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Issue 1 en

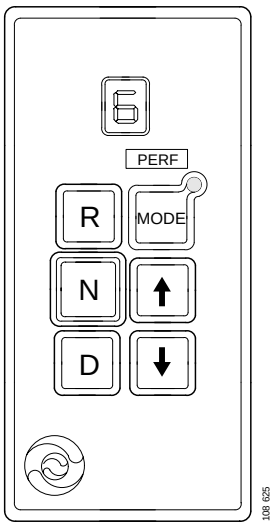
Automatic Gearboxes GA750/751/752 and GA851/852 with variants

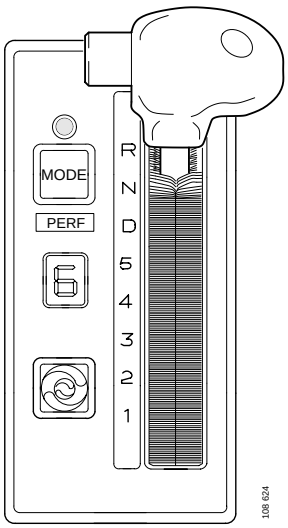
(Allison World Transmission type MD and HD respectively)

Function and work description

Applies to vehicles built from December 1997

(from chassis no. 123759)





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Contents

General

Introduction

This service information covers only the WTEC III control system and two different series of automatic gearboxes manufactured by Allison Transmission. The Scania model designations for these gearboxes are GA750/751/752 (Allison WT MD-series) and GA851/852 (Allison WT HD-series) respectively.

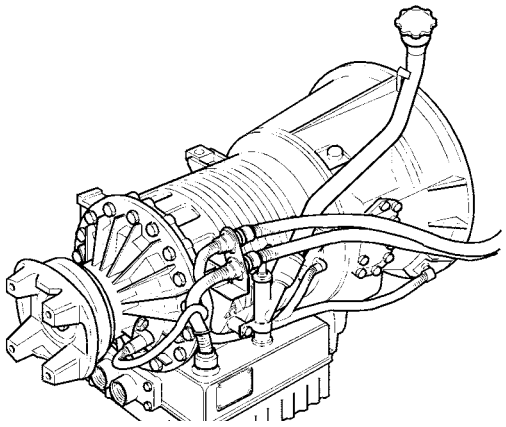
This description is also applicable to gearboxes with retarder. The Scania model designation for these gearboxes has an R suffix, e.g. GA851R.

The gearboxes are fully automatic, six-speed and equipped with torque converter. The gears are changed by an electrically controlled hydraulic system. The gearboxes are designed with a combination of mechanical[1] and hydraulic gears and can be equipped with power take-off.

A new control system, the Allison WTEC III, has from December 1997 (chassis no. 123579) replaced the earlier Allison WTEC II control system.

The major difference between the two control systems is that WTEC III has a new drive position selector in two different versions, with lever or button control.

The new control system is adapted to engines with EDC as well as throttle actuation sensor, i.e. with mechanical fuel injection.

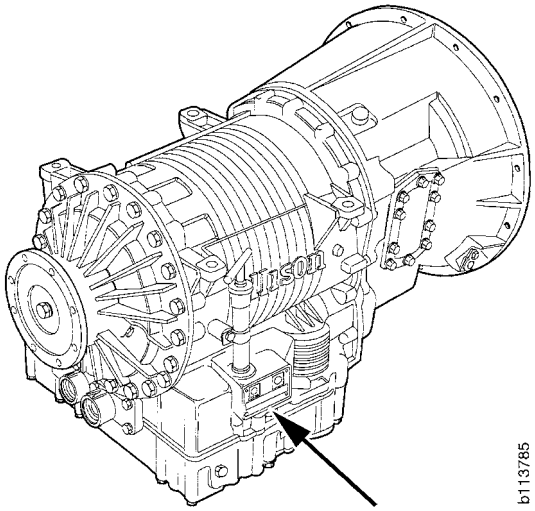


1. At Scania, "mechanical gear" means transmitting power entirely by mechanical means through the gearbox. In the Allison organisation, this is known as "Lock-up".

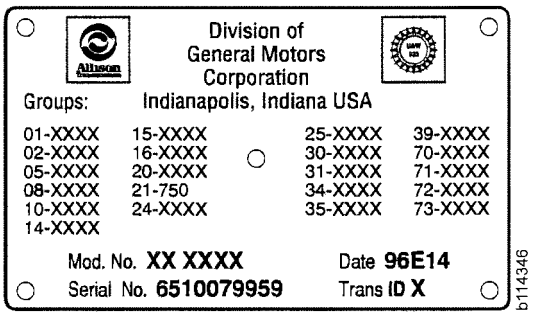
Gearbox type plate

Use Allison model designations shown on the gearbox type plate when contacting Allison representatives. The type plate is located under the electrical connection on the bottom right-hand side of the gearbox.

The type plate specifies the serial number, part number and model designation.



The type plate is located on the right-hand side of the gearbox.



Type designations

Allison model designations for gearboxes used by Scania:

Scania	Allison
GA750(R)	MD 3060 P(R)
GA751(R)	MD 3066 P(R)
GA752(R)	MD 3560 P(R)
GA851(R)	HD 4060 P(R)
GA852(R)	HD 4560 P(R)

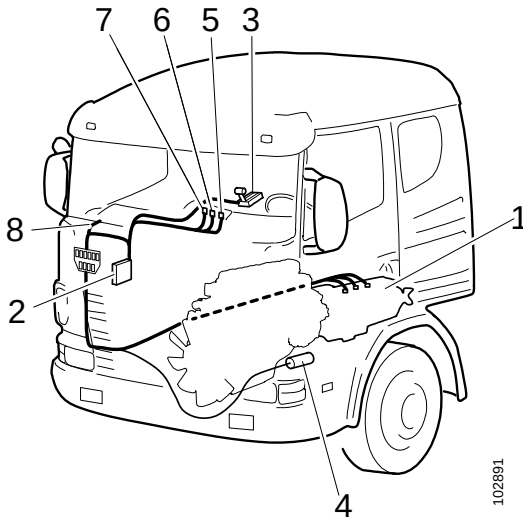
The letter P in the Allison designation indicates that the gearbox is ready for a power take-off.

The letter R indicates that the gearbox is equipped with an integrated retarder.

Location of components

Since this description covers several closely related models of gearbox, the appearance of gearbox components may differ slightly from those illustrated. Component locations may also differ depending on which engine is fitted on the vehicle.

To reduce the effect of variant dependency, the various steps in the work descriptions and function descriptions have been made as general as possible.



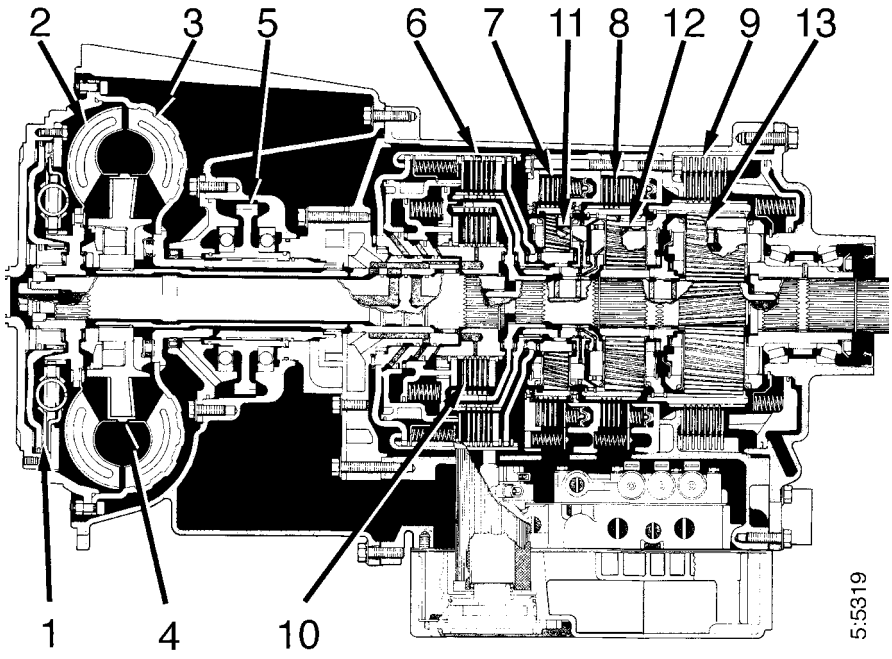
1 *Gearbox*
2 *Control unit*
3 *Drive position selector*
4 *Throttle actuation sensor on injection pump control lever. Only applies to vehicles without EDC.*
5 *"Check Trans" warning lamp*
6 *Warning lamp for high gearbox oil temperature*
7 *Indicator lamp for activated retarder*
8 *Allison diagnostic socket for Pro-Link test equipment*

Function description

Gearbox structure

General

These automatic gearboxes are six-speed with torque converter and lock-up. The gears are changed by an electrically controlled hydraulic system.



Torque converter

1 *Lock-up clutch LU for mechanical gear*
2 *Turbine wheel*
3 *Pump wheel*
4 *Stator*

Power take-off

5 *Gear for driving power take-off*

Clutches

6 *Clutch C2*
7 *Clutch C3*
8 *Clutch C4*
9 *Clutch C5*
10 *Clutch C1*

Planetary gears

11 *Planetary gear P1*
12 *Planetary gear P2*
13 *Planetary gear P3*

Planetary gears

There are three planetary gears in the gearbox. They are connected to the gearbox shafts and to each other with disc couplings. Engine torque is transferred through the planetary gears in various ways by applying or releasing different combinations of disc couplings, giving different gear ratios.

The control unit controls the solenoid valves, which in turn control the hydraulic system. The hydraulic system then implements the gear changes. The table shows which clutches and solenoid valves are active while the vehicle is being driven in various gears, where N1 to N4 are the different neutral positions. Which of these is used depends on the road speed of the vehicle when the driver puts the drive position selector into Neutral.

Active disc couplings and solenoid valves

Disc coupling							**Solenoid valve**						
	C1	**C2**	**C3**	**C4**	**C5**	**LU**	**A[a]**	**B[b]**	**C**	**D**	**E**	**F**	**G**
6		X		X		X	X			X		X	
5		X	X			X	X		X			X	X
4	X	X				X						X	X
3	X		X			X		X	X			X	X
2	X			X		X		X		X		X	Y
1	X				X	0		X			X	0	Y
N1					X	0	X	X			X	0	
N2				X			X	X		X			
N3			X				X	X	X				
N4				X			X	X		X			
R			X		X		X	X	X		X		

a. Solenoid valves A and B are normally open (the others are normally closed)
b. Solenoid valves A and B are open in the rest position (the others are closed in the rest position)

X = Active component

O = Optional (active or disengaged)

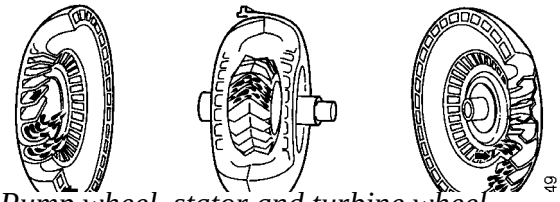
Y = Active in 1st and 2nd gear but disengaged when shifting from 1st to 2nd gear and when down-shifting from 2nd to 1st gear.

Torque converter

The torque converter enhances the engine torque when it is started and provides a smooth transmission of power. However, a torque converter is less efficient than mechanical transmission since the torque is transmitted hydraulically, i.e. with the oil in the torque converter.

The lock-up clutch LU is engaged at some time while 2nd gear is engaged. It locks both torque converter shafts to each other, i.e. the pump wheel shaft to the turbine wheel shaft so that torque is transmitted entirely mechanically. At Scania, we call this driving in mechanical gear. The lock-up clutch is engaged from 2nd gear up to 6th gear.

The torque converter comprises three parts: pump wheel, stator and turbine wheel. The pump wheel is located on the input shaft and acts as one half of a clutch. The pump wheel is cup-shaped and includes a number of curved vanes.



Pump wheel, stator and turbine wheel

The turbine wheel has the same design as the pump wheel but is located on the output shaft. The two cup-shaped wheels are located with their openings facing each other. Located in the space between them is the stator, which is also an impeller with curved vanes.

When the pump wheel starts to rotate, the oil inside the pump and turbine wheels will be put in motion. In this way, the torque from the pump wheel will be transmitted to the turbine wheel through the oil by centrifugal force. If there is a great difference in rotation speed between the pump wheel and turbine wheel, the stator, which is mounted on a freewheel, will give the turbine shaft additional torque.

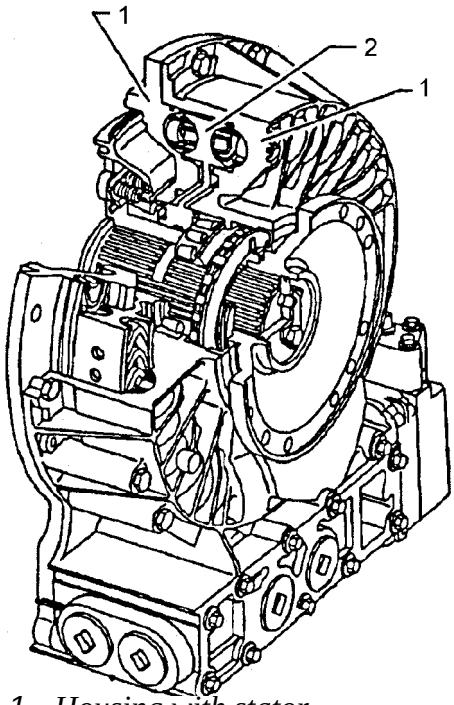
Retarder

The gearbox may be equipped with an integrated retarder. In this case, the model designation will be suffixed with an R, e.g. GA851R.

The retarder is located at the rear of the gearbox. The retarder comprises a stator, rotor and housing. The rotor always rotates at the same speed as the output shaft. The retarder is slowed down by hydraulic oil being pressed into it. This means that the rotor and the output shaft slow down. The hydraulic oil is emptied from the retarder when it is not in use. The hydraulic oil is stored in an external accumulator.

The retarder can be activated with a lever on the instrument panel to slow down the propeller shaft via the gearbox.

A switch next to the lever enables the retarder to be activated with the brake pedal instead of just the lever.

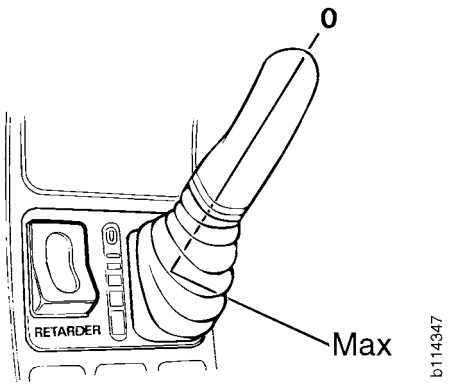


1 Housing with stator
2 Rotor

Switch for enabling the retarder with the brake pedal

The switch has three positions: off, low output, high output.

The low output position delivers 30% braking power and the high output position delivers 60%.



The switch for enabling via the brake pedal is located to the left of the lever.

Control unit

General

The gearbox control unit has three connectors.

On vehicles with EDC, the gearbox control unit communicates with the EDC control unit using the CAN protocol.

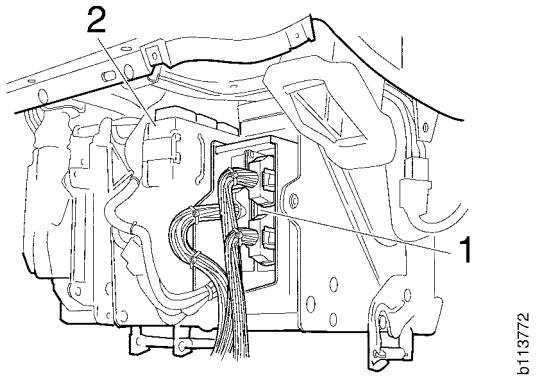
By compiling the information from the sensors on the gearbox, the drive position selector and the current throttle actuation, the control unit determines which gear to use. The control unit also controls the entire gear changing process and monitors the gearbox control system.

The gear changing process is controlled through the control unit continuously monitoring changes in engine speed with various sensors and then compensating to obtain good gear changing performance. After a gear change, it also checks that the correct gear has been engaged.

The gear change performance will vary during this "learning" period. After a short time driving at various speeds, the control unit will go to its normal mode when only minor adjustments will be made to the gear changes.

The gearbox control unit can also "learn" how the gearbox is equipped, which components are connected, to obtain good comfort and long gearbox service life. This learning process, called Auto-detect, takes place after a new control unit or exchange control unit has been fitted in the vehicle. Learning is complete once the power has been turned on 49 times with the starter key and then the memory will be locked. Certain parts of the memory are locked after the power has been turned on 24 times. However, the power must be on for at least 30 seconds to count.

Note: All the leads must be connected to a new control unit before switching on/off the power with the starter key.

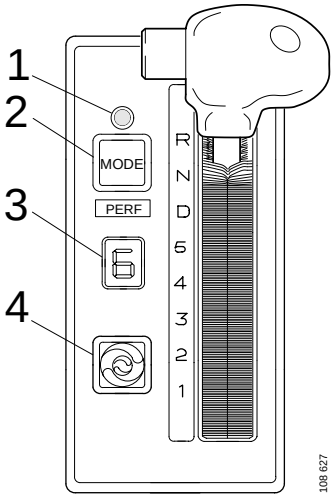


1 Gearbox control unit
2 Gearbox relays

Drive position selector

General

The drive position selector is available in two versions; with a lever or buttons.



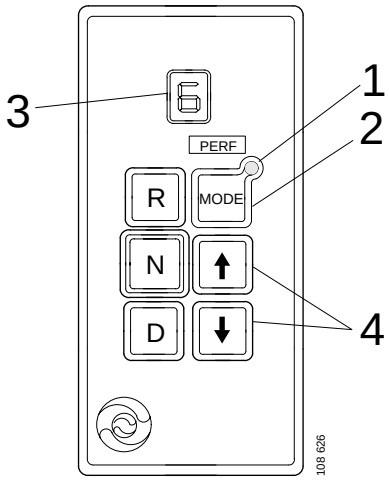
Drive position selector with lever

1 *The LED. Indicates that the power mode is engaged or that there is a fault code present.*

2 *MODE switch.*

3 *Display. Shows selected drive position.*

4 *Logotype switch. Also used for measuring oil level and reading fault codes.*



Drive position selector with buttons

1 *The LED. Indicates that the power mode is engaged or that there is a fault code present.*

2 *MODE switch.*

3 *Display. Shows selected drive position.*

4 *Switch for up- and down-shifting. Selects drive position 1-6. Used also for measuring oil level and reading fault codes.*

MODE switch

The MODE switch 2 can be used to change between two different programs; one normal program and one power program.

During the power program up- and down-shifting take place at higher engine speeds. When the ignition voltage is switched on, the gearbox automatically selects the normal driving program.

Power and normal modes can be toggled by pressing the MODE switch once. The red LED 1 comes on when power mode has been engaged.

Switches for up- and down-shifting and the logotype switch

The switches for up- and down-shifting on a drive position selector with buttons are used principally for selecting drive positions 1-6.

Number of presses	**Function**
1	Check oil level
2	Show fault code 1 of 5 possible
3	Back to current drive position

Note: The switches for up- and down-shifting are to be depressed simultaneously.

Drive position

A gear can only be engaged if the engine is idling and the throttle pedal is released.

The gearbox is protected against overrevving the engine. The gearbox will refuse to shift down if there is a risk of the engine overrevving in the lower gear.

- **R =** Reverse gear

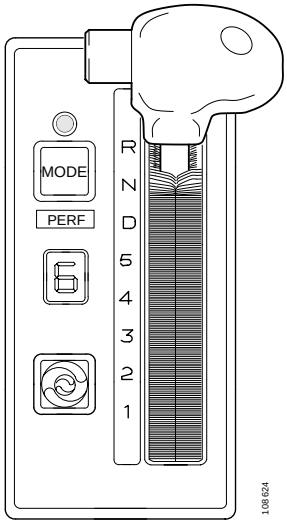
Note: R may only be engaged if the vehicle is stationary.

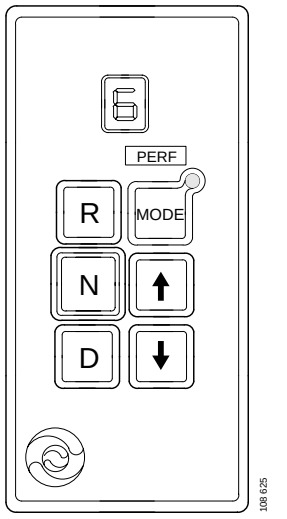
- **N =** Neutral. Used when starting the engine, during long stationary periods and for parking.

Note: Do not engage N while the vehicle is moving. This may damage the gearbox.

Note: The drive position selector must be in position N before the engine can be started.

- **D =** Normal position for driving forwards. All the gears are used.
- **2, 3, 4, 5 =** Forward gears. Only a limited number of gears will be used.
- **1 =** Forward gears. Only the lowest gear is used. It is intended for heavy conditions such as snow, mud, etc. The mechanical gear will also be engaged speed permitting. Position 1 can be used for engine braking at low speeds.

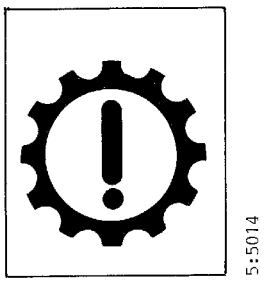




Warning and indicator lamps, etc.

"Check trans" warning lamp

The "Check Trans" warning lamp is located on the instrument panel. The lamp is part of the gearbox warning system and informs the driver of any faults. See "Warning system" and "General information on fault codes".

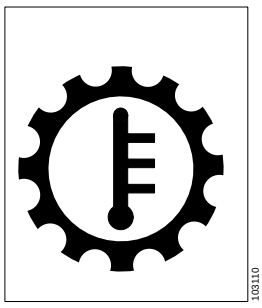


"Check Trans" warning lamp

Warning lamp

The warning lamp for high gearbox oil temperature may come on during long periods of retarder braking. This happens when the oil in the gearbox reaches a temperature of 121 ˚C or the oil in the retarder reaches 165 ˚C.

The lamp will start to flash if the coolant temperature gets too high.



Warning lamp for high gearbox oil temperature

Temperature gauge

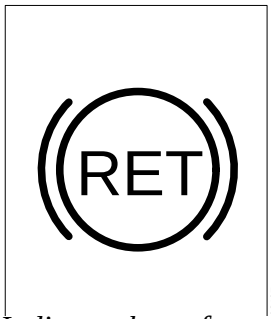
If the temperature reaches 149 ˚C, the control unit will automatically request a lower gear to increase the engine speed and consequently the flow of coolant. The objective is to cool the oil in the retarder.

IMPORTANT! The temperature must not exceed 165. ˚C.

Indicator lamp for activated retarder

The indicator lamp will stay on as long as the retarder is active irrespective of whether the retarder was activated with the lever or the brake pedal.

The lamp will come on especially often when being activated by the brake pedal. If this becomes irritating, the bulb can be removed without causing any other inconvenience.



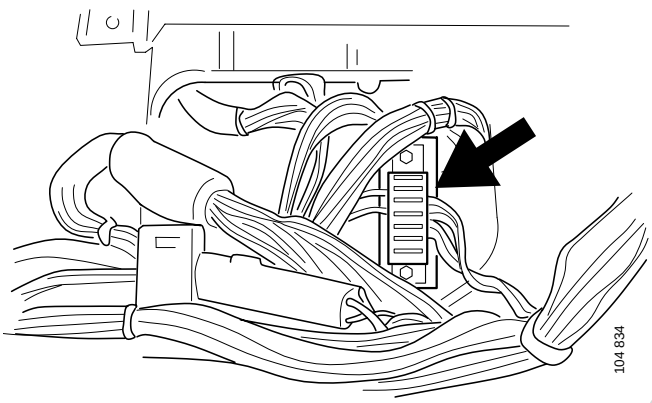
Indicator lamp for activated retarder

Miscellaneous

Allison diagnostic socket

The Allison test equipment is called Pro-Link and is not supplied by Scania. The diagnostic socket for this test equipment is located in the central electric unit and is made accessible by lowering the outer section of the central electric unit.

Do not confuse the rectangular Allison diagnostic socket with the round diagnostic socket that is used for ABS, EDC and other systems.



Location of Allison diagnostic socket for Pro-Link test equipment.

Kick-down

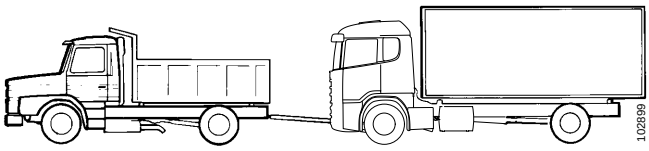
Kick-down can be engaged on vehicles equipped with TPS sensor as well as EDC vehicles.

Kick-down is used to change down, e.g. when overtaking. Kick-down can also be used to delay up-shifting. Loss of power through up-shifting on uphill inclines can be avoided by keeping the accelerator in kick-down position.

Work description

Towing

The vehicle cannot be tow-started.



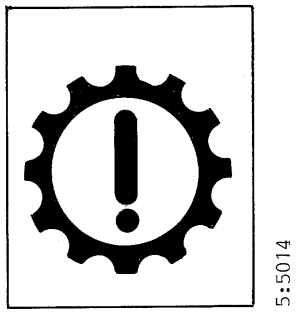
The gearbox oil pump is not driven when the vehicle is being towed. Gears cannot be engaged or disengaged nor can the mechanical gear be engaged unless the gearbox has oil pressure and lubrication. Therefore, power from the drive wheels cannot be transmitted to the engine.

IMPORTANT! The gearbox will not be lubricated when the vehicle is being towed since the oil pump will not work unless the engine is running. Always disconnect the propeller shaft or lift the drive wheels when towing the vehicle, irrespective of distance or speed.

Safety system

The objective of the safety system is mainly to inform the driver of any faults and to take measures to prevent the gearbox from causing problems. The safety system also attempts to minimise damage to the gearbox caused by any faults.

The control unit monitors itself as well as the gearbox. The control unit will immediately take measures if even the slightest fault should occur in a component or the control unit itself.



"Check Trans" warning lamp

Gearbox fault

If a fault occurs, the control unit will proceed in one of three different ways depending on the severity of the fault:

Minor faults not appreciably affecting the gearbox

The control unit will store a fault code in the memory and continue to operate. The gearbox continues to function as normal. Control unit does not light the "Check Trans" warning lamp.

The control unit will automatically clear certain fault codes after a while if they have not reoccurred.

Faults affecting gearbox function to a limited extent

Control unit turns on the "Check Trans" warning lamp.

The control unit will block the drive position. The drive position selector display will flash if an attempt is made to change the drive position. The drive position selector will indicate the gear that was engaged when the fault occurred.

The gearbox will continue to operate within certain limits depending on the type of fault. The mechanical gear (Lock-up) will disengage so that the gearbox only uses the hydraulic gears.

Note: If the power is switched off while the "Check Trans" warning lamp is on, the gearbox will be in neutral, N, when it is turned on again. The gearbox will stay in neutral until the fault is rectified.

Action: Note the fault codes before clearing them. Attempt to restore the gearbox, see Restoring the gearbox.

Faults seriously affecting gearbox function

An example of such a fault is that the control unit loses its power supply. In this case, the gearbox will go to an entirely hydraulic mode, known as "limp-home mode".

The gear that the gearbox selects as "limp-home mode" depends on the gear that was engaged when the fault occurred. The table shows the gear the gearbox will select if a fault occurs.

"Limp-home mode" means that the gearbox will not change gear and that the mechanical gear will remain disengaged.

Engaged gear when fault occurred	Hydraulic "limp-home mode" mode
1	3
2	4
3	4
4	4
5	4
6	5
N	N
R	N

Action: Check the fuses to the affected electrical equipment.

Restoring the gearbox (clearing fault codes)

Description

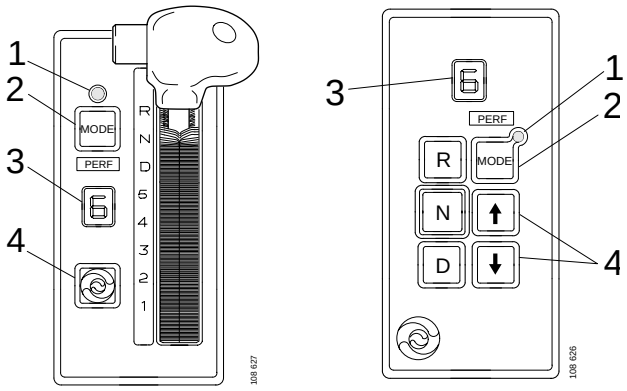
1 Stop the vehicle.

2 Apply the parking brake.

3 Turn off the engine.

4 Display fault codes:

- Lever control: Depress logotype-switch 4 twice.
- Button control: Depress the switches for up- and down-shifting 4 twice simultaneously.



5 Depress the MODE switch 2 and hold it for at least 10 seconds.

6 LED 1 will flash to confirm that the gearbox has been restored. After 3 seconds, the first flash, an active code will be cleared and after 10 seconds, the second flash, an inactive code will be cleared. Then, release the switch.

The warning lamp will only be on if the code is active.

Oil and filter

Checking the oil level

IMPORTANT! A correct oil level is essential for the function and service life of the gearbox. Both too high and too low an oil level can damage the gearbox.

Checking a warm gearbox

Note: The gearbox should be at operating temperature when checking the oil level.

The check can be carried out in two ways; using the dipstick in the same way as for a cold check or electronically from the driver area.

Electronic level check

1 The following conditions must be fulfilled:

- The vehicle must be standing on level ground.
- The engine must be idling.
- The oil temperature must be between 60 and 100 ˚C.
- The drive position selector must be in position N.
- The propeller shaft must be stationary.

2 Start measuring:

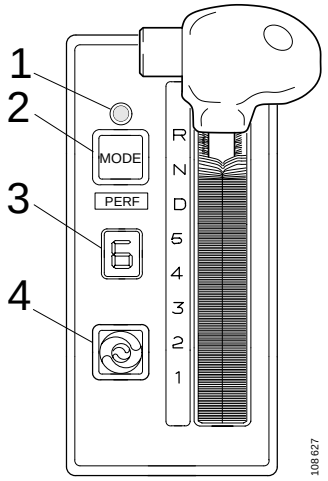
- Lever control: Depress logotype-switch 4 once.
- Button control: Depress the switches for up- and down-shifting 4 once simultaneously.

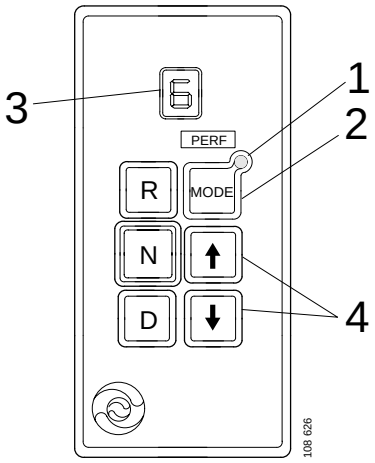
3 If all conditions have been fulfilled, the control unit will start to measure the oil level. Measurement will take about 2 minutes - the display will flash a countdown from 8 until the level is displayed. If the conditions are no longer fulfilled, the control unit will cancel the countdown and a fault code will be displayed. See Fault codes when checking the oil level.

4 After 2 minutes, display 3 will show one of the codes, see the table.

5 Finish measurement:

- Lever control: Depress logotype-switch 4 twice.
- Button control: Press the N-switch (Neutral) once or the switches for up- and down-shifting twice simultaneously.





Information codes when checking the oil level

Code	Action
o,L,o,K	Oil level correct
o,L,L,o,1	Top up with 1 litre oil
o,L,H,I,1	Drain off 1 litre oil

The maximum measuring range for the electronic oil level sensor is shown below.

Gearbox	Oil level	
	Low	High
GA750/751/752	L,o,4	H,I,4
GA851/852	L,o,6	H,I,7

Fault codes when checking the oil level

Fault code	Cause
o,L -, 0,X	Setting time is too short
o,L -, 5,0	Engine speed too low
o,L -, 5,9	Engine speed too high
o,L -, 6,5	Drive position selector is in position N
o,L -, 7,0	Oil temperature too low
o,L -, 7,9	Oil temperature too high
o,L -, 8,9	Propeller shaft rotating
o,L -, 9,5	Oil level sensor defective

Checking a cold gearbox

The objective of a cold check is to determine whether the correct amount of oil is in the gearbox so that it can be safely brought to operating temperature.

Note: The gearbox must be at operating temperature in order to carry out a reliable check of the oil level (warm check).

1 Start the engine and allow it to idle for about 1 minute. Apply the parking brake.

WARNING!

Depress the brake pedal. The parking brake alone is not sufficient to keep the vehicle stationary.

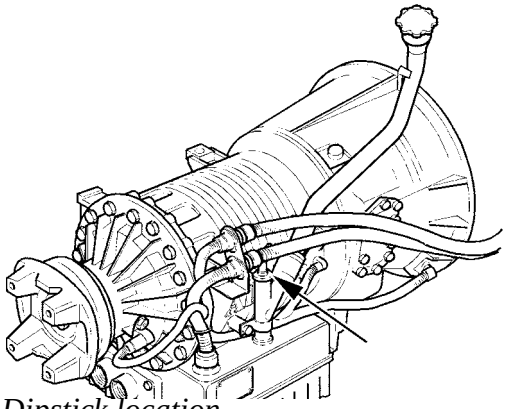
2 Select position D and increase the engine speed to 1000-1500 rpm for 30 seconds. Then, select position R to release any air that is in the system.

3 Select position N and allow the engine to idle.

WARNING!

Disengage the power take-off if applicable so that the rotating shaft is stationary. The shaft is located close to the dipstick and can cause personal injury if rotating.

4 Check the oil level with the dipstick. The dipstick is located on the right-hand side of the gearbox.



Dipstick location

5 Adjust the oil level so that it is between "COLD ADD" and "COLD FULL".

6 Bring the gearbox to operating temperature and then continue with "Checking a warm gearbox".

5:5342

Changing oil and filter

Note: It is best to change the oil and filter when the gearbox is at operating temperature. Warm oil runs faster and it is possible to remove more oil from the gearbox.

WARNING!

Handle hot oil with care. Use protective gloves and goggles.

Changing

Specifications

Oil capacity when changing oil and filter	
GA750/751/752	approx. 20 litres
GA851/852	approx. 34 litres
GA851/852 on vehicles with all-wheel drive (calculated with 2" shallow sump)	approx. 27 litres
Gearbox with retarder	+ approx. 1 litre
Total oil capacity, including oil cooler	
GA750/751/752	approx. 27 litres
GA851/852	approx. 50 litres
GA851/852 on vehicles with all-wheel drive (calculated with 2" shallow sump)	approx. 43 litres
Gearbox with retarder	+ approx. 2 litres

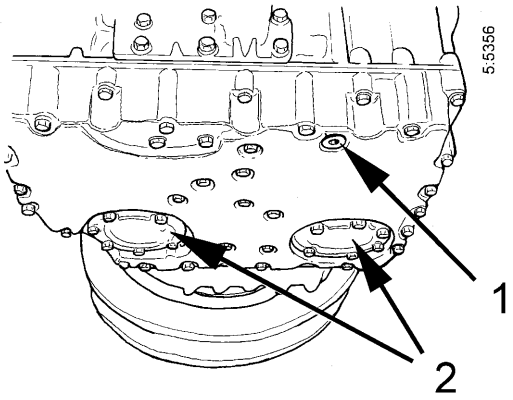
Description

1 Bring the gearbox to operating temperature so that the oil temperature is between 70 and 90 ˚C. Put the drive position selector in position N and switch off the engine. Clean around the drain plug.

2 Place a suitable container under the gearbox. Unscrew the drain plug 1 on the sump and allow the oil to drain. Use a 3/8" square spanner.

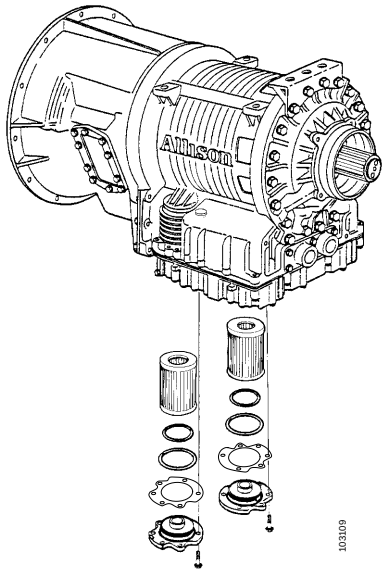
3 Inspect the condition of the oil. Check if there are any traces of water, metal particles or coolant. Water or coolant in the oil may indicate that the oil cooler is leaking. If this is the case, the oil cooler must be changed. Metal particles in the oil may indicate internal damage in the gearbox. If this is the case, contact an Allison dealer before taking any further measures.

4 The gearbox is fitted with two filters 2. Clean around the filter covers. Undo the bolts on the filter covers. Remove the covers, O-rings, gaskets and filters.



5 Lubricate and fit O-ring, gasket and filter to each filter cover. Position the filters in the sump using the bolt holes as guides and press them in by hand.

Note: Vehicles with all-wheel drive have a shallower sump. This means that a shorter oil filter must be used.



IMPORTANT! Do not use the bolts to press the lids in place. Do it by hand instead. Otherwise, the sump, filter covers or seals may be damaged.

6 Fit the bolts for the filter covers and tighten them to 60 Nm.

7 Clean the drain plug and change the O-ring.

8 Fit the drain plug and O-ring. Tighten the drain plug to 30 Nm.

9 Top up with oil through the dipstick pipe. When changing oil the volumes specified in Oil capacity when changing oil and filter must be followed.

10 Cold check the oil level, see Check the oil level. Adjust the oil level and then bring the gearbox to operating temperature. Make a final check of the oil level only when the gearbox has reached between 70 and 90 ˚C.

Drive position selector

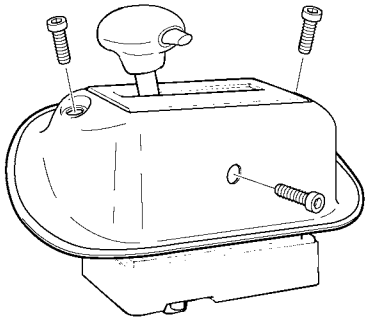
The drive position selector is only available as a complete unit. Change the complete drive position selector if a fault occurs.

Removal

1 Remove the bolts securing the protection cover and remove the cover. The protection cover is a separate part and is not included with the actual drive position selector.

2 Remove the bolts securing the drive position selector to the console.

3 Lift up the drive position selector and remove the connector by pressing in the catches.



Fitting

1 Fit the connector to the drive position selector.

2 Fasten the drive position selector to the console.

3 Fit the protection cover.

Control unit

The control unit is located under the central electric unit on the passenger side together with the relays for the gearbox control system.

Changing

1 Turn off the power supply with the starter key.

2 Remove the plastic cover on the control units.

3 Remove the mounting plate with control unit and relays by releasing the latch clamp.

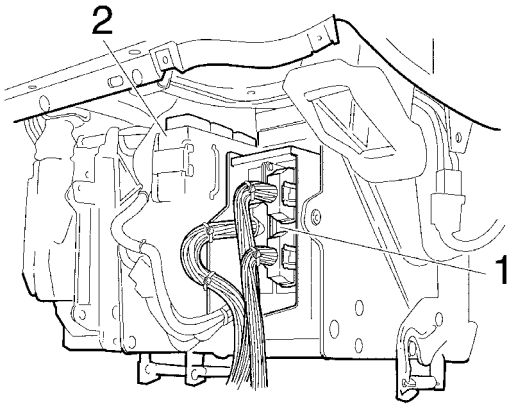
4 Remove the connectors from the control unit. They cannot be confused when reconnecting.

5 Change the control unit.

6 Fit the connectors.

7 Fit the mounting plate, control unit and relays.

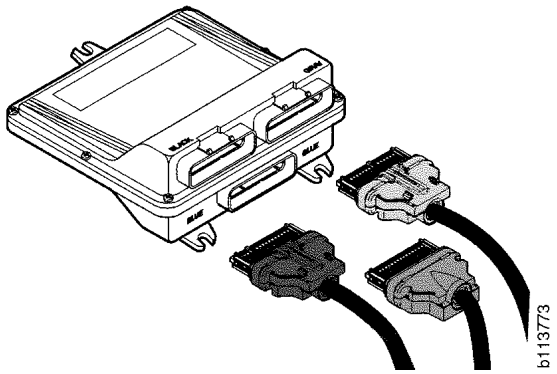
8 Fit the plastic cover.



1 Gearbox control unit
2 Gearbox relays

Checking voltage to control unit

1 Turn off the power supply with the starter key.



Control unit and connectors

2 Remove the connectors from the control unit.

3 Measure the voltage between the pins in the control unit connector. The position of the pins is marked on the connector. See wiring diagram in group 16.

Note: The cable terminals are deep inside the connector. Take care when connecting the multimeter so that nothing is damaged.

4 Switch on the power supply and turn on the headlamps to put a load on the battery.

5 Read off the multimeter. Correct voltage is between 22 and 28 volts. The voltage reading must equal the battery voltage.

6 Turn off the power supply with the starter key.

7 Fit the connectors.

8 If the multimeter indicated the wrong voltage, make sure the measured pins are not corroded or damaged. Clean or replace as necessary. Check the fuses to the gearbox.

9 Check the cable harness if the fault remains.

10 Change the control unit if none of the above faults is detected.

If the problem is solved by changing the control unit, refit the "old" control unit to make sure the control unit really was at fault. Change back to the "new" control unit again and compare the results.

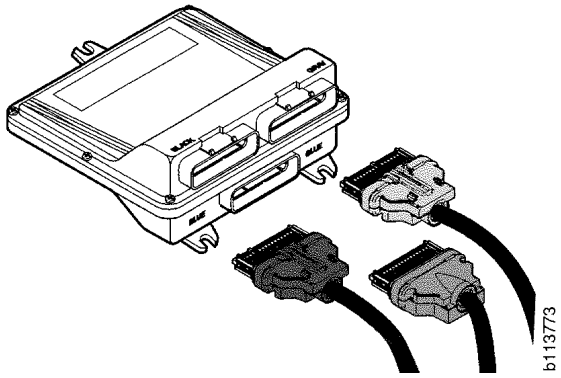
However, if the "old" control unit was in working order, check whether the connectors are corroded or damaged and make sure nothing was overlooked earlier.

Cable harness

Checking the cable harness

1 Make sure the power supply is switched off.

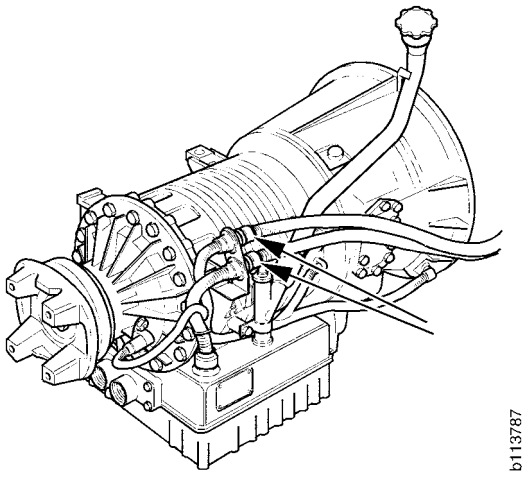
2 Check that all the connectors are fitted correctly.



Control unit connectors

3 Remove all the connectors and inspect them. If a connector is corroded or dirty it must be cleaned thoroughly.

4 Then, fit all the connectors again and clear the fault code. Check whether the fault code is still present. If this is the case, continue by checking each lead.



Gearbox connectors

Checking each lead

If all the connectors are fitted correctly and are free from dirt and corrosion but the fault is still present then the lead itself may be damaged.

How to check each lead pertaining to a certain fault code:

1 Remove the control unit and gearbox connectors.

2 Connect a cable to the lead you are checking down at the gearbox connectors. The cable should be long enough to reach to the control unit connectors in the cab.

3 Connect one of the test probes of an ohmmeter to the control unit connector. Then, connect the other test probe to the connector down at the gearbox. If the ohmmeter reading indicates a high resistance, there is a break in the lead.

4 Checking for short circuits: Connect one of the ohmmeter test probes to the lead in question in the control unit connector. Earth the other test probe to the chassis.

5 If the ohmmeter reading indicates a low resistance or none at all, the lead is shorted to the chassis earth.

6 Perform this test on both leads belonging to each circuit. Remember that a lead may not only be short circuited to the chassis earth but also to other leads in the cable harness.

Engine speed sensor

The gearbox has three speed sensors. These are all of the same type and they are not adjustable.

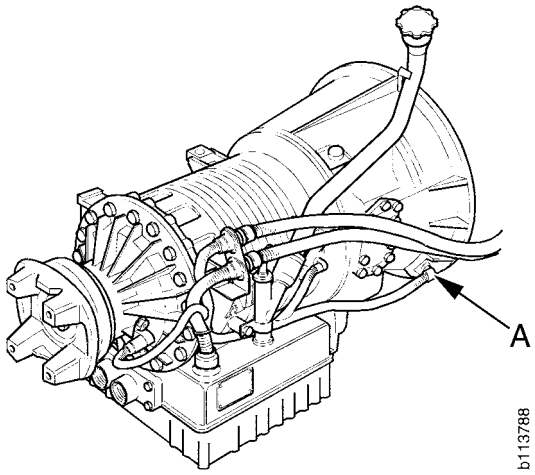
Scania workshops can easily replace all the speed sensors except the middle one on GA750/751/752.

All three speed sensors have the same resistance.

Temperature	Resistance
-40 ˚C	200 ohm
20 ˚C	300 ohm
110 ˚C	400 ohm

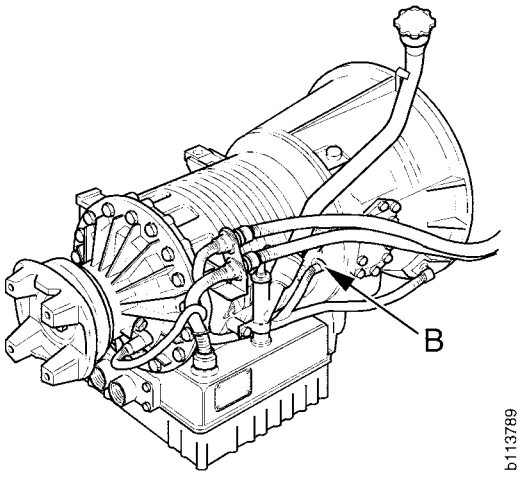
Permissible tolerance is +/- 30 ohm.

The front speed sensor A detects the input speed to the torque converter.



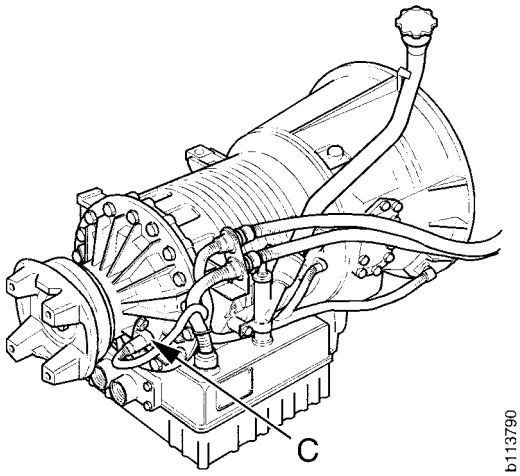
The middle speed sensor B detects how fast the turbine shaft is rotating. The control unit uses this value to distinguish between the mechanical gear (lock-up) and the hydraulic gear.

The middle speed sensor is only accessible for Scania workshops on GA851/852 gearboxes. An Allison representative must change the sensor on GA750/751/752 as it is integrated in the gearbox.



The rear speed sensor C detects how fast the output shaft is rotating.

The control unit ensures that the gear ratio is correct by detecting the difference in speed between speed sensor B and speed sensor C. The control unit controls the changing procedure by continually checking the change in speed and then compensating to obtain the correct speed.



Throttle actuation sensor

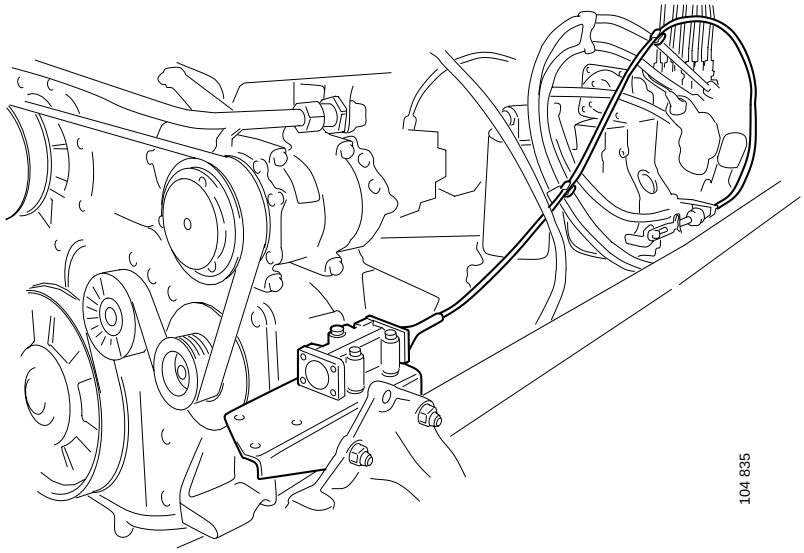
The throttle actuation sensor is located on the frame. The wire is attached to the control lever on the injection pump.

Note: Minimum bending radius allowed for the cable is 150 mm.

The throttle actuation sensor is self-adjusting within a certain range. The sensor must be adjusted roughly after being replaced. See Adjusting the throttle actuation sensor.

The accelerator must be fully depressed occasionally (can be done with the engine turned off and power switched on). Otherwise, the gear changing comfort will be inferior since the control unit must "learn" maximum accelerator actuation.

Vehicles with EDC are not fitted with a throttle actuation sensor. The EDC control unit communicates directly with the gearbox control unit using the CAN protocol.



Location of throttle actuation sensor on vehicles with 12-litre engine.

Removal and fitting

Specifications

Resistance of removed sensor

Pin	Resistance
A-C	9000-15000 ohm
A-B rest position	At least 500 ohms in rest position, increasing successively as the cable is pulled out.
A-B fully extended	9000-15000 ohm

Removal

1 Detach the cable from the control lever.

2 Remove the clamp holding the cable in place.

3 Remove the connector from the sensor by lifting the catch and pulling straight out.

4 Remove the sensor from the bracket.

Fitting

1 Fit the sensor to the bracket.

2 Fit the sensor connector. Make sure the catch on the electrical connection secures the connector at the sensor.

3 Attach the cable to the lever with a bolt, washer and split pin.

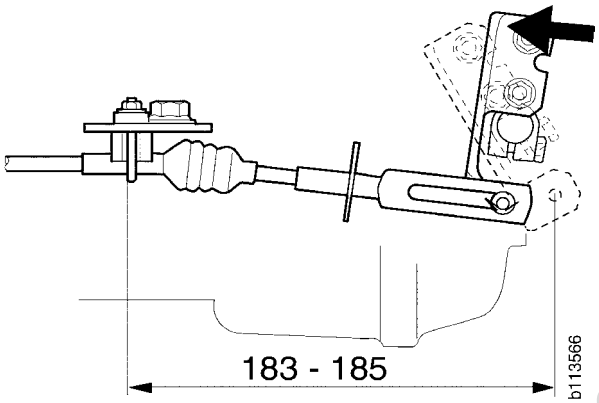
4 Place the cable in the clamp. The cable has a groove where the clamp is to be located.

Adjusting the throttle actuation sensor

1 Rotate the control lever to maximum by pressing the clamp arm as indicated by the arrow. Press the arm as far as possible so that it reaches the wide-open-throttle stop.

2 Adjust the clamp securing the cable by sliding it forward or backward until the correct adjustment length is obtained.

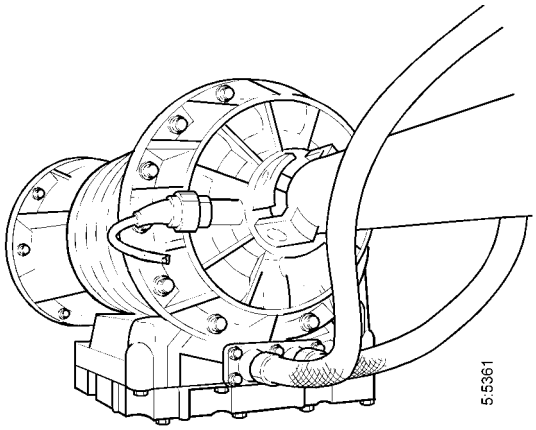
The length should be 183 - 185 mm. Measure between the outer edge of the clamp and the centre of the bolt on the control lever.



Road speed sensor

The road speed sensor is located beside the end yoke.

The sensor is sealed and delivers 4 pulses per revolution.



Location of road speed sensor.

Temperature sensor

Oil temperature sensor, gearbox sump

The temperature sensor detects the temperature of the oil in the automatic gearbox sump. The sensor provides the control unit with information, which in turn switches on the warning lamp W24 if necessary.

Scania workshops must not change the sensor as it is integrated in the gearbox. Measure the resistance of the temperature sensor to check whether it is faulty before calling an Allison representative.

Temperature	**Resistance**
-20 (C	680-705 ohm
0 (C	810-830 ohm
20 (C	950-975 ohm
40 (C	1100-1135 ohm
60 (C	1270-1305 ohm
80 ˚C	1440-1500 ohm
100 ˚C	1635-1705 ohm
120 ˚C	1840-1925 ohm
140 ˚C	2050-2165 ohm

Oil temperature sensor, retarder

Note: Only applies to gearbox with retarder.

The temperature sensor detects the temperature of the oil in the actual retarder. The sensor is attached to a bracket bolted on the gearbox housing.

Changing

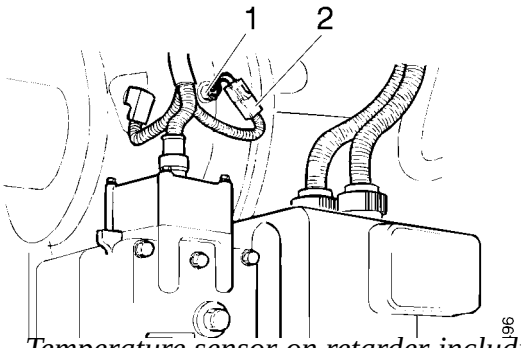
1 Remove the connector 2 to the sensor 1 by lifting the catch and pulling it straight out. Do not pull on the cable casing as the insulation may then come loose.

2 Remove the bolt from the mounting plates.

3 Carefully pull out the sensor and mounting plates. They are fastened together.

4 Place the new sensor in position in the gearbox housing and bolt it on with the mounting plate.

5 Fit the connector to the sensor. This can only be done in one way. Make sure the catch secures the connector properly.



1 Temperature sensor on retarder including mounting plate

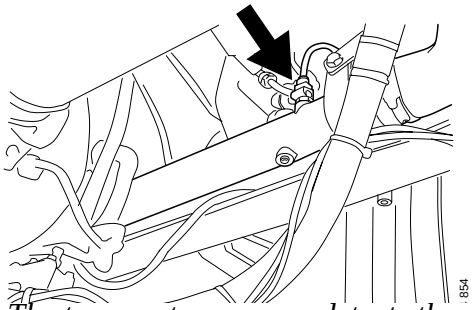
2 Connector to temperature sensor on retarder

Temperature	Resistance
-20 ˚C	680-705 ohm
0 ˚C	810-830 ohm
20 ˚C	950-975 ohm
40 ˚C	1100-1135 ohm
60 ˚C	1270-1305 ohm
80 ˚C	1440-1500 ohm
100 ˚C	1635-1705 ohm
120 ˚C	1840-1925 ohm
140 ˚C	2050-2165 ohm

Coolant temperature sensor

Note: Only applies to gearbox with retarder.

The temperature sensor detects the temperature in the coolant pipe to the oil cooler. The sensor provides the control unit with information. The control unit can limit the retarder power so that the coolant temperature does not get too high.



The temperature sensor detects the coolant temperature at the oil cooler outlet.

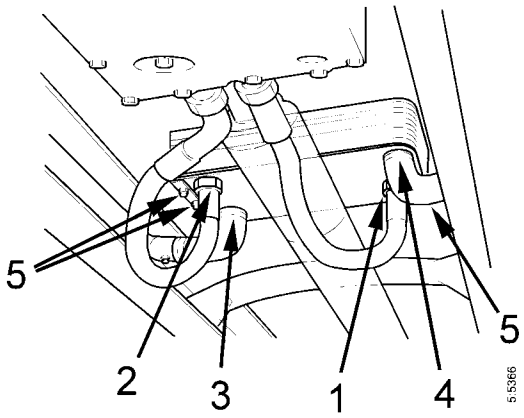
Temperature	Resistance
-20 ˚C	approx. 29000 ohm
0 ˚C	approx. 9500 ohm
20 ˚C	approx. 3600 ohm
40 ˚C	approx. 1500 ohm
60 ˚C	approx. 680 ohm
80 ˚C	approx. 340 ohm
100 ˚C	approx. 180 ohm
120 ˚C	approx. 100 ohm
140 ˚C	approx. 60 ohm

Oil cooler

General

Normally, the oil cooler will not require maintenance provided it is not leaking or has not broken down.

If impurities have entered the oil cooler, e.g. due to a breakdown, it is essential to clean the oil cooler. Otherwise, any dirt remaining in the oil cooler can loosened as a result of oil circulation, vibrations and changes in temperature. This can rapidly damage the gearbox.



1 Inlet oil hose
2 Outlet oil hose
3 Inlet coolant pipe
4 Outlet coolant pipe
5 Bolts

IMPORTANT! Do not hesitate to change the oil cooler if you are unsure of the result of the cleaning.

Removal and fitting

Removal

1 Drain the coolant from the cooling system.

2 Drain the oil from the gearbox as described in Changing oil and filter. If the oil has been polluted because of a cooler breakdown, change the oil cooler, oil and all the filters.

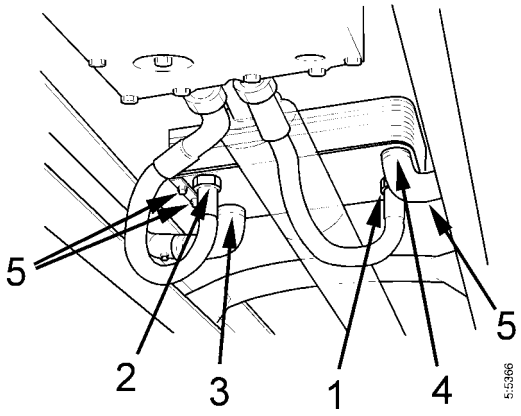
3 Detach the inlet and outlet oil hoses from the oil cooler. Collect the oil in a suitable container.

WARNING!

Handle hot oil and coolant with care! Use protective gloves and goggles.

4 Detach the coolant hoses from the oil cooler.

5 Remove the oil cooler.



Fitting

1 Fit the oil cooler to the bracket.

2 Connect the coolant hoses.

3 Connect the inlet and outlet oil hoses.

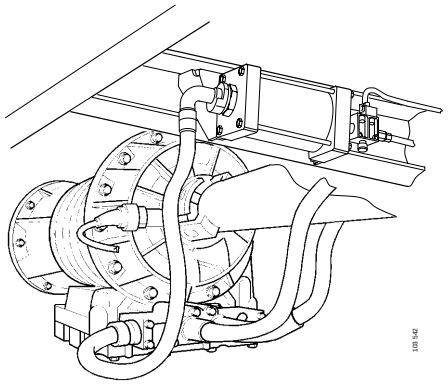
4 Fill the cooling system with coolant.

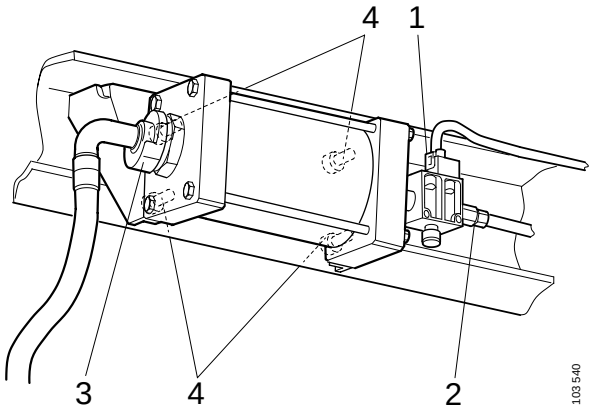
5 Fill the gearbox with oil as described in Changing oil and filter.

6 Adjust the gearbox oil level as described in Checking the oil level.

Retarder accumulator

The retarder accumulator is located between the oil cooler and the gearbox.





1 Solenoid valve connector
2 Compressed air connection
3 Oil hose connection
4 Bolts

Removal and fitting

Removal

1 Remove the solenoid valve connector by lifting the catch.

2 Detach the compressed air connection.

3 Detach the oil hose from the accumulator. Collect the oil in a suitable container.

4 Remove the accumulator from the bracket.

Fitting

1 Fit the accumulator to the bracket.

2 Connect the oil hose to the accumulator.

3 Fit the compressed air connection.

4 Fit the connector. Make sure the catch secures the connector.

Power take-off

Engaging and disengaging

Specifications

Rotation speed and maximum torque for power take-off

GA750/751/752, power take-off EG112

Rotation speed	1.17 x engine speed
Short-term operation, max. 5 min per 15 min.	565 Nm
Continuous operation	395 Nm
Continuous operation (emergency vehicles)	455 Nm

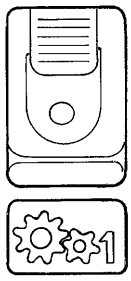
GA851/852, power take-off EG210

Rotation speed	1.08 x engine speed
Short-term operation, max. 5 min per 15 min.	780 Nm
Continuous operation	545 Nm
Continuous operation (emergency vehicles)	625 Nm

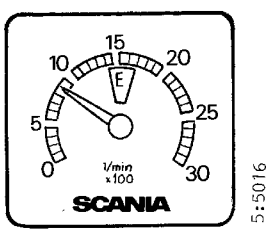
General

The power take-off is engaged using a switch in the driver area.

Note: The power take-off should be engaged at idle speed or max. 1000 rpm. The power take-off coupling will be subjected to high stresses if it is engaged at higher speeds.



Power take-off switch



As standard, the power take-off is connected so that it only will work when the drive position selector is in position N.

If the power take-off is to work in all drive positions, replace relay R72 with an insulated flat-pin bridge (part no. 1 123 250).

The power take-off is engaged and disengaged through a disc coupling. This means that the power take-off can be engaged and disengaged without turning off the engine.

Adjusting

The play between the power take-off and gearbox gears is adjusted with a rubber-coated metal gasket. The gasket is located between the power take-off and the gearbox. The correct play has been set at the factory and it does not usually require further adjustment.