

ST288

STARTING - PETROL ENGINE - Fig. ST288

Before starting the engine for the first time each day, check that the engine oil and radiator coolant levels are correct, top up if necessary. Check that the handbrake is on and that the main gear lever is in neutral. If the engine is cold, pull out the cold start control (2) and turn it clockwise to lock.

STARTER OPERATION

Insert and turn the ignition key to position 'II', then turn the key to position 'III' to operate the starter; release the key as soon as the engine is running. The RED ignition and oil pressure warning lights will go out when the engine is running.

In cold weather, depress the clutch pedal while the starter motor is in operation to improve engine starting speed.

Do not operate the starter for longer than 10 seconds; switch off and wait 10 seconds before re-using the starter. If the cold start control has been used to assist starting, unlock the control by turning it anti-clockwise and push it in to the mid-point of its travel and relock. As the engine warms and runs smoothly, progressively return the control to the fully in position. If after a few attempts the engine fails to start, switch off and investigate the cause.

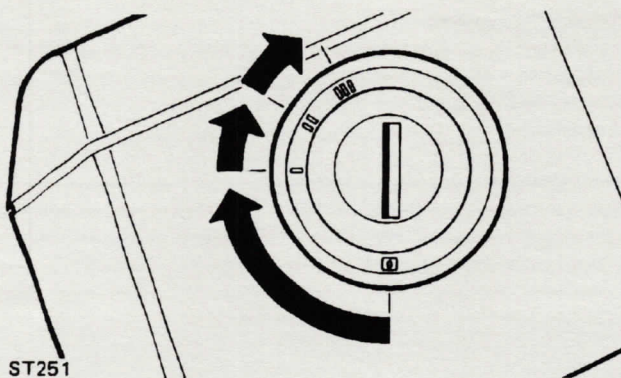
CAUTION: Continued use of the starter will not only discharge the battery but may damage the starter motor.

STARTING WITH A WARM ENGINE

DO NOT use the cold start control or pump the accelerator pedal. Depress the accelerator pedal to approximately half-way. Turn the ignition key to operate the starter, keeping the accelerator pedal in the half-way position. Release the ignition key and accelerator pedal immediately the engine starts.



WARNING: Carbon monoxide is a dangerous gas and can cause unconsciousness and may even be fatal. Do not breathe exhaust gas because it contains carbon monoxide which by itself has no colour or odour. Never start or leave the engine running in an enclosed unventilated area. If you think exhaust fumes are entering the vehicle have the cause determined and corrected as soon as possible. If you must drive under these conditions, drive only with all windows fully open.



STARTING AND STOPPING - DIESEL ENGINE - Fig. ST251

The following procedures must be used to ensure easy starting and avoid damage to turbo-charged models.

Before starting the engine for the first time each day, check that the engine oil and radiator coolant levels are correct, top up if necessary. Check that the handbrake is on and that the main gear lever is in neutral.

HEATER PLUGS

The Land Rover diesel engine will start satisfactorily, with the proper use of the heater plugs, down to temperatures of -32°C (22°F) even with batteries only 80% charged, provided the correct grade of oil is used. Turn the starter key to the heater plug position (II) when starting from cold. An amber warning light will glow when the engine starter key is turned to the 'heater plug' position, and will go off after a few seconds when the starting temperature is correct.

STARTER OPERATION

Insert the starter key and turn and hold it in position 'II' until the heater plug warning light goes off, then turn the key to position 'III' to operate the starter; release the key as soon as the engine is running. The RED charge and oil pressure warning lights will go out when the engine is running.

STARTING A COLD ENGINE

DO NOT use the accelerator pedal during the engine starting procedure; extra fuel for cold starting is automatically supplied by the injector pump.

CAUTION: The engine must not be run above fast idle until the oil pressure warning light goes off; this is to ensure that the engine bearings are receiving lubrication before being run at speed. This is very important on turbo-charged engines to ensure that the turbo-charger bearings are also receiving lubrication.

In cold weather, depress the clutch pedal while the starter motor is in operation to improve engine starting speed.

Do not operate the starter for longer than 10 seconds; switch off and wait 10 seconds before re-using the starter. If after a few attempts the engine fails to start, switch off and investigate the cause.

CAUTION: Continued use of the starter will not only discharge the battery but may damage the starter motor.

STOPPING THE ENGINE - TURBO-CHARGED MODEL

To avoid the possibility of inadequate lubrication of the turbo-charger, the following precaution must always be observed.

- Before stopping the engine, allow it to idle for 10 seconds to give time for the turbo-charger to slow down whilst oil pressure is available at the bearings.
- Switching the engine off too quickly could leave the turbine rotating at several thousand revolutions per minute without oil pressure.

STARTING A WARM ENGINE

DO NOT operate the accelerator pedal during the engine starting procedure. Turn the starter key to the engine start position. Release the key immediately the engine starts.

PRECAUTIONS FOR COLD WEATHER PROTECTION

The following recommendations should be considered to minimize difficulties associated with cold weather fuel problems.

- Ensure 'winter' grade fuel is used. Filling stations should automatically change to this fuel during winter.
- Renew the main fuel filter element at the recommended intervals.
- Maintain the state of charge of the battery in a satisfactory condition.
- Follow the starting procedures stated.

The use of paraffin (kerosene) as a diesel fuel additive, is illegal in the U.K. and the use of petrol as a fuel in a diesel engine is highly dangerous.



WARNING: Exhaust fumes contain noxious substances which can cause unconsciousness and may even be fatal. Do not breathe exhaust gas because it contains noxious substances which by itself has no colour or odour. Never start or leave the engine running in an enclosed unventilated area. If you think exhaust fumes are entering the vehicle have the cause determined and corrected as soon as possible. If you must drive under these conditions, drive only with all windows fully open.

ENGINE STARTING FAULT FINDING - PETROL AND DIESEL ENGINES

This chart gives a number of quick and easy checks which may help you to get the engine started.

Checking of any part of the electronic ignition system must be referred to your Land Rover Dealer or Distributor.



WARNING: The electronic ignition system involves very high voltages. Inexperienced personnel and wearers of medical pacemaker devices should not be allowed near any part of the high-tension circuit.

FAULT	POSSIBLE CAUSE	CHECK
STARTER MOTOR WILL NOT OPERATE		
If the starter motor does not operate when the key is turned to the start position, the fault may be -	1.	1.
	Loose battery leads	Clean and tighten the battery lead connections and try starting the engine.
	2. Discharged battery	2. Try push or tow starting the vehicle
	3. Faulty wiring	3. 3, 4 and 5, seek expert help.
	4. Faulty starter solenoid	
	5. Faulty starter motor	
STARTER MOTOR OPERATES BUT ENGINE WILL NOT START		
Do not use the starter motor for long periods, if the engine will not start, the fault may be -	1. Lack of fuel	1. The fuel gauge could be faulty. Check that there is fuel in the tank.
	2. Fuel not reaching engine	2a Slacken a fuel pipe nut at the engine and operate the starter for a few seconds. If fuel has leaked from the slackened nut, then fuel is reaching the engine. Retighten the fuel pipe nut and wipe away any fuel. b If fuel has not leaked, check for broken or disconnected pipes. c If the fault is not found, seek expert help.

CAUTION: If the vehicle runs out of fuel or the engine will not start, turn off the ignition/starter switch to prevent damage to electrical components.

FAULT

POSSIBLE CAUSE

CHECK

3. Petrol engines-Ignition fault Diesel engines-Heater plug fault

3. **PETROL ENGINES:** Remove one spark plug. Reconnect its lead and place it on the engine so that there is a metal-to-metal contact. Operate the starter while someone else looks to see if the plug sparks. If a spark is seen, ignition fault is unlikely. Refit the plug and make sure that the leads are connected in the right order, as shown in this manual. If no spark is seen, refit the plug, as above, and make sure that all the leads are firmly connected to the distributor cap, and that the centre lead is firmly connected to the ignition coil. Try starting the engine again. If the engine does not start, remove the distributor cap and wipe the inside to remove any damp or dirt. Four cylinder engines only: Check and adjust the contact breaker clearance, as described in this manual. Refit the distributor cap and try starting the engine again. If the engine does not start, seek expert help.
- DIESEL ENGINES:** Make sure that the yellow/black leads are firmly connected to all four heater plugs, and that the plug and socket is firmly connected on the timer unit at the rear of the engine compartment. Hold the starter key in the 'heater plug' position for at least twelve seconds, then try to start the engine. If the engine does not start, seek expert help.

DRIVING - PETROL AND DIESEL MODELS

WARMING-UP

When the engine is cold, drive the car as soon as the engine has started. Do not warm-up the engine by running it at a slow speed with the vehicle stationary.

CAUTION: Harsh acceleration and labouring the engine before normal temperature is reached can damage the engine.

EXCESSIVE TEMPERATURE

Excessive engine temperature is indicated when the temperature gauge indicator reaches the RED graduations. Any sudden increase in engine temperature must be investigated. Stop the engine and check the engine cooling system.



WARNING: Do not remove the filler cap or radiator filler plug when the engine is hot because the cooling system is pressurised and personal scalding could result.

Ensure there are no leaks, top up the radiator expansion tank if necessary. Make sure the fan belt is not broken and is correctly tensioned.

DRIVING CHARACTERISTICS



WARNING: Your Land Rover has a higher ground clearance and hence a higher centre of gravity than an ordinary passenger car to enable it to perform in a wide variety of off-road applications. An abrupt manoeuvre at an inappropriate speed or on an unsuitable surface could cause the Land Rover to go out of control.

RUNNING-IN PERIOD

Progressive running-in of a new Land Rover is important and has a direct bearing on reliability and smooth running throughout its life.

The most important point is not to hold the vehicle on large throttle opening for any sustained periods. To start with, the maximum speed should be limited to 65 to 80 km/h (40 to 50 mph) for 4 cylinder models and 80 to 95 km/h (50 to 60 mph) for V8 cylinder models, on a light throttle and this may be progressively increased over the first 2,500 km (1,500 miles).

FUEL RECOMMENDATIONS

Recommended fuels for petrol models are specified in the Data section. No advantage will be gained by the use of higher octane fuels. The fuel filler cap is located: Side tank: at the front right-hand side of the body. Rear tank: at the rear right-hand side of the body.

UNLEADED PETROL

All current petrol engines used in Land Rovers, 4 cylinder and V8, can be run on unleaded or leaded petrol. It is strongly recommended, that whenever it is available, unleaded petrol should be used to help protect the environment. It is permissible to mix unleaded and leaded petrol when refilling the petrol tank.

V8 PETROL ENGINES ONLY - If your vehicle is fitted with a low emission exhaust system, or if you intend purchasing a conversion kit from Land Rover Parts, the following important points should be noted. Always use **UNLEADED** (95 octane) petrol. Note the cautionary and instruction labels fitted to the vehicle, specifying the use of **UNLEADED** fuel only.

CAUTION: NEVER put any **LEADED** petrol in the fuel tank, as it would completely destroy the emission reducing properties of the catalyst exhaust.

CAUTION: Do not use oxygenated fuels such as blends of methanol/gasoline or ethanol/gasoline (e.g. Gasohol).



WARNING: Do not fill the tank completely if the vehicle is to be parked in direct sunlight or high ambient temperature, as this would cause the fuel to expand and escape through the breather pipe onto the ground.

- DIESEL ENGINES

Clean, good quality fuel should be used in diesel models. It is important that the sulphur content of diesel fuel does not exceed 1%. In Europe all supplies should be within the limit, but in other areas operators should check with their suppliers. Change the fuel filter element and clean sediment bowl regularly.

BRAKE, SERVO ASSISTANCE AND POWER ASSISTED STEERING - options

Do not coast in neutral with the engine switched off as the brake servo and power assistance for the steering will not operate. The brakes and steering will still function but more effort will be required by the driver. This will also apply if the vehicle is being towed without the engine running, and extra caution must be used.

SNOW CHAINS

Chains may be fitted to provide increased traction during extremely adverse heavy snow conditions. Never fit chains to one wheel only, always fit snow chains in pairs to the rear axle only, and ensure the gearbox differential control is in the **LOCKED** position. Remove the snow chains immediately the road is clear of snow.

Tdi ENGINES

If a radiator blind is fitted, it must not obscure the intercooler section, otherwise engine performance would be adversely affected. If in doubt, contact a Land Rover Dealer.

Driving in general



WARNING: Always wear a seat belt for personal protection while either **ON-ROAD** or **OFF-ROAD** driving. Driving off-road can be particularly hazardous therefore do not take risks. Drive carefully.

Do not use the handbrake while the vehicle is moving.

Do not rest your foot on the brake pedal while travelling as this may overheat the brakes, reduce their efficiency and cause excessive wear.

Do not overload the vehicle for sustained cross country work. See 'Vehicle weights' Section 6.

Do not wrap your thumbs round the steering wheel as any steering kick-back over rough ground may result in personal injury.

Do not coast with the engine switched off as the brake servo and steering assistance will not operate. The brakes will still function but more foot pressure will be required.



WARNING: Driving through water or heavy rain will result in braking surfaces becoming coated with moisture. This will affect braking efficiency until the surfaces are dried by intermittent light application of the brakes which should be done at a safe distance from other vehicles. Brakes should be dried and tested immediately after driving through water, every few miles when driving in heavy rain and especially before leaving a wet motorway. When parking, do not rely on the handbrake alone to hold the vehicle if the brake linings have been subjected to immersion in mud and water (See 'After wading' details later in this section).

Do not use a gear which is too high for the vehicle speed and travel conditions involved; it is preferable to select a lower gear and use more revolutions rather than allow the engine to labour at low speed.

Do not use the clutch pedal as a foot rest. Keep the left foot well clear of the clutch pedal while the vehicle is in motion.

DO NOT drive with your hand resting on the main gear level, it may damage the gearbox. Ensure pressure is only applied whilst changing gear.

TOWING

Consult a Land Rover Dealer for details and advice on approved towing equipment and accessories.

Land Rovers can tow loads over various types of terrain.

The torque ranges of Land Rover engines allow maximum-weight loads to be driven smoothly from standstill, and reduces gear changing on hills, or rough terrain. A smooth start will be achieved with trailers over 2000 kg (4400 lb) by moving off in low range then changing to high range while on the move.

The suspension is designed to cope with a heavy trailer load without upsetting the balance or feel of the vehicle. Details of gross maximum trailer weights are listed on the following page. When preparing the vehicle and trailer combination, careful attention must be paid to the trailer manufacturer's recommendations. An outline of the correct procedure is given here:

- (a) Vehicle tyre pressures must always be set at normal pressures, NOT the 'reduced for comfort' option, irrespective of the load being carried. See 'Tyre pressures' in Data Section.
- (b) Adjust tyre pressures on the trailer, as recommended by the manufacturer.
- (c) Balance the trailer and the vehicle, both unladen, so that the trailer draw-bar and the hitch point on the vehicle are at the same height. Adjust the height of the hitch point if necessary.
- (d) Check operation of trailer brakes and lights.
- (e) Load the trailer and check the weight on the hitch point (called the drawbar loading weight, or nose weight), in accordance with the manufacturer's recommendations.
- (f) The recommended nose weight limit is 75 kg (165 lb). The nose weight plus the load area and/or rear seats of the vehicle together with load and passengers must never exceed the maximum rear axle load or gross vehicle weight.

The weight of the trailer plus load depends upon several factors.

- (a) Towing stability.
- (b) Weight of the vehicle contents including passengers. When part of the weight is transferable, loading the towing vehicle will generally improve the stability of the combination.
- (c) Altitude: Engine performance is progressively reduced above altitudes of 300 m (1,000 feet).

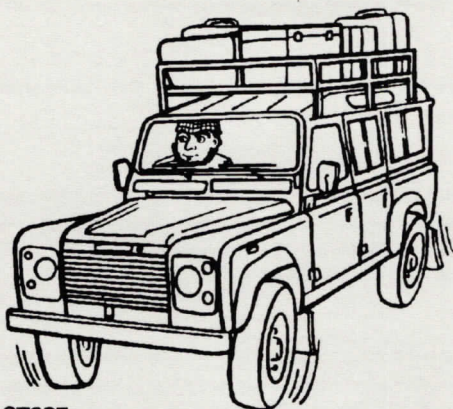
NOTE: Since towing regulations vary from country to country, it is important to refer to the relevant national motoring organisations for the laws relating to towing weights and speed limits.

The following maximum permissible towed weights refer to the design limitations.

Maximum Permissible Towed Weights		On-road kg	Off-road kg
Unbraked trailers		750	500
Trailers with overrun brakes		3500	1000
4 wheel trailers with coupled brakes	Diesel models (except Turbo)	3500	1000
	* Petrol and Diesel Turbo	4000	1000

* NOTE: In order to tow a trailer with a weight in excess of 3,500 Kg, it is necessary to adapt the vehicle to operate a Coupled Brake System, and the VIN plate must be changed to show the increased train weight.

A revised VIN plate may be obtained from Land Rover, which will be issued, subject to satisfactory proof that the vehicle has been fitted with an approved conversion.



ST287

ROOF LOADS Fig. ST287

All new, 'Hard Top' Land Rovers, except cab trucks, have roofs fitted with aluminium cant rails, which require the use of an appropriate roof rack. Information concerning suitable roof racks is available through the Land Rover parts service. These should be fitted very carefully following the manufacturers' instructions.

Maximum roof load including weight of roof rack is 75 kg (165 lb).

In an extreme emergency this load may be increased to 150 kg (331 lb).



WARNING: When the use of a roof rack is required care should be taken as the vehicle stability will be affected. Any load must be evenly distributed and firmly secured. Drive carefully.

ACCESSORIES AND CONVERSIONS

Land Rover vehicles are designed and constructed for a variety of uses but no alterations or conversions should be carried out to any vehicle produced by Land Rover which could affect the safety of the vehicle or its passengers.

Land Rover has tested and approved a large number of accessories and conversions, suitable for the Ninety and One Ten vehicles in its current range. Before fitting **ANY** accessory or commencing **ANY** conversion work to any Land Rover vehicle, **CHECK** that the accessory or conversion is approved by Land Rover.



WARNING: DO NOT FIT unapproved accessories or conversions, as they could affect the safety of the vehicle. Land Rover will not accept any liability for death, personal injury or damage to property which may occur as a direct result of fitment of non-approved accessories or the carrying out of non-approved conversions to Land Rover vehicles.

CAUTION: DO NOT use auxiliary devices, such as roller generators, that are driven by one wheel of the vehicle, as they could cause failure of the gearbox differential. If the gearbox differential lock is engaged in an attempt to avoid damage, the vehicle will drive itself forward.

DRIVING OFF ROAD

The following notes are a general guide to the technique of driving Land Rovers over rough terrain.



WARNING: Driving off road can be hazardous. **DO NOT** take unnecessary risks. Drive carefully and be prepared for emergencies.

MATCH ENGINE SPEED TO THE GEAR SELECTED

Before traversing a difficult section, select low range differential locked and a suitable gear, which, for most purposes, second or third is satisfactory. Remain in this gear whilst crossing and use care when applying the accelerator pedal since a sudden power surge may cause wheel spin. Unlock the differential as soon as practical.

RIDING THE CLUTCH

Keep the foot away from the clutch pedal. The practice of resting the foot on the clutch pedal should be avoided. Apart from premature clutch wear a sudden bump could cause the pedal to be depressed too far, disengaging the drive, and causing the vehicle to go out of control.

BRAKING

Keep the application of the brake pedal to a minimum.

Braking on wet or muddy slopes can induce sliding and loss of control.

USE OF ENGINE FOR BRAKING

Before descending steep slopes, first gear low range with differential locked should be selected and the engine should be allowed to provide the braking. This it will do without assistance from the wheel brakes. Failure to adopt this procedure may result in loss of control.

DRIVING ON SOFT GROUND

Where conditions are soft, such as marsh ground or sand, reduced tyre pressures will increase the contact area of the tyres with the ground. This will help to improve traction and reduce the tendency to sink. Tyre pressures should be reinflated to the standard pressures when firm ground is reached.

ROUGH ROCKY TRACKS

Although beaten rough tracks can be negotiated in normal drive, it is advisable to lock the differential if there is excessive suspension movement likely to induce wheel spin. As the track becomes rougher and more rocky, low range may be necessary to avoid slipping the clutch and to make the Land Rover easier to control. Do not hold the steering wheel with the fingers and thumbs inside the wheel. A sudden violent kick of the wheel could damage or even break the fingers. Grip the wheel on the outside of the rim when travelling across country, see Fig. ST027

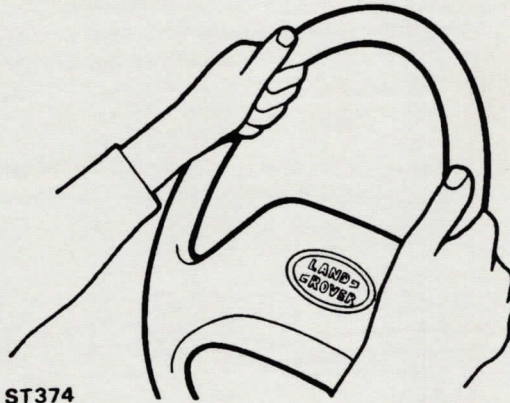
CLIMBING STEEP SLOPES

This will usually require the use of low range second or third gear with differential locked. Should the slope be slippery use the highest gear that the engine can manage without labouring and stalling.

If the vehicle fails to climb a slope but does not stall, the following procedure should be carried out. Hold the vehicle on the footbrake and engage reverse gear as quickly as possible. Release the brakes and allow vehicle to reverse down the slope whilst ensuring that both feet are clear of the brake and clutch pedals.

If the vehicle stalls on a slope, hold the Land Rover on the footbrake, engage reverse gear and remove the feet from both clutch and brake pedals. Start the engine whilst in gear and allow the Land Rover to reverse down the slope, using only the retardation effect of the engine for braking.

When back on level ground, or where forward traction can be regained, then a possible faster approach will overcome the inertia and extra momentum will often enable the slope to be climbed.

**ST374****GROUND CLEARANCE**

Be aware of the need to maintain ground clearance under the chassis and a clear approach and departure angle. Avoid existing deep wheel ruts, sudden changes in slope and obstacles which could interfere with the chassis.

RUTTED AND EXISTING WHEEL TRACKS

Generally the tendency is to over-steer the vehicle under these circumstances, resulting in the vehicle being driven on left- or right-hand lock in ruts. This should be avoided as it produces drag at the road wheels and can be dangerous, causing the vehicle to veer off the track the moment the front wheels reach level ground or find traction.



ST292

CROSSING RIDGES AND DITCHES - Fig. ST292

Select a path so that the condition under each wheel is similar to that under the opposite wheel of the same axle. This principle should be applied both in avoiding dissimilar ground surfaces under opposite wheels and in assessing the correct angle of approach to an obstacle so as to avoid the wheels being lifted off the ground.

CROSSING OVER A RIDGE

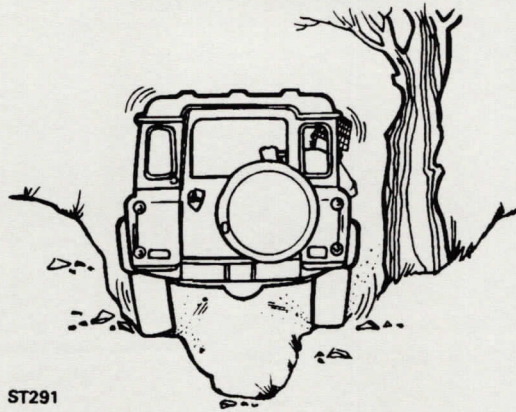
Approach a ridge at right angles so that both front wheels go over together. If approached at an angle, traction can be completely lost through diagonally opposite wheels leaving the ground.



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CROSSING A DITCH - Fig. ST289

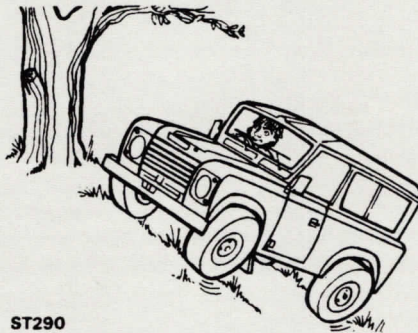
Ditches should be crossed at an angle so that three wheels are kept in contact with the ground. If approached at right angles the two front wheels will drop into the ditch, effectively preventing forward or rearward movement.



ST291

NEGOTIATING A 'V' SHAPED GULLY - Fig. ST291

This should be tackled with caution since steering up or down the gully walls could lead to the vehicle becoming trapped on the bank or on an obstacle such as a tree or rock.



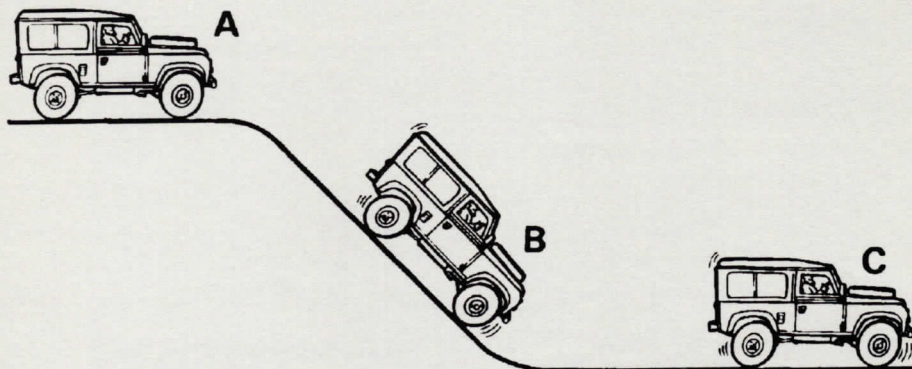
ST290

TRAVERSING SLOPES - Fig. ST290

Traversing a slope should be undertaken in the following way. Check that the ground is firm under all wheels and that it is not soft under the downhill side wheels. Also avoid the uppermost wheels climbing up over a rock or tree root, both of these situations could result in the vehicle rolling on to its side.



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



ST293

DESCENDING STEEP SLOPES - Fig. ST293

Stop the vehicle at least a vehicles length before the slope and engage first gear, low range with the differential locked. Check gear engagement before moving off. Do not touch the brake or clutch during the descent - the engine will limit the speed, and the vehicle will remain perfectly under control while the front wheels are turning. If the vehicle begins to slide, accelerate to maintain directional stability.

- A. Stop at least a vehicles length before the slope. Select first gear low range with the differential locked.
- B. Engine retardation.
- C. Now unlock differential and change into second or third gear.

DRIVING IN SOFT, DRY SAND

When conditions are soft, reduced tyre pressures will increase the contact area, help improve traction and reduce the tendency to sink. Select a gear, lock the differential and stay in it.

Because of the drag of the sand, the instant the clutch is disengaged the vehicle will stop. If a standing start in sand or on the side of dunes is necessary, exercise care in applying the accelerator pedal, as sudden power will induce wheel spin and cause the vehicle to dig itself into trouble.

ICE AND SNOW

Land Rovers are, of course, used extensively in snow and icy conditions. The driving techniques are generally the same as driving on mud or wet grass. Select the highest gear possible with the differential locked and use only sufficient engine revolutions to just move the vehicle forward without labouring. Avoid violent movements of the steering wheel and use the brakes, with care, only if necessary.

NOTE: The differential lock can be engaged or disengaged at any speed providing the road wheels are not spinning at different revolutions. For example, in slippery conditions if one wheel is spinning, ease off the accelerator before engagement.



ST294

WADING - Fig. ST294

The maximum advisable wading depth is approximately 0,5 metres (20 in). Before wading make sure that the timing cover drain plug fitted to the diesel model only; and the flywheel housing drain plug are in position, see Maintenance Section, and if the water is deep, slacken off the fan belt. To prevent saturation of the electrical system and air intake, avoid excessive engine speed. A low gear with the differential locked is desirable and sufficient throttle should be maintained to avoid stalling if the exhaust pipe is under water.

AFTER BEING IN WATER

Make sure that the brakes are dried out immediately so that they are fully effective when needed again. This can be accomplished by driving a short distance with the footbrake applied. Also re-tighten and adjust the fan belt, remove the flywheel housing drain plug and, on diesel models remove the timing cover drain plug see Maintenance Section for these operations.

Do not rely on the handbrake to hold the vehicle once the transmission brake has been subjected to mud and water; leave the vehicle parked in gear.

AFTER CROSS COUNTRY DRIVING

If the tyre pressures have been reduced, they **MUST** be restored to the normal recommended pressures as soon as reasonable road conditions or hard ground is reached.



WARNING: Before rejoining the highway (public metalled roads) or driving the vehicle at speeds above 40 km/h (25 mph), wheels and tyres must be inspected for damage, after cleaning off any mud. Do not forget the inside faces. Also, inspect the brake discs and calipers, and remove any stones or grit etc., that may have become lodged and affect the efficiency of the brakes.

VEHICLE RECOVERY

Should the vehicle become immobile due to loss of wheel grip, the following hints could be of value:

- (a) Avoid prolonged wheel spin; this will only make matters worse.
- (b) Try to remove obstacles rather than force the vehicle to cross them.
- (c) If the ground is very soft, reduce tyre pressures if this has not previously been done.
- (d) Clear clogged tyre treads.
- (e) Reverse as far as possible, then the momentum reached in going forward again may get the vehicle over the obstacle.
- (f) Brushwood, sacking, or any similar 'mat' material placed in front of the tyres will help in producing tyre grip.
- (g) If possible, jack up the vehicle and place material under the wheels. Great care must be taken when doing this to avoid personal injury.

WINCHING

Land Rovers may be fitted with a variety of winches, suited to different functions. Their correct use is most important if accidents are to be avoided.

WINCH USE

A winch may be used for self-recovery, for recovering other vehicles or for a wide variety of haulage. When hauling with the vehicle stationary, ground anchors may be used to advantage.

WINCH OPERATION

Winches vary considerably in their mode of operation and the operator should refer to the manufacturer's instructions for his own model. The following is a general outline:

Apply handbrake

If recovering a motor vehicle or hauling another object, position ground anchors.

Prepare winch for operation and attach wire or fibre rope according to manufacturer's instructions.

Start vehicle engine as necessary, maintain revs required by instructions, and begin winching.

After winching, spool wire onto drum winches. Remove rope from capstan winches for storage elsewhere.

DO'S AND DON'TS**POINTS OF SAFETY**

Safety is the most important consideration: ropes, and particularly wire ropes, will react with great force if they part and can cause very severe injury.



WARNING: Careless winch operation can result in serious injury or damage to property. Read and understand all safety precautions and operating instructions before operating a winch.

Never stand near a rope under tension and in particular never stand astride it. Wear suitable protective gloves particularly when handling wire rope to protect hands from broken strands. Never allow wire rope to kink, coil or overwrap. Do not attempt to continue winching if the winch has stalled through overload. If brass shear-pins are fitted, do not replace them with steel ones - if the pins do not shear, some other part of the winch may do so. After use, wire ropes must be cleaned and greased - hold a greasy or oily rag in a gloved hand and allow wire to pass through it. Synthetic rope should be cleaned and dried.

POWER TAKE-OFF DRIVES

GENERAL

The Land Rover Ninety and One Ten can provide a static or mobile power source for a wide range of ancillary equipment. This power is available at two positions on the vehicle, one on the transfer box and the other at the front of the vehicle where a coupling may be made to the engine crankshaft.

The transfer gear unit consists of a centre power take off which can be obtained as optional equipment. This forms the basic drive for several variations for power take off layouts, summarised as follows:

Centre power take off	- V-belt pulley drive
	- Hydraulic drive
Front power take off	- Mechanical
Rear Power Take Off	- Hydraulic
	- Mechanical
	(ONE TEN ONLY)

For stationary operation the transfer gearbox is placed in neutral to disconnect the drive to the wheels and then it is possible to operate the centre power take off independently.

In this condition any of the forward gears may be used to provide a wide range of speeds. It is recommended that the highest gear should be used where ever possible as this will prevent excessive loading of the transmission. The intermediate gears can be selected when lower speeds are required, but their use should be restricted to light loads and duties of an intermittent nature.

When the vehicle is moving, the centre power take off drive unit will operate at a speed which is in direct proportion to the road speed of the vehicle and the ratio of the transfer gear selected.

For more information on power take off drives and equipment, contact your Land Rover Dealer.

SPLIT CHARGE - OPTION - Fig. ST324

The split charge facility enables a second battery to be fitted to the vehicle charging circuit, to provide a separate source of 12 volt electrical supply for auxiliary use without risk of discharging the vehicle main battery.

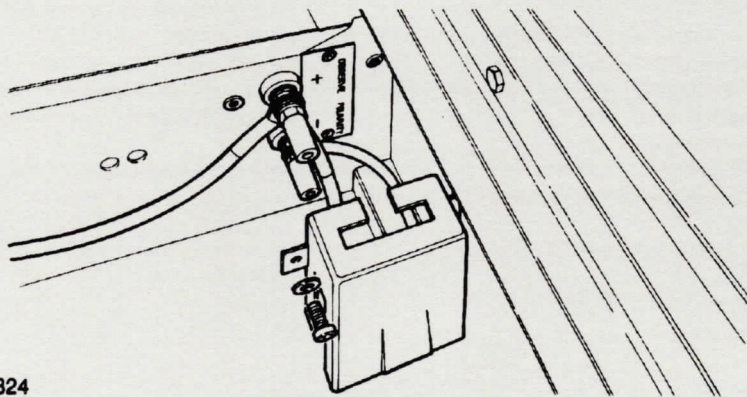
TERMINAL BOX PICK UP ASSEMBLY

Positive (+) and Negative (-) terminals, located in the battery box, are used for battery charging purposes. The ammeter is connected in the + line in order to monitor the current flow from the alternator to the batteries. **IMPORTANT:** It is essential that when charging additional batteries the cables used must be capable of carrying the maximum rated output of the alternator. When charging more than one 12 volt battery interconnections between batteries must be parallel.

AUXILIARY ELECTRICAL POWER

When power is required for driving low voltage equipment with the engine running, connections can be made directly to the terminals "+" and "-".

CAUTION: Ensure that correct polarity is observed to avoid damage to the circuit and equipment.



ST324

VEHICLE RECOVERY - TOWED

If the vehicle should suffer a breakdown or accident damage and it becomes necessary to make a towed recovery, it is essential to adhere to one of the following procedures depending on the type of tow to be undertaken.

This is because Land Rovers have permanent four-wheel drive and may be fitted with a steering lock.

TOWING THE LAND ROVER (ON FOUR-WHEELS)

- (a) Set the main gearbox in neutral.
- (b) Set the transfer box in neutral.
- (c) Turn the starter/steering lock key to the first position to unlock the steering.
- (d) Ensure the differential lock is in the normal 'unlocked' position.
- (e) Secure towing attachment to the vehicle.
- (f) Release the handbrake.

NOTE: Unless the engine is running, brake servo (and power steering assistance, if fitted) will not be effective. This will result in a considerable increase in pedal pressure or steering effort being required.

CAUTION: Where a front propeller shaft is to be removed check whether the four rear end fixing bolts in the gearbox flange are entered from the gearbox side. In this event they cannot readily be withdrawn. However, since the flange will revolve as soon as the vehicle is towed the four loose bolts **MUST** be tightly secured with nuts or suitably wired to prevent damage to the gearbox end casing.

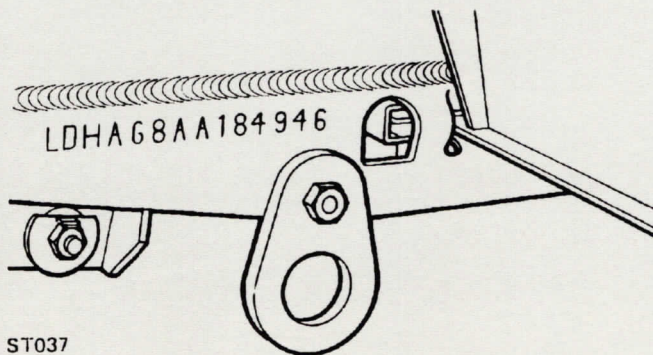
SUSPENDED TOW BY BREAKDOWN VEHICLE

Disconnect the propeller shaft from the axle to be trailed; this is necessary as the vehicle has a permanent four-wheel drive. If the front axle is to be trailed it will also be necessary to turn the starter steering lock key to position 1 to unlock the steering.

The steering wheel and/or linkage **MUST** be secured in a straight ahead position. The vehicle can then be attached to the breakdown vehicle and raised.

TRANSPORTING THE LAND ROVER ON A TRAILER - Fig. ST037

Lashing rings are available on the front and rear chassis members to facilitate the securing of the vehicle to a trailer.



ST037

