

Off-road Driving

BEFORE YOU DRIVE

Before venturing off-road, it is **absolutely essential** that inexperienced drivers become fully familiar with the vehicle's controls, in particular the transfer gearbox, and also study the off-road driving techniques described on this and the following pages.

WARNING

Off-road driving can be hazardous!

- **DO NOT take unnecessary risks and be prepared for emergencies at all times.**
- **Familiarise yourself with the recommended driving techniques in order to minimise risks to yourself, your vehicle AND your passengers.**

IMPORTANT INFORMATION

- Always wear a seat belt for personal protection in all off-road driving situations.
- DO NOT drive if the fuel level is low - undulating ground and steep inclines could cause fuel starvation to the engine.
- DO NOT stop while driving through water (wading) - water ingress to the exhaust tailpipe could result in severe damage to the catalytic converter.

BASIC OFF-ROAD TECHNIQUES

These basic driving techniques are an introduction to the art of off-road driving and do not necessarily provide the information needed to successfully cope with every single off-road situation.

We strongly recommend that owners who intend to drive off-road frequently, should seek as much additional information and practical experience as possible.

Before driving off-road it is important that you check the condition of the wheels and tyres and that the tyre pressures are correct. Worn or incorrectly inflated tyres will adversely affect the performance, stability and safety of the vehicle.

Gear selection

Correct gear selection is possibly the single most important factor for safe and successful off-road driving. While only experience will tell you which is the correct gear for any section of ground, the following basic rules apply:

- NEVER change gear or operate the clutch while negotiating difficult terrain - the drag on the wheels may cause the vehicle to stop when the clutch is depressed and restarting may be difficult.
- Generally, and especially where slippery or soft ground conditions prevail, the higher the gear you select the better.
- When descending very steep slopes always select first gear in LOW range.

Inexperienced drivers are advised to stop the vehicle (on firm ground) and carefully consider which gear will be most appropriate for each manoeuvre before continuing.

Off-road Driving

Slipping the clutch

Use of excessive clutch slip to prevent the engine stalling will result in premature clutch wear. Always select a gear low enough to enable the vehicle to proceed without needing to slip the clutch.

DO NOT drive with your foot resting on the clutch pedal; driving across uneven terrain could cause you to inadvertently depress the clutch, resulting in loss of control of the vehicle.

Transfer gears

High range gears should be used whenever possible - only change to low range when ground conditions become very difficult. The diff lock should be engaged whenever there is a risk of losing wheel grip, and disengaged as soon as firm, level, non-slippery ground is reached.

Braking

As far as possible, vehicle speed should be controlled through correct gear selection. Application of the brake pedal should be kept to a minimum. Unless ABS is fitted, any braking on wet, muddy or loose surfaces is likely to cause one or more wheels to lock - the resultant slide could prove dangerous.

NOTE: *If the correct gear has been selected, braking will be largely unnecessary.*

Use of engine for braking

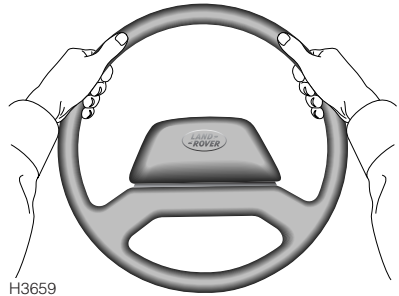
Before descending steep slopes, stop the vehicle at least its length before the descent, engage LOW range and then select first or second gear, depending on the severity of the incline.

While descending the slope it should be remembered that the engine will provide sufficient braking effort to control the rate of descent, and that the brakes should not be applied.

Accelerating

Use the accelerator with care - any sudden surge of power may induce wheel spin and, therefore, invoke unnecessary operation of traction control*, or in extreme conditions could lead to loss of control of the vehicle.

Steering



WARNING

DO NOT hold the steering wheel with your thumbs inside the rim - a sudden 'Kick' of the wheel as the vehicle negotiates a rut or boulder could seriously injure them. ALWAYS grip the wheel on the outside of the rim (as shown) when traversing uneven ground.

Off-road Driving

Survey the ground before driving

Before negotiating difficult terrain, it is wise to carry out a preliminary survey on foot. This will minimise the risk of your vehicle getting into difficulty through a previously unnoticed hazard.

Ground clearance

Don't forget to allow for ground clearance beneath the chassis, axles and under the front and rear bumpers. Note that the axle differentials are situated **BELOW** the chassis and are positioned slightly to the right of the centre of the vehicle. Note also that there are other parts of the vehicle which may come into contact with the ground - take care not to ground the vehicle.

Ground clearance is particularly important at the bottom of steep slopes, or where wheel ruts are unusually deep and where sudden changes in the slope of the ground are experienced.

On soft ground the axle differentials will clear their own path in all but the most difficult conditions. However, on frozen, rocky or hard ground, hard contact between the differentials and the ground will generally result in the vehicle coming to a sudden stop.

ALWAYS attempt to avoid obstacles that may foul the chassis or axle differentials.

Loss of traction

If the vehicle is immobilised due to loss of wheel grip, the following hints could be of value:

- Avoid prolonged wheel spin; this will only make matters worse.
- Remove obstacles rather than forcing the vehicle to cross them.
- Clear clogged tyre treads.
- Reverse as far as possible, then attempt an increased speed approach - additional momentum may overcome the obstacle.
- Brushwood, sacking or any similar material placed in front of the tyres may improve tyre grip.

Off-road Driving

AFTER DRIVING OFF-ROAD

IMPORTANT INFORMATION

Before rejoining the public highway, or driving at speeds above 40 km/h, consideration should be given to the following:

- Wheels and tyres must be cleaned of mud and inspected for damage.
- If wheels and tyres are not cleaned properly, damage to the wheels, tyres, braking system and suspension components could occur.
- Brake discs and callipers should be examined and any stones or grit that may affect braking efficiency removed.
- The underside of the vehicle should be checked for damage, especially the suspension air springs and dampers.
- Any damage to paint or protective coatings should be rectified by a Land Rover Dealer/Authorised Repairer.

If you have any doubt whether the vehicle has been damaged, have the vehicle inspected by a Land Rover Dealer/Authorised Repairer.

SERVICING REQUIREMENTS

Vehicles operated in arduous conditions, particularly on dusty, muddy or wet terrain, and vehicles undergoing frequent or deep wading conditions will require more frequent servicing. See '*OWNER MAINTENANCE*', page 124 and contact a Land Rover Dealer/Authorised Repairer for advice.

After wading in salt water or driving on sandy beaches, use a hose to wash the underbody components and any exposed body panels with fresh water. This will help to protect the vehicle's cosmetic appearance.

Driving Techniques

DRIVING ON SOFT SURFACES & DRY SAND

The ideal technique for driving on soft surfaces (dry sand for example), requires the vehicle to be kept moving at all times - soft sand causes excessive drag on the wheels resulting in a rapid loss of motion once driving momentum is lost. For this reason, gear changing should be avoided.

- Engage the diff lock.
- Select the highest suitable gear and REMAIN in that gear until a firm surface is reached. It is generally advisable to use LOW range gears, as they will enable you to accelerate through worsening conditions without the risk of being unable to restart.
- Disengage the diff lock as soon as firm ground is reached.

Stopping the vehicle on soft ground, in sand or on an incline

If you do stop the vehicle, remember:

Starting on an incline or in soft ground or sand may be difficult. Always park on a firm level area, or with the vehicle facing downhill.

On vehicles not fitted with traction control, to avoid wheel spin, select second or third gear and use the MINIMUM throttle necessary to get the vehicle moving.

If forward motion is lost, avoid excessive use of the throttle - this will cause wheel spin and tend to dig the vehicle into the sand. Clear sand from around the tyres and ensure that the chassis and axles are not bearing on the sand before again attempting to move.

If the wheels have sunk, use an air bag lifting device or high lift jack to raise the vehicle, and then build up sand under the wheels so that the vehicle is again on level ground. If a restart is still not possible, place sand mats or ladders beneath the wheels.

DRIVING ON SLIPPERY SURFACES (ice, snow, mud, wet grass)

- With the diff lock engaged, select the highest gear possible.
- Drive away using the MINIMUM throttle possible.
- Drive slowly at all times, keeping braking to a minimum and avoiding violent movements of the steering wheel.
- Disengage the diff lock as soon as a non-slippery surface is reached.

DRIVING ON ROUGH TRACKS

Although rough tracks can sometimes be negotiated in normal drive, it is advisable to lock the differential if excessive suspension movement is likely to induce wheel spin.

On very rough tracks, engage LOW range to enable a steady, low speed to be maintained without the constant use of the brake and clutch pedals.

Always disengage the diff lock when smooth, firm ground is reached.

WARNING

DO NOT drive the vehicle at speeds in excess of 60 km/h (35 mph) with the differential locked. Driving with the differential locked at speeds above 60 km/h (35 mph) may, under certain situations affect the brake performance under ABS conditions.

Driving Techniques

CLIMBING STEEP SLOPES

Engage the diff lock and ALWAYS follow the fall line of the slope - travelling diagonally could encourage the vehicle to slide broadside down the slope.

Steep climbs will usually require the LOW gear range. If the surface is loose or slippery, use sufficient speed in the highest practical gear to take advantage of your vehicle's momentum. However, too high a speed over a bumpy surface may result in a wheel lifting, causing the vehicle to lose traction. In this case try a slower approach. Traction can also be improved by easing off the accelerator just before loss of forward motion.

If the vehicle is unable to complete a climb, do not attempt to turn it around while on the slope. Instead, adopt the following procedure to reverse downhill to the foot of the slope.

1. Hold the vehicle stationary using both foot and hand brakes.
2. Restart the engine if necessary.
3. Engage reverse gear LOW range.
4. Release the handbrake. Then release the foot brake and clutch simultaneously, and allow the vehicle to reverse down the slope using engine braking to control the rate of descent.
5. Unless it is necessary to stop the vehicle to negotiate obstructions, DO NOT apply the brake or clutch pedal during the descent - even a light application may cause the front wheels to lock, rendering the steering ineffective.
6. If the vehicle begins to slide, accelerate slightly to allow the tyres to regain grip.

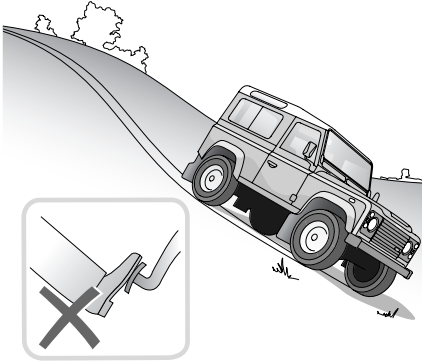
When the vehicle is back on level ground or where traction can be regained, a faster approach will probably enable the hill to be climbed. However, DO NOT take unnecessary risks, if the hill is too difficult to climb, find an alternative route.

WARNING

DO NOT attempt to reverse down a slope without the engine running, or the braking effect of the gearbox will be lost.

Driving Techniques

DESCENDING STEEP SLOPES



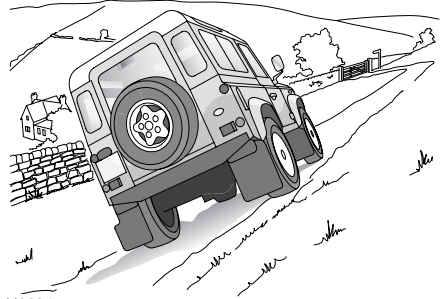
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WARNING

Failure to follow these instructions may cause the vehicle to roll over.

- Stop the vehicle at least a vehicle length before the start of the slope and engage first gear LOW range with the differential locked.
- Unless it is necessary to stop the vehicle in order to negotiate obstructions, **DO NOT** touch the brake or clutch pedals during the descent - the engine will limit the speed, keeping the vehicle under control provided the front wheels are rotating. If the vehicle begins to slide, accelerate gently to maintain directional stability. **DO NOT** use the brakes or attempt to change gear.
- Once level ground is reached, unlock the differential and select a suitable gear for the next stage of your journey.

TRAVERSING A SLOPE



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WARNING

Failure to follow these instructions may cause the vehicle to roll over.

Before crossing a slope ALWAYS observe the following precautions:

- Check that the ground is firm and not slippery.
- Check that the wheels on the downhill side of the vehicle are not likely to drop into depressions in the ground and that the 'uphill' wheels will not run over rocks, tree roots, or similar obstacles that could suddenly increase the angle of tilt.
- Ensure that passenger weight is evenly distributed, that all roof rack luggage is removed and that all other luggage is properly secured and stowed as low as possible. Always remember; any sudden movement of the load could cause the vehicle to overturn.
- Rear seat passengers should sit on the uphill side of the vehicle or, in extreme conditions, should vacate the vehicle until the sloping ground has been safely negotiated.

Driving Techniques

NEGOTIATING A 'V' SHAPED GULLY

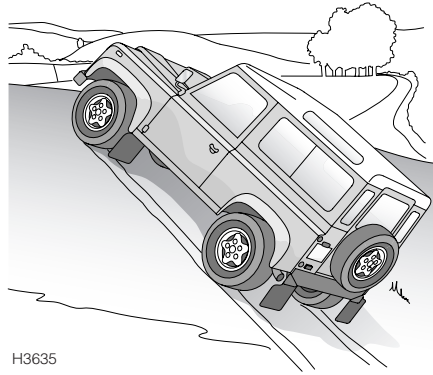
Observe extreme caution! Steering up either of the gully walls could cause the side of the vehicle to be trapped against the opposite gully wall.

DRIVING IN EXISTING WHEEL TRACKS

As far as possible allow the vehicle to steer itself along the bottom of the ruts. However, always keep a light hold of the steering wheel to prevent it from spinning free.

Particularly in wet conditions, if the steering wheel is allowed to spin free, the vehicle may appear to be driving straight ahead in the ruts, but in actual fact (due to the lack of traction caused by the wet ground) is unknowingly on full right or left lock. Then, when level ground is reached, or if a dry patch of ground is encountered, the wheels will find traction and cause the vehicle to suddenly veer to left or right.

CROSSING A RIDGE



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Approach at right angles so that both front wheels cross the ridge together - an angled approach could cause traction to be lost through diagonally opposite wheels lifting from the ground at the same time.

Driving Techniques

CROSSING A DITCH



With the diff lock engaged, cross ditches at an angle so that three wheels always maintain contact with the ground. If a ditch is approached head on, both front wheels will drop into the ditch together, possibly resulting in the chassis and front bumper being trapped on opposite sides of the ditch.

WADING



WARNING

The maximum advisable wading depth is 0,5 m (20 inches).

Severe electrical damage may occur if the vehicle remains stationary for any length of time when the water level is above the door sills.

Severe damage to the catalytic converter could occur if the engine is stopped for any length of time when the water level is above the exhaust pipe.

If the water is likely to exceed 0,5 m (20 inches), the following precautions should be observed:

- Fix a plastic sheet in front of the radiator grille to prevent water from soaking the engine and mud from blocking the radiator.
- Fit a drain plug to the flywheel housing and engine timing cover (Tdi engines and vehicles fitted with Heavy Duty Suspension only).
- Ensure that the silt bed beneath the water is free of obstacles and firm enough to support the vehicle's weight and provide sufficient traction.
- Ensure that the engine air intake is clear of the water level.

Driving Techniques

- To prevent saturation of the electrical system and air intake, avoid excessive engine speed.
- With the diff lock engaged, select a low gear and maintain sufficient throttle to prevent the engine from stalling. This is particularly important if the exhaust pipe is under water.
- Drive slowly into the water and accelerate to a speed which causes a bow wave to form; then maintain that speed.

At all times, keep all the doors fully closed.

After wading

- Drive the vehicle a short distance and apply the foot brake to check that the brakes are fully effective.
- DO NOT rely on the handbrake to hold the vehicle stationary until the transmission has thoroughly dried out; in the meantime, leave the vehicle parked in gear.
- Remove the timing cover drain plug (where fitted) and also any protective covering from the front of the radiator grille.
- If the water was particularly muddy, remove any blockages (mud and leaves) from the radiator to reduce the risk of overheating.
- If deep water is regularly negotiated, check all oils for signs of water contamination - contaminated oil can be identified through its 'milky' appearance. In addition, check the air filter element for water ingress and replace if wet - consult a Land Rover Dealer/Authorised Repairer if necessary.
- If salt water is frequently negotiated, thoroughly wash the underbody components and exposed body panels with fresh water.

NOTE: Vehicles required to undergo frequent or deep wading conditions will require more frequent servicing. Contact a Land Rover Dealer/Authorised Repairer for advice.

Wading plugs*

WARNING

For safety, DO NOT work underneath the vehicle unless it is safely parked with the wheels chocked, or is supported by heavy duty stands.

Under severe wading conditions, the timing cover and flywheel housing must be sealed to prevent the ingress of mud and water. Fit the plugs, supplied in the tool kit. Remove the plugs immediately after wading, or periodically if the vehicle is required to do prolonged wading or very muddy work.

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