

Off-road Driving

FRAGILE EARTH OFF-ROAD CODE

Land Rover take pride in their environmental policies. These policies extend to the use of our vehicles, and the impact that they have on our environment.

- Rights of access vary from country to country. Do not assume they will be the same as back home, always check. Where required seek permission to cross/access private land.
- Follow existing routes wherever possible.
- Respect the peace and tranquillity of others.
- Avoid imposing your presence on other road/track users.
- Drive carefully to minimise erosion and damage to the land. Avoid causing ruts as they can form channels which lead to water erosion.
- Always repair any damage caused to the surface that has been driven over.
- 'As slowly as possible, as fast as necessary' will get you through most obstacles and minimise environmental impact.
- If your vehicle is equipped with a differential lock, ensure that it is engaged before venturing onto low traction surfaces (mud, sand, snow etc). If your vehicle is equipped with Terrain Response, engage the appropriate mode.
- Animals/livestock can be startled by vehicles. Be prepared to proceed slowly, or switch your engine off and wait for them to move off.
- Ensure that your vehicle is properly maintained, equipped, and supplied for the journey.
- Do not allow any vehicle fluids to contaminate water courses. If your vehicle is leaking any fluid the leak should be repaired before venturing off-road.
- Do not leave litter behind.
- Avoid cutting/removing any vegetation from your route or the surrounding area.
- Ensure that you are familiar with any codes of conduct, by-laws, or restrictions for use of the area.
- Take extra care to avoid sparks or flames near dry vegetation.
- Do not park your vehicle in long grass or other vegetation following a journey. The heat from the exhaust can be sufficient to start a fire.
- Only clean your vehicle in an area approved for the washing of vehicles.
- Be aware that diseases can be transported from one area to another by vehicles. Avoid any area of suspected infection.

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BEFORE DRIVING OFF-ROAD

Before venturing off-road, it is **absolutely essential** that inexperienced drivers become fully familiar with the vehicle's controls.

Study the off-road driving techniques described on this and the following pages, but be aware that they are only a guide.

Inexperienced drivers should seek professional training before venturing off-road. For more information visit

<http://www.landroverexperience.com>

Carry out a visual inspection of the vehicle prior to going off-road. Checks should include:-

- Fuel, oil and water levels, and the security of the caps.
- Radiator grille (ensure it's clear of debris and obstructions).
- Wheels, tyres, and valves should be checked for condition and pressures. Ensure that each valve has the valve cap firmly in place.
- Identify jacking points.
- Identify towing points.
- Identify the lowest points on the vehicle.
- Approach, departure, and ramp angles.
- The position of the air intake, and the exhaust outlet.
- Position and functionality of the driving controls, as well as the warning lights and indicators.

Ensure that your seat, steering wheel, mirrors etc are set to give maximum comfort and visibility. Be aware that the settings required may be different to those used when driving on-road.

Low profile tyre and wheel combinations

Caution: Low profile tyre and wheel combinations should not be used for off-roading, as damage to the tyres, wheels and/or the vehicle may result.

Land Rover recommends using off-road tyre and wheel combinations, which can be purchased as an accessory.

Basic kit to be carried

There are certain supplies and equipment that are recommended to be carried when off-roading. This list is not exhaustive, and the items to be included or discarded will depend greatly upon the terrain and weather conditions. Therefore, use this list as a primer:-

- First aid kit.
- Any medical supplies required by driver or passengers. Insulin for example.
- Fire extinguisher.
- Wet weather, and climate related clothing.
- Boots/Wellingtons.
- High visibility jacket.
- Wheel changing equipment, including a suitable base for jacking on soft ground.
- Navigation equipment. (Maps, compass, local guide etc). Satellite navigation should NOT be the only navigational aid that you take off-road.
- Two-way radio, and/or mobile telephone.
- Clean drinking water/Hot drinks depending on climate.

Additional items will be required, depending on the terrain to be travelled, duration of the trip, and weather conditions etc.

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Risk assessment

Before travelling off-road, or negotiating any obstacle, assess the risks involved.

The risk assessment should be approached in the following order.

1. Risks to personnel.
2. Risks to the environment (flora and fauna).
3. Risks to the vehicle.

In many instances it will be necessary to get out of the vehicle to make an informed assessment. It may also be necessary to walk some distance ahead before proceeding in the vehicle.

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.

***Note:** If the vehicle is equipped with a Temporary spare wheel and you need to fit it whilst driving off-road, then you must proceed with extra caution.*

It is good practice to anticipate possible problems and be prepared for them. Extra equipment should include, at the very least, a shovel, a tow rope, local maps and a torch.

Caution: DO NOT drive if the fuel level is low - undulating ground and steep inclines could cause fuel starvation to the engine and consequent damage to the catalytic converter and fuel pump.

To prevent damage, and improve departure angles, it may be necessary to remove and stow any towing equipment fitted to the vehicle.

As a precaution against accidental loss, remove the towing eye cover before driving off-road.

BASIC OFF-ROAD TECHNIQUES



WARNING:

Off-road driving can be hazardous.

- **DO NOT take unnecessary risks and be prepared for emergencies at all times.**
 - **Your vehicle has a higher ground clearance and hence a higher centre of gravity than an ordinary passenger car. An abrupt manoeuvre at an inappropriate speed or on an unstable surface could cause the vehicle to go out of control or rollover.**
 - **Familiarize yourself with the recommended driving techniques in order to reduce risks to yourself, your vehicle AND your passengers.**
 - **Always ensure that seat belts are worn for personal protection while driving on-road or off-road.**
 - **Keep all windows closed during off-road driving to prevent ingress of dirt and water and to prevent tree branches from injuring occupants.**
 - **DO NOT drive off-road alone or without letting someone know where you are going and when you plan to return.**
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Off-road Driving

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, including off-road recovery techniques.

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

Starting the engine

In some extreme off-road driving conditions, it may be desirable to start the engine with a gear engaged, e.g. a steep hill start. Use the following procedure to start the engine with a manual transmission.

1. Press the clutch and select a gear.
2. Release the clutch.
3. Release the parkbrake. Do not release the parkbrake before a gear is selected.
4. Start the engine. An interlock will prevent the engine from cranking until the parkbrake is released.

Note: *The battery charging and oil pressure warning lights should extinguish as soon as the engine is running.*

Gear selection (Automatic transmission)

With the main selector lever set at **D**, the gearbox automatically provides the correct gear for the appropriate gear range selected (HIGH or LOW). For greater vehicle control through gear selection, manual CommandShift mode is recommended.

HIGH range gears should be used whenever possible - only change to LOW range when ground conditions become very difficult.

Braking

As far as possible, vehicle speed should be controlled through correct gear selection and the use of Hill Descent Control (HDC). Application of the brake pedal should be kept to a minimum. In fact, if the correct gear and HDC have been selected, braking will be largely unnecessary.

If the brake pedal is depressed when HDC is active, HDC is overridden and the brakes will perform as normal. If the brake pedal is then released, HDC will recommence operating, at reduced speed.

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 HDC. Use of manual CommandShift™ gear selection to limit the transmission to lower gears will also increase engine braking. Select **1** or **2** LOW range, depending on the severity of the descent.

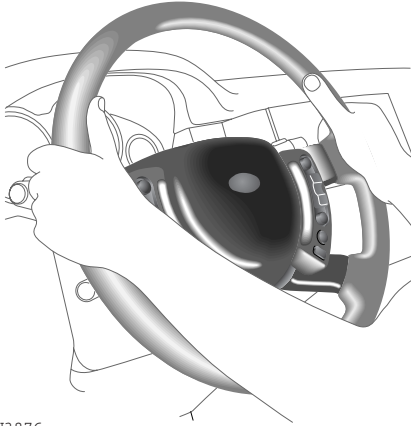
While descending a slope (either forwards or in **R** - reverse) it should be remembered that HDC and the engine will provide sufficient braking effort to control the rate of descent. In extreme circumstances the brakes may be applied.

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.

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Steering



H3876



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.

Ground clearance

Don't forget to allow for ground clearance beneath the vehicle suspension components and under the front and rear bumpers. 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.

ALWAYS attempt to avoid obstacles that may foul the vehicle.

Electronic air suspension

Select Off-road height, to increase approach/departure angles and ground clearance.

Loss of traction

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

- Remove obstacles before trying to cross them.
- Reverse a short distance, then attempt an increased speed approach - additional momentum may overcome the obstacle.

CD autochanger

Playing CDs while negotiating arduous off-road terrain is not recommended. Severe jolting of the vehicle may disturb the operation of the autochanger, causing the disc to jump or skip.

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DRIVING ON ROUGH TRACKS

Although rough tracks can sometimes be negotiated in normal drive, on very rough tracks, engage LOW range to enable a steady, low speed to be maintained without constant use of the brake pedal. Engage Terrain Response/Differential lock before proceeding.

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

- Select **D** (drive) in LOW range.
- Engage Terrain Response/Differential lock before proceeding.
- Drive away using the MINIMUM accelerator possible.
- Drive slowly at all times, keeping braking to a minimum and avoiding violent movements of the steering wheel.

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 Range Rover, deactivate DSC. Select **D** (drive) and **REMAIN** in that gear until a firm surface is reached. It is generally advisable to use LOW range, as this will enable you to accelerate through worsening conditions without the risk of being unable to restart. Engage Terrain Response/Differential lock before proceeding.

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.
- To avoid wheel spin, select **D** (drive) and use the MINIMUM accelerator necessary to get the vehicle moving.
- If forward motion is lost, avoid excessive use of the accelerator - this may dig the vehicle into the sand. Clear sand from around the tyres and ensure that the vehicle underside is 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 tyres so that the vehicle is again on level ground. If a restart is still not possible, place sand mats or ladders beneath the tyres.

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CLIMBING STEEP SLOPES

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

Caution: Do not attempt to drive the vehicle continuously at angles greater than 35 degrees nose up or down, or 30 degrees side to side. It is acceptable to drive up or down at angles between 35 degrees and 45 degrees, but only momentarily.

Failure to follow these instructions will result in damage to the engine.

Steep climbs will usually require the LOW gear range and selecting **2**, CommandShift selection is recommended. It is advisable to engage HDC, in case there is a need to reverse down the slope. Engage Terrain Response/Differential lock before proceeding. If the surface is loose or slippery, use sufficient speed in the highest practical gear to take advantage of your vehicle's momentum and disable DSC. However, too high a speed over a bumpy surface may result in a wheel lifting, causing the vehicle to lose stability. 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 the foot brake.
2. Engage **N** (neutral) and engage LOW range, then select **R** (reverse).
3. Restart the engine if necessary.
4. Select Hill Descent Control (HDC).
5. Fully release the foot brake and allow the vehicle to reverse down the slope using engine braking and HDC to control the rate of descent.
6. If the vehicle begins to slide, accelerate slightly to allow the tyres to regain grip.

When the vehicle is back on level ground and safety permits, a faster approach may enable the hill to be climbed. However, **DO NOT** take unnecessary risks, if the hill is too difficult to climb, find an alternative route.

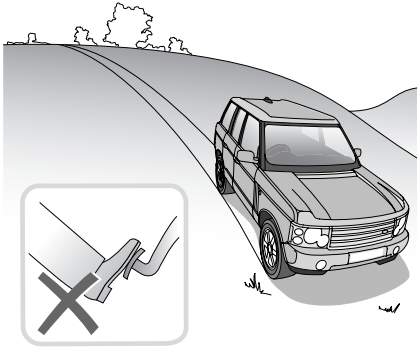


WARNING:

DO NOT attempt to reverse down a slope without the engine running and ensure that reverse gear (R) is selected. Otherwise, HDC and the braking effect of the gearbox will be lost.

Off-road Driving

DESCENDING STEEP SLOPES



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Caution: Do not attempt to drive the vehicle continuously at angles greater than 35 degrees nose up or down, or 35 degrees side to side. It is acceptable to drive up or down at angles between 35 degrees and 45 degrees, but only momentarily.

Failure to follow these instructions will result in damage to the engine.



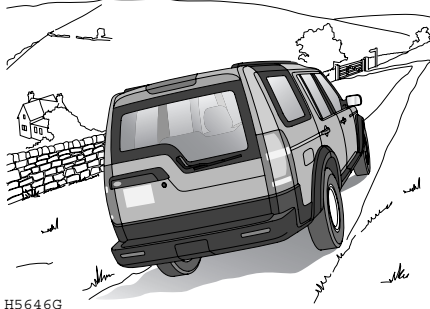
WARNING:

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

- Slow the vehicle and select LOW range.
- With the transmission in manual CommandShift mode, change down the gears to select **1** before bringing the vehicle to a stop at least vehicle length before the start of the slope.
- Engage Terrain Response/Differential lock before proceeding.
- Select Hill Descent Control (HDC).
- Once the descent has been started, **D** can be selected in the main gearbox. HDC will continue to operate and the previously selected manual gear will be retained until the descent is complete.

Off-road Driving

TRAVERSING A SLOPE



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WARNING:

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

Traversing a slope is widely considered as one of the most dangerous activities when driving off-road.

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.
- Engage Terrain Response/Differential lock before proceeding in 1st gear low range.

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

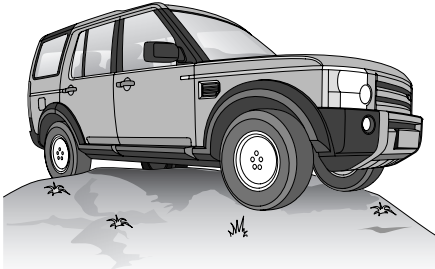
As far as possible allow the vehicle to steer itself along the bottom of the ruts and always keep a light hold of the steering wheel to prevent it from spinning free. Deactivation of DSC may help in deep ruts.

Raise the air suspension to Off-Road height, and engage Terrain Response/Differential lock before proceeding.

The vehicle may appear to be driving straight ahead in the ruts, but in actual fact 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.

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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 stability to be lost, through diagonally opposite wheels lifting from the ground at the same time. Engage Terrain Response/Differential lock before proceeding.

CROSSING A DITCH



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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. If the severity of terrain makes this inevitable, selecting Off-road height with the Air Suspension, to increase clearance between the ground and the bottom of the vehicle, may help.

Off-road Driving

WADING



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WARNING:

DO NOT attempt to wade through fast moving water. Fast moving water is capable of washing a vehicle away.

Fast moving water can also carry debris, (trees, branches, etc) which can cause injury to the occupants, or damage to the vehicle.

Caution: The maximum advisable wading depths are:-

- **700mm (28 inches) for Range Rover, Range Rover Sport and Discovery 3/LR 3 with the air suspension at off-road height.**
- **600mm (24 inches) for Discovery 3/LR 3 with coil springs.**
- **500mm (20 inches) for Defender & Freelander 2/LR 2.**

Wading at a depth greater than the maximum advisable wading depth regularly, is not recommended.

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

Before wading, ensure the electronic air suspension is set to off-road height and engage Terrain Response/Differential lock before proceeding.

If the water is likely to exceed the maximum wading depth, 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.
- 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.
- Drive slowly into the water and accelerate to a speed which causes a bow wave to form; then maintain that speed.
- Remove the CD autochanger.

At all times, keep all the doors fully closed.

Caution: Do not switch off the engine during wading. If the engine stalls during wading, restart it immediately and, as soon as possible, get the vehicle checked by a Land Rover Dealer/Authorised Repairer.

If, during wading, it is thought that water may have entered the engine air intake, switch off the engine immediately. Have the vehicle towed out and delivered to a Land Rover Dealer/Authorised Repairer for checking.

Note: *If deep wading is to be carried out regularly, contact your Land Rover Dealer/Authorised Repairer and/or your local Land Rover Experience centre for advice.*

After wading

- Drive the vehicle a short distance and apply the foot brake to check that the brakes are fully effective.

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- DO NOT rely on the handbrake to hold the vehicle stationary until the brakes have thoroughly dried out; in the meantime, leave the vehicle parked in **P** for an automatic transmission, or in gear for a manual transmission.
- Remove any protective covering from in front of the radiator grille.
- If the water was particularly muddy, remove any blockages (mud and leaves) from the condenser and 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.

AFTER DRIVING OFF-ROAD

Note: *In some countries it is illegal to contaminate the highway with mud etc. In any event, contaminating the highway with mud, soil, etc can prove hazardous to other road users. Ensure that your vehicle is cleared of mud, dirt etc before driving on the highway.*

Before rejoining the public highway, or driving at speeds above 40 km/h (24 mph), 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 calipers should be examined and any stones or grit removed that may affect braking or handbrake efficiency.
- Inspect the drive belts and pulleys at the front of the engine for damage.
- The underside of the vehicle should be checked for damage, especially the suspension air springs, dampers, drive-shaft boots and steering gear boots. Any debris, packed mud, etc should be cleared from the areas around the drive shaft boots, including the chassis portholes. All rubber components such as drive shaft boots, steering boots, air springs etc should be checked for splits, punctures and deformities.
- Any damage to paint or protective coatings, should be rectified by a Land Rover Dealer/Authorised Repairer as soon as possible.

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

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Cleaning after off-road driving

Caution: Ensure that the areas around air intakes and the front grille are clean and clear of debris. Pay particular attention to the lower grille and radiator. Failure to do so may cause the engine to overheat, leading to severe engine damage.

Ensure that the vehicle and underside is cleaned soon after off-road driving, taking particular care to clean areas where mud and debris has compacted.

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 and prevent impairment of park brake efficiency.

Ensure that the vehicle is only cleaned in an area designated as suitable for vehicle cleaning. Vehicle cleaning products, and water run off can damage the environment if not processed properly. This includes products which are described as 'Eco Friendly' or 'Environmentally safe' etc.

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. Contact a Land Rover Dealer/Authorised Repairer for advice.