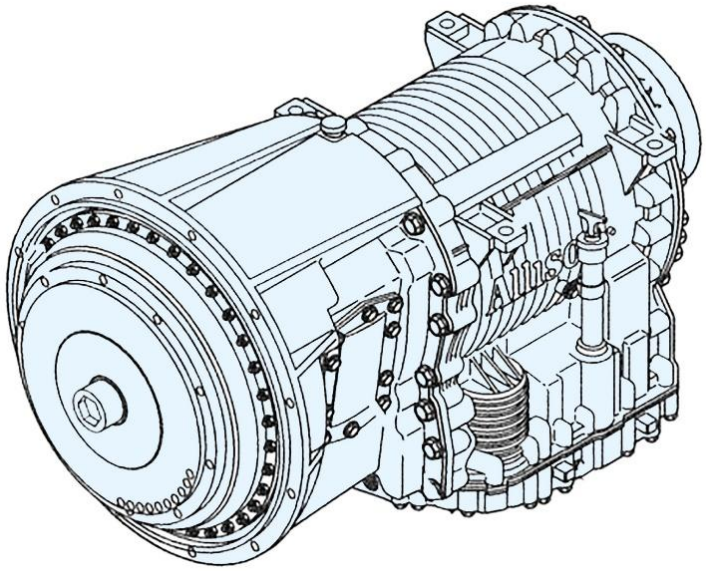
OPERATION MANUAL



Allison 3000 Series

Automatic Transmission
5th Generation

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TERBERG BENSCHOP
MANUFACTURER OF SPECIAL VEHICLES

Contents

1 Scope of this manual

1.1 How to use this document

This document is a supplement to the main tractor operation manual and advices specifically on the operation and safety of the Allison transmission.

The manual MUST be read thoroughly before using the tractor.

Terberg is in no way responsible for damage caused by using or maintaining this tractor. The given instructions are an advice. You are responsible for creating a safe working environment.

No attempt should be made to operate or maintain this equipment until this manual and its supplements have been read and fully understood.

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These are the original instructions, The English language is binding. Request your language if it is missing.

1.2 Abbreviations and Acronyms

ABS	Anti-lock Brake System.
D	Drive (Forward).
DMD	Display Mode/Diagnostic.
DIM	Driver Information Module.
DTC	Diagnostic Trouble Code.
ECO	Economy.
FLGS	Full Load Governed Speed.
FLI	Filter Life Indicator.
FM	Filter Life Monitor.
FMI	Failure Mode Identifier.
I/O	Input/Output.
N	Neutral.
OEM	Original Equipment Manufacturer.
OLS	Oil Level Sensor.
OM	Oil Life Monitor.
PTO	Power Takeoff.
PWR	Power.
R	Reverse.
RELS	Reduced Engine Load at Stop.
Rpm	Revolutions per minute.
SESS	Super Economy Shift Schedule.
SPN	Suspect Parameter Numbers.
TCM	Transmission Control Module.
TM	Transmission Health Monitor.

2 Important Safety Information

IT IS YOUR RESPONSIBILITY to be completely familiar with the warnings and cautions in this manual.
These warnings and cautions advise of specific methods or actions that can result in personal injury, equipment damage, or cause the equipment to become unsafe.

The WARNINGS, CAUTIONS, and NOTES in this manual apply only to the Allison® transmission and not to other vehicle systems which may interact with the transmission.

WARNINGS:

- When starting the engine, make sure the service brakes are applied. If you do not apply service brakes may result in unexpected vehicle movement.
- If you leave the vehicle and the engine is running, the vehicle can move unexpectedly and you or others could be injured. If you must leave the engine running, DO NOT LEAVE the vehicle until you have completed all of the following procedures:
    - Put the transmission in **N** (Neutral).
    - Be sure the engine is at low idle (500 - 800 Rpm).
    - Apply the parking and emergency brakes and make sure they are properly engaged.
    - On a slope: chock the wheels and take other steps necessary to keep the vehicle from moving.
- The vehicle service brakes or parking brake must be applied whenever **N** is selected to prevent unexpected vehicle movement. Selecting **N** does not apply the vehicle brakes.
- Transmission is shifted to **N** automatically when engaging the parking brake. A gear has to be re-selected after releasing the parking brake.
- Transmission uses ‘ECO’ (Economy) shift points whenever possible and automatically detects the load and shifts to ‘Pwr’ (Power) shift points when needed.
- To help avoid injury or property damage caused by sudden movement of the vehicle, do not make shifts from **N** to **D** (Drive) or **R** (Reverse) when the throttle is open. The vehicle may lurch forward or rearward and the transmission can be damaged. Avoid this condition by making shifts from **N** to a forward range or **R** only when thethrottle is closed and the service brakes are applied.
- To help avoid unexpected vehicle movement that might cause death, serious injury, or property damage, always have your foot on the brake, the throttle released, and the engine at idle before making a **N** to **D**; **N** to **R**; **D** to **R**; or **R** to **D** selection.
- When starting the engine, make sure the service brakes are applied. Failure to apply the service brakes can result in unexpected vehicle movement.
- If you let the vehicle coast in **N**, there is no engine braking and you could lose control. Coasting can also cause severe transmission damage. To help avoid injury and property damage, do not allow the vehicle to coast in **N**.
- To avoid loss of control, use a combination of downshifting, braking, and other retarding devices. Downshifting to a lower transmission range increases engine braking and can help you maintain control.

The transmission has a feature to prevent automatic upshifting above the lower range selected. However, during downhill operation, if engine governed speed is exceeded in the lower range, the transmission will upshift to the next higher range to prevent engine damage.
This will reduce engine braking and could cause a loss of control.
Apply the vehicle brakes or other retarding device to prevent exceeding engine governed speed in the lower range selected.

3 Driving tips

3.1 The Automatic Experience

Smooth automatic upshifts and downshifts, without interruption of power to the wheels, occur in your Allison automatic transmission based on engine rpm, throttle position, vehicle load, road speed, and driver or feature request, such as manually preselecting ranges.

Allison® automatic transmissions, along with a vehicle specification appropriate for the particular duty cycle, can provide superior fuel efficiency and optimum fuel economy. In vehicles with a manual or automated manual transmission, the power interrupts that occur during shifts reduce the engine's inertia energy, resulting in lower average wheel horsepower.
Because the engine is not working efficiently, it cannot run at full load. With an Allison automatic transmission, there is no power interrupt during shift changes.
The inertia energy built up by the engine is maintained, equating to higher wheel horsepower.
As a result, not as much engine horsepower is needed to get the job done.
Allison automatic transmissions provide smooth, seamless shifts at all points of the power curve, there is no jarring power interrupts to jostle the driver.
Allison automatic transmission equipped vehicles are more nimble in traffic and easier to maneuver on congested routes.
Vehicles equipped with Allison International Series fully automatic transmissions will keep you on schedule with maximum operating economies and improved vehicle performance.

3.2 Starting the engine

WARNING	
	When starting the engine, make sure the service brakes are applied. Failure to apply service brakes may result in unexpected vehicle movement.

This indicates that **N** has been selected and attained, and the engine may now be started.

3.3 Cold weather starts

If the Transmission Fluid Temperature (TFT) sensor detects the transmission fluid is below 7°C (45°F), then the transmission is programmed to start in 2nd gear.

If the transmission fluid temperature is below 10°C (50°F) then follow these procedures when making directional shift changes:

- To shift from **D** to **R**, select **N** and then **R**.
- To shift from **R** to forward, select **N** and then **D**, or other forward range.

NOTICE	
	■ During cold fluid conditions, always place the transmission in **N** prior to any direction changes. ■ Failure to follow these procedures during cold fluid conditions, may cause the CHECK TRANS light to illuminate and the transmission to be restricted to **N**.

Transmission operation at extremely cold ambient temperatures may require preheating or the use of a TES 295 transmission fluid. (TES 295 is initially filled at Terberg factory).

3.3.1 Preheating requirement

- If ambient temperatures drop below the specified minimum levels for the fluid type, preheat the transmission fluid before beginning transmission operation.
- The minimum fluid temperatures at which the transmission may be safely operated without preheating are:

Fluid type	Minimum Temperature	
	°C	°F
TES 295	–35	–31
TES 389	–25	–13

Preheat the transmission fluid using one of the following methods:

- Use an auxiliary heat source such as a sump heater.
- Operate the transmission in **N** with the engine running at idle for a minimum of 20 minutes before attempting range operation.

CAUTION	
	**Transmission malfunction or damage may occur if you operate the transmission with the fluid temperature below the minimum fluid temperature specification limit.**

3.4 High temperature

The transmission is considered to be overheated when any of the following temperatures are exceeded:

Sump fluid	**121°C (250°F)**
Fluid to cooler	149°C (300°F)
Retarder out fluid	165°C (330°F)

Typical continuous sump temperature is 93°C (200°F).
If the transmission overheats during normal operation, make sure the transmission fluid level is correct. Refer to Chapter Fluid level check using dipstick, daily.

CAUTION	
	■ The engine should never be operated for more than 10 seconds at full throttle with the transmission in range and the output stalled. ■ Prolonged operation of this type will cause the transmission fluid temperature to become excessively high and will cause severe overheat damage to the transmission.

- If the engine temperature gauge indicates a high temperature, the transmission is probably overheated. Stop the vehicle and check the cooling system.
- If it appears to be functioning properly, run the engine at 1200 - 1500 Rpm with the transmission in **N**. This should reduce the transmission and engine temperatures to normal operating levels in 2 or 3 minutes.
- If the transmission and engine temperatures do not decrease, reduce the engine rpm. If the engine temperature indicates a high temperature, an engine or radiator problem is indicated.
- If high temperature in either the engine or transmission persists, stop the engine and have the overheating condition investigated by maintenance personnel.

NOTICE

- Some shift schedules may be inhibited as a result of operating conditions, such as engine or transmission fluid temperature.

3.5 Turning Off the vehicle

Always select **N** before turning off the vehicle.

WARNING PARKING BRAKE

If you leave the vehicle and the engine is running, the vehicle can move unexpectedly and you or others could be injured.

DO NOT LEAVE the vehicle until you have completed all of the following procedures:

- Put the transmission in **N**.
- Be sure the engine is at low idle (500-800 Rpm).
- Apply the parking and emergency brakes and make sure they are properly engaged.
- Chock the wheels and take other steps necessary to keep the vehicle from moving.

The parking brake is only intended to secure an unattended vehicle with the ignition **off**.
Always maintain the vehicle parking brake system according to the manufacturer's specifications.
The parking brake may not have sufficient capacity to restrain a vehicle with the engine running and the Transmission in a forward or reverse range.
When the vehicle is unattended and the engine is running, the transmission **must be in N** with the **brakes fully applied** and the **wheels chocked.**

WARNING

- The vehicle service brakes, parking brake, or emergency brake must be applied whenever N is selected to prevent unexpected vehicle movement.
- Selecting N does not apply the vehicle brakes unless an auxiliary system to apply the parking brake is installed by the OEM.

3.6 Driving on snow or ice

WARNING

- If you use the engine brake on wet or slippery roads, it may cause loss of traction on the drive wheels - your vehicle may slide out of control.
- To help avoid injury or property damage, turn the engine brake enable to OFF when driving on wet or slippery roads.

NOTICE

A retarder is disabled automatically whenever the ABS is active. However, in the event that the ABS malfunctions, it is recommended that the retarder enable switch is disabled (if present).

If possible, reduce vehicle speed and select a lower range before losing traction. Select the range that will not exceed the speed expected to be maintained.

Accelerate or decelerate very gradually to prevent the loss of traction. It is very important to decelerate gradually when a lower range is selected. It is important that you reach the selected lower range before attempting to accelerate. This avoids unexpected downshift during acceleration.

3.7 Rocking Out

WARNING

- To help avoid injury or property damage caused by sudden movement of the vehicle, do not make shifts from N to D or R when the throttle is open.
- The vehicle may lurch forward or rearward and the transmission can be damaged.
  Avoid this condition by making shifts from N to a forward range or R only when the throttle is closed and the service brakes are applied.

CAUTION

- DO NOT make N to D or directional shift changes when the engine rpm is above idle.
  Also, if the wheels are stuck and not turning, do not apply full power for more than 10 seconds in either D or R.
- Full power for more than 10 seconds under these conditions causes the transmission to overheat.
- If the transmission overheats, shift to N and operate the engine at 1200-1500 Rpm until it cools (2-3 min.)

If the vehicle is stuck in deep sand, snow, or mud, it may be possible to rock it out using the following procedure:

- Shift to **D** and apply a steady, light throttle (never full throttle).
- When the vehicle has rocked forward as far as it will go, apply and hold the vehicle service brakes.
- When engine has returned to idle, select **R**.
- Release the vehicle service brakes and apply a steady, light throttle (never full throttle) allowing the vehicle to rock in **R** as far as it will go.
- Apply and hold the vehicle service brakes and allow the engine to return to idle.

This procedure may be repeated in **D** and **R** if each directional shift continues to move the vehicle a greater distance.

3.8 Towing or pushing

Before pushing or towing a vehicle with an Allison 3000 Series transmission, do one of the following:

- Lift the drive wheels off the road.
- Disconnect the driveline, or:
- Remove the axle drive shafts.

3.9 Operating down steep grades

CAUTION

With this transmission, the service brakes must be used when backing a loaded trailer down a hill.

Too much brake application, particularly on an unpaved surface, can lock the front brakes and reduce steering control. Then, a crash can occur.

Instructions to help prevent injury or property damage:

- Drive forward down the hill and then exit by backing up the grade when you can do so.
- If equipped, use the trailer brake when backing the trailer down a grade.
- Do not use the trailer brake as a parking brake once the vehicle is at the bottom of the grade.
- If a trailer brake is not available, back the trailer down the grade by modulating the service brakes to control and maintain a safe, steady vehicle speed.
- Avoid abrupt stops and starts.

NOTICE

- Conditions responsible for illuminating the CHECK TRANS indicator will not allow any shift selector changes until the DTC related to the condition goes inactive.
- The DIM shows the range the transmission has locked in because of an active DTC.
  Move the vehicle to a safe location before turning off the vehicle and seek qualified assistance if needed.

3.10 Description of available ranges

WARNING

If you leave the vehicle and the engine is running, the vehicle can move unexpectedly and you or others could be injured.

If you must leave the engine running, DO NOT LEAVE the vehicle until you have completed all of the following procedures:

- Put the transmission in **N**.
- Be sure the engine is at low idle (500 - 800 rpm).
- Apply the parking and emergency brakes and make sure they are properly engaged.
- Chock the wheels and take other steps necessary to keep the vehicle from moving.

R may not be attained due to an active inhibitor.
Always apply the service brakes when selecting **R** to prevent unexpected vehicle movement and because a service brake inhibit may be present.
When **R** is flashing, it indicates the shift to **R** is inhibited.
Determine if diagnostic codes are active if **R** is not attained.
Check the brake functions.

CAUTION

- Do not idle in Reverse for more than five minutes.
- Extended idling in these ranges can cause transmission overheating and damage.
- Always select N whenever time at idle exceeds five minutes.

NOTICE

- Completely stop the vehicle and let the engine return to idle before shifting from a forward range to **R** and from **R** to a forward range.
- The display shows **R R** when Reverse is selected and engaged.

WARNING

- When starting the engine, make sure the service brakes are applied. If you do not apply the service brakes, this can result in unexpected vehicle movement.
- The vehicle service brakes, parking brake, or emergency brake must be applied whenever N is selected to prevent unexpected vehicle movement.
- Selecting N does not apply the parking brake.
- If you let the vehicle coast in N, there is no engine braking and you could lose control. Coasting can also cause severe transmission damage. To help avoid injury and property damage, do not allow the vehicle to coast in N.

NOTICE

- Use **N** when starting the engine to check vehicle accessories and for extended periods of engine idle operation (longer than five minutes).
- The digital display shows **N N** when **N** is selected and engaged. Always select **N** before turning off the vehicle engine.

WARNING

- D may not be attained due to an active inhibitor.
- Always apply the service brakes when selecting D to prevent unexpected vehicle movement and because a service inhibit may be present.

When the selected range is flashing, it indicates the shift to **D** is inhibited. Determine if diagnostic codes are active if **D** is not attained.

CAUTION

- Do not idle in D for more than 5 minutes. Extended idling in D may cause transmission overheating and damage.
- Always select N if time at idle exceeds five minutes.

NOTICE

- If equipped with a HIGH IDLE switch, turn the HIGH IDLE switch off before shifting from **N** to **D** or **R**. **D** or **R** may not be attained unless the shift is made with the engine at idle.
- Also, be aware of other interlocks that would prevent attaining **D** or **R**.
- Example: ‘Service brakes not applied’ (service brake interlock present).

NOTICE

- The transmission initially attains its lowest programmed range when **D** is selected, right digit.
- As vehicle speed increases, the transmission upshifts automatically through each range.
  As the vehicle or equipment slows down, the transmission downshifts automatically to the correct range.
- The left digit shows the highest programmed gear available in **D**.
- The right digit shows the actual engaged gear.

WARNING	
	**To avoid loss of control, use a combination of braking, and other retarding devices.** The transmission has a feature to prevent automatic upshifting above the lower range selected. However, during downhill operation, if engine governed speed is exceeded in the lower range, the transmission will upshift to the next higher range to prevent engine damage. This will reduce engine braking and could cause a loss of control. Apply the vehicle brakes or other retarding device to prevent exceeding engine governed speed in the lower range selected.

NOTICE	
	Selecting lower ranges provide greater engine braking for going downgrades (the lowest range delivers the greatest braking effect). It is desirable to restrict automatic shifting to a lower range.

3.11 Shift schedules and automatic range shifts

Each transmission shift calibration includes multiple shift schedules which are used to control transmission shifts in various operating conditions.
The shift schedules affect the timing of shifts between gears.
The actual number of forward gears determined, is based on the transmission model and the selected range position of the shift selector, the speed limit, axle ratio and tyre size.

3.11.1 Accelerator control

The position of the accelerator pedal influences when automatic shifting occurs. An Electronic throttle position signal tells the TCM how much the operator has pressed the pedal. When the pedal is fully pressed, upshifts occur automatically at higher engine speeds. A partially pressed position of the pedal causes upshifts to occur at lower engine speeds.

3.11.2 Over-temperature shift schedule

Regardless of operator request, the TCM automatically limits transmission operation to 4th range or below during oil overtemperature conditions.
If the transmission is above 4th range when overtemperature occurs, the preselect shift schedule is used for all downshifts until 4th range is reached.

4 Operation of the Transmission

WARNING	
	To help avoid unexpected vehicle movement that might cause death, serious injury, or property damage, always have your foot on the brake, the throttle released, and the engine at idle before making a selection: **N** to **D**; **N** to **R**; **D** to **R**; or **R** to **D**.

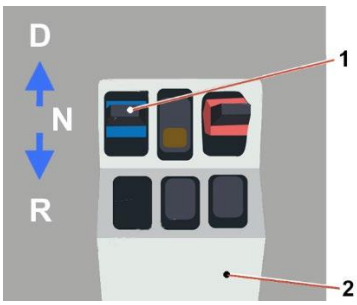
4.1 Driver operating console

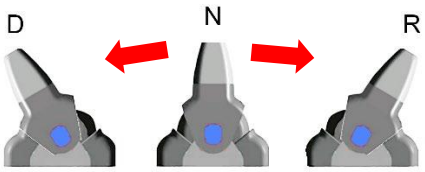
The console (2) is located next to the driver's seat.
The blue gear lever (1) is a three-position switch to control the transmission.

The three switch positions are:

- **D** Drive (Forward)
- **N** Neutral
- **R** Reverse

In idle mode, gear lever (1) must be in the center position: **N**.





YTxx3 Console and gear lever switch.

4.2 Selecting a shift program

To drive forward:

- Press the service brake.
- Push gear lever (1) forward in position **D**.

  Left digit stands for max. number of gears for the regarding mode.

  Right digit stands for lowest programmed starting gear for the regarding mode.

  You can start to drive forward.

Two shift programs are possible:

- **ECO**: (Economic) when the vehicle is not heavily loaded.
- **PWR:** (Power) when the vehicle is heavily loaded.

To drive backward:

- Press the service brake.
- Pull the switch backwards in position **R**.
  In the DIM appears: **R R**.
  You can start to drive reverse.

  When **R** is flashing, it indicates the shift to **R** is inhibited.

Meaning of Lockup message:

- If 'lockup' appears in the DIM, it means that there is a fixed connection between the engine and the transmission gearset. The fluid coupling is out of use.
- As long as this message does not appear during traction, then there is a risk of overheating the transmission.

No communication

- Two slashes appear in the DIM when there is no communication between the transmission and the vehicle control system. Contact a technician.

Auto Neutral

When the Auto Neutral becomes active, it will show as actual gear N and the max available gear will be showed, this number will blink.

Check transmission

The 'Check transmission' icon appears during start up of the engine. Normally it disappears a few seconds after the engine starts running.

- If the icon will not disappear, the transmission system has to be checked.
- If there is an active fault code (DTC), this icon steadily appears (for most DTC's).
- In that case (for certain DTC's), the selected shift range indication on the selector display disappears, it only shows the attained gear.
- The vehicle can still be operated in the current gear, to enable it to drive to a workshop.
- Be aware that, pending the active fault, it can occur that you can not select a gear again after an engine re-start.

Temperature controls

Via the DIM you can select the temperature control data for:

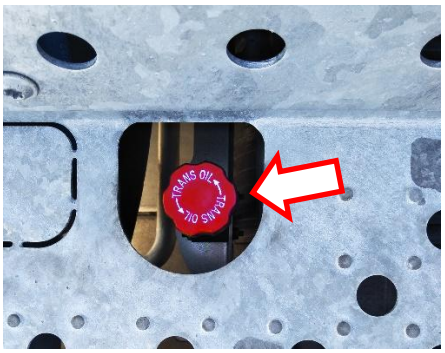
- Oil sump temperature icon (1).
- Torque converter temperature icon (2).

If the temperature gets too high, then a warning appears in the DIM for the regarding item, the icon colour will be red.

5 Care, Maintenance

5.1 Fluid level check using dipstick, daily

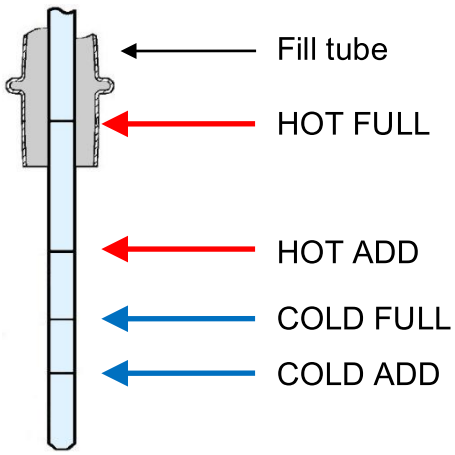
The transmission oil check point is located on the chassis floor behind the cabin, see figure.



The oil dipstick shows two temperature bands marked to allow for transmission fluid expansion when the temperature increases.

- Dipstick marks:
- The lower mark, COLD ADD, is the minimum transmission fluid level below operating temperature. You must add fluid until COLD FULL.
- The upper mark, HOT FULL, refers the max. transmission fluid level at normal operating temperature.
- The OEM may refer to these marks as:
  - COLD FULL/COLD ADD (COLD CHECK) and:
  - HOT FULL/HOT ADD (HOT CHECK).

Dipstick



Cold check:

The COLD CHECK band verifies the transmission has adequate fluid for start-up and operation until it can be checked at the operating (hot) temperature.

Only use this check to confirm adequate fluid level for a cold startup and not to set fluid levels for continued operation.

Typically, the check is most accurate with fluid temperatures of 16 - 49°C (61 - 120°F).

5.2 Transmission oil level check (DIM)

The oil level can be checked via the digital dashboard (DIM).

- Follow the instructions as described in paragraph ‘Transmission’ in the DIM explanation in the Operator manual.

5.3 Other points of attention

Check the transmission daily, always report the following discrepancies:

- leaking fluid around fittings or hydraulic lines;
- dripping oil from the transmission or output seal area;
- debris that is blocking the breather located on top of the torque converter housing;
- Loose bolts securing transmission to engine or vehicle components attached to the transmission.

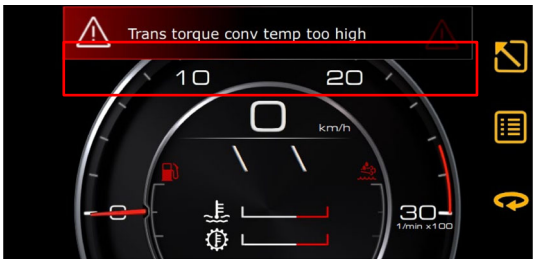
Always report any abnormal condition to the service department.

6 Error Codes

In extraordinary situations, transmission error codes can appear in the DIM.

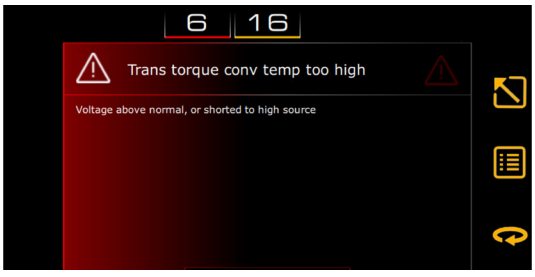
When a (transmission) fault occurs, while systems are active, then at first a header pops up in the DIM.

- Press the button  to open the pop-up message.



A new screen shows the fault code menu.

- Press button  .



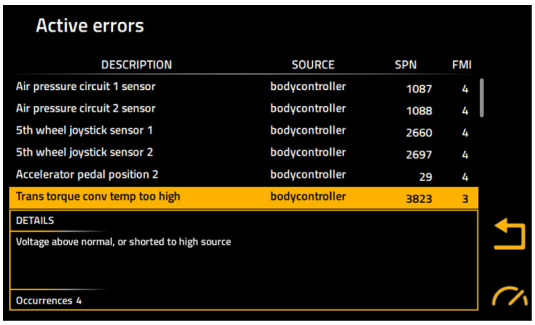
A new selection menu appears. You can choose between:

- ‘Active errors (DMI)’
- ‘Error memory’.

Press button ‘Active errors (DMI)’.

The ‘Active error’ menu appears and shows the following error data:

- SPN (Suspect parameter numbers).
- FMI (Failure mode identifier).
- Occurrence (Number of times an error occurred).



Important information

- Contact a service technician to trace back error codes and how to handle if problems cannot be solved on site.