

There seems to be a lot of anxiety about the reliability of Comfortmatic gearboxes and plenty of misinformation floating around the web (and here)

The Comfortmatic system performs the operations your left foot or left hand (or right hand on LHD vans) would usually perform in a manual van.

The gearbox and clutch in both the manual and Comfortmatic vehicles are identical. The differences only occur in how the gear selector is operated and how the clutch master cylinder is operated.

### **Gear Selection**

The gear selector cam on a manual gearbox is operated by cables directly connected to the gear lever to provide the up/down and rotations required to select the 6+R different gears. On the Comfortmatic system the gear selector cam is operated by 2 actuators operated by 3 hydraulic solenoids in the Comfortmatic hydraulic module. 3 solenoids are required to mimic the movements of the 6+R manual cable operations. All of these gear selection operations are done outside of the gearbox so it doesn't know, or care what is actually changing gears inside the box.

The Comfortmatic hydraulic gear selector module is very reliable , the only failure seems to be occasional cracked solenoid casings. These can be sourced and replaced but garages will tend to replace the whole unit just in case (and it's not their money).

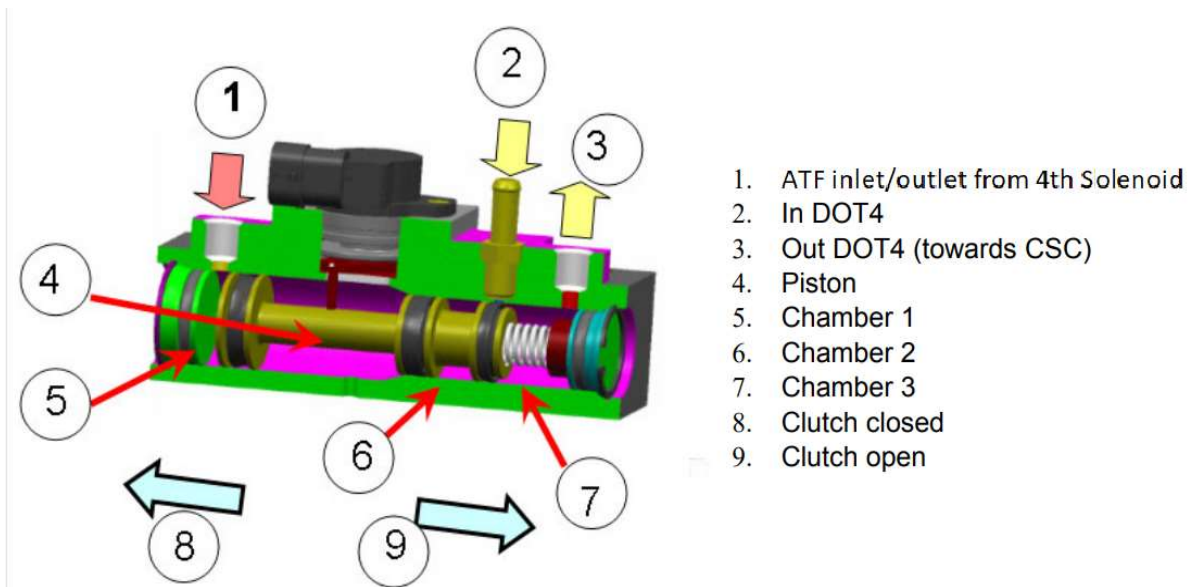
### **Gear Selection system Durability**

The fluid used in this gear selector module is Dexron III Automatic Transmission Fluid and is the red fluid in the rectangular reservoir on the top of the gearbox. The module has a scavenge system that captures any minor fluid weepage past seals and recirculates it back into the reservoir to be reused. The system has a very easy life by hydraulic standards and no parts wear out and no fluid should get used so it is effectively sealed for life and needs no maintenance. The caveat is that the 4<sup>th</sup> solenoid that feeds the clutch actuation system does not have a scavenge system.

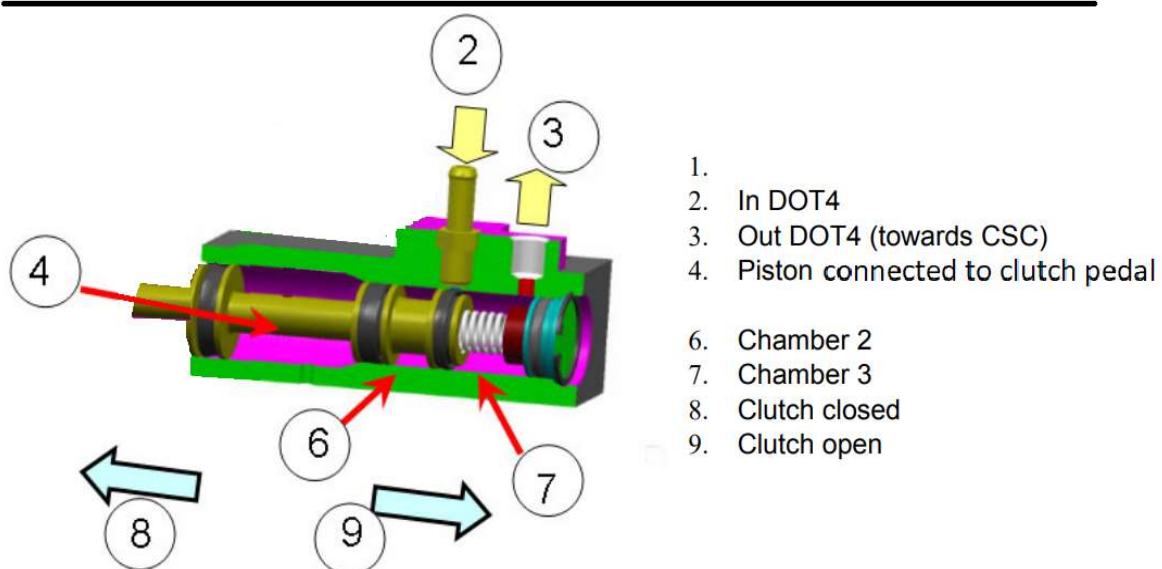
### **Clutch Actuation**

The clutch actuation in the Comfortmatic system is the same as the manual clutch except the master cylinder is operated by hydraulics rather than the organic blob holding the steering wheel.

On a manual clutch when you press the pedal this pushes a pushrod in the clutch master cylinder to send fluid under pressure to the slave cylinder. With the Comfortmatic the 4<sup>th</sup> solenoid in the gear selector module provides the hydraulic pressure to the Master/Slave unit to mimic the manual clutch pedal pushrod operation.



## Comfortmatic Master/Slave Unit



## Manual Clutch Master Cylinder

The Concentric Slave Cylinder (CSC) in the clutch bell-housing is the same for all gearboxes and doesn't know, or care where the pressure to release the clutch pressure plate comes from.

### Clutch Actuation system Durability

The Master/Slave unit of the Comfortmatic clutch is one of the weak points in the system. Over time the hydraulic ATF can weep past the Chamber 1 seal and contaminate the DOT4 fluid in chamber 2. This is normal and rarely catastrophic. **Regular DOT4 fluid change is good preventative maintenance to manage the concentration of any ATF contamination.**

The level of ATF should also be monitored to make sure there is no excessive loss. Not all Master/Slave units will weep ATF and contaminate the DOT4 fluid, it depends on manufacturing tolerances.

Both manual and Comfortmatic clutch CSC can fail and this is common on any hydraulic clutch system and the Comfortmatic should be just as reliable as the manual clutch system if maintained properly.

**If the 'gears unavailable' error appears when a gear change is being requested then suspect the Master/Slave unit or CSC (but check TCU wiring first - see below)**

**If there is obvious hydraulic fluid loss from the rectangular reservoir on top of the gearbox then this points to a catastrophic failure of the Master/Slave Cylinder 1 seal.**

**If there is obvious DOT 4 fluid loss either from the brake reservoir or egg cup reservoir on the gearbox (there are two types of clutch reservoir) this points to catastrophic failure of the CSC in the bell housing and there should be evidence of fluid on the bottom of the bell-housing and engine tray.**

### **Transmission Control Unit (TCU)**

The process of changing gears in the Comfortmatic is controlled by the Transmission Control Unit (TCU). This takes values from various sensors including the engine control unit (ECU), gearbox speed sensor, clutch position sensor, gear selector stick.. and then has logics to control clutch activation and gear selection by activation the 4 hydraulic solenoids (and 2 further gear selector pistons).

The TCU is located where the manual clutch pedal would normally be and is connected by a thick wiring loom to the gear lever and the Comfortmatic module and various sensors in the engine bay.

### **Transmission Control Unit durability**

The TCU is a very reliable electronic PCB control unit and any failures are usually due to a fuse blowing in the supplementary fuse box in the engine bay.

The weak point of the electronic control is the wiring loom from the TCU to the engine bay. RHD vehicles seem to be more prone to damage of the loom due to the more tortuous route it has to take from the TCU, across the brake and throttle pedals, through the bulkhead, across the engine bay behind the wiper mechanism to the Comfortmatic unit on the gearbox.

There have been several instances of the loom chafing on the brake pedal, bulkhead or wiper mechanism. This allows one of the wires in the loom to short to earth and throw an error code.

The error codes are random as they do not conform to the normal algorithm for the alleged component failure but garages seem to believe them and change expensive components to try and track the problem. If the wiring loom is disturbed during these repair works then the problem may not manifest for many miles until the wiring loom gets comfortable again and shorts to earth.

**If the 'gears unavailable' error appears during normal driving when no gear changes are being requested then suspect the wiring loom to be shorting out somewhere before any other possible causes.**

### **Limping home to avoid recovery**

If you get a 'gear unavailable' dash error and drop in to limp mode then it is usually possible to still get home unless there has a catastrophic failure of a component. Unfortunately, you'll probably need a copy of Multiecuscan (MES) and a means of connecting it to the OBD port.

Try these in the following order:

1. Turn ignition off and back on again. This occasionally works.
2. In MES connect to the Gearbox module and clear all codes. This sometimes allows gears to be selected but rarely lets you get more than a few miles before the TCU gets confused again and throws the 'gear unavailable' error. The reason is that some stored values for sensors are out of spec. and the TCU throws the error.
3. In MES connect to the Gearbox module, clear all codes and 'delete all statistical data'. Run a 'clutch self calibration enable' routine. Depending on the version of MES you have this may be a static routine or it may require you to drive at full throttle for 300yds. This allows new sensor values to be reported to the TCU within the correct range. This also resets the value of the clutch transmissibility index. This is a value used by the TCU to determine when, and how to activate the CSC to ensure smooth clutch operation. The clutch transmissibility index also allows for clutch wear by measuring the clutch degradation index. This is what is going on when the KISS point is being determined by the TCU.

Any of the above procedures require the TCU wiring loom to be wiggled away from any short circuit. This is a hit 'n' miss operation of tracing the loom from the Comfortmatic unit on top of the gearbox and making sure it is secure to the clips etc around the engine bay. The loom must also pass through the bulkhead grommet centrally. Tracing the loom over the brake and throttle pedal is beyond the dexterity of most of us so good luck finding a short circuit up there!

The above is all based around a Right Hand Drive vehicle, although much of it applies to Left Hand Drive vehicles. It also assumes that there are no catastrophic component failures which thankfully seem to be very rare, or only as rare as the manual gear change components.

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### **Working on the Comfortmatic gear change system**

If you are unfortunate enough to have a catastrophic component failure and mechanical works need to be undertaken then it is necessary to perform some routines to safely undertake the works and then setup the system once reassembled.

Multiecuscan (MES) has all the necessary routines.

1. You need to run the '**accumulator depressurization**' routine in MES to safely reduce the hydraulic oil pressure in the Comfortmatic module before any works are undertaken.

Undertake the mechanical works in the same way as the manual gearchange. Gearbox out, change CSC, clutch and DMF (if necessary).

Reassemble everything including adding hydraulic oil and gravity bleeding the clutch.

a&b). Run the '**clutch and electropump replacement**' routines in MES to reset the Transmission Control Unit (TCU) electronics

c). Run '**actuator base adjustment**' in MES to setup the hydraulic and clutch units.

d). Run the '**clutch drain**' routine in MES to ensure there is no air in the clutch system

e). Run '**clutch self-calibration enable**' in MES to fine tune the clutch actuation to engine specific behaviour.

It sounds like a lot of routines to run but in reality it takes less than 5 mins