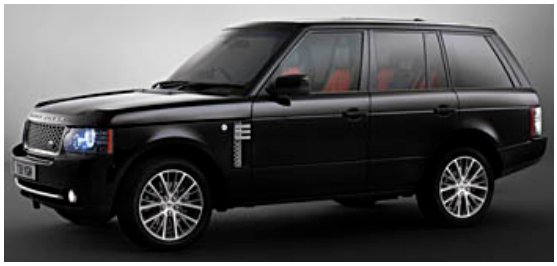
Overview: Range Rover, 2011

For the 2011 model year, Land Rover's flagship will be powered by a new 4.4-litre V8 diesel. Distantly derived from its 3.6-litre predecessor, the new engine offers improvements in performance and fuel economy and drives through ZF's 8HP70 eight-speed automatic transmission. The car's electronically-controlled Terrain Response system is also revised. Petrol Range Rovers will keep the familiar ZF 6HP28 six-speed automatic.



2011 Range Rover TDV8.

Land Rover's 4.4-litre TDV8 uses 'parallel sequential turbocharging', almost identical in concept to that of the three-litre TDV6 fitted to the Discovery. This system makes use of two turbochargers of different sizes, but inverts current practice by deploying the larger blower — which has variable geometry — at low engine speeds, with the smaller unit contributing at higher revs. The larger blower produces less back-pressure, reducing pumping losses during gentler driving, while the smaller unit offers quick response during transitional loads.

When the crankshaft speed reaches 2400rpm, valves in the exhaust manifold open to wake up the smaller, secondary blower; this reaches its full operating speed in 20ms, with full twin-turbo operation achieved in 180ms. A balance pipe connecting the two exhaust manifolds equalises pressure across the system.

Packaging of the system is unusual. Because there is no room inside the 'V' for the blowers, an asymmetrical arrangement places one turbo (and manifold, obviously) below each bank of cylinders.

Increasing the engine's swept volume by 22 per cent. over the 3.6-litre V8 equates to a slightly lower specific output: 71.6PS/l for the 4.4 against 74.9PS/l for the 3.6. Land Rover claims that NO_x emissions have been significantly reduced.

Among the less attention-grabbing features of the new diesel include ceramic glow plugs that operate 250°C hotter than the previous steel units and are more durable. The plugs are run for a longer period after start-up — 100

One less convincing 'advance' is the lack of a dipstick. The oil level is monitored electronically by means of an ultrasonic sensor, which informs the driver of the oil level and the amount of oil that needs to be added. Perhaps the loss of one strip of metal doesn't count for much in Esher, but we would feel happier if a weekly dip were still possible.

ZF's 8HP70 transmission is mapped to engage the torque-converter lock-up clutch at the lowest possible crankshaft speeds. The wider ratio spread, closer ratios better able to chase the torque curve, a tall overdriven top gear and the fact that no more than two internal clutches are open at any one time all contribute to improved fuel economy and emissions compared with the previous drivetrain.

Transmission Idle Control disengages 70 per cent. of the drive when the vehicle is stationary and the engine is idling in Drive, reducing consumption in the urban cycle. In cold conditions, the transmission selects a lower gear than otherwise 'to promote fast warm-up' — a strange decision, taken at face value, as it is thermal loads and not engine speeds that accelerate the warm-up process. Perhaps the engine is a little smoky at low speeds when it's cold?

The transmission is also programmed to keep the revs up in hot conditions, to run the air-conditioning pump faster. Someone really should invent an electric air-conditioning pump...

'Driver Type Detection' monitors the driver's inputs and the car's systems to match the responses of the gearbox to the driver's style. Curve detection — by way of an accelerometer — is used to prevent the gearbox from making upshifts in mid-bend. The gearbox also monitors the driver's use of the brakes together with the rate of deceleration to set up the correct gear for entry and exit to a corner.

The 8HP70 does not have to change to a lower gear sequentially and can skip up to six ratios if necessary. Shift paddles on the steering-wheel are fitted as standard. A sport mode is available, programmed to give quicker responses and sharper upshifts.

Petrol V8

The directly-fuelled five-litre V8 supercharged petrol engine, introduced in 2010, remains unchanged for the 2011 model year. It delivers 510PS and 625Nm, with forced induction by way of a twin-vortex Eaton supercharger.

seconds — and more frequently, improving efficiency and reducing emissions during the warm-up phase. They provide instant starting from key-on in 'normal' conditions; at -30°C the new plugs heat up twice as quickly as before, though no operation time is quoted.

Diesel Range Rovers fitted with the new power-unit will come with the same Brembo-based braking system fitted to the 5.0-litre supercharged petrol model. The system comprises 380mm ventilated front discs with lightweight aluminium six-piston opposed-action monoblock calipers. At the rear, 365mm ventilated discs with single piston sliding calipers are fitted.

Land Rover uses a power management system to control the alternator, keeping the generator off-load during acceleration. The battery is charged when less power is being demanded by the driver. The charging system is designed to charge the battery to 80 per cent., reducing loads on the alternator. It also reduces the charge rate in cold weather, when the battery is less able to cope with a high charge current, benefiting battery life.

The new engine's vital statistics include an improvement in mid-range acceleration from 50mph-75mph, falling from 6.3s to 5.1s. Emissions of CO_2 over the E.U test cycle have dropped from 294g/km to 253g/km, a 14 per cent. reduction.

Maximum torque is available from 1500rpm to 3000rpm, with maximum power produced between 3250rpm and 4000rpm.

A new compacted graphite iron (CGI) cast-iron block forms the basis for the new V8. Although it is similar in design to the outgoing 3.6-litre engine, it is taller to accommodate a longer stroke; it's also 11mm longer, to make room for duplex timing chains.

A forged steel crankshaft is used, with aluminium pistons and steel connecting rods.

The oil filter, engine oil cooler and EGR cooler have been designed as one unit, which sits in the centre of the 'V'. A crankcase breather is incorporated through the centre of the assembly and incorporates a cyclone design to separate oil droplets from the fumes being ingested back into the engine.

Each cylinder head has twin overhead camshafts with composite cam covers, acoustically isolated from the cylinder heads by elastomeric gaskets to reduce NVH.

The common-rail fuel injection system mirrors that of the Discovery's three-litre TDV6, operating at a rail pressure of up to 2000 bar (20MPa). Eight-hole piezo injectors are used — the V6 has seven-hole items.

Earlier common-rail delivery pumps were designed to over-supply the injector rails, with the surplus being re-circulated back to the tank. This approach raises fuel temperature and means that the fuel has to be cooled before being returned to the tank, wasting energy. Land Rover's new system supplies fuel on demand, reducing the amount of cooling required.

Fuel is injected at 150 bar (15MPa) through multi-hole, spray-guided injectors. All four camshafts use torque-actuated variable timing.

Terrain Response

For 2010, the Range Rover's Terrain Response system was bolstered by the addition of Sand Launch Control, revisions to the Rock Crawl Program, and the addition of Gradient Release Control, which inhibits the rate of initial acceleration when descending steep inclines.

For 2011, the system has two new features: Hill Start Assist and Gradient Acceleration Control. The former is the familiar type of system aimed at drivers who have forgotten how to use the hand-brake: it retains the driver's initial brake line pressure long enough for the foot to move from brake pedal to throttle without the car rolling backwards. The brake is released after a sufficient time has elapsed or when the engine is supplying enough torque to move the car up the hill. Hill Start Assist is always active and its operation is not indicated to the driver.

Gradient Acceleration Control is designed to provide safety cover on severe gradients when the driver does not have Hill Descent Control engaged. By pressurising the brake system, GAC slows the car to a limit determined by the throttle position when the car is descending the slope in the driver's intended direction of travel. This includes descending the slope forwards in drive, or rearwards in reverse. Otherwise (such as descending while facing up the gradient with Drive selected) GAC restricts speed to 3mph for up to 20 seconds, allowing the driver to regain proper control.

Range Rover 2011	4.4 TDV8	5.0 SC
Cylinders	8V	8V
Valves	4	4
Bore/stroke	84.0/98.5	92.5/93.0
Swept volume	4367cc	4999cc
Compression ratio	16.1:1	9.5:1
PS/rpm	313/4000	510/6000
Nm/rpm	700/1500	625/2500
Maximum speed	130	140
0-100km/h	7.8	6.2
Urban MPG (l/100km)	24.6 (11.5)	12.5 (22.6)
Combined MPG (l/100km)	30.1 (9.4)	19.0 (14.9)
CO_2 g/km	253	348
Emissions	EU5	EU5
Transmission	A8	A6
Driven wheels	All	All
Fuel tank	97l	101l
Kerb mass *	2580	2580
PS/t	121	197

The new V8's ancillary drive-belts use six ribs, replacing the seven-rib belts of the 3.6-litre engine. The use of a stretch belt to drive the viscous fan and a dynamic tensioner for the six-rib alternator belt does away with the need for adjustment during servicing in both cases.

The 4.4 is the first Land Rover engine designed from the outset to use low SAPS – Sulphated Ash, Phosphorus, Sulphur – oil. This reduces the build-up of ash in the DPFs (diesel particulate filters), giving longer life and improved efficiency. Conventional, close-coupled oxidation catalysts are used for exhaust after-treatment.

The cooling fan is no longer mounted on the coolant pump, reducing loads on the pump bearings. This also allows the use of a larger fan, increased in diameter from 500mm to 520mm.

'Top-down servicing' is a feature of the new diesel. There is no need to lift the car on a ramp, even for oil changes – assuming an oil extraction pump is available. Happily, a conventional sump drain is fitted.

Nm/t	271	242
Length	4872	4872
Width	2216	2216
Height	1865	1865
Wheelbase	2880	2880
Track: front	1629	1629
Track: rear	1625	1625
C_d	0.38	0.38

* DIN. EU kerb mass = DIN + 75kg. Minimum, basic specification.