SECTION J

THE STEERING GEAR

●●

Section J.1

STEERING-WHEEL

Removal

Early models

(1) Disconnect the battery.

(2) Withdraw the grub screw in the wheel hub and lift up the horn switch.

1968 *models*

(3) Carefully prise off the wheel hub centre cover.

(4) Unscrew the wheel retaining nut and pull off the wheel.

Refitting

Reverse the above removing instructions. Tighten the nut to the recommended torque (see **'GENERAL DATA'**).

Section J.2

STEERING-COLUMN

Removing

(1) Disconnect the flasher switch and horn wiring connectors located below the parcel shelf.

(2) Remove the bolt from the lower column clamp/steering rack pinion shaft.

(3) Remove the column upper support clamp bolt.

(4) Mark the fitted position of the outer column with the upper support bracket.

(5) Pull the column assembly upwards and out of the car.

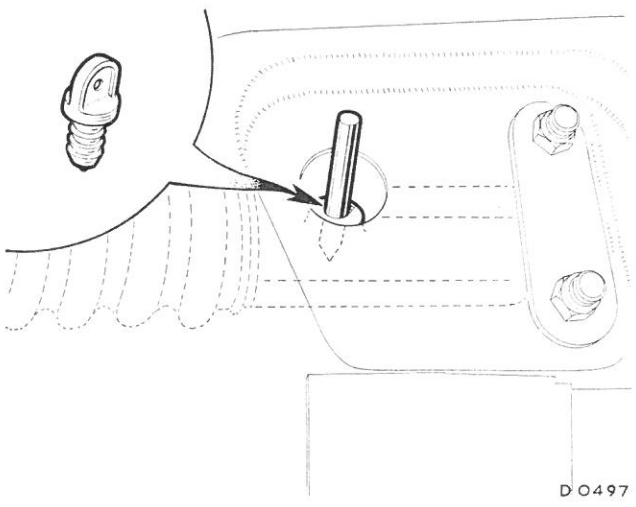

Fig. J.1

Using a locator pin to centralize the rack, with (inset) the plastic plug

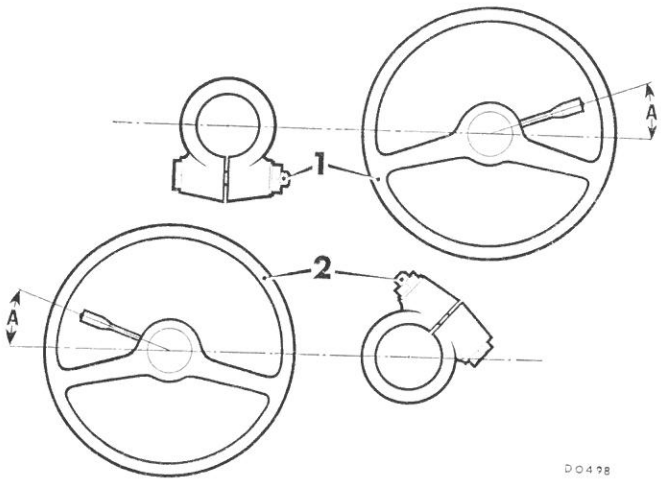

Fig. J.2

The position of the clamp bolt and direction indicator lever, A=20°

1. Right-hand-drive models. 2. Left-hand-drive models.

Dismantling

(6) Remove the steering-wheel as described in Section J.1.

(7) Remove both halves of the column cowl.

(8) Remove the flasher indicator switch and screw out the cancelling stud from the column.

(9) *Early models.* Remove the horn connection slip-ring assembly.

(10) Withdraw the inner column from the lower end of the outer column tube.

(11) Extract the upper and lower bushes from the outer column tube.

Inspection

(12) Check the inner column alignment and rectify if required to ensure that when rotated, the upper bearing face must not exceed $\frac{1}{8}$ in. (3 mm.) run-out.

(13) Examine the upper and lower felt bushes and use replacements if necessary. Cylindrical polythene upper replacement bushes are now fitted to all later models.

Reassembly

(14) Soak the lower felt bush in oil.

(15) Lubricate the polythene bush with a graphite-based grease and insert it fully into the upper end of the outer column tube.

(16) Insert the inner column into the outer column, and at the same time roll the lower felt bush around its fitted position on the inner column until both joint faces butt together, then carefully enter the assembly into the outer column.

(17) Reverse the removal procedure for the other components.

(18) Before refitting the assembly to the car ensure that the inner column turns freely (see instruction (12)).

Refitting

●(19) Slacken the rack 'U' bolts to allow the rack pinion to align with the column.

(20) Slacken the column fascia bracket bolts to allow sideways movement.

(21) Align the road wheels to the straight-ahead position and refit the assembly to the car.

(22) *Early models.* Engage the marked spline of the pinion shaft with the split portion of the inner column clamp. Push down the assembly until the clamp bolt can be easily inserted. The clamp must be positioned as follows:
Left-hand-drive. The clamping bolt axis must be above the steering-column at an angle of 16° to the rack housing.
Right-hand-drive. The clamping bolt axis must be below and parallel to the rack axis.
Tighten the clamping bolt to the correct torque figure (see **'GENERAL DATA'**).

(23) 1968 *models.* Pull out the plastic plug from the rack casing and insert a locator pin, i.e. a $\frac{1}{4}$ in. (6 mm.) diameter bolt approximately 2 in. (50 mm.) long into the hole. Centralize the rack until the locator pin fully engages in the rack shaft to lock the centralized assembly in position (see Fig. J.1).

(24) 1968 *models.* Refit the column onto the pinion with the clamp bolt positioned as shown in Fig. J.2, and tighten to the torque figure given in **'GENERAL DATA'.**

(25) Lift the column and insert the clip into the support bracket, moving the bracket to meet the clip and **not** vice versa, so that the column remains free of load. Tighten the bracket to fascia rail securing bolts.

(26) Refit and adjust the indicator trip stud until the combined measurement of the column and the stud is between 1·176 and 1·195 in. (29·87 and 30·35 mm.). Ensure that the longitudinal head of the stud is parallel to the column and tighten the locknut. Tighten the column clip to the fascia bracket.

(27) Ensure that the outer column and direction indicator lever is positioned as shown in Fig. J.2, i.e. with the indicator trip stud exactly between the two cancelling mechanisms of the switch.

(28) Tighten each of the rack 'U' bolts nuts as a pair, turning each nut alternately a half-turn at a time until secure.

(29) 1968 *models.* Remove the locator pin and refit the plastic plug.

(30) The remainder is a reversal of the removing procedure.

Section J.3

●STEERING RACK ASSEMBLY

The rack fitted to the 1968 models is not inter-changeable as a unit or as individual components with those racks fitted to earlier vehicles. Together with the new rack, modified steering levers are fitted and combine to provide the vehicle with a smaller turning circle. Correct wheel alignment is vitally important (see Section J.4).

Removing

(1) Remove the air cleaner.

(2) Slacken the column clamp bolt.

(3) Remove the nut, bolt, and spring washer securing the column to the pinion shaft.

(4) Mark the lower edge of the column shroud at the clamp bracket so that they can be refitted in line.

(5) Pull the column upwards to free it from the pinion shaft.

(6) Jack up the front sub-frame and remove the wheels and dampers. Remove the rack ball end retaining nuts and release the ball ends with Service tool 18G 1063.

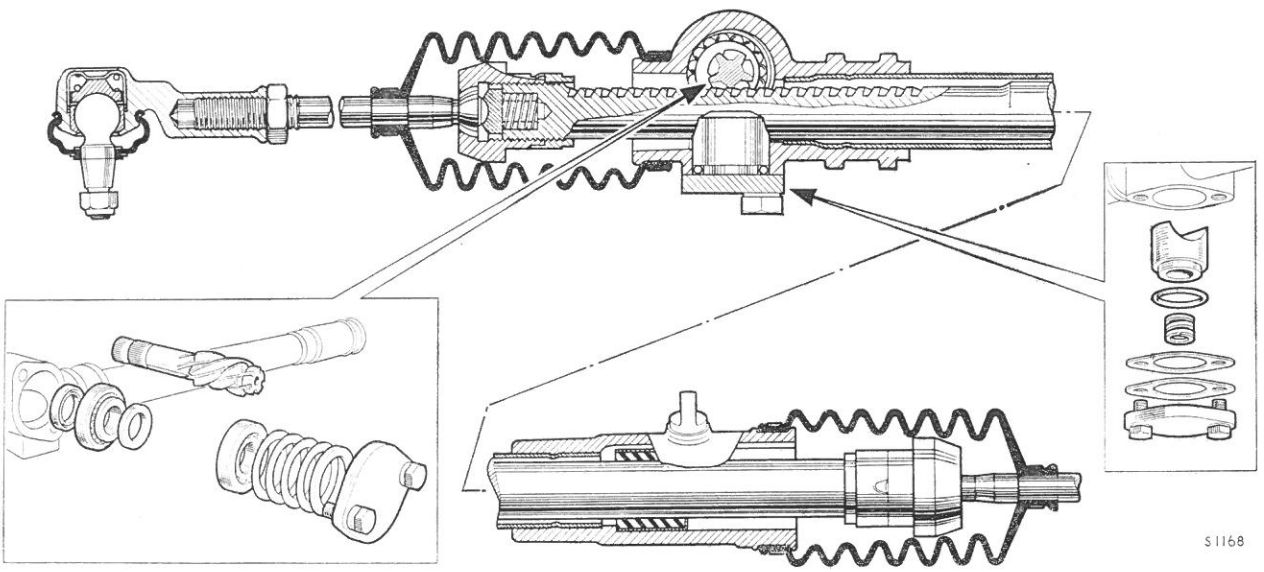

Fig. J.3

A section through the 1968 model steering-rack assembly, with the damper and pinion components shown inset

(7) Unscrew the four nuts and bolts securing the rear of the sub-frame to the body.
(8) Remove the four bolts securing the sub-frame towers to the bulkhead cross-member.
(9) Disconnect the exhaust pipe from the manifold and gear-change extension.
(10) Disconnect the engine tie-rod.
(11) Slacken the front sub-frame mounting bolts.
(12) Remove the nuts from the steering rack 'U' bolts.
(13) Support the body and remove the jack from the sub-frame; allow the sub-frame to drop and give clearance for the removal of the steering rack.
(14) *Mk. III models.* Disconnect the remote-control gear lever extension from the floor (see Fig. A.36).

Dismantling

(15) Disconnect the tie-rods from the steering-arms.
(16) Remove the rubber gaiters.
(17) Remove the damper cover plate, yoke, and spring(s).
(18) Remove the pinion shaft tail bearing retaining plate, shims, thrust washer, bearing and bearing race, and withdraw the pinion. Extract the top bearing race, bearing, and thrust washer from behind the rack teeth.
(19) Extract the pinion shaft oil seal.
(20) Use Service tool 18G 707 to unscrew the ball housing and release the tie-rod, ball seat and tension spring. Remove the second tie-rod.
(21) Withdraw the rack from the pinion end of the rack housing to obviate damage to the felt or 'Vulkollan' bush fitted in the opposite end of the rack housing.
(22) Remove the bush securing screw from the rack housing, lever the felt bush at its joint and extract it. The felt bush metal sleeve must be removed if a plastic ('Vulkollan') bush is to be fitted as a replacement for the felt bush.

Inspecting

(23) Clean all parts and examine for wear, particularly the rack and pinion teeth, and the rubber gaiters. Fit new parts where necessary.

Reassembling

(24) Reverse the dismantling sequence but note: If fitting a new felt bush (early models), soak the bush in E.P. S.A.E. 140 oil.
(25) The plastic bush may be used as a replacement for the felt bush and is used together with a steel sleeved bush and spacer. Insert the spacer (plain end first) into the rack housing. Fit the plastic bush into the steel sleeve and insert it into the rack housing (plain end first), with the flats on the plastic bush positioned offset to the retaining screw hole in the rack housing. Ensure that the spacer and bush are correctly positioned and drill through the retaining screw hole and the bush with a $\frac{7}{64}$ in. (·27 mm.) drill.

Remove all swarf; coat the retaining screw with a jointing compound and refit to secure the bush.

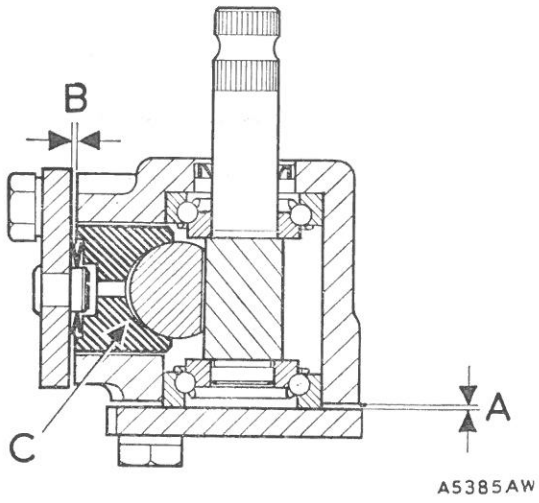

Fig. J.4

A section through the steering pinion and rack damper (1st type)

A. Take a feeler gauge measurement and fit the pinion end cover with shims to the value of the measurement minus ·001 to ·003 in. (·025 to ·076 mm.) before fitting the damper yoke (C).
B. Measure the gap and fit shims.
C. Damper yoke.

Check that the screw does not project into the bore of the plastic bush.

(26) *Pinion adjustment (early models).* Refit the cover without the shims, but do not over-tighten the screws. Measure the gap between the cover and the housing. Remove the cover and add shims to the thickness of the measurement minus ·002 in. (·05 mm.). Refit the cover with jointing compound.
(27) *Pinion adjustment (1968 models).* Refit the pinion and bearings as shown in Fig. J.3. Add sufficient shims together with the spacer washer to provide a clearance of approximately ·010 in. (·25 mm.) between the rack housing and the cover plate. Fit and lightly tighten the cover plate. Take a feeler gauge measurement of the clearance (A) and reduce the shimming by the measurement taken, less ·002 to ·005 in. (·05 to ·13 mm), to give the required pre-load.
(28) Refers to item (20). Screw the ball housing locking ring onto the rack end as far as it will go and refit the lock washer. On models not fitted with a lock washer, fit a new locking ring. Refit the seat spring. seat, tie-rod and ball housing, and tighten up until the tie-rod is pinched. Slacken the housing one-eighth of a turn and tighten the locking ring to the recommended torque. Punch the lock washer into the slots of the housing and locking ring. If no lock washer is fitted, punch the lips of the locking ring into the slots of the ball housing and rack.
(29) *Damper adjustment (1st type).* Refit the yoke with the disc springs but without the packing shims.

With the rack in the straight-ahead position, tighten the cover screws until it is just possible to rotate the pinion with the pre-load gauge, 18G 207 and 18G 207 A set at 15 lb. in. (·17 kg. m.).

Measure the gap between the damper housing flange and the rack housing, Remove, and then refit the damper with shims to the thickness of the measurement minus ·002 in. (·05 mm.).

(30) *Damper adjustment* (*2nd type and* 1968 *models*)· Refit the yoke and cover plate without the spring.

Follow the measurement checking procedure as in item (29) and refit the yoke with its 'O' ring seal (1968 models), together with the spring and cover plate, with shims to the value of the measurement plus ·002 in. to ·005 in. (·05 to ·13 mm.).

(31) Refit the rubber gaiters to the housing and the tie-rods. Before securing the gaiter clip on the tie-rod at the pinion end, stand the assembly upright and pour in approximately $\frac{1}{3}$ pint (·4 U.S. pint, ·19 litre) of Extreme Pressure S.A.E. 90 oil through the end of the gaiter. Refit and tighten the gaiter clip.

(32) Check that the tie-rods have an equal number of threads visible behind each locknut, i.e. approximately eight threads on early racks and 11 threads on racks fitted to the 1968 model.

(33) *Early models.* Centralize the rack in the housing. The full travel of the rack in each direction is 1·75 in. (44·5 mm.).

Refitting

ALL MODELS

Reverse the removal instructions, but note:

(34) Refit the rack to the body with the 'U' bolts lightly tightened to allow the pinion to accept the column alignment.

(35) Align the road wheels to the straight-ahead position.

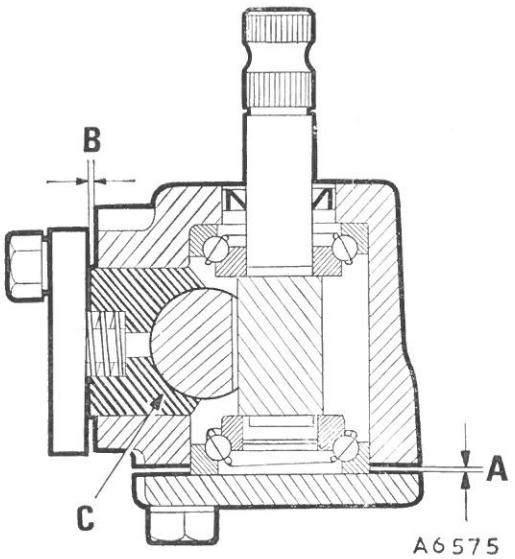

Fig. J.5

A section through the steering pinion and rack damper (*2nd type*)

A. Take a feeler gauge measurement and fit the pinion end cover with shims to the value of the measurement minus ·001 to ·003 in. (·025 to ·076 mm.) before fitting the damper yoke (C).
B. Measure the gap and fit shims.
C. Damper yoke.

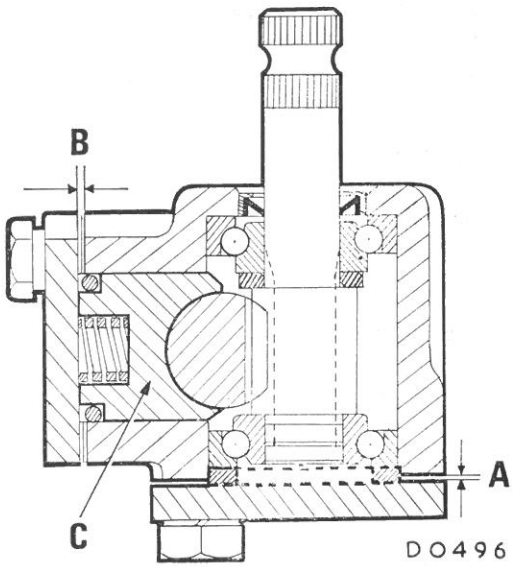

Fig. J.6

A section through the steering pinion and rack damper (1968 *models*)

A. Take a feeler gauge measurement and fit the pinion end cover with shims to the value of the measurement minus ·002 to ·005 in. (·05 to ·13 mm.) before fitting the damper yoke (C).
B. Measure the gap and fit shims.
C. Damper yoke.

(36) Carry out the operations (20), amd (22) to (30) in Section J.2.

(37) Check and reset the wheel alignment (see Section J.4).

Section J.4

FRONT WHEEL ALIGNMENT

Checking

When checking or adjusting the front wheel alignment it is essential to use equipment designed to work at the specified height and diameter, and preferably a gauge which measures the angles involved rather than the difference in distance between the wheels in front of and behind the centres.

With the car unladen, tyres at the correct pressures, and the steering in the straight-ahead position, each wheel should make an angle of 7′ 30″ with the longitudinal axis of the car. When this angle is correct the distance between the front of the wheels will be $\frac{1}{16}$ in. (1·6 mm.) greater than that at the rear (see Fig. J.7).

When measuring distances rather than angles the measurements must be made on a $14\frac{1}{2}$ in. (368·3 mm.) diameter on the side wall of the tyre at a distance of 9·4 in. (239 mm.) above the ground.

If a base-bar alignment gauge is used, take two measurements; take a measurement at the front, mark the point on the tyres with chalk, push the car forward half a road wheel revolution and take the second measurement at the same points on the tyres and behind the centres.

With an optical gauge, take two readings with the car moved forward 180° and three with it moved forward 120°. The average figure should then be calculated.

Adjustment (Early models)

To adjust the track, slacken the tie-rod ball joint locknuts and the rubber gaiter clips, and turn each tie-rod the same number of turns until the adjustment is correct.

The tie-rods must be exactly the same length.

1968 MODELS

The later steering-rack provides a smaller turning circle and it is vitally important that the wheel alignment is checked, and adjusted if necessary, following the correct procedure. Incorrect adjustment could result in excess articulation of the drive shaft constant velocity joints, and subsequent fouling of the suspension tie-rods by the road wheels when on full lock. Checking and adjustment must only be carried out when the vehicle is at 'kerbside' trim, i.e. fully equipped but without occupants or excess luggage.

Checking

(1) With the vehicle resting on its wheels, turn the steering on each lock and check the clearance between the road wheel and the suspension tie-rod. The minimum clearance should not be less than $\frac{3}{4}$ in. (19 mm.), or with the suspension at full rebound, not less than $\frac{1}{4}$ in. (6·5 mm.).

Correct adjustment on each tie-rod will be indicated by the clearance figures given above being approximately the same on each side. Check the wheel alignment with an optical gauge, see item (6).

Adjustment

(2) Slacken the rack tie-rod locknuts and the gaiter clips. Disconnect the ball joints from the steering levers, using Service tool 18G 1063.

(3) Lift the floor covering and remove the rubber grommet from the floor panel (opposite side to the rack pinion).

(4) Pull out the plastic plug from the rack body and insert a locator pin, i.e. $\frac{1}{4}$ in. (6 mm.) diameter bolt into the hole (see Fig. J.1).

(5) Centralize the rack until the locator pin fully engages with the rack, to lock the centralized assembly.

(6) Use an optical setting gauge and align the road wheels to the straight-ahead position, i.e. $\frac{1}{16}$ in. (1·6 mm.) toe out, and in alignment with the centre line of the car.

(7) Adjust the tie-rods until each ball pin will correctly locate its steering lever without disturbing the alignment given in item (6), and secure in position.

(8) Recheck the setting and adjust equally each tie-rod until the setting is obtained and tighten the locknuts. Ensure that the rubber gaiters are not under stress from twist and tighten the securing clips.

(9) Remove the locator pin and refit the plastic plug.

(10) Recheck the adjustment as detailed in item (1).

(11) Refit the floor gromet and covering.

NOTE.—The hole in the rack from which the plastic plug was removed MUST NOT be utilized for the purpose of 'topping up' with lubricant.

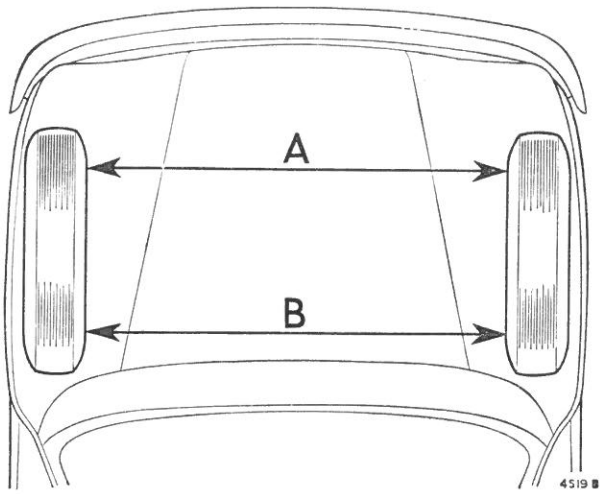

Fig. J.7

The front wheel alignment check must be taken with the front wheels in the straight-ahead position. Dimension (A) *must be* $\frac{1}{16}$ *in.* (1·6 *mm.*) *greater than* (B)

Section J.5

STEERING RACK LUBRICATION

Lubricating nipples are not provided and rack lubrication is only necessary if leakage is evident from the rack housing or the rubber gaiters.

The following procedure should be followed provided the leakage can be rectified without the assembly being removed.

(1) Centralize the steering rack.

(2) Remove the gaiter retaining clip on the driver's side.

(3) Inject $\frac{1}{3}$ pint (·2 litre) of E.P. S.A.E. 90 oil into the rubber gaiter.

(4) Refit the gaiter clip and turn the steering from side to side to distribute the oil through the housing.

WARNING.—If the vehicle is hoisted with its front wheels clear of the ground care should be taken to avoid forceful movement of the wheels from lock to lock, otherwise damage may occur within the steering mechanism.

Section J.6

NYLON TIE-ROD BALL ENDS

The ball joints have nylon seats sealed for life and protected by rubber boots; no lubrication is required.

The rubber boots must be maintained in good condition, and if it is found that a boot has become damaged in service both boot and joint must be renewed. However, if a boot is damaged in the workshop during the removal of a joint which has therefore not become contaminated by road dirt, the boot alone may be renewed.

Before fitting a boot smear the area adjacent to the joint with a little Dextragrease Super G.P. lubricant.