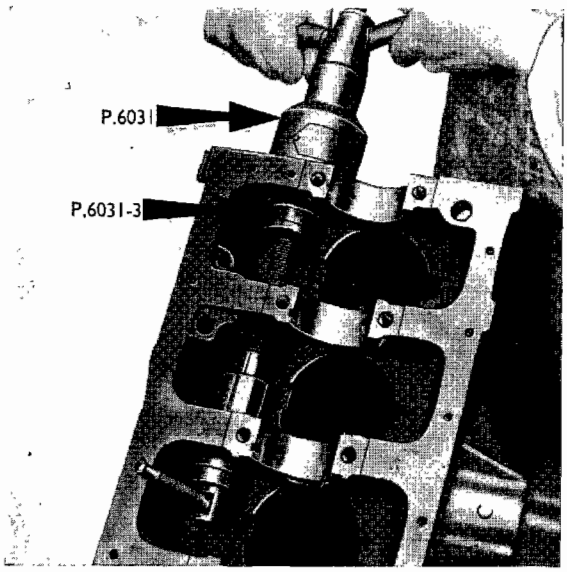
Valve Timing Marks Location

4. Unscrew the bolts several turns and tap them to release the big end caps. Completely unscrew the bolts and remove the caps. Push the pistons up into the cylinder bores.
5. Unscrew the main bearing cap bolts evenly and lift off each cap. Lift out the crankshaft. Remove the thrust washers and bearing liners.
6. Remove the camshaft bearing bushes using Tool No. P.6031 with adaptors Tool No. P.6031-3.
7. Check all the oilways to ensure that they are clear, apply EM-4G-52 sealing compound to the oil gallery plugs prior to refitting.

To Install

8. Fit new camshaft bearing bushes again using Tool No. P.6031 and P.6031-3. Ensure that the oil holes in the bushes and cylinder block are aligned.
9. Fit the main bearing liners and replace the crankshaft. Locate the crankshaft, thrust washers with the oil grooves facing the crankshaft flange. Refit the main bearing caps and tighten the retaining bolts to 7.60 to 8.29 kg.m. (55 to 60 lb. ft.) torque.
10. Check the crankshaft end-float with feeler blades between the crankshaft and the thrust washers. This should be between 0.08 and 0.28 mm. (0.003 and 0.011 in.).
11. Turn the crankshaft as necessary to fit the connecting rod big ends to the crank pins. Tighten the bolts to a torque of 2.76 to 3.45 kg.m. (20 to 25 lb. ft.).
12. Fit a new crankshaft rear oil seal.
13. Fit a new gasket to the rear oil seal carrier using ESEE-M4G-1008A jointing compound at the ends. Secure the carrier to the cylinder block. Tighten the bolts evenly to 1.66 to 2.07 kg.m. (12 to 15 lb. ft.) torque.
14. Locate the flywheel squarely on the crankshaft flange. Tighten the retaining bolts to 6.22 to 6.91 kg.m. (45 to 50 lb. ft.) torque.
15. Check the flywheel run-out using gauge Tool No. P.4008. This should not exceed 0.102 mm. (0.004 in.) total indicator reading on the 997 cc. engine, or 0.153 mm. (0.006 in.) on the 1198 cc. engine.
16. Centralise the clutch disc with the hub assembly away from the flywheel using Too No. P.7091. Tighten the bolts evenly to a torque of 1.66 to 2.07 kg.m. (12 to 15 lb. ft.) and remove the clutch disc locator.

OP 6250-C CAMSHAFT BEARINGS – RENEW
(Includes 6250-B and B1)



Fitting the Camshaft Bushes

OP 6250-D CAMSHAFT LOBES – CHECK LIFT
(Includes remove and install rocker cover, rocker shaft and check lift of lobes at push rod with dial gauge and adjust valves)

1. Remove the rocker cover, see Operation No. 6450-A sub-sections 1 to 6.
2. Unscrew the rocker shaft bolts evenly and lift off the rocker shaft assembly.
3. Mount the dial gauge Tool No. P.4008 at a suitable location and position the gauge anvil in the push rod socket. Zero the gauge with the tappet on the heel of the cam.
4. Turn the engine until the tappet is on the toe of the cam and measure the lift.
5. Repeat for the other cam lobes.
6. Fit the rocker shaft assembly to the cylinder head, engaging the push rods with the adjusting screws. Tighten the bolts evenly to a torque of 2.35 to 3.04 kg.m. (17 to 22 lb. ft.)
7. Adjust the valve clearances, see Operation No. 6450-A1.
8. Install the rocker cover, see Operation No. 6450-A sub-sections 7 to 12.

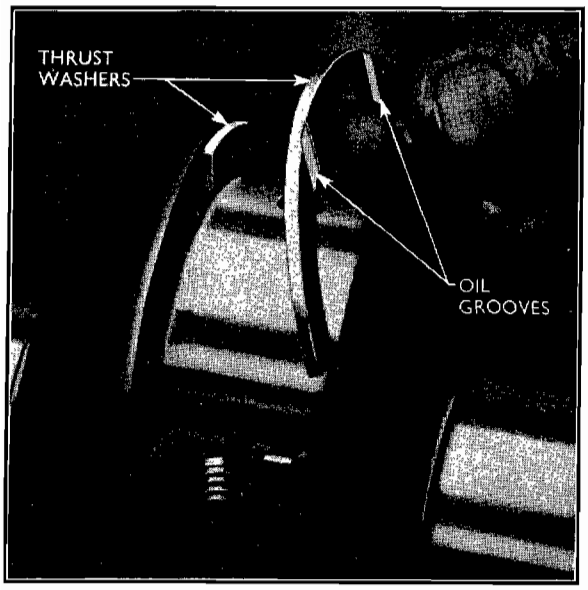
OP 6303-A CRANKSHAFT – REMOVE AND INSTALL
(Includes remove and install engine, connecting rod and main bearing liners and transferring crankshaft sprocket)

Tools Required

Universal	Engine stand
P.4008	Crown wheel and pinion backlash gauge
P.4061	Crankshaft pulley remover
P.6107	Engine bracket
P.6115	Engine lifting brackets
P.6116	Crankshaft sprocket remover
P.6111	Front cover oil seal remover/replacer
P.7091	Clutch disc locator

To Remove

1. Remove the engine assembly as described in OP 6000-C.
2. Fit a bracket Tool No. P.6107 and mount the engine on to the universal stand. Remove the lifting brackets Tool No. P.6115.

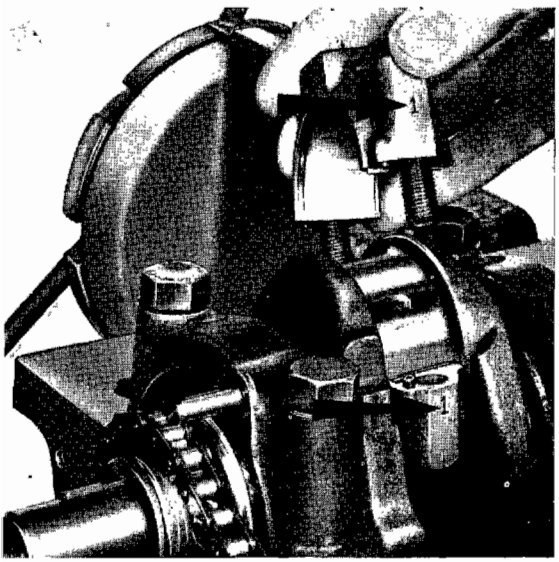


The Crankshaft Thrust Washers

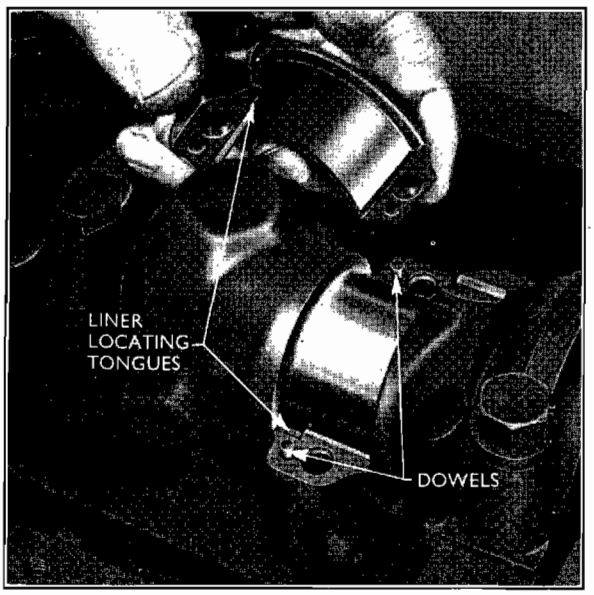
3. Remove the crankshaft pulley using Tool No. CP.4061
4. Unscrew the pressure plate bolts evenly and remove the pressure plate and clutch disc.
5. Remove the flywheel.
6. Remove the sump and gaskets.
7. Remove the front cover, gasket and crankshaft oil slinger.
8. Remove the timing chain tensioner.
9. Remove the camshaft sprocket and timing chain.
10. Remove the crankshaft sprocket using Tool No. P.6116.
11. Remove the crankshaft, see Operation No. 6000-C18 sub-sections 1 to 3.

To Install

12. Install the crankshaft, see Operation No. 6000-C18 sub-sections 4 to 6.
13. Replace the camshaft sprocket.
14. Locate the timing chain around the camshaft sprocket and fit the camshaft sprocket with the timing mark adjacent to and in line with the corresponding mark on the crankshaft sprocket.
15. Turn the crankshaft as necessary to fit the connecting rod big ends to the crank pins. Tighten the connecting rod bolts to 2.76 to 3.45 kg.m. (20 to 25 lb. ft.) torque.
16. Fit a new crankshaft rear oil seal.
17. Locate a new gasket on the rear oil seal carrier using ESEE-M4G-1008A jointing compound at the ends and fit the carrier to the block rear face.
18. Position the tensioner arm on the pivot pin and fit the timing chain tensioner.
19. Fit the oil slinger on the crankshaft.
20. Fit a new oil seal to the front cover using Tool No. P.6111.
21. Position a gasket on the front cover using ESEE-M4G-1008A jointing compound at the ends. Secure the cover in place and tighten the bolts evenly to a torque of 0.69 to 0.97 kg.m. (5 to 7 lb. ft.).



Fitting a Big End Cap



A Connecting Rod and Cap

22. Locate the flywheel, squarely upon the crankshaft flange. Tighten the bolts evenly to 6.22 to 6.91 kg.m. (45 to 50 lb. ft.) torque.

23. Check the flywheel run-out using the gauge Tool No. P.4008 at the rim. The flywheel run-out should not exceed 0.102 mm (0.004 in.) total indicator reading on the 997 cc. engine or 0.153 mm. (0.006 in.) on the 1198 cc. engine.

24. Centralise the clutch disc with the hub assembly away from the flywheel using Tool No. P.7019. Fit the pressure plate and cover assembly and tighten the bolts evenly to a torque of 1.68 to 2.07 kg.m. (12 to 15 lb. ft.) then remove the disc locator.

25. Fit the crankshaft pulley aligning the pulley slot with the crankshaft key.

26. Fit new gaskets on the block flange using ESEE-M4G-1008A jointing compound at each end. Fit the cork packing strips with the chamfered ends into the grooves, again using ESEE-M4G-1008A jointing compound and refit the sump. Tighten the bolts.

27. Remove the engine from the stand using the lifting brackets Tool No. P.6115. Remove the bracket Tool No. P.6107.

28. Refit the engine assembly in the car as described in OP 6000-C.

OP 6312-A CRANKSHAFT PULLEY – REMOVE AND INSTALL

To Remove

1. Raise the bonnet and fit wing covers.
2. Slacken the generator mounting bolts and remove the fan belt.
3. Remove crankshaft pulley using Tool No. P.4061.

To Replace

4. Replace crankshaft pulley aligning the pulley slot with the crankshaft key and tighten the retaining bolt.
5. Replace the fan belt and adjust the tension to give 12.7 mm. (0.5 in.) total movement.
6. Remove the wing covers and close the bonnet.

OP 6335-A CRANKSHAFT REAR OIL SEAL CARRIER – REMOVE AND INSTALL (Includes remove and install engine)

Tools Required

Universal	Engine stand
P.4008	Crown wheel and pinion backlash gauge
P.6107	Engine bracket
P.6115	Engine lifting brackets
P.7091	Spigot bearing replacer and clutch disc locator.

To Remove

1. Remove the engine assembly as described in Op 6000-C.
2. Fit a bracket Tool No. P.6107 and mount the engine on the universal engine stand. Remove the lifting brackets Tool No. 6115.
3. Unscrew the pressure plate bolts evenly and remove the pressure plate and clutch disc.
4. Remove the flywheel.
5. Remove the sump and gaskets.
6. Remove the rear oil seal carrier.

To Install

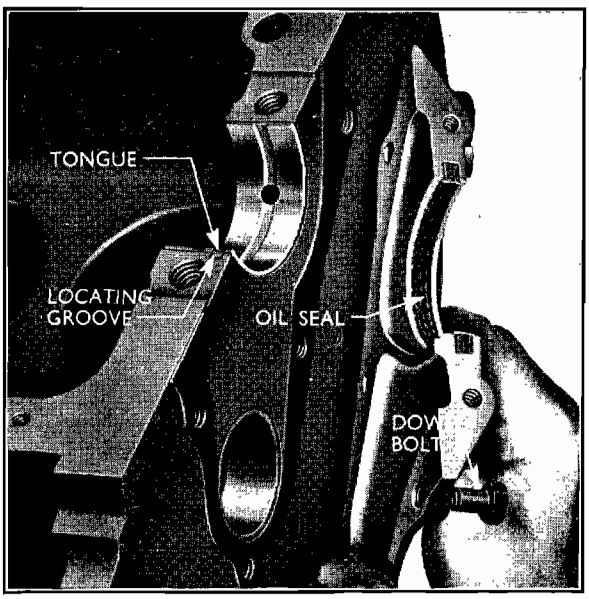
7. Locate a new gasket on the rear oil seal carrier, using ESEE-M4G-1008A jointing compound at the ends, and fit the carrier to the block rear face. Tighten the bolts evenly to a torque of 1.66 to 2.07 kg.m. (12 to 15 lb. ft.).
8. Locate the flywheel squarely upon the crankshaft flange. Tighten the bolts evenly to a torque of 6.22 to 6.91 kg.m. (45 to 50 lb. ft.).
9. Check the flywheel run-out using the gauge Tool No. P.4008 at the rim. The flywheel run out should not exceed 0.102 mm (0.004 in.) total indicator reading on the 997 cc. engine and 0.153 mm. (0.006 in.) on the 1198 cc. engine.
10. Centralise the clutch disc with the hub assembly away from the flywheel using Tool No. P.7081. Fit the pressure plate and cover assembly and tighten the bolts evenly to a torque of 1.68 to 2.07 kg.m. (12 to 15 lb. ft.) then remove the disc locator.
11. Fit new gaskets on the block flange using ESEE-M4G-1008A jointing compound at each end. Fit the cork packing strips with the chamfered ends into the grooves, again using ESEE-M4G-1008A jointing compound and refit the sump. Tighten the bolts to a torque of 0.83 to 1.11 kg.m. (6 to 8 lb. ft.).
12. Remove the engine from the stand using the lifting brackets Tool No. P.6115. Remove the bracket Tool No. P.6107.
13. Refit the engine assembly in the car as described in OP 6000-C.

OP 6375-A FLYWHEEL ASSEMBLY – REMOVE AND INSTALL
(Includes remove and install gearbox assembly, clutch disc and pressure plate)

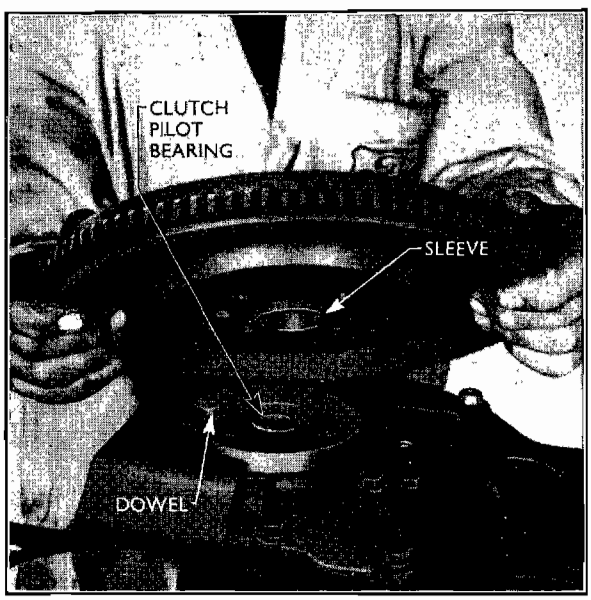
P.4008 Crown wheel and pinion backlash gauge
P.7091 Spigot bearing replacer and clutch disc locator

To Remove

1. Remove the gearbox as described in Op 7003-A of Section 7A.
2. Unscrew the pressure plate bolts evenly and remove the pressure plate and disc.
3. Remove the flywheel.



The Crankshaft Rear Oil Seal



Refitting the Flywheel

To Install

4. Locate the flywheel squarely on the crankshaft flange. Fit and tighten the bolts evenly to a torque of 6.22 to 6.91 kg.m. (45 to 50 lb. ft.).
5. Check the flywheel run-out using the gauge Tool No. P.4008 at the rim. The flywheel run-out should not exceed 0.102 mm. (0.004 in.) total indicator reading for the 997 cc. engine and 0.153 mm (0.006 in.) on the 1198 cc. engine.
6. Centralise the clutch disc, with the hub assembly away from the flywheel using Tool No. P.7091. Fit the pressure plate and cover assembly and tighten the bolts evenly to a torque of 1.66 to 2.07 kg.m (12 to 15 lb. ft.) and remove the clutch disc locator.
7. Replace the gearbox in the car as described in Op 7003-A of Section 7A.

OP 6375-A1 EXTRA: FLYWHEEL RING GEAR – RENEW (with flywheel removed)

To Remove

1. Cut between two adjacent teeth with a hacksaw and split the flywheel ring gear with a chisel.

To Install

2. Heat the new ring gear evenly to a temperature not exceeding 316°C (600°F) and fit the ring gear. Allow the ring to cool naturally in air. DO NOT QUENCH.

OP 6375-B FLYWHEEL RING GEAR – RENEW
(Includes 6375-A and A1)

OP 6450-A ROCKER COVER AND/OR GASKET – REMOVE AND INSTALL

To Remove

1. Raise the bonnet and fit wing covers.
2. Remove the air cleaner
3. Unscrew the four retaining screws and lift off the rocker cover and gasket.

To Install

4. Inspect the gasket and if necessary replace it. Locate the gasket on the rocker cover flange and fit the rocker cover. Tighten the screws evenly to a torque of 0.35 to 0.48 kg.m. (2.5 to 3.5 lb. ft.).
5. Remove the wing covers and lower the bonnet.

OP 6450-A1 EXTRA: ALL VALVE CLEARANCES – ADJUST

To check valve clearances turn the crankshaft until the valves in the first column are fully open, when the valves shown in the second column may be checked and adjusted as required:–

Valves Open	Valves to Adjust
1 and 6	3 In. and 8 Ex.
3 and 8	1 Ex. and 6 In.
2 and 4	5 Ex. and 7 In.
5 and 7	2 In. and 4 Ex.

To adjust a valve clearance, slacken off the adjusting screw locknut and insert a feeler blade between the rocker and the valve end. Turn the adjusting screw until the correct clearance has been obtained and tighten the locknut. Recheck the gap after tightening the locknut.

		INLET	EXHAUST
997 cc.	HOT	0.25 mm. (0.010 in.)	0.43 mm. (0.017 in.)
	COLD	0.20 mm. (0.008 in.)	0.46 mm. (0.018 in.)
1198 cc.	HOT	0.25 mm. (0.010 in.)	0.43 mm. (0.017 in.)
	COLD	0.20 mm. (0.008 in.)	0.46 mm. (0.018 in.)

OP 6450-A2 EXTRA: ROCKER SHAFT ASSEMBLY OR ALL ROCKERS AND/OR PUSH RODS – REMOVE AND INSTALL

To Remove

1. Unscrew the rocker shaft bolts evenly and lift off the rocker shaft assembly.
2. Withdraw the push rods from their locations and keep them in their correct order.

To Install

3. Locate the push rods in their respective push rod bores.
4. Fit the rocker shaft assembly to the cylinder head, engaging the push rods with the adjusting screws. Tighten the bolts evenly to a torque of 2.35 to 3.04 kg.m. (17 to 22 lb. ft.)

OP 6450-A3 EXTRA: ANY OR ALL ROCKER SHAFT PARTS – RENEW

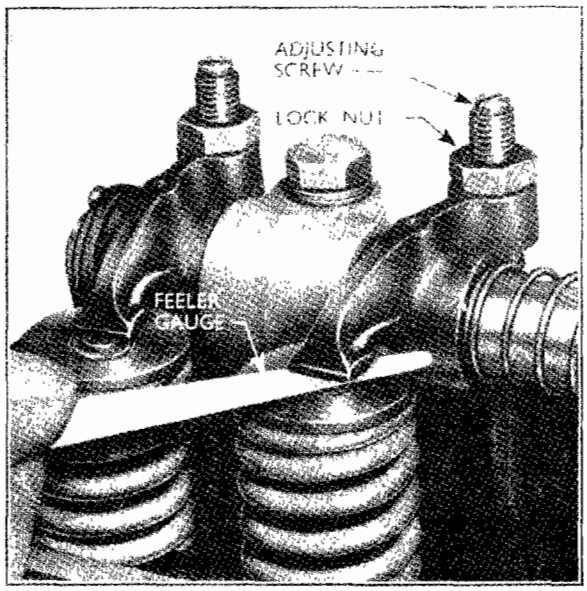
To Remove

1. Remove the split pin from one end of the shaft and detach the flat washer, crimped spring washer and second flat washer, which bear against the end rocker arm. The rocker shaft supports, rocker arms and springs can now be removed from the shaft.

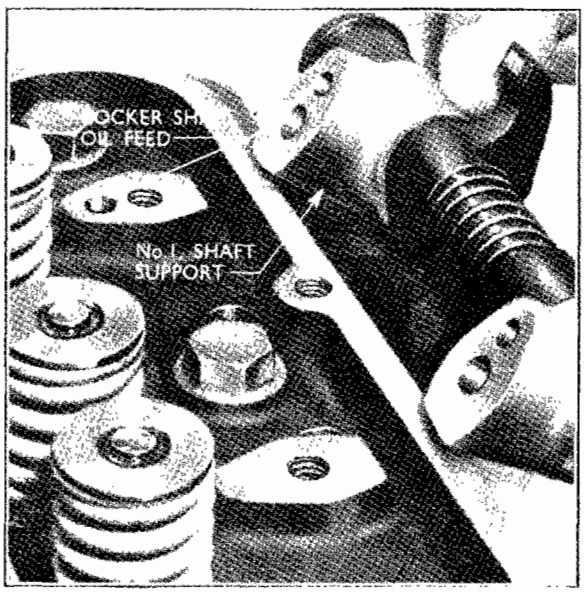
To Install

2. Build up the rocker shaft assembly in the reverse order to removal.

   Note that the bolt hole in the rocker shaft support must be on the same side as the adjusting screw in the rocker arm and that the rocker arms are handed, the rocker pads being inclined towards the support. Fit the split pins with heads upwards and bend over the legs to secure.



Adjusting Valve Clearances



Assembling the Rocker Shaft to the Cylinder Head

OP 6450-B VALVE CLEARANCES – ADJUST
(Includes 6450-A and A1)

OP 6450-C ROCKER SHAFT OR ALL ROCKERS AND/OR PUSH RODS – REMOVE AND INSTALL
(Includes 6450-A, A1 and A2)

OP 6450-D ROCKER SHAFT – OVERHAUL
(Includes 6450-A, A1, A2 and A3)

OP 6513-A VALVE SPRING AND/OR STEM SEAL – ONE – RENEW
(Includes remove and install rocker cover, rocker shaft, spark plugs and supporting valve through spark plug hole)

Tools Required

6118 Valve spring compressor

To Remove

1. Remove the rocker cover, see Operation No. 6450-A sub-sections 1 to 6.
2. Remove the rocker shaft and push rods, see Operation No. 6450-A2 sub-sections 1 and2.
3. Remove the spark plug from the cylinder corresponding to the valve.
4. Turn the engine until the piston in this cylinder is at T.D.C. and support the valve with a suitable lever through the spark plug hole.
5. Compress the valve spring, using Tool No. 6118A located in an adjacent rocker support bolt hole. Remove the split tapered collets and release the spring.
6. Remove the valve spring retainer, valve spring and seal.

To Replace

7. Fit the seal to the valve stem, with the open end to the cylinder head, followed by the valve spring and retainer.
8. Compress the valve spring using Tool No. 6118A as before. Locate the split collets in the valve stem collet grooves and slowly release the spring compressor to engage the collets in the retainer tapers. Remove the lever, from the spark plug hole.
9. Refit the push rods and rocker shaft, see Operation No. 6450-A2 sub-operations 3 and 4.
10. Adjust the valve clearances, see Operation No. 6450-A1.
11. Refit the sparking plug.
12. Refit the rocker cover, see Operation No. 6450-A sub-operations 7 to 12.

OP 6513-A1 EXTRA: EACH ADDITIONAL VALVE SPRING AND/OR STEM SEAL – RENEW

1. Remove the spark plug and turn the engine as necessary and renew each additional valve spring and/or seal, see Operation No. 6513-A sub-operations 5 to 8.

OP 6600-A OIL PUMP ASSEMBLY – REMOVE AND INSTALL

To Remove

1. With the handbrake applied, jack up the front of the car and fit stands.
2. Remove the oil pump and filter assembly.

To Install

3. Locate a new gasket on the oil pump mounting flange and fit the oil pump and filter assembly to the cylinder block and tighten the bolts.
4. Jack up the car, remove the stands and lower the car to the ground.

OP 6600-A1 EXTRA: OIL PUMP – OVERHAUL

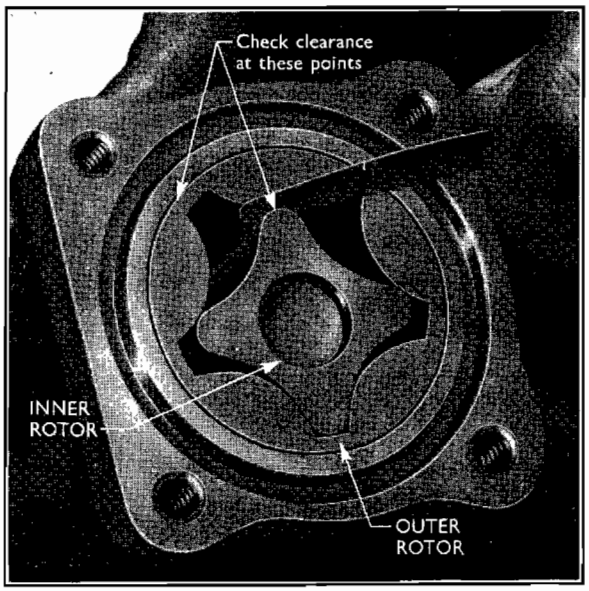
(a) **The Eccentric Bi-Rotor Type**

To Dismantle

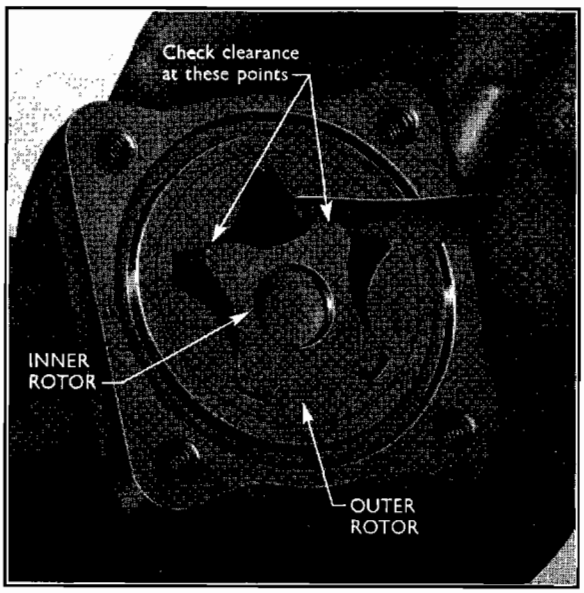
1. Remove the filter body and element and extract the sealing ring from the groove.
2. Remove the end plate and withdraw the rubber 'O' ring from the groove in the pump body.
3. Check the clearance between the lobes of the inner and outer rotors. This should not exceed 0.15 mm. (0.006 in.). The rotors are supplied as a matched pair only so that if clearance is excessive a new rotor must be fitted.
4. Check the clearance between the outer rotor and the housing, this should not exceed 0.19 mm. (0.0075 in.). If clearance between the outer rotor and pump body is excessive a new rotor assembly and/or pump body should be fitted.
5. Place a straight edge across the face of the pump body and check the clearance between the face of the rotors and the straight edge. This should not exceed 0.13 mm. (0.005 in.). If this clearance is excessive the face of the pump body can be carefully lapped on a flat surface.
6. If it is necessary to renew the rotor or drive shaft, remove the outer rotor, then drive out the retaining pin securing the skew gear to the drive shaft and pull off the gear.
7. Withdraw the inner rotor and drive shaft.

To Reassemble

8. If the pump has been completely dismantled, fit the inner rotor and drive shaft assembly to the pump body. Press the skew gear onto the drive shaft, supporting the shaft, at the rotor end, on a suitable spacer, until the far end of the gear teeth is 56.9 mm (2.24 in.).



Checking Rotor Clearances (a)



Checking Rotor Clearances (b)

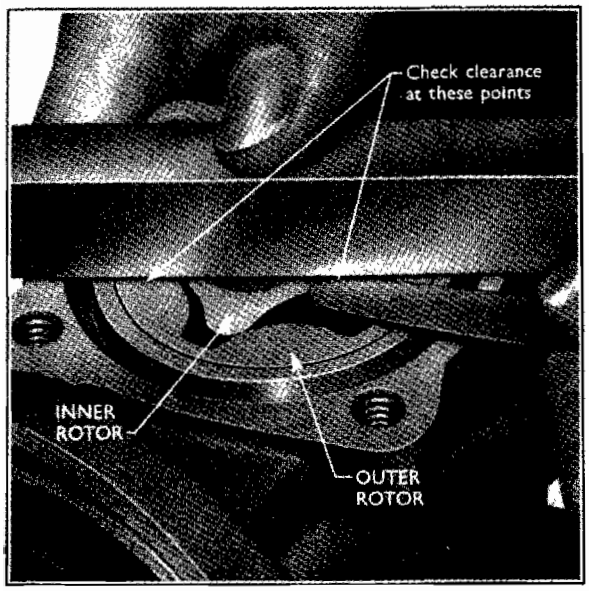
from the mounting flange. Drill a 3.0 mm. (0.12 in.) hole at right angles to the shaft through the gear shoulder 33.0 mm. (1.3 in.) from the mounting flange. Fit a new gear retaining pin and peen over the ends securely.

9. Install the outer rotor with its chamfered face inwards, towards the pump body.
10. Place the rubber 'O' ring in the groove in the pump body.
11. Fit the end plate with the machined face towards the rotors.
12. Locate a new filter body sealing ring in the groove and fit the filter assembly to the oil pump. Fit a new aluminium washer to the centre bolt and tighten to 1.66 to 2.07 kg.m. (12 to 15 lb. ft).

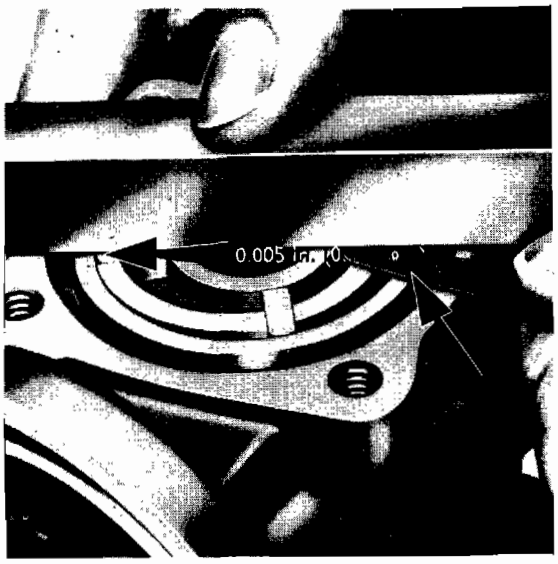
(b) Vane Type

To Dismantle

1. Remove the filter body and element and extract the sealing ring from the groove.
2. Remove the end plate, keeping the pump shaft vertical. Withdraw the 'O' ring from the groove in the pump body.
3. Place a straight edge across the face of the pump body and check the clearance between the face of the vanes and rotor assembly and the straight edge. This should not exceed 0.13 mm. (0.005 in.). Should the clearance be greater than this the face of the pump body can be carefully lapped on a flat surface.
4. Turn the oil pump until one of the vanes is in the centre of the cam form. Check the clearance between the rotor and the oil pump body at the closest points. If this exceeds 0.13 mm. (0.005 in.) a worn body is indicated and a new oil pump assembly should be fitted.
5. With the rotor in the same position centralise the locating ring and check the clearance between the diametrically opposite vane and the pump body. If the clearance exceeds 0.25 mm. (0.010 in.) the vanes are worn and should be renewed.
6. Check the vane clearance in the locating grooves, if this exceeds 0.13 mm (0.005 in.) the vans and/or a rotor are worn. Substitute new vanes and recheck the clearance to see if the rotor grooves are worn. If the rotor is worn fit a new rotor and shaft assembly.



Checking Rotor End Clearances



Checking the Vane and Rotor End-float

7. If it is necessary to renew the rotor or drive shaft, lift out the vanes and the outer locating ring. Drive out the retaining pin securing the skew gear to the drive shaft and pull off the gear.
8. Remove the drive shaft and rotor assembly together with the vane locating inner ring from the pump housing.

To Reassemble

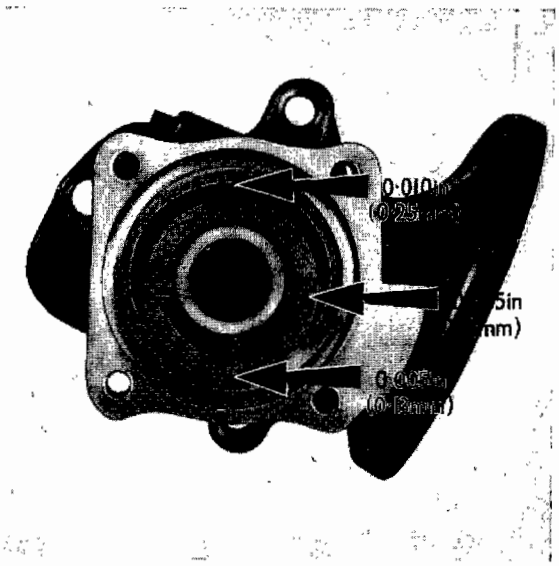
9. If the pump has been completely dismantled, place the vane locating inner ring in the pump housing and fit the drive shaft and rotor assembly to the pump body. Press the skew gear onto the drive shaft, supporting the shaft, at the rotor end, on a suitable spacer, until the far end of the gear teeth is 56.9 mm. (2.24 in.) from the mounting flange. Drill a 3.0 mm. (0.12 in.) hole at right angles to the shaft through the gear shoulder 33.0 mm. (1.3 in.) from the mounting flange. Fit a new gear retaining pin and peen the ends over securely.
10. Replace the vane locating outer ring and locate the sliding vanes in the rotor grooves with the curved edges outwards.
11. Place the rubber 'O' ring in the groove in the pump body and fit the end plate with the machined face towards the rotor.
12. Locate a new filter body sealing ring in the groove and fit the filter assembly to the oil pump. Fit a new aluminium washer to the centre bolt and tighten to 1.66 to 2.07 kg.m. (12 to 15 lb.ft.).

OP 6600-B OIL PUMP – OVERHAUL
(Includes 6600-A and A1)

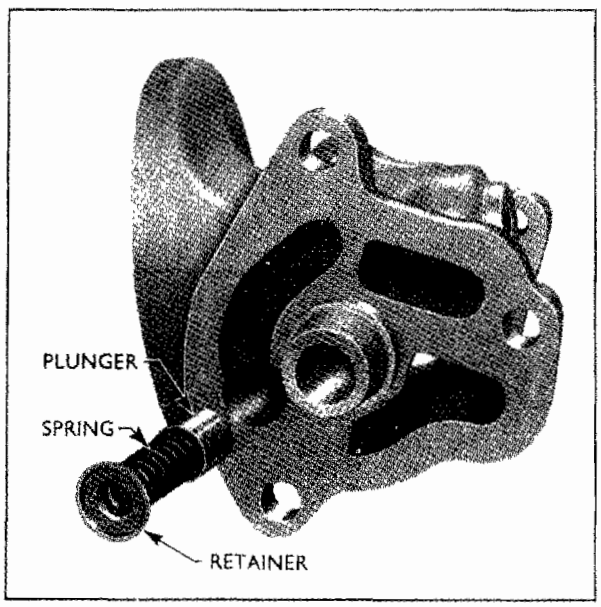
OP 6675-A SUMP AND/OR GASKET – REPLACE

To Remove

1. Raise the bonnet and fit wing covers.
2. Drain the engine oil.
3. Disconnect the battery.
4. With the handbrake applied, jack up the front of the car and fit stands.
5. Position a jack under the gearbox.



Checking the Vane and Rotor Clearances



The Oil Pump Relief Valve

6. Remove the engine front mounting bolts.
7. Remove the starter motor.
8. Remove the sump and gasket.
9. Clean the sump and cylinder block faces and remove the cork packing strips.

To **Install**

10. Fit new gaskets on the block flange, using ESEE-M4G-1008A jointing compound at each end. Fit the cork packing strips, with the chamfered ends into the grooves, again using ESEE-M4G-1008A jointing compound. Refit the sump and tighten the bolts evenly.
11. Clean and replace the starter motor.
12. Replace the engine front mounting bolts and remove the jack.
13. Jack up the car, remove the stands and lower the car to the ground.
14. Reconnect the battery.
15. Refill the sump with the correct grade engine oil.
16. Run up the engine, check for oil leaks, check the oil level and top-up if necessary.
17. Remove the wing covers and close the bonnet.

OP 6675-A1 EXTRA: TIMING CHAIN TENSIONER – REMOVE AND INSTALL

To **Remove**

1. Remove the timing chain tensioner and tensioner arm.

To **Install**

2. Locate the tensioner arm on the pivot pin and fit the tensioner, tighten the bolts.

OP 6675-A3 EXTRA: ALL MAIN BEARING CLEARANCES – CHECK (WITH SUMP REMOVED)

See Operation No. 6000-C13, but support the crankshaft, witha jack adjacent to the bearing being measured, to transfer the clearance to the bottom of the journal.

OP 6675-A4 EXTRA: ALL MAIN BEARING LINERS AND/OR THRUST WASHERS – REMOVE AND INSTALL (with sump removed)

See Operation No. 6000-C14.

OP 6675-A5 EXTRA: ALL MAIN BEARING LINERS AND THRUST WASHERS – CHECK CLEARANCES AND RENEW (with sump removed)

See Operation No. 6000-C15, but support the crankshaft, with a jack adjacent to the bearing being measured, to transfer the clearance to the bottom of the journal.

OP 6675-A6 EXTRA: ALL CONNECTING ROD LINERS – REMOVE AND INSTALL (with sump removed)

See Operation No. 6000-C12.

OP 6675-A7 EXTRA: ONE PISTON, CONNECTING ROD AND RINGS ASSEMBLY – REMOVE AND INSTALL
(Includes remove and install cylinder head. Does not include any dismantling of piston, connecting rod and rings assembly)

Tools Required

38 U 3	Piston ring squeezer
PT.4063	Cylinder head gasket locating studs

To Remove

1. Remove the cylinder head, see Operation No. 6051-A sub-sections 1 to 14.
2. Unscrew the big end bolts several turns and tap them to release the cap. Completely unscrew the bolts and remove the big end cap. Push the piston out of the bore and withdraw the assembly.

To Replace

3. Position the oil control ring gap to the rear and the top and second compression ring gaps at 180° and 90° to this. Compress the rings using Tool No. 38 U 3 and push the piston into its cylinder bore with the arrow on the crown pointing towards the front of the engine.
4. Turn the crankshaft as necessary to fit the connecting rod big end to the crank pin. Tighten the connecting rod bolts to a torque of 2.76 to 3.45 kg.m. (20 to 25 lb. ft.).
5. Refit the cylinder head, see Operation No. 6051-A sub-sections 15 to 30.

OP 6675-A8 EXTRA: EACH ADDITIONAL PISTON, CONNECTING ROD AND RINGS ASSEMBLY – REMOVE AND INSTALL
(with cylinder head removed)

1. Remove and install each additional piston, connecting rod and ring assembly, see Operation No. 6675-A7 sub-sections 2 to 4.

OP 6675-A9 EXTRA: EACH SET OF PISTON RINGS – RENEW
(with piston, connecting rod and rings assembly removed)
(Includes checking ring gaps and cleaning ring grooves)

Tools Required

Piston ring groove cleaner

1. Remove the piston rings.
2. Clean the ring grooves in the piston with a proprietary ring groove cleaner.
3. Locate the piston rings in the unworn portion of the cylinder bore and check the ring gaps, which should be between 0.23 to 0.36 mm. (0.009 to 0.014 in.).
4. Fit the piston rings, fitting the oil control ring first, followed by the lower and then the upper compression rings. Ensure that the compression rings are fitted the correct way up.
5. Check piston ring to groove clearances which should be as follows:–

Upper compression ring Lower compression ring	... ...	0.041 to 0.091 mm. (0.0016 to 0.0036 in.)
Oil control ring		0.046 to 0.097 mm. (0.0018 to 0.0038 in.)

OP 6675-A10 EXTRA: EACH PISTON, PIN AND RINGS ASSEMBLY – RENEW
(with piston, connecting rod and rings assembly removed)
(Includes check piston fit with pull gauge, checking ring gaps and fitting rings to piston)

Tools Required

512	Piston pull scale

1. Extract the two piston pin circlips and push the pin out of the piston. Separate the piston and connecting rod.

2. Select pistons for the individual bores. Each piston should be fitted to its individual cylinder bore by direct measurement.

   NOTE—The cylinder bores are measured at a point 8.9 cm. (3.5 in.) on the 997 cc. engine, 3.96 cm. (1.56 in.) on the 1198 cc. engine, from the top face of the cylinder block across the axis of the crankshaft. Grade numbers are stamped in accordance with the sizes at the end of the engine section. Pistons are also graded and stamped on the crown with the appropriate grade number.

   Pistons of the correct grade number are fitted to the appropriate bore. This gives the specified clearance of 0.0127 to 0.0275 mm. (0.0005 in. to 0.0011 in.) on the 997 cc. engine, or 0.0203 to 0.0356 mm. (0.0008 in. to 0.0014 in.) on the 1198 cc. engine, when measured at the bottom of the skirt on the thrust axis, (997 cc. engine) or at the grading plane, which is 1.8796 cm. (0.74 in.) from the bottom of the piston on the major axis, on the 1198 cc. engine.

3. Piston Fit. Pistons (rings not fitted) are to be fitted to cylinder bores so that when a steel feeler blade 12.7 mm. (0.5 in.) wide and 0.038 (0.0015 in.) thick is inserted between the piston, (at right angles to the axis of the piston pin) and the cylinder wall, a pull of 1.36 to 3.18 kg. (3 to 7 lbs.) is required to remove the blade.

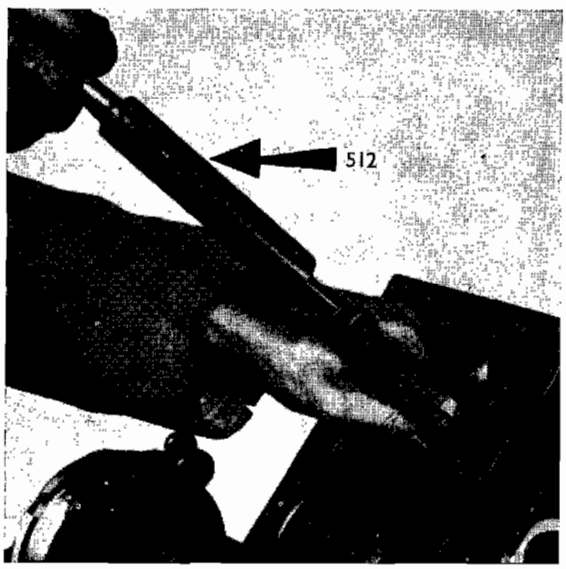
   The feeler must project, inside the bore, farther than the piston.

   (i) Insert the 0.038 mm. (0.0015 in.) feeler blade (supplied with the pull scale, Tool No. 512), together with the piston, into the bore in which it is to operate, positioning the blade at right angles to the centre line of the piston pin. Holding the piston as shown, apply a steady pull to the piston scale, observing the poundage required to remove the feeler blade.

   (ii) Select a piston for each bore to give a pull of between 1.36 to 3.18 kg. (3 and 7 lbs.).

   Locate the piston compression and oil control rings in the unworn portion of the cylinder bore and check the ring gaps, which should be between 0.229 to 0.356 mm. (0.009 to 0.014 in.).

Top compression ring Lower compression ring	0.0406 to 0.0914 mm. (0.0016 to 0.0036 in.)
Oil control ring	0.0457 to 0.0965 mm. (0.0018 to 0.0038 in.)



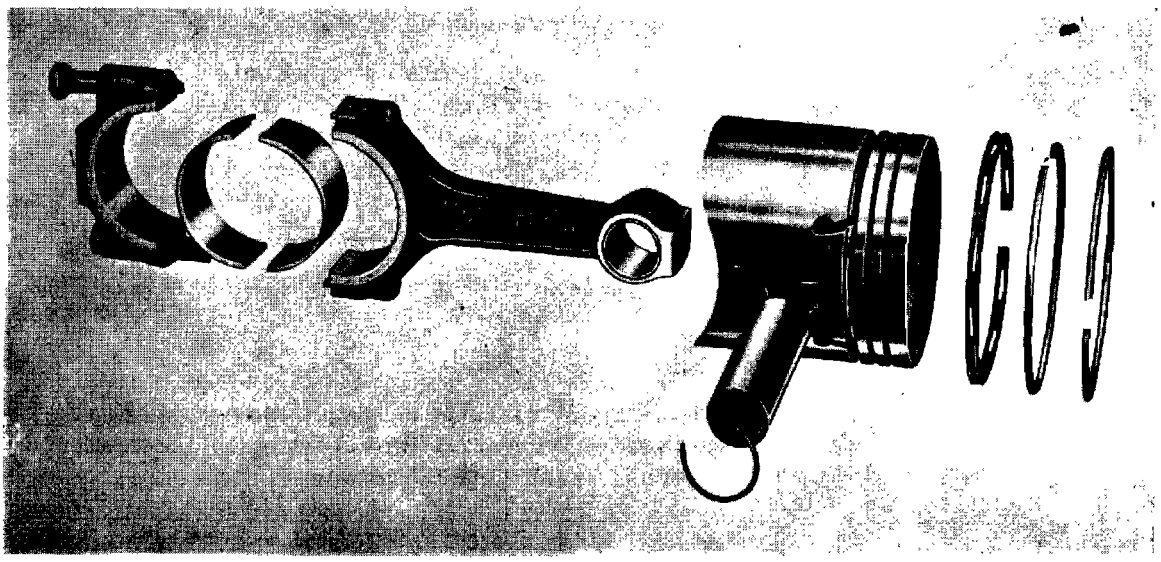
Checking a Piston with a Pull Scale

Fit a circlip in position in one of the piston pin bosses and locate the connecting rod in the piston with the marking FRONT on the connecting rod on the same side of the assembly as the arrow mark in the piston crown. Heat the piston in water or oil and slide the piston pin through the pin bosses and connecting rod small end until it abuts the circlip already fitted. Fit the second circlip.

Assemble the piston rings, noting that the compression rings are marked TOP and that the upper compression ring is chromium plated. Space the ring gaps at 120°.

OP 6675-A11 EXTRA: EACH CONNECTING ROD AND/OR PISTON PIN – RENEW
(with piston connecting rod and rings assembly removed)
(Includes measuring size of piston pin)

1. Extract the two piston pin circlips and push the pin out of the piston. Separate the piston and connecting rod.
2. Select a new connecting rod to maintain the correct assembly weight or, alternatively select a new piston pin to give the correct fit in the piston and small end.
3. Assemble the piston to the connecting rod. Ensure that the "FRONT" marking on the connecting rod is on the same side of the assembly as the arrow in the piston crown. Heat the piston in water or oil prior to inserting the piston pin. Retain the piston pin with the circlips.



Connecting Road and Piston Assembly

OP 6675-B TIMING CHAIN TENSIONER – REMOVE AND INSTALL
(Includes 6675-A and A1)

OP 6675-C MAIN BEARING CLEARANCES – ALL – CHECK
(Includes 6675-A, A1 and A3)

OP 6675-D MAIN BEARING LINERS – ALL – RENEW
(Includes 6675-A, A1 and A4)

OP 6675E MAIN BEARING LINERS – ALL – CHECK AND RENEW
(Includes 6675-A, A1 and A5)

OP 6675-F CONNECTING ROD LINERS – ALL – RENEW
(Includes 6675-A, A1 and A6)

OP 6675-G PISTON RINGS – ONE PISTON – REMOVE AND INSTALL
(Includes 6675-A and A9)

OP 6675-H PISTON RINGS – ALL – REMOVE AND INSTALL
(Includes 6675-A, A7, A8 and A9)

OP 6675-I PISTON – ONE – REMOVE AND INSTALL
(Includes 6675-A, A7 and A10)

OP 6675-J PISTONS – ALL – REMOVE AND INSTALL
(Includes 6675-A, A7, A8 and A10)

OP 6675-K CONNECTING ROD AND/OR PISTON PIN – ONE – REMOVE AND INSTALL
(Includes 6675-A, A7 and A11)

OP 6675-L CONNECTING RODS AND PISTON PINS – ALL – REMOVE AND INSTALL
(Includes 6675-A, A7, A8 and A11)

OP 6675-M SUMP BOLTS – TORQUE
(Includes removing and installing any components necessary to gain access to all the sump bolts)

1. Open the bonnet and fit wing covers.
2. Jack up the car and fit stands.
3. Tighten the sump bolts to a torque of 0.83 to 1.11 kg.m. (6 to 8 lb. ft.).
4. Remove the stands and lower the car.
5. Remove the wing covers and lower the bonnet.

OP 6731-A OIL FILTER ELEMENT – RENEW
(Does not include change engine oil)

1. Unscrew the securing bolt and withdraw the filter body and element.
2. Remove the sealing ring from the groove in the filter body mounting flange and the washer from the securing bolt.
3. Thoroughly clean the filter body.
4. Insert the new element into the body and fit the sealing ring, supplied with the element, to the groove in the filter body mounting flange.

   NOTE—Do not fit the ring at one point and then work it round the groove, as the rubber may stretch, thus leaving a surplus which may cause an oil leak.
5. Refit the filter assembly to the oil pump body and tighten the securing bolt.

OP 6731-B OIL FILTER ELEMENT AND ENGINE OIL – RENEW

1. Remove the sump plug and drain the engine oil while it is hot.
2. Renew the oil filter, see Operation No. 6731-A.
3. Refit the sump drain plug and tighten.
4. Refill the sump with an approved grade of engine oil.

OP 6900-A OIL PRESSURE SWITCH OR GAUGE SENDER UNIT – REMOVE AND INSTALL

To Remove

1. Raise the bonnet and fit wing covers.
2. Disconnect the lead.
3. Unscrew the switch or sender unit.

To Install

4. Refit the switch or sender unit.
5. Connect the lead.
6. Remove the wing covers and lower the bonnet.

OP 6900-A1 EXTRA: OIL PRESSURE – CHECK
(with switch or sender unit removed)

Tools Required

500 X Gang Gauge

1. Remove the switch or sender unit, see Operation No. 6900-A sub-operation 1 to 3.
2. Connect a suitable gauge, such as gang gauge Tool No. 500 X, to the oil pressure tapping.
3. Start engine and increase speed to record maximum pressure. If necessary warm up engine before taking final reading.
4. Remove the gauge after stopping the engine.
5. Refit the switch or sender unit, see Operation No. 6900-A sub-operations 4 to 6.

OP 6900-B TEMPERATURE GAUGE OR WARNING LIGHT SENDER UNIT – REMOVE AND INSTALL

To Remove

1. Raise the bonnet and fit wing covers.
2. Disconnect the lead.
3. Ensure that the radiator filler cap is secure and remove the sender unit.

To Install

4. Install the sender unit and top-up the radiator if any coolant has been lost.
5. Reconnect the lead.
6. Remove the wing covers and close the bonnet.

SPECIFICATIONS, SERVICING AND REPAIR DATA FOR THE 997 cc ENGINE

General

Type	4 cylinder-in-line-O.H.V.
Bore	8.096 cm. (3.1875 in.)
Stroke	4.841 cm. (1.906 in.)
Cubic capacity	996.6 c.c. (60.84 cu. in.)
Compression ratio	8.9 : 1 Standard 7.5 : 1 Optional
Maximum brake horse-power	39 at 5,000 r.p.m. (8.9 c.r.) 37 at 5,000 r.p.m. (7.5 c.r.)
Maximum torque	52.5 at 2,700 r.p.m. (8.9 c.r.) 50.0 at 2,700 r.p.m. (7.5 c.r.)
Firing order	1, 2, 4, 3
Location of No. 1 cylinder	Next to radiator
Engine mounting	3 point suspension on rubber mountings

Camshaft

Material	Special Ford cast alloy iron
Bearings	Steel backed babbit liners
Journal diameter	3.692 cm. (1.56 in.)
Bearing length—Front	20.07 mm. (0.79 in.)
Centre	17.27 mm. (0.68 in.)
Rear	20.07 mm. (0.79 in.)
Camshaft end-float	0.051 to 0.178 mm. (0.002 to 0.007 in.)
Camshaft thrust plate thickness	4.47 to 4.52 mm. (0.176 to 0.178 in.)
Camshaft drive	Single roller chain, with tensioner
Camshaft sprocket	Located by offset dowel and two bolts

Connecting Rods

Length between centres	11.712 to 11.714 cm. (4.611 to 4.612 in.)
Big end bearings	Steel backed copper lead or lead bronze, with 0.025 mm. (0.001 in.) lead overlay
Crankpin to bearing clearance	0.0127 to 0.057 mm. (0.0005 to 0.0022 in.)
Bearing length	22.35 mm. (0.875 in.)
Small end	Bronze bush, steel backed
Diameter	20.62 mm. (0.812 in.)

Piston pin to small end clearance 0.0025 to 0.0076 mm. (0.0001 to 0.0003 in.) (selective)

Crankshaft

Main bearings	White metal steel backed liners
Main bearing clearance	0.0127 to 0.051 mm. (0.0005 to 0.002 in.)
Bearing length	2.54 cm. (1.00 in.)
End-float	0.076 to 0.279 mm. (0.003 to 0.011 in.)

Cylinder Block

Type	Cylinders cast integral with top half of crankcase
Water jackets	Full length

Cylinder Head

Type	Cast iron with vertical valves. Separate inlet and exhaust ports
Combustion chamber	Fully machined

Flywheel Ring Gear

Type	Shrunk on
Number of teeth	110

Lubrication

Type	Pressure feed
Pressure fed bearings	Main, camshaft and connecting rod. Reduced pressure to rocker shaft
Piston pin and cylinder wall lubrication	Splash, with squirt holes in connecting rods
Timing chain lubrication	Controlled spray
Oil filter	Full flow incorporated with oil pump
Crankcase ventilation	Directed flow via road draught tube on right-hand side of engine

Grade of oil:

Summer or winter	S.A.E. 20 or 20W
From 32°F. to −10°F.	S.A.E. 10W
Below −10°F.	S.A.E. 10W + 10% kerosene or S.A.E. 5W
Sump capacity	2.27 litres (4 pints)
Filter capacity	0.284 litre (0.5 pint)
Oil pump type	Eccentric bi-rotor
Oil pump relief pressure	2.46 to 2.81 kg./sq. cm. (35 to 40 lbs./sq. in.)
Oil pressure warning light operates at	0.391 to 0.492 kg./sq. cm. (5 to 7 lbs./sq. in.)
Oil pump capacity	9.09 litres per min. at 2,000 r.p.m. (2 galls.)

Pistons

Type	Autothermic aluminium alloy
Number of rings	Two compression, one oil control
Ring gap	0.229 to 0.356 mm. (0.009 to 0.014 in.)
Ring to wall pressure	2.900 to 3.765 kg. (6.4 to 8.3 lbs.) upper compression 2.272 to 3.629 kg. (6.00 to 8.00 lbs.) lower compression 2.427 to 3.130 kg. (5.35 to 6.90 lbs.) oil control

Piston grades :	Standard Bore	0.762 mm. (0.030 in.) Oversize Bore
Grade 1	80.925 to 80.932 mm. (3.1861 to 3.1864 in.)	81.685 to 81.692 mm. (3.2161 to 3.2164 in.)
Grade 2	80.932 to 80.940 mm. (3.1864 to 3.1867 in.)	81.692 to 81.700 mm. (3.2164 to 3.2167 in.)
Grade 3	80.940 to 80.948 mm. (3.1867 to 3.1870 in.)	81.700 to 81.708 mm. (3.2167 to 3.2170 in.)
Grade 4	80.948 to 80.956 mm. (3.1870 to 3.1873 in.)	81.708 to 81.716 mm. (3.2170 to 3.2173 in.)
Piston fit	3.63 to 4.99 kg. (8 to 11 lbs.) pull on 0.038 mm. (0.0015 in.) feeler blade, 12.7 mm. (0.5 in.) wide	

Valves

Head diameter	3.205 to 3.231 cm. (1.262 to 1.272 in.)	inlet
	3.004 to 3.030 cm. (1.183 to 1.193 in.)	exhaust
Stem diameter	7.861 to 7.882 mm. (0.3095 to 0.3105 in.)	inlet
	7.838 to 7.864 mm. (0.3086 to 0.3096 in.)	exhaust
Stem to guide clearance	0.021 to 0.076 mm. (0.0008 to 0.003 in.)	inlet
	0.043 to 0.099 mm. (0.0017 to 0.0039 in.)	exhaust
Valve lift	7.347 mm. (0.2893 in.)	inlet
	7.380 mm. (0.2904 in.)	exhaust
Valve seat angle (cylinder head and valve)	45° inlet and exhaust	
Valve clearance (normal operating temperature)	0.254 mm. (0.010 in.)	inlet
	0.432 mm. (0.017 in.)	exhaust
Valve clearance (cold)	0.203 mm. (0.008 in.)	inlet
	0.457 mm. (0.018 in.)	exhaust
Valve springs—free length	4.57 cm. (1.48 in.)	
Spring load at fitted length	20.41 kg. (45 lbs.)	

Valve timing (at valve clearance of 0.381 mm. (.015 in.) inlet and 0.686 mm. (.027 in.) exhaust, cold)

Inlet opens	10° B.T.D.C.
Inlet closes	50° A.B.D.C.
Exhaust opens	44° B.B.D.C.
Exhaust closes	10° A.T.D.C.

Valve Seat Inserts

Insert	Valve	I.D. of Recess in Head	Depth of Recess in Head
Standard	Inlet	36.055/36.068 mm. (1.4195/1.4200 in.)	0.7239/0.7266 mm. (0.2175/0.2225 in.)
	Exhaust	32.207/32.220 mm. (1.2680/1.2685 in.)	0.7239/0.7266 mm. (0.2175/0.2225 in.)
0.254 mm. (0.010 in.) o/s dia. std. depth	Inlet	36.309/36.322 mm. (1.4295/1.4300 in.)	0.7239/0.7266 mm. (0.2175/0.2225 in.)
	Exhaust	32.461/32.474 mm. (1.2780/1.2785 in.)	0.7239/0.7266 mm. (0.2175/0.2225 in.)
0.254 mm. (0.010 in.) o/s dia. and depth	Inlet	36.309/36.322 mm. (1.4295/1.4300 in.)	0.7393/0.7520 mm. (0.2275/0.2325 in.)
	Exhaust	32.461/32.474 mm. (1.2780/1.2785 in.)	0.7393/0.7520 mm. (0.2275/0.2325 in.)
0.508 mm. (0.020 in.) o/s dia. std. depth	Inlet	36.563/36.576 mm. (1.4395/1.4400 in.)	0.7293/0.7266 mm. (0.2175/0.2225 in.)
	Exhaust	32.715/32.728 mm. (1.2880/1.2885 in.)	0.7293/0.7266 mm. (0.2175/0.2225 in.)
0.508 mm. (0.020 in.) o/s dia. and depth	Inlet	36.563/36.576 mm. (1.4395/1.4400 in.)	0.7647/0.7774 mm. (0.2375/0.2425 in.)
	Exhaust	32.715/32.728 mm. (1.2880/1.2885 in.)	0.7647/0.7774 mm. (0.2375/0.2425 in.)

Bolt Tightening Torques

Cylinder Head	8.987 to 9.679 kg.m. (65 to 70 lbs. ft.)
Main Bearings	7.604 to 8.295 kg.m. (55 to 60 lbs. ft.)
Big End Bearings	2.765 to 3.456 kg.m. (20 to 25 lbs. ft.)
Flywheel	6.221 to 6.913 kg.m. (45 to 50 lbs. ft.)
Manifold nuts/bolts	1.66 to 2.67 kg.m. (12 to 15 lbs. ft.)
Timing chain cover	0.69 to 0.97 kg.m. (5 to 7 lbs. ft.)
Camshaft sprocket	1.66 to 2.07 kg.m. (12 to 15 lbs. ft.)
Camshaft thrust plate	0.35 to 0.48 kg.m. (2.5 to 3.5 lbs. ft.)
Clutch pressure plate	1.66 to 2.07 kg.m. (12 to 15 lbs. ft.)
Rocker shaft bolts	2.35 to 3.04 kg.m. (17 to 22 lbs. ft.)
Sump bolts	0.83 to 1.11 kg.m. (6 to 8 lbs. ft.)

SPECIFICATIONS, SERVICING AND REPAIR DATA FOR THE 1198 cc ENGINE

General

Type	4 cylinder-in-line O.H.V.
Bore	80.96 mm. (3.1875 in.)
Stroke	58.17 mm. (2.29 in.)
Cubic capacity	1,197.8 cc. (73.09 cu. in.)
Compression ratio	8.7 : 1 Standard 7.3 : 1 Optional
Maximum brake horsepower	48.5 at 4,800 r.p.m. (8.7 : 1) 46 at 4,800 r.p.m. (7.3 : 1)
Maximum torque	8.710 kg.m. (63 lb. ft.) at 2,700 r.p.m. (8.7 : 1) 8.295 kg.m. (60 lb. ft.) at 2.700 r.p.m. (7.3 : 1)
Firing order	1, 2, 4, 3
Location of No. 1 cylinder	Next to radiator
Engine mounting	3-point suspension on shear type bonded rubber mounting
Compression pressures	12.3 kg/sq. cm. (175 lb/sq. in.) at 400 r.p.m.

Camshaft

Material	Special Ford cast iron alloy
Bearings	Steel shell, babbitt-faced
Journal diameter	3.962 to 3.963 cm. (1.5600 to 1.5605 in.)
Bearing—inside diameter	3.966 to 3.967 cm. (1.5615 to 1.5620 in.)
Bearing length—Front	1.90 cm. (0.75 in.)
—Centre	1.63 cm. (0.64 in.)
—Rear	1.90 cm. (0.75 in.)
Bearing clearance	0.025 to 0.051 mm. (0.001 to 0.002 in.)
End-float	0.051 to 0.178 mm. (0.002 to 0.007 in.)
Thrust plate thickness	4.47 to 4.52 mm. (0.176 to 0.178 in.)
Drive	Single roller chain, with tensioner
Sprocket location	Offset dowel and two bolts
Maximum cam lift—Inlet	0.535 cm. (0.2108 in.)
—Exhaust	0.5523 cm. (0.2176 in.)
Cam heel to toe dimension—Inlet	19.581 mm. (0.77082 in.)
—Exhaust	19.494 mm. (0.76762 in.)

Connecting Rods

Type	" H " section
Length between centres	11.22 to 11.23 cm. (4.419 to 4.421 in.)
Big end bearings	Sintered copper/lead or lead/bronze, steel backed with 0.025 mm. (0.001 in.) thick lead overlay
Big end bore (housing)	5.2908 to 5.2894 cm. (2.0830 to 2.0825 in.)
Big end bearing inside diameter	4.9223 to 4.9256 cm. (1.9380 to 1.9392 in.)
Crankpin to bearing clearance	0.0127 to 0.056 mm. (0.0005 to 0.00022 in.)
Effective bearing length	2.11 to 2.21 cm. (0.83 to 0.87 in.)
Small end bush	Steel backed bronze
Small end bush inside diameter	2.0626 to 2.0629 cm. (0.8122 to 0.8125 in.)
Piston pin to small end clearance	0.0025 to 0.0076 mm. (0.0001 to 0.0003 in.) selective
End-float on crankpin	0.102 to 0.254 mm. (0.004 to 0.010 in.)

Crankshaft and Main Bearings

Crankpin journal length	2.698 to 2.708 cm. (1.062 to 1.066 in.)
Main journal length—Front	3.096 to 3.047 cm. (1.219 to 1.239 in.)
—Centre	3.168 to 3.173 cm. (1.247 to 1.249 in.)
—Rear	3.450 to 3.474 cm. (1.358 to 1.368 in.)
Crankpin journal diameter	4.9200 to 4.9213 cm. (1.9370 to 1.9375 in.)
Main bearing journal diameter	5.3988 to 5.4000 cm. (2.1255 to 2.1260 in.)
Regrind diameters	0.254 mm. (0.010 in.), 0.508 mm. (0.020 in.), 0.762 mm. (0.030 in.) undersize
Block bore for bearing liners	5.768 to 5.77 cm. (2.2710 to 2.2715 in.)
Main bearing liner wall thickness	1.8259 to 1.8354 mm. (0.0719 to 0.0722 in.)
Main bearing clearance	0.0127 to 0.056 mm. (0.0005 to 0.0022 in.)
Crankshaft end-float	0.076 to 0.279 mm. (0.003 to 0.011 in.)
End-float thrust washer thickness	2.31 to 2.36 mm. (0.091 to 0.093 in.)
Overall length	98.26 cm. (19.505 in.)

Cylinder Block

Type	Cylinder cast integral with top half of crankcase
Water jackets	Full length
Lubrication	Pressure feed
Pressure fed bearings	Main, camshaft and connecting rods
Reduced pressure fed bearings	Rocker shaft
Piston pin and cylinder wall lubrication	Splash, with squirt holes in connecting rods
Timing chain	Controlled spray
Oil filter	Full flow, incorporated with oil pump
Crankcase ventilation	Oil filler cap and road draught tube

Cylinder Head

Type	Cast iron with vertical valves. Separate inlet and exhaust ports
Combustion chamber	" Bath Tub " type, fully machined

Flywheel and Ring Gear

Type	Ring gear shrunk on
Number of teeth on ring gear	110
Maximum run-out	0.152 mm. (0.006 in.)
Number of flywheel retaining bolts	4
Size	0.375 in. x 24 U N F
Clutch pilot bearing—Type	Sintered metal
—Inside diameter	1.7053 to 1.7084 cm. (0.6713 to 0.6725 in.)
—Outside diameter	3.9988 to 4.0013 cm. (1.5743 to 1.5753 in.)
—Length	1.257 to 1.283 cm. (0.495 to 0.505 in.)

Engine Dimensions

Length (fan to flywheel housing)	51.82 cm. (20.4 in.)
Height—Less air cleaner	58.93 cm. (23.2 in.)
—With air cleaner	66.8 cm. (26.3 in.)
Width (to clear)	44.7 cm. (17.6 in.)
Installation angle	2° 31'

Lubrication System

Grade of oil :

Temperature Range	S.A.E. Viscosity No.
Summer or Winter	20W
From 32°F. to—10°F.	10W
Below—10°F.	10W + 10% Kerosene or 5W if available
Sump capacity	2.27 litres (4 Imp. pints)
Oil pressure	2.46 to 2.81 kg. per sq. cm. (35 to 40 lb. sq. in.)
Oil filter capacity	0.284 litres (0.5 Imp. pints)
Oil pressure warning light operates at	0.352 to 0.492 kg. sq. cm. (5 to 7 lb. per sq. in.)
Oil filter type	Full flow

Oil Pump

Oil pump type	Vane or eccentric bi-rotor
Capacity	9.09 litres at 2000 r.p.m. (2.5 galls.)
Housing bore inside diameter	12.7 to 12.725 mm. (0.500 to 0.501 in.)
Oil pump shaft diameter	12.653 to 12.665 mm. (0.4980 to 0.4985 in.)
Shaft to body clearance	0.038 to 0.076 mm. (0.0015 to 0.003 in.)
Clearance between lobes of inner and outer rotors—maximum	0.152 mm. (0.006 in.)
Clearance between outer rotor and housing—maximum	0.254 mm. (0.010 in.)
Shaft end-float—maximum	0.127 mm. (0.005 in.)

Pistons

Type	Aluminium alloy
Number of rings	Two compression, one oil control
Width of ring grooves:	
Compression rings	2.022 to 2.047 mm. (0.0796 to 0.0806 in.)
Oil control ring	4.008 to 4.034 mm. (0.1578 to 0.1588 in.)
Piston pin—Offset	1.016 mm. (0.040 in.)
—Bore	2.0624 to 2.0631 cm. (0.8121 to 0.8124 in.)
—Diameter	2.0621 to 2.0629 cm. (0.8120 to 0.8123 in.)
Piston pin to piston clearance (selective)	0.000 to 0.0051 mm. (0.000 to 0.0002 in.)

Piston grades :	Standard Bore
Grade—1	8.0917 to 8.0925 cm. (3.1858 to 3.1861 in.)
—2	8.0925 to 8.0932 cm. (3.1861 to 3.1864 in.)
—3	8.0932 to 8.0940 cm. (3.1864 to 3.1867 in.)
—4	8.0940 to 8.0948 cm. (3.1867 to 3.1870 in.)
—5	8.0948 to 8.0956 cm. (3.1870 to 3.1873 in.)
—6	8.0956 to 8.0964 cm. (3.1873 to 3.1876 in.)

Piston grades :	0.762 mm. (0.030 in.) oversize
Grade—1	8.1677 to 8.1685 cm. (3.2158 to 3.2161 in.)
—2	8.1685 to 8.1692 cm. (3.2161 to 3.2164 in.)
3	8.1692 to 8.1700 cm. (3.2164 to 3.2167 in.)
—4	8.1700 to 8.1708 cm. (3.2167 to 3.2170 in.)
—5	8.1708 to 8.1716 cm. (3.2170 to 3.2173 in.)
—6	8.1716 to 8.1724 cm. (3.2173 to 3.2176 in.)

Piston fit ... 1.36 to 3.18 kg. (3 to 7 lb.) pull on 0.038 mm. (0.0015 in.) feeler blade, 12.7 mm. (0.5 in.) wide

(Grades 5 and 6 only supplied in service)

Piston Rings

Width—Compression	1.956 to 1.9811 mm. (0.077 to 0.078 in.)
—Oil control	3.937 to 3.962 mm. (0.155 to 0.156 in.)
Ring to groove clearance—Compression	0.041 to 0.091 mm. (0.0016 to 0.0036 in.)
—Oil control	0.046 to 0.097 mm. (0.0018 to 0.0038 in.)
Ring gap	0.229 to 0.356 mm. (0.009 to 0.014 in.)
Ring to wall pressure—Top compression	2.822 to 4.100 kg. (6.22 to 9.04 lb.)
—Lower compression	2.54 to 3.992 kg. (5.6 to 8.8 lb.)
—Oil control	2.43 to 3.13 kg. (5.35 to 6.90 lb.)

Tightening Torques

Cylinder head	8.987 to 9.679 kg.m. (65 to 70 lb. ft.)
Main bearings	7.604 to 8.295 kg.m. (55 to 60 lb. ft.)
Big end bearings	2.765 to 3.456 kg.m. (20 to 25 lb. ft.)
Flywheel	6.221 to 6.913 kg.m. (45 to 50 lb. ft.)
Manifold nuts/bolts	1.66 to 2.07 kg.m. (12 to 15 lb. ft.)
Timing chain cover	0.69 to 0.97 kg.m. (5 to 7 lb. ft.)
Camshaft sprocket	1.66 to 2.07 kg.m. (12 to 15 lb. ft.)
Camshaft thrust plate	0.35 to 0.48 kg.m. (2.5 to 3.5 lb. ft.)
Clutch pressure plate	1.66 to 2.07 kg.m. (12 to 15 lb. ft.)
Rocker shaft bolts	2.35 to 3.04 kg.m. (17 to 22 lb. ft.)
Sump	0.85 to 1.11 kg.m. (6 to 8 lb. ft.)

Valves

Head diameter ... ... 3.205 to 3.231 cm. (1.262 to 1.272 in.) inlet
3.004 to 3.030 cm. (1.183 to 1.193 in.) exhaust

Stem diameter ... ... 7.861 to 7.882 mm. (0.3095 to 0.3105 in.) inlet
7.838 to 7.864 mm. (0.3086 to 0.3096 in.) exhaust

Valve guide bore inside diameter
Inlet ... ... 7.903 to 7.934 mm. (0.3113 to 0.3125 in.)
Exhaust ... ... 7.903 to 7.934 mm. (0.3113 to 0.3125 in.)

Stem to guide clearance ... ... 0.020 to 0.076 mm. (0.0008 to 0.003 in.) inlet
0.043 to 0.099 mm. (0.0017 to 0.0039 in.) exhaust

Valve lift ... ... 8.00 mm. (0.315 in.) inlet
8.10 mm. (0.319 in.) exhaust

Valve seat angle (cylinder head and valve) ... ... 45° inlet and exhaust

Valve clearance (normal operating temperature) ... ... 0.254 mm. (0.010 in.) inlet
0.432 mm. (0.017 in.) exhaust

Valve clearance (cold) ... ... 0.203 mm. (0.008 in.) inlet
0.457 mm. (0.018 in.) exhaust

Valve springs—free length ... ... 4.57 cm. (1.48 in.)

Spring load at fitted length—valve closed ... 21.09 kgs. (46.5 lb.) at 32.08 mm. (1.263 in.)

Valve timing (at valve clearance of 0.381 mm. (0.015 in.) inlet and 0.686 mm. (0.027 in.) exhaust, cold)

Inlet opens ... ... 17° B.T.D.C.
Inlet closes ... ... 51° A.B.D.C.
Exhaust opens ... ... 51° B.B.D.C.
Exhaust closes ... ... 17° A.T.D.C.

Valve Seat Inserts

Insert	Valve	I.D. of Recess in Head	Depth of recess in head
Standard	Inlet Exhaust	36.055/36.068 mm. (1.4195/1.4200 in.) 32.207/32.220 mm. (1.2680/1.2685 in.)	5.521/5.654 mm. (0.2175/0.2225 in.) 5.521/5.654 mm. (0.2175/0.2225 in.)
0.254 mm. (0.010 in.) o/s dia. std depth	Inlet Exhaust	36.309/36.322 mm. (1.4295/1.4300 in.) 32.461/32.474 mm. (1.2780/1.2785 in.)	5.521/5.654 mm. (0.2175/0.2225 in.) 5.521/5.654 mm. (0.2175/0.2225 in.)
0.254 mm. (0.010 in.) o/s dia. and depth	Inlet Exhaust	36.309/36.322 mm. (1.4295/1.4300 in.) 32.461/32.474 mm. (1.2780/1.2785 in.)	5.781/5.904 mm. (0.2275/0.2325 in.) 5.781/5.904 mm. (0.2275/0.2325 in.)
0.508 mm. (0.020 in.) o/s dia. std. depth	Inlet Exhaust	36.563/36.576 mm. (1.4395/1.4400 in.) 32.715/32.728 mm. (1.2880/1.2885 in.)	5.521/5.654 mm. (0.2175/0.2225 in.) 5.521/5.654 mm. (0.2175/0.2225 in.)
0.508 mm. (0.020 in.) o/s dia. std. depth	Inlet Exhaust	36.563/36.576 mm. (1.4395/1.4400 in.) 32.715/32.728 mm. (1.2880/1.2885 in.)	6.031/6.164 mm. (0.2375/0.2425 in.) 6.031/6.164 mm. (0.2375/0.2425 in.)

7

CLUTCH & GEARBOX

SECTION INDEX

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"	7657-A1	Extra: extension housing bush – renew
"	7657-B	**EXTENSION HOUSING BUSH – RENEW** (Includes OPS 7657-A and A1)

GENERAL DESCRIPTION

CLUTCH

The clutch assembly fitted is of the single dry plate type of 18.32 cm. (7.25 in.) outside diameter. The clutch disc incorporates a spring-cushioned hub and the woven asbestos linings are flexibly mounted to ensure a smooth take up of the drive. The clutch disc hub is free to slide along the splines of the main drive gear, the forward end of which forms a spigot to fit into the clutch pilot bearing in the centre of the flywheel and crankshaft flange. The clutch cover, springs, clutch release mechanism and pressure plate are serviced as an assembly.

The clutch release mechanism is hydraulically actuated by a pendant pedal connected by a short push rod to the clutch master cylinder. A pipe line connects the clutch master cylinder with the clutch operating cylinder mounted on the clutch housing and retained by means of a circlip. This method of clutch operation eliminates the possibility of irregular clutch engagement due to relative movement between the clutch operating mechanism and the engine.

GEARBOX

The gearbox is of the constant mesh type having four forward gears and one reverse. 997 c.c. vehicles have synchromesh engagement on second, third and top gears, while on 1198 c.c. vehicles synchromesh engagement is provided on all forward gears. The constant mesh gears are helical to ensure silent operation.

The main drive gear and mainshaft are mounted on ball bearings, whilst the countershaft and mainshaft spigot are supported on needle rollers. On 997 c.c. vehicles the first gear, which is a spur gear, is also machined to form the second gear synchroniser; on 1198 c.c. vehicles the reverse mainshaft gear, which is the only spur gear on the mainshaft, is machined to form the first and second gear synchroniser sleeve.

The synchroniser assemblies are splined to the mainshaft, whilst the second and third gears, which are in constant mesh with the corresponding gears on the countershaft, rotate directly on the mainshaft on bronze bushes.

QUICK REFERENCE DATA

PERIODIC SERVICE ATTENTION

The clutch master cylinder fluid level should be checked at 8,000 km. (5,000 mile) service intervals.

Top-up to the correct level, approximately 12.7 mm. (0.5 in.) below the top face, with approved fluid, Part No. ME-3833-F. The cap and the area surrounding it should be wiped with a clean rag before removing the cap, to prevent dirt entering when it is removed.

Ensure that the air vent in the filler cap is clear before replacing the cap.

The master cylinder and operating cylinder hydraulic seals should be replaced at 64,000 km. (40,000 miles).

The gearbox filler plug screws into the side of the gearbox casing and the drain plug screws into the bottom.

At the first 1000 km. (500 miles) top-up the gearbox oil

At the first 8,000 km. (5,000 miles) drain the gearbox oil and refill with new oil of the correct grade; thereafter topping-up as required every 8,000 km. (5,000 miles).

DATA

Clutch

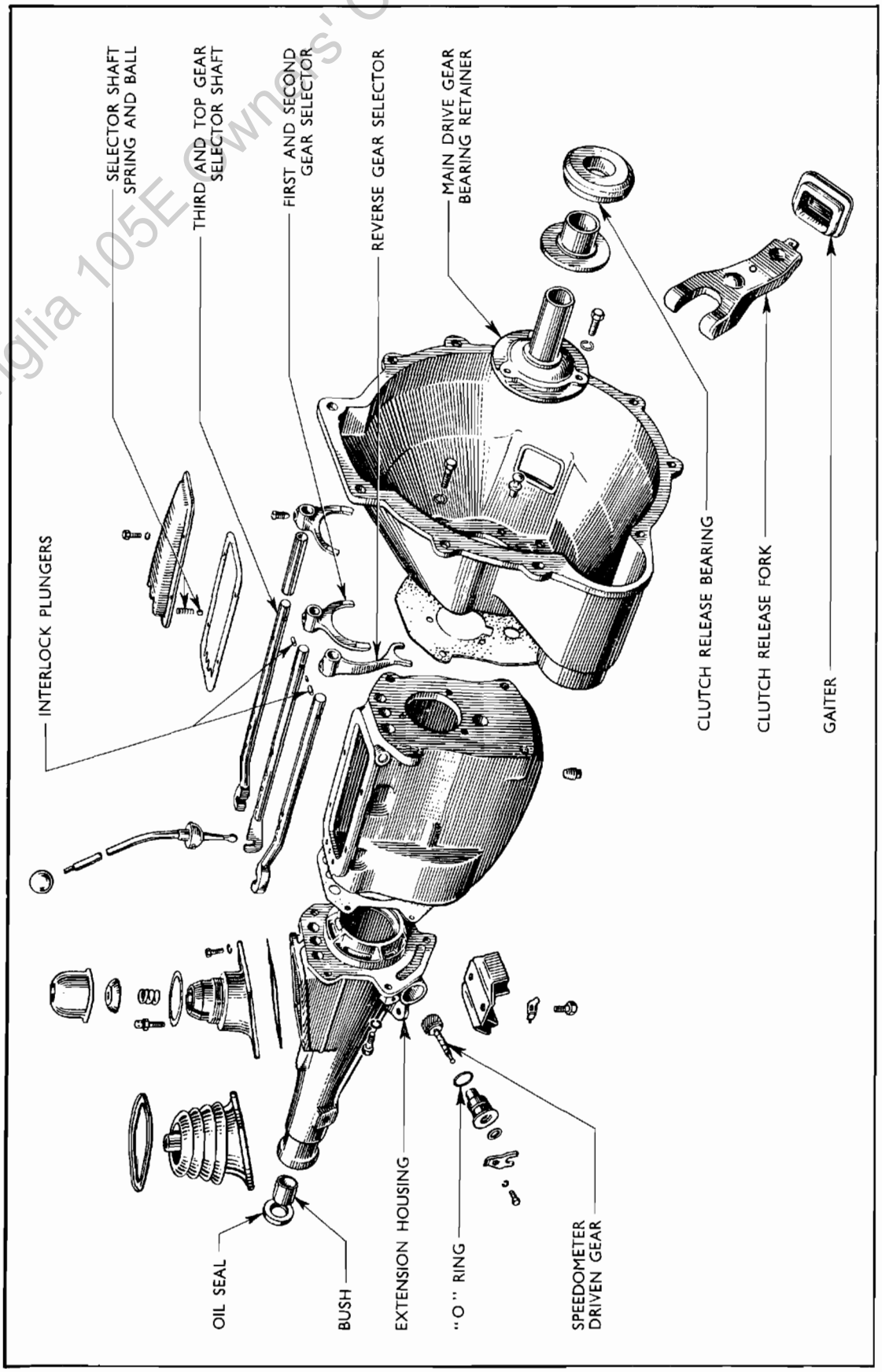
Type	Single dry plate
Actuation	Hydraulic
Hydraulic fluid	ME-3833-F
Master cylinder diameter	1.78 cm. (0.70 in.)
Operating cylinder diameter	2.22 cm. (0.875 in.)
Clutch disc lining — outside diameter	18.42 cm. (7.25 in.)
Pressure plate — diameter	18.42 cm. (7.25 in.)
— to flywheel bolt tightening torque	1.6 to 2.0 kg.m. (12 to 15 lb. ft.)

Gearbox

Grade of lubricant	S.A.E. 80 E.P.
Gearbox capacity	0.99 litres (1.75 Imp. pints)
Speedometer driven gear	22 (Anglia) natural 23 (Prefect) black
Speedometer driving gear	6

Ratios

	Gearbox	Overall	
(1,000 c.c. engine)		4.125:1 axle ratio	4.44:1 axle ratio
First	4.118:1	16.987:1	18.300:1
Second	2.396:1	9.884:1	10.648:1
Third	1.412:1	5.825:1	6.275:1
Top	1.000:1	4.125:1	4.44 :1
Reverse	5.404:1	22.292:1	24.015:1
(1,200 c.c. engine)			
First	3.543:1	14.615:1	15.745:1
Second	2.396:1	9.884:1	10.648:1
Third	1.412:1	5.825:1	6.275:1
Top	1.000:1	4.125:1	4.44 :1
Reverse	3.963:1	16.347:1	17.612:1



Exploded View of the Gearbox (External)

OP 7000-A GEARBOX AND CLUTCH HOUSING ASSEMBLY – REMOVE AND INSTALL

To Remove

1. Open the bonnet and disconnect the battery earth strap.
2. Disconnect the throttle linkage at the carburettor.
3. Remove the metal ring securing the gear lever gaiter to the floor pan and slide the gaiter upwards. Unscrew the gear lever turret, and remove gear lever.
4. Jack up the car and fit stands all round.
5. Mark the drive shaft and rear axle pinion flanges, and remove the four bolts. Lower the rear and slide the front yoke from the gearbox. Fit a dummy yoke in the gearbox to prevent oil loss.
6. Unscrew the forked retainer and disconnect the speedometer cable and driven gear.
7. Disconnect the exhaust pipe from the manifold.
8. Remove the clutch operating cylinder circlip and move the cylinder to one side.
9. Remove the two starter motor securing bolts and move the starter motor to one side.
10. Remove the bolts securing the clutch housing to the engine. Note that a top bolt also secures an earth strap.
11. Remove the bolts securing the lower dust cover and detach the cover.
12. Place a support jack beneath the front of the engine.
13. Remove the four bolts securing the gearbox crossmember to the body. Slide the gearbox rearwards whilst supporting its weight and detach it from the engine.
14. Unscrew the four bolts securing the clutch housing to the gearbox and remove it.
15. Remove the crossmember centre bolt and detach it from the gearbox.

To Install

16. Place the crossmember on the rubber mounting and fit the centre bolt to attach it to the gearbox.
17. Fit the clutch housing to the gearbox and tighten the four bolts. Fit the clutch release arm and bearing.
18. Ensure that the adaptor plate is positioned on the rear of the engine and offer the gearbox up so that the main drive gear spigot enters the crankshaft pilot bearing. Push the gearbox fully home.
19. Replace the four crossmember-to-body bolts and spring washers. Remove the engine support jack.
20. Replace the bolts securing the clutch housing to the engine. The uppermost pair are plain bolts and one also secures an earth strap. The remainder are dowel bolts.
21. Replace the lower dust cover.
22. Refit the starter motor.
23. Replace the clutch operating cylinder and retain it with a circlip.
24. Reconnect the exhaust pipe to the manifold.
25. Replace the speedometer driven gear and retain it with the forked retainer.
26. Refit the drive shaft and replace the four nuts and bolts at the pinion flange.

27. Reposition the gear lever and secure the gear lever turret. Reposition the rubber gaiter and retain it with the metal ring.
28. Reconnect the throttle linkage at the carburettor.
29. Reconnect the battery earth strap.
30. Top-up the gearbox with oil as required, ensuring car is level.

OP 7000-A1 EXTRA: CLUTCH RELEASE BEARING – RENEW

To Remove

1. Remove the release arm rubber gaiter.
2. Withdraw the release arm and bearing assembly from the clutch housing.
3. Unhook the release arm from the bearing.
4. Press the release bearing from the hub.

To Install

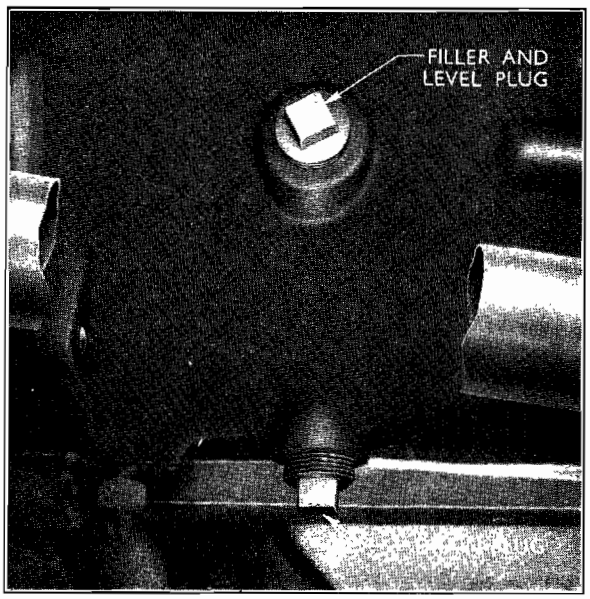
5. Press the release bearing onto the hub.
6. Engage the release arm in the hooked ends of the release bearing.
7. Pass the release arm through the aperture in the clutch housing and slide the release bearing onto the main drive gear bearing retainer.
8. Replace the rubber gaiter.

OP 7000-A2 EXTRA: CLUTCH PRESSURE PLATE AND/OR DISC – REMOVE AND INSTALL

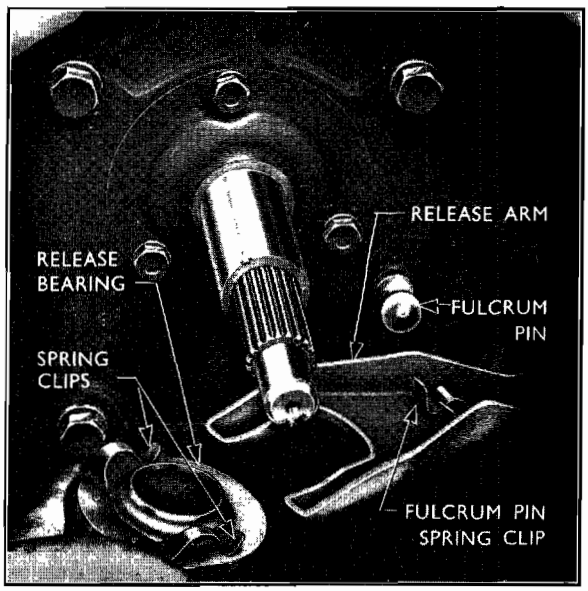
Tools Required

P.7091-A Clutch disc locator or Tool P.7137

1. Slacken the six clutch retaining bolts evenly, working diagonally across the clutch.
2. Remove the clutch disc and pressure plate.
3. Place the clutch disc in position on the flywheel with the hub towards the flywheel. Align the clutch disc with the locator Tool No. P.7091-A or Tool No. P.7137.



Filler, Level and Drain Plug Locations



Remove Clutch Release Bearing

4. Refit the pressure plate assembly, locating on the dowels. Fit the six securing bolts and spring washers; torque to 1.7 to 2.1 kg.m. (12 to 15 lb. ft.).
5. Remove locator tool.

OP 7000-A3 EXTRA: CLUTCH PILOT BEARING – RENEW

Tools Required

7600-A or B	Clutch pilot bearing remover (main tool)
CP.7600-7	Clutch pilot bearing remover (adaptor)
P.7137	Spigot bearing replacer and clutch disc locator

1. Push the adaptor, Tool No. CP.7600-7, behind the bearing and screw the main tool, 7600-A or B, into the adaptor. Tighten the wing nut to extract the bearing.
2. Position the new bearing on Tool No. P.7137 with the integral grease seal away from the crankshaft. Tap it into place in the crankshaft flange, ensuring that the bearing is 3.96 to 4.44 mm. (0.156 to 0.175 in.) below the crankshaft flange.

OP 7000-A6 EXTRA: MAIN DRIVE GEAR BEARING RETAINER OIL SEAL – RENEW

Tools Required

P.7118	Main drive gear oil seal replacer and 575 handle

To Dismantle

1. Remove clutch release arm and bearing.
2. Unscrew the three bolts and spring washers securing the main drive gear retainer to the gearbox case.
3. Withdraw the retainer and paper gasket.
4. Remove the retainer oil seal with suitable tool.

To Reassemble

5. Place a new oil seal on the replacer (Tool No. P.7118) so that when fitted the lips of the seal face the gearbox. Drive the seal into the retainer.
6. Apply a smear of molygrease to the main drive gear bearing retainer then fit the retainer to the gearbox. Cover the main drive gear splines before fitting the retainer and oil seal to prevent damage to the seal lip on assembly. First fit a new gasket on the gearbox front face. Ensure that the oil groove in the retainer is in line with the oil passage in the gearbox casing and that the gasket does not cover this passage. Coat the three retaining bolts with sealer (Part No. ESEE-M4G-1008A) and fit them, complete with spring washers. Tighten securely.
7. Replace clutch release arm and bearing.

OP 7000-A7 EXTRA: EXTENSION HOUSING REAR OIL SEAL – RENEW

Tools Required

7657	Extension housing oil seal remover
P.7657-4	Extension housing oil seal remover (adaptor)
P.7095	Extension housing oil seal replacer

1. Extract the extension housing oil seal by screwing Tool No. P.7657-4 into Tool No. 7657 and screw the assembly into the seal. Tighten the tool centre bolt to withdraw the seal.
2. Fit new extension housing oil seal by driving it squarely into position using Tool No. P.7095.

OP 7000-A8 EXTRA: EXTENSION HOUSING REAR BUSH – RENEW

Tools Required

7657	Extension housing oil seal remover
P.7657-4	Extension housing oil seal remover (adaptor)
P.7095	Extension housing oil seal replacer
P.7149	Extension housing bush remover
P.7150	Extension housing bush replacer

1. Extract the extension housing oil seal by screwing Tool No. P.7657-4 into Tool No. 7657 and screw the assembly into the seal. Tighten the tool centre bolt to withdraw the seal.
2. Extract extension housing bush using Tool No. P7149.
3. Assemble a new bush to the replacing Tool No. P.7150 and drive into position.
4. Fit new extension housing oil seal by driving it squarely into position using Tool No. P.7095.

OP 7000-B CLUTCH RELEASE BEARING – RENEW
(Includes OPS 7000-A and A1)

OP 7000-C CLUTCH DISC AND/OR PRESSURE PLATE – REMOVE AND INSTALL
(Includes OPS 7000-A and A2)

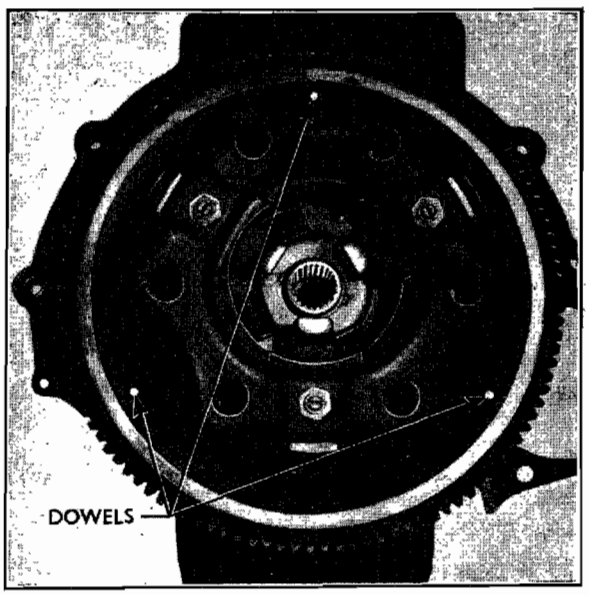
OP 7000-D CLUTCH PILOT BEARING – RENEW
(Includes OPS 7000-A, A2 and A3)

OP 7003-A GEARBOX ASSEMBLY – REMOVE AND INSTALL
(See OP 7000-A)

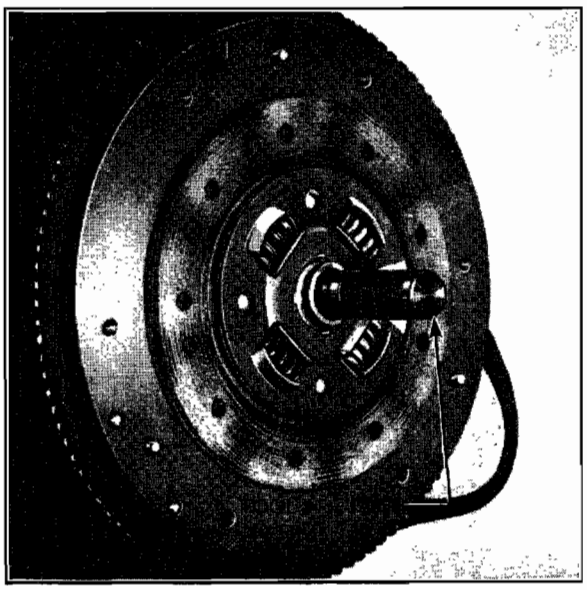
OP 7003-A1 EXTRA: SELECTOR MECHANISM – OVERHAUL
(Includes removing selector levers and selector forks)

Tools Required

200A	Engine stand
P.7089	Gearbox mounting bracket



Clutch Pressure Plate



Clutch disc locator

To Remove

1. Using the gearbox mounting bracket mount the gearbox on the engine stand.
2. Remove the gearbox top and inspection covers, springs and detent balls.
3. Remove the tapered screw securing the selector forks to the selector rails.
4. Remove the central first/second gear rail.
5. Remove the left-hand side third/top gear rail and slide off the over-run stop tube.
6. Remove the reverse selector rail.

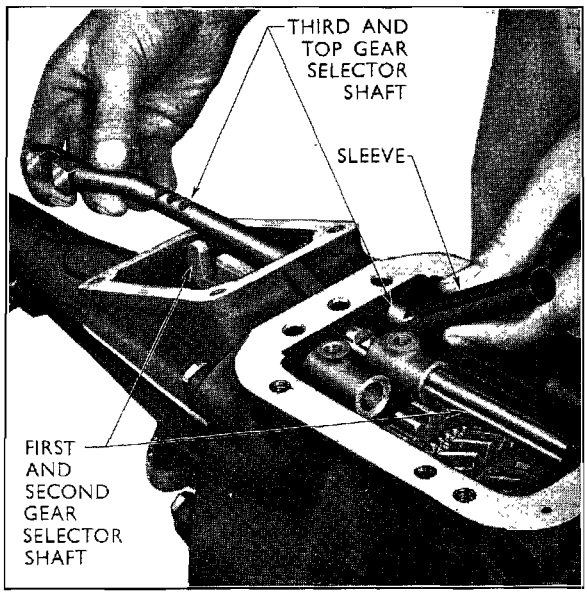
To Install

7. Fit the reverse gear selector rail (identified by two detent grooves) through the right-hand bore in the extension housing.
8. Locate the selector fork on the rail then engage the rail in the gearbox case and on the reverse relay lever.
9. Fit the centre rail (identified by a cross drilling with a floating pin in one end). Engage the first/second gear selector fork as the rail is pushed in.
10. Slide in the third/top gear rail, passing it through the over-run stop tube and the third/top selector fork.
11. Secure the selector forks to the rails.
12. Replace the top cover, detent balls and springs, securing with four bolts and spring washers.
13. Replace the gear lever housing ensuring that the reverse relay lever engages with the reverse selector rail, and secure with bolts and spring washers. The breather should be towards the rear of the gearbox.
14. Check engagement of all gears.

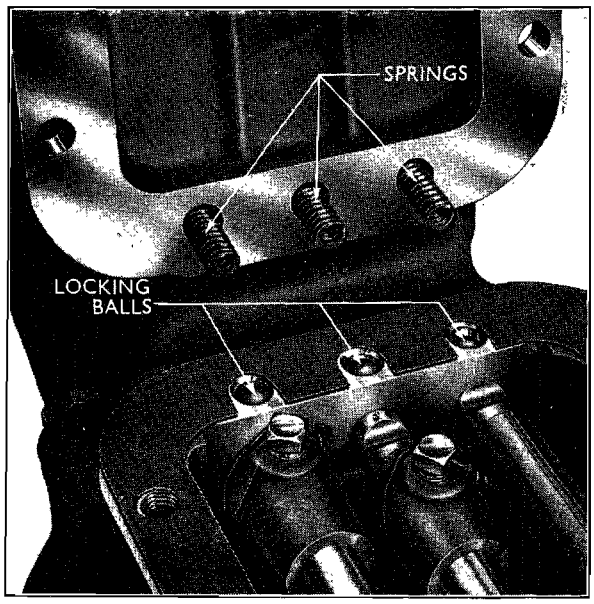
OP 7003-A12 EXTRA: EXTENSION HOUSING AND MAINSHAFT ASSEMBLY – REMOVE AND INSTALL

To Remove

1. Remove the gearbox top cover and springs, and the inspection cover. Tip the gearbox and remove the detent balls.



Third and Top Selector Shaft Removal

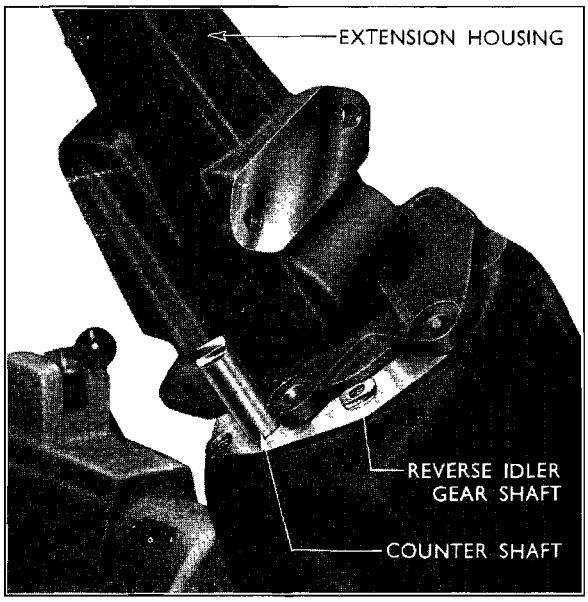


Selector Shaft Balls and Springs

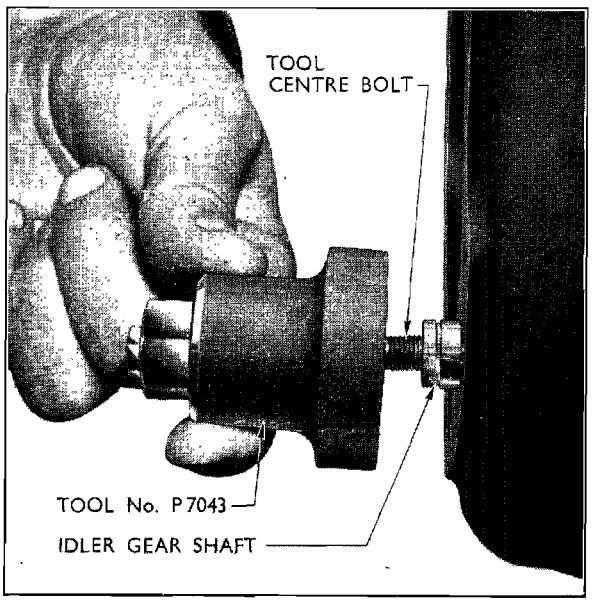
2. After removing the lock wires, release the tapered screws securing the selector forks to the selector rails.
3. Remove the central first/second gear rail, taking care that the floating pin in the forward end of the rail does not fall out.
4. Remove the left-hand side third/top gear rail, detaching the over-run stop tube.
5. Remove the extension housing complete with the reverse selector rail.
6. Lift out the selector forks.
7. From the front face of the casing, drive the countershaft rearwards slightly, then using a dummy countershaft, Tool No. P.7113, push the countershaft out of the gearbox. The countershaft gear will now lie at the bottom of the gearbox case.
8. Withdraw the mainshaft assembly from the gearbox.

To Install

9. Install the caged needle rollers in the bore in the main drive gear.
10. Position a blocker ring inside the third/top gear synchroniser assembly, aligning the slots with the blocker bars.
11. Position a new extension housing gasket on the rear of the gearbox, securing it with a thin smear of grease.
12. Pass the mainshaft into the gearbox, locating the front spigot in the main drive gear bearing. Tap the mainshaft in, aligning the dowel pin on the rear bearing carrier with the centre selector rail hole.
13. Carefully, with pieces of string at each end, lift the countershaft gear into mesh with the mainshaft and main drive gears. Take care that the thrust washers in the case at each end of the countershaft gear are not displaced.
14. Refit the countershaft from the rear, keeping it in contact with dummy countershaft and finally tap it in so that the front face just protrudes from the gearbox.
15. Ensure that the flat on the end is so positioned to fit in the recess in the extension housing.
16. Engage the reverse rail in the gearbox case and push the extension housing home. Fit the five bolts and spring washers.



Remove Countershaft



Remove Reverse Idler Gear Shaft

17. Slide the reverse rail back slightly, fit the centre rail, (identified by a cross drilling with a floating pin in one end). Engage the first/second gear selector fork as the rail is pushed in.

18. Slide in the third/top gear rail, passing it through the over-run stop tube and the third/top selector fork.

19. Screw the selector forks to the rails, and secure screws with locking wire.

20. Replace the top cover, detent balls and springs, securing with four bolts and spring washers.

21. Replace the gear lever housing, ensuring that the reverse relay lever engages with the reverse selector rail and secure with bolts and spring washers. The breather hole should be towards the rear of the gearbox.

22. Check engagement of all gears.

OP 7003-A13 EXTRA: EXTENSION HOUSING AND MAINSHAFT ASSEMBLY — OVERHAUL

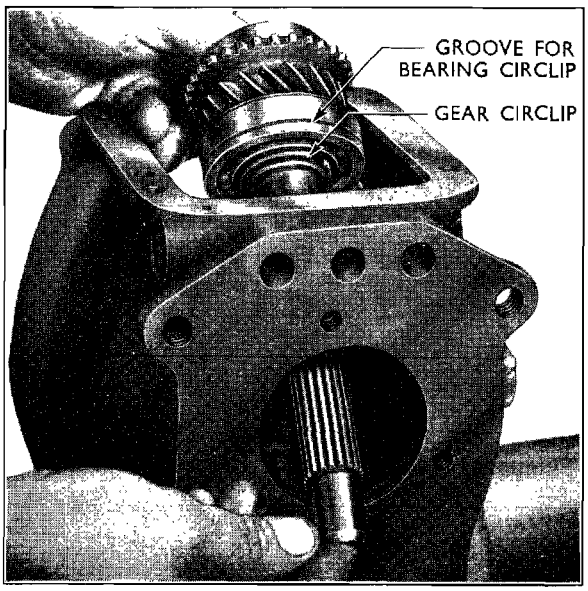
Tools Required

P.7098	Mainshaft nut spanner
P.4090-6	Third/top synchroniser remover
P.4090-7	First gear and mainshaft bearing remover
P.4090-3	First/second synchroniser remover
P.4000-31A	Mainshaft bearing replacer
P.7657-4	Extension housing oil seal remover
P.7095	Extension housing oil seal replacer
P.7038	Extension housing bearing remover/replacer

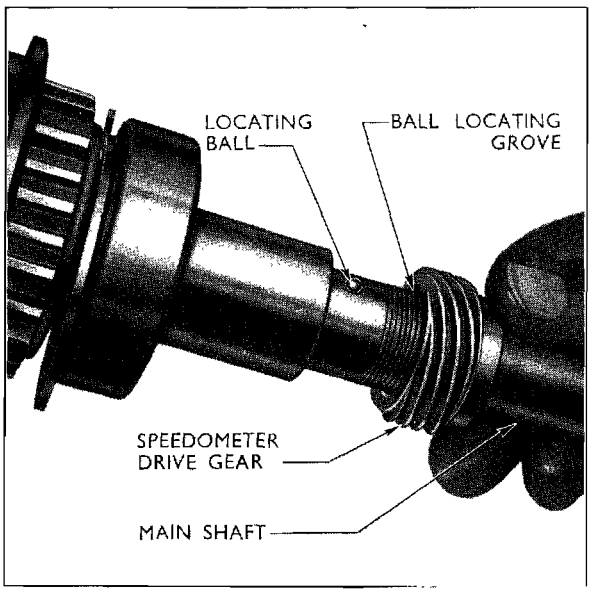
1. Dismantle the mainshaft assembly.

(a) Lift up the retaining tab behind the mainshaft nut and then unscrew this nut (use ring spanner, Tool No. P.7098). Remove the speedometer drive gear, lock-ball and spacer from the mainshaft. On early models, expand and remove the circlip from the rear of the speedometer drive gear and slide off the gear. Extract the locating ball and remove the front gear retaining circlip.

(b) Remove the circlip at the forward end of the mainshaft and discard it. Locate the adaptor (Tool No. P.4090-6) around the rear face of the third gear and in the base plate of a press. Press the mainshaft out of the third/top gear synchroniser and the third gear



Remove Main Drive Gear



Removing Speedometer Drive Gear

whilst supporting the mainshaft from beneath to prevent it dropping.

(c) Remove the first gear, splined collar, bearing carrier and bearing from the mainshaft by locating the adaptors (Tool No. P.4090-7) around the front face of the first gear and in the base plate of a press. Press the components off the mainshaft in the same way as in item (b) above but bring the ram down on the splined end.

(d) Carefully remove the circlip which is located in the mainshaft behind the first/second gear synchroniser hub and discard it.

(e) Locate the adaptors (Tool No. P.4090-3) around the front face of the second gear and in the base plate of a press. Press the second gear and the first/second gear synchroniser assembly from the mainshaft.

NOTE: The synchroniser hubs and sleeves are mated together and also to the mainshaft. Mating marks are etched on the corresponding splines of the hub, the sleeve and adjacent to the spline on the mainshaft.

2. Reassemble the mainshaft assembly.

When reassembling the mainshaft **new** circlips must be used.

(a) Slide the second gear along the mainshaft and onto its bearing so that the dog-teeth face to the rear.

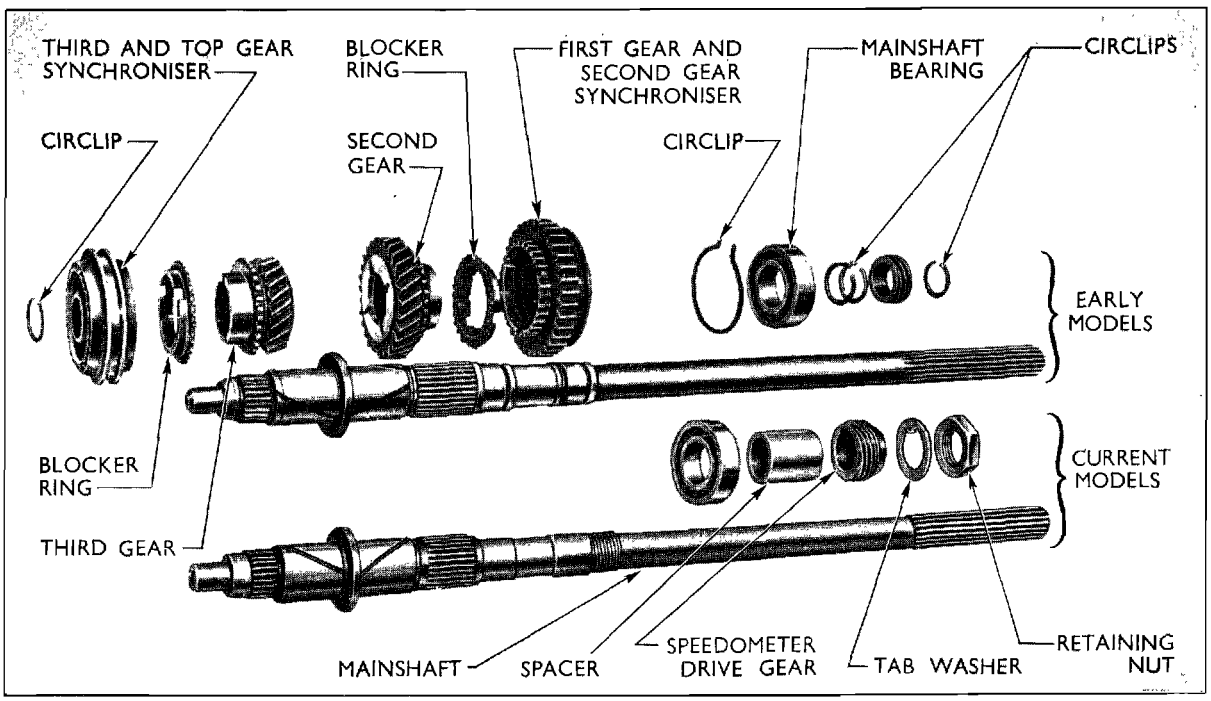
(b) Locate a blocker ring on the cone face of the second gear.

(c) Assemble the first/second gear synchroniser.

(i) If a new unit is being installed, slide the synchroniser sleeve off the splined hub. Clean all the preservative from the hub, sleeve, blocker bars and springs. Lightly oil them.

(ii) Fit the synchroniser sleeve over the hub with the mating marks aligned. Locate a blocker bar in each of the three slots cut in the hub.

(iii) Install a blocker bar spring to run around, clockwise, or anti-clockwise, inside the synchroniser sleeve beneath the blocker bars. The tagged end of the spring must locate in the "U" section of a blocker bar. Fit the other spring to the opposite face of the synchroniser unit ensuring that the spring tag locates in the same blocker bar as the spring just previously fitted and runs in the same rotational direction. View direct onto



Exploded Mainshaft Assembly

one side of the synchroniser assembly and note the direction of rotation of the spring (clockwise or anti-clockwise). View direct onto the other side of the synchroniser assembly—the direction of rotation of the spring should be the same as for the first spring, when viewed face on.

(d) Locate the first/second gear synchroniser assembly on the mainshaft and engage it on the splines as far as possible. Fit a suitable adaptor (Tool No. P.4090-7) behind the synchroniser assembly and locate it in the bed of a press. Press the mainshaft into the synchroniser assembly, taking care that it does not tilt as it moves over the circlip groove.

(e) Carefully fit a new circlip to the groove in the mainshaft behind the first/second gear synchroniser.

(f) Fit a blocker ring in the first/second gear synchroniser so that the cut-outs in the blocker ring fit over the blocker bars.

(g) Slide the first gear onto the mainshaft so that the dog-teeth are located adjacent to the blocker ring on the first/second gear synchroniser.

(h) Fit the splined collar behind the first gear.

(i) Position the bearing carrier on the mainshaft with the dowel hole to the rear. Fit the mainshaft bearing. Slightly withdraw the bearing carrier rearwards to fit over the bearing.

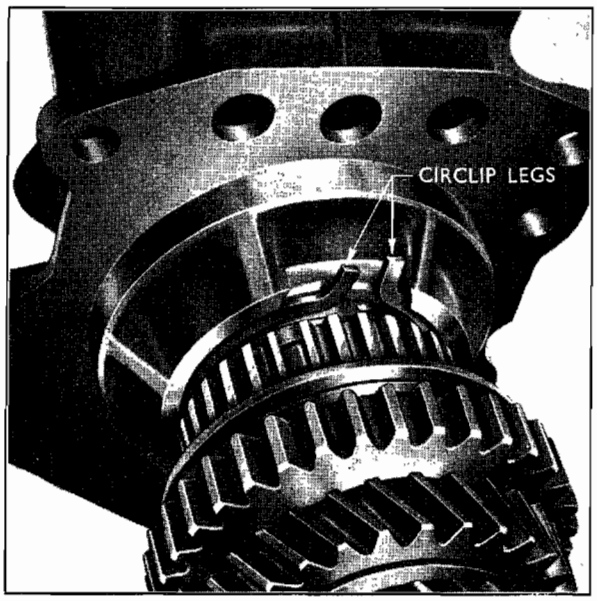
(j) Locate the adaptor, Tool No. P.4000-31A, over the bearing and insert the assembly in a slave ring, Tool No. 370, in the beds of a press. Press the bearing home onto its journal on the mainshaft. On early models fit the small mainshaft bearing retaining circlip in its groove on the shaft.

(k) Slide the third gear onto the front end of the mainshaft with the dog-teeth away from the integral thrust collar. Locate a blocker ring on the taper face of the gear.

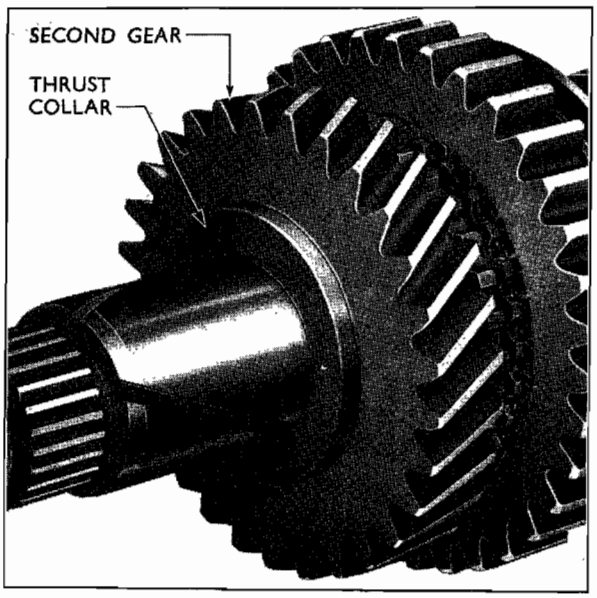
(l) Place a blocker bar spring in position on the rear face of the third/top gear synchroniser hub and note its direction of rotation. Ensure that the mating marks on the hub and mainshaft correspond and engage it on the splines as far as possible.

Support the hub on the adaptor, Tool No. P.4090-7, and locate it in the bed of a press. Press the hub fully home and then fit a new circlip on the mainshaft in front of the hub.

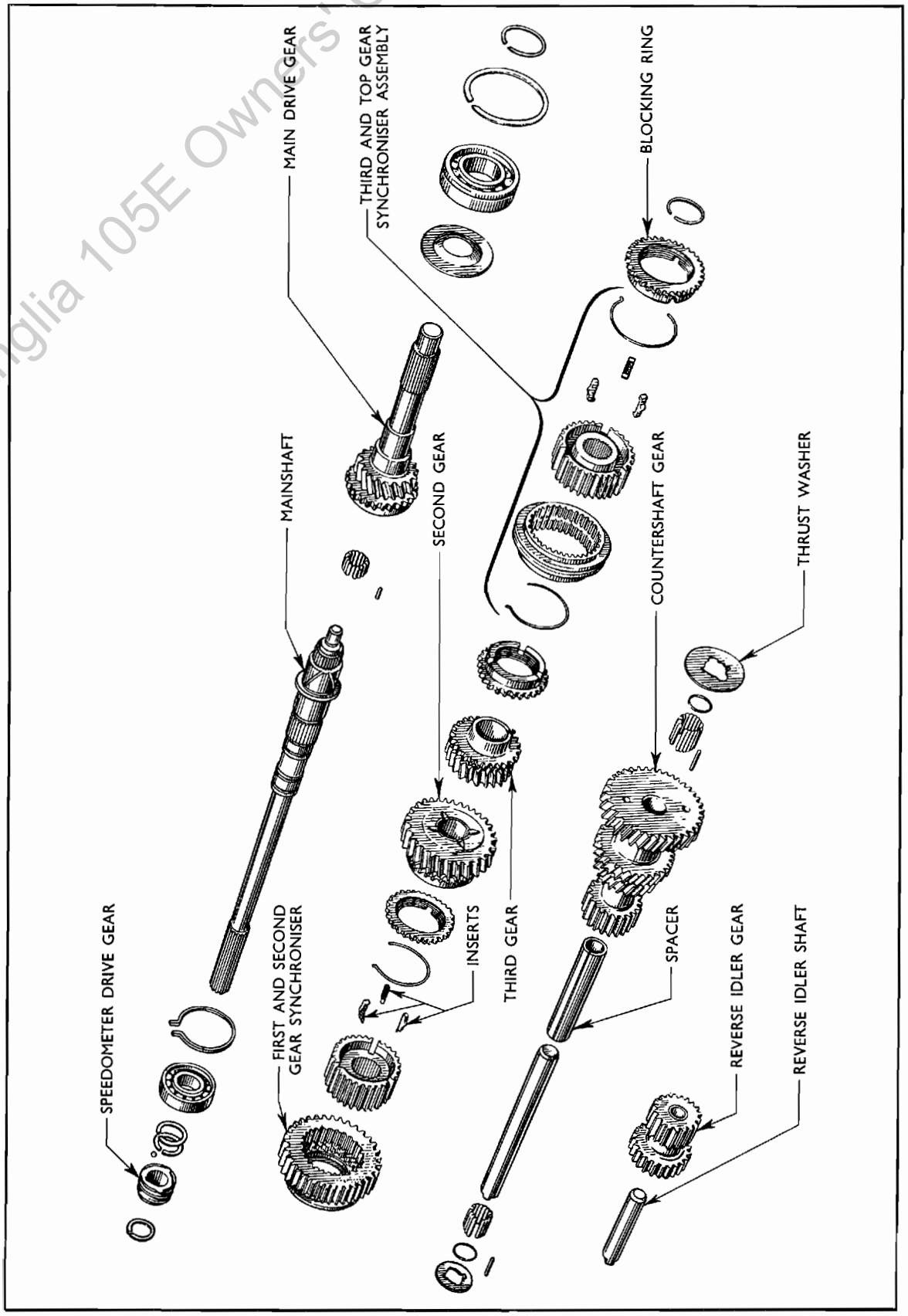
(m) Locate the blocker bars in position and fit the synchroniser sleeve onto the hub with the back angling on the internal splines facing the third gear and the mating marks in line.



Removing Mainshaft Circlip



The Second Gear and Thrust Collar



Exploded View of the Gearbox (Internal, prior to approx. Engine Nos. Anglia 105E-34518 Prefect 105E-35089)

(n) Install the remaining blocker bar spring in the synchroniser hub in the same way as described previously (paragraph (c) iii).

(o) Place the spacer and lock-ball on the mainshaft and slide on the speedometer gear and lock tab. Screw on the mainshaft nut and torque to 3.4 kg.m. (25 lb. ft.) use ring spanner, Tool No. P.7098. Bend the lock tabs to retain the nut. On early models fit the front speedometer drive gear retaining circlip in its groove in the shaft. Install the locating ball in its seating in the mainshaft, slide on the gear and fit the rear retaining circlip.

3. Extract the extension housing oil seal by screwing Tool No. P.7657-4 into Tool No. 7657 and then screw the assembly into the seal. Tighten the centre bolt to remove the seal.
4. Drive the rear bearing into the housing to remove it. Use Tool No. P.7038.
5. Locate a new bearing on Tool No. P.7038 and drive it into the extension housing until the rear end is flush with the deeper recessed face. This bearing must be fitted with the oil lubrication scroll starting at the bottom when viewed from the rear.
6. Fit a new extension housing oil seal, driving it into position with Tool No. P.7095.

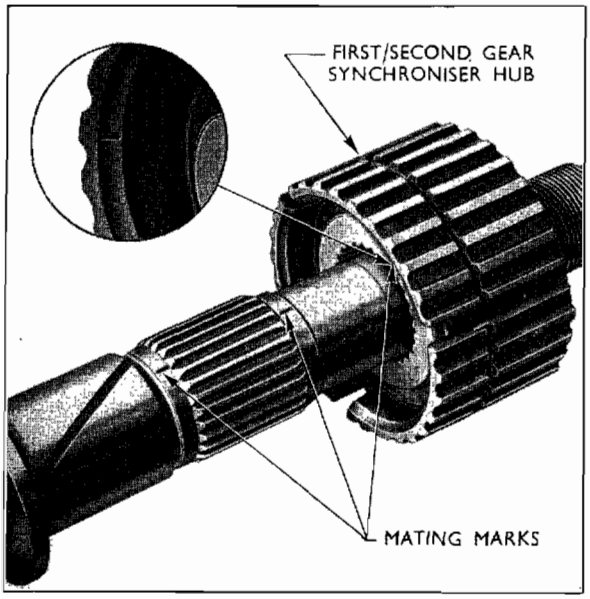
OP 7003-A14 EXTRA: GEARBOX – OVERHAUL

Tools Required

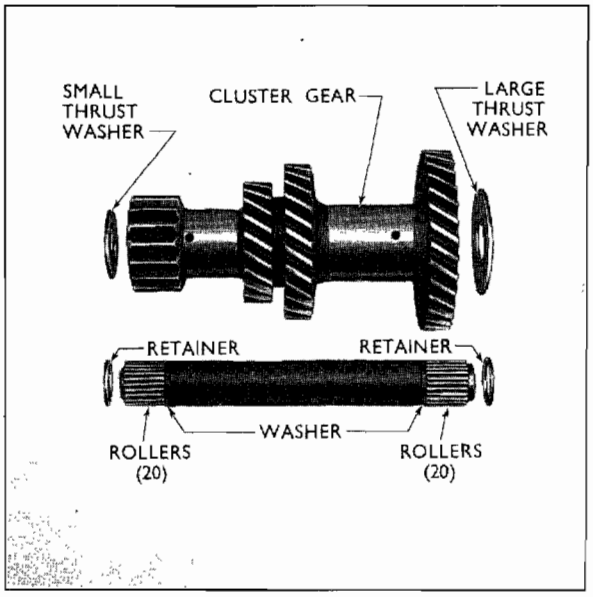
P.7043	Reverse idler gear remover
P.4090-3A	Main drive gear bearing remover
P.7136	Main drive gear oil seal replacer
P.7113	Dummy countershaft
P.4000-29	Detail "a" and "b" Main drive gear bearing replacer

To Dismantle

1. Unscrew the three bolts and spring washers securing the main drive gear retainer to the gearbox case. Withdraw the retainer and paper gasket, taking care not to damage the seal. Carefully tap out the main drive gear.
2. Remove the countershaft gear and two thrust washers from the gearbox. In both ends of the countershaft there are twenty needle rollers retained by a small washer on each side of each set of rollers. Remove these rollers and the dummy countershaft.



Fitting Second Gear Synchroniser Hub



Countershaft Assembly

3. Withdraw the reverse idler shaft with Tool No. P.7043. Should this tool not be available, locate a nut, a flat washer and a sleeve on a 5/16 in. 24 UNF threaded bolt. Screw the bolt into the reverse idler shaft and tighten the nut to withdraw the shaft.

4. Dismantle the main drive gear. Remove the circlip securing the main drive gear bearing support the bearing in adaptors, Tool No. P.4090-3A, and press out the main drive gear.

5. Overhaul the main drive gear bearing retainer if necessary:—

   (a) Remove the oil seal and discard it.

   (b) Place a new seal on the replacer, Tool No. P.7136, so that when fitted the lips face the gearbox. Drive the seal into the retainer.

To Reassemble

6. Reassemble the countershaft gear:—

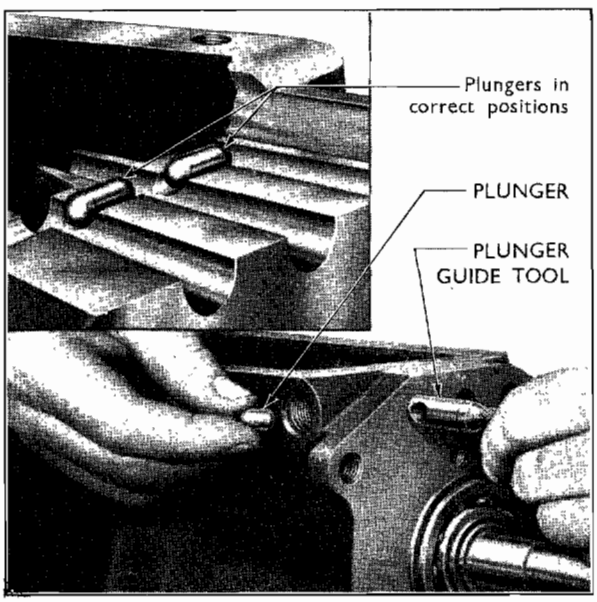
   Fit a retaining washer to abut the machined shoulder inside the gear. Grease the needle rollers and locate twenty in the recess in the gear. Fit a retaining washer over the rollers and slide the dummy countershaft, Tool No. P.7113, through the gear. Repeat the procedure for the rollers at the other end. Grease the thrust washers and locate them in position inside the gearbox with the tongues in the machined recesses.

7. Position the countershaft gear in the bottom of the gearbox case, taking care not to displace the thrust washers.

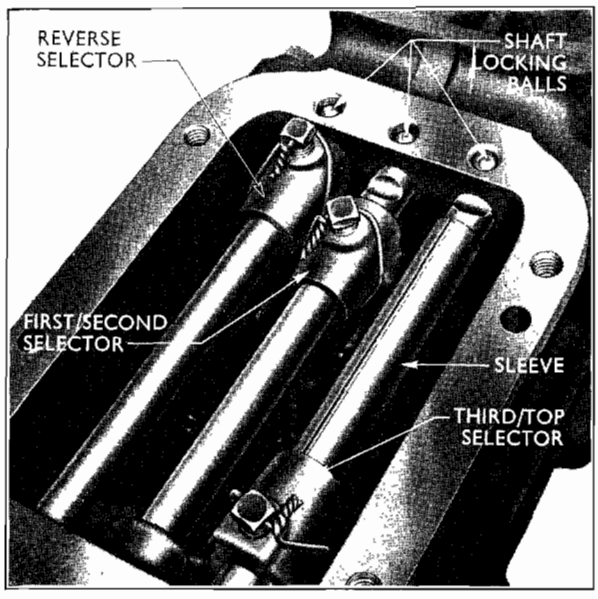
8. Assemble the main drive gear. Position the main drive gear bearing on the gear with the external circlip groove on the bearing away from the gear. Support the assembly with the adaptor, Tool No. P.4000-29, detail "a", and press the bearing home on the gear, using a press adaptor, detail "b", located in the spigot recess of the main drive gear. Fit the small circlip in the groove in the shaft.

9. Fit a large circlip to the groove in the main drive gear bearing and then fit the main drive gear to the gearbox.

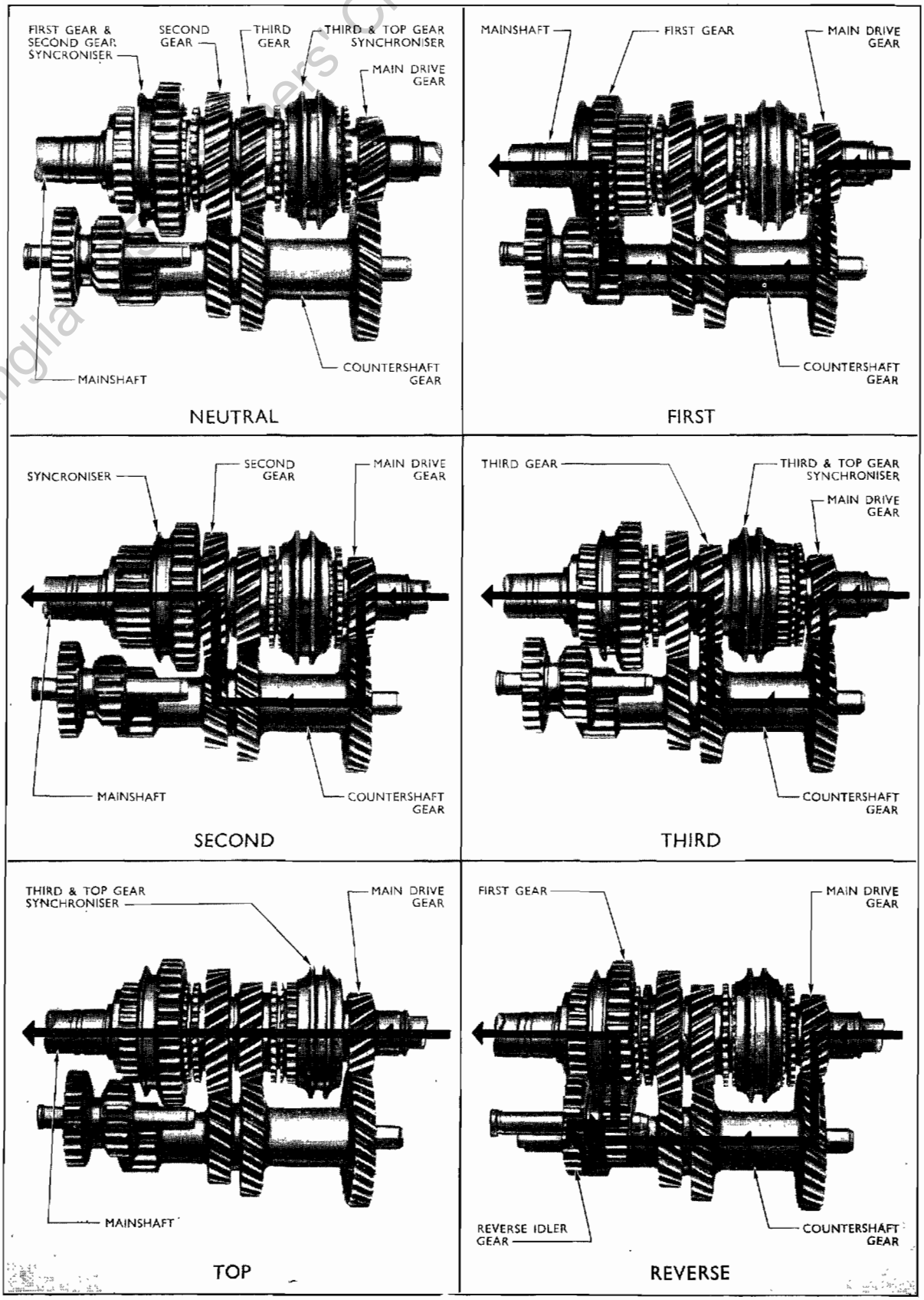
10. Fit the main drive gear bearing retainer to the gearbox. Cover the main drive gear splines before fitting the retainer and oil seal to prevent damage to the seal lip on assembly. First fit a new gasket on the gearbox front face. Ensure that the oil groove in the retainer is in line with the oil passage in the gearbox casing and that the gasket does not cover this passage. Coat the three retaining bolts with sealer, Part No. EM-4G-47, and fit them, complete with spring washers. Tighten securely.



Assembly of Interlock Plungers



Assembly of Selector Mechanism



Power Train Diagrams

11. Position the reverse idler gear inside the gearbox with the selector fork groove towards the rear. Fit the shaft through the case and gear so that the flats will be positioned to mate with the recess in the extension housing.

OP 7003-B SELECTOR MECHANISM – OVERHAUL
(Includes OPS 7003-A and A1)

OP 7003-K GEARBOX ASSEMBLY – OVERHAUL
(Includes OPS 7003-A, A1, A12, A13 and A14)

OP 7003-M EXTENSION HOUSING AND MAINSHAFT ASSEMBLY – OVERHAUL
(Includes OPS 7003-A, A12 and A13)

OP 7202-A GEAR LEVER – REMOVE AND INSTALL

To Remove

1. Lift the gear lever gaiter and unscrew the dome nut. Withdraw the gear lever.

To Install

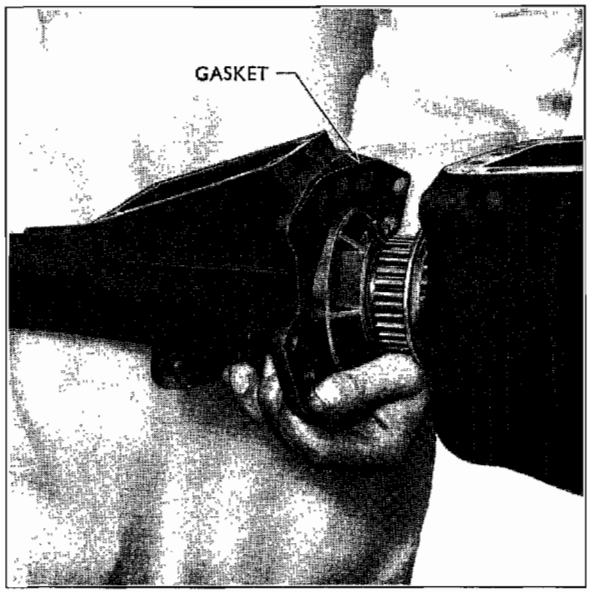
2. Locate the gear lever, fitting the gasket between the ball cap and the housing cover, and securely tighten the cap. Refit the rubber gaiter to the floor pan, fit the retainer and secure with four self tapping screws.

OP 7500-A CLUTCH HYDRAULIC SYSTEM – BLEED

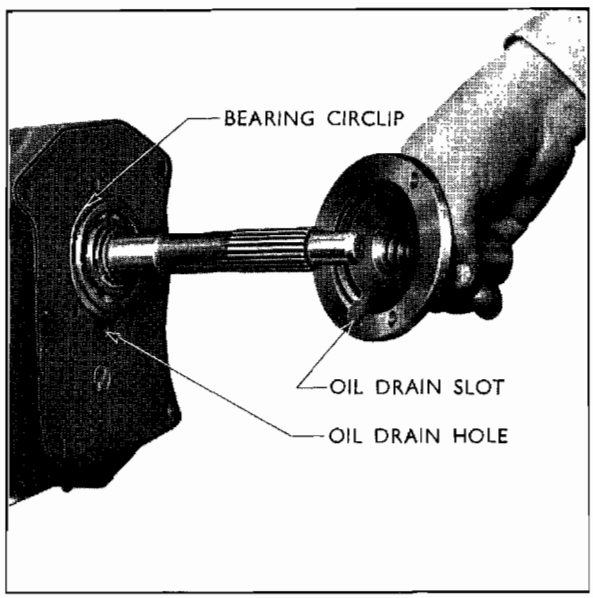
Tools Required

P.2006 Bleed tube

1. Clean the area around the bleed valve on the slave cylinder and remove the rubber dust cap.
2. Fit a bleed tube, Part No. P.2006, and place the other end of the tube in a jar containing fluid, Part No. ME-3833-F, keeping the end of the tube beneath the surface of the fluid throughout the bleeding operation.
3. Open the bleed valve by turning it anti-clockwise and slowly depress and release the clutch pedal several times. For each stroke some fluid and/or air should be pumped out



Fitting Extension Housing



Fitting Main Drive Gear Bearing Retainer

of the tube. If neither fluid nor air is pumped out, the bleed valve is not properly opened or there is a blockage in the pipe line.

NOTE: Where air in the system is suspected, remember that initial application of the clutch pedal will cause air trapped in the bleed tube to be forced into the fluid container.

4. Continue depressing and releasing the clutch pedal slowly until no more air bubbles emerge from the tube. Ensure that the fluid level in the reservoir is maintained during the bleeding operation.

   Do not replenish the reservoir with fluid obtained from the system as it may be aerated or contaminated.

5. Close the bleed valve tightly with the pedal fully depressed, when fluid alone comes out of the bleed tube with each stroke of the clutch pedal. Refit the dust cap on the valve.

6. Refill the reservoir to the correct level and refit the cap.

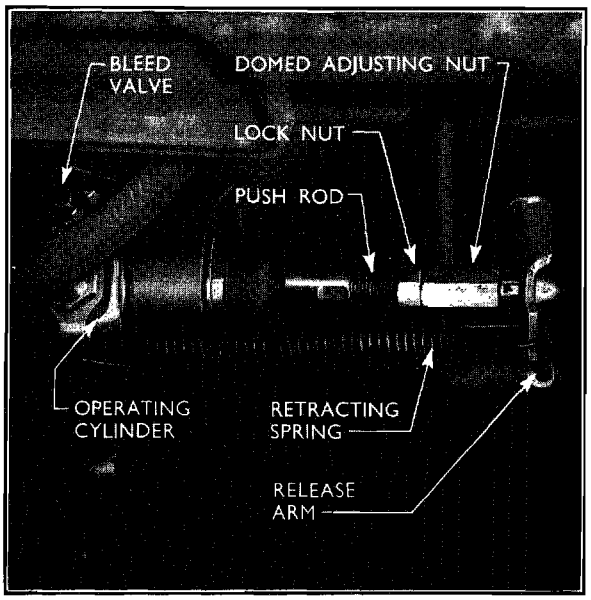
OP 7501-B CLUTCH HYDRAULIC SLAVE CYLINDER – REMOVE AND INSTALL

To Remove

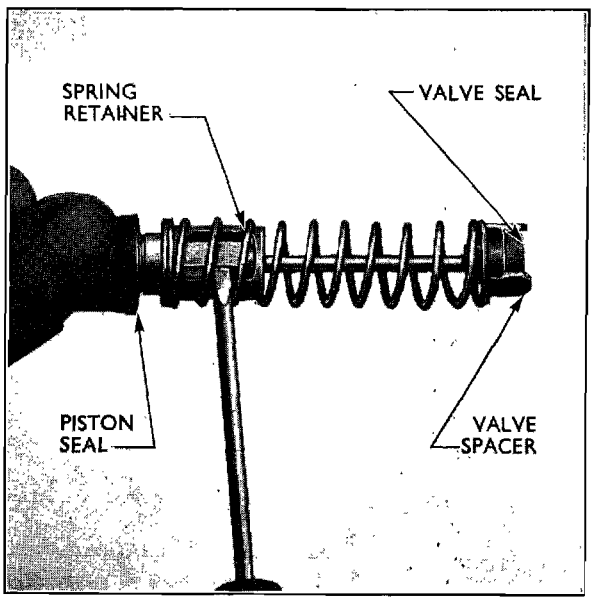
1. Jack up the front of the car and fit chassis stands.
2. Detach the fluid pipe by unscrewing the union nut, using a blanking plug to prevent dirt entering the pipe. Remove the fluid pipe to slave cylinder adaptor.
3. Remove the retaining circlip from around the cylinder body after slipping the rubber boot off the slave cylinder.
4. Push the cylinder forwards out of its location, removing the boot and the push rod simultaneously.

To Install

5. Slide the cylinder into its location in the clutch housing flange from the front. Push the push-rod through the rubber boot and insert the push-rod, with the boot hanging loose, into the operating cylinder and clutch release arm.
6. Fit a circlip, ensuring that it is correctly located in its groove and fit the rubber boot on the slave cylinder. Replace the fluid pipe adaptor.
7. Reconnect the fluid pipe, tighten the union nut.
8. Bleed the system as described in OP 7500-A.



Clutch Release Arm Adjustment (Prefect)



Removing the Piston Valve

OP 7501-B1 EXTRA: CLUTCH HYDRAULIC SLAVE CYLINDER – OVERHAUL

To Dismantle

1 Remove the piston and seal by extracting the circlip from the cylinder body, and then removing the piston spring from the cylinder.

2. Unscrew the bleed valve on the side of the operating cylinder.

3. Pull the spring and then the rubber piston off the spigot at the front of the piston.

4. Wash all parts in hydraulic fluid, Part No. ME-3833-F, methylated spirit or commercial alcohol and examine the rubber piston seal carefully. Renew the seal if there is any sign of damage to the sealing lip.

To Reassemble

5. Locate the piston seal on the spigot at the front end of the piston with the recess in the seal away from the piston. Locate the spring on the piston spigot.

6. Dip the piston and seal in hydraulic fluid and carefully insert, spring first, into the cylinder.

7. Replace the bleed valve but do not tighten.

OP 7501-C CLUTCH HYDRAULIC SLAVE CYLINDER – OVERHAUL
(Includes OPS 7501-B and B1)

OP 7534-A CLUTCH HYDRAULIC MASTER CYLINDER – REMOVE AND INSTALL

To Remove

1. Disconnect the clutch master cylinder push-rod from the pedal by unscrewing the nut and withdrawing the spring washer and concentric bolt.

2. Detach the fluid pipe by unscrewing the union nut, using a blanking plug to prevent dirt entering the line.

3. Withdraw the master cylinder after removing two spring washers and nuts securing the master cylinder to the bulkhead.

4. Empty the contents of the fluid reservoir into a waste container.

To Install

5. Refit the master cylinder to the engine bulkhead, securing with two spring washers and nuts.

6. Reconnect the fluid pipe, do not overtighten the union.

7. Reconnect the clutch master cylinder push rod to the pedal by passing the concentric bolts through the push rod and then the pedal. Fit a spring washer and nut; 1.66 to 2.07 kg.m. (12 to 15 lb.ft.).

8. Top-up the master cylinder reservoir with clean approved fluid, ME-3833-F, and then bleed the system; see OP 7500-A. Check the action of the clutch.

OP 7534-A1 EXTRA: CLUTCH MASTER CYLINDER – OVERHAUL

To Dismantle

1. Remove the rubber boot. Withdraw the circlip and remove the pushrod.

2. Withdraw the piston and valve assembly from the cylinder.

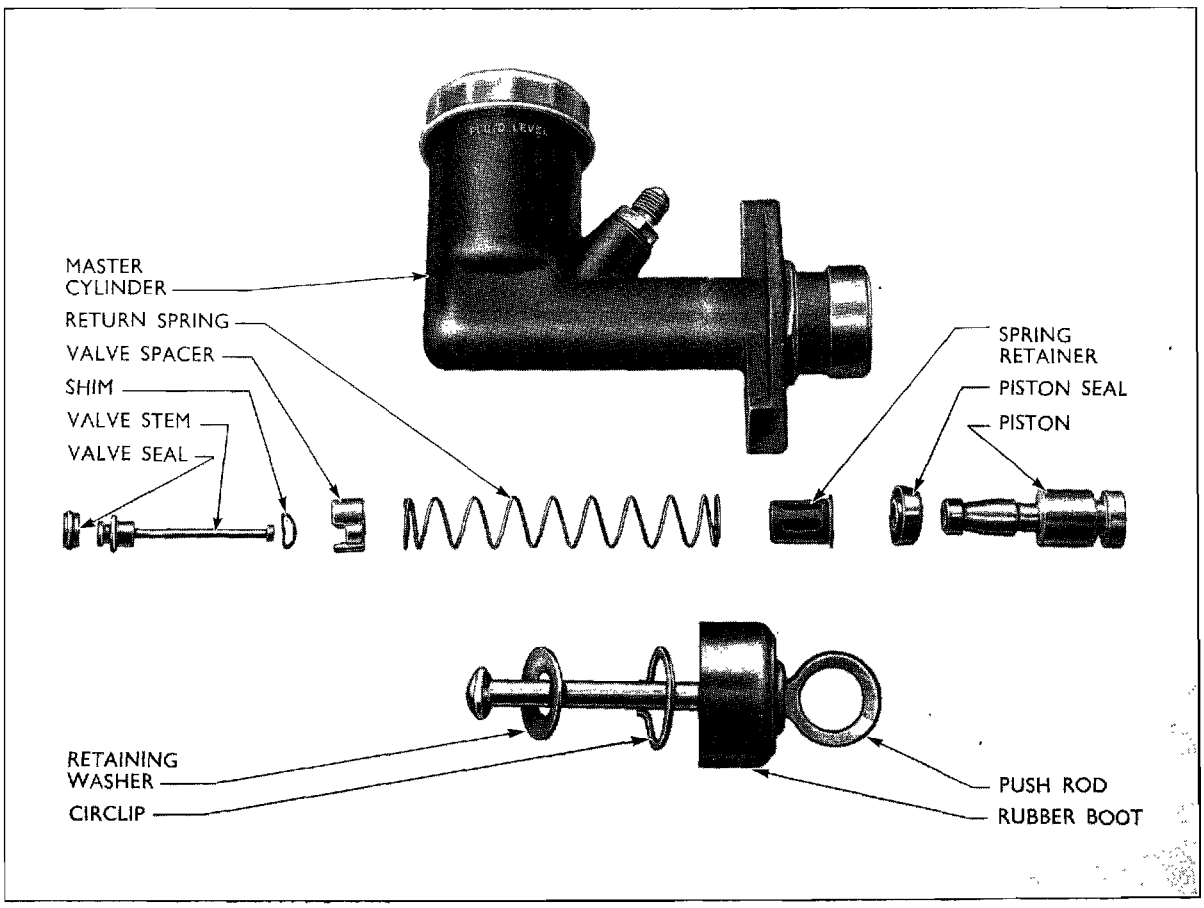
3. Remove the piston from the valve assembly. The spring retainer is held in position on the spigot end of the piston by a tab which engages under a shoulder on the front of the

piston. Lift up the tab and remove the spring retainer, spring and valve assembly from the piston.

4. Dismantle the valve assembly by compressing the spring and moving the valve stem to one side in the retainer, so releasing the end of the valve stem from the key-hole slot in the retainer. Slide the valve spacer and shim off the valve stem.
5. Remove the rubber valve seal and piston seal if necessary.
6. Wash the parts in methylated spirits, approved fluid ME-3833-F, or commercial alcohol. Carefully inspect the piston rubber seal and renew if there is any sign of damage to the sealing lip.

To Reassemble

7. Replace the piston seal with the lip away from the large diameter of the piston.
8. Fit the valve seal to the valve stem with lip outwards and away from the spring. Slide the shim, valve spacer, with legs over the valve seal, and return spring over the valve stem. Ensure that the convex face of the shim abuts the valve stem flange.
9. Fit the spring retainer in the rear end of the return spring, compress the spring and locate the valve stem in the key-hole slot in the end of the spring retainer.
10. Insert the front of the piston in the spring retainer, and secure it by locating the spring retainer tab under the front shoulder of the piston.
11. Dip the piston and seal in hydraulic fluid and insert the piston assembly in the cylinder, valve seal end first.
12. Install the push-rod in the master cylinder. Locate the washer and fit the retaining circlip.
13. Refit the rubber boot to the clutch master cylinder.



Master Cylinder—Exploded

OP 7534-B CLUTCH MASTER CYLINDER – OVERHAUL
(Includes OPS 7534-A and A1)

OP 7657-A EXTENSION HOUSING OIL SEAL – RENEW
(Gearbox in situ)

Tools Required

7657	Oil seal remover (main tool)
P.7657-4	Adaptor for 7657
P.7095	Oil seal replacer

To Remove

1. Chock the front wheels and jack up the rear of the car. Fit stands.
2. Mark the driveshaft pinion flanges and remove the four bolts and self-locking nuts, and withdraw the drive shaft rearwards.
3. Extract the oil seal from the rear of the extension housing using Tool No's. 7657 and P.7657-4.

To Install

4. Locate a new extension housing oil seal on replacer Tool No. P.7095, so that the lip on the seal faces into the extension housing and then drive the seal into position in the housing.
5. Replace the driveshaft by sliding the front universal joint yoke onto the splines of the mainshaft, taking care not to damage the extension housing oil seal. Align the mating marks on the driveshaft and pinion flanges, fit the retaining bolts and secure with four new self-locking nuts.
6. Remove the stands, lower the car to the ground and remove the chocks from the front wheels.
7. With the car on level ground, check gearbox oil level and top-up if necessary.

OP 7657-A1 EXTRA: EXTENSION HOUSING REAR BUSH – RENEW
(Extension housing oil seal removed)

Tools Required

P.7149	Gearbox extension housing bush remover
P.7150	Gearbox extension housing bush replacer

1. Insert the bush removing Tool No. P.7149 into the rear of the extension housing so that it locates on the forward end of the bush. Withdraw the bush.
2. Assemble the new bush to the replacing Tool No. P.7150, and drive it into position.

OP 7657-B EXTENSION HOUSING REAR BUSH – RENEW
(Includes OPS 7657-A and A1)

8

COOLING SYSTEM

SECTION INDEX

GENERAL DESCRIPTION

QUICK REFERENCE DATA

SERVICE AND REPAIR OPERATIONS

OPERATION	8005-A	RADIATOR ASSEMBLY – REMOVE AND INSTALL
"	8005-A1	Extra: radiator hoses – renew
"	8115-A	DRAIN PLUG – REMOVAL AND INSTALL
"	8250-A	RADIATOR TOP HOSE – RENEW
"	8250-A1	Extra: thermostat or water outlet – renew
"	8250-A2	Extra: thermostat – test
"	8286-A	RADIATOR BOTTOM HOSE – RENEW
"	8501-A	WATER PUMP ASSEMBLY – REMOVE AND INSTALL
"	8501-A1	Extra: water pump – overhaul
"	8501-B	**WATER PUMP OVERHAUL** (Includes OPS 8501-A and A1)
"	8606-A	FAN – REMOVE AND INSTALL
"	8620-A	FAN BELT – RENEW
"	8620-B	FAN BELT – ADJUST

GENERAL DESCRIPTION

The cooling system is of the impeller assisted thermo-syphon type with a thermostat to assist in rapid engine warm-up.

Radiator

A corrugated high efficiency fin radiator is fitted at the front of the engine to cool the water down from engine operating temperature.

Water Pump

The water pump, bolted to the front face of the cylinder block, draws cooling water from the base of the radiator and into the cylinder block.

Thermostat

The thermostat, located at the front of the cylinder head, in conjunction with a by-pass tube, assists in rapid engine warm-up. When the engine reaches its normal operating temperature, the thermostat opens and allows the hot coolant to return to the radiator.

Fan

The fan is bolted to the water pump, drive being taken from the crankshaft pulley, and assists in drawing cooling air through the radiator.

QUICK REFERENCE DATA

PERIODIC SERVICE ATTENTION

Daily

Check the coolant level and top-up if necessary.

At first 1000 km. (500 miles)

Check the fan belt tension.
Check the coolant level and top-up if necessary.

8,000 km. (5,000 miles) or six months

Check the fan belt tension.
Check the coolant level and top-up if necessary.

40,000 km. (25,000 miles)

Change anti-freeze and hoses.

DATA

Cooling system capacities:—

Without heater	5.82 litres (10.25 Imp. pints)
With heater	6.39 litres (11.25 Imp. pints)
Fan	2 blade 22.82 cm. (9 in.) diam.
Thermostat: Prior to Jan. '63	Bellows type
Thermostat: After Jan. '63	Wax type
Thermostat — starts to open	85° to 89°C (185° to 192°F)
— fully open	99° to 102°C (210° to 216°F)
Fan belt free play	13 mm. (0.5 in.)

Anti-Freeze concentration

Specific Gravity (providing no other additive is in the coolant)	Proportion of Anti-freeze (by volume)	Remains Fluid to °C	Remains Fluid to °F	Solidifies at °C	Solidifies at °F
1.080	50%	−37°	−34°	−58°	−72°
1.065	40%	−25°	−13°	−48°	−54°
1.050	30%	−16°	+ 3°	−39°	−38°
1.042	25%	−13°	+ 9°	−29°	−20°
1.034	20%	− 9°	+15°	−19°	− 3°
1.026	15%	− 7°	+20°	−14°	+ 7°
1.016	10%	− 4°	+25°	− 8°	+17°

SERVICE AND REPAIR OPERATIONS

OP 8005-A RADIATOR ASSEMBLY – REMOVE AND INSTALL

To Remove

1. Position a drain tray under the radiator, open the drain plug and remove the radiator cap. Leave the radiator to drain. If anti-freeze is used it should be retained.
2. Disconnect the radiator top and bottom hoses.
3. Remove the radiator assembly.
4. Remove the drain tap and the overflow pipe from the base of the filler neck.

To Install

5. Replace the drain tap and the overflow pipe.
6. Fit the radiator.
7. Reconnect the radiator top and bottom hoses and tighten the two hose clips.
8. Refill the cooling system with the anti-freeze solution, and check for leaks.

OP 8005-A1 EXTRA: RADIATOR HOSES – RENEW

1. Unscrew the two hose clips and remove the hoses.
2. Refit the hoses, and secure firmly with the hose clips.
3. Test for leaks.

OP 8115-A DRAIN TAP – REMOVE AND INSTALL (RADIATOR OR CYLINDER BLOCK)

To Remove

1. Drain the radiator coolant as in OP 8005-A.
2. Remove the radiator or cylinder block drain plug or tap.

To Install

3. Replace the radiator or cylinder block drain plug or tap.
4. Refill the cooling system with the anti-freeze solution, and test for leaks.

OP 8250-A RADIATOR TOP HOSE – RENEW

To Remove

1. Partially drain the radiator to below the top hose level and store the anti-freeze.
2. Remove the top hose.

To Install

3. Replace the top hose and tighten the two retaining clips.
4. Top-up the radiator coolant level with a 50% solution of Ford Antifreeze Plus solution, and test for leaks.

OP 8250-A1 EXTRA: THERMOSTAT OR WATER OUTLET – RENEW

To Remove

1. Remove the water outlet and gasket.
2. Extract the thermostat from the recess in the cylinder head.

To Install

3. Locate the thermostat in the recess at the front of the cylinder head, fit a new gasket and fit the water outlet connection.

OP 8250-A2 EXTRA: THERMOSTAT – TEST

1. Suspend the thermostat in water in a suitable container so that it does not touch the sides of the container.
2. Gradually heat the water, frequently checking the temperature with an accurate thermometer. The thermometer must not touch the container.
3. The thermostat should start to open at 85°C to 89°C (185°F to 192°F) and be fully opened at 99°C to 102°C (210°F to 216°F).
4. If the thermostat does not function properly, do not attempt any adjustment, but replace with a new unit.

OP 8286-A RADIATOR BOTTOM HOSE – RENEW

To Remove

1. Drain the cooling system as in OP 8005-A.
2. Remove the bottom hose.

To Install

3. Replace the radiator bottom hose and tighten the two retaining clips.
4. Refill the cooling system with a 50% solution of Ford Antifreeze Plus and check for leaks.

OP 8501-A WATER PUMP ASSEMBLY – REMOVE AND INSTALL

To Remove

1. Drain the cooling system as in OP 8005-A.
2. Detach the bottom radiator hose from the water pump and remove the heater hose if a heater is fitted.
3. Slacken the generator adjusting arm clamp bolt and mounting bolts, pivot the generator towards the engine and remove the fan belt.
4. Remove the fan and water pump pulley.
5. Remove the water pump and gasket.

To Install

6. Clean the front face of the cylinder block and locate a new gasket on the block face.
7. Fit the water pump.
8. Fit the fan and pulley to the pulley hub.

9. Locate the fan belt around the pulleys and adjust the fan belt tension to give 12.7 mm. (0.5 in.) total movement between the generator and water pump pulleys. Tighten the generator clamp and mounting bolts.
10. Reconnect the radiator hose and the heater hose, if a heater is fitted, and tighten the retaining clips.
11. Refill the cooling system with a 50% solution of Ford Antifreeze Plus solution, and test for leaks.

OP 8501-A1 EXTRA: WATER PUMP – OVERHAUL

Tools Required

CPT 8000	Hand press
P.8000-4	Water pump overhaul kit

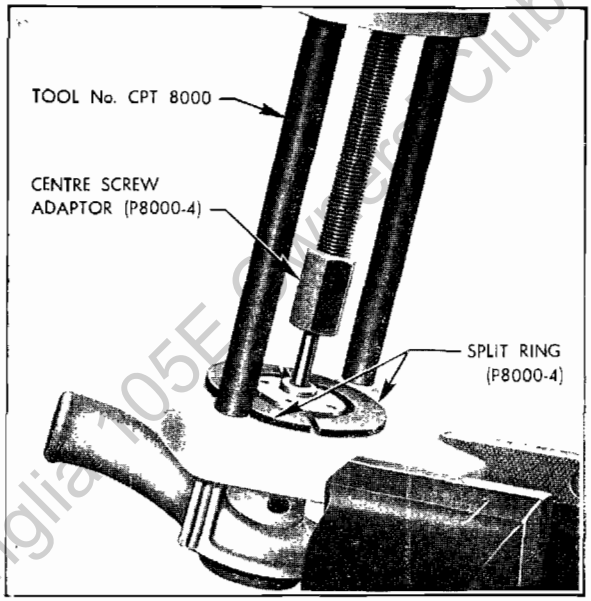
To Dismantle

1. Withdraw the bearing retainer clip from the slot in the housing.
2. Remove the pump pulley hub from the shaft using the split ring (detail 'a') and centre screw adaptor (detail 'b') in conjunction with the hand press Tool No. CPT 8000.
3. Press the impeller, seal, slinger, shaft and bearing assembly out of the housing, using the ring and thrust block adaptors, details 'd' and 'e'. Adaptor detail 'e' is hollow and fits over the shaft and bears against the outer diameter of the bearing.
4. Press the impeller off the end of the shaft, using adaptors, details 'a' and 'b', ensuring that the vanes avoid the slots.
5. Remove the pump seal from the shaft and carefully split the slinger bush with a chisel to detach it from the shaft.

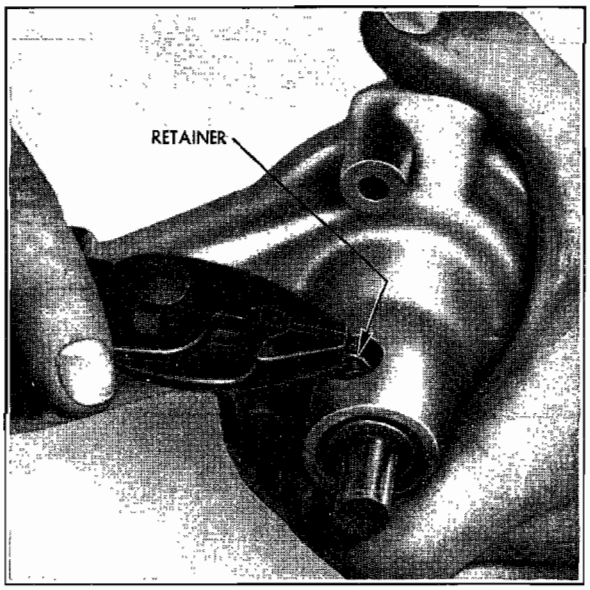
To Reassemble

6. Press the shaft and bearing assembly into the housing (short end of shaft to the front of the housing) until the groove in the shafts is in line with the groove inside the housing, again using the ring and thrust block adaptors, details 'd' and 'e'.
7. Refit the bearing retainer clip in the groove of the bearing and housing.
8. Press the pump pulley hub on to the front end of the shaft until the end of the shaft is 12.7 mm. (½ in.) away from the outer front face of the gub, using adaptors details 'd' and 'e'.
9. Press a new slinger onto the shaft (flanged end first) using driver Tool No. P.8000-4/f so that the non-flanged end is approximately 12.7 mm. (½ in.) from the shaft end, the tool will automatically position the slinger at this dimension. As a rough guide the flanged end of the slinger will just be 'in-line' with the impeller side of the 'window' in the housing.
10. Using the tool, Tool No. P.8000-4B/k, or by hand if the former type seal is being fitted, push the new seal over the shaft and into the counterbore in the water pump housing. Press the impeller onto the shaft, using Tool Nos. P.8000-4 'a' and 'b', until a clearance of 0.762 mm. (0.030 in.) is obtained between the impeller blades and the housing face. During this operation the slinger will also be pushed into its final position by the impeller.

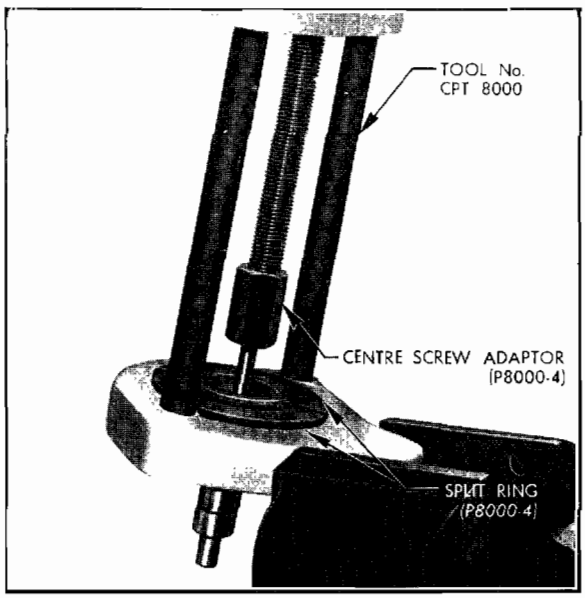
OP 8501-B WATER PUMP – OVERHAUL
(Includes OPS 8501-A and A1)



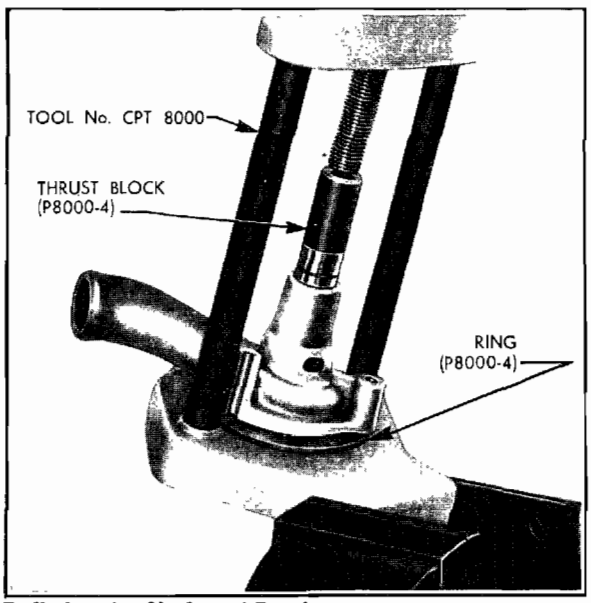
Removing the Pulley Hub



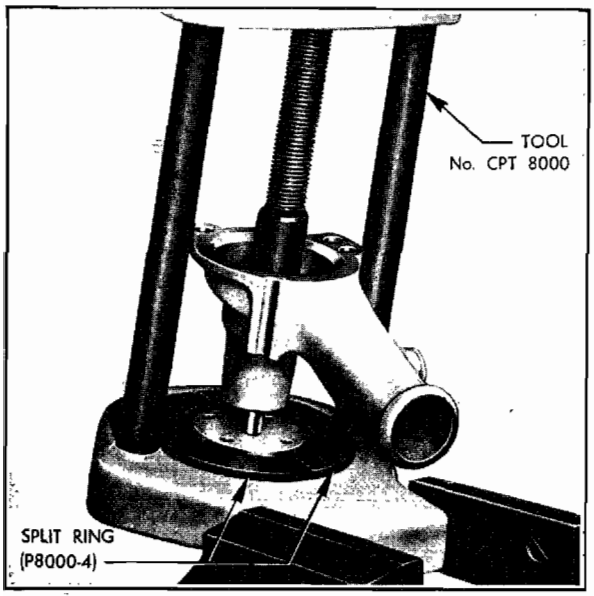
Removing the Retainer



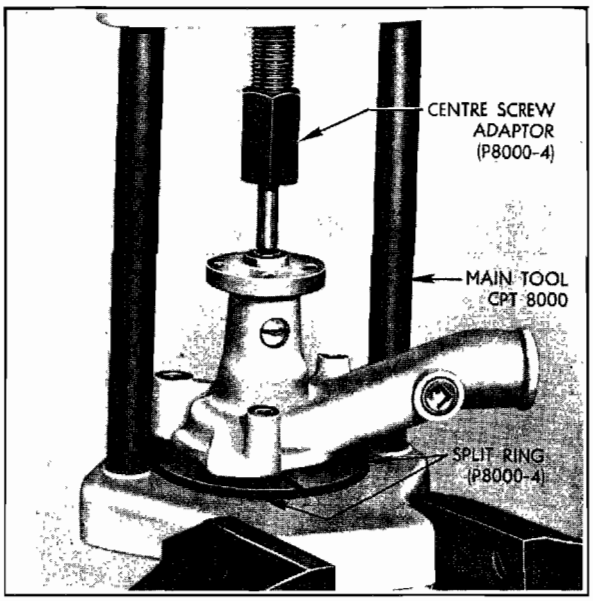
Removing the Shaft and Bearing Assembly



Refitting the Shaft and Bearing



Fitting the Pulley Hub



Fitting the Impeller

OP 8606-A FAN – REMOVE AND INSTALL

To Remove

1. Unscrew four bolts, fitted with washers, and remove the fan.

To Install

2. Reposition the fan and secure with four bolts and washers.

OP 8620-A FAN BELT – RENEW

To Remove

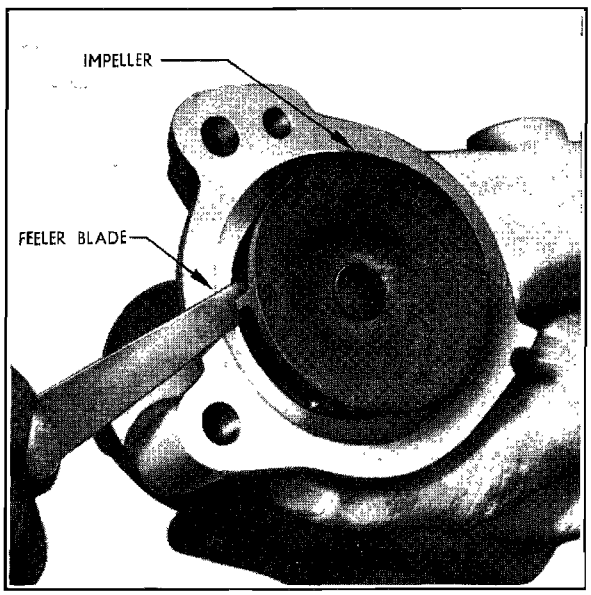
1. Slacken the generator mounting bolts and move the generator towards the engine.
2. Slip the belt over the edge of the generator pulley, taking care not to damage the pulley. The belt may then be detached from the crankshaft and fan pulleys.

To Install

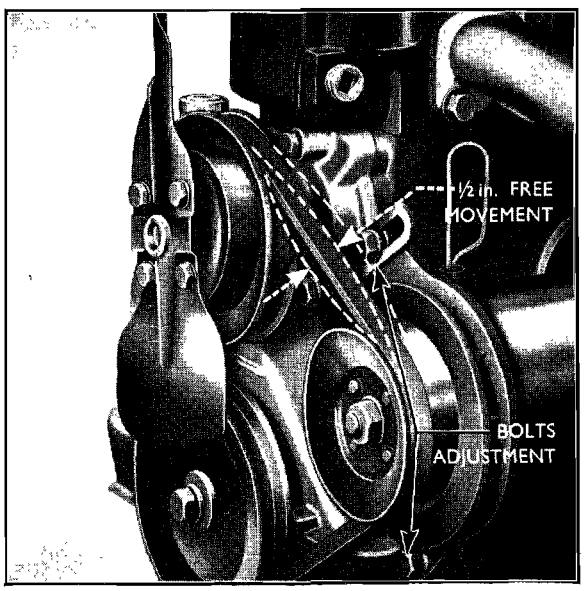
3. Pass the new fan belt around the water pump and crankshaft pulleys and engage it in the generator pulley.
4. Adjust the fan belt tension to give 13 mm. (½ in.) total movement between the water pump and generator pulleys.
5. Tighten the generator mounting bolts.

OP 8620-B FAN BELT – ADJUST

1. Slacken the generator adjustment locking bolt and the generator mounting bolts.
2. Move the generator as necessary until there is 13 mm. (½ in.) free movement at a point mid-way between the generator and fan pulleys.
3. Tighten the adjusting bolt and generator mounting bolts.



Checking the Clearance of Impeller Blades



Fan Belt Tension Adjustment

9

FUEL SYSTEM

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GENERAL DESCRIPTION
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SERVICE AND REPAIR OPERATIONS

OPERATION	9000-A	FUEL SYSTEM AND CARBURETTOR—CLEAN
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"	9275-A	FUEL GAUGE TANK UNIT—REMOVE AND INSTALL
"	9280-A	FUEL GAUGE—REMOVE AND INSTALL
"	9350-A	FUEL PUMP—REMOVE AND INSTALL
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"	9350-B	**FUEL PUMP DIAPHRAGM—RENEW** (Includes OPS 9350-A and A1)
"	9350-C	**FUEL PUMP MECHANISM—OVERHAUL** (Includes OPS 9350-A, A1 and A2)
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"	9425-A	INLET MANIFOLD—REMOVE AND INSTALL
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"	9510-A	CARBURETTOR—REMOVE AND INSTALL—AND/OR GASKET—RENEW
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"	9533-A	CARBURETTOR JETS AND FLOAT CHAMBER—CLEAN
"	9600-A	AIR CLEANER—REMOVE AND INSTALL
"	9700-A	CHOKE CONTROL CABLE—REMOVE AND INSTALL

GENERAL DESCRIPTION

The fuel system consists of a fuel tank, a mechanical fuel pump operated by the camshaft and a down-draught carburettor together with the necessary fuel lines.

A fuel tank, capacity 31.82 litres (7 Imperial galls.), is located at the rear of the car beneath the luggage compartment. On vans, the tank is mounted at the rear of the vehicle on the left-hand side and has a capacity of 27.28 litres (6 Imperial galls.).

The fuel gauge on the instrument panel registers the quantity of fuel in the tank when the ignition is switched on. The gauge is designed to eliminate needle fluctuation whilst the ignition is switched on.

The fuel pump is a self priming unit operated through a spring loaded arm from an eccentric on the camshaft and incorporates a glass sediment bowl and filter screen.

The fuel pump is supplied from beneath the tank by means of a fuel line which runs beneath the floor of the vehicle. A short length of flexible hose between the fuel pipe and the fuel pump is also incorporated.

An air cleaner of either the dry gauze, paper element or oil bath type can be fitted to the engine and is mounted on the carburettor throat.

Air/fuel mixture is ducted into the engine by a cast iron inlet manifold. Exhaust gases leave the engine by means of a cast iron manifold, the junction of the two manifolds provides a hot spot to assist the correct vaporisation of the fuel.

FUEL TANK

On saloon models the fuel tank is mounted at the rear of the car beneath the luggage compartment. The tank is retained in position by two straps and clamps which are adjustable and hook into brackets attached to the floor pan. There are anti-squeak pads attached to the fuel tank in the area covered by the tank support straps and on the upper surface of the tank. The Estate car tank is similarly situated but is retained in position by ten bolts and nuts.

A drain plug is situated in the tank.

The quantity of fuel in the tank is measured electrically by a gauge in the instrument panel and a sender unit in the front face of the tank.

The sender unit consists of a float and a rheostat. The float is attached to a hinged arm which is connected to the rheostat moving contacts. As the float rises or falls, according to the fuel level, the resistance of the rheostat varies, and thus the voltage applied at the fuel gauge also varies to indicate the quantity of fuel in the tank.

Fuel gauge needle fluctuations due to car movement, are eliminated as slight variations in voltage, caused by float movement, do not react quickly enough to cause a needle fluctuation on the gauge.

Fuel Gauge and Sender Unit Diagnosis

With the ignition switched on, disconnect the wire from the fuel tank sender unit. The instrument panel gauge needle should now be at the empty mark. Earth the fuel tank sender unit wire and the gauge needle should now be at the full mark. This needle action indicates that the fuel gauge is satisfactory. If the gauge operates correctly then the tank sender unit may require renewing or there may be a fault in the wiring.

Fuel Tank Repairs

NOTE—In no circumstances should any repair involving the application of heat be attempted on any fuel tank, without first rendering the tank safe. For many territories this is a legal requirement and for the United Kingdom, Section 31 (4) of the Factories Act 1961 reads:

'No plant, tank or vessel which contains or has contained any explosive or inflammable substance shall be subjected

(a) to any welding, brazing or soldering operation;

(b) to any cutting operation which involves the application of heat;

or

(c) to any operation involving the application of heat for the purpose of taking apart or removing the plant, tank or vessel or any part of it; until all practicable steps have been taken to remove the substance and any fumes arising from it, or to render them non-explosive or non-inflammable; and if any plant, tank or vessel has been subjected to any such operation, no explosive or inflammable substance shall be allowed to enter the plant, tank or vessel until the metal is cooled sufficiently to prevent any risk of igniting the substance.'

There are two main methods of rendering the tank safe:-

1. **Steaming Out**

   The filler cap and the tank sender unit must be removed and the tank emptied as completely as possible before steaming out. The tank should then be steamed for at least two hours with low pressure steam. Position the tank so that the condensate can drain away freely, thus ensuring that sediment and sludge, not volatilised by the steam, are washed out during the steaming process.

2. **Boiling Out**

   Again the filler cap and the tank sender unit must be removed and the tank emptied. Immerse the tank completely in boiling water containing an effective alkaline degreasing agent or a detergent, with the water filling as well as surrounding the tank. Boil the tank for at least two hours.

As an added precaution fuel tanks should have a PETROL (GASOLINE) VAPOUR warning label attached to them as soon as they are removed from the vehicle. After steaming or boiling out a signed and dated label to this effect should be attached to the tank.

Where it is necessary to cut a tank open, without first steaming or boiling out, it is advisable to use a reduced sparking tool made of some material such as beryllium bronze.

FUEL PUMP

The fuel pump is a self-priming unit operated through a spring-loaded arm from an eccentric on the engine camshaft.

The pump consists of two castings forming the upper and lower bodies. The lower body houses the operating lever and diaphragm and incorporates a mounting flange for attaching the pump to the engine. The operating lever has a spring-loaded rocker arm, which bears against the camshaft eccentric, and a link connected to the diaphragm pull rod. Rocker arm action only pulls the diaphragm downwards, its return action is by a return spring. As the link is separate from the rocker arm this allows the pump to "free-wheel" when the carburettor float chamber is full.

The upper body incorporates valve assemblies which are serviced as complete units. Each unit consists of a small brass cage holding the valve and spring and can be fitted in either inlet or outlet position. Inlet and outlet ports from the valves are threaded to take normal pipe unions. A short cranked pipe, onto which the flexible pipe to the carburettor connects, is fitted to the outlet port with the end inclined outwards from the engine at an angle of 45^{o} to the vertical. The fuel line from the fuel tank connects directly to the inlet port. An inverted sediment bowl and gauze filter screen are also fitted to the upper body to provide primary filtration.

CARBURETTOR

Each of the carburettors fitted are of the single venturi down draught type and are described and illustrated later in this section.

AIR CLEANER

The air cleaner for each carburettor is mounted directly on top of the carburettor upper body. A rubber ring in the air cleaner body ensures an airtight joint on the carburettor air intake lip. On early models the air cleaner is secured to the carburettor by a clamp and bolt situated below the air cleaner. On the Ford carburettor the air cleaner is secured by a bolt through the centre of the air cleaner screwed into a bracket attached to the carburettor upper body by two pins pressed into the casting on either side of the air intake.

Air enters the cleaner through a spout firmly attached to the air cleaner body and it is positioned so that the opening is facing towards the front of the engine compartment. The air is filtered by an oil-wetted wire gauze type element or by a paper element filter.

Cleaning and Inspection

The air cleaner element should be removed at normal service intervals, or more frequently when operating in extremely dusty conditions, for cleaning and inspection.

Wire Gauze Type

Wash the element and the air cleaner body in petrol. Allow the element to dry, immerse in clean engine oil, allow excess oil to drain off and then refit the air cleaner to the carburettor.

Paper Element Type

Dry type paper filter elements should be inspected by holding them up to a light and looking for splits, cracks, pin holes or distortions; any of which require the element to be replaced. Paper elements should never be cleaned with an inflammable solvent or cleaning solution. Neither should oil be added to the surfaces of the filter element or air cleaner body. Dry type paper elements should be cleaned by one of the following methods:-

1. Direct a stream of compressed air through the element, opposite to the flow of intake air (that is, blow air from the inside outward). Hold the nozzle at least 12.7 to 15.2 cm. (5 to 6 in.) from the element, and do not use air pressure in excess of 7.03 kg./cm^2 (100 lb./sq.in.).
2. Hold the element vertically and gently tap against a smooth horizontal surface until all dirt and dust is removed.

QUICK REFERENCE DATA

PERIODIC SERVICE ATTENTION

At first 1,000 km. (500 miles)

Clean the sediment from the fuel pump sediment bowl
Adjust the carburettor slow-running

Every 8,000 km. (5,000 miles) or six months

Clean the sediment from the fuel pump sediment bowl
Check the throttle cable and adjust if necessary
Clean the air cleaner element
Adjust the carburettor slow-running

Every 24,000 km. (15,000 miles) or eighteen months

Renew the air cleaner paper element (where fitted)

DATA

Fuel tank capacity (cars)	31.82 litres (7 Imperial gallons)
(vans)	27.24 litres (6 Imperial gallons)
Petrol Tank Location	Under luggage boot floor at rear (cars), or in left-hand side at rear (vans)
Fuel	Premium Grade (Standard Cylinder Head) Regular Grade (Low Compression Cylinder Head).
Carburettor	Downdraught type

Jet Sizes (1,000 c.c. Engine)

	Prior to Jan.60	After Jan.60	After May.62
Main Jet	115	115	97.5
Main Air Correction Jet	175	175	160
Economiser Jet	140	140	–
Economiser Air Correction Jet	195	195	–
Idling Jet	50	40	50
Idling Air Correction Jet	120	150	–
Starter Jet	125	125	–
Choke Tube	22 mm.	22 mm.	21.5 mm.
Needle Valve	–	–	1.3
Idling air bleed (fixed)	–	–	0.85
Accelerator pump jet	–	–	45

Jet Sizes (1,200 c.c. Engine)

Main Jet	–	110	–
Air correction jet	–	200	–
Accelerator pump jet	–	40	–
Idling air bleed (fixed)	–	60	–
Idling jet	–	50	–
Economy jet	–	65	–
Econostat air jet (fixed drilling)	–	130	–
Econostat petrol jet (fixed drilling)	–	80	–
Choke tube	–	23 mm.	–
Needle valve	–	1.6 mm.	–

Fuel pump:	
Type	Mechanical
Delivery pressure	0.088 to 0.141 kg./sq.cm. (1.25 to 2 lb./sq.in.)
Diaphragm spring:	
Test length	11.883 mm. (0.468 in.)
Test pressure	1.474 to 1.588 kg. (3.25 to 3.50 lb.)
Rocker arm spring:	
Test length	11.18 mm. (0.44 in.)
Test pressure	2.268 to 2.495 kg. (5 to 5.50 lb.)

Tightening torques, kg.m. (lb. ft.)

Fuel pump	½ in A/F 18 UNC	...	1.66 to 2.07 (12 to 15)
Manifold—Nuts	½ in A/F 24 UNF	...	2.07 to 2.49 (15 to 18)
—Bolts	½ in A/F 18 UNC	...	2.07 to 2.49 (15 to 18)
Air cleaner	7/16 in A/F 20 UNC	...	0.42 to 0.69 (3 to 5)

THE CARBURETTOR (1959-62)

The carburettor fitted is of the single venturi down-draught type. A separate two-stage starter device is incorporated, this progressively weakens the mixture as the choke control is pushed in from the intermediate to the "off" position. The starter device is dustproof, all combustion air being drawn from above the choke tube.

Description and Operation

Starting

The starting device consists of a separate chamber secured to the main body of the carburettor and contains two spring-loaded disc valves. The disc valves are secured to a spindle which in turn is connected by a lever to the choke control on the facia panel.

The inner disc valve has a slot machined in it which, when the choke control is pulled fully out, connects the starter fuel supply drilling to the starter device outlet port and inlet manifold. The outer disc valve is lightly spring loaded against the air ports in the face of the outer cover.

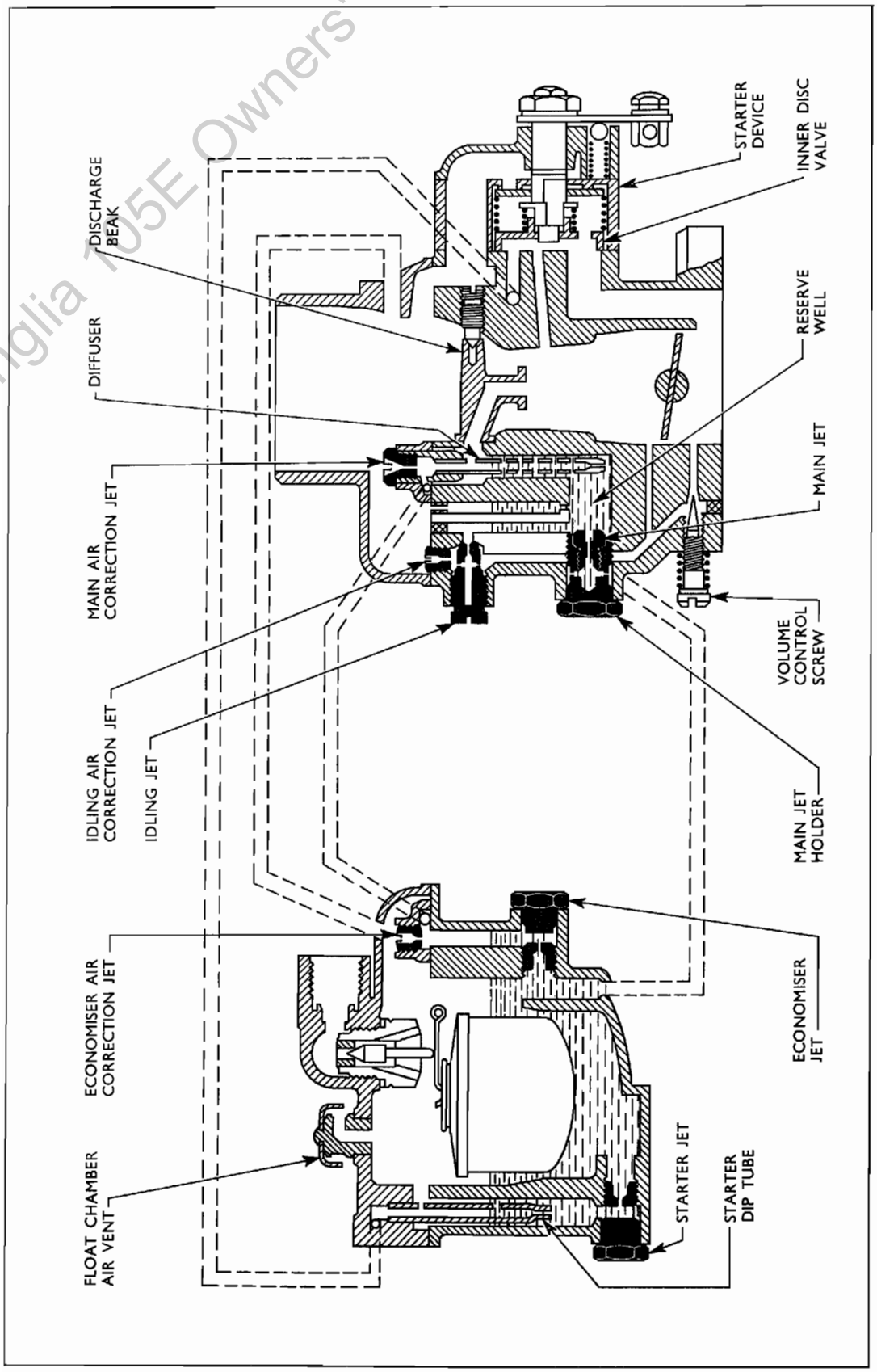
When the choke control is pulled fully out the disc valves are rotated so that the slot in the inner disc valve lines up with the fuel supply channel and starter outlet port. The drilling in the lower half of the inner disc valve also connects the starter outlet port to the inside of the starting device.

Fuel is supplied from the float chamber through the starter jet to the starter well. A dip tube incorporating an air bleed is pressed into the float chamber cover and is located in the starter jet well. The upper end of the dip tube is connected via drillings in the carburettor body to the fuel inlet port in the starter device.

As the engine is cranked by the starter motor the depression is felt through the starter device outlet port, through the slot in the disc valve and the drillings in the carburettor body to the top of the starter dip tube. Petrol is drawn up the inside of the dip tube, this being emulsified by air drawn in through the air bleed in the tube, through the connecting drillings in the carburettor body, across the slot in the inner disc valve and through the outlet port into the inlet manifold. As soon as the engine fires, the increased depression on the starter outlet port lifts the outer disc valve off its seat against the spring admitting additional air past the valve and through the drilling in the inner disc valve so weakening the mixture.

When the choke is pushed into the half-way position (located by a spring-loaded ball) the disc valves are rotated so that the volume of mixture drawn from the starter dip tube is considerably reduced at the same time the maximum amount of air is drawn past the outer disc valve into the starting device. Air is also drawn through the starter air bleed channel again reducing the volume of fuel drawn from the starter dip tube. If the vehicle is driven with the choke in the half-way position, the air speed through the choke tube past the end of the starter air bleed channel causes a depression to be felt on this channel and mixture supplied from the starter dip tube is drawn through it additional to the mixture drawn from the starter device.

As the choke control is pushed in the mixture supplied by the starter device is progressively weakened until the fuel supply port and starter outlet port are completely blanked off.

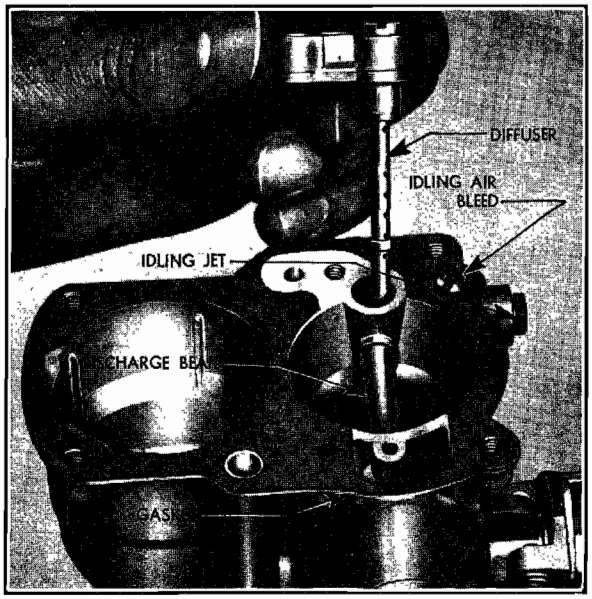


Operation of Carburettor

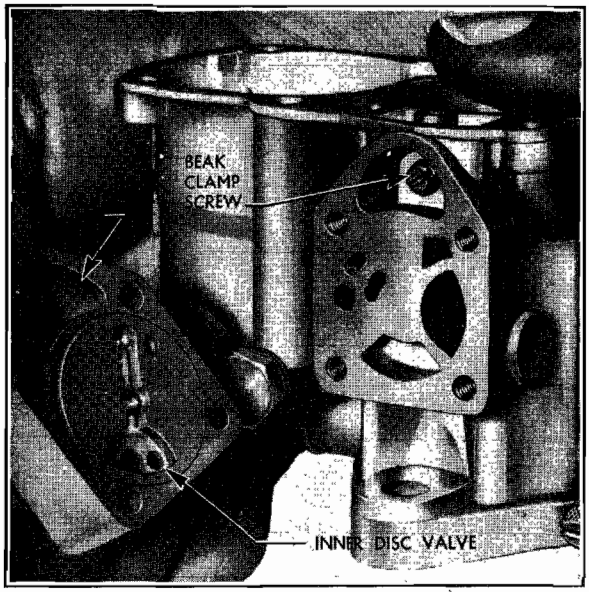
Idling Supply

With the engine running, the choke control pushed fully home and the throttle in the idling position depression is felt on the idling discharge port, past the volume control screw on to the idling petrol and air correction jets. Petrol is supplied from the main jet to the reserve well and is drawn from this well through the idling jet. The fuel metered by the idling petrol jet is emulsified by air drawn through the idling air correction jet, extra air being drawn through the progression drilling to further weaken the mixture. The volume of mixture supplied by the idling port is controlled by the setting of the volume control screw. The mixture supplied by the idling discharge port is still further emulsified by air drawn past the slightly opened throttle plate.

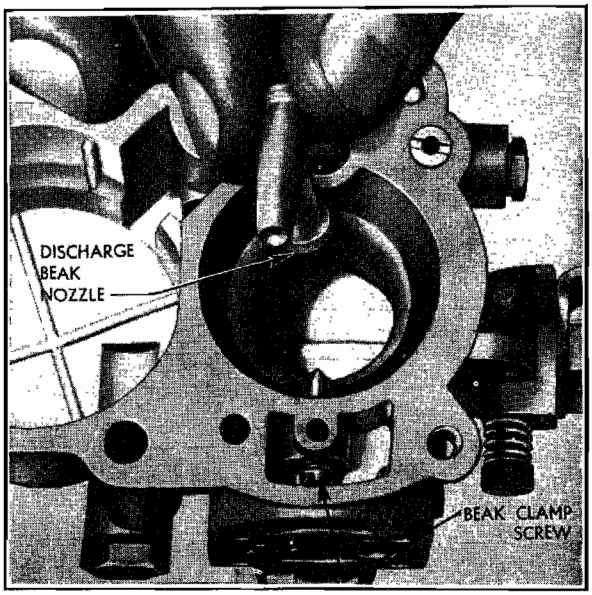
As the throttle is opened further the air drawn past the throttle plate creates a depression on the progression drilling and mixture is drawn from this in addition to mixture supplied from the idling port.



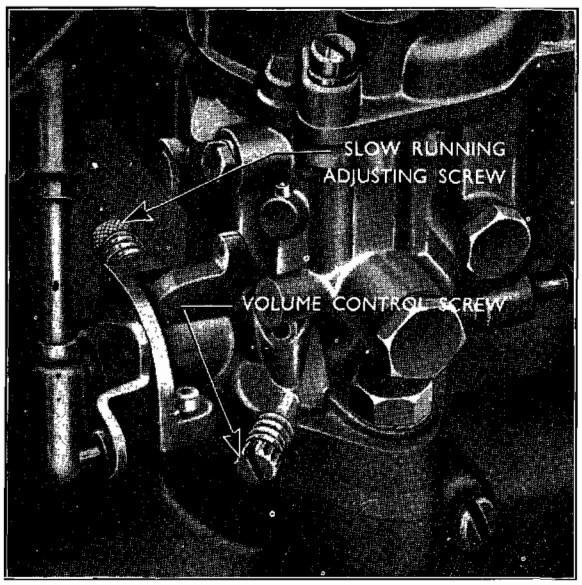
Removing the Diffuser Tube



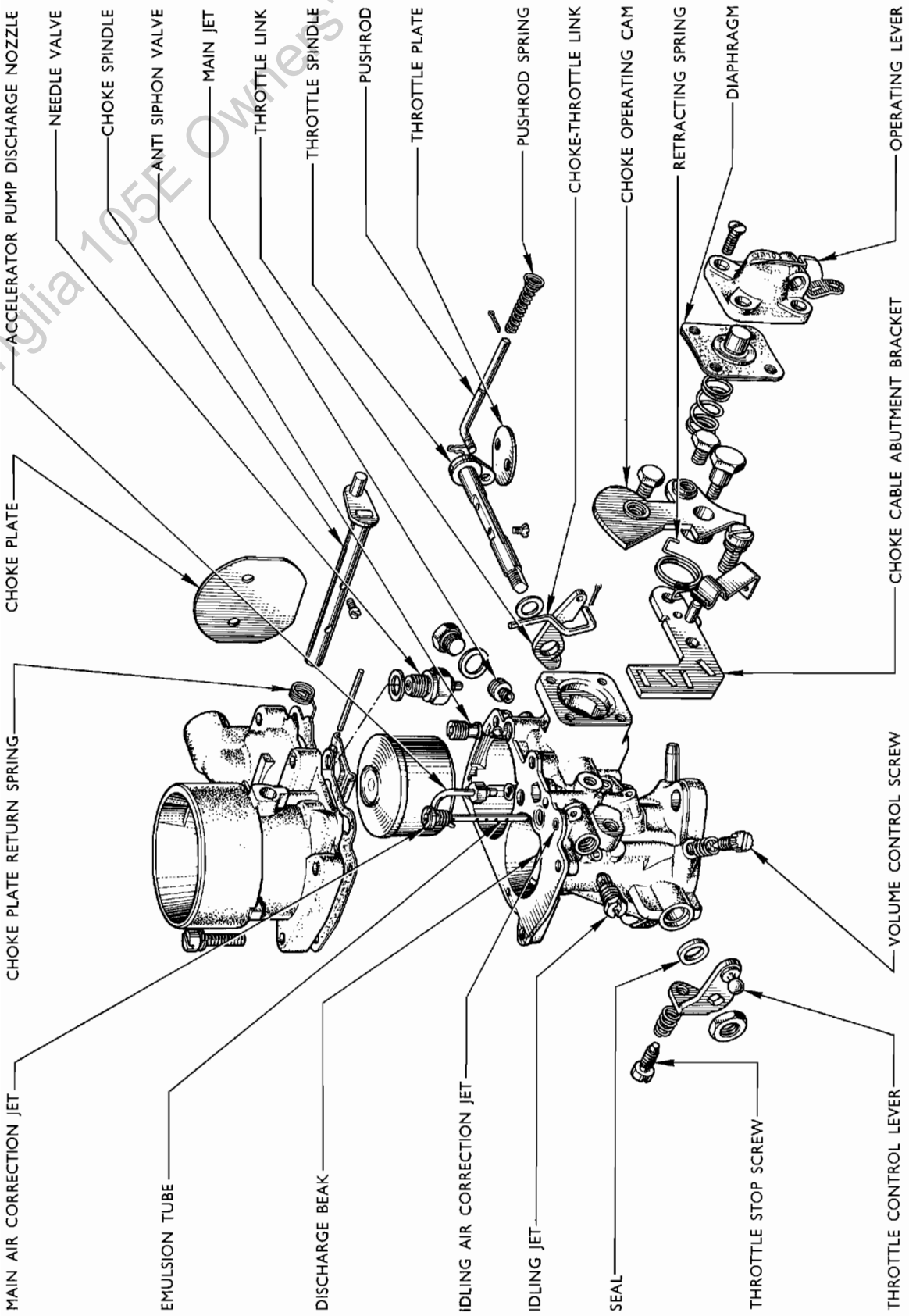
Removing Starter Device



Refitting Discharge Beak



Slow-Running Adjustments



Exploded View of Carburettor

Check the air cleaner to ensure that the element is clean and, in the case of the oil bath type cleaner, that the oil is clean and at the correct level.

1. Screw in the slow-running adjustment screw until the idling speed is a little faster than normal.
2. Unscrew the volume control screw until the engine begins to "hunt" (or if a vacuum gauge is in use, screw in or out to obtain maximum reading).
3. Screw the volume control screw in again until the engine runs evenly.
4. If the engine speed is then too high, unscrew the slow-running screw until a reasonably slow idling speed is obtained.

   This may cause a slight resumption of "hunting". If so, screw in the volume control screw until the idling is perfect.

   Note it is not advisable to have too slow an idling speed, or excessive movement of the engine on its flexible rubber mountings will result.
5. Once the carburettor has been readjusted, it may be found advisable to check and, if necessary, readjust the ignition setting.

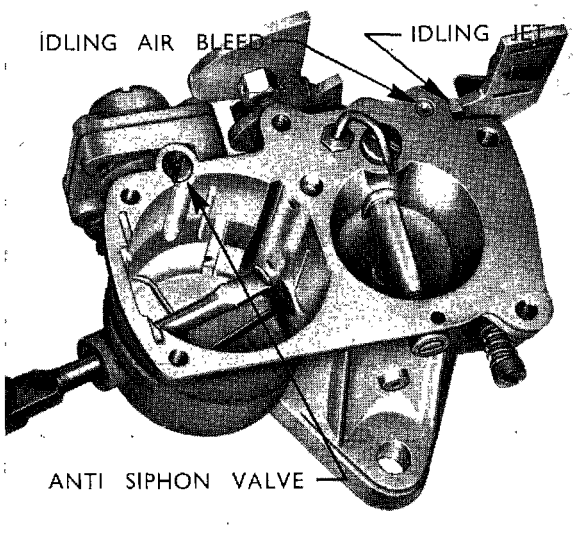
Fuel Level

To check the float it is necessary to remove the float chamber cover, the float may then be examined to ensure that it is not punctured.

The level of the fuel in the float chamber is automatically regulated by the slight rise and fall of the float, closing or opening the needle valve to cut off or admit petrol from the fuel pump as required. This form of design ensures complete stability of the pre-determined level, thus eliminating all need for routine checking. In event of damage, however, the float assembly must be replaced immediately in order to maintain the correct fuel level.

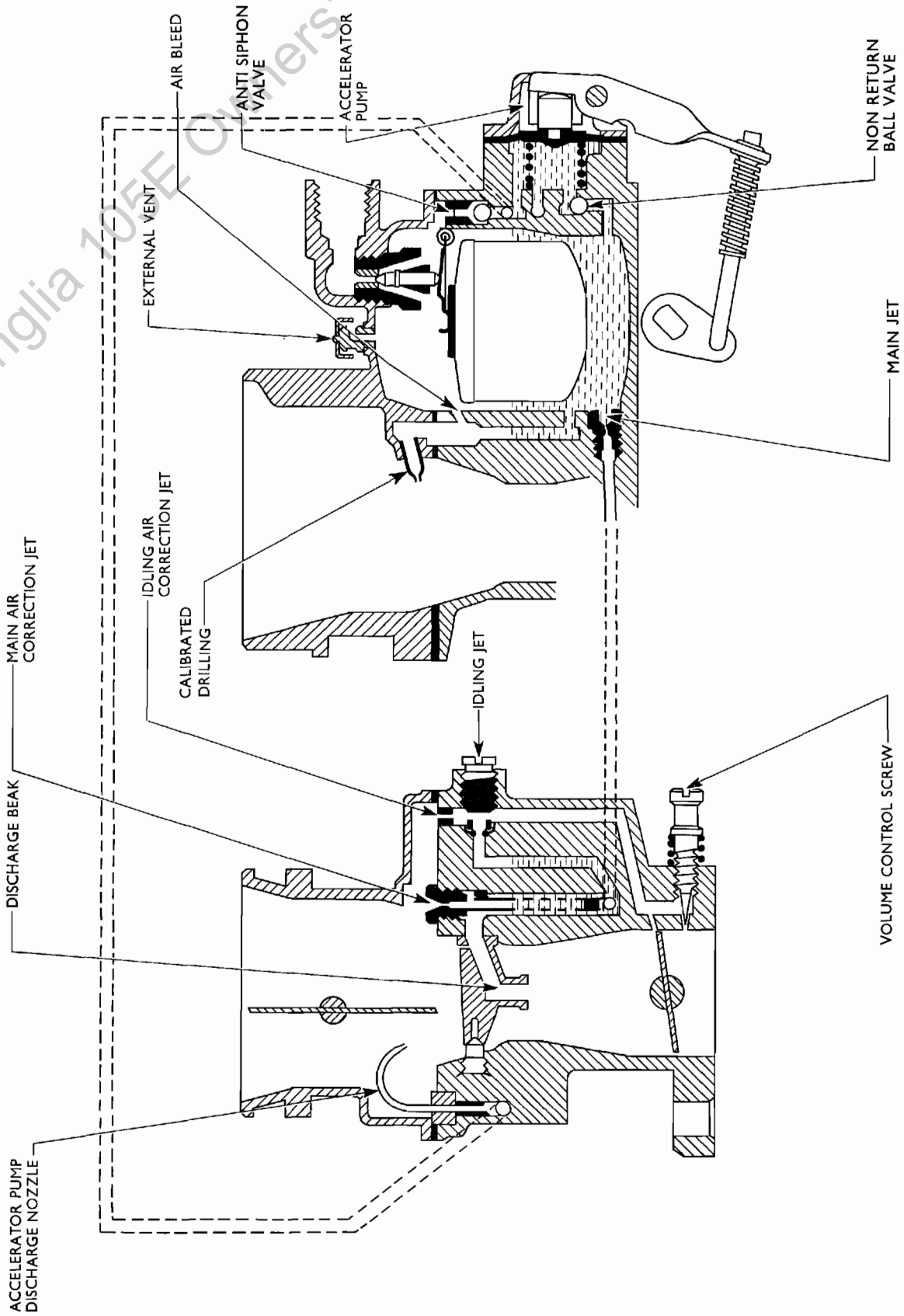
Cleaning the Carburettor

At periodic intervals the float chamber cover should be removed from the carburettor, the float arm and float lifted out, and the bowl swilled in petrol to remove all sediment. The jets should occasionally be removed and cleared, using compressed air supply.



Refitting Main Jet

Slow-Running Adjustments



Theoretical Fuel System Diagram

Carburettor Adjustments

Certain adjustment may be required from time to time and these are detailed under the following headings:—

Choke Adjustments

The choke control cable is adjusted at the choke operating cam so that there is approximately 0.125 in. free play in the cable when control is pushed in fully.

The correct degree of throttle opening when the choke plate is closed for starting is obtained by placing a 1.1 mm, drill (No. 57) between the edge of the throttle plate and the carburettor body at right-angles to the throttle spindle. This setting can, alternatively, be obtained by screwing in the throttle stop screw approximately three turns from the position at which it abuts the throttle plate stop when the throttle is fully closed (it will be necessary to remove the throttle stop screw spring for making this adjustment as the spring becomes "coil-bound"). The length of the choke-throttle link should then be adjusted to that the choke operating cam is in the fully closed position.

Slow-Running Adjustment

To obtain the best slow-running adjustment, the engine should be tuned against a vacuum gauge connected to the inlet manifold. This connection can be made by removing the blanking plug and fitting the appropriate adaptor and gauge.

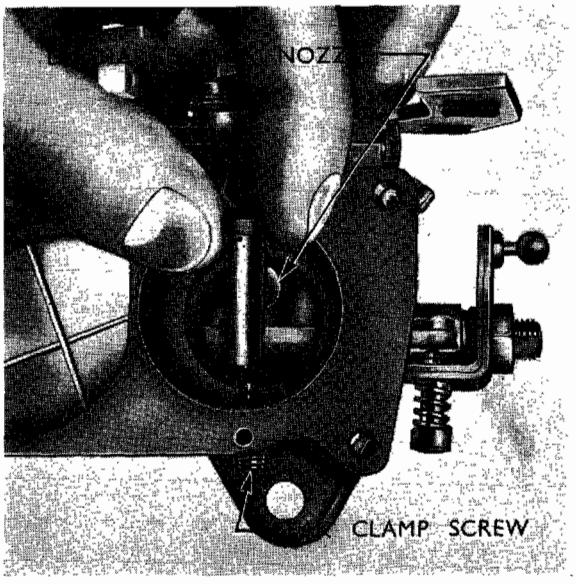
Before commencing adjustment, check the air cleaner to ensure that the element is clean and, in the case of oil bath cleaner, that the oil is clean and at the correct level.

Run the engine allowing it to warm up. To adjust the slow-running, screw in the throttle stop screw until a fast idling speed is obtained then turn the volume control screw either clockwise or anti-clockwise to obtain the maximum vacuum reading. Readjust the idling speed as necessary and continue the adjustment until the maximum possible reading is obtained with a reasonable slow-running speed. It may be necessary to adjust the ignition setting.

Main Supply

As the throttle is opened still further, the air speed through the choke tube creates a depression around the main discharge beak.

Refitting Acclerator Pump



Refitting Discharge Beak

This depression is felt on the main jet well and through the drillings in the emulsion tube and the main air correction jet. Fuel is supplied by the main jet to the main jet well and reserve well. The depression on the discharge beak draws fuel from the main jet well, this fuel being emulsified by air drawn through the air correction jet and through the lateral holes in the emulsion tube.

As the engine speed and consequently the air speed increases, the level of the fuel in the main jet well drops. This progressively uncovers the remaining holes in the emulsion tube and increases the volume of air to maintain the uniform mixture strength at all engine speeds and loads.

Econostat Device

The econostat device allows maximum economy to be maintained over the cruising range. The unit is non-mechanical and completely automatic, being controlled by the demands of the engine.

The system includes an air bleed and calibrated petrol drilling, together producing an emulsified mixture that is discharged into the air intake at a point above the choke tube. As the engine speed increases, the discharge will take place, only when the depression within the discharge tube has become great enough to lift the petrol up to its inner end. The depression inside the tube is controlled by the depression at the outer end of the tube and the relative size of the air bleed and the outlet orifice. The size of the air bleed determines the point at which the device comes into operation, the calibrated drilling controlling the rate at which fuel is supplied.

The size of the air bleed and calibrated petrol drilling make it possible from a chosen engine speed up to maximum r.p.m. to supplement the mixture supplied by the main jet with that from the econostat device. Thus, the device allows the size of the main jet to be chosen with regard to cruising economy, whilst over richness under full throttle low speed conditions can be avoided.

Accelerator Pump System

The purpose of the accelerator pump is to ensure smooth acceleration, and prevent any hesitation when the throttle is suddenly opened. The richer mixture required to fulfil these conditions is provided by a controlled and metered supply of fuel from the accelerator pump into the carburettor coincident with the opening of the throttle.

When the accelerator is depressed the movement of the actuating rod and lever displaces the pump diaphragm, this action forces petrol through the calibrated pump injector tube into the main air stream thereby ensuring a condition of rapid smooth acceleration. The non-return valve prevents petrol returning to the float chamber when the diaphragm is displaced.

An anti-siphon valve is positioned between the fuel chamber of the pump and the float chamber in order to prevent overspill from the injector tube thus eliminating the possibility of difficulty restarting when warm. A ball is positioned beneath the anti-siphon valve to prevent air entering the system when the pump fuel chamber re-charges.

CARBURETTOR (1962-65)

The carburettor is of the single venturi downdraught type. It incorporates an accelerator pump to ensure smooth and rapid acceleration, an economy device controlled by the manifold depression and a choke valve of the semi-automatic strangler type.

Description and Operation

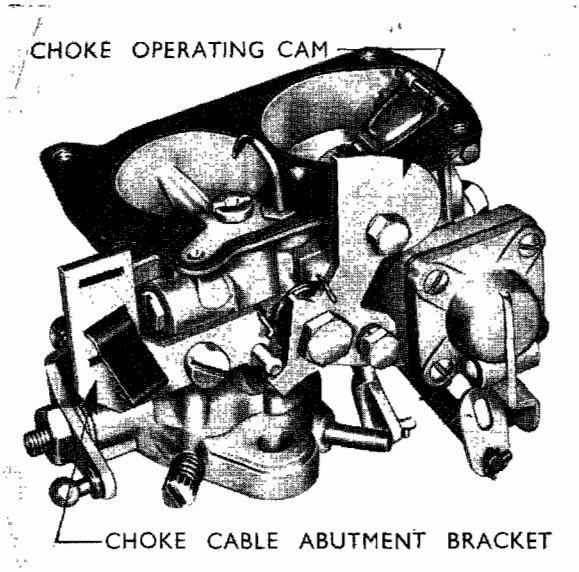
The starting device consists of a choke plate which is connected by means of a flexible cable to a friction locking type control on the facia panel. Pulling the control closes the choke plate and at the same time, by means of an interconnecting rod opens the throttle plate a pre-determined amount; the degree of throttle opening allowing depression created by the induction strokes to reach the mixture chamber and choke tube areas, and ensuring a fast idle speed after starting.

As the engine is rotated by the starter motor, depression caused by the induction strokes causes a suitably proportioned mixture to discharge from the main spraying well through the main spraying orifice, into the manifold. At the instant of the engine firing and running, a rise in depression consequent upon the increase in engine revolutions will automatically open the choke plate a certain amount, thus admitting air for the dual purpose of weakening the mixture, and, together with the partly opened throttle plate allowing the engine to develop a pre-determined fast idle speed to prevent stalling during the warming up period.

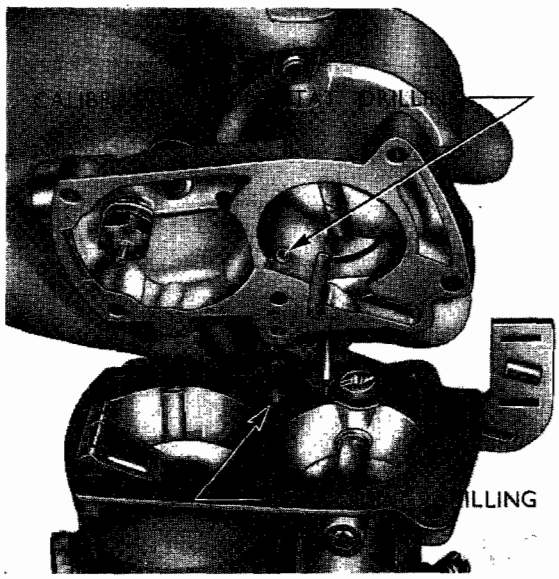
As the engine temperature rises the control knob should be gradually pushed in towards the "off" position in accordance with the requirements of the engine. Once the normal operating temperature has been reached the control knob should be pushed fully in.

Idling Supply

With the engine running, the choke control pushed fully home and the throttle in the idling position, depression is felt on the idling discharge port, past the volume control on to the idling petrol and air correction jets. Petrol is supplied from the main jet to the reserve well and is drawn from this well through the idling jet. The fuel metered by the idling petrol jet is emulsified by air drawn through the idling air correction jet, extra air being drawn through the progression drilling to maintain correct mixture strength. The volume of mixture supplied by the idling port is controlled by the setting of the volume control screw. The mixture supplied by the idling discharge port is still further emulsified by air drawn past the slightly opened throttle plate.



Choke Operating Mechanism



Float Chamber Cover

As the throttle is opened further the air drawn past the throttle plate creates depression on the progression drilling and mixture is drawn from this in addition to the mixture supplied from the idling port until the throttle has been opened sufficiently for the main spraying system to come into operation.

Main Supply

As the throttle is opened still further, the air speed through the choke tube creates a depression around the main discharge beak. This depression is felt on the main jet well and through the top drilling in the emulsion tube on the main air correction jet. Fuel is supplied by the main jet to the main jet well and reserve wells. The depression on the discharge beak draws fuel from the main jet well this fuel being emulsified by air drawn through the air correction jet and through the lateral holes in the emulsion tube.

As the engine speed and consequently the air speed increases the level of fuel in the main jet well drops, progressively uncovering the remaining holes in the emulsion tube and increases the volume of air bled in to maintain the uniform mixture strength at all engine speeds.

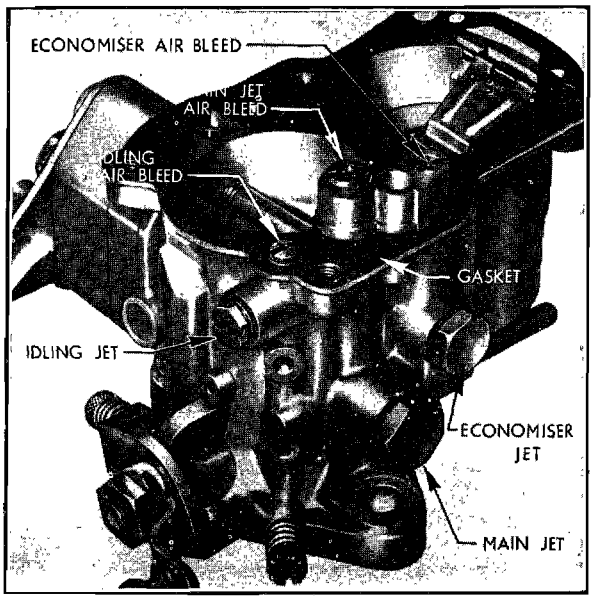
Economy Device

An economy device is incorporated in the carburettor. The operation of this unit is dependent upon engine speed and the consequent air speed and depression created around the main discharge beak, so that at high engine speeds the fuel supplied by the main jet is supplemented by the discharge from the economiser jet. At cruising and lower engine speeds the fuel is supplied only by the main jet.

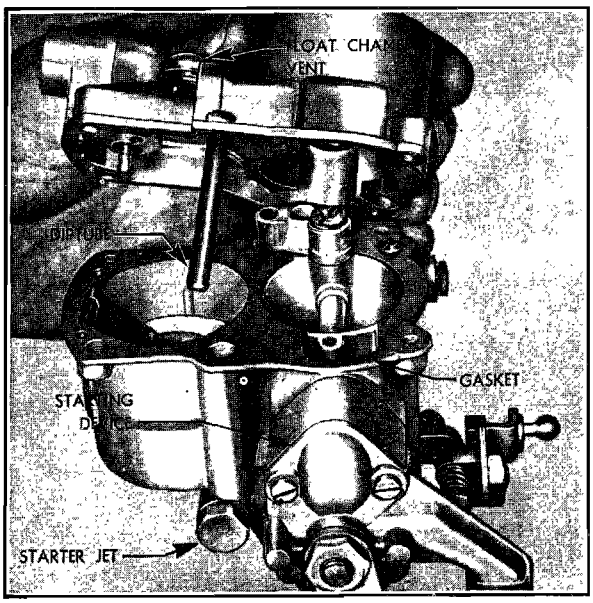
Fuel is supplied through the economiser jet to the economiser jet well. Located in the economiser body at the top of the jet well is the discharge port and economiser air bleed. At high engine speeds the depression on the main jet well is felt on the economiser discharge port through the centre of the main jet diffuser so that emulsified fuel drawn from the economiser well supplements the discharge from the main jet. As the engine speed and depression decrease the discharge from the economiser ceases, fuel then being supplied by the main jet only.

Carburettor Adjustments

Provision is made for adjusting the volume of mixture at idling speed, by means of the volume control screw, and the idling speed, by means of the slow-running adjustment screw.



Carburettor Jet Positions



Float Chamber Cover

Volume Control Screw

The volume control screw is provided to adjust the fuel/air mixture when the engine is idling. Screwing it inwards reduces the volume of mixture and vice versa.

A small compression spring is fitted beneath the knurled head of the screw and this must be in good condition, otherwise vibration may affect the adjustment.

Slow-Running Adjustment

To obtain the exact setting for an individual engine, the slow-running adjustment screw and volume control screw should be adjusted together when the engine is thoroughly warm.

The best slow-running adjustment can be obtained when the engine is tuned against a vacuum gauge, which should be connected to the inlet manifold.

When a suitable vacuum gauge is not available, the engine should be warmed up and the throttle stop screw turned clockwise so that the engine is running at a fast idling speed. Screw the volume control screw in or out until the engine runs evenly. Readjust the throttle stop screw if the engine is running too fast, followed by a further readjustment of the volume control screw.

These operations should be repeated until the idling speed is satisfactory and if necessary, followed by a readjustment to the ignition setting.

Accelerator Pump Stroke Adjustment

For normal operating conditions set the pump so that the push rod passes through the outer elongated hole in the operating lever and the split pin through the outer hole in the push rod.

For cold climatic conditions set the pump so that the push rod passes through the inner elongated hole in the operating lever and the split pin through the inner hole in the push rod.

GENERAL DIAGNOSIS

If the engine operation is unsatisfactory and it is suspected that the fault is due to **poor carburation**, the items listed under the following headings may, when checked, help to locate the cause.

Difficult Starting from Cold

1. Ensure first that fuel is being supplied from the fuel pump.
2. Check that the needle valve at the top of the float chamber is free to operate and that fuel is supplied through this valve when the engine is rotated. If the needle sticks on its seating, this can be overcome by washing the assembly in methylated spirit.
3. Remove air cleaner and check that the choke plate closes completely when the control is operated. Should this plate fail to close fully, ensure that the choke plate spindle is not bent or the return spring broken, also check that the spindle bearings are free from dirt, thus preventing full movement of the choke plate.

Difficult Starting of a Warm Engine

This is usually due to an over-rich mixture which may normally be cleared by fully opening the throttle and turning the engine over on the starter motor with the ignition switched off. However, should this condition be recurrent, check the following items to determine the actual cause.

1. Ensure that the air cleaner is serviceable, cleaning element if necessary.
2. Check the fuel pump delivery pressure.
3. Ensure that the needle valve and seating at the top of the float chamber are not damaged or dirty, and are screwed tightly in place.

4. Examine the float ensuring that it has not been punctured, and the float arm to see that this is not damaged or bent.

Stalling and Irregular Slow-Running

1. Check adjustment of volume control and idling control screws as described under the heading "Slow-Running Adjustment."
2. Clean the idling jet and check that the idling air correction jet is free from obstruction.
3. Check that the slow-running and progression outlet holes are clear.
4. Remove the volume control screw and inspect to ensure that the taper end has not been damaged and that the coil spring is in good condition, spring loading the screw to prevent it from vibrating out of position.

Poor Acceleration

1. Ensure that fuel is emitted into the venturi when the accelerator pump is operated.
2. Clean the accelerator pump discharge nozzle, main air correction jet and main jet.
3. Check that the econostat drillings are free from obstruction.

Excessive Fuel Consumption

1. Check that the air cleaner is serviceable and clean element if necessary.
2. Ensure that the choke plate returns to the open position when the control is released. Failure to do this may be caused by dirty spindle bearings or a dirty return spring.
3. Thoroughly clean all jets and passages. Inspect the pump diaphragm and ensure that the spring is in good condition, located on the metal seating in the centre of the diaphragm on reassembly. Tighten the screws retaining the pump securely when replacing.
4. Check that the econostat drillings are free from obstruction.

FORD CARBURETTOR (1966 onwards)

A new type of carburettor is fitted in production to vehicles manufactured from 1st January 1966, and is available in three models for various engine applications. Generally, carburettor Part No. C6AH-9510-A is for use on car engines and van high compression engines, whilst carburettor Part No. C6EH-9510-A is for use in vans with the standard low compression engine. This later carburettor is also used on cars exported to certain export territories. In addition to these two carburettors, a further version Part No. C6AH-9510-C is available for engines equipped with a positive ventilation system (export only).

The carburettor is of the single venturi downdraught type with a semi-automatic strangler type choke valve for cold starting. In addition to the usual idling and main systems an accelerator pump is also incorporated to ensure smooth and rapid acceleration when the throttle valve is opened quickly and, on the car version of the carburettor, a full load enrichment system is incorporated for maximum performance.

The carburettor consists of two castings forming the upper and lower bodies. The upper body incorporates the float chamber cover, float pivot brackets, fuel inlet connection tube, needle valve, air intake, choke plate, the complete main system and discharge beak, full load enrichment dip tube (where fitted), idling jet and first idle air bleed of the idling system and the accelerator pump discharge nozzle. The lower body incorporates the float chamber, throttle barrel and integral choke tube, throttle plate, idling discharge orifices and adjustment screws, the accelerator pump, the distributor vacuum connection and the choke linkage.

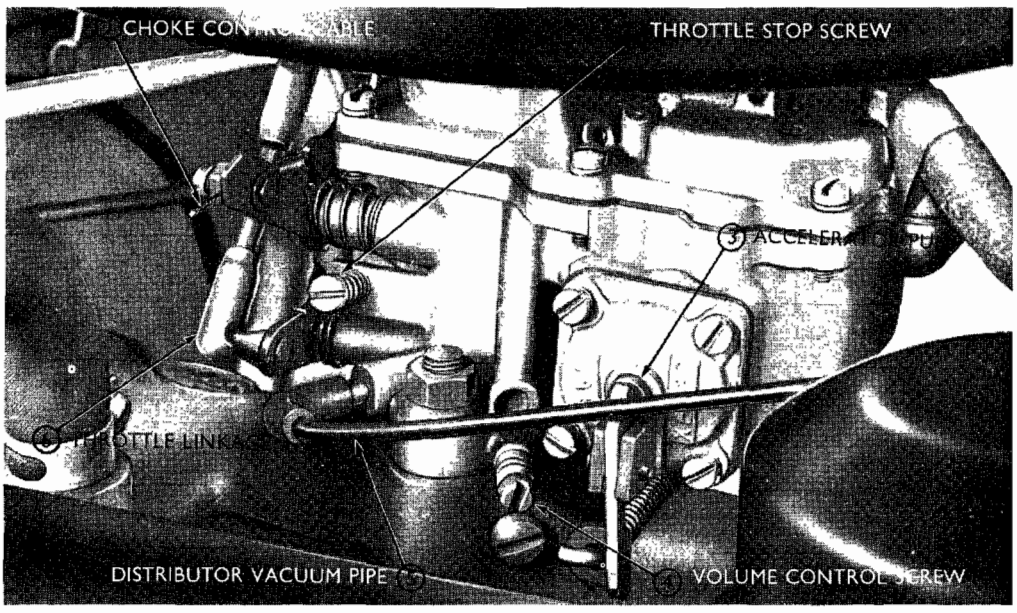
Description of Operation

Fuel Supply

Fuel is supplied to the carburettor float chamber by the engine driven mechanical pump. The fuel in the float chamber is automatically maintained at a pre-determined level by the slight rise and fall of the float, closing or opening the needle valve to cut off or admit fuel from the pump as required.

Starting

The starting device consists of a choke plate which is connected by means of a link to the choke lever on the carburettor body. A flexible cable connects the choke lever to a friction



The Carburettor in Situ

locking type control on the facia panel. Pulling the control closes the choke plate and at the same time, by means of the fast idle cam on the choke lever, opens the throttle plate a pre-determined amount; the degree of throttle opening allowing depression created by the induction strokes to reach the mixture channels and choke tube area, and ensuring a fast idle speed after starting.

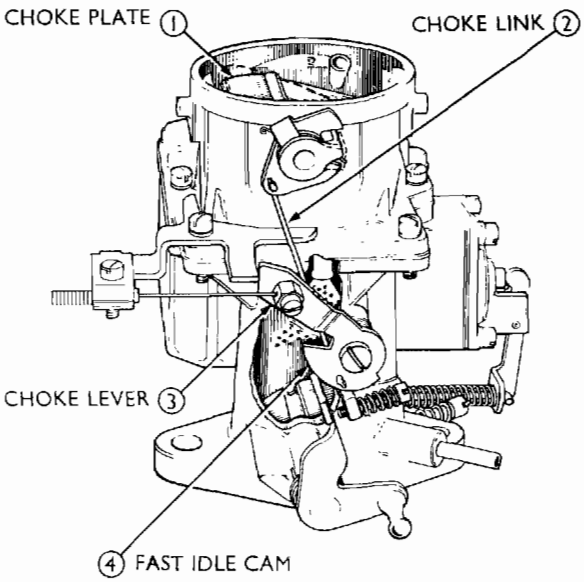
As the engine is rotated by the starter motor, depression created by the induction strokes causes a suitably proportioned mixture of emulsified fuel to be drawn from the main discharge beak into the inlet manifold. At the instant of the engine firing and running, a rise in depression consequent upon the increase in engine revolutions will automatically open the choke plate a certain amount, thus admitting air for the dual purpose of weakening the mixture, and, together with the partially opened throttle plate, allowing the engine to attain a pre-determined fast idle speed to prevent stalling during this warming-up period.

As the engine temperature rises the control knob should be gradually pushed towards the 'off' position in accordance with the requirements of the engine. Once the normal operating temperature has been reached the control knob should be pushed fully in, when the engine's fuel requirements, at idling, will be met by the idling system only.

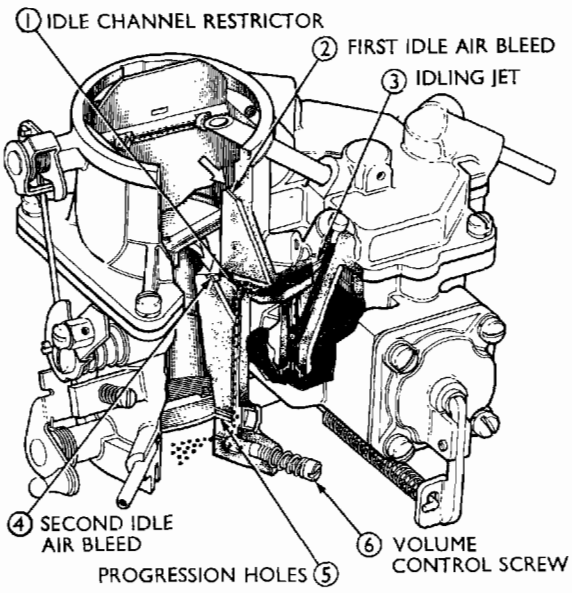
Idling and Progression Supply

With the engine running and the choke control pushed fully home, the throttle plate returns to the normal idling position. Manifold depression acting on the volume control screw orifice draws fuel up to the idling jet via the main jet (which is mounted in the base of the pendant housing within the float chamber). The fuel discharging through the idling jet is now emulsified by air drawn through the first idle air bleed situated in the carburettor air intake. The resulting mixture is drawn through the idle channel restrictor into the vertical duct in the carburettor body and is further emulsified by air bleeding in through the second idle air bleed and the two small progression holes, before it finally reaches the idling discharge aperture just below the throttle plate. It will be noted that the two progression holes are situated in a slightly offset horizontal position along the closed throttle plate line. Their effect is to provide a more accurate progressively controlled delivery. The quantity of mixture entering the inlet manifold of the engine is regulated by a needle-type volume control screw operating within the idling discharge orifice.

When the accelerator pedal is gradually depressed, to increase the speed, the two small air bleed or progression holes are first covered in turn by the throttle plate to cut off the air bleed at this point.



Starting



Idling

The richer mixture, now supplied by the idling system, mixes with the greater volume of air flowing past the partially opened throttle plate to give the correct mixture strength for the engine. As the progression holes are uncovered by the throttle plate, mixture discharges from them into the inlet manifold, thus providing a smooth and progressive transition from the idling to the main system.

Main System

On opening the throttle plate further, increased depression is created around the main discharge beak by the air passing through the choke tube. This depression on the discharge beak draws fuel from the main jet well, which is supplied with fuel by the main jet. The fuel is emulsified by air drawn into the system through the air correction jet and through lateral holes in the emulsion tube. As the engine speed increases, the depression is increased and the fuel level drops in the main jet well progressively exposing the holes in the emulsion tube to maintain a balanced emulsified fuel/air ratio regardless of the engine speed.

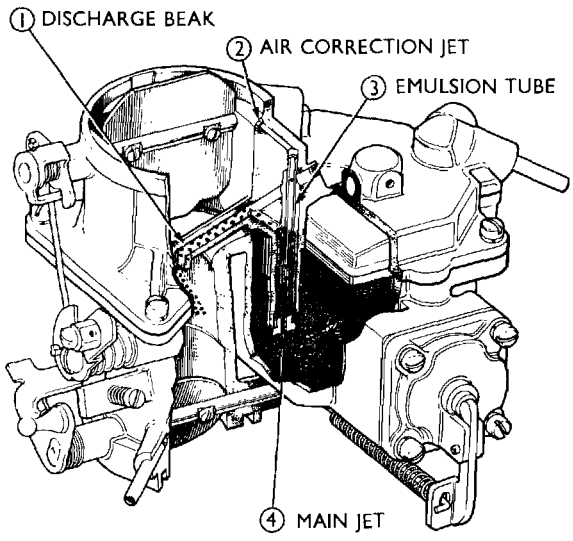
Full Load Enrichment (Car only)

The main system is designed to give maximum economy throughout the vehicle's cruising range. For maximum performance at high speed (on the car only) the main system is supplemented by the full load enrichment system. This system consists of a calibrated dip-tube drawing fuel from the float chamber with a supplementary discharge beak in the carburettor air intake above the main discharge beak.

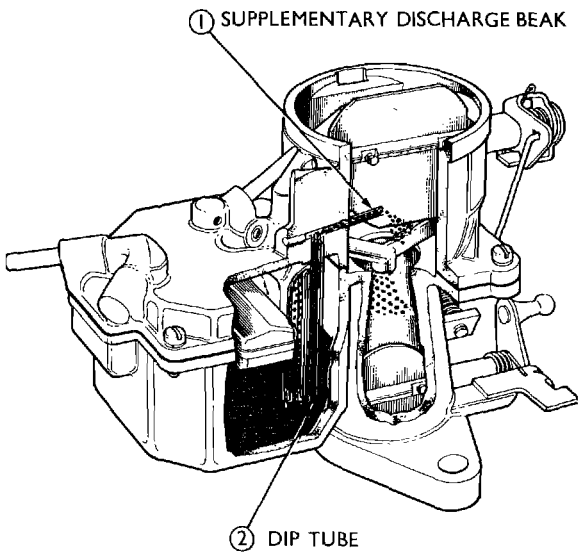
When the throttle is fully opened the engine is operating at full load and at high speed air passing the supplementary discharge beak draws a column of fuel up the dip-tube. This fuel is emulsified by air entering the tube through a bleed hole. The emulsified fuel discharges through a calibrated jet into the supplementary discharge tube and thence into the carburettor air stream.

Accelerator Pump System

The purpose of the accelerator pump is to ensure a smooth transition from the idling and progression system on to the main system, without any hesitation, when the throttle is suddenly opened. The richer mixture required to fulfil these conditions is provided by a controlled and metered supply of fuel from the accelerator pump into the carburettor barrel coincident with the opening of the throttle plate.



Main System



Full Load Enrichment

When the accelerator pedal is depressed the movement of the throttle spindle actuates the pump push-rod and lever to displace the pump diaphragm. This action forces fuel past the discharge valve and out through the calibrated discharge jet into the main air stream, thereby ensuring a condition of rapid smooth acceleration. A non-return ball valve prevents fuel returning to the float chamber when the diaphragm is displaced.

As the accelerator pump only operates during a part of the throttle opening the pump lever is connected to the push rod by a compression spring thus allowing full throttle opening after completing the pump operating stroke. This action also prevents a partial hydraulic lock occurring during very rapid throttle opening and provides a progressive feed at the start of acceleration. During very slow throttle opening the fuel in the pump chamber bleeds back through a small jet into the float chamber without any discharge into the carburettor barrel.

When the throttle plate is closed, and the push rod and lever are in the released condition the diaphragm is returned by its spring to the 'charged' position ready for the next stroke. The travel of the diaphragm and consequently, the volume of fuel discharged at each stroke, can be set by adjustment to the push-rod as outlined in the ensuing maintenance chapters.

CARBURETTOR MAINTENANCE

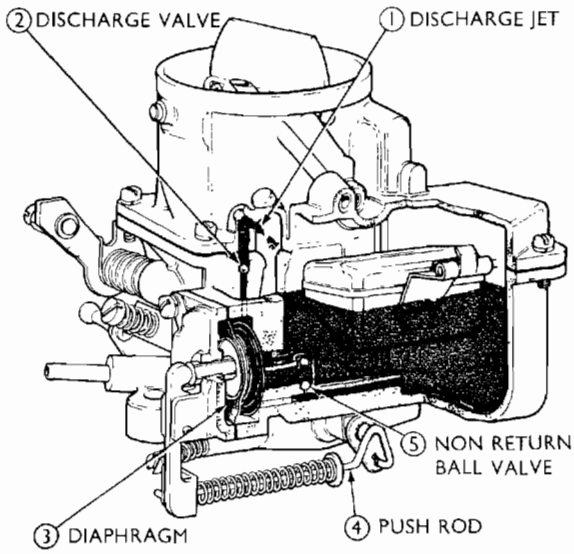
1. Slow-Running Adjustment

After 800 km. (500 miles) and thereafter every 8,000 km. (5,000 miles) the carburettor slow-running should be checked and adjusted if necessary. Before commencing adjustment check that all other direct influences on engine behaviour e.g. electrical system, valve clearances, etc., are correct and in working order. Check the air cleaner to ensure that the element is clean; also check that the throttle operation is free and unrestricted.

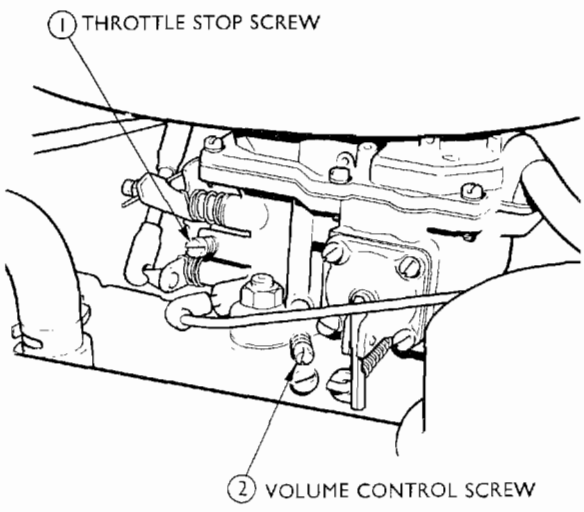
If the engine or carburettor has been disturbed, it will be necessary to check that the throttle and choke operations are correctly synchronised prior to effecting any slow-running adjustments.

To obtain the best slow-running adjustment, the engine should be tuned against a vacuum gauge connected to the inlet manifold. This connection can be made by removing the blanking plug from the inlet manifold and fitting the appropriate adaptor and gauge.

Run the engine until it has reached normal operating temperatures. To adjust the slow-



Accelerator Pump System



Slow-Running Adjustments

running, screw in the throttle stop screw until a fast idling speed is obtained then turn the volume control screw, illustrated either clockwise or anti-clockwise to obtain a maximum vacuum reading. Readjust the idling speed as necessary and continue the adjustment until the maximum possible reading is obtained, compatible with a reasonable slow-running speed.

When a vacuum gauge is not available, the engine should be warmed up as previously described and the throttle stop screw turned clockwise so that the engine is running at a fast idling speed. Screw the volume control screw in or out until the engine runs evenly. Readjust the throttle stop-screw if the engine is running too fast, followed by a further readjustment of the volume control screw. These operations should be repeated until the idling speed is satisfactory—this should be approximately 600 rev./min.

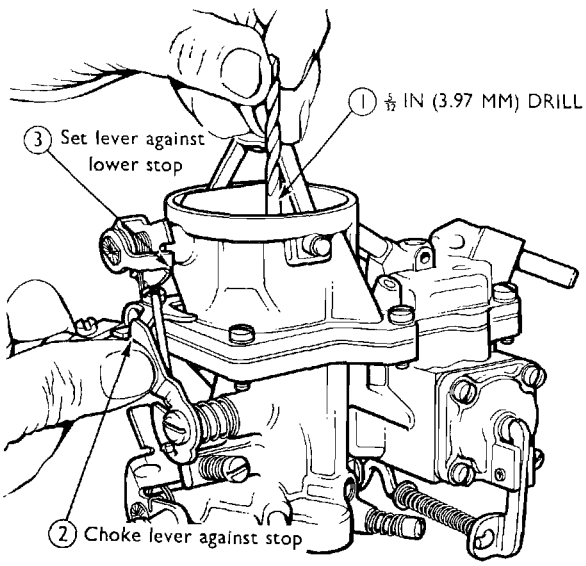
2. Choke Adjustment

Choke Plate Pull-down

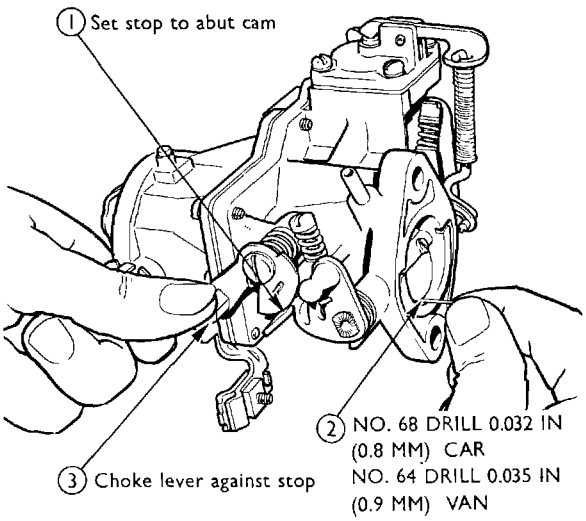
Remove the air cleaner and rotate the choke lever to its stop. With the lever in this position the choke plate should now be depressed and the clearance between the lower edge of the choke plate and the inside of the carburettor air intake should be checked. This measurement should be 3.97 mm. (0.156 in.). It is suggested that a 3.97 mm. (0.156 in.) drill or gauge rod be used in this operation and inserted between the choke plate and the inside of the carburettor air intake. The tab on the choke spindle should be bent to achieve this result.

Fast Idle

The fast idle adjustment can only be checked on the engine after first checking and adjusting (if necessary) the choke pull-down. If a tachometer is available this should be connected to the ignition. Run the engine until it reaches its normal operation temperature and idling speed (600 rev./min.). With the engine still running, hold the choke plate in the fully opened (vertical) position and rotate the choke lever until it is stopped by the choke linkage. With the choke lever in this position the fast idle cam will be opening the throttle plate a small amount and the engine speed should now rise to 1,000 to 1,100 rev./min. Ascertain the amount of radial movement required on the throttle lever to achieve this result and turn off the engine. Clamp the throttle lever fully open with a pair of grips on the stop portion of the casting boss and bend up the tab to increase the fast idle or down to decrease. Repeat the operation and check as necessary.



Choke Pull Down Setting



Fast Idle Adjustment

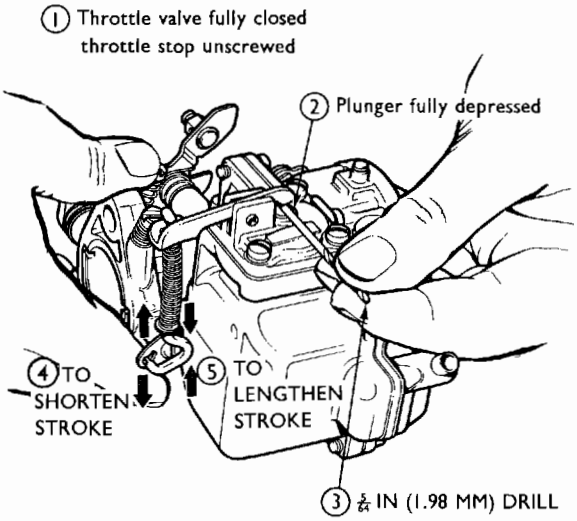
If this operation is done off the engine rotate the choke lever to its stop and check the clearance between the lower edge of the throttle plate and the inside of the carburettor barrel. This clearance should be 0.8 mm. (0.032 in.) for the car carburettor and 0.9 mm. (0.035 in.) for the van. Check the clearance with a No. 68 drill or gauge rod for the car and a No. 64 drill or gauge rod for the van.

If necessary adjust the throttle lever tab (as described previously) to obtain the correct clearance.

3. Accelerator Pump Adjustment

The accelerator pump has been set on manufacture for optimum requirements under normal operation conditions giving a pre-determined stroke and delivery of fuel at normal ambient temperatures.

The only adjustment to check and/or effect is the stroke.

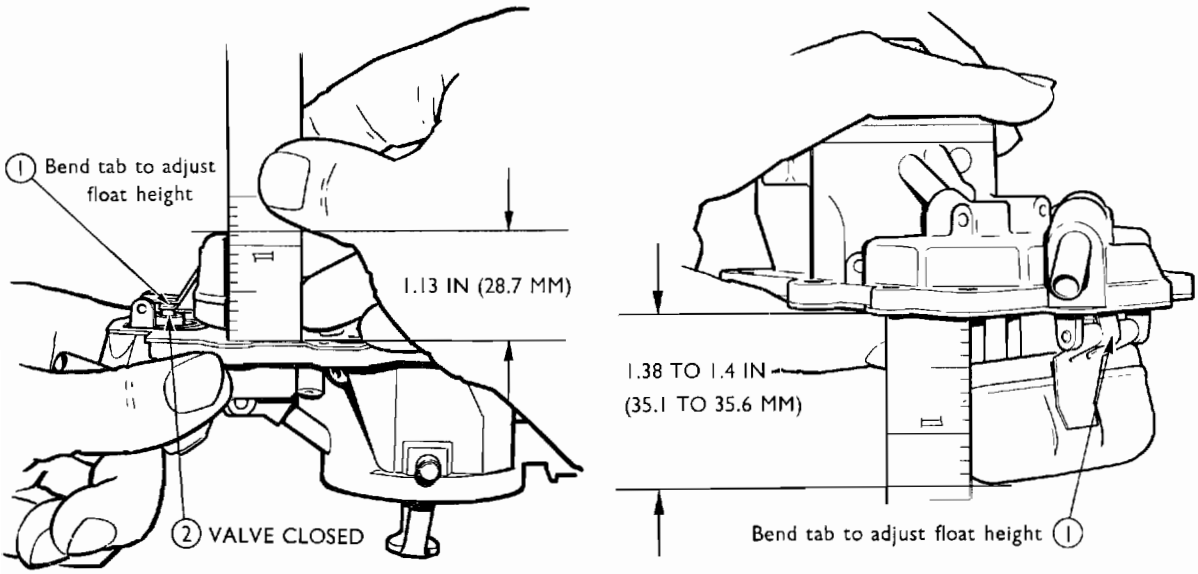


Accelerator Pump Stroke Adjustment

With the throttle stop screw backed off so that the throttle plate is fully closed, depress the diaphragm plunger. Check the clearance between the operating lever and the plunger. This should be 1.98 mm. (0.078 in.) and can be checked with a 1.98 mm. (0.078 in.) drill or gauge rod. Bend the gooseneck of the pump push rod to adjust the stroke. Close the gooseneck to lengthen the stroke or expand it to shorten the stroke.

4. Float and Fuel Level Setting

To check the float or set the fuel level it is necessary to remove the air cleaner and the float chamber cover.

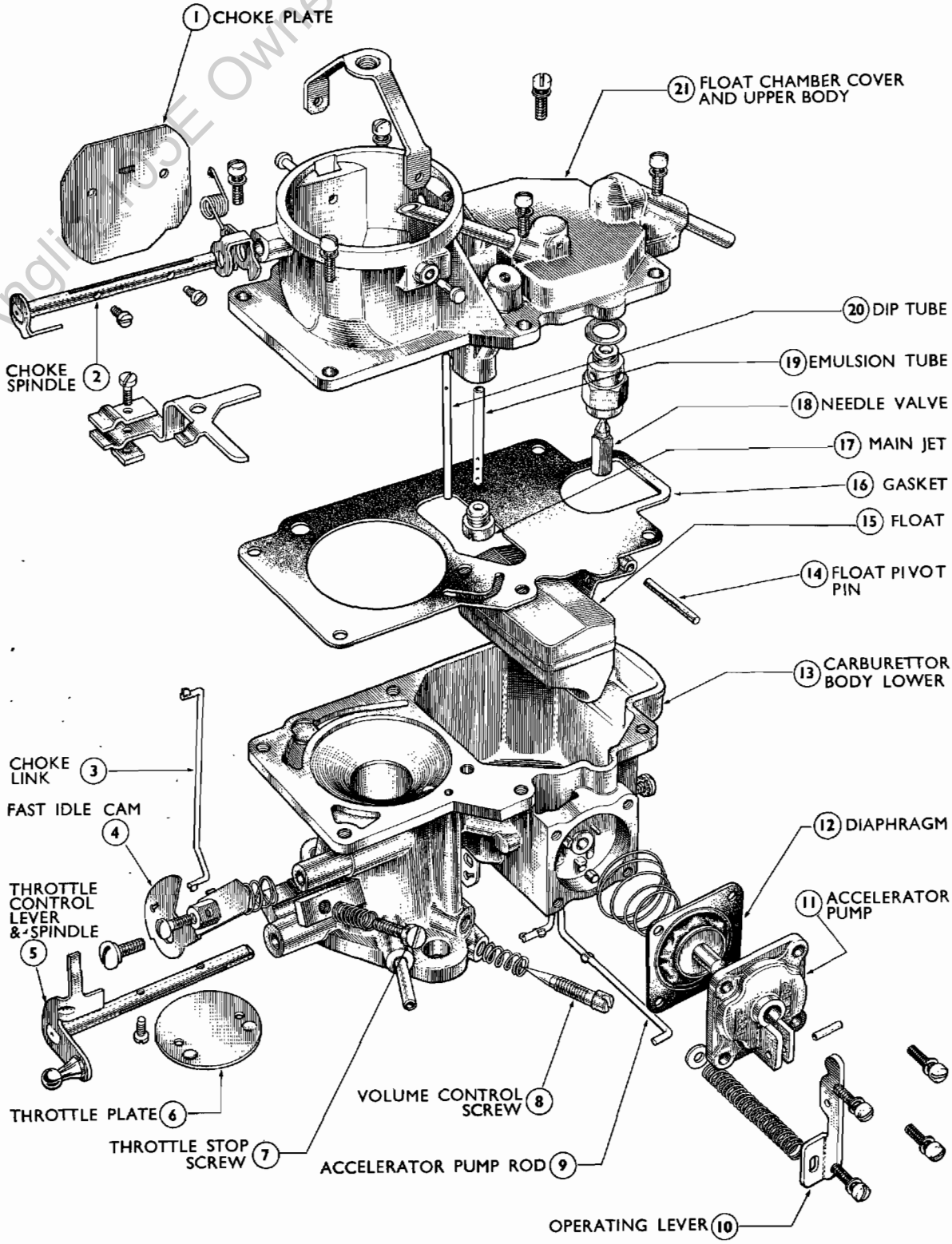


Float Settings

Release the outer choke cable from its clamped position to the carburettor top by undoing the clamp screw. Undo the six screws and spring washers retaining the upper body to the lower part of the carburettor body (one of these screws retains the choke cable bracket) lift off the upper body carefully, unlatch the choke link and at the same time observe that the gasket is not adhering to the lower body. Examine the float, ensuring that it has not been punctured, and the float arm to see that this is not damaged or bent.

With the carburettor upper body inverted the distance from what is now the top of the float (normally the bottom) to the mating surface of the gasket must be 28.7 mm. (1.13 in.). The position of the float is determined by the tab resting on the fuel inlet needle valve. Bend as necessary to achieve the desired measurement. Turn the upper body upright when the same measurement must now be 35.1 to 35.6 mm. (1.38 to 1.40 in.), this can be adjusted by bending the tab resting on the needle valve housing.

Before replacing the carburettor upper body it is advisable to swill the chamber out with clean fuel to remove all sediment and to check on the correct functioning of the needle valve in the upper body.



The Carburettor—Exploded

DATA

Carburettor

Type	... Single venturi downdraught with semi-automatic strangler, accelerator pump and on cars only full load enrichment system
Throttle barrel diameter	... 30 mm.
Venturi diameter	21.6 mm.
Main jet—car...	1.15 mm.
—van	1.12 mm.
Idling speed	600 rev./min.
Fast idle speed (choke open)	1,000 to 1,100 rev./min.
Fast idle setting—car	0.8 mm. (0.032 in.) No. 68 drill
van	0.9 mm. (0.035 in.) No. 64 drill
Choke plate pull-down	3.97 mm. (0.156 in.)
Accelerator pump stroke	1.98 mm. (0.078 in.)
Float setting—inverted	28.7 mm. (1.13 in.)
upright	35.1 to 35.6 mm. (1.38 to 1.40 in.)

Air Cleaner

Type—Std.	Wire gauze
—Export	Paper element

SERVICE AND REPAIR OPERATIONS

OP 9000-A FUEL SYSTEM AND CARBURETTOR—CLEAN (excludes Fuel Tank)

1. Raise the bonnet and fit wing covers.
2. Remove the air cleaner.
3. Clean the air cleaner element. If a wire gauze type filter is fitted, the filter element and body should be washed in petrol and allowed to dry. Soak the element in engine oil and allow to drain before replacing it in the air cleaner body. The paper element type should be shaken clean or blown out with compressed air. Renew if unserviceable.
4. Disconnect the fuel pipe and remove the carburettor upper body. The accelerator pump discharge valve (Ford carburettor only) is exposed when the upper body is removed. DO NOT dislodge it from its seating, as it may enter the engine and cause serious damage.
5. Clean the float chamber with petrol. Blow out the jets and passages. Clean the gauze filter, located above the needle valve housing on the "Ford" carburettor.
6. Refit the carburettor upper body but do not connect the fuel pipe.
7. Remove the fuel pump to carburettor pipe and blow it out with an air line. Refit the pipe and connect both ends.
8. Remove the fuel pump sediment bowl and filter, blow them clean or wash them in petrol and refit them to the pump.
9. Refit the air cleaner.
10. Remove the wing covers and close the bonnet.

OP 9002-A FUEL TANK—REMOVE AND INSTALL

SALOON

Tools Required

P.9082 Fuel tank sender unit lock ring wrench

Bostik model D hand gun

To Remove

1. Drain the fuel from the tank by syphoning into a suitable container. Disconnect the battery.
2. Remove the fuel tank filler cap. Unscrew the two filler neck hose clamps and remove the rubber hose and filler neck from inside the boot.
3. Suitably support the fuel tank. Unscrew the clamp retaining nuts, unhook the clamps from the brackets and lower the tank sufficiently to give access to the gauge unit sender wire.
4. Disconnect the wire and lower the tank to the ground.

To Install

5. Re-connect the sender wire, raise the fuel tank into its location under the luggage compartment floor, and engage the support strap hook clamps in their respective brackets.
6. Ensure that the support straps cover the anti-squeak pads attached to the underside of the tank. Do not fully tighten the nuts on the hook clamps at this stage.
7. Refit the rubber hose and the filler neck to the tank securely tightening the two hose clamps.

8. Reconnect the fuel line to the tank and securely tighten the hook clamp nuts.
9. Refill the tank with fuel and replace the filler cap. Re-connect the battery.

OP 9275-A FUEL TANK GAUGE UNIT—REMOVE AND INSTALL

SALOON

To Remove

1. Drain the fuel tank by syphoning the fuel into a suitable container.
2. Remove the fuel tank (see operation 9002-A).
3. Unscrew the six screws securing the tank unit to the tank and remove the unit.

To Install

4. Fit a new sealing ring in the recess in the tank, fit the sender unit and secure with the six screws.

   Note: On saloon variants the float arm should make an angle of 30^{o} with the float towards the left-hand rear corner of the tank. On estate cars the float arm hangs vertically.

5. Refit the fuel tank (see operation 9002-A).
6. Refill the tank with fuel.

OP 9280-A FUEL GAUGE—REMOVE AND INSTALL

To Remove

1. Disconnect the battery.
2. Disconnect the speedometer cable and remove the two crosshead screws and nut retaining the speedometer head assembly to the instrument panel.
3. Withdraw the assembly and remove the screw retaining the fuel gauge unit to the speedometer head.
4. Disconnect the leads and remove the unit.

To Install

5. Re-connect the leads to the fuel gauge and secure the unit to the head assembly.
6. Locate the speedometer head assembly on the instrument panel and secure with the two crosshead screws and nut. Re-connect the speedometer cable.
7. Re-connect the battery and check the operation of the fuel gauge unit.

OP 9350-A FUEL PUMP ASSEMBLY—REMOVE AND INSTALL

To Remove

1. Raise the bonnet and fit wing covers.
2. Disconnect the fuel lines at the pump. The line should be suitably plugged to prevent loss of fuel or the ingress of foreign matter.
3. Unscrew and remove the two bolts and spring washers securing the fuel pump to the cylinder block and detach the fuel pump, lifting the operating lever to clear the eccentric and the slotted hole in the block. Remove the gasket.

To Install

4. Clean the mounting face on the cylinder block, removing any trace of gasket which may be adhering to the face.
5. Fit a new gasket to the fuel pump flange and insert the rocker arm through the slot in the block wall so that the arm lies on the camshaft eccentric. Secure the fuel pump to the cylinder block with two spring washers and bolts, tightening the bolts evently to a torque of 1.66 to 2.07 kg.m. (12 to 15 lb.ft.).
6. Ensure that the pipe joints are clean and refit the fuel pipes.
7. Run the engine and check for leaks at the joints.
8. Remove the wing covers and lower the bonnet.

OP 9350-A1 EXTRA: DIAPHRAGM—RENEW

To Remove

1. Slacken the clamp nut and remove the sediment bowl and gasket.
2. Remove the filter and clean.
3. Mark the position of the diaphragm tab on both halves of the pump body, remove the screws and separate the two halves of the pump body.
4. Turn the diaphragm, approximately a quarter turn (in either direction), to free the diaphragm rod from the rocker arm link, and detach the diaphragm.
5. Remove the diaphragm spring, oil seal retaining washer and rubber oil seal.

To Install

6. Replace the oil seal, oil seal retainer and the diaphragm spring.
7. Insert the end of the rod in the slotted end of the link. Engage the grooves in the pull rod end by turning the diaphragm a quarter of a turn, so that the **Smaller Tab** on the diaphragm aligns with the mating mark on the lower body flange.
8. Replace the pump upper body, align the mating marks and loosely secure with six screws.
9. Operate the rocker arm several times to centralise the diaphragm and fully tighten the screws with the rocker arm fully depressed.
10. Replace the filter.
11. Replace the sediment bowl and gasket and secure with the clamp.

OP 9350-A2 EXTRA: FUEL PUMP MECHANISM—OVERHAUL

To Dismantle

1. Relieve the staking over the two pin retainers and withdraw the retainers. The pin, rocker arm, spring, link and two washers may then be removed as an assembly.

To Reassemble

2. Position the rocker arm, with the boss between the flanges of the link, ensuring that the central web of the link and the spring seat location on the rocker arm are uppermost. Align the holes in the link and rocker arm and insert the pivot pin.
3. Fit one thrust washer to each end of the pin, next to the link, and carefully insert the assembly into the lower pump body casting, with the spring seat on the rocker arm uppermost. Place the rocker arm spring in position so that the ends are located by the registers on the body and the rocker arm.

4. Insert two new pin retainers, one at each end of the pin, ensuring that these positively locate the pin in the casting. Stake over the casting to the pin retainers in two locations each side. Check the operation of the rocker arm and link.

   NOTE — New pin retainers should always be fitted after dismantling the lower pump body, as service replacement parts are supplied oversize with a shorter shoulder to enable the staking to be carried out satisfactorily. No attempt should be made to refit the old pin retainers.

OP 9350-A3 EXTRA: VALVES—RENEW
(Fuel pump removed and upper and lower bodies separated.)

To Remove

1. Carefully relieve the staking and remove the valves from the upper body.

To Install

2. Fit the gaskets in the upper body, then fit the two valve assemblies.

   NOTE — The valves will only seat properly when in their correct locations and the right way up.

3. Ensure that the valves are pressed fully home and retain each valve securely by staking at six points around its housing.

OP 9350-B FUEL PUMP DIAPHRAGM—RENEW
(Includes OPS 9350-A and A1)

OP 9350-C FUEL PUMP MECHANISM—OVERHAUL
(Includes OPS 9350-A, A1 and A2)

OP 9350-D FUEL PUMP VALVES—RENEW
(Includes OPS 9350-A and A3)

OP 9350-E FUEL PUMP DIAPHRAGM AND VALVES—RENEW
(Includes OPS 9350-A, A1 and A3)

OP 9350-F FUEL PUMP—OVERHAUL
(Includes OPS 9350-A, A1, A2 and A3)

OP 9425-A INLET MANIFOLD—REMOVE AND INSTALL

To Remove

1. Raise the bonnet and fit wing covers.
2. Remove the air cleaner.
3. Disconnect the throttle shaft from the carburettor throttle lever.
4. Disconnect the fuel pipe and the distributor vacuum pipe from the carburettor.
5. Disconnect the choke cable.
6. Unscrew the retaining nuts and lift the carburettor and gasket off the manifold.
7. Remove the exhaust pipe clamp from the manifold and detach the exhaust pipe.
8. Unscrew the retaining bolts and detach the manifold assembly from the cylinder head.
9. Separate the exhaust and inlet manifolds and clean all mating surfaces.

To Install

10. Refit the exhaust and inlet manifolds and locate the assembly on the cylinder head tightening the retaining bolts to a torque of 2.07 to 2.49 kg.m. (15 to 18 lb.ft.).
11. Position the exhaust pipe to the manifold stub and secure with the manifold clamp.
12. Refit the carburettor to the inlet manifold, securely tightening the two retaining nuts.
13. Reconnect the distributor vacuum pipe and the fuel pipe to the carburettor.
14. Reconnect the throttle shaft to the throttle lever.
15. Reconnect the choke cable with both the choke control knob and the lever in the OFF position.
16. Refit the air cleaner.
17. Remove the wing covers and close the bonnet.

OP 9428-A EXHAUST MANIFOLD—REMOVE AND INSTALL

Repeat sub-operations 1 to 17 of OP. 9425-A.

OP 9510-A CARBURETTOR AND/OR GASKET—REMOVE AND INSTALL

To Remove

1. Raise the bonnet and fit wing covers.
2. Remove the air cleaner.
3. Disconnect the fuel and the distributor vacuum pipes at the carburettor.
4. Disconnect the throttle control shaft from the throttle lever.
5. Disconnect the choke cable.
6. Remove the carburettor retaining nuts and spring washers and lift the carburettor and gasket off the manifold.

To Install

7. Locate a new gasket on the manifold flange and position the carburettor over the studs. Refit the spring washers and nuts on the mounting studs and tighten them securely.
8. Reconnect the fuel and the distributor vacuum pipes to the carburettor.
9. Refit the throttle shaft to the throttle lever.
10. Reconnect the choke cable with both the choke control knob and the lever in the OFF position.
11. Replace the air cleaner.
12. Remove the wing covers and close the bonnet.

OP 9510-A2 EXTRA: CARBURETTOR—OVERHAUL

FORD CARBURETTOR

To Dismantle

1. Remove the six screws and spring washers securing the carburettor upper body to the lower. Carefully lift off the body and unlatch the choke link at the same time. The gasket should come away with the upper component and care should be exercised to see it is not adhering to the lower body.

2. Withdraw the float arm pivot pin and remove the float.
3. Extract the needle valve.
4. Lift off the gasket from the upper body.
5. Remove the accelerator pump discharge ball valve and weight from the lower body.
6. Undo the needle valve housing and extract the gauze screen.
7. Unscrew the main jet.
8. If it is required to remove the choke plate and shaft, first remove the two air cleaner retainer pins using side cutters and then remove the retainer.
9. Unscrew the two screws clamping the choke plate within its spindle and remove the plate.
10. Remove the burrs from around the choke plate screw holes and withdraw the choke spindle and slide the choke pull-down stop and spring off the spindle.
11. Unscrew the four screws securing the accelerator pump in position and remove the accelerator pump body and operating arm, diaphragm and return spring.
12. Disconnect the accelerator pump push rod and spring assembly from the pump operating lever and the arm on the throttle spindle.
13. Remove the accelerator pump push rod arm from the throttle spindle.
14. Unscrew the cheese head pivot screw and remove the choke lever and return spring.
15. Undo the two screws clamping the throttle plate within its spindle and remove the plate.
16. Remove the burrs from around the throttle plate screw holes and withdraw the throttle spindle from the body.
17. Undo the volume control needle screw and remove the spring.
18. Remove the throttle stop screw and spring.

To Reassemble

19. Slide the throttle spindle into the body and fit the throttle plate to the shaft. Centralise the throttle plate in the throttle barrel with the throttle plate in the closed position. Ensure that the two indentations in the throttle plate face the same way as the screw head recesses in the throttle shaft.
20. Replace the volume control screw and spring, tightening it until it just seats and then back off one turn.
21. Replace the throttle stop screw and spring.
22. Fit the accelerator pump push rod arm to the throttle spindle.
23. Connect the accelerator pump push rod and spring assembly to the arm and to the pump operating lever.
24. Fit the diaphragm and plunger into the accelerator pump cover and locate the diaphragm return spring within the pump housing. Carefully replace the cover, securing it with the four screws and spring washers.
25. Slide the pull-down spring and stop onto the choke spindle and insert the spindle into the carburettor body. Refit the choke plate and centralise in the air intake.
26. Replace the air cleaner retainer and secure with two pins squeezed into the holes.
27. Refit the main jet.

28. Locate the gauze screen in the needle valve housing and replace the needle valve housing.
29. Install the needle in the needle valve housing, needle end upwards.
30. Position a new gasket on the upper body.
31. Replace the float assembly, sliding the pivot pin into position.
32. Check the float and fuel level setting and adjust if necessary, see Operation No. 9510-C.
33. Place the return spring on the bearing abutment of the body and refit the choke lever with its pivot screw.
34. Replace the accelerator pump, discharge ball valve and weight.
35. Insert one end of the choke link into the pull-down stop and the other into the fast idle cam and carefully refit the upper body to the lower body. Secure the upper to the lower body with the six screws. The rear left-hand screw also secures the choke cable abutment bracket. Tighten these screws while holding the choke lever in the closed position.

    NOTE – Failure to observe this procedure will result in the choke lever being over-centred and the choke rendered inoperative. **Do not force** the lever back to the correct position if this occurs, as the choke link will be damaged, but slacken the upper body screws until the lever can be turned to the correct position and then retighten.
36. Check and adjust, if necessary, the choke plate pull-down, the fast idle setting and the accelerator pump stroke, see Operation No. 9510-C.

OP 9510-A2 EXTRA: CARBURETTOR OVERHAUL

SOLEX CARBURETTOR

1. Remove the four screws and spring washers securing the float chamber cover to the body and lift off the cover and gasket.
2. Lift out the float arm and hinge pin and remove the float.
3. Remove the nut and flat washer retaining the operating lever to the starter device spindle, pull off the lever and extract the locking ball and spring.
4. Unscrew the four bolts securing the starter device to the body and remove the device.
5. Unscrew the economiser and main jet air correction jets from the economiser body, remove the screw securing the body and lift off the body and diffuser tube assembly.
6. Remove the starter jet, main jet holder, idling and idling air bleed jets.

   NOTE—the main jet is screwed into the main jet holder and fibre washers are fitted under the starter and main jets. Remove the screw securing the discharge beak and withdraw the beak.
7. Remove the two screws securing the throttle plate in position and withdraw the spindle and plate.

To Reassemble

8. Position the throttle plate and spindle to the carburettor body and secure with the two screws. Note that when the plate is closed the "No. 8" stamped on the plate should face downwards and toward the starting device.
9. Ensure the fibre washers are in good condition and refit the starter and main jets, together with the main jet holder, idling and idling air bleed jets.
10. Refit the discharge beak securing it with the taper-ended clamp screw.

11. Locate the gasket on the economiser body and refit the body and diffuser tube assembly and secure it with the retaining screw. Refit the economiser and main air correction jets.
12. Fit the starter device to the carburettor body and secure with the four screws.
13. Install the float in the float chamber with cup washer upwards.

    NOTE – Fit the float lever and hinge pin with the curve on the end of the float lever towards the float.
14. Position a new gasket on top of the float chamber and secure the float cover in place with the four screws and spring washers.

OP 9510-C CARBURETTOR–OVERHAUL
(Includes OPS 9510-A and A2)

OP 9533-A CARBURETTOR JETS AND FLOAT CHAMBER–CLEAN

1. Remove the air cleaner, see Operation No. 9600-A sub-operations 1 to 3.
2. Remove the choke cable.
3. Remove the upper to lower body screws and carefully lift the upper body off, ensuring that the gasket comes away with it. On the "Ford" carburettor unlatch the choke link as the upper body is lifted off, note also that the manual choke bracket is retained by the rear left-hand screw.

   NOTE – On the "Ford" carburettor the accelerator pump discharge valve will be exposed in its bore when the upper body is removed. Exercise care when operating the throttle linkage in this condition as the valve and weight may be ejected. Serious damage will occur if the valve enters the engine.
4. Wash the float chamber with clean petrol (gasoline).
5. Remove the various jets as detailed in operation 9510-A2, blow through to clean, refitting jets in correct position.
6. Refit the upper body to the lower body.

   On the "Ford" carburettor connect the choke link to the fast idle cam while fitting the upper body, also position the manual choke cable bracket beneath the rear left-hand retaining screw. Tighten the retaining screws on this carburettor while holding the choke lever in the closed position.

   NOTE – Failure to observe this procedure will result in the choke lever being over-centred and the choke rendered inoperative. **DO NOT FORCE** the lever back to the correct position if this occurs, but slacken the retaining screws and retighten with the lever in the closed position.
7. Reconnect the choke cable.
8. Refit the air cleaner, see Operation No. 9600-A sub-operations 4 to 6.

OP 9600-A AIR CLEANER–REMOVE AND INSTALL

FORD CARBURETTOR

To Remove

1. Unscrew the centre bolt and lift the air cleaner assembly off the carburettor.
2. Remove the cover from the body.
3. Remove the element from the body.

To Install

4. Locate the body on the carburettor with the spout facing towards the front of the engine compartment.
5. Place the element into the body and centralise it on its seat.
6. Position the cover on the body with the alignment arrow pointing along the spout and retain with the centre bolt tightened to a torque of 0.42 to 0.69 kg.m. (3 to 5 lb.ft.).

OP 9700-A CHOKE CONTROL CABLE—RENEW

To Remove

1. Raise the bonnet and fit wing covers.
2. Disconnect the choke cable at the carburettor.
3. Remove the choke control from the facia by pulling out the inner cable and then unscrewing the chrome bezel and removing the outer cable.

To Install

4. Replace the outer cable and tighten the chrome bezel. Feed the inner cable through the outer until it protrudes at the carburettor end.
5. Reconnect the choke cable with both the choke control knob and the lever in the OFF position.
6. Remove the wing covers and close the bonnet.

10

ELECTRICAL SYSTEM

SECTION INDEX

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CHARGING SYSTEM

GENERAL DESCRIPTION

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"	10001-A3	Extra: brushes – renew and commutator – clean (Generator pulley removed)
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"	10001-B	**GENERATOR PULLEY – REMOVE AND INSTALL** (Includes OPS 10001-A and A1)
"	10001-C	**GENERATOR BRUSHES – RENEW AND COMMUTATOR – CLEAN** (Includes OPS 10001-A, A1 and A3)
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GENERAL DESCRIPTION

QUICK REFERENCE DATA

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"	11001-A3	Extra: starter motor – overhaul (drive components, brushes and armature removed)

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"	11001-D	**STARTER MOTOR – OVERHAUL** (Includes OPS 11001-A, A1, A2, and A3)
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GENERAL DESCRIPTION

QUICK REFERENCE DATA

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INSTRUMENTS, CONTROLS AND ANCILLARIES

GENERAL DESCRIPTION

QUICK REFERENCE DATA

SERVICE AND REPAIR OPERATIONS

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"	17262-B	SPEEDOMETER INNER AND OUTER CABLES – REMOVE AND INSTALL

WIRING SYSTEM

WIRING DIAGRAMS

GENERAL DESCRIPTION

The electrical system is of the 12 volt earth return type, the positive terminal of the battery being earthed. The lead acid battery, of either 38 or 51 amp hour capacity, is mounted on a tray in the engine compartment, forward of the suspension leg.

A two brush generator, in conjunction with a current/voltage regulator, is used to charge the battery and is driven at 1.5 times the engine speed.

The starter motor is mounted on the front of the flywheel housing on the left hand side of the engine. The motor has four pole pieces and four sets of field coils. Four commutator brushes are fitted, two of which are earthed, the other two being insulated and connected to the ends of the field coils.

The ignition system consists of a distributor, coil and spark plugs. The distributor is mounted on the right-hand side of the engine, and driven by a skew gear from the camshaft. The ignition advance is controlled according to engine speed by governor weights within the distributor body, and according to engine load by vacuum control from the inlet manifold.

Instrumentation consists of a speedometer, incorporating odometer, and a cluster of fuel and temperature gauges. Generator, oil pressure, direction indicator and main beam warning lights are fitted. Switches for the driving lights, instrument panel lights, windscreen wiper and heater blower are mounted on the instrument panel. Headlamp dipping and flashing together with direction indicator and horn controls are combined in a single steering column lever. The ignition switch is located on the instrument panel and, in addition to the 'OFF' position, has three operational positions, controlling ignition, starting and accessory circuits.

Lighting consists of two dipping headlamps, side and direction indicator lamps and stop/tail lamps.

Battery The 12 volt positive earthed battery of 38 amp hour (51 amp hour optional) capacity is mounted on a tray in the engine compartment forward of the right-hand suspension leg.

Generator The generator, of 22 amp output is mounted at the left-hand side of the engine. It is driven by the fan belt at 1.5 times engine speed.

Regulator A regulator, consisting of a cut-out, a voltage regulator and a current regulator controls the generator output by inserting a resistance into the field coil circuit.

QUICK REFERENCE DATA

PERIODIC SERVICE ATTENTION

Weekly

Check battery electrolyte level

Every 8,000 km. (5,000 miles) or three months

Lubricate the generator rear bearing with engine oil
Check battery condition, check connections and top-up
Adjust fan belt tension

Battery

Type	Lead acid
Voltage	12
Capacity (amp hr.)—Standard equipment	38 at 20 hr. rate
—Cold climate	51 at 20 hr. rate
Specific gravity charged	1.275 to 1.290
Low limit while discharging at 20 hr. rate	1.105

Generator

Type	12 volt, two brush
Speed (ratio to engine)	1.5 : 1
Maximum charge	22 amps (standard) 25 amps (option)
Fan belt tension (total free movement)	13 mm (0.50 in.)

Regulator

Cut-out—Cut-in voltage	12.6 to 13.4 volts
—Drop-off voltage	9.25 to 11.25 volts
—Armature to core air gap	0.9 to 1.1 mm. (0.035 to 0.045 in.)
—'Follow-through' of moving contact	0.3 to 0.5 mm. (0.010 to 0.020 in.)
Current regulator on-load setting	Maximum rated generator output + 1.50 amps
Armature to core air gap	1.3 to 1.4 mm. (0.052 to 0.056 in.)
Voltage regulator open circuit setting	14.4 to 15.6 volts at 20°C (68°F)
Armature to core air gap	1.3 to 1.4 mm. (0.052 to 0.056 in.)

SERVICE AND REPAIR OPERATIONS

OP 10001-A GENERATOR ASSEMBLY – REMOVE AND INSTALL

To Remove

1. Disconnect the battery.
2. Disconnect the leads from D and F terminals on the rear of the generator.
3. Slacken the three generator securing bolts and tilt the generator towards the engine.
4. Remove the fan belt.
5. Remove the generator securing bolts and detach the generator.

To Install

6. Fit the generator and retain with three bolts.
7. Replace the fan belt and tighten the generator bolts so that the fan belt has 13 mm. (0.50 in.) free movement at a point mid-way between the generator and water pump pulleys.
8. Reconnect the D and F leads to the generator and reconnect the battery.

OP 10001-A1 EXTRA: GENERATOR PULLEY – REMOVE AND INSTALL (GENERATOR ASSEMBLY REMOVED)

To Remove

1. Hold the generator pulley and slacken the pulley securing nut.
2. Remove the nut, lockwasher, generator pulley, Woodruff key and spacer.

To Install

3. Fit the spacer and pulley to the generator, taking care to correctly position the key in its key-way.
4. Secure the pulley with a lockwasher and nut.

OP 10001-A3 EXTRA: GENERATOR BRUSHES – RENEW AND COMMUTATOR – CLEAN (GENERATOR PULLEY REMOVED)

To Remove

1. Unscrew and remove the two generator through bolts.
2. Withdraw the commutator end bracket from the yoke.
3. Remove the generator drive end bracket and armature.
4. Unscrew the brush securing screws and remove the brushes.

To Reassemble

5. Clean the brush holders and fit new brushes.
6. Check the circuit to earth with a simple bulb circuit.
7. Clean the armature. Undercut the commutator segments if necessary (fabricated type only) and test the armature casing for earth.
8. Refit the drive end bracket and armature to the yoke.

9. Refit the commutator end bracket and replace the through bolts.
10. Check the position and free movement of brush springs.

NOTE: The generator fitted may have either a fabricated or a moulded type commutator. A fabricated commutator can be recognised by an insulating cone and a metal "roll-over" at the exposed end; the moulded commutator has a smooth exposed end.

OP 10001-A4 EXTRA: GENERATOR – OVERHAUL
(GENERATOR BRUSHES AND COMMUTATOR REMOVED)

Tools Required

CPT.9504	Pole piece screwdriver
CPT.9507	Endplate bush remover and replacer
CPT.9509	Pole expander

1. Remove the terminal post from the yoke (secured by a rivet).
2. Using the pole piece screwdriver remove the pole piece securing screws.
3. Remove the pole pieces and field coils after marking the pole pieces and yoke so that they can be refitted in their original positions.
4. Disconnect the field coil wires at the field posts (note connections).
5. Relocate the field coils to the field posts.
6. Rivet the terminal post to the yoke.
7. Replace the pole pieces and field coils to the yoke.
8. Remove the commutator end bracket bush.
9. Fit a new bush (bush must have been soaked in oil for 24 hours).
10. Remove three rivets securing the bearing retainer plate to the drive end bracket and remove the plate.
11. Press out the bearing assembly.
12. Clean the bearing housing and fit a new bearing.
13. Test the field coils for continuity and earth.

OP 10001-B GENERATOR PULLEY – REMOVE AND INSTALL
(Includes OPS 10001-A and A1)

OP 10001-C GENERATOR BRUSHES – RENEW AND COMMUTATOR – CLEAN
(Includes OPS 10001-A, A1 and A3)

OP 10001-D GENERATOR ASSEMBLY – OVERHAUL
(Includes OPS 10001-A, A1, A3 and A4)

OP 10001-E GENERATOR FRONT BEARING – RENEW
(Includes OPS 10001-A, A1 and A2)

OP 10001-M CHARGING CIRCUIT – TEST AND ADJUST

To isolate the source of any charging system fault, the following checks should be carried out:–

The following gives all the information required to check and adjust all parts of the charging system. Normally, the area of the fault will be pin-pointed with diagnosis equipment, and only

that part of the system will require attention. For this reason, this operation should not be considered as a basic repair operation.

1. **Fan belt tension**

   Check, and if necessary adjust, the fan belt to give 13 mm. (0.50 in.) total free movement at a point mid-way between the generator and water pump pulleys.

2. **Battery conditions**

   (a) Ensure that the battery exterior is clean and free from cracks and corrosion particularly around the terminals.

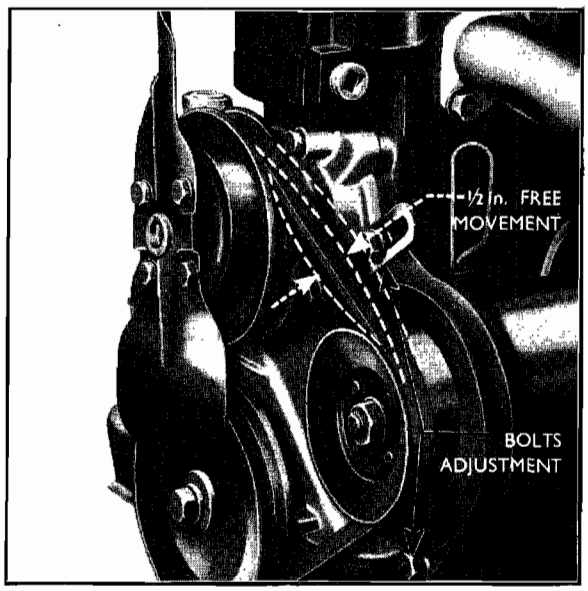
   (b) Check the specific gravity with a hydrometer. If the electrolyte level is less than 7 mm. (0.25 in.) above the plates, distilled water should be added and the battery bench charged for at least one hour before carrying out the check. Draw enough electrolyte into the hydrometer to make the scale float. Repeat the test for each cell.

   (c) The following table relates the specific gravity to the battery condition at 16°C (60°F):–

Hydrometer Reading	*Battery Condition*
1.280	Fully charged
1.240	75% charged
1.200	50% charged
1.160	25% charged
1.120	Discharged

   If the electrolyte temperature varies from 16°C (60°F), adjust the reading obtained as follows:–

Add 0.004 for every 5.50°C (10°F) above 16°C (60°F)
Subtract 0.004 for every 5.50°C (10°F) below 16°C (60°F)



Generator and Fan Belt Adjustment

For example:—

1.272 specific gravity at 27°C (80°F)
= 1.272 + 0.008
= 1.280 at 16°C (60°F), i.e. battery fully charged.

1.204 specific gravity at 10°C (50°F)
= 1.204 - 0.004
= 1.200 at 16°C (60°F), i.e. battery 50% charged.

(d) If one cell is about 0.030 lower than the rest it is possibly failing. An extended bench charge may revive it.

If the readings are irregular, with one or more cells 0.050 lower than the rest, the battery is not fit for further use.

If the readings are reasonably uniform, the battery is probably healthy, although low readings indicate a bench charge is required.

(e) Take a high rate discharge test across the battery terminals.

If a hand test instrument is used, push the probes onto the battery terminals and hold for 10 seconds. Note the voltmeter reading for the 10 seconds.

If a test set (such as Crypton, Ford and Sun; is used, connect the ammeter and voltmeter to the battery terminals: negative to negative and positive to positive. Turn the control knob to give an ammeter reading of 150 amps. Note the voltmeter reading for 10 seconds.

In both tests there should be virtually no voltage fall-off and the reading should be approximately 7.2 to 9.5 volts.

Any appreciable drop-off or a voltage of less than 5 volts indicates that the battery has reached the end of its useful life.

DIAGNOSIS CHART OF TEST RESULTS

Specific Gravity Readings	High Rate Discharge Test Readings	Battery Condition
Readings uniform and within Range 1.260—1.280	Readings High and Steady	Healthy and in reasonable State of Charge
Readings uniform but lower than 1.260	Readings Low and Steady	Healthy but requires Charging
One cell about 0.030 lower than remainder	Reading shows Falling Voltage	Probable Failing Cell
Irregular Readings more than one cell 0.050 lower than remainder	Reading Low and showing rapid fall	Battery at End of Life
Very Low Readings	Very Low Voltage	Battery has internal fault or is in deeply sulphated condition

The High Rate Discharge Test and the Specific Gravity Test are complementary, no advantage will be gained by performing one test and not the other.

3. **Generator Output Test**

(a) Disconnect the wires from the "D" and "F" regulator terminals and join them together.

(b) Connect a 0–30 voltmeter between this junction and earth.

(c) Run the engine at approximately 1,000 rev./min.

NOTE – Do not exceed this speed or the generator may be damaged.

(d) The voltmeter reading should rise rapidly without fluctuation to more than 24 volts.

(e) Should the reading be incorrect, connect a jumper wire between the "D" and "F" terminals on the generator, and connect the voltmeter between this wire and earth.

(f) If the reading is now more than 20 volts, the continuity of the "D" or "F" leads is suspect. If the reading is still incorrect, there is a fault in the generator.

4. **Testing and Adjusting the Regulator**

(a) Insulate the cut-out points with a thin strip of mica or withdraw the cables from the terminals marked "A" and "A1", and joint them together.

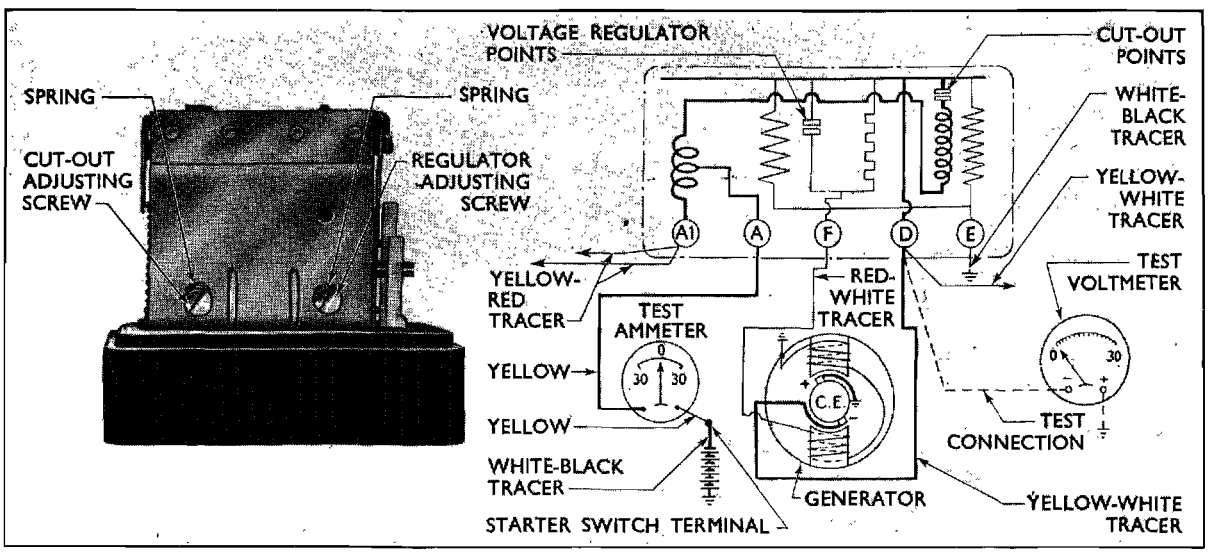
(b) Connect the negative lead of the test voltmeter to terminal "D" on the regulator and the positive lead to either a good earth or the "E" terminal.

(c) Adjustment should be made with the regulator cold, i.e. immediately on starting the engine the ambient temperature should be noted.

(d) Start the engine and gradually increase the speed until the voltmeter reading is steady and between the following limits.

Ambient Temperature	*Voltage Checking Limits*
10°C (50°F)	15.7 to 16.1
20°C (68°F)	15.6 to 16.0
30°C (86°F)	15.5 to 15.9
40°C (104°F)	15.4 to 15.8

(e) If the reading is steady but outside these limits the regulator requires adjustment.



Regulator and Wiring Diagram

NOTE – The top cover of the regulator box must not be removed during the Warranty Period.

(f) Stop the engine, remove the top cover and turn the regulator adjusting screw clockwise to raise the setting or anti-clockwise to lower the setting.

(g) Start the engine and recheck the settings, repeat as necessary until the correct setting is obtained.

NOTE – Adjustment of the regulator open circuit voltage should be completed within 30 seconds, otherwise heating of the shunt winding will cause false settings to be made.

(h) Reconnect the wires to the terminals "A" and "A1", or remove the insulation from the cut-out points.

5. **Reset, if Necessary, the Regulator Armature**

(a) Disconnect the battery.

(b) Slacken the fixed contact screw locknut and unscrew the contact screw until it is clear of the armature moving contact.

(c) Slacken the regulator adjusting screw until it is completely clear of the armature tension spring.

(d) Slacken the two armature assembly securing screws. Using a 0.381 mm. (0.015 in.) feeler blade, wide enough to cover the complete core face, insert the blade between the armature and core skin, taking care not to damage or burr the edge of the skin.

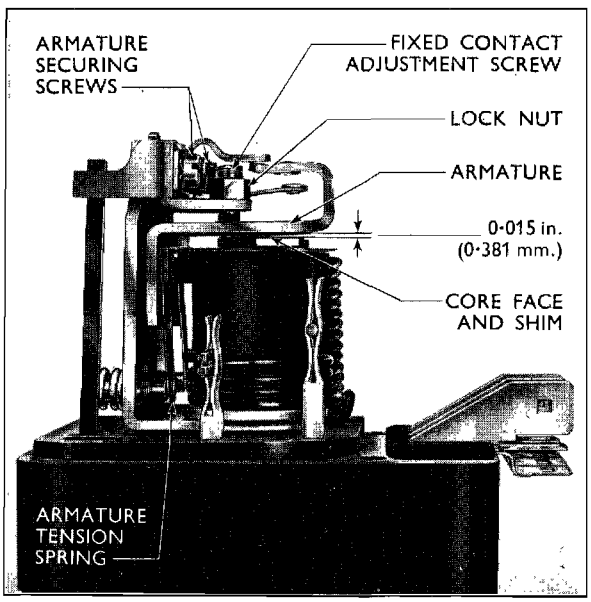
(e) Press the armature squarely down against the blade and holding it firmly, retighten the two armature assembly securing screws. Screw the adjustable contact down until it just touches the armature contact. Retighten the locknut.

(f) Reconnect the battery.

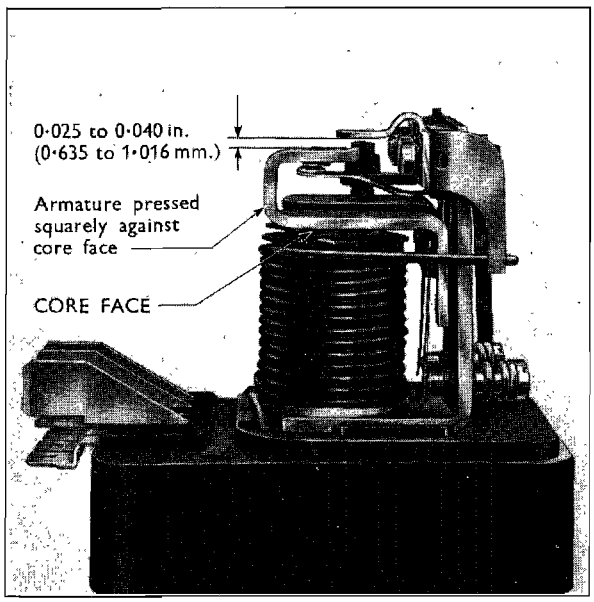
(g) Reset the regulator adjusting screw as described in 'Testing and Adjusting the Regulator'.

6. **Testing the Cut-out**

(a) Connect the voltmeter between the "D" terminal and a good earth at the "E" terminal.



Voltage Regulator



Cut-out Points
(Setting the Fixed Contact)

(b) Start the engine, slowly increase the speed and note the voltage reading immediately before the points close. This voltage should be 12.7 to 13.3 volts. The voltage may be adjusted by turning the cut-out adjusting screw in an anti-clockwise direction to decrease the voltage and vice versa.

7. **Resetting the Cut-out Armature**

(a) Slacken the adjusting screw until it is clear of the armature tension spring.

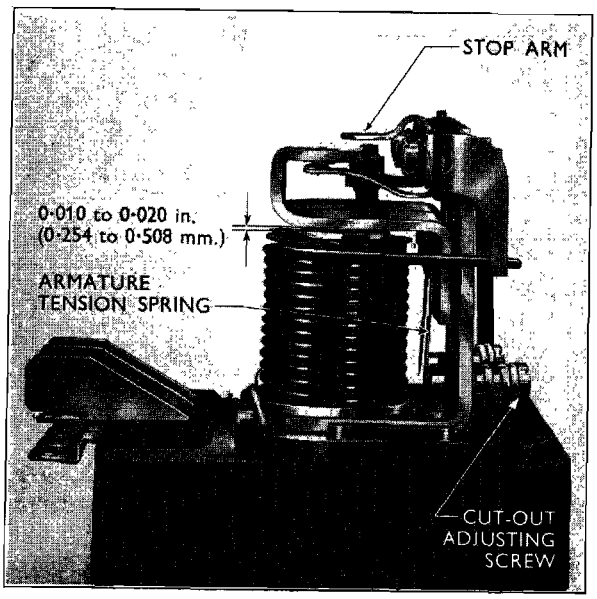
(b) Slacken the two armature securing screws.

(c) Press the armature down squarely against the copper coated core face and, holding it there, retighten the armature securing screws.

(d) Still holding the armature down against the core, bend the armature stop arm so that a gap of 0.635 to 1.016 mm. (0.25 to 0.40 in.) exists between it and the armature tongue.

(e) Insert the end of a 0.254 to 0.508 mm. (0.010 to 0.020 in.) feeler blade between the outer end of the armature and core face and set the fixed contact, by bending the arm, so that the points are just touching.

(f) Reset the cut-out adjusting screw as described in 'Testing the Cut-out'.



Cut-out Points
(Setting Armature Stop Arm)

SPECIFICATIONS AND REPAIR DATA

Battery:

Type		Lead/acid
Battery Voltage		12V.
Plates per cell		9 Standard 11 Cold Climate
Specific gravity (charged)		1.270 to 1.285
Low limit while discharging at 20 hr. rate	S.G.	1.15 Standard 1.1 Cold Climate
	Cell Volts	1.8 both
Terminal earthed		Positive
Capacity in A.H. when discharging at 20 hr. rate		38 Standard 51 Cold Climate
Amperes for 20 mins.		47.5 Standard 64.5 Cold Climate
Electrolyte capacity		2.73 litre (4.80 Imperial pints) 3.76 litre (6.40 Imperial pints)

Generator:

Type	12V. Two-brush
Speed (ratio to engine)	1.5 : 1
Brush length	18.233 mm. (0.718 in.)
Max. continuous output with 2 in. (5.1 cm.) dia. pulley	20 amps.
Fan belt tension (measured mid-way between pulleys)	13 mm. (0.50 in.)

GENERAL DESCRIPTION

The engine is started by the starter motor pinion engaging with the flywheel ring gear. Electricity for starting is supplied to the starter motor through a solenoid controlled by a pull start switch mounted on the facia panel.

QUICK REFERENCE DATA

Inertia Starter Motor

Teeth on pinion	10
Teeth on ring gear	110
Gear ratio	11 : 1
Minimum brush length	10.3 mm. (0.40 in.)
Brush spring pressure	0.96 kg. (34 oz.)

SERVICE AND REPAIR OPERATIONS

OP 11001-A STARTER MOTOR ASSEMBLY – REMOVE AND INSTALL

To Remove

1. Disconnect the battery.
2. Remove the starter motor lead from the starter.
3. Remove the upper securing bolt.
4. With the handbrake applied, jack up the front of the car and fit stands.
5. Slacken the starter motor lower mounting bolt.
6. Support the motor, remove the bolt and then remove the motor.

To Install

7. Replace the starter motor and refit the lower mounting bolt.
8. Fit the upper bolt and tighten the two bolts securely.
9. Lower the car to the ground.
10. Reconnect the lead to the starter.
11. Reconnect the battery.

OP 11001-A1 EXTRA: DRIVE COMPONENTS – REMOVE AND INSTALL (STARTER MOTOR REMOVED)

To Remove

1. Compress the spring and remove the circlip.
2. Remove the main drive spring, spring cup and retaining washer.
3. Pull the drive pinion barrel assembly from the armature shaft.

To Install

4. Refit the pinion barrel assembly on the armature shaft with the pinion teeth toward the armature windings.
5. Replace the main drive spring, spring cup and retaining washer; compress the spring and replace the circlip.

OP 11001-A2 EXTRA: BRUSHES – RENEW AND COMMUTATOR – CLEAN (DRIVE COMPONENTS REMOVED)

To Remove

1. Slacken the clamp and slide the cover along the body.
2. Raise the brush holding springs and withdraw the brushes.
3. Unscrew two through bolts and remove the starter motor drive end plate and armature. Clean off the commutator.
4. Remove the commutator end plate.
5. Unsolder the brush leads connected to the earthed holders.
6. Cut the brushes from the field coils, leaving approximately 7 mm. (0.25 in.) copper wire attached to the field coils.

To Install

7. Solder new brushes to the ends of the copper wire still attached to field coils.

   NOTE – Do not attempt to solder new brushes directly onto aluminium field coils. This requires special equipment.
8. Solder new brushes to the earthed holders.
9. Replace the starter motor drive end plate and armature.
10. Replace the commutator end plate and insert the brushes.
11. Relocate the cover band and tighten.

OP 11001-A3 EXTRA: STARTER MOTOR – OVERHAUL (DRIVE COMPONENTS BRUSHES AND COMMUTATOR REMOVED)

Tools Required

CPT.9504	Pole piece screwdriver
CPT.9509	Pole expander

1. Remove the four pole pieces in the yoke.
2. Install new field coils and replace the pole pieces in the yoke.
3. Test the coils for continuity.
4. Remove the two end plate bushes.
5. Replace the two end plate bushes.

OP 11001-B STARTER MOTOR DRIVE COMPONENTS – REMOVE AND INSTALL
(Includes OPS 11001-A and A1)

OP 11001-C STARTER MOTOR BRUSHES – RENEW AND COMMUTATOR – CLEAN
(Includes OPS 11001-A, A1 and A2)

OP 11001-D STARTER MOTOR – OVERHAUL
(Includes OPS 11001-A, A1, A2,and A3)

OP 11450-A STARTER SOLENOID – REMOVE AND INSTALL

1. Open the bonnet and disconnect the battery.
2. Disconnect the leads from the starter solenoid.
3. Slacken the set screw in the operating wire connector located beneath the facia and position the switch operating cable aside.
4. Remove the starter solenoid.
5. Replace the starter solenoid.
6. Position the switch operating cable to the connector and retain with the set screw.
7. Reconnect the leads to the starter solenoid.
8. Reconnect the battery and check the starter solenoid operation.

GENERAL DESCRIPTION

The current ignition system consists of a Ford coil, distributor and spark plugs. Early models were fitted with a Lucas coil and distributor and Champion spark plugs. Different distributors are used on the high and low compression engines, the various distributor types and periods of use are listed below.

Coil

The Lucas coils fitted to early model vehicles were superseded by the introduction of the Ford coil.

Distributor

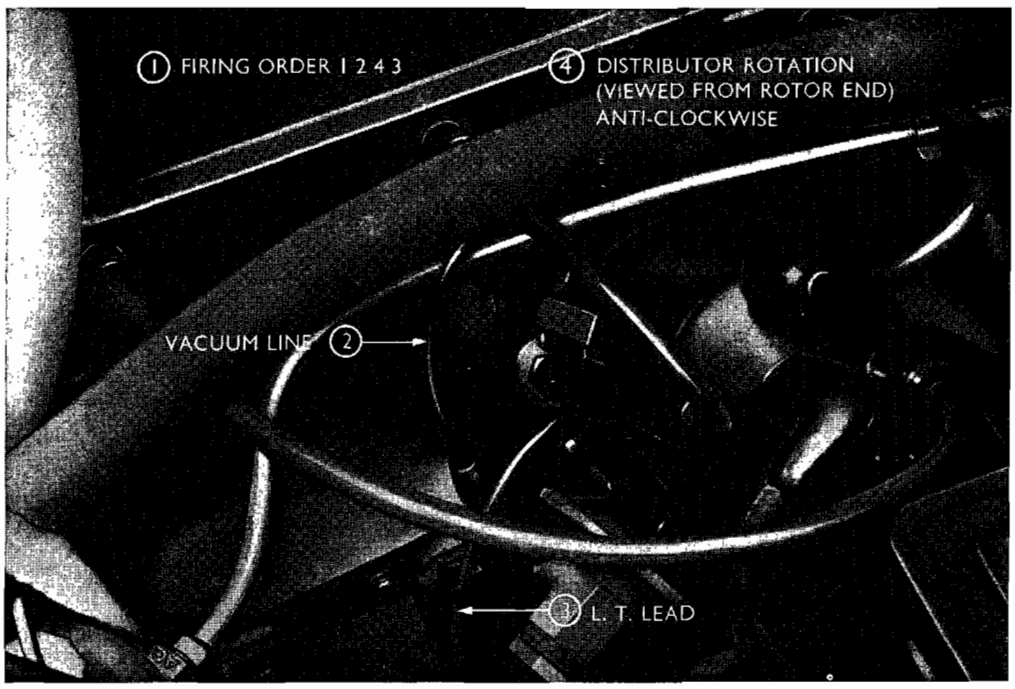
The distributor is driven by a skew gear from the camshaft and controls the spark advance both by governor weights and vacuum from the inlet manifold.

QUICK REFERENCE DATA

Distributor Identification

High Compression Engine

Distributor Number		Engine	Period of use
105E–12100-A	– Replaced by 105E–12100E	–	Sept. 1959 to Sept. 1961
105E–12100-C	– Replaced by 105E–12100E	–	Sept. 1961 to July 1963
105E–12100-E	– Replaces 12100 A/C	997 cc	July 1963 to Jan. 1966
105E–12100-E	– Replaces 12100 A/C	1198 cc	July 1963 to March 1966
C6AH–12100-A		997 cc	Jan. 1966 onwards
113E–12100-C		1198 cc	March 1966 to Aug. 1966
C6AH–12100-A		1198 cc	Aug. 1966 onwards



The Distributor in Situ

Low Compression Engine

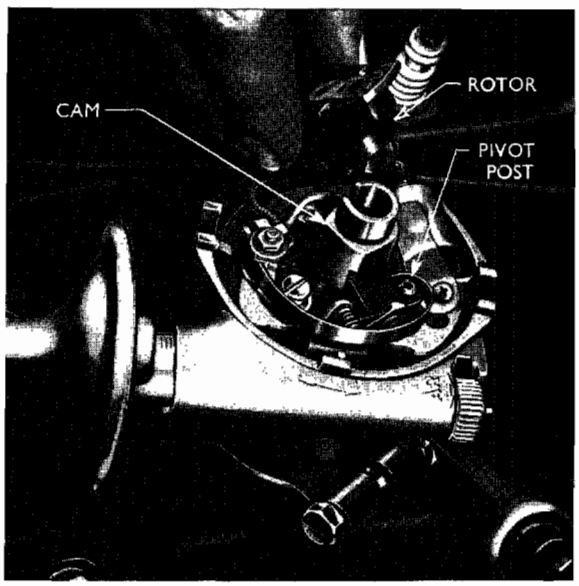
Distributor Number		Engine	Period of use
105E–12100-B	– Replaced by 105E–12100-F	–	Sept. 1959 to Sept. 1961
105E–12100-D	– Replaced by 105E–12100-F	–	Sept. 1961 to July 1963
105E–12100-F	– Replaces 12100 B/D	997 cc	July 1963 to Jan. 1966
105E–12100-F	– Replaces 12100 B/D	1198 cc	July 1963 to March 1966
C6AH-12100-B		997 cc	January 1966 onwards
113E-12100-D		1198 cc	March 1966 to August 1966
C6AH–12100-B		1198 cc	August 1966 onwards

Every 8,000 km. (5,000 miles)

Examine and adjust distributor points
Check and adjust the ignition timing
Clean and adjust the spark plugs
Lubricate the distributor cam spindle wick with two drops of engine oil
Lubricate the distributor cam with lithium base grease
Clean the distributor cap, H.T. leads and coil

CAUTION – Do not over-lubricate any part of the distributor, otherwise lubricant may reach the breaker contacts, resulting in burning and difficult starting. Points which have become dirty or contaminated with oil or grease should be cleaned with a stiff brush and carbon tetra-chloride.

NOTE – The distributor contact breaker points should only be changed if they are worn, badly burnt, or if excessive metal transfer has occurred or have a "high resistance". Contacts showing a greyish colour and only slight signs of pitting need not be renewed. Metal transfer is considered excessive when it equals or exceeds the recommended gap setting. The resistance is considered "high" when the voltage drop across the points exceeds 0.25 volts.



Distributor Lubrication

DATA

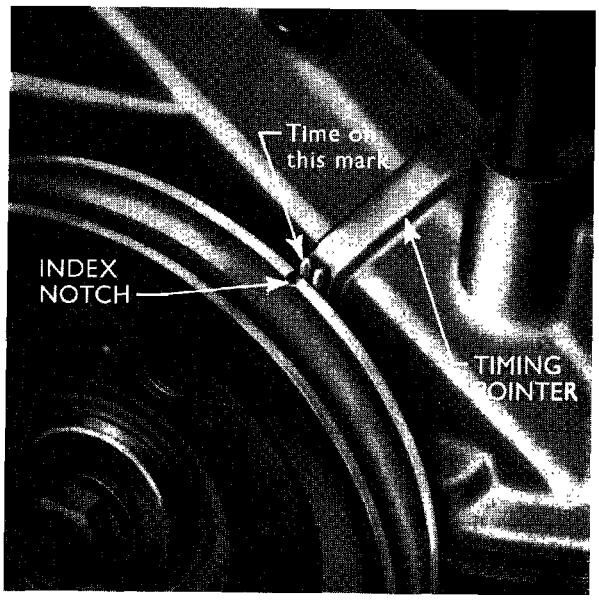
Distributor points gap	0.355 to 0.406 mm. (0.014 to 0.016 in.) Lucas. 0.64 mm. (0.025 in.) Ford.
Firing order	1. 2. 4. 3.
Rotation	Anti-Clockwise
Autolite Spark Plug type and gap	AG.32, 0.59 mm. (0.023 in.)
Champion Spark Plug type and gap	N5: 0.71 to 0.84 mm. (0.028 to 0.033 in.)
Initial advance (997 c.c. engines)	10° Crankshaft. High Compression
	8° Crankshaft. Low Compression (After Sept. 1963)
	10° Crankshaft. Low Compression (Prior Sept. 1963)
Initial advance (1198 c.c. engines)	6° Crankshaft. High Compression
	10° Crankshaft. Low Compression (After Feb. 1965)
	6° Crankshaft. Low Compression (Prior Feb. 1965)

IGNITION TIMING

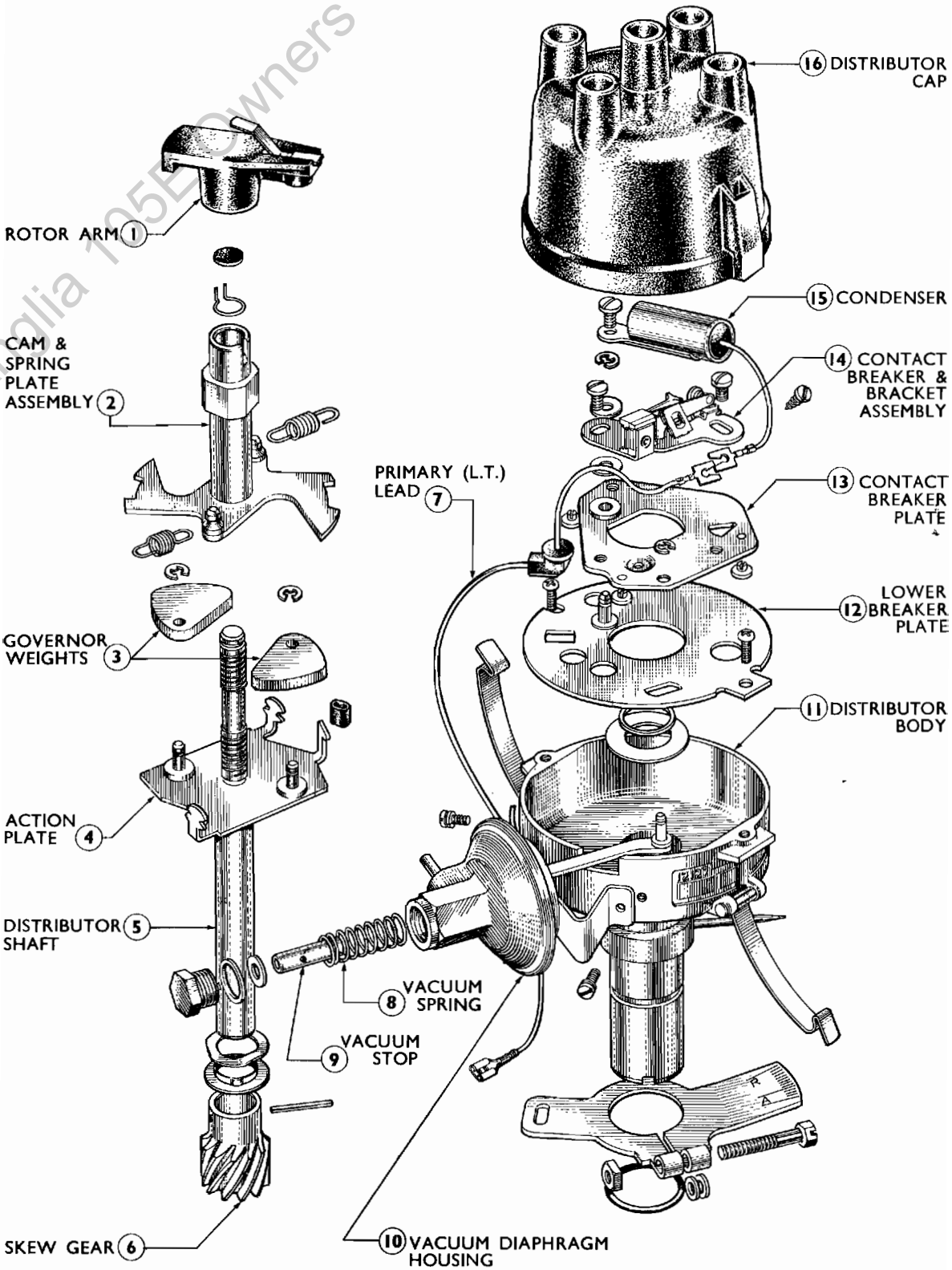
(a) Establish that the correct distributor is fitted.

(b) Check the octane rating of the fuel that is to be used with the engine, as this can affect the initial advance.

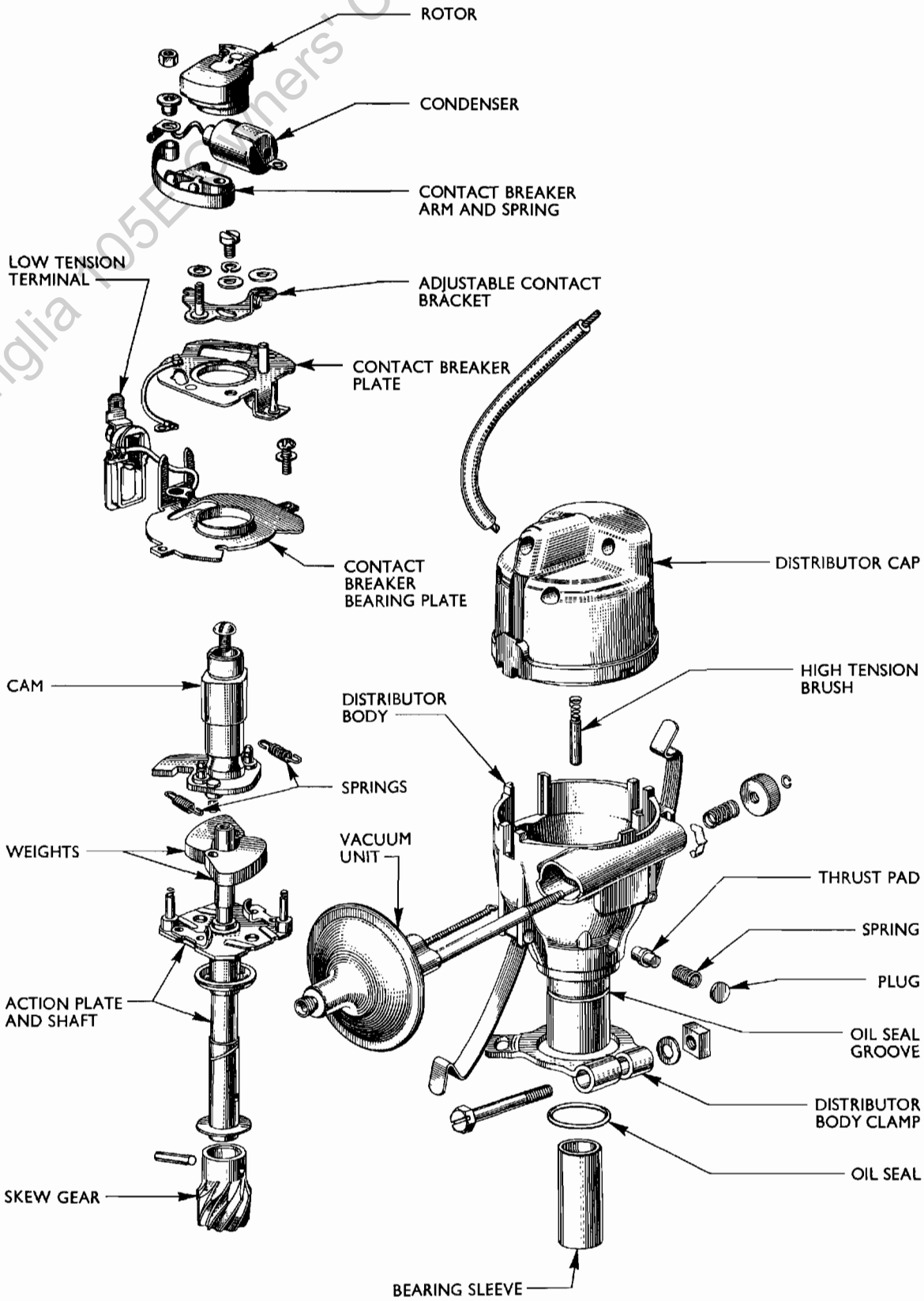
(c) The initial advance is "built-in" to the engine and when one of the marks on the crankshaft pulley aligns with the appropriate mark on the front cover timing pointer the initial advance setting is correct and no further adjustment is required at this stage.



Correct Engine Timing Position



The Ford Distributor Assembly—Exploded



The Lucas Distributor Assembly—Exploded

SERVICE AND REPAIR OPERATIONS

OP 12024-A IGNITION COIL – REMOVE AND INSTALL

To Remove

1. Disconnect the battery cables.
2. Remove the wires from the ignition coil.
3. Undo the bolt securing the ignition coil mounting bracket mount.
4. Remove the coil from the bracket.

To Install

5. Reposition the ignition coil and bracket and secure in position with the bolt.
6. Reconnect the wires to the coil.
7. Reconnect battery cables.

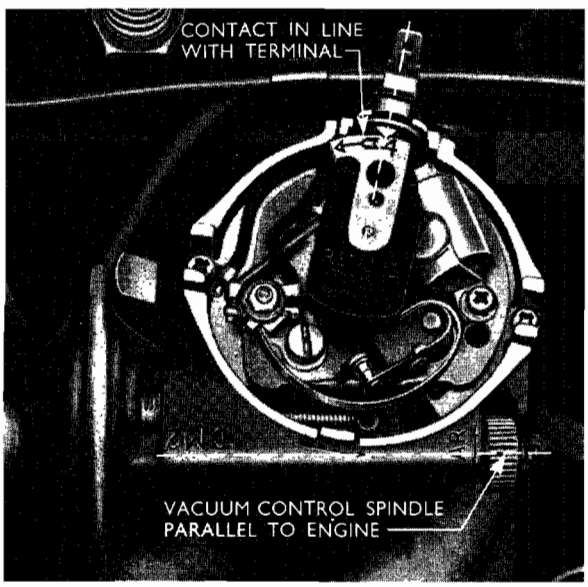
OP 12100-A DISTRIBUTOR ASSEMBLY – REMOVE AND INSTALL

To Remove

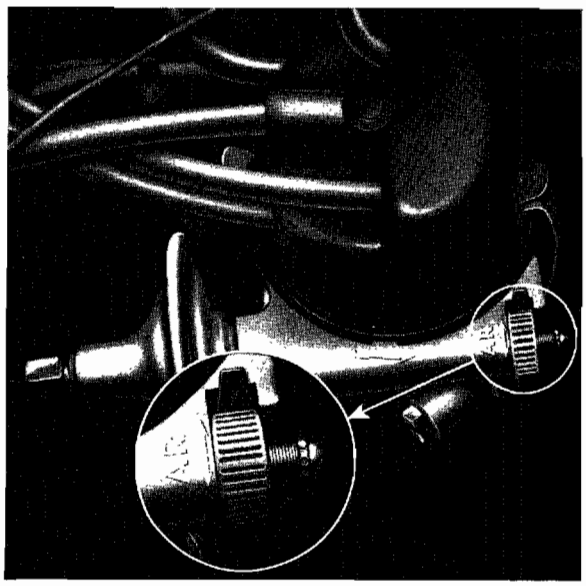
1. Disconnect the high tension leads from the spark plugs.
2. Disconnect the high tension lead and the low tension lead from the coil.
3. Disconnect the vacuum line from the distributor.
4. Unscrew the bolt retaining the distributor on the engine and carefully withdraw the distributor.

To Install

5. Turn the engine crankshaft until the appropriate timing mark on the timing cover is in line with the notch on the crankshaft pulley as the No. 1 piston comes up on the compression stroke.



Locating the Distributor on the Engine



Varying the Ignition Setting

6. With the vacuum advance unit pointing to the rear of the engine position the rotor to point to No. 2 spark plug.

7. Insert the distributor and, as the gears mesh, the rotor should rotate slightly. If necessary re-position the clamp, without turning the distributor, so that the hole is in line with the one in the cylinder block. Fit the retaining bolt and tighten.

A. To Adjust the Timing without the use of a Timing Light

(a) Slightly turn the distributor body as necessary until the contact breaker points are just opening when the rotor is adjacent to No. 1 H.T. electrode in the distributor cap.

NOTE — Excessive movement from the specified position would indicate that the gears are meshing one or more teeth out. Remove the distributor and refit if this occurs.

(b) Tighten the distributor body clamp bolt sufficiently to hold the distributor in position. DO NOT OVER-TIGHTEN.

8. Replace the distributor cap.

9. Reconnect the spark plug leads (firing order 1, 2, 4, 3 anti-clockwise rotation) and connect the grommet to the rocker cover bracket.

10. Reconnect the low tension lead to the coil.

B. To Adjust the Timing using a Timing Light

(a) Connect the leads of the timing light, using the clips provided, in accordance with the manufacturer's instructions.

(b) Check that the timing marks on the crankshaft pulley and front cover are visible and mark with chalk or paint if necessary.

(c) Start the engine and allow it to idle. Ensure that the distributor vacuum pipe is disconnected.

(d) Point the timing light at the timing pointer. Check that the mark on the crankshaft pulley is adjacent to the appropriate mark on the front coyer timing pointer.

If the mark of the pulley is above and to the left of the correct timing mark, the engine is too far advanced. Slacken the distributor body clamp and turn body anti-clockwise slightly to retard the ignition.

Should the mark be below and to the right of the correct timing mark, the distributor body should be turned clockwise slightly to advance the ignition.

(e) After making and adjustment, tighten the clamp sufficiently to hold the distributor in position. DO NOT OVER-TIGHTEN.

The operation of the governor weights may be checked by opening and closing the throttle. As the throttle is gradually opened, the mark should move away from the indicator upwards; and as the throttle is closed the notch will move down in line with the indicator. Any tendency for erratic advance shown by the mark jumping suddenly away from the indicator shows that the governor weights are binding, or that the springs are weak.

11. Reconnect the distributor vacuum pipe.

12. A slight readjustment to the distributor may be necessary and should be carried out on the road in the following manner:—

(i) Warm up the engine to normal operating temperature.

(ii) Accelerate in top gear on wide throttle opening from 32 k.p.h. (20 m.p.h.) to 64 k.p.h. (40 m.p.h.).

(iii) If heavy pinking occurs, **retard** the ignition until a trace pink can just be heard under these conditions of acceleration.

NOTE – It is not necessary to advance the ignition beyond the initial setting (except under high altitude operating conditions previously detailed). Also, there is no need to use a fuel of a higher octane rating than that specified.

OP 12100-A1 EXTRA: DISTRIBUTOR CAP – REMOVE AND INSTALL

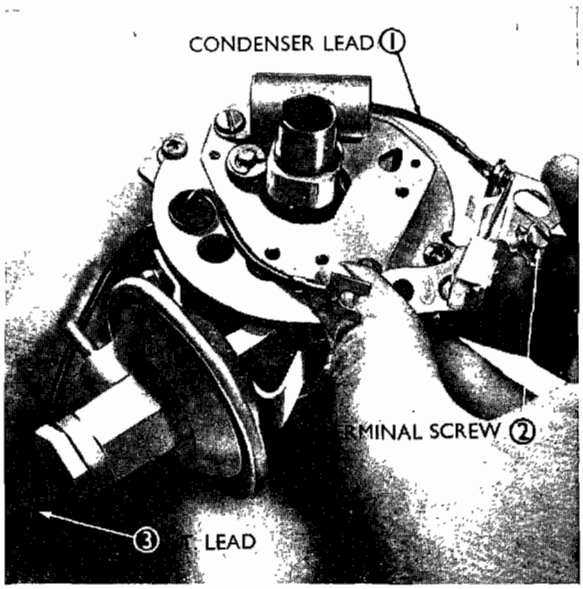
1. Remove the spark plug leads and high tension lead from the distributor cap.
2. Release the two spring clips and remove the cap.
3. Replace the cap and retain with the two spring clips.
4. Replace the leads, taking care to place these in their correct sockets.

OP 12100-A2 EXTRA: CONDENSER – RENEW (DISTRIBUTOR CAP REMOVED)

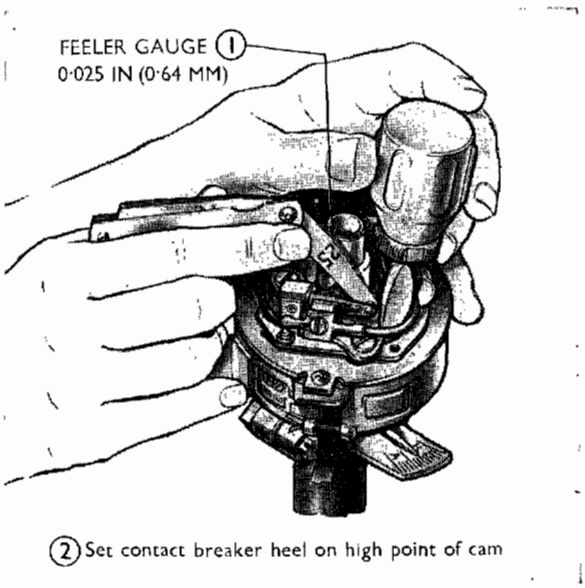
1. Unscrew the condenser lead, and the condenser retaining screw.
2. Replace the condenser, retain in position and replace the wire.

OP 12100-A3 EXTRA: POINTS – RENEW (DISTRIBUTOR CAP REMOVED)

1. Loosen the retaining screw and remove the low tension and condenser wires from the points.
2. Unscrew the retaining and adjusting screws and remove the points.
3. Replace the points and lightly retain in position.
4. Adjust the points to give a points gap of 0.64 mm. (0.025 in.) Ford, 0.355 to 0.406 mm. (0.014 to 0.016 in.) Lucas.
5. Tighten the adjusting screw.
6. Replace the two wires and retain in position.



Replacing the Contact Breaker Points Assembly



Adjusting the Contact Breaker Points

OP 12100-A4 EXTRA: DISTRIBUTOR BREAKER PLATE ASSEMBLY – REMOVE AND INSTALL (DISTRIBUTOR CAP REMOVED)

Ford Distributors

To Remove

1. Remove the circlip on the vacuum unit pivot post.
2. Remove the two screws securing the breaker plate assembly to the distributor body.
3. Remove the breaker plate assembly.

To Install

4. Replace the breaker plate assembly and secure it with the two screws.
5. Replace the circlip on the end of the vacuum unit pivot post.

Lucas Distributors

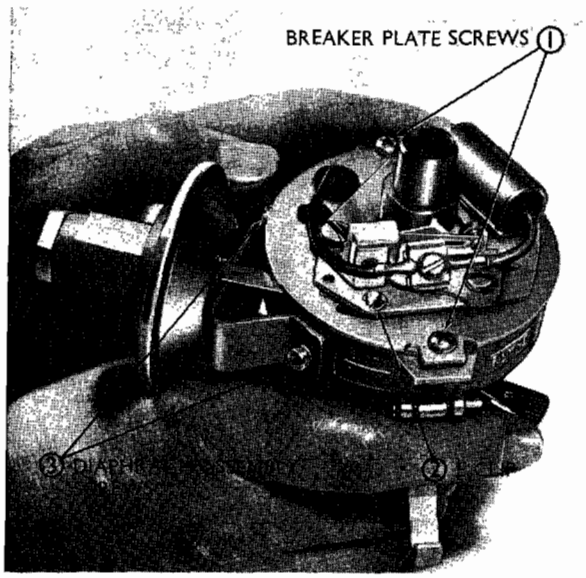
To Remove

1. Unhook the vacuum unit spring from its mounting pin on the breaker plate assembly.
2. Remove the two screws and lockwashers securing the assembly to the distributor body sides.

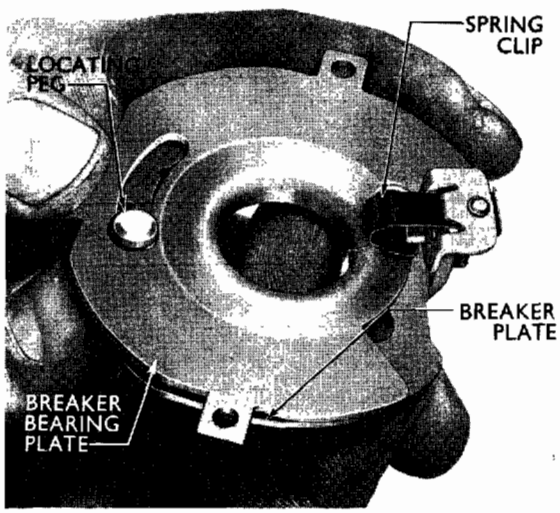
   NOTE that the screw adjacent to the vacuum unit retains the other end of the contact breaker plate earth wire.
3. Remove the low tension terminal nylon block and wire by sliding the assembly up from its location on the distributor body.
4. Remove the breaker plate assembly.

To Install

5. Replace the breaker plate assembly and secure with the two screws.
6. Locate the low tension terminal nylon block and wire in its housing on the distributor body.
7. Relocate the vacuum unit spring on the breaker plate mounting pin.



The Lower Breaker Plate and Vacuum Diaphragm Screws



Separating the Breaker Plate and Bearing Plate

OP 12100-A5 EXTRA: DISTRIBUTOR BREAKER PLATE ASSEMBLY – OVERHAUL (BREAKER PLATE REMOVED)

Ford Distributors

To Dismantle

1. Remove the large circlip on the pivot post.
2. Remove the flat washer, wave washer and upper contact breaker plate, turning the upper breaker plate as necessary to disengage the holding down screw from the keyhole slot in the lower plate. Take care not to lose the earth spring between the upper and lower breaker plates.
3. Remove the rubber grommet holding the low tension wire in position in the lower plate.

To Reassemble

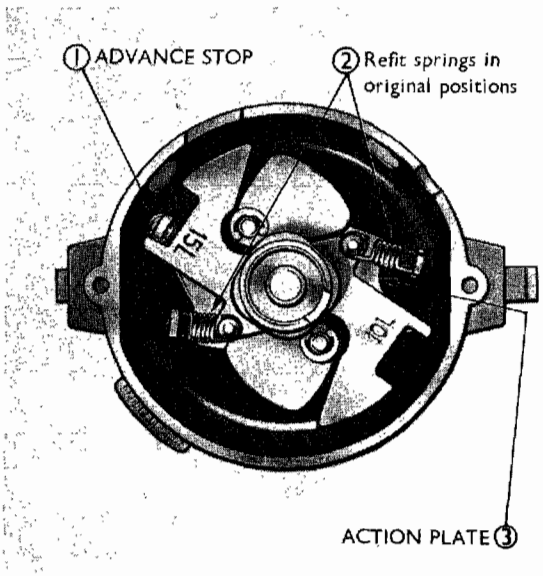
4. Replace the rubber grommet in the lower plate, taking care to leave enough wire to reach the contact breaker connection.
5. Replace the earth spring on the pivot post, followed by the upper contact breaker plate, and engage the holding down spindle in the keyhole slot.
6. Retain in position by the wave washer, flat washer and large circlip.
7. Check the clearance between the breaker plates beneath the nylon bearing nearest the holding down pin.

   The maximum clearance is 0.25 mm. (0.010 in.). To reduce the clearance, screw the nut further onto the holding down screw.

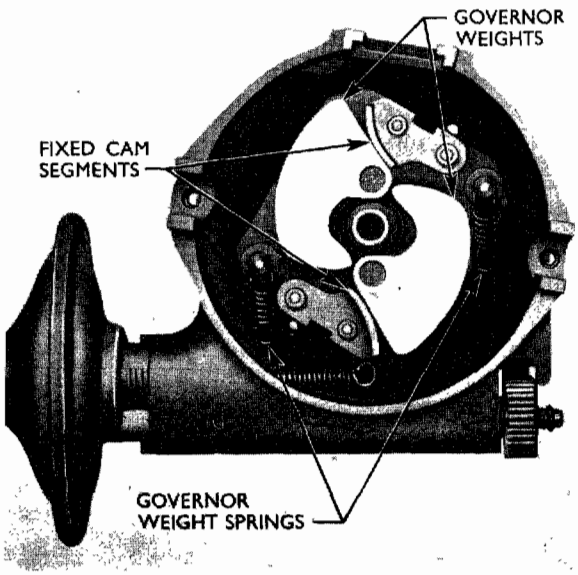
Lucas Distributors

To Remove

1. Twist the breaker plate fully anti-clockwise until the locating peg enters the opening at the end of the slot in the breaker bearing plate. Separate the breaker plate and breaker bearing plate by disengaging the spring dip.



Assembling the Mechanical Advance Mechanism



Governor Weights in Position Prior to Fitting Cam Assembly

To Install

2. Check the fit of the breaker plate on the bearing plate and also the breaker arm pivot for looseness or wear

3. Refit the breaker plate to the bearing plate by springing the spring clip over the bearing plate slot edge, inserting the pea of the breaker plate in the slot in the bearing plate and twisting it slightly clockwise.

OP 12100-A6 EXTRA: GOVERNOR WEIGHTS AND SPRINGS – RENEW (BREAKER PLATE REMOVED)

To Remove

1. Prise off the clips retaining the governor weights and remove the weights.
2. Unclip the advance springs after noting which spring fits to which post.

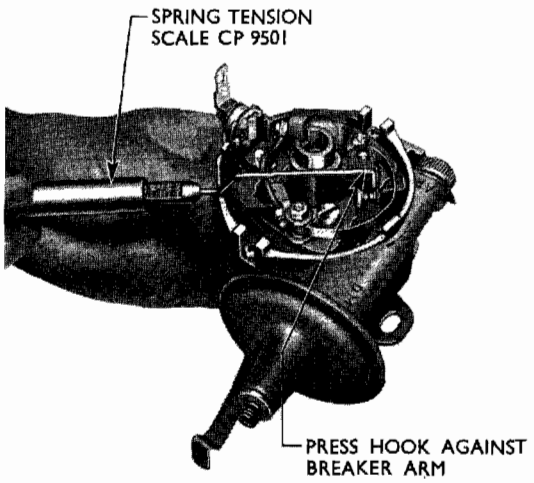
To Install

3. Refit the springs to the posts, ensuring that the primary spring (larger coil diameter) is fitted to the post from which it was removed.
4. Refit the governor weights with their flat edge adjacent to the cam spindle and retain them with the spring clips.

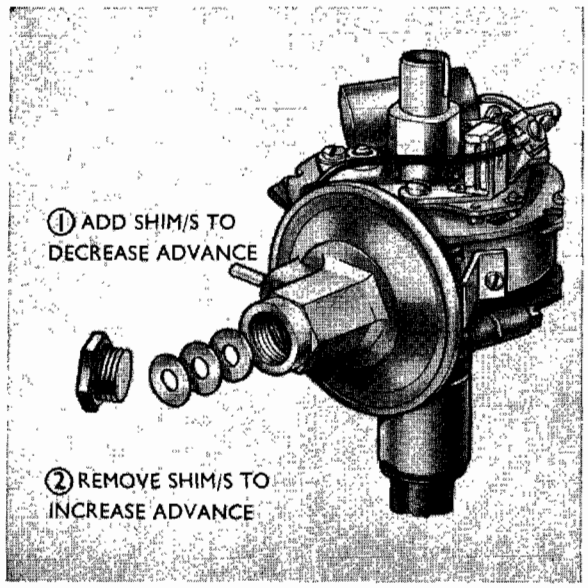
OP 12100-A7 EXTRA: VACUUM UNIT – RENEW (BREAKER PLATE REMOVED)

Ford Distributors

1. Remove the two crosshead screws and spring washers securing the vacuum unit, and remove the unit.
2. Replace the vacuum unit, and retain in position with the two crosshead screws and spring washers.



Checking Contact Breaker Arm Spring Tension



Adjusting the Vacuum Advance Characteristics

Lucas Distributors

1. Detach the small circlip securing the advance adjustment nut, unscrew the nut and remove the vacuum unit from the distributor body.
2. Locate the vacuum unit in the distributor body, replace the adjustment nut and circlip tightening the nut until the fourth line on the timing scale behind the vacuum housing is in line with edge of the distributor body.

OP 12100-A8 DISTRIBUTOR – OVERHAUL (GOVERNOR WEIGHTS AND VACUUM UNIT REMOVED)

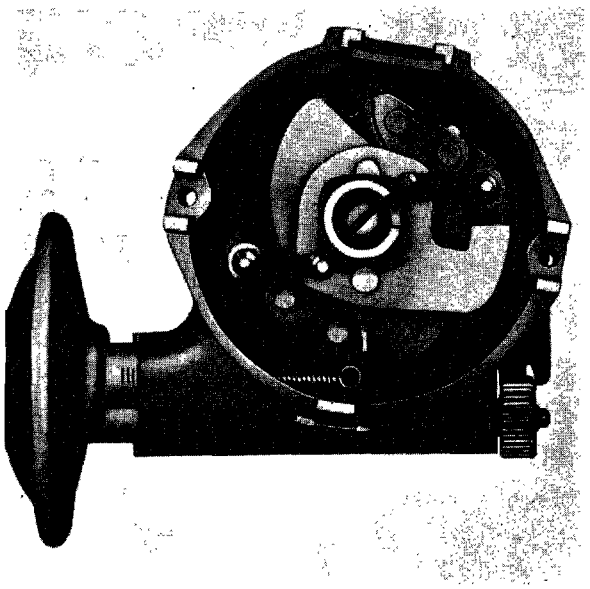
Ford Distributors

To Dismantle

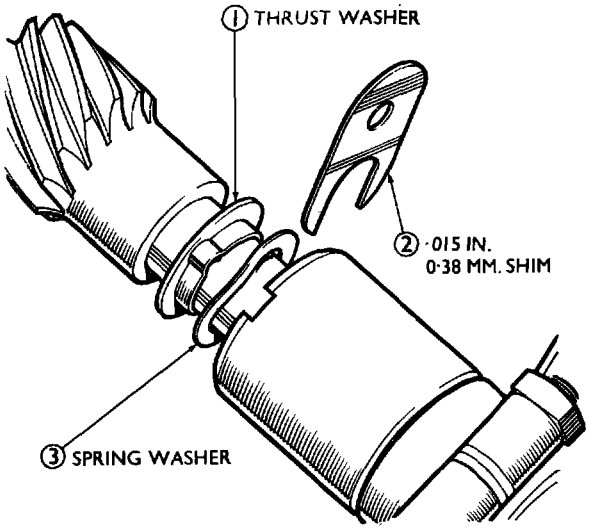
1. Remove the felt pad in the top of the cam spindle and then expand and remove the retaining circlip. Lift off the cam spindle, noting in which slot the advance stop is located.
2. Drive out the drive gear retaining pin and withdraw the gear with the two washers located above it. Withdraw the action plate and shaft from the distributor body. Remove the thrust washers below the action plate.
3. Unscrew the bolt on the end of the vacuum unit and withdraw the vacuum spring, stop shim(s).

To Reassemble

4. Reassemble the vacuum spring, stop and shim(s) to the vacuum unit. Replace the bolt and sealing washer.
5. Slide the thrust washers onto the shaft below the action plate. Fit the shaft and action plate to the distributor body and slide on the thrust washer, wave washer and gear. Refit the tension pin.
6. If a new gear or shaft is being fitted it will be necessary to drill a new tension pin hole. Note that a new gear will already have a pilot drilling for the tension pin hole.



Cam Assembly in Position



Setting the Distributor Shaft Pre-Load

(a) Assemble the thrust washers to the shaft and fit it into the distributor body.

(b) Obtain or make a 0.38 mm. (0.015 in.) thick shim.

(c) Assemble a new thrust washer, wave washer and the 0.38 mm. (0.015 in.) shim on the distributor shaft.

(d) If a new gear is being used, position the pilot hole at 90° to the rotor arm slot, with zero advance in the mechanism.

(e) Using a suitable screw compression clamp, push the gear along the shaft until the spring washer is compressed and all slack is removed. **Do not over-tighten.**

(f) Position the assembly carefully in Vee blocks under a press drill. Drill a 3.18 mm. (0.125 in.) hole through gear and shaft using the pilot hole as a guide. When using the original gear with a new shaft, drill the roll pin hole through the gear at right angles to the original hole.

(g) Remove the drill and install a new roll pin.

(h) Release the compression of the clamp and extract the 0.38 mm (0.015 in.) shim.

7. Replace the cam spindle, ensuring that the advance stop is located in the correct slot and secure with the spring circlip. Replace the felt wick.

Lucas Distributors (vacuum unit removed)

To Dismantle

1. Remove the screw retaining the cam spindle to the distributor shaft and carefully lift the cam spindle clear of the governor weights.
2. Disconnect the springs from the pegs on the action plate and lift off the weights.
3. Drill out the end of the skew gear retaining pin and drive it through the gear with a suitable punch. Remove the gear and washer.
4. Remove the distributor shaft and action plate from the distributor body together with the nylon spacing washer beneath the action plate.

To Reassemble

5. Locate the spacing washer on the underside of the distributor shaft action plate and refit the assembly in the distributor body.
6. Locate the washer on the lower end of the shaft and refit the skew gear. Fit a new skew gear retaining pin and peen over the end.

   If a new distributor driving shaft has been fitted, locate a new brass washer on the shaft with its three raised "pips" towards the skew gear and then assemble the gear. With the assembly held tightly together drill the driving shaft with a No. 16 (0.177 in.) drill using the hole in the skew gear as a guide and fit a new retaining pin as described above. Sharply tap the end of the driving shaft with a hide mallet in order to flatten slightly the raised "pips" on the washer. This action will result in a slight shaft end float thus promoting the free rotation of the assembly.
7. Fit the governor weight restraining springs to the pegs on the action plate.
8. Locate the governor weights on the action plate with the flat sides abutting the fixed cam segments and the cut-away portions nearest the shaft.
9. Refit the distributor cam assembly to the shaft and ensure that it turns smoothly without tightness. Engage the cam pegs in the governor weight holes and refit the securing screw.
10. Connect the springs to the pegs on the cam plate and check the action of the weights in the fully advanced and retarded positions for freedom of movement and lightly lubricate all parts with engine oil.

OP 12100-B GOVERNOR WEIGHTS AND SPRINGS – RENEW – FORD TYPE
(Includes OPS 12100-A, A1, A4 and A6)

OP 12100-C VACUUM UNIT – RENEW – FORD TYPE
(Includes OPS 12100-A, A1, A4 and A7)

OP 12100-D DISTRIBUTOR – OVERHAUL – FORD TYPE
(Includes OPS 12100-A, A1, A2, A3, A4, A5, A6, A7 and A8)

OP 12199-A CONTACT BREAKER POINTS – RENEW (DISTRIBUTOR IN SITU)

Ford Distributors

To Remove

1. Remove the distributor cap.
2. Loosen the retaining screw and remove the low tension and condenser wires from the points.
3. Unscrew the retaining and adjusting screws and remove the points.

To Install

4. Replace the points and lightly retain in position.
5. Adjust the points to give a gap of 0.64 mm. (0.025 in.).
6. Tighten the adjusting screw.
7. Replace the two wires and retain in position.
8. Replace the distributor cap.

Lucas Distributors

To Remove

1. Remove the distributor cap and rotor arm.
2. Unscrew the terminal nut and detach the flanged nylon bush together with the primary and condenser leads.
3. Remove the breaker arm and spring assembly, together with the fibre washers, from the terminal and pivot posts.
4. Remove the locking screw and detach the adjustable contact plate.

To Install

5. Loosely secure the adjustable contact plate to the breaker plate.
6. Locate the fibre washer on the pivot post and breaker arm terminal post and refit the breaker arm assembly.
7. Locate the primary and condenser leads on the shouldered bush, pass this over the terminal post through the looped end of the breaker spring and secure with the terminal nut.
8. Adjust the points to give a gap of 0.355 to 0.406 mm. (0.014 to 0.016 in.).
9. Replace the rotor arm and distributor cap.

OP 12300-A CONDENSER – RENEW (DISTRIBUTOR IN SITU)

1. Remove the distributor cap.

2. Unscrew the condenser lead and the condenser retaining screw.
3. Reposition the condenser, retain in position and replace the wire.
4. Replace the distributor cap.

OP 12405-A SPARK PLUGS – REMOVE AND INSTALL

1. Disconnect the spark plug leads.
2. Remove the spark plugs.
3. Replace the spark plugs.
4. Reconnect the spark plug leads.

OP 12405-A1 EXTRA: SPARK PLUGS – CLEAN AND RESET

1. Sandblast spark plugs.
2. File centre electrode flat and at 90°.
3. Set spark plug gap to 0.59 mm. (0.023 in.) Ford or 0.71 to 0.84 mm. (0.028 to 0.033 in.) Champion.

OP 12405-B SPARK PLUGS – CLEAN AND RESET
(Includes OPS 12405-A and A1)

SPECIFICATION AND REPAIR DATA (FORD)

Type ... ... Single pair contact breaker point
Automatic advance ... ... Mechanically and vacuum controlled
Drive ... ... Skew gear from camshaft
Rotation ... ... Anti-clockwise from rotor end
Shaft pre-load ... ... Set wtih 0.38 mm. (0.015 in.) shim
Identification:
High compression (C6AH-12100-A) ... ... Red paint mark on vacuum plug
Low compression (C6AH-12100-B) ... . Green paint mark on vacuum plug
Static advance (initial)
High compression ... ...10° before T.D.C. (on the upper/inner timing mark)
Low compression ... ... 8° before T.D.C. (midway between the timing marks)
Breaker arm spring tension ... ... 481.9 to 567.0 gms. (17 to 21 oz.)
Condenser capacity ... ... 0.21 to 0.25 microfarad
Contact breaker points gap ... ...0.64 mm. (0.025 in.)
Dwell angle ... ... 38° to 40°
Firing order 1, 2, 4, 3

Advance characteristics:

Mechanical		Vacuum	
High compression			
Distributor Speed rev./min.	Degrees Advance (Distributor)	Vacuum in. of Hg. (cm. of Hg.)	Degrees Advance (Distributor)
500	o	5 (12.7)	o
700	1½ to 3½	8 (20.3)	2½ to 5
900	4 to 6	10 (25.4)	6 to 8
1,500	8½ to 10½	12 (30.5)	8 to 10
2,500	12½ to 14½	15 to 20 (38.1 to 50.8)	9 to 11
Low compression			
Distributor Speed rev./min.	Degrees Advance (Distributor)	Vacuum in. of Hg. (cm. of Hg.)	Degrees Advance (Distributor)
600	o	5 (12.7)	o
800	½ to 2½	8 (20.3)	3½ to 6
1,200	4½ to 6½	10 (25.4)	6½ to 9
1,800	9 to 11	12 (30.5)	8½ to 11
2,500	12 to 14	15 to 20 (38.1 to 50.8)	11 to 13

Mechanical and Vacuum Advance Curves

SPECIFICATION AND REPAIR DATA (LUCAS)

Type ... ... Single pair contact breaker point
Drive ... ... Skew gear from camshaft
Ignition advance: ... ... Centrifugal and vacuum controlled
Static advance (Initial) ... ... 10° before T.D.C. (on upper timing mark)
Automatic advance (no vacuum):
Starts ... ... 1,250 r.p.m. (crankshaft) (8.5 c.r.) 1,325 r.p.m. (crankshaft) (7.2 c.r.)
Ends ... ... 5,000 r.p.m. (crankshaft) (8.5 c.r.) 5,000 r.p.m. (crankshaft) (7.2 c.r.)
Breaker arm spring tension ... ... 510.3 to 680.36 gms. (18 to 24 oz.)
Condenser capacity ... ... 0.18 to 0.22 microfarad
Contact breaker points gap ... ... 0.356 to 0.406 mm. (0.014 to 0.016 in.)
Spark plug gap ... ... 0.59 to 0.70 mm. (0.023 to 0.028 in.)

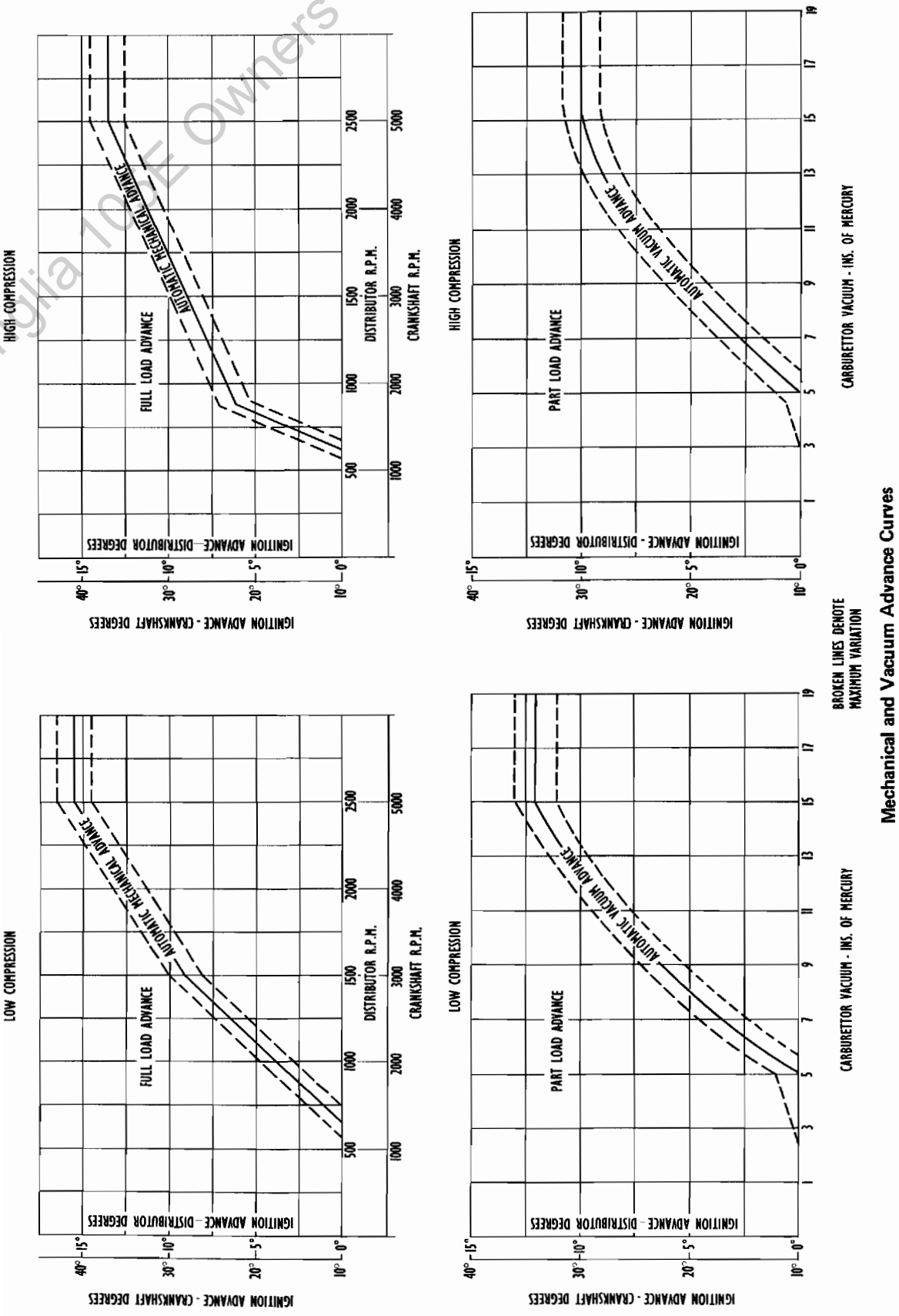
Distributor Shaft

Diameter ... ... 12.432 to 12.450 mm. (0.4895 to 0.490 in.)
End-float ... ... 0.051 to 0.152 mm. (0.002 to 0.006 in.)
Clearance ... ... 0.000 to 0.038 mm. (0.000 to 0.0015 in.)

Advance characteristics:

Mechanical		Vacuum	
High compression			
Distributor Speed rev./min.	Degrees Advance (Distributor)	Vacuum in. of Hg. (cm. of Hg.)	Degrees Advance (Distributor)
600	0° to ½°	3	No advance
700	½° to 3°	6	¼° to 2½°
850	4½° to 6½°	8	3° to 5°
950	5½° to 7½°	11	6½° to 8½°
1,500	8° to 10°	13	8° to 10°
2,050	10½° to 12½°	20	9° to 11°
2,500	12½° to 14½°		

Low Compression			
Distributor Speed rev./min.	Degrees Advance (Distributor)	Vacuum in. of Hg. (cm. of Hg.)	Degrees Advance (Distributor)
650	0° to 1°	2½	No advance
800	½° to 2½°	5	0° to 1°
1,100	3½° to 5½°	6½	1½° to 4°
1,500	8° to 10°	9½	6° to 8°
2,050	11½° to 13½°	13	9¾° to 11¾°
2,500	14½° to 16½°	20	11° to 13°



Mechanical and Vacuum Advance Curves

GENERAL DESCRIPTION

The instruments are positioned directly in front of the driver and consist of a speedometer, water temperature gauge and fuel gauge together with generator and oil pressure warning lights, direction indicator and main beam warning lights.

Switching for headlamp, side and panel lighting is controlled by one switch, with the exception of early models where a separate switch for panel lighting was included. The push pull method of windscreen wiper control used on early models was later superseded by the combined wiper/washer control. Headlamp dipping is controlled by a lever mounted on the left of the steering column while the direction indicator and horn controls are combined in a single lever mounted on the right of the column. The ignition switch is located adjacent to the speedometer and, in addition to the 'OFF' position, has three operational positions controlling ignition, starting and accessory circuits.

On early models the driving lamps consisted of two headlamps with a combined turn indicator/side lamp as a separate assembly. This assembly was first changed to two separate units and then to a direction indicator only with the side light incorporated in the headlamp unit. The rear direction indicator/side and stop lamp unit has remained virtually unchanged throughout the production run of the model. The circular headlamps on early models were of the semi-sealed beam type and were later superseded by the fully sealed beam units used on current models.

The bonnet lock control, ashtray and, where fitted, the heater control are located in the centre of the facia panel. Provision is also made for the fitting of an auxiliary panel on which accessories such as the radio and cigar lighter can be mounted.

On the later super models this panel is a standard fitting together with the cigar lighter and heater.

QUICK REFERENCE DATA

Bulbs—Quantity and Description	Voltage	Wattage
2 Headlight Bulbs	12	50/40
2 Side Light and Front Direction Indicator Bulbs	12	21/6
2 Rear and Stop Light Bulbs	12	21/6
2 Rear Direction Indicator Bulbs	12	21
1 Interior Lamp Bulb	12	3
1 Rear Number Plate Bulb	12	6
1 Instrument Panel Bulb	12	2.2
2 Direction Indicator Warning Light Bulbs ...	12	2.2
1 Generator Warning Light Bulb	12	2.2
1 Oil Pressure Warning Light Bulb	12	2.2
1 Headlight Beam Warning Light Bulb	12	2.2

OP 10883-A TEMPERATURE GAUGE – REMOVE AND INSTALL

To Remove

1. Disconnect the battery.
2. Disconnect the speedometer cable and remove the two crosshead screws and nut retaining the speedometer head assembly to the instrument panel.
3. Withdraw the assembly and remove the screw retaining the temperature gauge unit to the speedometer head.
4. Disconnect the leads and remove the unit.

To Install

5. Reconnect the leads to the temperature gauge and secure the unit to the speedometer head.
6. Locate the speedometer head assembly on the instrument panel and secure with the two crosshead screws and nut. Reconnect the speedometer cable.
7. Reconnect the battery and check the operation of the temperature gauge unit.

OP 11654-A LIGHT SWITCH – REMOVE AND INSTALL

To Remove

1. Open the bonnet and disconnect the battery.
2. From behind the instrument cluster remove the leads to the lighting switch.
3. Remove the knob from the switch stalk, unscrew the bezel and withdraw the switch from the instrument cluster.

To Install

4. Locate the switch on the instrument cluster and secure with the bezel. Replace the knob on the switch stalk.
5. Reconnect the leads to lighting switch.
6. Reconnect the battery and check the operation of the light switch.

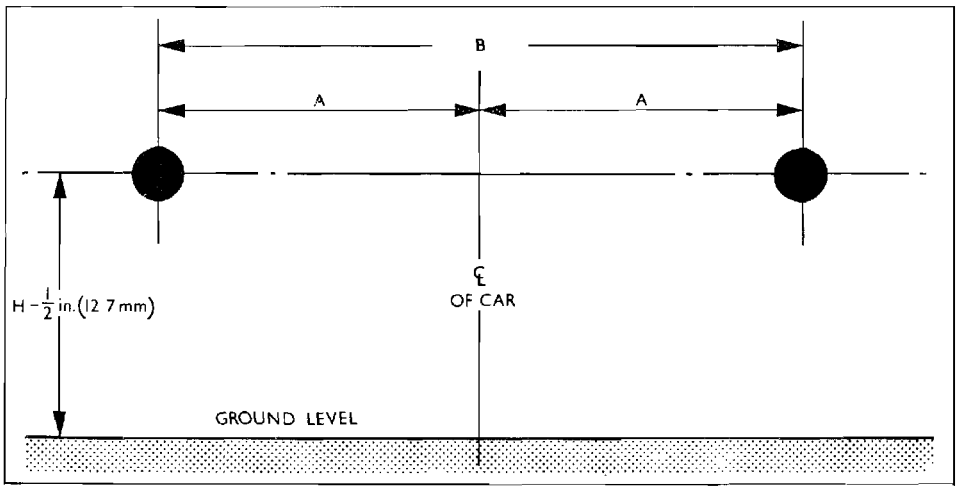
OP 13000-A HEADLAMPS ALL – ALIGN

The headlamps can be aligned with any suitable alignment equipment, but if this is not available, the following procedure should be carried out.

1. Position the car on level ground 3.048 m (10 ft.) in front of a suitable darkened board which is marked with a vertical and horizontal line.

   This board must be at right-angles to the vehicles centre-line.
2. Bounce the car to ensure correct settlement of the suspension and then measure the height 'H' from the ground to the centre of the headlamps.
3. Position the board so that the vertical line is exactly in line with the car centre-line.

   Position the board, also, so that the horizontal line is parallel to the ground and at a height 'H' from the ground.



Headlamp Alignment Chart

4. Remove each headlamp outer bezel and switch on the main beams.
5. By means of the horizontal and vertical adjusting screws, adjust each headlamp so that the centres of brightest illumination lie on the horizontal dividing line 1155.70 mm. (45.5 in.) apart (B) and equidistant (A) from the vertical dividing line. It is advisable to cover one headlamp while adjusting the other.
6. Switch off the headlamps and refit the outer bezels

OP 13005-A HEADLAMP SEALED BEAM UNIT OR LENS – REMOVE AND INSTALL

To Remove

1. Remove the two crosshead screws located towards the top of the outer bezel and also the crosshead screw located at the bottom of the bezel and then remove the bezel and the bezel seal.
2. Unscrew the three crosshead screws and remove the retaining ring.

   NOTE – Do not disturb the two slot-head screws as these control the headlamp alignment.
3. Lift out the sealed beam unit from its location and disconnect the wiring connection plug from the rear of the unit.

To Install

1. Reconnect the wiring connection plug at the rear of the unit.
2. Locate the unit into its position in its mount, locate the retaining ring and secure in position with the three crosshead screws.
3. Locate the outer bezel and seal in its location and retain them in position by means of the three crosshead screws.

OP 13200-A FRONT INDICATOR AND/OR SIDE LAMP ASSEMBLY – REMOVE AND INSTALL

To Remove

1. Open the bonnet and disconnect the battery.
2. Remove the three screws securing the lens and remove the lens plate and gasket.
3. Unscrew the three studs securing the lamp body assembly to the radiator grille panel and remove the assembly.

To Install

4. Position the lamp body and gasket on the radiator grille panel and secure with the three studs.
5. Locate the lens, plate and gasket on the lamp body and securely fasten the three retaining screws.
6. Reconnect the battery and close the bonnet.
7. Check the operation, the side lamp and indicator.

OP 13404-C REAR LAMP ASSEMBLY – REMOVE AND INSTALL SALOON

To Remove

1. Open the bonnet and disconnect the battery.

2. Unscrew the crosshead screws retaining the indicator and stop/tail lenses, remove the lenses, gaskets and bulbs.
3. Open the boot and remove the three nuts securing the rear lamp body, disconnect the leads to the bulb holders and remove the lamp body and gaskets.

To Install

4. Locate the lamp body and gaskets on the tail lamp opening and secure with the three nuts. Reconnect the leads to the bulb holders.
5. Position the indicator and stop/tail lenses, together with their respective gaskets, on the rear lamp body and secure with the crosshead screws.
6. Reconnect the battery and check the operation of the rear lamp, stop lamp and indicator.

OP 13404-D REAR LAMP ASSEMBLIES – REMOVE AND INSTALL
(Includes OP 13404 C x 2)

OP 13480-A STOP LAMP SWITCH – REMOVE AND INSTALL
(BRAKE PIPE MOUNTING)

To Remove

1. Jack up the front end of the vehicle and fit axle stands.
2. Disconnect the leads to the stop light switch and remove the switch.

To Install

3. Refit the switch assembly to the five-way brake pipe union and reconnect the leads.
4. Bleed the brakes as detailed in OP 2000-A.
5. Check the operation of the stop light.

STOP LIGHT SWITCH – REMOVE AND INSTALL
(PEDAL BRACKET MOUNTING)

To Remove

1. Disconnect the battery.
2. Make a note of the wires to the switch then disconnect them.
3. Unscrew the locknut and remove the stop light switch.

To Install

4. Locate the stop light switch in its mounting bracket and secure it with a locknut.
5. Reconnect the wires to the switch.
6. Connect the battery and check the operation and adjustment of the stop light switch.

OP 13532-A HEADLAMP DIPPER SWITCH – REMOVE AND INSTALL

To Remove

1. Open the bonnet and disconnect the battery.
2. Remove the steering column shroud and plastic mouldings.
3. Disconnect the leads to the dipper switch; remove the two nuts securing the switch to the column and withdraw the assembly.

To Install

4. Position the switch on the steering column and secure with the two nuts. Reconnect the leads to their respective terminals.
5. Refit the steering column shroud and plastic mouldings.
6. Reconnect the battery and check the operation of the switch.

OP 13543-B REAR LICENCE PLATE LAMP ASSEMBLY AND/OR BULB – REMOVE AND REPLACE

To Remove

1. Disconnect the battery.
2. Remove the two screws securing the lens and gasket to the lamp bracket.
3. Remove the bulb.
4. Disconnect the lead at the bulb socket, remove the two self-tapping screws securing the lamp bracket to the body and remove the bracket.

To Install

5. Position the bracket and the body and secure with the two self-tapping screws.
6. Replace the bulb and lead.
7. Locate the lens and gasket on the lamp bracket and securely fasten with the two screws.
8. Reconnect the battery and check the operation of the lamp.

OP 13776-A INTERIOR LIGHT – REMOVE AND INSTALL

To Remove

1. Disconnect the battery.
2. Remove the interior light lens.

   NOTE – On estate car variants the lens is retained by two screws.
3. Disconnect the wiring, remove the screws retaining the lamp base assembly and remove the assembly.

To Install

4. Position the lamp base assembly to the body, secure with the retaining screws.
5. Reconnect the wiring and replace the lamp base.
6. Reconnect the battery and check the operation of the light.

OP 13801-A HORN – REMOVE AND INSTALL

To Remove

1. Disconnect the battery
2. Disconnect the wiring from the horn terminals.
3. Remove the two bolts securing the horn to the engine side apron panel and remove the horn.

To Install

4. Position the horn on the engine side apron and secure with the two bolts.
5. Reconnect the horn wiring.
6. Reconnect the battery and check the operation of the horn.

OP 17255-A SPEEDOMETER HEAD ASSEMBLY – REMOVE AND INSTALL

To Remove

1. Disconnect the battery.
2. Disconnect the speedometer cable and remove the two crosshead screws and nut retaining the speedometer head assembly to the instrument panel.
3. Note the position of the various leads before removal and withdraw the assembly from the instrument panel.

To Install

4. Replace the leads to their respective terminals, position the assembly in the instrument panel and securely fasten with the two screws and nut.
5. Replace the speedometer cable, reconnect the battery and check the operation of the various units contained in the head assembly.

OP 17262-A SPEEDOMETER CABLE – REMOVE AND INSTALL

To Remove

1. Disconnect the cable from the speedometer head.
2. Withdraw the inner cable from the outer casing.

To Install

3. Push the inner cable into the outer casing, using a rotating action to engage with the speedometer drive gear.
4. Reconnect the cable to the speedometer head.

OP 17262-B SPEEDOMETER INNER AND OUTER CABLES – REMOVE AND INSTALL

To Remove

1. Repeat sub-operations 1 and 2 of operation 17262-A.
2. Jack up the front end of the vehicle and fit stands.
3. Remove the bolt and clip retaining the speedometer cable to the gear box and withdraw the cable.

To Install

4. Position the speedometer cable to the gearbox and securely fasten with the retaining bolt and clip.
5. Jack up the car and remove the stands.
6. Repeat sub-operations 3 and 4 of operation 17262-A.

OP 17508-C WINDSHIELD WIPER ASSEMBLY – REMOVE AND INSTALL

To Remove

1. Disconnect the battery.
2. Remove the heater and bonnet release control knobs.
3. Remove the screws securing the centre control panel and withdraw the panel.
4. Remove the speedometer head assembly (see OP 17255-A).
5. Disconnect the right-hand demister hose from the nozzle.
6. Remove the windscreen wiper arms and unscrew the two nuts securing the wiper arm spindles.
7. Disconnect the leads to the wiper motor and withdraw the wiper motor, linkage and mounting bracket assembly.
8. Remove the three bolts retaining the wiper motor to the motor mounting bracket, disconnect the linkage and separate the wiper motor from the assembly.

To Install

9. Reassemble the wiper motor, linkage and mounting bracket.
10. Position the assembly on the windscreen opening panel and secure the wiper arm spindles with the two nuts.

    NOTE – Ensure that the spindle sealing grommet is in good condition before replacement.
11. Replace the windscreen wiper arms.
12. Reconnect the leads to their respective terminals.
13. Reconnect the right-hand demister hose to the demister nozzle.
14. Replace the speedometer head assembly.
15. Position the centre control panel on the instrument panel and securely tighten the retaining screws.
16. Replace the heater and bonnet release control knobs.
17. Reconnect the battery and check the operation of the windscreen wipers.

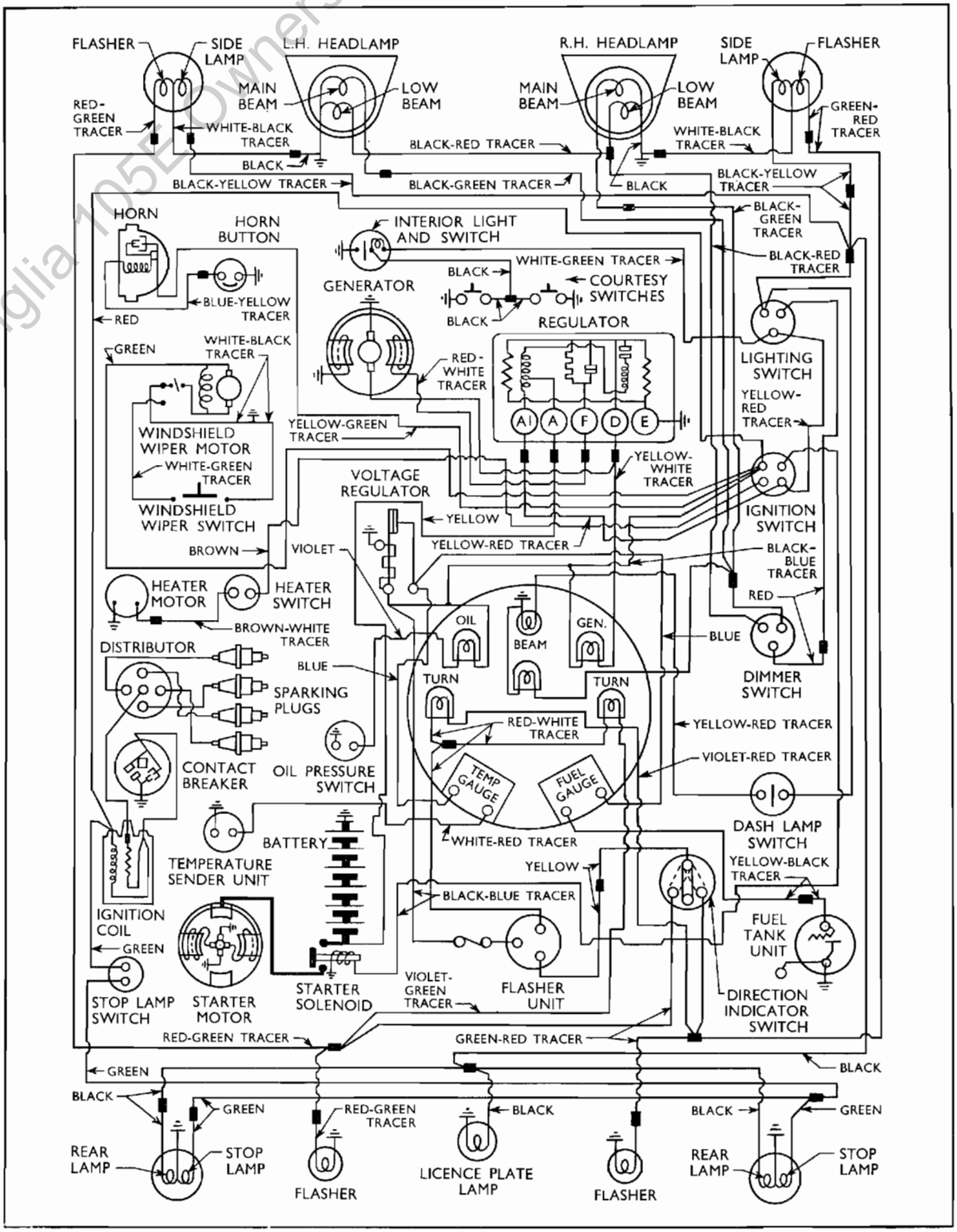
OP 17535-A WINDSCREEN WIPER SWITCH – REMOVE AND INSTALL

To Remove

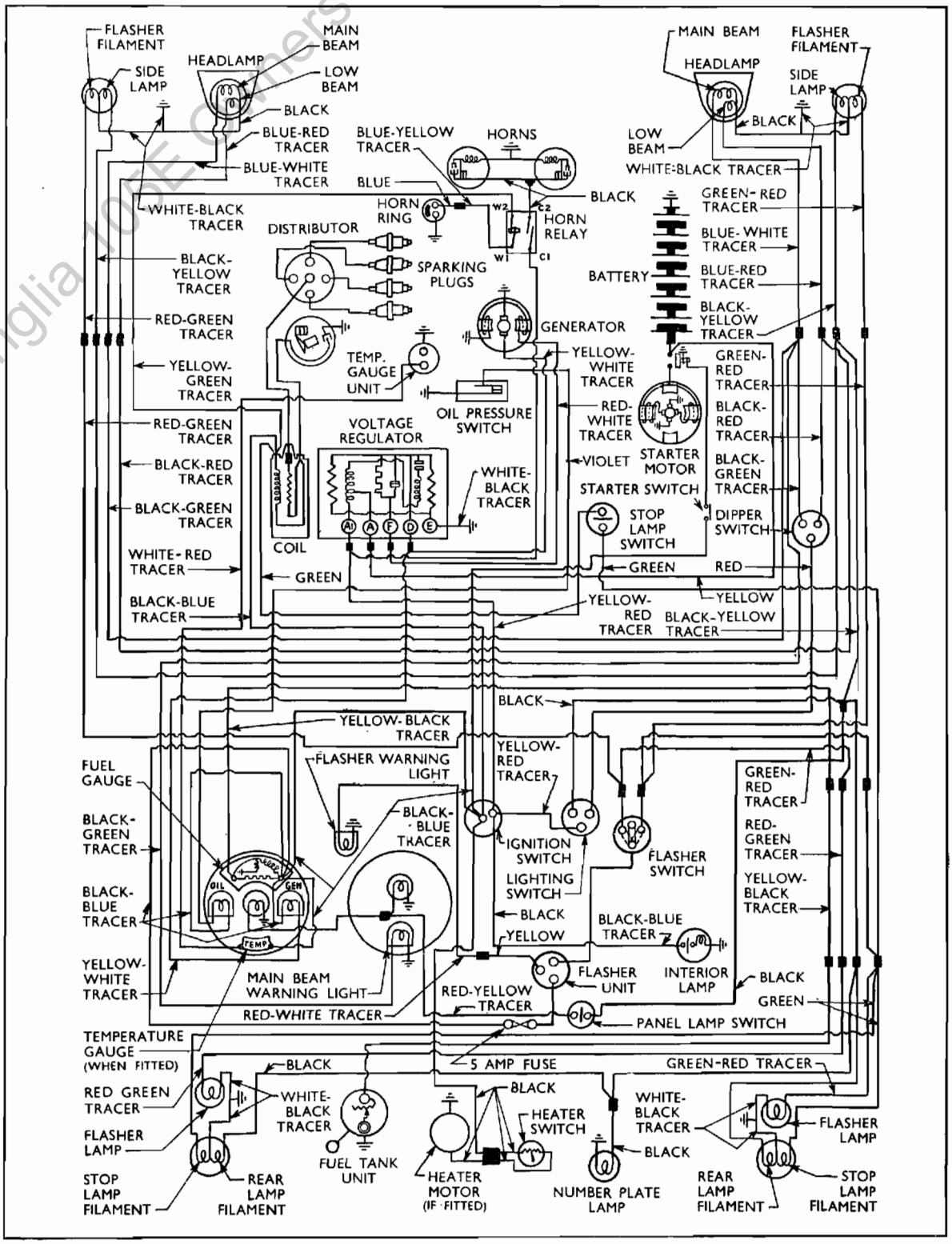
1. Open the bonnet and disconnect the battery.
2. From behind the centre control panel remove the leads to the wiper switch.
3. Remove the knob from the switch stalk, unscrew the bezel and withdraw the switch from the control panel.

To Install

4. Locate the switch on the centre control panel and secure with the bezel. Replace the knob on the switch stalk.
5. Reconnect the leads to the switch.
6. Reconnect the battery and check the operation of the wiper switch.



The New Anglia Wiring Diagram



The New Prefect Wiring Diagram

12
BODYWORK
WATER & DUST SEALING

SECTION INDEX

GENERAL DESCRIPTION

SERVICE AND REPAIR OPERATIONS

OPERATION	M 1005-A	BUMPER BAR – FRONT – REMOVE AND INSTALL (SALOON, ESTATE CAR AND VAN)
"	M 1005-A1	Extra: replace bumper bracket – each (SALOON, ESTATE CAR AND VAN)
"	M 1010-A	BUMBER BAR – REAR – REMOVE AND INSTALL (SALOON AND ESTATE CAR)
"	M 1010-A1	Extra: replace bumper bracket – each (SALOON, ESTATE CAR AND VAN)
"	M 1012-A	BUMBER BARS REAR QUARTER BUMPER – REMOVE AND INSTALL (VAN)
"	M 1030-A	RADIATOR GRILLE – REMOVE AND INSTALL (De-Luxe SALOON AND ESTATE CAR) (PRIOR TO 11/61)
"	M 1030-A	RADIATOR GRILLE – REMOVE AND INSTALL (DE-LUXE SALOON AND ESTATE CAR) – POST 11/61
"	M 1030-A	RADIATOR GRILLE – REMOVE AND INSTALL (DE-LUXE VAN) – PRIOR TO 12/62
"	M 1030-A	RADIATOR GRILLE REMOVE AND INSTALL (DE-LUXE VAN) – POST 12/62
"	M 1030-B	RADIATOR GRILLE MOULDINGS – REMOVE AND INSTALL (STD. SALOON AND VAN)
"	M 1035-A	BONNET ASSEMBLY – REMOVE AND INSTALL (SALOON, ESTATE CAR AND VAN)
"	M 1037-A	BONNET STRIKER POST – REMOVE AND INSTALL (SALOON, ESTATE CAR AND VAN)
"	M 1038-A	BONNET LOCK ASSEMBLY – REMOVE AND INSTALL (SALOON, ESTATE CAR AND VAN)
"	M 1042-A	BONNET STAY – REMOVE AND INSTALL (SALOON, ESTATE CAR AND VAN)
"	M 1043-C	BONNET HINGE – ONE – REMOVE AND INSTALL (SALOON, ESTATE CAR AND VAN)
"	M 1060-A	DOOR ASSEMBLY – REMOVE AND INSTALL (SALOON, ESTATE CAR AND VAN)

OPERATION	M 1060-A2	Extra: door components – replace (SALOON, ESTATE CAR AND VAN)
"	M 1060-D	**DOOR SHELL – REMOVE AND INSTALL** (Includes OPS M 1060-A and A2) (SALOON, ESTATE CAR AND VAN)
"	M 1061-A	DOOR HINGE – REMOVE AND INSTALL (SALOON, ESTATE CAR AND VAN)
"	M 1062-A	DOOR APERTURE WINDCORD/WEATHERSTRIP – REMOVE AND INSTALL (SALOON, ESTATE CAR AND VAN)
"	M 1063-A	DOOR EXTERIOR HANDLE – REMOVE AND INSTALL (SALOON, ESTATE CAR AND VAN)
"	M 1063-A1	Extra: door exterior handle – overhaul (SALOON, ESTATE CAR AND VAN)
"	M 1063-B	**DOOR EXTERIOR HANDLE – OVERHAUL** (Includes OPS M 1063-A and A1) (SALOON, ESTATE CAR AND VAN)
"	M 1066-A	DOOR STRIKER PLATE – REMOVE AND INSTALL AND/OR ADJUST (SALOON, ESTATE CAR AND VAN)
"	M 1067-A	DOOR INNER AND OUTER BELT WEATHERSTRIPS – REMOVE AND INSTALL (SALOON, ESTATE CAR AND VAN)
"	M 1068-A	DOOR VENT WINDOW CATCH – REMOVE AND INSTALL (SALOON, ESTATE CAR AND VAN)
"	M 1069-A	DOOR REMOTE CONTROL HANDLE – REMOVE AND INSTALL (SALOON, ESTATE CAR AND VAN)
"	M 1070-A	WINDOW REGULATOR HANDLE – REMOVE AND INSTALL (SALOON, ESTATE CAR AND VAN)
"	M 1071-A	DOOR ARMREST – REMOVE AND INSTALL (SALOON, ESTATE CAR AND VAN) PRIOR TO 7/62
"	M 1071-A	DOOR ARMREST – REMOVE AND INSTALL (SALOON, ESTATE CAR AND VAN) POST 7/62
"	M 1072-A	DOOR TRIM PANEL – REMOVE AND INSTALL (SALOON, ESTATE CAR AND VAN)
"	M 1072-A1	Extra: window regulator – remove and install (SALOON, ESTATE CAR AND VAN)

OPERATION	M 1072-A2	Extra: door lock assembly – remove and install (SALOON, ESTATE CAR AND VAN)
"	M 1072-A3	Extra: door lock remote control assembly – remove and install (SALOON, ESTATE CAR AND VAN)
"	M 1072-A4	Extra: door vent window – remove and install (SALOON, ESTATE CAR AND VAN)
"	M 1072-A5	Extra: opening door vent window glass weatherstrip and inner frame – remove and install (vent window assembly removed) (SALOON, ESTATE CAR AND VAN)
"	M 1072-A6	Extra: door window glass silent channel – remove and install (SALOON, ESTATE CAR AND VAN)
"	M 1072-A7	Extra: door window glass – remove and install (SALOON, ESTATE CAR AND VAN)
"	M 1072-B	**WINDOW REGULATOR ASSEMBLY – REMOVE AND INSTALL** (Includes OPS M 1072-A and A1) (SALOON, ESTATE CAR AND VAN)
"	M 1072-C	**DOOR LOCK ASSEMBLY – REMOVE AND INSTALL** (Includes OPS M 1072-A and A2) (SALOON, ESTATE CAR AND VAN)
"	M 1072-D	**DOOR REMOTE CONTROL ASSEMBLY – REMOVE AND INSTALL** (Includes OPS M 1072-A and A3) (SALOON, ESTATE CAR AND VAN)
"	M 1072-E	**QUARTER VENT WINDOW ASSEMBLY – FIXED OR OPENING – REMOVE AND INSTALL** (Includes OPS M 1072-A and A4) (SALOON, ESTATE CAR AND VAN)
"	M 1072-F	**OPENING VENT WINDOW GLASS, WEATHERSTRIP AND INNER FRAME – REMOVE AND INSTALL** (Includes OPS M 1072-A, A4 and A5) (SALOON, ESTATE CAR AND VAN)
"	M 1072-G	**DOOR WINDOW GLASS SILENT CHANNEL – REMOVE AND INSTALL** (Includes OPS M 1072-A and A6) (SALOON, ESTATE CAR AND VAN)
"	M 1072-H	**DOOR WINDOW GLASS – REMOVE AND INSTALL** (Includes OPS M 1072-A, A1, A4 and A7) (SALOON, ESTATE CAR AND VAN)

OPERATION	M 1072-M	OPENING VENT WINDOW GLASS – REMOVE AND INSTALL (SALOON, ESTATE CAR AND VAN)
"	M 1073-A	REAR DOOR WINDOW GLASS OR WEATHERSTRIP – REMOVE AND INSTALL (VAN)
"	M 1105-A	LUGGAGE COMPARTMENT LID ASSEMBLY – REMOVE AND INSTALL (SALOON)
"	M 1107-A	LUGGAGE COMPARTMENT LID MOTIFS – REMOVE AND INSTALL (SALOON)
"	M 1108-A	LUGGAGE COMPARTMENT STRIKER POST – REMOVE AND INSTALL (SALOON)
"	M 1109-A	LUGGAGE COMPARTMENT LOCK – REMOVE AND INSTALL (SALOON)
"	M 1109-A1	Extra: luggage compartment lock barrel – remove and install (SALOON)
"	M 1111-C	LUGGAGE COMPARTMENT HINGE – ONE – REMOVE AND INSTALL (SALOON)
"	M 1150-A	TAILGATE DOOR ASSEMBLY – REMOVE AND INSTALL (ESTATE CAR)
"	M 1150-A1	Extra: Tail gate door components – remove and install – tailgate door removed – (Estate car)
"	M 1152-A	REAR DOOR ASSEMBLY – ONE – REMOVE AND INSTALL (VAN)
"	M 1152-A2	Extra: Rear door components – LH – remove and install – door assembly removed (Van)
"	M 1152-A3	Extra: Rear door components – RH – remove and install (Van)
"	M 1155-A	TAILGATE LOCK – REMOVE AND INSTALL (ESTATE CAR)
"	M 1156-A	TAILGATE DOOR LOCK STRIKER PLATE – REMOVE AND INSTALL (ESTATE CAR)
"	M 1160-A	TAILGATE DOOR EXTERNAL HANDLE ASSEMBLY REMOVE AND INSTALL (ESTATE CAR)
"	M 1162-A	REAR DOOR EXTERNAL HANDLE ASSEMBLY – REMOVE AND INSTALL (VAN)
"	M 1162-A2	Extra: Rear door lock – remove and install – external handle removed (Van)

OPERATION	M 1165-A	TAILGATE DOOR HINGE AND TORSION BAR ASSEMBLY – REMOVE AND INSTALL (ESTATE CAR)
"	M 1180-A	REAR DOOR LOCK BAR ASSEMBLY – REMOVE AND INSTALL (VAN)
"	M 1205-A	WINDSCREEN GLASS AND/OR MOULDING – REMOVE AND INSTALL (SALOON, ESTATE CAR AND VAN)
"	M 1210-A	REAR WINDOW GLASS AND/OR MOULDING – REMOVE AND INSTALL (SALOON)
"	M 1210-A	REAR WINDOW GLASS AND/OR MOULDING – REMOVE AND INSTALL (ESTATE CAR)
"	M 1215-A	REAR QUARTER WINDOW GLASS (FIXED) AND/OR MOULDING – REMOVE AND INSTALL (SALOON AND ESTATE CAR)
"	M 1215-A	REAR QUARTER WINDOW GLASS (OPENING) – REMOVE AND INSTALL (SALOON)
"	M 1215-A	REAR QUARTER WINDOW GLASS (OPENING) – REMOVE AND INSTALL (ESTATE CAR)
"	M 1305-A	FRONT PARCEL SHELF AND/OR SUPPORT BRACKET – REMOVE AND INSTALL
"	M 1305-A1	Extra: cowl side trim panel – remove and install
"	M 1305-B	**COWL SIDE TRIM PANEL – REMOVE AND INSTALL** (Includes OPS M 1305-A and A1)
"	M 1315-A	REAR QUARTER TRIM PANEL – REMOVE AND INSTALL
"	M 1317-A	LOAD SPACE SIDE TRIM PANEL – REMOVE AND INSTALL (ESTATE CAR)
"	M 1320-A	DRIP RAIL MOULDING – REMOVE AND INSTALL (SALOON AND ESTATE CAR)
"	M 1325-A	REAR SEAT – REMOVE AND INSTALL (SALOON)
"	M 1325-A	REAR SEAT – REMOVE AND INSTALL (ESTATE CAR)
"	M 1327-A	REAR SEAT CUSHION – REMOVE AND INSTALL (SALOON)
"	M 1327-A	REAR SEAT CUSHION – REMOVE AND INSTALL (ESTATE CAR)

OPERATION	M 1330-A	FRONT BUCKET SEAT – REMOVE AND INSTALL (SALOON, ESTATE CAR AND VAN)
"	M 1340-A	INTERIOR MIRROR – REMOVE AND INSTALL
"	M 1345-A	SUN VISOR – REMOVE AND INSTALL
"	M 1351-A	GLOVE LOCKER LID – REMOVE AND INSTALL (SALOON AND ESTATE CAR)
"	M 1360-A	HEADLINING – RENEW (SALOON)
"	M 1360-A	HEADLINING – RENEW (ESTATE CAR)

GENERAL DESCRIPTION

BODY

The body is of all-steel welded construction and is produced on a series of jigs which hold the various panels within close tolerances.

Toughened safety glass is fitted to all windows including the curved windscreen and rear window. As an additional safety precaution the safety glass fitted to the windscreen is "Zone" toughened, which means if the glass is fractured an area in front of the driver's face breaks into large pieces, thus allowing vision for the driver. A laminated glass windscreen is also available as an option. This glass consists of a layer of clear plastic sandwiched between two layers of glass. This prevents the glass, if fractured, from being blown into the car.

The wide opening front doors are hung on hinges which are bolted to both door and body. Adjustment of the doors within the body aperture may be obtained by slackening the hinge securing bolts and moving the door to the required position.

On Estate Cars, the tailgate door is spring assisted to hold the door in the open position by torsion bars located in the roof rear panel.

The front door locks are of the rotary type where an external rotor in conjunction with a striker rack operates an internal ratchet, to give two locking positions and thus provide a safety catch and a fully closed lock position.

To provide a water and dust seal, rubber weatherstrips are secured by adhesive to the doors and luggage compartment lid.

Four types of sealing materials are used in production. The air drying equivalents for these in Service are:-

Type A. To seal panel joints externally on the painted surfaces a material such as "BB1297" manufactured by B.B. Chemicals, Ulverscroft Rd. Leicester.

Type B. To seal panel joints externally on the floor pan and underbody, Ford Underbody protective compound, Part No. 105E 19L 545.

Type C. To seal between the fixed window glasses and rubber weatherstrips to the body, a sealing material which remains permanently flexible, such as "S.R.-51-B" manufactured by Expandite Ltd, Chase Road, London N.W.10.

Type D. To seal panel joints in protected location, a bulk sealing material such as "E.C. 1279V" manufactured by The Minnesota Mining and Manufacturing Co.Ltd. 3M House, Wigmore St, London W.1. or "Seel-a-strip S grade",manufactured by Expandite Ltd, Chase Road, London, N.W.10.

PAINT

The finish coats of paint are applied in two stages.

Stage 1 is the application of special primer paints, which are baked or stoved on the body for thirty minutes at 149°C (300°F), to produce a tough durable paint film with excellent adhesion properties. When hard this paint film is sanded to produce a really smooth surface, in preparation for stage 2.

Stage 2 is the application of the enamel colour coats, which in turn are baked or stoved for approximately 30 minutes at 121°C to 129°C (250°F to 265°F). The result is a hard high gloss paint film with excellent colour and gloss retention.

SERVICE REPAIRS

For Service repairs, by arrangement with the major paint manufacturers, specially tested

repair paints which are known to possess durability and gloss characteristics similar to the original finish are available in all current body colours.

These approved repair paints carry a label on the lid "Approved by Ford Motor Company Ltd". and should be used whenever possible to ensure satisfaction.

BEAUTY CARE

The only attention the paintwork normally requires to retain its high gloss is regular washing. To obtain the best results, fill a bucket with warm water (Never Use Hot Water) and add a quantity of Ford car shampoo. Using a soft sponge, apply the shampoo mixture generously over the car. Thoroughly wash off all traces of shampoo using copious amounts of clean warm water. When all traces of shampoo have been washed off, leather the car dry. If required, the paintwork lustre may be further enhanced by occasionally polishing the body after washing, using Ford body polish.

Listed below is a selection from the extensive range of Ford beauty aids, all of which are available from your local Ford Main Dealer.

	Part Number
Upholstery Cleaner	204E-19526
Paint Touch-in Pencil	E56-WY-1 to E96-WY-1
Paint Touch-in Aerosol	105E-19L531-A to 3008E-19L531-S
Paint Touch-in Tin and Brush	211E-19K500-B to 3004E-19K500-E49
Body Polish	M-230-A
Liquid Wax Polish	105E-19520
Polish Cream	211E-19530
Car Shampoo (Bottle)	204E-19524
Car Shampoo (Satchet)	211E-19524
Chrome Cleaner (Can)	105E-19522
Chrome Cleaner (Satchet)	EOA-19522
Vehicle Washing Brush	105E-19M510-A
Shampoo Tablets	105E-19M512-A
Cleaning Sponge	105E-19K508-A
Chamois Leather	211E-19517-G to 211E-19517-L
Engine Cleaner	3014E-19L531-A

BODYWORK REPAIR PROCEDURE

Dimensional drawings of the underbody and upper bodywork of the Anglia and Prefect (1953-1959), Popular (1959 onwards), Anglia (1959 onwards) and the Anglia Estate Car are contained in this section. When used in conjunction with a level floor and suitable stands, these drawings will be of assistance in checking or undertaking repairs to the body. To complete the equipment necessary for accurate alignment of the front suspension and engine mounting points, a jig is needed. Available from our approved suppliers under Tool No. P.5509, the jig is common to new Anglia cars (1959 onwards), Anglia Estate cars (1961 onwards) and Thames 5 and 7 cwt. vans (1961 onwards). It is built to meet a mean tolerance of new bodies and two types of locating pins are provided for the upper suspension mounting location.

Type 1 Internally threaded pins (6 off) are used for two purposes.

a. In conjunction with wing-headed bolts, to align the upper suspension mounting reinforcement ring during the rectification of accident repairs.

b. To check the position of the upper suspension mounting reinforcement ring in the case of suspected misalignment.

Type 2 Larger diameter plain pins (6 off) are used to locate and align the engine side apron panels during the rectification of accident repairs.

In addition, two further sets of locating pins (each set consisting of two pins) are provided to locate the lower portion of the jig to the front body side members and the stabiliser bar brackets.

ANGLIA (1959 onwards)

In the plan view two reference points have been taken at each front suspension unit location; a centre line through the pitch circle formed by the three front suspension mounting support stud holes, and the centre line through the inner of these three holes. However, in the side view, only the reference line through the pitch circle is employed and care should be taken not to confuse the centre lines when checking measurements.

Wheel Alignment (unladen)

Castor	1° 30′ to 3° 0′
Camber	0° 30′ to 2° 0′
King pin inclination	4° 45′ to 6° 15′
Toe-out on 20° turns	1° 36′ to 3° 6′
Toe-in	3.17 to 4.76 mm. (1/8 to 3/16 in.)

ANGLIA AND PREFECT (1953-1959), POPULAR (1959 onwards)

It will be noted that front end dimensions are given to the suspension unit upper mountings under the mudguards. It is essential that the suspension units are correctly located, otherwise the steering geometry will be affected. The wheelbase dimension can vary between 219.39 cm. (86 3/8 in.) and 221.3 cm. (87 1/8 in.) provided that the variation between these dimensions on left-hand and right-hand sides of the same vehicle does not exceed 6.35 mm. ¼ in.

Wheel Alignment (unladen)

Castor	1° 0′ to 3° 0′
Camber	0° 30′ to 2° 15′
King pin inclination	3° 30′ to 5° 0′
Toe-out on 20° turns	3° 0′ to 5° 0′
Toe-in	1.58 to 3.17 mm. (1/16 to 1/8 in.)

ANGLIA ESTATE CAR

Wheel Alignment (unladen)

Castor	1° 30′ to 3° 0′
Camber	0° 30′ to 2° 0′
King pin inclination	4° 45′ to 6° 15′
Toe-out on 20° turns	1° 36′ to 3° 6′
Toe-in	3.17 to 4.76 mm. (1/8 to 3/16 in.)

CHECKING THE ENGINE COMPARTMENT

If the damaged car is still on its wheels and misalignment of the body within the engine compartment is suspected, carry out a full steering geometry check. If these checks indicate any discrepancy outside the allowed tolerances and no damage to the suspension or steering controls exists, then it will be necessary to investigate further in the following manner.

Remove the engine assembly, the front suspension crossmember and the front suspension completely from the car.

Remove the detachable locating pins from the engine compartment jig and slide in the telescopic bar located in the front cross tube.

Place the jig in position within the engine compartment, locating the lower portion between the front body side members. From under the front mudguards; pass the longer threaded locating pins (one either side) through the foremost holes in each body front side member for the front suspension crossmember securing bolts. Engage the corresponding holes in the jig and tighten the locating pins.

Extend the telescopic bar of the jig and secure it in position with the attached locking pin by entering the pin in the holes provided in the gauge bar and the front cross tube.

Raise the front of the jig and fit a locating pin through each of the front stabiliser bar brackets to engage in the corresponding holes in the jig.

To check the alignment of the holes in the upper suspension reinforcement ring in relation to those of the jig, engage the internally threaded pins. The three pins in each of the two clusters should pass freely through the holes in the body. Under no circumstances should they be forced into engagement.

Check the clearance between the upper face of the mudguard side apron panel and the underside of the jig top plate. A clearance of 3.57 to 5.95 mm. (9/64 to 15/64 in.) should be present.

Finally, determine the clearance between the inner face of each front stabiliser bar mounting bracket and the end of the jig front cross tube where a clearance of 15.48 to 16.27 mm. (39/64 to 41/64 in.) should be present.

If distortion to any major component affecting the front suspension (e.g. a distorted front side member or apron panel) is disclosed as a result of tests carried out, no attempt should be made to straighten members, etc. by using hydraulic body jacks with the jig in position, or damage to the jig will result. In view of the importance of the front end alignment, it is suggested that in general, distortion to these items should be corrected by replacing affected parts.

ACCIDENT REPAIRS

When rebuilding the engine compartment as part of an accident repair, the jig may be used to align and assemble any or all of the engine compartment components. Thus, if necessary, a complete engine compartment may be built and welded together as a sub-assembly around the jig. The two longest locating pins which are threaded may be used to hold the body side members and side apron panels to the jig during this operation. To establish a dimension between the stabiliser brackets, utilise the 11.9 mm. (15/32 in.) spacers attached to the jig. To position the apron bulkhead panel, the "H" shaped locating bar hinged to the front of the jig, should be raised and located under the top flange of the panel.

Note:—If a complete engine compartment is built around the jig in this manner, offer the welded assembly to the body **with the jig in position**. When correctly aligned to the body, the sub-assembly may then be welded in position. Do not remove the jig until both front mudguards and the radiator grille panel have been welded in position, otherwise distortion to the engine compartment may occur.

In a similar manner, when changing a radiator grille panel, to avoid the possibility of distortion to the engine compartment during this operation, secure the side apron panels with a temporary tie bar secured to each front suspension unit top mounting stud. (This tool may be improvised from a length of strip steel approximately 3/16 in. thick by 2 in. wide by 34 in. long, suitably drilled at either end, but accurate dimensions may be obtained by direct measurements taken from an undamaged car.)

BODY ALIGNMENT

Before attempting to repair a damaged body where misalignment is apparent or suspected, it is necessary to check the underbody tolerances which are given in this section.

Checking the Underbody

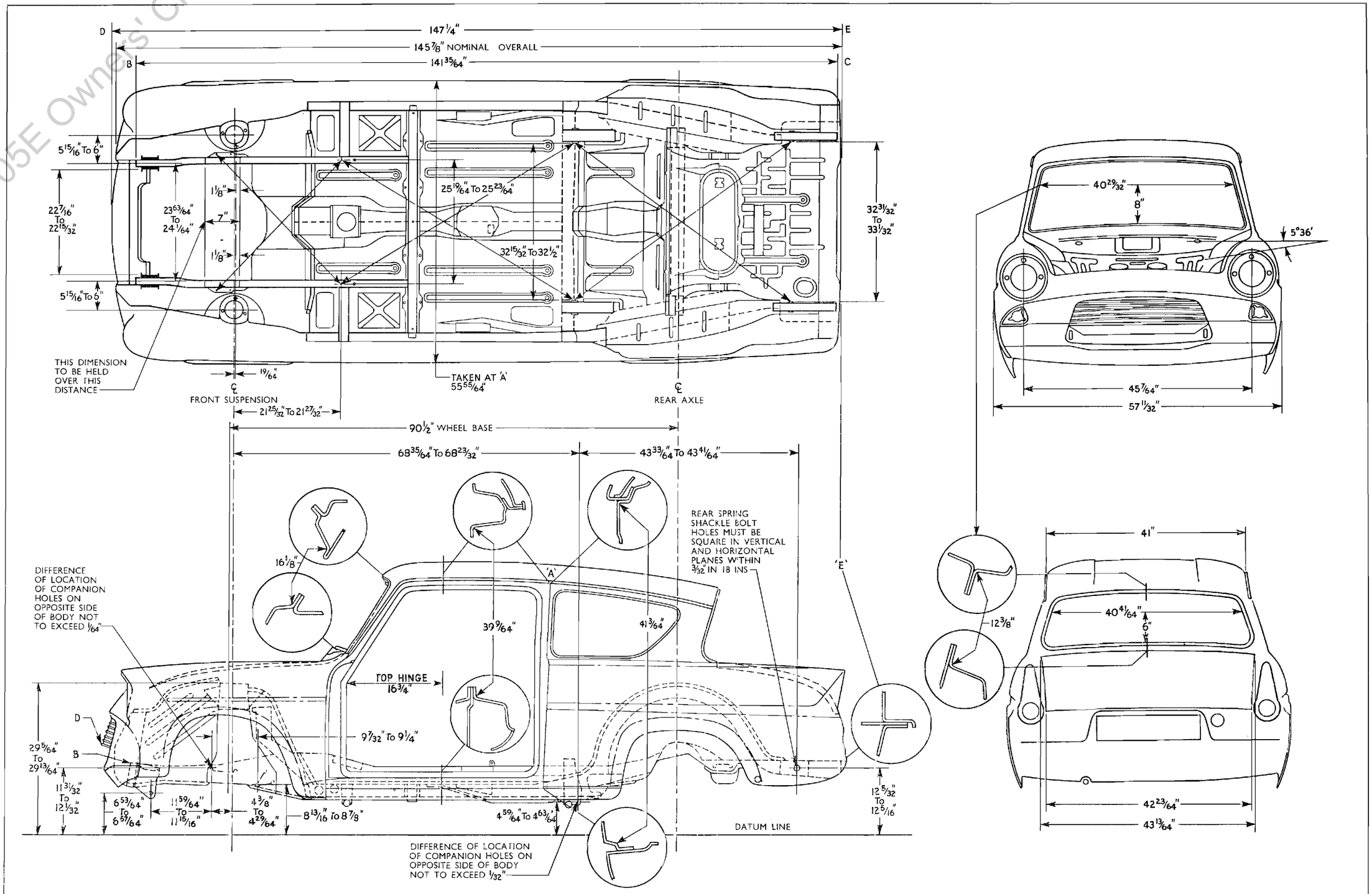
Support the body on suitable stands or adjustable supports on a level floor extending the full length of the vehicle. Check the dimensions shown along the whole length of the body and note any discrepancy outside the allowed tolerances shown on the chart overleaf.

The diagonals marked on the plan view can be checked by using large callipers or a pair of trammels, or alternatively, they may be checked by using a plumb bob and line. The latter method enables a simple and accurate check to be made. Suspend the plumb bob from the appropriate reference points on the body and carefully mark the floor at each location. Connect these points by a chalk line and then draw a line through the intersecting points of the diagonals.

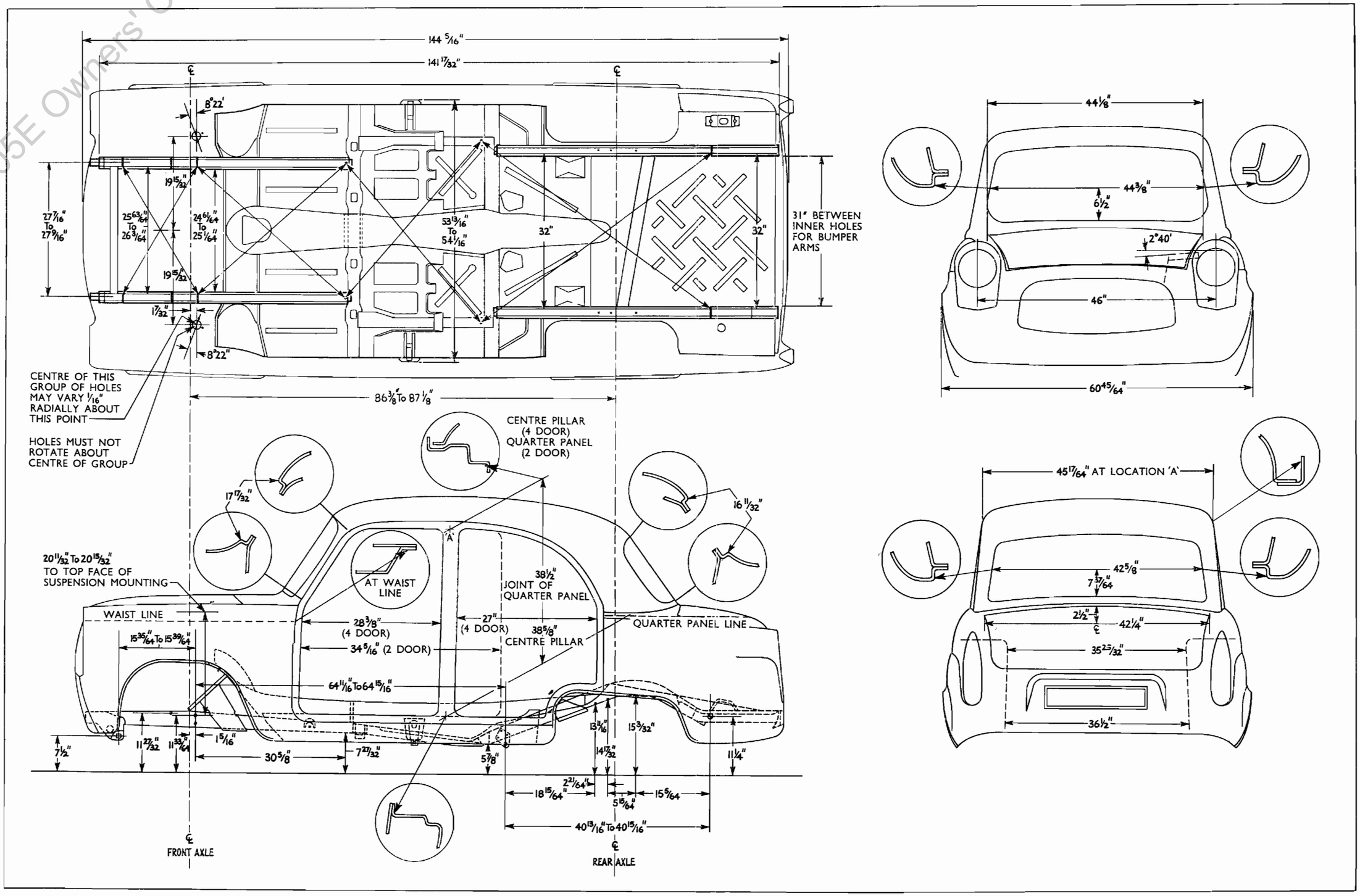
Finally, check the dimensions between the front and rear side members.

METRIC EQUIVALENTS (IN DIMENSIONAL SEQUENCE)

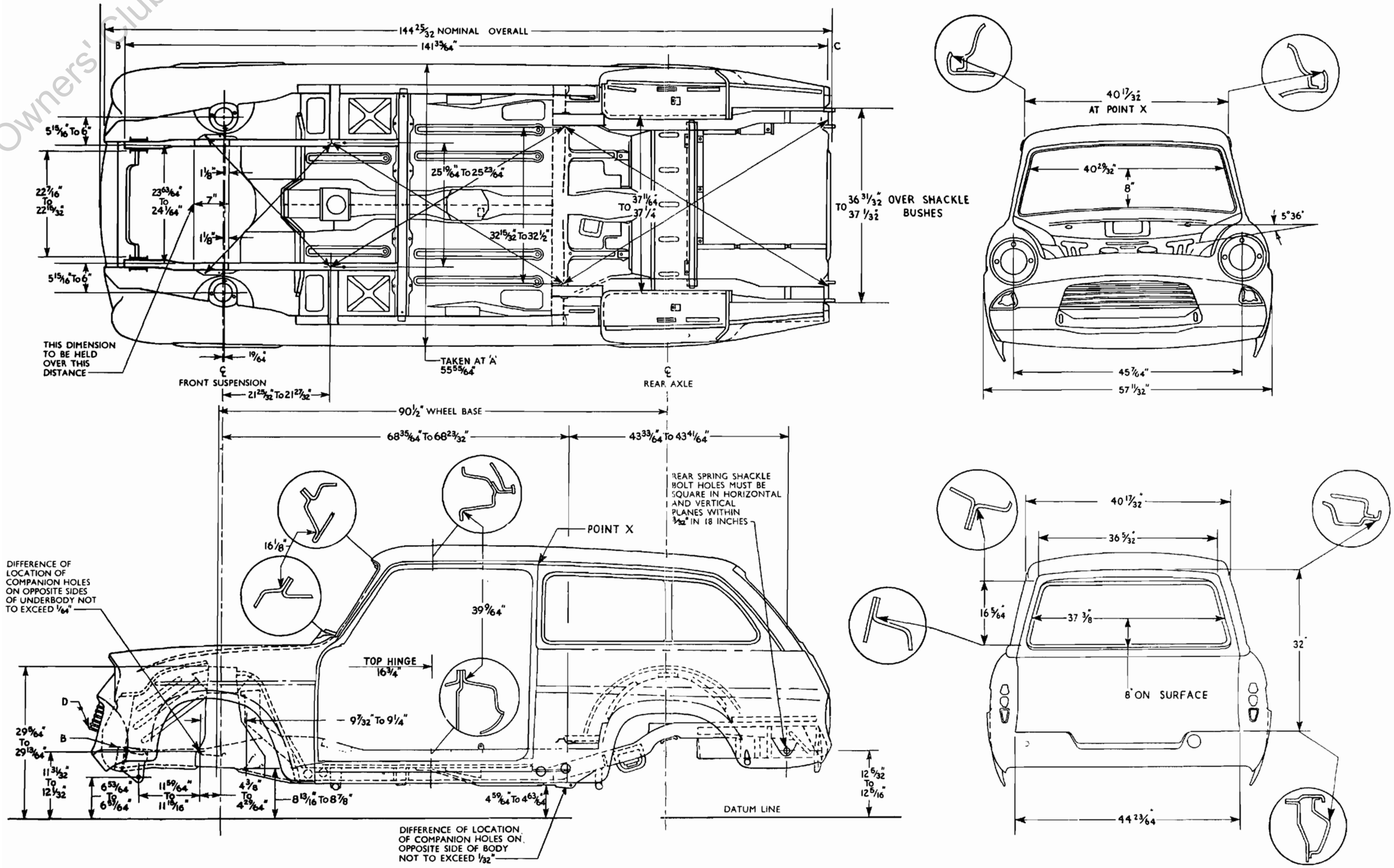
Inches	*Centimetres*	*Inches*	*Centimetres*	*Inches*	*Centimetres*
$\frac{1}{64}$	0.04	$11\frac{31}{32}$ to $12\frac{1}{32}$	30.40 to 30.56	41	104.14
$\frac{1}{32}$	0.079	$12\frac{5}{32}$ to $12\frac{5}{16}$	30.88 to 31.28	$41\frac{3}{64}$	104.26
$\frac{3}{32}$ in 18	0.238 in 45.72	$12\frac{3}{8}$	31.43	$42\frac{23}{64}$	107.59
$\frac{19}{64}$	0.754	$16\frac{1}{8}$	40.96	$43\frac{13}{64}$	109.73
$1\frac{1}{8}$	2.86	$16\frac{3}{4}$	42.55	$43\frac{33}{64}$ to $43\frac{41}{64}$	110.53 to 110.85
$4\frac{3}{8}$ to $4\frac{29}{64}$	11.11 to 11.31	$21\frac{25}{32}$ to $21\frac{27}{32}$	55.32 to 55.48	$45\frac{7}{64}$	114.58
$4\frac{59}{64}$ to $4\frac{63}{64}$	12.50 to 12.66	$22\frac{7}{16}$ to $22\frac{15}{32}$	56.99 to 57.07	$55\frac{55}{64}$	141.88
$5\frac{5}{16}$ to 6	15.08 to 15.24	$23\frac{63}{64}$ to $24\frac{1}{64}$	60.92 to 61.00	$57\frac{11}{32}$	145.65
6	15.24	$25\frac{19}{64}$ to $25\frac{23}{64}$	64.25 to 64.41	$68\frac{35}{64}$ to $68\frac{33}{64}$	174.11 to 174.55
$6\frac{53}{64}$ to $6\frac{57}{64}$	17.34 to 17.50	$29\frac{5}{64}$ to $29\frac{19}{64}$	73.86 to 74.18	$90\frac{1}{2}$	229.87
7	17.78	$32\frac{15}{32}$ to $32\frac{1}{2}$	82.47 to 82.55	$141\frac{35}{64}$	359.53
8	20.32	$32\frac{31}{32}$ to $33\frac{1}{2}$	83.74 to 83.89	$145\frac{7}{8}$	370.52
$8\frac{13}{16}$ to $8\frac{7}{8}$	22.38 to 22.54	$39\frac{9}{64}$	99.42	$147\frac{1}{4}$	374.02
$9\frac{7}{32}$ to $9\frac{1}{4}$	23.42 to 23.49	$40\frac{11}{64}$	103.23		
$11\frac{59}{64}$ to $11\frac{15}{16}$	30.28 to 30.32	$40\frac{29}{32}$	103.9		



Body Tolerance Chart—Anglia (1959 onwards)



Body Tolerance Chart—Anglia and Prefect (1953-1959) Popular (1959 onwards)



Body Tolerance Chart (Estate Car)

METRIC EQUIVALENTS (IN DIMENSIONAL SEQUENCE)

Inches	*Centimetres*	*Inches*	*Centimetres*	*Inches*	*Centimetres*
1/16	0.159	15 3/32	38.34	36 1/2	92.71
1 7/32	3.09	15 35/64 to 15 39/64	39.49 to 39.65	38 1/2	97.79
1 5/16	3.33	16 11/32	41.51	38 5/8	98.11
2 21/64	5.91	17 17/32	44.53	40 13/16 to 40 15/16	103.66 to 103.98
2 1/2	6.35	18 15/64	46.31	42 1/4	107.31
5 5/64	13.29	19 15/32	49.45	42 5/8	108.27
5 7/8	14.92	20 11/32 to 20 15/32	51.67 to 51.99	44 1/8	112.08
6 1/2	16.51	24 61/64 to 25 1/64	63.38 to 63.54	44 3/8	112.71
7 1/2	19.05	25 63/64 to 26 3/64	66.00 to 66.16	45 17/64	114.97
7 37/64	19.25	27	68.58	46	116.84
7 27/32	19.92	27 7/16 to 27 9/16	69.69 to 70.01	53 13/16 to 54 1/16	136.68 to 137.32
11 1/4	28.57	28 3/8	72.07	60 45/64	154.18
11 33/64	29.25	30 5/8	77.79	64 11/16 to 64 15/16	164.31 to 164.94
11 27/32	30.08	31	78.74	86 3/8 to 87 1/8	244.79 to 246.70
13 11/16	34.77	32	81.28	141 17/32	359.49
14 17/32	36.91	34 5/16	87.15	144 5/16	366.55
15 5/64	38.30	35 25/32	90.88		

SERVICE AND REPAIR OPERATIONS

OP M 1005-A BUMPER BAR – FRONT – REMOVE AND INSTALL (Saloon, Estate Car and Van)

To Remove

1. Remove the four chrome headed bolts securing the bumper to the support brackets and remove the bumper assembly and spacers.

To Install

2. Position the bumper and loosely retain it with the two centre bolts and nuts.
3. Replace the two bolts and spacers securing the ends of the bumper.
4. Finally tighten all four bolts.

OP M 1005-A1 Extra: Bumper bracket – each – remove and install (Saloon, Estate Car and Van)

To Remove

1. Remove the two bolts securing the bumper bracket to the engine side apron panel.
2. Remove the bracket.

To Install

3. Position the bracket on the engine side apron panel and secure it with two bolts.

OP M 1010-A BUMPER BAR – REAR – REMOVE AND INSTALL (Saloon and Estate Car)

To Remove

1. Remove the four chrome headed bolts securing the bumper to the support brackets and remove the bumper assembly.

To Install

2. Position the bumper and loosely retain it with the four securing bolts and nuts.
3. Fully tighten all four bolts.

OP M 1010-A1 Extra: Bumper bracket – each – remove and install (Saloon, Estate Car and Van)

To Remove

1. Remove two bolts and washers securing the bumper support bracket to the lower back panel and remove the bracket.

To Install

2. Replace the bracket, loosely secure it to the lower back panel with the two bolts and washers, then fully tighten the two securing bolts.

OP M 1012-A BUMPER BARS – REAR – QUARTER BUMPER – REMOVE AND INSTALL (Van)

To Remove

1. Remove the two bolts securing the bumper bar to the support bracket and remove the bumper.

To Install

2. Position the bumper and loosely retain it with the two securing bolts.
3. Fully tighten the two securing bolts.

OP M 1030-A RADIATOR GRILLE – REMOVE AND INSTALL (Deluxe Saloon and Estate Car Prior to 11/61)

To Remove

1. Remove nine screws and flat washers, (seven along the grille upper edge and two along the lower edge).
2. Carefully flex and bend the grille to withdraw one end from its location behind a wing lamp bezel. (It may be necessary to slacken the securing screws on one wing lamp bezel).
3. Withdraw the other end of the grille from behind the other wing lamp bezel and remove the grille.

To Install

4. Carefully locate one end of the grille behind a wing lamp bezel.
5. Carefully flex and bend the grille to insert the other end behind the other wing lamp bezel. (Tighten the wing lamp bezel securing screws if loosened in operation 2).
6. Secure the grille with nine screws and flat washers.

OP M 1030-A RADIATOR GRILLE – REMOVE AND INSTALL (Deluxe Saloon and Estate Car Post 11/61)

To Remove

1. Remove eight screws and flat washers, 6 along the upper edge and two along the grille lower edge.
2. From under the front mudguards, remove one nut and one screw from each side and remove the grille and wing lamp bezel assembly.

To Install

3. Locate the grille assembly and from under the front mudguards secure it with one nut and one screw on each side.
4. Secure the grille to the front panel with eight screws and washers.

OP M 1030-A RADIATOR GRILLE – REMOVE AND INSTALL (Deluxe Van Prior to 12/62)

To Remove

1. From behind the lower front panel, remove four nuts and spring washers and remove the grille.

To Install

2. Locate the grille on the lower front panel and secure it with four nuts and spring washers.

OP M 1030-A RADIATOR GRILLE – REMOVE AND INSTALL
(Deluxe Van Post 12/62)

To Remove

1. Remove four screws and remove the grille.

To Install

2. Locate the grille on the lower front panel and secure it with four screws.

OP M 1030-B RADIATOR GRILLE MOULDING – REMOVE AND INSTALL
(Standard Saloon and Van)

To Remove

1. Using a covered screw driver, carefully insert it between the moulding and the front body panel and prise the moulding and six retaining clips from the panel.

To Install

2. Locate the moulding and retaining clips to the front body panel and press the moulding to engage the securing clips.

OP M 1035-A BONNET ASSEMBLY – REMOVE AND INSTALL
(Saloon, Estate Car and Van)

To Remove

1. Operate the release control and open the bonnet. Cover the top edge of the radiator grille panel with a soft cloth to protect the paintwork.
2. From under the front mudguard remove two bolts securing the bonnet pivot bracket to the engine side apron panel. Allow the bonnet and attached bracket to rest on the cloth covered grille panel on one side. Repeat this operation on the other side.
3. Remove the nut securing the support stay and detach the bonnet.

To Install

1. Place a soft cloth along the top edge of the radiator grille panel to avoid accidental damage to the paintwork.
2. Offer the bonnet with the pivot brackets attached to the vehicle and attach the bonnet support stay.
3. Allow the bonnet to rest on top of the cloth covered radiator grille panel. From under the front mudguard, pass two bolts through the appropriate, holes in the engine side apron panel and engage them in the captive nuts attached to one bonnet pivot bracket. Repeat this operation on the other side.

Note:-

If necessary, adjustment should be carried out in the following manner.

A. Examine the bonnet to ensure that equal and even gaps exist between the bonnet edges and the front mudguard, and between the leading edge of the bonnet and the radiator grille panel. If necessary, from underneath the front mudguard slacken the hood pivot bracket(s) securing bolts and move the bonnet until a satisfactory appearance fit has been obtained.

B. Close the bonnet, check the relative height of the bonnet rear edges to the front mudguards. If necessary, slacken the catch post locknut and screw the post in or out to produce the desired effect.

C. With the bonnet closed, check the relative height of the bonnet front edge and the upper edge of the radiator grille panel and the front mudguard(s). If necessary, again slacken the hood pivot bracket(s) securing bolts and move them up or down to produce the desired effect.

D. Adjust the length of the spring-loaded catch post to give full locking action and if necessary, re-position it laterally to give correct approach to the lock.

OP M 1037-A BONNET STRIKER POST – REMOVE AND INSTALL
(Saloon, Estate Car and Van)

To Remove

1. Open the bonnet and with a soft pencil, scribe a line around the striker post base plate.
2. Remove two bolts and washers securing the post to the bonnet underside.

To Install

3. Locate the striker post to the scribed line on the bonnet.
4. Secure the striker post with two bolts and washers.

OP M 1038-A BONNET LOCK ASSEMBLY – REMOVE AND INSTALL
(Saloon, Estate Car and Van)

To Remove

1. Open the bonnet. Prise off a spring clip and disconnect the bonnet release rod from the lock.
2. Remove three bolts and washers and remove the lock assembly.

To Install

3. Re-locate the lock and secure it to the body with three bolts and washers.
4. Re-connect the bonnet lock release control rod and secure it with a spring clip.

OP M 1042-A BONNET STAY – REMOVE AND INSTALL
(Saloon, Estate Car and Van)

To Remove

1. Open and support the bonnet. Remove one nut and washer securing the stay to the bonnet and one nut and washer securing the stay to the body.
2. Remove the stay.

To Install

3. Locate the support stay and secure it to the body with one nut and washer and the bonnet with a nut and washer.

OP M 1043-C BONNET HINGE – ONE – REMOVE AND INSTALL
(Saloon, Estate Car and Van)

To Remove

1. Open the bonnet. Cover the top edge of the radiator grille panel with a soft cloth to protect the paintwork.
2. From under the front mudguard, remove two bolts and washers securing the hinge or pivot bracket to the engine side panel.
3. Support the bonnet and remove the hinge.

To Install

4. Relocate the pivot bracket to hinge to the bonnet and side apron panel.
5. From under the front mudguard replace and tighten the two securing bolts and washers.

OP M 1060-A DOOR ASSEMBLY – REMOVE AND INSTALL
(Saloon, Estate Car and Van)

To Remove

1. Open the door and remove the interior handles, arm rest and trim panel (see OPS M 1069A, M 1070-A, M 1071-A and M 1072-A).
2. Locally detach the water shield plastic sheet, remove three bolts and flat washers securing each hinge to the door and remove the door.

To Install

3. Relocate the door to the hinges and loosely retain it with three bolts and washers to each hinge.
4. Carry out a visual examination, to determine whether the door will need to be moved within the body aperture to obtain correct alignment.

Note:-

If required, adjustment may be carried out as follows:-

Lift or lower the door and support it in the desired position. Tighten one bolt on each hinge and re-check the door alignment. When a satisfactory "setting" has been obtained, tighten the remaining securing bolts.

Adjustment to the striker plate may then be necessary but adjustment to lift or lower the door should never be made by moving this component only.

5. Replace the plastic water shield, trim panel, arm rest and door interior handles. (See OPS M 1069A, M 1070-A, M 1071-A and M 1072-A).

OP M 1060-A2 Door components – remove and install (Includes OPS M 1063-A, M 1067-A, M 1072-A, A1, A2, A3, A4, A6, and A7) Plus OP M 1074-A (Saloon, Estate Car and Van)

OP M 1060-D DOOR SHELL – REMOVE AND INSTALL (Includes OPS M 1060-A and M 1062-A2) (Saloon, Estate Car and Van)

OP M 1061-A FRONT DOOR UPPER OR LOWER HINGE – REMOVE AND INSTALL (Saloon, Estate Car and Van)

To Remove

1. Remove the door (see OP M 1060-A)
2. With a pencil, scribe a line around the hinge on the body pillar.
3. Remove two bolts and washers and remove the hinge.

To Install

4. Replace the hinge to the body, aligning it with the scribed line.
5. Secure it to the body with two bolts and washers.
6. Replace the door (See OP M 1060-A)

OP M 1062-A DOOR APERTURE WINDCORD/WEATHERSTRIP – REMOVE AND INSTALL
(Saloon, Estate Car and Van)

To Remove

1. Remove five screws and remove the floor carpet aluminium retaining strip.
2. Carefully pull off the combined windcord/weatherstrip.

To Install

3. Using a rubber mallet tap the combined windcord/weatherstrip over the door aperture flange.
4. Replace the floor carpet aluminium retaining strip, ensuring that the ends of the windcord/weatherstrip are securely trapped under its ends. Secure the retaining strip with five screws.

OP M 1063-A DOOR EXTERIOR HANDLE – REMOVE AND INSTALL
(Saloon, Estate Car and Van)

To Remove

1. Wind the window up and remove the door trim panel, interior handles and armrest (see OPS M 1069-A, M 1070-A, M 1071-A and M 1072-A).
2. Remove the screw and washer securing the rear end of the handle to the door.
3. Through the door access hole remove the nut and washer securing the front of the handle.
4. Remove the handle and gaskets.

To Install

5. Position the gaskets and handle on the door.
6. Secure the rear end of the handle with a screw and washer.
7. Through the access hole in the door, secure the front end of the handle with a nut and washer.
8. Replace the door trim panel, interior handles and armrest. (See OPS M 1069-A, M 1070-A, M 1071-A, and M 1072-A).

OP M 1063-A1 Extra: door exterior handle – overhaul

Both front door handles incorporate an adjustable plunger to release the door lock from the outside. An additional control or private lock is fitted to the driver's door handle. Operated by the ignition key, it is contained within the release plunger.

To Dismantle

1. Remove the locking barrel retaining spring clip.
2. Punch out a tapered pin disclosed by removal of the retaining clip.
3. Insert the ignition key and withdraw the barrel from the plunger.

To Re-Assemble

4. Insert the ignition key in the lock barrel and insert the barrel within the plunger.
5. Turn the barrel to align the tapered pin locating holes and press in the tapered pin.
6. Fit the retaining spring clip.

OP M 1066-A DOOR STRIKER PLATE – REMOVE AND INSTALL (Saloon, Estate Car and Van)

To Remove

1. Remove two screws and remove the striker plate and anti-slip shim.

To Install

2. Position the anti-slip shim and striker plate on the lock pillar and loosely secure it with two screws.
3. Press the door outside push button and slowly close the door to the full catch position.
4. Move the door in or out until the door is flush with the bodywork.
5. Depress the door outside push button and slowly open the door and check that the striker plate is vertical.
6. Tighten the securing screws to 1.0 to 1.3 kg.m. (7 to 9 lb. ft.).

Note:-

When tightening the striker plate fixing screws it is recommended that a torque wrench with a suitable adaptor is used. If this is not available a Tee handle screwdriver should be used. It is not possible to tighten these screws using a normal handled screwdriver.

If required, further adjustment should be carried out in two stages in the following manner:-

A. Close the door, grasp the door handle and endeavour to push the door in and out. If any perceptible movement is noticed, adjust the striker plate by slackening the two crosshead screws securing it to the lock pillar, moving the catch inwards and re-tightening the screws. Test the effort required to close the door and adjust the striker plate until the door closes firmly without any perceptible movement when shut.

B. Open the door, hold the handle so that the lock catch is inoperative and slowly close the door. Observe that the male wedge section of the dovetail, which is secured to the door, enters the female section, which is secured to the door lock pillar, without fouling. At the same time, ensure that the spring-loaded slide block, incorporated in the dovetail makes contact with the male wedge to provide vertical restraint to the door. If necessary, again slacken the two cross-head screws, securing the dovetail to the lock pillar and move the plate up or down until this condition is obtained.

OP M 1067-A DOOR INNER AND OUTER BELT WEATHERSTRIPS – REMOVE AND INSTALL
(Saloon, Estate Car and Van)

To Remove

1. Wind the window down.
2. Using a thin-bladed screwdriver carefully prise out one end of the inner belt weatherstrip from its retaining clips.
3. Carefully pull the rest of the weatherstrip from its retaining clips.
4. Repeat OPS 1 to 3 for the remaining weatherstrip.

To Install

5. Position the inner belt weatherstrip on the door and push downwards to engage the retaining clips.
6. Repeat OP 5 for the remaining door belt weatherstrip.

OP M 1068-A DOOR VENT WINDOW CATCH – REMOVE AND INSTALL
(Saloon, Estate Car and Van)

To Remove

1. Open the quarter vent window and using a suitable pin punch drive out the catch retaining pin.
2. Withdraw the catch and wave washer from the pivot shaft.

To Install

3. Position the wave washer and catch on the vent window pivot shaft.
4. Locate the catch assembly by carefully driving in its retaining pin.

OP M 1069-A DOOR REMOTE CONTROL HANDLE – REMOVE AND INSTALL
(Saloon, Estate Car and Van)

To Remove

1. Remove the central screw and washer securing the handle and escutcheon plate to its control shaft and remove the handle and escutcheon plate.

To Install

2. Position the escutcheon plate and handle on its control shaft and secure it with a screw and washer.

OP M 1070-A WINDOW REGULATOR HANDLE – REMOVE AND INSTALL
(Saloon, Estate Car and Van)

To Remove

1. Remove the central screw and washer securing the handle and escutcheon plate to its control shaft and remove the handle and escutcheon plate.

To Install

2. Position the escutcheon plate over the control shaft with the widest side upwards and the two lugs located in their cut-outs in the door trim panel.
3. Replace the handle on its control shaft and secure it with a screw and washer.

OP M 1071-A DOOR ARMREST – REMOVE AND INSTALL
(Saloon, Estate Car and Van) Prior to 7/62

To Remove

1. On the underside of the armrest remove two screws and detach the padded portion from the mounting.
2. Remove two screws and remove the armrest mounting.

To Install

3. Relocate the armrest mounting and secure it to the door with two screws.
4. Relocate the armrest pad and secure it to the mounting with two screws.

OP M 1071-A DOOR ARMREST – REMOVE AND INSTALL
(Saloon, Estate Car and Van)

To Remove

1. Remove the two screws securing the armrest to the door and remove the armrest.

To Install

2. Position the armrest on the door trim panel and secure it with two screws.

OP M 1072-A DOOR TRIM PANEL – REMOVE AND INSTALL
(Saloon, Estate Car and Van)

To Remove

1. Remove the window regulator handle and remote control handle.
2. Remove two screws securing the combined armrest/door pull and remove the armrest.
3. Carefully pull the trim panel away from the door inner panel to release the securing trim clips and remove the panel and waterproof sheet.

To Install

4. Replace the waterproof sheet ensuring that all the edges are sealed.
5. Position the trim panel on the door and press the edges of the panel to engage the trim clips.
6. Replace the door interior handles and combined armrest/door pull.

OP M 1072-A1 Extra: window regulator – remove and install
(Saloon, Estate Car and Van)

To Remove

1. Wind down the window.
2. Remove the four screws and washers securing the regulator assembly to the door.

3. Carefully pull the regulator towards the rear of the door to disconnect the regulator operating arm from the window glass.
4. Push the window up and support it, then remove the regulator through the door access hole.

To Install

5. Position the regulator in the door, remove the window prop and connect the regulator operating arm to the window glass.
6. Secure the regulator to the door with four screws and washers.

OP M 1072-A2 Extra: door lock assembly — remove and install (Saloon, Estate Car and Van)

To Remove

1. Wind the window up.
2. Remove two screws securing the rear glass run and move the run and supporting channel to one side.
3. Remove the wire clip and flat washer and detach the remote control rod from the lock.

Note:-

A. A twin-legged "Vee" shaped nylon silencer, or anti-rattle wedge is clipped to the lock remote control operating rod. Once the rod has been detached from the lock, the anti-rattle wedge will become misplaced and will require refitting on reassembly of the lock.

4. Remove four lock assembly securing screws and shakeproof washers and withdraw the lock assembly through the access hole in the door inner panel.

To Install

5. Locate the lock assembly in position within the door, passing the rotor and dovetail through the appropriate holes in the door frame. Secure the lock assembly with four screws and shakeproof washers.
6. Engage the remote control rod to the lock assembly and secure it with a flat washer and a spring wire clip.

Note:-

B. At this stage, the "Vee" shaped nylon silencer or anti-rattle wedge must be secured to the remote control operating rod in the following manner. Examination of the remote control operating rod will disclose two protrusions between which the anti-rattle wedge must be clipped at the apex. The two legs of the clip must then be positioned so that the end of each leg abuts the inside face of the door outer panel.

7. Replace the rear glass run and channel and secure it with two screws.

OP M 1072-A3 Extra: door lock remote control assembly — remove and install (Saloon, Estate Car and Van)

To Remove

1. Wind the window up.
2. Remove a wire clip and flat washer securing the lock remote control rod to the lock.

3. Remove three screws and washers and remove the remote control and rod. (See note A in OP M 1072-A2).

To Install

4. Locate the remote control with rod attached within the door. Attach the remote control rod to the lock with a flat washer and spring clip.
5. Secure the remote control with three screws and shakeproof washers. (See Note B in OP M 1072-A2).

OP M 1072-A4 Extra: door vent window assembly – remove and install (Saloon, Estate Car and Van)

To Remove

1. Wind the window down.
2. Remove the vent window dividing channel lower securing screw.
3. Open the vent window, pull out a section of the vent window weatherstrip to disclose two screws which pass through the vent window outer frame into the door frame. Remove these screws.
4. Prise out the door glass silent channel adjacent to the vent window dividing channel and move it to one side.
5. Remove two screws and washers and remove the door glass lower stop.
6. Remove four screws and washers and remove the window regulator assembly. Lower the glass and regulator to the bottom of the door.
7. Pull the vent window frame rearwards and upwards and withdraw it from the door.

To Install

8. Locate the vent window assembly and dividing channel in the door.
9. Lift the door window glass and engage it in the dividing channel glass run.
10. Replace the window regulator and secure it with four screws and shakeproof washers.
11. Replace the door glass lower stop and secure it with two screws and washers.
12. Secure the vent window dividing channel lower end with one screw and washer.
13. Replace and tighten the two screws securing the vent window outer frame to the door frame.
14. Lubricate the vent window sealing weatherstrip and replace it in the outer frame.
15. Replace the door glass upper silent channel adjacent to the dividing channel.

OP M 1072-A5 Extra: opening door vent window glass and inner frame (door vent window assembly removed) remove and install (Saloon, Estate Car and Van)

To Remove

1. Remove the nut below the lower pivot point and remove the tension spring.
2. Remove the nuts securing the spring bracket and remove the bracket and spacing washers.
3. Drill out two rivets securing the upper pivot and remove the glass and inner frame.

To Install

4. Refit the glass and inner frame, passing the lower pivot stud through the hole in the outer frame and door.
5. Refit the upper pivot and secure it with two rivets.
7. Replace the spacing washers and spring bracket and secure with two nuts and washers.
8. Replace the lower pivot tension spring and retain it with one nut.

OP M 1072-A6 Extra: door window glass silent channel – remove and install
(Saloon, Estate Car and Van)

To Remove

1. Remove the screw securing the bottom of the window glass lower rear run and pull down the metal backing to disconnect the run from the door.
2. Pull the silent channel out of the door frame and lower rear run.

To Install

3. Replace the silent channel in the door frame starting at the top front edge.
4. Position the lower rear glass run metal backing over the silent channel and position the top edge in the door. Secure the lower edge with a screw.

OP M 1072-A7 Extra: door window glass – remove and install
(Saloon, Estate Car and Van)

To Remove

1. Remove the vent window assembly. (See OP M 1072-A4).
2. Lift the window glass to disengage the regulator arm.
3. Turn the glass through 90^{o} and lift it out through the door frame.

To Install

4. Locate the window glass within the door and engage the regulator arm in the glass carrier.
5. Replace the vent window assembly. (See OP M 1072-A4).

OP M 1072-B WINDOW REGULATOR ASSEMBLY – REMOVE AND INSTALL
Includes OPS M 1072-A and A1
(Saloon, Estate Car and Van)

OP M 1072-C DOOR LOCK ASSEMBLY – REMOVE AND INSTALL
Includes OPS M 1072-A and A2
(Saloon, Estate Car and Van)

OP M 1072-D DOOR REMOTE CONTROL ASSEMBLY – REMOVE AND INSTALL
Includes OPS M 1072-A and A3
(Saloon, Estate Car and Van)

OP M 1072-E QUARTER VENT WINDOW ASSEMBLY – REMOVE AND INSTALL
Includes OPS M 1072-A and A4
(Saloon, Estate Car and Van)

OP M 1072-F OPENING VENT WINDOW GLASS, WEATHERSTRIP AND INNER FRAME – REMOVE AND INSTALL
Includes OPS M 1072-A, A4 and A5
(Saloon, Estate Car and Van)

OP M 1072-G DOOR WINDOW GLASS SILENT CHANNEL – REMOVE AND INSTALL
Includes OPS M 1072-A and A6
(Saloon, Estate Car and Van)

OP M 1072-H DOOR WINDOW GLASS – REMOVE AND INSTALL
Includes OPS M 1072-A, A1, A4 and A7
(Saloon, Estate Car and Van)

OP M 1072-M OPENING QUARTER VENT WINDOW GLASS, OR WEATHERSTRIP, REMOVE AND INSTALL
(Saloon, Estate Car and Van)

To Remove

1. Using a covered screwdriver inserted between the top corner of the frame and the vent window glass, gently prise the glass downwards to free the top of the glass.
2. Hold the glass and insert the screwdriver at the bottom corner between the frame and vent window glass. Gently prise the glass upwards out of the frame and remove the glass.

To Install

3. Fit a length of weatherstrip around the glass and place the glass in the frame so that the bottom edge is correctly positioned.
4. Place a covered screwdriver on the top edge of the glass and beneath the top corner of the frame and carefully prise the glass into position.

OP M 1073-A REAR DOOR WINDOW GLASS OR WEATHERSTRIP – REMOVE AND INSTALL
(Van)

To Remove

1. Using a lipping tool or a screwdriver with all sharp edges removed, from outside the van, push the weatherstrip lip under the window aperture flange.
2. Treat approximately two thirds of the weatherstrip in this manner then push the glass and weatherstrip into the van.

To Install

3. Fit the weatherstrip to the glass and insert a length of cord in the rubber to body groove of the weatherstrip, so that the cord ends emerge, at the bottom centre and overlap for approximately 6 inches.

Note:

Thread the cord through a length of ¼ in. tube. Draw the tube round the weatherstrip groove. allowing the cord to pass through the tube and remain in the groove.

If necessary the weatherstrip may temporarily be secured to the glass by short lengths of masking tape stuck over the weatherstrip and secured to both sides of the glass.

4. Using a sealer gun fitted with a $\frac{1}{8}$ in. diameter bore swan-necked nozzle, insert the nozzle tip between the weatherstrip and glass on the outside of the glass. Apply suitable semi-liquid sealer between the glass and rubber all round the window. In a similar manner, apply a continuous bead of sealer to the rubber to body face of the weatherstrip.
5. Offer the glass and fitted weatherstrip to the body from within the van, ensuring that the cord ends are outside the door. Maintain light pressure on the glass from inside the van and from the outside commence to pull out the draw-cord, pulling always towards the centre of the glass.
6. Remove any masking tape used to secure the weatherstrip to the glass, one piece at a time, immediately before the weatherstrip lip is positioned over the aperture flange in that location. At the same time, maintain a light pressure on the glass.

   Upon reaching the top centre of the window, start pulling out the other end of the cord, repeating the operation.
7. When the cord has been completely withdrawn, gently tap the weatherstrip with a rubber mallet to obtain a satisfactory seating of the glass and weatherstrip.
8. Clean off any surplus sealing material.

OP M 1105-A LUGGAGE COMPARTMENT LID ASSEMBLY – REMOVE AND INSTALL
(Saloon)

To Remove

1. Open the luggage compartment lid.
2. On the underside of the lid, remove four nuts and washers, two on each hinge.
3. Remove one nut and washer and detach the support stay.
4. Remove the lid and hinge gaskets.

To Install

5. Replace the luggage compartment lid, ensuring that the two hinge gaskets are correctly located.
6. Secure each hinge with two nuts and washers.
7. Relocate and secure the support stay to the lid with one nut and washer.

OP M 1107-A LUGGAGE COMPARTMENT LID MOTIFS – REMOVE AND INSTALL
(Saloon)

To Remove

1. Using a thin blade with all sharp edges removed, carefully prise the motif off the luggage compartment lid.

To Install

2. Position the motif on the luggage compartment and press it in to engage the securing clips.

OP M 1108-A LUGGAGE COMPARTMENT STRIKER POST – REMOVE AND INSTALL
(Saloon)

To Remove

1. Open the luggage compartment lid.
2. Remove two bolts and washers securing the striker plate to the body lower back panel and remove the striker plate.

To Install

3. Position the striker plate on the body and secure it with two bolts and washers.

OP M 1109-A LUGGAGE COMPARTMENT LOCK – REMOVE AND INSTALL
(Saloon)

To Remove

1. Open the luggage compartment lid. Remove one nut and washer from the end of the lock handle spindle and withdraw the handle, escutcheon and rubber gasket.
2. Remove two bolts and washers securing the lock to the luggage compartment lid and remove the catch.

To Install

3. Position the lock catch on the underside of the luggage compartment lid and secure it with two bolts and washers.
4. From the outside, locate the lock escutcheon, gasket and handle in the lid, ensuring that the handle spindle correctly engages in the lock catch.
5. Secure the lock handle with one nut and washer on the end of the spindle.

OP M 1109-A1 Extra: luggage compartment lock barrel – remove and install
(Saloon)

To Remove

1. Remove the locking barrel retaining spring clip.
2. Punch out a tapered pin, disclosed by removal of the spring clip.
3. Insert the ignition key and withdraw the barrel from the handle.

To Install

4. Insert the ignition key in the lock barrel and insert the barrel in the handle.
5. Turn the barrel to align the tapered pin location holes and press in the pin.
6. Fit the barrel retaining spring clip.

OP M 1111-C LUGGAGE COMPARTMENT HINGE – ONE – REMOVE AND INSTALL
(Saloon)

To Remove

1. Open the luggage compartment lid.

2. Remove two nuts and washers securing the hinge to the lid. Detach the hinge and gasket from the lid.
3. From under the back panel upper, remove one nut and washer securing the hinge to the body. Remove the hinge.

To Install

4. Relocate the hinge on the body back panel upper and secure it with one nut and washer.
5. Locate the gasket in position and refit the hinge to the luggage compartment door. Secure it with two nuts and washers.

OP M 1150-A TAILGATE DOOR ASSEMBLY – REMOVE AND INSTALL
(Estate Car)

To Remove

1. Open the tailgate door.
2. Remove four bolts and washers, two either side, securing the tailgate door to the hinges and remove the door.

To Install

3. Relocate the door to the hinges. Secure it to each hinge with two bolts and washers.

OP M 1150-A1 Extra: tailgate door components – remove and install – tailgate door removed
Includes OPS M 1155-A, M 1160-A, M 1170-A, M 1175-A
(Estate Car)

OP M 1152-A REAR DOOR ASSEMBLY – ONE – REMOVE AND INSTALL
(Van)

To Remove

1. Open both rear doors.
2. On the outside of the door, remove two bolts and washers securing each hinge to the door and remove the door.

To Install

3. Relocate the door to the hinges and secure it to each hinge with two bolts and washers.

OP M 1152-A2 Extra: door components – LH–remove and install
Includes OPS M 1180-A, M 1073-A and M 1167-A
(Van)

OP M 1152-A3 Extra: door components – RH–remove and install
Includes OPS M 1180-A, M 1162-A and M 1167-A
(Van)

OP M 1155A TAILGATE LOCK – REMOVE AND INSTALL
(Estate Car)

To Remove

1. Open the tailgate door.

2. Carefully pull the tailgate door interior trim panel away from the door to release the securing trim clips.
3. Remove a nut and washer securing the handle spindle and two screws securing the lock to the door.
4. Remove the handle and escutcheon plate and lock assembly.

To Install

5. Relocate the lock within the tailgate door.
6. Fit the handle and escutcheon plate and engage the handle spindle in the lock.
7. Secure the handle with one nut and washer.
8. Secure the lock to the door with two screws.
9. Replace the interior trim panel.

OP M 1156-A TAILGATE DOOR LOCK STRIKER PLATE – REMOVE AND INSTALL
(Estate Car)

To Remove

1. Open the tailgate door. Scribe a line around the base of the lock striker plate.
2. Remove two cross head screws and remove the striker plate.

To Install

3. Replace the striker plate to coincide with the line scribed around it.
4. Secure the striker to the body with two cross head screws.

OP M 1160-A TAILGATE DOOR EXTERNAL HANDLE ASSEMBLY – REMOVE AND INSTALL
(Estate Car)

To Remove

1. Open the tailgate door.
2. Carefully pull the tailgate door interior trim panel away from the door to release the securing trim clips.
3. Remove a nut and washer securing the handle spindle and remove the handle and escutcheon plate.

To Install

4. Relocate the escutcheon plate and engage the handle spindle in the lock.
5. Secure the handle with one nut and washer.
6. Replace the interior trim panel.

OP M 1162-A REAR DOOR EXTERNAL HANDLE ASSEMBLY – REMOVE AND INSTALL
(Van)

To Remove

1. Open the right hand door.

2. Remove a screw and washer from the end of the lock spindle.
3. From the outside remove two screws securing the handle base plate to the door and remove the handle.

To Install

4. Relocate the handle to the lock and secure the base plate to the door with two screws.
5. Secure the handle spindle with one screw and washer.

OP M 1162–A2 Extra: rear door lock – remove and install (Van) – (External handle removed)

To Remove

1. From inside the door, remove three screws and washers and remove the lock assembly.

To Install

2. Relocate the lock within the door and secure it with three screws and washers.

OP M 1165-A TAILGATE DOOR HINGE AND TORSION BAR ASSEMBLY – REMOVE AND INSTALL
(Estate Car)

To Remove

1. Remove the tailgate door (see OP M 1150-A).
2. Detach the plastic securing rivets by pushing the centre locking pin through the rivet and remove the roof trim panels covering the hinge and torsion bar assembly.
3. Remove eight bolts, flat and spring washers, four each side and remove the hinge and torsion bar assembly.

To Install

4. Locate the hinge and torsion bar assembly to the roof panel rear reinforcement and secure it with eight bolts, flat and spring washers, four each side.
5. Reposition the hinge and torsion bar trim cover panels and secure them with the plastic rivets.
6. Replace the tailgate door (see OP M 1150-A).

OP M 1180-A REAR DOOR LOCK BAR ASSEMBLY – REMOVE AND INSTALL
(Van)

To Remove

1. Open both rear doors.
2. Remove three screws and shakeproof washers which secure the lock operating lever base plate.
3. Withdraw the upper and lower locking rods from their guide bushes and remove the lock assembly.

To Adjust

This lock is capable of adjustment, to maintain effective sealing and prevent water ingress through the rear doors and also to prevent rattles developing in service.

The over centre action is operated by a centrally placed lever on the inside of the door. Normally, sufficient adjustment may be obtained by moving the upper and lower door locking rod striker plates, which are secured to the body, inwards, thus increasing the interference fit of the rods.

A further adjustment is provided in the bushes secured to the door, through which each locking rod passes. Each bush is threaded and should a rattle develop between the locking rods and the thrust washers fitted to each bush the bushes may be screwed further into the door.

To Install

1. Engage each locking rod in its respective bush.
2. Offer the lock assembly to the door and secure it with three screws and shakeproof washers.

OP M 1205-A WINDSCREEN GLASS AND OR WEATHERSTRIP – REMOVE AND INSTALL
(Saloon, Estate Car and Van)

Note:

Before commencing to remove or refit a windscreen glass, ascertain the type of glass being dealt with. Two types of safety glass are used, toughened and laminated. A close examination will reveal a distinguishing mark placed centrally on the windscreen approximately one inch (2.5 cm.) above the lower transverse section of weatherstrip, which includes the words TOUGHENED or LAMINATED or "T" or "L".

To Remove

1. Cover the bonnet and cowl top with a cloth to prevent accidental damage.
2. Remove the windscreen wiper arms and blades.
3. Using a lipping tool from inside the vehicle push the weatherstrip lip under the top and sides of the windscreen aperture flange.
4. Push out the windscreen and weatherstrip as an assembly.
5. Prise out the joint cover clip and pull the finish strip out of the weatherstrip and remove the weatherstrip from the glass.

Note:-

A second method of Toughened Glass windscreen removal often employed by experienced operators is described below. This method, however, must not be used to remove a laminated windscreen. It is essential that laminated glass is treated with care and not subjected to distortion.

Ensure that the operator is wearing lightweight shoes, then –

(a) Sit in the front seat.

(b) To avoid scratching the glass, place a piece of soft cloth between the soles of the shoes and the windscreen glass.

(c) Place both feet in one top corner of the windscreen and push firmly.

(d) When the weatherstrip is free of the body flange in that area, repeat the procedure at intervals along the top edge of the windscreen until, from outside the car, the glass and weatherstrip can be removed together.

If the glass is being replaced due to accident damage remove all traces of hardened sealer and shattered glass from the weatherstrip and body aperture flange.

To Install

6. Refit the weatherstrip around the windscreen glass.
7. Using a sealer gun fitted with a $\frac{1}{8}$ in. (3mm.) swan-necked nozzle, apply a suitable sealer to the weatherstrip.
8. Fit a drawcord in the weatherstrip rubber to body groove allowing a crossover of approximately 6 in. (15 cm.) at the bottom.
9. Position the windscreen in the body aperture with the cord ends inside the car.
10. Pull out the cord whilst applying light pressure to the outside of the glass.
11. Using a sealer gun fitted with a $\frac{1}{8}$ in. (3mm.) swan-necked nozzle, apply a suitable sealer to the rubber to glass groove.
12. Replace the finish strip in its groove in the weatherstrip. The lipping tool will help in replacement. Replace the joint cover clip.
13. Replace the windscreen wiper arms and blades.
14. Remove the cloth covering the bonnet and cowl top and remove any surplus sealer from around the windscreen.

OP M 1210-A REAR WINDOW GLASS AND/OR MOULDING – REMOVE AND INSTALL
(Saloon)

To Remove

1. Cover the luggage compartment lid and rear quarter panels with a cloth to prevent accidental damage.
2. Using a lipping tool from inside the car, push the weatherstrip lip under the top and sides of the rear window aperture flange.
3. From inside the car push out the window and weatherstrip as an assembly.
4. Remove the joint cover clip and pull the finish strip out of the weatherstrip and remove the weatherstrip from the glass.

Note:-

If the glass is being replaced due to accident damage, remove all traces of hardened sealer and shattered glass from the weatherstrip and body aperture flange.

To Install

5. Refit the weatherstrip around the rear window glass.
6. Using a sealer gun fitted with a $\frac{1}{8}$ in. (3mm.) swan-necked nozzle, apply a suitable sealer to the weatherstrip.
7. Fit a drawcord in the weatherstrip rubber to body groove, allowing a crossover of approximately 6 in. (15 cm.) at the bottom.
8. Position the rear window in the body aperture with the cord ends inside the car.
9. Pull out the cord whilst applying light pressure to the outside of the glass.
10. Using a sealer gun fitted with a $\frac{1}{8}$ in. (3mm.) swan-necked nozzle, apply a suitable sealer to the rubber to glass groove.

11. Replace the finish strip in its groove in the weatherstrip. The lipping tool will help in replacement. Replace the joint cover clip.
12. Remove the cloth covering the luggage compartment lid and rear quarter panels and any surplus sealer from the glass, weatherstrip or bodywork.

OP M 1210-A REAR WINDOW GLASS AND/OR MOULDING – REMOVE AND INSTALL
(Estate Car)

To Remove

1. Using a lipping too, from inside the vehicle, push the weatherstrip lip under the top and sides of the rear window aperture flange.
2. Push out the window and weatherstrip as an assembly.
3. Remove the joint cover clip and pull the finish strip out of the weatherstrip and remove the weatherstrip from the glass.

Note:-

If the glass is being replaced due to accident damage, remove all traces of hardened sealer and shattered glass from the weatherstrip and body aperture flange.

To Install

4. Refit the weatherstrip around the rear window glass.
5. Using a sealer gun fitted with a $\frac{1}{8}$ in. (3mm.) swan-necked nozzle, apply a suitable sealer to the weatherstrip.
6. Fit a drawcord in the weatherstrip rubber to body groove, allowing a crossover of approximately 6 in. (15 cm.) at the bottom.
7. Position the rear window in the body aperture with the cord ends inside the car.
8. Pull out the cord whilst applying light pressure to the outside of the glass.
9. Using a sealer gun fitted with a $\frac{1}{8}$ in. (3mm.) swan-necked nozzle, apply a suitable sealer to the rubber to glass groove.
10. Replace the finish strip in its groove in the weatherstrip. The lipping tool will help in replacement. Replace the joint cover clip and clean any surplus sealer from the glass, weatherstrip and body.

OP M 1215-A FIXED REAR QUARTER WINDOW GLASS AND/OR WEATHER-STRIP – REMOVE AND INSTALL
(Saloon and Estate Car)

To Remove

1. Using a lipping tool, from inside the vehicle, push the weatherstrip lip under the top and sides of the body aperture flange.
2. Push out the window and weatherstrip as an assembly.

Note:-

If the glass is being replaced due to accident damage, remove all traces of hardened sealer and shattered glass from the weatherstrip and body aperture flange.

To Install

3. Replace the weatherstrip around the rear quarter glass.
4. Using a sealer gun fitted with a $\frac{1}{8}$ in. (3mm.) swan-necked nozzle, apply a suitable sealer (SR-51-B) to the rubber to body groove of the weatherstrip.
5. Using a sealer gun fitted with a $\frac{1}{8}$ in. (3mm.) swan-necked nozzle, apply a suitable sealer to the rubber to glass groove.
6. Fit a drawcord in the weatherstrip rubber to body groove allowing a crossover of approximately 6 in. (15 cm.) at the bottom.
7. Locate the rear quarter window in the body aperture with the cord ends within the car.
8. Pull out the cord whilst applying light pressure to the outside of the glass.
9. Remove any surplus sealer from around the rear quarter window.

OP M 1215-A OPENING REAR QUARTER WINDOW – REMOVE AND INSTALL
(Saloon)

To Remove

1. Open the window. Unscrew and remove two screws securing the window frame catch to the body.
2. Carefully pull the window assembly rearwards to disengage the hinge lugs from the two rubber sockets located in the body lock pillar.

To Install

3. Ensure that the window hinge rubber sockets are correctly located in the lock pillar.
4. Slightly lubricate the hinge lugs on the window frame, locate them to the rubber sockets and push the frame to enter the lugs in the sockets.
5. Relocate the rear frame catch and secure it to the body with two screws.

OP M 1215-A OPENING REAR QUARTER WINDOW – REMOVE AND INSTALL
(Estate Car)

To Remove

1. Remove two screws retaining the window catch to the body.
2. Remove the rear quarter trim panel.
3. From underneath the front lower corner of the window, slacken the lock nut, and screw the lower pivot down. The pivot will not screw completely out but will lower sufficient to allow the window frame lower lug to be disengaged so that the window frame can be pulled from the body.

To Install

4. Locate the window frame to the body and engage the lower lug in the rubber grommet.
5. Screw the lower pivot up to engage and secure the window frame lugs.
6. Replace the rear trim quarter panel.
7. Relocate the window catch and secure it to the body with two screws.

OP M 1305-A FRONT PARCEL SHELF AND OR SUPPORT BRACKET – REMOVE AND INSTALL
(Saloon, Estate Car and Van)

To Remove

1. Remove four nuts and washers, two either side, securing the parcel shelf to the cowl side.
2. Remove two screws securing the parcel shelf to the bulkhead panel.
3. Remove two bolts and nuts securing the shelf to the steering column bracket.
4. Remove the parcel shelf.

To Install

5. Relocate the parcel shelf and secure it to the cowl side with four nuts and washers, two either side.
6. Secure the shelf to the bulkhead with two screws.
7. Secure the shelf to the steering column bracket with two bolts and nuts.

OP M 1305-A1 Extra: cowl side trim panel – remove and install
(Saloon, Estate Car and Van)

To Remove

1. Remove the front parcel tray (See OP M 1305-A).
2. Carefully lift the cowl side trim to disengage the securing clips and remove.

To Install

3. Relocate the cowl side trim panel and press it to the cowl side to engage the retaining clips.
4. Replace the front parcel tray (See OP M 1305-A).

OP M 1315-A REAR QUARTER TRIM PANEL – REMOVE AND INSTALL
(Saloon)

To Remove

1. Remove the rear seat cushion (See OP M 1327-A) and the seat back rest (See OP M 1325-A).
2. Carefully lift the trim panel to disengage the securing clips and remove the panel.

To Install

3. Relocate the trim panel and press to engage the securing clips.
4. Replace the rear seat back rest (See OP M 1325-A) and the seat cushion (See OP M 1327-A).

OP M 1315-A REAR QUARTER TRIM PANEL – REMOVE AND INSTALL
(Estate Car)

To Remove

1. Carefully lift the lower edge of the trim panel to disengage the retaining clips.

2. Disengage the trim panel upper edge from under the "U" section channel secured to the body and remove the trim panel.

To Install

3. Locate the trim panel and engage the upper edge under the "U" section channel secured to the body.
4. Press the panel to the body to engage the retaining clips.

OP M 1317-A LOAD SPACE SIDE TRIM PANEL – REMOVE AND INSTALL (Estate Car)

To Remove

1. Carefully lift the lower edge of the trim panel to disengage the retaining clips.
2. Disengage the upper edge of the trim panel from under the "U" section channel secured to the body and remove the trim panel.

To Install

3. Locate the trim panel and engage the upper edge under the "U" section channel secured to the body.
4. Press the trim panel to engage the retaining clips.

OP M 1320-A DRIP RAIL MOULDING – ONE – REMOVE AND INSTALL (Saloon and Estate Car)

To Remove

1. Carefully prise the one-piece drip rail moulding off the drip rail.

To Install

2. Position the drip rail moulding on the drip rail and using a rubber mallet carefully tap into position.

OP M 1325-A REAR SEAT BACK REST – REMOVE AND INSTALL (Saloon)

To Remove

1. Remove the rear seat cushion (See OP M 1327-A).
2. Open the luggage compartment lid and from within the luggage compartment remove three screws and washers securing the rear seat back rest.
3. Lift the rear seat back rest to disengage the lower edge from the body recess and remove the back rest.

To Install

4. Replace the rear seat back rest and locate the lower edge.
5. From within the luggage compartment, secure the back rest with three screws and washers.
6. Replace the rear seat cushion (See OP M 1327-A).

OP M 1325-A REAR SEAT BACK REST – REMOVE AND INSTALL
(Estate Car)

To Remove

1. Lift the rear seat cushion.
2. Raise the rear seat back rest to the vertical or seat back rest position.
3. Remove 4 bolts, 2 each side securing the rear seat back rest to the hinges. Remove the rear seat back rest.

To Install

4. Replace the rear seat back rest in the vertical position.
5. Replace 4 bolts, 2 either side securing the back rest to the hinges.
6. Return the seat cushion section to the seat position.

OP M 1327-A REAR SEAT CUSHION – REMOVE AND INSTALL
(Saloon)

To Remove

1. Lift the front edge of the seat cushion to disengage the retaining frame wire from behind the heel board.
2. Lift the cushion and remove.

To Install

3. Replace the seat cushion. Push firmly to the rear until the front end drops behind the retaining heel board.

OP M 1327-A REAR SEAT CUSHION – REMOVE AND INSTALL
(Estate Car)

To Remove

1. Turn the rear seat cushion to the horizontal or load floor position.
2. Remove 4 screws securing the seat cushion to the hinge. Remove the cushion.

To Install

3. Replace the rear seat cushion in the horizontal or load floor space position.
4. Secure the seat to the hinge with 4 screws, 2 to each hinge.

OP M 1330-A FRONT BUCKET SEAT – REMOVE AND INSTALL
(Saloon, Estate Car and Van)

To Remove

1. Remove two bolts and washers securing the front ends of the seat mounting brackets.
2. Tip the seat forward and remove the two bolts and washers securing the rear ends of the seat mounting brackets.
3. Remove the seat and mounting brackets from the car.

To Install

4. Position the seat and mounting brackets in the car ensuring that the mounting brackets are correctly positioned on the floorpan.
5. Replace the two bolts and washers securing the seat mounting brackets at the front.
6. Tip the seat forward and replace the two bolts and washers securing the rear ends of the mounting brackets.

OP M 1340-A INTERIOR MIRROR – REMOVE AND INSTALL
(Saloon and Estate Car)

To Remove

1. Remove the interior light cover.
2. Remove two screws securing the interior mirror to the windscreen leader panel and remove the mirror.

To Install

3. Locate the mirror base beneath the interior lamp base and secure it to the header panel with two screws.
4. Replace the interior light cover.

OP M 1345-A SUN VIZOR – ONE – REMOVE AND INSTALL
(Saloon and Estate Car)

To Remove

1. Remove two screws securing the sun vizor to the windscreen header panel.
2. Remove the sun vizor.

To Install

3. Locate the sun vizor on the windscreen header panel.
4. Secure the sun vizor with two screws.

OP M 1351-A GLOVE LOCKER LID – REMOVE AND INSTALL
(Saloon and Estate Car)

To Remove

1. Open the locker lid.
2. Remove two screws securing the lid to the hinge.
3. Remove two screws, one either side securing the lid support stays and remove the lid.

To Install

4. Locate the glove locker lid and secure it with two screws.
5. Attach the lid support stays with two screws, one either side.

OP M 1360-A HEADLINING – RENEW
(Saloon)

To Remove

1. Remove four screws and detach the sun vizors (where fitted).
2. Remove two screws and detach the rear view mirror.
3. Disconnect the battery, remove two screws and pull down the interior light and disconnect the wiring.
4. Pull the door finish strips away from the door aperture flanges adjacent to the headlining.
5. Carefully lift the roof to rear quarter panel interior trim to detach the retaining clips.
6. Remove the wiper arms and blades.
7. Remove the windscreen (see OP M 1205-A) and rear window (see OP M 1210-A).
8. Carefully free the edges of the headlining where secured by adhesive (the windscreen aperture, door apertures, and rear window aperture).
9. Insert a thin blade such as a blunt paintscraper between the headlining and retainer strip in the area immediately above the rear quarter windows. Carefully lift the headlining material off the teeth on the back face of the retaining strip.
10. Disconnect the listing wires from their sockets and remove the headlining and listing wires as an assembly.

To Install

11. If a new headlining is being fitted, transfer the listing wires from the old headlining to the appropriate cotton sleeve in the new headlining.

Note:-

The listing wires are colour coded with a daub of paint. Starting at the front the colours are: 1 = Blue, 2 = Green, 3 = Brown, 4 = Yellow, 5 = Red.

12. Break the cotton sleeves to allow the listing wires to protrude approximately 4 to 6 in. (101 to 152 mm.) then locate the headlining complete with listing wires in the car and position the listing wires in their respective sockets. Ensure that the assembly is centrally located with equal lengths of material hanging at each side and front and rear end.
13. Locate two wire clips in the header panel and connect them to the front listing wire.
14. Apply adhesive to the windscreen header panel, offer the lining up to the panel and temporarily secure it across the header panel. Pull down the lining material across the windscreen header panel and allow the adhesive to become tacky. Starting in the centre of the header panel re-stick the lining and temporarily secure it with spring clips.
15. Pull the lining firmly from front to back and repeat the procedure outlined in 14 across the rear window header bar.
16. Apply adhesive along the top of the door apertures, pull the material from each side and carefully stick in position.
17. In the areas above each rear window, carefully push the material up behind the retainer strip, using a blunt paint scraper.
18. Trim the lining around all apertures, allowing approximately ½ in. (12.7mm.) of material to overlap the flanges.
19. Replace the windscreen (see OP M 1205-A) and the rear window (see OP M 1210-A).
20. Replace the roof to rear quarter panel trim covers and clip in position.

21. Replace the wiper arms and blades.
22. Replace the door aperture finish strips.
23. Cut a hole in the headlining, pull the interior light wires through and connect them to the interior light.
24. Position the interior light and secure it with two screws.
25. Replace the rear view mirror and secure it with two screws.
26. Replace the two sun vizors and secure with four screws.
27. Reconnect the battery.

OP M 1360-A HEADLINING – RENEW
(Estate Car)

To Remove

1. Remove four screws and detach the sun vizors (where fitted).
2. Remove two screws and detach the rear view mirror.
3. Disconnect the battery, remove two screws and pull down the interior light and disconnect the wiring.
4. Pull the door finish strips away from the door aperture flanges adjacent to the headlining.
5. Remove the tailgate door hinge and torsion bar assembly trim covers by pushing the centre locking bar through each securing trim clip.
6. Remove the wiper arms and blades and remove the windscreen (see OP M 1205-A).
7. Carefully detach the lining where secured by adhesive. (The windscreen aperture, door apertures and rear end.)
8. Insert a thin blade such as a blunt paint scraper between the headlining and retainer strip in the area immediately above the rear quarter windows. Carefully lift the headlining material off the teeth on the back face of the retaining strip.
9. Disconnect the listing wires from their sockets and remove the headlining and listing wires as an assembly.

To Install

10. If a new headlining is being fitted, transfer the listing wires from the old headlining to the appropriate cotton sleeve in the new headlining.

Note:-

The listing wires are colour coded with a daub of paint. Starting at the front the colours are: 1 = Blue, 2 = Green, 3 = Brown, 4 = Yellow, 5 = Red.

11. Break the cotton sleeves to allow the listing wires to protrude approximately 4 to 6 in. (101 to 152 mm.) then locate the headlining complete with listing wires in the car and position the listing wires in their respective sockets. Ensure that the assembly is centrally located with equal lengths of material hanging at each side and front and rear end.
12. Locate two wire clips in the header panel and connect them to the front listing wire.
13. Apply adhesive to the windscreen header panel, offer the lining up to the panel and temporarily stick it in position. Pull down the lining material across the windscreen header panel and allow the adhesive to become tacky. Starting in the centre of the header panel re-stick the lining and temporarily secure it with spring clips.

14. Pull the lining firmly from front to back and repeat the sticking procedure outlined in 13 above, across the rear end.
15. Apply adhesive along the top of the door apertures, pull the material from each side and carefully stick in position.
16. In the areas above each rear quarter window, carefully push the material up behind the retainer strip, using a blunt paint scraper.
17. Trim the lining around all apertures, allowing approximately ½ in. (12.7mm.) of material to overlap the flanges.
18. Replace the windscreen (see OP M 1205-A).
19. Replace the hinge and torsion bar assembly trim covers.
20. Replace the wiper arms and blades.
21. Replace the door aperture finish strips.
22. Cut a hole in the headlining and pull the interior light wires through and connect them to the interior light.
23. Position the interior light and secure it with two screws.
24. Replace the rear view mirror and secure it with two screws.
25. Replace the two sun vizors and secure with four screws.
26. Reconnect the battery.

WATER & DUST SEALING

The subject of sealing bodies against the entry of dust or water is one that has received considerable attention and if the initial qualities of a well-sealed car are to be preserved it must also receive careful attention in service.

In production, different types of sealers are used according to the location of the joint, the types of sealers and method described in this section will be found quite satisfactory for normal service purposes in body repairs or for complaints arising of imperfect water or dust sealing.

We would emphasise that all joints and holes which connect to the outside of the car are potential points of water and dust entry. It is important that the trim wind cords are correctly positioned and the rubber weather strips around the doors and luggage compartment lid are in good condition and firmly cemented in position.

There are three important points to bear in mind when investigating a complaint of water ingress.

1. Carry out a step by step water test to locate possible leaks.
2. Ascertain the locations to which sealer is applied in production.
3. To ensure proper sealing, use the correct type of sealing material for the location to be sealed. Before starting work on a complaint of water or dust entry, the front carpet, cowl side trim panels and rear seat cushion should be removed, the carpet under-felt lifted around the edges and panel joints, and the car given a careful water test, to determine the actual points of water entry. Use a low pressure hose on the upper parts of the bodywork mentioned (e.g. windscreen and roof drain channels) and a high pressure hose on the joints under the front and rear mudguards.

   In some cases, it may be an advantage to apply a strong light to the outside of each joint and inspect from the inside of the car; if the light can be seen through the joint, the necessary corrective action should be taken.

Sealing Materials

There are many different types of sealing compound available on the market which are suitable for use on the various locations on the car. In all probability dealers will have stocks of these materials, and a general purpose sealer, or alternatively, sealers of the following general specifications should be used when carrying out the operations described in this section.

a. A sealing compound for general application to panel joints where a neat fillet of sealer is required. This sealer should be water resistant and available in a fairly fluid form which dries to a rubbery consistency with good adhesive properties, so that it may be applied with a gun or tube and nozzle.

b. A brush on sealer with good adhesive and water resistant properties which dries fairly hard and can be applied in locations under the front mudguard, etc., without being penetrated by grit and stones thrown up by the road wheels.

c. A liquid sealer suitable for sealing the windscreen and rear window weather strips to the glass and body metal which can be applied by means of a force feed oil can, or sealer gun.

d. A bulk sealer for use in protected locations where the joints are not exposed to the weather.

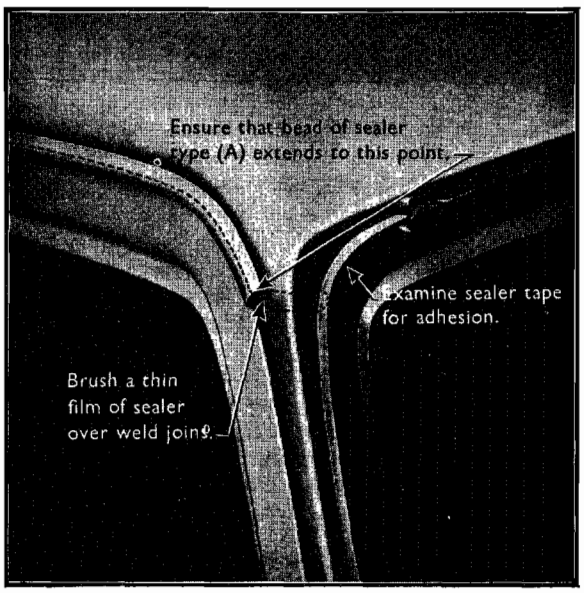
e. A plastic sealer tape ¾ in. wide for use round the screen and rear window aperture.

f. A suitable adhesive for re-sticking the carpet under-felt, and sponge weather strips to doors, etc.

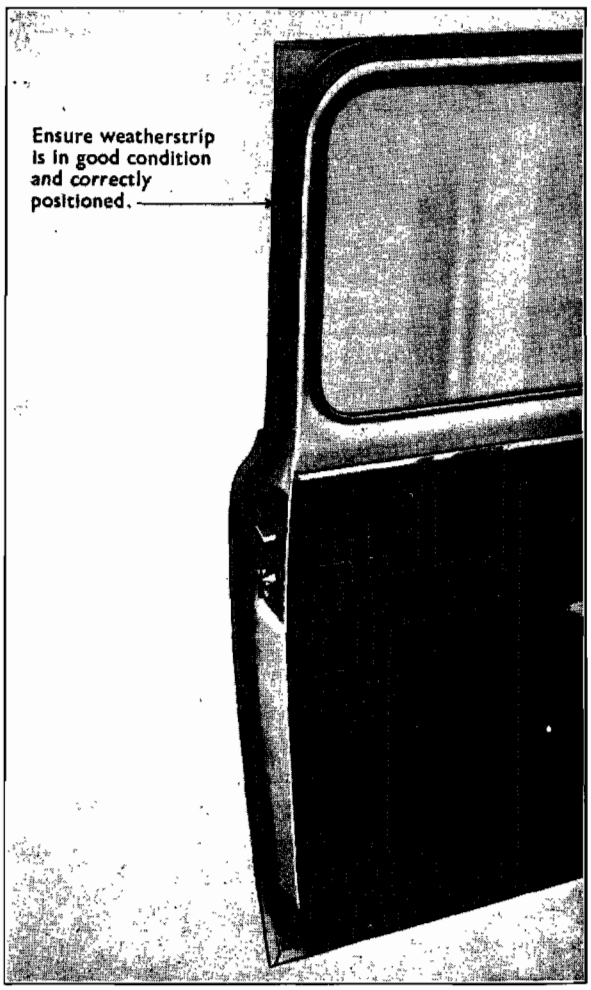
The successful use of any sealing compound depends upon absolute cleanliness of the joint faces, consequently all dirt and water should be removed from the area of the joints before applying a sealing compound.

In general, fairly fast drying sealers are required to ensure that the joints are dry before the car is put back in service. Although many sealers are touch dry within an hour or so, it is advisable to allow at least 24 hours to elapse before using the car.

If it is necessary to smooth off the fillet of sealer, this can be done directly after application with a well-moistened finger. Excess sealer on the paint-work can be removed with petrol or white spirit, and after drying, fillets of sealer on the exterior bodywork should be touched up with the correct colour paint to preserve the appearance of the car. If difficulty is experienced in removing the adhesive used for retaining door and window weather strips in position, Bostik cleaner, or cellulose thinner can be carefully applied to the affected area. **On no account should cellulose thinner be applied to a body finished in cellulose.**



Location of Sealers at Windscreen Pillars



Checking Door Weatherstrip

LEAKS ONTO THE FLOOR OF THE CAR

Water leaks onto the carpet may be divided into the following categories:

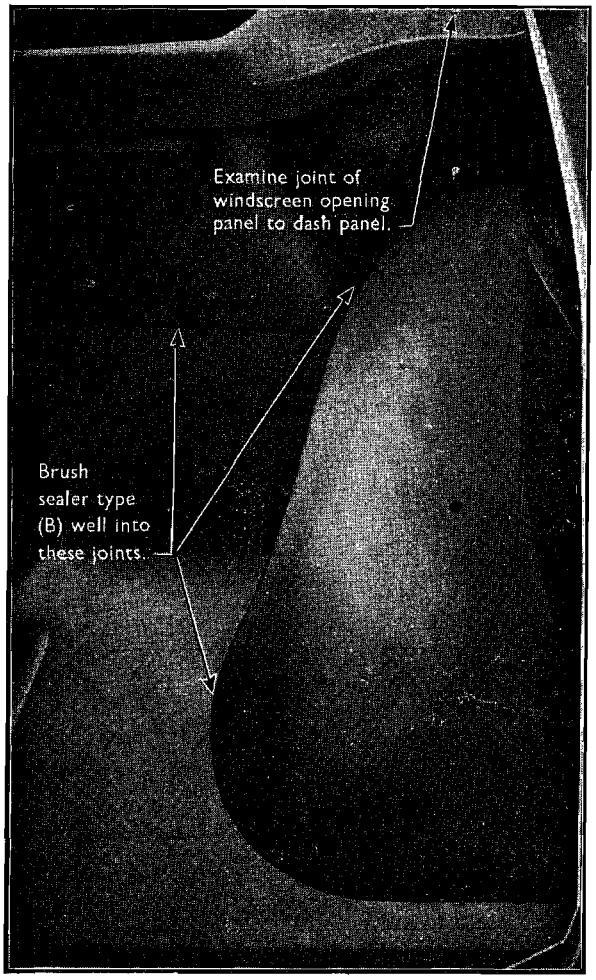
a. Water dripping onto front carpet under dash panel and from door pillar faces (items A1 to A4).

b. Water seeping onto front carpet through the joints and holes in engine rear bulkhead and/or floor pan (items B1 to B6).

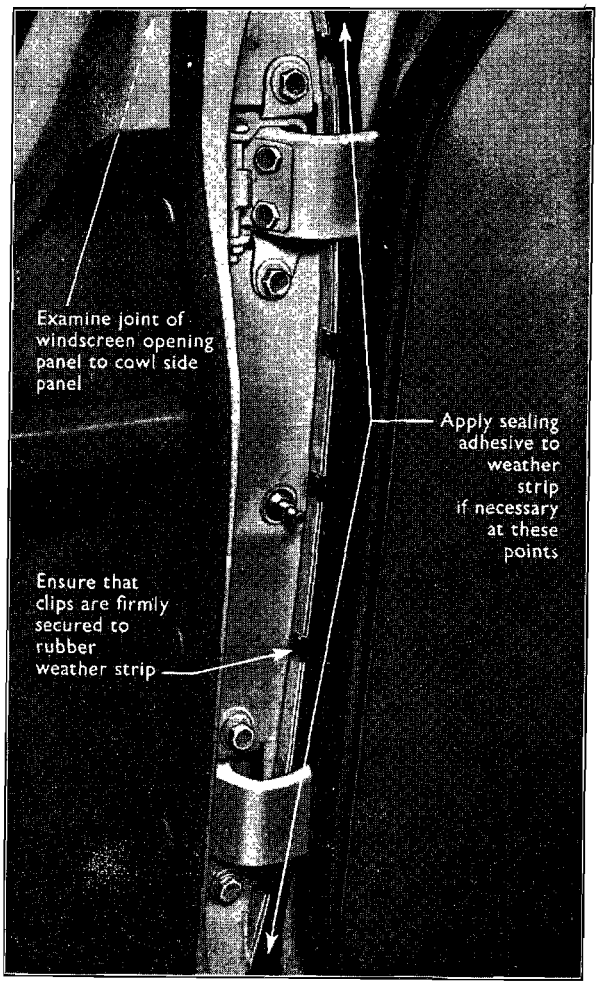
c. Leaks at other points onto the car floor.

Water dripping onto front carpet

A1. Examine the roof drain channels for leaks through the joints of the channels and roof panel. Seal along the inner and underside edge of each channel with a smooth fillet of sealer applied from a suitable gun or tube and nozzle. It is advisable to seal these joints along the entire channel lengths on both sides of the car. If it is suspected that water is entering the windscreen pillars and is finding its way down into the corners of the belt rail panel, remove the chrome mouldings on the windscreen pillars by drilling out the three rivets on each moulding. Ensure that the beads of sealer between the roof panel and channels extend to the extreme front ends.



Sealing Cowl Side (Interior)



Checking Door Pillar Weatherstrip

Examine the waterproof tape covering the flange joint of roof panel and screen opening panel and ensure that the flange is well covered, paying particular attention to the top corners. If in doubt, a small quantity of sealer type (c) can be applied.

As a further precaution, the two gas-welded joints on the windscreen pillar can also be covered with a thin film of sealer type (a), and a further check made by examining the front underside of the roof drain channels, and any breaks in the sealer film filled by application of sealer type (a).

A2. Whilst the chrome mouldings are removed, examine the seal around the windscreen weather strip and if necessary, apply a continuous bead of sealer type (c) to the inner and outer lip of the weatherstrip using a force feed oil can or sealer gun, again paying particular attention to the top corners. Clean any surplus sealer from the glass and rubber immediately.

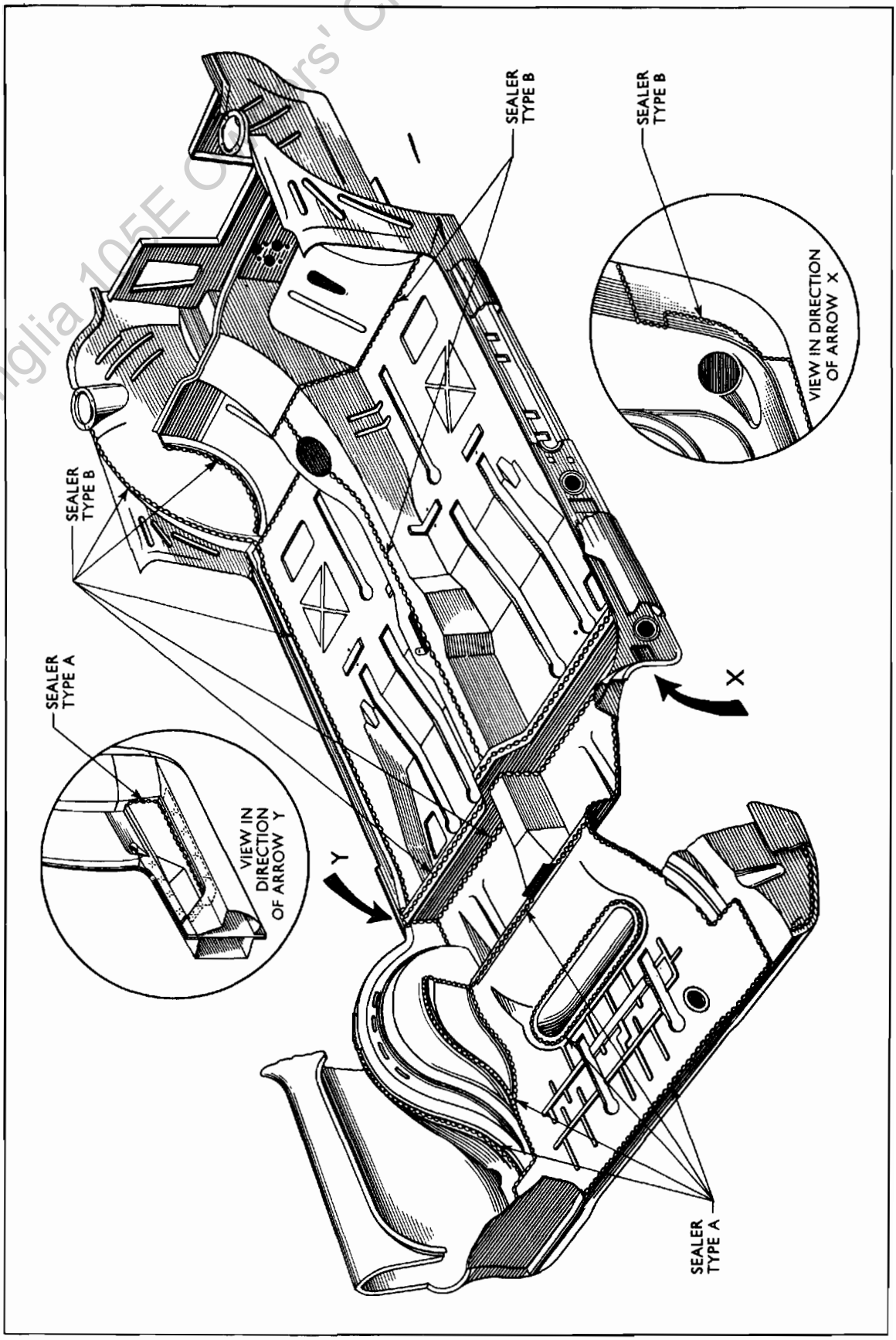
From inside the car, examine the joints between the windscreen opening panel to the cowl side panel, and the windscreen opening panel to the dash panel. If necessary, apply a fillet of sealer type (b).

A3. In some cases, a water leak may occur at the windscreen wiper grommet below the windscreen. Remove the wiper blades and arms, chrome nuts, rubber grommets and wiper motor. Renew the rubber grommets if necessary and seal the front face of the aperture before refitting the nuts, arms and blades. When replacing the blades, adjust them so that they rest on the glass when in the parked position and not on the windscreen weather strip.

A4. If water is running down the door pillar face after test, check that the rubber weather-strips around the doors are in good condition and that there is a good joint between the rubber on the pillar and the door weather strip when the door is shut. This can be checked by pressing a piece of paper over the weather strip closing the door and attempting to pull out the paper. If the paper is nipped, this indicates that a satisfactory seal is being made. If the seal is unsatisfactory, check that the door is aligned correctly and then, if necessary, pack out the weather strip with slivers of rubber between it and the door. If the weather strip is correctly cemented it should withstand an outward pull of approx. 2.72 kg. (6 lbs.) which can easily be measured with a spring scale, attached to a suitable toothed clip which will grip the weather strip.

Apply sealing adhesive between the rubber weather strip and the front body pillar and check that the five securing clips are in position, and are firmly holding to the flange joint.

Ensure that the front vent window rubber weather strips are in good condition and correctly located. If a gap is apparent between a window and the weather strip remove the vent window and tighten the self-locking nut on the threaded end of the lower pivot stud until the gap is eliminated but the window continues to operate without excessive friction. If at any time the plastic sheeting beneath the door trim pad is disturbed, it is essential that when replacing or renewing the sheet, care is taken when applying the adhesive so that drain holes provided on the inner door frame are not sealed off.



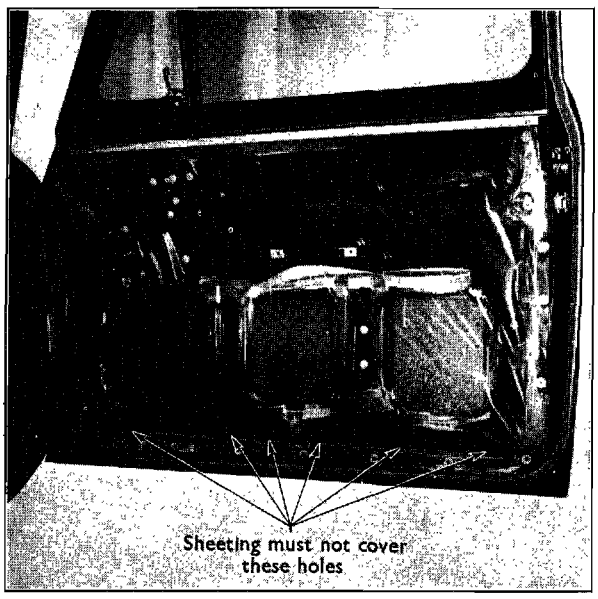
Sealing Locations on Floor Pan Assembly

Water Entry through Bulkhead and Floor Pan

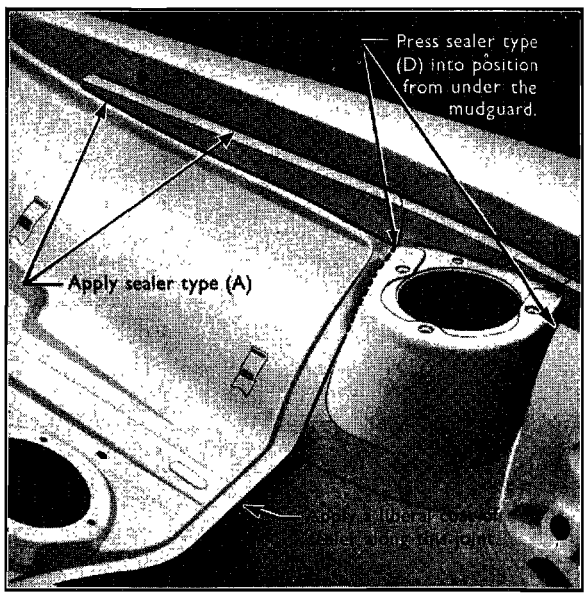
B1. Check the sealing of all bulkhead joints, and apply sealer where necessary. All locations are listed in the Table A below with recommended sealing materials.

Location	Sealer	Action
Windscreen opening panel to front mudguard panel joint.	A	Cover with a liberal coating of sealer and brush over the joint.
Windscreen opening panel to dash panel joint.	A	Apply a liberal coating of sealer along the joint.
Windscreen opening panel to front mudguard apron joint.	A	Flow sealer along the joint.
Front mudguard to cowl side and front mudguard to front mudguard apron joint.	A	Apply a continuous bead of sealer along the joint.
Front suspension unit reinforcement to side apron joint.	D	Press sealer firmly in position from underneath the mudguard.
Junction of dash panel to front mudguard apron	D	Press into position.
Hood weather strip retainer to windscreen opening panel joint.	A	Apply a continuous bead of sealer and brush in neatly.
Master cylinder bracket to dash panel joint.	A	Apply a continuous bead of sealer around the perimeter of the bracket.

Table A



Aplication of Adhesive to Door Plastic Sheeting



Sealing Locations on Dash and Bulkhead Panels

A steering column cover plate forms part of the bulkhead. Ensure that the rubber gasket is firmly secured by the cover plate; if necessary, apply sealer to the plate retaining screws.

B2 Potential points of water and dust entry through the front floor pan, with the appropriate corrective action to be taken are described on previous page.

Note:—On left-hand drive vehicles fitted with a floor dipper switch, check that the rubber boot is in good condition and correctly located; renew it necessary. If dust or water entry is still suspected from this location, seal around the joint of the dipper switch and floor pad with a suitable sealer.

B3. Check that the rubber washers are correctly positioned behind the bonnet or hood lock assembly, and if necessary, apply sealer between the front face of each washer and the engine bulkhead.

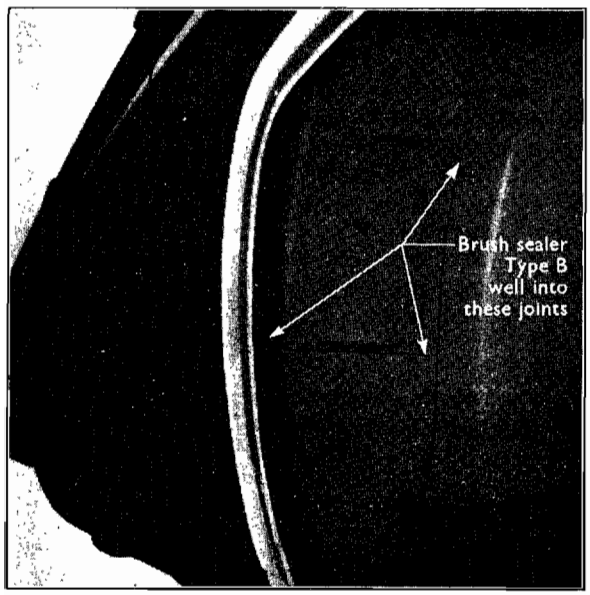
B4. The holes provided in the engine bulkhead for wires, cables, tubes, etc., should be checked to ensure that they are adequately sealed against the ingress of water and dust by the appropriate rubber grommet. If any of these holes are not used, check that the blanking plugs are inserted. Fit new plugs if any are missing and seal with an adhesive compound if loose.

B5. Ensure that the rubber covers of hand brake lever and gear change lever are securely positioned by the cover plate, and if necessary seal around the cover plate retaining screw holes.

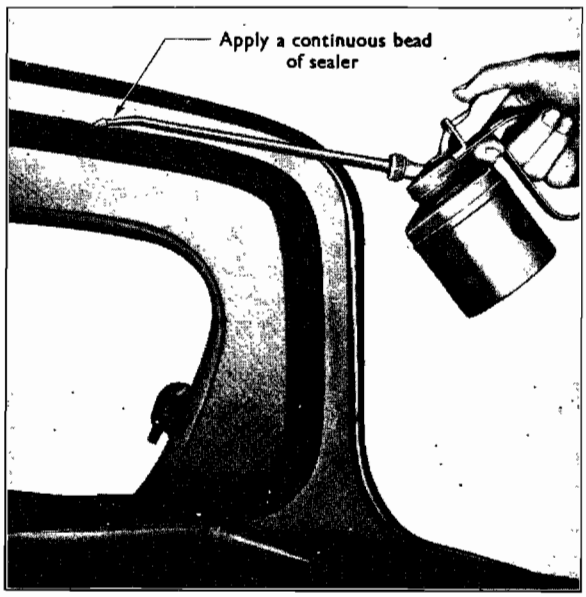
B6. If water or dust entry through the front seat mountings is suspected, remove the seat and apply a daub of sealer at each bolt location before replacing the bolts.

Leaks at other points onto the car floor

1. Check that all the blanking plugs are inserted in the paint drain holes in the floor pan. Fit new plugs if any are missing and seal with an adhesive compound if loose. (All plug and sealing locations on the underbody are illustrated at the end of this section).



Sealing Under Rear Wheel Housing



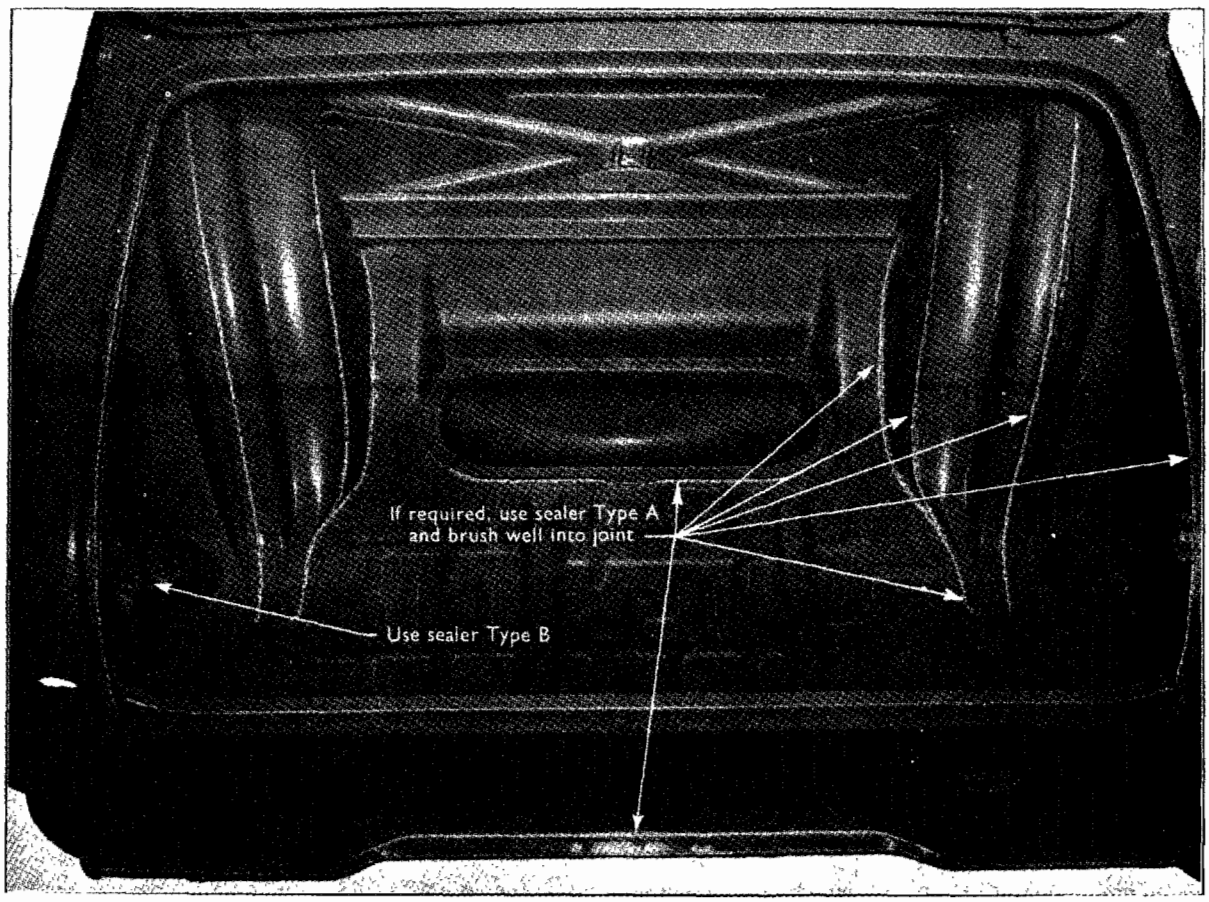
Sealing Rear Window

2. On the standard model New Anglia seal around the rear quarter window weather strips—as described for sealing around the windscreen weather strips (see A2). On the De-luxe Anglia if a leak is occurring between the weather strip and the body, the weather strip should be removed and a continuous bead of sealer applied to the weather strip groove before refitting to the aperture. If the leak is between the quarter window frame and the weather strip, the lock catch can be re-located to provide additional pressure on the weather strip sealing lip.

3. If it is suspected that water is entering the well section, forward of the rear wheel housing, examine the underside of the rear wheel housing and if any breaks in the sealer film are noticed apply a liberal coating of sealer type (b).

LEAKS INTO THE LUGGAGE COMPARTMENT

1. Seal around the rear window weather strip as described for sealing around the windscreen weather strip. Carefully ease the chrome mouldings from around the rear window a and examine the plastic sealer tape covering the flange of rear window aperture and rear quarter panel. Check that the luggage compartment lid weather strips are securely cemented to the lid, and are seating securely on the drain channel edges when the lid is closed. If necessary, re-cement the weather strips with sealing adhesive, ensuring that the weather strip is securely fitted at the junction of the upper and lower strips.



Sealer Locations in Luggage Compartment

Check that the channels are clear of excess sealer; if water is leaking through the spot welded joints of the channel, apply a small fillet of sealer along the inside of the channel, taking care not to obstruct the flow of water. Later production vehicles have a drilled hole in the luggage compartment lid reinforcement, and if water is found to be present within the framework a 3/16 in. hole should be drilled in the reinforcement.

If the above checks do not cure water leaks at this location, inspect for distortion of the luggage compartment lid and drain channel edges. If necessary, lift the weather strip along the upper edge of the lid and insert a packing strip between the lid flange and the rubber to increase the compression of the weather strip when the lid is shut. Cement the rubber with sealing adhesive. Check the sealing of all luggage compartment body joints, and apply sealer when necessary. All locations are listed in Table B with recommended sealing materials.

Dust Entry

The problem of dust entry raises additional problems, since a body sealed effectively against water entry is not necessarily proof against dust. It should be remembered that

Location	Sealer	Action
Quarter panel to drain trough joint	A	Apply a bead of sealer and carefully brush into the joint.
Rear lamp reinforcement to rear quarter panel joint.	A	Apply a bead of sealer and carefully smooth off.
Rear lamp reinforcement and back panel joint	A	Apply a bead of sealer and carefully smooth off.
Rear quarter panel to rear back panel joint.	A	Flow a bead of sealer into the joint.
Spare wheel well to boot compartment floor joint.	A	Apply sealer liberally.
Rear wheel house inner panel to rear floor panel joint.	A	Apply sealer liberally and brush smooth.
Back panel lower to rear floor pan joint.	A	Flow a bead of sealer around the joint from inside the boot compartment.
Inner and outer rear wheel housing joint.	A	Apply sealer and brush into the joint.
Outer wheel house to rear quarter panel joint.	B	Inject a liberal quantity of sealer between these two panels.
Reinforcement panel to front end of rear wheel housing joint.	B	Apply sealer liberally from the underside of the rear quarter panel

Table B

the forward motion of a car creates a slight vacuum or depression within the body, particularly if a window or ventilator is open. Any small crevice in the body will permit air to enter carrying dust with it. This dust may seep into the hollow box section rocker panels, which extend along the edge of the floor below the door panels, and accumulate there. Dust may then find its way into the box sections of the rear passenger compartment and luggage compartment.

When investigating a complaint of dust entry, a careful examination to reveal the point of entry should be carried out. As explained above, the point of entry can sometimes be deceptive, because dust may enter at one point then follow the passages formed by box members and make itself apparent at another point. As previously stated for water leaks, it will be necessary to remove the front carpet, cowl side trim panels, rear seat cushions and to lift the underfelt around the edges and panel joints before making any checks. It may again be an advantage to use a strong light on the outside of each joint and inspect from the inside of the car.

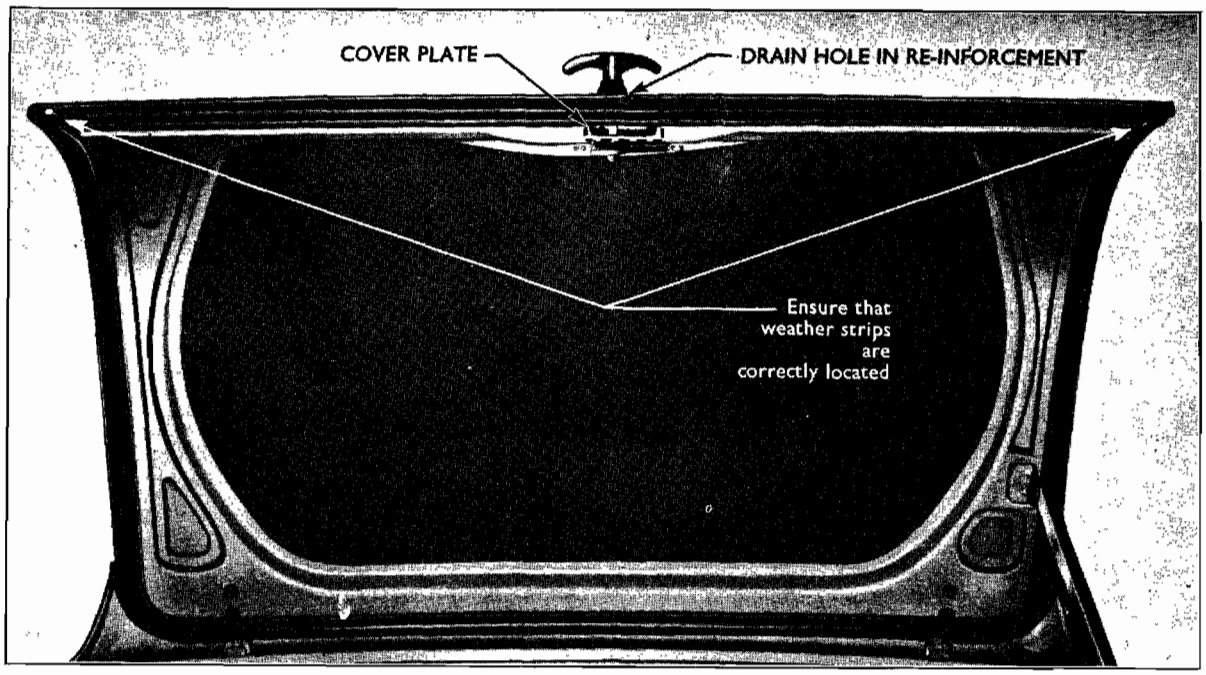
1. Badly fitting trim windcords, or windcords that have deteriorated may allow dust entry into the car interior, particularly below the waistline, and it is thus necessary to check the condition of these items and renew if necessary.

2. Ensure that the polyurethene packings fitted over the trim clips on rear quarter panel lower trims are correctly fitted.

3. A polyurethene packing is also fitted to the drain holes on door frames and a careful examination should be made and if necessary the packings renewed.

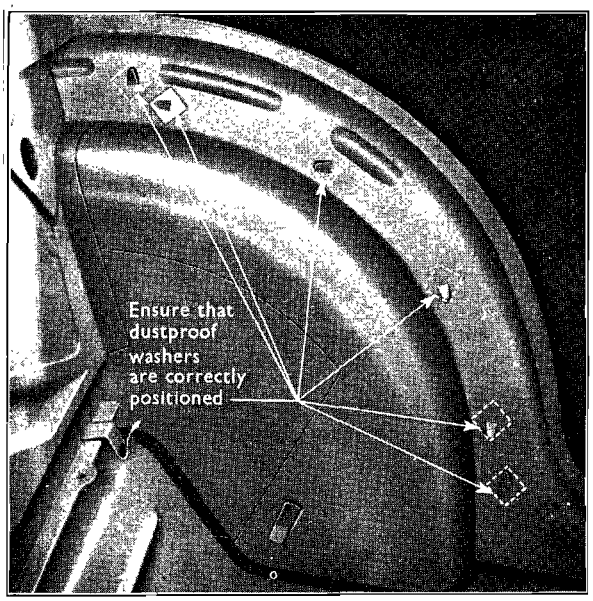
4. On later production models, a cover plate part No. E2854/AA/1 secured by two self-tapping screws has been incorporated on the luggage compartment lid, to cover the lock assembly, and can be fitted to earlier production cars if dust is found to be entering at this point.

5. If dust is found to be entering at the fuel tank neck grommet, apply a filler of sealer type (a) around the perimeter of the rubber seal to floor pan.

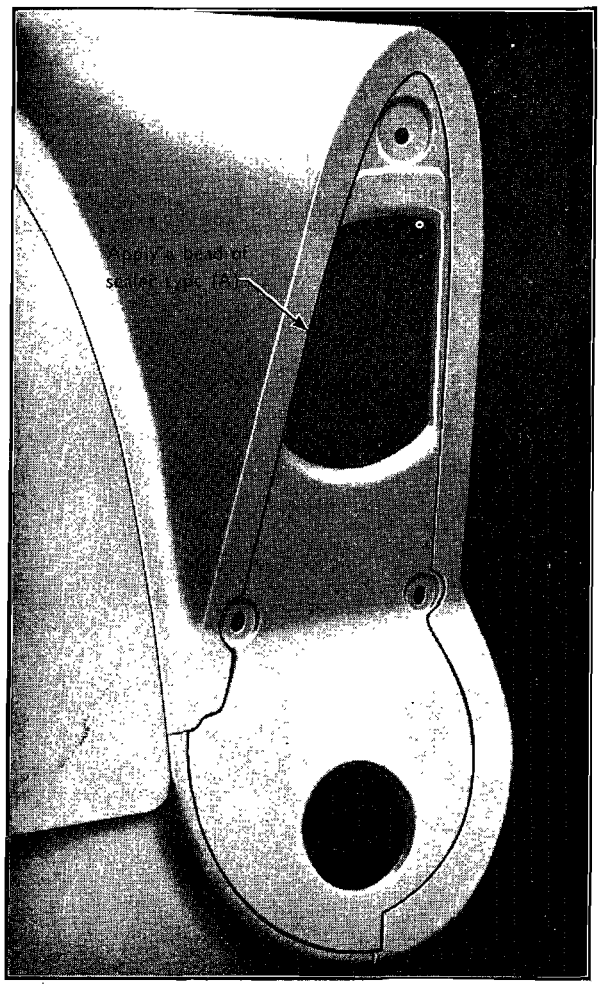


Luggage Compartment Lid and Lock Cover Plate

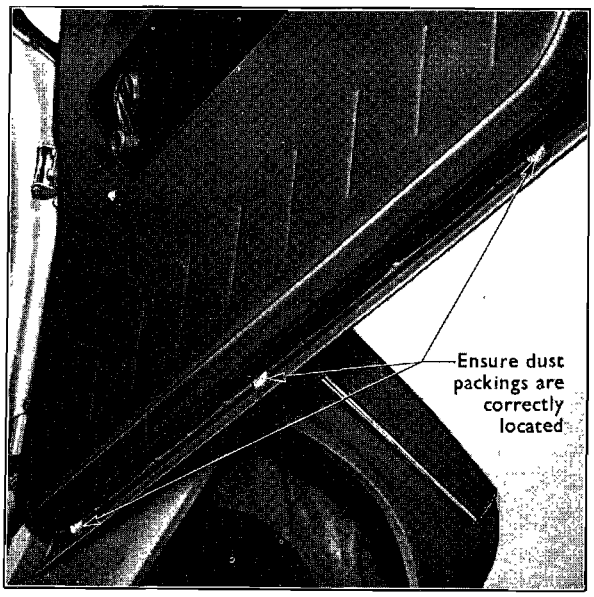
Note:—In territories with low rainfall and excessively dusty conditions, it may be an advantage to seal the holes provided in the rocker panels for water drainage, in order to prevent dust entry. **However, it must be appreciated that the advantages which these drain holes provide, in respect of water drainage, are then eliminated and it would be advisable under these circumstances, to remove this sealing periodically, or after washing the vehicle, to ensure that no water is trapped within these members.**



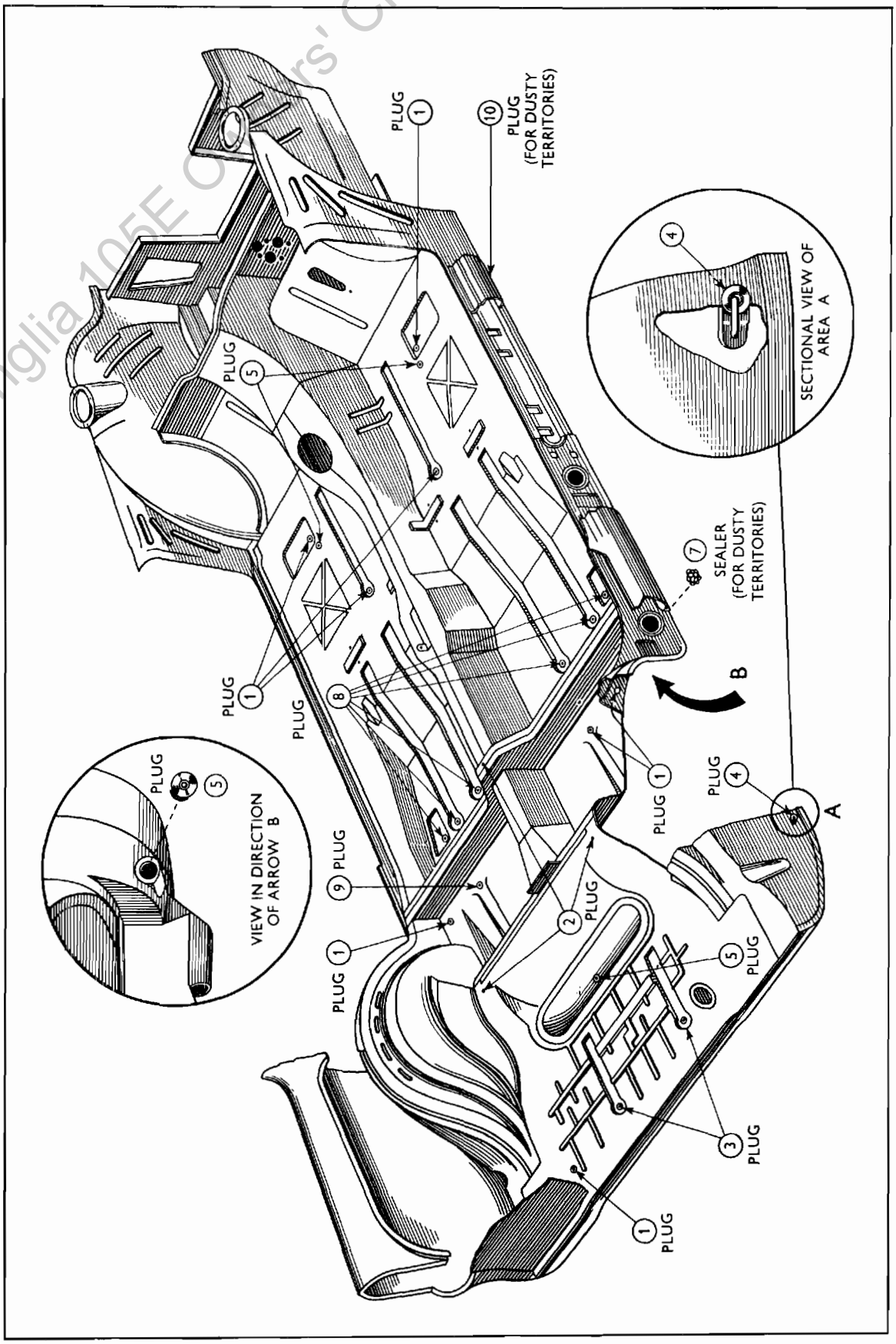
Dustproof Packings on Rear Quarter Panel Trim



Sealing a Rear Lamp Reinforcement



Dust Packing Fitted to Drain Holes in Door Frame



Location of Plugs, etc., positioned in Floor Pan Assembly

METRIC EQUIVALENTS (IN DIMENSIONAL SEQUENCE)

Inches	*Centimetres*	*Inches*	*Centimetres*	*Inches*	*Centimetres*
$\frac{1}{64}$	0.04	$11\frac{31}{32}$ to $12\frac{1}{32}$	30.40 to 30.56	$37\frac{11}{64}$ to $37\frac{23}{64}$	94.42 to 94.89
$\frac{1}{32}$	0.08	$12\frac{5}{32}$ to $12\frac{5}{16}$	30.87 to 31.27	$37\frac{3}{8}$	94.93
$\frac{3}{32}$ in 18	0.23 in 45.72	$16\frac{5}{64}$	40.64	$39\frac{9}{64}$	99.42
$\frac{19}{64}$	0.75	$16\frac{1}{8}$	40.96	$40\frac{17}{32}$	102.95
$1\frac{1}{8}$	2.86	$16\frac{3}{4}$	42.54	$40\frac{29}{32}$	103.90
$4\frac{3}{8}$ to $4\frac{29}{64}$	11.11 to 11.31	$21\frac{25}{32}$ to $21\frac{27}{32}$	55.32 to 55.48	$43\frac{33}{64}$ to $43\frac{41}{64}$	110.53 to 110.85
$4\frac{59}{64}$ to $4\frac{63}{64}$	12.50 to 12.66	$22\frac{7}{16}$ to $22\frac{15}{32}$	56.99 to 57.07	$44\frac{23}{64}$	112.67
$5\frac{15}{16}$ to 6	15.08 to 15.24	$23\frac{63}{64}$ to $24\frac{1}{64}$	60.92 to 61.00	$57\frac{11}{32}$	145.65
$6\frac{53}{64}$ to $6\frac{57}{64}$	17.34 to 17.50	$25\frac{19}{64}$ to $25\frac{23}{64}$	64.25 to 64.41	$68\frac{35}{64}$ to $68\frac{23}{32}$	174.11 to 174.55
7	17.78	$29\frac{5}{64}$ to $29\frac{13}{64}$	73.86 to 74.17	$90\frac{1}{2}$	229.87
8	20.32	32	81.28	$141\frac{35}{64}$	359.53
$8\frac{13}{16}$ to $8\frac{7}{8}$	22.38 to 22.54	$32\frac{15}{32}$ to $32\frac{1}{2}$	82.37 to 82.55	$144\frac{25}{32}$	367.74
$9\frac{7}{32}$ to $9\frac{1}{4}$	23.41 to 23.49	$36\frac{5}{32}$	91.84		
$11\frac{59}{64}$ to $11\frac{15}{16}$	30.28 to 30.32	$36\frac{31}{32}$ to $37\frac{1}{2}$	93.90 to 94.06		

13
LUBRICATION AND MAINTENANCE

SERVICING INTERVALS

First Service: 1,000 Km (500 Miles) Second Service: 4,000 Km (2,500 Miles) continuing at 4,000 Km (2,500 Miles) intervals.

LUBRICANTS AND FLUIDS

FRONT WHEEL BEARINGS		Lithium base grease EMIC-3
BRAKE FLUID RESERVOIR ...		ME-3833-F
STEERING GEAR		S.A.E. 90 E.P. gear oil
REAR AXLE		S.A.E. 90 Hypoid oil
ENGINE ...	Up to -18°C (0°F)	5W/20 or 5W/30
	-18°C to 0°C (0°F to 32°F)	10W, 10W/30 or 10W/40
	0°C to 32°C (32°F to 90°F)	20W/20, 20W/30, 10W/30, 10W/40, 20W/40 or 20W/50
	Over 32°C (90°F)	40, 20W/40 or 20W/50
GEARBOX		S.A.E. 80 Gear Oil
GENERATOR		Engine Oil
DISTRIBUTOR		Engine oil and lithium base grease
GENERAL		Lithium base grease – EMIC-3 with 1% molybdenum disulphide
ANTI-FREEZE		Ford Antifreeze Plus Part No. M97B18-C in 50% solution

Approved Lubricants

Multigrade oil is used in production for the engine for "initial fill" and this oil should not normally be changed until the first 5,000 miles (8,000 km.) have been completed. The tabulated list of engine and transmission oils is divided into four categories.

"Category A"

Lubricants which carry official Ford of Britain approval, are available readily throughout the United Kingdom and are manufactured by a company supplying Ford of Britain with lubricants for production use. Lubricants in this category are listed in all Domestic Editions of Owner Handbooks, Ford Service Voucher Books and similar publications.

"Category B"

Lubricants which carry official Ford of Britain approval, are available throughout the United Kingdom, but are not manufactured by a supplier to Ford of Britain.

"Category C"

Lubricants which carry a qualified Ford of Britain approval by meeting all technical requirements, but not necessarily being generally available throughout the United Kingdom.

"Category D"

Lubricants which carry a qualified Ford of Britain approval by meeting all technical requirements but being available only in European territories excluding the United Kingdom.

It does not follow that the lubricants listed under Categories A and B (C is not applicable to this model range at present) will be necessarily marketed in any Export territory or, if available, under the same brand name. However, to enable you to obtain lubricants of the same specification the appropriate Ford Specification Numbers are also quoted on the following pages. In any case, temperature variations in individual territories could involve a change of viscosity rating of the lubricant concerned.

All the approved engine and transmission lubricants tabulated are miscible and compatible with one another but if, for instance, an S.A.E. 10W engine oil were added to one of S.A.E. 10W/30 type then the viscosity rating of the latter would be affected according to the percentage of dilution.

APPROVED LUBRICANTS

Manufacturer	Engine	Gearbox	Rear Axle
Ford Specification	ESE–M2C96A ESE–M2C26 ESE–M2C101–A ESE–M2C27–A	ME–568–D	EM–2C–22 EM–2C–29
"Category A"			
Amoco (U.K.) Ltd.	Super Permalube or Permalube 20W/20	American Multi-Purpose Gear Lubricant SAE 80	American Multi-Purpose Gear Lubricant SAE 90
B.P. (Shell-Mex & B.P. Ltd.)	B.P. Super Visco-Static or B.P. Energol SAE 20W	B.P. Gear Oil SAE 80 EP	B.P. Gear Oil SAE 90 EP
Castrol Ltd.	Castrolite	Castrol Hypoy Light	Castrol Hypoy
Alexander Duckham Ltd.	Duckham's Q5500 or Duckham's Nol Twenty	Duckham's Nol EP 80	Duckham's Hypoid 90
Esso Petroleum Ltd.	Esso Extra Motor Oil	Esso Gear Oil GP 80	Esso Gear Oil GP 90/140
Mobil Oil Co. Ltd.	Mobiloil Special or Mobiloil Arctic	Mobilube GX 80	Mobilube GX 90
Petrolfina (Great Britain) Ltd.	Fina Multigrade Motor Oil 10W/30	Fina Pontonic MP, SAE 80	Fina Pontonic MP, SAE 90
Regent Oil Co. Ltd.	Regent Havoline Motor Oil 10W/30 or Regent Havoline Motor Oil 20/20W	Regent Multi-Gear Lubricant E.P. 80	Regent Multi-Gear Lubricant E.P. 90
Shell (Shell-Mex & B.P. Ltd.)	Shell Super Motor Oil or Shell X-100 20W	Shell Spirax 80 EP	Shell Spirax 90 EP
"Category B"			
British Oil & Turpentine Corporation Ltd.	Speedwell Ten-thirty Multigrade or Speedwell Hyduty 20/20W Motor Oil	Speedwell Hyduty Hypoid 80	Speedwell Hyduty Hypoid 90
Filtrate Ltd.	Filtrate 10W/30 Multigrade or Filtrate Zero 20/20W	Filtrate EP 80	Filtrate EP Gear Oil 90
Germ Lubricants Ltd.	Hilo 10W/30 or Germol Delta 20W/30	Germ Gear Oil AP 80	Germ Gear Oil AP 90
Morris & Co. (Shrewsbury) Ltd.	Golden Film Multivis 10W/30 or Golden Film Supreme 20/20W	Golden Film EP 80	Golden Film EP 90
Sternol Ltd.	Sternol Multigrade 10W/30 or Sternol WW 20W	Ambroleum EP 80	Ambroleum EP 90
"Category D"			
B. V. Aral	Aral Super Motor Oil 10W/30	–	–

Service Schedule

Daily and Weekly Attention

Check engine oil level—Daily
Check radiator level—Daily
Check battery electrolyte level—Weekly
Check levels of brake and clutch fluid reservoirs—Weekly
Correct tyre pressures if necessary—Weekly
Check operation of all lights—Weekly

At the first 800 km. (500 miles)

Check engine oil level
Check gearbox oil level
Check rear axle oil level
Check clutch adjustment at operating cylinder
Check rear spring 'U' bolts
Check for oil and water leaks
Check steering box oil level
Check levels of brake and clutch fluid reservoirs
Check battery electrolyte levels and connections
Check tightness of cylinder head, sump and manifold bolts
Check valve clearances and adjust if necessary
Check fan belt adjustment and tightness of generator mounting bolts
Clean fuel pump sediment bowl and filter screen
Examine and adjust distributor contact breaker points
Adjust carburettor slow running and ignition
Check front wheel bearing adjustment
Adjust brakes if necessary
Check tightness of wheel nuts
Check front wheel toe-in
Lubricate all grease gun and oil can points
Top up radiator and windscreen washer (where fitted)
Check door operation and adjust striker plate (if necessary)
Check controls and instruments, operation of lights and align if necessary

Every 4,000 km. (2,500 miles)

Check engine oil level
Check gearbox oil level
Check rear axle oil level
Check steering box oil level
Check levels of brake and clutch fluid reservoirs
Lubricate all grease gun points
Check fan belt adjustment
Check clutch adjustment at operating cylinder
Lubricate throttle linkage trunnions
Top up battery
Top up radiator and windshield washer (where fitted)
Check seat belts for security and wear

Every 8,000 km. (5,000 miles)

Change engine oil and filter
Check gearbox oil level (change oil at FIRST 5,000 MILES ONLY)
Check rear axle oil level
Lubricate grease gun points
Check clutch adjustment at operating cylinder
Check rear spring 'U' bolts
Spray rear springs
Check steering box oil level
Check levels of brake and clutch fluid reservoirs
Check battery electrolyte level and connections
Lubricate generator rear bearing
Lubricate throttle linkage trunnions
Lubricate distributor
Lubricate door and luggage compartment locks and lock cylinders
Adjust or renew contact breaker points if necessary
Check valve clearances and adjust if necessary
Clean fuel pump sediment bowl and filter
Check fan belt adjustment
Clean and adjust sparking plugs
Clean oil filler cap
Clean air cleaner
Adjust carburettor slow running
Adjust ignition
Check front and rear brake shoes
Clean repack and adjust front wheel bearings
Adjust brakes if necessary
Check brake hoses for signs of leaks or chafing
Check front wheel toe-in
Reposition road wheels if required
Top up radiator and windshield washer (where fitted)
Top up front suspension units and rear shock absorbers (where applicable)
Correct tyre pressures if necessary
Check operation of lights (align if necessary), controls, instruments, etc.
Check seat belts for security and wear

Every 16,000 km. (10,000 miles)

Renew paper air cleaner element (when applicable)

Every 64,000 km. (40,000 miles) or 3 years (whichever occurs first)

Discuss with your Authorised Dealer the advisability of renewing all brake seals, hydraulic fluid and flexible brake hoses.

14
SPECIFICATIONS, SERVICING AND REPAIR DATA

SPECIFICATIONS

ENGINE (1,000 c.c.)

Type...	4-cylinder in line overhead valve type
Bore....	80.97 mm. (3.1878 in.)
Stroke	48.412 mm. (1.906 in.)
Cubic Capacity...	996.6 c.c. (60.84 cu.in.)
Compression Ratio	8.9 : 1 Standard. For Premium Grade Fuel.
	8.0 : 1 Optional (September 1963 onwards). For Regular Grade Fuel. (Export only)
	7.5 : 1 Optional (Prior to September 1963). For Regular Grade Fuel. (Export only)
Cylinder Head	Detachable cast-iron type. Fully machined combustion chambers.
Valves	Vertical overhead type, push rod operated.
Valve Clearance	0.254 mm. (0.010 in.) inlet. 0.432 mm. (0.017 in.) exhaust Normal running temperature
Firing Order	1, 2, 4, 3.
Max. Brake Horse Power (Nett) ...	39 at 5,000 R.P.M. (8.9 C.R.). 37 at 5,000 R.P.M. (7.5 C.R.).
Maximum Torque	52.85 lb. ft. at 2,700 R.P.M. (8.9 C.R.). 50.43 lb. ft. at 2,700 R.P.M. (7.5 C.R.).

ENGINE (1,200 c.c.)

Type...	4-cylinder in line overhead valve type.
Bore...	80.97 mm. (3.1878 in.)
Stroke	58.17 mm. (2.29 in.)
Cubic Capacity...	1,198 c.c. (73.09 cu. in.)
Compression Ratio	8.7 : 1 Standard. For Premium Grade Fuel 7.3 : 1 Optional. For Regular Grade Fuel. (Export only)
Cylinder Head	Detachable cast-iron type. Fully machined combustion chambers.
Valves	Vertical overhead type, push rod operated.
Valve Clearance	0.254 mm. (0.010 in.) inlet. 0.432 mm. (0.017 in.) exhaust. At normal running temperature
Firing Order	1, 2, 4, 3.
Max. Brake Horse Power (Nett) ...	48.5 at 4,800 R.P.M. (8.7 C.R.) 46 at 4,800 R.P.M. (7.3 C.R.)
Max. Torque	63 lb. ft. at 2,700 R.P.M. (8.7 C.R.). 60 lb. ft. at 2,700 R.P.M. (7.3 C.R.).

LUBRICATION

Lubrication System	Pressure feed by external oil pump with combined filter head.
Sump Capacity including filter	2.56 litres (4½ Imperial pints). Prior to approximately November 1964. 3.12 litres (5½ Imperial pints). After approximately November 1964.

Lubricant (See also Page 20)	Temperature Range	S.A.E, Viscosity No.
	Under −23°C (−10°F)	5W/20
	−23°C to −7°C (−10°F to +20°F)	10W/30
	−7°C to 30°C (+20°F to +90°F)	20W/20, 10W/30
	Over 30°C (+90°F)	20W/40 or 30

COOLING SYSTEM

Type...	Pressurised thermo-syphon, impeller assisted circulation.
Thermostat: Prior to Jan. '63	Bellows type in cylinder head water outlet.
Thermostat: After Jan. '63	Wax type in cylinder head water outlet.
Radiator Pressure Cap ...	0.492 kg./sq. cm. (7 lb./sq.in.) – (997 c.c. engine) 0.703 kg/sq.cm. (10 lb/sq. in.) – (1198 c.c. engine)
Capacity without heater ...	5.82 litres (10¼ Imperial pints).
Capacity with heater ...	6.39 litres (11¼ Imperial pints).
Fan	2 Blade 22.82 cm. (9 in. diam.) Driven by single "V" belt at crankshaft speed.

FUEL SYSTEM

Petrol Tank Location ...	Under luggage boot floor at rear.
Fuel	Premium Grade (Standard Cylinder Head). Regular Grade (Low Compression Cylinder Head).
Capacity	31.82 litres (7 Imperial gallons).
Carburettor	Downdraught type

Jet Sizes (1,000 c.c. engine)	Prior to Jan. 60	After Jan. 60	After May 62
Main Jet	115	115	97.5
Main Air Correction Jet	175	175	160
Economiser Jet...	140	140	–
Economiser Air Correction Jet...	195	195	–
Idling Jet	50	40	50
Idling Air Correction Jet	120	150	–
Starter Jet	125	125	–
Choke Tube	22 mm.	22 mm.	21.5 mm.
Needle Valve	–	–	1.3
Idling air bleed (fixed)	–	–	0.85
Accelerator pump jet	–	–	45
Jet Sizes (1,200 c.c. engine)			
Main Jet	–	110	–
Air correction jet	–	200	–
Accelerator pump jet	–	40	–
Idling air bleed (fixed)	–	60	–
Idling jet	–	50	–
Economy jet	–	65	–
Econostat air jet (fixed drilling)	–	130	–
Econostat petrol jet (fixed drilling)	–	80	–
Choke tube	–	23 mm.	–
Needle valve	–	1.6 mm.	–

IGNITION SYSTEM

Type...	Coil and distributor automatic control by distributor governor weight mechanism combined with vacuum control from induction manifold.
Initial Advance (1,000 c.c. engines)	10° (crankshaft) High Compression. 8° (crankshaft) Low Compression (After September, 1963). 10° (crankshaft) Low Compression (Prior to September, 1963).
Initial Advance (1,200 c.c. engines)	6° (crankshaft) High Compression. 10° (crankshaft) Low Compression (After February, 1965). 6° (crankshaft) Low Compression (Prior to February, 1965).
Spark Plugs	14 mm. Autolite AG32.
Gap	0.584 mm. (0.023 in.)
Contact Breaker Gap ...	(Models prior to 1st Jan., 1966) 0.356 to 0.406 mm. (0.014 to 0.016 in.).
Contact Breaker Gap ...	(Models subsequent to 1st Jan., 1966 fitted with Ford distributor) 0.64 mm. (0.025 in.)

CLUTCH

Type	Dry single plate, hydraulic release.
Friction Area	279 sq. cm. (43.28 sq. in.)
Diameter	184.15 mm. (7¼ in.)

GEARBOX

Type (1,000 c.c. engine) ...	Four-speed constant mesh, helical gears on all speeds except first and reverse. Manual control central gear lever. Synchromesh on 2nd, 3rd and 4th.
Type (1,200 c.c. engine) ...	Four-speed, constant mesh, helical gears with synchromesh on all forward speeds. Manual control central gear lever.
Oil Capacity	0.99 litres (1¾ pints).
Lubricant	S.A.E. 80 E.P. gear oil.

GEAR RATIOS

	Gearbox	Overall	
(1,000 c.c. engine)		4.125 : 1 axle ratio	4.440 : 1 axle ratio
First...	4.118 : 1	16.987 : 1	18.300 : 1
Second	2.396 : 1	9.884 : 1	10.648 : 1
Third	1.412 : 1	5.825 : 1	6.275 : 1
Top	1.000 : 1	4.125 : 1	4.440 : 1
Reverse	5.404 : 1	22.292 : 1	24.015 : 1

	Gearbox	Overall	
(1,200 c.c. engine)		4.125 : 1 axle ratio	4.440 : 1 axle ratio
First	3.543 : 1	14.615 : 1	15.745 : 1
Second	2.396 : 1	9.884 : 1	10.648 : 1
Third	1.412 : 1	5.825 : 1	6.275 : 1
Top	1.000 : 1	4.125 : 1	4.440 : 1
Reverse	3.963 : 1	16.347 : 1	17.612 : 1

REAR AXLE

Type...	Semi-floating, hypoid.
Oil Capacity	1.13 litres (2 Imperial pints)
Lubricant...	Use an approved brand of S.A.E. 90 hypoid oil in the summer and winter, temperatures above – 10°F. (See page 20). In winter, temperatures below – 10°F., use an approved brand of S.A.E. 80 hypoid oil.
Ratio	4.125 : 1 Standard Optional 4.440 : 1 Standard

STEERING GEAR

Type...	Worm and Nut Re-circulatory Ball.
Ratio	14 : 1
Steering Wheel Diameter ...	40.6 cm. (16 in.)
Turning Circle	9.75 m. (32 ft. 0 in.)
Oil Capacity	0.28 litres (½ Imperial pint)
Lubricant...	Use an approved brand of S.A.E. 90 E.P. gear oil in summer and winter.

BRAKES

Type...	Hydraulic two-leading shoe on front. Handbrake, cable and rod operates through independent linkage to rear wheels only.
1,000 c.c. engine:	
Drums	20.32 cm. (8 in.) diameter.
Linings—Front and Rear	19.51 cm. (7.68 in.) x 3.18 cm. (1.25 in.)
Total Area	495 sq. cm. (76.80 sq. in.)
1,200 c.c. engine:	
Drums	20.32 cm. (8 in.) diameter.
Linings—Front	15.88 cm. (6.26 in.) x 4.45 cm. (1.75 in.)
Rear	15.88 cm. (6.26 in.) x 3.8 cm. (1.5 in.)
Total Area	526.7 sq. cm. (81.68 sq. in.)

WHEELS AND TYRES

Type of wheel	Pressed disc with wide base rims.
Tyres—Type	Tubeless
Saloon	Size: 5.20-13, 4 ply.
Pressures—Front and Rear	1.54 kg./sq.cm. (22 lb./sq. in.)
Estate	5.60-13, 6 ply.
Pressures—Front	1.687 kg./sq.cm. (24 lb./sq. in.)
Rear	2.109 kg./sq.cm. (30 lb./sq. in.)

FRONT SUSPENSION

Type...	Independent, coil spring suspension, embodying built-in, double-acting hydraulic shock absorbers.	
Deflection Rate	14.15 kg./cm. (80 lb./in.)	
Castor	1° 30′ to 3° 0′	
Camber...	0° 30′ to 2° 0′	
Toe-in	3.175 to 4.76 mm. (1/8 in. to 3/16 in.)	Car
Toe-out on 20° turns ...	1° 36′ to 3° 6′	Unladen
King-pin Inclination... ...	4° 45′ to 6° 15′	
Track	116.8 cm. (46 in.)	

REAR SUSPENSION

Type...	Longitudinal, asymmetrical semi-elliptic.
Saloon:	
Number of Leaves ...	5
Estate:	
Number of Leaves ...	7

ELECTRICAL SYSTEM

Battery	Lead acid 12-volt, 9 plates per cell, 38 ampere hour (51 A.H. Special Equipment) capacity at 20 hour rate. Positive terminal earthed.
Generator...	Two-brush type with separate compensated voltage control regulator. Ratio to engine speed 1 to 1.5.
Starter Motor Ratio	12.2 to 1.

Bulbs—Quantity and Description

	Voltage	Wattage
2 Headlight Bulbs	12	50/40
2 Side Light and Front Direction-Indicator Bulbs ...	12	21/6
2 Rear and Stop Light Bulbs	12	21/6
2 Rear Direction Indicator Bulbs	12	21
1 Interior Lamp Bulb	12	3
1 Rear Number Plate Bulb	12	6
1 Instrument Panel Bulb	12	2.2
2 Direction Indicator Warning Light Bulbs	12	2.2
1 Generator Warning Light Bulb	12	2.2
1 Oil Pressure Warning Light Bulb	12	2.2
1 Headlight Beam Warning Light Bulb	12	2.2

VEHICLE IDENTIFICATION NUMBER (November 1961 onwards)

Stamped around the front suspension unit upper mounting on the right-hand mudguard, and on the identification plate mounted on the right-hand side of the engine compartment, at the front.

CHASSIS NUMBER (Prior to November, 1961)

Location	Stamped around the front suspension unit upper mounting on the right-hand mudguard.

WEIGHTS AND DIMENSIONS

	Saloon	Estate
Wheel base	230 cm. (7 ft. 6½ in.)	230 cm. (7 ft. 6½ in.)
Overall Length	390 cm. (12 ft. 9½ in.)	392 cm. (12 ft. 10¼ in.)
Overall Width	145 cm. (4 ft. 9 1/8 in.)	145 cm. (4 ft. 9 1/8 in.)
Overall Height (unladen) ...	144 cm. (4 ft. 8 5/8 in.)	146 cm. (4 ft. 9½ in.)
Ground Clearance	16.3 cm. (6½ in.)	17 cm. (6¾ in.)
Kerb Weight:	1,000 c.c. engine	1,200 c.c. engine
Anglia Saloon—Standard	741.1 kg. (1,634 lb.)	755.3 kg. (1,665 lb.)
De Luxe	746.1 kg. (1,645 lb.)	760.2 kg. (1,676 lb.)
Super	764.3 kg. (1,685 lb.)	—
Anglia Estate—Standard	804.7 kg. (1,774 lb.)	818.7 kg. (1,805 lb.)
De Luxe	815.1 kg. (1.797 lb.)	829.1 kg. (1,828 lb.)

15

SPECIAL TOOLS

GENERAL DESCRIPTION

This Workshop Manual contains repair and overhaul procedures which, in some cases, require the use of special service tools to ensure the completion of a satisfactory and economical repair.

The purpose of this section is to list all essential tools of this kind numerically within sections.

Enquiries regarding the supply of these tools should be directed to:—

U.K.

V. L. Churchill and Co. Ltd.,
London Road,
Daventry,
Northants.

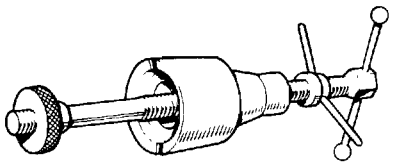
Overseas Locations

Room 1/330,
Ford Motor Company Limited,
Warley,
Brentwood,
Essex,
England.

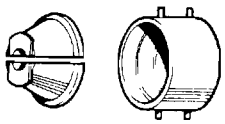
or through local Churchill Tool Distributors.

1. HUBS AND DRUMS

PT 1024 Front Hub Bearing Cup Remover/ Replacer (Main Tool)



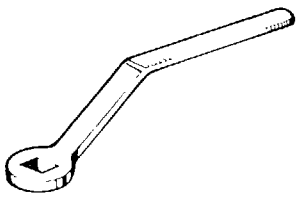
P 1024-7 Front Hub Bearing Cup Remover/ Replacer (Adaptor)



2. BRAKES

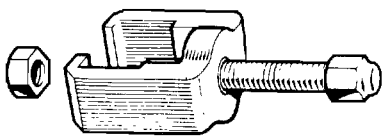
CP 2006 Brake Bleeder Tubes

P 2010A Brake Adjusting Wrench

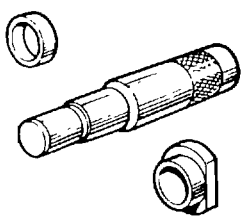


3. STEERING GEAR

P 3041C Drop Arm Remover

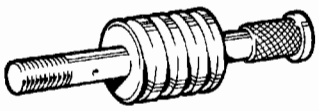


P 3066 Rocker Shaft Bush Remover

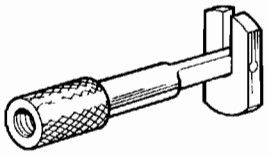


4. REAR AXLE

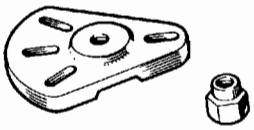
PT 3072 Slide Hammer (Main Tool)



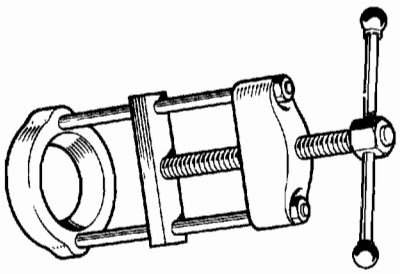
P 3072-3 Rear Axle Shaft Oil Seal Remover



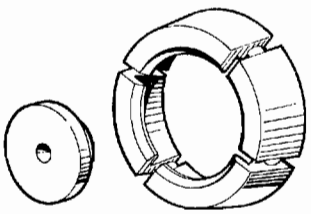
P 3072-4A Rear Axle Shaft Remover/Replacer



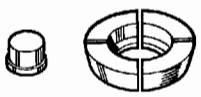
CP 4000 Hand Press (Main Tool)



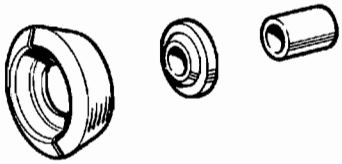
P 4000-3A Main Drive Bearing Remover



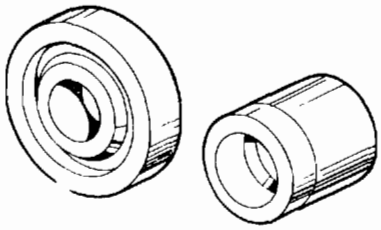
P 4000-27A Differential Bearing Cone Remover



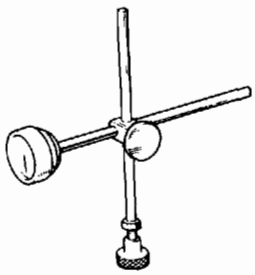
P 4000-28 Pinion Bearing Cone Remover/ Replacer



P 4000-31A Mainshaft Bearing and Hub Remover/ Replacer (Adaptor)

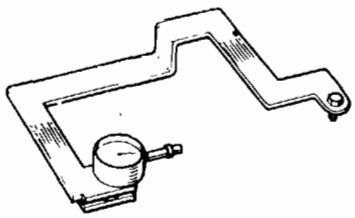


P 4008 Crownwheel Pinion Backlash Gauge

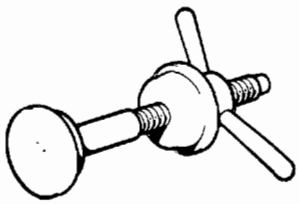


P 4008-1 Crownwheel Pinion Backlash Gauge (Adaptor)

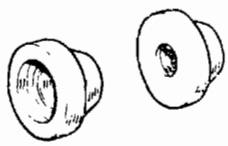
P 4009 Differential Bearing Preload Gauge



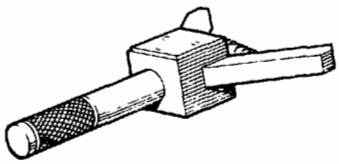
P 4013A Drive Pinion Bearing Cup and Oil Seal Replacer (Main Tool)

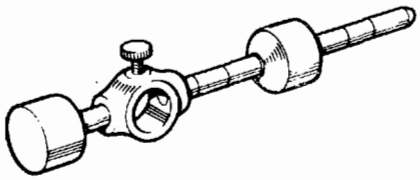
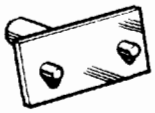
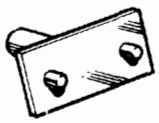
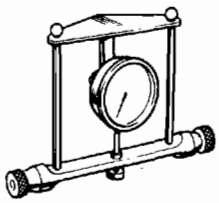
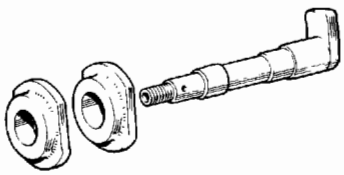
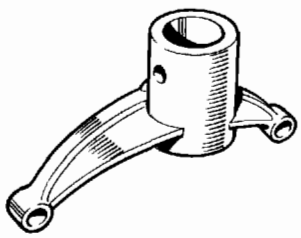
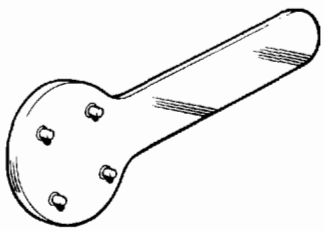


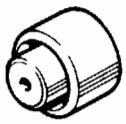
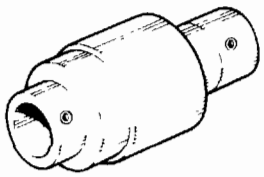
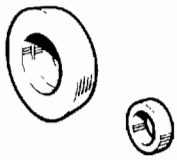
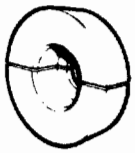
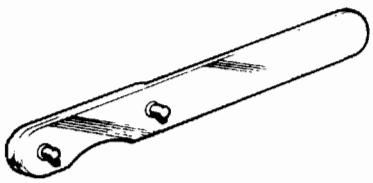
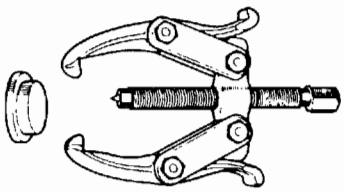
P 4013-3 Drive Pinion Bearing Cup and Oil Seal Replacer (Adaptor)



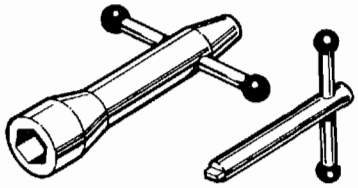
P 4015A Drive Pinion Bearing Cups Remover



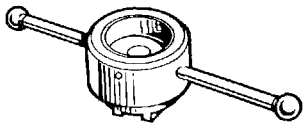
CP 4030	Drive Pinion Bearing Pre-load Gauge	
P 4030-1	Drive Pinion Bearing Pre-load Gauge (Adaptor)	
P 4030-4	Pre-load Gauge (Adaptor)	
P 4075	Drive Pinion Depth Gauge (Main Tool)	
P 4075-4	Drive Pinion Depth Gauge (Adaptor)	
P 4077A	Differential Carrier Bracket	
P 4079	Differential Bearing Adjusting Nut Wrench	

P 4080	Differential Bearing Cone Replacer	
P 4084	Spring Indicator for Press	
P 4090-2	Axle Shaft Bearing and Retainer Replacer	
P 4090-6	Axle Shaft Bearing Retainer Remover (Adaptor)	
P 4097	Flange Holding Wrench	
CP 4111A	Differential Bearing Cone Remover	

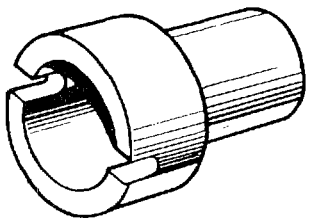
5. SUSPENSION

P 5016	Front Suspension Unit Upper Bearing Locknut Wrench	

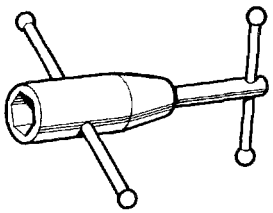
P 5017A Front Suspension Unit Upper Guide Seat Wrench



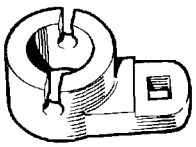
P 5017-1 Front Suspension Unit Guide Seat Wrench Torque Adaptor



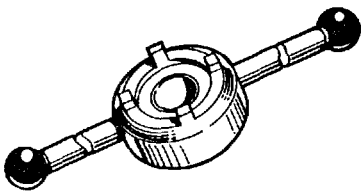
P 5025 Front Suspension Unit Thrust Bearing Locknut Wrench



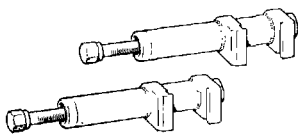
P 5026 Front Suspension Unit Torque Wrench (Adaptor)



P 5032 Upper Guide Seat Wrench

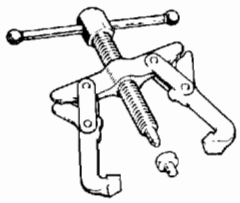


P 5045 Coil Spring Adjustable Restrainers

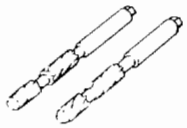


6. ENGINE

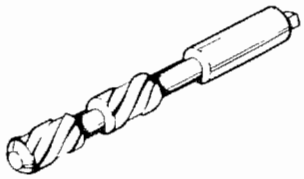
CP 6041 Crankshaft Pulley Remover



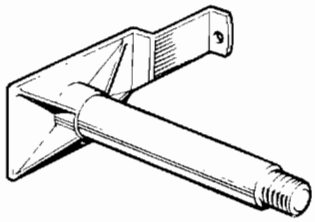
P 6056-015 Valve Guide Reamer



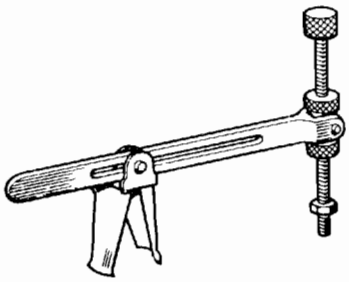
P 6056-030 Valve Guide Reamer



P 6107 Engine Bracket



P6118A Valve Spring Compressor (Main Tool)

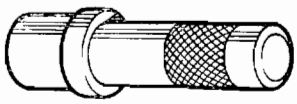


P 6118-3A Valve Spring Compressor (Adaptor)

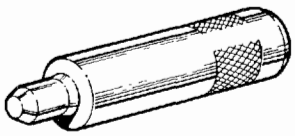
CP 6161 Crankshaft Front Cover Remover/ Replacer

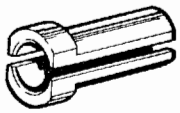
7. CLUTCH/GEARBOX

P 7038 Transmission Extension Bearing Remover/Replacer

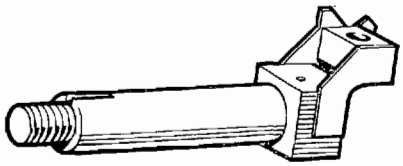


P 7041 Transmission Extension Bearing Remover/Replacer



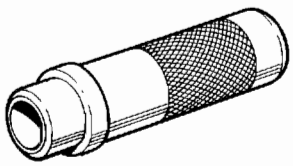


P 7089 Gearbox Bracket

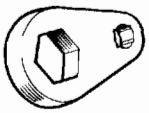


P 7090 Dummy Countershaft

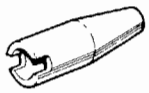
P 7095 Transmission Mainshaft Oil Seal Replacer



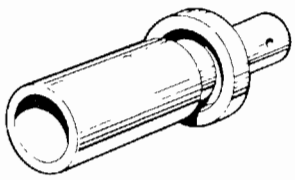
CP 7098 Mainshaft Nut Wrench



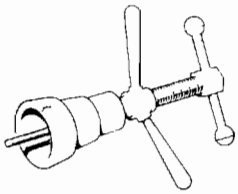
P 7116B Gear Selector Oil Seal Protector



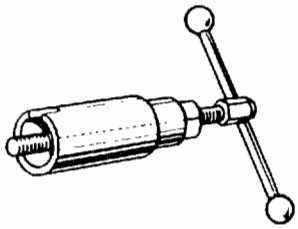
P 7118 Main Drive Gear Oil Seal Replacer



P 7600-B Flywheel Bearing Remover

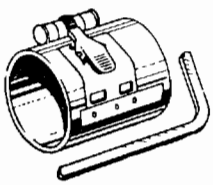


P 7657-4 Mainshaft Oil Seal Remover

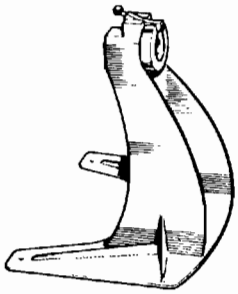


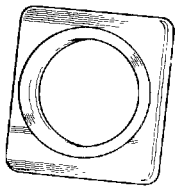
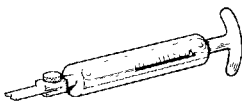
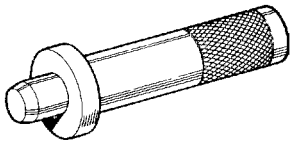
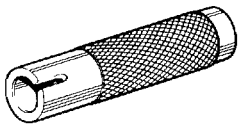
GENERAL TOOLS

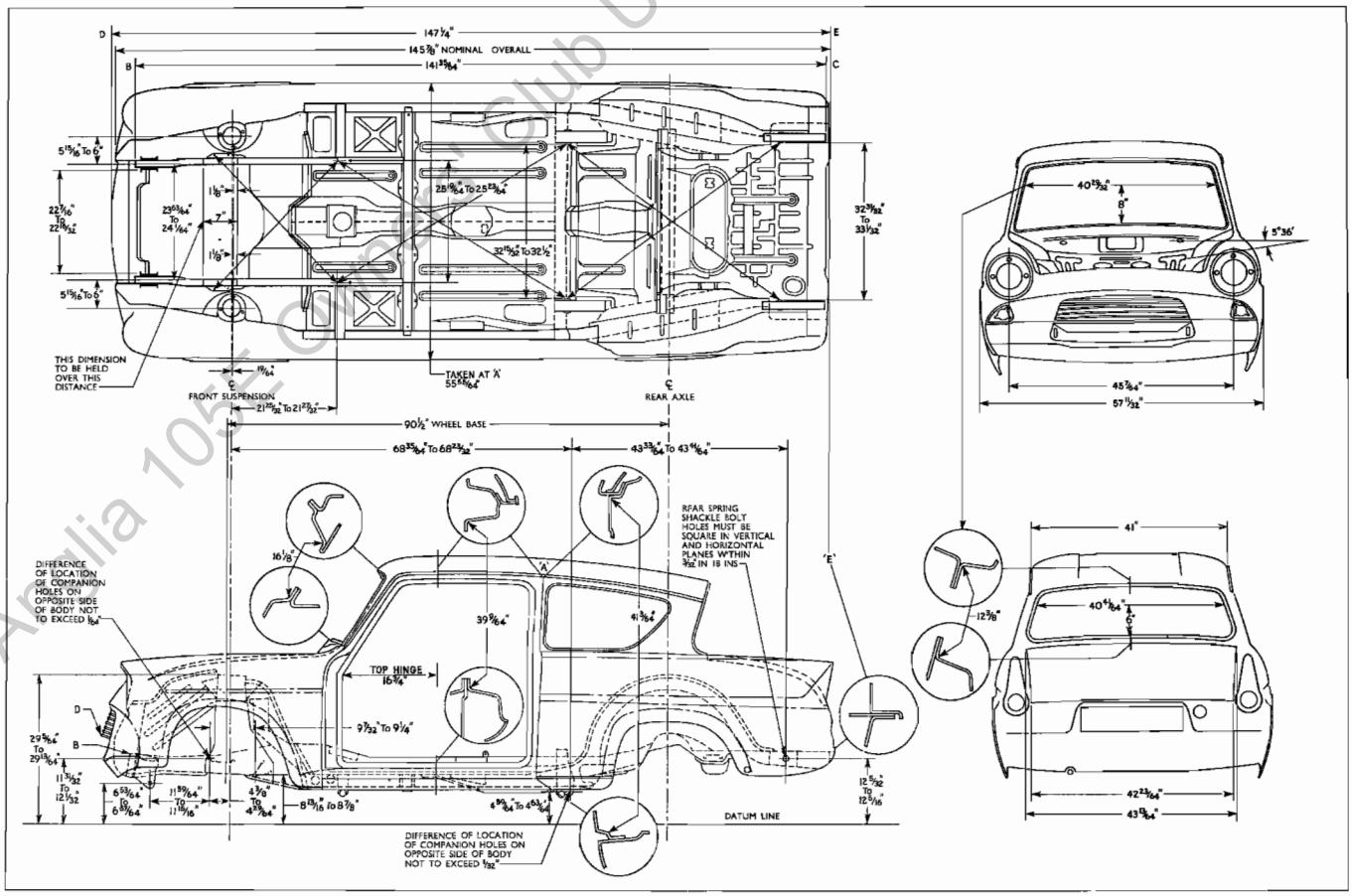
3803 Piston Ring Compressor



200B Engine Stand



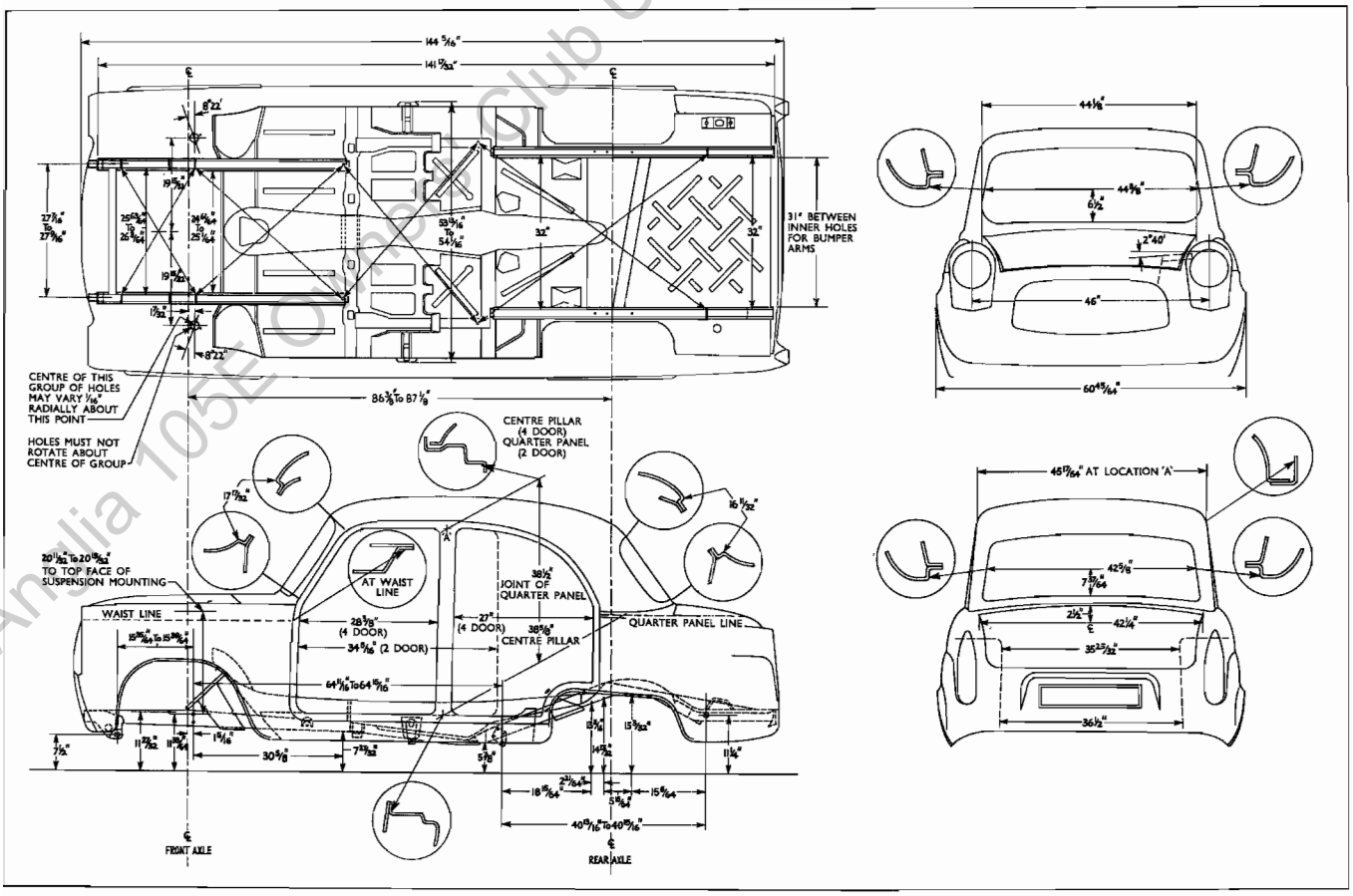
370	Unuversal Taper Base	
512	Piston Pull Scale	
550	Oil Seal Driver Handle	
575	Light Universal Handle	



Body Tolerance Chart—Anglia (1959 onwards)

METRIC EQUIVALENTS (IN DIMENSIONAL SEQUENCE)

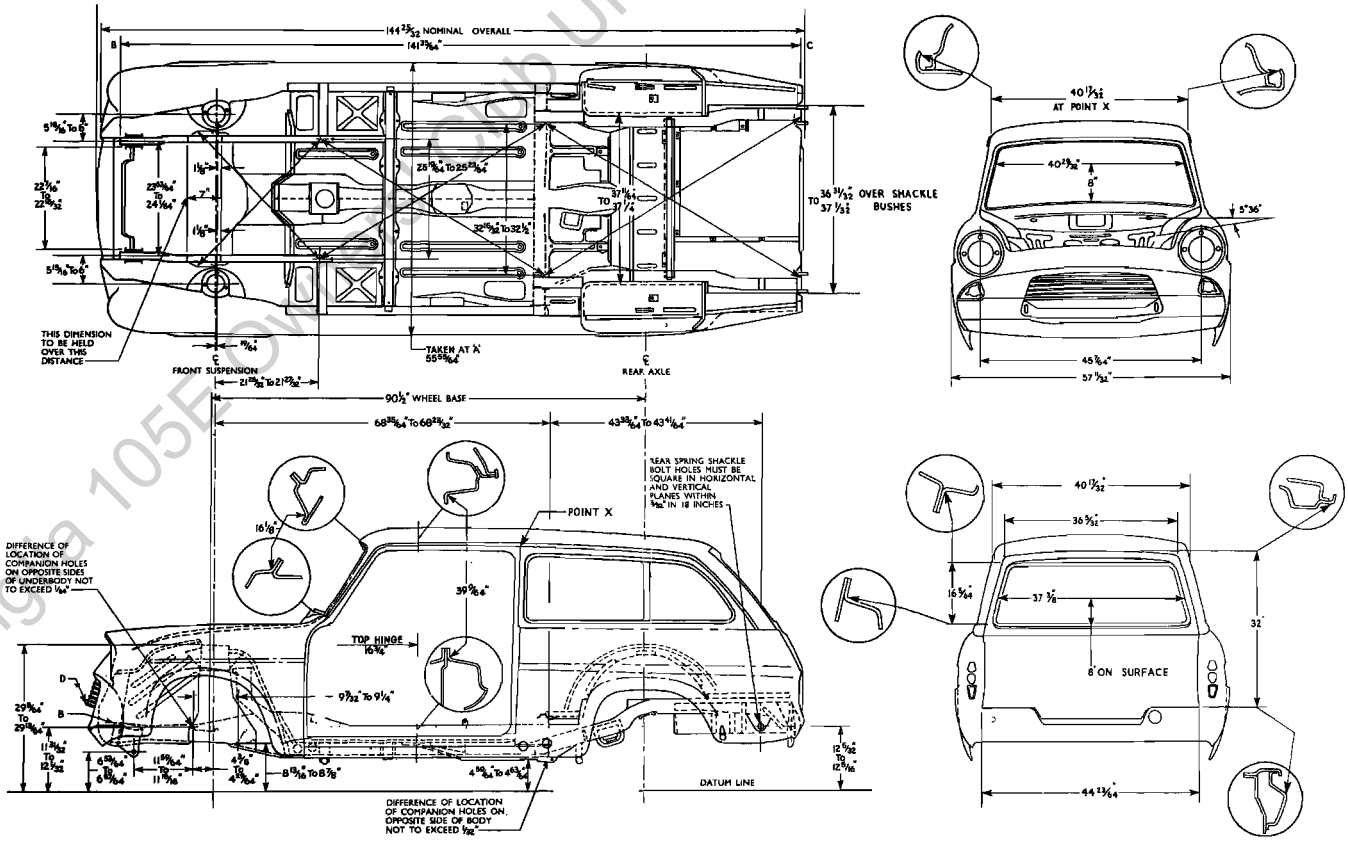
Inches	*Centimetres*	*Inches*	*Centimetres*	*Inches*	*Centimetres*
1/64	0.04	11 31/32 to 12 1/32	30.40 to 30.56	41	104.14
1/32	0.079	12 5/16 to 12 3/8	30.88 to 31.28	41 3/64	104.26
3/32 in 18	0.238 in 45.72	12 1/2	31.43	42 23/64	107.59
1/32	0.754	16 1/8	40.96	43 1/32	109.73
1 1/8	2.86	16 3/4	42.55	43 29/64 to 43 31/64	110.53 to 110.85
4 3/8 to 4 33/64	11.11 to 11.31	21 49/64 to 21 55/64	55.32 to 55.48	45 7/64	114.58
4 49/64 to 4 53/64	12.50 to 12.66	22 7/16 to 22 15/32	56.99 to 57.07	55 49/64	141.88
5 1/16 to 6	15.08 to 15.24	23 49/64 to 24 1/64	60.92 to 61.00	57 11/32	145.65
6	15.24	25 13/64 to 25 29/64	64.25 to 64.41	68 43/64 to 68 53/64	174.11 to 174.55
6 53/64 to 6 57/64	17.34 to 17.50	29 1/64 to 29 13/64	73.86 to 74.18	90 1/8	229.87
7	17.78	32 15/64 to 32 1/8	82.47 to 82.55	141 33/64	359.53
8	20.32	32 13/64 to 33 1/2	83.74 to 83.89	145 3/4	370.52
8 13/16 to 8 7/8	22.38 to 22.54	39 3/64	99.42	147 1/4	374.02
9 7/32 to 9 1/4	23.42 to 23.49	40 51/64	103.23		
11 53/64 to 11 59/64	30.28 to 30.32	40 53/64	103.9		



Body Tolerance Chart—Anglia and Prefect (1953-1959) Popular (1959 onwards)

METRIC EQUIVALENTS (IN DIMENSIONAL SEQUENCE)

Inches	*Centimetres*	*Inches*	*Centimetres*	*Inches*	*Centimetres*
1/16	0.159	15 25/64	38.34	36 1/2	92.71
1 7/64	3.09	15 33/64 to 15 49/64	39.49 to 39.65	38 1/2	97.79
1 5/16	3.33	16 11/32	41.51	38 5/8	98.11
2 23/64	5.91	17 17/32	44.53	40 13/16 to 40 15/16	103.66 to 103.98
2 1/4	6.35	18 13/32	46.31	42 1/4	107.31
5 21/64	13.29	19 29/64	49.45	42 5/8	108.27
5 7/8	14.92	20 11/64 to 20 15/16	51.67 to 51.99	44 1/16	112.08
6 1/2	16.51	24 51/64 to 25 1/64	63.38 to 63.54	44 3/8	112.71
7 1/2	19.05	25 33/64 to 26 5/64	66.00 to 66.16	45 17/64	114.97
7 37/64	19.25	27	68.58	46	116.84
7 51/64	19.92	27 7/16 to 27 9/16	69.69 to 70.01	53 13/16 to 54 1/16	136.68 to 137.32
11 1/2	28.57	28 3/8	72.07	60 49/64	154.18
11 33/64	29.25	30 5/8	77.79	64 11/16 to 64 15/16	164.31 to 164.94
11 57/64	30.08	31	78.74	86 3/8 to 87 1/8	244.79 to 246.70
13 11/16	34.77	32	81.28	141 47/64	359.49
14 17/32	36.91	34 1/16	87.15	144 1/16	366.55
15 1/64	38.30	35 49/64	90.88		



Body Tolerance Chart (Estate Car)

METRIC EQUIVALENTS (IN DIMENSIONAL SEQUENCE)

Inches	*Centimetres*	*Inches*	*Centimetres*	*Inches*	*Centimetres*
1/64	0.04	11 31/32 to 12 5/16	30.40 to 30.56	37 11/32 to 37 13/32	94.42 to 94.89
1/32	0.08	12 7/16 to 12 1/8	30.87 to 31.27	37 1/2	94.93
3/32 in 18	0.23 in 45.72	16 5/64	40.64	39 5/64	99.42
1/64	0.75	16 1/8	40.96	40 17/32	102.95
1 1/8	2.86	16 3/4	42.54	40 29/32	103.90
4 3/8 to 4 7/16	11.11 to 11.31	21 29/32 to 21 31/32	55.32 to 55.48	43 7/16 to 43 1/64	110.53 to 110.85
4 7/16 to 4 1/2	12.50 to 12.66	22 7/16 to 22 15/16	56.99 to 57.07	44 1/64	112.67
5 15/16 to 6	15.08 to 15.24	23 7/16 to 24 1/64	60.92 to 61.00	57 1/16	145.65
6 7/16 to 6 1/32	17.34 to 17.50	25 1/16 to 25 1/8	64.25 to 64.41	68 7/16 to 68 1/32	174.11 to 174.55
7	17.78	29 5/64 to 29 1/16	73.86 to 74.17	90 1/2	229.87
8	20.32	32	81.28	141 3/32	359.53
8 1/16 to 8 5/16	22.38 to 22.54	32 1/16 to 32 1/8	82.37 to 82.55	144 3/16	367.74
9 3/64 to 9 1/4	23.41 to 23.49	36 5/32	91.84		
11 3/32 to 11 1/16	30.28 to 30.32	36 31/32 to 37 1/4	93.90 to 94.06		

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