

Workshop Service Manual

5400 series tractors

Supplement to
version M5 of October 2007



5400 series tractors

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1 Adjustments

1.1 Adjusting the selector rails and forks

Preliminary steps

NOTE: To carry out this adjustment, the primary and secondary shafts must be refitted and correctly shimmed in the housing.

- L52** Range 1 solenoid valve
- L53** Range 2 solenoid valve
- L54** Range 3 solenoid valve
- L55** Range 4 solenoid valve
- L56** Range 1 position switch
- L57** Range 2 position switch
- L58** Range 3 position switch
- L59** Range 4 position switch

1. Fit solenoid valves **L52** - Range 1 solenoid valve, **L53** - Range 2 solenoid valve, **L54** - Range 3 solenoid valve and **L55** - Range 4 solenoid valve.

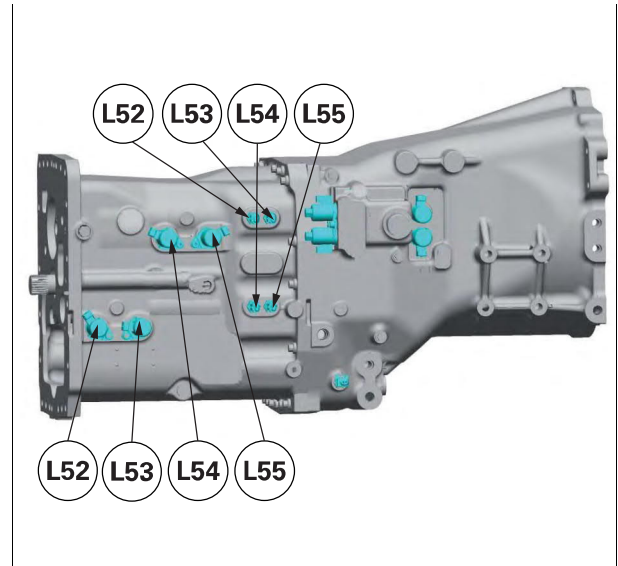


Fig. 1.

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2. Fashion a union to supply the control circuit with compressed air at a maximum pressure of 4 bar (58 psi) (A).
3. Connect the selector rail adjustment service tool ref. 3378805M1.
4. Connect the pneumatic system (B).

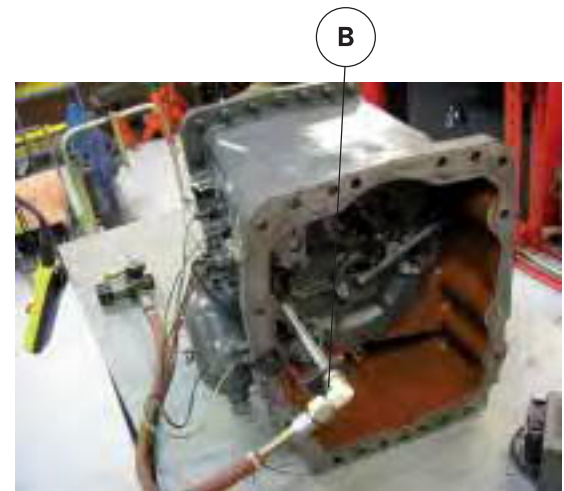
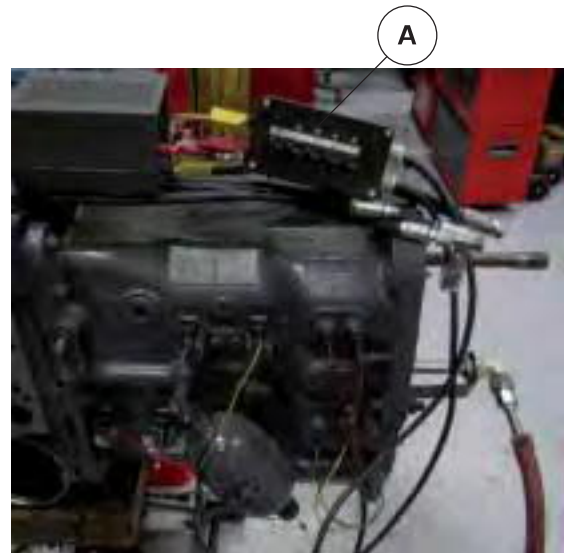


Fig. 2.

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General information about the selector rail adjustment service tool ref. 3378805M1

The selector rail adjustment tool is used to supply the solenoid valves **L52** - Range 1 solenoid valve, **L53** - Range 2 solenoid valve, **L54** - Range 3 solenoid valve and **L55** - Range 4 solenoid valve of the gearbox to carry out the various adjustments.

The range switches **L56** - Range 1 position switch, **L57** - Range 2 position switch, **L58** - Range 3 position switch and **L59** - Range 4 position switch can be checked once the selector rails have been adjusted and the switches fitted. Each LED on the tool corresponds to a switch.

Switches, LEDs/connectors	
Switch 1	L52 - Range 1 solenoid valve
Switch 2	L53 - Range 2 solenoid valve
Switch 3	L54 - Range 3 solenoid valve
Switch 4	L55 - Range 4 solenoid valve
Switch R	L52 - Range 1 solenoid valve, L53 - Range 2 solenoid valve, L54 - Range 3 solenoid valve and L55 - Range 4 solenoid valve.
LED 1	L56 - Range 1 position switch
LED 2	L57 - Range 2 position switch
LED 3	L58 - Range 3 position switch
LED 4	L59 - Range 4 position switch



Fig. 3.

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The switches on the tool supply the solenoid valves of the gearbox. They work independently of the LED lighting.

The range switches light the LEDs of the tool. When a range is engaged, the corresponding LED for the range is lit.

NOTE: The switches are normally closed. When a range is engaged, they open the circuit and the tool reverses the signal to light the LEDs. When the switches are not connected, the four LEDs on the tool are thus lit.

Connection of the selector rail adjustment service tool ref. 3378805M1

1. Connect the tool to a 12 V, 4 A power supply.



Fig. 4.

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- Connect the connectors (1) to the solenoid valves and the connectors (2) to the range switches. Each wire is marked with a number indicating the range concerned.

Marks	1	2	3	4
Con- nec- tors				
Sole- noid valves	L52 - Range 1 sole- noid valve	L53 - Range 2 sole- noid valve	L54 - Range 3 sole- noid valve	L55 - Range 4 sole- noid valve
Switche s	L56 - Range 1 posi- tion switch	L57 - Range 2 posi- tion switch	L58 - Range 3 posi- tion switch	L59 - Range 4 posi- tion switch

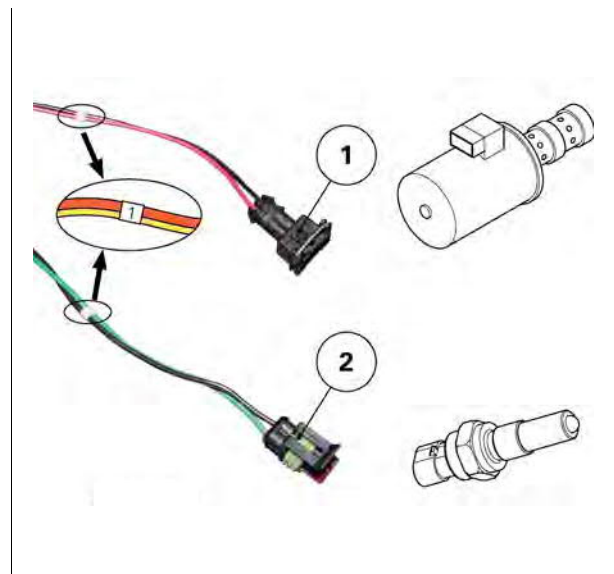


Fig. 5.

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Using the selector rail adjustment service tool ref. 3378805M1

Supplying the solenoid valves

- Activate switches 1, 2, 3 and 4 one by one to supply the solenoid valves required to adjust the selector rails. To return the two selector rails to neutral automatically, use switch R on the tool (4 solenoid valves supplied).

Example:

L52 - Range 1 solenoid valve supplied by switch 1, the selector rail pushes the **L56** - Range 1 position switch and LED 1 illuminates.

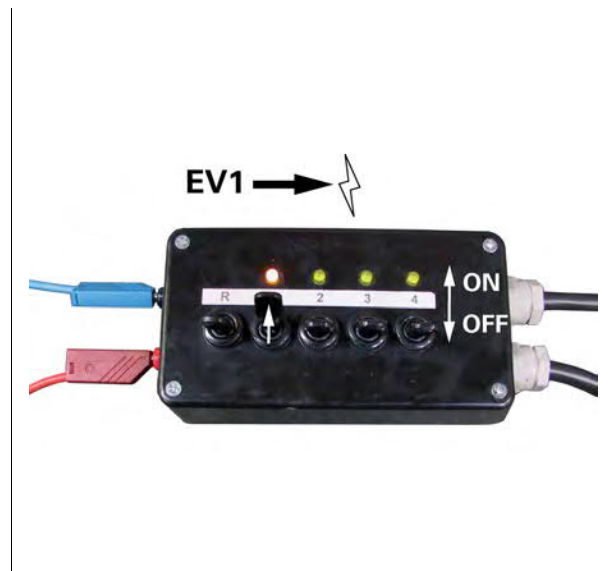


Fig. 6.

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Checking the switches

- Once the selector rails have been adjusted, fit the switches. Engage a range using the corresponding switch. The LED that corresponds to the range engaged should light up.

Checking the 1st/2nd selector rails before adjustment

Before adjusting the travel of the selector rails, it is important to check that their movement is within the permitted tolerances.

1. Using a depth gauge and a suitable fixture, check the following dimensions (see the table):
 - X: dimension between face F of the housing and the end of the selector rail with range 1 engaged
 - Y: dimension between face F of the housing and the end of the selector rail in neutral position
 - Z: dimension between face F of the housing and the end of the selector rail with range 2 engaged

	Manufacturer's values	Values recorded
X	66,515 mm (2.6 in) ± 0,5 mm (0.02 in)	
Y	76,61 mm (3.0 in) ± 1,08 mm (0.04 in)	
Z	86,625 mm (3.4 in) ± 0,5 mm (0.02 in)	

If the measured dimensions are outside these tolerances, manually turn the gears using the reverse gear, then repeat the measurements. If the dimensions are still incorrect, check that the selector rails and synchronisers have been fitted correctly.

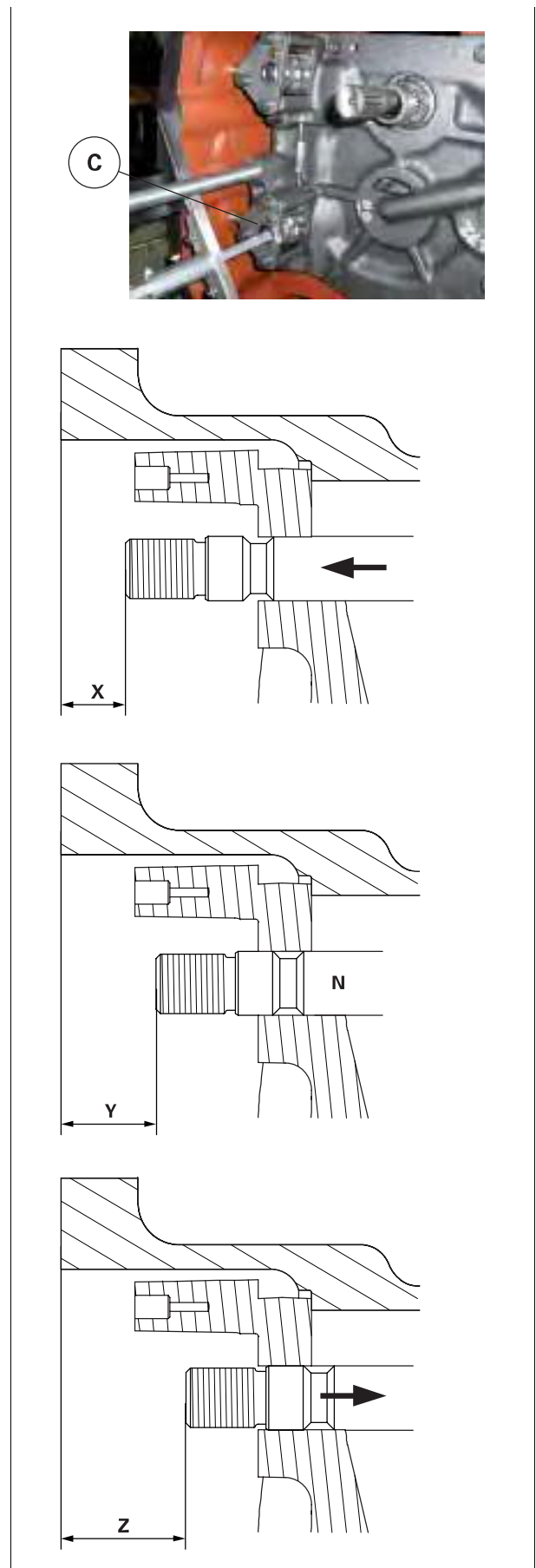


Fig. 7.

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Checking the 3rd/4th selector rails before adjustment

1. Using a depth gauge and a suitable fixture, check the following dimensions (see the table):
 - U: dimension between face F of the housing and the end of the selector rail with range 3 engaged
 - V: dimension between face F of the housing and the end of the selector rail in neutral position
 - W: dimension between face F of the housing and the end of the selector rail with range 4 engaged

	Manufacturer's values	Values recorded
U	65,95 mm (2.6 in) ± 0,5 mm (0.02 in)	
V	76,762 mm (3.0 in) ± 1,093 mm (0.04 in)	
W	87,6 mm (3.5 in) ± 0,5 mm (0.02 in)	

If the measured dimensions are outside these tolerances, manually turn the gears using the reverse gear, then repeat the measurements. If the dimensions are still incorrect, check that the selector rails and synchronisers have been fitted correctly.

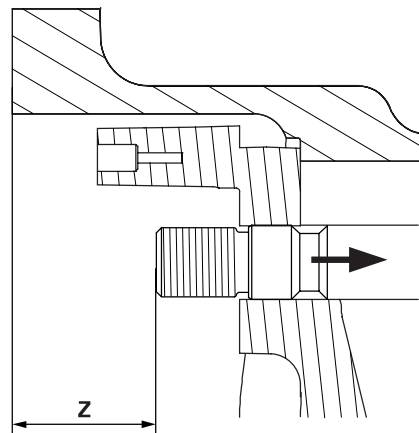
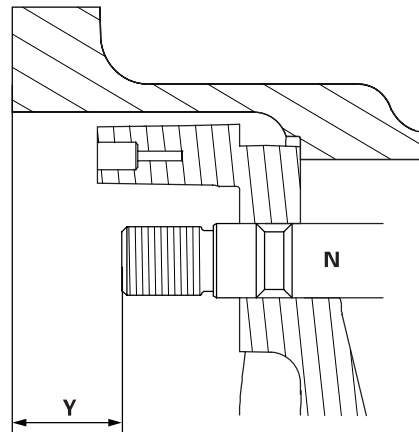
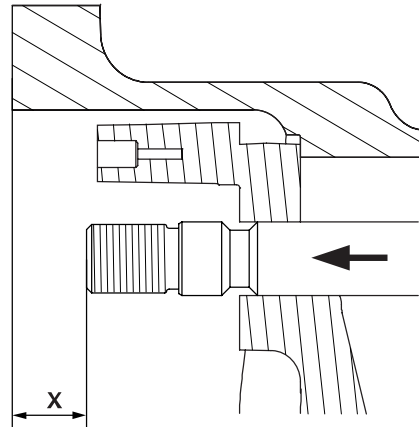


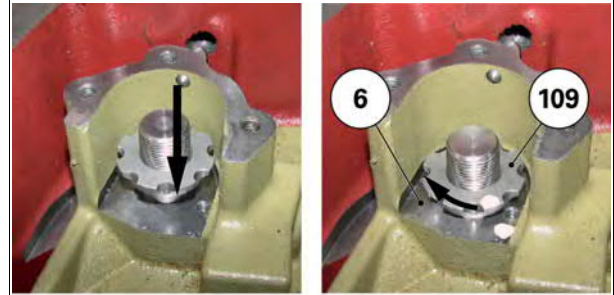
Fig. 8.

1028062

Adjusting the selector rails

Adjusting the selector rail (ranges 1 and 2)

1. Set the rail to neutral.
2. Fit the castellated nut without tightening (109).
3. Engage range 2 (supply **L53** - Range 2 solenoid valve).
4. Tighten the nut (109) up against the cover plate (6).
5. Reposition the selector rail to neutral. Screw on the nut (109) by two slots and line up the next slot opposite the hole of the lock screw (107).



EV2 → ⚡

Fig. 9.

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6. With paint, mark the position of the nut (109) in relation to the cover plate (6).

NOTE: The synchroniser may not fully engage when the gearbox is not running. If this is the case, position the shaft (121) and reverse layshaft gear (119) and slowly run the gearbox while engaging the range.

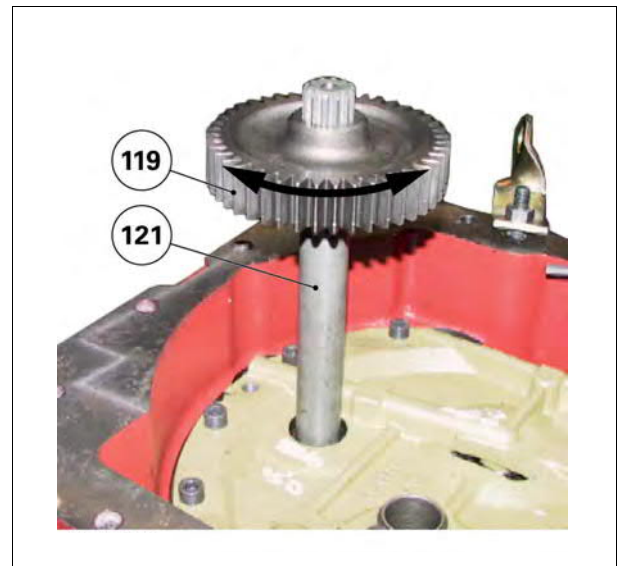


Fig. 10.

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7. Fit the castellated nut (108). Screw it on until it is almost touching the nut (109).

NOTE: Be careful not to move the nut (109) from its set position and not to erase the paint marks.

8. Fit the plate (111). Fit the screws (110) smeared with Loctite 242 or equivalent. Tighten to a torque of 29 Nm (21 lbf ft) - 37 Nm (27 lbf ft).

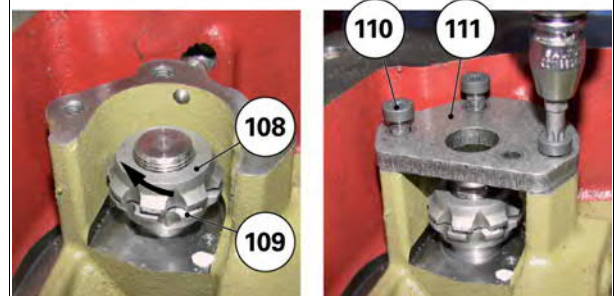


Fig. 11.

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9. Engage range 1 (supply **L52** - Range 1 solenoid valve).
10. Unscrew the nut (108) fitted home against the plate (111).
11. Reposition the selector rail to neutral. Unscrew the nut (108) by two slots and line up the next slot opposite the hole of the lock screw (107).
12. With paint, mark the nut (108) aligned with the mark on the cover (6) as in step 6.

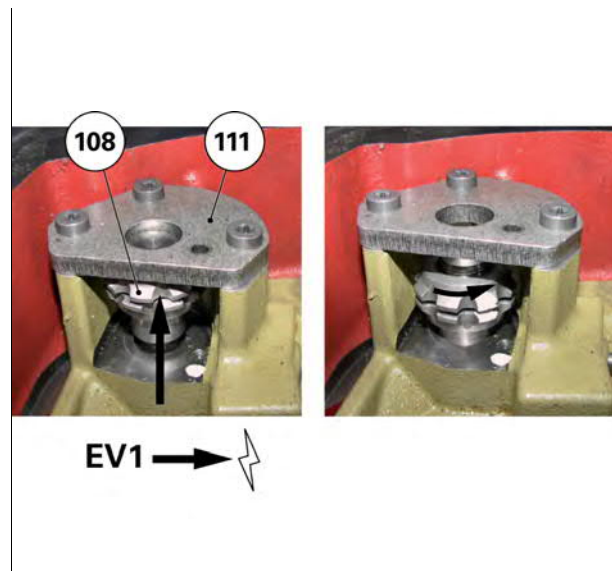


Fig. 12.

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13. Insert the screw (107) to lock the nuts (108) and (109), aligning the marks made during steps 6 and 12.
14. Check for correct operation. The nuts should act as a stop.
15. Firmly fit the screw (107), smeared with Loctite 242 or equivalent. Tighten to a torque of 12 Nm (9 lbf ft) - 16 Nm (12 lbf ft).

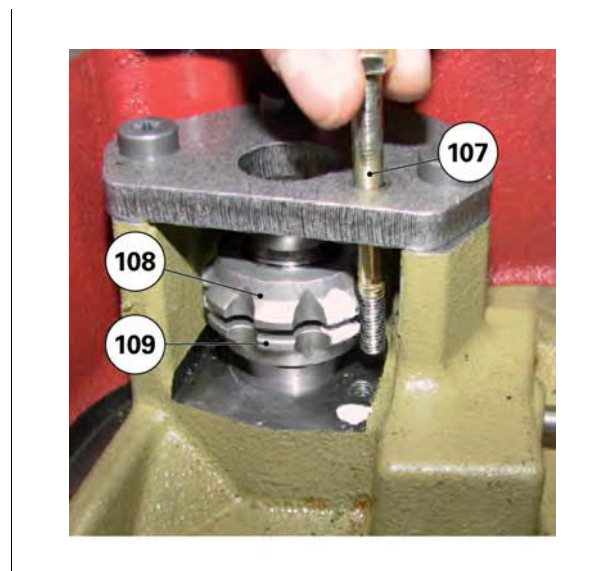


Fig. 13.

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Adjusting the selector rail (73) (ranges 3 and 4)

16. Repeat steps 1 to 15 with the selector rail (73) and the nuts (99) and (101).

Adjusting the interlock mechanism

NOTE: This adjustment must be carried out after setting the selector rails (see 5A16, "Adjusting the selector rails", page 43).

1. Screw home the rod (106) in the reverse pitch nut (131).
2. Using the service tool ref. 3378805M1, engage a range on a selector rail and leave the other selector rail in neutral.

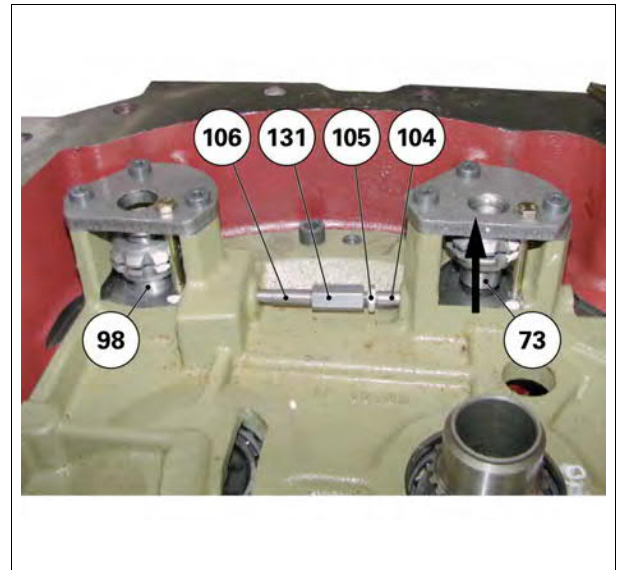


Fig. 14.

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3. Unscrew the rod (104) until the lock reaches maximum axial clearance as shown:
 $J = 0,1 \text{ mm (0.004 in) to } 0,3 \text{ mm (0.01 in)}$
4. Tighten the counter-nut (105).

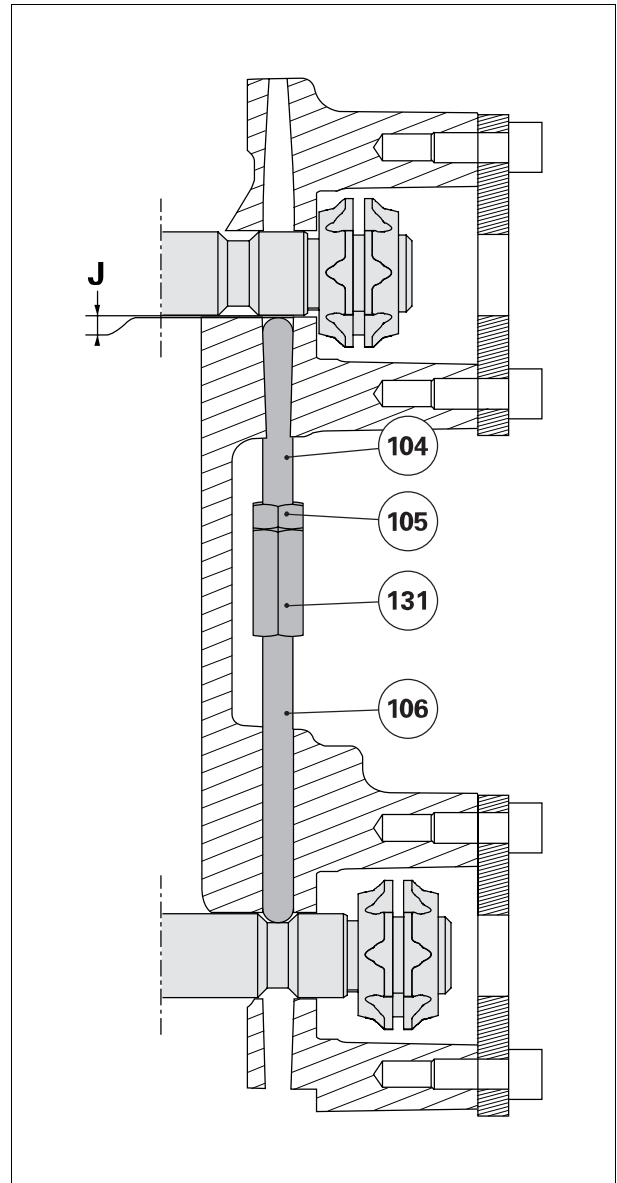


Fig. 15.

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Check

5. Using the service tool ref. 3378805M1, engage a range on a selector rail.
6. Try to shift a range on the other selector rail. It should not engage.
7. Repeat the procedure with all the ranges.

Final steps

1. Fit the gearbox on the rear axle and engine.
2. Reconnect the harnesses and hydraulic pipes that were removed.
3. Check the level of the transmission oil.
4. Carry out a gearbox calibration and check the operation of the transmission.

1.2 Overhauling the synchronisers

Single cone synchronisers (ranges 3 and 4) - operation

- (1) Sliding coupler
- (2) Cone (brake)
- (3) Coupling flange
- (4) Ball bearing
- (5) Thrust components
- (6) Spring

– Locked position

When the slider (1) moves towards the gear to be locked, it presses against the cone (2), which in turn presses against the male cone of the coupling flange (3) by means of the ball bearings (4) and thrust components (5).

When the synchronisation is set, the slider (1) can mesh and silently lock with the teeth of the coupling flange (3).

– Neutral position

The slider (1) is in the middle position. The ball bearings (4) are pushed into the V groove of the slider by the pressure springs (6). In this neutral position, the slider is locked by three balls held in place by the pressure springs.

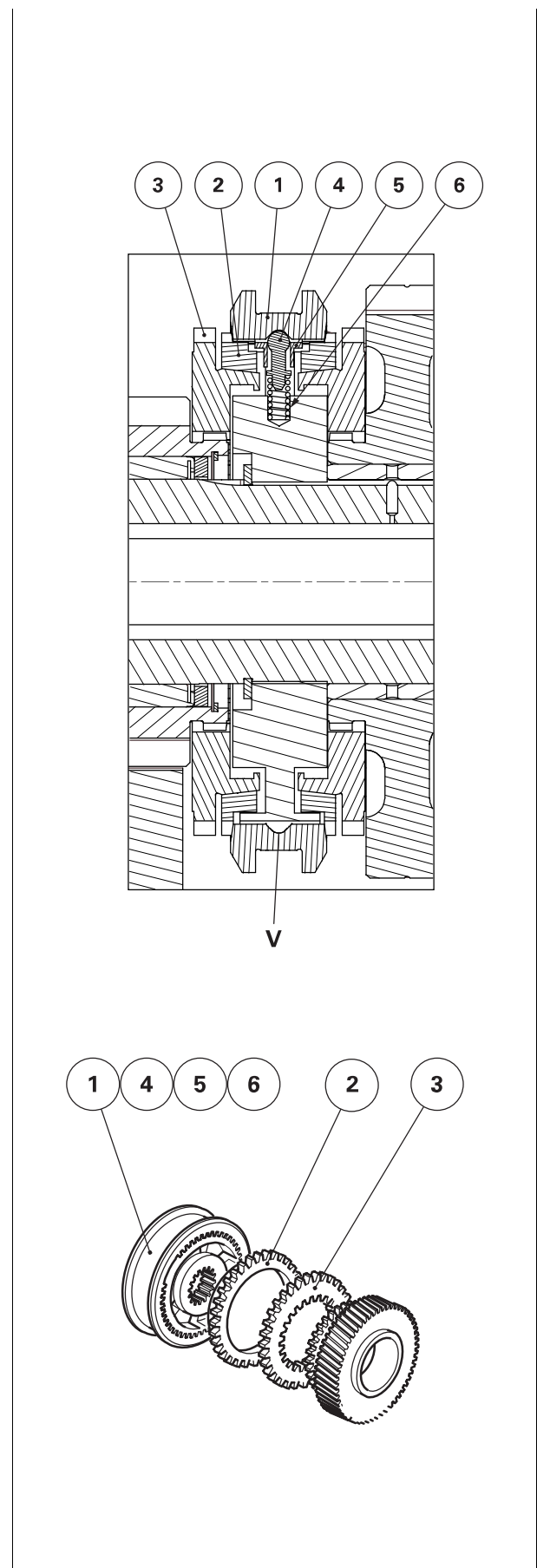


Fig. 16.

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Single cone synchronisers - overhaul

If the single cone synchronisers (11), (23) and (31) have been disassembled, check the wear to the cone (2) as follows:

1. Stack the coupling flange (3) and the cone (2) on the relevant gear.
2. Correctly position the cone (2) on the male cone of the coupling flange, turning it one way then the other several times and applying manual pressure.
3. Using a set of shims, measure dimension X at three equidistant points.

Calculate the average of the three values and proceed as described below, depending on the result obtained.

On a new synchroniser, dimension X must be 1,5 mm (0.06 in) maximum.

After operation, if X is less than or equal to 0,80 mm (0.03 in):

- replace the cone (2);
- check the measurement of X again, using the same process.

If dimension X is still incorrect, also replace the coupling flange (3) or, if necessary, the entire synchroniser.

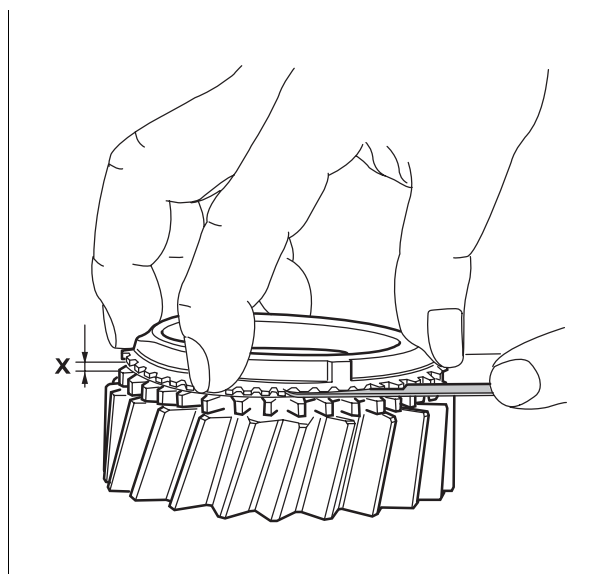


Fig. 17.

I019833

Double cone synchronisers (ranges 1 and 2) - operation

- (1) Sliding coupler
- (2) Cone (brake)
- (3) Coupling flange
- (4) Ball bearing
- (5) Thrust components
- (6) Spring
- (7) Ring
- (8) Cone (brake)

Advantages and operation

The double cone synchroniser has the following advantages: increased reliability and greater resistance to transmission effort.

The operating principle of the double cone synchroniser is similar to that of the single cone synchroniser. The positions (locked and neutral) are obtained in the same way.

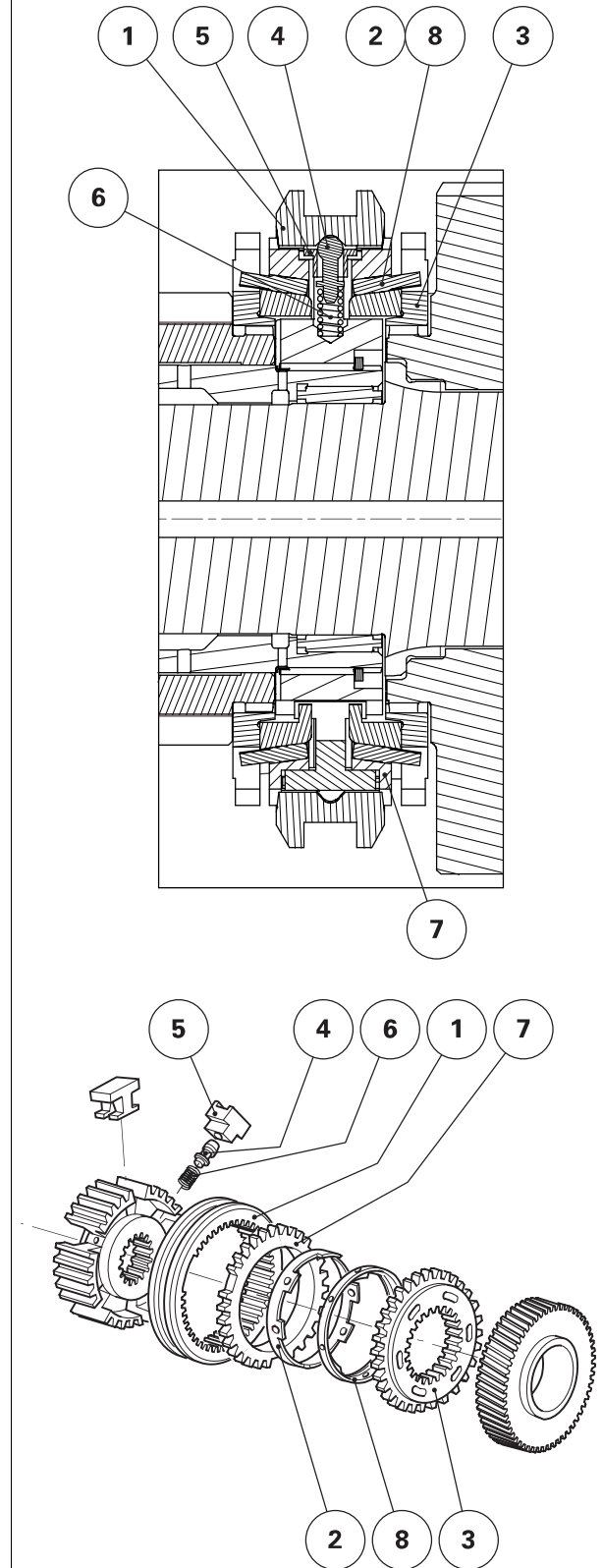


Fig. 18.

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