

Section J2

Half-shafts

Half-shaft — To remove

The half-shaft can be removed with the final drive unit in position. Half-shaft assemblies complete with ball and trunnion joint, seal and universal joint, are available as Service Exchange items.

If a half-shaft is to be removed proceed as follows.

1. Drive the car onto a ramp and securely chock the road wheels.
2. On the respective side remove the wheel disc and loosen but do not remove the wheel nuts.
3. Using a hydraulic jack with an extension piece and hardwood block positioned under the final drive differential casing, raise the rear of the car until the road wheels are clear of the ramp.
4. Position blocks and sill beams beneath the body sill. Place screw jacks beneath the trailing arms. Lower the hydraulic jack from beneath the final drive allowing the car to rest on the sill beams and supports.
5. Remove the road wheel.
6. Remove the four setscrews and the two bearing caps from the outer universal joint (see Fig. J13). Ease the half-shaft inwards to disengage the universal joint from the hub yoke; care should be taken during removal to retain the needle roller bearing caps in position on the universal joint. Support the half-shaft to avoid excessive strain on the ball and trunnion joint seal; a convenient method of doing this is to support the half-shaft on a piece of cord looped around the final drive crossmember.
7. Remove the six nuts securing the bearing housing to the side of the final drive casing; tap the housing with a nylon headed mallet to break the joint.
8. With the trailing arm in its lowest position, lift the half-shaft outer end upwards; withdraw the housing and shaft assembly from the final drive casing.

Note

When removing a right-hand half-shaft assembly care must be taken when withdrawing the housing. A thin rod or screwdriver should be inserted behind the housing to prevent the possibility of the Belleville washers falling down into the final drive casing (see Fig. J15).

When handling the half-shaft assembly, both ends should be supported. Do not carry the shaft holding one end only, place the shaft in an unsupported position or allow the trunnion body to hang downwards otherwise oil may be lost through the small breather hole in the centre of the splined shaft.

9. After removal of the half-shaft assembly the final drive casing must be blanked off to prevent the ingress of foreign matter.

Half-shaft — To dismantle

1. Remove the circlip and washer retaining the ball and trunnion joint body to the side bearing housing. Remove the housing from the splined shaft.

2. Remove the drain plug from the joint body and drain the oil from the housing (each trunnion joint holds approximately 150 ml. of lubricant).
3. Release the clips securing the convoluted seal to the joint body and half-shaft.
4. Position the shaft with the drain plug hole horizontal; ease the seal over the edge of the joint body and carefully withdraw the ball and trunnion assembly, taking care not to dislodge the button assemblies. Push the seal down the shaft and clear of the buttons.
5. Remove the trunnion buttons, adjusting washers, bearing outer races and needle rollers from the trunnion pin (see Fig. J14). Keep each assembly separate and note from which side of the pin they have been removed.
6. Whilst dismantled the trunnion bearing assemblies should be lubricated and wrapped in greaseproof paper for protection.
7. If the outer universal joint is to be removed, clean any paint or foreign matter from the yoke eyes and remove the circlips.
8. Hold the shaft horizontal and using a nylon mallet, shock drive the needle bearing races from the yoke eyes; care must be taken to avoid damage to the lip seals.
9. Thoroughly clean and inspect all items for wear and damage. Also inspect the convoluted trunnion joint seal for serviceability and if necessary renew.

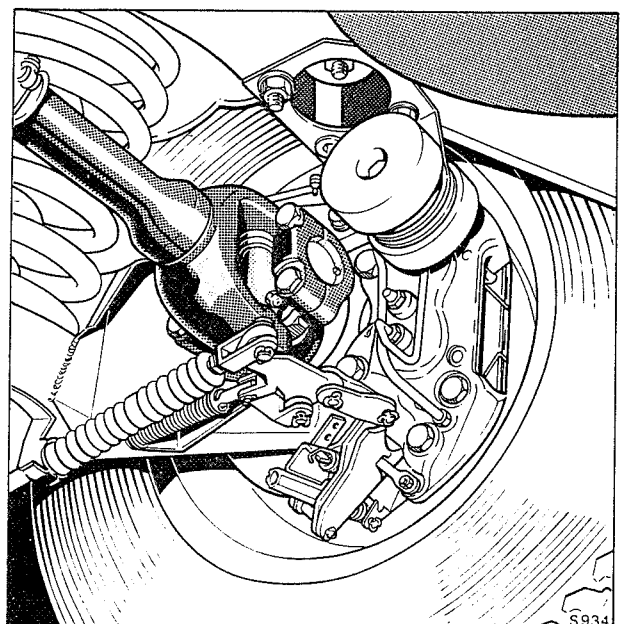


Fig. J13 Half-shaft outer universal joint

Ball and trunnion joint seal – To renew

When renewing a ball and trunnion joint seal, the half-shaft and trunnion assembly must be removed from the car.

1. Remove the half-shaft and trunnion joint assembly and carry out Operations 2 to 6 inclusive of 'Half-shaft – To dismantle'.
2. The trunnion pin must be pressed out of the half-shaft using equipment capable of exerting a pressure of up to 2362, kg/sq.m. (15 ton/sq.in.).

Heat must not be used for this operation

3. Remove the pin and joint seal.
4. Fit a new seal and press the trunnion pin into position.

The trunnion pin must be pressed in squarely and the length of pin which protrudes from each side must be equal to within 0,152 mm. (0.006 in.); check the pins for scoring or damage after fitting.

If the original pin and the bore are in good condition and the minimum pressing load of 394, kg/sq.m. (2.5 ton/sq.in.) can be achieved, the original pin may be used again; if not it is recommended that a new trunnion pin is fitted.

5. When the trunnion pin and new seal have been fitted the half-shaft should be assembled as instructed under 'Half-shaft – To assemble'.

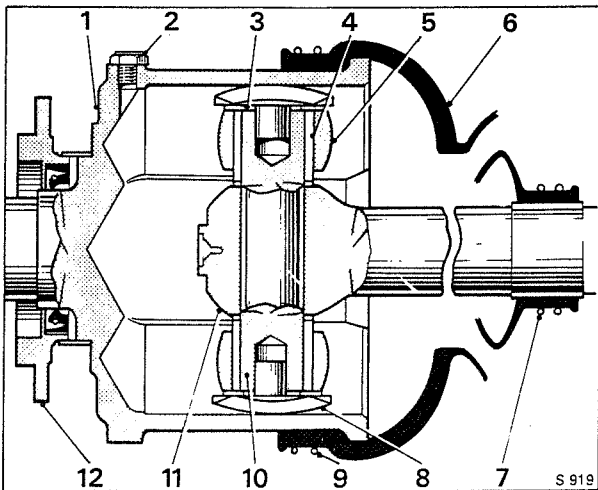


Fig. J14 Half-shaft ball and trunnion joint

- 1 Ball and trunnion joint body
- 2 Drain plug
- 3 Adjusting washer
- 4 Needle rollers
- 5 Needle roller race
- 6 Joint seal
- 7 Seal clip
- 8 Trunnion buttons
- 9 Seal clip
- 10 Trunnion pin
- 11 Half-shaft knuckle end
- 12 Final drive side housing

Half-shaft – To assemble

The half-shaft should be assembled by reversing the procedure given for dismantling, noting the following points.

1. Thoroughly clean all components before assembly.
2. Assemble the universal joint into the half-shaft end yoke (see Universal joint – To fit).
3. Using a micrometer measure the length of the trunnion pin on each side of the half-shaft knuckle and note any difference in length.
4. Fit the trunnion buttons onto the trunnion pin, but at this stage do not fit the adjusting washers and trunnion bearings.

Insert the trunnion into the joint body and using feeler gauges measure the total gap between one button and the body wall. This measurement gives the total amount of adjustment required. Any difference of pin lengths noted earlier should be taken into account when equally dividing the total adjustment required between the trunnion adjusting washers. For example, if pin measurements differ by 0,101 mm. (0.004 in.), half this amount should be added to the thickness of the adjusting washer fitted to the shorter side of the trunnion pin and subtracted from the washer thickness fitted to the long side. This will give a difference of 0,101 cm. (0.004 in.) in washer thicknesses and centralise the half-shaft in the body. Shim washers are available for this purpose in a range from 0,304 mm. to 0,584 mm. (0.012 in. to 0.023 in.) in 0,025 mm. (0.001 in.) increments.

5. Fit the inner washers and the needle roller assemblies to each side of the trunnion pin then, fit the trunnion buttons together with their correctly selected adjusting washers to the pin ends (see Fig. J14).
6. Fit the correctly adjusted trunnion assembly into the joint body. Ease the joint seal over the body and tighten the two wire clips ensuring that the small end of the seal locates on the machined diameter of the shaft.
7. Fill the joint body with 150 ml. of the recommended lubricant (see Chapter D Lubricants) and fit the filler plug.
8. Fit the half-shaft to the car as instructed under 'Half-shaft – To fit'.

Half-shaft – To fit

Fit the half-shaft by reversing the procedure given for removal noting the following points.

1. If a service exchange shaft is being fitted, it will be supplied suitably blanked and protected.

Remove the protective covering from the joint body splines. Also remove the cover on the breather hole in the end of the splined shaft. All traces of protective material must be removed.

2. Remove the circlip and washer from behind the bearing housing on the old shaft and fit the housing, washer and circlip to the new shaft.

It is essential that the side bearing housings removed from the final drive assembly are fitted to the half-shafts, as the fitting of any other housing will result in an incorrectly adjusted final drive assembly.

3. Remove the drain plug from the trunnion joint body and inject 150 ml. of recommended lubricant (see Chapter D Lubricants) into the joint body and fit the plug.

4. Fit the half-shaft to the car. When fitting a right-hand half-shaft, care must be taken to ensure that the belleville washers and distance piece are retained in position. Also ensure that the belleville washers are fitted with the concave side of the washers facing the crown wheel assembly (see Fig. J15).
5. When fitting the half-shaft assembly to the final drive casing it should be noted that the bearing housing has one off-set hole and can only be fitted in one position. Therefore, the holes should be aligned as the shaft is inserted into the final drive unit.
6. Ensure that the needle bearing caps are located correctly in the hub yoke and caps. Fit and torque tighten the four setscrews (see Chapter P).
7. Fit the road wheel and nuts, remove the sill beams and blocks from beneath the car, tighten the wheel nuts and fit the disc.
8. All nuts and setscrews should be torque tightened in accordance with the figures quoted in Chapter P.
9. When the half-shaft has been fitted to the car and with the car in its normal standing height position, inspect the seal to ensure that the seal convolutions are not 'crimped' or strained. If they are the position of the seal should be adjusted on the shaft.

Universal joint – To remove

1. Remove the half-shaft as described under 'Half-shaft – To remove'.
2. Remove any paint or foreign matter from around the circlips in the universal joint yoke eyes and remove the circlips.

Note

Due to circlips of different thickness having been fitted, care should be taken to ensure that the circlips are fitted to their original locations. If new circlips are fitted they should be of the same thickness as those they replace.

3. Hold the shaft with both ends supported to avoid excessive strain being put on the convoluted seal. Using a nylon mallet shock drive the races from the yoke eyes.

Universal joint – To fit

1. Ensure that the bores in the yokes are clean and in good condition; lightly grease the needle rollers and locate them in their housings. Each bearing housing is fitted with 38 needle roller bearings.
2. Fit the cross-piece, minus the needle roller and housing assemblies, into the yoke eyes. Hold the cross-piece central and press the bearing housing assemblies into the yoke bores sufficiently to enable the circlips to be fitted. Care should be taken not to damage the joint seals during this operation.
3. Fit the circlips and check the free movement of the universal joint.
4. Grease the universal joint at the nipple provided.

Output shaft oil seal – To renew

The oil seals on the ball and trunnion joint shaft are located in the housings, on each side of the final drive unit and can be renewed with the final drive in position.

1. Remove the half-shaft assembly as described under 'Half-shaft – To remove'.

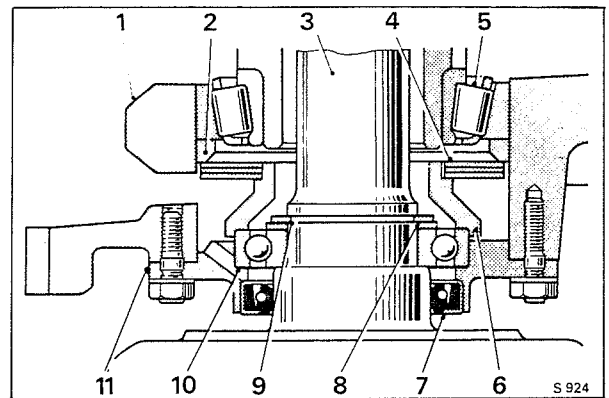


Fig. J15 Final drive side housing

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| 1 | Differential housing bearing cap |
| 2 | Adjusting washer |
| 3 | Ball and trunnion joint splined shaft |
| 4 | Belleville washers |
| 5 | Taper roller bearing |
| 6 | Distance piece |
| 7 | Ball and trunnion joint shaft oil seal |
| 8 | Retaining washer |
| 9 | Retaining circlip |
| 10 | Ball and trunnion joint shaft bearing |
| 11 | Final drive side housing |

2. Remove the circlip and washer located on the ball and trunnion joint shaft behind the bearing housing and remove the housing from the shaft.
3. Remove the seal from the housing.
4. Fit a new seal, ensuring that it is fitted squarely in its locating bore and with the seal lip pointing inwards towards the bearing.
5. Fit the housing onto the shaft, place the washer in position behind the bearing and fit the circlip ensuring it is correctly located in the groove.
6. Fit the half-shaft as described under 'Half-shaft – To fit'.

Output shaft bearing – To renew

1. Remove the half-shaft assembly as described under 'Half-shaft – To remove'.
2. Remove the circlip and washer from the ball and trunnion joint shaft and remove the housing from the shaft.
3. Left-hand housings have a circlip fitted to retain the bearing. Remove this circlip.
4. Remove the bearing from the housing using a mandrel or drift, taking care not to damage the oil seal.
5. Clean and inspect the housing bore and lightly stone out any damage marks or burrs.
6. Fit a new bearing ensuring that it is fitted squarely in the bore and up to its abutment face.
7. On a left-hand housing fit the circlip and locate it correctly in the retaining groove.
8. Fit the housing to the ball and trunnion joint shaft, fit the washer and circlip.
9. Fit the half-shaft assembly to the car as described under 'Half-shaft – To fit'.