




ETC

The ETC function uses brake intervention to prevent wheel spin and maintain even torque distribution to the wheels. ETC is automatically enabled while the brakes are off at speeds up to 62.5 mph (100 km/h), and operates the brakes either individually or in axle pairs:

- At speeds up to 31.3 mph (50 km/h), ETC uses individual brake intervention to maintain even torque distribution between wheels on the same axle.
- **Vehicles up to 03 model year** – At speeds between 0 and 62.5 mph (0 and 100 km/h), ETC also uses brake intervention in axle pairs to maintain even torque distribution between the front and rear axles. In effect, this mode of operation replaces the centre differential lock of the transfer box which, although still incorporated, is non operational under normal driving conditions.

 **TRANSFER BOX - LT230SE, DESCRIPTION AND OPERATION, Description.** If the centre differential lock is in the locked condition, the SLABS ECU illuminates the ABS and ETC warning lamps and inhibits the ETC function (the ABS, EBD and HDC functions are retained, but at degraded performance levels).

- **Vehicles from 03 model year (with differential lock fitted)** – At speeds between 0 and 62.5 mph (0 and 100 km/h), ETC uses brake intervention in axle pairs to maintain even torque distribution between the front and rear axles. If the centre differential lock is in the locked condition, the differential lock warning lamp in the instrument pack is illuminated. The ABS, EBD, ETC and HDC functions are retained, but with revised parameters to suit the locked differential.

While the ETC function is enabled, if the SLABS ECU detects a wheel accelerating faster than the average, indicating loss of traction, it operates the ABS modulator in the active braking mode. Depending on the vehicle speed, active braking is employed for either the brake of the affected wheel or for both brakes on the affected axle, until all four wheels are driven at approximately the same speed again. During active braking the SLABS ECU also illuminates the ETC warning lamp, for a minimum of 2 seconds or for the duration that ETC is active. ETC operation is desensitised during 'hard' cornering.

HDC

HDC uses brake intervention to provide a controlled descent ability in off road conditions when engine braking is insufficient to maintain a comfortable speed. This allows the driver to leave HDC selected and to control the vehicle's descent speed, down to the system's minimum target speed, using only the accelerator pedal. The HDC function is selected on/off by a switch on the fascia. When selected on, HDC is enabled in all forward gears and reverse provided:

- Vehicle speed is below 31.3 mph (50 km/h).
- The transfer box is in low range.
- On manual gearbox vehicles, the clutch is engaged.

When HDC is enabled, the HDC information warning lamp illuminates. If HDC is selected outside the above conditions, the HDC information warning lamp flashes and the audible warning sounds continuously.

When HDC is enabled, the SLABS ECU calculates a target speed from the throttle position element of the engine data input, and compares this with actual speed. If the actual speed is higher than the target speed, the SLABS ECU operates the ABS modulator in the active braking mode to slow the vehicle down to the target speed. While the braking force is being applied, the SLABS ECU also energizes the brake lamp relay to put the brake lamps on. Active braking is discontinued while vehicle speed is below the target speed or if the foot brakes are applied. Applying the foot brakes during active braking may result in a pulse through the brake pedal, which is normal.

During active braking, the brakes are operated predominantly on the wheels of the leading axle, but if that is not sufficient to achieve the required deceleration the brakes of the trailing axle are also applied. The deceleration rate is dependent on the speed differential between initial vehicle speed and the target speed. The deceleration rates are relatively low at higher speed differentials, then progressively increase as vehicle speed approaches the target speed. Anti-lock braking is also enabled during active braking, but at very low speeds some wheel lock can occur.

The target speed increases as the accelerator pedal is pressed, from a programmed minimum with the accelerator pedal released, up to a maximum of 31.3 mph (50 km/h). For any given accelerator pedal position, while travelling uphill or on level ground the target speed is always greater than the corresponding vehicle speed, which allows the vehicle to be driven normally without HDC intervention. However, when travelling downhill, the gravitational effect on the vehicle means that for any given accelerator pedal position the target speed is less than the corresponding vehicle speed, and HDC intervenes to limit vehicle speed to the target speed.